126-DRI-10-006
SAFETY COMPLIANCE TESTING FOR FMVSS 126
Electronic Stability Control Systems

Chrysler Group LLC
2010 Dodge Ram 1500
NHTSA No. CA0306

DYNAMIC RESEARCH, INC.
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10 November, 2010

Final Report

Prepared Under Contract No.: DTNH22-08-D-00098

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
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16. Abstract A test was conducted on a 2010 Dodge Ram 1500 , NHTSA No. CA0306, 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			
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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this test is to determine if the test vehicle, a 2010 Dodge Ram 1500, meets the minimum equipment and performance requirements stated in Federal Motor Vehicle Safety Standard (FMVSS) 126, "Electronic Stability Control Systems."

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS

Testing of the 2010 Dodge Ram 1500 was conducted at Dynamic Research, Inc (DRI) 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 20 km/h (12.4 mph), when being driven in reverse, or during system initialization).

The vehicle was subjected to a 0.7 Hz Sine with Dwell 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).

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS (CONTINUED)

- 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, tested in both a 2-wheel drive and 4-wheel drive configuration, 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 (CONTD)

Data Summary Sheet (Page 1 of 2)

Vehicle: *2010 Dodge Ram 1500*

NHTSA No. *CA0306* VIN: *1D7RV1CT9AS172866*

Vehicle Type: *Truck* Manufacture Date: *2/10*

Laboratory: *Dynamic Research, 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 and operational characteristics requirements. (S126, S5.1, S5.6)	***PASS***
ESC Malfunction Telltale (Data Sheet 3)	
Vehicle is equipped with a telltale that indicates one or more ESC system malfunctions. (S126, S5.3)	***PASS***
"ESC Off" and other System Controls and Telltale (Data Sheet 3,4)	
Vehicle is equipped with an ESC off telltale indicating the vehicle 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)	***PASS***
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)	***PASS***

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS (CONTD)

Data Summary Sheet (Page 2 of 2)

REQUIREMENTS:	PASS/FAIL
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)	***PASS***
Yaw Rate Ratio at 1.75 seconds after COS is less than 20% of peak value. (S126, S5.2.2)	***PASS***
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 3,500kg (7,716 lb) or less, and 1.52 m (5 feet) for vehicles with a GVWR greater than 3,500 Kg (7,716 lb). (S126, S5.2.3)	***PASS***
ESC Malfunction Warning (Data Sheet 9)	
Warning is provided to driver after malfunction occurrence. (S126. S5.3)	***PASS***
Malfunction telltale stayed illuminated as long as malfunction existed and must extinguish after malfunction was corrected. (S126, S5.3.7)	***PASS***

3.0 TEST DATA

Data Sheet 1 (Page 1 of 2)

TEST VEHICLE INSPECTION AND TEST PREPARATION

Vehicle: *2010 Dodge Ram 1500 Truck*

NHTSA No. *CA0306* Data Sheet Completion Date: *4/16/2010*

VIN *1D7RV1CT9AS172866* Manufacture Date: *2/10*

GVWR (kg): *3085.0* Front GAWR (kg): *1770.0* Rear GAWR (kg): *1770.0*

Seating Positions Front: *2* Mid: Rear: *3*

Odometer reading at time of inspection: *8 miles (12.8 km)*

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:

Front axle: *P275/60 R20* Rear axle: *P275/60 R20*

INSTALLED TIRE SIZE(S) ON VEHICLE (from tire sidewall)

		Front Axle		Rear Axle
	Tire Manufacturer:	*Goodyear*		*Goodyear*
	Tire Model:	*Wrangler HP*		*Wrangler HP*
	Tire Size:	*P275/60 R20*		*P275/60 R20*
TIN	Left Front:	*MKYN AIWR 1709*	Right Front:	*MKYN AIWR 1709*
	Left Rear:	*MKYN AIWR 1709*	Right Rear:	*MKYN AIWR 1709*

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

DRIVE CONFIGURATION(S):(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 no locked full time (4WD Automatic)

[X] Four Wheel Drive (High Gear Locked Differential 4WD HGLD)

[X] Four Wheel Drive Low Gear (4WD Low)

[ ] Other (Describe)

3.0 TEST DATA (CONTD)

Data Sheet 1 (Page 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: *Standard default ESC on, ESC partial off*
Drive Configuration: *4WD HGLD*
Mode: *Standard default ESC on, ESC partial off, ESC off*
Drive Configuration: *4WD Low*
Mode: *Standard default ESC off*

VEHICLE STABILITY SYSTEMS (Check applicable technologies):

List other systems:

[X] ESC	[X] Traction Control	[X] Roll Stability Control
[ ] Active Suspension	[X] Electronic Throttle Control	[ ] Active Steering
[X] ABS		

REMARKS:

RECORDED BY: *J Lenkeit* DATE RECORDED: *4/16/2010*
APPROVED BY: *B Kebschull* DATE APPROVED: *5/5/2010*

3.0 TEST DATA (CONTD)

Data Sheet 2 (Page 1 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

Vehicle: *2010 Dodge Ram 1500 Truck*

NHTSA No *CA0306* Data Sheet Completion Date: *4/16/2010*

ESC SYSTEM IDENTIFICATION

Manufacturer/Model *TRW/ Model EBC445*

ESC SYSTEM HARDWARE (Check applicable hardware)

[X] Electronic Control Unit	[X] Hydraulic Control Unit
[X] Wheel Speed Sensors	[X] Steering Angle Sensor
[X] Yaw Rate Sensor	[X] Lateral Acceleration Sensor

List other Components: *Longitudinal accelerometer*

ESC OPERATIONAL CHARACTERISTICS

System is capable of generating brake torque at each wheel — [X] Yes (Pass) [ ] No (Fail)
List and describe Components: *Hydraulic modulator and control computer.*

System is capable of determining yaw rate — [X] Yes (Pass) [ ] No (Fail)
List and describe Components: *Dedicated yaw rate sensor is used to measure yaw rate.*

System is capable of monitoring driver steering input — [X] Yes (Pass) [ ] No (Fail)
List and describe Components: *Steering wheel angle sensor is used to measure steering wheel angle.*

System is capable of estimating side slip or side slip derivative — [X] Yes (Pass) [ ] No (Fail)
List and describe Components: *Speed sensors, yaw rate sensor, steer angle sensor. Sideslip is estimated based on these sensors and vehicle and tire properties.*

3.0 TEST DATA (CONTD)

Data Sheet 2 (Page 2 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

ESC OPERATIONAL CHARACTERISTICS (continued)

System is capable of modifying engine torque during ESC activation. **X** Yes (Pass) ___ No (Fail)

Method used to modify torque: *- ESC sends torque request to Powertrain Control Module (PCM) using vehicle CAN bus and PCM achieves torque reduction by using combination of techniques such as cylinder deactivation, spark retardation and throttle reduction through electronic throttle control.*

System is capable of activation at speeds of 20 km/h (12.4 mph) and higher **X** Yes (Pass) ___ No (Fail)

Speed system becomes active: *15 km/h*

System is capable of activation during the following driving phases: **X** Yes (Pass) ___ No (Fail)

- acceleration
- braking
- coasting
- during activation of ABS or traction control

Driving phases during which ESC is capable of activation:
ESC is capable of activation in all driving phases except when the transfer case is in 4WD low mode, which is considered as an off-road driving mode. Does not operate while vehicle is in reverse

Vehicle manufacturer submitted documentation explaining how the ESC mitigates understeer **X** Yes (Pass) ___ No (Fail)

DATA INDICATES COMPLIANCE: **X** Yes (Pass) ___ No (Fail)

REMARKS:

RECORDED BY: *J Lenkeit* DATE RECORDED: *4/16/2010*
APPROVED BY: *Brian Kebschull* DATE APPROVED: *5/5/2010*

3.0 TEST DATA (CONTD)

Data Sheet 3 (Page 1 of 2)
ESC MALFUNCTION AND OFF TELLTALES

Vehicle: *2010 Dodge Ram 1500 Truck*

NHTSA No. *CA0306* Data Sheet completion date: *4/19/2010*

ESC Malfunction Telltale

Vehicle is equipped with malfunction telltale? *Yes*

Telltale Location: *Lower center of instrument cluster, see Figure 5.6*

Telltale Color: *Yellow*

Telltale symbol or abbreviation used

or **ESC**

[ ] Vehicle uses this symbol

[ ] Vehicle uses this abbreviation

[X] Neither symbol or abbreviation is used

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

"ESP BAS" indicates an ESC malfunction

Is telltale part of a common space? *Yes*

Is telltale also used to indicate activation of the ESC system? *No (see below)*

If yes explain telltale operation during ESC activation:

The telltale used to indicate the ESC system has been turned off, located in lower right of instrument panel flashers during ESC activation, refer to page 10 and figure 5.6

3.0 TEST DATA (CONTD)

Data Sheet 3 (Page 2 of 2)
ESC MALFUNCTION AND OFF TELLTALES

"ESC OFF" Telltale (if provided)

Vehicle is equipped with "ESC OFF" telltale? *Yes*

Is "ESC Off" telltale combined with "ESC Malfunction" telltale utilizing a two part telltale? *No*

Telltale Location: *Lower right of instrument panel, see Figure 5.6*

Telltale Color: *Amber*

Telltale symbol or abbreviation used

or **ESC OFF**

- [ ] Vehicle uses this symbol
- [ ] Vehicle uses this abbreviation
- [x] Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used. *As symbol above but without the word "off". The same symbol flashes to indicate ESC activation*

Is telltale part of a common space? *No*

DATA INDICATES COMPLIANCE *Yes*

(Vehicle is compliant if equipped with a malfunction telltale)

Remarks: *An additional ESC off notification is provided, displaying "ESC System Off" in common information area between speedometer and tachometer. See Figure 5.6*

RECORDED BY:	*J Lenkeit*	DATE RECORDED:	*4/19/2010*
APPROVED BY:	*Brian Kebschull*	DATE APPROVED:	*5/5/2010*

3.0 TEST DATA (CONTD)

Data Sheet 4 (Page 1 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

Vehicle: *2010 Dodge Ram 1500 Truck*

NHTSA No. *CA0306* Data Sheet completion date: *4/14/2010*

"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? **X** Yes ___ No

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

- [ ] Dedicated "ESC Off" Control
- [X] Multi-functional control with an "ESC Off" mode
- [ ] Other (describe)

Identify each control location, labeling and selectable modes.

First Control: Location *Center of dash below radio, above HVAC controls*
Labeling *Skidding car symbol with word "OFF" below symbol*
Modes *ESC on, TCS off/ESC partial off, ESC off (4WD Only)*

Second Control: Location ___
Labeling ___
Modes ___

Identify standard or default drive configuration *2WD*

Verify standard or default drive configuration selected **X** 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?

X 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?

X Yes ___ No (Fail)

If no, describe how the "Off" control functions

3.0 TEST DATA (CONTD)

Data Sheet 4 (Page 2 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

If a multi-function control is provided, cycle through each mode setting on the control and record which modes illuminate the "ESC Off" telltale. Also, for those modes that illuminate the ESC Off" telltale identify if the telltale extinguishes upon cycling the ignition system.

Control Mode	"ESC Off" telltale illuminates upon activation of control? (Yes/No)	"ESC Off" telltale extinguishes upon cycling ignition? (Yes/No)
ESC partial off / TCS off	*Yes*	*Yes*

For each mode that illuminates the "ESC Off" telltale, did the telltale extinguish when the ignition was cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position?

X Yes ____ No

Other System Controls that have an ancillary effect on ESC Operation:

Is the vehicle equipped with any ancillary controls that upon activation may 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? **X** Yes ____ No

Ancillary Control: System Transfer case switch (4WD Low)

Control Description Shifting the transfer case to 4WD Low deactivates ESC

Labeling 4WD LOW

Ancillary Control: System _____

Control Description _____

Labeling _____

Ancillary Control: System _____

Control Description _____

Labeling _____

3.0 TEST DATA (CONTD)

Data Sheet 4 (Page 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
Transfer case switch (4WD Low)	*Yes*	*"ESC System Off", "ESP BAS", and "slip" indicator*

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)
Transfer case switch (4WD Low)	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 activating the control 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.

X Yes ____ No (Fail)

DATA INDICATES COMPLIANCE: PASS

Remarks:

RECORDED BY: *J Lenkeit* DATE RECORDED: *4/14/2010*
APPROVED BY: *B Kebschull* DATE APPROVED: *5/5/2010*

3.0 TEST DATA (CONTD)

Data Sheet 5 (Page 1 of 3)
TEST TRACK AND VEHICLE DATA

Vehicle: *2010 Dodge Ram 1500 Truck*

NHTSA No. *CA0306* Data Sheet completion date: *4/26/2010*

Test Track Requirements: Test surface slope (0-1%): *0.5%*

Peak Friction Coefficient (at least 0.9) *0.959*

Test track data meets requirements: *Yes* If no, explain:

Full Fluid Levels: Fuel *Yes* Other Fluids *Yes* (specify)

Coolant *Yes* *Oil, washers*

Tire Pressures:

Required; Front Axle *240* KPA Rear Axle *240* KPA

Actual; LF *240* KPA RF *240* KPA

LR *240* KPA RR *240* KPA

Vehicle Dimensions: Front Track Width *173.4* cm Wheelbase *351.2* cm

Rear Track Width *172.7* cm

Vehicle Weight Ratings: GAWR Front *1770.0* KG GAWR Rear *1770.0* KG

Unloaded Vehicle Weight (UVW):

Front Axle *1441.1* KG Left Front *733.0* KG Right Front *708.1* KG

Rear Axle *1088.6* KG Left Rear *560.2* KG Right Rear *528.4* KG

Total UVW *2529.7* KG

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

Calculated baseline weight (UVW + 73kg) *2602.7* KG

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

Standard - Baseline weight under 2772 kg (6000 lb)
Heavy - Baseline weight equal to or greater than 2772 kg (6000 lb)

3.0 TEST DATA (CONTD)

Data Sheet 5 (Page 2 of 3)
TEST TRACK AND VEHICLE DATA

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

Front axle *1485.5* KG Left front *750.7* KG Right front *734.8* KG

Rear axle *1107.7* KG Left rear *573.8* KG Right rear *533.9* KG

Total UVW with outriggers *2593.2* KG

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

Front axle *1591.7* KG Left front *822.8* KG Right front *768.9* KG

Rear axle *1168.1* KG Left rear *605.4* KG Right rear *562.7* KG

Vehicle Weight *2759.8* KG

Ballast Required =

[Total UVW with Outriggers (if applicable)]		+ *168*	KG	- [Loaded Weight w/Driver and Instrumentation)]	
= *2593.2*	KG	+ *168*	KG	- 2759.8	KG

= *1.4* KG

Total Loaded Vehicle Weight w/Driver and Instrumentation and Ballast

Front axle *1592.0* KG Left front *822.8* KG Right front *769.2* KG

Rear axle *1169.4* KG Left rear *605.8* KG Right rear *563.6* KG

Total UVW *2761.4* KG

3.0 TEST DATA (CONTD)

Data Sheet 5 (Page 3 of 3)
TEST TRACK AND VEHICLE 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	*58.5*	in	*148.7*	cm	*66.5*	in	*169.0*	cm
y-distance	*-1.2*	in	*-3.0*	cm	*-0.4*	in	*-1.0*	cm
z-distance	*28.8*	in	*73.1*	cm	*31.3*	in	*79.6*	cm
Roof Height					*75.687*	in	*192.2*	cm
Distance between ultrasonic sensors					*93.5*	in	*237.5*	cm

Remarks:

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/26/2010*
APPROVED BY: *J Lenkeit* DATE APPROVED: *5/4/2010*

3.0 TEST DATA (CONTD)

Data Sheet 6 (Page 1 of 6)
BRAKE AND TIRE CONDITIONING

Vehicle: *2010 Dodge Ram 1500 Truck 2WD Configuration*

NHTSA No. *CA0306*

Measured tire pressure: LF *248* KPA RF *249* KPA

LR *249* KPA RR *247* KPA

Wind Speed *1* m/s (10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) *24.9* °C

Brake Conditioning Time: *12:01:00 PM* Date: *4/26/2010*

56 km/h (35 mph) Brake Stops

Number of stops executed (10 required)	*10*	Stops
Observed deceleration rate range (.5g target)	*.45-.55*	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	*0.8-0.9*	g

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

Duration of cool down period (5 minutes min.)	*5*	Minutes

3.0 TEST DATA (CONTD)

Data Sheet 6 (Page 2 of 6)
BRAKE AND TIRE CONDITIONING

Tire Conditioning series No. 1	Time:	*12:14:00 PM*		Date:	*4/26/2010*	
Measured cold tire pressure	LF	*268*	KPA	RF	*268*	KPA
	LR	*264*	KPA	RR	*264*	KPA
Wind Speed *1.9* m/s	(10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)					

Ambient Temperature (7°C (45°F) - 40°C (104°F)) *28.7*°C

30 meter (100 ft) Diameter Circle Maneuver				
Test Run	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (Km/h)
1-3	Clockwise	0.5 – 0.6	*0.5 - 0.6*	*32 - 33.6*
4-6	Counterclockwise	0.5 – 0.6	*0.5 - 0.6*	*32 - 33.6*

5-1 Hz Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle for 0.5-0.6 g Lateral Acceleration					
Test Run	Data File	Vehicle Speed Km/h(mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	2	56 ± 2 (35 ± 1)	*60*	0.5 - 0.6	*0.33*
2	3	56 ± 2 (35 ± 1)	*100*	0.5 - 0.6	*0.52*
3		56 ± 2 (35 ± 1)		0.5 - 0.6	
4		56 ± 2 (35 ± 1)		0.5 - 0.6	

Steering wheel angle that corresponds to a peak 0.5-0.6 g lateral acceleration:
100 **degrees**

10-1 Hz Cycle Sinusoidal Steering Maneuver					
Test Run	Data File	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1-3	*4-6*	56 ± 2 (35 ± 1)	*100* (cycles 1-10)	0.5 - 0.6	*0.52*
4	*7*	56 ± 2 (35 ± 1)	*100* (cycles 1-9)	0.5 - 0.6	*0.52*
			200 (cycle10)*	NA	*0.76*

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9

3.0 TEST DATA (CONTD)

Data Sheet 6 (Page 3 of 6)
BRAKE AND TIRE CONDITIONING

Tire Conditioning series No. 2 Time: *1:53:00 PM* Date: *4/26/2010*

Measured cold tire pressure LF *273* KPA RF *275* KPA

LR *266* KPA RR *265* KPA

Wind Speed *1.3* m/s (10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) *28.5* °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Run	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (Km/h)
1-3	Clockwise	0.5 - 0.6	*0.5 - 0.6*	*32 - 33.6*
4-6	Counterclockwise	0.5 - 0.6	*0.5 - 0.6*	*32 - 33.6*

Steering wheel angle that corresponds to a peak 0.5-0.6 g lateral acceleration:

100 **degrees**

10-1 Hz Cycle Sinusoidal Steering Maneuver					
Test Run	Data File	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1-3	*17-19*	56 ± 2 (35 ± 1)	*100* (cycles 1-10)	0.5 - 0.6	*0.52*
4	*20*	56 ± 2 (35 ± 1)	*100* (cycles 1-9)	0.5 - 0.6	*0.52*
			200 (cycle 10)*	NA	*0.76*

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9

Remarks:

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/26/2010*

APPROVED BY: *J Lenkeit* DATE APPROVED: *5/4/2010*

3.0 TEST DATA (CONTD)

Data Sheet 6 (Page 4 of 6)
BRAKE AND TIRE CONDITIONING

Vehicle: *2010 Dodge Ram 1500 Truck 4WD High Configuration*

NHTSA No. *CA306*

Measured tire pressure: LF *248* KPA RF *247* KPA

LR *246* KPA RR *246* KPA

Wind Speed *2.1* m/s (10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)

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

Brake Conditioning Time: *12:05:00 PM* Date: *4/28/2010*

56 km/h (35 mph) Brake Stops

Number of stops executed (10 required)	*10*	Stops
Observed deceleration rate range (.5g target)	*0.45-0.55*	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	*0.8-0.9*	g

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

Duration of cool down period (5 minutes min.)	*5*	Minutes

3.0 TEST DATA (CONTD)

Data Sheet 6 (Page 5 of 6)
BRAKE AND TIRE CONDITIONING

Tire Conditioning series No. 1	Time:	*12:40:00 PM*		Date:	*4/28/2010*	
Measured cold tire pressure	LF	*259*	KPA	RF	*259*	KPA
	LR	*254*	KPA	RR	*254*	KPA
Wind Speed *2.6* m/s	(10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)					

Ambient Temperature (7°C (45°F) - 40°C (104°F)) *24.4*°C

30 meter (100 ft) Diameter Circle Maneuver				
Test Run	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (Km/h)
1-3	Clockwise	0.5 – 0.6	*0.5-0.6*	*30.4 - 32*
4-6	Counterclockwise	0.5 – 0.6	*0.5-0.6*	*30.4 - 32*

5-1 Hz Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle for 0.5-0.6 g Lateral Acceleration					
Test Run	Data File	Vehicle Speed Km/h(mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	2	56 ± 2 (35 ± 1)	*60*	0.5 - 0.6	*0.32*
2	3	56 ± 2 (35 ± 1)	*100*	0.5 - 0.6	*0.51*
3		56 ± 2 (35 ± 1)		0.5 - 0.6	
4		56 ± 2 (35 ± 1)		0.5 - 0.6	

Steering wheel angle that corresponds to a peak 0.5-0.6 g lateral acceleration:
100 **degrees**

10-1 Hz Cycle Sinusoidal Steering Maneuver					
Test Run	Data File	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1-3	*4-6*	56 ± 2 (35 ± 1)	*100* (cycles 1-10)	0.5 - 0.6	*0.51*
4	*7*	56 ± 2 (35 ± 1)	*100* (cycles 1-9)	0.5 - 0.6	*0.51*
			200 (cycle10)*	NA	*0.74*

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9

3.0 TEST DATA (CONTD)

Data Sheet 6 (Page 6 of 6)
BRAKE AND TIRE CONDITIONING

Tire Conditioning series No. 2 Time: *1:42:00 PM* Date: *4/28/2010*

Measured cold tire pressure LF *261* KPA RF *260* KPA

LR *256* KPA RR *255* KPA

Wind Speed *3.5* m/s (10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) *27.1* °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Run	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (Km/h)
1-3	Clockwise	0.5 - 0.6	*0.5-0.6*	*30.4 - 32*
4-6	Counterclockwise	0.5 - 0.6	*0.5-0.6*	*30.4 - 32*

Steering wheel angle that corresponds to a peak 0.5-0.6 g lateral acceleration:

100 **degrees**

10-1 Hz Cycle Sinusoidal Steering Maneuver					
Test Run	Data File	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1-3	*16-18*	56 ± 2 (35 ± 1)	*100* (cycles 1-10)	0.5 - 0.6	*0.51*
4	*19*	56 ± 2 (35 ± 1)	*100* (cycles 1-9)	0.5 - 0.6	*0.51*
			200 (cycle 10)*	NA	*0.74*

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9

Remarks:

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/28/2010*

APPROVED BY: *J Lenkeit* DATE APPROVED: *5/4/2010*

3.0 TEST DATA (CONTD)

Data Sheet 7 (Page 1 of 4)
SLOWLY INCREASING STEER (SIS) MANEUVER

Vehicle: *2010 Dodge Ram 1500 Truck 2WD Configuration*

NHTSA No. *CA0306*

Measured tire pressure: LF *271* KPA RF *271* KPA

LR *266* KPA RR *265* KPA

Wind Speed *2.4* m/s

(10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) *30* °C

Selected drive configuration *2WD*

Selected Mode: *Default- ESC on*

Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle

$a_{y,30degrees}$ = *0.25* g

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at 0.55g:

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

δ_{sis} = *66.0* degrees (@.55g)

δ_{sis} = *70* degrees (rounded)

Steering Wheel Angle at Corrected 0.3g Lateral Acceleration:

Maneuver	Initial Steer Direction	Time Clock (5 min max between runs)	Steering Wheel Angle to nearest 0.1° (degrees)	Data Run	Good/NG
1	Left	*1:00:45 PM*	*-40.8*	*10*	*Good*
2	Left	*1:03:54 PM*	---	*11*	*NG*
3	Left	*1:05:34 PM*	*-41.0*	*12*	*Good*
4	Left	*1:08:52 PM*	*-41.4*	*13*	*Good*
1	Right	*1:11:49 PM*	*39.4*	*14*	*Good*
2	Right	*1:16:07 PM*	*39.3*	*15*	*Good*
3	Right	*1:18:55 PM*	*41.6*	*16*	*Good*

3.0 TEST DATA (CONTD)

Data Sheet 7 (Page 2 of 4)
SLOWLY INCREASING STEER (SIS) MANEUVER

Average Overall Steering Wheel Angle:

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

$\delta_{0.3\ g,\ overall}$ = *40.6* degrees

[to nearest 0.1 degree]

Remarks:

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/26/2010*
APPROVED BY: *J Lenkeit* DATE APPROVED: *5/4/2010*

3.0 TEST DATA (CONTD)

Data Sheet 7 (Page 3 of 4)
SLOWLY INCREASING STEER (SIS) MANEUVER

Vehicle: *2010 Dodge Ram 1500 Truck 4WD High Configuration*

NHTSA No. *CA306*

Measured tire pressure: LF *259* KPA RF *258* KPA

LR *256* KPA RR *255* KPA

Wind Speed *3.4* m/s

(10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) *21.5* °C

Selected drive configuration *4WD High (w/ locked differential*

Selected Mode: *Default- ESC on*

Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle

$a_{y,30degrees}$ = *0.24* g

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at 0.55g:

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

δ_{sis} = *68.8* degrees (@.55g)

δ_{sis} = *70* degrees (rounded)

Steering Wheel Angle at Corrected 0.3g Lateral Acceleration:

Maneuver	Initial Steer Direction	Time Clock (5 min max between runs)	Steering Wheel Angle to nearest 0.1° (degrees)	Data Run	Good/NG
1	Left	*1:20:36 PM*	*-40.1*	*10*	*Good*
2	Left	*1:24:46 PM*	*-42.5*	*11*	*Good*
3	Left	*1:27:48 PM*	*-41.5*	*12*	*Good*
1	Right	*1:30:50 PM*	*39.3*	*13*	*Good*
2	Right	*1:33:51 PM*	*39.1*	*14*	*Good*
3	Right	*1:36:51 PM*	*39.7*	*15*	*Good*

3.0 TEST DATA (CONTD)

Data Sheet 7 (Page 4 of 4)
SLOWLY INCREASING STEER (SIS) MANEUVER

Average Overall Steering Wheel Angle:

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

$\delta_{0.3\ g,\ overall}$ = *40.4* degrees

[to nearest 0.1 degree]

Remarks:

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/28/2010*
APPROVED BY: *J Lenkeit* DATE APPROVED: *5/4/2010*

3.0 TEST DATA (CONTD)

Data Sheet 8 (Page 1 of 6)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Vehicle: *2010 Dodge Ram 1500 Truck 2WD Configuration*

NHTSA No. *CA0306* Data sheet completion date: *4/26/2010*

Tire conditioning completed	[X] Yes	[ ] No
ESC system is enabled	[X] Yes	[ ] No
On track calibration checks have been completed	[X] Yes	[ ] No
On track static data file for each sensor obtained	[X] Yes	[ ] No

Selected Drive Configuration: *2WD*

Selected Mode: *Default- ESC on*

Overall steering wheel angle ($\delta_{0.3\ g,\ overall}$) *40.6* degrees

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

Maneuver #	Clock Time (1.5 – 5.0 min max between runs)	Commanded Steering Wheel Angle[1]		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [≤ 35%]		YRR at 1.75 sec after COS [≤ 20%]	
		Scalar (* $\delta_{0.3\ g}$)	Angle (degrees)	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
25	*14:36*	*1.5*	*61*	*12.28*	*-0.14*	*-0.14*	*-1.14*	*PASS*	*-1.18*	*PASS*
26	*14:39*	*2.0*	*81*	*16.10*	*-0.12*	*-0.15*	*-0.74*	*PASS*	*-0.93*	*PASS*
27	*14:42*	*2.5*	*102*	*20.17*	*-0.33*	*-0.32*	*-1.63*	*PASS*	*-1.57*	*PASS*
28	*14:45*	*3.0*	*122*	*23.50*	*-0.35*	*-0.29*	*-1.49*	*PASS*	*-1.22*	*PASS*
29	*14:48*	*3.5*	*142*	*27.42*	*-0.25*	*-0.15*	*-0.92*	*PASS*	*-0.54*	*PASS*
30	*14:51*	*4.0*	*162*	*31.23*	*-0.32*	*-0.29*	*-1.02*	*PASS*	*-0.94*	*PASS*
31	*14:54*	*4.5*	*183*	*34.52*	*0.17*	*-0.28*	*0.49*	*PASS*	*-0.82*	*PASS*
32	*14:57*	*5.0*	*203*	*37.91*	*0.51*	*-0.18*	*1.34*	*PASS*	*-0.49*	*PASS*
33	*14:59*	*5.5*	*223*	*39.67*	*-0.29*	*-0.17*	*-0.72*	*PASS*	*-0.42*	*PASS*
34	*15:02*	*6.0*	*244*	*41.03*	*0.4*	*-0.4*	*0.97*	*PASS*	*-0.98*	*PASS*
35	*15:05*	*6.5*	*264*	*41.71*	*0.72*	*-0.25*	*1.73*	*PASS*	*-0.61*	*PASS*
36	*15:08*	*-*	*270*	*42.58*	*0.01*	*-0.13*	*0.02*	*PASS*	*-0.30*	*PASS*

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

3.0 TEST DATA (CONTD)

DATA SHEET 8 (2 of 6)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

LATERAL STABILITY TEST SERIES NO. 2 – Clockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5.0 min max between runs)	Commanded Steering Wheel Angle[1]		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [< 35%]		YRR at 1.75 sec after COS [< 20%]	
		Scalar (* $\delta_{0.3\ g}$)	Angle (degrees)	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
37	*15:12*	*1.5*	*61*	*-12.88*	*-0.02*	*0.14*	*0.15*	*PASS*	*-1.07*	*37*
38	*15:15*	*2.0*	*81*	*-16.96*	*0.40*	*0.34*	*-2.36*	*PASS*	*-2.0*	*38*
39	*15:19*	*2.5*	*102*	*-21.16*	*0.25*	*0.16*	*-1.18*	*PASS*	*-0.75*	*39*
40	*15:21*	*3.0*	*122*	*-24.88*	*0.21*	*0.24*	*-0.86*	*PASS*	*-0.95*	*40*
41	*15:24*	*3.5*	*142*	*-29.25*	*0.09*	*0.01*	*-0.30*	*PASS*	*-0.02*	*41*
42	*15:27*	*4.0*	*162*	*-33.03*	*0.24*	*0.04*	*-0.73*	*PASS*	*-0.11*	*42*
44	*15:32*	*4.5*	*183*	*-35.61*	*0.15*	*0.17*	*-0.42*	*PASS*	*-0.47*	*44*
45	*15:35*	*5.0*	*203*	*-38.82*	*0.10*	*0.09*	*-0.25*	*PASS*	*-0.23*	*45*
46	*15:38*	*5.5*	*223*	*-41.3*	*0.00*	*-0.03*	*0.00*	*PASS*	*0.07*	*46*
48	*15:45*	*6.0*	*244*	*-40.64*	*0.11*	*0.11*	*-0.27*	*PASS*	*-0.27*	*48*
49	*15:48*	*6.5*	*264*	*-42.18*	*0.06*	*0.11*	*-0.15*	*PASS*	*-0.25*	*49*
50	*15:51*	*-*	*270*	*-42.39*	*0.10*	*0.11*	*-0.23*	*PASS*	*-0.25*	*50*

1. Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5*\delta_{0.3\ g,\ overall}$ or 270 degrees is utilized, whichever is greater provided the calculated $6.5*\delta_{0.3\ g,\ overall}$ is less than or equal to 300 degrees. If $6.5*\delta_{0.3\ g,\ overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5*\delta_{0.3\ g,\ overall}$ 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 debeading	[ ] 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 (CONTD)

DATA SHEET 8 (3 of 6)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Responsiveness – Lateral Displacement

Maneuver #	Initial Steer Direction	Commanded Steering Wheel Angle (5.0*$\delta_{0.3\ g,\ overall}$ or greater)		Calculated Lateral Displacement[1]	
		Scalar *$\delta_{0.3\ g}$	Angle (degrees)	Distance (m)	Pass/Fail
32	*Counter Clockwise*	*5.0*	*203*	*-2.8*	*PASS*
33	*Counter Clockwise*	*5.5*	*223*	*-2.7*	*PASS*
34	*Counter Clockwise*	*6.0*	*244*	*-2.9*	*PASS*
35	*Counter Clockwise*	*6.5*	*264*	*-2.8*	*PASS*
36	*Counter Clockwise*	-	*270*	*-2.8*	*PASS*
45	*Clockwise*	*5.0*	*203*	*2.6*	*PASS*
46	*Clockwise*	*5.5*	*223*	*2.6*	*PASS*
48	*Clockwise*	*6.0*	*244*	*2.6*	*PASS*
49	*Clockwise*	*6.5*	*264*	*2.7*	*PASS*
50	*Clockwise*	-	*270*	*2.7*	*PASS*

1. Lateral displacement should be $\geq$ 1.83 m (6 ft) for vehicle with a GVWR of 3,500 kg (7,716 lb) or less; and $\geq$ 1.52 m (5 ft) for vehicles with GVWR greater than 3,500 kg (7,716 lb).

DATA INDICATES COMPLIANCE: ☑ PASS ☐ FAIL

Remarks:

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/26/2010*

APPROVED BY: *J Lenkeit* DATE APPROVED: *5/4/2010*

3.0 TEST DATA (CONTD)

Data Sheet 8 (Page 4 of 6)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Vehicle: *2010 Dodge Ram 1500 Truck 4WD High Configuration*

NHTSA No. *CA0306* Data sheet completion date: *4/28/2010*

Tire conditioning completed	[X] Yes	[ ] No
ESC system is enabled	[X] Yes	[ ] No
On track calibration checks have been completed	[X] Yes	[ ] No
On track static data file for each sensor obtained	[X] Yes	[ ] No

Selected Drive Configuration: *4WD High Locked*

Selected Mode: *Default- ESC on*

Overall steering wheel angle ($\delta_{0.3\ g,\ overall}$) *40.4* degrees

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

Maneuver #	Clock Time (1.5 – 5.0 min max between runs)	Commanded Steering Wheel Angle[1]		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [≤ 35%]		YRR at 1.75 sec after COS [≤ 20%]	
		Scalar (* $\delta_{0.3\ g}$)	Angle (degrees)	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
22	*2:11 PM*	*1.5*	*61*	*12.24*	*-0.22*	*-0.11*	*-1.82*	*Pass*	*-0.92*	*Pass*
23	*2:13 PM*	*2.0*	*81*	*15.21*	*-0.12*	*-0.18*	*-0.76*	*Pass*	*-1.19*	*Pass*
24	*2:17 PM*	*2.5*	*101*	*19.03*	*-0.21*	*-0.02*	*-1.09*	*Pass*	*-0.11*	*Pass*
26	*2:21 PM*	*3.0*	*121*	*21.82*	*-0.04*	*0.04*	*-0.17*	*Pass*	*0.19*	*Pass*
28	*2:25 PM*	*3.5*	*141*	*25.52*	*-0.10*	*-0.04*	*-0.41*	*Pass*	*-0.14*	*Pass*
29	*2:30 PM*	*4.0*	*162*	*29.26*	*-0.27*	*-0.12*	*-0.91*	*Pass*	*-0.41*	*Pass*
30	*2:34 PM*	*4.5*	*182*	*32.61*	*-0.20*	*-0.04*	*-0.60*	*Pass*	*-0.13*	*Pass*
31	*2:39 PM*	*5.0*	*202*	*35.24*	*-0.39*	*-0.30*	*-1.12*	*Pass*	*-0.84*	*Pass*
32	*2:44 PM*	*5.5*	*222*	*37.54*	*-0.41*	*-0.19*	*-1.08*	*Pass*	*-0.51*	*Pass*
33	*2:46 PM*	*6.0*	*242*	*38.49*	*-0.47*	*-0.26*	*-1.23*	*Pass*	*-0.67*	*Pass*
34	*2:50 PM*	*6.5*	*263*	*38.90*	*-0.16*	*-0.08*	*-0.42*	*Pass*	*-0.21*	*Pass*
35	*2:55 PM*	*-*	*270*	*41.42*	*0.74*	*-0.20*	*1.79*	*Pass*	*-0.49*	*Pass*

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

3.0 TEST DATA (CONTD)

DATA SHEET 8 (5 of 6)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

LATERAL STABILITY TEST SERIES NO. 2 – Clockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5.0 min max between runs)	Commanded Steering Wheel Angle[1]		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [< 35%]		YRR at 1.75 sec after COS [< 20%]	
		Scalar (* $\delta_{0.3\ g}$)	Angle (degrees)	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
36	*2:57 PM*	*1.5*	*61*	*-12.05*	*0.19*	*0.09*	*-1.55*	*Pass*	*-0.72*	*Pass*
37	*3:02 PM*	*2.0*	*81*	*-16.06*	*0.01*	*0.11*	*-0.03*	*Pass*	*-0.70*	*Pass*
38	*3:06 PM*	*2.5*	*101*	*-20.15*	*0.09*	*0.13*	*-0.44*	*Pass*	*-0.64*	*Pass*
39	*3:08 PM*	*3.0*	*121*	*-23.16*	*0.31*	*0.30*	*-1.32*	*Pass*	*-1.29*	*Pass*
40	*3:12 PM*	*3.5*	*141*	*-27.25*	*0.03*	*0.13*	*-0.10*	*Pass*	*-0.47*	*Pass*
41	*3:14 PM*	*4.0*	*162*	*-30.52*	*0.16*	*-0.08*	*-0.52*	*Pass*	*0.25*	*Pass*
42	*3:18 PM*	*4.5*	*182*	*-33.83*	*0.21*	*0.00*	*-0.63*	*Pass*	*-0.01*	*Pass*
43	*3:23 PM*	*5.0*	*202*	*-36.09*	*0.26*	*0.06*	*-0.71*	*Pass*	*-0.18*	*Pass*
44	*3:26 PM*	*5.5*	*222*	*-38.20*	*0.21*	*0.14*	*-0.54*	*Pass*	*-0.38*	*Pass*
45	*3:29 PM*	*6.0*	*242*	*-38.98*	*0.25*	*0.17*	*-0.65*	*Pass*	*-0.44*	*Pass*
46	*3:34 PM*	*6.5*	*263*	*-41.65*	*0.45*	*0.26*	*-1.07*	*Pass*	*-0.63*	*Pass*
47	*3:38 PM*	*7.0*	*270*	*-43.27*	*0.24*	*0.00*	*-0.56*	*Pass*	*0.01*	*Pass*

1. Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5*\delta_{0.3\ g,\ overall}$ or 270 degrees is utilized, whichever is greater provided the calculated $6.5*\delta_{0.3\ g,\ overall}$ is less than or equal to 300 degrees. If $6.5*\delta_{0.3\ g,\ overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5*\delta_{0.3\ g,\ overall}$ 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	☒ No
Tire debeading	☐ Yes	☒ No
Loss of pavement contact of vehicle tires	☐ Yes	☒ No
Did the test driver experience any vehicle loss of control or spinout?	☐ Yes	☒ No

If "Yes" explain the event and consult with the COTR.

3.0 TEST DATA (CONTD)

DATA SHEET 8 (6 of 6)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Responsiveness – Lateral Displacement

Maneuver #	Initial Steer Direction	Commanded Steering Wheel Angle (5.0*$\delta_{0.3\ g,\ overall}$ or greater)		Calculated Lateral Displacement[1]	
		Scalar *$\delta_{0.3\ g}$	Angle (degrees)	Distance (m)	Pass/Fail
31	*Counter Clockwise*	*5.0*	*202*	*-2.75*	*NA*
32	*Counter Clockwise*	*5.5*	*222*	*-2.80*	*NA*
33	*Counter Clockwise*	*6.0*	*242*	*-2.87*	*NA*
34	*Counter Clockwise*	*6.5*	*263*	*-2.97*	*NA*
35	*Counter Clockwise*	*-*	*270*	*-2.95*	*NA*
43	*Clockwise*	*5.0*	*202*	*2.62*	*NA*
44	*Clockwise*	*5.5*	*222*	*2.62*	*NA*
45	*Clockwise*	*6.0*	*242*	*2.65*	*NA*
46	*Clockwise*	*6.5*	*263*	*2.62*	*NA*
47	*Clockwise*	*-*	*270*	*2.71*	*NA*

1. Lateral displacement should be $\geq$ 1.83 m (6 ft) for vehicle with a GVWR of 3,500 kg (7,716 lb) or less; and $\geq$ 1.52 m (5 ft) for vehicles with GVWR greater than 3,500 kg (7,716 lb).

DATA INDICATES COMPLIANCE: ☑ PASS ☐ FAIL

Remarks: *Lateral displacement requirement is not applicable to 4WD high locked drive configuration.*

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/26/2010*

APPROVED BY: *J Lenkeit* DATE APPROVED: *5/4/2010*

3.0 TEST DATA (CONTD)

Data Sheet 9 (Page 1 of 2)
MALFUNCTION WARNING TESTS

Vehicle: *2010 Dodge Ram 1500 Truck*

NHTSA No. *CA0306* Data Sheet Completion Date: *4/27/2010*

TEST 1

MALFUNCTION SIMULATION: Describe method of malfunction simulation

Disconnected the "Dynamics Sensor" (which includes the yaw rate and longitudinal and lateral acceleration sensors).

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 and vehicle speed of 48 ± 8 km/h (30 ± 5mph) is reached.

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

TEST 1 DATA INDICATES COMPLIANCE: *PASS*

Remarks: *Two telltales illuminated immediately upon ignition, after the malfunction was caused. One of the telltales says "ESP BAS", in part of the common area (in yellow, near the center of the IP), and the other is the "skidding car symbol" telltale (not part of the common area, on the lower right of the IP). Both telltales extinguished immediately upon ignition after the system was restored. No driving was required.*

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/27/2010*

APPROVED BY: *J Lenkeit* DATE APPROVED *5/4/2010*

3.0 TEST DATA (CONTD)

Data Sheet 9 (Page 2 of 2)
MALFUNCTION WARNING TESTS

Vehicle: *2010 Dodge Ram 1500 Truck*

NHTSA No. *CA0306* Data Sheet Completion Date:

TEST 2

MALFUNCTION SIMULATION: Describe method of malfunction simulation

Disconnected left front wheel speed sensor.

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 and vehicle speed of 48 ± 8 km/h (30 ± 5mph) is reached.

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

TEST 2 DATA INDICATES COMPLIANCE: PASS

Remarks: *Three telltales illuminated immediately upon ignition, after the malfunction was caused. One of the telltales says "ESP BAS", alternating with "SERV 4WD", in part of the common area (in yellow, near the center of the IP). The second is the "skidding car symbol" telltale (not part of the common area, at the lower right of the IP). The third is the yellow ABS telltale (not part of the common area, at the lower left of the IP). All telltales extinguished immediately upon ignition after the system was restored. No driving was required.*

RECORDED BY: *Brian Kebschull* DATE RECORDED: *4/27/2010*

APPROVED BY: *J Lenkeit* DATE APPROVED *5/4/2010*

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION (1 OF 2)

TABLE 1. TEST INSTRUMENTATION

Type	Output	Range	Resolution	Accuracy	Specifics	Serial Number	Calibration
Tire Pressure Gauge	Vehicle Tire Pressure	0-100 psi 0-690 kPa	1 psi 6.89 kPa	0.5 psi 3.45 kPa	Ashcroft D1005PS	1039350	By: DRI Date:2/25/10 Due: 2/25/11
Platform Scales	Vehicle Total, Wheel, and Axle Load	8000 lb 35.6 kN	0.5 lb 2.2 N	±1.0% of applied load	Intercomp Model SWII	24032361	By: American Scale Date: 2/25/10 Due: 2/25/11
Automated Steering Machine with Steering Angle Encoder	Handwheel Angle	±800 deg	0.25 deg	±0.25 deg	Heitz Automotive Testing Model: Sprint 3	60304	By: DRI Date: 2/25/10 Due: 2/25/11
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	0767	By: Systron Donner Date:11/23/09 Due: 11/23/10
Radar Speed Sensor and Dashboard Display	Vehicle Speed	0-125 mph 0-200 km/h	0.009 mph .014 km/h	±0.25% of full scale	A-DAT Corp. Radar Model: DRS-6 Display Model: RD-2	1400.604	By: DRI Date:3/2/10 Due:3/2/11
Ultrasonic Distance Measuring System	Left and Right Side Vehicle Height	5-24 inches 127-610 mm	0.01 inches .254 mm	±0.25% of maximum distance	Massa Products Corporation Model: M-5000/220	DOT-NHTSA D2646	By: DRI Date:2/26/10 Due: 2/26/11
						DOT-NHTSA D3272	By: DRI Date:2/26/10 Due: 2/26/11

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION (2 OF 2)

TABLE 1. TEST INSTRUMENTATION (CONTD)

Type	Output	Range	Resolution	Accuracy	Specifics	Serial Number	Calibration
Data Acquisition System [Includes amplification, anti-aliasing, and analog to digital conversion.]	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	SoMat eDaq ECPU processor	MSHLB.03-2476	By: DRI Date:2/9/10 Due: 2/9/11
					SoMat High level Board EHLS	MSHLS.03-3182	By: DRI Date: 2/9/10 Due: 2/9/11
Load Cell	Vehicle Brake Pedal Force	0-300 lb 0-1.33 kN	1 lb 4.44 N	±0.05% of full scale	Lebow 3663-300	767	Confirmed by DRI prior to test
Coordinate Measurement Machine	Inertial Sensing System Coordinates	0-8 ft 0-2.4 m	±.0020 in. ±.051 mm	±.0020 in. ±.051 mm (Single point articulation accuracy)	Faro Arm Fusion	UO8-05-08-06636	By: Faro Date: 8/18/09 Due: 8/18/10
Outriggers	No output. Safety Item.	N/A	N/A	N/A	DRI manufactured Aluminum meeting the weight and MOI specifications of Docket 2007-27662-11	N/A	N/A

5.0 PHOTOGRAPHS (1 of 14)

Figure 5.1. Front View of Test Vehicle

5.0 PHOTOGRAPHS (2 of 14)

Figure 5.2. Rear View of Test Vehicle

5.0 PHOTOGRAPHS (3 of 14)

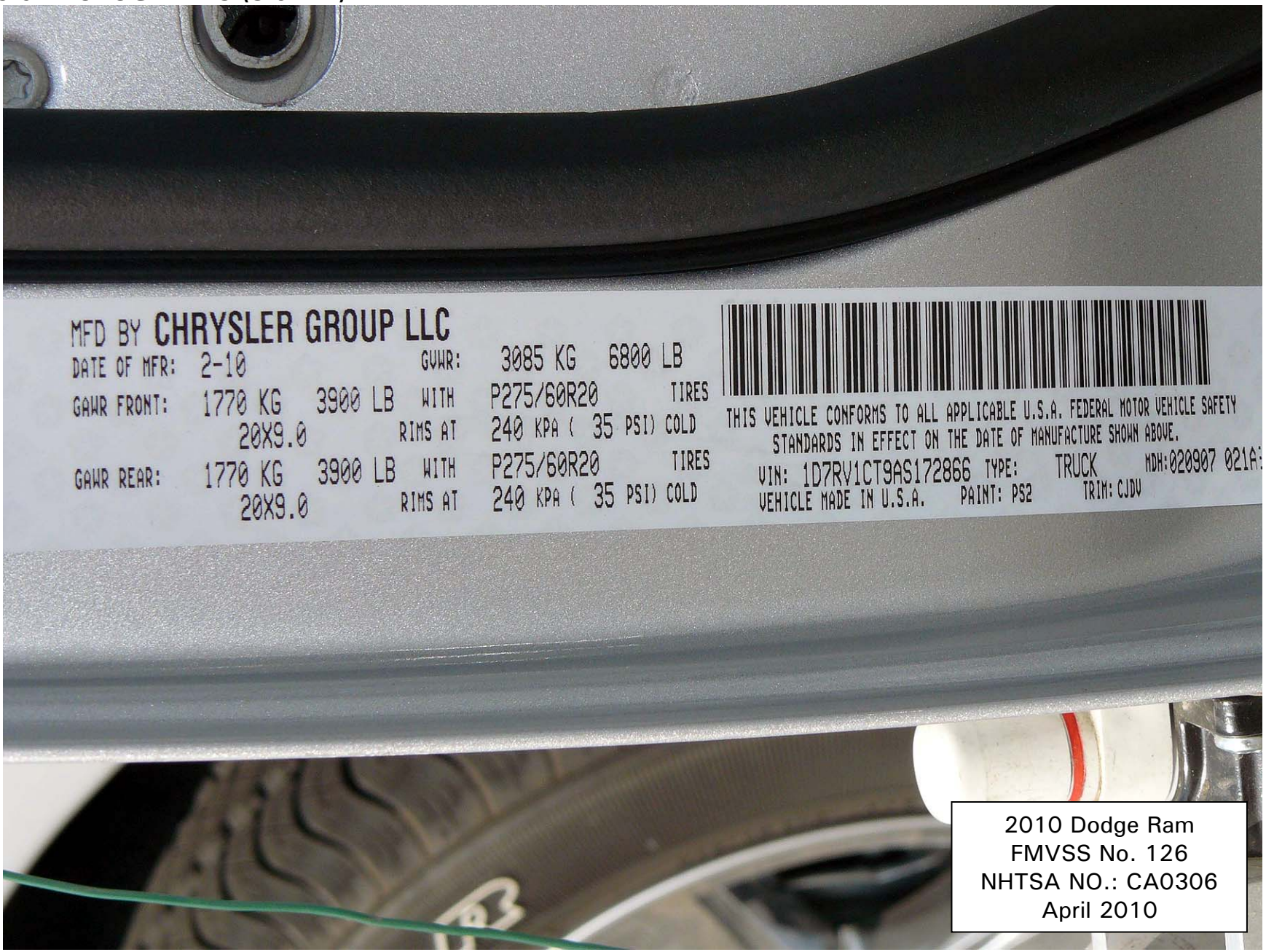


Figure 5.3. Vehicle Certification Label

5.0 PHOTOGRAPHS (4 of 14)

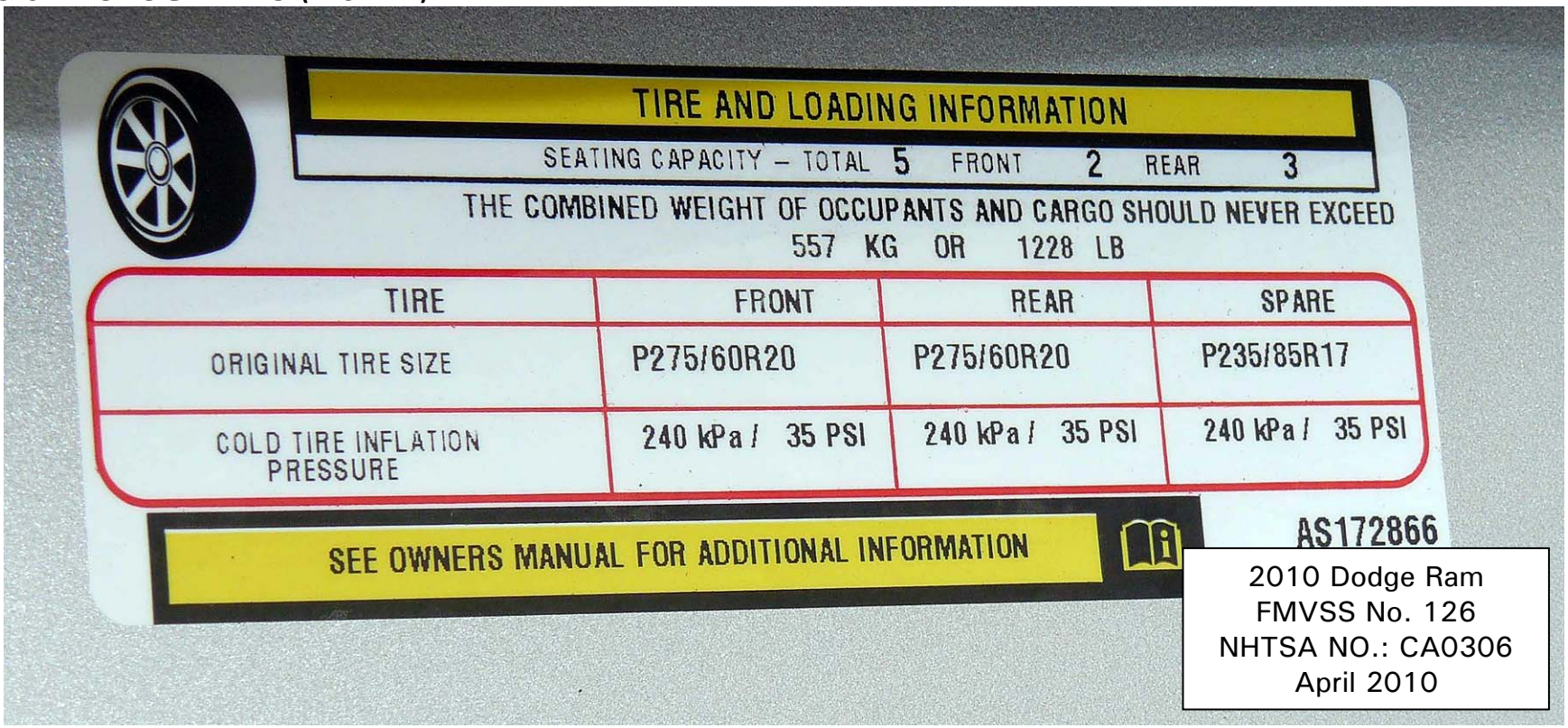


Figure 5.4. Vehicle Placard

5.0 PHOTOGRAPHS (5 of 14)

2010 MODEL YEAR

RAM 1500 SLT CREW CAB 4X4

DODGE

THIS VEHICLE IS MANUFACTURED TO MEET SPECIFIC UNITED STATES REQUIREMENTS. THIS VEHICLE IS NOT MANUFACTURED FOR SALE OR REGISTRATION OUTSIDE OF THE UNITED STATES.

MANUFACTURER'S SUGGESTED RETAIL PRICE OF THIS MODEL INCLUDING DEALER PREPARATION

Base Price: $34,240

DODGE RAM 1500 SLT CREW CAB 4X4
Exterior Color: Bright Silver Metallic Clear Coat Exterior Paint
Interior Color: Dark Slate Gray Interior Color
Interior: Leather-Trimmed Bucket Seats
Power 10-Way Driver / 6-Way Passenger Seats
Heated Steering Wheel
Engine: 5.7-Liter V8 HEMI MDS VVT Engine
Transmission: 5-Speed Automatic 545RFE Transmission

STANDARD EQUIPMENT (UNLESS REPLACED BY OPTIONAL EQUIPMENT)
FUNCTIONAL/SAFETY FEATURES
26-Gallon Fuel Tank
Advanced Multistage Front Airbags
Supplemental Side-Curtain Front and Rear Airbags
Tire Pressure Monitoring Display
Electronic Stability Control
Antilock 4-Wheel-Disc Brakes
Electric Shift-on-the-Fly Part Time Transfer Case
205MM Heavy Duty Front Axle
3.55 Rear Axle Ratio
Heavy Duty Engine Cooling
Heavy Duty Transmission Oil Cooler
Speed Control
Remote Keyless Entry
Sentry Key Theft Deterrent System
Power Locks
Power Accessory Delay
Variable Intermittent Windshield Wipers
Locking Tailgate
INTERIOR FEATURES
Air Conditioning
Media Center 130 CD/MP3 Radio
SIRIUS Satellite Radio
1-Year SIRIUS Radio Service

OPTIONAL EQUIPMENT
Leather-Trimmed Bucket Seats — $1,875
Power 10-Way Driver / 6-Way Passenger Seats
Heated Steering Wheel
Ventilated Front Seats
Heated Front Seats
Customer Preferred Package 26L — $2,925
Auto-Dimming Exterior Mirrors
Body-Color Door Handles
Bright / Bright Grille
Power Lumbar Adjust
Rear 60 / 40 Split-Folding Seat
115-Volt Auxiliary Power Outlet
Leather-Wrapped Steering Wheel
Steering Wheel Mounted Audio Controls
Body-Color Exterior Mirrors
Dual Rear Exhaust
Rear View Auto-Dim Mirror
Overhead Console with Universal Garage Door Opener
Exterior Mirrors with Supplemental Signals
Exterior Mirrors Courtesy Lamps
Exterior Mirrors with Heating Element
Floor Mounted Automatic Shift Lever
Halogen Quad Headlamps
Highline Door Trim Panel
Power 10-Way Driver Seat
Fold-Away Power Heated Mirrors
Sport Cloth Bucket Seats
P275/60R20 OWL All Season Tires
20-Inch x 9.0-Inch Aluminum Chrome-Clad Wheels
Sun Visors with Illuminated Vanity Mirrors
Fog Lamps
Full-Size Restricted Use Spare Tire
Locking Lug Nuts
Body-Color Rear Bumper with Step Pads
Body-Color Front Fascia
Sport Premium Group — $750
ParkSense Rear Park Assist System
Air Conditioning with Dual Zone Temperature Control
506-Watt Alpine Surround w/ 9 Speakers & Subwoofer
5.7-Liter V8 HEMI MDS VVT Engine — $1,310
Electronically Controlled Throttle
32-Gallon Fuel Tank — $75
Media Center 430 CD/DVD/HDD Radio — $800
30 GB Hard Drive with 6,700 Song Capacity
6.5-Inch Touch Screen Display
iPod Control
Class IV Receiver Hitch — $335

DESTINATION CHARGE — **$900**

TOTAL PRICE: * $43,210

WARRANTY COVERAGE
5-year or 100,000-mile Powertrain Limited Warranty.
3-year or 36,000-mile Basic Limited Warranty.
24-hour towing assistance; certain restrictions apply.
Ask Dealer for a copy of the limited warranties or see your owner's manual for details.

5 YEAR / 100,000 MILE POWERTRAIN WARRANTY

Assembly Point/Port of Entry: WARREN, MICHIGAN, U.S.A.
VIN: 1D7-RV1CT9AS-172866 L4-VON: 0845 0222

SHIPTO: 24099 05
ORANGE COAST CHRYSLER JEEP DODGE
2929 HARBOR BLVD
COSTA MESA CA 92626-3912

SOLDTO: 71 24099
ORANGE COAST CHRYSLER JEEP DODGE
2929 HARBOR BLVD
COSTA MESA CA 92626-3912

THIS LABEL IS ADDED TO THIS VEHICLE TO COMPLY WITH FEDERAL LAW. THE LABEL CANNOT BE REMOVED OR ALTERED PRIOR TO DELIVERY TO THE ULTIMATE PURCHASER.

* STATE AND/OR LOCAL TAXES IF ANY, LICENSE AND TITLE FEES AND DEALER SUPPLIED AND INSTALLED OPTIONS AND ACCESSORIES ARE NOT INCLUDED IN THIS PRICE. DISCOUNT, IF ANY, IS BASED ON PRICE OF OPTIONS IF PURCHASED SEPARATELY.

For more information visit: www.dodge.com
or call 1-800-4ADODGE

Chrysler Group LLC

2010 Dodge Ram
FMVSS No. 126
NHTSA NO.: CA0306
April 2010

EPA Fuel Ec

These estimates reflect new E

CITY MPG
13
Expected range for most drivers **11** to **15** MPG

Estimated Annual Fuel Cost
$2,601
based on 15,000 miles at $2.60 per gallon

18
Expected range for most drivers **15** to **21** MPG

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

Combined Fuel Economy
This vehicle
15
10 — 22
All STANDARD PICKUPS

See the FREE Fuel Economy Guide at dealers or www.fueleconomy.gov

GOVERNMENT SAFETY RATINGS

Frontal Crash — Driver ★★★★★ / Passenger ★★★★★
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 range 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

The safety ratings above are based on Federal Government tests of particular vehicles equipped with certain features and options. The performance of this vehicle may differ.

PARTS CONTENT INFORMATION
FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 76 %
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT:
WARREN, MICHIGAN, U.S.A.
COUNTRY OF ORIGIN:
ENGINE: MEXICO
TRANSMISSION: UNITED STATES

Snow Plow Prep Disclaimer
This vehicle not factory equipped for Snow Plow installation - See dealer for details.

Figure 5.5. Window Sticker (Monroney Label)

5.0 PHOTOGRAPHS (6 of 14)

Figure 5.6. Telltales for ESC Malfunction and ESC Off

5.0 PHOTOGRAPHS (7 of 14)

Figure 5.7. ESC Off Control Switch

5.0 PHOTOGRAPHS (8 of 14)

Figure 5.8. Front View of Vehicle As-Tested

5.0 PHOTOGRAPHS (9 of 14)

Figure 5.9. Rear View of Vehicle As-Tested

Figure 5.10. Ultrasonic Height Sensor Mounted on Left Side of Vehicle for Determining Body Roll Angle

5.0 PHOTOGRAPHS (11 of 14)

Figure 5.11. Rear Outrigger, Mount and Speed Sensor

5.0 PHOTOGRAPHS (12 of 14)

Figure 5.12. Steering Controller and Data Acquisition Computer

5.0 PHOTOGRAPHS (13 of 14)

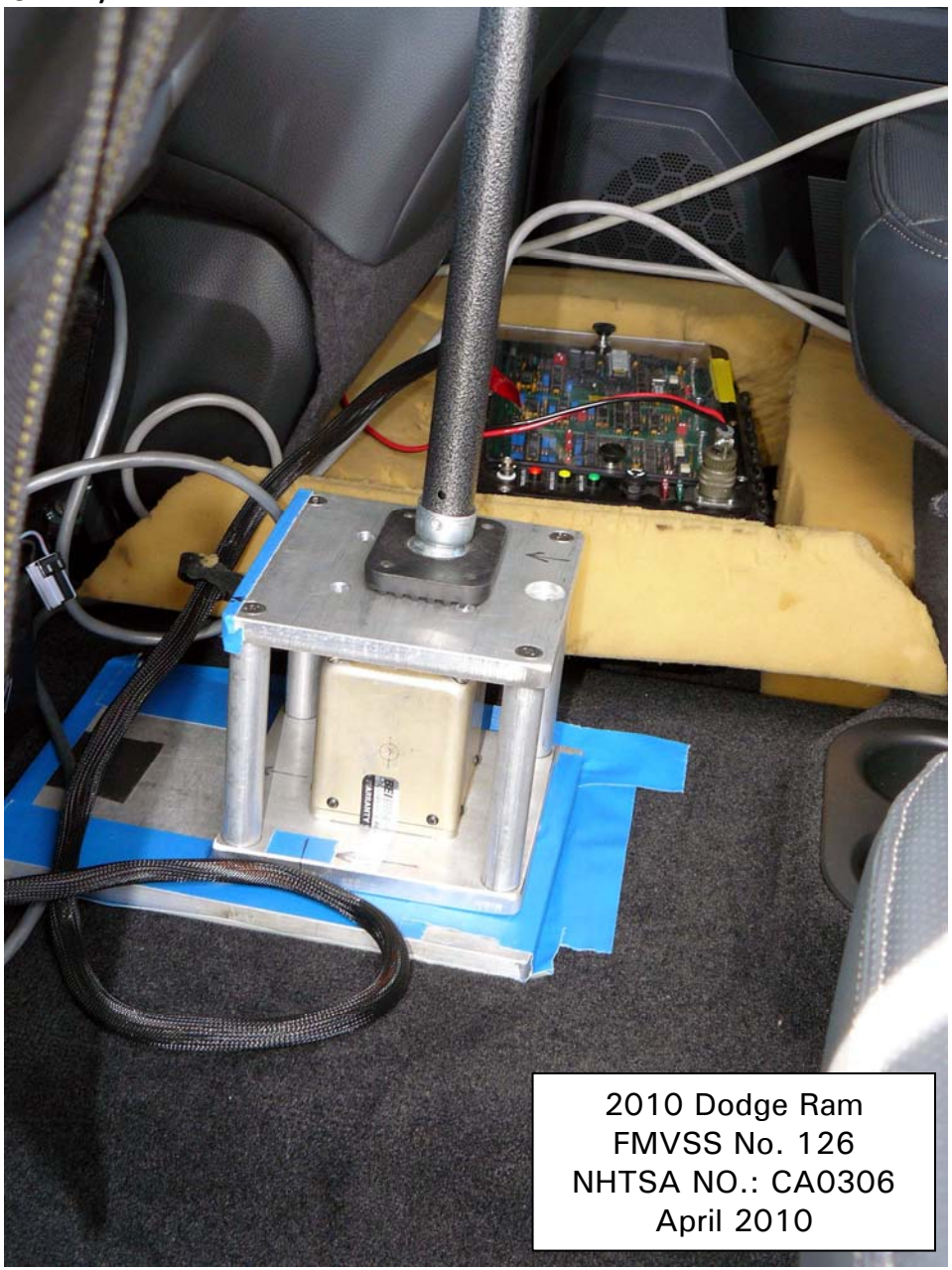


Figure 5.13. Inertial Measurement Unit Mounted in Vehicle

5.0 PHOTOGRAPHS (14 of 14)

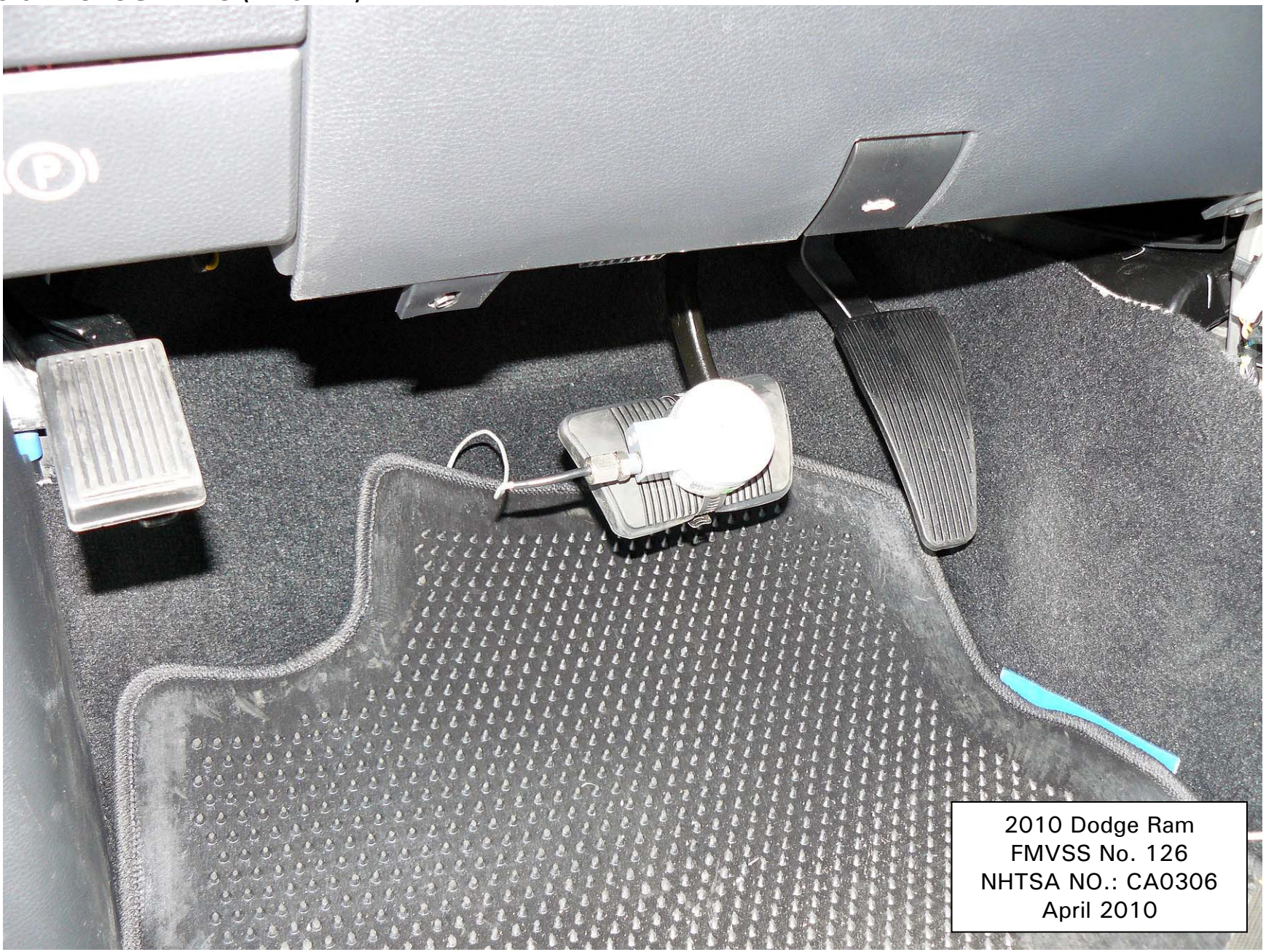


Figure 5.14. Brake Pedal Load Cell

6.0 DATA PLOTS (1 of 8)

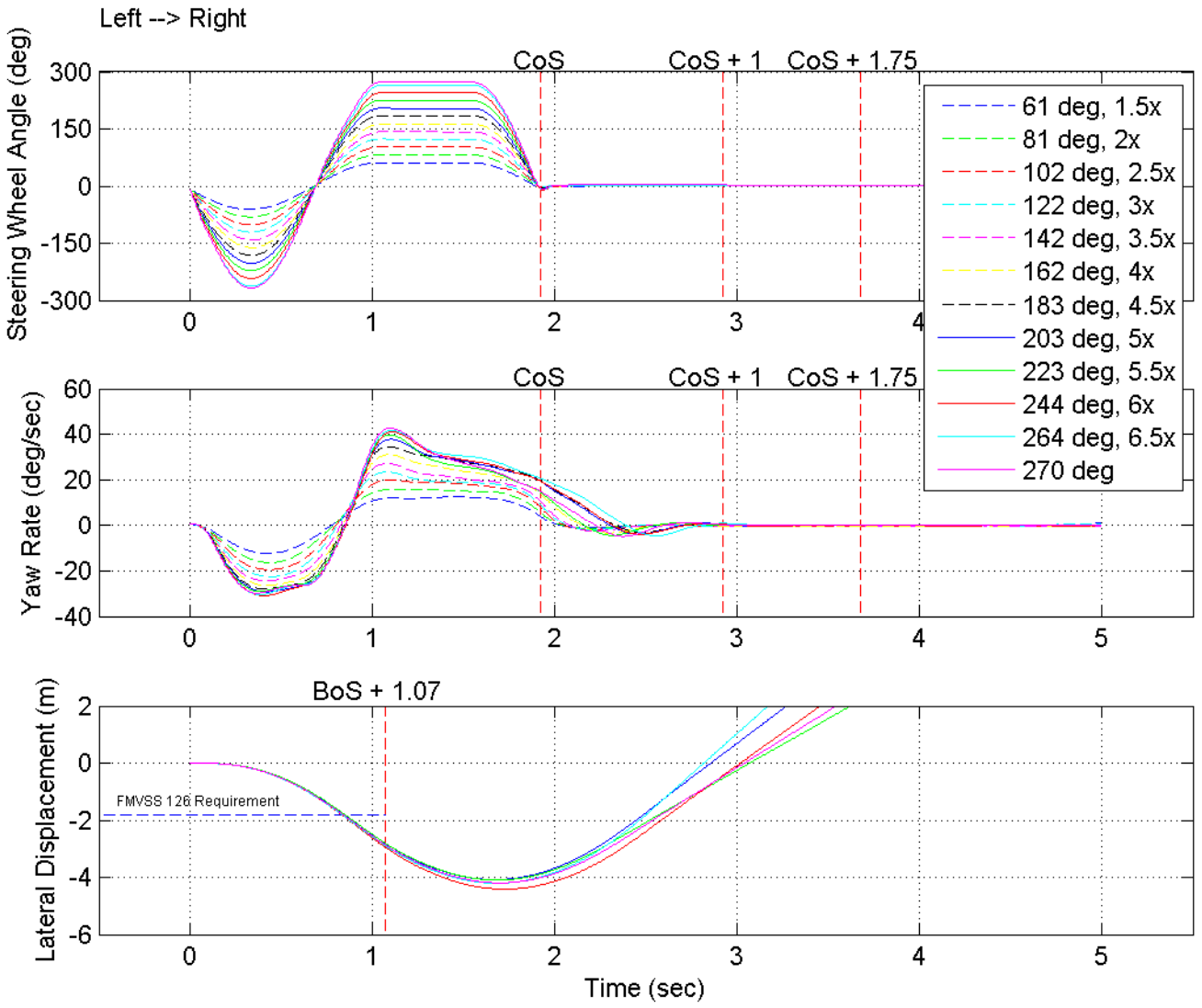


Figure 6.1. Steering Wheel Angle, Yaw Rate and Lateral Displacement for L-R Series, 2WD configuration

6.0 DATA PLOTS (2 of 8)

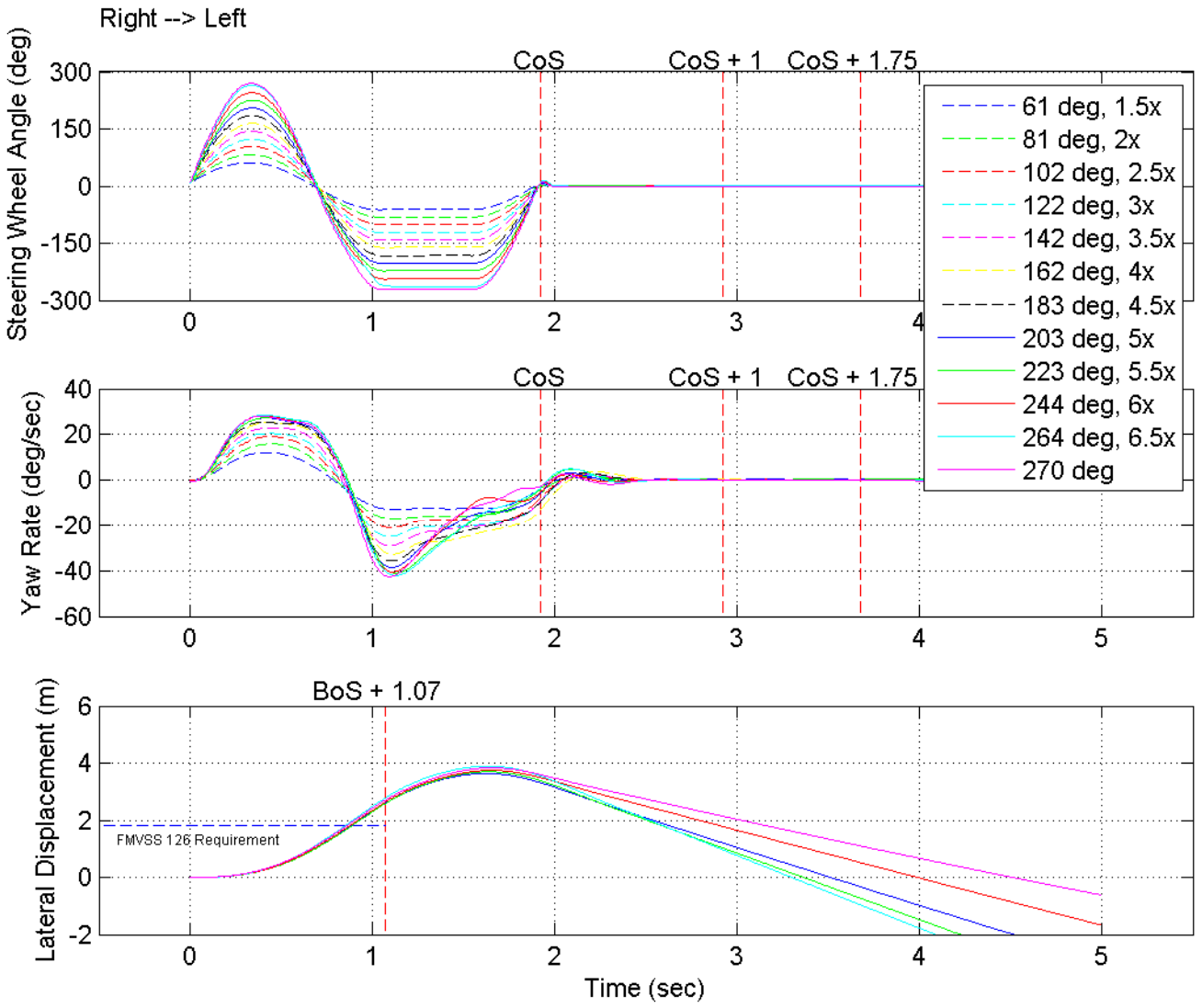


Figure 6.2. Steering Wheel Angle, Yaw Rate and Lateral Displacement for R-L Series, 2WD configuration

6.0 DATA PLOTS (3 of 8)

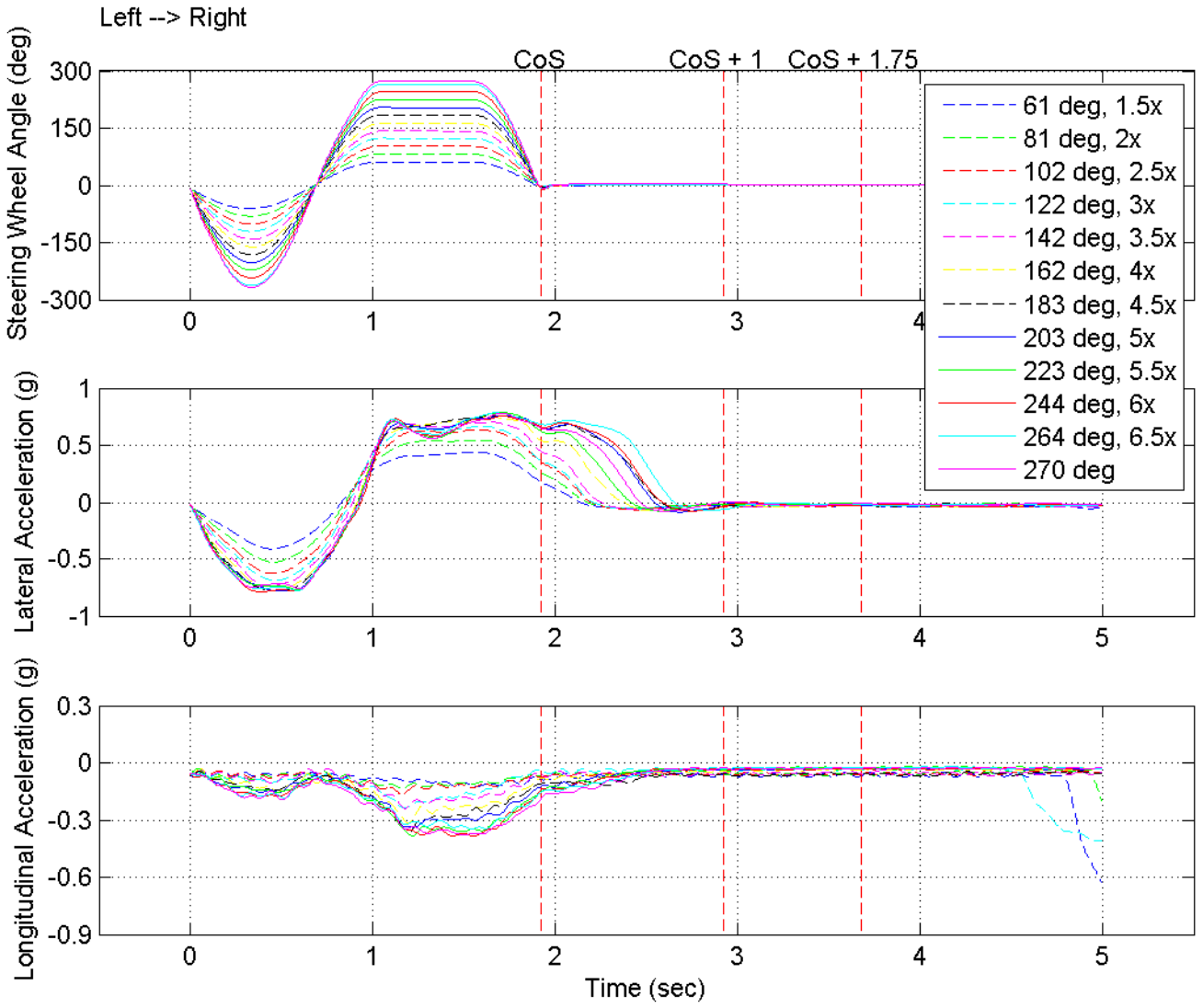


Figure 6.3. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for L-R Series, 2WD configuration

6.0 DATA PLOTS (4 of 8)

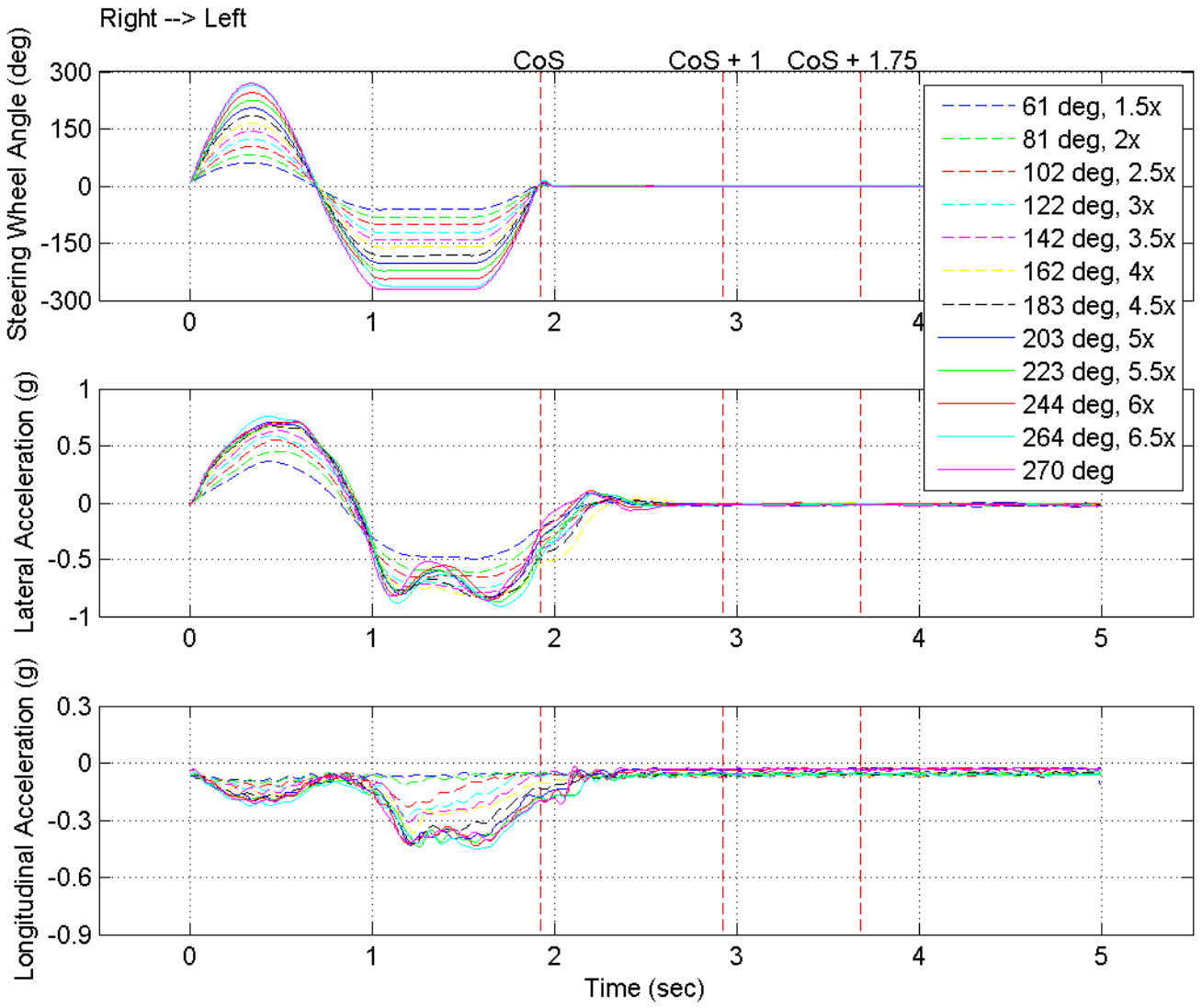


Figure 6.4. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for R-L Series, 2WD configuration

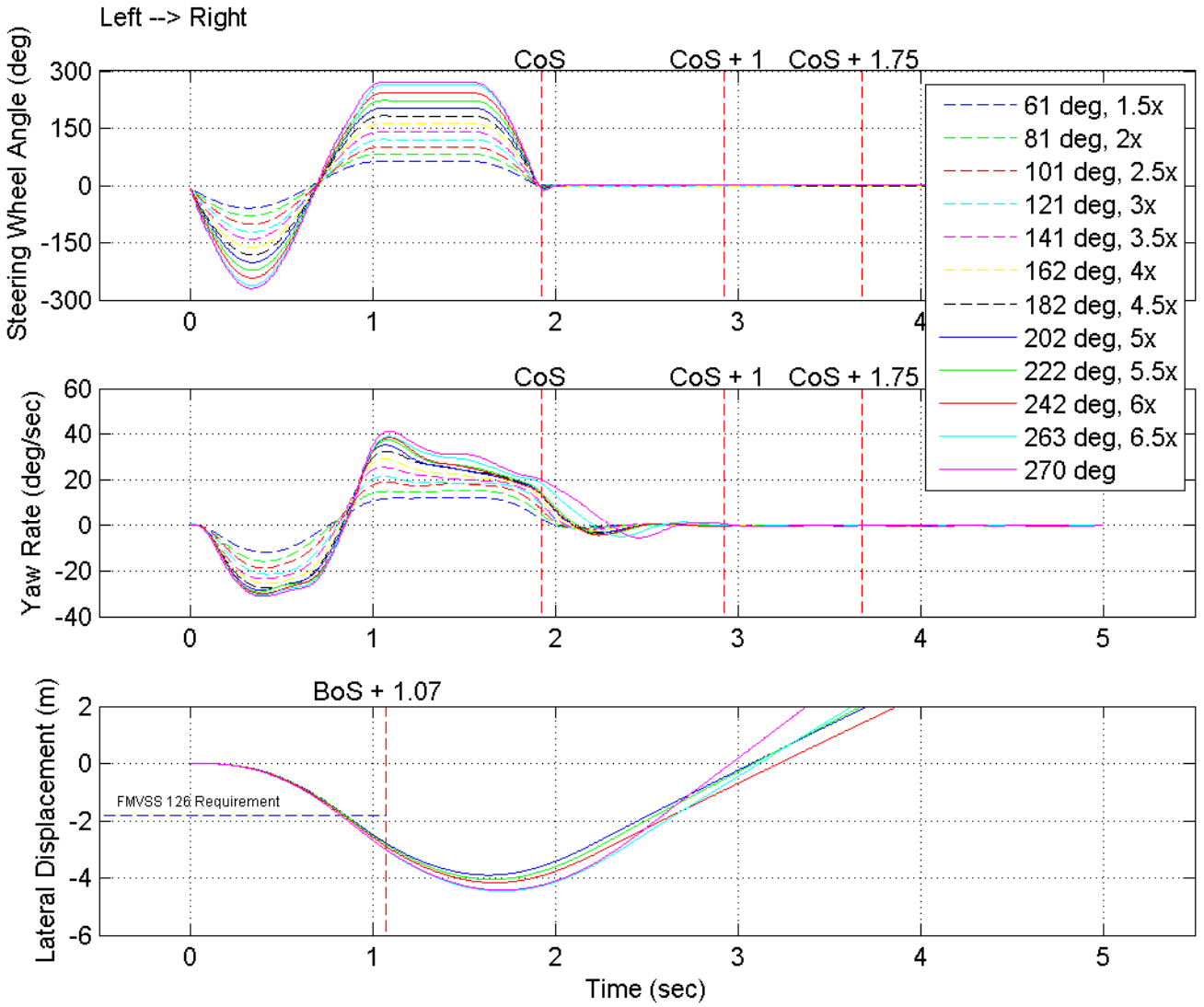


Figure 6.5. Steering Wheel Angle, Yaw Rate and Lateral Displacement for L-R Series, 4WD High Configuration

6.0 DATA PLOTS (6 of 8)

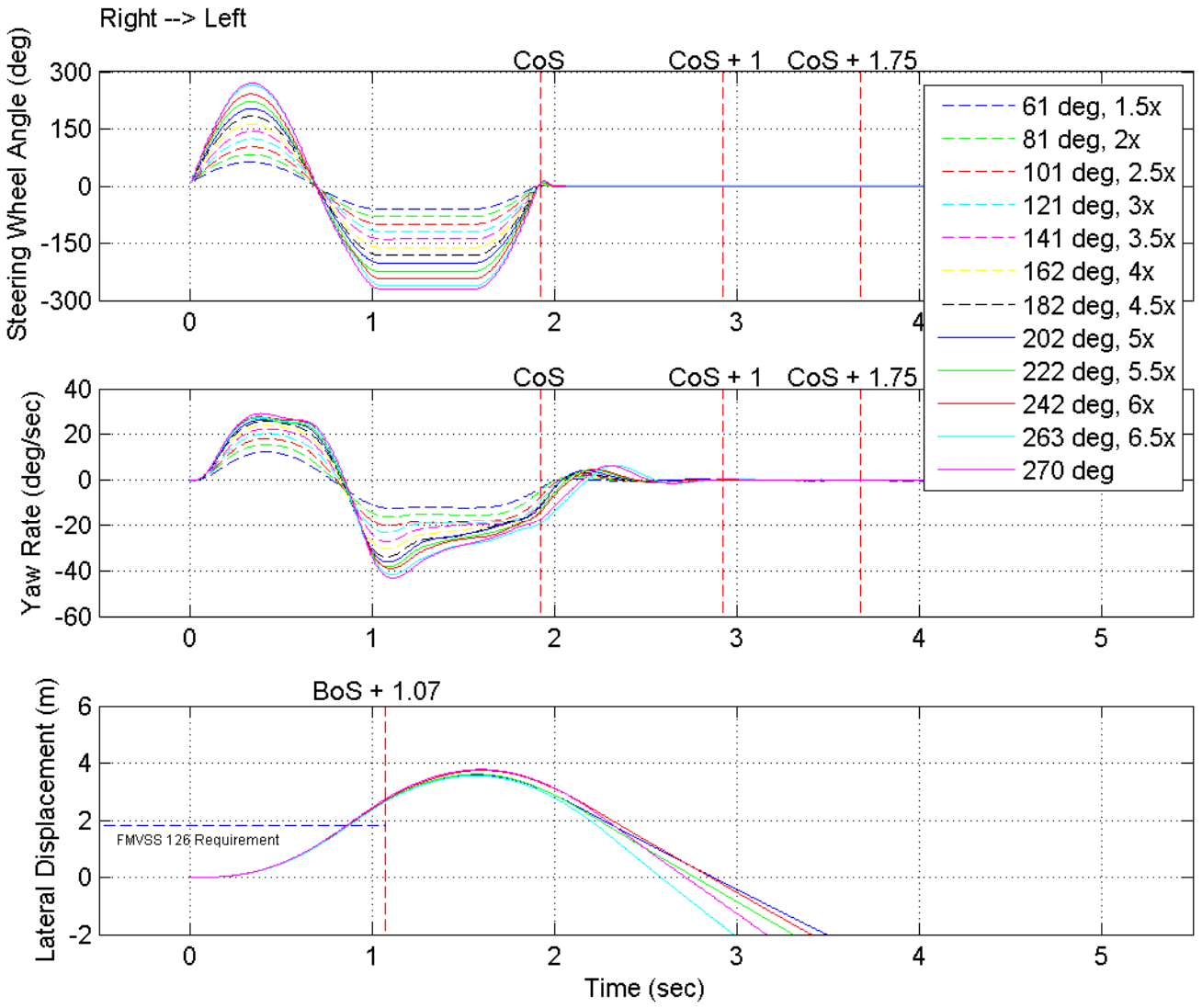


Figure 6.6. Steering Wheel Angle, Yaw Rate and Lateral Displacement for R-L Series, 4WD High Configuration

6.0 DATA PLOTS (7 of 8)

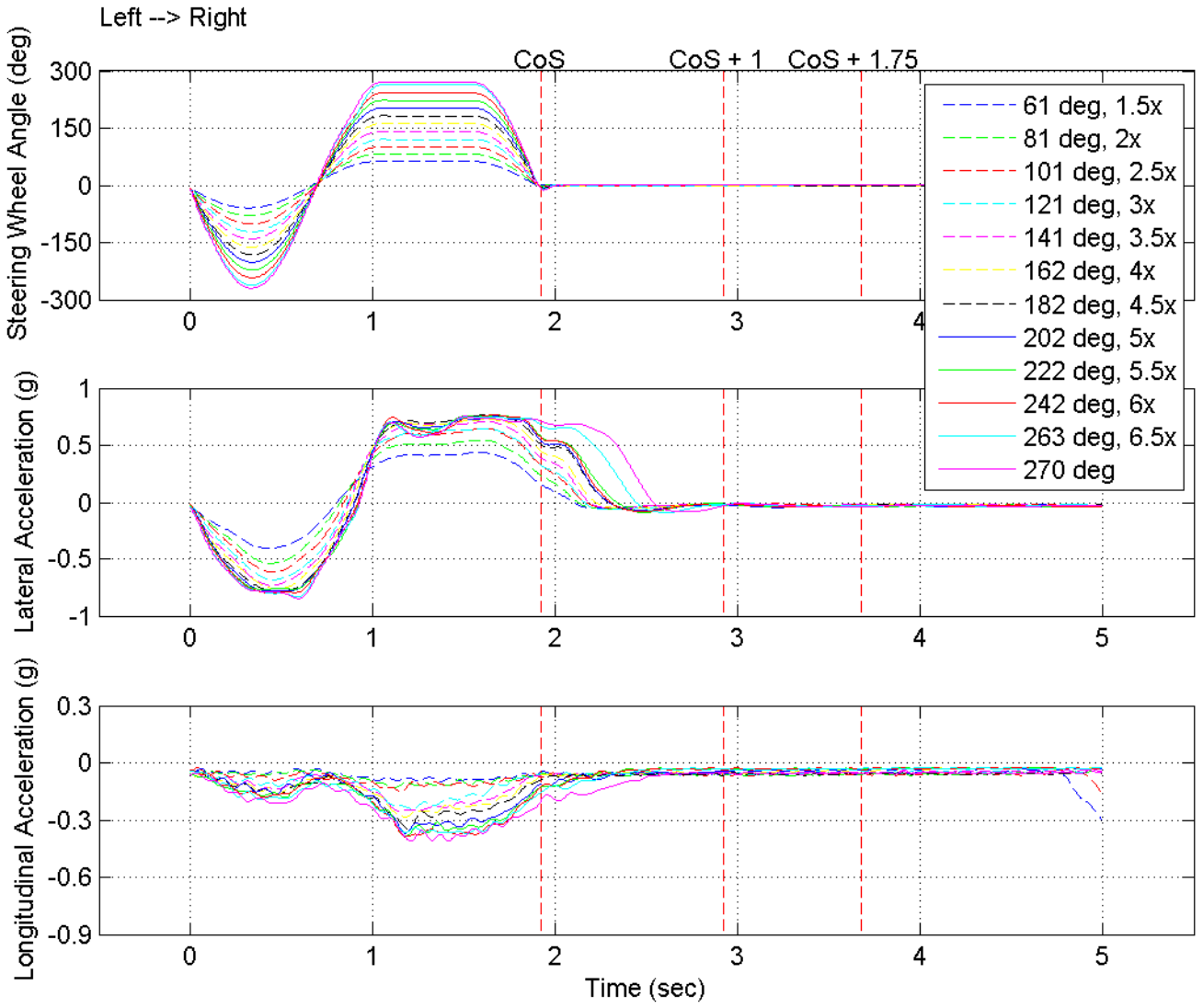


Figure 6.7. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for L-R Series, 4WD High Configuration

6.0 DATA PLOTS (8 of 8)

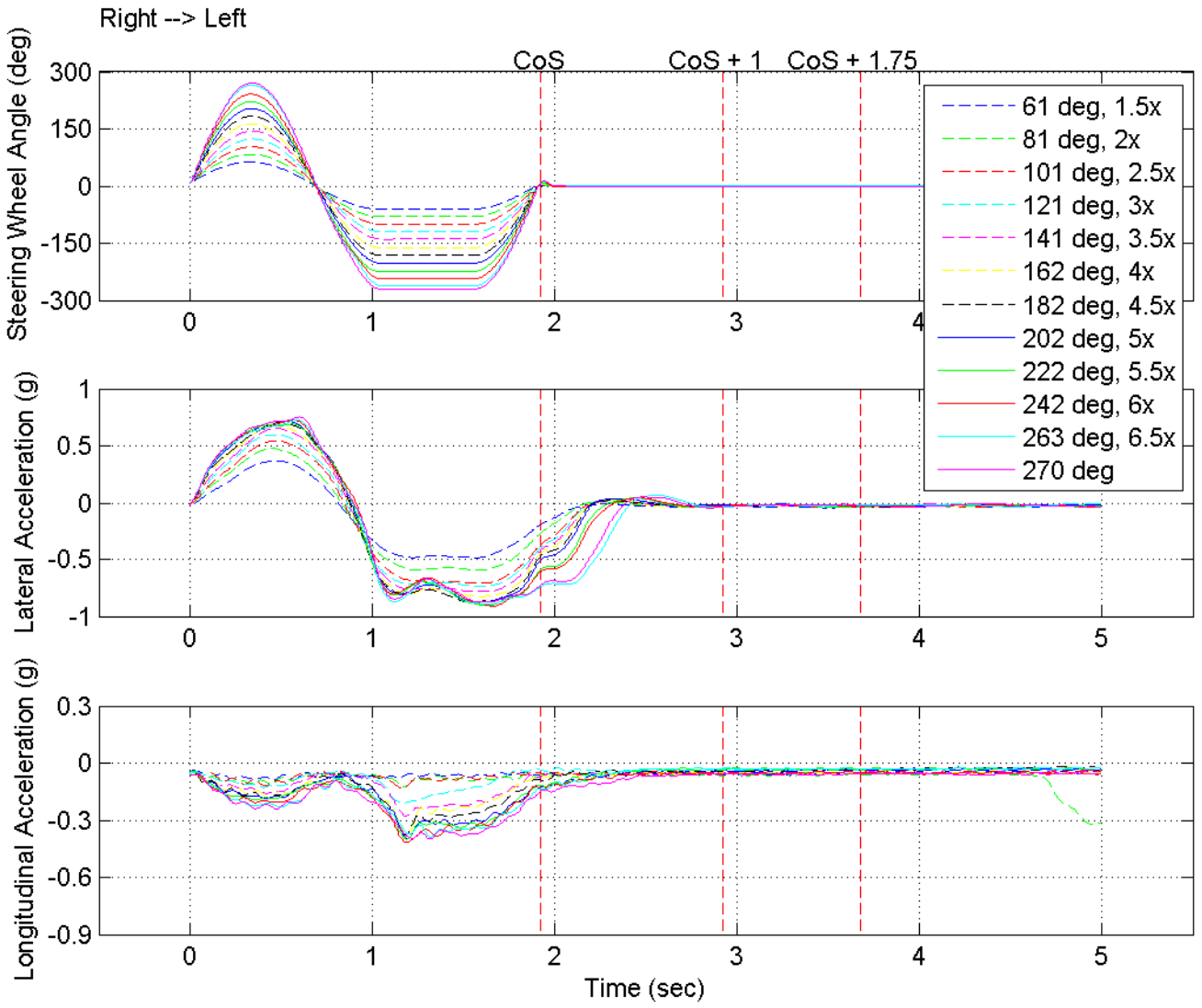


Figure 6.8. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for R-L Series, 4WD High Configuration

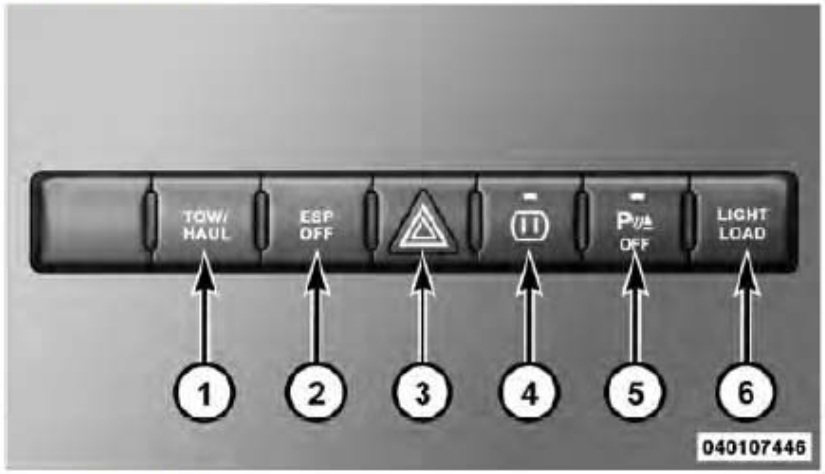
7.0 OTHER DOCUMENTATION

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

SWITCH BANK BUTTON DESCRIPTION

Upper Switch Bank

The upper switch bank is located on the center of the instrument panel.



1. TOW/HAUL
Refer to "Starting And Operating" for more information.

2. ESP OFF
Refer to "Starting And Operating" for more information.

3. HAZARD WARNING FLASHER
Refer to "What To Do In Emergencies" for more information.

4. 115V POWER INVERTER
Refer to "Understanding The Features Of Your Vehicle" for more information.

5. REAR PARK ASSIST
Refer to "Understanding The Features Of Your Vehicle" for more information.

6. TPMS LIGHT LOAD — IF EQUIPPED
Refer to "Starting And Operating" for more information.

Lower Switch Bank

The lower switch bank is located on the center of the instrument panel.

9. 4WD Auto Indicator

4WD AUTO

The 4WD auto indicator will be illuminated whenever the four-wheel drive mode is automatically engaged.

10. SERV (Service) 4WD

SERV 4WD

The SERV 4WD light monitors the electric shift four-wheel drive system. If the SERV 4WD light stays on or comes on during driving, it means that the four-wheel drive system is not functioning properly and that service is required.

For vehicles equipped with a premium cluster this indicator will display in the Electronic Vehicle Information Center (EVIC). Refer to "Electronic Vehicle Information Center (EVIC) — If Equipped" for further information.

11. TOW/HAUL

TOW/ HAUL

The TOW HAUL button is located on the center stack upper switch bank. This light will illuminate when TOW HAUL mode is selected.

12. Electronic Stability Program (ESP) Indicator Light — If Equipped

If this indicator light flashes during acceleration, apply as little throttle as possible. While driving, ease up on the accelerator. Adapt your speed and driving to the prevailing road conditions, and do not switch off the Electronic Stability Program (ESP) or Traction Control System (TCS).

13. Vehicle Security Light — If Equipped

This light will flash at a fast rate for approximately 15 seconds, when the vehicle security alarm is arming, and then will flash slowly until the vehicle is disarmed.

4

cycling operation is controlled by the engine control module. Post-heat operation can run for several minutes, and then the electrical system and voltmeter needle will stabilize.

22. *Cargo Light*

The cargo light will illuminate when the cargo light is activated by pressing the cargo light button on the headlight switch.

23. *Brake Warning Light*

BRAKE

This light monitors various brake functions, including brake fluid level and parking brake application. If the brake light turns on, it may indicate that the parking brake is applied, that the brake fluid level is low, or that there is a problem with the Anti-lock Brake System reservoir.

If the light remains on when the parking brake has been disengaged, and the fluid level is at the full mark on the master cylinder reservoir, it indicates a possible brake hydraulic system malfunction or that a problem with the Brake Booster has been detected by the Anti-Lock Brake System (ABS) / Electronic Stability Program (ESP) system. In this case, the light will remain on until the condition has been corrected. If the problem is related to the brake booster, the ABS pump will run when applying the brake and a brake pedal pulsation may be felt during each stop.

4

The dual brake system provides a reserve braking capacity in the event of a failure to a portion of the hydraulic system. A leak in either half of the dual brake system is indicated by the Brake Warning Light, which will turn on when the brake fluid level in the master cylinder has dropped below a specified level.

The light will remain on until the cause is corrected.

unbuckled, the seat belt reminder light will flash or remain on continuously. Refer to "Occupant Restraints" in "Things To Know Before Starting Your Vehicle" for further information.

32. Charging System Light

This light shows the status of the electrical charging system. The light should come on when the ignition switch is first turned ON and remain on briefly as a bulb check. If the light stays on or comes on while driving, turn off some of the vehicle's non-essential electrical devices or increase engine speed (if at idle). If the charging system light remains on, it means that the vehicle is experiencing a problem with the charging system. Obtain SERVICE IMMEDIATELY. See an authorized dealer.

If jump starting is required, refer to "Jump Starting Procedures" in "What To Do In Emergencies".

For vehicles equipped with a premium cluster this indicator will display in the Electronic Vehicle Information Center (EVIC). Refer to "Electronic Vehicle Information Center (EVIC) — If Equipped" for further information.

33. Electronic Stability Program (ESP) Indicator Light / Brake Assist System (BAS) Warning Light — If Equipped

The malfunction light for the Electronic Stability Program (ESP) is combined with Brake Assist System (BAS). The yellow "ESP/BAS Warning Light" comes on when the ignition switch is turned to the "ON" position. They should go out with the engine running. If the "ESP/BAS Warning Light" comes on continuously with the engine running, a malfunction has been detected in either the ESP or the BAS system. If this light remains on after several ignition cycles, and the vehicle has been driven several miles (kilometers) at speeds greater than 30 mph (48 km/h), see an authorized dealer as soon as possible.

For vehicles equipped with a premium cluster this indicator will display in the Electronic Vehicle Information Center (EVIC). Refer to "Electronic Vehicle Information Center (EVIC) — If Equipped" for further information.

WARNING!

If a warning light remains on the system may not be working and you will not have the benefit of ESP or BAS. Under certain driving conditions, where ESP or BAS would be beneficial, you - if you have not adjusted your driving speeds and stopping in or to account for the lack of the feature, may be in accident.

ELECTRONIC VEHICLE INFORMATION CENTER (EVIC) — IF EQUIPPED

The Electronic Vehicle Information Center (EVIC) features a driver-interactive display that is located in the instrument cluster.

Electronic Vehicle Information Center (EVIC)

NOTE:

- The compass on your vehicle is self-calibrating, eliminating the need to manually calibrate the compass.
- The EVIC main menu will display Radio Off, AM/FM and SAT radio stations, and AUX/HDD sources at the top of the main menu above Fuel Economy.

4

Steering wheel EVIC control button, as it appears on the right side of the steering wheel.

SELECT

Press and release the SELECT button for access to main menus, sub menus or to select a personal setting in the system setup menu.

BACK

Press the BACK button to scroll back to a previous menu or sub menu.

EVIC Displays

When the appropriate conditions exist, the EVIC displays the following messages:

- Left front turn signal lamp out
- Right front turn signal lamp out
- Left rear turn signal lamp out
- Right rear turn signal lamp out
- Service air filter
- Check Tire Pressure
- Perform service
- ESP Off
- Service Tire Pressure System
- Coolant Low
- Check Trailer Brake Wiring
- Service Trailer Brake System
- Trailer Brake Connected
- Trailer Brake Disconnected

4

If the light remains lit with the engine running your vehicle, will usually be drivable, however, see an authorized dealer for service as soon as possible. If the light is flashing when the engine is running, immediate service is required and you may experience reduced performance, an elevated/rough idle or engine stall and your vehicle may require towing.

- *Engine Temperature Warning Light*

This light warns of an overheated engine condition. As temperatures rise and the gauge approaches H, this indicator will illuminate and a single chime will sound after reaching a set threshold. Further overheating will cause the temperature gauge to pass H, the indicator will continuously flash and a continuous chime will occur until the engine is allowed to cool.

If the light turns on while driving, safely pull over and stop the vehicle. If the A/C system is on, turn it off. Also, shift the transmission into NEUTRAL and idle the vehicle. If the temperature reading does not return to normal, turn the engine off immediately and call for service. Refer to "If Your Engine Overheats" in "What To Do In Emergencies" for more information.

- *SERV 4WD*

SERV 4WD

The SERV 4WD light monitors the electric shift 4WD system. If the SERV 4WD light stays on or comes on during driving, it means that the 4WD system is not functioning properly and that service is required.

- *Electronic Stability Program (ESP) Indicator Light / Brake Assist System (BAS) Warning Light*

ESP BAS

The malfunction light for the Electronic Stability Program (ESP) is combined with Brake Assist System (BAS). The yellow ESP/BAS Warning Light comes on when the ignition switch is turned to the ON position. They should go out

with the engine running. If the ESP/BAS Warning Light comes on continuously with the engine running, a malfunction has been detected in either the ESP or the BAS system. If this light remains on after several ignition cycles and the vehicle has been driven several miles at speeds greater than 30 mph (48 km/h), see an authorized dealer as soon as possible.

- *Transmission Temperature Light*

This light indicates that there is excessive transmission fluid temperature that might occur with severe usage such as trailer towing. It may also occur when operating the vehicle in a high torque converter slip condition, such as 4-wheel-drive operation (e.g., snow plowing, off- road operation). If this light comes on, stop the vehicle and run the engine at idle or faster, with the transmission in NEUTRAL until the light goes off.

CAUTION!

Continuous driving with the Transmission Temperature Indicator illuminated will eventually cause severe transmission damage or transmission failure.

WARNING!

In some circumstances a Transmission Temperature Indicator, under continued operation, could cause the fluid to boil over, come in contact with hot engine or exhaust components and cause a fire.

- *Loose Gascap Indicator*

If the vehicle diagnostic system determines that the fuel filler cap is loose, improperly installed, or damaged, a loose gascap indicator will display in the telltale display area. Tighten the fuel filler cap properly and press the SELECT button

WARNING! (Continued)

- The ABS cannot prevent accidents, including those resulting from excessive speed in turns, following another vehicle too closely, or hydroplaning. Only a safe, attentive, and skillful driver can prevent accidents.
- The capabilities of an ABS-equipped vehicle must never be exploited in a reckless or dangerous manner which could jeopardize the user's safety or the safety of others.

ELECTRONIC BRAKE CONTROL SYSTEM

Your vehicle is equipped with an advanced electronic brake control system that includes Anti-Lock Brake System (ABS), Traction Control System (TCS), Brake Assist System (BAS), Hill Start Assist (HSA), Electronic Stability Program (ESP) and Trailer Sway Control (TSC). All of the systems work together to enhance vehicle stability and control in various driving conditions, and are commonly referred to as ESP.

Anti-Lock Brake System (ABS)

The ABS aids the driver in maintaining vehicle control under adverse braking conditions. The system controls hydraulic brake pressure to prevent wheel lockup and help avoid skidding on slippery surfaces during braking. Refer to "Anti-Lock Brake System" in "Starting and Operating" for further information.

NOTE: ABS improves steering control of the vehicle during hard braking maneuvers.

WARNING!

- ABS cannot prevent the natural laws of physics from acting on the vehicle, nor can it increase braking or steering efficiency beyond that afforded by the condition of the vehicle brakes and tires or the traction afforded.
- The ABS cannot prevent accidents, including those resulting from excessive speed in turns, following another vehicle too closely, or hydroplaning. Only a safe, attentive, and skillful driver can prevent accidents.
- The capabilities of an ABS-equipped vehicle must never be exploited in a reckless or dangerous manner which could jeopardize the user's safety or the safety of others.

Traction Control System (TCS) – If Equipped

The TCS monitors the amount of wheel spin of each of the driven wheels. If wheel spin is detected, brake pressure is applied to the slipping wheel(s), and engine power is reduced to provide enhanced acceleration and stability. A feature of the TCS functions similarly to a limited-slip differential and controls the wheel spin across a driven axle. If one wheel on a driven axle is spinning faster than the other, the system will apply the brake of the spinning wheel. This will allow more engine torque to be applied to the wheel that is not spinning. This feature remains active even if TCS and ESP are in the "Partial Off" mode. Refer to "Electronic Stability Program (ESP)" in this section of this manual. This brake pressure modulation transfers drive torque from slipping to non-slipping wheels to provide optimal forward traction.

WARNING! (Continued)

- **HSA is not a parking brake. If you stop the vehicle on a hill without putting the transmission in PARK or using the parking brake, it will roll down the incline and could cause a collision with another vehicle or object. Always remember to use the parking brake while parking on a hill and that the driver is responsible for braking the vehicle.**

HSA Off

Non-EVIC Equipped Vehicles

If you wish to turn off the HSA system, follow this procedure:

1. Start with the engine OFF, and the vehicle in PARK with the wheels straight.
2. Start the engine.
3. With the engine running and the brake applied, rotate the steering wheel 180° counterclockwise from center.
4. Press the ESP OFF switch four times within 20 seconds. The "ESP/TCS Indicator Light" should appear and disappear four times.
5. Rotate the steering wheel 360° clockwise (180° clockwise from center).
6. Cycle the ignition switch OFF then ON.
7. If the sequence was completed properly, the "ESP/TCS Indicator Light" will blink several times to confirm HSA is off.

Steps 1 through 7 must be completed within 90 seconds to turn off HSA. Repeat steps 1 through 7 to re-enable HSA functionality.

EVIC Equipped Vehicles

HSA is a Customer Programmable Feature on a EVIC equipped vehicle. If you wish to turn off the HSA feature, refer to "Customer Programmable Features/Electronic Vehicle Information Center (EVIC)" in "Understanding Your Instrument Panel" for further information.

Electronic Stability Program (ESP) – If Equipped

The ESP system enhances directional control and stability of the vehicle under various driving conditions. ESP corrects for oversteering or understeering of the vehicle by applying the brake of the appropriate wheel to assist in counteracting the oversteer or understeer condition. Engine power may also be reduced to help the vehicle maintain the desired path.

ESP OFF Switch

ESP uses sensors in the vehicle to determine the vehicle path intended by the driver and compares it to the actual path of the vehicle. When the actual path does not match the intended path, ESP applies the brake of the appropriate wheel to assist in counteracting the oversteer or understeer condition.

- Oversteer - when the vehicle is turning more than appropriate for the steering wheel position.
- Understeer - when the vehicle is turning less than appropriate for the steering wheel position.

ESP/TCS Indicator Light

The "ESP/TCS Indicator Light" located in the instrument cluster, starts to flash as soon as the tires lose traction and the ESP system becomes active. The "ESP/TCS Indicator Light" also flashes when TCS is active. If the "ESP/TCS Indicator Light" begins to flash during acceleration, ease up on the accelerator and apply as little throttle as possible. Be sure to adapt your speed and driving to the prevailing road conditions.

WARNING!

- **ESP cannot prevent the natural laws of physics from acting on the vehicle, nor can it increase the traction afforded by prevailing road conditions.**
- **ESP cannot prevent accidents, including those resulting from excessive speed in turns, driving on slippery surfaces or hydroplaning. Only a safe, attentive, and skillful driver can prevent accidents.**
- **The capabilities of an ESP-equipped vehicle must never be exploited in a reckless or dangerous manner which could jeopardize the user's safety or the safety of others.**

5

The ESP system has multiple operating modes depending on vehicle type: Two-Wheel Drive (2WD) or Four-Wheel Drive (4WD). Four-wheel drive vehicles may be equipped with either a four-mode position (2WD/4WD LOCK/4WD LOW/NEUTRAL) or a five-mode position

(2WD/4WD AUTO/4WD LOCK/4WD LOW/ NEUTRAL) transfer case. If you have a four-wheel drive vehicle, and want to determine which transfer case is on your vehicle and how to operate it, refer to "Four-Wheel Drive Operation" in "Starting and Operating" for further information.

All Two-Wheel Drive Vehicles and Four-Wheel Drive Vehicles in 2WD, 4WD AUTO, or 4WD LOCK Modes Can Choose the Following ESP Operating Modes:

ESP On

This is the normal operating mode for ESP in 2WD/4WD AUTO/4WD LOCK modes and in 2WD vehicles. Whenever the vehicle is started or the transfer case (if equipped) is shifted from 4WD LOW or Neutral, back to 4WD LOCK or 4WD AUTO, the ESP system will be in this mode. This mode should be used for almost all driving situations. ESP should only be turned to "Partial Off" or "ESP Off" for specific reasons as noted below.

ESP Partial Off

This mode is entered by momentarily pressing the ESP OFF switch. When in "Partial Off" mode, the TCS portion of ESP, except for the "limited slip" feature described in the TCS section, has been disabled and the "ESP/TCS Indicator Light" will be illuminated. All other stability features of ESP function normally. This mode is intended to be used if the vehicle is in deep snow, sand, or gravel conditions and more wheel spin than ESP would normally allow is required to gain traction. To turn ESP on again, momentarily press the ESP OFF switch. This will restore the normal "ESP On" mode of operation.

NOTE: To improve the vehicle's traction when driving with snow chains or starting off in deep snow, sand or gravel, it may be desirable to switch to the "Partial Off" mode by pressing the ESP OFF switch. Once the situation

requiring ESP to be switched to the "Partial Off" mode is overcome, turn ESP back on by momentarily pressing the ESP OFF switch. This may be done while the vehicle is in motion.

WARNING!

In the "Partial Off" mode, the engine torque reduction and stability features are desensitized. Therefore, the enhanced vehicle stability offered by ESP is unavailable.

All Four-Wheel Drive Vehicles in 4WD AUTO and 4WD LOCK Modes Can Also Choose the Following ESP Operating Mode. This is the Only ESP Operating Mode in 4WD LOW:

Full Off

This mode is intended for off-road use when ESP stability features could inhibit vehicle maneuverability due to trail conditions. This mode is entered by pressing and holding the ESP OFF switch for five seconds when the vehicle is stopped and the engine is running. After five seconds, the "ESP/TCS Indicator Light" will illuminate and the "ESP Off" message will appear in the odometer. Press and release the trip odometer button located on the instrument cluster to clear this message.

NOTE: The "ESP OFF" message will display and the audible chime will sound when the shift lever is placed into the PARK position from any other position and then moved out of the PARK position. This will occur even if the message was previously cleared.

In this mode, ESP and TCS except for the "limited slip" feature described in the TCS section are turned off until the vehicle reaches a speed of 40 mph (64 km/h). At 40 mph (64 km/h) the system returns to "Partial Off" mode, described above. When the vehicle speed drops below 35 mph (56 km/h) the ESP system shuts off. ESP is

off at low vehicle speeds so that it will not interfere with off-road driving but ESP function returns to provide the stability feature at speeds above 40 mph (64 km/h). The "ESP/TCS Indicator Light" will always be illuminated when ESP is off. To turn ESP on again, momentarily press the ESP OFF switch. This will restore the normal "ESP On" mode of operation.

"ESP Off" is the only operating mode for ESP in 4WD LOW. Whenever the vehicle is started in 4WD LOW or the transfer case (if equipped) is shifted from 4WD LOCK or NEUTRAL, to 4WD LOW, the ESP system will be in this mode.

WARNING!

With the ESP switched off, the enhanced vehicle stability offered by ESP is unavailable. In an emergency evasive maneuver the ESP system will not engage to assist in maintaining stability. "ESP Off" mode is intended for off-highway or off-road use only.

ESP/BAS Warning Light and ESP/TCS Indicator Light

The malfunction indicator for the ESP is combined with the BAS indicator. The "ESP/BAS Warning Light" and the "ESP/TCS Indicator Light" in the instrument cluster both come on when the ignition switch is turned to the ON position. They should both go out with the engine running. If the "ESP/BAS Warning Light" comes on continuously with the engine running, a malfunction has been detected in either the ESP or BAS system or both. If

this light remains on after several ignition cycles and the vehicle has been driven several miles/kilometers at speeds greater than 30 mph (48 km/h), see your authorized dealer as soon as possible to have the problem diagnosed and corrected.

NOTE:

- The "ESP Indicator Light" and the "ESP/BAS Warning Light" will come on momentarily each time the ignition switch is turned ON.
- Each time the ignition is turned ON, the ESP will be ON even if it was turned off previously.
- The ESP will make buzzing or clicking sounds when it is active. This is normal. The sounds will stop when ESP becomes inactive following the maneuver that caused the ESP activation.

Trailer Sway Control (TSC) – If Equipped

The TSC system uses sensors in the vehicle to recognize an excessively swaying trailer and will take the appropriate actions to attempt to stop the sway. The system may reduce engine power and apply the brake of the appropriate wheel(s) to counteract the sway of the trailer. TSC will become active automatically once an excessively swaying trailer is recognized. No driver action is required. Note that TSC cannot stop all trailers from swaying. Always use caution when towing a trailer and follow the trailer tongue weight recommendations. Refer to "Trailer Towing" in "Starting and Operating" for further information. When TSC is functioning, the "ESP/TCS Indicator Light" will flash, the engine power may be reduced and you may feel the brakes being applied to individual wheels to attempt to stop the trailer from swaying. TSC is disabled when the ESP system is in the "Partial Off" or "Full Off" modes.

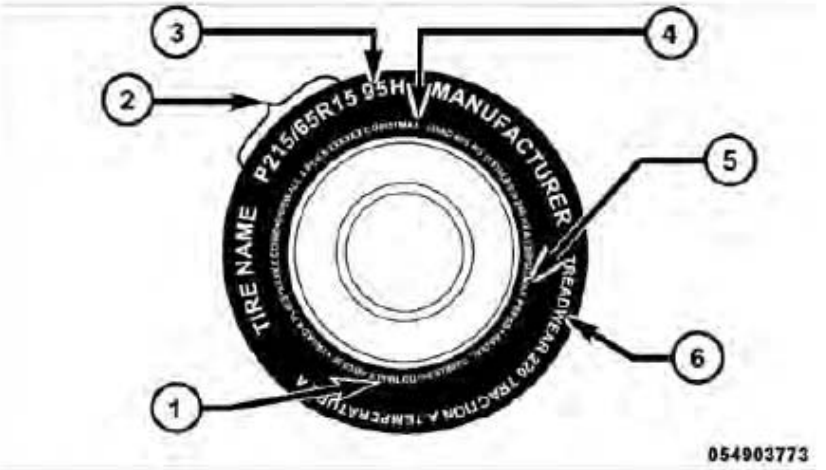
TSC is only active in the default "ESP On" mode. TSC can be disabled by pressing the ESP OFF switch and entering "ESP Partial Off" mode. It is not active in the "ESP Partial Off" or "ESP Off" modes. Refer to the ESP portion of this section for an explanation of the different ESP operating modes.

WARNING!

If TSC activates while driving, slow the vehicle down, stop at the nearest safe location, and adjust the trailer load to eliminate trailer sway.

TIRE SAFETY INFORMATION

Tire Markings



1 — U.S. DOT Safety Standards Code (TIN)
2 — Size Designation
3 — Service Description
4 — Maximum Load
5 — Maximum Pressure
6 — Treadwear, Traction and Temperature Grades

7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO.: *DTNH22-08-D-00098*
DATE: *4/2/2010*

From: *Automotive Allies, Inc*
To: Dynamic Research, Inc

Purpose ☒ Initial Receipt
☐ Received via Transfer
☐ Present Vehicle Condition

Vehicle VIN: *1D7RV1CT9AS172866* NHTSA NO.: *CA0306*
Model Year: *2010* Odometer Reading: *8* Miles
Make *Dodge* Body Style: *Truck*
Model: *Ram 1500* Body Color: *Silver*
Manufacture Date: *2/10* Dealer: *Automotive Allies, Inc*
GVWR (kg/lb) *3085/6800* Price: *Leased*

☒ All options listed on the "Window Sticker" are present on the test vehicle

☒ Tires and wheel rims are new and the same as listed

☒ There are no dents or other interior or exterior flaws

☒ The vehicle has been properly prepared 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

☒ Place vehicle in storage area

☒ 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.

NOTES:

RECORDED BY: *J Lenkeit* DATE RECORDED: *4/2/2010*

APPROVED BY: *B Kebschull* DATE APPROVED: *4/2/2010*

7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO.: *DTNH22-08-D-00098*
DATE: *5/5/2010*

Vehicle VIN: *1D7RV1CT9AS172866* NHTSA NO.: *CA0306*
Model Year: *2010* Odometer Reading: *104* Miles
Make: *Dodge* Body Style: *Truck*
Model: *Ram 1500* Body Color: *Silver*
Manufacture Date: *2/10* Dealer:
GVWR (kg/lb) *3085 (6800)* Price: *Leased*

LIST OF FMVSS TESTS PERFORMED BY THIS LAB: *126*

☒ 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:

Explanation for equipment removal:

Test Vehicle Condition:

As new

RECORDED BY: *J Lenkeit* DATE RECORDED: *5/5/2010*

APPROVED BY: *Brian Kebschull* DATE APPROVED: *5/5/2010*

7.4 SINE WITH DWELL TEST RESULTS

2010 Dodge Ram 1500 Truck **2WD Configuration**
NHTSA No.: CA0306
Date of Test : *4/26/2010*
Date Created: *4/27/2010*

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

File	SWA @ 5deg Ct	MES	Time @ 5deg	COS	Time @ COS	MOS	Time @ MOS	YRR1	YR1	YRR 1 Ct	YRR 175	YR175	YRR17 5 Ct	2nd Yaw Peak	2nd Yaw Peak Ct	Lat Disp	Lat. Acc. 1.07 s	1st SWA Peak	1st SWA Peak Ct	2nd SWA Mean
	(deg)	(mph)	(s)		(s)		(sec)	(%)	(deg/s)		(%)	(deg/s)		(deg/s)		(ft)	(g)	(deg)		(deg)
25	709	49.49	3.538	1090	5.445	847	4.226	-1.14	-0.14	1290	-1.18	-0.14	1440	12.28	931	-3.74	0.37	61.20	775	60.96
26	708	49.92	3.532	1090	5.444	846	4.225	-0.74	-0.12	1290	-0.93	-0.15	1440	16.10	932	-5.06	0.44	81.18	775	81.03
27	707	49.81	3.528	1090	5.444	846	4.225	-1.63	-0.33	1290	-1.57	-0.32	1440	20.17	929	-6.32	0.49	102.00	775	101.90
28	707	49.82	3.526	1090	5.443	846	4.225	-1.49	-0.35	1290	-1.22	-0.29	1440	23.5	924	-7.07	0.54	122.17	775	122.01
29	706	49.86	3.524	1090	5.443	846	4.225	-0.92	-0.25	1290	-0.54	-0.15	1440	27.42	923	-7.78	0.61	142.18	775	141.88
30	706	50.22	3.524	1090	5.443	846	4.225	-1.02	-0.32	1290	-0.94	-0.29	1440	31.23	925	-8.59	0.59	162.13	775	161.87
31	706	50.15	3.524	1090	5.443	847	4.226	0.49	0.17	1290	-0.82	-0.28	1440	34.52	926	-8.95	0.59	183.31	775	182.85
32	706	50.06	3.524	1090	5.442	847	4.226	1.34	0.51	1290	-0.49	-0.18	1440	37.91	928	-9.05	0.59	203.41	775	202.74
33	706	49.90	3.524	1090	5.442	847	4.226	-0.72	-0.29	1290	-0.42	-0.17	1440	39.67	927	-9.02	0.64	223.58	775	222.78
34	706	50.02	3.524	1090	5.441	847	4.226	0.97	0.40	1290	-0.98	-0.40	1440	41.03	930	-9.49	0.62	244.48	775	243.71
35	706	49.89	3.525	1090	5.444	847	4.226	1.73	0.72	1290	-0.61	-0.25	1440	41.71	929	-9.33	0.67	264.42	775	263.58
36	706	49.99	3.524	1090	5.444	847	4.226	0.02	0.01	1290	-0.3	-0.13	1440	42.58	928	-9.21	0.65	270.40	775	269.41

7.4 SINE WITH DWELL TEST RESULTS

2010 Dodge Ram 1500 Truck **2WD Configuration**

NHTSA No.: CA0306

Date of Test : *4/26/2010*

Date Created: *4/27/2010*

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

File	SWA @ 5deg Ct	MES	Time @ 5deg	COS	Time @ COS	MOS	Time @ MOS	YRR1	YR1	YRR 1 Ct	YRR 175	YR175	YRR17 5 Ct	2nd Yaw Peak	2nd Yaw Peak Ct	Lat Disp	Lat. Acc. 1.07 s	1st SWA Peak	1st SWA Peak Ct	2nd SWA Mean
	(deg)	(mph)	(s)		(s)		(sec)	(%)	(deg/s)		(%)	(deg/s)		(deg/s)		(ft)	(g)	(deg)		(deg)
37	709	49.96	3.536	1090	5.444	847	4.226	0.15	-0.02	1290	-1.07	0.14	1440	-12.88	934	3.91	-0.35	61.91	775	61.47
38	708	50.41	3.531	1090	5.443	847	4.226	-2.36	0.40	1290	-2.00	0.34	1440	-16.96	932	5.08	-0.43	81.99	775	81.47
39	707	49.97	3.527	1090	5.443	846	4.225	-1.18	0.25	1290	-0.75	0.16	1440	-21.16	927	5.90	-0.51	102.86	775	102.26
40	706	49.87	3.525	1090	5.442	846	4.225	-0.86	0.21	1290	-0.95	0.24	1440	-24.88	926	6.73	-0.56	123.14	775	122.3
41	706	50.10	3.523	1090	5.442	846	4.225	-0.30	0.09	1290	-0.02	0.01	1440	-29.25	926	7.26	-0.60	143.11	775	142.27
42	706	50.04	3.523	1090	5.441	846	4.225	-0.73	0.24	1290	-0.11	0.04	1440	-33.03	928	7.82	-0.59	163.04	775	162.15
44	706	50.15	3.523	1090	5.441	847	4.226	-0.42	0.15	1290	-0.47	0.17	1440	-35.61	928	8.19	-0.62	184.13	775	183.21
45	706	50.10	3.523	1090	5.441	847	4.226	-0.25	0.10	1290	-0.23	0.09	1440	-38.82	929	8.39	-0.63	204.09	775	203.07
46	706	50.19	3.523	1090	5.441	847	4.226	0.00	0.00	1290	0.07	-0.03	1440	-41.30	932	8.42	-0.63	224.27	775	223.18
48	706	50.27	3.523	1090	5.441	847	4.226	-0.27	0.11	1290	-0.27	0.11	1440	-40.64	929	8.54	-0.69	245.15	775	244.12
49	706	49.79	3.524	1089	5.440	847	4.226	-0.15	0.06	1289	-0.25	0.11	1439	-42.18	933	9.02	-0.71	264.97	775	264.06
50	706	49.97	3.524	1090	5.443	847	4.226	-0.23	0.10	1290	-0.25	0.11	1440	-42.39	927	8.71	-0.72	270.87	775	269.97

7.4 SINE WITH DWELL TEST RESULTS

2010 Dodge Ram 1500 Truck **4WD High Configuration**
NHTSA No.: CA0306
Date of Test : *4/28/2010*
Date Created: *4/28/2010*

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

File	SWA @ 5deg Ct	MES	Time @ 5deg	COS	Time @ COS	MOS	Time @ MOS	YRR1	YR1	YRR 1 Ct	YRR 175	YR175	YRR17 5 Ct	2nd Yaw Peak	2nd Yaw Peak Ct	Lat Disp	Lat. Acc. 1.07 s	1st SWA Peak	1st SWA Peak Ct	2nd SWA Mean
	(deg)	(mph)	(s)		(s)		(sec)	(%)	(deg/s)		(%)	(deg/s)		(deg/s)		(ft)	(g)	(deg)		(deg)
22	709	49.98	3.537	1090	5.444	847	4.226	-1.82	-0.22	1290	-0.92	-0.11	1440	12.24	936	-3.73	0.39	61.07	775	61.00
23	708	50.06	3.532	1090	5.445	847	4.226	-0.76	-0.12	1290	-1.19	-0.18	1440	15.21	926	-5.02	0.48	81.05	775	81.08
24	707	49.98	3.528	1090	5.444	846	4.225	-1.09	-0.21	1290	-0.11	-0.02	1440	19.03	923	-6.03	0.53	100.99	775	100.85
26	707	49.95	3.526	1090	5.444	846	4.225	-0.17	-0.04	1290	0.19	0.04	1440	21.82	919	-6.78	0.58	121.10	775	121.01
28	706	49.92	3.524	1090	5.443	846	4.224	-0.41	-0.10	1290	-0.14	-0.04	1440	25.52	919	-7.69	0.59	141.02	775	140.97
29	706	49.98	3.524	1090	5.442	846	4.225	-0.91	-0.27	1290	-0.41	-0.12	1440	29.26	920	-8.20	0.63	162.08	775	161.86
30	706	49.81	3.523	1090	5.442	846	4.225	-0.60	-0.20	1290	-0.13	-0.04	1440	32.61	922	-8.62	0.65	182.21	775	181.90
31	706	50.14	3.524	1090	5.442	847	4.226	-1.12	-0.39	1290	-0.84	-0.30	1440	35.24	921	-9.02	0.68	202.34	775	201.78
32	706	50.07	3.525	1090	5.442	847	4.226	-1.08	-0.41	1290	-0.51	-0.19	1440	37.54	923	-9.18	0.67	222.45	775	221.85
33	706	49.93	3.524	1090	5.441	847	4.226	-1.23	-0.47	1290	-0.67	-0.26	1440	38.49	925	-9.40	0.71	242.44	775	241.65
34	706	50.14	3.525	1090	5.443	847	4.226	-0.42	-0.16	1290	-0.21	-0.08	1440	38.9	926	-9.73	0.69	263.43	775	262.54
35	706	50.11	3.525	1090	5.442	847	4.226	1.79	0.74	1290	-0.49	-0.20	1440	41.42	926	-9.69	0.68	270.23	775	269.51

7.4 SINE WITH DWELL TEST RESULTS

2010 Dodge Ram 1500 Truck **4WD High Configuration**

NHTSA No.: CA0306

Date of Test : *4/28/2010*

Date Created: *4/28/2010*

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

File	SWA @ 5deg Ct	MES	Time @ 5deg	COS	Time @ COS	MOS	Time @ MOS	YRR1	YR1	YRR 1 Ct	YRR 175	YR175	YRR17 5 Ct	2nd Yaw Peak	2nd Yaw Peak Ct	Lat Disp	Lat. Acc. 1.07 s	1st SWA Peak	1st SWA Peak Ct	2nd SWA Mean
	(deg)	(mph)	(s)		(s)		(sec)	(%)	(deg/s)		(%)	(deg/s)		(deg/s)		(ft)	(g)	(deg)		(deg)
36	709	50.01	3.536	1090	5.445	847	4.226	-1.55	0.19	1290	-0.72	0.09	1440	-12.05	932	3.98	-0.38	62.00	775	61.40
37	708	50.01	3.531	1090	5.444	846	4.225	-0.03	0.01	1290	-0.70	0.11	1440	-16.06	928	5.14	-0.46	82.00	775	81.39
38	707	50.11	3.528	1090	5.443	847	4.226	-0.44	0.09	1290	-0.64	0.13	1440	-20.15	925	6.03	-0.53	101.94	775	101.20
39	706	50.3	3.525	1090	5.443	847	4.226	-1.32	0.31	1290	-1.29	0.30	1440	-23.16	921	6.78	-0.60	122.04	775	121.39
40	706	50.14	3.524	1090	5.443	846	4.225	-0.10	0.03	1290	-0.47	0.13	1440	-27.25	922	7.32	-0.63	142.12	775	141.21
41	706	49.65	3.523	1090	5.442	847	4.226	-0.52	0.16	1290	0.25	-0.08	1440	-30.52	923	7.76	-0.66	163.09	775	162.14
42	706	50.09	3.523	1090	5.441	847	4.226	-0.63	0.21	1290	-0.01	0.00	1440	-33.83	923	8.17	-0.68	183.19	775	182.13
43	706	50.11	3.523	1090	5.441	847	4.226	-0.71	0.26	1290	-0.18	0.06	1440	-36.09	924	8.61	-0.69	203.16	775	202.01
44	706	50.04	3.523	1089	5.440	847	4.226	-0.54	0.21	1289	-0.38	0.14	1439	-38.2	925	8.59	-0.72	223.29	775	222.06
45	706	49.83	3.524	1090	5.441	847	4.226	-0.65	0.25	1290	-0.44	0.17	1440	-38.98	929	8.69	-0.71	243.12	775	242.08
46	706	49.91	3.524	1090	5.443	847	4.226	-1.07	0.45	1290	-0.63	0.26	1440	-41.65	929	8.59	-0.77	264.03	775	262.93
47	706	50.04	3.524	1090	5.442	847	4.226	-0.56	0.24	1290	0.01	0.00	1440	-43.27	929	8.90	-0.74	270.81	775	269.90

7.5 SLOWLY INCREASING STEER TEST RESULTS

2010 Dodge Ram 1500 Truck **2WD Configuration**

NHTSA No.: *CA0306*

Date of Test: *4/26/2010*

Date Created: *4/26/2010*

File	EventPt	DOS	MES	Mean SPD	AYcount_3	THETAENCF_3	AYCG_CD2_3	r_squared	ZeroBegin	ZeroEnd
			(mph)	(mph)		(deg)	(g)			
10	700	1	50.036	50.1258	1307	-40.7521	-0.3020	0.9969	500	700
12	700	1	50.153	50.3113	1313	-40.9548	-0.3134	0.9901	500	700
13	706	1	50.297	50.2648	1318	-41.3805	-0.3037	0.9955	506	706
14	700	0	50.067	50.0030	1284	39.3538	0.2955	0.9979	500	700
15	700	0	50.526	50.4731	1286	39.3325	0.2986	0.9965	500	700
16	700	0	48.962	49.2427	1320	41.5652	0.3074	0.9941	500	700
				Averages		40.6	0.3034			

Scalars	Steering Angles (deg)
1.5	61
2.0	81
2.5	102
3.0	122
3.5	142
4.0	162
4.5	183
5.0	203

Scalars	Steering Angles (deg)
5.5	223
6.0	244
6.5	264
6.7	270

7.5 SLOWLY INCREASING STEER TEST RESULTS

2010 Dodge Ram 1500 Truck **4WD High Configuration**

NHTSA No.: *CA0306*

Date of Test: *4/28/2010*

Date Created: *4/28/2010*

File	EventPt	DOS	MES	Mean SPD	AYcount_3	THETAENCF_3	AYCG_CD2_3	r_squared	ZeroBegin	ZeroEnd
			(mph)	(mph)		(deg)	(g)			
10	711	1	50.898	50.5584	1299	-40.0591	-0.3054	0.9891	511	711
11	700	1	50.164	50.1751	1336	-42.5108	-0.2912	0.9961	500	700
12	700	1	50.233	50.1718	1322	-41.5409	-0.3021	0.9957	500	700
13	717	0	50.201	50.1150	1287	39.3418	0.2986	0.9977	517	717
14	700	0	49.812	50.0831	1282	39.1246	0.3076	0.9948	500	700
16	718	0	49.836	50.0404	1292	39.7164	0.3055	0.9935	518	718
				Averages		40.4	0.3017			

Scalars	Steering Angles (deg)
1.5	61
2.0	81
2.5	102
3.0	122
3.5	142
4.0	162
4.5	183
5.0	203

Scalars	Steering Angles (deg)
5.5	223
6.0	244
6.5	264
6.7	270

7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

Vehicle:	**2010 Dodge Ram 1500 Truck**	NHTSA No.:	CA0306
Wheelbase:	138.25 Inches	Faro Arm S/N:	U08-05-08-06636
Measurement date:	4/7/2010	Certification date:	8/18/2009

CMM Measurements

Coordinate system: SAE (X,Y,Z positive forward, to the right, and downward, respectively)

Origin defined at 48" point on lateral arm of measurement fixture, projected onto the ground plane

	Ref X	Ref Y	Ref Z
M_PLANE001_Ground_Plane	-	-	0.000
M_Line_Y_Axis	-1.733	10.593	0.000
M_Point_48_Ref	0.000	0.000	-
M_CIRCLE001_I_Left_Rear_Wheel_Axle	-59.049	8.540	-15.492
M_Point_IMU_side	12.653	46.073	-31.348
M_Point_ROOF	-	-	-75.687
Motion Pak reference point taken from mid height of unit left side			
Motion Pak Width = 3.05" ==> 1/2 W = 1.525			
Motion_PAK_Location	12.653	47.598	-31.348

Measurement Notes

1. The Faro arm is positioned just to the left of the vehicle, near the rear door.

2. A "centerline jig" is used in the Faro arm measurement. The jig consists of a long beam with a 4 ft lateral arm that is perpendicular to the beam. The jig is placed on the ground underneath the vehicle with the long beam positioned along the centerline of the vehicle, such that the lateral arm extends to the left, slightly forward of the left rear tire. The lateral arm has a marked indentation point which is located 48.00" from the edge of the centerline beam.

3. The Faro arm is used to make the following measurements:
   - Three points on the ground, which establishes the ground plane.
   - Two points along the lateral arm, and projected onto the ground plane. This establishes the y axis.
   - One point at the 48 inch reference point on the lateral arm. This establishes the origin.
   - Three points on the left rear wheel or wheel cover. The Faro arm then computes the center point of the wheel.
   - One point to establish the height of the highest point on the roof of the vehicle.

Coordinate Measurements Calculated for S7D (Matlab Program)

Coordinate system: X,Y,Z positive rearward, to the right, and upward, respectively

Origin defined as follows: X axis: front axle, Y axis: vehicle centerline, Z axis: ground plane

	Ref X	Ref Y	Ref Z
Motion_PAK_Location in S7D (Matlab program) coordinate system	**66.548**	**-0.402**	**31.348**

Calculation Notes:

1. X axis value is the difference between the wheelbase and the calculated distance from the rear axle centerline to the IMU (the value must be positive and less than the wheelbase).

2. Y axis value is -48.00 (the Y axis offset of the measurement origin in the S7D coordinate system) plus the measured Y axis value (a negative value indicates the IMU is to the left of the vehicle centerline, and a positive value indicates it is to the right)

3. Z axis value is from the ground plane up to the center of the IMU (value must be positive).