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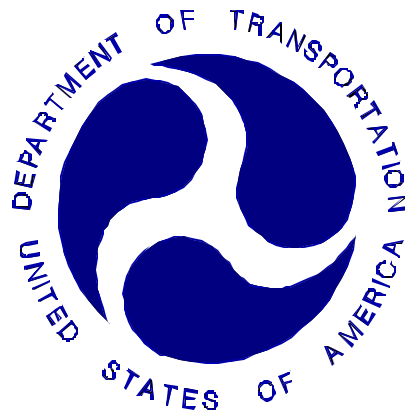
NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE AIRBAG OUT-OF-POSITION INJURY TESTING

2004 CHRYSLER CROSSFIRE

NHTSA NUMBER: C40305TWG2

GENERAL DYNAMICS TEST NUMBER: 8642-TWG-07

GENERAL DYNAMICS
ADVANCED INFORMATION ENGINEERING SERVICES
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May 25, 2004

FINAL REPORT

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
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Washington, DC 20590

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16. Abstract This side impact out-of-position test was performed in conjunction with a New Car Assessment Program (NCAP). This test was conducted at the General Dynamics Advanced Information Engineering Services Crash Test Facility in Buffalo, New York on May 25, 2004.							
Injury Summary							
HIC15	HIC36	Clip (g's)	Chest Displacement (mm)	NIJ NTF	NIJ NTE	NIJ NCF	NIJ NCE
8.3	8.3	19.1	-22.9	0.02	1.01	0.01	0.13
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SECTION 1

PURPOSE AND SUMMARY OF TEST C40305TWG2

1.1 PURPOSE

The purpose of this test was to obtain data in a static out-of-position side impact. These data constitute part of the general consumer information collected by the New Car Assessment Program (NCAP) sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract No. DTNH22-01-D-32005.

1.2 SUMMARY

The effects of a seat mounted side airbag deployment in a 2004 Chrysler Crossfire with an out-of-position three-year-old child were evaluated. The test was performed by General Dynamics Advanced Information Engineering Services on May 25, 2004. Pre-and post-test photographs of the vehicle and dummy can be found in Appendix A.

One high-speed digital camera was used to document the side airbag deployment event. The camera was placed in line with the right-front seat centerline as to capture the deployment event. The recorded image rate is 1000 frames per second.

One part 572, Hybrid III three-year-old child anthropomorphic test device (ATD), was placed in the right front seat situated in the outboard facing position according to dummy placement instructions specified in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as prepared by the Side Airbag Out-of-Position Injury Technical Working Group (TWG).

The child dummy was instrumented with head, chest, and pelvic triaxial accelerometers. In addition, chest displacement and upper and lower six axial neck force and moment load cell sensors were utilized.

Twenty-three 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 Hybrid III three-year-old child dummy's visible contact points were as follows: The airbag to the chin and the sternum, and abdomen of the ATD.

The three-year-old child dummy was placed in the outboard facing position kneeling on the outboard portion of the seat cushion leaning against the seat and door trim panel. The right side window was raised and the seatback was initially set to the manufacturer's design position for a fiftieth percentile male dummy. The seat was placed in the lowest height position and the seat track was set in order to align the vertical centerline of the sternum with the vertical centerline of the airbag module. The dummy's arms and seatback angle were adjusted to stabilize the dummy so that its head remained in a neutral orientation with its sternum and airbag module's vertical centerlines aligned. The dummy was then leaned outboard so that its upper chest contacted the door trim panel. The dummy's knees were then adjusted outboard in order to align the upper ribs with the top of the airbag module while maintaining vertical centerline orientation, neutral head position and chest contact. This orientation complies with section 3.3.4.1 of the TWG Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as defined by Lund, et al and the Technical Working Group dated July 2003.

SECTION 2

DATA SHEET NO. 1

TEST SUMMARY

TEST CONFIGURATION INFORMATION:

	TEST DATA	DESCRIPTION
Seating Position:	P2	Right Front Seating Position
Test:	3.3.4.1*	Outboard facing Hybrid-III 3-year-old child dummy on booster block
Airbag:	Door	Door mounted side airbag
Booster Block	N/A	Booster block not required for this test configuration.
ATD Type/Serial No.:	P572P/044	Hybrid III three-year-old child dummy

*- Procedure as defined by Lund, et al and the Technical Working Group dated July 2003

<u>Number of Data Channels</u>	23	
<u>Number of Cameras:</u>	0	<u>Real Time</u>
	1	<u>High Speed Digital</u>
	0	<u>High Speed Film</u>

VISIBLE DUMMY CONTACT POINTS

Head Contact:	The chin was struck by the airbag during deployment
Upper Torso Contact:	The sternum and pectoral region..
Lower Torso Contact:	The lower rib and abdominal area.
Left Knee Contact:	None
Right Knee Contact:	None

DATA SHEET 2

VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style:	2004 Chrysler Crossfire Three-Door Hatchback		
Vehicle Body Color:	White	VIN:	1C3AN69L34X000260‡
Vehicle NHTSA No.:	C40305	Month & Year of Manufacture:	04/03
Engine Data:	6 Cylinders;	-	CID; 3.2 Liters; - cc
Engine Placement:	X Longitudinal;	or -	Lateral
Transmission:	6 Speed; X Manual;	- Automatic;	X Overdrive
Final Drive:	X Rear Wheel Drive;	- Front Wheel Drive;	Four Wheel Drive
Odometer Reading	85	km	
Supplemental Airbag Restraints:			
Front Occupant:	X Frontal;	- Knee;	X Side; - Curtain
Rear Occupant:	N/A Frontal;	N/A Knee;	N/A Side; N/A Curtain
Options: X A/C; X Power Steering; X Power Brakes; X Power Windows			

DATA FROM TIRE PLACARD

Recommended Tire Size: Front: P225/40R18 88W Rear: P255/35R19 92W

* Recommended Cold Tire Pressure: 220 kpa FRONT; 227 kpa REAR

DATA FROM TIRE SIDEWALL:

Size of Tires on Test Vehicle: Front: P225/40ZR18 92Y Rear: P255/35ZR19 96Y Manufacturer: Michelin

Tire Pressure with Maximum Capacity Vehicle Load: Front: 275 kPa; Rear: 275 kPa

Treadwear: 220 ; Traction: AA ; Temperature: A

VEHICLE CAPACITY DATA:

Number of Occupants:	2	Front;	-	Rear;	-	3rd Seat;	2	Total
Type of Front Seats:	X	Bucket;	-	Bench;	-	Split Bench;		
Type of Rear Seats:	N/A	Bucket;	N/A	Bench;	N/A	Split Bench;	N/A	Contoured
Type of Front Seat Back:	-	Fixed;	X	Adjustable with	X	Lever or	-	Knob
Type of Rear Seat Back:	N/A	Fixed;	N/A	Adjustable with	N/A	Lever or	N/A	Knob
Vehicle Max Capacity Loading =	188.0 kg (A)							
No. of Occupants x 68.04 kg. =	136.08 kg (B)							
Vehicle Cargo Capacity =	51.92 kg (A-B)							

TEST VEHICLE DELIVERED WEIGHT WITH MAXIMUM FLUIDS:

Left Front =	378.0 kg	Left Rear =	312.0 kg
Right Front =	373.0 kg	Right Rear =	325.0 kg
TOTAL FRONT =	751.0 kg	TOTAL REAR =	637.0 kg
% of Total Weight =	54.1 %	% of Total Weight =	45.9 %
TOTAL WEIGHT =	1388.0 kg		

* Tire pressure used in test.

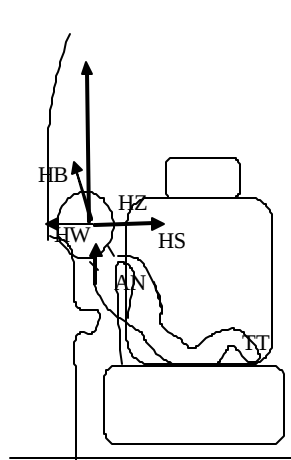
‡ This vehicle had previously been tested in an Indicant FMVSS 214 side impact on April 20, 2004.

DATA SHEET NO. 3

CHILD DUMMY POSITIONING IN VEHICLE

NHTSA No. C40305TWG2

Measurements for Door Mounted Airbags



X-Y View

HZ = Head CG to Roof
 HC = Head CG to C-Pillar
 HB = Head CG to B-Pillar
 HS = Head CG to Seat
 HW = Head CG to Window
 TT = Toe to Toe
 AN = Top of the Airbag Module to
 the Head/Neck Junction

Measurements for Position #2 (Right Front)	
	Dimension (mm)
HZ	190
HW	180
HC	765
HB	345
HS	160
TT	140
AN	43
Airbag Module Length	105
Airbag Module Width	160
Foam Block Depth ¹	-
Foam Block Width ¹	-
Foam Block Thickness ¹	-

¹ Foam block was not required for this test configuration

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES

NHTSA No. C40305TWG2

		MAXIMUM VALUE			
		Position #2			
DESCRIPTION	Unit	Maximum	Time (ms)	Minimum	Time (ms)
Head X	g	1.5	57.5	-16.7	10.6
Head Y	g	3.0	8.9	-8.5	10.2
Head Z	g	7.9	13.4	-14.5	9.2
Head Resultant	g	18.2	10.0	0.0	-43.3
Head Rear Z	g	29.1	9.2	-11.8	18.8
Upper Neck Fx	N	16.2	56.1	-450.3	14.3
Upper Neck Fy	N	10.5	60.2	-150.3	15.0
Upper Neck Fz	N	794.9	10.9	-13.0	188.5
Upper Neck F Resultant	N	842.3	10.9	0.0	-20.3
Upper Neck Mx	N-m	4.4	15.0	-0.8	19.9
Upper Neck My	N-m	0.8	117.6	-20.1	14.3
Upper Neck Mz	N-m	1.1	30.0	-2.3	60.0
Upper Neck M Resultant	N-m	20.5	14.3	0.0	-22.0
Lower Neck Fx	N	135.3	10.5	-199.1	18.1
Lower Neck Fy	N	184.4	11.4	-18.6	29.5
Lower Neck Fz	N	741.9	10.9	-20.0	186.6
Lower Neck F Resultant	N	765.2	11.0	0.0	1.7
Lower Neck Mx	N-m	1.7	11.5	-7.1	18.4
Lower Neck My	N-m	14.8	14.4	-3.7	58.4
Lower Neck Mz	N-m	8.8	9.6	-2.8	57.0
Lower Neck M Resultant	N-m	17.1	14.4	0.0	-38.6
Chest X	g	10.6	20.5	-20.4	11.6
Chest Y	g	1.2	22.2	-9.4	12.9
Chest Z	g	4.2	8.6	-12.5	10.6
Chest Resultant	g	23.1	11.0	0.0	-41.5
Chest Displacement	mm	0.0	-24.4	-22.9	13.6
Pelvic X	g	5.2	38.5	-11.3	19.1
Pelvic Y	g	1.7	53.1	-2.9	16.1
Pelvic Z	g	7.7	11.5	-7.5	13.7
Pelvic Resultant	g	13.3	19.1	0.0	-13.6

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

NHTSA No. C40305TWG2

	HEAD INJURY CRITERIA (HIC)							
	HIC15				HIC36			
	HIC	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂	HIC	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
	Position #2 – Right Front	8.3	8.7	22.0	13.1	8.3	8.7	22.0

	CLIP SUMMARY*			
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
	Position #2 – Right Front	19.1	9.6	12.6

* The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

Position 2 Neck Injury Summary (HIII 3 year old – Out of Position)

Nij V10	Nij	Time (ms)	Z Force (N)	X Force (N)	Y Moment (N-m)
Ntf	0.02	117.6	14.5	8.4	0.8
Nte	1.01	14.0	581.6	-449.5	-19.9
Ncf	0.01	145.2	-4.3	6.8	0.5
Nce	0.13	53.2	-0.1	6.4	-3.4

Peak Tension (CFC1000) 794.9 N

Peak Compression (CFC1000) -13.0 N

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	2120 N	Extension (mCVe)	27 N-m	Tension	1430 N
Compression (CVc)	2120 N	Flexion (mCVf)	68 N-m	Compression	-1380 N

Condyle Offset 0.0

APPENDIX A

PHOTOGRAPHS

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Figure A-1: Pre-Test Vehicle Left Side View



Figure A-2: Post-Test Vehicle Left Side View



Figure A-3: Vehicle Certification Placard



Figure A-4: Vehicle Tire Placard



Figure A-5: Pre-Test Frontal View of Dummy



Figure A-6: Post-Test Frontal View of Dummy



Figure A-7: Pre-Test Left Side View of Dummy



Figure A-8: Post-Test Left Side View of Dummy



Figure A-9: Pre-Test Rear View of Dummy



Figure A-9: Post-Test Rear View of Dummy

APPENDIX B

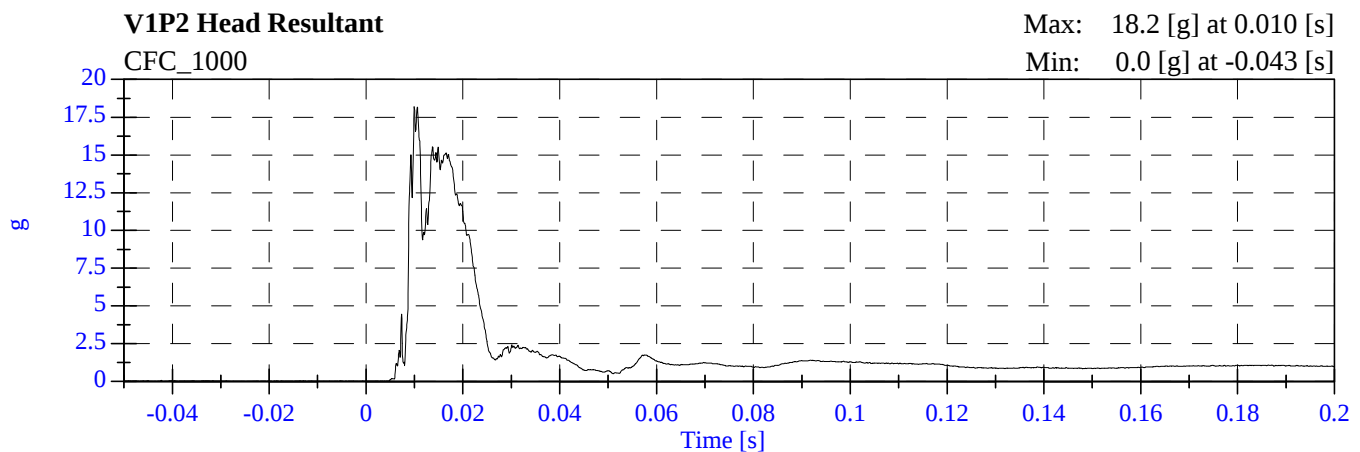
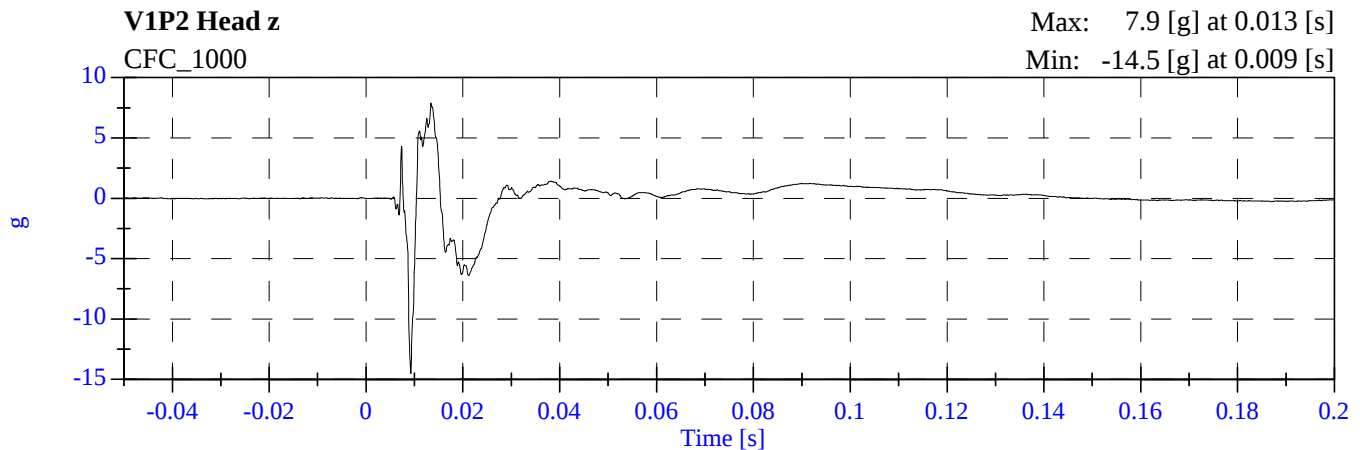
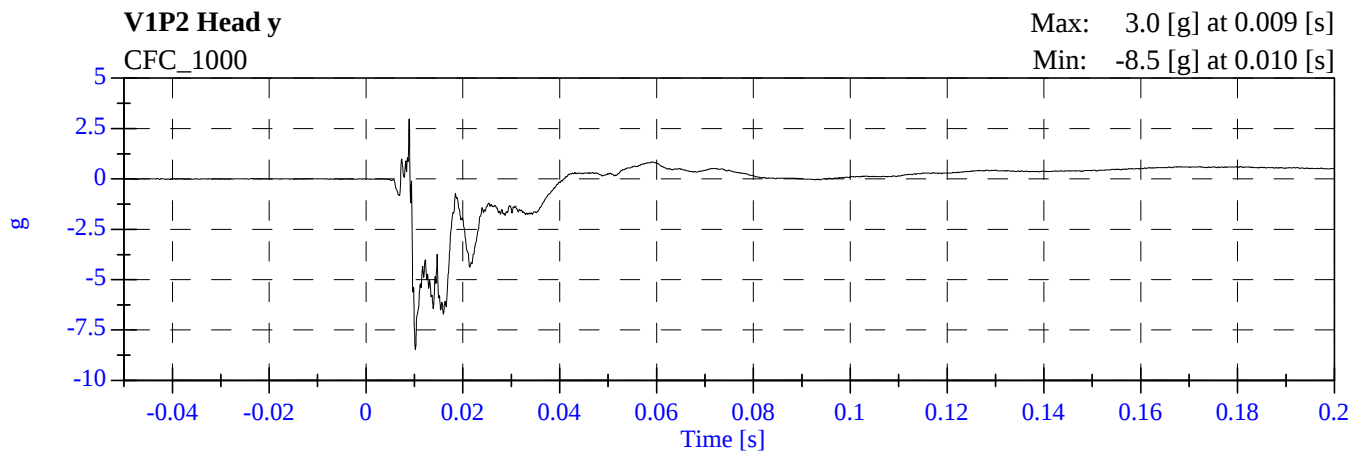
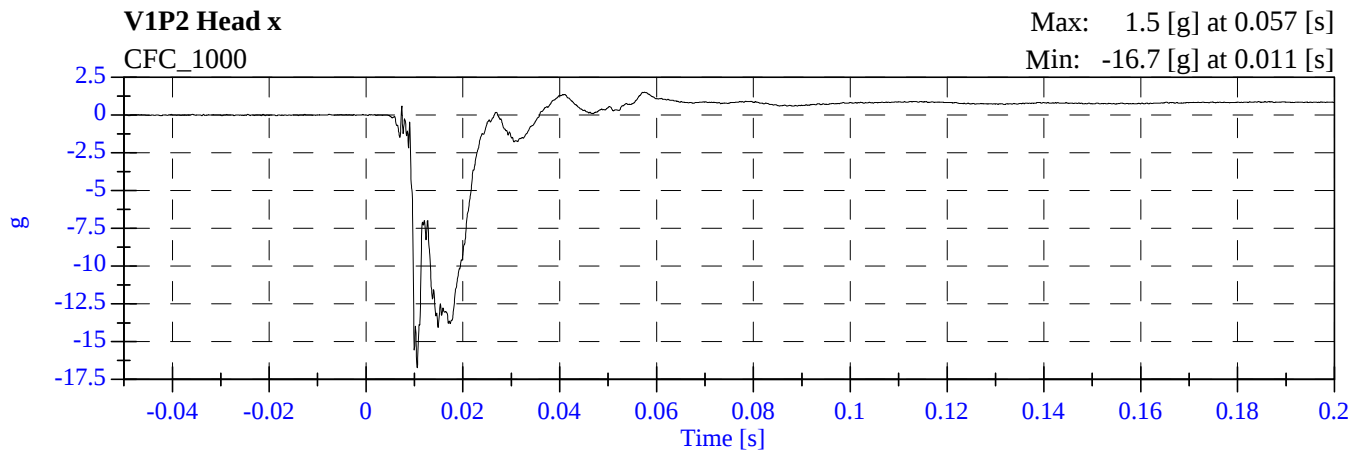
CHILD DUMMY RESPONSE DATA TRACES

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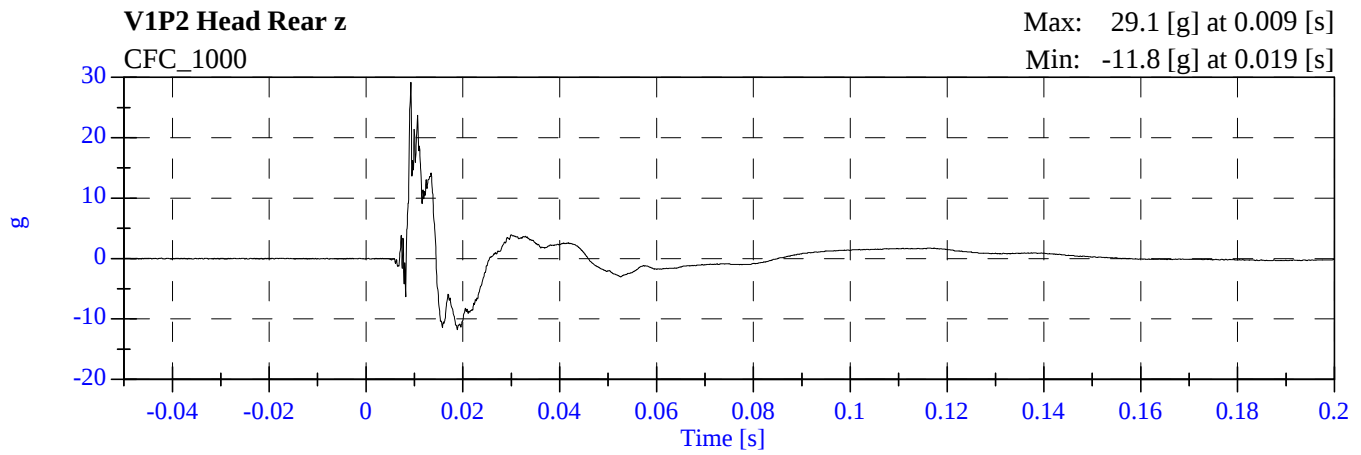
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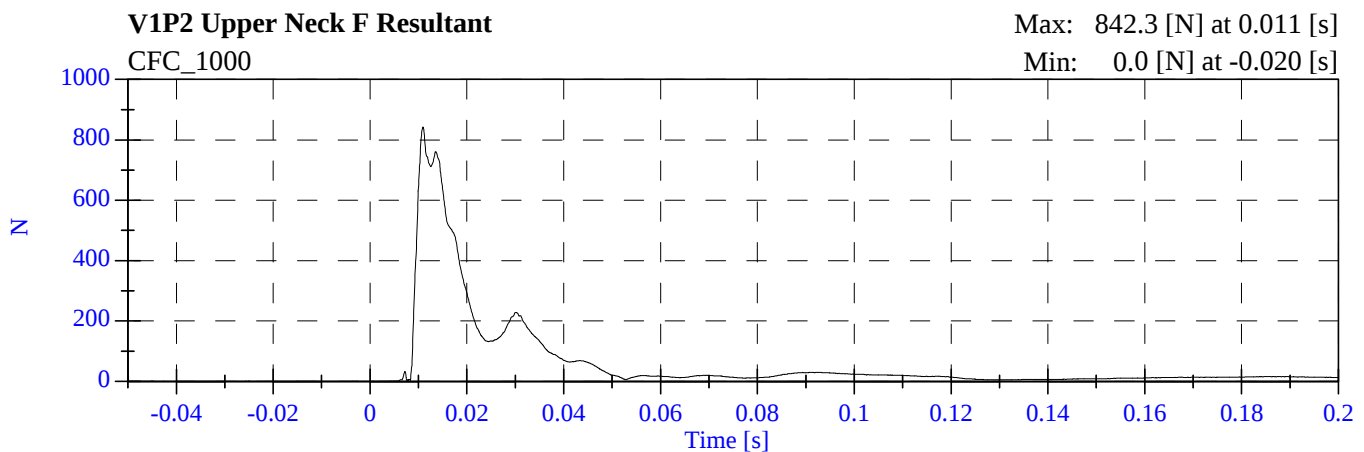
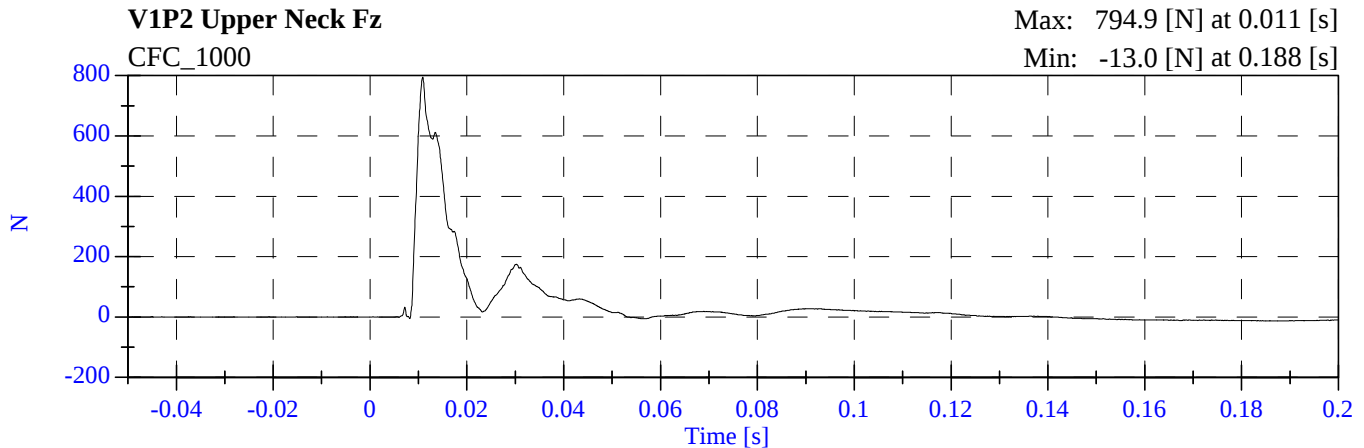
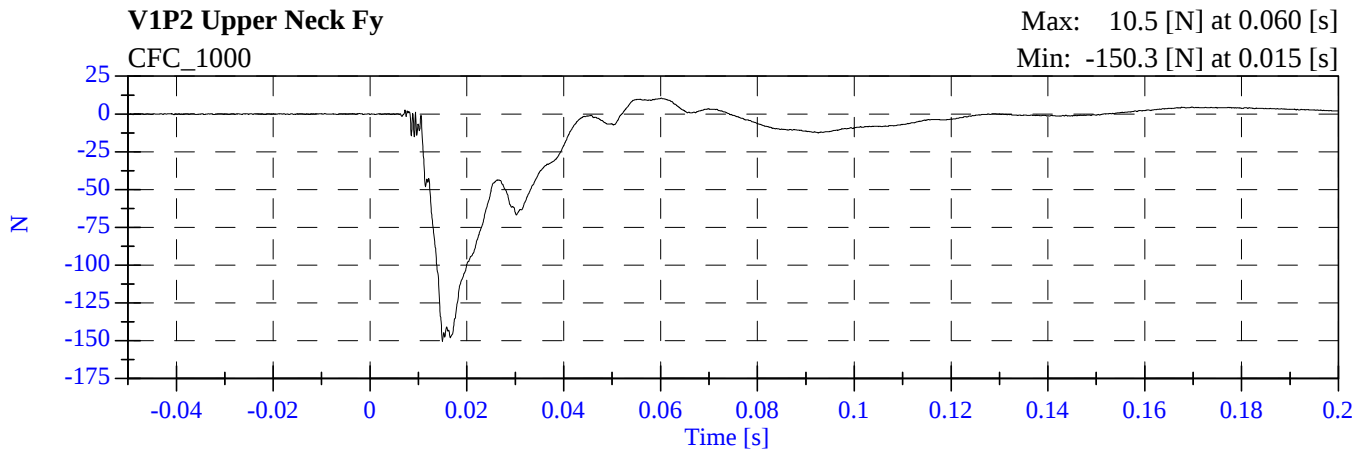
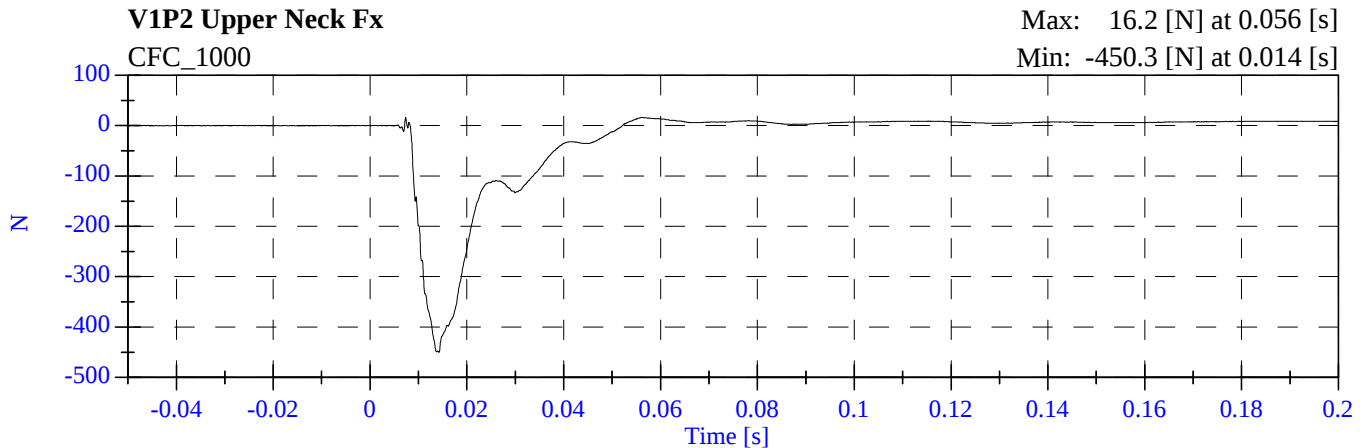


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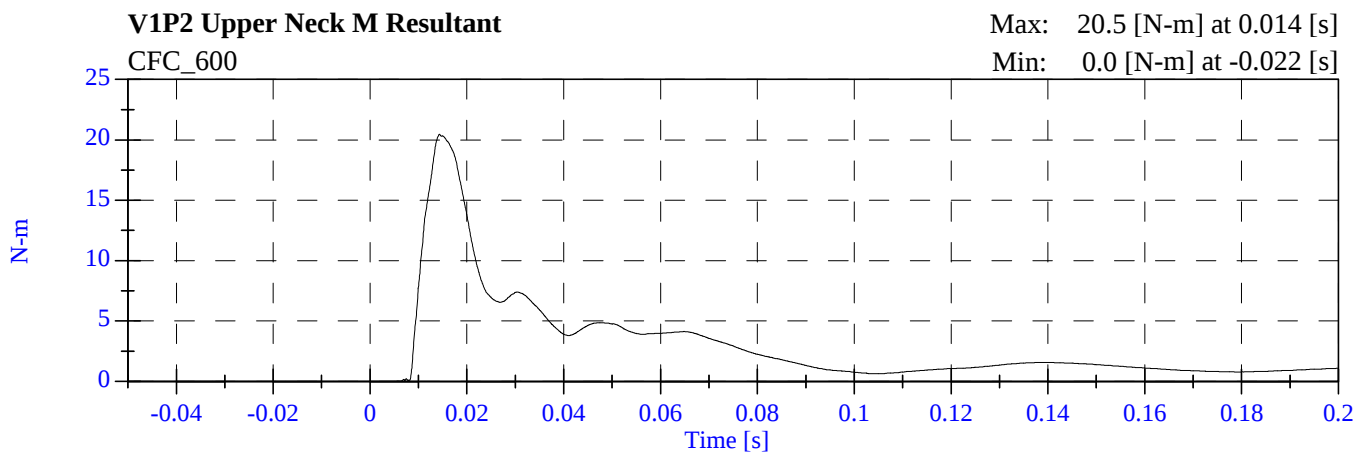
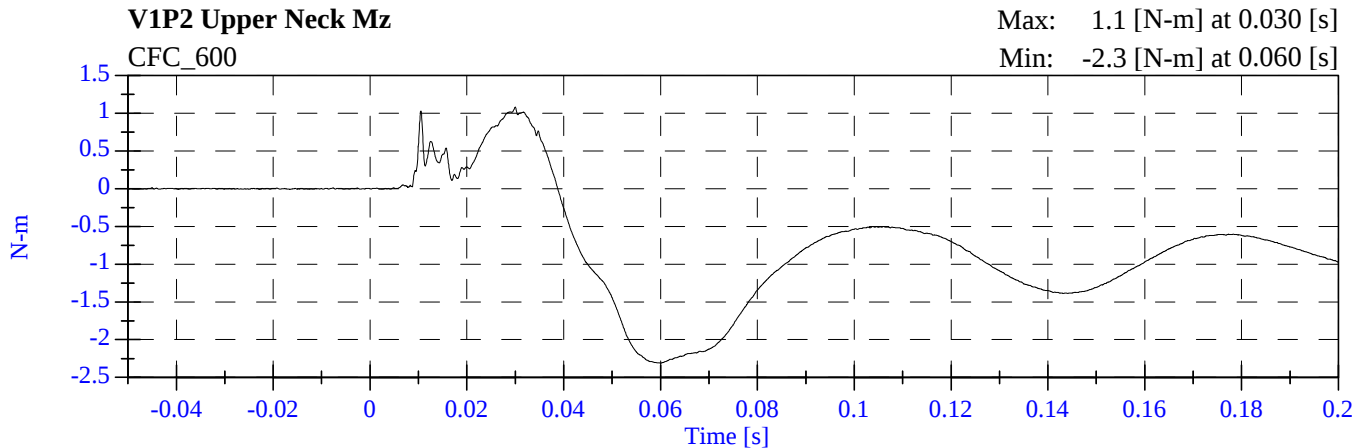
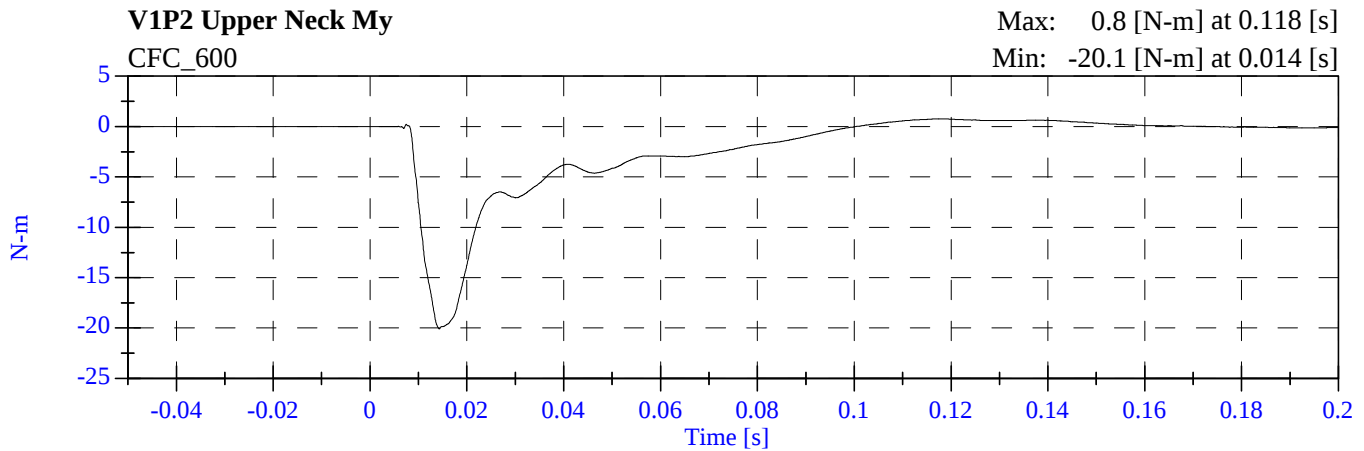
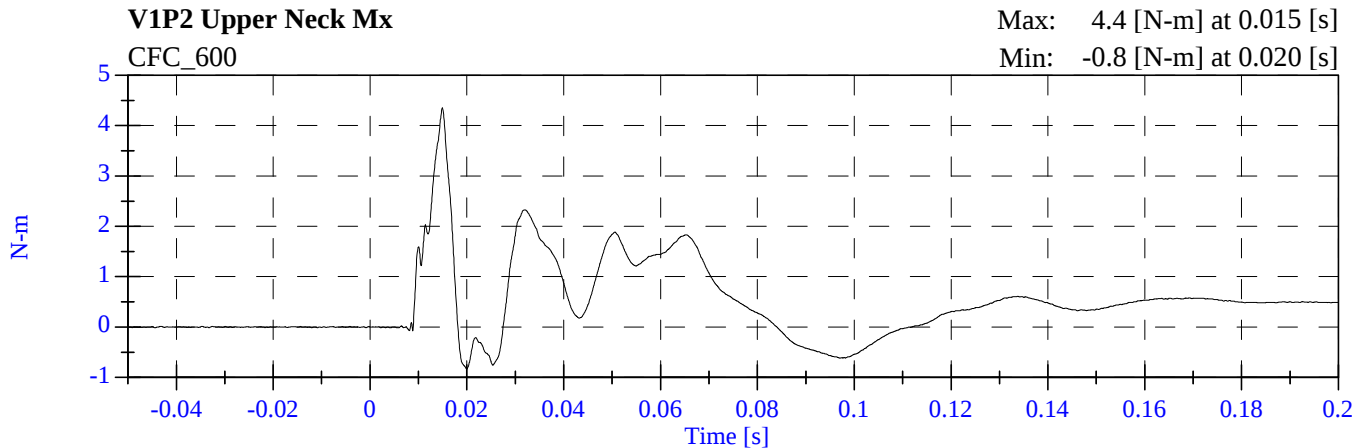
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C40305TWG2 - May 25, 2004



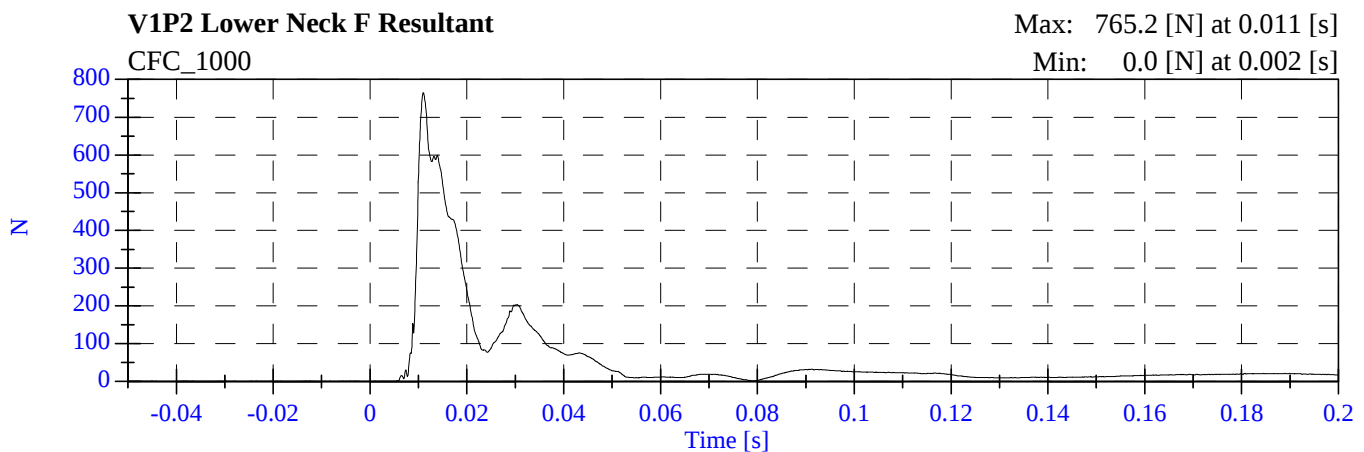
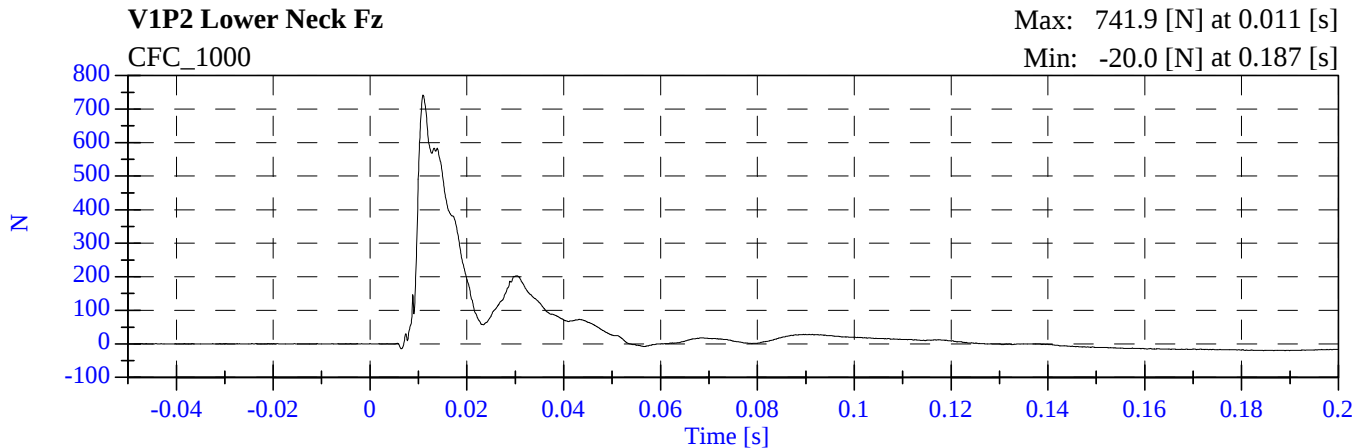
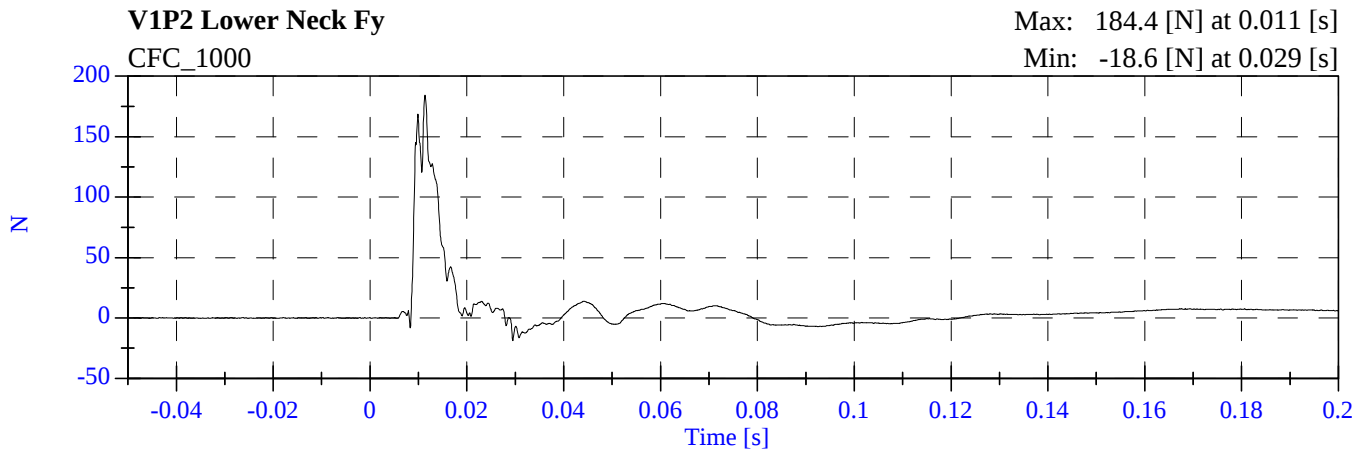
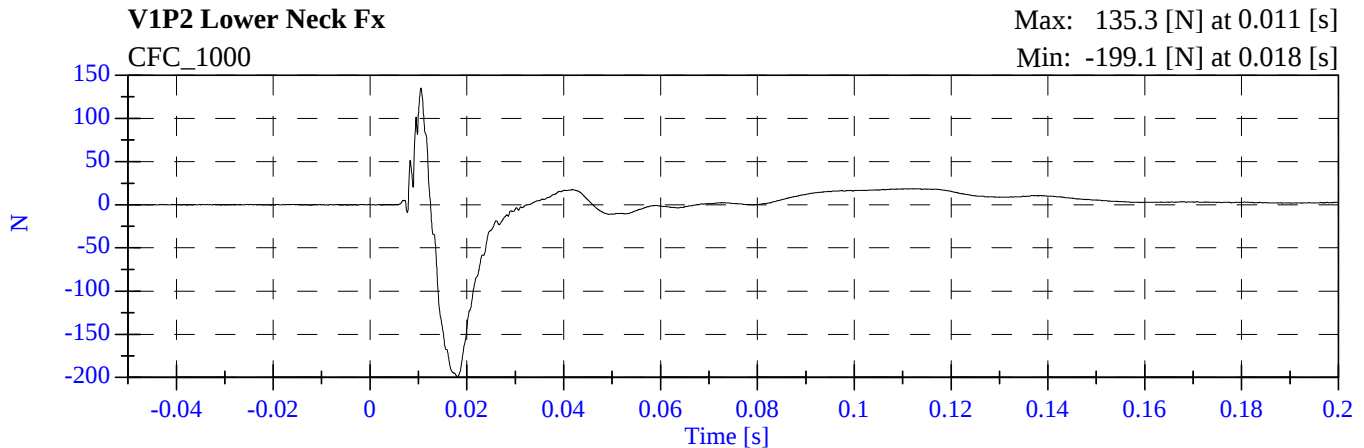
TWG07 - 2004 Chrysler Crossfire

C40305TWG2 - May 25, 2004



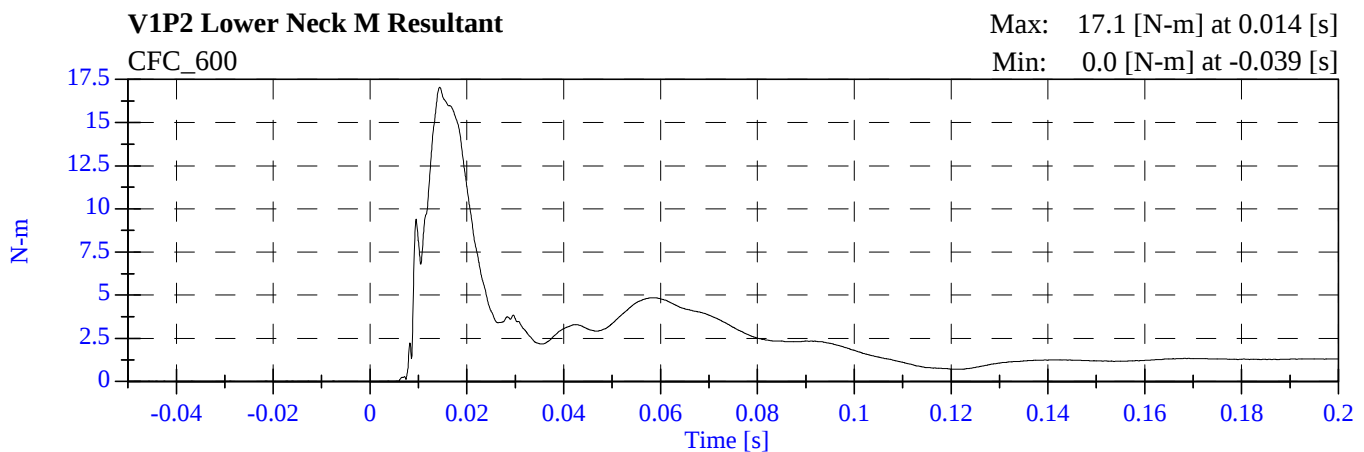
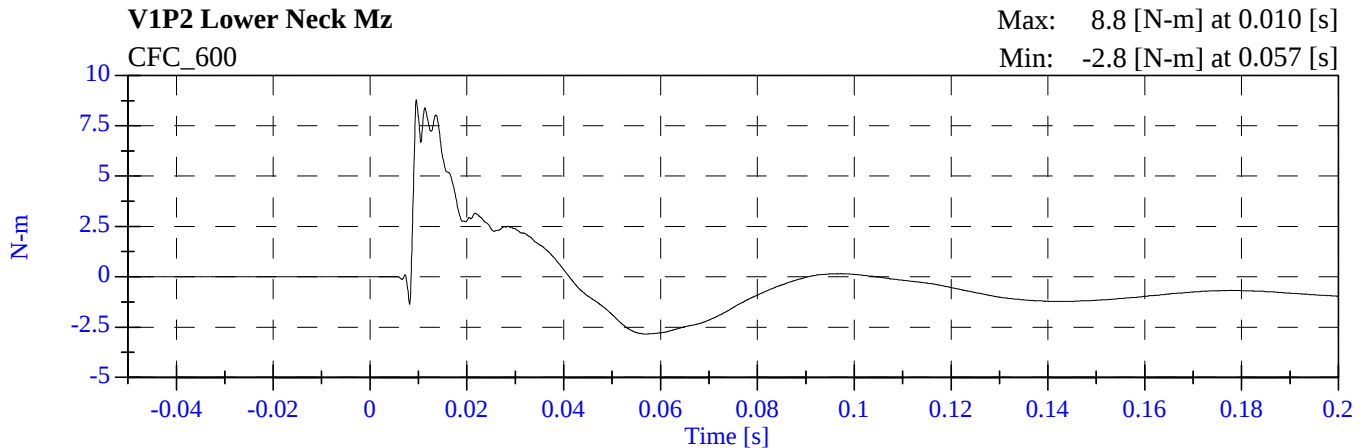
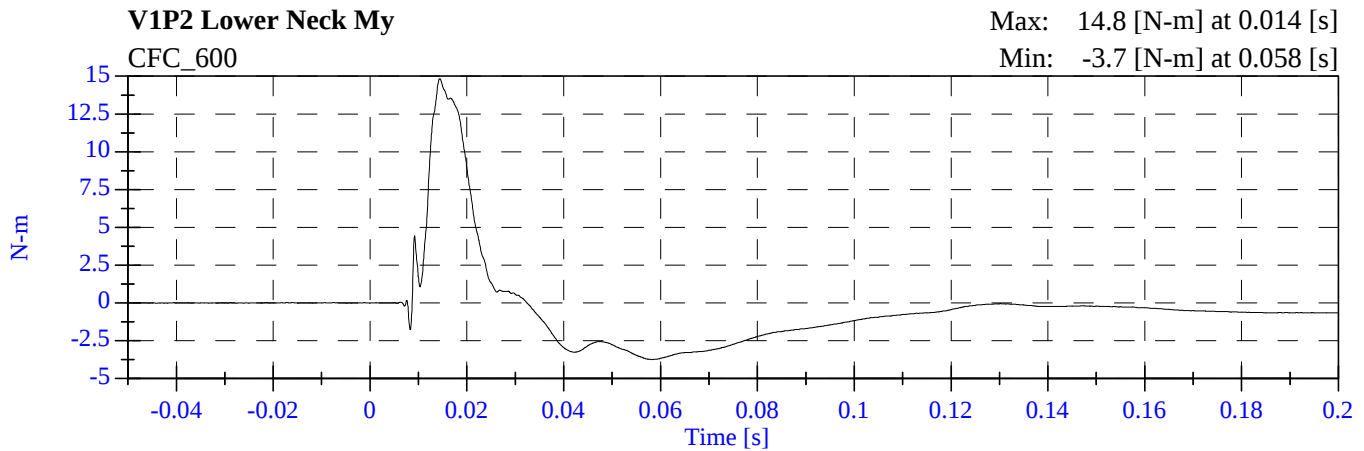
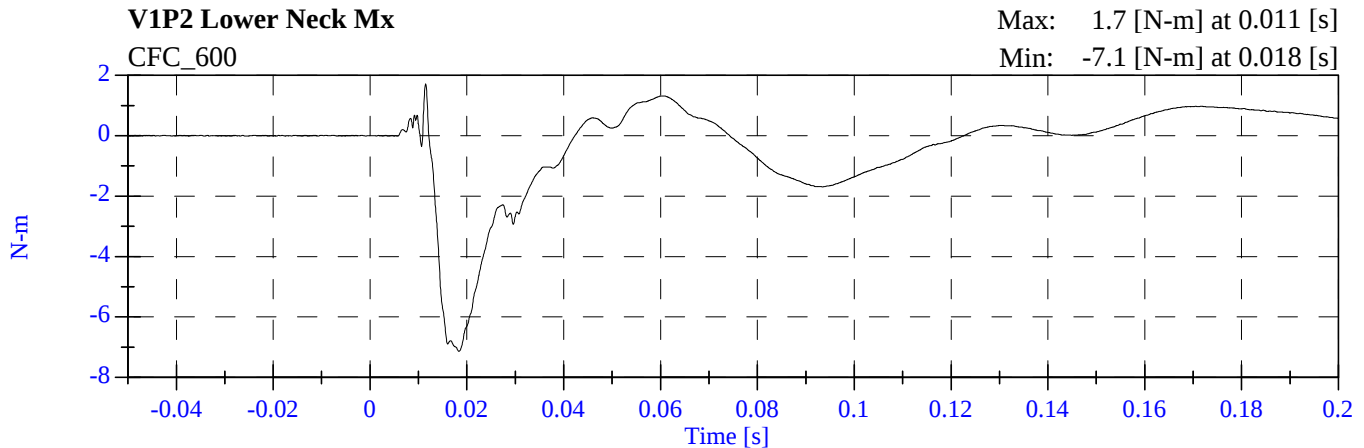
TWG07 - 2004 Chrysler Crossfire

C40305TWG2 - May 25, 2004



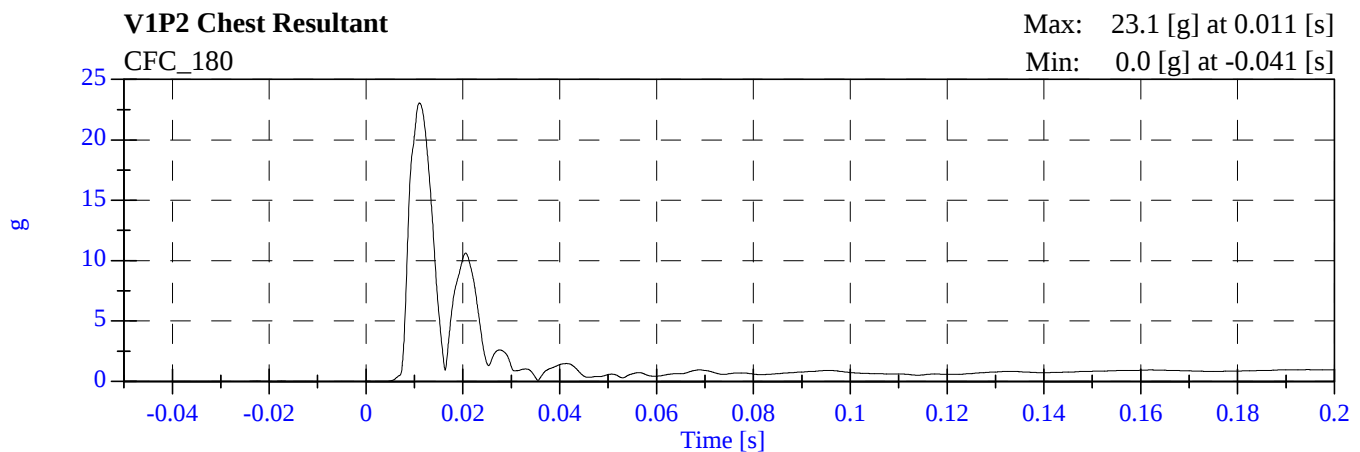
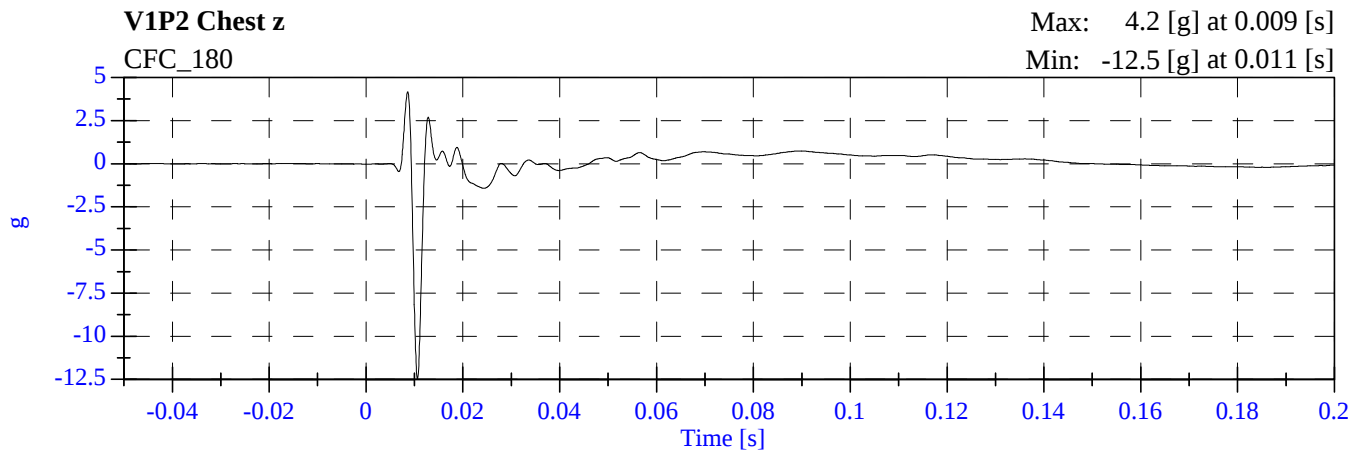
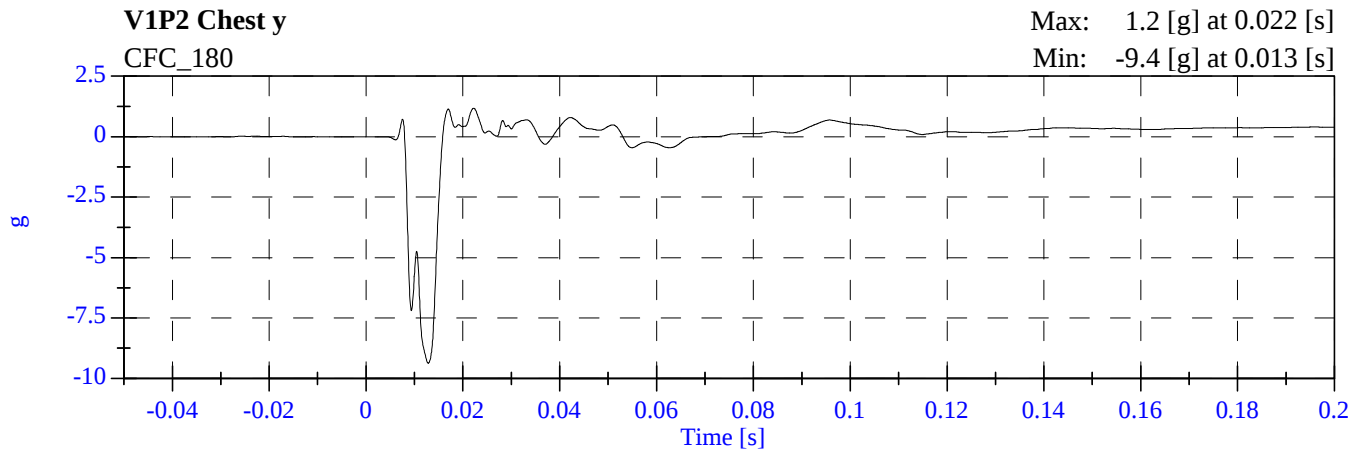
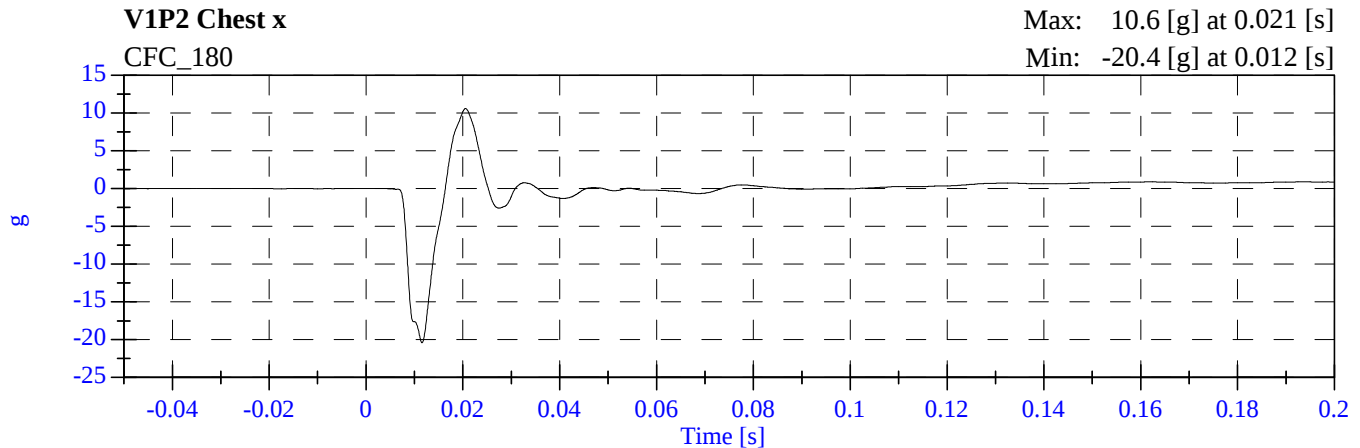
TWG07 - 2004 Chrysler Crossfire

C40305TWG2 - May 25, 2004

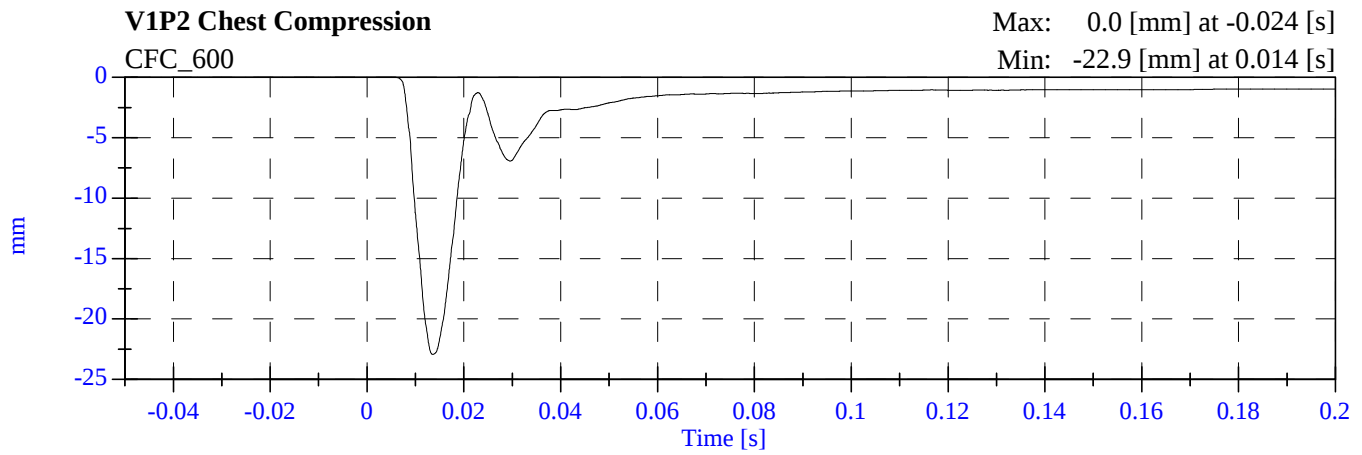


TWG07 - 2004 Chrysler Crossfire

C40305TWG2 - May 25, 2004

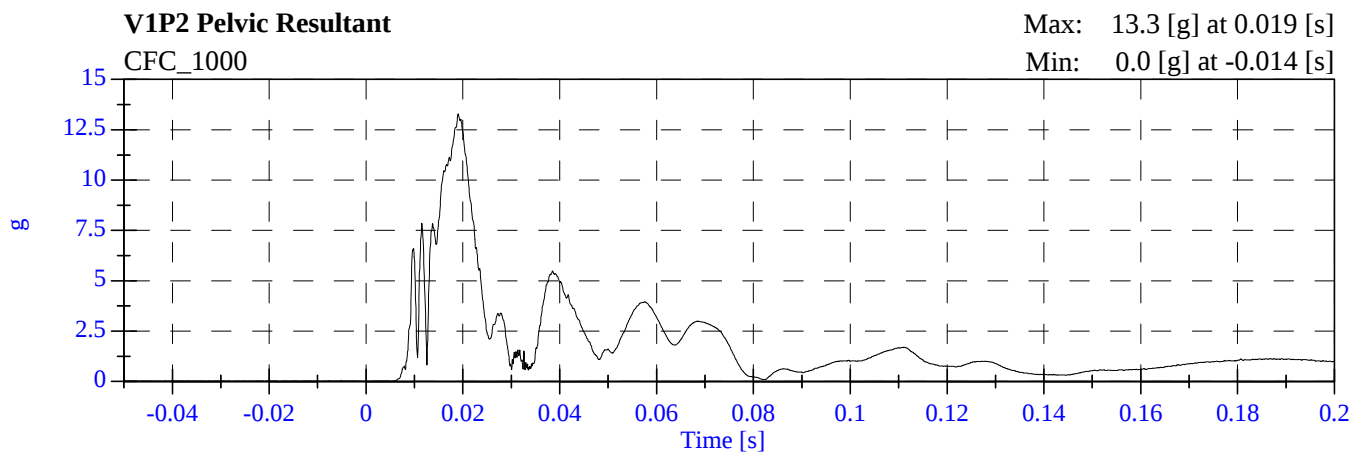
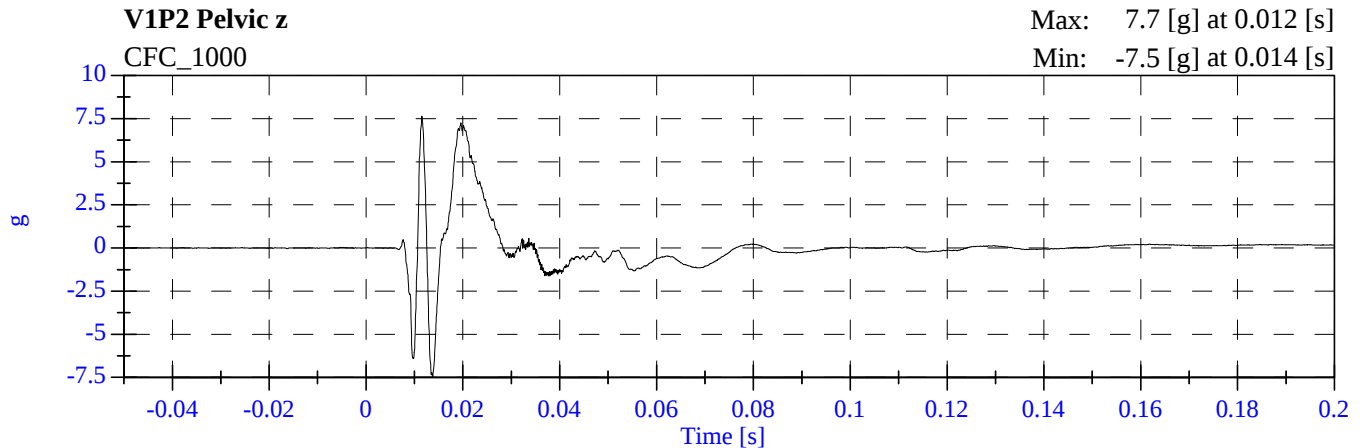
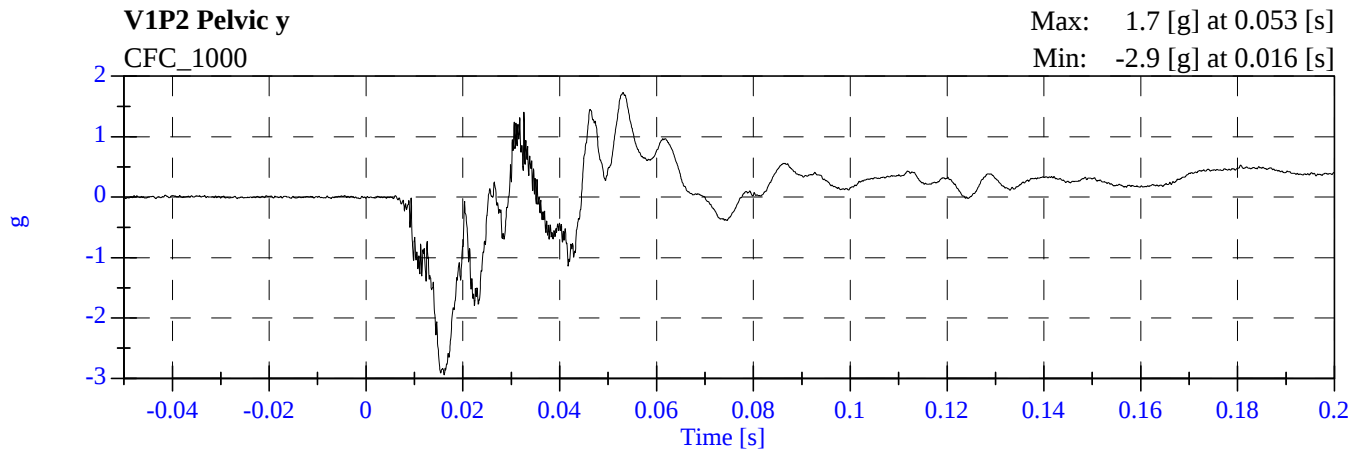
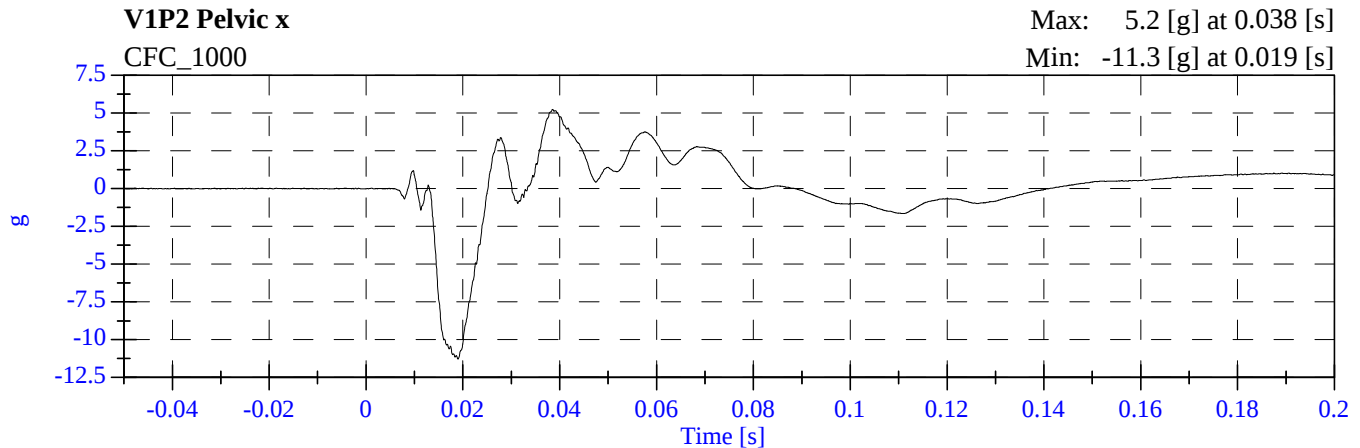


TWG07 - 2004 Chrysler Crossfire
C40305TWG2 - May 25, 2004



TWG07 - 2004 Chrysler Crossfire

C40305TWG2 - May 25, 2004



APPENDIX C

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

P572P INSTRUMENTATION

	POSITION #2 (RIGHT FRONT) SERIAL NO.: 044		
	SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
HEAD AX	AC-01G18-F20	ENTRAN	5/3/2004
HEAD AY	AC-P17743	ENDEVCO	5/4/2004
HEAD AZ	AC-P15319	ENDEVCO	5/4/2004
HEAD REAR AZ	AC-02I02I10-N06	ENTRAN	5/4/2004
UPPER NECK FX	LC-248-FX	Denton	10/1/2003
UPPER NECK FY	LC-248-FY	Denton	10/1/2003
UPPER NECK FZ	LC-248-Fz	Denton	10/1/2003
UPPER NECK MX	LC-248-Mx	Denton	10/1/2003
UPPER NECK MY	LC-248-My	Denton	10/1/2003
UPPER NECK MZ	LC-248-Mz	Denton	10/1/2003
LOWER NECK FX	LC-249Fx	Denton	10/1/2003
LOWER NECK FY	LC-249Fy	Denton	10/1/2003
LOWER NECK FZ	LC-249Fz	Denton	10/1/2003
LOWER NECK MX	LC-249Mx	Denton	10/1/2003
LOWER NECK MY	LC-249My	Denton	10/1/2003
LOWER NECK MZ	LC-249Mz	Denton	10/1/2003
CHEST AX	AC-P15334	ENDEVCO	5/4/2004
CHEST AY	AC-P15321	ENDEVCO	5/4/2004
CHEST AZ	AC-P17758	ENDEVCO	5/4/2004
CHEST DISPLACEMENT X	DS-044	SERVO	11/22/2003
PELVIS AX	AC-P16755	ENDEVCO	5/4/2004
PELVIS AY	AC-P15591	ENDEVCO	5/4/2004
PELVIS AZ	AC-P16155	ENDEVCO	5/4/2004