

REPORT NUMBER: NCAP-CAL-14-002

**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**GM Korea Company
2014 Chevrolet Spark
5Dr Hatchback**

NHTSA No: M20140114

**PREPARED BY:
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January 20, 2014

FINAL REPORT

**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE SE, ROOM W43-410
WASHINGTON, D.C. 20590**

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FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

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16. Abstract A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2014 Chevrolet Spark five door hatchback in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on November 27, 2013. The impact velocity of the vehicle was 56.93 km/h, and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 403 mm at the centerline. The test vehicle's occupant performance data is as follows:																																																									
<table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD (Serial No. 064)</th> <th colspan="2">Passenger ATD (Serial No. 273)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td></td> <td>700</td> <td>146.06</td> <td>700</td> <td>255.00</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-33.857</td> <td>52</td> <td>-17.50</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.27</td> <td>1</td> <td>0.36</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>800.46</td> <td>2,620</td> <td>586.70</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-50.41</td> <td>2,520</td> <td>-127.98</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-709.76</td> <td>6,805</td> <td>-951.72</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-1845.44</td> <td>6,805</td> <td>-2094.70</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD (Serial No. 064)		Passenger ATD (Serial No. 273)		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)		700	146.06	700	255.00	Maximum Chest Compression	mm	63	-33.857	52	-17.50	Nij		1	0.27	1	0.36	Neck Tension	N	4,170	800.46	2,620	586.70	Neck Compression	N	4,000	-50.41	2,520	-127.98	Left Femur Force	N	10,008	-709.76	6,805	-951.72	Right Femur Force	N	10,008	-1845.44	6,805	-2094.70
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-12-D-00260. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test procedure, dated August 2013.

SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2014 Chevrolet Spark five door hatchback at a velocity of 56.93 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on November 27, 2013. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 14 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part 572E, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure. Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right / left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 064) and the right-front passenger (position 2) ATD (Serial No. 273) were calibrated previous to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 136 channels of data were recorded on an on-board data acquisition system. Please refer to Appendix B for the dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of stoddard solvent leakage after the event and including all phases of the static rollover. The maximum static crush of the test vehicle was 403 mm at the centerline. During and after the impact event, the driver's and passenger's side door were closed and operational.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee airbag.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee airbag.

The occupant data is summarized below.

ATD Position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	146.06	0.27	800.46	-50.41	44.17	-33.86	-709.76	-1845.44
Passenger (5 th)	255.00	0.36	586.70	-127.98	38.86	-17.50	-951.72	-2094.70

GENERAL COMMENTS:

1. P1 (Driver) serial number - 064
2. P2 (Passenger) serial number - 273

Data Anomalies:

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat Adjustment, Fuel System, and Steering Wheel Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

Data Sheet No. 6 – High-Speed Camera Locations and Data

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

Data Sheet No. 9 – Load Cell Locations on Fixed Barrier

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of FMVSS 212, 219 (Partial), and 301 Data

Data Sheet No. 16 – FMVSS 301 Static Rollover Results

Data Sheet No. 17 – Dummy/Vehicle Temperature Stabilization Chart

**DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20140114	Traction Control System (TCS)	Yes
Model Year	2014	Power Steering	Yes
Make	Chevrolet	Power Window Auto-Reverse	No
Model	Spark	Driver Frontal Airbag	Yes
Body Style	5 Door Hatchback	Driver Curtain Airbag	Yes
VIN	KL8CA6S96EC403844	Driver Head/Torso Airbag	No
Body Color	Yellow	Driver Torso Airbag	No
Odometer Reading (km /mi)	222.1 km / 138 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	1.2	Driver Pelvis Airbag	No
Type / No. Cylinders	I4	Driver Knee Airbag	Yes
Engine Placement	Transverse	Front Pass. Frontal Airbag	Yes
Transmission Type	Manual	Front Pass. Curtain Airbag	Yes
Transmission Speeds	5-Speed	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	Front Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	No	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	No	Other	-

Does owner's manual provide instructions to turn off automatic door locks?

N/A

DATA FROM CERTIFICATION LABEL

Manufactured By	GM Korea Company	GVWR (kg)	1390
Date of Manufacture	05/13	GAWR Front (kg)	790
		GAWR Rear (kg)	710

VEHICLE SEATING AND WEIGHT CAPACITY DATA

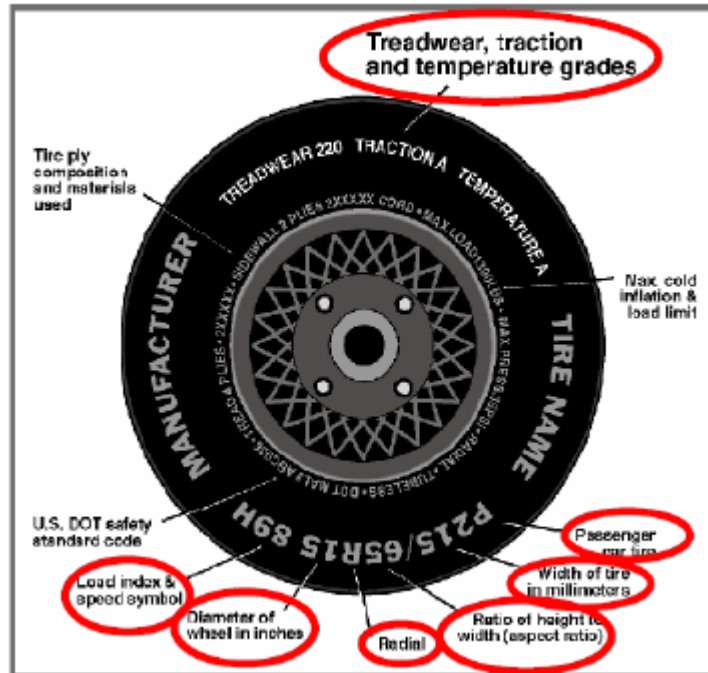
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	2		4
Capacity Wt. (VCW) (kg)				300
Cargo Wt. (RCLW) (kg)				27.84

DATA SHEET NO. 1 ... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

Collect items circled in red, tire manufacturer, and tire name.



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	275	275
Recommended Tire Size	P185/55R15	P185/55R15
Tire Size on Vehicle	P185/55R15	P185/55R15
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Integrity	Integrity
Treadwear	400	400
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	1 Polyester, 2 Steel	1 Polyester, 2 Steel
Load Index / Speed Symbol	82T	82T
Tire Material	Rubber	Rubber
DOT Safety Code Left	PJ8XJTIR0413	PJ8XJTIR4612
DOT Safety Code Right	PJ8XJTIR0413	PJ8XJTIR0413

DATA SHEET NO. 1 ... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	330	192		379	235	
Right	kg	320	195		332	254	
Ratio	%	62.7%	37.3%		59.3%	40.7%	
Totals	kg	650	387	1037	711	489	1200

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1037	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.7	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	27.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1205.5	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	638	642	644	644	886
As Tested	mm	641	640	621	617	968
Post-Test	mm	701	694	620	613	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2375
Total Vehicle Length at Left Side	mm	3501
Total Vehicle Length at Centerline	mm	3628
Total Vehicle Length at Right Side	mm	3508
Weight of Ballast in Cargo Area	kg	8
Weight of Vehicle Components Removed	kg	21.3
Amount of Stoddard Solvent in Fuel Tank	L	32.5

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

The rear seats, tail light, trunk carpeting, and rear speakers were removed to install the
Data acquisition boxes.

DATA SHEET NO.1 ... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	3628
2	Total Width	1583
3*	Bumper Top Height	500
4*	Bumper Bottom Height	405
5*	Longitudinal Member Top Height	550
6	Distance Between Longitudinal Members	986
7	Longitudinal Member Width	70
8*	Engine Top Height	775
9*	Engine Bottom Height	199
10	Engine and Gearbox Width	396
11	Front Bumper-Engine Distance	335
12*	Front Shock Absorber Fixing Height	802
13*	Bonnet Leading Edge Height	773
14	Front Shock Absorber Fixing Width	1049
15	Front Bumper – Front Axle Distance	741
16	Front Axle – A Pillar Distance	395
17	A-Pillar – B-Pillar Distance	1091
18	B-Pillar – Rear Axle Distance	889
19	B-Pillar – C-Pillar Distance	889
20*	Roof Sill Bottom Height	1391
21*	Roof Sill Top Height	1482
22*	Floor Sill Bottom Height	304
23*	Floor Sill Top Height	368

*Height Measurements are taken from the ground
 Note: All measurements are in millimeters

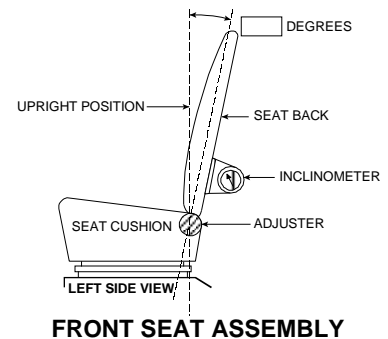
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

NOMINAL DESIGN RIDING POSITION

The driver's seat back was set to the manufacturer's designated angle. The passenger's seat back was positioned in a similar manner as the driver's seat back. Seat back angles are measured at the headrest post bezel using a digital inclinometer.



Seating Position	Degrees
Driver Seat Back Angle	12.1
Passenger Seat Back Angle	8.1

SEAT FORE / AFT POSITIONS

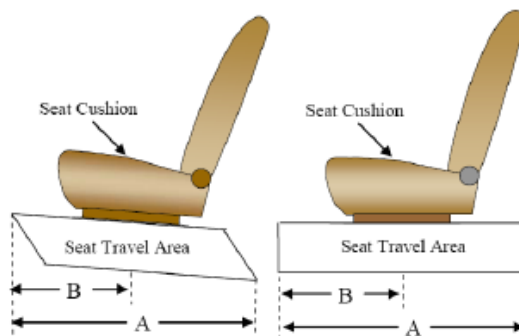
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	16	8
Passenger Seat	16	0

SEAT BELT UPPER ANCHORAGE

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50th percentile adult male ATD. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5th percentile adult female ATD. For this test zero is defined as the uppermost position.

Seating Position	Total # of Positions	Placed in Position #
Driver Seat	5	0
Passenger Seat	5	0



DATA SHEET NO. 2 ... (CONTINUED)
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

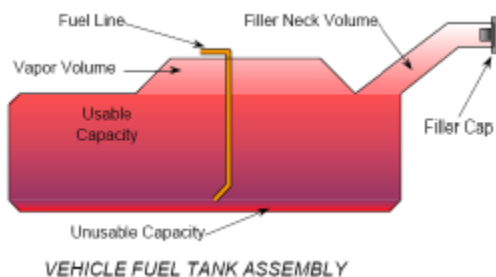
NHTSA No.: M20140114
 Test Date: 11/27/2013

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	34.9
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	32.1 – 32.8
Actual Amount of Solvent Used	32.5
1/3 of Usable Capacity	11.6

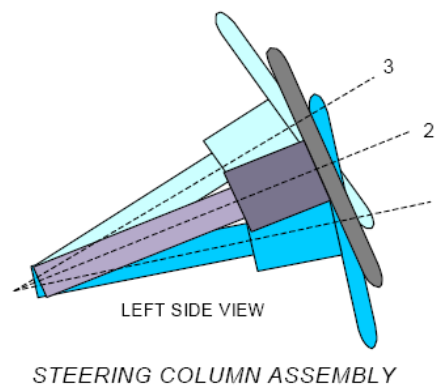
FUEL PUMP

The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



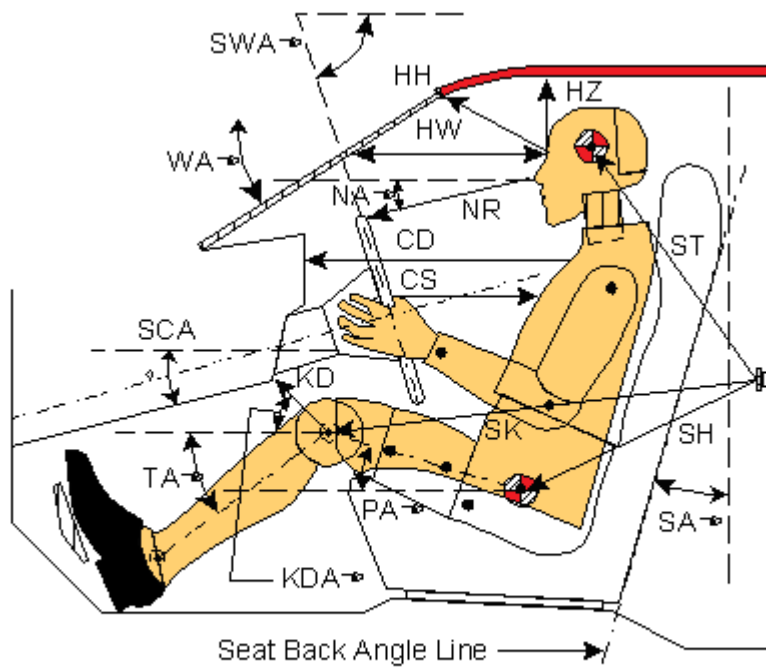
STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	19.8	
Geometric center position No. 2	21.65	
Uppermost position No. 3	23.5	
Telescoping Steering Wheel Travel		N/A
Test Position	21.7	N/A

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013



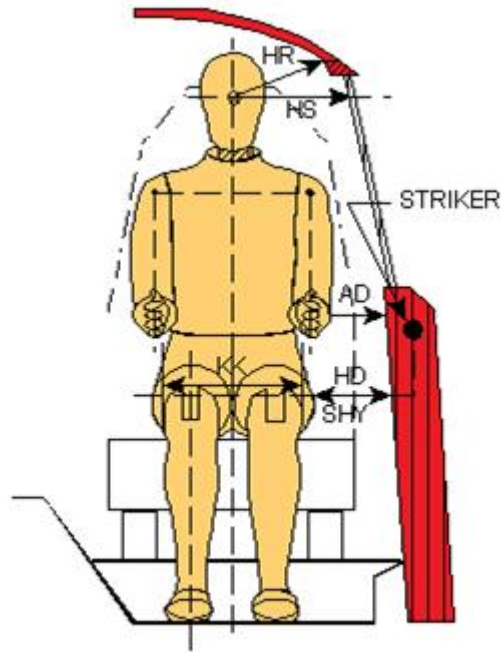
Left Side View

Code	Measurement Description	Driver (SN: 064)		Passenger (SN: 273)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		-28.9		
SWA°	Steering Wheel Angle		-21.9		
SCA°	Steering Column Angle		68.1		
SA°	Seat Back Angle (on headrest post)		12.6		8.1
HZ	Head to Roof (Z)	216	90	277	90
HH	Head to Header	484	13.6	407	29.6
HW	Head to Windshield	734	0	740	0
NR	Nose to Rim	436	-12.4	527	30.9
CD	Chest to Dash	496		458	
CS	Chest to Steering Hub	330	0		
RA	Rim to Abdomen	233	0		
KDL	Left Knee to Dash	207	31.6	152	34.4
KDR	Right Knee to Dash	183	42.1	158	31.2
PA°	Pelvic Angle		23.7		20.4
TA°	Tibia Angle		-33.9		43.6
SK	Striker to Knee	553	-3.3	653	-4.7
ST	Striker to Head	525	82.2	500	62.6
SH	Striker to H-Point	222	-40.6	333	-21.8

**DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013



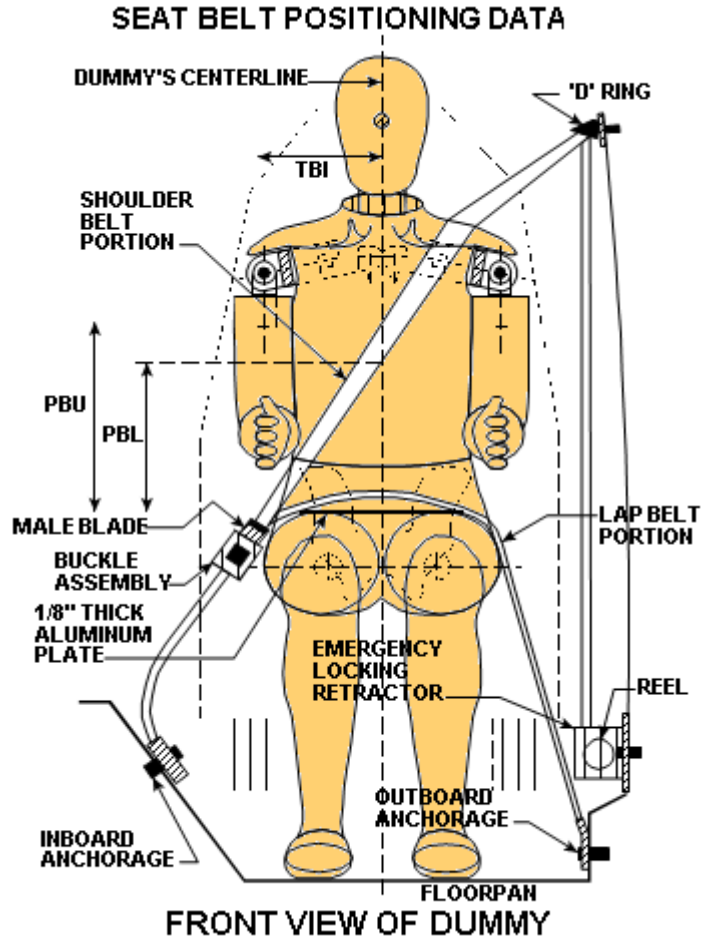
Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	89	58
HD	H-Point to Door	116	150
HR	Head to Side Header	220	280
HS	Head to Side Window	330	350
KK	Knee to Knee	320	165
SHY	Striker to H-Point (Y Direction)	225	225
AA	Ankle to Ankle	335	166

**DATA SHEET NO. 5
SEAT BELT POSITIONING DATA**

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	380	330
PBL — Top surface of reference to belt lower edge	mm	305	250

BELT LENGTH DATA

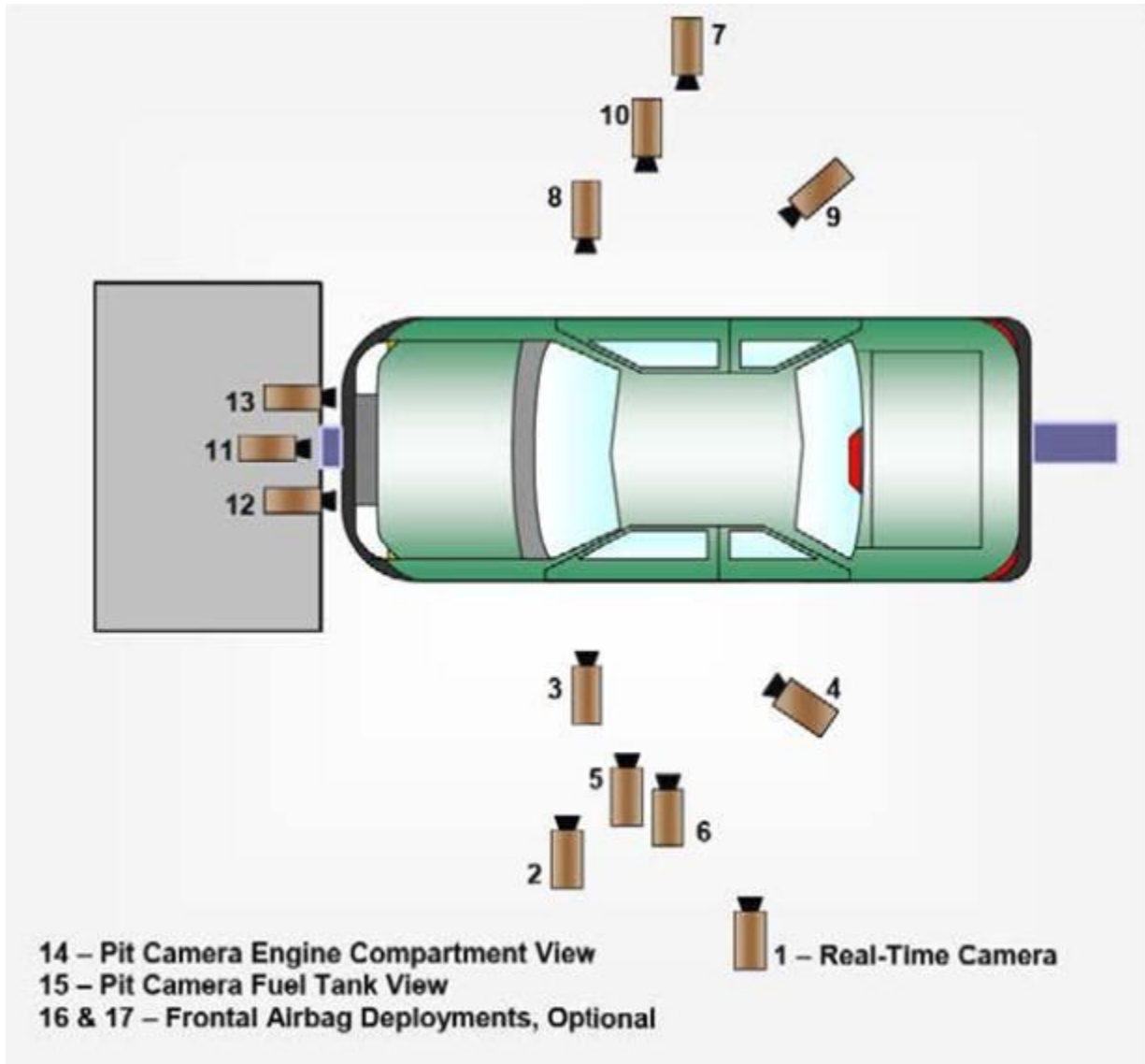
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	825	875
Lap Belt Length as measured on ATD	mm	630	670
Remainder of belt on reel	mm	945	855
Total belt length for continuous webbing systems	mm	2400	2400

**DATA SHEET NO. 6
HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2014 Chevrolet Spark five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
Test Date: 11/27/2013

CAMERA POSITIONS FOR FRONTAL IMPACTS



Top View

DATA SHEET NO. 6 ... (CONTINUED)
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

CAMERA LOCATIONS

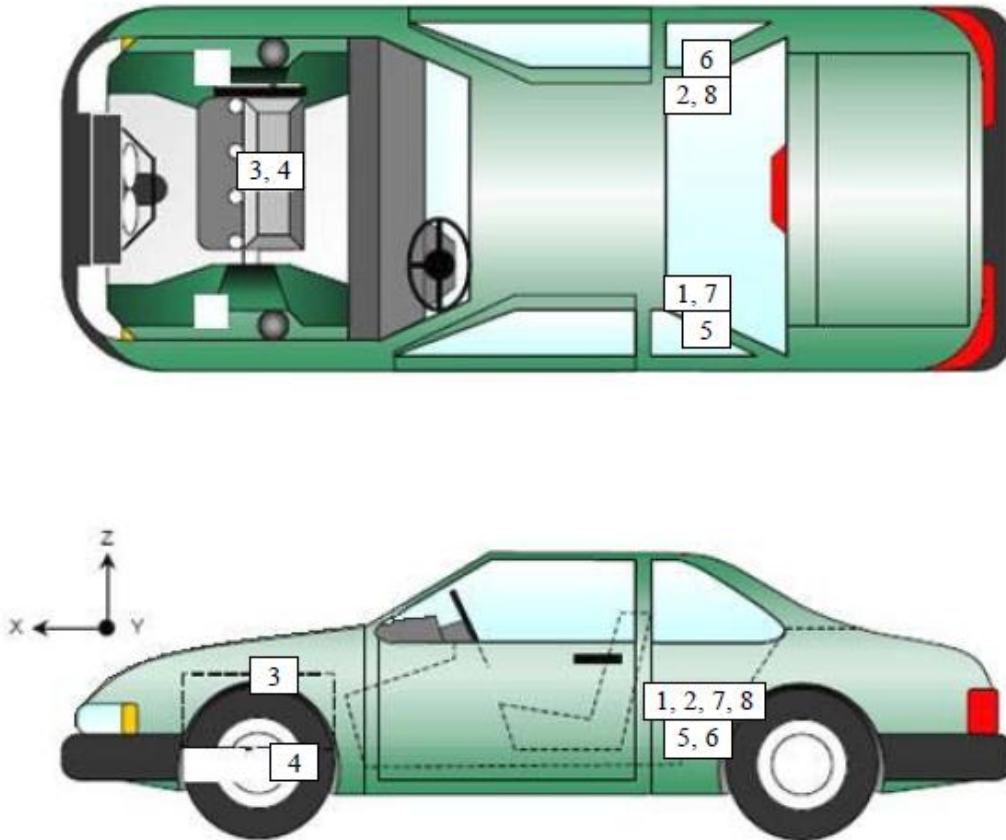
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		-
2	Driver Close-Up	1307	-8153	1287	50	1000
3	Left Front Half	747	-8863	1377	50	1000
4	Left Angle	3127	-3254	2402	24	1000
5	Steering Column - Top	2066	-8359	1834	24-70	1000
6	Steering Column - Bottom	2066	-8359	1231	24-70	1000
7	Right Overall	1547	8191	1036	28	1000
8	Passenger Close-Up	1100	8779	1133	50	1000
9	Right Front Half	698	9553	1013	50	1000
10	Right Angle	3250	3095	2164	28	1000
11	Windshield	-533	0	3476	24	1000
12	Driver Windshield	-191	-638	2026	25	1000
13	Passenger Windshield	-191	621	2026	25	1000
14	Pit Front	976	0	2052	12.5	1000
15	Pit Rear	2310	0	2052	12.5	1000
16	Onboard Driver Airbag (Optional)					
17	Onboard Passenger Airbag (Optional)					

* COORDINATES: +X = forward of impact plane
 +Y = right of monorail center
 +Z = into ground

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2014 Chevrolet Spark five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
Test Date: 11/27/2013



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1244	-502	236
2	Right Rear Accelerometer – X Direction	1244	508	246
3	Engine Top X	3096	295	-196
4	Engine Bottom X	3161	-122	361
5	Left Rear Accelerometer – Z Direction	1244	-502	236
6	Right Rear Accelerometer – Z Direction	1244	508	246
7	Left Rear Accelerometer – X Direction Redundant	1244	-502	236
8	Right Rear Accelerometer – X Direction Redundant	1244	508	246

Reference Points: *X – Rear Surface of Vehicle (+ forward)*
 Y – Vehicle Centerline (+ to right)
 Z – Ground Plane (+ down)

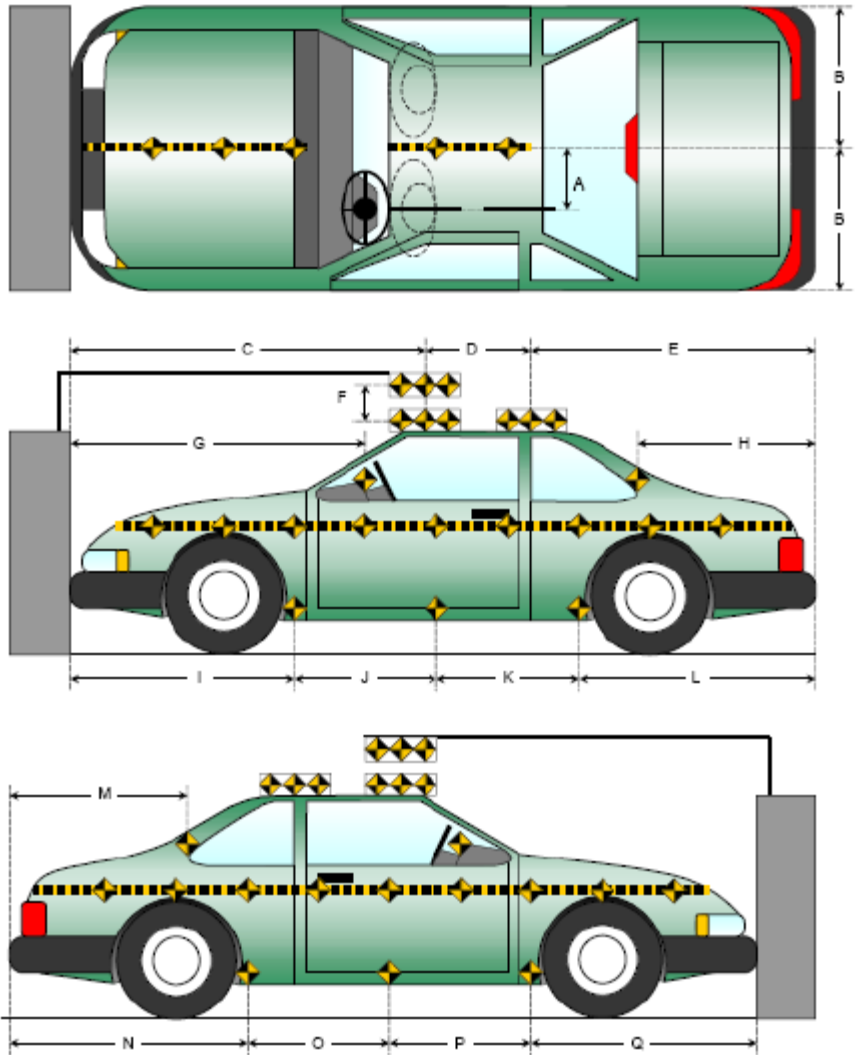
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

Item	Value
A	315
B	791
C	2025
D	773
E	830
F	122
G	1413
H	445
I	1145
J	787
K	786
L	909
M	447
N	912
O	788
P	788
Q	1140

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

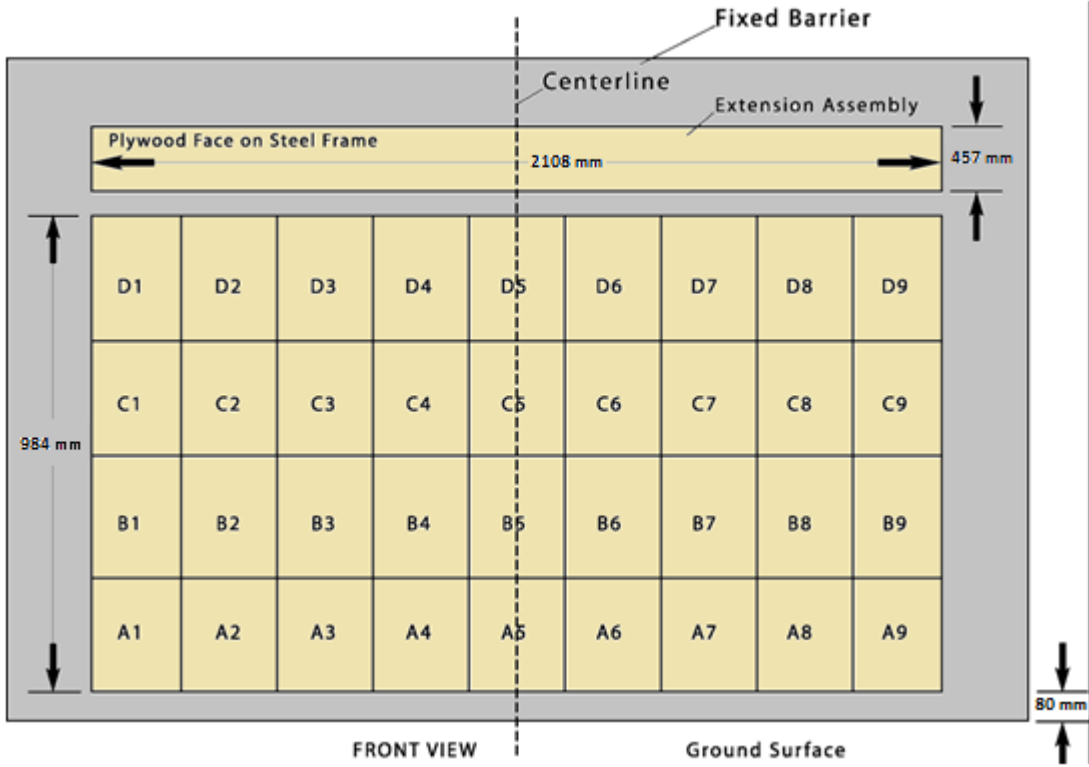


Figure 1 - Load Cell Locations on a 36-Load Cell Barrier with Plywood Height Extension

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2014 Chevrolet Spark five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
Test Date: 11/27/2013

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	46
Passenger Dummy Accelerometers	46
Vehicle Structure Accelerometers	8
Load Cell Barrier	36
Total	136

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	0
High-Speed Offboard	14
Real-Time Panning	1
Total	15

**DATA SHEET NO. 11
POST-TEST OBSERVATIONS**

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50 th Male / 064	P5720 5 th Female / 273
Head Contact	Front Airbag & Headrest	Front Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

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	No	No
Glazing Damage	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	None
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1105
Center	mm	1107
Right Side	mm	1163
Average	mm	1125

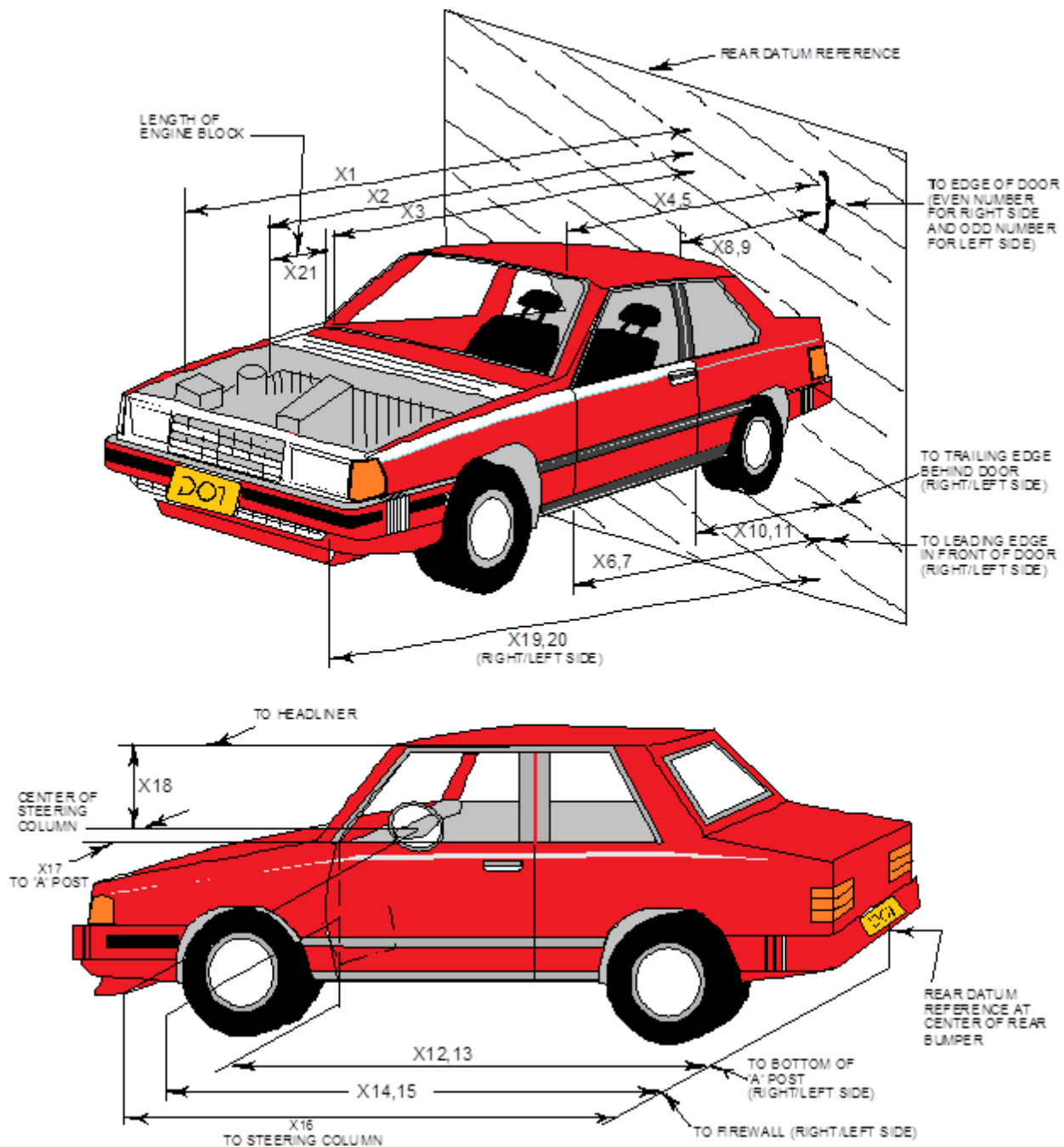
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 - Curtain	Yes	No	Yes	No
Side Airbag 2 - Torso/Pelvis Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

**DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013



DATA SHEET NO. 12 ... (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	3628	3224	-403
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3293	3078	-215
3	RSOV to Firewall	2895	2894	-1
4	RSOV to Upper Leading Edge of Right Door	2490	2493	3
5	RSOV to Upper Leading Edge of Left Door	2490	2491	0
6	RSOV to Lower Leading Edge of Right Door	2471	2470	0
7	RSOV to Lower Leading Edge of Left Door	2467	2469	2
8	RSOV to Upper Trailing Edge of Right Door	1409	1410	2
9	RSOV to Upper Trailing Edge of Left Door	1408	1408	1
10	RSOV to Lower Trailing Edge of Right Door	1450	1450	0
11	RSOV to Lower Trailing Edge of Left Door	1449	1449	1
12	RSOV to Bottom of "A" Post of Right Side	2647	2649	1
13	RSOV to Bottom of "A" Post of Left Side	2650	2649	0
14	RSOV to Firewall, Right Side	2897	2825	-72
15	RSOV to Firewall, Left Side	2896	2892	-4
16	RSOV to Steering Column	2036	2103	67
17	Center of Steering Column to "A" Post	303	293	-10
18	Center of Steering Column to Headliner	415	441	26
19	RSOV to Right Side of Front Bumper	3540	3189	-351
20	RSOV to Left Side of Front Bumper	3535	3195	-340
21	Length of Engine Block	428	428	0
RD	RSOV to Right Side of Dash Panel	2221	2217	-4
CD	RSOV to Center of Dash Panel	2261	2262	1
LD	RSOV to Left Side of Dash Panel	2219	2220	0

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
Test Date: 11/27/2013

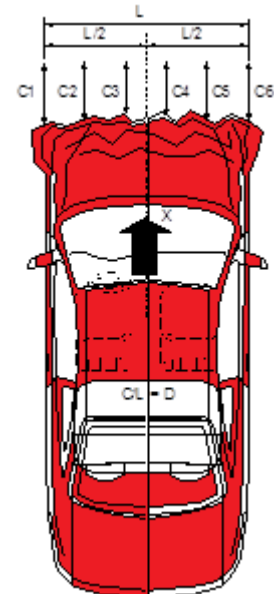
VEHICLE INFORMATION

VIN: KL8CA6S96EC403844
Vehicle Size Category: Passenger

Wheelbase (mm): 2375
Test Weight (kg): 1,200

ACCELEROMETER DATA

Accelerometer Locations: Please See Data Sheet No. 7
Cal. Procedure / Interval: Calspan Procedure / 6 month
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (km/h): 56.93
Velocity Change (km/h): 56.93
Time of Separation (ms):



CRUSH PROFILE

Collision Deformation Classification: 12FDEW4
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1096
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	3505	3197	308
C2	Crush Zone 2 at Left Side	mm	3605	3209	396
C3	Crush Zone 3 at Left Side	mm	3621	3220	401
C4	Crush Zone 4 at Right Side	mm	3621	3218	403
C5	Crush Zone 5 at Right Side	mm	3597	3195	402
C6	Crush Zone 6 at Right Side	mm	3497	3207	290
L	C1 to C6	mm	1096	1129	-33

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Chevrolet Spark five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

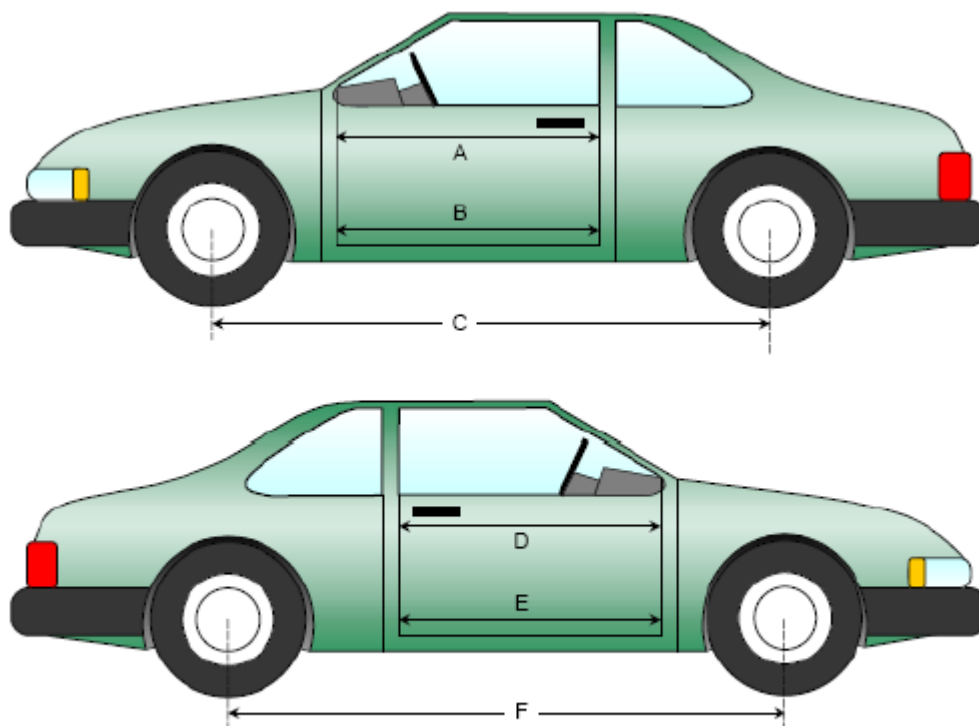
NHTSA No.: M20140114
Test Date: 11/27/2013

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	952	952	0
B	Left Side Lower	mm	846	846	0
D	Right Side Upper	mm	953	952	-1
E	Right Side Lower	mm	820	819	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2375	2297	-79
F	Right Side Wheelbase	mm	2375	2316	-59



Left & Right Side Views

**DATA SHEET NO.14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS**

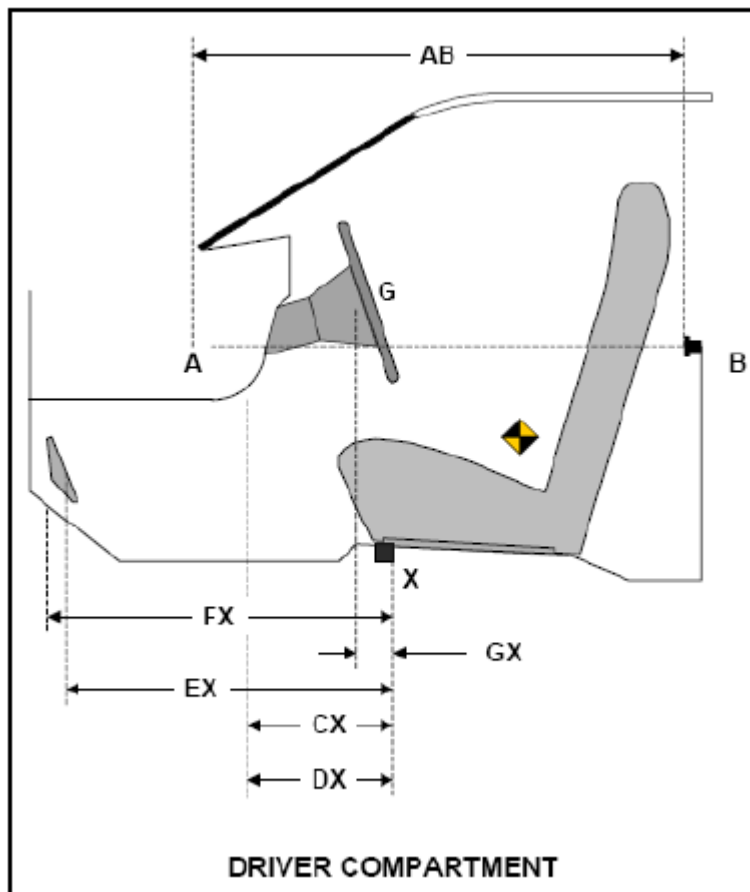
Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	744	745	1
CX	Left Knee Bolster to X	mm	418	423	4
DX	Right Knee Bolster to X	mm	394	402	8
EX	Brake Pedal to X	mm	638	585	-53
FX	Foot Rest to X	mm	683	670	-13
GX	Center of Steering Column Wheel Hub to X	mm	153	223	70

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013

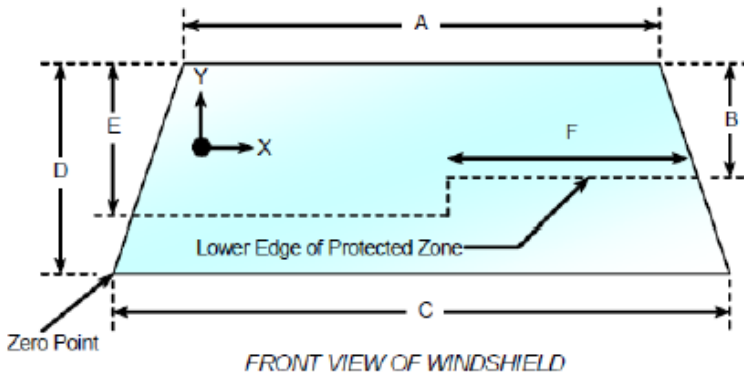
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2010	2010	100%
Right Side	2010	2010	100%
Total	4020	4020	100%



Item	Units	Value
A	mm	1110
B	mm	500
C	mm	1310
D	mm	800
E	mm	490
F	mm	315

AREAS OF PROTECTED ZONE FAILURES

- A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.
- No Penetration

X	Y

- B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.
- No Penetration

X	Y

DATA SHEET NO. 15 ... (CONTINUED)
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2014 Chevrolet Spark five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
Test Date: 11/27/2013

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C

Test Time: 3:55 PM

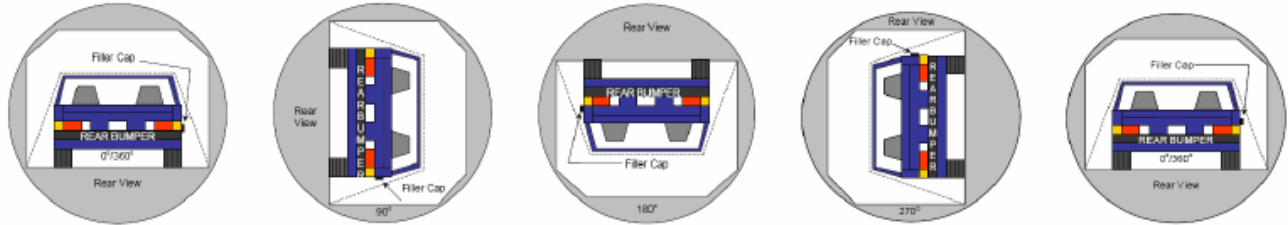
STODDARD SOLVENT SPILLAGE MEASUREMENTS

- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases: 0 oz.
(Maximum allowable is 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable is 1 oz./minute)
- D. Spillage: No Spillage Occurred

**DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013



0° TO 90° 90° TO 180° 180° TO 270° 270° TO 360°

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage: No Spillage Occurred

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	73	300	373
90° to 180°	62	300	362
180° to 270°	61	300	361
270° to 360°	72	300	372

FMVSS 301 SPILLAGE TABLE

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

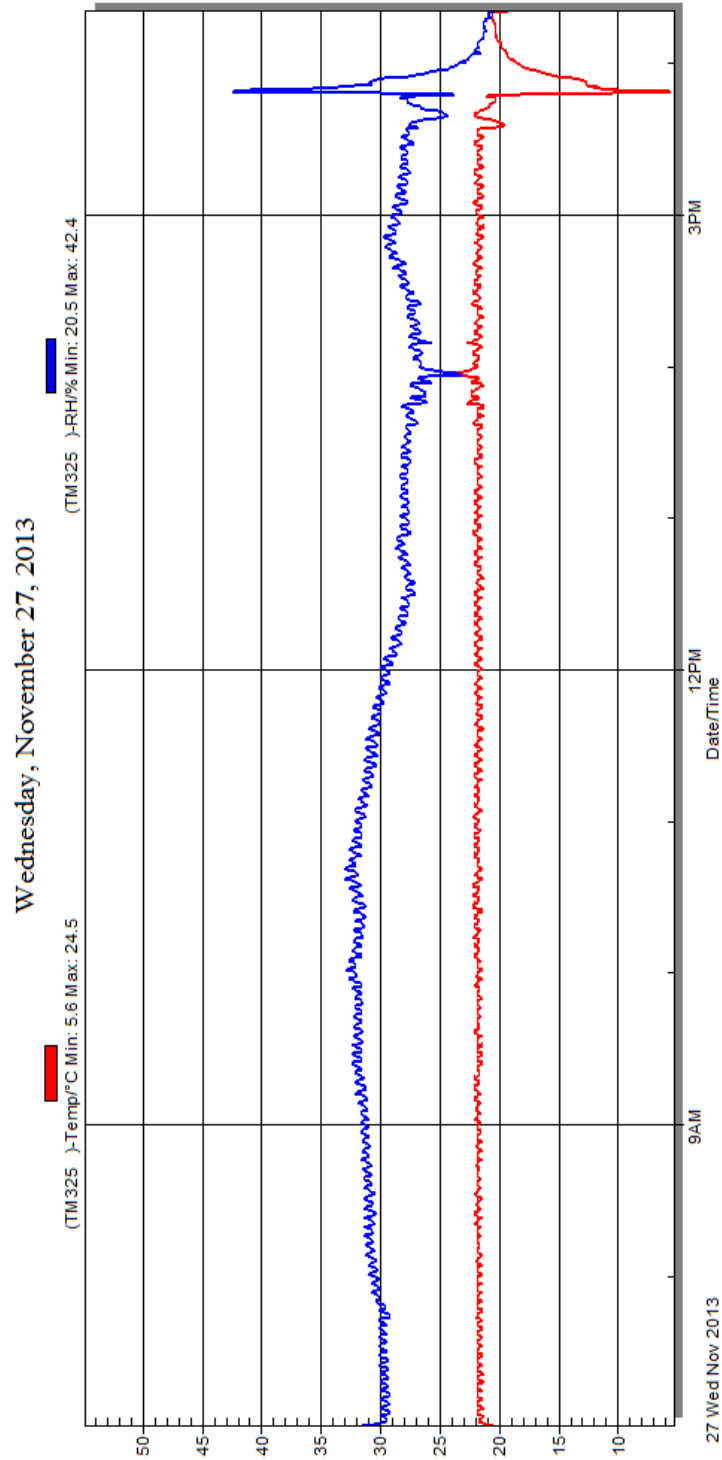
SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2014 Chevrolet Spark five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140114
 Test Date: 11/27/2013



Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle

APPENDIX A
PHOTOGRAPHS

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44	Post-Test Driver's Side Floorpan	A-26
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60	Pre-Test Passenger Dummy Feet	A-34
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¹**NOTE:** *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*



Figure A-1: Load Cell Location



Figure A-2: Load Cell Wall

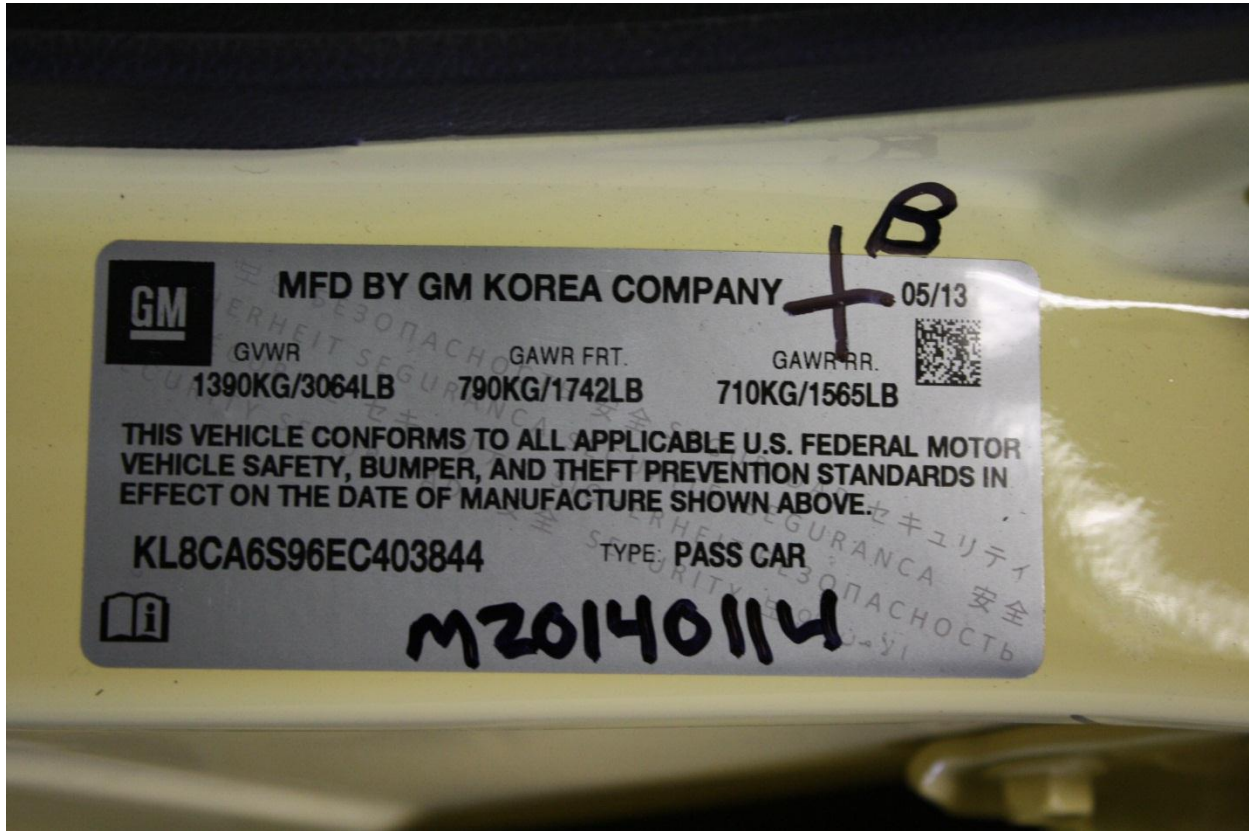


Figure A-3: Manufacturer's Label

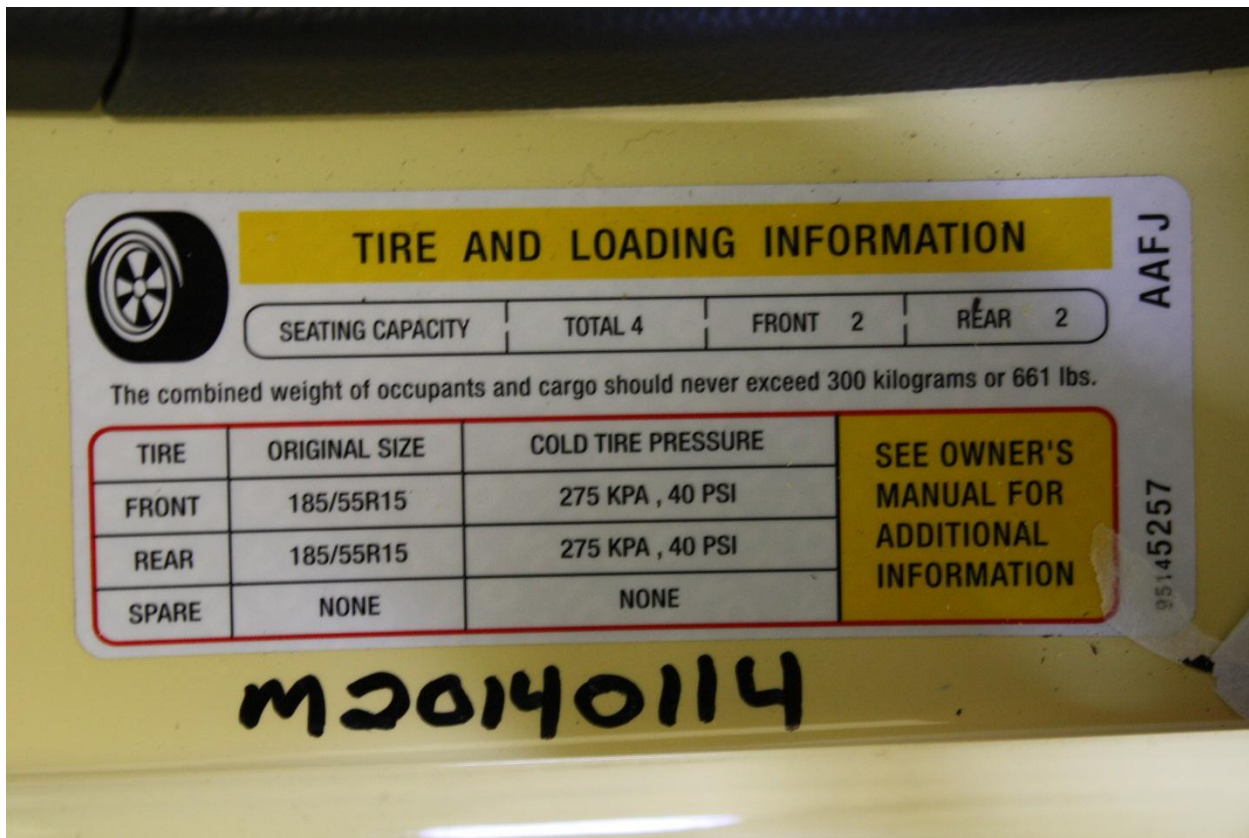


Figure A-4: Tire Placard



Figure A-5: 2014 Chevrolet Spark Frontal As Delivered



Figure A-6: Left Rear 3-4 View, As Received



Figure A-7: Pre-Test Front View of Test Vehicle



Figure A-8: Post-Test Front View of Test Vehicle



Figure A-9: Pre-Test Left View of Test Vehicle



Figure A-10: Post-Test Left View of Test Vehicle



Figure A-11: Pre-Test Right View of Test Vehicle



Figure A-12: Post-Test Right View of Test Vehicle



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 Windshield View



Figure A-18: Post-Test Windshield View



Figure A-19: Pre-Test Engine Compartment View



Figure A-20: Post-Test Engine Compartment View



Figure A-21: Pre-Test Fuel Filler Cap View



Figure A-22: Post-Test Fuel Filler Cap View

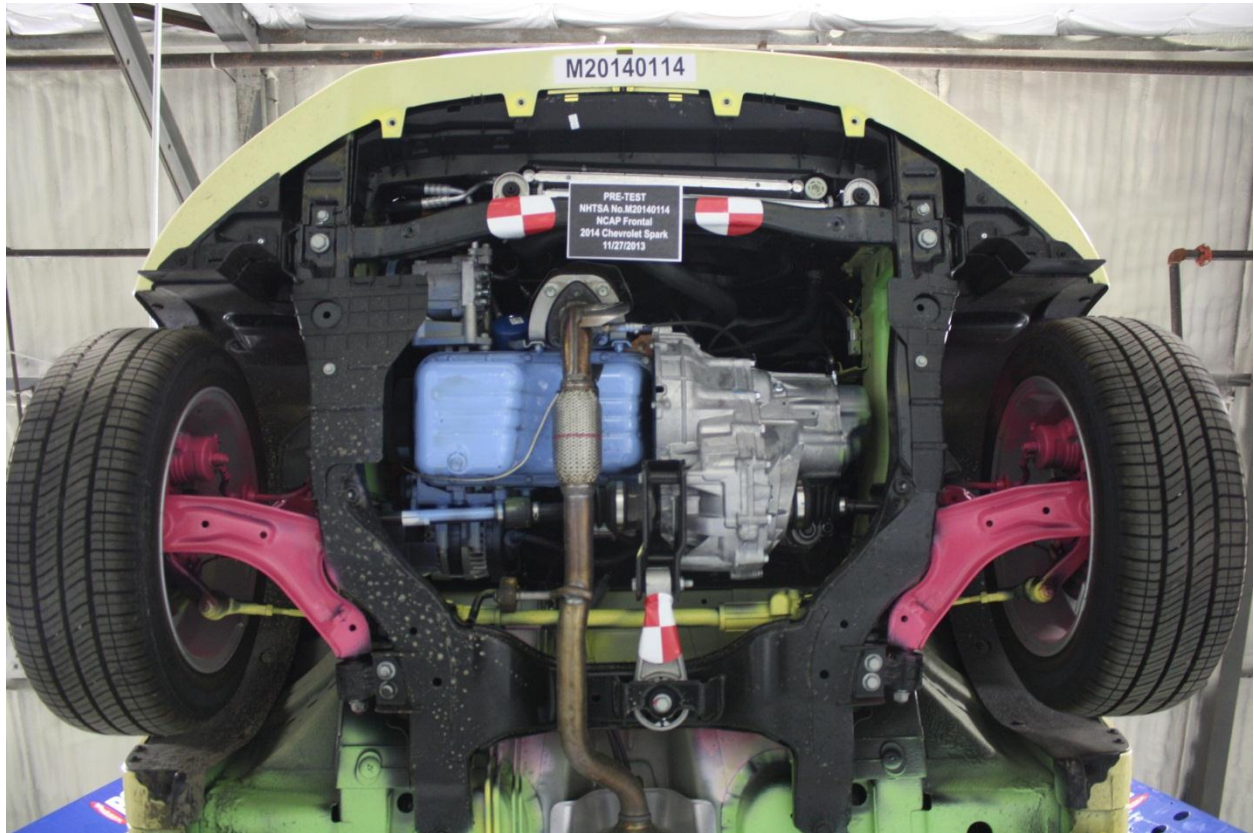


Figure A-23: Pre-Test Front Underbody View



Figure A-24: Post-Test Front Underbody View

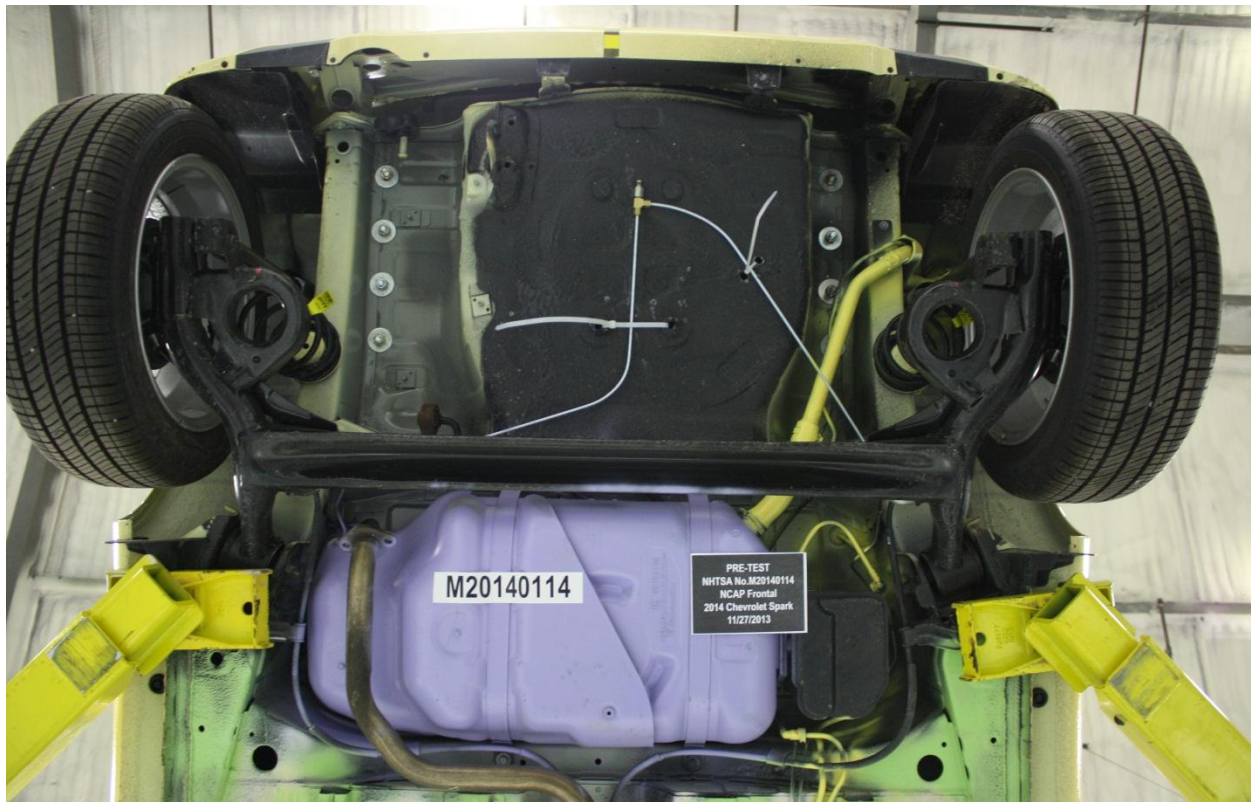


Figure A-25: Pre-Test Rear Underbody View



Figure A-26: Post-Test Rear Underbody View



Figure A-27: Pre-Test Dummy Cable Routing



Figure A-28: Post-Test Dummy Cable Routing



Figure A-29: Pre-Test Driver Dummy Front View



Figure A-30: Post-Test Driver Dummy Front View



Figure A-31: Pre-Test Driver Dummy Window View



Figure A-32: Post-Test Driver Dummy Window View



Figure A-33: Pre-Test Driver Dummy and Vehicle Interior View



Figure A-34: Post-Test Driver Dummy and Vehicle Interior View



Figure A-35: Pre-Test Driver's Seat Fore-Aft Markings



Figure A-36: Post-Test Driver's Seat Fore-Aft Markings



Figure A-37: Pre-Test View of Belt Anchorage for Driver Dummy



Figure A-38: Post-Test View of Belt Anchorage for Driver Dummy

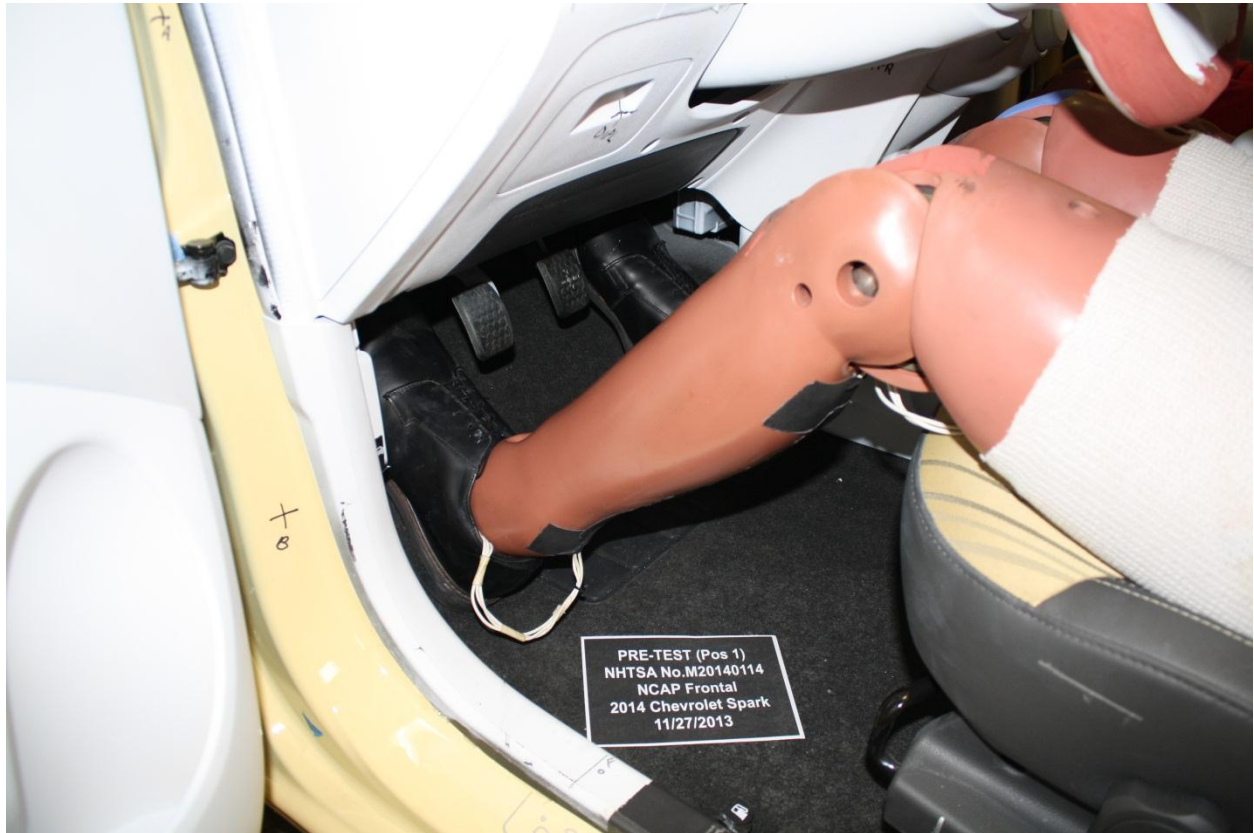


Figure A-39: Pre-Test Driver Dummy Feet



Figure A-40: Post-Test Driver Dummy Feet



Figure A-41: Pre-Test Driver's Side Knee Bolster



Figure A-42: Post-Test Driver's Side Knee Bolster



Figure A-43: Pre-Test Driver's Side Floorpan



Figure A-44: Post-Test Driver's Side Floorpan



Figure A-45: Post-Test Driver Dummy Face



Figure A-46: Post-Test Driver Dummy Contact With Airbag



Figure A-47: Post-Test Driver Dummy Contact With Headrest

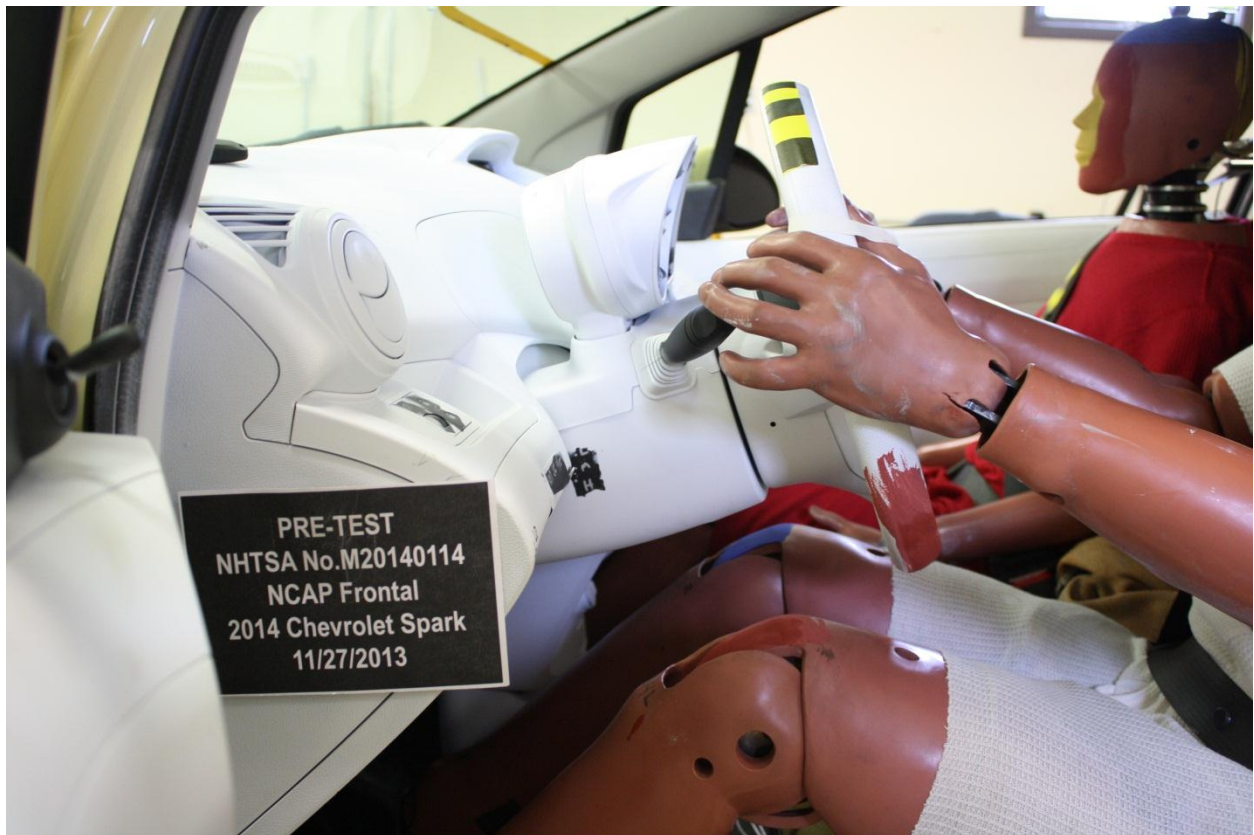


Figure A-48: Pre-Test View of the Steering Wheel



Figure A-49: Post-Test View of the Steering Wheel



Figure A-50: Pre-Test Passenger Dummy Front View

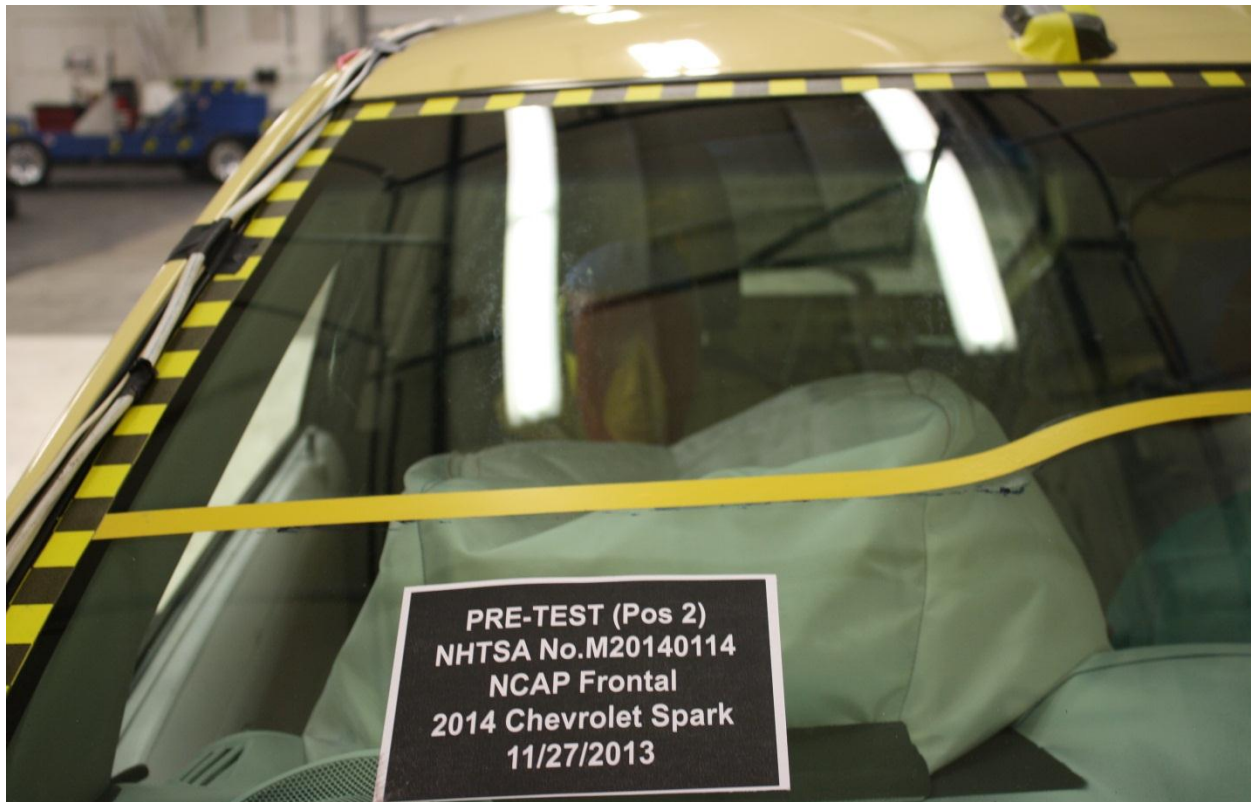


Figure A-51: Post-Test Passenger Dummy Front View



Figure A-52: Pre-Test Passenger Dummy Window View



Figure A-53: Post-Test Passenger Dummy Window View



Figure A-54: Pre-Test Passenger Dummy and Vehicle Interior View



Figure A-55: Post-Test Passenger Dummy and Vehicle Interior View



Figure A-56: Pre-Test Passenger's Seat Fore-Aft Markings



Figure A-57: Post-Test Passenger's Seat Fore-Aft Markings – **Wrong Placard was used**



Figure A-58: Pre-Test View of Belt Anchorage for Passenger Dummy



Figure A-59: Post-Test View of Belt Anchorage for Passenger Dummy– **Wrong Placard was used**



Figure A-60: Pre-Test Passenger Dummy Feet



Figure A-61: Post-Test Passenger Dummy Feet– **Wrong Placard was used**



Figure A-62: Pre-Test Passenger's Side Knee Bolster



Figure A-63: Post-Test Passenger's Side Knee Bolster– **Wrong Placard was used**



Figure A-64: Pre-Test Passenger's Side Floorpan

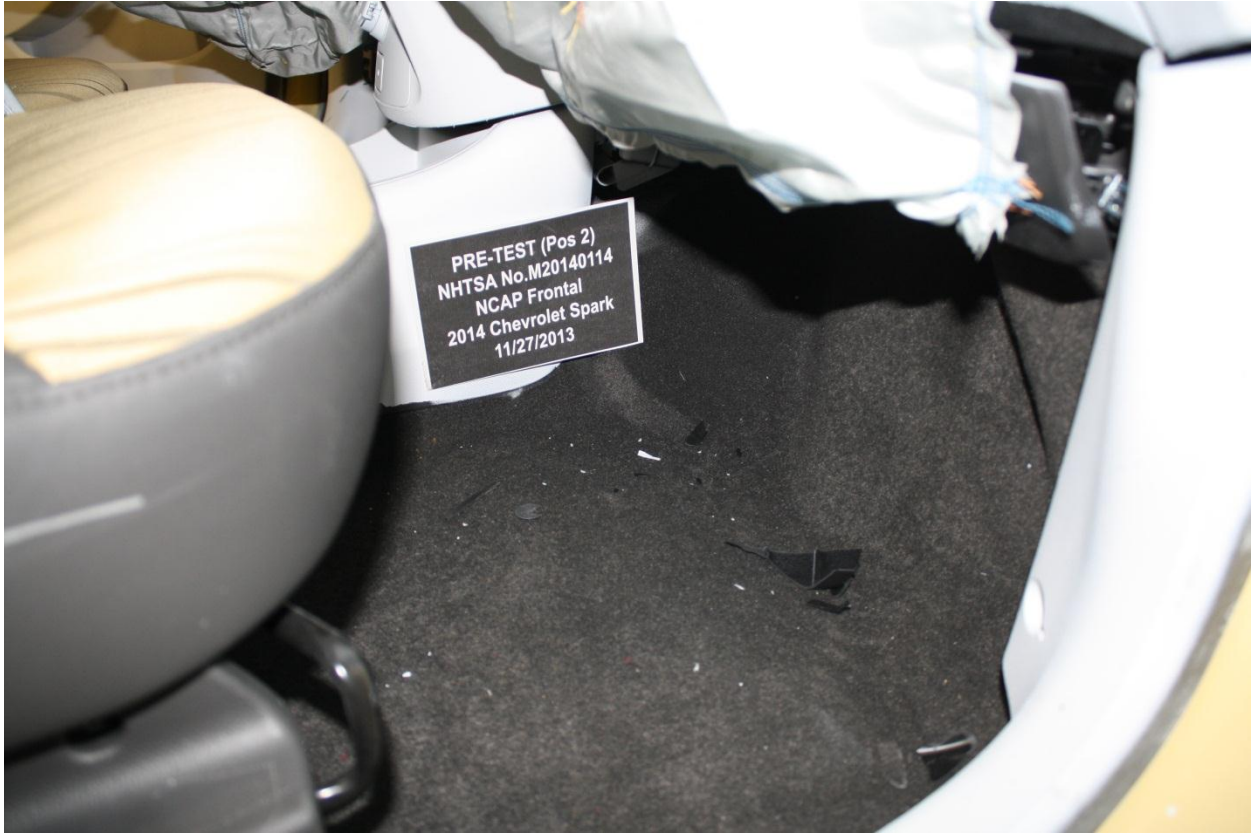


Figure A-65: Post-Test Passenger's Side Floorpan– **Wrong Placard was used**



Figure A-66: Post-Test Passenger Dummy Face



Figure A-67: Post-Test Passenger Dummy Contact With Airbag– **Wrong Placard was used**



Figure A-68: Post-Test Passenger Dummy Contact With Headrest– **Wrong Placard was used**



Figure A-69: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

Figure A-70: Post-Test Stoddard Solvent Spillage Location View, If Required



Figure A-71: Post-Test Speed Trap Read-Out



Figure A-72: Vehicle at 0° on Static Rollover Device



Figure A-73: Vehicle at 90° on Static Rollover Device



Figure A-74: Vehicle at 180° on Static Rollover Device



Figure A-75: Vehicle at 270° on Static Rollover Device

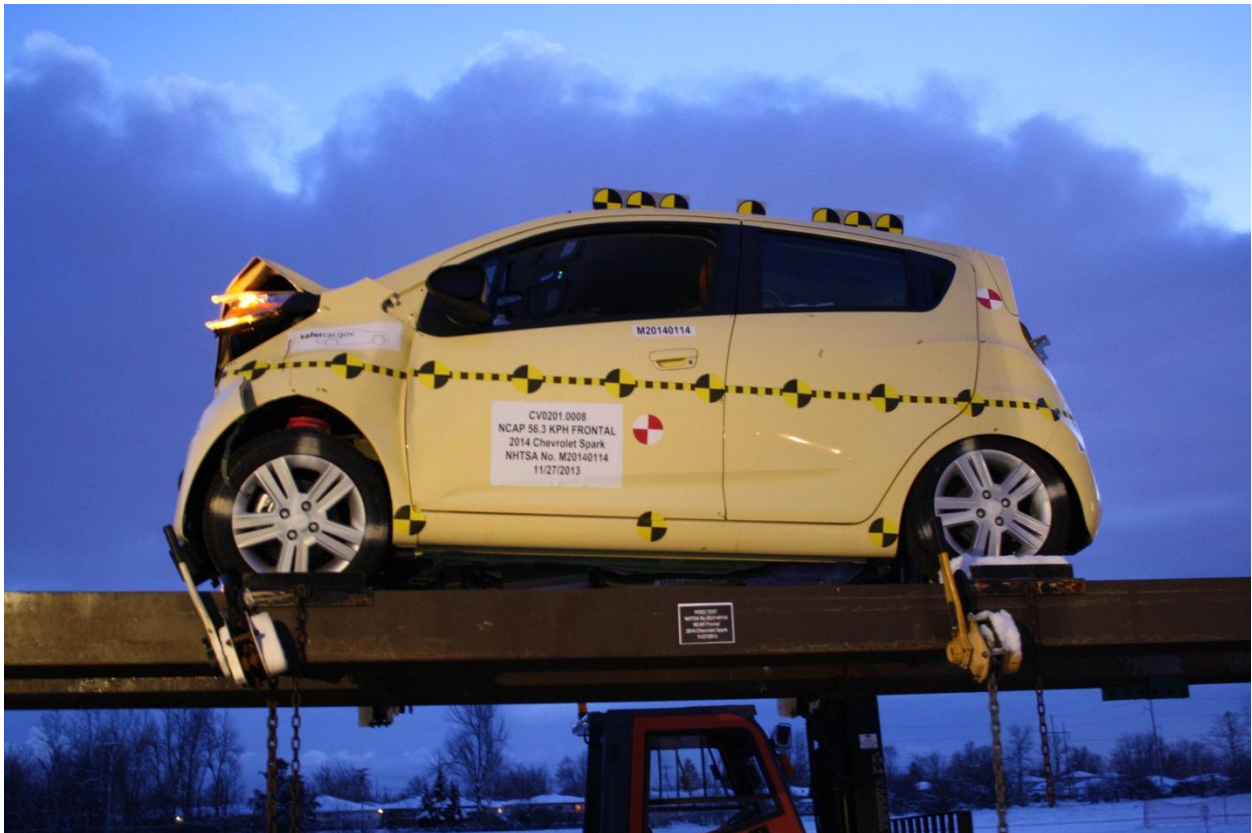



Figure A-76: Vehicle at 360° on Static Rollover Device




Figure A-77: 2014 Chevrolet Spark Frontal Impact Event



CHEVROLET

**2014 CHEVROLET SPARK
1LS MANUAL**



**EXTERIOR: LEMONADE
INTERIOR: YELLOW W/ YELLOW TRIM**

**ENGINE, ECOTEC 1.2L DOHC 4-CY
TRANSMISSION, 5-SPEED MANUAL**

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<p>STANDARD EQUIPMENT</p> <p><small>ITEMS LISTED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SHOWN.</small></p> <ul style="list-style-type: none"> • 5 YEAR / 100,000 MILE POWERTRAIN LIMITED WARRANTY. SEE DEALER FOR DETAILS. • SCHEDULED MAINTENANCE 2YR / 24,000 MILES OIL & FILTER • 4 WHEEL, TIRE ROTATION. SEE WWW.CHEVY.COM OR DEALER FOR DETAILS. <p>MECHANICAL</p> <ul style="list-style-type: none"> • TRANSMISSION, 5-SPEED MANUAL • ENGINE, ECOTEC 1.2L DOHC 4-CY • HILL HOLD FEATURE • OIL LIFE MONITOR SYSTEM • DRIVER INFORMATION CENTER • POWER STEERING, ELECTRIC <p>SAFETY & SECURITY</p> <ul style="list-style-type: none"> • 10 AIRBAGS, DRIVER & FRONT PASSENGER FRONTAL, KNEE SIDE 	<p>IMPACT & HEAD CURTAIN, REAR OUTBOARD PASSENGERS' SIDE</p> <ul style="list-style-type: none"> • IMPACT & HEAD CURTAIN • 6 MTHS ONSTAR DIRECTIONS AND CONNECTIONS W/ AUTO CRASH RESPONSE, TURN-BY-TURN NAV, & 5-YEARS REMOTE-LINK APP KEY FOR SERVICES ASK DEALER ABOUT GEOGRAPHIC COVERAGE) • TIRE PRESSURE MONITOR SYSTEM • STABILITRAK-STABILITY CONTROL SYSTEM W/ TRACTION CONTROL • BRAKES, 4-WHEEL ANTILOCK, FRONT DISC REAR DRUM • WINDSHIELD WIPERS, FRONT INTERMITTENT • REAR WINDOW DEFROSTER • REAR WIPER • L.A.T.C.H. SYSTEM • BRAKE ASSIST <p>EXTERIOR</p> <ul style="list-style-type: none"> • WHEELS, 15" SILVER PAINTED 	<p>ALUMINUM</p> <ul style="list-style-type: none"> • SPOILER, REAR • CHROME GRILLE SURROUND • MIRRORS, OUTSIDE, BODY-COLOR, MANUAL-FOLDING • BODY COLOR DOOR HANDLES • SOLAR ABSORBING GLASS <p>INTERIOR</p> <ul style="list-style-type: none"> • POWER WINDOWS • SEATS, FRONT HIGH-BACK BUCKET W/ ADJUSTABLE HEAD RESTRAINT • REAR SEAT, SPLIT BACK FOLDING • AIR CONDITIONING • AIR FILTRATION SYSTEM • ARMREST, DRIVER, FOLDING • STEERING COLUMN, TILT • AM / FM STEREO 4 SPEAKERS • SEEK / SCAN • ASSIST HANDLES, OUTBOARD, FRONT AND REAR • 4 CUP HOLDERS • FRONT-PASSENGER SEATBACK 	<p>MAP POCKET</p> <ul style="list-style-type: none"> • ELECTRONIC LIFTGATE RELEASE • REAR CENTER CONSOLE WITH STORAGE TRAY • REAR CARGO COMPARTMENT LAMP & SECURITY SHELF <p>OPTIONS & PRICING</p> <p style="text-align: right;"><small>MANUFACTURER'S SUGGESTED RETAIL PRICE</small></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">STANDARD VEHICLE PRICE</td> <td style="text-align: right;">\$12,170.00</td> </tr> <tr> <td colspan="2"><small>OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN)</small></td> </tr> <tr> <td style="text-align: right;">TOTAL OPTIONS</td> <td style="text-align: right;">\$0.00</td> </tr> <tr> <td style="text-align: right;">TOTAL VEHICLE & OPTIONS</td> <td style="text-align: right;">\$12,170.00</td> </tr> <tr> <td style="text-align: right;">DESTINATION CHARGE</td> <td style="text-align: right;">825.00</td> </tr> <tr> <td style="text-align: right;">TOTAL VEHICLE PRICE*</td> <td style="text-align: right;">\$12,995.00</td> </tr> </table>	STANDARD VEHICLE PRICE	\$12,170.00	<small>OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN)</small>		TOTAL OPTIONS	\$0.00	TOTAL VEHICLE & OPTIONS	\$12,170.00	DESTINATION CHARGE	825.00	TOTAL VEHICLE PRICE*	\$12,995.00
STANDARD VEHICLE PRICE	\$12,170.00														
<small>OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN)</small>															
TOTAL OPTIONS	\$0.00														
TOTAL VEHICLE & OPTIONS	\$12,170.00														
DESTINATION CHARGE	825.00														
TOTAL VEHICLE PRICE*	\$12,995.00														

<p>EPA DOT Fuel Economy and Environment</p> <p>Fuel Economy</p> <p>34 MPG <small>combined city/hwy</small></p> <p>31 MPG <small>city</small></p> <p>39 MPG <small>highway</small></p> <p>2.9 gallons per 100 miles</p> <p>You save \$3,750 <small>in fuel costs over 5 years compared to the average new vehicle.</small></p> <p>Annual fuel cost \$1,550</p> <p>Fuel Economy & Greenhouse Gas Rating (tailpipe only)</p> <p>8 (Best)</p> <p><small>This vehicle emits 268 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; learn more at fuelconomy.gov.</small></p> <p>Smog Rating (tailpipe only)</p> <p>6 (Best)</p> <p><small>This vehicle emits 268 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; learn more at fuelconomy.gov.</small></p> <p><small>Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 23 MPG and costs \$1,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.59 per gallon. MPGS is miles per gallon city equivalent. Vehicle emissions are a significant cause of climate change and smog.</small></p> <p>fuelconomy.gov <small>Calculate personalized estimates and compare vehicles</small></p>	<p>GOVERNMENT 5-STAR SAFETY RATINGS</p> <p><small>This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.</small></p> <p><small>Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4236</small></p>	<p>PARTS CONTENT INFORMATION</p> <p><small>This label has been applied pursuant to Federal law. Do not remove prior to delivery to the ultimate purchaser. Includes Manufacturer's Recommended tire, battery, fluids, oil, and accessories not listed above, but listed below, here, later or in some text.</small></p> <p>FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 8% MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA 74%</p> <p><small>NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.</small></p> <p>FOR THIS VEHICLE: FINAL ASSEMBLY POINT: CHANGWON, KY KOREA COUNTRY OF ORIGIN: ENGINE: KOREA TRANSMISSION: KOREA</p> <p><small>© 2009 General Motors LLC (GM), INC. PROUDLY PRINTED IN THE U.S.A.</small></p>
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DANVILLE, NY 14437-9258

Figure A-78: Monroney Label Photograph

A-43

TR2663

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

Driver & Passenger Dummy Instrumentation Plots

Fig.	Description	Page
1	Driver Head X Acceleration vs. Time Primary	B-5
2	Driver Head Y Acceleration vs. Time Primary	B-5
3	Driver Head Z Acceleration vs. Time Primary	B-5
4	Driver Head Resultant Acceleration vs. Time Primary	B-5
5	Driver Chest X Deflection vs. Time	B-6
6	Driver Chest X Acceleration vs. Time Primary	B-6
7	Driver Chest Y Acceleration vs. Time Primary	B-6
8	Driver Chest Z Acceleration vs. Time Primary	B-6
9	Driver Chest Resultant Acceleration vs. Time Primary	B-7
10	Driver Upper Neck Force X vs. Time Primary	B-7
11	Driver Upper Neck Force Z vs. Time Primary	B-7
12	Driver Upper Neck Moment Y vs. Time Primary	B-7
13	Driver Nij vs. Time Primary	B-8
14	Driver Left Femur Force vs. Time	B-8
15	Driver Right Femur Force vs. Time	B-8
16	Passenger Head X Acceleration vs. Time Primary	B-8
17	Passenger Head Y Acceleration vs. Time Primary	B-9
18	Passenger Head Z Acceleration vs. Time Primary	B-9
19	Passenger Head Resultant Acceleration vs. Time Primary	B-9
20	Passenger Chest X Deflection vs. Time	B-9
21	Passenger Chest X Acceleration vs. Time Primary	B-10
22	Passenger Chest Y Acceleration vs. Time Primary	B-10
23	Passenger Chest Z Acceleration vs. Time Primary	B-10
24	Passenger Chest Resultant Acceleration vs. Time Primary	B-10
25	Passenger Upper Neck Force X vs. Time Primary	B-11
26	Passenger Upper Neck Force Z vs. Time Primary	B-11
27	Passenger Upper Neck Moment Y vs. Time Primary	B-11
28	Passenger Nij vs. Time Primary	B-11
29	Passenger Left Femur Force vs. Time	B-12
30	Passenger Right Femur Force vs. Time	B-12

The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

Additional Driver Dummy Instrumentation Data

Driver Head X Acceleration Redundant
Driver Head Y Acceleration Redundant
Driver Head Z Acceleration Redundant
Driver Upper Neck Force Y
Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration Redundant
Driver Pelvis X
Driver Pelvis Y
Driver Pelvis Z
Driver Left Femur Redundant
Driver Right Femur Redundant
Driver Left Upper Tibia Moment X
Driver Left Upper Tibia Moment Y
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Driver Shoulder Belt Force
Driver Lap Belt Force

Additional Passenger Dummy Instrumentation Data

Passenger Head X Acceleration Redundant
Passenger Head Y Acceleration Redundant
Passenger Head Z Acceleration Redundant
Passenger Upper Neck Force X
Passenger Upper Neck Force Z
Passenger Upper Neck Moment Y
Passenger Chest X Acceleration Redundant
Passenger Chest Y Acceleration Redundant
Passenger Chest Z Acceleration Redundant
Passenger Pelvis X

Additional Passenger Dummy Instrumentation Data ... (continued)

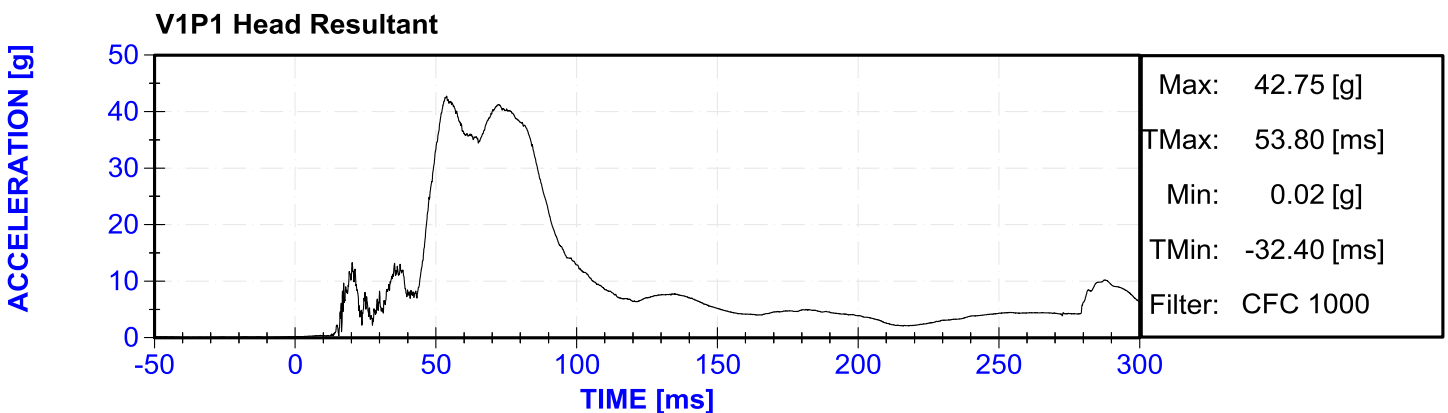
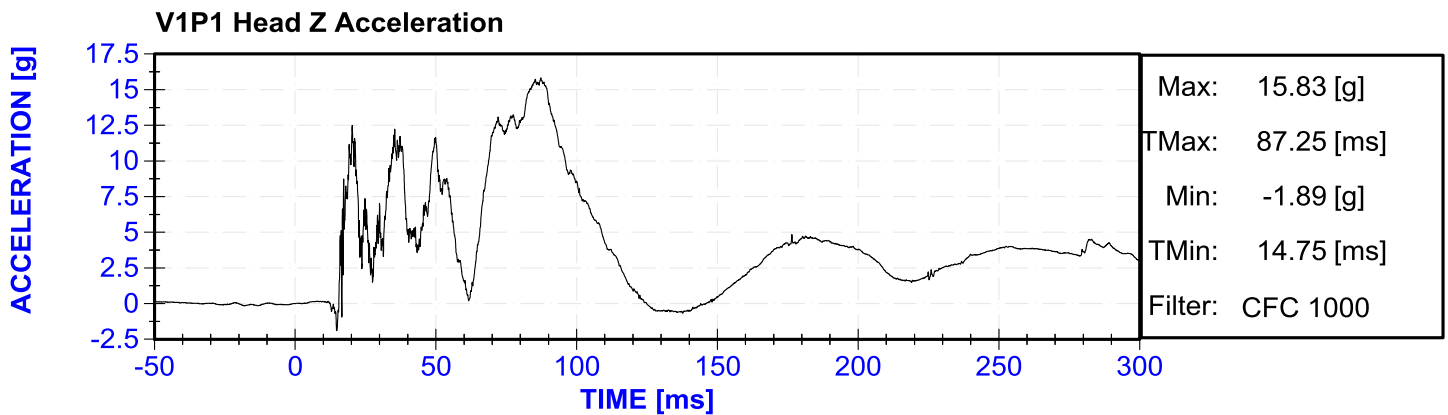
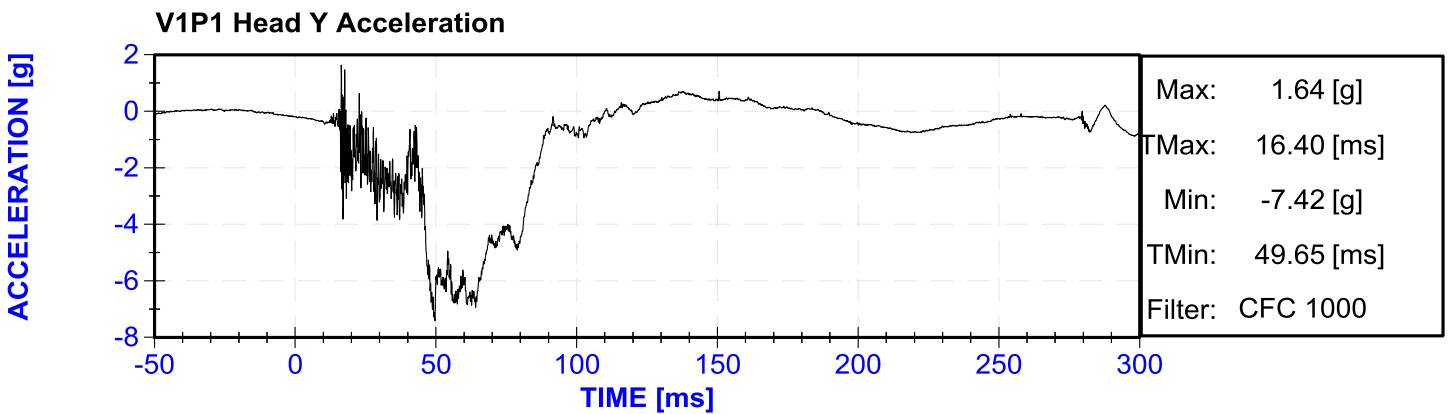
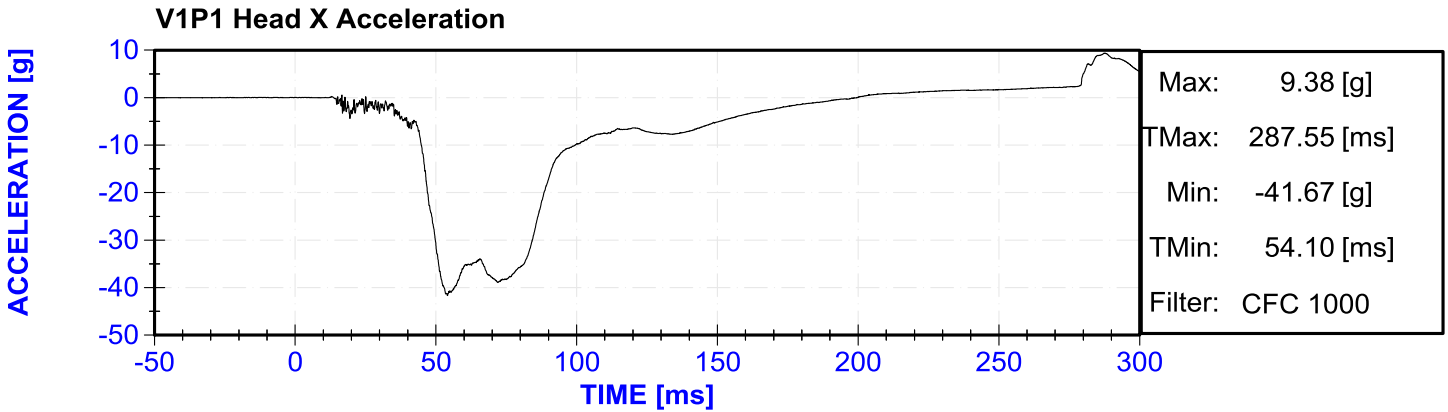
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Passenger Left Lower Tibia Moment X
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Passenger Left Lower Tibia Force Z
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Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
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Passenger Right Foot Aft Z
Passenger Shoulder Belt Force
Passenger Lap Belt Force

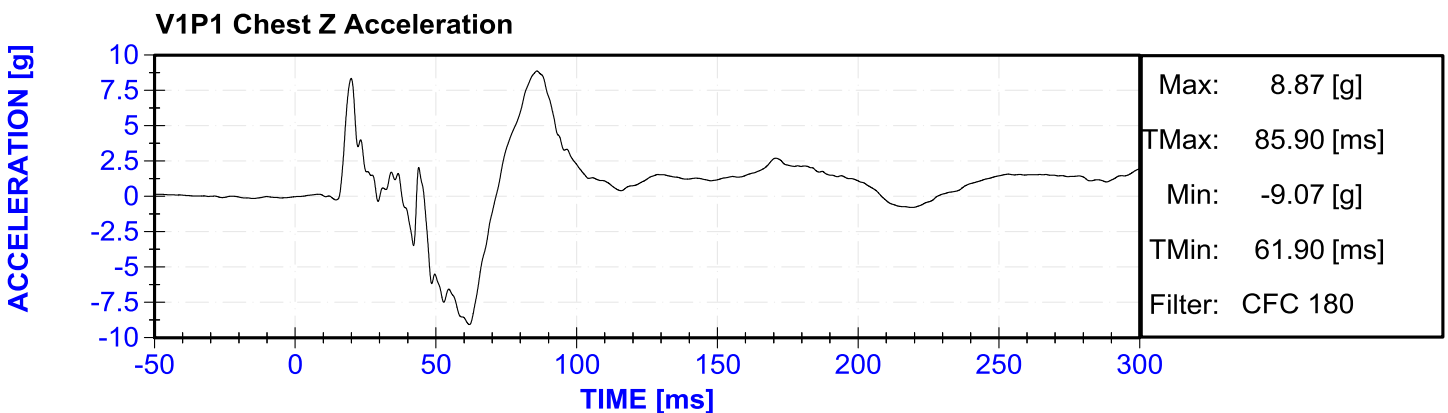
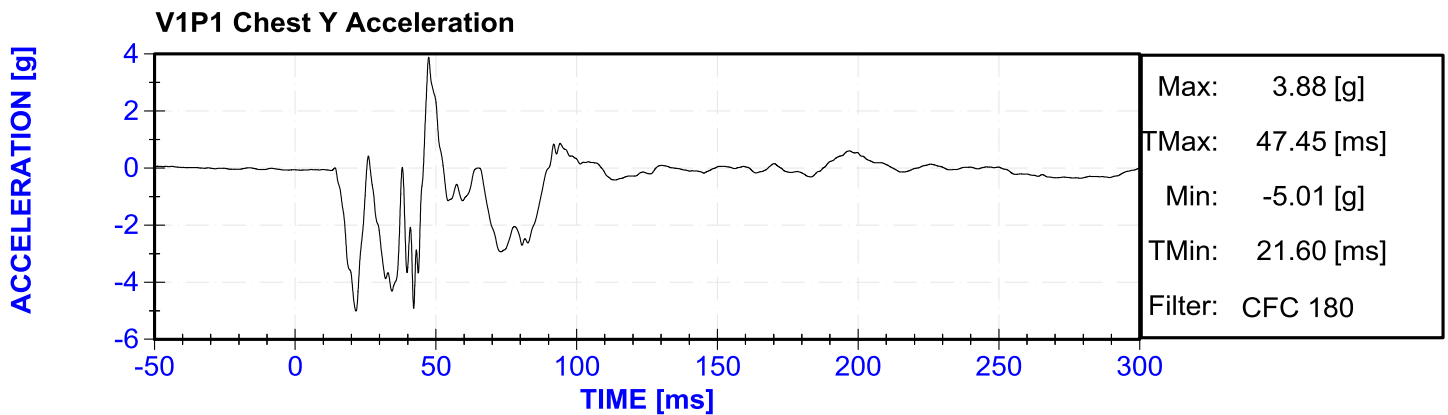
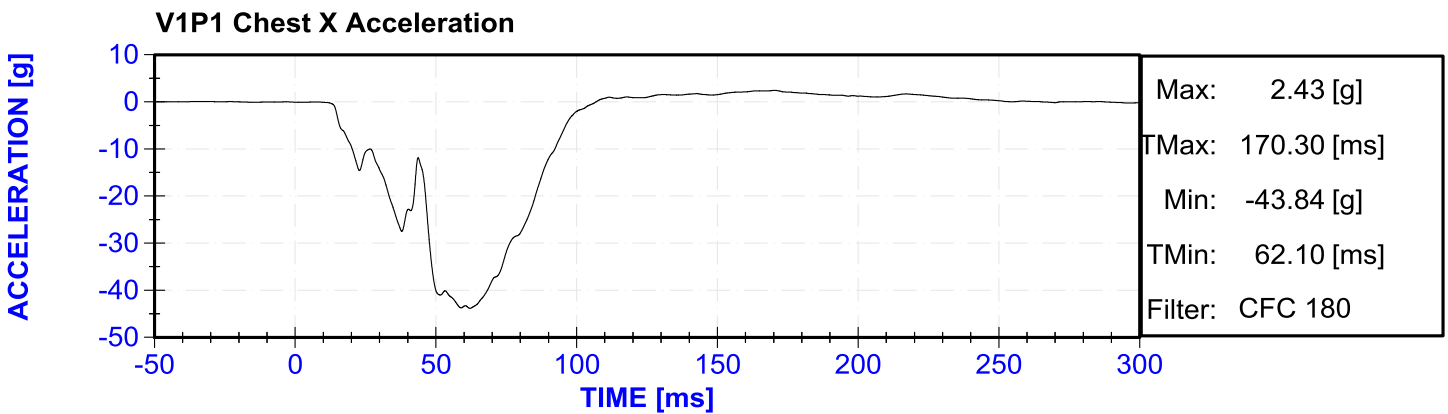
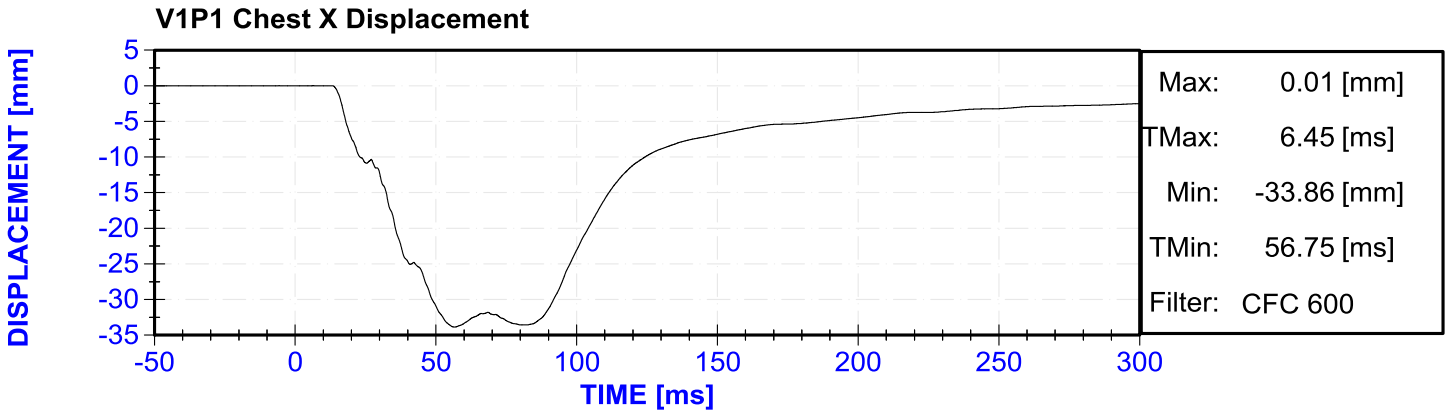
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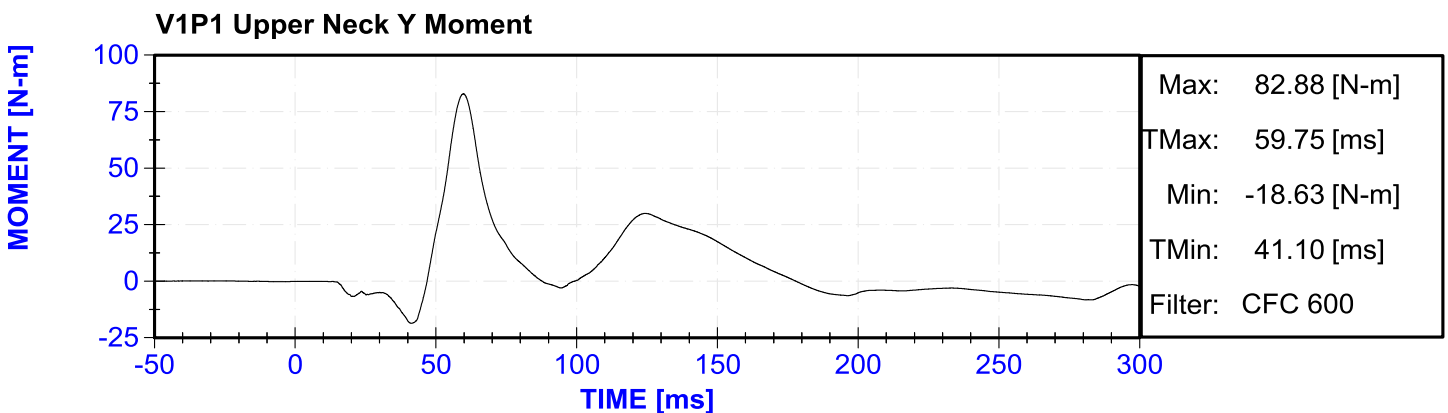
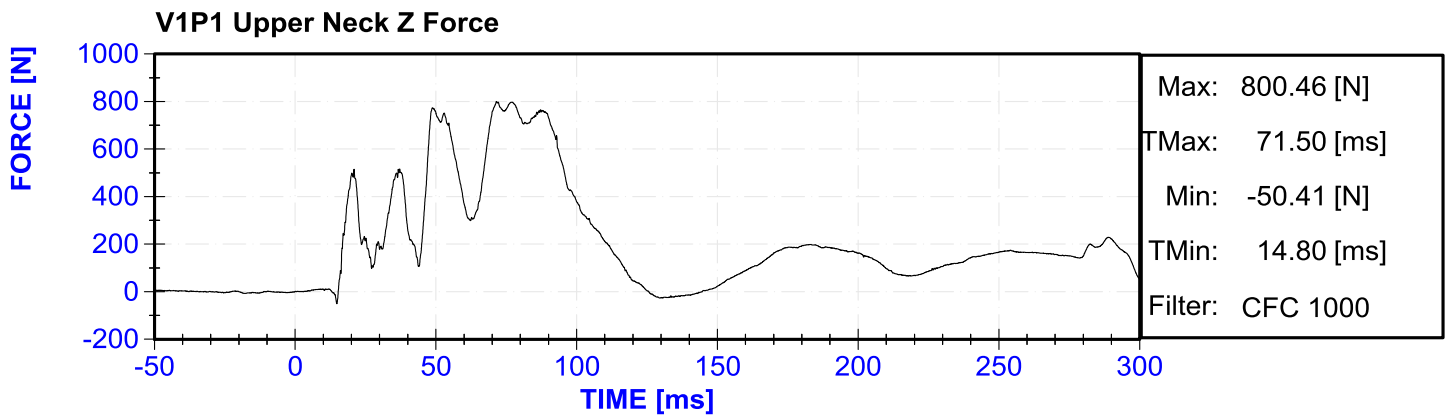
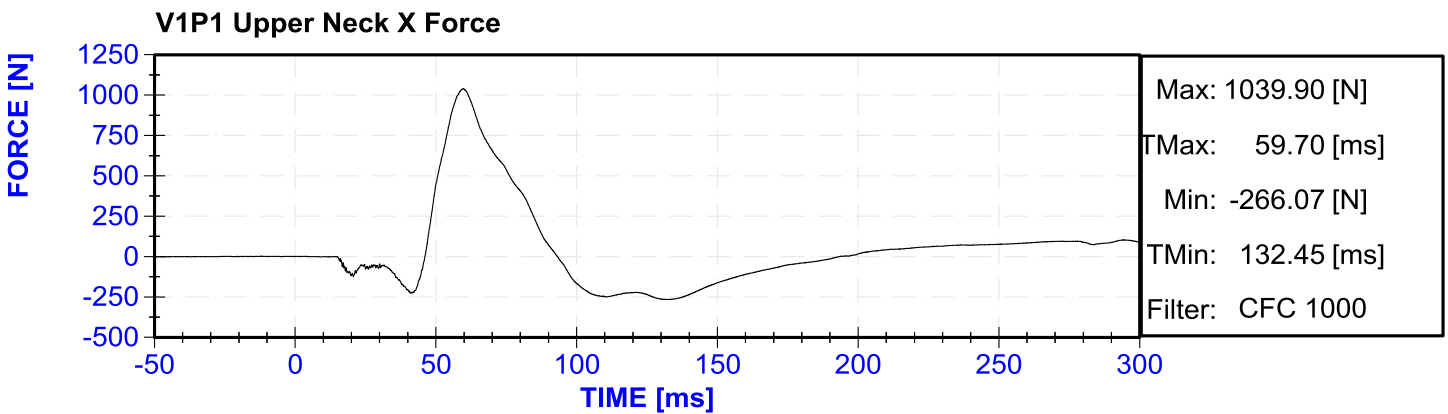
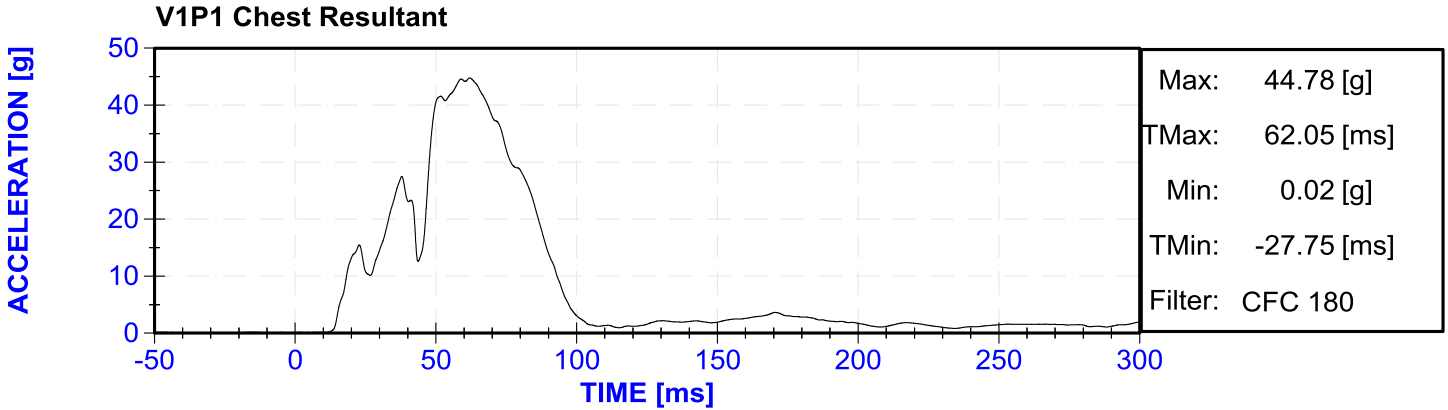
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Right Rear Seat Crossmember X Redundant
Vehicle Engine Top X
Vehicle Engine Bottom X

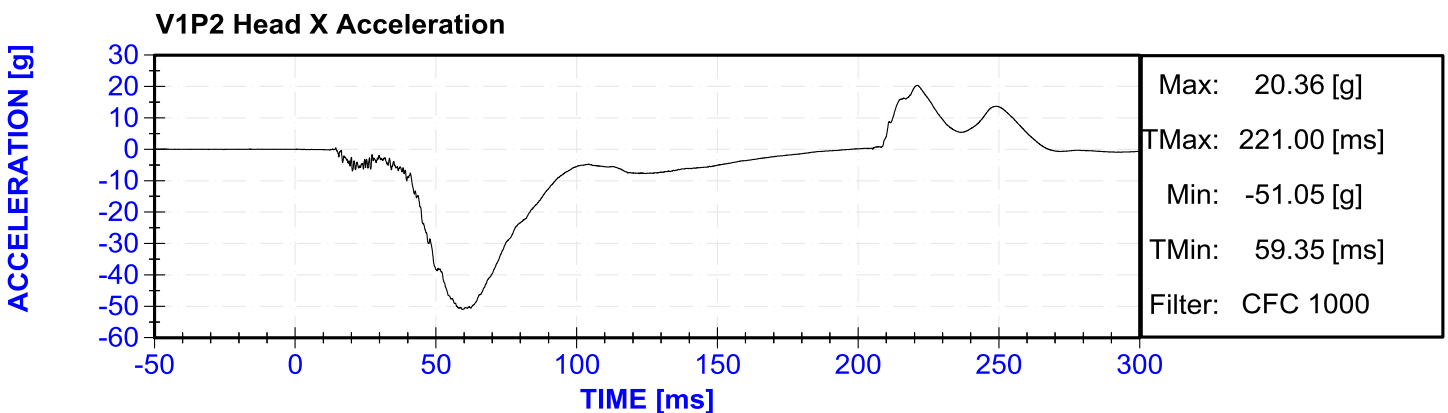
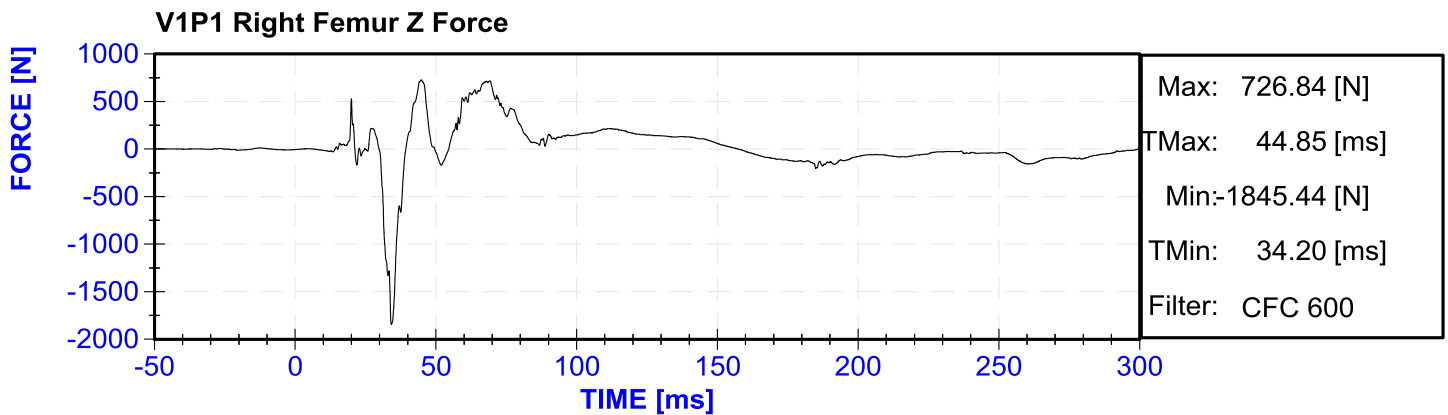
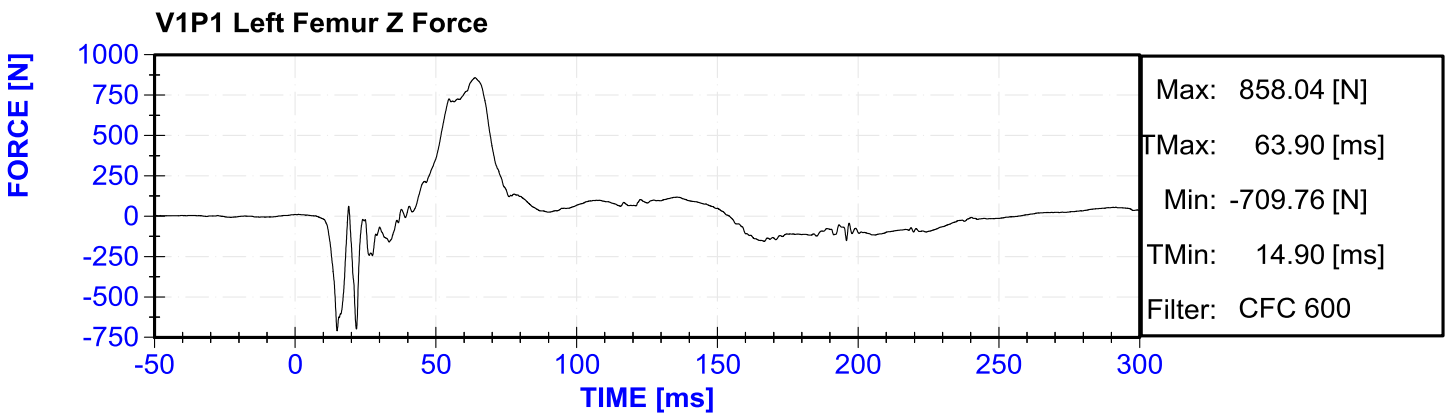
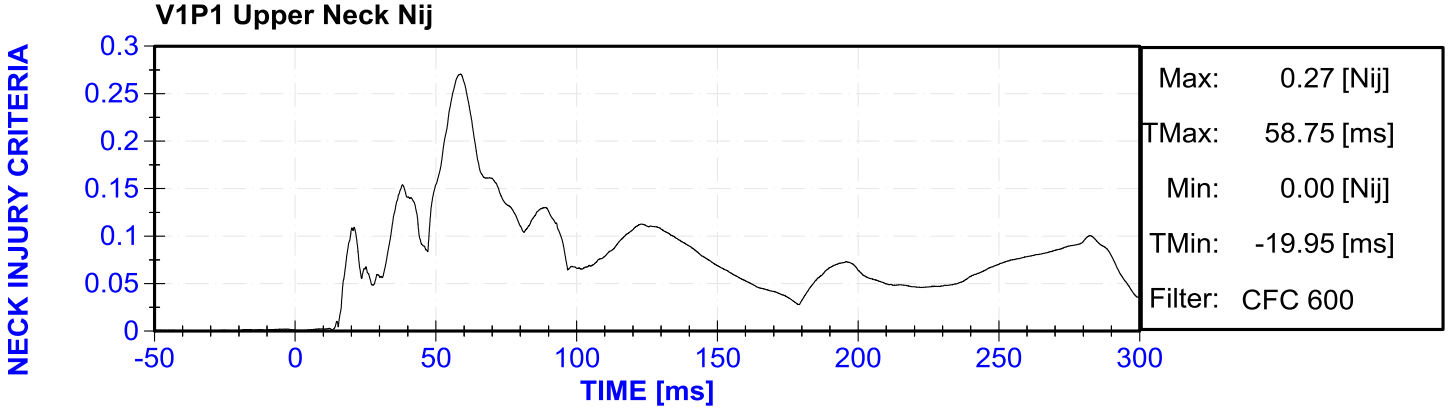
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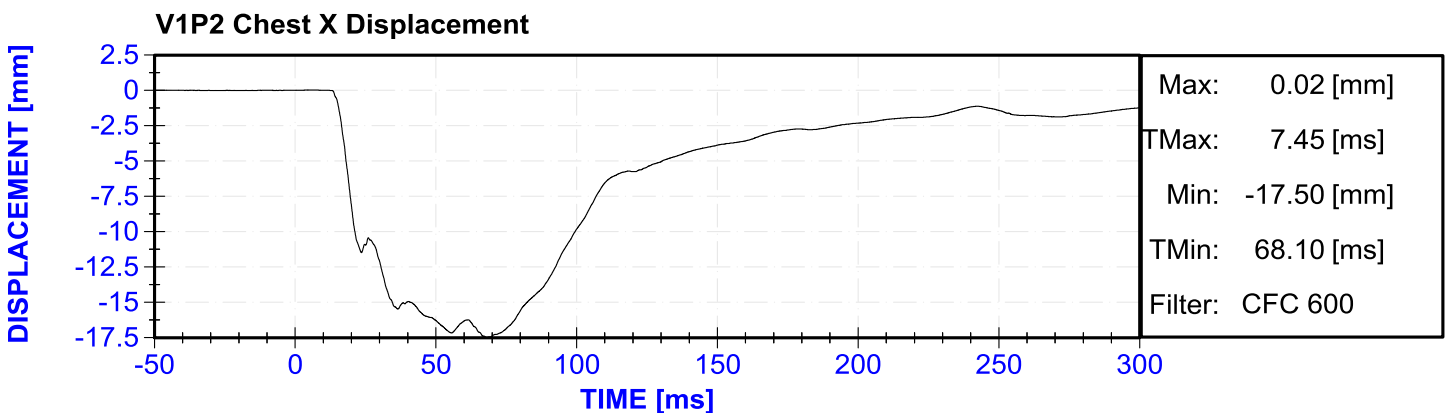
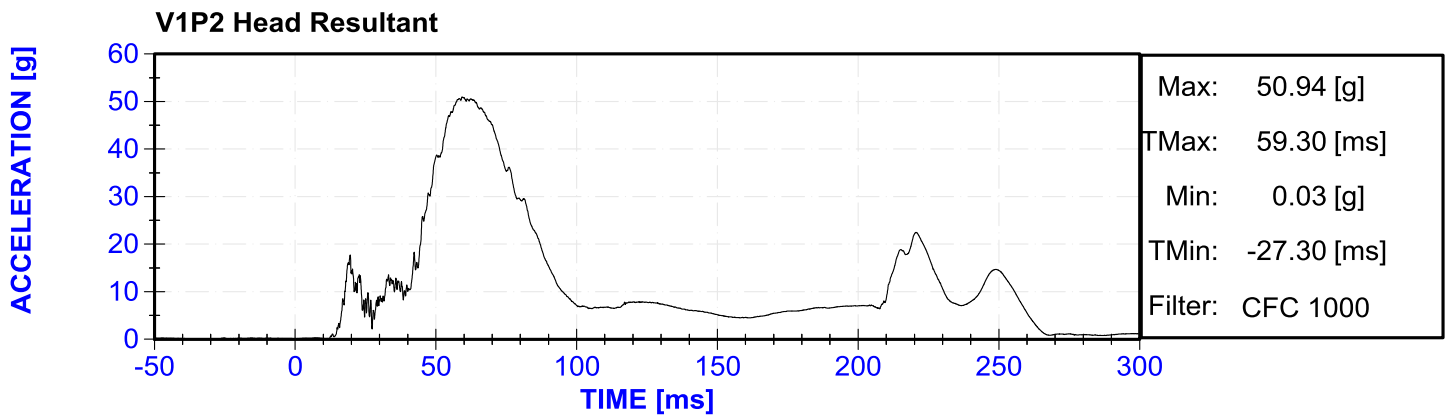
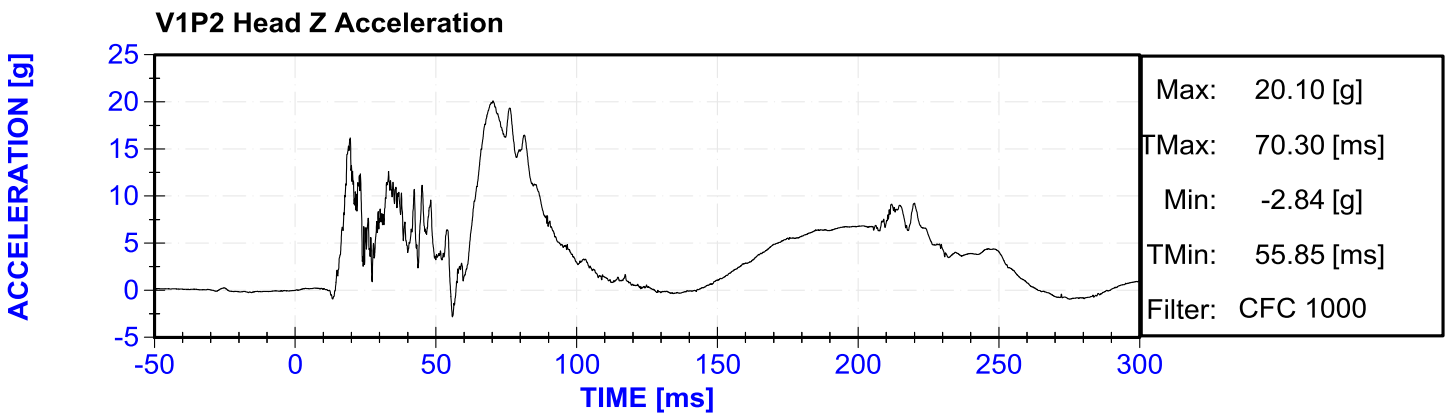
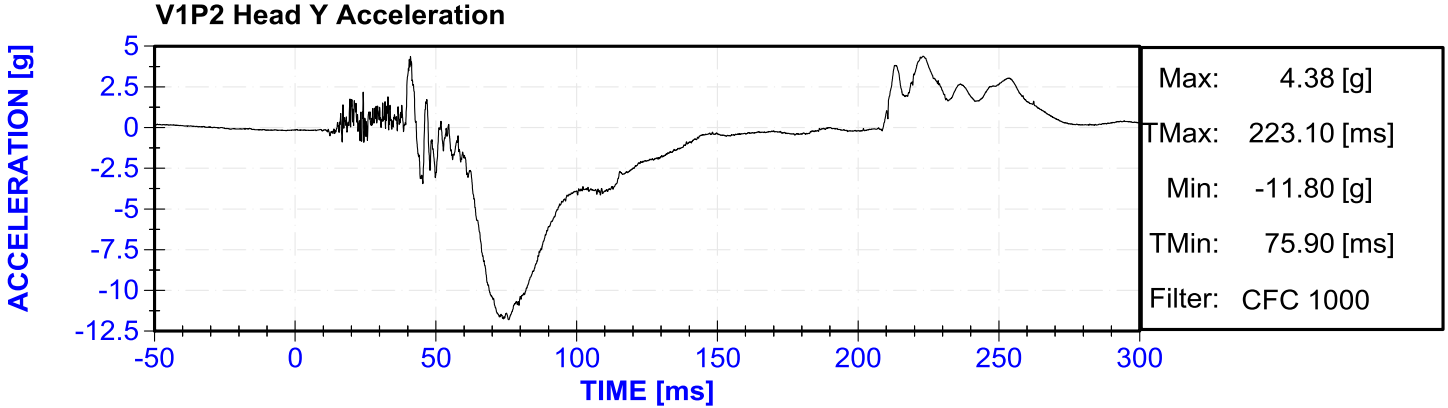
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Load Cell Barrier C1-A9
Load Cell Barrier D1-A9

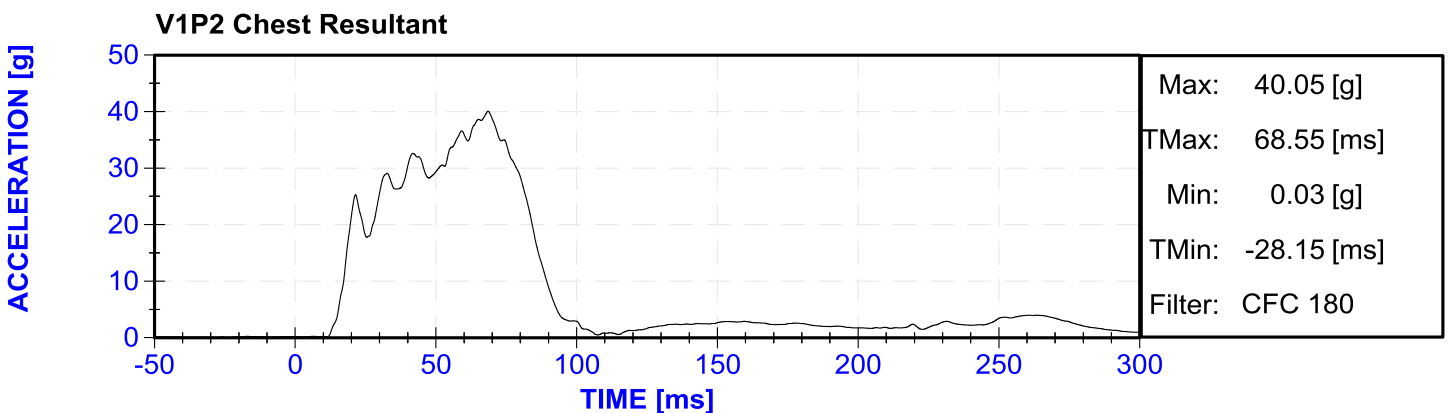
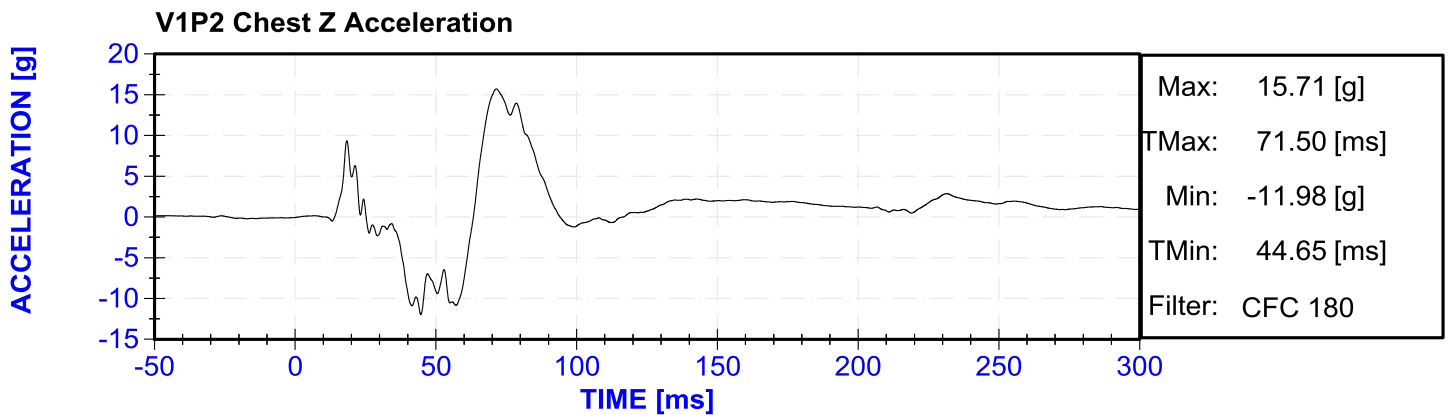
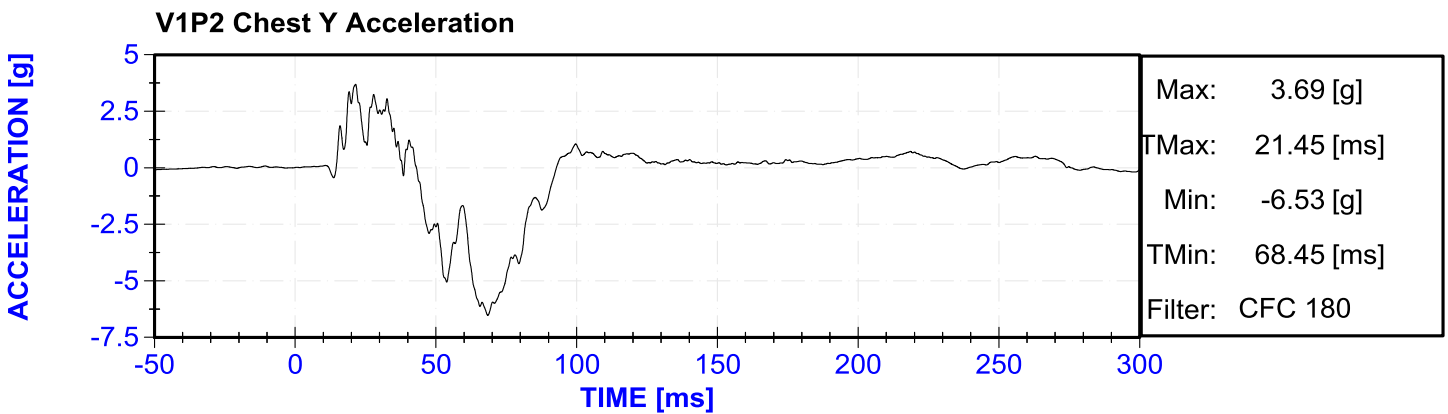
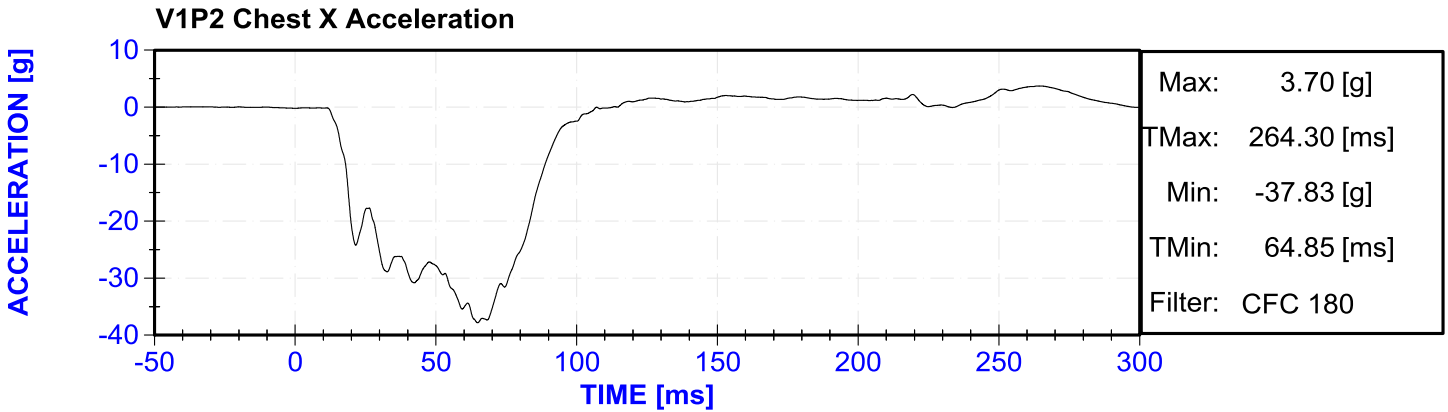


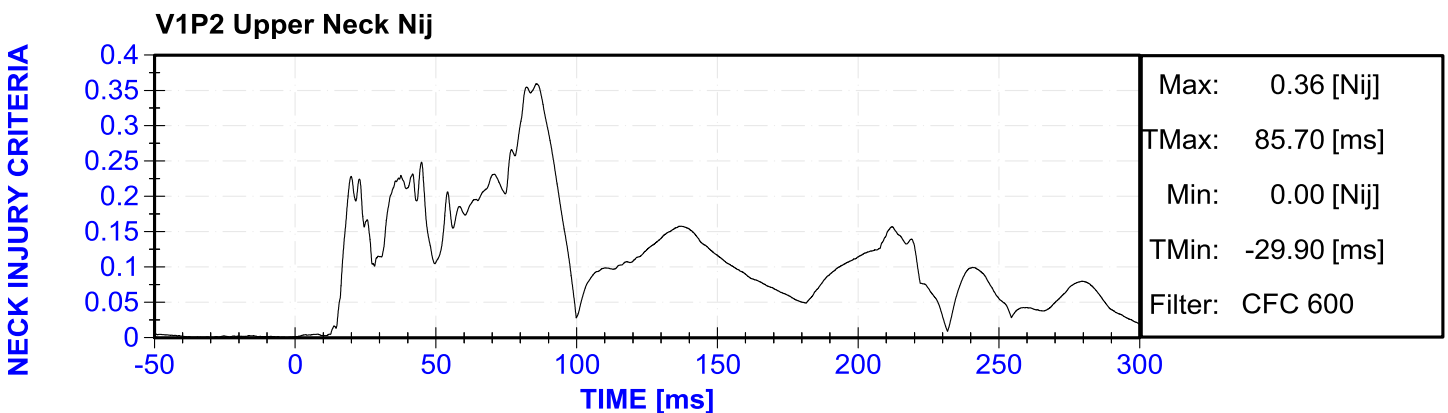
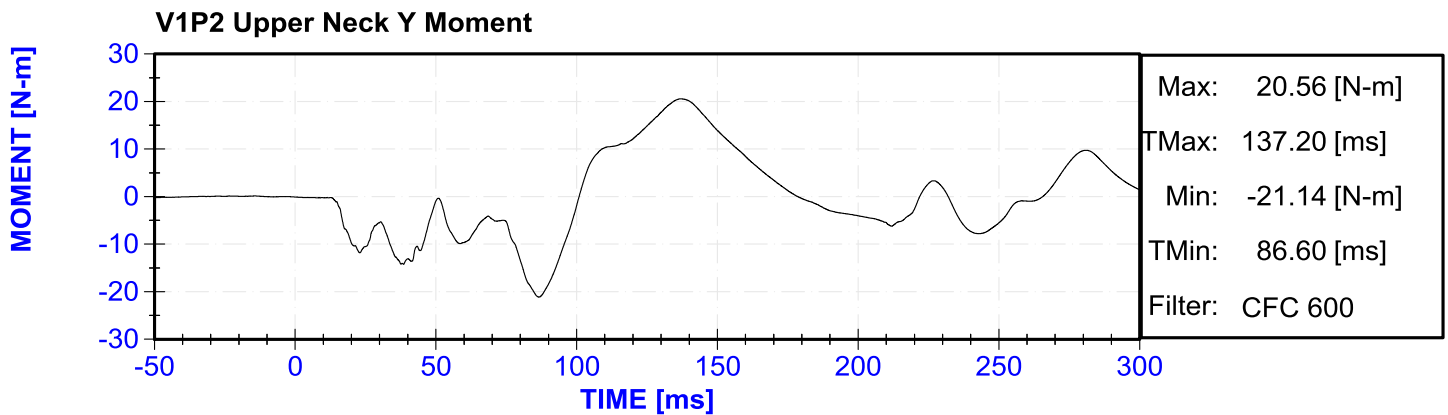
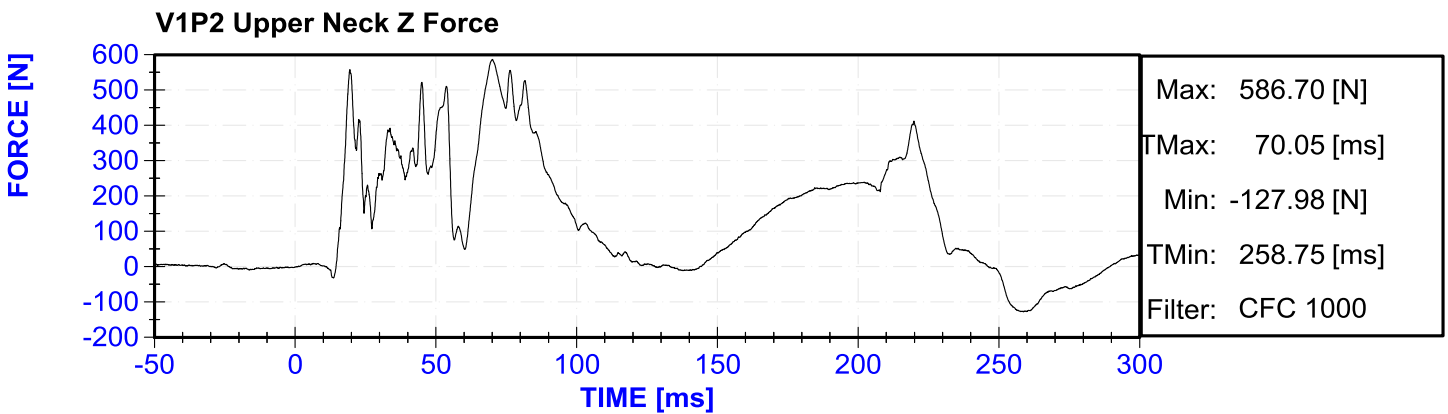
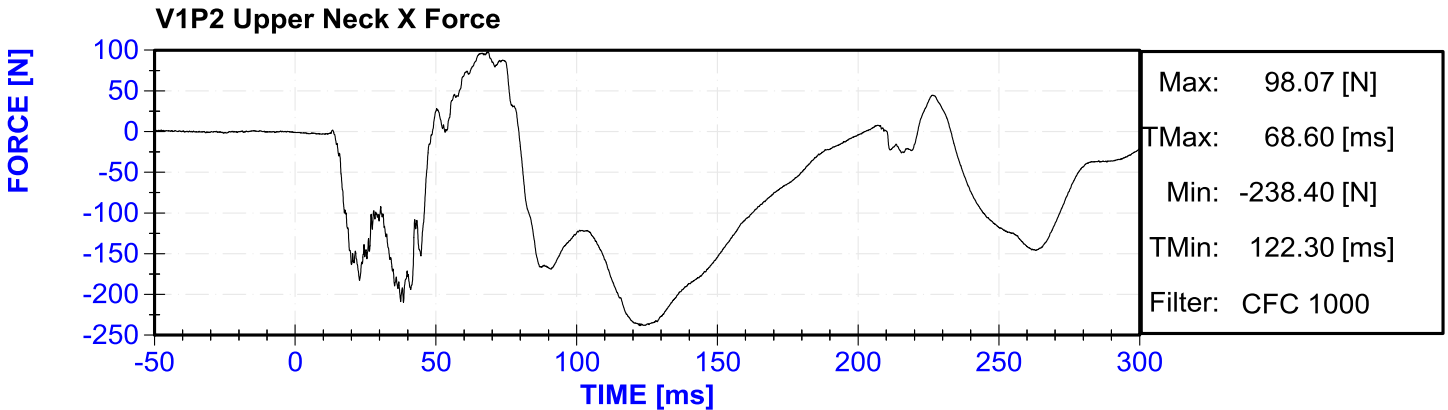


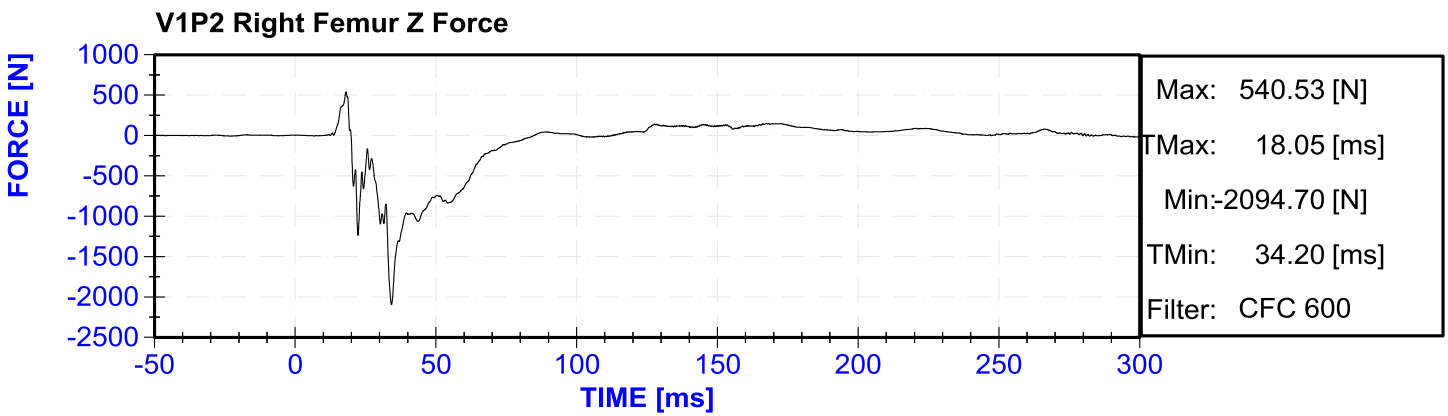
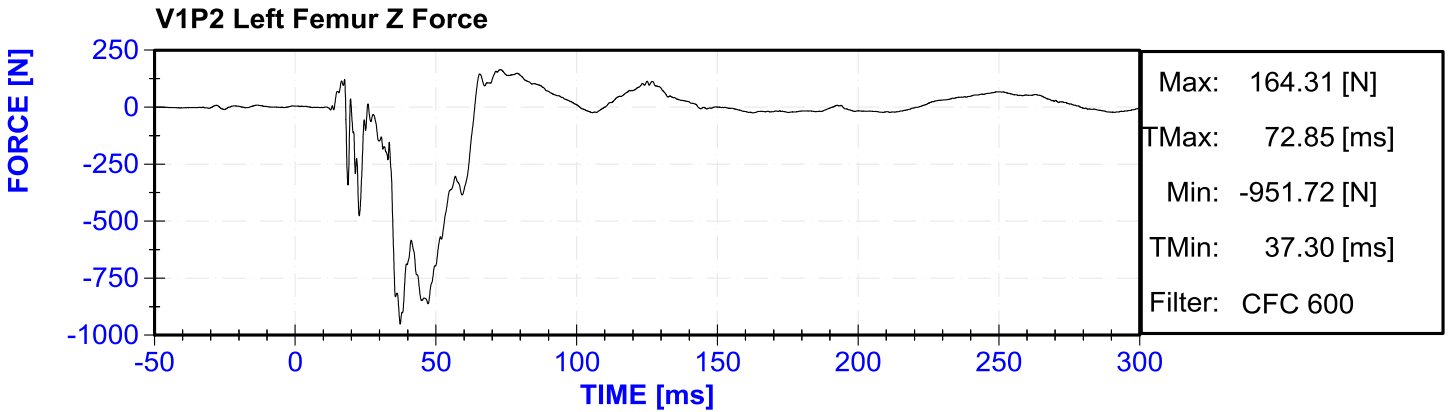












APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 064



50th Male External Measurements

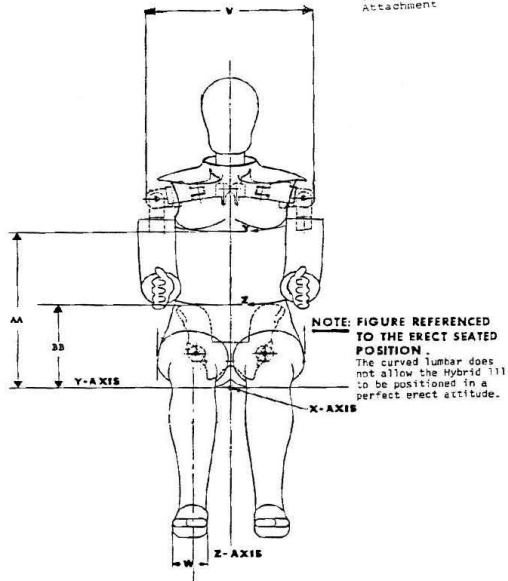
S/N 064

Symbol	Description	Specification	Results	Pass
		in	in	
A	Sitting Height	34.6 – 35.0	34.9	Yes
B	Shoulder Pivot Height	19.9 - 20.5	20.2	Yes
C	H-Point Height	3.3 – 3.5	3.4	Yes
D	H-Point from Backline	5.3 – 5.5	5.5	Yes
E	Shoulder Pivot from Backline	3.3 – 3.7	3.5	Yes
F	Thigh Clearance	5.5 – 6.1	6.0	Yes
G	Back of Elbow to Wrist Pivot	11.4 – 12.0	11.6	Yes
H	Head Back to Backline	1.6 – 1.8	1.7	Yes
I	Shoulder to Elbow Length	13.0 – 13.6	13.4	Yes
J	Elbow Rest Height	7.5 – 8.3	7.8	Yes
K	Buttock to Knee Length	22.8 – 23.8	23.1	Yes
L	Popliteal Height	16.9 – 17.9	17.3	Yes
M	Knee Pivot Height	19.1 – 19.7	19.4	Yes
N	Buttock Popliteal Length	17.8 – 18.8	18.7	Yes
O	Chest Depth without Jacket	8.4 – 9.0	8.5	Yes
P	Foot Length (right)	9.9 – 10.5	10.2	Yes
V	Shoulder Breadth	16.3 – 17.2	16.9	Yes
W	Foot Breadth	3.6 – 4.2	3.9	Yes
Y	Chest Circumference with Jacket	38.2 – 39.4	38.9	Yes
Z	Waist Circumference	32.9 – 34.1	33.7	Yes
AA	Reference Location (Chest Circumference)	16.9 – 17.1	16.9	Yes
BB	Reference Location (Waist Circumference)	8.9 – 9.1	9.0	Yes

Technician: R.Weil

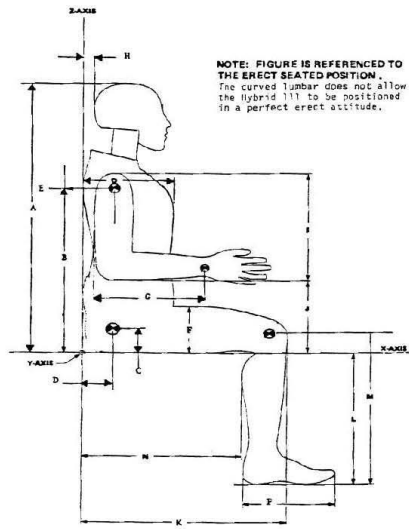
03/27/2013

USG 2485
Attachment



HYBRID III Exterior Body Dimensions - Front View

USG 2485
Attachment



HYBRID III Exterior Body Dimensions - Side View



VERIFICATION REPORT

Test Name:	Head Drop	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:		Test Date:	3/26/2013
		Test Time:	4:16:33 PM

Component Part Number	Component Serial Number
Head Skin - 78051-228	7997

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	22.5 deg C P
Humidity	10 -- 70	28.1 %RH P
Resultant Acceleration	225 -- 275	247.9 g P
Oscillation	0 -- 10	2.5 % P
Lateral Acceleration	-15 -- 15	2.3 g P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



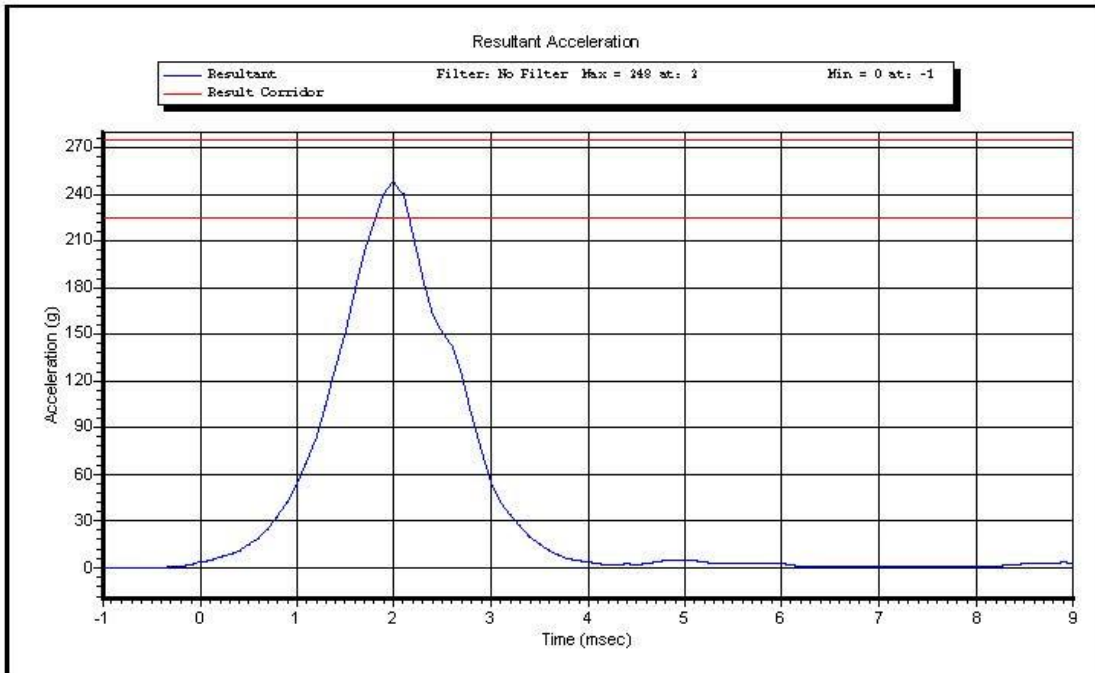
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58904	1/25/2013
Endevco	7264-2000	P58911	1/26/2013
Endevco	7264-2000	P58757	1/26/2013



Test Name: **Head Drop**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**

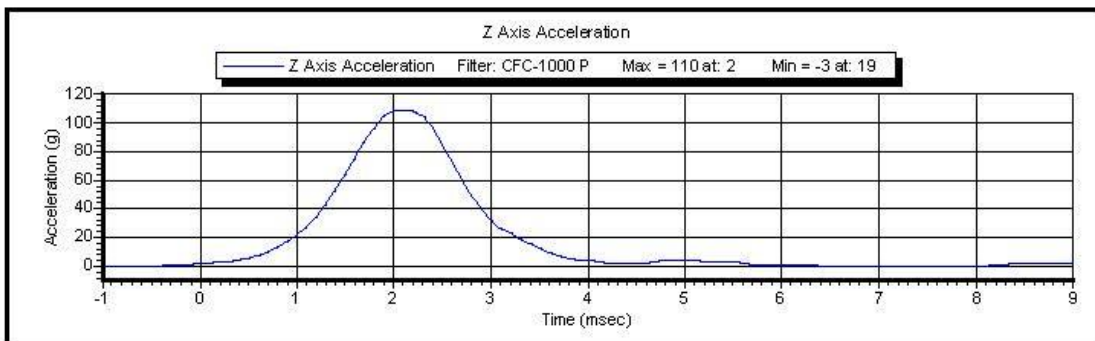
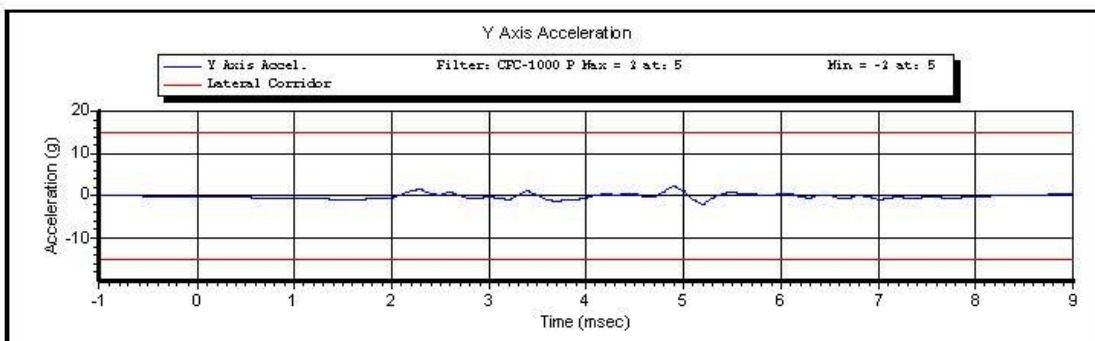
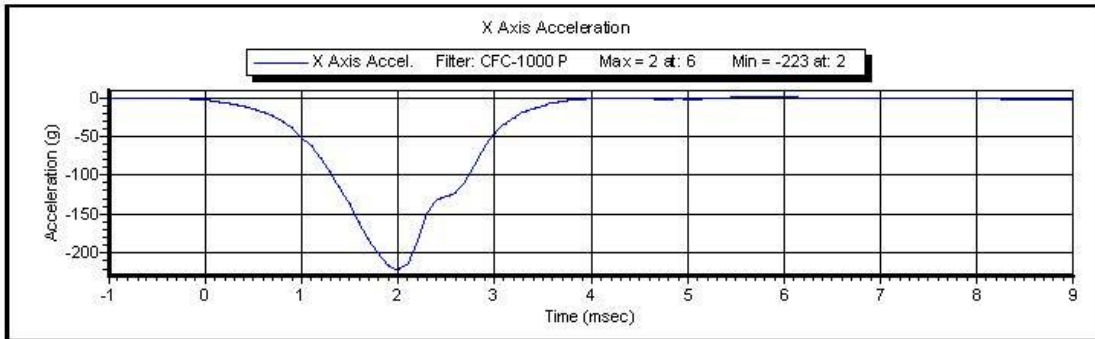


Test ID:

Test Time: **4:16:33 PM**

Test Date: **3/26/2013**

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Test ID:

Test Time: 4:16:33 PM

Test Date: 3/26/2013

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:		Test Date:	3/27/2013
		Test Time:	11:38:05 AM

Component Part Number	Component Serial Number
Neck - 78051-336	02-1692

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	23.2 %RH P
Velocity	5.94 -- 6.19	6.116 m/s P
Pendulum Deceleration at 10 ms	17.2 -- 21.2	18.33 g P
Pendulum Deceleration at 20 ms	14 -- 19	16.5 g P
Pendulum Deceleration at 30 ms	11 -- 16	13.2 g P
Max Pendulum Deceleration after 30 ms	0 -- 22	13.9 g P
Decel Time to 5 g	38 -- 46	40.4 ms P
D Plane Rotation	81 -- 106	101.3 degrees P
Time at Max Rotation	72 -- 82	78.6 ms P
Rotation Decay to Zero	147 -- 174	157.3 ms P
Moment About Occipital Condyle	-80.0 -- -52.9	-67.57 Nm P
Time at Max Moment	65 -- 79	74.7 ms P
Moment Decay to Zero	120 -- 148	143.8 ms P

All test parameters are within specifications

Technician: **R.Weil**
 Supervisor: **E.Dutton**



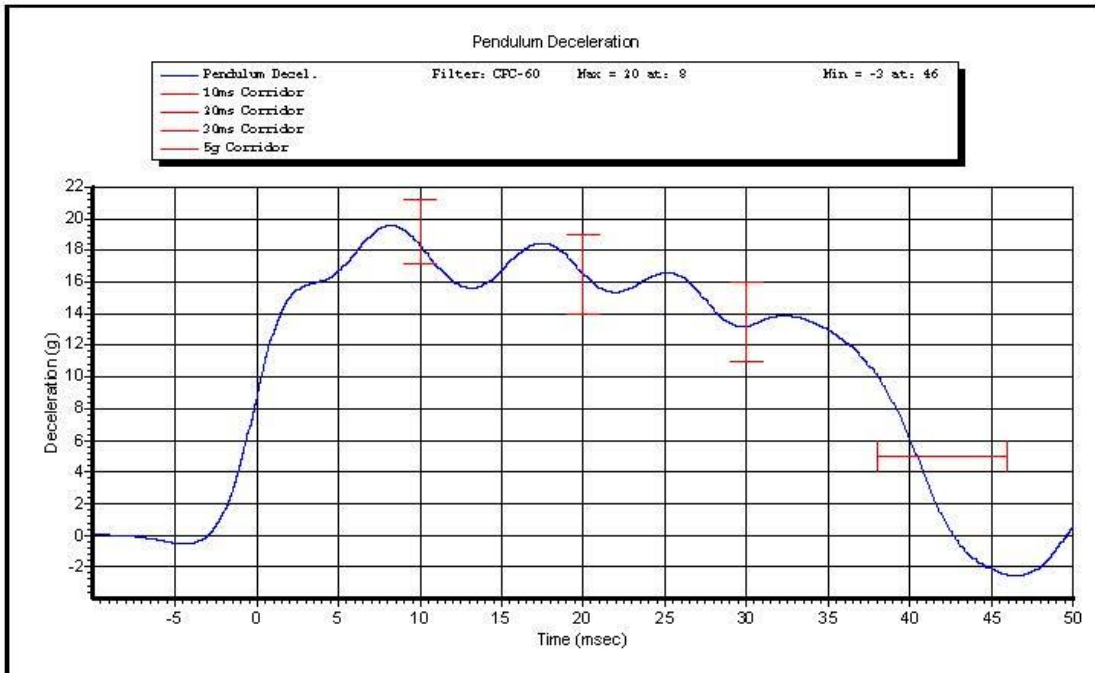
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C15016	2/20/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	1/25/2013
Denton	1716A	LC-2186 My	5/21/2012
Denton	1716A	LC-2186 Fx	5/21/2012



Name of Test: **Neck Extension**
Name of Sub Test:
Type of ATD: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**

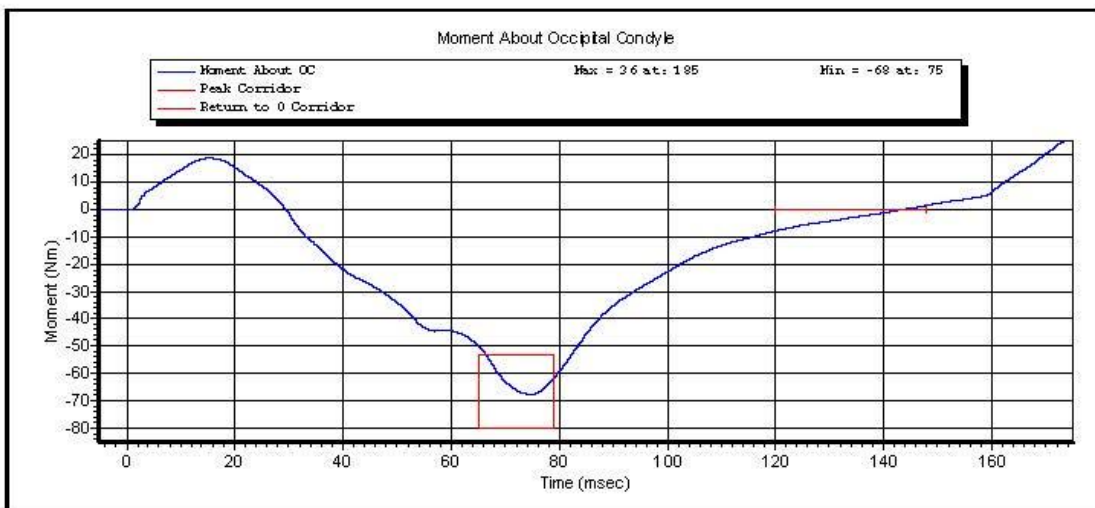
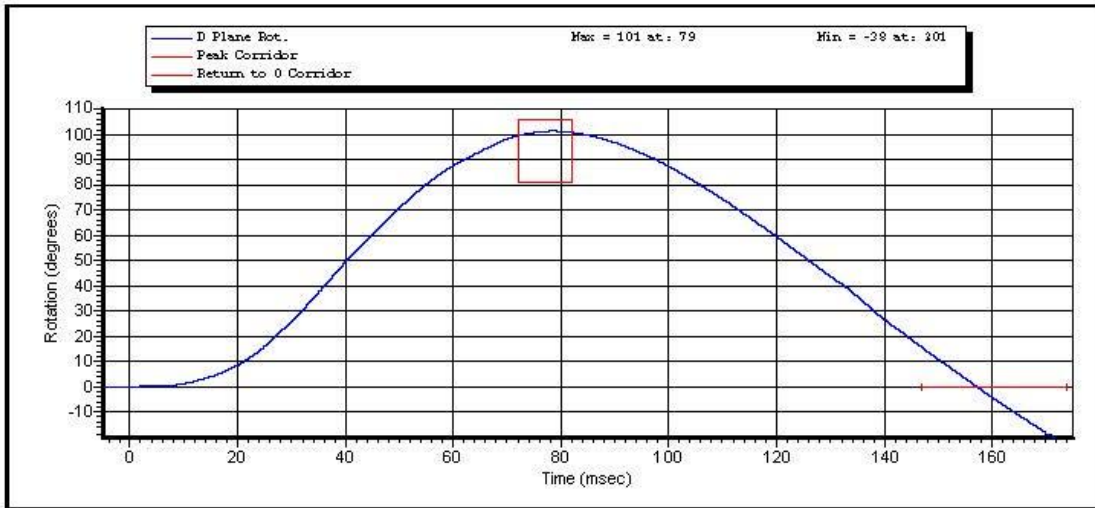


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Time of Test: **11:38:05 AM**

Date of Test: **3/27/2013**

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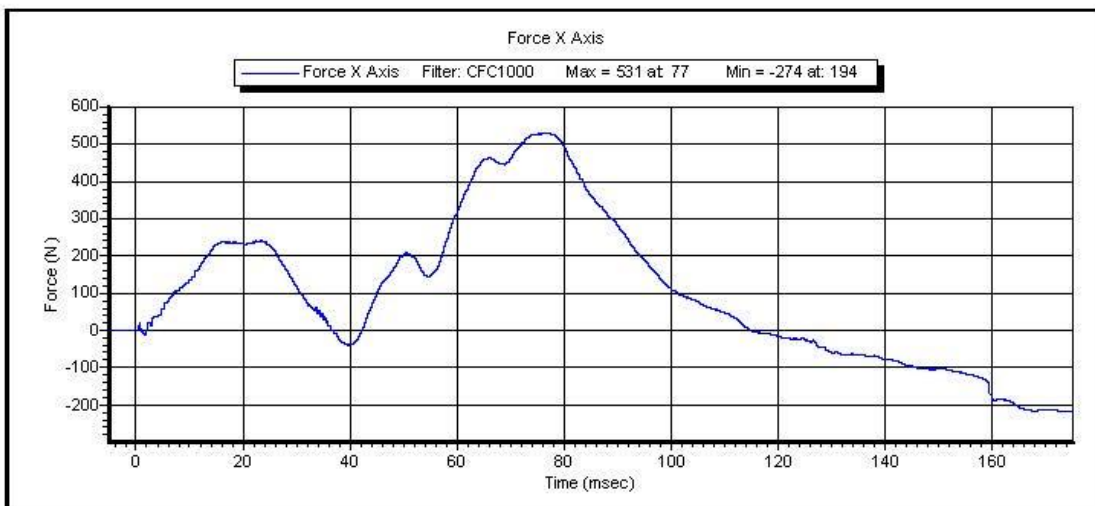
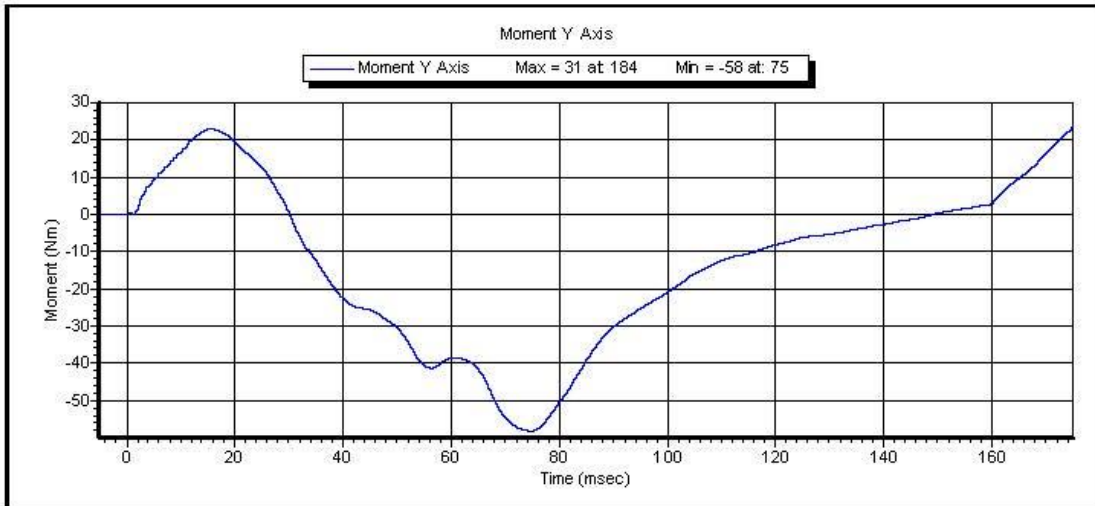


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Date of Test: 3/27/2013

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ID of Test:

Time of Test: **11:38:05 AM**

Date of Test: **3/27/2013**

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VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:		Test Date:	3/27/2013
		Test Time:	9:56:48 AM

Component Part Number	Component Serial Number
Neck - 78051-336	02-1692

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	21.5 deg C	P
Humidity		10	-- 70	23.0 %RH	P
Velocity		6.89	-- 7.13	7.058 m/s	P
Pendulum Deceleration at	10 ms	22.5	-- 27.5	24.08 g	P
Pendulum Deceleration at	20 ms	17.6	-- 22.6	20.64 g	P
Pendulum Deceleration at	30 ms	12.5	-- 18.5	14.93 g	P
Max Pendulum Deceleration After	30 ms	0	-- 29	14.9 g	P
Deceleration time to	5 g	34	-- 42	36.9 ms	P
D Plane Rotation		-78	-- -64	-72.3 degrees	P
Time at max rotation		57	-- 64	58.6 ms	P
Rotation Decay to Zero		113	-- 128	113.4 ms	P
Moment about OC		88.1	-- 108.4	93.87 Nm	P
Time at Max Moment		47	-- 58	50.9 ms	P
Moment Decay to Zero		97	-- 107	99.0 ms	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



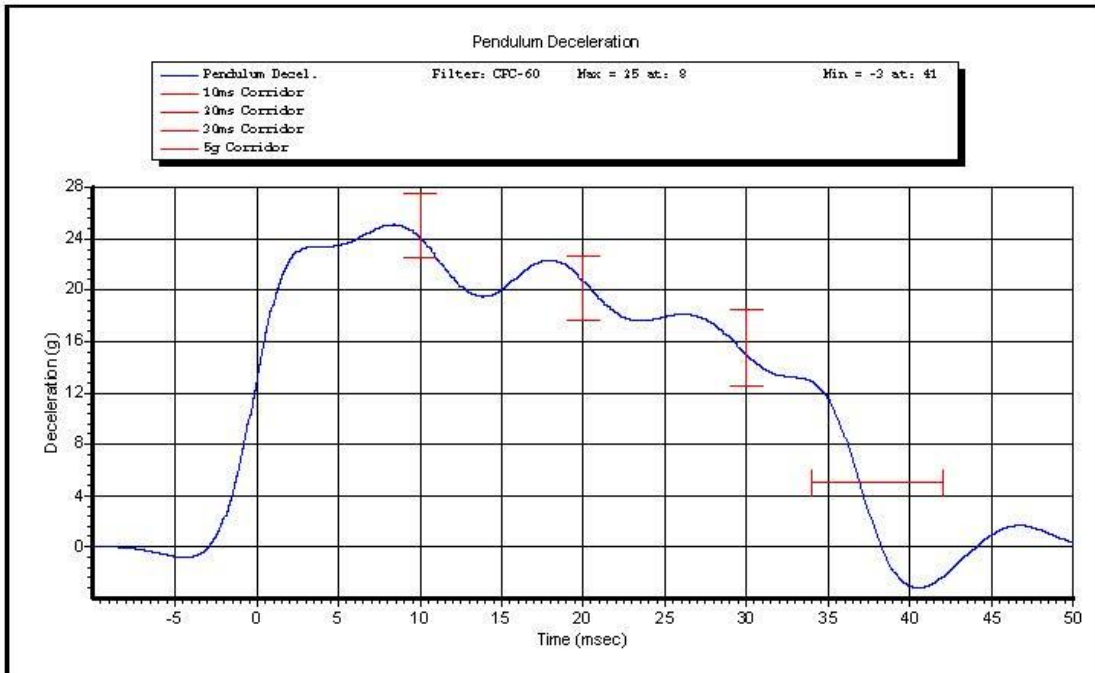
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C15016	2/20/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	1/25/2013
Denton	1716A	LC-2186 My	5/21/2012
Denton	1716A	LC-2186 Fx	5/21/2012



Name of Test: **Neck Flexion**
Name of Sub Test:
Type of ATD: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**

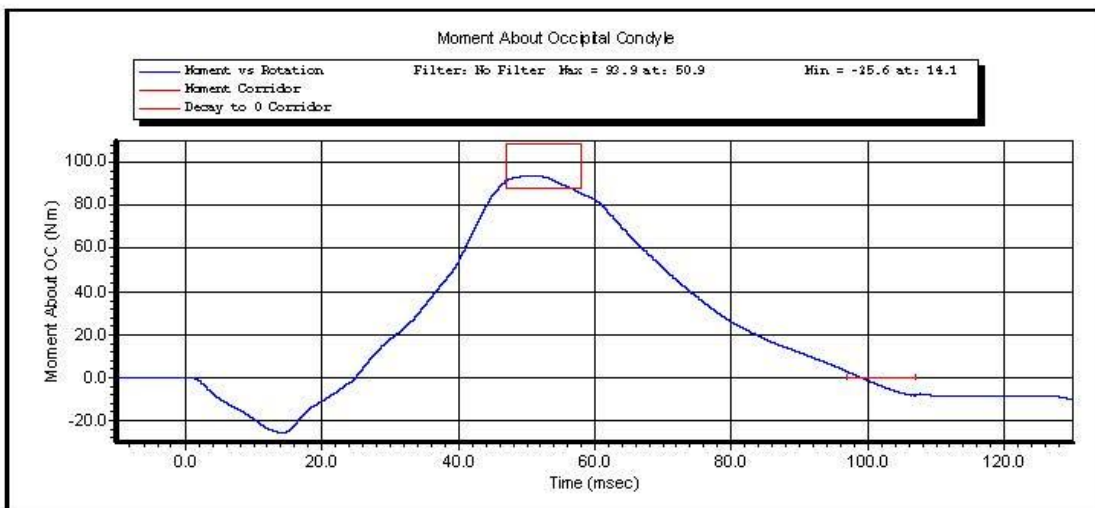
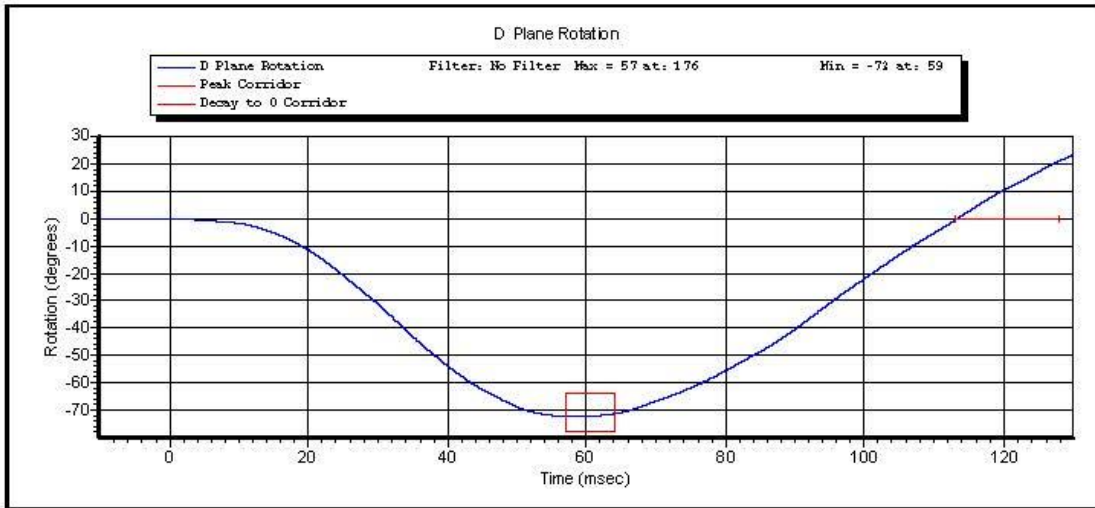


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Time of Test: **9:56:48 AM**

Date of Test: **3/27/2013**

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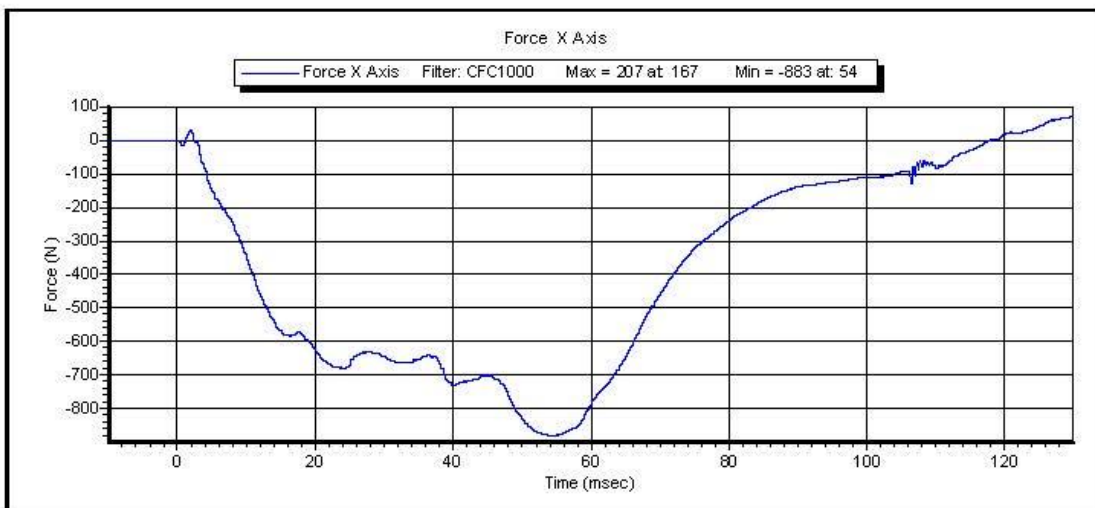
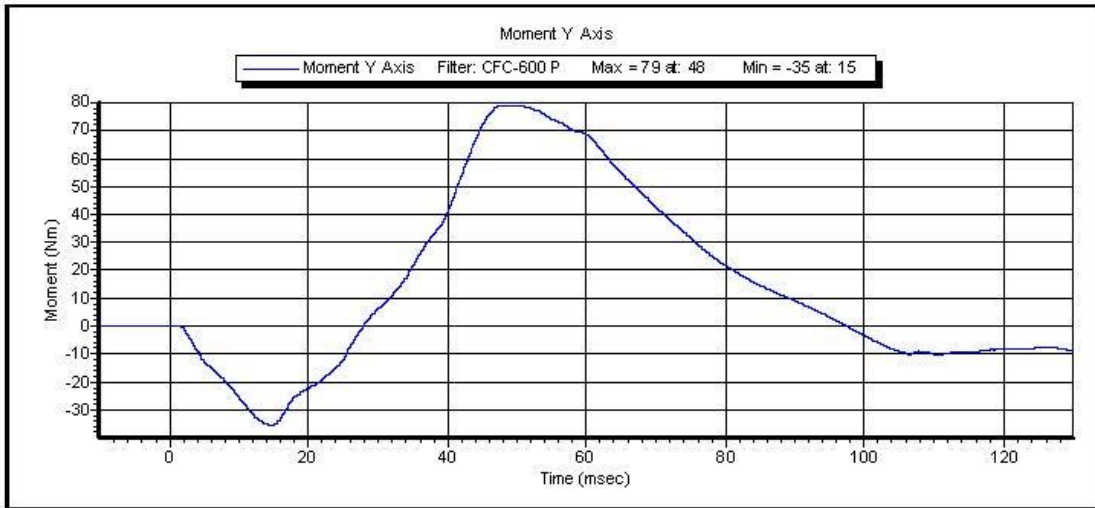


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Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test:

Time of Test: 9:56:48 AM

Date of Test: 3/27/2013

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VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:		Test Date:	3/26/2013
		Test Time:	2:49:50 PM

Component Part Number	Component Serial Number
Ribs 78051-RS	3964
Chest Jacket - 78051-169	2589

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.0 deg C P
Humidity	10 -- 70	27.8 %RH P
Velocity	6.59 -- 6.83	6.828 m/s P
Resistive Force	-5.894 -- -5.160	-5.5471 kN P
Sternum Displacement	-72.6 -- -63.5	-65.14 mm P
Hysteresis	69 -- 85	74.9 % P

All test parameters are within specifications

Technician: **R.Weil**

Supervisor: **E. Dutton**



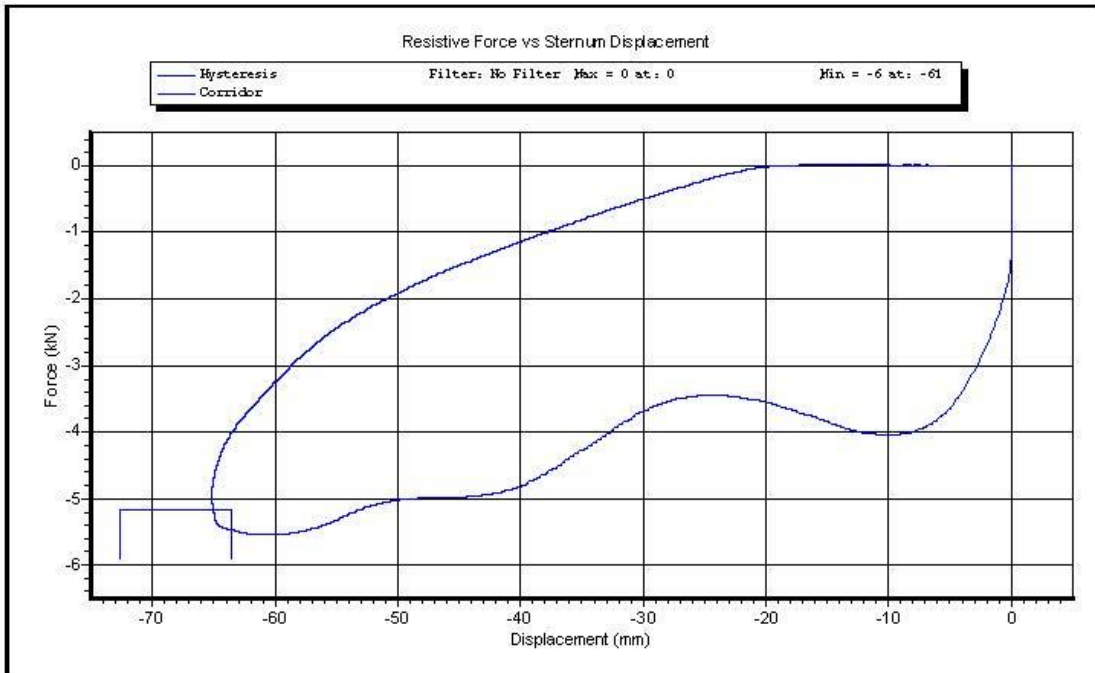
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	11/28/2012
DentonATD	78051-342	DS-064	5/18/2012



Test Name: **Thorax Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**

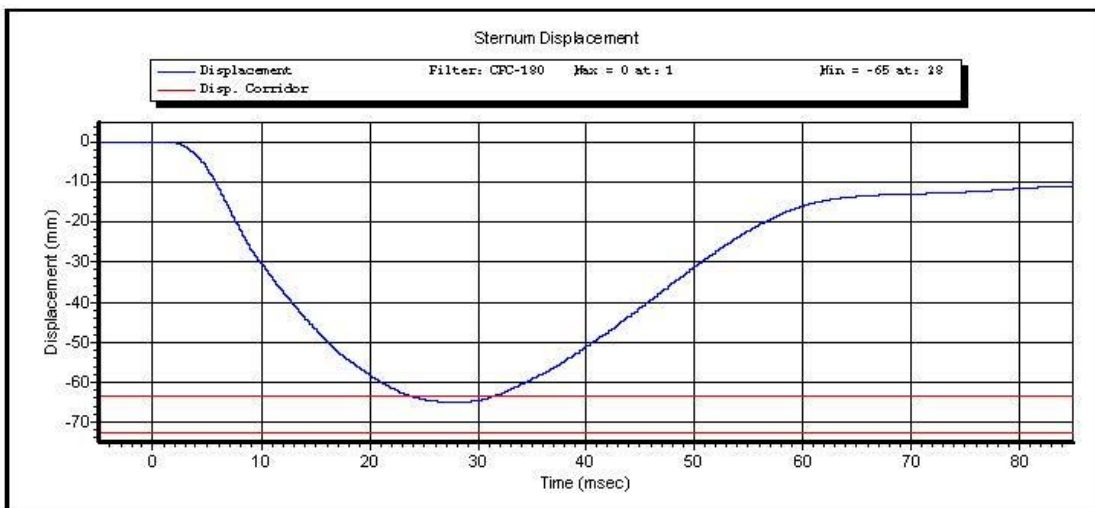
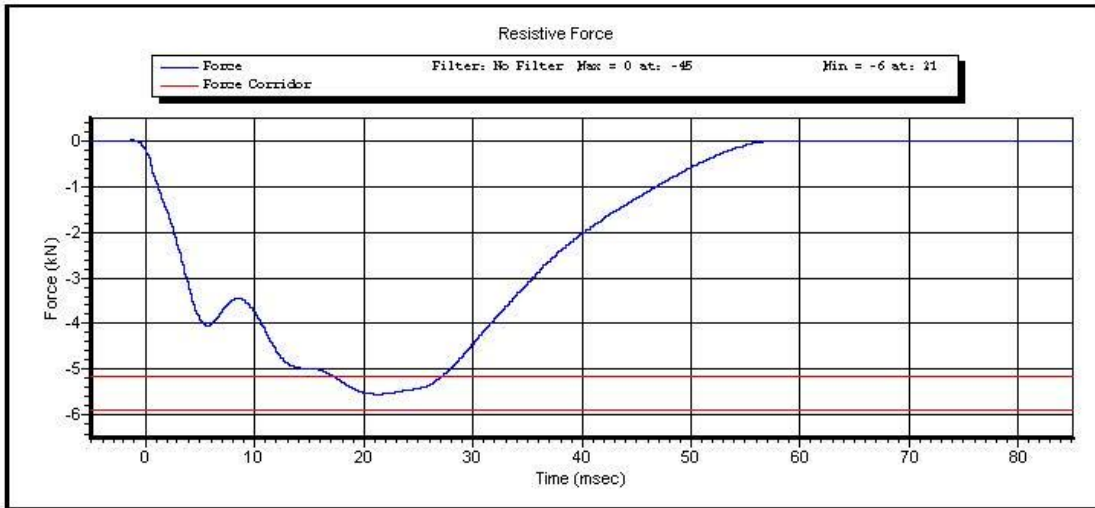


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Test Time: **2:49:50 PM**

Test Date: **3/26/2013**

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Test ID:

Test Time: 2:49:50 PM

Test Date: 3/26/2013

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Hip Flexion Left	Test Date:	3/25/2013
		Test Time:	12:20:25 PM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	1445

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.9 deg C P
Humidity	10 -- 70	24.0 %RH P
Average Velocity	5 -- 10	9.5 deg/s P
Angle at 203 Nm	40 -- 50	41.9 degrees P
Moment at 30 degrees	0.0 -- 94.9	71.35 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **Ed Dutton**



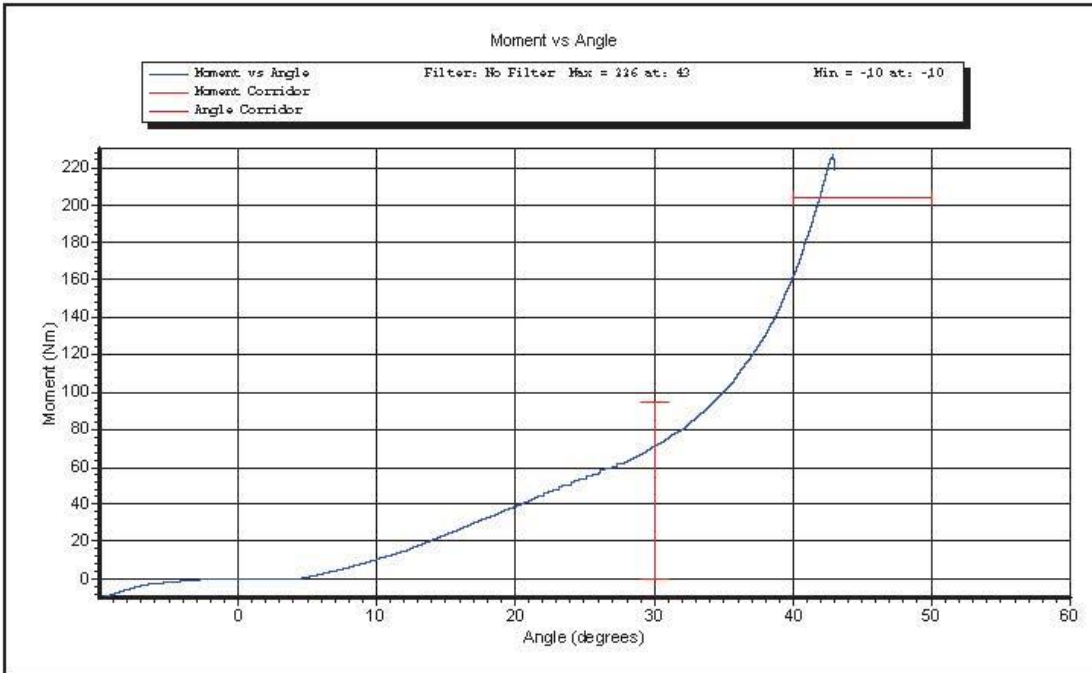
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14CB1-3615	0008	2/21/2013
DentonATD	Velocity Trap	1	1/11/2013



Test Name: **Hip ROM**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**



Test ID: **Hip Flexion Left**

Test Time: **12:20:25 PM**

Test Date: **3/25/2013**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Hip Flexion Right	Test Date:	3/25/2013
		Test Time:	1:30:26 PM

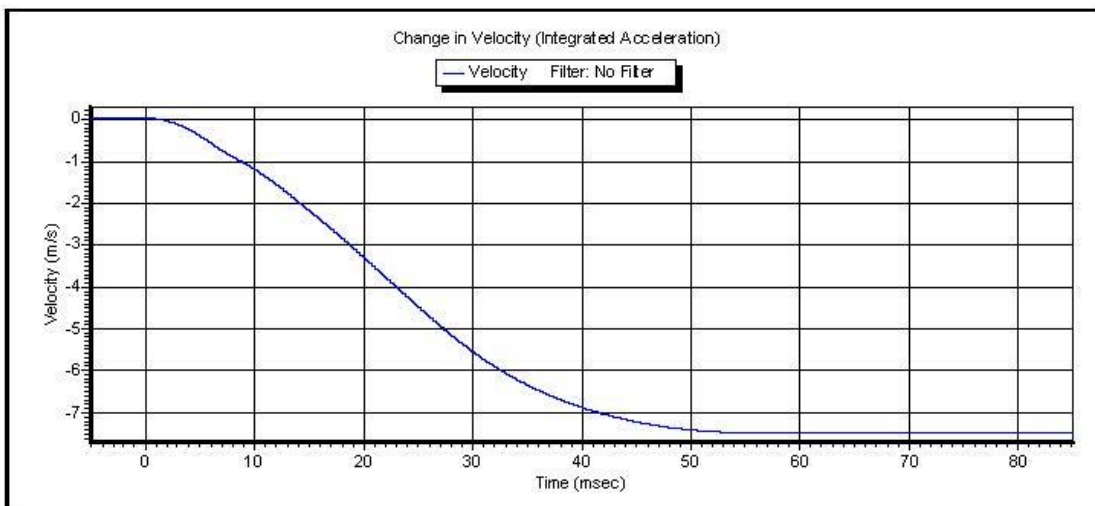
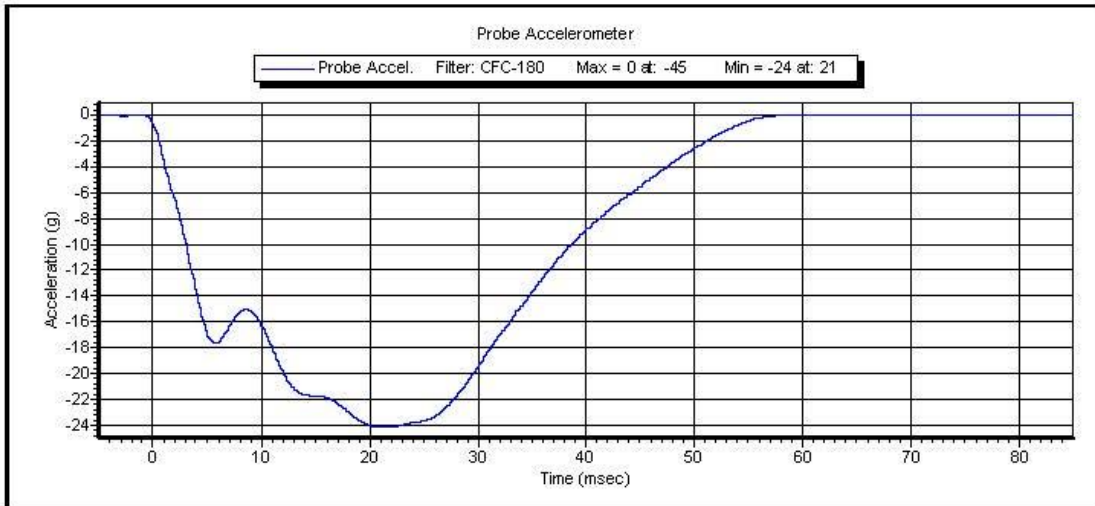
Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	1445

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.6 deg C P
Humidity	10 -- 70	17.3 %RH P
Average Velocity	5 -- 10	9.6 deg/s P
Angle at 203 Nm	40 -- 50	40.5 degrees P
Moment at 30 degrees	0.0 -- 94.9	82.21 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **Ed Dutton**



Test ID:

Test Time: 2:49:50 PM

Test Date: 3/26/2013

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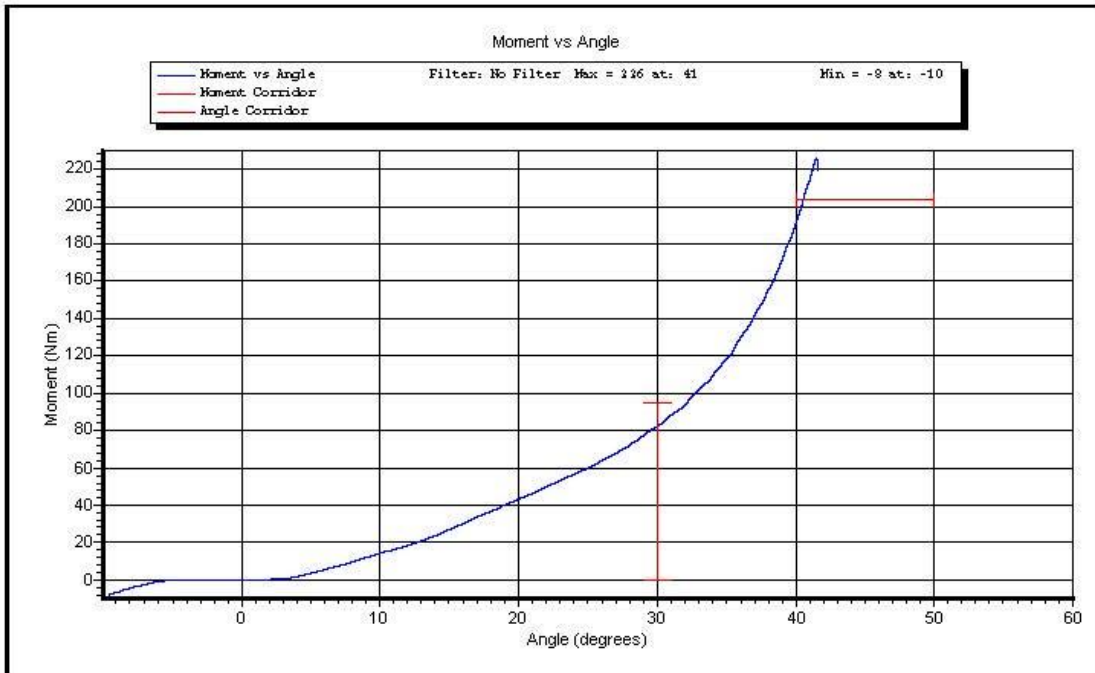
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/21/2013
DentonATD	Velocity Trap	1	1/11/2013



Test Name: **Hip ROM**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**



Test ID: **Hip Flexion Right** Test Time: **1:30:26 PM**

Test Date: **3/25/2013**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Knee Impact Left	Test Date:	3/26/2013
		Test Time:	9:43:19 AM

Component Part Number	Component Serial Number
Knee Skin - 78051	2882

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.3 deg C P
Humidity	10 -- 70	26.0 %RH P
Velocity	2.07 -- 2.13	2.101 m/s P
Resistive Force	-5.78 -- -4.72	-5.488 kN P

All test parameters are within specifications

Technician: **A. Rudniski**
Supervisor: **E. Dutton**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Probe Velocity	1	1/22/2013
Endevco	Vane (CALSPAN) 7231CT	C14953	11/28/2012



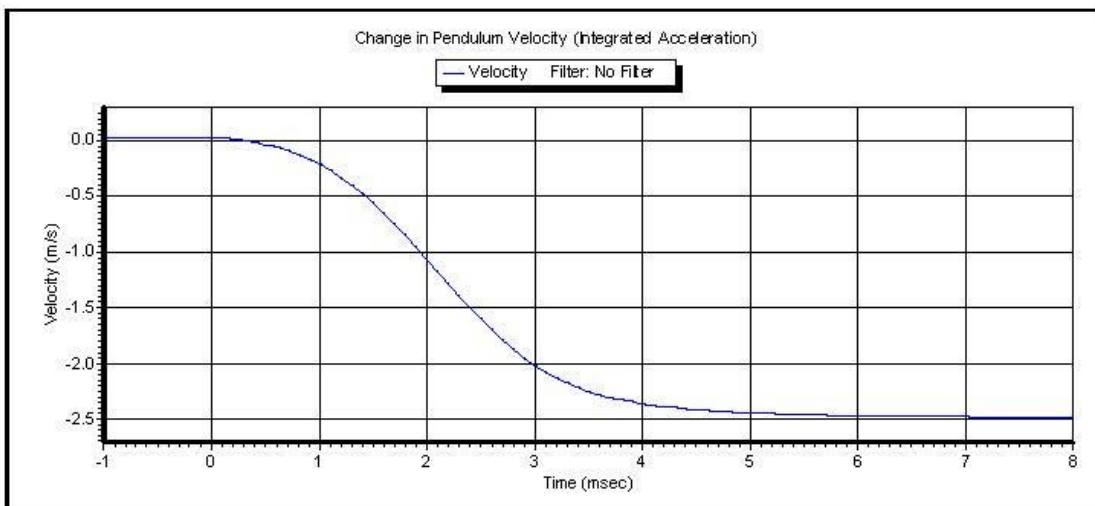
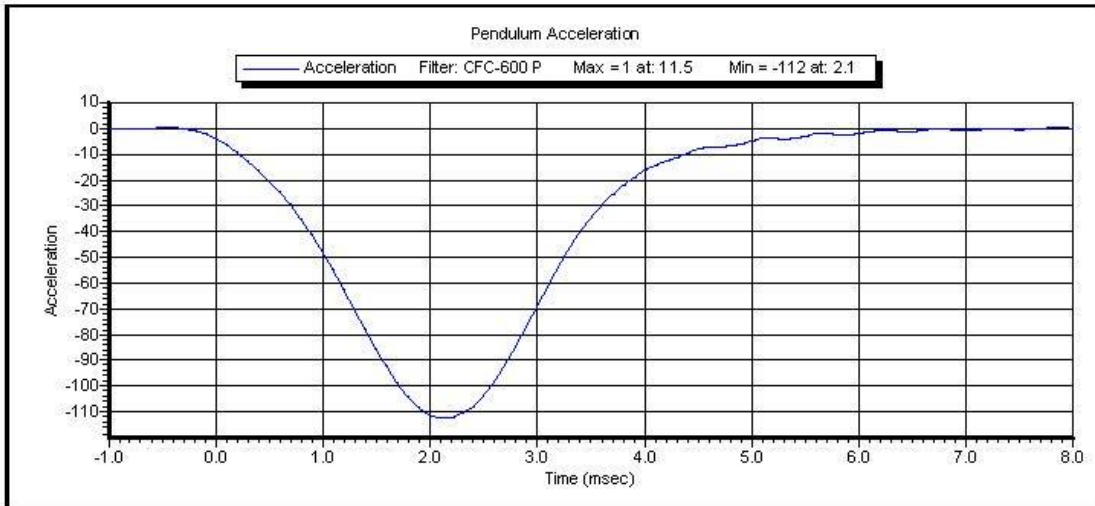
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Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**



Test ID: **Knee Impact Left** Test Time: **9:43:19 AM**

Test Date: **3/26/2013**

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Test ID: **Knee Impact Left** Test Time: **9:43:19 AM**

Test Date: **3/26/2013**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Knee Impact Right	Test Date:	3/26/2013
		Test Time:	10:01:21 AM

Component Part Number	Component Serial Number
Knee Skin - 78056	2531

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.3 deg C P
Humidity	10 -- 70	26.0 %RH P
Velocity	2.07 -- 2.13	2.110 m/s P
Resistive Force	-5.78 -- -4.72	-5.407 kN P

All test parameters are within specifications

Technician: **A. Rudniski**
Supervisor: **E. Dutton**



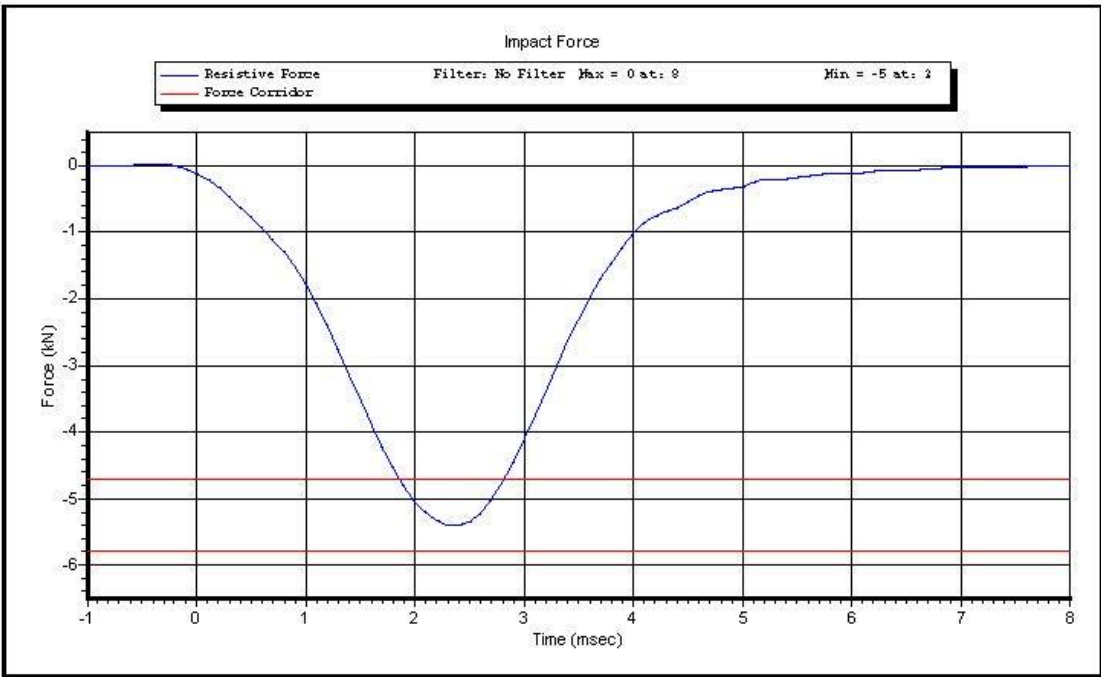
VERIFICATION REPORT

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<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Probe Velocity	1	1/22/2013
Endevco	Vane (CALSPAN) 7231CT	C14953	11/28/2012



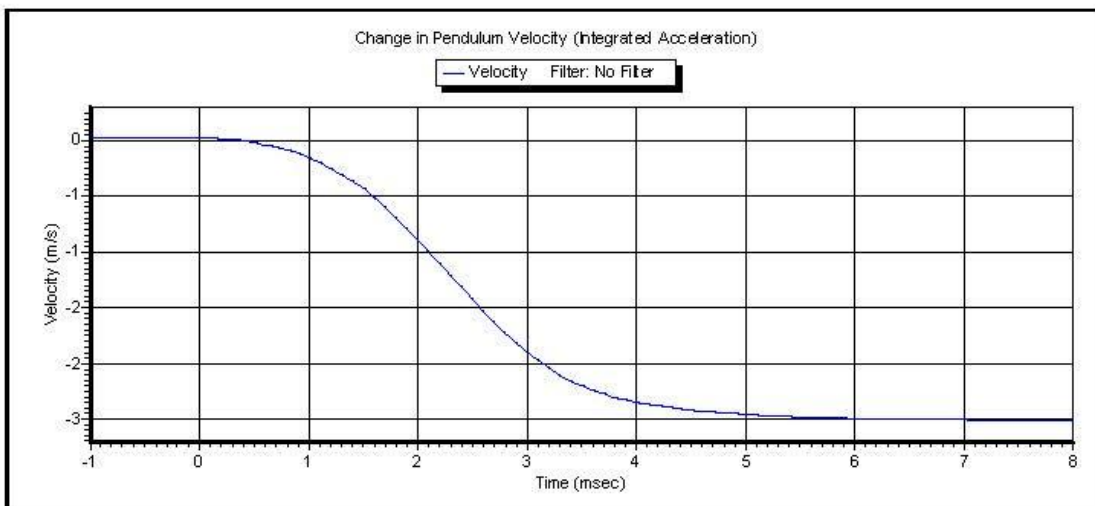
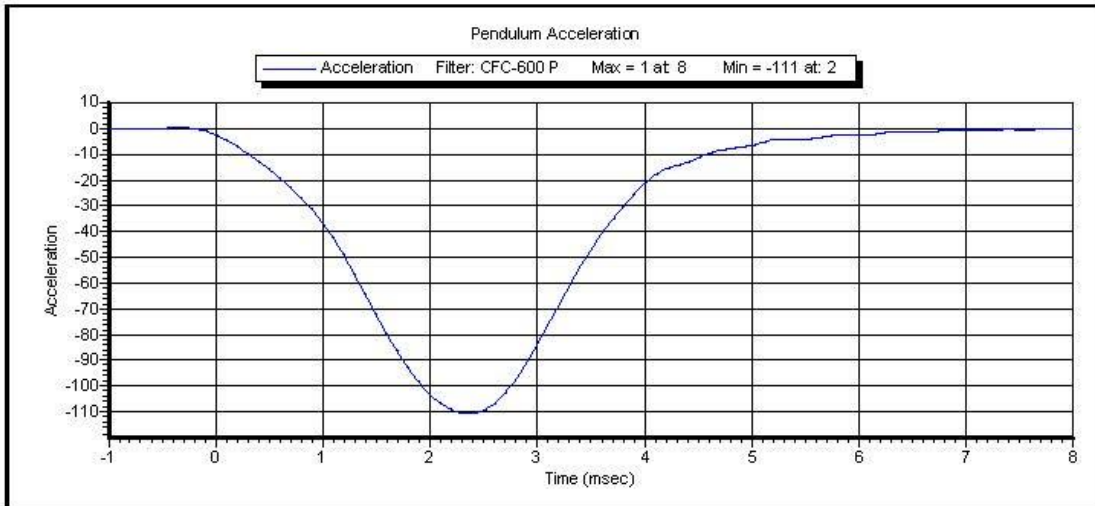
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Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**



Test ID: **Knee Impact Right** Test Time: **10:01:21 AM**

Test Date: **3/26/2013**

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Test ID: **Knee Impact Right** Test Time: **10:01:21 AM**

Test Date: **3/26/2013**

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CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 273



External Measurements

5th Female SN 273

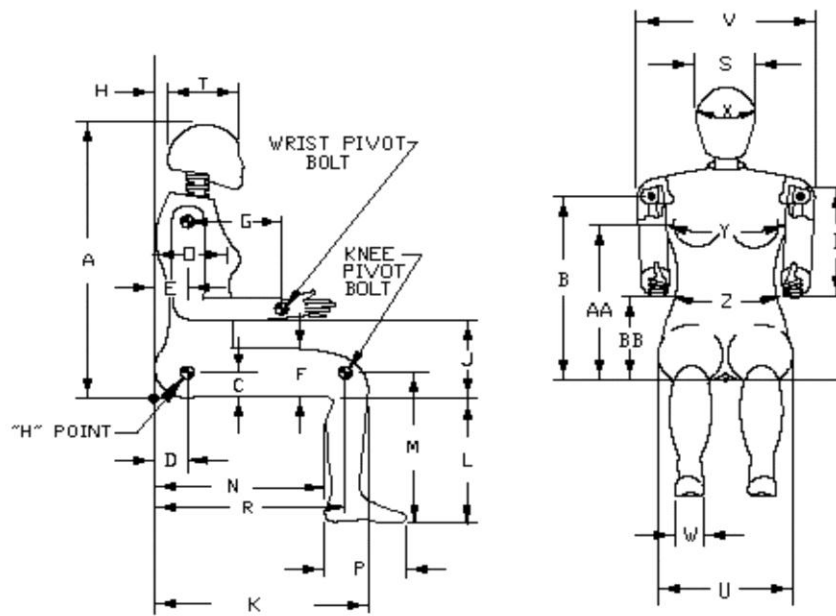
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	774.7 – 800.1	786	Yes
B	Shoulder Pivot Height	431.8 – 457.2	451	Yes
C	H-Point Height	81.3 – 86.3	84	Yes
D	H-Point from Backline	144.8 – 149.8	146	Yes
E	Shoulder Pivot from Backline	68.6 – 83.8	76	Yes
F	Thigh Clearance	119.4 – 134.6	132	Yes
G	Back of Elbow to Wrist Pivot	243.9 – 259.1	249	Yes
H	Head Back to Backline	43.2 – 48.2	46	Yes
I	Shoulder to Elbow Length	276.8 – 297.2	286	Yes
J	Elbow Rest Height	182.8 – 203.2	194	Yes
K	Buttock to Knee Length	520.7 – 546.1	537	Yes
L	Popliteal Height	355.6 – 376	360	Yes
M	Knee Pivot Height	393.7 – 419.1	397	Yes
N	Buttock Popliteal Length	414 – 439.4	420	Yes
O	Chest Depth without Jacket	175.3 – 190.5	184	Yes
P	Foot Length (right)	218.5 – 233.7	220	Yes
R	Buttock To Knee Pivot Length	457.2 – 482.6	468	Yes
S	Head Breadth	137.1 – 147.3	143	Yes
T	Head Depth	177.8 – 188	183	Yes
U	Hip Breadth	299.7 – 314.9	310	Yes
V	Shoulder Breadth	350.5 – 365.7	357	Yes
W	Foot Breadth	78.8 – 94	82	Yes
X	Head Circumference	528.3 – 548.7	538	Yes
Y	Chest Circumference with Jacket	850.9 – 881.3	860	Yes
Z	Waist Circumference	759.5 – 789.9	771	Yes
AA	Reference Location (Chest Circumference)	332.7 – 358.1	345	Yes
BB	Reference Location (Waist Circumference)	160.1 – 170.2	165	Yes

Technician: R. Weil

Date: 06/28/2013

Hybrid III 5th Female External Measurements

Reference Diagram





VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Head Drop	Test Date:	6/27/2013
		Test Time:	10:06:20 AM

Component Part Number	Component Serial Number
Head Skin - 78051-228	780

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.5 deg C P
Humidity	10 -- 70	62.5 %RH P
Resultant Acceleration	250 -- 300	296.5 g P
Oscillation	0 -- 10	0.0 % P
Lateral Acceleration	-15 -- 15	-3.3 g P

All test parameters are within specifications

Technician: **R. weil**
Supervisor: **E. Dutton**



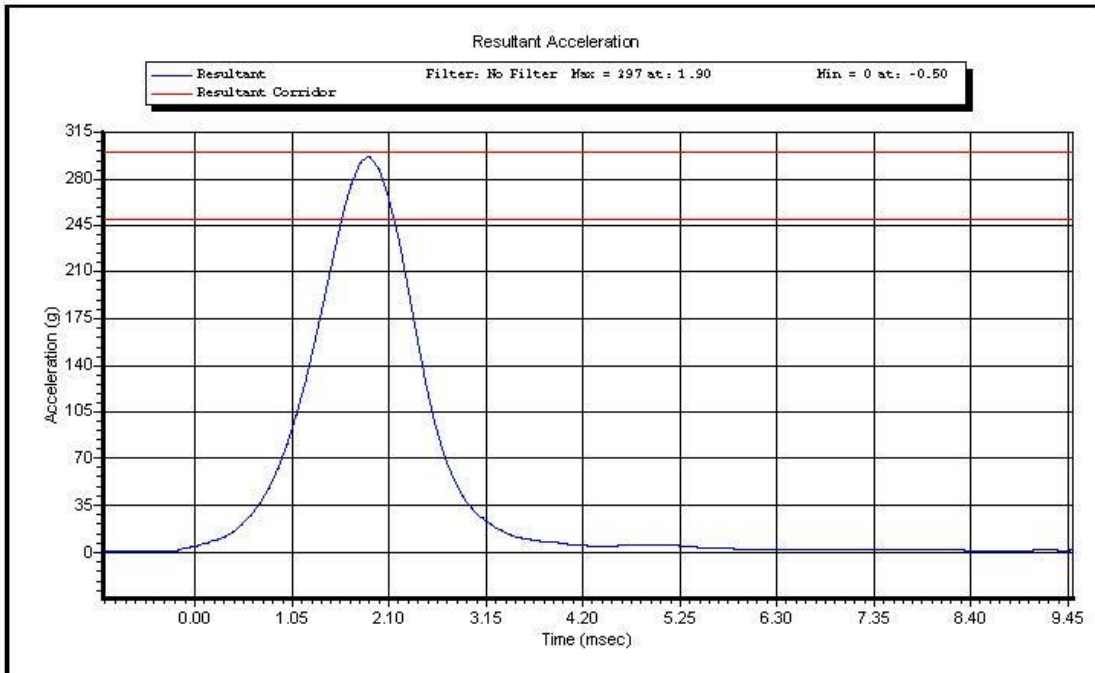
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58833	6/11/2013
Endevco	7264-2000	P58905	6/20/2013
Endevco	7264-2000	P52114	6/11/2013



Test Name: **Head Drop**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**

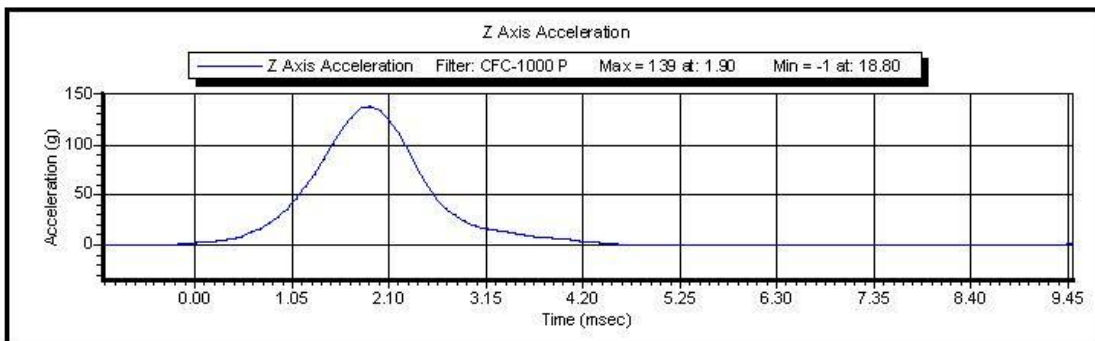
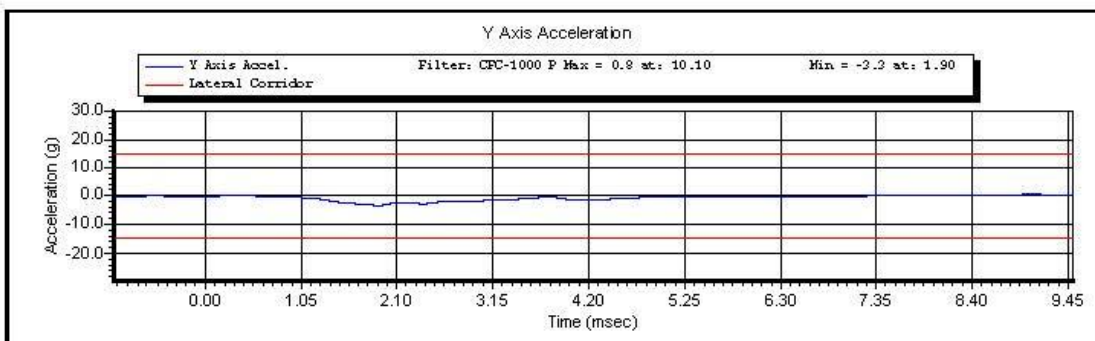
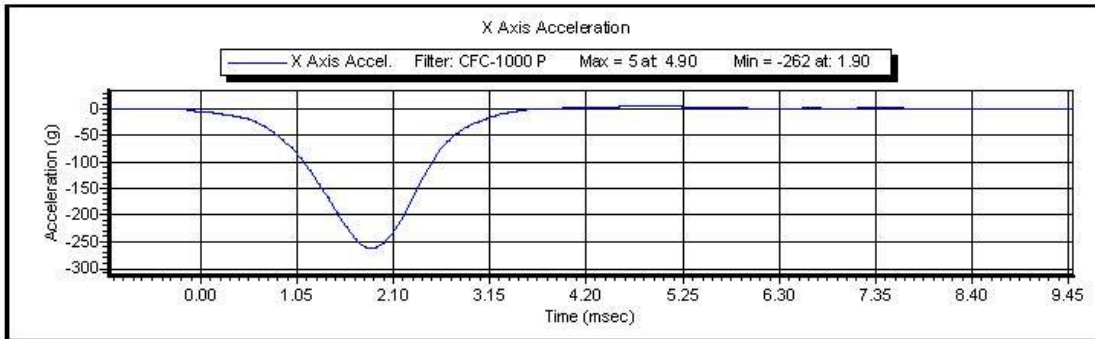


Test ID: **Head Drop**

Test Time: **10:06:20 AM**

Test Date: **6/27/2013**

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Test ID: **Head Drop**

Test Time: **10:06:20 AM**

Test Date: **6/27/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Neck Extension	Test Date:	6/28/2013
		Test Time:	7:13:01 AM

Component Part Number	Component Serial Number
Neck - 880105-255	660

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	20.7 deg C P
Humidity	10 -- 70	69.0 %RH P
Velocity	5.95 -- 6.19	6.128 m/s P
Pendulum Impulse at 10 ms	1.5 -- 1.9	1.85 m/s P
Pendulum Impulse at 20 ms	3.1 -- 3.9	3.69 m/s P
Pendulum Impulse at 30 ms	4.6 -- 5.6	5.39 m/s P
D Plane Rotation	99 -- 114	107.1 degrees P
Moment During Rotation Interval	-65 -- -53	-59.4 Nm P
Moment Decay to -10.0 Nm	94 -- 114	101.3 ms P

All test parameters are within specifications

Technician: **R. Weil**
Supervisor: **E. Dutton**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	4/11/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-1629 My	4/30/2013
Denton	1716A	LC-1629 Fx	4/30/2013



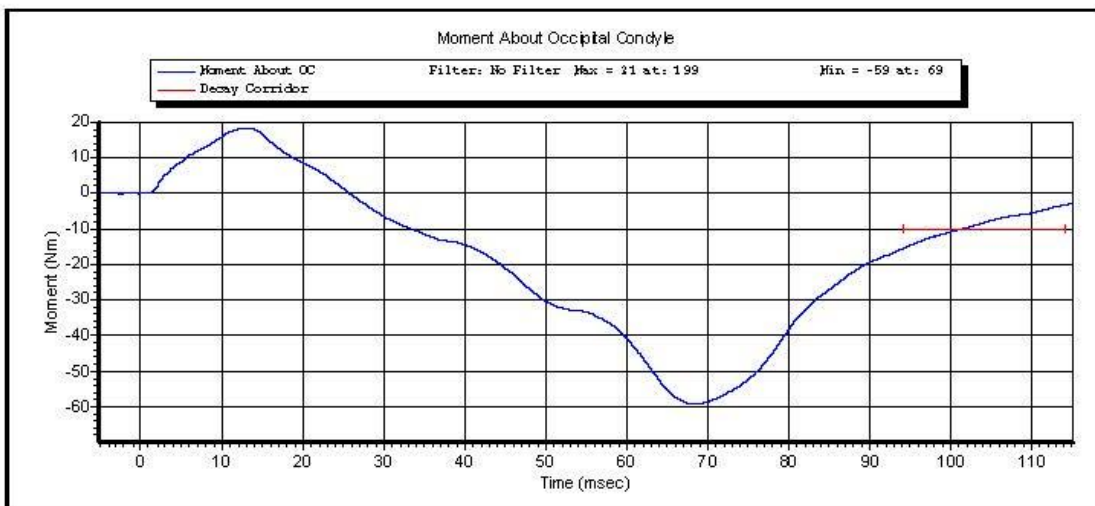
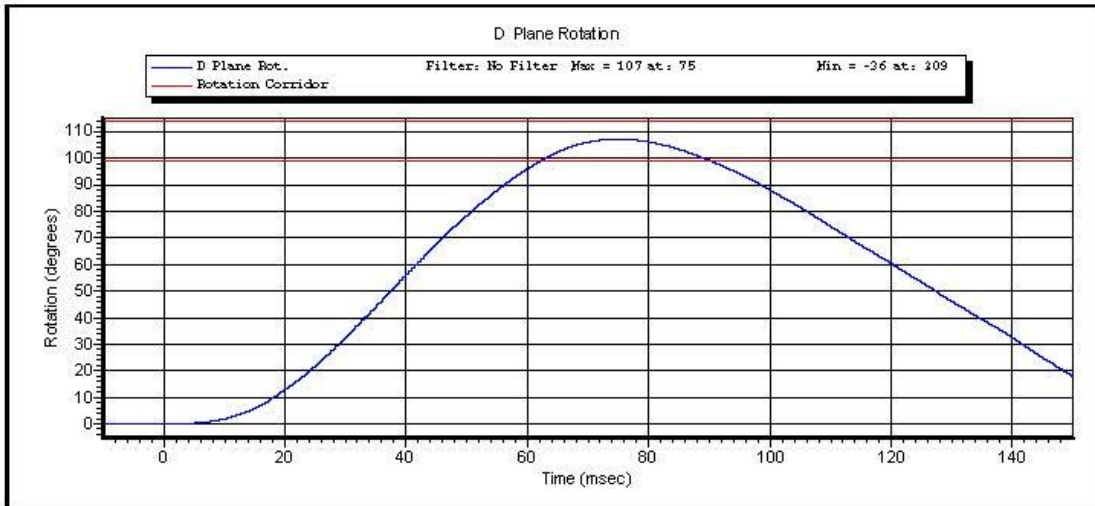
Test Name: **Neck Extension**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**



Test ID: **Neck Extension** Test Time: **7:13:01 AM**

Test Date: **6/28/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

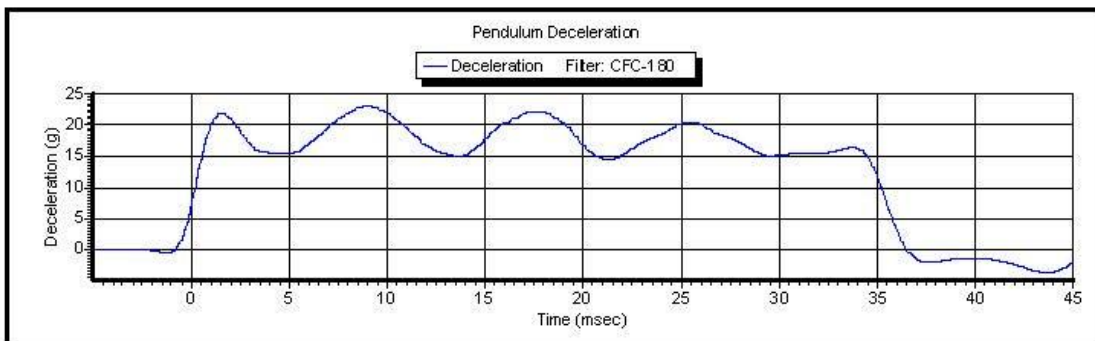
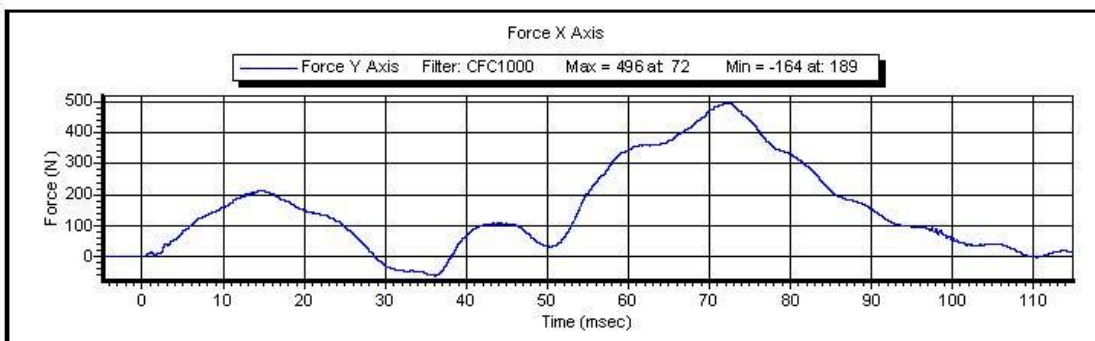
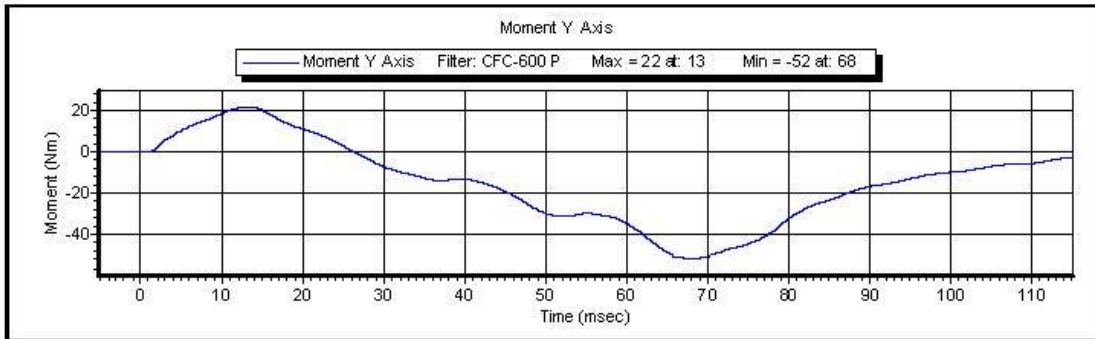


Test ID: Neck Extension

Test Time: 7:13:01 AM

Test Date: 6/28/2013

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Test ID: **Neck Extension**

Test Time: **7:13:01 AM**

Test Date: **6/28/2013**

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VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Neck Flexion	Test Date:	6/27/2013
		Test Time:	4:15:39 PM

Component Part Number	Component Serial Number
Neck - 880105-255	660

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.0 deg C P
Humidity	10 -- 70	64.9 %RH P
Velocity	6.89 -- 7.13	7.116 m/s P
Pendulum Impulse at 10 ms	2.1 -- 2.5	2.21 m/s P
Pendulum Impulse at 20 ms	4 -- 5	4.5 m/s P
Pendulum Impulse at 30 ms	5.8 -- 7.0	6.55 m/s P
D Plane Rotation	-91 -- -77	-78.7 degrees P
Moment During Rotation Interval	69 -- 83	70.5 Nm P
Moment Decay to 10.0 Nm	80 -- 100	87.4 ms P

All test parameters are within specifications

Technician: **R.Weil**
Supervisor: **E. Dutton**



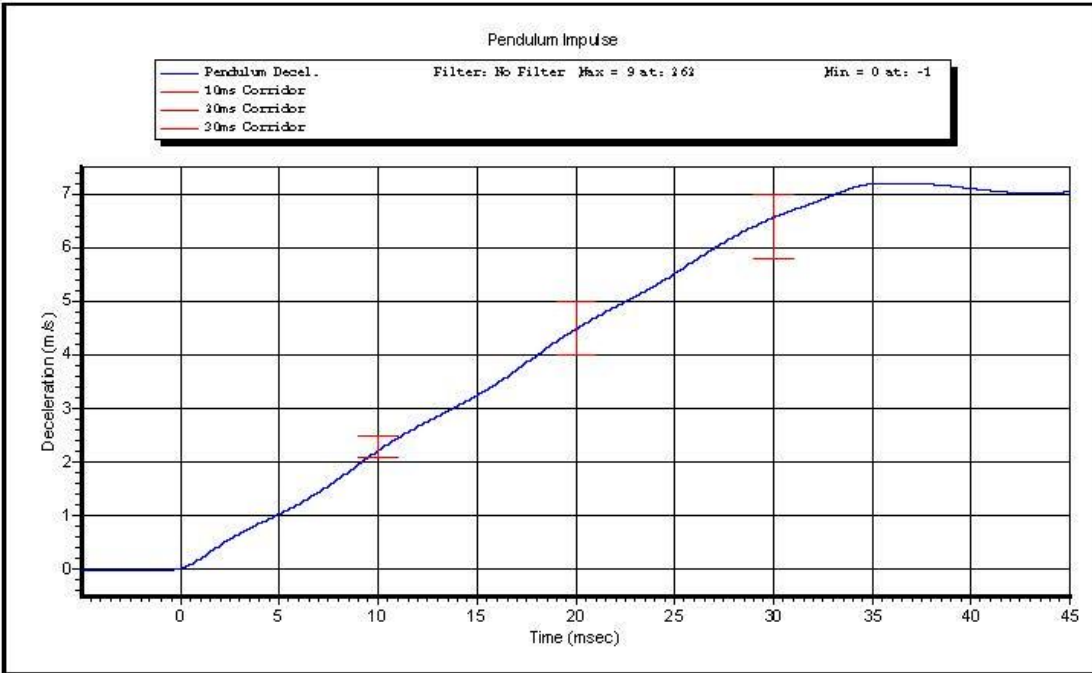
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	4/11/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-1629 My	4/30/2013
Denton	1716A	LC-1629 Fx	4/30/2013



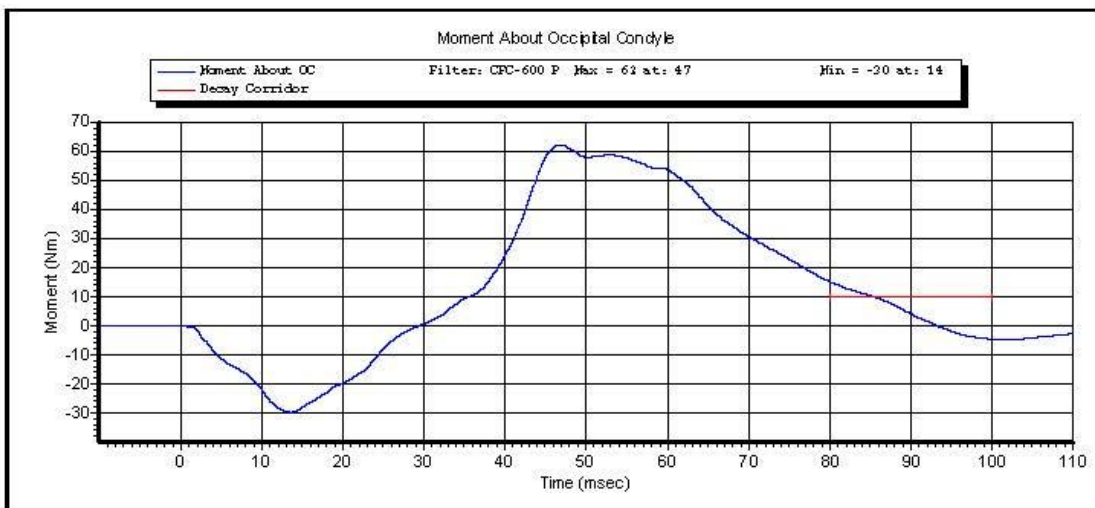
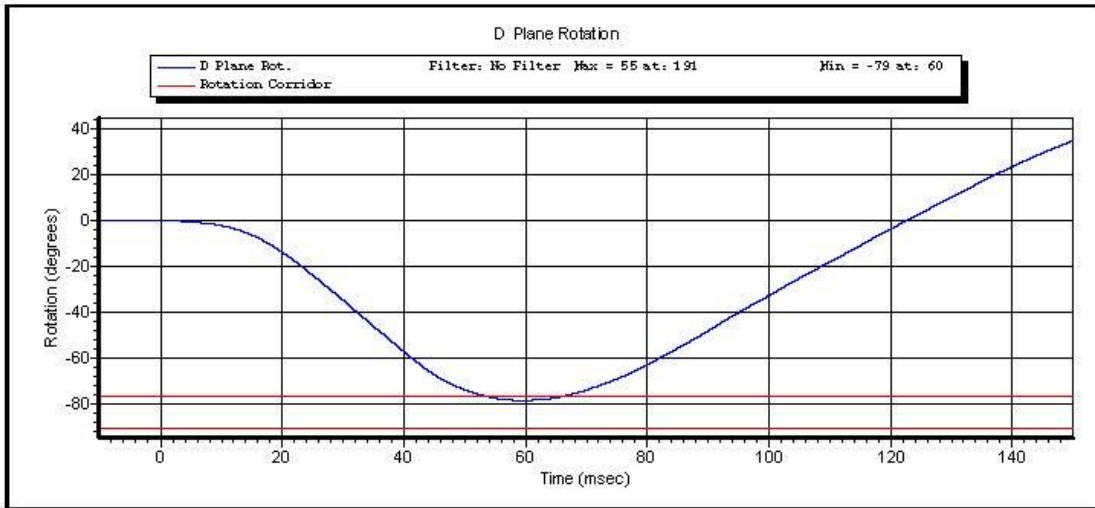
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Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**



Test ID: **Neck Flexion** Test Time: **4:15:39 PM**

Test Date: **6/27/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

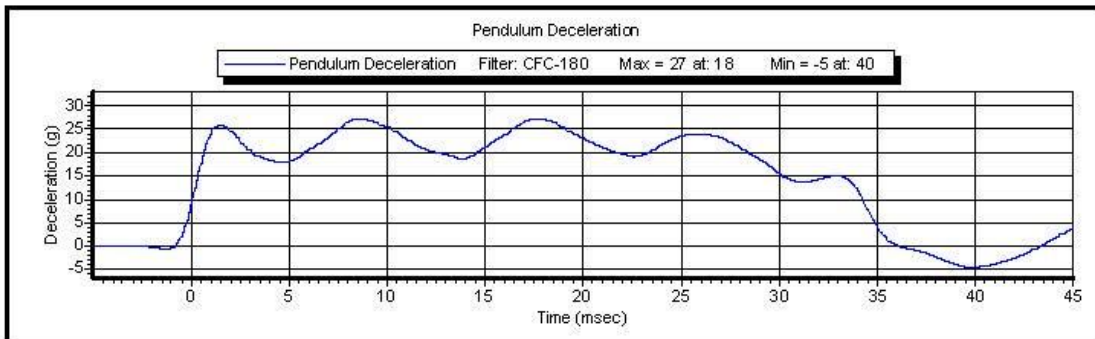
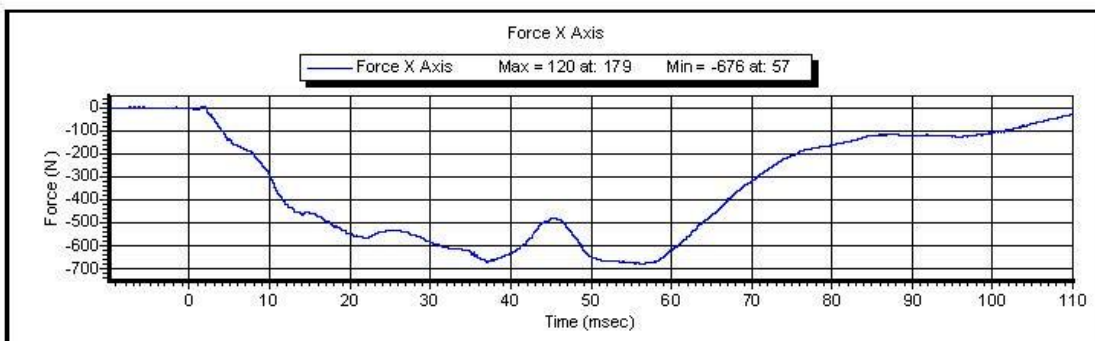
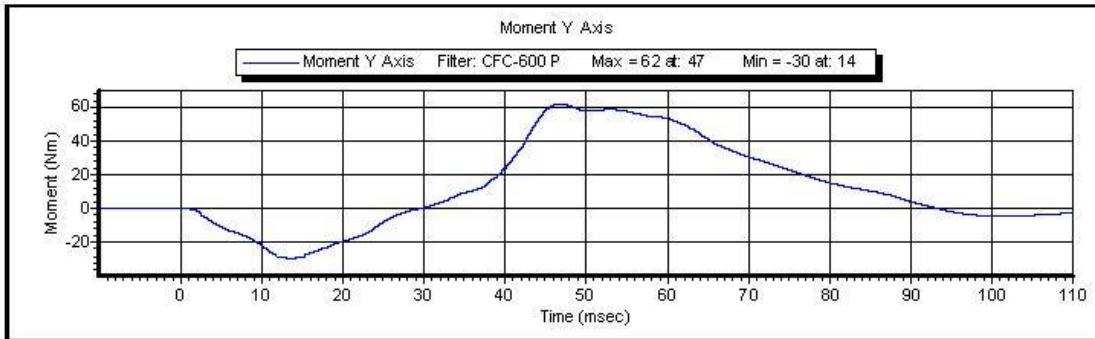


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Test Time: 4:15:39 PM

Test Date: 6/27/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Neck Flexion**

Test Time: **4:15:39 PM**

Test Date: **6/27/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Torso Flexion

Pre-Test

Part 5720 HIII 5% Female

ATD Serial No: 273

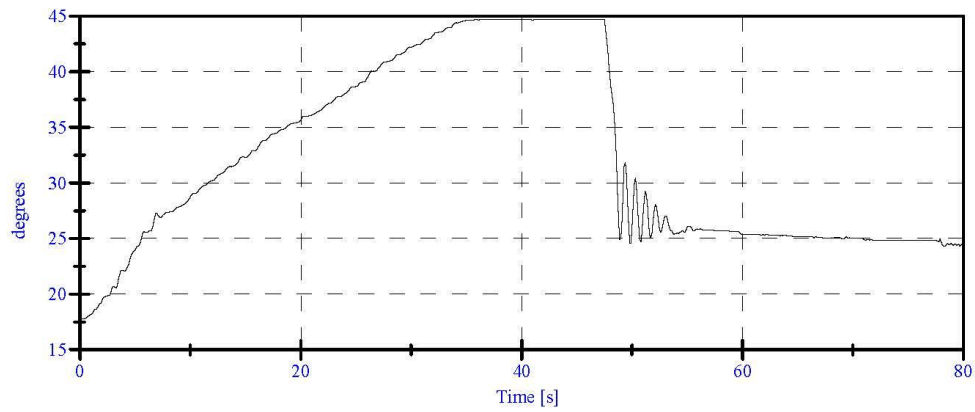
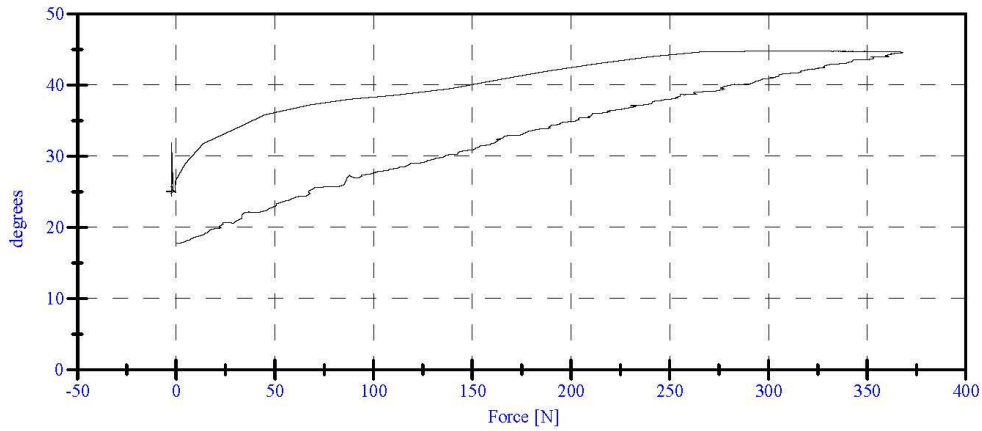
Laboratory Supervisor: E. Dutton

Date: 7/28/2013

Laboratory Technician: M. Goehle

<u>TEST PARAMETER</u>	<u>SPECIFICATION</u>	<u>TEST RESULTS</u>	<u>STATUS</u>
Lab Temperature:	18.9-25.6 C	21.0 C	Passed
Lab Humidity:	10-70 %	56.00 %	Passed
Initial Angle:	0.00-20.00 Deg	17.74 Deg	Passed
Force at 45 Deg	320.00-390.00 N	368.26 N	Passed
Return Angle	8 Deg Max from Initial	22.20 deg	Passed

LUMBAR SPINE FLEXION TEST





VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Thorax Impact	Test Date:	6/28/2013
		Test Time:	12:01:41 PM

Component Part Number	Component Serial Number
Ribs 880105-RS	670
Chest Jacket - 880105-355-E	DH0069

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.1 deg C P
Humidity	10 -- 70	58.0 %RH P
Velocity	6.59 -- 6.83	6.618 m/s P
Sternum Displacement	-58 -- -50	-54.1 mm P
Force During Displacement Interval	-4400 -- -3900	-4167.0 N P
Force -18.0 to -50.0 Displacement	-4600 -- 0	-4053.6 N P
Hysteresis	69 -- 85	71.1 % P

All test parameters are within specifications

Technician: **R. weil**
Supervisor: **E. Dutton**



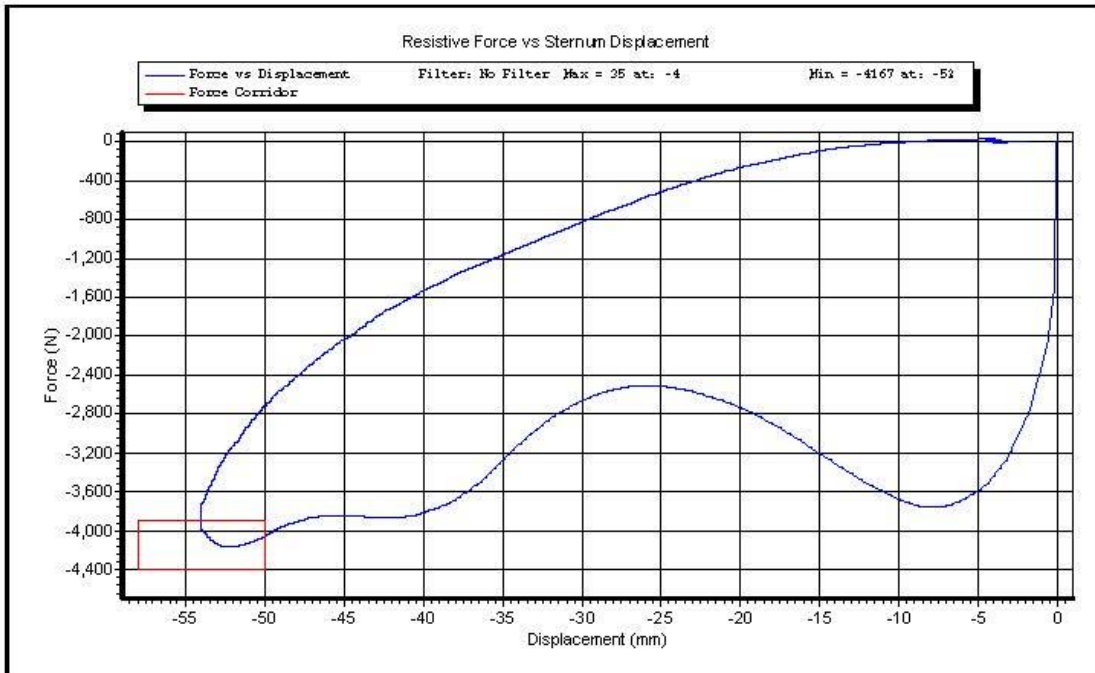
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013
DentonATD	78051-342	DS-273	6/17/2013



Test Name: **Thorax Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**

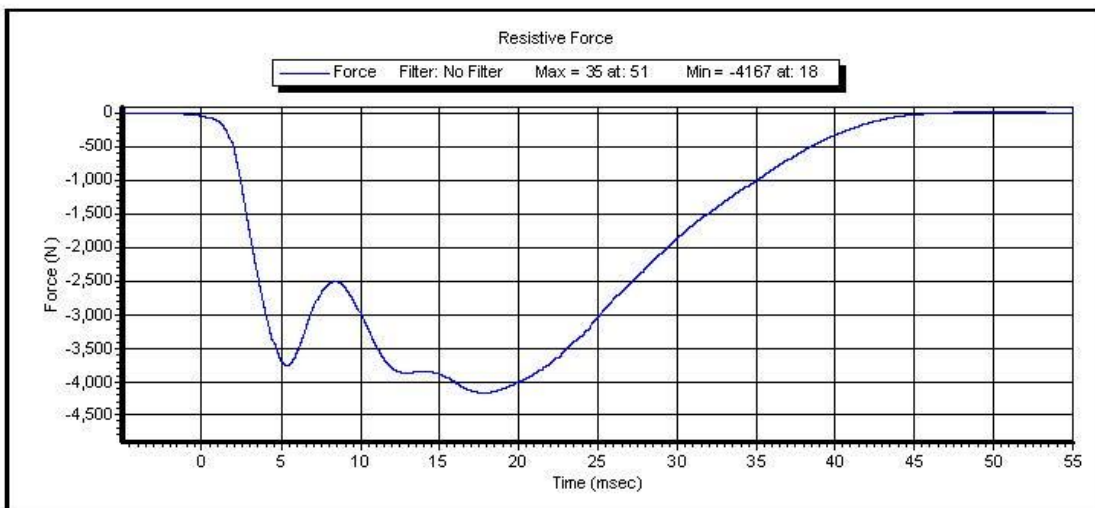
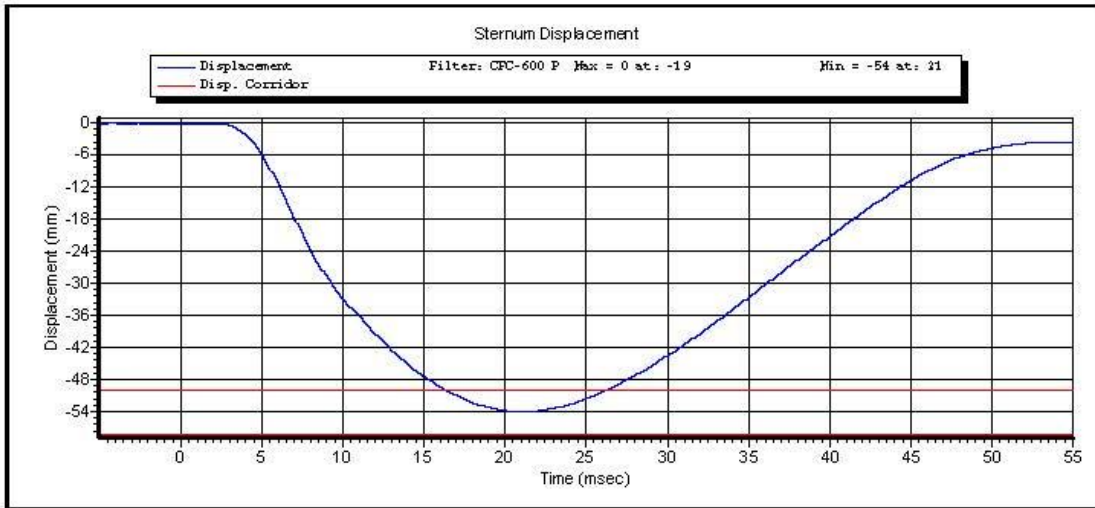


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Test Time: **12:01:41 PM**

Test Date: **6/28/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

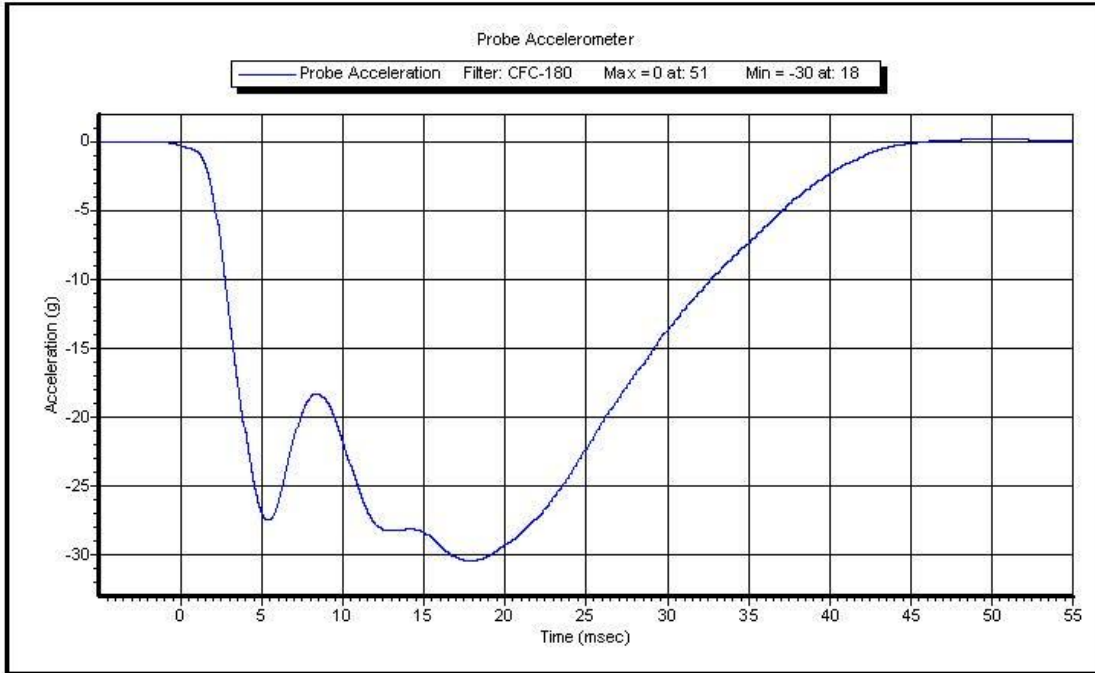


Test ID: **Thorax Impact**

Test Time: **12:01:41 PM**

Test Date: **6/28/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Thorax Impact**

Test Time: **12:01:41 PM**

Test Date: **6/28/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Knee Impact Left	Test Date:	6/26/2013
		Test Time:	4:01:35 PM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1726

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.5 deg C P
Humidity	10 -- 70	55.9 %RH P
Velocity	2.07 -- 2.13	2.094 m/s P
Resistive Force	-4060 -- -3450	-4000.5 N P

All test parameters are within specifications

Technician: **R. Weil**
Supervisor: **E. Dutton**



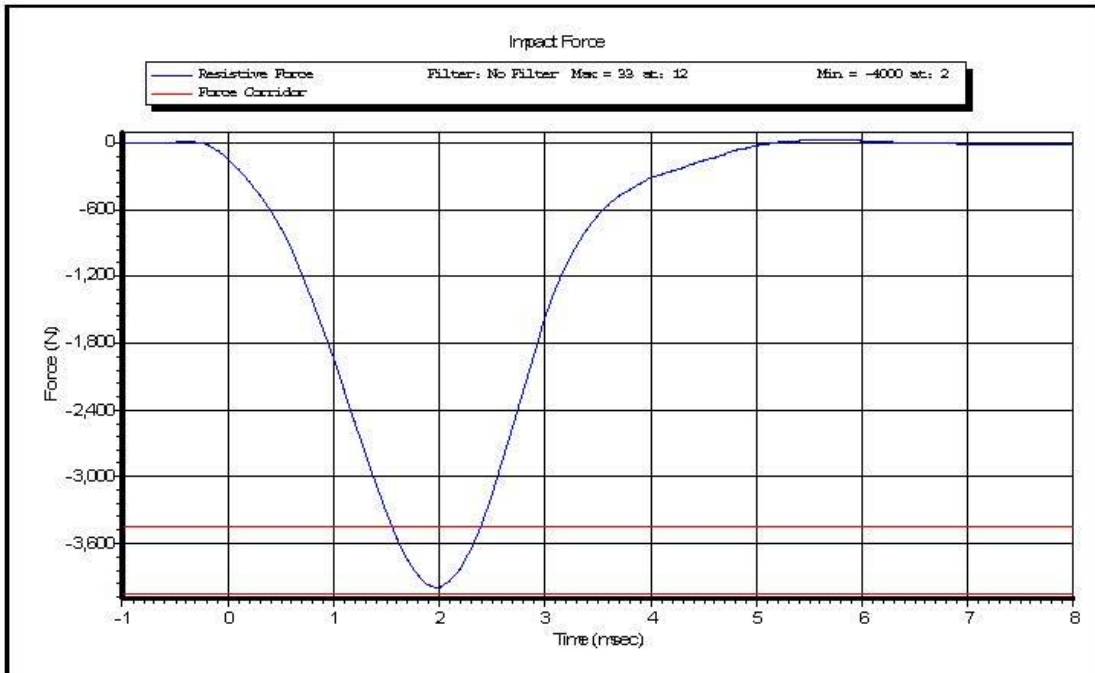
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



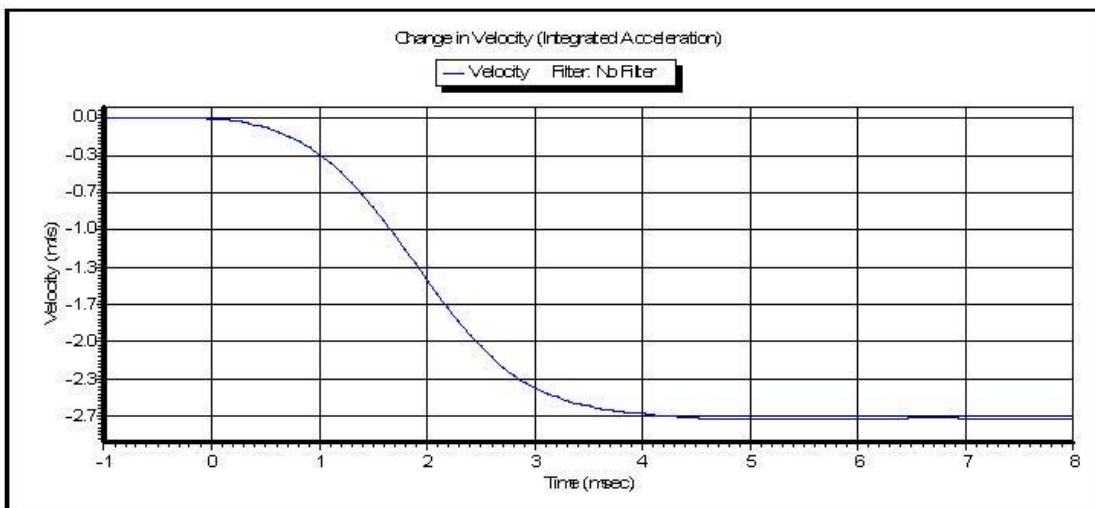
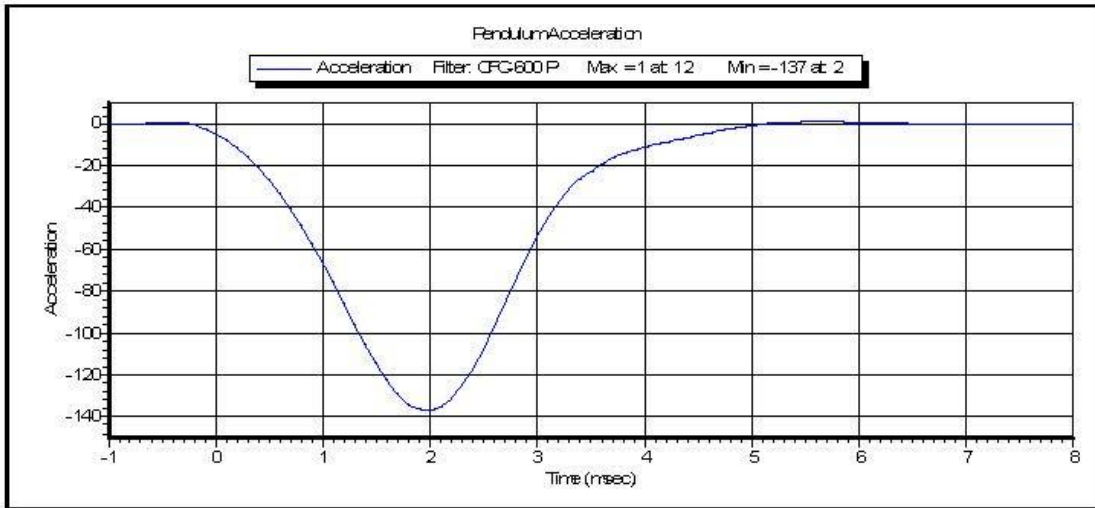
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Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**



Test ID: **Knee Impact Left** Test Time: **4:01:35 PM**

Test Date: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Knee Impact Left** Test Time: **4:01:35 PM**

Test Date: **6/26/2013**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Knee Impact Right	Test Date:	6/26/2013
		Test Time:	3:49:25 PM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1051

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.4 deg C P
Humidity	10 -- 70	55.6 %RH P
Velocity	2.07 -- 2.13	2.091 m/s P
Resistive Force	-4060 -- -3450	-3803.4 N P

All test parameters are within specifications

Technician: **R. Weil**
Supervisor: **E. Dutton**



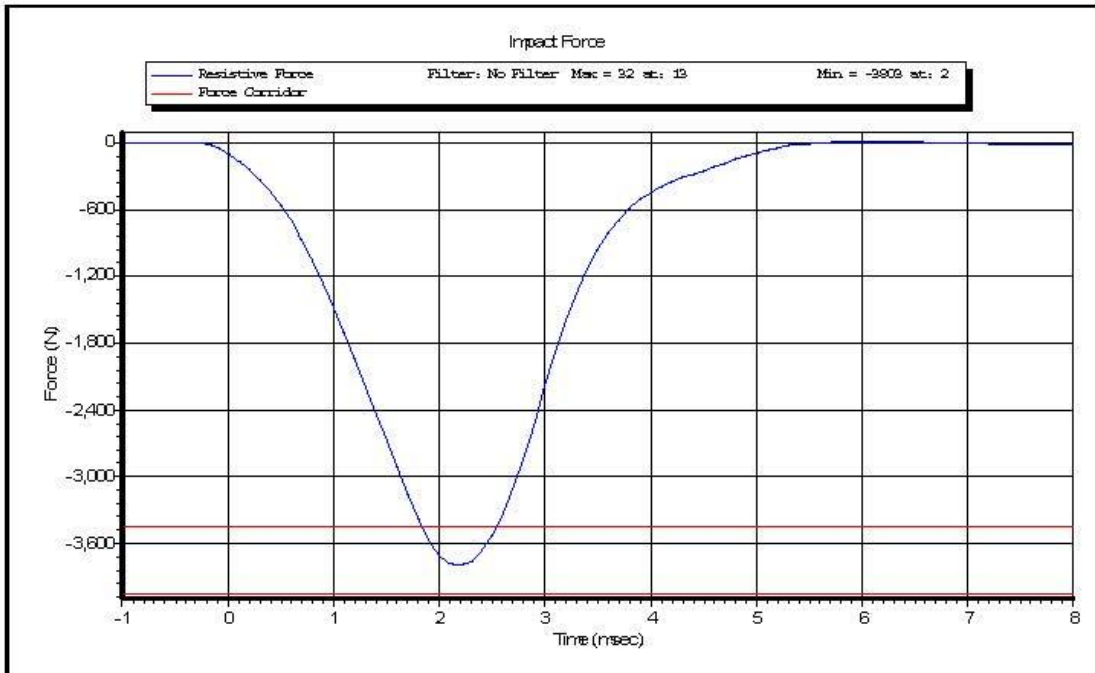
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



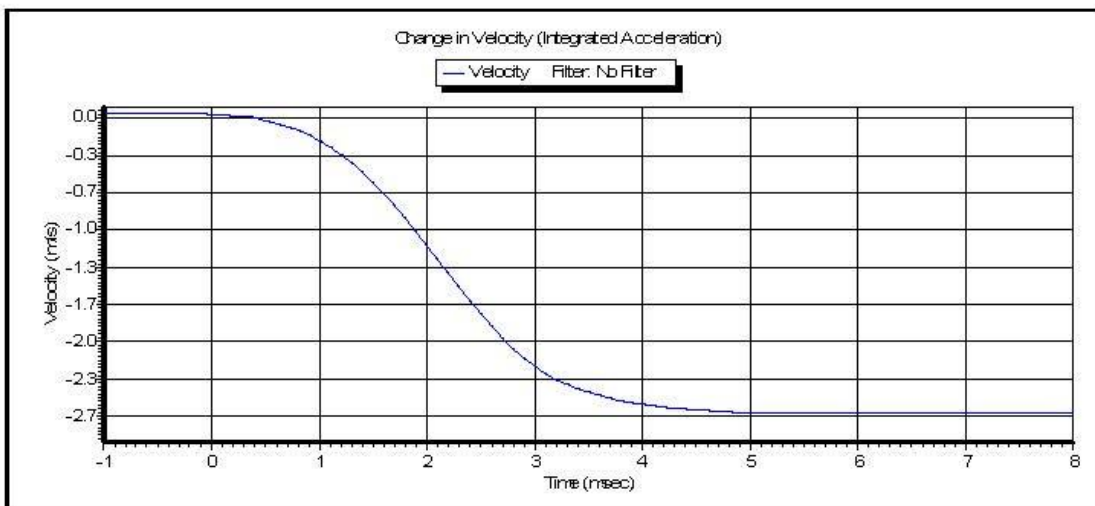
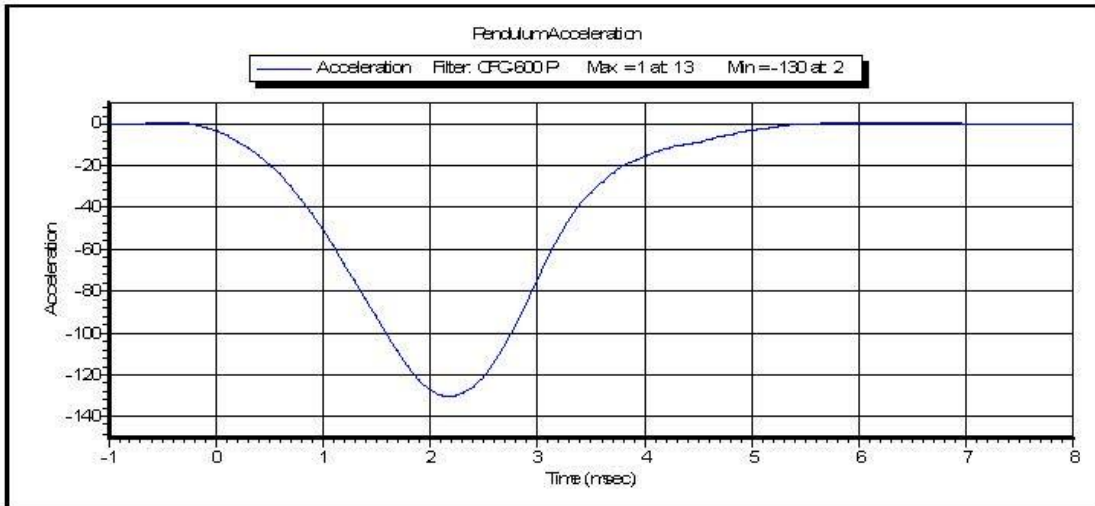
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Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**



Test ID: **Knee Impact Right** Test Time: **3:49:25 PM**

Test Date: **6/26/2013**

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Test ID: **Knee Impact Right** Test Time: **3:49:25 PM**

Test Date: **6/26/2013**

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CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 064



50th Male External Measurements

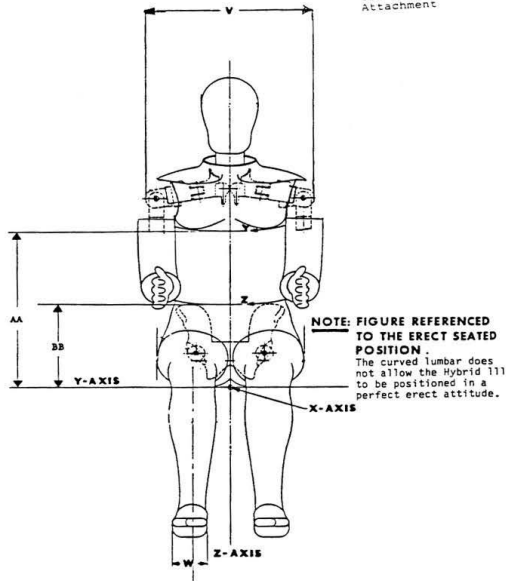
S/N 064

Symbol	Description	Specification	Results	Pass
		in	In	
A	Sitting Height	34.6 – 35.0	34.7	Yes
B	Shoulder Pivot Height	19.9 - 20.5	20.0	Yes
C	H-Point Height	3.3 – 3.5	3.3	Yes
D	H-Point from Backline	5.3 – 5.5	5.4	Yes
E	Shoulder Pivot from Backline	3.3 – 3.7	3.4	Yes
F	Thigh Clearance	5.5 – 6.1	6.0	Yes
G	Back of Elbow to Wrist Pivot	11.4 – 12.0	11.5	Yes
H	Head Back to Backline	1.6 – 1.8	1.7	Yes
I	Shoulder to Elbow Length	13.0 – 13.6	13.0	Yes
J	Elbow Rest Height	7.5 – 8.3	8.1	Yes
K	Buttock to Knee Length	22.8 – 23.8	23.0	Yes
L	Popliteal Height	16.9 – 17.9	17.1	Yes
M	Knee Pivot Height	19.1 – 19.7	19.3	Yes
N	Buttock Popliteal Length	17.8 – 18.8	18.5	Yes
O	Chest Depth without Jacket	8.4 – 9.0	8.5	Yes
P	Foot Length (right)	9.9 – 10.5	10.3	Yes
V	Shoulder Breadth	16.3 – 17.2	16.8	Yes
W	Foot Breadth	3.6 – 4.2	3.9	Yes
Y	Chest Circumference with Jacket	38.2 – 39.4	39.0	Yes
Z	Waist Circumference	32.9 – 34.1	33.6	Yes
AA	Reference Location (Chest Circumference)	16.9 – 17.1	17.0	Yes
BB	Reference Location (Waist Circumference)	8.9 – 9.1	9.0	Yes

Technician: R. Weil

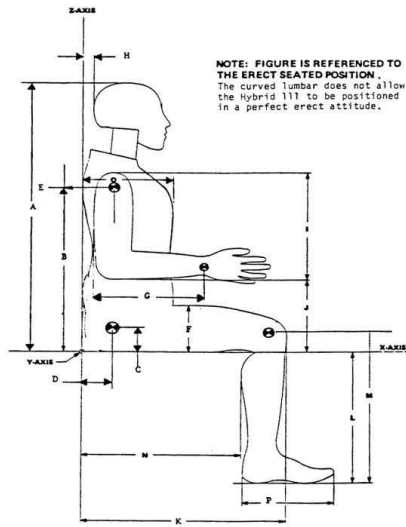
12/05/2013

USG 2485
Attachment



HYBRID III Exterior Body Dimensions - Front View

USG 2485
Attachment



HYBRID III Exterior Body Dimensions - Side View



VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male -NEW		
ATD Serial Number:	064		
Test ID:	Head Drop	Test Date:	12/5/2013
		Test Time:	8:35:17 AM

Component Part Number	Component Serial Number
Head Skin - 78051-228	7997
Cap Skin - 78051-229	2494

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.3 deg C P
Humidity	10 -- 70	48.2 %RH P
Resultant Acceleration	225 -- 275	245.1 g P
Oscillation	0 -- 10	2.1 % P
Lateral Acceleration	-15 -- 15	-6.2 g P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



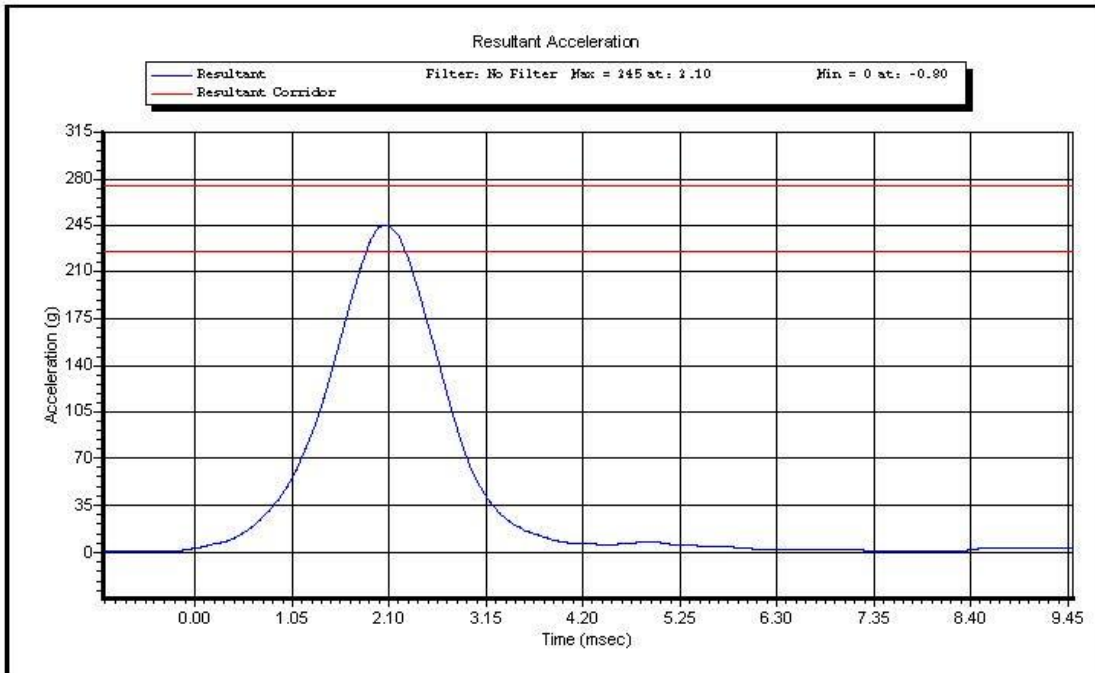
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58904	6/13/2013
Endevco	7264-2000	P58911	6/13/2013
Endevco	7264-2000	P58776	6/11/2013



Test Name: **Head Drop**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male -NEW**
ATD Serial Number: **064**

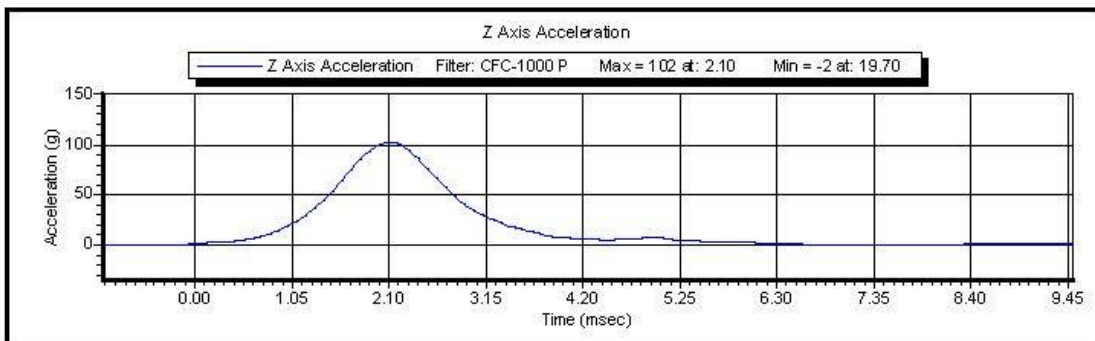
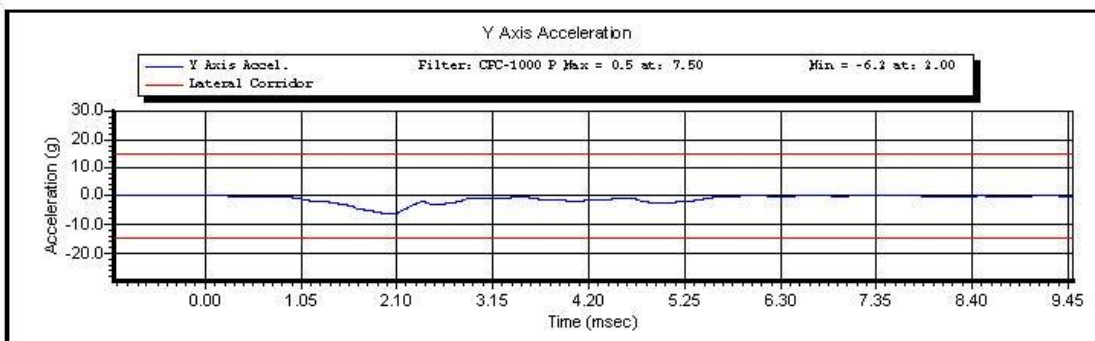
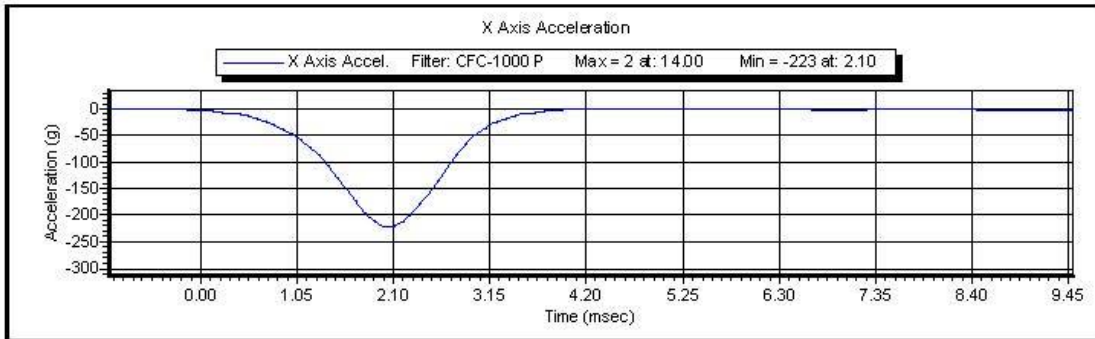


Test ID: **Head Drop**

Test Time: **8:35:17 AM**

Test Date: **12/5/2013**

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Test ID: **Head Drop**

Test Time: **8:35:17 AM**

Test Date: **12/5/2013**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Neck Extention	Test Date:	12/4/2013
		Test Time:	4:15:56 PM

Component Part Number	Component Serial Number
Neck - 78051-336	021692

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	35.5 %RH P
Velocity	5.94 -- 6.19	6.114 m/s P
Pendulum Deceleration at 10 ms	17.2 -- 21.2	19.35 g P
Pendulum Deceleration at 20 ms	14 -- 19	16.2 g P
Pendulum Deceleration at 30 ms	11 -- 16	13.6 g P
Max Pendulum Deceleration after 30 ms	0 -- 22	13.6 g P
Decel Time to 5 g	38 -- 46	40.0 ms P
D Plane Rotation	81 -- 106	101.1 degrees P
Time at Max Rotation	72 -- 82	78.3 ms P
Rotation Decay to Zero	147 -- 174	157.9 ms P
Moment About Occipital Condyle	-80.0 -- -52.9	-69.46 Nm P
Time at Max Moment	65 -- 79	74.5 ms P
Moment Decay to Zero	120 -- 148	146.9 ms P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



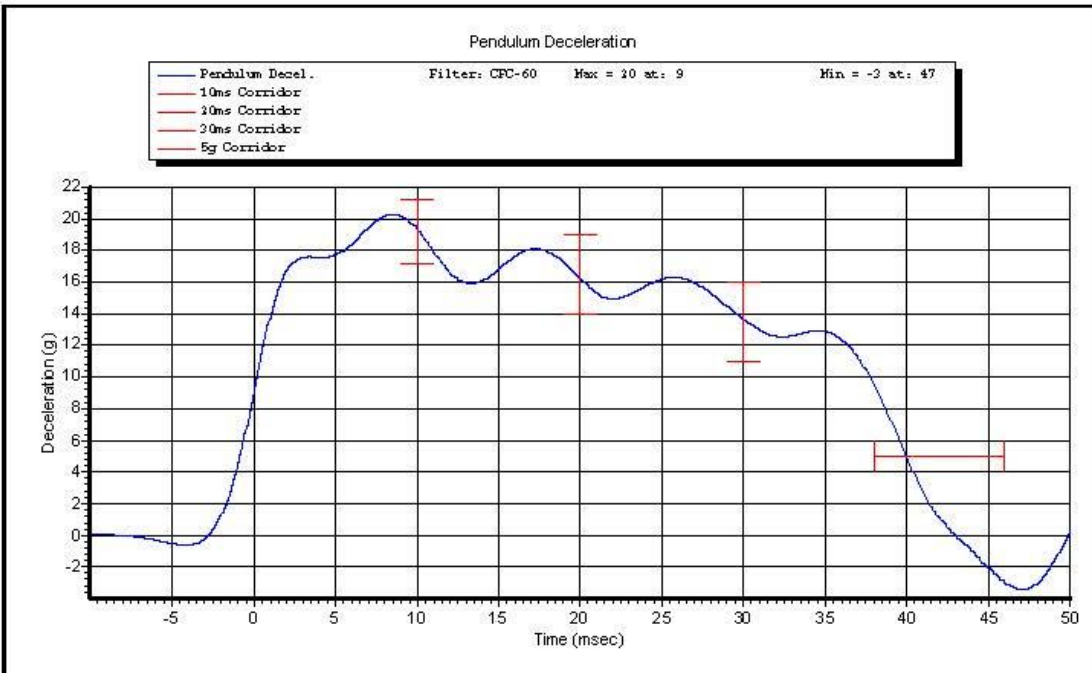
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-2186 My	5/23/2013
Denton	1716A	LC-2186 Fx	5/23/2013



Name of Test:	Neck Extension
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	064

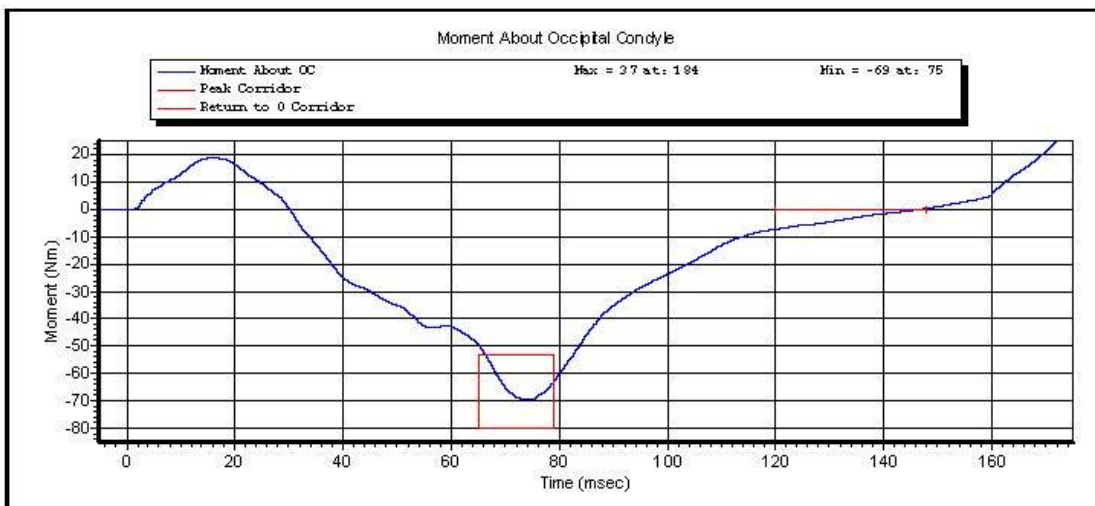
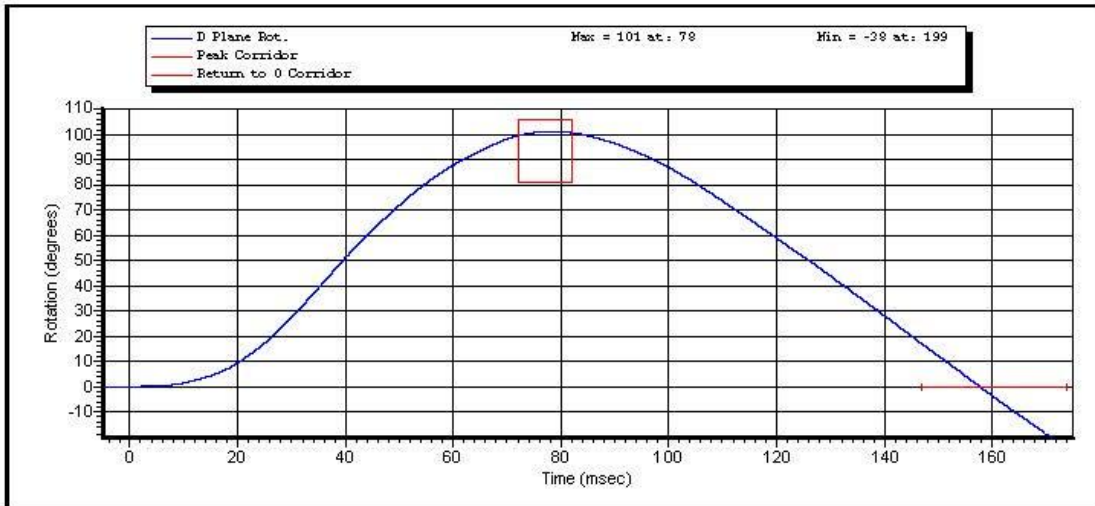


ID of Test: **Neck Extension**

Time of Test: **4:15:56 PM**

Date of Test: **12/4/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

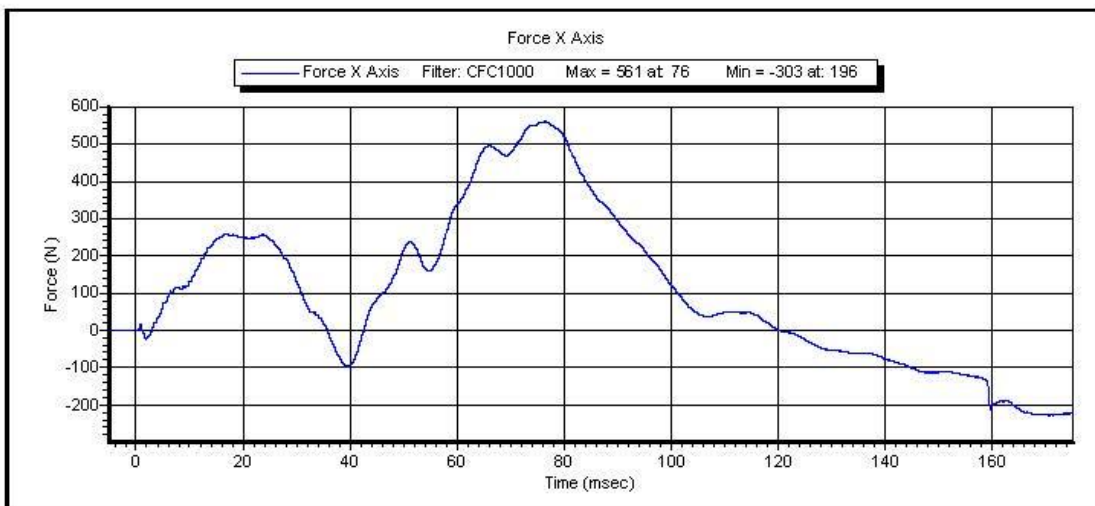
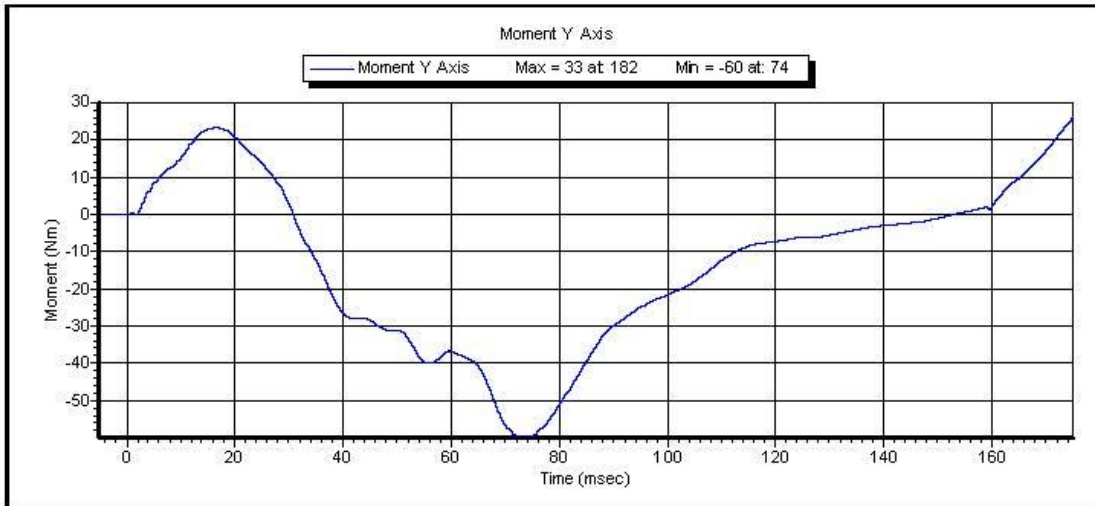


ID of Test: **Neck Extension**

Time of Test: **4:15:56 PM**

Date of Test: **12/4/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test: **Neck Extention** Time of Test: **4:15:56 PM**

Date of Test: **12/4/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Neck Flexion	Test Date:	12/4/2013
		Test Time:	11:53:33 AM

Component Part Number	Component Serial Number
Neck - 78051-336	021692

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	21.5 deg C	P
Humidity		10	-- 70	34.0 %RH	P
Velocity		6.89	-- 7.13	7.084 m/s	P
Pendulum Deceleration at	10 ms	22.5	-- 27.5	24.14 g	P
Pendulum Deceleration at	20 ms	17.6	-- 22.6	20.03 g	P
Pendulum Deceleration at	30 ms	12.5	-- 18.5	14.89 g	P
Max Pendulum Deceleration After	30 ms	0	-- 29	14.9 g	P
Deceleration time to	5 g	34	-- 42	38.1 ms	P
D Plane Rotation		-78	-- -64	-71.2 degrees	P
Time at max rotation		57	-- 64	59.3 ms	P
Rotation Decay to Zero		113	-- 128	114.5 ms	P
Moment about OC		88.1	-- 108.4	92.47 Nm	P
Time at Max Moment		47	-- 58	52.4 ms	P
Moment Decay to Zero		97	-- 107	99.0 ms	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



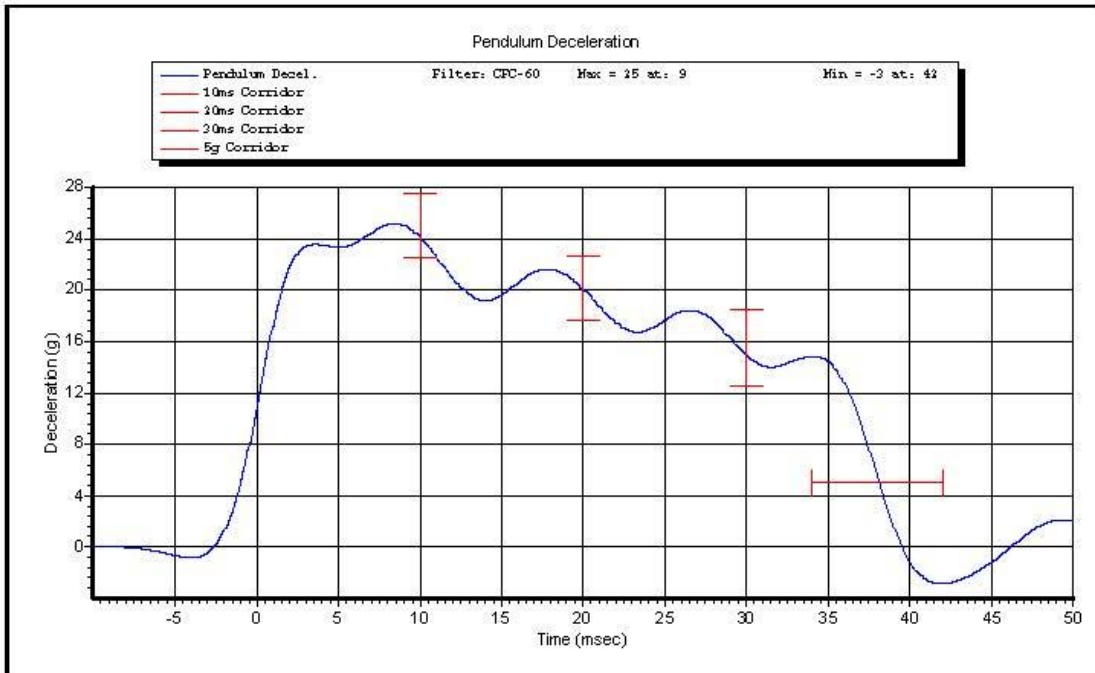
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-2186 My	5/23/2013
Denton	1716A	LC-2186 Fx	5/23/2013



Name of Test: **Neck Flexion**
Name of Sub Test:
Type of ATD: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**

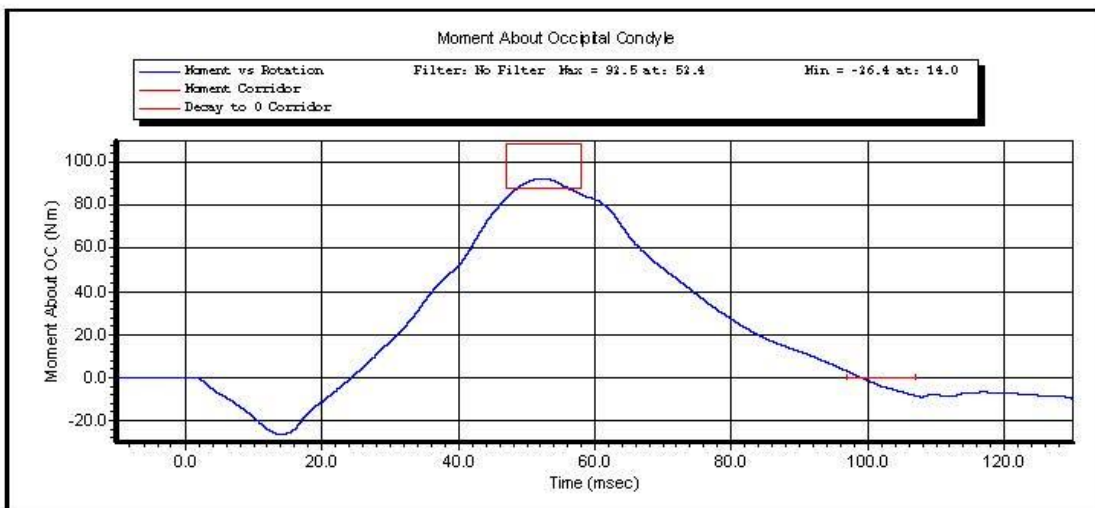
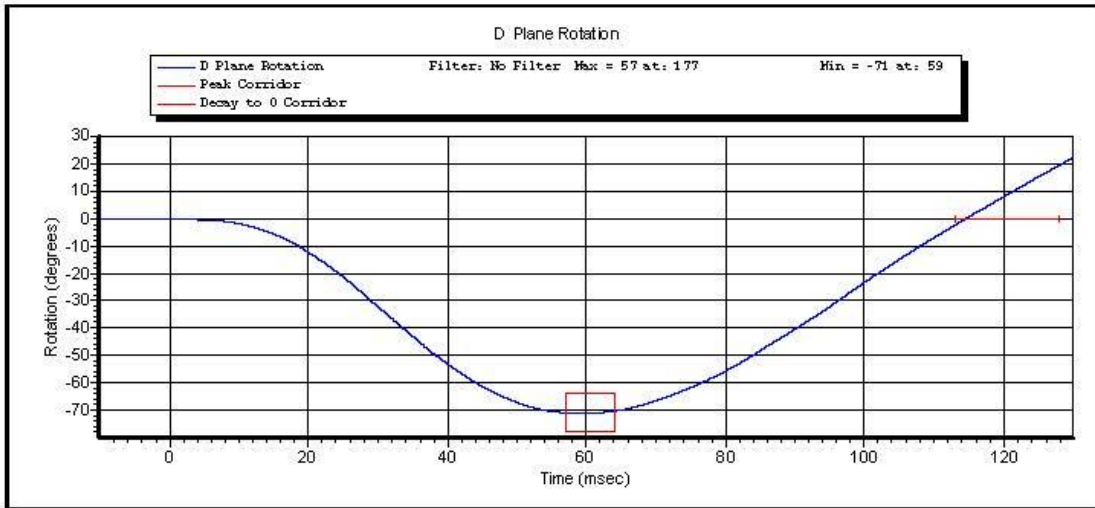


ID of Test: **Neck Flexion**

Time of Test: **11:53:33 AM**

Date of Test: **12/4/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

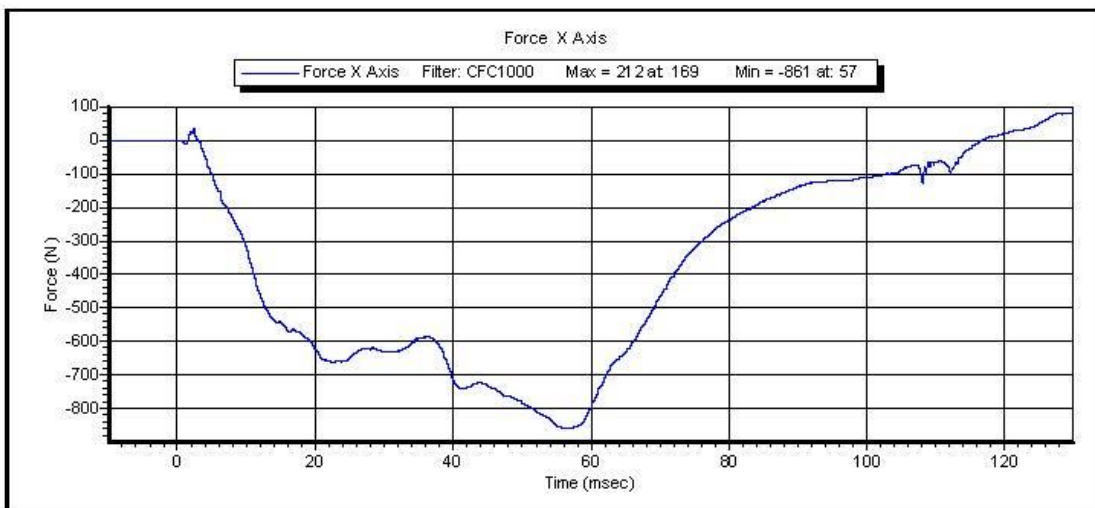
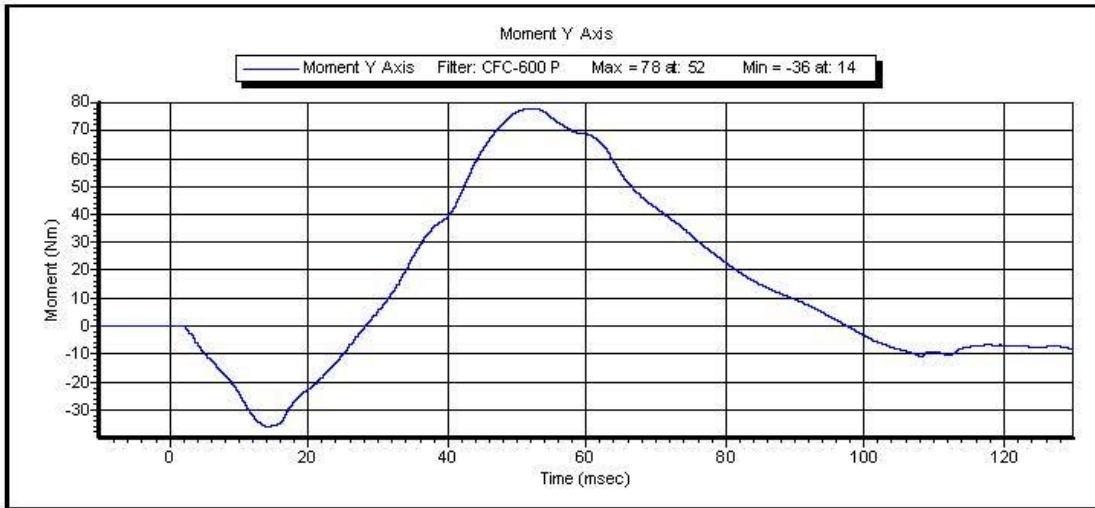


ID of Test: Neck Flexion

Time of Test: 11:53:33 AM

Date of Test: 12/4/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test: **Neck Flexion**

Time of Test: **11:53:33 AM**

Date of Test: **12/4/2013**

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VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Thorax Impact	Test Date:	12/4/2013
		Test Time:	7:46:34 AM

Component Part Number	Component Serial Number
Chest Jacket - 78051-169	DL 7598

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.0 deg C P
Humidity	10 -- 70	26.7 %RH P
Velocity	6.59 -- 6.83	6.741 m/s P
Resistive Force	-5.894 -- -5.160	-5.5599 kN P
Sternum Displacement	-72.6 -- -63.5	-72.33 mm P
Hysteresis	69 -- 85	69.5 % P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



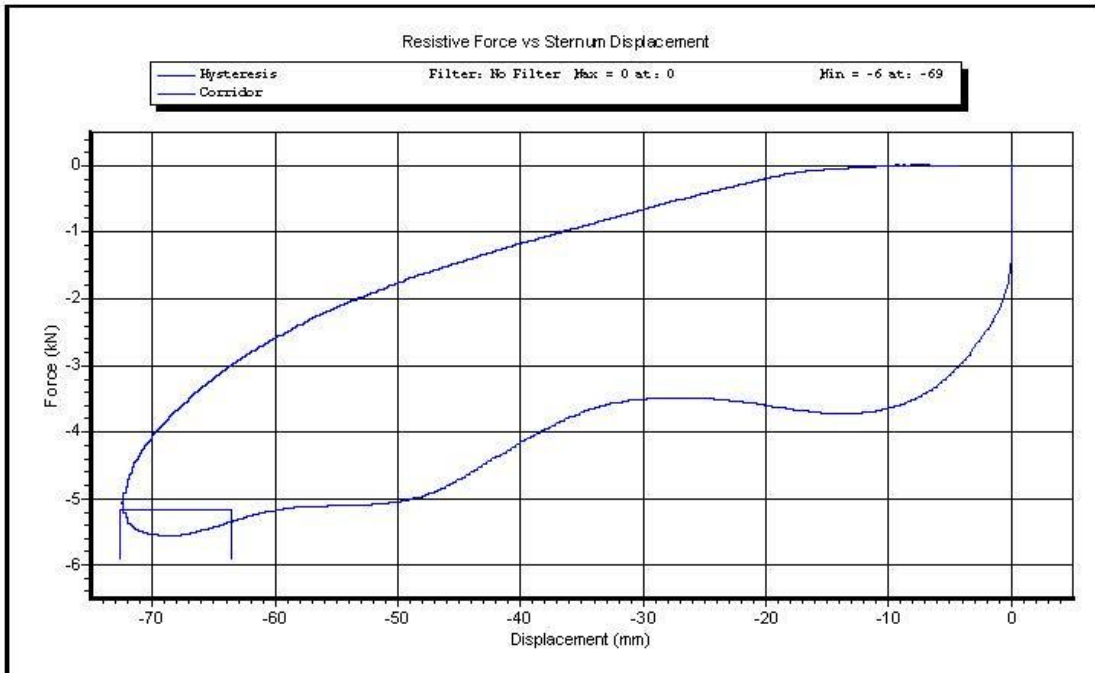
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	12/4/2013
DentonATD	78051-342	DS-064	6/18/2013



Test Name: **Thorax Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**

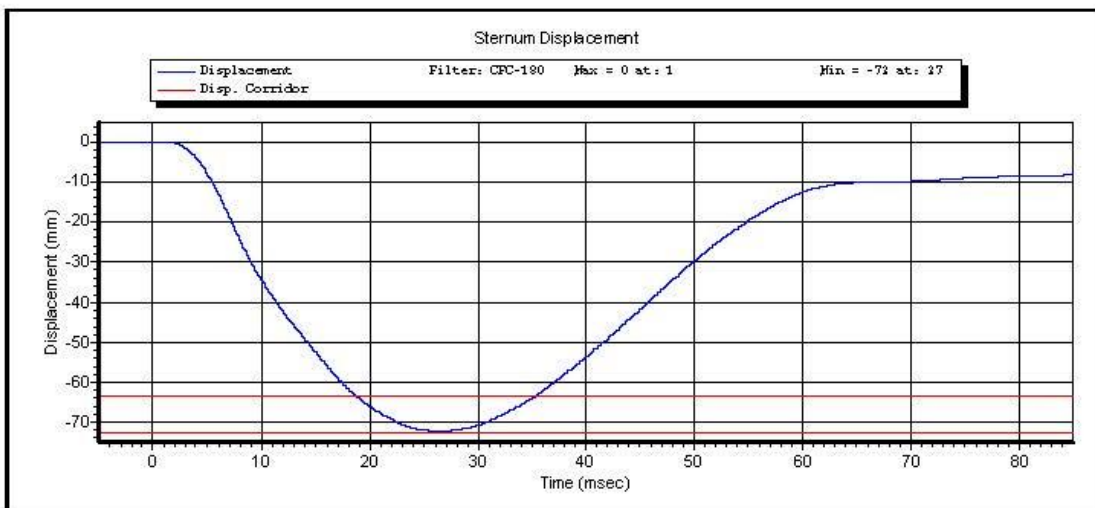
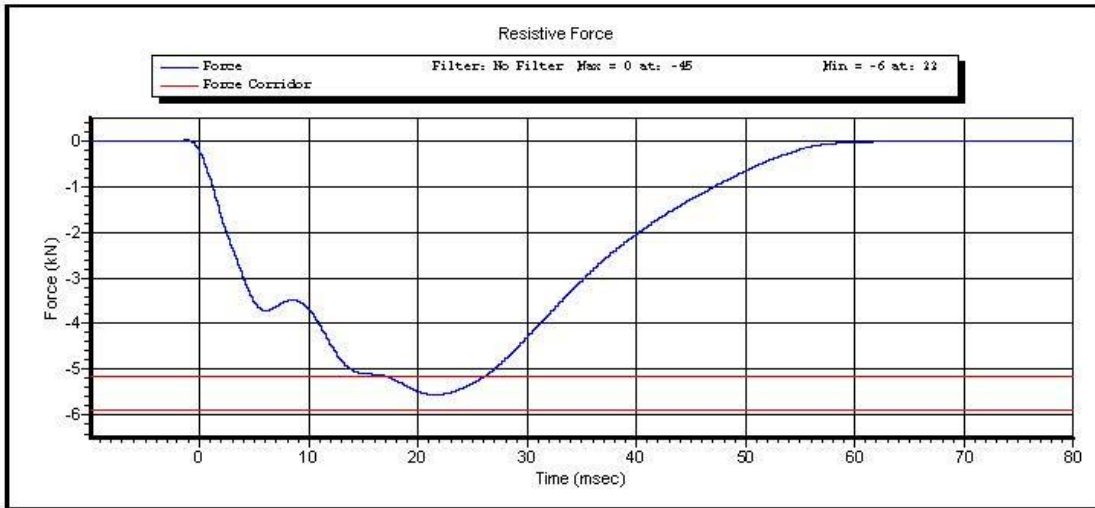


Test ID: **Thorax Impact**

Test Time: **7:46:34 AM**

Test Date: **12/4/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

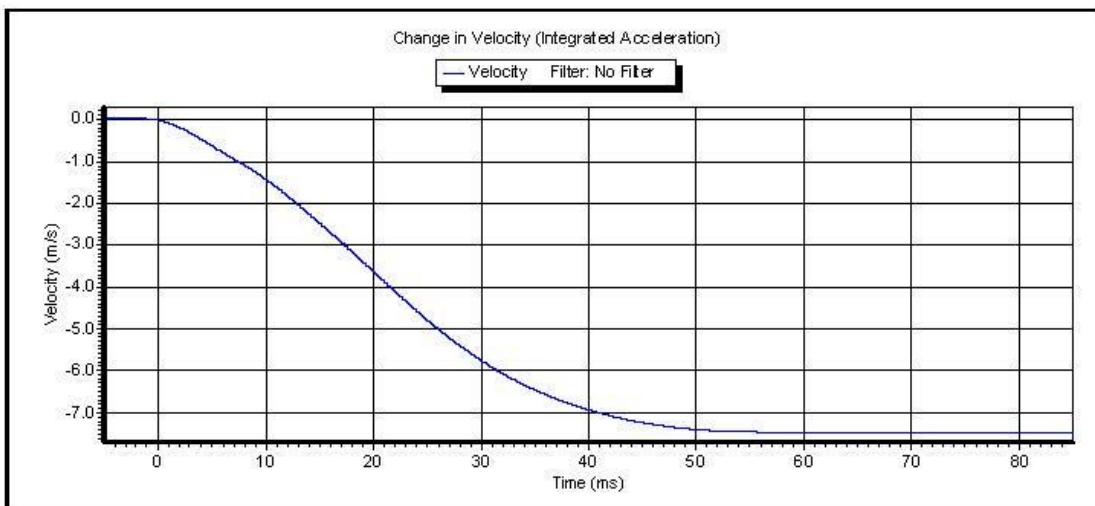
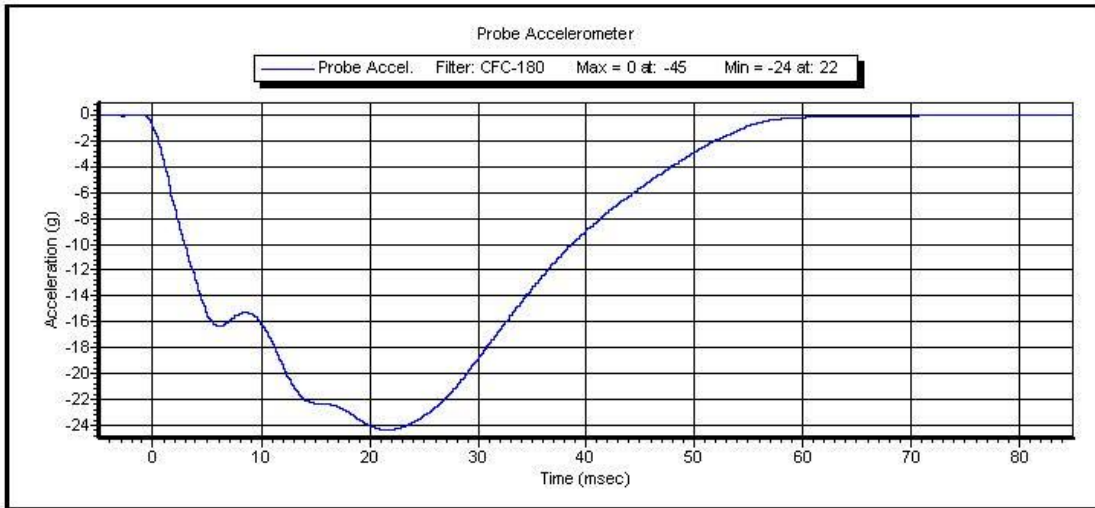


Test ID: **Thorax Impact**

Test Time: **7:46:34 AM**

Test Date: **12/4/2013**

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Test ID: **Thorax Impact**

Test Time: **7:46:34 AM**

Test Date: **12/4/2013**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Hip ROM Left	Test Date:	12/4/2013
		Test Time:	9:49:05 AM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	1445

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.1 deg C P
Humidity	10 -- 70	32.2 %RH P
Average Velocity	5 -- 10	5.2 deg/s P
Angle at 203 Nm	40 -- 50	42.4 degrees P
Moment at 30 degrees	0.0 -- 94.9	73.33 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



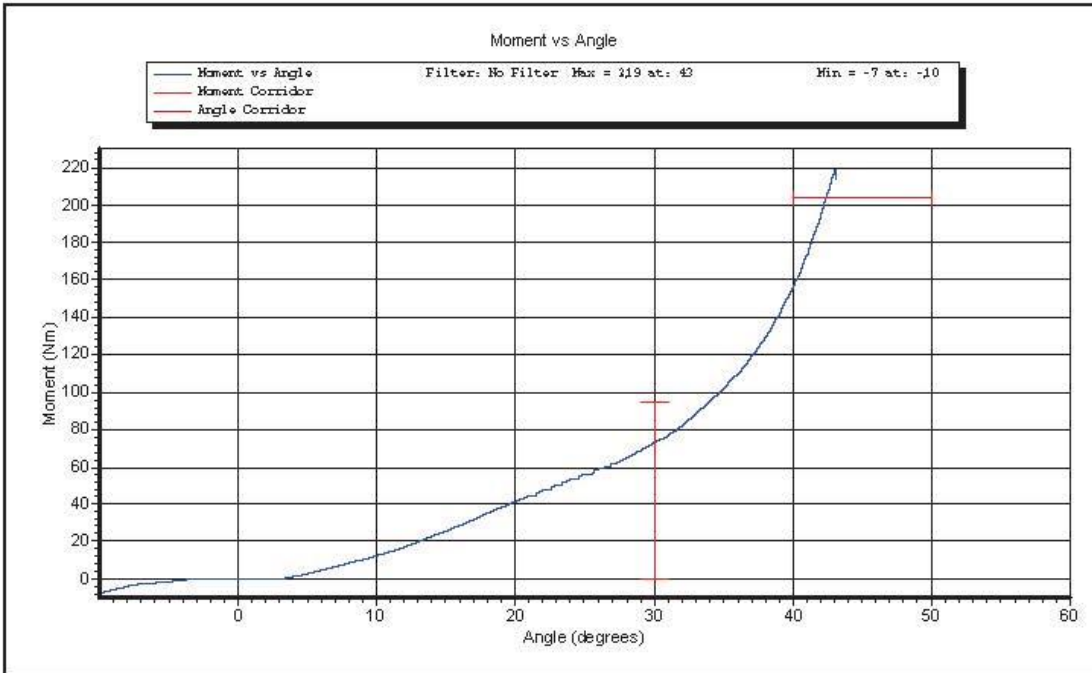
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14CB1-3615	0008	2/21/2013
DentonATD	Velocity Trap	1	1/11/2013



Test Name: **Hip ROM**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**



Test ID: **Hip ROM Left**

Test Time: **9:49:05 AM**

Test Date: **12/4/2013**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Hip Rom Right	Test Date:	12/4/2013
		Test Time:	9:31:12 AM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	1445

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.2 deg C P
Humidity	10 -- 70	31.8 %RH P
Average Velocity	5 -- 10	5.7 deg/s P
Angle at 203 Nm	40 -- 50	41.0 degrees P
Moment at 30 degrees	0.0 -- 94.9	86.14 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



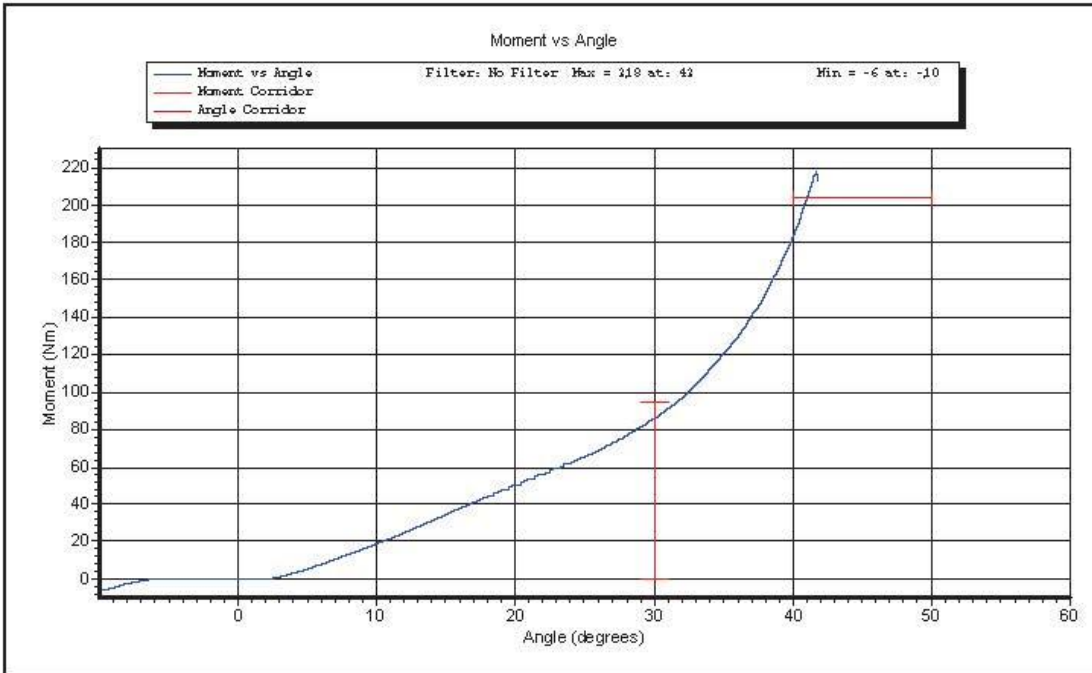
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14CB1-3615	0008	2/21/2013
DentonATD	Velocity Trap	1	1/11/2013



Test Name: **Hip ROM**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**



Test ID: **Hip Rom Right**

Test Time: **9:31:12 AM**

Test Date: **12/4/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Knee Impact Left	Test Date:	12/2/2013
		Test Time:	4:18:25 PM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	2882 (L)

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.6 deg C P
Humidity	10 -- 70	25.5 %RH P
Velocity	2.07 -- 2.13	2.094 m/s P
Resistive Force	-5.78 -- -4.72	-4.942 kN P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



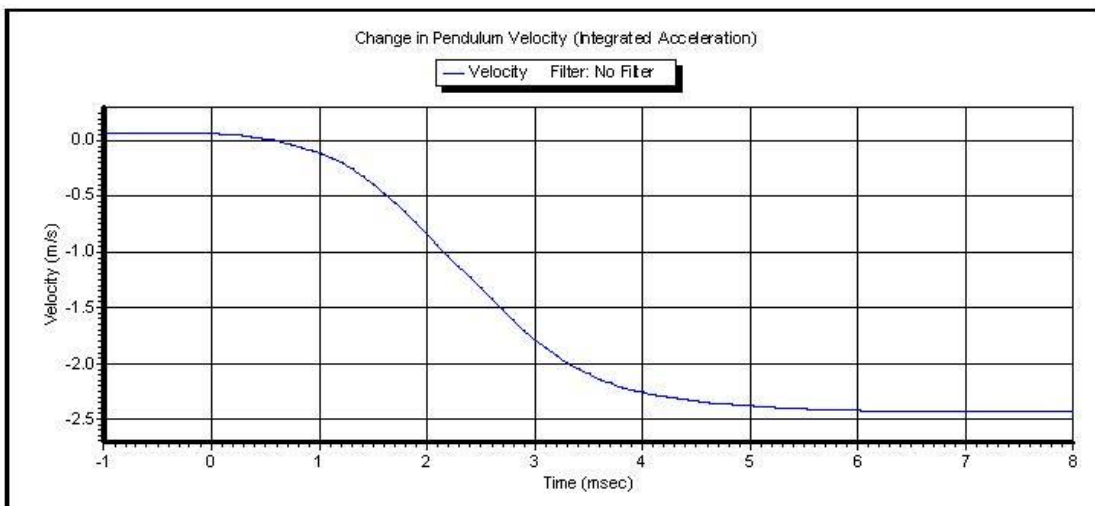
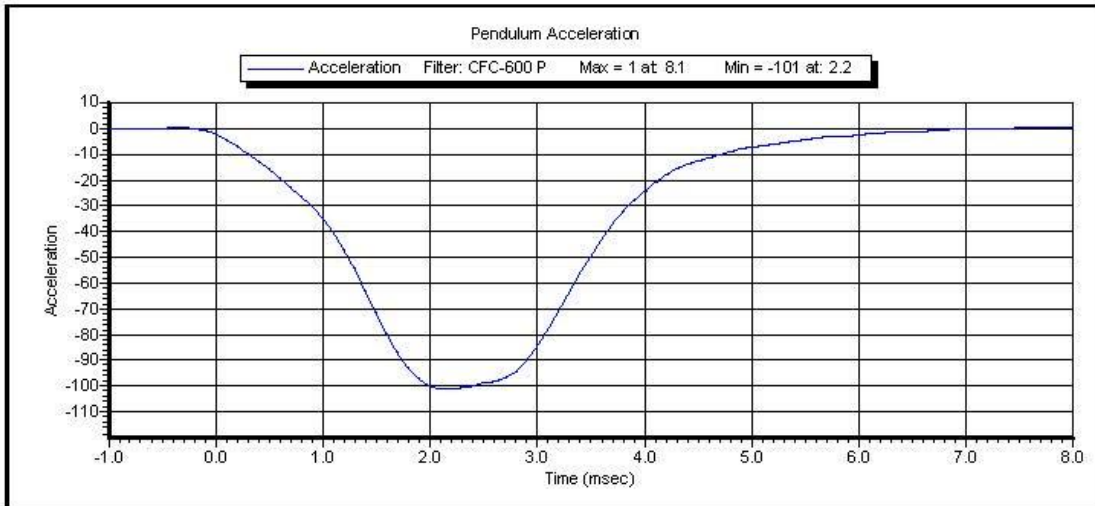
Test Name: **Knee Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**



Test ID: **Knee Impact Left** Test Time: **4:18:25 PM**

Test Date: **12/2/2013**

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Test ID: **Knee Impact Left** Test Time: **4:18:25 PM**

Test Date: **12/2/2013**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	064		
Test ID:	Knee Impact Right	Test Date:	12/2/2013
		Test Time:	4:12:24 PM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	2531 (R)

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.6 deg C P
Humidity	10 -- 70	25.5 %RH P
Velocity	2.07 -- 2.13	2.095 m/s P
Resistive Force	-5.78 -- -4.72	-5.335 kN P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



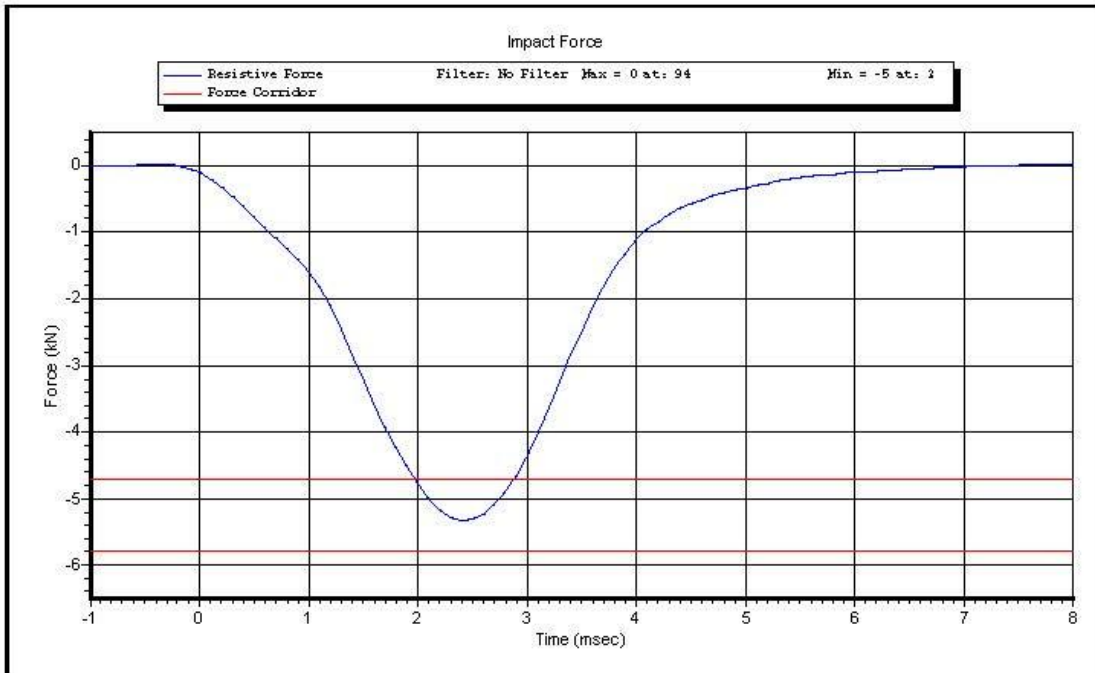
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



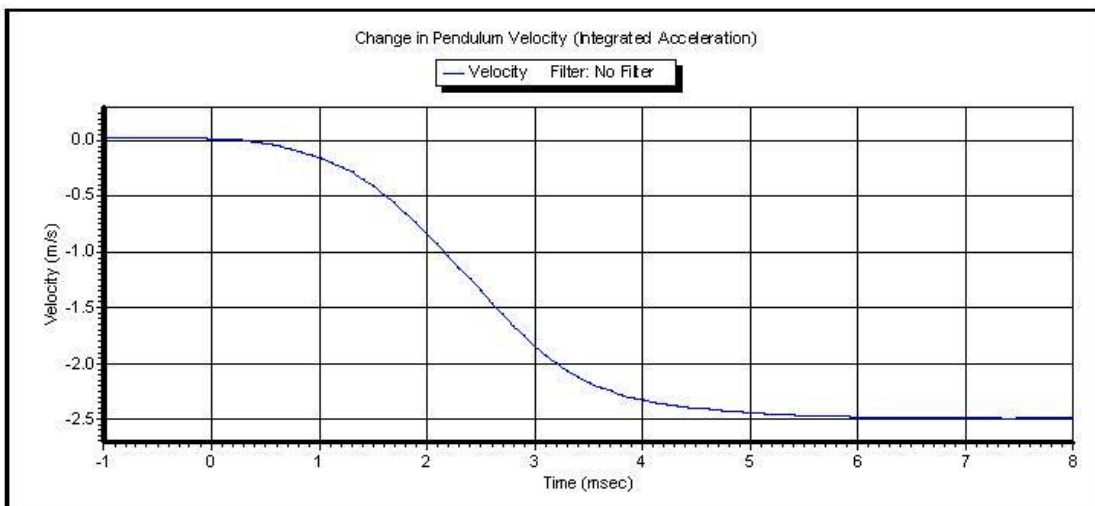
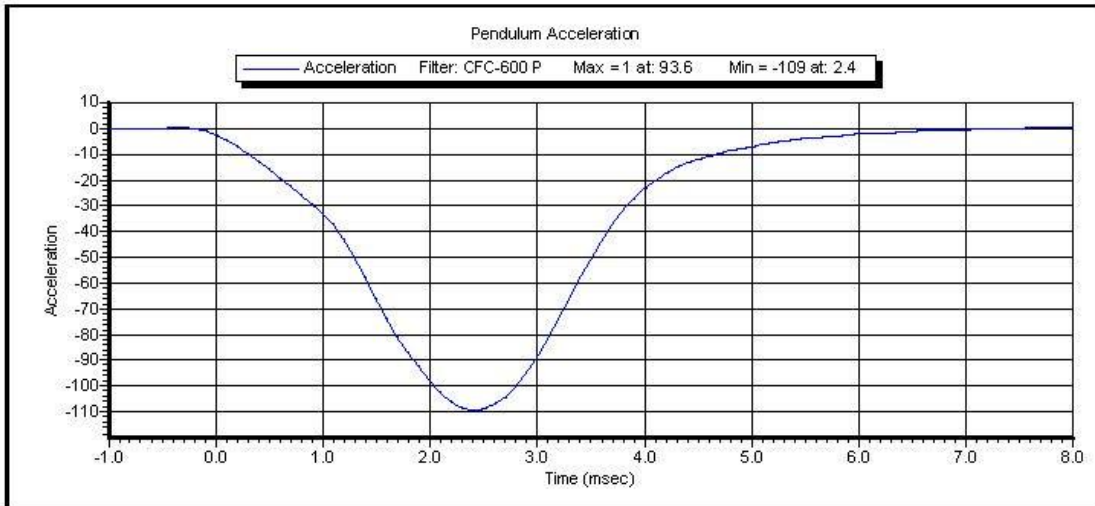
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Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **064**



Test ID: **Knee Impact Right** Test Time: **4:12:24 PM**

Test Date: **12/2/2013**

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Test ID: **Knee Impact Right** Test Time: **4:12:24 PM**

Test Date: **12/2/2013**

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CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 273



External Measurements

5th Female SN 273

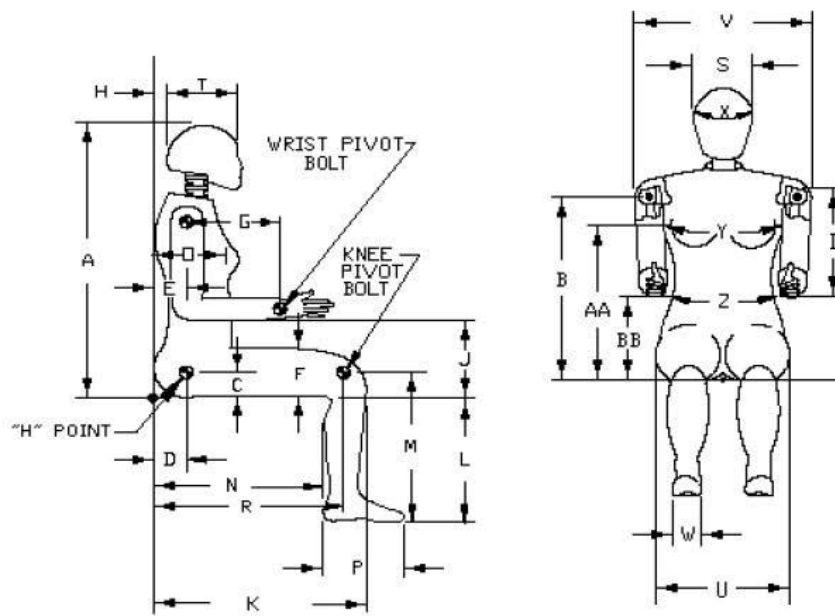
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	774.7 – 800.1	786	Yes
B	Shoulder Pivot Height	431.8 – 457.2	448	Yes
C	H-Point Height	81.3 – 86.3	86	Yes
D	H-Point from Backline	144.8 – 149.8	145	Yes
E	Shoulder Pivot from Backline	68.6 – 83.8	75	Yes
F	Thigh Clearance	119.4 – 134.6	133	Yes
G	Back of Elbow to Wrist Pivot	243.9 – 259.1	252	Yes
H	Head Back to Backline	43.2 – 48.2	44	Yes
I	Shoulder to Elbow Length	276.8 – 297.2	286	Yes
J	Elbow Rest Height	182.8 – 203.2	193	Yes
K	Buttock to Knee Length	520.7 – 546.1	534	Yes
L	Popliteal Height	355.6 – 376	360	Yes
M	Knee Pivot Height	393.7 – 419.1	395	Yes
N	Buttock Popliteal Length	414 – 439.4	423	Yes
O	Chest Depth without Jacket	175.3 – 190.5	181	Yes
P	Foot Length (right)	218.5 – 233.7	221	Yes
R	Buttock To Knee Pivot Length	457.2 – 482.6	467	Yes
S	Head Breadth	137.1 – 147.3	143	Yes
T	Head Depth	177.8 – 188	180	Yes
U	Hip Breadth	299.7 – 314.9	312	Yes
V	Shoulder Breadth	350.5 – 365.7	356	Yes
W	Foot Breadth	78.8 – 94	84	Yes
X	Head Circumference	528.3 – 548.7	540	Yes
Y	Chest Circumference with Jacket	850.9 – 881.3	856	Yes
Z	Waist Circumference	759.5 – 789.9	771	Yes
AA	Reference Location (Chest Circumference)	332.7 – 358.1	345	Yes
BB	Reference Location (Waist Circumference)	160.1 – 170.2	165	Yes

Technician: M. Geesey

Date: 12/04/2013

Hybrid III 5th Female External Measurements

Reference Diagram





VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Head Drop	Test Date:	12/2/2013
		Test Time:	9:26:34 AM

Component Part Number	Component Serial Number
Head Skin - 78051-228	780
Cap Skin - 78051-229	866

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.7 deg C P
Humidity	10 -- 70	30.2 %RH P
Resultant Acceleration	250 -- 300	292.9 g P
Oscillation	0 -- 10	0.0 % P
Lateral Acceleration	-15 -- 15	-8.5 g P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



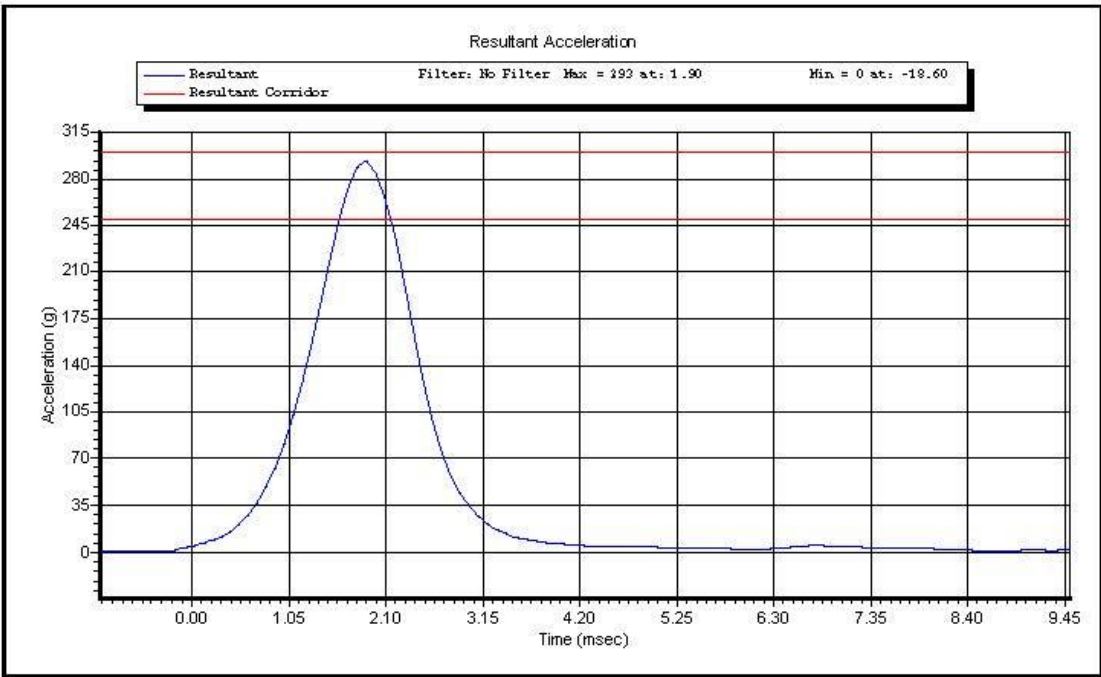
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58833	6/11/2013
Endevco	7264-2000	P58905	6/20/2013
Endevco	7264-2000	P52114	6/11/2013



Test Name: **Head Drop**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**

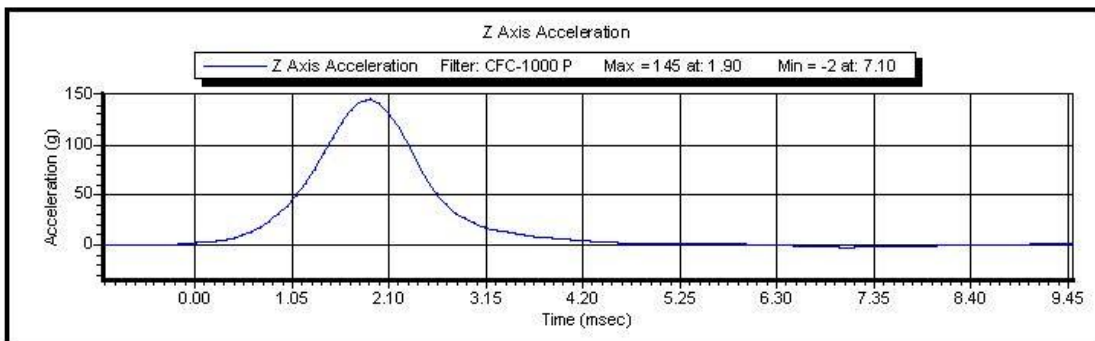
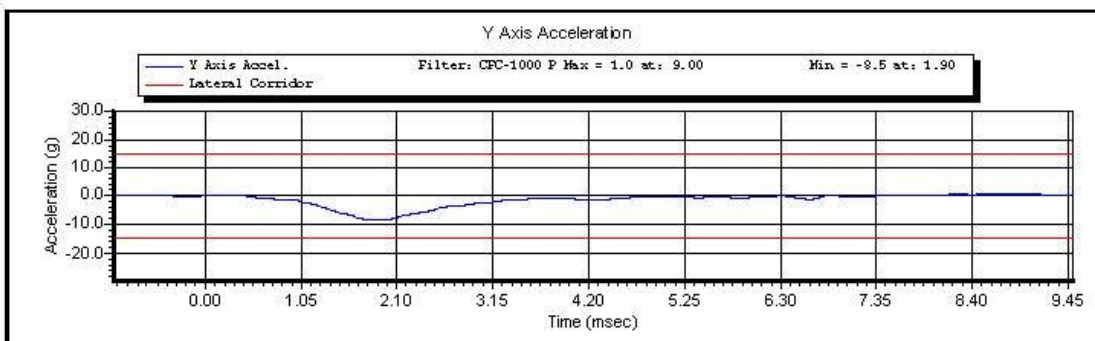
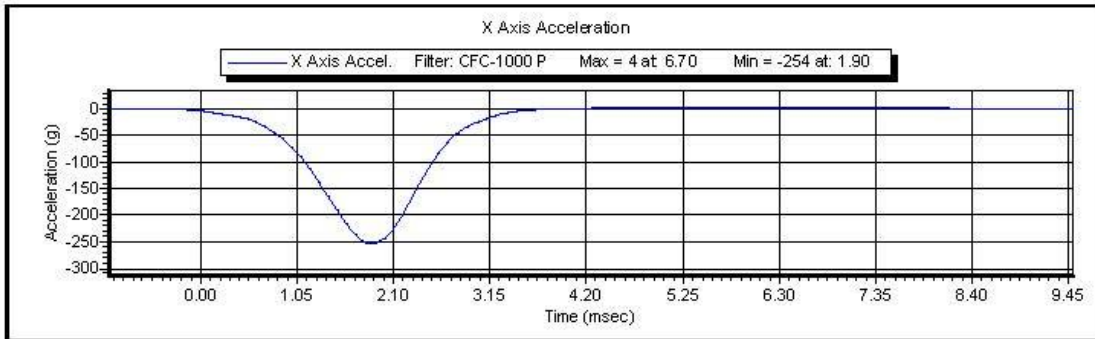


Test ID: **Head Drop**

Test Time: **9:26:34 AM**

Test Date: **12/2/2013**

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Test ID: **Head Drop**

Test Time: **9:26:34 AM**

Test Date: **12/2/2013**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Neck Extension	Test Date:	12/3/2013
		Test Time:	8:22:24 AM

Component Part Number	Component Serial Number
Neck - 880105-255	660
Head Skin - 880105-109	780

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.1 deg C P
Humidity	10 -- 70	24.4 %RH P
Velocity	5.95 -- 6.19	6.137 m/s P
Pendulum Impulse at 10 ms	1.5 -- 1.9	1.80 m/s P
Pendulum Impulse at 20 ms	3.1 -- 3.9	3.60 m/s P
Pendulum Impulse at 30 ms	4.6 -- 5.6	5.24 m/s P
D Plane Rotation	99 -- 114	103.0 degrees P
Moment During Rotation Interval	-65 -- -53	-54.4 Nm P
Moment Decay to -10.0 Nm	94 -- 114	101.2 ms P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



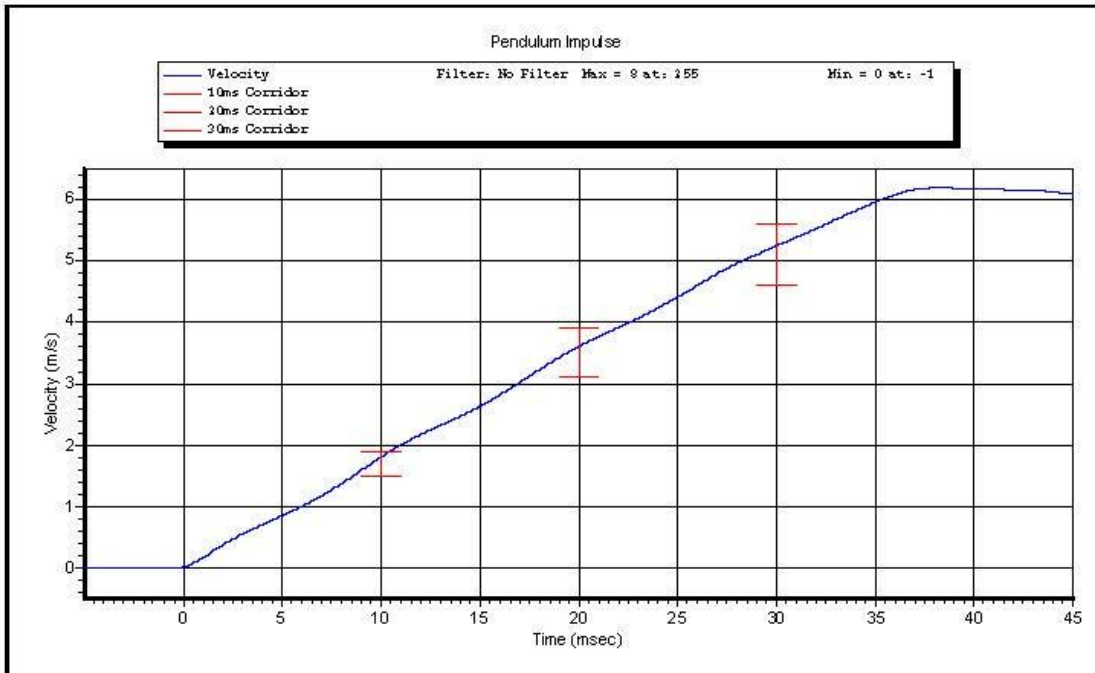
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-1629 My	4/30/2013
Denton	1716A	LC-1629 Fx	4/30/2013



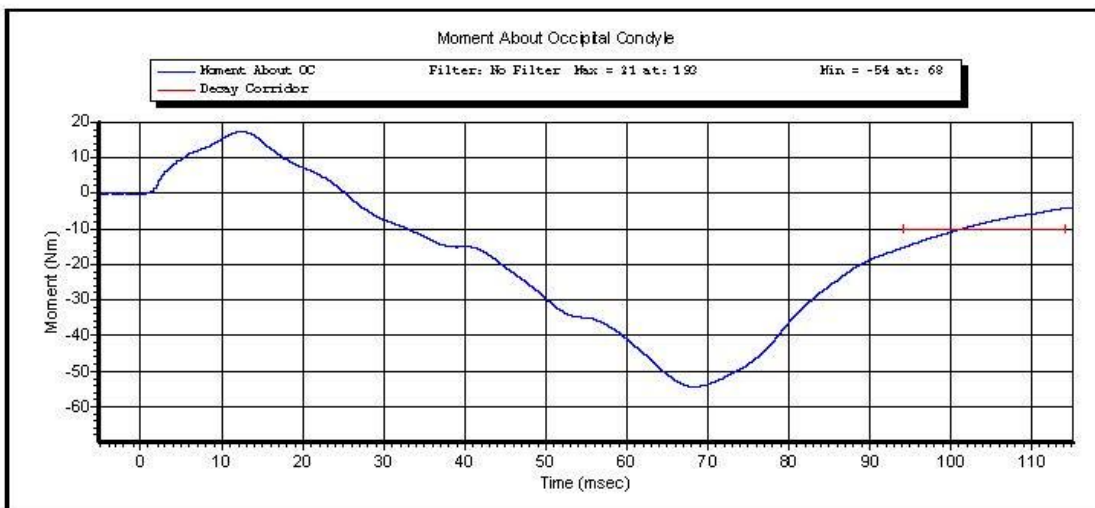
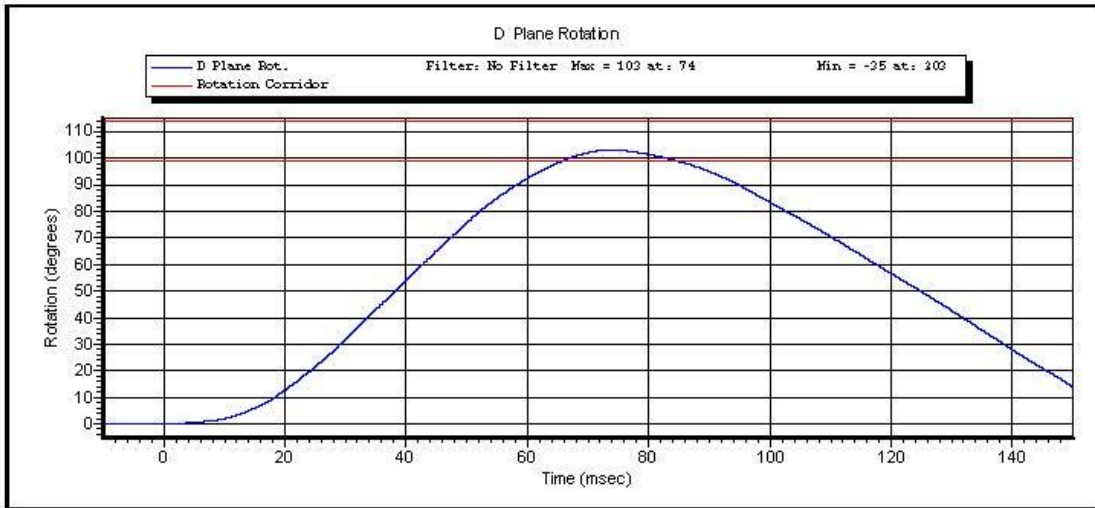
Test Name: **Neck Extension**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**



Test ID: **Neck Extension** Test Time: **8:22:24 AM**

Test Date: **12/3/2013**

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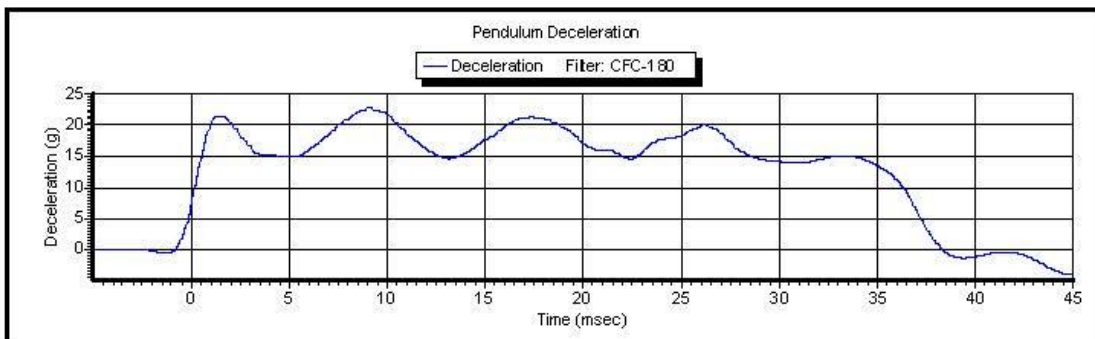
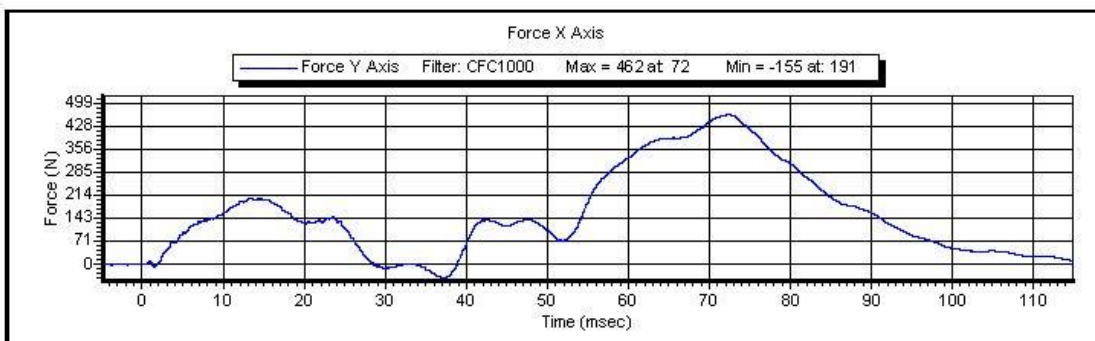
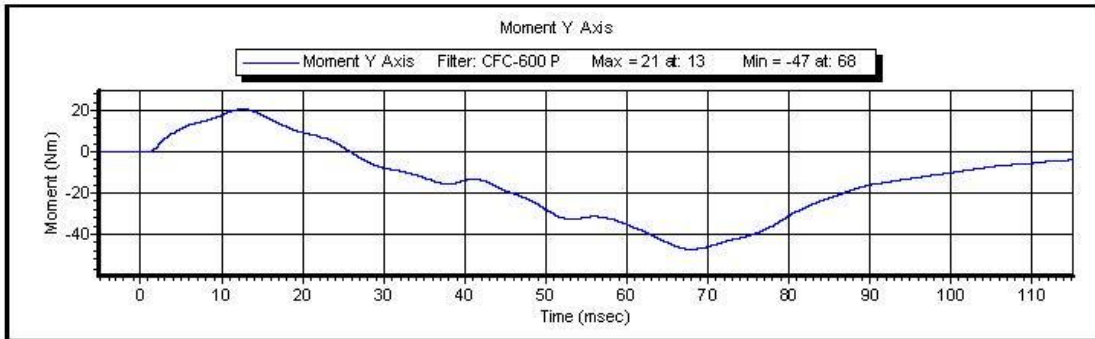


Test ID: Neck Extension

Test Time: 8:22:24 AM

Test Date: 12/3/2013

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Test ID: **Neck Extension**

Test Time: **8:22:24 AM**

Test Date: **12/3/2013**

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VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Neck Flexion	Test Date:	12/3/2013
		Test Time:	12:50:12 PM

Component Part Number	Component Serial Number
Neck - 880105-255	660

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.1 deg C P
Humidity	10 -- 70	26.1 %RH P
Velocity	6.89 -- 7.13	7.113 m/s P
Pendulum Impulse at 10 ms	2.1 -- 2.5	2.46 m/s P
Pendulum Impulse at 20 ms	4 -- 5	4.8 m/s P
Pendulum Impulse at 30 ms	5.8 -- 7.0	6.73 m/s P
D Plane Rotation	-91 -- -77	-79.2 degrees P
Moment During Rotation Interval	69 -- 83	70.6 Nm P
Moment Decay to 10.0 Nm	80 -- 100	85.7 ms P

All test parameters are within specifications

Technician: **M. Goehle**
Supervisor: **E. Dutton**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-1629 My	4/30/2013
Denton	1716A	LC-1629 Fx	4/30/2013



Test Name: **Neck Flexion**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**

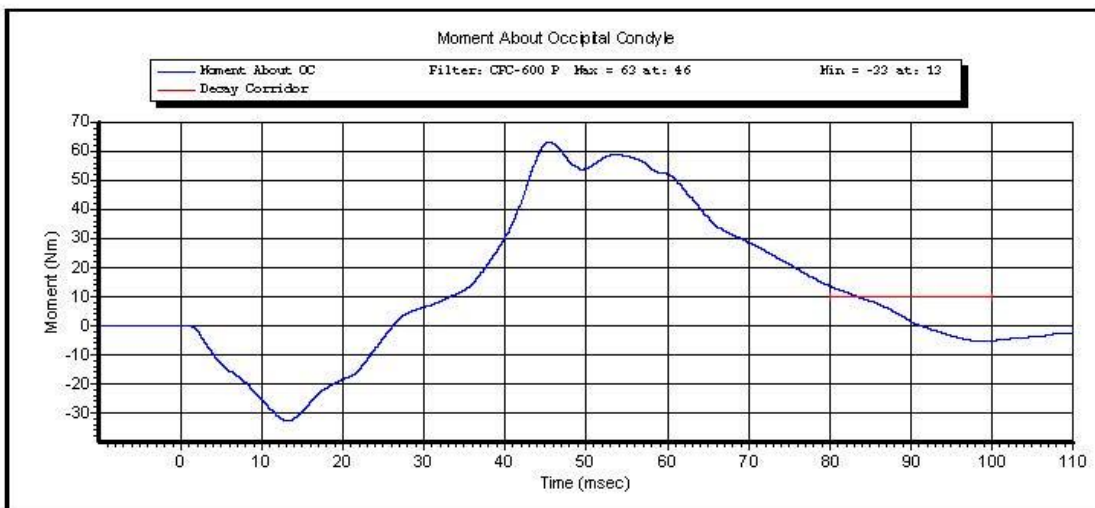
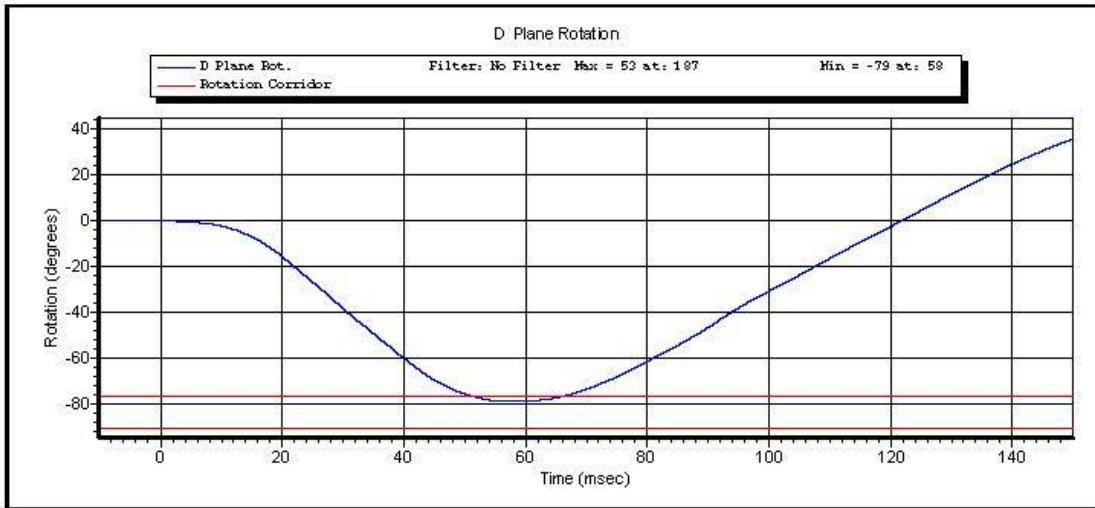


Test ID: **Neck Flexion**

Test Time: **12:50:12 PM**

Test Date: **12/3/2013**

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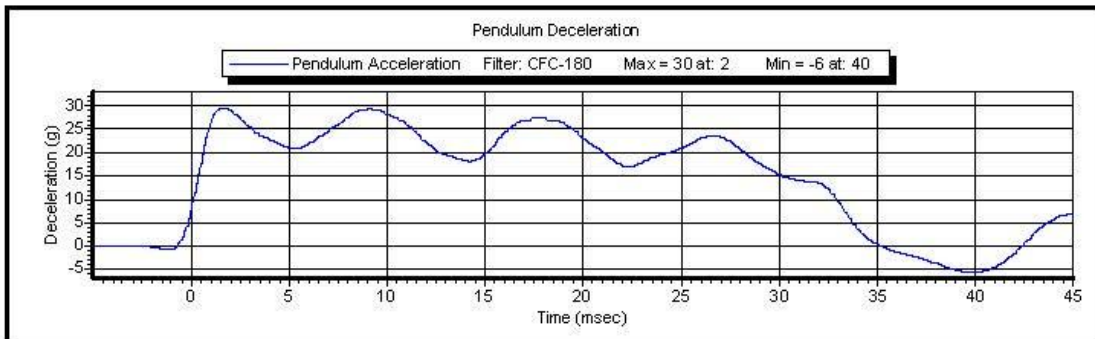
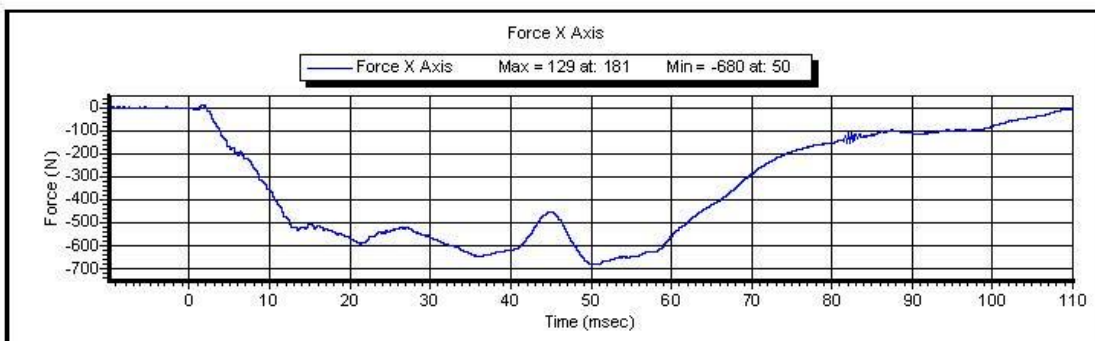
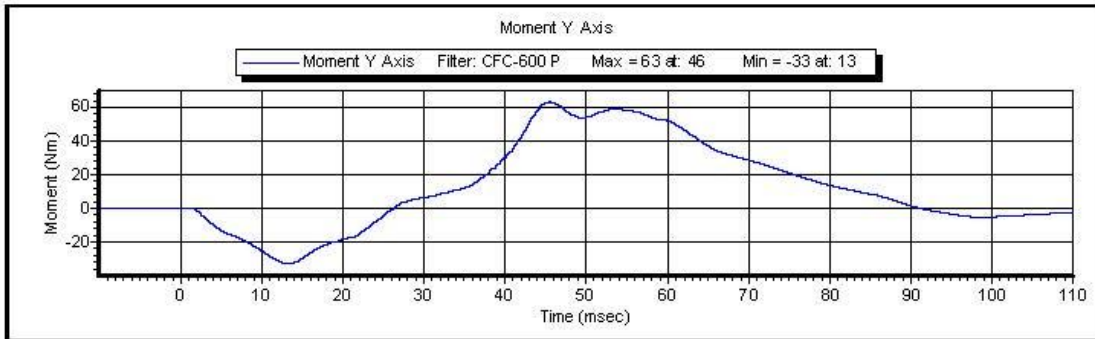


Test ID: Neck Flexion

Test Time: 12:50:12 PM

Test Date: 12/3/2013

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Test ID: **Neck Flexion**

Test Time: **12:50:12 PM**

Test Date: **12/3/2013**

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VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Thorax Impact	Test Date:	12/4/2013
		Test Time:	11:15:23 AM

Component Part Number	Component Serial Number
Chest Jacket - 880105-355-E	DH 0069

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.4 deg C P
Humidity	10 -- 70	33.4 %RH P
Velocity	6.59 -- 6.83	6.708 m/s P
Sternum Displacement	-58 -- -50	-52.4 mm P
Force During Displacement Interval	-4400 -- -3900	-4188.4 N P
Force -18.0 to -50.0 Displacement	-4600 -- 0	-4188.4 N P
Hysteresis	69 -- 85	72.0 % P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



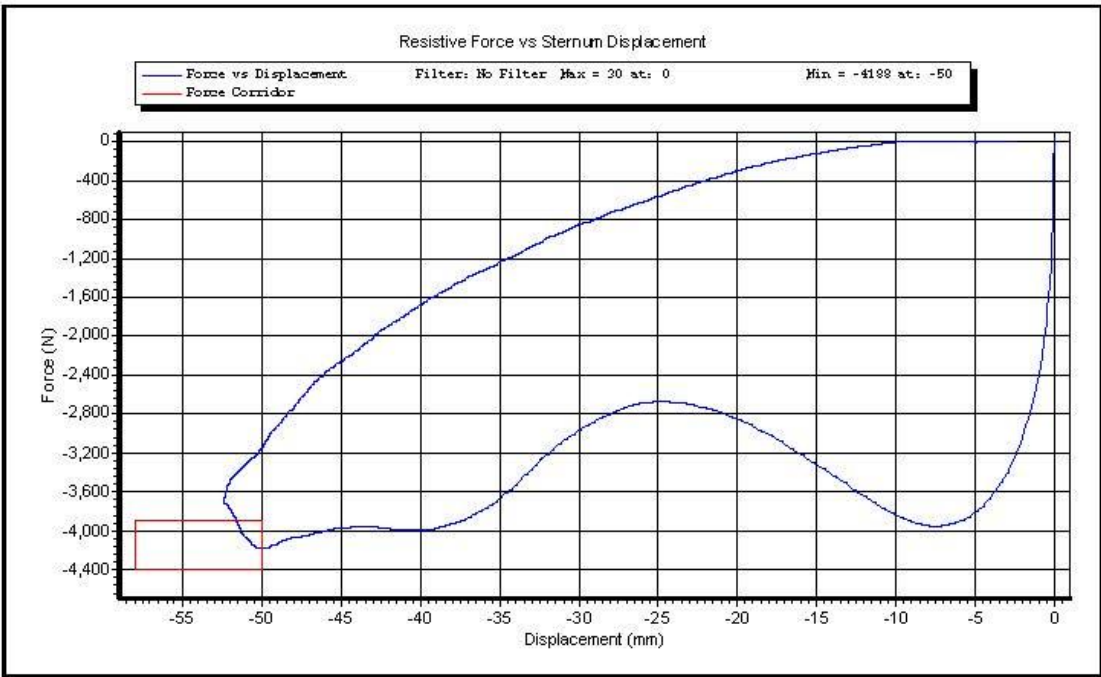
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	12/4/2013
DentonATD	78051-342	DS-273	6/17/2013

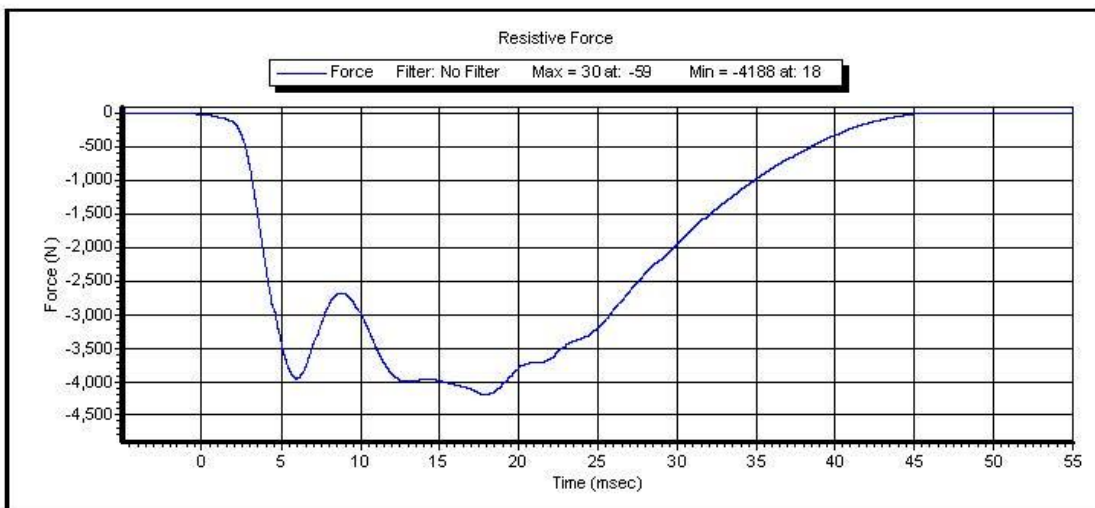
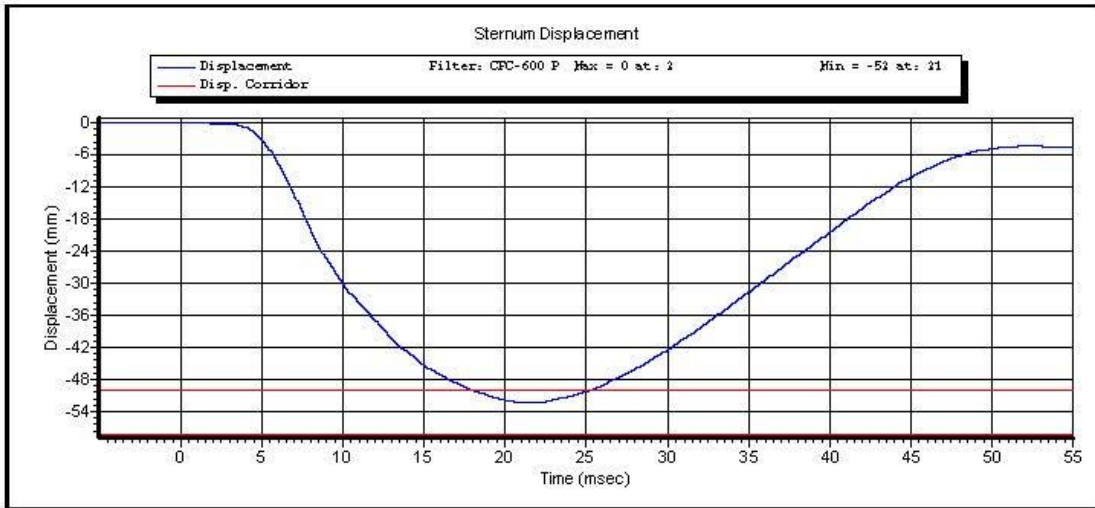


Test Name: **Thorax Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**



Test ID: **Thorax Impact** Test Time: **11:15:23 AM** Test Date: **12/4/2013**

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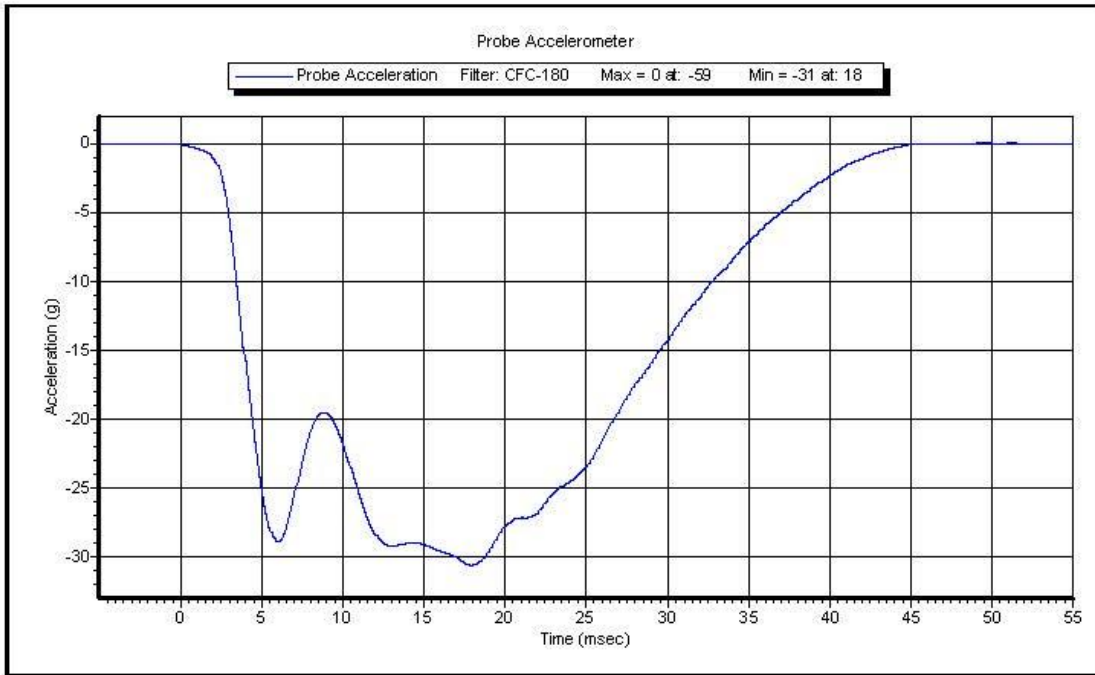


Test ID: **Thorax Impact**

Test Time: **11:15:23 AM**

Test Date: **12/4/2013**

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Test ID: **Thorax Impact**

Test Time: **11:15:23 AM**

Test Date: **12/4/2013**

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Torso Flexion

Post-Test

Part 572O HIII 5% Female

ATD Serial No: 273

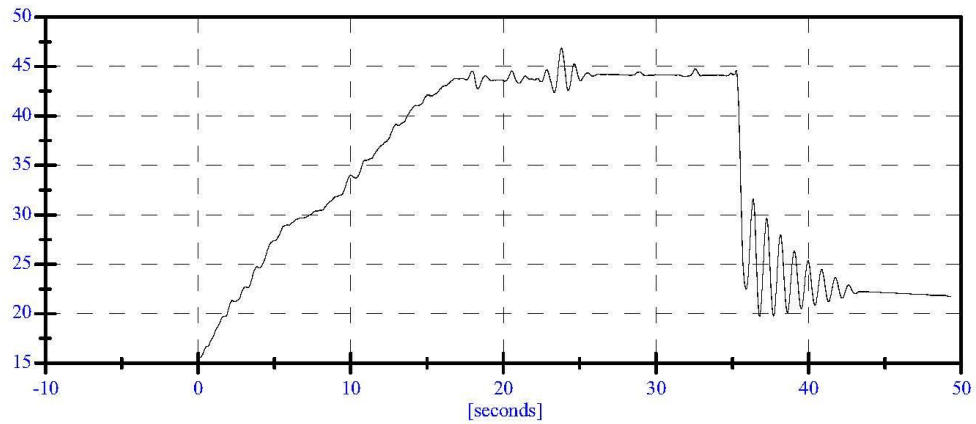
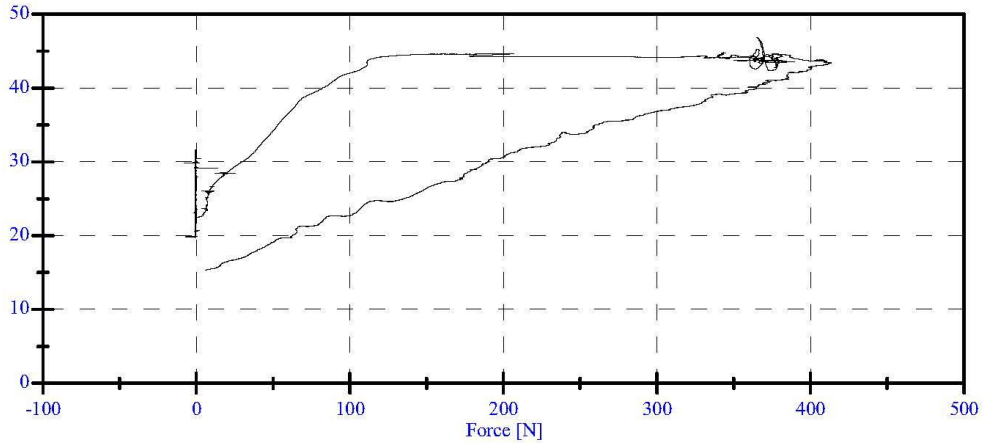
Laboratory Supervisor: E. Dutton

Date: 12/04/2013

Laboratory Technician: M. Geesey

<u>TEST PARAMETER</u>	<u>SPECIFICATION</u>	<u>TEST RESULTS</u>	<u>STATUS</u>
Lab Temperature:	18.9-25.6 C	21.3 C	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Initial Angle:	0.00-20.00 N	15.29 N	Passed
Force at 45 Deg	320.00-390.00 N	389.85 N	Passed
Return Angle	8 Deg Max from Initial	21.00 deg	Passed

LUMBAR SPINE FLEXION TEST





VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Knee Impact Left	Test Date:	12/2/2013
		Test Time:	11:56:07 AM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1726

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.9 deg C P
Humidity	10 -- 70	30.9 %RH P
Velocity	2.07 -- 2.13	2.120 m/s P
Resistive Force	-4060 -- -3450	-3765.3 N P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



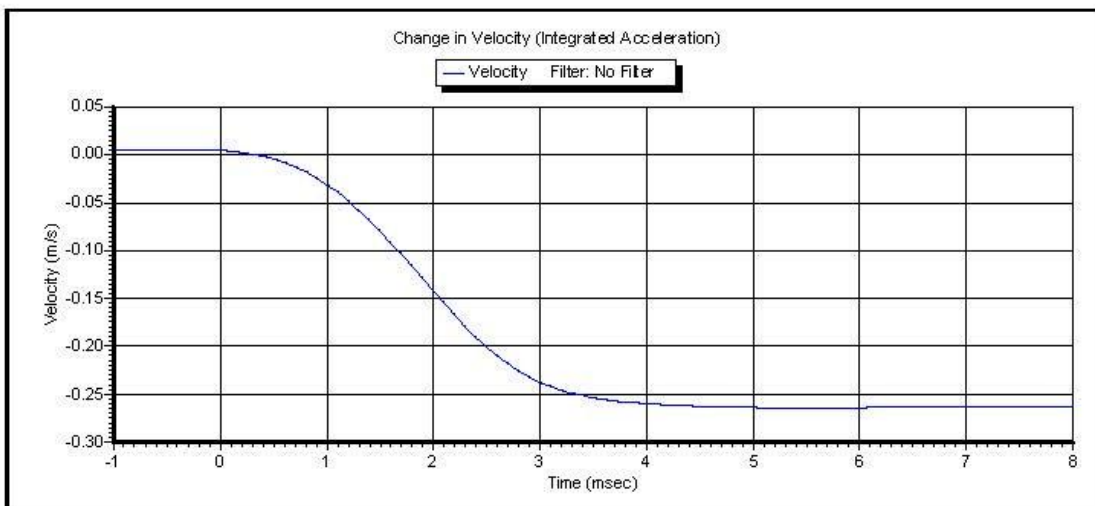
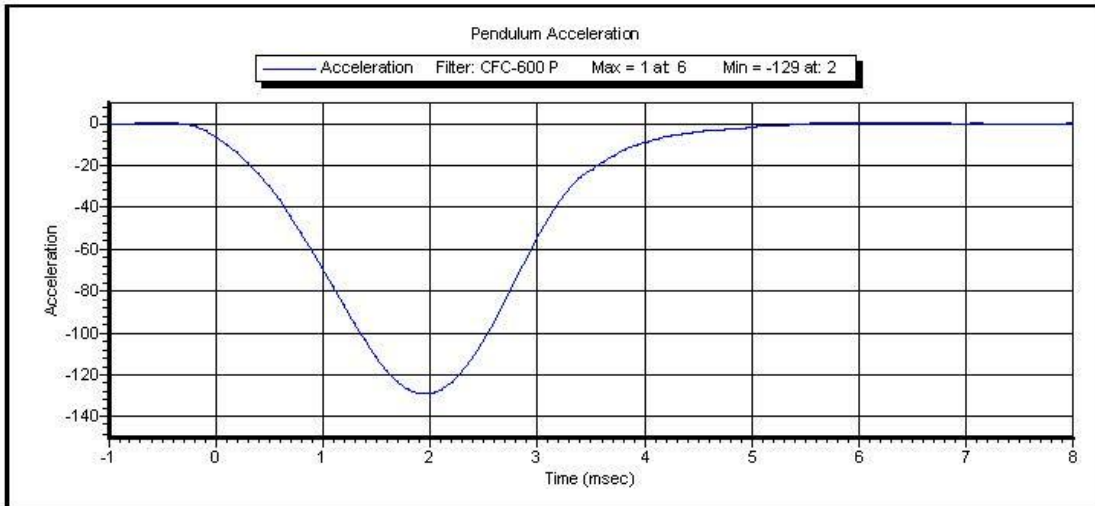
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Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**



Test ID: **Knee Impact Left** Test Time: **11:56:07 AM**

Test Date: **12/2/2013**

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Test ID: **Knee Impact Left** Test Time: **11:56:07 AM**

Test Date: **12/2/2013**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	273		
Test ID:	Knee Impact Right	Test Date:	12/2/2013
		Test Time:	11:48:46 AM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1051 (R)

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.9 deg C P
Humidity	10 -- 70	30.9 %RH P
Velocity	2.07 -- 2.13	2.118 m/s P
Resistive Force	-4060 -- -3450	-3856.0 N P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



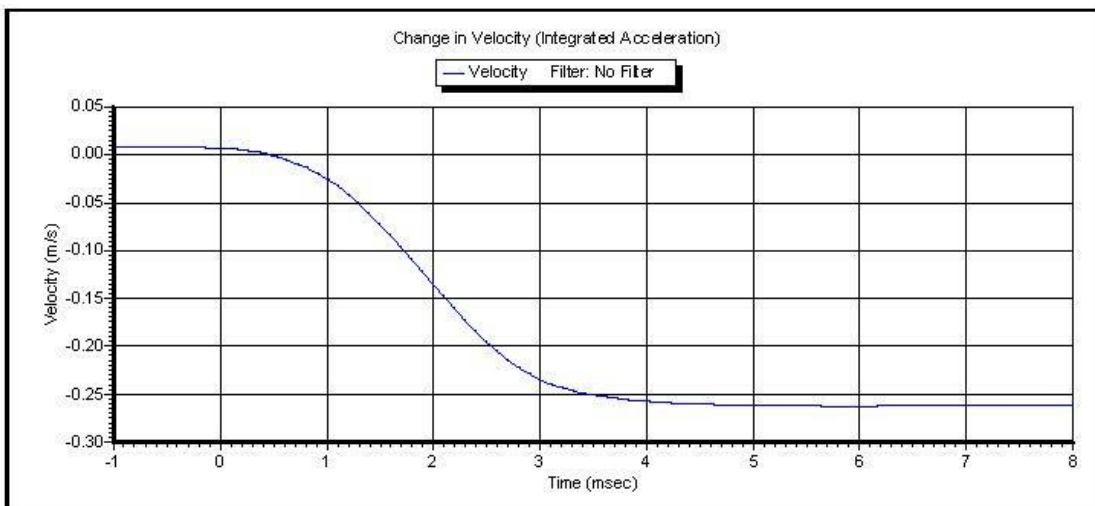
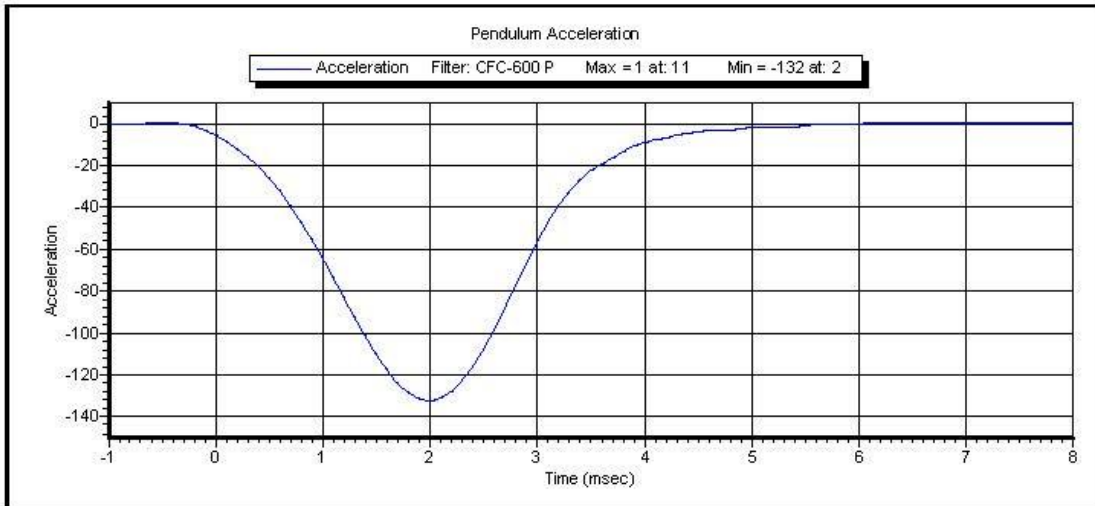
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Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **273**



Test ID: **Knee Impact Right** Test Time: **11:48:46 AM**

Test Date: **12/2/2013**

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Test ID: **Knee Impact Right** Test Time: **11:48:46 AM**

Test Date: **12/2/2013**

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