Volume 7, Issue 1

CRASH TALK

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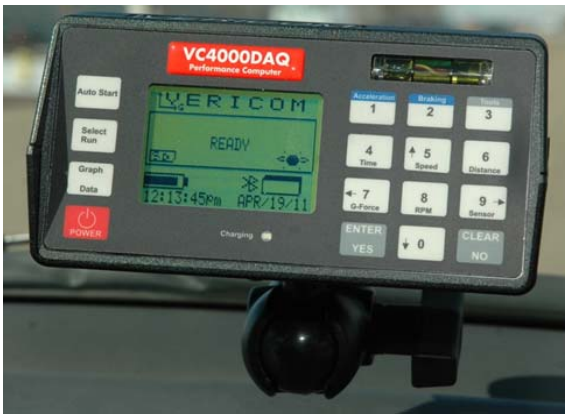
Vericom® Computers: Measuring Acceleration, Braking and More…

By: Don Pohl, P.Eng, Partner

Vericom® manufactures vehicle performance computers, typically used by Police, Engineers or car enthusiasts. These devices mount to a vehicle's windshield via suction cups and thereby undergo the same acceleration and deceleration that the vehicle undergoes. The heart of the Vericom computer consists of accelerometers that measure the vehicle acceleration forces. Most smart phones (e.g. iPhone) now employ the same basic technology that allows them to measure acceleration; however the Vericom computer is dedicated to measuring vehicle performance and makes the task relatively simple and accurate.

Why do we care about the acceleration forces of a vehicle? Accident Reconstruction Engineering involves calculations using these acceleration forces. For example, when a driver skids for 30 meters (98 feet) and comes to a stop, how fast was the driver going? A deceleration rate of 0.7*g* is commonly used for dry pavement, as all passenger vehicles should be able to decelerate at this rate. However, high performance sports cars like the Corvette ZR1 can decelerate at 1.2*g* from 60 mph to zero. A high performance sports car can stop in 30 meters from 96 km/h at 1.2*g*, whereas an ordinary vehicle needs 30 meters to stop from only 73 km/h at 0.7*g*.



The latest Vericom computers have the ability to measure more than just acceleration. It can be equipped to measure impact forces of crash tests. Alternately, it can be connected to a vehicle's OBDII port to receive output signals from a vehicle's onboard computers, including vehicle speed, RPM, throttle position, etc. The Vericom is also equipped with a GPS system so the vehicle's position can be tracked and mapped, or the vehicle speed monitored in an independent manner.

Testing with the Vericom computer allows engineers to become familiar with the acceleration rates expected with full braking, normal acceleration from a traffic light, or lane change forces. It is also a simple method to measure the braking rate on snow or ice with all-season and winter tires. Having firsthand knowledge of expected acceleration or deceleration rates is a valuable asset in Accident Reconstruction.

When a vehicle has remained intact and driveable after a collision, our office has tested the actual vehicle at the collision site to verify proper brake function. For example, a gravel truck and trailer was tested on a gravel surface to verify that all wheels locked up and to determine the deceleration rate of the vehicle. On another occasion, the Vericom computer was used to measure the deceleration rate of a vehicle that had struck a cyclist. The vehicle was older and the tires were worn such that an argument could be made that the vehicle could not decelerate properly. Our testing determined that the vehicle could decelerate at 0.76*g*, which exceeded the minimum expected rate of 0.7*g*. In yet another case, a pickup came to a sliding stop in soft sand. Our office tested this with an exemplar pickup to determine the likely deceleration rate, and thereby the speed.

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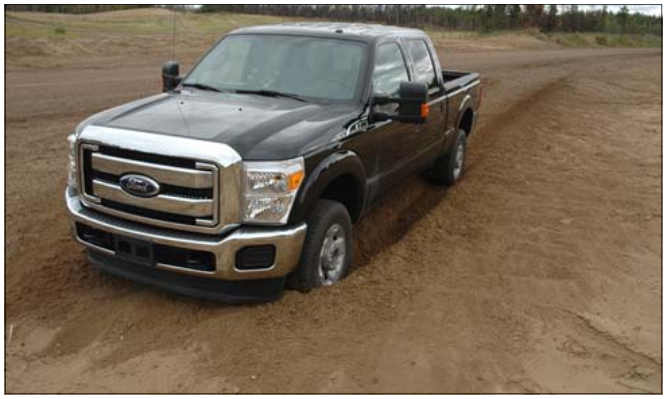
Lastly, our office has conducted numerous acceleration tests for low-speed impacts when a driver indicates his/her foot simply slipped off the brake when stopped behind another vehicle. These tests can be completed on the actual vehicle to determine the speed that the vehicle can achieve in one, two or three meters (half a car length). Typically, stopped vehicles achieve about 5 km/h in a couple meters when the brake is simply released and the accelerator pedal is not depressed (automatic transmission equipped vehicles).



In summary, real world testing of vehicle dynamics using an accelerometer like a Vericom computer allow a more realistic analysis to be completed.

Don Pohl, P. Eng. has been a Collision Reconstruction Engineer with Graham Ryan Consulting Ltd. for thirteen years, and a Partner for five years. Don can be reached at don.pohl"at"grahamryan.com.

Recalls

- Hyundai is recalling 2012 and 2012 Sonata vehicles due to side airbags going off unexpectedly.
- Hyundai is also recalling 2007 and 2008 Santa Fe SUVs which may have passenger air bags that do not deploy when they should.
- Ford has recalled 2013 Ford Escape with 1.6L GTDI engines. Fuel leakage may occur, causing a fire.

EDR UPDATE

By: Craig Assenheimer, P. Eng.

The world of EDRs – Event Data Recorders – is a fast-changing place. For the past ten years or so, we've been able to use the Bosch Crash Data Retrieval (CDR) tool to access useful collision-related electronic data from General Motors branded vehicles (Chevrolet, Buick, Cadillac…), starting with a few 1994 models, and expanding to most models by 1998. Then, a few years later, Ford (Mercury, Lincoln) signed on to the CDR tools, and some of their 2001 models had data available. It was a slow and fitful phase-in, though, and only in 2012 was their full model line supported. Many of their older supported vehicles did not have useful data for collision reconstruction. Chrysler (Dodge, Jeep) had a similar long phase-in, with the first supported model (the Durango) in 2005, and the full line-up supported in 2010.

New in 2011 was the ability to download data from Toyota (Lexus, Scion) vehicles. It was noteworthy in that the vehicles with available data went retroactive to 2004 for most models, and all the way back to 2001 for a couple of Lexus models.

Honda (Acura) recently signed on to the CDR tool, starting with 2012 models. Nissan just became supported, starting with select 2013 models. Many other manufacturers are expected to follow suit in the near future; which ones, and when is still up in the air.

In addition to passenger vehicles, most heavy trucks (Mack, Volvo, Kenworth, Freightliner) have the capability to record collision-related information. This information typically includes vehicle speed, throttle, clutch, and brake position, and so on. It is usually recorded in one of three cases: The vehicle is suddenly slowed (a "hard brake" event), a trouble code is set (low oil pressure, etc.), or the vehicle is stopped ("last stop event"). The first two are typically stamped with the time, date, and odometer reading, whereas the 'last stop' event, which is only recorded by vehicles with Detroit Diesel engines, is lost if the vehicle is stopped again. So the vehicle might need to be towed to a repair shop for download – take the keys out so that nobody tries to move it in the yard!

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