

126-TRC-11-010

**SAFETY COMPLIANCE TESTING FOR FMVSS 126
Electronic Stability Control Systems**

Toyota Motor Manufacturing, Texas, Inc.
2011 Toyota Tundra
NHTSA No. CB5109

TRANSPORTATION RESEARCH CENTER INC.
10820 State Route 347
East Liberty, Ohio 43319



October 17, 2011

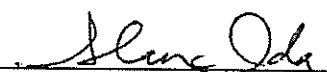
FINAL REPORT

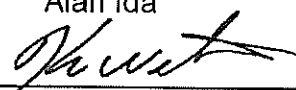
Prepared Under Contract No.: DTNH22-08-D-00097

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
1200 New Jersey Avenue, SE
West Building, 4th Floor (NVS-221)
Washington, DC 20590

Prepared for the Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-08-D-00097.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products of manufacturers.

Prepared By: 
Alan Ida

Approved By: 
Ken Webster

Approval Date: 9/9/11

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: 

Acceptance Date: 10/17/11

1. Report No. 126-TRC-11-010	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of FMVSS 126 Compliance Testing of 2011 Toyota Tundra, NHTSA No. CB5109		5. Report Date October 17, 2011	
		6. Performing Organization Code TRC 20080734 / 1110	
7. Author(s) Alan Ida, Project Engineer Ken Webster, Manager, DDO Project Operations		8. Performing Organization Report No. TRC-DOT-126-11-010	
9. Performing Organization Name and Address Transportation Research Center Inc. 10820 State Route 347 East Liberty, OH 43319		10. Work Unit No.	
		11. Contract or Grant No. DTNH22-08-D-00097	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance 1200 New Jersey Avenue, SE, West Building, 4 th Floor (NVS-221) Washington, D.C. 20590		13. Type of Report and Period Covered Final test report August 24, 2011 to October 17, 2011	
		14. Sponsoring Agency Code NVS-220	
15. Supplementary Notes			
16. Abstract A test was conducted on a 2011 Toyota Tundra, NHTSA No. CB5109, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-126-02 for the determination of FMVSS 126 compliance. Test failures identified were as follows: None			
17. Key Words Compliance Testing Safety Engineering FMVSS 126		18. Distribution Statement Copies of this report are available from: NHTSA Technical Information Services (TIS) (NPO 411) 1200 New Jersey Avenue, SE Washington, D.C. 20590 Email: tis@nhtsa.dot.gov FAX: (202) 493-2833	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 80	22.

TABLE OF CONTENTS

<u>SECTION</u>		<u>PAGE</u>
1.0	PURPOSE OF COMPLIANCE TEST	1
2.0	TEST PROCEDURE AND DISCUSSION OF RESULTS	1
3.0	TEST DATA	5
4.0	TEST EQUIPMENT LIST AND CALIBRATION INFORMATION	34
5.0	PHOTOGRAPHS	35
6.0	DATA PLOTS	53
7.0	OTHER DOCUMENTATION	62
	7.1 Owner's Manual Pages	63
	7.2 Vehicle Arrival Condition Report	72
	7.3 Vehicle Completion Condition Report	73
	7.4 Sine with Dwell Test Results	74
	7.5 Slowly Increasing Steer Test Results	78
	7.6 Inertial Sensing System Location Coordinates	80

1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this test is to determine if the test vehicle, a MY 2011 Toyota Tundra meets the minimum equipment and performance requirements stated in Federal Motor Vehicle Safety Standard (FMVSS) 126, "Electronic Stability Control Systems."

This standard establishes performance and equipment requirements for Electronic Stability Control (ESC) Systems installed in passenger cars, multipurpose passenger vehicles, trucks, and buses with a gross vehicle weight rating of 4,536 kilograms or less.

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS

Testing of the MY 2011 Toyota Tundra was conducted at Transportation Research Center Inc. (TRC Inc.) in accordance with NHTSA TP-126-02, dated November 19, 2008.

The vehicle was inspected to ensure it was equipped with an ESC System that:

- Augments vehicle directional stability by applying and adjusting brake torques individually at each wheel to induce a correcting yaw moment to a vehicle;
- Is computer controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;
- Has a means to determine the vehicle's yaw rate and to estimate its side slip or side slip derivative with respect to time;
- Has a means to monitor driver steering inputs;
- Has an algorithm to determine the need, and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle, and
- Is operational over the full speed range of the vehicle (except at vehicle speeds less than 20km/h (12.4mph), when being driven in reverse, or during system initialization).

The vehicle was subjected to a 0.7Hz Sine with Dwell (SWD) Steering Maneuver to ensure that it would meet the stability and responsiveness requirements of the standard as follows:

- At 1.0 second after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 35 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).
- At 1.75 seconds after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 20 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).

- The lateral displacement of the vehicle center of gravity with respect to its initial straight path must be at least 1.83 m (6 feet) (for vehicles with a GVWR of 3,500kg (7,716 lb) or less) when computed 1.07 seconds after the Beginning of Steer (BOS) at the specified steering wheel angles.

System malfunction simulations were executed to verify vehicle could identify and indicate a malfunction.

The vehicle's ESC System appears to meet the performance and equipment requirements as required by FMVSS 126. The test results are summarized on the following summary sheet.

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS ...continued

DATA SUMMARY (Sheet 1 of 2)

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA NO.: CB5109 VIN: 5TFUW5F12BX191007

VEHICLE TYPE: Truck DATE OF MANUFACTURE: 02/11

LABORATORY: Transportation Research Center Inc.

REQUIREMENTS

PASS/FAIL

ESC Equipment and Operational Characteristics (Data Sheet 2)

The vehicle is to be equipped with an ESC System that meets the equipment PASS and operational characteristics requirements. (S126, S5.1, S5.6)

ESC Malfunction Telltale (Data Sheet 3)

The vehicle is equipped with a telltale that indicates one or more PASS ESC System malfunctions. (S126, S5.3)

“ESC Off” and other System Controls and Telltale (Data Sheet 3 & 4)

The vehicle is equipped with an ESC off telltale indicating the vehicle PASS has been put into a mode that renders the ESC System unable to satisfy the performance requirements of the standard, if such a mode exists. (S5.5.1)

If provided, off control and other system controls as well as the ESC PASS off telltale meets the operational requirements (S126, S5.4, S5.4.1, S5.4.2, S5.5.4, and S5.5.9)

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS ...continued

DATA SUMMARY (Sheet 2 of 2)

REQUIREMENTS	PASS/FAIL
If provided, off control and other system controls as well as the ESC off telltale meets the operational requirements (S126, S5.4, S5.4.1, S5.4.2, S5.5.4, and S5.5.9)	<u>PASS</u>
Vehicle Lateral Stability (Data Sheet 8)	
Yaw Rate Ratio at 1 second after COS is less than 35% of peak value. (S126, S5.2.1)	<u>PASS</u>
Yaw Rate Ratio at 1.75 seconds after COS is less than 20% of peak value. (S126, S5.2.2)	<u>PASS</u>
Vehicle Responsiveness (Data Sheet 8)	
Lateral displacement at 1.07 seconds after BOS is at least 1.83 m (6 feet) for vehicles with a GVWR of 3,500 kg (7,716 lbs.) or less, and 1.52 m (5 feet) for vehicles with a GVWR greater than 3,500 kg (7,716 lbs.). (S126 S5.2.3)	<u>PASS</u>
ESC Malfunction Warning (Data Sheet 12)	
Warning is provided to driver after malfunction occurrence. (S126. S5.3)	<u>PASS</u>
Malfunction telltale stayed illuminated as long as malfunction existed and must extinguish after malfunction was corrected. (S126, S5.3.7)	<u>PASS</u>

REMARKS

3.0 TEST DATA

**DATA SHEET 1 (Sheet 1 of 2)
TEST VEHICLE INSPECTION AND TEST PREPARATION**

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

NHTSA No.: CB5109 TEST DATE: 8-25-11

VIN: 5TFUW5F12BX191007 MANUFACTURE DATE: 02/11

GVWR: 3,220 KG FRONT GAWR: 1,810 KG REAR GAWR 1,880 KG

SEATING POSITIONS: FRONT 2 REAR 3

ODOMETER READING AT START OF TEST: 12 (19) Miles (Kilometers)

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:

Front Axle LT285 / 70R 17 Rear Axle LT285 / 70R 17

INSTALLED TIRE SIZE(S) ON VEHICLE:

<u>From Tire Sidewall</u>	<u>Front Axle</u>	<u>Rear Axle</u>
Manufacturer and Model	<u>BFGoodrich All-Terrain T/A KO</u>	<u>BFGoodrich All-Terrain T/A KO</u>
Tire Size Designation	<u>LT285 / 70R 17</u>	<u>LT285 / 70R 17</u>

Are installed tire sizes same as labeled tire sizes? X Yes No
If no, contact COTR for further guidance.

DRIVE CONFIGURATIONS (MARK ALL THAT APPLY):

- X Two Wheel Drive (2WD): () Front Wheel Drive (X) Rear Wheel Drive
- All Wheel Drive (AWD)
- Four Wheel Drive Automatic – differential not locked full time (4WD Automatic)
- Four Wheel Drive High Gear Unlocked Center Differential
- X Four Wheel Drive High Gear Locked Center Differential
- Four Wheel Drive Low Gear Unlocked Center Differential
- X Four Wheel Drive Low Gear Locked Center Differential
- Other (define _____)

3.0 TEST DATA....continued

**DATA SHEET 1 (Sheet 2 of 2)
TEST VEHICLE INSPECTION AND TEST PREPARATION**

DRIVE CONFIGURATIONS AND MODES: (ex. default, performance, off)
(For each of the vehicle's drive configurations identify available operating modes)

Drive Configuration 2WD
Mode(s) default

Drive Configuration 4WD Hi
Mode(s) default

Drive Configuration 4WD Lo
Mode(s) default

VEHICLE STABILITY SYSTEMS (Check applicable technologies):

ESC Traction Control Roll Stability Control
 Active Suspension Electronic Throttle Control Active Steering
 ABS

List other systems; Brake Assist, TRAC, A-TRAC

REMARKS:

RECORDED BY: Alan Ida
APPROVED BY: Ken Webster

DATE: 8-25-11
DATE: 9-09-11

3.0 TEST DATA....continued

DATA SHEET 2 (Sheet 2 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

ESC SYSTEM OPERATIONAL CHARACTERISTICS (continued):

System is capable of modifying engine torque during ESC activation. Yes (PASS)
 No (FAIL)

Method used to modify engine torque: During traction control and VSC (ESC) operation, the VSC computer outputs an engine output control signal to the ECM. Upon receiving this signal, the ECM effects throttle control to regulate the engine output.

System is capable of activation at speeds of 20 km/h (12.4 mph) and higher. Yes (PASS)
 No (FAIL)

Speed system becomes active. above 15 km/h (9.3 mph)

System is capable of activation during the following driving phases (acceleration, deceleration, coasting, and during activation of ABS or traction control). Yes (PASS)
 No (FAIL)

Driving phases that the system is capable of activation. The ESC system is active during acceleration, braking, coasting, and during activation of ABS or traction control in the forward driving direction.

Vehicle manufacturer submitted documentation explaining how the ESC system mitigates understeer? Yes (PASS)
 No (FAIL)

DATA INDICATES COMPLIANCE PASS/FAIL PASS

RECORDED BY: Alan Ida
APPROVED BY: Ken Webster

DATE: 9-08-11
DATE: 9-09-11

3.0 TEST DATA....continued

DATA SHEET 3 (Sheet 1 of 2)
ESC MALFUNCTION AND OFF TELLTALES

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA NO. CB5109 TEST DATE: 9-07-11

ESC Malfunction Telltale

Vehicle is equipped with malfunction telltale? Yes (Pass) No (Fail)

Telltale Location Instrument cluster, left side, inside the tachometer

Telltale Color Amber

Telltale symbol or abbreviation used.



Or **ESC**

- Vehicle uses this symbol
- Vehicles uses this abbreviation
- Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used.

Is telltale part of a common space? Yes No

Is telltale also used to indicate activation of the ESC system? Yes No

If yes, explain telltale operation during ESC activation: During ESC Activation, the ESC telltale flashes.

3.0 DATA SHEETS....continued

DATA SHEET 3 (Sheet 2 of 2)
ESC MALFUNCTION AND OFF TELLTALES

“ESC OFF” Telltale (if provided)

Vehicle is equipped with “ESC Off” telltale? X Yes No

Is “ESC OFF” telltale combined with “ESC Malfunction” telltale utilizing a two part telltale?
 Yes X No

Telltale Location Instrument cluster, left side, inside the tachometer

Telltale Color Amber

Telltale symbol or abbreviation used.



Or

ESC OFF

- X Vehicle uses this symbol
- Vehicle uses this abbreviation
- Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used.

Is telltale part of a common space? Yes X No

DATA INDICATES COMPLIANCE PASS/FAIL PASS
(Vehicle is compliant if equipped with a malfunction telltale)

REMARKS:

RECORDED BY: Alan Ida
APPROVED BY: Ken Webster

DATE: 9-07-11
DATE: 9-09-11

3.0 TEST DATA....continued

DATA SHEET 4 (Sheet 1 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

“ESC OFF” Controls Identification and Operational Check:

Is the vehicle equipped with a control or controls whose purpose is to deactivate the ESC system or place the ESC system in a mode or modes that may no longer satisfy the performance requirements of the standard?

Yes No

Type of control or controls provided? (mark all that apply)

<input type="checkbox"/>	Dedicated “ESC Off” control
<input checked="" type="checkbox"/>	Multi-functional control with an “ESC Off” mode
<input type="checkbox"/>	Other (describe)

Identify each control location, labeling and selectable modes.

First Control: Location Instrument panel, right of steering column

Labeling Skidding car symbol with “Off” underneath

Modes Traction Control Off
VSC (ESC) Off & Traction Control Off
VSC (ESC) On & Traction Control On

Identify standard or default drive configuration Default – 2WD

Verify standard or default drive configuration selected. Yes No

Does the “ESC Off” telltale illuminate upon activation of the dedicated ESC off control or selection of the “ESC Off” mode on the multi-function control?

Yes No (fail)

Does the “ESC Off” telltale extinguish when the ignition is cycled from “On” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position?

Yes No (fail)

If no, describe how the off control functions:

3.0 TEST DATA....continued

**DATA SHEET 4 (Sheet 3 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS**

Activate each control listed above and record whether the control illuminates the “ESC Off” telltale. Also, record warnings or messages provided regarding the ESC System.

Ancillary Control	Control Activates “ESC Off” Telltale? (Yes/No)	Warnings or Messages Provided
4L	Yes	ESC Off telltale illuminates

For those controls that illuminate the “ESC Off” telltale above identify if the “ESC Off” telltale extinguishes upon cycling the ignition system.

Ancillary Control	“ESC Off” telltale extinguishes upon cycling ignition? (Yes/No)
4L	No

For each control that illuminates the “ESC Off” telltale, did the telltale extinguish when the ignition is cycled from “On” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position? If the control activated places the vehicle into a low-range four-wheel drive configuration designed for low-speed, off-road driving, the ESC System may remain turned off after the ignition has been cycled off and then back on and therefore the “ESC Off” telltale may not extinguish.

_____ Yes X (See Remarks) No (fail)

DATA INDICATES COMPLIANCE: PASS/FAIL PASS

REMARKS:

*The control places the vehicle in a low-range four-wheel drive configuration designed for low-speed, off-road driving, which allows the ESC to remain off after the ignition has been cycled off and then back on.

RECORDED BY: Alan Ida
APPROVED BY: Ken Webster

DATE: 9-07-11
DATE: 9-09-11

3.0 TEST DATA....continued

**DATA SHEET 5 (Sheet 1 of 3)
VEHICLE AND TEST TRACK DATA**

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

NHTSA No.: CB5109 TEST DATE: 8-29-11

Test Track Requirements: Test Surface Slope (0-1 %) 1 %

Peak Friction Coefficient (at least 0.9) 0.97

Full Fluid Levels: Fuel X Coolant X Other Fluids Washer (specify)

Tire Pressures: Required: Front Axle 275 kPa Rear Axle 275 kPa

Actual: LF: 275 kPa RF: 275 kPa LR: 275 kPa RR: 275 kPa

Vehicle Dimensions: Track Width 174.9 cm Wheelbase 370.7 cm

Roof Height 193.1 cm

Vehicle weight ratings: GAWR Front 1,810 KG GAWR Rear 1,880 KG

Unloaded Vehicle Weight (UVW)

Front Axle 1,484.6 KG Left Front 773.2 KG Right Front 711.4 KG

Rear Axle 1,078.4 KG Left Rear 546.4 KG Right Rear 532.0 KG

Total UVW 2,563.0 KG

Baseline Weight and Outrigger Selection (only for MPVs, Trucks, Buses)

Calculated Baseline Weight (UVW+ 73 kg) 2,636.0 KG

Outrigger size required ("Standard" or "Heavy") Standard

Standard - Baseline weight under 2,722 kg (6,000 lbs.)

Heavy - Baseline weight equal to or greater than 2,722 kg (6,000 lbs.)

3.0 TEST DATA....continued

**DATA SHEET 5 (Sheet 2 of 3)
VEHICLE AND TEST TRACK DATA**

UVW with Outriggers (only for MPVs, Trucks, Buses)

Front Axle 1,517.8 KG Left Front 789.8 KG Right Front 728.0 KG

Rear Axle 1,095.8 KG Left Rear 555.0 KG Right Rear 540.8 KG

Total UVW w/ Outriggers 2,613.6 KG

Loaded Vehicle Weight w/ Driver and Instrumentation (No Ballast)

Front Axle 1,608.8 KG Left Front 847.8 KG Right Front 761.0 KG

Rear Axle 1,141.4 KG Left Rear 581.8 KG Right Rear 559.6 KG

Total Loaded Vehicle Weight 2,750.2 KG

Ballast Required = [UVW w/ Outriggers + 168 KG] - **Total Loaded Weight w/
Driver and Instrumentation**

= [2,613.6 KG + 168 KG] - 2,750.2 KG

= 31.4 KG

Total Loaded Vehicle Weight

Front Axle 1,626.2 KG Left Front 849.2 KG Right Front 777.0 KG

Rear Axle 1,155.4 KG Left Rear 586.6 KG Right Rear 568.8 KG

Total Loaded Vehicle Weight 2,781.6 KG

3.0 TEST DATA....continued

**DATA SHEET 5 (Sheet 3 of 3)
VEHICLE AND TEST TRACK DATA**

Center of Gravity and Inertial Sensing System Location at Loaded Vehicle Condition

x-distance (longitudinal) Point of reference is the front axle centerline.
(Positive from front axle toward rear of vehicle.)

y-distance (lateral) Point of reference is the vehicle centerline.
(Positive from the center toward the right.)

z-distance (vertical) Point of reference is the ground plane.
(Positive from the ground up.)

Locations:

	Center of Gravity	Inertial Sensing System
x-distance	<u>154.0</u> cm	<u>171.4</u> cm
y-distance	<u>-2.8</u> cm	<u>-1.2</u> cm
z-distance	<u>73.4</u> cm	<u>126.7</u> cm

Distance Between Ultrasonic Sensors: 210.5 cm

TEST TRACK DATA MEETS REQUIREMENTS: YES/NO YES
If no, explain: _____

REMARKS:

RECORDED BY: Alan Ida
APPROVED BY: Ken Webster

DATE: 8-29-11
DATE: 9-09-11

3.0 TEST DATA....continued

**DATA SHEET 6 (Sheet 1 of 3)
BRAKE AND TIRE CONDITIONING
2WD MODE**

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA No.: CB5109

Measured Cold Tire Pressures: LF 275 kPa RF 275 kPa
LR 275 kPa RR 275 kPa

Wind Speed 2.2 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 22.8 °C

Brake Conditioning Time; 12:38 PM Date; 8-30-11

56 km/h (35 mph) Brake Stops

Number of stops executed (10 required) 10 stops

Observed deceleration rate range (.5g target) 0.50 – 0.54 g

72 km/h (45 mph) Brake Stops

Number of stops executed (3 required) 3 stops

Number of stops ABS activated (3 required) 3 stops

Observed deceleration rate range 1.00 – 1.10 g

72 km/h (45 mph) Brake Cool Down Period

Duration of cool down period (5 minutes min.) 5:11 minutes

3.0 TEST DATA....continued

DATA SHEET 7 (1 of 2) SLOWLY INCREASING STEER (SIS) MANEUVER 2WD MODE

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA No.: CB5109 TEST DATE: 8-30-11

Wind Speed 2.2 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 23.3 °C

Static Data File Number: 0009

Selected Drive Configuration: 2WD

Selected Mode: default

Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle ($a_{y,30 \text{ degrees}}$)

$$a_{y,30 \text{ degrees}} = \underline{0.31} \text{ g}$$

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at .55g.

$$\frac{30 \text{ degrees}}{a_{y,30 \text{ degrees}}} = \frac{\delta_{SIS}}{0.55 \text{ g}}$$

$$\delta_{SIS} = \underline{53.2} \text{ degrees @ } 0.55\text{g}$$

$$\delta_{SIS} = \underline{50} \text{ degrees (rounded)}$$

Steering Wheel Angle at Corrected 0.3 g Lateral Acceleration:

Maneuver #	Initial Steer Direction	Time Clock (5 min max between runs)	Steering Wheel Angle to nearest 0.1 degree (degrees)	All Conditions Met?
0012	Left	1:27 pm	-40.9	Yes
0014	Left	1:32 pm	-41.7	Yes
0016	Left	1:37 pm	-41.6	Yes
0017	Right	1:42 pm	42.3	Yes
0018	Right	1:45 pm	42.6	Yes
0019	Right	1:47 pm	42.8	Yes

3.0 TEST DATA....continued

DATA SHEET 7 (2 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER
2WD MODE

Average Overall Steering Wheel Angle:

$$\delta_{0.3 \text{ g, overall}} = (|\delta_{0.3 \text{ g, left (1)}}| + |\delta_{0.3 \text{ g, left (2)}}| + |\delta_{0.3 \text{ g, left (3)}}| + \delta_{0.3 \text{ g, right (1)}} + \delta_{0.3 \text{ g, right (2)}} + \delta_{0.3 \text{ g, right (3)}}) / 6$$

$$\delta_{0.3 \text{ g, overall}} = \frac{42.0}{\text{[to nearest 0.1 degree]}} \text{ degrees}$$

REMARKS:

RECORDED BY: Alan Ida
APPROVED BY: Ken Webster

DATE: 8-30-11
DATE: 9-09-11

3.0 TEST DATA....continued

DATA SHEET 8 (1 of 3) VEHICLE LATERAL STABILITY AND RESPONSIVENESS 2WD MODE

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA No.: CB5109 TEST DATE: 8-30-11

Tire conditioning completed	<u>X</u>	Yes	<u> </u>	No
ESC system is enabled	<u>X</u>	Yes	<u> </u>	No
On track calibration checks have been completed	<u>X</u>	Yes	<u> </u>	No
On track static data file for each sensor obtained	<u>X</u>	Yes	<u> </u>	No

Selected Drive Configuration: 2WD
Selected Mode: default

Overall steering wheel angle ($\delta_{0.3g, overall}$) 42.0 degrees

Static Data File Number 0024

Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle ¹ (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [$\leq 35\%$]		YRR at 1.75 sec after COS [$\leq 20\%$]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
0025	2:38 pm	1.5* $\delta_{0.3g}$	63	12.32	-0.12	0.04	-0.99	Pass	0.34	Pass
0026	2:41 pm	2.0* $\delta_{0.3g}$	84	16.24	-0.04	-0.04	-0.26	Pass	-0.22	Pass
0027	2:44 pm	2.5* $\delta_{0.3g}$	105	18.97	-0.10	-0.06	-0.55	Pass	-0.33	Pass
0028	2:47 pm	3.0* $\delta_{0.3g}$	126	22.35	-0.08	-0.01	-0.35	Pass	-0.04	Pass
0029	2:50 pm	3.5* $\delta_{0.3g}$	147	26.10	-0.08	-0.01	-0.31	Pass	-0.06	Pass
0030	2:53 pm	4.0* $\delta_{0.3g}$	168	26.00	0.00	0.04	-0.01	Pass	0.13	Pass
0031	2:57 pm	4.5* $\delta_{0.3g}$	189	26.96	0.02	0.02	0.08	Pass	0.08	Pass
0032	3:00 pm	5.0* $\delta_{0.3g}$	210	28.31	0.00	-0.05	0.01	Pass	-0.16	Pass
0033	3:03 pm	5.5* $\delta_{0.3g}$	231	20.93	-0.06	0.06	-0.31	Pass	0.28	Pass
0034	3:06 pm	6.0* $\delta_{0.3g}$	252	22.47	0.07	0.21	0.29	Pass	0.93	Pass
0035	3:09 pm	6.5* $\delta_{0.3g}$	273	23.38	-0.06	0.11	-0.25	Pass	0.47	Pass

1. Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5 * \delta_{0.3g, overall}$ or 270 degrees is utilized, whichever is greater provided the calculated magnitude of $6.5 * \delta_{0.3g, overall}$ is less than or equal to 300 degrees. If $6.5 * \delta_{0.3g, overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5 * \delta_{0.3g, overall}$ without exceeding the 270 degree steering wheel angle.

3.0 TEST DATA....continued

**DATA SHEET 10 (1 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER
4WD MODE**

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA No.: CB5109 TEST DATE: 9-01-11

Wind Speed 3.6 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 29.4 °C

Static Data File Number: 0009

Selected Drive Configuration: 4WD

Selected Mode: default

Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle ($a_{y,30 \text{ degrees}}$)

$$a_{y,30 \text{ degrees}} = \underline{0.30} \text{ g}$$

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at .55g.

$$\frac{30 \text{ degrees}}{a_{y,30 \text{ degrees}}} = \frac{\delta_{SIS}}{0.55 \text{ g}}$$

$$\delta_{SIS} = \underline{55.0} \text{ degrees @ } 0.55\text{g}$$

$$\delta_{SIS} = \underline{60} \text{ degrees (rounded)}$$

Steering Wheel Angle at Corrected 0.3 g Lateral Acceleration:

Maneuver #	Initial Steer Direction	Time Clock (5 min max between runs)	Steering Wheel Angle to nearest 0.1 degree (degrees)	All Conditions Met?
0011	Left	11:25 am	-42.5	Yes
0012	Left	11:27 am	-44.1	Yes
0013	Left	11:30 am	-44.8	Yes
0015	Right	11:35 am	43.1	Yes
0016	Right	11:37 am	42.7	Yes
0017	Right	11:40 am	43.8	Yes

3.0 TEST DATA....continued

DATA SHEET 10 (2 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER
4WD MODE

Average Overall Steering Wheel Angle:

$$\delta_{0.3g, \text{ overall}} = (|\delta_{0.3g, \text{ left (1)}}| + |\delta_{0.3g, \text{ left (2)}}| + |\delta_{0.3g, \text{ left (3)}}| + \delta_{0.3g, \text{ right (1)}} + \delta_{0.3g, \text{ right (2)}} + \delta_{0.3g, \text{ right (3)}}) / 6$$

$$\delta_{0.3g, \text{ overall}} = \frac{43.5}{\text{[to nearest 0.1 degree]}} \text{ degrees}$$

REMARKS:

RECORDED BY: Alan Ida
APPROVED BY: Ken Webster

DATE: 9-01-11
DATE: 9-09-11

3.0 TEST DATA....continued

DATA SHEET 11 (1 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS
4WD MODE

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA No.: CB5109 TEST DATE: 9-01-11

Tire conditioning completed	<u>X</u>	Yes	<u> </u>	No
ESC system is enabled	<u>X</u>	Yes	<u> </u>	No
On track calibration checks have been completed	<u>X</u>	Yes	<u> </u>	No
On track static data file for each sensor obtained	<u>X</u>	Yes	<u> </u>	No

Selected Drive Configuration: 4WD
 Selected Mode: default

Overall steering wheel angle ($\delta_{0.3g, overall}$) 43.5 degrees

Static Data File Number 0022

Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle ¹ (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [$\leq 35\%$]		YRR at 1.75 sec after COS [$\leq 20\%$]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
0023	1:04 pm	1.5* $\delta_{0.3g}$	65	12.43	0.01	-0.14	0.09	Pass	-1.10	Pass
0024	1:07 pm	2.0* $\delta_{0.3g}$	87	16.23	-0.06	-0.07	-0.34	Pass	-0.44	Pass
0025	1:10 pm	2.5* $\delta_{0.3g}$	109	19.99	-0.06	-0.01	-0.31	Pass	-0.04	Pass
0026	1:13 pm	3.0* $\delta_{0.3g}$	131	23.30	0.01	0.04	0.03	Pass	0.16	Pass
0027	1:16 pm	3.5* $\delta_{0.3g}$	152	26.36	0.06	0.01	0.23	Pass	0.05	Pass
0028	1:19 pm	4.0* $\delta_{0.3g}$	174	27.55	-0.08	-0.19	-0.28	Pass	-0.69	Pass
0029	1:22 pm	4.5* $\delta_{0.3g}$	196	27.67	-0.18	-0.15	-0.65	Pass	-0.53	Pass
0030	1:25 pm	5.0* $\delta_{0.3g}$	218	24.69	0.07	0.02	0.28	Pass	0.08	Pass
0031	1:28 pm	5.5* $\delta_{0.3g}$	239	25.40	0.05	0.00	0.18	Pass	0.00	Pass
0032	1:31 pm	6.0* $\delta_{0.3g}$	261	25.77	0.10	0.02	0.40	Pass	0.06	Pass
0035*	2:08 pm	6.5* $\delta_{0.3g}$	283	26.89	-0.09	-0.06	-0.34	Pass	-0.22	Pass

1. Maneuver execution should continue until a steering wheel angle magnitude factor of 6.5* $\delta_{0.3g, overall}$ or 270 degrees is utilized, whichever is greater provided the calculated magnitude of 6.5* $\delta_{0.3g, overall}$ is less than or equal to 300 degrees. If 6.5* $\delta_{0.3g, overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of 0.5* $\delta_{0.3g, overall}$ without exceeding the 270 degree steering wheel angle.

3.0 TEST DATA....continued

**DATA SHEET 11 (2 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS
4WD MODE**

Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle ¹ (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [< 35%]		YRR at 1.75 sec after COS [< 20%]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
0036	2:11 pm	1.5* $\delta_{0.3g}$	65	-13.02	-0.05	-0.02	0.36	Pass	0.12	Pass
0037	2:19 pm	2.0* $\delta_{0.3g}$	87	-16.85	0.01	-0.13	-0.06	Pass	0.77	Pass
0038	2:22 pm	2.5* $\delta_{0.3g}$	109	-20.48	0.05	-0.03	-0.22	Pass	0.14	Pass
0039	2:25 pm	3.0* $\delta_{0.3g}$	131	-24.07	-0.06	0.07	0.23	Pass	-0.28	Pass
0040	2:28 pm	3.5* $\delta_{0.3g}$	152	-26.77	-0.07	-0.12	0.28	Pass	0.45	Pass
0041	2:31 pm	4.0* $\delta_{0.3g}$	174	-27.95	-0.06	-0.06	0.22	Pass	0.23	Pass
0042	2:34 pm	4.5* $\delta_{0.3g}$	196	-27.76	-0.04	-0.05	0.15	Pass	0.16	Pass
0043	2:37 pm	5.0* $\delta_{0.3g}$	218	-24.81	0.17	0.04	-0.68	Pass	-0.17	Pass
0044	2:40 pm	5.5* $\delta_{0.3g}$	239	-25.26	0.02	0.04	-0.09	Pass	-0.16	Pass
0045	2:43 pm	6.0* $\delta_{0.3g}$	261	-26.82	-0.08	-0.04	0.31	Pass	0.14	Pass
0047	2:48 pm	6.5* $\delta_{0.3g}$	283	-26.14	-0.20	-0.21	0.76	Pass	0.79	Pass

1. Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5 * \delta_{0.3g, overall}$ Or 270 degrees is utilized, whichever is greater provided the calculated $6.5 * \delta_{0.3g, overall}$ is less than or equal to 300 degrees. If $6.5 * \delta_{0.3g, overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5 * \delta_{0.3g, overall}$ without exceeding the 270 degree steering wheel angle.

During execution of the sine with dwell maneuvers were any of the following events observed?

- Rim-to-pavement contact _____ Yes X No
- Tire debanding _____ Yes X No
- Loss of pavement contact of vehicle tires _____ Yes X No
- Did the test driver experience any vehicle loss of control or spinout? _____ Yes X No

If “Yes” explain the event and consult with the COTR. _____

3.0 TEST DATA....continued

DATA SHEET 12 (Sheet 1 of 2)
MALFUNCTION WARNING TEST

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA No.: CB5109 TEST DATE: 9-07-11

METHOD OF MALFUNCTION SIMULATION:

Describe method of malfunction simulation: Disconnect the Right Front wheel speed sensor connector.

MALFUNCTION TELLTALE ILLUMINATION:

Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

X Yes No

Time for telltale to illuminate after ignition system is activated.

0 Seconds (must be within 2 minutes) X Pass Fail

ESC SYSTEM RESTORATION:

Telltale extinguishes after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

X Yes No

Time for telltale to extinguish after ignition system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.

0 Seconds (must be within 2 minutes) X Pass Fail

DATA INDICATES COMPLIANCE:

PASS/FAIL PASS

REMARKS:

The vehicle did not require driving to illuminate the malfunction telltales. When the wheel speed sensor was disconnected, the ESC and ABS malfunction telltales illuminated and the 4Hi telltale flashed rapidly. After the wheel speed sensor connector was restored, the 4Hi telltale extinguished, however, the ESC and ABS malfunction telltales remained illuminated. The vehicle required driving in the forward direction at approximately 8 mph to extinguish both the ESC and ABS malfunction telltales.

RECORDED BY: Alan Ida

DATE: 9-07-11

APPROVED BY: Ken Webster

DATE: 9-09-11

3.0 TEST DATA....continued

**DATA SHEET 12 (Sheet 2 of 2)
MALFUNCTION WARNING TEST**

VEHICLE MAKE/MODEL/BODY STYLE: Toyota / Tundra / Truck

VEHICLE NHTSA No.: CB5109 TEST DATE: 9-14-11

METHOD OF MALFUNCTION SIMULATION:

Describe method of malfunction simulation: Disconnect the Active Brake Booster electrical connector.

MALFUNCTION TELLTALE ILLUMINATION:

Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

Yes No

Time for telltale to illuminate after ignition system is activated.

0 Seconds (must be within 2 minutes) Pass Fail

ESC SYSTEM RESTORATION:

Telltale extinguishes after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

Yes No

Time for telltale to extinguish after ignition system is activated.

0 Seconds (must be within 2 minutes) Pass Fail

DATA INDICATES COMPLIANCE:

PASS/FAIL PASS

REMARKS:

The vehicle did not require driving to illuminate or extinguish the malfunction telltale. When the active brake booster connector was disconnected, the ESC malfunction telltale illuminated. After the brake booster connector was restored, the ESC malfunction telltale remained illuminated until the brake pedal was depressed for 3 seconds and released. Once the brake pedal was released, the ESC malfunction telltale extinguished.

RECORDED BY: Alan Ida

DATE: 9-14-11

APPROVED BY: Ken Webster

DATE: 9-14-11

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

Type	Output	Range	Resolution	Accuracy	Specifics	Serial Number	Calibration
Tire Pressure Gauge	Vehicle Tire Pressure	0-60psi	0.5 psi	±0.5% of applied pressure	Moroso Model: 89562 0-60psi	<u>N/A</u>	By: <u>TRC</u> Date: <u>6-14-11</u> Due: <u>9-12-11</u>
Platform Scales	Vehicle Total, Wheel, and Axle Load	0-2500 lb per each of four pads	0.5 lb	±1.0% of applied load	Mettler Toledo Model: JXGA1000	<u>5225831-5JC</u>	By: <u>Mettler Toledo</u> Date: <u>8-11-11</u> Due: <u>11-11-11</u>
Automated Steering Machine with Steering Angle Encoder	Handwheel Angle	±800 deg	0.25 deg	±0.25 deg	Heitz Automotive Testing Model: Sprint 3	<u>60303</u>	By: <u>ATI-Heitz</u> Date: <u>2-18-11</u> Due: <u>2-18-12</u>
Multi-Axis Inertial Sensing System	Longitudinal, Lateral, and Vertical Acceleration Roll, Yaw, and Pitch Rate	Accelerometers: ±2 g Angular Rate Sensors: ±100 deg/s	Accelerometers: ≤10 ug Angular Rate Sensors: ≤0.004 deg/s	Accelerometers: ≤0.05% of full range Angular Rate Sensors: 0.05% of full range	BEI Technologies Model: MotionPAK MP-1	<u>0768</u>	By: <u>BEI Tech.</u> Date: <u>1-10-11</u> Due: <u>1-10-12</u>
Radar Speed Sensor and Dashboard Display	Vehicle Speed	0-125 mph	0.009 mph	±0.25% of full scale	A-DAT Corp. Radar Model: DRS-6 Display Model: RD-2	<u>1400603</u>	By: <u>B+S Multidata</u> Date: <u>2-14-11</u> Due: <u>2-14-12</u>
Ultrasonic Distance Measuring System	Left and Right Side Vehicle Height	5-24 inches	0.01 inches	±0.25% of maximum distance	Massa Products Corporation Model: M-5000/220	<u>104619 & 104613</u>	By: <u>Consumers Energy Laboratory Services</u> Date: <u>1-20-11</u> Due: <u>1-20-12</u>
Data Acquisition System [Amplify, Anti-Alias, and Digitize]	Record Time; Velocity; Distance; Lateral, Longitudinal, and Vertical Accelerations; Roll, Yaw, and Pitch Rates; Steering Wheel Angle.	Sufficient to meet or exceed individual sensors	200 Hz	Sufficient to meet or exceed individual sensors	Dewetron Sidehand DAS Model: DA-121-16 Digitizer Model: Dewe-Orion-1616-100 Amplifier/AntiAliasing: MDAQ-FILT-10-S	<u>12060</u> <u>1105</u>	By: <u>Dewetron</u> Date: <u>12-02-10</u> Due: <u>12-02-11</u>
Load Cell	Vehicle Brake Pedal Force	0-300 lb	1 lb	±0.05% of full scale	DATRON Model: DTM-LPA	<u>4970-1103</u>	By: <u>TRC</u> Date: <u>per test</u> Due: <u>per test</u>
Coordinate Measurement Machine	Inertial Sensing System Location	0-10 feet	0.001 inch	±0.003% of full scale	FARO International Model: Faro Arm N10	<u>U12-05-08-07108</u>	By: <u>FARO</u> Date: <u>8-19-11</u> Due: <u>8-19-12</u>
Outriggers	No output. Safety Item.	N/A	N/A	N/A	NHTSA Titanium Outriggers Model: Docket 2007-27662-11	N/A	N/A

5.0 PHOTOGRAPHS

- 5.1 ¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE
- 5.2 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE
- 5.3 VEHICLE CERTIFICATION LABEL
- 5.4 TIRE AND LOADING INFORMATION LABEL
- 5.5 WINDOW STICKER (MONRONEY LABEL)
- 5.6 ESC OFF TELLTALE
- 5.7 ESC MALFUNCTION TELLTALE
- 5.8 ESC OFF CONTROL
- 5.9 ¾ FRONT VIEW - TEST VEHICLE INSTRUMENTED
- 5.10 ¾ REAR VIEW – TEST VEHICLE INSTRUMENTED
- 5.11 STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM
- 5.12 STEERING CONTROLLER BATTERY BOX
- 5.13 INERTIA MEASUREMENT UNIT
- 5.14 VEHICLE SPEED SENSOR
- 5.15 BODY ROLL SENSOR (DRIVER SIDE)
- 5.16 BODY ROLL SENSOR (PASSENGER SIDE)
- 5.17 BRAKE PEDAL FORCE TRANSDUCER



36

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.1 ¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE



37

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.2 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE

MFD. BY: TOYOTA MOTOR MANUFACTURING, TEXAS, INC.

02/11

GVWR: 3220KG (7100LB)

GAWR: FRT. 1810KG (4000LB) WITH P275/65R18 TIRES,
18X8J RIMS, AT 210KPA (30PSI) COLD.
RR. 1880KG (4150LB) WITH P275/65R18 TIRES,
18X8J RIMS, AT 230KPA (33PSI) COLD.

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR
VEHICLE SAFETY AND THEFT PREVENTION STANDARDS IN EFFECT ON
THE DATE OF MANUFACTURE SHOWN ABOVE.

5TFUW5F12BX191007 TRUCK

38



C/TR: 202/FA20
A/TM: B02A/AB60F

USK56L-CRTSGA
MADE IN U.S.A.

939

1

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.3 VEHICLE CERTIFICATION LABEL



TIRE AND LOADING INFORMATION RENSEIGNEMENTS SUR LES PNEUS ET LE CHARGEMENT

SEATING CAPACITY	TOTAL	FRONT	REAR
NOMBRE DE PLACES	TOTAL : 5	AVANT : 2	ARRIÈRE : 3

The combined weight of occupants and cargo should never exceed 625 kg or 1380 lbs.
Le poids total des occupants et du chargement ne doit jamais dépasser kg ou lb.

39

TIRE PNEUS	ORIGINAL TIRE SIZE DIMENSIONS DES PNEUS D'ORIGINE	COLD TIRE INFLATION PRESSURE PRESSION DE GONFLAGE À FROID
FRONT AVANT	LT285/70R17	40 PSI, 275 kPa
REAR ARRIÈRE	LT285/70R17	40 PSI, 275 kPa
SPARE SECOURS	P255/70R18	33 PSI, 230 kPa

**SEE OWNER'S
MANUAL FOR
ADDITIONAL
INFORMATION**

CONSULTER LE GUIDE
DU PROPRIÉTAIRE POUR
DE PLUS AMPLES
RENSEIGNEMENTS

MDC #00602-0C085

939

22K5T
22K5T15398

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.4 TIRE AND LOADING INFORMATION LABEL



moving forward

DESC.: **TUNDRA 4X4** DBL CAB 5.7L V8
VIN: **5TFUW5F12BX191007**
YR/MDL: 2011/8331C
CLR: BLACK/FA20 (0202/20)
PORT/PLANT: San Antonio, TX/TMMTX RAILHEAD:

STANDARD EQUIPMENT

MECHANICAL & PERFORMANCE

- 5.7L DOHC 32V i-FORCE V8 with Dual Ind VVT- 381HP/401 lb-ft, E85 Flex Fuel
 - 6-Spd Automatic Trans w/Sequential Shift
 - 4WDemand, Part-time 4x4 Sys w/ 2-speed Electronically Controlled Transfer Case
 - TripleTech Frame: Fully-boxed Fr Section Reinforced C Under Cab, Open C Under Bed
 - 4.10 Rear Differential w/10.5" Ring Gear
 - Automatic Limited-Slip Differential
 - Front Ind Coil-Spring High-Mounted Double Wishbone Susp w/Stabilizer Bar
 - Trapezoidal Multi-Leaf Rear Suspension & Staggered Outboard Mounted Shocks
 - Power-Assisted 4 Wheel Disc Brakes
 - 18" Steel Wheels w/ P255/70R18 Tires
- SAFETY**
- Star Safety System: Vehicle Stability Control (VSC), Traction Control (TRAC), Anti-lock Brake System (ABS) with Electronic Brake Force Distribution (EBD), Brake Assist (BA), & Smart Stop Technology (SST)
 - Trailer Sway Control
 - Dr & Fr Pass Advanced Airbag System
 - Dr & Fr Pass Seat Side & Knee Airbags
 - Roll-Sensing Curtain Airbags (RSCA)
 - 3-Point Seatbelts in All Positions with Driver ELR & ALR/ELR for All Passengers
 - Tire Pressure Monitor System (TPMS)
- EXTERIOR**
- 6.5' Double-Walled Bed w/Rail Caps
 - Manual Headlamp Level Control
- INTERIOR**
- 40/20/40 Split-& Fold 8-Way Driver & 4-Way Passenger Adjustable Bench Seat
 - Dual Zone Climate Control w/Sync Mode
 - AM/FM CD w/ MP3/WMA Playback Capability, 6 Spkrs, XM Compat (Hrdw & Sub Req), Aux
 - Power Windows/Door Locks/Mirrors
 - Remote Keyless Entry System
 - Tilt Steering Wheel with Column Shifter
 - Cruise Control, Engine Immobilizer
 - ***Full Tank of Gas***

MANUFACTURER'S SUGGESTED RETAIL PRICE \$30,715.00

OPTIONAL EQUIPMENT

- RE Federal Emissions
- EV AM/FM CD Player 510.00
- with MP3/WMA Playback Capability, 6 Speakers, XM Radio (Includes 90-Day Trial Subscription), Auxiliary Audio Jack, USB Port with iPod Connectivity, and Hands-Free Phone Capability and Music Streaming via Bluetooth Wireless Technology
- HM Heated Power Outside Mirrors 30.00
- CK Cold Weather Package: 160.00
- Includes Heavy-Duty Battery and Starter, Windshield Wiper De-Icer Grid with Timer and Front and Rear Mudguards
- RK TRD Rock Warrior Package: 3,630.00
- Includes 17" TRD Forged Alloy Wheels with LT285/70R17 BFGoodrich All-Terrain T/A tires, Bilstein Shocks, Color-Keyed Front Bumper and Grille Surround, Matte-Black Rear Bumper, Fog Lamps, Manual Sliding Rear Window with Privacy Glass, Black Cloth 8-Way Manual-Adjustable Driver's and 4-Way Adjustable Passenger Bucket Seats, Center Console with 12V Power Outlet & Tilt/Telescopic Steering Wheel with Console Shifter, and TRD Rock Warrior Graphics
- RL Daytime Running Lights (DRL) 40.00
- TO Tow Package: 660.00
- Includes Tow Hitch Receiver, Trailer Brake Controller Prewire, 4.300 Rear Axle Ratio, TOW/HAUL Mode Switch, Transmission fluid Temperature Gauge, Supplemental Transmission Cooler, Engine Oil Cooler, 7-Pin Connector and Heavy-Duty Alternator
- R3 Tube Steps - Chrome 534.00
- LU Bedliner w/out Deck Rail System 345.00
- CF Carpet Floor Mats w/Door Sill Protector 178.00

GOVERNMENT SAFETY RATINGS

Frontal Crash Driver **Not Rated**
Passenger **Not Rated**

Star ratings based on the risk of injury in a frontal impact. Frontal ratings should ONLY be compared to other vehicles of similar size and weight.

Side Crash Front seat **Not Rated**
Rear seat **Not Rated**

Star ratings based on the risk of injury in a side impact.

Rollover ★★★★★

Star ratings based on the risk of rollover in a single vehicle crash.

Star ratings from 1 to 5 stars (★★★★★) with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA).

www.safercar.gov or 1-888-327-4236

EPA Fuel Economy Estimates

40

CITY MPG

13

Expected range for most drivers
10 to 16 MPG

HIGHWAY MPG

17

Expected range for most drivers
14 to 20 MPG

Estimated Annual Fuel Cost \$3,002

based on 15,000 miles at \$3.00 per gallon

Combined Fuel Economy This Vehicle

15

10 21
All Standard Pickups

Your actual mileage will vary depending on how you drive and maintain your vehicle.

DELIVERY PROCESSING AND HANDLING FEE 975.00

TOTAL \$37,777.00

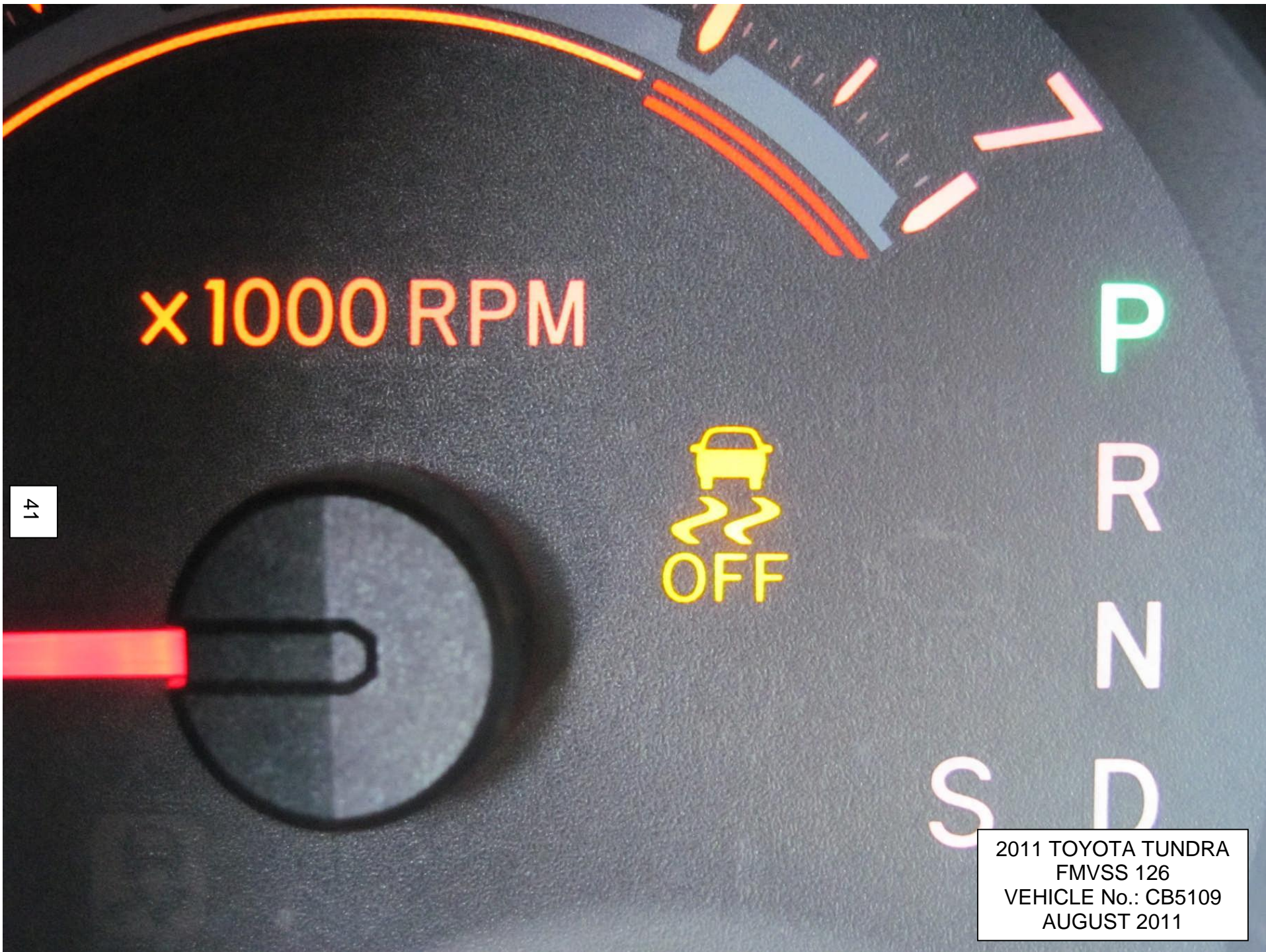
The New Vehicle Limited Warranty provides 3-year/36,000 mile basic coverage, 5-year/60,000 mile powertrain coverage, plus 5-year/unlimited mile corrosion perforation coverage. See Owner's Warranty Information book for details. An extended service contract may be available for the vehicle. Ask dealer for details. Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline, license and title fees, applicable federal, state and local taxes and dealer and distributor installed options and accessories are not included in the manufacturer's suggested retail price.

Dealer Name / Address: 21061
LA FONTAINE TOYOTA
2027 S. TELEGRAPH ROAD
DEARBORN MI48124
Ship to:



2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.5 WINDOW STICKER - MONRONEY LABEL



41

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.6 ESC OFF TELLTALE



42

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.7 ESC MALFUNCTION TELLTALE

43



2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.8 ESC OFF CONTROL



44

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.9 ¾ FRONT VIEW - TEST VEHICLE INSTRUMENTED



45

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

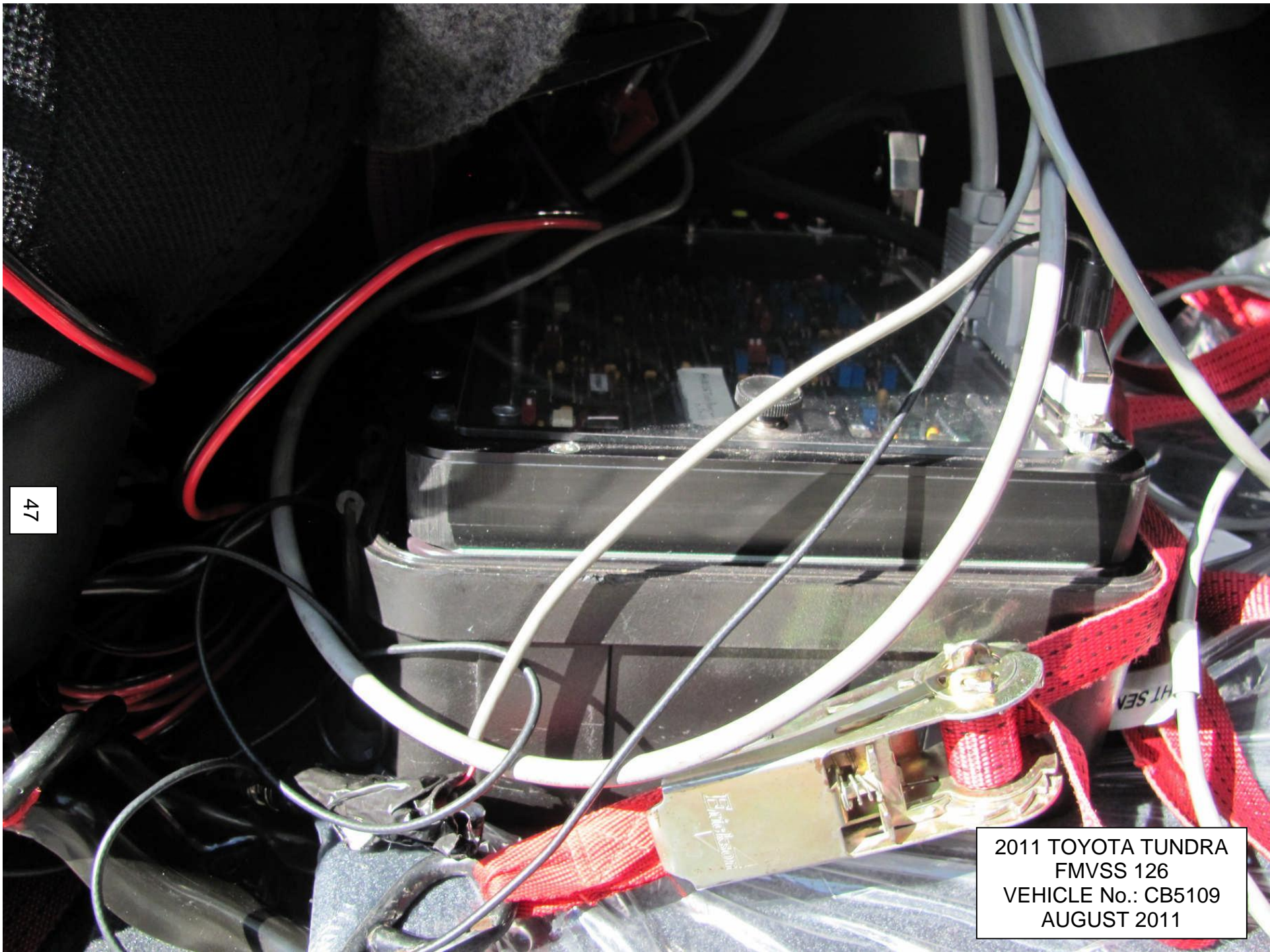
5.10 ¾ REAR VIEW - TEST VEHICLE INSTRUMENTED



46

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

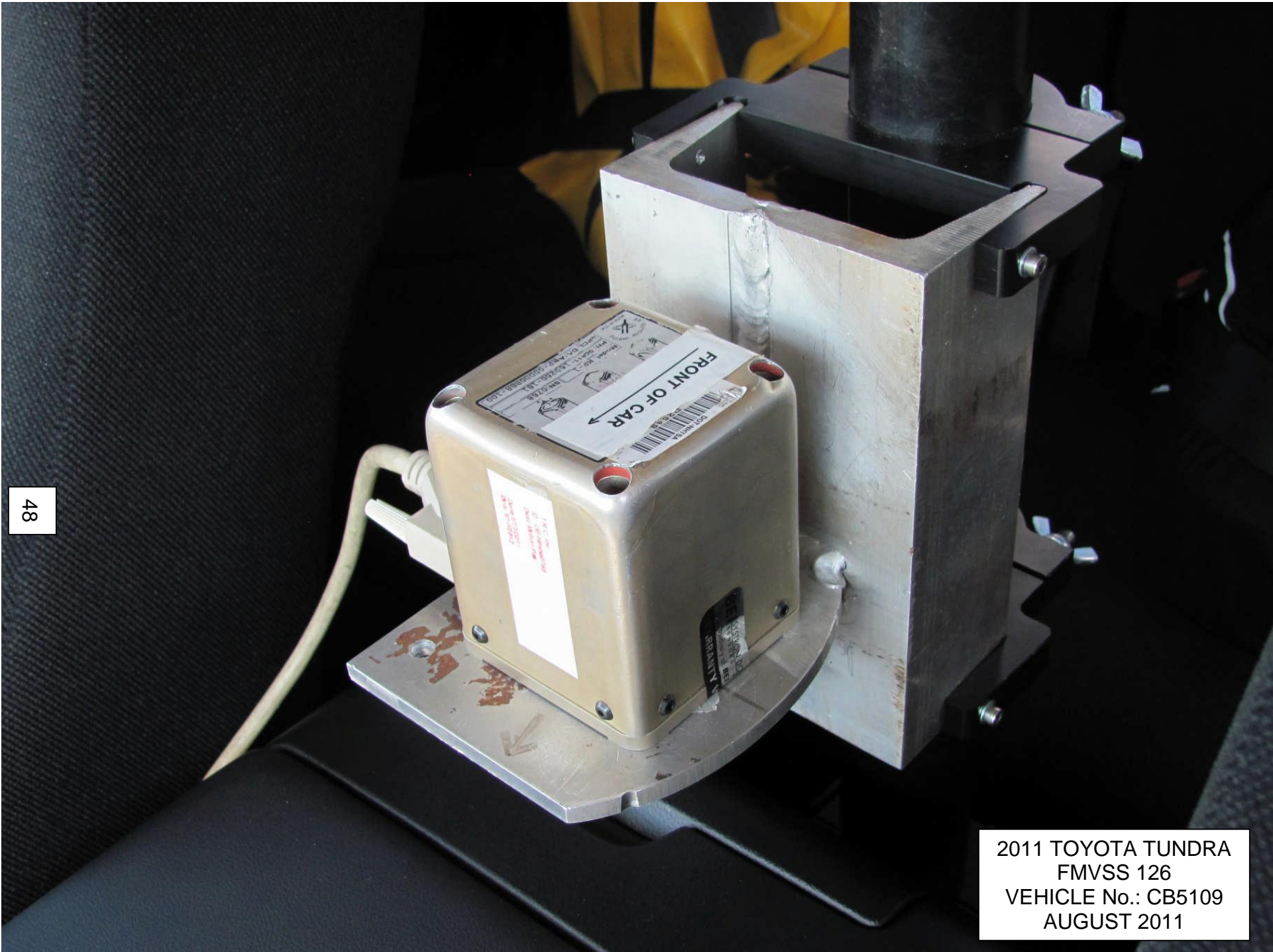
5.11 STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM



47

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

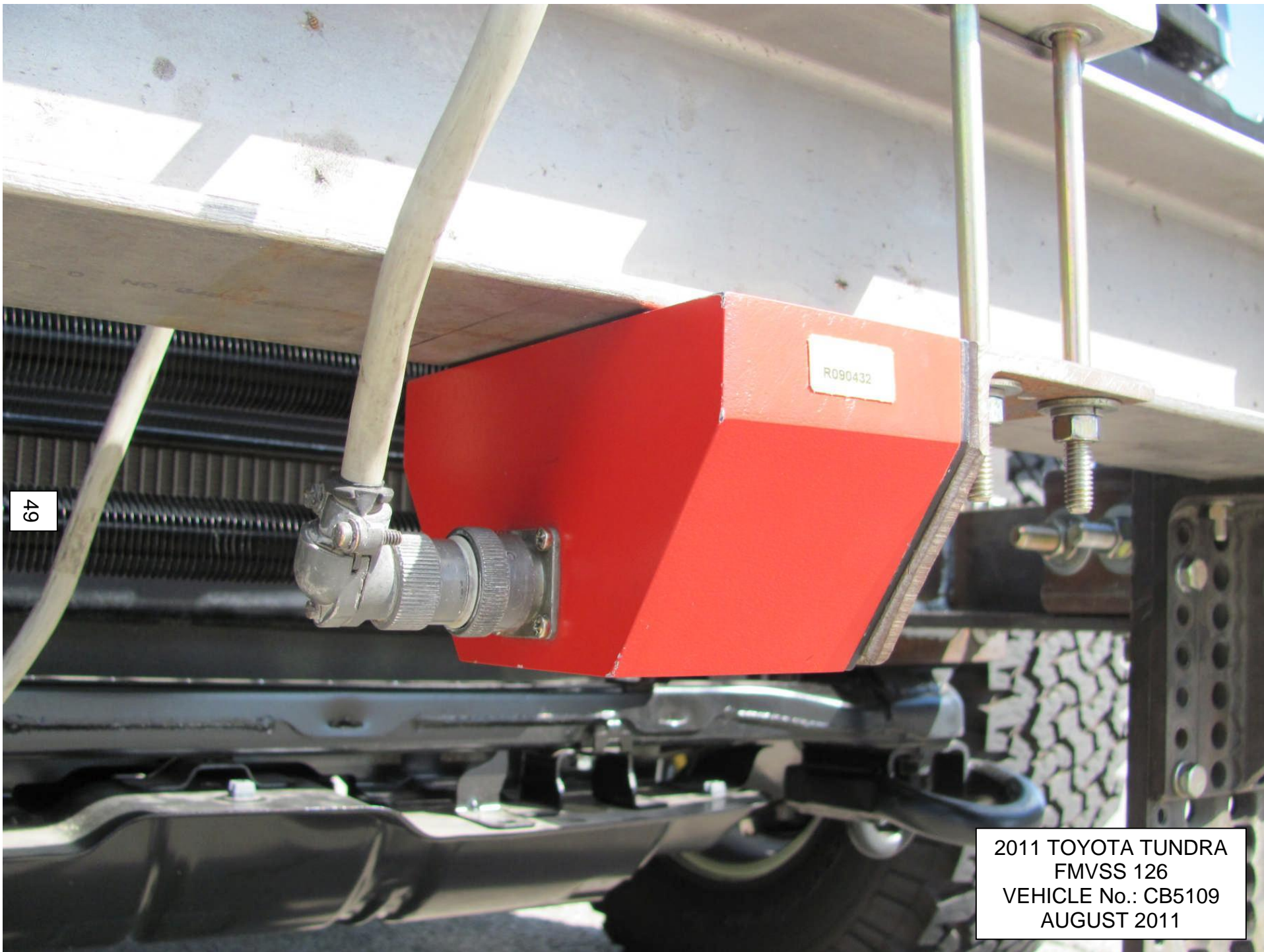
5.12 STEERING CONTROLLER BATTERY BOX



48

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

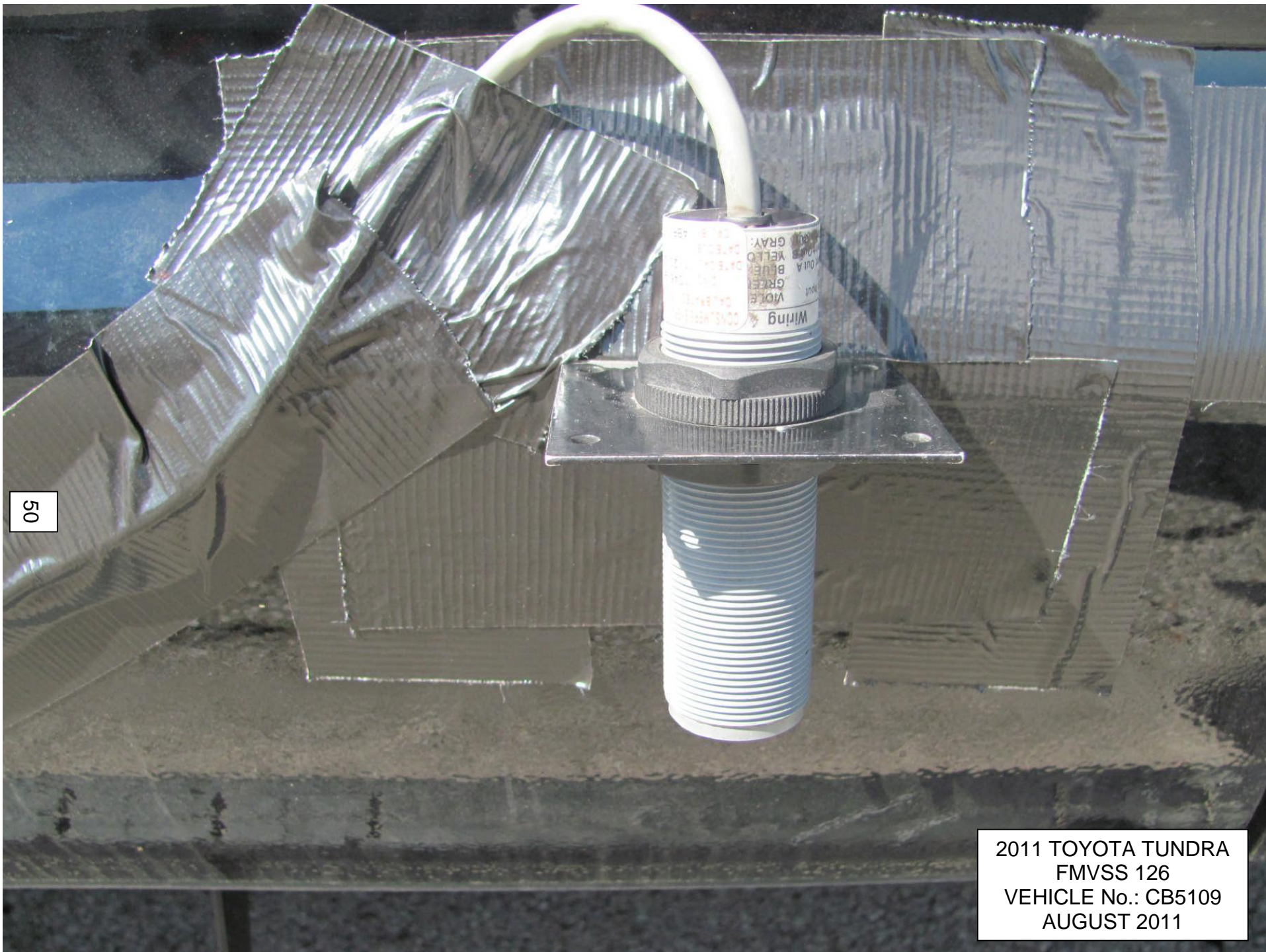
5.13 INERTIA MEASUREMENT UNIT



49

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.14 VEHICLE SPEED SENSOR



50

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

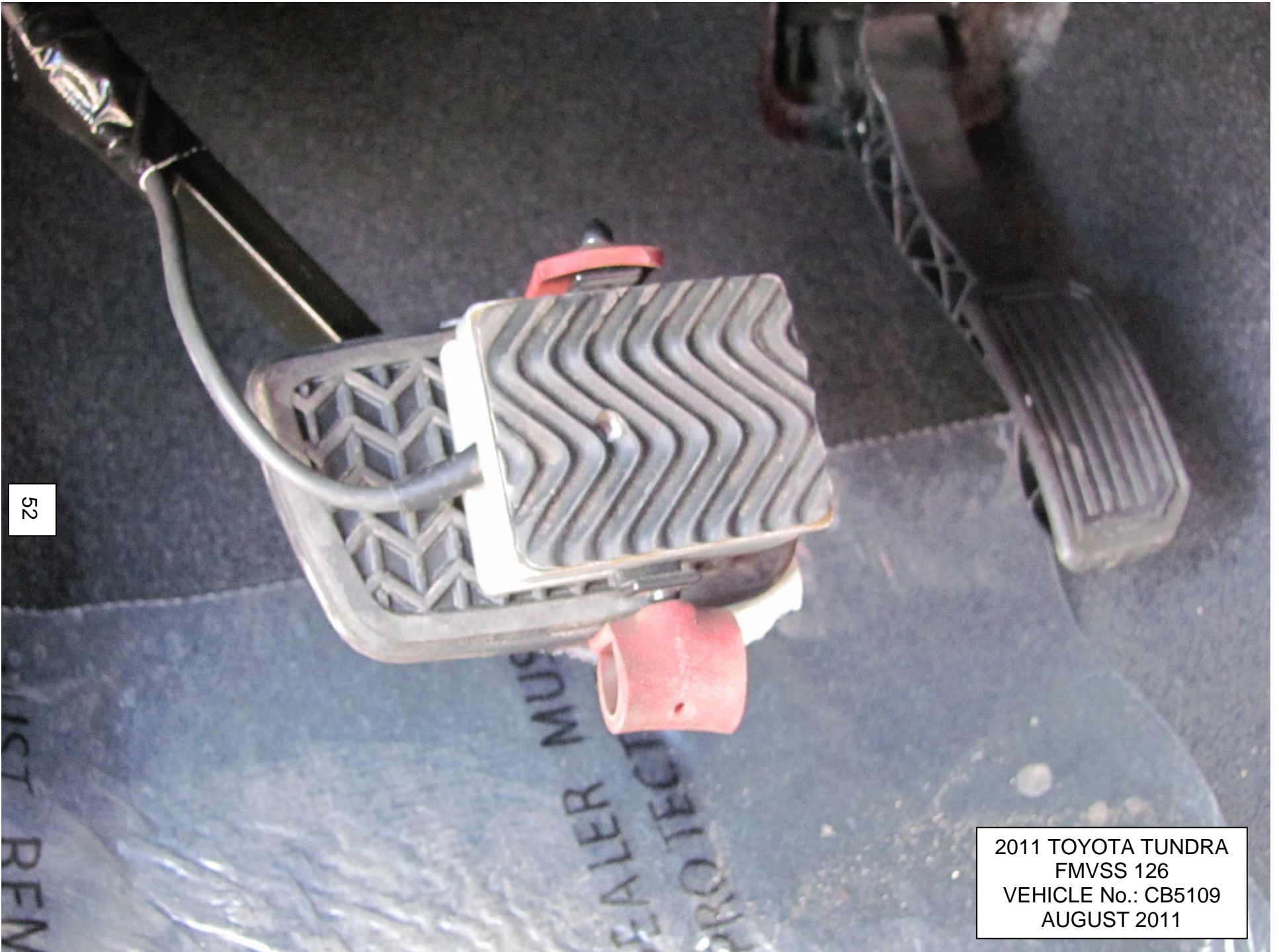
5.15 BODY ROLL SENSOR (DRIVER SIDE)



51

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

5.16 BODY ROLL SENSOR (PASSENGER SIDE)



52

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

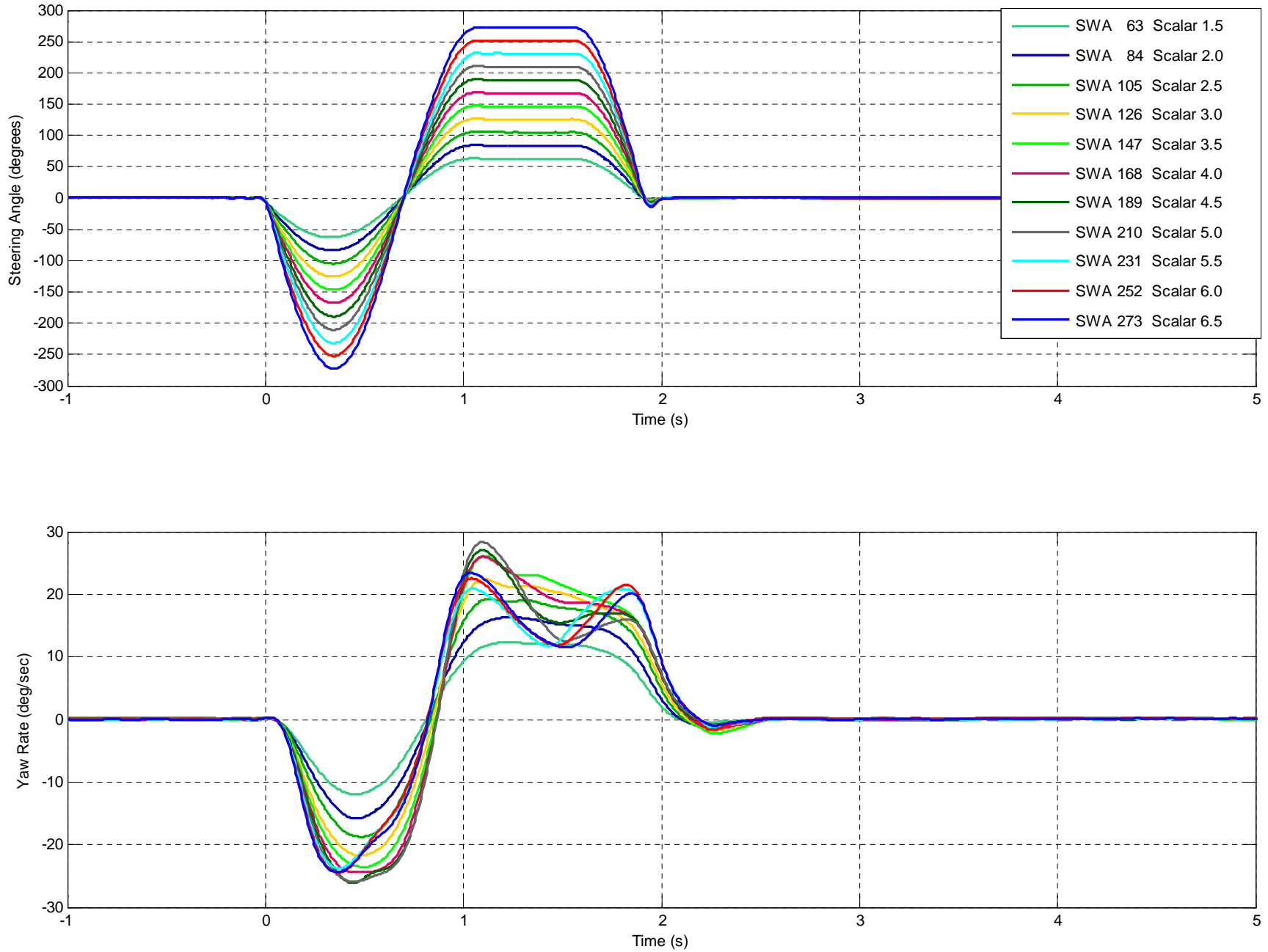
5.17 BRAKE PEDAL FORCE TRANSDUCER

6.0 DATA PLOTS

- Figure 1. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests (2WD)
- Figure 2. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests (2WD)
- Figure 3. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests (2WD)
- Figure 4. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests (2WD)
- Figure 5. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests (4WD)
- Figure 6. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests (4WD)
- Figure 7. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests (4WD)
- Figure 8. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests (4WD)

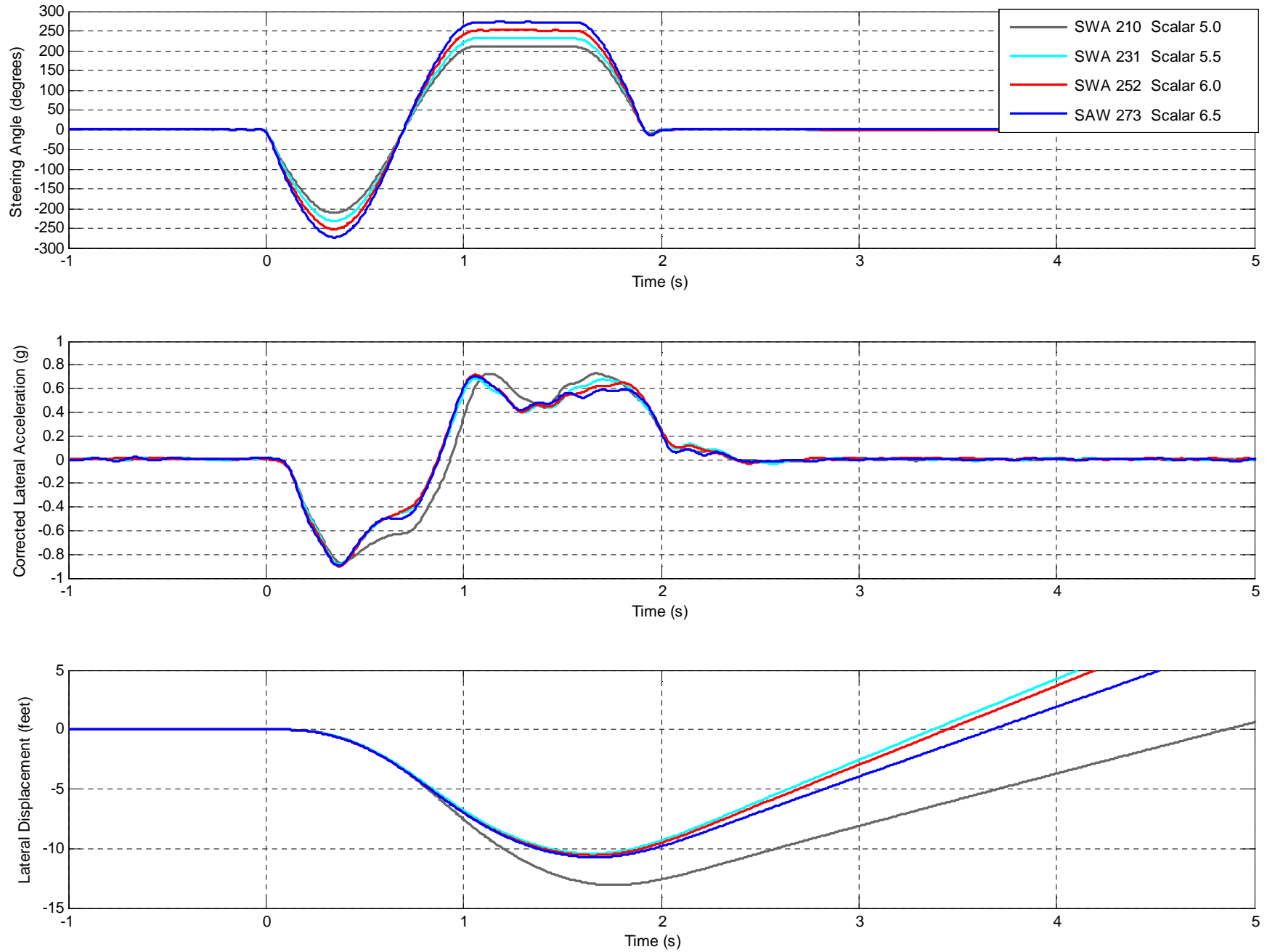
6.0 2011 TOYOTA TUNDRA 2WD DATA PLOTS

Figure 1. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests



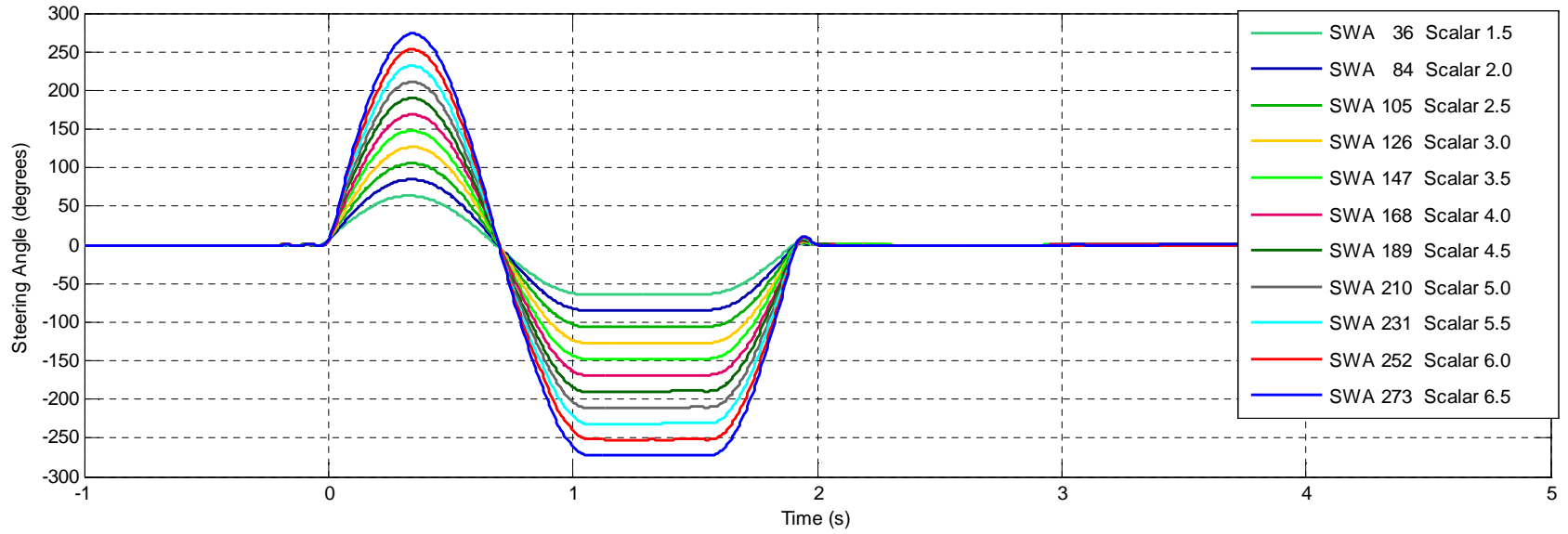
6.0 2011 TOYOTA TUNDRA 2WD DATA PLOTS...continued

Figure 2. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests

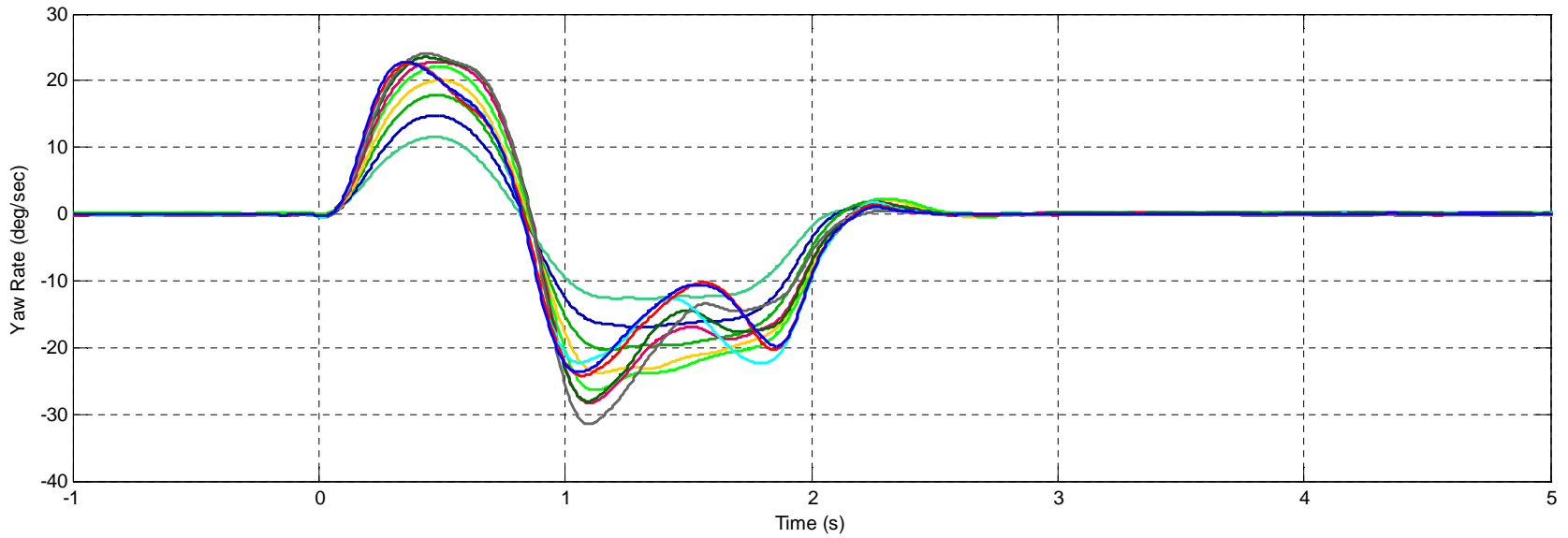


6.0 2011 TOYOTA TUNDRA 2WD DATA PLOTS...continued

Figure 3. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests

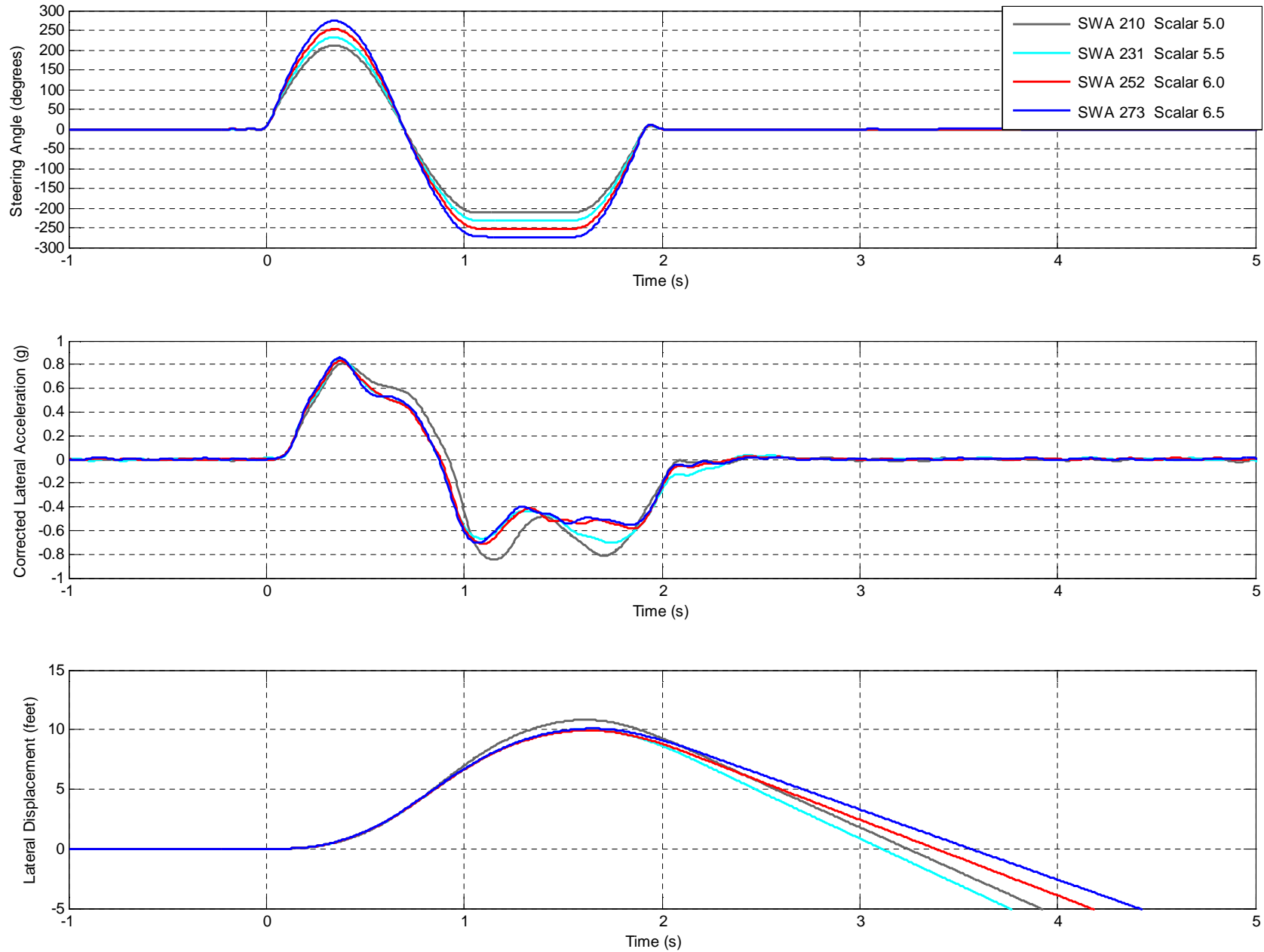


56



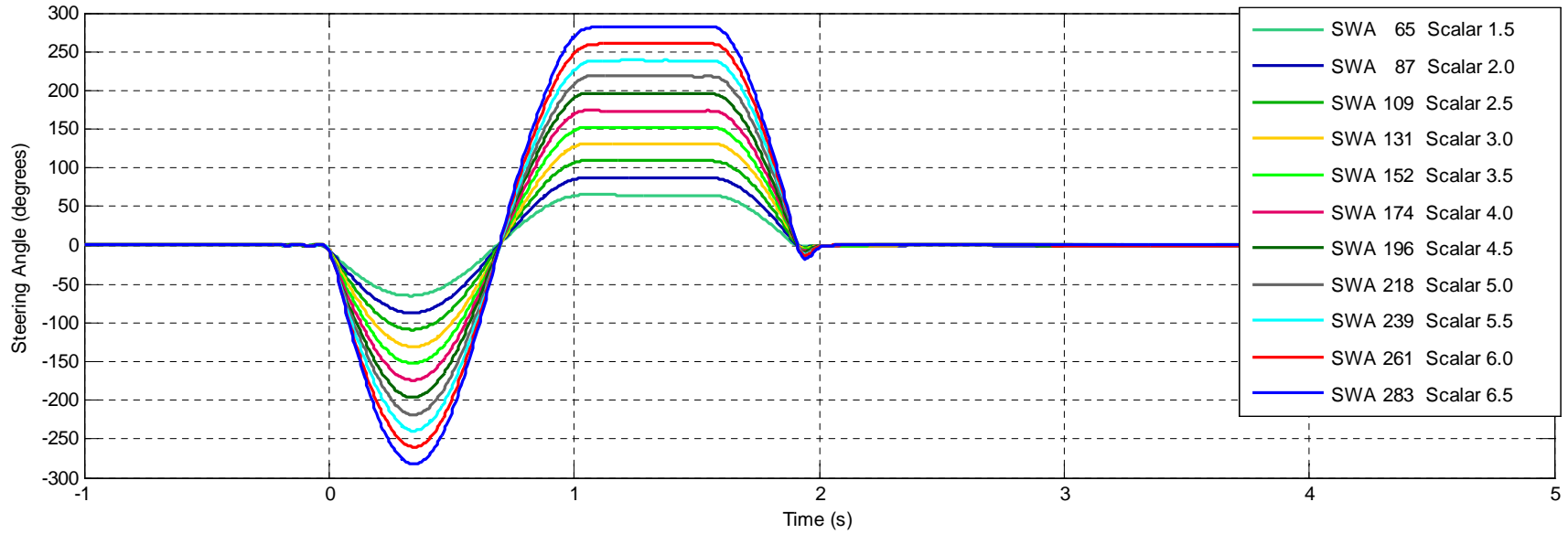
6.0 2011 TOYOTA TUNDRA 2WD DATA PLOTS...continued

Figure 4. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests

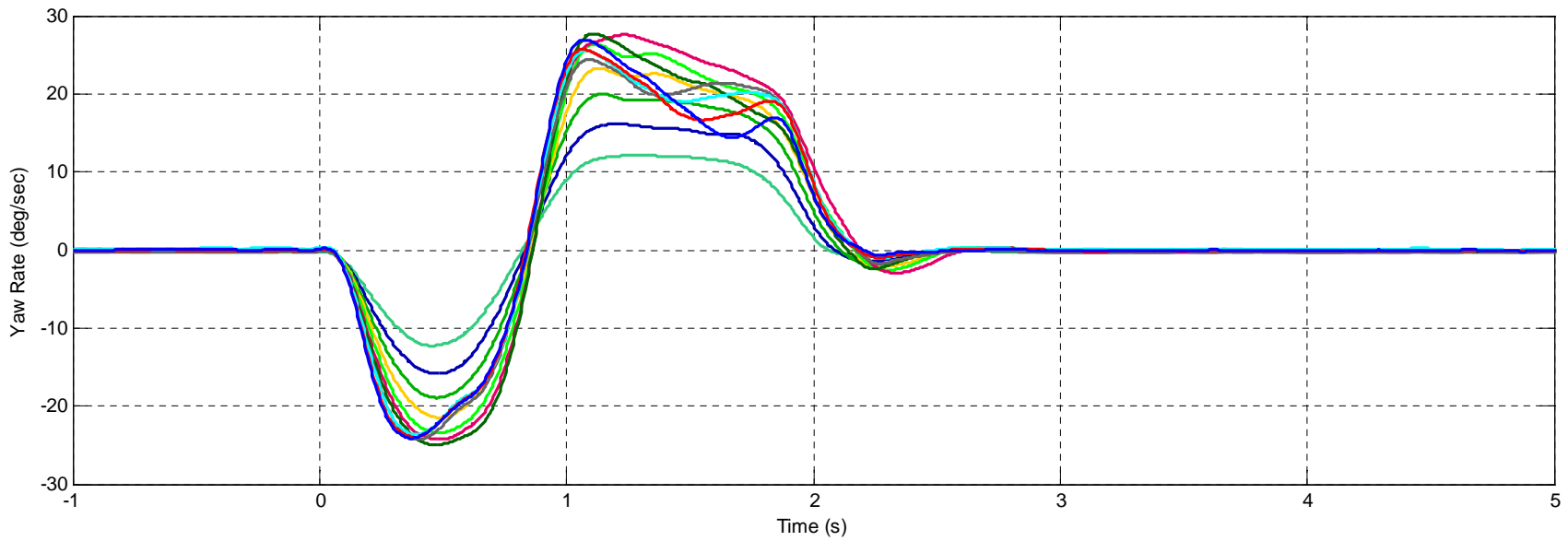


6.0 2011 TOYOTA TUNDRA 4WD DATA PLOTS

Figure 5 Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests

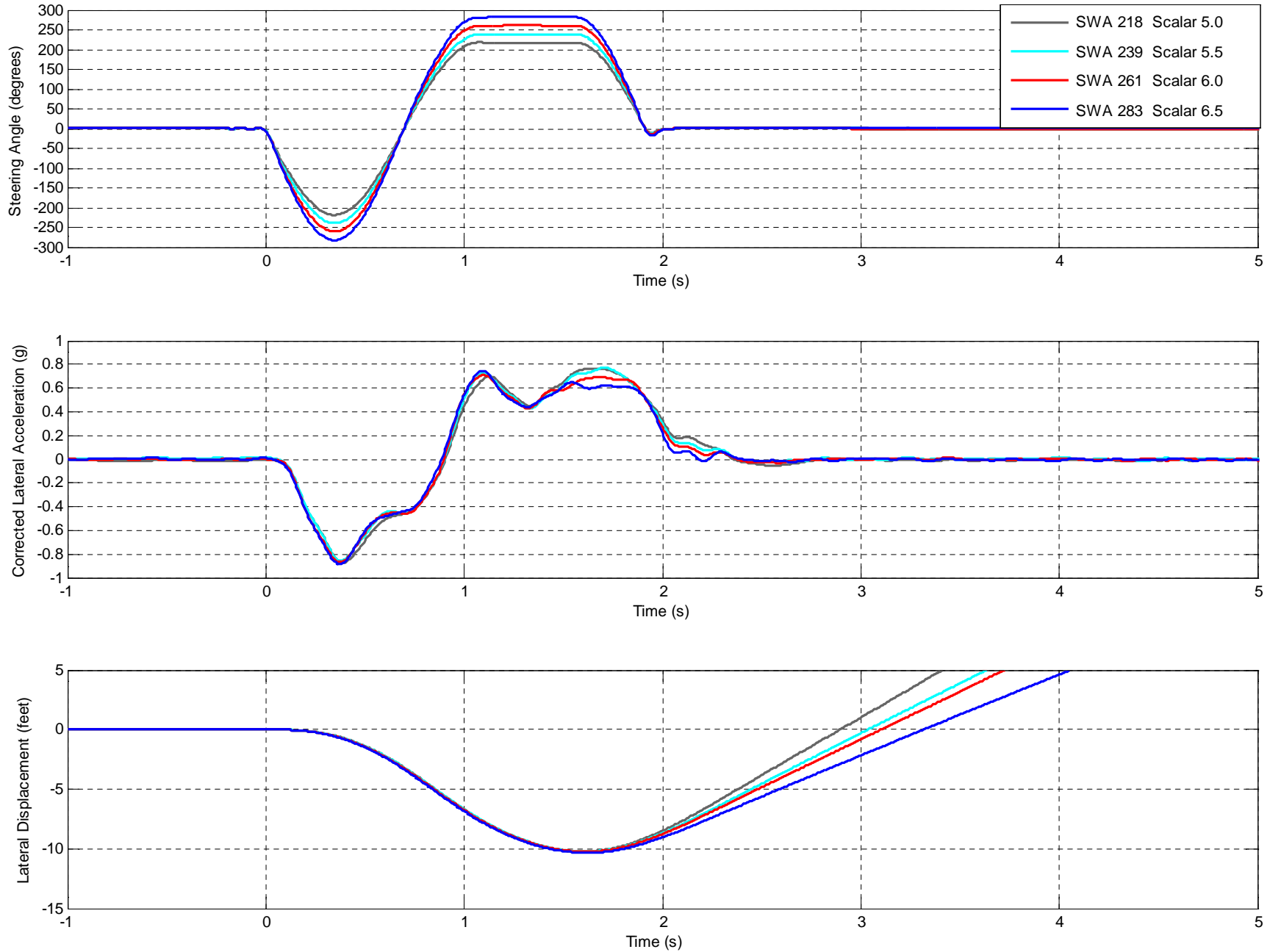


58



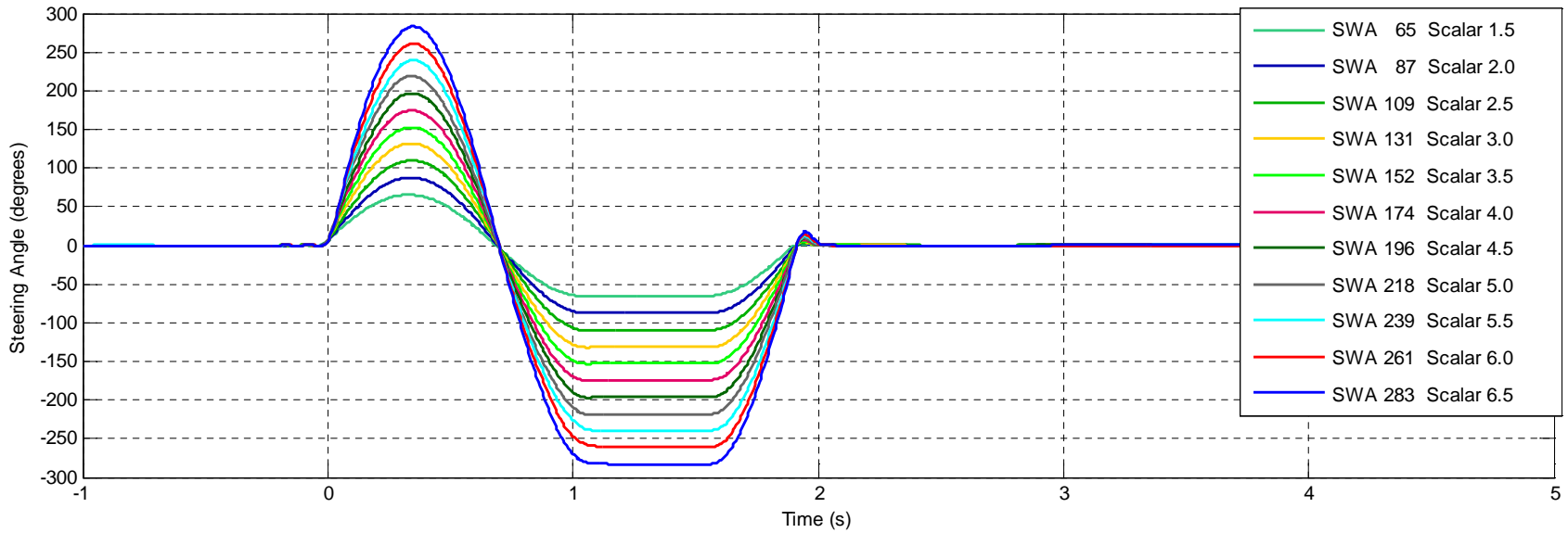
6.0 2011 TOYOTA TUNDRA 4WD DATA PLOTS...continued

Figure 6 Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests

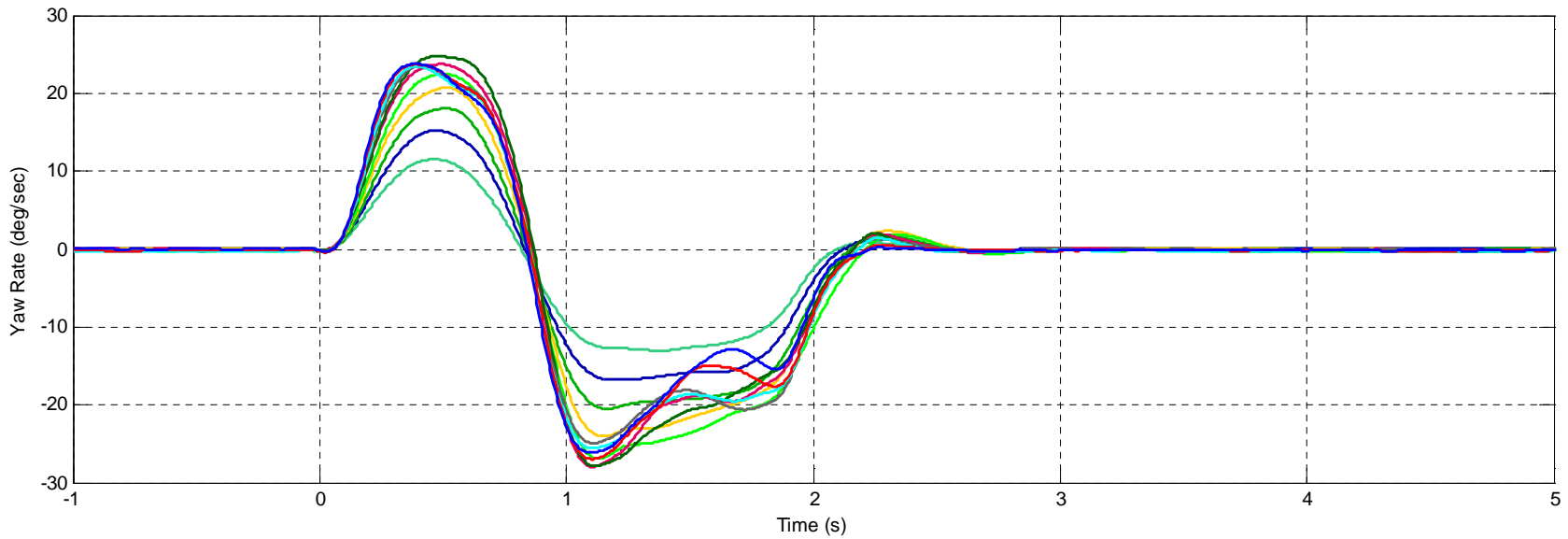


7.0 2011 TOYOTA TUNDRA 4WD DATA PLOTS...continued

Figure 7 Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests

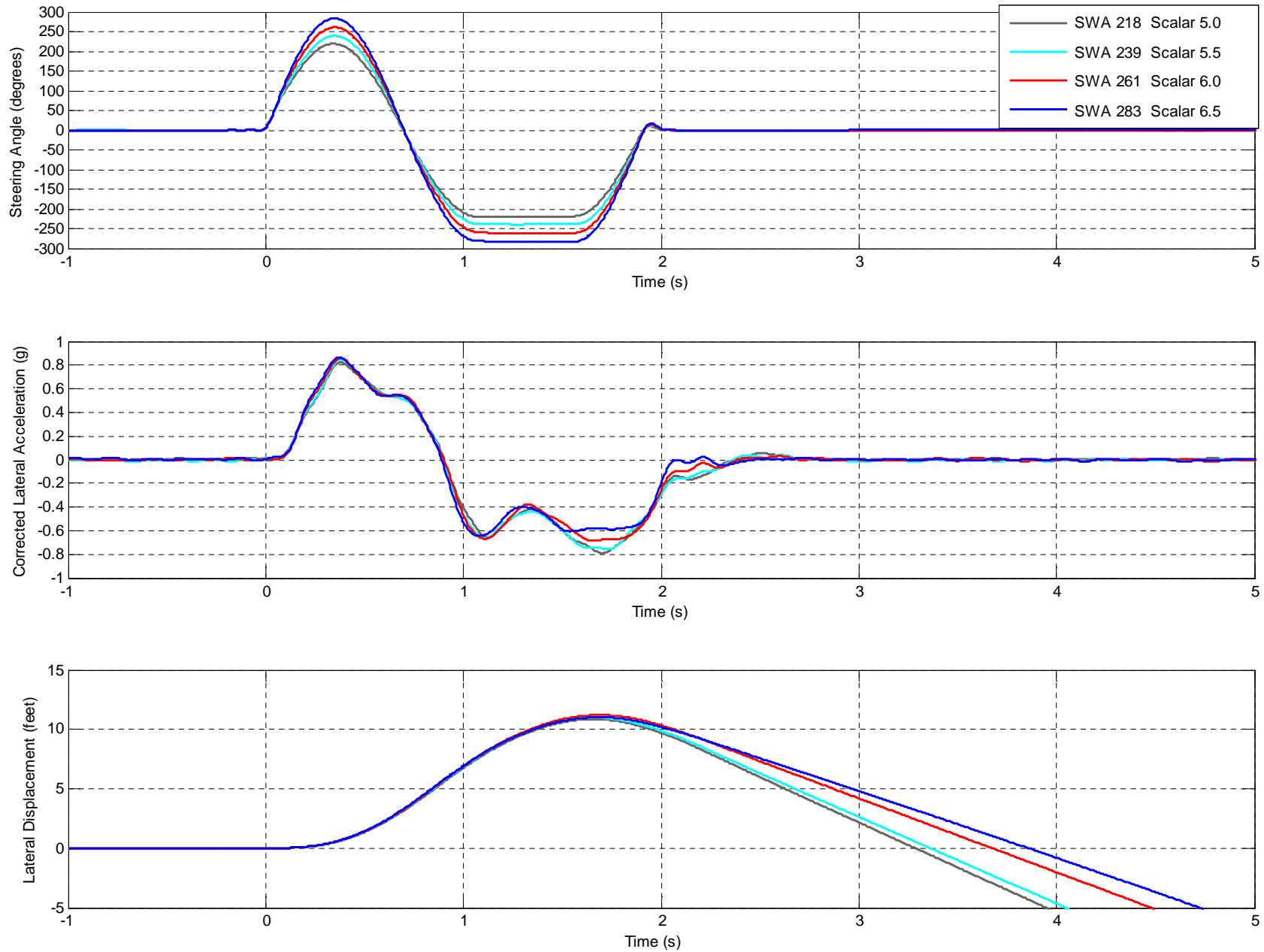


09



6.0 2011 TOYOTA TUNDRA 4WD DATA PLOTS...continued

Figure 8 Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests



7.0 OTHER DOCUMENTATION

- 7.1 OWNER'S MANUAL PAGES
- 7.2 VEHICLE ARRIVAL CONDITION REPORT
- 7.3 VEHICLE COMPLETION CONDITION REPORT
- 7.4 SINE WITH DWELL TEST RESULTS
- 7.5 SLOWLY INCREASING STEER TEST RESULTS
- 7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

7.1 OWNER'S MANUAL PAGES

2-4. Using other driving systems

Driving assist systems

To help enhance driving safety and performance, the following systems operate automatically in response to various driving situations. Be aware, however, that these systems are supplementary and should not be relied upon too heavily when operating the vehicle.

■ **ABS (Anti-lock Brake System)**

Helps to prevent wheel lock when the brakes are applied suddenly, or if the brakes are applied while driving on a slippery road surface.

■ **Brake Assist**

Generates an increased level of braking force after the brake pedal is depressed, when the system detects a panic stop situation.

■ **VSC (Vehicle Stability Control)**

Helps the driver to control skidding when swerving suddenly or turning on slippery road surfaces.

■ **Trailer Sway Control**

Helps the driver to control trailer sway by selectively applying brake pressure for individual wheels and reducing engine torque when trailer sway is detected.

Trailer Sway Control is part of the VSC system and will not operate if VSC is turned off or experiences a malfunction.

■ **TRAC (Traction Control) for 2WD models and 2WD mode on 4WD models**

Maintains drive power and prevents the rear wheels from spinning when starting the vehicle or accelerating on slippery roads.

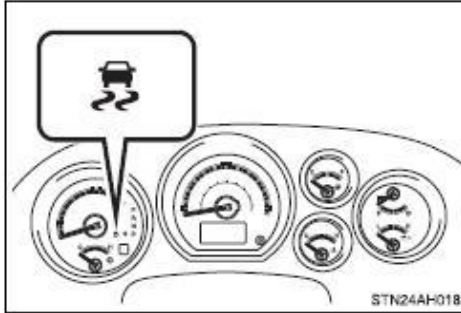
■ **A-TRAC (Active Traction Control) for 4WD mode on 4WD models**

Maintains drive power and prevents all wheels from spinning when starting the vehicle or accelerating on slippery roads.

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

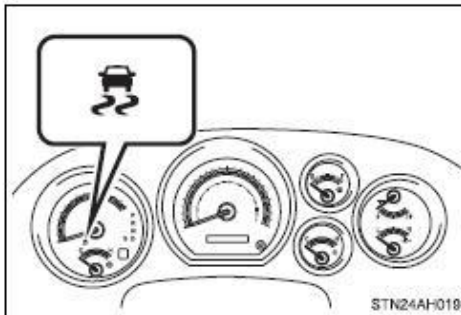
When VSC/Trailer Sway Control/TRAC/A-TRAC are operating

▶ Vehicles with multi-information display



If the vehicle is in danger of slipping, or if the rear wheels (2WD models and 2WD mode on 4WD models) or all wheels (4WD mode on 4WD models) spin, the slip indicator flashes to indicate that VSC/Trailer Sway Control/TRAC/A-TRAC have been engaged.

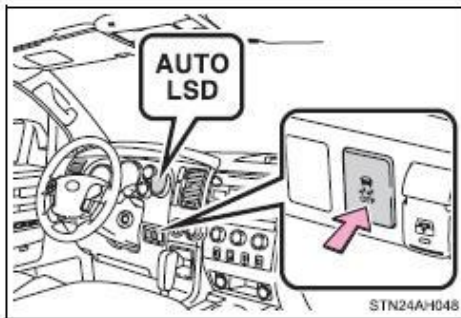
▶ Vehicles without multi-information display



To disable VSC, Trailer Sway Control and/or TRAC (2WD models and 2WD mode on 4WD models)

If the vehicle gets stuck in fresh snow or mud, VSC, Trailer Sway Control and TRAC may reduce power from the engine to the wheels. You may need to turn the system off to enable you to rock the vehicle in order to free it.

■ TRAC OFF mode



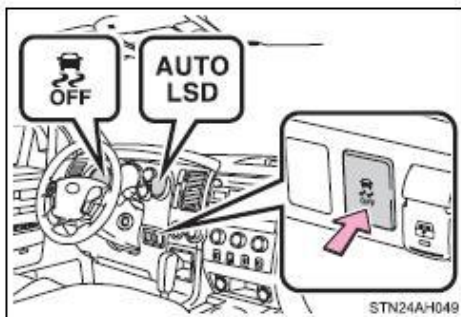
Press the VSC OFF switch briefly.

The AUTO LSD indicator will come on.

The system is in TRAC off, AUTO LSD on and VSC, Trailer Sway Control on mode.

Push the switch again to turn the system back on.

■ AUTO LSD mode



Stop the vehicle completely, and press the VSC OFF switch for more than 3 seconds, when the system is in the TRAC OFF mode.

The VSC OFF and AUTO LSD indicators will come on.

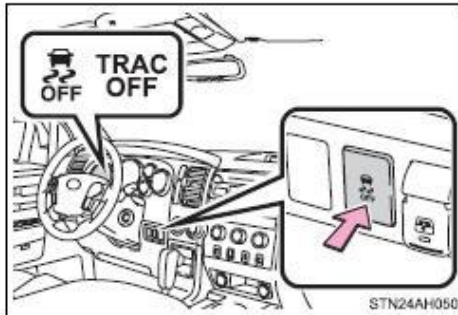
The system is in TRAC off, AUTO LSD on and VSC, Trailer Sway Control off mode.

2
When driving

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

245

■ VSC OFF mode



Stop the vehicle completely, and press the VSC OFF switch for more than 3 seconds, when the system is in the AUTO LSD mode.

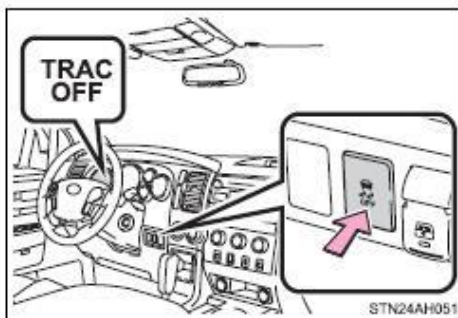
The VSC OFF and TRAC OFF indicators will come on.

The system is all off mode.

To disable VSC, Trailer Sway Control or A-TRAC (4H mode on 4WD models)

If the vehicle gets stuck in fresh snow or mud, VSC, Trailer Sway Control or A-TRAC may reduce power from the engine to the wheels. You may need to turn the system off to enable you to rock the vehicle in order to free it.

■ A-TRAC OFF mode



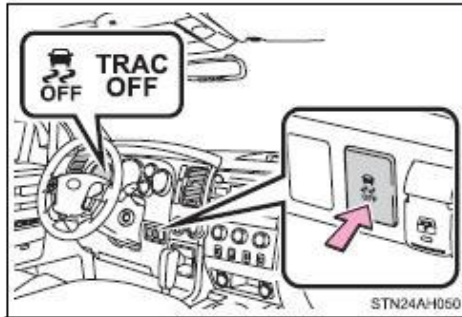
Press the VSC OFF switch briefly.

The TRAC OFF indicator will come on.

The system is in A-TRAC off and VSC, Trailer Sway Control on mode.

Push the switch again to turn the system back on.

11 VSC OFF mode



Stop the vehicle completely, and press the VSC OFF switch for more than 3 seconds.

The VSC OFF and TRAC OFF indicators will come on.

The system is all off mode.

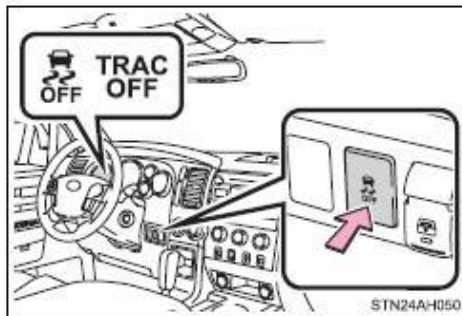
Push the switch again to turn the system back on.

2

When driving

To disable A-TRAC (4L mode on 4WD models)

If the vehicle gets stuck in fresh snow or mud, A-TRAC may reduce power from the engine to the wheels. You may need to turn the system off to enable you to rock the vehicle in order to free it.



Stop the vehicle completely, and press the VSC OFF switch for more than 3 seconds.

The TRAC OFF indicators will come on.

Push the switch again to turn the system back on.

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

247

ii **Automatic reactivation of TRAC, A-TRAC, VSC and Trailer Sway Control**

Turning the engine switch off after turning off the TRAC, A-TRAC, VSC and Trailer Sway Control systems will automatically re-enable them.

ii **Sounds and vibrations caused by the ABS, TRAC, A-TRAC, VSC, Trailer Sway Control and Brake Assist system**

i A sound may be heard from the engine compartment when the engine is started and just after the vehicle begins to move. This sound does not indicate that a malfunction has occurred in any of these systems.

i Any of the following conditions may occur when the above systems are operating. None of these indicates that a malfunction has occurred.

- Vibrations may be felt through the vehicle body and steering.
- A motor sound may be heard after the vehicle comes to a stop.
- The brake pedal may pulsate slightly after the ABS is activated.
- The brake pedal may move down slightly after the ABS is activated.

ii **If the brake system overheats**

TRAC or A-TRAC will cease operation, and the slip indicator will change from flashing to being on continuously to alert the driver. Stop the vehicle in a safe place. (There is no problem with continuing normal driving.)

ii **Shifting to 4L**

VSC and Trailer Sway Control are automatically turned off.

⚠ CAUTION

Any of the following conditions may result in an accident which could cause death or serious injury.

■ The ABS does not operate effectively when

- ! The limits of the gripping performance have been exceeded.
- ! The vehicle hydroplanes while driving at high speed on the wet or slick road.

■ Stopping distance when the ABS is operating will exceed that of normal conditions

The ABS is not designed to shorten the vehicle's stopping distance. Always maintain a safe distance from the vehicle in front of you in the following situations.

- ! When driving on dirt, gravel or snow-covered roads
- ! When driving with tire chains
- ! When driving over bumps in the road
- ! When driving over roads with potholes or roads with uneven roads

■ When VSC and Trailer Sway Control are activated

The slip indicator flashes. Always drive carefully. Reckless driving may cause an accident. Exercise particular care when the indicator flashes.

■ TRAC or A-TRAC may not operate effectively when

Directional control and power may not be achievable while driving on slippery road surfaces, even if TRAC or A-TRAC is operating. Do not drive the vehicle in conditions where stability and power may be lost.


■ Replacing tires

Make sure that all tires are of the same size, brand, tread pattern and total load capacity. In addition, make sure that the tires are inflated to the appropriate tire pressure level.

The ABS, VSC and Trailer Sway Control will not function correctly if different tires are fitted on the vehicle.

Contact your Toyota dealer for further information when replacing tires or wheels.

2011 TOYOTA TUNDRA
FMVSS 126
VEHICLE No.: CB5109
AUGUST 2011

 CAUTION

n Handling of tires and suspension

Using tires with any kind of problem or modifying the suspension will affect the driving assist systems, and may cause the system to malfunction.

n Trailer Sway Control precaution

The Trailer Sway Control system is not able to reduce trailer sway in all situations. Depending on many factors such as the conditions of the vehicle, trailer, road surface, and driving environment, the Trailer Sway Control system may not be effective. Refer to your trailer owner's manual for information on how to tow your trailer properly.

n If trailer sway occurs

Observe the following precautions.

Failing to do so may cause death or serious injury.

- 1** Firmly grip the steering wheel. Steer straight ahead.
Do not try to control trailer swaying by turning the steering wheel.
- 1** Begin releasing the accelerator pedal immediately but very gradually to reduce speed.
Do not increase speed. Do not apply vehicle brakes.

If you make no extreme correction with the steering or brakes, your vehicle and trailer should stabilize. (→P. 284)

7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO. DTNH22-08-D-00097 DATE: 8/24/11

FROM: Automotive Allies

TO: TRC

PURPOSE: (X) Initial () Received () Present
Receipt via Transfer vehicle condition

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2011 / Toyota / Tundra / Truck

MANUFACTURE DATE: 02/11 NHTSA NO.: CB5109

BODY COLOR: Black VIN: 5TFUW5F12BX191007

ODOMETER READING: 12 miles GVWR: 3,220 KG

PURCHASE PRICE: \$ rented / leased DEALER'S NAME: Automotive Allies,
209 W. Alameda Avenue, Suite 101, Burbank, CA 91502

X ALL OPTIONS LISTED ON "WINDOW STICKER" ARE PRESENT ON THE TEST VEHICLE

X TIRES AND WHEEL RIMS ARE NEW AND THE SAME AS LISTED

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

X THE VEHICLE HAS BEEN PROPERLY PREPARED AND IS IN RUNNING CONDITION

X THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

X PLACE VEHICLE IN STORAGE AREA

X INSPECT THE VEHICLE'S INTERIOR AND EXTERIOR, INCLUDING ALL WINDOWS, SEATS, DOORS, ETC., TO CONFIRM THAT EACH SYSTEM IS COMPLETE AND FUNCTIONAL PER THE MANUFACTURER'S SPECIFICATIONS. ANY DAMAGE, MISADJUSTMENT, OR OTHER UNUSUAL CONDITION THAT COULD INFLUENCE THE TEST PROGRAM OR TEST RESULTS SHALL BE RECORDED. REPORT ANY ABNORMAL CONDITION TO THE NHTSA COTR BEFORE BEGINNING ANY TEST

RECORDED BY: Alan Ida

DATE: 8-24-11

APPROVED BY: Ken Webster

DATE: 9-09-11

7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO. DTNH22-08-D-00097 DATE: 9/08/11

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2011 / Toyota / Tundra / Truck

MANUFACTURE DATE: 02/11 NHTSA NO.: CB5109

BODY COLOR: Black VIN: 5TFUW5F12BX191007

ODOMETER READING: 128 miles GVWR: 3,220 KG

LIST OF FMVSS TESTS PERFORMED BY THIS LAB: 126, 135

- THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS
- THE VEHICLE HAS BEEN PROPERLY MAINTAINED AND IS IN RUNNING CONDITION
- THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS
- PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

REMARKS:

Equipment that is no longer on the test vehicle as noted on Vehicle Arrival Condition Report:

None.

Explanation for equipment removal:

N/A

Test Vehicle Condition:

Like new.

RECORDED BY: Alan Ida

DATE: 9-08-11

APPROVED BY: Ken Webster

DATE: 9-09-11

7.4 SINE WITH DWELL TEST RESULTS
2011 Toyota Tundra 2WD Mode
NHTSA No.: CB5109

Date Crea 30-Aug-11

LEFT-TO-RIGHT (INITIAL COUNTER-CLOCKWISE STEER)

File	SWA @ 5deg Ct	MES	Time@5deg	COS	Time@COS	MOS	Time@MOS	YRR1(%)	YR1 (deg/sec)	YRR1 Ct	YRR175(%)	YR175 (deg/sec)
0025	617	50.237	3.077	998	4.985	755	3.767	-0.991	-0.122	1198	0.337	0.042
0026	616	50.216	3.072	999	4.985	755	3.767	-0.259	-0.042	1199	-0.222	-0.036
0027	615	50.350	3.068	998	4.984	755	3.766	-0.552	-0.105	1198	-0.332	-0.063
0028	615	50.213	3.067	998	4.983	755	3.766	-0.350	-0.078	1198	-0.035	-0.008
0029	615	50.054	3.068	998	4.985	755	3.769	-0.311	-0.081	1198	-0.057	-0.015
0030	615	50.373	3.069	999	4.986	755	3.769	-0.008	-0.002	1199	0.135	0.035
0031	615	50.252	3.068	998	4.985	755	3.769	0.084	0.023	1198	0.079	0.021
0032	615	50.210	3.069	998	4.985	755	3.769	0.013	0.004	1198	-0.160	-0.045
0033	615	50.172	3.069	998	4.985	755	3.769	-0.307	-0.064	1198	0.278	0.058
0034	615	50.370	3.067	998	4.982	755	3.767	0.294	0.066	1198	0.934	0.210
0035	615	50.145	3.067	998	4.983	755	3.767	-0.251	-0.059	1198	0.469	0.110

RIGHT-TO-LEFT (INITIAL CLOCKWISE STEER)

0036	618	50.366	3.080	999	4.989	755	3.770	-0.106	0.013	1199	-0.760	0.096
0037	616	50.258	3.075	999	4.988	755	3.769	-0.746	0.127	1199	-1.173	0.200
0038	616	50.354	3.073	999	4.989	756	3.770	0.179	-0.037	1199	-0.077	0.016
0039	615	50.449	3.069	999	4.985	755	3.768	0.168	-0.040	1199	-0.429	0.101
0040	615	50.145	3.066	998	4.982	755	3.766	0.142	-0.038	1198	-0.008	0.002
0041	615	50.320	3.069	999	4.986	755	3.769	-0.597	0.169	1199	-0.315	0.089
0042	615	50.255	3.065	998	4.982	755	3.765	-0.512	0.143	1198	-1.064	0.297
0043	615	50.180	3.066	998	4.983	755	3.767	-0.259	0.081	1198	-0.183	0.058
0044	615	50.304	3.065	998	4.982	755	3.765	-0.411	0.091	1198	-0.492	0.109
0045	615	50.437	3.067	998	4.984	755	3.767	-0.052	0.013	1198	-0.309	0.075
0046	615	50.069	3.067	998	4.984	755	3.766	0.223	-0.053	1198	-0.026	0.006

7.4 SINE WITH DWELL TEST RESULTS
2011 Toyota Tundra 2WD Mode
NHTSA No.: CB5109

Date Created 30-Aug-11

LEFT-TO-RIGHT (INITIAL COUNTER-CLOCKWISE STEER)

File	YRR175 Ct	2nd Yaw Peak(deg/sec)	2nd Yaw Peak Ct	Lat Disp (ft)	Lat. Acc. 1.07s (g)	1st SWA Peak(deg)	1st SWA Peak Ct	2nd SWA Mean(deg)
0025	1348	12.323	862	-3.926	0.322	63.142	683	62.809
0026	1349	16.245	864	-5.101	0.400	83.970	683	83.855
0027	1348	18.974	841	-6.190	0.462	105.171	683	105.020
0028	1348	22.348	836	-7.013	0.501	126.115	683	125.987
0029	1348	26.097	837	-7.606	0.521	147.149	684	146.903
0030	1349	26.000	835	-8.081	0.497	168.081	684	167.975
0031	1348	26.964	834	-8.311	0.479	189.330	684	188.780
0032	1348	28.306	834	-8.464	0.488	210.500	684	209.841
0033	1348	20.932	825	-7.493	0.473	231.488	684	230.847
0034	1348	22.475	823	-7.652	0.494	252.422	684	251.550
0035	1348	23.384	822	-7.706	0.475	273.000	684	272.567

RIGHT-TO-LEFT (INITIAL CLOCKWISE STEER)

0036	1349	-12.670	859	3.773	-0.331	63.552	684	63.359
0037	1349	-17.006	877	4.796	-0.418	84.548	684	84.370
0038	1349	-20.376	851	5.792	-0.474	105.721	684	105.550
0039	1349	-23.647	844	6.479	-0.515	126.723	684	126.486
0040	1348	-26.570	839	6.982	-0.547	147.818	683	147.369
0041	1349	-28.297	835	7.387	-0.560	168.800	684	168.407
0042	1348	-27.953	833	7.713	-0.525	189.913	683	189.227
0043	1348	-31.398	835	7.752	-0.598	211.048	683	210.342
0044	1348	-22.160	826	7.307	-0.478	232.024	683	231.196
0045	1348	-24.182	829	7.311	-0.498	252.886	684	252.265
0046	1348	-23.703	826	7.365	-0.481	273.699	684	273.073

7.4 SINE WITH DWELL TEST RESULTS
2011 Toyota Tundra 4WD Mode
NHTSA No.: CB5109

Date Createc 1-Sep-11

LEFT-TO-RIGHT (INITIAL COUNTER-CLOCKWISE STEER)

File	SWA @ 5deg Ct	MES	Time@5deg	COS	Time@COS	MOS	Time@MOS	YRR1(%)	YR1 (deg/sec)	YRR1 Ct	YRR175(%)	YR175 (deg/sec)
0023	617	50.405	3.076	999	4.985	755	3.767	0.085	0.011	1199	-1.096	-0.136
0024	616	50.605	3.073	999	4.987	755	3.769	-0.343	-0.056	1199	-0.441	-0.071
0025	615	50.482	3.067	998	4.983	754	3.765	-0.308	-0.062	1198	-0.045	-0.009
0026	615	50.400	3.069	999	4.986	755	3.768	0.034	0.008	1199	0.155	0.036
0027	615	50.341	3.067	998	4.984	755	3.767	0.231	0.061	1198	0.049	0.013
0028	615	50.420	3.066	998	4.982	755	3.766	-0.277	-0.076	1198	-0.688	-0.190
0029	616	50.313	3.070	999	4.986	756	3.770	-0.647	-0.179	1199	-0.531	-0.147
0030	615	50.454	3.068	998	4.983	755	3.768	0.276	0.068	1198	0.081	0.020
0031	615	50.499	3.068	998	4.983	755	3.768	0.179	0.046	1198	0.000	0.000
0032	615	50.485	3.067	998	4.982	755	3.766	0.400	0.103	1198	0.061	0.016
0035	615	50.146	3.066	998	4.981	755	3.766	-0.341	-0.092	1198	-0.216	-0.058

RIGHT-TO-LEFT (INITIAL CLOCKWISE STEER)

0036	617	50.365	3.076	998	4.985	755	3.766	0.358	-0.047	1198	0.118	-0.015
0037	616	50.428	3.074	999	4.988	755	3.770	-0.060	0.010	1199	0.766	-0.129
0038	615	50.322	3.069	999	4.986	755	3.767	-0.225	0.046	1199	0.140	-0.029
0039	615	50.343	3.066	998	4.983	755	3.765	0.229	-0.055	1198	-0.277	0.067
0040	615	50.248	3.066	998	4.982	755	3.766	0.277	-0.074	1198	0.453	-0.121
0041	615	50.538	3.067	998	4.983	755	3.767	0.223	-0.062	1198	0.227	-0.063
0042	615	50.293	3.067	998	4.983	755	3.768	0.151	-0.042	1198	0.164	-0.046
0043	615	50.388	3.065	998	4.981	755	3.765	-0.680	0.169	1198	-0.167	0.042
0044	615	50.500	3.069	998	4.985	755	3.769	-0.091	0.023	1198	-0.165	0.042
0045	615	50.464	3.069	998	4.984	755	3.769	0.315	-0.084	1198	0.138	-0.037
0047	615	50.232	3.068	998	4.983	755	3.768	0.760	-0.199	1198	0.789	-0.206

7.4 SINE WITH DWELL TEST RESULTS
2011 Toyota Tundra 4WD Mode
NHTSA No.: CB5109

Date Created 1-Sep-11

LEFT-TO-RIGHT (INITIAL COUNTER-CLOCKWISE STEER)

File	YRR175 Ct	2nd Yaw Peak(deg/sec)	2nd Yaw Peak Ct	Lat Disp (ft)	Lat. Acc. 1.07s (g)	1st SWA Peak(deg)	1st SWA Peak Ct	2nd SWA Mean(deg)
0023	1349	12.435	876	-3.927	0.302	65.104	683	64.819
0024	1349	16.228	857	-5.045	0.388	87.028	684	86.739
0025	1348	19.993	844	-5.940	0.441	109.054	683	109.108
0026	1349	23.304	841	-6.632	0.481	131.036	684	130.853
0027	1348	26.361	838	-7.262	0.500	152.012	684	151.849
0028	1348	27.551	862	-7.552	0.490	174.170	684	173.747
0029	1349	27.671	838	-7.843	0.494	196.236	684	195.693
0030	1348	24.685	833	-7.414	0.493	218.504	684	217.908
0031	1348	25.401	830	-7.380	0.483	239.266	684	238.762
0032	1348	25.772	828	-7.436	0.462	260.446	685	260.594
0035	1348	26.887	830	-7.535	0.477	282.461	685	282.496

RIGHT-TO-LEFT (INITIAL CLOCKWISE STEER)

0036	1348	-13.019	892	3.703	-0.314	65.528	683	65.410
0037	1349	-16.853	855	4.772	-0.387	87.552	684	87.351
0038	1349	-20.476	848	5.649	-0.436	109.677	684	109.513
0039	1348	-24.071	845	6.360	-0.463	131.651	683	131.354
0040	1348	-26.766	841	6.938	-0.486	152.695	683	152.358
0041	1348	-27.945	836	7.482	-0.498	174.707	683	174.322
0042	1348	-27.763	838	7.771	-0.468	196.728	684	196.131
0043	1348	-24.810	837	7.474	-0.449	218.993	683	218.359
0044	1348	-25.257	836	7.653	-0.455	239.657	685	239.336
0045	1348	-26.824	836	7.696	-0.448	261.124	685	261.073
0047	1348	-26.143	835	7.669	-0.439	283.149	685	282.985

7.5 SLOWLY INCREASING STEER TEST RESULTS
2011 Toyota Tundra 2WD Mode
NHTSA No.: CB5109

Date Created 30-Aug-11

File	Vehicle	EventPt	DOS	MES [mph]	Mean SPD [mph]	AYcount_3	THETAENCF_3 [degree]	AYCG_CD2_3 [g]	r_squared	ZeroBegin	ZeroEnd
0012	2011 Toyota Tundra 2WD	702	1	50.197	50.194	1308	-40.854	-0.298	0.998	502	702
0014	2011 Toyota Tundra 2WD	705	1	49.968	50.089	1324	-41.743	-0.300	0.997	505	705
0016	2011 Toyota Tundra 2WD	703	1	49.884	49.909	1320	-41.594	-0.304	0.997	503	703
0017	2011 Toyota Tundra 2WD	703	0	50.103	49.758	1325	42.272	0.304	0.998	503	703
0018	2011 Toyota Tundra 2WD	703	0	49.783	49.983	1329	42.551	0.301	0.995	503	703
0019	2011 Toyota Tundra 2WD	702	0	49.984	50.110	1332	42.790	0.299	0.997	502	702
Averages							42	0.301			

Scalars	Steering Angles (deg)
1.5	63
2	84
2.5	105
3	126
3.5	147
4	168
4.5	189
5	210
5.5	231
6	252
6.5	273

7.5 SLOWLY INCREASING STEER TEST RESULTS
2011 Toyota Tundra 4WD Mode
NHTSA No.: CB5109

Date Created 1-Sep-11

File	Vehicle	EventPt	DOS	MES [mph]	Mean SPD [mph]	AYcount_3	THETAENCF_3 [degree]	AYCG_CD2_3 [g]	r_squared	ZeroBegin	ZeroEnd
0011	2011 Toyota Tundra 4WD	703	1	49.982	50.214	1333	-42.465	-0.315	0.991	503	703
0012	2011 Toyota Tundra 4WD	703	1	50.094	49.955	1356	-44.051	-0.295	0.995	503	703
0013	2011 Toyota Tundra 4WD	703	1	50.574	50.170	1367	-44.772	-0.305	0.996	503	703
0015	2011 Toyota Tundra 4WD	704	0	49.702	50.222	1339	43.104	0.299	0.998	504	704
0016	2011 Toyota Tundra 4WD	697	0	49.776	50.328	1334	42.681	0.303	0.996	497	697
0017	2011 Toyota Tundra 4WD	605	0	50.069	49.867	1353	43.833	0.300	0.997	405	605
Averages							43.5	0.303			

Scalars	Steering Angles (deg)
1.5	65
2	87
2.5	109
3	131
3.5	152
4	174
4.5	196
5	218
5.5	239
6	261
6.5	283

7.6 INERTIA SENSOR MEASUREMENTS

2011 Toyota Tundra

NHTSA No.: CB5109

Device : U12-05-08-07108
 device version : 2.24
 device certification date : 08/19/11
 today is : 8/29/2011
 units : Millimeters

Label	ActualX	ActualY	ActualZ
C_DEVICEPOS001			
M_PLANE001	1391.848	-518.012	-389.401
M_LINE001	707.133	121.721	-9.190
M_FRONT_AXLE_CENTER	0.000	0.000	0.000
C_COORDSYS001	0.000	0.000	0.000
M_TIRE_TREAD_CENTER	340.653	91.899	-234.303
M_INERTIA_PACK	1713.884	954.624	923.142
M_ROOF	1938.707	951.251	1543.304
M_GROUND	1936.513	-114.861	-388.051

Track Width 1749.425

Roof Height (relative to ground) 1931.355

Motion Pak - x-distance (mm) 1713.884
Motion Pak - y-distance (mm) -11.987
Motion Pak - z-distance (mm) 1266.744

Motion Pak - x-distance (inches) 67.476
Motion Pak - y-distance (inches) -0.472
Motion Pak - z-distance (inches) 49.872

x-distance (longitudinal) Point of reference is the front axle centerline.
 (Positive from front axle toward rear of vehicle.)

y-distance (lateral) Point of reference is the vehicle centerline.
 (Positive from the center toward the right.)

z-distance (vertical) Point of reference is the ground plane.
 (Positive from the ground up.)