

REPORT NUMBER TR-P29018-01-NC

**SIDE AIRBAG OCCUPANT RISK PROGRAM
OCCUPANT OUT-OF-POSITION TESTS**

**CHRYSLER LLC
2009 DODGE RAM 1500 SLT 4X4
4-DOOR TRUCK**

NHTSA NUMBER: M90302TWG2

**PREPARED BY:
KARCO ENGINEERING, LLC
9270 HOLLY ROAD
ADELANTO, CALIFORNIA 92301**

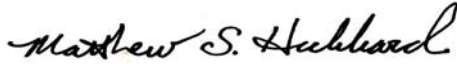
SEPTEMBER 10, 2009

FINAL REPORT

**PREPARED FOR:
ALPHA TECHNOLOGY ASSOCIATE, INC.
2810 OLD LEE HWY, SUITE 120
FAIRFAX, VA 22031**

This final test report was prepared for the U.S. Department of Transportation, Alpha Technology Associate, Inc., in response to Contract Number DTNH22-03-D-32005.

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Prepared by: _____
Mr. Matthew S. Hubbard, Test Engineer
KARCO Engineering, LLC

Date: 09/10/09



Reviewed by: _____
Mr. Michael L. Dunlap, Director of Operations
KARCO Engineering, LLC

Date: 09/10/09



Approved by: _____
Mr. Frank D. Richardson, President
KARCO Engineering, LLC

Date: 09/10/09

FINAL REPORT ACCEPTED BY:

Manager, New Car Assessment Program

Date of Acceptance

COTR, NCAP Frontal Impact Program

Date of Acceptance

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SECTION 1

PURPOSE AND SUMMARY OF TEST M90302TWG2

1.1 PURPOSE

This occupant out-of-position static side airbag deployment test is part of the Technical Working Group Occupant Injury Risk from Deploying Side Airbags Testing Program sponsored by Alpha Technology Associate, Inc. under Contract No. DTNH22-03-D-32005. The purpose of this test was to obtain occupant injury data for a side airbag deployment.

The occupant out-of-position side airbag test was conducted in accordance with the Technical Working Group Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags.

1.2 SUMMARY

The effects of a roof mounted curtain airbag deployment in a 2009 Dodge Ram 1500 SLT 4x4 4-Door Truck with an out-of-position SID IIs 5th percentile adult female dummy were evaluated. The test was performed at Karco Engineering, LLC on September 10, 2009. Pre- and post-test photographs of the vehicle and dummy can be found in Appendix A.

Three high-speed digital cameras and one real time camera were used to document the curtain airbag deployment. Camera locations and other pertinent camera information can be found on Data Sheet No.1 and Data Sheet No.6.

SID IIs 5th percentile adult female anthropomorphic test device (ATD) was placed in the right front passenger seating position facing forward according to the dummy placement instructions (3.3.5.2) in the July 2003 Revision of the Technical Working Group's 'Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags'.

The SID IIs 5th percentile adult female ATD was instrumented with head tri-axial accelerometers, and upper and lower neck transducers.

Fifteen (15) channels of data were recorded using an on-board data acquisition system. Appendix A contains Photographs. Appendix B contains dummy response data traces. Appendix C contains the Instrumentation Data Channel assignments.

The front passenger side door remained closed during the deployment and was operable after the deployment.

The SID IIs 5th percentile adult female dummy's visible contact points were as follows: The curtain airbag contacted the ATD's head.

OUT OF POSITION OCCUPANT DATA SUMMARY

ATD Position	HIC ₁₅
Passenger	13.1

Orientation of the SID IIs 5th percentile adult female dummy was in the forward facing position leaning against the front passenger door. The dummy's spine was aligned with the deploying trajectory of the curtain airbag. The lower legs were extended. This orientation complies with section 3.3.5.2 of the Technical Working Group (TWG) recommendation in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2009 Dodge Ram 1500 SLT 4x4 4-Door Truck NHTSA No.: M90302TWG2
Test Program: TWG 3.3.5.2. Test Date: 09/10/09

CONVERSION FACTORS USED IN THIS REPORT*

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	mile/h	km/h	1.609
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressures	lbf/in ²	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	$=(tf - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

* Based on the Recommended Practice in SAE J916, May 85

DATA SHEET NO. 1

TEST SUMMARY

Test Vehicle: 2009 Dodge Ram 1500 SLT 4x4 4-Door Truck NHTSA No.: M90302TWG2

Test Program: TWG 3.3.5.2. Test Date: 09/10/09

TEST DUMMY INFORMATION

Description	Passenger Seat Forward Facing
Dummy Type / Serial No.	SID IIs / 294
Head Contact	Yes
Chest Contact	None
Abdomen Contact	None
Pelvis	None
Left Knee Contact	None
Right Knee Contact	None

MOVIE COVERAGE

High Speed Digital	3
Real Time	1
Total	4

DATA CHANNELS

SID IIs ATD Sensors	15
Belt Assessment Sensors	0
Vehicle Structure Accelerometers	0
Total	15

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Dodge Ram 1500 SLT 4x4 4-Door Truck NHTSA No.: M90302TWG2

Test Program: TWG 3.3.5.2. Test Date: 09/10/09

TEST VEHICLE INFORMATION

Make	Dodge
Model	Ram 1500 SLT 4x4
Body Style	4-Door Truck
NHTSA No.	M90302TWG2
VIN	1D3HV13T19S711621
Color	SILVER
Delivery Date	November 3, 2008
Odometer Reading (mile)	25
Dealer	Glendora Dodge
Transmission	Automatic
Final Drive	4WD
Type/Number Cylinders	V8
Engine Displacement (L)	5.7
Engine Placement	Longitudinal

TEST VEHICLE OPTIONS

Driver Front Airbag	Yes
Driver Side Airbag	No
Driver Side Curtain Airbag	Yes
Pass. Front Airbag	Yes
Pass.Side Airbag	No
Pass. Curtain Airbag	Yes
Power Brakes	Yes
Power Steering	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	Yes
Anti-lock Brakes	Yes
Tilt Steering Wheel	Yes
Power Windows	Yes
Power Seats	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Chrysler LLC	GVWR (kg)	3085
Date of Manufacture	September-08	GAWR Front (kg)	1770
		GAWR Rear (kg)	1770

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	240
Recommend Tire Size	P275/65R20	P275/65R20
Tire Size on Vehicle	P275/65R20	P275/65R20
Tire Manufacturer	Goodyear	Goodyear

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	Bench	
Number of Occupants	2	3	0	5
Capacity Wt. (VCW) (kg)				585

* Vehicle had undergone New Car Assessment Program Frontal Impact Testing on November 21, 2008

DATA SHEET NO. 3

TEST VEHICLE INFORMATION

Test Vehicle: 2009 Dodge Ram 1500 SLT 4x4 4-Door Truck NHTSA No.: M90302TWG2
Test Program: TWG 3.3.5.2. Test Date: 09/10/09

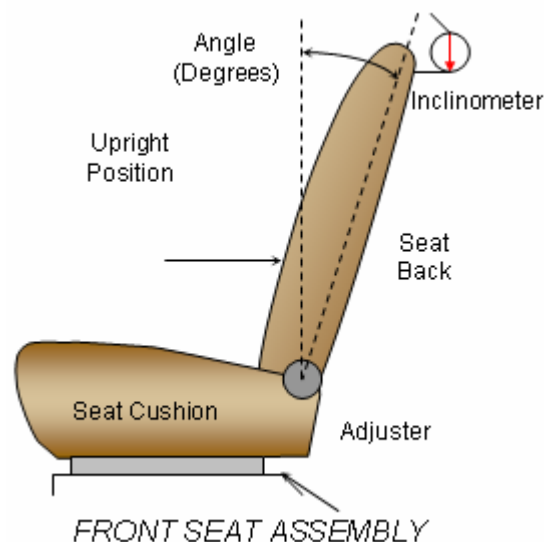
NOMINAL DESIGN RIDING POSITION

The passenger seat back is positioned to section 3.3.5.2. of the Technical Working Group (TWG) recommendation in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags.

SEAT BACK ANGLES

Position	Deg.
Passenger w/ Dummy	16

Seat upright is 0 degrees.



SEAT FORE/AFT POSITIONS

The first or forward most position is counted as number one (1). The fore/aft position is set aft of the middle position for the passenger seat.

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Passenger Seat	24 detents	13th detent

DATA SHEET NO. 4

DUMMY POSITIONING INFORMATION

Test Vehicle: 2009 Dodge Ram 1500 SLT 4x4 4-Door Truck NHTSA No.: M90302TWG2

Test Program: TWG 3.3.5.2. Test Date: 09/10/09

TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	SID IIs 5th percentile female	
		Length (mm)	Angle (°)
SA	Seat Back Angle		16
AMW	Side Airbag Module Width	75	
ABW	Side Airbag Width	440	
AML	Side Airbag Module Length	0	
ABL	Side Airbag Length	1465	
AN	Top of Airbag Module to Head/Neck Junction	300	
HD	Head CG to Door Panel/ Window	145	
HSC	Head to Seat Back Centerline	97	
HB	Head to B-Pillar (first contact)	132	
HZ	Head to Roof (Z)	173	
HHD	Head to Header	381	
ND	Nose to Dash	584	
NS	Nose to Seat Back	N/A	
NR	Nose to Header	391	
CD	Chest to Dash	496	
CS	Chest to Seat Back	275	
RACL	Right Arm to Seat Back Centerline	282	
LACL	Left Arm to Seat Back Centerline	N/A	
RA	Right Arm to Door Panel	7	
LA	Left Arm to Door Panel	N/A	
KK	Knee to Knee	125	
TT	Toe to Toe	113	
KSCR	Right Knee to Seat Cushion Centerline	45	
KSCL	Left Knee to Seat Cushion Centerline	62	
TSCR	Right Toe to Seat Cushion Centerline	40	
TSCL	Left Toe to Seat Cushion Centerline	59	

DATA SHEET NO. 5
HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2009 Dodge Ram 1500 SLT 4X4 4-Door Truck

NHTSA No.: M90302TWG2

Test Program: TWG 3.3.5.2

Test Date: 9/10/09

HEAD PEAK ACCELERATIONS

Location	Axis	Units	Pass. SID-IIs			
			Max	Time	Min	Time
Head CG	X	G's	2.7	25.1	-7.0	31.9
Head CG	Y	G's	4.9	43.7	-21.1	22.5
Head CG	Z	G's	15.3	23.2	-11.8	27.1
Head CG Resultant	N/A	G's	24.9	22.5		

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Pass. SID-IIs			
			Max	Time	Min	Time
Neck Force	X	Newtons	579.6	33.0	-58.6	195.2
Neck Force	Y	Newtons	411.6	27.5	-71.0	192.5
Neck Force	Z	Newtons	398.4	37.5	-60.7	273.9
Neck Force Resultant	N/A	Newtons	703.1	33.0		
Neck Moment	X	Nm	16.2	25.8	-0.2	6.3
Neck Moment	Y	Nm	1.1	32.6	-5.1	42.4
Neck Moment	Z	Nm	3.4	26.1	-0.3	0.0
Neck Moment Resultant	N/A	Nm	16.6	25.8		

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Pass. SID-IIs			
			Max	Time	Min	Time
Neck Force	X	Newtons	40.5	27.5	-9.2	38.3
Neck Force	Y	Newtons	55.7	47.3	-59.0	34.0
Neck Force	Z	Newtons	6.3	221.8	-523.9	25.8
Neck Force Resultant	N/A	Newtons	524.4	25.8		
Neck Moment	X	Nm	22.2	46.1	-2.1	31.7
Neck Moment	Y	Nm	39.8	25.8	-2.9	218.8
Neck Moment	Z	Nm	10.1	43.7	-2.8	31.9
Neck Moment Resultant	N/A	Nm	40.0	25.8		

DATA SHEET NO. 5...(CONTINUED)Test Vehicle: 2009 Dodge Ram 1500 SLT 4X4 4-Door TruckNHTSA No.: M90302TWG2Test Program: TWG 3.3.5.2Test Date: 9/10/09**HEAD INJURY CRITERIA (HIC 15)**

Location	Pass. SID-IIs			
	HIC15	T ¹	T ²	Avg G
Head CG	13.1	21.2	33.5	16.2

UPPER NECK NIJ VALUES

Location	Pass. SID-IIs			
	Ntf	Nte	Ncf	Nce
Upper Neck	0.01	0.02	0.06	0.26

DATA SHEET NO. 6**CAMERA LOCATIONS**Test Vehicle: 2009 Dodge Ram 1500 SLT 4x4 4-Door Truck NHTSA No.: M90302TWG2Test Program: TWG 3.3.5.2. Test Date: 09/10/09

No.	Camera View	Location (mm)			Angle (Deg.)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Real Time	70	2060	-1695	-1.0	N/A	30
2	High Speed Side View	70	2050	-1600	-1.0	20	1000
3	High Speed 3/4 View	1850	1700	-1705	-2.0	35	1000
4	High Speed Front View	1900	10	-1698	-11.0	24	1000

* All measurements are taken relative to CG of dummy's head.

APPENDIX A

PHOTOGRAPHS



Figure A-1: Right Front $\frac{3}{4}$ View, As Received

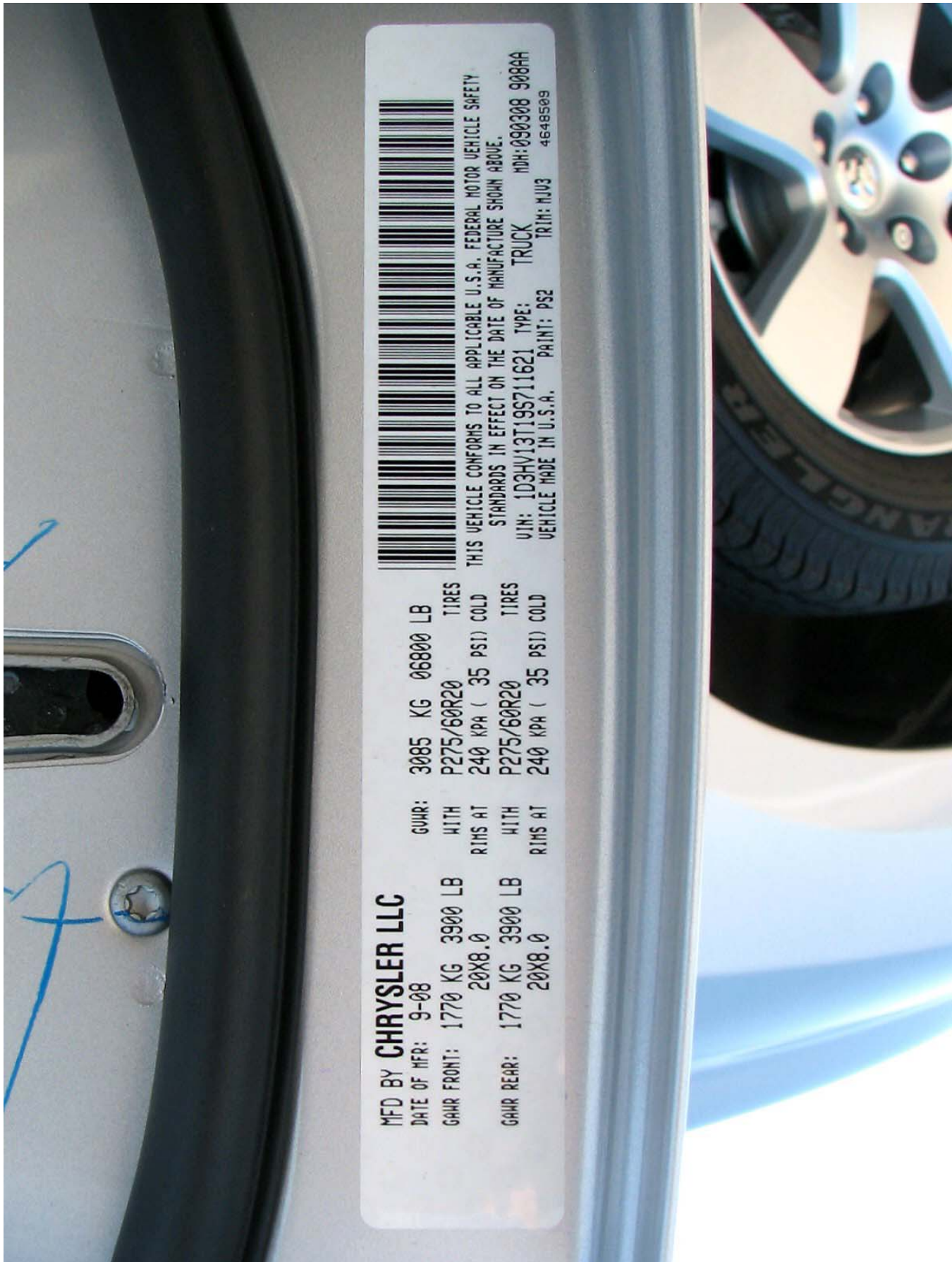


Figure A-2: Vehicle Certification Label



Figure A-3: Post-Test Right Front $\frac{3}{4}$ View of Frontal NCAP Test



Figure A-4: Post-Test Right Side View of Frontal NCAP Test



Figure A-5: Pre-Test Dummy Position, Left Side View

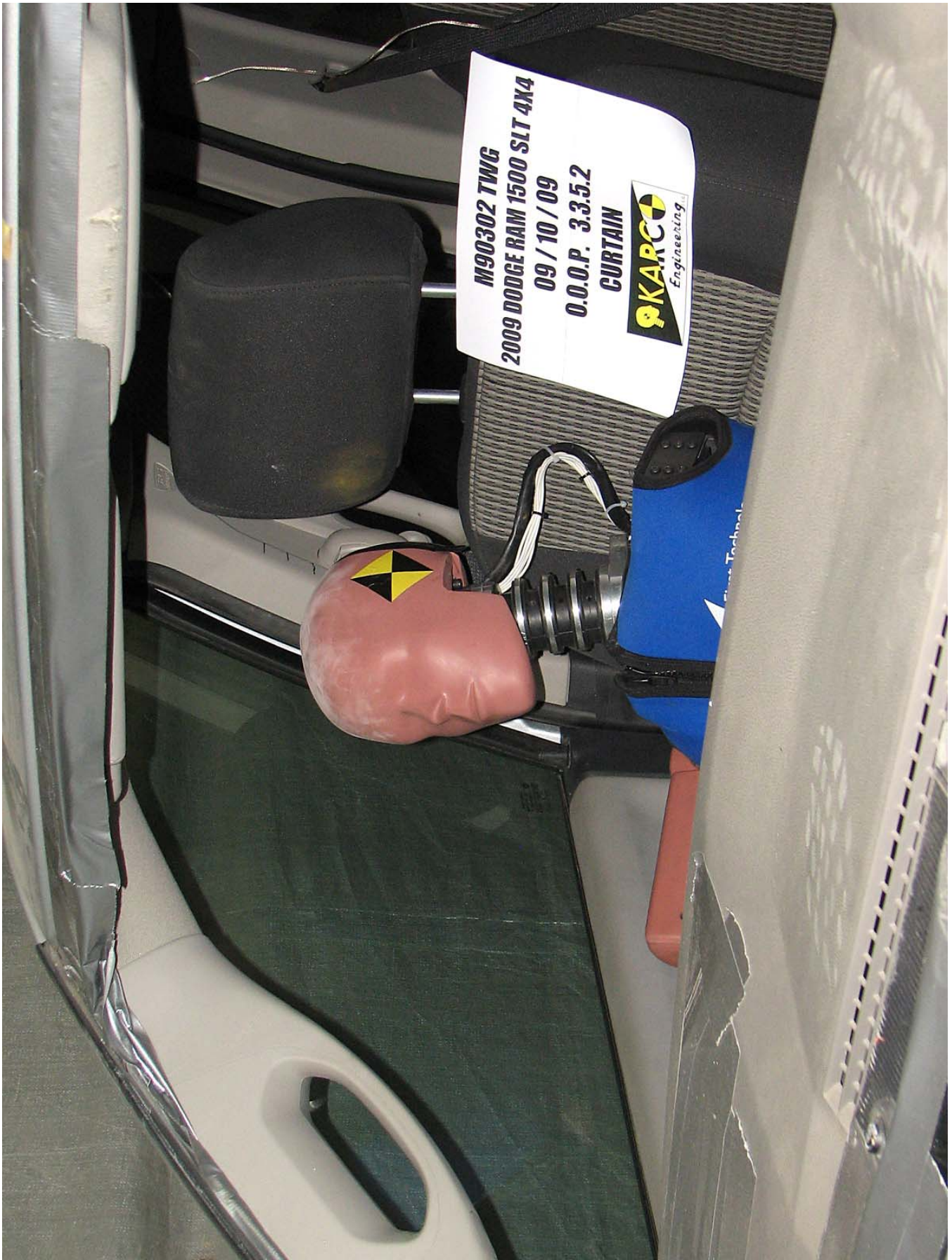


Figure A-6: Pre-Test Dummy Position, $\frac{3}{4}$ View

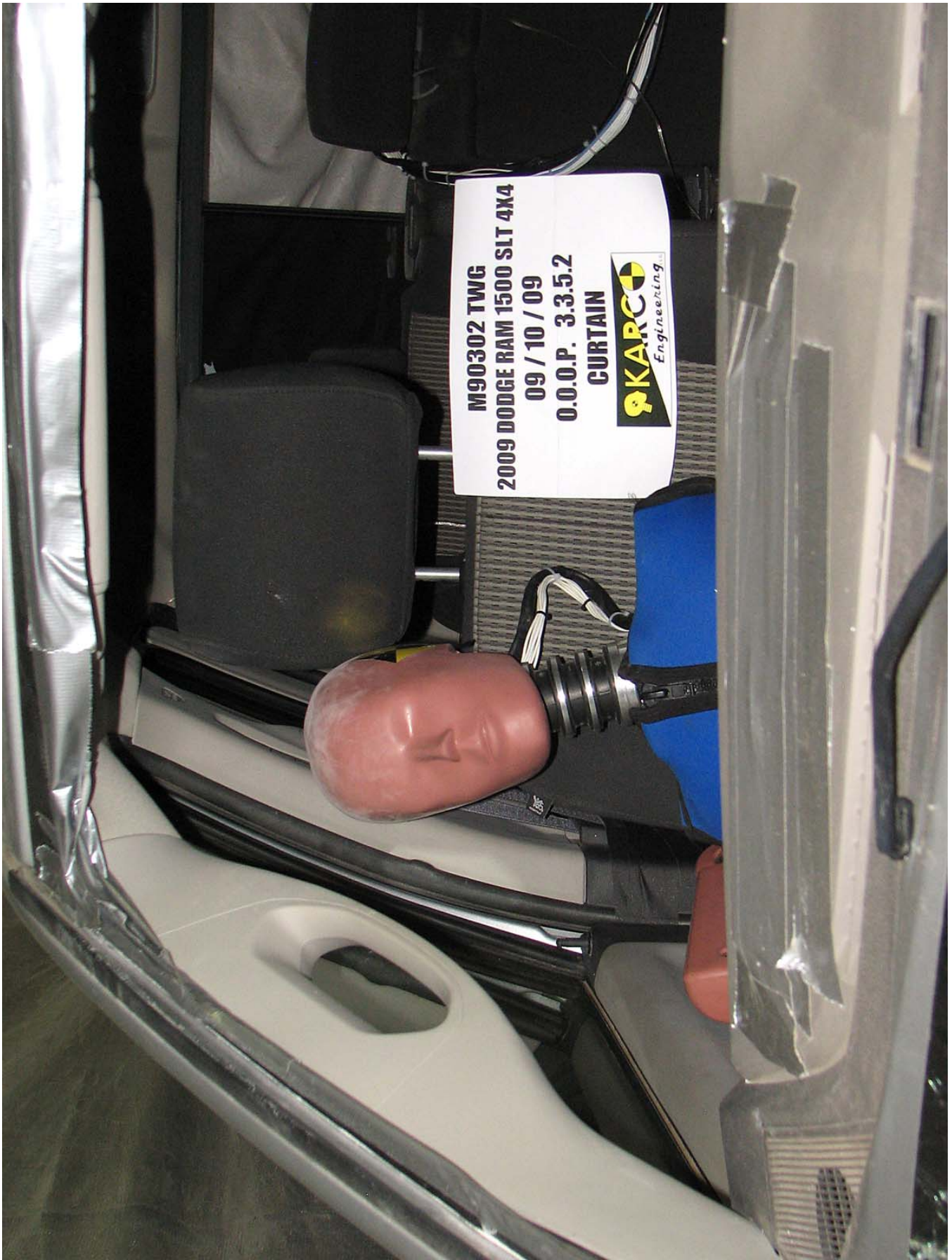


Figure A-7: Pre-Test Dummy Position, Front View



Figure A-8: Post-Test Dummy Position and Airbags, Left Side View

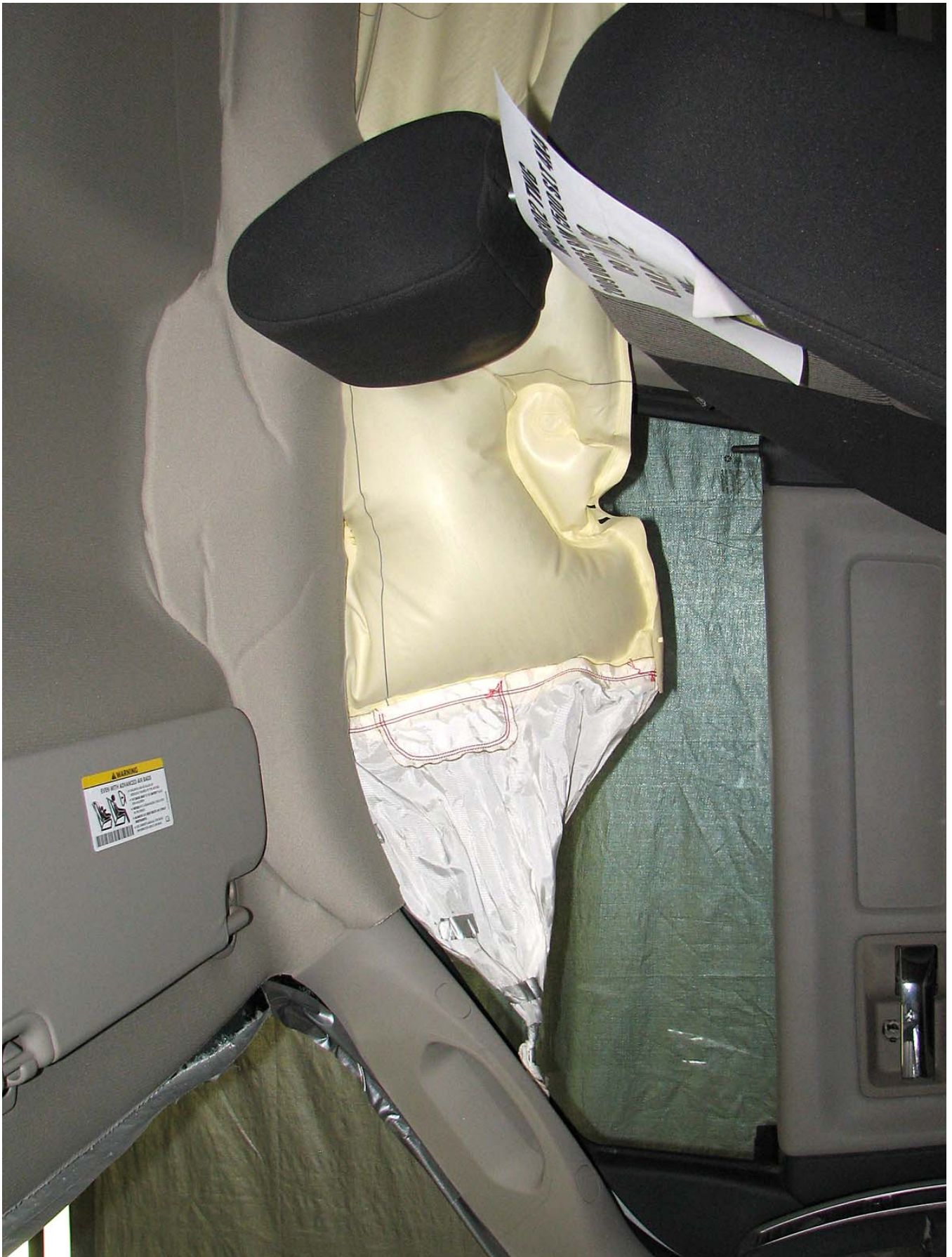


Figure A-9: Post-Test Airbags, Left Side View



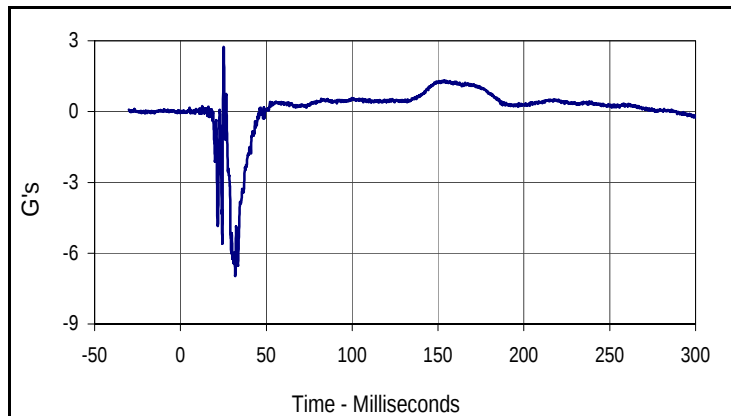
Figure A-10: Post-Test Airbags, Close-up View

APPENDIX B

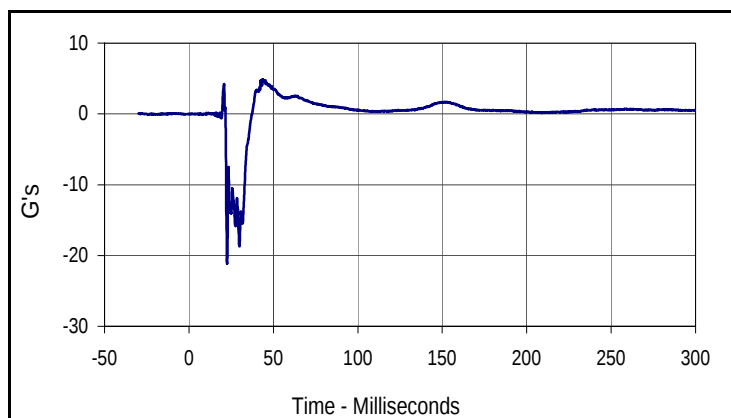
DATA PLOTS

Test Vehicle: 2009 Dodge Ram 1500 SLT 4X4 4-Door Truck
 Test Program: TWG 3.3.5.2

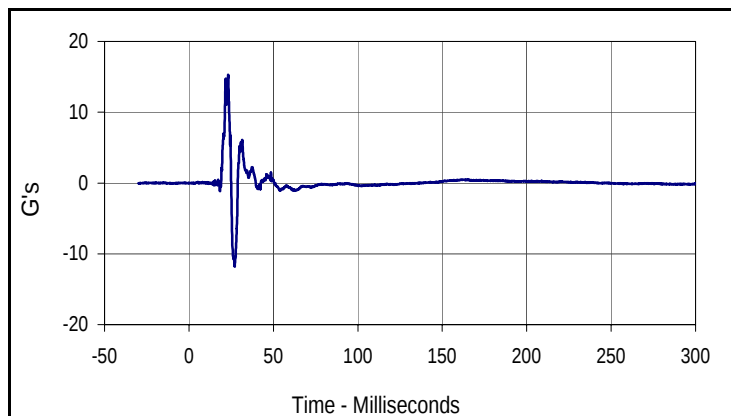
Test Date: 9/10/09
 NHTSA No.: M90302TWG2



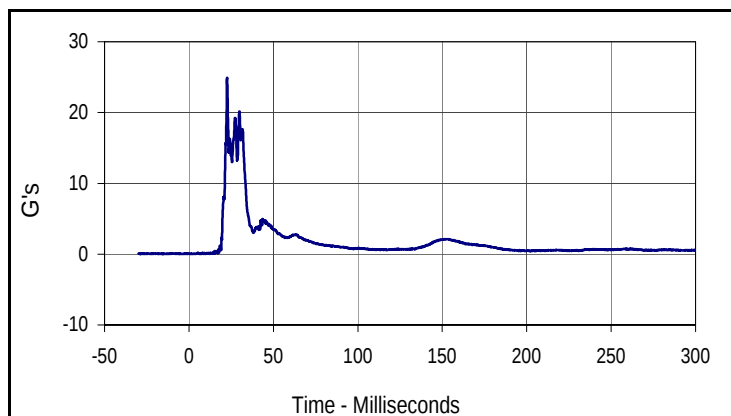
Curve Description			
Pass. SID-IIs Head X Primary			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
2.7	25.1	-7.0	31.9



Curve Description			
Pass. SID-IIs Head Y Primary			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.9	43.7	-21.1	22.5



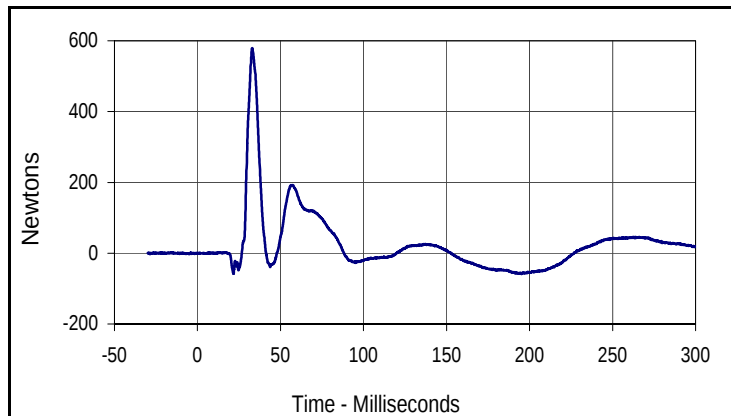
Curve Description			
Pass. SID-IIs Head Z Primary			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
15.3	23.2	-11.8	27.1



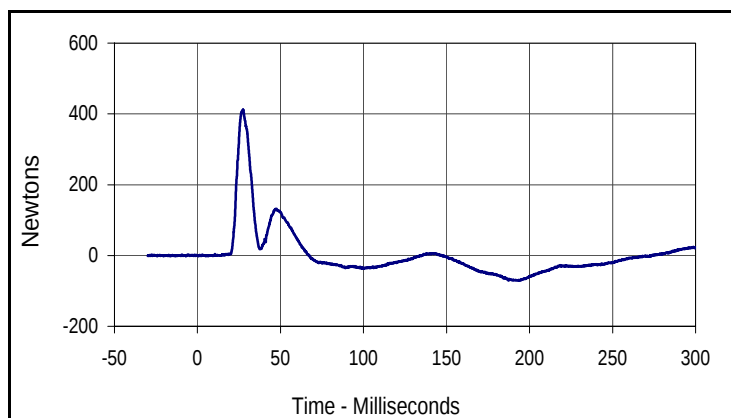
Curve Description			
Pass. SID-IIs Head Primary Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
24.9	22.5	0.0	768.1

Test Vehicle: 2009 Dodge Ram 1500 SLT 4X4 4-Door Truck
 Test Program: TWG 3.3.5.2

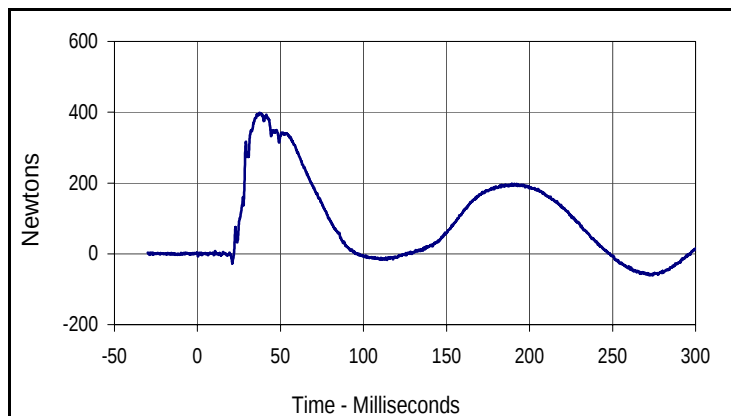
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 NHTSA No.: M90302TWG2



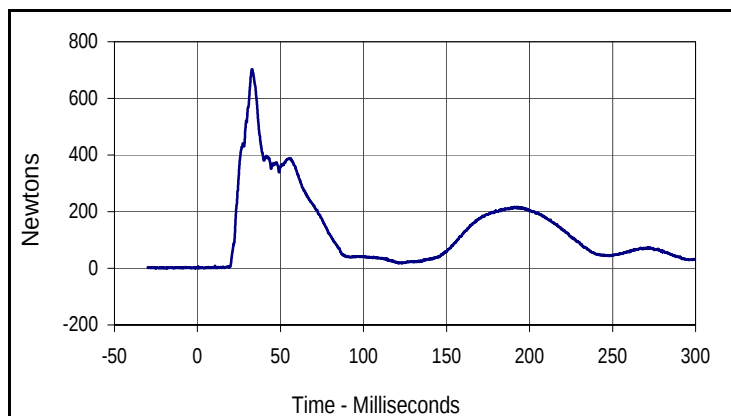
Curve Description			
Pass. SID-IIs Upper Neck Force X			
CURNO	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
579.6	33.0	-58.6	195.2



Curve Description			
Pass. SID-IIs Upper Neck Force Y			
CURNO	Type	SAE Class	Units
005	FIL	1000	Newtons
Max	Time	Min	Time
411.6	27.5	-71.0	192.5



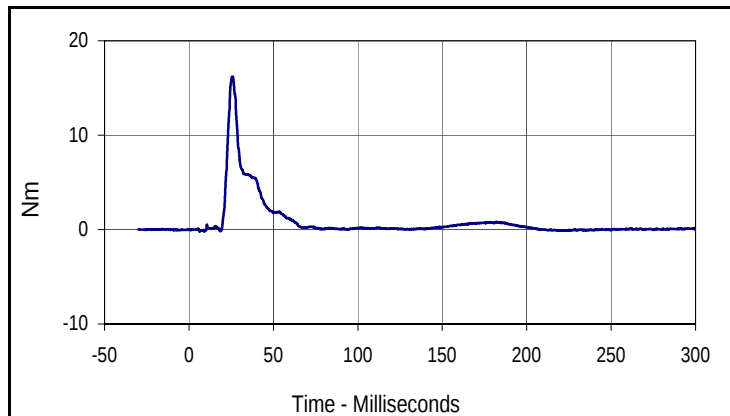
Curve Description			
Pass. SID-IIs Upper Neck Force Z			
CURNO	Type	SAE Class	Units
006	FIL	1000	Newtons
Max	Time	Min	Time
398.4	37.5	-60.7	273.9



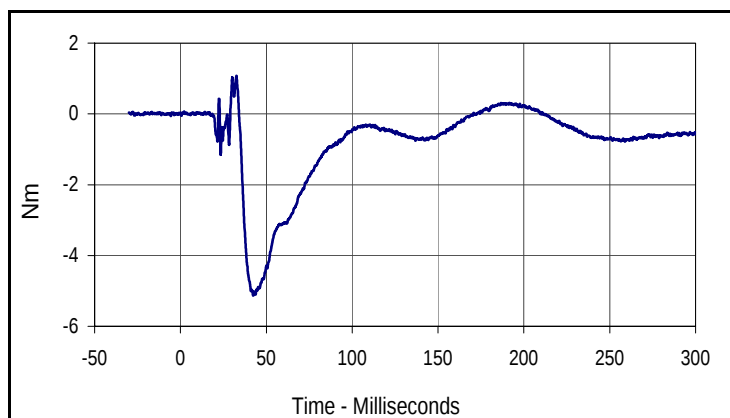
Curve Description			
Pass. SID-IIs Upper Neck Force Resultant			
CURNO	Type	SAE Class	Units
004	RES	1000	Newtons
Max	Time	Min	Time
703.1	33.0	0.4	0.9

Test Vehicle: 2009 Dodge Ram 1500 SLT 4X4 4-Door Truck
 Test Program: TWG 3.3.5.2

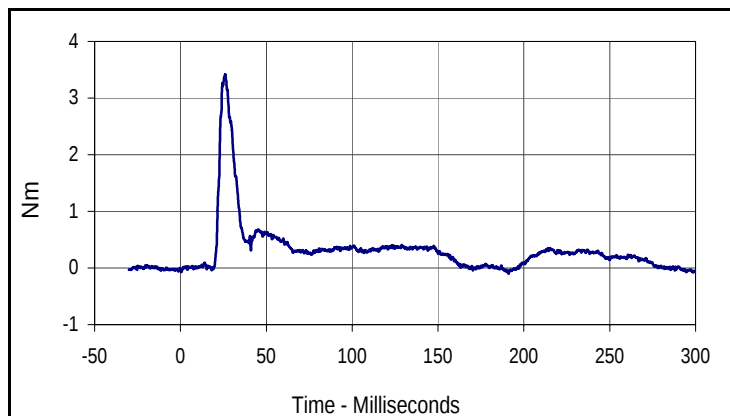
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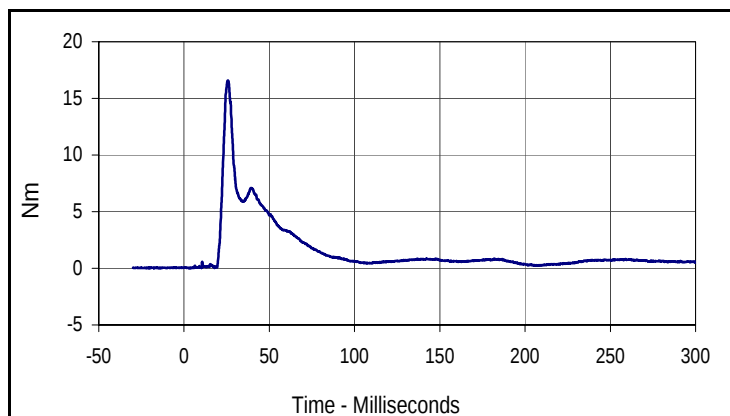
Curve Description			
Pass. SID-IIs Upper Neck Moment X			
CURNO	Type	SAE Class	Units
007	FIL	600	Nm
Max	Time	Min	Time
16.2	25.8	-0.2	6.3



Curve Description			
Pass. SID-IIs Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
008	FIL	600	Nm
Max	Time	Min	Time
1.1	32.6	-5.1	42.4



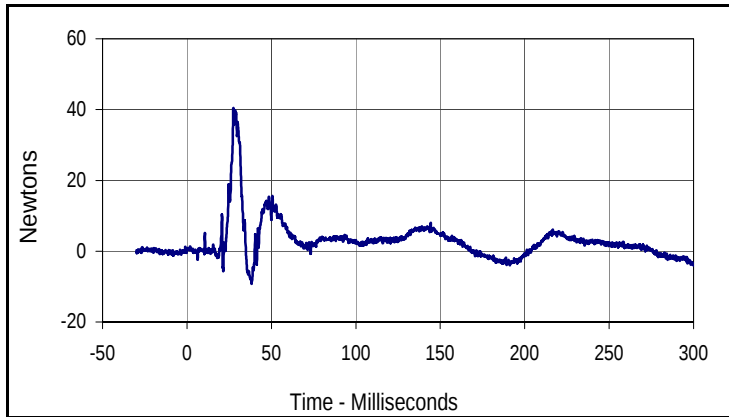
Curve Description			
Pass. SID-IIs Upper Neck Moment Z			
CURNO	Type	SAE Class	Units
009	FIL	600	Nm
Max	Time	Min	Time
3.4	26.1	-0.3	0.0



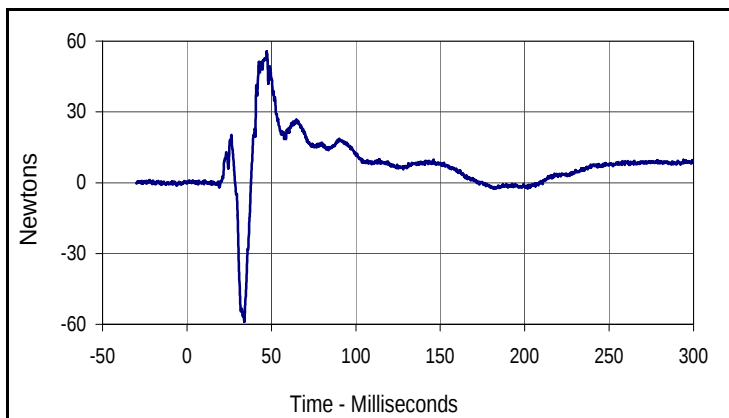
Curve Description			
Pass. SID-IIs Upper Neck Moment Resultant			
CURNO	Type	SAE Class	Units
007	RES	600	Nm
Max	Time	Min	Time
16.6	25.8	0.0	3.9

Test Vehicle: 2009 Dodge Ram 1500 SLT 4X4 4-Door Truck
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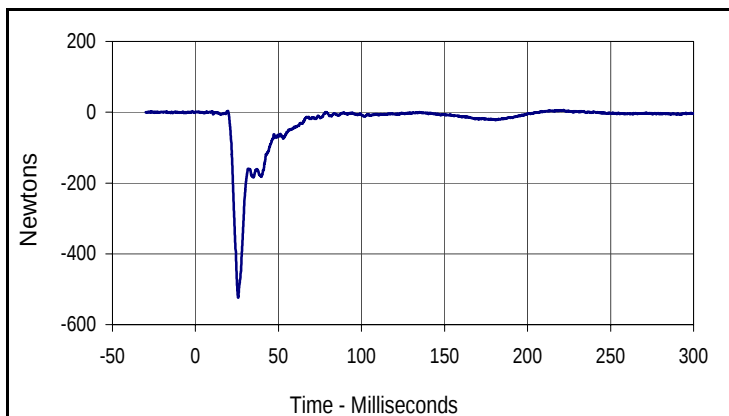
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 NHTSA No.: M90302TWG2



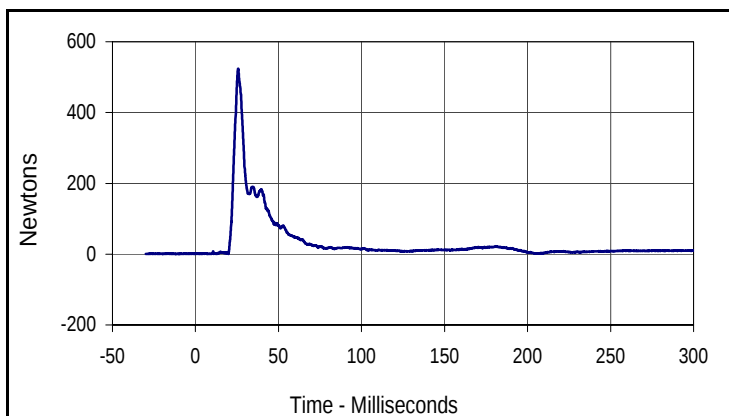
Curve Description			
Pass. SID-IIs Lower Neck Force X			
CURNO	Type	SAE Class	Units
010	FIL	1000	Newtons
Max	Time	Min	Time
40.5	27.5	-9.2	38.3



Curve Description			
Pass. SID-IIs Lower Neck Force Y			
CURNO	Type	SAE Class	Units
011	FIL	1000	Newtons
Max	Time	Min	Time
55.7	47.3	-59.0	34.0



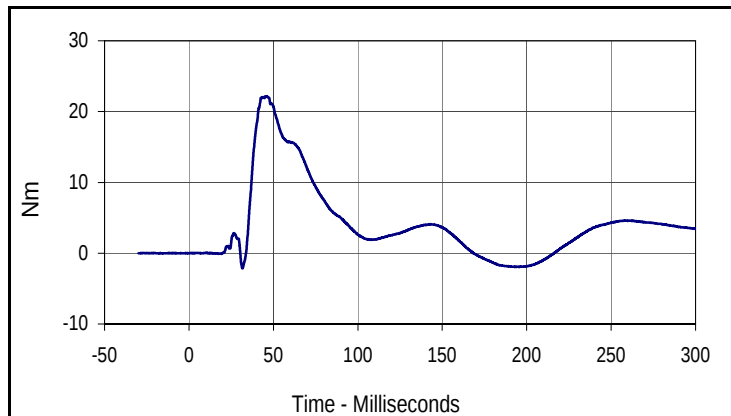
Curve Description			
Pass. SID-IIs Lower Neck Force Z			
CURNO	Type	SAE Class	Units
012	FIL	1000	Newtons
Max	Time	Min	Time
6.3	221.8	-523.9	25.8



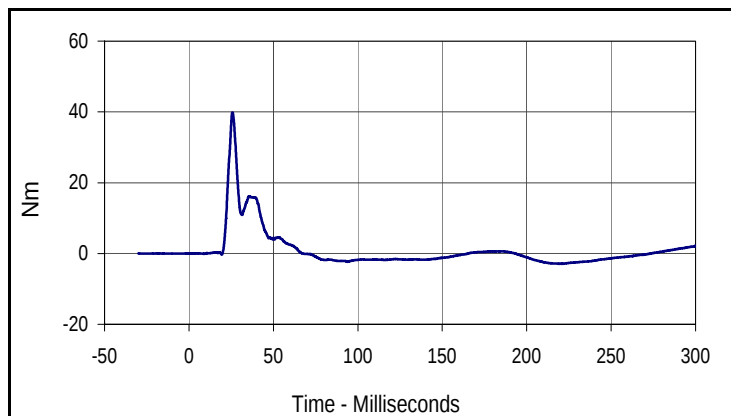
Curve Description			
Pass. SID-IIs Lower Neck Force Resultant			
CURNO	Type	SAE Class	Units
010	RES	1000	Newtons
Max	Time	Min	Time
524.4	25.8	0.4	3.6

Test Vehicle: 2009 Dodge Ram 1500 SLT 4X4 4-Door Truck
 Test Program: TWG 3.3.5.2

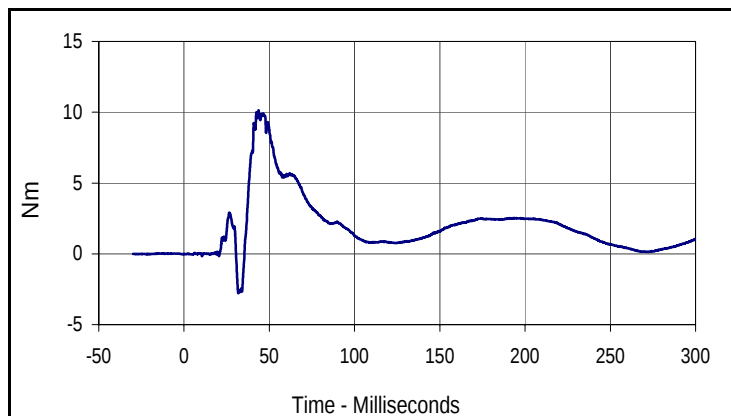
Test Date: 9/10/09
 NHTSA No.: M90302TWG2



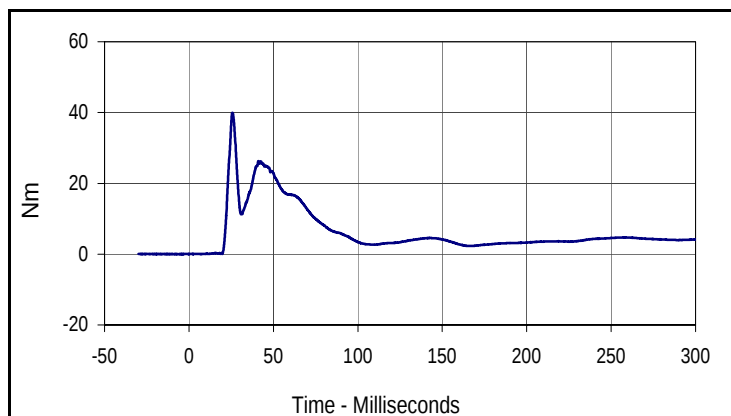
Curve Description			
Pass. SID-IIs Lower Neck Moment X			
CURNO	Type	SAE Class	Units
013	FIL	600	Nm
Max	Time	Min	Time
22.2	46.1	-2.1	31.7



Curve Description			
Pass. SID-IIs Lower Neck Moment Y			
CURNO	Type	SAE Class	Units
014	FIL	600	Nm
Max	Time	Min	Time
39.8	25.8	-2.9	218.8



Curve Description			
Pass. SID-IIs Lower Neck Moment Z			
CURNO	Type	SAE Class	Units
015	FIL	600	Nm
Max	Time	Min	Time
10.1	43.7	-2.8	31.9



Curve Description			
Pass. SID-IIs Lower Neck Moment Resultant			
CURNO	Type	SAE Class	Units
013	RES	600	Nm
Max	Time	Min	Time
40.0	25.8	0.0	7.3

APPENDIX C

INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

TWG 3.3.5.2
Instrumentation Data Channel Assignments
A.T.D. Serial Number 294
9/10/09
2009 Dodge Ram 1500 SLT 4X4 4-Door Truck

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
1	HEAD	X	P45011	Accel.,full bridge	ENDEVCO	7264-2000	G
2	HEAD	Y	P51696	Accel.,full bridge	ENDEVCO	7264-2000	G
3	HEAD	Z	P51708	Accel.,full bridge	ENDEVCO	7264-2000	G
4	UPPER NECK FORCE	X	157 FX	Load cell, six axis neck	R. A. Denton	IF-205	N
5	UPPER NECK FORCE	Y	157 FY	Load cell, six axis neck	R. A. Denton	IF-205	N
6	UPPER NECK FORCE	Z	157 FZ	Load cell, six axis neck	R. A. Denton	IF-205	N
7	UPPER NECK MOMENT	X	157 MX	Load cell, six axis neck	R. A. Denton	IF-205	Nm
8	UPPER NECK MOMENT	Y	157 MY	Load cell, six axis neck	R. A. Denton	IF-205	Nm
9	UPPER NECK MOMENT	Z	157 MZ	Load cell, six axis neck	R. A. Denton	IF-205	Nm
10	LOWER NECK FORCE	X	180 FX	Load cell, six axis neck	R. A. Denton	2430	N
11	LOWER NECK FORCE	Y	180 FY	Load cell, six axis neck	R. A. Denton	2430	N
12	LOWER NECK FORCE	Z	180 FZ	Load cell, six axis neck	R. A. Denton	2430	N
13	LOWER NECK MOMENT	X	180 MX	Load cell, six axis neck	R. A. Denton	2430	Nm
14	LOWER NECK MOMENT	Y	180 MY	Load cell, six axis neck	R. A. Denton	2430	Nm
15	LOWER NECK MOMENT	Z	180 MZ	Load cell, six axis neck	R. A. Denton	2430	Nm