126-DRI-09-001

SAFETY COMPLIANCE TESTING FOR FMVSS 126
Electronic Stability Control Systems

General Motors
2009 SATURN VUE
NHTSA No. C90112

DYNAMIC RESEARCH, INC.
355 Van Ness Avenue, STE 200
Torrance, California 90501

September 10, 2009

FINAL REPORT

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

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
1200 New Jersey Avenue, SE
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Washington, DC 20590

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16. Abstract A test was conducted on a 2009 Saturn Vue, NHTSA No. C90112, 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 2009 Saturn Vue, 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 2009 Saturn Vue 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 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: *2009 Saturn Vue :MPV*

NHTSA No *C90112* VIN: *3GSCL33PX9S582679*

Vehicle Type: *MPV* Manufacture Date: *11/08*

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: *2009 Saturn Vue :MPV*

NHTSA No *C90112* Data sheet completion date: *5/27/2009*

VIN: *3GSCL33PX9S582679* Manufacture Date: *11/08*

GVWR (kg): *2189* Front GAWR (kg): *1130* Rear GVWR (kg): *1280*

Seating Positions Front: *2* Mid: *3* Rear: *0*

Odometer reading at time of inspection: *49 (78) miles (km)*

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:

Front Axle: *P235/65 R16* Rear Axle: *P235/65 R16*

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

	Front Axle	Rear Axle
Tire Manufacturer:	*Firestone*	*Firestone*
Tire Model:	*Destination LE*	*Destination LE*
Tire Size:	*P235/65 R16*	*P235/65 R16*

TIN Left Front: *VN74DIS 4108* Right Front: *VN74DIS 4108*

Left Rear: *VN74DIS 4108* Right Rear: *VN74DIS 4108*

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

DRIVE CONFIGURATION(S):(mark all that apply)

☑ Two Wheel Drive (2WD) ☑ Front Wheel Drive ☐ Rear Wheel Drive

☐ All Wheel Drive (AWD)

☐ Four Wheel Drive Automatic - differential no locked full time (4WD Automatic)

☐ Four Wheel Drive (High Gear Locked Differential 4WD HGLD)

☐ 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: *FWD*
Mode: *Default*
Drive Configuration:
Mode:
Drive Configuration:
Mode:

VEHICLE STABILITY SYSTEMS (Check applicable technologies):

☑ ESC ☑ Traction Control ☑ Roll Stability Control

☐ Active Suspension ☑ Electronic Throttle Control ☐ Active Steering

☑ ABS

List other systems:

REMARKS:

RECORDED BY: *J Lenkeit* DATE RECORDED: *5/27/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/9/2009*

3.0 TEST DATA (CONTD)

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

Vehicle: *2009 Saturn Vue :MPV*

NHTSA No *C90112* Data Sheet Completion Date: *5/29/2009*

ESC SYSTEM IDENTIFICATION

Manufacturer/Model *Continental Automotive Systems/CTMk25e*

ESC SYSTEM HARDWARE (Check applicable hardware)

☑ Electronic Control Unit ☑ Hydraulic Control Unit

☑ Wheel Speed Sensors ☑ Steering Angle Sensor

☑ Yaw Rate Sensor ☑ Lateral Acceleration Sensor

List other Components: *Brake actuation booster, Engine management interface*

ESC OPERATIONAL CHARACTERISTICS

System is capable of generating brake torque at each wheel _X_ *Yes (Pass)* ____ *No (Fail)*
List and describe Components: *Hydraulic control unit, individual wheel brake systems, brake booster*

System is capable of determining yaw rate _X_ *Yes (Pass)* ____ *No (Fail)*
List and describe Components: *Yaw rate sensor*

System is capable of monitoring driver steering input _X_ *Yes (Pass)* ____ *No (Fail)*
List and describe Components: *Steering wheel angle sensor*

System is capable of estimating side slip or side slip derivative _X_ *Yes (Pass)* ____ *No (Fail)*
List and describe Components: *Sideslip and sideslip derivative are calculated values within the ESC electronic control unit based on sensor output data including four independent wheel speeds, yaw rate, lateral acceleration, and steering wheel angle.*

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: *The ESC electronic control unit sends a signal to the powertrain control module requesting a specific percent engine torque reduction. The powertrain control module delivers the requested engine torque reduction using its own control algorithm.*

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: *14.75* 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:
Acceleration, deceleration, coasting, during activation of ABS and during activation of TCS, except if the vehicle is being driven in reverse or if the vehicle is being driven forward at a speed less than 14.75 km/h.

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: *5/29/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/9/2009*

3.0 TEST DATA (CONTD)

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

Make: *Saturn* Model: *Vue* Body Style: *MPV*

NHTSA No *C90112* Data sheet completion date: *5/21/2009*

ESC Malfunction Telltale

Vehicle is equipped with malfunction telltale? *Yes*

Telltale Location *Tachometer cluster*

Telltale Color *Orange/Yellow*

Telltale symbol or abbreviation used

or **ESC**

☐ Vehicle uses this symbol

☐ Vehicles uses this abbreviation

☑ Neither symbol or abbreviation is used

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

Symbol above, inside orange triangle (refer to Figure 5.6)

Is telltale part of a common space? *No*

Is telltale also used to indicate activation of the ESC system? *Yes*

If yes explain telltale operation during ESC activation:

From Owner Manual p. 3-34: "The light flashes while the StabiliTrak or the Traction Control System (TCS) is working

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 *Tachometer cluster*

Telltale Color *Orange/Yellow*

Telltale symbol or abbreviation used

or **ESC OFF**

☑ Vehicle uses this symbol

☐ Vehicle uses this abbreviation

☐ Neither symbol or abbreviation is used

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

When the above symbol is illuminated by itself it identifies the Traction Control System has been turned off (refer to Figure 5.8). When the StabiliTrak System has been turned off both telltales above (malfunction and OFF) are illuminated (refer to Figure 5.6). Also, the common area states "StabiliTrak Off."

Is telltale part of a common space? *No*

DATA INDICATES COMPLIANCE ***PASS***

(Vehicle is compliant if equipped with a malfunction telltale)

Remarks:

RECORDED BY: *J Lenkeit* DATE RECORDED: *5/21/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/09/2009*

3.0 TEST DATA (CONTD)

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

Make: *Saturn* Model: *Vue* Body Style: *MPV*

NHTSA No *C90112* Data sheet completion date: *5/21/2009*

"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
- ☑ Multi-functional control with an "ESC Off" mode
- ☐ Other (describe)

Identify each control location, labeling and selectable modes.

First Control: Location *Center console*
Labeling *Traction Control off symbol (refer to Figure 5.7)*
Modes *TCS off, TCS and StabiliTrak off*

Second Control: Location _____
Labeling _____
Modes _____

Identify standard or default drive configuration *FWD*

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")

X Yes ___ No (Fail)

If no, describe how the off control functions
NA

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)
Push and release for TCS off	*No*	*NA*
Push and hold for TCS and ESC 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 (Fail)

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?

_____Yes __X__No

Ancillary Control: System _____

Control Description _____

Labeling _____

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
NA	*NA*	*NA*
NA	*NA*	*NA*
NA	*NA*	*NA*

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)
NA	*NA*
NA	*NA*
NA	*NA*

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

_____Yes _____No (Fail)

DATA INDICATES COMPLIANCE: *PASS*

Remarks:

RECORDED BY: *J Lenkeit* DATE RECORDED: *5/21/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/9/2009*

3.0 TEST DATA (CONTD)

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

Vehicle: *2009 Saturn Vue :MPV*

NHTSA No *C90112* Data sheet completion date: *5/28/2009*

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

Peak Friction Coefficient (at least 0.9) *0.92*

Test track data meets requirements: *Yes*

If no, explain:

Full Fluid Levels: Fuel *Full* Coolant *Full* Other Fluids *Full*

(specify) *oil*

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 *156* cm Wheelbase *270.8* cm

Rear Track Width *157* cm

Vehicle Weight Ratings: GAWR Front *1130* KG GAWR Rear *1280* KG

Unloaded Vehicle Weight (UVW):

Front axle	*956*	KG	Left Front	*499*	KG	Right Front	*457*	KG
Rear axle	*731*	KG	Left Rear	*350*	KG	Right Rear	*381*	KG

Total UVW *1687* KG

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

Calculated baseline weight (UVW + 73kg) *1760* 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	*1004* KG	Left Front	*523* KG	Right Front	*481* KG
Rear axle	*786* KG	Left Rear	*376* KG	Right Rear	*410* KG

Total UVW with outriggers *1790* KG

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

Front axle	*1089* KG	Left Front	*560* KG	Right Front	*529* KG
Rear axle	*861* KG	Left Rear	*448* KG	Right Rear	*413* KG

Vehicle Weight *1950* KG

Ballast Required =

[Total UVW with Outriggers (if applicable)]	+ *168* KG	- [Loaded Weight w/Driver and Instrumentation)]
= *1790* KG	+ *168* KG	- *1950* KG

= *8* KG

Total Loaded Vehicle Weight w/Driver and Instrumentation and Ballast

Front axle	*1092* KG	Left Front	*562* KG	Right Front	*530* KG
Rear axle	*866* KG	Left Rear	*449* KG	Right Rear	*417* KG

Total UVW *1958* 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	*47.15* in	*119.8* cm	*68.6* in	*174.2* cm
y-distance	*-1.00* in	*-2.6* cm	*0.5* in	*1.3* cm
z-distance	*25.12* in	*63.8* cm	*18* in	*45.7* cm

Roof Height	*66.1*	in	*167.9*	cm
Distance between ultrasonic sensors	*84.5*	in	*214.6*	cm

Remarks:

RECORDED BY: *J Lenkeit* DATE RECORDED: *6/5/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/9/2009*

3.0 TEST DATA (CONTD)

Data Sheet 6 (Page 1 of 3)
BRAKE AND TIRE CONDITIONING

Vehicle: *2009 Saturn Vue :MPV*

NHTSA No *C90112*

Measured tire pressure: LF *240* KPA RF *240* KPA

LR *240* KPA RR *240* 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)) *31* °C

Brake Conditioning Time: *9:21:00 AM* Date: *5/28/2009*

56 km/h (35 mph) Brake Stops

Number of stops executed (10 required) *10* Stops

Observed deceleration rate range (.5g target) *0.5 – 0.6* 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 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning series No. 1 Time: *9:32:00 AM* Date: *5/28/2009*

Measured cold tire pressure LF *263* KPA RF *271* KPA

LR *268* KPA RR *263* 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)) *30* °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 – 34*
4-6	Counterclockwise	0.5 – 0.6	*0.5 – 0.6*	*32 – 34*

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)	*30*	0.5 - 0.6	*0.18*
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: *110* 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)	*110* (cycles 1-10)	0.5 - 0.6	*0.54*
4	7	56 ± 2 (35 ± 1)	*110* (cycles 1-9)	0.5 - 0.6	*0.54*
			220 (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 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning series No. 2 Time: *11:45:00 AM* Date: *5/28/2009*

Measured cold tire pressure LF *269* KPA RF *264* KPA

LR *264* KPA RR *259* 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)) *36* °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 -34 Km/h*
4-6	Counterclockwise	0.5 - 0.6	*0.5 – 0.6*	*32 -34 Km/h*

Steering wheel angle that corresponds to a peak 0.5-0.6 g lateral acceleration: *110*

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)	*110* (cycles 1-10)	0.5 - 0.6	*0.54*
4	19	56 ± 2 (35 ± 1)	*110* (cycles 1-9)	0.5 - 0.6	*0.54*
			220 (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: *J Lenkeit* DATE RECORDED: *5/28/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/9/2009*

3.0 TEST DATA (CONTD)

Data Sheet 7 (Page 1 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER

Vehicle: *2009 Saturn Vue :MPV*

NHTSA No *C90112*

Measured tire pressure: LF *264* KPA RF *270* KPA

LR *258* KPA RR *263* KPA

Wind Speed *1.4* 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 *FWD*

Selected Mode: *Default*

Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle

$a_{y,30\text{degrees}}$ = *0.3* g

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

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

δ_{sis} = *55* degrees (@.55g)

δ_{sis} = *60* 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	*10:44:00 AM*	*-33.8*	*10*	*Good*
2	Left	*10:49:00 AM*	*-33.7*	*11*	*Good*
3	Left	*10:53:00 AM*	*-33.8*	*12*	*Good*
4	Left				
5	Left				
1	Right	*10:58:00 AM*	*33.7*	*13*	*Good*
2	Right	*11:02:00 AM*	*35.0*	*14*	*Good*
3	Right	*11:05:00 AM*	*33.4*	*15*	*Good*
4	Right				
5	Right				

3.0 TEST DATA (CONTD)

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

Average Overall Steering Wheel Angle:

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

$\delta_{0.3\ g,\ overall}$ = 33.9 degrees

[to nearest 0.1 degree]

Remarks:

RECORDED BY: *J Lenkeit* DATE RECORDED: *5/28/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/09/2009*

3.0 TEST DATA (CONTD)

Data Sheet 8 (Page 1 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Vehicle: *2009 Saturn Vue :MPV*

NHTSA No *C90112* Data sheet completion date: *5/28/2009*

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

Selected Drive Configuration: *FWD*

Selected Mode: *Default*

Overall steering wheel angle ($\delta_{0.3\ g,\ overall}$) *33.9* 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
1	12:03 PM	1.5	51	12.3	-0.3	-0.1	-2.3	*PASS*	-1.0	*PASS*
2	12:07 PM	2.0	68	16.6	-0.2	-0.2	-1.2	*PASS*	-1.4	*PASS*
3	12:11 PM	2.5	85	20.1	-0.4	-0.2	-2.1	*PASS*	-1.1	*PASS*
4	12:14 PM	3.0	102	23.2	-0.3	-0.3	-1.5	*PASS*	-1.3	*PASS*
5	12:17 PM	3.5	119	26.1	-0.6	-0.5	-2.2	*PASS*	-1.8	*PASS*
6	12:20 PM	4.0	136	29.7	-0.5	-0.3	-1.6	*PASS*	-1.1	*PASS*
7	12:24 PM	4.5	153	33.7	-0.3	-0.3	-0.9	*PASS*	-0.7	*PASS*
8	12: 26 PM	5.0	170	36.6	0	0	-0.1	*PASS*	0.1	*PASS*
9	12: 29 PM	5.5	186	38.3	-0.3	-0.3	-0.8	*PASS*	-0.7	*PASS*
10	12: 32 PM	6.0	203	41.2	-0.2	-0.1	-0.4	*PASS*	-0.3	*PASS*
11	12: 35 PM	6.5	220	40.8	0	0.1	0.0	*PASS*	0.1	*PASS*
12	12:38 PM	7.0	237	36.8	-0.1	-0.1	-0.3	*PASS*	-0.2	*PASS*
13	12:41 PM	7.5	254	38.6	0	0.1	0.0	*PASS*	0.1	*PASS*
14	12:45 PM	8.0	270	39.9	-0.1	0	-0.3	*PASS*	-0.1	*PASS*
15										
16										

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 3)
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
1	12:51 PM	1.5	51	-13.4	0.2	0.1	-1.3	*PASS*	-0.4	*PASS*
2	12:54 PM	2.0	68	-18	0.2	0.1	-1.1	*PASS*	-0.6	*PASS*
3	12:57 PM	2.5	85	-22.5	0.1	0.2	-0.5	*PASS*	-0.7	*PASS*
4	1:02 PM	3.0	102	-25.2	0.2	0.1	-0.6	*PASS*	-0.2	*PASS*
5	1:06 PM	3.5	119	-28.1	0.2	-0.1	-0.7	*PASS*	0.2	*PASS*
6	1:09 PM	4.0	136	-31	0.2	0.1	-0.5	*PASS*	-0.4	*PASS*
7	1:12 PM	4.5	153	-33.5	0.2	0.1	-0.6	*PASS*	-0.4	*PASS*
8	1:15 PM	5.0	170	-36.6	0.3	0.2	-0.7	*PASS*	-0.5	*PASS*
9	1:18 PM	5.5	186	-40.6	0.2	0.1	-0.4	*PASS*	-0.3	*PASS*
10	1:21 PM	6.0	203	-43.7	0.2	0.2	-0.5	*PASS*	-0.5	*PASS*
11	1:24 PM	6.5	220	-45.5	-0.2	0	-0.3	*PASS*	0.0	*PASS*
12	1:28 PM	7.0	237	-47.3	0.2	0.2	-0.4	*PASS*	-0.5	*PASS*
13	1:31 PM	7.5	254	-41.5	0.1	0.1	-0.1	*PASS*	-0.1	*PASS*
14	1:34 PM	8.0	270	-51.1	0.2	0.1	-0.5	*PASS*	-0.2	*PASS*
15										
16										

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 (3 of 3)
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
8	Counter Clockwise	5.0	170	-2.8	*PASS*
9	Counter Clockwise	5.5	186	-2.9	*PASS*
10	Counter Clockwise	6.0	203	-2.9	*PASS*
11	Counter Clockwise	6.5	220	-2.9	*PASS*
12	Counter Clockwise	7.0	237	-3.0	*PASS*
13	Counter Clockwise	7.5	254	-3.0	*PASS*
14	Counter Clockwise	8.0	270	-3.0	*PASS*
22	Clockwise	5.0	170	2.7	*PASS*
23	Clockwise	5.5	186	2.8	*PASS*
24	Clockwise	6.0	203	2.8	*PASS*
25	Clockwise	6.5	220	2.9	*PASS*
26	Clockwise	7.0	237	2.9	*PASS*
27	Clockwise	7.5	254	2.9	*PASS*
28	Clockwise	8.0	270	3.0	*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: *J Lenkeit* DATE RECORDED: *5/29/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/9/2009*

3.0 TEST DATA (CONTD)

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

Vehicle: *2009 Saturn Vue :MPV*

NHTSA No *C90112* Data Sheet Completion Date: *5/28/2009*

TEST 1

METHOD OF MALFUNCTION SIMULATION:

Describe method of malfunction simulation:

Disconnect 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 as specified

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 as specified.

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/FAIL *PASS*

Remarks: *No driving was required to illuminate or extinguish telltale.*

RECORDED BY: *J Lenkeit* DATE RECORDED: *5/28/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *5/31/2009*

3.0 TEST DATA (CONTD)

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

Vehicle: *2009 Saturn Vue :MPV*

NHTSA No *C90112* Data Sheet Completion Date: *5/28/2009*

TEST 2

METHOD OF MALFUNCTION SIMULATION:

Describe method of malfunction simulation:

Disconnect yaw rate 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 as specified.

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 as specified.

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/FAIL *PASS*

Remarks: *No driving was required to illuminate or extinguish telltale.*

RECORDED BY: *J Lenkeit* DATE RECORDED: *5/28/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *5/31/2009*

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: Innocal Date:1/15/09 Due: 1/15/10
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: Intercomp Date:1/29/09 Due: 1/29/10
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: Heitz Date:1/29/09_ Due: 1/29/10
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:12/11/08 Due: 12/11/09
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: ADAT Date:1/5/09 Due:1/5/10
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:3/16/09 Due: 3/16/10
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 D2647	By: DRI Date:3/16/09 Due: 3/16/10

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: Somat Date:1/13/09 Due: 1/14/10
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 High level Board EHLS	MSHLS.03-3182	By: Somat Date:1/14/09 Due: 1/15/10
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	By: Davis Date:2/3/09 Due: 2/3/10
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: 5/30/08 Due: 5/30/09
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 16)

Figure 5.1. Right Front View of Test Vehicle

5.0 PHOTOGRAPHS (2 of 16)

Figure 5.2. Left Rear View of Test Vehicle

5.0 PHOTOGRAPHS (3 of 16)

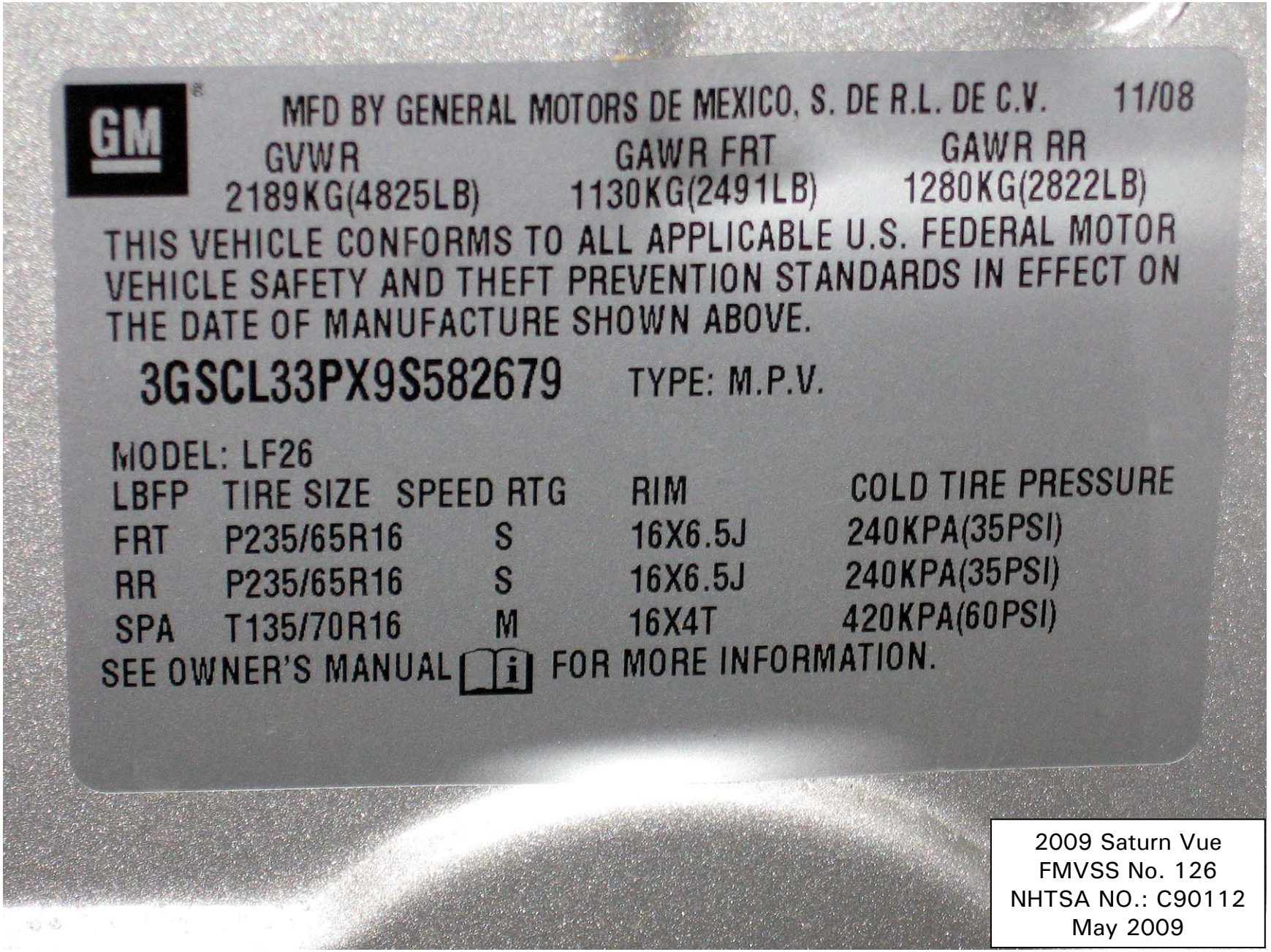


Figure 5.3. Vehicle Certification Label

5.0 PHOTOGRAPHS (4 of 16)

Figure 5.4. Vehicle Placard

5.0 PHOTOGRAPHS (5 of 16)

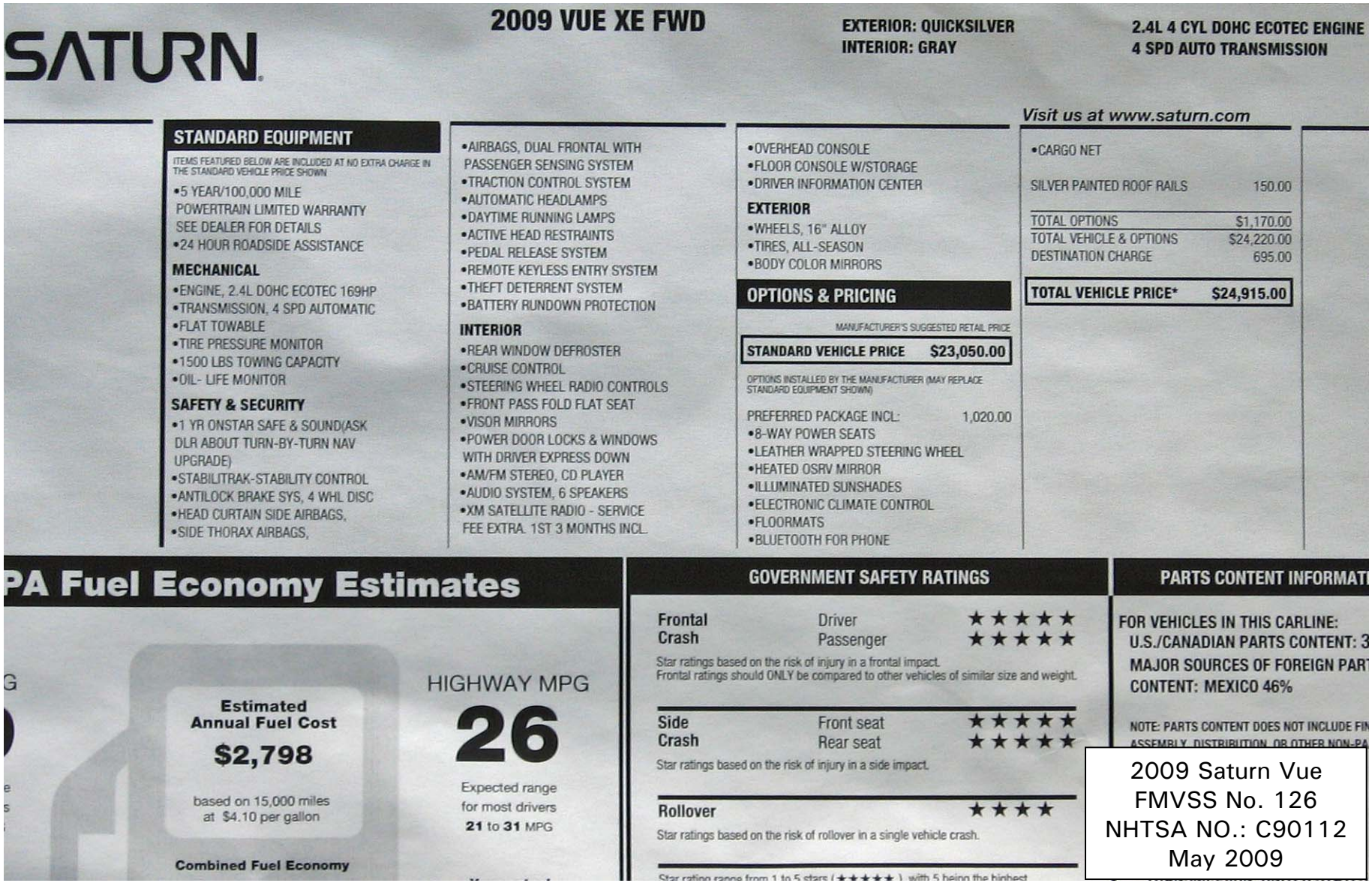


Figure 5.5. Window Sticker (Monroney Label)

5.0 PHOTOGRAPHS (6 of 16)

2009 Saturn Vue
FMVSS No. 126
NHTSA NO.: C90112
May 2009

Figure 5.6. Telltale for ESC Malfunction and ESC Off

5.0 PHOTOGRAPHS (7 of 16)

Figure 5.7. ESC Off Control Switch

5.0 PHOTOGRAPHS (8 of 16)

Figure 5.8. Traction Control Off Display

5.0 PHOTOGRAPHS (9 of 16)

Figure 5.9. Front View of Vehicle As-Tested

5.0 PHOTOGRAPHS (10 of 16)

Figure 5.10. Rear View of Vehicle As-Tested

5.0 PHOTOGRAPHS (11 of 16)

Figure 5.11. Ultrasonic Height Sensor Mounted on Left Side of Vehicle for Determining Body Roll Angle

5.0 PHOTOGRAPHS (12 of 16)

Figure 5.12. Rear Outrigger, Mount and Speed Sensor

5.0 PHOTOGRAPHS (13 of 16)

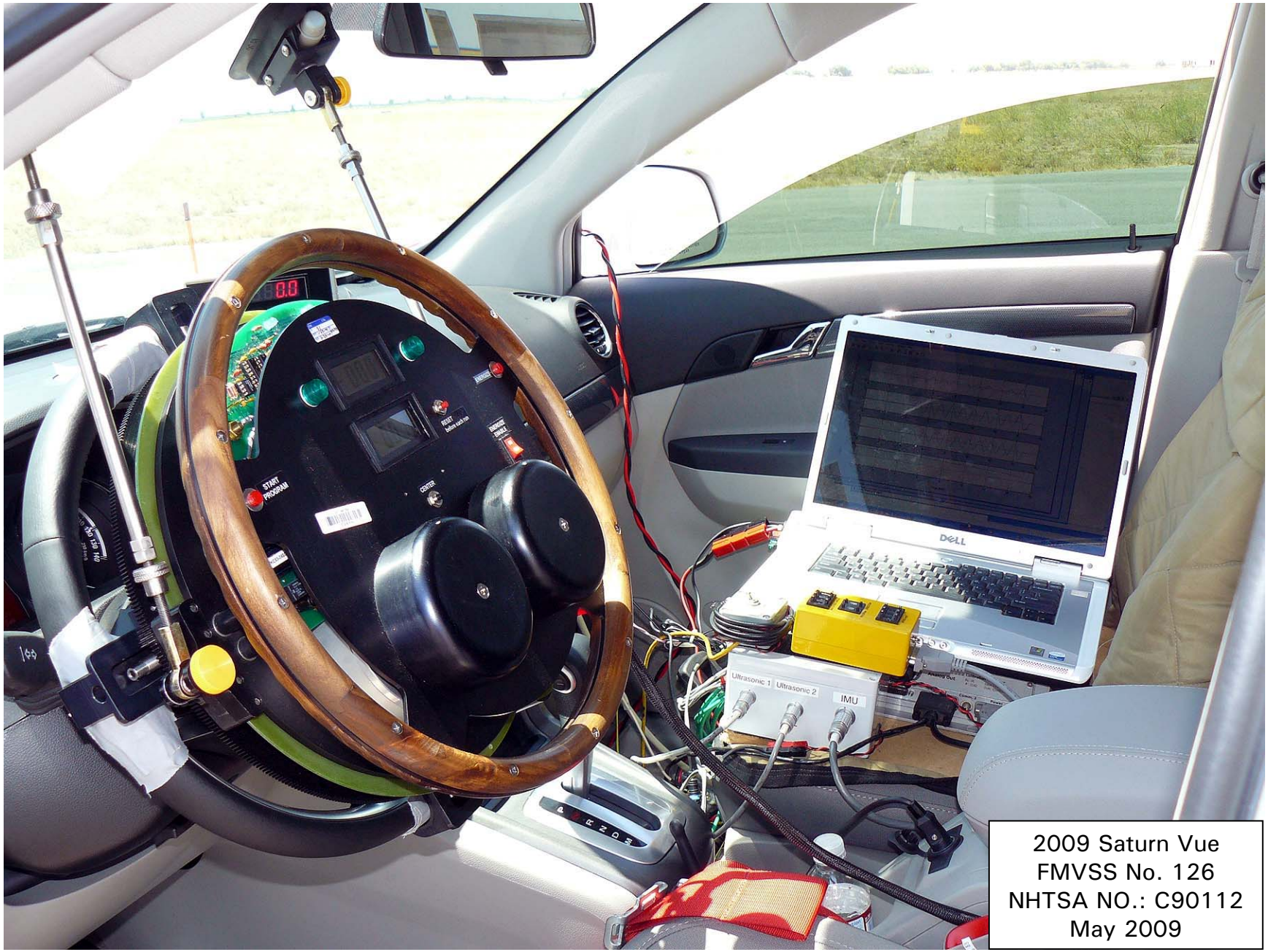


Figure 5.13. Steering Controller and Data Acquisition Computer

5.0 PHOTOGRAPHS (14 of 16)

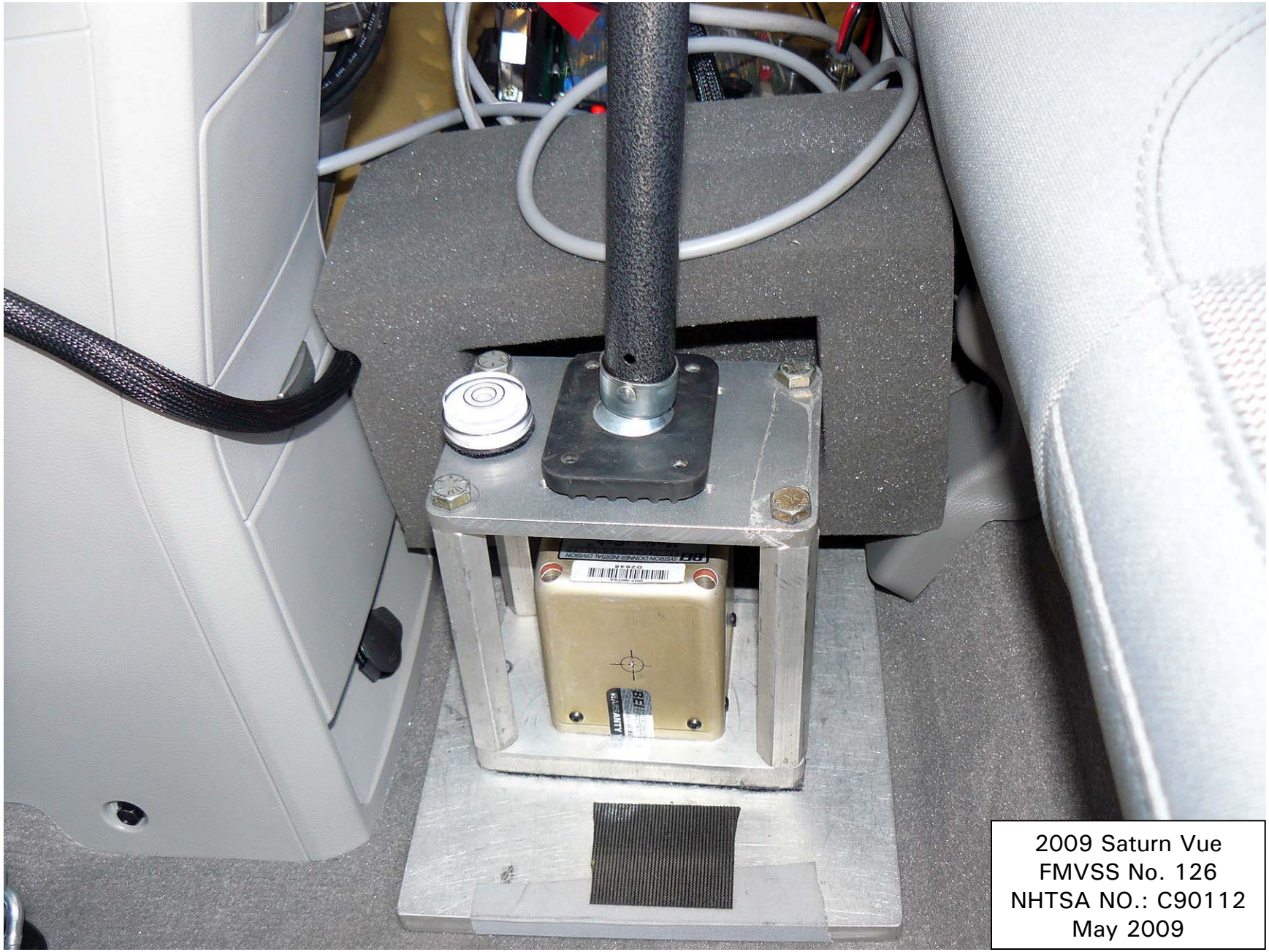


Figure 5.14. Inertial Measurement Unit Mounted in Vehicle

5.0 PHOTOGRAPHS (15 of 16)

Figure 5.15. Brake Pedal Load Cell

6.0 DATA PLOTS (1 of 4)

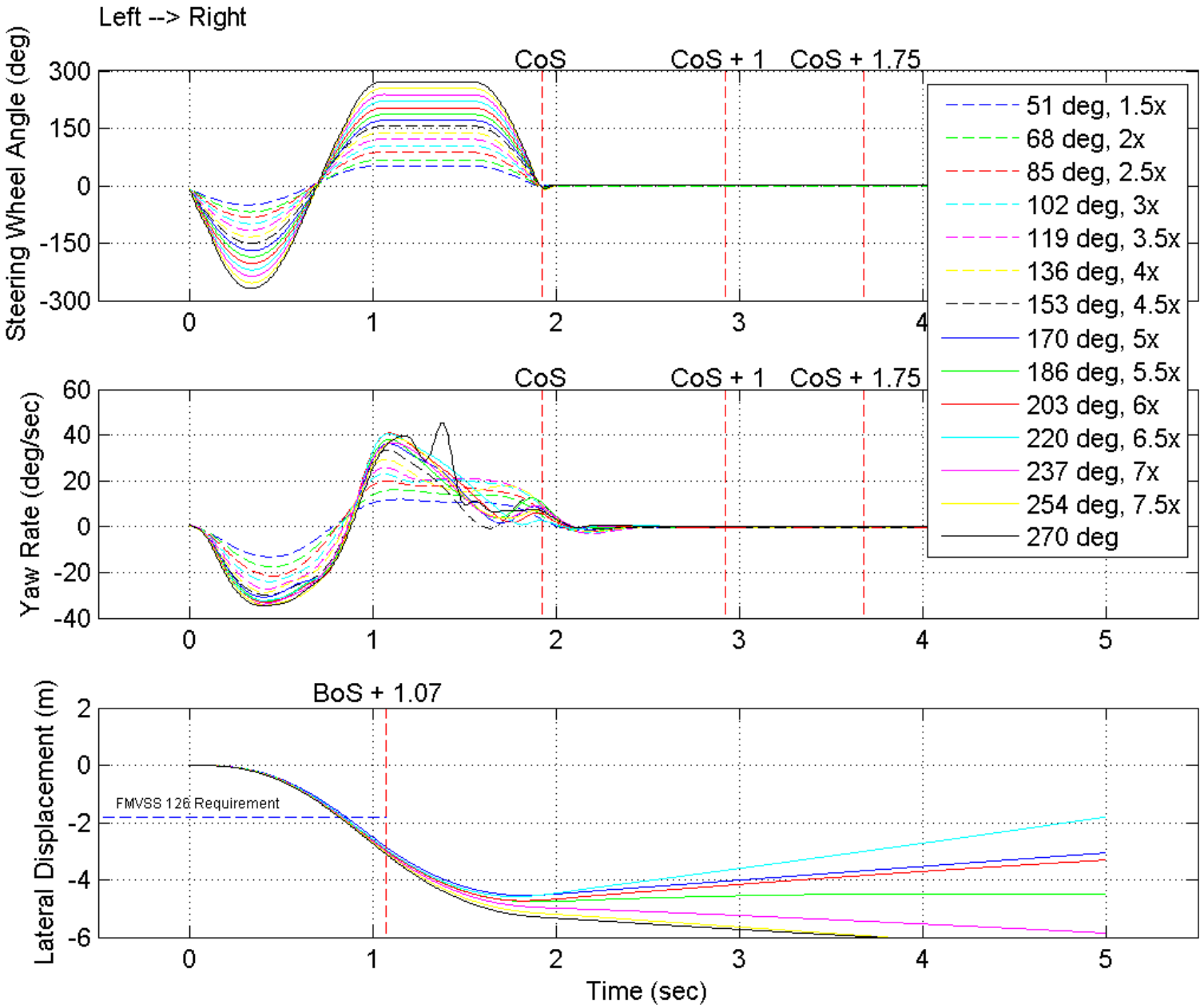


Figure 6.1. Steering Wheel Angle, Yaw Rate and Lateral Displacement for L-R Series

6.0 DATA PLOTS (2 of 4)

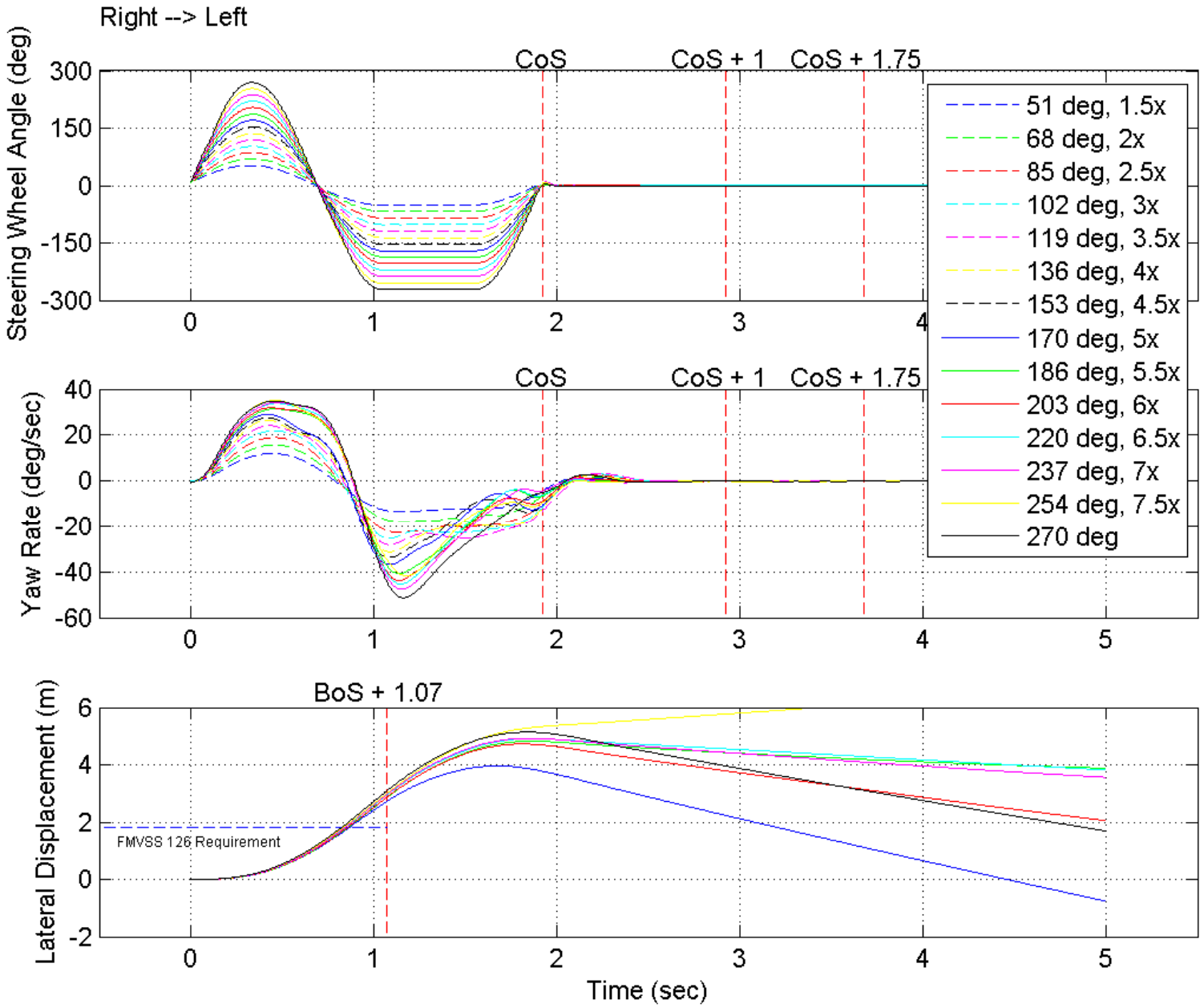


Figure 6.2. Steering Wheel Angle, Yaw Rate and Lateral Displacement for R-L Series

6.0 DATA PLOTS (3 of 4)

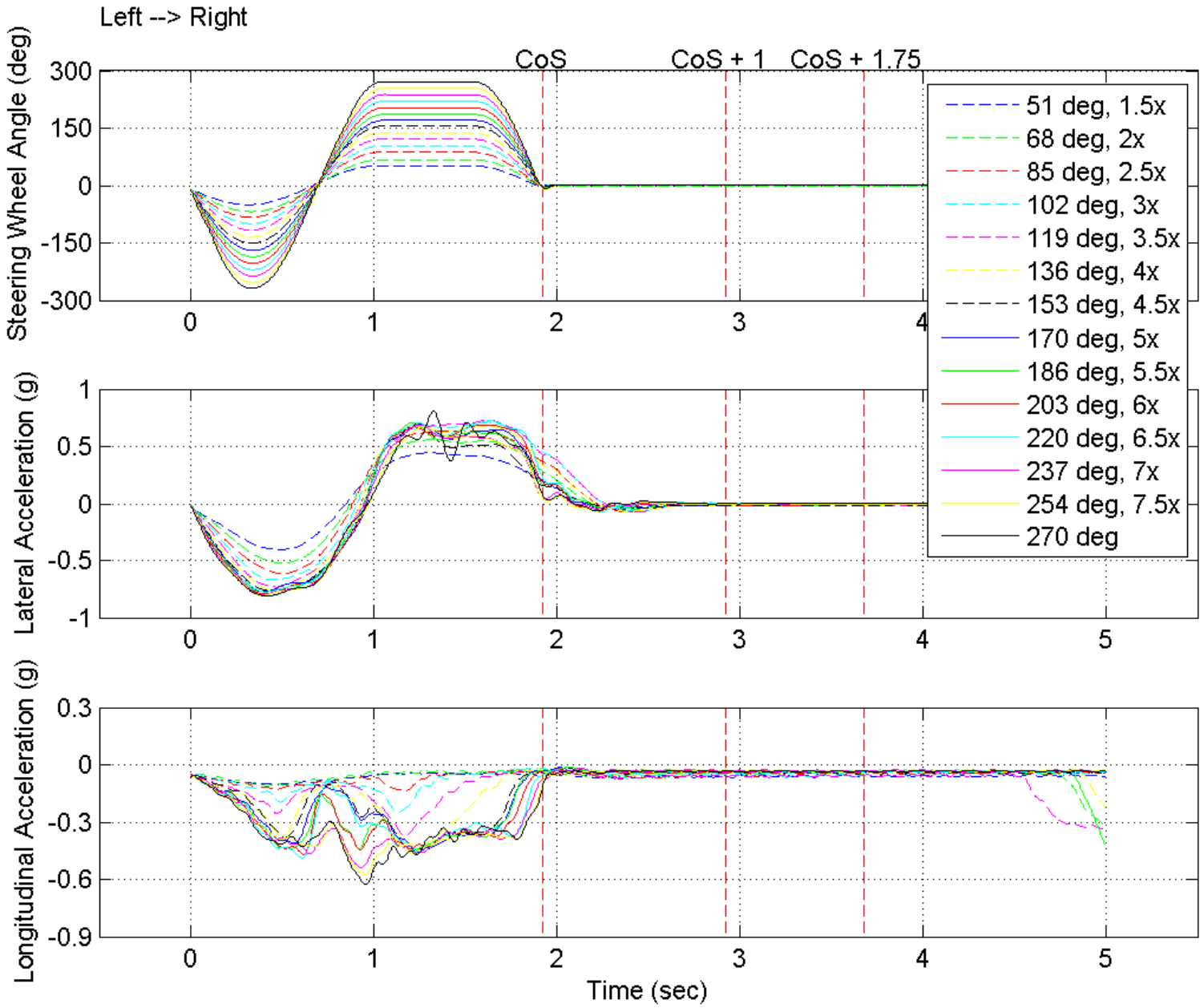


Figure 6.3. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for L-R Series

6.0 DATA PLOTS (4 of 4)

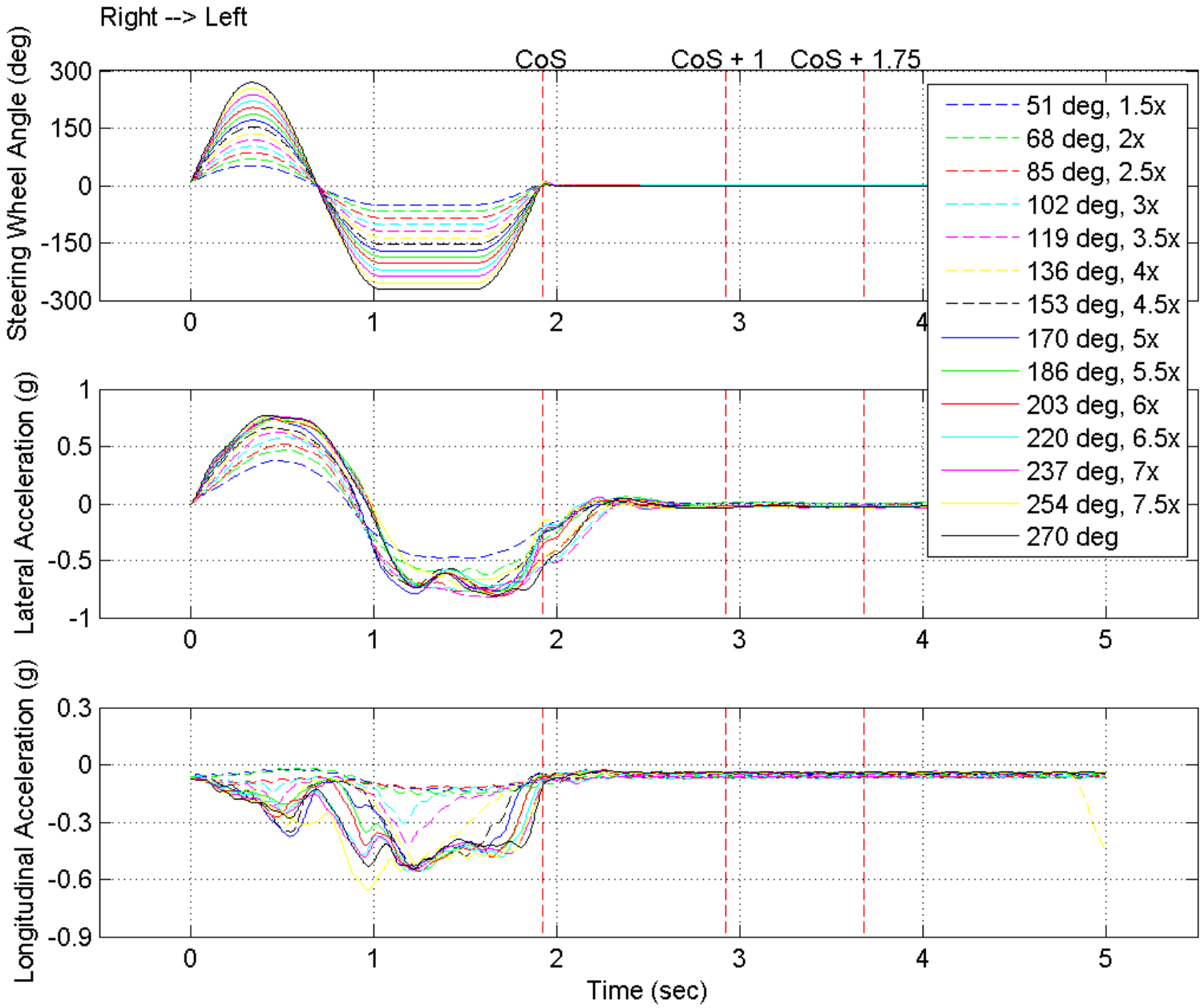


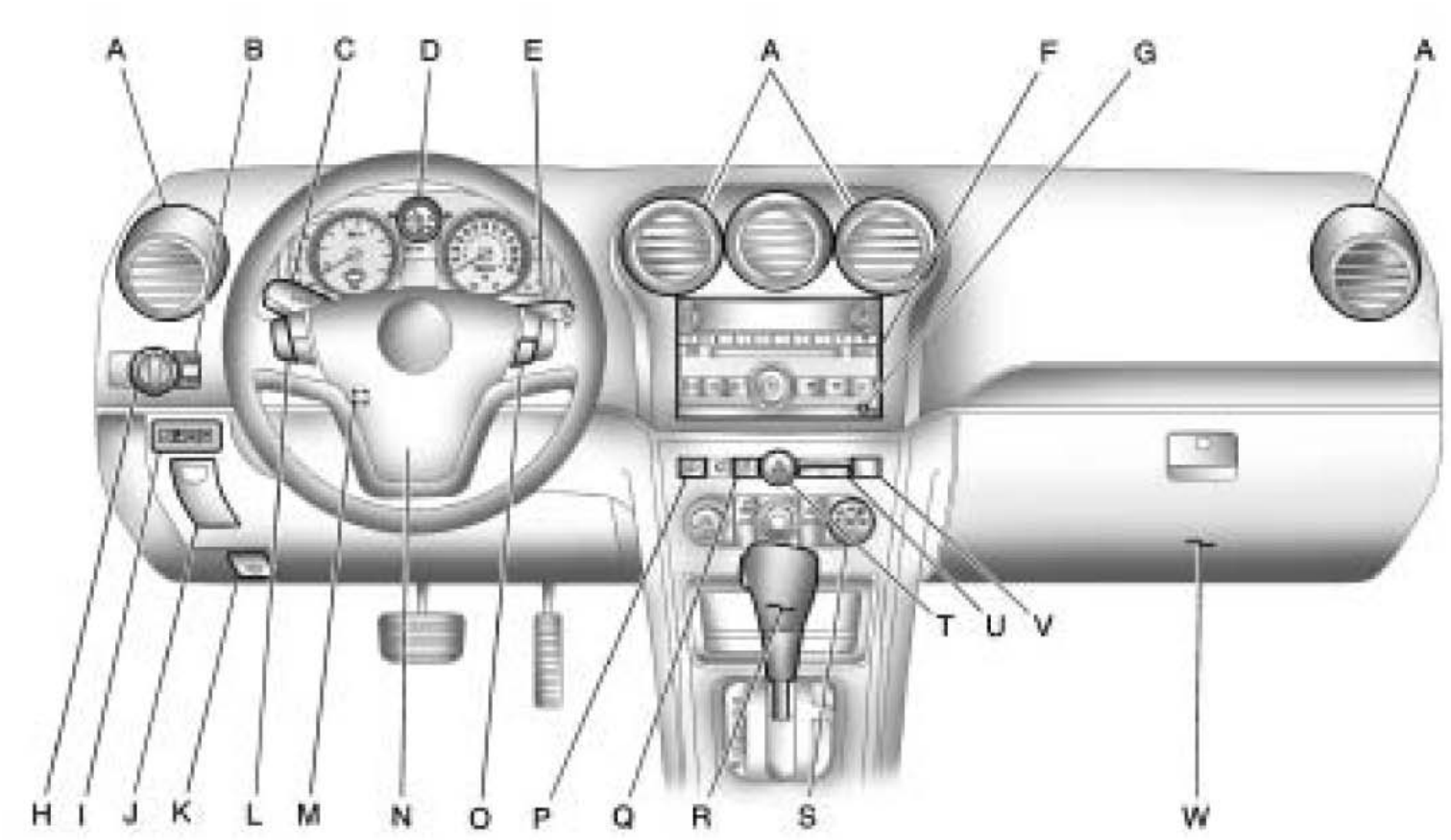
Figure 6.4. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for R-L Series

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

3-4 Instrument Panel

Instrument Panel Overview



The main components of the instrument panel are the following:

A. *Outlet Adjustment on page 3-25.*

B. *Instrument Panel Brightness on page 3-14.*

C. *Turn Signal/Multifunction Lever on page 3-6.*

D. *Instrument Panel Cluster on page 3-28.*

E. *Windshield Wipers on page 3-7.*

F. *Audio System(s) on page 3-64.*

G. Auxiliary Input Jack. See *Radio(s) on page 3-66.*

H. *Fog Lamps on page 3-13. Exterior Lamps on page 3-12.*

I. *Driver Information Center (DIC) on page 3-43.*

J. *Instrument Panel Storage on page 2-38.*

K. *Hood Release on page 5-11.*

L. *Cruise Control on page 3-9.*

M. *Tilt Wheel on page 3-6.*

N. *Horn on page 3-5.*

O. *Audio Steering Wheel Controls on page 3-90.*

P. *Rear Window Wiper/Washer on page 3-9.*

Q. *Traction Control System (TCS) on page 4-8.*

R. Shift Lever. See *Automatic Transmission Operation (Uplevel) on page 2-19* or *Automatic Transmission Operation (Base) on page 2-22.*

S. *Climate Control System on page 3-17* or *Automatic Climate Control System on page 3-21* (If Equipped).

T. *Hazard Warning Flashers on page 3-5.*

U. *Passenger Airbag Status Indicator on page 3-31.*

V. *Safety Belt Reminders on page 3-29.*

W. *Glove Box on page 2-37.*

Hazard Warning Flashers

(Hazard Warning Flasher): Press this button located on the instrument panel, to make the front and rear turn signal lamps flash on and off. This warns others that you are having trouble.

Press again to turn the flashers off.

Horn

Press near or on the horn symbols on the steering wheel pad to sound the horn.

Warning Lights, Gages, and Indicators

Warning lights and gages can signal that something is wrong before it becomes serious enough to cause an expensive repair or replacement. Paying attention to the warning lights and gages could prevent injury.

Warning lights come on when there may be or is a problem with one of the vehicle's functions. Some warning lights come on briefly when the engine is started to indicate they are working.

Gages can indicate when there may be or is a problem with one of the vehicle's functions. Often gages and warning lights work together to indicate a problem with the vehicle.

When one of the warning lights comes on and stays on while driving, or when one of the gages shows there may be a problem, check the section that explains what to do. Follow this manual's advice. Waiting to do repairs can be costly and even dangerous.

3-28 Instrument Panel

Instrument Panel Cluster

The instrument cluster is designed to indicate how the vehicle is running. It shows how fast the vehicle is going, about how much fuel the vehicle has left, and many other things needed to drive safely and economically.

United States Base version shown, Canada and Uplevel similar

Speed Sensitive Power Steering (SSPS) Warning Light

The speed sensitive power steering (SSPS) light comes on briefly when the ignition is turned to ON/RUN as a check to show it is working.

If it does not come on have the vehicle serviced by your dealer/retailer.

If the SSPS light stays on, or comes on while driving, the SSPS system may not be working. If this happens, see your dealer/retailer for service.

Traction Control System (TCS) Warning Light

The Traction Control System (TCS) Warning Light shows one of these two symbols.

This light comes on briefly as the engine is started. If it does not come on have the vehicle serviced by your dealer/retailer.

It also comes on when the Traction Control System (TCS) has been turned off or when the Electronic Stability Program (ESP) is not ready. If there is a problem with the TCS or the ESP, this light and the TCS warning light comes on at the same time. See *Traction Control System (TCS) on page 4-8* and *StabiliTrak® System on page 4-7* for more information.

StabiliTrak® Indicator Light

The StabiliTrak® light comes on briefly as the engine is started. If it does not come on have the vehicle serviced by your dealer/retailer.

This light flashes while the StabiliTrak or the Traction Control System (TCS) is working. The light comes on when the ESP has been turned off and if there is a problem with the StabiliTrak or the TCS. See *Traction Control System (TCS) on page 4-8* and *StabiliTrak® System on page 4-7* for more information.

If the DIC display does not show a heading, for example, N for North, or the heading does not change after making turns, there may be a strong magnetic field interfering with the compass. Such interference may be caused by a magnetic CB or cell phone antenna mount, a magnetic emergency light, magnetic note pad holder, or any other magnetic item. Turn off the vehicle, move the magnetic item, then turn on the vehicle and calibrate the compass.

To calibrate the compass, use the following procedure:

Compass Calibration Procedure

1. Before calibrating the compass, make sure the compass is set to the variance zone in which the vehicle is located. See "Compass Variance (Zone) Procedure" earlier in this section.

   Do not operate any switches such as window, sunroof, climate controls, seats, etc. during the calibration procedure.
2. Press the vehicle information button until PRESS ✓ TO CALIBRATE COMPAS (Compass) displays.
3. Press the set/reset button to start the compass calibration.
4. The DIC will display CALIBRATING COMPASS: TURN IN CIRCLES. Drive the vehicle in tight circles at less than 5 mph (8 km/h) to complete the calibration. The DIC will display COMPASS CALIBRATION COMPLETE for a few seconds when the calibration is complete. The DIC display will then return to the previous menu.

DIC Warnings and Messages

Messages are displayed on the DIC to notify the driver that the status of the vehicle has changed and that some action may be needed by the driver to correct the condition. Multiple messages may appear one after another.

Some messages may not require immediate action, but you can press any of the DIC buttons, or the trip odometer reset stem on the instrument panel cluster to acknowledge that you received the messages and to clear them from the display.

Some messages cannot be cleared from the DIC display because they are more urgent. These messages require action before they can be cleared. Take any messages that appear on the display seriously and remember that clearing the messages will only make the messages disappear, not correct the problem.

SERVICE AIR BAG

This message displays when there is a problem with the airbag system. Have your vehicle serviced by your dealer/retailer immediately. See *Airbag Readiness Light on page 3-30* for more information.

SERVICE BRAKE SYSTEM

This message displays along with the brake system warning light if there is a problem with the brake system or when the brake fluid level is low. See *Brake System Warning Light on page 3-32*. Have the brake system serviced by your dealer/retailer as soon as possible.

SERVICE POWER STEERING

This message displays if there has been a problem detected with the power steering. See *Steering on page 4-9* for more information.

SERVICE STABILITRAK

This message displays if there has been a problem detected with StabiliTrak®. A warning light also appears on the instrument panel cluster. See *StabiliTrak® Indicator Light on page 3-34*. See *StabiliTrak® System on page 4-7* for more information.

If this message turns on while you are driving, pull off the road as soon as possible and stop carefully. Try resetting the system by turning the ignition off and then back on. If this message still stays on or turns back on again while you are driving, your vehicle needs service. Have the system inspected by your dealer/retailer as soon as possible.

SERVICE TIRE MONITORING SYSTEM

On vehicles with the Tire Pressure Monitor System (TPMS), this message displays if a part on the TPMS is not working properly. The tire pressure light also flashes and then remains on during the same ignition cycle. See *Tire Pressure Light on page 3-35*. Several conditions may cause this message to appear. See *Tire Pressure Monitor Operation on page 5-53* for more information. If the warning comes on and stays on, there may be a problem with the TPMS. See your dealer/retailer.

SERVICE TRACTION CONTROL

This message displays when the Traction Control System (TCS) is not functioning properly. A warning light also appears on the instrument panel cluster. See *Traction Control System (TCS) Warning Light on page 3-34* and *Traction Control System (TCS) on page 4-8* for more information. Have the TCS serviced by your dealer/retailer as soon as possible.

SERVICE TRANSMISSION

This message displays when there is a problem with the transmission. See your dealer/retailer for service.

SERVICE VEHICLE SOON

This message displays when a non-emissions related malfunction occurs. Have the vehicle serviced by your dealer/retailer as soon as possible.

STABILITRAK NOT READY

If your vehicle has StabiliTrak, this message may display and the StabiliTrak indicator light on the instrument panel cluster may be on after first driving the vehicle and exceeding 20 mph (32 km/h) for 30 seconds. The StabiliTrak system is not functional until the light has turned off. See *StabiliTrak® System on page 4-7* for more information.

STABILITRAK OFF

If your vehicle has StabiliTrak, this message displays when you turn off the StabiliTrak, or when the stability control has been automatically disabled. To limit wheel spin and realize the full benefits of the stability enhancement system, you should normally leave StabiliTrak on. However, you should turn StabiliTrak off if your vehicle gets stuck in sand, mud, ice, or snow and you want to rock your vehicle to attempt to free it, or if you are driving in extreme off-road conditions and require more wheel spin. See *If Your Vehicle is Stuck in Sand, Mud, Ice, or Snow on page 4-27*. To turn the StabiliTrak system on or off, see *StabiliTrak® System on page 4-7*.

TIGHTEN GAS CAP

This message may display along with the check engine light on the instrument panel cluster if the vehicle's fuel cap is not tightened properly. See *Malfunction Indicator Lamp on page 3-36*. Reinstall the fuel cap fully. See *Filling the Tank on page 5-8*. The diagnostic system can determine if the fuel cap has been left off or improperly installed. A loose or missing fuel cap allows fuel to evaporate into the atmosphere. A few driving trips with the cap properly installed should turn this light and message off.

TIRE LEARNING ACTIVE

On vehicles with the Tire Pressure Monitor System (TPMS), this message displays when the TPMS is re-learning the tire positions on your vehicle. The tire positions must be re-learned after rotating the tires or after replacing a tire or sensor. See *Tire Inspection and Rotation on page 5-56*, *Tire Pressure Monitor System on page 5-51*, and *Inflation - Tire Pressure on page 5-49* for more information.

TRACTION CONTROL OFF

This message displays when the Traction Control System (TCS) turns off. See *StabiliTrak® System on page 4-7* for more information.

This message only displays while the ignition is in ON/RUN and disappears after 10 seconds, unless it is acknowledged or an urgent warning appears.

Any of the following conditions may cause the TCS to turn off:

- The TCS is turned off by pressing the TCS/StabiliTrak button. See *StabiliTrak® System on page 4-7* for more information.
- The battery is low.
- There is a TCS failure. See your dealer/retailer for service.

TRACTION CONTROL ON

This message displays when the Traction Control System (TCS) turns on. See *StabiliTrak® System on page 4-7* for more information.

TRANSMISSION HOT IDLE ENGINE

Notice: **If you drive your vehicle while the transmission fluid is overheating and the transmission temperature warning is displayed on the instrument panel cluster and/or DIC, you can damage the transmission. This could lead to costly repairs that would not be covered by your warranty. Do not drive your vehicle with overheated transmission fluid or while the transmission temperature warning is displayed.**

This message displays along with a chime if the transmission fluid in the vehicle gets hot. Driving with the transmission fluid temperature high can cause damage to the vehicle. Stop the vehicle and let it idle to allow the transmission to cool. This message clears and the chime stops when the fluid temperature reaches a safe level.

TURN SIGNAL ON

This message displays and a chime sounds as a reminder to turn off the turn signal if you drive your vehicle for more than about 3/4 mile (1.2 km) with a turn signal on. See *Turn and Lane-Change Signals on page 3-6* for more information.

StabiliTrak® System

The vehicle has a vehicle stability enhancement system called StabiliTrak which combines antilock brake, traction and stability control systems and helps the driver maintain directional control of the vehicle in most driving conditions.

StabiliTrak activates when the computer senses a discrepancy between the intended path and the direction the vehicle is actually traveling. StabiliTrak selectively applies braking pressure at any one of the vehicle's brakes to assist the driver with keeping the vehicle on the intended path.

When the vehicle is started and begins to move, the system performs several diagnostic checks to insure there are no problems. The system may be heard or felt while it is working. This is normal and does not mean there is a problem with the vehicle.

This light is located on the instrument panel cluster.

It will flash when StabiliTrak is both on and activated.

If the system fails to turn on or activate, this light will be on solid. When the light is on solid, the system will not assist the driver maintain directional control of the vehicle. Adjust your driving accordingly.

The StabiliTrak system automatically comes on whenever the vehicle is started. To assist the driver with vehicle directional control, especially in slippery road conditions, the system should always be left on. StabiliTrak can be turned off if needed.

The Traction Control System (TCS)/StabiliTrak button is located on the instrument panel.

TCS can be turned off or turned on by pressing and releasing the TCS/StabiliTrak button. To disable both StabiliTrak and TCS, press and hold the button until the TCS/StabiliTrak warning light turns on solid.

It is recommended to leave the system on for normal driving conditions, but it may be necessary to turn the system off if the vehicle is stuck in sand, mud, ice or snow, and you want to "rock" the vehicle to attempt to free it.

StabiliTrak may also turn off automatically if it determines that a problem exists with the system.

The TCS/StabiliTrak warning light will be on solid to warn the driver that StabiliTrak is disabled and requires service. If the problem does not clear itself after restarting the vehicle, see your dealer/retailer for service.

If cruise control is being used when StabiliTrak activates, the cruise control automatically disengages. The cruise control can be re-engaged when road conditions allow. See *Cruise Control on page 3-9*.

Trailer Sway Control (TSC)

The vehicle has a Trailer Sway Control (TSC) feature as part of the StabiliTrak system. If the vehicle is towing a trailer and the system detects that the trailer is swaying, the vehicle's brakes are applied without the driver pressing the brake pedal. The TCS/StabiliTrak warning light will flash on the instrument panel cluster to notify the driver to reduce speed.

If the trailer continues to sway, StabiliTrak will reduce engine torque to help slow the vehicle.

Adding non-dealer/non-retailer accessories can affect the vehicle's performance. See *Accessories and Modifications on page 5-3* for more information.

Traction Control System (TCS)

The vehicle has a Traction Control System (TCS) that limits wheel spin. This is especially useful in slippery road conditions. The system operates only if it senses that any of the drive wheels are spinning or beginning to lose traction. When this happens, TCS applies the brakes to limit wheel spin and also reduces engine power. The system may be heard or felt while it is working, but this is normal.

OFF

This light will flash when TCS is limiting wheel spin.

It is recommended to leave the system on for normal driving conditions, but it may be necessary to turn the system off if the vehicle is stuck in sand, mud, ice, or snow, and you want to "rock" the vehicle to attempt to free it. See *Rocking Your Vehicle to Get It Out on page 4-27* and *If Your Vehicle is Stuck in Sand, Mud, Ice, or Snow on page 4-27* for more information.

The TCS/StabiliTrak® button is located on the instrument panel.

Press and release this button to turn off TCS. The TCS warning light will be displayed on the instrument panel cluster. The traction control system can be turned back on by pressing the TCS/StabiliTrak button.

If the system is limiting wheel spin when the button is pressed, the system will not turn off until there is no longer a current need to limit wheel spin. The system can be turned back on at any time by pressing the button again. If the TCS light does not come on, TCS may not be functioning properly and the vehicle should be serviced at your dealer/retailer.

Adding non-dealer/non-retailer accessories can affect the vehicle's performance. See *Accessories and Modifications on page 5-3* for more information.

All-Wheel Drive (AWD) System

If the vehicle has all-wheel drive (AWD), the AWD system operates automatically without any action required by the driver. If the front drive wheels begin to slip, the rear wheels will automatically begin to drive the vehicle as required. There may be a slight engagement noise during hard use but this is normal.

This light is located on the instrument panel cluster.

It will come on and stay on to indicate there may be a problem with the drive system and service is required. If the light stays on, it must be reset. To reset the light, turn the ignition off and then back on again. If the light stays on, see your dealer/retailer for service.

If the vehicle is exposed to extended heavy AWD usage, the AWD system will shut off to protect the system from overheating. When the system cools down, the AWD system will activate again automatically; this cool-down can take up to 20 minutes depending on outside temperature and vehicle use.

Steering

Electric Power Steering

If the vehicle has the electric power steering system and the engine stalls while driving, the power steering assist system will continue to operate until you are able to stop the vehicle. If power steering assist is lost because the electric power steering system is not functioning, the vehicle can be steered but it will take more effort.

The following information has many time-tested, important trailering tips and safety rules. Many of these are important for your safety and that of your passengers. So please read this section carefully before pulling a trailer.

Load-pulling components such as the engine, transmission, rear axle, wheel assemblies and tires are forced to work harder against the drag of the added weight. The engine is required to operate at relatively higher speeds and under greater loads, generating extra heat. The trailer also adds considerably to wind resistance, increasing the pulling requirements.

The vehicle has Trailer Sway Control (TSC). See "Trailer Sway Control (TSC)" in *StabiliTrak® System on page 4-7* for more information.

Pulling A Trailer

Here are some important points:

- There are many different laws, including speed limit restrictions, having to do with trailering. Make sure the rig will be legal, not only where you live but also where you will be driving. A good source for this information can be state or provincial police.
- Do not tow a trailer at all during the first 500 miles (800 km) the new vehicle is driven. The engine, axle or other parts could be damaged.
- Then, during the first 500 miles (800 km) that a trailer is towed, do not drive over 50 mph (80 km/h) and do not make starts at full throttle. This helps the engine and other parts of the vehicle wear in at the heavier loads.
- Vehicles can tow in D (Drive). Shift the transmission to a lower gear if the transmission shifts too often under heavy loads and/or hilly conditions.
- Obey speed limit restrictions when towing a trailer. Do not drive faster than the maximum posted speed for trailers, or no more than 55 mph (90 km/h), to save wear on the vehicle's parts.
- Do not tow a trailer when the outside temperature is above 100°F (38°C).

Three important considerations have to do with weight:

- The weight of the trailer
- The weight of the trailer tongue
- The total weight on the vehicle's tires

Hitches

It is important to have the correct hitch equipment. Crosswinds, large trucks going by and rough roads are a few reasons why the right hitch is needed.

- The rear bumper on the vehicle is not intended for hitches. Do not attach rental hitches or other bumper-type hitches to it. Use only a frame-mounted hitch that does not attach to the bumper.
- Will any holes be made in the body of the vehicle when the trailer hitch is installed? If so, be sure to seal the holes when the hitch is removed. If they are not sealed, deadly carbon monoxide (CO) from the engine's exhaust can get into the vehicle. See *Engine Exhaust on page 2-27*. Sealing the holes will also prevent dirt and water from entering the vehicle.

Safety Chains

Always attach chains between the vehicle and the trailer. Cross the safety chains under the tongue of the trailer to help prevent the tongue from contacting the road if it becomes separated from the hitch. Instructions about safety chains may be provided by the hitch manufacturer or by the trailer manufacturer. Follow the manufacturer's recommendation for attaching safety chains and do not attach them to the bumper. Always leave just enough slack so the rig can turn. Never allow safety chains to drag on the ground.

Trailer Brakes

A loaded trailer that weighs more than 1,000 lbs (900 kg) needs to have its own brake system that is adequate for the weight of the trailer. Be sure to read and follow the instructions for the trailer brakes so they are installed, adjusted and maintained properly. Because the vehicle has StabiliTrak®, do not try to tap into the vehicle's hydraulic brake system. If you do, both brake systems will not work well, or at all.

Driving with a Trailer

⚠ CAUTION

When towing a trailer, exhaust gases may collect at the rear of the vehicle and enter if the liftgate, trunk/hatch, or rear-most window is open.

Engine exhaust contains carbon monoxide (CO) which cannot be seen or smelled. It can cause unconsciousness and even death.

(Continued)

7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO.: DTNH22-08-D-00098
DATE: 5/18/2009

From: *Saturn of Riverside*

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

To: *Dynamic Research, Inc*

Vehicle VIN: *3GSCL33PX9S582679* NHTSA NO.: *C90112*

Model Year: *2009* Odometer Reading: *49 Miles*
Make: *Saturn* Body Style: *MPV*
Model: *Vue* Body Color: *Silver*
Manufacture Date: 11/08 Dealer: *Saturn of Riverside*
GVWR (kg/lb) *2189/4825* 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: *5/18/2009*

APPROVED BY: *B Kebschull* DATE APPROVED: *6/9/2009*

7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO.: DTNH22-08-D-00098
DATE: 7/06/2009

Vehicle VIN: *3GSCL33PX9S582679* NHTSA NO.: *C90112*

Model Year: *2009* Odometer Reading: *93 Miles*
Make: *Saturn* Body Style: *MPV*
Model: *Saturn* Body Color: *Silver*
Manufacture Date: *11/08* Dealer: *Saturn of Riverside*
GVWR (kg/lb) *2189 (4825)* Price: *Leased*

LIST OF FMVSS TESTS PERFORMED BY THIS LAB: 126

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

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

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

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE.

REMARKS:

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

None

Explanation for equipment removal:

N/A

Test Vehicle Condition:

Like new

RECORDED BY: *J Lenkeit* DATE RECORDED: *7/06/2009*
APPROVED BY: *B Kebschull* DATE APPROVED: *7/07/2009*

7.4 SINE WITH DWELL TEST RESULTS

2009 Saturn Vue
NHTSA No. 90112
Date of Test 5/28/2009
Date Created 6/11/2009

File	SWA @ 5deg Ct	MES	Time @ 5deg	COS	Time @ COS	MOS	Time @ MOS	YRR1	YR1	YRR 1 Ct	YRR 175	YR17 5	YRR1 75 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)
20	710	49.8	3.541	1091	5.446	847	4.226	-2.27	-0.28	1291	-1.01	-0.12	1441	12.34	942	-4.11	0.33	50.96	775	50.86
21	708	50	3.535	1090	5.445	847	4.226	-1.15	-0.19	1290	-1.4	-0.23	1440	16.59	934	-5.32	0.41	67.87	775	67.75
22	707	49.7	3.53	1090	5.444	846	4.225	-2.12	-0.43	1290	-1.05	-0.21	1440	20.05	926	-6.5	0.45	84.81	775	84.76
23	707	49.8	3.528	1090	5.445	847	4.226	-1.47	-0.34	1290	-1.32	-0.3	1440	23.16	922	-7.4	0.48	101.65	775	101.69
24	707	49.9	3.526	1090	5.443	846	4.225	-2.21	-0.58	1290	-1.77	-0.46	1440	26.06	922	-8.18	0.47	118.75	775	118.68
25	706	49.7	3.525	1090	5.444	846	4.225	-1.62	-0.48	1290	-1.07	-0.32	1440	29.66	923	-8.54	0.5	135.86	775	135.9
26	706	49.8	3.524	1090	5.444	846	4.225	-0.94	-0.32	1290	-0.73	-0.25	1440	33.67	924	-8.99	0.5	153.02	775	153.03
27	706	49.8	3.524	1090	5.444	847	4.226	-0.09	-0.03	1290	0.11	0.04	1440	36.62	925	-9.22	0.51	170.1	775	169.87
28	706	49.7	3.524	1090	5.444	847	4.226	-0.83	-0.32	1290	-0.73	-0.28	1440	38.29	926	-9.59	0.51	186.11	775	186
29	706	49.8	3.523	1090	5.443	847	4.226	-0.41	-0.17	1290	-0.27	-0.11	1440	41.19	926	-9.57	0.51	203.15	775	203
30	706	49.8	3.523	1090	5.443	847	4.226	0	0	1290	0.12	0.05	1440	40.78	924	-9.48	0.51	220.37	775	220.03
31	706	49.9	3.523	1090	5.443	847	4.227	-0.34	-0.13	1290	-0.17	-0.06	1440	36.82	929	-9.73	0.41	237.12	775	236.95
32	706	49.6	3.524	1090	5.443	847	4.227	-0.01	0	1290	0.14	0.06	1440	38.63	934	-9.87	0.35	253.99	775	253.89
33	706	49.9	3.524	1090	5.445	847	4.229	-0.3	-0.12	1290	-0.08	-0.03	1440	39.94	942	-9.97	0.28	269.86	775	269.64
34	709	49.8	3.54	1090	5.445	847	4.226	-1.31	0.17	1290	-0.41	0.06	1440	-13.35	941	3.8	-0.35	51.68	775	51.46
35	708	49.7	3.534	1090	5.444	847	4.226	-1.09	0.2	1290	-0.59	0.11	1440	-18.03	941	4.81	-0.43	68.56	775	68.41
36	708	49.8	3.531	1090	5.444	847	4.226	-0.49	0.11	1290	-0.71	0.16	1440	-22.51	935	5.74	-0.48	85.45	775	85.4
37	707	49.6	3.527	1090	5.443	847	4.226	-0.61	0.15	1290	-0.22	0.06	1440	-25.24	925	6.51	-0.51	102.36	775	102.32
38	706	49.8	3.524	1090	5.442	846	4.225	-0.66	0.19	1290	0.17	-0.05	1440	-28.12	924	7.13	-0.52	119.38	775	119.41
39	706	49.8	3.523	1090	5.444	846	4.225	-0.47	0.15	1290	-0.4	0.12	1440	-31.04	924	7.78	-0.55	136.42	775	136.62
40	706	49.7	3.522	1090	5.445	846	4.225	-0.64	0.22	1290	-0.41	0.14	1440	-33.52	924	8.14	-0.55	153.57	775	153.75
41	706	49.7	3.522	1090	5.444	846	4.225	-0.73	0.27	1290	-0.48	0.18	1440	-36.56	925	8.79	-0.58	170.56	775	170.69
42	706	49.8	3.522	1090	5.444	847	4.226	-0.41	0.17	1290	-0.32	0.13	1440	-40.57	934	9.22	-0.32	186.77	775	186.57
43	706	49.8	3.522	1090	5.443	847	4.226	-0.48	0.21	1290	-0.49	0.21	1440	-43.65	935	9.25	-0.34	203.83	775	203.43
44	706	49.9	3.522	1090	5.442	847	4.226	0.34	-0.16	1290	0.01	-0.01	1440	-45.51	937	9.49	-0.33	221.05	775	220.49
45	706	49.8	3.522	1090	5.442	847	4.226	-0.42	0.2	1290	-0.49	0.23	1440	-47.34	937	9.57	-0.34	238.01	775	237.34
46	706	49.9	3.523	1090	5.444	847	4.227	-0.13	0.06	1290	-0.13	0.05	1440	-41.51	944	9.62	-0.2	255.01	775	254.1
47	706	49.7	3.523	1091	5.45	847	4.228	-0.45	0.23	1291	-0.18	0.09	1441	-51.06	940	9.91	-0.32	270.78	775	269.96

7.5 SLOWLY INCREASING STEER TEST RESULTS

2009 Saturn Vue
NHTSA No. 90112
Date of Test 5/28/2009
Date Created 6/11/2009

File	EventPt	DOS	MES	Mean SPD	AYcount_3	THETAENCF_3	AYCG_CD2_3	r_squared	ZeroBegin	ZeroEnd
			(mph)	(mph)		(deg)	(g)			
10	700	1	50.66	50.95	1207	-33.85	-0.305	0.9931	500	700
11	700	1	49.32	50.33	1204	33.65	-0.300	0.9978	500	700
12	700	1	49.74	49.39	1206	-33.78	-0.300	0.9980	500	700
13	704	0	50.24	50.76	1204	33.72	0.301	0.9978	504	704
14	704	0	49.13	49.39	1222	35.04	0.298	0.9967	504	704
15	705	0	49.35	50.25	1201	33.37	0.298	0.9975	505	705
Averages						33.9	0.300			

Scalars	Steering Angles (deg)
1.5	51
2	68
2.5	85
3	102
3.5	119
4	136
4.5	153
5	169
5.5	186
6	203
6.5	220
7	237
7.5	254
8	270

7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

2009 Saturn Vue
NHTSA No. 90112
Date of Test 5/27/2009
Date Created 5/29/200
Device : 408_05_08_06636
Device certification date : 5/30/2008
Today is : 5/27/2009
Units : inches

C_COORDSYS001 = Mid-point between centers of front wheels @ ground		Ref X	Ref Y	Ref Z
M_PLANE001_Ground_Plane		-	-	0
M_PLANE002_RIGHT_WHEEL		-	34.5094	-
M_PLANE006_LEFT_WHEEL		-	-34.5499	-
M_CIRCLE001_I_Right_Wheel_Axel		-	34.5209	
M_CIRCLE005_I_Left_Wheel_Axel		-	-34.5209	
M_POINT001_Motion_PAK_Left_Side		-68.5796	-2.022	-17.9298
M_Point_ROOF		0	0	-66.1362
(with respect to the Ground Plane)				
-				
Motion Pack Width = 3.05" 1/2 W = 1.525				
Motion_PAK_Location	-68.5796		-0.497	17.9298

Motion Pak ref point taken from mid point of unit on left side

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