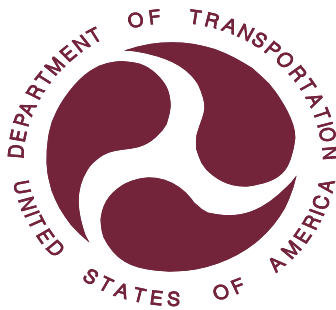


REPORT NUMBER 138-STF-10-005

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

FUJI HEAVY INDUSTRIES, LTD.
2010 SUBARU OUTBACK
FOUR-DOOR MPV
NHTSA NO. CA5502

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



June 18, 2010

FINAL REPORT

PREPARED FOR

**U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
NVS-220
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVENUE, SE
WASHINGTON, D.C. 20590**

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SECTION 1
INTRODUCTION

1.1 PURPOSE OF COMPLIANCE TEST

A 2010 Subaru Outback four-door MPV 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 2010 Subaru Outback four-door MPV. Nomenclatures applicable to the test vehicle are:

A. Vehicle Identification Number: 4S4BRCACXA1324198

B. NHTSA Number: CA5502

C. Manufacturer: Fuji Heavy Industries, Ltd.

D. Manufacture Date: 08/2009

1.3 TEST DATE

The test vehicle was tested during the time period May 3 through May 7, 2010.

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 and vehicle labeling information were 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 rear seat, 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.
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.

Two malfunction scenarios were performed on the Subaru Outback. 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 disconnecting the wiring harness from the TPMS module.

2.2 SUMMARY OF RESULTS

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

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

One malfunction detection scenario was performed on the test vehicle at UVW + VCW:

- H. Wiring harness was disconnected from TPMS module.

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

SECTION 3
TEST DATA

FMVSS No. 138 – TEST DATA SUMMARY

TEST DATES: May 3 – May 7, 2010 LAB: U.S. DOT San Angelo Test Facility

VIN: 4S4BRCACXA1324198 VEHICLE NHTSA NUMBER: CA5502

CERTIFICATION LABEL BUILD DATE: 08/2009

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

REMARKS: None

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

TEST DATE: May 3, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502 VIN: 4S4BRCACXA1324198

CERTIFICATION LABEL BUILD DATE: 08/2009 ENGINE: 2.5 liter, 4 cylinder

MY/MAKE/MODEL/BODY STYLE: 2010 Subaru Outback four-door MPV

TIRE CONDITIONING:

(X) Tires used more than 100 km. Actual odometer reading : 103 km (64 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: Sensor: Schrader Electronics; receiver: Calsonic Kansei Corp.

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

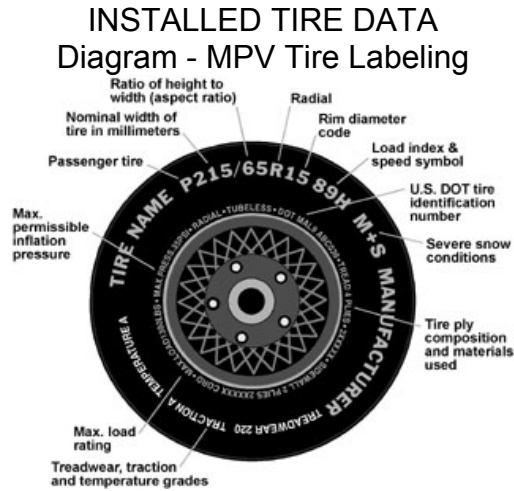
TPMS MALFUNCTION INDICATOR TYPE:

() None () Dedicated Telltale (X) 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	P215/70R16	220 kPa (32 psi)	Vehicle placard
Rear	P215/70R16	210 kPa (30 psi)	Vehicle placard



Front and Rear Axles

Tire Size and Load Index / Speed Rating: P215/70R16 99S

Manufacturer/Tire Name: Continental ContiProContact

Sidewall Max Load Rating: 775 kg (1,709 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**

Worksheet for Determining FMVSS No. 138 Telltale Warning Activation Pressure for Tires Installed on Vehicle		
Part	Front Axle	Rear Axle
(A) Recommended Inflation Pressure x .75	<u>220 kPa</u> x .75 = <u>165</u> kPa	<u>210 kPa</u> x .75 = <u>157.5</u> kPa
(B) Information from FMVSS 138 Table 1 below, Tire types are: Inflation pressure Minimum activation pressures from Table 1	(X) P-metric-Standard load () P-metric-Extra Load Load Range () C, () D, or () E (X) Maximum or () Rated <u>300</u> kPa (44 psi) <u>140</u> kPa (20 psi)	(X) P-metric-Standard load () P-metric-Extra Load Load Range () C, () D, or () E (X) Maximum or () Rated <u>300</u> kPa (44 psi) <u>140</u> kPa (20 psi)
(C) Telltale Warning Activation Pressure is the higher of Part (A) or (B)	<u>165.0</u> kPa (24 psi)	<u>157.5</u> kPa (23 psi)
(D) Pressure at which to deflate tire(s) = (C) – 7 kPa	<u>158.0</u> kPa (23 psi)	<u>150.5</u> kPa (22 psi)

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

Tire Type	Maximum or Rated Inflation Pressure		Minimum Activation Pressure	
	(kPa)	(psi)	(kPa)	(psi)
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: May 3, 2010

APPROVED BY: Kenneth H. Yates

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

TEST DATE: May 3, 2010 LAB: U.S. DOT San Angelo Test Facility

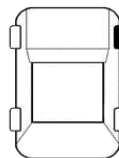
VEHICLE NHTSA NUMBER: CA5502

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: Six o'clock position in tachometer ring

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 () Dedicated stand-alone (X) Combined with low tire pressure telltale

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

TEST DATE: May 3, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

Time: Start: 10:30 am End: 12:13 pm

Ambient Temperature: Start: 20.5°C (68.9°F) End: 21.5°C (70.7°F)

Trip Odometer Reading: Start: 103.0 km (64 mi)

Fuel Level: Start: Full

Weather Conditions: Sunny, light breeze

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:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Pre-test cold measurements after ambient soak: Inflation Pressure	220.0 kPa (31.9 psi)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	20.8°C (69.4°F)	21.4°C (70.5°F)	21.6°C (70.9°F)	20.8°C (69.4°F)

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

VEHICLE WEIGHT:

Vehicle Ratings from Certification Label:

GVWR: 2,080 kg (4,585 lbs)

GAWR (front): 1,070 kg (2,360 lbs)

GAWR (rear): 1,060 kg (2,340 lbs)

Vehicle Capacity Weight:

Vehicle Capacity Weight: 408 kg (900 lbs)

Measured Unloaded Vehicle Weight:

LF	<u>433 kg (954 lbs)</u>	LR	<u>353 kg (778 lbs)</u>
RF	<u>417 kg (920 lbs)</u>	RR	<u>334 kg (737 lbs)</u>
Front		Rear	
Axle	<u>850 kg (1,874 lbs)</u>	Axle	<u>687 kg (1,515 lbs)</u>
Total Vehicle <u>1,537 kg (3,389 lbs)</u>			

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

LF	<u>481 kg (1,061 lbs)</u>	LR	<u>396 kg (874 lbs)</u>
RF	<u>464 kg (1,022 lbs)</u>	RR	<u>378 kg (833 lbs)</u>
Front		Rear	
Axle	<u>945 kg (2,083 lbs) (≤ GAWR)</u>	Axle	<u>774 kg (1,707 lbs) (≤ GAWR)</u>
Total Vehicle <u>1,719 kg (3,790 lbs) (not greater than GVWR)</u>			

Note: For scenarios A through C, this Total Vehicle Weight measures the vehicle loaded to Lightly Loaded Vehicle Weight (LLVW), 182 kg (401 lbs) of driver, passenger, and test equipment.

RECORDED BY: Todd P. Groghan

DATE: May 3, 2010

APPROVED BY: Kenneth H. Yates

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

SCENARIO A – Right Front Tire Deflation at LLVW

TEST DATE: May 3, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

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 LLVW, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>22.5°C (72.5°F)</u> Vehicle cool down period: <u>185</u> minutes				
Inflation Pressure	220.0 kPa (31.9 psi)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	22.6°C (72.7°F)	23.0°C (73.4°F)	23.2°C (73.8°F)	22.2°C (72.0°F)
San Angelo Test Facility Shop Floor Temp	21.2°C (70.2°F)	21.4°C (70.5°F)	21.4°C (70.5°F)	21.2°C (70.2°F)

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 17:56:02 UTC End: 18:21:36 UTC
 Trip Odometer Reading: Start: 74.5 km (46.3 mi) End: 106.9 km (66.4 mi)
 Ambient Temperature: Start: 22.5°C (72.5°F) End: 22.4°C (72.3°F)
 Roadway Temperature: Start: 40.2°C (104.4°F) End: 38.0°C (100.4°F)

Driving in first direction:

Goodfellow Air Force
 Starting point: Base (GAFB) north gate Direction: see chart, page 59
10:14 minutes (stopwatch time) 15.9 km (9.9 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 59
10:30 minutes (stopwatch time) 16.3 km (10.1 mi) distance

Max speed: 99.3 km/h (61.7 mph)

Total Driving Time: 20:45 minutes (VBox time)

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

SCENARIO A – 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	238.4 kPa (34.6 psi)	226.2 kPa (32.8 psi)	225.6 kPa (32.7 psi)	238.3 kPa (34.6 psi)
Tire Sidewall Temp	34.2°C (93.6°F)	33.6°C (92.5°F)	31.2°C (88.2°F)	32.6°C (90.7°F)
San Angelo Test Facility Shop Floor Temp	21.2°C (70.2°F)	21.2°C (70.2°F)	21.4°C (70.5°F)	20.8°C (69.4°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 ()LR ()RR (X)RF Inflation Pressure				158.0 kPa (22.9 psi)

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Illumination at 3:57 minutes (stopwatch time – non-cumulative)

0.8 km (0.5 mi) distance

Driving above 50 km/h was not necessary.

TEST RESULTS

TELLTALE ILLUMINATES WITHIN 20 MINUTES: (X)YES ()NO (fail)
--

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 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>23.1°C (73.6°F)</u> Vehicle cool down period: <u>60</u> minutes				
Inflation Pressure	227.6 kPa (33.0 psi)	214.6 kPa (31.1 psi)	214.6 kPa (31.1 psi)	151.7 kPa (22.0 psi)
Tire Sidewall Temp	27.2°C (81.0°F)	25.4°C (77.7°F)	25.6°C (78.1°F)	27.2°C (81.0°F)
San Angelo Test Facility Shop Floor Temp	21.6°C (70.9°F)	21.6°C (70.9°F)	22.2°C (72.0°F)	21.6°C (70.9°F)

After the cool down period of a minimum of one hour, 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)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 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

1:58 minutes (stopwatch time – non-cumulative) 0.6 km (0.4 mi) distance

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL)

PASS

Right front tire was deflated at LLVW.

REMARKS: None

RECORDED BY: Todd P. Groghan

DATE: May 3, 2010

APPROVED BY: Kenneth H. Yates

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

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

TEST DATE: May 4, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

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 LLVW, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>11.5°C (52.7°F)</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	220.0 kPa (31.9 psi)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	13.4°C (56.1°F)	13.2°C (55.8°F)	13.6°C (56.5°F)	14.0°C (57.2°F)
San Angelo Test Facility Shop Floor Temp	17.2°C (63.0°F)	17.0°C (62.6°F)	17.2°C (63.0°F)	17.4°C (63.3°F)

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 13:03:16 UTC End: 13:28:18 UTC
 Trip Odometer Reading: Start: 110.6 km (68.7 mi) End: 142.9 km (88.8 mi)
 Ambient Temperature: Start: 11.5°C (52.7°F) End: 13.4°C (56.1°F)
 Roadway Temperature: Start: 14.2°C (57.6°F) End: 14.4°C (57.9°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 60
10:13 minutes (stopwatch time) 15.9 km (9.9 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 60
10:30 minutes (stopwatch time) 16.4 km (10.2 mi) distance

Max speed: 101.9 km/h (63.3 mph)

Total Driving Time: 20:45 minutes (VBox time)

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

SCENARIO B – Left Rear, Right 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	238.4 kPa (34.6 psi)	226.7 kPa (32.9 psi)	226.5 kPa (32.9 psi)	237.3 kPa (34.4 psi)
Tire Sidewall Temp	26.2°C (79.2°F)	25.2°C (77.4°F)	22.4°C (72.3°F)	22.8°C (73.0°F)
San Angelo Test Facility Shop Floor Temp	15.6°C (60.1°F)	15.4°C (59.7°F)	16.0°C (60.8°F)	16.2°C (61.2°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 (X)RR (X)RF Inflation Pressure		150.5 kPa (21.8 psi)	150.5 kPa (21.8 psi)	158.0 kPa (22.9 psi)

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Illumination at 1:35 minutes (stopwatch time – non-cumulative)

0.3 km (0.2 mi) distance

Driving above 50 km/h was not necessary.

TEST RESULTS

TELLTALE ILLUMINATES WITHIN 20 MINUTES:	(X)YES ()NO (fail)
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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, Right 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>20.2°C (68.4°F)</u> Vehicle cool down period: <u>60</u> minutes				
Inflation Pressure	230.6 kPa (33.4 psi)	145.5 kPa (21.1 psi)	146.3 kPa (21.2 psi)	154.5 kPa (22.4 psi)
Tire Sidewall Temp	21.8°C (71.2°F)	20.6°C (69.1°F)	20.4°C (68.7°F)	22.2°C (72.0°F)
San Angelo Test Facility Shop Floor Temp	19.0°C (66.2°F)	18.4°C (65.1°F)	18.6°C (65.5°F)	18.6°C (65.5°F)

After the cool down period of a minimum of one hour, 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)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 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

3:07 minutes (stopwatch time – non-cumulative) 0.6 km (0.4 mi) distance

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL)

PASS

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

REMARKS: None

RECORDED BY: Todd P. Groghan

DATE: May 4, 2010

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 9 of 22)
TPMS OPERATIONAL PERFORMANCE
SCENARIO C – Left Front, Left Rear, Right Rear,
and Right Front Tire Deflation at LLVW

TEST DATE: May 5, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

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 LLVW, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>18.7°C (65.7°F)</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	220.0 kPa (31.9 psi)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	20.2°C (68.4°F)	19.8°C (67.6°F)	20.4°C (68.7°F)	20.6°C (69.1°F)
San Angelo Test Facility Shop Floor Temp	21.4°C (70.5°F)	21.4°C (70.5°F)	21.6°C (70.9°F)	21.4°C (70.5°F)

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 12:43:37 UTC End: 13:09:29 UTC
Trip Odometer Reading: Start: 201.2 km (125.0 mi) End: 233.5 km (145.1 mi)
Ambient Temperature: Start: 18.7°C (65.7°F) End: 18.7°C (65.7°F)
Roadway Temperature: Start: 16.8°C (62.2°F) End: 18.6°C (65.5°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 61
10:12 minutes (stopwatch time) 15.9 km (9.9 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 61
10:22 minutes (stopwatch time) 16.4 km (10.2 mi) distance

Max speed: 98.6 km/h (61.3 mph)

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

DATA SHEET 3 (Sheet 10 of 22)
TPMS OPERATIONAL PERFORMANCE
SCENARIO C – Left Front, Left Rear, Right 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	233.6 kPa (33.9 psi)	223.0 kPa (32.3 psi)	222.3 kPa (32.2 psi)	234.1 kPa (34.0 psi)
Tire Sidewall Temp	29.8°C (85.6°F)	29.4°C (84.9°F)	26.6°C (79.9°F)	28.4°C (83.1°F)
San Angelo Test Facility Shop Floor Temp	21.2°C (70.2°F)	21.2°C (70.2°F)	21.2°C (70.2°F)	21.2°C (70.2°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 (X)LR (X)RR (X)RF Inflation Pressure	158.0 kPa (22.9 psi)	150.5 kPa (21.8 psi)	150.5 kPa (21.8 psi)	158.0 kPa (22.9 psi)

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Illumination at 1:58 minutes (stopwatch time – non-cumulative)

0.5 km (0.3 mi) distance

Driving above 50 km/h was not necessary.

TEST RESULTS

TELLTALE ILLUMINATES WITHIN 20 MINUTES: (X)YES ()NO (fail)

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,
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>21.7°C (71.1°F)</u> Vehicle cool down period: <u>62</u> minutes				
Inflation Pressure	154.2 kPa (22.4 psi)	146.0 kPa (21.2 psi)	146.5 kPa (21.2 psi)	154.2 kPa (22.4 psi)
Tire Sidewall Temp	25.0°C (77.0°F)	23.2°C (73.8°F)	23.4°C (74.1°F)	25.8°C (78.4°F)
San Angelo Test Facility Shop Floor Temp	22.2°C (72.0°F)	22.0°C (71.6°F)	22.0°C (71.6°F)	22.6°C (72.7°F)

After the cool down period of a minimum of one hour, 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)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 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

2:06 minutes (stopwatch time – non-cumulative) 0.5 km (0.3 mi) distance

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: Todd P. Groghan

DATE: May 5, 2010

APPROVED BY: Kenneth H. Yates

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

TEST DATE: May 5, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

Time: Start: 10:45 am End: 11:48 am

Ambient Temperature: Start: 26.5°C (79.7°F) End: 27.4°C (81.3°F)

Trip Odometer Reading: Start: 237 km (147.5 mi)

Fuel Level: Start: Full

Weather Conditions: Sunny, 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:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Pre-test cold measurements after ambient soak: Inflation Pressure	220.0 kPa (31.9 psi)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	27.0°C (80.6°F)	25.8°C (78.4°F)	26.0°C (78.8°F)	27.2°C (81.0°F)

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

VEHICLE WEIGHT:

Vehicle Ratings from Certification Label:

GVWR: 2,080 kg (4,585 lbs)

GAWR (front): 1,070 kg (2,360 lbs)

GAWR (rear): 1,060 kg (2,340 lbs)

Vehicle Capacity Weight:

Vehicle Capacity Weight: 408 kg (900 lbs)

Measured Unloaded Vehicle Weight:

LF	<u>432 kg (953 lbs)</u>	LR	<u>353 kg (777 lbs)</u>
RF	<u>416 kg (918 lbs)</u>	RR	<u>336 kg (740 lbs)</u>
Front		Rear	
Axle	<u>848 kg (1,871 lbs)</u>	Axle	<u>689 kg (1,517 lbs)</u>
Total Vehicle <u>1,537 kg (3,388 lbs)</u>			

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

LF	<u>492 kg (1,084 lbs)</u>	LR	<u>499 kg (1,100 lbs)</u>
RF	<u>473 kg (1,044 lbs)</u>	RR	<u>481 kg (1,060 lbs)</u>
Front		Rear	
Axle	<u>965 kg (2,128 lbs) (≤ GAWR)</u>	Axle	<u>980 kg (2,160 lbs) (≤ GAWR)</u>
Total Vehicle <u>1,945 kg (4,288 lbs) (not greater than GVWR)</u>			

Note: For scenarios D through F, this Total Vehicle Weight measures the vehicle loaded to Unloaded Vehicle Weight (UVW) and Vehicle Capacity Weight (VCW), 408 kg (900 lbs) of driver, passenger, test equipment, and ballast.

RECORDED BY: Todd P. Groghan

DATE: May 5, 2010

APPROVED BY: Kenneth H. Yates

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

TEST DATE: May 5, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

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>28.4°C (83.1°F)</u> Vehicle cool down period: <u>97</u> minutes				
Inflation Pressure	220.0 kPa (31.9 psi)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	27.8°C (82.0°F)	26.8°C (80.2°F)	26.8°C (80.2°F)	27.6°C (81.7°F)
San Angelo Test Facility Shop Floor Temp	23.0°C (73.4°F)	23.6°C (74.5°F)	24.0°C (75.2°F)	23.4°C (74.1°F)

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 16:33:26 UTC End: 16:57:40 UTC
Trip Odometer Reading: Start: 237.4 km (147.5 mi) End: 269.7 km (167.6 mi)
Ambient Temperature: Start: 28.4°C (83.1°F) End: 29.4°C (84.9°F)
Roadway Temperature: Start: 41.8°C (107.2°F) End: 44.0°C (111.2°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 62
10:12 minutes (stopwatch time) 15.9 km (9.9 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 62
10:13 minutes (stopwatch time) 16.4 km (10.2 mi) distance

Max speed: 98.9 km/h (61.5 mph)

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

DATA SHEET 3 (Sheet 15 of 22)
TPMS OPERATIONAL PERFORMANCE
SCENARIO D – Left Rear 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	241.0 kPa (35.0 psi)	233.6 kPa (33.9 psi)	233.3 kPa (33.8 psi)	240.8 kPa (34.9 psi)
Tire Sidewall Temp	43.0°C (109.4°F)	43.4°C (110.1°F)	41.6°C (106.9°F)	40.6°C (105.1°F)
San Angelo Test Facility Shop Floor Temp	24.2°C (75.6°F)	23.4°C (74.1°F)	24.4°C (75.9°F)	23.6°C (74.5°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 ()RF Inflation Pressure		150.5 kPa (21.8 psi)		

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Illumination at 2:30 minutes (stopwatch time – non-cumulative)

0.6 km (0.4 mi) distance

Driving above 50 km/h was not necessary.

TEST RESULTS

TELLTALE ILLUMINATES WITHIN 20 MINUTES: (X)YES ()NO (fail)

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 Rear 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>32.3°C (90.1°F)</u> Vehicle cool down period: <u>60</u> minutes				
Inflation Pressure	229.6 kPa (33.3 psi)	147.2 kPa (21.3 psi)	219.4 kPa (31.8 psi)	229.2 kPa (33.2 psi)
Tire Sidewall Temp	35.2°C (95.4°F)	34.2°C (93.6°F)	33.4°C (92.1°F)	35.6°C (96.1°F)
San Angelo Test Facility Shop Floor Temp	25.2°C (77.4°F)	25.2°C (77.4°F)	25.2°C (77.4°F)	24.6°C (76.3°F)

After the cool down period of a minimum of one hour, 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)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 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

1:23 minutes (stopwatch time – non-cumulative)

0.3 km (0.2 mi) distance

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL)

PASS

Left rear tire was deflated at UVW + VCW.

REMARKS: None

RECORDED BY: Todd P. Groghan

DATE: May 5, 2010

APPROVED BY: Kenneth H. Yates

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

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

TEST DATE: May 6, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

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>20.9°C (69.6°F)</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	220.0 kPa (31.9 psi)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	21.0°C (69.8°F)	21.0°C (69.8°F)	21.2°C (70.2°F)	21.0°C (69.8°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 CALIBRATION/LEARNING PHASE:

Time: Start: 12:56:05 UTC End: 13:22:17 UTC
 Trip Odometer Reading: Start: 273.1 km (169.7 mi) End: 305.3 km (189.7 mi)
 Ambient Temperature: Start: 20.9°C (69.6°F) End: 20.9°C (69.6°F)
 Roadway Temperature: Start: 20.6°C (69.1°F) End: 22.4°C (72.3°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 63
10:13 minutes (stopwatch time) 15.9 km (9.9 mi) distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 63
10:21 minutes (stopwatch time) 16.3 km (10.1 mi) distance

Max speed: 99.1 km/h (61.6 mph)

Total Driving Time: 20:36 minutes (VBox time)

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

SCENARIO E – Left 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>23.8°C (74.8°F)</u> Vehicle cool down period: <u>63</u> minutes				
Inflation Pressure	226.6 kPa (32.9 psi)	143.5 kPa (20.8 psi)	214.5 kPa (31.1 psi)	153.0 kPa (22.2 psi)
Tire Sidewall Temp	27.4°C (81.3°F)	25.4°C (77.7°F)	25.6°C (78.1°F)	27.8°C (82.0°F)
San Angelo Test Facility Shop Floor Temp	23.4°C (74.1°F)	23.4°C (74.1°F)	23.4°C (74.1°F)	23.4°C (74.1°F)

After the cool down period of a minimum of one hour, 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)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 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

2:12 minutes (stopwatch time – non-cumulative) 0.8 km (0.5 mi) distance

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL)

PASS

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

REMARKS: None

RECORDED BY: Todd P. Groghan

DATE: May 6, 2010

APPROVED BY: Kenneth H. Yates

**DATA SHEET 3 (Sheet 20 of 22)
TPMS OPERATIONAL PERFORMANCE**

SCENARIO F – Left Front, Left Rear, and Right Front Tire Deflation at UVW + VCW

TEST DATE: May 6, 2010 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

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>27.8°C (82.0°F)</u> Vehicle cool down period: <u>60</u> minutes				
Inflation Pressure	220.0 kPa (31.9 psi)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	28.4°C (83.1°F)	27.2°C (81.0°F)	27.2°C (81.0°F)	28.6°C (83.5°F)
San Angelo Test Facility Shop Floor Temp	24.0°C (75.2°F)	23.6°C (74.5°F)	24.0°C (75.2°F)	23.8°C (74.8°F)

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 15:58:46 UTC End: 16:24:07 UTC
 Trip Odometer Reading: Start: 308.8 km (191.9 mi) End: 341.0 km (211.9 mi)
 Ambient Temperature: Start: 27.8°C (82.0°F) End: 28.8°C (83.8°F)
 Roadway Temperature: Start: 36.4°C (97.5°F) End: 38.0°C (100.4°F)

Driving in first direction:

Starting point: GAFB north gate Direction: see chart, page 64
10:09 minutes (stopwatch time) 15.9 km (9.9 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: 100.1 km/h (62.2 mph)

Total Driving Time: 20:36 minutes (VBox time)

**DATA SHEET 3 (Sheet 21 of 22)
TPMS OPERATIONAL PERFORMANCE**

SCENARIO F – Left Front, Left 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	236.8 kPa (34.3 psi)	229.1 kPa (33.2 psi)	229.7 kPa (33.3 psi)	236.4 kPa (34.3 psi)
Tire Sidewall Temp	41.2°C (106.2°F)	40.8°C (105.4°F)	39.8°C (103.6°F)	39.4°C (102.9°F)
San Angelo Test Facility Shop Floor Temp	26.0°C (78.8°F)	25.2°C (77.4°F)	24.8°C (76.6°F)	24.8°C (76.6°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 (X)LR ()RR (X)RF Inflation Pressure	158.0 kPa (22.9 psi)	150.5 kPa (21.8 psi)		158.0 kPa (22.9 psi)

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Illumination at 1:27 minutes (stopwatch time – non-cumulative)

0.3 km (0.2 mi) distance

Driving above 50 km/h was not necessary.

TEST RESULTS

TELLTALE ILLUMINATES WITHIN 20 MINUTES: (X)YES ()NO (fail)

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, Left 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>30.7°C (87.3°F)</u> Vehicle cool down period: <u>64</u> minutes				
Inflation Pressure	151.8 kPa (22.0 psi)	143.2 kPa (20.8 psi)	215.6 kPa (31.3 psi)	152.5 kPa (22.1 psi)
Tire Sidewall Temp	32.4°C (90.3°F)	31.8°C (89.2°F)	31.6°C (88.9°F)	33.4°C (92.1°F)
San Angelo Test Facility Shop Floor Temp	25.2°C (77.4°F)	25.4°C (77.7°F)	25.6°C (78.1°F)	25.4°C (77.7°F)

After the cool down period of a minimum of one hour, 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)	210.0 kPa (30.5 psi)	210.0 kPa (30.5 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

2:03 minutes (stopwatch time – non-cumulative) 0.6 km (0.4 mi) distance

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL)

PASS

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

REMARKS: None

RECORDED BY: Todd P. Groghan

DATE: May 6, 2010

APPROVED BY: Kenneth H. Yates

DATA SHEET 4 (Sheet 1 of 4)
Scenario G – Malfunction Detection Test at LLVW –
Spare Installed on Right Front

TEST DATE: May 4, 2010

LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

Time:	Start: <u>18:20:22 UTC</u>	End: <u>18:31:54 UTC</u>
Trip Odometer Reading:	Start: <u>177.2 km (110.1 mi)</u>	End: <u>189.9 km (118.0 mi)</u>
Ambient Temperature:	Start: <u>29.1°C (84.4°F)</u>	End: <u>29.5°C (85.1°F)</u>
Roadway Temperature:	Start: <u>46.8°C (116.2°F)</u>	End: <u>42.4°C (108.3°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: Spare tire without TPMS sensor was
applied to right front at LLVW. (See Figure 5.16)

MALFUNCTION TELLTALE ILLUMINATION

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

Combination Malfunction Telltale

Driving in first direction:

Starting point: San Angelo Test Facility shop Direction: see chart, page 65

12.7 km (7.9 mi) distance

Max speed: 99.4 km/h (61.8 mph)

Total Driving Time: 7:55 minutes (VBox time)

COMBINATION MALFUNCTION TELLTALE ILLUMINATES (FLASHING AND ILLUMINATION SEQUENCE) WITHIN 20 MINUTES:

() YES () NO

DATA SHEET 4 (Sheet 2 of 4)
Scenario G – Malfunction Detection Test at LLVW –
Spare Installed on Right Front

After 5 minutes with the ignition locking system in the “Off” or “Lock” position, does the combination low tire pressure/malfunction telltale flash for a period of at least 60 seconds but no longer than 90 seconds, and then remain illuminated when the ignition locking system is activated to the “On” or “Run” position? YES NO (fail)

Time it takes before telltale starts flashing 3 seconds

Time telltale remains flashing 75 seconds

Time telltale remains illuminated >60 seconds
(Verified for a minimum of 60 seconds)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale’s illumination sequence repeat when the ignition locking system is activated and the engine running? YES NO (fail)

Extinguishment Phase:

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

Starting point: San Angelo Test Facility shop

 2:15 minutes (stopwatch time – non-cumulative) 0.3 km (0.2 mi) distance

COMBINATION MALFUNCTION TELLTALE EXTINGUISHED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> 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: Todd P. Groghan

DATE: May 4, 2010

APPROVED BY: Kenneth H. Yates

DATA SHEET 4 (Sheet 3 of 4)
Scenario H – Malfunction Detection Test –
TPMS Module Disconnected

TEST DATE: May 5, 2010

LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: CA5502

Time:	Start: <u>2:45 pm</u>	End: <u>3:03 pm</u>
Odometer Reading:	Start: <u>300.9 km (187 mi)</u>	End: <u>300.9 km (187 mi)</u>
Ambient Temperature:	Start: <u>34.4°C (93.9°F)</u>	End: <u>34.4°C (93.9°F)</u>
Roadway Temperature:	Start: <u>NA</u>	End: <u>NA</u>
Fuel Level:	Start: <u>Full</u>	

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: Wiring harness was disconnected from the TPMS module. (No picture for this scenario - TPMS module was inaccessible for photos.)

MALFUNCTION TELLTALE ILLUMINATION

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

Combination Malfunction Telltale

Illumination upon start-up - driving was not necessary.

COMBINATION MALFUNCTION TELLTALE ILLUMINATES (FLASHING AND ILLUMINATION SEQUENCE) WITHIN 20 MINUTES:

() YES () NO

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

TEST
DATE: May 3, 2010

LAB: San Angelo Test Facility

VEHICLE
NHTSA NO: CA5502

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: May 3, 2010

APPROVED BY: Kenneth H. Yates

SECTION 4
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

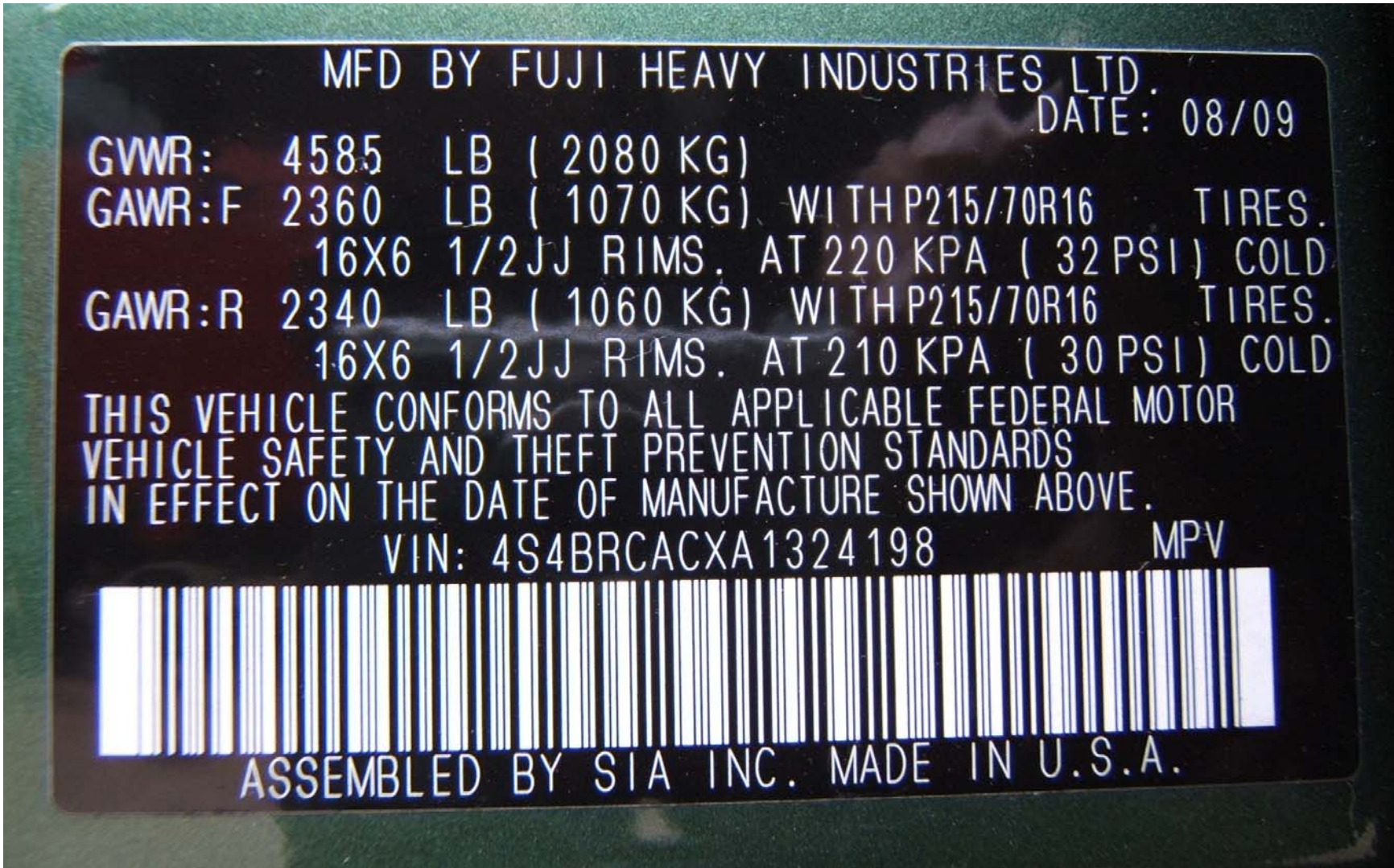
EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO	CAL. DATE	NEXT CAL. DATE
STOPWATCH	CHAMPION SPORTS TIMER	910 R	N/A	N/A
VBOX RECORDING DEVICE	RACELOGIC VBOX III	SERIAL # 030209	2/3/2010	2/3/2011
AMBIENT TEMPERATURE GAUGE	FLUKE 179 DIGITAL THERMOMETER	SERIAL # 84740316	2/24/2010	2/24/2011
LASER TEMPERATURE GAUGE (TIRES AND GROUND)	RAYTEK ST20	SERIAL 2065640101-0014	8/19/2009	8/19/2010
AIR PRESSURE GAUGE	ASHCROFT GENERAL PURPOSE DIGITAL GAUGE	MODEL # D1005PS 02L 100 PSI SERIAL # 20017398-01	12/9/2009	12/9/2010
FLOOR SCALES (VEHICLE)	INTERCOMP SW DELUXE SCALES	PART # 100156 SERIAL # 24032382	7/28/2009	7/28/2010
PLATFORM SCALE (BALLAST)	HOWE RICHARDSON	MODEL # 6401 SERIAL # 0181- 5509-26	7/28/2009	7/28/2010

SECTION 5
PHOTOGRAPHS



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO.138

FIGURE 5.1
¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO.138

FIGURE 5.2
VEHICLE CERTIFICATION LABEL



2010 SUBARU OUTBACK
 NHTSA NO. CA5502
 FMVSS NO. 138

FIGURE 5.3
 VEHICLE PLACARD



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FMVSS NO. 138

FIGURE 5.4
TIRE SHOWING BRAND



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FIGURE 5.5
TIRE SHOWING MODEL



2010 SUBARU OUTBACK
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FMVSS NO. 138

FIGURE 5.6
TIRE SHOWING SIZE AND LOAD INDEX / SPEED RATING



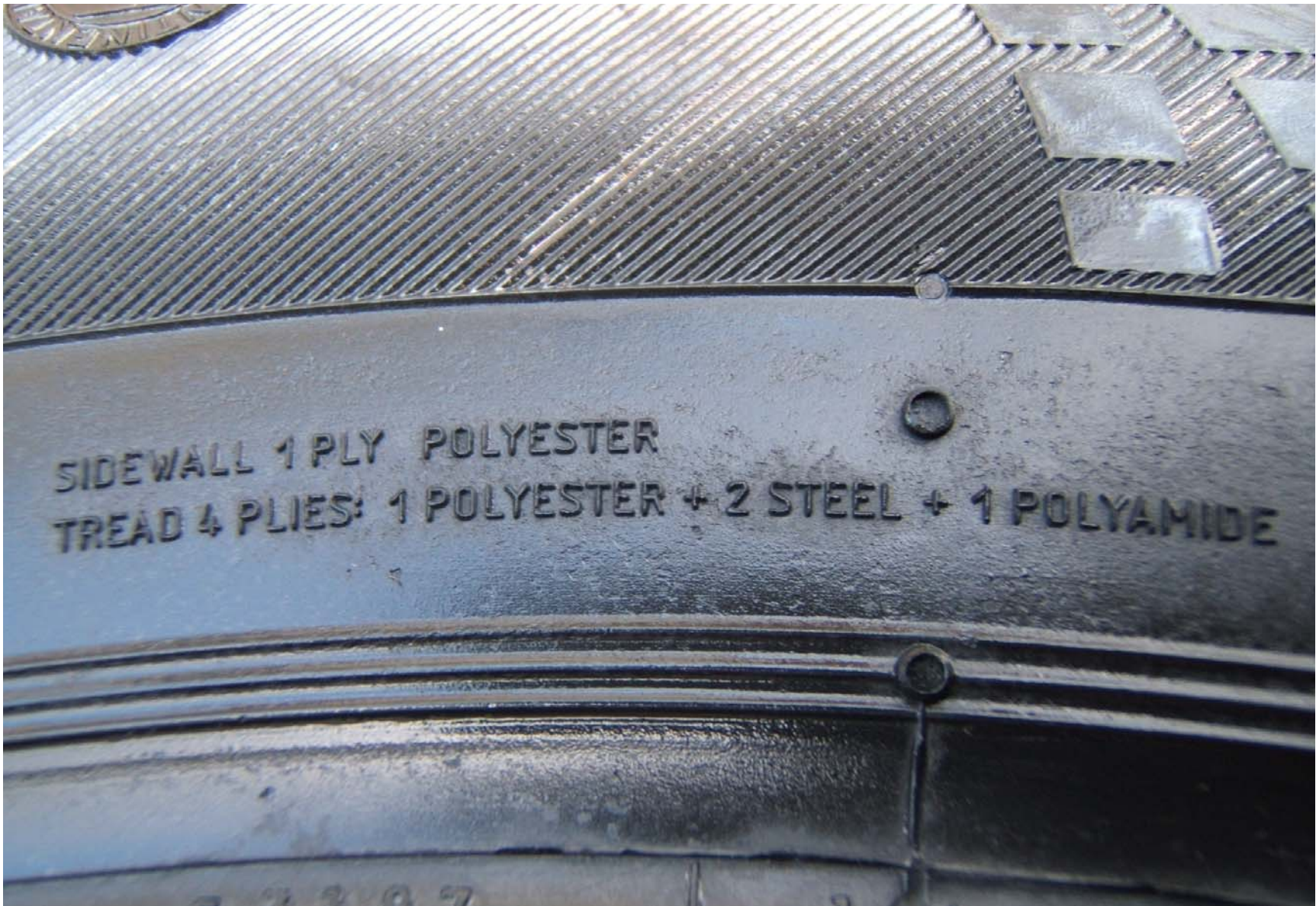
2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

FIGURE 5.7
TIRE SHOWING DOT SERIAL NUMBER



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

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



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

FIGURE 5.9
TIRE SHOWING SIDEWALL / TREAD CONSTRUCTION



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

FIGURE 5.10
RIM SHOWING TPMS SENSOR AND RIM
CONTOUR FOR FULL WIDTH OF CROSS SECTION



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

FIGURE 5.11
DISPLAY SHOWING COMBINATION LOW TIRE
PRESSURE / TPMS MALFUNCTION WARNING TELLTALE



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO 138

FIGURE 5.12
TEST INSTRUMENTATION INSTALLED IN VEHICLE



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

FIGURE 5.13
VEHICLE REAR SEAT BALLAST FOR UVW + VCW LOAD



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

FIGURE 5.14
VEHICLE CARGO AREA BALLAST FOR UVW + VCW LOAD



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

FIGURE 5.15
VEHICLE ON WEIGHT SCALES



2010 SUBARU OUTBACK
NHTSA NO. CA5502
FMVSS NO. 138

FIGURE 5.16
SPARE INSTALLED ON RIGHT FRONT

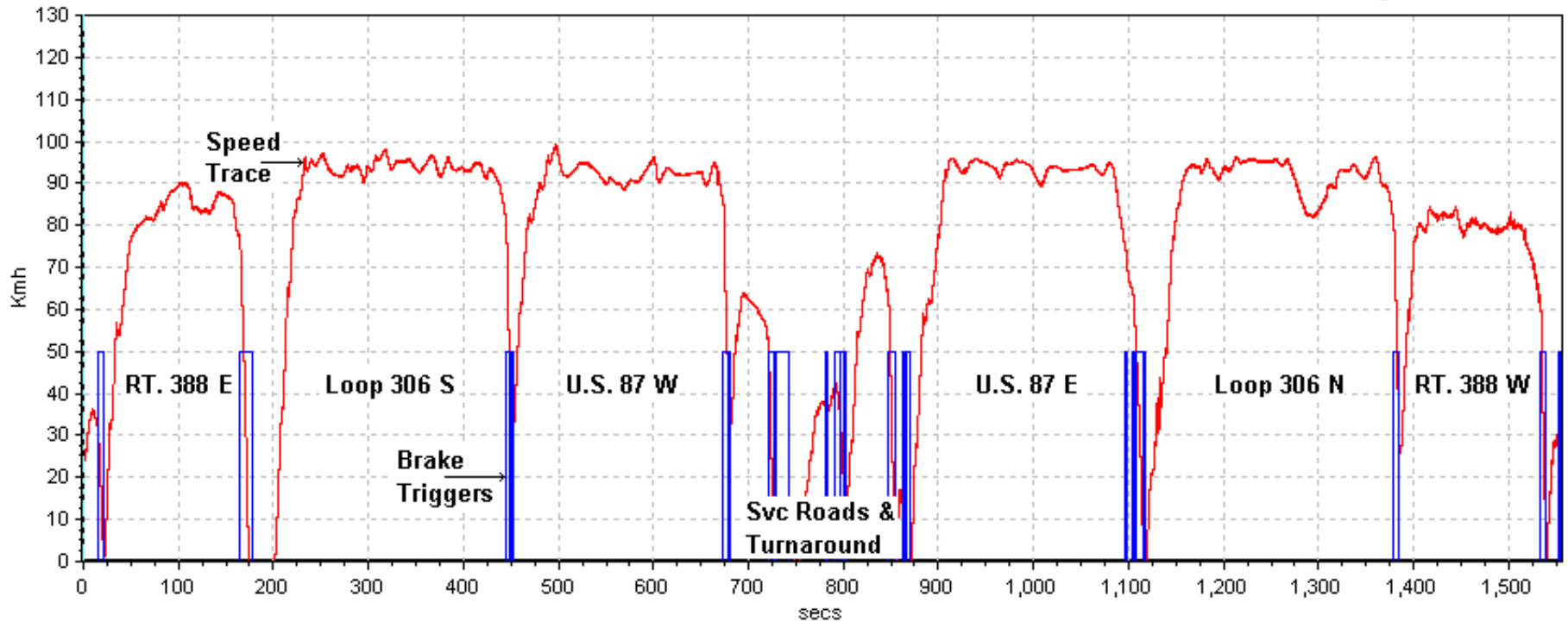
SECTION 6
TEST PLOTS

Scenario A: Right Front Tire at LLVW
Test Date: 5/3/10
Data File Time: 25:56 minutes
Cumulative Driving Time: 20:45minutes
Start Point: GAFB north gate

Calibration Phase:

2010 Subaru Outback (CA5502) RF Calibration LLVW

Log Rate := 100.00 Hz

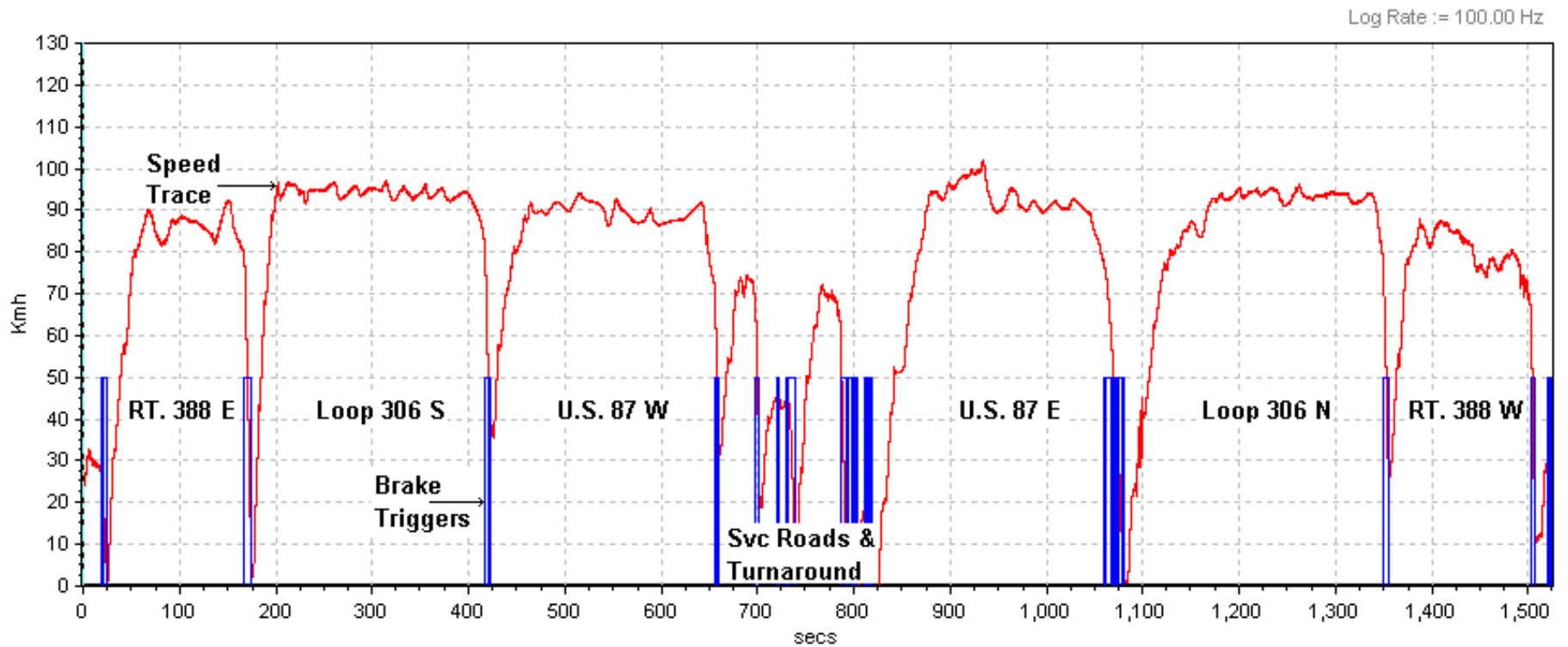


RF Detection Phase: Telltale illuminated 3:57 minutes after lamp check. Driving above 50 km/h was not necessary.

Scenario B: Left Rear, Right Rear, Right Front Tires at LLVW
 Test Date: 5/4/10
 Data File Time: 25:26 minutes
 Cumulative Driving Time: 20:45 minutes
 Start Point: GAFB north gate

Calibration Phase:

2010 Subaru Outback (CA5502) LR, RR, RF Calibration LLVW



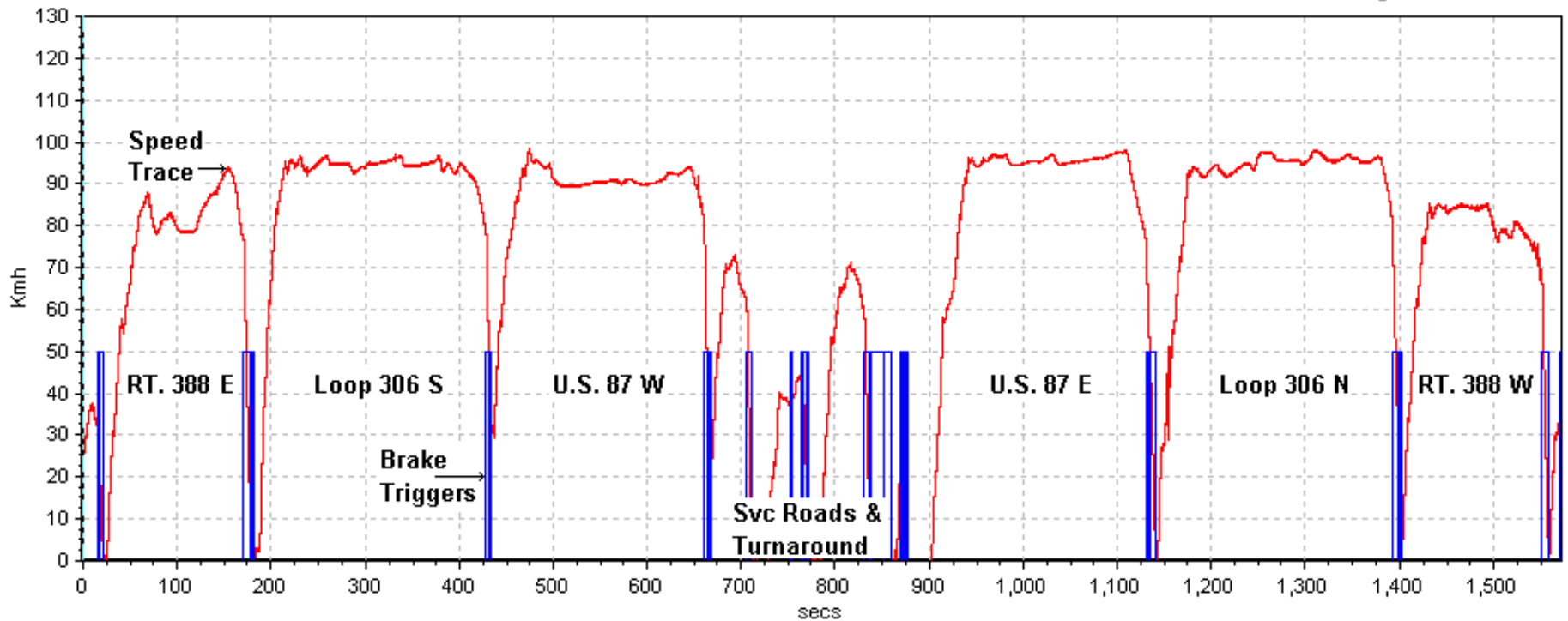
LR, RR, RF Detection Phase: Telltale illuminated 1:35 minutes after lamp check. Driving above 50 km/h was not necessary.

Scenario C: Left Front, Left Rear, Right Rear, Right Front Tires at LLVW
 Test Date: 5/5/10
 Data File Time: 26:13 minutes
 Cumulative Driving Time: 20:37 minutes
 Start Point: GAFB north gate

Calibration Phase:

2010 Subaru Outback (CA5502) LF, LR, RR, RF Calibration LLVW

Log Rate := 100.00 Hz



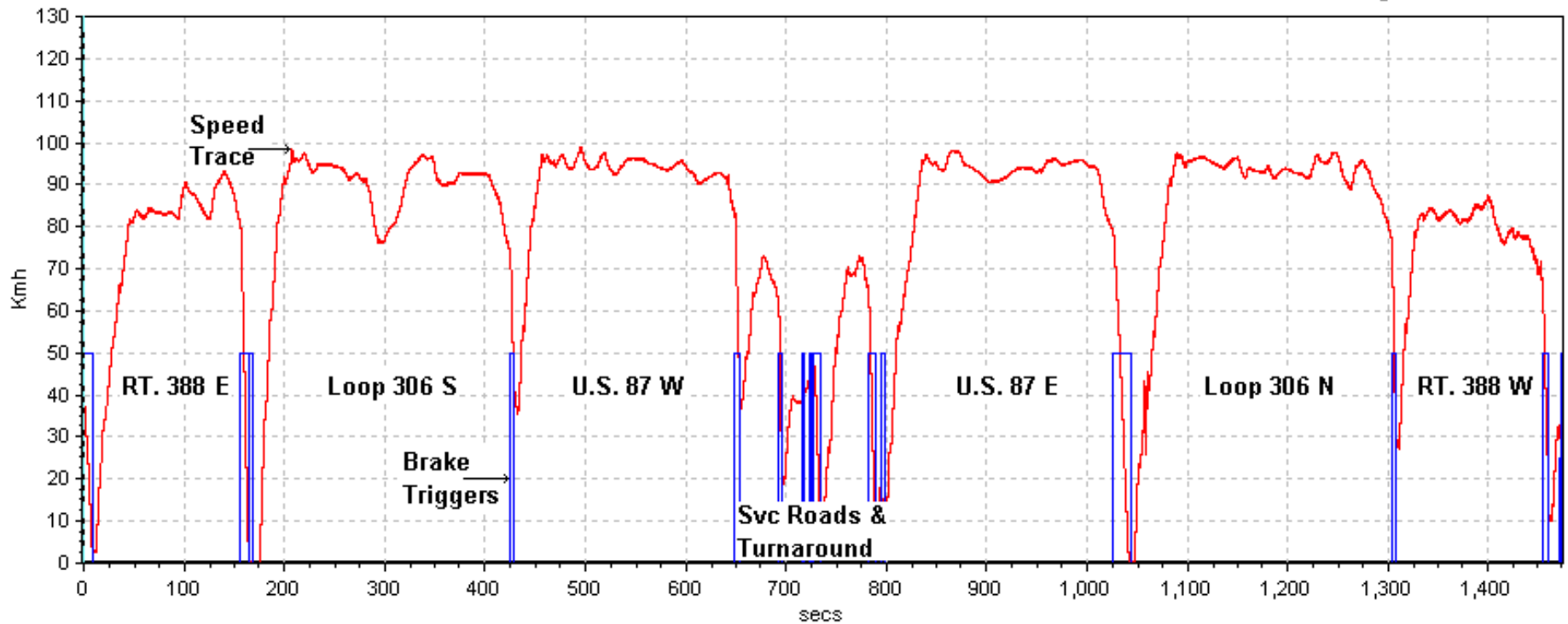
LF, LR, RR, RF Detection Phase: Telltale illuminated 1:58 minutes after lamp check. Driving above 50 km/h was not necessary.

Scenario D: Left Rear Tire at UVW + VCW
Test Date: 5/5/10
Data File Time: 24:35 minutes
Cumulative Driving Time: 20:38 minutes
Start Point: GAFB north gate

Calibration Phase:

2010 Subaru Outback (CA5502) LR Callibration UWW+VCW

Log Rate := 100.00 Hz



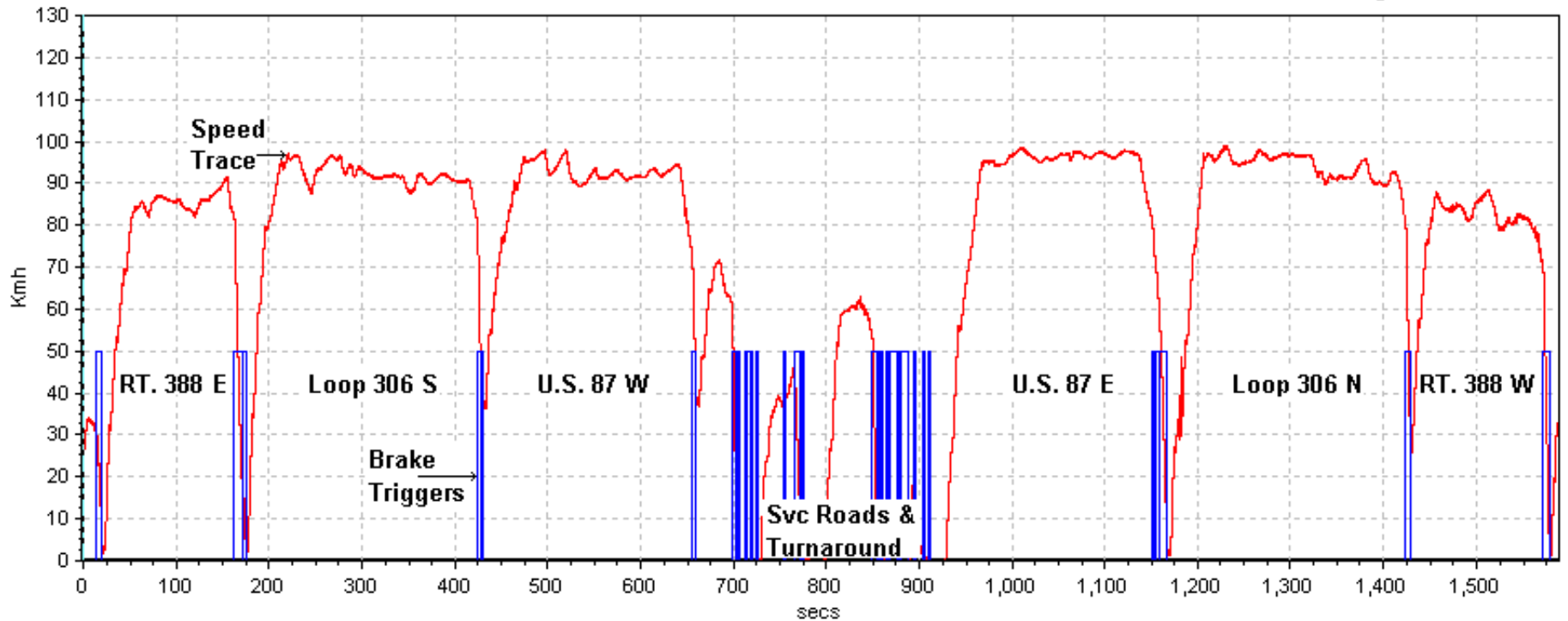
LR Detection Phase: Telltale illuminated 2:30 minutes after lamp check. Driving above 50 km/h was not necessary.

Scenario E: Left Rear, Right Front Tires at UVW + VCW
Test Date: 5/6/10
Data File Time: 26:29 minutes
Cumulative Driving Time: 20:36 minutes
Start Point: GAFB north gate

Calibration Phase:

2010 Subaru Outback (CA5502) LR, RF Calibration UVW+VCW

Log Rate := 100.00 Hz



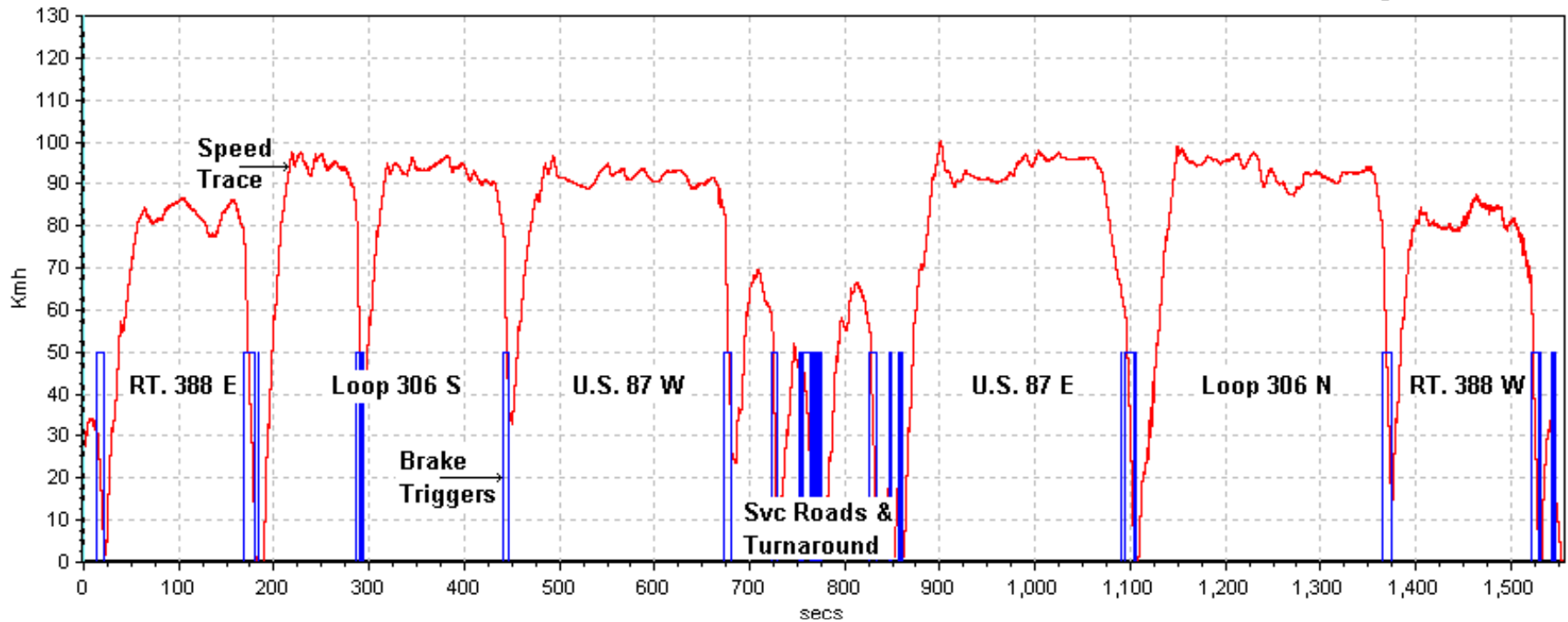
LR, RF Detection Phase: Telltale illuminated 1:46 minutes after lamp check. Driving above 50 km/h was not necessary.

Scenario F: Left Front, Left Rear, Right Front Tires at UVW + VCW
 Test Date: 5/6/10
 Data File Time: 25:56 minutes
 Cumulative Driving Time: 20:36 minutes
 Start Point: GAFB north gate

Calibration Phase:

2010 Subaru Outback (CA5502) LF, LR, RF Calibration UVW+VCW

Log Rate := 100.00 Hz

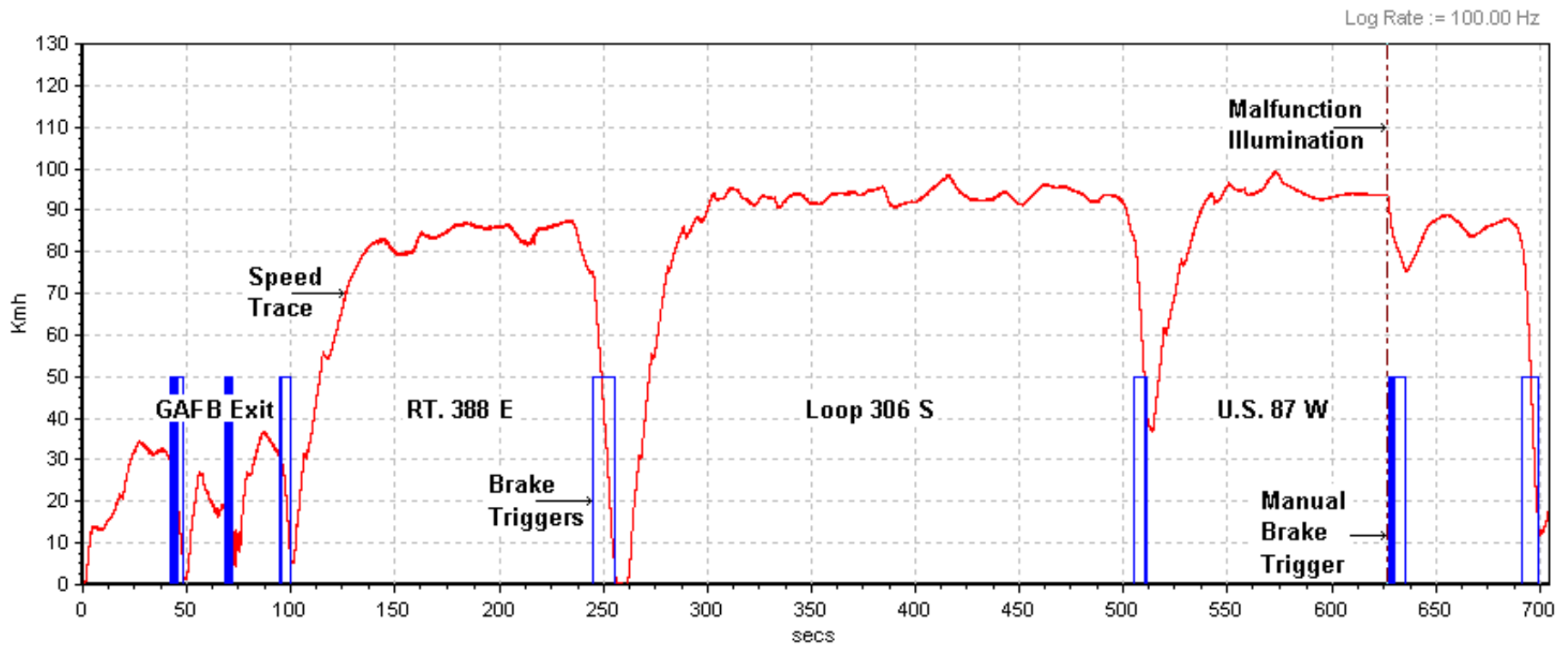


LF, LR, RF Detection Phase: Telltale illuminated 1:27 minutes after lamp check. Driving above 50 km/h was not necessary.

Scenario G: Malfunction Detection Test at LLVW - Spare Installed on Right Front
 Test Date: 5/4/10
 Data File Time: 11:45 minutes
 Cumulative Driving Time: 7:55 minutes
 Start Point: San Angelo Test Facility shop

Malfunction Telltale Illumination:

2010 Subaru Outback (CA5502) RF Spare Tire Malfunction Illumination LLVW



SECTION 7
OWNER'S MANUAL PAGES

at a safe and level location, and then check the engine oil level. When the engine oil level is not within the normal range, refill with engine oil if necessary. Refer to "Engine oil" 11-12.

If the warning light does not turn off after refilling with engine oil or the warning light illuminates even though the engine oil level is within the normal range, have the system checked by a SUBARU dealer.

NOTE

- The engine low oil level warning light will not turn off immediately even if you replace or add engine oil. It will turn off only when the vehicle is idling and the engine is warmed up completely.
- When the vehicle is considerably inclined on an uphill or steep slope, the warning light may illuminate temporarily due to the movement of engine oil in the engine.

■ AT OIL TEMP warning light (AT and CVT models) AT OIL TEMP

The AT oil temperature warning light "AT OIL TEMP" illuminates when the ignition switch is turned to the "ON" position and turns off after approximately 2 seconds.

If this light illuminates when the engine is running, it may indicate that the transmission fluid temperature is too hot.

If the light illuminates while driving, immediately stop the vehicle in a safe place and let the engine idle until the warning light turns off.

▼ Transmission control system warning

If the "AT OIL TEMP" warning light flashes after the engine has started, it may indicate that the transmission control system is not working properly. Contact your nearest SUBARU dealer for service immediately.

■ Low tire pressure warning light (U.S.-spec. models)

When the ignition switch is turned to the "ON" position, the low tire pressure warning light will illuminate for approximately 2 seconds to check that the tire pressure monitoring system (TPMS) is functioning properly. If there is no problem and all tires are properly inflated, the light will go out.

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.

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 com-

– CONTINUED –

3-16 Instruments and controls

bined 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. 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.

Should the warning light illuminate steadily after blinking for approximately one minute, have the system inspected by your nearest SUBARU dealer as soon as possible.

WARNING

If this light does not illuminate briefly after the ignition switch is turned ON or the light illuminates steadily after blinking for approximately one minute, you should have

your Tire Pressure Monitoring System checked at a SUBARU dealer as soon as possible.

If this light illuminates while driving, never brake suddenly and keep driving straight ahead while gradually reducing speed. Then slowly pull off the road to a safe place. Otherwise an accident involving serious vehicle damage and serious personal injury could occur.

If this light still illuminates while driving after adjusting the tire pressure, a tire may have significant damage and a fast leak that causes the tire to lose air rapidly. If you have a flat tire, replace it with a spare tire as soon as possible.

When a spare tire is mounted or a wheel rim is replaced without the original pressure sensor/transmitter being transferred, the Low tire pressure warning light will illuminate steadily after blinking for approximately one minute. This indicates the TPMS is unable to monitor all four road wheels. Contact your SUBARU dealer as soon as possible for tire and sensor replacement and/or system resetting. If the light illuminates steadily after blinking for approximately one minute,

promptly contact a SUBARU dealer to have the system inspected.

CAUTION

The tire pressure monitoring system is NOT a substitute for manually checking tire pressure. The tire pressure should be checked periodically (at least monthly) using a tire gauge. After any change to tire pressure(s), the tire pressure monitoring system will not re-check tire inflation pressures until the vehicle is first driven more than 20 mph (32 km/h). After adjusting the tire pressures, increase the vehicle speed to at least 20 mph (32 km/h) to start the TPMS re-checking of the tire inflation pressures. If the tire pressures are now above the severe low pressure threshold, the low tire pressure warning light should turn off a few minutes later. Therefore, be sure to install the specified size for the front and rear tires.

ABS warning light ABS/

The ABS warning light illuminates when the ignition switch is turned to the "ON"

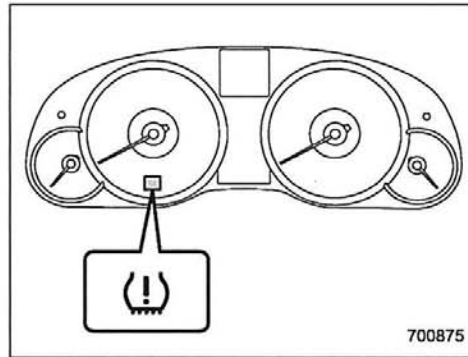
7-32 Starting and operating

turns off, the Vehicle Dynamics Control system is activated, and the system ignores any further pressing of the switch. To make the switch usable again, turn the ignition switch to the "LOCK" position and restart the engine.

- When the switch is pressed to deactivate the Vehicle Dynamics Control system, the vehicle's running performance is comparable with that of a vehicle that does not have a Vehicle Dynamics Control system. Do not deactivate the Vehicle Dynamics Control system except when absolutely necessary.

- Even when the Vehicle Dynamics Control system is deactivated, components of the brake control system may still activate. When the brake control system is activated, the Vehicle Dynamics Control operation indicator light illuminates.

Tire pressure monitoring system (TPMS) (if equipped)



The tire pressure monitoring system provides the driver with a warning message by sending a signal from a sensor that is installed in each wheel when tire pressure is severely low.

The tire pressure monitoring system will activate only when the vehicle is driven at speeds above 20 mph (32 km/h). Also, this system may not react immediately to a sudden drop in tire pressure (for example, a blow-out caused by running over a sharp object).

WARNING

If the low tire pressure warning light illuminates while driving, never brake suddenly and keep driving straight ahead while gradually reducing speed. Then slowly pull off the road to a safe place. Otherwise an accident involving serious vehicle damage and serious personal injury could occur.

Check the pressure for all four tires and adjust the pressure to the COLD tire pressure shown on the tire placard on the door pillar on the driver's side.

Even when the vehicle is driven a very short distance, the tires get warm and their pressures increase accordingly. Be sure to let the tires cool thoroughly before adjusting their pressures to the standard values shown on the tire placard. Refer to "Tires and wheels" φ 11-33. The tire pressure monitoring system does not function when the vehicle is stationary. After adjusting the tire pressures, increase the vehicle speed to at least 20 mph (32 km/h) to start the TPMS re-checking of the tire inflation pressures. If the tire pressures are now above the severe

low pressure threshold, the low tire pressure warning light should turn off a few minutes later.

If this light still illuminates while driving after adjusting the tire pressure, a tire may have significant damage and a fast leak that causes the tire to lose air rapidly. If you have a flat tire, replace it with a spare tire as soon as possible.

When a spare tire is mounted or a wheel rim is replaced without the original pressure sensor/transmitter being transferred, the low tire pressure warning light will illuminate steadily after blinking for approximately one minute. This indicates the TPMS is unable to monitor all four road wheels. Contact your SUBARU dealer as soon as possible for tire and sensor replacement and/or system resetting.

Do not inject any tire liquid or aerosol tire sealant into the tires, as this may cause a malfunction of the tire pressure sensors. If the light illuminates steadily after blinking for approximately one minute, promptly contact a SUBARU dealer to have the system inspected.

CAUTION

Do not place metal film or any metal parts under the driver's seat. This may cause poor reception of the signals from the tire pressure sensors, and the tire pressure monitoring system will not function properly.

NOTE

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada. 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.

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

Parking your vehicle

WARNING

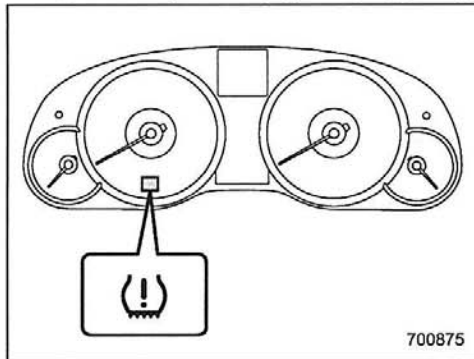
- Never leave unattended children or pets in the vehicle. They could accidentally injure themselves or others through inadvertent operation of the vehicle. Also, on hot or sunny days, the temperature in a closed vehicle could quickly become high enough to cause severe or possibly fatal injuries to them.
- Do not park the vehicle over flammable materials such as dry grass, waste paper or rags, as they may burn easily if they come near hot engine or exhaust system parts.
- Be sure to stop the engine if you take a nap in the vehicle. If engine exhaust gas enters the passenger compartment, occupants in the vehicle could die from carbon monoxide (CO) contained in the exhaust gas.

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⚠ WARNING

Never place a tire or tire changing tools in the passenger compartment after changing wheels. In a sudden stop or collision, loose equipment could strike occupants and cause injury. Store the tire and all tools in the proper place.

■ **Tire pressure monitoring system (TPMS) (if equipped)**



The tire pressure monitoring system provides the driver with the warning message indicated by sending a signal from a sensor that is installed in each wheel when tire pressure is severely low.

The tire pressure monitoring system will

activate only when the vehicle is driven. Also, this system may not react immediately to a sudden drop in tire pressure (for example, a blow-out caused running over a sharp object).

⚠ WARNING

If the low tire pressure warning light illuminates while driving, never brake suddenly and keep driving straight ahead while gradually reducing speed. Then slowly pull off the road to a safe place. Otherwise an accident involving serious vehicle damage and serious personal injury could occur.

Check the pressure for all four tires and adjust the pressure to the COLD tire pressure shown on the vehicle placard on the door pillar on the driver's side. If this light still illuminates while driving after adjusting the tire pressure, a tire may have significant damage and a fast leak that causes the tire to lose air rapidly. If you have a flat tire, replace it with a spare tire as soon as possible.

When a spare tire is mounted or a wheel rim is replaced without the original pressure sensor/transmitter

being transferred, the low tire pressure warning light will illuminate steadily after blinking for approximately one minute. This indicates the TPMS is unable to monitor all four road wheels. Contact your SUBARU dealer as soon as possible for tire and sensor replacement and/or system resetting.

Do not inject any tire liquid or aerosol tire sealant into the tires, as this may cause a malfunction of the tire pressure sensors.

If the light illuminates steadily after blinking for approximately one minute, promptly contact a SUBARU dealer to have the system inspected.

you apply the brake pedal, have the brake pads serviced by your SUBARU dealer as soon as possible.

■ Breaking-in of new brake pads and linings

When replacing the brake pad or lining, use only genuine SUBARU parts. After replacement, the new parts must be broken in as follows:

▼ Brake pad and lining

While maintaining a speed of 30 to 40 mph (50 to 65 km/h), step on the brake pedal lightly. Repeat this five or more times.

▼ Parking brake lining

The break-in maintenance for the parking brake linings should be performed at a SUBARU dealer.

Tires and wheels

■ Types of tires

You should be familiar with type of tires present on your vehicle.

▼ All season tires

The factory-installed tires on your new vehicle except 2.5 L turbo models are all season tires.

All season tires are designed to provide an adequate measure of traction, handling and braking performance in year-round driving including snowy and icy road conditions. However all season tires do not offer as much traction performance as winter (snow) tires in heavy or loose snow or on icy roads.

All season tires are identified by "ALL SEASON" and/or "M+S" (Mud & Snow) on the tire sidewall.

▼ Summer tires

The factory-installed tires on your new 2.5 L turbo models are summer tires. Summer tires are high-speed capability tires best suited for highway driving under dry conditions.

Summer tires are inadequate for driving on slippery roads such as on snow-covered or icy roads.

If you drive your vehicle on snow-covered

or icy roads, we strongly recommend the use of winter (snow) tires.

When installing winter tires, be sure to replace all four tires.

▼ Winter (snow) tires

Winter tires are best suited for driving on snow-covered and icy roads. However winter tires do not perform as well as summer tires and all season tires on roads other than snow-covered and icy roads.

■ Tire pressure monitoring system (TPMS) (if equipped)

The tire pressure monitoring system provides the driver with a warning message by sending a signal from a sensor that is installed in each wheel when tire pressure is severely low. The tire pressure monitoring system will activate only when the vehicle is driven. Also, this system may not react immediately to a sudden drop in tire pressure (for example, a blow-out caused by running over a sharp object).

If you adjust the tire pressures in a warm garage and will then drive the vehicle in cold outside air, the resulting drop in tire pressures may cause the low tire pressure warning light to illuminate. To avoid this problem when adjusting the tire pressures in a warm garage, inflate the tires to pressures higher than those shown on the

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tire placard. Specifically, inflate them by an extra 1 psi (6.9 kPa, 0.07 kgf/cm²) for every difference of 10°F (5.6°C) between the temperature in the garage and the temperature outside. By way of example, the following table shows the required tire pressures that correspond to various outside temperatures when the temperature in the garage is 60°F (15.6°C).

Example:

Tire size: P215/70R16 99S, P225/60R17 98T

Standard tire pressures:

Front: 32 psi (220 kPa, 2.2 kgf/cm²)

Rear: 30 psi (210 kPa, 2.1 kgf/cm²)

Garage temperature: 60°F (15.6°C)

Outside temperature	Adjusted pressure [psi (kPa, kgf/cm ²)]	
	Front	Rear
30°F (-1°C)	35 (240, 2.4)	33 (230, 2.3)
10°F (-12°C)	37 (255, 2.55)	35 (240, 2.4)
-10°F (-23°C)	39 (270, 2.7)	37 (255, 2.55)

Example:

Tire size: P205/60R16 91V, P215/50R17 90V, P225/50R17 93V, 225/45R18 91W

Standard tire pressures:

Front: 33 psi (230 kPa, 2.3 kgf/cm²)

Rear: 32 psi (220 kPa, 2.2 kgf/cm²)

Garage temperature: 60°F (15.6°C)

Outside temperature	Adjusted pressure [psi (kPa, kgf/cm ²)]	
	Front	Rear
30°F (-1°C)	36 (250, 2.5)	35 (240, 2.4)
10°F (-12°C)	38 (265, 2.65)	37 (255, 2.55)
-10°F (-23°C)	40 (280, 2.8)	39 (270, 2.7)

If the low tire pressure warning light illuminates when you drive the vehicle in cold outside air after adjusting the tire pressures in a warm garage, re-adjust the tire pressures using the method described above. Then, increase the vehicle speed to at least 20 mph (32 km/h) and check to see that the low tire pressure warning light goes off a few minutes later. If the low tire pressure warning light does not go off, the tire pressure monitoring system may not be functioning normally. In this event, go to a SUBARU dealer to have the system inspected as soon as possible.

While the vehicle is driven, friction between tires and the road surface causes the tires to warm up. After illumination of the low tire pressure warning light, any increase in the tire pressures caused by an increase in the outside air temperature

or by an increase in the temperature in the tires can cause the low tire pressure warning light to go off.

System resetting is necessary when the wheels are changed (for example, a switch to snow tires) and new TPMS valves are installed on the newly fitted wheels. Have this work performed by a SUBARU dealer following wheel replacement.

It may not be possible to install TPMS valves on certain wheels that are on the market. Therefore, if you change the wheels (for example, a switch to snow tires), use wheels that have the same part number as the standard-equipment wheels. Without four operational TPMS valve/sensors on the wheels, the TPMS will not fully function and the warning light in the instrument panel will illuminate steadily after blinking for approximately one minute.

When a tire is replaced, adjustments are necessary to ensure continued normal operation of the tire pressure monitoring system. As with wheel replacement, therefore, you should have the work performed by a SUBARU dealer.

▲ WARNING

If the low tire pressure warning light does not illuminate briefly after the ignition switch is turned ON or the light illuminates steadily after blinking for approximately one minute, you should have your Tire Pressure Monitoring System checked at a SUBARU dealer as soon as possible.

If this light illuminates while driving, never brake suddenly and keep driving straight ahead while gradually reducing speed. Then slowly pull off the road to a safe place. Otherwise an accident involving serious vehicle damage and serious personal injury could occur.

If this light still illuminates while driving after adjusting the tire pressure, a tire may have significant damage and a fast leak that causes the tire to lose air rapidly. If you have a flat tire, replace it with a spare tire as soon as possible.

When a spare tire is mounted or a wheel rim is replaced without the original pressure sensor/transmitter being transferred, the low tire pressure warning light will illuminate steadily after blinking for approxi-

mately one minute. This indicates the TPMS is unable to monitor all four road wheels. Contact your SUBARU dealer as soon as possible for tire and sensor replacement and/or system resetting. If the light illuminates steadily after blinking for approximately one minute, promptly contact a SUBARU dealer to have the system inspected.

■ Tire inspection

Check on a daily basis that the tires are free from serious damage, nails, and stones. At the same time, check the tires for abnormal wear.

Contact your SUBARU dealer immediately if you find any problem.

NOTE

- When the wheels and tires strike curbs or are subjected to harsh treatment as when the vehicle is driven on a rough surface, they can suffer damage that cannot be seen with the naked eye. This type of damage does not become evident until time has passed. Try not to drive over curbs, potholes or on other rough surfaces. If doing so is unavoidable, keep the vehicle's speed down to a walking pace or less, and

approach the curbs as squarely as possible. Also, make sure the tires are not pressed against the curb when you park the vehicle.

- If you feel unusual vibration while driving or find it difficult to steer the vehicle in a straight line, one of the tires and/or wheels may be damaged. Drive slowly to the nearest authorized SUBARU dealer and have the vehicle inspected.

■ Tire pressures and wear

Maintaining the correct tire pressures helps to maximize the tires' service lives and is essential for good running performance. Check and, if necessary, adjust the pressure of each tire (including the spare) at least once a month (for example, during a fuel stop) and before any long journey.

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