126-DRI-11-008
SAFETY COMPLIANCE TESTING FOR FMVSS 126
Electronic Stability Control Systems

Ford Motor Co.
2011 Ford Fiesta
NHTSA No. CB0207

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

30 November 2011

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 2011 Ford Fiesta , NHTSA No. CB0207, 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 2011 Ford Fiesta, 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 2011 Ford Fiesta 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).

- For steering inputs of scalar 5 and greater, 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 3,500 kg (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: *2011 Ford Fiesta*

NHTSA No. *CB0207* VIN: *3FADP4EJ2BM148839*

Vehicle Type: *Passenger Car* Manufacture Date: *10/10*

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: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207* Data Sheet Completion Date: *5/3/2011*

VIN *3FADP4EJ2BM148839* Manufacture Date: *10/10*

GVWR (kg): *1642* Front GAWR (kg): *839* Rear GAWR (kg): *816*

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

Odometer reading at time of inspection: *115 miles (184 km)*

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:

Front axle: *P185/60 R15* Rear axle: *P185/60 R15*

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

		Front Axle		Rear Axle
	Tire Manufacturer:	*Kumho*		*Kumho*
	Tire Model:	*Solus KH25*		*Solus KH25*
	Tire Size:	*P185/60 R15*		*P185/60 R15*
TIN	Left Front:	*COR9 YPL8 2910*	Right Front:	*COR9 YPL8 2910*
	Left Rear:	*COR9 YPL8 2910*	Right Rear:	*COR9 YPL8 2910*

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) [X] 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- ESC on*
Drive Configuration:
Mode:
Drive Configuration:
Mode:

VEHICLE STABILITY SYSTEMS (Check applicable technologies):

List other systems:

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

REMARKS:

RECORDED BY: *J. Lenkeit* DATE RECORDED: *5/3/2011*
APPROVED BY: *B. Kebschull* DATE APPROVED: *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No *CB0207* Data Sheet Completion Date: *4/22/2011*

ESC SYSTEM IDENTIFICATION

Manufacturer/Model *Conti MK60 EC Diagonal Split System*

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: *Brake light switch, Engine management ECU*

ESC OPERATIONAL CHARACTERISTICS

System is capable of generating brake torque at each wheel — [X] Yes (Pass) / [ ] No (Fail)
Brief explanation: *Hydraulic control unit (HCU) with integrated electronic control unit (ECU) including primary pressure sensor*

System is capable of determining yaw rate — [X] Yes (Pass) / [ ] No (Fail)
Brief explanation: *Yaw Rate Sensor*

System is capable of monitoring driver steering input — [X] Yes (Pass) / [ ] No (Fail)
Brief explanation: *Steering Wheel Angle Sensor*

System is capable of estimating side slip or side slip derivative — [X] Yes (Pass) / [ ] No (Fail)
Brief explanation: *Estimated by control module "observer" based on wheel speeds, steering angle, yaw rate, and lateral acceleration measurements*

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. Method used to modify torque: *Engine torque output is managed by reducing air flow, altering spark timing and/or selectively turning off fuel injectors*

X Yes (Pass)
___ No (Fail)

System is capable of activation at speeds of 20 km/h (12.4 mph) and higher

Speed system becomes active: *14.4 km/h*

X Yes (Pass)
___ No (Fail)

System is capable of activation during the following driving phases:
- acceleration
- braking
- coasting
- during activation of ABS or traction control

X Yes (Pass)
___ No (Fail)

Driving phases during which ESC is capable of activation:
Forward driving above 14.4 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: *4/22/2011*
APPROVED BY: *B. Kebschull* DATE APPROVED: *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207* Data Sheet completion date: *4/13/2011*

ESC Malfunction Telltale

Vehicle is equipped with malfunction telltale? *Yes*

Telltale Location: *Instrument panel, within speedometer*

Telltale Color: *Yellow*

Telltale symbol or abbreviation used

or **ESC**

[X] Vehicle uses this symbol

[ ] Vehicle uses this abbreviation

[ ] Neither symbol or abbreviation is used

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

Is telltale part of a common space? *No*

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

If yes explain telltale operation during ESC activation:

Telltale flashes during ESC (or TCS) activation, remains lit during malfunction.

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? *No*

Is "ESC Off" telltale combined with "ESC Malfunction" telltale utilizing a two part telltale? *NA*

Telltale Location: *NA*

Telltale Color: *NA*

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.

Is telltale part of a common space? *NA*

DATA INDICATES COMPLIANCE ***Yes***

(Vehicle is compliant if equipped with a malfunction telltale)

Remarks: *This vehicle does not have an ESC off telltale or a control for deactivating the ESC system.*

RECORDED BY: *J Lenkeit* DATE RECORDED: *4/13/2011*

APPROVED BY: *B. Kebschull* DATE APPROVED: *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207* Data Sheet completion date: *4/13/2011*

"ESC OFF" Controls Identification and Operational Check:

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

Second Control: Location ___
Labeling ___
Modes ___

Identify standard or default drive configuration *FWD*

Verify standard or default drive configuration **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 NA ___ 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 NA ___ Yes ___ No (Fail)

If no, describe how the "Off" control functions

This vehicle does not have an ESC off control

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)
NA		

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__ NA ____ 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? ____ Yes __X__ No

Ancillary Control: System NA

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 ancillary 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		

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	

For each ancillary 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.

___ Yes ___ No (Fail) X NA

DATA INDICATES COMPLIANCE: PASS

Remarks: *This vehicle does not have an ESC off mode*

RECORDED BY: *J Lenkeit* DATE RECORDED: *4/13/2011*
APPROVED BY: *B. Kebschull* DATE APPROVED: *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207* Data Sheet completion date: *5/4/2011*

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

Peak Friction Coefficient (at least 0.9) *0.957*

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

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

Coolant *Yes* *Oil, Washer Fluid, Brake Fluid*

Tire Pressures:

Required; Front Axle *220* kPa Rear Axle *220* kPa

Actual; LF *220* kPa RF *220* kPa

LR *220* kPa RR *220* kPa

Vehicle Dimensions: Front Track Width *146.6* cm Wheelbase *248.9* cm

Rear Track Width *146.0* cm

Vehicle Weight Ratings: GAWR Front *839.0* kg GAWR Rear *816.0* kg

Unloaded Vehicle Weight (UVW):

Front Axle *713.1* kg Left Front *364.7* kg Right Front *348.4* kg

Rear Axle *464.9* kg Left Rear *240.4* kg Right Rear *224.5* kg

Total UVW *1178.0* kg

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

Calculated baseline weight (UVW + 73kg) *1251.0* kg

Outrigger size required ("Standard" or "Heavy") *None*

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 *NA* kg Left front *NA* kg Right front *NA* kg

Rear axle *NA* kg Left rear *NA* kg Right rear *NA* kg

Total UVW with outriggers *NA* kg

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

Front axle *778.4* kg Left front *404.6* kg Right front *374.2* kg

Rear axle *535.2* kg Left rear *278.5* kg Right rear *256.7* kg

Vehicle Weight *1314.0* kg

Ballast Required =

[Total UVW with Outriggers (if applicable)]		+ *168*	kg	- [Loaded Weight w/Driver and Instrumentation)]	
= *1178.0*	kg	+ *168*	kg	- 1314.0	kg

= *32.0* kg

Total Loaded Vehicle Weight w/Driver and Instrumentation and Ballast

Front axle *789.6* kg Left front *403.2* kg Right front *386.4* kg

Rear axle *555.1* kg Left rear *287.5* kg Right rear *267.6* kg

Total UVW *1344.7* 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	*40.5*	in	*102.8*	cm	*63.7*	in	*161.8*	cm
y-distance	*-0.8*	in	*-2.0*	cm	*-0.6*	in	*-1.6*	cm
z-distance	*22.0*	in	*55.8*	cm	*16.0*	in	*40.6*	cm
Roof Height			*57.769*	in			*146.73*	cm
Distance between ultrasonic sensors			*80.8*	in			*205.1*	cm

Remarks:

RECORDED BY: *B. Kebschull* DATE RECORDED: *5/4/2011*
APPROVED BY: *P. Broen* DATE APPROVED: *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207*

Measured tire pressure: LF *227* kPa RF *228* kPa

LR *228* kPa RR *227* kPa

Wind Speed *2* 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)) *24.2* °C

Brake Conditioning Time: *11:20:00 AM* Date: *5/4/2011*

56 km/h (35 mph) Brake Stops

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

Observed deceleration 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 range *0.85 - 0.95* 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: *11:33:00 AM* Date: *5/4/2011*

Measured cold tire pressure LF *251* kPa RF *249* kPa

LR *245* kPa RR *243* kPa

Wind Speed *2.9* 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)) *26.8*°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	*0.42*
2	3	56 ± 2 (35 ± 1)	*80*	0.5 - 0.6	*0.58*
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:
80 **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)	*80* (cycles 1-10)	0.5 - 0.6	*0.58*
4	*7*	56 ± 2 (35 ± 1)	*80* (cycles 1-9)	0.5 - 0.6	*0.58*
			160 (cycle10)*	NA	*0.85*

* 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: *1:35:00 PM* Date: *5/4/2011*

Measured cold tire pressure LF *246* kPa RF *253* kPa

LR *240* kPa RR *241* kPa

Wind Speed *3.7* 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)) *29.2* °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:

80 **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)	*80* (cycles 1-10)	0.5 - 0.6	*0.58*
4	*20*	56 ± 2 (35 ± 1)	*80* (cycles 1-9)	0.5 - 0.6	*0.58*
			160 (cycle 10)*	NA	*0.85*

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

Remarks:

RECORDED BY: *P. Broen* DATE RECORDED: *5/4/2011*

APPROVED BY: *B. Kebschull* DATE APPROVED: *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207*

Measured tire pressure: LF *254* kPa RF *246* kPa

LR *245* kPa RR *240* kPa

Wind Speed *2.5* m/s

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

Ambient Temperature (7°C (45°F) - 40°C (104°F)) *27* °C

Selected drive configuration *FWD*

Selected Mode: *Default- ESC on*

Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle

$a_{y,30degrees}$ = *0.41* g

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

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

δ_{sis} = *40.2* degrees (@.55g)

δ_{sis} = *40* 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	*12:52*	*-25.4*	*11*	*Good*
2	Left	*12:55*	*-25.2*	*12*	*Good*
3	Left	*12:58*	*-25.6*	*13*	*Good*
4	Left				
5	Left				
1	Right	*13:01*	*24.8*	*14*	*Good*
2	Right	*13:04*	*24.5*	*15*	*Good*
3	Right	*13:07*	*24.5*	*16*	*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:

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

$\delta_{0.3\ g,\ overall}$ = *25.0* degrees

[to nearest 0.1 degree]

Remarks:

RECORDED BY: *P. Broen* DATE RECORDED: *5/4/2011*
APPROVED BY: *B. Kebschull* DATE APPROVED: *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207* Data sheet completion date: *5/4/2011*

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: *FWD*

Selected Mode: *Default*

Overall steering wheel angle ($\delta_{0.3\ g,\ overall}$) *25.0* 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
23	14:41	1.5	38	12.95	-0.10	-0.16	-0.75	PASS	-1.27	PASS
24	14:44	2.0	50	16.81	-0.05	-0.03	-0.31	PASS	-0.18	PASS
25	14:49	2.5	62	21.57	-0.03	0.15	-0.14	PASS	0.72	PASS
26	14:53	3.0	75	23.98	-0.09	0.02	-0.38	PASS	0.06	PASS
27	14:56	3.5	88	29.53	-0.08	-0.14	-0.26	PASS	-0.49	PASS
28	15:01	4.0	100	32.15	-0.11	0.11	-0.34	PASS	0.36	PASS
29	15:04	4.5	112	34.20	-0.31	-0.06	-0.91	PASS	-0.18	PASS
30	15:07	5.0	125	39.15	-0.05	0.04	-0.13	PASS	0.11	PASS
31	15:12	5.5	138	43.44	0.14	0.11	0.31	PASS	0.25	PASS
32	15:15	6.0	150	48.15	0.38	-0.03	0.79	PASS	-0.07	PASS
33	15:18	6.5	162	51.70	0.11	0.08	0.21	PASS	0.16	PASS
34	15:21	7.0	175	53.92	0.10	-0.04	0.19	PASS	-0.08	PASS
35	15:24	7.5	188	56.48	0.24	-0.02	0.43	PASS	-0.04	PASS
36	15:28	8.0	200	58.41	0.20	-0.13	0.34	PASS	-0.22	PASS
37	15:32	8.5	212	60.61	0.53	0.04	0.87	PASS	0.07	PASS
38	15:35	9.0	225	61.28	0.09	0.20	0.15	PASS	0.33	PASS
39	15:38	9.5	238	61.56	-0.19	-0.09	-0.31	PASS	-0.14	PASS
40	15:41	10.0	250	64.53	-0.03	-0.01	-0.05	PASS	-0.01	PASS
41	15:45	10.5	262	64.26	-5.20	-0.04	-8.10	PASS	-0.07	PASS
42	15:48	-	270	62.44	-1.97	0.01	-3.15	PASS	0.02	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 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
43	15:56	1.5	38	-13.22	0.14	-0.02	-1.08	PASS	0.15	PASS
45	15:59	2.0	50	-17.38	0.15	0.15	-0.83	PASS	-0.89	PASS
46	16:02	2.5	62	-21.65	0.10	-0.05	-0.47	PASS	0.23	PASS
47	16:05	3.0	75	-24.90	0.22	0.01	-0.89	PASS	-0.04	PASS
48	16:08	3.5	88	-29.67	-0.10	-0.09	0.35	PASS	0.29	PASS
49	16:11	4.0	100	-31.97	0.14	0.14	-0.45	PASS	-0.43	PASS
50	16:14	4.5	112	-37.36	0.18	-0.02	-0.48	PASS	0.06	PASS
51	16:17	5.0	125	-39.15	0.41	0.26	-1.05	PASS	-0.66	PASS
52	16:19	5.5	138	-44.63	0.58	0.22	-1.29	PASS	-0.48	PASS
53	16:22	6.0	150	-48.20	-0.01	-0.28	0.01	PASS	0.57	PASS
54	16:25	6.5	162	-52.76	0.53	0.27	-1.00	PASS	-0.52	PASS
55	16:28	7.0	175	-55.12	0.09	-0.10	-0.17	PASS	0.19	PASS
56	16:31	7.5	188	-57.77	-0.05	-0.07	0.08	PASS	0.12	PASS
57	16:35	8.0	200	-59.31	-0.04	0.19	0.06	PASS	-0.32	PASS
58	16:38	8.5	212	-61.84	-0.10	-0.01	0.16	PASS	0.02	PASS
59	16:40	9.0	225	-64.72	-0.72	-0.15	1.12	PASS	0.23	PASS
60	16:43	9.5	238	-66.41	-0.91	-0.10	1.37	PASS	0.14	PASS
61	16:49	10.0	250	-65.78	-0.51	-0.24	0.78	PASS	0.36	PASS
62	16:53	10.5	262	-65.72	-0.42	-0.08	0.64	PASS	0.13	PASS
63	16:55	-	270	-66.03	-0.81	0.05	1.23	PASS	-0.07	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	[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 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
30	Counter Clockwise	5.0	125	-3.1	*PASS*
31	Counter Clockwise	5.5	138	-3.3	*PASS*
32	Counter Clockwise	6.0	150	-3.4	*PASS*
33	Counter Clockwise	6.5	162	-3.4	*PASS*
34	Counter Clockwise	7.0	175	-3.5	*PASS*
35	Counter Clockwise	7.5	188	-3.5	*PASS*
36	Counter Clockwise	8.0	200	-3.6	*PASS*
37	Counter Clockwise	8.5	212	-3.6	*PASS*
38	Counter Clockwise	9.0	225	-3.6	*PASS*
39	Counter Clockwise	9.5	238	-3.6	*PASS*
40	Counter Clockwise	10.0	250	-3.6	*PASS*
41	Counter Clockwise	10.5	262	-3.5	*PASS*
42	Counter Clockwise	11.0	-	-3.5	*PASS*
51	Clockwise	5.0	125	3.1	*PASS*
52	Clockwise	5.5	138	3.2	*PASS*
53	Clockwise	6.0	150	3.3	*PASS*
54	Clockwise	6.5	162	3.4	*PASS*
55	Clockwise	7.0	175	3.4	*PASS*
56	Clockwise	7.5	188	3.4	*PASS*
57	Clockwise	8.0	200	3.5	*PASS*
58	Clockwise	8.5	212	3.5	*PASS*
59	Clockwise	9.0	225	3.6	*PASS*
60	Clockwise	9.5	238	3.5	*PASS*
61	Clockwise	10.0	250	3.5	*PASS*
62	Clockwise	10.5	262	3.5	*PASS*
63	Clockwise	11.0	-	3.5	*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: *B. Kebschull* DATE RECORDED: *5/4/2011*

APPROVED BY: *P. Broen* DATE APPROVED: *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207* Data Sheet Completion Date: *5/4/2011*

TEST 1

MALFUNCTION SIMULATION: Describe method of malfunction simulation

Disconnected left rear 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 ± 5 mph) 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 ± 5 mph) is reached.

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

TEST 1 DATA INDICATES COMPLIANCE: *PASS*

Remarks: *Telltale illuminated immediately upon ignition, after sensor was disconnected, and extinguished immediately upon ignition after sensor was reconnected. No driving was required.*

RECORDED BY: *B. Kebschull* DATE RECORDED: *5/4/2011*

APPROVED BY: *P. Broen* DATE APPROVED *5/4/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Ford Fiesta Passenger Car*

NHTSA No. *CB0207* Data Sheet Completion Date: *5/4/2011*

TEST 2

MALFUNCTION SIMULATION: Describe method of malfunction simulation

Removed ESC pump motor fuse.

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 ± 5 mph) 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 ± 5 mph) is reached.

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

TEST 2 DATA INDICATES COMPLIANCE: PASS

Remarks: *Telltale illuminated immediately upon ignition, after fuse was removed. Telltale extinguished after fuse was reconnected and vehicle was driven at approximately 10 mph.*

RECORDED BY: *B. Kebschull* DATE RECORDED: *5/4/2011*

APPROVED BY: *P. Broen* DATE APPROVED *5/4/2011*

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:2/22/11 Due: 2/22/12
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: DRI Date: 2/23/11 Due: 2/23/12
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: 3/30/11 Due: 3/30/12
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: 3/8/11 Due: 3/8/12
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: 5/3/11 Due: 5/3/12
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: 2/22/11 Due: 2/21/12
						DOT-NHTSA D3272	By: DRI Date: 2/22/11 Due: 2/22/12

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: 3/29/11 Due: 3/29/12
					SoMat High level Board EHLS	MSHLS.03-3182	By: DRI Date: 3/29/11 Due: 3/29/12
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	Operationally verified 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; DRI Date: 11/7/10 Due: 11/7/11
Outriggers	No output. Safety Item.	NA	NA	NA	DRI manufactured Aluminum meeting the weight and MOI specifications of Docket 2007-27662-11	NA	NA

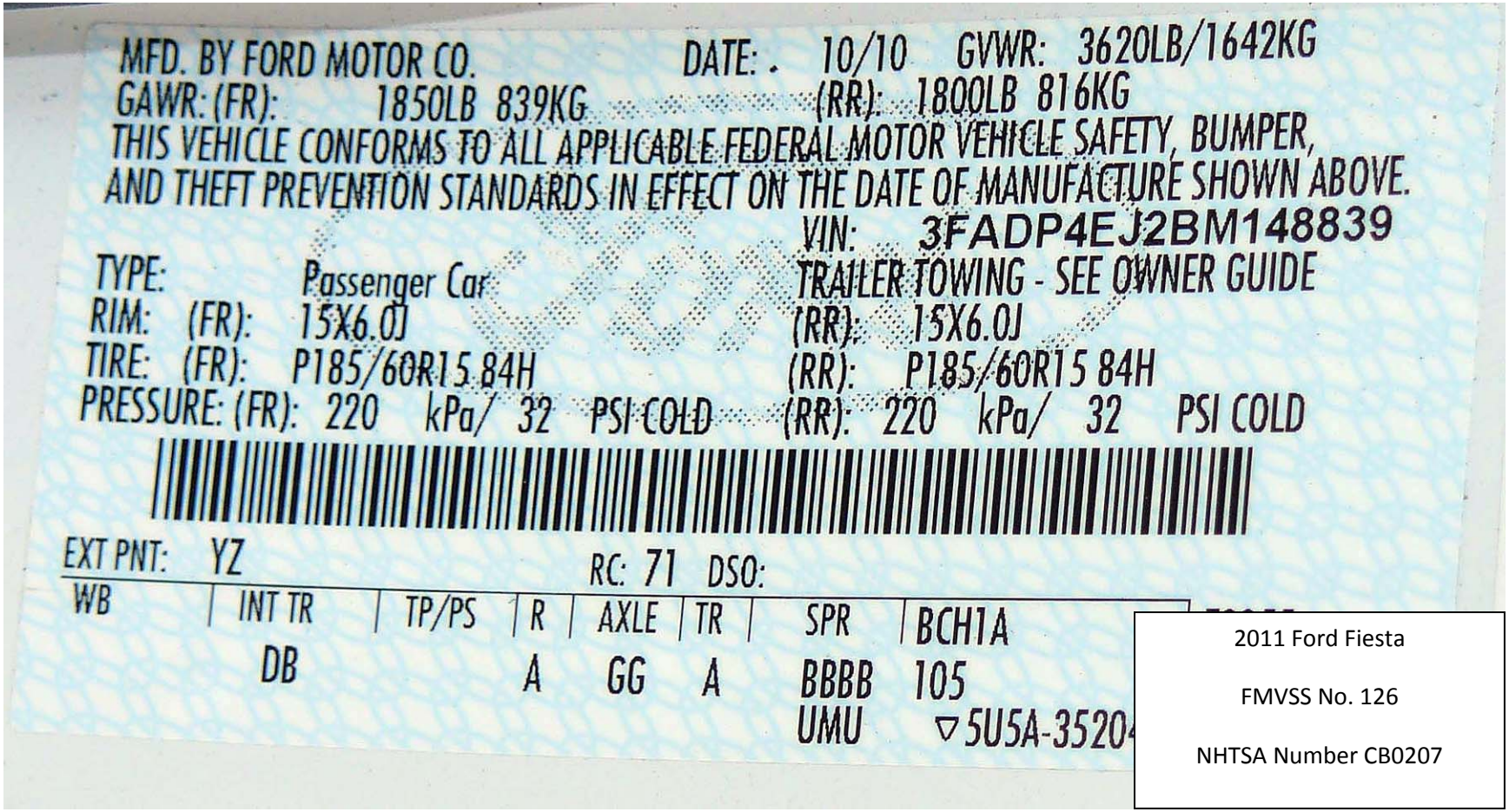
5.0 PHOTOGRAPHS (1 of 13)

Figure 5.1. Front View of Test Vehicle

5.0 PHOTOGRAPHS (2 of 13)

Figure 5.2. Rear View of Test Vehicle

5.0 PHOTOGRAPHS (3 of 13)



2011 Ford Fiesta

FMVSS No. 126

NHTSA Number CB0207

Figure 5.3. Vehicle Certification Label

5.0 PHOTOGRAPHS (4 of 13)

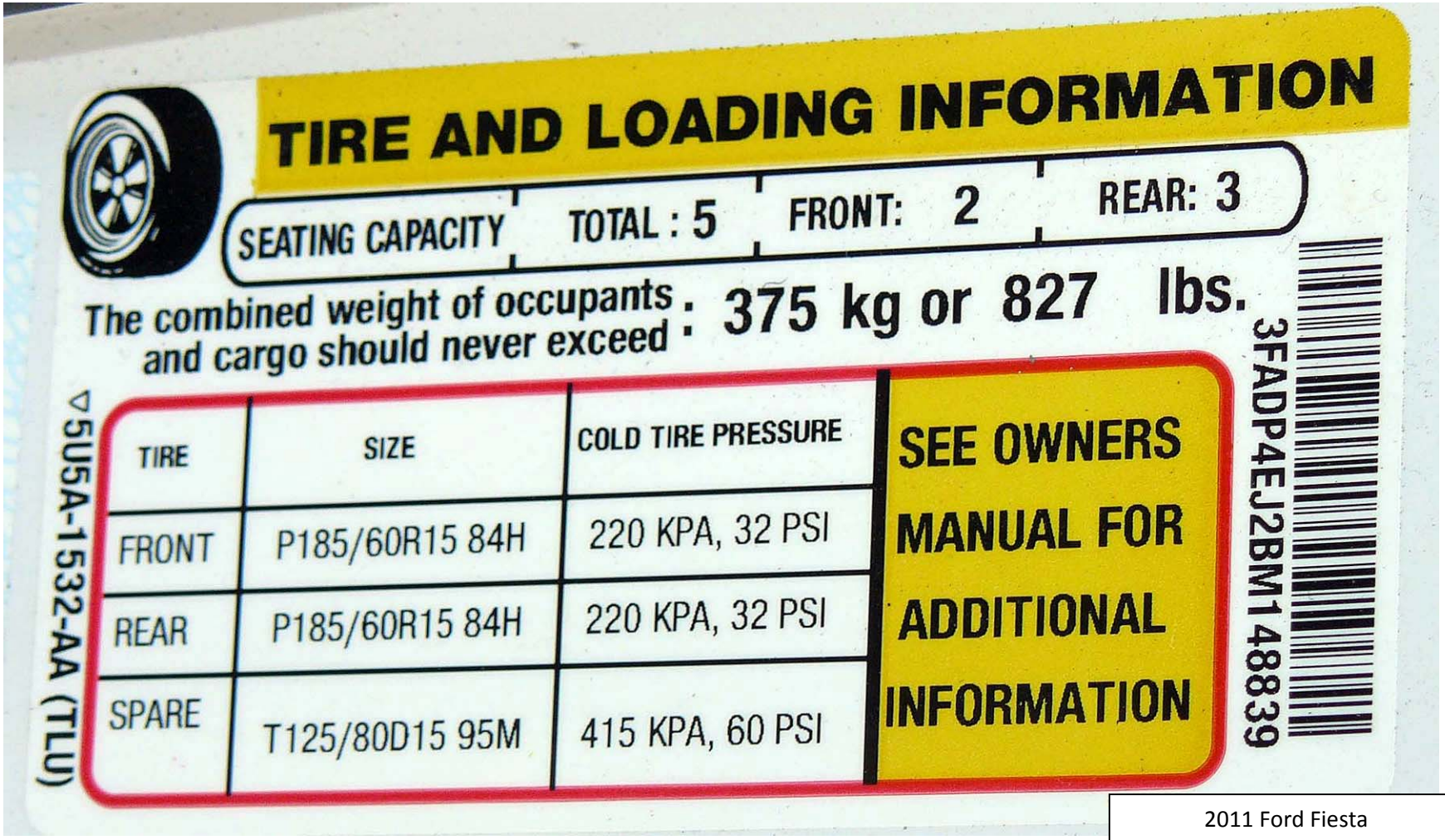


Figure 5.4. Vehicle Placard

2011 Ford Fiesta

FMVSS No. 126

NHTSA Number CB0207

5.0 PHOTOGRAPHS (5 of 13)

Figure 5.5. Window Sticker (Monroney Label)

5.0 PHOTOGRAPHS (6 of 13)

Figure 5.6. Front View of Vehicle as Tested

5.0 PHOTOGRAPHS (7 of 13)

Figure 5.7. Rear View of Vehicle as Tested

5.0 PHOTOGRAPHS (8 of 13)

Figure 5.8. Ultrasonic Height Sensor Mounted on Side of Vehicle for Determining Body Roll Angle

5.0 PHOTOGRAPHS (9 of 13)

Figure 5.9. Rear Mounted Speed Sensor

5.0 PHOTOGRAPHS (10 of 13)

Figure 5.10. Steering Controller and Data Acquisition Computer

5.0 PHOTOGRAPHS (11 of 13)

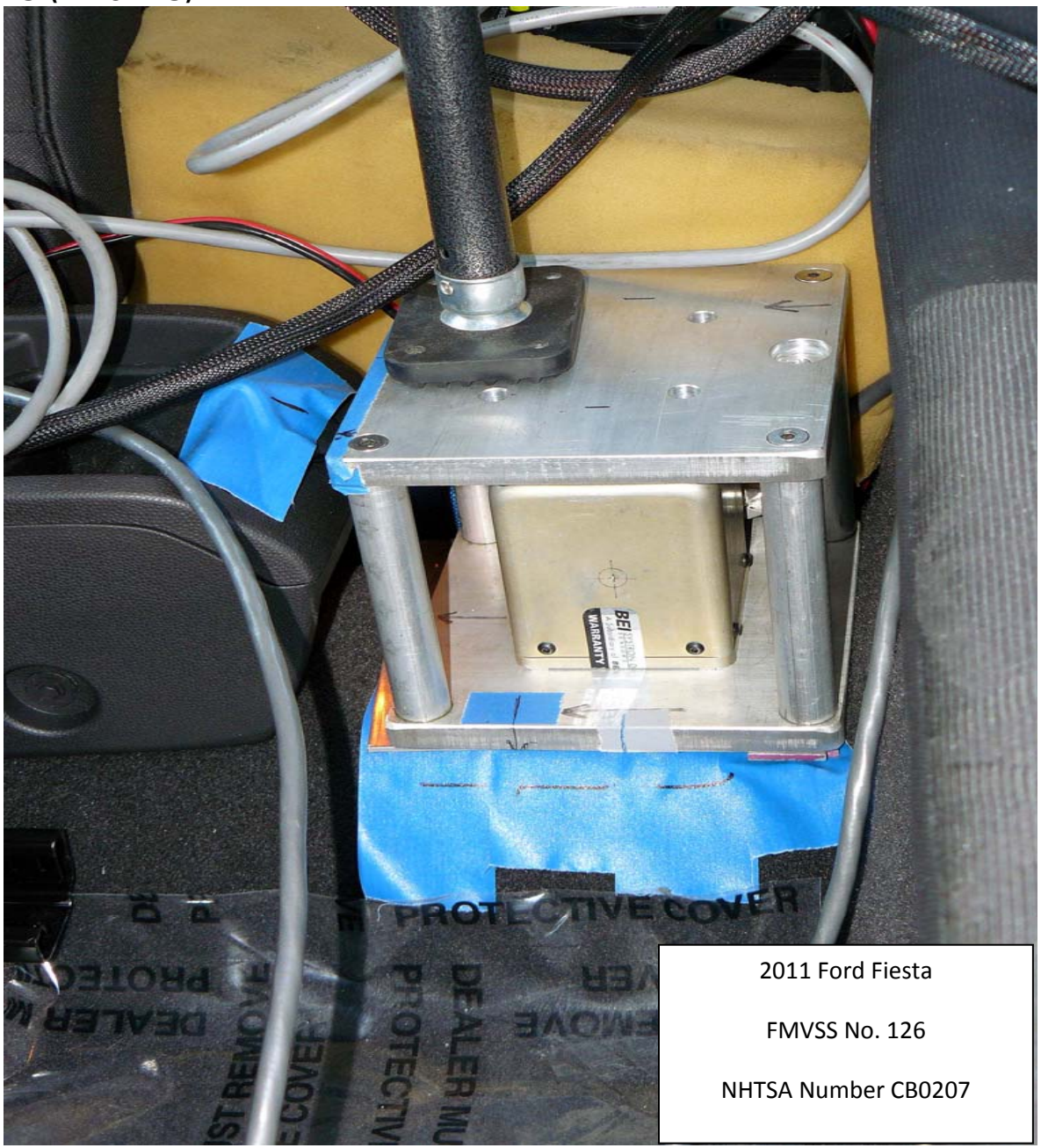


Figure 5.11. Inertial Measurement Unit Mounted in Vehicle

5.0 PHOTOGRAPHS (12 of 13)

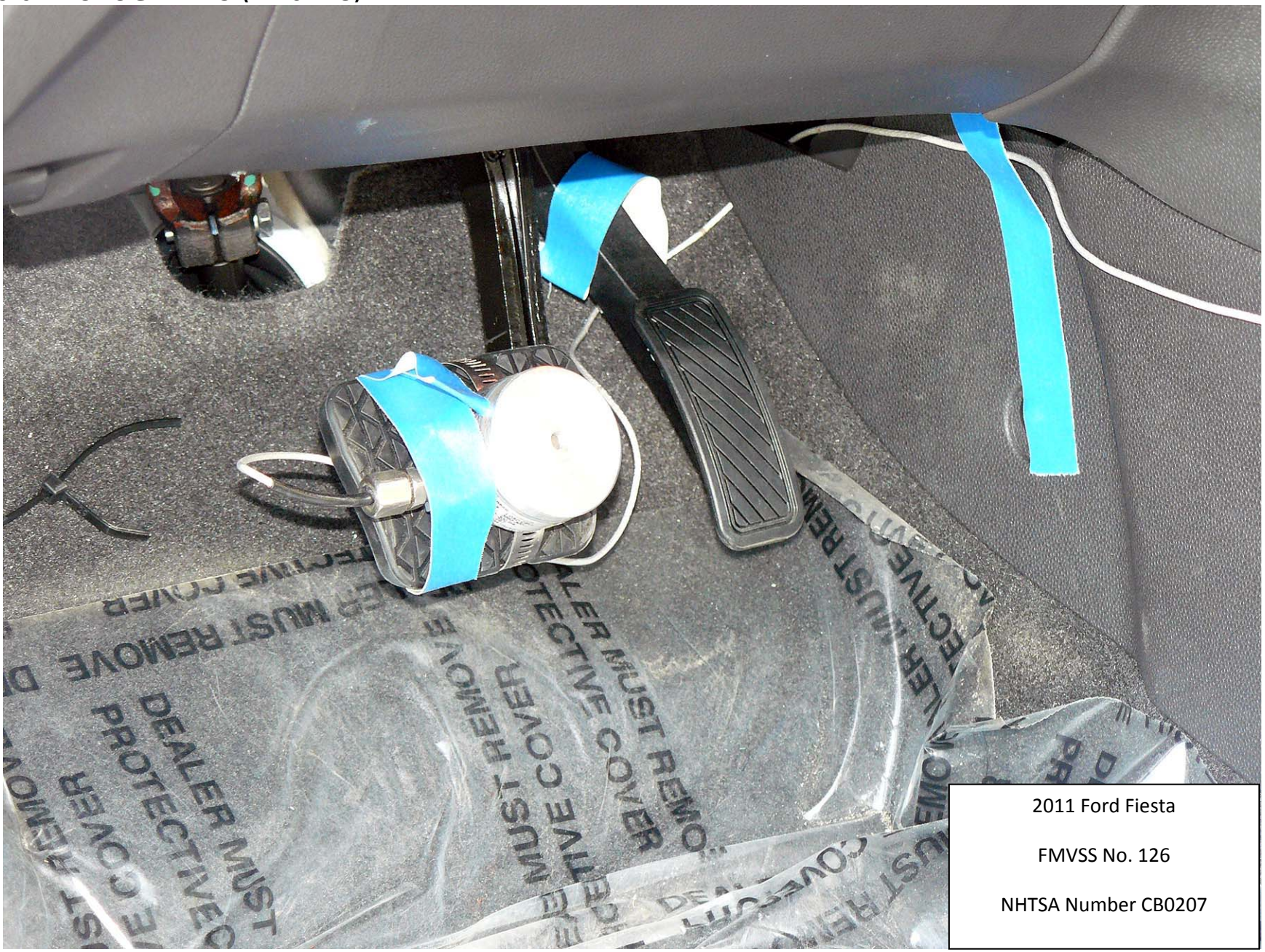


Figure 5.12. Brake Pedal Load Cell

5.0 PHOTOGRAPHS (13 of 13)

Figure 5.13. Telltale for ESC Malfunction

6.0 DATA PLOTS (1 of 4)

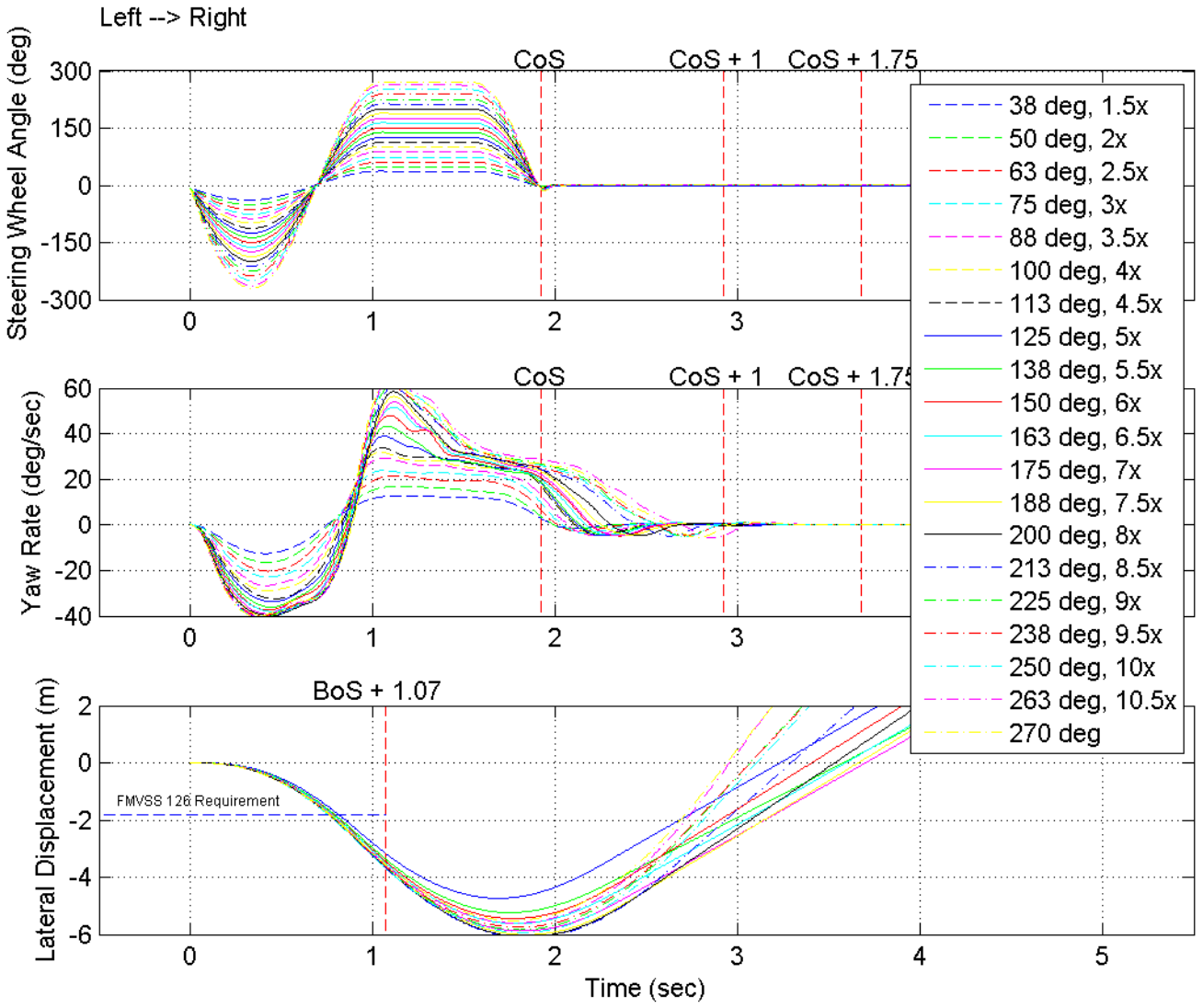


Figure 6.1. Steering Wheel Angle, Yaw Rate and Lateral Displacement for L-R Series

6.0 DATA PLOTS (2 of 4)

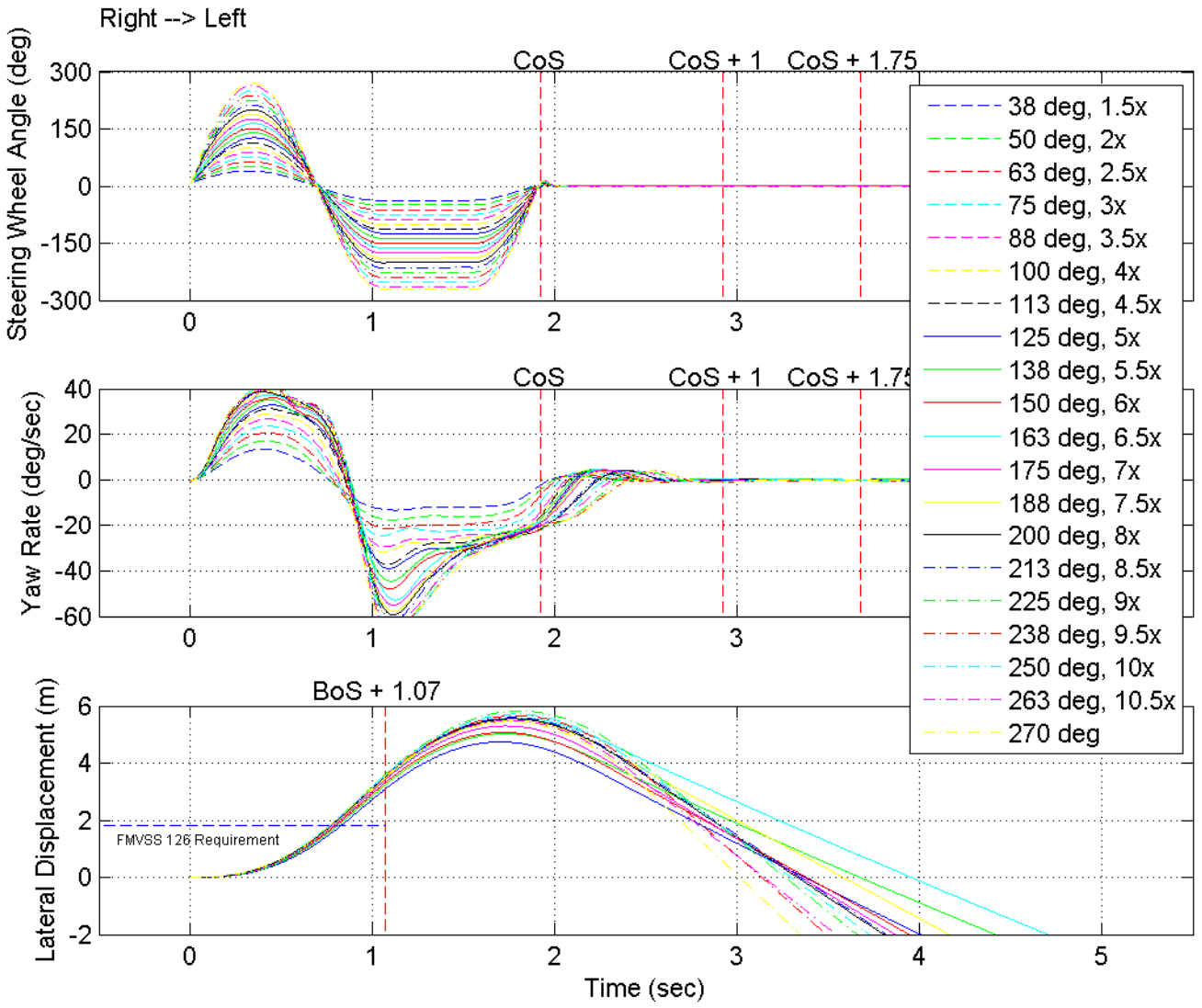


Figure 6.2. Steering Wheel Angle, Yaw Rate and Lateral Displacement for R-L Series

6.0 DATA PLOTS (3 of 4)

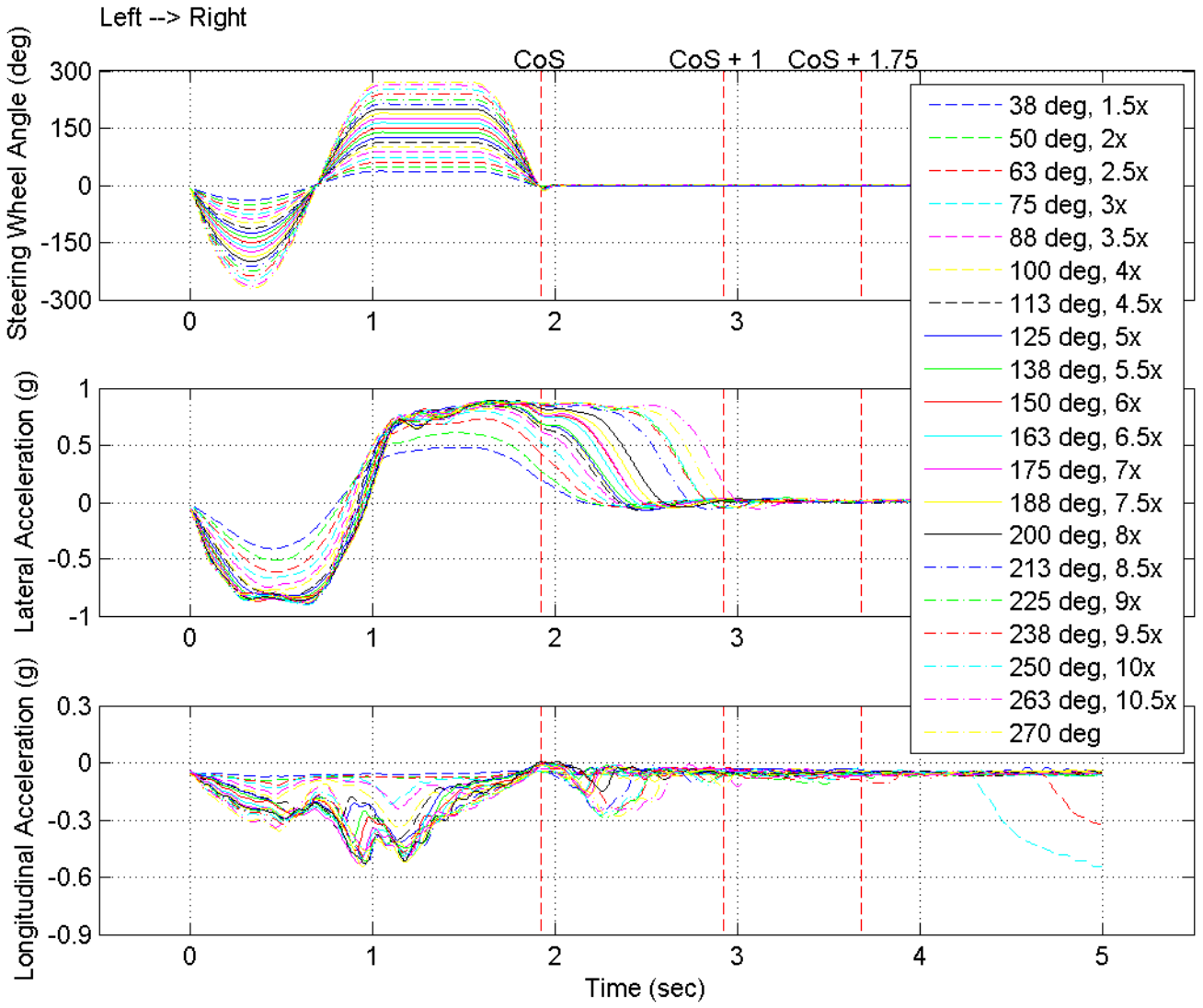


Figure 6.3. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for L-R Series

6.0 DATA PLOTS (4 of 4)

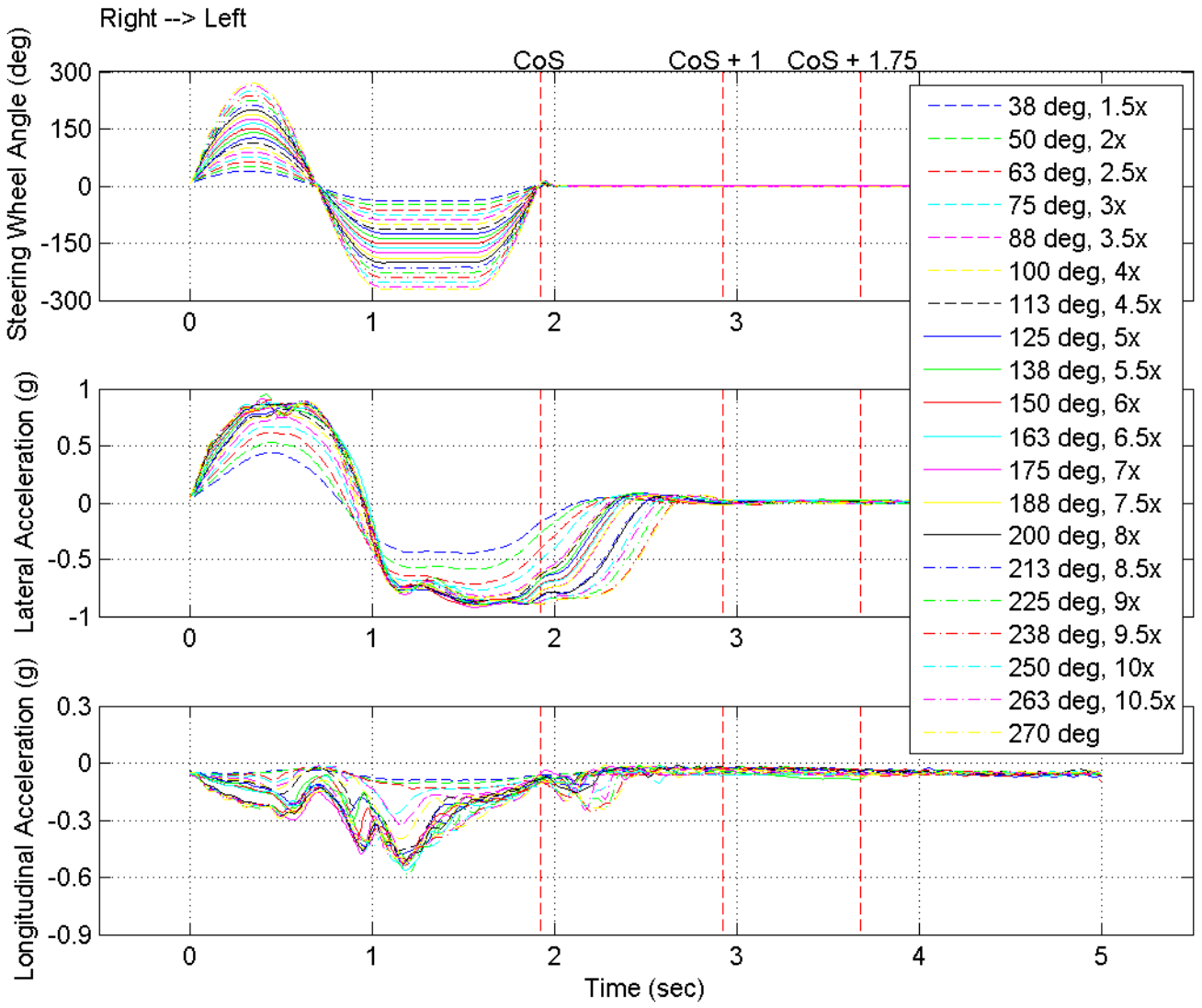


Figure 6.4. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for R-L Series

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

7.1 OWNER'S MANUAL PAGES

Introduction

These are some of the symbols you may see on your vehicle.

Vehicle Symbol Glossary

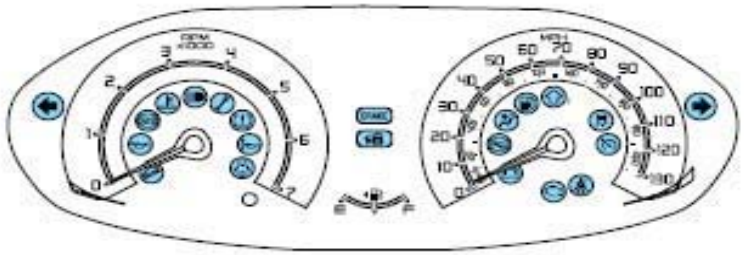
Safety Alert		See Owner's Guide	
Fasten Safety Belt		Airbag - Front	
Airbag - Side		Child Seat Lower Anchor	
Child Seat Tether Anchor		Brake System	
Anti-Lock Brake System		Parking Brake System	
Brake Fluid - Non-Petroleum Based		Parking Aid System	
Stability Control System		Speed Control	
Master Lighting Switch		Hazard Warning Flasher	
Fog Lamps-Front		Fuse Compartment	
Fuel Pump Reset		Windshield Wash/Wipe	
Windshield Defrost/Demist		Rear Window Defrost/Demist	

10

7.1 OWNER'S MANUAL PAGES

Instrument Cluster

WARNING LIGHTS AND CHIMES



Warning lights can alert you to a vehicle condition that may become serious enough to cause expensive repairs. A warning light may illuminate when a problem exists with one of your vehicle's functions. Many lights will illuminate when you start your vehicle to make sure the bulb works. If any light remains on after starting the vehicle, refer to the respective system warning light for additional information.

Service engine soon: The service engine soon indicator illuminates when the ignition is first turned to the on position to check the bulb and to indicate whether the vehicle is ready for Inspection/Maintenance (I/M) testing. Normally, the service engine soon indicator will stay on until the engine is cranked, then turn itself off if no malfunctions are present. However, if after 15 seconds the service engine soon indicator blinks eight times, it means that the vehicle is not ready for I/M testing. See the *Readiness for Inspection/Maintenance (I/M) testing* in the *Maintenance and Specifications* chapter.

Solid illumination after the engine is started indicates the on-board diagnostics system (OBD-II) has detected a malfunction. Refer to *On-board diagnostics (OBD-II)* in the *Maintenance and Specifications* chapter. If the light is blinking, engine misfire is occurring which could damage your catalytic converter. Drive in a moderate fashion (avoid heavy acceleration and deceleration) and have your vehicle serviced immediately by your authorized dealer.

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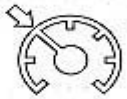
7.1 OWNER'S MANUAL PAGES

Instrument Cluster

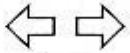
AdvanceTrac®/Traction control (if equipped): Displays when the AdvanceTrac®/Traction control is active. If the light remains on, have the system serviced immediately, refer to the *Driving* chapter for more information.

Speed control (if equipped): Illuminates when the speed control system is in use.



Anti-theft system: Flashes when the SecuriLock® Passive Anti-theft System has been activated.

Turn signal: Illuminates when the left or right turn signal or the hazard lights are turned on. If the indicators stay on or flash faster, check for a burned out bulb.



High beams: Illuminates when the high beam headlamps are turned on.

Key-in-ignition warning chime: Sounds when the key is left in the ignition in the off or accessory position and the driver's door is opened.

Headlamps on warning chime: Sounds when the headlamps or parking lamps are on, the ignition is off (the key is not in the ignition) and the driver's door is opened.

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7.1 OWNER'S MANUAL PAGES

Instrument Cluster

Message	Warning Lamp at Instrument Cluster	System
VEHICLE NOT IN PARK SELECT P	—	Starting/Transmission
DOOR OPEN APPLY BRAKE	—	Doors
X DOOR OPEN		Doors
TRUNK OPEN		Doors
HOOD OPEN		Hood
AIRBAG MALFUNCTION SERVICE NOW		Airbag
TCS OFF		Traction control system
TCS MALFUNCTION NEXT SERVICE		Traction control system
ENGINE OIL CHANGE DUE NEXT SERVICE		Engine Oil (See *Oil life monitoring system reset* later in this section)
ENGINE OIL PRESSURE LOW STOP SAFELY		Engine Oil
BRAKE FLUID LEVEL LOW SERVICE NOW		Brakes

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7.1 OWNER'S MANUAL PAGES

WARNING: Always set the parking brake fully and make sure that the gearshift is securely latched in P (Park) (automatic transmission) or in 1 (First) (manual transmission).

WARNING: If the parking brake is fully released, but the brake warning lamp remains illuminated, the brakes may not be working properly. See your authorized dealer as soon as possible.

ADVANCETRAC® STABILITY ENHANCEMENT SYSTEM

Your vehicle is equipped with the AdvanceTrac® system. The AdvanceTrac® system provides the following stability enhancement features for certain driving situations:

- Traction control system (TCS), which functions to help avoid drive-wheel spin and loss of traction.
- Electronic stability control (ESC), which functions to help avoid skids or lateral slides

WARNING: Vehicle modifications involving braking system, aftermarket roof racks, suspension, steering system, tire construction and/or wheel/tire size may change the handling characteristics of the vehicle and may adversely affect the performance of the AdvanceTrac® system. In addition, installing any stereo loudspeakers may interfere with and adversely affect the AdvanceTrac® system. Install any aftermarket stereo loudspeaker as far as possible from the front center console, the tunnel, and the front seats in order to minimize the risk of interfering with the AdvanceTrac® sensors. Reducing the effectiveness of the AdvanceTrac® system could lead to an increased risk of loss of vehicle control, vehicle rollover, personal injury and death.

WARNING: Remember that even advanced technology cannot defy the laws of physics. It's always possible to lose control of a vehicle due to inappropriate driver input for the conditions. Aggressive driving on any road condition can cause you to lose control of your vehicle increasing the risk of personal injury or property damage. Activation of the AdvanceTrac® system is an indication that at least some of the tires have exceeded their ability to grip the road; this could reduce the operator's ability to control the vehicle potentially resulting in a loss of vehicle control, vehicle rollover, personal injury and death. If your AdvanceTrac® system activates, SLOW DOWN.

7.1 OWNER'S MANUAL PAGES

WARNING: If a failure has been detected within the AdvanceTrac® system, the stability control light will illuminate steadily. Have the system serviced by an authorized dealer immediately.

The AdvanceTrac® system automatically enables each time the engine is started. All features of the AdvanceTrac® system (TCS and ESC) are active and monitor the vehicle from start-up. However, the system will only intervene if the driving situation requires it.

The AdvanceTrac® system includes a stability control light in the instrument cluster. The stability control light in the instrument cluster will illuminate temporarily during start-up as part of a normal system self-check, or during driving if a driving situation causes the AdvanceTrac® system to operate. If the stability control light illuminates steadily, have the system serviced by an authorized dealer immediately.

When AdvanceTrac® performs a normal system self-check, some drivers may notice a slight movement of the brake, and/or a rumble, grunting, or grinding noise after startup and when driving off.

When an event occurs that activates AdvanceTrac®, you may experience the following:

- A slight deceleration of the vehicle
- The stability control light will flash.
- A vibration in the pedal when your foot is on the brake pedal
- If the driving condition is severe and your foot is not on the brake, the brake pedal may move as the systems applies higher brake forces. You may also hear a whoosh of air from under the instrument panel during this severe condition.
- The brake pedal may feel stiffer than usual.

Traction control system (TCS)

Traction control is a driver aid feature that helps your vehicle maintain traction of the wheels, typically when driving on slippery and/or hilly road surfaces, by detecting and controlling wheel spin.

Excessive wheel spin is controlled in two ways, which may work separately or in tandem, engine traction control and brake traction control. Engine traction control works to limit drive-wheel spin by momentarily reducing engine power. Brake traction control works to limit wheel spin by momentarily applying the brakes to the wheel that is slipping. Traction control is most active at low speeds.

During TCS events, the stability control light in the instrument cluster will flash.

If the TCS is activated excessively in a short period of time, the braking portion of the system may become temporarily disabled to allow the brakes to cool down. In this situation, TCS will use only engine power reduction or transfer to help control the wheels from over-spinning. When the brakes have cooled down, the system will regain all features. Anti-lock braking, and ESC are not affected by this condition and will continue to function during the cool-down period.

Electronic stability control (ESC)

Electronic stability control (ESC) may enhance your vehicle's directional stability during adverse maneuvers, for example when cornering severely or avoiding objects in the roadway. ESC operates by applying brakes to one or more of the wheels individually and, if necessary, reducing engine power if the system detects that the vehicle is about to skid or slide laterally.

During ESC events, the stability control light in the instrument cluster will flash.

Certain adverse driving maneuvers may activate the ESC system, which include but are not limited to:

- Taking a turn too fast
- Maneuvering quickly to avoid an accident, pedestrian or obstacle
- Driving over a patch of ice or other slippery surfaces
- Changing lanes on a snow-rutted road
- Entering a snow-free road from a snow-covered side street, or vice versa
- Entering a paved road from a gravel road, or vice versa

STEERING

Your vehicle is equipped with an Electric Power Steering (EPS) system. There is no fluid reservoir to check or fill.

If your vehicle loses electrical power while you are driving (or if the ignition is turned off), you can steer the vehicle manually, but it takes more effort. Under extreme usage conditions, the steering effort may increase. This occurs to prevent overheating and permanent damage to your steering system. If this should occur, you will neither lose the ability to steer the vehicle manually nor will it cause permanent damage. Typical steering and driving maneuvers will allow the system to cool and steering assist will return to normal.

7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO.: *DTNH22-08-D-00098*
DATE: *4/7/2011*

From: *Automotive Allies*

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

To: *Dynamic Research, Inc*

Vehicle VIN: *3FADP4EJ2BM148839* NHTSA NO.: *CB0207*
Model Year: *2011* Odometer Reading: *115* Miles
Make *Ford* Body Style: *Passenger Car*
Model: *Fiesta* Body Color: *White*
Manufacture Date: *10/10* Dealer: *Automotive Allies*
GVWR (kg/lb) *1642/3620* 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: *4/7/2011*

APPROVED BY: *B. Kebschull* DATE APPROVED: *4/7/2011*

7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO.: *DTNH22-08-D-00098*
DATE: *5/4/2011*

Vehicle VIN: *3FADP4EJ2BM148839* NHTSA NO.: *CB0207*
Model Year: *2011* Odometer Reading: *200* Miles
Make: *Ford* Body Style: *Passenger Car*
Model: *Fiesta* Body Color: *White*
Manufacture Date: *10/10* Dealer: *Automotive Allies*
GVWR (kg/lb) *1642 (3620)* 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 delivered, like new

RECORDED BY: *J Lenkeit* DATE RECORDED: *5/4/2011*

APPROVED BY: *P Broen* DATE APPROVED: *5/5/2011*

7.4 SINE WITH DWELL TEST RESULTS

2011 Ford Fiesta Passenger Car
NHTSA No.: *CB0207*
Date of Test : *5/4/2011*
Date Created: *5/5/2011*

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	YRR175 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)
23	711	50.08	3.550	1091	5.449	847	4.228	-0.75	-0.10	1291	-1.27	-0.16	1441	12.95	951	-4.11	0.40	37.97	775	37.97
24	710	50.18	3.542	1091	5.447	847	4.227	-0.31	-0.05	1291	-0.18	-0.03	1441	16.81	931	-5.30	0.49	49.89	775	49.95
25	709	50.11	3.536	1091	5.447	847	4.227	-0.14	-0.03	1291	0.72	0.15	1441	21.57	930	-6.40	0.58	62.75	775	62.92
26	708	49.92	3.533	1091	5.448	847	4.228	-0.38	-0.09	1291	0.06	0.02	1441	23.98	919	-7.38	0.61	74.72	775	74.90
27	708	50.14	3.531	1091	5.448	847	4.228	-0.26	-0.08	1291	-0.49	-0.14	1441	29.53	921	-8.48	0.63	87.68	776	87.92
28	707	50.16	3.529	1091	5.447	847	4.227	-0.34	-0.11	1291	0.36	0.11	1441	32.15	918	-9.11	0.64	99.53	775	99.77
29	707	50.00	3.527	1091	5.447	847	4.227	-0.91	-0.31	1291	-0.18	-0.06	1441	34.20	918	-9.77	0.61	112.65	775	112.67
30	707	50.13	3.526	1091	5.447	847	4.227	-0.13	-0.05	1291	0.11	0.04	1441	39.15	921	-10.20	0.62	124.89	775	124.84
31	707	49.81	3.526	1091	5.446	847	4.226	0.31	0.14	1291	0.25	0.11	1441	43.44	925	-10.84	0.58	137.92	775	137.83
32	706	50.03	3.525	1091	5.446	847	4.227	0.79	0.38	1291	-0.07	-0.03	1441	48.15	927	-11.09	0.57	150.01	775	149.81
33	706	50.05	3.525	1090	5.445	847	4.227	0.21	0.11	1290	0.16	0.08	1440	51.70	931	-11.25	0.52	163.04	775	162.72
34	706	50.05	3.524	1090	5.445	847	4.226	0.19	0.10	1290	-0.08	-0.04	1440	53.92	932	-11.50	0.44	175.13	775	174.76
35	706	49.88	3.525	1090	5.445	847	4.227	0.43	0.24	1290	-0.04	-0.02	1440	56.48	931	-11.56	0.42	188.24	775	187.62
36	706	49.92	3.524	1090	5.443	847	4.226	0.34	0.20	1290	-0.22	-0.13	1440	58.41	931	-11.75	0.48	200.25	775	199.52
37	706	50.35	3.525	1090	5.444	847	4.227	0.87	0.53	1290	0.07	0.04	1440	60.61	930	-11.80	0.45	213.31	775	212.46
38	706	50.19	3.525	1090	5.444	847	4.227	0.15	0.09	1290	0.33	0.20	1440	61.28	929	-11.68	0.52	225.60	775	224.57
39	706	49.99	3.525	1090	5.443	847	4.227	-0.31	-0.19	1290	-0.14	-0.09	1440	61.56	926	-11.66	0.59	238.54	775	237.55
40	706	50.12	3.525	1090	5.443	847	4.227	-0.05	-0.03	1290	-0.01	-0.01	1440	64.53	929	-11.88	0.55	250.63	775	249.51
41	706	50.16	3.525	1090	5.443	847	4.227	-8.10	-5.20	1290	-0.07	-0.04	1440	64.26	928	-11.52	0.54	263.57	775	262.53
42	707	50.27	3.526	1090	5.444	847	4.227	-3.15	-1.97	1290	0.02	0.01	1440	62.44	925	-11.48	0.58	270.55	775	269.49

7.4 SINE WITH DWELL TEST RESULTS

2011 Ford Fiesta Passenger Car
NHTSA No.: *CB0207*
Date of Test : *5/4/2011*
Date Created: *5/5/2011*

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)
43	711	50.03	3.548	1091	5.449	847	4.229	-1.08	0.14	1291	0.15	-0.02	1441	-13.22	936	4.29	-0.39	38.77	776	38.60
45	710	49.82	3.541	1091	5.448	847	4.228	-0.83	0.15	1291	-0.89	0.15	1441	-17.38	931	5.45	-0.49	50.84	775	50.49
46	709	50.18	3.536	1091	5.447	847	4.228	-0.47	0.10	1291	0.23	-0.05	1441	-21.65	928	6.58	-0.57	63.79	775	63.36
47	708	50.27	3.533	1091	5.448	847	4.228	-0.89	0.22	1291	-0.04	0.01	1441	-24.90	918	7.50	-0.60	75.82	775	75.36
48	707	50.16	3.530	1091	5.448	847	4.227	0.35	-0.10	1291	0.29	-0.09	1441	-29.67	922	8.41	-0.62	88.75	775	88.40
49	707	49.75	3.528	1091	5.447	847	4.228	-0.45	0.14	1291	-0.43	0.14	1441	-31.97	920	9.20	-0.60	100.59	775	100.32
50	707	50.23	3.526	1091	5.446	847	4.228	-0.48	0.18	1291	0.06	-0.02	1441	-37.36	923	9.71	-0.59	113.58	775	113.33
51	706	50.24	3.525	1092	5.455	850	4.241	-1.05	0.41	1292	-0.66	0.26	1442	-39.15	925	10.03	-0.57	126.54	778	124.69
52	706	50.10	3.524	1091	5.448	849	4.236	-1.29	0.58	1291	-0.48	0.22	1441	-44.63	927	10.48	-0.58	140.08	777	137.02
53	706	50.02	3.523	1090	5.444	847	4.227	0.01	-0.01	1290	0.57	-0.28	1440	-48.20	926	10.72	-0.63	150.71	775	150.52
54	706	50.23	3.523	1091	5.448	848	4.235	-1.00	0.53	1291	-0.52	0.27	1441	-52.76	932	11.10	-0.52	164.68	776	162.35
55	706	50.18	3.523	1090	5.444	847	4.227	-0.17	0.09	1290	0.19	-0.10	1440	-55.12	931	11.05	-0.60	175.62	775	175.45
56	706	50.21	3.522	1090	5.443	847	4.227	0.08	-0.05	1290	0.12	-0.07	1440	-57.77	930	11.24	-0.58	188.55	775	188.44
57	706	50.18	3.523	1090	5.443	847	4.227	0.06	-0.04	1290	-0.32	0.19	1440	-59.31	930	11.41	-0.59	200.46	775	200.30
58	706	49.90	3.523	1090	5.443	847	4.227	0.16	-0.10	1290	0.02	-0.01	1440	-61.84	930	11.45	-0.59	213.56	775	213.28
59	706	50.17	3.523	1090	5.443	847	4.227	1.12	-0.72	1290	0.23	-0.15	1440	-64.72	933	11.66	-0.55	225.75	775	225.39
60	706	50.31	3.523	1090	5.443	847	4.227	1.37	-0.91	1290	0.14	-0.10	1440	-66.41	929	11.51	-0.59	238.75	775	238.33
61	706	50.09	3.523	1090	5.442	847	4.227	0.78	-0.51	1290	0.36	-0.24	1440	-65.78	930	11.63	-0.56	250.71	775	250.35
62	706	50.00	3.524	1090	5.443	847	4.227	0.64	-0.42	1290	0.13	-0.08	1440	-65.72	927	11.47	-0.63	263.83	775	263.22
63	706	50.16	3.524	1090	5.443	847	4.227	1.23	-0.81	1290	-0.07	0.05	1440	-66.03	926	11.47	-0.65	270.85	775	270.21

7.5 SLOWLY INCREASING STEER TEST RESULTS

2011 Ford Fiesta Passenger Car
NHTSA No.: *CB0207*
Date of Test: *5/4/2011*
Date Created: *5/4/2011*

File	EventPt	DOS	MES (mph)	Mean SPD (mph)	AYcount_3	THETAENCF_3 (deg)	AYCG_CD2_3 (g)	r_squared	ZeroBegin	ZeroEnd
11	724	1	50.338	50.276	1083	-25.383	-0.305	0.998	524	724
12	700	1	50.344	50.251	1080	-25.198	-0.300	0.995	500	700
13	728	1	50.337	50.161	1088	-25.643	-0.299	0.997	528	728
14	706	0	50.413	50.327	1071	24.760	0.299	0.995	506	706
15	677	0	50.354	50.312	1069	24.548	0.306	0.998	477	677
16	700	0	50.350	50.429	1064	24.472	0.300	0.998	500	700
				Averages		25	0.3014			

Scalars	Steering Angles
1.5	38
2.0	50
2.5	63
3.0	75
3.5	88
4.0	100
4.5	113
5.0	125

Scalars	Steering Angles
5.5	138
6.0	150
6.5	163
7.0	175
7.5	188
8.0	200
8.5	213
9	225

Scalars	Steering Angles
9.5	238
10	250
10.5	263
10.8	270

7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

Vehicle:	**2011 Ford Fiesta Passenger Car**	NHTSA No.:	CB0207
Wheelbase:	98 Inches	Faro Arm S/N:	U08-05-08-06636
Measurement date:	11/8/2010	Certification date:	11/7/10

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	-	-	20.520
M_Line_Y_Axis	2.386		0.000
M_Point_48_Ref	0.000	0.000	-
M_CIRCLE001_I_Left_Rear_Wheel_Axle	-23.883	15.495	-11.354
M_Point_IMU_side	10.433	45.844	-15.975
M_Point_ROOF	-	-	-57.769
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	10.433	47.369	-15.975

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	**63.684**	**-0.631**	**15.975**

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).