

REPORT NUMBER 138-STF-09-007

# SAFETY COMPLIANCE TESTING FOR FMVSS NO. 138 TIRE PRESSURE MONITORING SYSTEMS

KIA MOTORS CORPORATION  
2009 KIA RONDO  
FOUR-DOOR PASSENGER CAR  
NHTSA NO. C90505

U.S. DOT SAN ANGELO TEST FACILITY  
131 COMANCHE TRAIL, BUILDING 3527  
GOODFELLOW AFB, TEXAS 76908



April 30, 2009

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
ENFORCEMENT  
NVS-220  
OFFICE OF VEHICLE SAFETY COMPLIANCE  
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SECTION 1  
INTRODUCTION

1.1 PURPOSE OF COMPLIANCE TEST

A 2009 Kia Rondo four-door passenger car was tested to determine if the vehicle was in compliance with the requirements of FMVSS 138. All tests were conducted in accordance with NHTSA/Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure TP-138-03 dated July 12, 2007.

1.2 TEST VEHICLE

The test vehicle was a 2009 Kia Rondo four-door passenger car. Nomenclatures applicable to the test vehicle are:

A. Vehicle Identification Number: KNAFG528X97227753

B. NHTSA Number: C90505

C. Manufacturer: Kia Motors Corporation

D. Manufacture Date: 06/2008

1.3 TEST DATE

The test vehicle was tested during the time period April 14 through April 22, 2009.

## SECTION 2

### TEST PROCEDURE AND SUMMARY OF RESULTS

#### 2.1 TEST PROCEDURE

Prior to test, the test vehicle was inspected for completeness, systems operability, and appropriate fuel and liquid levels, i.e. oil and coolant. The vehicle was then photographically documented as required by the NHTSA/OVSC Test Procedure. Tire sidewall information was recorded. The owner's manual was reviewed, and pertinent tire and TPMS information were noted. Telltale's symbol, color, location, and lamp function were checked.

Subsequent events included weighing the vehicle to establish the Unloaded Vehicle Weight (UVW) and the distribution of weight on the front and rear axles and each wheel position. The vehicle was loaded to its Lightly Loaded Vehicle Weight (LLVW) for three tire deflation scenarios. This LLVW included the weights of driver, one passenger, and test equipment. The vehicle was loaded to its Unloaded Vehicle Weight plus Vehicle Capacity Weight (VCW) for three additional tire deflation scenarios. The VCW included the weights of driver, one passenger, test equipment, ballast in the mid and rear seats, and ballast in the rear cargo area. The vehicle is required to be loaded to its maximum capacity without exceeding either the Vehicle Capacity Weight or Gross Vehicle Weight Rating (GVWR). For determination of the telltale warning activation pressure, the recommended cold inflation pressure was identified from the vehicle placard.

The vehicle was instrumented with a Racelogic VBOX III 100 Hz GPS Data Logger and brake pedal trigger. The VBOX uses GPS to measure vehicle speed, time, and distance. Test data were recorded to a compact flash card. During the test, a stopwatch was used to determine the approximate "cumulative driving time" during each test phase. Cumulative driving time does not include time during the brake application or when the vehicle speed was below 50 km/h or above 100 km/h. Upon completion of a tire deflation scenario, graphs were generated by VBOX software showing vehicle speed versus time during the test procedures. The graphs furnish a second-by second analysis of each calibration and low inflation pressure detection phase (as appropriate). The cumulative driving time was calculated by post-processing the VBOX graph data, and is reported in Section 3 (Test Data) as 'Total Driving Time'.

The tire deflation test scenario consisted of four phases:

1. Calibration phase: Tires were set at vehicle placard cold inflation pressure and the vehicle was driven for at least twenty minutes of cumulative driving time between 50 and 100 km/h.

2. Detection phase: Immediately after calibration phase, the selected tire(s) were deflated to seven kPa (one psi) below the Telltale Warning Activation Pressure. After one minute, the inflation pressure(s) of only deflated tire(s) were rechecked and adjusted if necessary. The vehicle was started and driven to ensure that the low inflation pressure telltale illuminated, unless the TPMS low tire pressure telltale illuminated prior to engaging of transmission.
3. Cool down phase: Vehicle was parked in the San Angelo Test Facility (SATF) open bay shielded from direct sunlight. Tires were allowed to cool down for a minimum of one hour. After cool down, the vehicle was started and the low tire pressure telltale was checked for re-illumination.
4. Extinguishment phase: Tires were adjusted to vehicle placard cold inflation pressure. The vehicle was started and driven to ensure that the low inflation pressure telltale extinguished, unless the TPMS low tire pressure telltale extinguished prior to engaging of transmission.

Two malfunction scenarios were performed on the Kia Rondo. The first scenario was performed with the vehicle loaded to its LLVW. The malfunction was simulated by placing the compact spare tire, with no TPMS sensor, on the right front wheel position. The second scenario was performed by removing the TPMS fuse.

## 2.2 SUMMARY OF RESULTS

Three tire deflation scenarios were performed on the test vehicle at LLVW:

- A. Right rear
- B. Left rear and right front
- C. Left front, left rear, right rear, and right front

Three tire deflation scenarios were performed on the test vehicle at UVW + VCW:

- D. Left front
- E. Right rear and right front
- F. Left front, right rear, and right front

The data indicate compliance of the test vehicle's tire pressure monitoring system for the six tire deflation scenarios tested.

One malfunction detection scenario was performed on the test vehicle at LLVW:

- G. Spare tire without TPMS sensor was applied to right front wheel position.

A second malfunction detection scenario was performed on the test vehicle:

- H. The TPMS fuse was removed.

In both scenarios, the vehicle's dedicated malfunction telltale properly operated per the standard's requirements.

SECTION 3  
TEST DATA



## FMVSS No. 138 – TEST DATA SUMMARY

TEST DATES: April 14 – April 22, 2009      LAB: U. S. DOT San Angelo Test Facility

VIN: KNAFG528X97227753      VEHICLE NHTSA NUMBER: C90505

CERTIFICATION LABEL BUILD DATE: 06/2008

REQUIREMENTS	PASS/FAIL
LOW TIRE PRESSURE WARNING TELLTALE S138: S4.3.1 (a), (b); S4.3.3 (a), (b)	
Mounting	<b>PASS</b>
Symbol and color	<b>PASS</b>
Check of lamp function	<b>PASS</b>
MALFUNCTION TELLTALE S138: S4.4 (b) or (c)	
Mounting	<b>PASS</b>
Symbol and color	<b>PASS</b>
Check of lamp function	<b>PASS</b>
LOW TIRE PRESSURE WARNING - OPERATIONAL PERFORMANCE S138: S4.2, S4.3.1 (c), S4.3.2	
Telltale illumination	<b>PASS</b>
MALFUNCTION INDICATOR – OPERATIONAL PERFORMANCE S138: S4.4 (a)	
Telltale illumination	<b>PASS</b>
TPMS WRITTEN INSTRUCTIONS S138: S4.5	
Image of telltales	<b>PASS</b>
Verbatim statements	<b>PASS</b>

REMARKS: None

**DATA SHEET 1 (Sheet 1 of 3)**  
**TEST PREPARATION INFORMATION**

TEST DATE: April 14, 2009 LAB: U. S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505 VIN: KNAFG528X97227753

CERTIFICATION LABEL BUILD DATE: 06/2008 ENGINE: 2.4 liter DOHC 4 cylinder

MY/MAKE/MODEL/BODY STYLE: 2009 Kia Rondo four-door passenger car

**TIRE CONDITIONING:**

( X ) Tires used more than 100 km. Actual odometer reading : 106 km (66 mi)

**VEHICLE ALIGNMENT AND WHEEL BALANCING:**

Alignment checked: ( ) Front ( ) Rear ( X ) COTR waived

Wheels balanced: ( ) Front ( ) Rear ( X ) COTR waived

**TPMS IDENTIFICATION:**

TPMS MAKE/MODEL: Receiver: Lear

Sensor: Beru, part number 52933-2G200

Source: Manufacturer supplied information

TPMS TYPE: ( X ) Direct ( ) Indirect ( ) Other

Does TPMS require execution of a learning/calibration driving phase? ( ) YES ( X ) NO

Source: Manufacturer supplied information

Does TPMS have a manual reset control? ( ) YES ( X ) NO

**TPMS MALFUNCTION INDICATOR TYPE:**

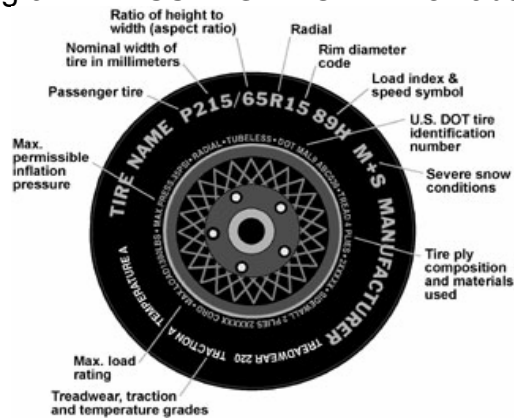
( ) None ( X ) Dedicated Telltale ( ) Combination low tire pressure/malfunction telltale

**DATA SHEET 1 (Sheet 2 of 3)  
TEST PREPARATION INFORMATION**

**DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING AND OWNER'S MANUAL:**

Axle	Tire Size	Recommended Cold Inflation Pressure	Source
Front	P205/60R16	220 kPa (32 psi)	Vehicle placard
Rear	P205/60R16	220 kPa (32 psi)	Vehicle placard

**INSTALLED TIRE DATA**  
Diagram - PASSENGER CAR Tire Labeling



**Front and Rear Axles**

Tire Size and Load Index / Speed Rating: P205/60R16 91H

Manufacturer/Tire Name: Michelin Energy MXV4 S8

Sidewall Max Load Rating: 615 kg (1,356 lbs)

Max Inflation Pressure: 300 kPa (44 psi)

Sidewall Construction (number of plies and ply material): 1 polyester

Tread Construction (number of plies and ply material): 1 polyester, 2 steel, 1 polyamide

**Do all installed tires have the same sidewall information?**     YES     NO

**Are all installed tires the same as designated by the vehicle manufacturer on the vehicle placard?**     YES     NO

**DATA SHEET 1 (Sheet 3 of 3)  
TEST PREPARATION**

<b>Worksheet for Determining FMVSS No. 138 Telltale Warning Activation Pressure for Tires Installed on Vehicle</b>		
<b>Part</b>	<b>Front Axle</b>	<b>Rear Axle</b>
<b>(A)</b> Recommended Inflation Pressure x .75	<u>220</u> kPa x .75 = <u>165</u> kPa	<u>220</u> kPa x .75 = <u>165</u> kPa
<b>(B)</b> Information from FMVSS 138 Table 1 below, Tire types are:  Inflation pressure  Minimum activation pressures from Table 1	( <input checked="" type="checkbox"/> ) P-metric-Standard load ( <input type="checkbox"/> ) P-metric-Extra Load Load Range ( <input type="checkbox"/> ) C, ( <input type="checkbox"/> ) D, or ( <input type="checkbox"/> ) E  ( <input checked="" type="checkbox"/> ) Maximum or ( <input type="checkbox"/> ) Rated <u>300</u> kPa (44 psi)  <u>140</u> kPa (20 psi)	( <input checked="" type="checkbox"/> ) P-metric-Standard load ( <input type="checkbox"/> ) P-metric-Extra Load Load Range ( <input type="checkbox"/> ) C, ( <input type="checkbox"/> ) D, or ( <input type="checkbox"/> ) E  ( <input checked="" type="checkbox"/> ) Maximum or ( <input type="checkbox"/> ) Rated <u>300</u> kPa (44 psi)  <u>140</u> kPa (20 psi)
<b>(C)</b> Telltale Warning Activation Pressure is the higher of Part (A) or (B)	<u>165</u> kPa (24 psi)	<u>165</u> kPa (24 psi)
<b>(D)</b> Pressure at which to deflate tire(s) = (C) – 7 kPa	<u>158</u> kPa (23 psi)	<u>158</u> kPa (23 psi)

**FMVSS 138 Table 1 - Low Tire Pressure Warning Telltale - Minimum Activation Pressure**

<b>Tire Type</b>	<b>Maximum or Rated Inflation Pressure</b>		<b>Minimum Activation Pressure</b>	
	<b>(kPa)</b>	<b>(psi)</b>	<b>(kPa)</b>	<b>(psi)</b>
P-metric -- Standard Load	240, 300, or 350	35, 44, or 51	140 140 140	20 20 20
P-metric - Extra Load	280 or 340	41 or 49	160 160	23 23
Load Range C	350	51	200	29
Load Range D	450	65	240	35
Load Range E	550	80	240	35

REMARKS: None

RECORDED BY: Todd P. Groghan

DATE: April 14, 2009

APPROVED BY: Kenneth H. Yates

**DATA SHEET 2 (Sheet 1 of 2)**  
**LOW TIRE PRESSURE WARNING AND MALFUNCTION TELLTALE**

TEST DATE: April 14, 2009 LAB: U. S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

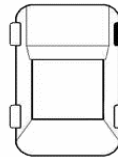
**TPMS Low Tire Pressure Warning Telltale**

Telltale is mounted inside the occupant compartment in front of and in clear view of the driver?

( X ) YES ( ) NO (fail)

TPMS Low Tire Pressure Warning Telltale Location: In gauge cluster to the left of  
tachometer

Identify Telltale Symbol Used (check box above figure).



OTHER (fail)  
(describe below)

Note any words or additional symbols used: None

Telltale is part of a reconfigurable display? ( ) YES ( X ) NO

**TPMS Malfunction Telltale**

( ) None ( X ) Dedicated stand-alone ( ) Combined with low tire pressure telltale

TPMS Dedicated Malfunction Telltale Location: In gauge cluster, left of tachometer

Telltale is mounted inside the occupant compartment in front of and in clear view of the driver?

( X ) YES ( ) NO (fail)

Malfunction telltale is part of a reconfigurable display? ( ) YES ( X ) NO

Identify Dedicated Telltale Symbol Used: ( X ) "TPMS" ( ) OTHER (fail)

Note any words or additional symbols used: None

**DATA SHEET 2 (Sheet 2 of 2)**  
**LOW TIRE PRESSURE WARNING AND MALFUNCTION TELLTALE**

**Check Telltale Lamp Functions:**

LOW TIRE PRESSURE WARNING TELLTALE

Ignition locking system position when telltale illuminates:

OFF/LOCK                       Between OFF/LOCK and ON/RUN

ON/RUN                               Between ON/RUN and START

Is the telltale yellow in color?      ( X )YES      ( )NO (fail)

Time telltale remains illuminated   3   seconds.

DEDICATED TPMS MALFUNCTION TELLTALE

Ignition locking system position when telltale illuminates during lamp check:

OFF/LOCK                       Between OFF/LOCK and ON/RUN

ON/RUN                               Between ON/RUN and START

Is the telltale yellow in color?      ( X )YES      ( )NO (fail)

Time telltale remains illuminated   3   seconds.

**Starter Interlocks:**

Does vehicle have any starter, transmission or other interlocks that affect operation of the telltale lamp check function?                      ( )YES      ( X )NO

Low Tire Pressure Warning and Malfunction Telltales (PASS/FAIL)                        PASS  

REMARKS:   None  

RECORDED BY:   Todd P. Groghan  

DATE:   April 14, 2009  

APPROVED BY:   Kenneth H. Yates

**DATA SHEET 3 (Sheet 1 of 22)  
TPMS OPERATIONAL PERFORMANCE**

TEST DATE: April 15, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Time: Start: 1:27 pm End: 2:01 pm

Ambient Temperature: Start: 23.0°C (73.4°F) End: 23.1°C (73.6°F)

Odometer Reading: Start: 106 km (66 mi)

Fuel Level: Start: Full

Weather Conditions: Overcast, slight breeze

Time vehicle remained with engine off and tires shielded from direct sunlight  
(1 hour minimum): overnight

**PRE-TEST TIRE INFLATION PRESSURES AND TIRE/SURFACE TEMPERATURES:**

<b>Execution Procedure</b>	<b>LF Tire</b>	<b>LR Tire</b>	<b>RR Tire</b>	<b>RF Tire</b>
Pre-test cold measurements after ambient soak: Inflation Pressure	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	22.6°C (72.7°F)	24.4°C (75.9°F)	24.6°C (76.3°F)	23.0°C (73.4°F)

**DATA SHEET 3 (Sheet 2 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**

**VEHICLE WEIGHT:**

**Vehicle Ratings from Certification Label:**

GVWR: 2,200 kg (4,850 lbs)

GAWR (front): 1,140 kg (2,513 lbs)

GAWR (rear): 1,180 kg (2,601 lbs)

**Vehicle Capacity Weight:**

Vehicle Capacity Weight 525 kg (1,157 lbs)

**Measured Unloaded Vehicle Weight:**

LF	<u>466 kg (1,028 lbs)</u>	LR	<u>336 kg (740 lbs)</u>
RF	<u>449 kg (989 lbs)</u>	RR	<u>337 kg (743 lbs)</u>
Front Axle	<u>915 kg (2,017 lbs)</u>	Rear Axle	<u>673 kg (1,483 lbs)</u>
Total Vehicle		<u>1,588 kg (3,500 lbs)</u>	

**Measured Test Weight: ( X )LLVW(+50, -0 kg) ( )UVW + VCW ( )GVWR(+0, -50 kg)**

LF	<u>519 kg (1,144 lbs)</u>	LR	<u>381 kg (839 lbs)</u>
RF	<u>508 kg (1,119 lbs)</u>	RR	<u>385 kg (848 lbs)</u>
Front Axle	<u>1,027 kg (2,263 lbs) ( ≤ GAWR)</u>	Rear Axle	<u>766 kg (1,687 lbs) ( ≤ GAWR)</u>
Total Vehicle		<u>1,793 kg (3,950 lbs) (not greater than GVWR)</u>	

Note: For scenarios A, B, C, and G, this total vehicle weight measures the vehicle loaded to Lightly Loaded Vehicle Weight (LLVW), 204 kg (450 lbs) of driver, passenger, and test equipment.



**DATA SHEET 3 (Sheet 3 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO A – Right Rear Tire Deflation at LLVW**

TEST DATE: April 16, 2009 LAB: U. S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Note: See Data Sheet 3 (Sheet 2 of 22) for Test Weight.

**TIRE INFLATION PRESSURES AND TIRE/SURFACE TEMPERATURES  
BEFORE CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After loading vehicle to lightly loaded vehicle weight, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>18.1°C (64.6°F)</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	18.8°C (65.8°F)	18.8°C (65.8°F)	18.8°C (65.8°F)	18.8°C (65.8°F)
San Angelo Test Facility Shop Floor Temp	19.0°C (66.2°F)	19.2°C (66.6°F)	19.2°C (66.6°F)	19.0°C (66.2°F)

**SYSTEM CALIBRATION/LEARNING PHASE:**

Time: Start: 13:16:39 UTC End: 13:41:31 UTC  
 Trip Odometer Reading: Start: 107.8 km (67.0 mi) End: 139.7 km (86.8 mi)  
 Ambient Temperature: Start: 18.1°C (64.6°F) End: 18.1°C (64.6°F)  
 Roadway Temperature: Start: 19.2°C (66.6°F) End: 20.0°C (68.0°F)

Driving in first direction:

Goodfellow Air Force  
 Starting point: Base (GAFB) north gate Direction: see chart, page 63  
10:12 minutes (stopwatch time) 15.8 km (9.8 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 63  
10:27 minutes (stopwatch time) 16.1 km (10.0 mi) distance

**Max speed:** 99.0 km/h (61.5 mph)

**Total Driving Time:** 20:39 minutes (VBox time)

**DATA SHEET 3 (Sheet 4 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO A – Right Rear Tire Deflation at LLVW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Immediately, after vehicle is stopped, engine off: Inflation Pressure	240.2 kPa (34.8 psi)	240.2 kPa (34.8 psi)	240.5 kPa (34.9 psi)	242.2 kPa (35.1 psi)
Tire Sidewall Temp	29.6°C (85.3°F)	27.2°C (81.0°F)	27.4°C (81.3°F)	30.0°C (86.0°F)
San Angelo Test Facility Shop Floor Temp	19.4°C (66.9°F)	19.6°C (67.3°F)	19.6°C (67.3°F)	19.4°C (66.9°F)

**SYSTEM DETECTION PHASE:**

**LOCATION AND PRESSURE(S) OF DEFLATED TIRE(S):**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Indicate Location of Tire(s) Deflated: ( )LF ( )LR ( X )RR ( )RF Inflation Pressure			158.0 kPa (22.9 psi)	

**TELLTALE ILLUMINATION:**

Driving in first direction:

Starting point: San Angelo Test Facility shop

Direction: west

1:20 minutes (stopwatch time – non-cumulative)

0.3 km (.2 mi) distance

<b>TELLTALE ILLUMINATES WITHIN 20 MINUTES: ( X )YES ( )NO (fail)</b>
--

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?  
( X )YES ( )NO (fail)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?  
( X )YES ( )NO (fail)

**DATA SHEET 3 (Sheet 5 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**

**SCENARIO A – Right Rear Tire Deflation at LLVW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>19.0°C (66.2°F)</u> Vehicle cool down period: <u>64</u> minutes				
Inflation Pressure	226.7 kPa (32.9 psi)	226.5 kPa (32.9 psi)	149.6 kPa (21.7 psi)	228.0 kPa (33.1 psi)
Tire Sidewall Temp	20.6°C (69.1°F)	20.6°C (69.1°F)	21.8°C (71.2°F)	21.8°C (71.2°F)
San Angelo Test Facility Shop Floor Temp	19.2°C (66.6°F)	19.6°C (67.3°F)	19.8°C (67.6°F)	19.4°C (66.9°F)

After the cool down period of a minimum of one hour, restart the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?      ( X )YES    ( )NO (fail)

**TELLTALE EXTINGUISHMENT:**

**RE-ADJUSTED TIRE INFLATION PRESSURES:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:				
	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)

Is it necessary to drive the vehicle to extinguish the telltale?      ( X )YES    ( )NO

Starting point: San Angelo Test Facility shop

1:20 minutes (stopwatch time – non-cumulative)      0.3 km (0.2 mi) distance

**TEST RESULTS**

**TPMS Performance Test Results (PASS/FAIL)**

PASS

Right rear tire was deflated at LLVW.

REMARKS: None

RECORDED BY: Jack R. Stewart

DATE: April 16, 2009

APPROVED BY: Kenneth H. Yates

**DATA SHEET 3 (Sheet 6 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO B – Left Rear and Right Front Tire Deflation at LLVW**

TEST DATE: April 17, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Note: See Data Sheet 3 (Sheet 2 of 22) for Test Weight.

**TIRE INFLATION PRESSURES AND TIRE/SURFACE TEMPERATURES  
BEFORE CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After loading vehicle to lightly loaded vehicle weight, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>21.5°C (70.7°F)</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	20.4°C (68.7°F)	21.2°C (70.2°F)	20.8°C (69.4°F)	20.6°C (69.1°F)
San Angelo Test Facility Shop Floor Temp	20.2°C (68.4°F)	20.6°C (69.1°F)	20.6°C (69.1°F)	20.2°C (68.4°F)

**SYSTEM CALIBRATION/LEARNING PHASE:**

Time: Start: 16:57:06 UTC End: 17:21:35 UTC  
 Trip Odometer Reading: Start: 142.3 km (88.4 mi) End: 174.1 km (108.2 mi)  
 Ambient Temperature: Start: 21.5°C (70.7°F) End: 22.5°C (72.5°F)  
 Roadway Temperature: Start: 32.8°C (91.0°F) End: 35.6°C (96.1°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 64  
10:12 minutes (stopwatch time) 15.8 km (9.8 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 64  
10:25 minutes (stopwatch time) 16.1 km (10.0 mi) distance

**Max speed:** 97.9km/h (60.8 mph)

**Total Driving Time:** 20:37 minutes (VBox time)

**DATA SHEET 3 (Sheet 7 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO B – Left Rear and Right Front Tire Deflation at LLVW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Immediately, after vehicle is stopped, engine off: Inflation Pressure	245.7 kPa (35.6 psi)	244.3 kPa (35.4 psi)	244.6 kPa (35.5 psi)	247.5 kPa (35.9 psi)
Tire Sidewall Temp	35.4°C (95.7°F)	33.4°C (92.1°F)	33.8°C (92.8°F)	34.2°C (93.6°F)
San Angelo Test Facility Shop Floor Temp	20.2°C (68.4°F)	20.8°C (69.4°F)	20.6°C (69.1°F)	20.2°C (68.4°F)

**SYSTEM DETECTION PHASE:**

**LOCATION AND PRESSURE(S) OF DEFLATED TIRE(S):**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Indicate Location of Tire(s) Deflated: ( )LF ( X )LR ( )RR ( X )RF Inflation Pressure		158.0 kPa (22.9 psi)		158.0 kPa (22.9 psi)

**TELLTALE ILLUMINATION:**

Driving in first direction:

Starting point: San Angelo Test Facility shop Direction: west  
1:20 minutes (stopwatch time – non-cumulative) 0.2 km (0.1 mi) distance

<b>TELLTALE ILLUMINATES WITHIN 20 MINUTES: ( X )YES ( )NO (fail)</b>
--

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?  
 ( X )YES ( )NO (fail)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?  
 ( X )YES ( )NO (fail)

**DATA SHEET 3 (Sheet 8 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO B – Left Rear and Right Front Tire Deflation at LLVW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>25.5°C (77.9°F)</u> Vehicle cool down period: <u>60</u> minutes				
Inflation Pressure	230.5 kPa (33.4 psi)	148.5 kPa (21.5 psi)	228.0 kPa (33.1 psi)	148.0 kPa (21.5 psi)
Tire Sidewall Temp	25.4°C (77.7°F)	25.0°C (77.0°F)	24.8°C (76.6°F)	25.0°C (77.0°F)
San Angelo Test Facility Shop Floor Temp	22.2°C (72.0°F)	22.2°C (72.0°F)	21.8°C (71.2°F)	22.0°C (71.6°F)

After the cool down period of a minimum of one hour, restart the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?             YES     NO (fail)

**TELLTALE EXTINGUISHMENT:**

**RE-ADJUSTED TIRE INFLATION PRESSURES:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)

Is it necessary to drive the vehicle to extinguish the telltale?             YES     NO

Starting point: San Angelo Test Facility shop

1:26 minutes (stopwatch time – non-cumulative)            0.3 km (0.2 mi) distance

**TPMS Performance Test Results (PASS/FAIL)**

**PASS**

Left rear and right front tires were deflated at LLVW.

REMARKS: None

RECORDED BY: Jack R. Stewart

DATE: April 17, 2009

APPROVED BY: Kenneth H. Yates

**DATA SHEET 3 (Sheet 9 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO C – Left Front, Left Rear, Right Rear, Right Front Tire Deflation at LLVW**

TEST DATE: April 20, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Note: See Data Sheet 3 (Sheet 2 of 22) for Test Weight.

**TIRE INFLATION PRESSURES AND TIRE/SURFACE TEMPERATURES  
BEFORE CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After loading vehicle to lightly loaded vehicle weight, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>11.7°C (53.1°F)</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	14.4°C (57.9°F)	13.4°C (56.1°F)	14.2°C (57.6°F)	15.2°C (59.4°F)
San Angelo Test Facility Shop Floor Temp	17.2°C (63.0°F)	17.2°C (63.0°F)	17.6°C (63.7°F)	17.4°C (63.3°F)

**SYSTEM CALIBRATION/LEARNING PHASE:**

Time: Start: 13:15:46 UTC End: 13:40:07 UTC  
 Trip Odometer Reading: Start: 177.7 km (110.4 mi) End: 209.5 km (130.2 mi)  
 Ambient Temperature: Start: 11.7°C (53.1°F) End: 11.7°C (53.1°F)  
 Roadway Temperature: Start: 13.2°C (55.8°F) End: 15.6°C (60.1°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 65  
10:11 minutes (stopwatch time) 15.8 km (9.8 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 65  
10:31 minutes (stopwatch time) 16.1 km (10.0 mi) distance

**Max speed:** 99.2 km/h (61.6 mph)

**Total Driving Time:** 20:42 minutes (VBox time)

**DATA SHEET 3 (Sheet 10 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO C – Left Front, Left Rear, Right Rear, Right Front Tire Deflation at LLVW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER CALIBRATION PHASE:**

<b>Execution Procedure</b>	<b>LF Tire</b>	<b>LR Tire</b>	<b>RR Tire</b>	<b>RF Tire</b>
Immediately, after vehicle is stopped, engine off: Inflation Pressure	242.2 kPa (35.1 psi)	241.0 kPa (35.0 psi)	241.5 kPa (35.0 psi)	241.8 kPa (35.1 psi)
Tire Sidewall Temp	26.4°C (79.5°F)	23.4°C (74.1°F)	22.0°C (71.6°F)	25.0°C (77.0°F)
San Angelo Test Facility Shop Floor Temp	16.8°C (62.2°F)	16.4°C (61.5°F)	16.2°C (61.2°F)	16.4°C (61.5°F)

**SYSTEM DETECTION PHASE:**

**LOCATION AND PRESSURE(S) OF DEFLATED TIRE(S):**

<b>Execution Procedure</b>	<b>LF Tire</b>	<b>LR Tire</b>	<b>RR Tire</b>	<b>RF Tire</b>
Indicate Location of Tire(s) Deflated: ( X )LF ( X )LR ( X )RR ( X )RF Inflation Pressure	158.0 kPa (22.9 psi)	158.0 kPa (22.9 psi)	158.0 kPa (22.9 psi)	158.0 kPa (22.9 psi)

**TELLTALE ILLUMINATION:**

Driving in first direction:

Starting point: San Angelo Test Facility shop

Illumination immediately after lamp check. Driving was not necessary.

<b>TELLTALE ILLUMINATES WITHIN 20 MINUTES:</b> <b>( X )YES ( )NO (fail)</b>
---

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                      ( X )YES ( )NO (fail)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                      ( X )YES ( )NO (fail)



**DATA SHEET 3 (Sheet 11 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO C – Left Front, Left Rear, Right Rear, Right Front Tire Deflation at LLVW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>15.7°C (60.3°F)</u> Vehicle cool down period: <u>62</u> minutes				
Inflation Pressure	149.3 kPa (21.7 psi)	149.5 kPa (21.7 psi)	149.8 kPa (21.7 psi)	150.1 kPa (21.8 psi)
Tire Sidewall Temp	17.4°C (63.3°F)	17.4°C (63.3°F)	17.6°C (63.7°F)	18.6°C (65.5°F)
San Angelo Test Facility Shop Floor Temp	17.2°C (63.0°F)	17.2°C (63.0°F)	17.2°C (63.0°F)	17.6°C (63.7°F)

After the cool down period of a minimum of one hour, restart the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the "On" or "Run" position?       YES     NO (fail)

**TELLTALE EXTINGUISHMENT:**

**RE-ADJUSTED TIRE INFLATION PRESSURES:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:				
	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)

Is it necessary to drive the vehicle to extinguish the telltale?       YES     NO

**TEST RESULTS**

**TPMS Performance Test Results (PASS/FAIL)**

**PASS**

Left front, left rear, right rear, and right front tires were deflated at LLVW.

**REMARKS:** None

RECORDED BY: Jack R. Stewart

DATE: April 20, 2009

APPROVED BY: Kenneth H. Yates

**DATA SHEET 3 (Sheet 12 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**

TEST DATE: April 20, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Time: Start: 2:15 pm End: 3:15 pm

Ambient Temperature: Start: 25.4°C (77.7°F) End: 26.4°C (79.5°F)

Odometer Reading: Start: 238 km (148 mi)

Fuel Level: Start: Full

Weather Conditions: Sunny and calm

Time vehicle remained with engine off and tires shielded from direct sunlight  
(1 hour minimum): 1 hour

**PRE-TEST TIRE INFLATION PRESSURES AND TIRE/SURFACE TEMPERATURES:**

<b>Execution Procedure</b>	<b>LF Tire</b>	<b>LR Tire</b>	<b>RR Tire</b>	<b>RF Tire</b>
Pre-test cold measurements after ambient soak: Inflation Pressure	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	25.2°C (77.4°F)	25.2°C (77.4°F)	25.2°C (77.4°F)	25.0°C (77.0°F)

**DATA SHEET 3 (Sheet 13 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**

**VEHICLE WEIGHT:**

**Vehicle Ratings from Certification Label:**

GVWR: 2,200 kg (4,850 lbs)

GAWR (front): 1,140 kg (2,513 lbs)

GAWR (rear): 1,180 kg (2,601 lbs)

**Vehicle Capacity Weight:**

Vehicle Capacity Weight 525 kg (1,157 lbs)

**Measured Unloaded Vehicle Weight:**

LF	<u>465 kg (1,026 lbs)</u>	LR	<u>337 kg (742 lbs)</u>
RF	<u>450 kg (991 lbs)</u>	RR	<u>336 kg (741 lbs)</u>
Front Axle	<u>915 kg (2,017 lbs)</u>	Rear Axle	<u>673 kg (1,483 lbs)</u>
Total Vehicle		<u>1,588 kg (3,500 lbs)</u>	

**Measured Test Weight: ( ) LLVW(+50, -0 kg) ( X ) UVW + VCW ( ) GVWR(+0, -50 kg)**

LF	<u>526 kg (1,159 lbs)</u>	LR	<u>539 kg (1,189 lbs)</u>
RF	<u>512 kg (1,129 lbs)</u>	RR	<u>535 kg (1,180 lbs)</u>
Front Axle	<u>1,038 kg (2,288 lbs)</u> ( ≤ GAWR )	Rear Axle	<u>1,074 kg (2,369 lbs)</u> ( ≤ GAWR )
Total Vehicle		<u>2,112 kg (4,657 lbs)</u> (not greater than GVWR)	

Note: For scenarios D, E, and F, this Total Vehicle Weight measures the vehicle loaded to Unloaded Vehicle Weight (UVW) and Vehicle Capacity Weight (VCW), 525 kg (1,157 lbs) of driver, passenger, test equipment, and ballast.

**DATA SHEET 3 (Sheet 14 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**  
**SCENARIO D – Left Front Tire Deflation at UVW + VCW**

TEST DATE: April 21, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Note: See Data Sheet 3 (Sheet 13 of 22) for Test Weight.

**TIRE INFLATION PRESSURES AND TIRE/SURFACE TEMPERATURES  
BEFORE CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After loading vehicle to UVW + VCW, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>16.1°C (61.0°F)</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	17.8°C (64.0°F)	17.4°C (63.3°F)	17.4°C (63.3°F)	17.4°C (63.3°F)
San Angelo Test Facility Shop Floor Temp	18.4°C (65.1°F)	18.6°C (65.5°F)	18.6°C (65.5°F)	18.6°C (65.5°F)

**SYSTEM CALIBRATION/LEARNING PHASE:**

Time: Start: 13:29:20 UTC End: 13:53:54 UTC  
Trip Odometer Reading: Start: 240.1 km (149.2 mi) End: 272.0 km (169.0 mi)  
Ambient Temperature: Start: 16.1°C (61.0°F) End: 17.0°C (62.6°F)  
Roadway Temperature: Start: 17.4°C (63.3°F) End: 20.8°C (69.4°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 66  
10:12 minutes (stopwatch time) 15.8 km (9.8 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 66  
10:25 minutes (stopwatch time) 16.1 km (10.0 mi) distance

**Max speed:** 98.8 km/h (61.4 mph)

**Total Driving Time:** 20:37 minutes (VBox time)

**DATA SHEET 3 (Sheet 15 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**  
**SCENARIO D – Left Front Tire Deflation at UVW + VCW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Immediately, after vehicle is stopped, engine off: Inflation Pressure	244.7 kPa (35.5 psi)	249.7 kPa (36.2 psi)	250.1 kPa (36.3 psi)	246.1 kPa (35.7 psi)
Tire Sidewall Temp	33.2°C (91.8°F)	32.8°C (91.0°F)	31.8°C (89.2°F)	30.8°C (87.4°F)
San Angelo Test Facility Shop Floor Temp	19.4°C (66.9°F)	19.4°C (66.9°F)	19.4°C (66.9°F)	19.2°C (66.6°F)

**SYSTEM DETECTION PHASE:**

**LOCATION AND PRESSURE(S) OF DEFLATED TIRE(S):**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Indicate Location of Tire(s) Deflated: ( X )LF ( )LR ( )RR ( )RF Inflation Pressure	158.0 kPa (22.9 psi)			

**TELLTALE ILLUMINATION:**

Driving in first direction:

Starting point: San Angelo Test Facility shop

Illumination in 21 seconds. Driving was not necessary.

<b>TELLTALE ILLUMINATES WITHIN 20 MINUTES:</b> <b>( X )YES ( )NO (fail)</b>
---

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                      ( X )YES ( )NO (fail)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                      ( X )YES ( )NO (fail)

**DATA SHEET 3 (Sheet 16 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO D – Left Front Tire Deflation at UVW + VCW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>24.0°C (75.2°F)</u> Vehicle cool down period: <u>60</u> minutes				
Inflation Pressure	149.7 kPa (21.7 psi)	231.0 kPa (33.5 psi)	231.3 kPa (33.5 psi)	232.1 kPa (33.7 psi)
Tire Sidewall Temp	22.8°C (73.0°F)	23.2°C (73.8°F)	23.0°C (73.4°F)	23.2°C (73.8°F)
San Angelo Test Facility Shop Floor Temp	19.8°C (67.6°F)	20.4°C (68.7°F)	19.8°C (67.6°F)	20.2°C (68.4°F)

After the cool down period of a minimum of one hour, restart the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?            ( X )YES    ( )NO (fail)

**TELLTALE EXTINGUISHMENT:  
RE-ADJUSTED TIRE INFLATION PRESSURES:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)

Is it necessary to drive the vehicle to extinguish the telltale?            ( X )YES    ( )NO

Starting point: San Angelo Test Facility shop

2:17 minutes (stopwatch time – non-cumulative)            0.5 km (0.3 mi) distance

**TEST RESULTS**

**TPMS Performance Test Results (PASS/FAIL)**

Left front tire was deflated at UVW + VCW.

**PASS**

**REMARKS:** None

RECORDED BY: Jack R. Stewart

DATE: April 21, 2009

APPROVED BY: Kenneth H. Yates

**DATA SHEET 3 (Sheet 17 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO E – Right Rear, Right Front Tire Deflation at UVW + VCW**

TEST DATE: April 21, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Note: See Data Sheet 3 (Sheet 13 of 22) for Test Weight.

**TIRE INFLATION PRESSURES AND TIRE/SURFACE TEMPERATURES  
BEFORE CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After loading vehicle to UVW + VCW, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>27.0°C (80.6°F)</u> Vehicle cool down period: <u>62</u> minutes				
Inflation Pressure	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	23.6°C (74.5°F)	24.8°C (76.6°F)	24.6°C (76.3°F)	25.4°C (77.7°F)
San Angelo Test Facility Shop Floor Temp	20.6°C (69.1°F)	21.2°C (70.2°F)	21.8°C (71.2°F)	21.6°C (70.9°F)

**SYSTEM CALIBRATION/LEARNING PHASE:**

Time: Start: 16:31:39 UTC End: 16:56:21 UTC  
 Trip Odometer Reading: Start: 274.6 km (170.6 mi) End: 306.4 km (190.4 mi)  
 Ambient Temperature: Start: 27.0°C (80.6°F) End: 28.0°C (82.4°F)  
 Roadway Temperature: Start: 32.8°C (91.0°F) End: 39.8°C (103.6°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 67  
10:10 minutes (stopwatch time) 15.8 km (9.8 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 67  
10:27 minutes (stopwatch time) 16.1 km (10.0 mi) distance

**Max speed:** 98.4 km/h (61.1 mph)

**Total Driving Time:** 20:37 minutes (VBox time)

**DATA SHEET 3 (Sheet 18 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO E – Right Rear, Right Front Tire Deflation at UVW + VCW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Immediately, after vehicle is stopped, engine off: Inflation Pressure	245.3 kPa (35.6 psi)	250.5 kPa (36.3 psi)	252.0 kPa (36.5 psi)	245.6 kPa (35.6 psi)
Tire Sidewall Temp	42.0°C (107.6°F)	42.8°C (109.0°F)	42.8°C (109.0°F)	41.2°C (106.2°F)
San Angelo Test Facility Shop Floor Temp	22.2°C (72.0°F)	22.2°C (72.0°F)	22.4°C (72.3°F)	22.0°C (71.6°F)

**SYSTEM DETECTION PHASE:**

**LOCATION AND PRESSURE(S) OF DEFLATED TIRE(S):**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Indicate Location of Tire(s) Deflated: ( )LF ( )LR ( X )RR ( X )RF Inflation Pressure			158.0 kPa (22.9 psi)	158.0 kPa (22.9 psi)

**TELLTALE ILLUMINATION:**

Driving in first direction:

Starting point: San Angelo Test Facility shop Direction: west  
1:37 minutes (stopwatch time – non-cumulative) 0.2 km (0.1 mi) distance

<b>TELLTALE ILLUMINATES WITHIN 20 MINUTES:</b> <b>( X )YES ( )NO (fail)</b>
---

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                      ( X )YES ( )NO (fail)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                      ( X )YES ( )NO (fail)



**DATA SHEET 3 (Sheet 19 of 22)  
TPMS OPERATIONAL PERFORMANCE**

**SCENARIO E – Right Rear, Right Front Tire Deflation at UVW + VCW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>31.0°C (87.8°F)</u> Vehicle cool down period: <u>60</u> minutes				
Inflation Pressure	228.5 kPa (33.1 psi)	228.0 kPa (33.1 psi)	144.0 kPa (20.9 psi)	148.2 kPa (21.5 psi)
Tire Sidewall Temp	29.4°C (84.9°F)	29.2°C (84.6°F)	29.2°C (84.6°F)	29.0°C (84.2°F)
San Angelo Test Facility Shop Floor Temp	23.4°C (74.1°F)	23.4°C (74.1°F)	23.6°C (74.5°F)	22.8°C (73.0°F)

After the cool down period of a minimum of one hour, restart the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the "On" or "Run" position? ( X )YES ( )NO (fail)

**TELLTALE EXTINGUISHMENT:  
RE-ADJUSTED TIRE INFLATION PRESSURES:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)

Is it necessary to drive the vehicle to extinguish the telltale? ( X )YES ( )NO

Starting point: San Angelo Test Facility shop

1:11 minutes (stopwatch time – non-cumulative) 0.2 km (0.1 mi) distance

**TEST RESULTS**

**TPMS Performance Test Results (PASS/FAIL)**

Right rear and right front tires were deflated at UVW + VCW.

**PASS**

REMARKS: None

RECORDED BY: Jack R. Stewart

DATE: April 21, 2009

APPROVED BY: Kenneth H. Yates

**DATA SHEET 3 (Sheet 20 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**  
**SCENARIO F – Left Front, Right Rear, and Right Front**  
**Tire Deflation at UVW +VCW**

TEST DATE: April 22, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Note: See Data Sheet 3 (Sheet 13 of 22) for Test Weight.

**TIRE INFLATION PRESSURES AND TIRE/SURFACE TEMPERATURES**  
**BEFORE CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After loading vehicle to UVW + VCW, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>22.0°C (71.6°F)</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	22.4°C (72.3°F)	22.4°C (72.3°F)	22.2°C (72.0°F)	22.4°C (72.3°F)
San Angelo Test Facility Shop Floor Temp	22.6°C (72.7°F)	22.8°C (73.0°F)	22.8°C (73.0°F)	22.6°C (72.7°F)

**SYSTEM CALIBRATION/LEARNING PHASE:**

Time: Start: 13:28:03 UTC End: 13:52:20 UTC  
 Trip Odometer Reading: Start: 310.1 km (192.7 mi) End: 342.0 km (212.5 mi)  
 Ambient Temperature: Start: 22.0°C (71.6°F) End: 22.9°C (73.2°F)  
 Roadway Temperature: Start: 20.4°C (68.7°F) End: 24.0°C (75.2°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 68  
10:13 minutes (stopwatch time) 15.8 km (9.8 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 68  
10:25 minutes (stopwatch time) 16.1 km (10.0 mi) distance

**Max speed:** 99.9 km/h (62.1 mph)

**Total Driving Time:** 20:38 minutes (VBox time)

**DATA SHEET 3 (Sheet 21 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**  
**SCENARIO F – Left Front, Right Rear, and Right Front**  
**Tire Deflation at UVW +VCW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER CALIBRATION PHASE:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Immediately, after vehicle is stopped, engine off: Inflation Pressure	243.8 kPa (35.4 psi)	247.6 kPa (35.9 psi)	248.1 kPa (36.0 psi)	243.5 kPa (35.3 psi)
Tire Sidewall Temp	36.4°C (97.5°F)	35.4°C (95.7°F)	32.8°C (91.0°F)	32.6°C (90.7°F)
San Angelo Test Facility Shop Floor Temp	23.2°C (73.8°F)	23.4°C (74.1°F)	24.2°C (75.6°F)	23.4°C (74.1°F)

**SYSTEM DETECTION PHASE:**

**LOCATION AND PRESSURE(S) OF DEFLATED TIRE(S):**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Indicate Location of Tire(s) Deflated: ( X )LF ( )LR ( X )RR ( X )RF Inflation Pressure	158.0 kPa (22.9 psi)		158.0 kPa (22.9 psi)	158.0 kPa (22.9 psi)

**TELLTALE ILLUMINATION:**

Driving in first direction:

Starting point: San Angelo Test Facility shop

Illumination in 10 seconds. Driving was not necessary.

<b>TELLTALE ILLUMINATES WITHIN 20 MINUTES:</b> <b>( X )YES ( )NO (fail)</b>
---

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                      ( X )YES ( )NO (fail)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                      ( X )YES ( )NO (fail)

**DATA SHEET 3 (Sheet 22 of 22)**  
**TPMS OPERATIONAL PERFORMANCE**  
**SCENARIO F – Left Front, Right Rear, and Right Front**  
**Tire Deflation at UVW +VCW**

**TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>25.8°C (78.4°F)</u> Vehicle cool down period: <u>60</u> minutes				
Inflation Pressure	148.9 kPa (21.6 psi)	227.2 kPa (33.0 psi)	147.0 kPa (21.3 psi)	149.9 kPa (21.7 psi)
Tire Sidewall Temp	25.8°C (78.4°F)	25.6°C (78.1°F)	25.6°C (78.1°F)	25.8°C (78.4°F)
San Angelo Test Facility Shop Floor Temp	24.0°C (75.2°F)	24.2°C (75.6°F)	24.2°C (75.6°F)	24.2°C (75.6°F)

After the cool down period of a minimum of one hour, restart the vehicle engine. Does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the "On" or "Run" position?      ( X )YES    ( )NO (fail)

**TELLTALE EXTINGUISHMENT:**  
**RE-ADJUSTED TIRE INFLATION PRESSURES:**

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)

Is it necessary to drive the vehicle to extinguish the telltale?      ( X )YES    ( )NO

Starting point: San Angelo Test Facility shop

0:49 minutes (stopwatch time – non-cumulative)      0.2 km (0.1 mi) distance

**TEST RESULTS**

**TPMS Performance Test Results (PASS/FAIL)**

Left front, right rear, and right front tires were deflated at UVW +VCW.

**PASS**

REMARKS: None

RECORDED BY: Todd P. Groghan

DATE: April 22, 2009

APPROVED BY: Kenneth H. Yates

**DATA SHEET 4 (Sheet 1 of 4)**  
**Scenario G – Malfunction Detection Test at LLVW**

TEST DATE: April 20, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Time:	Start:	<u>16:12:37 UTC</u>	End:	<u>16:22:02 UTC</u>
Trip Odometer Reading:	Start:	<u>210.3 km (130.7 mi)</u>	End:	<u>219.7 km (136.5 mi)</u>
Ambient Temperature:	Start:	<u>19.6°C (67.3°F)</u>	End:	<u>22.3°C (72.1°F)</u>
Roadway Temperature:	Start:	<u>27.6°C (81.7°F)</u>	End:	<u>39.8°C (103.6°F)</u>
Fuel Level:	Start:	<u>Full</u>		

Note: See Data Sheet 3 (Sheet 2 of 22) for Test Weight.

TPMS TYPE: (  ) Direct (  ) Indirect (  ) Other Describe: \_\_\_\_\_

TPMS MALFUNCTION TELLTALE:

(  ) Dedicated stand-alone (  ) Combination low tire pressure warning/malfunction telltale

**METHOD OF MALFUNCTION SIMULATION:**

Describe method of malfunction simulation: Spare tire without TPMS sensor was applied to right front at LLVW.

**MALFUNCTION TELLTALE ILLUMINATION**

(after ignition locking system is activated to “On” (“Run”) position):

**Dedicated Malfunction Telltale**

Driving in first direction:

Starting point: San Angelo Test Facility shop Direction: see chart , page 69

5:50 minutes (stopwatch time) 9.3 km (5.8 mi) distance

Max speed: 93.7 km/h (58.2 mph)

Total Driving Time: 5:50 minutes (VBox time)

<b>TELLTALE ILLUMINATES WITHIN 20 MINUTES:</b> ( <input checked="" type="checkbox"/> ) YES ( <input type="checkbox"/> ) NO
--

**DATA SHEET 4 (Sheet 2 of 4)**  
**Scenario G – Malfunction Detection Test at LLVW**

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                    ( X )YES   ( )NO (fail)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated for at least 60 seconds when the ignition locking system is activated to the “On” or “Run” position?                    ( X )YES   ( )NO (fail)

**Extinguishment Phase:**

Restore the TPMS to normal operation. Is it necessary to drive the vehicle to extinguish the telltale?                    ( X )YES   ( )NO

Starting point:    San Angelo Test Facility shop  
1:41 minutes (stopwatch time – non-cumulative)                    0.2 km (0.1 mi) distance

<b>DEDICATED MALFUNCTION TELLTALE EXTINGUISHED:</b> ( X )YES   ( )NO (FAIL)
--

**TPMS MALFUNCTION PERFORMANCE TEST RESULTS (PASS/FAIL)**                    PASS  
Spare without TPMS sensor was applied to right front at LLVW.

**REMARKS:** None

RECORDED BY:    Jack R. Stewart

DATE:    April 20, 2009

APPROVED BY:    Kenneth H. Yates

**DATA SHEET 4 (Sheet 3 of 4)**  
**Scenario H – Malfunction Detection Test**

TEST DATE: April 21, 2009 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C90505

Time:	Start:	<u>2:35 pm</u>	End:	<u>2:50 pm</u>
Trip Odometer Reading:	Start:	<u>2.4 km (191.8 mi)</u>	End:	<u>32.8 km (191.8 mi)</u>
Ambient Temperature:	Start:	<u>33.0°C (40.8°F)</u>	End:	<u>8.5°C (47.3°F)</u>
Fuel Level:	Start:	<u>Full</u>		

Note: See Data Sheet 3 (Sheet 2 of 22) for Test Weight.

TPMS TYPE: (  ) Direct (  ) Indirect (  ) Other Describe: \_\_\_\_\_

TPMS MALFUNCTION TELLTALE:

(  ) Dedicated stand-alone (  ) Combination low tire pressure warning/malfunction telltale

**METHOD OF MALFUNCTION SIMULATION:**

Describe method of malfunction simulation: TPMS fuse was removed.

**MALFUNCTION TELLTALE ILLUMINATION**

(after ignition locking system is activated to “On” (“Run”) position):

**Dedicated Malfunction Telltale**

Driving in first direction:

Starting point: San Angelo Test Facility shop

Illumination was immediate. Driving was not necessary.

<b>TELLTALE ILLUMINATES WITHIN 20 MINUTES:</b>	<b>( <input checked="" type="checkbox"/> ) YES ( <input type="checkbox"/> ) NO</b>
--	--

**DATA SHEET 4 (Sheet 4 of 4)**  
**Scenario H – Malfunction Detection Test**

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?                    ( X )YES   ( )NO (fail)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated for at least 60 seconds when the ignition locking system is activated to the “On” or “Run” position?                    ( X )YES   ( )NO (fail)

**Extinguishment Phase:**

Restore the TPMS to normal operation. Is it necessary to drive the vehicle to extinguish the telltale?                    ( X )YES   ( )NO

Starting point:    San Angelo Test Facility shop

Extinguishment was immediate.    Driving was not necessary.

<b>DEDICATED MALFUNCTION TELLTALE EXTINGUISHED:</b> ( X )YES   ( )NO (FAIL)
--

**TPMS MALFUNCTION PERFORMANCE TEST RESULTS (PASS/FAIL)**                    PASS  
TPMS fuse was removed.

**REMARKS:**    None

RECORDED BY:    Todd P. Groghan

DATE:    April 21, 2009

APPROVED BY:    Kenneth H. Yates



**DATA SHEET 5 (Sheet 1 of 3)**  
**TPMS WRITTEN INSTRUCTIONS**

TEST  
DATE: April 14, 2009

LAB: San Angelo Test Facility

VEHICLE  
NHTSA NO: C90505

**The following statement, in the English language, is provided verbatim in the Owner's Manual.** (X)YES ( )NO

"Each tire, including the spare (if provided), should be checked monthly when cold and inflated to the inflation pressure recommended by the vehicle manufacturer on the vehicle placard or tire inflation pressure label. (If your vehicle has tires of a different size than the size indicated on the vehicle placard or tire inflation pressure label, you should determine the proper tire inflation pressure for those tires.)

As an added safety feature, your vehicle has been equipped with a tire pressure monitoring system (TPMS) that illuminates a low tire pressure telltale when one or more of your tires is significantly under-inflated. Accordingly, when the low tire pressure telltale illuminates, you should stop and check your tires as soon as possible, and inflate them to the proper pressure. Driving on a significantly under-inflated tire causes the tire to overheat and can lead to tire failure. Under-inflation also reduces fuel efficiency and tire tread life, and may affect the vehicle's handling and stopping ability.

Please note that the TPMS is not a substitute for proper tire maintenance, and it is the driver's responsibility to maintain correct tire pressure, even if under-inflation has not reached the level to trigger illumination of the TPMS low tire pressure telltale."

**DATA SHEET 5 (Sheet 2 of 3)**  
**TPMS WRITTEN INSTRUCTIONS**

**As specified, the following sections, in the English language, are required verbatim in paragraph form in the Owner's Manual:**

*The following statement is required for all vehicles certified to the standard starting on September 1, 2007 and for vehicles voluntarily equipped with a compliant TPMS MIL before that time.*

"Your vehicle has also been equipped with a TPMS malfunction indicator to indicate when the system is not operating properly."

**The above statement in the English language is provided verbatim in owner's manual:**

YES    NO

*For vehicles with a dedicated MIL telltale, add the following statement:*

"The TPMS malfunction indicator is provided by a separate telltale, which displays the symbol "TPMS" when illuminated."

**The above statement in the English language is provided verbatim in owner's manual:**

YES    NO    N/A

*For vehicles with a combined low tire pressure/MIL telltale, add the following statement:*

"The TPMS malfunction indicator is combined with the low tire pressure telltale. When the system detects a malfunction, the telltale will flash for approximately one minute and then remain continuously illuminated. This sequence will continue upon subsequent vehicle start-ups as long as the malfunction exists."

**The above statement in the English language is provided verbatim in owner's manual:**

YES    NO    N/A

*The following statement is required for all vehicles certified to the standard starting on September 1, 2007 and for vehicles voluntarily equipped with a compliant TPMS MIL before that time.*

"When the malfunction indicator is illuminated, the system may not be able to detect or signal low tire pressure as intended. TPMS malfunctions may occur for a variety of reasons, including the installation of replacement or alternate tires or wheels on the vehicle that prevent the TPMS from functioning properly. Always check the TPMS malfunction telltale after replacing one or more tires or wheels on your vehicle to ensure that the replacement or alternate tires and wheels allow the TPMS to continue to function properly."

**The above statement in the English language is provided verbatim in owner's manual:**

YES    NO

DATA INDICATES COMPLIANCE:

PASS/FAIL: PASS

**DATA SHEET 5 (Sheet 3 of 3)**  
**TPMS WRITTEN INSTRUCTIONS**

**Does the Owner's Manual provide an image of the Low Tire Pressure Warning Telltale symbol (and an image of the TPMS Malfunction Telltale warning ("TPMS")), if a dedicated telltale is utilized for this function)?** ( X )YES ( )NO

**Does the Owner's Manual include the following (allowable) information?**

- Significance of the low tire pressure warning telltale illuminating
- A description of corrective action to be undertaken
- Whether the tire pressure monitoring system functions with the vehicle's spare tire (if provided)
- How to use a reset button, if one is provided
- The time for the TPMS telltale(s) to extinguish once the low tire pressure condition or the malfunction is corrected

**REMARKS:** None

RECORDED BY: Todd P. Groghan

DATE: April 14, 2009

APPROVED BY: Kenneth H. Yates

**SECTION 4**  
**TEST EQUIPMENT LIST AND CALIBRATION INFORMATION**

<b>EQUIPMENT</b>	<b>DESCRIPTION</b>	<b>MODEL/ SERIAL NO</b>	<b>CAL. DATE</b>	<b>NEXT CAL. DATE</b>
STOPWATCH	CHAMPION SPORTS TIMER	910 R	N/A	N/A
VBOX RECORDING DEVICE	RACELOGIC VBOX III	SERIAL # 030209	3/22/2009	3/22/2010
AMBIENT TEMPERATURE GAUGE	FLUKE 179 DIGITAL THERMOMETER	SERIAL #84740316	2/12/2009	2/12/2010
LASER TEMPERATURE GAUGE (TIRES AND GROUND)	RAYTEK ST20	SERIAL 2065640101-0014	8/14/2008	8/08/2009
AIR PRESSURE GAUGE	ASHCROFT GENERAL PURPOSE DIGITAL GAUGE	MODEL # D1005PS 02L 100 PSI SERIAL # 20017398-01	11/20/2008	11/20/2009
FLOOR SCALES (VEHICLE)	INTERCOMP SW DELUXE SCALES	PART # 100156 SERIAL # 27032382	8/5/2008	8/5/2009
PLATFORM SCALE (BALLAST)	HOWE RICHARDSON	MODEL # 6401 SERIAL # 0181- 5509-26	8/5/2008	8/5/2009

SECTION 5  
PHOTOGRAPHS



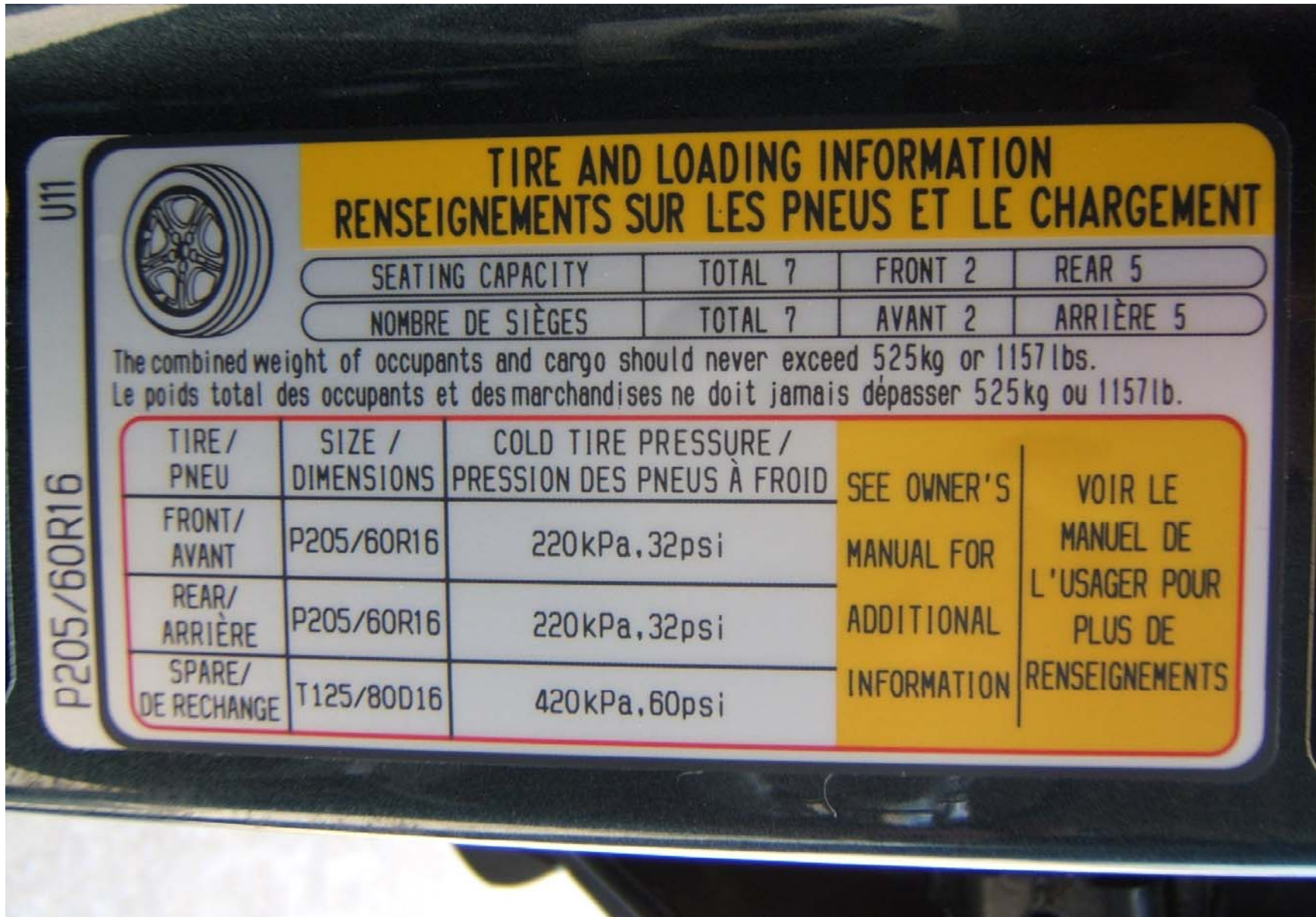
2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO.138

FIGURE 5.1  
¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO.138

FIGURE 5.2  
VEHICLE CERTIFICATION LABEL



2009 KIA RONDO  
 NHTSA NO. C90505  
 FMVSS NO. 138

FIGURE 5.3  
 VEHICLE PLACARD





2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.4  
TIRE SHOWING BRAND



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.5  
TIRE SHOWING MODEL



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.6  
TIRE SHOWING SIZE AND LOAD INDEX / SPEED RATING



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.7  
TIRE SHOWING DOT SERIAL NUMBER



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.8  
TIRE SHOWING MAX LOAD RATING  
AND MAX COLD INFLATION PRESSURE



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FMVSS NO. 138

FIGURE 5.9  
TIRE SHOWING SIDEWALL / TREAD CONSTRUCTION



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.10  
TPMS SENSOR



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.11  
RIM CONTOUR FOR FULL WIDTH OF CROSS SECTION





2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.12  
DISPLAY SHOWING LOW TIRE  
PRESSURE WARNING TELLTALE



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.13  
DISPLAY SHOWING DEDICATED TPMS  
MALFUNCTION WARNING TELLTALE



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO 138

FIGURE 5.14  
TEST INSTRUMENTATION INSTALLED IN VEHICLE



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.15  
VEHICLE MID SEAT BALLAST  
FOR UVW + VCW LOAD



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.16  
VEHICLE REAR SEAT BALLAST FOR UVW + VCW LOAD



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.17  
VEHICLE CARGO AREA BALLAST FOR UVW + VCW LOAD



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.18  
VEHICLE ON WEIGHT SCALES



2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.19  
SPARE INSTALLED ON RIGHT FRONT  
FOR MALFUNCTION DETECTION TEST





2009 KIA RONDO  
NHTSA NO. C90505  
FMVSS NO. 138

FIGURE 5.20  
TPMS FUSE REMOVED FOR  
MALFUNCTION DETECTION TEST

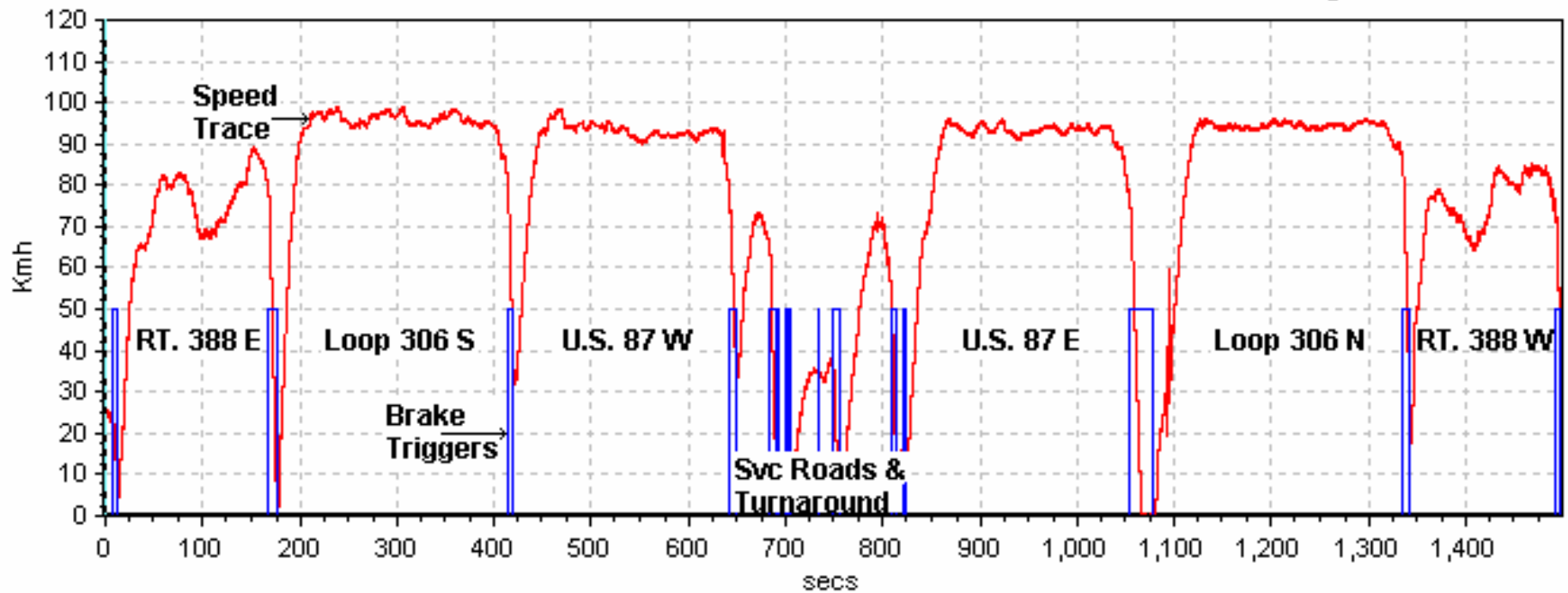
SECTION 6  
TEST PLOTS

Scenario A: Right Rear Tire at LLVW  
Test Date: 4/16/09  
Data File Time: 24:59 minutes  
Cumulative Driving Time: 20:39 minutes  
Start Point: GAFB North Gate

Calibration Phase:

2009 Kia Rondo (C90505) RR Calibration LLVW

Log Rate := 100.00 Hz



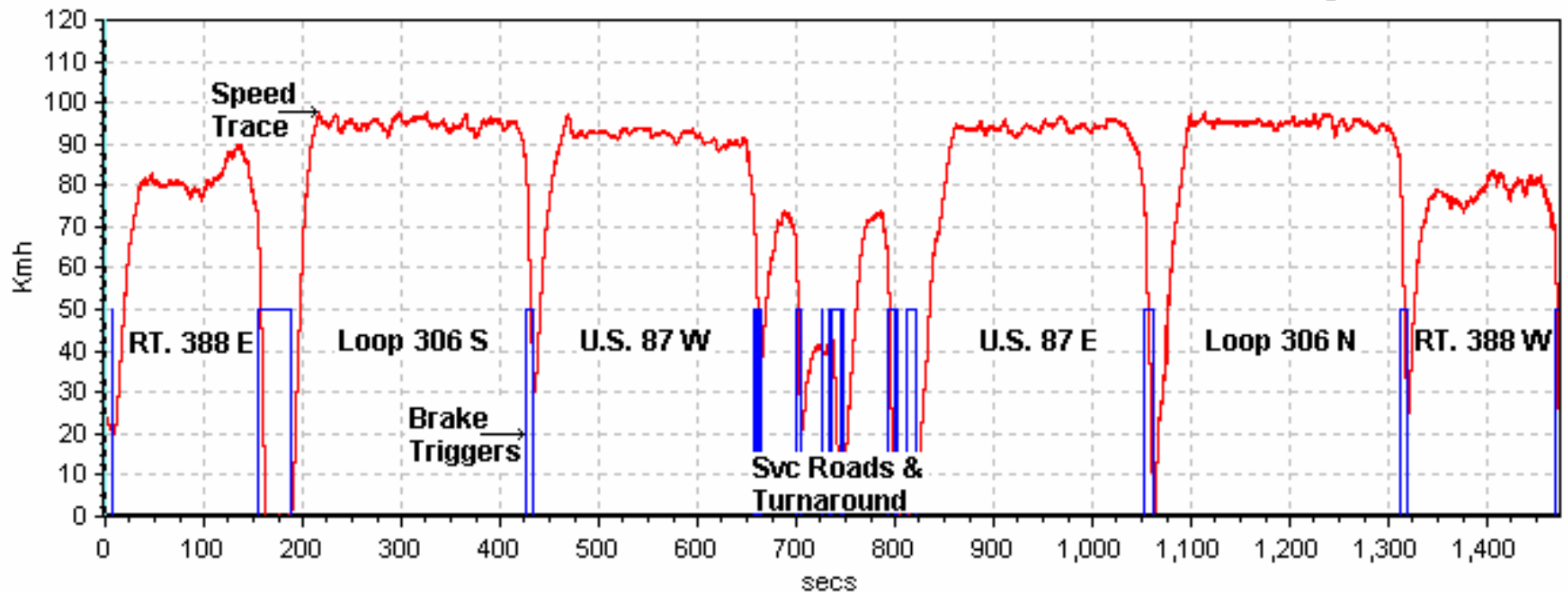
RR Detection Phase: Illumination occurred in 1:20 minutes. Driving above 50 km/h was not necessary.

Scenario B: Left Rear, Right Front Tires at LLVW  
Test Date: 4/17/09  
Data File Time: 24:35 minutes  
Cumulative Driving Time: 20:37 minutes  
Start Point: GAFB North Gate

Calibration Phase:

2009 Kia Rondo (C90505) LR, RF Calibration LLVW

Log Rate := 100.00 Hz



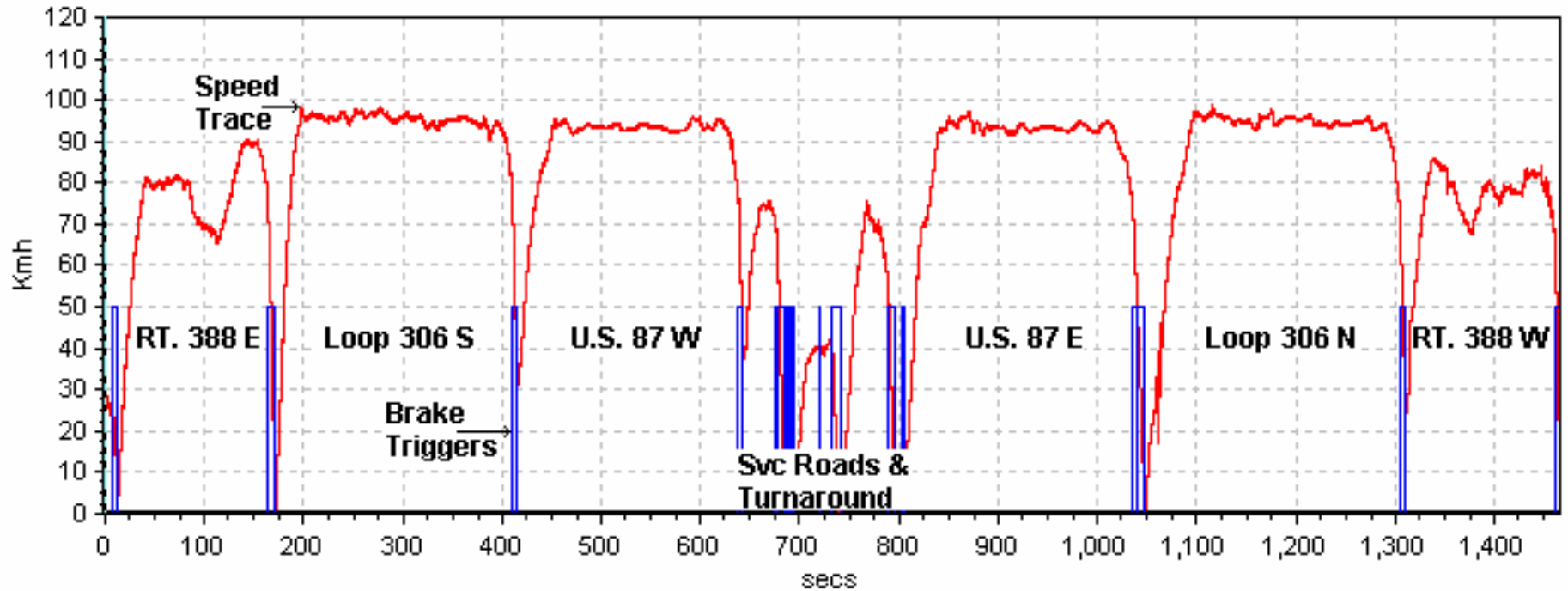
LR, RF Detection Phase: Illumination occurred in 1:20 minutes. Driving above 50 km/h was not necessary.

Scenario C: Left Front, Left Rear, Right Rear, Right Front Tires at LLVW  
 Test Date: 4/20/09  
 Data File Time: 24:26 minutes  
 Cumulative Driving Time: 20:42 minutes  
 Start Point: GAFB North Gate

Calibration Phase:

2009 Kia Rondo (C90505) LF, LR, RR, RF Calibration LLVW

Log Rate := 100.00 Hz

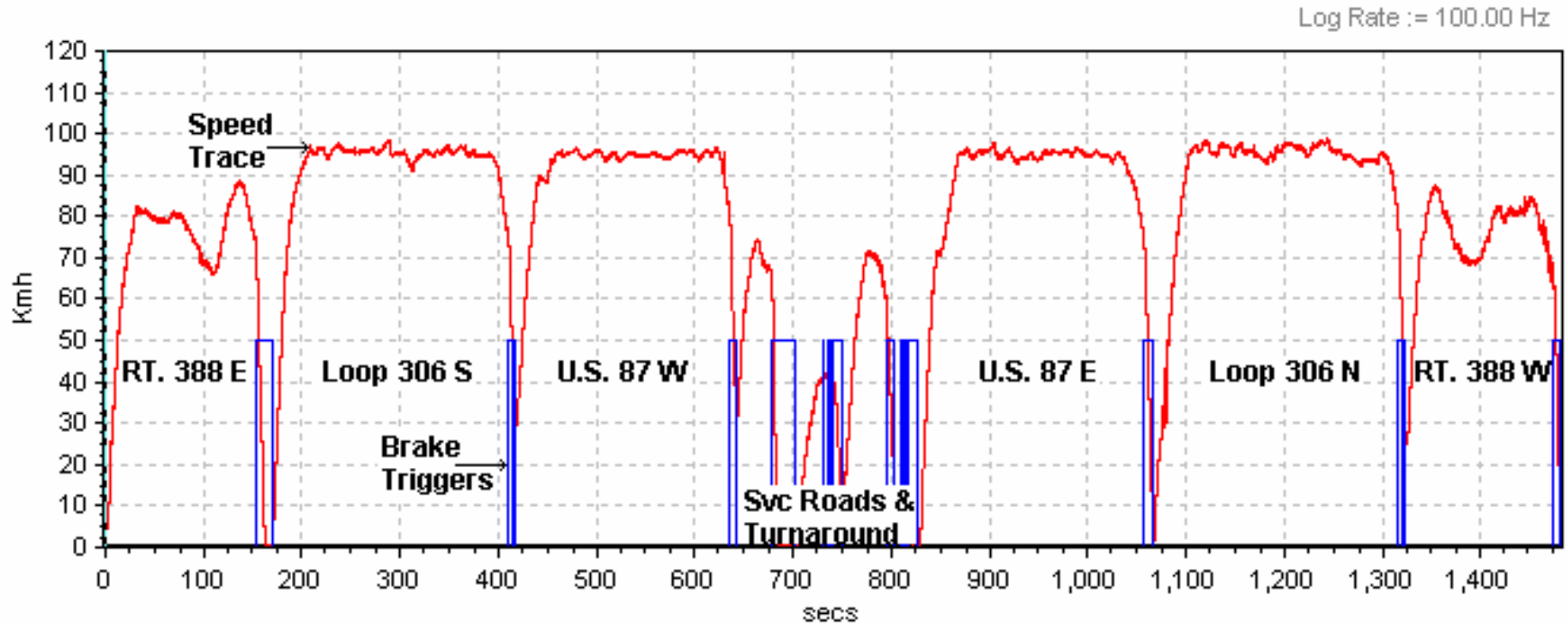


LF, LR, RR, RF Detection Phase: Illumination occurred immediately after lamp check. Driving above 50 km/h was not necessary.

Scenario D: Left Front Tire at UVW + VCW  
Test Date: 4/21/09  
Data File Time: 24:43 minutes  
Cumulative Driving Time: 20:37 minutes  
Start Point: GAFB North Gate

Calibration Phase:

2009 Kia Rondo (C90505) LF Calibration UVW+VCW



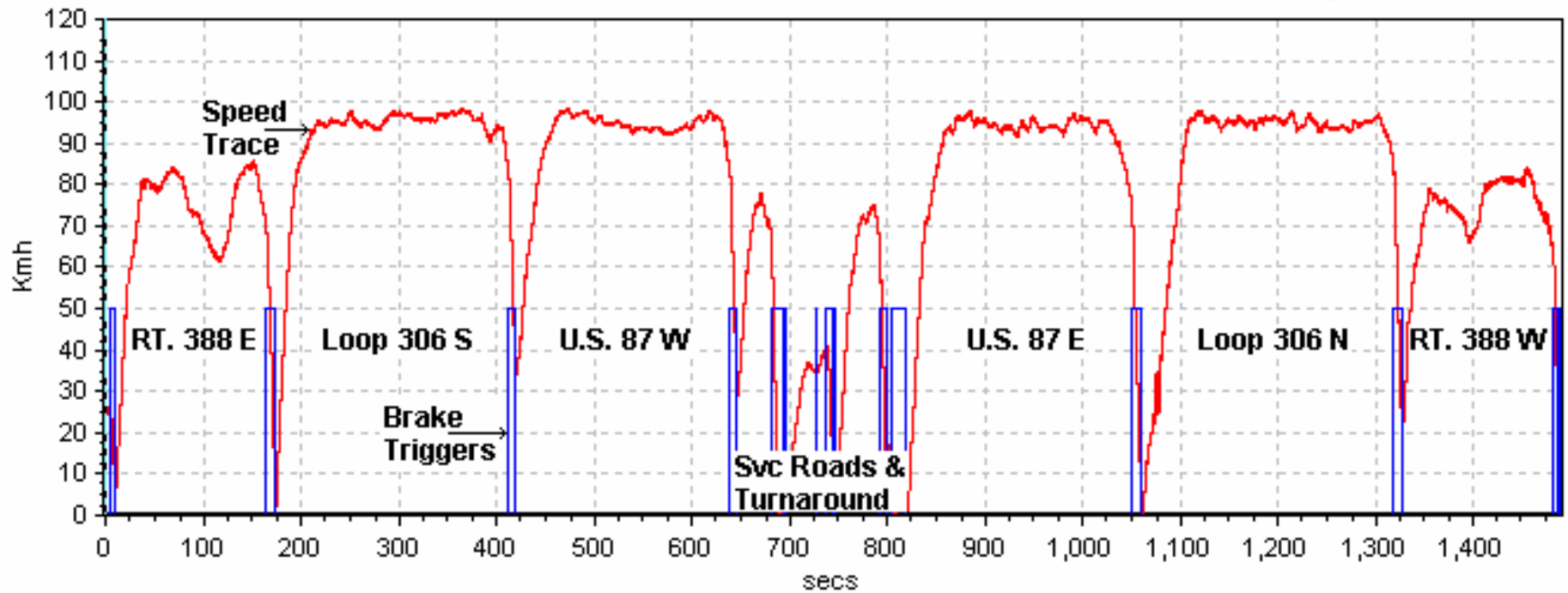
LF Detection Phase: Illumination occurred in 21 seconds. Driving above 50 km/h was not necessary.

Scenario E: Right Rear, Right Front Tires at UVW + VCW  
Test Date: 4/21/09  
Data File Time: 24:51 minutes  
Cumulative Driving Time: 20:37 minutes  
Start Point: GAFB North Gate

Calibration Phase:

2009 Kia Rondo (C90505) RR, RF Calibration UWW+VCW

Log Rate := 100.00 Hz

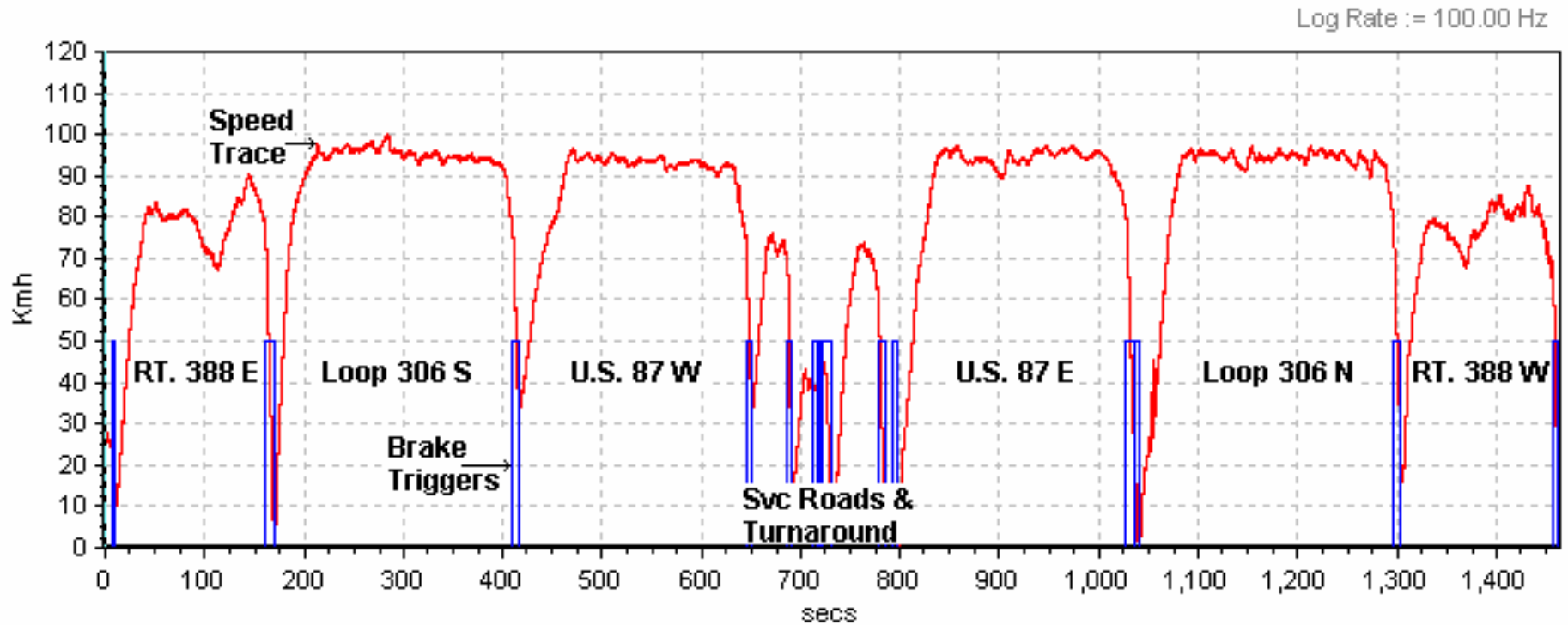


RR, RF Detection Phase: Illumination occurred in 1:37 minutes. Driving above 50 km/h was not necessary.

Scenario F: Left Front, Right Rear, Right Front Tires at UVW + VCW  
Test Date: 4/21/09  
Data File Time: 24:51 minutes  
Cumulative Driving Time: 20:38 minutes  
Start Point: GAFB North Gate

Calibration Phase:

2009 Kia Rondo (C90505) LF, RR, RF Calibration UVW+VCW



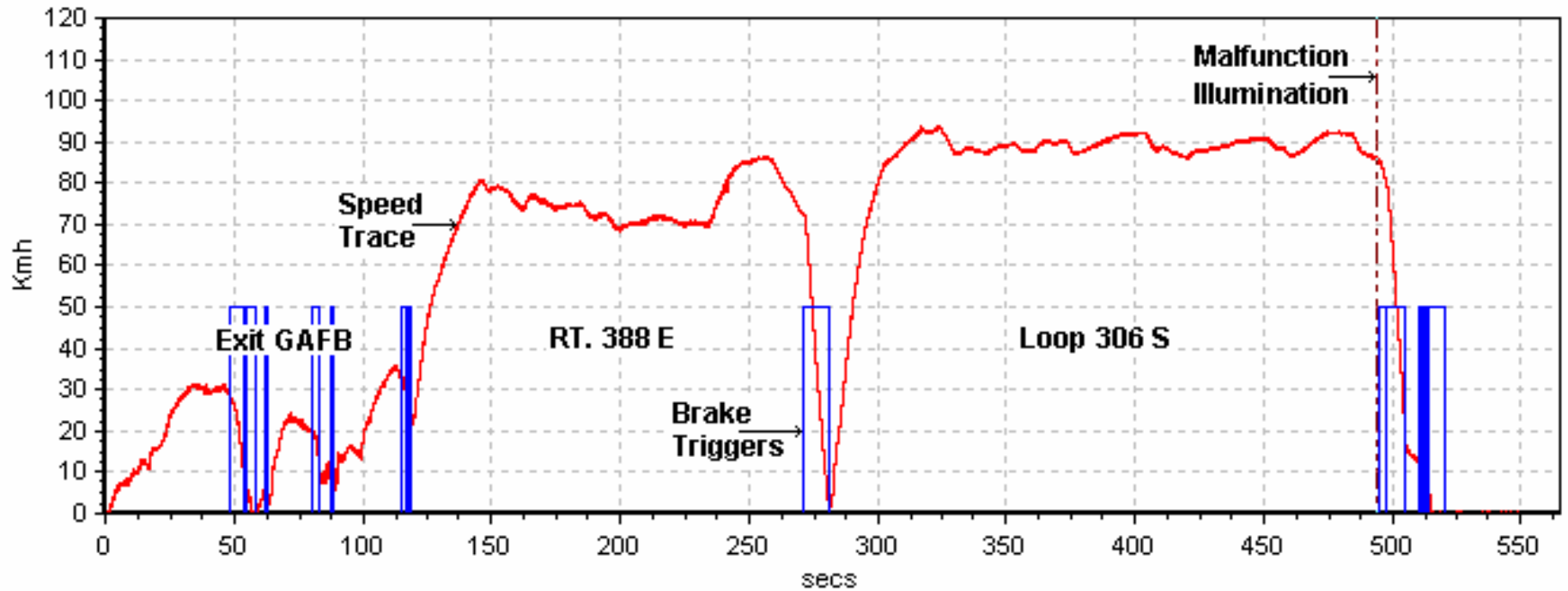
LF, RR, RF Detection Phase: Illumination occurred in 1:37 minutes. Driving above 50 km/h was not necessary.



Scenario G Malfunction Illumination: Spare Tire without TPMS Sensor Applied to Right Front at LLVW  
Test Date: 4/20/09  
Data File Time: 9:25 minutes  
Cumulative Driving Time: 5:50 minutes  
Start Point: San Angelo Test Facility shop

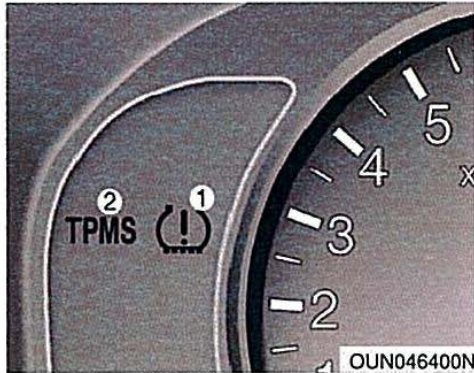
2009 Kia Rondo (C90505) RF Spare Tire Malfunction Illumination LLVW

Log Rate := 100.00 Hz



SECTION 7  
OWNER'S MANUAL PAGES

## TIRES PRESSURE MONITORING SYSTEM (TPMS) (IF EQUIPPED)



- (1) Low tire pressure telltale
- (2) TPMS malfunction indicator

F060000AUN

Each tire, including the spare (if provided), should be checked monthly when cold and inflated to the inflation pressure recommended by the vehicle manufacturer on the vehicle placard or tire inflation pressure label. (If your vehicle has tires of a different size than the size indicated on the vehicle placard or tire inflation pressure label, you should determine the proper inflation pressure for those tires.)

As an added safety feature, your vehicle has been equipped with a tire pressure monitoring system (TPMS) that illuminates a low tire pressure telltale when one or more of your tires is significantly under-inflated. Accordingly, when the low tire pressure telltale illuminates, you should stop and check your tires as soon as possible, and inflate them to the proper pressure. Driving on a significantly under-inflated tire causes the tire to overheat and can lead to tire failure. Under-inflation also reduces fuel efficiency and tire tread life, and may affect the vehicle's handling and stopping ability.

Please note that the TPMS is not a substitute for proper tire maintenance, and it is the driver's responsibility to maintain correct tire pressure, even if under-inflation has not reached the level to trigger illumination of the TPMS low tire pressure telltale.

Your vehicle has also been equipped with a TPMS malfunction indicator to indicate when the system is not operating properly. The TPMS malfunction indicator is provided by a separate telltale, which displays the symbol "TPMS" when illuminated. When the malfunction indicator is illuminated, the system may not be able to detect or signal low tire pressure as intended. TPMS malfunctions may occur for a variety of reasons, including the installation of replacement or alternate tires or wheels on the vehicle that prevent the TPMS from functioning properly. Always check the TPMS malfunction telltale after replacing one or more tires or wheels on your vehicle to ensure that the replacement or alternate tires and wheels allow the TPMS to continue to function properly.

## What to do in an emergency

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### Low tire pressure telltale

When the tire pressure monitoring system warning telltale is illuminated, one or more of your tires is significantly under-inflated.

Immediately reduce your speed, avoid hard cornering and anticipate increased stopping distances. You should stop and check your tires as soon as possible. Inflate the tires to the proper pressure as indicated on the vehicle's placard or tire inflation pressure label located on the driver's side center pillar outer panel. If you cannot reach a service station or if the tire cannot hold the newly added air, replace the low pressure tire with the compact spare tire. Because the compact spare tire is not equipped with a tire pressure sensor, the TPMS malfunction indicator may go on and the Low tire pressure telltale still turn on after restarting and about 20 minutes of continuous driving before you have the low-pressure tire repaired and replaced on the vehicle.

### **⚠ CAUTION**

*In winter or cold weather, the low tire pressure telltale may be illuminated if the tire pressure was adjusted to the recommended tire inflation pressure in warm weather. It does not mean your TPMS is malfunctioning because the decreased temperature leads to a proportional lowering of tire pressure.*

*When you drive your vehicle from a warm area to a cold area or from a cold area to a warm area, or the outside temperature is greatly higher or lower, you should check the tire inflation pressure and adjust the tires to the recommended tire inflation pressure.*

### **⚠ WARNING - Low pressure damage**

**Significantly low tire pressure makes the vehicle unstable and can contribute to loss of vehicle control and increased braking distances.**

**Continued driving on low pressure tires will cause the tires to overheat and fail.**

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**TPMS**

**TPMS (Tire Pressure Monitoring System) malfunction indicator**

The TPMS malfunction indicator comes on and stays on when there is a problem with the Tire Pressure Monitoring System. If the system is able to correctly detect an under-inflation warning at the same time as system failure then it will illuminate both the TPMS malfunction and the low tire pressure telltale e.g. if Front Left sensor fails, the TPMS malfunction indicator comes on, but if Front Right, Rear Left, or Rear Right tire is under-inflated, the low tire pressure indicator may come on with the TPMS malfunction indicator.

Have the system checked by an authorized KIA dealer as soon as possible to determine the cause of the problem.

**⚠ CAUTION**

- *The TPMS malfunction indicator may be illuminated if the vehicle is moving around electric power supply cable or radio transmitter such as police stations, government and public offices, broadcasting stations, military installations, airports, or transmitting tower, etc. which can interfere with normal operation of the Tire Pressure Monitoring System (TPMS).*
- *The TPMS malfunction indicator may be illuminated if snow chains or some electronic devices, such as notebook computers, are used in the vehicle. This can interfere with normal operation of the Tire Pressure Monitoring System (TPMS).*

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**Changing a tire with TPMS**

If you have a flat tire, the Low Tire Pressure telltale will turn on. Have the flat tire repaired by an authorized KIA dealer as soon as possible or replace the flat tire with the compact spare tire.

**⚠ CAUTION**

**NEVER use a puncture-repairing agent to repair and/or inflate a low pressure tire. If used, you will have to replace the tire pressure sensor.**

Each wheel is equipped with a tire pressure sensor mounted inside the tire behind the valve stem. You must use TPMS specific wheels. It is recommended that you always have your tires serviced by an authorized KIA dealer as soon as possible.

## What to do in an emergency

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After you replace the low pressure tire with the compact spare tire, the TPMS malfunction indicator may illuminate and the low tire pressure telltale still illuminate after restarting and about 20 minutes of continuous driving.

Once the low pressure tire is re-inflated to the recommended pressure and installed on the vehicle, the TPMS malfunction indicator and the low tire pressure telltale will be extinguished. If the low pressure and TPMS malfunction indicators are not extinguished after about 20 minutes of continuous driving, please visit an authorized KIA dealer.

You may not be able to identify a low tire by simply looking at it. Always use a good quality tire pressure gauge to measure the tire's inflation pressure. Please note that a tire that is hot (from being driven) will have a higher pressure measurement than a tire that is cold (from sitting stationary for at least 3 hours and driven less than 1 mile (1,6 km) during that 3 hour period). Allow the tire to cool before measuring the inflation pressure.

Always be sure the tire is cold before inflating to the recommended pressure.

A cold tire means the vehicle has been sitting for 3 hours and driven for less than 1 mile (1.6 km) in that 3 hour period.

### CAUTION

- *Do not use any tire sealant if your vehicle is equipped with a Tire Pressure Monitoring System. The liquid sealant can damage the tire pressure sensors.*
- *In order for the system to correctly monitor tires for under-inflation, there should be a total of exactly 4 sensors fitted to each of the four driven wheel positions. There should be no other sensors in the vehicle including spare tire since this could cause the system to monitor the wrong sensors.*

### WARNING - TPMS

- **The TPMS cannot alert you to severe and sudden tire damage caused by external factors such as nails or road debris.**
- **If you feel any vehicle instability, immediately take your foot off the accelerator, apply the brakes gradually and with light force, and slowly move to a safe position off the road.**

**⚠ WARNING - Protecting TPMS**

Tampering with, modifying, or disabling the Tire Pressure Monitoring System (TPMS) components may interfere with the system's ability to warn the driver of low tire pressure conditions and/or TPMS malfunctions. Tampering with, modifying, or disabling the Tire Pressure Monitoring System (TPMS) components may void the warranty for that portion of the vehicle.

**This device complies with Part 15 of the FCC rules.**

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

**⚠ WARNING**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.