

# FMVSS NO. 138

## Tire Pressure Monitoring System Compliance Test Program

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# Presentation Overview

- Tire Failure Statistics
- Rule History/Implementation
- Final Rule Highlights
- OVSC Compliance Test Procedure
- Compliance Program
- TPMS NHTSA Points-of-Contact
- Available Information

# Tire Failure Statistics

- Tire failures are caused by several factors including underinflation, overloading and insufficient safety margin
- Estimated 414 fatalities and 10,275 non-fatal injuries result annually from tire related problems (e.g., flat tires/blowouts)
- Underinflation is involved in 20% of flat tire/blowout cases that result in a crash

Data as provided in 68 FR 38116 of June 26, 2003 (FMVSS No. 139 final rule)

# Rule History/Implementation

- Final Rule published April 8, 2005 (70 FR 18136)  
Response to petitions published Sept. 7, 2005
- Phase-in Schedule began Oct. 2005, requires that all light vehicles be equipped with TPMS by Sept. 2007, multi-stage and alterers by Sept. 2008
- OVSC conducted a public Technical Workshop and Demonstration in Sept. 2005 in San Angelo, TX
- OVSC's Compliance Program is underway



# Final Rule Highlights

- Standard is technology-neutral allowing any TPMS design that complies with the performance requirements
- Applies to PC, MPV, trucks and buses with GVWR of 4,536 kg (10,000 lb) or less
- Requires a TPMS telltale warning lamp to activate within 20 min. of when the pressure in 1-4 tires is 25% or more below the manufacturer's recommended cold inflation pressure, or a minimum level of pressure specified, whichever is higher
- A Malfunction Indicator Lamp (MIL) is required for all vehicles, effective September 1, 2007 (MY08)

# Final Rule Highlights - continued

- The standard requires TPMS performance testing with tires on vehicle at time of first retail sale
- Test Course specified is the Southern Loop of the UTQG Treadwear Course in San Angelo, Texas
- Procedures for conducting system calibration, low pressure and malfunction testing are specified
- Owner's manual must explain system operation

# OVSC Compliance Test Procedure

- Test Preparation
- Test Instrumentation
- Test Conditions
- Test Execution

# OVSC Compliance Test Procedure

## Test Preparation

- Request TPMS design and function information from the vehicle manufacturer prior to start of compliance testing
- Review vehicle owner's manual to understand the operation and special procedures of the vehicle's TPMS
- Verify calibration of test instrumentation and install on test vehicle

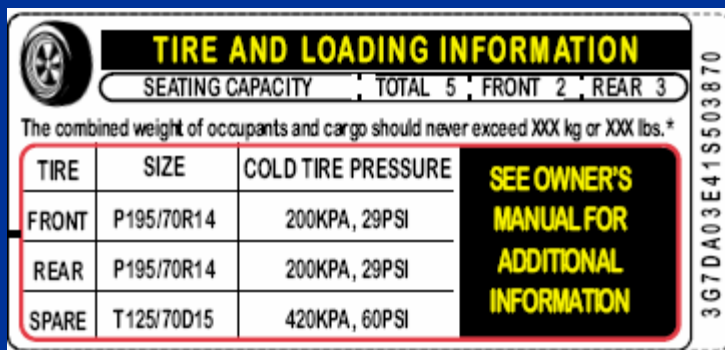


# OVSC Compliance Test Procedure

## Test Preparation

- Locate vehicle manufacturer's recommended cold inflation pressure from FMVSS No. 110 Vehicle Placard or optional Tire Inflation Pressure Label
- Determine low inflation pressure telltale activation point

Vehicle Placard

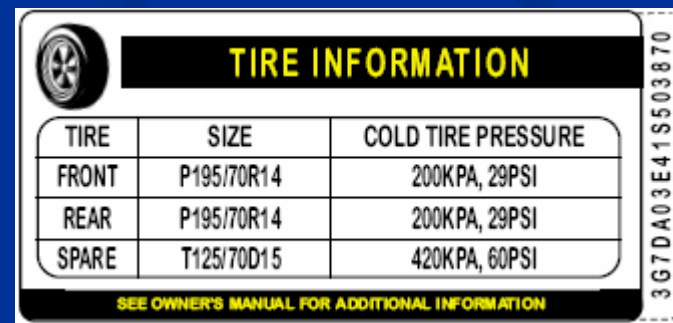


The combined weight of occupants and cargo should never exceed XXX kg or XXX lbs.\*

TIRE	SIZE	COLD TIRE PRESSURE	<b>SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION</b>
FRONT	P195/70R14	200KPA, 29PSI	
REAR	P195/70R14	200KPA, 29PSI	
SPARE	T125/70D15	420KPA, 60PSI	

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Tire Inflation Pressure Label



TIRE	SIZE	COLD TIRE PRESSURE
FRONT	P195/70R14	200KPA, 29PSI
REAR	P195/70R14	200KPA, 29PSI
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SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION

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# OVSC Compliance Test Procedure

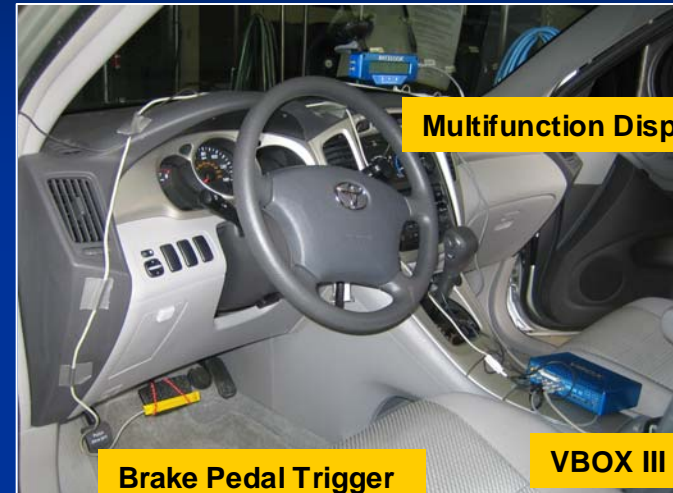
## Test Instrumentation

- Data Acquisition System for a continuous recording of velocity, distance and time. (Racelogic VBOX 100 Hz GPS Data Logger)

- Pressure Gage for tire pressure (Ashcroft Digital)



- Platform Weight Scales for determining individual wheel, axle and vehicle loads (Intercomp SW 15"x15" pads)



# OVSC Compliance Test Procedure

## Test Conditions

- UTQG Treadwear test course; ambient temperature 0-40° C; dry road
- Vehicle test speeds 50-100 km/h, no cruise control
- Driving time does not accumulate during braking or when speeds are outside 50-100 km/h range
- Vehicle's tires are shaded from direct sun when the vehicle is parked

# OVSC Compliance Test Procedure

## Test Execution- Telltale Check

- Check location and symbols used for low tire pressure warning and malfunction telltale(s)
- Cycle ignition locking system to verify telltale bulb function and color



# OVSC Compliance Test Procedure

## Test Execution - Setup

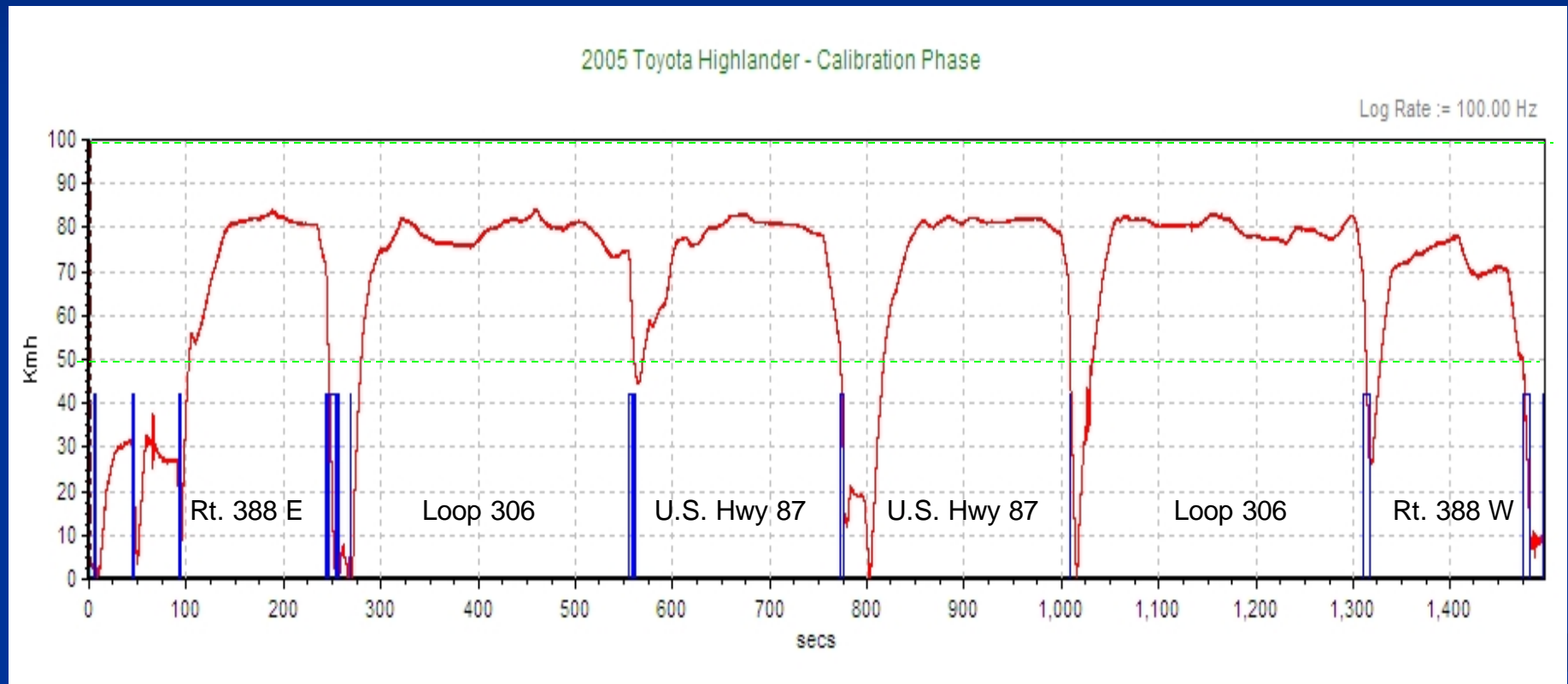
- Normalize vehicle temperature outdoors with tires shaded from direct sunlight
- Inflate tires to manufacturer's recommended cold pressure
- Load vehicle to LLVW or VCW without exceeding any vehicle ratings
- Check/reset tire inflation pressures
- If applicable manually set or reset the TPMS per owner's manual instructions



# OVSC Compliance Test Procedure

## Test Execution - Calibration Phase

### Vehicle Speed vs. Time Graph



Total Cumulative Driving Time from graph = 20.33 minutes



# OVSC Compliance Test Procedure

## Test Execution - Tire Deflation

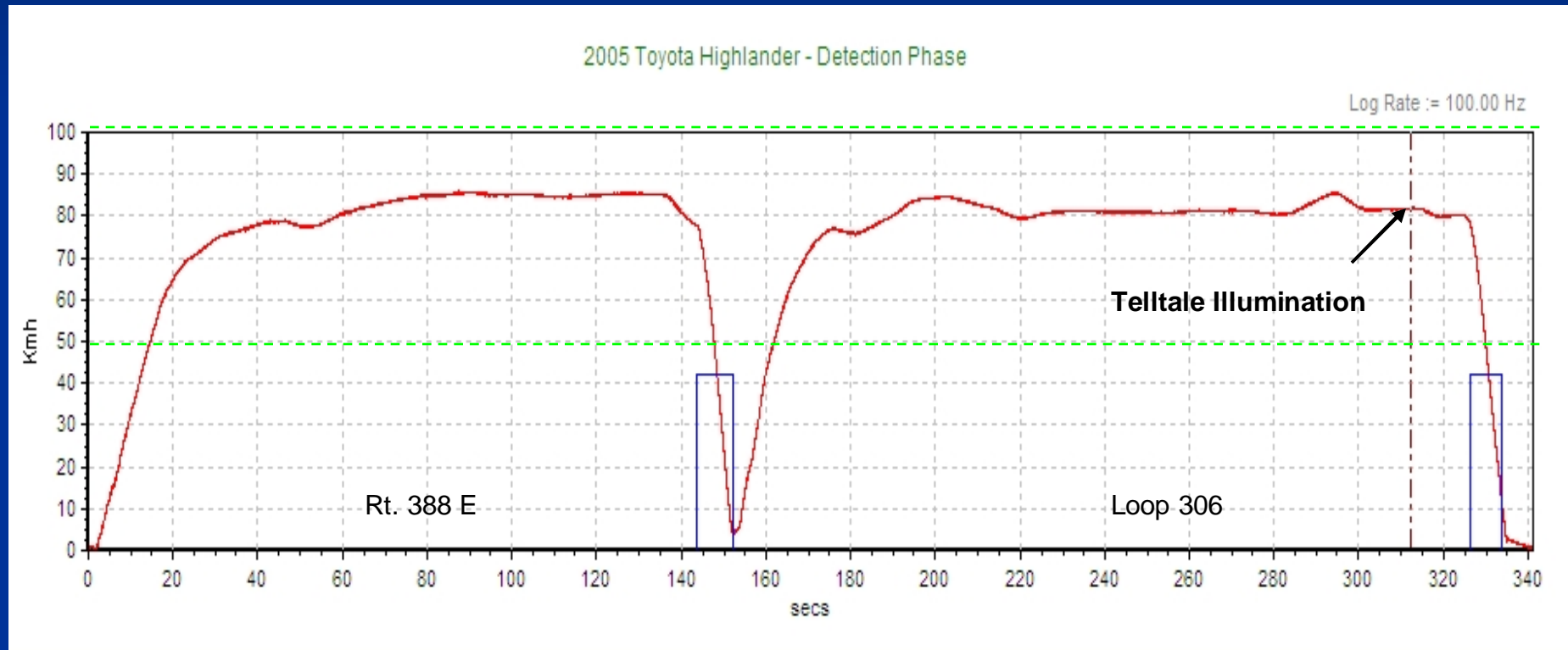
- Stop vehicle and shut off engine
- Deflate tire(s) to 7kPa (1 psi) below determined warning activation pressure
- Check/reset inflation pressure of deflated tire(s) 1 min after deflation
- Within 5 min of deflating drive vehicle until telltale illuminates



# OVSC Compliance Test Procedure

## Test Execution - Low Inflation Pressure Detection Phase

### Vehicle Speed vs. Time Graph



From start of detection phase to telltale illumination. Total Cumulative Driving Time from graph = 4.82 min



# OVSC Compliance Test Procedure

## Test Execution - Telltale Reactivation and Deactivation

- Turn ignition off and then on after 5 min, verify telltale illuminates
- Allow the vehicle to cool down approx. 1 hour
- Start vehicle engine and verify telltale illuminates
- Adjust tire air pressures per FMVSS 110 placard
- Check/reset pressures 1 min after adjustment
- If applicable manually reset TPMS
- Verify telltale extinguishes, if necessary drive vehicle

# OVSC Compliance Test Procedure

## Test Execution - Multiple Tire Combinations

- Repeat steps above with:
  - Different individual tires deflated
  - Two-tire combinations deflated
  - Three-tire combinations deflated
  - Four-tires deflated
- Repeat steps above at other vehicle load condition

# OVSC Compliance Test Procedure

## Test Execution - Malfunction Detection

Certification requirement does not take effect until Sept 2007 (MY 2008)

- Malfunction – Problem affecting the generation or transmission of control or response signals
- TPMS design and function information provided by vehicle manufacturer
- Simulate one or more malfunctions by:
  - Disconnecting power source to a TPMS component
  - Disconnecting connections between components
  - Simulating a TPMS sensor malfunction

# OVSC Compliance Program

- Demonstration tests to validate OVSC's test procedure were conducted in 2005
- Vehicles were not required to meet FMVSS No. 138
- Vehicles evaluated included:
  - MY 2005 Jeep Grand Cherokee (direct TPMS)
  - MY 2005 Ford Explorer (direct TPMS)
  - MY 2005 Nissan Armada (direct TPMS)
  - MY 2005 Toyota Highlander (indirect TPMS)

# OVSC Compliance Program

## Evaluation Results - 2005 Vehicles

- Direct TPMS equipped vehicles
  - Illuminated the low tire pressure warning telltales in 2 minutes or less
  - Some systems did not require any driving
  - Some systems required minimal driving below the test speed
- Indirect TPMS equipped vehicle
  - Illuminated the low tire pressure warning telltale for specific tire deflation tests in 9 minutes or less
  - Not all tire deflation tests illuminated the telltale
- Malfunction detection test executed on the Ford Explorer
  - Installation of a full size spare tire not equipped with a sensor
  - The vehicle was equipped with a combination low tire pressure/malfunction telltale that flashed after 33 minutes of cumulative driving time and did not remain continuously illuminated

# OVSC Compliance Program

## FY 2006 Test Program

Only 20% of MY 2006 large manufacturer production vehicles must comply with FMVSS No. 138

Test Vehicles	TPMS Design*	Test Status/Results
Chrysler 300	Direct	Test Complete/Pass (Rental)
VW Passat	Direct	Test Complete/Pass (Lease)
BMW X3	Direct	Vehicle Procurement Ongoing
Ford Expedition	Direct	Vehicle Procurement Ongoing
Mazda RX-8	Direct	Vehicle Procurement Ongoing
Nissan Pathfinder	Direct	Vehicle Procurement Ongoing
Nissan Titan	Direct	Vehicle Procurement Ongoing
Toyota Camry	Direct	Vehicle Procurement Ongoing



\*TPMS Sensor suppliers include BERU, Schrader, Siemens and Pacific Industrial.

# TPMS NHTSA Points-of-Contact

- Rulemaking Issues

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- Enforcement Issues

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- Legal Issues

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# Available Information

- For a copy of this presentation, go to the NHTSA website <http://www.nhtsa.dot.gov>
- For a copy of the presentation given at the TPMS Technical Workshop and Demonstration in San Angelo, TX on Sept. 21, 2005, go to <http://dms.dot.gov> and enter docket# **22027**
- To view the latest revision of the OVSC Laboratory Test procedure, go to <http://www.nhtsa.dot.gov> (under “Test Procedures” on the Vehicles and Equipment page)



# Questions ?