Traction Control

Rumors of black boxes have existed since the first time man competitively raced automobiles. In the last few years, the black box accusations and pit arguments have reached full steam, especially when the black box is traction control and the motor sport is drag racing. A lot of questions exist concerning traction control in drag racing: Is it available? How does it work? How do I install it in my car? It is worth two tenths and five miles per hour? One popular rumor is if a team is winning, they must be using it. I have been asked to write an article to help drag racers answer these questions and understand traction control.

I grew up on a farm and in 1997 completed a computer information systems degree. With the combination of mechanics and electronics in my blood, I like to describe myself as a computer geek crossed with a grease monkey. My father and I had been drag racing for ten years before I graduated college. After college I started to apply my skills in drag racing. I realized that there was a big gap between electronic technology and drag racers. Quite a bit was available however drag racers weren't readily embracing it. So I started helping teams use technology. I have been really fortunate in that I work with a lot of top teams and learn a lot from great minds. I started to hear about traction control the first day I was involved in professional drag racing. Naturally I started to look into it. One system really caught my eye: the Davis Technologies unit. Eventually the Davis group and myself went in together to build a unit for outlaw style drag racing.

Other than the Davis system, there are a few other approaches to traction control in drag racing. A popular motor sports company builds an ignition box that controls the acceleration rate of the engine. The acceleration rate is programmed into the box by the user creating an engine RPM map. The map consists of a timeline on the 'X' axis and RPM on the 'Y' axis. The ignition system constantly monitors the running engine RPM to the RPM value on the time graph. If the running RPM begins to exceed the programmed RPM value, the limiter is activated until the RPM is under the 'Map.'

Another approach to traction control is a form that we have all experienced when driving a modern car. Modern cars use a traction control system that monitors the front and rear wheel speed. Some manufacturers use one front wheel and others use both. None the less, tire slip is easily detected using this method. However there is one fundamental flaw of the application for drag racing. The front tire is not always on the ground. So instead of using a front wheel speed sensor, a ground speed sensor is a great substitute. The sensor though, is somewhat bulky and not designed to be used inside of a drag racing vehicle. However I am sure there are brilliant minds that have found a way for this method to be very effective.

Obviously, the Davis unit is the one approach I am most familiar with in drag racing. The Davis unit looks for changes in the driveshaft acceleration rate to detect tire spin, so the unit requires only one input to detect tire slip; drive shaft RPM (DSRPM). How is DSRPM measured? If you already have a form of data acquisition you are already familiar with this, however I don't want to leave anyone out. A two piece ring is clamped somewhere onto the driveline. Typically the ring is clamped around the pinion. Inside the aluminum ring are eight steel triggers. A sensor is mounted on the third-member to sense the triggers. Each time a trigger is detected by the sensor, a pulse is sent to the unit. So in essence, the box is counting pulses over a set time span to calculate DSRPM. By knowing the DSRPM, the acceleration rate of the driveshaft can be calculated. When a drag car is going down the track, the unit calculates the acceleration rate of the driveshaft 200 times a second. The unit constantly learns the acceleration rate. When this rate begins to increase at a pace that is higher than what has just previously been "learned", it outputs a 12v signal like other forms of traction control.

The 12 volt signal has been used several different ways to control tire spin. The majority of Outlaw teams use the 12 volt signal to trigger an ignition retard. Other applications for the 12v signal include opening a boost valve, closing a nitrous stage, controlling the brakes, and engaging a limiter. All ideas have their merit. I will concentrate on the ignition retard route because of its popularity. Initially, there was quite a backlash from engine builders when retarding timing was suggested as a means to control tire spin. However, after track testing it became obvious that the retard wasn't engaged long enough to damage the engine. Typically the retard event is on at most three tenths of a second. After that was addressed, teams began to use the unit connected to a retard module. The ignition retard value is determined by a retard chip. While this was extremely beneficial, it was apparent that more retard was needed at the start of the run to fix tire spin than later in the run. Resourceful teams would use two retard modules and a timer to turn on/off retards for sections of the run. Fortunately, ignition systems have progressed drastically in the last few years. Now digital systems allow a retard map to be constructed, eliminating the need for multiple retard modules. Traction control is connected to a retard stage of digital ignitions.

Traction control will not make a perfect run any faster. How often is a perfect run made? It will not turn a bottom of the pack car into the low qualifier on the next run nor will it allow you to leave at 10,000RPM with 50lbs of boost. If traction control is looked at and used by the team as another tool, success will quickly follow. Traction control used properly will give a huge competitive advantage. The tuning window grows exponentially, the amount of aborted passes drops considerably; the crew chief will not be chasing track conditions. If a team has a data acquisition system, the traction control activity can be monitored. Data acquisition is not required for any form of traction control I am aware of. However the combination of the two provides for a great opportunity to learn about your vehicle. I encourage my customers to log the traction control output with their data acquisition system. After each run, the team knows exactly where the TC saved them. The attached JPG has a run that the TC activity was recorded in conjunction with engine, clutch and driveshaft RPM. Notice that each time the DSRPM spikes, the TC unit turns on. The team was not using the traction control to trigger a retard at this point, just testing to see when the unit would detect tire spin. There are two things I would like to point out with this example. There is a spike at the beginning of the run and yet the TC unit didn't turn on. This is because a start RPM can be configured with the TC. Most drag cars need initial wheel spin to create wheel speed. So this team programmed the TC unit to not correct until 2000 RPM. Secondly, the unit didn't correct for one spike in third gear. If the team wanted to fix this small spike, the threshold number would need to be increased by one count. This is easily done by the selector knob on the front of the unit. However trying to fix every little bump in the driveshaft trace would not be the best. Sometimes the spikes are due to track bumps so not much can be done. This is where a team decides how sensitive to set the unit.

I often get asked how much this will improve a cars ET. This is a difficult question to answer. I don't know everyone's combinations or the tracks they race on each weekend. I can tell you that traction control will create a larger tuning window for your car. I really enjoy receiving calls from my customers after they use the system for the first time. All of them report the car being much easier to drive, more consistent, and tunable. I cannot stress enough, no matter what traction control system is used; it must be used as a tool, not a crutch. Ideally you want the traction control to never activate during a run. That means a perfect run is being made. However, that is pretty difficult to pull off round after round. Use the traction control to let you stay on the aggressive side of your tuning decisions and you will love the results year after year.

If you have any questions, feel free to contact me at 303.885.7428 or email questions to sales@dragtraction.com