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**EFI-TC 1**

**TRACTION CONTROL**

**FOR**

**Holley® EFI**

**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.

**DAVIS TECHNOLOGIES PRODUCTS ARE  
FOR CLOSED COURSE USE ONLY.**

## **HOW DOES IT WORK?**

The *Non Self-Learning* systems, like our EFI-TC1 series, periodically compares the rate of acceleration of the driveshaft to an Adjustable Fixed Rate (AFR), known as Threshold. If the DS RPM rate of change is in excess of that Threshold, then a correction is made. The comparison is made every 1/8 of a turn of the driveshaft.

Basically, this [Patented](#) system looks for spikes in DS 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 user can tune the system to correct larger slips, while not reacting to smaller, harmless, slips. This means the user does not have to figure out the desired DS/Engine RPM and build a preset “Dot Plot” (anybody got a crystal ball?).

A typical 1/8th mile car turns the drive shaft about 300 times in a 660 ft. run. At 8 triggers per rev, that would be like building a “Dot Plot” w/ 2400 dots, and ¼ mile cars turn the drive shaft about 550-600 times in 1320 ft. run. At 8 triggers per rev, that would be 4400-4800 dots.

[Self-Learning](#) systems, such as our EFI-TC2, compare the rate of acceleration of the drive shaft to a calculated threshold value that is constantly updated based on the average of the previous measurements. This update occurs on every drive shaft revolution. So, if the last 1/8 of a turn of the drive shaft is faster than the average of the last full revolution, then a slip is detected. Through this very advanced [Patented](#)

process, the system constantly accounts for track conditions, tire condition, etc. to constantly update the internal settings. These settings are updated as many as 800 times a second to keep the unit calibrated to exactly the right settings regardless of changing conditions.

Basically, the system learns the average rate of acceleration of the drive shaft, and if there is a sudden spike in RPM above that learned rate, then a correction is made. With the Self-Learning feature, the user doesn't have to try to figure out the DS RPM rate of change and set a "Threshold", the system does it for you, every drive shaft revolution!

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 user can tune the system to correct larger slips, while not reacting to smaller, harmless, slips.

*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 system's 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 system.

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 is recommended to connect the power and ground leads for the traction control directly to the ECU when possible to reduce electrical noise issues.

The ECU has pins dedicated to supply 12v positive and ground. Do not share these if already used by another sensor or system. The dedicated pins are listed in the table below.



Power Pins				
HP			Dominator	
Connector	Pin		Connector	Pin
J1	B20		J1	B20
			J2	B20

Ground Pins				
HP			Dominator	
Connector	Pin		Connector	Pin
J1	B14		J1	B14
			J2	A18
			J2	A22
			J2	B14
			J3	B1
			J3	B16
			J4	B14

If a 12v output is not available, you can configure a 12v output in the I/O ICF. Set the "Type" to "+12v". Configure this output to come on using a "Sensor Input Trigger" such as "RPM Above 100 RPM", or "Battery Above 8 Volts". This will provide a 12v source under these conditions.

**Make the connections as follows:**

**6 Pin Square Connector (P1)**

- 1. Connect pin 1 (RED wire) to 12v positive.**
- 2. Connect pin 2 (BLACK wire) to ground.**
- 3. Connect pin 4 (BLUE wire) to supply voltage for optional output on pin 3 below. Must be 5-20 volts positive source.**
- 4. Connect pin 3 (PINK wire) to optional LED light or data system. Output is supply voltage as supplied by pin 4 anytime TC is active. 5 AMP Max. Many users connect this output to an LED tail light.**

**6 Pin Flat Connector (P2)**

- 1. Connect pin 1 (YELLOW wire) to any “F Type” input pin on the Holley® ECU. This is the “T.C. Input” as defined in the Holley EFI in the traction control ICF. When slip is detected, a signal is sent to the Holley ECU.**
- 2. Connect pin 6 (WHITE wire) to the signal wire from the drive shaft sensor. This is the white wire on sensors supplied by Davis Technologies. For other sensors, please refer to manufactures instructions. (See Appendix A)**
- 3. Connect pin 5 (ORANGE wire) to any “F Type” input**

pin on the Holley® ECU and configure for Drive Shaft speed. This is required to properly utilize the multiple correction levels (See Tuning Section later in this manual). May also be connected to data system Drive Shaft RPM input if required. Output is the same as the input on pin 6 above.

Holley EFI ECU Pin Map

View Inputs View LCD View Outputs View Injectors View

**UNASSIGNED INPUTS**

**CONNECTOR J1**

Pin	Input Number	Input Type
A12	Input #1	H ECU Log Trig ,Master Enable,T.C. Enable
A3	Input #2	H T-Brake/Launch
A13	Input #3	F DRIVEHAFT SPEED
A4	Input #4	F T.C. Input

**CONNECTOR J2**

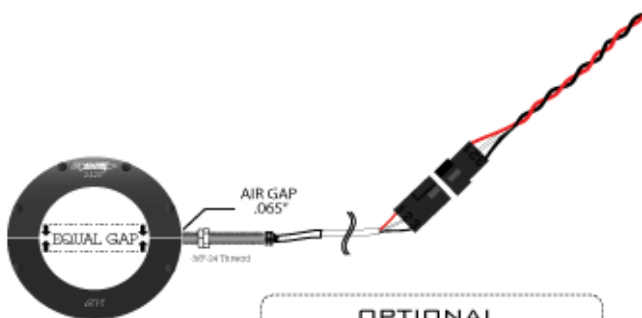
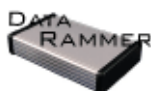
Pin	Input Number	Input Type
A10	Input #5	5 2 T H G
A1	Input #5	5 2 T H G

## **SYSTEM OVERVIEW**

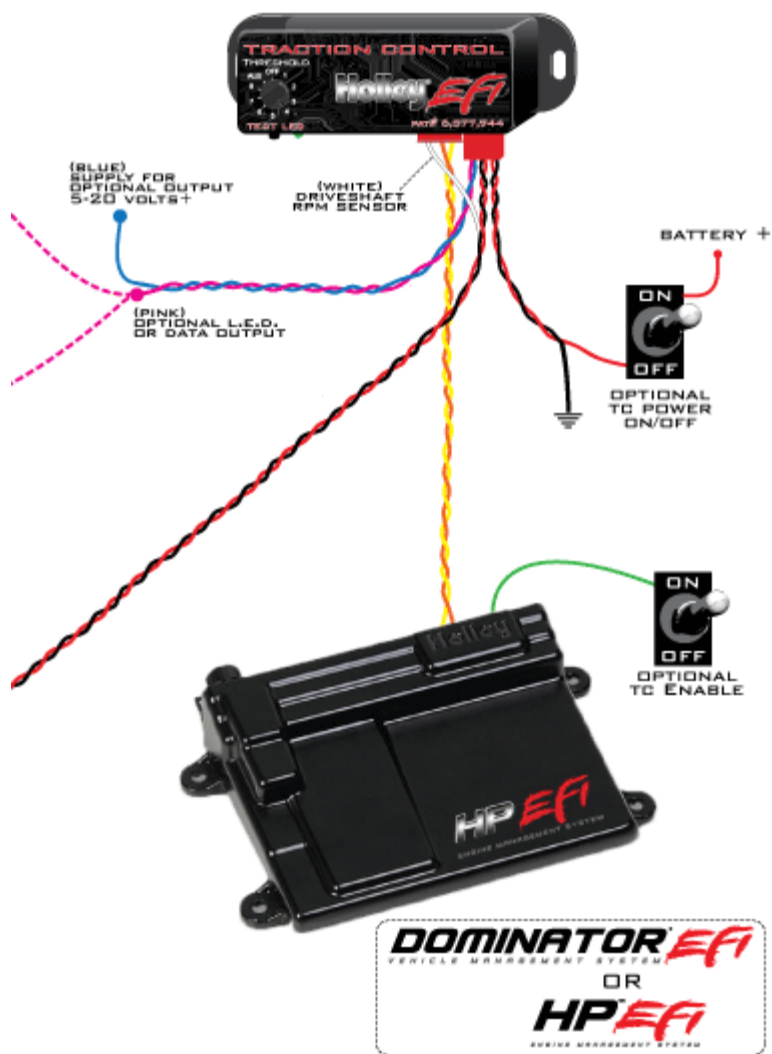
**OPTIONAL  
LED TAIL LIGHT**



**OPTIONAL  
DATA LOGGER**



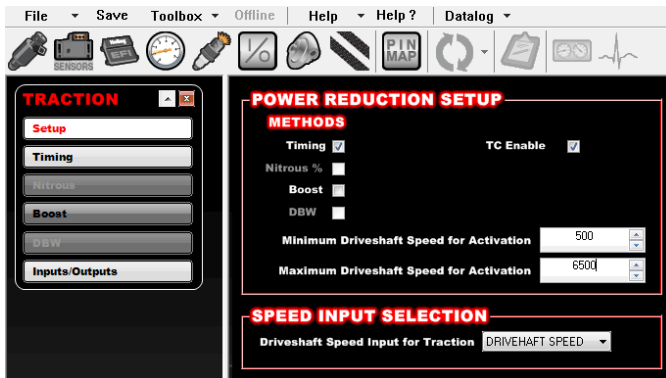
**OPTIONAL  
DAVIS TECHNOLOGIES  
8 TRIGGER RING &  
HIGH SPEED SENSOR**



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## **HOLLEY® ECU SETUP**

The Holley® EFI must be configured to allow the Traction Control signals to cause a reduction in power. This can be done using an Ignition Timing Retard, A reduction of Boost, a reduction of the amount of Nitrous delivered or even by reducing the throttle opening on systems equipped with Drive By Wire Throttle.



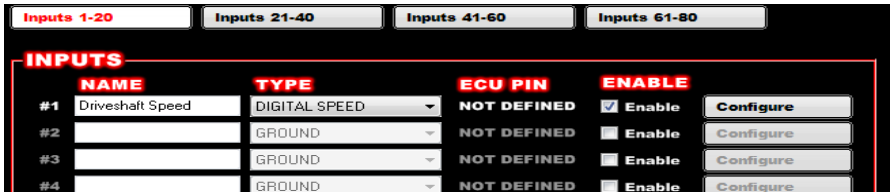
Minimum Driveshaft Speed is a user adjustable setting that allows the racer to set the point at which the unit Begins making corrections. If the Starting RPM is set to 500 RPM, then the unit is active and monitoring the acceleration, but not making any corrections until the Minimum Driveshaft Speed of 500 RPM is reached. This may be useful to prevent the Traction Control from interfering with an already established launch setup.

Maximum Driveshaft Speed is a user adjustable setting that allows the racer to set the point at which the unit Stops making corrections. 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 the entire run.

## Driveshaft Speed:

The orange wire from P2 on the TC unit can also be used for the “Driveshaft Speed Input for Traction”. This needs to be set up in the I/O ICF first and then selected in the Traction Control ICF. Other shaft speed inputs can be configured and used, but the simplest method is to just pull it from pin 5 on the TC connector P2.

To set up the driveshaft speed input, create a “Digital Speed” input in the I/O ICF.



The screenshot shows the I/O ICF configuration interface. At the top, there are four tabs: "Inputs 1-20", "Inputs 21-40", "Inputs 41-60", and "Inputs 61-80". Below the tabs is a table titled "INPUTS". The table has four columns: "NAME", "TYPE", "ECU PIN", and "ENABLE". There are four rows of input configurations. The first row is for "Driveshaft Speed", with "TYPE" set to "DIGITAL SPEED", "ECU PIN" set to "NOT DEFINED", and "ENABLE" checked. The other three rows are for "GROUND" inputs, with "TYPE" set to "GROUND", "ECU PIN" set to "NOT DEFINED", and "ENABLE" unchecked. Each row has a "Configure" button to its right.

	NAME	TYPE	ECU PIN	ENABLE	
#1	Driveshaft Speed	DIGITAL SPEED	NOT DEFINED	<input checked="" type="checkbox"/> Enable	Configure
#2		GROUND	NOT DEFINED	<input type="checkbox"/> Enable	Configure
#3		GROUND	NOT DEFINED	<input type="checkbox"/> Enable	Configure
#4		GROUND	NOT DEFINED	<input type="checkbox"/> Enable	Configure

Next, select the “Configure Tab. If using the orange wire from TC pin 5 P2, configure it as follows:

**Type** = RPM (this will be the driveshaft speed)

**Display** – See example below. If RPM exceed 10,000, then increase the values as needed.

**Pulses** – Set to 8 (pulses per rotation) if using a Davis Technologies 8 trigger ring. If not set to whatever the magnet count is on the collar used.

**Pulses to Average** – Set to 4 as a baseline. If the Shaft Speed is too “jumpy” on the Holley EFI, this can be increased.



# Example Driveshaft Speed Setup

**Driveshaft Speed - DIGITAL SPEED**

Type: RPM

Units: rpm

Format: 1

Sensor Min: 0 rpm

Display Min: 0 rpm

Caution Min: 0 rpm

Normal Min: 0 rpm

Sensor Max: 999999 rpm

Display Max: 10000 rpm

Caution Max: 10000 rpm

Normal Max: 10000 rpm

Enable PC/LCD Caution Output

Enable Switched Caution Output

Enable PC/LCD Warning Output

Enable Switched Warning Output

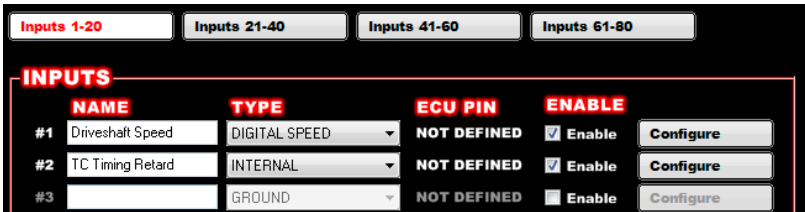
Pulses to Average: 4

Pulses: 8 pprot

## LOGGING TRACTION CONTROL PARAMETERS:

Most of the Holley traction control data can be logged and reviewed. To do this, these channels must be set up as “Internal Parameters”. This must be done in the I/O ICF. Contact Holley or review Holley V2 software for more information. The following is a brief setup example.

First create a new input. In the dropdown select the “INTERNAL” selection.



The screenshot shows a software interface for configuring inputs. At the top, there are four tabs: "Inputs 1-20", "Inputs 21-40", "Inputs 41-60", and "Inputs 61-80". Below the tabs is a table titled "INPUTS" with the following columns: NAME, TYPE, ECU PIN, ENABLE, and a "Configure" button. The table contains three rows of input configurations.

	NAME	TYPE	ECU PIN	ENABLE	
#1	Driveshaft Speed	DIGITAL SPEED	NOT DEFINED	<input checked="" type="checkbox"/> Enable	Configure
#2	TC Timing Retard	INTERNAL	NOT DEFINED	<input checked="" type="checkbox"/> Enable	Configure
#3		GROUND	NOT DEFINED	<input type="checkbox"/> Enable	Configure

Next, go into “Configure”. Select the “Source” for the channel you want to use (see picture below). At the bottom of the list there are many traction control channels. They all start with “TC”. They are self explanatory. You don’t “Pin Map” these. You can select them to be viewed in the Data Monitor, or in the Data Logger.

## Example TC Timing Retard Logging Setup

**TC Timing Retard - INTERNAL**

Source: TC\_Timing\_Retard

Units: °

Format: 1.23

Sensor Min: 0.00 °

Display Min: 0.00 °

Caution Min: 0.00 °


Normal Min: 0.00 °

Sensor Max: 60.00 °

Display Max: 60.00 °

Caution Max: 60.00 °

Normal Max: 60.00 °



Enable PC/LCD Caution Output

Enable Switched Caution Output

Enable PC/LCD Warning Output

Enable Switched Warning Output

Warning Enabled Timing Offset: 0

## TC ENABLE:

The TC Enable feature allows the user to configure a pin to enable / disable the traction control with a remote toggle switch. This toggle switch can be the same as used to enable data logging and assigned to the same pin as the data log enable in the pin map. If a separate pin is desired, simply pin map it to a type “H” or “G” pin per normal Holley pin assignment. **This must be a “Constant On” switch, not a momentary push button!**

**NOTE: Leave the TC Enable check box unchecked to activate the TC if a remote switch is not used.**

Some users like to disable the TC during the burnout, however this is not necessary as the TC will only make correction when a spike in RPM is detected. In the burnout, the TC will only activate on the initial “Hit” and on gear shifts. It will not cut power for the duration of the burnout.

### Example of Pin Map for TC Enable

Pin	Input Number	Input Type
A12	Input #1	H ECU Log Trig ,Master Enable,T.C. Enable
A3	Input #2	H T-Brake/Launch
A13	Input #3	F DRIVEHAFT SPEED
A4	Input #4	F T.C. Input

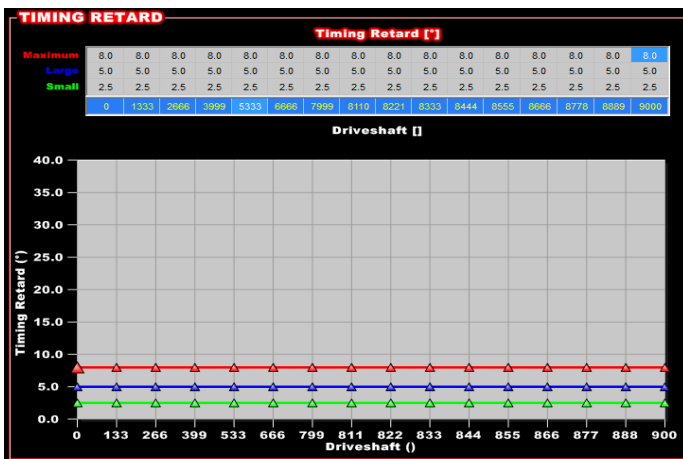
Pin	Input Number	Input Type
A10	Input #5	5 2 T H G
A11	Input #6	5 2 T H G

## TIMING RETARD TABLE:

The most common method to reduce power is Timing Retard, which we will use for this example.

Here is a basic retard table that will retard 2.5 degrees for a small spin, and 5 degrees for a larger spin. When a “small” slip indication occurs, the timing will immediately step to the corresponding “small” retard value. When a “large” slip indication occurs, the timing will immediately step to the corresponding “Large” retard value. If a large or small slip indication remains, the timing will retard at a rate based on the “Removal” rate until the “Maximum” retard value is met (see Timing Rates below). In the event that repeated large corrections do not correct the tire slip, then the system will make a Maximum correction of 8 degrees. **(TC-1 systems only make the Large and Maximum corrections. Set the Small and Large to the same values.)**

The user can set the values to whatever amount of timing retard is desired, and even change it throughout the run depending on Drive Shaft speed.



## TIMING RATES:

The rate at which the timing is removed from, and restored back to the base timing map is also adjustable.

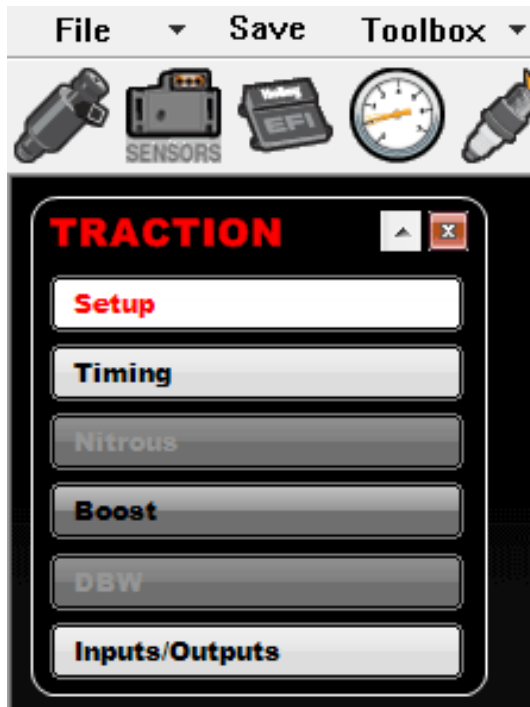
		Timing [°/sec]															
Removal	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	
Restore	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
	0	1333	2666	3999	5333	6666	7999	8110	8221	8333	8444	8555	8666	8778	8889	9000	
		Driveshaft [ ]															

The Removal rate is how fast the timing is removed towards the “Maximum” retard, after the TC makes a correction of the small or large value. A value of 15-25 is likely a good starting point. So a Removal Rate of 15 degrees per second is 1.5 degrees in 1/10<sup>th</sup> of a second. A setting of 25 in the Removal table would result in the timing being retarded faster, at a rate of 2.5 degrees in 1/10<sup>th</sup> of a second.

The Restore Rate is used to “Ramp” the timing back in after a slip has been corrected. As a rule of thumb, 2.5 degrees per 1/10<sup>th</sup> of a second is good. So a Restore Rate of 25 degrees per second is 2.5 degrees in 1/10<sup>th</sup> of a second. A setting of 50 in the Restore table would result in the timing being restored faster, at a rate of 5 degrees in 1/10<sup>th</sup> of a second.

## OTHER METHODS:

In addition to Timing Retard, Nitrous Percentage, Boost Level, and Drive By Wire throttle body reductions can occur to reduce power. These can be selected in the Setup Menu. Any combination of them can be used. The methodology is the same as that used in the Timing Retard example above.



# **TRACTION CONTROL SETUP**

## **TRACTION CONTROL ADJUSTMENTS**

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 Drag-Sportsman incorporates a patented method to control wheel spin where the users sets a Threshold of acceleration that if exceeded will cause the timing to retard.

The sensitivity of the system is adjusted using the Threshold dial. The Threshold simply sets the maximum rate of acceleration allowed. If this rate is exceeded then a correction is made. The higher the number the more aggressive the system is. A good starting point is Threshold 3. If you feel that your system is making too many corrections while set to Threshold 3, then try Threshold 2. Valid settings for Threshold are 1-8.

**(OFF turns unit off, except for sensor test / AUX activates window RPM test).**



## SETTING THE DIAL:

The “Threshold” dial can be set to a value of 1-8. This simply sets the maximum rate of acceleration allowed. If this rate is exceeded then a correction is made. The higher the number the more aggressive the system is. A good starting point is Threshold 3. If you feel that your system is making too many corrections while set to Threshold 3, then try Threshold 2. Valid settings for Threshold are 1-8.

(When using this method the Mode setting has no effect on the system, with the exception of Mode OFF, or Mode AUX).

(OFF turns unit off, except for sensor test / AUX activates window RPM test).



## **CONFIGURING**

### **TRIGGER COUNT:**

The unit is factory set for 8 triggers per revolution.

The unit can be configured to use between 4 – 16 triggers per revolution. Davis Technologies recommends 8 triggers per revolution.

Once the value is set, the value will remain until changed by the user.

To change the value, follow these steps.

1. Set the Threshold dial to “4”
2. Hold down the “Test” button
3. Turn the power On
4. While holding the “Test” button down, move the Threshold dial to the desired number of triggers divided by two. (example- 8 triggers/2=4)
5. Release the “Test” button.

The LED will flash to show the number of triggers the unit is now set to. **(The Trigger Count must be set correctly for the accurate RPM calculations)**

## **TESTING**

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

### **SENSOR TEST:**

This test is useful for setting up the trigger ring and sensor if used.

1. Set the dial to “OFF”
2. Rotate the RPM trigger-

The LED will flash each time a trigger is sensed. The unit is not active in any other way and no corrections will be made. The LED will appear to glow if triggered quickly.

### **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 dial to “9”
2. Start the engine and accelerate the driveline.
3. When the RPM is within the window of 1000 to 3000 rpm the LED will glow solid and the unit will make a large correction.

## **FORCED ACTIVATION TEST:**

This test is useful to check both stages of retard.

This is also useful to test the connections to a data system if used.

1. Set the dial to any setting between 1 to 7.
2. Connect a timing light to the engine
3. Turn “on” the power to the unit, the LED should begin to flash.
4. Start the engine.
5. With the engine idled up to about 3500 rpm; press the Test button on the unit until the LED glows solid. The first correction level will activate for 4 seconds, then the second stage for the next 4 seconds.

**IMPORTANT- The Minimum Driveshaft Speed Must Be Exceeded For The Timing To Retard. You may want to temporarily set the Minimum Driveshaft Speed to 0 rpm for this test. (see Holley ECU Setup above)**

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

If unit does not pass all tests, recheck all setup parameters and connections and retest.

## **FACTORY RESET**

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

1. Set the dial to “5”
2. Hold down the “Test” button
3. Turn the power On
4. While holding the “Test” button down, move the dial to the “Off” position.
5. Release the “Test” button,

The LED will flash rapidly to indicate the Factory Settings have been restored.

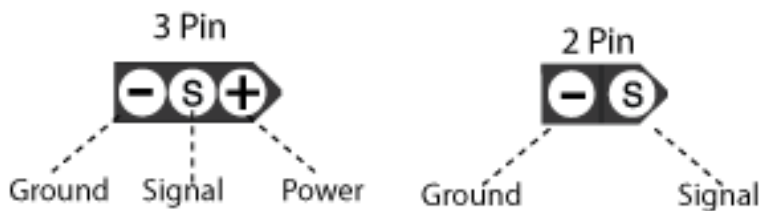
## **FIRMWARE UPDATING**

Davis Technologies may release firmware updates or upgrades periodically to ensure the best possible functionality of the Traction Control System. These are typically installed using the USB connector and the supplied USB cable. Instructions for this procedure will be included in the firmware update file located on the web site.

Users should log onto [www.moretraction.com](http://www.moretraction.com) occasionally to check for updates.

## **APPENDIX A**

### **RacePak® Sensor Pin Out**



## **APPENDIX B**

The biggest difference in our systems is the Speed and the Self-Learning capabilities. Other systems “brag” that their TC works 10 times a second—our older systems worked 20 times a second, and while it would help “save a run”, it just was not fast enough to help you go faster.

The new systems (since Jan 2009) work every 1/8th of a turn of the driveshaft. At 3000 RPM DS speed, a very critical area for tire slip, it measures the DS RPM 400 times a second, at 6000 DS RPM it measures 800 times a second! The system then processes those measurements 50 times a second (typically), and as fast as 100 times a second, to calculate acceleration change (DS RPM Delta). (We can actually use up to 30 triggers, which would be 1500 times a second at 3000 DS RPM, and 3000 times a second at 6000 DS RPM !!)

Our units utilize 2 high speed processors to measure and calculate drive shaft data, and nothing else. Our patented systems are not simply a few lines of code thrown into an existing engine management system and called traction control. This is all we do, and all we have done for the past 15+ years!

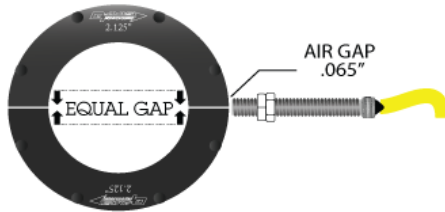
**Traction Control Is What We Do!**



## **RING & SENSOR**

Use the following guidelines to install the Davis Technologies ring & sensor.

!!!! Set Gap to .065" !!!!



!!!! DO NOT OVERTIGHTEN  
SENSOR JAM-NUTS !!!!

## **DISCLAIMER**

### **DAVIS TECHNOLOGIES PRODUCTS ARE FOR CLOSED COURSE USE ONLY.**

The following terms and conditions apply to all products manufactured and sold (“Products”) by Davis Technologies, LLC (“Davis”).

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