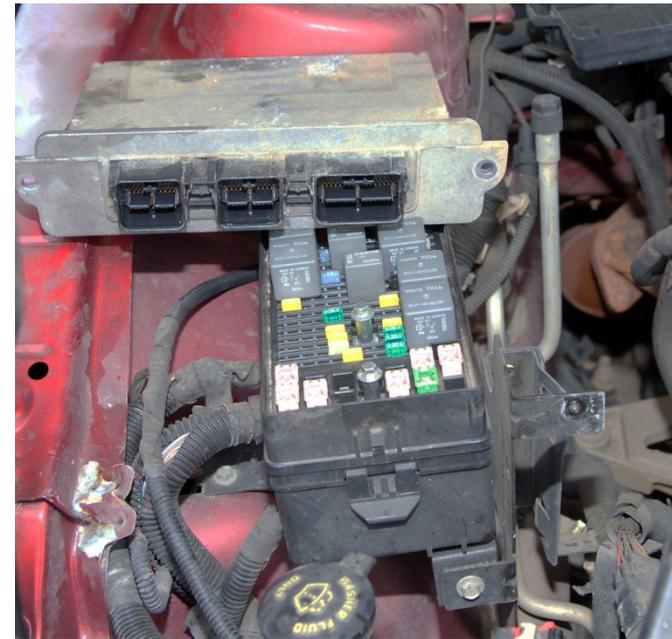


The photo to the right of this text is a Powertrain Control Module (PCM) in a late-model Ford product. Ford Motor Company calls its airbag control module a Restraint Control Module (RCM); for many years, the Ford occupant protection systems included pre-tensioners on the front seatbelts. The systems were designed such that, in some cases, the only deployed restraint would be those pre-tensioners. The RCMs, however, were not designed to store a large amount of data, so Ford designed the PCMs to store crash data whenever a deployment command was sent by the RCM. After that deployment, the RCM was designed to send a Restraint Deployment Signal (RDS) to the PCM. Once an RDS was received by the PCM, it would lock a data loop in non-volatile memory. Although some PCMs would retain more data, most would save pre-crash data for 20 seconds before the RDS was received and for five seconds after. The stored data points included vehicle speed, accelerator pedal position, engine rpm, ABS condition (active/inactive), brake switch condition (on or off), transmission condition (neutral, not neutral, reverse), driveline torque (both commanded and actual), stability control (active or not), and a property called key-on timer. These data points were recorded at intervals of 0.2 second for a period of time from approximately 20 seconds before the PCM received the RDS to five seconds after; a few PCMs stored six minutes of data.

The PCM shown in the photo at the top of the adjacent column is the same one shown above, after it was removed from the engine compartment of the Ford product. Since this is a recent and active case, I cannot share many details. However, data contained in the PCM showed that, for the entire 25 seconds of recorded data, the throttle position was zero and the brake switch was off; the engine was idling, and the transmission was in neutral. However, for the first 15 seconds of the recording period, the vehicle's speed was steadily increasing; for the five seconds before the crash, it was gradually decreasing. During this period, the actual driveline torque was negative; in other words, the vehicle was traveling faster than the speed corresponding to its engine speed--the engine speed was shown as idling for the entire period of the recording. This vehicle was pushed toward a fixed object, then allowed to drift away into the crash. At the time of the crash, there



were no occupants in this vehicle. The owner apparently realized that the ignition switch would have to be in the on position in order for the airbags to fire, but he apparently did not realize that deployment of any restraint would cause the PCM to store 20 seconds of pre-crash data to prove that this vehicle was not moving under its own power before the crash. Without that data and with no known witnesses to the event, it could not be demonstrated that this vehicle was pushed (or perhaps pulled and released) with the intention of crashing it to the extent of causing a total loss.

The first Ford products to incorporate the PCM data storage feature were manufactured for the 2003 model year. Most of the models in the 2005 model year with electronic throttle control featured the PCM data storage feature. The last vehicle to incorporate that feature was the 2011 Crown Victoria, which Ford was phasing out of production. The rest of the 2011-model-year vehicles and all subsequent vehicles to date are storing information in the RCM, as required under Part 593, which requires that crash data, if stored in the vehicle, be stored in the airbag control module.

You probably noticed that part of the name of my newsletter changed from Accident to Crash. Seems like change is the only constant. For a while, many reconstructionists used Collision in place of Accident, but it now seems that the trend is toward calling all of them crashes, perhaps because of Bosch's Crash Data Retrieval (CDR) system.

There are many changes to the Bosch CDR Toolkit and to the field of CDR. The complete set of hardware from Bosch, at last tally, costs \$9200. Annual software licenses are approximately \$800. There were 15 new cables in 2102; Bosch is expecting to release approximately 10 new cables in 2013. Most cables cost \$150 each, but some cost over \$300 each. Bosch estimates that there are now 52 million GM vehicles and 19 million Ford vehicles with CDR coverage. Also, approximately 61 percent of Toyota vehicles and 26 percent of Chrysler vehicles currently on the road have CDR coverage.

The NHTSA has granted some petitions under Part 563: an extra year for adding a clipping flag to the stored data file (clipping refers to a situation where a particular parameter exceeds the device's capability to measure it) and steering specified as percent can go back to degrees. Part 563 will eventually become Federal Motor Vehicle Safety Standard (FMVSS) 405, effective September 1, 2014, essentially applying to all 2015-model-year vehicles with a gross vehicle weight rating (GVWR) less than 8500 pounds. GPS data are expressly forbidden to be included; small

volume manufacturers are exempt from the requirements of FMVSS 405. I don't know yet how they define (or will define) "small volume manufacturers."

CDR data files can be extremely helpful in some situations. Virtually all of them will record acceleration as a function of time in small-millisecond increments, usually simultaneously providing the resultant calculated values of delta-v, which is the sudden speed change which occurs during the contact phase of a collision. Delta-v is usually the most significant factor in assessing the likelihood of personal injury to vehicle occupants. Where it can be especially helpful is in low-speed, rear-end crashes. Even if the struck vehicle does not have Event Data Recorder (EDR) capabilities, if the striking vehicle does, the delta-v of the striking vehicle may become a permanent record. Although there are factors which do not necessarily provide precise correlation of one delta-v to another, the delta-v of the striking vehicle and the ratios of their masses will usually provide a relatively narrow range of resultant delta-v values for the struck vehicle. As an example, my wife was involved in a low-speed collision where she struck the rear of an SUV. The delta-v to her car was 4.7 mph; the calculated probable delta-v for the struck vehicle was 3 mph. The struck vehicle had no damage (my wife's car had very minor damage), and the driver/sole occupant of the SUV never complained of injuries; we never heard from her after the incident, although names and insurance information were clearly presented on the police report. (Perhaps that woman would have "developed" some neck and back pains requiring extensive chiropractic care and missed work if she had known that my wife is a physician. All of our vehicles are registered in my name, with no reference to her or her profession, for just that reason. I am not dismissing the valuable contributions that reputable chiropractors and physicians, as well as reliable attorneys, can make to situations where people incur real injuries in collisions, but I have investigated many cases over the years in which the claims of injury are totally inconsistent with vehicle damages—or lack of damages.)

Some of you may have heard of "cleared" modules. Some facilities claim to be able to take an Airbag Control Module (ACM) which has fired restraints during a crash, clear the crash data, and restore the ACM to operable condition. Before a recent crash conference, modules were sent to four such facilities; they came back with the same data (or most of it) that they contained when they were sent. As of this writing, those four modules have not been tested to determine whether or not they will properly deploy occupant restraints if reinstalled.

It is rumored that Hyundai and Kia will have their own, proprietary kits for accessing crash data in their vehicles. It will be interesting to see if they actually do develop and market such kits and what they will cost.

Except for a few Ducati motorcycles with their DAQ system, motorcycles have no crash data. Honda Gold Wings have had airbags available as an option, but that system stores no data. Honda may discontinue its airbag option on Gold Wings due to lack of consumer interest.

Time marches along, and change with it. Please contact me anytime you have a question concerning my motor-vehicle-related services.

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