126-DRI-11-004
SAFETY COMPLIANCE TESTING FOR FMVSS 126
Electronic Stability Control Systems

Honda Motor Co., Ltd
2011 Honda CR-Z
NHTSA No. CB5305

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

11 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
West Building, 4th Floor (NVS-221)
Washington, DC 20590

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16. Abstract A test was conducted on a 2011 Honda CR-Z , NHTSA No. CB5305, 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 Honda CR-Z, 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 Honda CR-Z 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 Honda CR-Z*

NHTSA No. *CB5305* VIN: *JHMZF1D48BS016218*

Vehicle Type: *Passenger Car* Manufacture Date: *6/11*

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 3,500 kg (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 Honda CR-Z*

NHTSA No. *CB5305* Data Sheet Completion Date: *8/23/2011*

VIN *JHMZF1D48BS016218* Manufacture Date: *6/11*

GVWR (kg): *1435* Front GAWR (kg): *815* Rear GAWR (kg): *625*

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

Odometer reading at time of inspection: *42 miles (67.2 km)*

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:

Front axle: *P195/55R16* Rear axle: *P195/55R16*

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

		Front Axle	Rear Axle
	Tire Manufacturer:	*Bridgestone*	*Bridgestone*
	Tire Model:	*EL470 Turanza*	*EL470 Turanza*
	Tire Size:	*P195/55R16*	*P195/55R16*
TIN	Left Front:	*ELL3 CKM 1211*	Right Front: *ELL3 CKM 1211*
	Left Rear:	*ELL3 CKM 1211*	Right Rear: *ELL3 CKM 1211*

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: *FWD*
Mode: *ESC off*
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: *8/23/2011*
APPROVED BY: *B Kebschull* DATE APPROVED: *9/16/2011*

3.0 TEST DATA (CONTD)

Data Sheet 2 (Page 1 of 3)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

Vehicle: *2011 Honda CR-Z*

NHTSA No *CB5305* Data Sheet Completion Date: *9/7/2011*

ESC SYSTEM IDENTIFICATION

Manufacturer/Model *Continental Automotive Corporation / MK60E1*

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: _____

ESC OPERATIONAL CHARACTERISTICS

System is capable of generating brake torque at each wheel — [X] Yes (Pass) [ ] No (Fail)
Brief explanation: *VSA Modulator (ESC Computer) estimates understeer and oversteer based on various sensor signals and brake fluid pressure is adjusted at each of the four individual wheels. For example, when understeer occurs the necessary braking control pressure is calculated and applied to the rear wheel inside the turn to bring the lateral acceleration from the traveling direction close to the target traveling direction.*

System is capable of determining yaw rate — [X] Yes (Pass) [ ] No (Fail)
Brief explanation: *Yaw rate is measured by a yaw rate sensor*

System is capable of monitoring driver steering input — [X] Yes (Pass) [ ] No (Fail)
Brief explanation: *Steering angle is measured by a steering angle sensor*

Data Sheet 2 (Page 2 of 3)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

ESC OPERATIONAL CHARACTERISTICS (continued)

System is capable of estimating side slip or side slip derivative — **X** Yes (Pass) / ___ No (Fail)

Brief explanation: *VSA Modulator (ESC Computer) collects actual vehicle data as follows:*

・Vehicle speed from wheel speed sensor

・Steering angle from steering angle sensor

・Lateral acceleration and Yaw rate from yaw rate/lateral acceleration sensor

A proprietary algorithm is used to calculate vehicle side slip derivative (with respect to time) from the signals listed above.

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

Method used to modify torque: *VSA Modulator (ESC Computer) calculates vehicle speed and wheel slip based on various sensor signals and requires Fuel Injection Electronic Control Unit (FI-ECU) to adjust engine torque (TCS function). For example, if understeer occurs by the wheel acceleration slippage, TCS reduces the engine torque to decrease the difference between the traveling direction and the target traveling direction. FI-ECU estimates to change ignition timing and/or cut fuel delivery after the request of VSA Modulator.*

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

Speed system becomes active: *15 km/h*

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

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

Data Sheet 2 (Page 3 of 3)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

ESC OPERATIONAL CHARACTERISTICS (continued)

Driving phases during which ESC is capable of activation:
Acceleration, deceleration, coasting, during activation of ABS, during activation of traction control. ESC cannot operate during reverse driving.

Vehicle manufacturer submitted documentation explaining how the ESC mitigates understeer

X Yes (Pass)
___ No (Fail)

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

REMARKS: *ESC is called "Vehicle Stability Assist (VSA)" in owner's manual*

RECORDED BY: *J Lenkeit* DATE RECORDED: *9/7/2011*
APPROVED BY: *B Kebschull* DATE APPROVED: *9/7/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Honda CR-Z*

NHTSA No. *CB5305* Data Sheet completion date: *9/7/2011*

ESC Malfunction Telltale

Vehicle is equipped with malfunction telltale? *Yes*

Telltale Location: *Top left portion of instrument panel*

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 blinks when VSA (ESC) is active

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: *Top left portion of instrument panel (directly beneath ESC telltale)*

Telltale Color: *Yellow*

Telltale symbol or abbreviation used

or **ESC OFF**

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

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

Is telltale part of a common space? *No*

DATA INDICATES COMPLIANCE ***Yes***
(Vehicle is compliant if equipped with a malfunction telltale)

Remarks:

RECORDED BY: *B Kebschull* DATE RECORDED: *9/7/2011*
APPROVED BY: *J Lenkeit* DATE APPROVED: *9/16/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Honda CR-Z*

NHTSA No. *CB5305* Data Sheet completion date: *9/7/2011*

"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? **X** Yes ____ No

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

- [X] 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 *Left side of instrument panel*
Labeling *ESC symbol with "OFF" beneath it*
Modes *On/off (Press and hold until beep is heard)*

Second Control: Location *NA*
Labeling
Modes

Identify standard or default drive configuration *Front wheel drive*

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?

____ NA **X** Yes ____ No (Fail)

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

____ NA **X** Yes ____ No (Fail)

If no, describe how the "Off" control functions

3.0 TEST DATA (CONTD)

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

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

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

RECORDED BY: *B Kebschull* DATE RECORDED: *9/7/2011*
APPROVED BY: *J Lenkeit* DATE APPROVED: *9/16/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Honda CR-Z*

NHTSA No. *CB5305* Data Sheet completion date: *9/8/2011*

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

Peak Friction Coefficient (at least 0.9) *0.926*

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 *210* kPa Rear Axle *210* kPa

Actual; LF *210* kPa RF *210* kPa

LR *210* kPa RR *210* kPa

Vehicle Dimensions: Front Track Width *150.8* cm Wheelbase *242.8* cm

Rear Track Width *149.6* cm

Vehicle Weight Ratings: GAWR Front *815* kg GAWR Rear *625* kg

Unloaded Vehicle Weight (UVW):

Front Axle *728.9* kg Left Front *364.2* kg Right Front *364.7* kg

Rear Axle *490.4* kg Left Rear *256.3* kg Right Rear *234.1* kg

Total UVW *1219.3* kg

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

Calculated baseline weight (UVW + 73kg) *1292.3* 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 *803.8* kg Left front *427.3* kg Right front *376.5* kg

Rear axle *560.2* kg Left rear *285.3* kg Right rear *274.9* kg

Vehicle Weight *1364.0* kg

Ballast Required =

[Total UVW with Outriggers (if applicable)]		+ *168*	kg	- [Loaded Weight w/Driver and Instrumentation)]	
= *1219.3*	kg	+ *168*	kg	- 1364.0	kg

= *23.3* kg

Total Loaded Vehicle Weight w/Driver and Instrumentation and Ballast

Front axle *808.3* kg Left front *427.7* kg Right front *380.6* kg

Rear axle *578.8* kg Left rear *292.1* kg Right rear *286.7* kg

Total LVW *1387.1* 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	*39.9*	in	*101.3*	cm	*57.7*	in	*146.5*	cm
y-distance	*-1.1*	in	*-2.9*	cm	*-0.2*	in	*-0.6*	cm
z-distance	*20.1*	in	*50.9*	cm	*20.5*	in	*52.2*	cm
Roof Height					*52.783*	in	*134.1*	cm
Distance between ultrasonic sensors					*82.0*	in	*208.3*	cm

Remarks:

RECORDED BY: *P Broen* DATE RECORDED: *9/8/2011*
APPROVED BY: *B Kebschull* DATE APPROVED: *9/12/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Honda CR-Z*

NHTSA No. *CB5305*

Measured tire pressure: LF *217* kPa RF *221* kPa

LR *213* kPa RR *212* kPa

Wind Speed *0.7* 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)) *24.7* °C

Brake Conditioning Time: *8:20:00 AM* Date: *9/8/2011*

56 km/h (35 mph) Brake Stops

Number of stops executed (10 required)	*10*	Stops
Observed deceleration range (0.5g target)	*0.5*	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	*0.9-1.0*	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: *8:27:00 AM* Date: *9/8/2011*

Measured cold tire pressure LF *227* kPa RF *236* kPa

LR *220* kPa RR *221* kPa

Wind Speed *1.2* 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)) *25.9*°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	*0.5*
2	3	56 ± 2 (35 ± 1)	*70*	0.5 - 0.6	*0.55*
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:
70 **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)	*70* (cycles 1-10)	0.5 - 0.6	*0.55*
4	*7*	56 ± 2 (35 ± 1)	*70* (cycles 1-9)	0.5 - 0.6	*0.55*
			140 (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: *9:45:00 AM* Date: *9/8/2011*

Measured cold tire pressure LF *236* kPa RF *246* kPa

LR *223* kPa RR *224* kPa

Wind Speed *1.1* 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)) *29.4* °C

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

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

70 **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)	*70* (cycles 1-10)	0.5 - 0.6	*0.55*
4	*20*	56 ± 2 (35 ± 1)	*70* (cycles 1-9)	0.5 - 0.6	*0.55*
			140 (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: *9/8/2011*

APPROVED BY: *J Lenkeit* DATE APPROVED: *9/16/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Honda CR-Z*

NHTSA No. *CB5305*

Measured tire pressure: LF *228* kPa RF *235* kPa

LR *219* kPa RR *221* kPa

Wind Speed *0.6* 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)) *28.4* °C

Selected drive configuration *FWD*

Selected Mode: *Default - ESC on*

Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle

$a_{y,30degrees}$ = *0.4* 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} = *41.2* 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	*9:08*		*10*	*NG*
2	Left	*9:18*	*-25.4*	*11*	*Good*
3	Left	*9:19*	*-25.4*	*12*	*Good*
4	Left	*9:23*	*-25.4*	*13*	*Good*
5	Left				
1	Right	*9:26*	*24.0*	*14*	*Good*
2	Right	*9:29*	*23.8*	*15*	*Good*
3	Right	*9:32*	*24.1*	*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:

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

$\delta_{0.3\ g,\ overall}$ = *24.7* degrees

[to nearest 0.1 degree]

Remarks:

RECORDED BY: *P Broen* DATE RECORDED: *9/8/2011*
APPROVED BY: *J Lenkeit* DATE APPROVED: *9/16/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Honda CR-Z*

NHTSA No. *CB5305* Data sheet completion date: *9/8/2011*

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 - ESC on*

Overall steering wheel angle ($\delta_{0.3\ g,\ overall}$) *24.7* 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
26	10:36	1.5	37	13.03	-0.23	-0.16	-1.76	*PASS*	-1.26	*PASS*
27	10:41	2.0	49	16.90	-0.28	-0.15	-1.69	*PASS*	-0.88	*PASS*
28	10:46	2.5	62	21.19	-0.34	-0.27	-1.62	*PASS*	-1.29	*PASS*
29	10:49	3.0	74	25.92	-0.21	-0.09	-0.82	*PASS*	-0.36	*PASS*
36	11:07	3.5	86	32.19	-0.18	-0.10	-0.57	*PASS*	-0.32	*PASS*
37	11:10	4.0	99	38.33	-0.57	-0.29	-1.48	*PASS*	-0.75	*PASS*
38	11:12	4.5	111	41.36	-0.33	-0.29	-0.81	*PASS*	-0.70	*PASS*
39	11:15	5.0	124	47.28	-0.44	-0.32	-0.93	*PASS*	-0.67	*PASS*
40	11:20	5.5	136	52.41	-0.10	-0.20	-0.19	*PASS*	-0.39	*PASS*
41	11:22	6.0	148	54.69	-0.23	-0.26	-0.42	*PASS*	-0.47	*PASS*
42	11:25	6.5	161	60.99	-0.21	-0.15	-0.34	*PASS*	-0.25	*PASS*
43	11:29	7.0	173	61.93	0.30	-0.19	0.49	*PASS*	-0.31	*PASS*
44	11:32	7.5	185	62.30	1.30	-0.10	2.08	*PASS*	-0.16	*PASS*
47	11:41	8.0	198	66.58	-1.68	-0.13	-2.53	*PASS*	-0.20	*PASS*
48	11:44	8.5	210	65.38	-0.26	-0.41	-0.40	*PASS*	-0.62	*PASS*
49	11:47	9.0	222	64.35	-0.82	-0.16	-1.28	*PASS*	-0.25	*PASS*
50	11:51	9.5	235	62.61	0.95	-0.19	1.52	*PASS*	-0.30	*PASS*
51	11:54	10.0	247	62.73	0.00	-0.19	0.00	*PASS*	-0.30	*PASS*
52	11:56	10.5	259	62.95	-0.14	-0.20	-0.23	*PASS*	-0.32	*PASS*
54	12:02	-	270	63.10	-0.23	-0.14	-0.37	*PASS*	-0.22	*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
55	12:06	1.5	37	-13.46	-0.10	-0.07	0.75	*PASS*	0.52	*PASS*
56	12:09	2.0	49	-17.85	0.36	0.13	-2.03	*PASS*	-0.72	*PASS*
57	12:12	2.5	62	-22.49	0.18	0.10	-0.80	*PASS*	-0.43	*PASS*
58	12:16	3.0	74	-28.09	0.21	0.18	-0.73	*PASS*	-0.62	*PASS*
59	12:19	3.5	86	-33.09	0.22	0.19	-0.65	*PASS*	-0.58	*PASS*
60	12:22	4.0	99	-40.49	0.16	0.24	-0.40	*PASS*	-0.59	*PASS*
61	12:26	4.5	111	-41.86	0.15	0.07	-0.35	*PASS*	-0.17	*PASS*
62	12:29	5.0	124	-49.17	0.17	0.19	-0.34	*PASS*	-0.39	*PASS*
63	12:31	5.5	136	-53.30	0.60	0.61	-1.12	*PASS*	-1.14	*PASS*
64	12:35	6.0	148	-60.76	0.24	0.16	-0.39	*PASS*	-0.26	*PASS*
65	12:38	6.5	161	-61.54	0.99	0.84	-1.60	*PASS*	-1.36	*PASS*
68	12:45	7.0	173	-66.58	0.82	0.73	-1.23	*PASS*	-1.09	*PASS*
69	12:48	7.5	185	-71.05	-1.38	-0.29	1.95	*PASS*	0.40	*PASS*
70	12:51	8.0	198	-73.29	4.12	0.08	-5.62	*PASS*	-0.11	*PASS*
71	12:55	8.5	210	-73.21	4.66	0.07	-6.36	*PASS*	-0.09	*PASS*
73	13:00	9.0	222	-70.27	-0.01	0.18	0.01	*PASS*	-0.26	*PASS*
74	13:03	9.5	235	-69.32	0.38	0.11	-0.54	*PASS*	-0.16	*PASS*
75	13:06	10.0	247	-70.35	-1.34	-0.17	1.90	*PASS*	0.24	*PASS*
76	13:10	10.5	259	-68.56	-0.13	0.07	0.19	*PASS*	-0.10	*PASS*
77	13:13	-	270	-68.08	-0.01	0.04	0.02	*PASS*	-0.06	*PASS*

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

During execution of the Sine with Dwell maneuvers were any of the following events observed?

Rim-to-pavement contact	☐ Yes	☒ No
Tire debeading	☐ Yes	☒ No
Loss of pavement contact of vehicle tires	☐ Yes	☒ No
Did the test driver experience any vehicle loss of control or spinout?	☐ Yes	☒ No

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

3.0 TEST DATA (CONTD)

DATA SHEET 8 (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
39	Counter Clockwise	5.0	124	-3.27	*PASS*
40	Counter Clockwise	5.5	136	-3.37	*PASS*
41	Counter Clockwise	6.0	148	-3.40	*PASS*
42	Counter Clockwise	6.5	161	-3.51	*PASS*
43	Counter Clockwise	7.0	173	-3.49	*PASS*
44	Counter Clockwise	7.5	185	-3.47	*PASS*
47	Counter Clockwise	8.0	198	-3.53	*PASS*
48	Counter Clockwise	8.5	210	-3.57	*PASS*
49	Counter Clockwise	9.0	222	-3.53	*PASS*
50	Counter Clockwise	9.5	235	-3.47	*PASS*
51	Counter Clockwise	10.0	247	-3.47	*PASS*
52	Counter Clockwise	10.5	259	-3.49	*PASS*
54	Counter Clockwise	-	270	-3.45	*PASS*
62	Clockwise	5.0	124	3.16	*PASS*
63	Clockwise	5.5	136	3.25	*PASS*
64	Clockwise	6.0	148	3.26	*PASS*
65	Clockwise	6.5	161	3.36	*PASS*
68	Clockwise	7.0	173	3.24	*PASS*
69	Clockwise	7.5	185	3.38	*PASS*
70	Clockwise	8.0	198	3.44	*PASS*
71	Clockwise	8.5	210	3.39	*PASS*
73	Clockwise	9.0	222	3.47	*PASS*
74	Clockwise	9.5	235	3.36	*PASS*
75	Clockwise	10.0	247	3.35	*PASS*
76	Clockwise	10.5	259	3.36	*PASS*
77	Clockwise	-	270	3.34	*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: *Runs 30-35 were no good, incorrect steering angles were used. Runs 45, 46, 53, 66, 67 and 72 were no good due to equipment issues and difficulty with speed regulation. In all cases a 5 minute interval between runs was maintained.*

RECORDED BY: *P Broen* DATE RECORDED: *9/8/2011*

APPROVED BY: *J Lenkeit* DATE APPROVED: *9/16/2011*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Honda CR-Z*

NHTSA No. *CB5305* Data Sheet Completion Date: *9/8/2011*

TEST 1

MALFUNCTION SIMULATION: Describe method of malfunction simulation

Disconnected left front wheel speed sensor.

MALFUNCTION TELLTALE ILLUMINATION:

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

X Yes ___ No

Time for telltale to illuminate after ignition system is activated and vehicle speed of 48 ± 8 km/h (30 ± 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: *ESC icon illuminated when ignition was switched on, no driving was required. In common display area, "check ABS system" and " check VSA system" were displayed. When sensor was reconnected the icon extinguished at the conclusion of the normal bulb check. No information in common area.*

RECORDED BY: *P Broen* DATE RECORDED: *9/8/2011*

APPROVED BY: *J Lenkeit* DATE APPROVED *9/16/11*

3.0 TEST DATA (CONTD)

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

Vehicle: *2011 Honda CR-Z*

NHTSA No. *CB5305* Data Sheet Completion Date:

TEST 2

MALFUNCTION SIMULATION: Describe method of malfunction simulation

Disconnect steering wheel angle 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 2 DATA INDICATES COMPLIANCE: PASS

Remarks: *ESC telltale illuminated when ignition was switched on, no driving was required. In common display area, "check VSA system" with skidding car was displayed. When sensor was reconnected the telltale extinguished at the conclusion of the normal bulb check. No information in common area.*

RECORDED BY: *P Broen* DATE RECORDED: *9/8/11*

APPROVED BY: *J Lenkeit* DATE APPROVED *9/16/11*

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 15)

Figure 5.1. Front View of Test Vehicle

5.0 PHOTOGRAPHS (2 of 15)

Figure 5.2. Rear View of Test Vehicle

5.0 PHOTOGRAPHS (3 of 15)

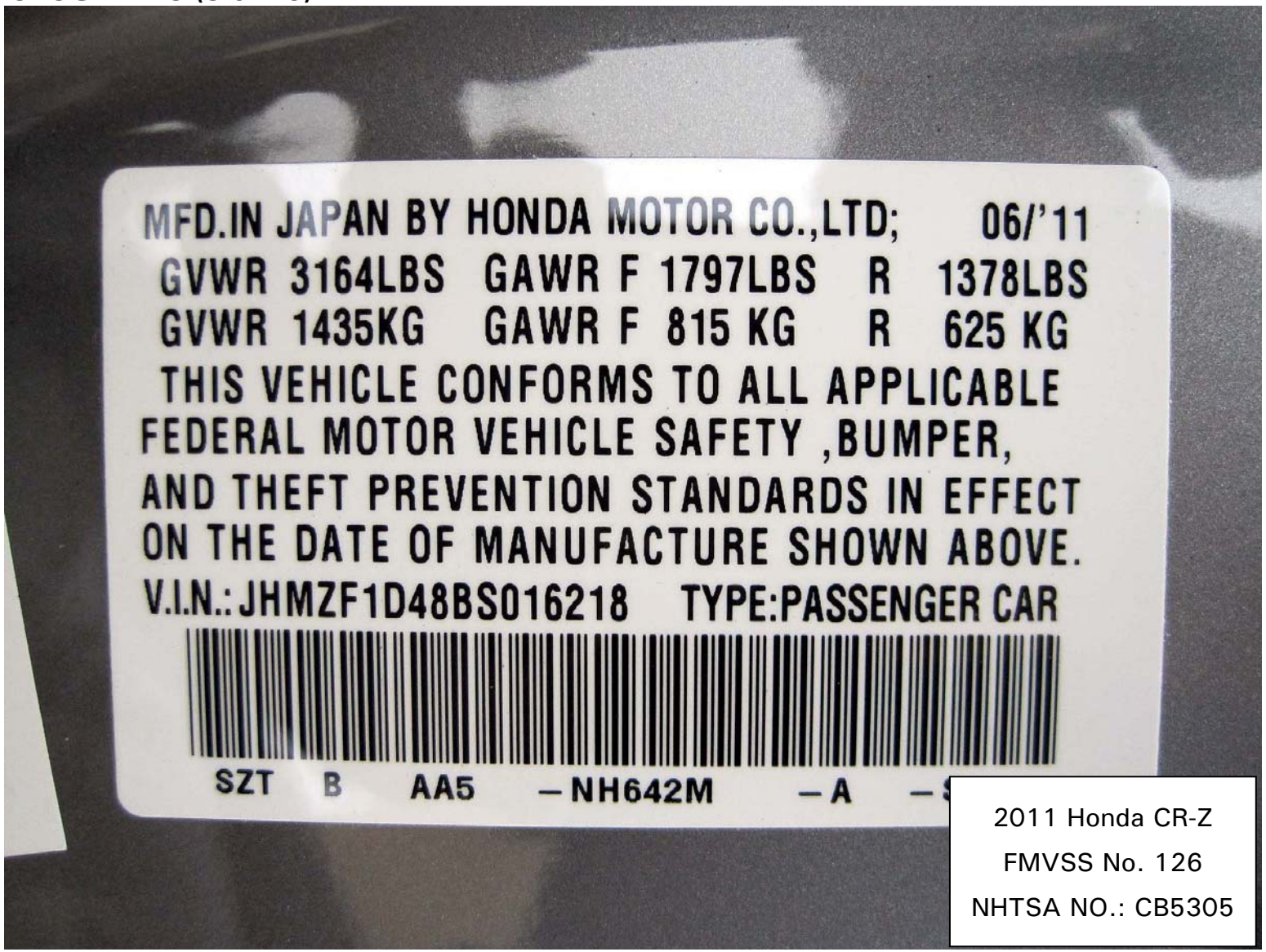


Figure 5.3. Vehicle Certification Label

5.0 PHOTOGRAPHS (4 of 15)

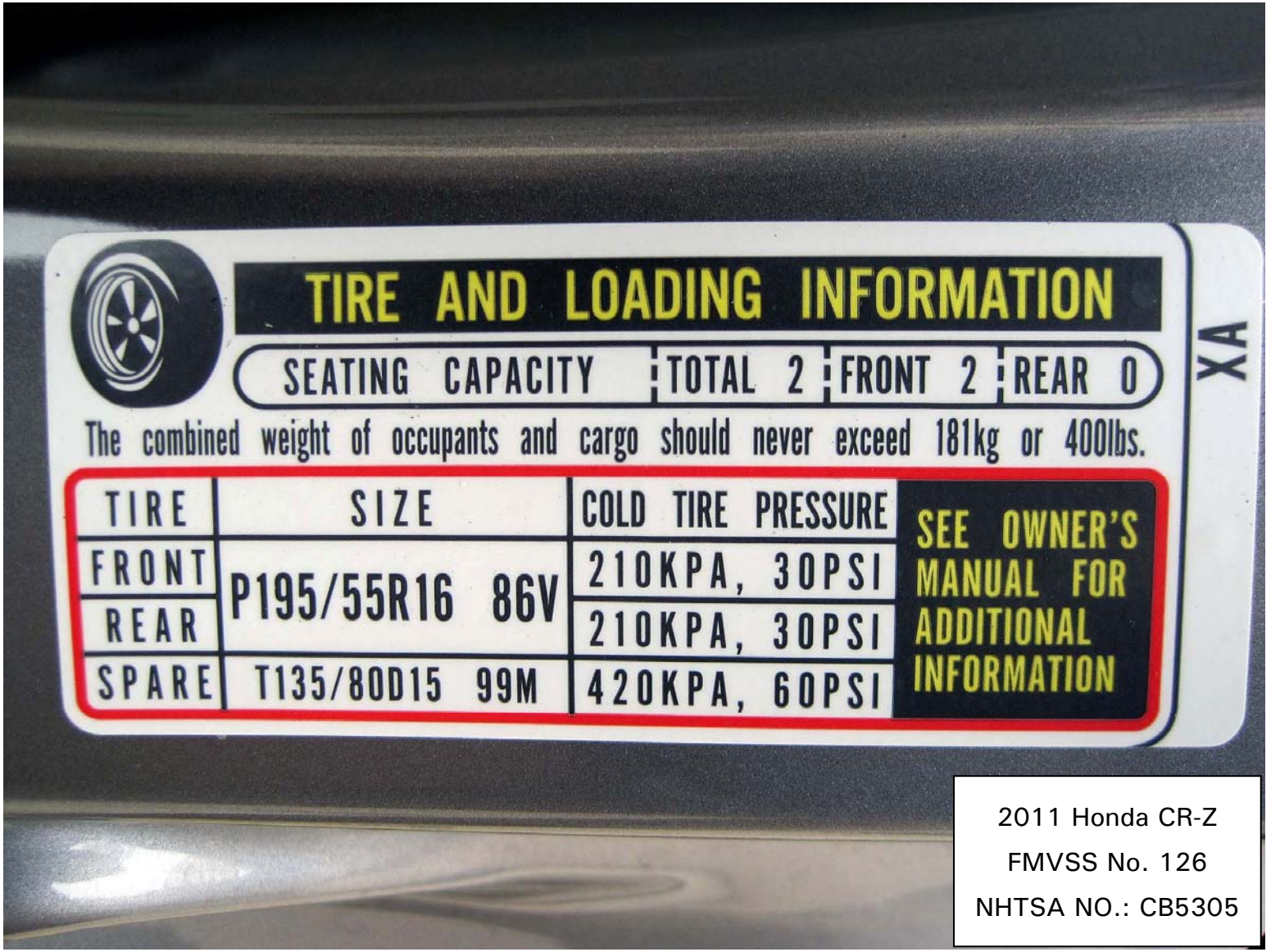


Figure 5.4. Vehicle Placard

5.0 PHOTOGRAPHS (5 of 15)

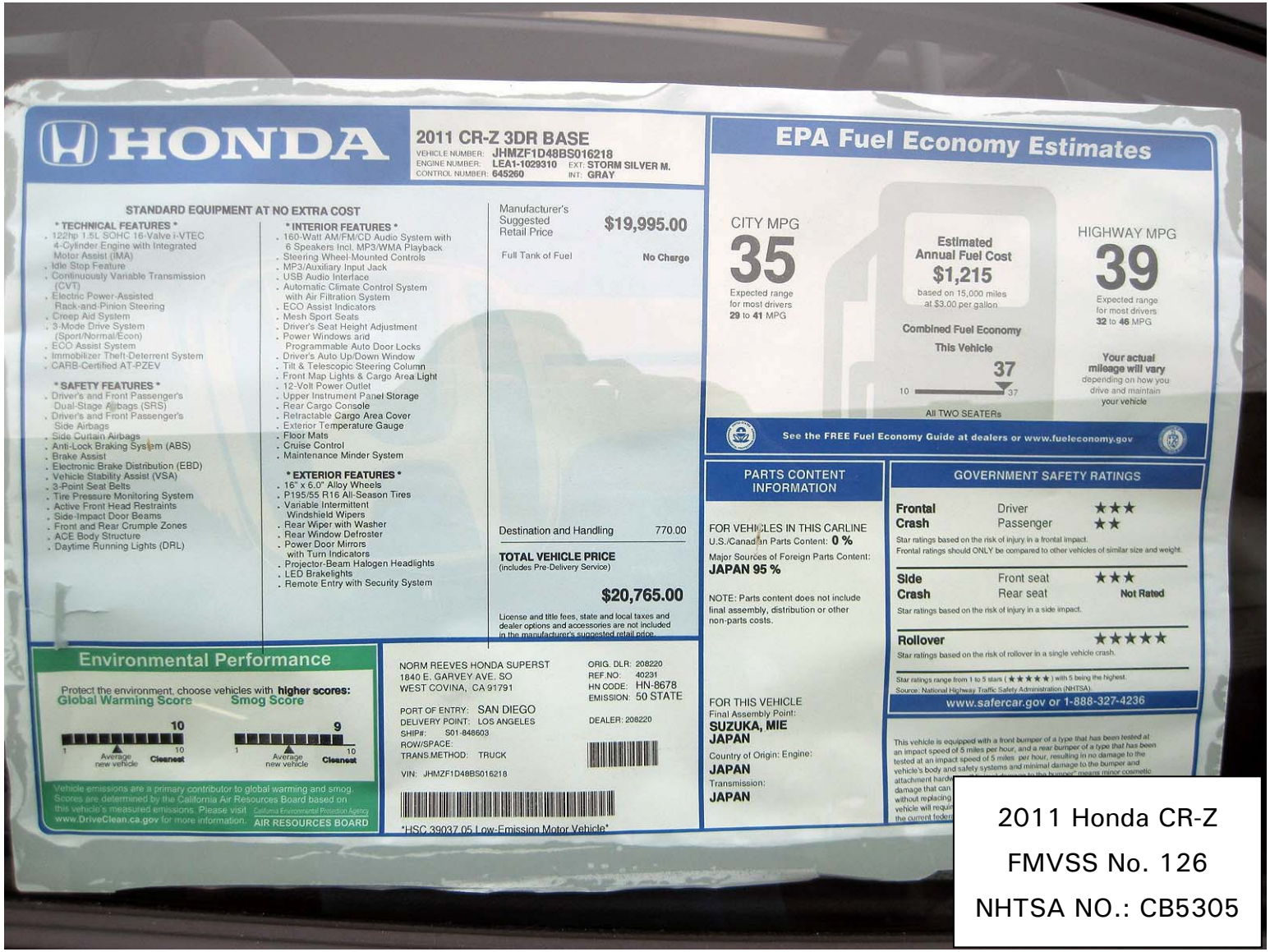


Figure 5.5. Window Sticker (Monroney Label)

5.0 PHOTOGRAPHS (6 of 15)

Figure 5.6. Front View of Vehicle as Tested

5.0 PHOTOGRAPHS (7 of 15)

Figure 5.7. Rear View of Vehicle as Tested

5.0 PHOTOGRAPHS (8 of 15)

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

5.0 PHOTOGRAPHS (9 of 15)

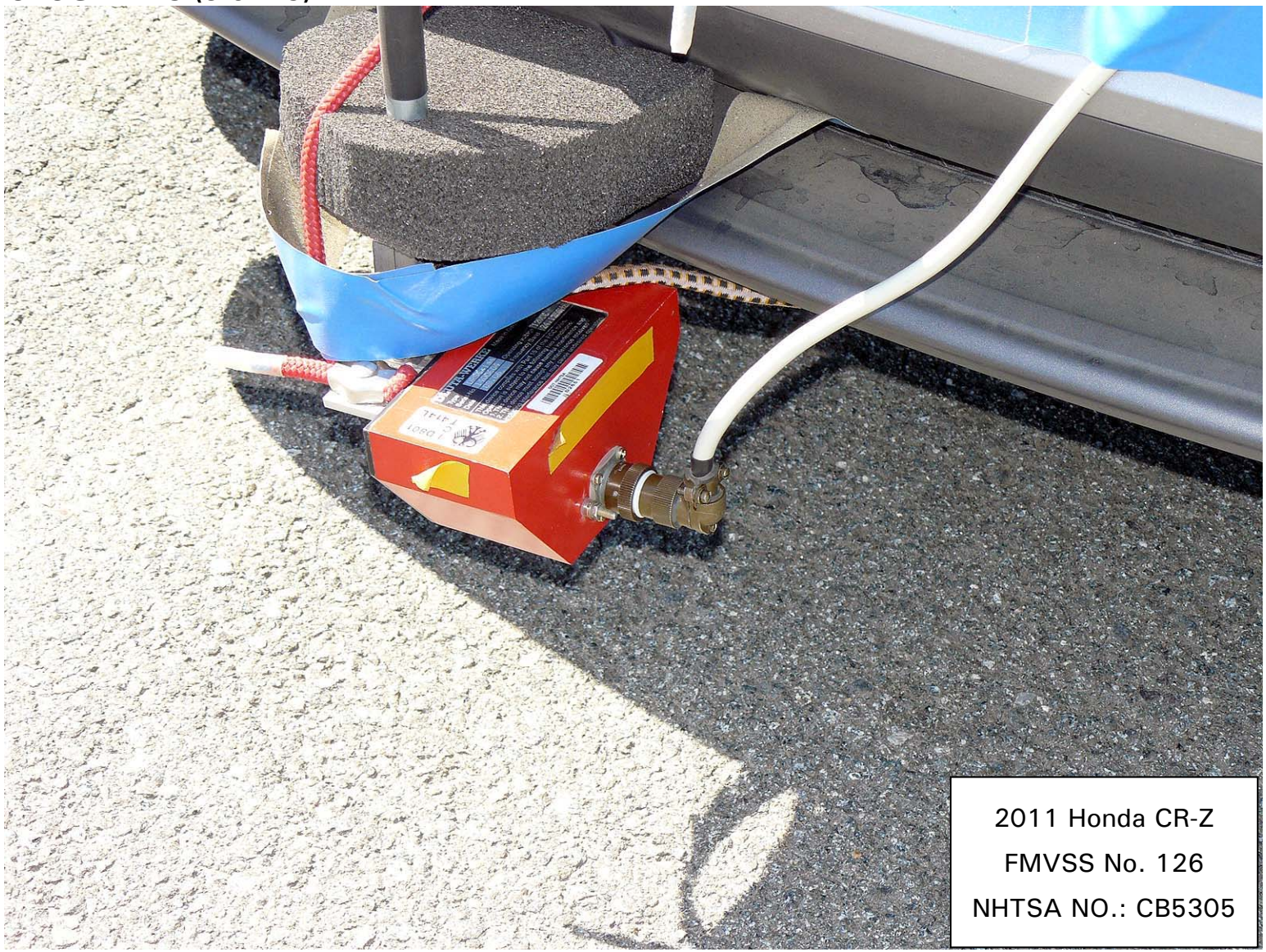


Figure 5.9. Rear Mounted Speed Sensor

5.0 PHOTOGRAPHS (10 of 15)

Figure 5.10. Steering Controller and Data Acquisition Computer

5.0 PHOTOGRAPHS (11 of 15)

Figure 5.11. Inertial Measurement Unit Mounted in Vehicle

5.0 PHOTOGRAPHS (12 of 15)

Figure 5.12. Brake Pedal Load Cell

5.0 PHOTOGRAPHS (13 of 15)

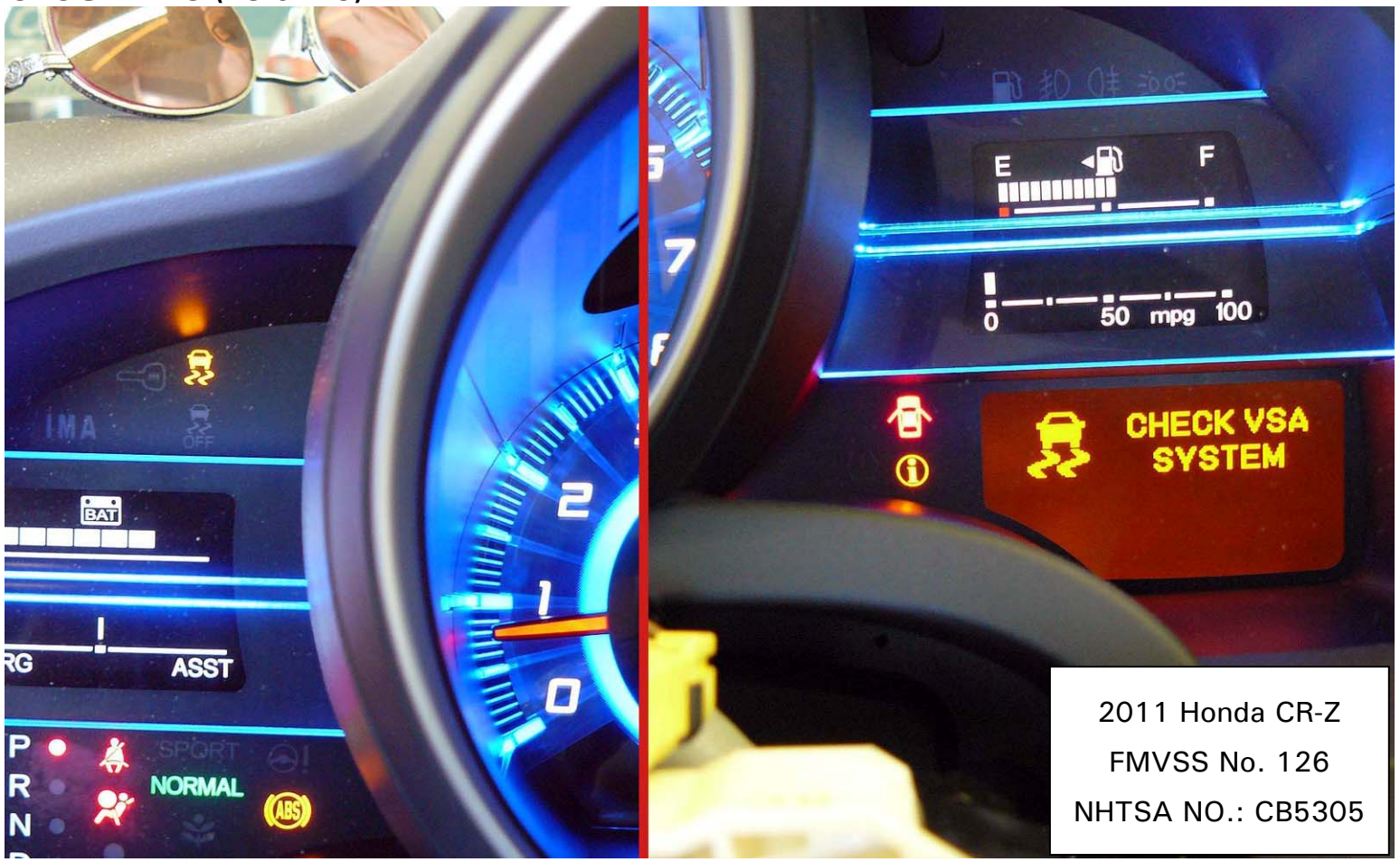


Figure 5.13. Telltales for ESC Activation and Malfunction

5.0 PHOTOGRAPHS (14 of 15)

Figure 5.14. Telltale for ESC Off

5.0 PHOTOGRAPHS (15 of 15)

Figure 5.15. ESC Off Control Switch

6.0 DATA PLOTS (1 of 4)

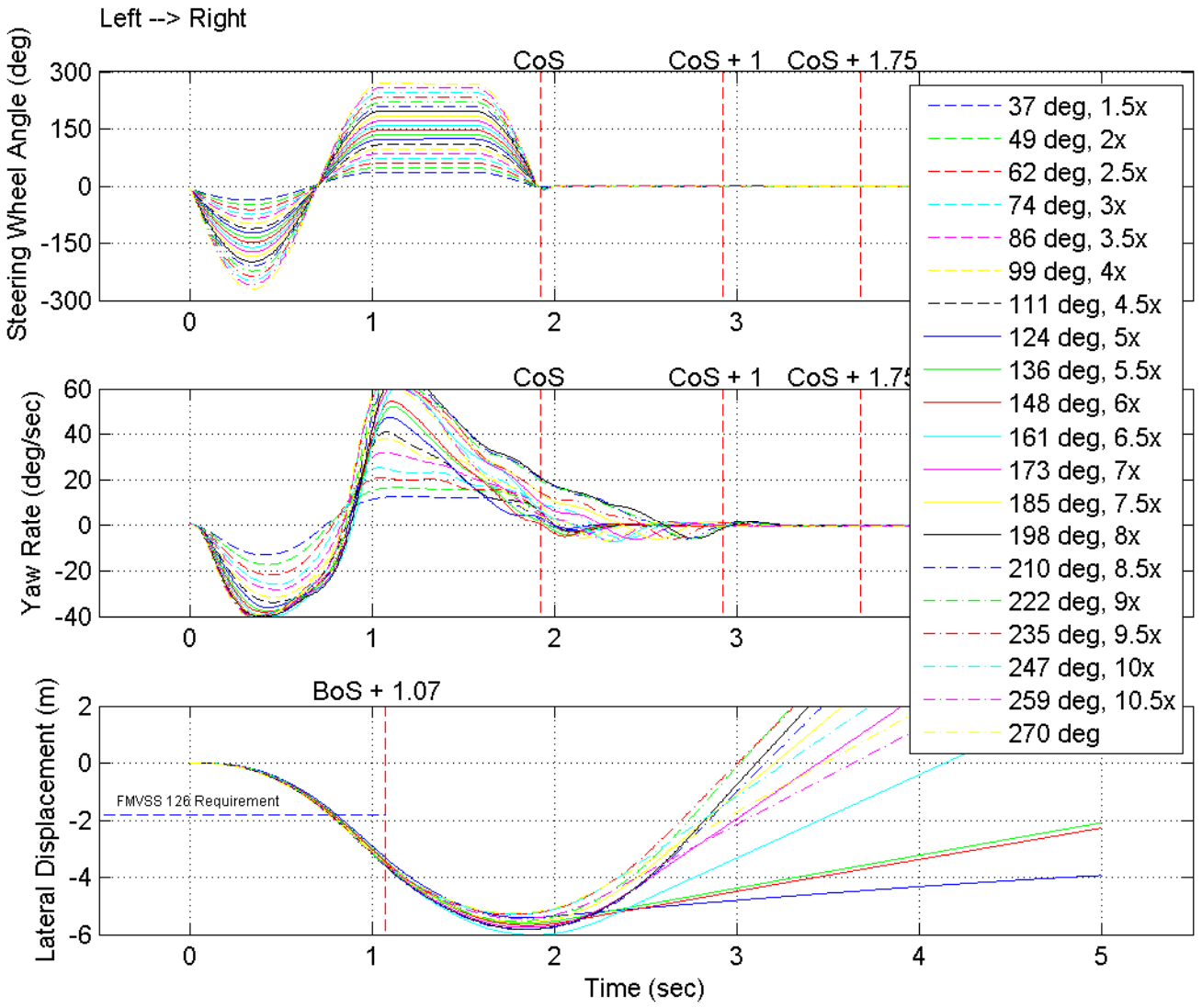


Figure 6.1. Steering Wheel Angle, Yaw Rate and Lateral Displacement for L-R Series

6.0 DATA PLOTS (2 of 4)

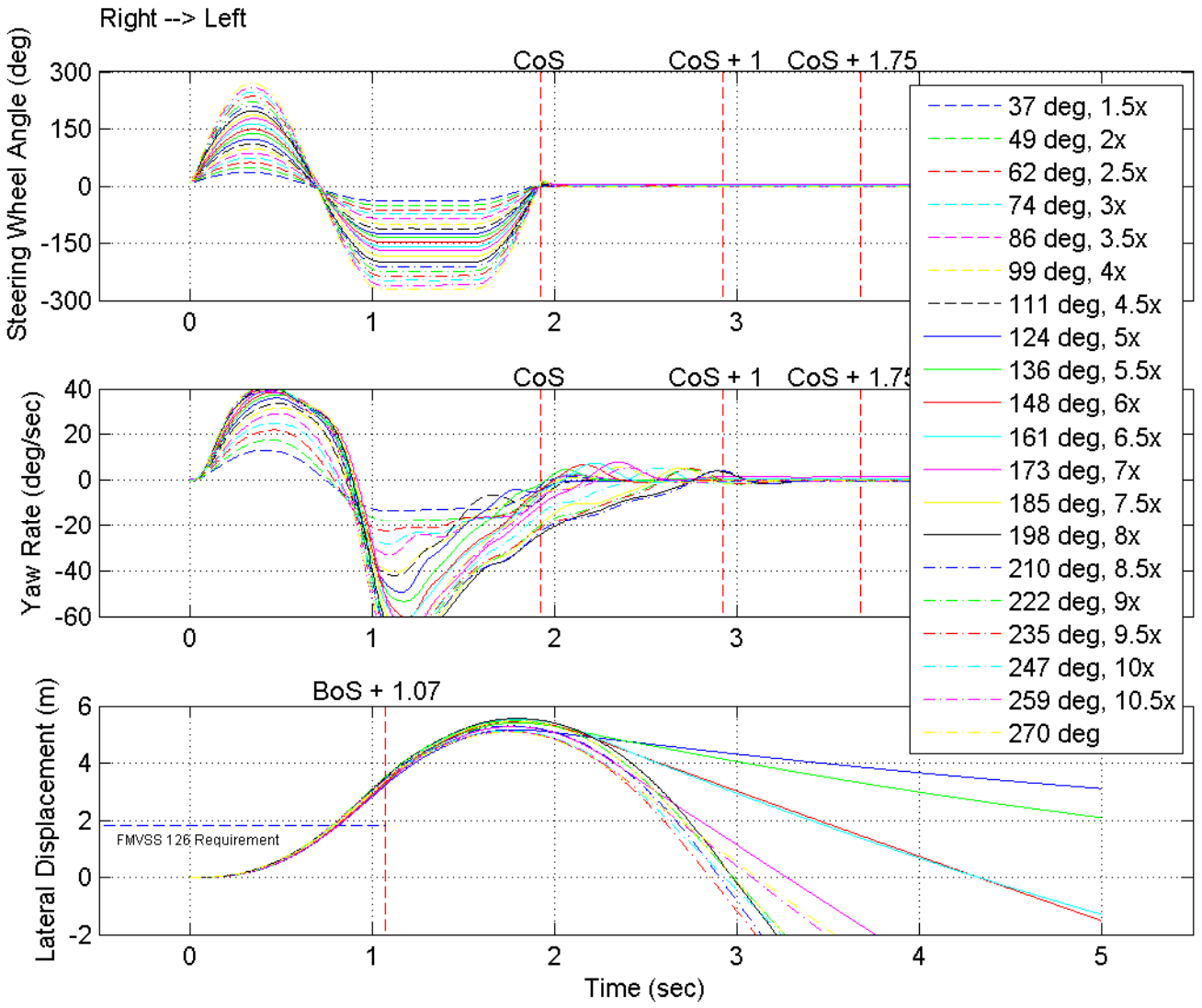


Figure 6.2. Steering Wheel Angle, Yaw Rate and Lateral Displacement for R-L Series

6.0 DATA PLOTS (3 of 4)

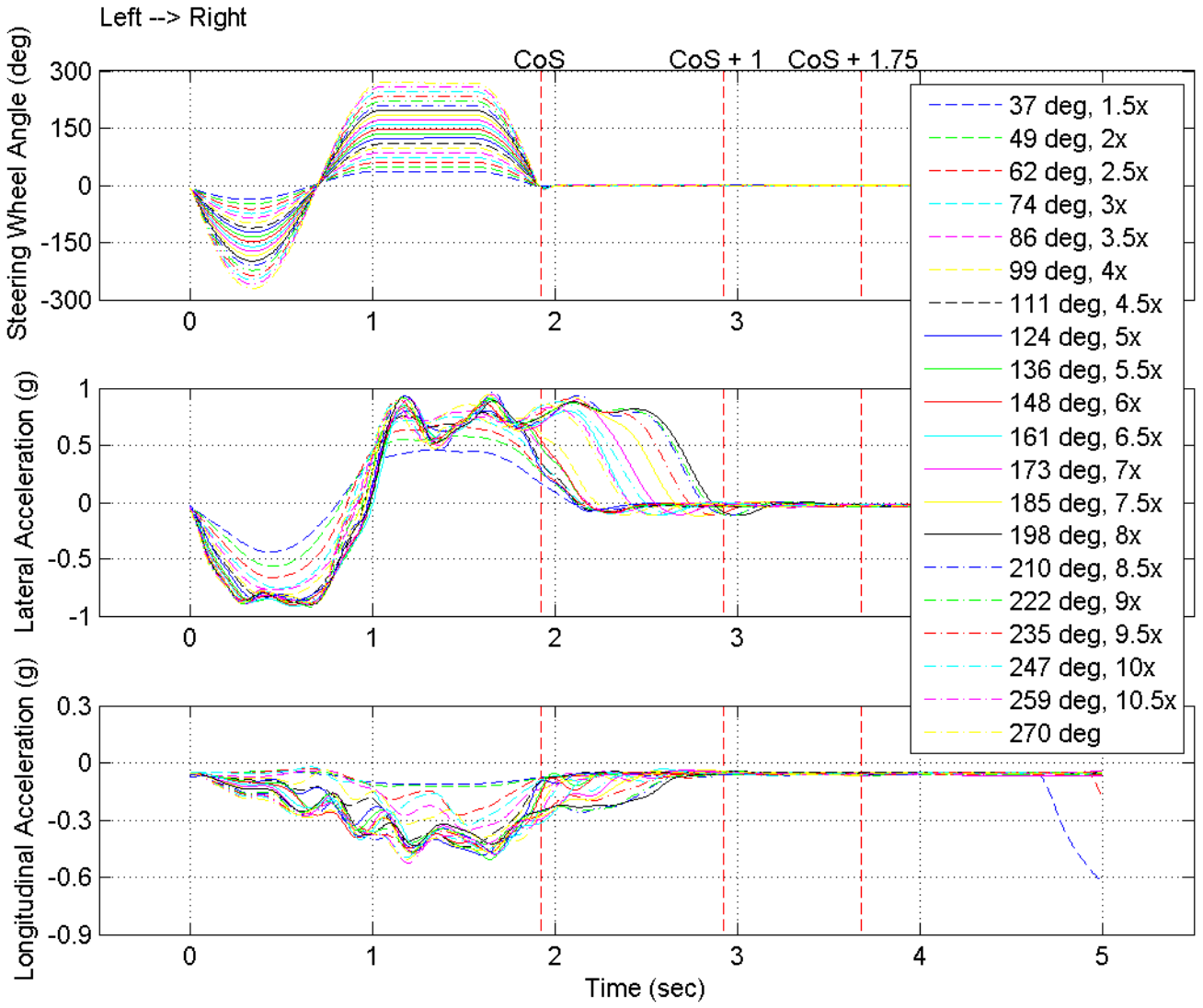


Figure 6.3. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for L-R Series

6.0 DATA PLOTS (4 of 4)

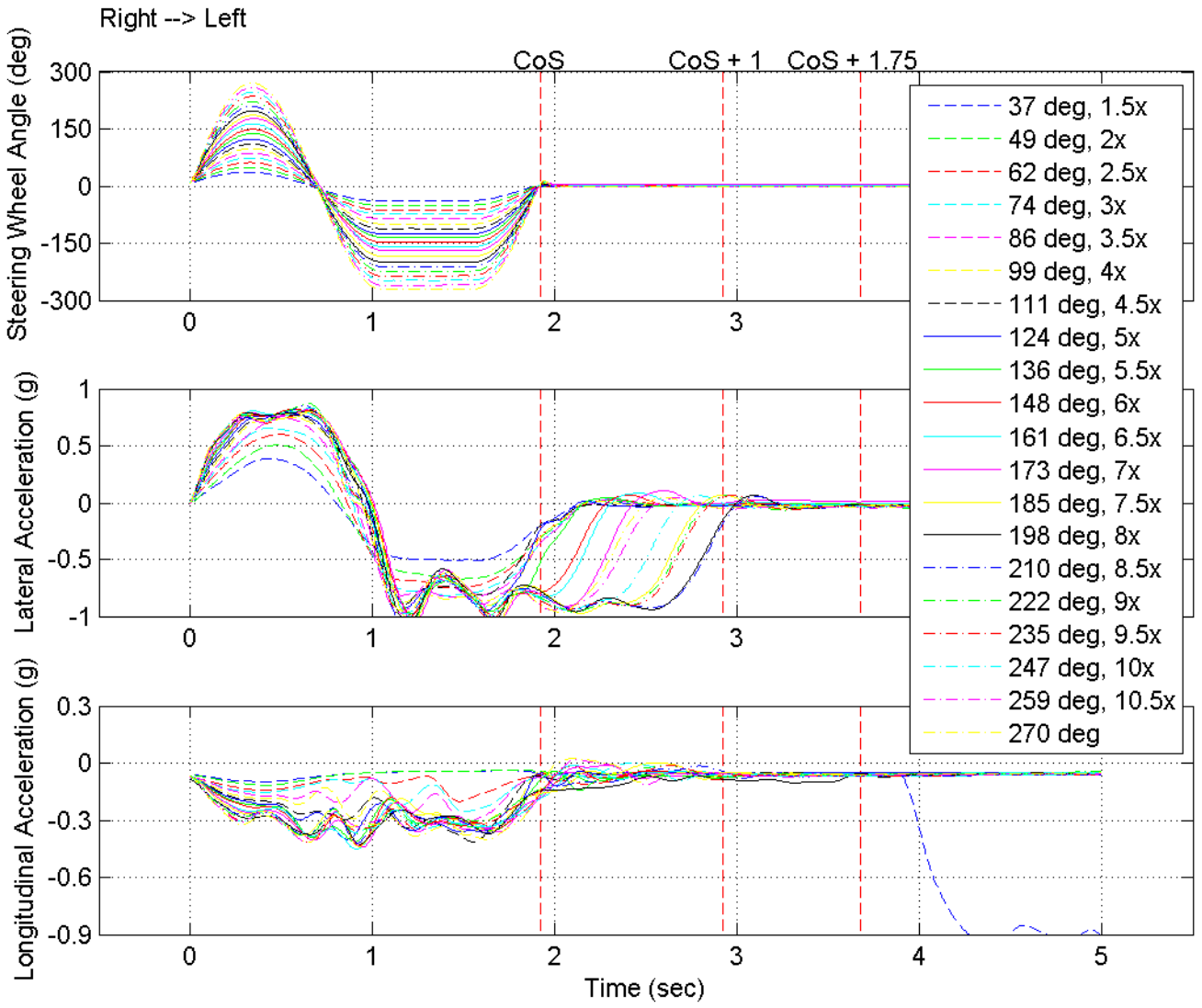


Figure 6.4. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for R-L Series

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

Quick Reference Guide

Instrument Panel P.67

Gauges P.81

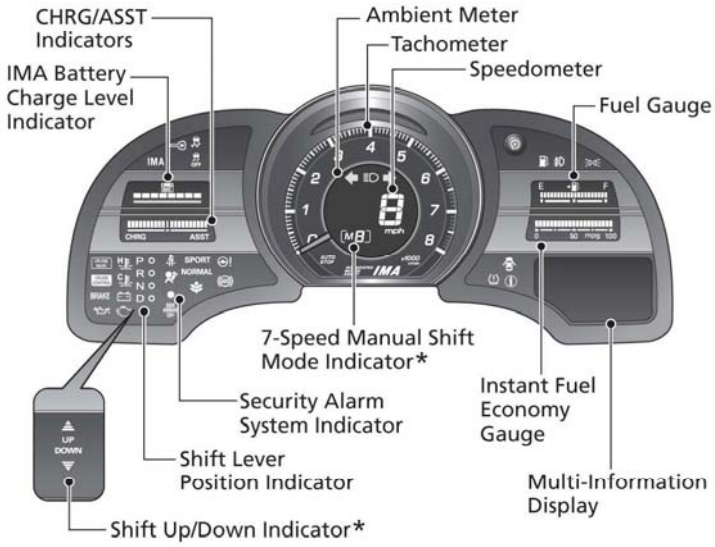
Lights Reminders

- Lights On Indicator
- High Beam Indicator
- Fog Light Indicator*

System Indicators

- Malfunction Indicator Lamp
- Low Oil Pressure Indicator
- 12 Volt Battery Charging System Indicator
- Anti-lock Brake System (ABS) Indicator
- Vehicle Stability Assist (VSA®) System Indicator
- VSA® OFF Indicator
- Turn Signal and Hazard Warning Indicators
- Electric Power Steering (EPS) Indicator
- IMA System Indicator
- Auto Idle Stop Indicator

Multi-Information Display P.83



System Indicators

- High Temperature Indicator
- Low Temperature Indicator
- Low Fuel Indicator

System Indicators

- SPORT Mode Indicator
- NORMAL Mode Indicator
- ECON Mode Indicator

System Indicators P.68

System Indicators

- Seat Belt Reminder Indicator
- Immobilizer System Indicator
- Parking Brake and Brake System Indicator
- Supplemental Restraint System Indicator
- Side Airbag Off Indicator
- U.S. models only
- Low Tire Pressure/ TPMS Indicator
- Door/Hatch Open Indicator
- Cruise Main Indicator
- Cruise Control Indicator
- System Message Indicator

14

VSA® Off Button P.215

- The vehicle stability assist (VSA®) system helps stabilize the vehicle during sharp cornering, and helps maintain traction while accelerating on loose or slippery road surfaces.
- VSA® comes on automatically every time you start the engine.
- To turn VSA® on or off, press and hold the button until you hear a beep.

Cruise Control P.211

- Cruise control allows you to maintain a set speed without keeping your foot on the accelerator pedal.
- To use cruise control, press the CRUISE button, then press the DECEL/SET button when the vehicle speed is above 25 mph (40 km/h).

Tire Pressure Monitoring System (TPMS) P.216

U.S. models only

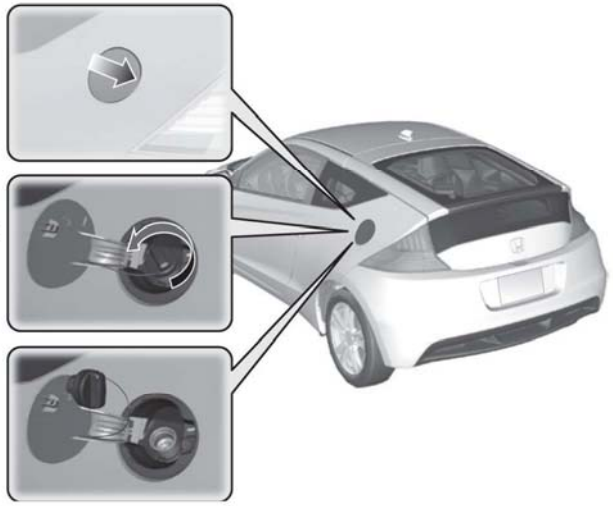
- TPMS monitors tire pressure.
- TPMS is turned on automatically every time you start the engine.

Refueling P.231

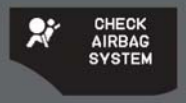
Fuel recommendation: Unleaded gasoline with a pump octane number 87 or higher

Fuel tank capacity: 10.6 US gal (40 L)

1. Press and release the center of the rear edge of the fuel fill door. You hear a click. The door pops open slightly.
2. Turn the fuel fill cap slowly to remove the cap.
3. Place the cap in the holder on the fuel fill door.
4. After refueling, screw the cap back on until it clicks at least once.



7.1 OWNER'S MANUAL PAGES

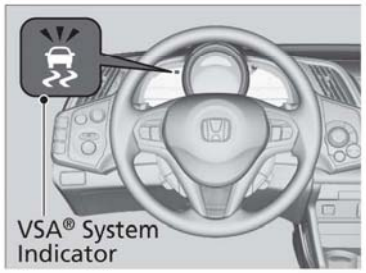
Indicator	Name	On/Blinking	Explanation	Message
	Supplemental Restraint System Indicator	• Comes on for a few seconds when you turn the ignition switch to ON II, then goes off. • Comes on if a problem with any of the following is detected: - Supplemental restraint system - Side airbag system - Side curtain airbag system - Seat belt tensioner	• **Stays on constantly or does not come on at all** - Have the vehicle checked by a dealer.	
	VSA® (Vehicle Stability Assist) System Indicator	• Comes on for a few seconds when you turn the ignition switch to ON II, then goes off. • Blinks when VSA® is active. • Comes on if there is a problem with the VSA® system. • Comes on if there is a problem with the hill start assist system. • Comes on if there is a problem with the creep aid system (CVT) or the brake assist system.	• **Stays on constantly** - Have the vehicle checked by a dealer. **VSA® (Vehicle Stability Assist) System** P.214	
	VSA® (Vehicle Stability Assist) OFF Indicator	• Comes on for a few seconds when you turn the ignition switch to ON II, then goes off. • Comes on when you deactivate VSA®.	**VSA® (Vehicle Stability Assist) System** P.215	—

7.1 OWNER'S MANUAL PAGES

VSA® (Vehicle Stability Assist), aka ESC (Electronic Stability Control), System

VSA® helps to stabilize the vehicle during cornering if the vehicle turns more or less than what was intended. It also assists in maintaining traction on slippery surfaces. It does so by regulating engine output and selectively applying the brakes.

VSA® Operation



When VSA® activates, you may notice that the engine does not respond to the accelerator. You may also notice some noise from the hydraulic system. You will also see the indicator blink.

VSA® (Vehicle Stability Assist), aka ESC (Electronic Stability Control), System

The VSA® may not function properly if tire type and size are mixed. Make sure to use the same size and type of tire, and the air pressures as specified.

When the VSA® indicator comes on and stays on while driving, there may be a problem with the system. While this may not interfere with normal driving, have your vehicle checked by a dealer immediately.

VSA® cannot enhance stability in all driving situations and does not control the entire braking system. You still need to drive and corner at speeds appropriate for the conditions and always leave a sufficient margin of safety.

The main function of the VSA® system is generally known as Electronic Stability Control (ESC). The system also includes a traction control function.

VSA® On and Off

This button is on the driver side control panel. To turn the VSA® system on and off, press and hold it until you hear a beep.

VSA® will stop and the indicator will come on.

To turn it on again, press the (VSA® off) button until you hear a beep.

VSA® is turned on every time you start the engine, even if you turned it off the last time you drove the vehicle.

VSA® (Vehicle Stability Assist), aka ESC (Electronic Stability Control), System

Without VSA®, your vehicle will have normal braking and cornering ability, but it will not have VSA® traction and stability enhancement.

In certain unusual conditions when your vehicle gets stuck in shallow mud or fresh snow, it may be easier to free it with the VSA® temporarily switched off.

When the VSA® system is off, the traction control system is also off. You should only attempt to free your vehicle with the VSA® off if you are not able to free it when the VSA® is on.

Immediately after freeing your vehicle, be sure to switch VSA® on again. We do not recommend driving your vehicle with the VSA® and traction control systems switched off.

If the low tire pressure/TPMS indicator comes on or blinks, the VSA® system comes on automatically. In this case, you cannot turn the system off by pressing the button.

You may hear a motor sound coming from the engine compartment while system checks are being performed immediately after starting the engine or while driving. This is normal.

7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO.: *DTNH22-08-D-00098*
DATE: *8/24/11*

From: *Automotive Allies*

To: *Dynamic Research, Inc*

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

Vehicle VIN: *JHMZF1D48BS016218* NHTSA NO.: *CB5305*
Model Year: *2011* Odometer Reading: *42* Miles
Make *Honda* Body Style: *Passenger Car*
Model: *CR-Z* Body Color: *Silver*
Manufacture Date: *6/11* Dealer: *Automotive Allies*
GVWR (kg/lb) *1435/3164* 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: *8/22/2011*

APPROVED BY: *P Broen* DATE APPROVED: *8/23/2011*

7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO.: *DTNH22-08-D-00098*
DATE: *9/16/2011*

Vehicle VIN: *JHMZF1D48BS016218* NHTSA NO.: *CB5305*
Model Year: *2011* Odometer Reading: *98* Miles
Make: *Honda* Body Style: *Passenger Car*
Model: *CR-Z* Body Color: *Silver*
Manufacture Date: *6/11* Dealer: *Automotive Allies*
GVWR (kg/lb) *1435 (3164)* 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:

None

Explanation for equipment removal:

NA

Test Vehicle Condition:

As-delivered, like new

RECORDED BY: *J Lenkeit* DATE RECORDED: *9/16/2011*

APPROVED BY: *B Kebschull* DATE APPROVED: *9/16/2011*

7.4 SINE WITH DWELL TEST RESULTS

2011 Honda CR-Z
NHTSA No.: *CB5305*
Date of Test : *9/8/2011*
Date Created: *9/12/11*

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

File	SWA @ 5deg Ct	MES	Time @ 5deg	COS	Time @ COS	MOS	Time @ MOS	YRR1	YR1	YRR 1 Ct	YRR 175	YR175	YRR17 5 Ct	2nd Yaw Peak	2nd Yaw Peak Ct	Lat Disp	Lat. Acc. 1.07 s	1st SWA Peak	1st SWA Peak Ct	2nd SWA Mean
	(deg)	(mph)	(s)		(s)		(sec)	(%)	(deg/s)		(%)	(deg/s)		(deg/s)		(ft)	(g)	(deg)		(deg)
26	711	50.16	3.549	1091	5.450	847	4.227	-1.8	-0.23	1291	-1.26	-0.16	1441	13.03	950	-4.17	0.41	36.71	775	36.89
27	710	50.01	3.542	1091	5.448	847	4.228	-1.7	-0.28	1291	-0.88	-0.15	1441	16.90	937	-5.44	0.53	48.55	776	48.92
28	709	50.16	3.536	1091	5.448	847	4.227	-1.6	-0.34	1291	-1.29	-0.27	1441	21.19	918	-6.79	0.59	61.36	775	61.79
29	708	50.07	3.533	1091	5.447	847	4.227	-0.8	-0.21	1291	-0.36	-0.09	1441	25.92	916	-7.90	0.65	73.22	775	73.81
36	707	49.98	3.530	1090	5.445	847	4.226	-0.6	-0.18	1290	-0.32	-0.10	1440	32.19	921	-8.74	0.66	85.18	775	85.89
37	707	49.86	3.528	1090	5.443	847	4.227	-1.5	-0.57	1290	-0.75	-0.29	1440	38.33	923	-9.53	0.67	98.09	775	98.79
38	707	50.01	3.527	1091	5.446	847	4.226	-0.8	-0.33	1291	-0.70	-0.29	1441	41.36	922	-10.14	0.64	110.06	776	110.56
39	706	49.88	3.525	1090	5.445	847	4.226	-0.9	-0.44	1290	-0.67	-0.32	1440	47.28	926	-10.74	0.57	123.18	775	123.71
40	706	49.94	3.524	1090	5.444	847	4.226	-0.2	-0.10	1290	-0.39	-0.20	1440	52.41	930	-11.05	0.52	135.39	775	135.63
41	706	49.95	3.524	1090	5.445	847	4.227	-0.4	-0.23	1290	-0.47	-0.26	1440	54.69	929	-11.17	0.55	147.60	775	147.55
42	706	50.22	3.524	1091	5.446	847	4.227	-0.3	-0.21	1291	-0.25	-0.15	1441	60.99	936	-11.51	0.44	160.64	775	160.40
43	706	50.06	3.523	1090	5.443	847	4.227	0.5	0.30	1290	-0.31	-0.19	1440	61.93	935	-11.44	0.57	172.82	775	172.42
44	706	50.13	3.522	1090	5.442	847	4.226	2.1	1.30	1290	-0.16	-0.10	1440	62.30	932	-11.38	0.69	184.99	775	184.57
47	706	50.02	3.523	1090	5.444	847	4.227	-2.5	-1.68	1290	-0.20	-0.13	1440	66.58	937	-11.59	0.55	198.16	775	197.50
48	706	50.17	3.523	1090	5.444	847	4.227	-0.4	-0.26	1290	-0.62	-0.41	1440	65.38	934	-11.71	0.64	210.07	775	209.46
49	706	50.17	3.522	1090	5.443	847	4.227	-1.3	-0.82	1290	-0.25	-0.16	1440	64.35	931	-11.58	0.72	222.30	775	221.56
50	706	50.27	3.523	1090	5.443	847	4.227	1.5	0.95	1290	-0.30	-0.19	1440	62.61	926	-11.40	0.78	235.24	775	234.61
51	706	50.02	3.522	1090	5.442	847	4.226	0.0	0.00	1290	-0.30	-0.19	1440	62.73	924	-11.39	0.78	247.46	775	246.58
52	706	50.05	3.522	1090	5.443	847	4.227	-0.2	-0.14	1290	-0.32	-0.20	1440	62.95	922	-11.44	0.74	259.31	775	258.58
54	706	50.20	3.522	1090	5.443	847	4.227	-0.4	-0.23	1290	-0.22	-0.14	1440	63.10	920	-11.33	0.78	270.25	775	269.43

7.4 SINE WITH DWELL TEST RESULTS

2011 Honda CR-Z
NHTSA No.: *CB5305*
Date of Test : *9/8/2011*
Date Created: *9/12/11*

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	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)
55	711	50.05	3.548	1091	5.450	847	4.228	0.8	-0.10	1291	0.52	-0.07	1441	-13.46	937	4.16	-0.42	37.57	775	37.34
56	710	50.17	3.541	1091	5.448	847	4.228	-2.0	0.36	1291	-0.72	0.13	1441	-17.85	932	5.53	-0.51	49.64	775	49.21
57	709	49.95	3.536	1091	5.448	847	4.227	-0.8	0.18	1291	-0.43	0.10	1441	-22.49	924	6.72	-0.58	62.39	775	61.94
58	708	50.15	3.532	1091	5.448	847	4.227	-0.7	0.21	1291	-0.62	0.18	1441	-28.09	926	7.83	-0.61	74.36	775	73.91
59	707	49.72	3.530	1091	5.447	847	4.227	-0.7	0.22	1291	-0.58	0.19	1441	-33.09	927	8.59	-0.64	86.36	775	85.94
60	707	50.09	3.528	1091	5.446	847	4.227	-0.4	0.16	1291	-0.59	0.24	1441	-40.49	934	9.53	-0.58	99.19	775	99.03
61	707	49.91	3.526	1091	5.447	847	4.227	-0.4	0.15	1291	-0.17	0.07	1441	-41.86	933	9.83	-0.56	110.89	775	111.00
62	706	49.98	3.524	1090	5.445	847	4.227	-0.3	0.17	1290	-0.39	0.19	1440	-49.17	940	10.37	-0.45	124.10	775	124.23
63	602	49.96	3.002	986	4.921	744	3.712	-1.1	0.60	1186	-1.14	0.61	1336	-53.30	837	10.66	-0.39	137.68	672	134.46
64	708	49.86	3.531	1092	5.454	850	4.241	-0.4	0.24	1292	-0.26	0.16	1442	-60.76	947	10.69	-0.35	148.98	778	147.34
65	707	49.95	3.526	1090	5.443	849	4.238	-1.6	0.99	1290	-1.36	0.84	1440	-61.54	942	11.01	-0.45	163.80	777	158.39
68	706	49.82	3.522	1090	5.443	849	4.238	-1.2	0.82	1290	-1.09	0.73	1440	-66.58	948	10.64	-0.35	176.12	777	170.08
69	706	49.95	3.522	1090	5.442	847	4.227	2.0	-1.38	1290	0.40	-0.29	1440	-71.05	947	11.08	-0.44	185.19	775	185.32
70	706	50.03	3.522	1090	5.442	847	4.227	-5.6	4.12	1290	-0.11	0.08	1440	-73.29	947	11.28	-0.49	198.15	775	198.43
71	706	50.17	3.522	1090	5.443	847	4.227	-6.4	4.66	1290	-0.09	0.07	1440	-73.21	943	11.13	-0.61	210.17	775	210.31
73	706	49.95	3.522	1090	5.443	847	4.228	0.0	-0.01	1290	-0.26	0.18	1440	-70.27	943	11.39	-0.55	222.34	775	222.37
74	706	50.11	3.522	1090	5.441	847	4.227	-0.5	0.38	1290	-0.16	0.11	1440	-69.32	939	11.01	-0.63	235.48	775	235.24
75	706	49.98	3.522	1090	5.441	847	4.227	1.9	-1.34	1290	0.24	-0.17	1440	-70.35	938	10.99	-0.60	247.56	775	247.21
76	707	50.24	3.527	1091	5.446	848	4.234	0.2	-0.13	1291	-0.10	0.07	1441	-68.56	932	11.04	-0.70	260.24	776	258.50
77	706	50.12	3.522	1090	5.442	847	4.227	0.0	-0.01	1290	-0.06	0.04	1440	-68.08	933	10.96	-0.67	270.56	775	270.06

7.5 SLOWLY INCREASING STEER TEST RESULTS

2011 Honda CR-Z
NHTSA No.: *CB5305*
Date of Test: *9/8/2011*
Date Created: *9/8/2011*

File	EventPt	DOS	MES (mph)	Mean SPD (mph)	AYcount_3	THETAENCF_3 (deg)	AYCG_CD2_3 (g)	r_squared	ZeroBegin	ZeroEnd
11	700	1	50.175	49.921	1084	-25.412	-0.298	0.999	500	700
12	700	1	49.905	50.110	1084	-25.372	-0.318	0.985	500	700
13	700	1	50.183	50.058	1084	-25.410	-0.307	0.996	500	700
14	700	0	50.203	50.226	1059	24.029	0.307	0.998	500	700
15	700	0	50.257	50.180	1056	23.802	0.304	0.998	500	700
16	673	0	50.288	50.219	1060	24.073	0.302	0.998	473	673
					Averages	24.683	0.306			

Scalars	Steering Angles (deg)
1.5	37
2.0	49
2.5	62
3.0	74
3.5	86
4.0	99
4.5	111
5.0	124

Scalars	Steering Angles (deg)
5.5	136
6.0	148
6.5	161
7.0	173
7.5	185
8.0	198
8.5	210
9.0	222

Scalars	Steering Angles (deg)
9.5	235
10.0	247
10.5	259
11.0	270

7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

Vehicle:	**2011 Honda CR-Z**	NHTSA No.:	CB5305
Wheelbase:	95.6 Inches	Faro Arm S/N:	U08-05-08-06636
Measurement date:	8/25/2011	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	-	-	0.000
M_Line_Y_Axis	2.460		0.000
M_Point_48_Ref	0.000	0.000	-
M_CIRCLE001_I_Left_Rear_Wheel_Axle	-25.126	14.966	-11.699
M_Point_IMU_side	12.797	46.246	-20.539
M_Point_ROOF	-	-	-52.783
Motion Pak reference point taken from mid height of unit left side			
Motion Pak Width = 3.05" ==> 1/2 W = 1.525			
Motion_PAK_Location	12.797	47.771	-20.539

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	**57.677**	**-0.229**	**20.539**

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).