DataMaster
Operating Manual
Windows 95, 98, NT4.0
Version 3.3.0
25-October-2000

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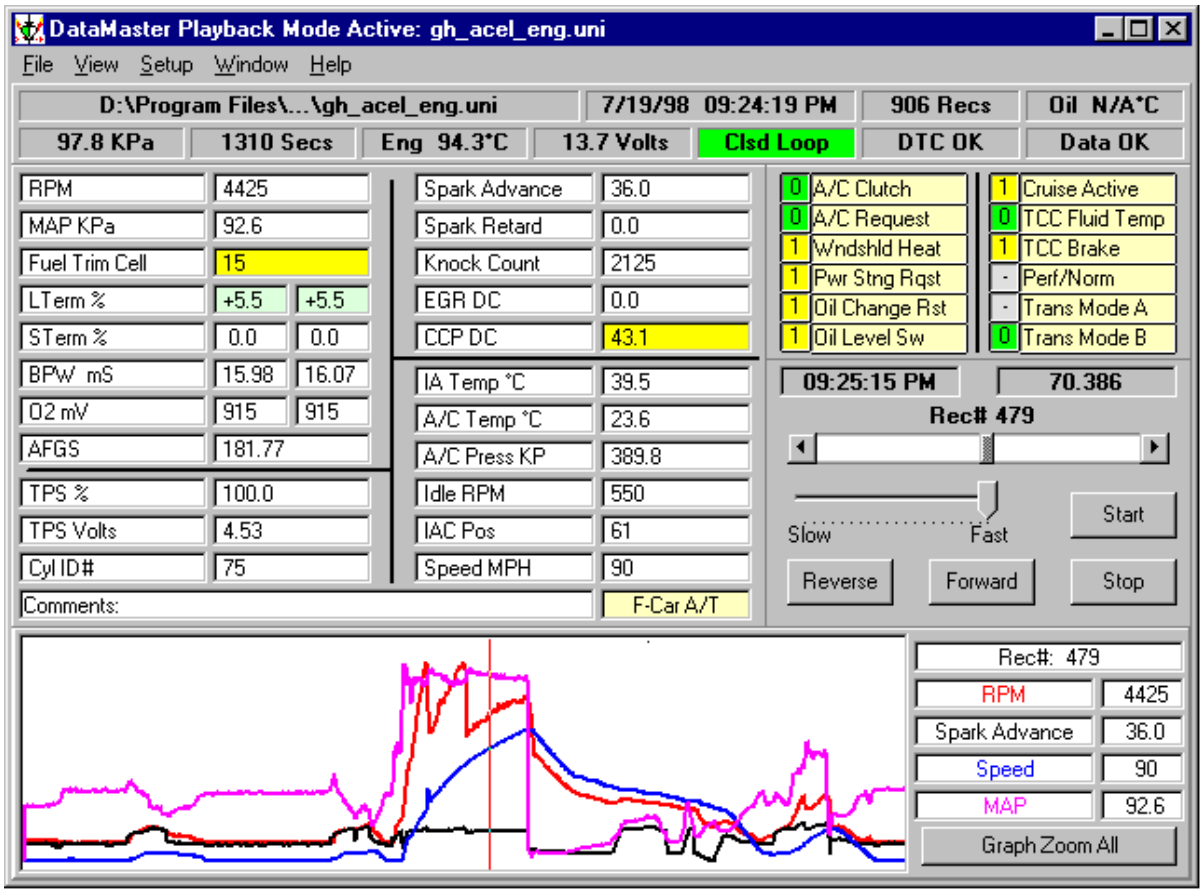
TABLE OF CONTENTS

Chapter 1: Introduction

General Information

DataMaster is a complete software application used to monitor and record engine and transmission data from 1990 to 1995 General Motors S-,C-,K-series trucks, and F & Y-body cars. DataMaster provides a highly graphical display of all engine parameters, and allows the user to quickly identify and zoom in on critical regions of operation. All engine operational parameters are displayed, including Diagnostic Trouble Codes ("DTC") and Binary Status Bit data. If supported by the particular vehicle, DataMaster will also record and display the transmission data stream, either separately or interleaved with the engine data to provide a comprehensive method of monitoring powertrain performance.



Datafiles

DataMaster data is organized as individual records in a file, where each record is a single "snapshot" of information from the Powertrain Control Module (PCM). Up to 16,000 records of data may be recorded per session, allowing almost 30 minutes of continuous recording at the maximum sample rate of 10 per second! TTS supplies the necessary signal adapter to connect the PC to the vehicle's PCM through the ALDL port without requiring any external power supply or batteries.

Playback

After data is captured, it can be played back immediately or transferred to another computer for playback by the DataMaster software. Each PCM has a unique data configuration, thus each version of DataMaster is tailored to a specific car/engine combination, and will not display files collected for a different PCM.

Minimum Computer Requirements

Operating System	Windows 95, 98 or NT v4.0 W/ SP3 or above
CPU	Pentium 90 or above recommended
Memory	Windows 95, 16 MB minimum; 32 MB recommended Windows 98 or NT4: 32 MB minimum, 64MB recommended
Display	SVGA 800 x 600 minimum; 768 x 1024 or above with good graphics performance recommended
Free Disk Storage	10 MB for initial DataMaster program installation 3 MB for each additional version installed

Documentation Supplied

DataMaster User Guide (Adobe PDF format).

NOTE: On-line help is available by selecting Help from the main menu bar from within the DataMaster program.

Installation of DataMaster Software

DataMaster software is supplied on CD-ROM or several 1.44 MB floppy disks depending on the version. Follow these steps for a successful installation:

Insert diskette #1, and from Explorer (or My Computer) double-click on INSTALL.EXE. This will invoke the installation program which will prompt you through the install process. You may select either the default destination drive and directory or specify any other drive and directory structure you wish. If you specify your own directory, note that each version of DataMaster must be installed to a unique directory name to prevent interference between the programs.

The install program will copy all necessary files to the specified directory.

Several test runs are also copied to the \TESTDATA subdirectory so you can immediately start familiarizing yourself with the DataMaster program. A DataMaster program group is created, and the DataMaster icons will appear there. A shortcut icon will also be placed on the desktop.

Removal of DataMaster Software

The DataMaster software may be removed by running the "Add/Remove Programs" program (found under Start—Settings—Control Panel). Select from the list the program that you want removed and click on the Add/Remove button.

CAUTION: Make sure you select the intended program for removal, there is no undo for this command!

Updates to DataMaster Software

When updating an earlier version of DataMaster software, the old version should first be removed following the above instructions *UNLESS THE UPDATE INSTRUCTIONS TELL YOU OTHERWISE*!

Installation of Multiple Versions of DataMaster Software

There are currently several versions of the DataMaster software available to support various GM vehicles as follows:

Program Version	Vehicles Supported
DM32x85	91-93 trucks with 4L80E or Manual Trans.
DM32xE6	93 trucks with 4L60E or Manual Trans.
DM32x0D	94-95 trucks with 4L60E or Manual Trans.
DM32x31	94-95 trucks with 4L80E or Manual Trans.
DM32x8D	90-92 F-Car, 90-91 Y-Car
DM32xDA	93 F-Car, 92-93 Y-Car (LT1)
DM32xEE	94-95 F-Car, 94-95 Y-Car, 94-95 B-Car (LT1)
DM32xZ1	90-92 Y-Car ZR1 (LT5)
DM32xZ2	93-95 Y-Car ZR1 (LT5)
DM32xTT	91-93 Syclone and Typhoon 4.3 V6-Turbo

Any number of these versions may be installed on the same PC at one time. Each version will keep track of its individual setup parameters independently of the others. Refer to Appendix D for additional information on which vehicle models are supported for each version.

Note that each version of DataMaster must be installed to a unique directory to prevent interference between the programs.

Chapter 2: Getting Started

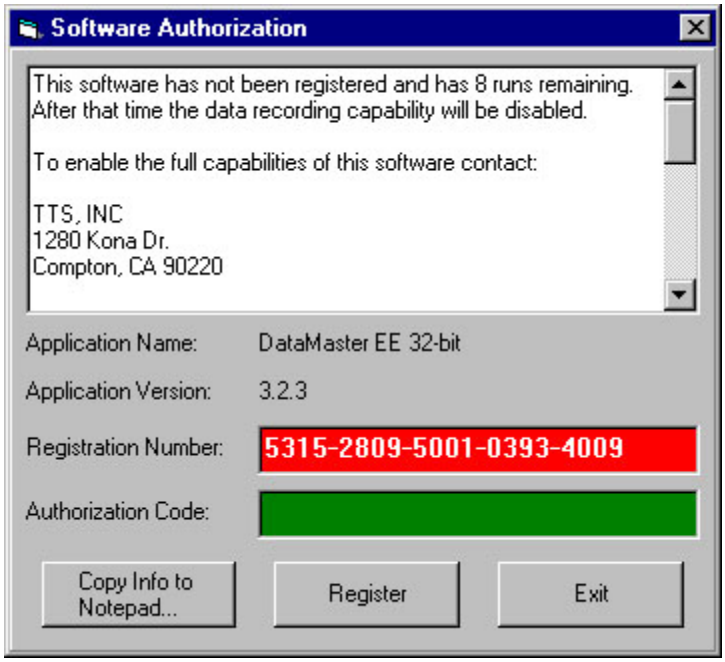
Launching and Configuring DataMaster

DataMaster is invoked from Windows by double clicking on the DataMaster icon on the desktop, or by selection from the Start—Programs—DataMaster menu. This will bring up the main display.

PLEASE NOTE: The first time DataMaster is run, the position and sizing of the forms are set to their default values and are located in the upper left of the display screen. The forms may be re-sized and moved to the positions that best suit your needs and monitor size. DataMaster will remember the last size and position of all forms and return to them the next time the program is started.

Authorizing the DataMaster Program

The DataMaster program as initially installed operates in demonstration mode. Demonstration mode allows the user full capability to playback all datafiles, but limits the ability to record new data to 20 total uses. Whenever the File—Record ALDL menu item is selected, the user will be prompted with a reminder of the remaining trial period and a choice is given to return to playback mode or continue and record data. If the user selects Return to Playback, no usage is subtracted from the trial period.



In order to fully authorize DataMaster, select the Setup—Authorization Code menu item and a dialog will be presented prompting the user with instructions. You will need to contact TTS and supply the application name, the application version, and the registration number. TTS will return the authorization code which must be entered in the authorization form. Press the Register button to complete the registration process. The registration number and authorization code is unique for every installation on every PC, and will not transfer between machines.

If you need to transfer the license to a different machine, contact TTS for further instructions. Note that reinstalling the software will not reset an expired trial period!

All the required registration information can be automatically copied to a Notepad text file by pressing the “Copy Info to Notepad” command button. You may then use the cut and paste functions in Notepad to copy the information and EMAIL to TTS or, print the page and fax it to TTS.

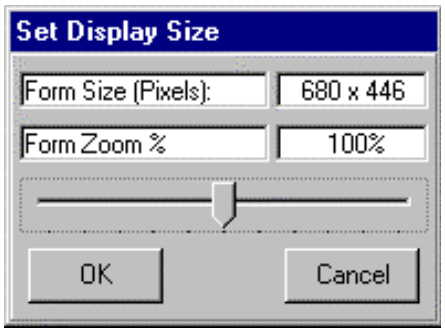
Configuring the DataMaster Program

The DataMaster program requires no configuration by the user. However, the user may wish to configure some of the following options as a convenience.

Re-sizing the Screen

Depending on your monitor and/or screen resolution, you may wish to expand or shrink the size of the main program display. To re-size the main form, complete the following steps:

Select “Setup Screen Size...” from the Setup menu located at the top of the PCM Display module and a dialog box will be presented which allows re-sizing the main form from 50% to 150 % of the nominal 800 x 600 pixel size.



To re-size, drag the scroll bar (pointer) from left to right, and press OK when the desired Zoom value is reached.
The screen may be re-sized at any time, and the new size will be recalled automatically the next time the program is launched. This feature is especially useful when running on lower-resolution laptop computers.

Setting the Default Path to the Datafiles

This function has been eliminated for the version 3.2.5 and later software. DataMaster will now track the directory which was last used, and always return to that point. This is individually tracked for Playback, Record and Export files

Selecting the Printer and Page Size/Orientation

To select which printer to print or plot to follow the steps shown below.

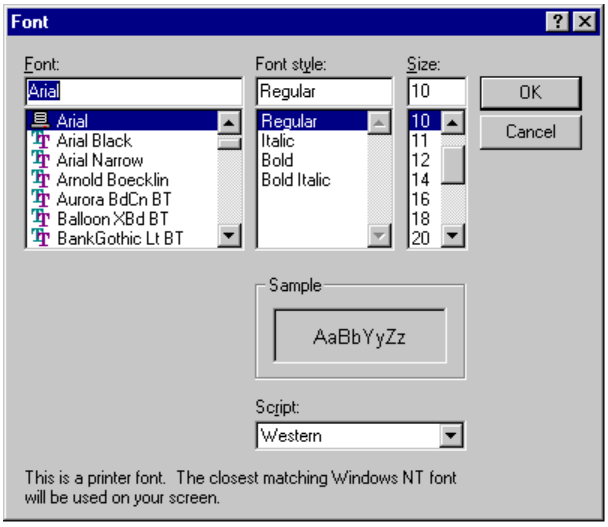
Select the File—Print Setup menu selection. This will display the standard Windows printer selection dialog box. At this point, you will be able to select and setup whichever printers you have installed on your system, adjust the page orientation (portrait or landscape), and select a paper size and/or source.

NOTE: If no windows printer is installed, this option will not be available.

Configuring the printer fonts

To select what fonts you want to appear on your printout:

Fonts can be selected from the Print Record dialog box only after a file has been loaded. Select the Fonts button and the standard Windows printer fonts dialog box will appear. This will display the standard windows printer fonts dialog box. The default font is 10 point Ariel which works well for most printouts



PLEASE NOTE: Selecting a font that is too large to print a record on a sheet may result in erratic printing. If this occurs, try using the Courier 8- or 10-point font as this will give very consistent results.

Setting the Measurement Units

DataMaster may be configured to display in any combination of English or Metric units. These are configured under the Setup—Display Units Menu. Note that the MAP sensor setting allows selecting either the OEM calibration, or an alternate 3-bar calibration for used with some aftermarket super- or turbocharged applications such as the GMC Syclone or Typhoon.

Selecting the Vehicle Type

Most DataMaster versions support several vehicle types that have small differences in the data collected. A vehicle type is automatically selected when a file is loaded based on information recorded in the datafile. To setup the vehicle type, use the Setup—Vehicle type menu and make a choice from the options given. The vehicle type can be changed at any time, but it may take several seconds for the data to be reformatted and plotted on screen. Some items previously selected may not be available for the new vehicle type, and will appear as "N/A". Selecting the correct vehicle type is critical when recording data so that the correct vehicle identification is stored in the file.

Selecting Graph and Print Colors

Graph and print colors are selected from the Setup—Graph Colors and Setup—Print Colors menus. This will bring up a standard windows dialog box allowing selection of any color the PC supports.

Turning ToolTips On/Off

As the mouse cursor is moved over various parts of the screen, a "ToolTip" is generated giving information about the control or label. This feature may be turned on or off via the Setup—Preferences—ToolTips menu item.

Turning the BEEP On/Off

When a file record has a DTC error, this is signaled immediately by turning the DTC label red and sounding a "Beep". If the DTC is present in all records, this can be very annoying so this feature may be turned off via the Setup—Preferences—Beep on DTC menu item.

Running the DataMaster Program

Loading a File

After launching DataMaster, a datafile must be loaded before any playback features of the program can be used.

From the “File” menu at the top of the PCM Display module, select “Playback Data File...” and a File Dialog box will be presented.

Navigate the directory structure to the location where you installed the DataMaster program, and go to the \TESTDATA subdirectory. You will find several data files here, each with a .uni file extension. Select any file by double-clicking on the file name or typing the name in the box and selecting “OK”. This will read the file into DataMaster and display the first record.

The last 4 files that have been accessed are remembered by DataMaster and are displayed on the bottom of the “File” menu. Double-clicking on one of these entries will immediately load that file into DataMaster.

Note on Datafile Size

When data is collected from the PCM, it is stored as a series of records. Each record contains a complete “snapshot” of exactly what the PCM was doing at that instant in time and is 128 bytes in length. Up to approximately 10 records per second may be collected by DataMaster; the exact rate depends on the particular PCM and the computer being used to collect the data. DataMaster allows loading a file containing up to 16,000 records of information. If collected at the maximum rate of 10 per second, this is roughly 27 minutes of continuous data! Note that the maximum 16,000 record file will require approximately 2 MB of disk storage. There is no limit to the size of the datafile that can be collected (until HDD capacity is reached), however only the first 16,000 records will be displayed on playback.

Note that when a large datafile is loaded, it may take significant time to plot the records on the display. This will be dependent on the PC speed, so find what works best for your application. Typically, 1000 to 4000 records will provide reasonable playback performance.

Reading DIACOM files:

Diacom .GDF files can now be played back with DataMaster. From the “File” menu at the top of the PCM Display module, select “Playback Diacom File...” and a File Dialog box will be presented. Note that Diacom files do not utilize any time stamping of the PCM data, so this information is calculated by DataMaster when the file is loaded. For this reason, time related calculations (speed to distance and quarter-mile) will not be as accurate as DataMaster recorded files.

Chapter 3: Using The DataMaster Program

This chapter will introduce you to the various features of the DataMaster program. First, the various methods of moving through the datafile are presented, followed by a description of the top-level displays. This includes the status bar display, the main data display, the graphing display and the status bit display.

If your particular PCM supports transmission data, a separate data screen can be activated to display Transmission information, but only if the datafile contains transmission data records. The use of the Transmission display is very similar to the Main engine display, but a few options are no longer available, including the Histogram Display and the Speed to Distance estimator.

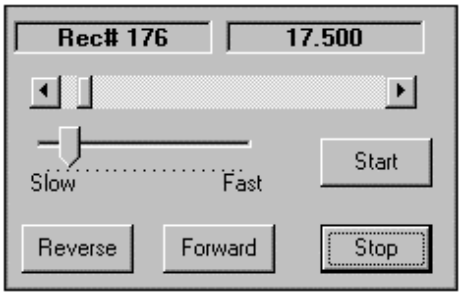
Moving Through the Datafile

There are several ways of moving through the data records as detailed below.

Using the Record Scroll Bar Control

In the right-hand center of the screen there are several controls that allow the user to scroll through the datafile.

By clicking on the scroll bar, the user can either step through the records 1 at a time (small increment) or 10 at a time (large increment). The user can also drag the button with the mouse and drop it along its length to move anywhere in the datafile. The current record is indicated in the box just above the scroll bar. Also indicated is the PC Time (upper left) and the Record Timestamp (upper right).



Autoplayback

Adjacent to the record scroll bar are several buttons that control Autoplayback of the file. By utilizing the Forward, Reverse Start and Stop buttons, the user can watch for anomalous conditions as the file is played back. The speed of the Autoplayback is controlled by the Slow..Fast scroll bar.

Left-mouse Click on the Graph Display

The user can also move to an area of interest by clicking the left mouse button when the cursor is in the graph display. The current record will move to the location under the cursor. The user can then "home in" on the area using the Record Scroll bar control.

Zooming in on an Interesting Area of the Graph

A very powerful tool is the “Zoom Box” which magnifies an area of interest in the graph. This can be done by drawing a “Zoom Box” on the graph display while holding down the Right Mouse Button. When the button is released, the display will zoom in to the area you drew. You can continue to zoom in until the maximum magnification is reached, which graphs only 10 records. To zoom back out, the Graph Zoom All button must be pressed.

Understanding the Status Bar Display

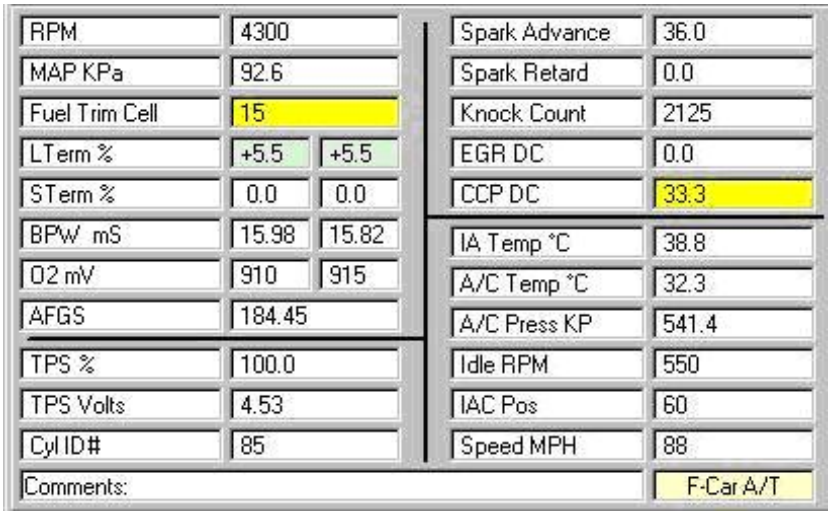
The status display at the top of the form shows information about the current file and other slowly changing PCM information. It also shows some key status indicators; Open Loop, DTC Errors, and DataOK. Below is a field listing outlining in detail each of the fields.

Filename	This shows the current file that is loaded into DataMaster. The display is truncated to 40 characters in length, so the complete path may not show in this box. A filepath-name combination may be up to 255 characters in length.
Date/Time	Shows the date and time of the current file. This will be the time at which the first data was written to disk
Recs	The Record Count display shows the total number of records in the current file. The maximum playback file size is limited to 16,000 records. If a larger file is loaded, DataMaster will only display the first 16,000 records.
Oil	Shows the Engine Oil Temperature. Will display N/A if not supported.
Baro KPa	This indicates the PCM's computed atmospheric pressure in KPA. Unless you are at high altitudes, this will be close to 100 KPA. **A few vehicles do not support BARO readout, in this case the display will read "N/A" or will not appear in the status bar at all.**
Secs	This shows the number of seconds elapsed since the engine was last started.
Eng	Shows the current engine coolant temperature.
Volts	Shows the ignition (battery) voltage. Very informative to watch during engine cranking!
Open/Closed Loop	This display indicates if the PCM is operating in open loop of closed loop mode. When the PCM is open loop, the display will be Yellow; when in closed loop this display will be Green.
DTC OK	This display shows if there is a Diagnostic Trouble Code set. Will turn red on any record that contains a DTC, instantly flagging a DTC error. Click on this box to bring up the error code display
Data OK	The Data OK display shows if the data record contains any data errors (checksum error). If this turns red, that particular record is bad and should not be trusted. This can occasionally occur during data collection if there is noise on the ALDL (Assembly Line Diagnostic Link) data link, or if a data transmission is interrupted. Also, if a datafile from a different PCM type is loaded, this display will immediately show the data mismatch.

Understanding the Main Data Display

This section will explain each of the display items in the main display form as shown in the example on the following page.

PLEASE NOTE: The main display is divided into several groupings, the contents of which depend on the specific program version.



In general, the groupings fall into the following areas:

- Engine Learning & Operation
- Throttle and Idle Control
- Fuel Metering
- Spark Control
- Miscellaneous

Use the field listing below to become familiarized with each grouping.

Note that several fields in the above example are divided into left and right columns. In these cases, there are two sensors or values for this data, for the Left and Right sides of the engine.

Engine Learning & Operation Group

RPM	This displays the current engine RPM. Note that sometimes during initial engine starting this value will be shown as extremely high as the PCM attempts to sync-up with the engine.
MAP	Manifold Absolute Pressure (MAP). Indicates the pressure measured in the intake manifold. **Note on Absolute pressure readings**: An absolute pressure of "0 KPA" indicates a perfect vacuum, while a reading of "100 KPA" is approximately atmospheric pressure. A typical reading for an engine is 35-40 KPA during idle, and 90-100 KPA under full throttle.
Long Term, LT (BLM)	Formally called the Block Learn Mode (BLM), this is the long-term fuel correction factor that the PCM is using. This is displayed in percent deviation from the nominal value of 128 counts. Negative values indicate that the AFR is rich, and if this exceeds 2% the display will turn red. Conversely, positive values indicate the AFR is lean, and if this exceeds 2% the display will turn green.
Short Term, ST (Integrator)	Formally called the Integrator, this is the short-term fuel correction factor that the PCM is using. This is displayed in percent deviation from the nominal value of 128 counts. Negative values indicate that the AFR is rich, and if this exceeds 2% the display will turn red. Conversely, positive values indicate the AFR is lean, and if this exceeds 2% the display will turn green.

Fuel Trim Cell	Formally called the BLM Cell, this shows the current Fuel Trim cell that the PCM is operating out of. The PCM typically has 16-20 distinct operating regions that are each assigned a unique Fuel Trim cell number. Each of these cells has a stored Long-Term correction factor that corrects for each engine's unique operating conditions.
AFGS	Mass airflow. This value is measured by the mass airflow meter and is a good representation of the power output of the engine.

Throttle and Idle Control Group

Idle Target (RPM)	Not used by all PCM's. This shows the RPM that the PCM is attempting to reach during idle conditions.
IAC Position	This is the actual counts (0 to 255) for the Idle Air Control Valve position. This valve controls the idle speed and air density during throttle overrun conditions.
TPS %	Shows the percent throttle opening. This is calculated by the PCM and will be a value 0 to 100%
TPS Volts	This shows the voltage measured from the Throttle Position Sensor. Will generally range from 0.5 Volts (throttle closed) to 4.5 Volts (throttle fully open).

Fuel Metering Group

INJ BPW	This is the fuel injector Base Pulse Width measured in Milliseconds.
INJ DC (Calc) ***New with version 3.3.0***	This is the calculated Injector Duty cycle based on the current BPW and Engine RPM and EFI mode (Batch fire or Sequential). This is useful for determining if the injectors are sized correctly.
O^2 Volts	This is the measured voltage (in Millivolts) generated by the O2 (Oxygen) sensor. Will typically range from 100 mV (lean) to 800 mV(rich).
O^2 Xcounts (Cross Counts)	This is a cumulative count of the number of times the O2 sensor voltage has crossed back and forth from high to low voltage. Will typically count from 0 to 255, then start over again from 0. Note: When plotted, it is not always apparent the O2 voltage is varying, even though the Crosscounts are increasing. This seems to be due to minute variations that may not show on the plot being counted as a crosscount!
Target AFR (Air-Fuel Ratio)	Target AFR is output only by only a few unique PCM's, and indicates the Air/Fuel ratio that the PCM is trying to control to. Generally, this is only different from 14.7 during warm-up, full throttle operation, and highway economizer mode.

Spark Control Group

Spark Retard	This indicates how many degrees spark retard the PCM has calculated is required. Spark retard is typically caused by the Knock Sensor detecting a knock condition and is generally between 0 and 10 degrees.
Spark Advance	This indicates how many degrees spark advance the PCM has calculated is required.
Knock Count	This is a cumulative count of the number of knocks that have been detected. Will count from 0 to 16,335 (or higher), then start over again from 0.

Miscellaneous Group

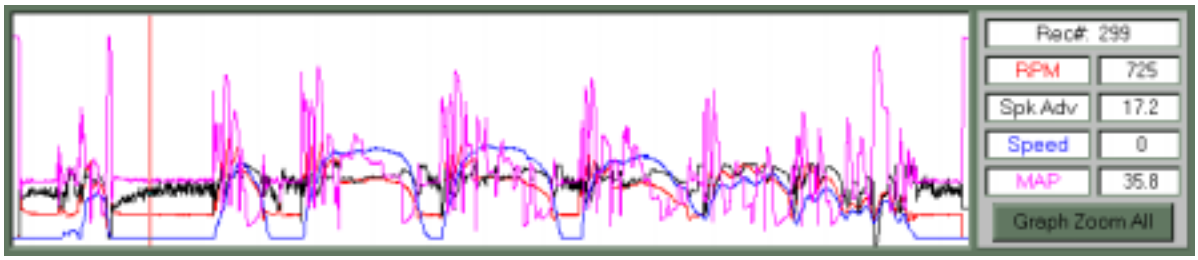
EGR DC (Exhaust Gas Re-circulation Duty Cycle)	This value reports the percent opening of the EGR valve that the PCM is requesting, and will be a value from 0 to 99%.
CCP DC (Charcoal Canister Purge Duty Cycle)	This value reports the percent opening of the CCP valve that the PCM is requesting, and will be a value from 0 to 99%.
Speed	This is the current speed of the vehicle.
IA Temp (Manifold Air Temperature)	This reports the measured temperature of the air entering the intake manifold. Not all vehicles use this sensor, and will show a value of -40°C in this case. The value will range from -40°C to +151°C.
Active Gear	This is the current gear that is activated within the automatic transmission. Shows "N/A" for manual transmission applications.
Selected Gear	This is the current automatic transmission gear that is selected by the gearshift lever. Shows "N/A" for manual transmission applications.
Cylinder ID #	Identifies which cylinder is being monitored at the time this data record was recorded.
A/C Temp	The temperature measured at the air conditioning evaporator coil.
A/C Press	The air conditioning system high-side pressure.

Using the Graph and SnapShot Display

The graph at the bottom left of the display is a powerful way to quickly zoom into an area of interest in the datafile.

Vertical Graph Scaling

The items that are plotted are all scaled to fit within the fully zoomed-out vertical axis. There are no units or conversion factors that can be easily applied to the plot itself. What the plot clearly shows is what signals are trending and how they are related, not their absolute value!



The exact values at any point are shown either by the SnapShot display to the right, or the Main display above. For accurately scaled presentation plots, the files may be exported to a spreadsheet program (such as Excel) and plotted from there.

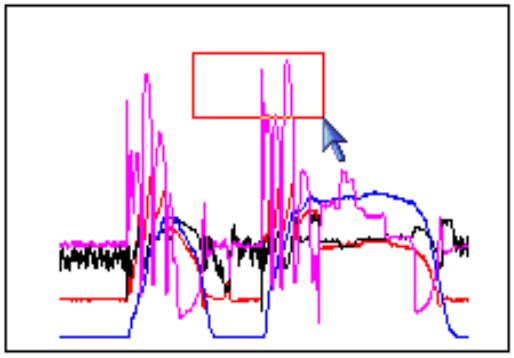
Moving to a Specified Record in the Graph

As mentioned earlier, there are two ways to move around the datafile using the graph: The Left mouse click in the display area, and by holding the Right mouse button and drawing a Zoom Box around the area of interest.

Left-Mouse Click on the Graph Display

The user can move to an area of interest by clicking the left mouse button when the cursor is in the graph display area. The current record will move to the location under the cursor. The user can then hone in on the area using the Record Scrollbar control.

Zooming in on an Interesting Area of the Graph



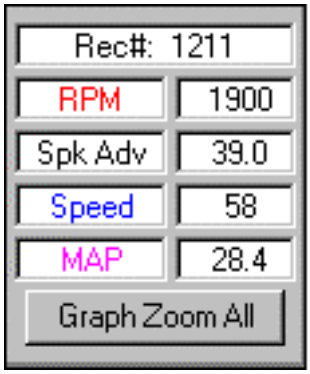
A very powerful tool is the “Zoom Box” which magnifies an area of interest in the graph. This can be done by drawing a “Zoom Box” on the graph display while holding down the Right Mouse Button. Doing so draws a “red” box around your selection as shown in the illustration here.

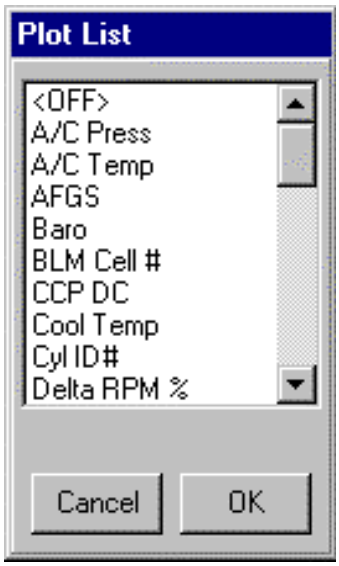
When the button is released, the display will zoom in to the area you drew. You can continue to zoom in until the maximum magnification is reached, which graphs only 10 records. To Zoom back out, the Graph Zoom All button must be pressed.

The SnapShot Display

The Graph SnapShot Display is located directly to the right of the graph display, and shows the color code and name of the 4 items selected for graphing.

As the cursor is moved through the display, these values rapidly change, indicating the exact value for those items anywhere in the display.



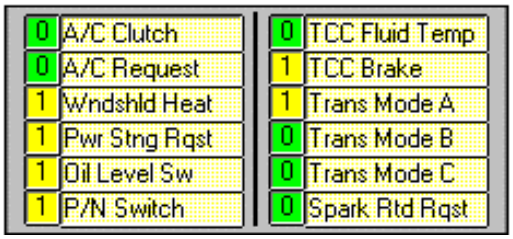


Changing the Graph Assignments

When DataMaster is first installed, a default set of items is loaded into the graph for plotting. These are easily changed by double-clicking on the Item Name in the SnapShot display. This will bring up a Plot List dialog box from which you can select what item you want plotted.

If you want nothing plotted, select the <OFF> item at the top of the list. Press the “OK or “Cancel” buttons to return to the main program. Alternately, double click on a selection to add it to the graph. The selections you make will be remembered the next time you invoke DataMaster.

Using the Status Bit Display



The status bit display is located on the upper right of the Main display, and shows up to 12 individual status bit values. A small indicator to the left of each bit description shows a Yellow “1” or a Green “0” to indicate its value.

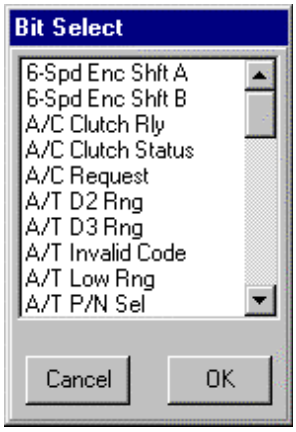
In general values of "1" indicate that a function is activated, but this is not always the case. Always check the bit descriptions if you’re not sure.

Obtaining Bit Descriptions

To find out what the function of a bit is Double-click on the value indicator. A dialog box will appear with information pertaining to that bit. You must click on the “OK” button to continue.

Changing Bit Assignments

When DataMaster is first installed, a set of default items is loaded into the Status Bit display. These items are easily changed by double-clicking on the yellow Bit Item Name. This will bring up a Bit Select dialog box from which you can select what status bits you want displayed.

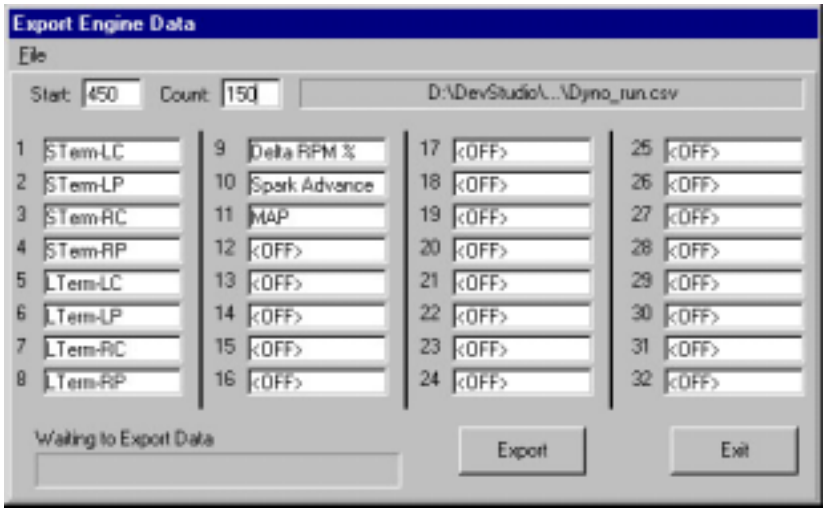


Press the “OK or “Cancel” buttons, or double-click the item to return to the main program with the selection. The selections you make will be remembered the next time you invoke DataMaster.

Note that for some versions of DataMaster, as one changes the vehicle type selection some of the bit items are not available. This is due to differences in the ALDL data of the vehicles involved. When this occurs, these assignments are automatically removed from the bit display. They must be manually added back in for the new vehicle type.

Exporting Data to a Spreadsheet

After a datafile has been loaded, the user can export any range of records to a "Comma Separated Value" (CSV) file. Most popular spreadsheets can directly import a CSV file, where the user can then manipulate the data and calculate and/or plot information of interest.



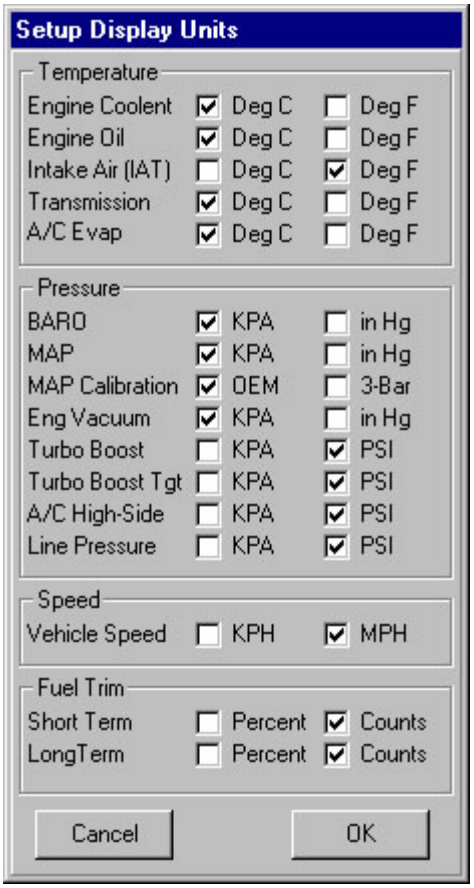
To export data, select File—Export Data from either the Main or Transmission data displays. A form will be presented which allows the user to select up to 32 data items to export. Items are selected by clicking on the "Column" entry, which will bring up a item selection box. Scroll to the data item of interest and press "OK" to add this to the export list.

Continue through the column assignments until all the items of interest are selected. Any column marked "<OFF>" is skipped and will not be exported.

Select a file name using the "File" menu, and enter the starting record number (Start) and the total number of records (Count) to export. Press the Export button to complete the process and generate the file. When you are finished and exit the data export form, you will be prompted to save the item selections you made. Selecting Yes will store the current selection list which will be automatically recalled the next time the Export function is selected.

Setting the Display Units

DataMaster may be configured to display in any combination of English or Metric units. These are configured under the Setup—Display Units Menu. After a selection is made, click on the "OK button to save the settings and return to the DataMaster display. The settings you made will immediately be shown on the screen, and will be remembered for future DataMaster sessions.



Note that there are some unit selections that may not apply to the specific vehicle being monitored. Changes made to these unused items will be ignored.

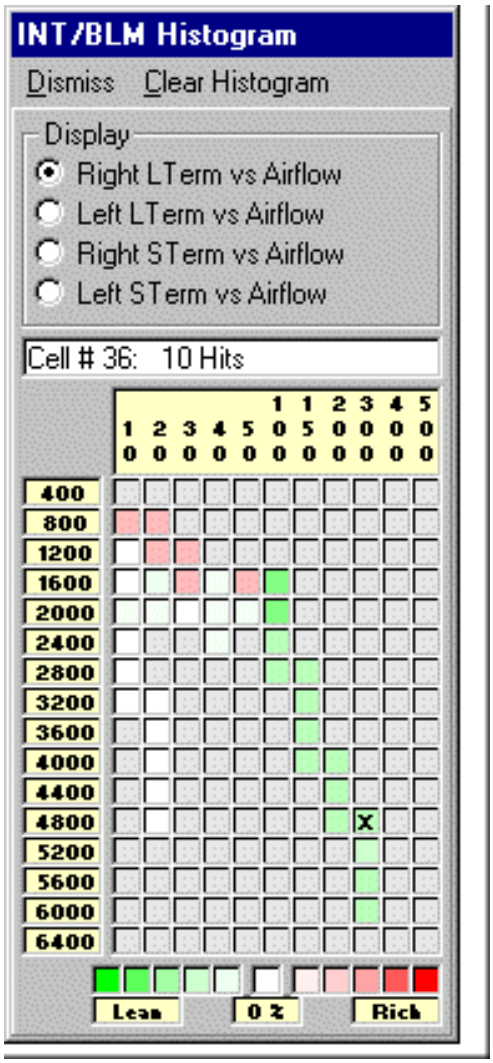
Also note that the MAP sensor setting allows selecting either the OEM calibration, or an alternate 3-bar calibration for used with some aftermarket super- or turbocharged applications such as the GMC Syclone or Typhoon that use a special 3-bar MAP sensor. Again, this is not implemented for most vehicles and in those cases the setting will be ignored.

Chapter 4: The View Menu Items

The View menu was developed to allow viewing more data than can be easily shown on the main screen, thus providing a powerful set of extensions to the main display. There are four additional types of data which can be displayed by activating the View Menu items: The INT/BLM Histogram, the DTC Codes, the Bit Data and the Custom Data displays. Each of these features will bring up a "floating" display that can be positioned anywhere on the computer screen, and dismissed when no longer needed.

The Histogram Display

The Histogram displays tracks the short or long term learning history of the PCM. This can be very useful in determining mixture trends and how the PCM is compensating during a test run history of the PCM. There are two basic forms of this display, depending on the PCM type that you purchased DataMaster for. Engines that do not use air mass flow meters use MAP (Manifold Absolute Pressure) verses engine RPM to determine the engine load operating point. Engines with air mass flow meters use air mass flow (AFGS, Air Flow Grams/Second) verses engine RPM to determine the engine load operating point.



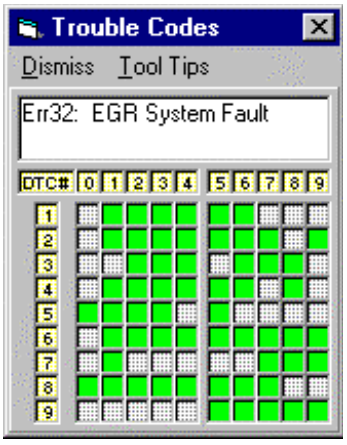
The Histogram display displays a color-coded record of the BLM or Integrator value verses MAP and RPM as a datafile is stepped through. Note that the display shows the cumulative value since the program was started. To observe the change for only a portion of the test, first position the record at the desired start (or end) point, select the "Clear Histogram", and scroll through the region of interest. The square indicated by the "X" indicated the current operating point, and this will move around as the engine load changes.

At any time the user can switch between the ST Vs MAP or the LT Vs MAP modes and observe the differences.

The color code is indicated along the bottom of the display and extends from a value of <117 (dark red), through 128 (white) and on to >139 (bright green). In general, the values lower than 128 indicates that the mixture is rich, and the PCM is compensating by generating a negative correction factor. Conversely, values greater than 128 indicate a lean mixture, and the PCM is generating a positive correction factor. The ideal operation point is between 126 to 129 for part throttle operation.

NOTE that ST and LT correction is generally disabled until the PCM enters closed loop mode. During this time, their values are generally locked at 128.

The DTC Code Display

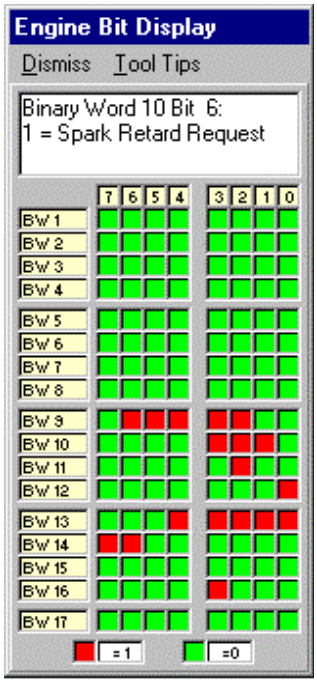


The Diagnostic Trouble Code display can be activated and quickly shows the status of all DTC codes for the record that is being displayed. The cells are arranged in a matrix, and DTC numbers are determined by the ROW, COLUMN location. For instance, the 3rd row down and the 5th column will be DTC #35. If a code is set, it will be indicated by a RED square, otherwise they will be green (no code set) or gray (unused code).

Clicking on any square will display the DTC # and a short description of the error. The factory manuals must be consulted for detailed descriptions and troubleshooting for any codes that are set. When DTC errors are encountered, the main panel DTC error label turns red and a “Beep” is generated. The Beep can be turned on/off on the Setup Preferences menu.

The Binary Data Display

The Binary Data Display shows the value of all control and status bits in the PCM data stream. Many of these bits are proprietary and used by the PCM to indicated different modes of operation and program status; not all of them are defined. A value of “1” is indicated by a red square, and a value of “0” is green.



Clicking on a bit square will bring up information on that bit's function (if known). Clicking on the left-hand column name (Binary Word #) will bring up a description of the word for that row. The top columns are numbered from 7 to 0, indication the bit location on the data word (Bit 0 = Least Significant Bit).

Some of the bit descriptions are cryptic, the user is on their own here!

The Transmission Data Display

The transmission data option will be grayed out unless the file contains transmission data to display. Selecting this option will bring up an entire form very similar to the main engine display, but with different data items listed. This form is laid out to act the same as the main display, however not all options are available. The transmission display is documented in the Using the Transmission Display chapter.

The Speed-Distance Calculator

The Speed-Distance calculator estimates the distance traveled between any two points during a data run by integrating the speed and high-resolution time data. Also calculated is the average acceleration and elapsed time for the run. To use the calculator, first set the beginning record by entering the data directly into the text box, or by positioning the red cursor in the graph to the beginning record and pressing the Set Begin Record button. Next, set the ending record following the same process.

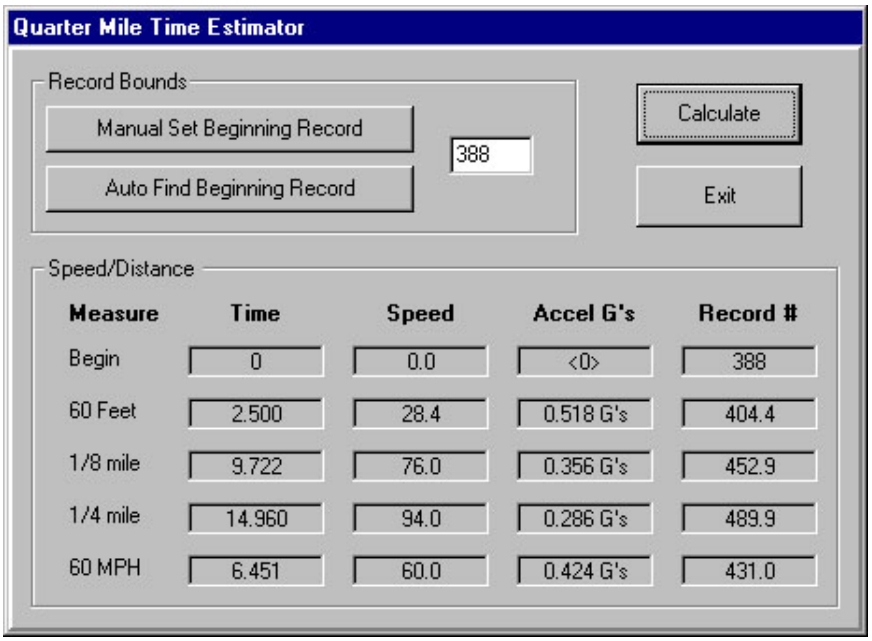
NOTE: The ending record must always be higher than the beginning record, else the program will automatically switch their order.

To calculate the distance and elapsed time, press the Calculate button. Be aware that excessive tire spin will result in a false speed reading, thus limiting the accuracy of this calculator. However, by carefully selecting your start and end records, a fairly good performance estimate can be made.

To calculate 1/4 mile times, set the begin record at the point where the acceleration run first started, then progressively move the end point until a calculated distance of approximately 1320 feet is obtained.

The Quarter-Mile Calculator

The Quarter-mile time estimator calculates the times to 60 feet, 1/8 and 1/4 mile during an acceleration run, as well as zero-to-60 times.

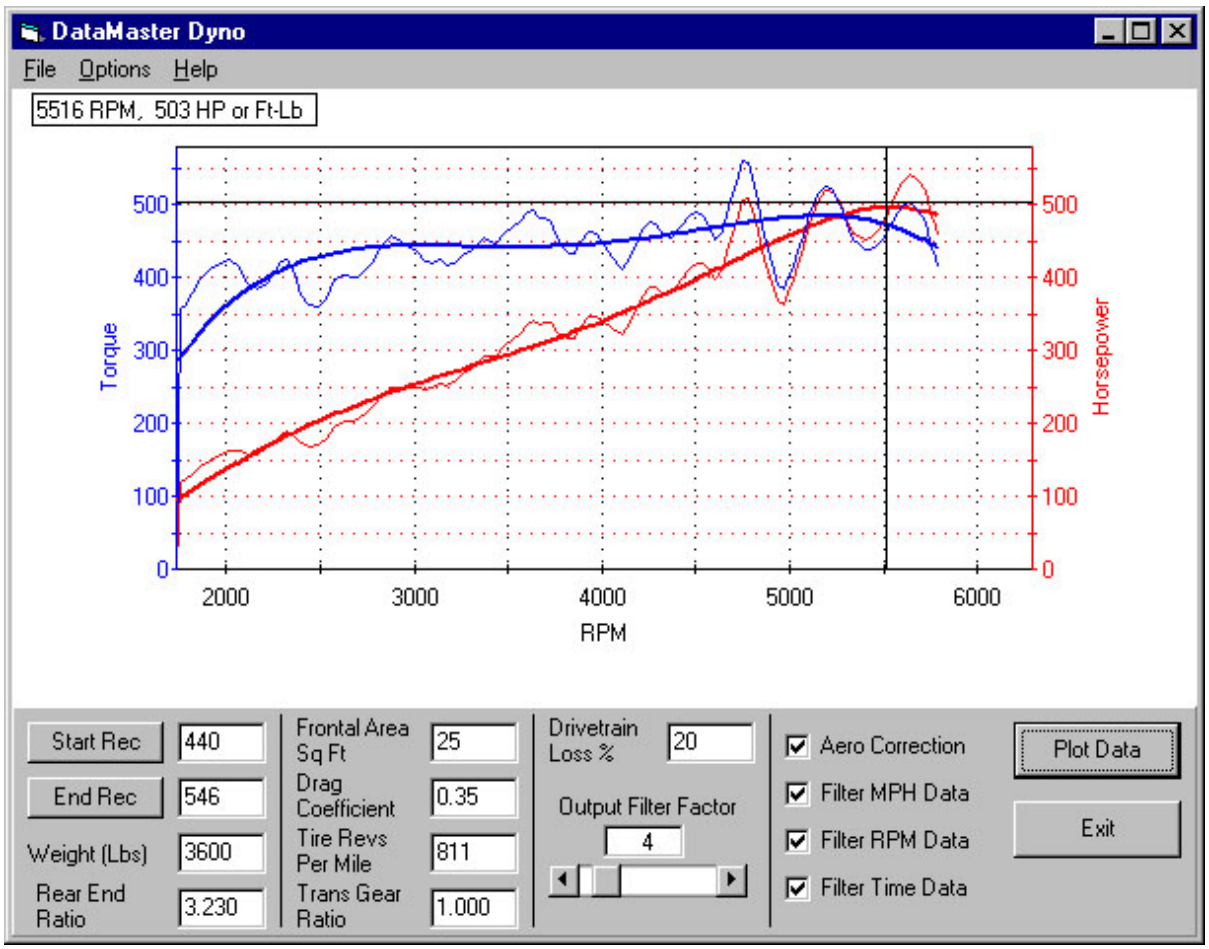


To use this calculator, set the cursor on the main display to the beginning point that you want to start the measurement from and press the "Manual Set Beginning Record" button. Alternately, if you position the cursor a bit earlier than this and press the "Auto Find Beginning Record" button, the estimator will look for the first non-zero speed and set the beginning record automatically.

To calculate the elapsed times, press the Calculate button. Be aware that excessive tire spin will result in a false speed reading, thus limiting the accuracy of this calculator. This calculator uses a linear interpolation of the speed data to give improved accuracy of the time to distance values.

The DataMaster Dyno display

The DataMaster Dyno uses PCM data collected during a vehicle test run to calculate horsepower and torque at the engine. It does this by measuring speed, time and engine RPM as the vehicle accelerates. Collecting good data to analyze is the key to getting realistic results. Good driving technique is a critical factor. To get best results, the vehicle should be accelerated in a fixed gear at full throttle through the broadest RPM range possible.



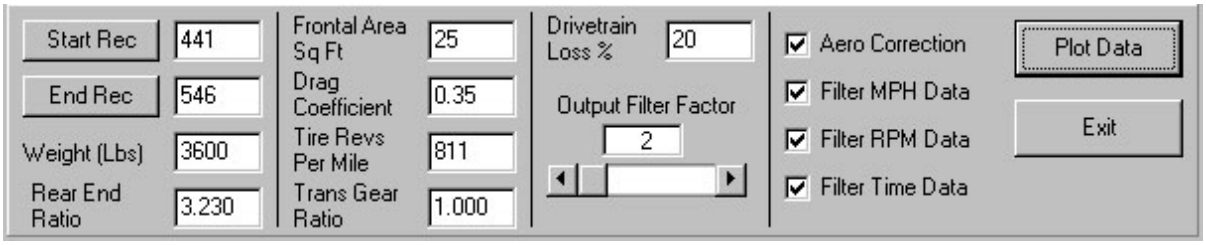
For this example plot above, a few items are quickly evident: First, the thin lines represent the “raw” torque and HP values, while the fat lines are the “smoothed” trends for this data. Note that the “raw” data is very noisy –In fact, this particular run is one of the better ones you will see! This illustrates the difficulty in working with the limited resolution of the data from the PCM.

Smoothing of the output data is very subjective, and is adjusted by setting the Output Filter Factor value. This applies a polynomial fit to the data with degree of 2 to 10. Use a fit that gives the best data appearance, each data capture will be unique in this respect. The data above was fit with a factor of 4, and shows the “typical” S-curve shape of the LT1 engine torque.

The Dyno uses the same scale for Torque and Horsepower, and the label in the upper left shows the current value for where the crosshairs are positioned. Move the mouse through the display to position the crosshairs at the area of interest.

Setting up the Dyno

This picture illustrates the input data for DataMaster Dyno. When first invoked, the Dyno will show a default set of values as shown below. These values can be changed for your particular vehicle, and the changed settings will be recalled the next time the Dyno is run.



Start and end record setting:
When the Dyno form is first opened, the beginning and end record will always be set to the current cursor position on the Engine Display (main) form. To change the setting, you may either enter a new value in the box or set the engine display to the desired record and press the Start Rec button. The end record is set in the same manner using the End Rec button.

Note that the Dyno program end record must always be greater than or equal the begin record. If set to a smaller number the program will automatically change this to equal the starting record.

Vehicle Weight:
Enter the weight of the vehicle as tested in this box. Units are Pounds. This value is used to calculate the force necessary to accelerate the vehicle, and also affects the rolling resistance correction.

Gear Ratios:
There are two boxes required for the gear ratio input: The rear end ratio and the transmission ratio. You must enter the correct transmission ratio used during the run for DataMaster Dyno to correctly calculate the torque and horsepower at the engine.

Appendix E lists transmission gear ratios for some common GM transmissions, while Appendix F lists some common GM rear end ratios.

Tire Revs per Mile:
Enter your tire revolutions per mile in this box. Typical values will be in the range of 800 to 1000, but you must consult the tire manufacturer for the exact value.

Appendix G lists Revs/Mile for some typical tire sizes.

Frontal Area and Drag Coefficient (Cd):
Enter the Vehicle frontal area in square feet and the drag coefficient (Cd) in these boxes. For example, a Corvette has a frontal area of 15 Square feet and a drag coefficient of 0.32 . These items are used to correct for aerodynamic drag, and start to come into play at speeds > 50 MPH.

Drivetrain Losses:
Enter the estimated drivetrain losses in percent, from 0 to 99 % Note that 100% loss means all power is lost before getting to the rear wheels. A typical automatic transmission vehicle has losses of 20 percent, while a manual transmission vehicle is closer to 15 percent.

Output Filter Factor:
Adjust the output “trendline” filter fit by setting the filter degree to a value from 2 to 10. This is used to compute a polynomial fit of the “raw” Horsepower and Torque data. Some input data will cause problems with the trendline calculation; for difficult cases, try experimenting with the starting and ending record positions, this can make the fit much better.

Checkbox Options:

Aero Correction: Use this selection if you want aerodynamic and rolling resistance correction applied to the plotted data.

Filter MPH, RPM and Time: These apply the smoothing filters to the input data. Typically, these need to be checked to get acceptable looking results. The smoothing filter output is based on the weighted average of the input data.

Using Diacom Data:

Starting with version 3.2 of DataMaster, a Diacom .GDF file may be imported for playback display. Because these files were not timestamped as the data was collected, an estimated timestamp is generated based on the number of data frames collected and the engine run time variable. While not as accurate as a "real" timestamp, this method generates fairly consistent results when played back on the Dyno.

Menu Selections:

File ..Print:

This selection brings up the windows printer dialog box, and allows printing of the graph. For version 1.0 software, just the graph is printed without any of the setup annotation.

File ..Save As JPEG Image:

This selection brings up the windows file dialog box, and allows saving a JPEG format of the image.

File ..Save as CSV:

This selection allows saving the raw and calculated Dyno data to a CSV (Comma Separated Value) file.

Options ..Always On Top:

This selection keeps the Dyno form on top of all other open forms. Deselect this to allow the Dyno to move into the background.

Help ..Contents:

This selection brings up the Dyno help file.

Calculation Method:

Engine horsepower and torque are calculated by measuring the vehicle acceleration. By knowing the vehicle weight, the force to cause this acceleration can be calculated. Correction is made for aerodynamic and rolling resistance. Vehicle gearing (which includes transmission, rear end and tire diameter) are then used to convert force at the vehicle to the torque at the engine. Finally, drivetrain loss is applied to give the actual torque supplied by the engine. Horsepower can then be calculated based on the engine RPM and torque.

Force to Accelerate Vehicle:

Accel = vehicle acceleration in feet per sec^2
W = Vehicle weight in pounds
Rmi = tire revs per mile
gear = overall gearing
TQmult = 840.33 / (gear * Rmi) Torque multiplier via gear and tire diameter
Tscale = TQmult * (W / 32.1741) Overall Torque Scale factor, weight to mass (Slugs)

Engine Torque = Accel * Tscale

Aerodynamic and Rolling Resistance Correction

(Only applied if option box checked)

Fa (drag force in pounds force) = q * A * Cd
q (dynamic pressure Lb/Ft^2) = .00256 * V^2 at STP
V = velocity in MPH

Fr = (rolling resistance in pounds force) = (W * Cf) + (W * Cv * V)
Cf = 0.015
Cv = .0001

Aero Corrected Engine Torque = Engine Torque + (Fa + Fr) * TQmult

Drivetrain Loss Correction

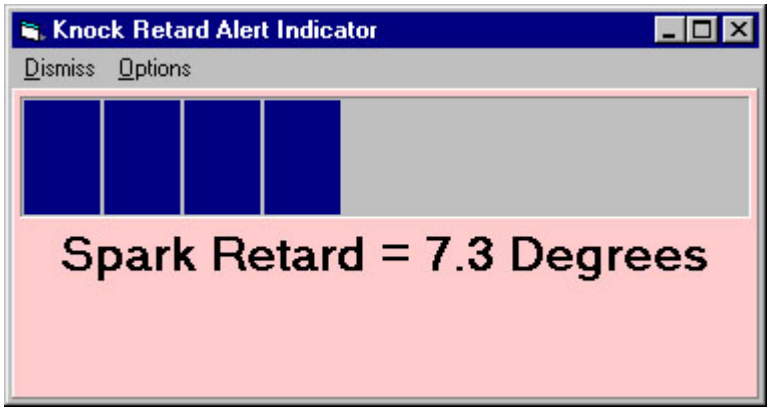
Loss = percentage drivetrain loss

Drivetrain Corrected Engine torque = Engine Torque / (1 - (0.01 * Loss))

Horsepower Calculation:
HP = (Torque * RPM) / 5252

The Knock Retard Alert Indicator

The Knock Retard Alert Indicator is selected from the View-Spark Retard Alert menu. This is a resizable form that changes color based on any spark retard that is present. The form will be gray if no spark retard is present, and turn progressively more red for increasing values. A large progress bar also graphically indicates any spark retard that is present.



This form is designed to get your attention, and can be resized by grabbing any corner and dragging with the mouse.

Chapter 5: THE SETUP MENU ITEMS

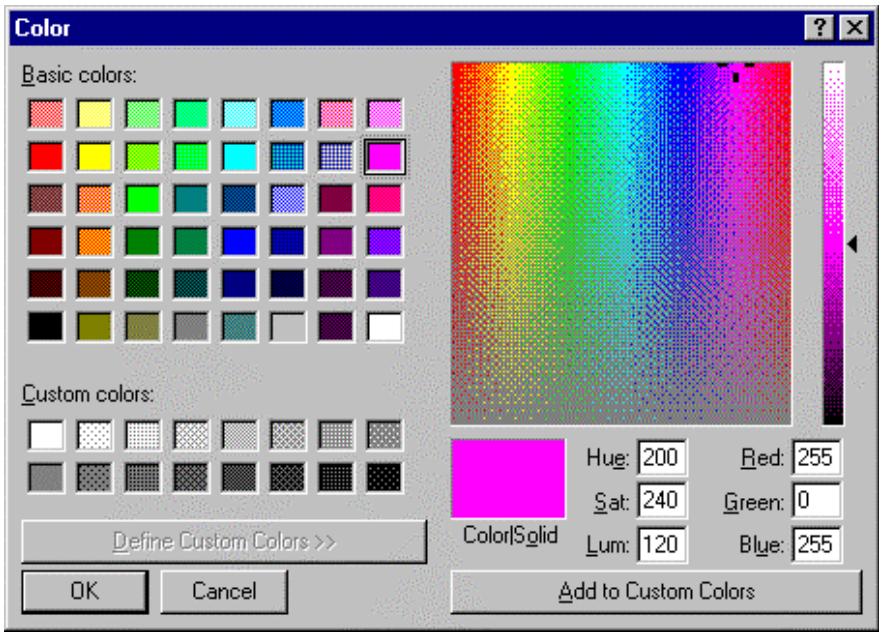
The Setup menu items are used to select the graph and printing color options to meet the user's needs.

Setup Graph Colors

Items 1 - 4

The individual graph items that are plotted are named here. When the menu item is selected, a color dialog box is presented allowing the user to choose any desired color for the plot.

The color scheme in the Snapshot window and in the graph display will change to match the new assignment.



Background

The background color may also be changed to improve contrast for some color schemes. Normally a white or black background gives the best contrast.

Setup Print Colors

Note that printed colors do not always correspond exactly to the screen colors; some experimentation may be required.

Items 1 - 4

Selects the plotted colors for the individual graph items corresponding to the Snapshot display.

Setup Preferences

No Beep on DTC

Turns on/off the “beep” when DTC errors occur. Used to reduce annoyance when scrolling through a record that has many DTC errors!

Tool Tips On/Off

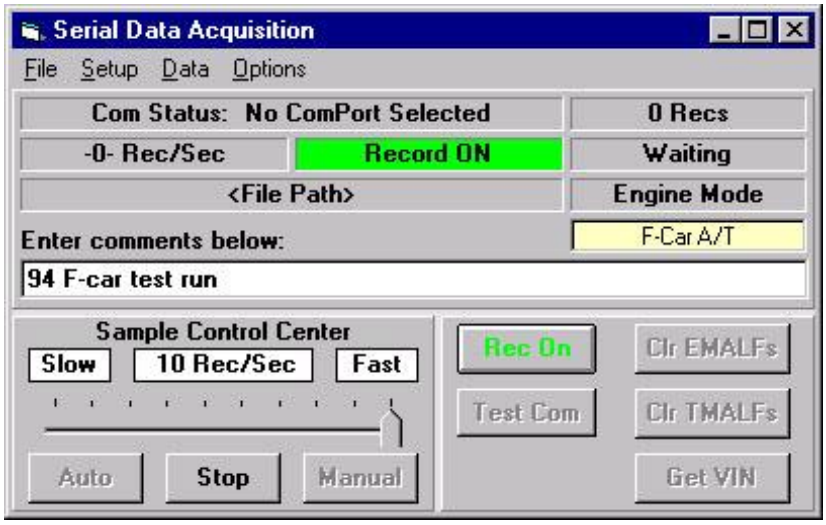
Turns on/off the tool tips which provide information as the mouse cursor is moved across the screen.

Chapter 6: Recording PCM Data

Following these steps activates the PCM data recording function:

Select File from the main menu.

From the submenu, select *Record Engine Data....* This will clear the existing forms, and bring up the Serial Data Acquisition form similar to the example shown below.



This form will remain the active form until you exit from it. **Note: This form may be placed in the background by deselecting the Options—Always on Top menu item**.

This feature is useful on screens with limited space.

Note to Corvette Owners

Corvettes require a special data protocol when connecting with DataMaster due to the Central Control Module (CCM), which updates the dashboard and Heating/Ventilation (HVAC) systems**. *If the CCM is not working correctly, or the vehicle has been modified to remove these components, it may be necessary to select the Options—Advanced—Disable ALDL Handshake and/or the Options—Advanced—Disable Dash Refresh in order to communicate and receive data.*** When first connecting, it will not be uncommon to receive multiple errors until a clear communication path has been established. If the Dash Refresh is disabled, the dashboard will be frozen until data collection is stopped. This will result in the Service ASR light turning on until the vehicle ignition is cycled "OFF". Also, during very long data collection periods, it is possible that the Service ASR light may be set. The light will be reset after cycling the vehicle ignition “OFF”.

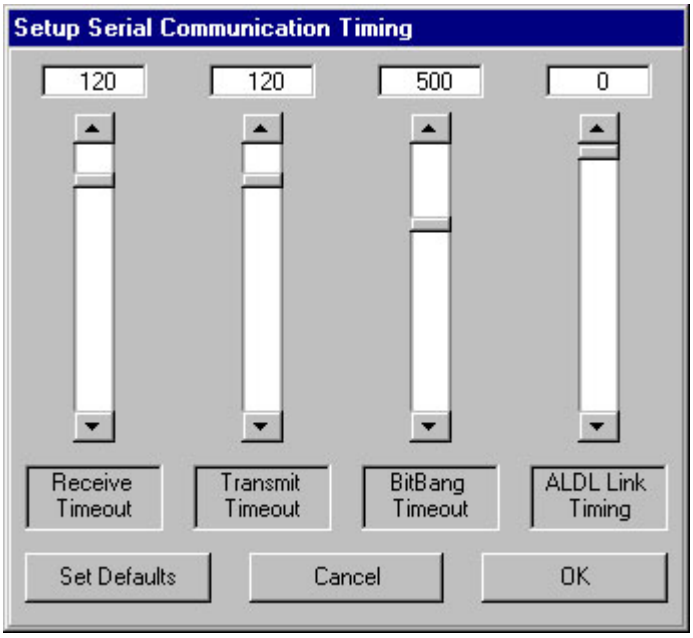
Note for Manual Transmission Vehicles

Manual transmission vehicles do not support transmission data. Make sure that when recording data from manual transmission vehicles that the Data Mode menu is set to "Engine". Failure to do this may result in missed records, or DataMaster may report "Waiting" and never collect any data.

Note for Early Year Vehicles (1990 – 1993) Communication Problems

Some early year vehicles (Notably the 1990 – 1993 Syclone and Typhoon) have a very tight timing window to link-up and communicate with the PCM. Because of this, certain laptops are unable to establish communication and receive data without adjusting the DataMaster ALDL Link Timing. The symptom of this problem is that when connecting to the vehicle, pressing the “Test Com” button gives

the response that “Test Com Passed, PCM Detected”. However, when “Start” or “Single” is pressed, an error occurs indicating “No PCM Sync, Recycling…” or “Unable to connect to PCM”.



To solve this problem, the ALDL Link Timing must be adjusted using the following procedure:

Bring up the Serial Data Acquisition form and from the menu select the ***Options—Advanced—Serial Communication Timing…*** item. This will bring up the Setup Serial Communication Timing form, and allow you to make adjustments to the ALDL Link Timing, the right-most slider control.

The default ALDL Link Timing value is set to “0”. This specifies the delay in mS from when the PCM ALDL Polling message is detected to when the computer responds with the link-up command. When the default value of “0” does not work, we need to increase the value to move to the link command timing up to the next poll message. The value required will be slightly different for different PC’s, but we have found the optimum range is usually between 190 and 205.

To establish the optimum setting, it is necessary to find both the lowest and highest values that work, and set the control to half-way between. TTS suggests starting at 195 and working up or down from this value to find these limits. Each time a change is made, press the OK button (which saves the change) and retry the connection by pressing the “Start” or “Single” button. Repeat the process until the upper and lower limits are found (generally a very narrow range of only 4 to 5), and set to the middle value. Note this can take 10-20 iterations to find the optimum setting!

Note for Windows NT users

Due to differences in the way Windows NT handles serial port communications, it may be necessary to disable the CCM handshake in order to reliably connect to certain PCM's. This can be done by selecting the Options—Advanced—Disable ALDL Handshake menu item.

Setting up and Acquiring PCM data

There are several items that must be set-up before you can record data from the PCM. First, a file name must be must be selected or entered; Second, the serial Communications port must be selected; Third, the correct Vehicle Type must be selected from the main form menu, and lastly, the Data Mode must be selected.

Selecting the PCM Data File Name

The file name is selected from the File—Open menu item. This will bring up a standard file selection dialog box. Navigate to the directory where you want to store your datafile and either select an existing file name or enter a new filename to receive your data. Press the Open button to complete your selection. If the filename you selected already exists, you will be prompted to overwrite the file, append to the file or cancel the operation. If you select Overwrite, the old file contents will be deleted and cannot be recovered. Append will add the new data to the end of the existing file so no data will be lost.

If you select FILE from the main menu of the Serial Acquisition box, the following selections are available from the menu:

Open	Selecting OPEN brings up a screen from which you can select a data file from.
Save Now	SAVE NOW saves any records that were collected since the last save to disk.
Exit	Exits out of the Acquisition menu and takes you back to the main DataMaster screen.

The Setup Menu

If you select SETUP from the main menu of the Serial Acquisition box, the following selections are available from the menu:

Com Port	Use this to set up a Com Port. This will bring up a list of the available serial communication ports that the PC currently has available for use. A grayed-out selection means that the port is in use by another program, or does not exist on the PC. Typically, COM1 or COM2 will be available for use with DataMaster. Select the COM port that you will use for the PCM Adapter Cable. DataMaster will remember the selection and automatically return to it the next time it is run.

Selecting the Vehicle Type

The Vehicle type is selected from the *main engine display menu* by selecting the Setup—Vehicle Info menu item. A list of supported vehicle types will be presented to choose from. Make the appropriate selection, and the yellow label near the Comments line will indicate what the current selection is. It is important that this is the same as the vehicle being monitored, as different vehicle types may have different data available for display.

The PCM Data Mode Menu Selections

The Data Mode is selected directly from the Data menu item. Depending on the vehicle type, several options may be available for the type of data to be collected. All PCM's support the Engine data, while others add Transmission data as well. If available, you may select between Engine only, Transmission only, or Alternate Engine and Trans data modes. The Alternate mode switches automatically between engine and transmission data, such that the data file contains a synchronized record of both! This can be extremely useful when solving an issue that involves an interaction between the engine and transmission.

Get Engine Data	Collect engine data only
Get Transmission Data	Collect transmission data only. NOTE: Do not select if the vehicle is a manual transmission.
Alternate Engine and Trans Data	Alternately collect engine and transmission Data. NOTE: Do not select if the vehicle is a manual transmission.

PCM Data Acquisition Status Bar

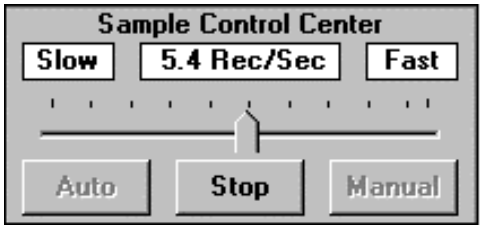
Use the field listing below the illustration to help assist you with the following fields shown on the Serial Data Acquisition status bar.

Com Status	This reports the status of the latest communications from the PC to the PCM. If any errors occur, it will be reported in this label.
Record Count	Reports the total number of records that DataMaster has successfully obtained from the PCM, whether recorded of not. Note that if both engine and transmission records are collected, this number will be divided between the engine and transmission display. Non-recorded data does not update the record count on the Engine and Transmission displays.
Records / Second	Shows the current interrogation rate for the PCM. This can be adjusted using the slidebar control in the record control center. The rate will vary, depending on the display update mode, sample control setting, PCM data type, and the speed of the PC. For full screen update mode at maximum speed, this will typically be in the range of 5-7 records per second. The maximum rate possible is approximately 10 records per second.
Record Mode	Indicates whether DataMaster Record mode is ON or OFF. Also indicated on the Record On/Off button.
Waiting	Shows if DataMaster is waiting to receive data from the PCM. This occurs if the PCM is busy and can't respond to DataMaster. When first connecting to the PCM, it is not uncommon to have several waiting counts while DataMaster and the PCM negotiate for control.
File Path	Shows the current file name and path for the current data collection session.
Mode	Indicates the data type that is being collected. Will read either

	Engine, Transmission, ALT: Engine or ALT: Trans. The ALT indicates that the Alternate mode has been selected, and data collection mode will automatically switch between Engine and Transmission.

Comments	Enter comments you want recorded in the datafile **PRIOR** to beginning data collection. If you are in the file append mode, any changes made to the comments will be lost; the original comments are retained. Comments are written to disk after the first 100 records have been collected, or if File—Save Now is selected, whichever occurs first.

PCM Data Acquisition Sample Control



Use the field listing shown below to help assist you with each fields shown in the section of the screen.

Sample Speed	Moving the slider control between slow and fast controls the sample speed. The selected sample rate is displayed in the label immediately above the slider control. During data collection, the actual sample rate is displayed in the status bar. Generally, the actual rate will be somewhat lower than the selected rate due to the speed of the PC and other factors. The minimum sample rate is 1 record per second, and the fastest rate is 10 records per second. The default setting is 10.
Auto Sample	This command button starts the auto sample process running. When Sampling is first started, It may take several seconds while DataMaster negotiates for control. During this time, you will see a message in the status bar indicating what's going on. When sampling begins, several other controls are disabled to prevent unintended program operation. After Auto Sample has started, it may be stopped at any time by pressing the Stop button.
Manual Sample	This button initiates a single record interrogation of the PCM. The same interrogation process takes place as during Auto Sample mode, except only one sample will be taken.
Stop	The Stop button is used to end the Auto Sample mode and return to an idle condition.

PCM Data Acquisition Command Buttons

There are up to 5 command buttons that support various PCM interrogation modes. Only those modes supported by the particular DataMaster version will be visible. For a description of each of the command buttons, use the field listing shown below.

Rec (Record) On / Off	This controls whether DataMaster is recording data or just monitoring the PCM. Pressing this button will toggle between these two modes. Note that when switching from record Off to Record On, if Record Memory On is selected (in the Options menu), the last 50 records that were monitored will be saved in the disk file. This allows capturing an event that you just noticed during a long monitoring run

Test Com	This command checks out the connection to the PCM by sending a test command. The results are reported back in a message box as follows: No errors: Com Test Successful, Normal operation **Error 0**: The COM link is dead. Generally caused if the adapter is not plugged into the computer, the wrong COM port is selected, or the COM port is bad. **Error 1**: The COM port is good and can talk to the adapter, but no PCM was detected. Generally caused by a bad connection between the adapter and the DLC, or if the ignition is turned off. **Error 2**: An unexpected response was received from the PCM. This can be caused by a noisy connection or if the wrong version of DataMaster is being used for the vehicle being tested. **Error 3**: An unknown polling message was detected. **Error 4**: DataMaster was unable to send a request for control of the ALDL bus. **Error 5**: DataMaster Timed out while taking control of the ALDL bus. **Error 6**: DataMaster requested control of the ALDL bus, but did not receive the expected response.
Clr EMALF's	If supported by your PCM, the Clear EMALF button will be displayed. When this button is pressed, a command is sent to the PCM to reset any engine related MALF codes that may have been set. Within a few seconds, the command should take effect and the results will be seen on the DTC form.
Clr TMALF's	If supported by your PCM, the Clear TMALF button will be displayed. When this button is pressed, a command is sent to the PCM to reset any transmission related MALF codes that may have been set. Within a few seconds, the command should take effect and the results will be seen on the DTC forms. Many times, some transmission MALF's displayed on the Engine DTC form. Additional transmission MALFS may be available by viewing the transmission DTC form (accessed from the Transmission Data Display). Which MALF's appear on which forms are very dependent on the particular vehicle being tested.

Get VIN	If supported by your PCM, the Get VIN button will be displayed. When this button is pressed, the PCM responds with the 17-digit VIN which has been programmed into the PCM. A message box is presented with the VIN for examination. Press OK to close the message box and append the VIN to the comments text box, or Cancel to exit without saving the VIN information. NOTE: If you want this to become a permanent part of the file record, you must perform this operation prior at the beginning of data collection, as the comment record is only written to disk one time after 100 records have been recorded or if the File—Save Now menu item is selected, whichever comes first!

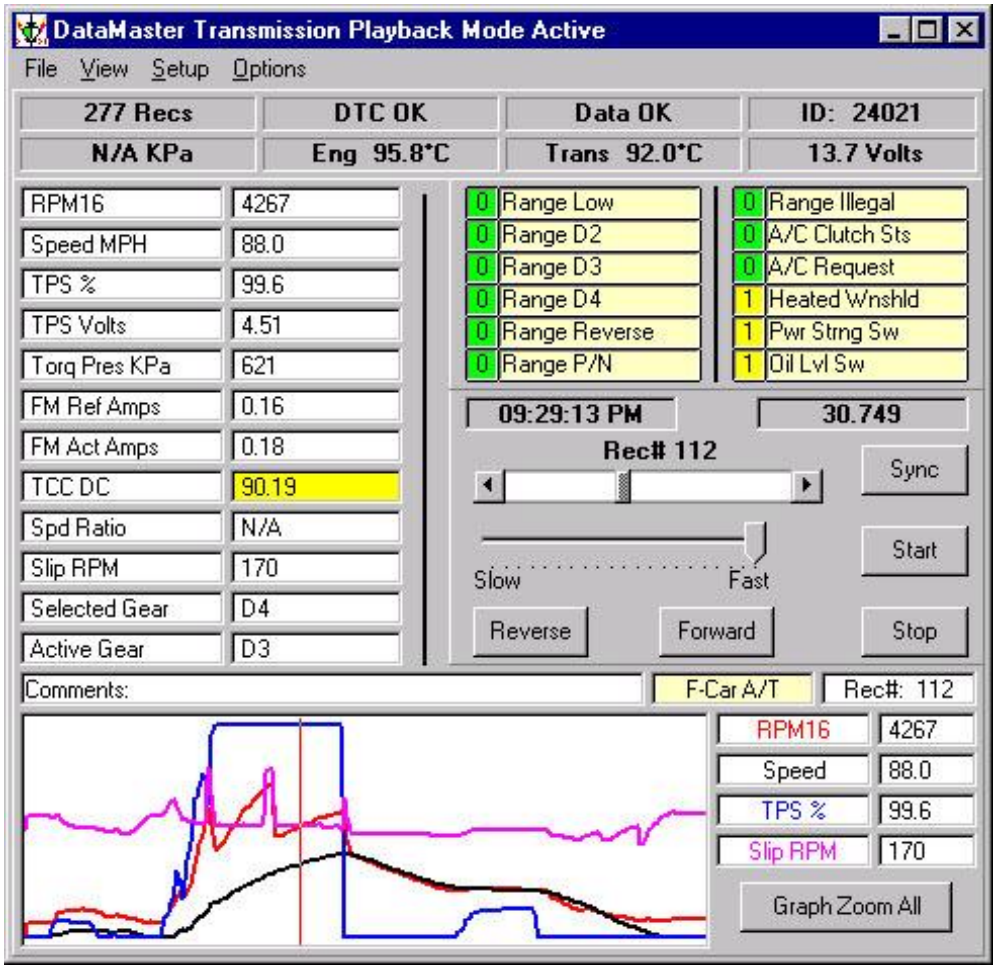
The Options File Menu Selections

Always On Top	Locks the Serial form "on top" so it is always visible
Record Memory On	When selected, causes the program to always remember the last 50 records that were collected, even if Recording is turned off. Useful when looking for intermittent problems so that the user can press Record when the problem occurs, and the data leading up to the event will be also saved.
Dispay: ♦ **Update All** ♦ **Update Partial** ♦ **Update Off**	Controls what data is updated on the screen during data collection. On slower PC's, the time taken to update the display can slow the maximum data sample rate. If you require the highest possible data sample rate, select "Update Off", otherwise select "Update Partial" or "Update All" depending on your needs.
Advanced: **Disable CCM Handshake**	This option is used only in cases where the "Central Control Module" is not working correctly or the vehicle has been modified to remove the CCM (Corvettes only). Also may be required when running under the Windows NT4 operating system when communicating with certain vehicles.
Advanced: **Disable Dash Refresh**	This disables the periodic update of the dashboard while collecting data. Normally, DataMaster will refresh the dashboard every 2 seconds, which allows for the maximum data collection rate.
Advanced: **Serial Communication Timing**	This allows adjustment of the serial port timeouts. The default values are 120 mS and should work with most all PCM's and computers. On rare occasion, it may be necessary to increase the timeout value if communication timeout errors occur. Also allows adjustment of the ALDL Link Timing. The default is 0 mS. and should not be changed unless there are problems linking the PCM as described at the beginning of Chapter 6

AutoLogging Enabled **New Feature starting with version 3.2.5**	Enables automatic keyboard control of ALDL Data Acquisition. This feature fully automates the data collection process and eliminates the need to use a mouse when recording data. When enabled in the Serial Data Acquisition form (under Options..AutoLogging Activated), pressing the SPACE bar will immediately start datalogging. To stop logging, simply press the ESC key. To turn Recording off, press the "P" (pause) key. When paused, the data display will continue, but data will not be saved. To resume recording, press the SPACE bar again. To exit back to playback, press the "Q" (Quit) key. The serial Data Acquisition mode can be entered from the main screen by pressing the ALT-F R key combination. Once enabled, AutoLog mode remains active for all future DataMaster sessions until the user turns it off. When in AutoLog mode, a sequentially numbered file is automatically created and saved in the AUTOLOG directory. There is no need to type in any file names. Each AUTOLOG session will create a new file and not overwrite old data until you get to 999 files.

Chapter 7: The Transmission Data Display

The Transmission display is only available for those vehicles that support a transmission data mode, which in general are Trucks and 1994-up F- and Y-Cars.



The Transmission display is modeled after the Engine (main) display, and shares many of the same setup and display options. However, the data displayed is different, and there is one new command button which synchronizes the transmission record to the current Engine record. The differences are covered in the following sections.

Differences between the Engine and Transmission Display

The transmission data is based on a totally separate information stream than the engine data. This data is focused on transmission functionality, and thus most engine information is not available to view on this form. For this reason, the "Alternate Engine and Transmission" data option was built into DataMaster which allows collecting closely interleaved records form both the Engine and transmission. By viewing both sets of data collected at the same time, one can diagnose issues that are due to the interaction between the engine and transmission.

File Menu Differences

The File menu does not support the Printer—Setup command. This must be done from the main Engine data form.

View Menu Differences

The transmission view menu does not support the Histogram and Speed-Distance calculator. DTC codes and Binary Data are displayed as in the Engine Data Form.

Setup Menu Differences

The Transmission Setup menu does not support Vehicle Type, Screen Size or Display Units items.

The Options Menu

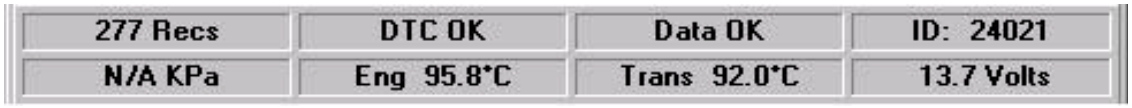
A new menu item is available under the Options—Always On Top menu selection. Selecting this option forces the Transmission Data Form to become the topmost form, overlaying all other forms. When another form is selected, the Transmission Data form will remain on top until this option is turned off or the form is closed.

The Synchronize Button (Sync)

Since the engine and transmission displays are not directly linked and can independently display different sections of a file, a Synchronize button has been added to the transmission record control. When this button is pressed, the transmission record number will be changed to the nearest engine record as determined by the exact time the data records were recorded. This allows a quick way to coordinate engine and transmission events.

Understanding the Transmission Data

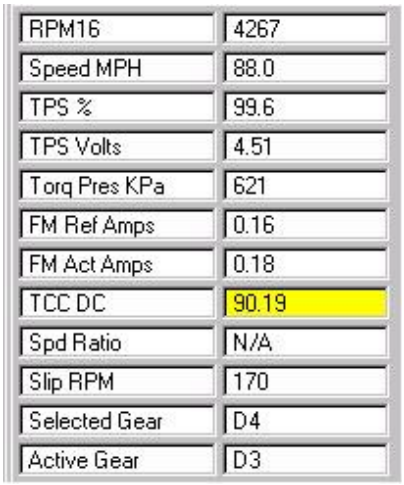
The Transmission Status Bar



The transmission status bar contains the following information:

Records	Indicates how many Transmission data records were recorded in this file.
DTC Errors	This display shows if there is a transmission Diagnostic Trouble Code set. Will turn red on any record that contains a DTC, instantly flagging a DTC error.
Data OK	The Data OK display shows if the transmission data record contains any data errors (checksum error). If this turns red, that particular record is bad and should not be trusted! This can occasionally occur during data collection if there is noise on the ALDL data link, or if a data transmission is interrupted.
PROM ID	This indicates the PCM internal EPROM ID #. This is identifies the exact version of EPROM code that the PCM is using. This is not used by all vehicle types, so this item may not be present in your display.
Baro KPA	This indicates the PCM's computed atmospheric pressure. Unless you are at high altitudes, this will be close to 100 KPA. A few vehicles do not support BARO readout, in this case the display will read "N/A".
Engine Coolant Temp	Shows the current engine coolant temperature.

Transmission Fluid Temp	Shows the current transmission fluid temperature.
Ignition Volts	Shows the voltage ignition (battery) voltage.



The Transmission Data Display

There are 12 key transmission data items displayed, detailed as follows:

RPM16	This is a high-resolution engine RPM value the PCM uses for transmission calculations. The resolution is 1 RPM.
Speed	Indicates the current speed of the vehicle.
TPS %	Shows the percent throttle opening. This is calculated by the PCM and will be a value 0 to 100%. Same as used for the Engine Data Form.
TPS Volts	This shows the voltage measured from the Throttle Position Sensor. Will generally range from 0.5 Volts (throttle closed) to 4.5 Volts (throttle fully open). Same as used for the Engine Data Form.
Torque Pressure	This value is the current torque signal pressure within the transmission.
Force Motor (FM) Reference Amps	This is the commanded current to the Pressure Control Solenoid (PCS) circuit and will have a value between 0 and 1.1 Amps. A value of zero indicates commanded higher line pressure; a value of 1.1 indicates a commanded lower line pressure.
Force Motor (FM) Actual Amps	This is the actual current to the Pressure Control Solenoid (PCS) circuit and will have a value between 0 and 1.1 Amps. A value of zero indicates actual higher line pressure; a value of 1.1 indicates a actual lower line pressure.
TCC Duty Cycle	This is the duty cycle of the torque converter lock-up solenoid, and typically ranges from 0 to 90%.
Speed Ratio	Indicates the ratio of input speed to output speed of the transmission. Quickly shows what the current gear ratio is.
Slip RPM	Indicates the difference between the transmission input speed (at the engine) and the transmission output speed (at the output shaft). A negative value indicates that the input speed is less than the output speed (deceleration); a positive value indicates that the input speed is greater than the output speed (acceleration). A value of zero indicates input speed equals output speed (the torque converter is locked).
Selected Gear	This is the current automatic transmission gear that is selected by the gear shift lever. Shows "N/A" for manual transmission applications. Not available for all vehicles.
Active Gear	This is the current gear that is activated within the automatic transmission. Shows "N/A" for manual transmission applications. Not available for all vehicles.

Appendix A: Unit Conversion Factors

Conversion Table

To Convert From	To	Multiply By
Feet	Centimeters	30.48
Inch	Centimeters	2.54
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.4516
Cubic Inches	Cubic Centimeters	16.3871
Pounds per Square Inch (PSI)	Kilo Pascals (KP)	6.8948
PSI	Inches Mercury	2.0360
Kilo Pascals Absolute (KPA)	Inches Mercury	0.2953
Degrees Centigrade	Degrees Fahrenheit	(1.8 x °C) + 32
Degrees Fahrenheit	Degrees Centigrade	(°F - 32) x 0.5556
Horsepower	Watts	746.0
1 “G” Acceleration	Meters/Sec2	9.80665
1 “G” Acceleration	Ft/Sec2	32.1741
Pounds	Kilograms	0.4536
Foot-Pounds	Newton-Meters	1.3558

Appendix B: Glossary

SAE Recommended Acronyms

Numeric Acronyms

3GR -- Third Gear

2GR -- Second Gear

3-2TS -- 3-2 Timing Solenoid. A device that controls the "third to second" timing valve in an automatic transmission.

4WD -- Four Wheel Drive

4GR -- Fourth Gear

A Through C Acronyms

A/T -- Automatic Transmission or Transaxle

A/C -- Air Conditioner

ACL -- Air Cleaner

AAT -- Ambient Air Temperature

AFGS -- Air Flow Grams per Second. The mass air flow reading., used on engines that have mass flow meters.

AFR -- Air Fuel Ratio

ALDL -- Assembly Line Diagnostic Link. The serial data link from the PCM to the monitoring computer. Also referred to as ALCL.

AP -- Accelerator Pedal

APP -- Accelerator Pedal Position

B+ -- Battery Positive Voltage

BARO -- Barometric Pressure. A measure of the atmospheric pressure

BLM -- Block Learn Multiplier. Now called Long Term Fuel Trim. The Long Term fuel correction factor that the PCM is using.

BLM Cell -- Now called Fuel Trim Cell. Fuel Trim cells store Long Term correction factors that correct for each engine's unique operating conditions. A cell is active within a particular operating region as determined by engine RPM and load. Most PCM's use 16 to 20 cells.

BPW -- Base Pulse Width. The length of time of the injector pulse, usually measured in Milliseconds (1/1000 second).

BPP -- Brake Pedal Position

CAT -- Catalytic Converter

CCM -- Central Control Module. Used in Corvettes to communicate between the various on-board computers. Also called body computer.

CCS -- Coast Clutch Solenoid

CCP -- Charcoal Canister Purge. Typically, there is a solenoid that controls when purge is active. Used to control evaporative emissions.

CFI -- Continuos Fuel Injection. A fuel injection system whereby the injector flow is controlled by the fuel pressure.

CL -- Closed Loop. An operating mode which allows modification engine control parameters based on a feedback system.

CMP -- Camshaft Position

CTOX -- A system for lowering Diesel engine particulate emissions by collecting particulates and continuously burning them through oxidation.

CKP -- Crankshaft Position

CPP -- Clutch Pedal Position

D Through F Acronyms

DC -- Duty Cycle. A value from 0 to 100%. The ratio of ON to OFF of a controlled device. A value of 0 means the device is OFF, a value of 25% means the device is 1/4 of full on.

DTC -- Diagnostic Trouble Code

DFI -- Direct Fuel Injection. A fuel injection system that supplies fuel directly into the combustion chamber.

DI -- Distributor Ignition. A system in which the ignition coil secondary circuit is sequentially switched by a distributor to the spark plugs

DLC -- Data Link Connector

DLI -- Distributor less Ignition, also called Electronic Ignition (EI). A system in which the ignition coil secondary circuit is dedicated to specific spark plugs without the use of a distributor.

DRIVER -- An electronic switching device used to control an output state.

DTM -- Diagnostic Test Mode. Any of various PCM Test modes that allow the observation and control of PCM signals.

DTC -- Diagnostic Trouble Code

EATX -- Electronic Automatic Transmission/Transaxle.

ECM -- Engine Control Module

ECL -- Engine Coolant Level

ECT -- Engine Coolant Temperature

EDF -- Electro Drive Fan Control

EECS -- Evaporative Emission Control System

EFI -- Electronic Fuel Injection

EGO, EGOS -- Exhaust Gas Oxygen Sensor (O2S)

EGR -- Exhaust Gas Recirculation. Reduces Nox emissions by adding exhaust gas to the incoming air/fuel mixture.

EGRT -- EGR Temperature

EGRV -- EGR Vacuum Regulator Valve

EOP -- Engine Oil Pressure

EOT -- Engine Oil Temperature

EP -- Exhaust Pressure

EPROM -- An electronic memory device which is erasable and reprogrammable

EI -- Electronic Ignition. A distributorless ignition system in which the ignition coil secondary circuit is dedicated to specific spark plugs without the use of a distributor.

EVAP -- A system used to prevent fuel vapor from escaping into the atmosphere. Typically includes a charcoal canister to store fuel vapors.

EVP -- EGR Valve Position

F4WD -- Full-time Four Wheel Drive

FBC -- Feed Back Control or Feed Back Carburetor

FC -- Fan Control

FI -- Fuel Injection

FREEZE FRAME -- A block of data containing vehicle operating conditions for a specific instance.

FP -- Fuel Pump

FT -- Fuel Trim. A fuel correction term.

FWD -- Front Wheel Drive

G Through O Acronyms

GEN -- Generator

GCM -- Governor Control Module

GPM -- Grams Per Mile

GND -- Ground. An electrical conductor used as a common return for an electrical circuit
HEI -- High Energy Ignition

HO2S -- Heated Oxygen Sensor

IA -- Intake Air

IAC -- Idle Air Control

IACV -- Idle Air Control Valve

IAT -- Intake Air Temperature

IC -- Ignition Control

ICM -- Ignition Control Module

ICP -- Injection Control Pressure

IFS -- Inertia Fuel Shut-off

ISC -- Idle Speed Control

ISS -- Input Shaft Speed

IMRC -- Intake Manifold Runner Control

INT -- Integrator. Now called Short Term Fuel Trim. The Short Term fuel correction factor that the PCM is using.

KS -- Knock Sensor

LTerm, Long Term -- Long Term Fuel Trim (previously called Block Learn)

MAF -- Mass Air Flow

MAP -- Manifold Absolute Pressure

MAT -- Manifold Temperature

MFI -- Multipoint Fuel Injection. A fuel injection system in which each cylinder is individually fueled.

MDP -- Manifold Differential Pressure

MIL -- Malfunction Indicator Lamp

MST -- Manifold Surface Temperature

NVRAM -- Non-Volatile RAM. Memory which retains information typically via an internal battery.

O2S -- Oxygen Sensor

OBD -- On Board Diagnostic. A system that monitors some or all computer input and control signals. Signal(s) outside a predetermined range imply a fault in the system or a related system.

OC -- Oxidation Catalytic Converter. A catalytic converter system that reduces HC and CO.

OL -- Open Loop. An operating mode based on programmed values and not modified by a feedback system.
OSS -- Output Shaft Speed

P Through S Acronyms

PCM -- Powertrain Control Module

PCV -- Positive Crankcase Ventilation

PNP -- Park Neutral Position

PRNDL -- Automatic transmission gear selection lever. Park, Reverse, Neutral, Drive, Low

PROM -- Programmable Read Only Memory. A memory chip which can be programmed only one time.

PSP -- Power Steering Pressure

PSPS -- Power Steering Pressure Switch

PTOX -- A system for lowering Diesel engine particulate emissions by collecting particulates and periodically burning them through oxidation.

PWM -- Pulse Width Modulation. A method of proportionally controlling an actuator by varying the on/off time of a rectangular waveform.

QDM -- Quad Driver Module. An electronic component that contains four output driver circuits.

RAM -- Random Access Memory. A memory which does not maintain its content when power is removed.

RM -- Relay Module

ROM -- Read Only Memory. Memory which is programmed by the device manufacturer and whose contents cannot be altered.

RPM -- Revolutions Per Minute

RWD -- Rear Wheel Drive

Sterm, Short Term -- Short Term Fuel Trim. The Short Term fuel correction factor that the PCM is using.

SA -- Spark Advance. The crankshaft angle relative to TDC (generally) at which a spark event is initiated.

SC -- Supercharger

SCB -- Supercharger Bypass

SRT -- System Readiness Test (applicable to OBD2 scan tool communications)

SFI -- Sequential Fuel Injection. A multiport fuel injection system in which each injector is individually energized and timed relative to its cylinder intake event.

SR -- Spark Retard. The degrees of spark retard which have been subtracted form the nominal spark advance value. Is generally caused by an engine knock condition.

SRI -- Service Reminder Indicator

SS -- Shift Solenoid

SIR -- Supplemental Inflatable Restraint (air bag)

T Through Z Acronyms

TAC -- Throttle Actuator Control

TBI -- Throttle Body Injection. An electronically controlled fuel injection system in which one or more fuel injectors are located in a throttle body.

TC -- Turbocharger

TCC -- Torque Converter Clutch

TCCP -- Torque Converter Clutch Pressure

TCM -- Transmission Control Module

TDC -- Top Dead Center. The position of the crankshaft when the piston of interest is at the topmost point of travel.

TFP -- Transmission Fluid Pressure

TFT -- Transmission Fluid Temperature

TR -- Transmission Range

TSS -- Turbine Shaft Speed

TRLHP -- Track Road Load Horsepower. The power required to maintain a vehicle at a constant speed, taking into account power losses due to wind resistance, tire losses, bearing friction, etc.

TP -- Throttle Position

TPS -- Throttle Position Sensor

TFP -- Transmission Fluid Pressure

TVV -- Thermal Vacuum Valve. A valve that controls vacuum levels or routing based on temperature.

TWC -- Three Way Catalyst. A Catalytic converter system that reduces HC, NO and Nox.

VAF -- Volume Air Flow. A system that provides information on the volume flow rate of the intake air to the engine.

VCM -- Vehicle Control Module

VCRM -- Variable Control Relay Module

VIN -- Vehicle Identification Number

WOT -- Wide Open Throttle. A mode of PCM operation that is dependent on the throttle being open beyond a programmed percentage.

WU -- Warm Up

Appendix C: Last Minute Information

Issues

Wrong printer font on printout

Occasionally when a printer selection or font is changed, the system will not correctly recognize this the first time a record is printed. The workaround is to reprint the record.

Wrong colors on color printer/plotter

Sometimes the colors on the screen do not match the colors on the printout. This is a result of color substitutions made by the video or printer drivers. Check with your hardware manufacturer that you have the most current versions of these drivers installed on your system. In some cases, an exact match between screen and plotter colors will not be possible.

Graph lines and/or labels don't print/plot

This is usually caused by the color selection for the printer. You can either try different color assignments, or print in monochrome mode.

Difficulty establishing communications with the vehicle

Note that it is not unusual to miss a few records while first establishing communication with the vehicle, particularly at high sample rates. After several seconds, however, the communication should be error-free.

If there is no communication at all, check that the correct COM port has been selected and the adapter cable is securely connected to it. Also verify that the adapter cable is securely fastened to the vehicle's ALDL port. Run the "Test Com" command and note what it reports back.

Always verify that the correct vehicle type is selected. From the main engine display, select Setup—Vehicle Type and make the selection appropriate for your application. The selection should appear on both the Engine form and the Serial Data Acquisition form near the comments label.

It is also possible that the Data Mode is set to "Transmission" or "Alternate Eng / Trans", but the vehicle has a manual transmission. In this case, when the program attempts to get transmission data, there is no response from the PCM and a "Waiting" status is reported. Verify that the Data Mode is set to "Engine" to solve this problem.

Some early PCM's (Notably the 1990-1993 Syclone and Typhoon) have difficulty communicating with certain laptops. This may be caused by a ALDL link timing problem, and can be corrected by making the adjustments described in the note at the beginning of Chapter 6.

If problems persist, you may not have the correct version of DataMaster for your vehicle or the adapter cable may be damaged. In these cases, contact TTS Power Systems.

If you are using the Windows NT 4.0 operating system, it may be necessary to disable the CCM handshake in order to reliably connect to certain PCM's. This is due to differences in the way Windows NT handles serial port communications. This is done by selecting the Options--Advanced--Disable ALDL Handshake menu item.

Data not all saved when exiting Record Mode

This is usually caused by the record mode being switched "OFF" while collecting data. In this case, only the last 50 records are saved when record mode is exited.

Appendix D: DataMaster Versions and Vehicles Supported

Program Version Details

The following charts detail the specific engine and vehicle combinations supported by each program version. Combinations not listed in this chart are not guaranteed to operate correctly.

DM32x0D:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
L03 TBI	5.0L	94	VIN = H	C,K,G
L05 TBI	5.7L	94	VIN = K	C,K,G
L35 CPI	4.3L	94	VIN = W	S,T,M,L
LB4 TBI	4.3L	94	VIN = Z	G,M,L,S,T,C,K
LB4 TBI	4.3L	94	VIN = Z	C,K MANUAL TRANS.
L03 TBI	5.0L	95	VIN = H	C,K,G
L05 TBI	5.7L	95	VIN = K	C,K,G
L35 CPI	4.3L	95	VIN = W	S,T,M,L
LB4 TBI	4.3L	95	VIN = Z	G,M,L,S,T,C,K

DM32x31:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
LB4 TBI	4.3L	94	VIN = Z	C,K,G,P 4L80E Trans
L05 TBI	5.7L	94	VIN = K	C,K,G,P,W-MD 4L80E Trans
L19 TBI	7.4L	94	VIN = N	C,K,G,P 4L80E Trans
LB4 TBI	4.3L	94	VIN = Z	C,K (HD) Manual Trans
L19 TBI	7.4L	94	VIN = N	C,K (HD) Manual Trans
LB4 TBI	4.3L	95	VIN = Z	C,K,G,P 4L80E Trans
L05 TBI	5.7L	95	VIN = K	C,K,G,P,W-MD 4L80E Trans
L19 TBI	7.4L	95	VIN = N	C,K,G,P 4L80E Trans
LB4 TBI	4.3L	95	VIN = Z	C,K (HD) Manual Trans
L19 TBI	7.4L	95	VIN = N	C,K (HD) Manual Trans

DM32x85:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
LB4 TBI	4.3L	91	VIN = Z	
L05 TBI	5.7L	91	VIN = K	
L19 TBI	7.4L	91	VIN = N	
LB4 TBI	4.3L	92,93	VIN = Z	C,K,P
L05 TBI	5.7L	92,93	VIN = K	C,K,G,P
L19 TBI	7.4L	92,93	VIN = N	C,K,G,P

DM32x8D:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
LB9 PFI	5.0L	90-92	VIN = F	F-Car
L98 PFI	5.7L	90-92	VIN = 8	F-Car
L98 PFI	5.7L	90-91	VIN = 8	Y-Car

DM32xDA:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
LT1 MFI H.O.	5.7L	92	VIN = P	Y-CAR
LT1 MFI H.O.	5.7L	93	VIN = P	Y-CAR, F-CAR

DM32xE6:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
L03	5.0L	93	VIN = H	C,K,G
L05	5.7L	93	VIN = K	C,K,G
L35	4.3L	93	VIN = W	S,T,M,L
LB4	4.3L	93	VIN = Z	G,M,L,S,T,C,K

DM32xEE:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
LT1 SFI	5.7L	94-95	VIN=P	1,4B, 6D, 1Y, 1F - CARS
L99 SFI	4.3L	94-95	VIN=W	1B - CAR

DM32xZ1:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
LT5 SFI	5.7L	90-92	VIN = J	CPC/Lotus Y-CAR

DM32xZ2:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
LT5 SFI	5.7L	93-95	VIN = J	CPC/Lotus Y-CAR

DM32xTT:				
Engine Family	**Displacement**	**Year**	**VIN ID**	**Model**
LB4 SFI	4.3L	91-93	VIN = Z	Syclone & Typhoon

Appendix E: Transmission Gear Ratios

Common Transmission Gear Ratios

4L60E, 700R4

Gear Select	Ratio
1	**3.06**
2	**1.63**
3	**1.00**
4 (OD)	**0.70**

Borg-Warner T-5 (F-Body V-8)

Gear Select	Ratio
1	**2.95**
2	**1.94**
3	**1.34**
4	**1.00**
5 (OD)	**0.74**
5 (OD)	**(0.63 some)**

ZF 6-Speed (Corvette)

Gear Select	Ratio
1	**2.68**
2	**1.80**
3	**1.31**
4	**1.00**
5 (OD)	**0.75**
6 (OD)	**0.50**

Borg-Warner 6-Speed
(1993 F-Body standard)

Gear Select	Ratio
1	**3.36**
2	**2.07**
3	**1.35**
4	**1.00**
5 (OD)	**0.80**
6 (OD)	**0.62**

Borg-Warner 6-Speed
(1993 F-Body Close Ratio G92)

Gear Select	Ratio
1	**2.97**
2	**2.07**
3	**1.43**
4	**1.00**
5 (OD)	**0.80**
6 (OD)	**0.62**

Borg-Warner 6-Speed
(1994 – on F-Body)

Gear Select	Ratio
1	**2.66**
2	**1.78**
3	**1.30**
4	**1.00**
5 (OD)	**0.74**
6 (OD)	**0.50**

Appendix F: 'Standard' GM rear-end ratios

GM Rear End Ratios and RPO numbers

GM RPO numbers

Z28/Formula/TA	Corvette	Impala,Caprice
2.73 -GU2	**2.59 -GM1**	**2.56 - GM8**
3.08 -GU4	**3.07 -G44**	**2.93 -GW9**
3.23 -GU5	**3.45 -GM3**	**3.08 -GU4**
3.42 -GU6		**3.23 -GU5**

Appendix G: Typical Tire Revs per Mile

Tire Revs per Mile

From NITTOTIRE.com

NITTO NT460

Tire Size	Revs Per Mile	Static Radius (in)	Static Width (in)	Dynamic Radius (in)
P185/60R13	**956**	**9.92**	**7.91**	**10.55**
P185/60R14	**912**	**10.43**	**7.91**	**11.06**
P195/60R14	**896**	**10.59**	**8.43**	**11.26**
P205/60R14	**877**	**10.79**	**8.66**	**11.50**
P195/60R15	**857**	**11.10**	**8.43**	**11.77**
P205/60R15	**843**	**11.26**	**8.66**	**11.97**
P215/60R15	**824**	**11.50**	**9.17**	**12.24**
P225/60R15	**808**	**11.65**	**9.61**	**12.48**
P215/60R16	**793**	**11.97**	**9.17**	**12.72**
P225/60R16	**779**	**12.17**	**9.61**	**12.95**

NITTO NT450

Tire Size	Revs Per Mile	Static Radius (in)	Static Width (in)	Dynamic Radius (in)
P205/55R15	**871**	**10.94**	**8.98**	**11.57**
P195/50R15	**912**	**10.51**	**8.19**	**11.06**
P205/50R15	**902**	**10.63**	**8.90**	**11.18**
P225/50R15	**871**	**10.94**	**9.45**	**11.57**
P205/55R16	**834**	**11.46**	**8.98**	**12.09**
P215/55R16	**821**	**11.61**	**9.29**	**12.28**
P225/55R16	**811**	**11.77**	**9.65**	**12.44**
P235/55R16	**795**	**11.97**	**10.20**	**12.68**
205/50R16	**865**	**11.14**	**8.90**	**11.65**
P225/50R16	**837**	**11.46**	**9.57**	**12.05**
P245/50R16	**811**	**11.73**	**10.20**	**12.44**
205/45R16	**896**	**10.79**	**8.78**	**11.26**
205/40R16	**925**	**10.51**	**8.82**	**10.91**
215/40R16	**912**	**10.63**	**9.13**	**11.06**
225/50R17	**800**	**12.01**	**9.53**	**12.60**
255/50R17	**767**	**12.44**	**10.75**	**13.15**
275/50R17	**745**	**12.76**	**11.81**	**13.54**
215/45ZR17	**845**	**11.46**	**8.98**	**11.93**
225/45ZR17	**834**	**11.57**	**9.49**	**12.09**
205/40ZR17	**886**	**11.02**	**8.90**	**11.38**
215/40ZR17	**874**	**11.14**	**9.13**	**11.54**
235/40ZR17	**851**	**11.38**	**10.35**	**11.85**
215/35ZR18	**868**	**11.30**	**8.94**	**11.61**

NITTO NT555

Tire Size	Revs Per Mile	Static Radius (in)	Static Width (in)	Dynamic Radius (in)
205/45ZR16	**899**	**10.79**	**8.82**	**11.22**
235/45ZR17	**821**	**11.73**	**9.88**	**12.28**
P245/45ZR17	**811**	**11.89**	**10.20**	**12.44**
P255/45ZR17	**800**	**12.01**	**10.67**	**12.60**
205/40ZR17	**884**	**11.06**	**9.10**	**11.41**
225/40ZR17	**862**	**11.26**	**9.57**	**11.69**
255/40ZR17	**829**	**11.65**	**10.75**	**12.17**
P285/40ZR17	**800**	**12.01**	**12.05**	**12.60**
225/40ZR18	**829**	**11.73**	**9.57**	**12.17**
235/40ZR18	**821**	**11.85**	**10.00**	**12.28**
245/40ZR18	**811**	**12.01**	**10.31**	**12.44**
P275/40ZR18	**781**	**12.36**	**11.57**	**12.91**
255/35ZR18	**829**	**11.77**	**10.67**	**12.17**
265/35ZR18	**821**	**11.85**	**11.10**	**12.28**
275/35ZR18	**812**	**11.98**	**11.56**	**12.42**
285/35ZR18	**800**	**12.09**	**11.97**	**12.60**

NITTO NT555R Extreme Drag

Tire Size	Revs Per Mile	Static Radius (in)	Static Width (in)	Dynamic Radius (in)
205/55R14	**908**	**10.43**	**8.90**	**11.10**
275/50R15	**808**	**11.68**	**11.77**	**12.48**
205/45R15	**938**	**10.28**	**8.66**	**10.75**
225/50R16	**834**	**11.46**	**9.57**	**12.09**
245/50R16	**811**	**11.77**	**10.39**	**12.44**
205/45R16	**899**	**10.79**	**8.66**	**11.22**
275/40ZR17	**811**	**11.85**	**11.57**	**12.44**

Appendix H: Frequently Asked Questions (FAQS)

Q: Why are there individual versions of DataMaster for each platform?

A: Each GM platform has a unique datastream which includes much engineering data not normally seen. We provide the user access to ALL the data so they can decide what is useful. As a result, each DataMaster version is tailored to a particular platform's individual datastream, and is not compatible with other platforms.

Q: Is there a way to start and stop data recording without using the Mouse?

A: Yes. After opening a file and preparing to record data, use the Tab key to shift focus to the Auto button. To begin recording, press the space bar. To end recording, press the space bar again. To restart again, you will need to use the tab or left arrow key to shift the focus to the "Auto" key again.

Q: When I exit the record mode, only the last 50 records of data were saved. What Happened?

A: When this occurs, the most common cause is that the program was in monitor mode, not recording mode. When in monitor mode, only the last 50 records are retained and saved.

Q: Is there a way to scroll back and forth through the playback records without clicking on the scrollbar control?

A: Yes. After clicking on the scrollbar or the graph display, the records may be individually scrolled by using the left and right arrow keys.

Q: How come the graph has no scaling?

A: This is because each item on the graph would have a totally different scale, resulting in too much to show in the limited space available. Use of the graph to view trends and points of interest which can be zoomed in and examined in detail using the SnapShot display in conjunction with the main display.

Q: After exporting my data in CSV format, when I load it into Excel some of the values are changed. What is causing this?

A: The newer versions of Excel automatically import CSV files using the "general" format for cells. In some cases, this causes certain values to be interpreted as a date, and Excel replaces the original data with a date. The workaround is to rename the file with a "TXT" (or other) file extension, and excel will then prompt you via a wizard on how to import the data. This allows you to select Text or Numeric as your datatype, and the original data will be preserved.

Q: I've noticed some "glitches" in the data that is recorded. What Happened?

A: On some of the early ECU's (generally 1993 and earlier), this occurs when interrogating at the maximum sample rate. Basically, these older PCM designs do not have enough "headroom" to simultaneously run the engine and provide data at the maximum rate, thus some datapoints are skipped. Try reducing the sample rate to 5 or less samples/second. Also, we have found that certain PCMs actually have bugs in their internal ALDL routines such that erronious data is occasionally transmitted.

Q: I want to record a run longer than the 16,000 record limit. Is this possible?

A: Yes, you can record an unlimited length run, but the playback program will only allow display of the first 16,000 records. 16,000 records represents almost 30 minutes of continuous recording at the maximum sample rate of 10/second. If you require a longer time interval, slow down the sample rate as required to meet the 16,000 record playback limit.

Q: I can't get the sample rate all the way to 10. What's the problem?

A: The actual sample rate is dependant on the particular PCM, the speed of your PC, and the "Options.. Display" setting on the Data Acquisition screen. To maximize the sample rate, select the "Update Off" or "Update Partial" setting. This frees the PC to spend its time collecting data, instead of drawing on the screen.

Q: I get a message the printer is not installed every time I start up DataMaster. How do I fix this?

A: This can happen if the Windows system printer was deinstalled after DataMaster has been run. The best workaround is to reinstall any printer (even if there is not one connected to the system).

Q: When I click on the or Start menu to launch DataMaster, the “Initializing DataMaster” logo screen appears, but after about 2 seconds the program quits and exits with a system error. What is wrong?

A: This has been reported to happen occasionally if a printer driver is not installed, or cannot be found. The solution is to install any printer driver on the PC and set it as a default, even if there is no physical printer present. TTS is investigating the root cause of this problem.

Q: The instructions regarding "Setting up and acquiring ALDL data" talk about selecting using "file open" to select a file..... There is no "open" option under the "file" menu. They also talk about selecting a COM port from the "setup" menu..... but the "Setup" menu has no "COM port" option. What gives?

A: In order to record or monitor data, the “Serial Data Acquisition” form must first be opened from the main DataMaster playback form by selecting the File..Record ALDL Data menu. Option. The “Serial Data Acquisition” form has the communication and File menu selections you are looking for.

Q: I was playing with Datamaster some more and noticed that the histogram has 176 cells scattered across the VE vs. RPM range. Is this the same thing as the BLM cells? I thought there were only 16 BLM cells, 0 thru 15?

A: The cells in the histogram do not directly correspond to the BLM cells that the PCM uses. There are a couple of main reasons for this:

1) Different PCM's use different operating regions for there BLM definitions ie, we could not just choose one and have it be correct for all applications. In fact, different calibrations for the same vehicle many times move the cells around a bit!

2) Having more cells gives you better resolution as to exactly where the operating point is. This gives you better information on what region of the fuel map needs to be altered.

If you know the exact boundaries of the PCM you are evaluation, you can export the data to excel and write some equations to tell you what cell you are in for each line. You could then do an X-Y scatter plot of this and see how it looks--However, you loose the "live" aspect of the playback that the Histogram gives you!

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Q: I am having a licensing problem: I put in the code you supplied and hit the register button--the registration # changed but when I tried to Record ALDL it said my demo had run out. What next?

A: There was a bad digit in the Authorization or Registration number. Send us the new Registration number and we will issue you a new Authorization code.

Q: The software is a great ! However, the Data frame rate is only 5.0 - 5.5 samples per second. Is this PC or CPU related ?

A: Samples per sec depends on 3 factors: 1) the specific PCM, 2) the speed of the PC, and 3) what screen Update options are selected.

When recording or monitoring data, there are 3 options you can select from the Serial Data Acquisition form: Update.. All, Update.. Partial, and Update.. Off. The less that is updated on the screen, the faster data can be collected until the limit of the PCM is reached. For example, a Pentium 166 laptop with Win98 can typically receive data from the LT1 at about 6 F/sec with Update..All selected, and about 8-9 with Update..None selected. A faster PC will be able to maintain a higher frame rate when lots of graphics are displayed. The ultimate limit is the PCM, which tops out at about 10 frames per second.

Q: I was under the impression that the "Record ALDL data" option was for data logging only. Is that not correct? I am not trying to log (record) data over a period of time, I just want to view the current data stream to check the DTC's, BLM's, O2's, etc. Is it necessary to "record" the data for this, and does the software require an authorization code?

A: The way DataMaster works, there is currently no distinction between monitoring and recording of data from an authorization standpoint, after the free trial period expires authorization is required for either. Both modes are accessed from the same "Record ALDL Data" menu selection. This brings up the Serial Data Acquisition form, where all the communication and ALDL options selected from, including Monitor or Record mode.

Q: I got the cable yesterday and my laptop today. I downloaded the Demo TTS software but when I click on it, it gives me an error message saying "A device to the system is not functioning" What gives?

A: It's not uncommon for a laptop to be improperly configured for use of the serial ports the first time out of the box.

First, has your serial port ever been set up to use an external mouse or a device such as a Palm Pilot cradle? If so, those drivers can interfere with the proper operation of the software.

Next, if you go to Start... Settings... Control Panel... System Icon... Device Manager... Ports(Com and LPT) and take a look in there, do you see COM ports? Is COM1 available, or is there another port? Or does it have an X through it?

If you have an infrared device driver loaded on your laptop (many of them do), they can actually interfere with the serial port you're trying to use. You might disable infrared devices in that Device Manager setup.

If you don't see any Com ports under the Device Manager, then you'll need to go in to your BIOS (how you get there depends on your laptop), and enable the Com port. See the PC's manual for how to get in to the BIOS, it varies from machine to machine.