

REPORT NUMBER: 301R/305-CAL-12-005

**SAFETY COMPLIANCE TESTING FOR FMVSS 301 & 305
Fuel System Integrity – Rear Impact
Electric Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection**

**CODA Automotive
2012 CODA CODA
Four Door Sedan**

NHTSA No: CC1002

**PREPARED BY:
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October 8, 2012

FINAL REPORT


**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration Enforcement
Office of Vehicle Safety Compliance
Mail Code: NVS-220
1200 New Jersey Avenue, SE
Washington, DC 20590**

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TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	Purpose and Test Procedure	1-1
2	Compliance Test Results Summary	2-1
3	Data Sheets	3-1
<u>Data Sheet</u>		<u>Page</u>
1	Test Vehicle Specifications	3-2
2	Pre-Test Data	3-4
3	Moving Deformable Barrier (MDB) Data	3-7
4	Pre-Impact Electrical Isolation Measurements & Calculations	3-8
5	High Speed Camera Locations and Data Summary	3-9
6	Post-Test Data	3-10
7	Post-Impact Electrical Isolation Measurements & Calculations	3-12
8	FMVSS No. 301 Static Rollover Test Data	3-13
9	FMVSS No. 305 Static Rollover Test Data	3-14
10	Photograph Data Sheet Checklist	3-17
<u>Appendix</u>		<u>Page</u>
A	Photographs	A-1

SECTION 1

PURPOSE AND TEST PROCEDURE

This rear impact test is part of the FMVSS 301R/305 Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-11-D-00243. The purpose of this test was to determine if the subject vehicle, a 2012 CODA CODA Four Door Sedan, meets the performance requirements of FMVSS No. 301R "Fuel System Integrity – Rear Impact." and FMVSS No. 305 "Electric Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection". The test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-301R-02, dated January 17, 2007) and (TP-305-01, dated September 11, 2008).

SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

A 1853.0 kg 2012 CODA CODA Four Door Sedan was impacted by a 1357.0 kg moving barrier at a velocity of 79.09 kph (49.14 mph). The test was performed by Calspan Corporation on 8/10/2012.

The test vehicle was an all-electric vehicle and was not equipped with a fuel tank. Additional ballast (21.0kg) was secured in the vehicle cargo area. Two ballast Part 572E 50th percentile male Anthropomorphic Test Devices (ATD) were placed in the front occupant seating positions. Electrical isolation measurements were taken immediately post-impact and observations were made related to electrolyte spillage and battery retention. A static rollover was subsequently performed on the subject vehicle and electrical isolation measurements were taken at every stage of the rollover.

There was no fuel system fluid spillage following the impact and including all portions of the static rollover test. The maximum vehicle longitudinal crush was 827 millimeters of which the average was 674 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

Based on the test results, the 2012 CODA CODA Four Door Sedan appears to meet all requirements regarding electrolyte spillage, battery retention, and electrical isolation for FMVSS No.305 compliance testing.

The crash event was recorded by three high-speed cameras and one real-time camera. High-speed camera locations and other pertinent camera information are found on page 3-9 of this report. Data sheets can be found starting on page 3-2. Pre-test and post-test photographs of the vehicle can be found in Appendix A.

SECTION 3
DATA SHEETS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – Test Vehicle Specifications

Data Sheet No. 2 – Pre-Test Data

Data Sheet No. 3 – Moving Deformable Barrier (MDB) Data

Data Sheet No. 4 – Pre-Impact Electrical Isolation Measurements & Calculations

Data Sheet No. 5 – High Speed Camera Locations and Data Summary

Data Sheet No. 6 – Post-Test Data

Data Sheet No. 7 – Post-Impact Electrical Isolation Measurements & Calculations

Data Sheet No. 8 – FMVSS No. 301 Static Rollover Test Data

Data Sheet No. 9 – FMVSS No. 305 Static Rollover Test Data

Data Sheet No. 10 – Photograph Data Sheet Checklist

**DATA SHEET NO. 1
TEST VEHICLE SPECIFICATIONS**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	CC1002
Model Year	2012
Make	CODA
Model	CODA
Body Style	Four Door Sedan
Body Color	Black
Odometer Reading (km/mi)	45 / 28
Engine Displacement (L)	0.0
Type/No. Cylinders	0
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	Continuously VT
Final Drive	Front Wheel Drive

Overdrive	No
Air Conditioning (AC)	Yes
All-Wheel Drive (AWD)	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADL)	No
Power Brakes	Yes
Power Seats	No
Power Steering	Yes
Power Windows	Yes
Stability Control (Auto-Leveling)	No
Sunroof/T-Top	No
Tilt Steering Wheel	Yes
Traction Control System (TCS)	Yes

DEALER AND DELIVERY INFORMATION FROM CERTIFICATION LABEL

Manufactured By	CODA Automotive
Date of Manufacture	2/12
VIN	53G1U4A41CB000062

GVWR (kg)	2045
GAWR Front (kg)	995
GAWR Rear (kg)	1050

TIRE PLACARD & SIDEWALL INFORMATION

Tire Placard Location: Driver's Door Sill Spare Tire Type: None

Measured Parameter	Front	Rear
Tire Manufacturer	Kumho	Kumho
Tire Name	ECSTA AST	ECSTA AST
Tire Type	All Season	All Season
Max. Tire Pressure (kPa)	340	340
Recommended Tire Size	205/45R17	205/45R17
Load Index/Speed Symbol	88H	88H
Recommended Cold Tire Pressure (kPa)	290	290
Tire Size on Vehicle	205/45R17	205/45R17
Treadwear/ Traction Grade/ Temperature Grade	400/A/A	400/A/A

VEHICLE CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	0	5
Seat Type (Bench, Bucket, or Split Bench)	Bucket	Bench	--	
Capacity Weight (VCW) (kg)				375.00
DSC X 68.04 (kg)				340.20
Cargo Weight (RCLW) (kg)				34.80

**DATA SHEET NO. 1 (Continued)
TEST VEHICLE SPECIFICATIONS**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	Lithium Ion
Nominal Voltage (Volts)	333
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Internal to Battery System
Auxiliary Battery Type	12V lead Acid

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	EC/DEC/LiPF6
Electrolyte Fluid Specific Gravity	No Free Electrolyte
Electrolyte Fluid Kinematic Viscosity (centistokes)	No Free Electrolyte
Electrolyte Fluid Color	Colorless
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Air Cooled
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
<i>For all battery types:</i> Voltage Range corresponding to useable energy of the battery:		
Minimum State of Charge	V	0
Maximum State of Charge	V	385.000
95% of Maximum	V	365.750
Test Voltage *	V	347.300
<i>For batteries that are rechargeable ONLY by an energy source on the vehicle:</i> Voltage range corresponding to useable energy of the battery :		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

* For all battery types-No less than 95% of Maximum Operating Voltage; for batteries that are rechargeable ONLY by an energy source on the vehicle-maximum practicable state of charge within normal operating range.

**DATA SHEET NO. 2
PRE-TEST DATA**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	433.5	394.5		484.0	436.0	
Right	kg	458.0	383.0		513.0	420.0	
Ratio	%	53.4	46.6		53.8	46.2	
Totals	kg	891.5	777.5	1,669.0	997.0	856.0	1,853.0

TARGET TEST WEIGHT CALCULATION (TTW)

Measured Parameter	Units	Value	
Total Unloaded Vehicle Weight (UVW)	kg	1,669.0	(A)
Rated Cargo/Luggage Weight (RCLW)	kg	34.8	(B)
Weight of two P572E ATDS @ 78kg each	kg	156.0	(C)
Target Vehicle Test Weight (TVTW)	kg	1,859.8	(A+B+C)

*As tested Weight = (TTW -10kg) <=ATW < (TTW -5kg); TTW = Weight of Test Vehicle with 2 dummies and 34.8kg of Cargo Weight

GENERAL TEST VEHICLE DATA

Measured Parameter	Units	Value
Vehicle Wheelbase	mm	2608
Vehicle Length (at Centerline)	mm	4482
Vehicle Width	mm	1718
Weight of Ballast Secured in Cargo Area ¹	kg	21.0
Type of Ballast		Lead shot
Method of Securing Ballast		Rear Passenger Foot Well
Components Removed for Weight Reduction		None
Vehicle Width at Widest Point	mm	1718
Vehicle Width at Widest Point Location		B-Pillar
Centerline offset for impact line	mm	344
Filler neck side (left/right)		Right - Charge Port

¹ Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

TEST VEHICLE ATTITUDE AND CG

	Units	Left		Right		CG (aft of front axle)
		Front	Rear	Front	Rear	
As Delivered (UVW)	mm	677	684	678	681	1214
As Tested (ATW)	mm	659	673	660	665	1205

**DATA SHEET NO. 2 (Continued)
PRE-TEST DATA**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

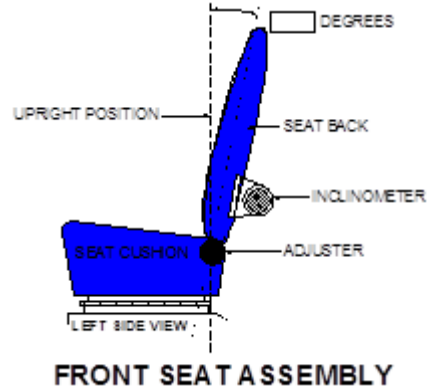
NHTSA No.: CC1002
 Test Date: 8/10/2012

SEATING

Nominal Design Riding Position (for adjustable driver and passenger seat backs). *Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.*

Driver Seat Instructions: The driver seat back was positioned according to the Nominal Design Riding position listed in FORM 1.

Passenger Seat Instructions: The passenger seat back was positioned to allow for a zero head angle of the passenger dummy.

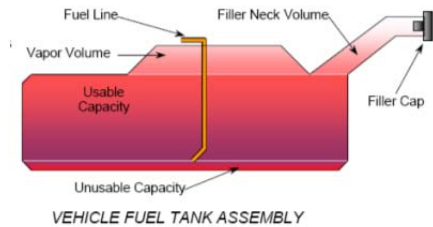


Measured Parameter	Deg.
Driver Seat Back Angle	14.7
Passenger Seat Back Angle	14.1

SEAT FORE/AFT POSITIONING

Driver Seat: Was positioned at the mid-point of fore/aft travel and in the full down position.
 Passenger Seat: Was positioned at the mid-point of fore/aft travel and in the full down position.

	Total # of Positions	Placed in Position #
Driver Seat	23	10
Passenger Seat	23	11



FUEL TANK CAPACITY DATA

Measured Parameter	Reference	Liters
Fuel System Capacity (Standard Tank)	Owner's Manual	
COTR Usable Capacity (Standard Tank)	Form No. 1	
Test Volume Range	91-94% of Usable Capacity	
Actual Test Volume (Solvent Used)	93% of Usable Capacity	

FUEL SYSTEM DATA

Measured Parameter	Value
Test Fluid Type	
Test Fluid Specific Gravity	
Test Fluid Kinematic Viscosity (centistokes)	
Test Fluid Color	
Electric Fuel Pump?	
Can Activate Electric Fuel Pump with Ignition Switch On but Engine Off?	

Fuel Pump Comments : All electric vehicle and therefore did not have any solvent or fuel pump.

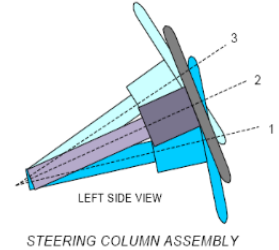
**DATA SHEET NO. 2 (Continued)
PRE-TEST DATA**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.



Operational Instructions: Steering wheel and column adjustments were set to the center of its geometric locus at 23 degrees as there was no telescope function.

SEAT BELT UPPER ANCHORAGE

Nominal design riding position

Operational Instructions: Were set to the most upright position defined as zero.

MEASURED COLD TIRE PRESSURE @ TOTAL TEST WEIGHT

Measured Parameter	Units	Value
Left Front (LF)	kPa	290
Right Front (RF)	kPa	290
Left Rear (LR)	kPa	290
Right Rear (RR)	kPa	290

VEHICLE CHASSIS GROUND PT(S) LOCATION(S) & PROPULSION BATTERY SYSTEM

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	The vehicle chassis ground point was located under the hood next to the disconnect that the positive and negative leads were connected into.
Details of Propulsion Battery Components	

COMMENTS: None

**DATA SHEET NO. 3
MOVING DEFORMABLE BARRIER (MDB) DATA**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

MDB Face Manufacturer: Plascore MDB Face Serial No. A1110017

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length of MDB (incl. honeycomb impactor face)	4120
Wheelbase of Framework Carriage	2591
Tread of Framework Carriage (Front & Rear)	1875
CG Location of Front Axle	1139

MDB WEIGHTS

	Units	Front	Rear	Total
Left	kg	358.0	322.0	680.0
Right	kg	404.0	273.0	677.0
Ratio	%	56.2%	43.8%	100.0%
Totals	kg	762.0	595.0	1357.0

MDB TIRE SIZE & PRESSURES

	Units	Requirement	Left Front	Right Front	Left Rear	Right Rear
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	207	207	207	207

Brake Abort System? (Yes/No): Yes

Date of Last MDB Calibration: May 15th, 2010

DATA SHEET NO. 4
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Resolution	V	600.000
Last Calibration Date		10/20/2011

NOTES:

- The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 MΩ
- An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.

PROPULSION BATTERY VOLTAGE, RESISTANCE & ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V _b	V	333
Propulsion Battery Voltage : (ready to drive position)	V _b	V	347.300
Propulsion Battery to Vehicle Chassis	V ₁	V	137.000
Propulsion Battery to Vehicle Chassis	V ₂	V	150.000
Propulsion Battery to Vehicle Chassis Across Known Resistor	R _o	Ω	191900
Propulsion Battery to Vehicle Chassis with R _o installed	V ₁ '	V	17.240
Propulsion Battery to Vehicle Chassis with R _o installed	V ₂ '	V	6.280
$R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$	R _{i1}	Ω	2,792,613
$R_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$	R _{i2}	Ω	8,402,784
Lesser value of R _{i1} and R _{i2}	R _i	Ω	2,792,613
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R _i /V _b	Ω/V	8,041

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? X Yes No (Fail)

NOTES:

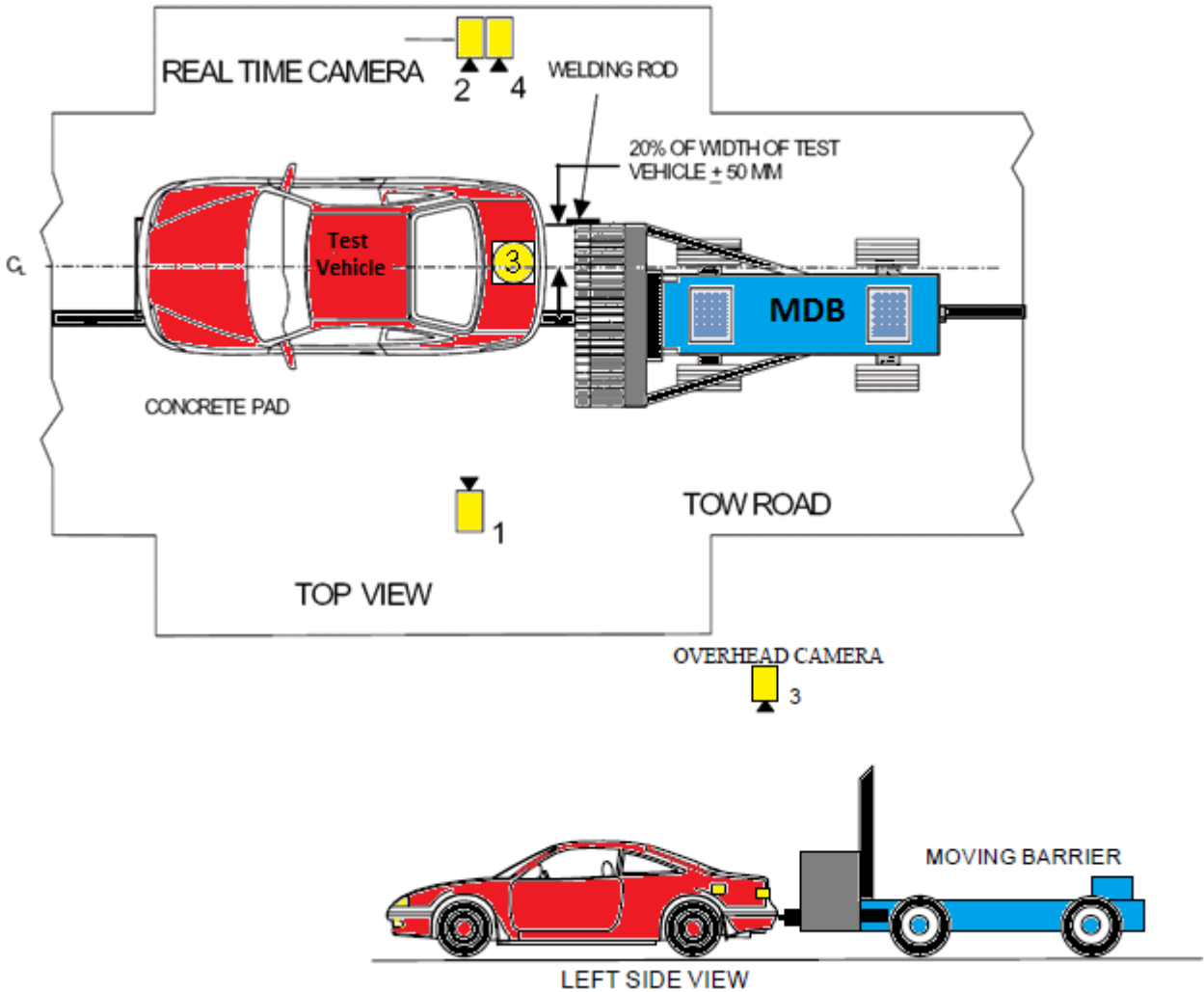
- The measurement shall be made with the propulsion battery connected to the vehicle propulsion system, and the vehicle in the "ready-to-drive" (propulsion motor(s) activated) position.
- If the voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.
- The known resistance R_o (in Ohms) should be approximately 500 times the nominal operating voltage of the vehicle (in volts) per SAE J1766
- If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant

COMMENTS: None

DATA SHEET NO. 5
HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012



No.	Camera View	Coordinates (mm)			Angle (Deg)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Left Side View	1424	8909	956	0.4	24	1000
2	Real-Time Camera						30
3	Overhead View	517	0	5287	0.0	20	1000
4	Right Side View	1775	8404	916	0.8	24	1000

* Reference (from point of impact); all measurements accurate to within ± 6 mm.
 X = (Impact Point) + Forward
 Y = (Impact Point) + To Right
 Z = (Ground Level) + Down

**DATA SHEET NO. 6
POST-TEST DATA**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

VIN: 53G1U4A41CB000062

REQUIRED IMPACT VELOCITY RANGE: 78.5 to 80.1 km/h

ACTUAL IMPACT VELOCITY (WITHIN 1.5 M OF IMPACT PLANE)

Measurement Description	Units	Speed
Trap No. 1	km/h	79.09
Trap No. 2	km/h	79.08
Average Impact Speed	km/h	79.09

WELDING ROD IMPACT POINT

Measurement Description	Tolerance	Units	Value
Vertical distance from target center (+ is above)	±40 mm	mm	0
Horizontal distance from target center (+ is right)	±50 mm	mm	-14

STODDARD SOLVENT SPILLAGE MEASUREMENT:

- A. From impact until vehicle motion ceases:
 (Maximum allowable is 28 grams) 0 grams
- B. For the 5-minute period after motion ceases:
 (Maximum allowable is 28 grams) 0 grams
- C. For the next 25 minutes:
 (Maximum allowable is 28 grams/minute) 0 grams
- D. Spillage Details: No Spillage Occurred

**DATA SHEET NO. 6
POST-TEST DATA (Continued)**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	UnLocked	UnLocked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None
Glazing Damage	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	None
Window Damage	None
Other Notable Effects	Rear windshield shattered on impact

VEHICLE CRUSH MEASUREMENTS: LENGTH

Measurement	Left Side	Centerline	Right Side
Pre-Test	4374	4482	4375
Post-Test	3547	3722	3940
Crush	827	760	435

VEHICLE CRUSH MEASUREMENTS: WHEELBASE

Measurement	Left Side	Centerline	Right Side
Pre-Test	2611		2605
Post-Test	2530		2575
Crush	81		30

DATA SHEET NO. 7
POST-IMPACT ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V _b)	V	0.001

NOTES:

- The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω
- An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
V ₁ =	2.193	V	Impact Time:	4	Minutes	2	Seconds
V ₂ =	1.079	V	Impact Time:	4	Minutes	25	Seconds
R ₀ =	191,900	Ω	Impact Time:		Minutes		Seconds
V ₁ ' =	0.013	V	Impact Time:	4	Minutes	34	Seconds
V ₂ ' =	0.010	V	Impact Time:	4	Minutes	48	Seconds
R _{i1} =	48,013,435	Ω	Impact Time:	4	Minutes	34	Seconds
R _{i2} =	62,207,755	Ω	Impact Time:	4	Minutes	48	Seconds
R _i =	48,013,435	Ω	Impact Time:	4	Minutes	34	Seconds
R _i /V _b =	48,013,435,000	Ω/V	Impact Time:	4	Minutes	34	Seconds

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? X Yes No (Fail)

NOTES:

- $R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$, $R_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$, $R_i =$ Lesser value of R_{i1} and R_{i2}
- If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant
- Minimum Electrical Isolation Value is 500 Ω/V

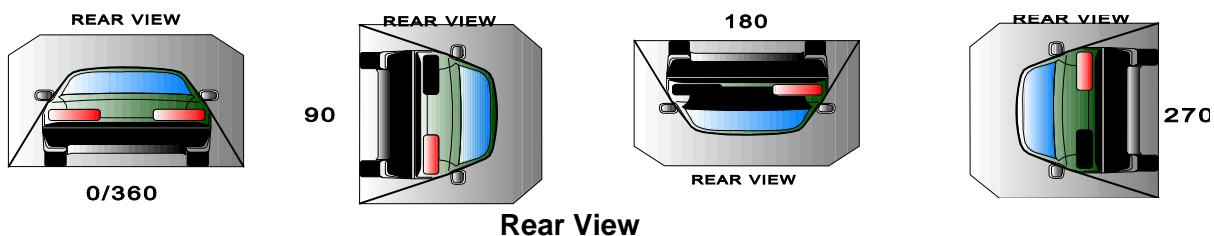
PROPULSION BATTERY SYSTEM COMPONENTS

Measured Parameter	Comments	Passed	Failed
Propulsion Battery Module movement within the passenger compartment	No Movement	X	
Intrusion of an outside Propulsion Battery Component into the passenger compartment	No Intrusion	X	
Is propulsion battery electrolyte spillage visible in the passenger compartment?		X	

**DATA SHEET NO. 8
FMVSS NO. 301 STATIC ROLLOVER TEST DATA**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012



ROLLOVER SOLVENT COLLECTION TIME TABLE

Test Phase	Rotation Time (spec. 1 -3 min)		Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds		Minutes	Seconds	
0° to 90°	1	14	5	6	14	7
90° to 180°	1	5	5	6	5	7
180° to 270°	1	1	5	6	1	7
270° to 360°	1	4	5	6	4	7

FMVSS 301 REQUIREMENTS TABLE (Maximum allowable solvent spillage)

First 5 Minutes (grams)	6th Minute (grams)	7th Minute (grams)	8th Minute (grams)
142	28	28	28

ACTUAL TEST VEHICLE STODDARD SOLVENT SPILLAGE TABLE

Test Phase	First 5 Minutes (grams)	6th Minute (grams)	7th Minute (grams)	8th Minute (grams)
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

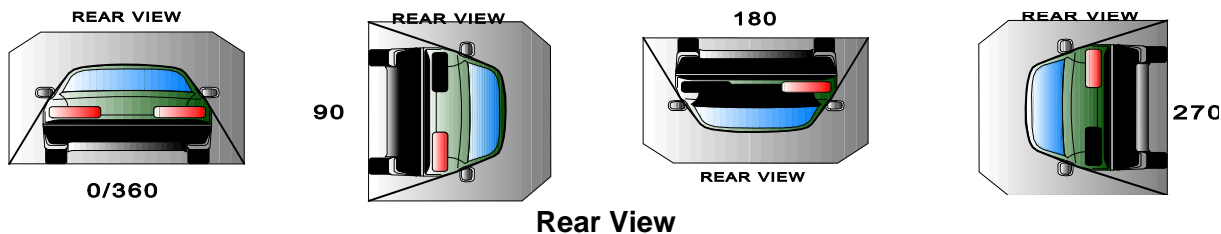
ROLLOVER STODDARD SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

**DATA SHEET NO. 9
FMVSS NO. 305 STATIC ROLLOVER TEST DATA**

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012



Rear View

**DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION
TIME PERIOD**

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds		Minutes	Seconds	
0° to 90°	1	14	5	6	14	7
90° to 180°	1	5	5	6	5	7
180° to 270°	1	1	5	6	1	7
270° to 360°	1	4	5	6	4	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

Rollover Stage	Propulsion Battery Electrolyte Spillage	Units	Spillage Location
0° to 90°	0	Liters	
90° to 180°	0	Liters	
180° to 270°	0	Liters	
270° to 360°	0	Liters	
Total Spillage	No Spillage	Liters	

* FMVSS 305 Requirements: Maximum allowable propulsion battery electrolyte spillage is 5.0 Liters

Is the total spillage of propulsion battery electrolyte greater than 5.0 Liters? Yes (Fail) No
 Is propulsion battery electrolyte spillage visible in the passenger compartment? Yes (Fail) No

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V _b)	V	0.001

NOTES:

- The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 MΩ
- An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.

DATA SHEET NO. 9 (Continued)
FMVSS NO. 305 STATIC ROLLOVER TEST DATA

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units		Minutes	Seconds
$V_1 =$	90°	0.146	V	Time:	2	14
	180°	0.130	V		8	19
	270°	0.130	V		14	31
	360°	0.138	V		20	45
$V_2 =$	90°	0.132	V	Time:	2	25
	180°	0.115	V		8	35
	270°	0.104	V		14	39
	360°	0.103	V		20	53
$V_1' =$	90°	0.003	V	Time:	2	40
	180°	0.004	V		8	44
	270°	0.003	V		15	3
	360°	0.002	V		21	8
$V_2' =$	90°	0.003	V	Time:	2	52
	180°	0.004	V		8	56
	270°	0.002	V		15	27
	360°	0.002	V		21	22
$R_{i1} =$	90°	17,417,335	Ω	Time:	2	40
	180°	11,392,217	Ω		8	44
	270°	14,622,780	Ω		15	3
	360°	22,788,820	Ω		21	8
$R_{i2} =$	90°	17,378,580	Ω	Time:	2	52
	180°	11,345,045	Ω		8	56
	270°	22,020,525	Ω		15	27
	360°	22,674,941	Ω		21	22
$R_i =$	90°	17,378,580	Ω	Time:	2	52
	180°	11,345,045	Ω		8	56
	270°	14,622,780	Ω		15	3
	360°	22,674,941	Ω		21	22
$R_i/V_b =$	90°	17,378,580,	Ω/V	Time:	2	52
	180°	11,345,045,	Ω/V		8	56
	270°	14,622,780,	Ω/V		15	3
	360°	22,674,941,	Ω/V		21	22

Is the Electrical Isolation Value $\geq 500 \Omega/V$ (Yes/No)? Yes No (Fail)

DATA SHEET NO. 9 (Continued)
FMVSS NO. 305 STATIC ROLLOVER TEST DATA

Test Vehicle: 2012 CODA CODA Four Door Sedan
Test Program: FMVSS 301R/305 Compliance Rear Impact Test

NHTSA No.: CC1002
Test Date: 8/10/2012

NOTES:

- $R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$, $R_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$, $R_i =$ Lesser value of R_{i1} and R_{i2} ,
 $R_i/V_b =$ Electrical Isolation Value/ Nominal Battery Voltage
- V_1 , V_2 , V_1' , & V_2' voltage measurements were recorded at the start of each successive increment of **90°**, **180°**, **270°**, and **360°** of the static rollover test. The increment of rotation for each turn was completed within a maximum of 3 minutes.
- If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant
- Minimum Electrical Isolation Value is 500 Ω/V

COMMENTS: Vb was recorded as zero and is compliant.

DATA SHEET NO. 10
PHOTOGRAPH DATA SHEET CHECKLIST

Test Vehicle: 2012 CODA CODA Four Door Sedan
 Test Program: FMVSS 301/305 Compliance Rear Impact Test

NHTSA No.: CC1002
 Test Date: 8/10/2012

Pre-Test	Post-Test	Photograph	
X	X	A.	View of the propulsion battery if any part of it is visible. Do NOT disassemble any parts other than carpet, seats and overlay to take these photographs.
X	X	B.	View of the electric propulsion drive. Take the best photograph possible without removing any parts.
X	X	C.	View of the vehicle passenger compartment adjacent to propulsion battery.
	X	D.	Post-test battery module movement, or retention loss, if applicable.
	X	E.	Post-test battery component intrusion.
	X	F.	Post-test view of test vehicle while vehicle is on static rollover machine.
X	X	G.	Photographs of propulsion battery system mounting and/or intrusion failures.
	X	H.	Post-test propulsion battery electrolyte spillage location view.
X	X	I.	Labels and markings related to propulsion battery system.
X	X	J.	Other photographs requested by COTR.

COMMENTS: None

APPENDIX A
PHOTOGRAPHS

Fig.	Description	Page
1	Vehicle Certification Placard	A-4
2	Vehicle Tire Placard	A-4
3	As Delivered Left Front 3/4 View	A-5
4	As Delivered Right Rear 3/4 View	A-5
5	Pre-Test Front View	A-6
6	Post-Test Front View	A-6
7	Pre-Test Left Side View	A-7
8	Post-Test Left Side View	A-7
9	Pre-Test Right Side View	A-8
10	Post-Test Right Side View	A-8
11	Pre-Test Left Front 3/4 View	A-9
12	Post-Test Left Front 3/4 View	A-9
13	Pre-Test Right Front 3/4 View	A-10
14	Post-Test Right Front 3/4 View	A-10
15	Pre-Test Left Rear 3/4 View	A-11
16	Post-Test Left Rear 3/4 View	A-11
17	Pre-Test Right Rear 3/4 View	A-12
18	Post-Test Right Rear 3/4 View	A-12
19	Pre-Test Rear View	A-13
20	Post-Test Rear View	A-13
21	Pre-Test MDB Front View	A-14
22	Post-Test MDB Front View	A-14
23	Pre-Test MDB Left Side View	A-15
24	Post-Test MDB Left Side View	A-15
25	Pre-Test MDB Right Side View	A-16
26	Post-Test MDB Right Side View	A-16
27	Pre-Test MDB Top View	A-17
28	Post-Test MDB Top View	A-17
29	Pre-Test Overhead Vehicle and MDB View	A-18
30	Post-Test Impact Target View	A-18
31	Pre-Test Front Underbody View	A-19
32	Post-Test Front Underbody View	A-19
33	Pre-Test Mid Underbody View	A-20
34	Post-Test Mid Underbody View	A-20
35	Pre-Test Rear Underbody View	A-21
36	Post-Test Rear Underbody View	A-21
37	Pre-Test Fuel Filler Cap View	A-22
38	Post-Test Fuel Filler Cap View	A-22
39	Impact View	A-23
40	Speed Trap View	A-23
41	Auxiliary Power Module Warning Label	A-24
42	Power Inverter Warning Label	A-24
43	First Responder Warning Label	A-25
44	First Responder Warning Label Location	A-25
45	Other Vehicle Label(s) Related to Electrical Propulsion System	A-26

Fig.	Description	Page
46	Manual High Voltage Service Disconnect in Place	A-26
47	Manual High Voltage Service Disconnect Removed (Plug)	A-27
48	Manual High Voltage Service Disconnect Removed (Location where removed)	A-27
49	Pre-Impact View of Propulsion Battery	A-28
50	Post-Impact Front View of Propulsion Battery	A-28
51	Post-Impact Rear View of Propulsion Battery (if any part of it is visible)	A-29
52	Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules	A-29
53	Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules	A-30
54	Pre-Impact View of Propulsion Battery Module(s)	A-30
55	Post-Impact View of Propulsion Battery Module(s)	A-31
56	Pre-Impact View of Electric Propulsion Drive	A-31
57	Post-Impact View of Electric Propulsion Drive	A-32
58	Pre-Impact View of High Voltage Interconnect(s)	A-32
59	Pre-Impact View Propulsion Battery Venting System(s)	A-33
60	Pre-Impact View of Other Visible Electric Propulsion Components	A-33
61	Pre-Impact View of Ground Lead Attached	A-34
62	Pre-Impact View of High Voltage Leads Attached	A-34
63	Pre-Impact Close-Up View of High Voltage Leads Attached	A-35
64	Pre-Impact View of Installed Test Interface Port	A-35
65	Post-Impact View of Installed Test Interface Port	A-36
66	Pre-Impact View of Other Test Devices	A-36
67	Post-Impact View of Other Test Devices	A-37
68	FMVSS No. 301 Static Rollover 90° View	A-37
69	FMVSS No. 301 Static Rollover 180° View	A-38
70	FMVSS No. 301 Static Rollover 270° View	A-38
71	FMVSS No. 301 Static Rollover 360° View	A-39
72	FMVSS No. 305 Static Rollover at 90° highlighting propulsion battery location	A-39
73	FMVSS No. 305 Static Rollover at 180° highlighting propulsion battery location	A-40
74	FMVSS No. 305 Static Rollover at 270° highlighting propulsion battery location	A-40
75	FMVSS No. 305 Static Rollover at 360° highlighting propulsion battery location	A-41
76	Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery	A-41
77	Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery	A-42
78	Post-Impact Propulsion Battery System Mounting and/or Intrusion Failure(s)	A-42
79	Post-Impact View of Battery Component Intrusion (if applicable)	A-43
80	Post-Impact View of Battery Module Movement or Retention Loss (if applicable)	A-43
81	Post-Impact View of Propulsion Battery Electrolyte Spillage Location (if applicable)	A-44
82	Post-Test View of Propulsion Battery Electrolyte Spillage Location (if applicable)	A-44



Figure A-1: Vehicle Certification Placard

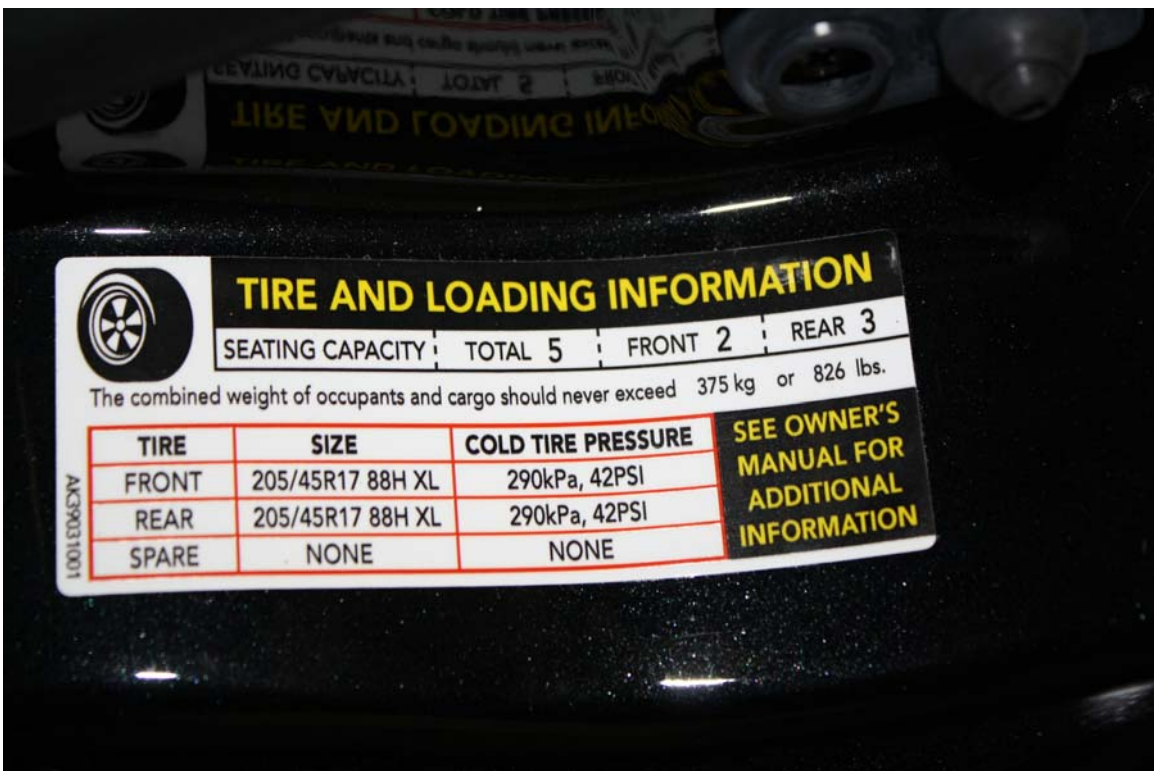


Figure A-2: Vehicle Tire Placard



Figure A-3: As Delivered Left Front $\frac{3}{4}$ View



Figure A-4: As Delivered Right Rear $\frac{3}{4}$ View



Figure A-5: Pre-Test Front View



Figure A-6: Post-Test Front View



Figure A-7: Pre-Test Left Side View



Figure A-8: Post-Test Left Side View



Figure A-9: Pre-Test Right Side View



Figure A-10: Post-Test Right Side View



Figure A-11: Pre-Test Left Front 3/4 View



Figure A-12: Post-Test Left Front 3/4 View



Figure A-13: Pre-Test Right Front 3/4 View



Figure A-14: Post-Test Right Front 3/4 View



Figure A-15: Pre-Test Left Rear 3/4 View



Figure A-16: Post-Test Left Rear 3/4 View



Figure A-17: Pre-Test Right Rear 3/4 View



Figure A-18: Post-Test Right Rear 3/4 View



Figure A-19: Pre-Test Rear View



Figure A-20: Post-Test Rear View



Figure A-21: Pre-Test MDB Front View



Figure A-22: Post-Test MDB Front View



Figure A-23: Pre-Test MDB Left Side View



Figure A-24: Post-Test MDB Left Side View



Figure A-25: Pre-Test MDB Right Side View



Figure A-26: Post-Test MDB Right Side View



Figure A-27: Pre-Test MDB Top View



Figure A-28: Post-Test MDB Top View



Figure A-29: Pre-Test Overhead Vehicle and MDB View



Figure A-30: Post-Test Impact Target View



Figure A-31: Pre-Test Front Underbody View



Figure A-32: Post-Test Front Underbody View



Figure A-33: Pre-Test Mid Underbody View



Figure A-34: Post-Test Mid Underbody View



Figure A-35: Pre-Test Rear Underbody View



Figure A-36: Post-Test Rear Underbody View



Figure A-37: Pre-Test Fuel Filler Cap View



Figure A-38: Post-Test Fuel Filler Cap View



Figure A-39: Impact View



Figure A-40: Speed Trap View



Figure A-41: Auxiliary Power Module Warning Label



Figure A-42: Power Inverter Warning Label

Photo Not Applicable

Figure A-43: First Responder Warning Label

Photo Not Applicable

Figure A-44: First Responder Warning Label Location

Photo Not Applicable

Figure A-45: Other Vehicle Label(s) Related to Electrical Propulsion System



Figure A-46: Manual High Voltage Service Disconnect in Place

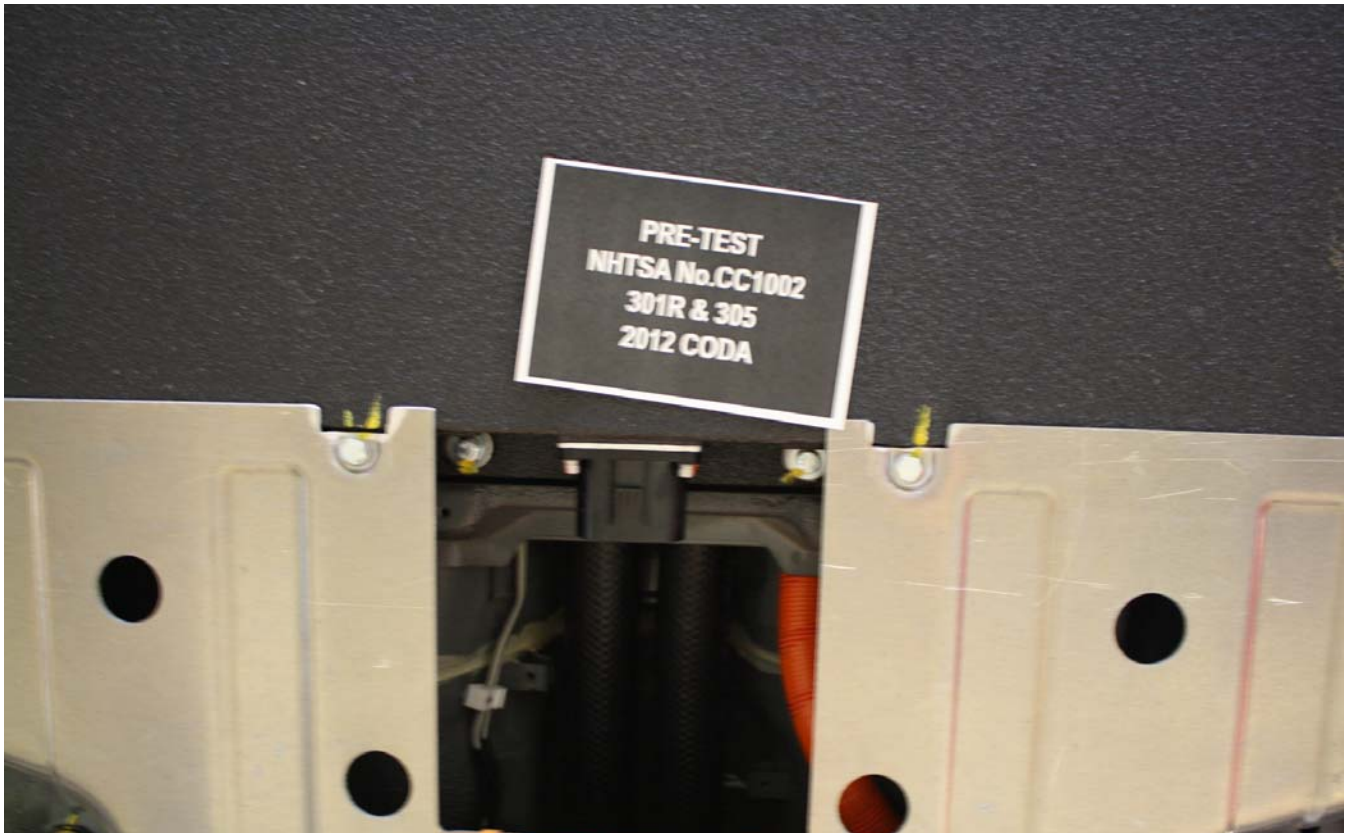


Figure A-47: Manual High Voltage Service Disconnect Removed (Plug)

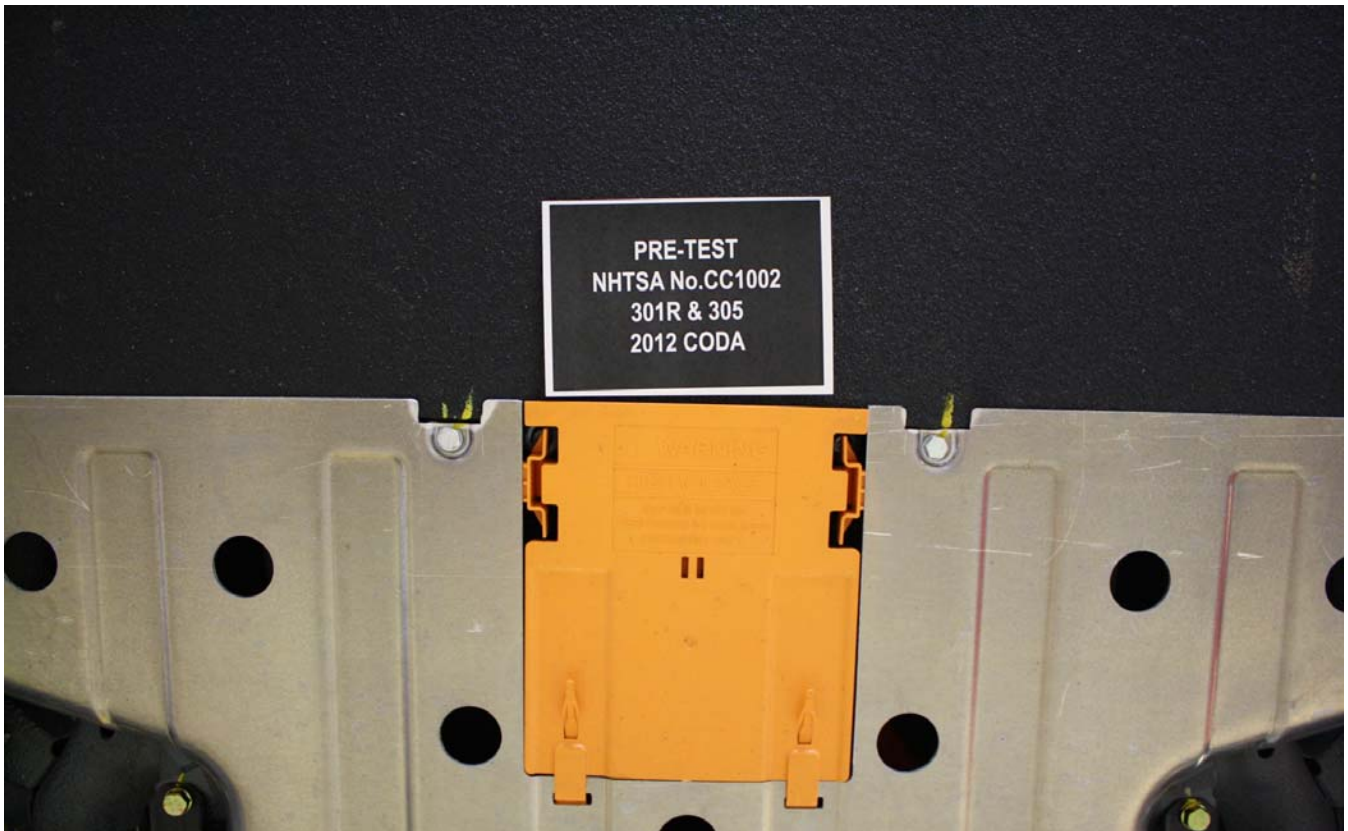


Figure A-48: Manual High Voltage Service Disconnect Removed (Location where removed)



Figure A-49: Pre-Impact View of Propulsion Battery

Photo Not Applicable

Figure A-50: Post-Impact Front View of Propulsion Battery

Photo Not Applicable

Figure A-51: Post-Impact Rear View of Propulsion Battery (if any part of it is visible)

Photo Not Applicable

Figure A-52: Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

Photo Not Applicable

Figure A-53: Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

Photo Not Applicable

Figure A-54: Pre-Impact View of Propulsion Battery Module(s)

Photo Not Applicable

Figure A-55: Post-Impact View of Propulsion Battery Module(s)



Figure A-56: Pre-Impact View of Electric Propulsion Drive



Figure A-57: Post-Impact View of Electric Propulsion Drive



Figure A-58: Pre-Impact View of High Voltage Interconnect(s)

Photo Not Applicable

Figure A-59: Pre-Impact View Propulsion Battery Venting System(s)

Photo Not Applicable

Figure A-60: Pre-Impact View of Other Visible Electric Propulsion Components



Figure A-61: Pre-Impact View of Ground Lead Attached



Figure A-62: Pre-Impact View of High Voltage Leads Attached

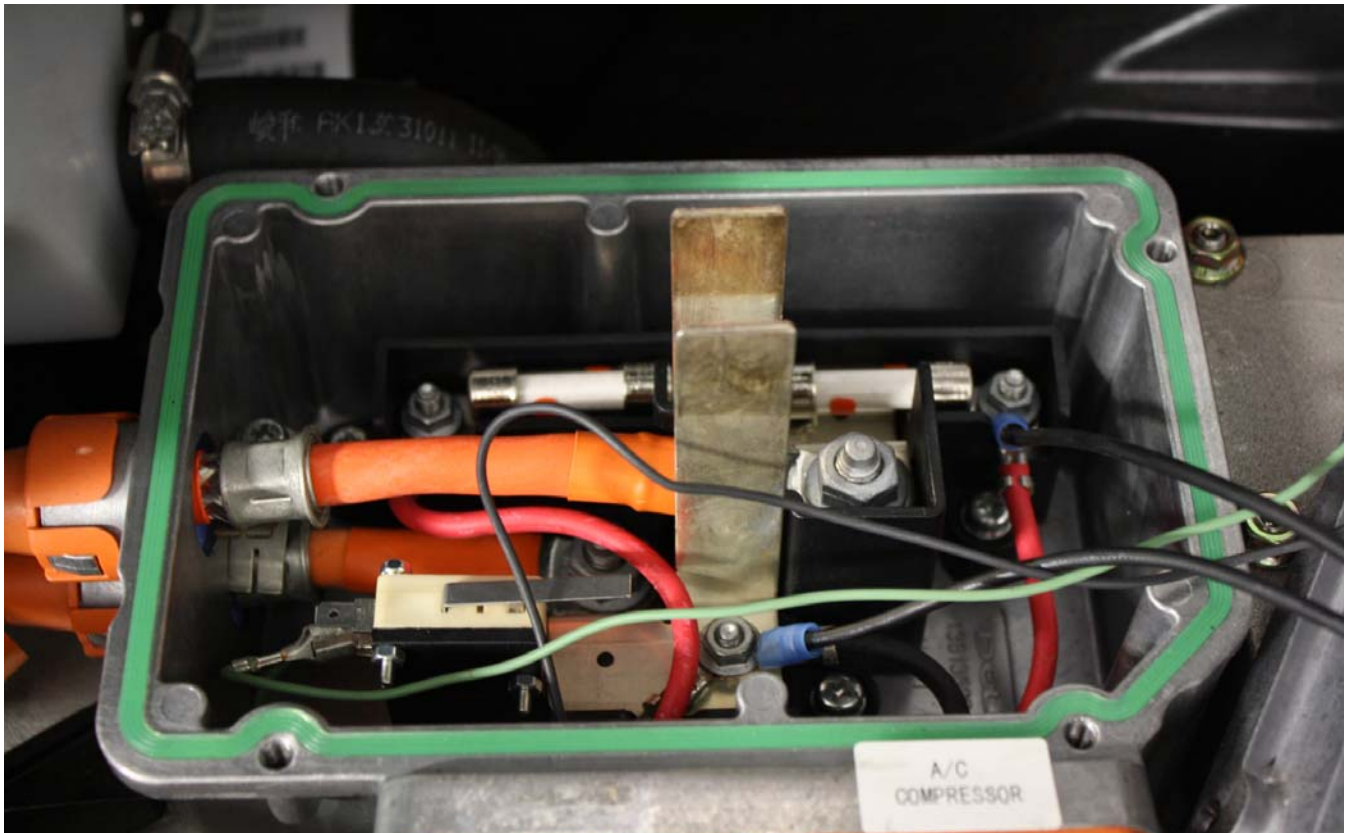


Figure A-63: Pre-Impact Close-Up View of High Voltage Leads Attached

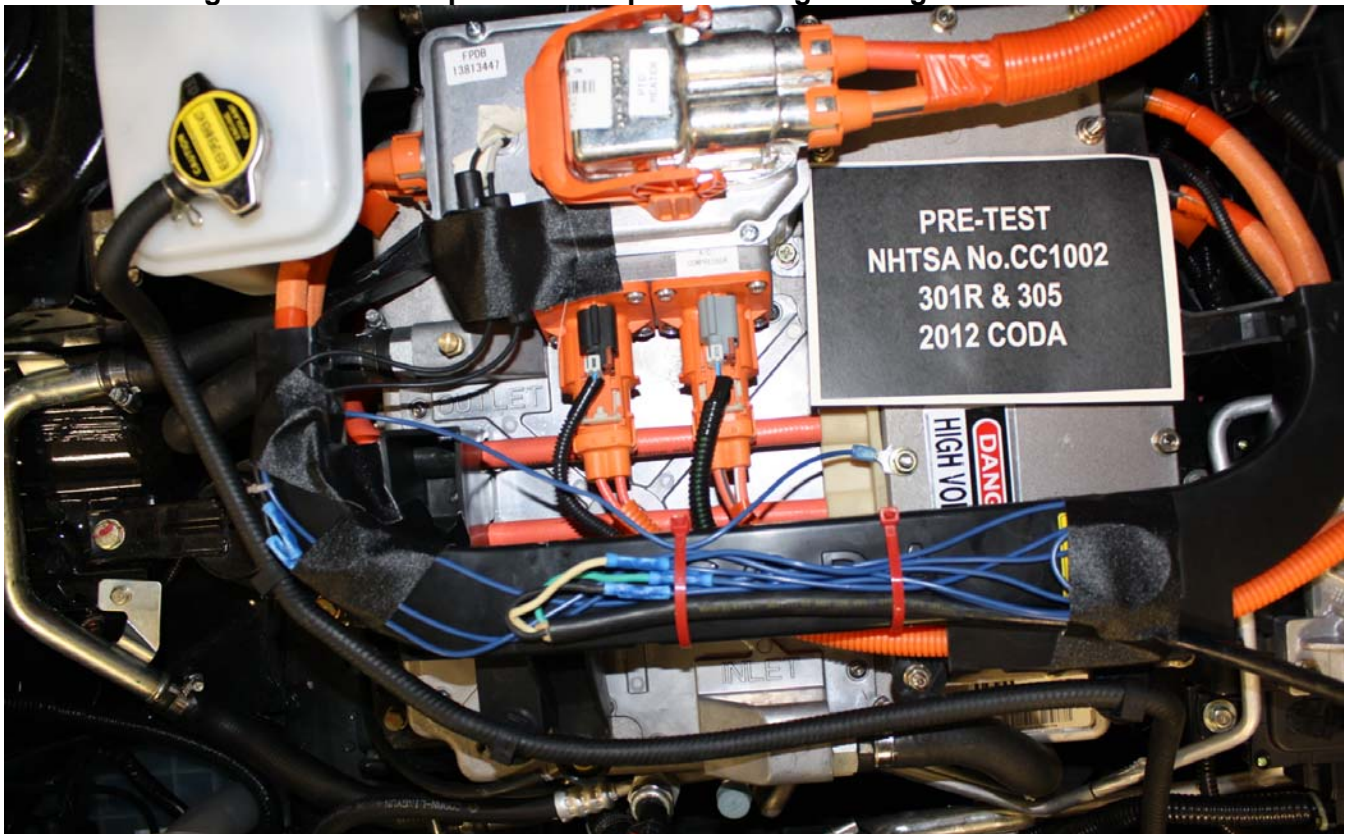


Figure A-64: Pre-Impact View of Installed Test Interface Port



Figure A-65: Post-Impact View of Installed Test Interface Port



Figure A-66: Pre-Impact View of Other Test Devices



Figure A-67: Post-Impact View of Other Test Devices



Figure A-68: FMVSS No. 301 Static Rollover 90° View



Figure A-69: FMVSS No. 301 Static Rollover 180° View



Figure A-70: FMVSS No. 301 Static Rollover 270° View



Figure A-71: FMVSS No. 301 Static Rollover 360° View



Figure A-72: FMVSS No. 305 Static Rollover at 90° Highlighting Propulsion Battery Location



Figure A-73: FMVSS No. 305 Static Rollover at 180° Highlighting Propulsion Battery Location



Figure A-74: FMVSS No. 305 Static Rollover at 270° Highlighting Propulsion Battery Location



Figure A-75: FMVSS No. 305 Static Rollover at 360° Highlighting Propulsion Battery Location



Figure A-76: Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery



Figure A-77: Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Photo Not Applicable

Figure A-78: Post-Impact Propulsion Battery System Mounting and/or Intrusion Failure(s)

Photo Not Applicable

Figure A-79: Post-Impact View of Battery Component Intrusion (if applicable)

Photo Not Applicable

Figure A-80: Post-Impact View of Battery Module Movement or Retention Loss (if applicable)

Photo Not Applicable

Figure A-81: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (if applicable)

Photo Not Applicable

Figure A-82: Post-Test View of Propulsion Battery Electrolyte Spillage Location (if applicable)