WWW.MORETRACTION.COM



TMS-9500-SL
Short
HEI

ELECTRONIC
TRACTION CONTROL

US PATENT 6,577,944
Other Patents Pending

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Introduction

We would first like to thank you for your purchase of our system. We believe it is the best system available to you on the market today. This system balances effectiveness with ease of installation, broad field of uses, and cost.

As with all technical devices such as engines, shocks, carburetors, clutches etc., the product's performance is based largely on your ability to use it properly. Testing in controlled circumstances will help you determine the proper settings for your application and your situation. Testing is very important since it will help you utilize this product to its full potential.

Please read all of the instructions and information thoroughly before attempting to install or use this product.

How Does It Work?

Spinning the tires not only makes the car harder to drive, but it also causes higher tire temps and excessive tire wear. Lifting off the throttle or counter steering to correct for this 5% mistake, not only upsets the rhythm, it slows the car down!

Typically, if a driver makes a 5% mistake with the throttle, he/she has to correct 20-25% to fix it. But if the tire slip is detected within one cylinder worth of crank rotation, as the Davis Technologies systems do, then a small reduction in power can reduce or stop the tire slip.

The Non Self-Learning systems, such as our TMS-750, periodically compare the rate of acceleration of the crankshaft to an Adjustable Fixed Rate (AFR), known as Threshold. If the Engine RPM rate of change is in excess of that Threshold, then a correction is made; therefore, reducing the slip.

The comparison is made every cylinder (1/4 of a turn of the crank shaft).

Basically, this Patented system looks for spikes in RPM that are caused by wheel slip. If these spikes are large enough, then a correction is made, reducing the slip.

By adjusting the Threshold, the driver can tune the system to the desired "feel"

Self-Learning systems, such as our TMS-750-SL, TMS-5500-SL, and TMS-9500-SL series, compare the rate of acceleration of the crankshaft to a calculated threshold value that is constantly updated based on the average of the previous measurements.

This update occurs on every crankshaft revolution.

So, if the last 1/4 of a turn of the crankshaft (one cylinder) is faster than the average of the last full revolution (4 cylinders), then a slip is detected.

Through this very advanced Patented process, the system constantly accounts for track conditions, tire condition, even driving style to constantly update the internal settings.

These settings are updated as many as 200 times a second to keep the unit calibrated to exactly the right settings regardless of changing conditions.

Basically, the systems learn the average rate of acceleration of the crankshaft, and if there is a sudden spike in RPM above that rate, then a correction is made.

This allows the system to adjust to the Correct settings even if one corner has more grip than another, or even one groove to another.

The user does have an adjustment referred to as "Mode" that sets the overall sensitivity of the system to make a correction based the extent of the tire slip. By adjusting the Mode, the driver can tune the system to the desired "feel".

This system is not simply a few lines of code added to an existing fuel injection or ignition system, and called traction control. This system utilizes a patented method and multiple high speed processors to very accurately and effectively monitor rates of acceleration to determine wheel speed, and tire slip. In fact, Davis Technologies' systems are at least 20 times faster than other systems which are integrated into the fuel injection or ignition system.

Our systems only job is Traction Control!

Installation

Installation of the system is very simple. It is very important to make all connections correctly. Improper installation could result in poor system performance or damage to the unit.

Keep all wires away from any spark plug wires and coils or other sources of electrical noise and heat.

The unit should be mounted away from any sources of electrical noise or high heat. It can be easily mounted with Velcro to allow for easy removal.

It is very important that the distributor pickup wires are kept away from the spark plug and coil leads.

Make Connections as follows:

Connect the terminal marked "+" to 12V+ .

Connect the terminal marked "--" to 12V- .

Connect the pin marked "D" (Pin C) to positive distributor pickup wire. On a "circuit board" style distributor module (green), this should be the white wire, on a "stock" style module (black) this is the green wire. (The wire color out of the TC unit is the same as the wire on the module to connect to.)



A toggle switch may be used, if desired to turn the unit on/off.

Testing

After installation it is recommended that you test the system. To do so please follow these instructions step by step.

Forced Activation Test:

This test is useful to check both stages of retard.

1. Turn "ON" the power, the LED will flash to indicate that power is on. Next the LED will blink to show the current Mode setting.
(Example-ON-ON-off-off-ON-ON-off-off-ON-ON-off-off-ON-ON-off-off, to show Mode 4).

2. Connect a timing light to the engine.

3. Start the engine.

4. With the engine idled up to about 3500 rpm; press the Test button on the unit until the LED glows solid. The first timing retard stage will activate for 4 seconds, then the second stage for the next 4 seconds.

RPM Window Test:

This mode is useful to check that the system is reading the RPM signal properly and activating the retard stages.

1. **Set the "Mode" to 9.**

2. **Start the engine and accelerate the engine.**

3. **When the RPM is within the window of 2000 to 5000 rpm the LED will glow solid and the unit will make a large timing correction.**

DO NOT USE WINDOW MODE ON TRACK!!

Note: After the test is complete, the LED will blink to show the firmware version.

Traction Control Adjustments

Davis Technologies' patented systems have the ability to learn the amount of acceleration that the vehicle is achieving on average and activate the outputs if this *learned average* is exceeded.

Different tracks, cars, conditions, etc. require different settings for the system to function effectively. There are two values that must be set. These values will allow you to tune the system for changing conditions. They are called "Mode" and "Retard".

The Mode setting is used to tune the sensitivity of the system. The Mode controls the allowable percentage of acceleration change. The higher the number the more sensitive the system is. A good starting point is 5. Valid settings for Mode are 1-8. (Mode 9 activates window RPM test).

The Retard adjustment is used to set how much timing is retarded when the unit makes a correction. The more the timing is retarded, the more the power is reduced. Too much retard may slow the car down. Too little retard will not reduce power enough to correct the wheel slip condition.

Different tracks, cars, conditions, etc. may require different settings for the system to function effectively. The dials on the unit are used for these settings. The values are referred to as Threshold, and Mode.

Setting The Mode:

To change the Mode, follow these steps.

1. **Hold down the "Test" button**

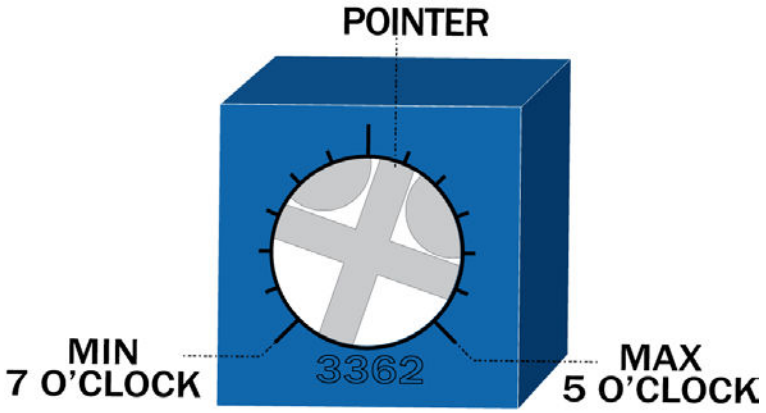
2. **Turn the power On**

3. **The LED will flash to indicate that the power is on. After the LED goes off, release the button and quickly press it down and hold it down. The LED will blink once to show that the button has been pressed. Each consecutive press will raise the Mode by one, starting at zero.**

4. **Once the desired Mode has been reached, release the button. After about 4 seconds the LED will blink to indicate the new Mode value.**

Setting The Retard Amount:

Retard is another adjustment that is used to tune the system to your preferences. This adjustment set the amount of timing that is removed with each correction. The small screw adjuster (Pot) sets the amount of retard. The more clockwise you turn Pot, the more retard. Range is approx. 10 to 30 degrees of retard. *Start with the adjuster at 12 O'clock.*



With testing and good record keeping, you should be able to easily predict the necessary settings for current conditions. The settings will not vary much once you determine what works best for your setup.

Traction Control Setup

The following parameters are adjustable; however they are factory set to the most common settings, and should not need to be adjusted by most users.

(These settings are only accessible using the "Traction Control Panel Software" or Handheld Programmer)

Trigger Count:

The unit is factory set for 4 triggers per revolution, for 8 cylinder operation. The unit can be configured to use between 1 – 9 triggers per revolution.

Starting RPM is a user adjustable setting that allows the racer to set the point at which the unit begins making corrections. If the Starting RPM is set to 5000 RPM, then the unit is active and monitoring the engine, but not making any corrections until the Starting RPM is reached. Once the Starting RPM is reached, the unit will make corrections as needed above 2000 RPM.

Buffer is another setting that can be used to fine tune the system. The buffer sets the number of consecutive errors required to cause a correction. Buffer 0 will react to each error in acceleration. Buffer 1 will require at least 2 consecutive slip conditions to cause a correction. This is useful to filter out small tire slips that may occur quickly, but have no ill effect on the car. (Default=1)

Sample Rate of the unit can also be changed by the user, however this should only be done after consulting w/ tech support. The lower the number

the faster the Sample Rate, which makes the unit less sensitive, but faster to react. The higher the number the slower the Sample Rate, which makes the unit more sensitive, but slower to react. Valid settings are 1-5. (Default=5)

Minimum Corrections:

Minimum correction is a user adjustable setting that allows the user to tune the minimum number of crank rotations that the timing will be retarded during a correction. This is useful to force the timing to stay retarded long enough to stop a high momentum spin, even though the RPM spike was very brief.

Small Corrections Only RPM:

The percent of Max engine RPM at which the unit makes only small corrections can be set by the user. Some users may want the unit to make smaller corrections after a certain RPM while others may want the unit to be able to make full corrections for more of the strait. Once set the value will remain until changed by the user. The RPM is set in a % of the maximum RPM turned at the end of the strait. (Default=75-85%)

Ending RPM:

The percent of Max engine RPM at which the unit *Stops* to make corrections can be set by the user. Some users may want the unit to stop at a certain RPM while others may want the unit to be able to make corrections for more of the strait. Once set the value will remain until changed by the user. The RPM is set in a % of the maximum RPM turned at the end of the strait. (Default=85-95%)

Factory Reset

All TC settings can be restored to *Factory Defaults* at any time by following these steps.

1. **Set the to Mode to 15**

2. **After about 3 seconds the LED will flash rapidly to indicate the Factory Settings have been restored.**

3. **Turn the power Off**

Firmware Updating

Davis Technologies, LLC may release firmware updates or upgrades periodically to ensure the best possible functionality of the Traction Control System. The traction control unit will need to be returned to Davis Technologies to have the updates installed and configured.

Users should log onto www.moretraction.com, or call Davis Technologies, LLC tech department occasionally to check for updates.

Appendix A

Another advantage of these systems is that they are actually able to detect wheel slip better than most wheel speed sensor based systems. The reason for this is that our systems monitor the rotation of the driveline. With 8 triggers on the driveline you can measure slip within 1/8 of a rotation. Now factor in a 5:1 final drive *(rear end)* ratio and tire rotation can be measured within 1/40 of a turn (that is about 2-3 inches on most tires). The fact that the driveline is turning much faster than the wheels, amplifies the slip at the driveline, making these systems much more sensitive than the typical wheel speed systems. Put simply, if the tires slip the driveline revs. The only reason for the sudden increases in revs in the driveline is wheel spin.

Sensor based systems usually measure tire rotation about every 1/4 of a turn. The front and rear are compared to each other to check for slip. With a margin of error of 1/4 of a turn at each wheel, it may take as much as 1/2 of a turn of tire slip for the system to react. If a tire is allowed to slip a half a turn before a correction is made, it is very hard to stop the slip.

A system that uses a preset percentage of slip, between the rear wheel speed to front wheel (or ground) speed, cannot compensate for these changing conditions that are inherent in all types of racing.

Traction Control Is What We Do!

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Traction Control Panel Software:

The optional Traction Control Panel (TCP) software interface is used to adjust advanced tuning features of the traction control system.

These tuning features can be used to fine tune the system to exactly what the user desires.

On a circle track systems, this includes being able to tune the engine RPM at which the system becomes active, as well as the RPM at which the system can be deactivated.

The user can also tune the length of corrections, and the amount of power that is cut on different parts of the race track.

The software based interface is included with the TMS-9500-SL, and easily downloaded from the web site and installed on your computer. The Traction Control is connected to the computer via a serial cable or through a secure wireless Bluetooth connection. Tuning is achieved through a few simple mouse clicks.



Main Tab Settings:

The Self Learning units incorporate two different methods to control wheel spin.

The second patented method is a less advanced process where the users sets a threshold of acceleration that if exceeded will cause the timing to retard.

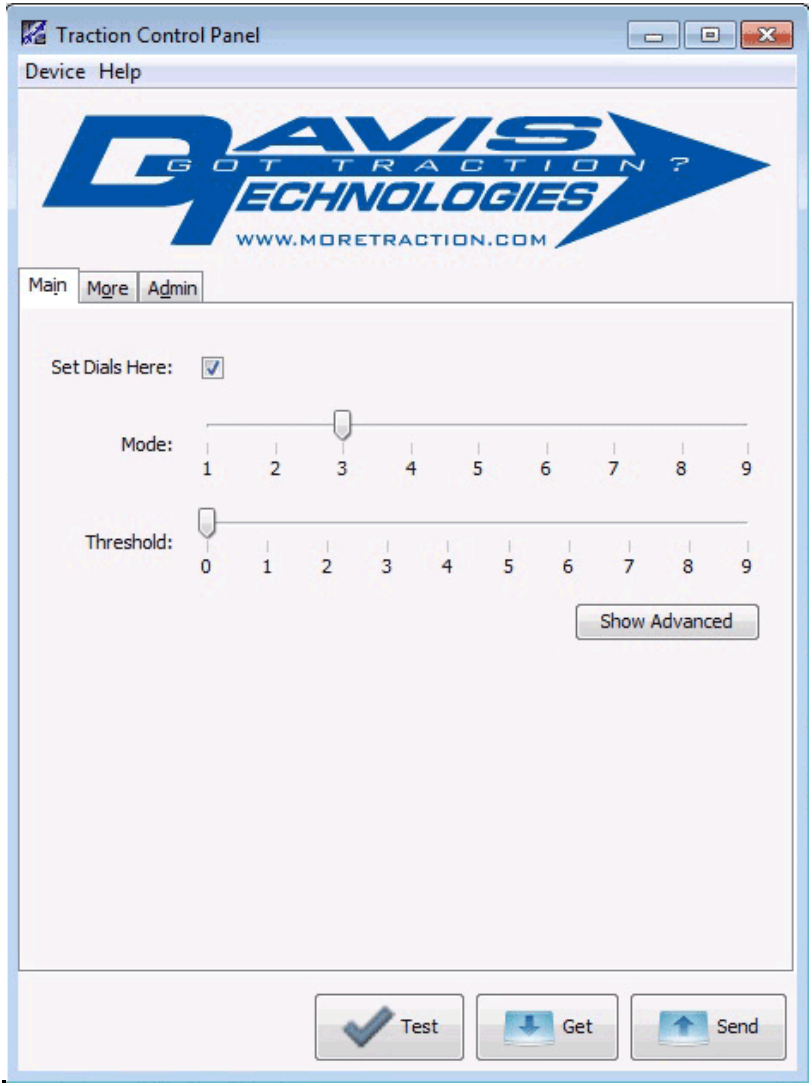
The second- *Non-Self Learning* system is activated when the "Threshold" setting is set to anything other than zero. The Non-Self Learning Method is only accessible using the "Traction Control Panel Software".

Threshold is used to set this value. The higher the number the more sensitive the system is. A good starting point is 4. Valid settings for threshold are 1-9.

Mode is used to adjust the Mode of the unit using the software instead of the button on the unit as described earlier in this manual.

Note: To use the Mode and Threshold sliders in the software, you must check the "Set Dials Here" box. When checked, the TC unit only uses the TCP settings, and the setting cannot be changed using the button on the unit. To use the button method, YOU MUST UN-CHECK THIS BOX!

Main Tab- Basic Screen



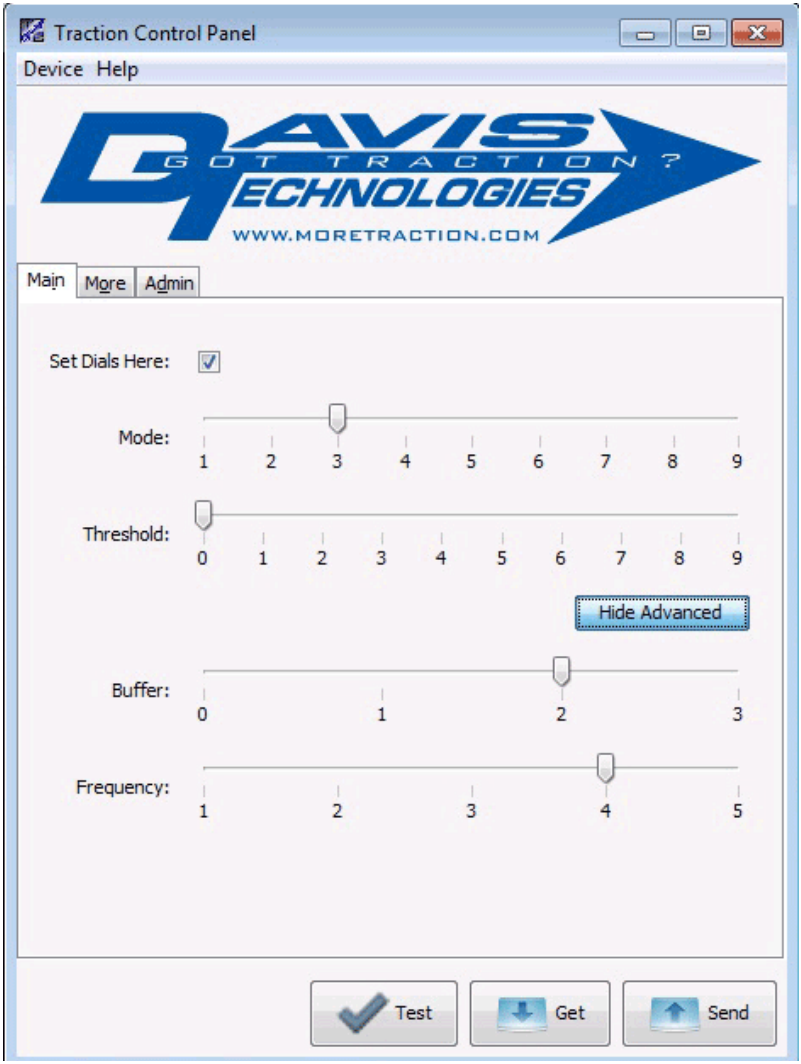
Advanced Main Tab Settings:

These settings should only be adjusted if advised to do so by Davis Technologies!

The *Buffer* setting is another feature that can be used to fine tune the system. The buffer sets the number of consecutive slip conditions required to cause a correction. Buffer 0 will react to each slip condition. Buffer 1 will require at least 2 consecutive slip conditions to cause a correction. This is useful to filter out small tire slips that may occur quickly, but have no ill effect on the car. (Buffer 1 is the default for most applications, but some experimenting with this setting may be useful to see what works best for you). **(This setting only accessible using the "Traction Control Panel Software")**

The *Frequency* of the unit can also be changed by the user, however this should only be done after consulting w/ tech support. The lower the number the faster the Sample Rate, which makes the unit less sensitive, but faster to react. The higher the number the slower the Sample Rate, which makes the unit more sensitive, but slower to react. Valid settings are 1-5. (Default=3 Dirt / 4 Asphalt) (This setting only accessible using the "Traction Control Panel Software")

Main Tab- Advanced Screen



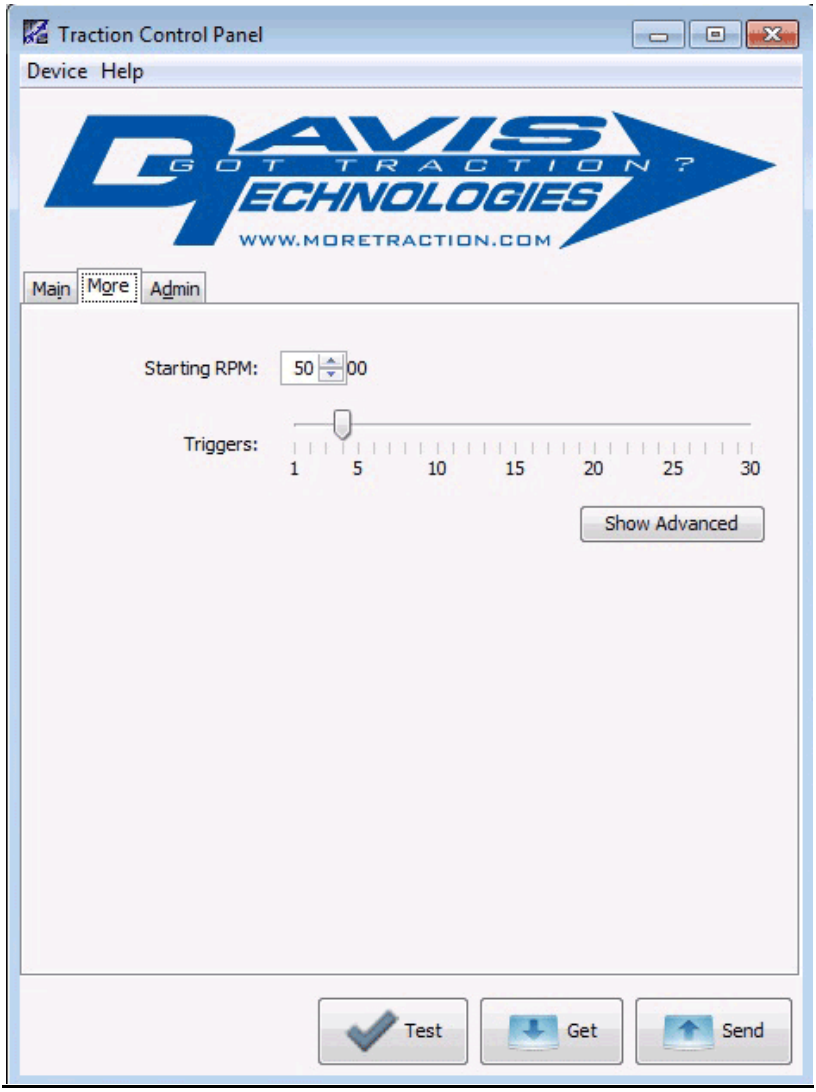
More Tab Settings:

The More Tab allows the user to set the Starting RPM, Triggers, as well as some Advanced RPM controls.

Starting RPM **is a user adjustable setting that allows the racer to set the point at which the unit begins making corrections. If the Starting RPM is set to 5000 RPM, then the unit is active and monitoring the engine, but not making any corrections until the Starting RPM is reached. Once the Starting RPM is reached, the unit will make corrections as needed above 2000 RPM. (This setting only accessible using the "Traction Control Panel Software")**

Triggers **is a user adjustable setting that allows the racer to set the number of triggers the TC is picking up for each revolution of the measured shaft. In most cases, this is the number of cylinders, divided by 2. For a V8, set the Triggers to 4. (This setting only accessible using the "Traction Control Panel Software")**

More Tab- Basic Screen



More Tab Advanced Settings:

The Advanced Screen of the More tab allows the user to tune how much timing, if any, is retarded on different parts of the track. These ranges are based on a percentage of the maximum RPM that has been turned this session. The Max RPM is calculated each time the car goes out on the track, and is reset each time the TC is shut off, or the RPM falls below 2000 rpm for 3 seconds.

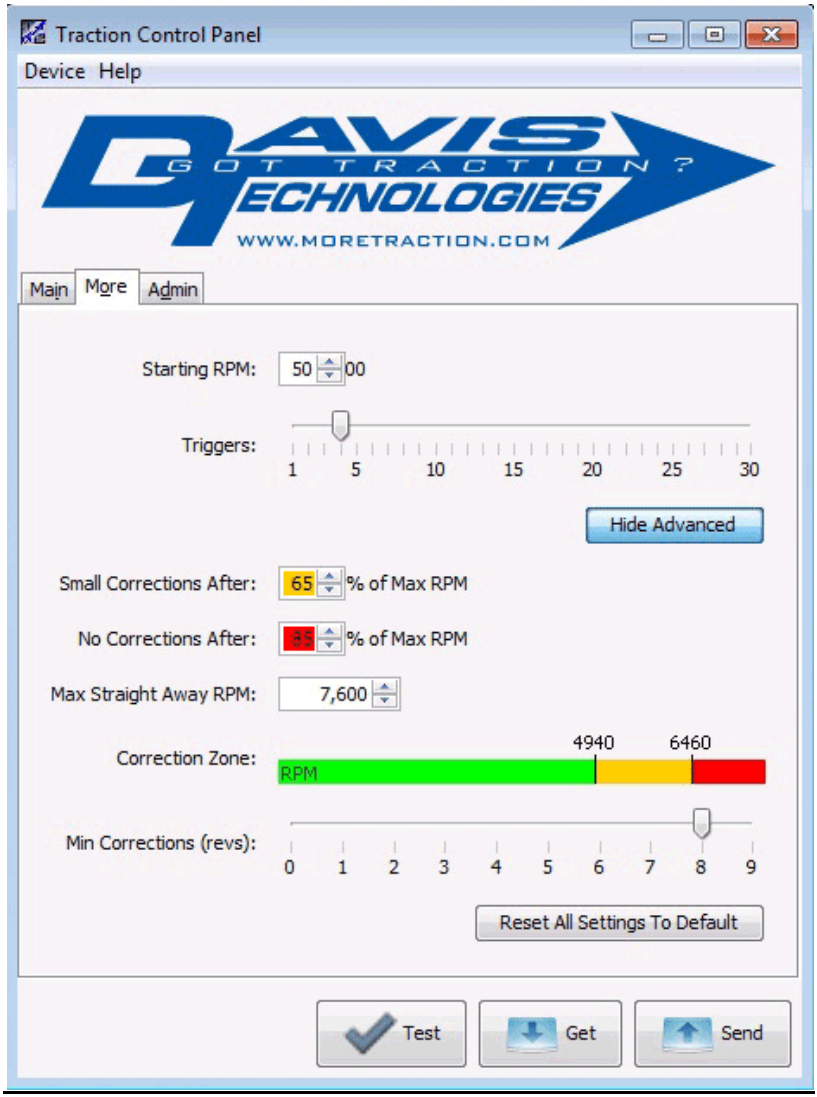
Small Corrections After: **is used to force the unit to only make small timing correction after the % of Max RPM set in the Box. In the example below, the TC will only make a small correction after 65% of the Max RPM turned this session.**

No Corrections After: **is used to prevent the TC from making any corrections after a certain point on the track. This is useful to prevent the TC from making corrections at the end of the straight if using the throttle to turn a tight car. In the example below, the TC will not make any corrections after 85% of the Max RPM turned this session.**

Max Straight Away RPM: **is only used for on screen calculations display on the color graph, and in no way affect the function of the TC. The user must set this value to match the max RPM actually reached on the track.**

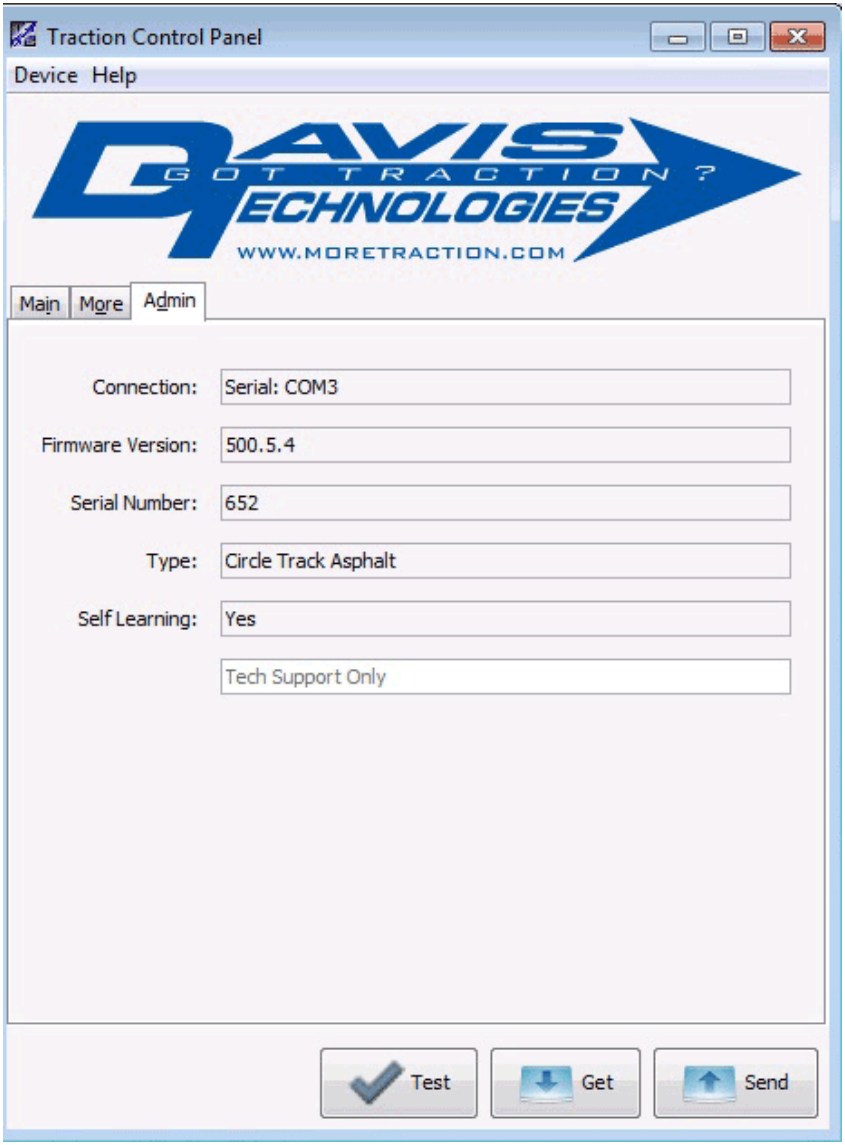
Min Corrections: **sets the minimum number of cylinders, in full revolutions, that will be retarded if a correction is made by the traction control unit.**

More Tab- Advanced Screen



Admin Tab:

The Admin screen is used to provide information about the unit for tech support by Davis Technologies.



USB to Serial Adapter:

Newer laptop computers may not have an actual RS232 DB9 connector installed. In this case a USB to Serial adapter will be required. Not all adapters are created equally, and some brands may not work properly with the Traction Control Panel software. Most brands work without any problems, but occasionally we find some that do not. Davis Technologies offers a model that has been tested on may brands of computers as well as across many operating systems. These are available for $29.95 from Davis Technologies directly.



Handheld Programmer

The handheld programmer can be used to adjust all of the parameters that the TCP software does, but is a simple, self contained system that does not require a computer. Most users prefer the handheld. The handheld programmer is available as a hard wired unit, or a wireless Bluetooth connected unit.



DISCLAIMER

Motor sports products and parts are sold "as is" without any warranty whatsoever. Implied warranties, including warranties of merchantability or fitness for a particular purpose, are excluded. The entire risk of quality and performance of such parts is with the buyer. Should such parts prove defective following their purchase, the buyer and not the manufacturers, distributors, or retailers, assumes the entire cost of all necessary services or repair.

The Davis Technologies, LLC's products and parts warranties are voided if the vehicle or part is used for competition or if they fail as a result of modification.

It is the purchaser/competitor's responsibility to inspect and verify the dimensions, specifications, and performance of all parts as being appropriate for the use to which the purchaser/competitor will put them prior to any actual installation and use of said products and/or parts.

The purchaser/competitor is on notice that motor sport competition (commonly known as "racing") is an inherently dangerous activity which can result in serious personal injury and even death to participants and even to spectators. If these parts and/or products are used in motor sport competition, any and all risk of and liability for any resulting damage, injury or death is with the purchaser/competitor. In no event shall Davis Technologies LLC be held liable for special or consequential damages.

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