



Family Software

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'Drag Racing Computers and Software' - www.iFamilySoftware.com

DataMaster™ Sportsman Computer- Instructions

Introduction

Congratulations on purchasing the most accurate drag racing data recorder available today. The Family Software DataMaster data recorder represents the future in drag racing data recorders. All other data recorders monitor their channels through interrupts which occur a small number of times per second. The number of interrupts that occur each second is referred to as the sampling rate. Sampling rates that are currently being used are about 10 to 60 times per second. This equates to approximately every one tenth of a second. Because events can and do occur faster than the sampling rate, the data gathered is distorted and results are often inaccurate. In fact, data gathered is usually so distorted that the resultant calculations must be smoothed (or averaged) to even be viewed. Consequently, by smoothing the data, the small changes that you are trying to see and analyze in the first place are no longer there. A smooth looking graph may make a pretty picture but it will not show the tiny variances drag racers are searching for. A collection of pretty pictures will not help you in your efforts to improve performance. In a sport where races are won and lost by one (1) thousandths of a second, sampling data only every tenth of a second is practically useless.

The Family Software DataMaster data recorder does not use interrupts. It continually monitors its input channels and records each event at the exact instant it occurs. A much higher sampling rate is provided (over 3300 times per second) which allows data to be viewed as a frequency. It's internal timer measures each pulse width of a frequency channel to within 1-1/100,000ths (.00001) of one second making it possible to see even the smallest change in frequency. Minute changes in engine or drive shaft revolutions can now be seen and analyzed that were never before possible. Excessive smoothing of data is no longer required or advantageous. Vehicle reaction time (VRT), elapsed time (ET), ET segment times and other events are reported to 1-1/1000ths of a second. While distance reported is in feet, in time to distance computations, DataMaster can effectively see the actual track distance traveled to less than two (2) inches. DataMaster is the only data recorder that reports accurate performance data in time slip form that will actually match a Compulink timing system. DataMaster downloads its data in under 4 seconds! There is nothing better.

The DataMaster will accept any DC power source from 9 to 36 volts. It uses a 128K battery backed RAM to store four (4) complete runs in memory before having to download data. A 64K EPROM contains the operating system. There are a total of 9 digital input channels currently available that can detect contact closures, count pulses, or respond to logic levels. Two of these digital inputs are used to record engine RPM and drive shaft RPM, one channel is used by the system, and six channels are used to measure events that occur on the run such as shifting, braking, throttle position, etc. Seven more channels are currently reserved for future expansion. A forty (40) character liquid crystal display (LCD) screen and 12 button keypad are used to display data after each run and to perform various other functions. The data recorder supports RS232 communication for downloading data directly to a IBM compatible PC for graphing and analysis.

Installation

Data recorders like all computer components are not vibration or water resistant. Therefore, the unit must be located on the vehicle where it is protected from moisture and vibration. Also locate the unit away from the engine to eliminate RFI interference. Use the rubber mounts provided (MSD Part # 8823) to secure the unit in a position where the keypad and LCD faces up.

Sensor Ring and Proximity Sensor

Using Blue Loctite on the two mounting screws, attach the split sensor ring to the drive coupler on the rear, equalizing the side gaps as much as possible. One end of the each ring half is center punched to show the correct alignment. Do not over tighten the screws.

Make a mounting bracket from some flat stock (See Separate Instruction Sheet) for the proximity sensor. Mount the bracket to one of the bolts on the rear that will allow the sensor to be centered over the sensor ring. Adjust the

sensor mounting nuts so that there is a minimum of .040" air gap between the sensor ring and the sensor at all six high points. The sensor should not contact the sensor ring or damage will occur. Attach the provided drive shaft sensor cable to the sensor and then run the other end of the cable with the tinned leads to the recorder.

Power Connections

Power hookup is fairly easy. (See the attached Wiring Schematic) Small gauge wire, 16, 18, or 20 should be used for connections. Bare wire ends leading to the data recorder terminals can be tinned lightly prior to connection. Any splices in your wiring should be soldered and shrink-wrapped for the best possible connection.

On both the top and bottom sides of the data recorder there are terminal strips for making connections to the unit. On the top side terminal strip, there are terminals marked **+DC** and **GND**. NHRA regulations demand that a separate switch be used to turn the unit on. Therefore, connect a wire leading from a toggle switch to the terminal marked **+DC**. Then, connect a wire from a 12 to 18 volt battery (DC power source) to the other end of the toggle switch. Connect a wire from the **GND** terminal to the negative side of the battery or to a good chassis ground. Terminals marked HV1 - HV14, 485+, and 485- are for future expansion and presently are not used.

On the bottom side terminal strip, there is a **Jumper** wire connected to the terminals **GND** and **PIN01**. The jumper is necessary for the keyboard to function when using **RPM Start Mode**.

MSD Tach Terminal Connection

The terminal marked **PIN 14** is the input channel used to record engine RPM. Connect a wire from this terminal to the **TACH** terminal of your MSD ignition.

Note: A shielded, single conductor shielded cable (Radio Shack Part # 278-512 Not Included) can be used if you have to run this wire directly past the ignition cables. The shielded braid from this cable must be connected to the ground terminal of the MSD ignition or a good chassis ground. The wire leading to your tachometer can also be replaced with shielded cable if the data recorder picks up RFI signals from other vehicles, magnetos, or generators, etc.

Drive Shaft Sensor Cable Connections

The **BLACK** wire in the drive shaft sensor cable must be connected to **PIN 13** on the data recorder.

The **BLUE** wire and the **bare** tinned lead from the drive shaft sensor cable must be twisted together, soldered, and then connected to the **GND** terminal next to PIN 16 **OR** a good chassis ground.

The **BROWN** wire in the drive shaft sensor cable must be attached to a 12 to 18 volt source. We recommend connecting this wire to the power lead coming from the toggle switch, so that the drive shaft sensor will only be powered when the recorder is turned on.

Start Point Connection

Most data recorders do not provide the start of a run. They provide a continuous string of gathered data and located somewhere in that data is the actual run. You must analyze the data and guess at where the run actually began. The DataMaster software can find the start of the run and provide only the actual run data itself. When reviewing the data you see the actual run in the exact time frame in which it occurred. To do this, DataMaster uses a Start Point which can be created by either a switch or by engine RPM.

When using a preset engine RPM to create a start point, we call this an **RPM Start**. This is the standard setup. In this case, the **Jumper** remains connected to **GND** and **PIN 01**. The RPM is then preset by pressing the RPM Start button on the DataMaster. When the actual engine RPM is higher than the current setting, the RPM start point is created. For example, if your car uses a two-step or other method of limiting engine RPM on the starting line, you can use an RPM Start. Input an RPM Start setting that is higher than the RPM the engine will see on the starting line. If the two-step or other device is set to 4400 RPM, and you have input a setting of 46 (46 x 100 = 4600 RPM), when you release the trans-brake button and engine RPM rises above 4599 RPM, the start point is created. See *RPM Start*.

Optionally, a Start Point can be indicated mechanically. Current sanctioning body regulations prohibit connecting any wires from a data recorder or other device to a trans-brake switch. However, a 50 pound pressure switch

(AutoMeter Part# 3243) can be installed in the rear servo of a Powerglide transmission. A 45 degree fitting may be required for proper clearance between the switch and the transmission shield, if equipped. In this mode, the **Jumper** is removed from **GND** and **PIN 01**. One wire from the switch is attached to a good chassis ground. The other wire is connected to **PIN 01** on the DataMaster. When the trans-brake is released, pressure drops in the rear servo, and a Start Point is immediately indicated. The data recorder is monitoring the transmission pressure and that is legal.

On a manual clutch equipped car, a micro switch can be installed in the clutch pedal linkage. When the clutch is depressed the switch opens, breaking the ground circuit to **PIN01** of the DataMaster. When the clutch is then released, the switch contacts close, grounding the circuit and creating a Start Point.

Event Switch Connections

Terminals marked **PIN 04**, **PIN 05**, **PIN 06**, **PIN 07**, **PIN 08**, and **PIN 09** are input channels which can be connected to switches used to locate precisely in time when a particular event occurred on a run. A switch can be connected to a shifter, brake pedal, throttle, or other unit to record such data. Connect one side of a switch to a good chassis ground. The tinned lead from the other side of the switch is connected to one of these terminals. The data recorder constantly monitors the current state of each switch. When a change in condition occurs, the exact time of the event is recorded. This event data is available after the recorder has been downloaded to a PC.

Using DataMaster

Every time the power switch is turned on, DataMaster flashes a copyright and version number on the LCD, displays the current memory bank being used, and immediately starts recording data and monitoring its input channels and keypad. If a key on the keypad is pressed before the run is made, DataMaster instantly stops recording and performs the function you have requested. There are twelve (12) keys on the keypad. Six (6) on the top row and six (6) on the bottom row. Left to right the top row is labeled **Enter**, **RPM Start**, **SEND/+100**, **RPM/+001**, **Shaft Data**, and **T/D Data**. The bottom row is labeled **Time Slip**, **Play 1**, **Play 2,-/100**, **Bank/-001**, **Pulse Data**, and **Setup**. After a run is made, the DataMaster must be turned off and then on again (re-booted) to access the functions on the keypad. Likewise, after calling a function from the keypad, the DataMaster must be re-booted to begin recording again.

Before you can begin using DataMaster for the first time, you must configure it to your own car, by running the Setup program. So, please read all of these instructions before attempting to use it. Some keys have more than one function. Keys marked +100, +001, -100, and -001 are used to adjust (edit) the value of a variable being displayed on the LCD. Pressing, or holding, the +001 key will increment the value shown by 1, while pressing -001 will decrease the value by 1. The +100 and -100 keys are used to increase or decrease a value by 100 when working with larger values. After editing the value shown, press Enter to accept the new value. Here is a description of each key on the keypad:

Enter - The Enter key is used exactly like the Enter key on your home computer. It is used after entering data or in some cases to continue to the next item in a list.

RPM Start - This key is used to preset a specific RPM for an RPM created Start Point. After pressing this key, the LCD will display 'START RPM x100:' and a value on the line below. This value is adjusted by pressing the keys marked +001 and -001. When the value is set correctly, press Enter to leave this function. If you enter a value that is out of range, the program will restore the original value and allow you to correct the error. The normal range expected is 0-140. The new value is stored in memory and only needs to be set one time, unless you want to change to a different RPM level later.

If this value is set to zero (0), the RPM Start feature is turned off. If you are using a manually created Start Point, this value must be set to 0. If you are using the RPM Start feature, adjust this value to the RPM divided by 100 that you want. For example, if you want an RPM Start Point created at 4000 RPM, adjust this value to 40 and press Enter.

SEND/+100 - This key is used to transmit or download the current memory bank to a PC or while in another function it is used to increment the current value being displayed by 100. To download data, first connect the provided cable to your RS-232 port and connect the other end to the RJ-45 phone jack on the right hand side of the DataMaster. Initiate a download from the PC, and then press the SEND key. The LCD will display '**BAUD x100:**' and a value below. After adjusting this value to the BAUD rate you want, press the Enter key to begin downloading. The BAUD rate is set to **12** for 1200 baud, **24** for 2400 baud, **48** for 4800 baud, **96** for 9600 baud, and **192** for

19200 baud. After the downloading is complete this function is terminated. A 12 foot extension cable is available from Radio Shack, use part #279-374 cable.

RPM/+001 - This key is used to view the actual engine RPM data stored in memory, or while in another function, to increment a value by 1. To view engine RPM data, press the RPM key. The LCD will display '**Displaying RPM Data:**' on line 1. On line 2, the LCD displays the crankshaft revolution number on the left and the actual data to the right. Each item of data is the actual time elapsed for each revolution of the crankshaft and is expressed in hundred/thousandths of a second (.00001). Use the +001, +100, -001, and -100 keys to scroll through the data. Press Enter to exit from this function.

Shaft Data - This key is used to view the actual drive shaft RPM data stored in memory. To view drive shaft RPM data, press the Shaft Data key. The LCD will display '**Displaying DS Data:**' on line 1. On line 2, the LCD displays the drive shaft revolution number on the left and the actual data to the right. Each item of data is the actual elapsed time for each revolution of the drive shaft and is expressed in hundred/thousandths of a second (.00001). Use the +001, +100, -001, and -100 keys to scroll through the data. Press Enter to exit.

T/P Data - This key is used to find the number of drive shaft pickup pulses that occurred for a specific time. This data is used to fine tune the DataMaster to match your vehicle and to individual race tracks. The Setup function uses the number of pickups, gear ratio, tire circumference, and estimated tire growth to calculate the proper time/pulse data to use in reporting time to distance performance data. Because of differences in tire growth, traction factors, track timing systems, and other factors, this feature is used to calibrate the system so that the performance data output from the DataMaster matches the performance data you receive on your race track supplied time slip. Specific time/pulse data in memory that DataMaster is currently using can be edited by using the Pulse Data function. When you press the T/P Data key the LCD displays '**Displaying T/P Data:**' on line 1 and the time in thousandths of a second on line 2. If you press the T/P Data key a second time, DataMaster will momentarily display the number of drive shaft pickup pulses that occurred in the time specified. For example, if you want to find the number of pulses that occurred to the 60 foot time on your race track supplied time slip, press the T/D Data key and then using the +100, +001, -100, -001 keys adjust the time shown until it matches the 60 foot time. Then, press the T/D Data key again and the number of pulses are momentarily displayed. Repeat this for the 330, 660, 1000, and 1320 foot times and write the number of pulses down for each distance. These new numbers can then be manually entered into the DataMaster by using the Pulse Data function. Press Enter to exit from this function. This function is also available in the DataMaster Analyzer software.

Time Slip - This key is used to review the performance calculations made by the DataMaster. Press the Time Slip key and the LCD displays the Vehicle Reaction Time (VRT), 60 foot ET/MPH, 270 foot ET, 330 foot ET/MPH, 600 foot ET, 660 foot ET/MPH, 940 foot ET, 1000 foot ET/MPH, 1260 foot ET, and 1320 foot ET and MPH. If you have calibrated the DataMaster to your vehicle properly, this performance data should match your track supplied time slip. In fact, this function is so accurate, it can be relied on even if you don't receive a track time slip. This function also shows very clearly when a so-called 'bogus run' occurs or not.

Play 1 - This function serves as a digital tachometer and shows a replay of actual engine RPM over the entire run. When the run is over this function exits automatically.

Play 2 - This function serves as a digital tachometer and shows a replay of actual drive shaft RPM over the entire run. When the run is over this function exits automatically.

Bank - This function allows you to switch between memory banks. The Setup program configures the default memory bank as Bank 1. When you turn the power switch on, DataMaster reports what memory bank it is currently using. If you don't have time to download your data, you can switch to a different memory bank and you won't lose the data from the previous run. There are four (4) memory banks currently available. This function will accept an entry between 1 and 4. If you enter a zero (0) or a number higher than four (4) no change will occur and the function will wait for you to enter a valid memory bank number. To examine or download the data from a previous run, just change back to that memory bank where that data is located.

Pulse Data - This function allows you to view and edit the pulse data that DataMaster is currently using to perform time to distance calculations for the Time Slip function. The LCD will display pulse data for vehicle reaction time (**PD-VRT**), 60 foot (**PD-60FT**), 330 foot (**PD-330FT**), 660 foot (**PD-660FT**), 1000 foot (**PD-1000FT**), and 1320

foot (**PD-1320FT**). Use the +001, +100, -001, and -100 keys to edit each value and press Enter to accept and move to the next value. Data for this function is gathered by using the T/P Data function.

Setup - This function must be used before you use your DataMaster for the very first time. It sets up certain variables that are different for every vehicle. It also clears all memory banks, so you are required to verify that you really want to perform this function. After pressing the Setup key, the LCD displays, '**Initial Setup?**' on line 1 and the value of zero (0) on line 2. While this value is equal to zero (0), if you want to abort the function, just press Enter. If you actually want to continue with Setup, verify by changing this value to one (1) and press Enter. If you continue, the LCD will display, '# **CYL:**' on line 1 and the default value '8' on line 2. Accepted values for this variable are 4, 6, or 8 cylinders. Use the +001 or -001 keys to edit this value and press Enter to accept your entry.

The LCD will display, '# **PICKUPS:**' on line 1 and the default value '6' on line 2. Enter the number of pickup HIGH points on the drive shaft sensor ring and press Enter. If you are using the Family Software supplied sensor ring, use the default value of '6'.

The LCD will display, '# **PULSES:**' on line 1 and the default value '12' on line 2. The number of pulses (4-12) is set to the total number of HIGH and LOW points on the drive shaft sensor ring that you are using. If you are using the Family Software supplied sensor ring, use the default value of 12. The number of pulses set here must also be used in the PC software.

Press Enter and the LCD will display, '**GEAR RATIO:**' on line 1 and the default value '**410**' on line 2. You must enter your vehicle's rear gear ratio as a three digit number (100 to 900) for this variable.

Press Enter and the LCD will display, '**TIRE CIRCUM:**' on line 1 and the default value '**10300**' on line 2. You must enter your vehicle's drive tire circumference. This must be entered as a five digit number. For example, If the tire circumference is 104.25 inches, enter this as 10425. If the tire circumference is 101, enter this as 10100.

The gear ratio and tire circumference are ONLY used to estimate the initial time/pulse data the DataMaster will use in it's calculations for your first run. After you have actual run data and a track time slip, you can manually edit the time/pulse data to calibrate the DataMaster more accurately to your vehicle and the race track. See the T/P Data and Pulse Data functions.

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