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Reading Toyota EDR Outputs of Pre-Crash Data

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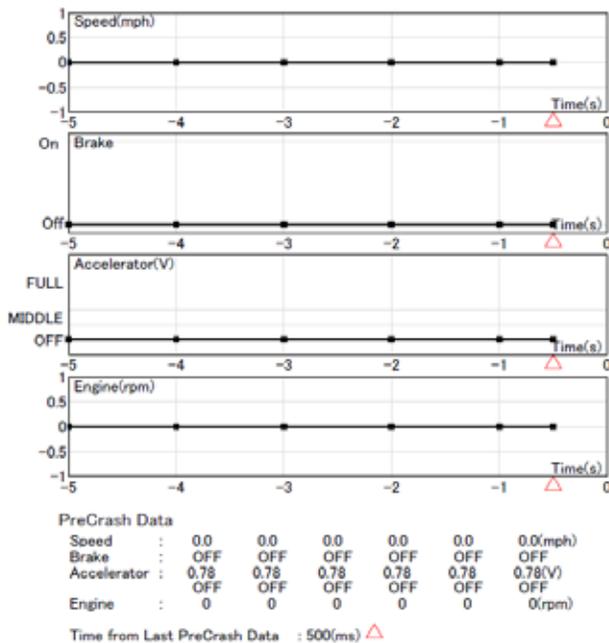
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Reading Toyota EDR Outputs of Pre- Crash Data

This project focused on the retrieval and review of pre-crash data from EDRs contained in Toyota vehicles reportedly involved in UA incidents. Pre-crash data are displayed using graphical charts and in a basic table form. The scaling of the data in graphical form is dependent on the data which is displayed at the indicated one second intervals (1 Hz). Changes in vehicle outputs between the 1 Hz intervals are not recorded. Currently Toyota EDR's only are able to take 5 one second consecutive captures of vehicle information before a crash. Engine rpm are displayed in 400 rpm increments. Accelerator pedal position was graphically depicted in three increments: Low / Off, Middle, Full until Version 1.3.1.2 of the EDR software, which gave the accelerator pedal position in more granular form in the form of a voltage readout from the accelerator pedal position. Pre-crash data are labeled as Latest and Next Most Recent to aid in aligning them with respect to the crash sequence. Depending on the vehicle model involved, one of two report formats is used. The data displayed are the same regardless of the format. Vehicles lacking pre-crash functionality use the same report format that has default data only in the pre-crash portions.



- **Speed** (mph) an average calculation of the two normally driven wheels
- **Brake** an input from the vehicle brake light circuit
- **Accelerator** displayed in Volts as an input to the ECU. A rise in voltage indicates an increase in accelerator pedal travel
- **Engine** (rpm) the measurement of crankshaft revolutions in one minute
- △ Time at which impact occurs (end of pre crash)

Additional caveats must be considered when reviewing this information: Vehicle speed indicated is derived by averaging the indicated wheel speed from the driven wheels. Confining a wheel (such as during an impact or skid) drives the average down to well below the actual speed of the vehicle. Similarly, spinning wheels will indicate abnormally high vehicle speeds. Several incidents examined included transmissions being shifted between Drive and Reverse. Indicated vehicle speed is always shown as a positive value regardless of direction. Toyota EDRs have a speed ceiling or a maximum speed value that is below that of the vehicle. These values have been observed either as 75.8 mph or 78.3 mph.

Traction control and cruise control systems can affect engine rpm and vehicle speed even while the accelerator pedal position is indicated as zero.