REPORT NUMBER 138-STF-07-003

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

BAYERISCHE MOTOREN WERKE
2007 BMW X3 3.0si
FOUR-DOOR MPV
NHTSA NO. C70506

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

December 17, 2007

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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16. Abstract Compliance tests were conducted on the subject 2007 BMW X3 3.0si four-door MPV in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-138-03 for the determination of FMVSS 138 compliance. Test failures identified were as follows: manufacturer did not comply with the exact written instruction requirements specified in S4.5. (See attached Laboratory Notice of Test Failure.)		
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INTRODUCTION

1.1 PURPOSE OF COMPLIANCE TEST

A 2007 BMW X3 3.0si 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 2007 BMW X3 3.0si four-door MPV. Nomenclatures applicable to the test vehicle are:

A. Vehicle Identification Number: WBXPC93497WF22356

B. NHTSA Number: C70506

C. Manufacturer: Bayerische Motoren Werke

D. Manufacture Date: 04/2007

1.3 TEST DATE

The test vehicle was tested during the time period September 18 through September 24, 2007.

SECTION 2

TEST PROCEDURE AND SUMMARY OF RESULTS

2.1 TEST PROCEDURE AND RESULTS

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 four tire deflation scenarios. This LLVW included the weights of driver, one passenger, and test equipment. The vehicle was loaded to its Gross Vehicle Weight Rating (GVWR) for four additional tire deflation scenarios. The Vehicle Capacity Weight included the weights of driver, one passenger, equipment, ballast in rear seat area, and ballast in the cargo area. 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 test, graph(s) were generated by VBOX software showing vehicle speed versus time during the test procedure calibration phase and detection phase. The graphs furnish a second-by-second analysis of each test phase. The cumulative driving time for each test 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 consisted of four parts:

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 50-100 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 is normally started and driven between fifty and one hundred km/h to verify telltale illumination, but in these instances the BMW telltale illuminated before driving was initiated.

3. Cool down phase: Vehicle was parked in the San Angelo Test Facility (SATF) garage. Tires were allowed to cool down for one hour, or until all tires excluding deflated tire(s) were within seven kPa (one psi) of vehicle placard cold inflation pressure. 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 is normally started and driven between fifty and one hundred km/h to verify telltale extinguishment, but in these instances the BMW telltale extinguished before driving was initiated.

A malfunction detection scenario was performed with the vehicle loaded to its LLVW. A malfunction was simulated by placing the compact spare tire (with no TPMS sensor) on the left front wheel position. The vehicle was driven until the malfunction telltale illuminated.

The malfunction was corrected and again the vehicle was driven to verify the malfunction telltale extinguished.

2.2 SUMMARY OF RESULTS

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

A. Left front
B. Right rear
C. Left rear, right front
D. Left front, left rear, right rear, right front

Four tire deflation scenarios were performed on the test vehicle at GVWR:

E. Left rear
F. Right front
G. Left rear, right rear
H. Left front, left rear, right rear, right front

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

One malfunction detection scenario was performed on the test vehicle at LLVW. Per the standard's requirements effective September 1, 2007, the vehicle's combination malfunction telltale properly indicated a malfunction. Testing of the extinguishment phase, with the original tire with sensor in place performed correctly.

The manufacturer did not comply with the exact written instruction requirements specified in S4.5. (see Laboratory Notice of Test Failure in Section 7).

SECTION 3

TEST DATA

FMVSS No. 138 – TEST DATA SUMMARY

TEST DATES: September 18 - September 24, 2007 LAB: U. S. DOT San Angelo Test Facility (SATF)

CERTIFICATION LABEL BUILD DATE: 04/2007 VIN: WBXPC93497WF22356

VEHICLE NHTSA NUMBER: C70506

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	**FAIL**

REMARKS: Statements provided in the owner's manual are not exactly as required by Standard S4.5, Written Instructions.

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

TEST DATE: September 19, 2007 LAB: U. S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506 VIN: WBXPC93497WF22356

CERTIFICATION LABEL BUILD DATE: 04/2007 ENGINE: 3.0i 6 cylinder

MY/MAKE/MODEL/BODY STYLE: 2007 BMW X3 3.0si four-door MPV

TIRE CONDITIONING:

(X) Tires used more than 100 km? Actual odometer reading : 126 km (78 mi)

VEHICLE ALIGNMENT AND WHEEL BALANCING:

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

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

TPMS IDENTIFICATION:

TPMS SENSOR MAKE/MODEL: Beru, part number 6 771 034 / BERU TSSRE 4Tb

Source: Vehicle manufacturer

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

TPMS MALFUNCTION INDICATOR TYPE:

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

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

Source: Information supplied by manufacturer

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

If yes, describe reset control location and function: Bottom of center dashboard section above gearshift, used to reset TPMS after inflation change.

Does TPMS require activation of manual reset control? (X)YES ( )NO

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	235/55R17	220 kPa (32 psi)	Vehicle placard
Rear	235/55R17	220 kPa (32 psi)	Vehicle placard
Spare	T135/90R17	420 kPa (61 psi)	Vehicle placard

INSTALLED TIRE DATA (Use diagrams as reference):

Diagram - Passenger Car Tire Labeling

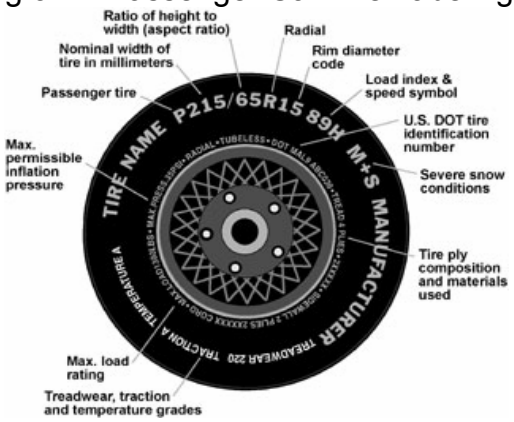
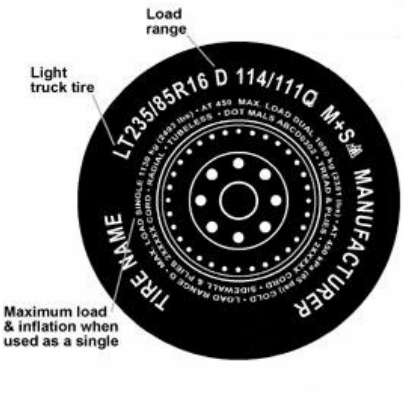


Diagram - Other Markings on Light Trucks



Front and Rear Axles

Tire Size (ex. P225/65R15 89H): 235/55R17 99H

Manufacturer/Tire Name: Pirelli Scorpion STR

Sidewall Max Load Rating: 775 kg (1,709 lbs)

Max Inflation Pressure: 350 kPa (51 psi)

Sidewall Construction (number of plies and ply material): 2 plies rayon

Tread Construction (number of plies and ply material): 4 plies – 2 nylon, 2 steel

Do all installed tires have the same sidewall information? (X)YES ( )NO

Are all installed tires the same as designated by the vehicle manufacturer?

(X)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	220 kPa x .75 = 165.0 kPa	220 kPa x .75 = 165.0 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 350 kPa (51 psi) 140 kPa (20 psi)	(X) P-metric-Standard load ( ) P-metric-Extra Load Load Range ( ) C, ( ) D, or ( ) E (X) Maximum or ( ) Rated 350 kPa (51 psi) 140 kPa (20 psi)
(C) Telltale Warning Activation Pressure is the higher of Part (A) or (B)	165.0 kPa (23.9 psi)	165.0 kPa (23.9 psi)
(D) Pressure at which to deflate tire(s) = (C) – 7 kPa	158.0 kPa (22.9 psi)	158.0 kPa (22.9 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: Robert N. Gregg DATE: September 19, 2007

APPROVED BY: Kenneth H. Yates

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

TEST DATE: September 19, 2007 LAB: U. S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

TPMS Low Tire Pressure Warning Telltale

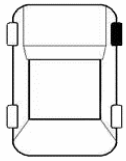
TPMS Low Tire Pressure Warning Telltale Location: Center of instrument cluster

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

(X)YES ( )NO (fail)

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

Identify Telltale Symbol Used (check box above figure).

[X]	[ ]	[ ]
		OTHER (fail) (describe below)

Note any words or additional symbols used.

None

TPMS Malfunction Telltale

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

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

DATA SHEET 2 (Sheet 2 of 2)

LOW TIRE PRESSURE WARNING AND MALFUNCTION TELLTALE

Check Telltale Lamp Functions:

LOW TIRE PRESSURE TELLTALE AND MALFUNCTION INDICATION, IF COMBINED

Identify position of ignition locking system when telltale illuminates.

[ ]	OFF/LOCK	[ ]	Between OFF/LOCK and ON/RUN
[ ]	ON/RUN	[X]	Between OFF/RUN and START

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

Time telltale remains illuminated 10 seconds.

Starter Interlocks:

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

TEST RESULTS

Low Tire Pressure Warning Telltale (PASS/FAIL) **PASS**

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 19, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 1 of 28)
TPMS OPERATIONAL PERFORMANCE

TEST DATE: September 18, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Time:	Start:	2:26 pm	End:	3:00 pm
Ambient Temperature:	Start:	32.0°C (89.6°F)	End:	32.8°C (91.0°F)
Odometer Reading:	Start:	126 km (78 mi)		
Fuel Level:	Start:	Full		
Weather Conditions:		Partly cloudy		

Time vehicle has remained with engine off and tires shielded from direct sunlight:
(1 hour minimum): 4 hours

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)	220.1 kPa (31.9 psi)	220.2 kPa (31.9 psi)	220.1 kPa (31.9 psi)
Tire Sidewall Temp	32.2°C (90.0°F)	34.2°C (93.6°F)	33.6°C (92.5°F)	32.6°C (90.7°F)

DATA SHEET 3 (Sheet 2 of 28)
TPMS OPERATIONAL PERFORMANCE

VEHICLE WEIGHT:

Vehicle Ratings from Certification Label:

GVWR: 2,315 kg (5,104 lbs)

GAWR (front): 1,150 kg (2,535 lbs)

GAWR (rear): 1,260 kg (2,778 lbs)

Vehicle Capacity Weight from Vehicle Placard:

Vehicle Capacity Weight 470 kg (1,036 lbs)

Measured Unloaded Vehicle Weight:

LF	462 kg (1,019 lbs)	LR	461 kg (1,017 lbs)
RF	471 kg (1,039 lbs)	RR	455 kg (1,004 lbs)
Front Axle	933 kg (2,058 lbs)	Rear Axle	916 kg (2,021 lbs)

Total Vehicle 1,849 kg (4,079 lbs)

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

LF	508 kg (1,119 lbs)		LR	505 kg (1,117 lbs)	
RF	517 kg (1,142 lbs)		RR	502 kg (1,108 lbs)	
Front Axle	1,025 kg (2,261 lbs)	(≤ GAWR)	Rear Axle	1,007 kg (2,225 lbs)	(≤ GAWR)

Total Vehicle 2,032 kg (4,486 lbs) (not greater than GVWR)

Note: For scenarios A, B, C, D, and I, this total vehicle weight measures the vehicle loaded to lightly loaded vehicle weight (LLVW), 184 kg (407 lbs) of driver, passenger, and equipment.

DATA SHEET 3 (Sheet 3 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO A - Left Front Tire Deflation at LLVW

TEST DATE: September 19, 2007 LAB: U. S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Note: See Data Sheet 3 (Sheet 2 of 28) 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: 22.4°C (72.3°F) Vehicle cool down period: overnight				
Inflation Pressure	220.1 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	24.0°C (75.2°F)	24.2°C (75.6°F)	24.0°C (75.2°F)	25.0°C (77.0°F)
San Angelo Test Facility Shop Floor Temp	25.4°C (77.7°F)	25.2°C (77.4°F)	25.4°C (77.7°F)	25.2°C (77.4°F)

SYSTEM CALIBRATION/LEARNING PHASE:
(VBox time – see Section 6 test plots)

Time:	Start:	12:55:28 UTC	End:	13:20:23 UTC
Odometer Reading:	Start:	148.2 km (92.1 mi)	End:	176.2 km (109.5 mi)
Ambient Temperature:	Start:	22.3°C (72.1°F)	End:	22.3°C (72.1°F)
Roadway Temperature:	Start:	24.6°C (76.3°F)	End:	24.8°C (76.6°F)

Driving in first direction:

Starting point: GAFB north gate Direction: south

10:31 minutes (stopwatch time) 14.0 km (8.7 mi) distance

Driving in opposite direction:

Starting point: Brodnax Lane Direction: north

10:27 minutes (stopwatch time) 14.0 km (8.7 mi) distance

Max speed: 84.0 km/hr (52.2 mph)

Total Driving Time: 21:05 minutes (VBox time)

DATA SHEET 3 (Sheet 4 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO A - Left 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	235.1 kPa (34.1 psi)	235.6 kPa (34.2 psi)	235.9 kPa (34.2 psi)	236.8 kPa (34.3 psi)
Tire Sidewall Temp	33.4°C (92.1°F)	31.6°C (88.9°F)	31.6°C (88.9°F)	33.2°C (91.8°F)
San Angelo Test Facility Shop Floor Temp	26.5°C (79.7°F)	26.4°C (79.5°F)	26.4°C (79.5°F)	26.2°C (79.2°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 ( )LR ( )RR ( )RF Inflation Pressure	158.0 kPa (22.9 psi)			

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Did the telltale illuminate? (X)YES ( )NO

Time to Illuminate:

Illumination in 10 seconds – driving was not required

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

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?
( )YES (X)NO

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)

DATA SHEET 3 (Sheet 5 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO A - Left Front Tire Deflation at LLVW

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)

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: 24.2°C (75.6°F) Vehicle cool down period: 62 minutes				
Inflation Pressure	153.4 kPa (22.2 psi)	225.4 kPa (32.7 psi)	224.8 kPa (32.6 psi)	227.1 kPa (32.9 psi)
Tire Sidewall Temp	27.4°C (81.3°F)	27.4°C (81.3°F)	27.4°C (81.3°F)	27.4°C (81.3°F)
San Angelo Test Facility Shop Floor Temp	26.6°C (79.9°F)	26.8°C (80.2°F)	26.8°C (80.2°F)	26.2°C (79.2°F)

After the cool down period of approximately 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 cool down period: Re-adjusted Inflation Pressure:	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)

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

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL) **PASS**
Left front tire was deflated at LLVW.

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 19, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 6 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO B – Right Rear Tire Deflation at LLVW

TEST DATE: September 19, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Note: See Data Sheet 3 (Sheet 2 of 28) 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: 27.2°C (81.0°F) Vehicle cool down period: 60 minutes				
Inflation Pressure	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	26.4°C (79.5°F)	27.0°C (80.6°F)	27.2°C (81.0°F)	26.8°C (80.2°F)
San Angelo Test Facility Shop Floor Temp	25.6°C (78.1°F)	25.8°C (78.4°F)	26.2°C (79.2°F)	25.0°C (77.0°F)

SYSTEM CALIBRATION/LEARNING PHASE:
(VBox time – see Section 6 test plots)

Time:	Start:	16:02:22 UTC	End:	16:27:17 UTC
Odometer Reading:	Start:	177.8 km (110.5 mi)	End:	205.8 km (127.9 mi)
Ambient Temperature:	Start:	27.2°C (81.0°F)	End:	27.4°C (81.3°F)
Roadway Temperature:	Start:	35.6°C (96.1°F)	End:	36.2°C (97.2°F)

Driving in first direction:

Starting point: GAFB north gate Direction: south

10:26 minutes (stopwatch time) 13.8 km (8.6 mi) distance

Driving in opposite direction:

Starting point: Brodnax Lane Direction: north

10:28 minutes (stopwatch time) 14.2 km (8.8 mi) distance

Max speed: 83.8 km/hr (52.1 mph)

Total Driving Time: 21:01 minutes (VBox time)

DATA SHEET 3 (Sheet 7 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO B – 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	236.2 kPa (34.3 psi)	237.4 kPa (34.4 psi)	238.6 kPa (34.6 psi)	237.1 kPa (34.4 psi)
Tire Sidewall Temp	40.4°C (104.7°F)	38.8°C (101.8°F)	39.0°C (102.2°F)	40.2°C (104.4°F)
San Angelo Test Facility Shop Floor Temp	27.2°C (81.0°F)	28.0°C (82.4°F)	27.8°C (82.0°F)	27.6°C (81.7°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:

Starting point: San Angelo Test Facility shop

Did the telltale illuminate? (X)YES ( )NO

Time to Illuminate:

Illumination in 9 seconds – driving was not required

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

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?
( )YES (X)NO

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)

DATA SHEET 3 (Sheet 8 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO B – Right Rear Tire Deflation at LLVW

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)

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: 29.7°C (85.5°F) Vehicle cool down period: 62 minutes				
Inflation Pressure	224.9 kPa (32.6 psi)	224.9 kPa (32.6 psi)	150.2 kPa (21.8 psi)	225.4 kPa (32.7 psi)
Tire Sidewall Temp	29.6°C (85.3°F)	29.4°C (84.9°F)	30.2°C (86.4°F)	29.6°C (85.3°F)
San Angelo Test Facility Shop Floor Temp	27.6°C (81.7°F)	27.8°C (82.0°F)	28.2°C (82.8°F)	27.8°C (82.0°F)

After the cool down period of approximately 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 cool down period: Re-adjusted Inflation Pressure:	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)

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

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL) **PASS**
Right rear tire was deflated at LLVW.

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 19, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 9 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO C – Left Rear and Right Front Tire Deflation at LLVW

TEST DATE: September 19, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Note: See Data Sheet 3 (Sheet 2 of 28) 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: 32.1°C (89.8°F) Vehicle cool down period: 60 minutes				
Inflation Pressure	220.1 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)
Tire Sidewall Temp	29.8°C (85.6°F)	30.0°C (86.0°F)	32.4°C (90.3°F)	31.6°C (88.9°F)
San Angelo Test Facility Shop Floor Temp	28.6°C (83.5°F)	29.0°C (84.2°F)	29.2°C (84.6°F)	28.9°C (84.0°F)

SYSTEM CALIBRATION/LEARNING PHASE:
(VBox time – see Section 6 test plots)

Time:	Start:	19:11:35 UTC	End:	19:36:51 UTC
Odometer Reading:	Start:	207.9 km (129.2 mi)	End:	235.9 km (146.6 mi)
Ambient Temperature:	Start:	32.1°C (89.8°F)	End:	32.9°C (91.2°F)
Roadway Temperature:	Start:	43.0°C (109.4°F)	End:	44.4°C (111.9°F)

Driving in first direction:

Starting point: GAFB north gate Direction: south

10:17 minutes (stopwatch time) 14.2 km (8.8 mi) distance

Driving in opposite direction:

Starting point: Brodnax Lane Direction: north

10:39 minutes (stopwatch time) 13.8 km (8.6 mi) distance

Max speed: 81.6 km/hr (50.7 mph)

Total Driving Time: 20:58 minutes (VBox time)

DATA SHEET 3 (Sheet 10 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO C – 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	236.0 kPa (34.2 psi)	237.0 kPa (34.4 psi)	236.8 kPa (34.3 psi)	237.4 kPa (34.4 psi)
Tire Sidewall Temp	34.0°C (93.2°F)	41.0°C (105.8°F)	42.5°C (108.5°F)	41.1°C (106.0°F)
San Angelo Test Facility Shop Floor Temp	29.2°C (84.6°F)	29.8°C (85.6°F)	29.6°C (85.3°F)	29.2°C (84.6°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 (X)LR ( )RR (X)RF Inflation Pressure		158.1 kPa (22.9 psi)		158.0 kPa (22.9 psi)

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Did the telltale illuminate? (X)YES ( )NO

Time to Illuminate:

Illumination in 10 seconds – driving was not required

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

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?
( )YES (X)NO

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)

DATA SHEET 3 (Sheet 11 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO C – Left Rear and Right Front Tire Deflation at LLVW

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)

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: 31.4°C (88.5°F) Vehicle cool down period: 68 minutes				
Inflation Pressure	222.0 kPa (32.2 psi)	150.4 kPa (21.8 psi)	222.3 kPa (32.2 psi)	149.0 kPa (21.6 psi)
Tire Sidewall Temp	32.4°C (90.3°F)	32.0°C (89.6°F)	32.2°C (90.0°F)	31.4°C (88.5°F)
San Angelo Test Facility Shop Floor Temp	30.2°C (86.4°F)	30.0°C (86.0°F)	30.1°C (86.2°F)	30.4°C (86.7°F)

After the cool down period of approximately 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 cool down period: Re-adjusted Inflation Pressure:	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.1 kPa (31.9 psi)

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

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL) **PASS**
Left rear and right front tires were deflated at LLVW.

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 19, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 12 of 28)
TPMS OPERATIONAL PERFORMANCE

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

TEST DATE: September 20, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Note: See Data Sheet 3 (Sheet 2 of 28) 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: 20.4°C (80.4°F) Vehicle cool down period: overnight				
Inflation Pressure	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)
Tire Sidewall Temp	23.4°C (74.1°F)	23.6°C (74.5°F)	23.4°C (74.1°F)	23.6°C (74.5°F)
San Angelo Test Facility Shop Floor Temp	24.8°C (76.6°F)	25.4°C (77.7°F)	25.4°C (77.7°F)	25.2°C (77.4°F)

SYSTEM CALIBRATION/LEARNING PHASE:
(VBox time – see Section 6 test plots)

Time:	Start:	12:08:54 UTC	End:	12:33:39 UTC
Odometer Reading:	Start:	237.5 km (147.6 mi)	End:	265.5 km (165.0 mi)
Ambient Temperature:	Start:	20.7°C (69.3°F)	End:	19.8°C (67.6°F)
Roadway Temperature:	Start:	23.8°C (74.8°F)	End:	24.2°C (75.6°F)

Driving in first direction:

Starting point: GAFB north gate Direction: south

10:26 minutes (stopwatch time) 13.8 km (8.6 mi) distance

Driving in opposite direction:

Starting point: Brodnax Lane Direction: north

10:38 minutes (stopwatch time) 14.2 km (8.8 mi) distance

Max speed: 83.5 km/hr (51.9 mph)

Total Driving Time: 21:08 minutes (VBox time)

DATA SHEET 3 (Sheet 13 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO D – 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	234.3 kPa (34.0 psi)	234.2 kPa (34.0 psi)	234.9 kPa (34.1 psi)	234.6 kPa (34.0 psi)
Tire Sidewall Temp	28.2°C (82.8°F)	29.8°C (85.6°F)	31.0°C (87.8°F)	30.8°C (87.4°F)
San Angelo Test Facility Shop Floor Temp	25.8°C (78.4°F)	26.2°C (79.2°F)	26.0°C (78.8°F)	26.2°C (79.2°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)	158.1 kPa (22.9 psi)	158.0 kPa (22.9 psi)	158.1 kPa (22.9 psi)

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Did the telltale illuminate? (X)YES ( )NO

Time to Illuminate:

Illumination in 9 seconds – driving was not required

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

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?
( )YES (X)NO

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)

DATA SHEET 3 (Sheet 14 of 28)
TPMS OPERATIONAL PERFORMANCE

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

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)

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: 22.6°C (72.7°F) Vehicle cool down period: 66 minutes				
Inflation Pressure	152.6 kPa (22.1 psi)	152.6 kPa (22.1 psi)	151.9 kPa (22.0 psi)	152.2 kPa (22.1 psi)
Tire Sidewall Temp	24.2°C (75.6°F)	25.6°C (78.1°F)	25.6°C (78.1°F)	25.6°C (78.1°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 approximately 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 cool down period: Re-adjusted Inflation Pressure:	220.1 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)

Is it necessary to drive the vehicle to extinguish the telltale? ( )YES (X)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: Robert N. Gregg DATE: September 20, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 15 of 28)
TPMS OPERATIONAL PERFORMANCE

TEST DATE: September 20, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Time:	Start:	12:55 pm	End:	2:30 pm
Ambient Temperature:	Start:	29.6°C (85.3°F)	End:	30.6°C (87.1°F)
Odometer Reading:	Start:	266.3 km (165.5 mi)		
Fuel Level:	Start:	Full		
Weather Conditions:		Mostly cloudy		

Time vehicle has remained with engine off and tires shielded from direct sunlight:
(1 hour minimum): 85 minutes (inside the SATF open bay)

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	220.1 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.2 kPa (31.9 psi)	220.0 kPa (31.9 psi)
Tire Sidewall Temp	31.2°C (88.2°F)	31.8°C (89.2°F)	32.4°C (90.3°F)	31.4°C (88.5°F)

DATA SHEET 3 (Sheet 16 of 28)
TPMS OPERATIONAL PERFORMANCE

VEHICLE WEIGHT:

Vehicle Ratings from Certification Label:

GVWR: 2,315 kg (5,104 lbs)

GAWR (front): 1,150 kg (2,535 lbs)

GAWR (rear): 1,260 kg (2,778 lbs)

Vehicle Capacity Weight from Vehicle Placard:

Vehicle Capacity Weight 470 kg (1,036 lbs)

Measured Unloaded Vehicle Weight:

LF	462 kg (1,019 lbs)	LR	463 kg (1,020 lbs)
RF	471 kg (1,038 lbs)	RR	457 kg (1,008 lbs)
Front Axle	933 kg (2,057 lbs)	Rear Axle	920 kg (2,028 lbs)

Total Vehicle 1,853 kg (4,085 lbs)

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

LF	511 kg (1,126 lbs)		LR	634 kg (1,397 lbs)	
RF	522 kg (1,151 lbs)		RR	626 kg (1,380 lbs)	
Front Axle	1,033 kg (2,277 lbs)	(≤ GAWR)	Rear Axle	1,260 kg (2,777 lbs)	(≤ GAWR)

Total Vehicle 2,293 kg (5,054 lbs) (not greater than GVWR)

Note: For scenarios E, F, G, and H, this Total Vehicle Weight measures the vehicle loaded to Vehicle Capacity Weight (GVWR), 440 kg (969 lbs) of driver, passenger, equipment, and ballast.

DATA SHEET 3 (Sheet 17 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO E – Left Rear Tire Deflation at GVWR

TEST DATE: September 21, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Note: See Data Sheet 3 (Sheet 16 of 28) 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 vehicle capacity weight, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: 21°C (69.8°F) Vehicle cool down period: overnight				
Inflation Pressure	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)
Tire Sidewall Temp	25.6°C (78.1°F)	26.0°C (78.8°F)	26.2°C (79.2°F)	26.4°C (79.5°F)
San Angelo Test Facility Shop Floor Temp	26.4°C (79.5°F)	26.4°C (79.5°F)	26.2°C (79.2°F)	26.4°C (79.5°F)

SYSTEM CALIBRATION/LEARNING PHASE:
(VBox time – see Section 6 test plots)

Time:	Start:	12:25:26 UTC	End:	12:49:41 UTC
Odometer Reading:	Start:	297.1 km (184.6 mi)	End:	324.9 km (201.9 mi)
Ambient Temperature:	Start:	21.0°C (69.8°F)	End:	21.1°C (70.0°F)
Roadway Temperature:	Start:	23.8°C (74.8°F)	End:	23.2°C (73.8°F)

Driving in first direction:

Starting point: GAFB north gate Direction: south

10:17 minutes (stopwatch time) 13.8 km (8.6 mi) distance

Driving in opposite direction:

Starting point: Brodnax Lane Direction: north

10:42 minutes (stopwatch time) 14.0 km (8.7 mi) distance

Max speed: 84.9 km/hr (52.8 mph)

Total Driving Time: 21:08 minutes (VBox time)

DATA SHEET 3 (Sheet 18 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO E – Left Rear Tire Deflation at GVWR

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	233.3 kPa (33.8 psi)	236.7 kPa (34.3 psi)	238.3 kPa (34.6 psi)	234.2 kPa (34.0 psi)
Tire Sidewall Temp	32.0°C (89.6°F)	32.0°C (89.6°F)	32.0°C (89.6°F)	31.6°C (88.9°F)
San Angelo Test Facility Shop Floor Temp	25.8°C (78.4°F)	26.2°C (79.2°F)	25.6°C (78.1°F)	25.9°C (78.6°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 (X)LR ( )RR ( )RF Inflation Pressure		158.1 kPa (22.9 psi)		

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Did the telltale illuminate? (X)YES ( )NO

Time to Illuminate:

Illumination in 4 seconds – driving was not required

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

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?
( )YES (X)NO

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)

DATA SHEET 3 (Sheet 19 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO E – Left Rear Tire Deflation at GVWR

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)

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: 22.6°C (72.7°F)	Vehicle cool down period: 68 minutes			
Inflation Pressure	222.2 kPa (32.2 psi)	150.2 kPa (21.8 psi)	225.4 kPa (32.7 psi)	223.2 kPa (32.4 psi)
Tire Sidewall Temp	25.4°C (77.7°F)	25.4°C (77.7°F)	26.4°C (79.5°F)	25.3°C (77.5°F)
San Angelo Test Facility Shop Floor Temp	25.2°C (77.4°F)	26.2°C (79.2°F)	26.2°C (79.2°F)	26.2°C (79.2°F)

After the cool down period of approximately 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 cool down period: Re-adjusted Inflation Pressure:	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)

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

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL) **PASS**
Left rear tire was deflated at GVWR.

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 21, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 20 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO F – Right Front Tire Deflation at GVWR

TEST DATE: September 21, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Note: See Data Sheet 3 (Sheet 16 of 28) 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 vehicle capacity weight, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: 23.8°C (74.8°F) Vehicle cool down period: 88 minutes				
Inflation Pressure	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)
Tire Sidewall Temp	25.2°C (77.4°F)	25.4°C (77.7°F)	25.8°C (78.4°F)	25.6°C (78.1°F)
San Angelo Test Facility Shop Floor Temp	26.0°C (78.8°F)	26.2°C (79.2°F)	26.4°C (79.5°F)	26.2°C (79.2°F)

SYSTEM CALIBRATION/LEARNING PHASE:
(VBox time – see Section 6 test plots)

Time:	Start:	14:54:21 UTC	End:	15:18:15 UTC
Odometer Reading:	Start:	326.5 km (202.9 mi)	End:	354.5 km (220.3 mi)
Ambient Temperature:	Start:	24.2°C (75.6°F)	End:	25.0°C (77.0°F)
Roadway Temperature:	Start:	29.4°C (84.9°F)	End:	32.6°C (90.7°F)

Driving in first direction:

Starting point: GAFB north gate Direction: south

10:27 minutes (stopwatch time) 13.8 km (8.6 mi) distance

Driving in opposite direction:

Starting point: Brodnax Lane Direction: north

10:41 minutes (stopwatch time) 14.2 km (8.8 mi) distance

Max speed: 84.8 km/hr (52.7 mph)

Total Driving Time: 21:13 minutes (VBox time)

DATA SHEET 3 (Sheet 21 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO F – Right Front Tire Deflation at GVWR

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	236.9 kPa (34.4 psi)	239.9 kPa (34.8 psi)	240.5 kPa (34.9 psi)	237.4 kPa (34.4 psi)
Tire Sidewall Temp	39.6°C (103.3°F)	38.0°C (100.4°F)	38.0°C (100.4°F)	37.4°C (99.3°F)
San Angelo Test Facility Shop Floor Temp	26.6°C (79.9°F)	26.8°C (80.2°F)	26.8°C (80.2°F)	26.4°C (79.5°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 ( )LR ( )RR (X)RF Inflation Pressure				158.0 kPa (22.9 psi)

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Did the telltale illuminate? (X)YES ( )NO

Time to Illuminate:

Illumination in 4 seconds – driving was not required

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

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?
( )YES (X)NO

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)

DATA SHEET 3 (Sheet 22 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO F – Right Front Tire Deflation at GVWR

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)

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: 27.6°C (81.7°F) Vehicle cool down period: 62 minutes				
Inflation Pressure	224.8 kPa (32.6 psi)	225.2 kPa (32.7 psi)	225.1 kPa (32.6 psi)	149.6 kPa (21.7 psi)
Tire Sidewall Temp	29.1°C (84.4°F)	28.4°C (83.1°F)	29.0°C (84.2°F)	27.8°C (82.0°F)
San Angelo Test Facility Shop Floor Temp	27.0°C (80.6°F)	27.8°C (82.0°F)	27.2°C (81.0°F)	27.2°C (81.0°F)

After the cool down period of approximately 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 cool down period: Re-adjusted Inflation Pressure:	220.1 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 (X)NO

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL) **PASS**
Right front tire was deflated at GVWR.

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 21, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 23 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO G – Left Rear, Right Rear Tire Deflation at GVWR

TEST DATE: September 21, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Note: See Data Sheet 3 (Sheet 16 of 28) 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 vehicle capacity weight, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: 28.3°C (82.9°F) Vehicle cool down period: 78 minutes				
Inflation Pressure	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)
Tire Sidewall Temp	28.6°C (83.5°F)	27.6°C (81.7°F)	28.2°C (82.8°F)	28.4°C (83.1°F)
San Angelo Test Facility Shop Floor Temp	26.8°C (80.2°F)	27.8°C (82.0°F)	27.6°C (81.7°F)	27.0°C (80.6°F)

SYSTEM CALIBRATION/LEARNING PHASE:
(VBox time – see Section 6 test plots)

Time:	Start:	17:13:25 UTC	End:	17:37:29 UTC
Odometer Reading:	Start:	356.0 km (221.2 mi)	End:	384.2 km (238.7 mi)
Ambient Temperature:	Start:	28.8°C (83.8°F)	End:	29.3°C (84.7°F)
Roadway Temperature:	Start:	40.4°C (104.7°F)	End:	42.2°C (108.0°F)

Driving in first direction:

Starting point: GAFB north gate Direction: south

10:32 minutes (stopwatch time) 14.0 km (8.7 mi) distance

Driving in opposite direction:

Starting point: Brodnax Lane Direction: north

10:38 minutes (stopwatch time) 14.2 km (8.8 mi) distance

Max speed: 82.7 km/hr (51.4 mph)

Total Driving Time: 21:18 minutes (VBox time)

DATA SHEET 3 (Sheet 24 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO G – Left Rear, Right Rear Tire Deflation at GVWR

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	237.8 kPa (34.5 psi)	240.6 kPa (34.9 psi)	241.8 kPa (35.1 psi)	238.7 kPa (34.6 psi)
Tire Sidewall Temp	41.2°C (106.2°F)	40.4°C (104.7°F)	40.8°C (105.4°F)	38.6°C (101.5°F)
San Angelo Test Facility Shop Floor Temp	27.2°C (81.0°F)	27.8°C (82.0°F)	27.8°C (82.0°F)	27.8°C (82.0°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 ( )RF Inflation Pressure		158.0 kPa (22.9 psi)	158.0 kPa (22.9 psi)	

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Did the telltale illuminate? (X)YES ( )NO

Time to Illuminate:

Illumination in 4 seconds – driving was not required

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

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?
( )YES (X)NO

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)

DATA SHEET 3 (Sheet 25 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO G – Left Rear, Right Rear Tire Deflation at GVWR

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)

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: 32.2°C (90.0°F) Vehicle cool down period: 62 minutes				
Inflation Pressure	223.4 kPa (32.4 psi)	148.9 kPa (21.6 psi)	148.0 kPa (21.5 psi)	226.1 kPa (32.8 psi)
Tire Sidewall Temp	30.9°C (87.6°F)	31.6°C (88.9°F)	31.5°C (88.7°F)	31.2°C (88.2°F)
San Angelo Test Facility Shop Floor Temp	28.4°C (83.1°F)	28.6°C (83.5°F)	28.6°C (83.5°F)	28.4°C (83.1°F)

After the cool down period of approximately 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 cool down period: Re-adjusted Inflation Pressure:	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)

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

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL) **PASS**
Left rear, right rear tires were deflated at GVWR.

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 21, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 3 (Sheet 26 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO H – Left Front, Left Rear, Right Rear, and Right Front Tire Deflation at GVWR

TEST DATE: September 24, 2007 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C70506

Note: See Data Sheet 3 (Sheet 16 of 28) 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 vehicle capacity weight, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: 22.2°C (72.0°F) Vehicle cool down period: overnight				
Inflation Pressure	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)
Tire Sidewall Temp	24.2°C (75.6°F)	24.6°C (76.3°F)	24.8°C (76.6°F)	24.6°C (76.3°F)
San Angelo Test Facility Shop Floor Temp	24.8°C (76.6°F)	25.6°C (78.1°F)	25.4°C (77.7°F)	24.8°C (76.6°F)

SYSTEM CALIBRATION/LEARNING PHASE:
(VBox time – see Section 6 test plots)

Time:	Start:	13:25:51 UTC	End:	13:50:06 UTC
Odometer Reading:	Start:	386.2 km (240.0 mi)	End:	414.4 km (257.5 mi)
Ambient Temperature:	Start:	22.2°C (72.0°F)	End:	22.9°C (73.2°F)
Roadway Temperature:	Start:	25.8°C (78.4°F)	End:	24.4°C (75.9°F)

Driving in first direction:

Starting point: GAFB north gate Direction: south

10:15 minutes (stopwatch time) 14.0 km (8.7 mi) distance

Driving in opposite direction:

Starting point: Brodnax Lane Direction: north

10:45 minutes (stopwatch time) 14.2 km (8.8 mi) distance

Max speed: 82.7 km/hr (51.4 mph)

Total Driving Time: 21:14 minutes (VBox time)

DATA SHEET 3 (Sheet 27 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO H – Left Front, Left Rear, Right Rear, and Right Front Tire Deflation at GVWR

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	236.6 kPa (34.3 psi)	239.7 kPa (34.8 psi)	239.9 kPa (34.8 psi)	237.3 kPa (34.4 psi)
Tire Sidewall Temp	33.2°C (91.8°F)	33.8°C (92.8°F)	33.8°C (92.8°F)	32.6°C (90.7°F)
San Angelo Test Facility Shop Floor Temp	24.6°C (76.3°F)	25.2°C (77.4°F)	25.2°C (77.4°F)	25.2°C (77.4°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: (X)LF (X)LR (X)RR (X)RF Inflation Pressure	158.0 kPa (22.9 psi)	158.1 kPa (22.9 psi)	158.0 kPa (22.9 psi)	158.1 kPa (22.9 psi)

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Did the telltale illuminate? (X)YES ( )NO

Time to Illuminate:

Illumination in 5 seconds – driving was not required

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

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?
( )YES (X)NO

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)

DATA SHEET 3 (Sheet 28 of 28)
TPMS OPERATIONAL PERFORMANCE

SCENARIO H – Left Front, Left Rear, Right Rear, and Right Front Tire Deflation at GVWR

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)

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: 24.3°C (75.7°F) Vehicle cool down period: 64 minutes				
Inflation Pressure	151.5 kPa (22.0 psi)	150.7 kPa (21.9 psi)	150.8 kPa (21.9 psi)	151.2 kPa (21.9 psi)
Tire Sidewall Temp	26.8°C (80.2°F)	26.8°C (80.2°F)	27.2°C (81.0°F)	25.8°C (78.4°F)
San Angelo Test Facility Shop Floor Temp	25.6°C (78.1°F)	26.4°C (79.5°F)	26.2°C (79.2°F)	25.2°C (77.4°F)

After the cool down period of approximately 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 cool down period: Re-adjusted Inflation Pressure:	220.1 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.0 kPa (31.9 psi)	220.1 kPa (31.9 psi)

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

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL) **PASS**
Left front, left rear, right rear, and right front tires were deflated at GVWR.

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 24, 2007

APPROVED BY: Kenneth H. Yates

DATA SHEET 4 (Sheet 1 of 2)
SCENARIO I – Malfunction Detection Test at LLVW

TEST DATE: September 20, 2007 LAB: SATF VEHICLE NHTSA NO: C70506

Time:	Start:	15:01:38 UTC	End:	15:05:24 UTC
Odometer Reading:	Start:	266.5 km (165.6 mi)	End:	271.7 km (168.8 mi)
Ambient Temperature:	Start:	25.2°C (77.4°F)		
Roadway Temperature:	Start:	31.2°C (88.2°F)		
Fuel Level:	Start:	Full		

Note: See Data Sheet 3 (Sheet 2 of 28) for Test Weight.

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

TPMS MALFUNCTION TELLTALE:
( )Dedicated stand-alone (X)Combination low tire pressure warning/malfunction telltale

METHOD OF MALFUNCTION SIMULATION:

Describe method of malfunction simulation: Compact spare tire assembly without sensor was installed on left front wheel position at LLVW.

MALFUNCTION TELLTALE ILLUMINATION
(after ignition locking system is activated to "On" ("Run") position):

Combination Low Tire Pressure Warning / Malfunction Telltale

Driving in first direction:

Starting point: San Angelo Test Facility shop Direction: east

Did the telltale illuminate? (X)YES ( )NO

8.7 seconds (stopwatch time) 0.16 km (0.1mi) distance

Max speed: 54.7 km/hr (34.0 mph)
Total Driving Time: 8.6 seconds (VBox time)

COMBINATION MALFUNCTION TELLTALE ILLUMINATES (FLASHING AND ILLUMINATION SEQUENCE) WITHIN 20 MINUTES:
(X)YES ( )NO

DATA SHEET 4 (Sheet 2 of 2)
SCENARIO I – Malfunction Detection Test at LLVW

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? (X)YES ( )NO (fail)

Time it takes before telltale starts flashing 3 seconds

Time telltale remains flashing 74 seconds

Time telltale remains illuminated 66+ seconds
(Verified for a minimum of 60 seconds)

Deactivate the ignition locking system and then re-start the vehicle engine. Does the telltale re-illuminate and stay illuminated (not flashing) for at least 60 seconds after flashing when the ignition locking system is activated and the engine running?
(X)YES ( )NO (fail)

Extinguishment Phase:

Restore the TPMS to normal operation. Does the malfunction telltale extinguish when the engine is started? ( )YES (X)NO

Driving in first direction:

Starting point: San Angelo Test Facility shop Direction: east

Did the telltale extinguish? (X)YES ( )NO

33 seconds (stopwatch time – non-cumulative) 0.16 km (0.1 mi) distance

Max speed: 34.5 km/hr (21.4 mph)

Total Driving Time: 00:00 minutes (VBox time)

COMBINATION MALFUNCTION TELLTALE EXTINGUISHED:
(X)YES ( )NO

TPMS MALFUNCTION PERFORMANCE TEST RESULTS (PASS/FAIL) **PASS**
Compact spare tire assembly was installed on left front wheel position at LLVW.

REMARKS: None

RECORDED BY: Robert N. Gregg DATE: September 20, 2007

APPROVED BY: Kenneth H. Yates

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

TEST DATE: September 28, 2007 LAB: San Angelo Test Facility VEHICLE NHTSA NO: C70506

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

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

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 (X)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 (X)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 (X)NO

DATA INDICATES COMPLIANCE: PASS/FAIL PASS/FAIL: **FAIL**

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

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: The X3 is equipped with a TPMS MIL that appears to be compliant with the requirements of the Standard. However, the owner's manual documentation is not exactly as required by the Standard Paragraph S.4.5, Written Instructions.

RECORDED BY: Robert N. Gregg DATE: September 20, 2007

APPROVED BY: Kenneth H. Yates

SECTION 4

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

TABLE 1 - INSTRUMENTATION AND EQUIPMENT INFORMATION LIST

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO	CAL. DATE	NEXT CAL. DATE
STOPWATCH	WESTCLOX QUARTZ STOPWATCH	NONE	N/A	N/A
VBOX RECORDING DEVICE	RACELOGIC VBOX III	SERIAL #030209	2/28/2007	2/27/2008
AMBIENT TEMPERATURE GAUGE	FLUKE 50D K/J THERMOMETER	SERIAL #80840101	3/8/2007	3/8/2008
LASER TEMPERATURE GAUGE (TIRES AND GROUND)	RAYNGER ST20 PRO NON-CONTACT INFRARED THERMOMETER	SERIAL #2065640101-0014	8/14/2007	8/14/2008
AIR PRESSURE GAUGE	ASHCROFT GENERAL PURPOSE DIGITAL GAUGE	MODEL #D1005PS 02L 100 PSI SERIAL #20017398-01	12/20/2006	12/20/2007
FLOOR SCALES (VEHICLE)	INTERCOMP SW DELUXE SCALES	PART #100156 SERIAL #27032382	8/14/2007	8/14/2008
PLATFORM SCALE (BALLAST)	HOWE RICHARDSON	MODEL #6401 SERIAL #0181-5509-26	8/14/2007	8/14/2008

SECTION 5

PHOTOGRAPHS

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO.138

FIGURE 5.1
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO.138

FIGURE 5.2
VEHICLE CERTIFICATION LABEL

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.3
VEHICLE PLACARD

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.4
TIRE SHOWING BRAND

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.5
TIRE SHOWING MODEL

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.6
TIRE SHOWING SIZE, LOAD INDEX, AND SPEED RATING

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

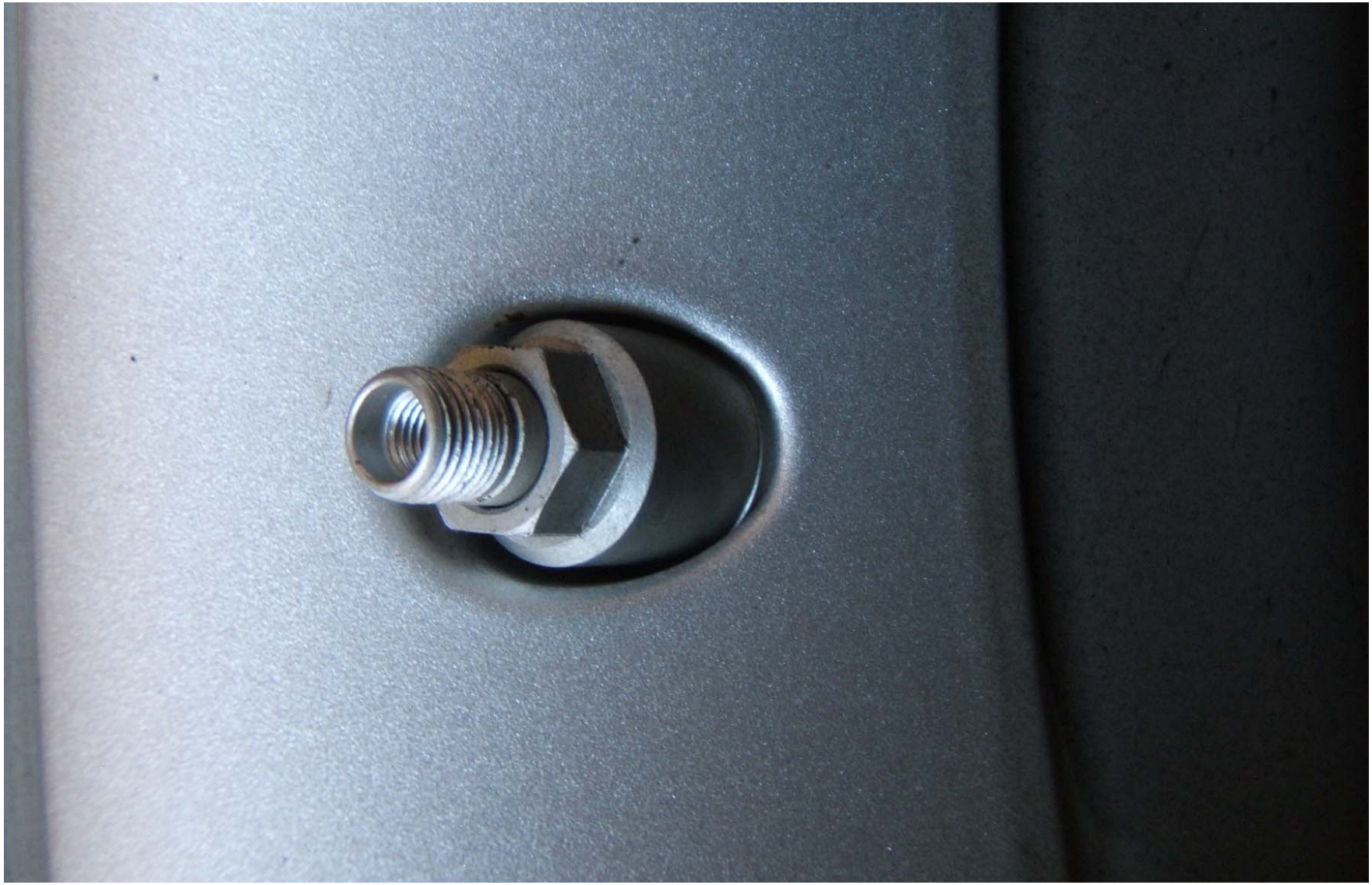
FIGURE 5.7
TIRE SHOWING DOT SERIAL NUMBER

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

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

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.9
TIRE SHOWING SIDEWALL/TREAD CONSTRUCTION



2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.10
RIM SHOWING VALVE STEM

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.11
INSTRUMENT PANEL SHOWING
COMBINATION LOW TIRE PRESSURE
TELLTALE / MALFUNCTION TELLTALE

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO 138

FIGURE 5.12
TEST INSTRUMENTATION ON VEHICLE

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.13
VEHICLE REAR SEAT BALLAST FOR GVWR LOAD

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.14
REAR OF VEHICLE BALLAST
FOR GVWR LOAD

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

FIGURE 5.15
VEHICLE ON WEIGHT SCALES

2007 BMW X3 3.0SI
NHTSA NO. C70506
FMVSS NO. 138

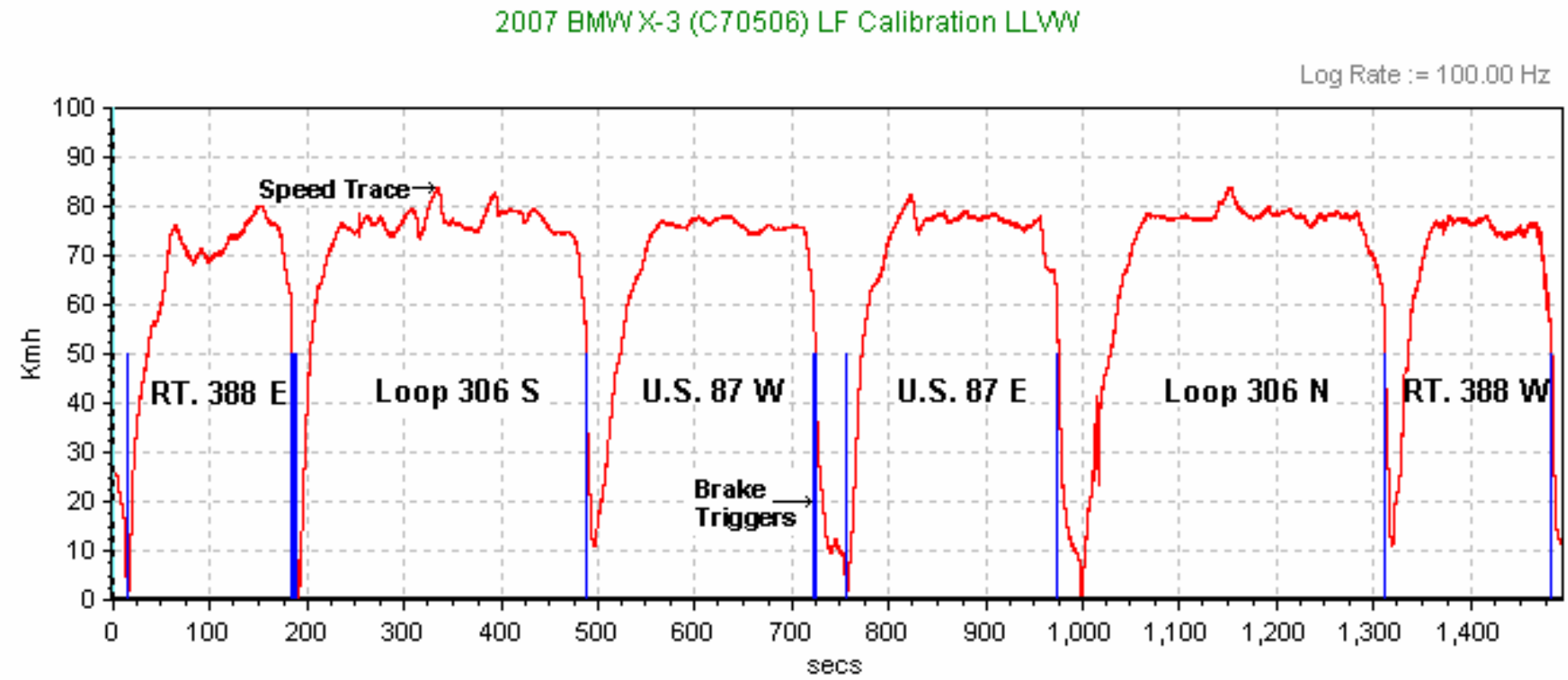
FIGURE 5.16
SPARE INSTALLED ON LEFT FRONT POSITION
FOR MALFUNCTION DETECTION TEST

SECTION 6

TEST PLOTS

Scenario A:	Left Front Tire
Test Date:	9/19//07
Data File Time:	24:55 minutes
Cumulative Driving Time:	21:05 minutes
Start Point:	GAFB North Gate

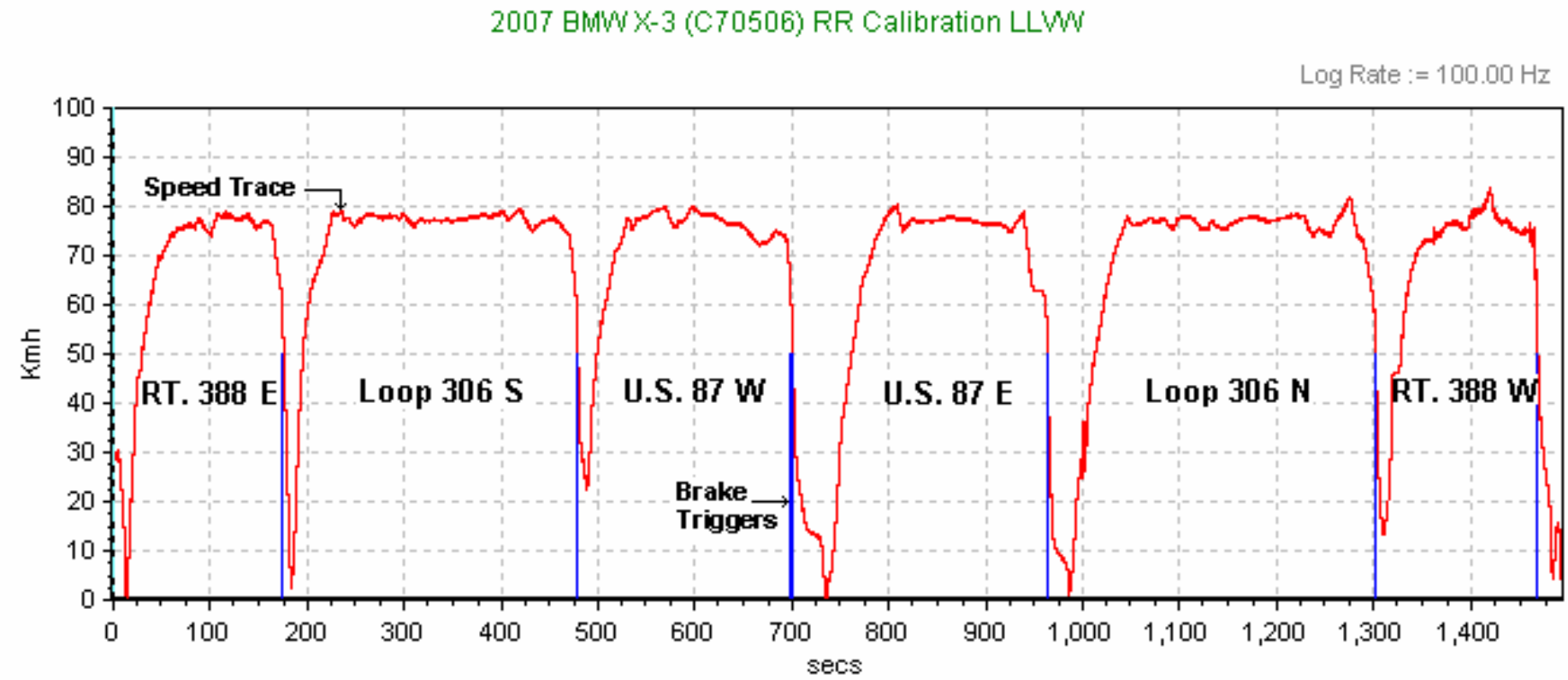
Calibration Phase:



LF Detection Phase: Illumination in 10 seconds. Driving was not required.

Scenario B:	Right Rear Tire
Test Date:	9/18/07
Data File Time:	24:55 minutes
Cumulative Driving Time:	21:01 minutes
Start Point:	GAFB North Gate

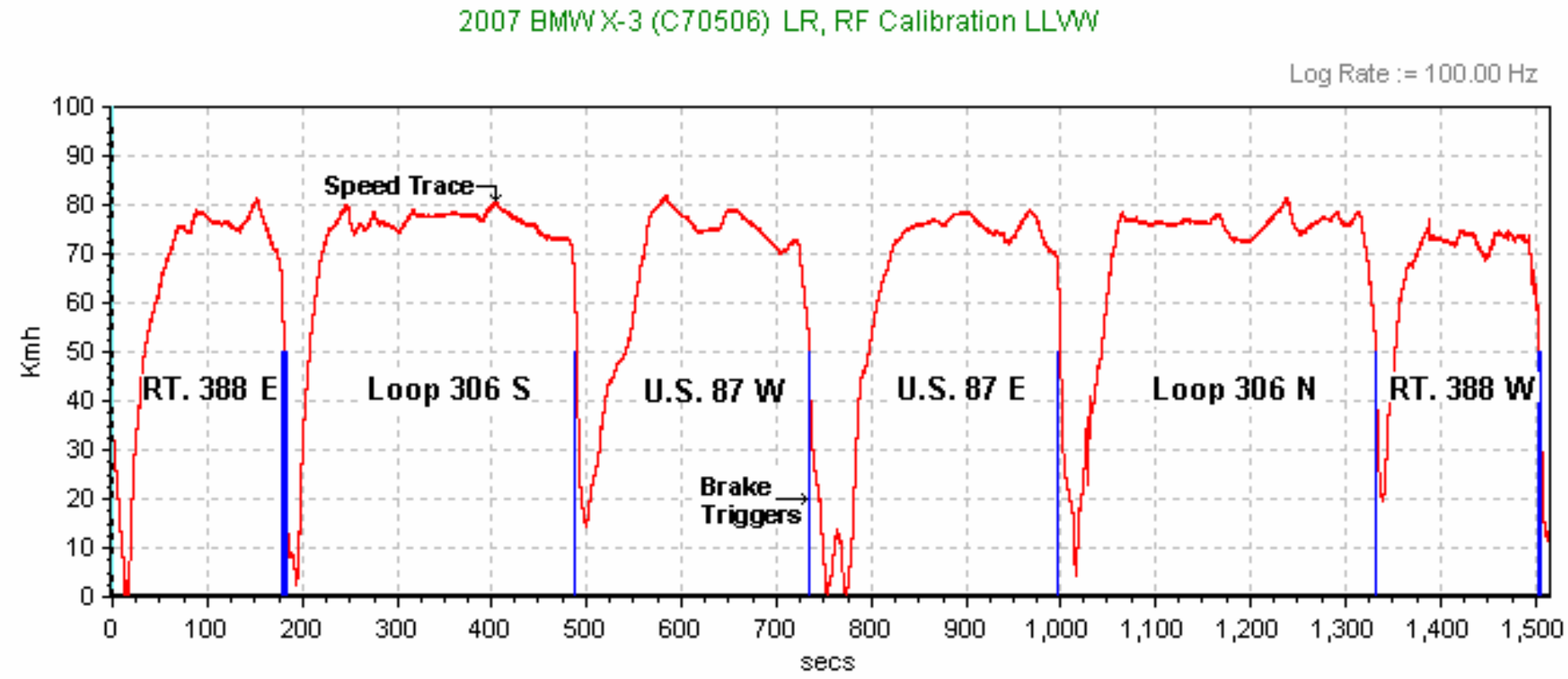
Calibration Phase:



RR Detection Phase: Illumination in 9 seconds. Driving was not required.

Scenario C:	Left Rear, Right Front Tires
Test Date:	9/19/07
Data File Time:	25:16 minutes
Cumulative Driving Time:	20:58 minutes
Start Point:	GAFB North Gate

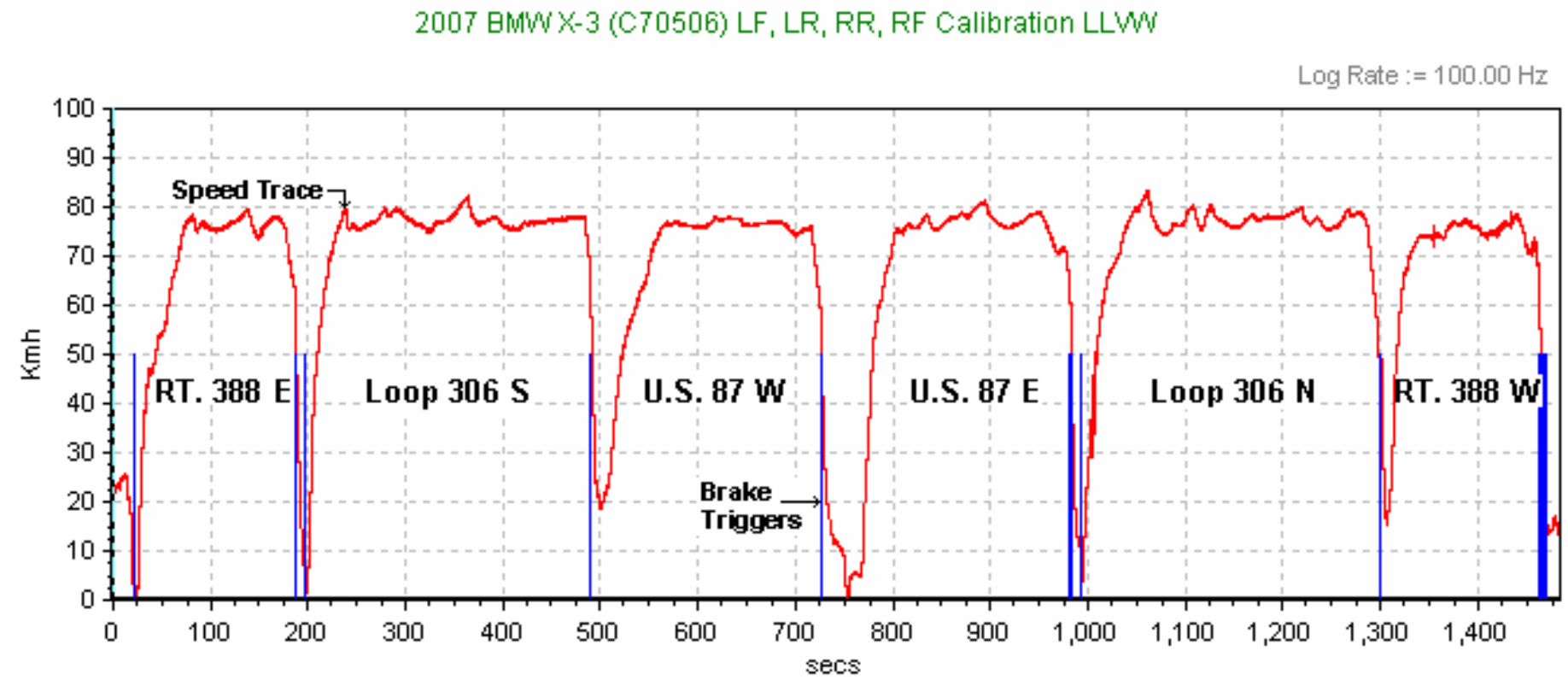
Calibration Phase:



LR, RF Detection Phase: Illumination in 10 seconds. Driving was not required.

Scenario D:	Left Front, Left Rear, Right Rear, Right Front Tire
Test Date:	9/20/07
Data File Time:	24:45 minutes
Cumulative Driving Time:	21:08 minutes
Start Point:	GAFB North Gate

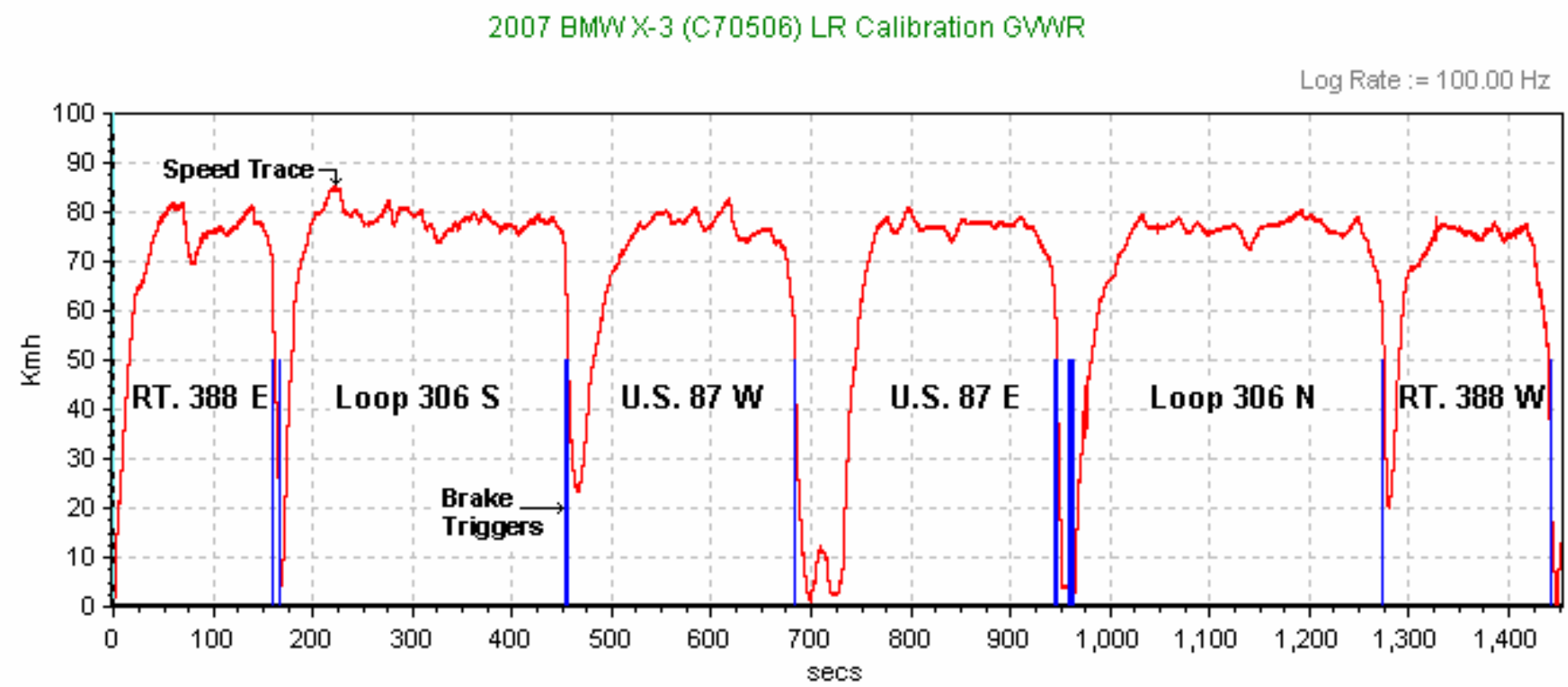
Calibration Phase:



LF, LR, RR, RF Detection Phase: Illumination in 9 seconds. Driving was not required.

Scenario E:	Left Rear Tire
Test Date:	9/21/07
Data File Time:	24:15 minutes
Cumulative Driving Time:	21:08 minutes
Start Point:	GAFB North Gate

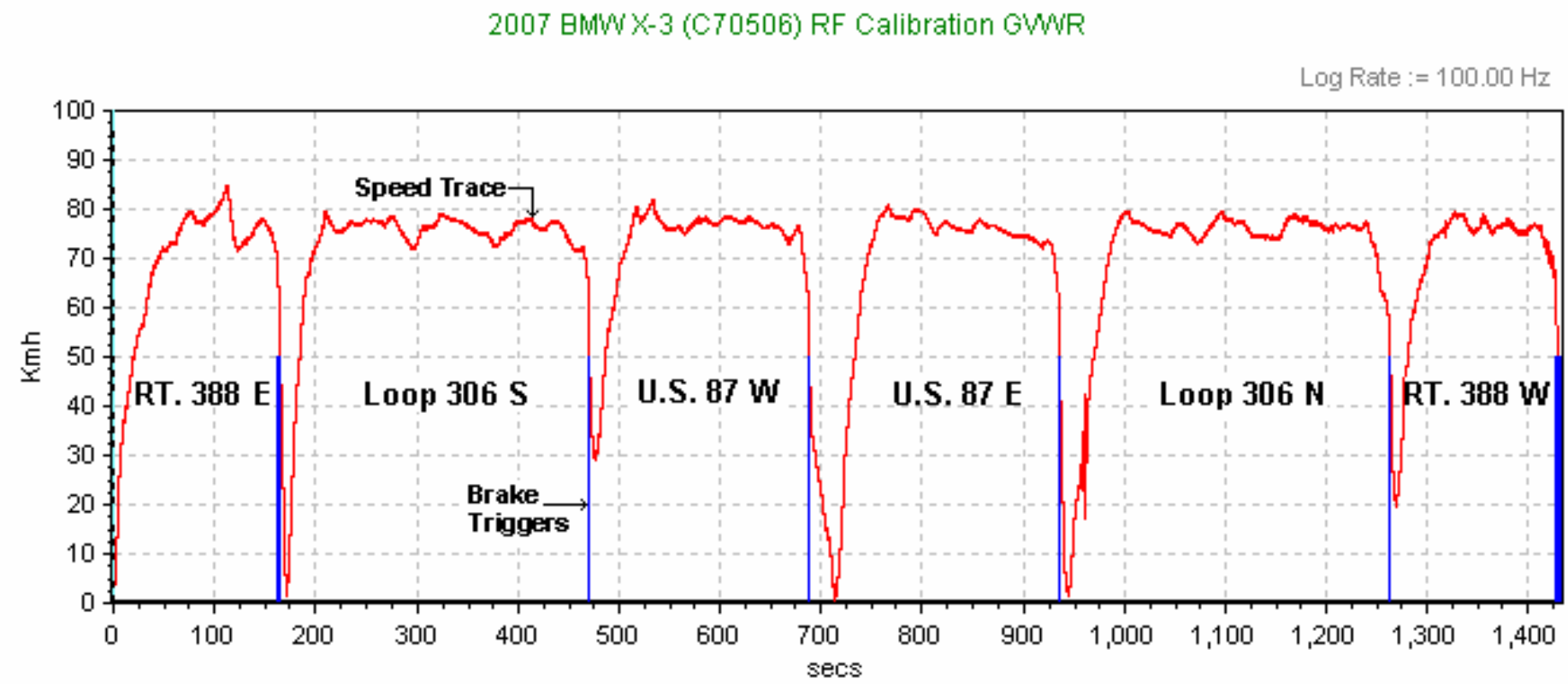
Calibration Phase:



LR Detection Phase: Illumination in 4 seconds. Driving was not required.

Scenario F:	Right Front Tire
Test Date:	9/21/07
Data File Time:	23:54 minutes
Cumulative Driving Time:	21:13 minutes
Start Point:	GAFB North Gate

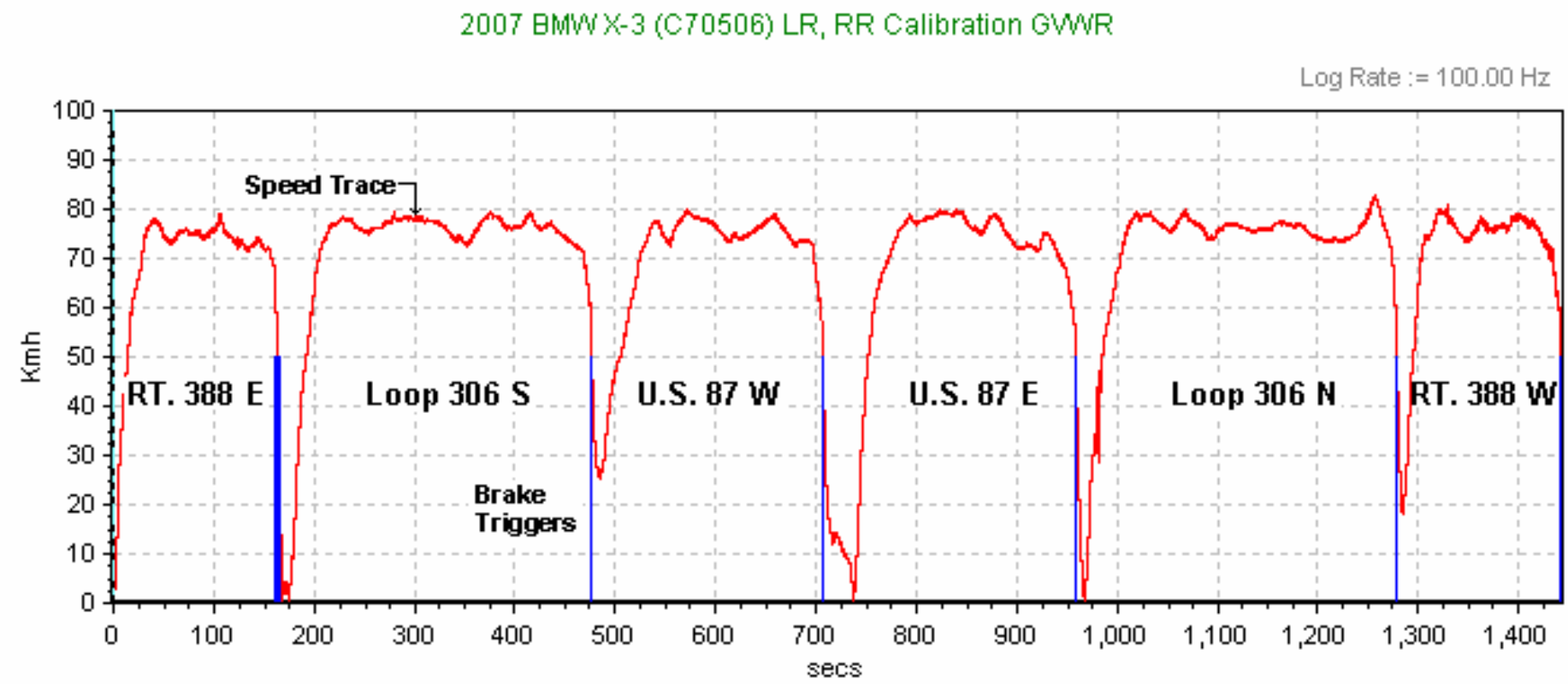
Calibration Phase:



RF Detection Phase: Illumination in 4 seconds. Driving was not required.

Scenario G:	Left Rear, Right Rear Tires
Test Date:	9/21/07
Data File Time:	24:04 minutes
Cumulative Driving Time:	21:18 minutes
Start Point:	GAFB North Gate

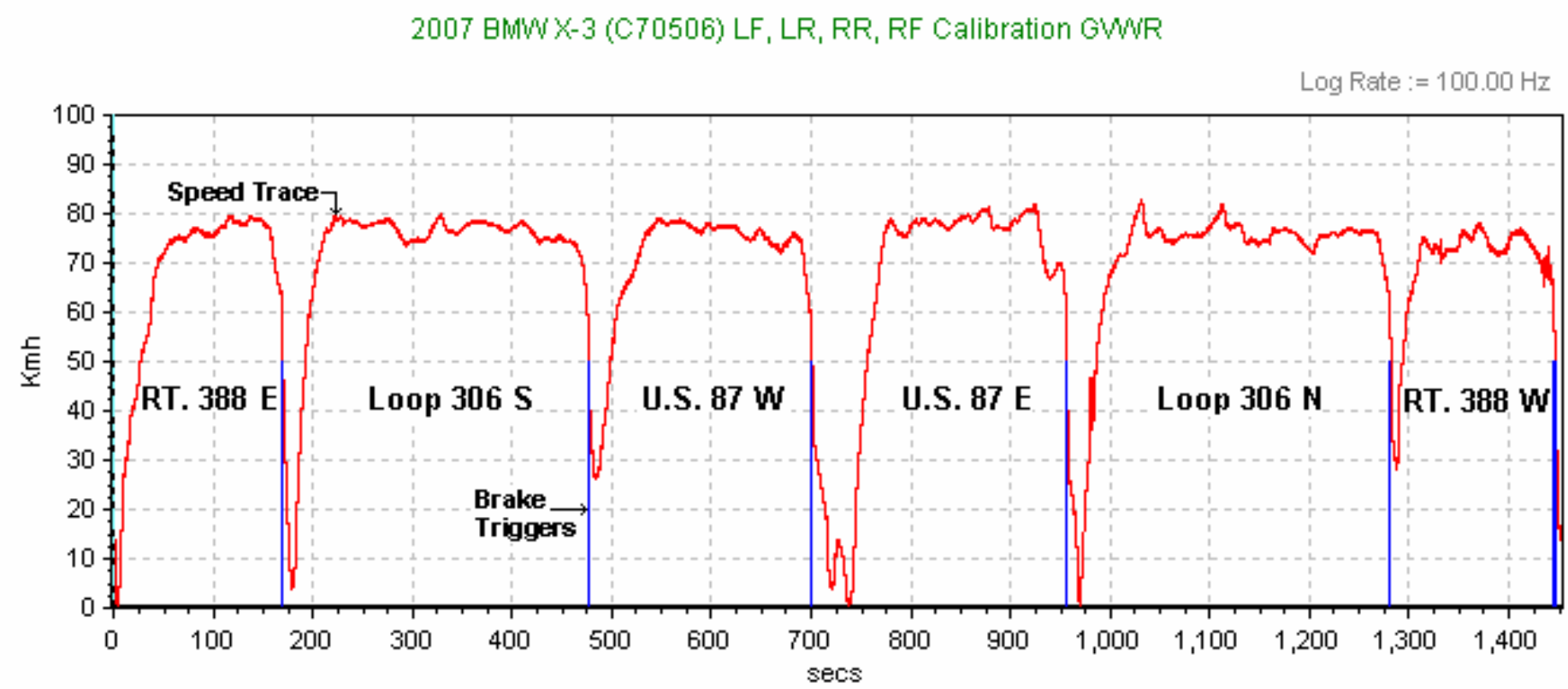
Calibration Phase:



LR, RR Detection Phase: Illumination in 4 seconds. Driving was not required.

Scenario H:	Left Front, Left Rear, Right Rear, Right Front Tires
Test Date:	9/24/07
Data File Time:	24:15 minutes
Cumulative Driving Time:	21:14 minutes
Start Point:	GAFB North Gate

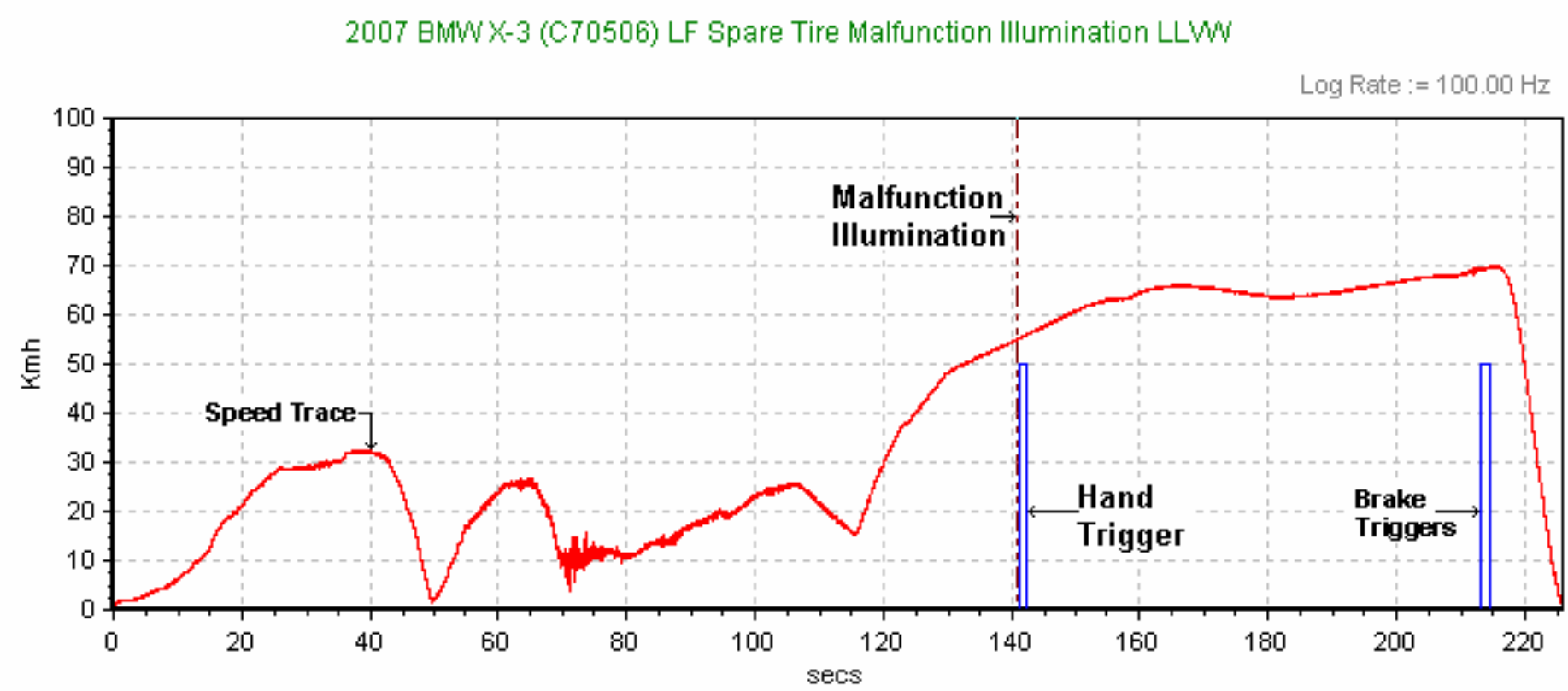
Calibration Phase:



LF, LR, RR, RF Detection Phase: Illumination in 5 seconds. Driving was not required.

Scenario I: Compact Spare without Sensor Installed on Left Front Position
Test Date: 9/20/07
Data File Time: 03:46 minutes
Cumulative Driving Time
to Illumination: 8.6 seconds
Start Point: San Angelo Test Facility Shop

Malfunction Detection:



SECTION 7

LABORATORY NOTICE OF TEST FAILURE

FMVSS NO.: 138 TEST DATE: September 18 through September 24, 2007

LABORATORY: US DOT San Angelo Test Facility

CONTRACT NO.: N/A DELIVERY ORDER NO.: N/A

LABORATORY PROJECT ENGINEER'S NAME: Kenneth H. Yates

TEST SPECIMEN DESCRIPTION: 2007 BMW X3 3.0si four-door MPV

NHTSA VEHICLE NUMBER: C70506 VIN: WBXPC93497WF22356

MANUFACTURER: Bayerische Motoren Werke AG

TEST FAILURE DESCRIPTION: The manufacturer did not comply with the exact written instruction requirements specified in S4.5.

FMVSS REQUIREMENT, PARAGRAPH : S138, S4.5

"Beginning on September 1, 2006, the owner's manual in each vehicle certified as complying with S4 must provide an image of the Low Tire Pressure Telltale symbol .... with the following statement in English....."

NOTIFICATION TO NHTSA (COTR): John Finneran

DATE: December 6, 2007 BY: Kenneth H. Yates

REMARKS: