Legalize Electronic Traction Control!

Words and photos by Glen Grissom

Editor's Note: DRO contributor Glen Grissom wrote this article for our sister publication Circle Racing Online. With all of the talk about traction control and traction control devices for everything from bracket 1 cars to Top Fuelers, we thought our readers might like a look at what is actually in use over in the oval racing field and how this might be applied to drag racing.

Should stock-car and open-wheel series in America follow Formula 1's lead and allow electronic traction control? (Photo courtesy of BMW PressClub)

Recent events prompted this examination into the somewhat clandestine world of racing electronic traction control (ETC). Just a few weeks ago, I received a "drop-the-dime" phone call from a member of a racing team in a major stock car touring series, angrily saying I should look into doing an updated article on ETC.

They knew they were getting beat by ETC, this crew member said, and might have to consider installing it just to stay competitive, even though they were ethically opposed to doing so. But ethics be damned-they figured if they couldn't beat'em, they'd have to join'em-and so what if the cost of getting caught was substantial? The cost of not being competitive seemed even higher. He said they had heard there were ETC units available that are virtually undetectable; so in the interest of keeping some racers on the ethical straight-and-narrow, I began to do a little research.

But first, full disclosure. I worked at MSD Ignition from the late-'80s to the early '90s, and even then we were hearing about separate MSD racing ignition spark boxes and timing controls being mated together by homebrew electronic techs, secretly mounted in race cars and used for rudimentary ETC. The policy of that company then-as it is now-was not to pursue building and marketing a distinct MSD-branded ETC product.

Later, while working as editor of *Circle Track* magazine, I worked with the staff to publish an article on a type of custom-designed ETC reportedly being tested for use in Winston Cup in the mid-90s. As one would expect, it demonstrated electronic expertise and packaging sophistication.

The powers that be in F1 recently conceded that policing ETC in their series was futile, so it was made legal after seasons of high-tech electronic cat-and-mouse between the major factory teams (with budgets bigger than many countries) and the smartest racing technical inspectors in the world. To me, that was the last shot fired. If the most technically aware racing series in the world-with the most technically capable inspection people, processes, and resources available-finds it impractical and not worth its effort to use those resources in detecting illicit ETC, then how can lesser series with far fewer resources be expected to do so? Better yet, should they even try?

To find out, I revisited some of my former ETC contacts and made some new ones to survey what is presently available on the market for the money. I discovered the basic physics and tactics of the electronic management of tire slip haven't changed much in the past five to six years. However, the cost to miniaturize and package electronic sensing and controlling components has become so relatively affordable that effective mass-produced ETC units can be made so small and portable that they have become virtually undetectable.

(next page)

(previous page)

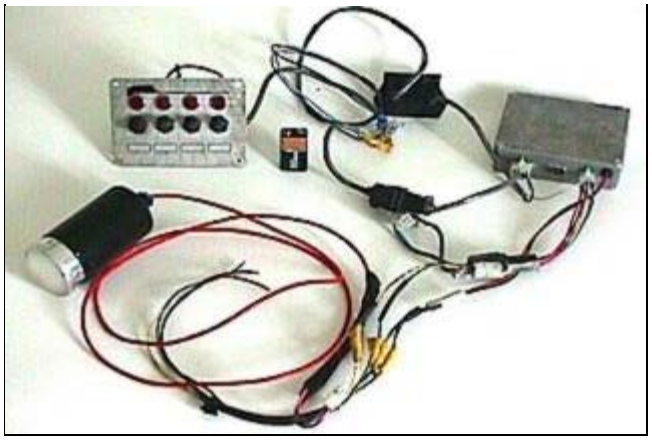
"You could build a [ETC] piece that would be one-and-a-quarter inch long, three-quarters of an inch wide, and an eighth of an inch thick using surface-mount circuit board technology," one manufacturer of ETC explained to me. "You could have a custom IC (integrated circuit) made for $50,000 that would be a one-quarter inch cube and could activate with a single, hair-sized wire. It's getting awful hard to find this stuff."

Right now, you can spend about $8,000 for ETC that *might* be found if both car and racer were given a post-race exam that would do a proctologist proud, or if the team was slack in its installation. To be successful in uncovering ETC at work, the inspection crew might have to involve X-rays, a pat-down search of a driver getting out of his car, a power metal saw, a cutting torch, and about eight hours of inspection-and I'm probably exaggerating just a little.

So, the cost of policing to this extent is so high (both politically and financially), and the odds of discovering certain current versions of ETC are so low that I don't think it's worth the effort. In my view, circle racing sanctioning bodies should just consider legalizing ETC and choose other, less formidable tech battles to fight.

ETC DEFINED

Basically, electronic traction control involves the electronic management of engine power to the driving wheels in order to achieve optimum grip from the tires. In this article we're only going to consider publicly available ETC for carbureted, rear-drive race cars without electronic engine management controls because the majority of race cars fit that description. This is not to say that ETC isn't available for race cars with electronic management of ignition and fuel-it is, and it's actually easier to implement and harder to detect-but the market caters to the greatest number of potential customers.



This is a used ETC system that uses ground speed measured via the round cylinder radar (at left) for tire slip calculation. The cylinder is mounted with a line-of-sight to the track surface. The 9-volt battery (center) shows the scale of the components-a challenge to mount secretly, but certainly not impossible.

Some slip of the driving wheels' tires is desirable for maximum traction-typically between eight and 12 percent, depending on track conditions and tires. Racers learn over time to manage the application of engine power to get the best grip via a calibrated right foot. He or she learns to sense and absorb inputs from the car and conditions, process those inputs, and then adjust the throttle for best grip. With ETC, electronics approximate the same actions, and in many cases the sensitivity and adjustability of the electronics is superior to the racer's seat-of-the-pants feel, so lap times improve, or at least stay exceptionally consistent.

ETC detects tire slip and then uses different methods to manage it, although all methods rely on reducing engine power to the driving tires. What separates the current ETC units on the open market is: 1) how they detect and discern excessive tire slip, and once doing so; 2) how they control the engine output to reduce it; and 3) their packaging of the sensor and control circuitry.

(next page)

(previous page)

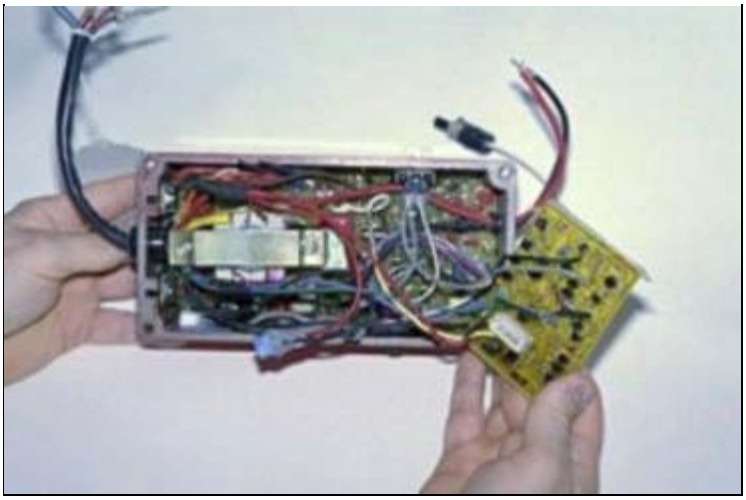
Detecting tire slip is done a variety of ways. Some units use wheel speed proximity sensors mounted on the wheels to detect a difference in wheel speed between the front and rear tires, while others compare ground speed to rear wheel speed. Still others monitor a speed signal indicative of engine RPM and use software to check the rate of change of this RPM-if it exceeds a certain rate of change (indicating the tires are slipping too much), then engine power is affected. For example, flywheel teeth can be counted to get this rate of change of engine speed, as can transmission gear teeth, or closely monitoring a tachometer signal.

Once tire slip is detected, electronic methods are used to reduce the engine power to the wheels. As one ETC manufacturer stated, "You can take away about 15 percent of an engine's HP with no indication it is being done. You can take more but you get into indicators like sound (engine note changes), temperature of the exhaust (increasing), or fire coming out the exhaust pipes (unburned fuel}."

Also, engine cylinders may be randomly dropped (controlled misfiring), ignition timing can be retarded a little at a time depending on the amount of tire slip, or electromechanical actuators may be applied once excessive tire slip is noted. For example, Racetronics (ph: 610-759-8217) has actuators that apply/release the rear brakes, or manipulate the throttle to manage the engine's output for best traction. Davis Technologies (ph: 828-645-1505) and Tri-Mark Performance (ph: 608-643-0088) market ETC using management of ignition timing, or misfiring.

ETC PACKAGING EVOLUTION

Four to six years ago a typical ETC unit could have been made by cannibalizing various MSD Ignition circuit boards out of their factory packaging and retrofitting them into one of the main ignition control spark boxes. This may still be done at the more local levels of racing. For instance, an off-the-shelf timing retard circuit board, or RPM limiter (controlled misfire) circuit board, might be piggy-backed inside the spark box, activated by a push button on the steering wheel, and then the racer could serve as sensor/activator.

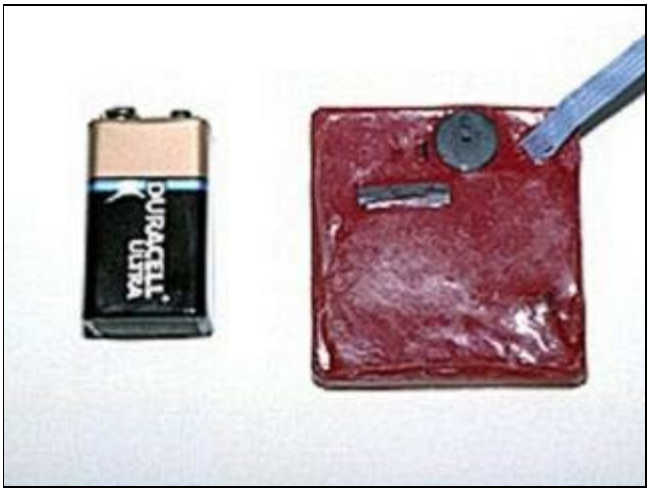


An ETC packaging method of a few generations ago. The extra ignition timing retard circuit board (right hand) is cannibalized from an off-the-shelf MSD Ignition product and installed inside the main ignition control box. This ETC unit established how much timing was retarded by plugging in retard "chips" disguised as RPM-limit chips.

A next step was to control the activation / deactivation of the timing retard circuit, or RPM limiter circuit via a "window switch," which turns the circuit on at one preset RPM and turns it off at another. The racer didn't have to be involved. Sometimes this timing retard circuitry, or controlled misfire circuitry, would be extracted from the factory packaging and installed elsewhere in the car (say for example, in the seat foam), if tech inspectors decided to open up spark boxes and see if they were just a bit too stuffed with electronics.

(next page)

Within the last four years, some ETC manufacturers have developed their own tire slip and ignition management circuitry to work inside an MSD spark box or other ignition control. Racetronics and Tri-Mark build theirs in separate ETC units that can be hidden in a race car if so desired. The Tri-Mark main control box is 3.5 X 5 X 1-inch. Not exactly tiny, but hideable from cursory tech inspection. Davis Technologies has produced some impressively small ETC circuitry that integrates inside a spark box. It's a convenient place to put it because plenty of critical inputs are available: power, ground, an engine RPM signal, etc.



ETC that is more current, but still about three to four years old. The custom-built ETC circuitry by Davis Technologies (right, next to 9-volt for scale only) could be mounted inside an MSD ignition control and be tough to detect on casual inspection of an open spark box. Note the ribbon-wire connection to the circuit pack.

I've seen the inside of plenty of stock MSD spark boxes used in racing, and I've seen the inside of one implanted with Davis Technologies ETC circuitry, and to be honest, a tech inspector would be very hard-pressed to tell the difference between the two. A hacksaw would make the job easier, but not too many racers are going to let tech inspectors hack into an ignition control-especially a modified one.

Nevertheless, according to one ETC manufacturer, many new sales are now of ETC units that are not integrated in an ignition control because some tracks have basically gone to a "claimer rule" where they can randomly take an ignition control, or they issue a racer one from the track. The tracks are not going to spend the time policing for ETC, but racers risk losing a relatively expensive ETC unit if their number is in the claimer pool. Consequently, the move to making ETC that is portable, or so small (see below) it can be taped into a wiring harness and look only like a bulge in a wiring loom.

Portable ETC unit (bottom) closer to what's currently available for race teams, just bring your checkbook. This one is not integrated into an ignition control, but its size makes it easy to mount or carry.

DOES ETC WORK?

When is ETC most effective? Any time you are racing at a track that you apply and lift the throttle. When running at Talladega when most of the race is WOT (wide-open throttle), it doesn't offer much of an advantage. But as one crewchief noted after experimenting with ETC recently, "We picked up three seconds on a road course."

ETC can improve fuel mileage because throttle transitions are electronically damped. Tire wear/conservation can be improved because it can calm down all the little tire slips that are going on during racing that wear and heat up the tires-the electronics can react faster than a human can.

(next page)

(previous page)

"I've seen at Darlington that after 50 laps we were a second-and-a-half faster per lap with it on, than with it off," said one ETC manufacturer. "This was very thorough test, the tires were in better shape, and the tire temps were showing 20 to 30 degrees cooler."

Certainly, ETC could help an inexperienced racer become more consistent with throttle application in a shorter amount of time than by learning it by feel. But experienced racers have seen benefits, too. According to one ETC maker who has tested with some of the best drivers in the country, the system promotes consistency.

"These are the best guys out there," he stated. "We put it [ETC] on and they don't go any faster, but they *stay* faster. They don't lose as much. And I've had a guy, and we went to a track he's strong at, and he went three-tenths of a second faster the next lap.

"I don't know of a series that I personally don't have units in. I'd like to see [sanctioning bodies] make a form of it legal," he continued. "It doesn't replace the driver; doesn't take that much away from the driver. You're not going to take a guy that can't drive and make him a racer with ETC. It is not a hero maker. It's not going to fix a bad race car, it may make a bad race car easier to drive, but it's going to be a slow race car at that point."

Given the reasonable cost, effectiveness, and portable packaging of current electronic traction control, it seems to me the amount of resources and/or aggravation expended to find this "unfair advantage" is unreasonable. ETC is just one of the many pieces of creative engineering going on in racing, and it's become one of the most difficult, if not impossible, aspects of racing to police. Legalize it and the price will come down, and focus the tech inspection effort on finding other trick parts-I'll drop a hint-start looking for titanium truck arms that a magnet will stick to. But that's another article.

Representative portable packaging of ETC available today - the yellow button is pressed to program the unit, the white LED lights when inputs are made. The 9-volt connection at top is the only wiring hookup.

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