

REPORT NUMBER TR-P31043-01-NC

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

**NISSAN MOTOR CO., LTD.
2011 NISSAN ALTIMA 2.5
4-DOOR SEDAN**

NHTSA NUMBER: MB5202TWG2

**PREPARED BY:
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ADELANTO, CALIFORNIA 92301**

APRIL 18, 2011

FINAL REPORT

PREPARED FOR:

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This final test report was prepared for the U.S. Department of Transportation, Alpha Technology Associate, Inc., in response to Contract Number DTNH22-06-D-00027.

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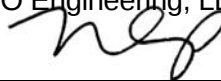
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Date of Acceptance

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SECTION 1

PURPOSE AND SUMMARY OF TEST MB5202TWG2

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. DTNH22-06-D-00027. 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 and a torso airbag deployment in a 2011 Nissan Altima 2.5 4-Door Sedan with an out-of-position SID IIs 5th percentile adult female dummy were evaluated. The test was performed at Karco Engineering, LLC on April 18, 2011. 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 airbag deployment. Camera locations and other pertinent camera information can be found on Data Sheet No.1 and Data Sheet No.6.

A 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 and the torso airbag contacted the ATD's back.

OUT OF POSITION OCCUPANT DATA SUMMARY

ATD Position	HIC ₁₅
Passenger	3.7

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 head centerline was aligned with the deploying trajectory of the curtain airbag. 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: 2011 Nissan Altima 2.5 4-Door Sedan NHTSA No.: MB5202TWG2
Test Program: TWG 3.3.5.2 Test Date: 04/18/11

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: 2011 Nissan Altima 2.5 4-Door Sedan NHTSA No.: MB5202TWG2

Test Program: TWG 3.3.5.2 Test Date: 04/18/11

TEST DUMMY INFORMATION

Description	Passenger Seat Inboard Facing
Dummy Type / Serial No.	SID IIs / 294
Head Contact	Yes
Chest Contact	None
Abdomen Contact	Yes
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: 2011 Nissan Altima 2.5 4-Door Sedan NHTSA No.: MB5202TWG2
 Test Program: TWG 3.3.5.2 Test Date: 04/18/11

TEST VEHICLE INFORMATION

Make	Nissan
Model	Altima 2.5
Body Style	4-Door Sedan
NHTSA No.	MB5202TWG2
VIN	1N4AL2AP4BN408371
Color	Metallic Slate
Delivery Date	October 29, 2010
Odometer Reading (mile)	88
Dealer	West Covina Nissan
Transmission	Automatic
Final Drive	Front
Type/Number Cylinders	Inline 4
Engine Displacement (L)	2.5
Engine Placement	Transverse

TEST VEHICLE OPTIONS

Driver Front Airbag	Yes
Driver Side Airbag	Yes
Driver Side Curtain Airbag	Yes
Pass. Front Airbag	Yes
Pass.Side Airbag	Yes
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	Nissan Motor Co. LTD.	GVWR (kg)	1941
Date of Manufacture	September-10	GAWR Front (kg)	1017
		GAWR Rear (kg)	185

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	220
Recommend Tire Size	P215/60R16	P215/60R16
Tire Size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Continental	Continental

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				375

* Vehicle had undergone New Car Assessment Program Frontal Impact Testing on November 17, 2010

DATA SHEET NO. 3

TEST VEHICLE INFORMATION

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan NHTSA No.: MB5202TWG2
 Test Program: TWG 3.3.5.2 Test Date: 04/18/11

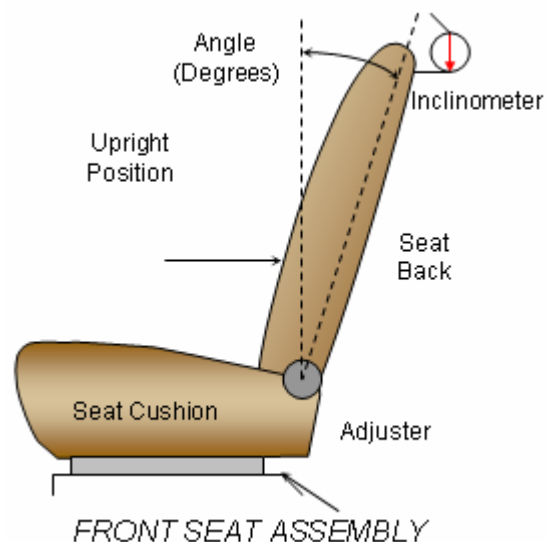
NOMINAL DESIGN RIDING POSITION

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	0

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	240mm	0 mm

DATA SHEET NO. 4

DUMMY POSITIONING INFORMATION

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan NHTSA No. MB5202TWG2
 Test Program: TWG 3.3.5.2 Test Date: 04/18/11

TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	SID IIs 5th percentile female	
		Length (mm)	Angle (°)
SA	Seat Back Angle		0
AMW	Side Airbag Module Width (Torso / Curtain)	40 / 35	
ABW	Side Airbag Width (Torso / Curtain)	578 / 488	
AML	Side Airbag Module Length (Torso / Curtain)	195 / 330	
ABL	Side Airbag Length (Torso / Curtain)	290 / 1745	
AN	Top of Airbag Module to Head/Neck Junction	319	
HD	Head CG to Door Panel/ Window	125	
HSC	Head to Seat Back Centerline	175	
HB	Head to B-Pillar (first contact)	142	
HZ	Head to Roof (Z)	144	
HHD	Head to Header	350	
ND	Nose to Dash	547	
NS	Nose to Seat Back	337	
NR	Nose to Header	340	
CD	Chest to Dash	485	
CS	Chest to Seat Back	282	
RACL	Right Arm to Seat Back Centerline	357	
LACL	Left Arm to Seat Back Centerline	N/A	
RA	Right Arm to Door Panel	28	
LA	Left Arm to Door Panel	N/A	
KK	Knee to Knee	165	
TT	Toe to Toe	308	
KSCR	Right Knee to Seat Cushion Centerline	-95	
KSCL	Left Knee to Seat Cushion Centerline	69	
TSCR	Right Toe to Seat Cushion Centerline	181	
TSCL	Left Toe to Seat Cushion Centerline	127	

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

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan

NHTSA No.: MB5202TWG2

Test Program: TWG 3.3.5.2

Test Date: 4/18/11

HEAD PEAK ACCELERATIONS

Location	Axis	Units	Pass. SID-IIs			
			Max	Time	Min	Time
Head CG	X	G's	7.9	15.2	-5.3	47.5
Head CG	Y	G's	6.3	14.4	-19.5	13.3
Head CG	Z	G's	20.3	11.7	-12.5	15.2
Head CG Resultant	N/A	G's	28.2	11.7		

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Pass. SID-IIs			
			Max	Time	Min	Time
Neck Force	X	Newtons	209.0	21.7	-1.9	0.0
Neck Force	Y	Newtons	2.4	1.1	-372.9	45.5
Neck Force	Z	Newtons	326.1	19.4	-688.2	13.7
Neck Force Resultant	N/A	Newtons	743.6	13.7		
Neck Moment	X	Nm	20.3	16.1	-10.6	29.2
Neck Moment	Y	Nm	12.5	21.6	-2.0	282.1
Neck Moment	Z	Nm	0.4	4.7	-6.7	126.1
Neck Moment Resultant	N/A	Nm	22.1	16.2		

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Pass. SID-IIs			
			Max	Time	Min	Time
Neck Force	X	Newtons	265.1	18.7	-6.1	78.1
Neck Force	Y	Newtons	3.1	0.8	-316.5	18.1
Neck Force	Z	Newtons	365.1	19.3	-765.3	14.8
Neck Force Resultant	N/A	Newtons	813.4	14.8		
Neck Moment	X	Nm	0.1	4.4	-52.6	62.4
Neck Moment	Y	Nm	21.4	14.7	-36.5	19.3
Neck Moment	Z	Nm	0.0	0.2	-15.6	18.0
Neck Moment Resultant	N/A	Nm	52.9	62.3		

HEAD INJURY CRITERIA (HIC 15)

Location	Pass. SID-IIs			
	HIC15	T ¹	T ²	Avg G
Head CG	3.7	11.4	26.1	9.1

UPPER NECK NIJ VALUES

Location	Pass. SID-IIs			
	Ntf	Nte	Ncf	Nce
Upper Neck	0.13	0.04	0.21	0.04

CAMERA LOCATIONS

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan NHTSA No.: MB5202TWG2
 Test Program: TWG 3.3.5.2 Test Date: 04/18/11

No.	Camera View	Location (mm)			Angle (Deg.)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Real Time	0	-2894	-1074	0.0	N/A	30
2	High Speed Side View	0	-2694	-924	0.3	35	1000
3	High Speed 3/4 View	-1614	-1420	-1424	10.1	50	1000
4	High Speed Front View	-1816	-150	-1181	1.9	35	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

MB5202TWG2

MFD BY NISSAN MOTOR CO., LTD.

09/10

DATE:

1941 KG

GWR:

4279 LB

GWR FR.:

1017 KG

2242 LB

GWR RR.:

993 KG

2189 LB

THIS VEHICLE CONFORMS TO
ALL APPLICABLE FEDERAL
MOTOR VEHICLE SAFETY,
BUMPER, AND THEFT
PREVENTION STANDARDS IN
EFFECT ON THE DATE OF
MANUFACTURE SHOWN ABOVE.

1N4AL2AP4BN 408371

PASSENGER CAR 687

MODEL: BDBALAZC72EVA-----

COLOR: KBC TRIM: K 9N00A



Figure A-2: Vehicle Certification Label



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

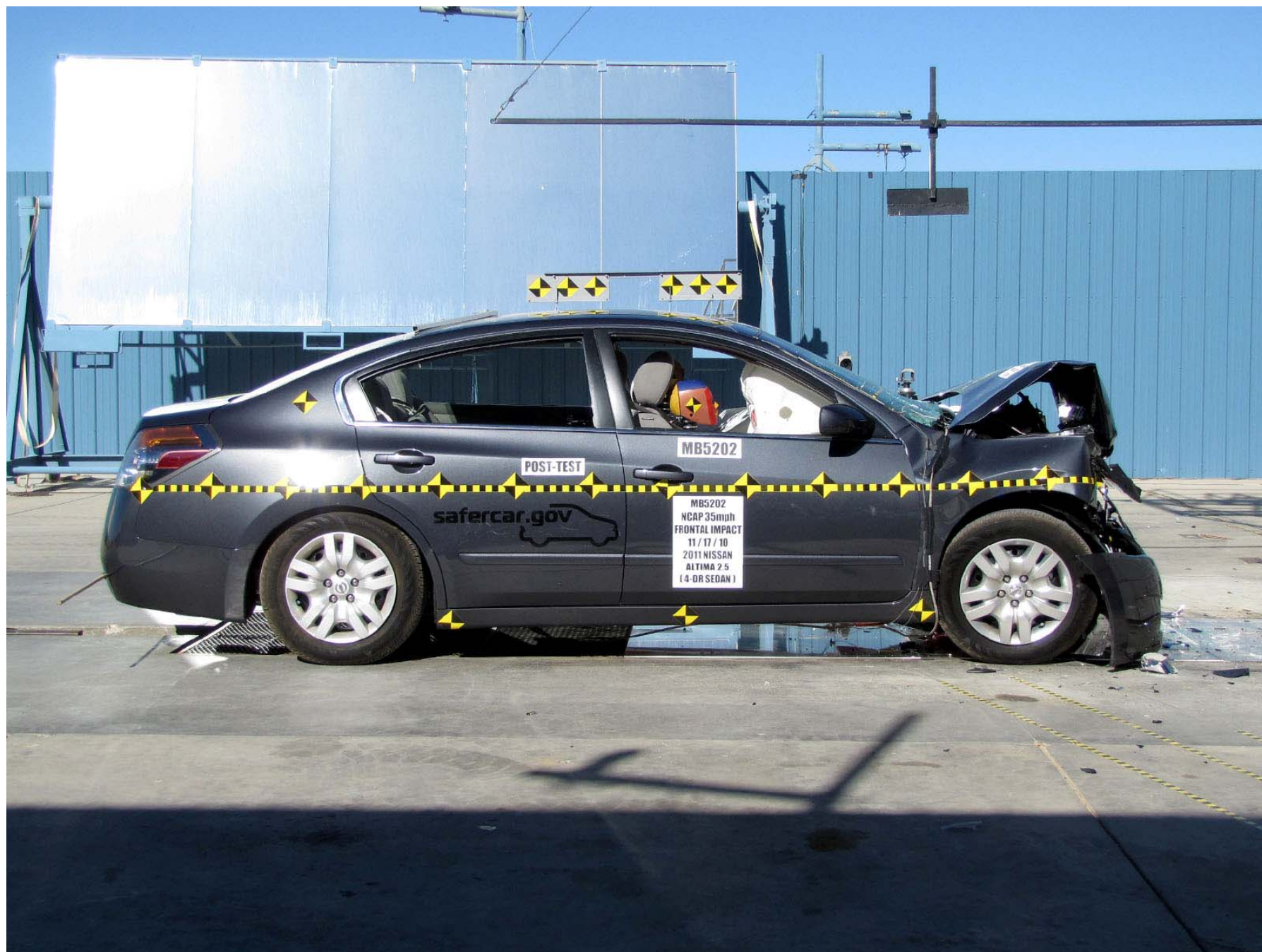


Figure A-4: Post-Test Right Side View of Frontal NCAP Test



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



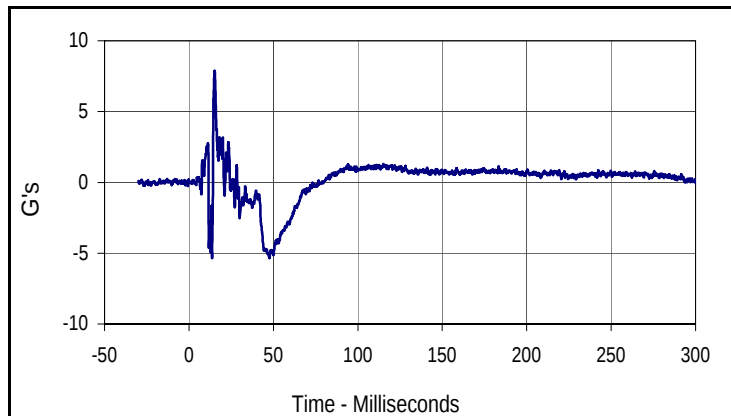
Figure A-10: Post-Test Airbags, Left Front $\frac{3}{4}$ View

APPENDIX B

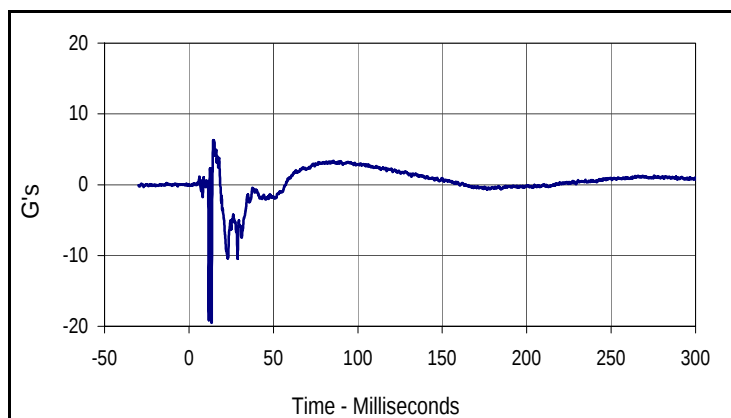
DATA PLOTS

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan
 Test Program: TWG 3.3.5.2

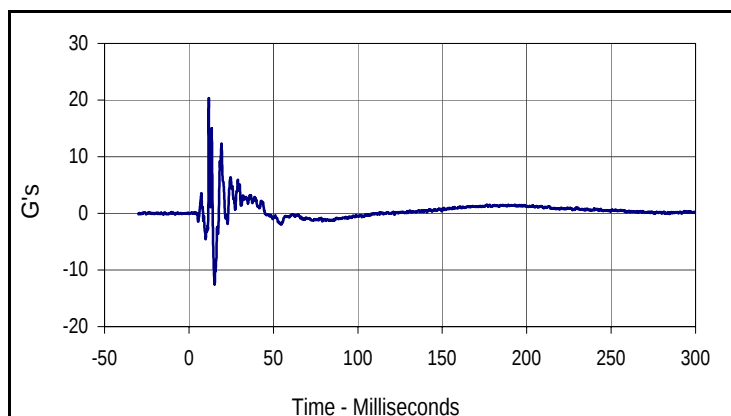
Test Date: 4/18/11
 NHTSA No.: MB5202TWG2



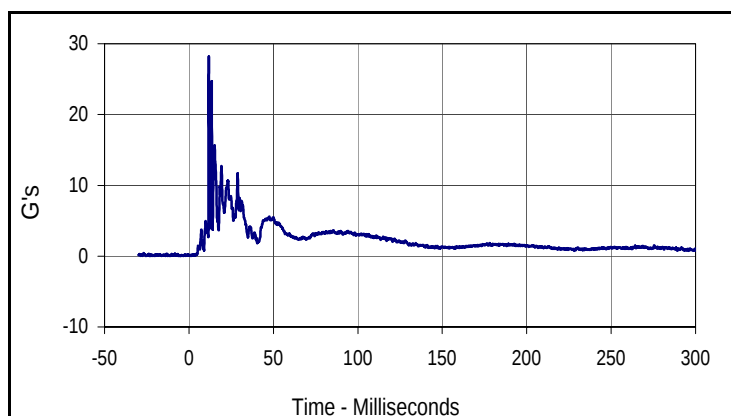
Curve Description			
Pass. SID-IIs Head X			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
7.9	15.2	-5.3	47.5



Curve Description			
Pass. SID-IIs Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
6.3	14.4	-19.5	13.3



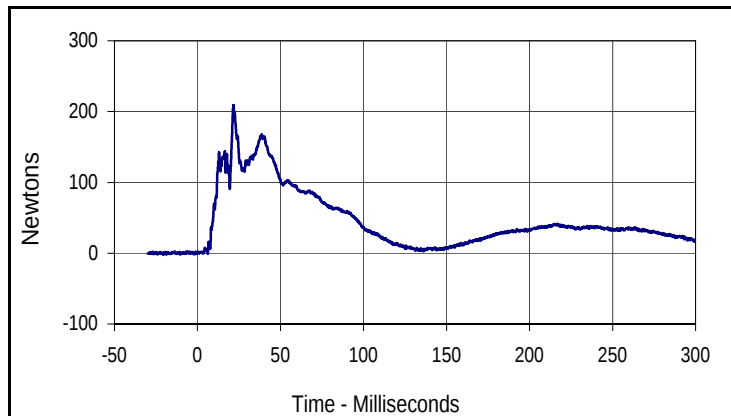
Curve Description			
Pass. SID-IIs Head Z			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
20.3	11.7	-12.5	15.2



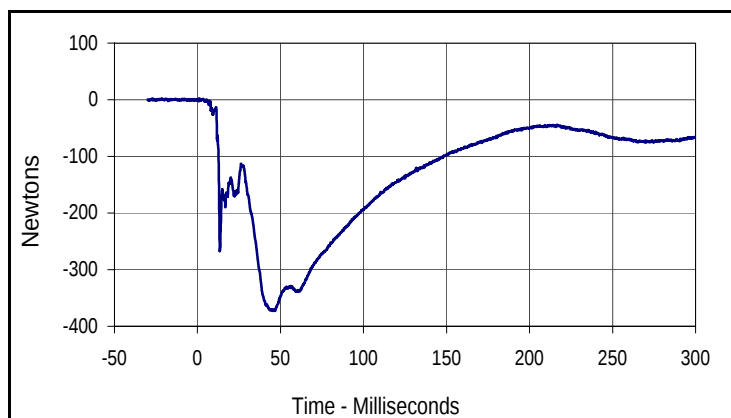
Curve Description			
Pass. SID-IIs Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
28.2	11.7	0.0	1.1

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan
 Test Program: TWG 3.3.5.2

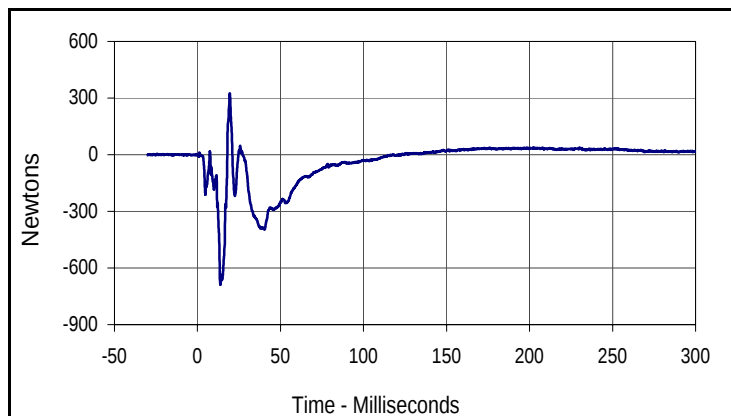
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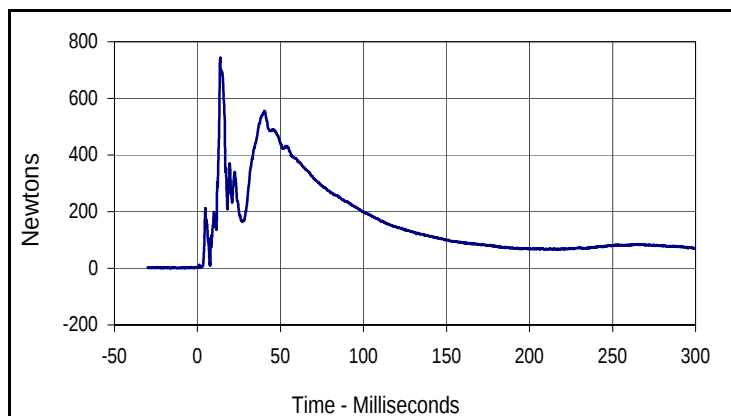
Curve Description			
Pass. SID-III Upper Neck Force X			
CURNO	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
209.0	21.7	-1.9	0.0



Curve Description			
Pass. SID-III Upper Neck Force Y			
CURNO	Type	SAE Class	Units
005	FIL	1000	Newtons
Max	Time	Min	Time
2.4	1.1	-372.9	45.5



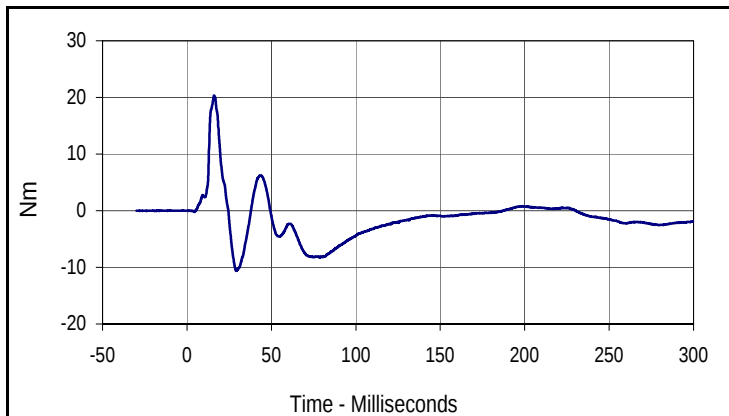
Curve Description			
Pass. SID-III Upper Neck Force Z			
CURNO	Type	SAE Class	Units
006	FIL	1000	Newtons
Max	Time	Min	Time
326.1	19.4	-688.2	13.7



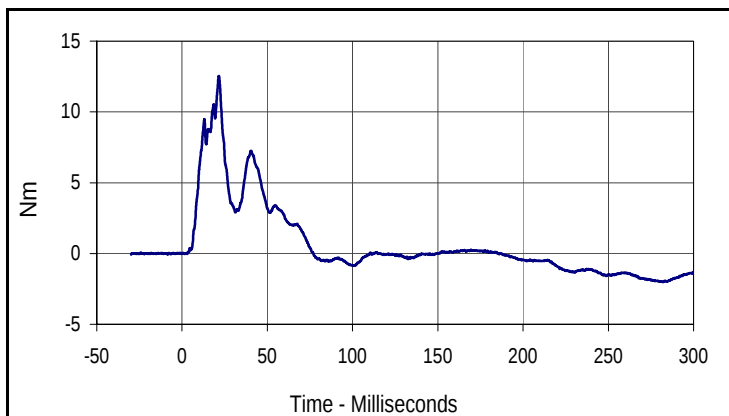
Curve Description			
Pass. SID-III Upper Neck Force Resultant			
CURNO	Type	SAE Class	Units
004	RES	1000	Newtons
Max	Time	Min	Time
743.6	13.7	1.5	0.1

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan
 Test Program: TWG 3.3.5.2

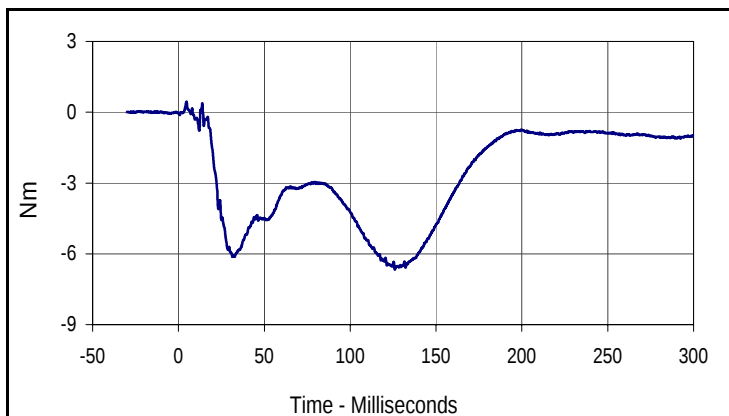
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 NHTSA No.: MB5202TWG2



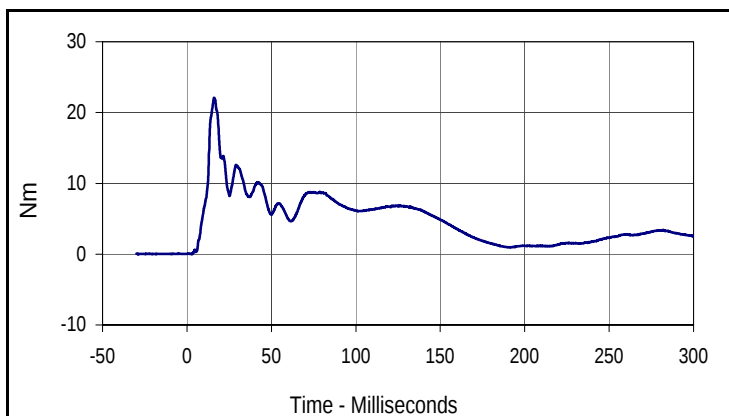
Curve Description			
Pass. SID-IIs Upper Neck Moment X			
CURNO	Type	SAE Class	Units
007	FIL	600	Nm
Max	Time	Min	Time
20.3	16.1	-10.6	29.2



Curve Description			
Pass. SID-IIs Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
008	FIL	600	Nm
Max	Time	Min	Time
12.5	21.6	-2.0	282.1



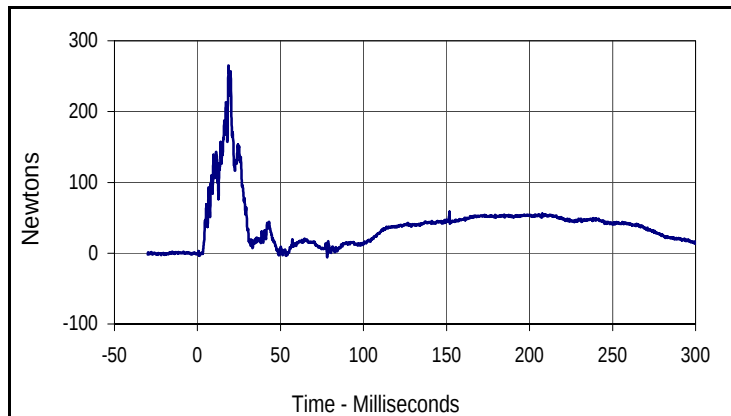
Curve Description			
Pass. SID-IIs Upper Neck Moment Z			
CURNO	Type	SAE Class	Units
009	FIL	600	Nm
Max	Time	Min	Time
0.4	4.7	-6.7	126.1



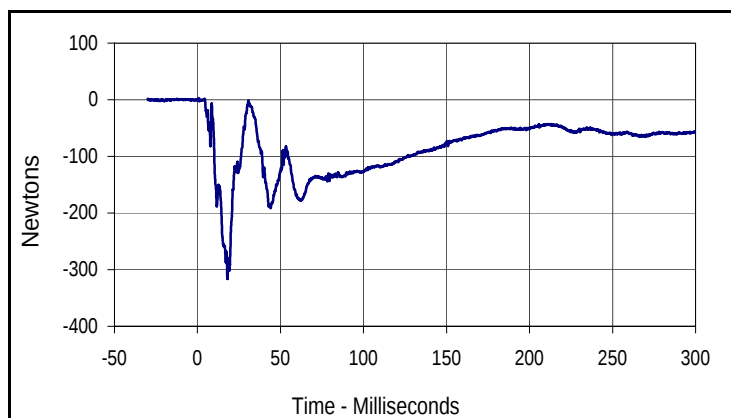
Curve Description			
Pass. SID-IIs Upper Neck Moment Resultant			
CURNO	Type	SAE Class	Units
007	RES	600	Nm
Max	Time	Min	Time
22.1	16.2	0.0	3.0

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan
 Test Program: TWG 3.3.5.2

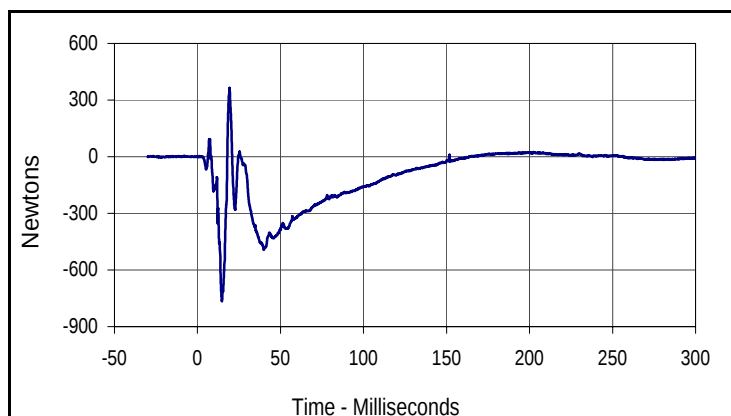
Test Date: 4/18/11
 NHTSA No.: MB5202TWG2



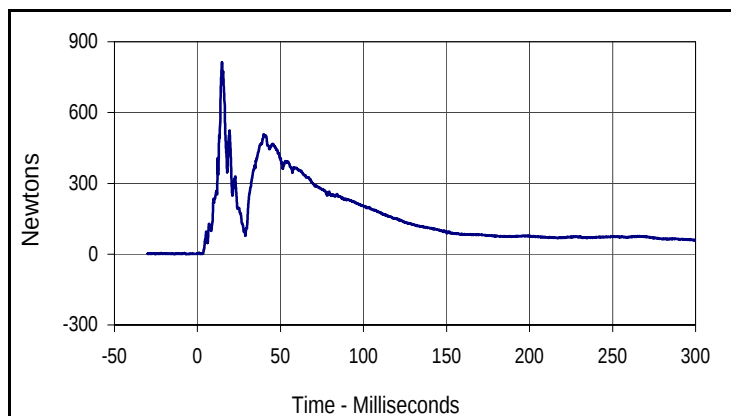
Curve Description			
Pass. SID-IIs Lower Neck Force X			
CURNO	Type	SAE Class	Units
010	FIL	1000	Newtons
Max	Time	Min	Time
265.1	18.7	-6.1	78.1



Curve Description			
Pass. SID-IIs Lower Neck Force Y			
CURNO	Type	SAE Class	Units
011	FIL	1000	Newtons
Max	Time	Min	Time
3.1	0.8	-316.5	18.1



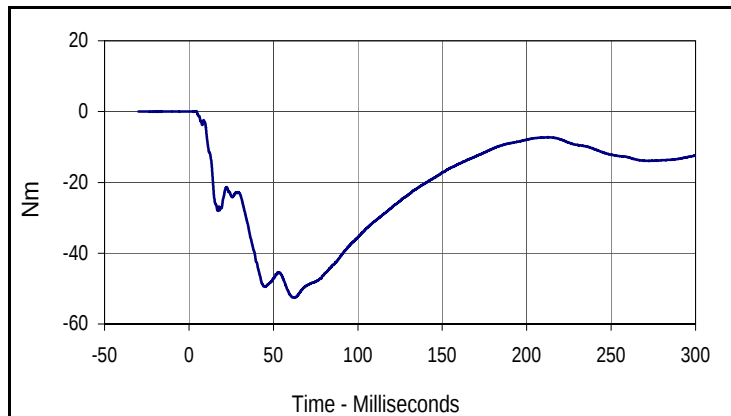
Curve Description			
Pass. SID-IIs Lower Neck Force Z			
CURNO	Type	SAE Class	Units
012	FIL	1000	Newtons
Max	Time	Min	Time
365.1	19.3	-765.3	14.8



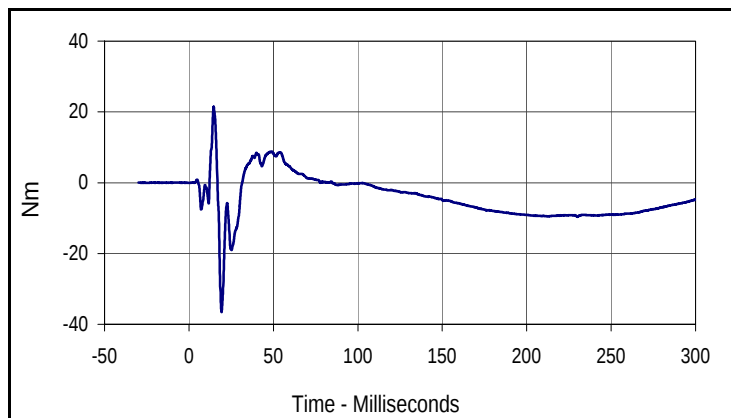
Curve Description			
Pass. SID-IIs Lower Neck Force Resultant			
CURNO	Type	SAE Class	Units
010	RES	1000	Newtons
Max	Time	Min	Time
813.4	14.8	0.5	1.9

Test Vehicle: 2011 Nissan Altima 2.5 4-Door Sedan
 Test Program: TWG 3.3.5.2

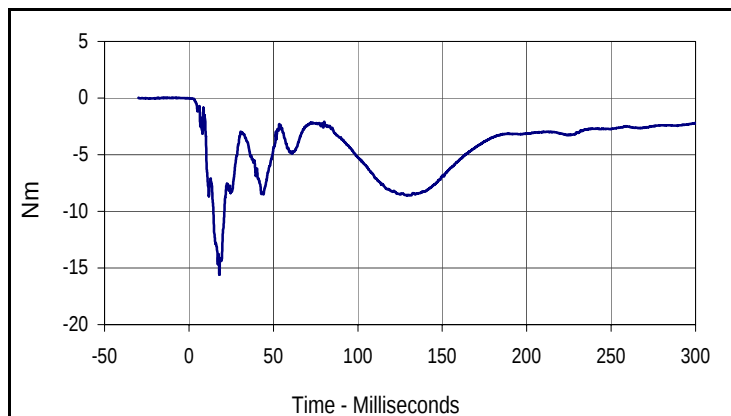
Test Date: 4/18/11
 NHTSA No.: MB5202TWG2



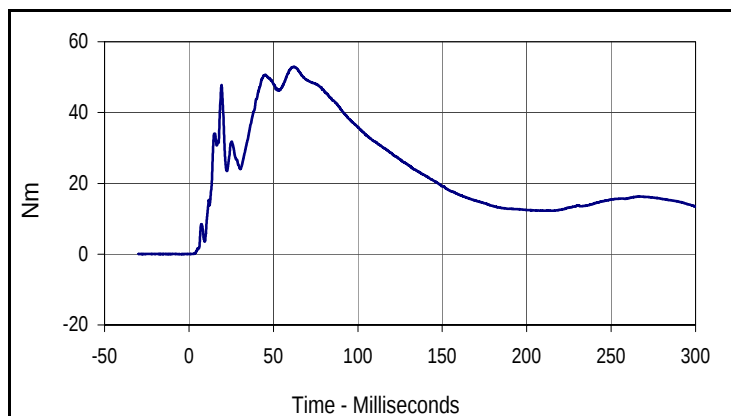
Curve Description			
Pass. SID-IIs Lower Neck Moment X			
CURNO	Type	SAE Class	Units
013	FIL	600	Nm
Max	Time	Min	Time
0.1	4.4	-52.6	62.4



Curve Description			
Pass. SID-IIs Lower Neck Moment Y			
CURNO	Type	SAE Class	Units
014	FIL	600	Nm
Max	Time	Min	Time
21.4	14.7	-36.5	19.3



Curve Description			
Pass. SID-IIs Lower Neck Moment Z			
CURNO	Type	SAE Class	Units
015	FIL	600	Nm
Max	Time	Min	Time
0.0	0.2	-15.6	18.0



Curve Description			
Pass. SID-IIs Lower Neck Moment Resultant			
CURNO	Type	SAE Class	Units
013	RES	600	Nm
Max	Time	Min	Time
52.9	62.3	0.0	0.9

APPENDIX C

INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

TWG 3.3.5.2
Instrumentation Data Channel Assignments
A.T.D. Serial Number 294
4/18/11
2011 Nissan Altima 2.5 4-Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
1	HEAD	X	P45011	Accel.,full bridge	ENDEVCO	7264C-2000	G
2	HEAD	Y	P51696	Accel.,full bridge	ENDEVCO	7264C-2000	G
3	HEAD	Z	P51708	Accel.,full bridge	ENDEVCO	7264C-2000	G
4	UPPER NECK FORCE	X	1913	Load cell, six axis neck	R. A. Denton	1716A	N
5	UPPER NECK FORCE	Y	1913	Load cell, six axis neck	R. A. Denton	1716A	N
6	UPPER NECK FORCE	Z	1913	Load cell, six axis neck	R. A. Denton	1716A	N
7	UPPER NECK MOMENT	X	1913	Load cell, six axis neck	R. A. Denton	1716A	Nm
8	UPPER NECK MOMENT	Y	1913	Load cell, six axis neck	R. A. Denton	1716A	Nm
9	UPPER NECK MOMENT	Z	1913	Load cell, six axis neck	R. A. Denton	1716A	Nm
10	LOWER NECK FORCE	X	108	Load cell, six axis neck	FTSS	IF-255	N
11	LOWER NECK FORCE	Y	108	Load cell, six axis neck	FTSS	IF-255	N
12	LOWER NECK FORCE	Z	108	Load cell, six axis neck	FTSS	IF-255	N
13	LOWER NECK MOMENT	X	108	Load cell, six axis neck	FTSS	IF-255	Nm
14	LOWER NECK MOMENT	Y	108	Load cell, six axis neck	FTSS	IF-255	Nm
15	LOWER NECK MOMENT	Z	108	Load cell, six axis neck	FTSS	IF-255	Nm