Drag Race DataMite Analyzer V3.2 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 vehicle, 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:

Tim and Deb Gillespie, a Super Gas race team, have been most helpful with suggestions and trying out new features and electronics.

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Chapter 1 Introduction

1.1 Overview of Features

The DataMite data logger packages by Performance Trends, Inc is a system to let racers, engine & chassis builders, and motorsports enthusiasts measure and optimize vehicle performance, especially for Drag Racing. The hardware comes in either a small 4 channel system or much larger 30 channel system, with many options to measure RPM, temperature, pressure, movement, acceleration rate, and more. The Drag Race DataMite Analyzer software 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 or vehicle modifications.

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

Basic Features:

- 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 vehicle, including Jr Dragsters, most any NHRA or IHRA classes, Funny Car or Top Dragster, street performance and motorcycles.
- User friendly, Windows interface, compatible with Windows 95, 98, Me, 2000 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 time or distance.
- Graphing features include cursor to pin-point values, overlaying runs, zooming and shifting, and more.
- Automatic finding and time aligning of runs.
- Record and save basic information about each run like weather, ET, MPH, comments, etc.

Added Features for Pro Version

- A full Log Book is added so you can record all types of details about each run, like opponent, your lane, reaction time, segment times, tire pressure, clutch or converter specs, shock and spring settings, and much more.
- Record 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.
- Compare more graphs on the screen.
- Write ASCII files for importing data into other computer programs.
- Filter (find) past tests based on certain criteria, like ET, Track or Event, dates, 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 Pentium computer running Windows 95, 98, Me, 2000 or NT (or 100% compatible).
- 64 Meg of RAM.
- Approximately 10 Megabyte of disk space. (More is required for storing large #s of tests.)

Many terms used by the Drag Race 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 Drag Race DataMite Analyzer.

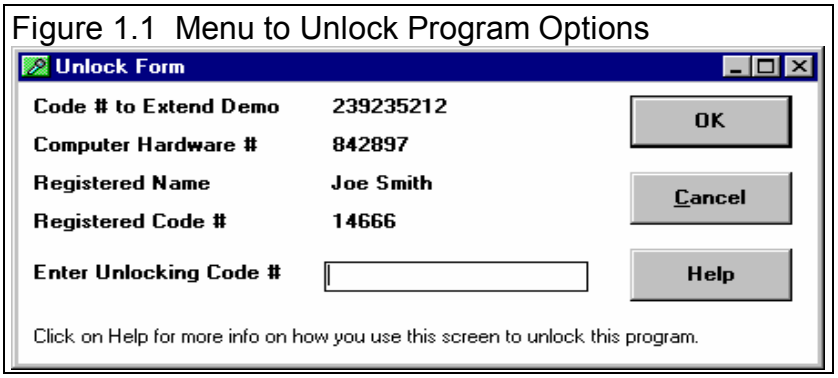
Occasionally it will be necessary to identify "typos" in the manual, known "bugs" and their "fixes", etc. which were not known at the time of publication. These will be identified in a file called README.DOC in the Drag Race DataMite Analyzer directory or folder. This file can be displayed right in the 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 Drag Race 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 your vehicle. This is covered in Appendix 2.

> ***If you are not familiar with proper safety precautions when working on engines or vehicles, HAVE A QUALIFIED MECHANIC OR ENGINE BUILDER HELP YOU. Drag Racing and testing can be dangerous. Vehicle components 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. Anticipate that the engine or vehicle component can fail and you will cut down on the chances they ever will.***

The Drag Race DataMite Analyzer has features which estimate the vehicle's performance based recorded data, some user input and assumptions. These estimates can be used for analysis of performance on the race track or on the street. However, these assumptions (like knowing the friction losses in the drivetrain, accurately knowing the vehicle's rotating 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 (not calculated) data and see if that looks correct. See Appendix 3 on Troubleshooting.
- If the Raw 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 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. (Remember, 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.)

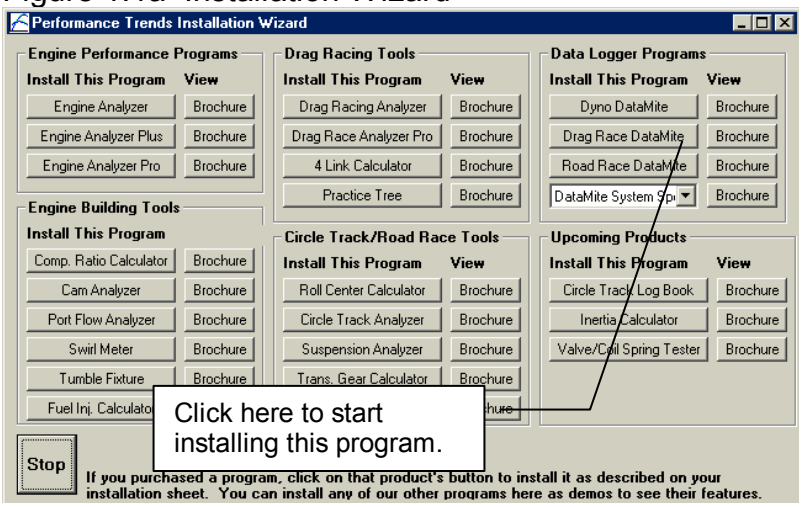
Please also read the Warranty and Warning at the beginning of this manual and on the diskette envelope.

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

1.4 Getting Started (Installation)

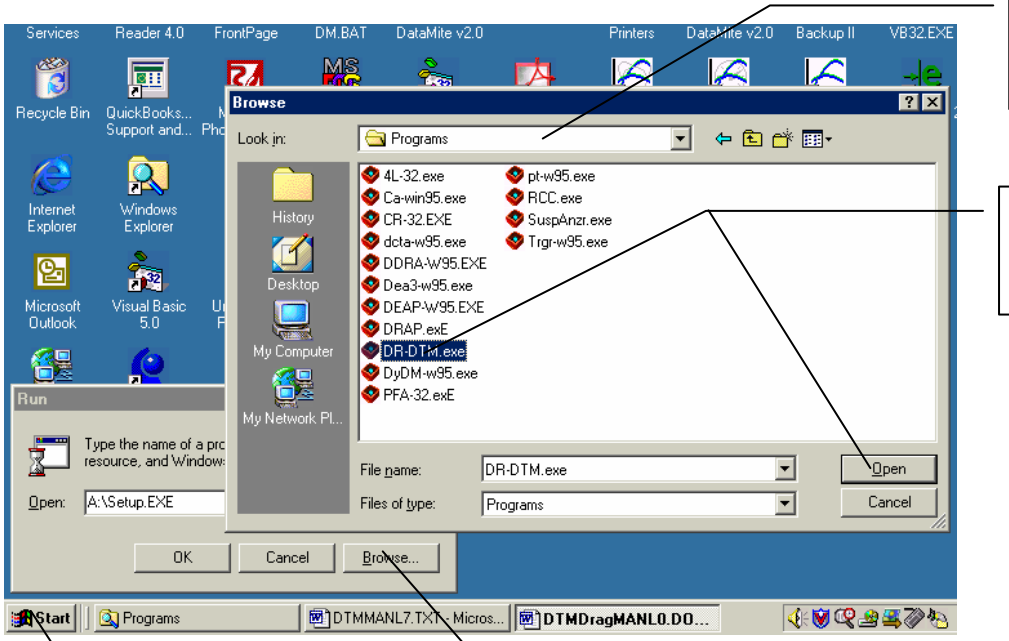
You must install the Drag Race DataMite Analyzer from the CD to a hard drive before it will run. To do this, generally you can simply put the CD in the CD drive and close the door. The installation program should start automatically, bringing up the Performance Trends Installation Wizard. This program can install most any of our products in Demo mode, including the Drag Race DataMite you just purchased. Select (click on) the button for Drag Race DataMite and the installation will begin.

Figure 1.1a Installation Wizard



If you have some problems or error messages during the start up of the Installation Wizard, you can possibly bypass these problems by running the Drag Race DataMite installation directly. This is done by clicking on Start, then Run, then Browse. In the Browse window, you will look for your CD rom drive, the drive with the Drag Race DataMite CD. Double click on it to display its contents, which should included a yellow folder called Programs. Double click on Programs to display its contents, which includes the individual product installation programs, including DR-DTM.EXE. Click on this file to highlight it, then click on Open, then click on OK when returned to the Run screen.

Figure 1.1b Bypassing the Installation Wizard



Entering Registered Owner's Name:

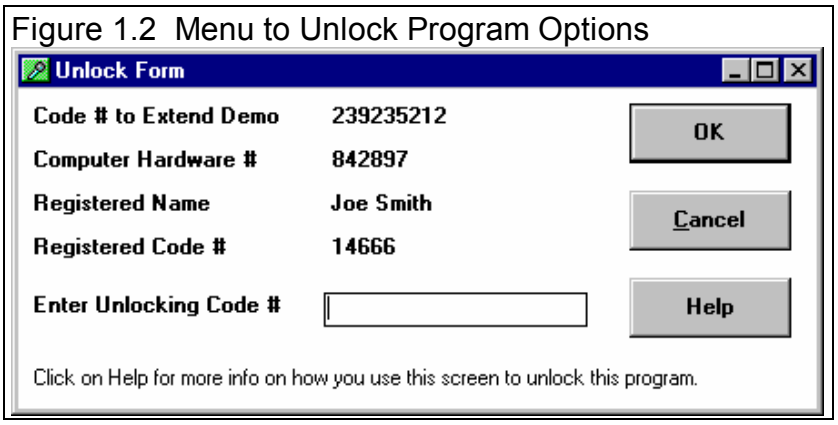
The first time you run the Drag Race DataMite Analyzer, you will be asked to enter your name as the Registered Owner. During this first session, you can modify it until you are satisfied. Once you accept the name, the computer will generate a Registered Code # based on the name. To be eligible for Tech 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 Drag Race DataMite Analyzer at the Main Screen to review your name and code # .

Unlocking Program Options:

The Drag Race 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***.

Figure 1.2 Menu to Unlock Program Options



Sometime during those 10 days, you should 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.

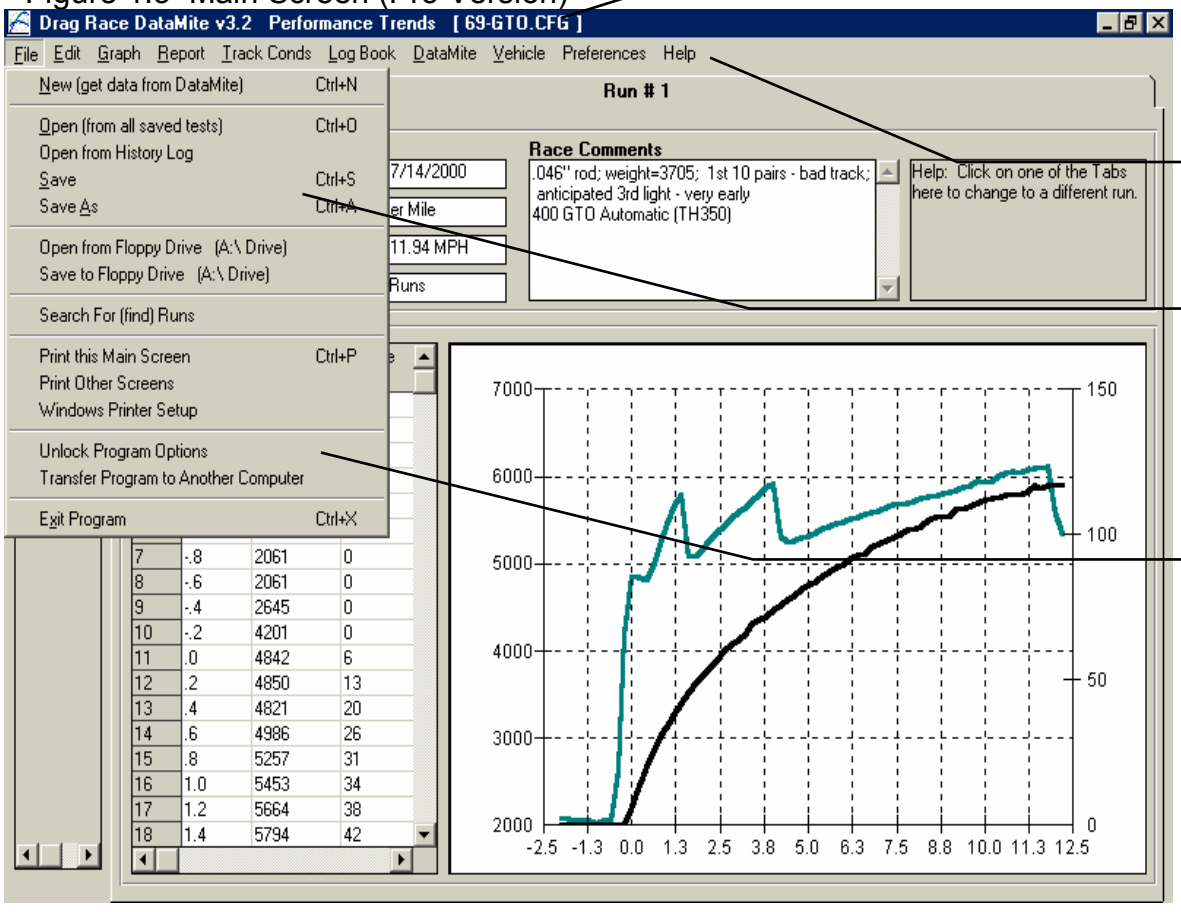
Important: In the 10 day Demo mode, all features work as in the working version. Therefore you do not need to immediately unlock it before you use it. Then, even after 10 days, you can still call for an unlock code. Its just that after 10 days, the program will not do anything other than let you unlock it.

1.5 Example to Get You Going

To start the Drag Race DataMite Analyzer, click on Start, then Programs, then Performance Trends, and then Drag Race DataMite Analyzer (or click on the Drag Race 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 drag race run loaded and displayed. This is for the last drag race run 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 [ ] , 69-GTO.CFG shown in Figure 1.3 .

Figure 1.3 Main Screen (Pro Version)



Name of current vehicle you are working with

Menu Commands

Click on File, then choose from different Save or Open options

Click on Unlock Program Options to obtain codes to give to Performance Trends to permanently unlock the program (take out of the 10 day demo mode).

From this Main Screen, you can:

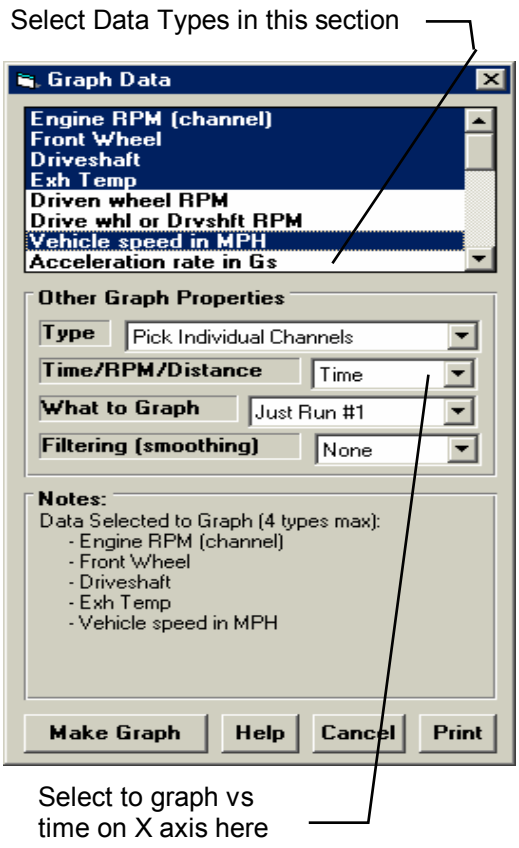
- Choose to review your options by clicking on the menu items at the top of the screen.
- Open or save a file of test results and specs by clicking on File in the upper left corner, and then the Open or Save commands.
- Edit or review test data, settings or comments for the file you are currently working 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.
- 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.

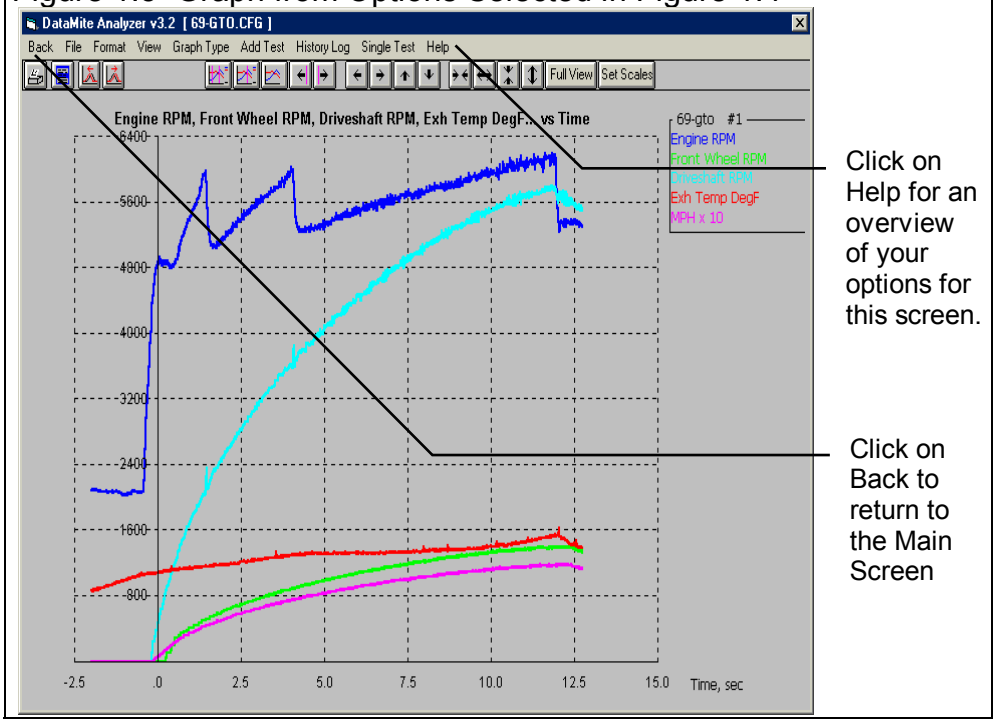
To get started, let's try a couple of Menu commands. Click on the Graph menu command to open up the graph options menu shown in Figure 1.4. The graph settings shown in Figure 1.4 are for some recorded and calculated (MPH calculated from front wheel RPM) drag racing data vs time .

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



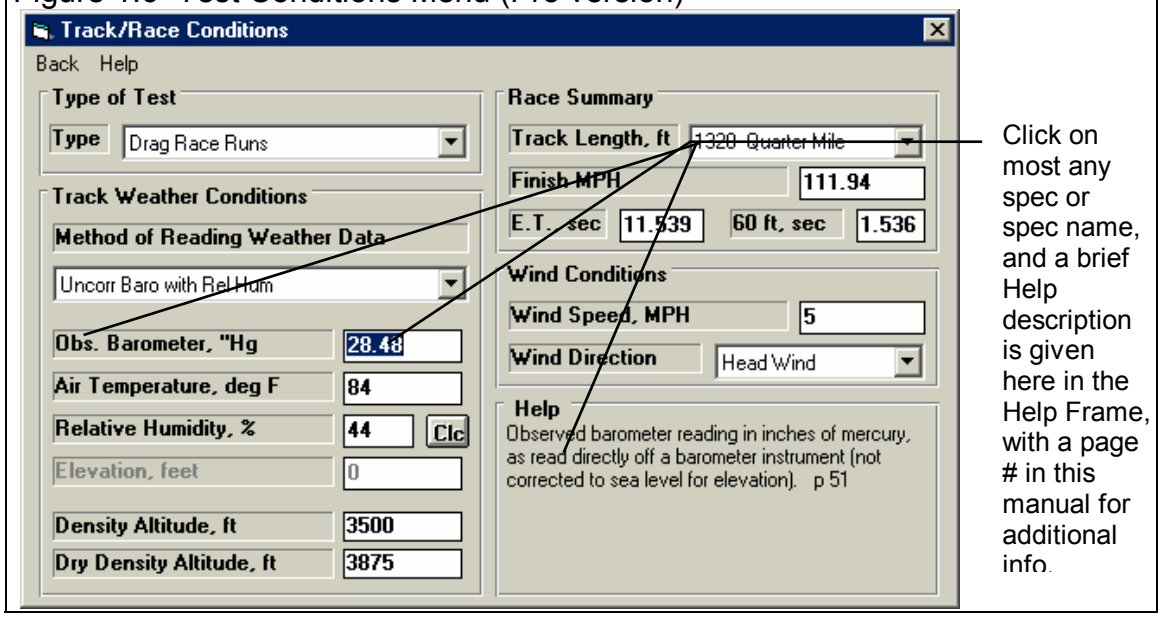
A Test File is actually made up of 3 files:

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)



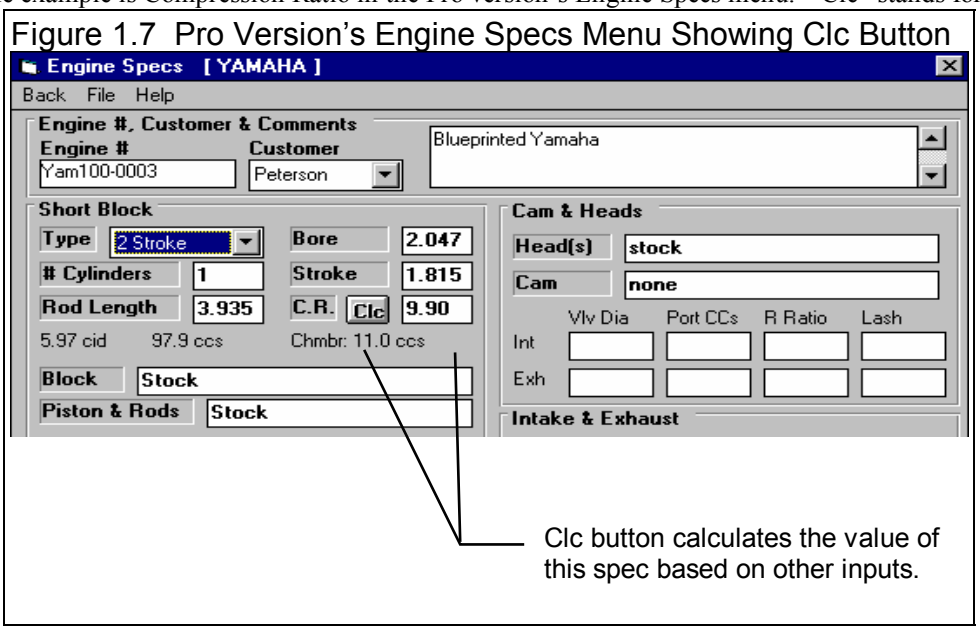
This is explained in Section 3.5 "Data Libraries". Click on the Test Conditions command to obtain a menu as shown in Figure 1.6.

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



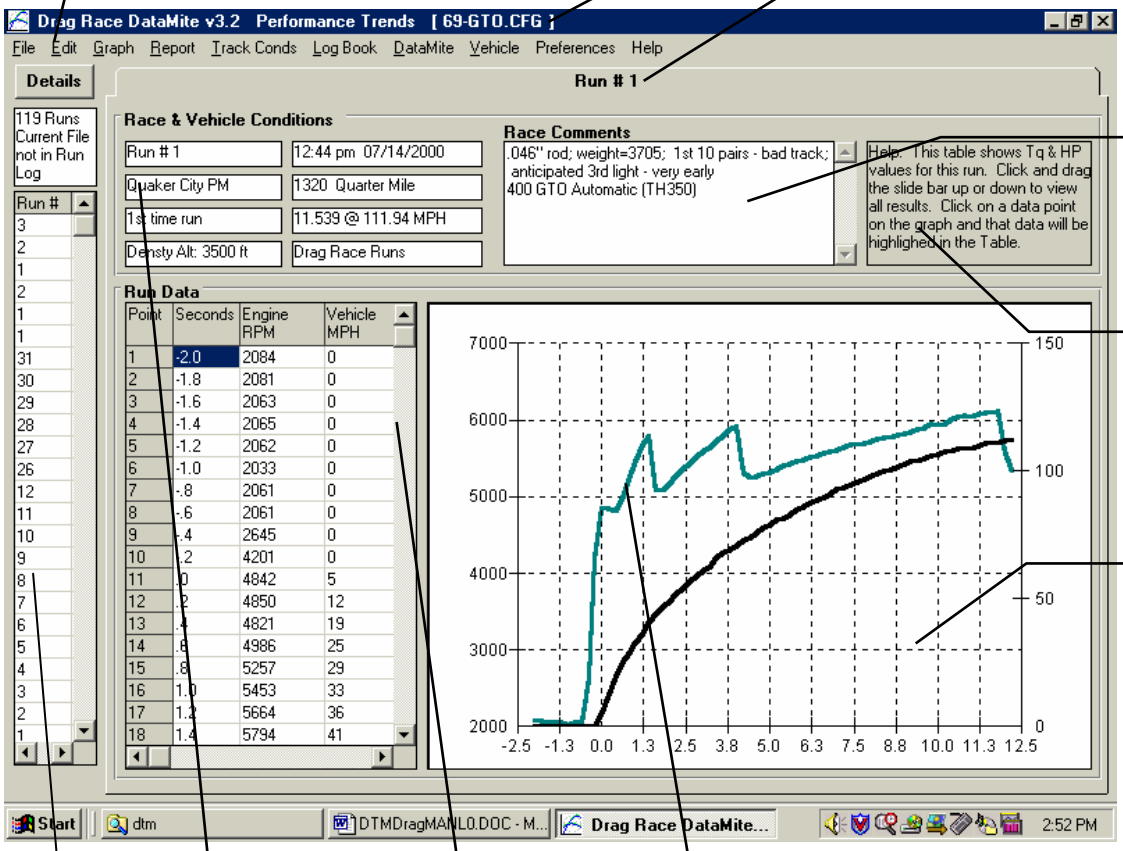
Once you feel comfortable changing specifications in the various menus and making various graphs and reports, read Section 3.5 of this manual called Data Libraries to learn how to save tests or recall tests which have been previously saved. Then you will know all the basic commands to operate the program. 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 Drag Race 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



Name of Current Test File

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

Click on these tabs to switch between the different runs of a particular file.

Enter most any test comments here to keep notes about this head or test.

Move the mouse over an area on the screen, and a Help description of that item is given here.

This summary graph shows how RPM and MPH for current run. If more than 1 run in a test, they are graphed also, in gray for comparison.

You can click on a point on the graph line and that point will be highlighted in the test data grid.

Click on Slide Bars to display more Test Data, which may not be able to fit on the screen.

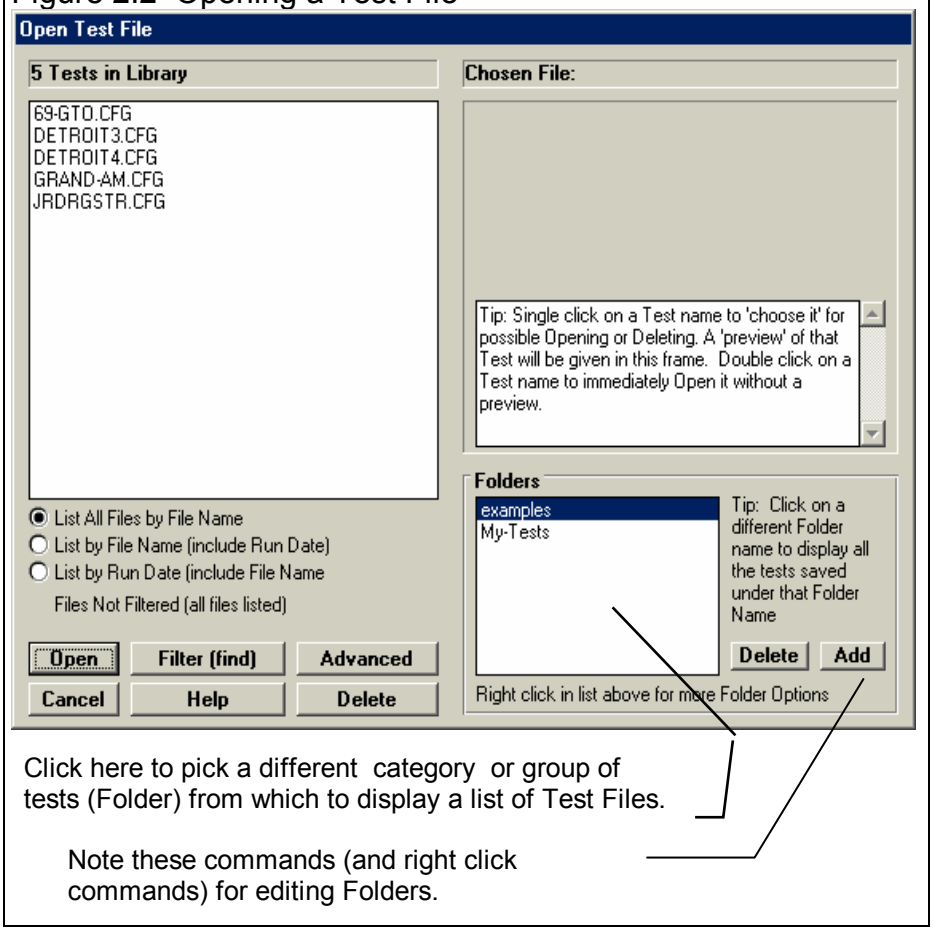
A summary of critical test settings is given here. Click on a setting to change it, or to bring up the menu where it can be changed (in this case shown, the Engine Specs menu).

Log book (Pro version only) lets you review various runs in the order you downloaded them, and open them up to this main screen. Click on Details for full view.

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



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 Recording Your First Drag race run:

It is recommend you becoming very familiar with the Drag Race 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 recording a run 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.

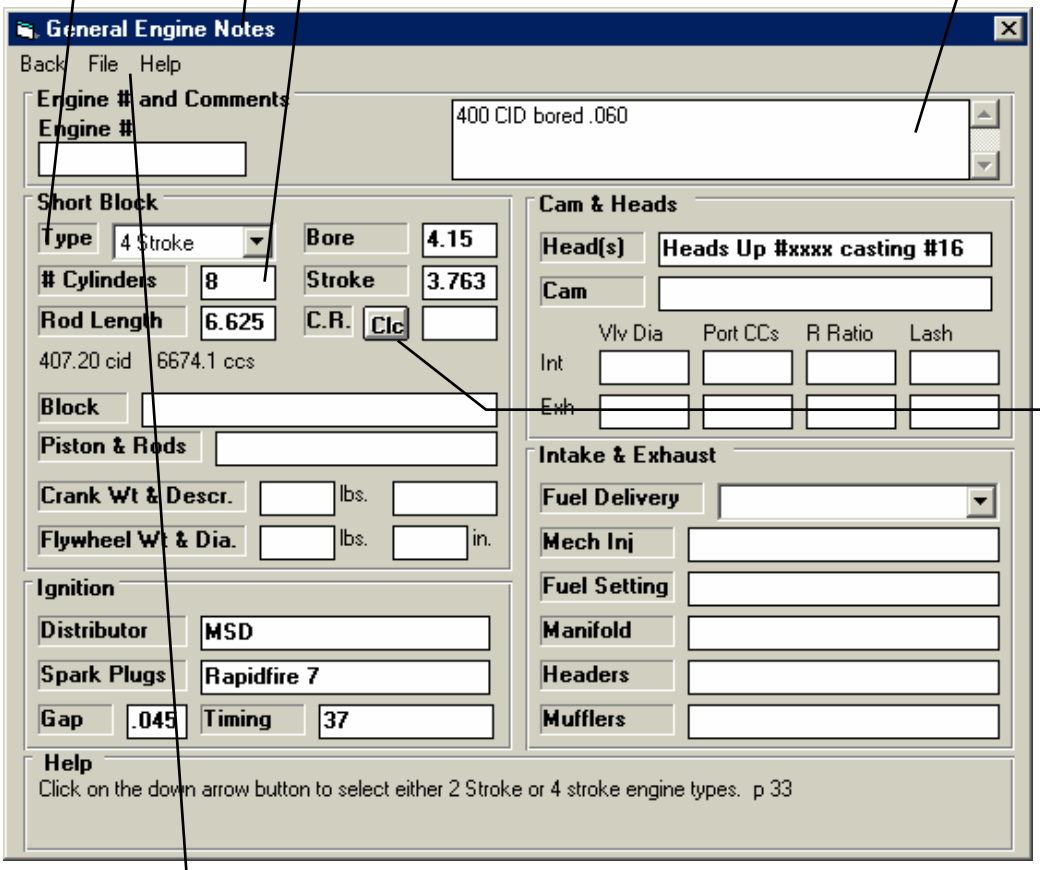
Figure 2.3, Explanation of Sections of Typical Menu (General Engine Specs menu from Log Book shown which is only available in the Pro version)

Names of component specs. Click on them for a description in the Help frame at the bottom of this screen.

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 drag race run.

Drop down combo box (not shown here). For some specs (like Track or Event in the Log Book) 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.

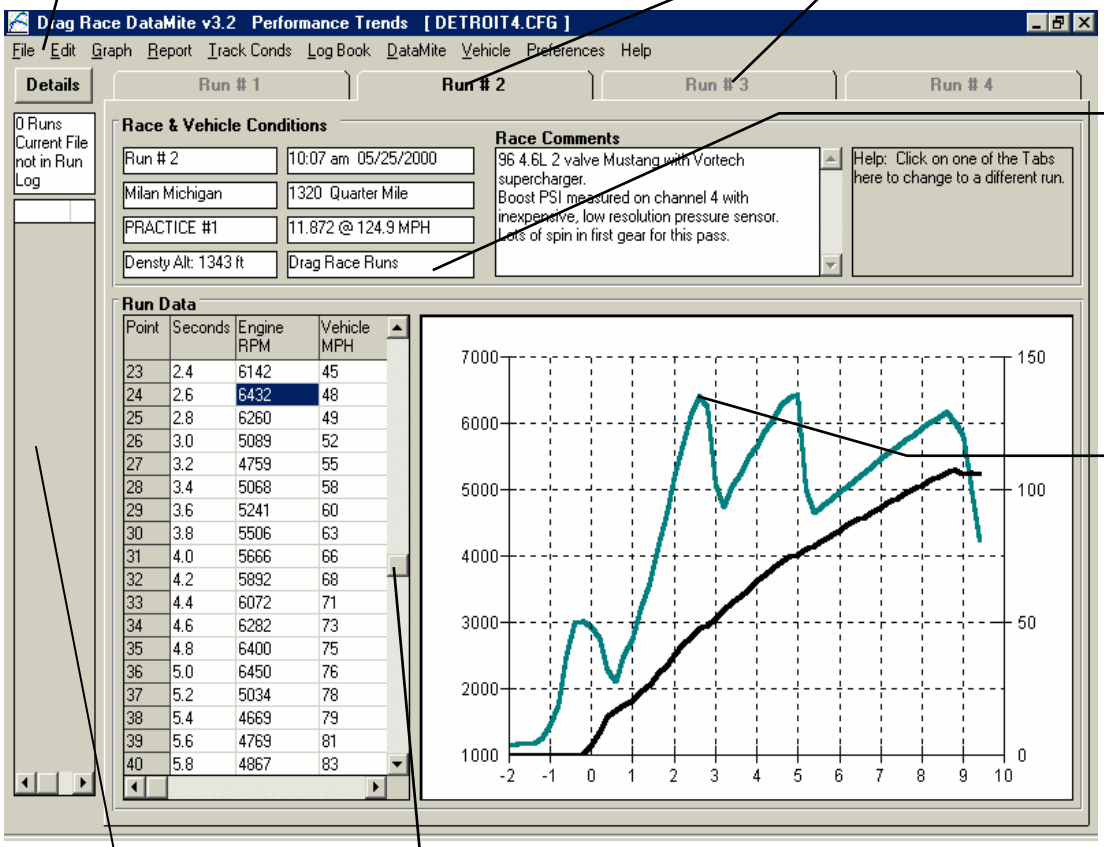
Some specs have a Clc (calculate) button, where you can either enter the specs directly (in this case the compression ratio) or click on the Clc button to calculate it from other inputs.

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 shows a summary of a run. It is not meant for detailed analysis or comparisons which can be done with Graphs or Reports. The Main Screen is made up of 6 basic sections as shown in Figure 2.4. These are discussed in the next 6 sections. The rest of this section gives an overview of how the Main Screen is organized.

Figure 2.4 Main Screen (Pro version)



2.1.1 Tabs

A test you download from the DataMite usually is for only 1 drag race run, however can be for as many runs as the DataMite's memory can store (possibly 10 or more). You move to different drag race 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 drag race run per test, click on Edit at the top of the Main Screen, and select Redetermine Beginning or End of Run. See Section 2.10, page 67.

2.1.2 Race and Vehicle Conds

Run # (Pro version only)
Track & Event (Pro version only)
Run Description (Pro version only)

Describes the run, track and event based on settings in the Log Book menu Click on this item to display the Log Book menu where this data is contained.

Density Altitude or Dry Density Altitude

Is the effective altitude 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. You can select either std or Dry Density Altitude in the Preferences section.

Run Time and Date

This records the time and date at the time you downloaded the test from the DataMite. When a drag race run 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.

Track Length

Is the length of the race track, either standard ¼ mile (1320 ft), 1/8 mile (660 ft) or some other length. Click on this item to display the Test Conditions menu where this data is contained.

ET and MPH

Is the length of the ET (elapsed time) and finish MPH for this particular run, which you have entered into the Test Conditions screen. Click on this item to display the Test Conditions menu where this data is contained.

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 “Englishtown” 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 Engine RPM and vehicle MPH graphed versus Time for the current run of this particular file (Figure 2.6). The increment of the time 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.

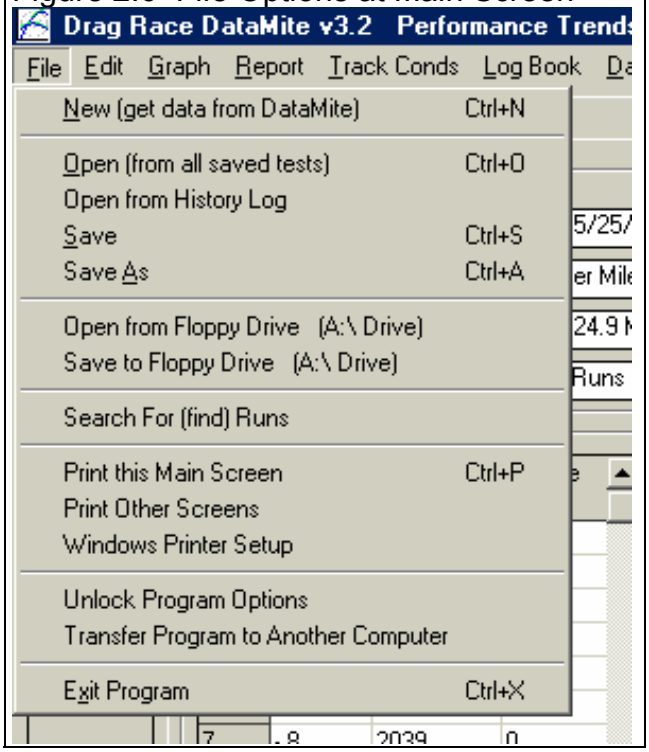
Seconds

Is the time for this row of data in seconds. The increment of the Seconds can be selected in the Preferences Menu, Section 2.2.

Engine RPM
Vehicle MPH

This is the engine RPM and vehicle speed in MPH for the corresponding times. These numbers are averaged for all the time data which is closer to this time than the time above or below it. For example, if the times are 2.0, 2.5, 3.0 etc, the RPM and MPH numbers given at 2.5 seconds RPM are for all times from 2.25 to 2.75 seconds.

Figure 2.6 File Options at Main Screen



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 run. 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.

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.)

Search For (find) Runs (Pro Version Only)

This option simply explains how to use the "Filter (find)" option in the Open (from all saved tests) command. After a brief explanation, you will be presented with the same screen as if you had clicked on Open (from all saved tests).

Print

Windows This Main Screen

Select this option to print the summary data shown on this main screen.

Print Other Screens

This option gives some general instructions on how to print data from other screens.

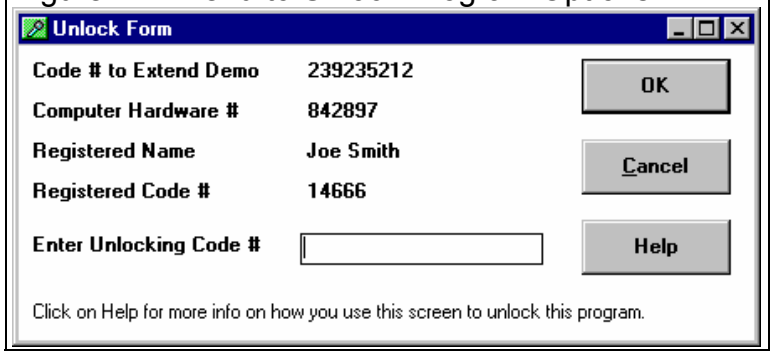
Windows Printer Setup

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

The Drag Race 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***.

Figure 2.7 Menu to Unlock Program Options



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 83.

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 75.

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 race conditions, like ET, MPH, 60 ft time, etc.

Log Book (Pro version only)

The Log Book command opens up the Log Book menu. There you can describe in detail the run you made. Most of the specs in this screen and the 5 additional screens you can get to through the Log Book screen are just spots to record info about this run. The Log Book is discussed in detail in Section 2.4, page 29.

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 35.***

Vehicle

The Vehicle command opens up the Vehicle Specs menu, where you can describe the vehicle you are running. These specs are critical for calculating information like acceleration rate, tire slip, clutch/converter slip, etc from the raw RPM data you are actually recording. Many of the specs in the Vehicle menu are critical for accurate calculated results, like tire slip, MPH, acceleration rate, etc. Be sure to read and understand the Vehicle Specs as discussed in detail in Section 2.6, page 47.

Preferences

Preferences let you customize the program for your needs and for your computer and printer. See Section 2.2, page 21.

Help

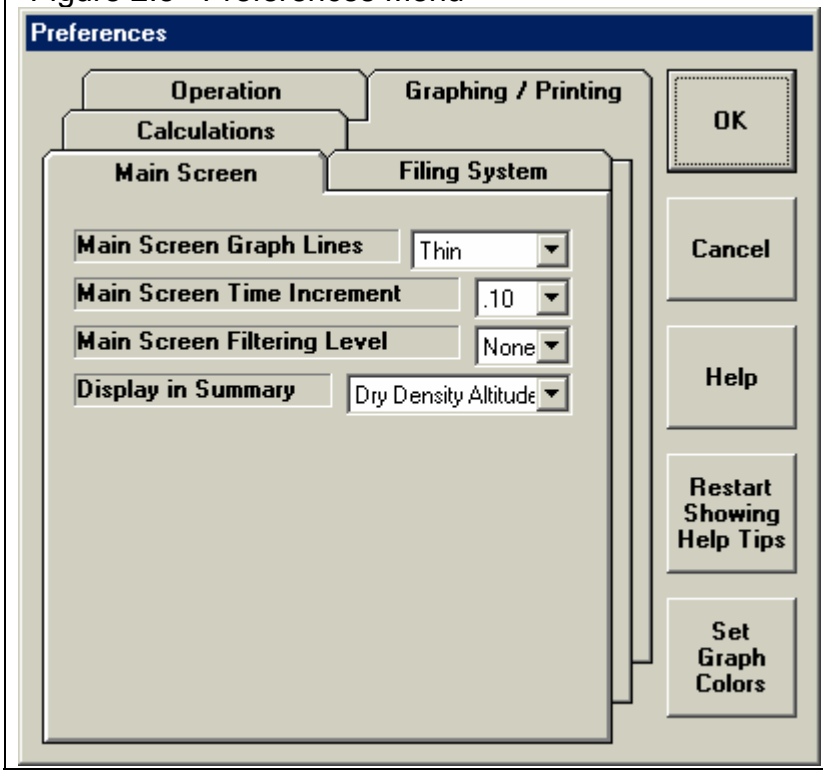
Click on Help for several options to help describe your options at the Main Screen, and for other information to help you understand how this program works.

2.1.6 Run Log

The Run Log is a chronological list of all tests as they have been downloaded from the DataMite. It is similar to the History Log and is explained in Section 3.9, page 113

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. There are 5 categories of settings, which you select by clicking on the different tabs. 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.

Main Screen Tab

Main Screen Graph Lines

This option lets you choose the line thickness of the summary graph of Engine RPM and MPH 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 and MPH reported on the Main Screen, much like the similar spec for Reports. The smaller this 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 and MPH data on the Main Screen, much like the similar spec for Reports. The higher the filtering, the less "jumpy" (more smooth) the Main Screen graphs.

Display in Summary

This spec lets you pick to display either the standard Density Altitude or Dry Density Altitude (which is corrected for humidity) on certain screens. It is recommended to use Dry Density Altitude, however many racers are used to the less accurate Density Altitude.

Filing System Tab

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.

Test Folder Name in Program

The Drag Race DataMite Analyzer saves tests under different folders (directories) under the main folder DTMDATA. Some users may prefer to have the 'Folder' be called 'Track' or 'Vehicle', depending how they choose to organize their tests. Your entry here of most any text up to 40 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.

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.

Calculations Tab

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.

Torque/HP Output

Pick the type of units for reporting torque and power in either Ft Lbs or NM (Newton Meters, metric) and Horsepower and Kw (kilowatts, metric).

Operation Tab

When Getting New Data from DataMite (Pro Version Only)
Automatically Filter Out Noise (Pro Version Only)

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 (Pro Version Only)

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.

Match Time Slip (Pro Version Only)

The DataMite can adjust your recorded data to be more accurate based on the ET and 60 ft times you have entered in the Test Conditions and/or Log Book screen. This option let you also turn off this feature. ***If you use this feature, you must be diligent about always entering accurate ETs and 60 ft times.***

Warn if Changing Run Numbers (Pro Version Only)

The DataMite program will generate Run Numbers based on the order you have downloaded them from DataMite and the current Run Number. If you change the Run Number in the Log Book screen, the program will warn that you may produce Run Numbers which are not in order and lead to confusion in the exact order of runs in the future. If this warning becomes bothersome, you can turn it off with this preference.

Auto. Check Other Com Ports

Choose Yes for this option and the DataMite software will always check all 4 likely Com ports on your computer if the DataMite can not be found. Set this to No, and the software will always use the Com Port specified in the DataMite screen. See Section 2.5.

Graphing / Printing

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.

Lap Top Graph Adjustment

Choose Yes and the graph screen is slightly more narrow. This ensures you can read the legend on the right side of the screen on some lap top screens.

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.

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.

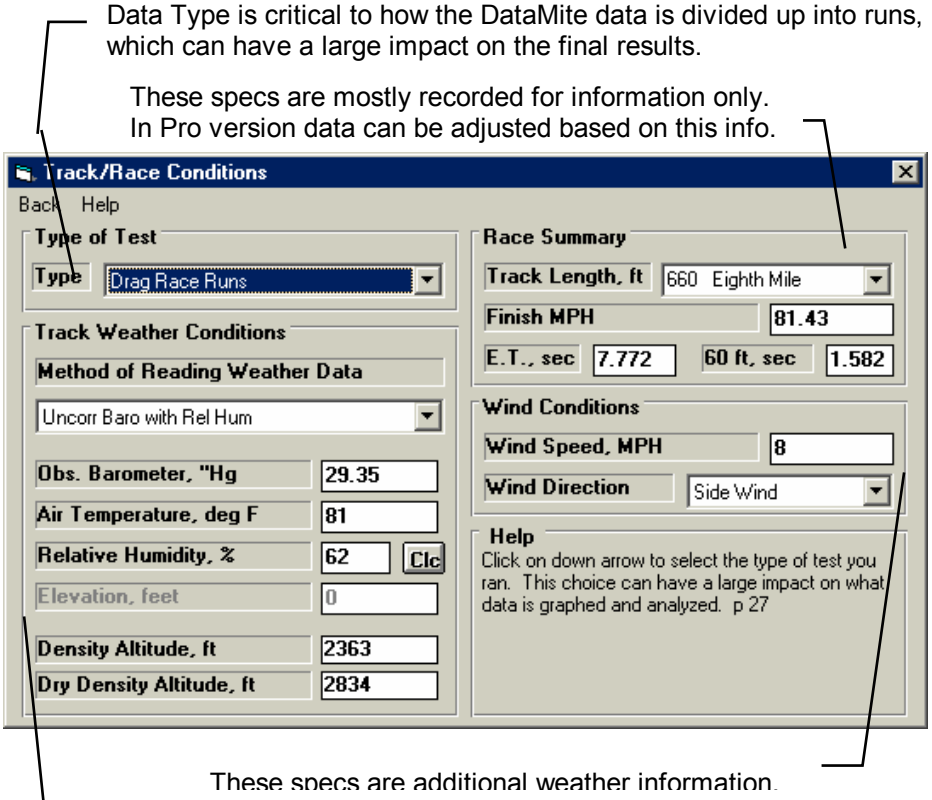
Printed Graph Width, % of Page

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.

2.3 Track Conds

The Track Conds let you record weather conditions and a summary of the race results. In the Pro version, these race results are also linked to info you enter in the Log Book and the actual DataMite recorded data can be "fine tuned" based on these results for better accuracy.

Figure 2.9 Track 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:

- Drag Race Runs
- Accel 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 other 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", or purchase one from Performance Trends to record weather information automatically. Be sure you read the Notes on Weather Conditions at the end of this section., page 27.

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 track.)

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. For example, at 600 ft, if the a barometer reported by at Radio weather report (Corrected Barometer) is 30.2 inches, you Observed Barometer on a weather station should be about 30.2 - .6 or 29.6 inches.

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 61.

> 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 60.

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 drag race runers 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 sells electronic weather stations to help eliminate any confusion, save time and improve accuracy.

Race Summary

Track Length, ft

Click on the down arrow button to select the length of the track, or type in most any number of feet for the track. In the Pro version, Quarter and Eighth mile choices allow for the DataMite program to correct the recorded data based on the ET and 60 ft times you have entered here.

Finish MPH

Enter the time slips finish MPH. This entry is for information only. No entry is required.

E.T., sec

Enter the time slip's finish E.T. (elapsed time). In the Pro version, this number is also loaded in the appropriate spot in the Log Book. If you have selected in Preferences to have the program "Match Time Slip", it will correct the DataMite's recorded data based on ET, this number can affect the recorded data also.

60 ft sec

Enter the time slip's 60 foot time. In the Pro version, this number is also loaded in the appropriate spot in the Log Book. If you have selected in Preferences to have the program "Match Time Slip", it will correct the DataMite's recorded data based on ET and 60 ft times, this number can affect the recorded data also.

Wind Conditions

Wind Speed, MPH

Enter the wind speed during the race in MPH. This entry is for information only. No entry is required.

Wind Direction

Choose a Enter the wind speed during the race in MPH. This entry is for information only. No entry is required.

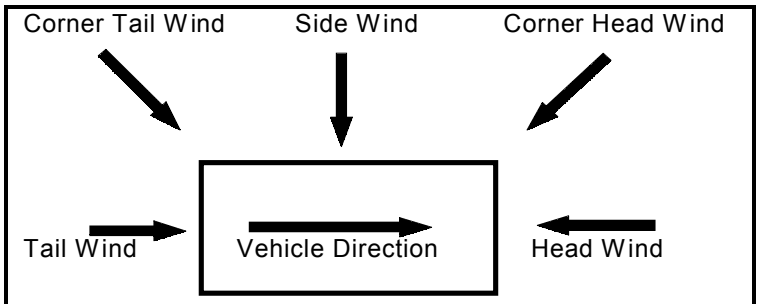
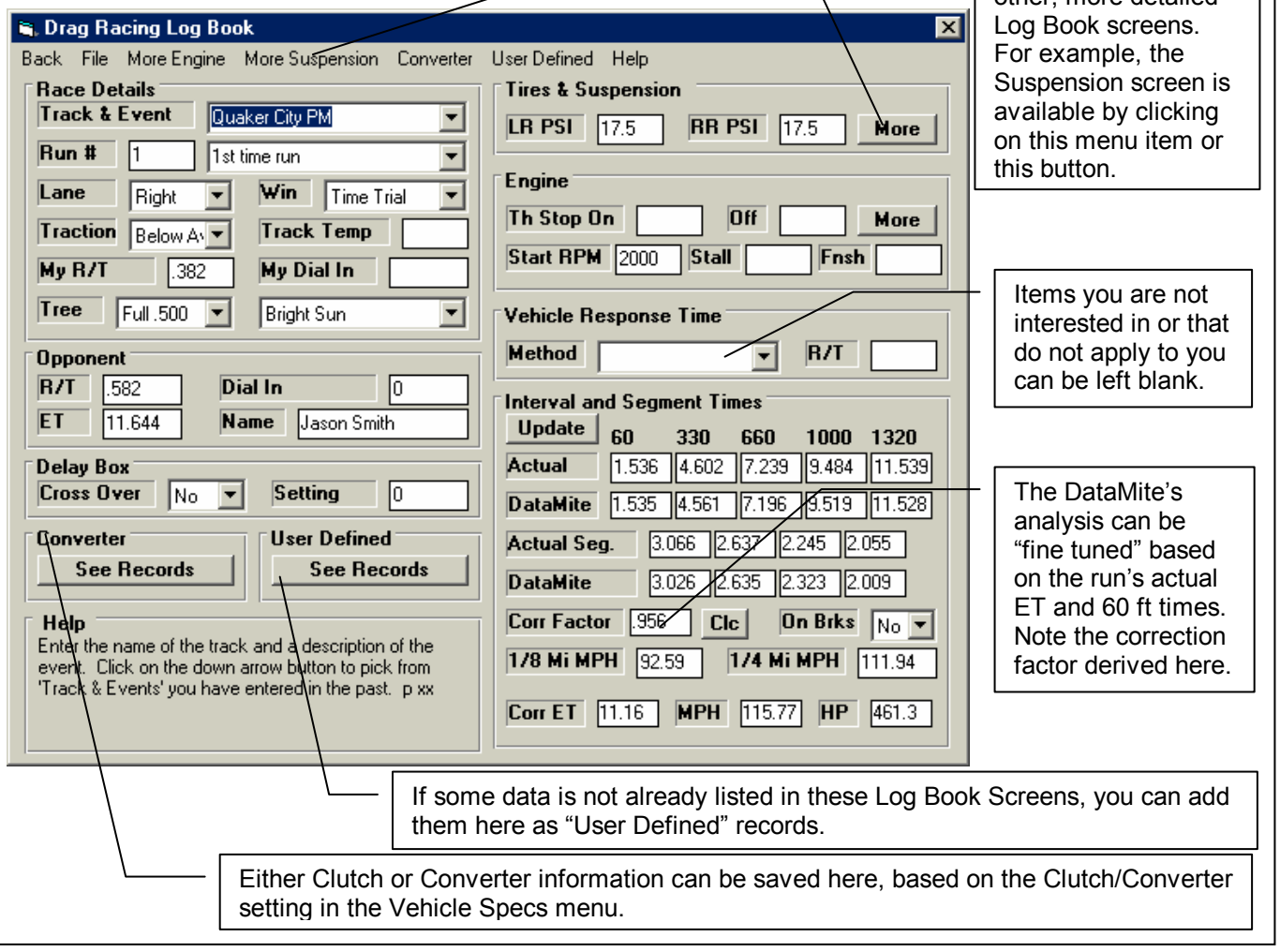


Figure 2.9 B

2.4 Log Book (Pro version only)

The Log Book lets you record additional data for each run, data not recorded by the DataMite recorder like ET and MPH (which you can record in the Track Conds screen), Track and Event Name, which lane you were in, your opponent, tire pressures, suspension settings, engine specs and checks, and much more. Since most all these entries are for your information only (not used by the DataMite software for calculations), you need to enter only the information you are interested in. You can leave most all entries blank if you wish.

Figure 2.10 Main Log Book Screen



From the main Log Book screen shown above, you can branch out to 6 other Log Book Details screens shown in this section. Some important notes about the Log Book entries include:

- There is only 1 set of Log Book entries for each data file. The DataMite lets you record from 1 to several passes before you have to download the data to the computer. During downloading the program finds the beginning and end of each run. If more than 1 run is found, the program gives you the option for breaking each run into a separate test file. If

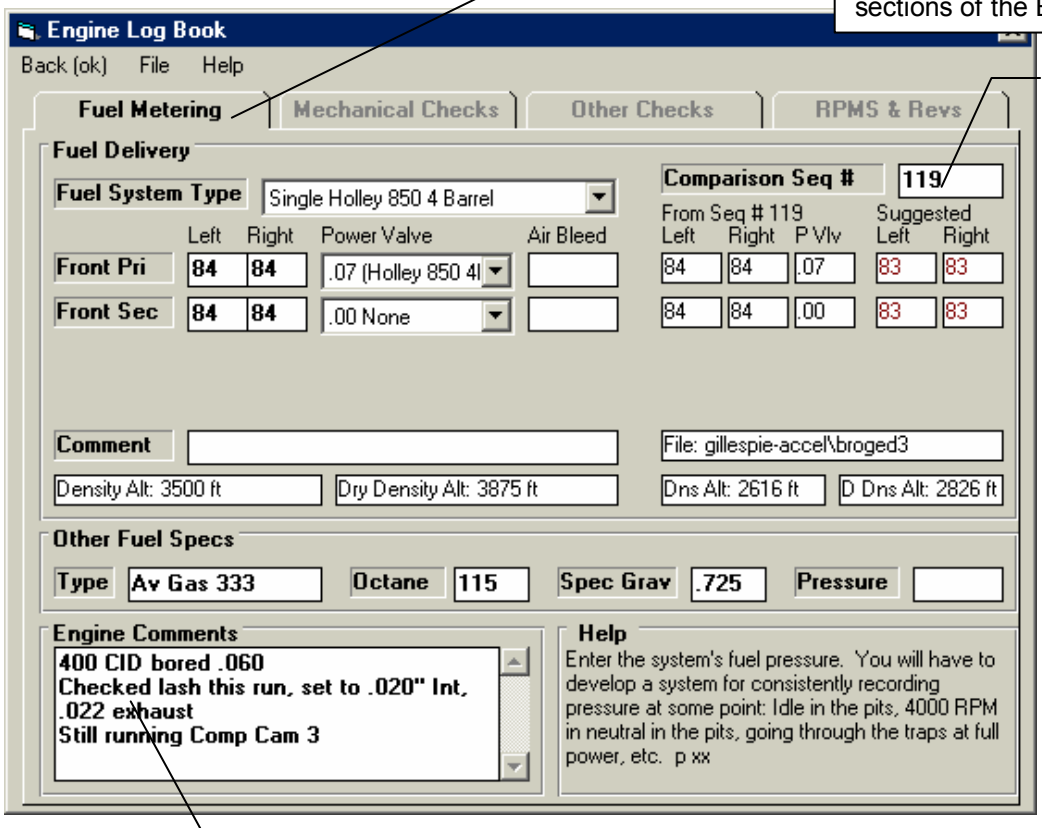
you say Yes (which is recommended by the program), then you will have a separate set of Log Book screens for each run or pass. If you keep all runs together, then you still have only 1 set of Log Book screens, and the data you enter in the Log Book screens could be for any of the several runs. This would be quite confusing.

- The Log Book entries are for your information only. You need not enter anything in the Log Book ever.
- The entries of ET, 60 ft time and MPH in the Log Book main screen are linked to the ET, 60 ft time and MPH entries in the Track Conds screen. If you change them in one screen, they are automatically changed in the other.
- The Log Book screens can be printed with reports, and you can select which screens. See Section 3.4, page 97.
- The Log Book screens can be searched using the Filter (find) option when you use the "Open (from all saved tests)" option after clicking on File at the upper left of the Main Screen. For example, you may want to search for an upcoming opponent to check their Reaction Times, search for what tire pressure you used at a particular track, etc.
- As with most all screens, when you click on an input, you are given a description of that input in the "Help" box, usually at the bottom of the screen. For this reason, and because most inputs here are for info only (not critical), each input is not listed and described in this section.

Engine Details

The Engine Details screen shown in Figure 2.11 is obtained by clicking on More Engine at the top of the main Log Book screen, then choosing Engine Details. There are 4 tabs at the top which let you choose any of 4 categories of inputs.

Figure 2.11 Engine Details Log Book Screen



Click on these 4 tabs for various sections of the Engine Log Book.

Jet Suggestions are only possible if you enter the weather conditions for your runs, you have selected a "Comparison" or "Baseline" run (in this case Sequence # 119 in the Run Log down the left side of the Main Screen), and the Fuel System settings for the current run and the Baseline run are the same. See explanation in this section.

Engine Comments can be most anything you want, but are kept separate from the Main comments on the Main Screen.

Fuel Metering

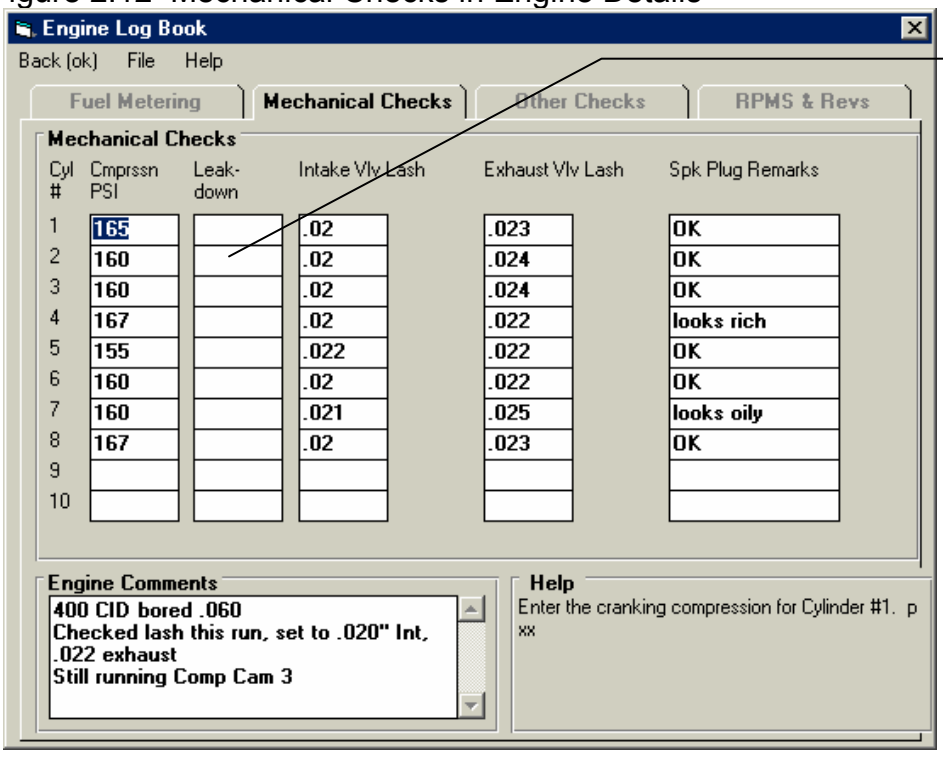
Most all Fuel Metering inputs are for info only. However, if you want the program to accurately recommend different jet sizes for weather changes, these inputs are critical. Jet suggestions are determined by you picking one particular run (the "Comparison" run) that you always want to match. The assumption is that this run had the carb jetted exactly correct for that run's weather conditions, and this is the jetting you want the program to match for different weather conditions.

Jet Suggestions are only possible if:

- You enter the correct weather conditions for the current run and some "Comparison" run.
- You have selected a "Comparison" or "Baseline" run (in this case Sequence # 119 in the Run Log). The Run Log is the list of runs down the left side of the Main Screen. You can click on the details button at the top of this list to see more details about each run. One of the columns is called "Sequence Number" and is the programs assignment of a sequential number for each run downloaded from the DataMite. This number should be unique for each run. The file name for this Sequence # is also displayed in the "File:" box. See Section 3.9, Run Log, page 113 for information of the Sequence #.
- The Fuel System settings (type of carb, for example) for the current run and the Baseline run are the same.

Figure 2.11 shows that Comparison run #119 had 84 jets (Holley Jet #) with a Dry Density Altitude of 2826 ft. For the current run, you kept the 84 jets when you ran in a Dry Density Altitude of 3875 ft, but the program would have recommended 83 jets instead.

Figure 2.12 Mechanical Checks in Engine Details



At the time of printing this manual, the RPMS & Revs section is available for you to make entries, but the program is not keeping totaling up time or runs for different parts.

Figure 2.13 Other Checks in Engine Details

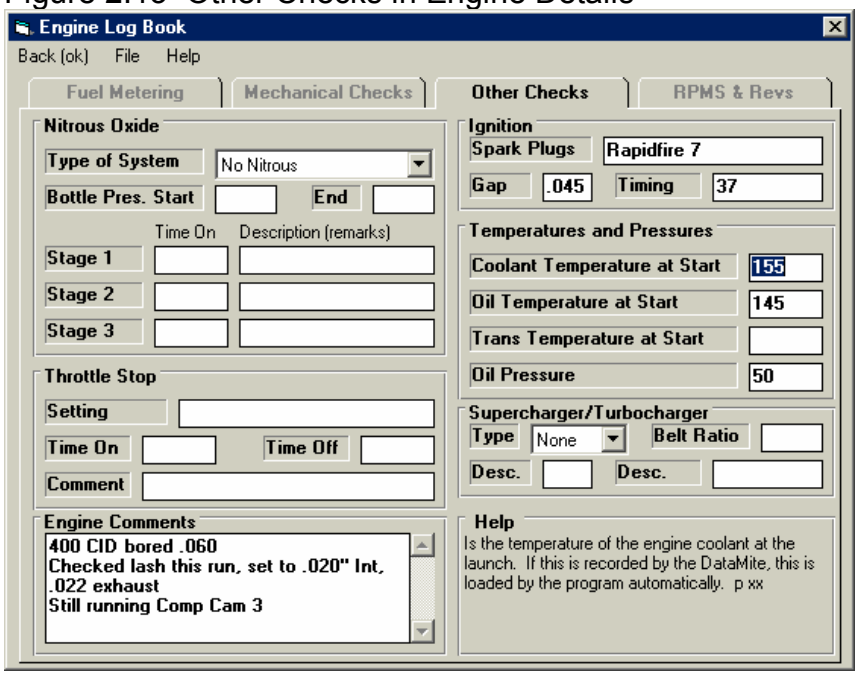
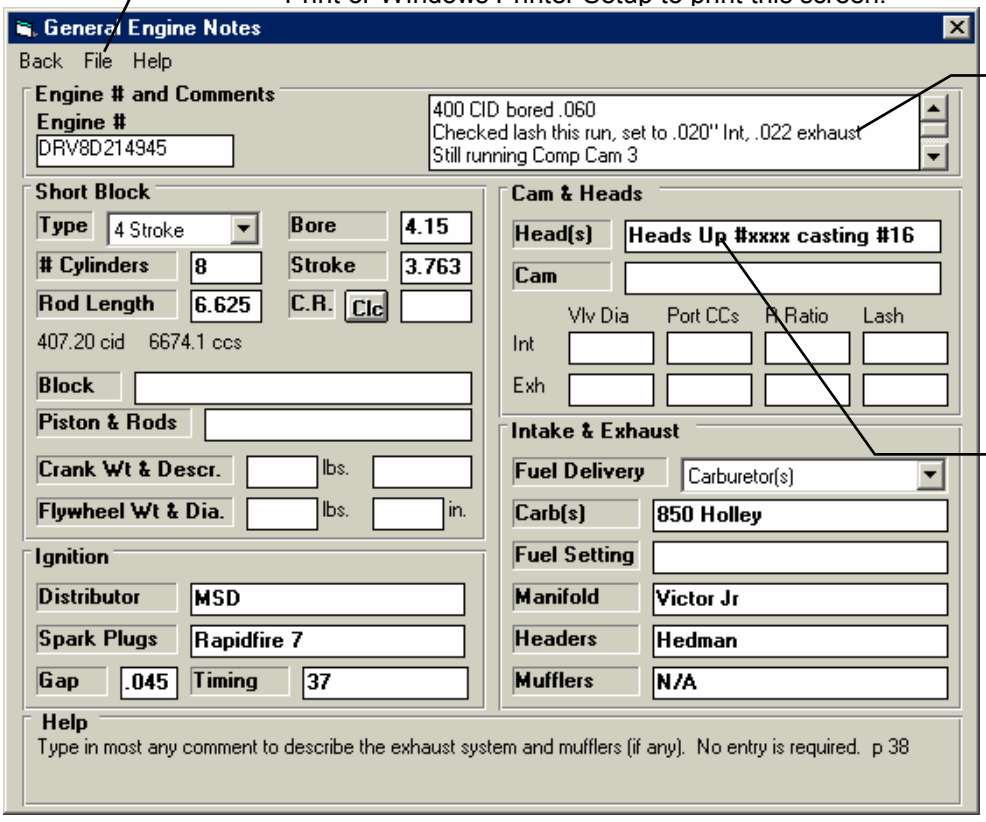


Figure 2.14 General Engine Description Screen

Click on File, then:

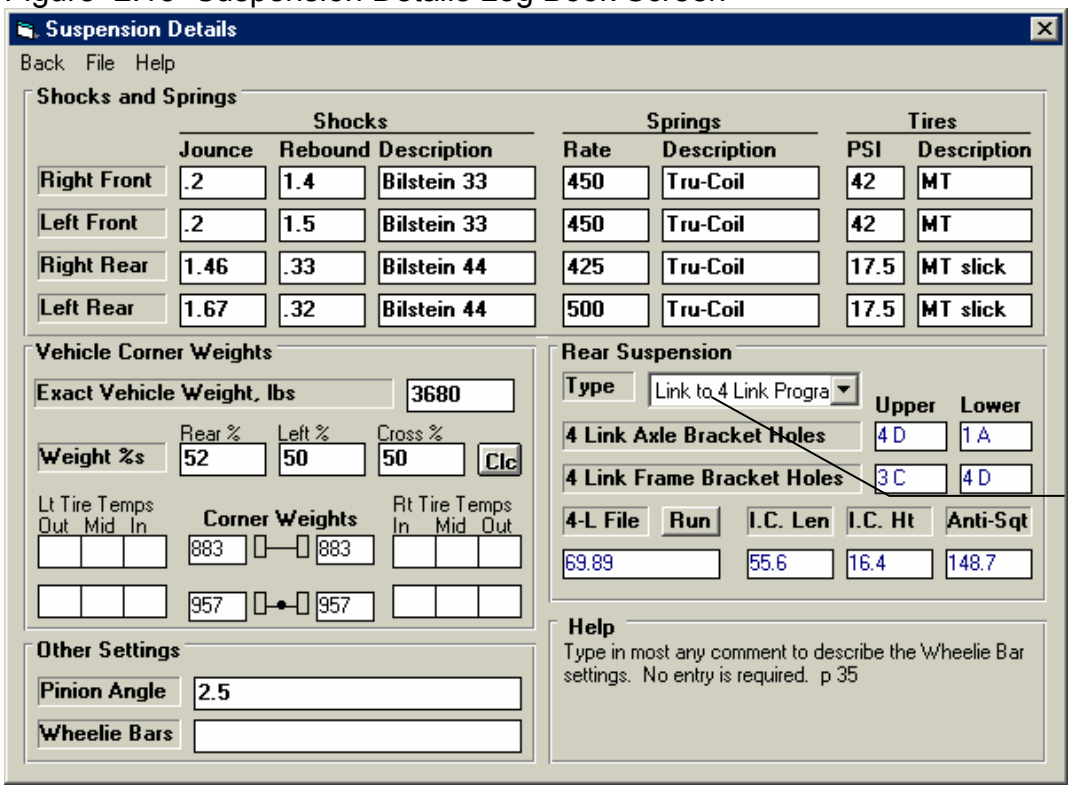
- New to blank out this menu.
- Print or Windows Printer Setup to print this screen.



Engine Comments (different than main Comments at the main screen) lets you describe the engine itself. These are the same comments displayed in the Engine Details screens.

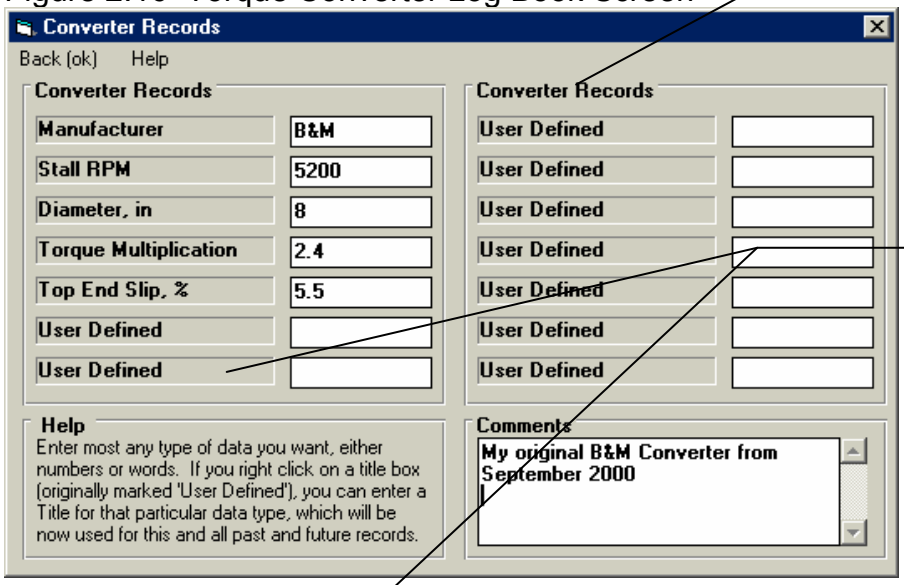
Most specs in this screen are for recording information only, and are not used for any calculations. You can enter most anything you want, or leave them blank.

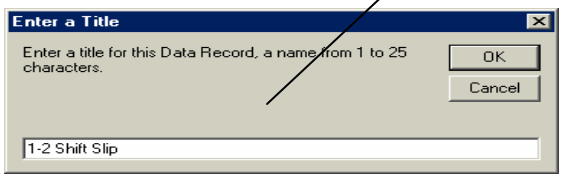
Figure 2.15 Suspension Details Log Book Screen



You can link to our 4 Link Calculator program to have Anti-Squat calculated for you here.

Figure 2.16 Torque Converter Log Book Screen

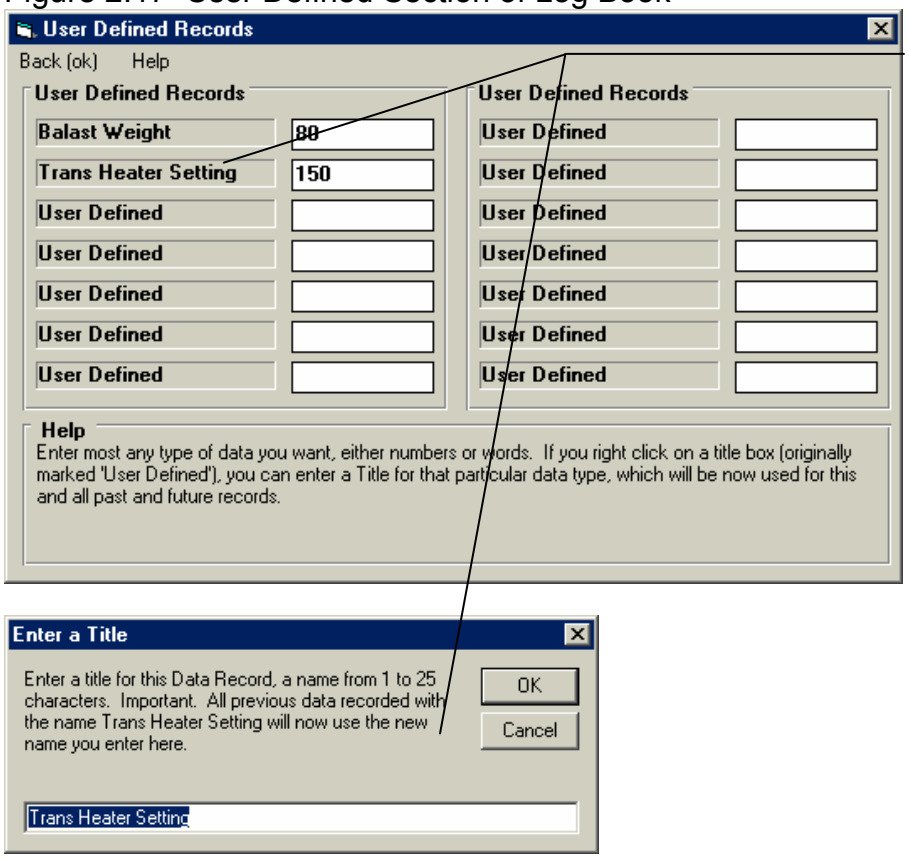




If in Vehicle Specs you had specified the transmission as having a clutch, this screen would be displaying various clutch inputs, plus some "User Defined" fields.

You can right click on any of these "User Defined" input names and the program will ask what name you want to call this input. This input will now be called, say the "1-2 Shift Slip" ***for all past and future records***. Note, that if you previously called this field "Fluid Type", and used ratings from A-G, the data you entered for previous runs of letters from A-G will still be displayed. Its just that the name will now be "1-2 Shift Slip".

Figure 2.17 User Defined Section of Log Book



You can right click on any of these "User Defined" input names and the program will ask what name you want to call this input. This input will now be called, say the "Trans Heater Setting" ***for all past and future records***. Note, that if you previously called this field "Trans Fluid Type", and used ratings from A-G, the data you entered for previous runs of letters from A-G will still be displayed. Its just that the name will now be "Trans Heater Setting".

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.

Master DataMite Specs

Figure 2.18 Typical Note on Master DataMite Specs

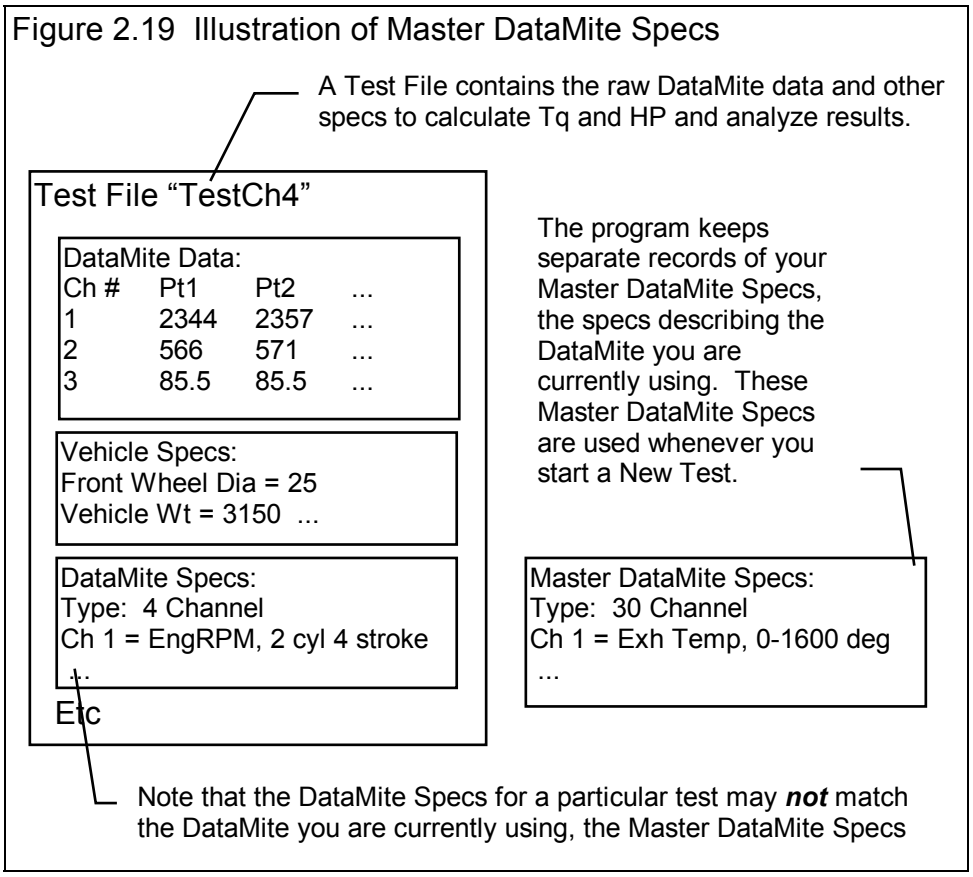
A critical concept for DataMite Specs is the idea of the Master DataMite Specs. When you download data from the DataMite, you are using a particular DataMite Setup with certain sensors and calibrations. (A calibration describes how the DataMite should convert a sensor input into useful information, like 2.2 volts is 34 ft lbs of torque.) When you save the drag race run, 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 30 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.

If you go into the DataMite Specs menu, you will likely get a message shown in Figure 2.18, saying that the DataMite Specs for TestCh4 do not match your ***Master DataMite Specs***, the specs for your current DataMite II 30 Channel system. You may ask "What are ***Master DataMite Specs?"***

The program keeps track of any changes to DataMite Specs, asking

Figure 2.19 Illustration of Master DataMite Specs

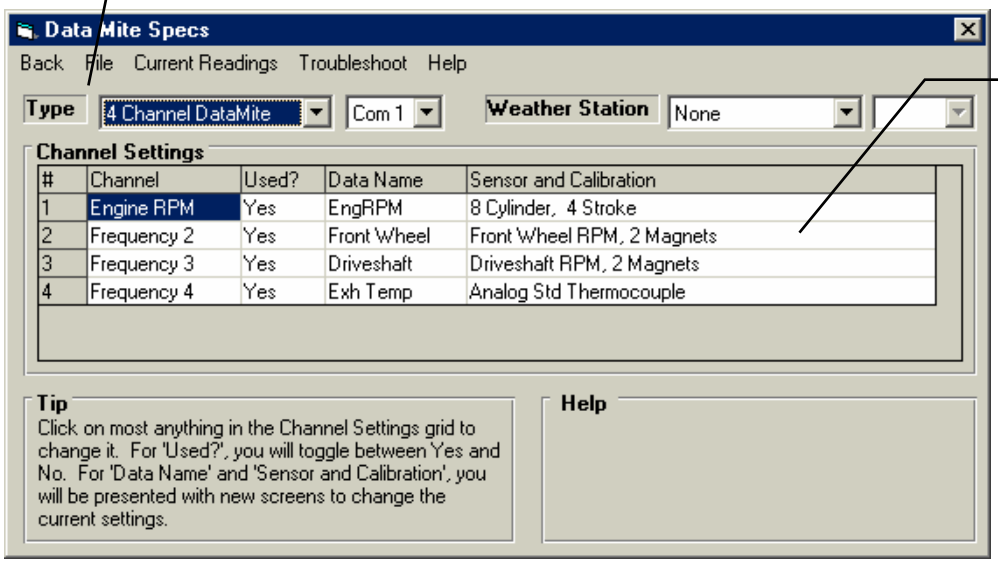


you if these changes should only apply to the DataMite Specs for a particular drag race run, or if these changes represent your actual DataMite, the Master DataMite specs. Whenever, you start a new test, either based on a previous test or starting completely blank, the Master DataMite Specs are used. Whenever you open an old test file, the DataMite specs used for that particular test are used.

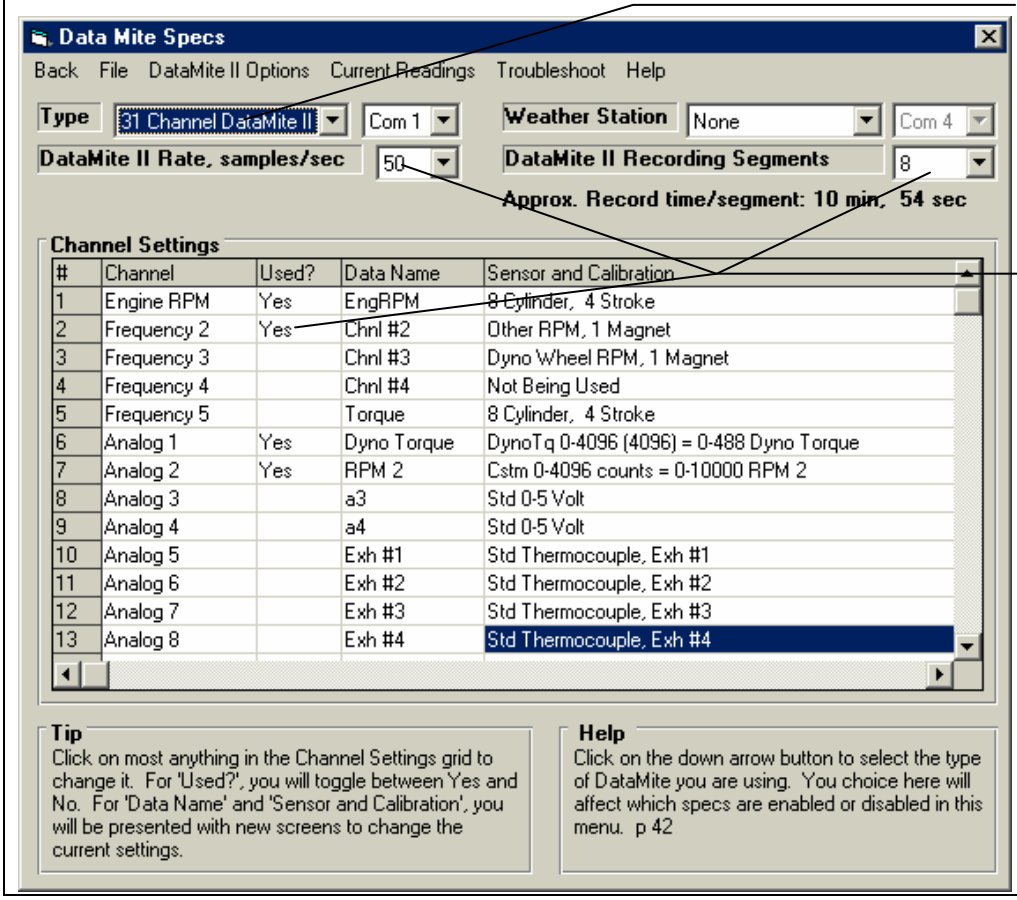
Figure 2.20 DataMite Specs Menu

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 2.21 and 2.22.



If you specify the 30 channel DataMite II, you have many more settings.

The combination of Rate, number of active channels (Used set to Yes), and Segments determine the approximate recording time for each segment.

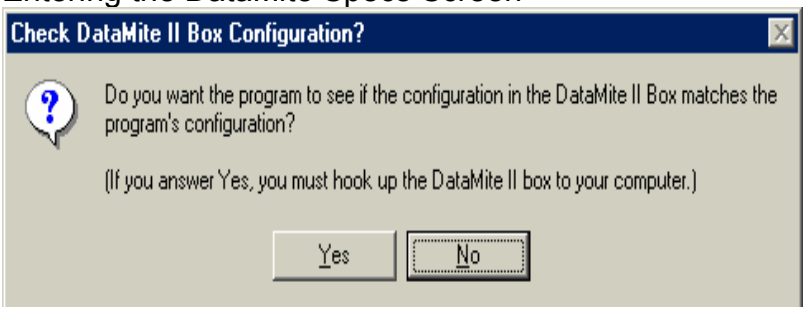
Type

Is the type of DataMite you are using, either 3 Channel, 4 Channel or the DataMite II 30 Channel system. You choice here will affect how the Channel Settings grid is displayed and how you can specify various channel #s. Differences between DataMite and DataMite II are further discusses at the end of this section and in Appendix 3.

One major difference between the DataMite and DataMite II is the DataMite II box needs information from the DataMite program on your computer to work correctly. This is information like, sample rate, # segments, which channels are being used, etc. When you first enter the DataMite specs screen, the program asks the question shown in Figure 2.20B. This is to help ensure the program's configuration matches the DataMite II box's configuration.

In addition, when you make changes in this DataMite screen, the program will ask if you want these changes saved (sent to) the DataMite II box when you exit this screen. You can force these changes to be saved to the DataMite box by clicking on File, then Save as Master DataMite Specs at the top of the DataMite screen.

Figure 2.20B Checking DataMite II Configuration when Entering the DataMite Specs Screen



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 and you have selected the correct Preference (see Section 2.2), the program automatically checks all Com Ports on your computer, 1-4.

Weather Station

Is the type of Weather Station being used by the DataMite program, if any. If you choose the Performance Trends Black Box, you will then have a new menu choice at the top of this screen, to Calibrate the Weather Station. Here you can enter calibration specs you received with the Black Box to improve its accuracy.

Com Port

Click on the down arrow button to select computer's Com (serial) port # you are using to 'talk' to the Weather Station, if any. If you have set this to the same port as the DataMite com port listed earlier, then the DataMite will request you to switch to the Weather Station (assuming you have a switch box) after downloading the DataMite data.

DataMite II Rate

Is the sampling rate for all DataMite II channels. The higher the number, the more data recorded. This allow for less recording time, but will possibly make the data slightly more accurate, and definitely make the data respond more quickly to changes. Changes to this DataMite II spec must be downloaded from the DataMite program to the DataMite II box

DataMite II Recording Segments

Is the number of memory segments you want for the DataMite II's memory. At the time of publishing this manual, the DataMite II's memory works differently than the standard 4 channel DataMite's memory. The box operation will be updated in the future through the DataMite software to work more like the smaller, more flexible standard DataMite. For now, the memory works as follows:

The current DataMite II has memory which can be broken up into from 1 to 8 segments. This is selectable in the DataMite menu, available at the top of the Main Screen. Say, for example, the DataMite's memory has 8000 seconds of recording time available, and you select 8 segments. Each segment will record for 1000 seconds. At the end of 1000 seconds, recording stops no matter where you are on the track. The next time you press the red button to start recording, the DataMite II automatically records in the next segment, overwriting any data which was in that segment. If there was good data in that segment that you have not yet downloaded to the PC, it is gone. If segment 8 was the last segment, the DataMite II will start recording in segment 1 for the next recording session.

When you go to get data from the box in the DataMite software, the program shows which segment was the last one recorded. You can select to download this segment (by default) or any of the other segments recorded.

In the program, if you click on DataMite at the top of the Main Screen, you will display the DataMite configuration screen. Here you tell the DataMite program (which can in turn tell the DataMite box), what channels you want recorded, at what rate and into how many segments. You also tell the DataMite which channels are analog inputs and which are thermocouple inputs.

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.

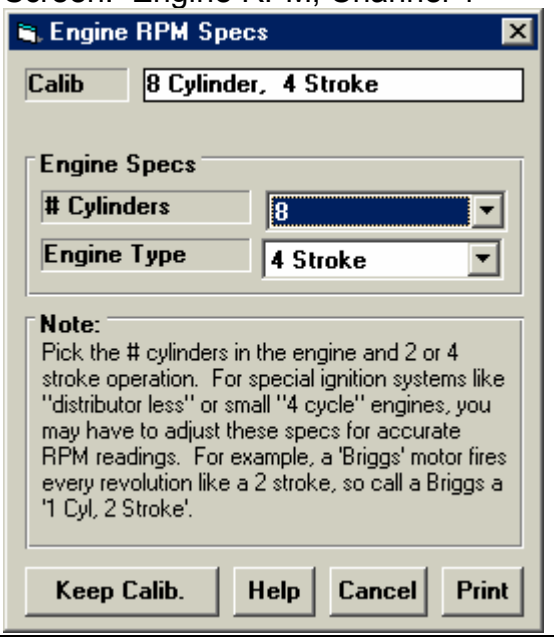
Sensor and Calibration

If you click in the Sensor and Calibration column, you will be presented with one of the screens shown if Figures 2.21 (if you click on the top row for Engine RPM) or 2.22 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 2.21

Figure 2.21 Sensor and Calibration Screen: Engine RPM, Channel 1



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 2.22

Sensor

Pick the source of the RPM data. This can be very critical for calculated results like MPH, distance, acceleration rate, clutch slip, etc.

The choices for this sensor include:

- Front Wheel RPM (which is used for MPH, distance, acceleration rate and tire slip unless you have an accelerometer).
- Rear Wheel RPM (which is used for tire slip and clutch or converter slip).
- Driveshaft RPM (which is used for tire slip and clutch or converter slip).
- "Other RPM", which could be some RPM on an engine pulley, like water pump or supercharger RPM.

- Analog Converter (for sensors like thermocouples for temperature, pressures, shock travel, etc.)
- 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.

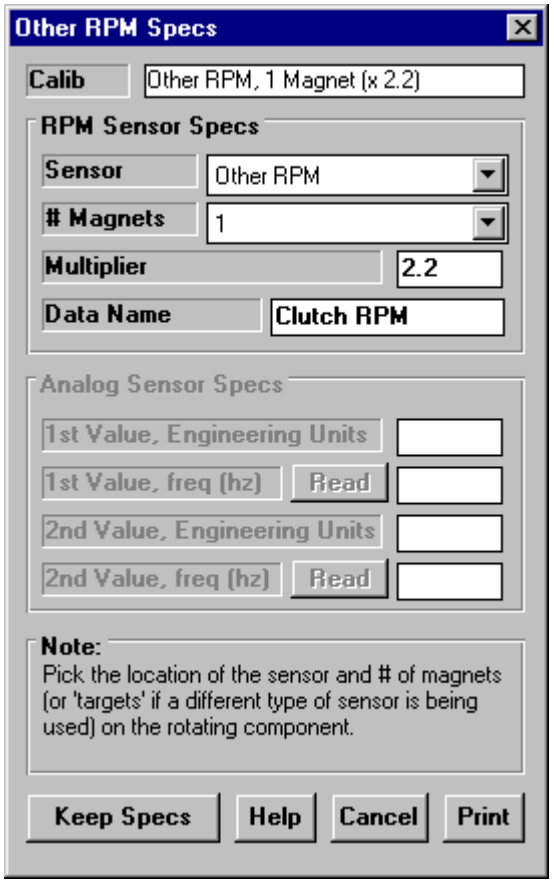
Multiplier

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.

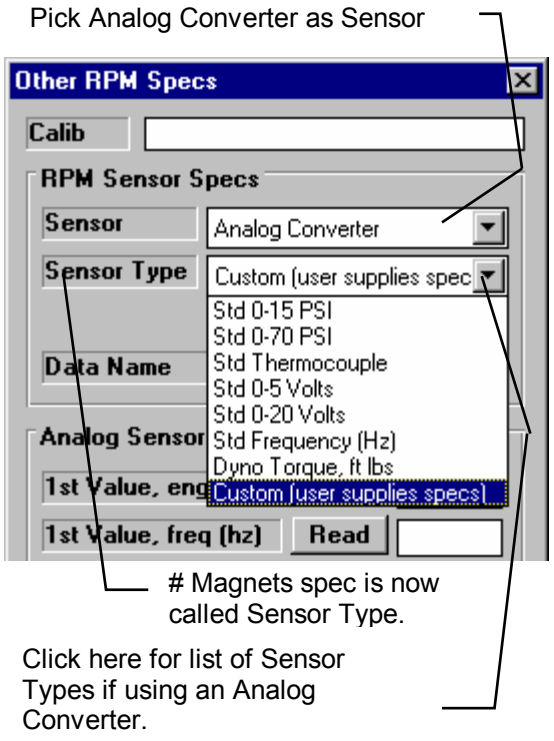
Data Name

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.

Figure 2.22 Sensor and Calibration Screen: Other RPM Channels



Screen for Analog Converter

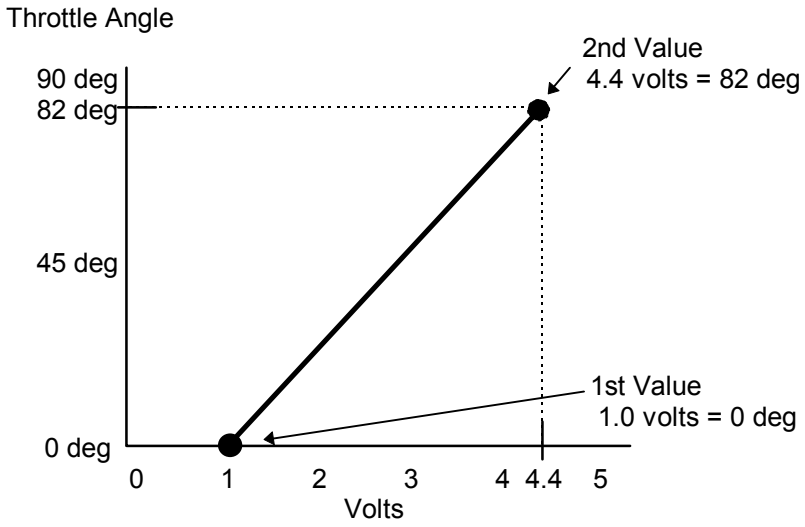


Analog Sensor Specs
1st Value, Engineering Units
1st Value, Freq (hz)
2nd Value, Engineering Units
2nd Value, Freq (hz)

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.

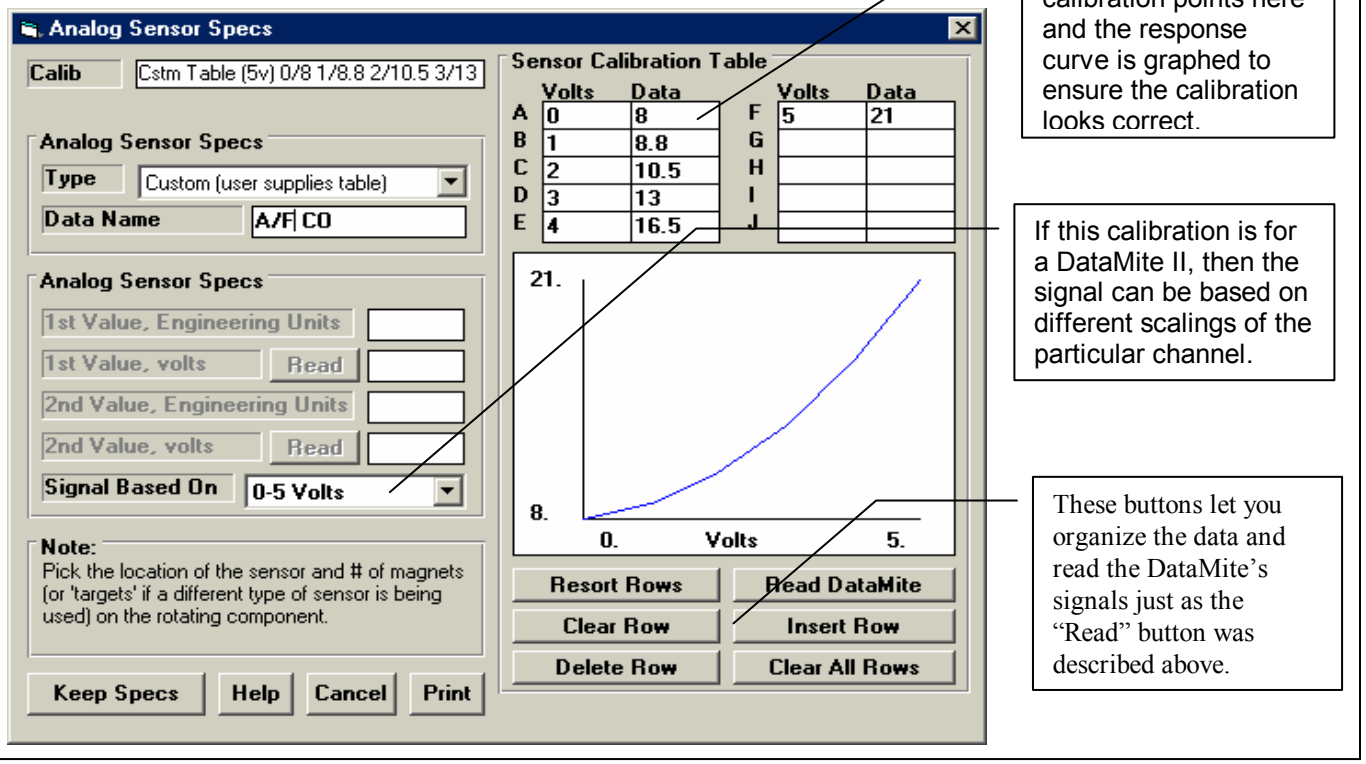
Figure 2.23 Illustration of a Custom Sensor Calibration



Custom (user supplies table) Calibration

Sometimes you have a sensor where the output is not linear (not a straight line). Then you can select the Type as "Custom (user supplies table) and you can enter in most any set of 10 calibration points you want. See Figure 2.24.

Figure 2.24 Custom (user supplies table)



Signal Based On

If this calibration is for a DataMite II, then the signal can be based on different scalings of the particular channel, either

- 0-4095 bits of resolution (works for either type of scaling of a channel, 0-5 or 0-10 volts)
- 0-5 volts (5 volts full scale on this particular channel, which is determined by a jumper inside the DataMite II)
- 0-10 volts (10 volts full scale on this particular channel, which is determined by a jumper inside the DataMite II)

For the analog converters for RPM channels, 0-4095 bits is replaced by 0-1000 Hz frequency. Your choice here changes the labels in the table.

Sensor Calibration Table Button Commands

The 6 buttons below the table let you move, delete, reorder and insert blank rows in the table. To tell the program which row to work with, the blinking cursor must be in that row. To place the cursor in that row, click on either the Data or Volts box in the row. The Read DataMite button will read the data from the DataMite channel you are currently calibrating and load the results with the appropriate scaling into the row with the cursor.

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

DataMite II Analog Channels

The analog channels for the DataMite II are calibrated much the same way as for the Analog Converter channels described above. However, there are these differences.

The first 16 analog channels are configured in the DataMite II box's hardware as either:

- Not Used (no electronics installed for these channels)
- Thermocouples (special sensors for recording temperatures)
- Analog (A jumper inside determines if the channel is 0-5 or 0-10 volts, which is most always set to 0-5 from the factory.)

These 16 channels are broken down into 4 groups of 4 channels. The 4 channels of each group must all be the same, either Not Used, Thermocouples or Analog channels. If you change a channel in a set of 4 that was previously set to, say Analog to thermocouples, the program will warn you that all channels for this group of 4 must be the same, and make this change for you.

The next 2 analog channels (17 and 18) are reserved for the standard accelerometers in the DataMite box. The next channel 19 is reserved for the 3rd axis accelerometer, and channel 20 is reserved for DataMite II power, typically car battery power (not yet available).

DataMite II Switch and Timer Channels

The next 4 channels are On/Off switch channels. These are useful for recording things like if a throttle switch which trips when the throttle is fully open is on or off, whether a nitrous oxide solenoid is on or off, etc. Switches are only recorded at the sampling rate of the other channels, say 25 or 50 times a second

Timer channels are the same as switch channels except they are recorded to the nearest .001 second or even finer. They can be useful for measuring the time between throttle stop going on and coming off, or from trans brake switch being released to delay box being activated, etc.

At the time of printing this manual, these channels have not been developed in the software.

Important: Some channel names have special meaning to the DataMite program. For example, if you are recording a temperature, you could just select one of the several Thermocouple calibrations, like "Std Thermocouple, Misc" and then name it yourself as Exh #2. This will get you a temperature reading, but some of the program's features may not work correctly. In this case, displaying this channel in the Current Readings screen's Exhaust Temp bar graph, and analyzing average exhaust temperatures and exhaust temperature spread would not include this channel. Therefore, try to pick a Calibration which is most appropriate for that particular channel and sensor. The Data Name for the channel can be most anything you want as this is not used by the program for anything critical, just to label graphs and reports. Also see Section 3.8, Send Data for additional special Calibration names to denote special analysis of a channel.

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.

As mentioned earlier about the DataMite II, if you save these settings as the Master DataMite, you ***must*** also download these changes to the DataMite II box, so it also has the new configuration.

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

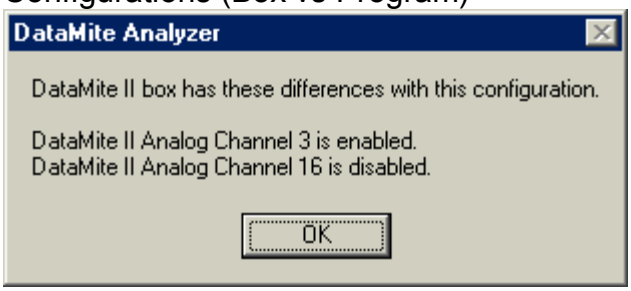
Click on File, then Print to print this screen.

DataMite II Options

Compare to DataMite II

This option compares the current DataMite configuration on this screen to that loaded in the DataMite II box. You will get a response as shown in Figure 2.25

Figure 2.25 Comparing DataMite Configurations (Box vs Program)



Save to DataMite II

This option saves the current DataMite configuration on this screen as the Master DataMite specs, and then loads this configuration into the DataMite II box.

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 drag race run, like a tachometer. See Section 2.7 for more details.

Troubleshoot

These options let you troubleshoot problems you may be having with your DataMite or DataMite II. Usually you will be requested to try these from a Performance Trends technician when doing diagnostics. These are covered in Appendix 3 in Troubleshooting.

Help

Click on Help for help on this screen.

2.6 Vehicle Specs

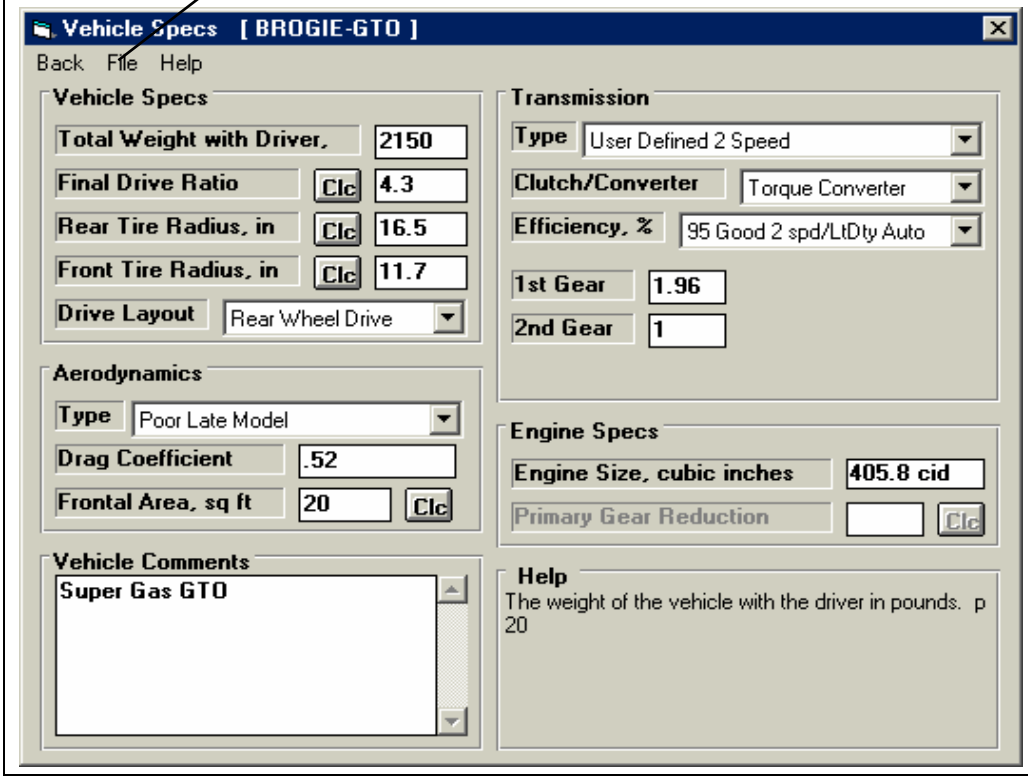
The specs shown in Figure 2.26 describe the vehicle which produced the data. These specs are used to do many of the calculations. Nearly all data calculated from wheel, engine or driveshaft RPM inputs depend on these specs being correct. These data include:

MPH *	Clutch Slip	Tq *
Accel Gs *	Converter Slip	HP *
Feet *	Tire Slip	Calc Gear Ratio
Gear #	Tire Growth	

* Calculated from accelerometer data or front wheel RPM, whichever is available.

Therefore, if the raw RPM data looks correct but one of these calculated outputs do not, double check these Vehicle Specs.

Figure 2.26 Vehicle Specs Menu



Click on File, then:

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

Vehicle Specs

Total Weight with Driver, lbs

The weight of the vehicle with the driver in pounds.

Final Drive Ratio

The ratio of the final drive gears or chain ratio or both. Click on the Clc button to calculate from # of gear teeth.

Rear Tire Radius, in

Distance from the ground to the center of the Rear wheel/tire in inches. Click on Clc button to calculate from tire size specs.

Front Tire Radius, in

Distance from the ground to the center of the Front wheel/tire in inches. Click on Clc button to calculate from tire size specs.

Drive Layout

Click on down arrow button to pick the location of the driving tires or axle. 'Motorcycle With Pri GR' means 'Primary Gear Reduction' between the engine and the clutch, which enables the Primary Gear Reduction spec in the Engine Specs section.

Aerodynamics

Type

Click on down arrow button to pick a general description of the car's aerodynamics, or choose 'Use Specs Below' to enable the aerodynamics specs. Then you can type in your own numbers to the specs below. These specs only effect torque and HP calculated from acceleration tests.

Drag Coefficient

The coefficient of drag (Cd) is an engineering term used to describe how aerodynamic a vehicle's exterior design is (how easily it "slices" through the wind). A low value for the Cd indicates the car is aerodynamic and requires little power from the engine to overcome wind resistance. Many automotive manufacturers now publish the vehicle's Cd in advertising, since an aerodynamic car is a more fuel efficient car. An aerodynamic car is also a faster car. If the actual Cd of a particular vehicle can not be found, use Table 2.3 to estimate the Cd for different types of vehicles Use Table 2.4 to estimate how much Cd will change from a modification. A more complete list is obtained by selecting one of the examples of Body Details.

Table 2.3: Estimate Drag Coefficient (Cd)

Type of Vehicle or Modification	Cd
Motorcycle	.70-1.10
Modern Motorcycle (fairings, etc.)	.50-.70
Pickup Truck	.50-.70
Sedan before 1980	.45-.60
Sports Car before 1980	.45-.55
Open Convertible	.50-.70
Modern Aerodynamic Sedan	.35-.45
Modern Aerodynamic Sports Car	.30-.40
“Best Case" vehicle	.11

Table 2.4: Estimate How Modifications Affect Cd and Cl (lift coefficient)

Modification	Change Cd	Change Cl (lift)
-4 deg Angle of Attack (vs stock) *1	-.04	-.20
+4deg Angle of Attack (vs stock)	+.04	+.20
Open Side Windows (vs closed)	+.02	
Open T-Top & Side Windows	+.08	
4" Flat Air Dam (width of vehicle) *2	-.04	-.05
8" Flat Air Dam (width of vehicle)	.00	-.10
12" Flat Air Dam (width of vehicle)	+.08	-.11
1" Flat Spoiler (width of vehicle) *3	-.03	-.03
2" Flat Spoiler (width of vehicle)	.00	-.05
4" Flat Spoiler (width of vehicle)	+.08	-.07
Blocking half radiator air flow	-.04	-.07

Notes concerning Table 2.3 and 2.4:

1* Change the vehicle's attitude from the production attitude 4 degrees, where a negative angle of attack is when the front is lowered and the rear is raised.

2* For this table, an air dam is defined as a flat plate the full width of the vehicle projecting vertically down directly below front bumper (based on typical 1970s or earlier design, say a 1974 Nova). Most modern designs integrate air dams for optimum Cd, therefore adding an air dam to a modern vehicle will likely show an increase in Cd but perhaps a reduction in Cl.

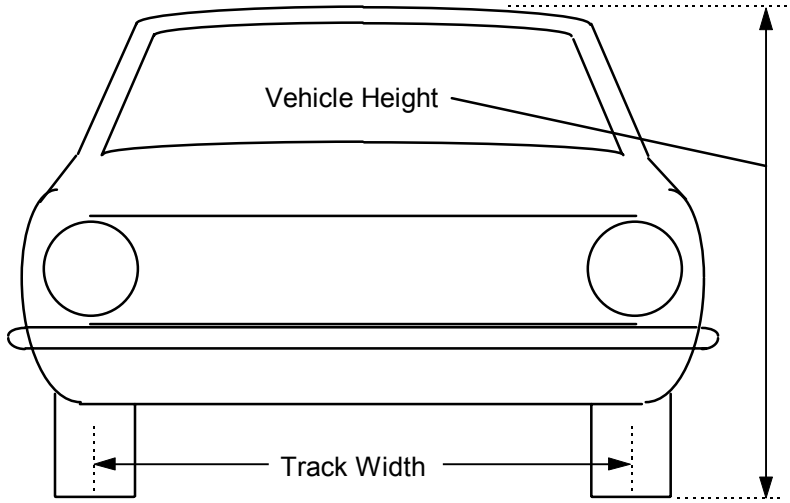
3* For this table, a spoiler is defined as a flat plate extending the full width of the vehicle at the top rear edge of the rear deck (trunk) lid, angled back 20 degrees from vertical.

- Cl is the lift coefficient. Assume that the lift coefficient was changed on the end of the car where the modification took place. For example, if you added a 4" Flat Air Dam to the front, subtrack .05 from the current Front Lift Coefficient and leave the Rear Lift Coefficient unchanged. For changing the "Angle of Attack", make the change to both the front and rear Lift Coefficients.
- Table 2.4 shows typical effects from modifications. Individual vehicle's can differ considerable.
- Advertised Cds are usually the "best case". For a realistic Cd, add .03 to .05 to the advertised Cd.

Frontal Area, sq ft

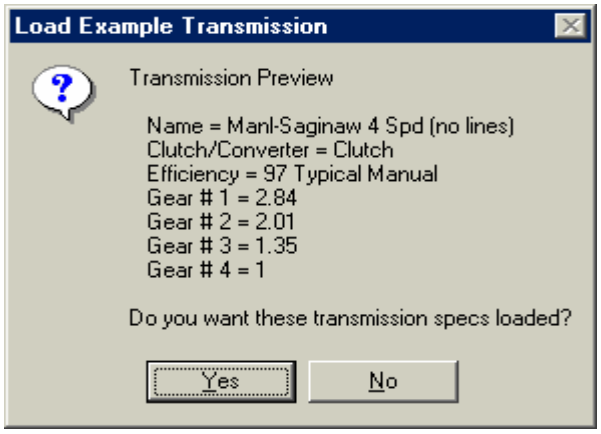
The frontal area is the area in square feet the vehicle's silhouette occupies when viewed from the front. Use the formula in Fig 2.28 to estimate frontal area. Frontal areas are in the range of 5 sq ft for a motorcycle, to 20 sq ft for a small passenger car to 30 sq ft or more for a full size pick-up truck. Also see Section 2.8.6 for calculating Frontal Area, sq ft by clicking on the Clc button.

Figure 2.28, Estimate of Frontal Area, sq ft



$$\text{Frontal Area, sq ft} = \frac{\text{Vehicle Height (in)} \times \text{Track Width (in)}}{144}$$

Figure 2.29 Picking a Type of Example Transmission



Transmission

Type

Click on down arrow button to pick a type of transmission. Select one of the "User Defined" types and you can enter most any specs in this section. If you select one of the "pre-programmed" example transmissions, these example specs are loaded. However, if you change any of these "pre-programmed" specs, the Type of the Transmission is converted to a "User Defined" type.

Clutch/Converter

Click on down arrow button to pick a type of coupling between the engine and transmission (or drive axle if no transmission), either a friction clutch or torque converter. This affects how the program checks for transmission shifts, etc.

Efficiency, %

Efficiency of the transmission. The lower the number, the more HP the transmission wastes. Click on down arrow button to pick a value, or pick "Program will estimate" if you are not sure.

1st – 6th Gear Ratio

Gear ratio of transmission gear #1. If you are not sure, pick an example transmission. If your transmission is not listed, pick one with the same # of gears.

Engine Specs

Engine Size, cubic inches (Pro Version Only)

Engine Size in cubic inches, which is used to improve accuracy in calculating Torque and HP. This information is contained in the Log Book specs under Engine, General Notes. This value can not be changed in this screen, but only in the Log Book General Engine Notes screen.

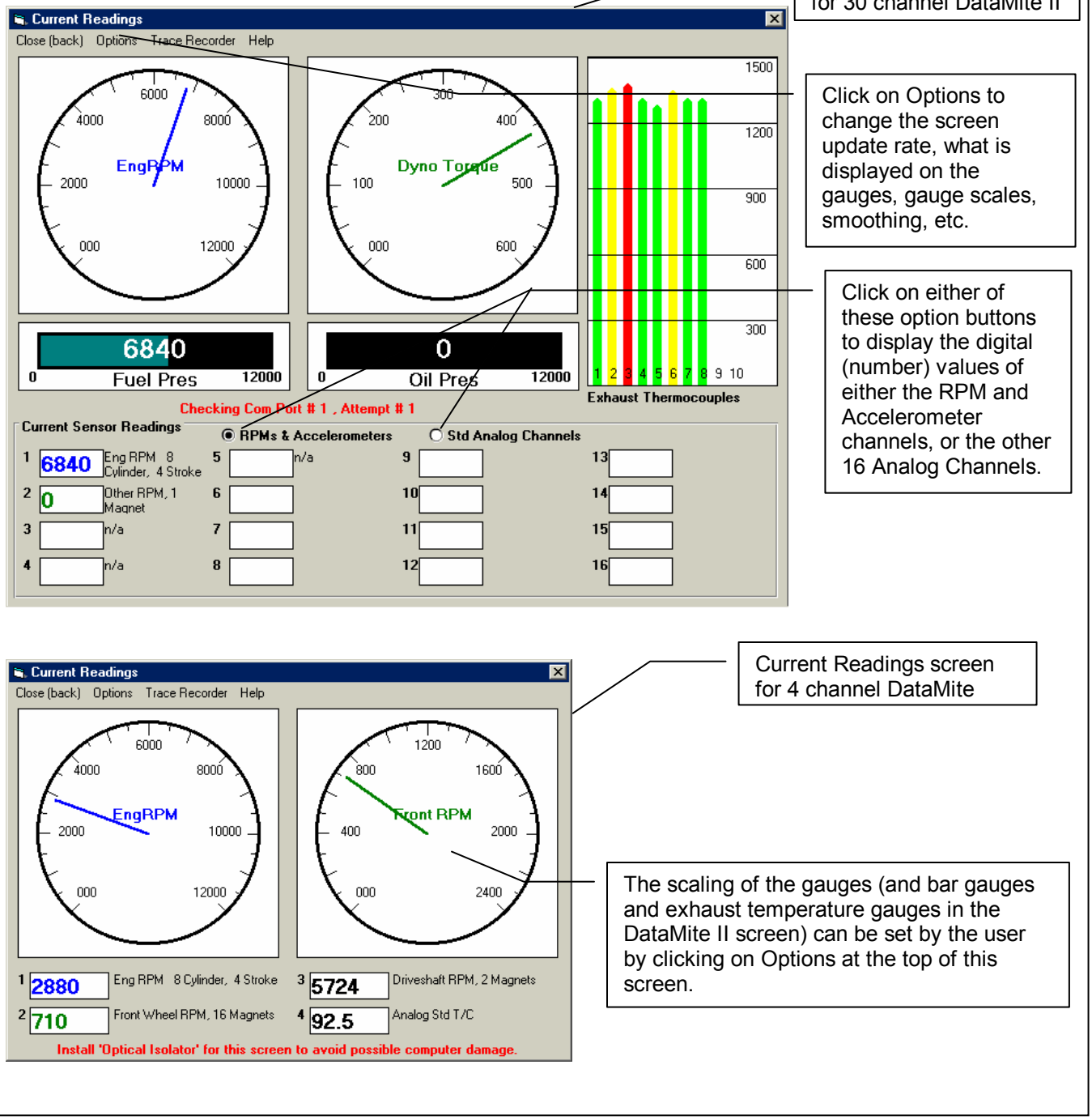
Primary Gear Reduction

Gear Ratio between engine crankshaft and clutch, typically found only on some motorcycles. Click on Clc button to calculate from number of gear teeth.

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. For the DataMite II, there are only 16 boxes for numbers, so you must select which channels to view, either the RPM and Accelerometer channels, or the other 16 Analog Channels.

Figure 2.30 Current Reading Screens



The Current Readings screen is very useful for troubleshooting the DataMite setup with the car in the shop. For example, you could wiggle connections and watch to see if a pressure reading jumps around, indicating faulty wiring.

IMPORTANT: Do Not use this screen while driving the car, unless you have a passenger dedicated to only watch this computer screen.

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 Engine RPM, you would probably pick an range like 0 – 2400 RPM. 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.

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

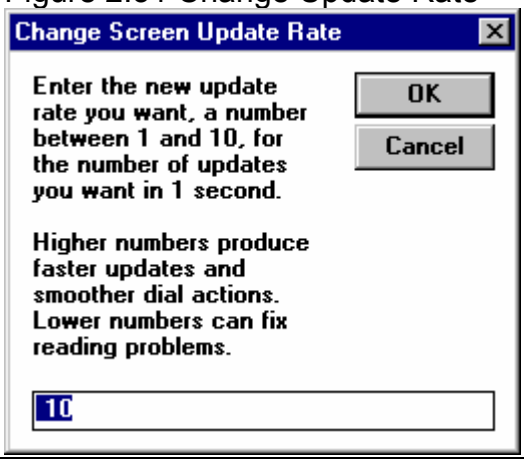
Click on Options to either select to:

- Change the update rate of this screen.
- Change what is displayed on the circular gauges.
- Change what is displayed on the Bar Gauge Settings (DataMite II only)
- Change the scale of the Exhaust Temp Scale (DataMite II only)
- Change the Color Warning Settings
- Change the Analog Filtering (smoothing)

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.

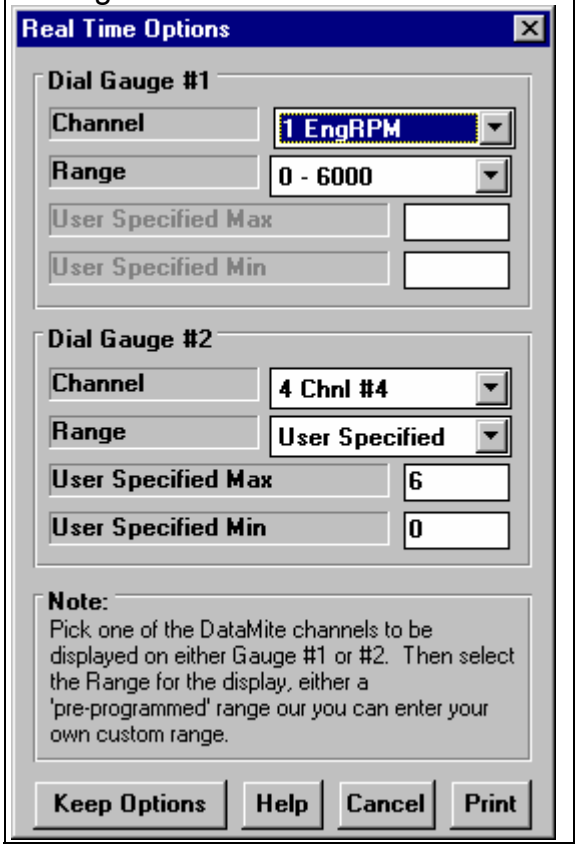
Channel

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.

Figure 2.32 Current Readings Gauge Settings



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.

Bar Gauge Settings (DataMite II Only)

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

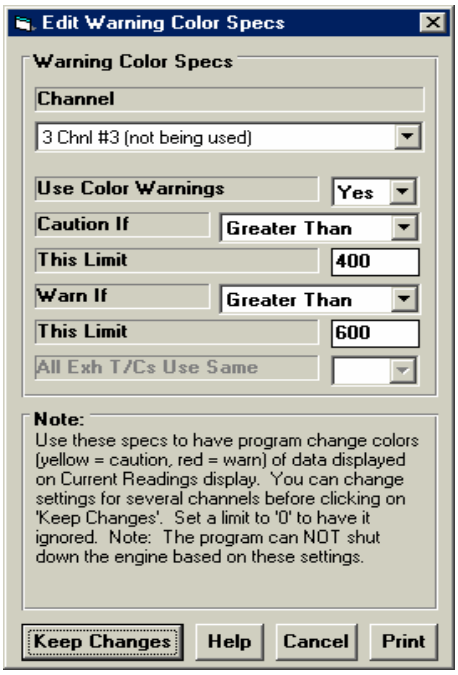
Exhaust Temp Scale (DataMite II Only)

Click on Options, then Exhaust Temp Scale and the program will ask for a minimum and maximum temperature to display on the exhaust temperature bar graphs. Note that you must have set the Sensor and Calibration in the DataMite specs screen to one of the Exhaust Thermocouple settings for that channel to be displayed on the Exhaust Temperature Bar graph.

Color Warnings

Click on Options, then Bar Gauge Settings, to be presented with a screen as shown in Figure 2.33. Here you can select if a particular channel should be highlighted in Yellow if it reaches a "Caution" limit or displayed in bright red if it reaches a "Warning" limit. This can be very handy if you want the operator to not go above 7000 RPM on the engine RPM, or if oil pressure should fall below 20 PSI.

Figure 2.33 Changing the Color Warning Settings



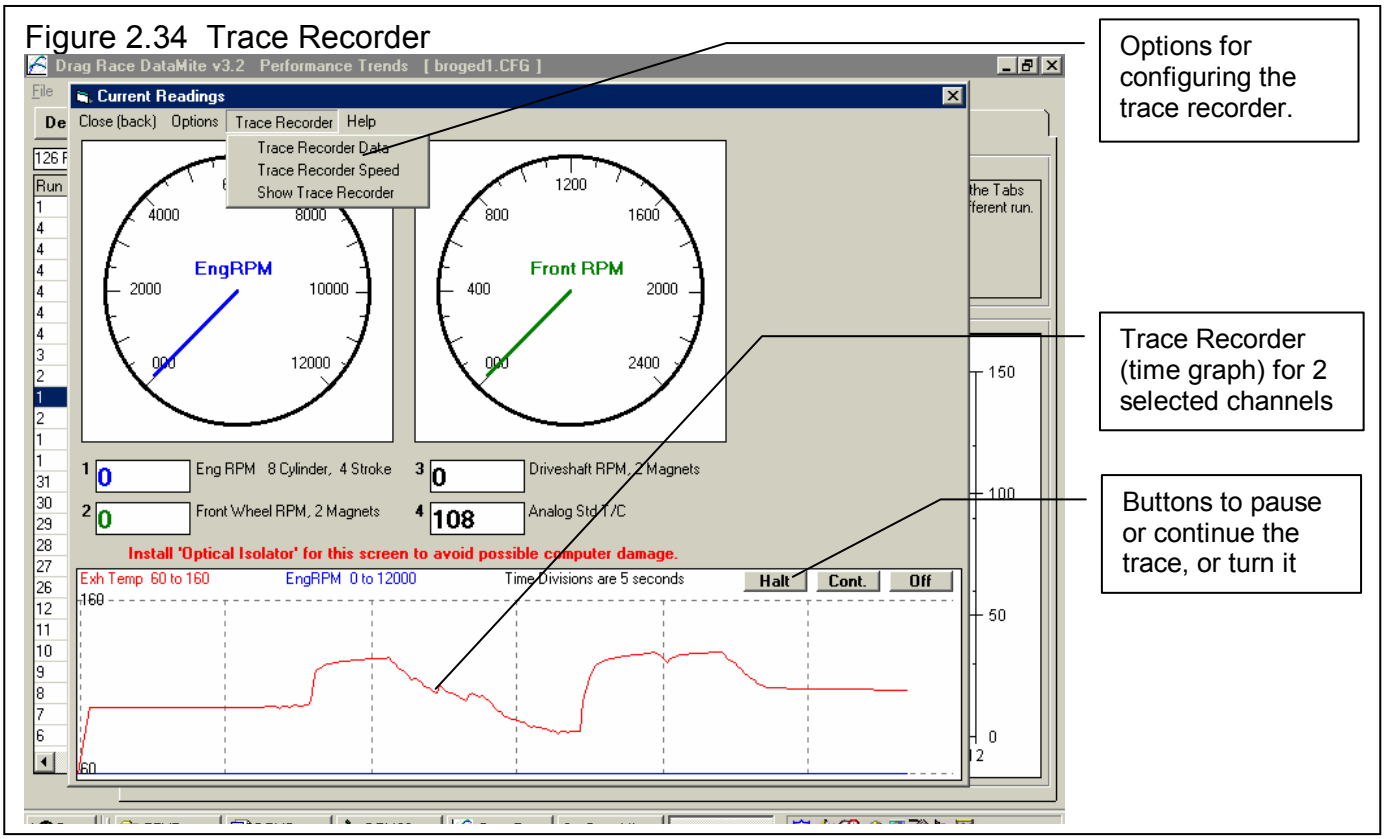
Analog Filtering

Click on Options, then Analog Filtering to select how much filtering (smoothing) should be done to just the analog readings. RPM readings are not filtered.

Trace Recorder (Pro Version Only)

Click on Trace Recorder to select which channels should be shown on a time graph and what the scales should be.

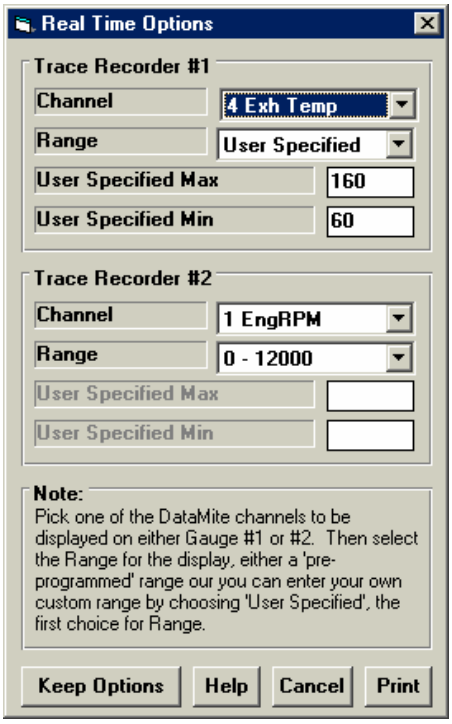
Figure 2.34 Trace Recorder



Trace Recorder Data

Click on Trace Recorder, then Trace Recorder Data at the top of the Current Readings screen to be presented with the screen shown in Figure 2.35. This works the same as the other screens for setting which data to graph and what scales to use. One difference here is both data types are graphed on the same graph. The numbers on the graph for the Y axis are for Trace Recorder #1 data.

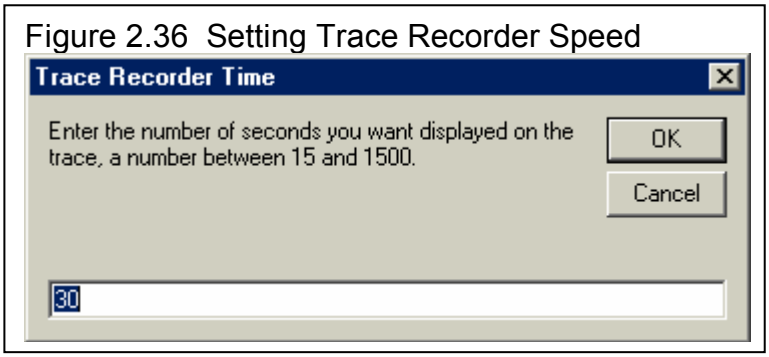
Figure 2.35 Setting Options for Trace Recorder



Trace Recorder Data

Click on Trace Recorder, then Trace Recorder Speed at the top of the Current Readings screen to display the question shown if Figure 2.36. The higher the number of seconds, the more data you can see on the trace, but you will see it with less detail.

Figure 2.36 Setting Trace Recorder Speed



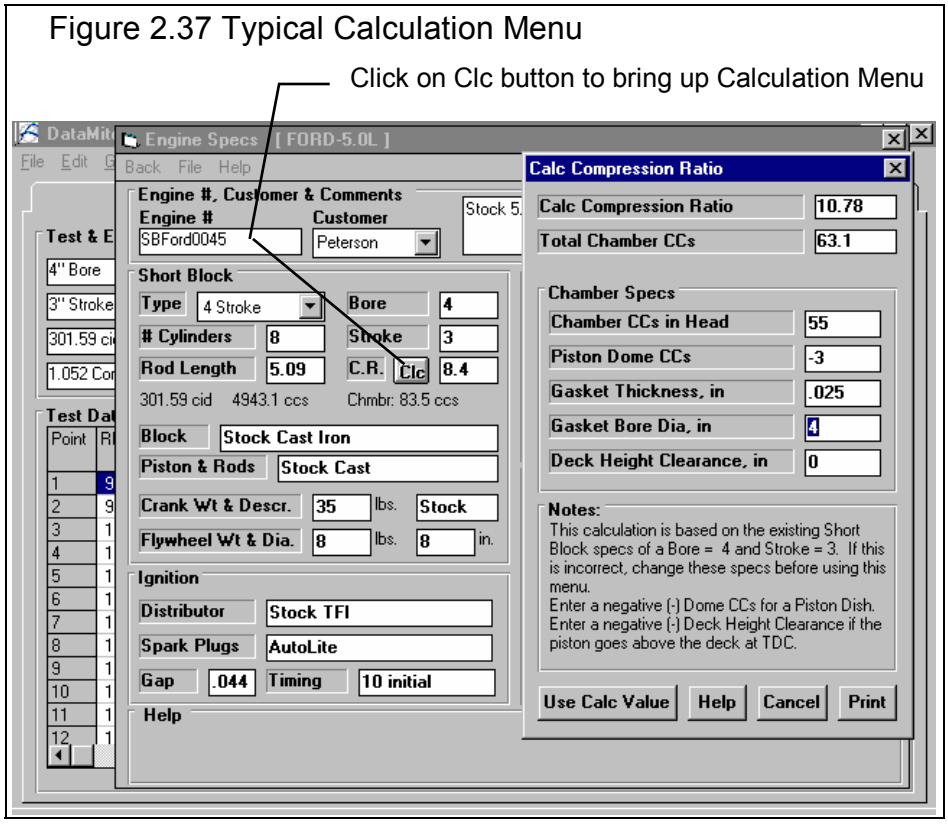
2.8 Calculation Menus

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 2.37 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 57 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.

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

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.

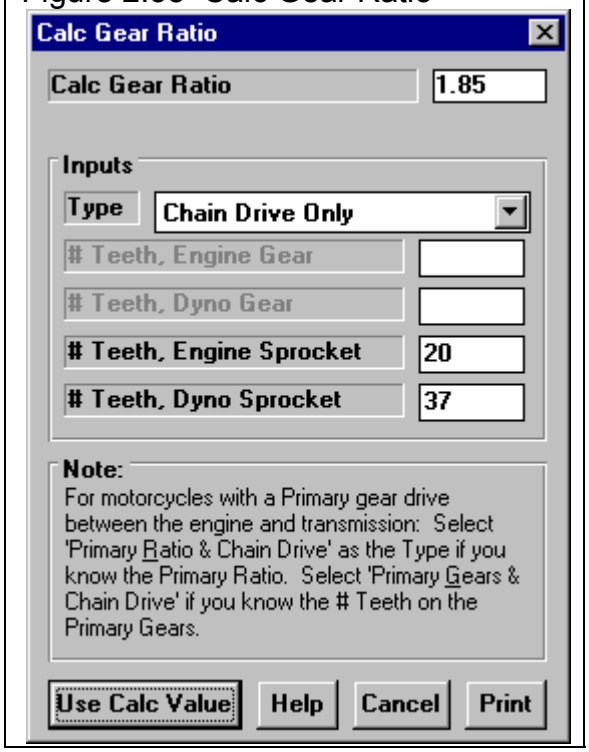
Gasket Bore Diameter, in

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.

Figure 2.38 Calc Gear Ratio



2.8.2 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

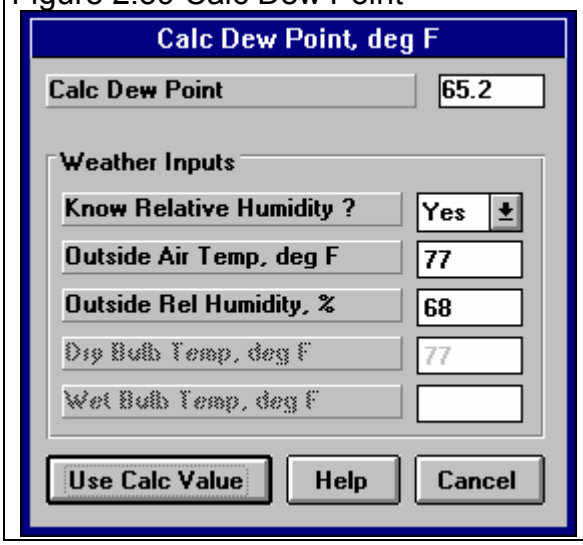
This is the number of teeth on the smaller drive sprocket on the engine or clutch for chain drive systems. In almost all cases, this number will be smaller than # Teeth Dyno Sprocket.

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

Figure 2.39 Calc Dew Point



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.

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

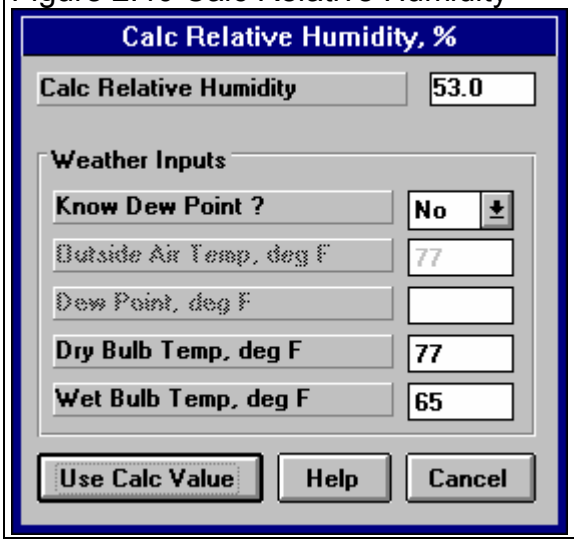
Is the temperature of the dry bulb thermometer on the psychrometer in degrees F. This is also the temperature of any thermometer mounted in the shade when the Wet Bulb Temp reading is taken. The Dry Bulb Temp must not be less than the Wet Bulb Temp.

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 2.40 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

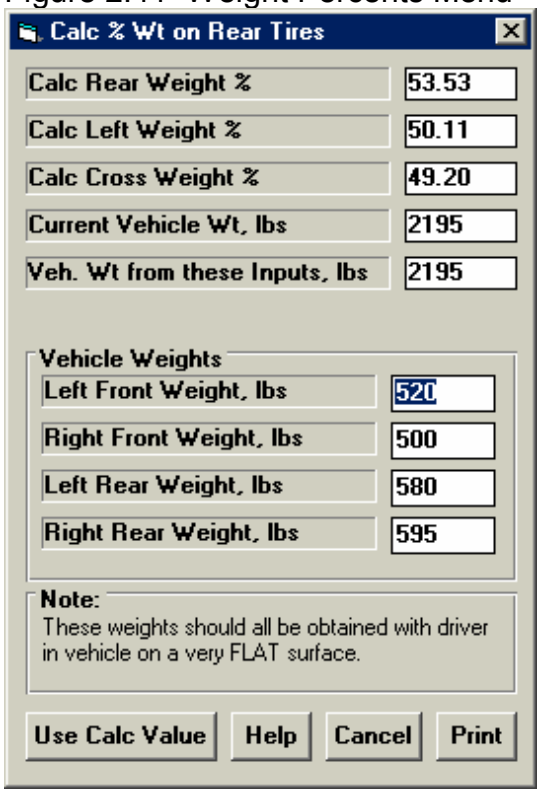
Is the temperature of the dry bulb thermometer on the psychrometer in degrees F. This is also the temperature of any thermometer mounted in the shade when the Wet Bulb Temp reading is taken. The Dry Bulb Temp must not be less than the Wet Bulb Temp.

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.

2.8.5 Weight Percents

Figure 2.41 Weight Percents Menu



This Calculation Menu is available at the Suspension Log Book screen, where you click on the Clc button next to the Weight % inputs. When enough inputs have been entered, it shows Weight %s (which can be copied back to the Vehicle Specs menu by clicking on Use Calc Values), the Current Vehicle Weight in the Vehicle specs menu (for comparison), and the new Vehicle Weight based on the 4 corner weights entered into this menu.

The weight measurements should be taken with the driver in the car, all fluid and fuel levels in race condition and on a ***very flat*** surface.

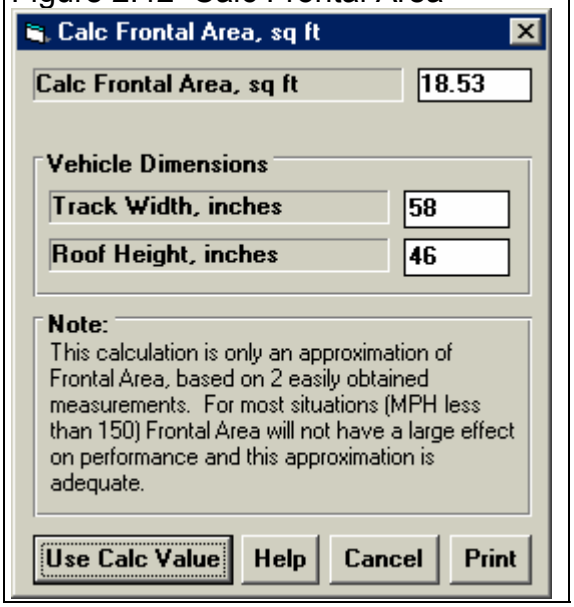
Left Front Weight, lbs
Right Front Weight, lbs
Left Rear Weight, lbs
Right Rear Weight, lbs

Are the weights on the respective tire in lbs. When you first open this menu, these are filled in with the corner weights which produce the Weight %s for the Vehicle Weight currently entered in the Vehicle Specs menu.

If you use the new weight %s from this menu, and the New Vehicle Weight is significantly different from the current vehicle weight, you will be asked if you want to load the New Vehicle Weight into the Vehicle Specs menu also.

2.8.6 Frontal Area

Figure 2.42 Calc Frontal Area



This calculation is available from the Vehicle Specs menu and allows you to estimate a vehicle's frontal area.

Track Width, inches

Is the distance from the center of one front tire to the center of the other front tire. This value is initially set to the Rear Track Width in the Body and Axle specs menu, but can be changed to most anything you want.

Roof Height, inches

The distance in inches from the ground to highest portion of the roof or vehicle in inches which extends nearly the full width of the vehicle.

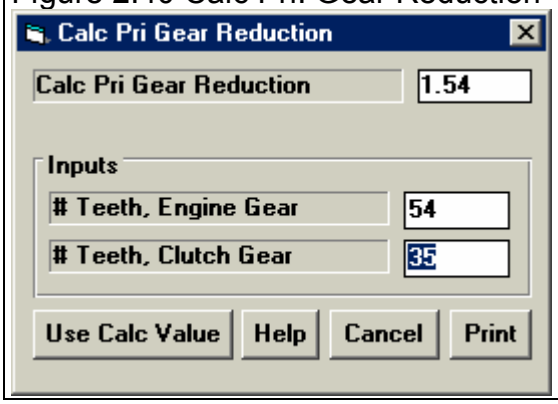
For example, for a truck with a roll bar behind the cab, measure to the top

of the roll bar, but not to the top of one of the spot lights mounted on the bar. However, if so many lights are mounted on the bar that they are nearly continuous for the full width of the vehicle, it may be more accurate to then measure to the top of the spot lights.

2.8.7 Primary Gear Reduction

This calculation is available from the Vehicle Specs menu and allows you to estimate a vehicle's frontal area.

Figure 2.40 Calc Pri. Gear Reduction



Teeth, Engine Gear

Is the number of gear teeth on the gear on the engine crankshaft.

Teeth, Clutch Gear

Is the number of gear teeth on the gear on the clutch input shaft.

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 2.44.

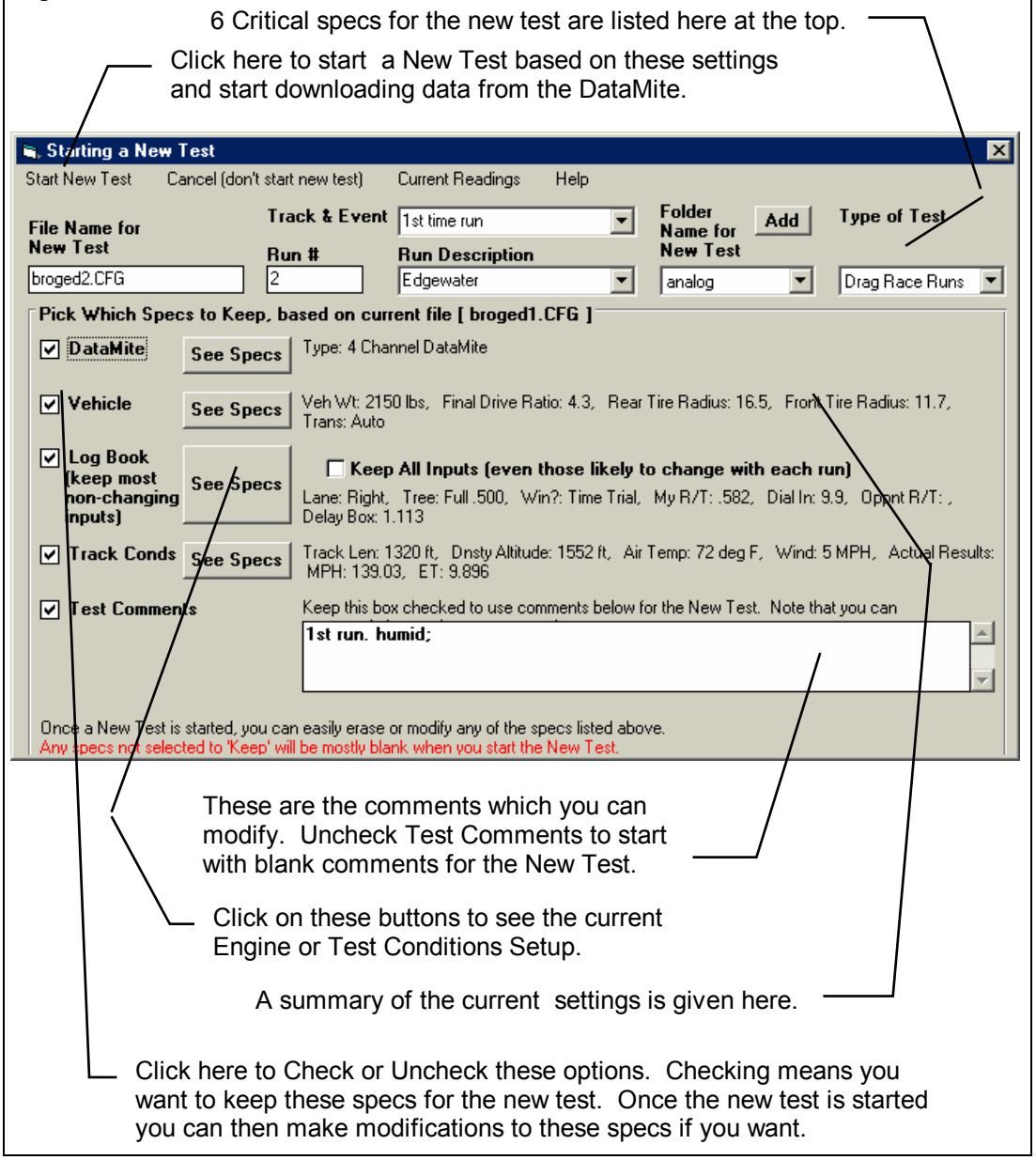
The New Test command is the only way to get a recorded data set (drag race run) from the DataMite. See Example 4.1 and 4.2 for more details on the New Test menu.

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 Vehicle 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 for the new test will be from the current Master DataMite, which should match your current DataMite 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

Figure 2.44 New Test Menu



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.

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 vehicle 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 vehicle and do not affect any calculations or what is recorded, like Engine Specs, Test Comments, etc.

Six (6) 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 Drag Race 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. Run # (Pro Version Only) is the Run # for the Log Book and for the Run Log listed down the left side of the Main Screen. This automatically incremented up by 1 by the program, but you can change it in this screen. Note that this is not based on the Run # from the current run on the Main Screen, because this could have been from several months ago. It is based on the Run Log listed down the left side of the Main Screen, which is based on recent runs downloaded from the DataMite. See Section x.x, Run Log.
3. Track/Event (Pro Version Only) is the Track & Event for the Log Book and for the Run Log listed down the left side of the Main Screen. This is for information only. Click on the down arrow button to its right to change the Track & Event to one you have already entered or type in a new one and it will be saved.
4. Run Description (Pro Version Only) is the Run Description for the Log Book and for the Run Log listed down the left side of the Main Screen. This is for information only. Click on the down arrow button to its right to change the Run Description to one you have already entered or type in a new one and it will be saved.
5. 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.
6. 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:
    - Drag Race Run (probably the usually choice)
    - Accel to measure torque and HP (very useful for engine testing in the vehicle).
    - 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 other versions of the software.

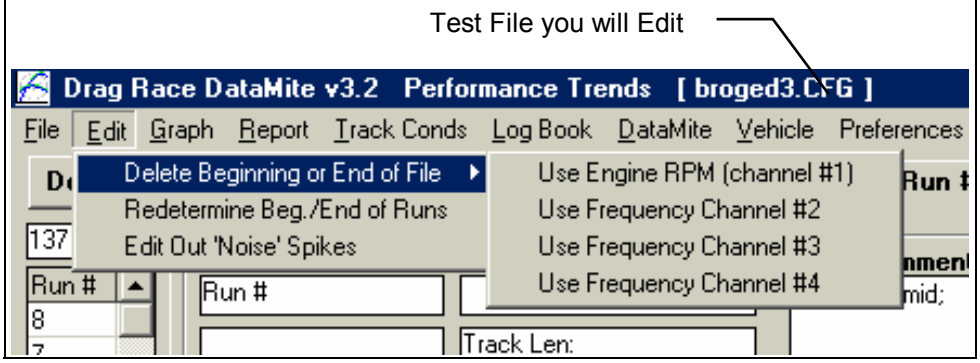
When you are ready to start the new test, click on 'Start New Test' at the top of the screen. If some critical specs has not been entered, the program may warn you and ask you for it at that time. The program will fill in the Test Time and Date based on the computer's time and date. This can be changed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

Important: When you start a New Test, the DataMite Specs will be from the current ***Master*** DataMite Specs, which should match your current DataMite 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 2.45. 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 2.45 Edit Options at Main Screen

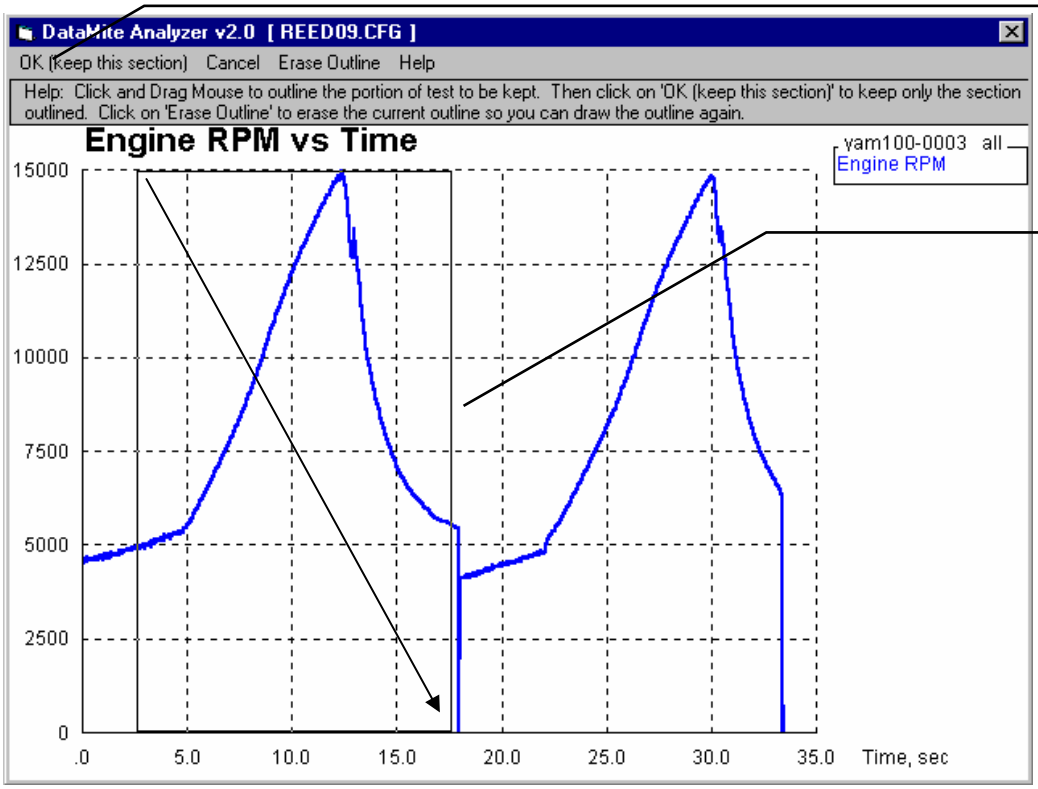


Delete Beginning or End of File

Figure 2.45 also shows that you can choose which 1 channel is used to represent the data from the file. Usually, Engine RPM is the best single channel, but you can choose any of the first 4 frequency channels.

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

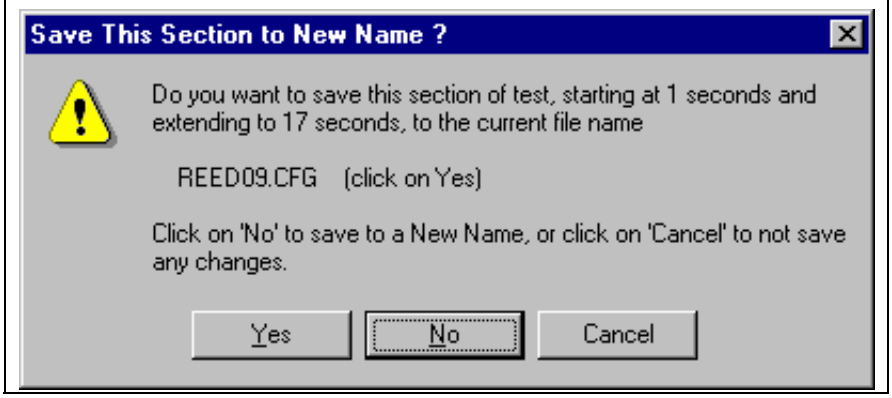


Click on OK (keep this section) if you want the outlined section of the test to be saved

Click and drag mouse from upper left to lower right to draw a frame around the part of the test you want to keep. DO NOT try to start or stop the frame at the exact start or end of the test run. Leave some data (at least 3 seconds) at the beginning and end so the program can find the start and end itself.

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 2.47.

Figure 2.47 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.

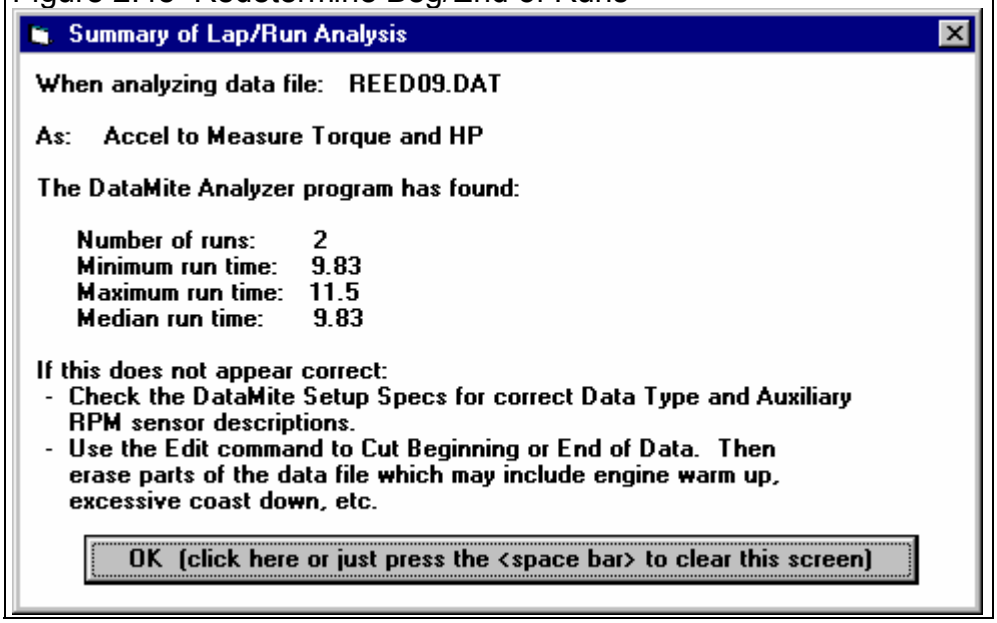
Redetermine Beg./End of Runs

Any time you download data for a New Test, the program checks for the type of test runs you've specified (Drag Race Runs, Accel to Meas Tq/HP or Custom). It looks for the patterns in the data it expects to see for the different types. 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 2.48.

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 2.48 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 doing the Test Type of "Accel to Meas. Tq/HP" if the noise spikes occur in the Accelerometer or Front Wheel RPM. One rather small spike can completely distort the entire torque and HP curve.** See Troubleshooting, Appendix 3 for more information.

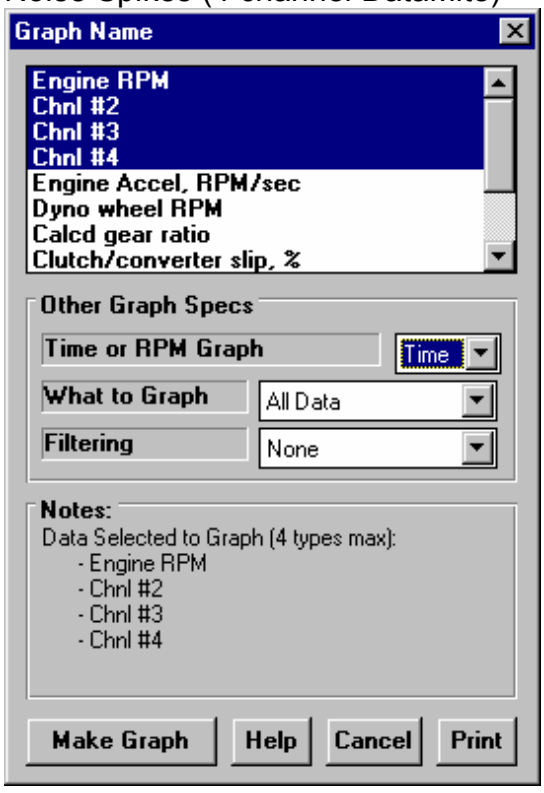
The process of checking for "noise spikes" happens automatically when you start a New Test (get data from DataMite) or download data. If spikes are found, you can select to NOT have them corrected. This is useful to determine the source of the noise spikes. Although accuracy improves by editing the spikes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

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 2.49 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 than 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 2.50 illustrates the difference between "noisy" data and "noise spikes".

Figure 2.49 Graph Specs to Graph Noise Spikes (4 channel DataMite)

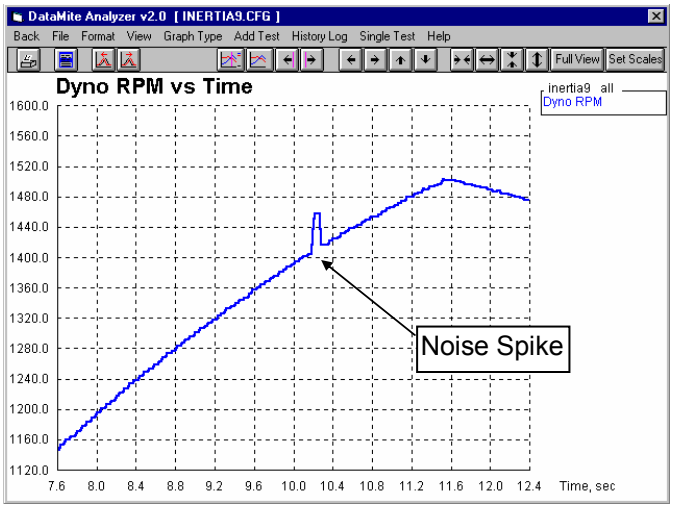


Some times the noise spikes are too numerous or come so close together that the program can not determine what is real data and what is a noise spike. In cases like this, especially if the noise is in channel used to calculate something else, like Engine RPM and Driveshaft RPM to calculate converter or clutch slippage, or an accelerometer to calculate vehicle MPH or distance traveled, you must try to eliminate the source of the noise. If the noise spike is in a channel that is not used to calculate something else , the noise spike is not as critical, say in an Exhaust Temperature. However, you must realize that the immediate jump up or down (the "spike") is not real.

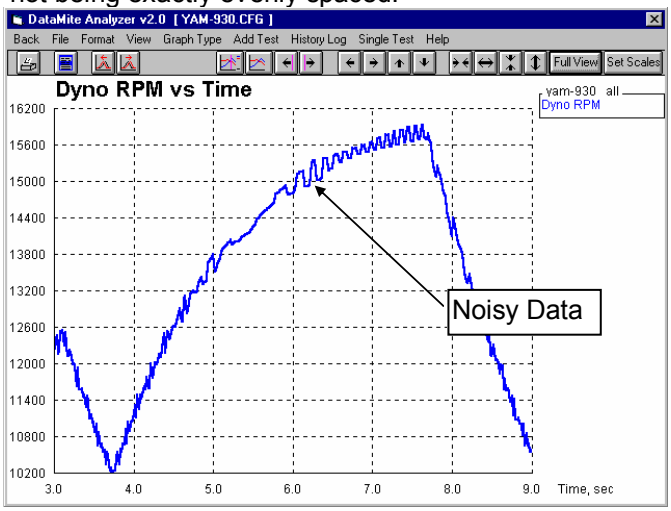
Figure 2.50 shows how even a relatively minor noise spike in the Front Wheel RPM for "Meas Tq/HP from Accel" race run can completely distort the torque and HP curve.

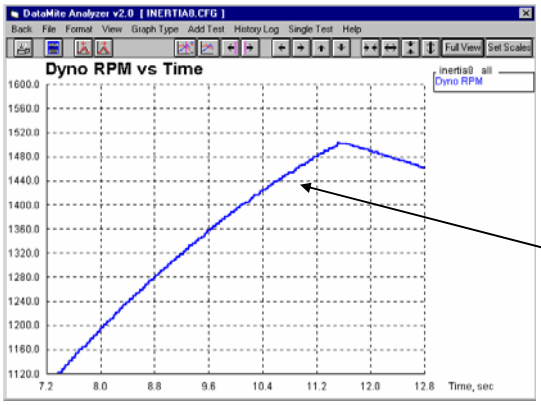
Figure 2.50 Noise Spikes vs Just Noisy (jumpy) Data

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.

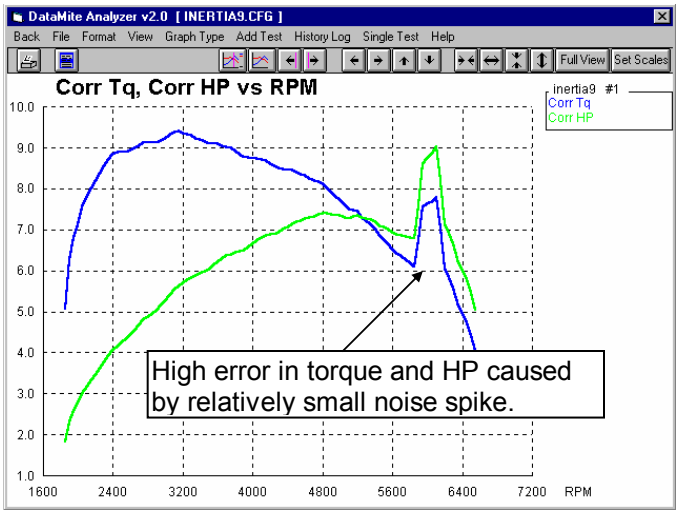




Dyno RPM is shown here, but the same effect will be seen for Front Wheel RPM.

Dyno RPM after program edit outs Noise spikes.

Errors Caused by Relatively Minor Noise Spike



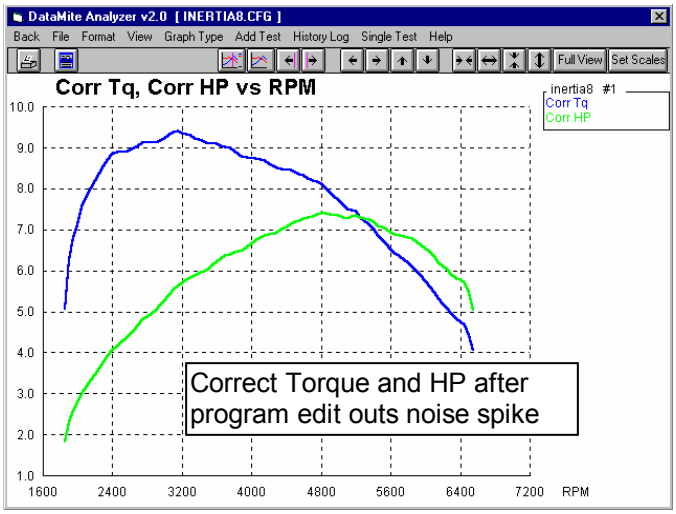
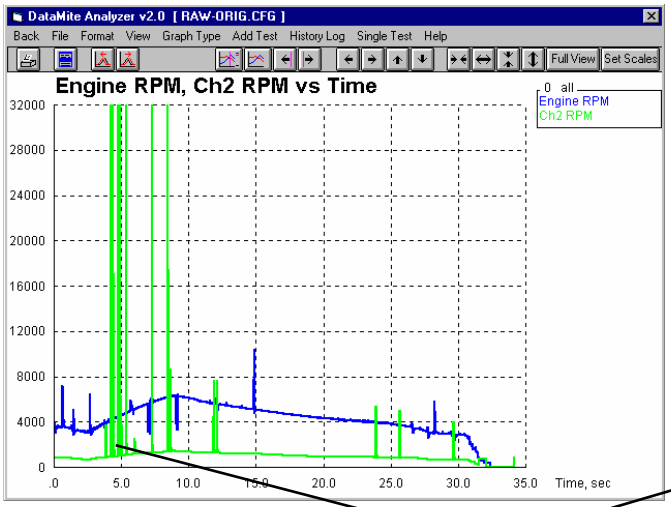
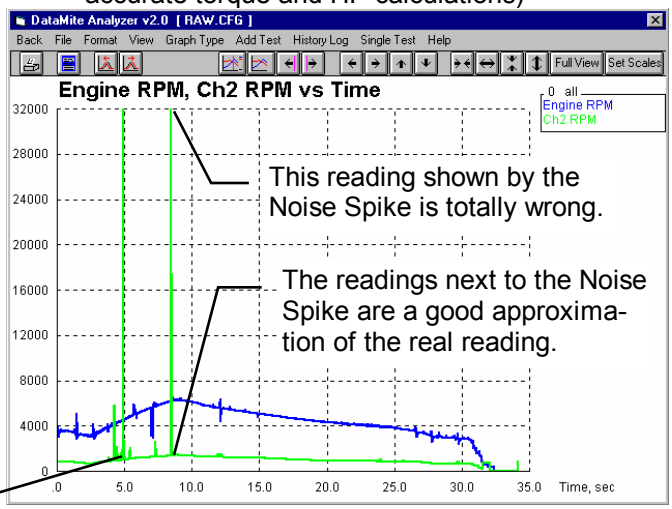


Figure 2.51 Example of Not Editing Out Noise Spikes Very Well

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.

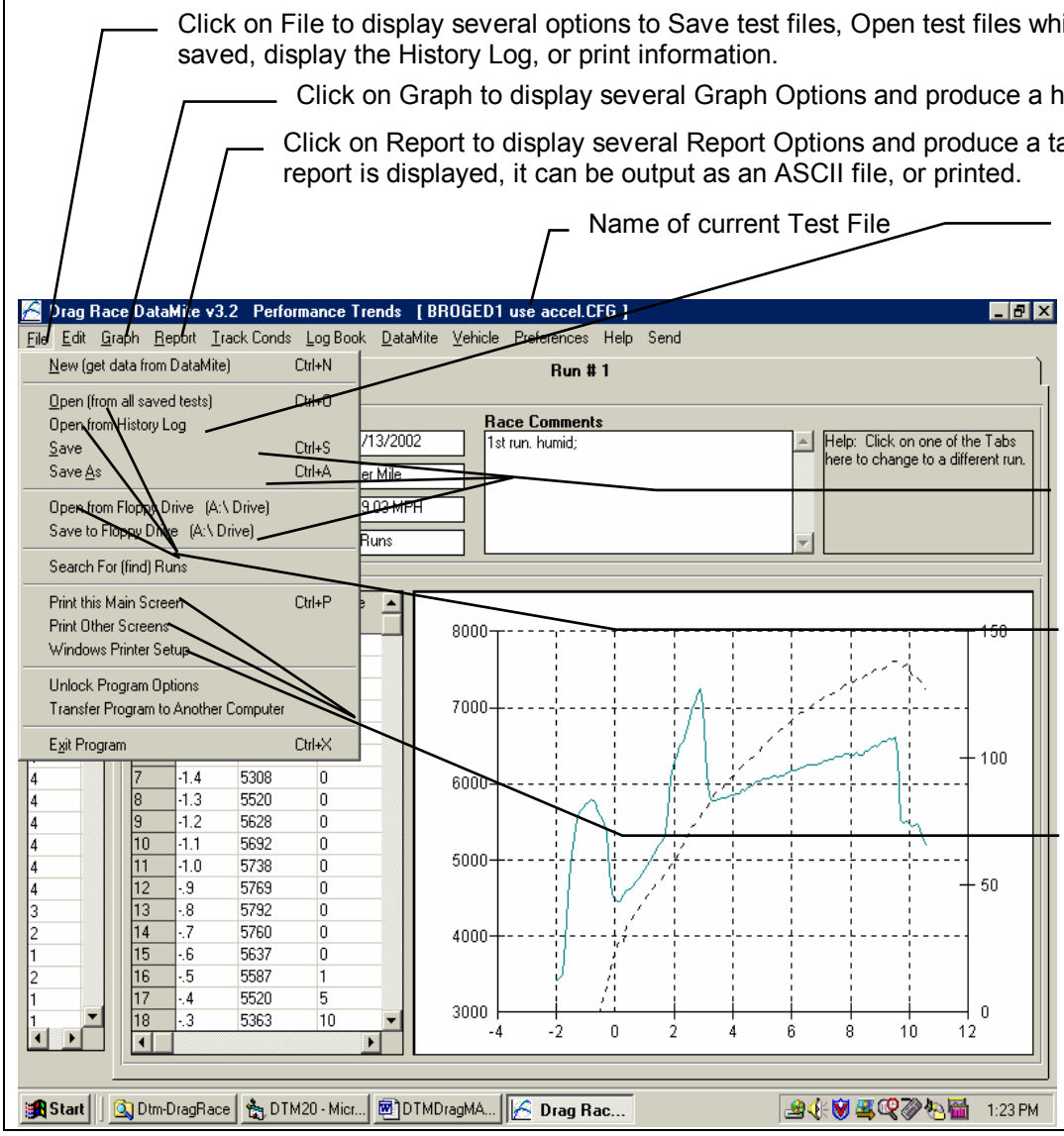
Chapter 3 Output

The Drag Race 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)
- Linking (Sending) recorded data to one of Performance Trends' suspension analysis programs (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.
- Run Log listing all tests in the order they were downloaded from the DataMite

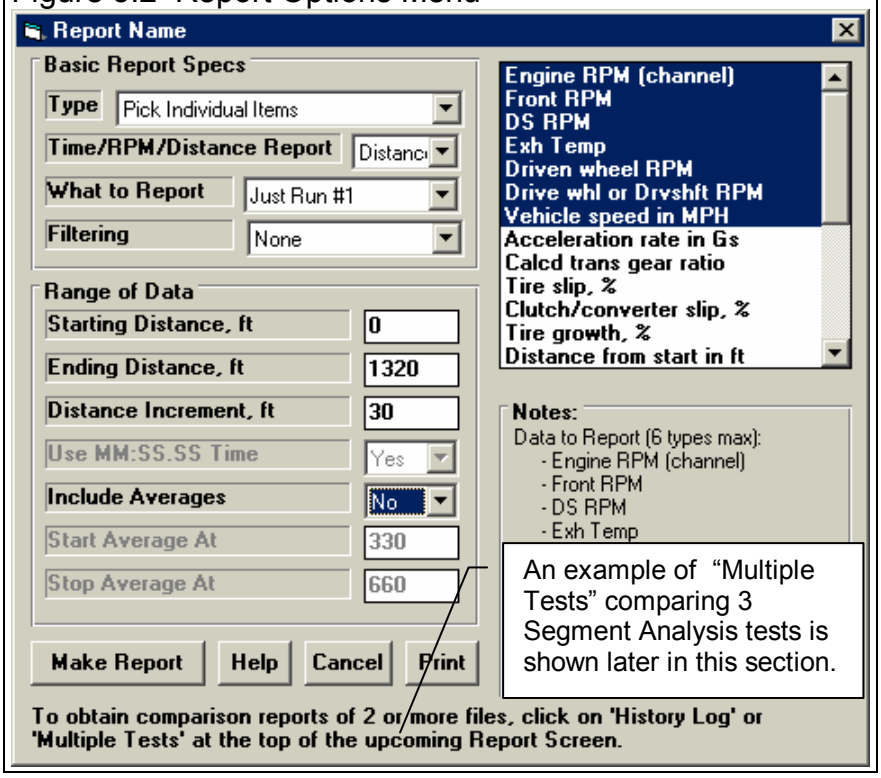
All these topics will be covered in this chapter. Figure 3.1 shows how to reach all these various features.

Figure 3.1 Various Output Options from the Main Screen



3.1 Reports

Figure 3.2 Report Options Menu



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.

Type

There are 2 basic types of reports:
1. Pick Individual Items.
2. Segment Time Analysis.

They can be picked by clicking on the down arrow key of this combo box. If you select Segment Time Analysis, 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/RPM/Distance Report

Click on the down arrow button to choose either Time, RPM or Distance for the various rows of the report. Your choice will appear in the left column of the report. RPM is usually only chosen for doing torque and HP curves for Accel to Meas Tq/HP type of runs.

What to Report

Select what part of the drag race run you want to make the report of:

- All Data
- Just Run #1
- Just Run #2 (if it exists)
- Just 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 86 and 87 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 or Distance 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 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 drag race 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

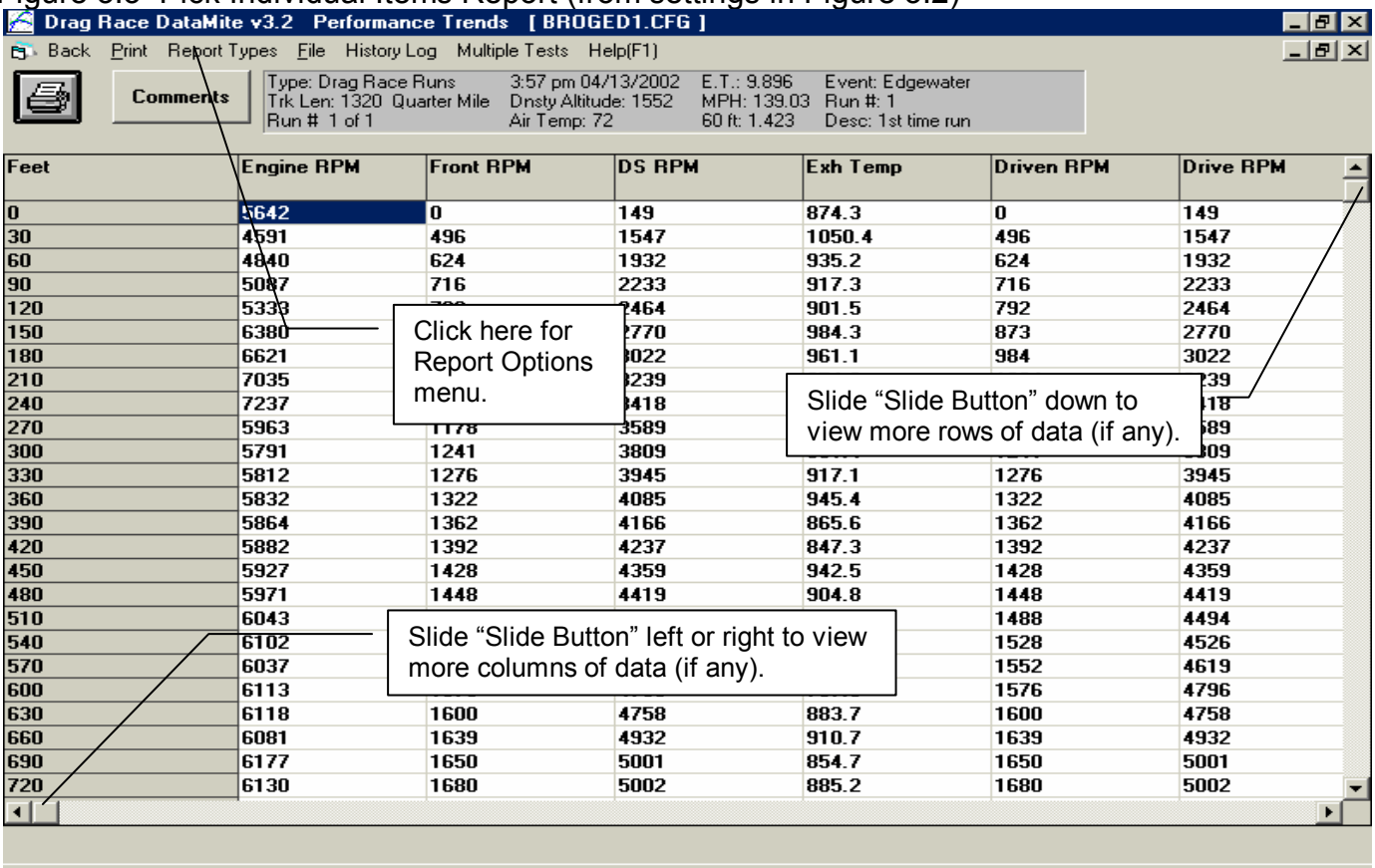
This report will include columns of data you have selected in the Report What section of the Reports menu. They will be reported following the other specifications you have set in the Reports menu. The Data Types are defined in Table 3.1. Figure 3.3 shows a report for the settings in the Report Menu 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
Individual Channels	User Specified Name	These are the individual raw data channels which the DataMite of DataMite II is recording. These are listed in the DataMite Specs calibration table as shown in Section 2.5. The names for these channels are what you have entered into the Calibration Table.
Driven Wheel RPM	Driven RPM	RPM of the driven wheel (front wheel on a rear wheel drive car). Because this is from an "unpowered" wheel, there should be little or no tire slip. Therefore, this RPM is very useful for calculating things like MPH, distance traveled, acceleration rate, etc. If you have an accelerometer set to Front Acceleration, then Acceleration Gs can be used to determine things usually calculated by Driven RPM. Usually, Driven RPM is more accurate than an Accelerometer, however some tracks/events do not allow front wheel RPM to be measured. Note for Calculations based on Driven RPM: If the front wheels leave the ground at the start of the run, the program then looks for when they touch down (Driven RPM jumps up) and fills in what it should have been if the tires had stayed on the ground. This is what the program uses for calculations which depend on Driven RPM. However, what is graphed for Driven RPM is the actual recorded data.
Drive Wheel RPM	Drive RPM	RPM of the driving wheel or driveshaft (rear wheel or driveshaft on a rear wheel drive car). Because this is directly tied to the transmission output, it can be used to determine clutch or converter slip, trans gear ratio, etc.
Vehicle Speed in MPH	MPH	Is Vehicle Speed in MPH calculated from Driven RPM or an Accelerometer.
Acceleration Rate in Gs	Accel Gs	Is Vehicle Acceleration in Gs (1 G is 22 MPH increase every second, or 32.2 ft/sec increase every second). This is the same acceleration of an object dropped in "free fall", or the acceleration of gravity. This is based on Driven RPM or Accelerometer data if available.
Calcd Trans Gear Ratio	Gear Ratio	Is the Gear Ratio based on Drive RPM and Engine RPM and Final Drive Ratio if necessary.
Tire Slip	Tire Slip	Is the tire slip based on Driven RPM, Drive RPM and the tire diameters and final drive ratio if necessary. This assumes tire diameters are constant.
Clutch/converter slip, %	Cltch Slip	Clutch slip in %. It is critical you have the Final Drive and Gear Ratios in the Vehicle Specs correct for Clutch Slip to be accurate.
Tire Growth, %	Tire Grwth	Is the tire growth based on Driven RPM, Drive RPM and the tire diameters and final drive ratio if necessary. This is similar, but opposite of Tire Slip, %.
Distance from Start, ft	Distance	Is distance traveled from the start of the run or data set calculated from Driven RPM or an Accelerometer.
Lap Number	Lap#	The sequential Lap Number, more useful for road racing data sets.

Transmission Gear	Gear#	Is the transmission gear the analysis believes the transmission is in, based on the calculated Gear Ratio and the Trans Gear Ratios entered in the Vehicle Specs.
Lap Time	Lap Time	The time from beginning to end of this data set. Drag Race Runs include time before the start and some time after the end of the run, so this time will be much larger than the actual ET of the run. This data is more useful for road racing data sets.
Observed flywheel torque	Obs Tq	Is the observed (uncorrected) torque the program estimates to be at the flywheel under steady state (non-accelerating) conditions. This is estimated to be similar to what an engine dyno would measure. The program makes estimates of driveline and inertia losses to arrive at this number.
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.
Road torque, HP, Corr. torque, HP	Obs RoadTq, etc.	Is the same as the Flywheel numbers above, except the program does not try to correct for driveline and inertia losses This is estimated to be similar to what a chassis dyno would measure.

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

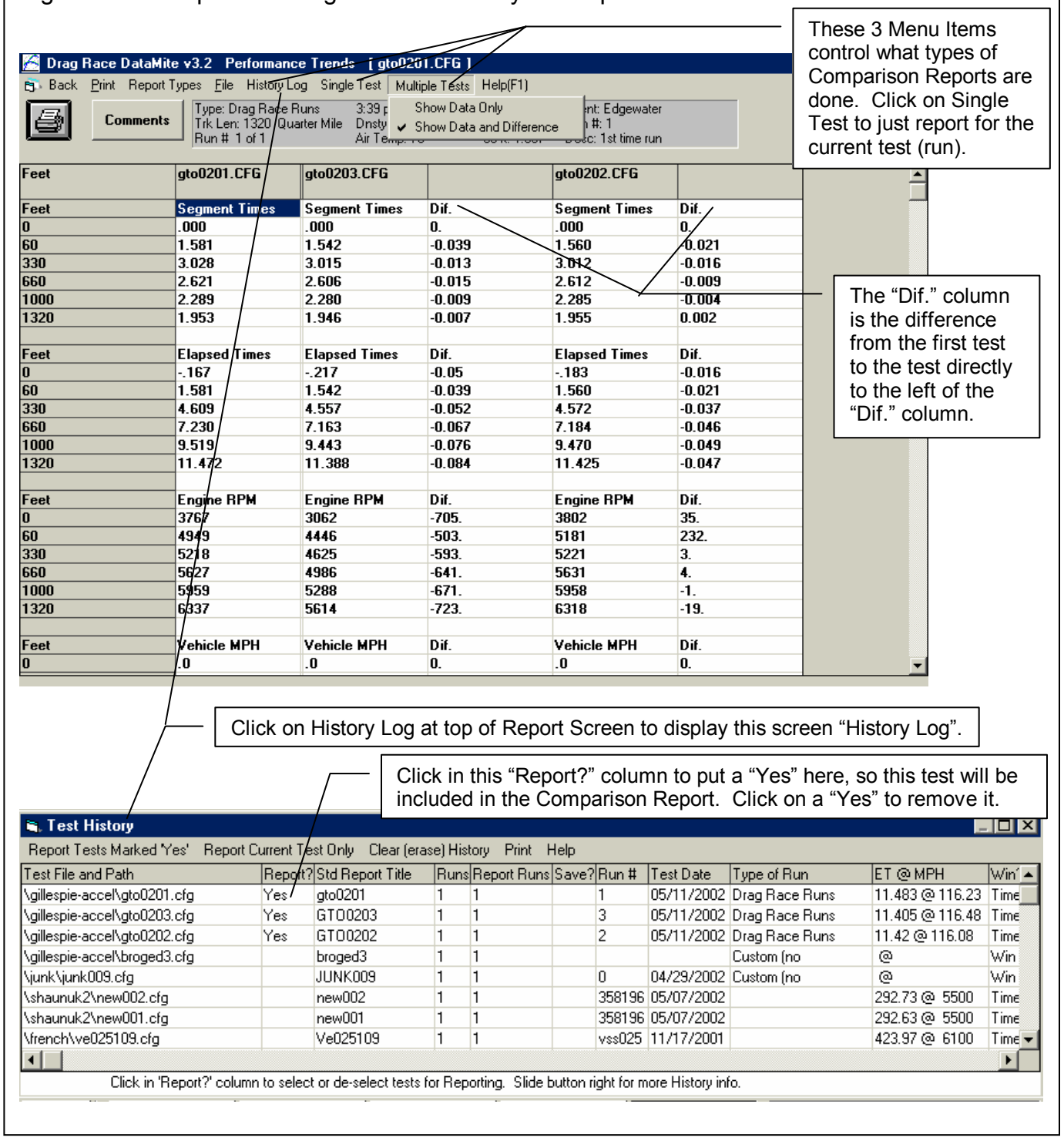


Feet	Engine RPM	Front RPM	DS RPM	Exh Temp	Driven RPM	Drive RPM
0	5642	0	149	874.3	0	149
30	4591	496	1547	1050.4	496	1547
60	4840	624	1932	935.2	624	1932
90	5087	716	2233	917.3	716	2233
120	5333		2464	901.5	792	2464
150	6380		2770	984.3	873	2770
180	6621		3022	961.1	984	3022
210	7035		3239			3239
240	7237		3418			3418
270	5963	1178	3589			3589
300	5791	1241	3809			3809
330	5812	1276	3945	917.1	1276	3945
360	5832	1322	4085	945.4	1322	4085
390	5864	1362	4166	865.6	1362	4166
420	5882	1392	4237	847.3	1392	4237
450	5927	1428	4359	942.5	1428	4359
480	5971	1448	4419	904.8	1448	4419
510	6043				1488	4494
540	6102				1528	4526
570	6037				1552	4619
600	6113				1576	4796
630	6118	1600	4758	883.7	1600	4758
660	6081	1639	4932	910.7	1639	4932
690	6177	1650	5001	854.7	1650	5001
720	6130	1680	5002	885.2	1680	5002

Segment Time Analysis and Multiple Tests (comparing 2 or more tests), Pro Version Only

This special report gives the time for the car to reach various distances on the track, points which coincide with the segment times reported at most drag strips on the time slips. Times are given both for cumulative time (from the first RPM) and time between each distance (segment times). Figure 3.4 also shows a Comparison Report of "Multiple Tests", 3 tests in this case.

Figure 3.4 Comparison "Segment Time Analysis" Report of 3 Runs



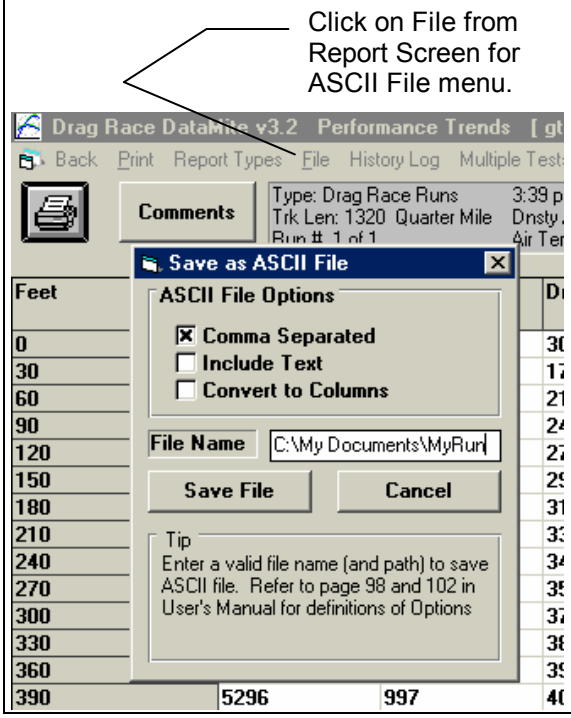
As Figure 3.4 shows, Multiple Tests are possible by clicking on Multiple Tests or History Log at the top of the Report screen. You select which tests to include in the comparison by clicking in the "Report?" column of the History Log. This is the same History Log as is used in the Graph screen to do comparison graphs of 2 or more tests. To go back to a single report of just the current test, click on Single Test at the top of the Report screen, or remove all the 'Yes' notations in the "Report?" column of the History Log. Removing a 'Yes' is done by clicking on the 'Yes' that is already there.

3.2 ASCII Data Files (Pro version only)

You may want to use the results from the Drag Race 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.

Figure 3.5 ASCII Files Options Menu



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. You can also include the complete path plus file name. Checks are made to ensure what you enter is a valid file name and that you are not overwriting an existing file. If just a file name is entered, the file is written to the Drag Race DataMite Analyzer folder (directory), the folder which contains the DTM-DR.EXE program file.

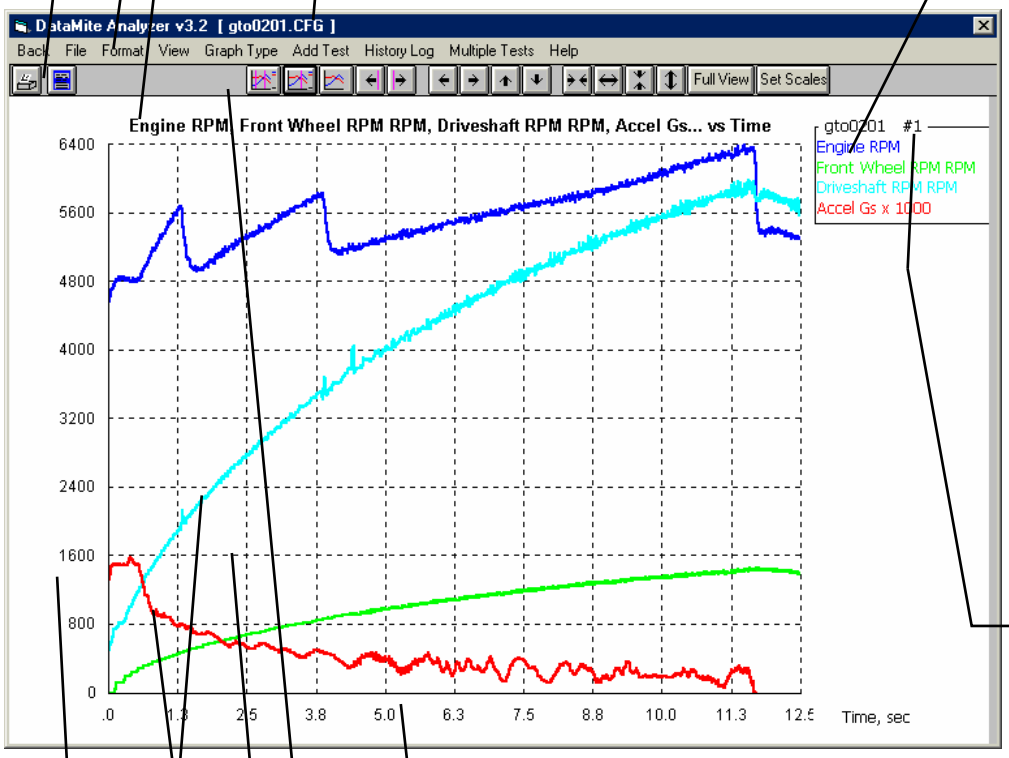
See Section 3.5 for more details on files and file names.

3.3 Graphs

Note: Also check Preferences, Section 2.2 for several Preferences which pertain to graph line colors, printing options, etc.

Graphs are obtained by clicking on the Graph menu command at the top of the Main Screen. Figure 3.6 shows a typical graph and a description of some of the basic graph screen items.

Figure 3.6 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 recorded data, vehicle specs, etc.

Graph Legend, which describes the data graphed. This includes Name of the Test Results file, the particular 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 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.)

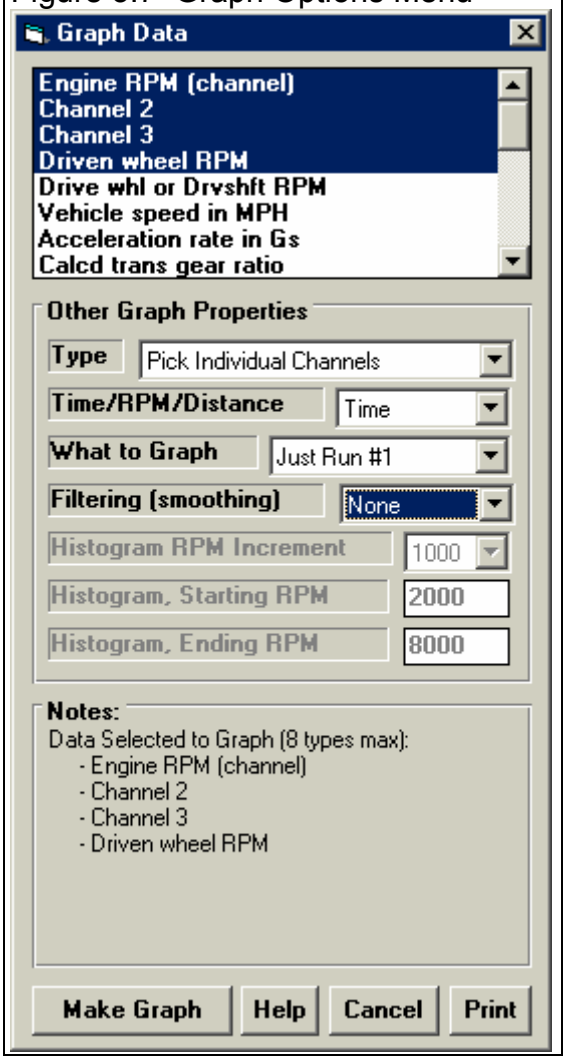
Grid lines. The style or elimination of grid lines can be changed by clicking on Format, then Grid Style (Pro version only).

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 3.7. 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 3.7 Graph Options Menu



Data Types

The Data Types you can select are listed and defined in the Report's section Table 3.1 on page 79. You are limited to selecting only 8 Data Types for a graph.

Other Graph Specs

Type

Click on the down arrow button to choose either Pick Individual Channels (as show here) or several choices of the special graph type of Engine RPM Histogram.

Time/RPM/Distance Graph

Click on the down arrow button to choose either Time or RPM or Distance for the horizontal X axis of the graph. RPM is usually chosen for doing torque and HP curves for Accel to Meas Tq/HP type of runs.

What to Report

Select what part of the drag race run 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.

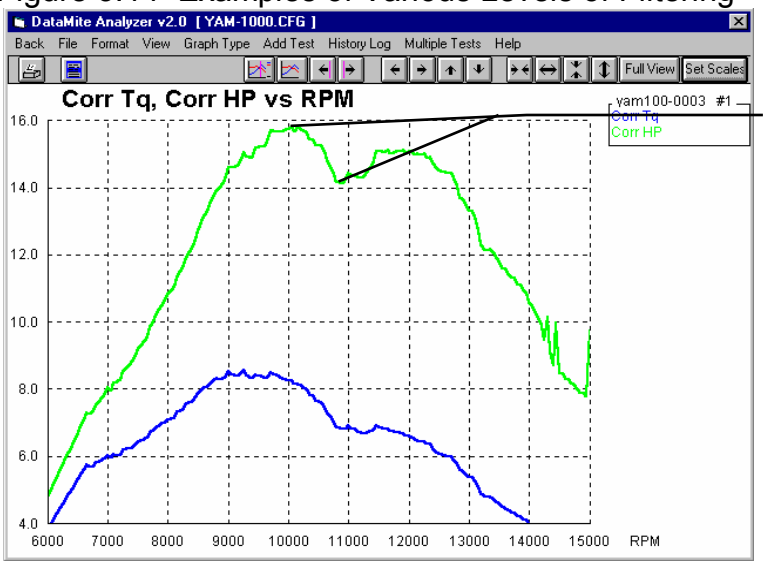
Filtering (smoothing)

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)

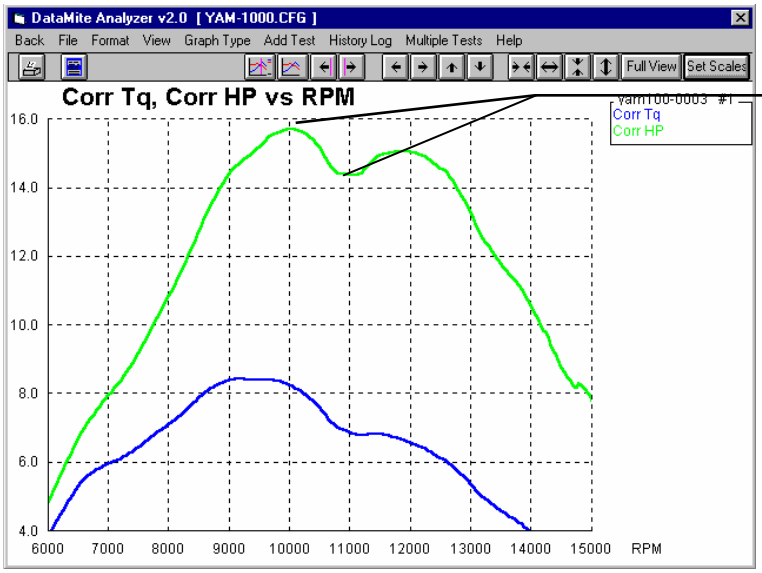
Select the lowest level that eliminates most (not all) of the 'jitter' in the data. Be careful not to 'over-filter', as this can completely distort the data. The dip seen in the Graphs of Figure 3.14 is real and is due to exhaust tuning effects on this 2 stroke engine. Note that the graph with Heavy 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



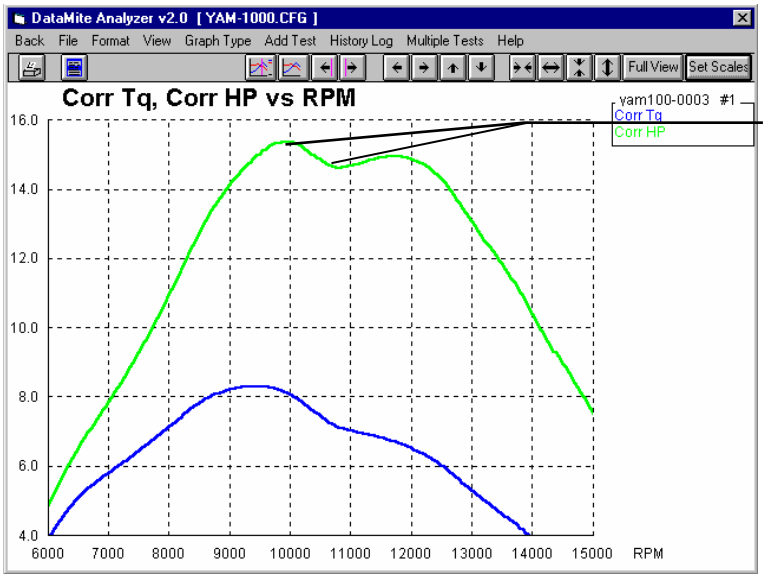
Note that the peak is the highest and the valley is the deepest when filtering is the least, in this case None. These torque and HP graphs look fairly smooth, even with Filtering = None, so even None would be an acceptable for these torque and HP graphs.

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

Histogram Specs

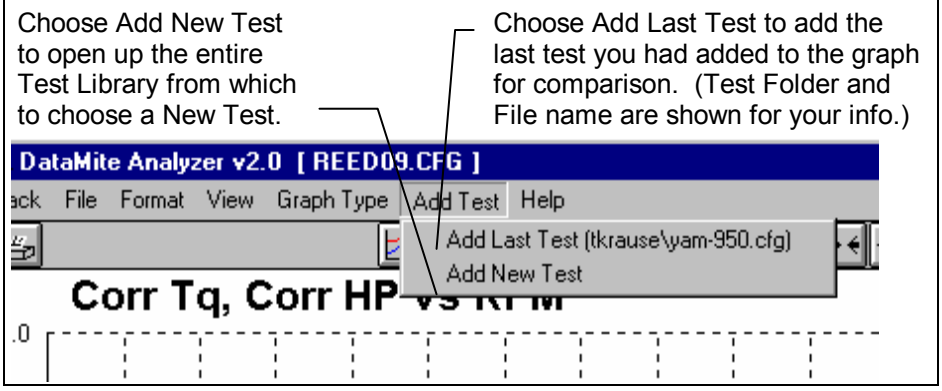
An Engine RPM Histogram is a graph which shows the amount of time the engine spends at different RPMs. This information can be useful for your engine builder in designing your engine. Your choices for the Type of Histogram include:
Including all RPM data, or just data when the engine is accelerating. Histograms when the engine is accelerating is timewhen the engine is probably wide open throttle, and is typically what you are more interested in.
Reporting the numbers in seconds of time, or percent time for the whole run. Using percent (%) makes it easier to compare Histograms for runs which may be quite different in length of time.

Histogram RPM Increment
Histogram, Starting RPM
Histogram, Engine RPM

These specs determine the lowest and highest RPM which will be displayed on the Histogram graph, and what RPM increment there will be between different RPM points.

Graphs Comparing More Than 1 Test (Basic Ver.)

Figure 3.9 Graphing Multiple Tests, 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***.

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.

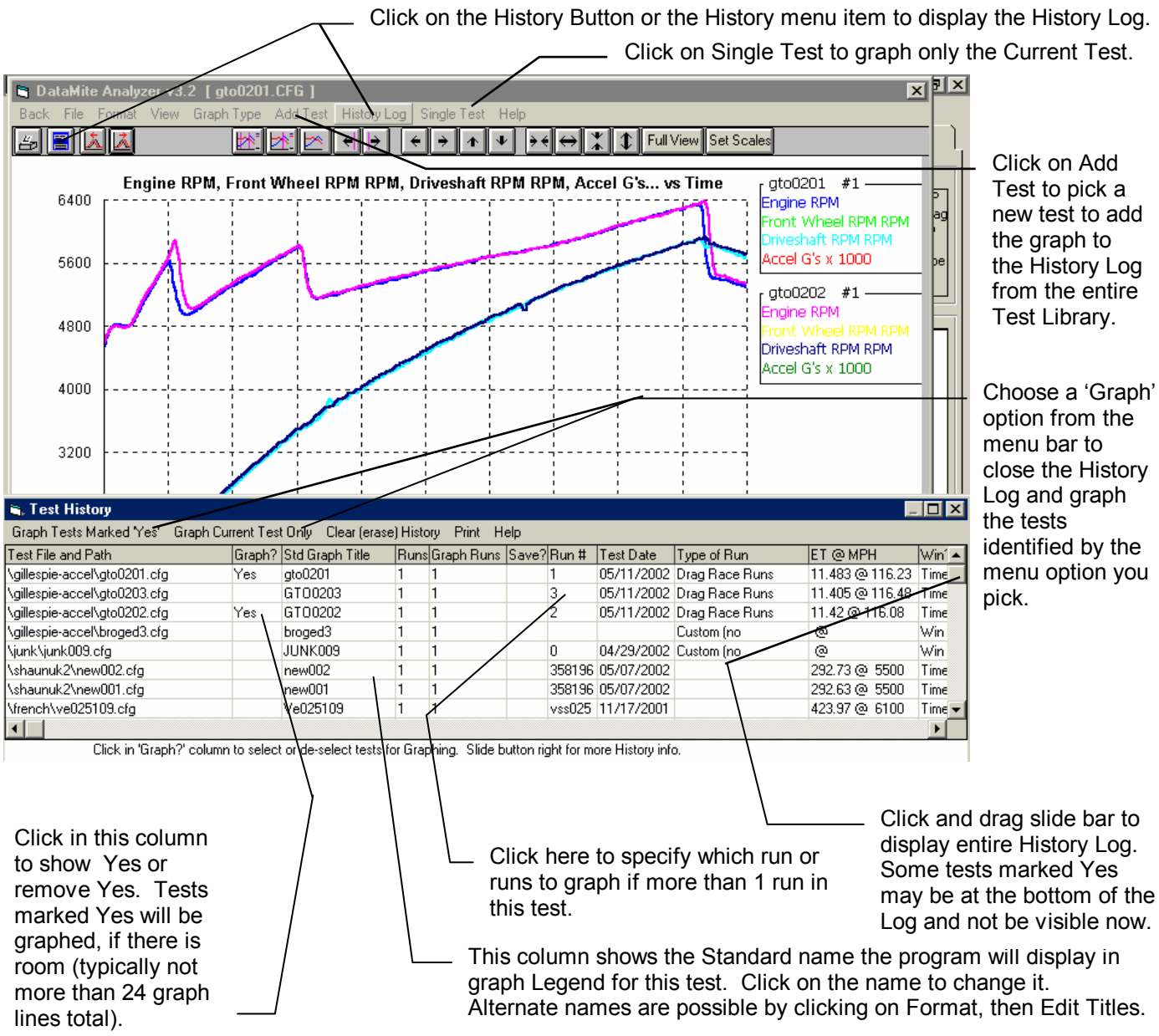
Graphs Comparing More Than 1 Test (Pro Version)

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, MPH, Engine RPM, Tire Slip and Converter Slip for 6 different drag race runs).

Figure 3.10 History Log (Pro version only See Section 3.7 for more details.)



Other Graphing Features

The next section discusses lists and discusses several other features from this screen, including:

- Printing
- Eliminating Scale Multipliers
- Displaying Comments and/or Density Altitudes for all tests graphed.
- Single or Dual Cursor(s) to pinpoint the value of a particular point or section on the graph
- Changing titles and legend names
- Changing the scales to zoom in or zoom out
- Time Aligning (moving one test forward or backward in time or distance for better comparisons)

Printing

Figure 3.11 shows the options for printing graphs and how to access these options. Figure 3.12 shows the screen for changing the Windows Printer Setup. Figure 3.13 shows how you can add information to a graph printout by clicking on Format, then Edit Printed Comments and Data Output.

Figure 3.11 Printing Graphs

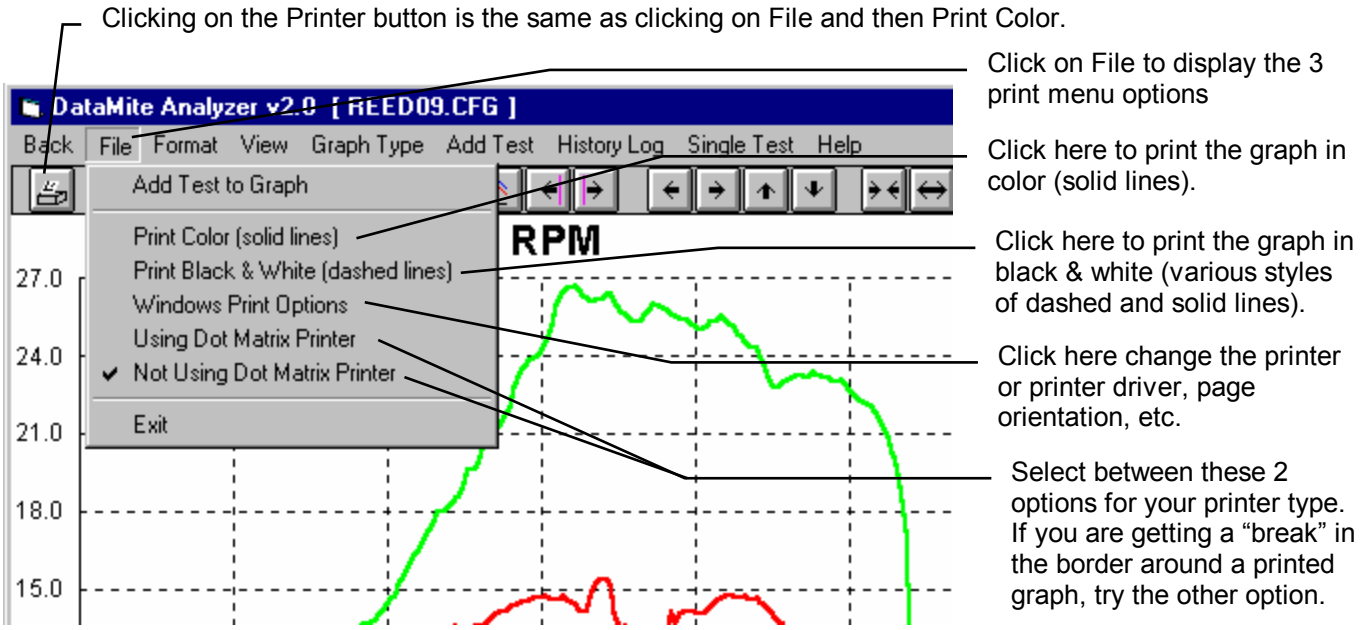
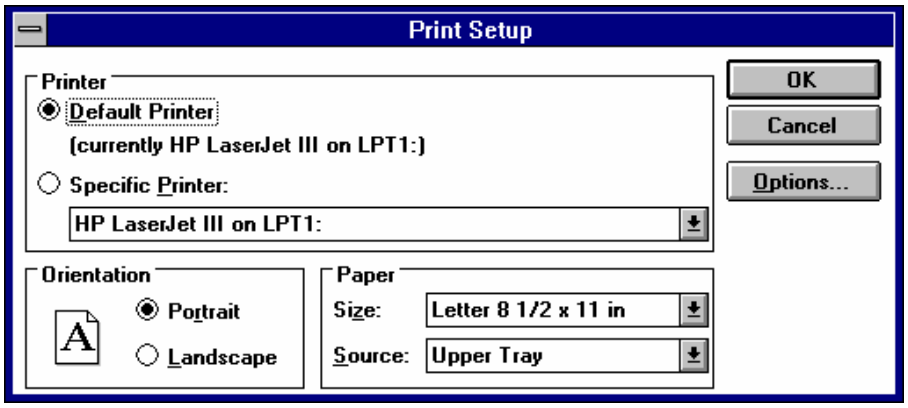
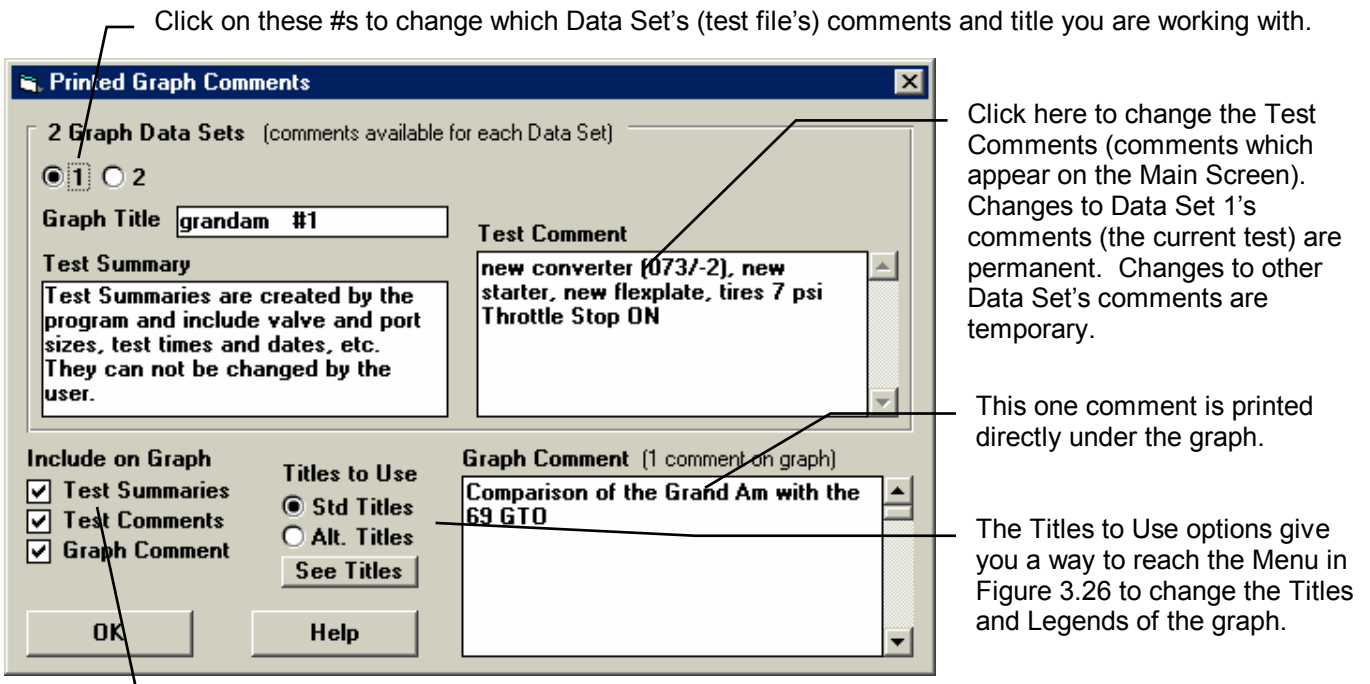


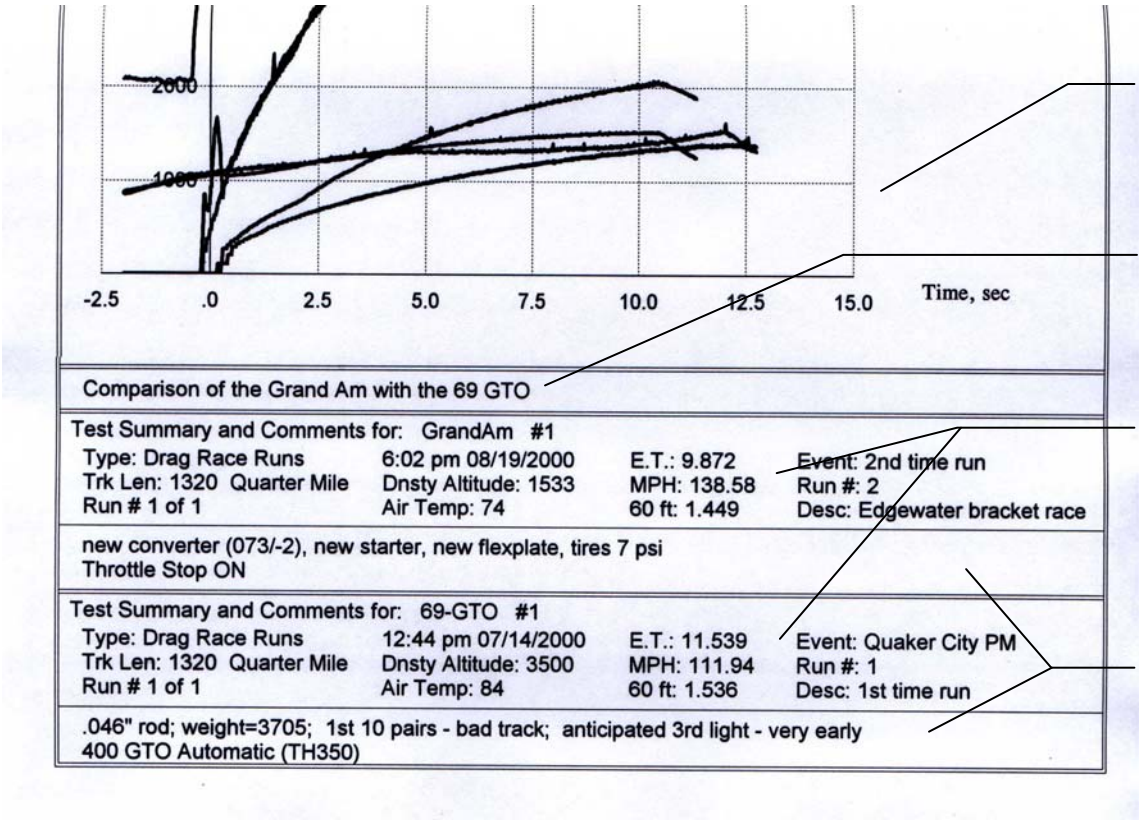
Figure 3.12 Standard Windows Printer Options



The Options (sometimes called "Advanced") button displays a screen for selecting various printing and color options. Try changing these settings to correct certain print problems.

Figure 3.13 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.)





Cursor

The cursor feature is very useful for determining or comparing the value of the graph lines at various places. See Figure 3.14 for explaining the use of the cursor.

Figure 3.14 Cursor Features and Commands

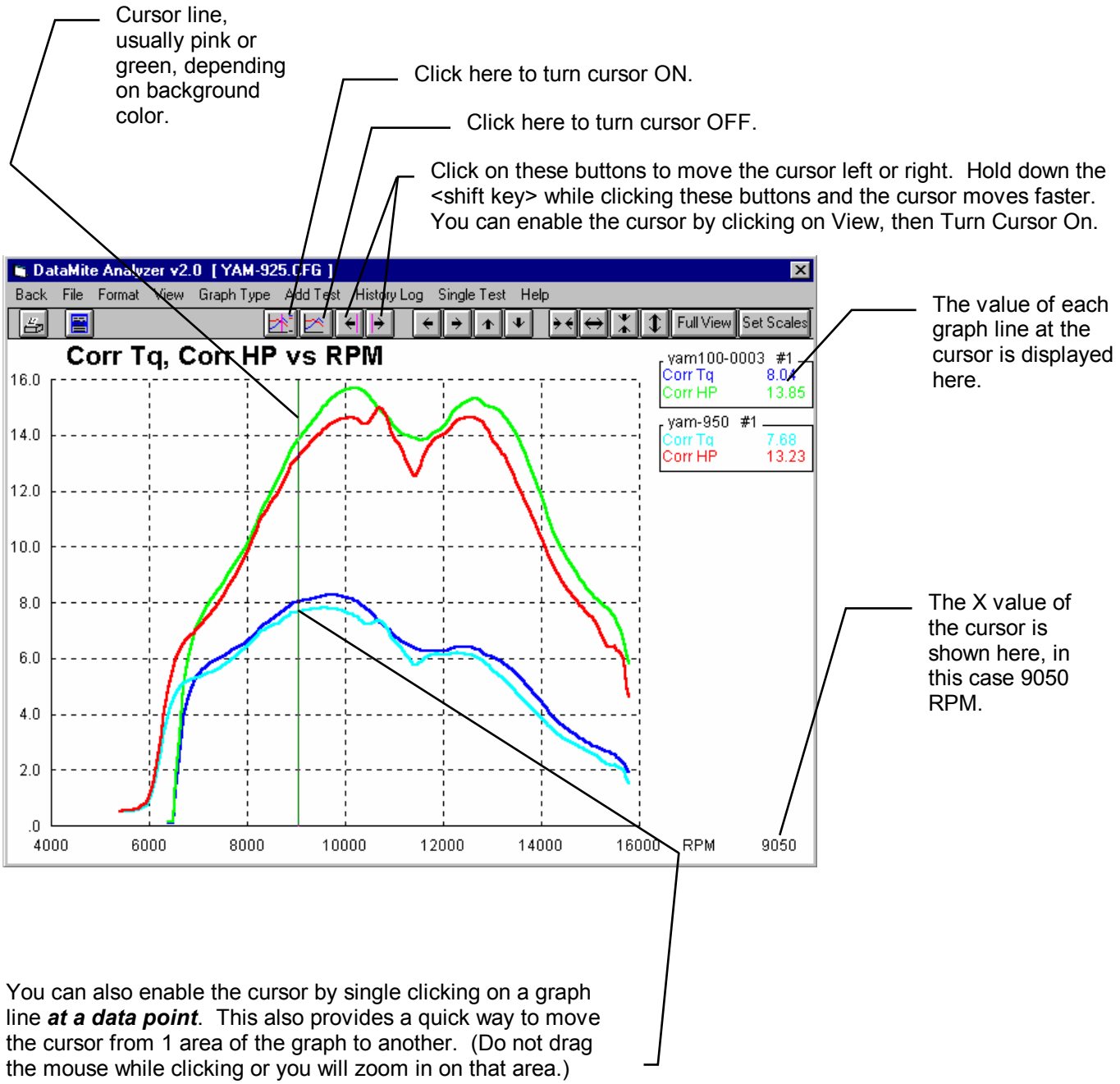
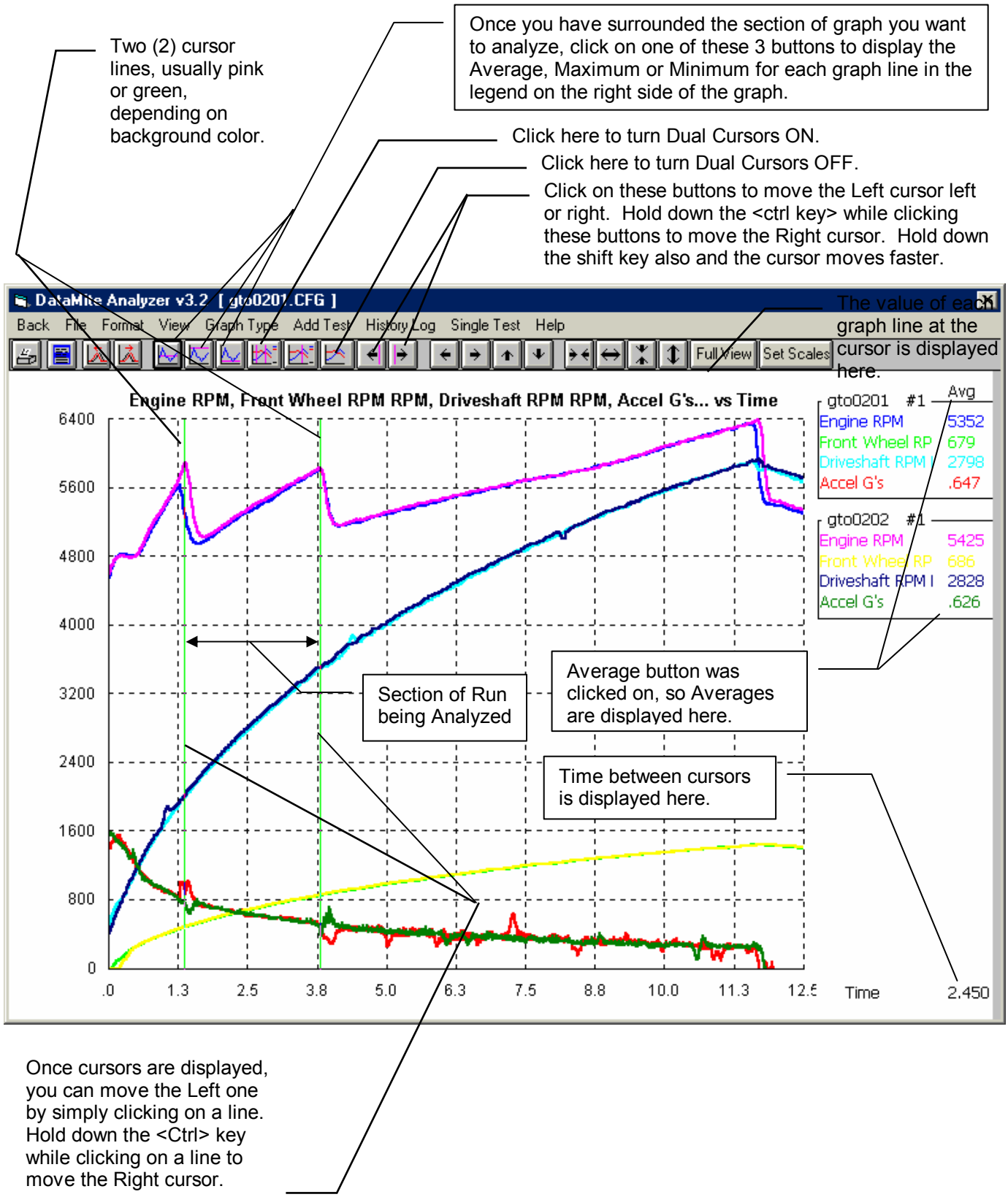


Figure 3.15 Dual Cursor Features and Commands

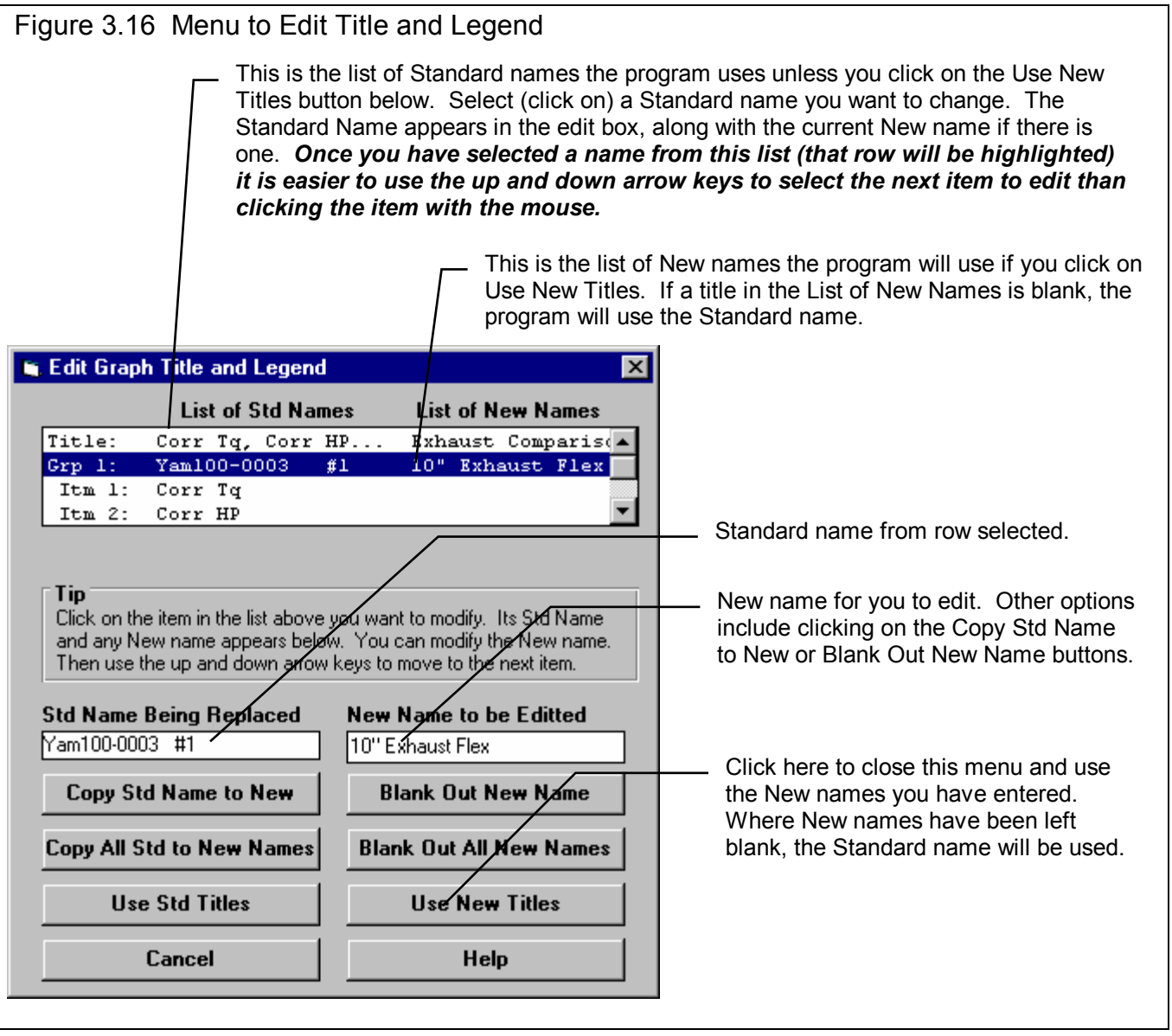


Changing titles and legend names (Pro version only)

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 3.16 which will allow you to do this.

Note that the names you enter here are for a particular ***position*** in the graph legend, not the particular file. The name you enter for Grp 1 (group 1 or the first file in the legend) will stay with first group in the legend, even if it is now for a different file. For this reason, it is often better to enter a descriptive "Graph Name" in the History Log that will stay with the particular file, and not use this method of changing names. This feature is very useful for printing a particular graph, or one time modifications.

Figure 3.16 Menu to Edit Title and Legend



Changing the scales

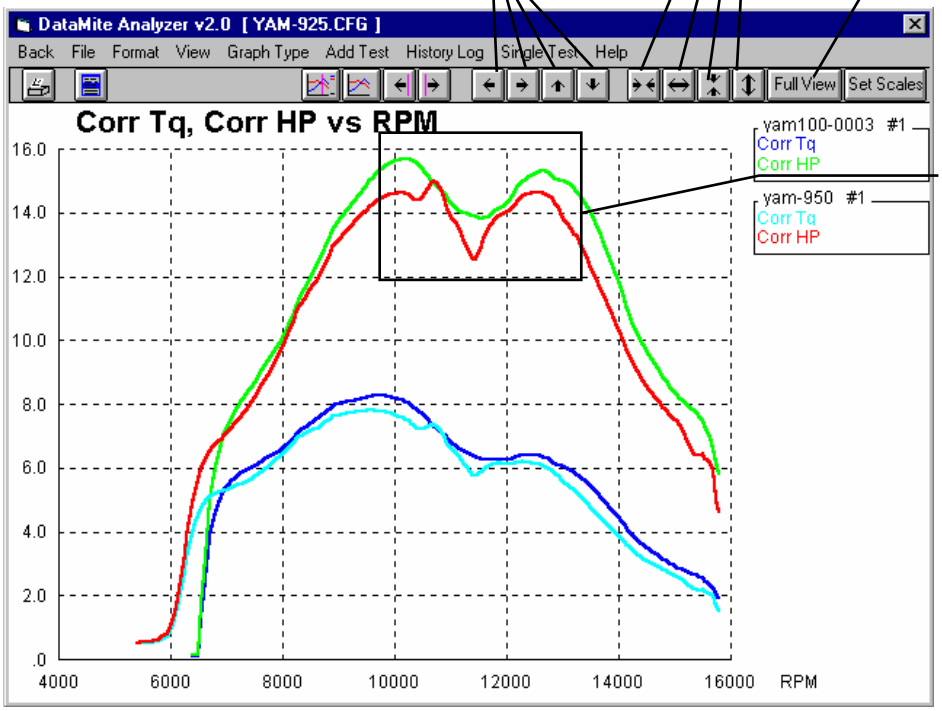
Many times you may want to change the scale of the X or Y axis. This may be to show an area in more detail or to match the scales of a previous graph. The Pro has several ways to change the scales as shown in Figures 3.17 and 3.18.

Figure 3.17 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.



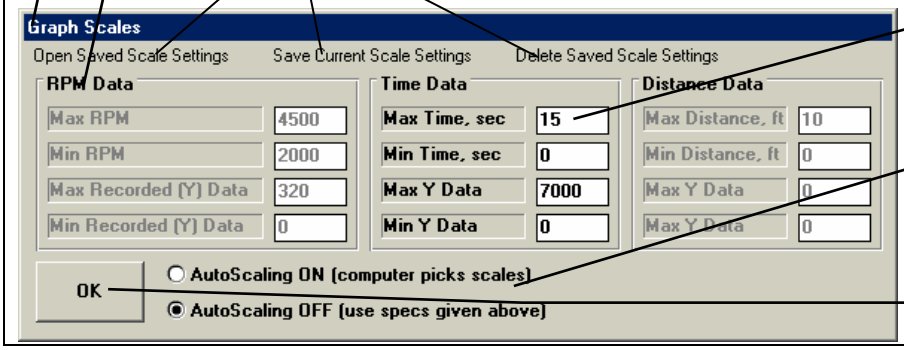
You can use the mouse to outline an area to be zoomed in on. Simply click on the mouse key in the upper left corner of the area, then hold the key down and drag the mouse to the lower right corner of the desired area. A box will be drawn as shown. When you release the mouse key, this area will fill the 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 3.18 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 3 sections will be enabled.

These 3 menu options let you save, open (recall) and delete combinations of scale settings for standard types of graphs you often make.



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.

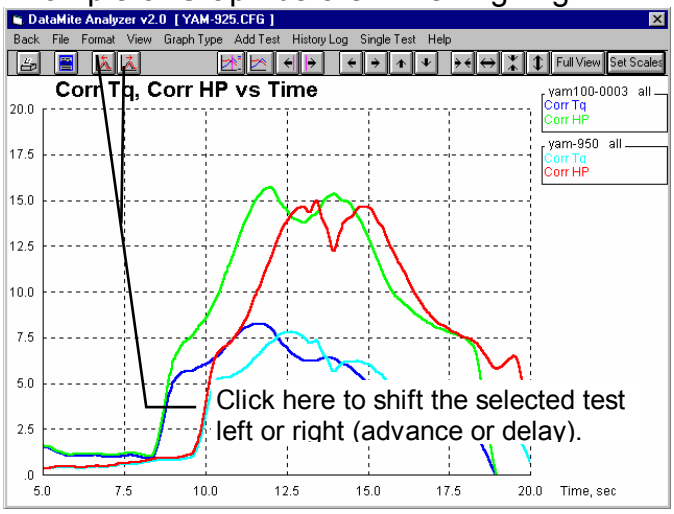
Click on OK to have the graph redrawn to these new scale

Time Aligning (shifting) Graphs

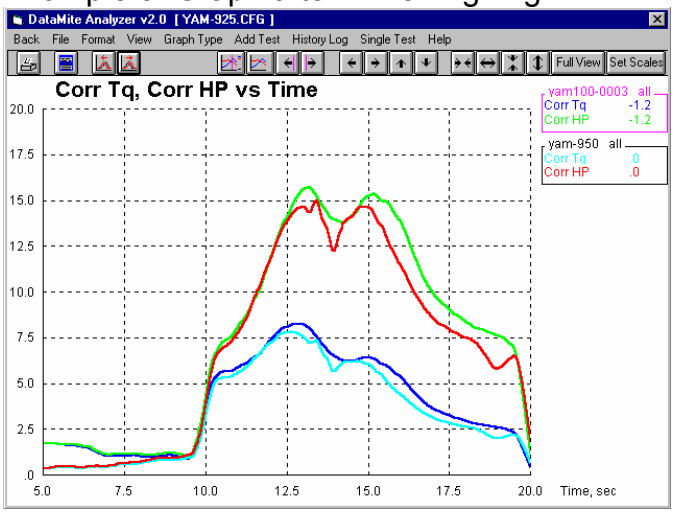
Many times you may want to realign 1 graph with respect to another, for example to line up the start of a run, a shift, etc. The program allows you to shift (advance or delay) one test over another on the graph, as shown in figure 3.19.

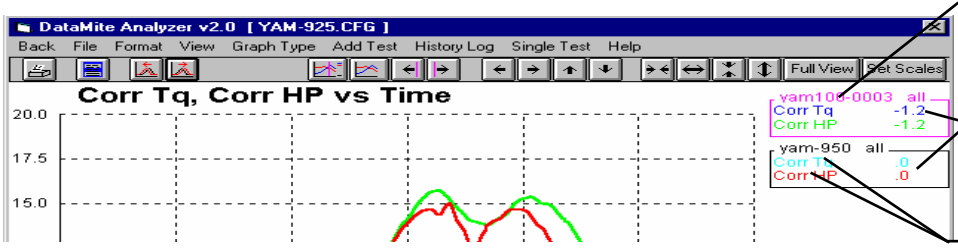
Figure 3.19 Showing Options to Shift Data from 1 File Over Another File

Example of Graph before Time Aligning



Example of Graph after Time Aligning

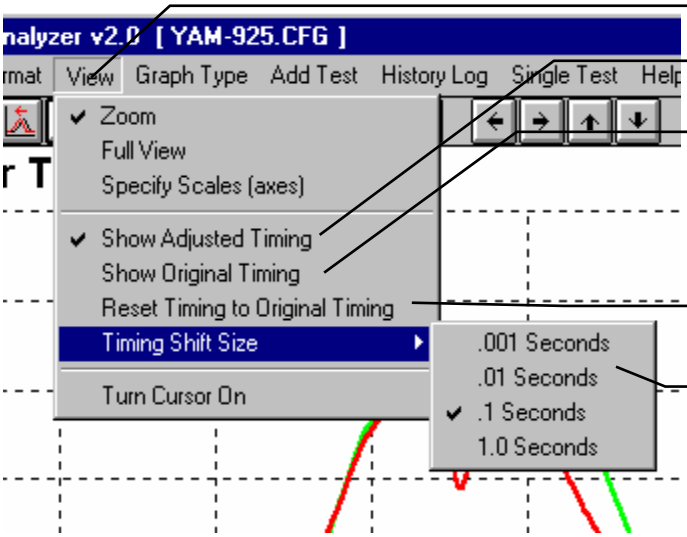




The test you are shifting is identified by printing the name and outline in bright pink.

The number of seconds each test has been shifted is displayed here.

To switch to a different file for time aligning, click on one of the graph data types for that file.



Click on View for other Shift options.

Click here to show the amount you have shifted each test.

Click here to return the graph to its “unshifted” original condition. Note that the program remembers the amount of shifting for the displayed lobes until you close the graph screen, open the History Log, or pick different file(s) to graph.

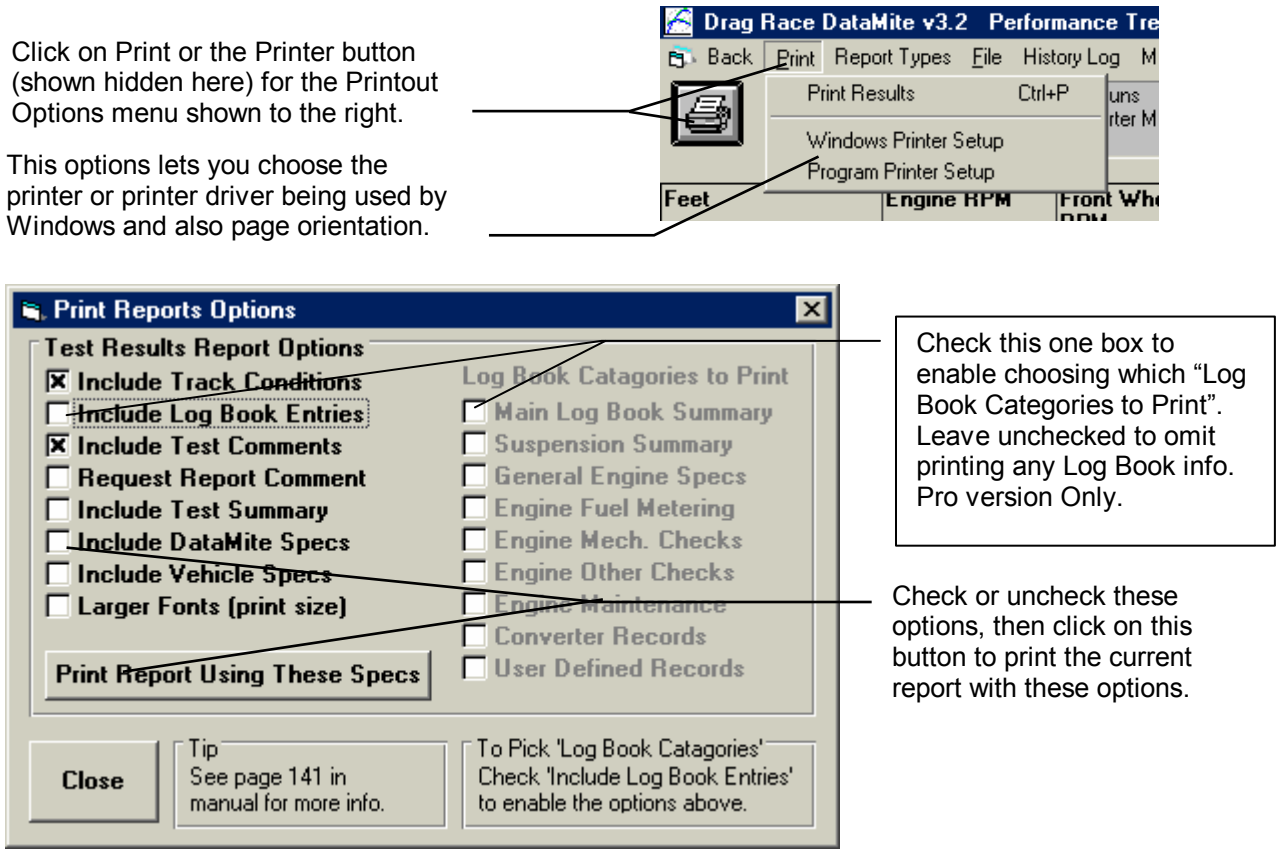
Click here to zero out the amount of shifting you have done.

Click on Timing Shift Size, then select the amount of time you want the selected test to shift for each click on the Shift Button. Note: You can also hold the Shift key down while clicking the shift button to shift a much larger amount.

3.4 Printer Output

The Drag Race 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 3.20 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 3.20 Printer Button and Print Menu Command Options - Report Screen



Test Results Report Options

Include Track Conditions
Include Log Book Entries (Pro Version Only)
Include Test Summary
Include DataMite Specs
Include Vehicle 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. Important: Check Include Log Book Entries to enable you to pick which Log Book Categories to include in the printout. Uncheck this one option and no Log Book Entries will be included.

Include Test Comments

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

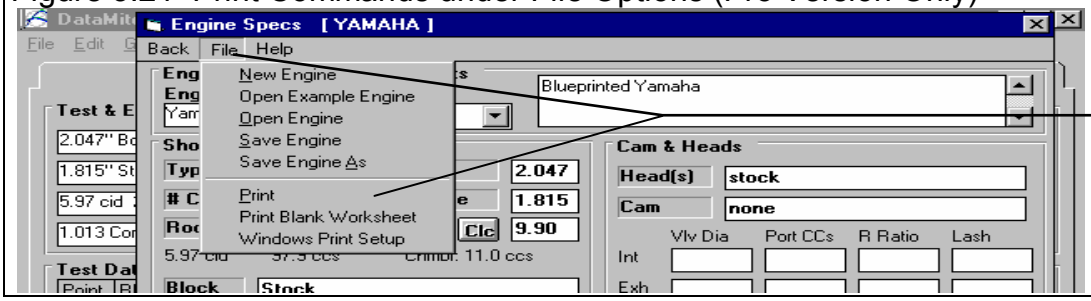
Request Report Comment

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 3.21 Print Commands under File Options (Pro Version Only)

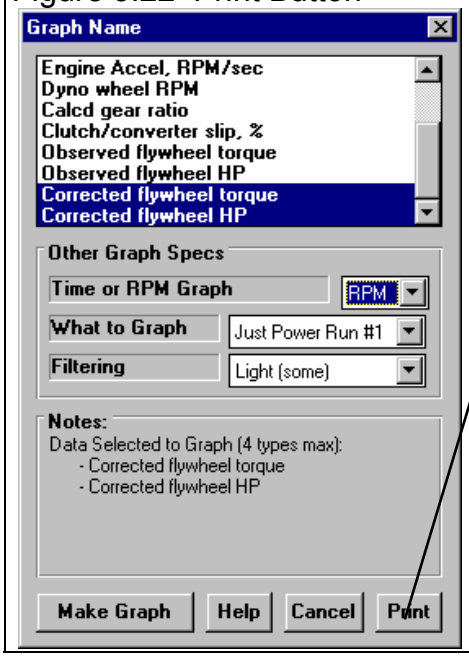


Click on File in some menus (Main Menu, Log Book, etc) to display these Print Options.

Other Print Options

Other menus have print menu commands or print buttons as shown in Figures 3.21 and 3.22. Graphs have their own set of print options. See Section 3.3.

Figure 3.22 Print Button

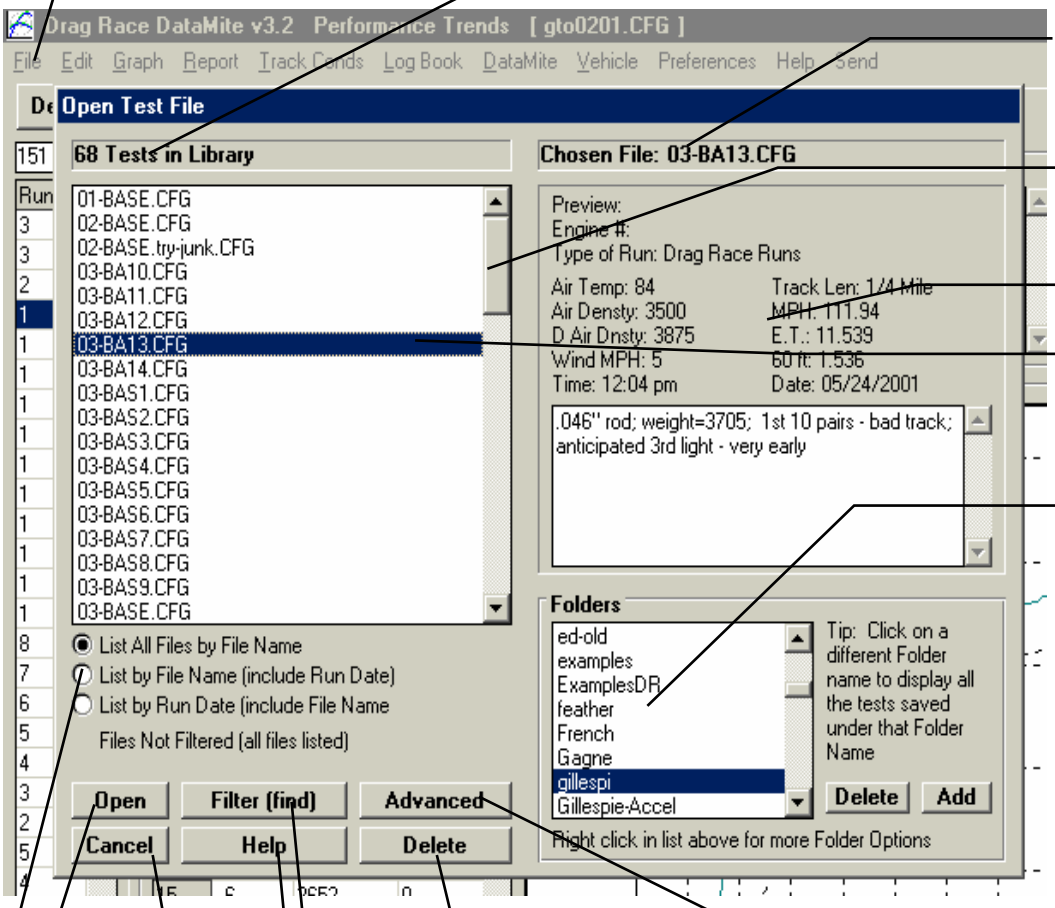


Many screens and menus have a Print button. Click on it to print that particular screen or menu.

3.5 Data Libraries

The Drag Race DataMite Analyzer allows you to save recorded DataMite Data and related specs (Vehicle Specs, Track 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 3.23 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 chosen

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

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 run date. 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.

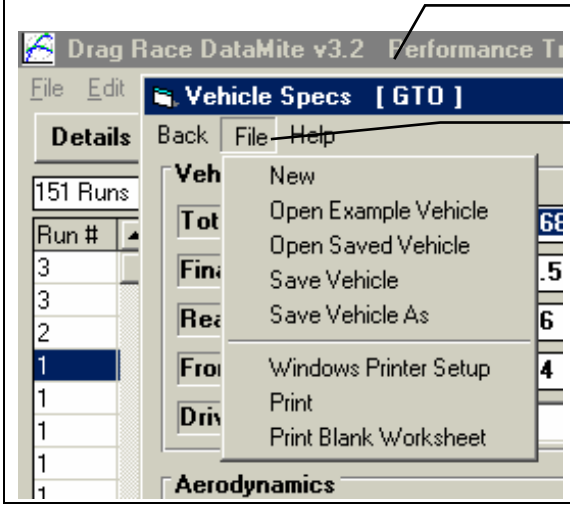
You will obtain the window shown on the previous page. Single click on one of the tests in the list, or click and drag the slide button on the right side of the list to display more tests. Once you single click on a test, it is now the Chosen Test File and a preview of the test is given in the Preview section. If the file you chose was not a valid Drag Race 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 Vehicle 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 Vehicle menu. See Figure 3.24.

Figure 3.24 Engine File Options (Pro version only)



Current Engine File Name

Click on File in the Vehicle 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 Vehicles for easily creating new tests in the future.

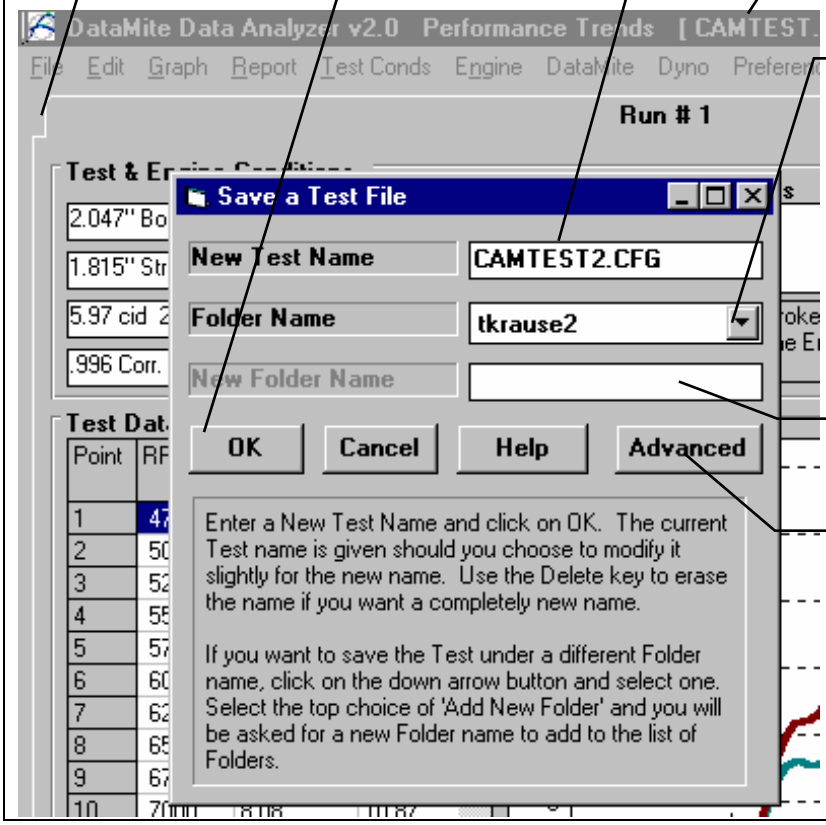
- New blanks out the current specs and comments.
- Open Example opens a library of example specs provided by Performance Trends.
- Open Saved opens a library of specs ***you*** have saved.
- Save saves the current specs to the same name as these specs are currently called.
- Save As saves the current 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 3.25 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.

Because the Suspension Analyzer is a 32 bit program (not compatible with the older Windows 3.1), it can use most any type of file name. The names can be up to 50 characters long and can include spaces, and upper case and lower case letters. However, there are certain limitations for file names, as they can ***not*** contain certain characters, like / \ : | > < * ? " . The program will warn you if you use an illegal character.

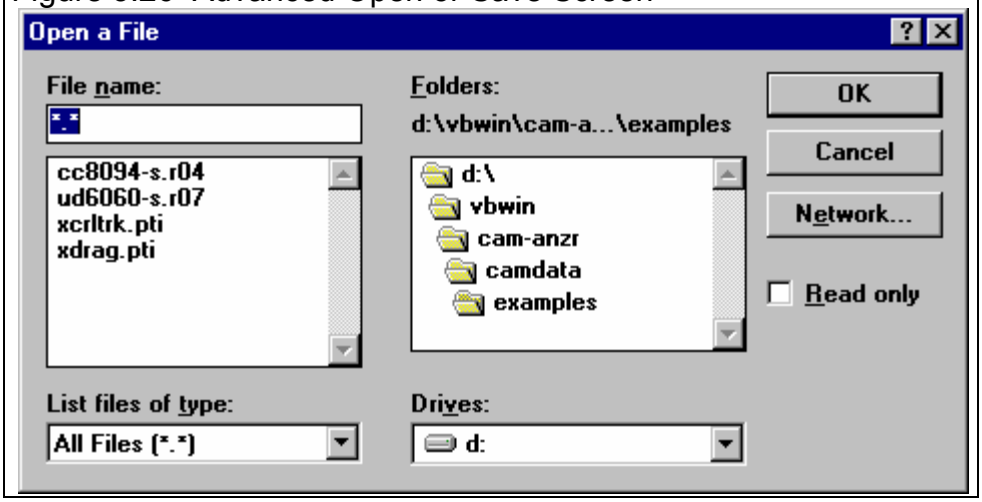
Test files are saved to folders (directories) you have created in the DTMDATA folder (directory) in the DTM20 folder (directory) under PERFTRNS.PTI folder (directory). You ***can*** copy Windows Drag Race DataMite Analyzer files from programs on other computers to this folder (directory) and they will 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 3.26. From here you can access most and file on the computer on most any disk drive.

Figure 3.26 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)

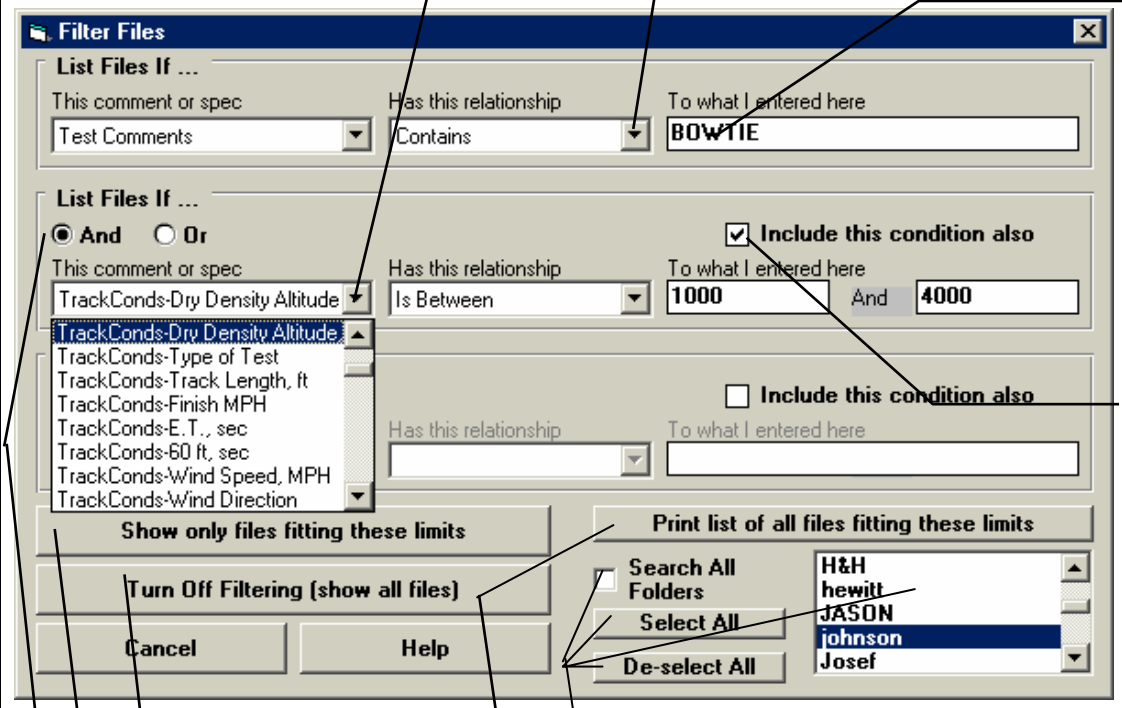
If you want to copy a DataMite test from one computer to another, you must copy all 3 files. This is done automatically whenever the program saves or opens a file, or when you used the Save to Floppy and Open From Floppy commands discussed on page 18.

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 Windows Explorer. 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 Drag Race 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 3.27.

Figure 3.27 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.

These options let you choose which folders to search, All Folders or just the ones you have selected in the list.

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 time.

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 a Dry Density Altitude between 1000 and 4000 ft (calculated from weather info in the Track Conds menu).**

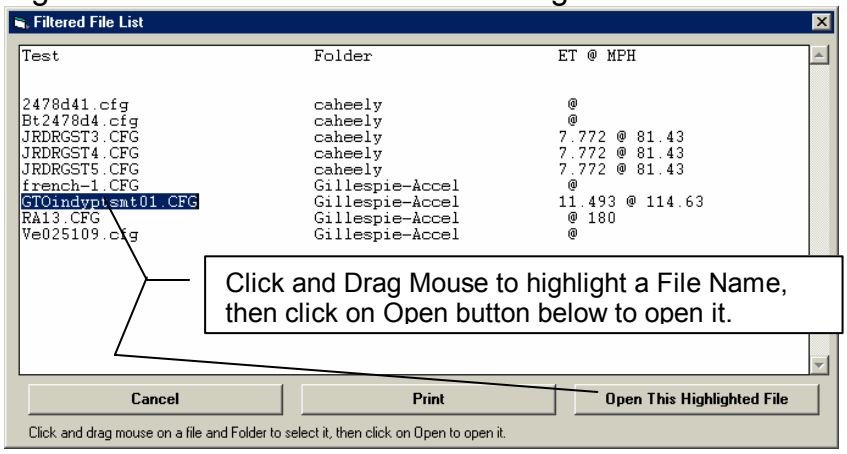
The Filter Feature is very useful for finding a specific test or to find all the tests which meet a certain set of conditions. For example, say you want to find a test that Operator "Jack" ran for Customer "Smith" on a "Big Block Chevy" engine. Or, say you want to check on all tests run with Weber carbs, 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".

Figure 3.28 Print List of All Files Fitting These Limits



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.

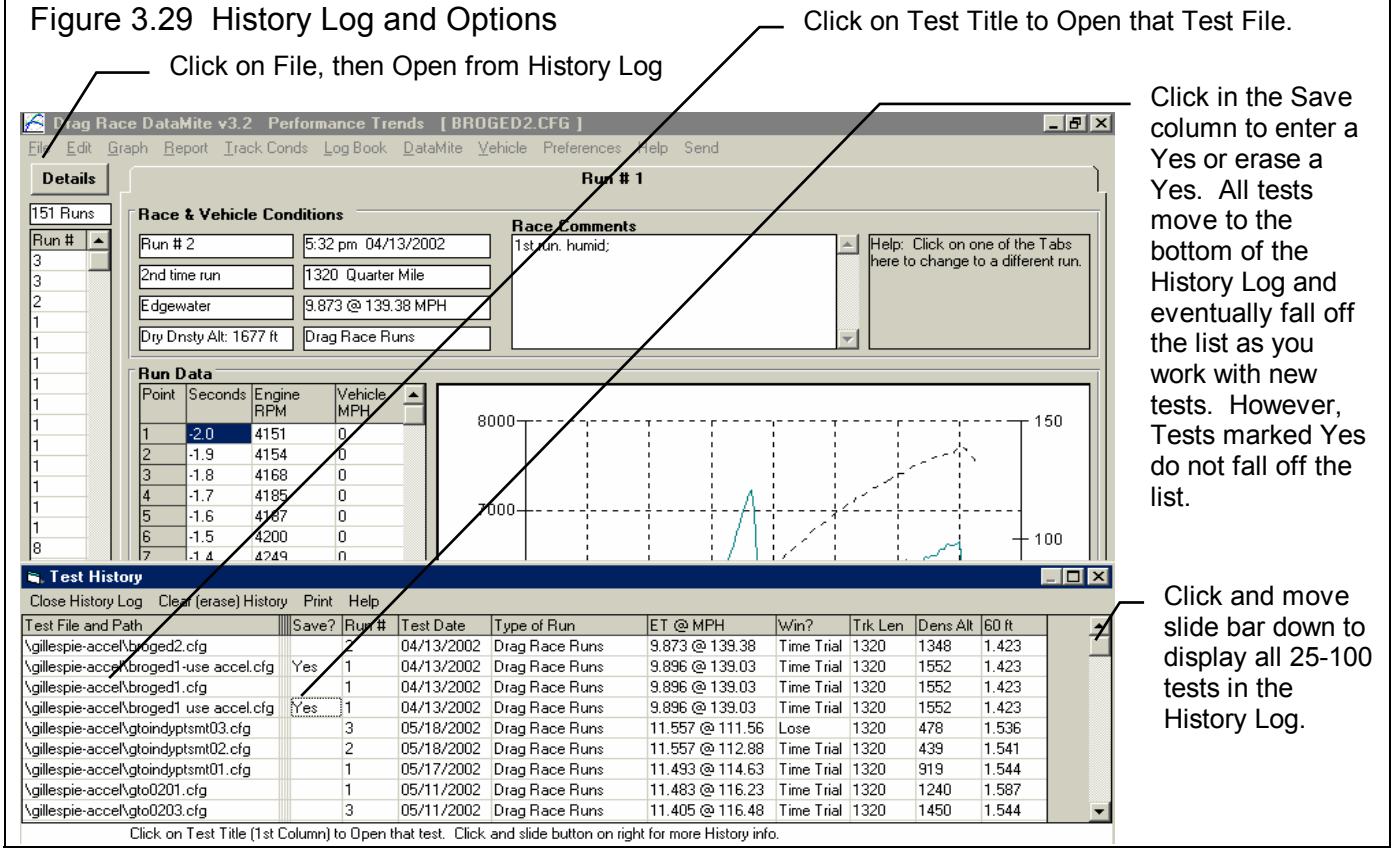
Tip: When looking for a word, the program doesn't care if it is in CAPITAL (upper case) or small (lower case) letters. In Figure 3.32 above you are looking for the word BowTie in the test comments. The program will display all files which have the word "BowTie" or the word "BOWTIE" or the word "bowtie" 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 3.29. 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.

Also see Section 3.9, Run Log, for a comparison of the similarities and differences to this History Log.

Figure 3.29 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.

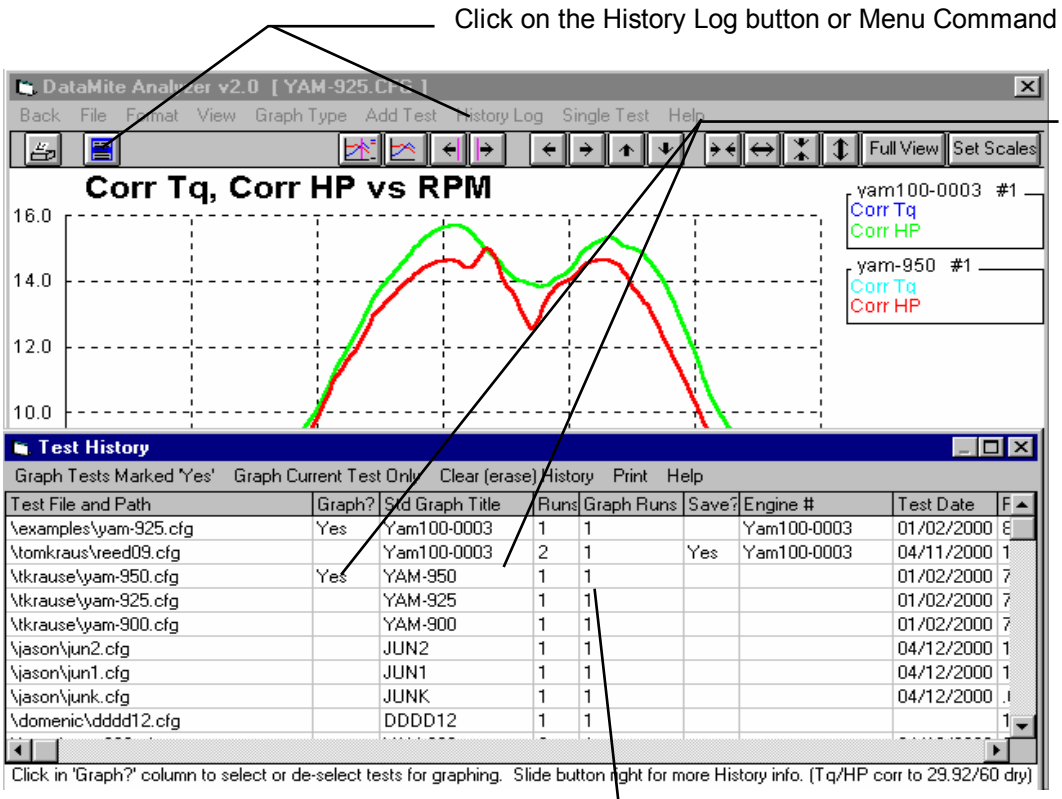
ET @ MPH, 60 Ft, etc. are handy to remind you what a run was, and for comparing different runs.

History Log at Graph Screen

At the Graph Scree, 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'.
- Click on 'Graph Title' to change the Standard Title for this test. The program will default to 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

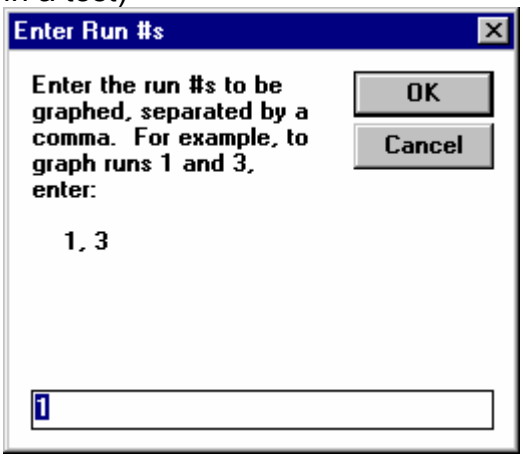
Figure 3.30 History Log at Graph Screen



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 3.31. 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.

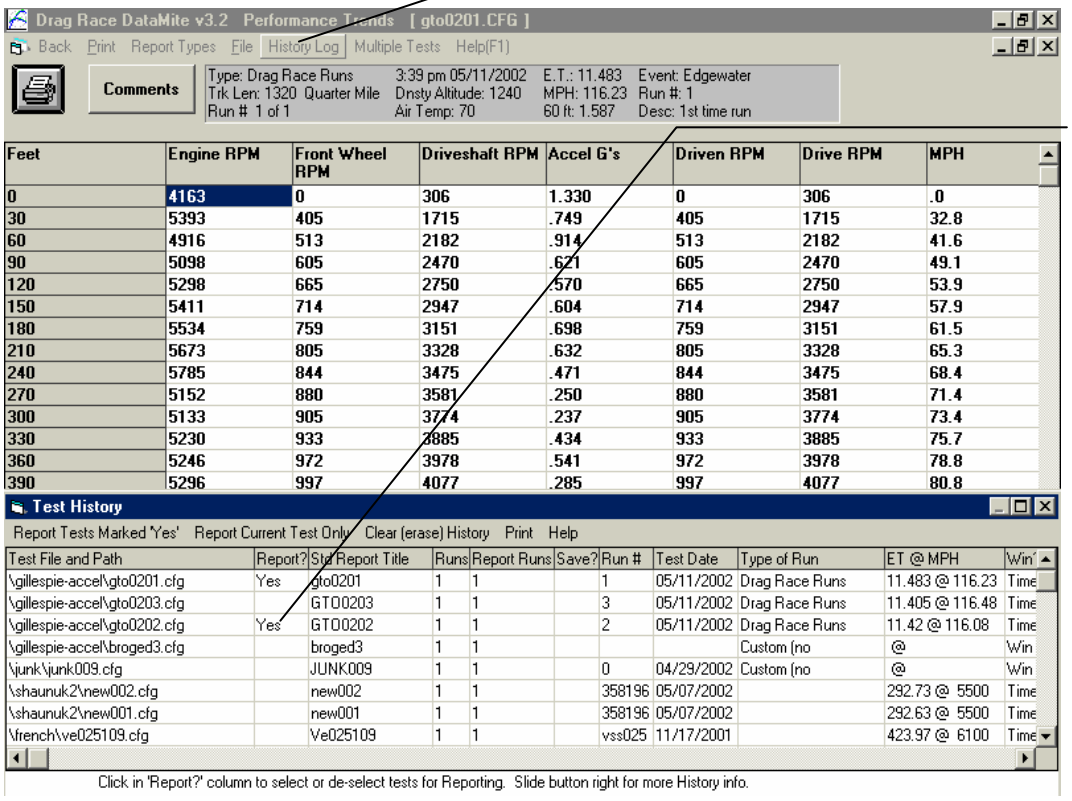
Figure 3.31 Specifying Which Runs to Graph (if more than 1 run in a test)



History Log at Report Screen

You can also make comparison reports, where the current run is compared to the runs marked "Yes" in the Report Column. See Figure 3.32. This is done almost exactly the same way as done in the History Log displayed at the Graph Screen.

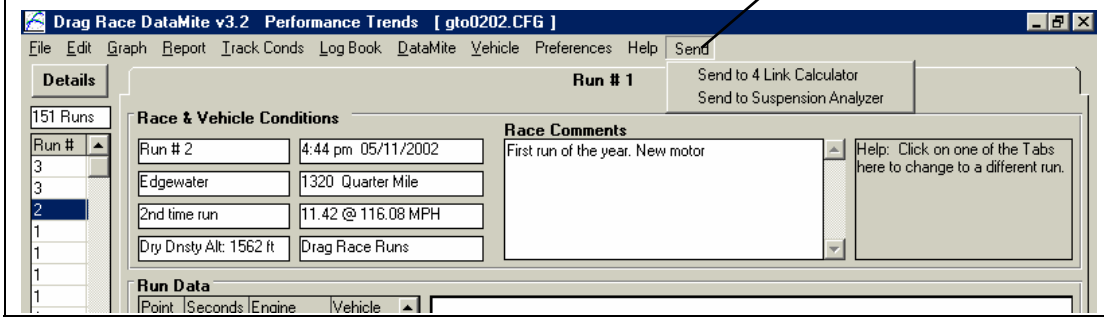
Figure 3.32 Report History Log



3.8 Send Data (Pro Version Only)

The DataMite's data can be analyzed in Performance Trends suspension analysis programs, like Suspension Analyzer or our smaller 4 Link Calculator. At this time, the only data actually analyzed in these programs is Shock Travel, where these programs determine the dive, squat, roll and pitch of the vehicle based on shock travel data and suspension geometry and measurements.

Figure 3.33 Send Options



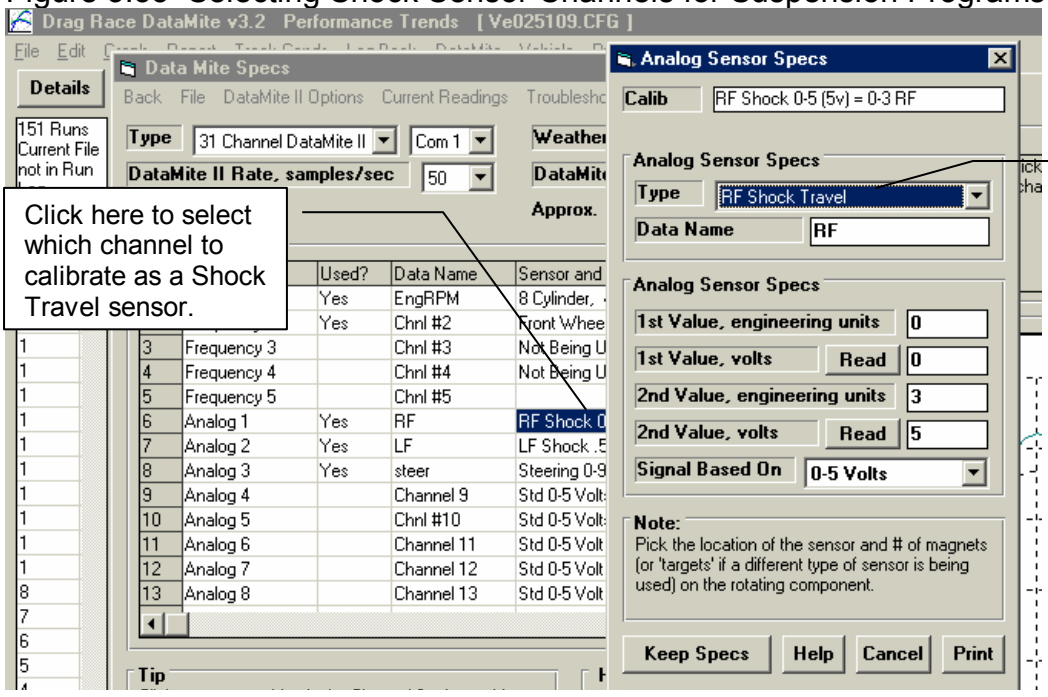
Click on Send at the top of the Main Screen to send shock data to another Performance Trends program. If the program is not currently running, it will be started automatically.

To send data, you first must make sure the DataMite has the required shock travel data and it has the correct calibration following these steps:

1. Install shock travel sensors. See Figure 3.34.
2. Assign the appropriate DataMite channels as Shock Travel sensors and do the appropriate calibration.
3. Click on Send at top of main screen to send data from current file to one of the suspension analysis programs.

Figure 3.34 Typical Shock Travel Sensor

Figure 3.35 Selecting Shock Sensor Channels for Suspension Programs



Click here to select which channel to calibrate as a Shock Travel sensor.

You must select one of the 4 Shock Travel sensor types, or Steering, for that data to be recognized as the appropriate data for the suspension analysis program.

There are some important differences between sending data to the Suspension Analyzer and the 4 Link Calculator.

The 4 Link Calculator can only use one front and one rear shock travel sensor. These must be the RF Shock Travel and RR Shock Travel (right front and right rear). Since it is a simple, 2 dimensional layout, its assumption is that the left and right both move the same amount. The Suspension Analyzer can use RF, LF, RR, LR Shock Travel and Steering inputs.

The shock sensor data sent to the 4 Link Calculator must be calibrated for vehicle (or wheel) movement, not just shock sensor movement. Shock sensors, or more accurately called suspension motion sensors, have a motion ratio associated with them. Motion Ratio is the ratio between the sensor's movement and the actual wheel's movement. See Figure 3.36. The 4 Link Calculator only deals with vehicle or wheel movement, not sensor movement. This means that when you calibrate a shock sensor for use in the 4 Link Program, you must move the ***wheel***, say 2.0 inches and tell the DataMite program sensor moved 2.0 inches, even though the sensor may have moved only, say 1.23 inches. For the Suspension Analyzer, because it calculates the motion ratio for all suspension motion sensors, you can calibrate the sensor directly. You would move the sensor, say, 2.0 inches and tell the DataMite program the sensor motion was 2.0 inches. See Figure 3.37.

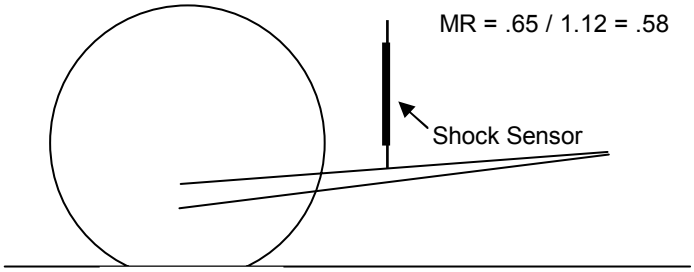
When the DataMite sends data to either of these 2 program, data is sent with a vehicle file name. This name is of either a 4 Link Calculator file or Suspension

Figure 3.36 Example of Motion Ratio (MR)

Say sensor moves only .65 inches and the wheel moves 1.12 inches

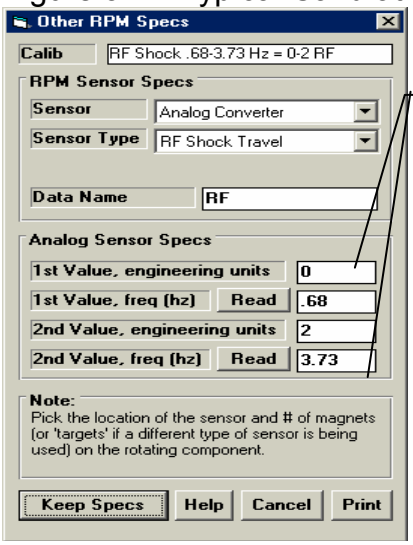
MR = Sensor Movement / Wheel Movement

MR = .65 / 1.12 = .58



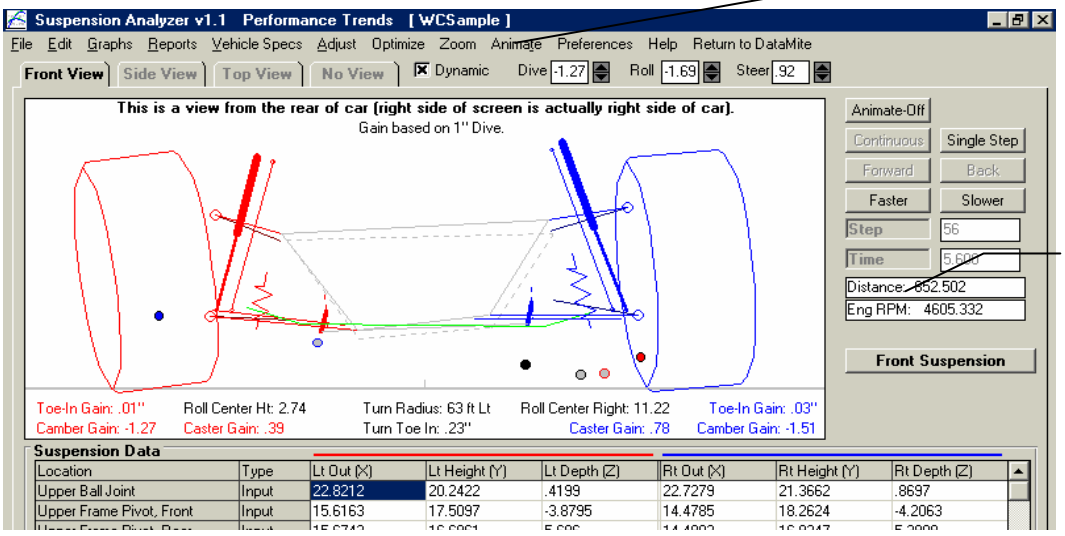
Side view of rear ladder bar with shock sensor

Figure 3.xx Typical Calibration Screen



When calibrating, these values are the either the Shock Sensor motion for Susp. Anzr or Wheel motion for the 4 Link Calculator program.

Figure 3.38 Sent DataMite Data in Suspension Analyzer

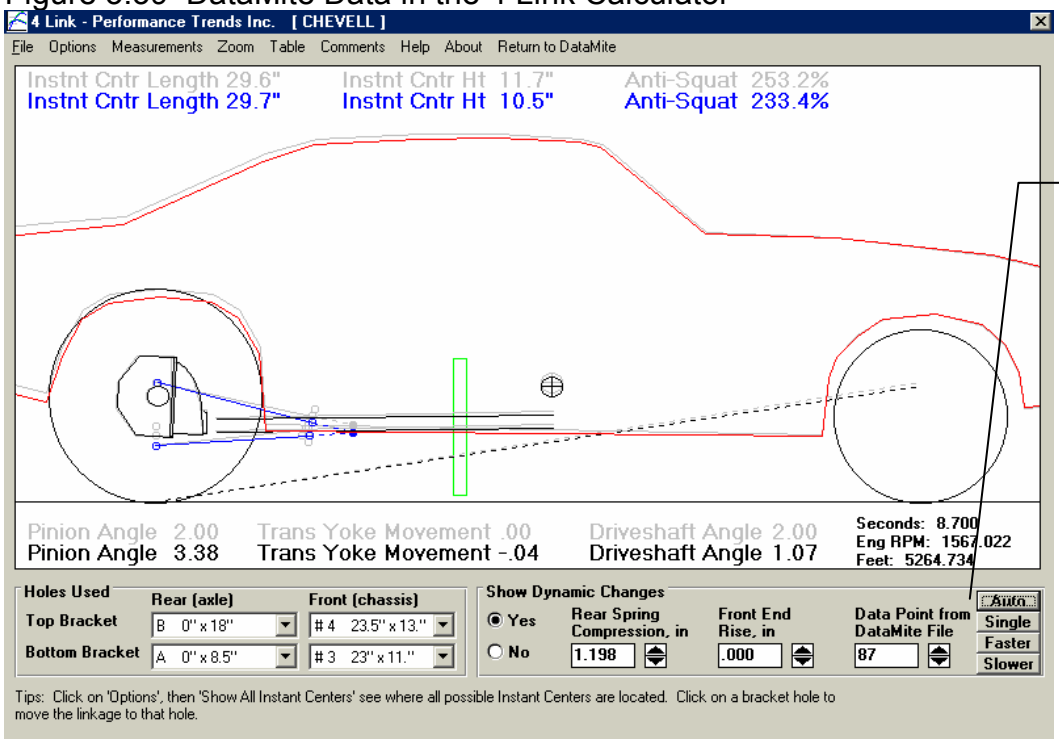


You can manually start displaying DataMite data by clicking on Animate and selecting DataMite data file as Data Source.

Additional data like Distance and Engine RPM are also displayed in this section so you can better relate to where you were on the track.

Analyzer file. When either of these 2 programs open up, the program automatically tries to load this file and automatically go into displaying the DataMite data. If this file can not be found, or if this is the first time you are trying to send data to these programs, instructions are given in those programs on how to open the correct vehicle file, and then display the DataMite data. Now that you have picked the appropriate vehicle file in either of these 2 program, this vehicle file name will be remembered by the DataMite program.

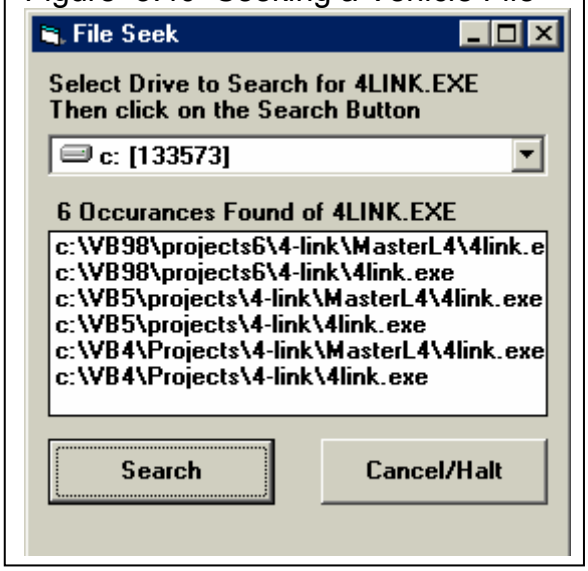
Figure 3.39 DataMite Data in the 4 Link Calculator



Options for stepping forward, backward, running slower, faster, single step, continuous, etc are available in this section.

If you click on the Send button in the DataMite program, and either the Suspension Analyzer or 4 Link Calculator can not be found where it should be, a "File Seek" screen will appear. Here you can choose which disk drive to search for the appropriate file, usually the "C:" drive. The screen will display all files which match the name of these files. When done searching, double click on the file you want to use. The DataMite program will then remember this path and you should not have to do this again.

Figure 3.40 Seeking a Vehicle File



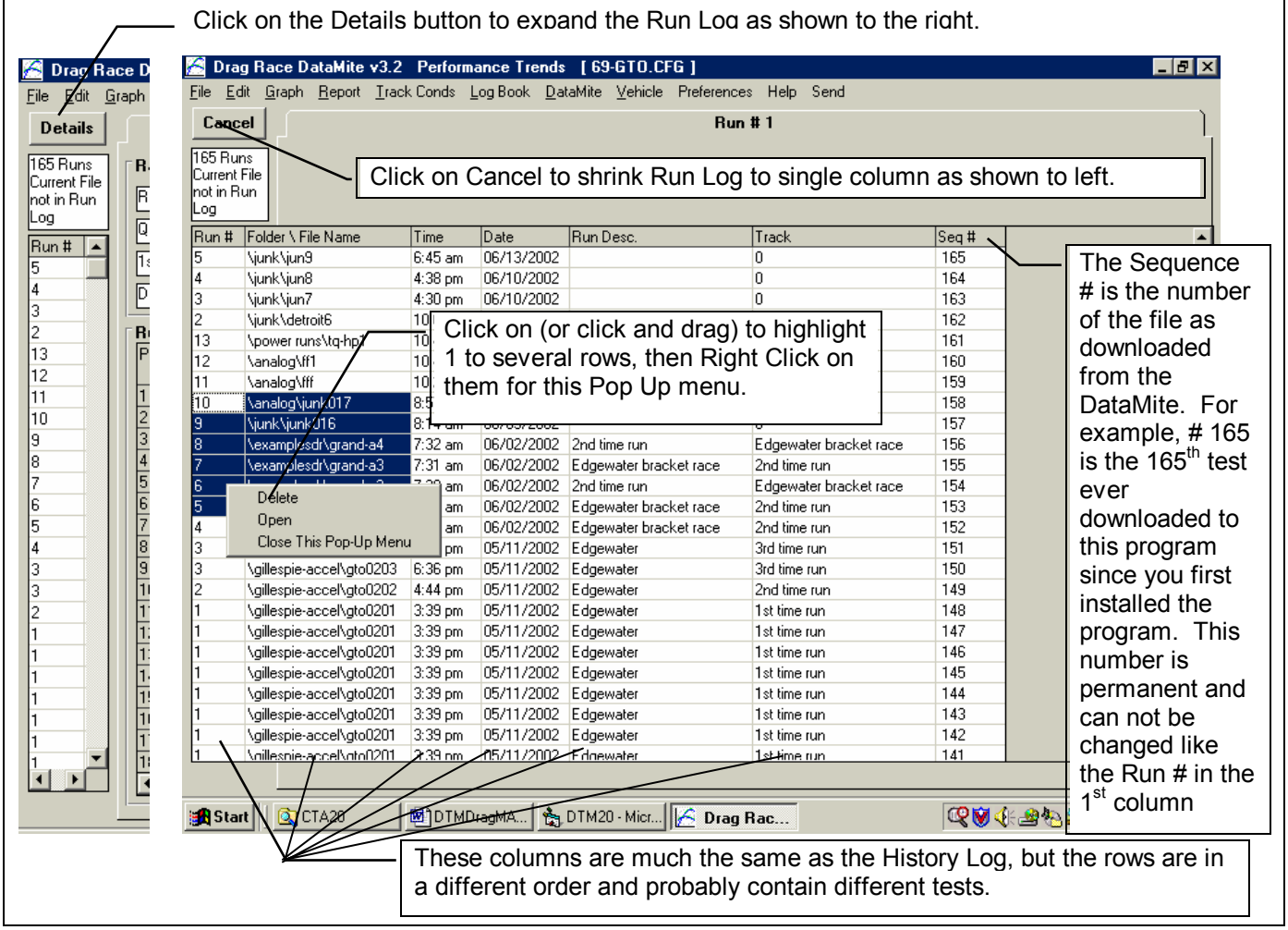
3.9 Run Log (Pro Version Only)

The Run Log is similar to the History Log described in Section 3.7, except:

- The Run Log is a chronological list of the tests in the order you have downloaded them from your DataMite.
- The History Log is a chronological list of the tests in the order you have opened them for graphing, making reports, etc. These are intended to be tests you are most recently interested in, even if you actually downloaded them several years ago.

The only way to add a test to the top of this list is to download a new test from your DataMite. You can not change the order of the tests. However, you can delete tests from the Run Log, by clicking on a test to highlight it (or clicking and dragging the mouse down to highlight several tests), then right clicking on this (these) highlighted tests. See Figure 3.41. You can then select to delete these tests from the Run Log, or open this test. If more than one test has been highlighted, only the first test will be opened.

Figure 3.41 Run Log and Options



Any time you open a past test, it is added to the top of the History Log. The History Log is what is used to pick which tests you want to include in Graph and Report comparisons of several tests.

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 a Vehicle and Recording a Drag Race Run

Suggested Background Reading:

- Section 1.5, Example to Get You Going
- Most all of Sections 2 and 3, Definitions of Inputs and Outputs
- Appendix 2, Hardware Installation and Operation

This example demonstrates the basic steps to installing a standard, 4 channel DataMite on a drag car, setting up the program's specs for this vehicle, and recording a drag race run. 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 a 4 channel DataMite as outlined in Appendix 2. The sensors include:

- Channel 1 is engine RPM wired to an MSD ignition module, Tach Out pin.
- Channel 2 is recording front wheel RPM with 2 magnets epoxied to the inside edge of the front wheel.
- Channel 3 is recording driveshaft RPM with 2 magnets epoxied to the driveshaft with a sensor mounted on a bracket mounted on the pinion housing.
- Channel 4 is recording exhaust temperature.

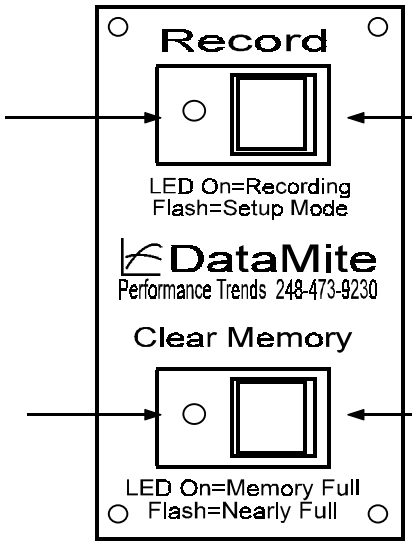
After the DataMite is installed, it is a good idea to check that all sensors are working. Put the DataMite into Setup Mode by powering up the DataMite. The Record LED (light emitting diode) may flash, or stay off for several seconds, but will eventually light steady. (If the DataMite's memory was full, 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 displaying the signal for channel #1, or Engine RPM, on the other LED. 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 front 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 displaying the signal for channel #2, or the front wheel RPM. If you jack the front wheel off the ground, or just drive slowly forward, you should see a flash each time a magnet passes the sensor. Otherwise, rotate the front wheel to place the magnet over the sensor and leave it there. The Clear Memory LED lights and remains on. Channel 2 or the front 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. You can also check channel 4, the same as the other channels,

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.

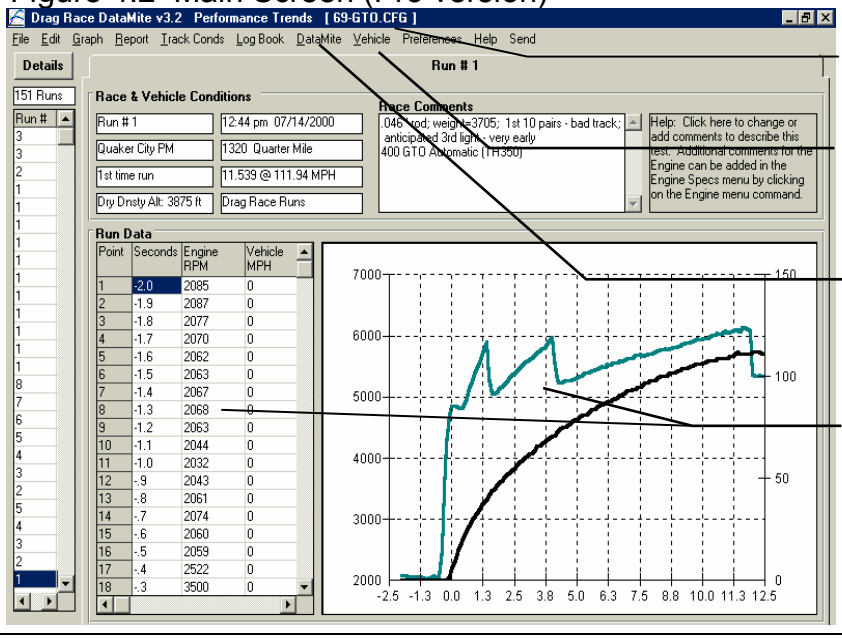
Push Clear Memory button to bring out of Setup Mode and go back to Recording Mode.

except the thermocouple converter will be flashing so fast that it may be difficult to see anything other than a light. You can disconnect the thermocouple and see that the flash rate or LED brightness changes, indicating it is working.

DataMite Software Setup

Start the program by clicking on Start, then Programs, then Perf Trends, then Drag Race DataMite Analyzer V2.0. Or you can click on the Drag Race DataMite Icon on your desktop. Each time you start the Drag Race 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

Figure 4.2 Main Screen (Pro version)



69-GTO is the current drag race run.

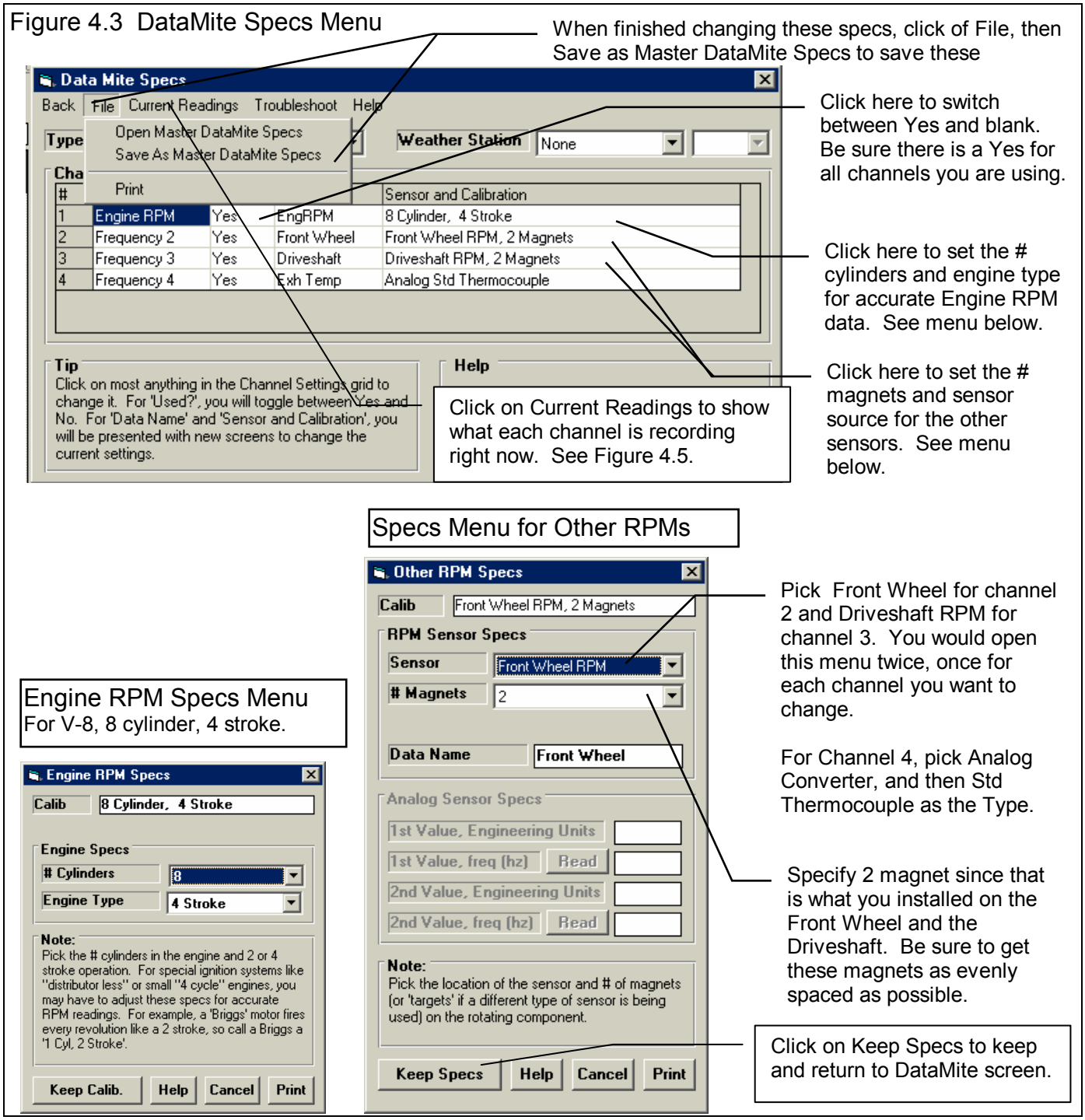
Click on Vehicle to set up Vehicle Specs to match your vehicle measurements and settings.

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

These current results are from the last run you were working with. This is identified by the name in square brackets [ ] at the top of the screen, in this case [69-GTO].

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 69-GTO is the Current Test.

Figure 4.3 DataMite Specs Menu

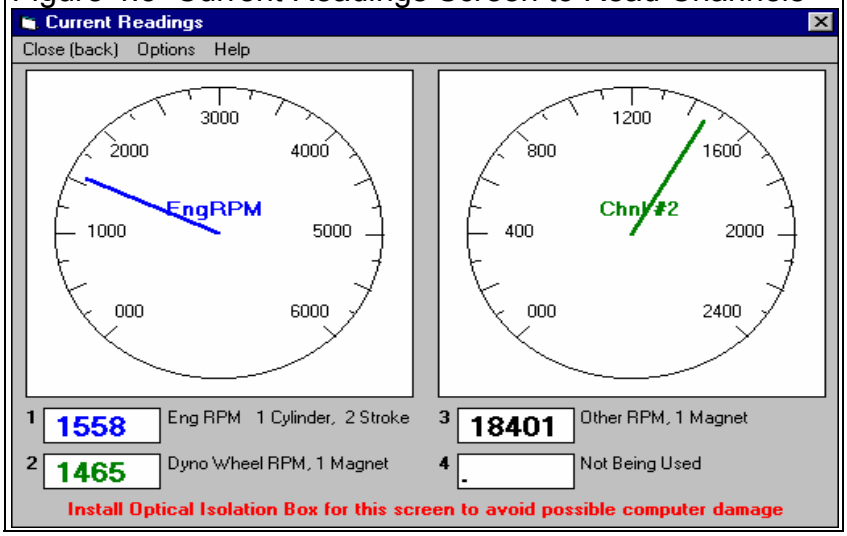


Click on DataMite at the top of the Main Screen to open the DataMite Specs menu shown in Figure 4.3. There will already be specs in this menu, which are the DataMite settings used when test 69-GTO was run. You will change these specs to match ***your DataMite.*** Put a Yes in each row you are using, the first 4. 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.

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. etc. The Sensor and Calibration descriptions are very important. Review what is outlined in Figure 4.3 and in Section 2.5. When you are finished, ***click on File, then Save as Master DataMite Specs to save these changes***.

Now that you have saved these settings as the Master DataMite specs, you can check these readings by clicking on the Current Readings menu option. This will bring up a screen like that shown in Figure 4.5. If you have the DataMite II, this screen will be larger to cover all channels. From here you can start the engine, jack the car up and spin the tires or driveshaft, watch temperatures and make sure everything is reading correctly. If they are not reading correctly, be sure you have the correct sensor plugged into the correct spot in the harness. Disconnect sensors one at a time to ensure you get a response on the Current Readings screen for the appropriate channel.

Figure 4.5 Current Readings Screen to Read Channels



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

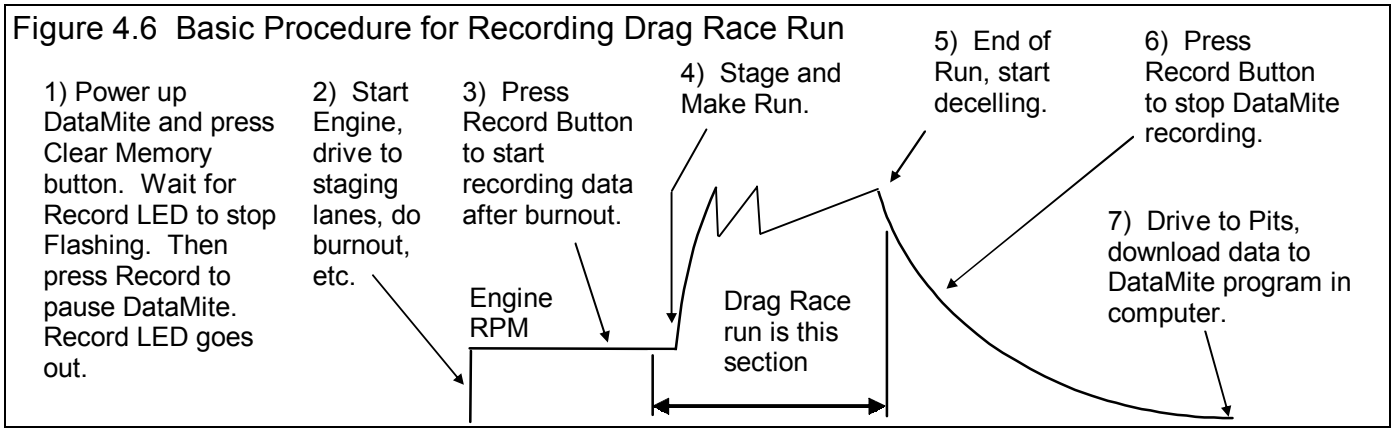
Click on Close (back) to close the Current Readings screen and return to the DataMite screen. Then click on Back to close the DataMite Specs menu. You will probably be asked if you want to keep these changes for the current test 69-GTO. Since they were ***not*** the DataMite specs for that test, answer 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.

Recording a Drag Race Run

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 specs to correctly match your DataMit. These initial settings and checks are only done for your first drag race run. Now you can actually start recording vehicle 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.

The DataMite program is actually smart enough to find your individual drag race runs in your recorded data. You do not have to time the pushing of the record button with the actual start and end of the run. The program wants to see some data before and after the actual drag race run. Therefore start recording before you stage (even before the burnout if you want) and stop recording well past the end of the run. See Figure 4.6

Figure 4.6 Basic Procedure for Recording Drag Race Run

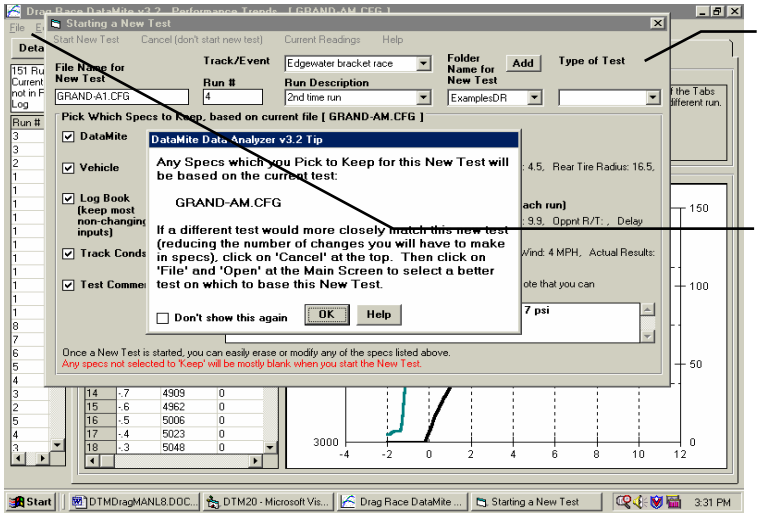


Drag Race Run Procedure (outlined in Figure 4.6)

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 drive to the staging lanes. Do your burnout.
3. Start the DataMite recording data by being sure power is on and pressing the Record button. This will light the Record LED by the yellow button. You may just want to press the red Clear Memory button on the DataMite's control panel to clear out any previously recorded data. There is a slightly longer delay between pressing a button and starting to record data pressing the Clear Memory button, but typically this is only 2-3 seconds.
4. Stage your vehicle and make your run.
5. Pass through the Traps at the end of the run.
6. After you are through the traps, and slowed to a safe speed, press the Record button to turn Off the Record LED. This pauses the DataMite from recording any more data.
7. Drive back to the pits and download the data recorded by the DataMite to the DataMite program in your computer.

Downloading Data

Figure 4.7 The New Test Screen with Tip Message

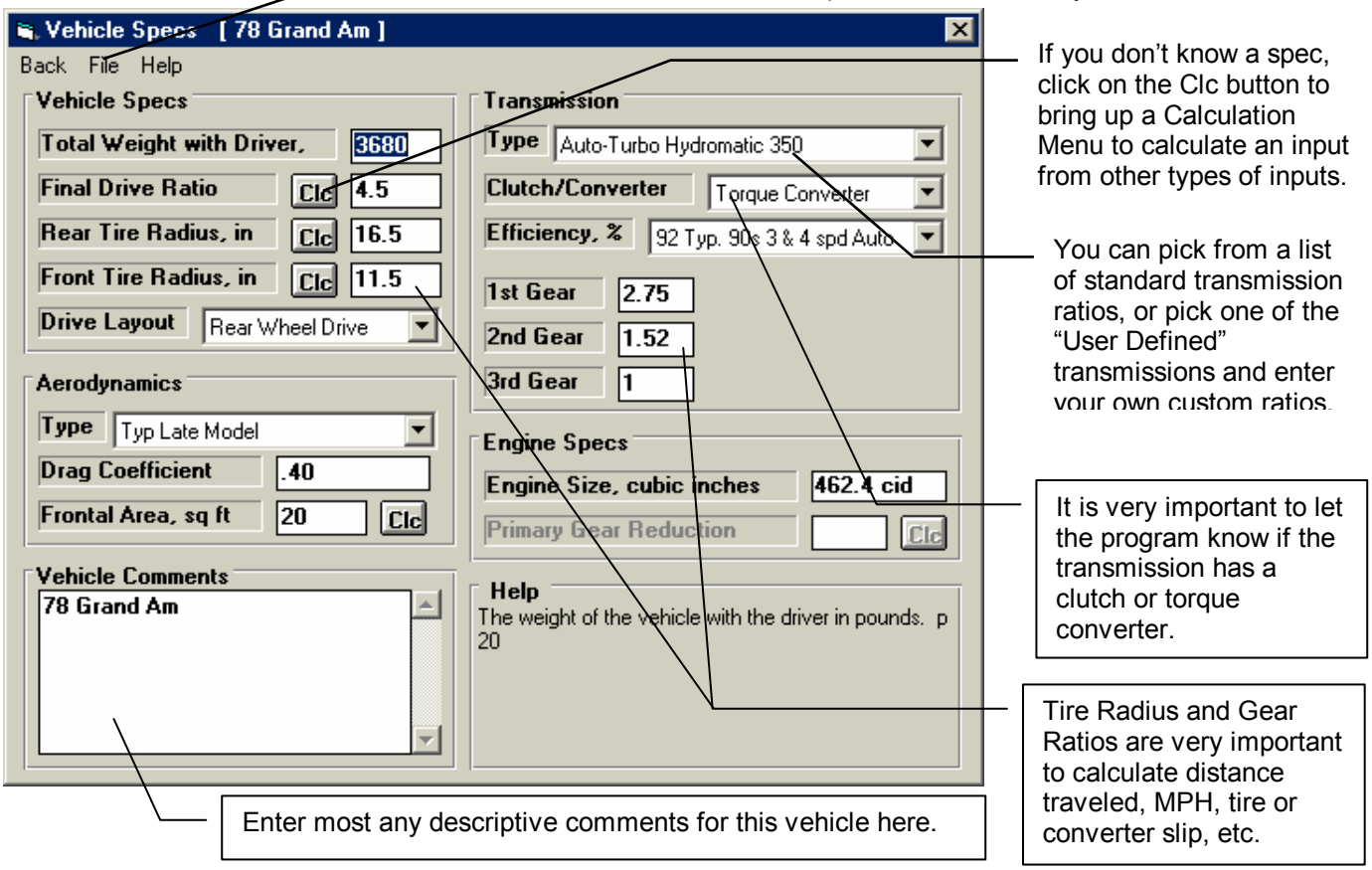


Once you have recorded a test with the DataMite, you must download it to your computer. Click on File (upper left corner of the Main Screen), then New (get data from DataMite) to bring up the New Test screen, which will likely show a Tip message. See Figure 4.7. As the Tip in Figure 4.7 says, it is usually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

As shown in Figure 4.7. There are 6 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 DataMite specs, there would be no summary of the Master DataMite specs. You would have to fill out the DataMite Specs before the program would let you start a New Test.

Figure 4.9 Vehicle Specs



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

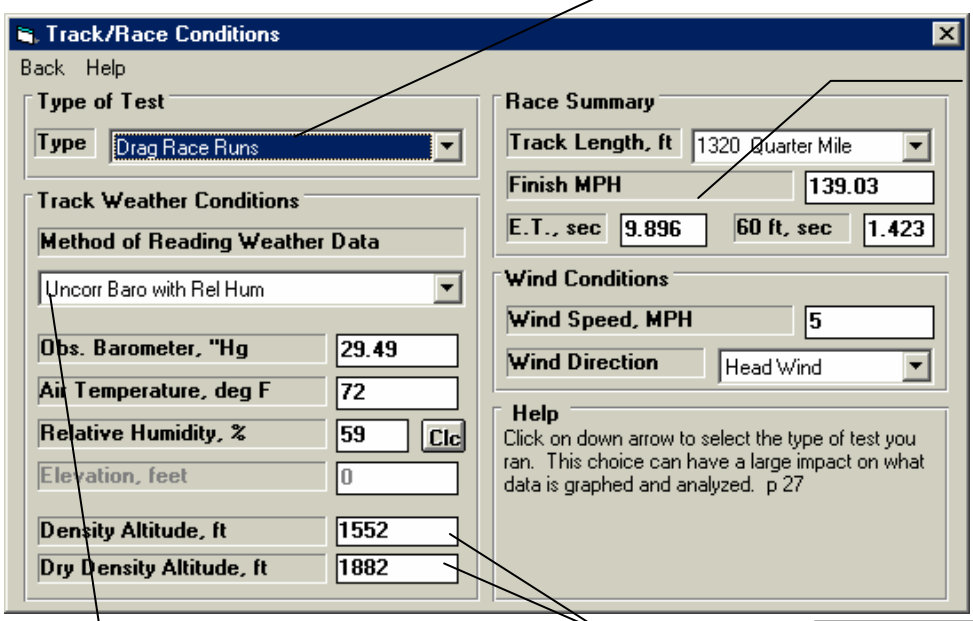
If you want to modify some specs from the previous run, click on the 'See Specs' buttons for each category of specs. Click on Help at these menus for more info on how to enter these specs.

Vehicle Specs are quite critical for some calculated results, like tire slip, clutch or converter slip, etc. To check these settings, click on "See Specs" button by Vehicle to obtain the screen shown in Figure 4.9. Again, these were the Vehicle specs for the 69-GTO test. You should enter the specs for your vehicle, the 78 Grand Am. If you didn't know an input, say front tire diameter, you can click on the Clc button by the it to bring up a calculation menu. There you can enter the tire specs, say for a P225-75-15 or something similar, to come up with the correct diameter. You can also pick one of the preloaded example transmissions, or click on File, then Open Example Vehicle to see what the specs for other typical vehicles look like.

With all the Vehicle specs set to match your vehicle, click on File, then Save As to save these changes to some vehicle name of your choosing, something like "Grand Am". Then click on Back to close the Vehicle Specs menu and return to the New Test screen. Since you saved these specs, you will not have to enter them again. If they are not already loaded for some new run, you can just go into the Vehicle Specs screen, click on File, then Open Vehicle and pick the "Grand Am" vehicle you have just saved.

Track Conditions are also important records of the run, and contain things like ET, MPH, Weather Specs, length of track (Quarter or Eighth mile or some other distance), etc. Click on the Track Conds button in the New Test screen so you can enter your time slip results of 1.449, 9.878 and 138.58 for 60 ft, ET and MPH.

Figure 4.10 Filling in Track Conds Menu



Select this Type for all your standard drag race runs

These entries are critical if you have set the Preference for the DataMite to auto-adjust itself to better match your ET. Auto-adjust enhances the accuracy of the results, meaning that if you look at 660 ft on a graph, the time, engine RPM, etc are more likely to be at exactly 660 ft.

Choose the appropriate "Method" based on your weather station instrument. See Section 2.3.

Density Altitudes can not be input directly, bur are calculated from the other weather inputs above.

Log Book Specs (Pro version only) can be filled out now or after you download data from the DataMite. However, it will save you considerable time and produce more reliable records to check the appropriate box on the New Test Screen. The "keep most non-changing inputs" is usually the best choice, as this keeps things like Engine specs and part descriptions, clutch or converter specs, suspension specs, but not things like segment times, reaction time, shock travel, your opponent's name and reaction time, etc. See Section 2.4 for more details.

There are six 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.

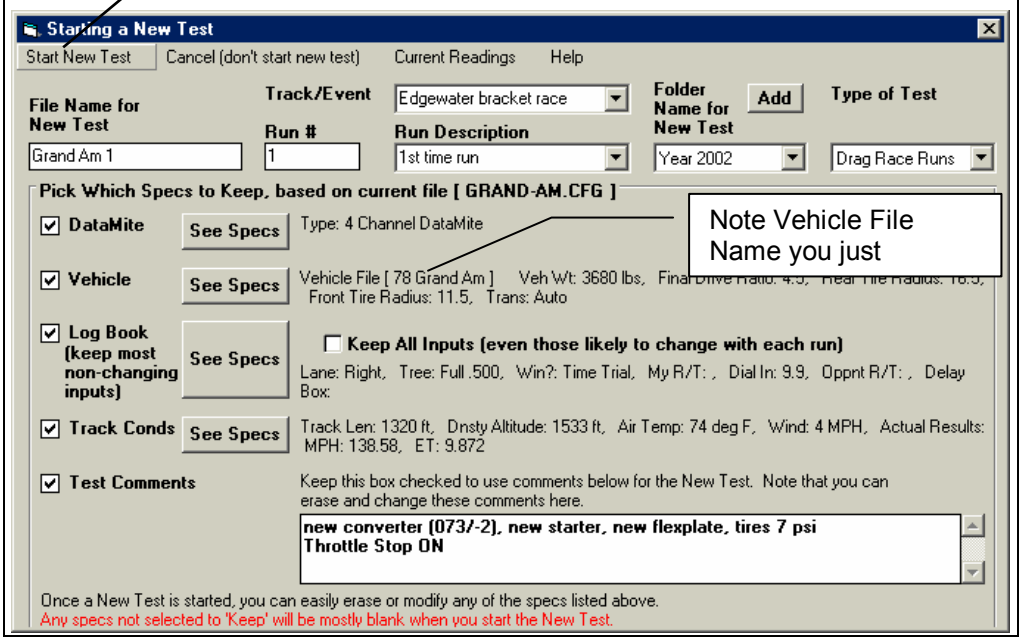
1. File Name for New Test is the file name the program will create for saving the Test Data for the new test you are starting. The program fills in a default name of the current test name, but incrementing the last digit in the name by 1. You can change this name to most anything you like. The program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

2. **Run # (Pro version only)** is based on the last test you downloaded from the DataMite, not the Run number of the current test displayed at the main screen. The DataMite program's Run Log , shown down the left side of the main screen, lists tests in the order they were downloaded from the DataMite. Each new test you download is incremented up by one based on the If you manually change the Run # at this New Test screen, or in the Log Book Screen, that will be the Run # that the next test downloaded will have its number based on. For example, say the last run downloaded from the DataMite box was Run # 245, and you called this test Grand Am 0.cfg. The Run # for a new test would be 246. If you change the Run # for Grand Am 0 to Run #1, like at the start of a particular event, to Run #1 in the Log Book, then the next Run # would be 2.

3. **Track and Event (Pro version only)** is a description of the track or event. You can type in most any name you want, or click on the down arrow button at the right of the name to pick from a list of previous Track and Event descriptions you have already entered. If possible, it is best to use a name from the list of your previous entries. Then it is easier to find tests because the names are more consistent between different test files.

4. **Run Description (Pro version only)** is much like Track and Event above. It is a description of the run, like time trials, test and tune, 3rd round, etc. You can type in most any name you want, or click on the down arrow button at the right of the name to pick from a list of previous Track and Event descriptions you have already entered. If possible, it is best to use a name from the list of your previous entries. Then it is easier to find tests because the names are more consistent between different test files.

Figure 4.11 New Test Screen for Starting This New Test



5. Folder Name for New Test is the folder in the DTMDATA folder where the test will be saved. Folders are a way to group similar tests together. You could start a new folder for each event, or a folder for each car (if you use the DataMite on more than 1 car), or a folder for each type of event (like "Test and Tune", "NHRA Competition" and "IHRA Competition". You can come up with most any way you want to organize your tests. 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 could enter a new folder name like Year 2002.** This folder will be used for all tests you download for the 2002 season.

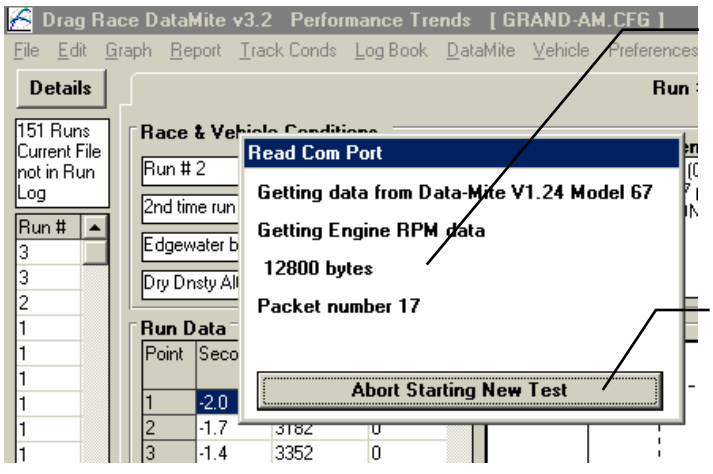
6. As you should do for most all drag race runs, **you choose the Data Type of Drag Race Runs.** Meas Tq/HP from Accel is a special type of test where you do a full power acceleration in 1 trans gear to obtain an engine power curve. See Example 4.3. Custom is used for anything else, like troubleshooting in the shop on jacks.

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

Figure 4.12 Main Screen While Downloading DataMite Data



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 drag race run run, based on pre-programmed criteria of what a drag race run looks like.

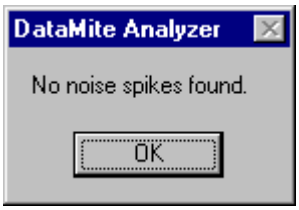
Figure 4.13 shows the messages the program could give to let you know how the data appears. If you get several noise spikes, you should investigate the source. Noise spikes can also cause problems when the program tries to find the beginning and end of the dyno run.

Note that editing out noise spikes, and having the program find the beginning and end of the drag race runs can also be done at anytime in the future. Click on Edit at the top of the Main Screen. See Section 2.10 Editing Tests.

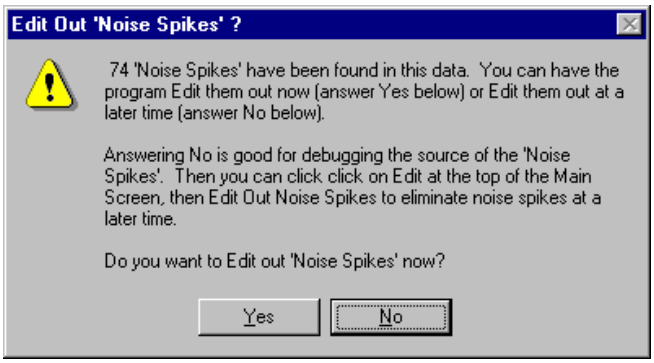
Figure 4.13 Messages After Download DataMite Data

Message to acknowledge data was read from the DataMite

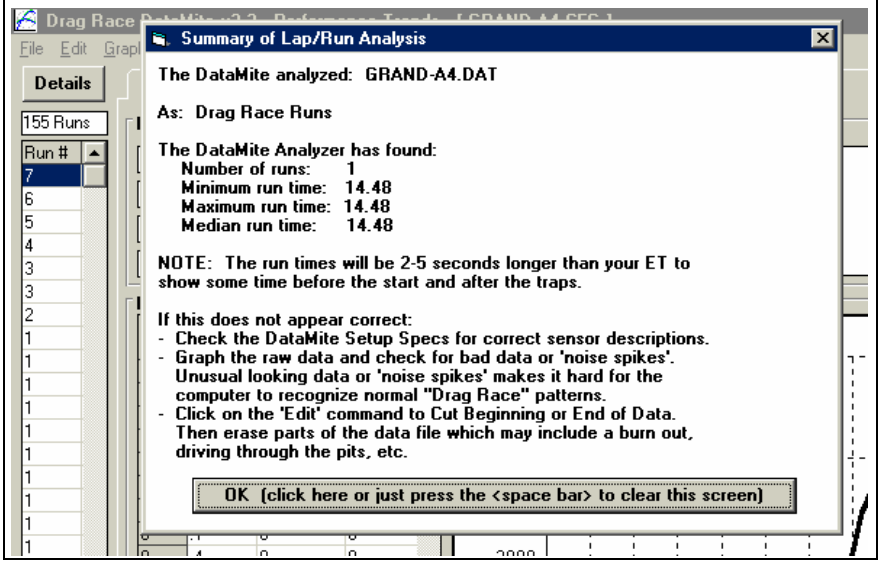
Message stating that data looks "clean", or free of what appears to be "bad" data points



If "Noise Spikes" had been found, you would have gotten a message like this, stating that the program has found what it believes is "bad data" points. You can elect to have the program edit them out now (recommended for beginners), or Not edit them now so you can try to investigate the source of the problem.



This message lets you know how many dyno runs the program found in the data you just downloaded.



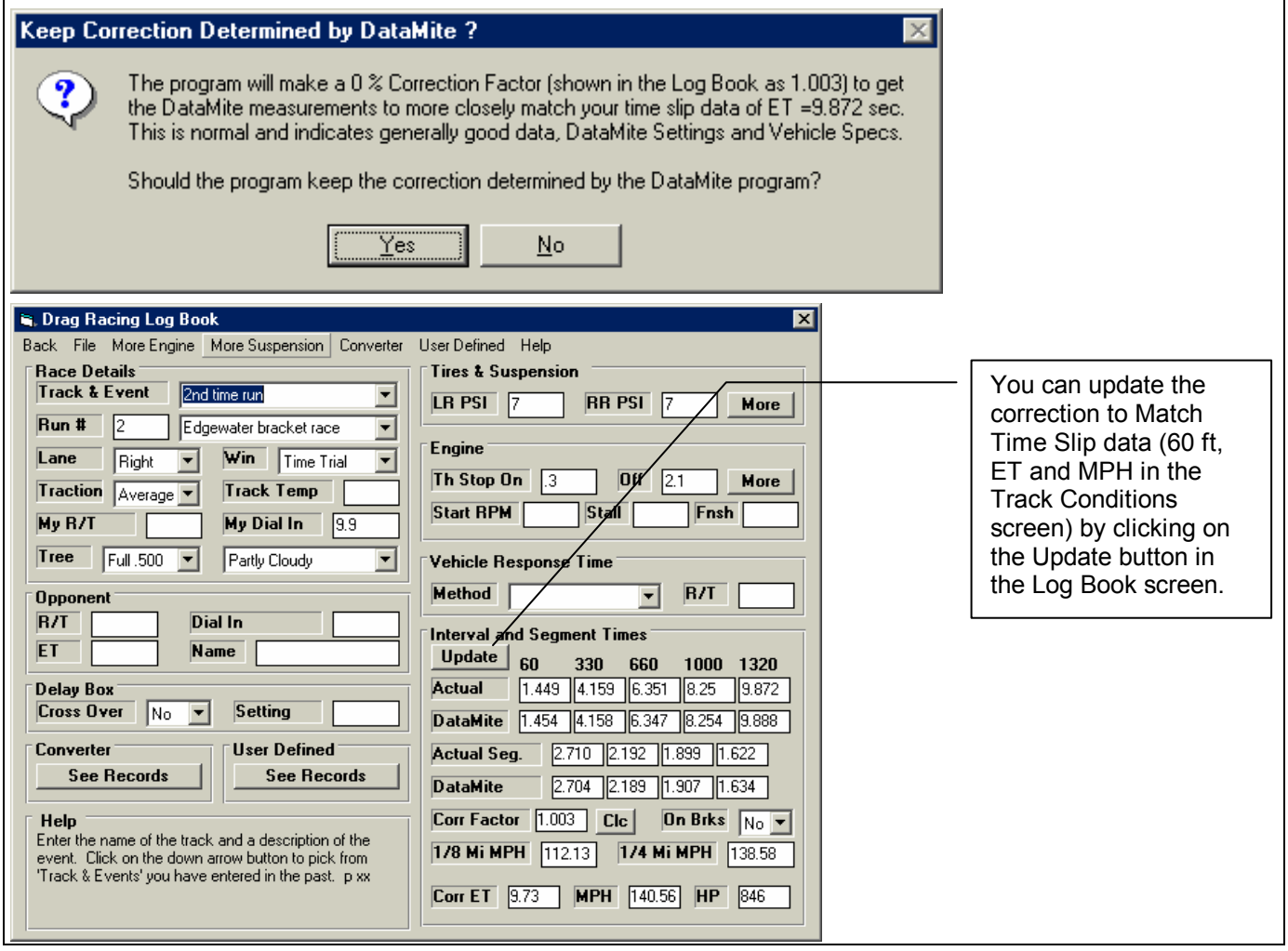
Match Time Slip (Pro version Only)

In the Pro version, there is a Preference called Match Time Slip. If this is turned On, then the program will use the 60 ft, ET and MPH you have entered into the Track Conditions menu to "fine tune" how it calculates distance and MPH. This will provide better accuracy in your analysis, but only if you are accurate about entering the 60 ft, ET and MPH into the Track Conditions menu. This "matching" will be done immediately after the program has looked to find the Beginning and End of the run. You may get a message like Figure 4.14, where the correction is less than 1% (1.003). The number being so small indicates that little correction is needed and the data recorded, the DataMite specs, the Track Conditions entries of 60 ft, ET and MPH, and your Vehicle Specs match ***very well***. If the program comes up with a large correction factor, check these specs.

If you have not yet entered the Track Conditions of 60 ft, ET and MPH , you can do it now. Then click on Log Book, and click on the Update button. See Figure 4.14. Note: Any changes in 60 ft, ET and MPH you make in the Track Conditions Screen are immediately loaded into the Log Book Screen, and vice versa. If you do make any changes to 60 ft time or ET, the program does not automatically update the Corr. Factor. You must click on the Update button in the Log Book Specs to have this updated.

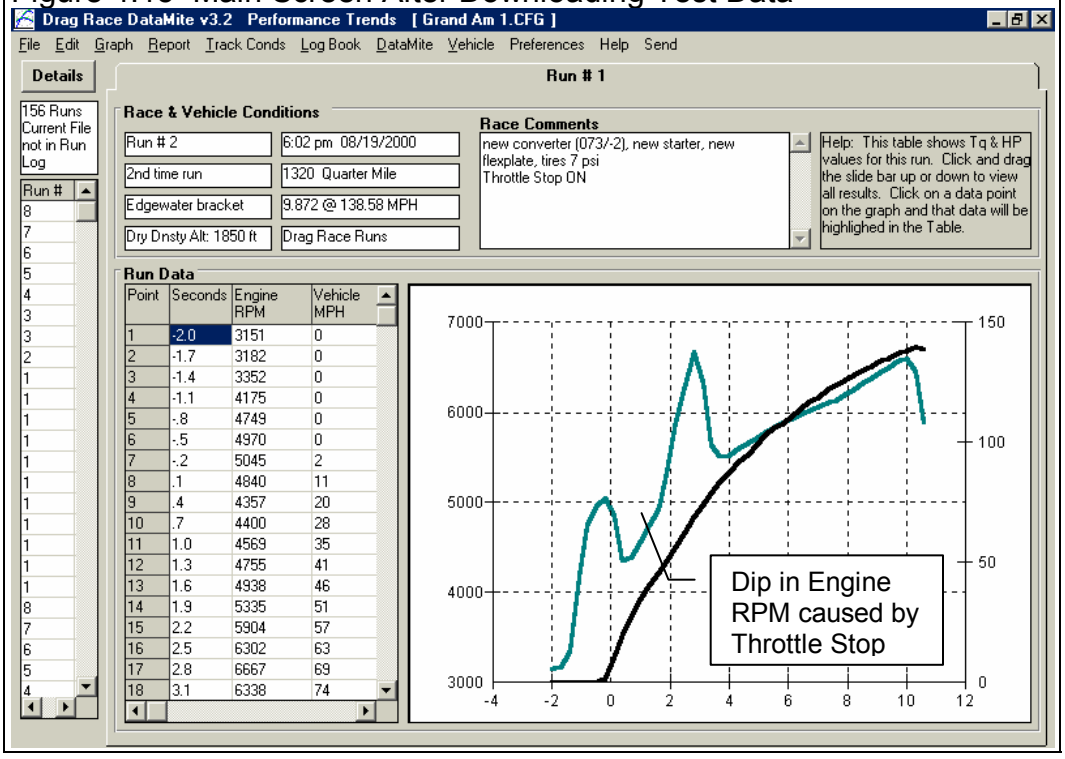
> Note: If you cancel out of the New Test screen during any part of this download procedure, you will loose all changes you have made. For this reason, you may want to just make critical changes from the new test screen (like ET and 60 ft time for the Match Time Slip feature to work). Then, after the data is downloaded, make changes in the other screens like Log Book, etc.

Figure 4.14 Messages Concerning Matching Time Slip Feature



Analyzing Data

Figure 4.15 Main Screen After Downloading Test Data



The Main Screen should now look like Figure 4.14, with a graph of the drag race run on the right side, and a table of engine RPM and MPH 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.

Notes:

The results on the Main Screen are not designed for detailed analysis, but just to give a summary of the run, and to show how some critical data looks.

The Grand Am is running a throttle stop, which is why there is such a large dip in Engine RPM right after the launch.

Graphing Data

You've heard the saying "a picture is worth a thousand words", well "a graph is worth a thousand numbers". Graphs are generally the best and quickest way to analyze data because your eye can quickly spot trends, see data points which look "out of line", etc.

To make a graph, click on Graph at the top of the Main Screen. Set the Type to Pick Individual Channels, and then select the data types to include in the graph from the list at the top of this Graph Specs menu. (In the Pro version you could have also selected one of the Histogram Types.) A good choice for a first look at a test run is to graph some "raw" recorded data like Engine RPM, other RPMs like driveshaft or wheel RPMs, accelerometer data if so equipped. That is because other information is calculated from these main inputs, like distance traveled, clutch/converter or tire slip, etc.

Once you have selected what data to graph, set the remaining specs below the list of data types. Set Time/RPM/Distance to Time and set What to Graph to Just Run #1. 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 4.16. Click on the Make Graph button to produce the graph shown in Figure 4.17. The graph shows no major "noise" spikes, but all channels show a little variation up and down. ***This is actually the sign of very good data***, as it indicates the response of the sensors is quite fast, but the number they record is repeating within a couple percent. You can click on Graph Type at the top of the Graph Screen and set Filtering to Light. This smoothes out the data some of of variation, but you know you still can have confidence in the data because it looked so good with Filtering set to None.

Figure 4.17 also shows that Exhaust Temp looks very steady, with a slow, steady rise during the run. This is a good indication that the fuel system is operating correctly and the engine is basically running well (no major misfires). The second graph of

Figure 4.17 shows the effect of changing Filtering (smoothing) from None to Light. The graph lines are now much smoother and easier to read.

Since the data quality of the raw recorded RPMs generally looks very good, you can have good confidence in the calculated results like tire slip, distance traveled, etc. Most of these calculated outputs appear farther down the list of Data Types in the Graph Menu. Click on Graph Type at the top of the Graph Screen, and select to graph Engine RPM (a good reference for knowing where you are in the test run), Accel Gs, MPH, Distance and Converter Slip With these changes, click on Make Graph button and you will obtain a graph shown in Figure 4.18. Figure 4.18 also shows how you can zoom in on a particular area, or bring up the vertical cursor line, to pin-point values on the graph.

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

Figure 4.16 Graph Menu Specs for Graph in Figure 4.17

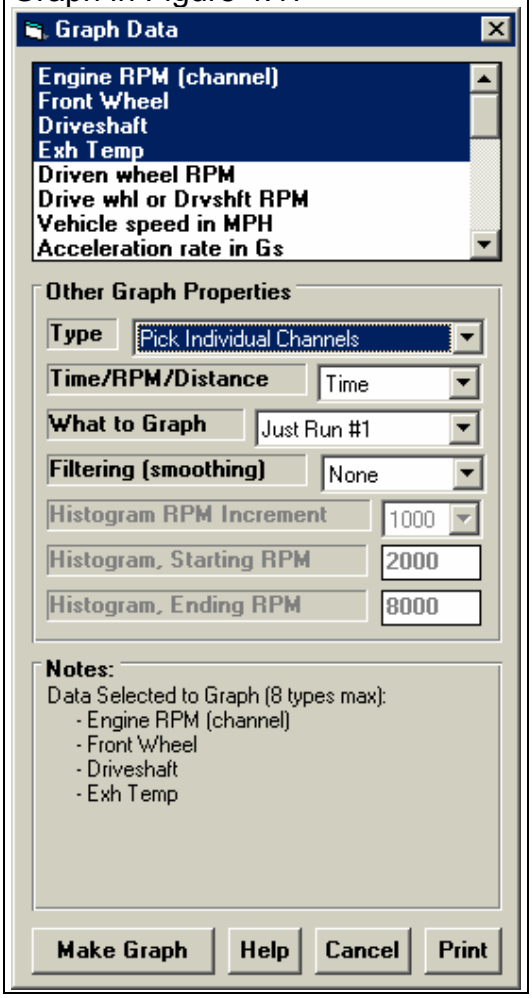


Figure 4.17 Torque and HP Graph

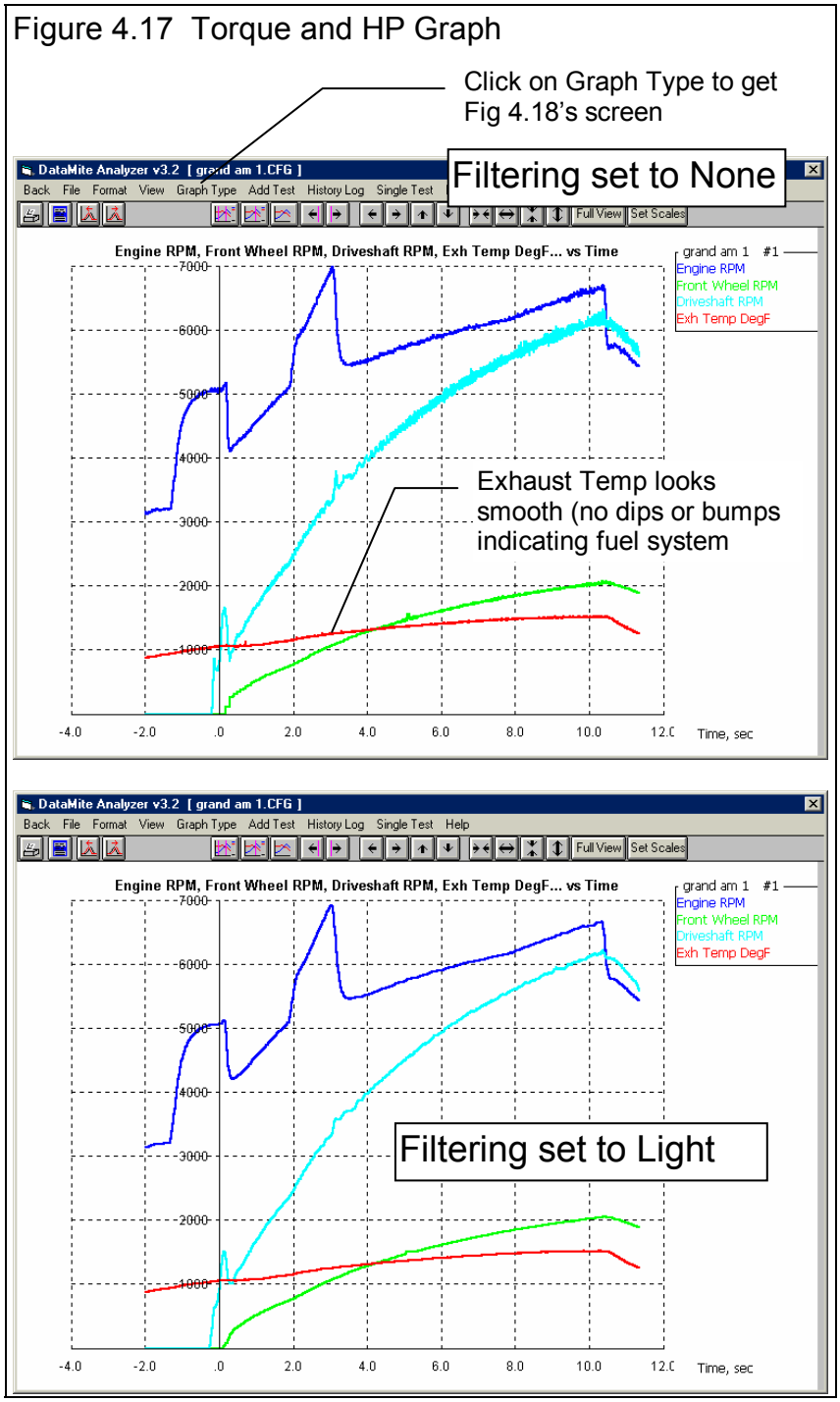
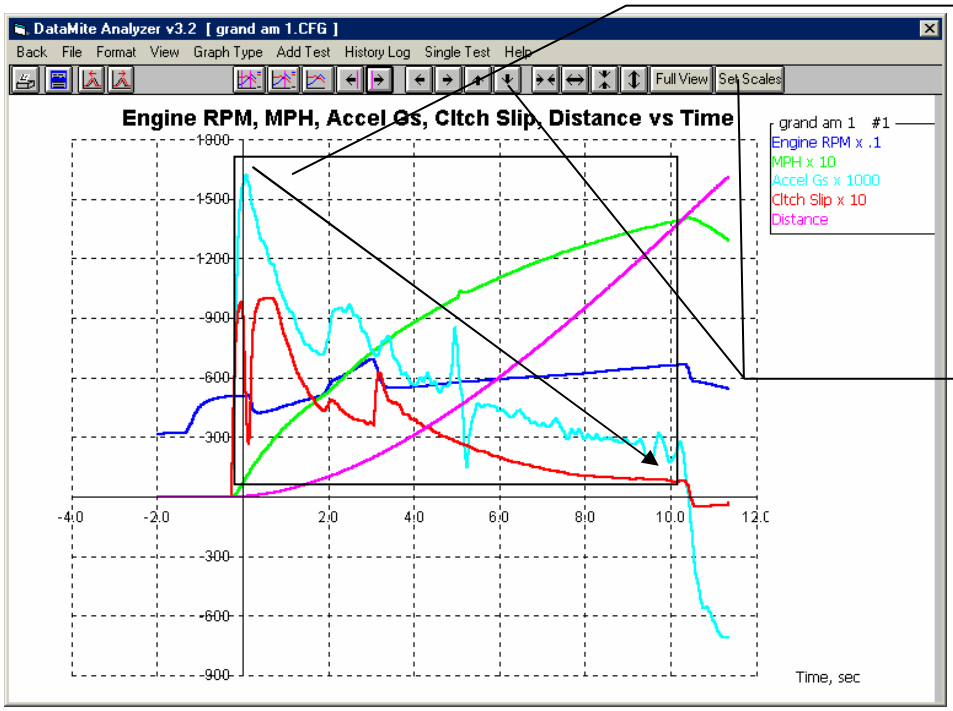
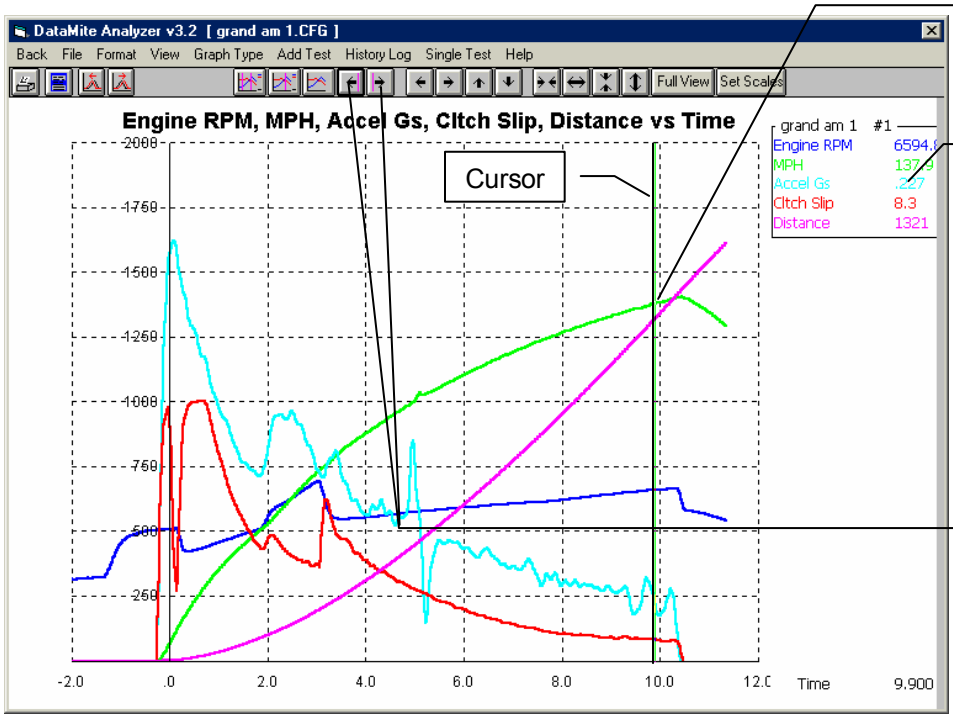


Figure 4.18 Graphing Calculated Outputs



One way to zoom in on an area of the graph is to click on the area in the upper left corner and drag (holding the mouse button down) to the lower right corner. A box is drawn around the area which will fill the graph once you release the mouse button. The graph below shows the result of this action.

Another way to zoom in (or out) is to click on the 8 arrow keys here or click on Set Scales button.



You can display the cursor line by clicking on one of the graph lines.

The value of all the graph lines at the cursor is displayed here. Note that at a distance of 1321 feet (almost exactly the quarter mile point of 1320 feet), that the time is 9.90 seconds (bottom of screen) and the MPH is 137.9. This is very close to your time slip of 9.872 at 138.58 MPH.

You can move the line left or right by clicking on the cursor arrow buttons here

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".
- Program settings, especially the DataMite settings, are critical for accurate data. These DataMite specs are saved in "Master" DataMite file so each new test starts with the current settings for these critical specs.
- Recording a Drag Race run is outlined as 7 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.
- In the Pro version, you have additional inputs for improving the accuracy of the data, like Matching Time Slip data. This lets the program calculate a "correction factor" to fine tune some measurements to get the recorded time, distance and MPH numbers better match the Time Slip results. In this example, the correction factor was quite small (less than 1%) which is a good indication the recorded data and program settings are quite correct.
- 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 other calculated results are good also.
- Results can be quickly and thoroughly analyzed with graphs, and the many graph features.

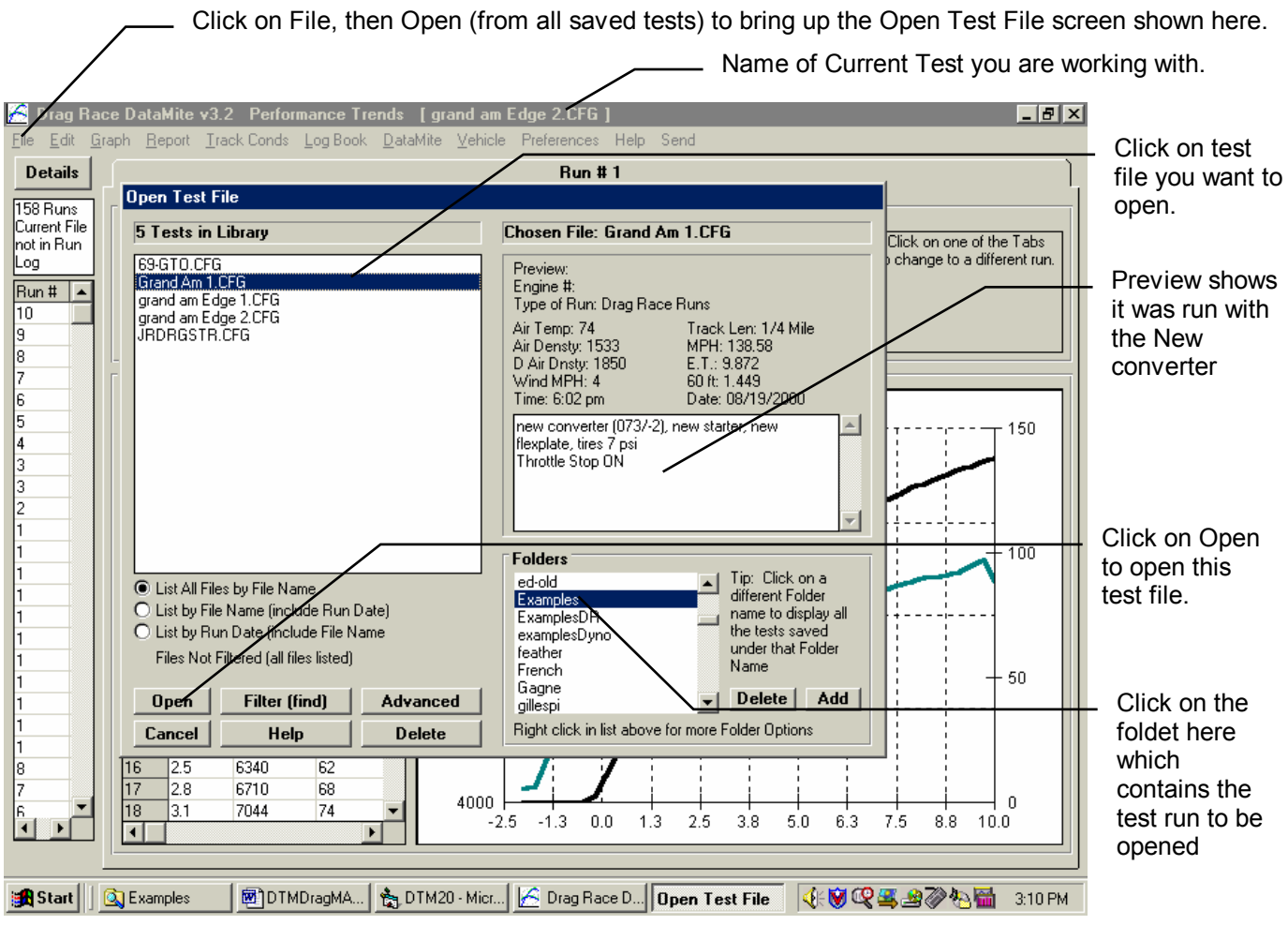
Example 4.2 Analyzing Drag Race Data

Sometimes you may want to just see how the car is running, if the engine RPM looks like it should, what the exhaust temperature is throughout the run, etc. This was outlined in Example 4.1.

Other times you want to make more detailed analysis of a particular run, and ***compare*** a particular run to other runs. This could be to check the effects of a modification, or to see if the car has developed a problem. This process will be shown in this example. We will look at the Grand Am 1 runs from Example 4.1 compared to 2 runs made prior with a different torque converter.

First you will want to make Grand Am 1 (the baseline run you want to compare to the other runs) the current test. If you had just downloaded this run, it would be the current test. If you had run this test several days or months ago, you may have to Open it from the Test Library to make it the current test. Click on File, then Open (from all saved tests) to open the Grand Am1 test with the original converter. See Figure 4.21. (In the Pro version you have 2 other methods of Opening tests, click on File, then Open (from History Log), or find the appropriate Run # from the Run Log down the left side of the Main Screen and click on it.)

Figure 4.21 Opening a Past Test



Comparison Graphs

Graphs are often the most insightful way to compare two runs. You can see at a glance how the runs compare, where one setup is stronger (higher acceleration rates, reaching certain distances quicker). You can also see if the data looks accurate. If you know something about how a modification should affect the run, you can see at a glance if it did. For example, if you made a minor change to the vehicle, you would expect the 2 drag race runs to be fairly similar. For changing a torque converter, you would expect stall RPM and converter slip to be the biggest changes.

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, driveshaft RPM and front wheel RPM and Distance vs Time for just the actual runs with Filtering set to None. You will obtain a graph like Figure 4.23. There are no noise spikes which need to be edited out, indicating the sensors are working quite well. If there were noise spikes, it may be possible to have the program remove them. See Section 2.10 on Editing Out Noise Spikes.

Figure 4.22 Graph Specs Menu

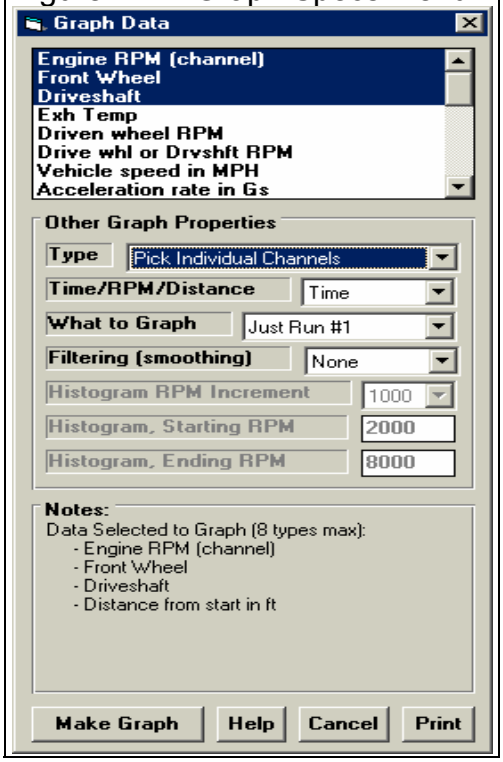
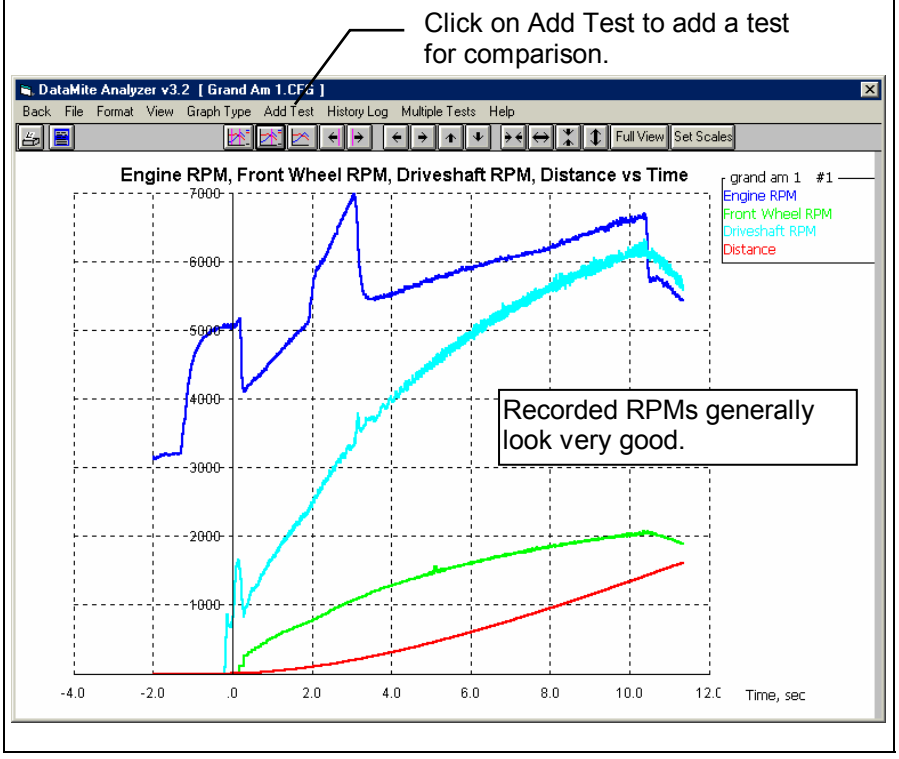


Figure 4.23 Graph Checking for Data Quality

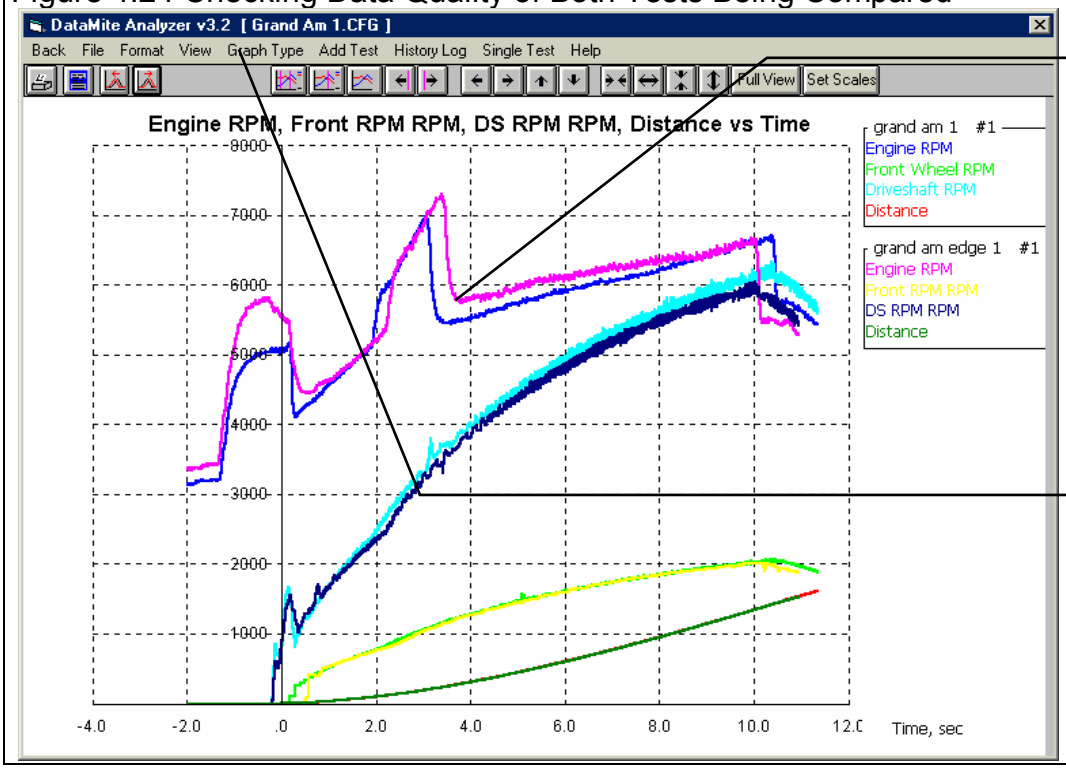


Now add the test you want to compare this test to by clicking on Add Test in the Graph Screen. See Figure 4.23. You will obtain a screen similar to Figure 4.21 on the previous page. Select the Grand Am Edge 1 test, which had been run at a different track (Edgewater) with the old converter.. You should now obtain a screen similar to that shown in Figure 4.24. The Grand Am Edge 1 has nothing that looks like a noise spike, so its data quality looks very good also.

Figure 4.24 shows both runs to look quite similar, but the Engine RPM for Grand Am 1 (the more recent test with the new converter) shows a lower Engine RPM through most of the run. To check if the converter is actually "tighter", click on Graph Type at the top of the Graph screen and de-select front wheel RPM and driveshaft RPM, by clicking on them. Then click on Converter Slip and Tire Slip to select them and make the graph again. Now we should clearly see if the new converter is tighter.

It should be noted here that both runs show the start of the acceleration 0.2 to 0.3 seconds before time = 0 seconds. That is because the DatgaMite program realizes that drag racing starts have a certain amount of "rollout" time, time required for the car to roll out of the timing lights and start the ET timer.. The program automatically estimates this time, and can fine tune it with the Match Time Slip feature. This means time on the graph should match the ET timer times on your time slip. You will

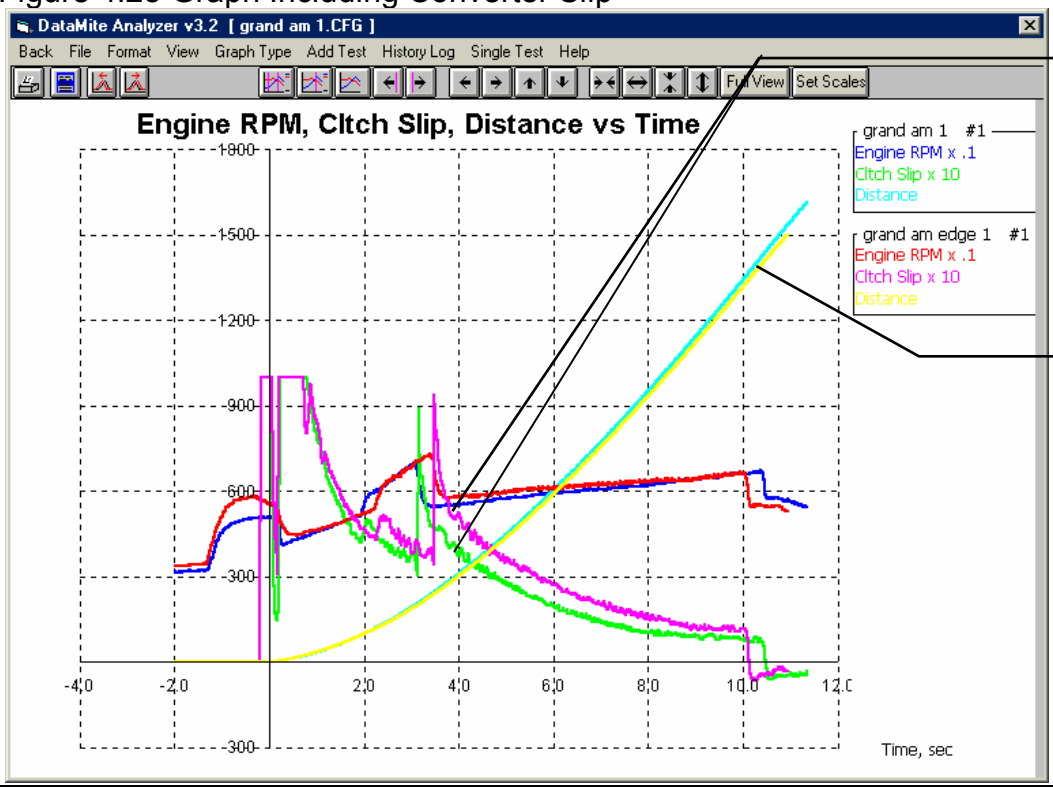
Figure 4.24 Checking Data Quality of Both Tests Being Compared



Both runs look quite "clean" (no noise spikes) and quite similar. The biggest difference is with Engine RPM. "Grand Am 1" with the new converter seems to have lower Engine RPM throught most of the run, possibly being a "tighter" converter.

Click on Graph Type to change the Data Types to Graph for Figure 4.25's graph

Figure 4.25 Graph Including Converter Slip



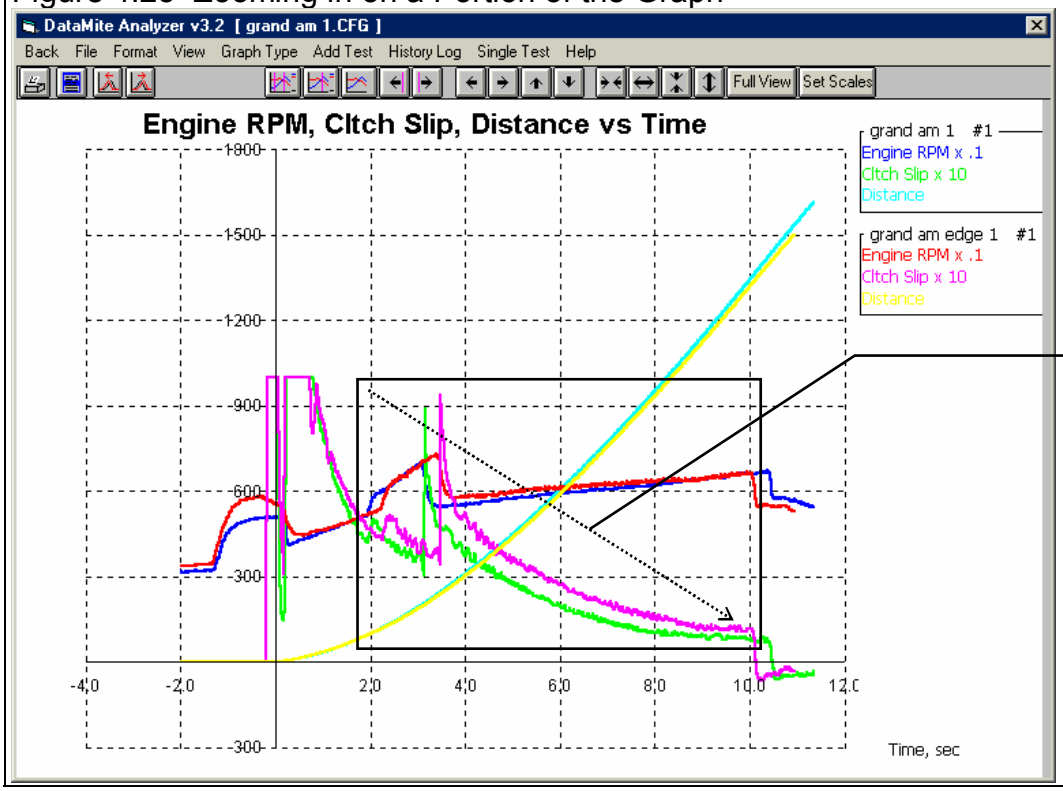
Rather large difference in Converter Slip, with the new converter bring "tighter".

The program's "auto-scaling" now shows Distance Travelled in more detail. You can now see that the Grand Am 1 is slightly quicker, higher distance in the same amount of time.

also notice that both runs automatically overlaid correctly, that both started at the same time. This is also done automatically by the program. ***These are not features you would get in other data logger software, even much more expensive software.***

To illustrate some features of the graph screen, lets say you wanted to compare the Converter Slip of these 2 runs after the 2-3 shift, just in 3rd gear. First lets "zoom in" on the 1-2 shift part of the test. 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 4.25 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).

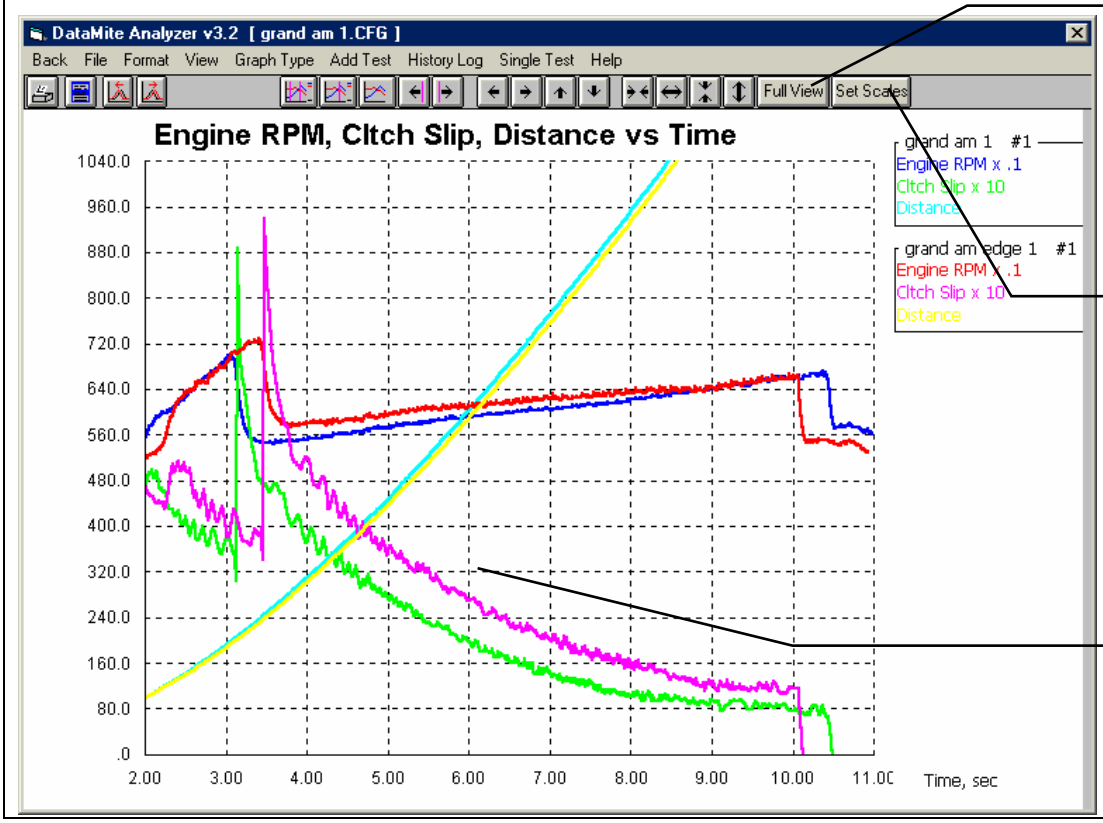
See Figure 4.26 to view the "zoomed in" graph.

Figure 4.26 shows the graph after you have zoomed in on the runs after the 2-3 shift. It still shows that the previous converter ("Edge" run) has more converter slip, just like the other graphs but in more detail. But, you wonder "Maybe that is because the 2-3 shift occurs sooner with the new converter?" The DataMite program lets you shift one test left or right (ahead or back in time) to get events to line up between various runs. This feature is called "Time Aligning" and is showed in Figure 4.27. With Time Aligning, you can position the 2 runs so the 2-3 shift occurs at exactly the same time. This was done by shifting the Grand Am 1 run .320 seconds later in time. Even after shifting the graphs so the 2-3 shift occurs at exactly the same point on the graph, the Grand Am 1 run with the new converter has less Converter Slip.

If you click on one of the graph lines, a vertical line called a "cursor" is drawn. The values of the graphs at the cursor are displayed at the right in the graph legend, and the time at the cursor is shown at the bottom right of the graph. See Figure 4.28. This is very useful to "pin-point" the exact values on the graph. See Figure 4.18 in Example 4.1.

Figure 4.29 shows how you can bring up 2 cursors, to "bracket" a section of the graph. The second cursor on the right side of the graph is moved exactly as the single cursor, except you must hold down the <Ctrl> key on the keyboard to move it. Once you have defined an area of interest on the graph, you can click on one of the Analyze buttons to display either the Maximum, Minimum or Average values in the defined area. These are displayed in the graph legend, the same as the values for the single cursor. Figure 4.29 shows the average converter slip for the New converter to be 20.90% and 25.38% for the old converter, about a 4.5% difference, which is quite large. Most any way you look at it, the new converter is significantly tighter (more efficient which also means better) than the old converter.

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

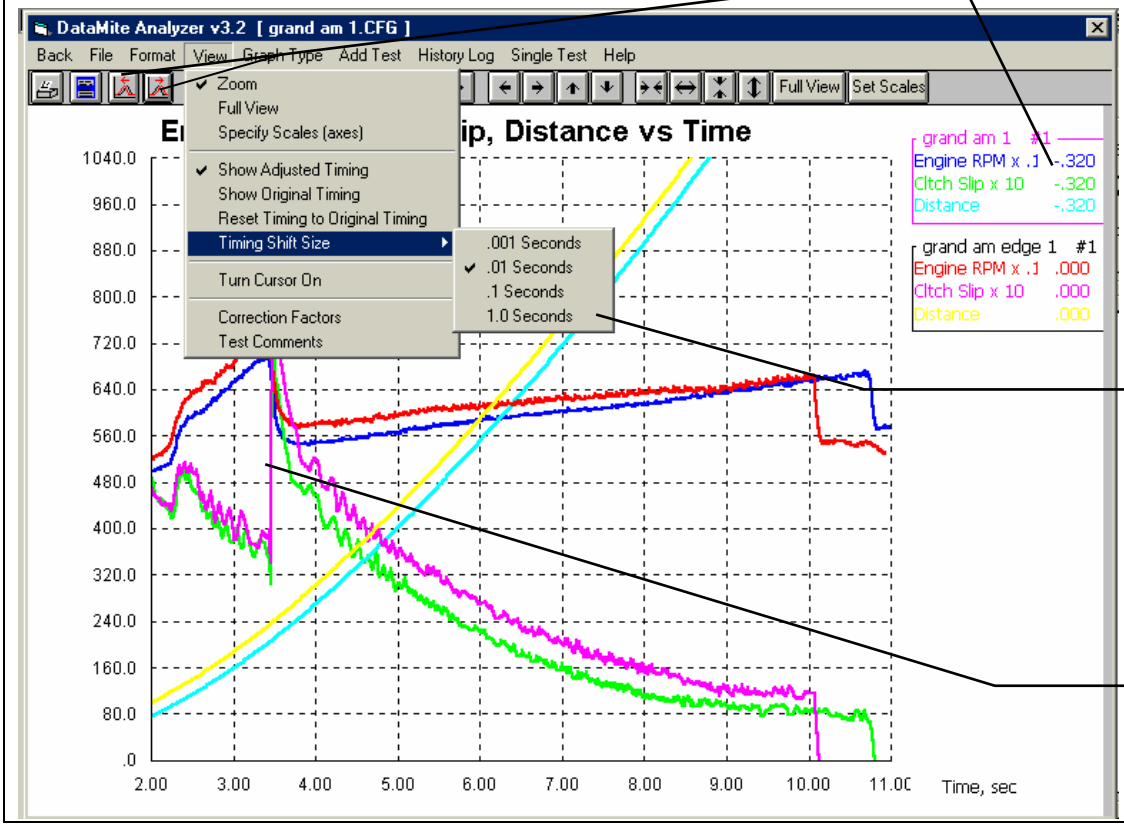


Click on Full View to return to the original scales where the complete test was displayed, as determined by the program. This is called "auto-scaling"

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

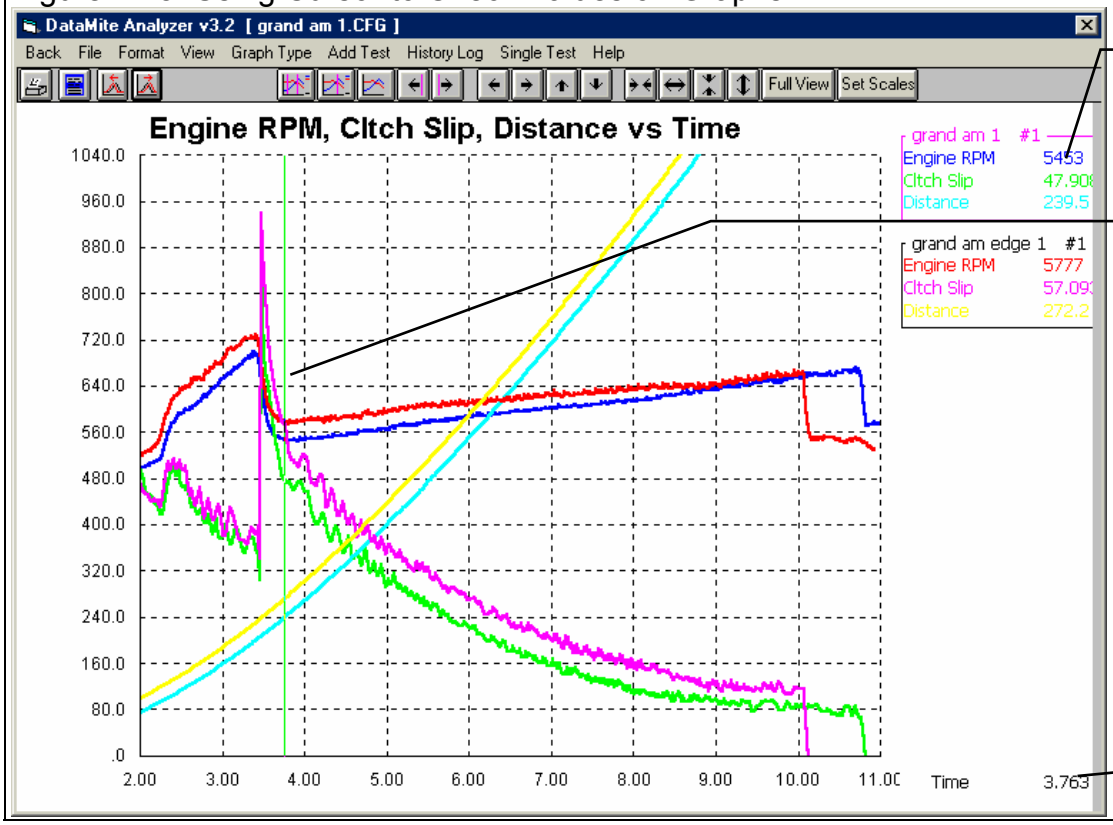


Click on these Time Align buttons to shift one of the tests over another. The amount of shift is shown in the legend. Grand Am 1 had to be shifted back .32 seconds for good alignment with the "Edge" test

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

2-3 Shifts for both tests now occur at same time.

Figure 4.28 Using Cursor to Check Values on Graphs

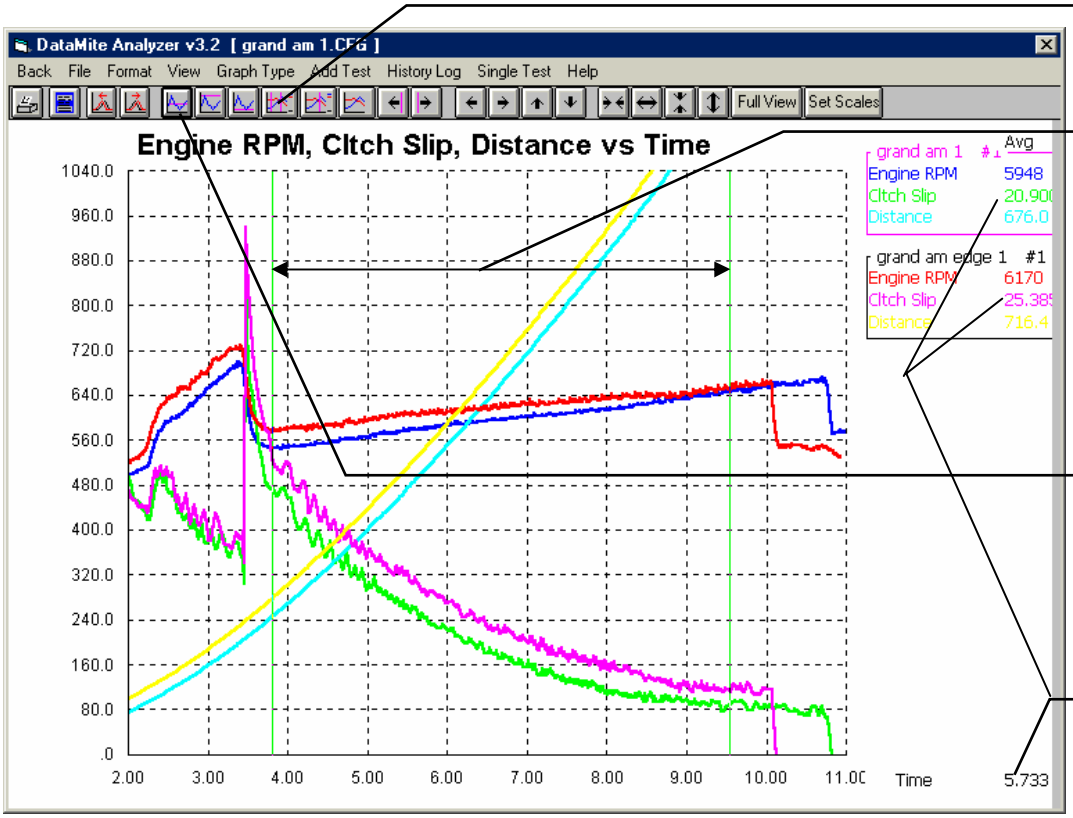


Values at the cursor line are shown here in the Legend.

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 Converter Slip is higher with the new converter, even if the shifts had occurred at exactly the same time.

Cursor Time.

Figure 4.29 Analyze a Section of a Graph with 2 Cursors



Click on Dual Cursor button to display 2 cursors

The left cursor moves like the single cursor. Hold down the <Ctrl> key while moving the cursor to move the right cursor. This lets you select a section of the graphed data to analyze.

Click on the Average button to display the average for the graphs between the 2 cursors.

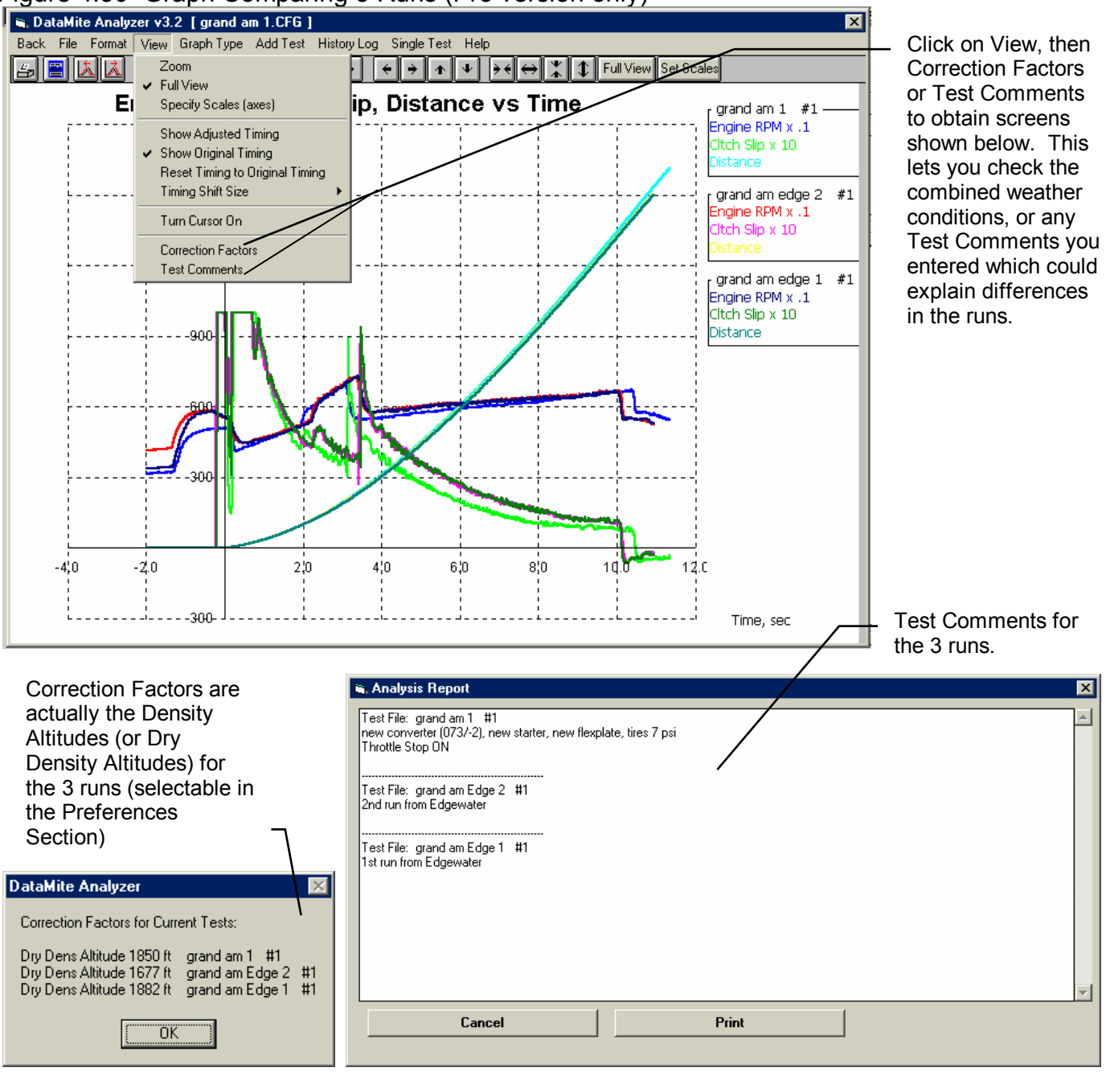
Average data and time between cursors displayed here and here.

Figures 4.25 through 4.29 show how you can use graph features like Time Aligning, Zooming, Cursor and the Dual Cursors to check various performance characteristics.

Another useful Graph feature, only available with the Pro version, is to compare more than just 2 runs. To add more runs, click on the Add Test command and pick another test run. You choose Grand Am Edge 2, a 2nd run with the old converter. You would obtain a graph as shown in Figure 4.30 showing all 3 tests.

Figure 4.30 also shows 2 useful "View" options. Click on View, then either Correction Factors to display the Density Altitudes (critical to understanding differences in runs), or the Test Comments you entered for each test.

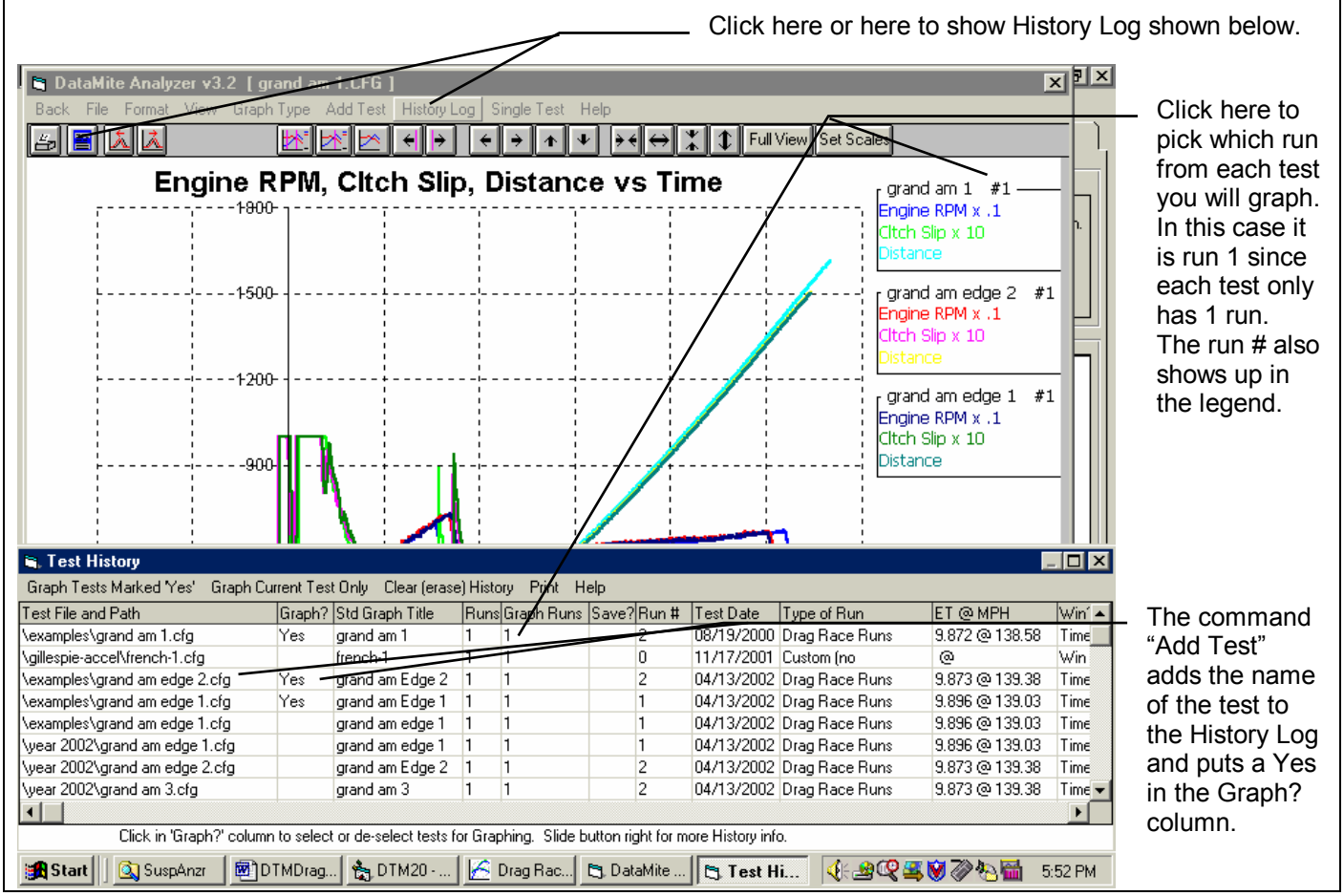
Figure 4.30 Graph Comparing 3 Runs (Pro version only)



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 4.31. 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.

Figure 4.31 Pro Version's History Log for Graphing Multiple Runs

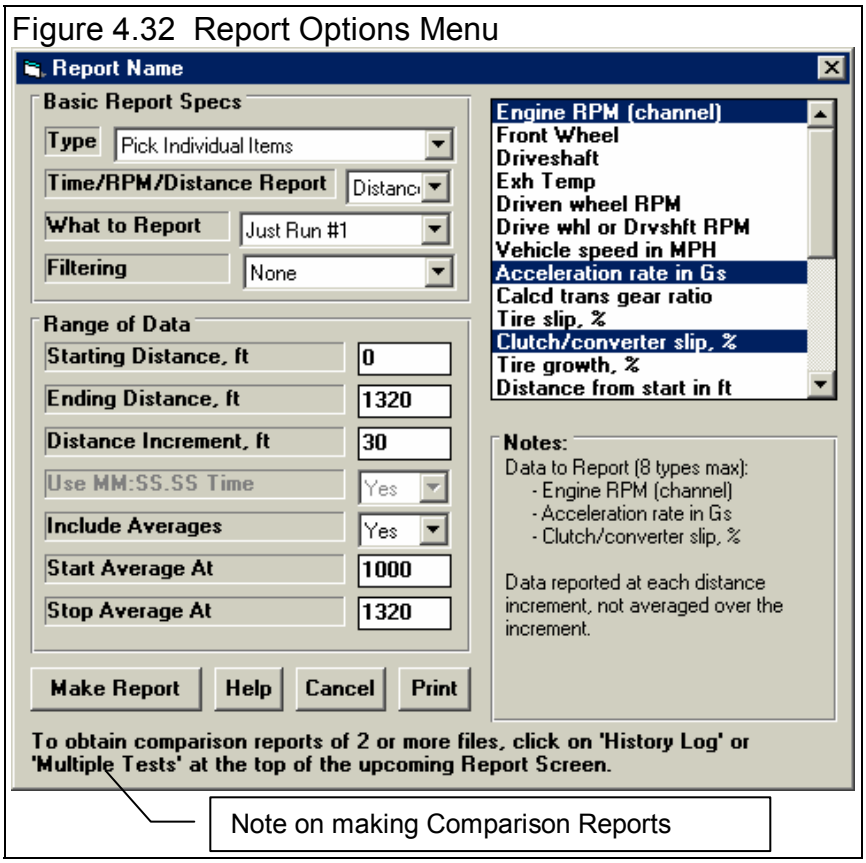


Reports

Some people prefer, or are more used to looking at, numbers instead of graphs. Reports are for these people where the run will be displayed as columns of numbers. 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 4.32.

The Reports Options menu is similar to the Graph Options screen but with a few more options. If you pick the Type "Pick Individual Items", you can highlight from the list of data types to report. Then you can choose to graph versus Time, RPM or Distance, pick What to Graph and the Filtering. These are just the same as with graphs. However, you have some additional options like the starting and ending points for the report, and if you want to averages calculated and over what range.

Figure 4.32 Report Options Menu



Averages can be quite useful for making comparisons from test to test. For example, in Figure 4.32, we requested to make an average from the 1000 ft mark through the run at the 1320 ft make. This may be a useful way to track the health of the engine, transmission or converter. For example, if the average Converter Slip over this length of track starts to increase, it may be indicating a problem with the converter or transmission. For example, the report in Figure 4.33 shows an average Converter Slip of 8.9% over this distance.

Figure 4.33 Report Showing Averages from 1000 to 1320 Ft

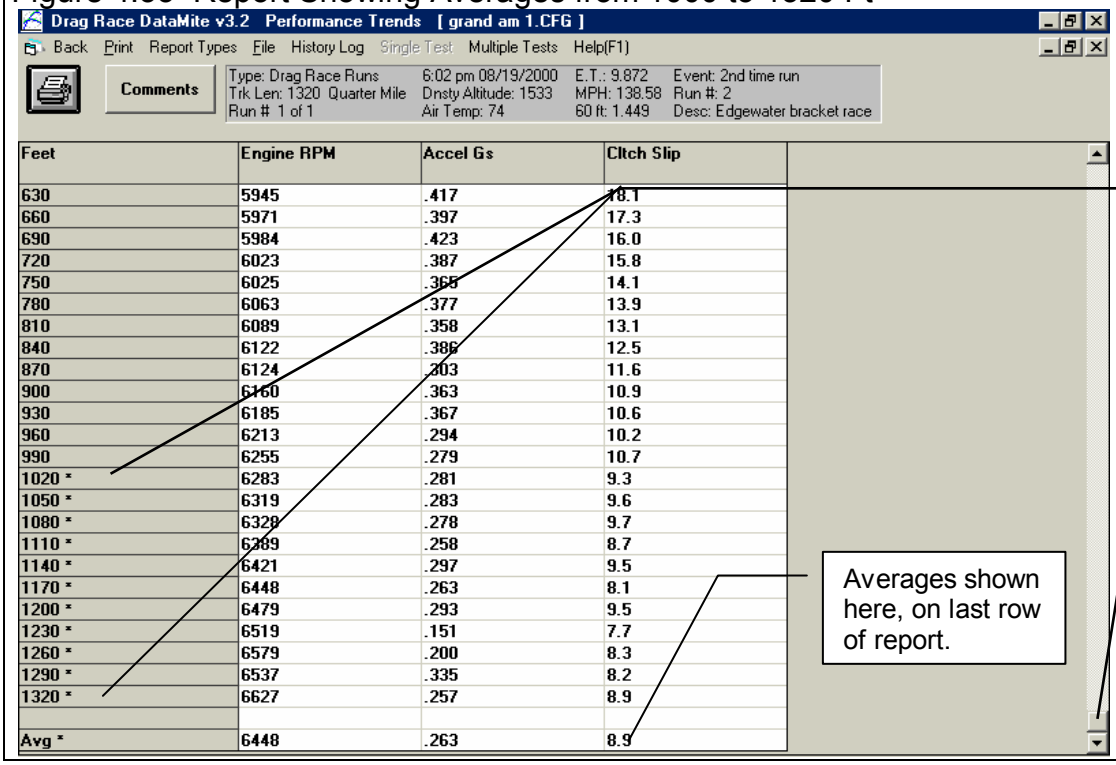
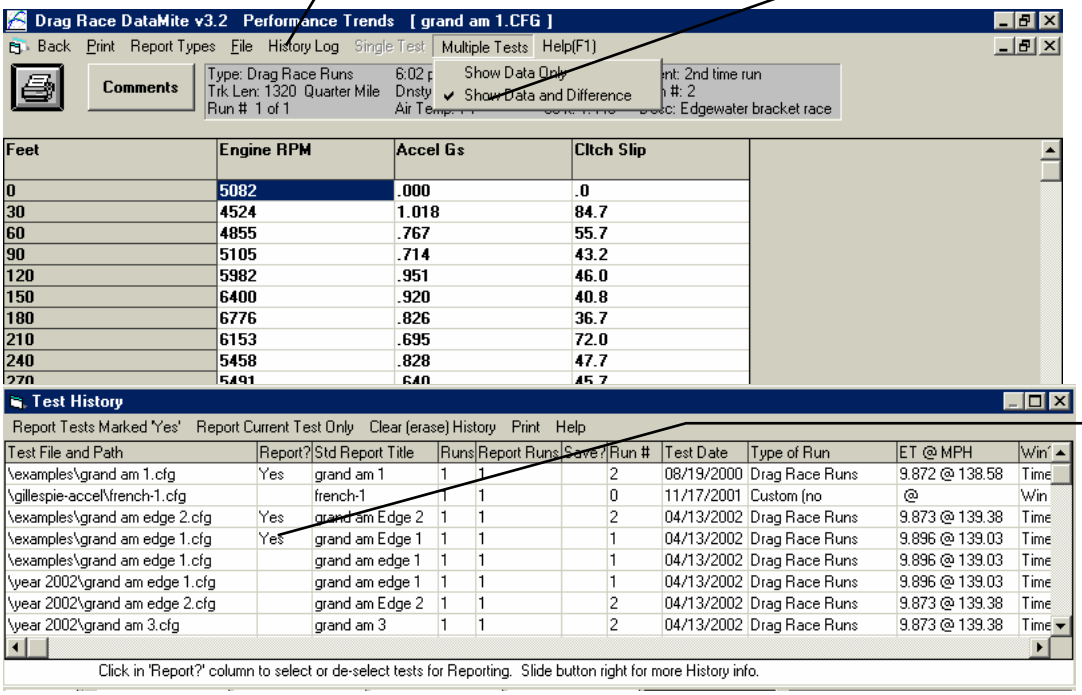


Figure 4.34 Making Comparison Reports of 2 or More Runs

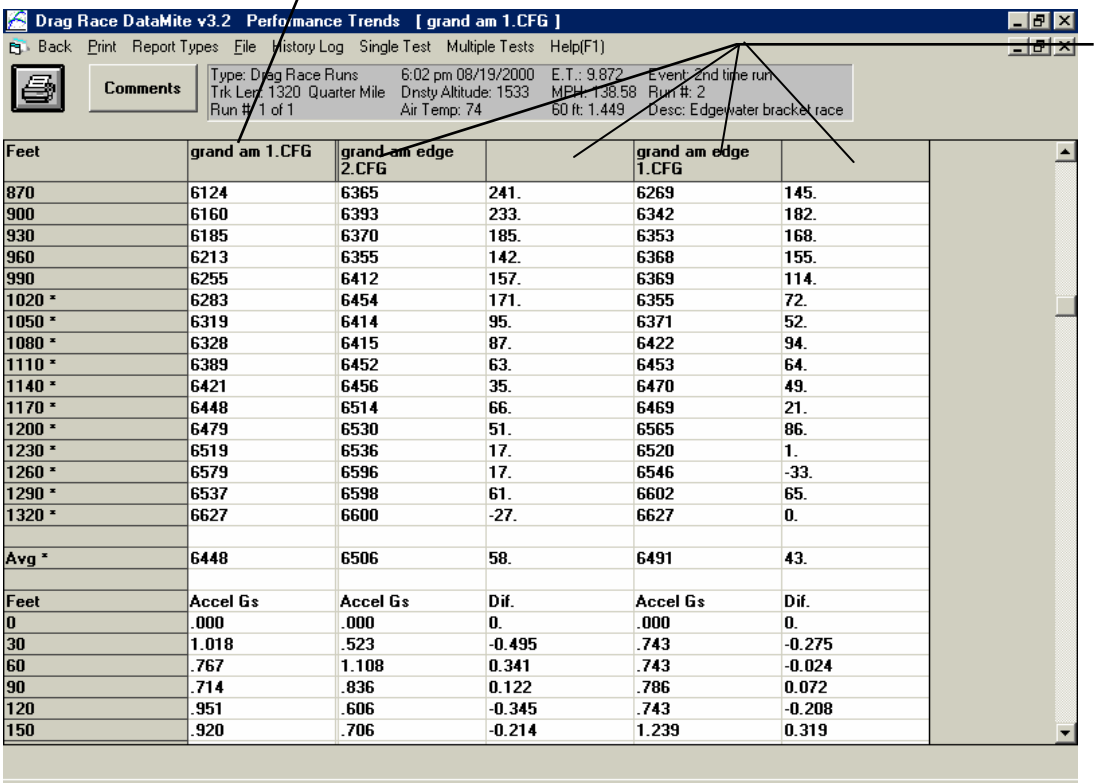
Click on “History Log” to display History Log shown below.

Click on “Multiple Tests” to have Report Screen display data from several tests for comparison. If you select “Show Data and Difference” the additional columns are added showing the difference between the current test and the other tests for comparison.



Just like with graphs, select which tests to include in the comparison report by putting a Yes in the “Report?” column.

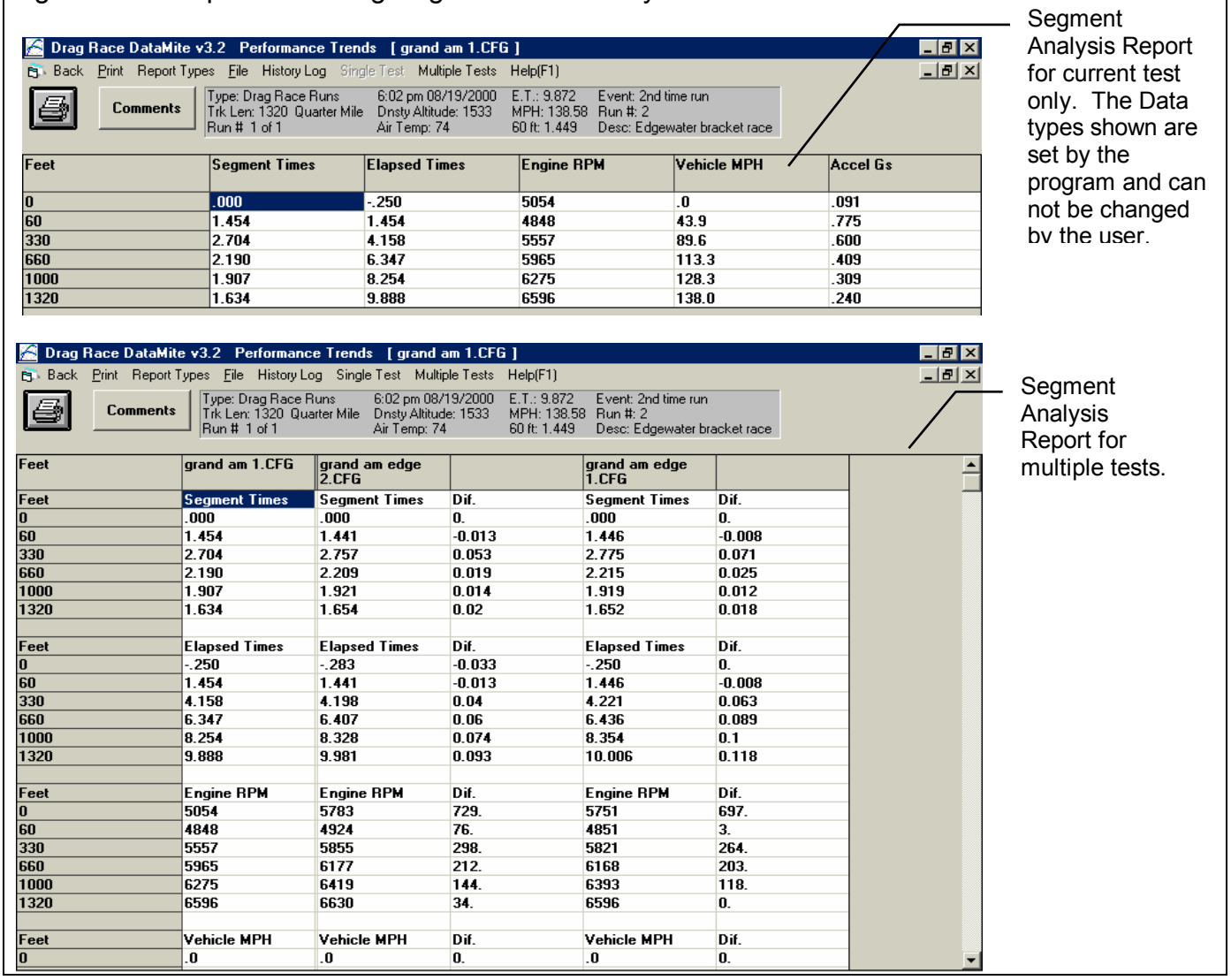
Results for current test in first column



Results for tests marked “Yes” in the Report? column of the History Log shown here with the Difference for each in the adjacent column.

Another useful type of report is the Segment Time Analysis. Choose Segment Time Analysis for the Type in the Report Options screen instead of Pick Individual Items. You will obtain reports like that shown in Figure 4.35 for either the single current test or for comparison to Multiple tests picked from the History Log.

Figure 4.35 Reports Showing Segment Time Analysis



Feet	Segment Times	Elapsed Times	Engine RPM	Vehicle MPH	Accel Gs
0	.000	-.250	5054	.0	.091
60	1.454	1.454	4848	43.9	.775
330	2.704	4.158	5557	89.6	.600
660	2.190	6.347	5965	113.3	.409
1000	1.907	8.254	6275	128.3	.309
1320	1.634	9.888	6596	138.0	.240

Feet	grand am 1.CFG	grand am edge 2.CFG		grand am edge 1.CFG	
Feet	Segment Times	Segment Times	Dif.	Segment Times	Dif.
0	.000	.000	0.	.000	0.
60	1.454	1.441	-0.013	1.446	-0.008
330	2.704	2.757	0.053	2.775	0.071
660	2.190	2.209	0.019	2.215	0.025
1000	1.907	1.921	0.014	1.919	0.012
1320	1.634	1.654	0.02	1.652	0.018
Feet	Elapsed Times	Elapsed Times	Dif.	Elapsed Times	Dif.
0	-.250	-.283	-0.033	-.250	0.
60	1.454	1.441	-0.013	1.446	-0.008
330	4.158	4.198	0.04	4.221	0.063
660	6.347	6.407	0.06	6.436	0.089
1000	8.254	8.328	0.074	8.354	0.1
1320	9.888	9.981	0.093	10.006	0.118
Feet	Engine RPM	Engine RPM	Dif.	Engine RPM	Dif.
0	5054	5783	729.	5751	697.
60	4848	4924	76.	4851	3.
330	5557	5855	298.	5821	264.
660	5965	6177	212.	6168	203.
1000	6275	6419	144.	6393	118.
1320	6596	6630	34.	6596	0.
Feet	Vehicle MPH	Vehicle MPH	Dif.	Vehicle MPH	Dif.
0	.0	.0	0.	.0	0.

Conclusions

- Graphs allow you to compare one dyno run to another to check the effect of modifications.
- Graphs and reports can compare runs on a time basis (typical) or distance or Engine 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 produce columns of numbers for each test. Like graphs, the data shown in these reports can be picked by the user.
- With reports, you can specify a range of values for which Average values can be calculated.
- Comparison reports (Pro version only) allow for columns of numbers for 2 or more runs to listed side-by-side for comparison, and an “difference” column can also be included for more convenience.

Example 4.3 Measure Torque and HP from Acceleration

Example 4.3 shows how you can do "dyno testing" right in your vehicle. By doing full throttle accelerations in 1 gear (manual transmission), you can obtain nearly dyno quality torque and HP curves.

The car is a stock, manual transmission 4.6L 96 Mustang. You are doing "baseline" testing for comparison to modifications you will do in the future. The sensor installation is nearly identical to that in Example 4.1 and 4.2 except there are 4 magnets installed on each wheel. You are doing your runs at a drag strip (not public roads), both for safety and to avoid tickets. Again we will assume you are the driver. You have installed your DataMite following the guidelines in Appendix 4.

Before testing, you should decide what 1 gear to use for the acceleration tests. The gear should not be too low as to cause tire spin, but not be so high as to cause excessive speed. Excessive speed is unsafe and may produce less accurate data since the aerodynamic specs of Drag Coefficient and Frontal Area must be very accurate. However, a slower acceleration (from a higher gear) can show smoother and more detailed torque and HP curves.

The acceleration should take approximately 6 to 12 seconds. Second gear is generally a good choice. Third gear may be needed if the final drive is very high numerically (over 4.0), or you if second gear gives "jumpy" or "noisy" curves. Since you have a 3.08 axle and the tires do not spin when you "stab the throttle" in 2nd gear, you decide to try 2nd gear.

Similar analysis is possible with automatic transmission vehicles. However, two aspects of automatic transmissions make it less accurate:

- The RPM range the engine goes through during full throttle tests is generally smaller, especially with high stall converters.
- There are more power losses in the converter and transmission which are more difficult to estimate.

For these reasons, the data (especially torque) is not as accurate with automatic transmissions.

Check Out DataMite with Setup Mode

Before doing any tests, you check out the RPM signals by putting the DataMite in Setup Mode, as outlined in Example 4.1.

Recording Acceleration Data

1. Press the Clear Memory button to bring the DataMite out of Setup Mode and go into Recording Mode. You will notice the Record LED is On indicating you are recording data. You let the DataMite record this "non-race" data while you stage at the drag strip.
2. You watch the “Christmas tree”, and launch in first gear, then shift nearly immediately to 2nd gear. Remember, you are not racing, so you can take your time. After you shift to 2nd gear, you apply the brakes to lug the engine down to 1000 RPM with the clutch fully released (foot off the clutch pedal). The vehicle will be rolling slowly. (For some race vehicles with race cams, do not lug the engine down to 1000 RPM. Pick some relatively smooth running RPM below the RPM range you are interested in testing.)

3. You quickly open the throttle to full throttle, being careful not to "break the tires loose" or cause a "jerky" acceleration. **Note: Engines are prone to knock and detonate at low RPM and full throttle. If this happens, quickly close the throttle, and try the test again with higher octane fuel or starting at a higher RPM.**
4. You close the throttle after reaching the maximum engine speed, being careful not to over-rev and damage the engine. You roll through the finish line.
5. You then press Record on the DataMite control panel to not record a lot of "non-test" data and drive back to the pits.

Important! If you press the red Clear Memory button at this time instead of the Record button, you will erase the first run from memory.

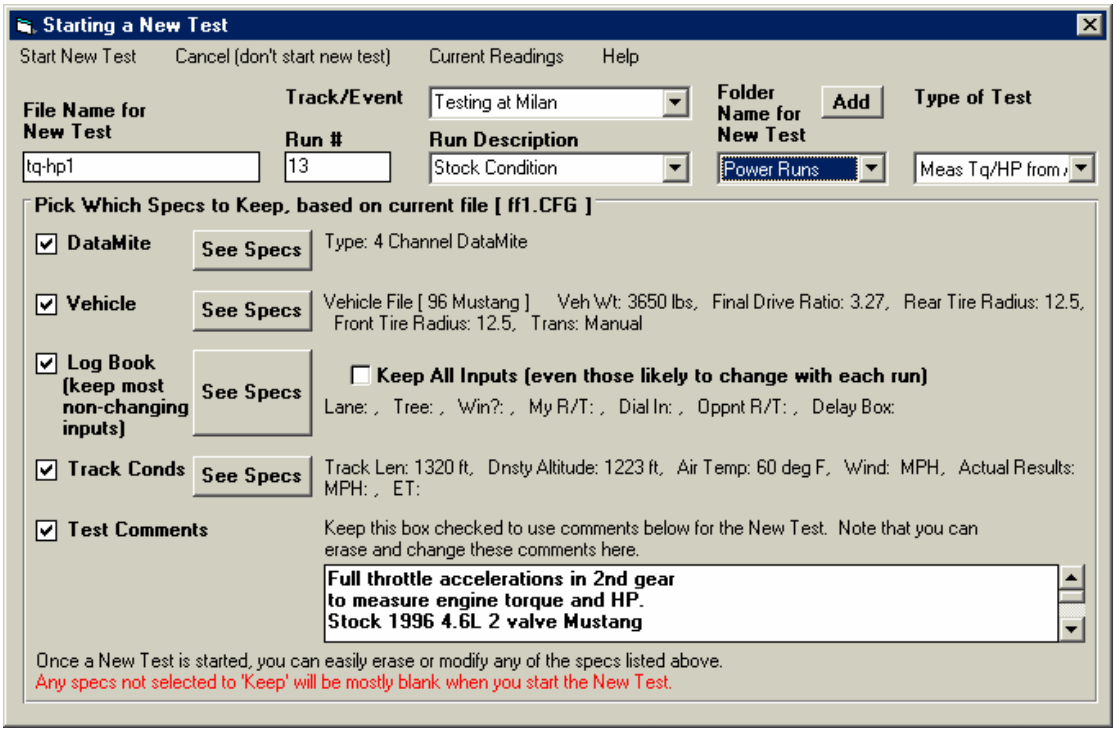
Note: The method the DataMite Analyzer uses to calculate torque and HP produces less accurate results at the very beginning and end of the RPM range of the acceleration. For example, if you want accurate data from 3000 - 6000 RPM, the ideal acceleration test would be from say 2500 - 6500 RPM. However, for engine and driver safety, do not over-rev the engine.

Getting DataMite Data

Back at the pits, you start the DataMite program to download the data. You select the Get New Data from DataMite option from the Main Menu and download the file as explained in Example 4.1.

Since you will want to obtain Corrected torque and HP numbers, weather conditions are very important. Be sure to enter accurate readings into the Track Conditions menu, either before or after downloading data. You also enter General Comments about the test. For Track/Event, type in the name of the drag strip, or pick from the list if you have already typed in this strip's name. The same can be done for Run Description.

Figure 4.36 New Test Screen Filled Out for First Power Run

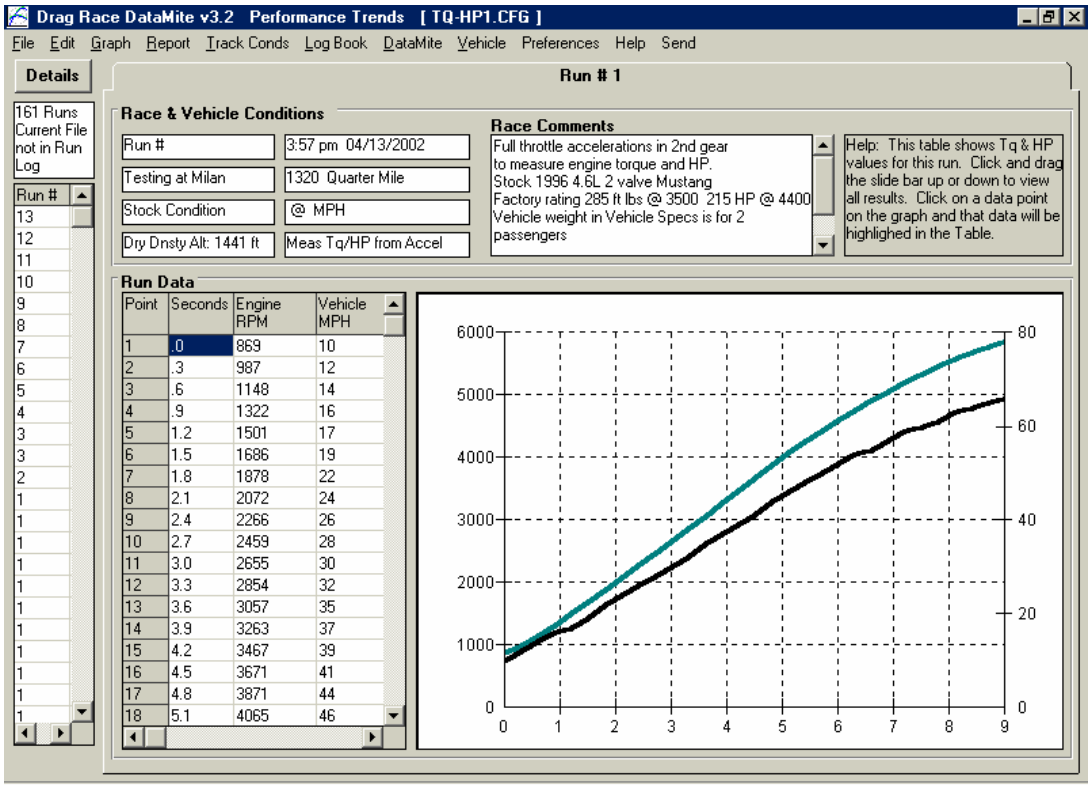


You give the new data file the name TQ-HP1 and save in a new folder name called "Power Runs". Adding a new Folder is done by clicking on the Add button by the folder name in the New Test screen. You also pick the Type of Run as "Meas Tq/HP from Accel" from the list of possible types. The program says 1 run has been found which is 10 seconds long, which looks correct.

Making Graphs

The program then leaves you at the Main Screen, where you see Engine RPM and MPH steadily increasing in the graph. This is exactly what the car did for this test. However, you are probably mre interested in dyno type power curves of torque and HP vs RPM. To obtain these, click on Graph at the top of the Main Screen.

Figure 4.37, Main Screen for Power Run



In the Graph Data screen, you select a Type of "Pick Individual Channels", and then select the Data Types of Corr Flywheel Torque and Corr Flywheel HP only. "Corr" means the data is corrected to standard dyno conditions for weather. "Flywheel" means the program ***estimates*** the losses in the vehicle based on Vehicle Specs and engine size to obtain a reasonable estimate of what the engine would produce on an engine dyno. If you had selected "Road" torque and HP, the power curves would be lower, more typical of a chassis dyno.

For Time/RPM/Distance, set it to RPM. Note that power curves are generally the only types of data which should be graphed versus RPM. What to Graph, set to Power Run #1. Filtering set to Medium. **Note: Most power curves require some level of filtering, either Light or Medium, to appear as typical dyno curves and to be repeatable from run to run.**

Click on the Make Graph button at the lower left to produce the graph shown in Figure 4.38. You are probably impressed at how much this looks like a dyno graph, one the could cost hundreds of dollars and many hours of time to produce on an engine dyno or chassis dyno.

Figure 4.38 Graph Data Menu to Create Corr Tq and HP vs RPM Graph

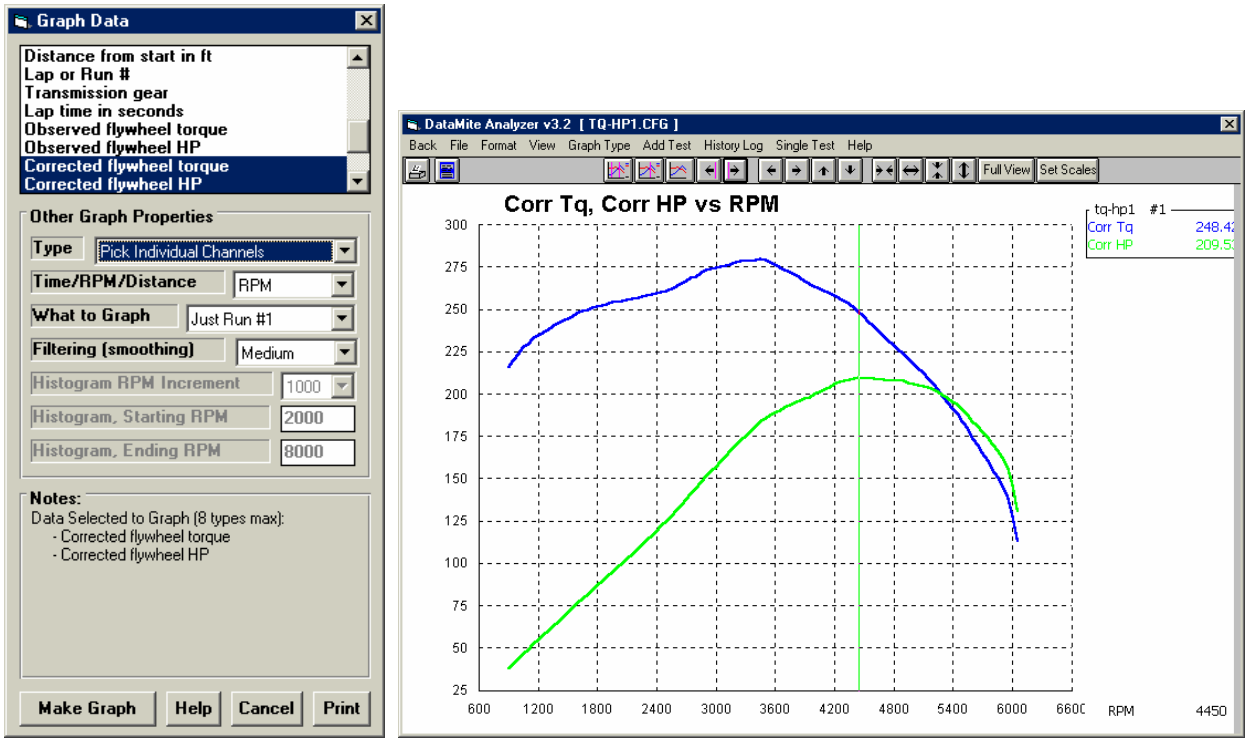


Table 4.1 Comparison of DataMite Results with Factory Rating

	Factory Rating	From Figure 4.37, using cursor
Corr Flywheel Torque	285 ft lbs @ 3500 RPM	279.6 ft lbs @ 3450
Corr Flywheel HP	215 HP @ 4400 RPM	209.5 HP @ 4450

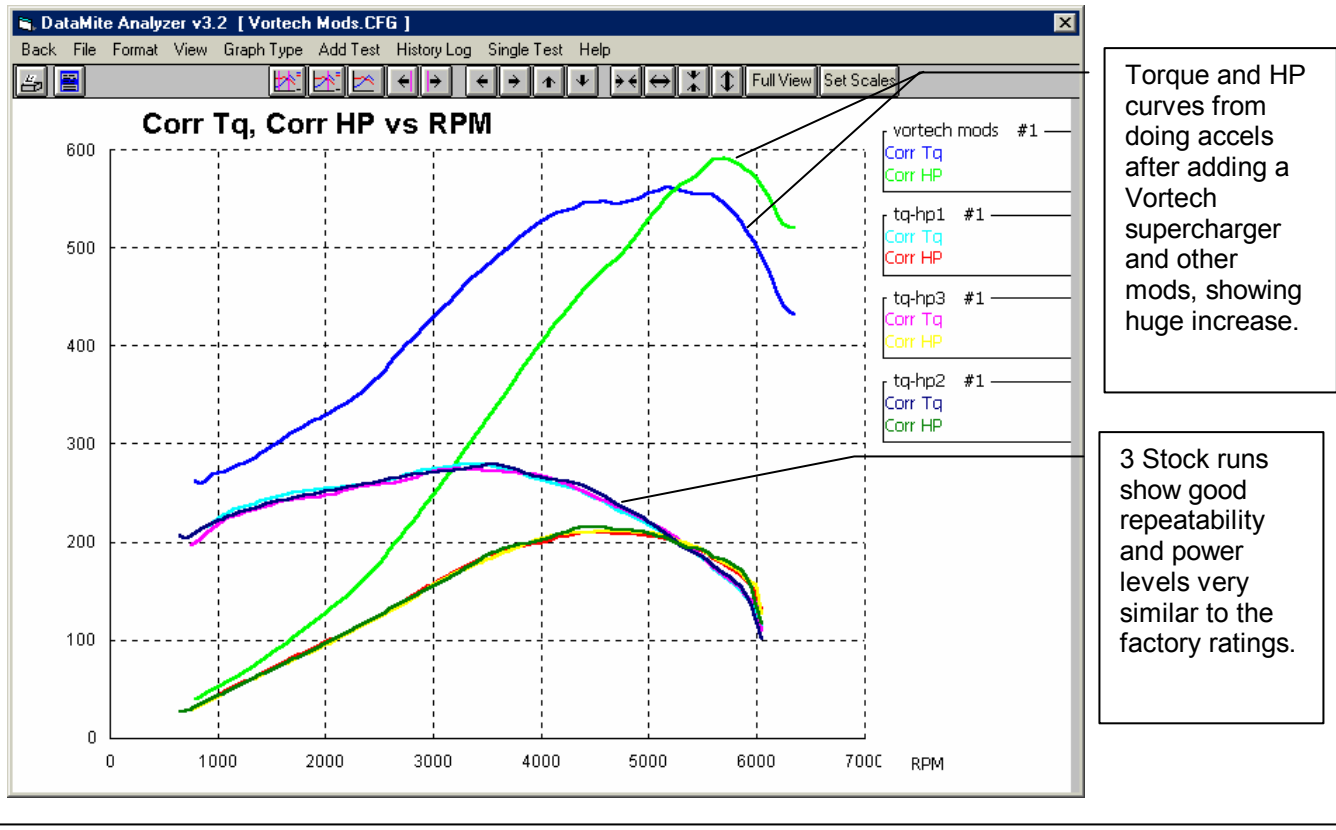
Some points concerning Figure 4.37 and Table 4.1 include:

- These plots are of Corrected torque and HP. That means they use the specs in the Test/Race Conditions to calculate a correction factor which has a major effect on the results. If you accurately enterTest/Race Conditions for this run and for your future runs, Corrected torque and HP will make better comparisons of your modifications. That is because Corrected torque and HP should correct for any change in performance due to weather. Any change you see in performance should then be due to a real change in the engine, not simply weather changes.
- Table 4.1 shows that not only do the levels of torque and HP match very well, but the RPMs where the peaks occur match very well also.
- By making changes in Vehicle Weight, aerodynamics specs, etc in the Vehicle Specs menu, you can shift the torque and HP numbers up or down. However, the RPMs where the peaks occur can not be changed by doing this.

You make two more runs, down load them, and call them TQ-HP2 and TQ-HP3. Figure 4.39 shows a graph of these multiple runs. The graph shows the resulting plot, which shows the resulting curves all agree quite closely. When you make a modification in the future, any one of these runs will make a good baseline to check for performance improvement.

Now, assume that you make some improvements to your 4.6L, like heads, Vortech, cams, etc. To check how these modifications have changed performance, you run another single acceleration to measure torque and HP. Figure x.x shows the huge improvement you have gained. Since both the torque and HP peak now occur at a much higher RPM, you will have to move your shift points to a higher RPM also.

Figure 4.39 Overlay of the 3 Baseline Runs with Modified 4.6L "Vortech" Run



Conclusions:

- The DataMite offers features for measuring engine torque and HP similar to a dynamometer without removing the engine from the vehicle. This feature is available for both automatic and manual transmission vehicles, but is more accurate with manual transmission vehicles.
- Done correctly, the results are both accurate and repeatable.
- The program can correct for weather conditions if these conditions are accurately entered into the program's Track Conditions menu.
- The graph features of the Pro version allow up to 4 (and more) different runs to be graphed together for comparison.

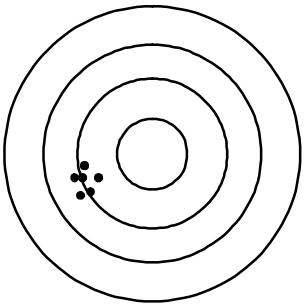
Appendix 1: Accuracy and Assumptions

Repeatability:

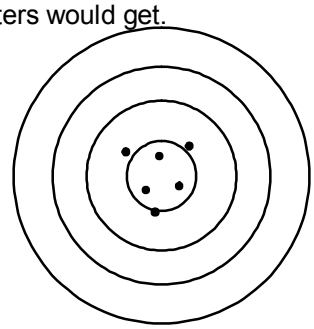
The difference between ***repeatability*** and ***accuracy*** is a concept you may not understand. Graphically, accuracy and repeatability are shown in Figure A.1.1. Think of the data logger as an "archer" which is trying to hit the "bulls eye" or the converter's true % Slip through the traps. Let's say the true converter slip was 8%, but one data logger always comes up with values between 4.5% and 5% slip. This data logger is not very accurate, but is very repeatable (only a 0.5% slip spread in the results). Another data logger comes up with measurements which vary from 5% to 11% Slip, which average out to the true 8% Slip. This data logger with the 6% spread in data is not nearly as ***repeatable*** as the first, but ***is more accurate***.

Figure A1.1

Repeatable Measurements
produce the same readings, test after test, but the reading may not be the true Slip %



Accurate Measurements
produce a reading which is close to the ***true*** Slip reading, which is a reading other accurate data logger testers would get.



Ideally, you want both a repeatable and accurate data logger, 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 data logger is the one to use.
- If you want data logger numbers to use in a magazine article, for other people to compare their data logger with, you are better off with the accurate data logger.
- If you want % Slip numbers to use for certifying the torque converter, for example selling a converter with a guarantee it produces a certain amount of slip, you are better off with the accurate data logger.

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

To Improve Repeatability:

The most basic thing for improving repeatability is "Don't change things". This means, that you should ***not*** "tweak" Vehicle Specs or DataMite sensor calibrations to make minor improvements.

The Pro version of the Drag Race DataMite program has a feature called "Match Time Slip", which can improve accuracy if you accurately enter the ET and 60 ft time for each run. However, if you do not do this for each run, you may want to turn off this feature, as this adjustment may introduce more error in the data. See Preferences, section 2.2.

Many times the DataMite will record actual difference from run to run, caused by difference in the actual vehicle's performance. Again, the best thing you can do to improve your vehicle's repeatability is to do your prep and staging procedure

exactly the same from run to run, and to stop "tweaking" and making adjustments. (Adjustments are obviously important for making improvements, but not for repeatability.)

To Improve Accuracy:

There are many types of calculations being performed by the Drag Race DataMite Analyzer. Their accuracy depends on the following:

- It is critical that the Vehicle Specs in the program be accurate. This includes things like gear ratios, vehicle weight, tire size, etc.
- In the Pro version, additional corrections can be made based on the time slip results of 60 ft time and ET called "Match Time Slip". See page xxx. If you consistently enter the actual time slip results into the Track Conditions or Log Book screen, the program can fine tune some calculations for better accuracy.
- 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 Conditions menu. See Section 2.3. An error here will affect accuracy ***and*** repeatability.

Major Assumptions:

The DataMite Analyzer program makes several simplifying assumptions about the vehicle which are listed below. Other approximations and assumptions exist as identified in Section 1.3 A Word of Caution and scattered throughout this manual. See Assumptions in the Index.

- There is no slip inside the transmission. For automatic transmissions, there may be slip in the clutches and bands. This slip is combined with Converter Slip and reported as Converter Slip in % .
- Tire growth is reported as the decrease in rear wheel RPM compared to front wheel RPM, correcting for differences in Tire Radius. However, there is also tire slip occurring with growth, which the program can not separate. Therefore, your actual tire growth will likely be HIGHER than what is calculated by the program as Tire Growth in %.
- Torque and HP are estimated based on the vehicle's acceleration rate, MPH, aerodynamics, etc. Obviously any error in Vehicle Specs will cause an error in calculating torque and HP. However, the program makes additional assumptions for specs which are difficult for the user to estimate, like driveline efficiency, engine inertia, transmission inertia, wheel & tire inertia, etc. Therefore, the absolute accuracy of torque and HP may be in error due to these assumptions. See Example 4.3.

Appendix 2: Hardware Installation and Operation

Most all DataMite sensors and wiring come with their own installation and instruction sheet. Those instructions are more detailed and up-to-date than what is contained in this Appendix. For that reason, it is important for you to read and keep those individual instructions.

1 Ensure All Pieces Were Shipped

The standard 4 channel 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. Small engine magnetos (like on a Briggs & Stratton engine are OK.)
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.

The larger 30 channel DataMite II data logger system should be shipped with:

1	DataMite II module **!!! Important !!!** The 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. Small engine magnetos (like on a Briggs & Stratton engine are OK.)
1	DataMite Control panel with 2 push buttons
1	RPM harness with standard wheel RPM sensors
4	Magnets for wheel RPM sensors
1	Serial cable for connecting DataMite to your computer's COM port.
1	Power cable for 12V power
1	Configuration diagram identifying which of the 16 analog channels are activated as thermocouples or 0-5 or 0-10 volt inputs.

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.

- Thermocouples to measure temperatures (analog converter required for standard 4 channel DataMite)
- Pressure sensors (analog converter required for standard 4 channel DataMite)
- Fuel Flow sensors
- Weather station for correction factors or air density measurements.

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. These instructions are more detailed and up to date than what could be contained in this manual. For that reason, it is important for you to read and keep those individual instructions.

2 Determine Signals to Record

Both the DataMite and the DataMite II systems are designed to record engine RPM on channel 1. Figure A2.7 and A2.8 gives typical sources for Engine RPM signals for various ignition systems. With the Inductive Pickup options, you can record spark from a spark plug wire, with no direct electrical connection to an ignition module or coil.

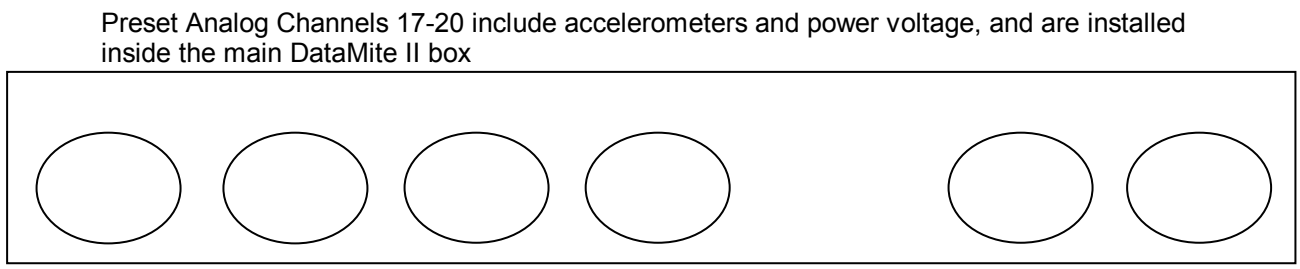
For the standard 4 channel DataMite, channels 2, 3 and 4 are for recording RPMs, or can record analog signals like temperatures and pressures with the addition of an optional Analog Converter.

The 30 channel DataMite II 5 several different types of channels for recording different types of signals:

1. RPM Channels 1-5
2. Selectable Analog Channels 1-16
3. Preset Analog Channels 17-20 (sensors installed inside the main box)
4. On/Off Switch Channels 1-4
5. Timer Channels 1-2

All of these channels (except the Preset Analog Channels) are accessed through the 9 pin Amp connectors at the front of the main box.

Figure A2.1A Signal Inputs on Front Panel of DataMite II



Depending on how you order your DataMite II, the analog channels from 1-16 may not be configured for anything, or can be configured as thermocouple channels for temps, or 0-5 or 0-10 volt analog inputs for most any other type of sensor. Check the documentation which comes with your DataMite II. These analog channels are configured in sets of 4 for each type of input, either thermocouple or analog. The analog range of 0-5 or 0-10 can be configured for each of these 16 channels individually with jumpers inside the box.

If thermocouple channels are turned On, they usually start on the right end, channels 13-16, then 9-12, etc. If analog channels are turned On, they usually start on the left end, channels 1-4, then 5-8, etc.

Generally, timer and switch channels, and the accelerometer channels for analog channels 17 and 18 are all turned On.

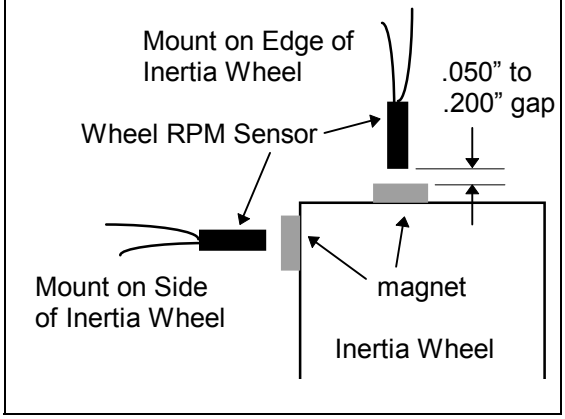
As you attach sensors, you must remember that you must also let the software know which sensors are attached to which channel. This is done in the DataMite Specs screen.

3 Build Brackets, Mount Magnets for RPM Sensors

For wheels and driveshafts, epoxying the standard magnets supplied to the outside of the inertia wheel works well. For clutch RPM on Lenco and Jehrico and other transmissions, there may already be a magnet installed on the trans input shaft. Performance Trends has sensors that typically fit the required size and thread for this application. 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.

Figure A2.1 B Spacing Required for RPM Sensor and 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

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 doing acceleration tests, it is critical that the magnets be evenly spaced for accurate torque and HP results. Occasionally, racers just use 1 magnet on the wheels or driveshaft to avoid this spacing issue (1 magnet is always evenly spaced). However, with only magnet, the DataMite's RPM measurements are slower and more erratic to record the exact start of the drag run from a standing start.

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. Also keep it out of sunlight to keep it cooler.

To mount the 4 channel 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 same procedure is used for the DataMite II except 4 screws are used.

Note the installation instructions for the DataMite II to obtain the correct orientation for the accelerometers to read correctly.

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.***

6 Install Wiring Harness

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.

The instructions which come with the harnesses must be followed as they are the most detailed and up to date.

> Important !!! The power to the DataMite must be clean. If you are using the car's battery, connect to the battery with separate wires. Do ***not*** connect to the same switch that controls power to the ignition system.

Engine RPM, Inductive Pickup:

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.

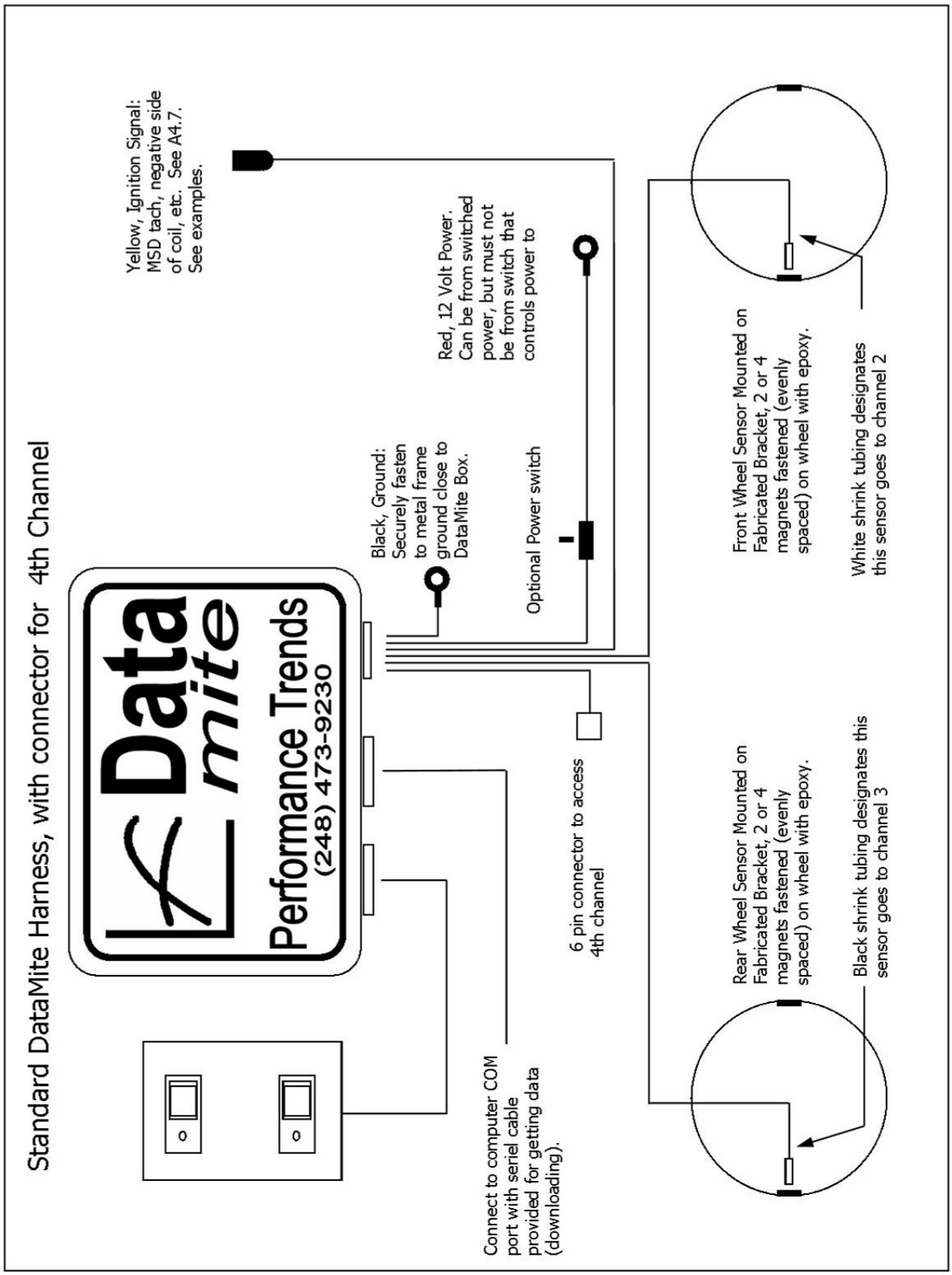
Engine RPM, Typical Automotive Spark Signal

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. (Note: It is designed for small engine magnetos, like that found on Briggs & Stratton or 2 stroke kart 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 12 seconds between power up and an LED lighting on the more memory 512K DataMites.

Figure A2.2 Typical DataMite Vehicle 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

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.

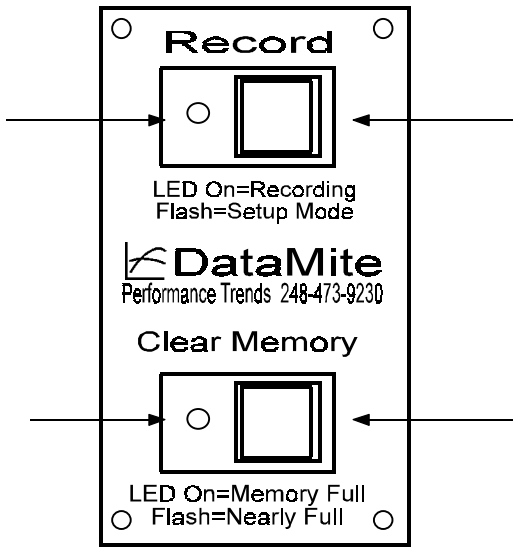
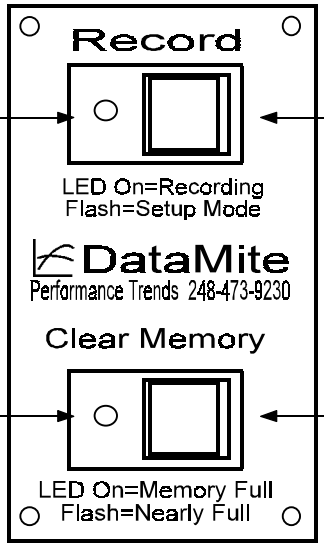


Figure 2.4 DataMite Recording Mode

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

Record LED is On when data is being recorded, goes Off when not recording.

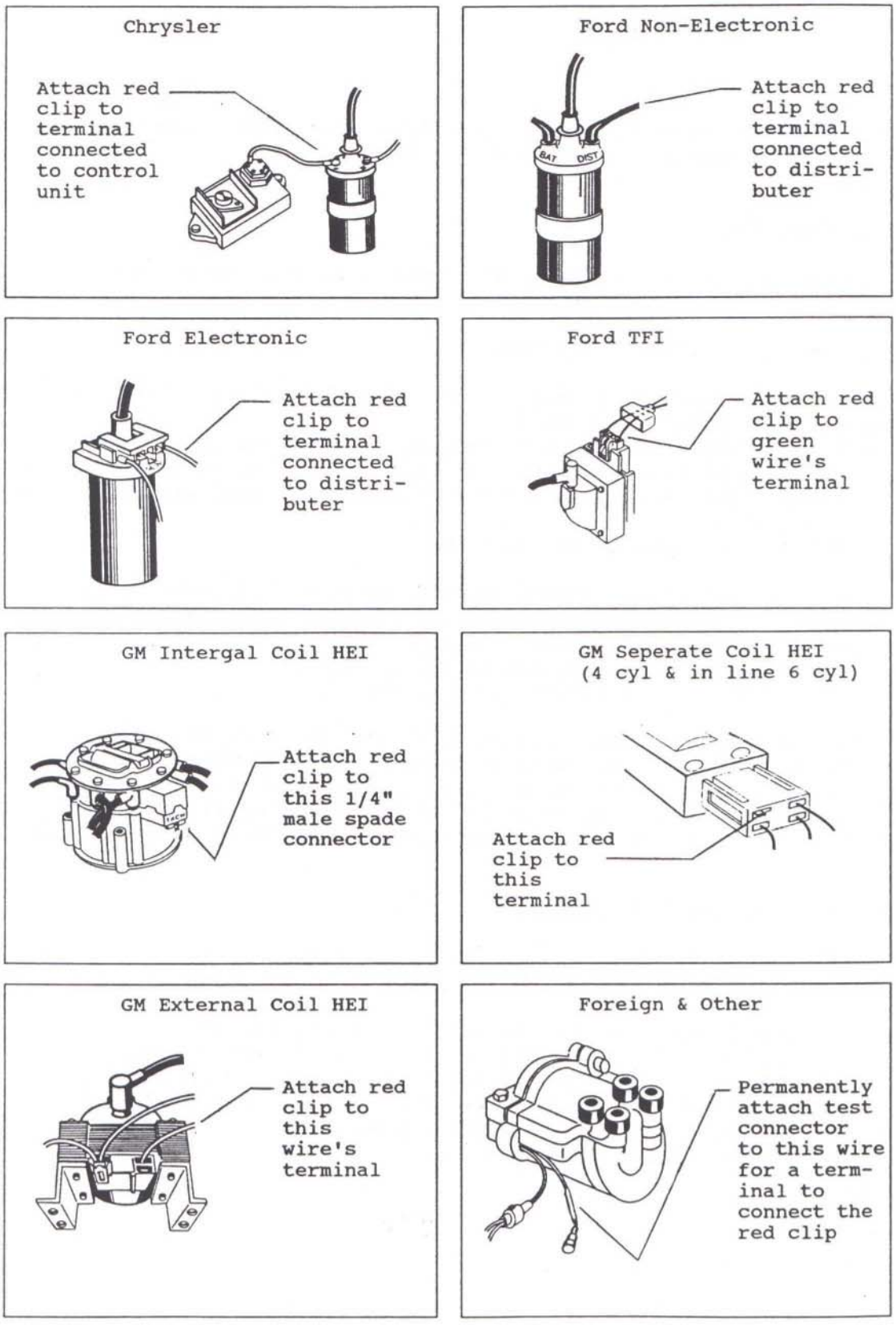


Push Record button to pause recording data (Record LED goes Off). Push Record button again to resume data recording (Record LED comes back On).

LED Flashes when data storage memory is 75% full, and remains On when memory is full and no more data can be recorded.

!!! Caution !!! Pushing Clear Memory button erases all data stored in DataMite.

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



Appendix 3: Troubleshooting Data

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:

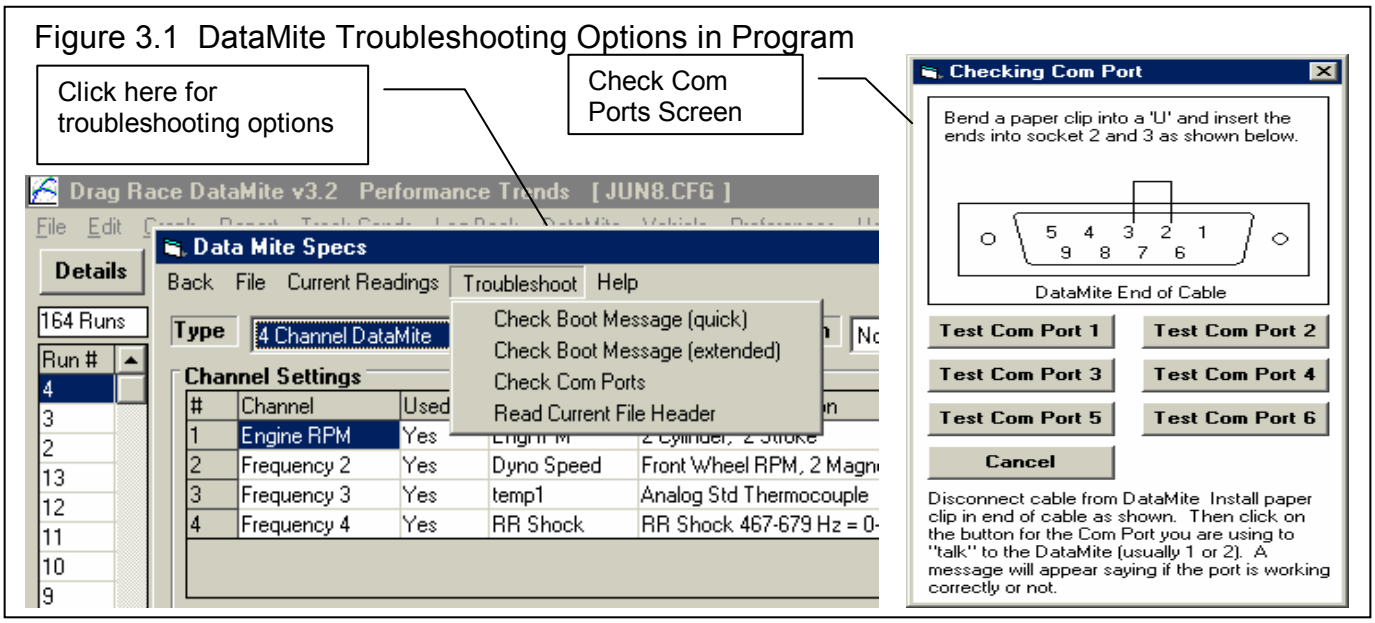
- First press the Clear Memory button and wait at least 20 seconds to see if an LED will light.
- Check that the power switch (if you installed one) is turned On.
- Check that your power supply is On or plugged in. Plug something else into that outlet (a light or radio) to make sure there is power there.

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.

See if the DataMite has an internal problem. Run the trouble shooting options in the DataMite screen.

Figure 3.1 DataMite Troubleshooting Options in Program



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:

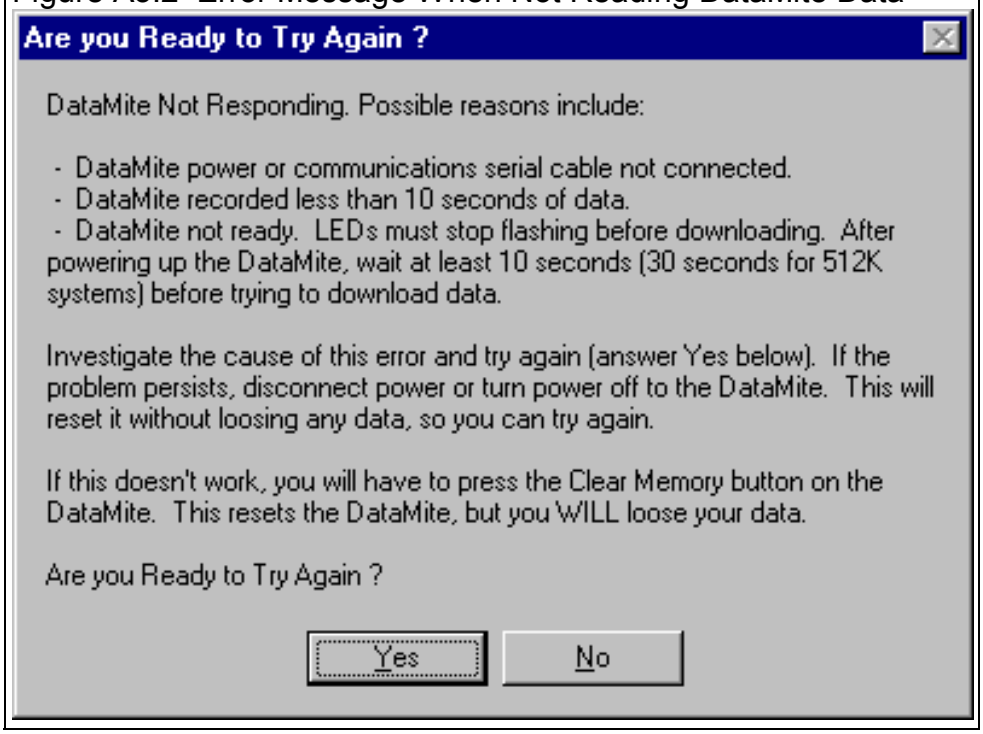
- Magnets must be adjusted closer to the sensor. (Note: Do not adjust closer than .050", or so close that the sensor may hit the magnet.)
- Leads to wheel sensors have a break in the harness.
- Black ground wire in harness is not well grounded. (A ground usually does ***not*** affect wheel RPM sensors.)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

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 A3.2, follow the suggestions in Figure A3.2 for troubleshooting.

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

Figure A3.2 Error Message When Not Reading DataMite Data



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

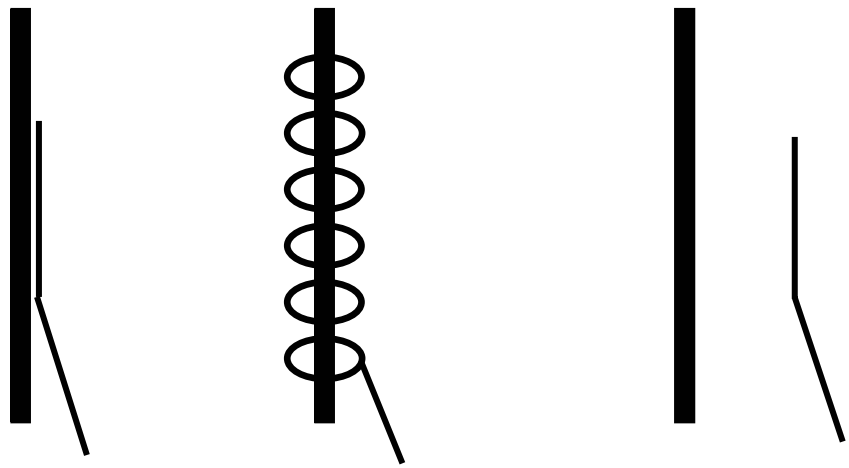
See Figures 2.46 and 2.47 on pages 78 and 79 for examples of "noisy" data versus "noise spikes". See Section 2.10 for the process to Edit Out 'Noise' Spikes. If an occasional noise spike appears in your data, this is normal (1-30) per test. Simply use the program's Edit feature to get rid of them.

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:

Figure A3.3 Inductive Pickup Adjustments for Signal Strength



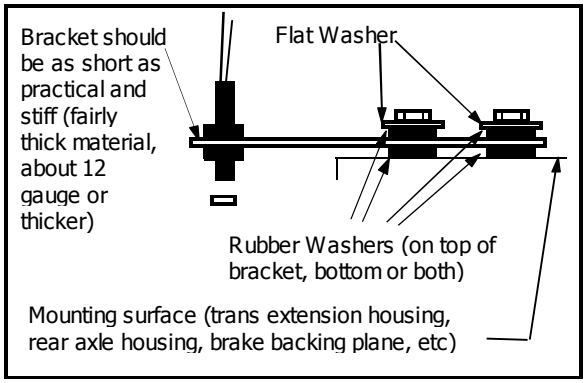
  - RPM looks correct at relatively low RPM, 1000 - 3000 RPM.
  - At higher RPM, the computer reads RPM too high, say the tachometer says 5000 but the computer reads 6000.

  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. It is hard to predict which way to go, to try stronger or weaker signal. 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. (It is designed to work on magnetos on small engines like Briggs & Stratton and 2 stroke kart engine.)

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 A3.4.

Figure A3.3 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.

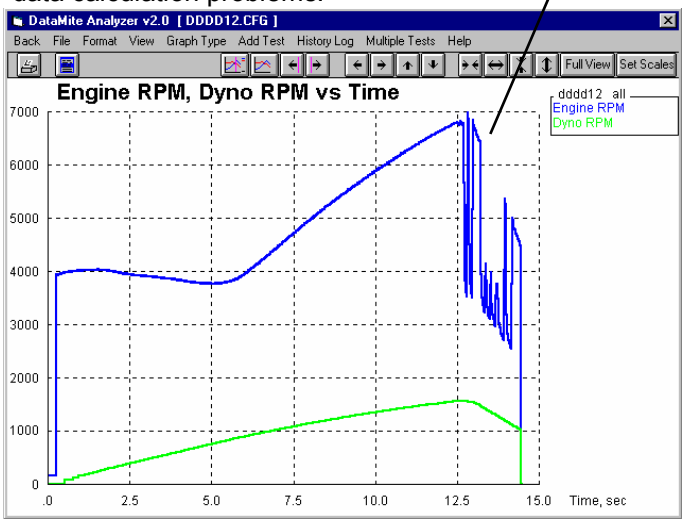
Use a “solid” ground source. Do not ground the DataMite to a terminal which also grounds the ignition system, as this will also be very unsteady.

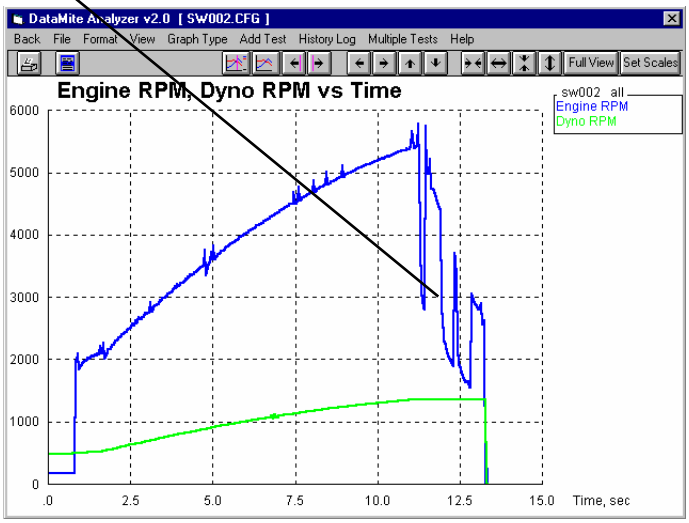
Make sure the engine is well grounded to the dyno frame and the dyno frame is well grounded to earth. This would mean a large ground strap which connects to a ground rod driven in the ground, or (2nd choice) a copper or at least metal cold water pipe.

Figure A3.4 Examples of Engine RPM "Drop Out" from Inductive Pickup

Examples of "drop outs" shown here happen to be on the decel (after throttle closes and spark voltage drops), but it can occur on the accel also, causing more severe data calculation problems.

Engine RPM will drop to about 1/2 or 1/3 of what it should be in signal to inductive pickup wire is weak. The "fix" is to wrap the inductive pickup wire around the spark plug wire 1 to 2 turns for a stronger signal.





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.

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:

MPH	Clutch Slip	Tq
Accel Gs	Converter Slip	HP
Feet	Tire Slip	Calc Gear Ratio
Gear #	Tire Growth	

These calculated outputs require some signal to determine vehicle speed. Typically this is done with a front wheel speed sensor, but these can be illegal in many drag racing events. Then you may want to use an accelerometer. Two (2) accelerometers are built into the DataMite II box, and they can be added to the smaller 4 channel DataMite with the proper choice of analog converter. Either way, you must pay attention to how you mount the DataMite II or analog converter box in the vehicle, so the axis of the accelerometer is aligned correctly with the axis of the car.

These data types are all based on the settings in the Vehicle Specs, DataMite Specs and Track Conditions menus. Check these settings and their definition in Chapter 2.

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 graph. 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, Converter or Tire Slip, Tire Growth or CalcGear Ratio be sure the Tire Radius and gear ratios are correct in the Vehicle Specs menu. Also, do a special test of cruising at a steady, slower speed like 30-50 MPH. When you look at this cruising data, you should see:

- 0 Clutch, Converter and Tire Slip
- 0 Tire Growth
- Calc Gear Ratio which matches the transmission gear ratio

If they are just slightly off (5% or so) adjust the Tire Radius as necessary to get them to read 0.

If you are getting negative (-) Tire Slip or Tire Growth, it sounds like the front and rear wheel signals are mixed up:

- Check that the RWD/FWD/AWD spec is correct for your car in the Vehicle Specs.
- Check that the Auxiliary RPM specs are set correct in the DataMite and Data Specs menu. Note: The white shrink tubing is on the Auxiliary RPM 1 sensor.
- If you are off a lot, be sure you not specifying a DriveshaftSensor in the DataMite and Data Menu when you are using a wheel sensor, or vice versa.

Note: The following conditions are normal:

- Clutch slip can go either positive or negative during shifts when the clutch is disengaged.
- Converter slip can go negative when you are engine braking.
- Tire growth can go negative during the launch or shifts. This is indicating tire squat or slip.

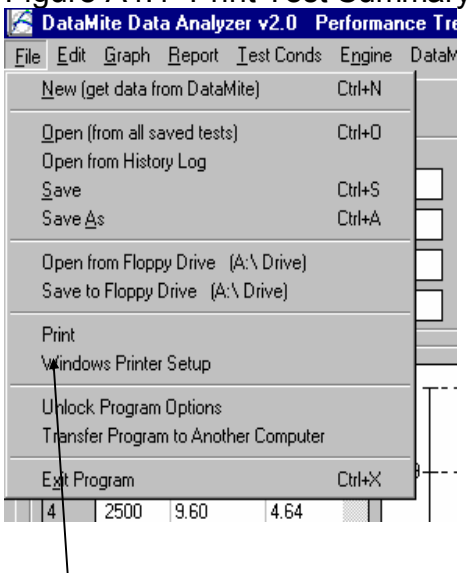
Appendix 4 Backing Up Data

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 drag race runs 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 Drag race run 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:

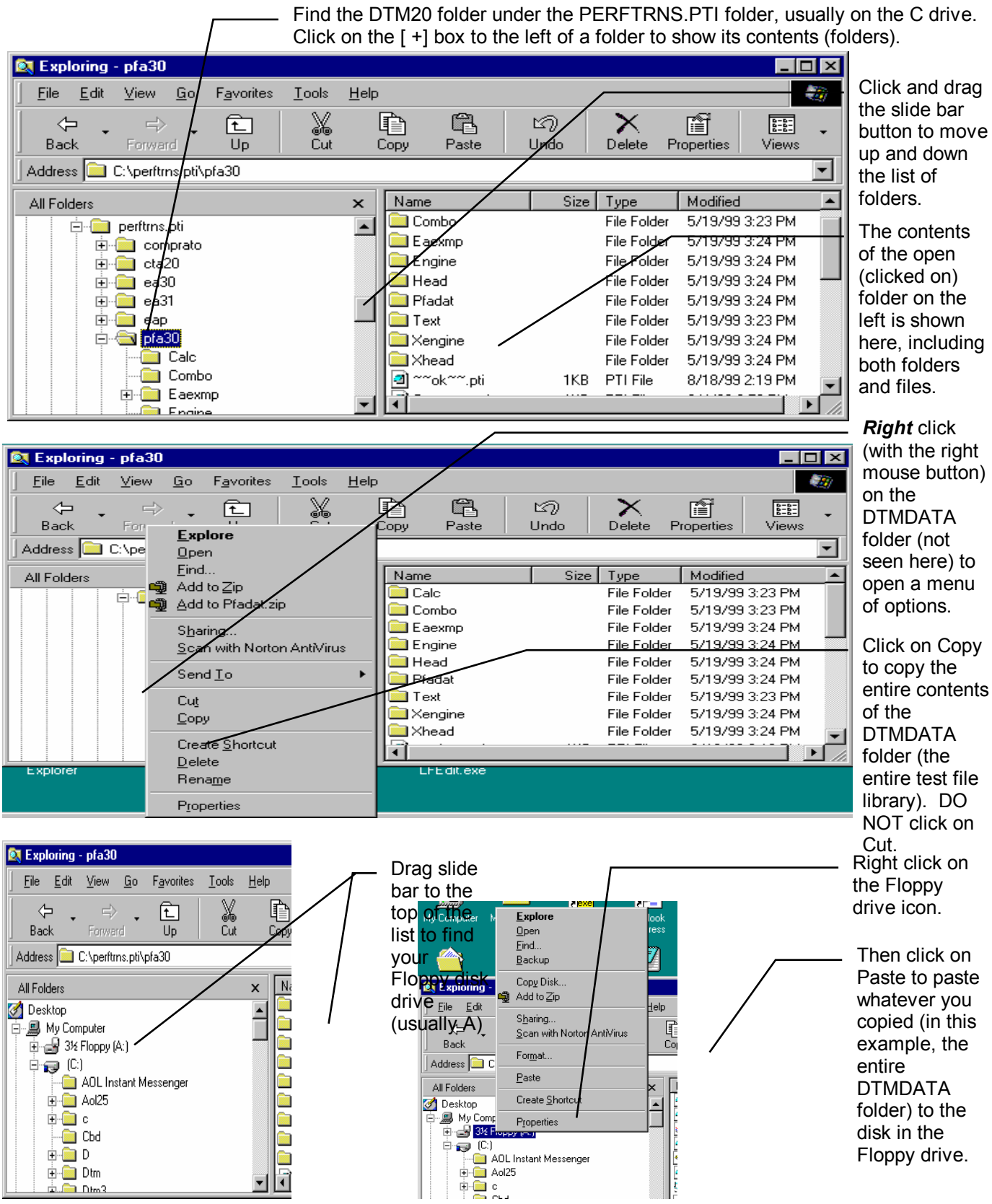
Click on Start, then Programs, then Windows Explorer (usually at the bottom of the list of programs). You will obtain the Windows Explorer screen shown in Figure A4.2.

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



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 Drag race run 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 Drag Race 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

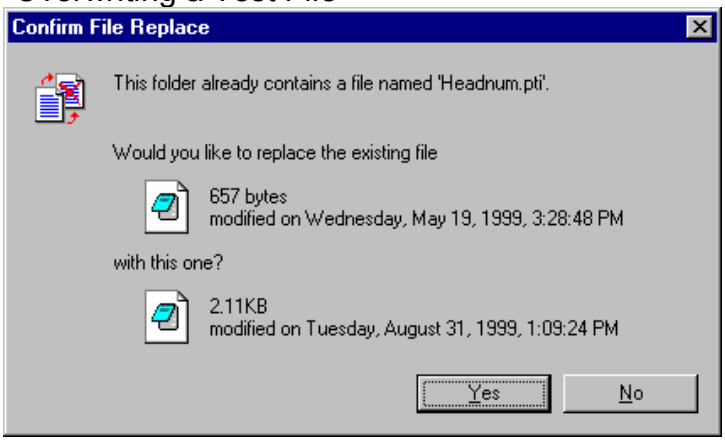
1 level up from the folder you are restoring. For example, if you are restoring the test file folder CHEV which was in the DTMDATA folder, you must click on the DTMDATA folder. If you are restoring the entire Test Library folder DTMDATA, you must click on the DTM20 folder. If you are restoring the test 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.

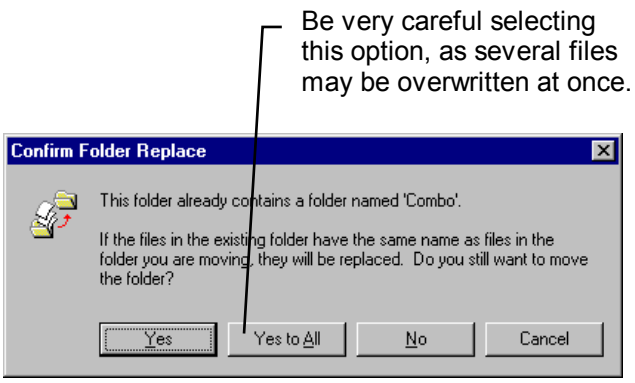
Before restoring test files, it is good practice to back up all test files first. Then if you make a mistake, and overwrite test files you didn't mean to, you have your backup copies to restore the test files from.

Figure A 4.3 Windows Explorer Warnings when Overwriting Test Files

Overwriting a Test File



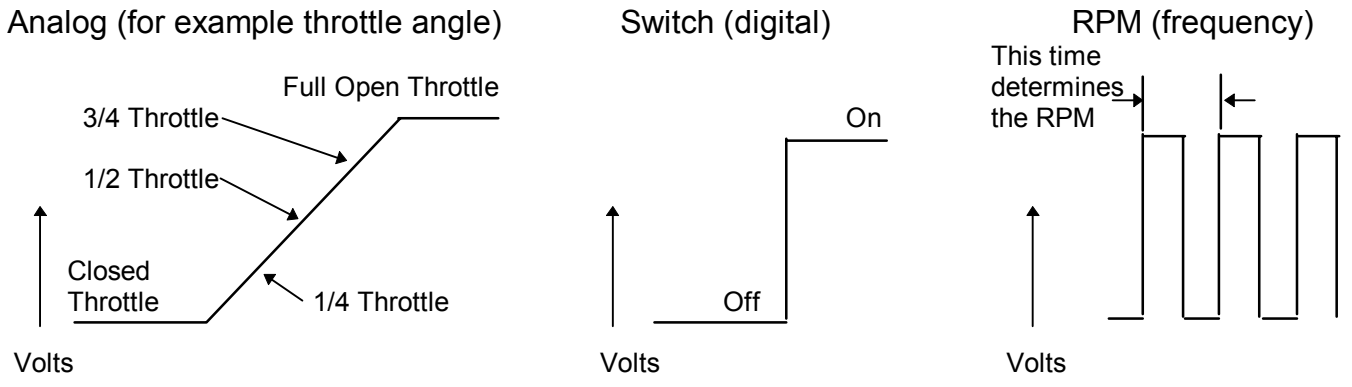
Overwriting an Entire Folder (several files)



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



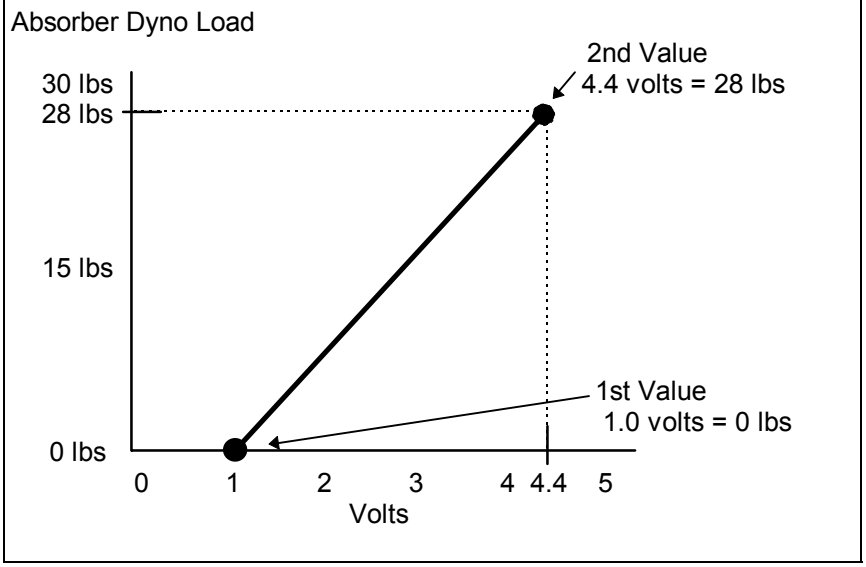
Switch Sensors and RPM Sensors do not require much calibration. Tell the program if either high or low voltage is opened or closed, or On or Off and the switch channel is calibrated. Just tell the program how many pulses you get on 1 revolution of a shaft, and the RPM channels are calibrated. These 2 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.

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.

Figure A5.2 Illustration of a Analog Sensor Calibration

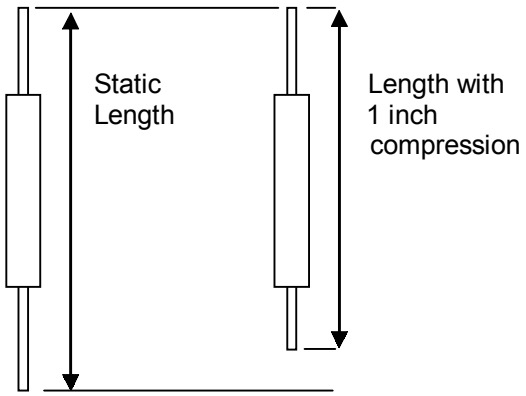


Example of Calibrating a Shock Travel Sensor

A Shock Travel Sensor was described in Section 2.9. It is a variable resistor that measures suspension travel, and must be calibrated so that the voltage output means something "real" like inches of travel. 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.

Usually one input is very easy, like zero travel, or the static length of the sensor with the vehicle at static ride height. The second combination can be more complicated. You must put a known travel on the sensor. The best way to do this is to shorten or elongate the sensor, and measure the change in length with a tape measure.

Figure A5.3 Shock Sensor Calibration Points



Calibration Procedure

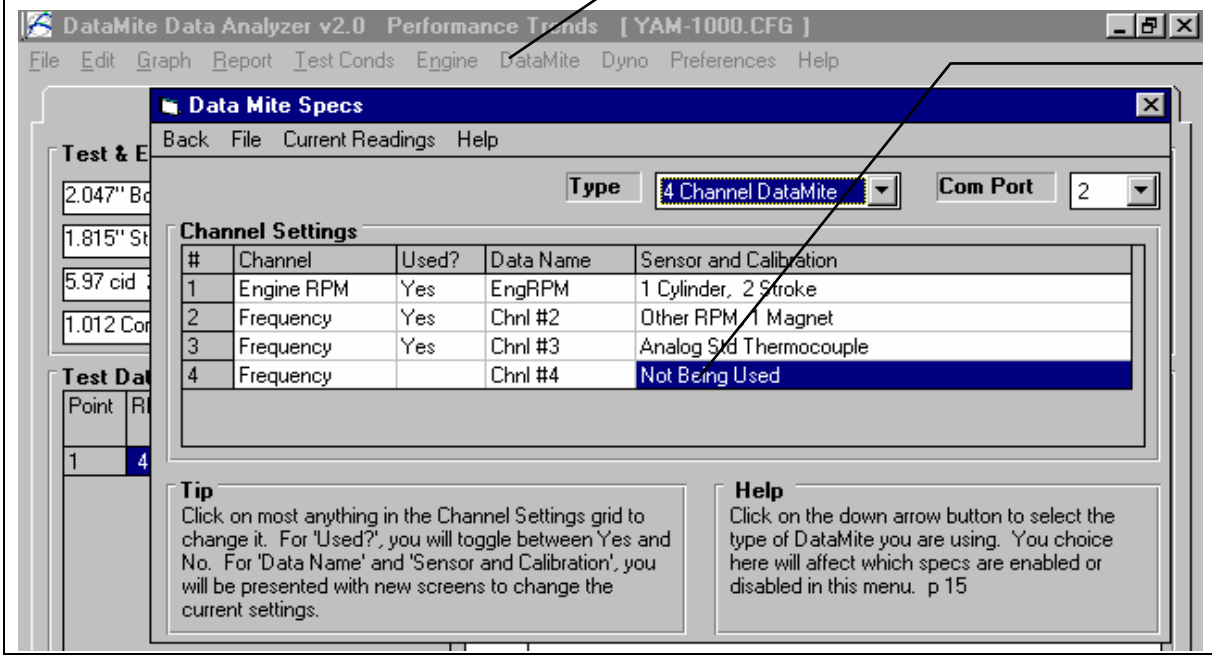
1) Turn on the DataMite to Read the Shock Sensor Channel

This procedure assumes you have installed the shock sensor following the instructions with the sensor for wiring and mechanical hookup. Turn on the DataMite or DataMite II 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 Rt Rear Shock 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, engineering units 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 shock travel. It will store this reading as the 1st Value, Freq (hz) where you can see it.

4) Obtain an "Upscale" Reading

Figure A5.6 Calibration Menu for Torque Sensor Using Analog Converter

"A" Choose Analog Converter as Sensor and Dyno Tq as Sensor Type. Type in some Data Name like RR Shock.

"B" Type in 0 for the 1st Value and click on Read button for program to read sensor at 0 shock travel (static shock length).

"C" Type in upscale travel for the 2nd Value (like 1" compression) and click on Read button for program to read sensor at the upscale torque.

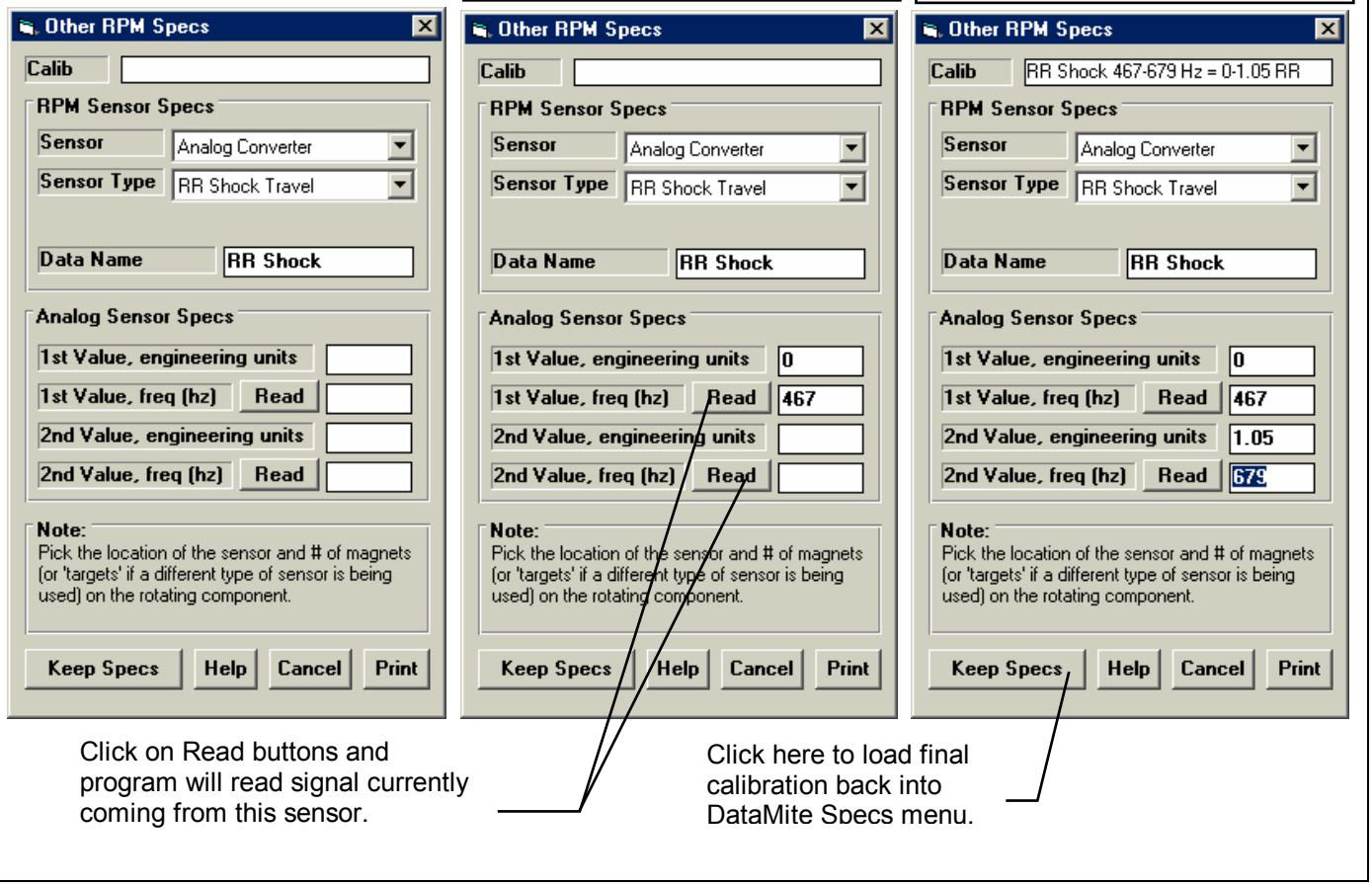


Figure out ***EXACTLY*** the shock travel that produced 2nd Value and type in into the appropriate spot in the calibration screen, perhaps 1.05 inch exactly.

Then click on the Read button for 2nd Value, Freq (hz) and the program will read the signal from the sensor with 1.05 inch of travel. It will store this reading as the 2nd Value, Freq (hz) where you can see it.

Notes:

- In the case of shock travel, where static length is 0, you could decide that 1 inch of compression (shorter) is a positive number, or 1 inch of elongation is positive. The choice is yours and you simply must remember which it is when you read your recorded data. However, if you send data to either Suspension Analyzer or the 4 Link Calculator, you must do it so compression (going shorter) is a positive number.
- In the case of shock travel data being sent to Suspension Analyzer, you calibrate for actual change in length of the shock sensor itself. If you send data to the 4 Link Calculator, you must calibrate for a certain amount of ***suspension travel***, not sensor travel. What this means is when you type in, for example 1 inch of travel like in the example above, it is for 1 inch of ***vehicle squat***, which may be only ¾ inch of sensor travel.
- In reference to point 2 above, even if you weren't sending data to the 4 Link Calculator, you may decide that vehicle squat is a better variable to calibrate to than sensor travel. The same is true for most any sensor. For example, you could calibrate a pressure sensor in units of Inches of Mercury instead of PSI, or throttle angle in Percent Closed instead of degrees of opening. It just depends on what you enter into the calibration screen as the Engineering Units for the 1st and 2nd points.

5) Save the Calibration

In Figure A5.6 "C" you will note the calibration shown at the top of:

RR Shock 467-679=0-1.05 RR Shock

This is the information the program will use to figure out how much shock travel 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.

Notes

Other sensors are calibrated much the same as a shock travel sensor. For example:

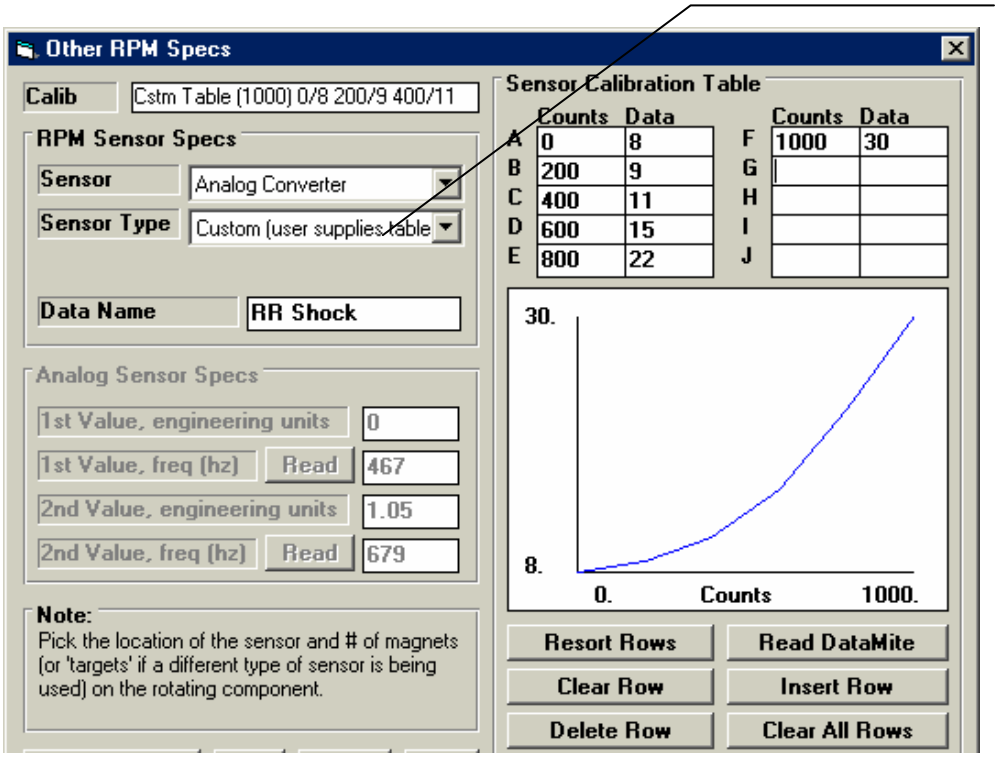
To calibrate a throttle position sensor: With the throttle closed, type in 0 and click on the Read button for the 1st Value. Then open the throttle fully, type in 90 degrees (or possibly 85 degrees would be more exact) and click on the Read button for the 2nd Value. Click on Keep Specs and you're done.

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 6" shock travel sensor with the static position at about half travel (3 inches), it should be at least .65 x 3" or at least 1.95".

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, and then it may be best to use the Sensor Type of "Custom, user supplies table".

Figure A5.7 Calibration Table for Non-Linear Sensors



Choose this Sensor Type for entering a calibration table.

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