

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

KIA MOTORS CORPORATION
2019 KIA SEDONA L
MPV
NHTSA NO. C20194200

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



MARCH 27, 2019

PREPARED FOR

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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
NEF-200
OFFICE OF VEHICLE SAFETY COMPLIANCE
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SECTION 1

INTRODUCTION

1.1 PURPOSE OF COMPLIANCE TEST

This testing was conducted as part of the Department of Transportation, National Highway Traffic Safety Administration's Federal Motor Vehicle Safety Standard (FMVSS) No. 138, "Tire Pressure Monitoring Systems" Compliance Program. The purpose of the test was to determine if the 2019 Kia Sedona L supplied by the Office of Vehicle Safety Compliance satisfies the requirements of TP-138-04 dated August 28, 2017.

1.2 TEST VEHICLE

The test vehicle was a 2019 Kia Sedona L MPV. Nomenclatures applicable to the test vehicle are:

- A. Vehicle Identification Number: KNDMA5C10K6508680
- B. NHTSA Number: C20194200
- C. Manufacturer: Kia Motors Corporation
- D. Manufacture Date: 10/2018

1.3 TEST DATE

The test vehicle was tested February 28 through March 14, 2019.

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 two tire deflation scenarios. This LLVW included the UVW and the weights of the driver, one passenger, and test equipment. The vehicle was loaded to its UVW plus Vehicle Capacity Weight (VCW) for two additional tire deflation scenarios. The VCW included the weights of the 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 3iSL 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 Cumulative Driving Time'.

The low tire pressure test scenarios consisted of five phases, in accordance with FMVSS 138, Test Procedures, Section S6:

1. Lamp Check Phase, S6(a) through (c): With the vehicle stationary and the ignition locking system in the "Lock" or "Off" position, the tires were set at the vehicle's placard cold inflation pressure and the ignition locking system was activated to the "On" ("Run") position. The ignition locking system can also be initially positioned as designated by the manufacturer as a check position. If applicable, the set/reset button was used to reset the TPMS system in accordance with the instructions in the vehicle owner's manual.
2. Calibration Phase, S6(d): The vehicle was driven for at least twenty minutes of cumulative driving time between 50 and 100 km/h. Immediately after, 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.
3. Detection Phase, S6(f): The vehicle was started and driven (if necessary) to ensure that the low inflation pressure telltale illuminated. The test is discontinued if no illumination occurs.
 4. Re-illumination Phase, S6(g) through (h): Vehicle was parked in the San Angelo Test Facility (SATF) open bay shielded from direct sunlight and the ignition locking system deactivated to the "Off" or "Lock" position. 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.
 5. Extinguishment Phase, S6(i): Tires were adjusted to vehicle placard cold inflation pressure. If the vehicle has a manual reset, the set/reset button was used to reset the TPMS system illumination. The system was reset as required by the owner's manual instructions or manufacturer's supplied information. If necessary, the vehicle was driven to ensure that the TPMS telltale is extinguished.

The two gradual deflation test scenarios, Section 13.4 of Test Procedures of FMVSS 138, followed the steps for the low tire pressure test above except that:

Calibration Phase: The vehicle was driven for 20 to 22 minutes of cumulative driving time between 50 and 100 km/h. Immediately after, the selected tire(s) were deflated to fourteen kPa (two psi) below the Recommended Cold Inflation Pressure(s). After one minute, the inflation pressure(s) of only deflated tire(s) were rechecked and adjusted if necessary.

Detection Phase: The vehicle was started and driven for 20 to 22 minutes at speeds between 50 and 100 km/h to determine if the low inflation pressure telltale illuminated. If no illumination occurred, the selected tire(s) were deflated an additional fourteen kPa (two psi) and after one minute, the pressure(s) were rechecked and adjusted if necessary. The cycle of fourteen kPa deflation was repeated until illumination occurred. Testing would have stopped if illumination had not occurred before deflation pressures reached more than 33% below the manufacturer's recommended cold inflation pressure threshold.

Two malfunction scenarios were performed: For the first malfunction, the right rear tire was replaced with the spare, which has no TPMS sensor, at LLVW. For the second malfunction scenario, the TPMS fuse was removed at UVW+VCW.

2.2 SUMMARY OF RESULTS

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

- A. Left rear
- B. Left front, left rear, right rear, right front

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

- C. Right front
- D. Right rear, right front

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

One gradual deflation scenario was performed on the test vehicle at LLVW:

Gradual Deflation 1: Left front, left rear, right rear, right front

One gradual deflation scenario was performed on the test vehicle at UVW+VCW:

Gradual Deflation 2: Left rear

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

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

Malfunction 1: Right rear tire was replaced with the spare, which has no TPMS sensor, at LLVW.

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

Malfunction 2: The TPMS fuse was removed at UVW+VCW.

The data indicate compliance of the test vehicle's tire pressure monitoring system for the two malfunction detection scenarios tested.

SECTION 3

TEST DATA

FMVSS No. 138 – TEST DATA SUMMARY

TEST DATES: February 23 through March 14, 2019

LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

VIN: KNDMA5C10K6508680

CERTIFICATION LABEL BUILD DATE: 10/2018

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: February 28, 2019 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200 VIN: KNDMA5C10K6508680

CERTIFICATION LABEL BUILD DATE: 10/2018 ENGINE: 3.3L, 6-cylinder

MY/MAKE/MODEL/BODY STYLE: 2019 Kia Sedona L MPV

TIRE CONDITIONING:

(X) Tires used more than 100 km. Actual odometer reading: 63 mi (101 km)

VEHICLE ALIGNMENT AND WHEEL BALANCING:

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

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

TPMS IDENTIFICATION:

TPMS MAKE/MODEL: Sensors: Mobis (Sensata); ECU: Mobis

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

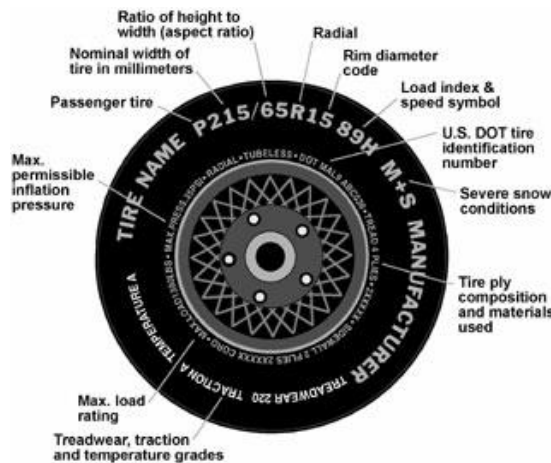
DATA SHEET 1 (Sheet 2 of 3)
TEST PREPARATION INFORMATION

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

Axle	Tire Size	Recommended Cold Inflation Pressure	Source
Front	235/65R17	240 kPa, 35 psi	Vehicle placard
Rear	235/65R17	240 kPa, 35 psi	Vehicle placard
Spare	T135/90R17	420 kPa 60 psi	Vehicle placard

INSTALLED TIRE DATA

Diagram – Passenger Car Tire Labeling



Front and Rear Axles

Tire Size and Load Index / Speed Rating: 235/65R17 104H

Manufacturer/Tire Name: Hankook Dynapro HP2

Sidewall Max Load Rating: 900 kg, 1,984 lbs.

Max Inflation Pressure: 350 kPa, 51 psi

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

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

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

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

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

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>240 kPa</u> x .75 = <u>180.0 kPa</u>	<u>240 kPa</u> x .75 = <u>180.0 kPa</u>
(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>350</u> kPa <u>140</u> kPa	(X) P-metric-Standard load () P-metric-Extra Load Load Range () C, () D, or () E (X) Maximum or () Rated <u>350</u> kPa <u>140</u> kPa
(C) Telltale Warning Activation Pressure is the higher of Part (A) or (B)	<u>180.0</u> kPa	<u>180.0</u> kPa
(D) Pressure at which to deflate tire(s) = (C) – 7 kPa	<u>173.0</u> kPa	<u>173.0</u> kPa

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: Anthony Walden and Tommy Oliver DATE: February 28, 2019

APPROVED BY: Kenneth Yates

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

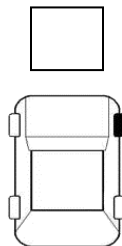
TEST DATE: February 28, 2019 LAB: U.S. DOT San Angelo Test Facility
VEHICLE NHTSA NUMBER: C20194200

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: Top left of LCD display, between
gauges

Identify Telltale Symbol Used (check box above figure).



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

Note any words or additional symbols used: None

DATA SHEET 3 (Sheet 1 of 36)
TPMS OPERATIONAL PERFORMANCE

TEST DATE: February 28, 2019

LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Time: Start: 9:57 am End: 10:23 am

Ambient Temperature: Start: 17.5°C End: 21.2°C

Trip Odometer Reading: Start: 63 mi

Fuel Level: Start: Full

Weather Conditions: Indoors

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

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

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Pre-test cold measurements after ambient soak:				
Inflation Pressure	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa
Tire Sidewall Temp	17.6°C	16.8°C	17.0°C	17.4°C

DATA SHEET 3 (Sheet 2 of 36)
TPMS OPERATIONAL PERFORMANCE

VEHICLE WEIGHT:

Vehicle Ratings from Certification Label:

GVWR: 6,085 lbs., (2,760 kg)
GAWR (front): 3,064 lbs., (1,390 kg)
GAWR (rear): 3,064 lbs., (1,390 kg)

Vehicle Capacity Weight:

Vehicle Capacity Weight: 525 kg, 1,158 lbs.

Measured Unloaded Vehicle Weight:

LF	<u>580.5 kg</u>	LR	<u>432.5 kg</u>
RF	<u>570.5 kg</u>	RR	<u>416.5 kg</u>
Front		Rear	
Axle	<u>1,151.0 kg</u>	Axle	<u>849.0 kg</u>
Total Vehicle <u>2,000.0 kg</u>			

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

LF	<u>641.0 kg</u>	LR	<u>475.5 kg</u>
RF	<u>626.0 kg</u>	RR	<u>457.5 kg</u>
Front		Rear	
Axle	<u>1,267.0 kg (≤ GAWR)</u>	Axle	<u>933.0 kg (≤ GAWR)</u>
Total Vehicle <u>2,200.0 kg</u> (not greater than GVWR)			

Note: For scenarios A and B, Malfunction Test 1, and Gradual Deflation 1, this Total Vehicle Weight measures the vehicle loaded to Lightly Loaded Vehicle Weight (LLVW). This consisted of the Unloaded Vehicle Weight (UVW) and 200.0 kg of driver, passenger, and test equipment.

RECORDED BY: Anthony Walden and Tommy Oliver DATE: February 28, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 3 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO A – Left Rear Tire Deflation at LLVW

TEST DATE: March 6, 2019 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Note: See Data Sheet 3 (Sheet 2 of 36) 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>12.2°C</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa
Tire Sidewall Temp	13.4°C	11.8°C	13.4°C	13.6°C
San Angelo Test Facility Shop Floor Temp	14.0°C	13.4°C	13.8°C	14.4°C

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 17:09:45 UTC End: 17:35:47 UTC
Trip Odometer Reading: Start: 63.9 mi End: 83.6 mi
Ambient Temperature: Start: 12.0°C End: 11.2°C
Roadway Temperature: Start: 15.2°C End: 16.6°C
Weather Conditions: Cold and clear

Driving in first direction:

Starting point: GAFB North Gate Direction: see chart, page 71
10:11 minutes (cumulative stopwatch time) 9.8 mi distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 71
10:25 minutes (cumulative stopwatch time) 9.9 mi distance

Max speed: 96.79 km/h

Total Cumulative Driving Time: 20:36 minutes (VBOX processed data)

DATA SHEET 3 (Sheet 4 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO A – Left 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	255.9 kPa	254.9 kPa	254.0 kPa	256.3 kPa
Tire Sidewall Temp	21.8°C	18.2°C	18.8°C	21.8°C
San Angelo Test Facility Shop Floor Temp	14.2°C	13.6°C	14.0°C	14.6°C

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		173.0 kPa		

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Direction: see chart, page 72

Total distance to illumination: 1.1 mi

Time to illumination: 0:41 seconds (cumulative stopwatch time)

Max speed: 83.22 km/h

Total Cumulative Driving Time: 0:41 seconds (VBOX processed data)

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?

()YES (X)NO*

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)

*The vehicle has a plan view which shows inflation for all tires.

DATA SHEET 3 (Sheet 5 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO A – Left Rear Tire Deflation at LLVW

TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>13.5°C</u> Vehicle cool down period: <u>66</u> minutes				
Inflation Pressure	246.7 kPa	168.1 kPa	245.4 kPa	247.4 kPa
Tire Sidewall Temp	17.4°C	14.8°C	16.4°C	18.6°C
San Angelo Test Facility Shop Floor Temp	15.4°C	14.2°C	14.8°C	15.6°C

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?

(X)YES ()NO (fail)

TELLTALE EXTINGUISHMENT:

RE-ADJUSTED TIRE INFLATION PRESSURES:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:				
	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa

Is it necessary to use a set/reset button to extinguish the low tire pressure telltale?

()YES ()NO (X)N/A

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

Starting point: San Angelo Test Facility shop

Total distance to extinguishment: 0.1 mi

Time to extinguishment: 1:42 minutes (non-cumulative stopwatch time)

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL)

PASS

Left rear tire was deflated at LLVW.

REMARKS: None

RECORDED BY: Anthony Walden and Tommy Oliver

DATE: March 6, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 6 of 36)
TPMS OPERATIONAL PERFORMANCE
NORMAL DEFLATION TEST, SCENARIO B – Left Front, Left Rear,
Right Rear, Right Front Tire Deflation at LLVW

TEST DATE: March 7, 2019 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Note: See Data Sheet 3 (Sheet 2 of 36) 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>11.9°C</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa
Tire Sidewall Temp	11.2°C	10.8°C	10.8°C	11.2°C
San Angelo Test Facility Shop Floor Temp	12.8°C	12.4°C	12.4°C	13.2°C

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 15:04:51 UTC End: 15:30:20 UTC
Trip Odometer Reading: Start: 87.8 mi End: 107.5 mi
Ambient Temperature: Start: 12.0°C End: 13.2°C
Roadway Temperature: Start: 12.8°C End: 16.4°C
Weather Conditions: Partly cloudy and cool

Driving in first direction:

Starting point: GAFB North Gate Direction: see chart, page 73
10:11 minutes (cumulative stopwatch time) 9.8 mi distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 73
10:26 minutes (cumulative stopwatch time) 9.9 mi distance

Max speed: 101.90 km/h

Total Cumulative Driving Time: 20:28 minutes (VBOX processed data)

DATA SHEET 3 (Sheet 7 of 36)
TPMS OPERATIONAL PERFORMANCE

**NORMAL DEFLATION TEST, SCENARIO B – Left Front, Left Rear,
Right Rear, 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	261.8 kPa	258.8 kPa	259.9 kPa	262.0 kPa
Tire Sidewall Temp	25.8°C	22.8°C	20.6°C	24.2°C
San Angelo Test Facility Shop Floor Temp	13.6°C	12.8°C	13.0°C	13.6°C

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	173.0 kPa	173.0 kPa	173.0 kPa	173.0 kPa

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Total distance to illumination: 0.4 mi

Time to illumination: 2:19 minutes (non-cumulative stopwatch time)

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?

()YES (X)NO*

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)

*The vehicle has a plan view which shows inflation for all tires.

DATA SHEET 3 (Sheet 8 of 36)
TPMS OPERATIONAL PERFORMANCE

**NORMAL DEFLATION TEST, SCENARIO B – Left Front, Left Rear,
Right Rear, Right Front Tire Deflation at LLVW**

TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>16.6°C</u> Vehicle cool down period: <u>65</u> minutes				
Inflation Pressure	167.4 kPa	168.0 kPa	168.3 kPa	168.3 kPa
Tire Sidewall Temp	19.8°C	17.4°C	18.0°C	19.6°C
San Angelo Test Facility Shop Floor Temp	15.4°C	14.8°C	15.0° C	15.6°C

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?

(X)YES ()NO (fail)

TELLTALE EXTINGUISHMENT:

RE-ADJUSTED TIRE INFLATION PRESSURES:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:				
	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa

Is it necessary to use the set/reset button to extinguish the low tire pressure telltale?

()YES ()NO (X)N/A

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

Starting point: San Angelo Test Facility shop

Total distance to extinguishment: 0.2 mi

Time to extinguishment: 2:16 minutes (non-cumulative stopwatch time)

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: Anthony Walden and Tommy Oliver

DATE: March 7, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 9 of 36)
TPMS OPERATIONAL PERFORMANCE

MALFUNCTION DETECTION TEST 1 -
Spare Tire without TPMS Sensor Mounted on Right Rear at LLVW

TEST DATE: March 7, 2019

LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Time: Start: 1:08 pm End: 2:32 pm

Trip Odometer Reading: Start: 109.5 mi End: 143.1 mi

Ambient Temperature: Start: 20.6°C End: 22.6°C

Note: See Data Sheet 3 (Sheet 2 of 36) 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 without TPMS sensor replaced the
right rear tire (see Figure 5.14).

MALFUNCTION TELLTALE ILLUMINATION

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

Combination Malfunction Telltale

Driving in first direction:

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Direction: see chart, page 77

Total distance to illumination: 18.1 mi

Time to illumination: 18:34 minutes total cumulative driving time

Max speed: 96.14 km/h

Total Cumulative Driving Time: 18:34 minutes (VBOX processed data)

TEST RESULTS

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

(☒) YES (☐) NO

DATA SHEET 3 (Sheet 10 of 36)
TPMS OPERATIONAL PERFORMANCE

MALFUNCTION DETECTION TEST 1 -
Spare Tire without TPMS Sensor Mounted on Right Rear 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 70 seconds (See Remarks)
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? (X)YES ()NO (fail)

Extinguishment Phase:

Starting point: San Angelo Test Facility shop
Total distance to extinguishment: 0.2 mi
Time to extinguishment: 1:50 total driving time (non-cumulative stopwatch time)

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

TPMS MALFUNCTION PERFORMANCE TEST RESULTS (PASS/FAIL) PASS
Spare tire without TPMS sensor was mounted on right rear.

REMARKS: None

RECORDED BY: Anthony Walden and Tommy Oliver DATE: March 7, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 11 of 36)
TPMS OPERATIONAL PERFORMANCE

**GRADUAL DEFLATION TEST 1 – Left Front, Left Rear, Right Rear,
Right Front Deflation at LLVW**

TEST DATE: March 8, 2019

LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Time: Start: 9:00 am End: 12:55 pm

Ambient Temperature: Start: 16.9°C End: 22.1°C

Odometer Reading (mi): Start: 144.4 End: 228.0

Fuel Level: Start: Full End: 3.0 gallons used

Note: See Data Sheet 3 (Sheet 2 of 36) for Test Weight.

TIRE INFLATION PRESSURES AND TIRE/ROADWAY TEMPERATURES

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Pre-test cold measurements after ambient soak	243.1 kPa	242.8 kPa	242.7 kPa	243.4 kPa

DATA SHEET 3 (Sheet 12 of 36)
TPMS OPERATIONAL PERFORMANCE

**GRADUAL DEFLATION TEST 1 – Left Front, Left Rear, Right Rear,
Right Front Deflation at LLVW**

**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: Vehicle cool down period: <u>overnight</u>				
Re-adjusted Inflation Pressure	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa
Tire Sidewall Temp	16.2°C	15.6°C	15.8°C	15.8°C
San Angelo Test Facility Shop Floor Temp	16.2°C	15.6°C	16.0°C	16.4°C

SYSTEM CALIBRATION/LEARNING PHASE

Driving in first direction:

Starting point: GAFB North Gate Direction: see chart, page 78
Cumulative vehicle driving time (10 – 15 minutes) at a vehicle speed of 75+ 25 km/h excluding time periods when brake pedal is applied.

10:11 minutes (a) 9.8 distance (mi)

Driving in opposite direction:

Starting point: Highway 87 crossover Direction: see chart, page 78
Cumulative vehicle driving time (5 - 12 minutes) at a vehicle speed of 75+ 25 km/h excluding time periods when brake pedal is applied.

10:25 minutes (a) 10.0 distance (mi)

Max speed: 102.25 km/h **Total Cumulative Driving Time**
VBOX Processed Data: 20:27 minutes
(20 - 22 minutes)

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	261.3 kPa	259.2 kPa	260.0 kPa	261.7 kPa
Tire Sidewall Temp	28.6°C	24.8°C	25.6°C	28.2°C
Roadway Temp	17.2°C	17.6°C	17.2°C	16.6°C

DATA SHEET 3 (Sheet 13 of 36)
TPMS OPERATIONAL PERFORMANCE

**GRADUAL DEFLATION TEST 1 – Left Front, Left Rear, Right Rear,
Right Front Deflation at LLVW**

TIRE PRESSURE & TEMPERATURE DURING LOW INFLATION PRESSURE TEST

Location of Deflated Tire(s)	(X) LF	(X) LR	(X) RR	(X) RF
Original Tire Pressures (kPa)	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa

Execution Procedure and Item	LF Tire	LR Tire	RR Tire	RF Tire
First 14-kPa Deflation Increment	226.0 kPa	226.0 kPa	226.0 kPa	226.0 kPa
Driving in first direction: Cumulative driving time (10 - 15 minutes) <u>10:11</u> minutes (a) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u>				
Driving in opposite direction: Cumulative driving time (5 - 12 minutes) <u>10:25</u> minutes (b) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Total cumulative driving time (20 - 22 minutes) <u>20:36</u> minutes (a + b)				
Tire Pressures and Temperatures	LF Tire	LR Tire	RR Tire	RF Tire
Inflation Pressure	230.7 kPa	230.5 kPa	230.9 kPa	231.3 kPa
Temperature	30.6°C	26.4°C	27.2°C	30.2°C

DATA SHEET 3 (Sheet 14 of 36)
TPMS OPERATIONAL PERFORMANCE

**GRADUAL DEFLATION TEST 1 – Left Front, Left Rear, Right Rear,
Right Front Deflation at LLVW**

TIRE PRESSURE & TEMPERATURE DURING LOW INFLATION PRESSURE TEST

Execution Procedure and Item	LF Tire	LR Tire	RR Tire	RF Tire
Second 14-kPa Deflation Increment	212.0 kPa	212.0 kPa	212.0 kPa	212.0 kPa
Driving in first direction: Cumulative driving time (10 - 15 minutes) <u>10:11</u> minutes (a) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Driving in opposite direction: Cumulative driving time (5 - 12 minutes) <u>10:26</u> minutes (b) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Total cumulative driving time (20 - 22 minutes) <u>20:37</u> minutes (a + b)				
Tire Pressures and Temperatures	LF Tire	LR Tire	RR Tire	RF Tire
Inflation Pressure	217.1 kPa	216.5 kPa	217.2 kPa	217.5 kPa
Temperature	32.8°C	28.2°C	28.8°C	31.6°C

DATA SHEET 3 (Sheet 15 of 36)
TPMS OPERATIONAL PERFORMANCE

**GRADUAL DEFLATION TEST 1 – Left Front, Left Rear, Right Rear,
Right Front Deflation at LLVW**

TIRE PRESSURE & TEMPERATURE DURING LOW INFLATION PRESSURE TEST

Execution Procedure and Item	LF Tire	LR Tire	RR Tire	RF Tire
Third 14-kPa Deflation Increment	198.0 kPa	198.0 kPa	198.0 kPa	198.0 kPa
Driving in first direction: Cumulative driving time (10 - 15 minutes) <u>10:11</u> minutes (a) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Driving in opposite direction: Cumulative driving time (5 - 12 minutes) <u>10:25</u> minutes (b) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Total cumulative driving time (20 - 22 minutes) <u>20:36</u> minutes (a + b)				
Tire Pressures and Temperatures	LF Tire	LR Tire	RR Tire	RF Tire
Inflation Pressure	202.4 kPa	202.3 kPa	203.1 kPa	202.8 kPa
Temperature	35.2°C	29.8°C	31.6°C	35.2°C

DATA SHEET 3 (Sheet 16 of 36)
TPMS OPERATIONAL PERFORMANCE

**GRADUAL DEFLATION TEST 1 – Left Front, Left Rear, Right Rear,
Right Front Deflation at LLVW**

TIRE PRESSURE & TEMPERATURE DURING LOW INFLATION PRESSURE TEST

Execution Procedure and Item	LF Tire	LR Tire	RR Tire	RF Tire
Fourth 14-kPa Deflation Increment	184.0 kPa	184.0 kPa	184.0 kPa	184.0 kPa
Driving in first direction: Cumulative driving time (10 - 15 minutes) <u>1:04</u> minutes (a) Did low inflation pressure telltale illuminate? Yes <u>X</u> No <u> </u> Driving in opposite direction: Cumulative driving time (5 - 12 minutes) <u>0</u> minutes (b) Did low inflation pressure telltale illuminate? Yes <u> </u> No <u> </u> Total cumulative driving time (20 - 22 minutes) <u>1:04</u> minutes (a + b)				
Tire Pressures and Temperatures	LF Tire	LR Tire	RR Tire	RF Tire
Inflation Pressure	184.3 kPa	184.7 kPa	184.0 kPa	184.8 kPa
Temperature	34.6°C	30.8°C	32.2°C	36.2°C

Max speed: 86.36 km/h

Total Cumulative Driving Time
VBOX Processed Data: 1:05 minutes

DATA SHEET 3 (Sheet 17 of 36)
TPMS OPERATIONAL PERFORMANCE

**GRADUAL DEFLATION TEST 1 – Left Front, Left Rear, Right Rear,
Right Front Deflation at LLVW**

TELLTALE ILLUMINATION:

Execution Procedure Paragraph and Item
Did the low inflation pressure warning telltale illuminate before the inflation pressures in the deflated tire(s) reached the low inflation pressure(s) threshold calculated? ☒ YES (pass) ☐ NO

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

Tire Locations Verified: (X) LF (X) LR (X) RR (X) RF

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 (i.e. Key-on-Engine-off)?
(X) YES () NO

After ignition locking system deactivation the and vehicle engine re-start, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position (i.e. Key-on-Engine-on)?
(X) YES () NO (fail)

TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:

Execution Procedure Paragraph and Item	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period.	Vehicle cool down period: <u>66</u> minutes			
Inflation Pressure	174.1 kPa	175.1 kPa	175.0 kPa	174.0 kPa
Tire Sidewall Temp	26.0°C	24.0°C	24.6°C	26.4°C
Roadway Temp	18.6°C	18.4°C	18.4°C	18.4°C

*The vehicle has a plan view which shows inflation for all tires.

DATA SHEET 3 (Sheet 18 of 36)
TPMS OPERATIONAL PERFORMANCE

**GRADUAL DEFLATION TEST 1 – Left Front, Left Rear, Right Rear,
Right Front Deflation at LLVW**

After the cool down period of approximately one hour, and vehicle engine restart, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?

(X)YES ()NO

TELLTALE EXTINGUISHMENT:

RE-ADJUSTED TIRE INFLATION PRESSURES:

Execution Procedure Paragraph and Item	LF Tire	LR Tire	RR Tire	RF Tire
After cool down period; Re-adjusted Inflation Pressure kPa	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa

If vehicle is equipped with a manual reset control, does activation of this control extinguish the telltale?

()YES ()NO (X)N/A

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

Starting point: San Angelo Test Facility shop

Total distance to extinguishment: 0.4 mi

Time to extinguishment: 1:55 minutes (non-cumulative stopwatch time)

TPMS PERFORMANCE TEST RESULTS (PASS/FAIL)

PASS

REMARKS: None

RECORDED BY: Tommy Oliver and Anthony Walden DATE: March 8, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 19 of 36)
TPMS OPERATIONAL PERFORMANCE

TEST DATE: March 11, 2019 LAB: U.S. DOT San Angelo Test Facility
VEHICLE NHTSA NUMBER: C20194200

Time: Start: 11:00 am End: 2:15 pm
Ambient Temperature: Start: 19.4°C End: 21.9°C
Trip Odometer Reading: Start: 228 mi
Fuel Level: Start: Full
Weather Conditions: Indoors

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

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

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Pre-test cold measurements after ambient soak:				
Inflation Pressure	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa
Tire Sidewall Temp	15.6°C	15.4°C	15.4°C	15.6°C

DATA SHEET 3 (Sheet 20 of 36)
TPMS OPERATIONAL PERFORMANCE

VEHICLE WEIGHT:

Vehicle Ratings from Certification Label:

GVWR: 6,085 lbs., (2,760 kg)
GAWR (front): 3,064 lbs., (1,390 kg)
GAWR (rear): 3,064 lbs., (1,390 kg)

Vehicle Capacity Weight:

Vehicle Capacity Weight: 525 kg, 1,158 lbs.

Measured Unloaded Vehicle Weight:

LF	<u>580.0 kg</u>	LR	<u>433.5 kg</u>
RF	<u>571.5 kg</u>	RR	<u>416.0 kg</u>
Front		Rear	
Axle	<u>1,151.5 kg</u>	Axle	<u>849.5 kg</u>
Total Vehicle <u>2,001.0 kg</u>			

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

LF	<u>658.0 kg</u>	LR	<u>621.5 kg</u>
RF	<u>643.5 kg</u>	RR	<u>603.0 kg</u>
Front		Rear	
Axle	<u>1,301.5 kg</u> (≤ GAWR)	Axle	<u>1,224.5 kg</u> (≤ GAWR)
Total Vehicle <u>2,526.0 kg</u> (not greater than GVWR)			

Note: For scenarios C and D, Malfunction 2, and Gradual Deflation 2, this Total Vehicle Weight measures the vehicle loaded to Unloaded Vehicle Weight (UVW) and Vehicle Capacity Weight (VCW). This consisted of the UVW and 525 kg of driver, passenger, test equipment, and ballast.

RECORDED BY: Tommy Oliver and Anthony Walden DATE: March 11, 2019
APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 21 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO C – Right Front Tire Deflation at UVW+VCW

TEST DATE: March 12, 2019 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Note: See Data Sheet 3 (Sheet 20 of 36) 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>19.3°C</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa
Tire Sidewall Temp	17.6°C	17.6°C	17.6°C	17.6°C
San Angelo Test Facility Shop Floor Temp	17.6°C	17.2°C	17.2°C	17.2°C

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 16:11:15 UTC End: 16:37:02 UTC
Trip Odometer Reading: Start: 228.6 mi End: 248.4 mi
Ambient Temperature: Start: 19.5°C End: 19.7°C
Roadway Temperature: Start: 17.4°C End: 18.2°C
Weather Conditions: Cool and cloudy

Driving in first direction:

Starting point: GAFB North Gate Direction: see chart, page 74
10:11 minutes (cumulative stopwatch time) 9.9 mi distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 74
10:25 minutes (cumulative stopwatch time) 9.9 mi distance

Max speed: 102.86 km/h

Total Cumulative Driving Time: 20:29 minutes (VBOX processed data)

DATA SHEET 3 (Sheet 22 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO C – 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	261.8 kPa	262.6 kPa	262.8 kPa	262.7 kPa
Tire Sidewall Temp	29.6°C	28.4°C	28.4°C	30.2°C
San Angelo Test Facility Shop Floor Temp	18.4°C	17.8°C	17.8°C	18.4°C

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				173.0 kPa

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Direction: see chart, page75

Total distance to illumination: 1.0 mi

Time to illumination: 0:44 seconds (cumulative stopwatch time)

Max speed: 82.08 km/h

Total Cumulative Driving Time: 0:44 seconds (VBOX processed data)

Does the vehicle have a telltale that identifies which tire(s) is (are) under-inflated?

()YES (X)NO*

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)

*The vehicle has a plan view which shows inflation for all tires.

DATA SHEET 3 (Sheet 23 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO C – 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>20.0°C</u> Vehicle cool down period: <u>69</u> minutes				
Inflation Pressure	251.2 kPa	248.3 kPa	249.7 kPa	167.5 kPa
Tire Sidewall Temp	24.6°C	22.6°C	23.4°C	25.2°C
San Angelo Test Facility Shop Floor Temp	19.0°C	18.4°C	18.6°C	19.0°C

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:				
	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa

Is it necessary to use the set/reset button to extinguish the low tire pressure telltale?
(☐)YES (☐)NO (☒)N/A

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

Starting point: San Angelo Test Facility shop

Total distance to extinguishment: 0.3 mi

Time to extinguishment: 1:25 minutes (non-cumulative stopwatch time)

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL)

PASS

Right front tire was deflated at UVW+VCW.

REMARKS: None

RECORDED BY: Anthony Walden and Tommy Oliver

DATE: March 12, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 24 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO D – Right Rear, Right Front
Tire Deflation at UVW+VCW

TEST DATE: March 13, 2019 LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Note: See Data Sheet 3 (Sheet 20 of 36) for Test Weight.

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

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After loading vehicle to UVW+VCW, positioning vehicle at selected test start point, and vehicle cool down period: Ambient Temperature: <u>16.2°C</u> Vehicle cool down period: <u>overnight</u>				
Inflation Pressure	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa
Tire Sidewall Temp	15.2°C	14.8°C	14.6°C	15.0°C
San Angelo Test Facility Shop Floor Temp	16.2°C	15.8°C	16.0°C	16.2°C

SYSTEM CALIBRATION/LEARNING PHASE:

Time: Start: 15:10:59 UTC End: 15:36:32 UTC
Trip Odometer Reading: Start: 253.3 mi End: 273.0 mi
Ambient Temperature: Start: 16.2°C End: 17.8°C
Roadway Temperature: Start: 16.0°C End: 17.4°C
Weather Conditions: Cool and windy

Driving in first direction:

Starting point: GAFB North Gate Direction: see chart, page 76
10:11 minutes (cumulative stopwatch time) 9.8 mi distance

Driving in opposite direction:

Starting point: US 87 crossover overpass Direction: see chart, page 76
10:25 minutes (cumulative stopwatch time) 9.9 mi distance

Max speed: 97.82 km/h

Total Cumulative Driving Time: 20:36 minutes (VBOX processed data)

DATA SHEET 3 (Sheet 25 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO D – Right Rear, Right Front
Tire Deflation at UVW+VCW

TIRE INFLATION PRESSURES AND TEMPERATURES AFTER CALIBRATION PHASE:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Immediately, after vehicle is stopped, engine off:				
Inflation Pressure	261.5 kPa	262.1 kPa	262.2 kPa	261.5 kPa
Tire Sidewall Temp	32.2°C	28.8°C	26.4°C	27.8°C
San Angelo Test Facility Shop Floor Temp	17.2°C	16.6°C	16.4°C	17.0°C

SYSTEM DETECTION PHASE:

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

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Indicate Location of Tire(s) Deflated: ()LF ()LR (X)RR (X)RF				
Inflation Pressure			173.0 kPa	173.0 kPa

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Total distance to illumination: 0.2 mi

Time to illumination: 1:08 minutes (non-cumulative stopwatch time)

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

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)

*The vehicle has a plan view which shows inflation for all tires.

DATA SHEET 3 (Sheet 26 of 36)
TPMS OPERATIONAL PERFORMANCE

NORMAL DEFLATION TEST, SCENARIO D – Right Rear, Right Front
Tire Deflation at UVW+VCW

TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period: Ambient Temperature: <u>19.9°C</u> Vehicle cool down period: <u>65</u> minutes				
Inflation Pressure	250.1 kPa	248.1 kPa	165.5 kPa	167.9 kPa
Tire Sidewall Temp	23.2°C	20.6°C	21.0°C	22.6°C
San Angelo Test Facility Shop Floor Temp	18.6°C	18.0°C	18.2°C	18.4°C

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?
(X)YES ()NO (fail)

TELLTALE EXTINGUISHMENT:

RE-ADJUSTED TIRE INFLATION PRESSURES:

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
After illumination verification: Re-adjusted Inflation Pressure:				
	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa

Is it necessary to use the set/reset button to extinguish the low tire pressure telltale?
()YES ()NO (X)N/A

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

Starting point: San Angelo Test Facility shop

Total distance to extinguishment: 0.1 mi

Time to extinguishment: 1:28 minutes (non-cumulative stopwatch time)

TEST RESULTS

TPMS Performance Test Results (PASS/FAIL)

PASS

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

REMARKS: None

RECORDED BY: Anthony L. Walden and Tommy Oliver DATE: March 13, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 27 of 36)
TPMS OPERATIONAL PERFORMANCE
MALFUNCTION DETECTION TEST 2 -
TPMS Fuse Removal at UVW+VCW

TEST DATE: March 13, 2019

LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Time: Start: 2:05 pm End: 2:10 pm

Trip Odometer Reading: Start: 274.2 mi End: 274.2 mi

Ambient Temperature: Start: 21.9°C End: 22.1°C

Note: See Data Sheet 3 (Sheet 20 of 36) 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: TPMS fuse was removed (see
Figure 5.15).

MALFUNCTION TELLTALE ILLUMINATION

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

Combination Malfunction Telltale

Driving in first direction:

TELLTALE ILLUMINATION:

Starting point: San Angelo Test Facility shop

Total distance to illumination: 0 mi

Time to illumination: 0:0 minutes total cumulative driving time

Telltale illuminated in three seconds. Driving the vehicle was not necessary.

TEST RESULTS

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

DATA SHEET 3 (Sheet 28 of 36)
TPMS OPERATIONAL PERFORMANCE

MALFUNCTION DETECTION TEST 2 -
TPMS Fuse Removal at UVW+VCW

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 70 seconds (See Remarks)
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? (X)YES ()NO (fail)

Extinguishment Phase:

Starting point: San Angelo Test Facility shop

Total distance to extinguishment: 0.0 mi

Time to extinguishment: 0:00 total driving time (non-cumulative stopwatch time)

Telltale extinguished in immediately. Driving the vehicle was not necessary.

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

TPMS MALFUNCTION PERFORMANCE TEST RESULTS (PASS/FAIL)

PASS

TPMS fuse was removed.

REMARKS: None

RECORDED BY: Anthony Walden and Tommy Oliver

DATE: March 13, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 3 (Sheet 29 of 36)
TPMS OPERATIONAL PERFORMANCE

GRADUAL DEFLATION TEST 2 – Left Rear Tire Deflation at UVW+VCW

TEST DATE: March 14, 2019

LAB: U.S. DOT San Angelo Test Facility

VEHICLE NHTSA NUMBER: C20194200

Time: Start: 9:45 am End: 1:30 pm

Ambient Temperature: Start: 16.4°C End: 22.1°C

Odometer Reading (mi): Start: 274.5 End: 359.1

Fuel Level: Start: Full End: 3.0 gallons below full

Note: See Data Sheet 3 (Sheet 20 of 36) for Test Weight.

TIRE INFLATION PRESSURES AND TIRE/ROADWAY TEMPERATURES

Execution Procedure	LF Tire	LR Tire	RR Tire	RF Tire
Pre-test cold measurements after ambient soak	239.1 kPa	239.1 kPa	239.4 kPa	235.3 kPa

DATA SHEET 3 (Sheet 30 of 36)
TPMS OPERATIONAL PERFORMANCE

GRADUAL DEFLATION TEST 2 – Left Rear Tire Deflation at UVW+VCW

**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: Vehicle cool down period: <u>overnight</u>				
Re-adjusted Inflation Pressure	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa
Tire Sidewall Temp	15.8°C	15.4°C	14.6°C	15.4°C
San Angelo Test Facility Shop Floor Temp	17.2°C	16.6°C	16.4°C	16.8°C

SYSTEM CALIBRATION/LEARNING PHASE

Driving in first direction:

Starting point: GAFB North Gate Direction: see chart, page 80
Cumulative vehicle driving time (10 – 15 minutes) at a vehicle speed of 75+ 25 km/h excluding time periods when brake pedal is applied.

10:11 minutes (a) 9.8 distance (mi)

Driving in opposite direction:

Starting point: Highway 87 crossover Direction: see chart, page 80
Cumulative vehicle driving time (5 - 12 minutes) at a vehicle speed of 75+ 25 km/h excluding time periods when brake pedal is applied.

10:26 minutes (a) 10.0 distance (mi)

Total Cumulative Driving
Max speed: 97.06 km/h Time - VBOX Processed Data: 20:34 minutes
(20 - 22 minutes)

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	259.6 kPa	261.1 kPa	263.0 kPa	261.3 kPa
Tire Sidewall Temp	27.0°C	24.8°C	26.4°C	27.4°C
Roadway Temp	20.8°C	20.4°C	20.6°C	21.8°C

DATA SHEET 3 (Sheet 31 of 36)
TPMS OPERATIONAL PERFORMANCE

GRADUAL DEFLATION TEST 2 – Left Rear Tire Deflation at UVW+VCW

TIRE PRESSURE & TEMPERATURE DURING LOW INFLATION PRESSURE TEST

Location of Deflated Tire(s)	(X) LF	(X) LR	(X) RR	(X) RF
Original Tire Pressures (kPa)		240.0 kPa		

Execution Procedure and Item	LF Tire	LR Tire	RR Tire	RF Tire
First 14-kPa Deflation Increment		226.0 kPa		
Driving in first direction: Cumulative driving time (10 - 15 minutes) <u>10:11</u> minutes (a) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u>				
Driving in opposite direction: Cumulative driving time (5 - 12 minutes) <u>10:26</u> minutes (b) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Total cumulative driving time (20 - 22 minutes) <u>20:37</u> minutes (a + b)				
Tire Pressures and Temperatures	LF Tire	LR Tire	RR Tire	RF Tire
Inflation Pressure	260.7 kPa	231.1 kPa	264.5 kPa	261.8 kPa
Temperature	28.6°C	26.8°C	26.6°C	28.0°C

DATA SHEET 3 (Sheet 32 of 36)
TPMS OPERATIONAL PERFORMANCE

GRADUAL DEFLATION TEST 2 – Left Rear Tire Deflation at UVW+VCW

TIRE PRESSURE & TEMPERATURE DURING LOW INFLATION PRESSURE TEST

Execution Procedure and Item	LF Tire	LR Tire	RR Tire	RF Tire
Second 14-kPa Deflation Increment		212.0 kPa		
Driving in first direction: Cumulative driving time (10 - 15 minutes) <u>10:11</u> minutes (a) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Driving in opposite direction: Cumulative driving time (5 - 12 minutes) <u>10:25</u> minutes (b) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Total cumulative driving time (20 - 22 minutes) <u>20:36</u> minutes (a + b)				
Tire Pressures and Temperatures	LF Tire	LR Tire	RR Tire	RF Tire
Inflation Pressure	261.5 kPa	216.3 kPa	265.7 kPa	262.9 kPa
Temperature	29.2°C	28.2°C	28.4°C	29.8°C

DATA SHEET 3 (Sheet 33 of 36)
TPMS OPERATIONAL PERFORMANCE

GRADUAL DEFLATION TEST 2 – Left Rear Tire Deflation at UVW+VCW

TIRE PRESSURE & TEMPERATURE DURING LOW INFLATION PRESSURE TEST

Execution Procedure and Item	LF Tire	LR Tire	RR Tire	RF Tire
Third 14-kPa Deflation Increment		198.0 kPa		
Driving in first direction: Cumulative driving time (10 - 15 minutes) <u>10:11</u> minutes (a) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Driving in opposite direction: Cumulative driving time (5 - 12 minutes) <u>10:25</u> minutes (b) Did low inflation pressure telltale illuminate? Yes _____ No <u>X</u> Total cumulative driving time (20 - 22 minutes) <u>20:36</u> minutes (a + b)				
Tire Pressures and Temperatures	LF Tire	LR Tire	RR Tire	RF Tire
Inflation Pressure	262.8 kPa	202.5 kPa	266.4 kPa	263.9 kPa
Temperature	32.2°C	31.2°C	30.8°C	31.6°C

DATA SHEET 3 (Sheet 34 of 36)
TPMS OPERATIONAL PERFORMANCE

GRADUAL DEFLATION TEST 2 – Left Rear Tire Deflation at UVW+VCW

TIRE PRESSURE & TEMPERATURE DURING LOW INFLATION PRESSURE TEST

Execution Procedure and Item	LF Tire	LR Tire	RR Tire	RF Tire
Fourth 14-kPa Deflation Increment		184.0 kPa		
Driving in first direction: Cumulative driving time (10 - 15 minutes) <u>1:11</u> minutes (a) Did low inflation pressure telltale illuminate? Yes <u>X</u> No <u> </u> Driving in opposite direction: Cumulative driving time (5 - 12 minutes) <u>0</u> minutes (b) Did low inflation pressure telltale illuminate? Yes <u> </u> No <u> </u> Total cumulative driving time (20 - 22 minutes) <u>1:11</u> minutes (a + b)				
Tire Pressures and Temperatures	LF Tire	LR Tire	RR Tire	RF Tire
Inflation Pressure	260.6 kPa	184.0 kPa	263.0 kPa	261.6 kPa
Temperature	31.6°C	31.8°C	29.8°C	30.2°C

Max speed: 85.73 km/h
 Total Cumulative Driving Time
 VBOX Processed Data: 1:10 minutes

DATA SHEET 3 (Sheet 35 of 36)
TPMS OPERATIONAL PERFORMANCE

GRADUAL DEFLATION TEST 2 – Left Rear Tire Deflation at UVW+VCW

TELLTALE ILLUMINATION:

Execution Procedure Paragraph and Item
Did the low inflation pressure warning telltale illuminate before the inflation pressures in the deflated tire(s) reached the low inflation pressure(s) threshold calculated? ☒ X YES (pass) ☐ NO

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

Tire Locations Verified: () LF (X) LR () RR () RF

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 (i.e. Key-on-Engine-off)?
(X) YES () NO

After ignition locking system deactivation the and vehicle engine re-start, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position (i.e. Key-on-Engine-on)?
(X) YES () NO (fail)

TIRE INFLATION PRESSURES AND TEMPERATURES AFTER TELLTALE ILLUMINATION:

Execution Procedure Paragraph and Item	LF Tire	LR Tire	RR Tire	RF Tire
After vehicle cool down period.	Vehicle cool down period: <u>69</u> minutes			
Inflation Pressure	249.8 kPa	171.9 kPa	249.3 kPa	250.8 kPa
Tire Sidewall Temp	25.0°C	23.4°C	22.8°C	25.0°C
Roadway Temp	19.4°C	19.2°C	18.8°C	19.4°C

*The vehicle has a plan view which shows inflation for all tires.

DATA SHEET 3 (Sheet 36 of 36)
TPMS OPERATIONAL PERFORMANCE

GRADUAL DEFLATION TEST 2 – Left Rear Tire Deflation at UVW+VCW

After the cool down period of approximately one hour, and vehicle engine restart, does the telltale re-illuminate and stay illuminated when the ignition locking system is activated to the “On” or “Run” position?

(X)YES ()NO

TELLTALE EXTINGUISHMENT:

RE-ADJUSTED TIRE INFLATION PRESSURES:

Execution Procedure Paragraph and Item	LF Tire	LR Tire	RR Tire	RF Tire
After cool down period: Re-adjusted Inflation Pressure kPa	240.0 kPa	240.0 kPa	240.0 kPa	240.0 kPa

If vehicle is equipped with a manual reset control, does activation of this control extinguish the telltale?

()YES ()NO (X)N/A

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

Starting point: San Angelo Test Facility shop

Total distance to extinguishment: 0.6 mi

Time to extinguishment: 3:08 minutes (non-cumulative stopwatch time)

TPMS PERFORMANCE TEST RESULTS (PASS/FAIL)

PASS

REMARKS: None

RECORDED BY: Anthony Walden and Tommy Oliver DATE: March 14, 2019

APPROVED BY: Kenneth Yates

DATA SHEET 4 (Sheet 1 of 3)
TPMS WRITTEN INSTRUCTIONS

TEST

DATE: February 28, 2019

LAB: San Angelo Test Facility

VEHICLE

NHTSA NO: C20194200

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 4 (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 (See Remarks) (☐)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

REMARKS: None

DATA SHEET 4 (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)? ()YES ()NO (X) N/A

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: Tommy Oliver

DATE: February 28, 2019

APPROVED BY: Kenneth Yates

SECTION 4
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO	CAL. DATE	NEXT CAL. DATE
AIR PRESSURE GAUGE	ASHCROFT GENERAL PURPOSE DIGITAL GAUGE	DG2551L2NAM02L 100#-XCA, SERIAL #3093017001	12/13/2018	12/13/2019
FLOOR SCALES (VEHICLE & BALLAST)	INTERCOMP SW DELUXE SCALES	SERIAL #27032382- 23746	10/25/2018	10/25/2019
DIGITAL THERMOMETER	FLUKE 50D	SERIAL #80840101	06/08/2018	06/08/2019
LASER TEMPERATURE GAUGE (TIRES AND GROUND)	RAYTEK MINITEMP MT6UVB	SERIAL # 12460128	12/12/2018	12/12/2019
VBOX RECORDING DEVICE	RACELOGIC VBOX 3iSL	SERIAL #24491	08/03/2018	08/03/2019
STOPWATCH	ROBIC SC-505W STOPWATCH	N/A	N/A	N/A

SECTION 5
PHOTOGRAPHS



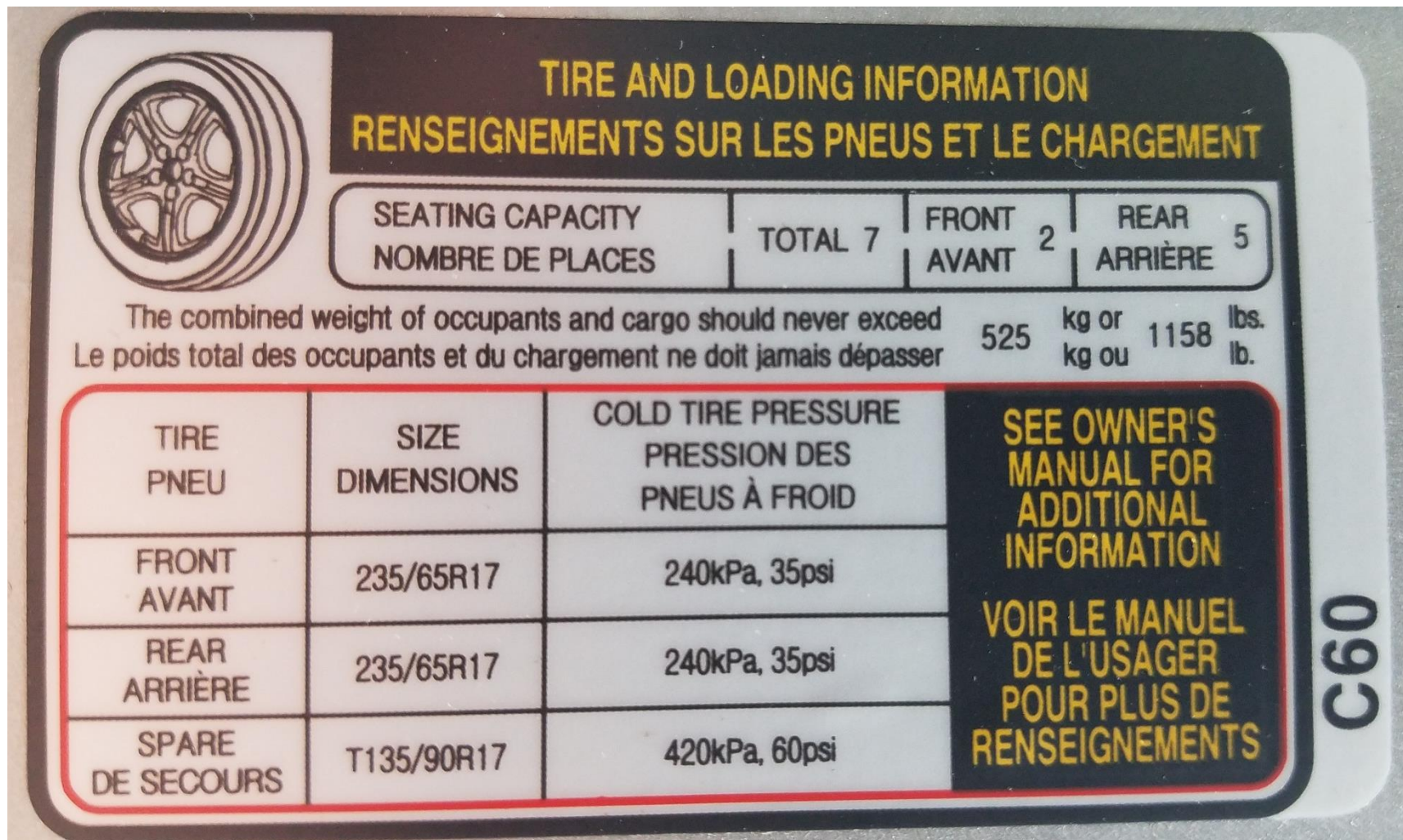
2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.1
¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.2
VEHICLE CERTIFICATION LABEL



2019 KIA SEDONA L
 NHTSA NO. C20194200
 FMVSS NO. 138

FIGURE 5.3
 VEHICLE PLACARD



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NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.4
TIRE SHOWING BRAND



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.5
TIRE SHOWING MODEL



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.6
TIRE SHOWING SIZE AND LOAD INDEX /SPEED RATING



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.7
TIRE SHOWING DOT NUMBER



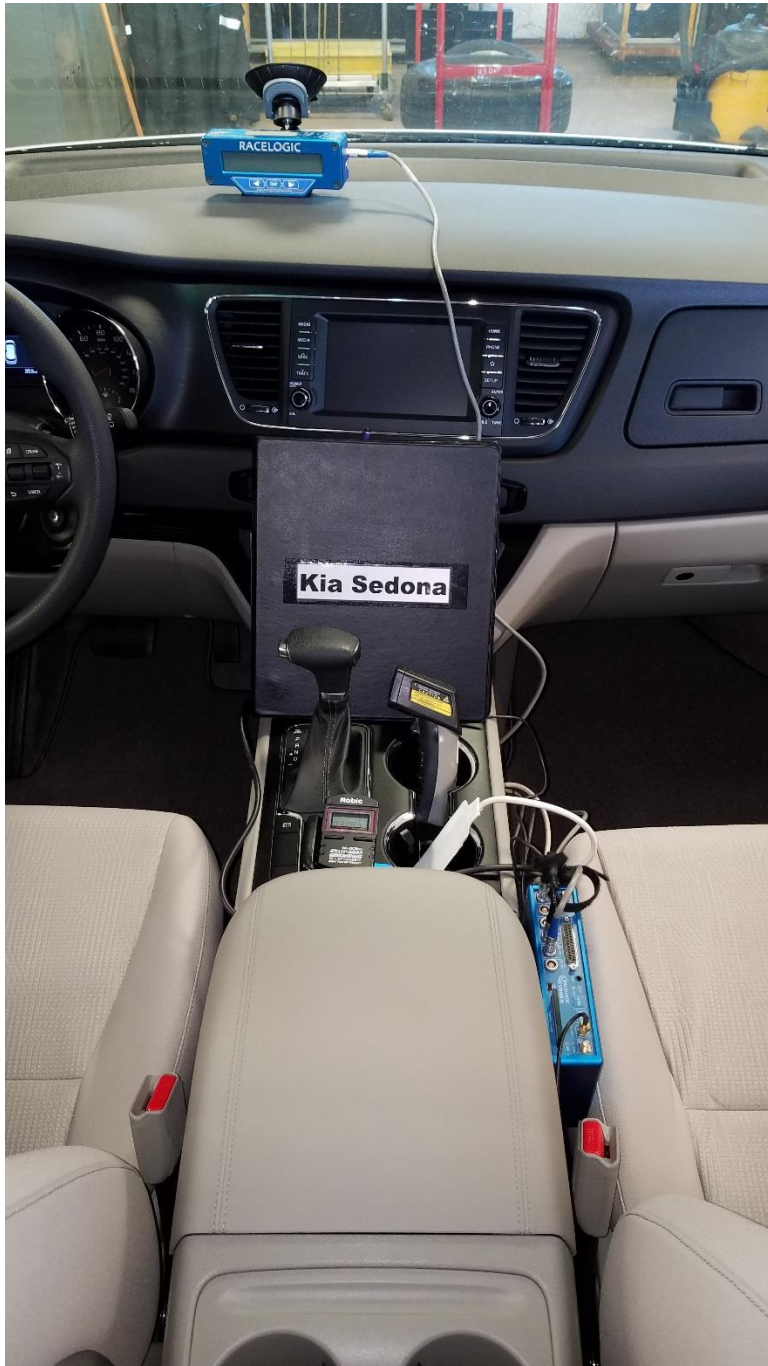
2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

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



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.9
TIRE SHOWING SIDEWALL / TREAD CONSTRUCTION



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FMVSS NO. 138

FIGURE 5.10
TEST INSTRUMENTATION INSTALLED IN VEHICLE



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FMVSS NO. 138

FIGURE 5.11
MID SEATS BALLASTED FOR UVW+VCW GAWR LOAD



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.12
REAR SEATS BALLASTED FOR UVW+VCW GAWR LOAD



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.13
VEHICLE CARGO AREA BALLASTED FOR UVW+VCW GAWR LOAD



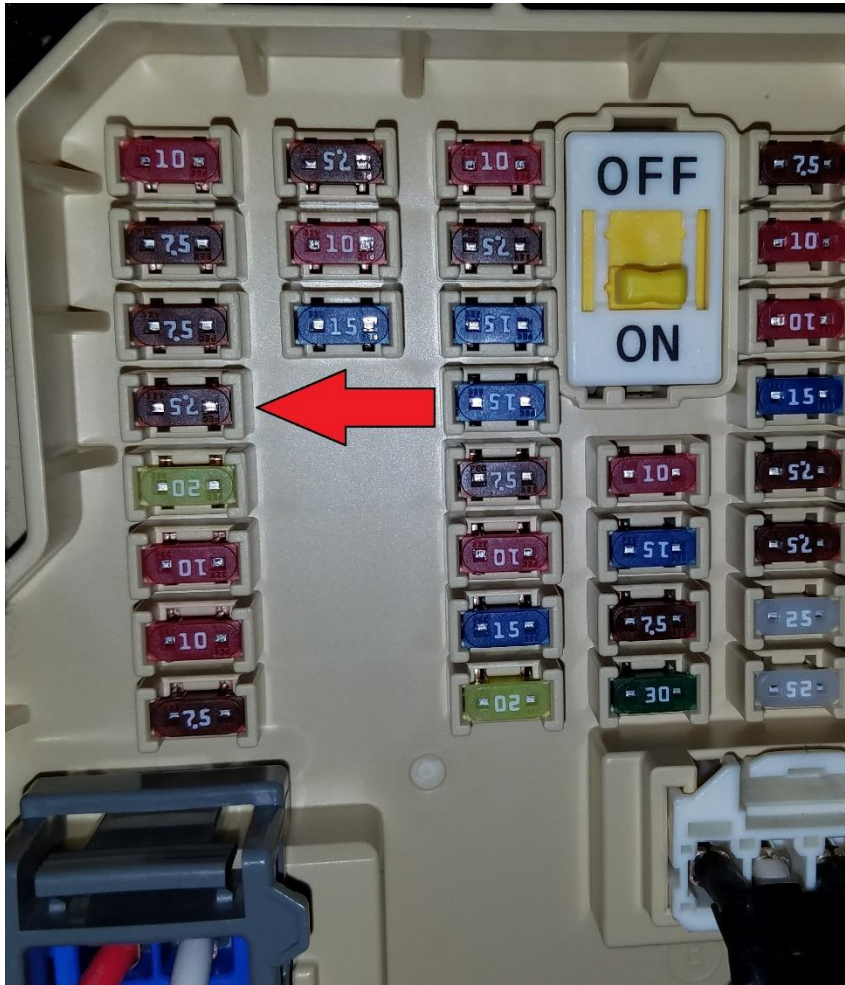
2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.14
VEHICLE ON WEIGHT SCALES



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.15
MALFUNCTION 1 - SPARE TIRE WITHOUT TPMS
SENSOR MOUNTED ON RIGHT REAR AT LLW



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138



FIGURE 5.16
MALFUNCTION 2 – TPMS FUSE REMOVAL



2019 KIA SEDONA L
 NHTSA NO. C20194200
 FMVSS NO. 138

FIGURE 5.17
 TPMS LOW TIRE PRESSURE/MALFUNCTION TELLTALE
 WITH DISPLAY SHOWING LOW TIRE LOCATION



2019 KIA SEDONA L
NHTSA NO. C20194200
FMVSS NO. 138

FIGURE 5.18
TPMS LOW TIRE PRESSURE/MALFUNCTION TELLTALE
WITH DISPLAY SHOWING MALFUNCTION WARNING

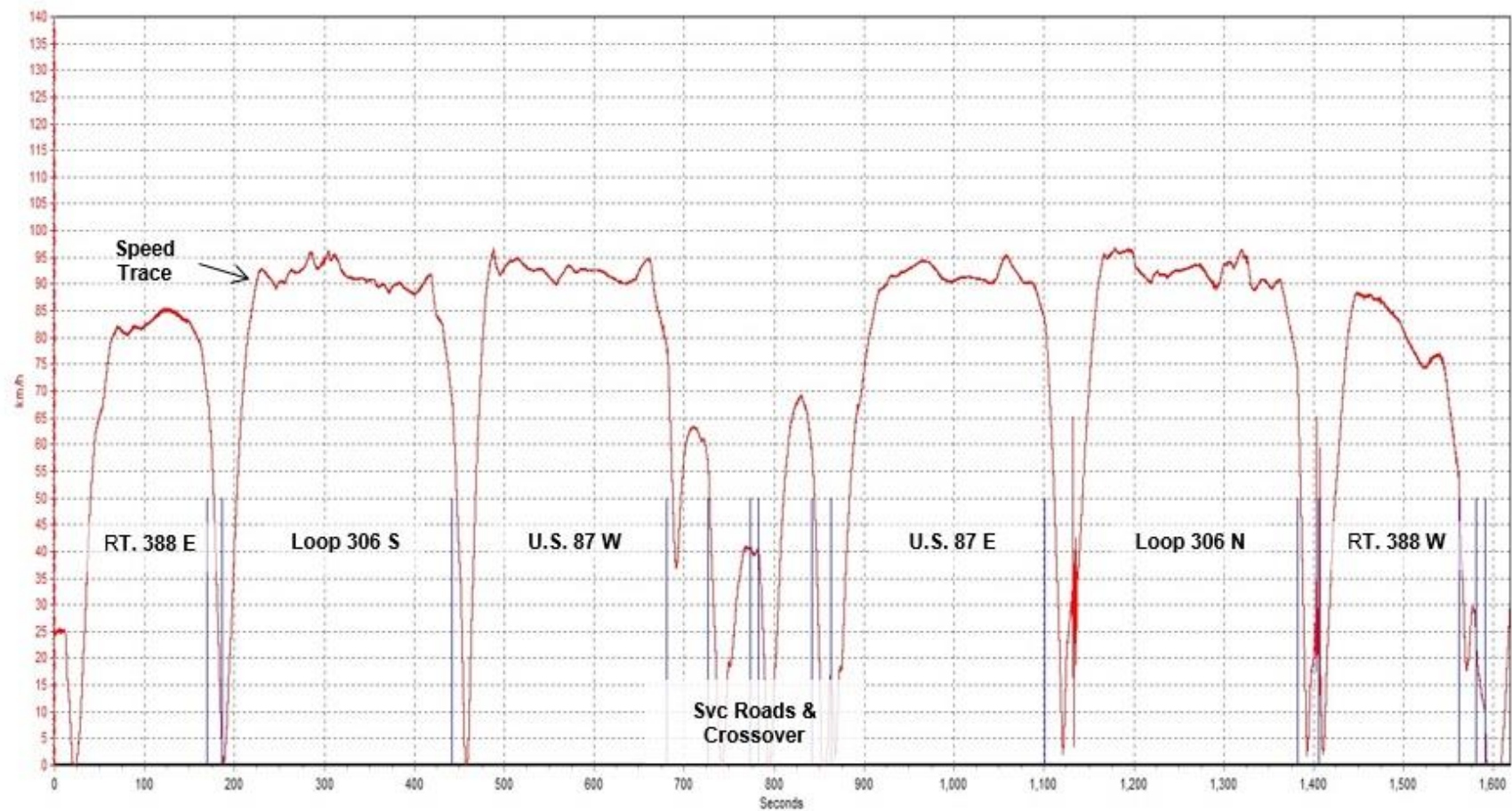
SECTION 6
TEST PLOTS

Scenario A: Left Rear Tire at LLVW
Test Date: 3/6/19
Data File Time: 26:59 minutes
Cumulative Driving Time: 20:36 minutes
Start Point: GAFB North Gate

Calibration Phase:

2019 Kia Sedona LR Calibration Run LLVW (Scenario A)

Graph

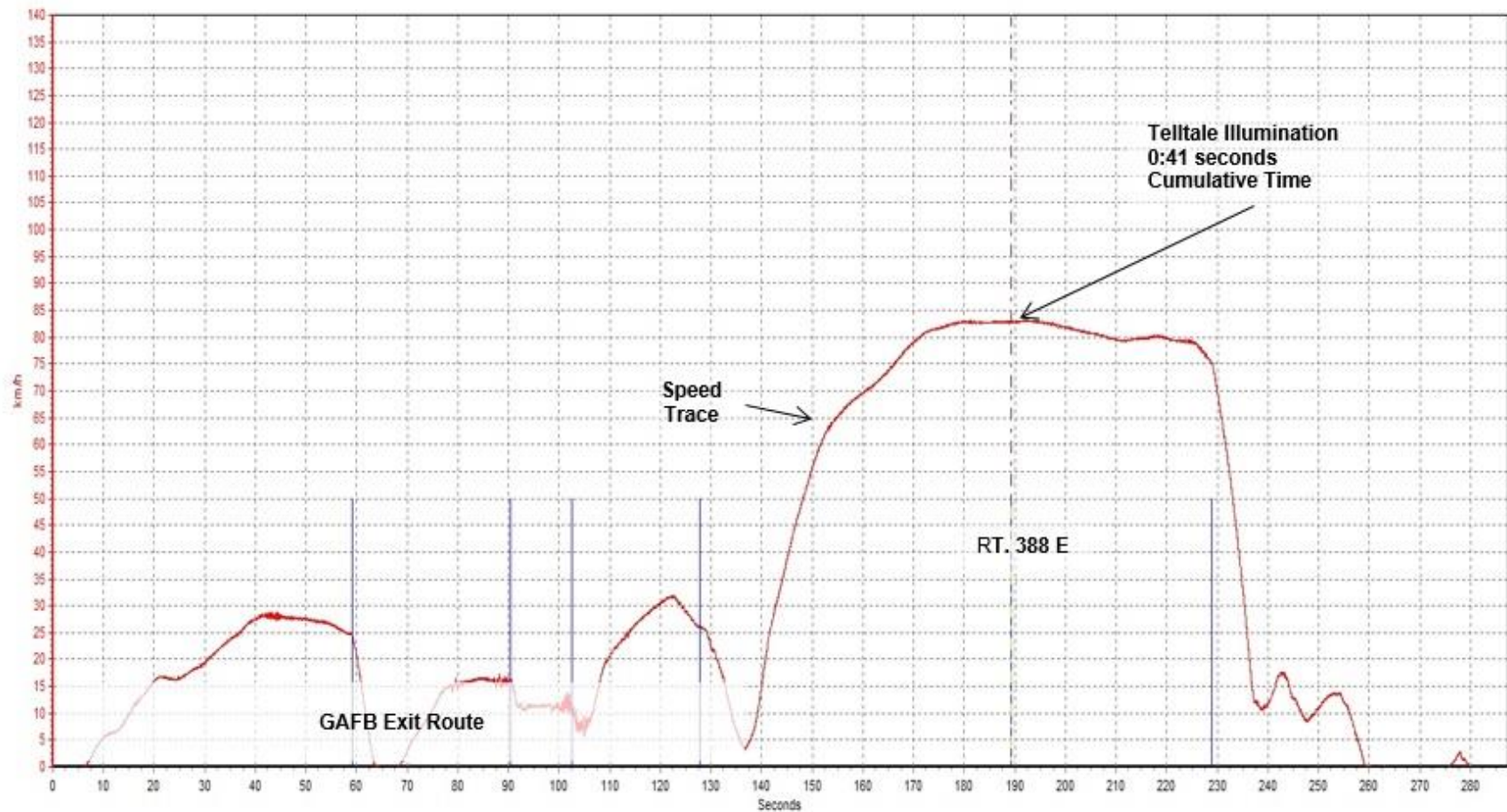


Scenario A: Left Rear Tire at LLVW
Test Date: 3/6/19
Data File Time: 4:47minutes
Cumulative Driving Time: 0:41 seconds
Start Point: San Angelo Test Facility shop

Detection Phase:

2019 Kia Sedona LR Illumination Run LLVW (Scenario A)

Graph



Scenario B: Left Front, Left Rear, Right Rear, Right Front Tires at LLVW
Test Date: 3/7/19
Data File Time: 26:38 minutes
Cumulative Driving Time: 20:28 minutes
Start Point: GAFB North Gate

Calibration Phase:

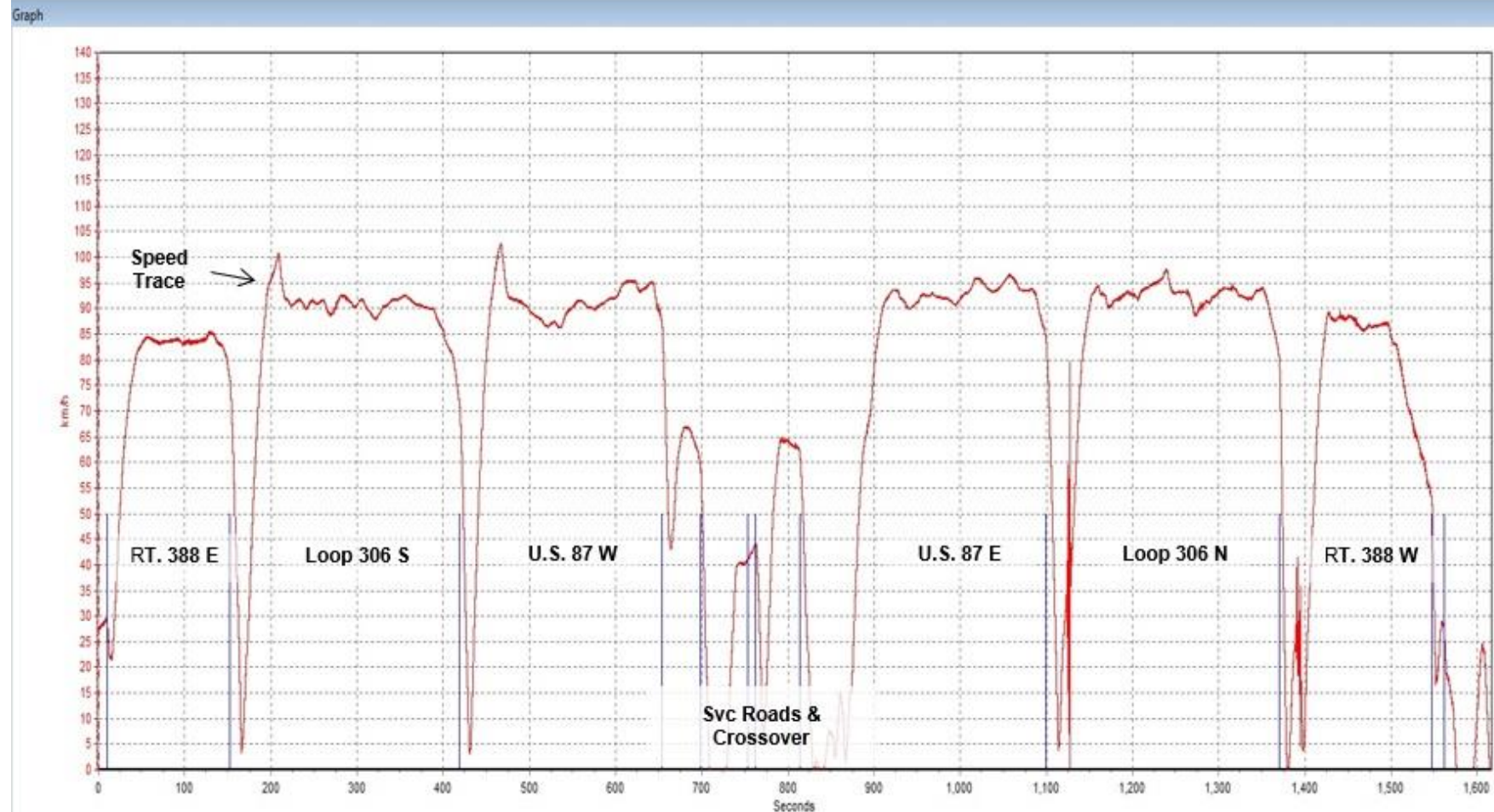
2019 Kia Sedona LF, LR, RR, RF Calibration Run LLVW (Scenario B)



Scenario C: Right Front Tire at UVW+VCW
Test Date: 3/12/19
Data File Time: 26:56 minutes
Cumulative Driving Time: 20:29 minutes
Start Point: GAFB North Gate

Calibration Phase:

2019 Kia Sedona RF Calibration Run UVW+VCW (Scenario C)

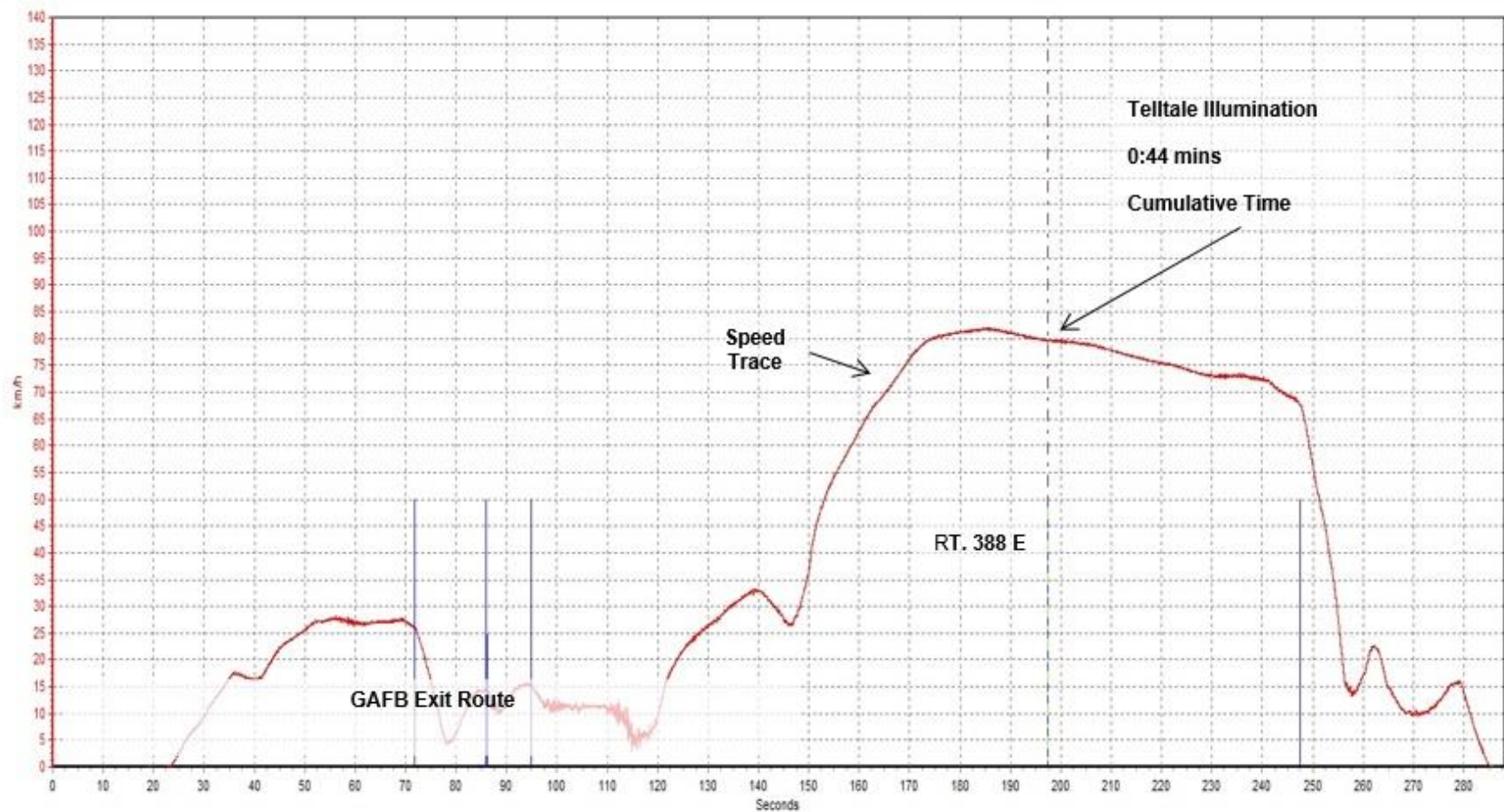


Scenario C: Right Front Tire at UVW+VCW
Test Date: 3/12/19
Data File Time: 4:48 minutes
Cumulative Driving Time: 0:44 seconds
Start Point: San Angelo Test Facility shop

Detection Phase:

2019 Kia Sedona RF Illumination Run UVW+VCW (Scenario C)

Graph

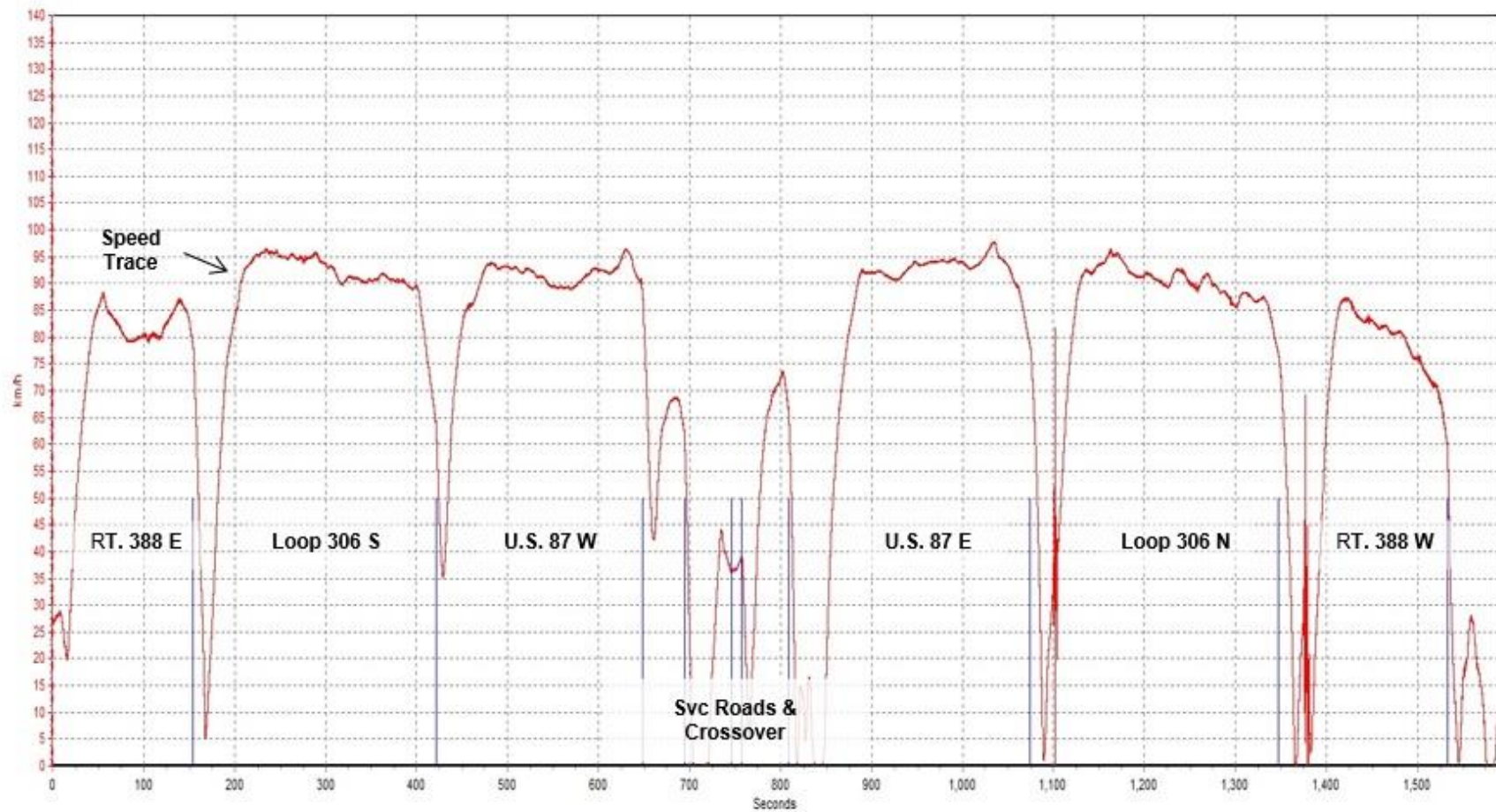


Scenario D: Right Rear, Right Front Tires at UVW+VCW
Test Date: 3/13/19
Data File Time: 26:29 minutes
Cumulative Driving Time: 20:36 minutes
Start Point: GAFB North Gate

Calibration Phase:

2019 Kia Sedona RR, RF Calibration Run UVW+VCW (Scenario D)

Graph

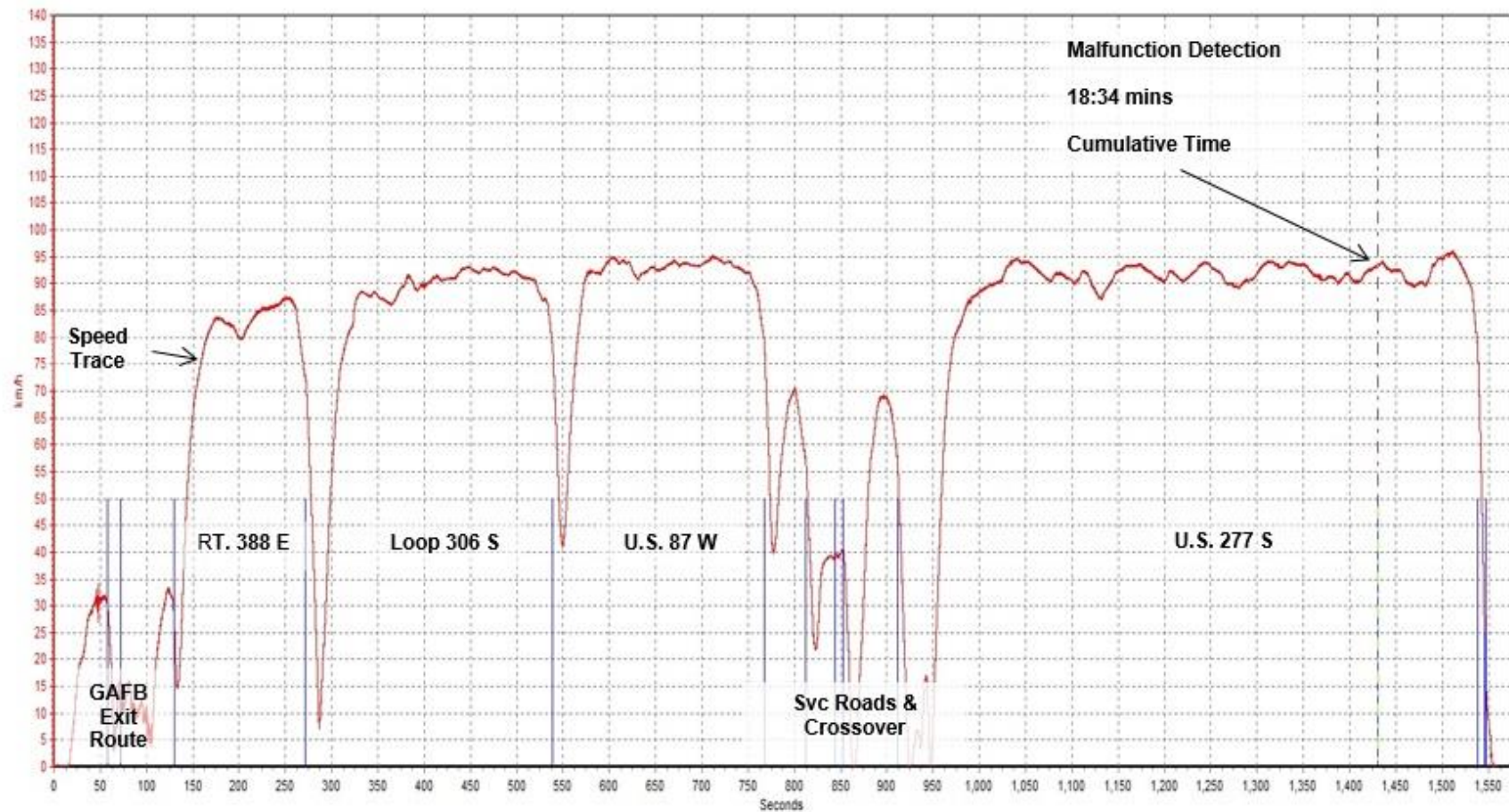


Malfunction 1: Right Rear Tire Replaced with Spare Having No TPMS Sensor at LLVW
Test Date: 3/7/19
Data File Time: 26:14 minutes
Cumulative Driving Time: 18:34 minutes
Start Point: San Angelo Test Facility shop

Detection Phase:

2019 Kia Sedona - Spare Tire on RR - LLVW (Malfunction 1)

Graph

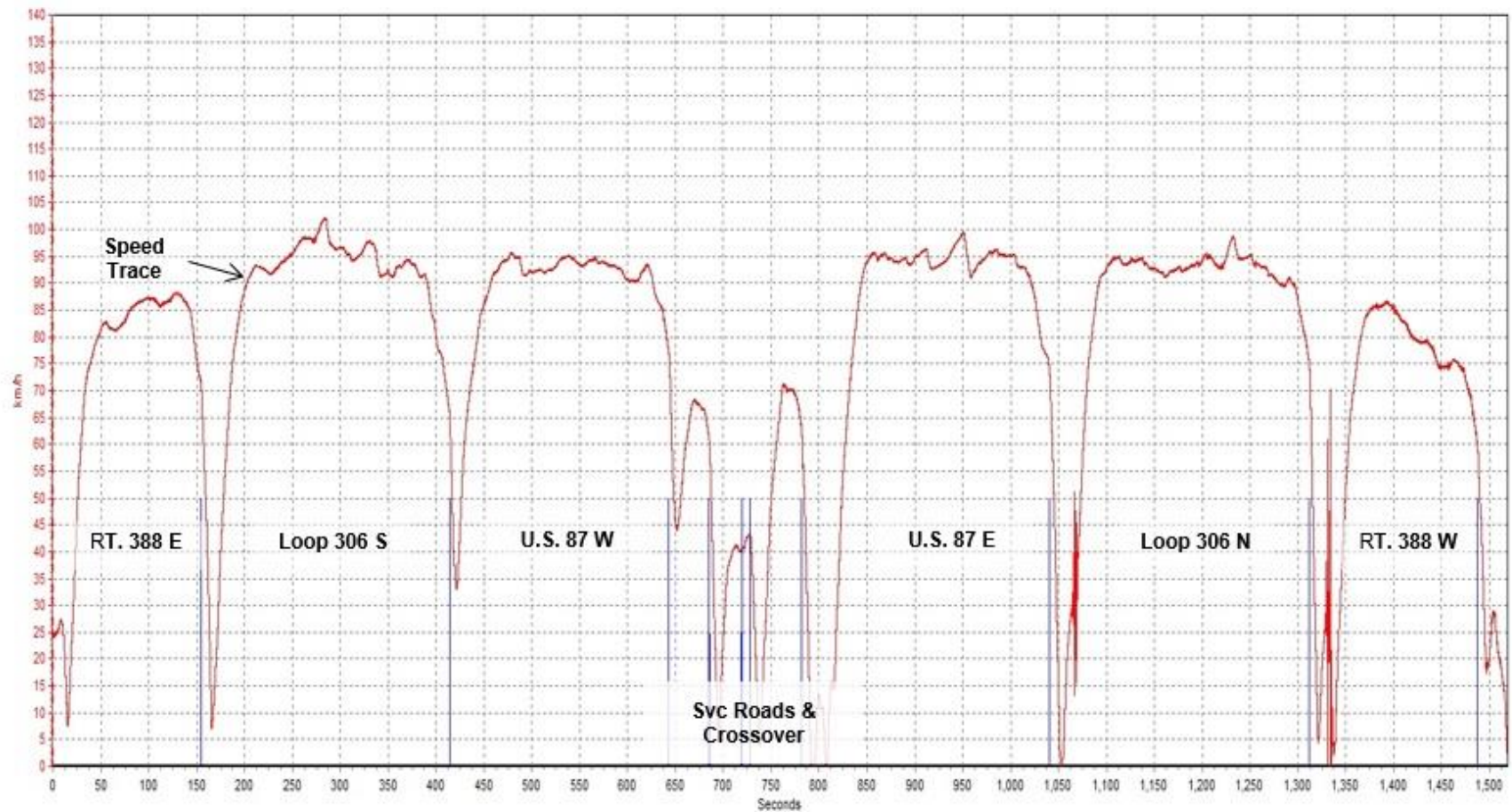


Gradual Deflation 1: Left Front, Left Rear, Right Rear, Right Front Tires at LLVW – Calibration at 240 kPa
Test Date: 3/8/19
Data File Time: 25:20 minutes
Cumulative Driving Time: 20:27 minutes
Start Point: GAFB North Gate

Calibration Phase:

2019 Kia Sedona LF, LR, RR, RF Calibration Run LLVW (Gradual Deflation 1)

Graph

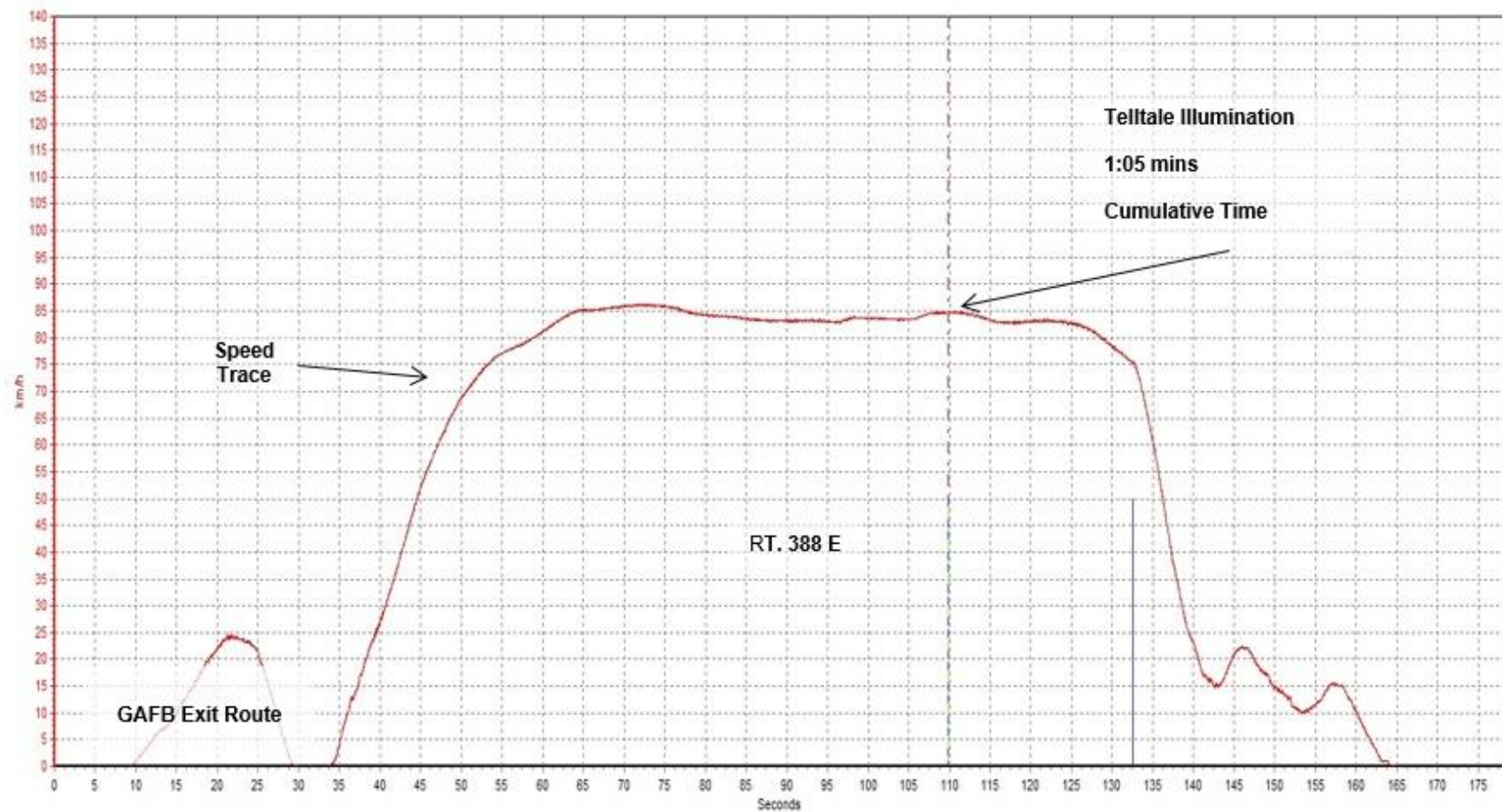


Gradual Deflation 1: Left Front, Left Rear, Right Rear, Right Front Tires at LLVW – Illumination at 184 kPa
Test Date: 3/8/19
Data File Time: 2:58 minutes
Cumulative Driving Time: 1:05 minutes
Start Point: GAFB North Gate

Detection Phase:

2019 Kia Sedona LF, LR, RR, RF Illumination Run @ 184 kPa - LLVW (Gradual Deflation 1)

Graph

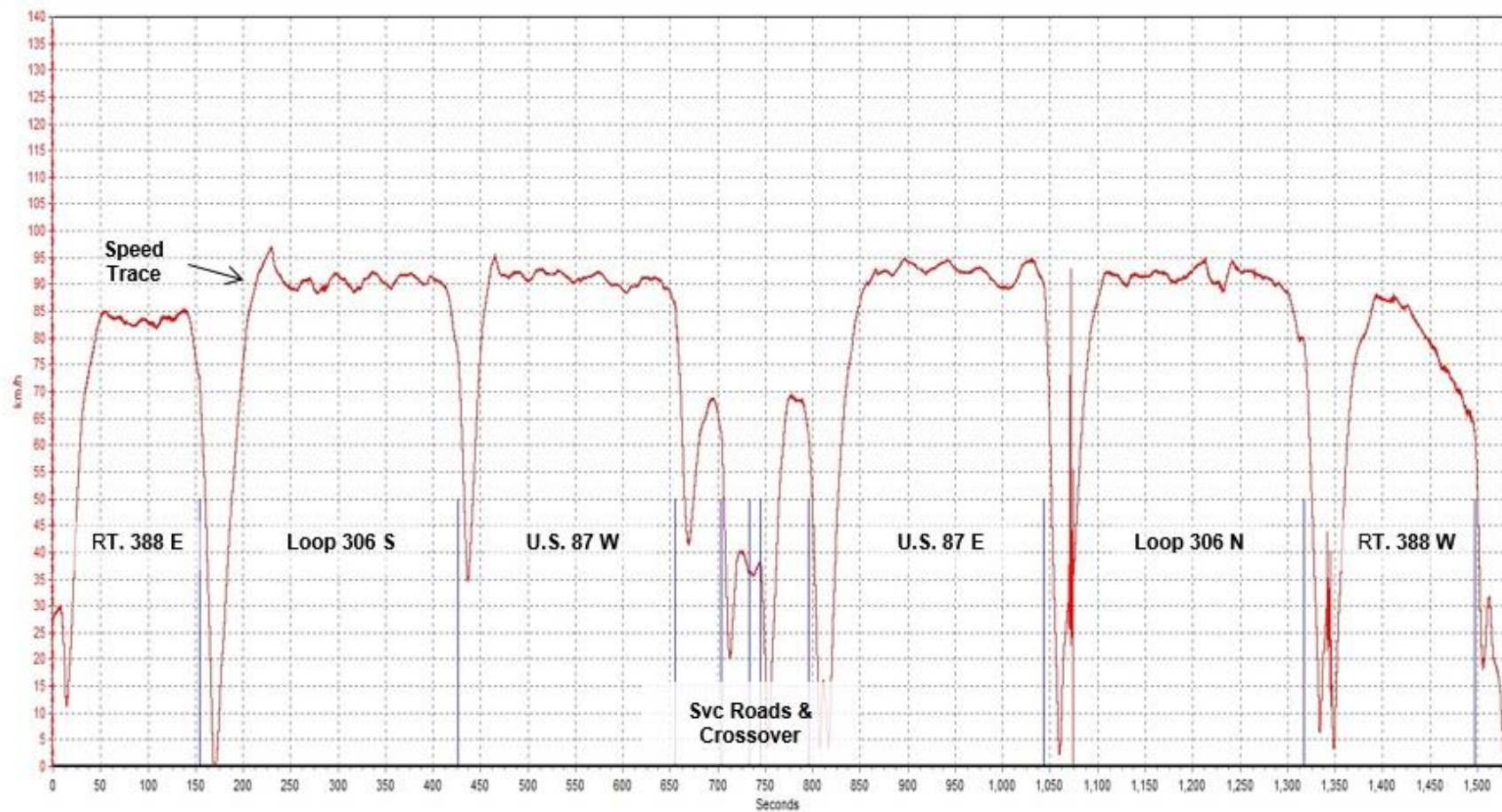


Gradual Deflation 2: Left Rear Tire at UVW+VCW – Calibration at 240 kPa
Test Date: 3/14/19
Data File Time: 25:28 minutes
Cumulative Driving Time: 20:34 minutes
Start Point: GAFB North Gate

Calibration Phase:

2019 Kia Sedona LR Calibration Run UVW+VCW (Gradual Deflation 2)

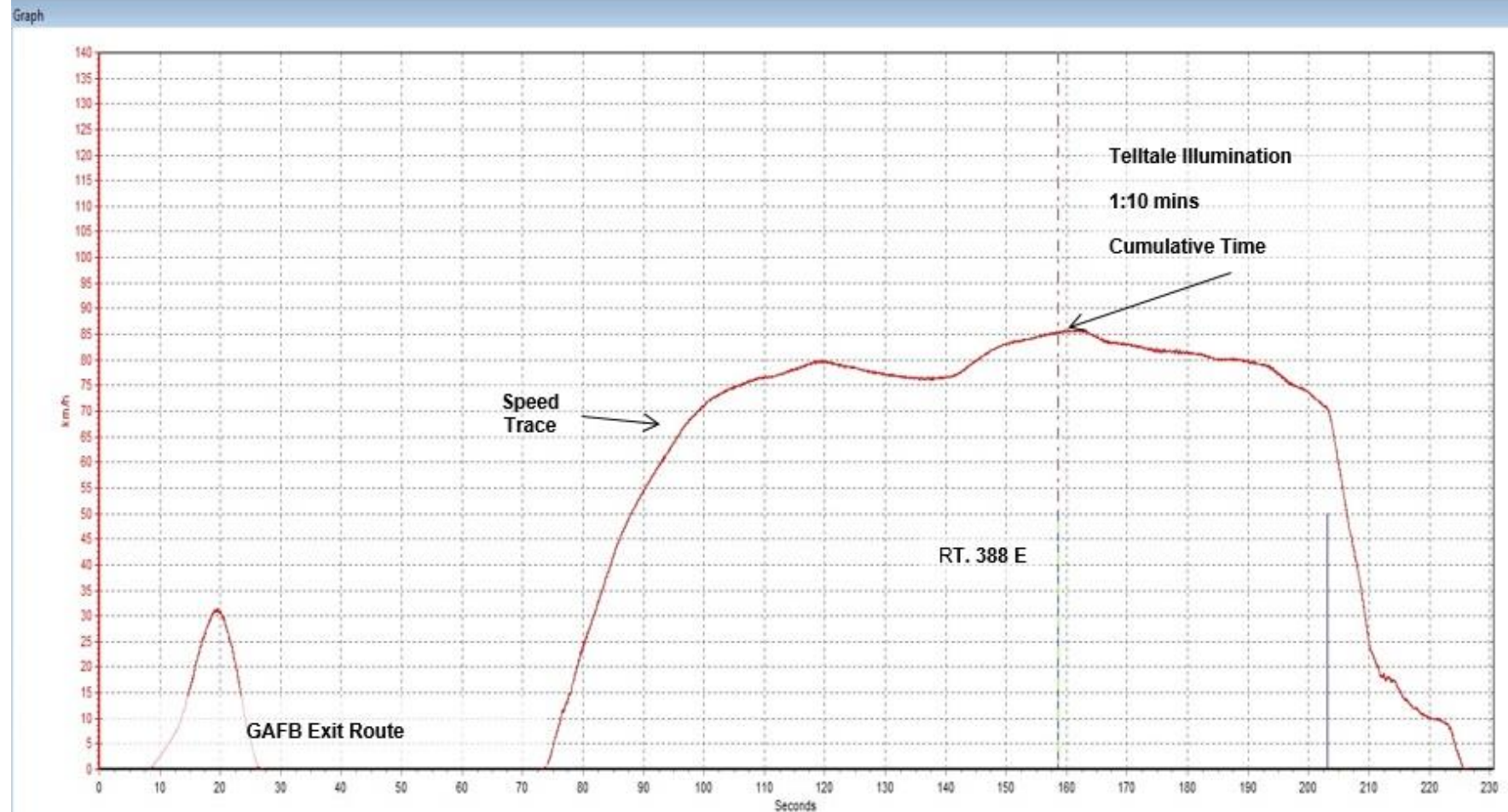
Graph



Gradual Deflation 2: Left Rear Tire at UVW+VCW – Illumination at 184 kPa
Test Date: 3/14/19
Data File Time: 3:51 minutes
Cumulative Driving Time: 1:10 minutes
Start Point: GAFB North Gate

Calibration Phase:

2019 Kia Sedona LR Illumination Run @ 184 kPa - UVW+VCW (Gradual Deflation 2)



SECTION 7
OWNER'S MANUAL PAGES

What to do in an emergency

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 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. 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.

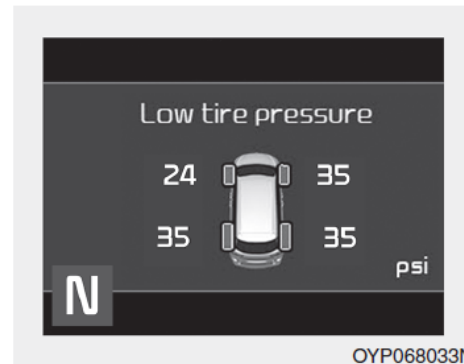
*** NOTICE**

If the TPMS, Low Tire Pressure indicator does not illuminate for 3 seconds when the ignition switch is turned to the ON position or engine is running, or if they remain illuminated after coming on for approximately 3 seconds, take your vehicle to your nearest authorized Kia dealer and have the system checked.



Low tire pressure telltale

Low tire pressure position telltale



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

If the telltale illuminates, immediately reduce your speed, avoid hard cornering and anticipate increased stopping distances. You should stop and check your tires as soon as possible.

Inflate the tires to the proper pressure as indicated on the vehicle's placard or tire inflation pressure label located on the driver's side center pillar outer panel. If you cannot reach a service station or if the tire cannot hold the newly added air, replace the low pressure tire with the spare tire.

Then the TPMS malfunction indicator and the Low Tire Pressure telltale may turn on and illuminate after restarting and about 20 minutes of continuous driving before you have the low pressure tire repaired and replaced on the vehicle.

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

What to do in an emergency

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

When filling tires with more air, conditions to turn off the low tire pressure telltale may not be met. This is because a tire inflator has a margin of error in performance. The low tire pressure telltale will be turned off if the tire pressure is above the recommended tire inflation pressure.

⚠ WARNING - Low pressure damage

Do not drive on low pressure tires. Significantly low tire pressure can cause the tires to overheat and fail making the vehicle unstable resulting in increased braking distances and a loss of vehicle control.



TPMS (Tire Pressure Monitoring System) malfunction indicator

The low tire pressure telltale will illuminate after it blinks for approximately one minute when there is a problem with the Tire Pressure Monitoring System. If the system is able to correctly detect an underinflation warning at the same time as system failure then it will illuminate both the TPMS malfunction and low tire pressure position telltales e.g. if Front Left sensor fails, the TPMS malfunction indicator illuminates, but if the Front Right, Rear Left, or Rear Right tire is under-inflated, the low tire pressure position telltales may illuminate together with the TPMS malfunction indicator.

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

- The TPMS malfunction indicator may be illuminated if the vehicle is moving around electric power supply cables or radios transmitters such as at police stations, government and public offices, broadcasting stations, military installations, airports, or transmitting towers, etc. This can interfere with normal operation of the Tire Pressure Monitoring System (TPMS).
- The TPMS malfunction indicator may be illuminated if snow chains are used or some separate electronic devices such as notebook computer, mobile charger, remote starter or navigation etc., are used in the vehicle. This can interfere with normal operation of the Tire Pressure Monitoring System (TPMS).

Changing a tire with TPMS

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



CAUTION - Repair Agents

Never use a puncture-repairing agent not approved by Kia to repair and/or inflate a low pressure tire. The tire sealant not approved by Kia may damage the tire pressure sensor.

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

Even if you replace the low pressure tire with the spare tire, the Low Tire Pressure telltale will remain on until the low pressure tire is repaired and placed on the vehicle.

After you replace the low pressure tire with the spare tire, the TPMS malfunction indicator may illuminate after a few minutes because the TPMS sensor mounted on the spare wheel is not initiated.

Once the low pressure tire is reinflated to the recommended pressure and installed on the vehicle or the TPMS sensor mounted on the replaced spare wheel is initiated by an authorized Kia dealer, the TPMS malfunction indicator and the low tire pressure telltale will extinguish within a few minutes of driving.

If the indicator is not extinguished after a few minutes of driving, please visit an authorized Kia dealer.

If an original mounted tire is replaced with the spare tire, the TPMS sensor on the replaced spare wheel should be initiated and the TPMS sensor on the original mounted wheel should be deactivated. If the TPMS sensor on the original mounted wheel located in the spare tire carrier still activates, the tire pressure monitoring system may not operate properly. Have the tire with TPMS serviced or replaced by an authorized Kia dealer.

What to do in an emergency

You may not be able to identify a low tire by simply looking at it. Always use a good quality tire pressure gauge to measure the tire's inflation pressure. Please note that a tire that is hot (from being driven) will have a higher pressure measurement than a tire that is cold (from sitting stationary for at least 3 hours and driven less than 1 mile (1.6 km) during that 3 hour period).

Allow the tire to cool before measuring the inflation pressure. Always be sure the tire is cold before inflating to the recommended pressure.

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

Do not use any tire sealant if your vehicle is equipped with a Tire Pressure Monitoring System. The liquid sealant can damage the tire pressure sensors.

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

*** NOTICE - Protecting TPMS**

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