

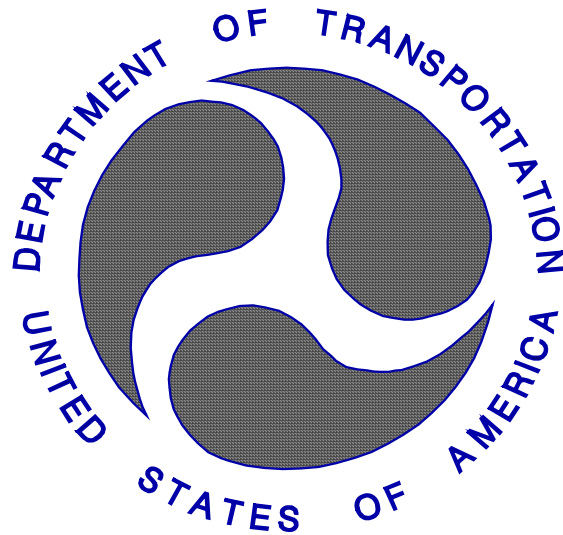
REPORT NO. MCW-DOT-NOSAD-101

TWG TEST 3.3.3.1

FORD MOTOR COMPANY
2003 JAGUAR X-TYPE 4 DOOR SEDAN
STATIC SIDE AIRBAG DEPLOYMENT

NHTSA NUMBER: M30111TWG2

MEDICAL COLLEGE OF WISCONSIN
5000 WEST NATIONAL AVENUE
MILWAUKEE, WI 53295



25 MARCH 2004

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
ROOM 5307, NVS-111
400 SEVENTH STREET, SW
WASHINGTON, DC 20590

This Final Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-01-D-02003. This document is disseminated under the sponsorship of the U. S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its content or use thereof.

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		6. Performing Organization Code MCW													
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15. Supplementary Notes															
16. Abstract A side airbag out of position test was done on a forward facing Hybrid III 3-year-old child dummy seated on a booster block in a 2003 Jaguar X-Type 4 Door Sedan in accordance with instructions specified in the TWG Recommended Procedures For Evaluating Occupant Injury Risk From Deploying Side Airbags, dated July 2003. This test was conducted at the Medical College of Wisconsin's Vehicle Crashworthiness Lab in Milwaukee, Wisconsin, on 25 March 2004. The ambient temperature at the passenger side (by the positioned dummy) of the vehicle at the time of deployment was 21° C. The test dummy's performance follows: <table border="0" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;"><u>Injury Value</u></th> </tr> </thead> <tbody> <tr> <td style="text-align: right;">Head Injury Criterion (HIC)</td> <td style="text-align: center;">23</td> </tr> <tr> <td style="text-align: right;">Ntf</td> <td style="text-align: center;">0.26</td> </tr> <tr> <td style="text-align: right;">Nte</td> <td style="text-align: center;">0.36</td> </tr> <tr> <td style="text-align: right;">Ncf</td> <td style="text-align: center;">0.43</td> </tr> <tr> <td style="text-align: right;">Nce</td> <td style="text-align: center;">0.00</td> </tr> </tbody> </table>					<u>Injury Value</u>	Head Injury Criterion (HIC)	23	Ntf	0.26	Nte	0.36	Ncf	0.43	Nce	0.00
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17. Key Words HIII 3-Year-Old New Car Assessment Program (NCAP) NHTSA No. M30111TWG2 Side Airbag Out-of-Position TWG		18. Distribution Statement <u>Copies of this report are available from:</u> National Highway Traffic Safety Administration Rulemaking Office of Crashworthiness Standards Room 5307, NVS-111 400 Seventh Street, SW Washington, DC 20590													
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SECTION 1

PURPOSE AND TEST PROCEDURE

This out of position airbag test was sponsored by the National Highway Traffic Safety Administrations (NHTSA), under Contract No. DTNH22-01-D-02003. The purpose of this test was to maximize the head/neck interaction by aligning the neck with the top of the seat side airbag module. This test was conducted in accordance with the instructions specified in the TWG Recommended Procedures For Evaluating Occupant Injury Risk From Deploying Side Airbags, dated July 2003.

The Medical College of Wisconsin does not endorse or certify products. The manufacturer's name appears solely for identification purposes only.

SECTION 2

SUMMARY OF SIDE IMPACT TEST

A front passenger seat-mounted side airbag was deployed in a 2003 Jaguar X-Type 4 Door Sedan on 25 March 2004. Previously, in February of 2003, the Jaguar was involved in a NCAP side impact. Both tests were conducted by the Medical College of Wisconsin.

One Hybrid III 3-Year-Old dummy was placed in the front passenger seat on the outboard edge of a foam booster block and orientated in the forward facing direction. The seat was placed in its lowest height position and the seatback at the manufacturer's design for a 50th percentile male. As a result of the vehicle previously being tested in a NCAP side impact, the side window was unable to be closed. The dummy's upper spine was aligned with the leading edge of the seat bolster. The head was placed between, but not contacting the seat bolster and the B-Pillar, keeping it in its neutral orientation. The heels were located at placement points 20 to 50 mm forward of the booster block and 75 mm to either side of the centerline. The dummy's pelvis was positioned so that the head/neck junction was aligned vertically with the top edge of the airbag module. Also, the pelvis and upper torso were positioned so that the pelvis or torso was in contact with the vehicle door. The outboard arm was placed on the armrest, and in the inboard arm was flexed so that the upper arm was in contact with the seatback, and the fingertips were in contact with the booster block. This orientation complies with section 3.3.3.1 of the TWG Recommended Procedures For Evaluating Occupant Injury Risk From Deploying Side Airbags as defined by Lund, et al. and the Technical Working Group dated July 2003. This event was documented by four high-speed video cameras. Camera locations and other pertinent camera information can be found in this report.

Hybrid III 3-Year-Old was instrumented with the following accelerometers.

1. Head Center of Gravity triaxial accelerometer (X-, Y-, and Z-direction)
2. Upper Neck (NKU) six axis load cell (Fx, Fy, Fz, Mx, My, Mz)

Pre- and post-test photographs of the test vehicle and the Hybrid III 3-Year-Old are included in Appendix A. Appendix B contains the dummy response data traces. A summary of the Hybrid III 3-Year-Old configuration and performance verification test data is shown in Appendix C. Dummy instrumentation calibration data can be found in Appendix D of this report.

The following table summarizes the results of this test.

Injury Criteria	Hybrid III 3-Year-Old
HIC36	23
Ntf	0.26
Nte	0.36
Ncf	0.43
Nce	0.00

The vehicle's airbag information is summarized in the following table

	Frontal	Side-Torso	Side-Torso/Head	Side-Head
Driver	Yes-Steering wheel	Yes- Seat	None	Yes- Curtain
Front Passenger	Yes- Dashboard	Yes- Seat	None	Yes- Curtain
Left Rear Passenger	None	None	None	Yes- Curtain
Right Rear Passenger	None	None	None	Yes- Curtain

SECTION 3
SUMMARY OF TEST RESULTS

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

Year/ Make/ Model/ Body Style				2003 Jaguar X-Type 4 Door Sedan			
Vehicle NHTSA NO.				M30211TWG2	VIN	SAJEB52D93XC90834	
Vehicle Body Color				British Racing Green	Build Date	June 2002	
Engine Data	<u>6</u>	Cylinders	<u> </u>	CID	<u>2.5</u>	Liter	<u> </u> cc
Placement	<u> </u>	Longitudinal	<u>X</u>	Lateral			
Transmission	<u>5</u>	Speed	<u>X</u>	Manual	<u> </u>	Automatic	<u>X</u> Overdrive
Final Drive	<u> </u>	Rear Wheel Drive	<u> </u>	Front Wheel Drive	<u>X</u>	Four Wheel Drive	
Odometer Reading	<u>44 miles</u>	Date	<u>13 Jan 03</u>				
Options	<u>X</u>	A/C	<u>X</u>	Power Steering	<u>X</u>	Power Brakes	<u>X</u> Power Windows
	<u>X</u>	Cruise Control	<u>X</u>	Tilt Wheel	<u>X</u>	Power Locks	

DATA FROM TIRE PLACARD:

Tire Pressure (at Capacity)	<u>32</u>	PSI Front
	<u>32</u>	PSI Rear
Recommended Tire Size	<u>205/55R16</u>	
Tires on Test Vehicle	<u>205/55R16</u>	Manufacturer <u>Continental</u>

TEST VEHICLE AIRBAG INFORMATION:

	<u>Frontal</u>	<u>Side-Torso</u>	<u>Side-Torso/Head</u>	<u>Side-Head</u>
Driver	Yes- Steering Wheel	Yes- Seat	None	Yes- Curtain
Front Passenger	Yes- Dashboard	Yes- Seat	None	Yes- Curtain
Left Rear Passenger	None	None	None	Yes- Curtain

VEHICLE CAPACITY DATA:

Number of Occupants:	<u>2</u>	Front	<u>3</u>	Rear	<u> </u>	3 rd Seat	<u>5</u>	Total
Type of Front Seats	<u>X</u>	Bucket	<u> </u>	Bench	<u> </u>	Split Bench		
Type of Front Seat Back	<u> </u>	Fixed	<u>X</u>	Adjustable w/	<u> </u>	Lever	<u> </u>	Knob
Vehicle Max Capacity Loading	<u>400</u>				kg	(A)		
No. of Occupants X 68.04 kg	<u>340.2</u>				kg	(B)		
Cargo Capacity (A) – (B)	<u>59.8</u>				kg			

TEST VEHICLE DELIVERED WEIGHT WITH MAXIMUM FLUIDS:

Left Front	=	<u>469</u>	kg	Left Rear	=	<u>305.7</u>	kg
Right Front	=	<u>467.2</u>	kg	Right Rear	=	<u>317.1</u>	kg
TOTAL FRONT	=	<u>936.2</u>	kg	TOTAL REAR	=	<u>622.8</u>	kg
% Total Weight	=	<u>60.1</u>	%	%Total Weight	=	<u>39.9</u>	%
TOTAL WEIGHT	=	<u>1559</u>	kg				

DATA SHEET 1 (continued)**GENERAL VEHICLE TEST PARAMETER DATA**Vehicle: 2003 Jaguar X-TypeNHTSA No. M30211TWG2CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Test Vehicle Delivered Weight with Max Fluids	=	<u>1559</u>	kg	(A)
Maximum Cargo Carrying Capacity of Test Vehicle	=	<u>59.8</u>	kg	(B)
Weight of (2) instrumented Side Impact Dummies	=	<u>161.5</u>	kg	(C)
TEST VEHICLE TARGET WEIGHT	=	<u>1780.3</u>	kg	(A+B+C)

FULLY LOADED TEST VEHICLE (UDVW + 1 OR 2 SID H3(s) + CARGO)

Left Front	=	<u>501.1</u>	kg	Left Rear	=	<u>408.2</u>	kg
Right Front	=	<u>485.8</u>	kg	Right Rear	=	<u>385.1</u>	kg
TOTAL FRONT	=	<u>986.9</u>	kg	TOTAL REAR	=	<u>793.3</u>	kg
% Total Weight	=	<u>55.4</u>	%	%Total Weight	=	<u>44.6</u>	%
TOTAL WEIGHT	=	<u>1780.3</u>	kg				

AS TESTED WEIGHT OF TEST VEHICLE (UDVW+ SID H3(s)+CARGO+EQUIPMENT & INSTRUMENTATION) *

Left Front	=	<u>499</u>	kg	Left Rear	=	<u>406.4</u>	kg
Right Front	=	<u>485.8</u>	kg	Right Rear	=	<u>383.7</u>	kg
TOTAL FRONT	=	<u>984.8</u>	kg	TOTAL REAR	=	<u>790.1</u>	kg
% Total Weight	=	<u>55.5</u>	%	%Total Weight	=	<u>44.5</u>	%
TOTAL WEIGHT	=	<u>1774.9</u>	kg				

TEST VEHICLE ATTITUDE (all dimensions in millimeters):

AS DELIVERED

Left Front	<u>693</u>	Right Front	<u>701</u>	Left Rear	<u>697</u>	Right Rear	<u>700</u>
------------	------------	-------------	------------	-----------	------------	------------	------------

FULLY LOADED

Left Front	<u>678</u>	Right Front	<u>685</u>	Left Rear	<u>658</u>	Right Rear	<u>668</u>
------------	------------	-------------	------------	-----------	------------	------------	------------

AS TESTED *

Left Front	<u>678</u>	Right Front	<u>687</u>	Left Rear	<u>658</u>	Right Rear	<u>668</u>
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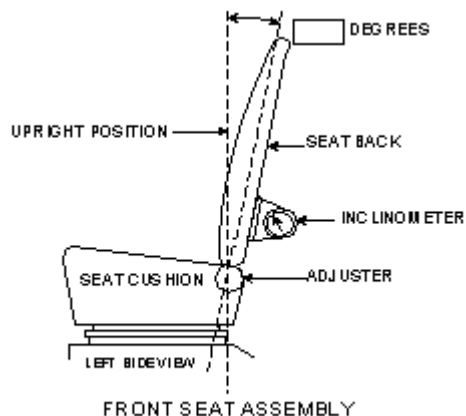
Test Vehicle Wheelbase 2702 mmAs Tested CG = 1202 mm rearward of front wheel centerlineTOTAL VEHICLE LENGTH:

Right Side	=	<u>4298</u>	mm
Left Side	=	<u>4298</u>	mm
Centerline	=	<u>4692</u>	mm

* Side NCAP Test

DATA SHEET 1 (continued)**GENERAL TEST VEHICLE PARAMETER DATA**Vehicle: 2003 Jaguar X-TypeNHTSA No.: M30211TWG2

Nominal Design Riding Position for adjustable driver and passenger seats. Please describe how to position the inclinometer to measure the seat back angle. Include a description of the adjustment latch detent if applicable

FRONT SEAT CUSHION PLACEMENT:

Total Length of Adjustment Travel		<u>207 mm</u>
Total Number of Detents	<u>N/A</u>	Test Position <u>Rearmost and Lowest Position</u>

FRONT SEAT BACK ADJUSTMENT:

Seat Back Angle	<u>24° measured at back rest</u>
-----------------	----------------------------------

REAR SEAT POSITION:

Total Length Fore/Aft Adjustment	<u>N/A</u>
Seat Back Adjustment Position	<u>N/A</u>

ADJUSTABLE STEERING COLUMN POSITION:

<u>N/A</u>

WINDOW POSITIONS:

Left Front	<u>N/A</u>	Right Front	<u>Down</u>
Left Rear	<u>N/A</u>	Right Rear	<u>N/A</u>

AMOUNT OF STODDARD SOLVENT IN FUEL TANK:

Fuel System usable Capacity	<u>N/A</u>	
Test Volume	<u>N/A</u>	<u>N/A</u>

DATA SHEET 2
TEST VEHICLE SUMMARY

VEHICLE IDENTIFICATION:

Year/Make/Model/Body Style	2003 Jaguar X-Type 4 Door Sedan		
Body Color	<u>British Racing Green</u>	VIN	<u>SAJEB52D93XC90834</u>
NHTSA No.	<u>M30211TWG2</u>	Test Date	<u>25 March 2004</u>
Overall Length	<u>4692 mm</u>	Overall Width	<u>1781 mm</u>

VEHICLE TEST WEIGHT (Pre-Test):

Left Front	=	<u>499</u>	kg	Left Rear	=	<u>406.4</u>	kg
Right Front	=	<u>485.8</u>	kg	Right Rear	=	<u>383.7</u>	kg
TOTAL FRONT	=	<u>984.8</u>	kg	TOTAL REAR	=	<u>790.1</u>	kg
% Total Weight	=	<u>55.5</u>	%	%Total Weight	=	<u>44.5</u>	%
TOTAL WEIGHT	=	<u>1774.9</u>	kg				
Wheelbase				=	<u>2702 mm</u>		
Longitudinal CG from Center of Front Axle				=	<u>1202 mm *</u>		

ACTUAL IMPACT POINT

Impact is 14 mm Forward and 5 mm Below impact point *

MAXIMUM EXTERIOR STATIC CRUSH: *

1. LEVEL 1	(238 mm above ground)	=	<u>124</u>	mm
2. LEVEL 2	(471 mm above ground)	=	<u>358</u>	mm
3. LEVEL 3	(577 mm above ground)	=	<u>362</u>	mm
4. LEVEL 4	(893 mm above ground)	=	<u>280</u>	mm
5. LEVEL 5	(1306 mm above ground)	=	<u>71</u>	mm

Maximum Post-Test intrusion at Level 3 is 362 mm

<u>OCCUPANTS</u>	<u>Right Front Passenger</u>
Dummy Identification	<u>III 3-Year-Old/042</u>
Restraints Used	<u>Torso Side Airbag</u>

INSTRUMENTATION:

Number of Cameras	Offboard	<u>4</u>
	TOTAL	<u>4</u>

* Side NCAP Test

DATA SHEET NO. 3**POST-TEST OBSERVATIONS**Vehicle: 2003 Jaguar X-TypeNHTSA No.: M30211TWG2VISIBLE DUMMY CONTACT POINTS:

	<u>LEFT FRONT SID H3</u>
Head	Not measured
Upper Torso	To seat mounted side airbag
Lower Torso	To seat mounted side airbag
Left Knee	Not measured
Left Leg	Not measured

DOOR OPENING:

	<u>LEFT DOOR</u>	<u>RIGHT DOOR</u>
Front	N/A	N/A
Rear	N/A	N/A

MDB DISTANCE FROM TARGET IMPACT POINT:

Horizontal	N/A	Vertical	N/A
------------	-----	----------	-----

ARM REST LOCATIONS:

Front	240 mm below window sill
Rear	N/A

SEAT MOVEMENT:

Front	N/A
Rear	N/A

GLAZING DAMAGE

Windshield	N/A
Window	N/A

PILLAR PERFORMANCE:

N/A

SILL SEPARATION

N/A

AIRBAG DEPLOYMENT STATUS:

	DRIVER	FRONT PASSENGER	REAR PASSENGER
FRONT	Did Not Deploy	Did Not Deploy	N/A
SIDE	Deployed Previously in Side NCAP Test	Deployed	Deployed Previously in Side NCAP Test

OTHER NOTABLE IMPACT EFFECTS:

None

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET 4**IIII 3-YEAR-OLD INSTRUMENTATION DATA**Vehicle: 2003 Jaguar X-TypeNHTSA No.: M30211TWG2

	Dummy ID 042 Accelerations			
	Max		Min	
	G's	msec	G's	Msec
HEAD ACCELERATION:				
Longitudinal (X)	24.4	9.9	-2.9	5.4
Lateral (Y)	1.4	55.0	-19.3	8.7
Vertical (Z)	8.9	21.0	-24.3	8.8
Resultant (R)	37.1	0.01		
HIC36	23			

REFERENCE:

Positive Direction -	Anterior/Posterior	+(X) = anterior
	Lateral	+(Y)= right
	Superior/Inferior	+(Z)= inferior
Negative Direction	Anterior/Posterior	-(X) = posterior
	Lateral	-(Y)= left
	Superior/Inferior	-(Z)= superior

Head Accelerations have been filtered at SAE Class 1000

DATA SHEET 4 (continued)**IIII 3-YEAR-OLD INSTRUMENTATION DATA**Vehicle: 2003 Jaguar X-TypeNHTSA No. M30211TWG2

	Dummy ID 042			
	Max		Min	
	N	msec	N	msec
NECK FORCE:				
Longitudinal (X)	360.3	9.7	-30.1	174.4
Lateral (Y)	35.4	53.7	-268.3	9.9
Vertical (Z)	470.6	21.0	-561.1	8.1
	Nm	msec	Nm	msec
NECK MOMENT:				
Lateral Bending (X)	4.7	7.1	-7.4	15.6
Flexion/Extension (Y)	16.1	9.8	-9.2	48.2
Rotation (Z)	4.1	60.5	-9.0	20.6

REFERENCE:*Upper neck load cell polarity follows the dummy manipulation table A-1 in the NHTSA Test Reference Guide version 5*

Force

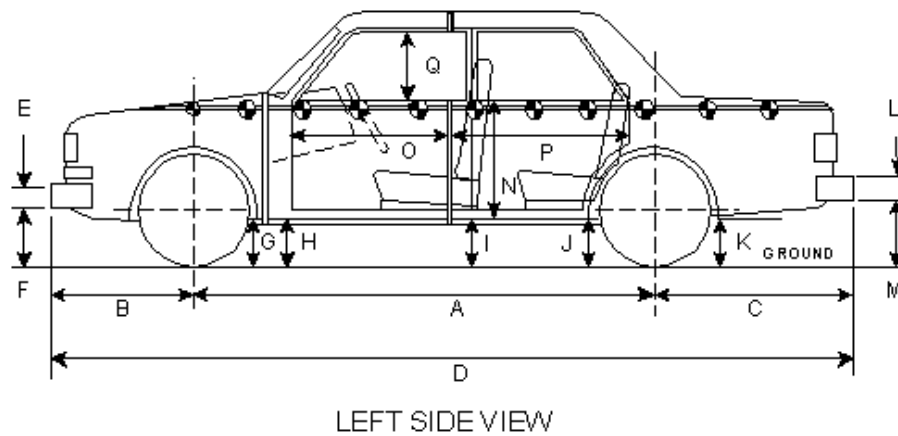
- Fx positive response: Head rearward, chest forward
- Fy positive response: Head leftward, chest rightward
- Fz positive response: Head upward, chest downward

Moment

- Mx positive response: Left ear to left shoulder
- My positive response: Chin to sternum
- Mz positive response: Chin to left shoulder

Neck forces have been filtered at SAE Class 1000

Neck moments have been filtered at SAE Class 600

DATA SHEET 5**VEHICLE PRE- AND POST- MEASUREMENTS**Vehicle: 2003 Jaguar X-TypeNHTSA No.: M30211TWG2

	PRE-TEST As delivered (mm)	PRE-TEST As Tested (mm)	POST-TEST (mm)	Δ CHANGE (mm)
A	2702	-	2667	-35
B	684	-	678	-6
C	912	-	906	-6
D	4692	-	4664	-28
E	260	-	260	0
F	268	260	267	7
G	303	280	279	-1
H	308	284	292	8
I	319	290	338	48
J1	212	173	188	15
J2	341	303	354	51
K	308	266	286	20
L	180	-	180	0
M	433	390	412	22
N	705	-	618	-87
O	1114	-	1096	-18
P	826	-	714	-112
Q	440	-	436	-4
R	4298	-	4305	7
S	4298	-	4251	-47
T	1781	-	1444	-337

* Side NCAP Test

DATA SHEET 6**HIII 3-YEAR-OLD LONGITUDINAL CLEARANCE DIMENSIONS**Vehicle: 2003 Jaguar X-TypeNHTSA No.: M30211TWG2

NOTE: All dimensions are in millimeters with tolerance of ± 3 mm and taken from tip of dummy nose

	Dummy ID/ HIII 3-Year-Old/042
ND	713
NS	198
NR	328

* Reference: (ND) Nose to dashboard
(NS) Nose to side
(NR) Nose to header

DATA SHEET 7**HIGH-SPEED CAMERA LOCATIONS AND DATA SUMMARY**Vehicle: 2003 Jaguar X-TypeNHTSA No. M30211TWG2

Camera No.	View	Coordinates (mm)*	Lens (mm)	Film Speed (fps)
101	Front close-up of HIII 3-Year-Old	2605	50	5000
102	Front overall of HIII 3-Year-Old	2866	25	5000
104	Front-right oblique of HIII 3-Year-Old	1040	12.5	5000
105	Left overall of HIII 3-Year-Old	2115	25	5000

* Reference: From camera lens to tip of dummy nose

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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Figure A-1: PRE-SIDE NCAP (20 FEB 2003) LEFT SIDE VIEW OF TEST VEHICLE



Figure A-2: POST-SIDE NCAP (20 FEB 2003) LEFT SIDE VIEW OF TEST VEHICLE



Figure A-3: PRE-TEST (25 MARCH 2004) RIGHT OCCUPANT COMPARTMENT VIEW OF HYBRID III 3-YEAR-OLD



Figure A-4: POST-TEST (25 MARCH 2004) RIGHT OCCUPANT COMPARTMENT VIEW OF HYBRID III 3-YEAR-OLD



Figure A-5: PRE-TEST (25 MARCH 2004) LEFT OCCUPANT COMPARTMENT VIEW OF HYBRID III 3-YEAR-OLD



Figure A-6: POST-TEST (25 MARCH 2004) LEFT OCCUPANT COMPARTMENT VIEW OF HYBRID III 3-YEAR-OLD



Figure A-7: PRE-TEST (25 MARCH 2004) FRONTAL VIEW OF HYBRID III 3-YEAR-OLD



Figure A-8: POST-TEST (25 MARCH 2004) REAR VIEW OF HYBRID III 3-YEAR-OLD



Figure A-9: PRE-TEST (25 MARCH 2004) VIEW OF HYBRID III 3-YEAR-OLD FEET PLACEMENT



Figure A-10: POST-TEST (25 MARCH 2004) LEFT OVERALL VIEW OF AIRBAG AND BOOSTER BLOCK



Figure A-11: POST-TEST (25 MARCH 2004) LEFT VIEW OF AIRBAG



Figure A-12: VEHICLE IDENTIFICATION NUMBER

APPENDIX B

HII 3 YR OLD RESPONSE DATA

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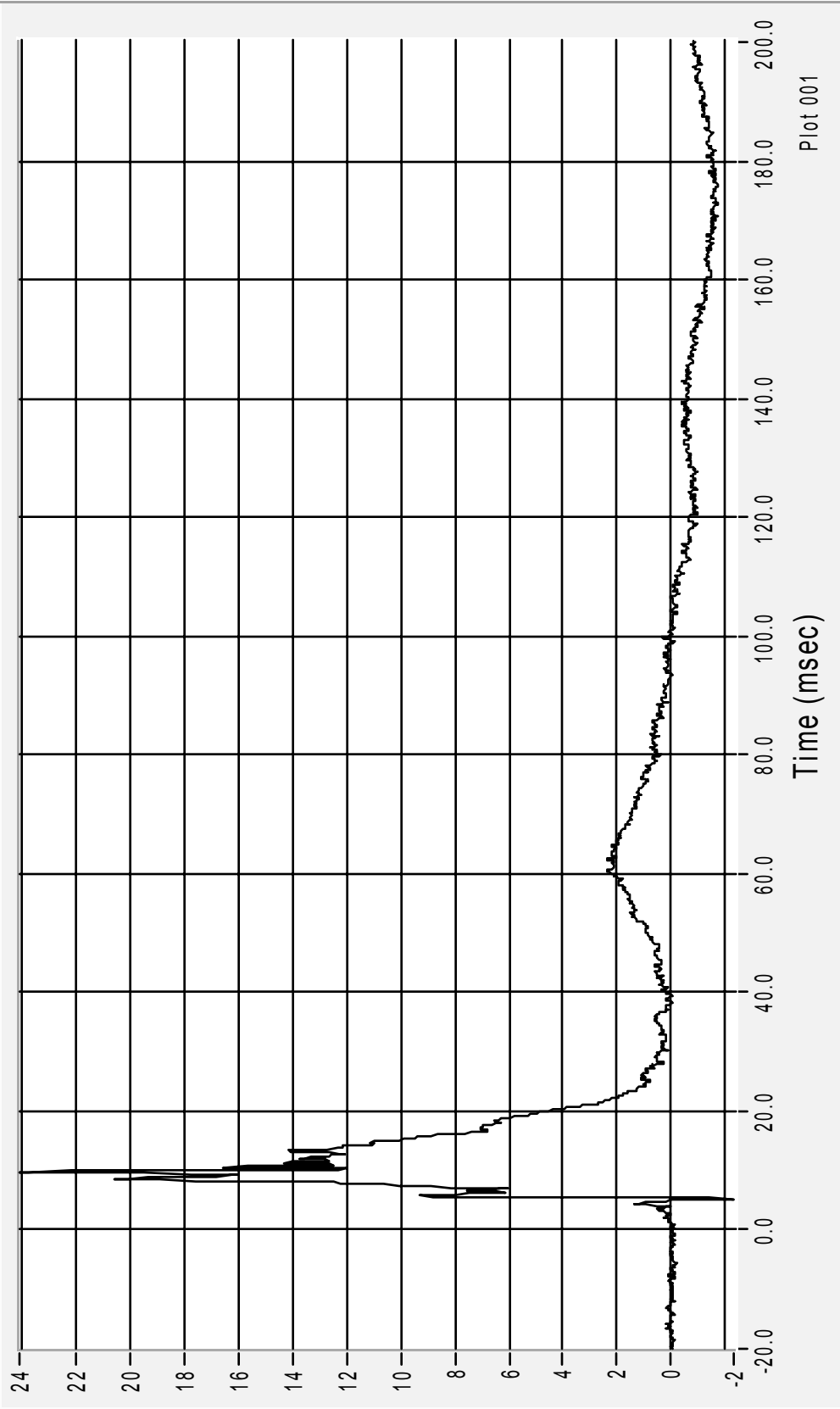
DUMMY INSTRUMENTATION PLOTS

ACCELERATION DATA – FILTER CLASS 1000,
UPPER NECK FORCES – FILTER CLASS 1000; UPPER NECK MOMENTS FILTER CLASS 600

<u>Plot No.</u>	<u>Data Plot Title</u>	<u>Page</u>
1	NOSAD-101 3 YO HEAD CG (X) ACCELERATION	B-3
2	NOSAD-101 3 YO HEAD CG (X) VELOCITY	B-4
3	NOSAD-101 3 YO HEAD CG (Y) ACCELERATION	B-5
4	NOSAD-101 3 YO HEAD CG (Y) VELOCITY	B-6
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6	NOSAD-101 3 YO HEAD CG (Z) VELOCITY	B-8
7	NOSAD-101 3 YO HEAD RESULTANT ACCELERATION	B-9
8	NOSAD-101 3 YO UPPER NECK (X) FORCE	B-10
9	NOSAD-101 3 YO UPPER NECK (Y) FORCE	B-11
10	NOSAD-101 3 YO UPPER NECK (Z) FORCE	B-12
11	NOSAD-101 3 YO UPPER NECK (X) MOMENT	B-13
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13	NOSAD-101 3 YO UPPER NECK (Z) MOMENT	B-15
14	NOSAD-101 3 YO UPPER NECK FORCES	B-16
15	NOSAD-101 3 YO UPPER NECK MOMENTS	B-17
16	NOSAD-101 3 YO N_{ij} CRITERIA	B-18
17	NOSAD-101 3 YO AXIAL LOAD VS OCCIPITAL CONDYL MOMENT	B-19

3 YO Head CG (X) Acceleration
Acceleration (G) CFC1000

Max	24.1	G	at	9.8	msec
Min	-2.3	G	at	5.3	msec



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NOSAD101 TWG 3.3.3.1

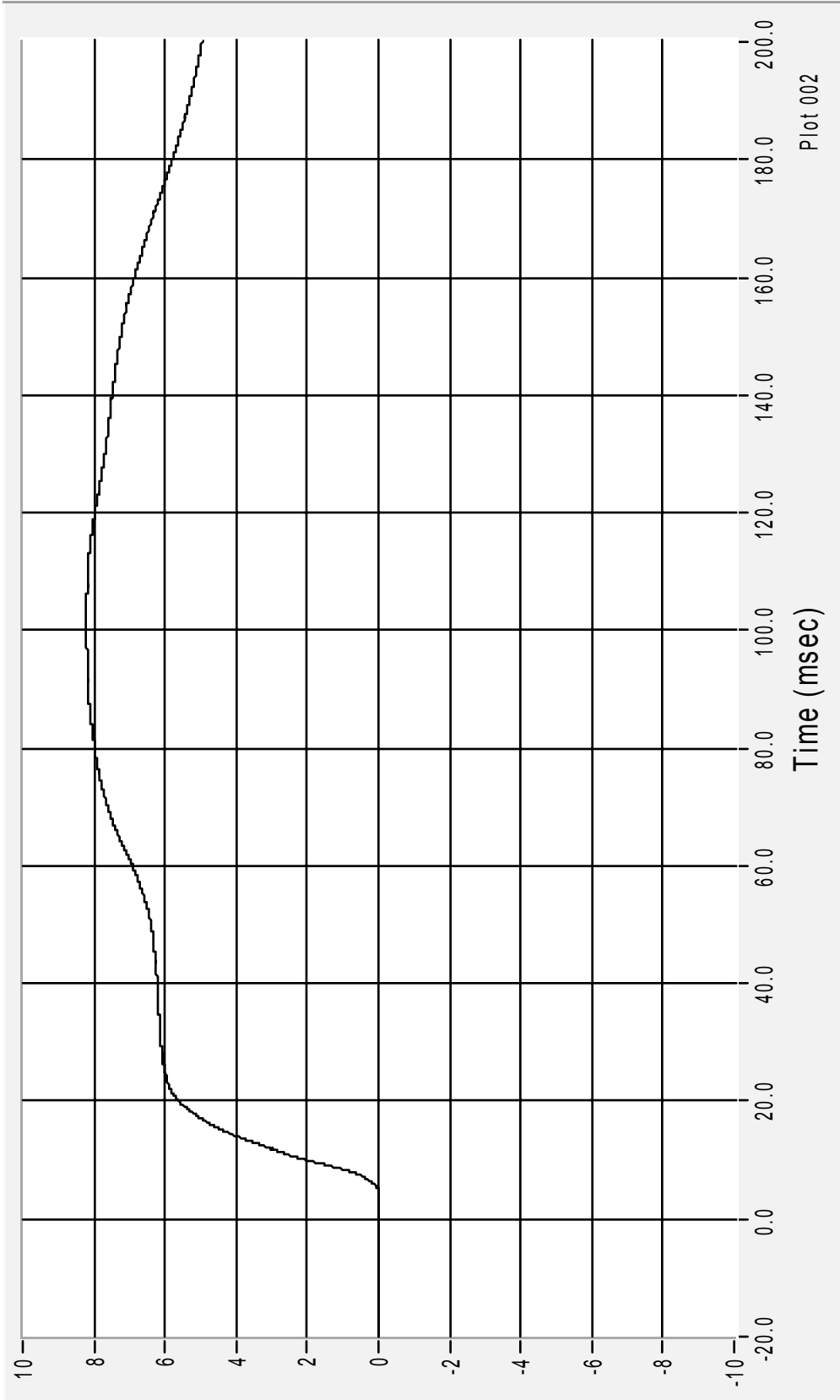
3 YO Head CG (X) Velocity

Velocity (km/h)

CFC180

Max 8.2 km/h at 100.9 msec

Min 0.0 km/h at 1.3 msec

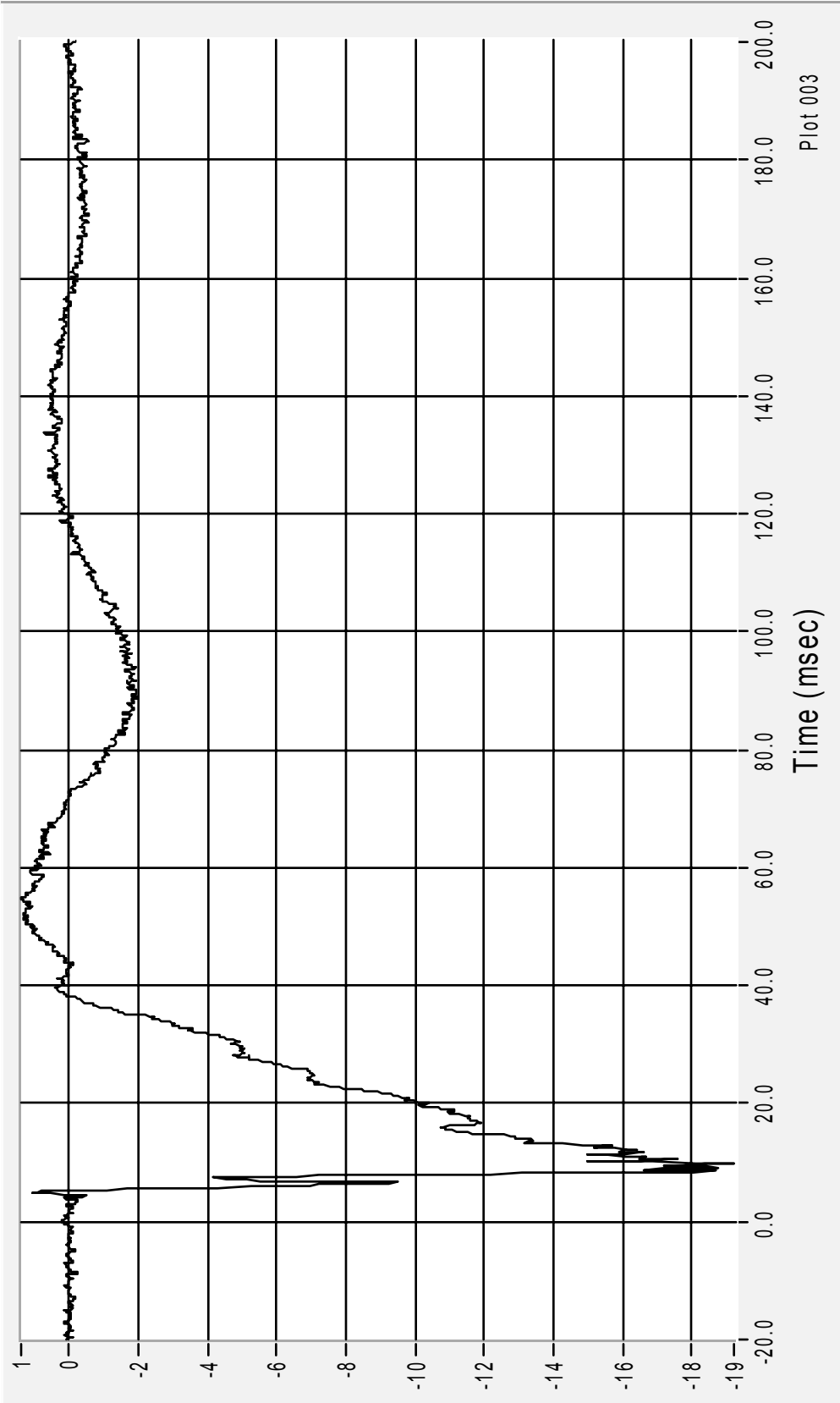


NOSAD101 TWG 3.3.3.1

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3 YO Head CG (Y) Acceleration
Acceleration (G) CFC1000

Max	1.4	G	at	54.9	msec
Min	-19.2	G	at	9.8	msec



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NOSAD101 TWG 3.3.3.1

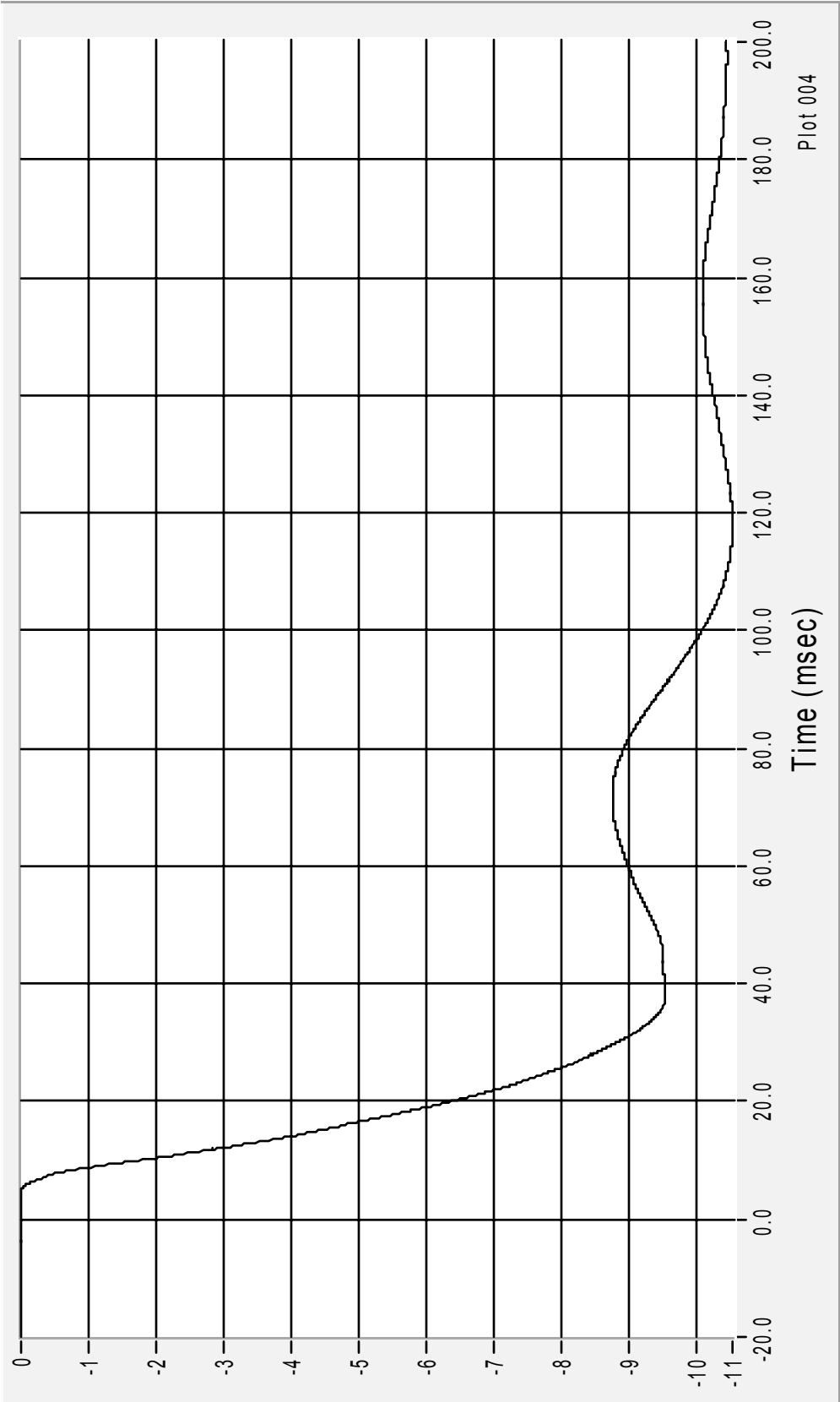
3 YO Head CG (Y) Velocity

Velocity (km/h)

CFC180

Max 0.0 km/h at 4.9 msec

Min -10.5 km/h at 117.8 msec



NOSAD101 TWG 3.3.3.1

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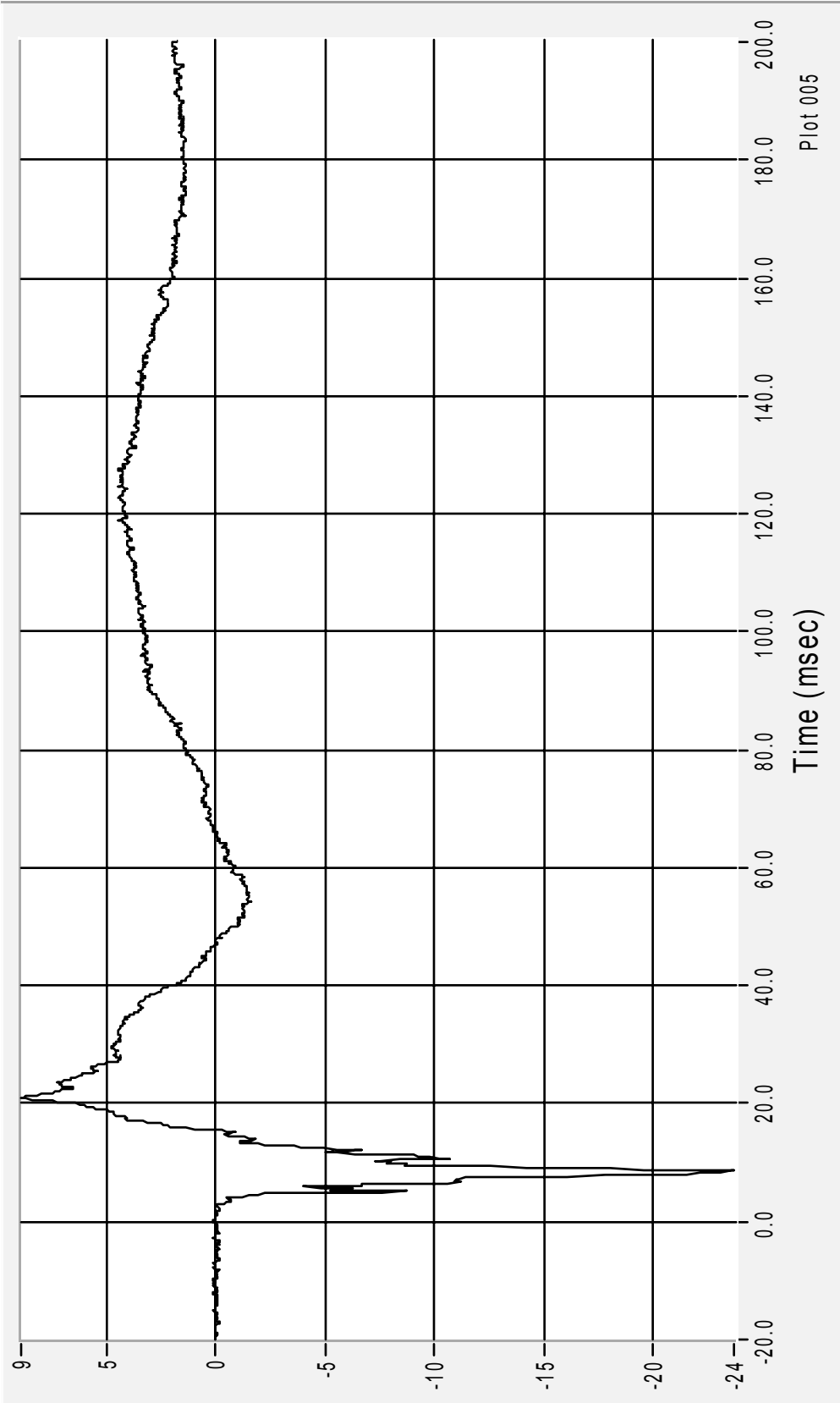
3 YO Head CG (Z) Acceleration

Acceleration (G)

CFC1000

Max 8.9 G at 21.0 msec

Min -23.7 G at 8.6 msec

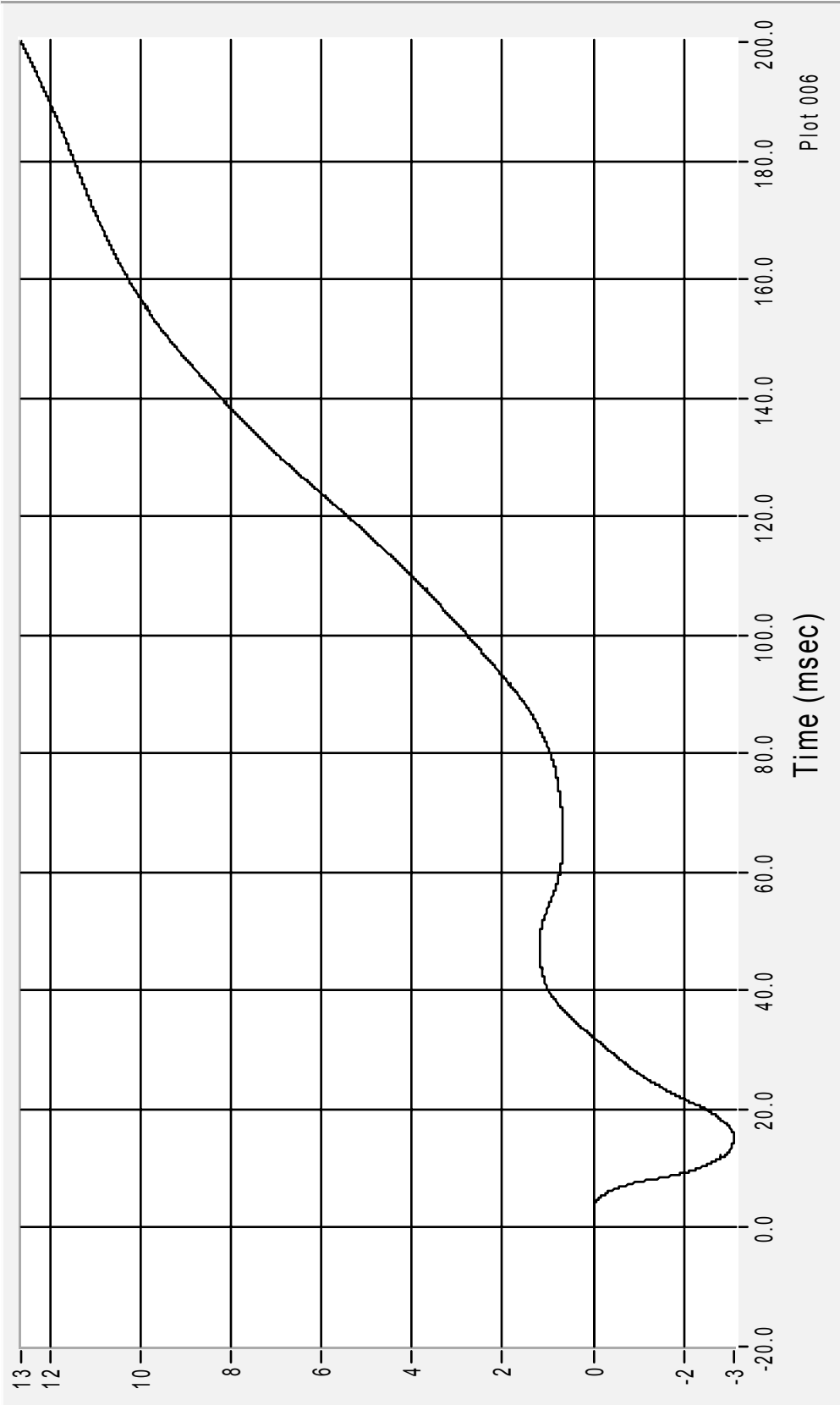


3 YO Head CG (Z) Velocity

Velocity (km/h)CFC180

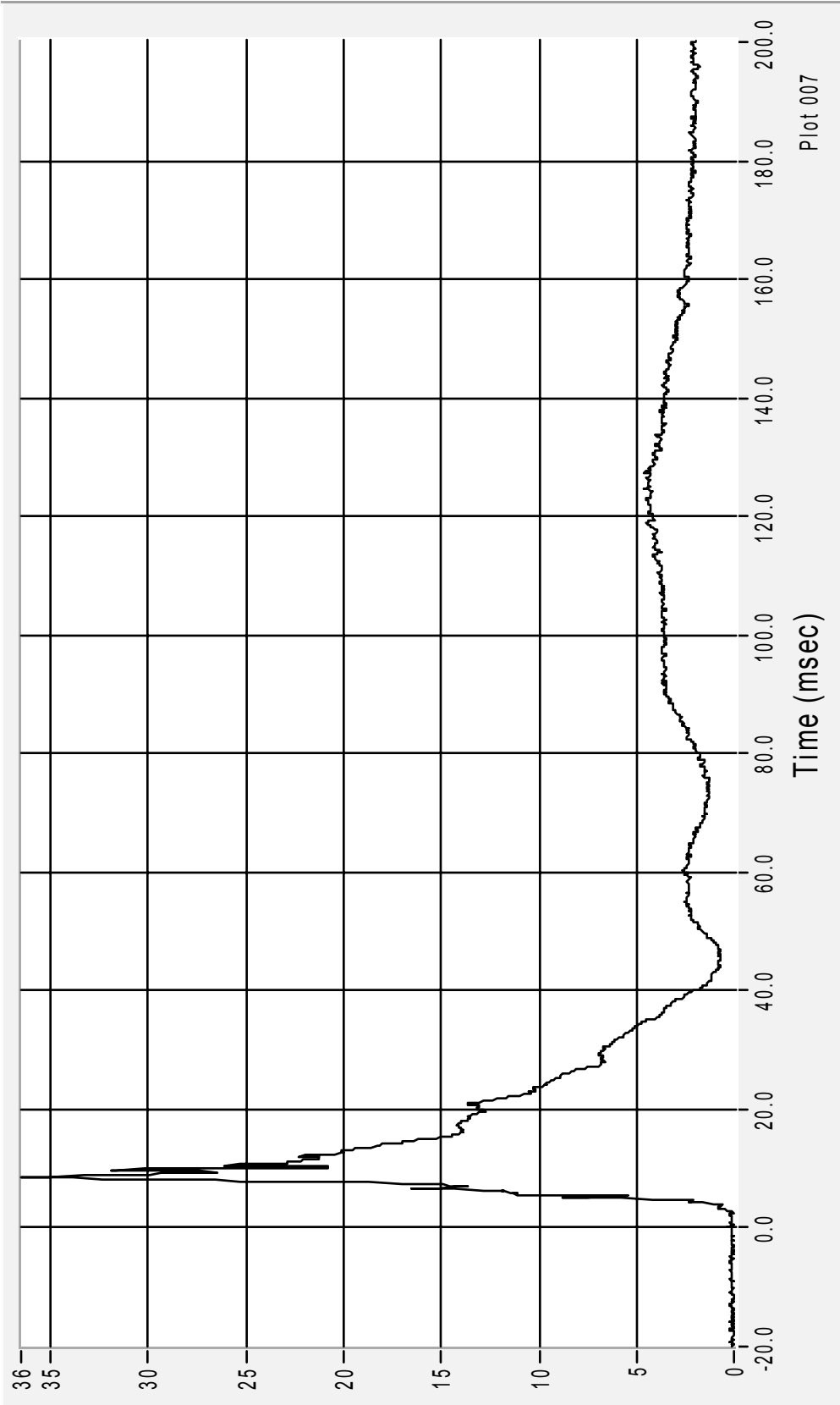
Max12.6km/h at 199.9msec

Min-3.1km/h at 15.4msec



3 YO Head Resultant Acceleration
Acceleration (G) CFC1000

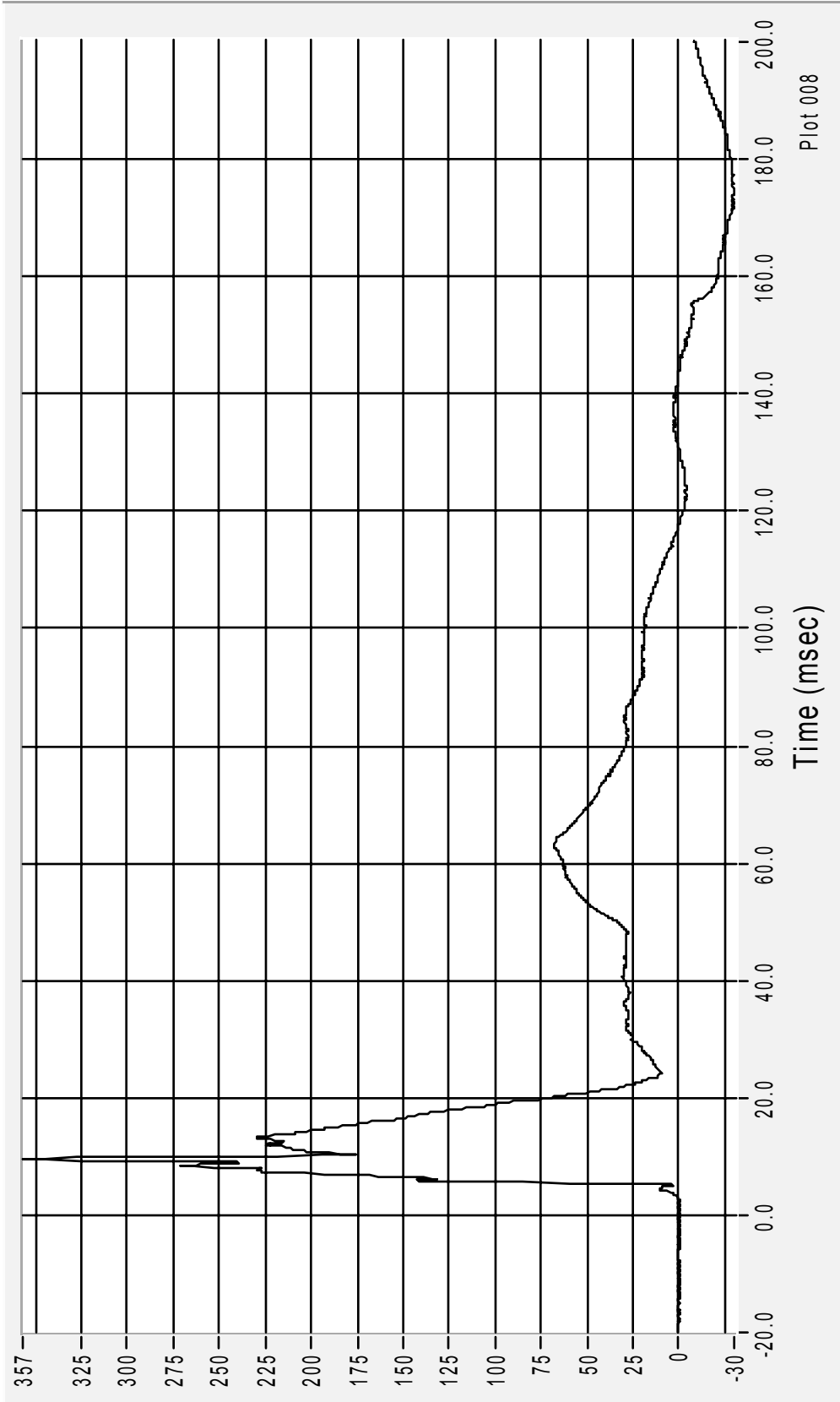
Max	36.5	G	at	8.6	msec
Min	0.0	G	at	2.6	msec



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NOSAD101 TWG 3.3.3.1

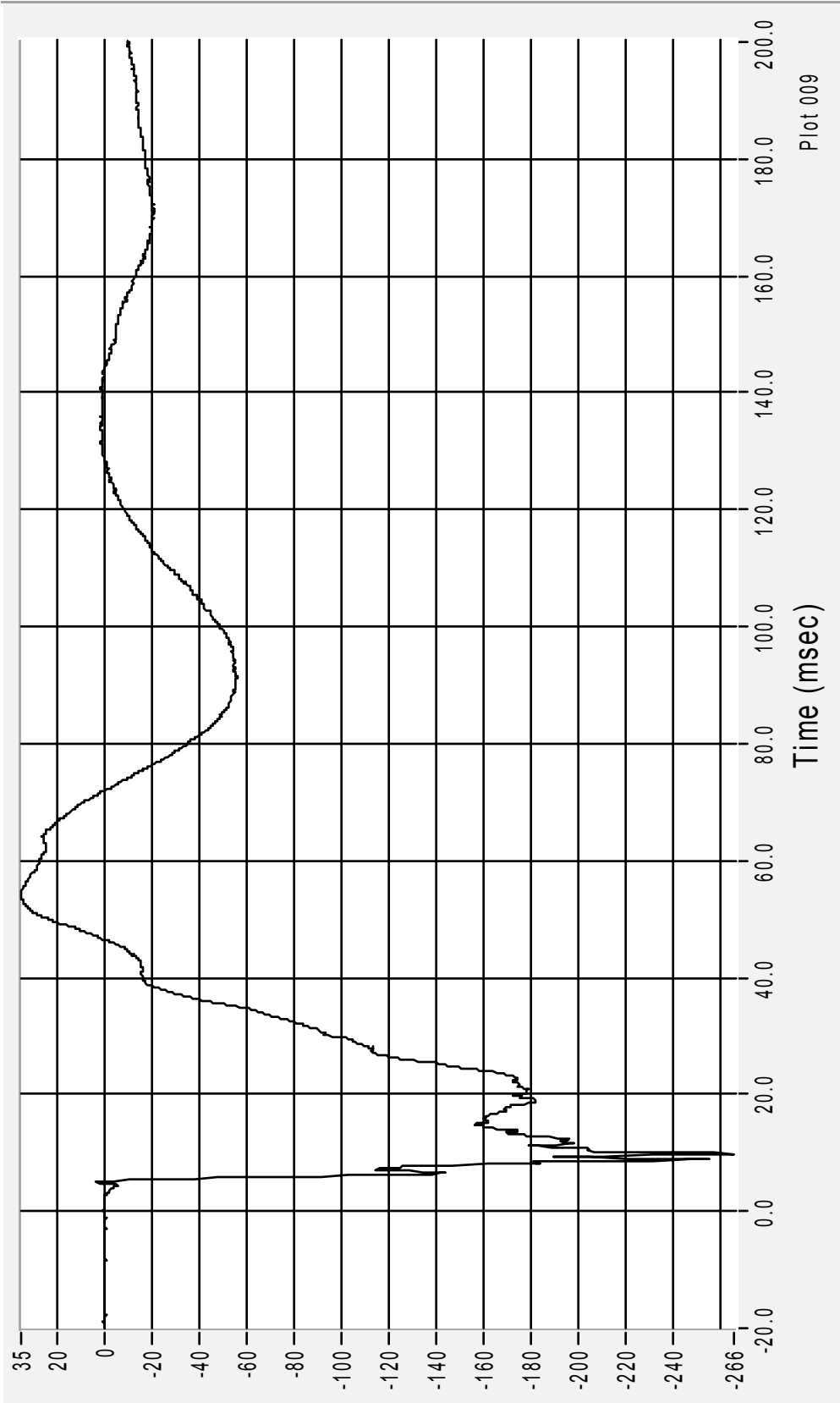
3 YO Upper Neck (X) Force
Force (N) CFC1000
Max 356.8 N at 9.5 msec
Min -30.0 N at 174.3 msec



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NOSAD101 TWG 3.3.3.1

3 YO Upper Neck (Y) Force
Force (N) CFC1000
Max 35.3 N at 53.5 msec
Min -266.2 N at 9.8 msec

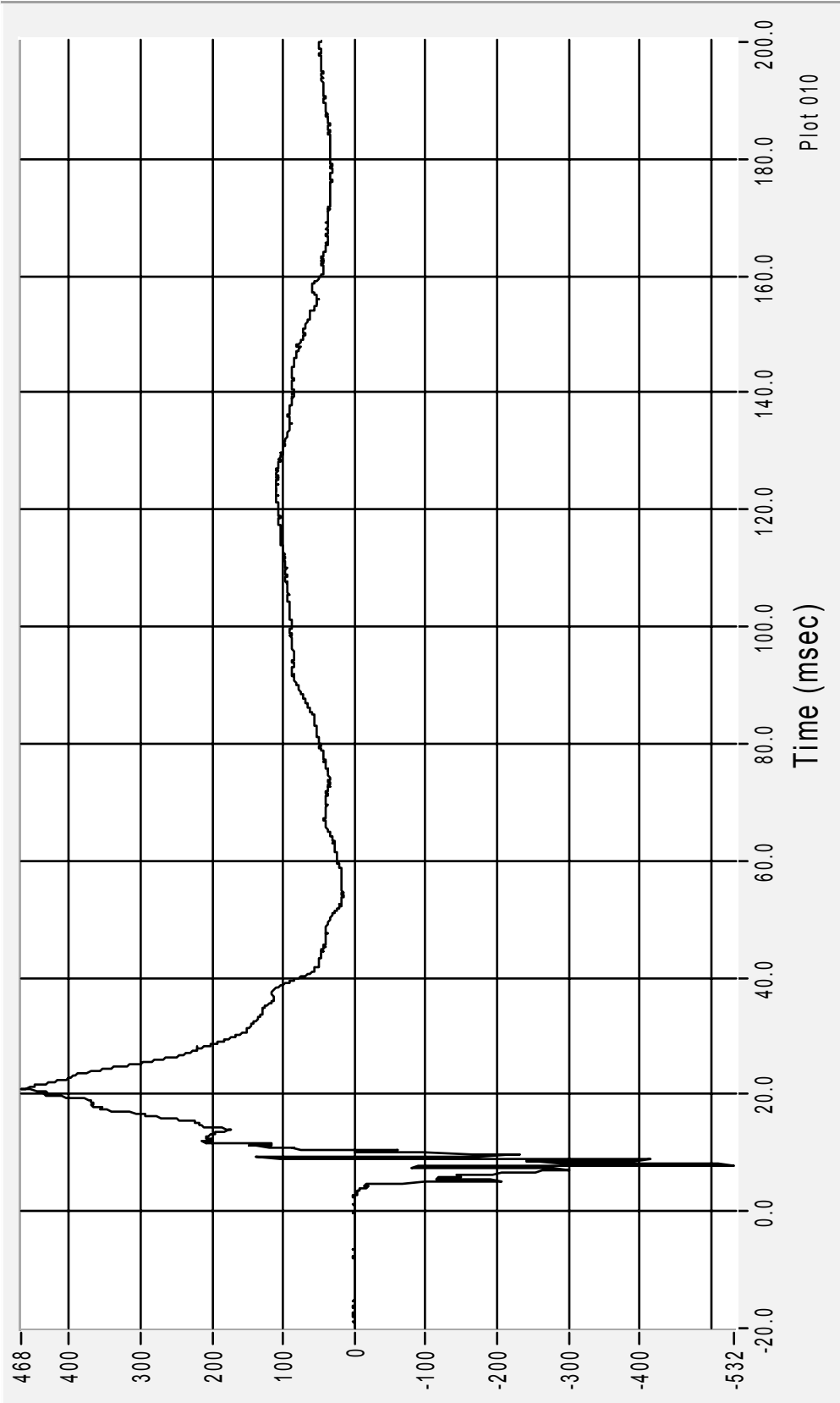


Plot 009

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NOSAD101 TWG 3.3.3.1

3 YO Upper Neck (Z) Force
Force (N) CFC1000
Max 467.8 N at 20.9 msec
Min -532.3 N at 7.9 msec



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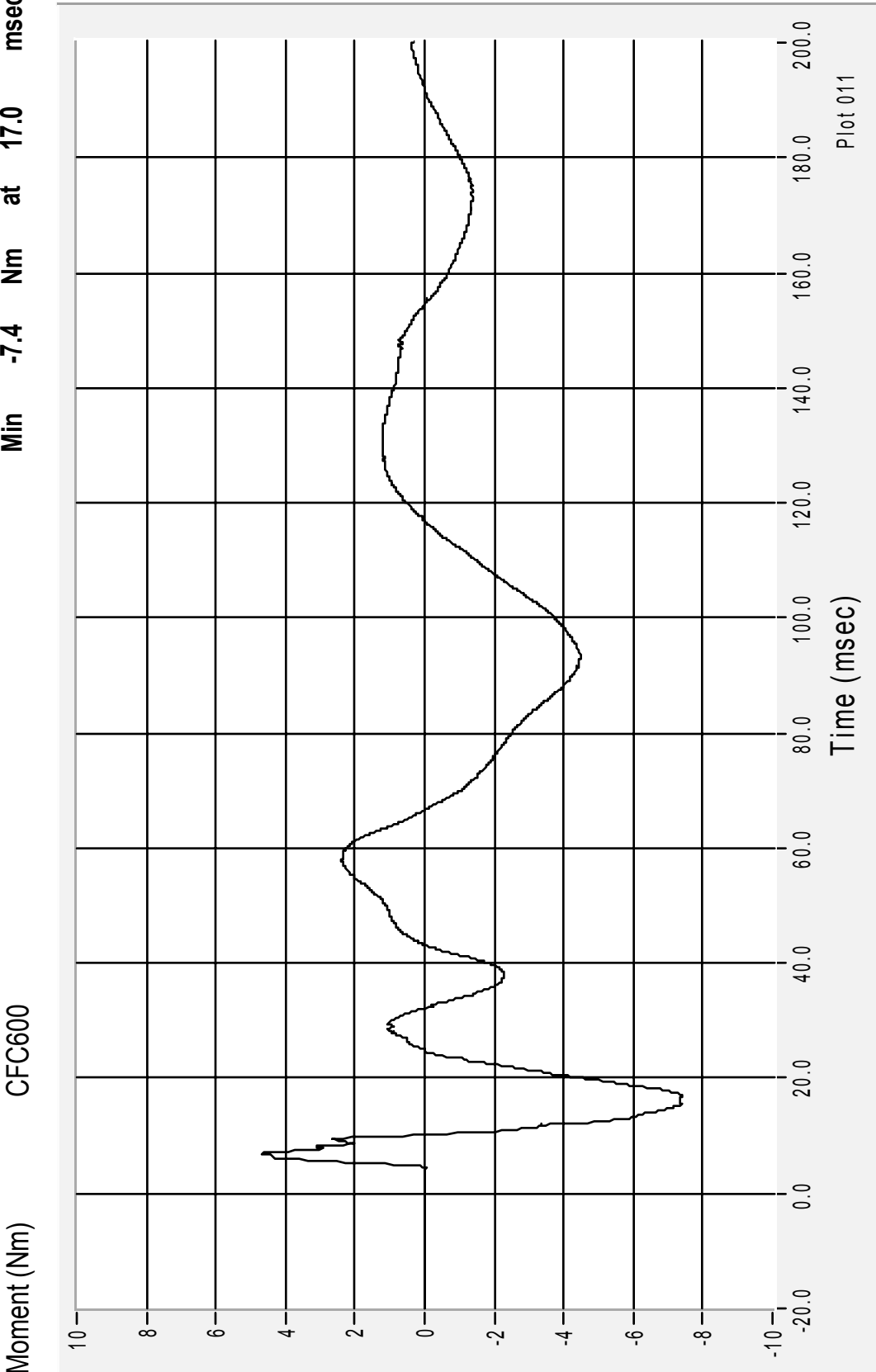
NOSAD101 TWG 3.3.3.1

3 YO Upper Neck (X) Moment

Max 4.7 Nm at 7.0 msec

Min -7.4 Nm at 17.0 msec

CFC600

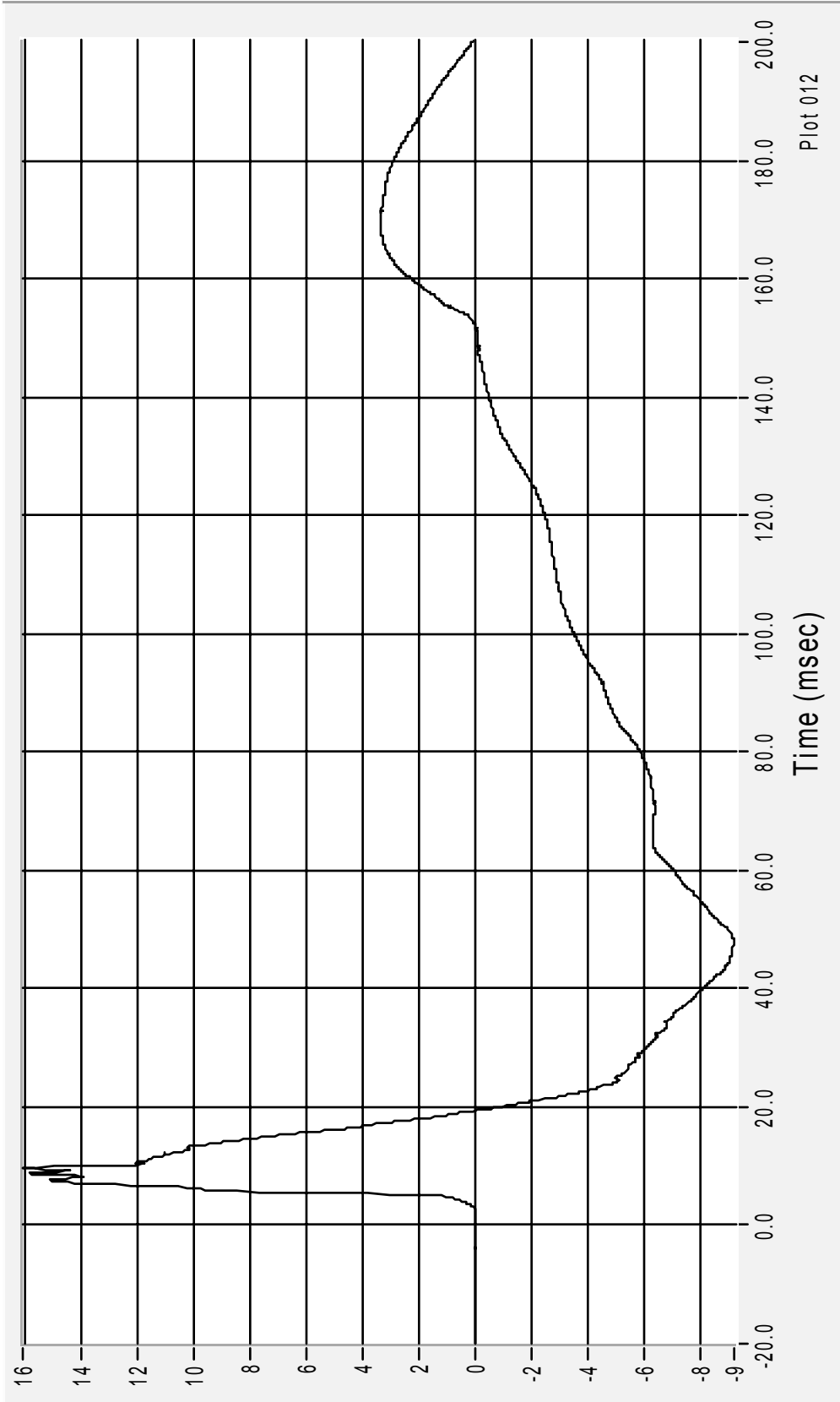


NOSAD101 TWG 3.3.3.1

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3 YO Upper Neck (Y) Moment
Moment (Nm) CFC600

Max	16.1	Nm	at	9.7	msec
Min	-9.2	Nm	at	48.0	msec

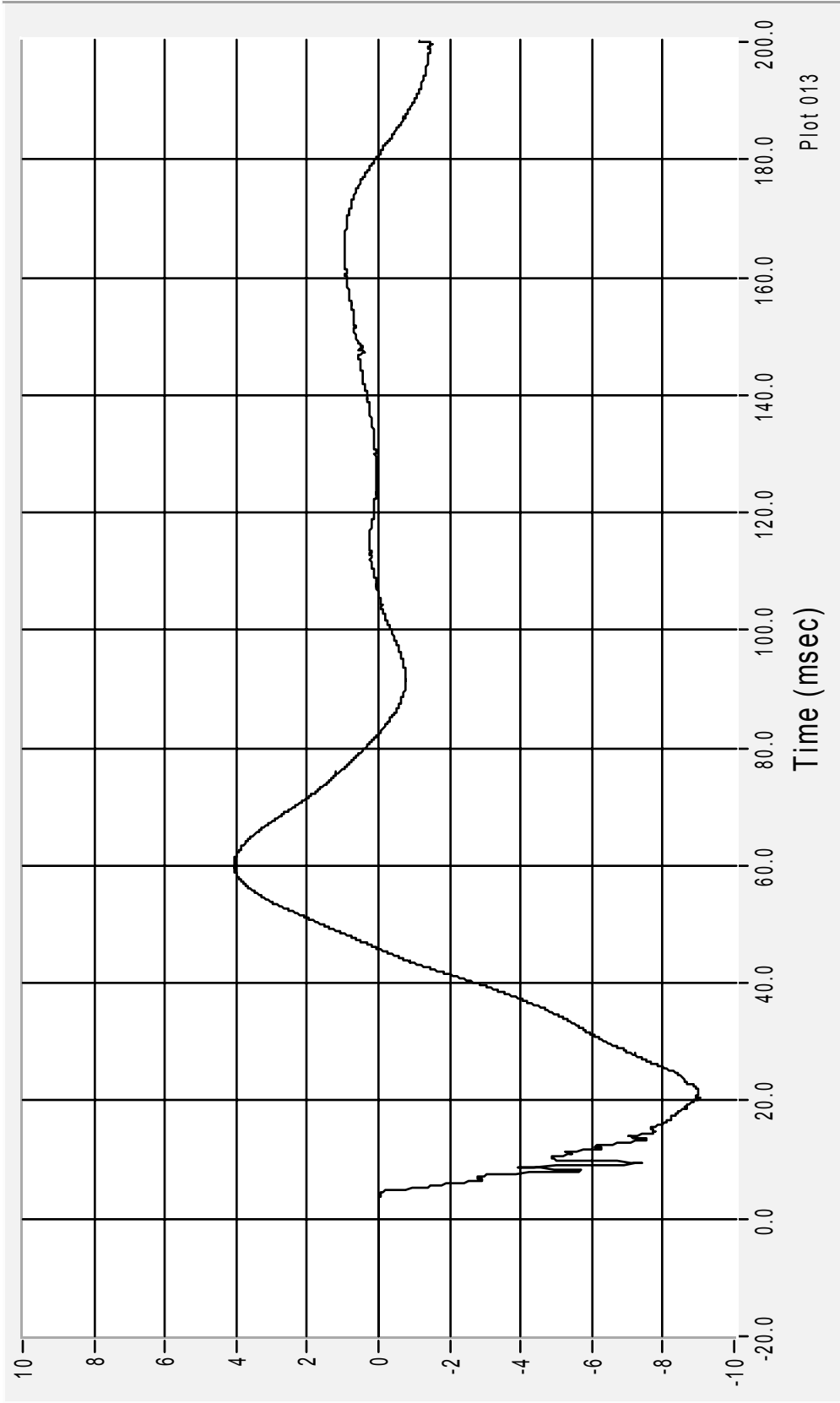


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NOSAD101 TWG 3.3.3.1

3 YO Upper Neck (Z) Moment
Moment (Nm) CFC600

Max	4.1	Nm	at	60.3	msec
Min	-9.0	Nm	at	20.4	msec

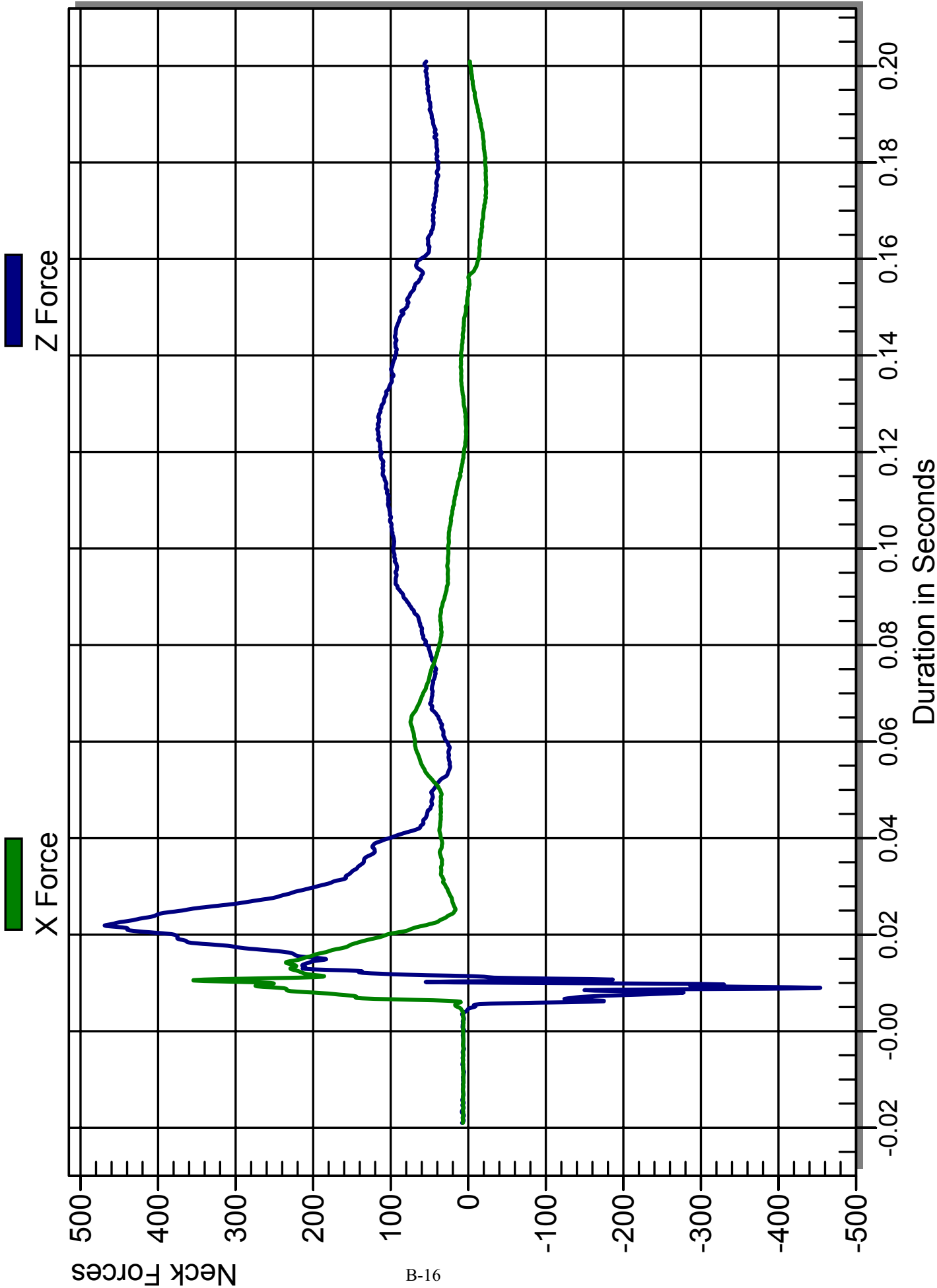


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NOSAD101 TWG 3.3.3.1

Nij Version 10

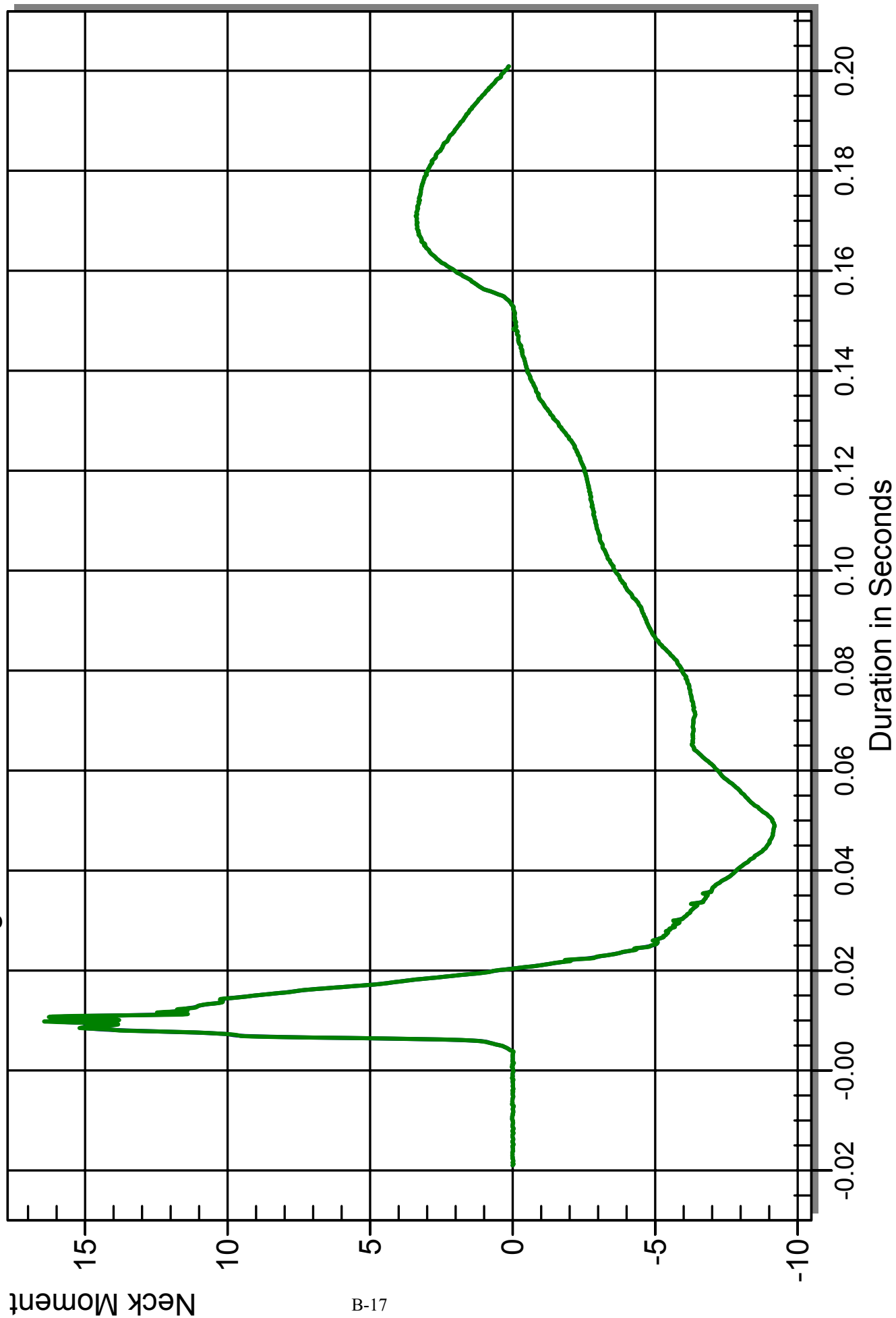
Ntff= 0.26, Nte= 0.36, Ncf= 0.43, Nce= 0.00



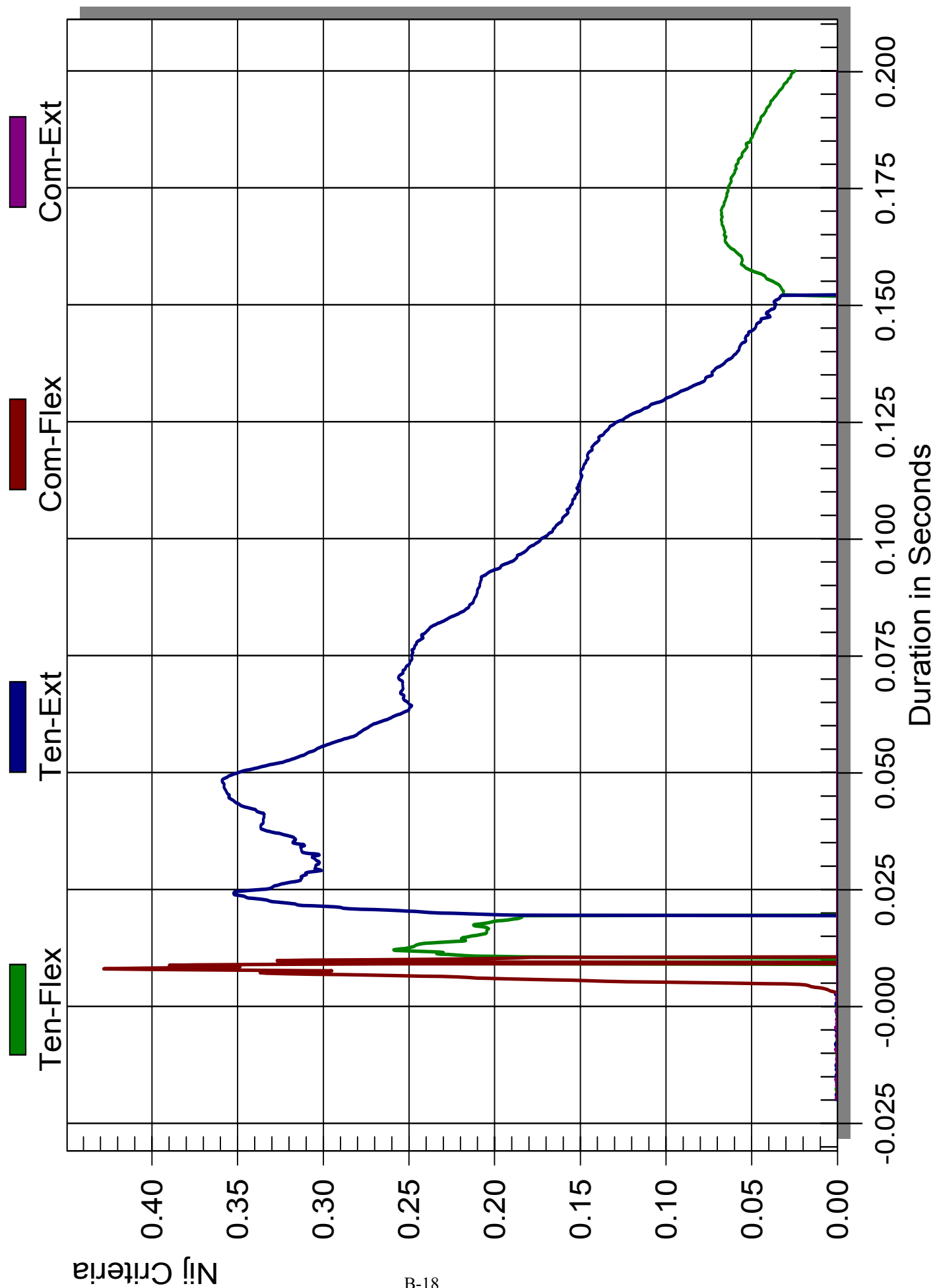
Nij Version 10

Ntff= 0.26, Nte= 0.36, Ncf= 0.43, Nce= 0.00

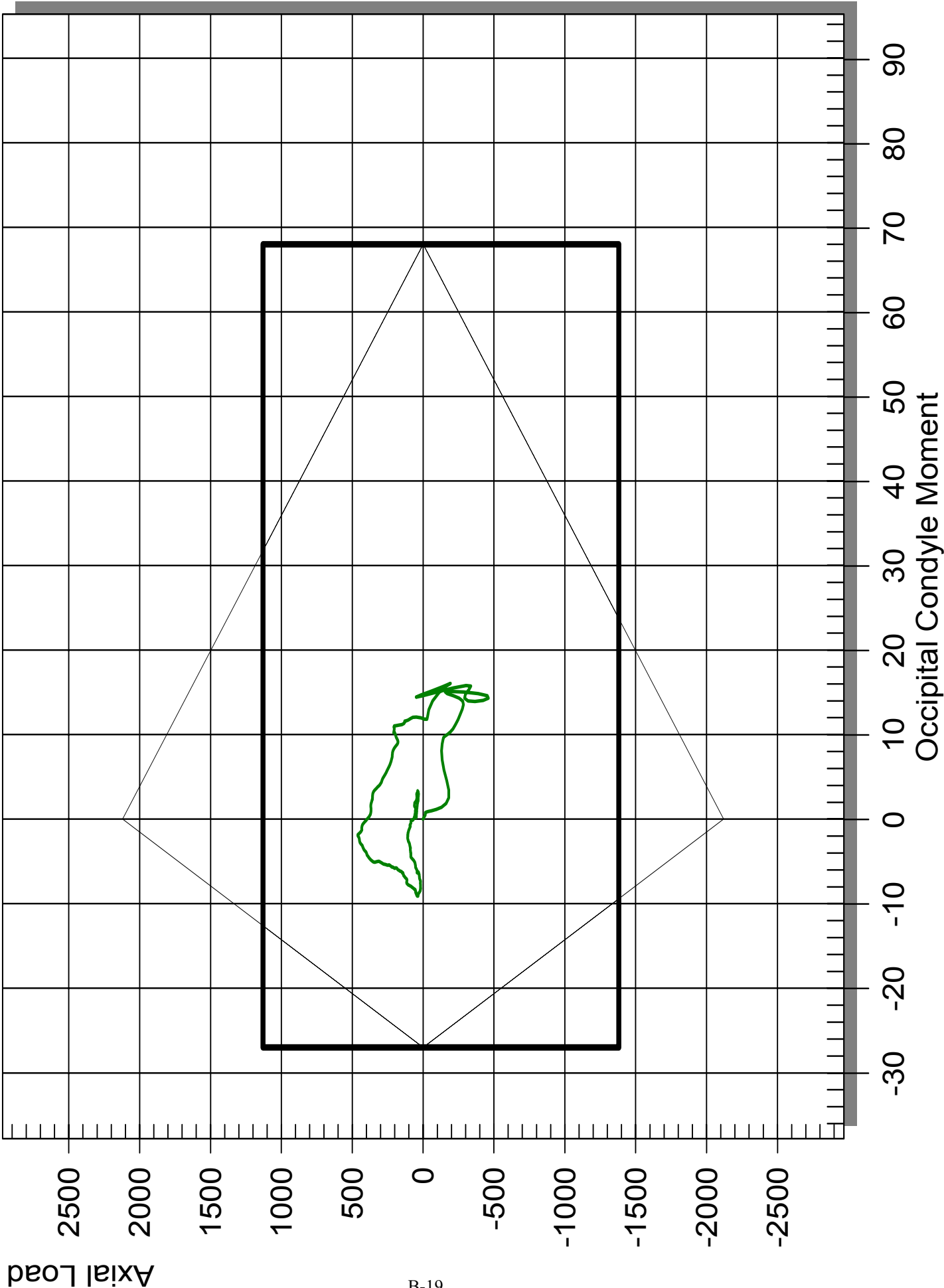
Original Corrected



Nij Version 10

 $N_{tf} = 0.26$, $N_{te} = 0.36$, $N_{cf} = 0.43$, $N_{ce} = 0.00$ 

Nij Version 10
Ntf= 0.26, Nte= 0.36, Ncf= 0.43, Nce= 0.00



Appendix C

IIII 3 YR OLD CONFIGURATION AND VERIFICATION RESULTS

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	Page No.
VERIFICATION TEST RESULTS SUMMARY PRE TEST	C-3
SUMMARY HIII 3 YR OLD PRE VERIFICATION	C-4
DUMMY INSPECTION LIST PRE TEST	C-8

**VERIFICATION TEST RESULTS SUMMARY
PRE TEST**Dummy Serial Number HIII 3-YR-OLD 042Test Sequences 02

TEST	PRE	
	COMMENTS	BY
EXTERNAL DIMENSIONS	Pass all requirements	Technician at TRC
HEAD DROP	Pass all requirements	Technician at TRC
NECK FLEXION TEST	Pass all requirements	Technician at TRC
NECK EXTENSION TEST	Pass all requirements	Technician at TRC
THORAX IMPACT TEST	Pass all requirements	Technician at TRC
TORSO FLEXION TEST	Pass all requirements	Technician at TRC

SUMMARY
HIII 3 YR OLD DUMMY PRE VERIFICATION

Dummy Serial Number HIII 3-YR-OLD 042 Calibration Number 02

MEASUREMENTS

TEST PARAMETER	SPECIFICATION	HIII 3-YR-OLD 042
		TEST RESULTS
A - Total Sitting Height (mm)	538.5 - 553.7	546
B - Shoulder Pivot Height (mm)	307.3 - 322.6	313
C - Hip Pivot Height (mm)	33.0 - 43.2	37
D - Hip Pivot From Backline (mm)	56.9 - 67.1	59
E - Shoulder Pivot from Backline (mm)	58.4 - 68.6	63
F - Thigh Clearance (mm)	81.0 - 91.2	87
G - Back of Elbow to Wrist Pivot (mm)	247.4 - 262.6	253
H - Head Back to Backline (mm)	48.3 - 58.4	49
I - Shoulder to Elbow Length (mm)	185.0 - 200.7	193
J - Elbow Rest Height (mm)	133.6 - 148.8	136
K - Buttock to Knee Length (mm)	287.3 - 302.5	293
L - Popliteal Height (mm)	221.0 - 236.2	228
M - Knee to Floor Height (mm)	241.6 - 256.8	249
N - Buttock Popliteal Height (mm)	217.9 - 233.2	229
O - Chest Depth without Jacket (mm)	134.6 - 149.9	137
P - Foot Length (mm)	137.7 - 147.8	141
Q - Stature (mm)	932.2 - 957.6	936
R - Buttock to Knee Pivot Length (mm)	251.5 - 261.6	258
S - Head Breadth (mm)	128.3 - 143.5	136
T - Head Depth (mm)	167.4 - 182.6	176
U - Hip Breadth (mm)	200.7 - 215.9	209
V - Shoulder Breadth (mm)	236.5 - 251.7	243
W - Foot Breadth (mm)	53.6 - 63.8	57
X - Head Circumference (mm)	500.4 - 515.6	510
Y - Chest Circumference with Jacket (mm)	527.1 - 552.5	536
Z - Waist Circumference (mm)	527.1 - 552.5	543
AA - Reference Location for Chest Circum. (mm)	248.9 - 259.1	254
BB - Reference Location for Waist Circum. (mm)	160.0 - 170.2	165

SUMMARY
HIII 3 YR OLD DUMMY PRE VERIFICATION

Dummy Serial Number	<u>HIII 3-YR-OLD 042</u>	Calibration Number	<u>02 - 1</u>
		Test Date	<u>15 Oct. 2003</u>

572P Head Drop Test

TEST PARAMETER	SPECIFICATION	HIII 3-YR-OLD 042
		TEST RESULTS
Temperature (degrees C)	18.9 - 25.6	21.1
Relative Humidity (%)	10 - 70	32
Peak Resultant Acceleration (G's)	250 - 280	259.5
Peak Lateral Acceleration (G's)	15 G Max	-8.0
Is Acceleration Curve Unimodal?	Yes	Yes

Dummy Serial Number	<u>HIII 3-YR-OLD 042</u>	Calibration Number	<u>02 - 2</u>
		Test Date	<u>15 Oct. 2003</u>

572P Neck Flexion Test - 6 Channel Transducer

TEST PARAMETER	SPECIFICATION	HIII 3-YR-OLD 042
		TEST RESULTS
Temperature (degrees C)	20.6 - 22.2	21.1
Relative Humidity (%)	10 - 70	31
Impact Velocity (m/s)	5.40 - 5.60	5.47
Integrated Pendulum Velocity (m/s)		
10 ms	2.00 - 2.70	2.36
15 ms	3.00 - 4.00	3.41
20 ms	4.00 - 5.10	4.62
Peak D Plane Rotation (degrees)	70 - 82	73.7
Peak Moment About Occipital Condyles (Nm)	42.0 - 53.0	42.46
Positive Moment Decay Time To 10 Nm (ms)	60 - 80	71.36

Summary
HIII 3 YR OLD DUMMY PRE VERIFICATION

Dummy Serial Number	<u>HIII 3-YR-OLD 042</u>	Calibration Number	<u>02 - 3</u>
		Test Date	<u>16 Oct. 2003</u>

572P Neck Extension Test - 6 Channel Transducer

TEST PARAMETER	SPECIFICATION	HIII 3-YR-OLD 042
		TEST RESULTS
Temperature (degrees C)	20.6 - 22.2	21.1
Relative Humidity (%)	10 - 70	32
Impact Velocity (m/s)	3.55 - 3.75	3.72
Integrated Pendulum Velocity (m/s)		
10 ms	1.00 - 1.40	1.37
15 ms	1.90 - 2.50	2.44
20 ms	2.80 - 3.50	3.29
Peak D Plane Rotation (degrees)	83 - 93	87.0
Peak Moment About Occipital Condyles (Nm)	-53.3 - (-43.7)	-47.07
Positive Moment Decay Time To 10 Nm (ms)	60 - 80	72.08

Dummy Serial Number	<u>HIII 3-YR-OLD 042</u>	Calibration Number	<u>02 - 1</u>
		Test Date	<u>17 Oct. 2003</u>

572P Thorax Test

TEST PARAMETER	SPECIFICATION	HIII 3-YR-OLD 042
		TEST RESULTS
Temperature (degrees C)	20.6 - 22.2	21.7
Relative Humidity (%)	10 - 70	30
Pedulum Velocity (m/s)	5.90 - 6.10	6.05
Maximum Chest Deflection (mm)	-38.0 - (-32.0)	-35.0
Peak Impact Probe Force Within Comp. Corr. (N)	680 - 810	746
Internal Hysteresis (%)	65 - 85	71
Max. Force Between 12.5 & 32 mm of Deflection	<=910	795

Summary
HIII 3 YR OLD DUMMY PRE VERIFICATION

Dummy Serial Number	<u>HIII 3-YR-OLD 042</u>	Calibration Number	<u>02 - 3</u>
		Test Date	<u>16 Oct. 2003</u>

572P Torso Flexion Test

TEST PARAMETER	SPECIFICATION	HIII 3-YR-OLD 042
		TEST RESULTS
Temperature (degrees C)	18.9 - 25.6	21.7
Relative Humidity (%)	10 - 70	36
Initial Angle of Unsupported Dummy (degrees)	<=15 Ref. to Vertical	4.9
Max. Force at 45 Deg. During 10 Sec. Period (N)	130 - 180	179.8
Return Angle (degrees)		2.5
Difference Between Return & Initial Angle (degrees)	+/- 10 Deg. of Initial Angle	7.4
Rate (degrees/sec)	0.5 - 1.5	1.0

**DUMMY INSPECTION LIST
PRE TEST**

Dummy Serial Number HIII 3-YR-OLD 042

		HIII 3-YR-OLD
		PRE
	DATE	22 Mar. 2004
	PERFORMED BY	Mark Meyer
PART	INSPECTION	Pass
Skin	Visual	Pass
Head	Visual, Accelerometer Mount	Pass
Neck	Visual	Pass
Spine Box	Visual	Pass
Rib Cage	Visual	Pass
Sternum	Visual	Pass
Lumbar Spine	Visual	Pass
Abdomen	Visual	Pass
Pelvis	Visual	Pass
Upper Legs	Visual	Pass
Knees	Visual, Stops, Inserts	Pass
Lower Legs	Visual, Range of Motion	Pass
Ankles	Visual, Range of Motion	Pass
Feet	Visual, Range of Motion	Pass
Joints	1 to 2 G Range	Pass
Other		None

APPENDIX D

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

TABLE OF CONTENTS

Section	Page No.
DUMMY INSTRUMENTATION	D-3

DUMMY INSTRUMENTATION**HYBRID III 3-Year-Old NO. 042**

	SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
HEAD X ACCELERATION	J44022	ENDEVCO	29Jan04
HEAD Y ACCELERATION	J43800	ENDEVCO	10Jan04
HEAD Z ACCELERATION	J43808	ENDEVCO	10Jan04
SIX AXIS UPPER NECK LOAD CELL (FX, FY, FZ, MX, MY, MZ)	94	DENTON ATD	02Sept02