

REPORT NUMBER TR-P28059-03-NC

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

**NISSAN MOTOR CO., LTD.
2008 NISSAN ARMADA SE
5-DOOR MPV**

NHTSA NUMBER: M85205TWG2

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



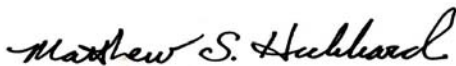
JULY 9, 2008

FINAL REPORT

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Date: 07/09/08



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Date: 07/09/08

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Manager, New Car Assessment Program

Date of Acceptance

COTR, NCAP Frontal Impact Program

Date of Acceptance

Technical Report Documentation Page

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16. Abstract A static side airbag deployment was conducted on a 2008 Nissan Armada SE 5-Door MPV at KARCO Engineering, LLC on 7/09/2008. This test was conducted to obtain data indicant of TWG Side Airbag Out-of-Position Injury criteria.			
Measurement Description	Units	Threshold	SID IIs 5th percentile female
Head Injury Criteria (HIC ₁₅)		700	3.0
17. Key Words TWG Occupant Out-of-Position Test Section 3.3.5.3 New Car Assessment Program (NCAP) 2008 Nissan Armada SE 5-Door MPV NHTSA NO. M85205TWG2		18. Distribution Statement Copies of this report available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 1200 New Jersey Ave SE, Room W43-410 Washington, D.C. 20590	
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SECTION 1

PURPOSE AND SUMMARY OF TEST M85205TWG2

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 the National Highway Traffic Safety Administration (NHTSA) 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 2008 Nissan Armada SE 5-Door MPV with an out-of-position SID IIs 5th percentile adult female dummy were evaluated. The test was performed at Karco Engineering, LLC on July 9, 2008. Pre- and post-test photographs of the vehicle and dummy can be found in Appendix A.

Two high-speed digital cameras 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 (3.3.5.3) 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	3.0

Orientation of the SID IIs 5th percentile adult female dummy was in the inboard 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 3.3.5.3 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: 2008 Nissan Armada SE 5-Door MPV NHTSA No.: M85205TWG2
Test Program: TWG 3.3.5.3. Test Date: 07/09/08

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: 2008 Nissan Armada SE 5-Door MPV NHTSA No.: M85205TWG2

Test Program: TWG 3.3.5.3. Test Date: 07/09/08

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	2
Total	2

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: 2008 Nissan Armada SE 5-Door MPV NHTSA No.: M85205TWG2
 Test Program: TWG 3.3.5.3. Test Date: 07/09/08

TEST VEHICLE INFORMATION

Make	Nissan
Model	Armada SE
Body Style	5-Door MPV
NHTSA No.	M85205TWG2
VIN	5N1AA08C88N605085
Color	Charcoal
Delivery Date	September 12, 2008
Odometer Reading (mile)	71
Dealer	Valley High Nissan
Transmission	Automatic
Final Drive	4WD
Type/Number Cylinders	V8
Engine Displacement (L)	5.6
Engine Placement	Longitudinal

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	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Nissan Motor Co., Ltd.	GVWR (kg)	3288
Date of Manufacture	May-07	GAWR Front (kg)	1677
		GAWR Rear (kg)	1950

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	308	308
Cold Pressure (kPa)	240	240
Recommend Tire Size	P275/70R18	P275/70R18
Tire Size on Vehicle	P275/70R18	P275/70R18
Tire Manufacturer	Continental	Continental

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	Bench	
Number of Occupants	2	3	3	8
Capacity Wt. (VCW) (kg)				650

* Vehicle had undergone New Car Assessment Program Frontal Impact Testing on September 25, 2007

DATA SHEET NO. 3

TEST VEHICLE INFORMATION

Test Vehicle: 2008 Nissan Armada SE 5-Door MPV NHTSA No.: M85205TWG2
Test Program: TWG 3.3.5.3. Test Date: 07/09/08

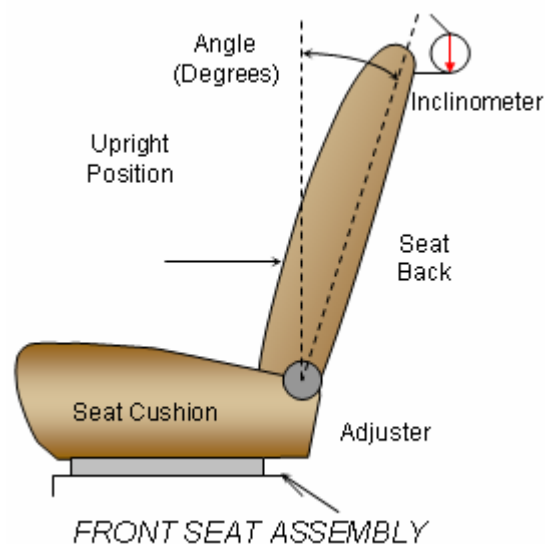
NOMINAL DESIGN RIDING POSITION

The passenger seat back is positioned to section 3.3.5.3. 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	4

Seat upright is 0 degrees. Measurement is taken off of head rest support.



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	21 detents	10th detent

DATA SHEET NO. 4

DUMMY POSITIONING INFORMATION

Test Vehicle: 2008 Nissan Armada SE 5-Door MPV NHTSA No.: M85205TWG2
 Test Program: TWG 3.3.5.3. Test Date: 07/09/08

TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	SID IIs 5th percentile female	
		Length (mm)	Angle (°)
SA	Seat Back Angle		4
AMW	Side Airbag Module Width	35	
ABW	Side Airbag Width	420	
AML	Side Airbag Module Length	280	
ABL	Side Airbag Length	1570	
AN	Top of Airbag Module to Head/Neck Junction	295	
HD	Head CG to Door Panel/ Window	230	
HSC	Head to Seat Back Centerline	210	
HB	Head to B-Pillar (first contact)	265	
HZ	Head to Roof (Z)	170	
HHD	Head to Header	438	
ND	Nose to Dash	673	
NS	Nose to Seat Back	240	
NR	Nose to Header	533	
CD	Chest to Dash	593	
CS	Chest to Seat Back	230	
RACL	Right Arm to Seat Back Centerline	N/A	
LACL	Left Arm to Seat Back Centerline	158	
RA	Right Arm to Door Panel	N/A	
LA	Left Arm to Door Panel	205	
KK	Knee to Knee	125	
TT	Toe to Toe	92	
KSCR	Right Knee to Seat Cushion Centerline	42	
KSCL	Left Knee to Seat Cushion Centerline	44	
TSCR	Right Toe to Seat Cushion Centerline	650	
TSCL	Left Toe to Seat Cushion Centerline	645	

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

Test Vehicle: 2008 Nissan Armada SE 5-Door MPV

NHTSA No.: M85205TWG2

Test Program: TWG 3.3.5.2

Test Date: 6/20/08

HEAD PEAK ACCELERATIONS

Location	Axis	Units	Pass. SID-IIS			
			Max	Time	Min	Time
Head CG	X	G's	27.5	9.7	-3.3	17.7
Head CG	Y	G's	15.3	10.0	-2.5	9.5
Head CG	Z	G's	9.1	9.4	-2.6	16.6
Head CG Resultant	N/A	G's	27.6	9.7		

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Pass. SID-IIS			
			Max	Time	Min	Time
Neck Force	X	Newtons	6.5	10.7	-100.2	19.0
Neck Force	Y	Newtons	36.6	42.4	-11.5	9.4
Neck Force	Z	Newtons	81.8	18.9	-236.4	15.7
Neck Force Resultant	N/A	Newtons	250.1	15.7		
Neck Moment	X	Nm	2.3	19.8	-0.5	111.8
Neck Moment	Y	Nm	6.6	27.9	-3.8	19.0
Neck Moment	Z	Nm	1.0	103.2	-2.4	25.1
Neck Moment Resultant	N/A	Nm	7.2	27.9		

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Pass. SID-IIS			
			Max	Time	Min	Time
Neck Force	X	Newtons	18.2	15.4	-38.3	20.5
Neck Force	Y	Newtons	12.4	45.6	-7.4	11.3
Neck Force	Z	Newtons	34.1	12.3	-138.6	15.8
Neck Force Resultant	N/A	Newtons	138.7	15.8		
Neck Moment	X	Nm	4.5	45.8	-0.7	11.3
Neck Moment	Y	Nm	16.9	16.8	-2.2	12.3
Neck Moment	Z	Nm	1.0	96.0	-2.9	16.9
Neck Moment Resultant	N/A	Nm	17.3	16.8		

DATA SHEET NO. 5...(CONTINUED)Test Vehicle: 2008 Nissan Armada SE 5-Door MPVNHTSA No.: M85205TWG2Test Program: TWG 3.3.5.2Test Date: 6/20/08**HEAD INJURY CRITERIA (HIC 15)**

Location	Pass. SID-IIS			
	HIC15	T ¹	T ²	Avg G
Head CG	3.0	9.2	16.8	10.8

UPPER NECK NIJ VALUES

Location	Pass. SID-IIS			
	Ntf	Nte	Ncf	Nce
Upper Neck	0.03	0.05	0.07	0.04

DATA SHEET NO. 6**CAMERA LOCATIONS**Test Vehicle: 2008 Nissan Armada SE 5-Door MPV NHTSA No.: M85205TWG2Test Program: TWG 3.3.5.3. Test Date: 07/09/08

No.	Camera View	Location (mm)			Angle (Deg.)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	High Speed Digital Side View	20	-3395	-1135	0.0	50	1000
2	High Speed Digital Front View	2271	-40	-1645	-8.0	50	1000

* Cameras aligned to the CG of dummy's head as reference.

APPENDIX A

PHOTOGRAPHS

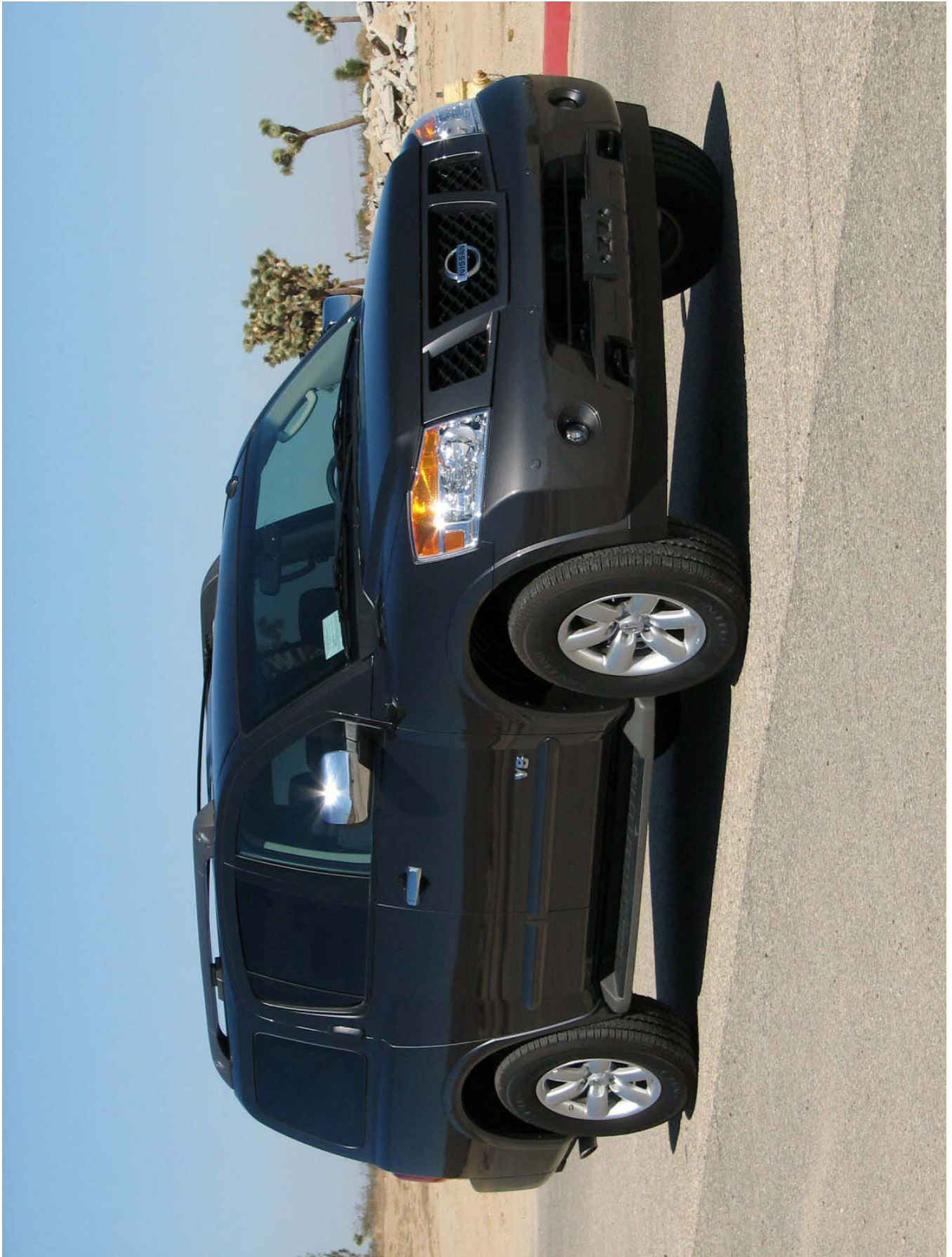


Figure A-1: Right Front $\frac{3}{4}$ View, As Received

MFD BY NISSAN MOTOR CO., LTD.

DATE 05/07

GVWR 7249 LB

GAWR 3699 LB

FR. P265/70R18 TIRES

WITH 18X8.0 RIMS AT 35 PSI

COLD SINGLE

GAWR RR. 4299 LB

WITH P265/70R18 TIRES

18X8.0 RIMS AT 35 PSI

COLD SINGLE

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

SEE OWNERS MANUAL FOR
ADDITIONAL INFORMATION.

5N1AA08C88N 605085

TYPE: MPV 668

MODEL: TPKWLT-K-EUA 0Z000

COLOR TRIM TRANS

K11 I G IRE5R05A

AXLE ENGINE

RD29 I VK56DE 5552CC



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



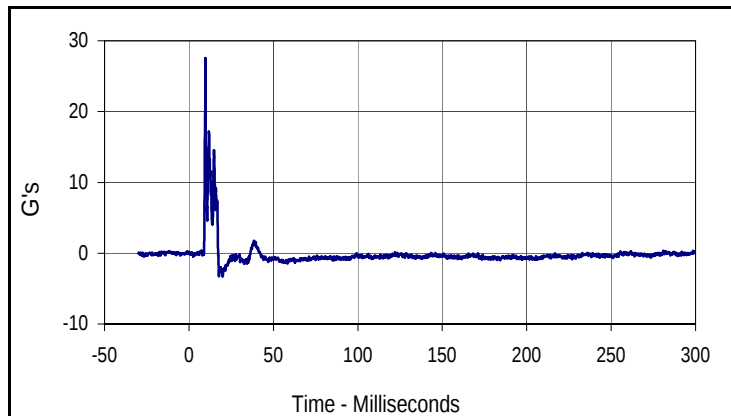
Figure A-10: Post-Test Airbags, Close-up View

APPENDIX B

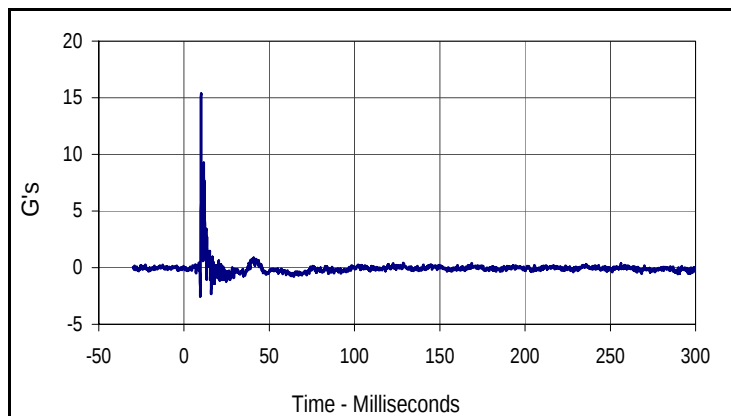
DATA PLOTS

Test Vehicle: 2008 Nissan Armada SE 5-Door MPV
 Test Program: TWG 3.3.5.2

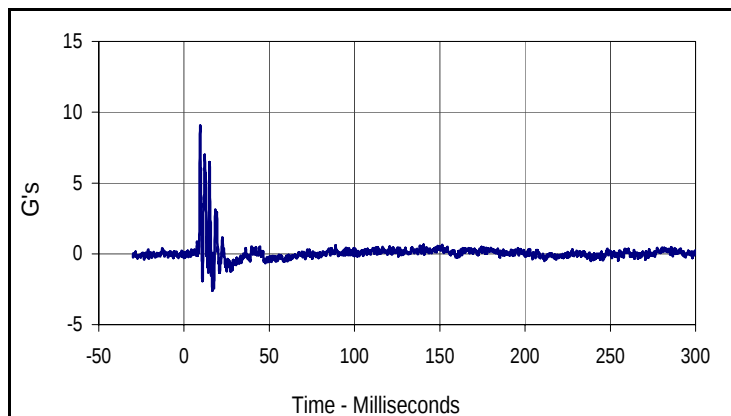
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 NHTSA No.: M85205TWG2



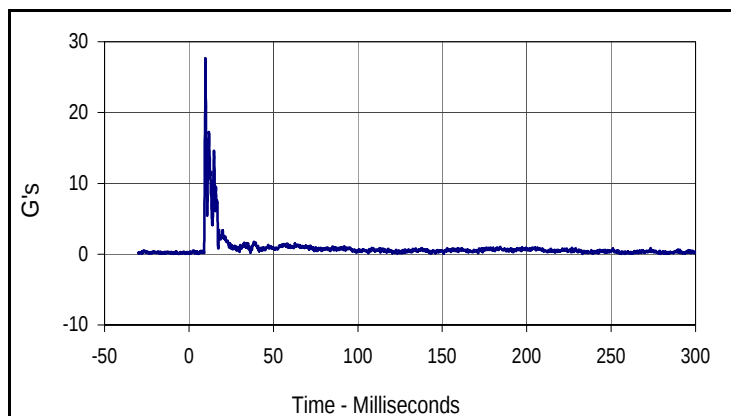
Curve Description			
Pass. SID-IIS Head X Primary			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
27.5	9.7	-3.3	17.7



Curve Description			
Pass. SID-IIS Head Y Primary			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
15.3	10.0	-2.5	9.5



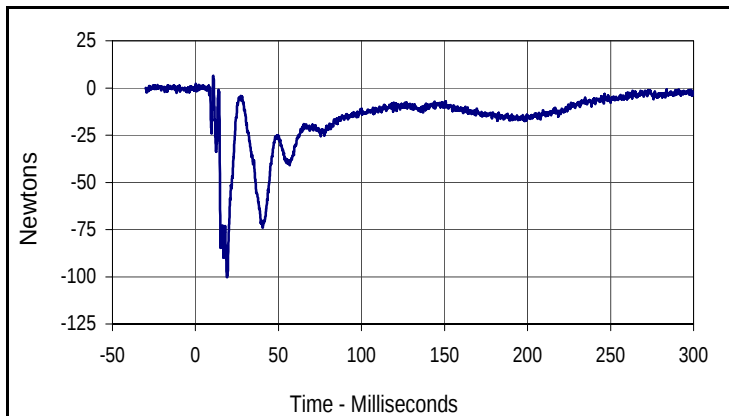
Curve Description			
Pass. SID-IIS Head Z Redundant			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
9.1	9.4	-2.6	16.6



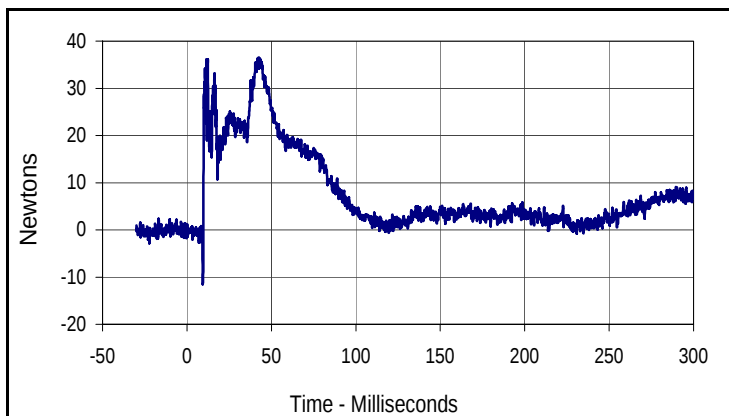
Curve Description			
Pass. SID-IIS Head Primary Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
27.6	9.7	0.0	257.9

Test Vehicle: 2008 Nissan Armada SE 5-Door MPV
 Test Program: TWG 3.3.5.2

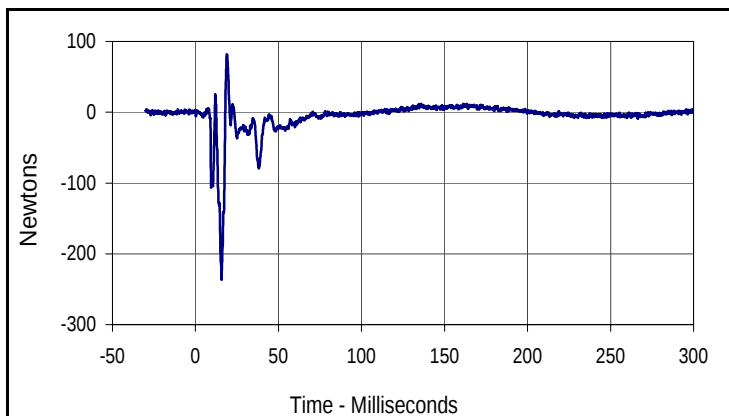
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 NHTSA No.: M85205TWG2



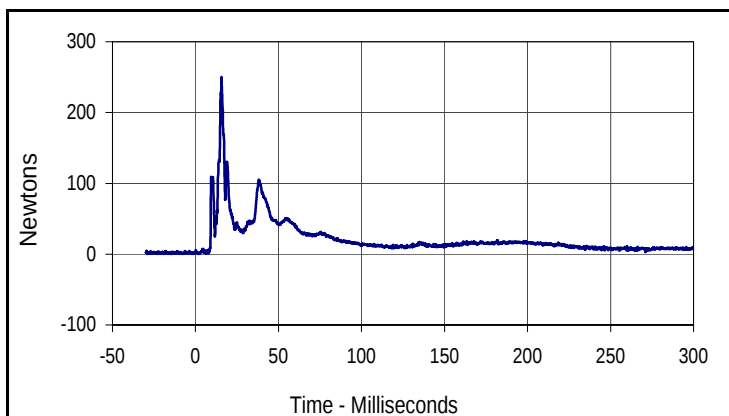
Curve Description			
Pass. SID-IIS Upper Neck Force X			
CURNO	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
6.5	10.7	-100.2	19.0



Curve Description			
Pass. SID-IIS Upper Neck Force Y			
CURNO	Type	SAE Class	Units
005	FIL	1000	Newtons
Max	Time	Min	Time
36.6	42.4	-11.5	9.4



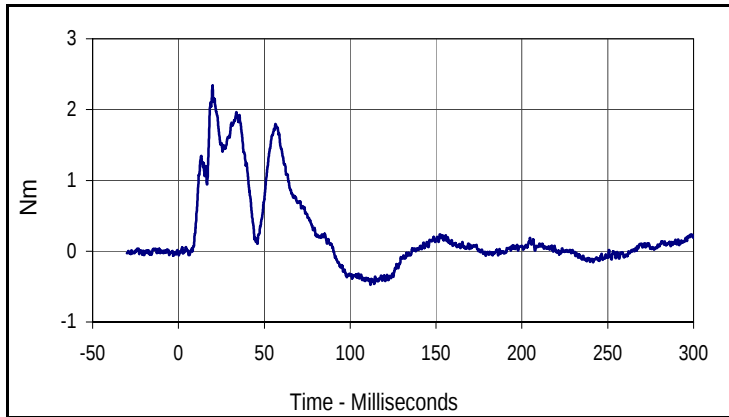
Curve Description			
Pass. SID-IIS Upper Neck Force Z			
CURNO	Type	SAE Class	Units
006	FIL	1000	Newtons
Max	Time	Min	Time
81.8	18.9	-236.4	15.7



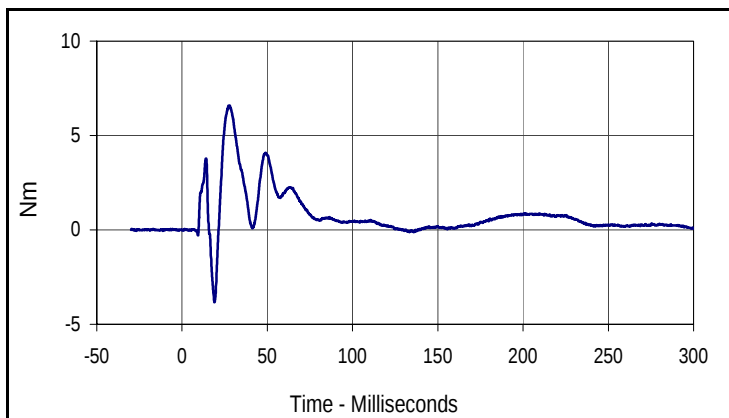
Curve Description			
Pass. SID-IIS Upper Neck Force Resultant			
CURNO	Type	SAE Class	Units
004	RES	1000	Newtons
Max	Time	Min	Time
250.1	15.7	0.3	1.4

Test Vehicle: 2008 Nissan Armada SE 5-Door MPV
 Test Program: TWG 3.3.5.2

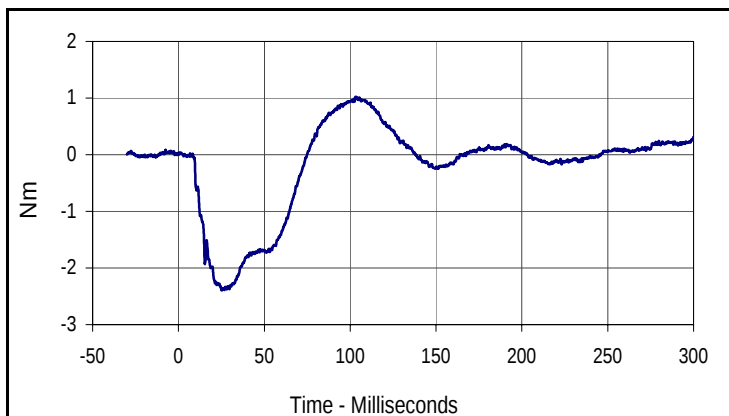
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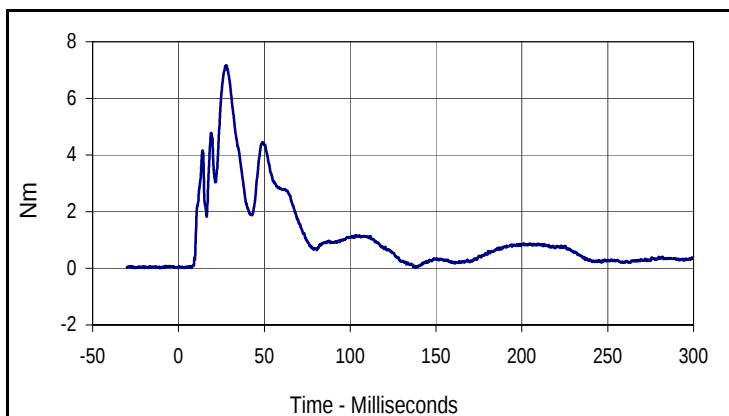
Curve Description			
Pass. SID-IIS Upper Neck Moment X			
CURNO	Type	SAE Class	Units
007	FIL	600	Nm
Max	Time	Min	Time
2.3	19.8	-0.5	111.8



Curve Description			
Pass. SID-IIS Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
008	FIL	600	Nm
Max	Time	Min	Time
6.6	27.9	-3.8	19.0



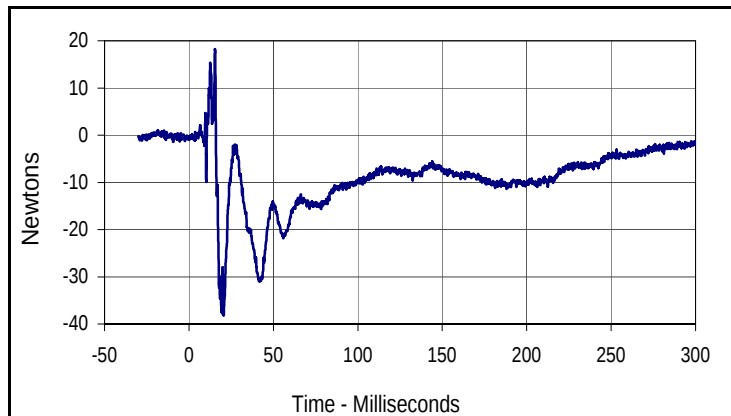
Curve Description			
Pass. SID-IIS Upper Neck Moment Z			
CURNO	Type	SAE Class	Units
009	FIL	600	Nm
Max	Time	Min	Time
1.0	103.2	-2.4	25.1



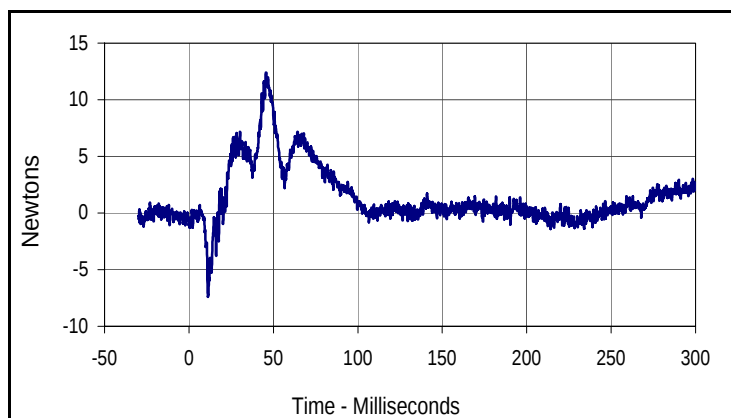
Curve Description			
Pass. SID-IIS Upper Neck Moment Resultant			
CURNO	Type	SAE Class	Units
007	RES	600	Nm
Max	Time	Min	Time
7.2	27.9	0.0	2.4

Test Vehicle: 2008 Nissan Armada SE 5-Door MPV
 Test Program: TWG 3.3.5.2

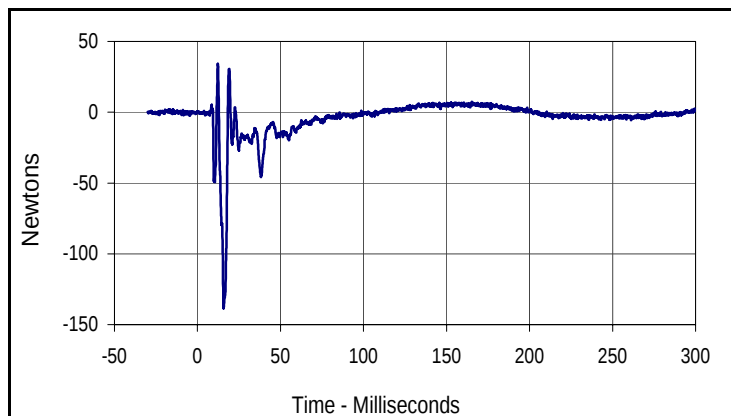
Test Date: 6/20/08
 NHTSA No.: M85205TWG2



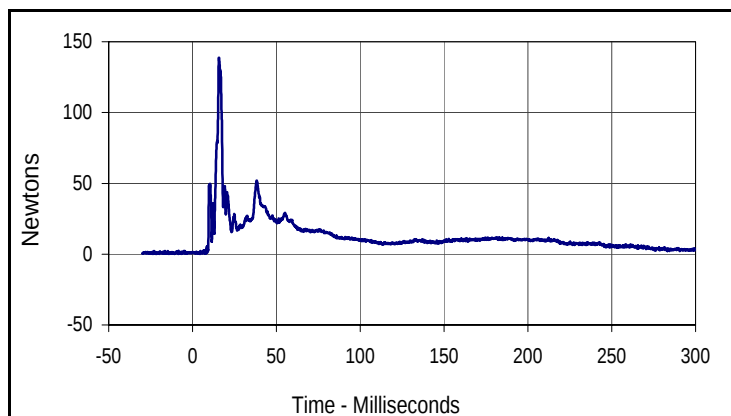
Curve Description			
Pass. SID-IIS Lower Neck Force X			
CURNO	Type	SAE Class	Units
010	FIL	1000	Newtons
Max	Time	Min	Time
18.2	15.4	-38.3	20.5



Curve Description			
Pass. SID-IIS Lower Neck Force Y			
CURNO	Type	SAE Class	Units
011	FIL	1000	Newtons
Max	Time	Min	Time
12.4	45.6	-7.4	11.3



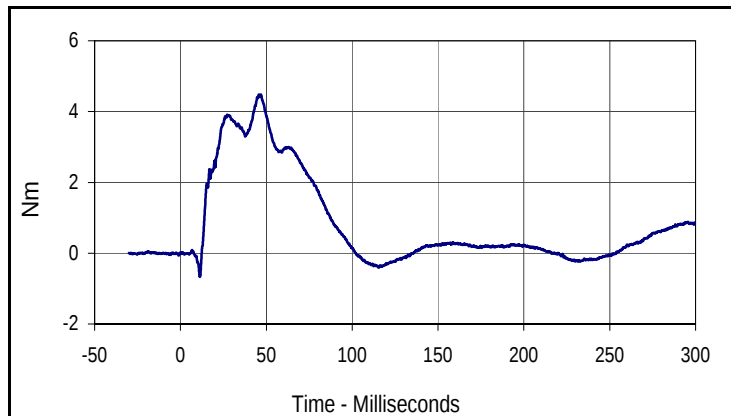
Curve Description			
Pass. SID-IIS Lower Neck Force Z			
CURNO	Type	SAE Class	Units
012	FIL	1000	Newtons
Max	Time	Min	Time
34.1	12.3	-138.6	15.8



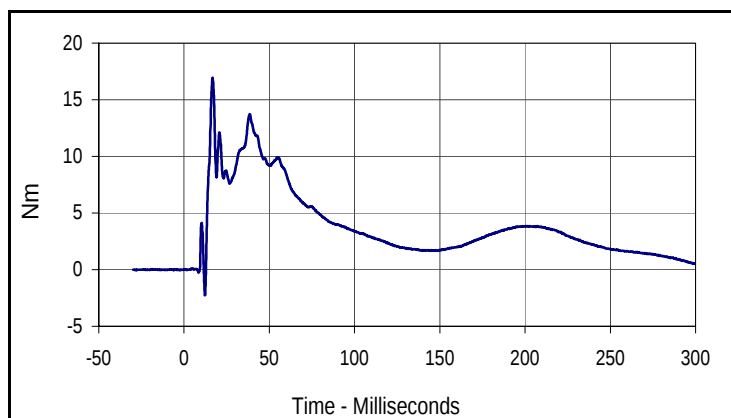
Curve Description			
Pass. SID-IIS Lower Neck Force Resultant			
CURNO	Type	SAE Class	Units
010	RES	1000	Newtons
Max	Time	Min	Time
138.7	15.8	0.2	4.4

Test Vehicle: 2008 Nissan Armada SE 5-Door MPV
 Test Program: TWG 3.3.5.2

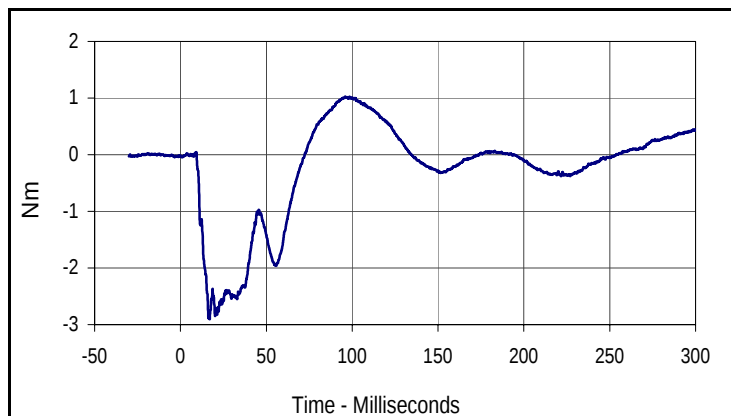
Test Date: 6/20/08
 NHTSA No.: M85205TWG2



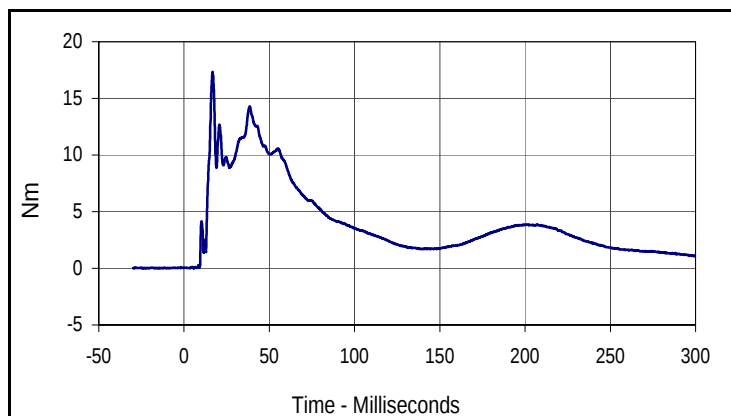
Curve Description			
Pass. SID-IIS Lower Neck Moment X			
CURNO	Type	SAE Class	Units
013	FIL	600	Nm
Max	Time	Min	Time
4.5	45.8	-0.7	11.3



Curve Description			
Pass. SID-IIS Lower Neck Moment Y			
CURNO	Type	SAE Class	Units
014	FIL	600	Nm
Max	Time	Min	Time
16.9	16.8	-2.2	12.3



Curve Description			
Pass. SID-IIS Lower Neck Moment Z			
CURNO	Type	SAE Class	Units
015	FIL	600	Nm
Max	Time	Min	Time
1.0	96.0	-2.9	16.9



Curve Description			
Pass. SID-IIS Lower Neck Moment Resultant			
CURNO	Type	SAE Class	Units
013	RES	600	Nm
Max	Time	Min	Time
17.3	16.8	0.0	5.6

APPENDIX C

INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

TWG 3.3.5.2
Instrumentation Data Channel Assignments
A.T.D. Serial Number 294
6/20/08
2008 Nissan Armada SE 5-Door MPV

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	ENTRANS	7264-2000	G
4	UPPER NECK FORCE	X	186 FX	Load cell, six axis neck	R. A. Denton	IF-205	N
5	UPPER NECK FORCE	Y	186 FY	Load cell, six axis neck	R. A. Denton	IF-205	N
6	UPPER NECK FORCE	Z	186 FZ	Load cell, six axis neck	R. A. Denton	IF-205	N
7	UPPER NECK MOMENT	X	186 MX	Load cell, six axis neck	R. A. Denton	IF-205	Nm
8	UPPER NECK MOMENT	Y	186 MY	Load cell, six axis neck	R. A. Denton	IF-205	Nm
9	UPPER NECK MOMENT	Z	186 MZ	Load cell, six axis neck	R. A. Denton	IF-205	Nm
10	LOWER NECK FORCE	X	294 FX	Load cell, six axis neck	R. A. Denton	2430	N
11	LOWER NECK FORCE	Y	294 FY	Load cell, six axis neck	R. A. Denton	2430	N
12	LOWER NECK FORCE	Z	294 FZ	Load cell, six axis neck	R. A. Denton	2430	N
13	LOWER NECK MOMENT	X	294 MX	Load cell, six axis neck	R. A. Denton	2430	Nm
14	LOWER NECK MOMENT	Y	294 MY	Load cell, six axis neck	R. A. Denton	2430	Nm
15	LOWER NECK MOMENT	Z	294 MZ	Load cell, six axis neck	R. A. Denton	2430	Nm