

***RPM*** *PERFORMANCE PRODUCTS INC.*

***DL10*** *DATA LOGGER*

*AND RPMPRO SOFTWARE*

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## **INTRODUCTION**

The DL10 Data Logger by RPM Performance Products is designed to be as simple to use as we could make it. If you are familiar with the Windows operating system, the majority of the functions will be familiar to you. If you are new to computers, don't worry, you only need to learn a few simple functions to be able to use the RPMPRO software. If you know someone who is familiar with Windows, having them show you the basics is the easiest way to get started. You should be up and running in less than an hour.. All the software functions are available in pull down menus, so once you know how to "point and click" the rest is easy.

The software contains all the programs necessary to setup the data logger, download runs, calibrate and display the data as well as functions to display data in real time and setup and fill in a log book. Once the initial setup is done to your liking, most of the rest is automatic.

Once you get used to using the data provided by the DL10 we are certain you will be very pleased with your unit and software.

## **SETUP**

The DL10 allows you to configure the way it works and the way the graphs look. There are two main SETUP screens for the DL10. The first screen is used to set the functions for the Data Logger itself. This screen is found in the CONNECT menu and is used to set the active channels, sample rates and record functions of the DL10. The second setup is the DEFAULT GRAPH in the SETUP menu. This screen is used to set how you want the data to be displayed when a run is graphed.

## **COMM PORT SETUP**

Once you have installed the software on your PC, the communication port needs to be setup so the PC can talk to the data logger. This is a simple, and only requires two selections. From the RPM PRO menu selections at the top of the screen, click on CONNECT to display the connect menu selections, then position the cursor on SETUP, then click on COMM PORT SETUP.

This brings up a setup window for the communications port. If you are using the standard serial port to connect to the data logger, select the port you will be connecting to the data logger. This will usually be COMM 1 or 2.

If you are using the USB adapter, you will need to first install the driver that came with the adapter. The instructions for installing the driver are on the driver CD that came with the USB adapter. Once the driver is installed you will need to look in the device settings on your computer to determine which comm port was assigned to the USB adapter, then start the RPM software and select that port as explained above.

The other setting is the baud rate, this should be set to 115,200.

## **DATA LOGGER SETUP**

The DL10 Data Logger is designed to be flexible in fit and function in order to allow you to select what works best for your car. The Data Logger Setup screen allows you to select the sample rate for each channel, the number of runs to store internally and the best method for controlling the record functions.

To setup the data logger you will need to connect the DL10 to the PC and turn on the 12 volt power to the logger.

Then click on CONNECT, then SETUP, then DATA LOGGER SETUP.

At this point, the PC will attempt to read the current setup from the data logger. If the comm port has been correctly setup, and communication is established, the Data Logger Setup Screen will be displayed.

There are three sections in the setup screen: Channels Setup, Memory Setup and Acquisition Setup.

The Channel Setup is used to select the sample rates for the channels and to setup the RPM functions. To setup your Data Logger channels, select the sample rates for the channels you are using.

For most sensors, 100 samples per second is more than enough. RPM channels, fuel pressure, oil pressure, acceleration, throttle position and flowmeters all present valid data at 100 samples per second. On some cars it may be necessary to sample shock travel sensors at 250 samples per second, but 100 is usually more than enough. Since higher sample rates use more memory, and take longer to download, the idea is to set the sample rates high enough to get all the data, but not so high as to unnecessarily reduce the total recording time available.

The first channel is the Engine RPM channel, labeled ERPM. For RPM channels, the actual number of samples recorded depends on three things. (1) Pulses/Revolution. (2) Pulses/Sample and (3) the actual RPM of the engine

Typically, set the sample rate to 100 Samples/Second and use the Pulses/Sample setting to setup for the RPM range your engine typically runs.

For 8 cyl engines, if your maximum RPM is less than 4500, set the Pulses/Sample to 2. If your max RPM is 4500 or higher, set it to 4.

# Cyl	Maximum Engine RPM	
	less than 4500	more than 4500
8	4/2	4/4
6	3/1	3/3
4	2/1	2/2

(Pulses per rev / Pulses per sample)

The Drive shaft RPM channel needs to be set a bit differently. The system is designed to allow for 1, 2, or 4 pulses per revolution. Most cars benefit from 4 pulses per revolution (4 magnet collar) and 2 pulses per sample. This gives 2 samples per revolution while the RPM is low at launch. Set the Samples per second to 100. If the pulses per sample is set to a value less than the number of pulses per revolution it is important to install the magnets so that the spacing between magnets is equal. If this is not done, the drive shaft graph will look "jittery" at higher RPMs..

Once the RPMs are setup, set the sample rates for the remaining channels. Keep in mind that the higher the sample rate, the less total recording time you will have. For most cars a 100 samples per second rate works out best overall, so unless you need a high rate for a particular sensor, use 100 or less. For any channels you are not using, set the rate to 0.

The next section is the memory setup. In most applications, the memory is large enough to hold several minutes of data. This allows the memory to be divided into several "partitions" in order to store several runs. When a recording is initiated, the computer will automatically store the data to the next available partition. If all partitions have been used, the computer will clear the oldest recording and use that partition to record the data.

When you select the number of runs to store, the seconds per run will be calculated from the sample rates you have selected and will be displayed in the seconds window. This tells you how long the recording will be, so select the number of runs that will allow the computer to store the complete run as well as some additional time. For example, if your car runs 9.90, select the number of runs that allows for 20 or more seconds of recording.

The Acquisition Mode setting tells the data logger how to store the run. This can be either Manual or Automatic. If Manual is selected, the computer will begin recording when the record button is pressed and record until the memory partition is full, then stop. This is ok in most cases, but can be frustrating if something delays the start of the run. For example, if the unit is setup to record eight, twenty second runs, and the record button is pressed before you stage, the recording starts at that time. Then if the racer in the other lane doesn't stage until 10 seconds later, and the green comes 2 seconds after that, you only have 8 seconds of recording time left. If you run 12.0, the last 4 seconds of the run won't be stored.

The Auto mode allows the computer to watch for the start of the run and use the memory efficiently, allowing the complete run to be stored regardless of how long it takes to start the run.

By selecting one or more of the Auto settings and entering "launch values" in the ERPM, DRPM and/or Accel windows, you are telling the computer how to detect the start of the run. If one or more of the Auto setting is selected, the logger will be setup to record the amount of time prior to launch that is selected in the "Seconds of prelaunch" window, then fill the remaining memory during the run, then stop. (You will need an accelerometer connected to the data logger for the Accel start function to work.)

For example, if Auto start is set for ERPM at 5000, and the unit is set for 8, 20 second runs, with 3 seconds of prelaunch, the computer will begin recording when the record button is pressed, and then watch for the engine RPM to exceed 5000. Once the RPM goes over 5000 during staging or at launch, the computer will store the previous three seconds of data, then record the run in the remaining memory.

This way, it doesn't matter how long the delay was from the time the record button was pressed until the run started, the computer still stores the complete run. The only thing to remember is that the computer will begin the main recording once the RPM level is exceeded, so if you press record, then rev the motor to clear it, the main recording will be started, so if you normally clear the motor prior to staging, don't press record until after you clear the motor, or use the DRPM and/or Accel setting for the Auto start.

When using the Auto start mode, it is best to set at least two of the start setting. If either of the start setting is seen, the computer will begin the main recording. This prevents you from losing a run if for any reason the selected Auto Start channel is not working. For example, if the Auto start is set for drive shaft RPM only, and the sensor was unplugged while working under the car and not plugged back in, the computer would not store the run. However, if DRPM and ACCEL are both set, the recording would still function correctly.

When setting Auto start values, set the ERPM value about 20% below the RPM your engine sees at launch, or, if you stage on a chip, 20% below the chip. For example, if you stage at 5000, set the ERPM start to 4000. When setting the DRPM start value, set it high enough so that it exceed the value it may see while you are staging. For most cars a DRPM start value of 500 or 1000 is best. If you have an accelerometer (G meter), when setting the Accel start value, set it to 50% of the peak acceleration you get at launch. If your car launches at 1.5 G's, set the start value to .75 G's.

Now that the Acquisition Mode is selected, we can set the memory accordingly. If you used Auto start recording, when setting the number of runs it is best to set it so that the seconds per run is at least 10 seconds longer than your ET, plus the prelaunch seconds. For example, if you run 9.50 and you selected 5 seconds of prelaunch data, select the Run value that gives you at least 24.5 seconds of recording time per run. This may seem like more than you need, but it gives you room for unforeseen events. It is not uncommon for a driver to forget not to clear the engine after the record button is pressed. With the extra 10 seconds, you may still get the run.

If you choose to use the Manual start mode, give yourself plenty of time to allow for unforeseen delays.

One other thing to remember is that longer runs take longer to download and process in the PC. A 30 second recording can usually be processed and graphed in a few seconds, but if you select 1, 5 minute recording, it may take a minute or two to download and process.

## DEFAULT GRAPH SETUP

From the RMPRO menu selections at the top of the screen, select CONNECT, then SETUP, then DEFAULT GRAPH SETUP. (The data logger needs to be connected to the PC and power applied)

This brings up a setup window that has four sections.

The Data Channel section of the screen allows you to set the way you want each channel to be displayed in the graphics. The first column on the left shows the data channels available in the data logger (the third RPM channel is not available yet). The columns to the right are used to set the graphics for each data channel. These columns are labeled *Position*, *Scale*, *Show/Hide Scale*, *Name*, *Filter* and *Default*.

The *Position* setting indicates whether the channel is to be displayed in the upper or lower section of the graphics display. Displaying all the channels on one graph can get a bit confusing, so the display screen can be divided into two sections, each one graphing different channels. Using the *Position* setting, you can select where you want each channel to be displayed. Usually, since the RPM channels are the most important and most looked at channels, they are set for Upper, and the rest of the channels are set for Lower.

The *Scale* settings set the range of the graph for each channel. The *Show/Hide Scale* box determines whether the scale values will be displayed to the side of the graph or not. Checking the box will enable the scale display. The *Name* column allows you to label the channel as to its function. This name will appear in the heading above the digital reading in the graph display, for example, you could name Aux1 "OIL" if its is connected to an oil pressure sensor. Then when the graph is displayed you don't have to remember which sensor is connected to which channel.

The *Filter* column allows you to select different levels of filtering for each channel. These are digital filters that can be used to "smooth" out the displayed data. The data logger does not filter the data when it is recorded, so you always see what is really there, but in some cases you may want the presentation to be filtered for better analysis. There are two reasons to use filtering. The first reason is if we are interested in the average value and not necessarily the how much it goes up and down. One example of this is carburetor fuel pressure. During a run, and especially at launch, the fuel in the bowls is sloshing around quite a bit, this causes the needle and seats to open and close frequently. The regulator is trying to keep up with the changes in flow, but most of them can't maintain a constant pressure under those conditions. This results in an fuel pressure display that varies quite a bit above and below the regulated pressure. Since we know this goes on, filtering the data to smooth out the display gives a better idea of the average fuel pressure.

The second reason to use filtering is to eliminate electrical noise. There are a lot of electric fields generated in a race car. Sometimes these fields induce voltage or "noise"

in sensors and cables. Careful placement of sensors and cables when installing a data logger will eliminate most of this noise, but sometimes it is unavoidable. In those cases the filtering can be used to keep it from showing up in the graphed data.

Typically, start with filter settings of 1 for all channels except the Accelerometer (G Meter). It is designed to use filter 3.

The last column is *Default*. When a run is downloaded or opened from a file, the channels with this box checked will be displayed in the initial graph. To display the other channels on the graph, left click on the digital value for that channel in the upper portion of the graphics display. So, if the first thing you want to see after downloading a run is ERPM, DRPM and G meter only, check those boxes and uncheck the others.

Below the Data channel section is the colors section. This allows you to set the color for each channel. Since the software allows you to display four runs at once, you can set the colors for each channel of each run. There are basically two ideas regarding setting colors, depending on how familiar you are with reading the graphs. If you are new to data loggers and graphic displays, set each channel to very different colors, and only load one run at a time for a while. Once you get used to what each channel looks like, you can set the channels in one run to similar shades and display multiple runs without getting confused. What this means is that once you get used to what your engine RPM and drive RPM look like, it will be obvious to you which one is which even if they are the same color, so for Run1 you could set the channels to different shades of blue and Run 2 to different shades of red, Run 3 to greens and so on. Then it will be obvious to you which curves go with each run even though you have a lot of channels on the screen.

Since identifying the channels can be confusing at times, the software also allows you to change the color of a channel while the graph is displayed. Just right click on the digital value for the channel and a color window will pop up, allowing you to change its color. This changes the color in that display only and does not alter the setting in the Default Graph Setup.

The next section of the Default Graph Setup is the Auto Zero feature. The graph display shows the elapsed time in seconds across the bottom of the graph. This function allows the computer to automatically set the seconds to zero at the point where you left the starting line. To use the Auto Zero, select either DRPM or Accelerometer (if you have one). If you select Accelerometer, set the Launch Level to about half of your max G's at launch.

The last section of the Default Graph Setup is the default display seconds. This will set the amount of time you want the computer to display in the initial graph. Typically, you will want to see a couple seconds before launch, the complete run, and a second or two after the finish line. This does not change the amount of data downloaded. The download always reads the complete recording. This only sets the initial display. If you want to see more than was initially displayed, just click on ZOOM OUT from the menu to see the complete recording.

If you used the Auto Zero function above, the start second for launch will be 0, so if you want to see some of the data prior to launch, set the graph seconds prior to launch to a negative number of seconds before launch such as -2 to see 2 seconds before launch. If you do not use the Auto Zero, the first second of the recording will be 0, and the "seconds before launch" will be the start at second, so you can adjust the start second accordingly. For the graph seconds after launch, if you use Auto Zero, set it to your ET plus a second or two. If you don't use the Auto Zero the "seconds after launch" will be the stop second.

This may be a little confusing, so as an example, consider a 9.90 run with Auto Zero set. The start seconds would be set to -2 and the stop seconds would be set to 11. This would display 2 seconds before launch, the 9.90 seconds of the run and 1.1 seconds after the finish line.

### **SAVING THE SETUP**

After you have these setting the way you want them click the SEND AND SAVE button at the bottom of the screen to store them permanently into the Data Logger. When you download a run, the display settings are read from the data logger and the display will be presented as you have configured it.

## **DISPLAYING REAL TIME DATA**

The DL10 data logger allows you to monitor real time data on your PC. This is useful for checking sensors and making adjustments. To monitor the sensors, connect the data logger to the PC, then from the CONNECT menu, select DISPLAY.

## **RECORDING DATA**

To start a recording, simply press the record button. (The button needs to be pressed even if you have the Auto Start function setup.)

The system will stop recording automatically, so you don't need to do anything else. If you have set the Acquisition mode to Auto, remember that in order to get a recording and store it, the computer needs to detect launch. For example, sometimes it is useful to record a warmup in the pits to checkout the car, so if you are set for Auto Acquisition using the drive shaft, be sure to turn the tires after pressing the record button so the computer will detect "launch", otherwise it won't record what you want to see.

Once the recording is started, the green light on the data logger will come on. This light will go out once the recording is done. Be sure not to turn off the data logger before the green light goes out. Once the recording is done, the data logger may be turned off without losing the run.

The memory in the data logger is non-volatile, that means that the stored data will be retained even if the data logger is turned off for an extended period of time.

## **DOWNLOADING DATA**

To download recorded runs, connect the data logger to the PC and start the RPMPRO program. From the CONNECT menu, select DOWNLOAD. This will bring up a window that displays the runs stored in the data logger. This window will have a Run number and the date and time for each run stored. If the run has been downloaded previously, the filename used will also be displayed in the far right column. If the filename column is blank, that run has not yet been downloaded. To download a run, click in the filename box and enter the filename you wish to store it as. Once the filename has been entered, you will notice that the far left box for that file will highlight, indicating that the run has been selected for download.

You can select up to four runs at a time to download by giving each a filename and highlighting the select box. Once the runs to download have been selected, click the DOWNLOAD button. The runs will then be downloaded, stored to files, opened and graphed automatically using windows protocols. During the download you can select the destination folder to store the runs in. The RPMPRO software will remember the last

destination used and offer it as the first choice. In this manner you can change to a new folder without having to select the path each time.

## **GRAPHING RUN DATA**

### **THE INITIAL DISPLAY**

The graphics display window in the RPMPRO software has four sections. The top line is the menu or "pull down menu" line. Below that is the Text window and below that are the two graph windows.

The menu line operates in standard Windows fashion, click on the heading to pull down the menu selections for that category, then click on your choice.

The Text window displays the files and text values for the data. Within the graph windows you will see a thin black vertical line. This is the text marker for the text window. That means that the data channel values displayed in the text window are the values at that text marker line. To move the text marker to a different point, position the arrow cursor at the point you want to read and click. The text marker will move to that position and the text values will be updated to display the values at that point in the run. The text marker can also be moved by using the left and right arrow keys or the page up/page down keys on the keyboard. By moving the text marker around, you can read the exact values for any channel at any point in the run.

### **ADDING OR REMOVING CHANNELS TO THE GRAPH**

We have tried to make the graphics control functions very flexible, and to have the functions operate with the least number of operator inputs. Since viewing the data is the primary function, we built in several ways to alter the displayed data. Most of the controls are operated by clicking on the text entries in the text window. To add or remove any channel to the graph display, simply click on the text value for that channel. Click to add, click again to remove. You will note that when the channel is displayed, the text color matches the color of the line in the graph. To change the color (temporarily), right click on the text value and a color window will pop up to select from. This will not change the Default Settings, only the color on this display.

If more than one run is displayed, you can add or remove the graphs for a specific channel in all runs by clicking the channel name above the text values. For example, if the graph is showing the ERPM, DRPM and Accel data for runs 1 through 4, and you wanted to turn off the four Accel graphs, just click on the "ACC" name above the text values for the accelerometer. Similarly, if you want to add or remove all the default curves for Run 2, click on the Run 2 filename. Basically, the add /remove function is like this: Click on the text reading for a data channel to add remove the channel, click on a column heading (Name) to add or remove all the curves in that column, click on a Run filename to add or remove the curves from that run.

## **TIME SLIP/NOTES DISPLAY**

Although the software provides for a detailed log book, we have found it useful to have quick access to important information regarding the run while the run data graph is being displayed. To bring up the quick information lines, RIGHT click on the filename listed in the far left column of the text portion of the display. The first RIGHT click will bring up a Time Slip line, where you can enter the information from your time slip. RIGHT click on the filename again to bring up a "Notes" line, where you can enter facts about the run you wish to record for future reference. RIGHT click on the filename again to bring up the "Split Times" line, which will display the time intervals between time slip entries.

These three information lines are also part of the Log page for the run, and can be filled in while displaying the lines on the run graph or by opening the log page.

These functions will also work if more than one run is being displayed at the same time. For example, if four runs are open and overlaid, by doing one right click on each of the four filenames, all four time slips can be displayed for comparison.

To close any of the quick information lines, click in the background of the line you wish to close.

## **ZOOMING IN / OUT**

To enlarge an area of the graph, hold down the Shift key on the keyboard, press the left mouse button and drag the mouse over the area to be enlarged. As you drag, a box will be drawn around an area of the display. Once the box encloses the area you want enlarged, release the shift key and mouse button and the software will enlarge that region to fill the graph window.

To return to the previous screen, click on ZOOM OUT in the menu at the top of the screen. Clicking on ZOOM OUT while the default screen is displayed will generate a graph of the complete recording, including all recorded data prior to and following the run.

## **MODIFYING THE DISPLAY**

Anytime a run is downloaded or opened from a file, the computer reads its setup information and displays the data accordingly. (This is the setup file that was generated when you did the Default Graph Setup.) If for any reason you wish to change the way an opened run is displayed, (usually scale changes), select RUN 1 SETUP from the SETUP menu, then change whatever you like. These changes will only change that run. If you want to change the setup for future downloads as well, you will need to connect the data logger to the PC and do the Default Graph Setup.

## **Multiple Run Display**

When more than one run is loaded it is possible that the runs may have different setup files. If more than one run is being displayed, the setup file for Run 1 is used. If you have added or changed sensors along the way, and the channel names for runs 2 to 4 are different, the software will "gray out" the text data box for those channels to let you know the data in those channels is not the same type as in Run 1.

## **LOG BOOK**

### **SETTING UP THE LOG PAGE**

Each time a run is downloaded from the data logger, the software stores a copy of the default log page with it. This log page can then be accessed while the run is opened and specific data for that run can be entered and saved for future reference. This log page provides for time slip entry, notes entry, split time calculation and a large "racer setup" section. The top three lines of the log page can also be viewed from the run graph screen. The racer setup section can contain whatever information you want to record.

To setup the racer setup section of your log page, select "DEFAULT LOG PAGE" from the LOG menu. The log page setup window is divided into two columns. The left column is where you will enter the information type while doing this setup. The right column is where the log information will be entered from each run. For example, if you want your log book to contain weather information, the first four lines in the left column could be TEMPERATURE, BARROMETER, HUMIDITY and ALTITUDE.

The basic function of the log page is that items in the left column can only be changed during the DEFAULT LOG PAGE setup. Items in the right column can be changed in the setup or when the page is opened for a run. By entering those items in the left column, they will appear on the log page when opened from a run. Then the information for that run can be entered in the right column and stored in the log page for that run.

Some information that you wish to be in the log page, may not change very often. Since it would be a nuisance to have to enter it every time you download a run, you may want to put it in the default log page so it will be there already. For example, if you don't change carb jets very often, enter "JETS" in the left column, and the jet sizes in the right column of default log setup. That way the sizes will be part of the log page for each run stored without having to enter them each time. If you change jets, modify the default page, so runs downloaded after that will have the new jet size recorded in the log page. For the items that you wish to enter each time you download a run, leave the right column blank.

### **ENTERING DATA TO THE LOG PAGE**

Entering run information into the log page can be done in several ways. When the run is open, Time slip and Notes sections can be filled in from the run graph display by RIGHT clicking on the run number in the text section. Also, if the run is open, the complete log page can be accessed by selecting "LOG FOR OPEN RUNS" from the LOG menu at the top of the page. If the run is not open, and you wish to view or modify the log page, select VIEW LOG BOOK from the LOG menu.

This will open the complete log book and you can select the log pages you wish to view or modify.

## **CALIBRATIONS**

Each of the four analog channels, and the Accelerometer channel needs a calibration to convert the voltage reading into the actual pressure, temperature or other reading. Most sensors will come with a calibration sheet, and you need only enter those values. If you purchased sensors with your unit, we have already entered the calibrations for you (except shock travel and other sensors that need to be calibrated on the car).

Entering the calibration is a simple process, and usually takes less than a minute for most channels. To bring up the calibration screen:

1. Connect the PC to the Data Logger.
2. Start the RPMPro software and power up the data logger.
3. From the CALIBRATE menu, select Calibrate Channels.

This will read the calibrations from the data logger, and display them on the screen.

## **ACCELEROMETER CALIBRATION**

The accelerometer (G meter) needs three calibration values, one for +1 G, one for -1 G and one for 0 G. These values are obtained by rotating the sensor relative to gravity. At the top of the screen you will see the three cal points, and, at the right, the "Current Data Reading". Connect the G meter to the data logger and hold it so that the arrow points straight up. Watch the "Current Data Reading" and slowly rotate the G meter slightly back and forth and sideways until you get the highest stable reading. This point should be very close to straight up. Enter the highest stable reading into the +1 G calibration box.

For the -1 G calibration, point the arrow straight down and position it for the lowest stable reading in the Current Data Reading. Enter this value in the -1 G calibration.

For the 0 G calibration, mount the G meter in the car and make sure the car is on level ground and the G meter is parallel to the ground with the arrow pointing directly to the front. Enter the Current Data Reading in the 0 G calibration. This value should be halfway between the +1 and -1 values. For example, if the +1 cal is 600 and the -1 cal is 400, the 0 cal should be very close to 500. If it is not, the G meter may not be mounted level and adjustment to the mount is needed.

Typical calibration readings for the G meter are -1 G = 385, +1 G = 635, 0 G = 510.

Once you have completed the calibration, click on the SAVE button at the bottom of the screen to store the calibration.

## **ANALOG CHANNEL CALIBRATIONS**

The analog channels will have two or more calibration points, depending on the sensor type. For temperature, pressure, vacuum and EGT sensors, a calibration sheet will be supplied with the sensor, and you simply enter the cals as shown on the sheet. For shock travel, position and other selected sensors you will need to calibrate them to actual reading taken with the sensor mounted on the car.

For example, to set up a throttle position sensor we would normally calibrate it to 0 to 100% throttle, so enter "%" in the "Units" box next to the channel number you will be using. With the sensor mounted and connected to the channel, enter 0.0 in the % box for the first calibration point. Now, with the throttle at idle, enter the value of the Current Data Reading into the volts box for the first calibration point. Next, enter 100.0 into the % box for the second calibration point. Now, with the throttle at Full, copy the Current Data Reading into the volts box for the second calibration point.

Once the calibration is complete, click the SAVE button at the bottom of the screen to store the calibration.

To check the calibration, select DISPLAY from the CONNECT menu. This will display the readings from the Data Logger, and you can vary the throttle position and verify that it reads from 0 to 100%.

If you need any assistance calibrating a sensor, please call us and we will be glad to help.

## **MENU DISCRIPTIONS**

### **FILE MENU**

Clicking on FILE in the menu section at the top of the screen will drop down the following selections to choose from:

#### **OPEN**

To open and graph one or more runs, click OPEN to bring up the file select window. To open one run, click on the run name, then click the OPEN button (or double click the run name). To open up to four runs at once, hold down the CTRL key and click on up to four runs then click the OPEN button.

#### **CLOSE**

To close one or more runs, click CLOSE, then select the runs you wish to close, then click OK.

#### **CLOSE ALL**

This will close all open runs.

#### **PRINT GRAPH**

This will print the current graph screen to the default printer connected to the PC.

#### **EXIT**

This will close the RPMPro program.

### **CONNECT MENU**

The four choices under the CONNECT menu are for functions that require connecting to the Data Logger. These are used to download and clear runs, display real time data, or perform the initial Data Logger setup. To use these functions the Data Logger needs to be on and connected to the PC.

#### **DOWNLOAD**

To read runs into the PC from the Data Logger. Selecting this function will connect to the Data Logger, read the file directory of runs currently stored in the Data Logger, and display them for selection.

The display has Select, Run #, Data/Time and File Name columns. For each run stored, there will be information in the Run#, Date and Time columns. If the run had been downloaded previously, the File Name column will also have the file name it was stored under. In the lower section of the window, the target destination for file storage is displayed with a Browse button to allow you to change the folder for file storage. The RPMPro software will "remember" the last target file address so you don't have to select it each time you download.

To download a run, first you need to give it a filename. Click in the File Name box for the run you want to download, then type in the filename you wish to use. When you first start using the Data Logger, give some thought to how you name the runs, so that later on, when you want to recall old runs, the names will help identify them.

Experienced Windows users may want to create a folder for each race such as DAL0603 for the Dallas race in June of 2003, then name the files Q1, Q2, Q3, E1, E2 etc for Qualify 1-3, and Eliminations 1-2. Another way is to just use the date, such as 070403Q1 for July 4, 03 Qualifying round 1. This way when you look at the filename, you know which round on which day, and they will be in date order in the select window.

When you enter a file name for a run the Select box will automatically change to show the file is selected for download. You can select up to four runs for download by giving them filenames or clicking in the Select box. Once you have selected the runs you wish to download, click the DOWNLOAD button in the lower portion of the window. The runs will then automatically be downloaded, stored, opened and graphed.

## DISPLAY

This function will provide a real time display of the data logger channels. The upper portion of the display shows bar graphs of the data with the numerical values displayed below the bar.

## CLEAR RUNS

This function allows you to erase runs in the Data Logger. If you wish to remove any of the runs stored in the data logger click the select box for each run to be cleared, then click CLEAR. It is not necessary to clear runs to allow for new recordings unless you just want to. If the Data Logger memory is full, it will automatically write over the oldest run when the record button is pressed.

## SETUP

This function allows you to set the Record functions of the Data Logger. This includes the sample rates, active channels, run storage capability and acquisition start functions. These functions are explained in the DATA LOGGER SETUP section in the beginning of this manual.

### **EDIT MENU**

The two functions of under the EDIT menu allow you to "Crop" unwanted data from the graph display. If, for example the display was showing a graph that contained the data from two seconds before launch through 5 seconds after the finish line, you may want to "Crop" the data following the point where you lifted at the finish line in order to see the run better.

To do this, move the arrow to a place on the graph after the finish line and click to move the vertical "text line" to that point. Then select CROP RIGHT from the EDIT menu. This will remove the data to the right of the vertical line and expand the graph to fill the window. You will also be asked if you want to make this permanent. If you answer YES, the program will permanently erase ALL the data in the file that was after the time corresponding to the crop point.

To remove data displayed before the run started, move the vertical line to the position on the graph of the first data you want displayed, then select CROP LEFT from the EDIT menu. Again, you will be asked if you want to make this permanent. Remember, if you say YES, you will never be able to see the cropped data again. (It is best to modify the Run1 Display Setup from the SETUP MENU to set the display seconds. That way no data is rendered unretrievable.)

### **LOG MENU**

The three selections under the LOG menu pertain to the Log Book function in the software. The VIEW LOGBOOK selection will bring up the index of runs stored in the logbook. To view the complete log page for one or more of the runs listed, click on the filename for each run you wish to view, then click on the VIEW button at the bottom of the screen. You can also open and graph the runs from here by selecting the runs and clicking on the OPEN button.

The second selection in the LOG menu is for setting up the DEFAULT LOG PAGE. This is explained in the SETUP section at the beginning of this manual.

The third selection, Log For Open Runs, is available when one or more runs are already opened. Clicking on this selection will bring up the log pages for all opened runs.

## **GRAPH SETUP MENU**

The Default Graph Setup is stored in the Data Logger and is used to determine how a run is to be displayed when downloaded from the Data Logger. (This is explained in the SETUP section at the beginning of this manual.)

The difference between the Default Graph Setup in the CONNECT menu, and this Graph Setup is that this Graph Setup only applies to the way the opened run is displayed, while the Default Graph Setup will change the way any run downloaded will be displayed.

Since runs may have different setups, if more than one run is displayed, the setup for run 1 is used, hence, "Run1 Graph Setup". If you want to change the way an opened run is displayed, without changing the way future downloads are displayed use the RUN1 Graph Setup. This may sound confusing, so a little more explanation may help.

When you configured the Default Graph Setup, it was stored in the Data Logger. When you download a run, that Default Graph Setup is also read and attached to the data file as its Run Graph Setup. Since, over time, you may add or change sensors, each run stored needs its own Run Graph Setup. That way when you open an old run, even if the Default Setup has changed, the old run still displays correctly.

By changing the Run Graph Setup, you are only changing the way that run graph is displayed. The changes will be stored back to the Run Graph Setup for that run and the next time you open it, they will be there. If you change the Default Graph Setup, the new setup will not affect any runs already downloaded, but will be used as the Run1 Setup for any runs downloaded from that time on.

## **CALIBRATE MENU**

There are two selections here. The Display/Edit Cals function allows you to modify the calibrations for an open run, while the Calibrate Channels is for doing actual calibrations. Just like the Graph setups in the preceding section, each run needs its own calibrations attached to it. That way if sensors change, the old run is still correct when opened.

When you Calibrate Channels, as explained in the Sensor Calibration section, the results are stored in the Data Logger. Each time a run is downloaded, the cals are read and attached to the run as it is stored. If, for any reason, those cals were not correct when the run was downloaded, you can use the Display/Edit Cals function to correct them so the data will be valid.

## **HELP MENU**

The HELP selection allows you to view this software manual. The manual provides detailed explanations of the menus and functions of the software.

## **ZOOM OUT**

The ZOOM OUT selection has two functions, depending on whether the display has been zoomed in from the Default Graph or not. As you remember, the Data Logger actually records more information than is typically displayed in the Default Graph. For example, lets assume the Data Logger has been setup to record 8, 30 second runs, with 5 seconds of data prior to launch. If the Default Graph has been set to display 2 seconds before launch, and 12 seconds after launch, we can see a 10 second run with 2 seconds before and after.

If the ZOOM OUT selection is used while the default (14 second) graph is displayed, the program will load and display the entire 30 second recording and the run will only occupy about 1/3 of the screen.

If, however, you have used the zoom in function to look closely at a portion of the Default Graph, selecting ZOOM OUT will return to the Default Graph display.

## **INSTALATION**

The DL10 system is easy to install, but it is important to remember a few guidelines. By taking the time to install the system according to these guidelines, you can ensure reliable operation and accurate data.

### **DATA LOGGER**

The Data Logger can be mounted at any angle just about anywhere in the car. Adhesive backed Velcro is a quick and easy method, or you can use the mounting screws on the sides of the computer..

In order to prevent ignition noise from interfering with the operation of the Data Logger computer, don't mount the computer within 1 foot of the ignition box, coil or ignition wires. The magnetic fields created by those components may cause erratic operation.

The power to the Data Logger should be provided through a 2 Amp fuse. This will prevent damage to the computer in the event of short circuits in the sensors or cables. The computer can operate on 10 to 18 volts, and normally draws less than 2/10ths of an amp. It is best not to use the ignition switch to provide power to the Data Logger. If you do this, the ignition will need to be on in order to download a run.

The Remote Record Switch can be placed anywhere you like to allow driver or crew to activate the computer during staging. Use a momentary, normally open switch for this function, and use shielded cable to connect it to the Data Logger.

### **SENSORS**

Each sensor type has different things to consider when mounting, but one thing to remember regarding the sensor cables applies to all sensors. Do not tiwrap the sensor cables to any other wires in the car, especially battery, ignition or fuel pump wires. These wires carry large, pulsating currents and will couple noise into the sensor wires. This is important, and is also the most frequent cause of erratic sensor readings. The sensor wires can be run within an inch of other wiring so long as they are not touching, and if it is necessary to run them through panel with other wires, position them for the least contact possible.

#### **DRIVE SHAFT RPM SENSORS**

The RPM sensors provide a "pulse" to the computer each time a magnet passes by it. The air gap between the sensor and the magnet should be maintained at a constant distance for the best readings. For this reason it is important that the sensor mount is sturdy enough to prevent flexing during the run. If you can flex the mount more than .050" with your

thumb and one finger, it will probably flex during the run, and you will not get stable readings.

With the sensor mounted to the rear end, it is subjected to a lot of vibration. As you know, if you flex a wire a lot at one point, it will eventually break. The most frequent cause of RPM sensor failure is when the sensor wires are subjected to frequent flexing at the point where they leave the sensor. To prevent this, once the sensor is mounted, tie wrap the wires to the mount in such a way that it limits their movement.

## PRESSURE SENSORS

The pressure sensors supplied for your Data Logger are high accuracy units designed for the operate within automotive applications. They can handle under hood temperatures and substantial vibration, however, limiting their exposure to excess temperature and vibration will lengthen their usable lifetime.

## POSITION SENSORS

The rotary style position sensors are a economical way to measure position for throttle, shocks, steering, shifter or others. Two things are important to remember when installing the rotary sensor. Firstly, the mount should have a positioning hole for the small tab on the sensor. This prevents the sensor itself from rotating in the mount and shifting the reading. Secondly, the sensor should be mounted so that it rotates clockwise for increasing measurements. For example, for throttle position, as the throttle is moved from idle to full, the sensor should rotate clockwise.

## VACUUM SENSORS

The vacuum sensors have a silicon measuring element, which is not compatible with fuels or hydrocarbon based oil. For this reason it is necessary to mount the sensor so that fuel or oil will not run into the sensor, limiting its life. Mount the sensor so that the port points down, and connect a hose from the port to the engine.

## TEMPERATURE SENSORS

The oil and water temp sensors can be mounted wherever necessary to access the fluids. The can withstand pressures up to 200 PSI. When mounting to a engine, remember to keep the wiring away from spark plug wires wherever possible.

## EGT SENSORS

The EGT probes should be installed into the header tube approximately 2 inches from the head. The best way to do this is to cut the threads off the compression fitting, weld it directly on the tube, then drill the 3/16" hole in the tube through the fitting. This provides a clean small nipple on the header for attaching the probe.

The depth of the probe into the header tube is also important. The thing to remember is that the probe tip should be at least 1/4" inside the main flow of the exhaust gasses. In most cases the main exhaust flow leaving the head flows to the top of the exhaust tube. This means that if you have mounted the probe to the top of the tube, it should extend into the tube about 3/8 to 1/2 inch. If you have mounted the probe to the underside of the tube, the probe tip will need to be positioned so that it is approximately in the center of the tube.

The EGT probe will require a thermocouple amplifier in order to connect it to the Data Logger. The amplifier should not be mounted on the engine. Mount it to the firewall, fenderwell or frame, away from ignition wiring.

Once the sensor and amp are mounted, route the probe wire to the amp, keeping it away from ignition wiring. Cut the probe wire to length, push back the stainless braid and install the yellow, thermocouple connector on the wire and plug it in to the amp. When installing the yellow connector, note that it is polarized, and is labeled + and -. The wires in the thermocouple probe cable are red and yellow, and the yellow wire is the positive wire. If the probe is wired backwards, it won't be damaged, but it won't read. Also, note that the prongs on the yellow connector are different sizes, and correct alignment to the plug on the amp is needed. It is not difficult to plug it in backwards, so be sure to align it correctly.