



# ECM & SPEED DATA

Robert Reed 11-23-07

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# TIRE DATA



- The manufacturer, size, type and depth of the tread of the original tires on the truck when new are important to the input of information for ECM speed data.
- The number of revolutions of the tire per mile must be correct for the brand, size & type of tire.
- The recommended air pressure and load on the tire must also be accounted for in the analyses
- Calibration of the speed sensor does not account for tire tread depth wear.
- Tire diameter and the roll-out of the tire affect the data.
- There are no standard size specifications for tires.

# MANUFACTURER SPECIFICATIONS

- The specifications for three different drive tires are listed for comparison.
- A Yokohama RY527 295/75R22.5 drive tire has a 41" overall diameter and a loaded radius of 19.2" with a tread depth of 32/32nds. and a rev/mile listing of 512.
- A Bridgestone M726EL 295/75R22.5 drive tire has a 40.9" overall diameter and a loaded radius of 19.1" with a tread depth of 32/32nds. and a rev/mile listing of 507.
- A General D460 295/75R22.5 drive tire has an overall diameter of 40.5" and a loaded radius of 18.9" with a tread depth of 26/32nds. and a rev/mile of 510.

# TIRE SPECIFICATIONS CONT.

- A Yokohama RY567 295/75R22.5 all purpose tire has an overall diameter of 40.4" and a loaded radius of 18.7" with a tread depth of 22/32nds. and a rev/mile of 518
- A Bridgestone R270 295/75R22.5 rib drive tire has an overall diameter of 40.4" and a loaded radius of 18.9" with a tread depth of 22/32nds. and a rev/mile of 514.
- One revolution of this size tire is approximately 10 and a half feet.
- Factors for tire wear and any use of recaps will provide for additional tire input & speed error.

# TIRE DATA

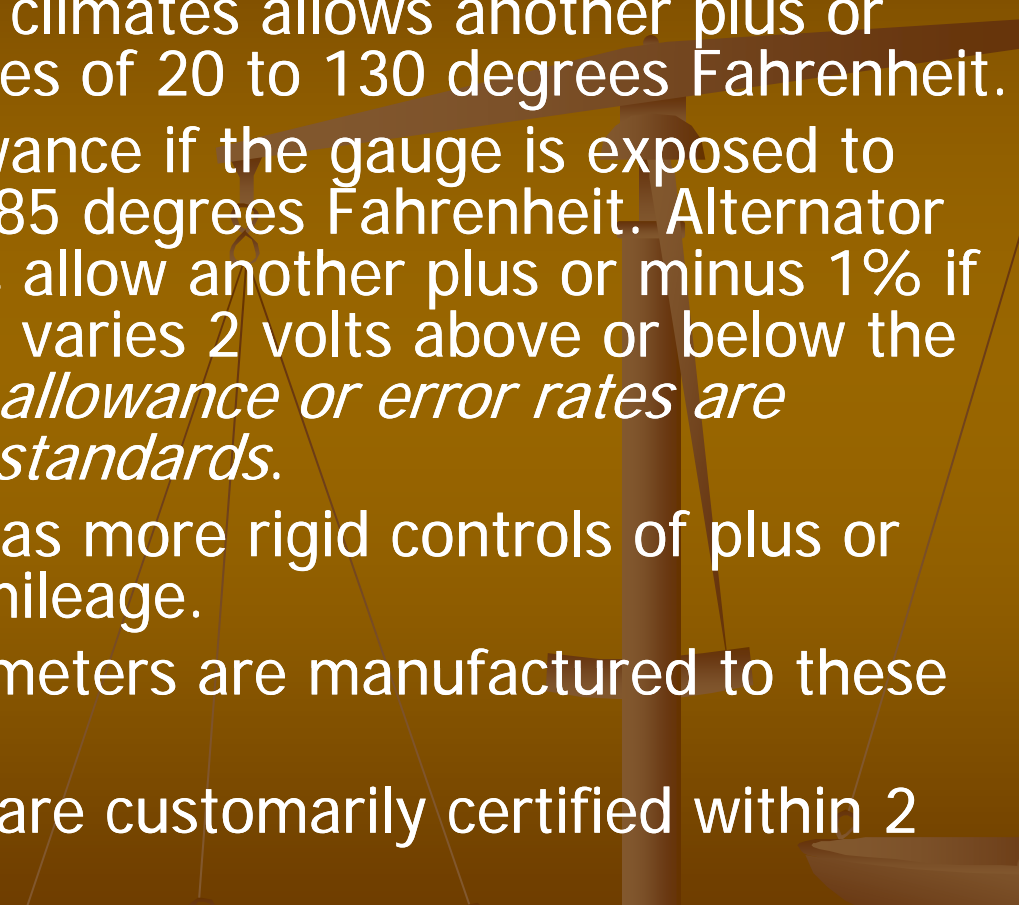


- The American Trucking Association (ATA) rulemaking petition to NHTSA & FMCSA of October 2006 states:
- “For example, the same diameter heavy truck tire but with a different width and sidewall ratio may have 15 to 20 revolutions per mile difference which will affect the actual top speed of the truck”.
- This same condition affects input to the speedometer and ECM for speed data.
- Loss of traction by wheel hops or spinning tires will also supply incorrect speed data

# SPEEDOMETERS

- Manufacturer recommended practice standard SAE J1226 of 1983 for Electric Speedometers – On Road states plus or minus 2% of absolute accuracy or to introduce bias to read high on a sliding scale from minus 1% to plus 3% at low speeds to zero to plus 4% above 55 mph.
- This is not percentage of actual speed but percentage of the total speed range indicated on the dial of the speedometer so the 4% allowable range on a 85 mph speedometer is 3.4 mph and the acceptable range on a 150 mph speedometer is 6 mph.

# SPEEDOMETERS CONT.

- Driving in cold or hot climates allows another plus or minus 2% for extremes of 20 to 130 degrees Fahrenheit.
  - There is also an allowance if the gauge is exposed to minus -40 or plus +185 degrees Fahrenheit. Alternator or electrical problems allow another plus or minus 1% if the operating voltage varies 2 volts above or below the normal range. \* *Tire allowance or error rates are excluded from these standards.*
  - Odometer accuracy has more rigid controls of plus or minus 4% of actual mileage.
  - Replacement speedometers are manufactured to these same standards.
  - Police speedometers are customarily certified within 2 mph of actual speed
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# FMCSA REGULATIONS



- 49 CFR 393.92 Speedometer

Each bus, truck, and truck tractor must be equipped with a speedometer indicating vehicle speed in miles per hour and/or kilometers per hour. The speedometer must be accurate to within plus or minus 8km/hr (5 mph) at a speed of 80 km/hr (50 mph) *[70 FR 48054, August 15, 2004]*

- Regulatory Guidance for 49 CFR 383.92 Speedometer

“Reasonable accuracy” is interpreted to mean accuracy to within plus or minus 5 mph at a speed of 50 mph.

*[62 FR 16418 April 4, 1997]*

# ENGINE CONTROL MODULE (ECM)

- The ECM came into existence with the electronic diesel engine in the late 80's. The parameters of fuel injection, combustion, and consumption along with air pollution and EPA guidelines necessitated this technology.
- The ECM also developed information on the operating parameters of other components by added sensors used for warranty purposes of manufacturers.
- This information also has expanded to include driving & use parameters of the unit.
- The ECM is not a sensing & diagnostic module (SDM), crash data recorder (CDR), event data recorder (EDR), electric on-board recording device, (EOBRD) or equivalent "Black Box" used in aircraft.

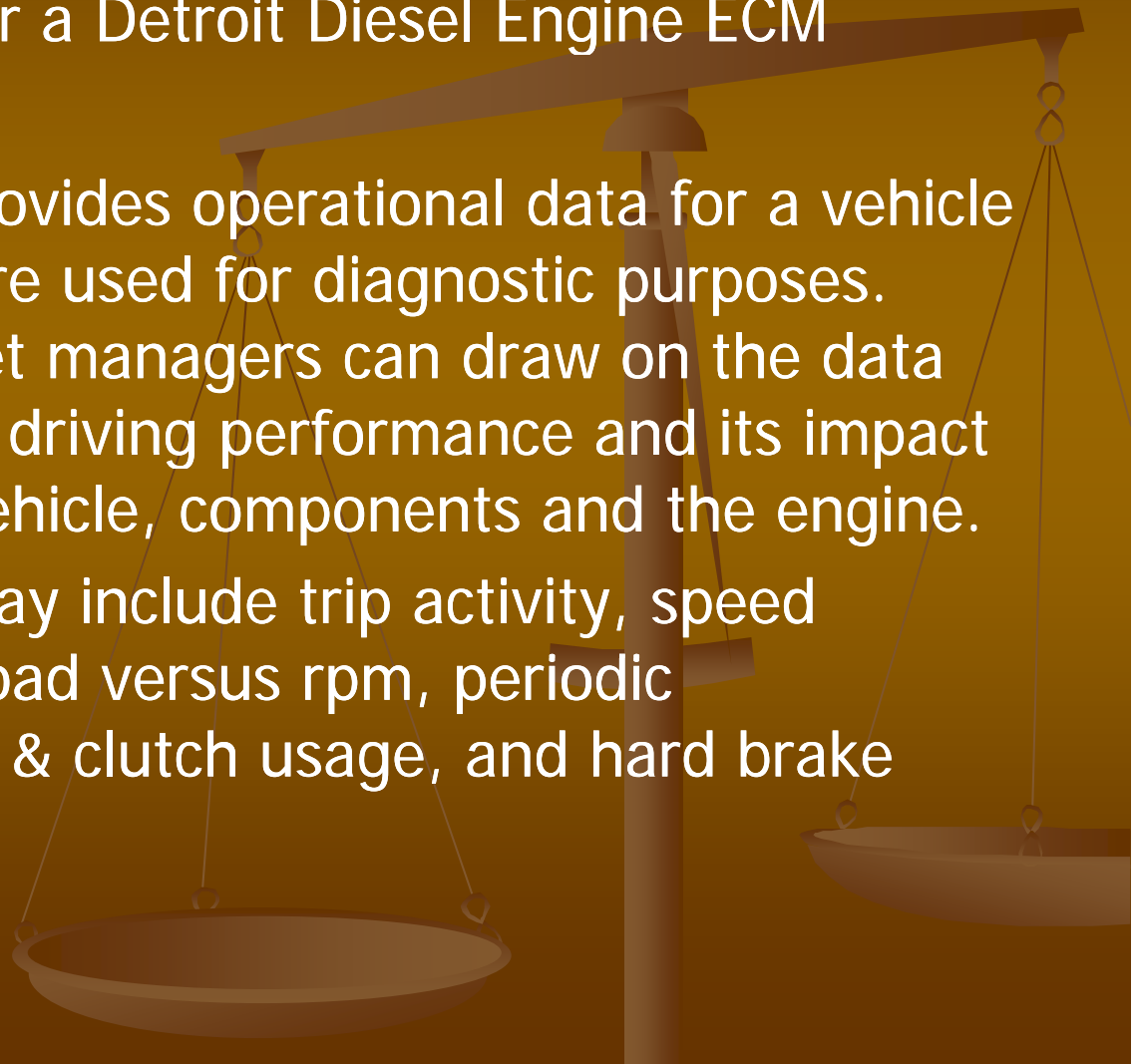
# STANDARDS



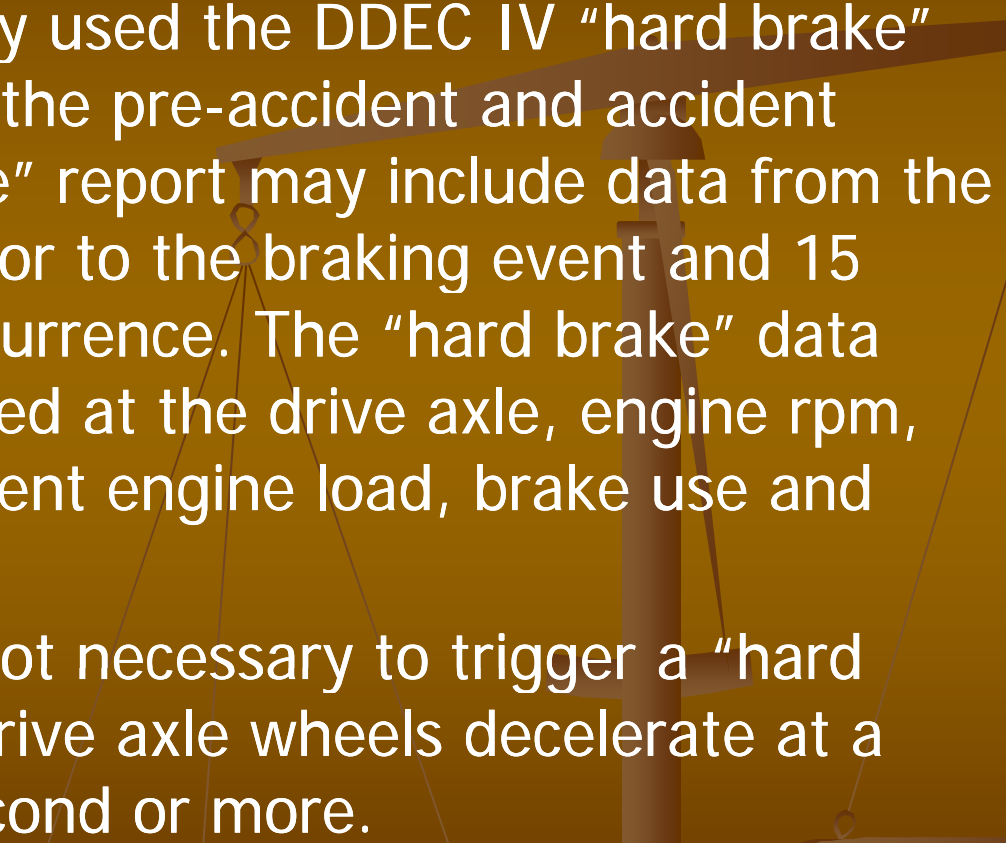
- There are no standards or uniform specifications for the relevant data from the ECM of the diesel engine.
- NHTSA has a 2010 proposed uniform standards rule for event data recorders (EDR) in vehicles for collection of uniform data for use in crash analysis.
- These standards do not include the ECM of large trucks.
- The ECM is designed and parameters are developed by each engine manufacturer. These parameters can be set, adjusted, calibrated or turned on or off.
- The ECM data has no absolutes and complete accuracy but may provide useful information with thorough and proper analyses.

# NTSB INFORMATION

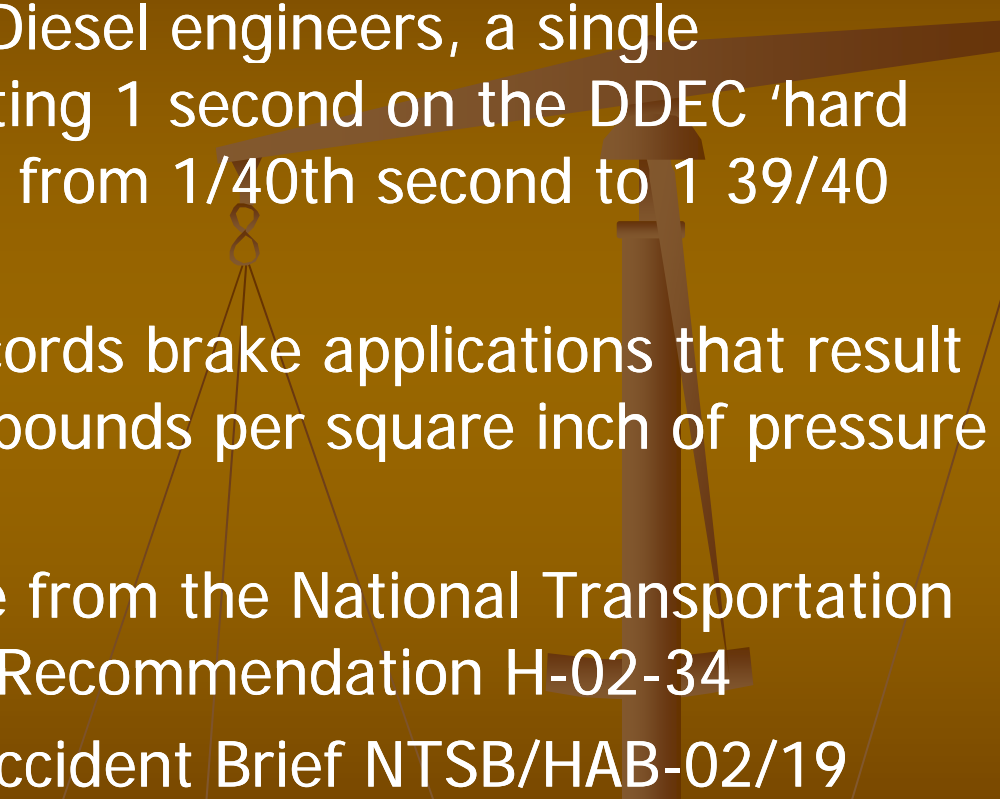
- This information is for a Detroit Diesel Engine ECM
- The DDEC IV ECM provides operational data for a vehicle and its engine that are used for diagnostic purposes. Maintenance and fleet managers can draw on the data to review and assess driving performance and its impact on the wear of the vehicle, components and the engine.
- The recorded data may include trip activity, speed versus rpm, engine load versus rpm, periodic maintenance, engine & clutch usage, and hard brake activity.



# NTSB CONT.

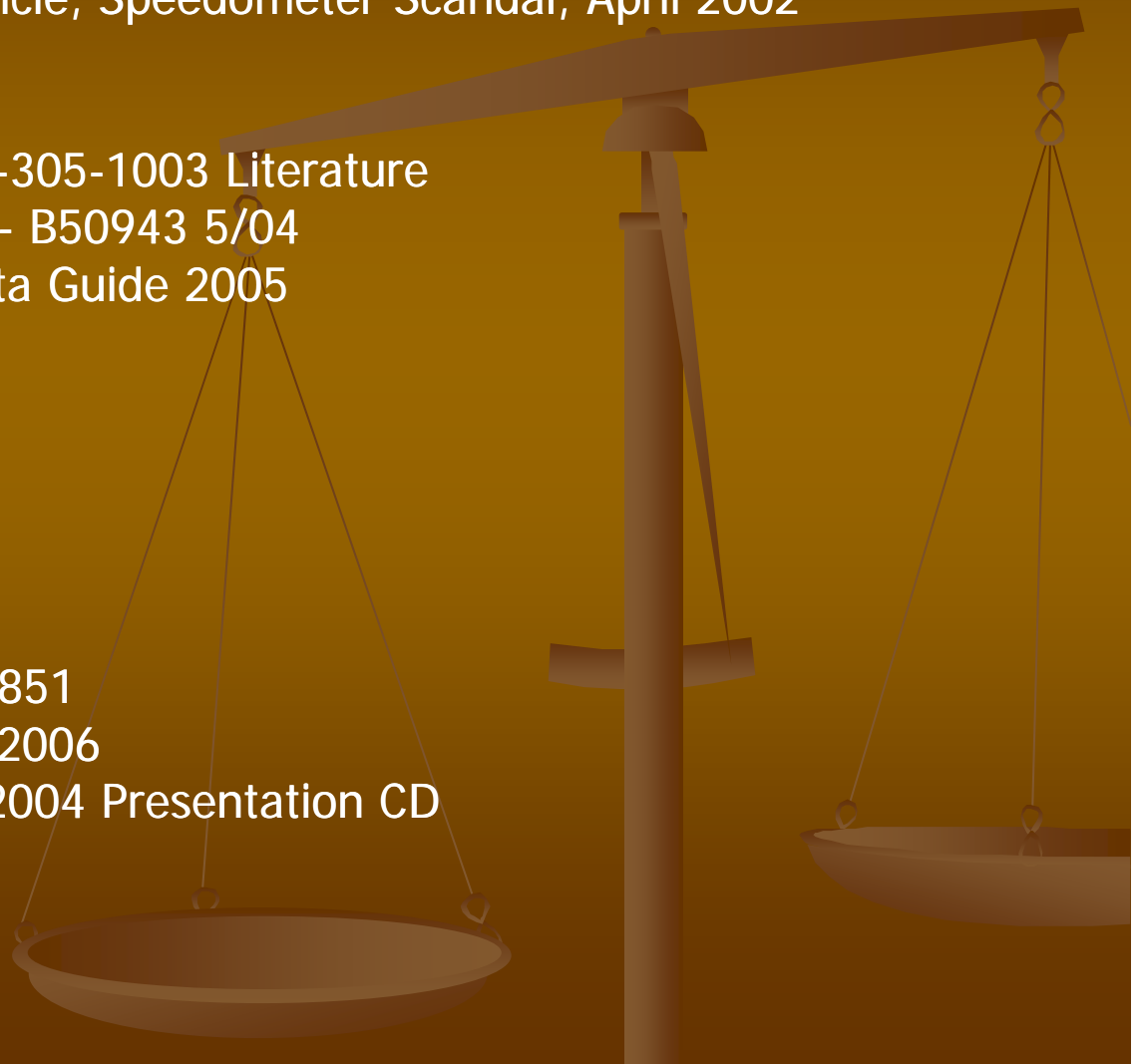
- Investigators primarily used the DDEC IV “hard brake” report to reconstruct the pre-accident and accident events. A “hard brake” report may include data from the previous 1 minute prior to the braking event and 15 seconds after the occurrence. The “hard brake” data relates to vehicle speed at the drive axle, engine rpm, percent throttle, percent engine load, brake use and clutch use.
  - Brake application is not necessary to trigger a “hard brake” report if the drive axle wheels decelerate at a rate of 7 mph per second or more.
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# NTSB CONT.

- According to Detroit Diesel engineers, a single application, representing 1 second on the DDEC "hard brake" report, can be from 1/40th second to 1 39/40 seconds long.
  - The Detroit DDEC records brake applications that result in a minimum of 3.5 pounds per square inch of pressure or more.
  - These statements are from the National Transportation Safety Board, Safety Recommendation H-02-34
  - See NTSB Highway Accident Brief NTSB/HAB-02/19
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# REFERENCES

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- DOT-MC-01-110
- SAE J1226 of 1983
- Yokohama - M-304-1003, M-305-1003 Literature
- Bridgestone Tire Data Book - B50943 5/04
- General/Continental Tire Data Guide 2005
- [www.caranddriver.com](http://www.caranddriver.com)
- [www.fmcsa.dot.gov](http://www.fmcsa.dot.gov)
- [www.nts.gov](http://www.nts.gov)
- [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)
- [www.regulations.gov](http://www.regulations.gov)
- [www.isspro.com](http://www.isspro.com)
- Docket # NHTSA -2007 - 26851
- ATA Petition of October 20, 2006
- ARC-CSI Crash Conference 2004 Presentation CD



# MORE INFORMATION

- This reference material is established upon extensive research, training, use and practical experience of the Author. The regulations and standards of the industry along with a multitude of facts, research, publications, comments, history, background, curriculum and news articles were used as resources. Due to ever-changing technology and standards this information carries no guarantees to correctness or completeness. The intended use of this reference material is for educational, training and awareness purposes of the receiver or user. Comments are welcomed.

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