

REPORT NUMBER: SLED-MGA-2001-004

**CHILD RESTRAINT SYSTEM IN
DYNAMIC SLED TEST**

TEST NUMBER: H01250

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



August 16, 2001

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
400 SEVENTH STREET, SW, ROOM 5311
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-01-D-12005.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by: _____
Chad Gadberry, Project Engineer

Date: _____

Reviewed by: _____
David Winkelbauer, Facility Director

Date: _____

FINAL REPORT ACCEPTED BY:

Manager, New Car Assessment Program

Date of Acceptance

COTR, NCAP Frontal Impact Program

Date of Acceptance

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Test Procedure	1
2	Child Restraint Information	2
3	Post-Test Observations	3
4	Hybrid III 3 Year Old ATD Injury Criteria and Sensor Data	4
5	Sled Test Set-Up	6
6	Camera Location	7
7	Photographs	8
8	Data Plots	23
9	Child Dummy Calibration Data Traces and Tables	52
10	Test Equipment and Instrumentation Calibration	70

SECTION 1

PURPOSE AND TEST PROCEDURE

1.1 PURPOSE

This dynamic sled testing is part of the FY' 01 New Car Assessment Program (NCAP) sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract Number DTNH22-01-D-12005. The purpose of this test is to obtain child seat research data for frontal dynamic testing.

1.2 TEST PROCEDURE

This frontal dynamic sled test was conducted in accordance with the child restraint test procedure provided by the Office of Crashworthiness Standards (OCS), New Car Assessment Program (NCAP).

The test was conducted at MGA Research Corporation on August 16, 2001 at a speed of 56.0 kph (34.8 mph). The FMVSS No. 213 sled pulse was used as a crash pulse. The requirements specified in the FMVSS No. 213 were also followed.

The bench seat contained one anthropomorphic test device (ATD). One (1) Part 572P 3 year old ATD was instrumented with head, chest, and pelvic tri-axial accelerometers, and upper and lower neck load cells. The child ATD was positioned according to the child seat manufacturer's instructions. The data was digitally sampled at 10,000 samples per second and processed per Section IP11 of the Laboratory Test Procedure.

SECTION 2
CHILD RESTRAINT INFORMATION

Test No: H01250

Test Date: August 16, 2001

Child Restraint Type (forward-facing, rear-facing, booster)	Forward-Facing
LATCH or NON-LATCH	Non-Latch
Child Restraint Manufacturer	Century
Child Restraint Model	Bravo
Child Restraint Age Limits	Toddler
Child Restraint Weight Limits (Forward) (kg)	18.1
Child Restraint Weight Limits (Rearward) (kg)	13.6
Weight of Child Restraint (kg)	7.3

SECTION 3
POST-TEST OBSERVATIONS

Test No: H01250

Test Date: August 16, 2001

Child Seat	Century Bravo
Belt Fraying	No
Stress Marks	Yes, minor stress marks at vehicle belt pass-through
Cracks	No
Buckle Stress	No
Latch Hooks	No

SECTION 4

HYBRID III 3 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA

Test No: H01250

Test Date: August 16, 2001

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	22.1	209	37.7	97
Head CG	Y	G's	3.9	219	45.0	97
Head CG	Z	G's	51.0	96	2.4	43
Head CG Resultant	N/A	G's	76.7	97		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	9.9	183	38.7	64
Chest CG	Y	G's	8.3	62	18.3	87
Chest CG	Z	G's	15.0	97	11.9	63
Chest CG Resultant	N/A	G's	40.4	63		

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	993	90		
Shoulder Belt	N/A	Newtons	125	58		
Lap Belt	N/A	Newtons	4634	71		

HEAD INJURY CRITERIA (HIC)

Location	Left Rear Passenger			
	HIC	Avg G's	T ¹	T ²
Head CG Primary (36 msec)	581	48.2	63.9	99.9
Head CG Primary (15 msec)	306	52.9	83.2	98.2

CHEST CLIP (3 MSEC)

Location	Left Rear Passenger		
	Clip	T ¹	T ²
Chest CG Primary	36.8	62.5	65.5

HYBRID III 3 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA...(continued)

Test No: H01250

Test Date: August 16, 2001

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	13.9	130	73.1	43
Pelvis	Y	G's	6.0	45	17.9	82
Pelvis	Z	G's	8.8	215	27.8	42

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	70	181	548	104
Neck Force	Y	Newtons	75	63	232	89
Neck Force	Z	Newtons	1369	91	75	43
Neck Moment	X	Nm	11.6	208	16.9	98
Neck Moment	Y	Nm	11.2	168	13.5	66
Neck Moment	Z	Nm	13.3	220	4.8	181

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	161	204	849	90
Neck Force	Y	Newtons	224	103	148	89
Neck Force	Z	Newtons	972	68	191	136
Neck Moment	X	Nm	18.7	204	47.2	94
Neck Moment	Y	Nm	80.9	113	16.2	212
Neck Moment	Z	Nm	7.2	226	22.5	103

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	mm			*	*

* No Valid Data Collected

SECTION 5

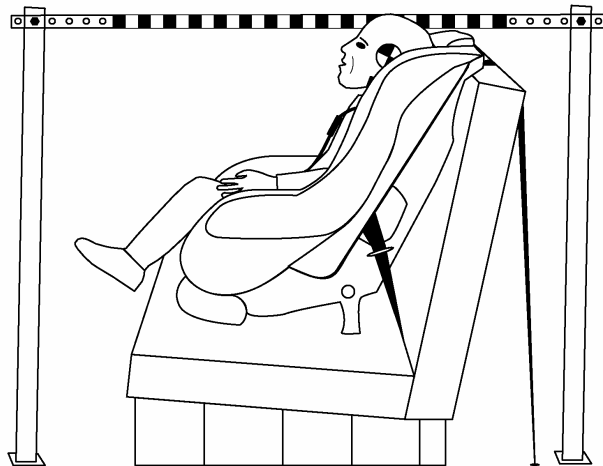
SLED TEST SET-UP

Test No: H01250

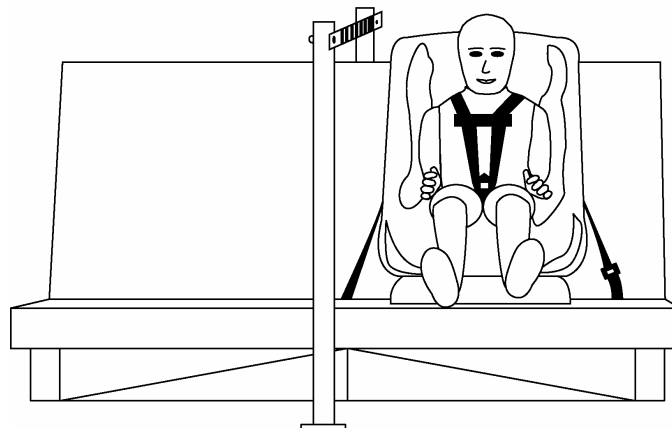
Test Date: August 16, 2001

An FMVSS 213 test bench was fixtured on the sled in order to simulate a frontal impact. One child seat was placed on the bench and fastened in a manner suggested in the owner's manual of the child seat. Modifications were made to the bench to accommodate the top tether and, if installed on the child seat, lower anchors. A row of inch-reference tape was placed on the sled to make it possible to obtain dummy excursion measurements.

Pre-Test Infant & Car Seat Positions



Left Side View



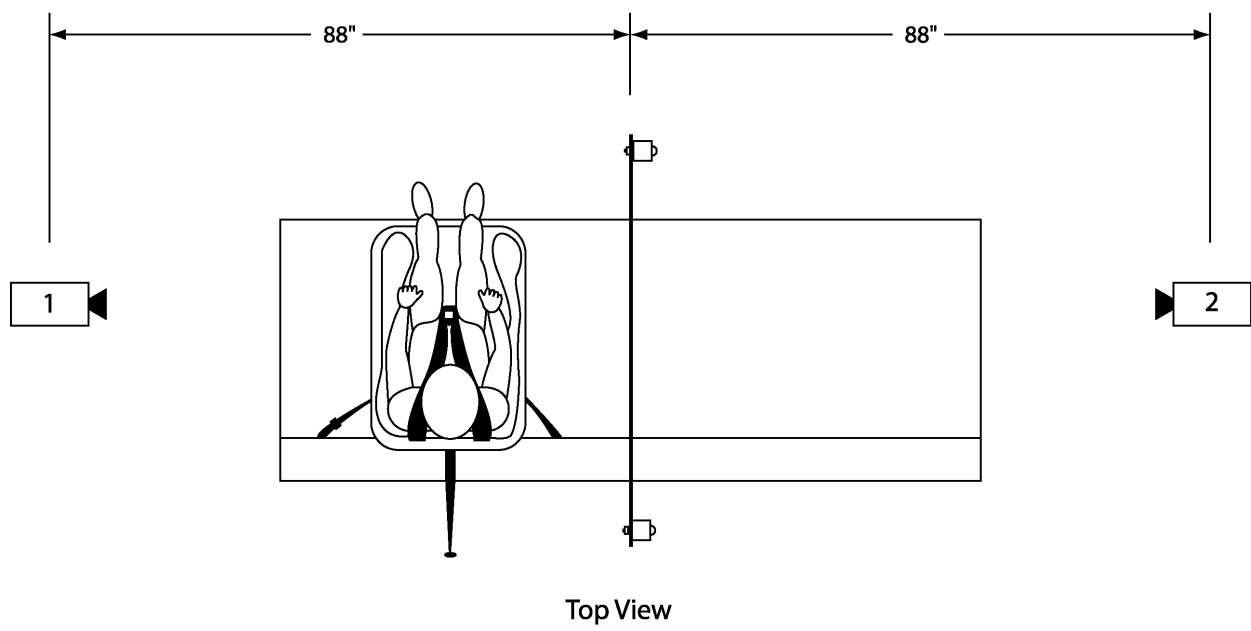
Front View

SECTION 6
CAMERA LOCATION

Test No: H01250

Test Date: August 16, 2001

There were two cameras mounted onto the sled carriage for views of the left and right side of the child seat.



SECTION 7
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

<u>Photographs</u>	<u>Page No.</u>
Photo 1 - Pre-Test Front View	9
Photo 2 - Post-Test Front View	10
Photo 3 - Pre-Test Rear View	11
Photo 4 - Post-Test Rear View	12
Photo 5 - Pre-Test Left Side View	13
Photo 6 - Post-Test Left Side View	14
Photo 7 - Pre-Test Right Side View	15
Photo 8 - Post-Test Right Side View	16
Photo 9 - Pre-Test Fixture	17
Photo 10 - Post-Test Fixture	18
Photo 11 – Post-Test Front View of Child Seat	19
Photo 12 – Post-Test Rear View of Child Seat	20
Photo 13 – Post-Test Left View of Child Seat	21
Photo 14 – Post-Test Right View of Child Seat	22



Photo 1 - Pre-Test Front View



Photo 2 - Post-Test Front View

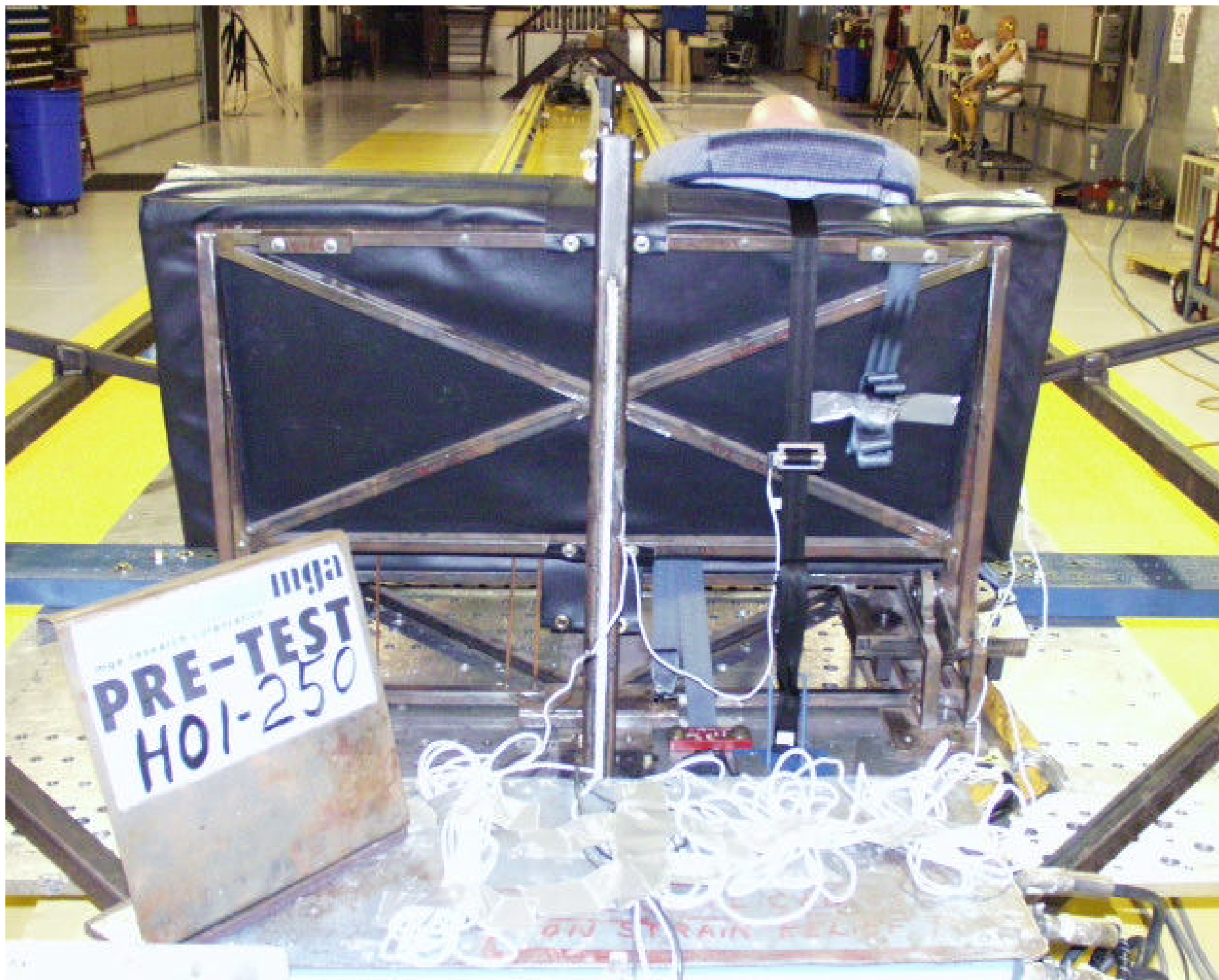


Photo 3 - Pre-Test Rear View



Photo 4 - Post-Test Rear View



Photo 5 - Pre-Test Left Side View



Photo 6 - Post-Test Left Side View



Photo 7 - Pre-Test Right Side View



Photo 8 - Post-Test Right Side View



Photo 9 - Pre-Test Fixture



Photo 10 - Post-Test Fixture



Photo 11 – Post-Test Front View of Child Seat



Photo 12 – Post-Test Rear View of Child Seat



Photo 13 – Post-Test Left View of Child Seat



Photo 14 – Post-Test Right View of Child Seat

SECTION 8
DATA PLOTS

TABLE OF DATA PLOTS

<u>Data Plots</u>	<u>Page No.</u>
Figure 1 - Sled X Acceleration vs. Time	24
Figure 2 - Sled X Velocity vs. Time	25
Figure 3 - Head X Acceleration vs. Time	26
Figure 4 - Head Y Acceleration vs. Time	27
Figure 5 - Head Z Acceleration vs. Time	28
Figure 6 - Head Resultant Acceleration vs. Time	29
Figure 7 - Chest X Acceleration vs. Time	30
Figure 8 - Chest Y Acceleration vs. Time	31
Figure 9 - Chest Z Acceleration vs. Time	32
Figure 10 - Chest Resultant Acceleration vs. Time	33
Figure 11 - Pelvis X Acceleration vs. Time	34
Figure 12 - Pelvis Y Acceleration vs. Time	35
Figure 13 - Pelvis Z Acceleration vs. Time	36
Figure 14 - Upper Neck Force X Acceleration vs. Time	37
Figure 15 - Upper Neck Force Y Acceleration vs. Time	38
Figure 16 - Upper Neck Force Z Acceleration vs. Time	39
Figure 17 - Upper Neck Moment X Acceleration vs. Time	40
Figure 18 - Upper Neck Moment Y Acceleration vs. Time	41
Figure 19 - Upper Neck Moment Z Acceleration vs. Time	42
Figure 20 - Lower Neck Force X Acceleration vs. Time	43
Figure 21 - Lower Neck Force Y Acceleration vs. Time	44
Figure 22 - Lower Neck Force Z Acceleration vs. Time	45
Figure 23 - Lower Neck Moment X Acceleration vs. Time	46
Figure 24 - Lower Neck Moment Y Acceleration vs. Time	47
Figure 25 - Lower Neck Moment Z Acceleration vs. Time	48
Figure 26 - Tether Belt Force vs. Time	49
Figure 27 - Shoulder Belt Force vs. Time	50
Figure 28 - Lap Belt Force vs. Time	51



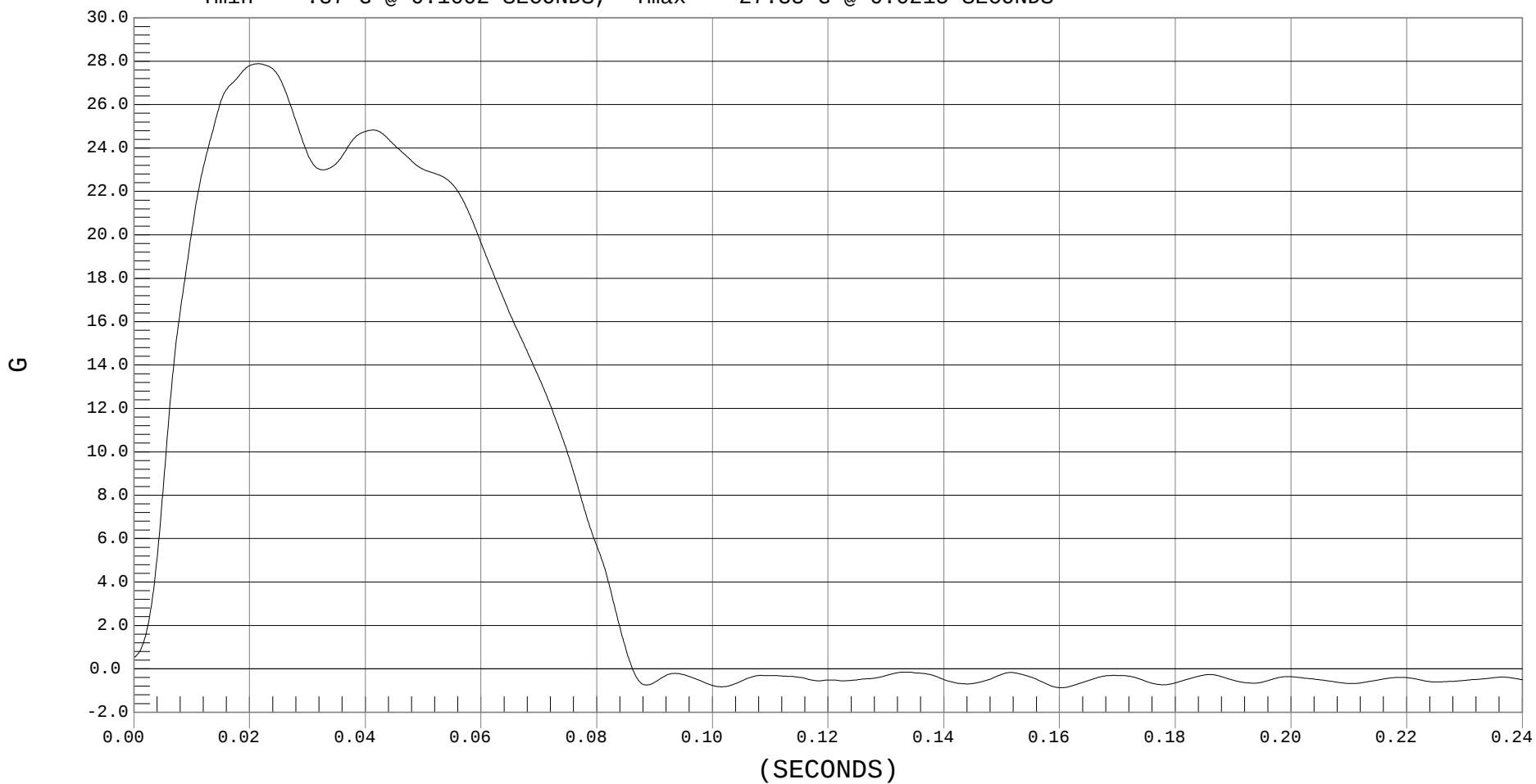
SLED X ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 60

— 1 SLED X ACCELERATION, H01250AF.A01

Ymin = -.87 G @ 0.1602 SECONDS, Ymax = 27.88 G @ 0.0215 SECONDS





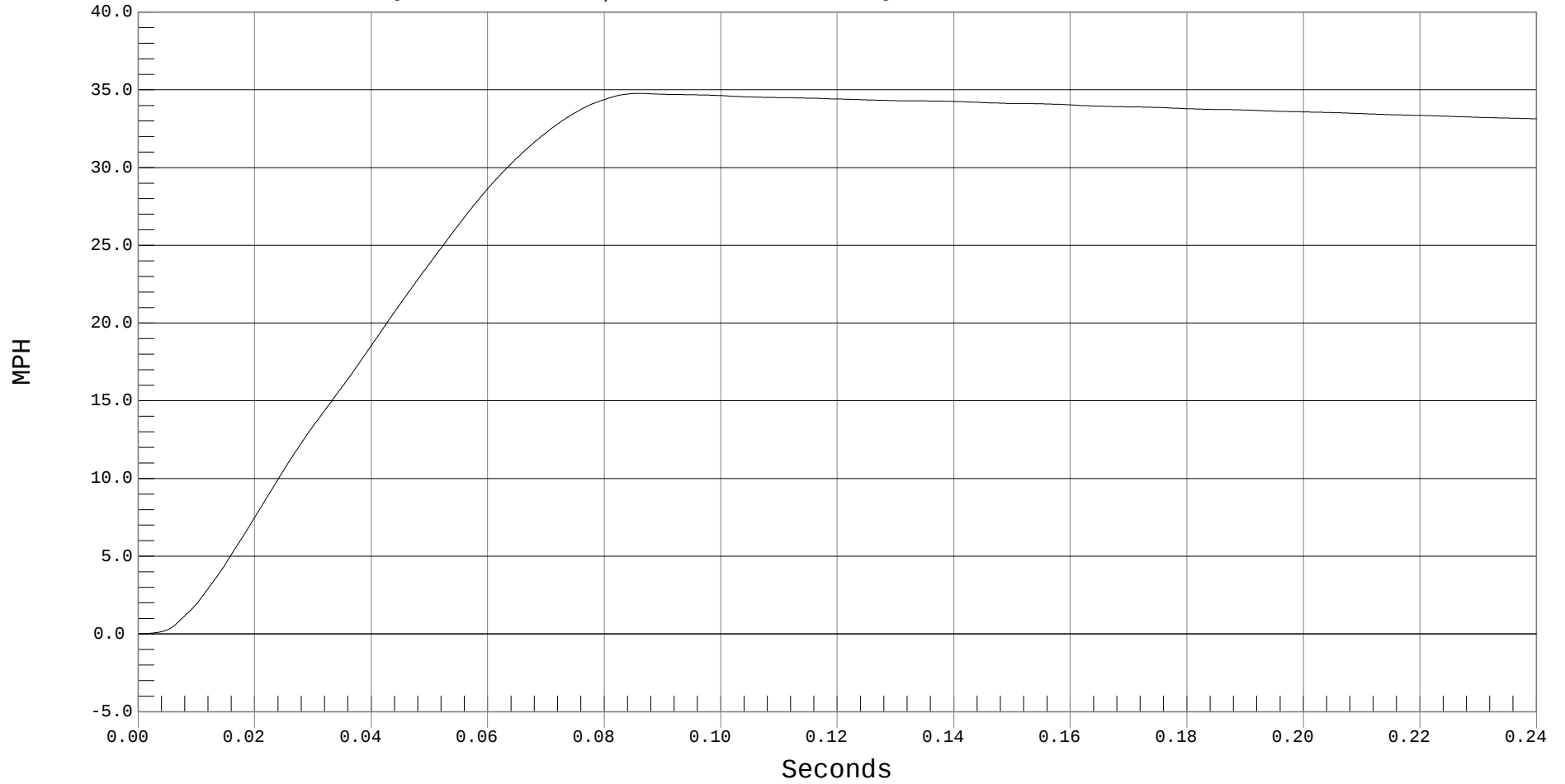
SLED X VELOCITY

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 SLED X VELOCITY, H01250AI.V01

Ymin = 0 MPH @ 0.0000 Seconds, Ymax = 34.77 MPH @ 0.0861 Seconds





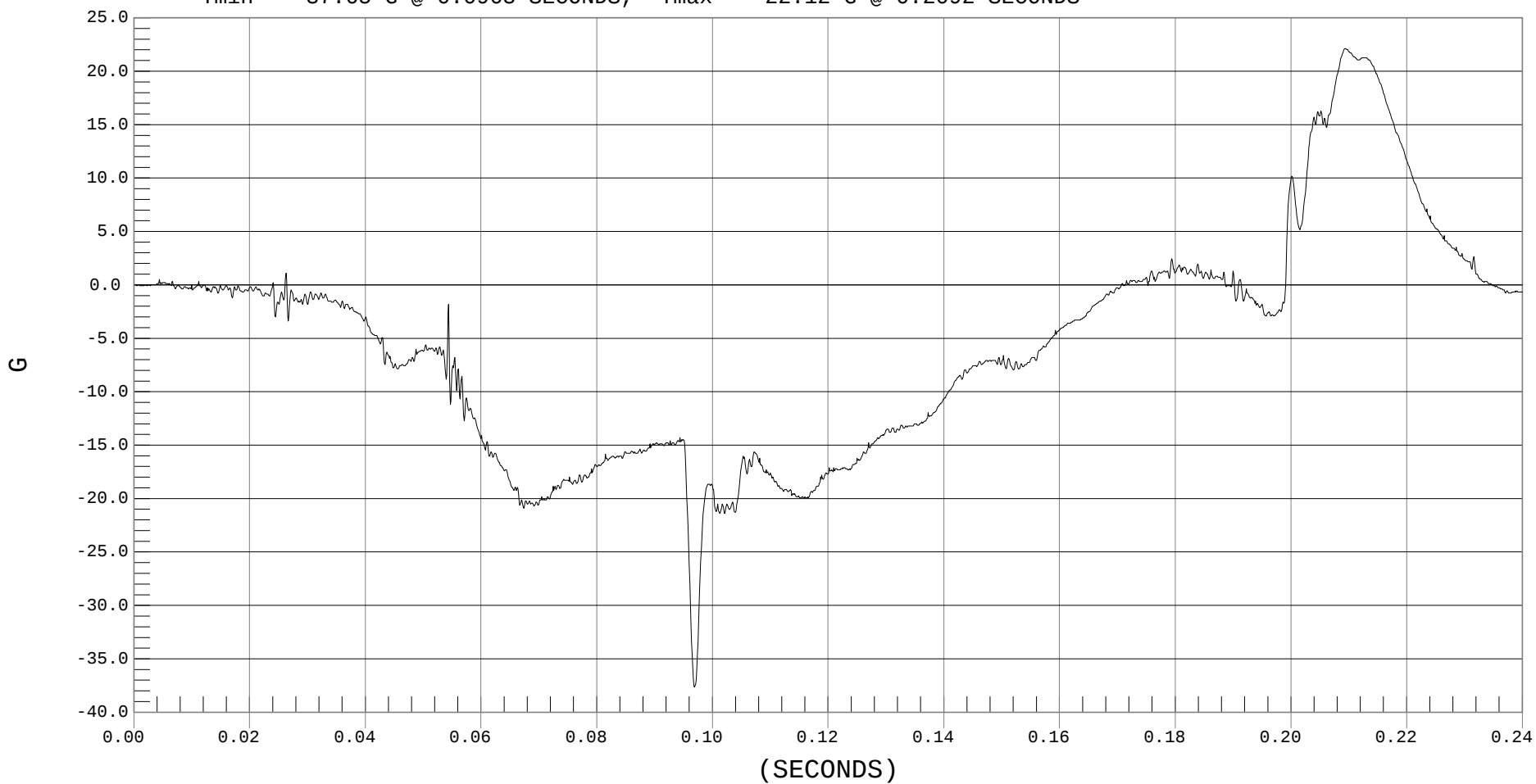
HEAD X ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 HEAD X, H01250AT.A03

Ymin = -37.65 G @ 0.0968 SECONDS, Ymax = 22.12 G @ 0.2092 SECONDS





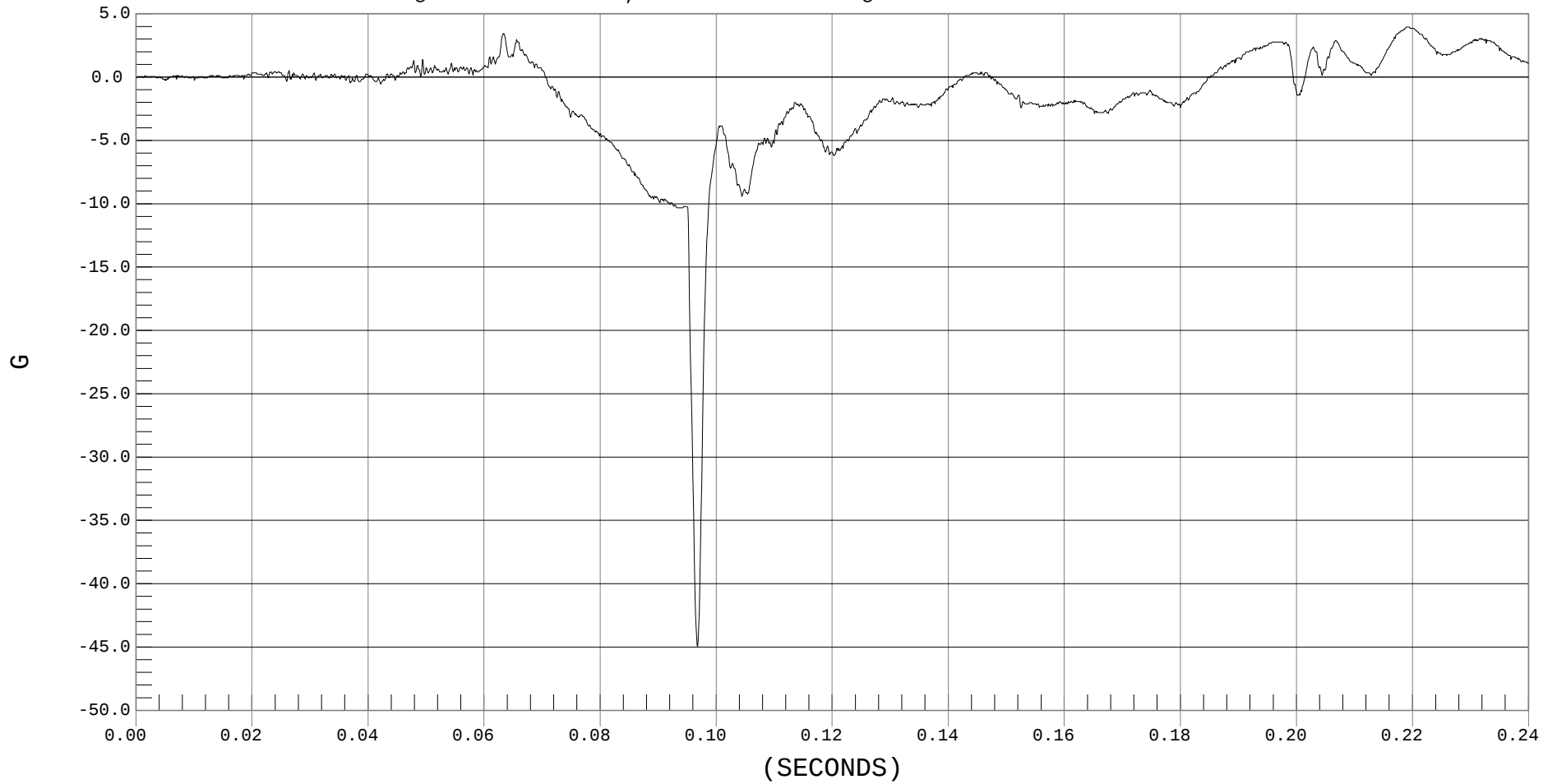
HEAD Y ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 HEAD Y, H01250AT.A05

Ymin = -44.98 G @ 0.0967 SECONDS, Ymax = 3.94 G @ 0.2188 SECONDS





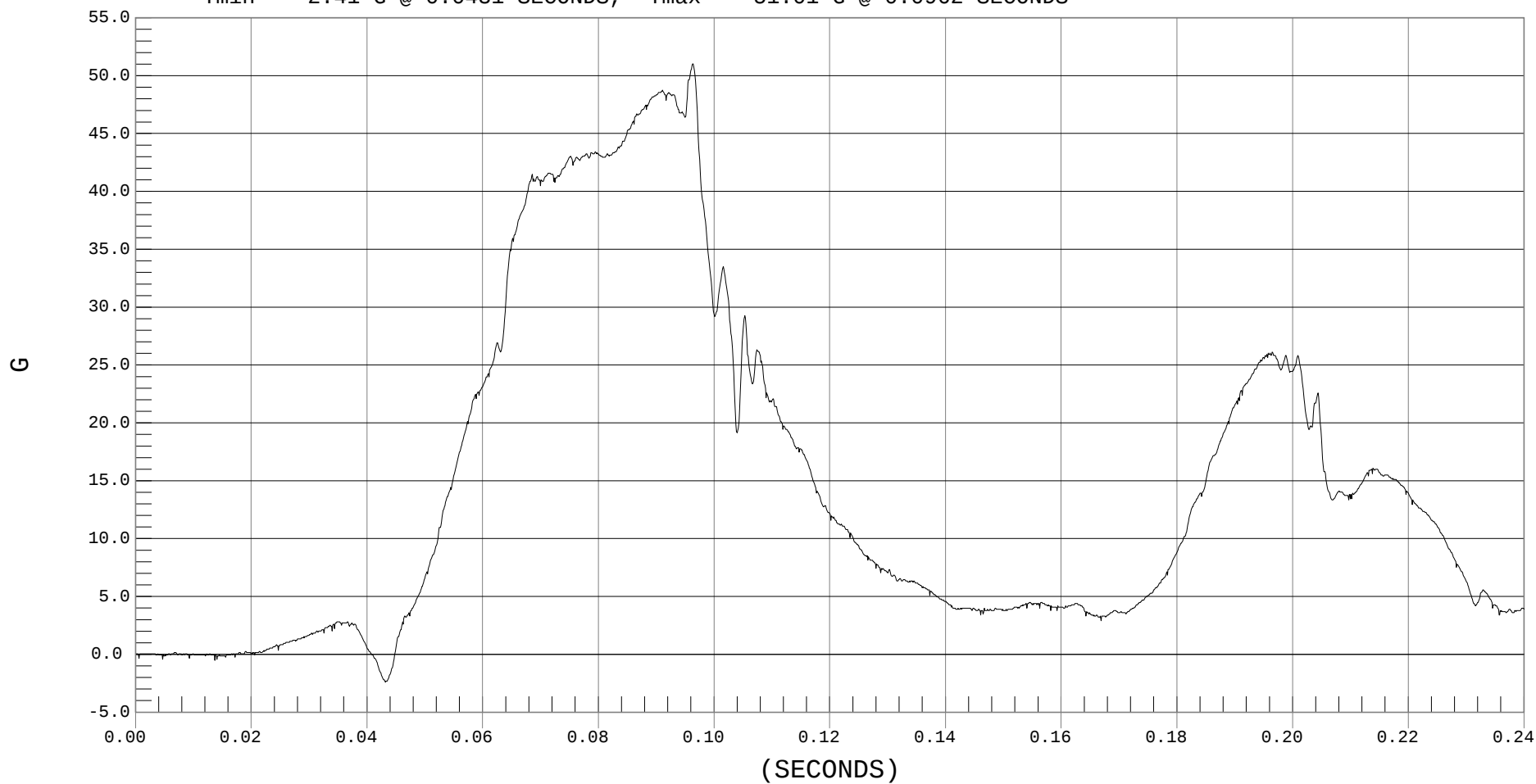
HEAD Z ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 HEAD Z, H01250AT.A06

Ymin = -2.41 G @ 0.0431 SECONDS, Ymax = 51.01 G @ 0.0962 SECONDS





HEAD RESULTANT ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)

Component: CENTURY BRAVO

Other Info:

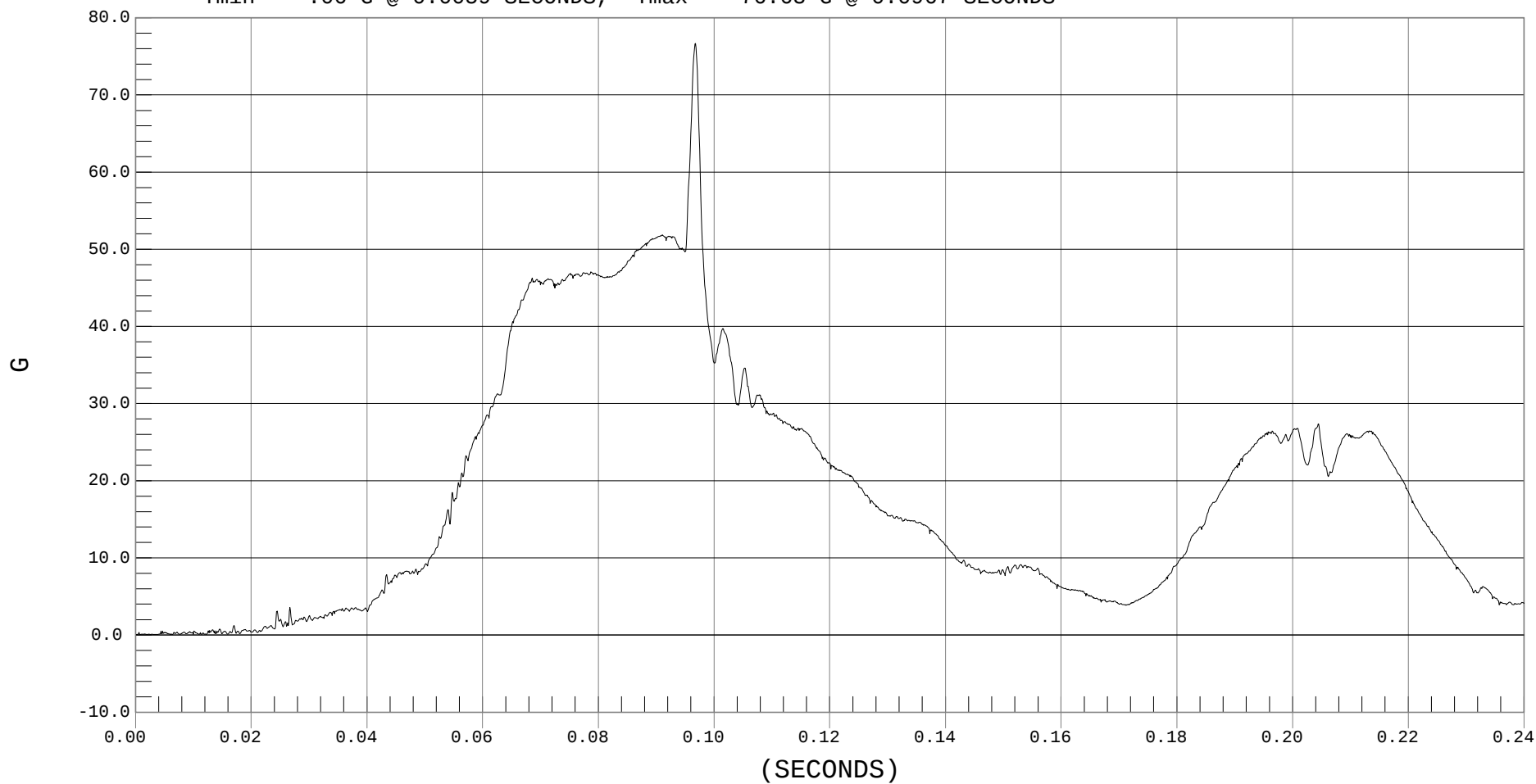
Test Date: 08-16-01

Speed: 0.0 MPH, 0.0 KPH

Filter Class: 1000

— 1 HEAD RESULTANT ACCELERATION, H01250AV.A03

Ymin = .06 G @ 0.0059 SECONDS, Ymax = 76.68 G @ 0.0967 SECONDS





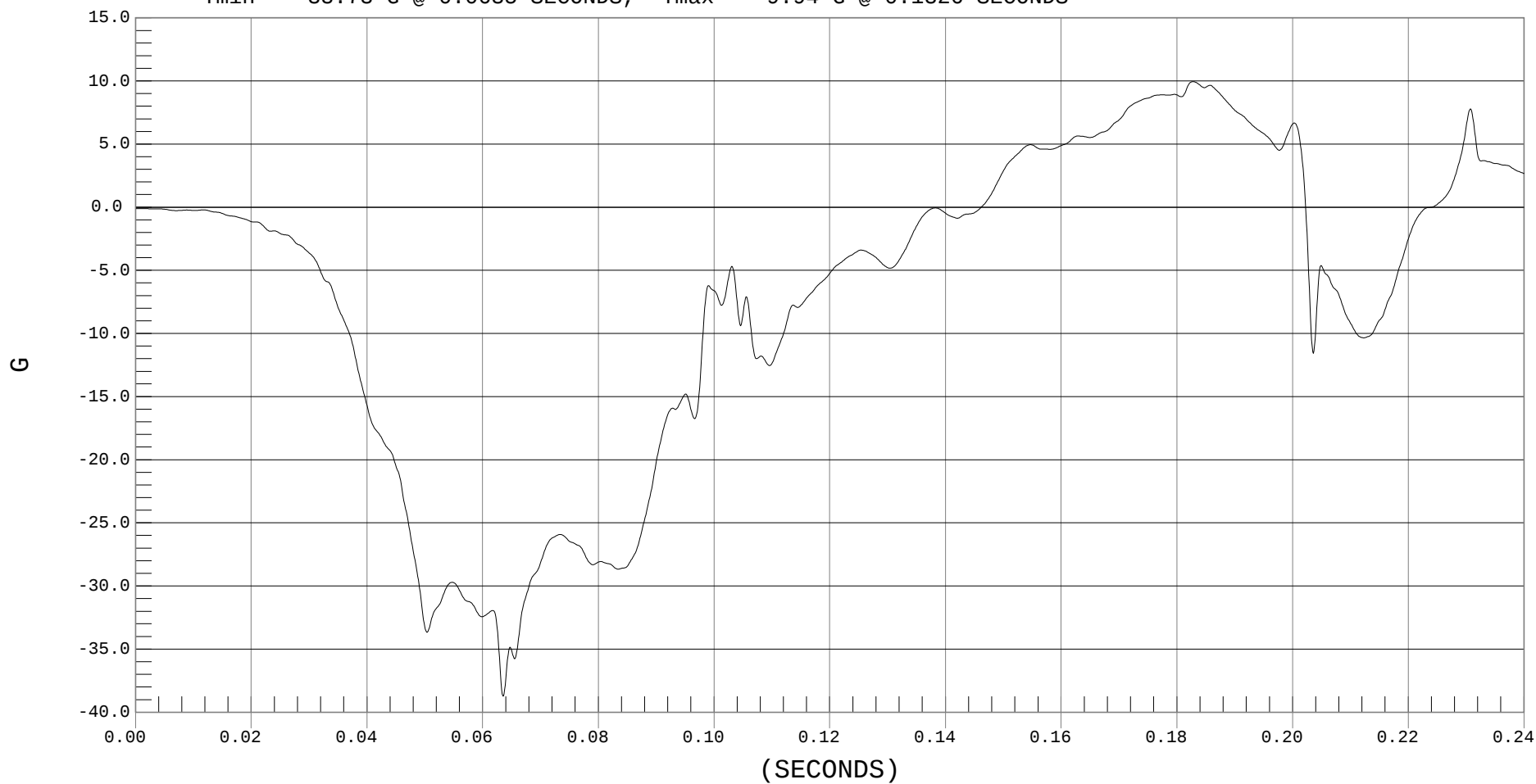
CHEST X ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 CHEST X, H01250AF.A08

Ymin = -38.73 G @ 0.0635 SECONDS, Ymax = 9.94 G @ 0.1826 SECONDS





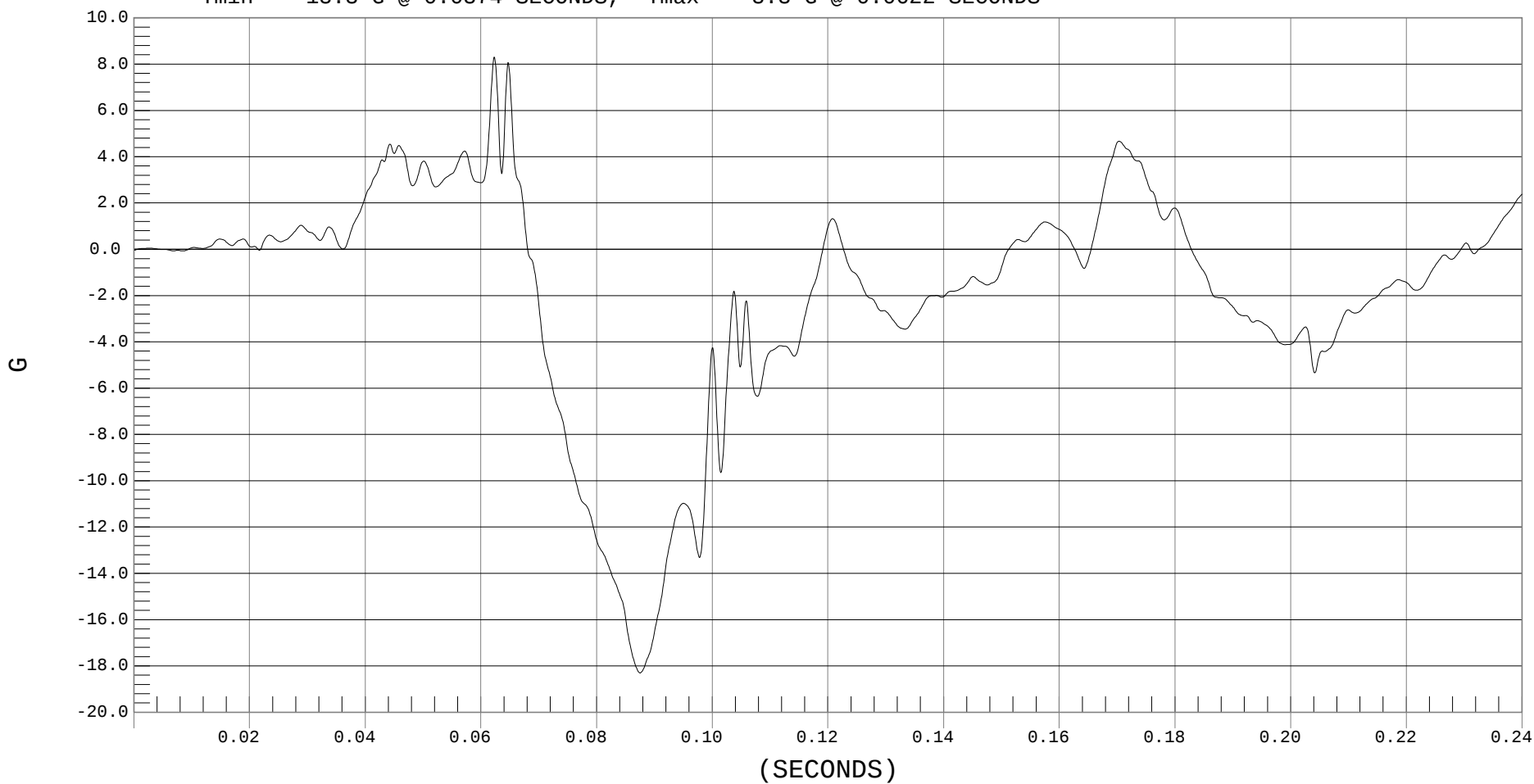
CHEST Y ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 CHEST Y, H01250AF.A09

Ymin = -18.3 G @ 0.0874 SECONDS, Ymax = 8.3 G @ 0.0622 SECONDS





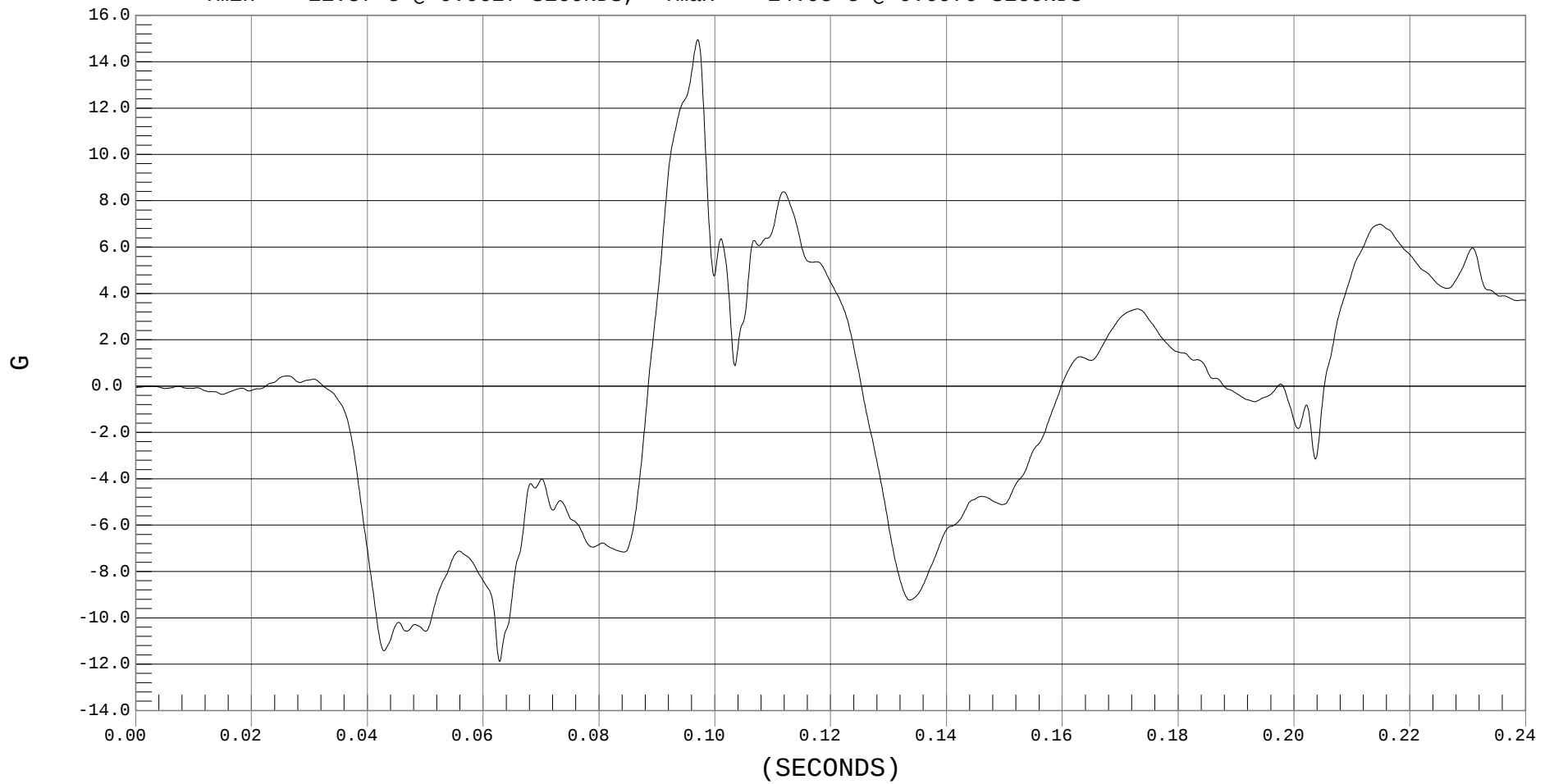
CHEST Z ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 CHEST Z, H01250AF.A12

Ymin = -11.87 G @ 0.0627 SECONDS, Ymax = 14.95 G @ 0.0970 SECONDS





CHEST RESULTANT ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)

Component: CENTURY BRAVO

Other Info:

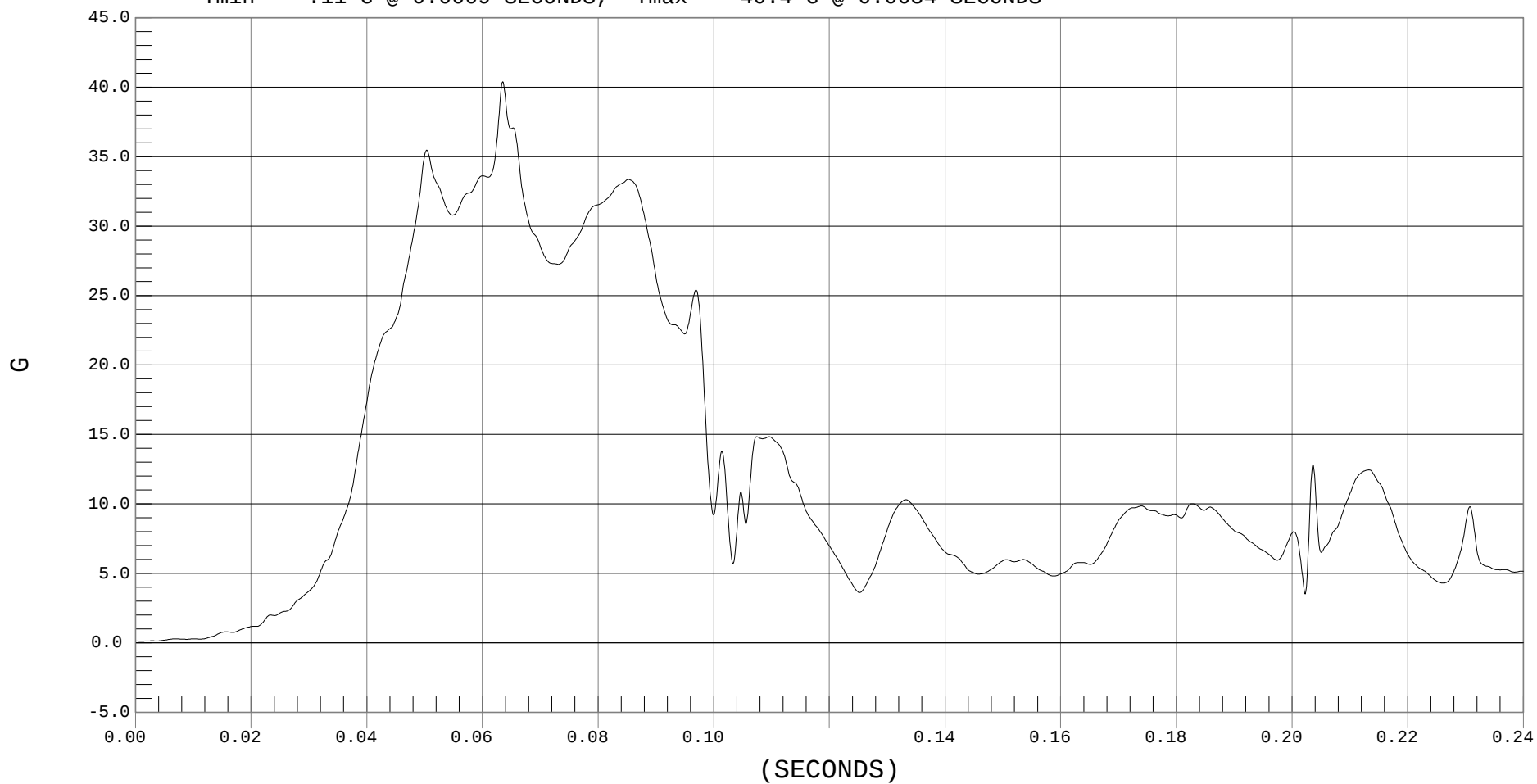
Test Date: 08-16-01

Speed: 0.0 MPH, 0.0 KPH

Filter Class: 180

— 1 CHEST RESULTANT ACCELERATION, H01250AV.A08

Ymin = .11 G @ 0.0009 SECONDS, Ymax = 40.4 G @ 0.0634 SECONDS





PELVIS X ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)

Component: CENTURY BRAVO

Other Info:

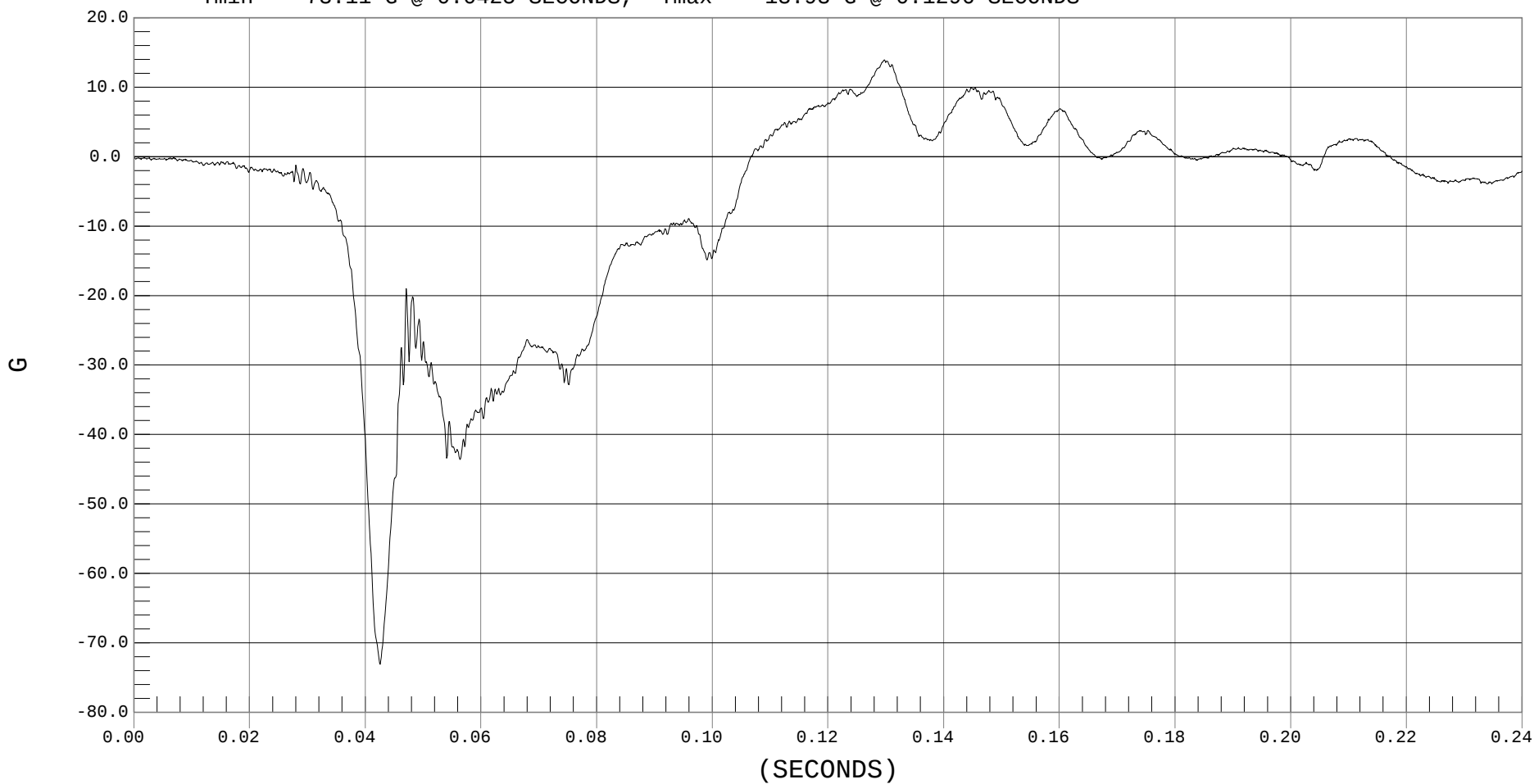
Test Date: 08-16-01

Speed: 0.0 MPH, 0.0 KPH

Filter Class: 1000

— 1 PELVIS X, H01250AT.A27

Ymin = -73.11 G @ 0.0425 SECONDS, Ymax = 13.93 G @ 0.1296 SECONDS





PELVIS Y ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)

Component: CENTURY BRAVO

Other Info:

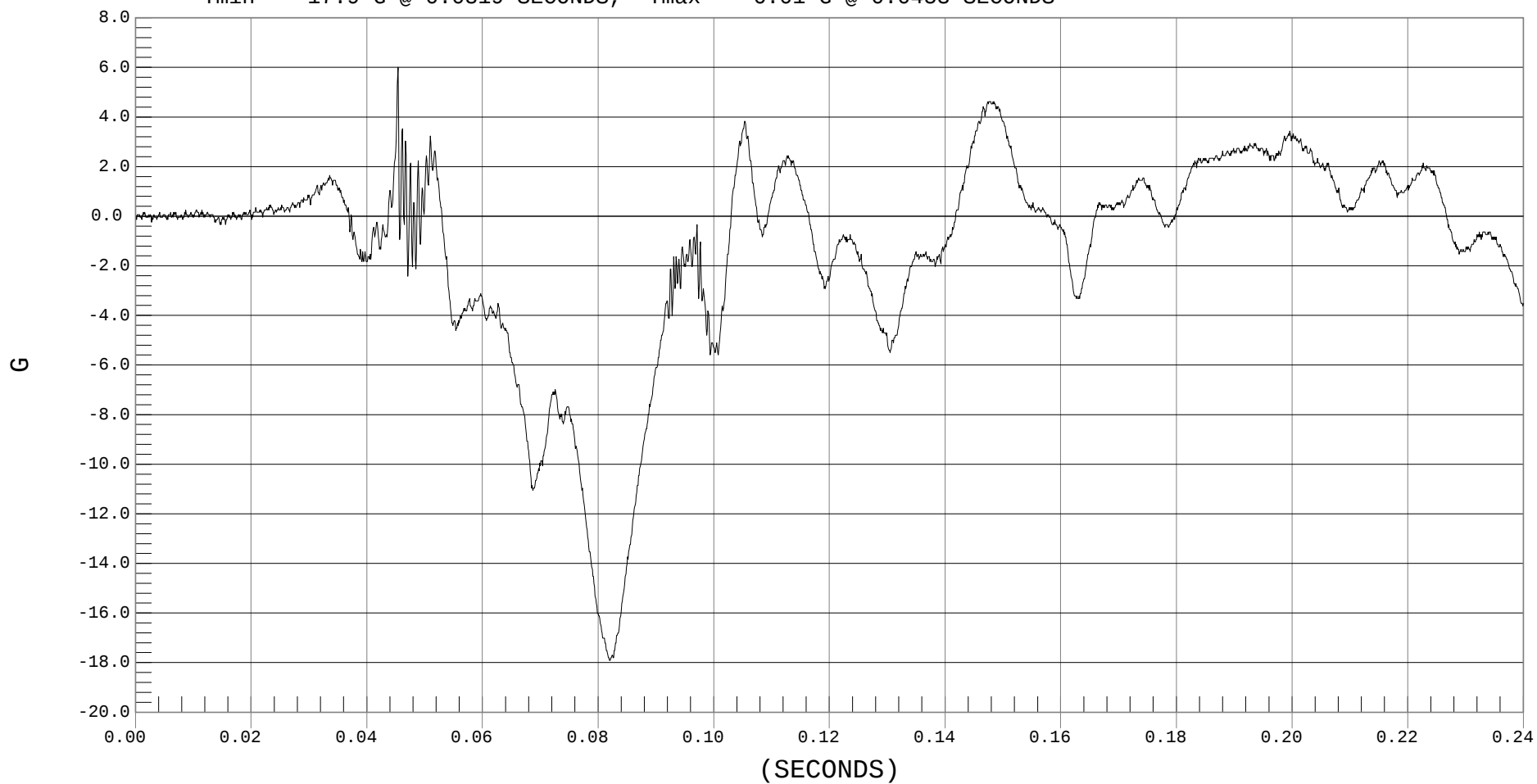
Test Date: 08-16-01

Speed: 0.0 MPH, 0.0 KPH

Filter Class: 1000

— 1 PELVIS Y, H01250AT.A28

Ymin = -17.9 G @ 0.0819 SECONDS, Ymax = 6.01 G @ 0.0453 SECONDS





PELVIS Z ACCELERATION

Test Desc.: FMVSS 213 34-35 MPH (H01250)

Component: CENTURY BRAVO

Other Info:

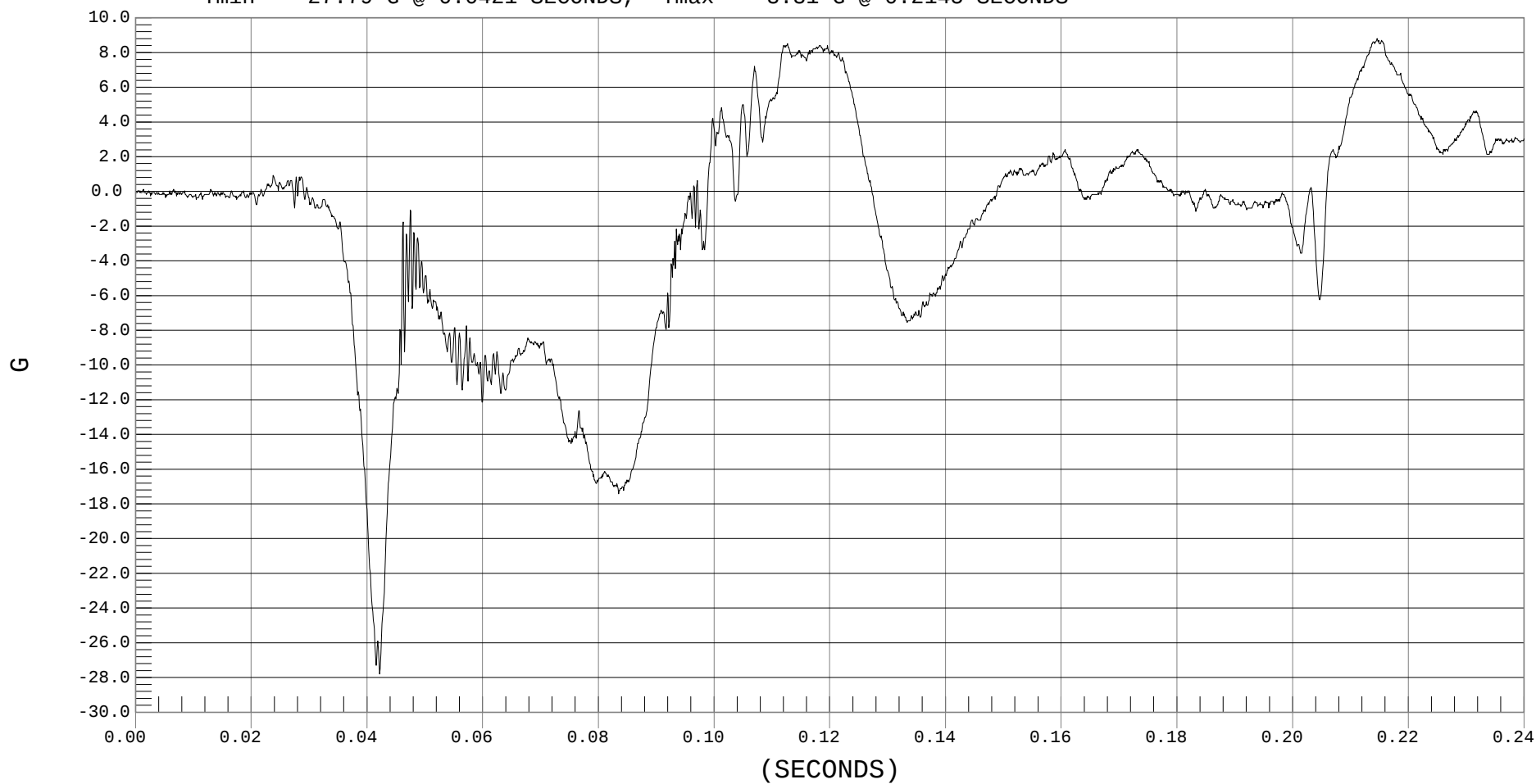
Test Date: 08-16-01

Speed: 0.0 MPH, 0.0 KPH

Filter Class: 1000

— 1 PELVIS Z, H01250AT.A29

Ymin = -27.79 G @ 0.0421 SECONDS, Ymax = 8.81 G @ 0.2145 SECONDS





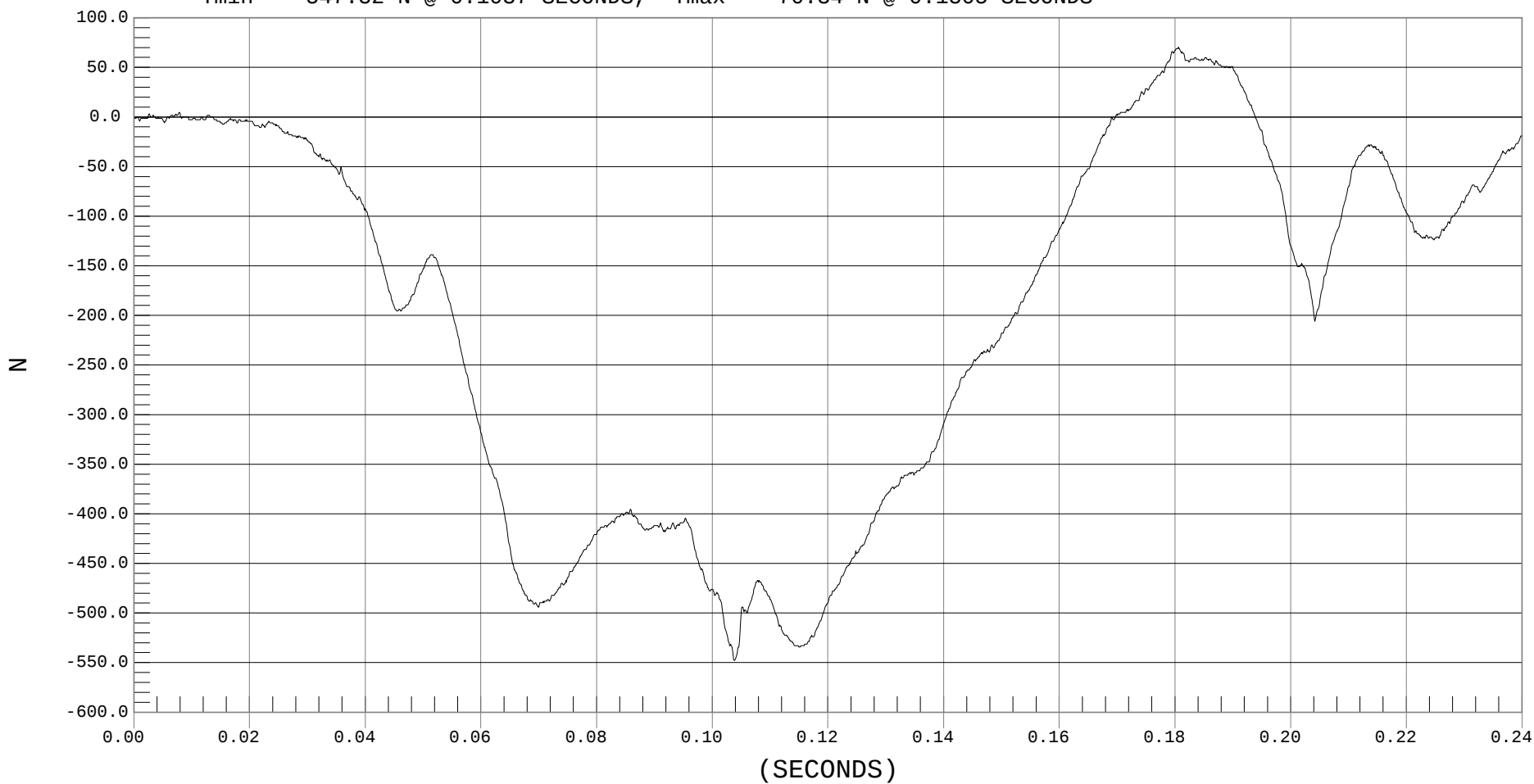
UPPER NECK FORCE X

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 UPPER NECK FX, H01250FT.F13

Ymin = -547.82 N @ 0.1037 SECONDS, Ymax = 70.34 N @ 0.1805 SECONDS





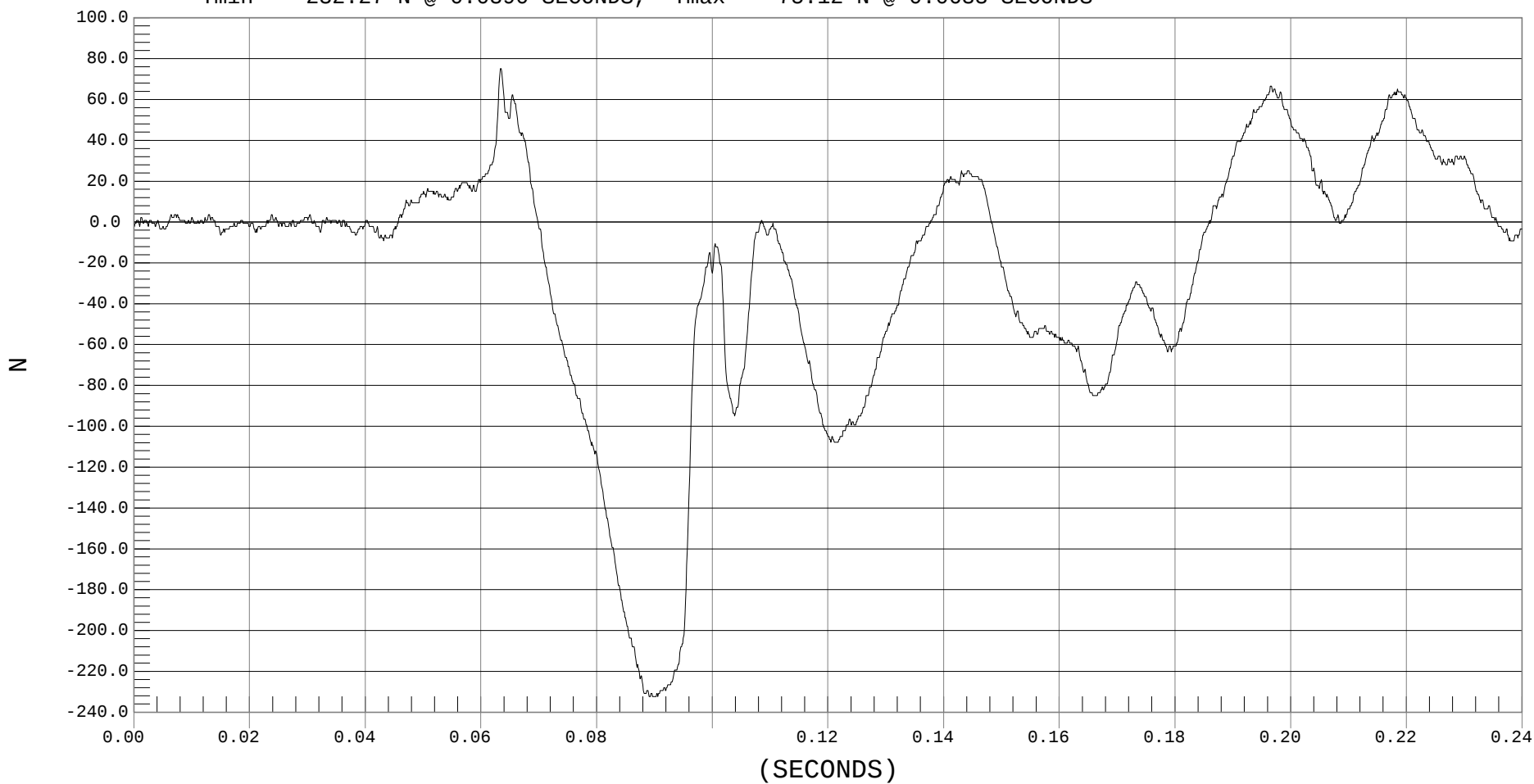
UPPER NECK FORCE Y

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 UPPER NECK FY, H01250FT.F14

Ymin = -232.27 N @ 0.0890 SECONDS, Ymax = 75.12 N @ 0.0633 SECONDS





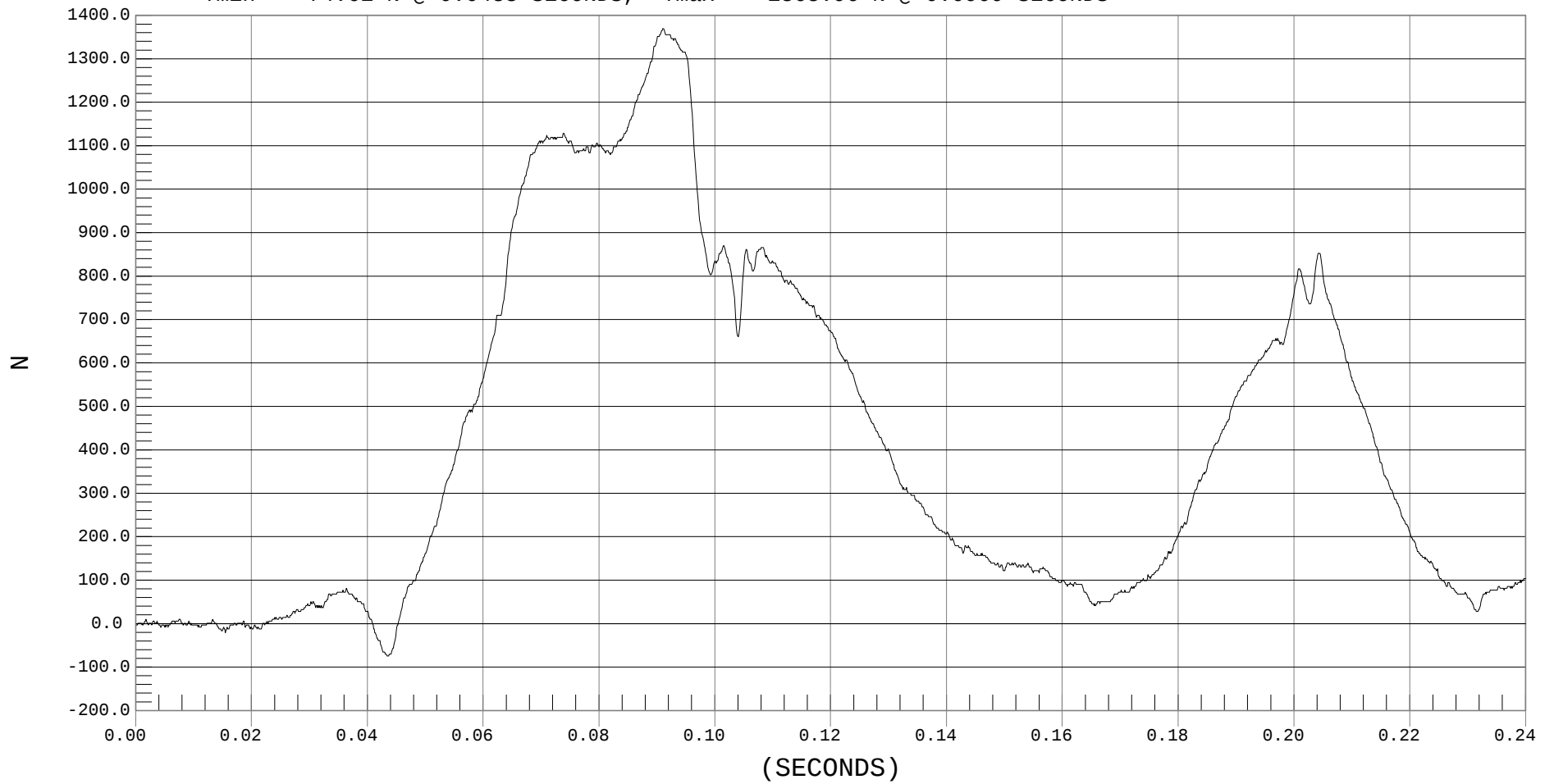
UPPER NECK FORCE Z

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 UPPER NECK FZ, H01250FT.F15

Ymin = -74.61 N @ 0.0433 SECONDS, Ymax = 1368.96 N @ 0.0909 SECONDS





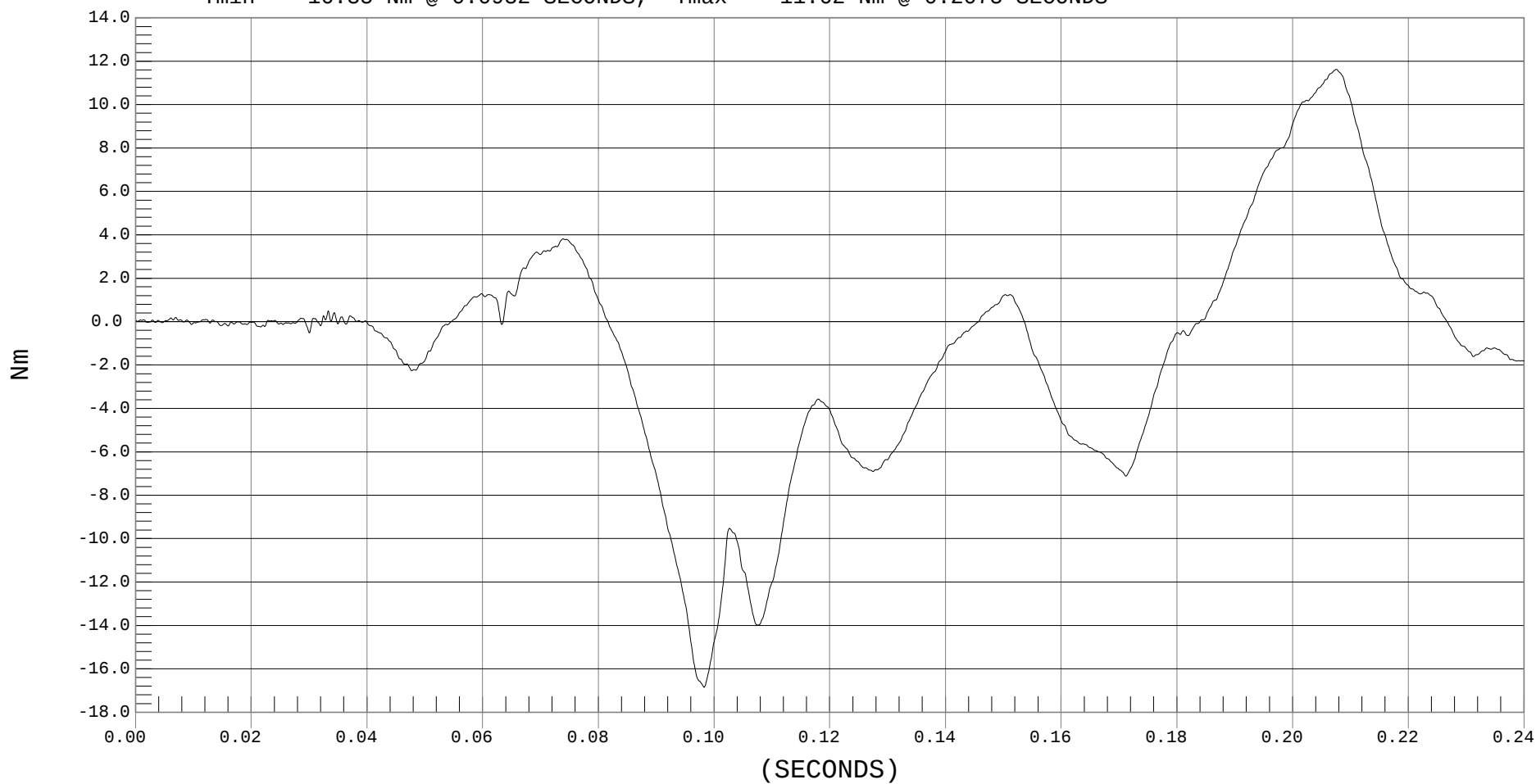
UPPER NECK MOMENT X

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

1 UPPER NECK MX, H01250MF.M16

Ymin = -16.85 Nm @ 0.0982 SECONDS, Ymax = 11.62 Nm @ 0.2075 SECONDS





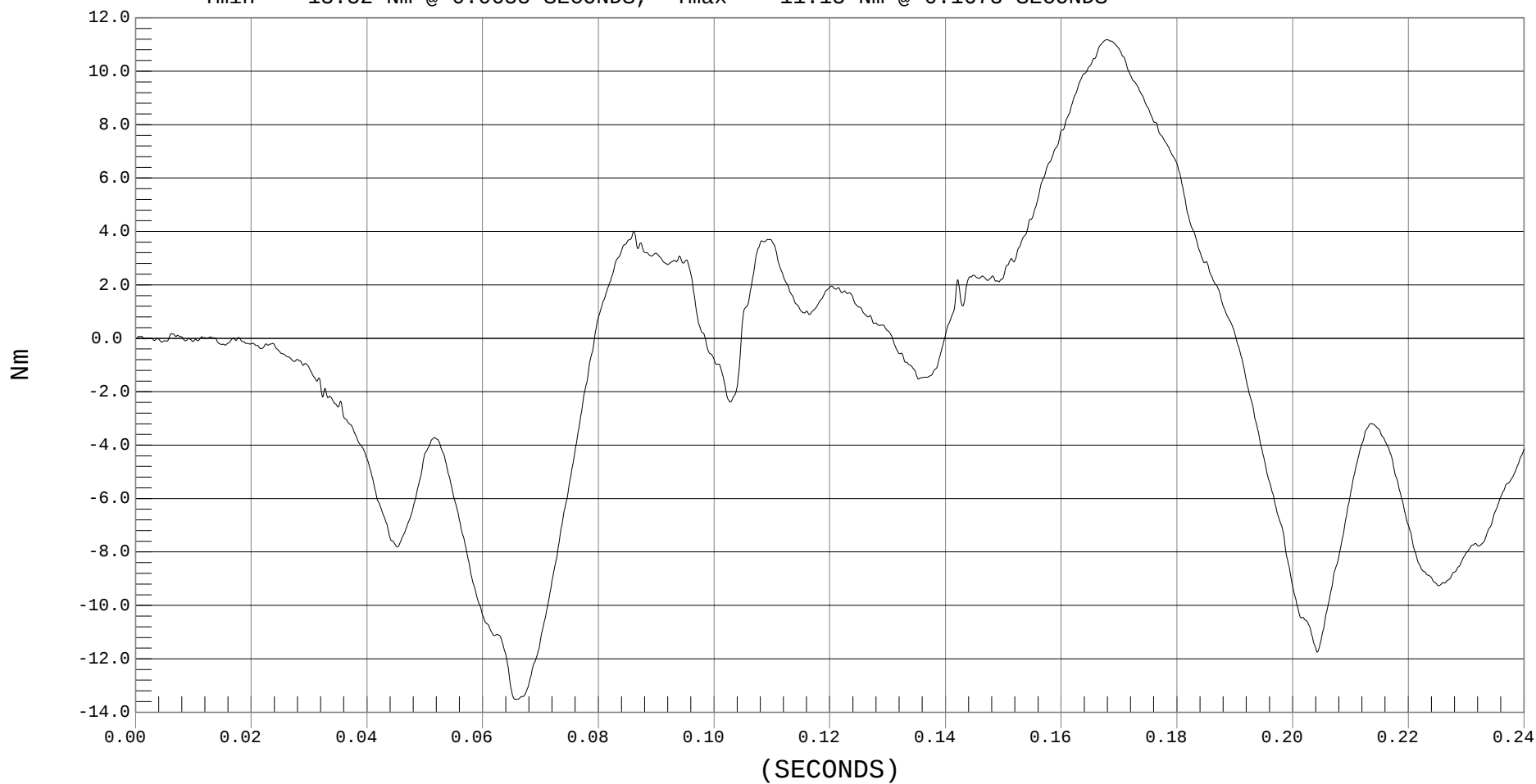
UPPER NECK MOMENT Y

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 UPPER NECK MY, H01250MF.M17

Ymin = -13.52 Nm @ 0.0655 SECONDS, Ymax = 11.18 Nm @ 0.1678 SECONDS





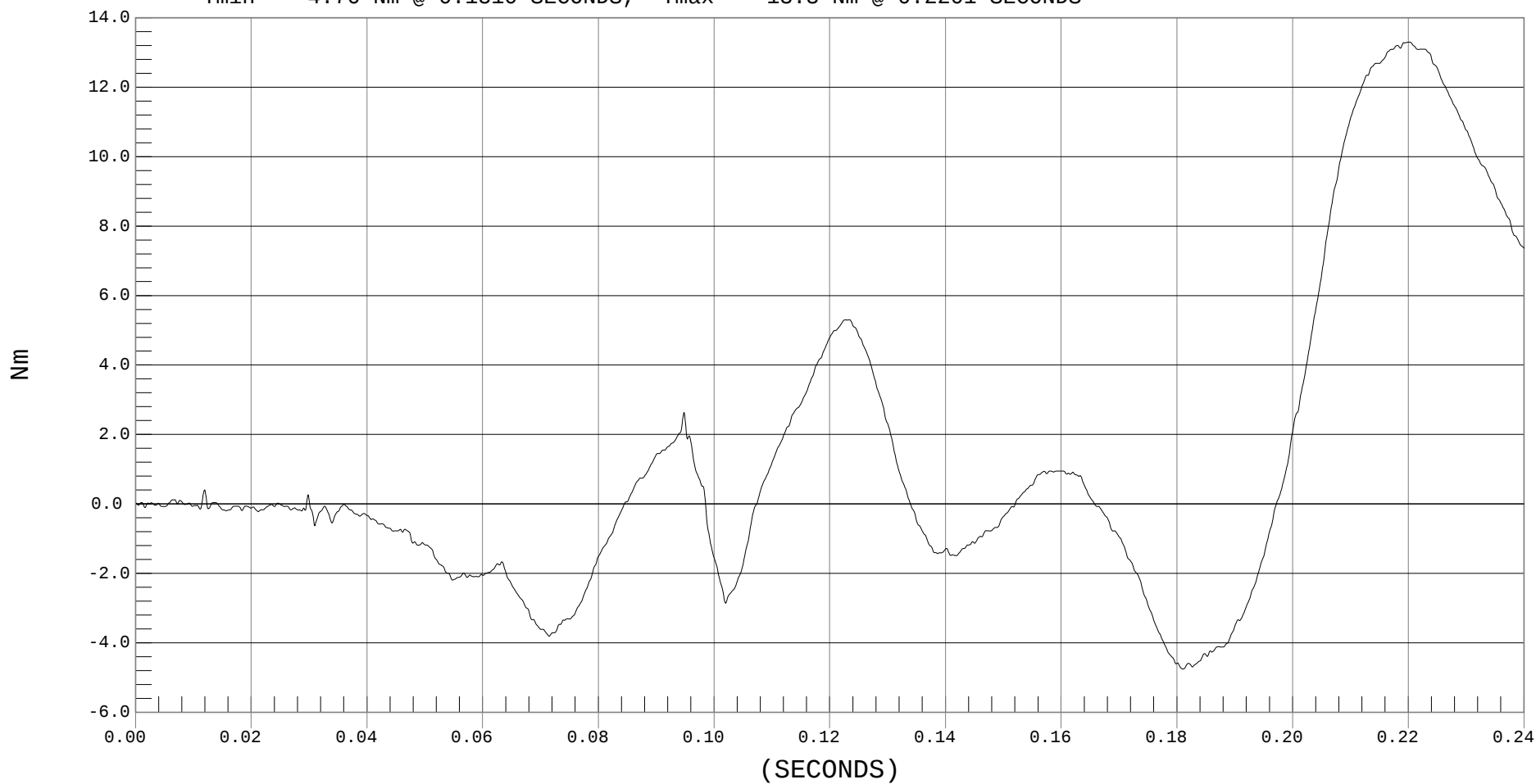
UPPER NECK MOMENT Z

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 UPPER NECK MZ, H01250MF.M18

Ymin = -4.76 Nm @ 0.1810 SECONDS, Ymax = 13.3 Nm @ 0.2201 SECONDS





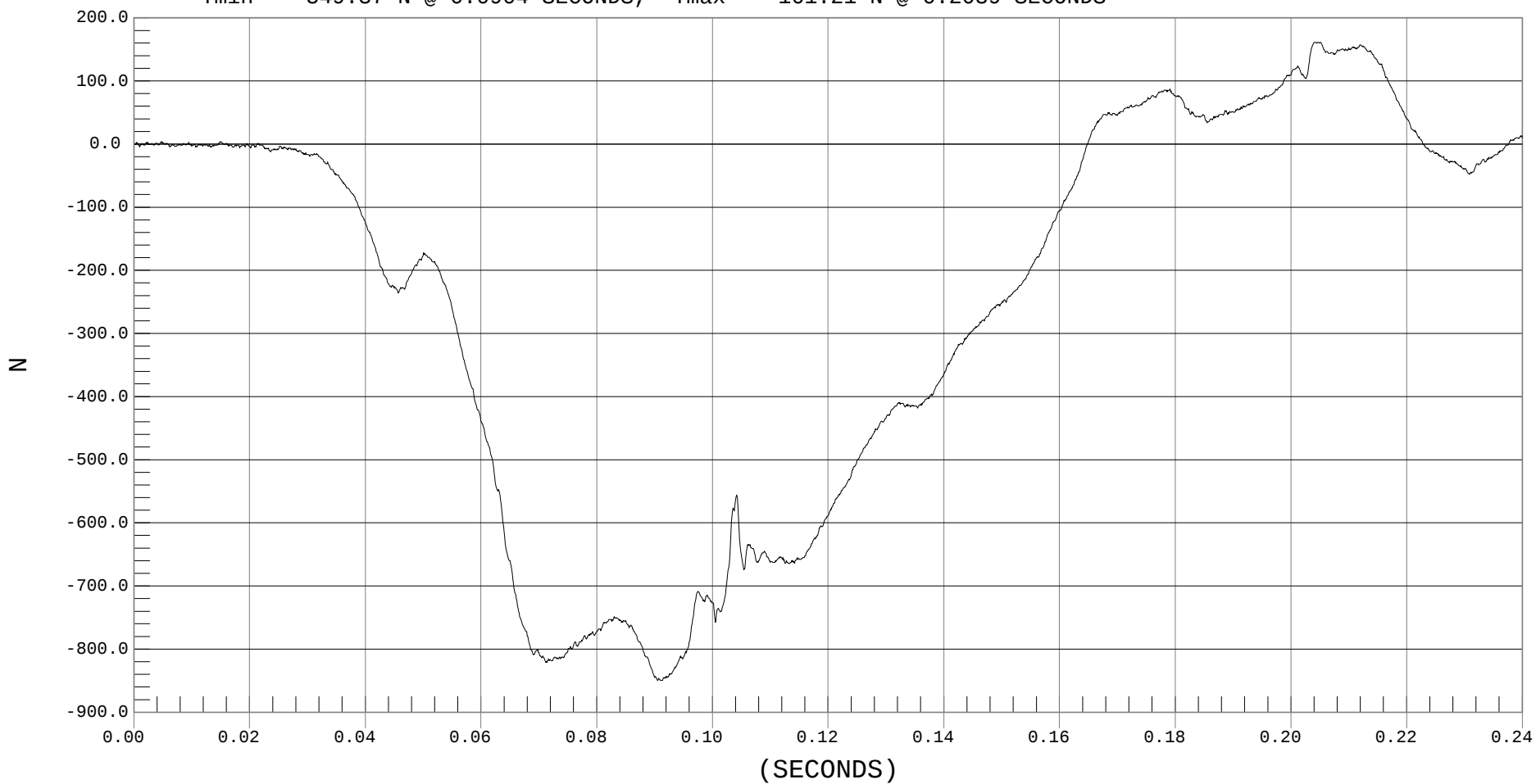
LOWER NECK FORCE X

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

1 LOWER NECK FX, H01250FT.F21

Ymin = -849.37 N @ 0.0904 SECONDS, Ymax = 161.21 N @ 0.2039 SECONDS





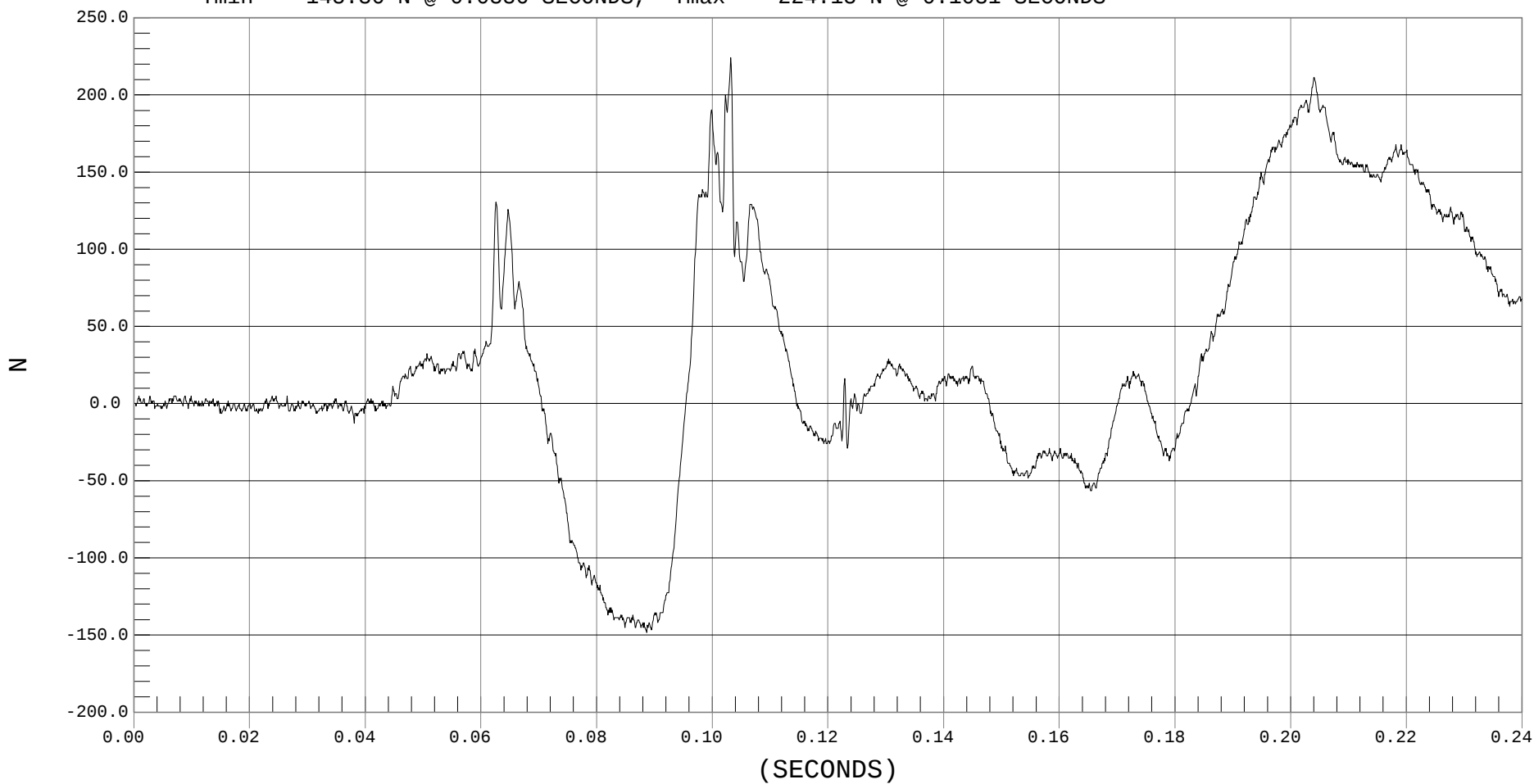
LOWER NECK FORCE Y

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 LOWER NECK FY, H01250FT.F22

Ymin = -148.36 N @ 0.0886 SECONDS, Ymax = 224.18 N @ 0.1031 SECONDS





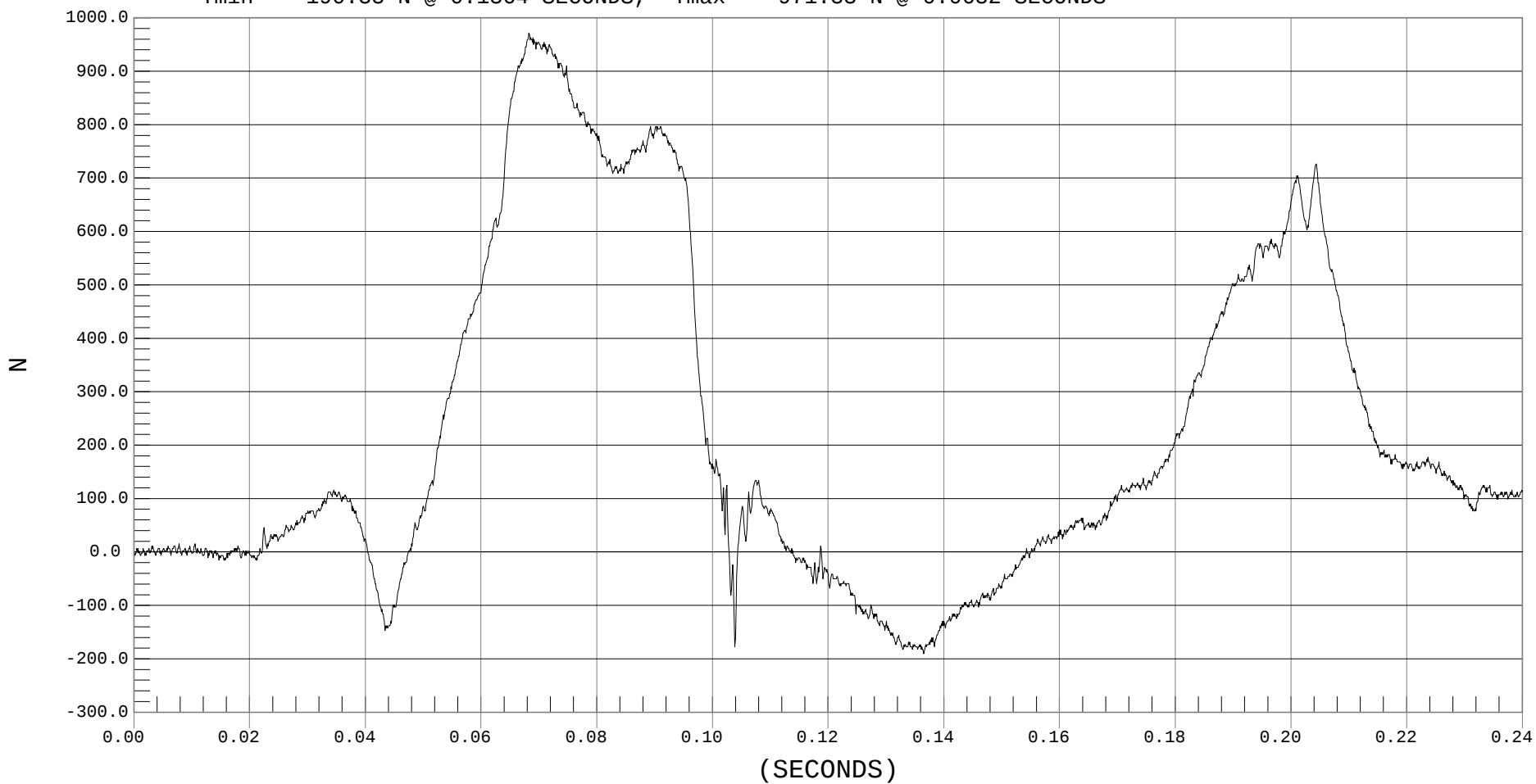
LOWER NECK FORCE Z

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 LOWER NECK FZ, H01250FT.F23

Ymin = -190.88 N @ 0.1364 SECONDS, Ymax = 971.83 N @ 0.0682 SECONDS





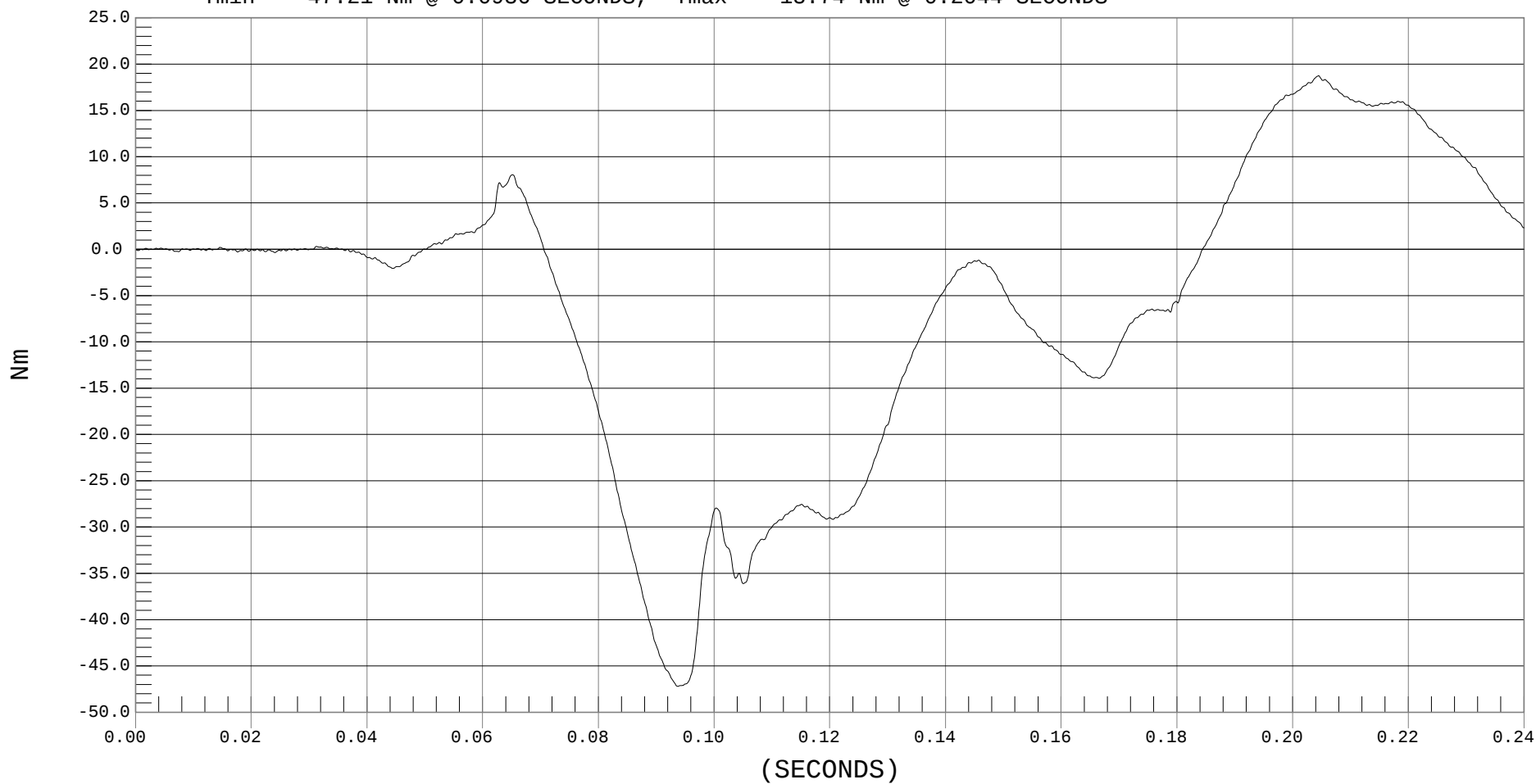
LOWER NECK MOMENT X

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 LOWER NECK MX, H01250MF.M24

Ymin = -47.21 Nm @ 0.0936 SECONDS, Ymax = 18.74 Nm @ 0.2044 SECONDS





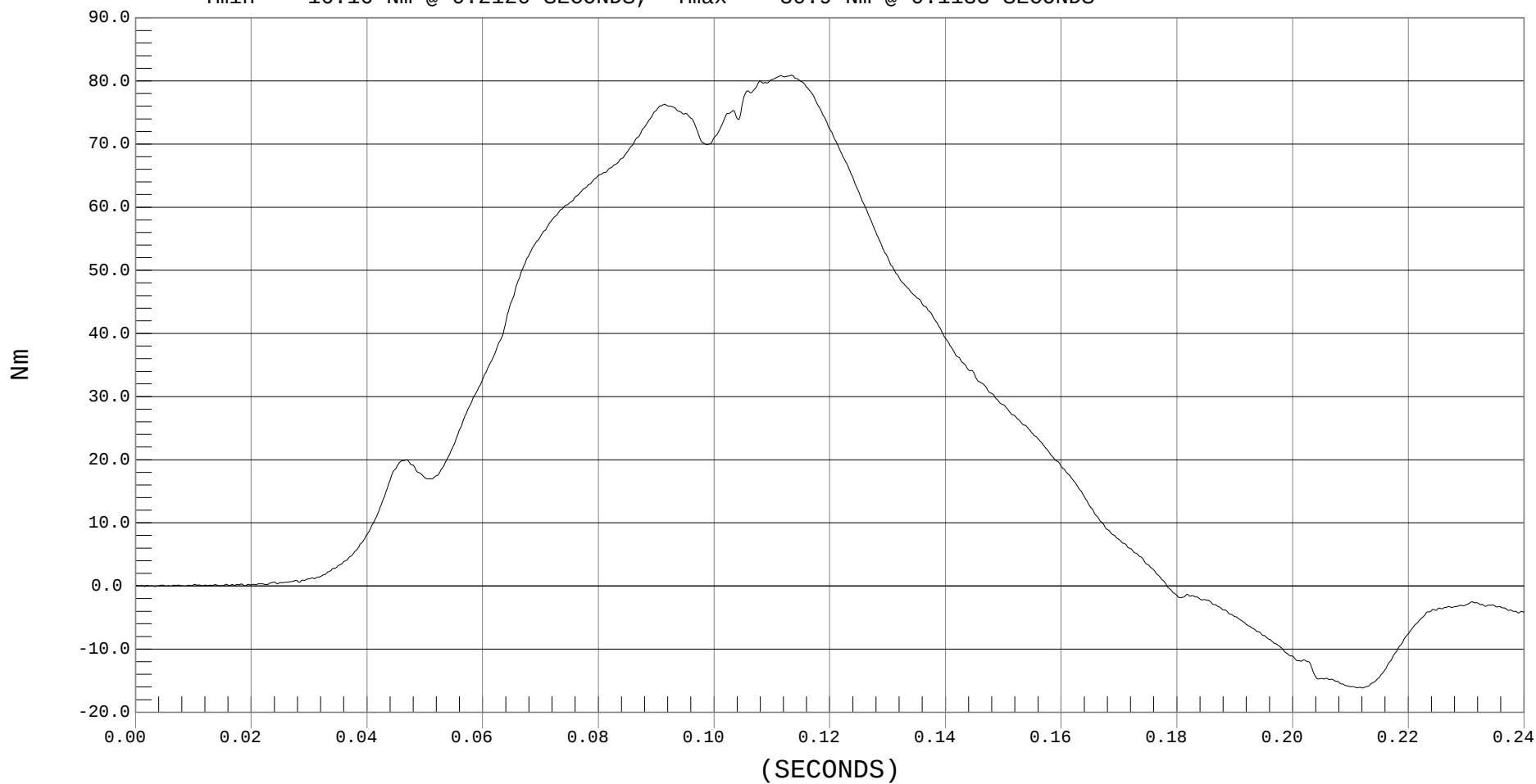
LOWER NECK MOMENT Y

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 LOWER NECK MY, H01250MF.M25

Ymin = -16.16 Nm @ 0.2120 SECONDS, Ymax = 80.9 Nm @ 0.1133 SECONDS





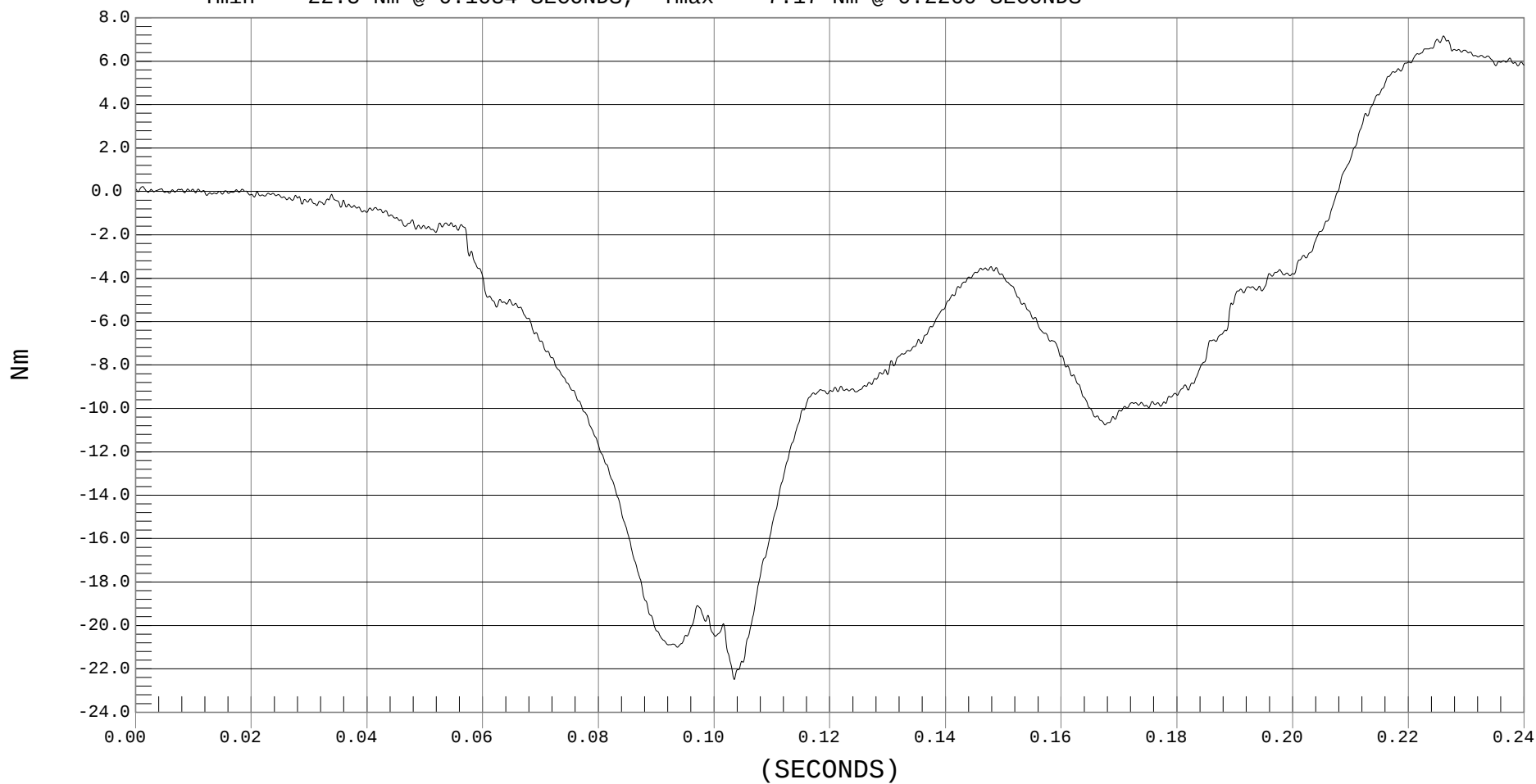
LOWER NECK MOMENT Z

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

1 LOWER NECK MZ, H01250MF.M26

Ymin = -22.5 Nm @ 0.1034 SECONDS, Ymax = 7.17 Nm @ 0.2260 SECONDS





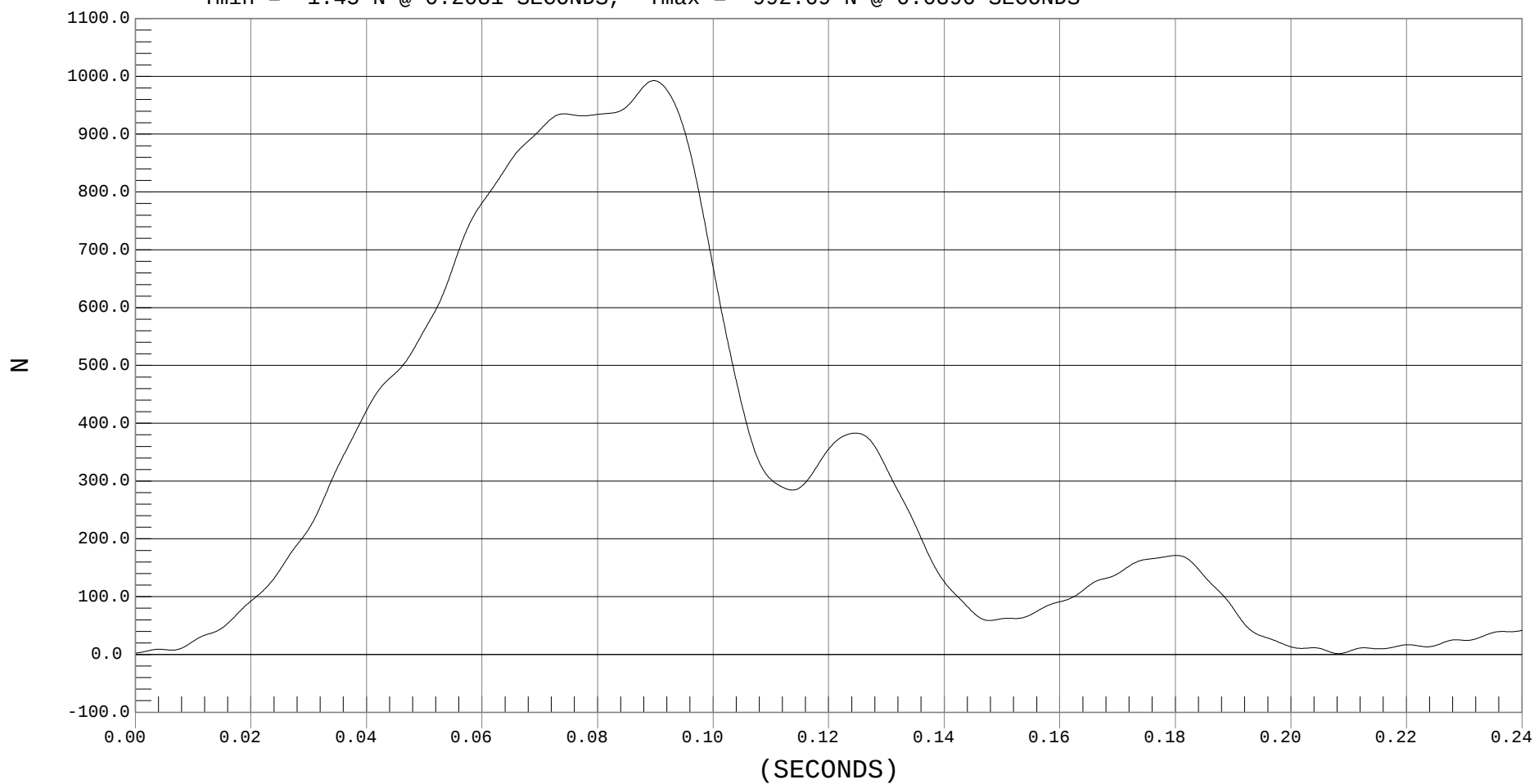
TETHER BELT FORCE

Test Desc.: FMVSS 213 34-35 MPH (H01250)
Component: CENTURY BRAVO
Other Info:

Test Date: 08-16-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 60

— 1 TETHER BELT, H01250FF.F19

Ymin = 1.45 N @ 0.2081 SECONDS, Ymax = 992.69 N @ 0.0896 SECONDS





SHOULDER BELT FORCE

Test Desc.: FMVSS 213 34-35 MPH (H01250)

Component: CENTURY BRAVO

Other Info:

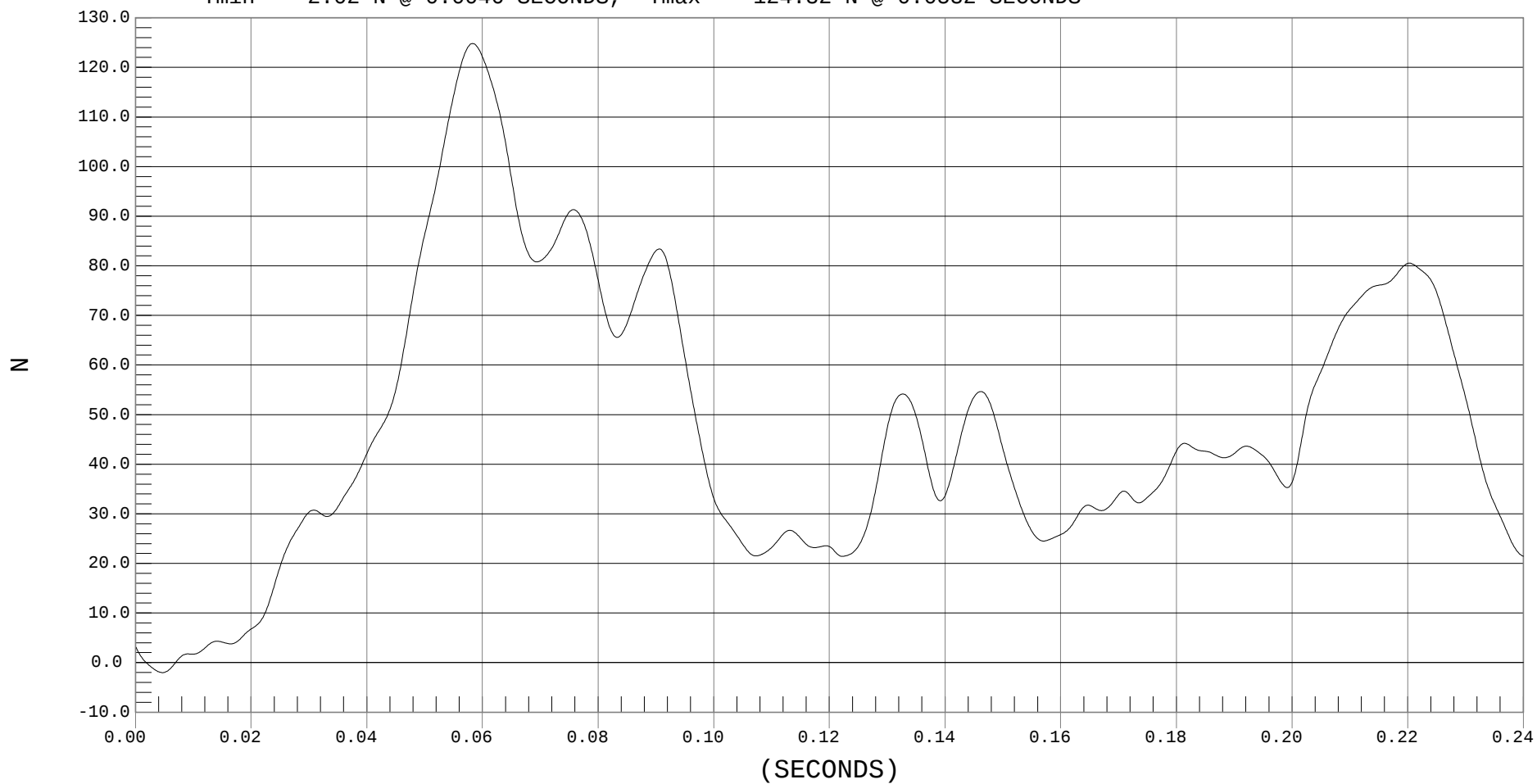
Test Date: 08-16-01

Speed: 0.0 MPH, 0.0 KPH

Filter Class: 60

— 1 SHOULDER BELT, H01250FF.F31

Ymin = -2.02 N @ 0.0046 SECONDS, Ymax = 124.82 N @ 0.0582 SECONDS





LAP BELT FORCE

Test Desc.: FMVSS 213 34-35 MPH (H01250)

Component: CENTURY BRAVO

Other Info:

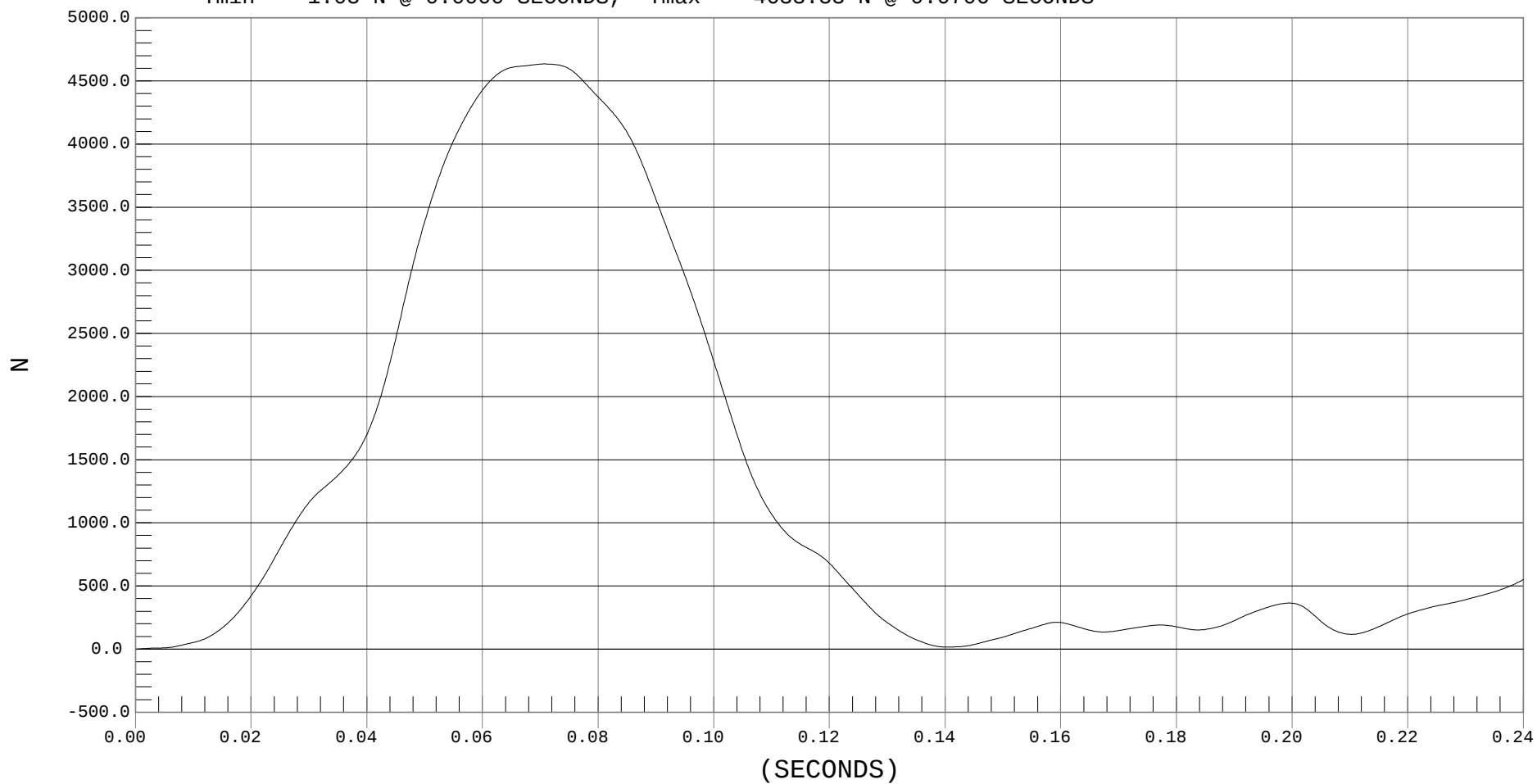
Test Date: 08-16-01

Speed: 0.0 MPH, 0.0 KPH

Filter Class: 60

— 1 LAP BELT, H01250FF.F32

Ymin = -1.08 N @ 0.0000 SECONDS, Ymax = 4633.83 N @ 0.0706 SECONDS



SECTION 9
CHILD DUMMY CALIBRATION DATA TRACES AND TABLES

CERTIFICATION DATA

Dummy Serial Number: 139

Calibration Test Results Summary

Dummy Serial Number: 139

Pre-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Flexion Test:	The neck passed all flexion test requirements.
Neck Extension Test:	The neck passes all extension test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Torso Flexion:	The torso passed all flexion test requirements.

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 3 YEAR OLD

Date: 6/22/01

Dummy Serial Number: 139

Test Number: D01911

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.9 – 25.6	21.5
Relative Humidity (%)	10 – 70	45
Peak Resultant Acceleration	250 – 280 g's	270
Peak Lateral Acceleration	± 15 g's	14
Is Acceleration Curve Unimodal	within 10% of peak	Yes

TEST MEETS SPECIFICATIONS

Technician: _____

Approved By: _____



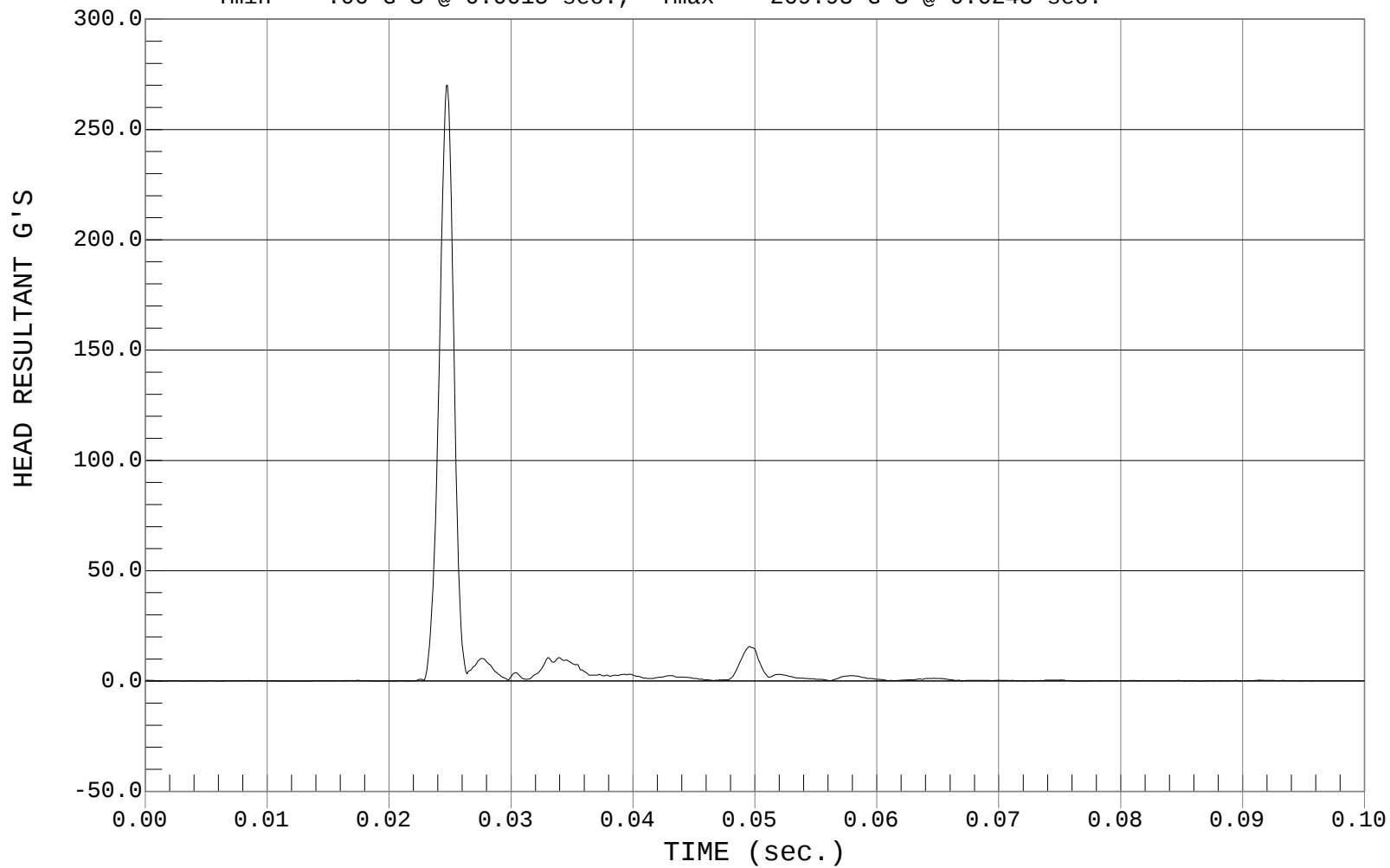
PEAK RESULTANT ACCELERATION

Test Desc.: Dummy Calibration - Head Drop
Component: Dummy #139

Test Date: 06-22-01
Speed: 0.00 FT/SEC, 0.00 M/SEC

— 1 HEAD RESULTANT, D01911AV.A01

Ymin = .06 G'S @ 0.0015 sec., Ymax = 269.98 G'S @ 0.0248 sec.





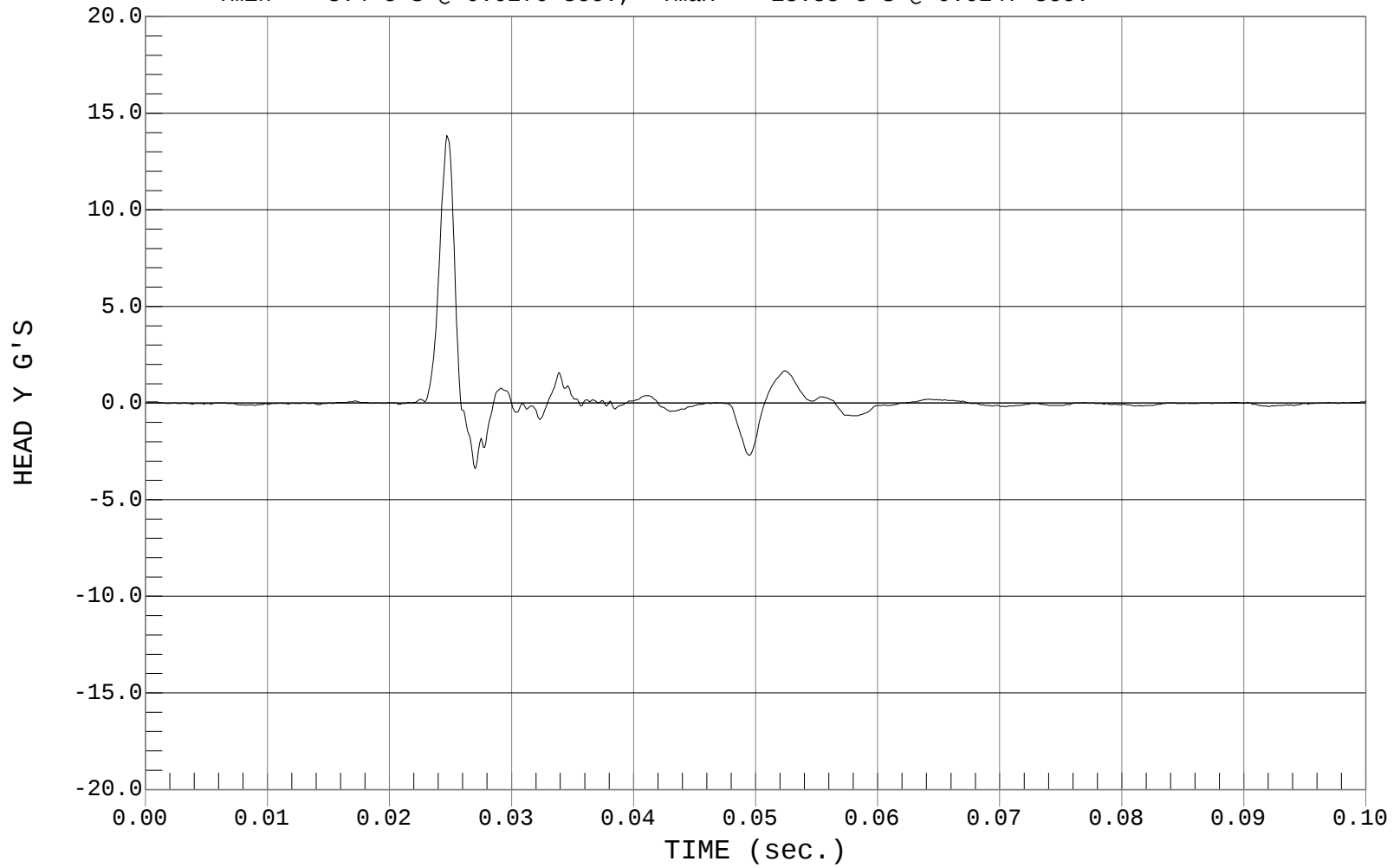
PEAK LATERAL ACCELARATION

Test Desc.: Dummy Calibration - Head Drop
Component: Dummy #139

Test Date: 06-22-01
Speed: 0.00 FT/SEC, 0.00 M/SEC

— 1 HEAD Y, D01911AR.A02

Ymin = -3.4 G'S @ 0.0270 sec., Ymax = 13.85 G'S @ 0.0247 sec.



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 3 YEAR OLD

Date: 6/22/01

Dummy Serial Number: 139

Test Number: D01912

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		20.6 – 22.2	21.5
Relative Humidity (%)		10 – 70	48
Pendulum Speed		5.4 – 5.6 m/sec	5.5
Pendulum Deceleration	10 ms	2.0 – 2.7 m/sec	2.3
	15 ms	3.0 – 4.0 m/sec	3.3
	20 ms	4.0 – 5.1 m/sec	4.4
D Plane Rotation	Max.	70 – 82 deg	80
Moment About Occipital Condyle	Max.	42.0 – 53.0 Nm	44.0
Positive Moment – Time Curve Decay to 10 Nm		60.0 – 80.0 ms from Time Zero	69.7

TEST MEETS SPECIFICATIONS

Technician: _____

Approved By: _____



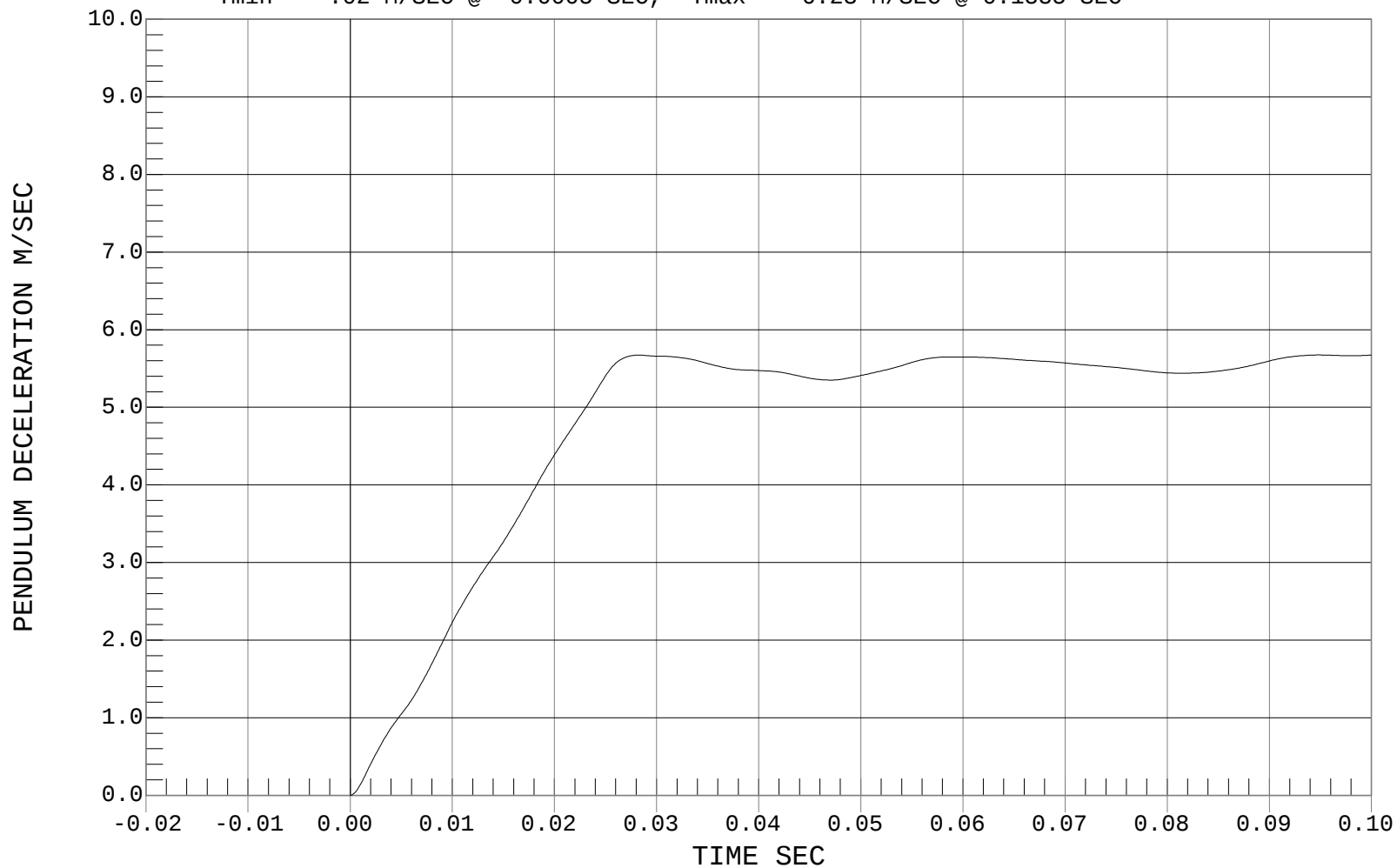
PENDULUM DECELERATION

Test Desc.: Dummy Calibration - Neck Flexion
Component: Dummy #139

Test Date: 06-22-01
Speed: 18.00 FT/SEC, 5.49 M/SEC

— 1 PENDULUM DECELERATION, D01912AI.V04

Ymin = -.02 M/SEC @ -0.0005 SEC, Ymax = 6.23 M/SEC @ 0.1885 SEC





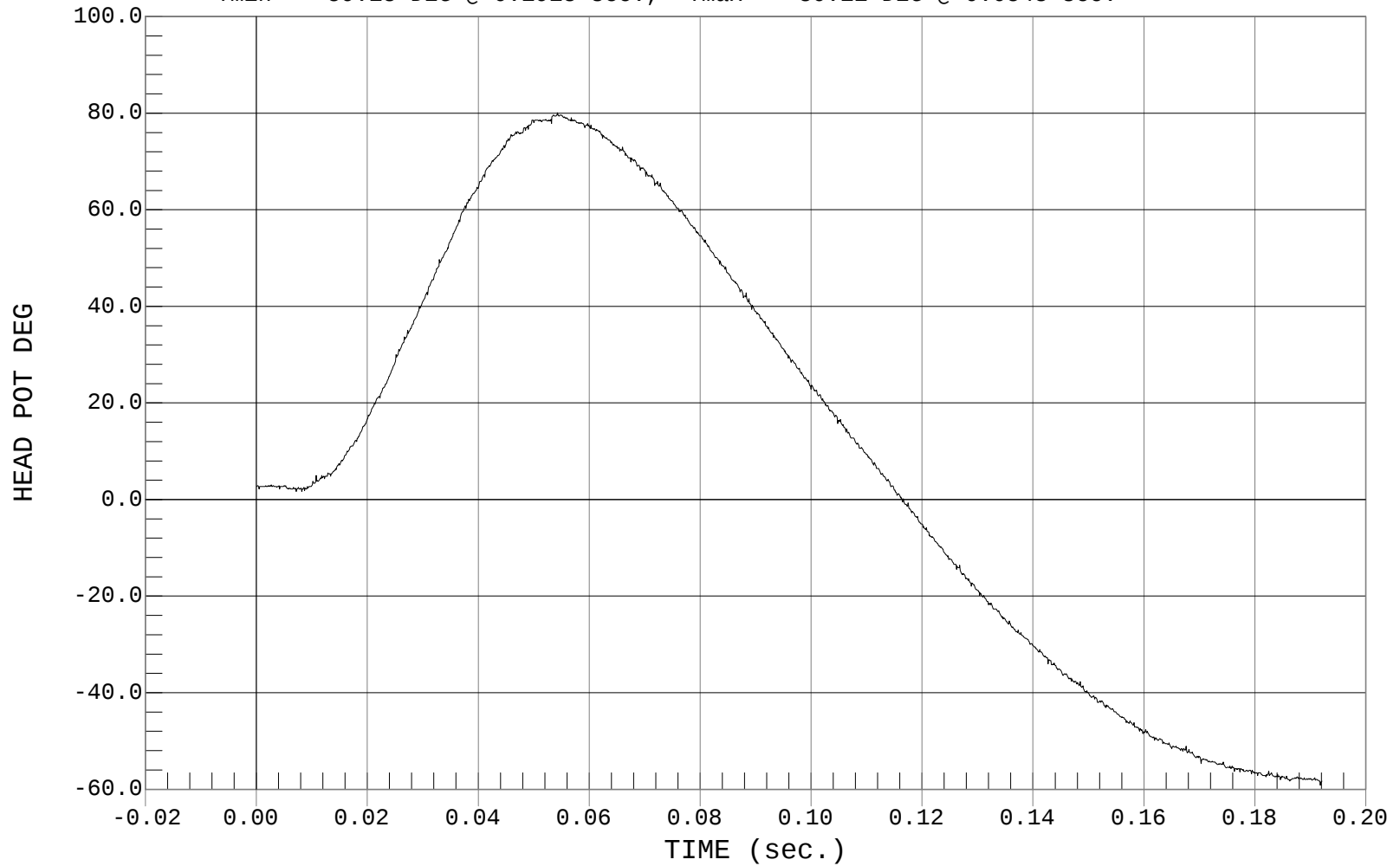
NECK ROTATION

Test Desc.: Dummy Calibration - Neck Flexion
Component: Dummy #139

Test Date: 06-22-01
Speed: 18.00 FT/SEC, 5.49 M/SEC

— 1 HEAD POT, D01912DU.D05

Ymin = -59.18 DEG @ 0.1918 sec., Ymax = 80.11 DEG @ 0.0543 sec.





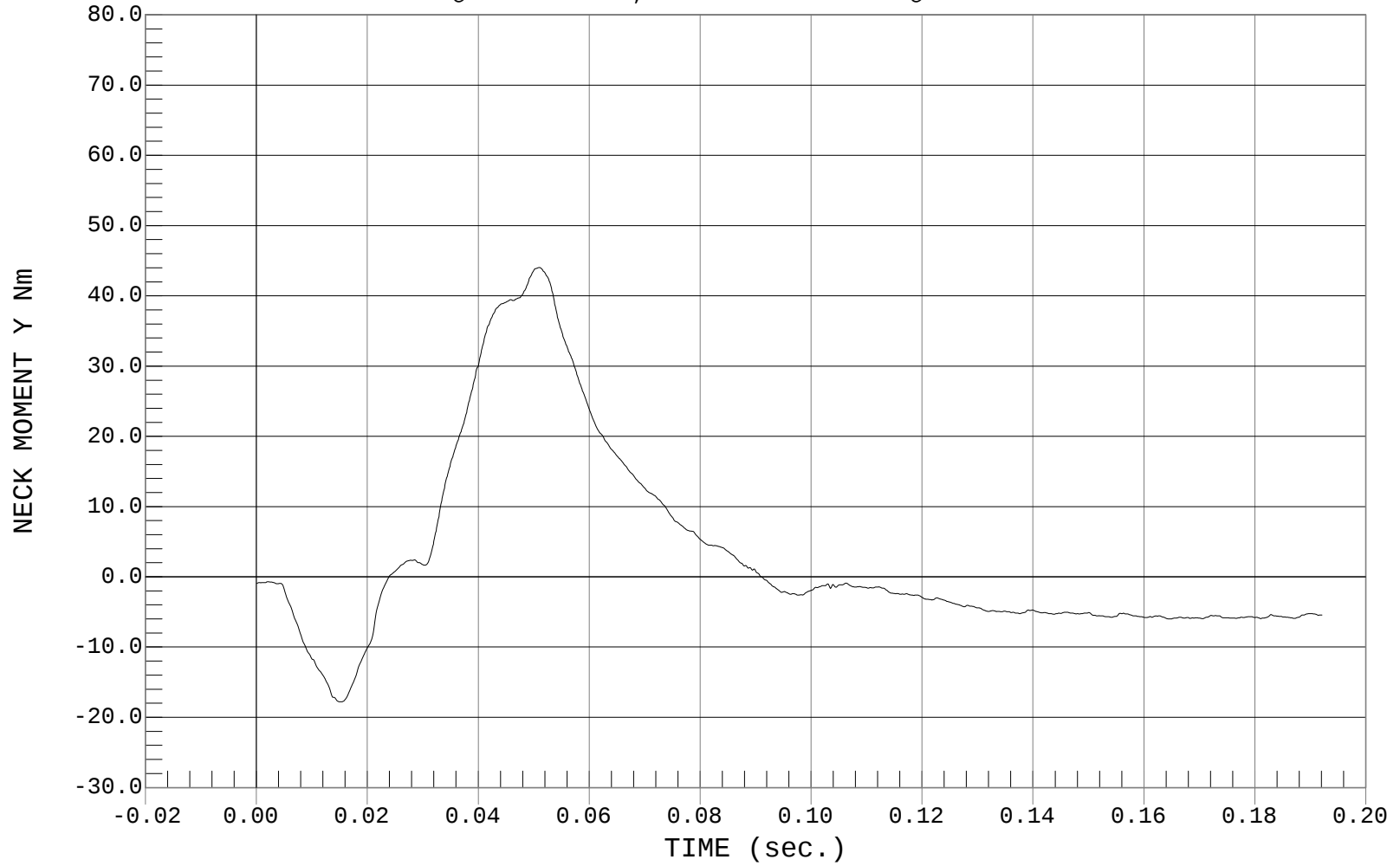
OCCIPITAL MOMENT

Test Desc.: Dummy Calibration - Neck Flexion
Component: Dummy #139

Test Date: 06-22-01
Speed: 18.00 FT/SEC, 5.49 M/SEC

— 1 NECK MOMENT Y, D01912MF.M01

Ymin = -17.78 Nm @ 0.0150 sec., Ymax = 44.03 Nm @ 0.0510 sec.



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 3 YEAR OLD

Date: 6/22/01

Dummy Serial Number: 139

Test Number: D01913

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		20.6 – 22.2	21.5
Relative Humidity (%)		10 – 70	48
Pendulum Speed		3.55 – 3.75 m/sec	3.66
Pendulum Deceleration	6 msec	1.0 – 1.4 m/sec	1.2
	10 msec	1.9 – 2.5 m/sec	2.1
	14 msec	2.8 – 3.5 m/sec	2.8
D Plane Rotation	Max.	83 – 93 deg.	89
Moment About Occipital Condyle	Min.	-53.3 – 43.7 Nm	-46.3
Negative Moment – Time Curve Decay Time to -10 Nm		60.0 – 80.0 ms from Time Zero	71.7

TEST MEETS SPECIFICATIONS

Technician: _____

Approved By: _____



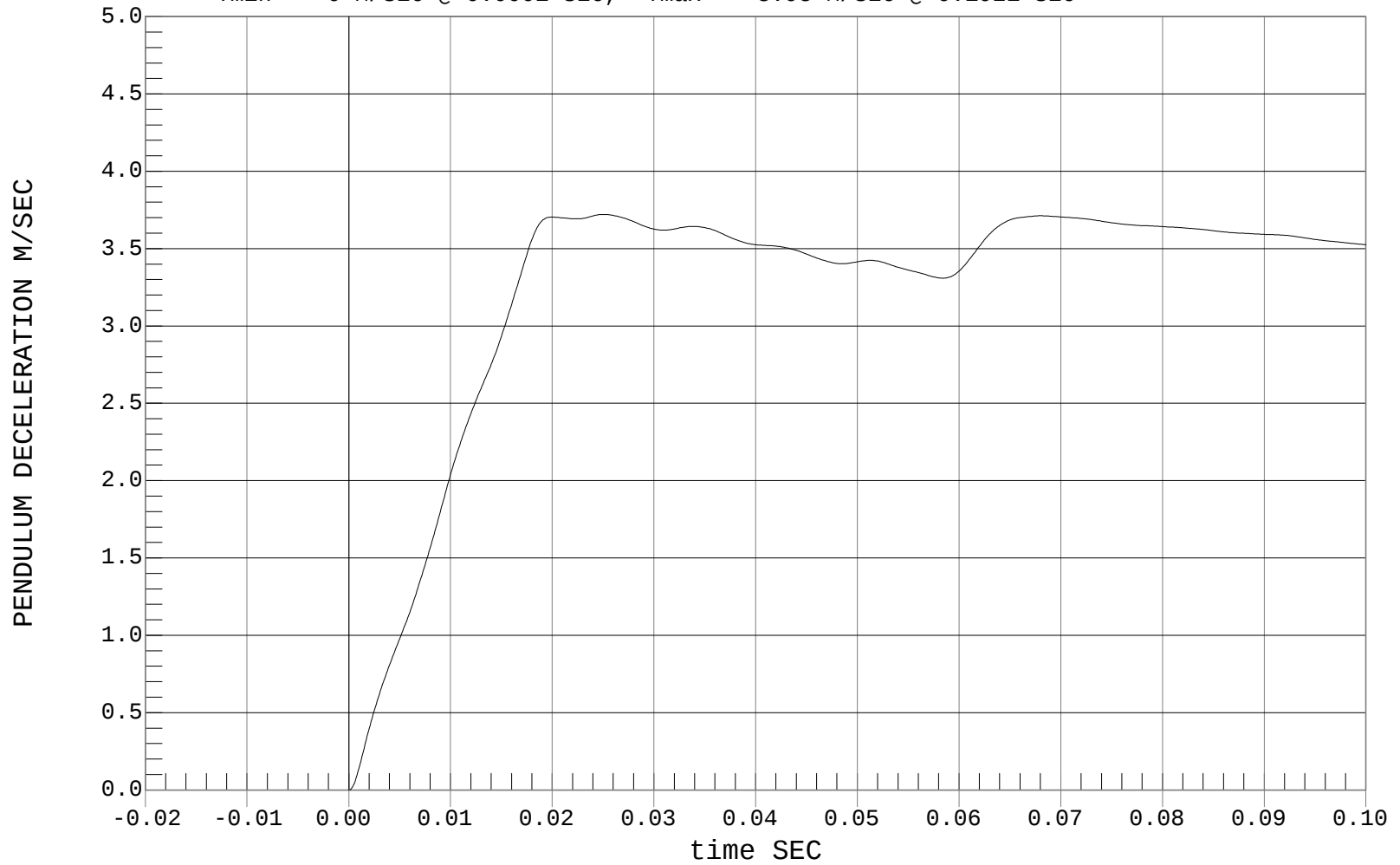
PENDULUM DECELERATION

Test Desc.: Dummy Calibration - Neck Extension
Component: Dummy #139

Test Date: 06-22-01
Speed: 12.00 FT/SEC, 3.66 M/SEC

— 1 PENDULUM DECELERATION, D01913AI.V04

Ymin = 0 M/SEC @ 0.0001 SEC, Ymax = 3.98 M/SEC @ 0.1921 SEC





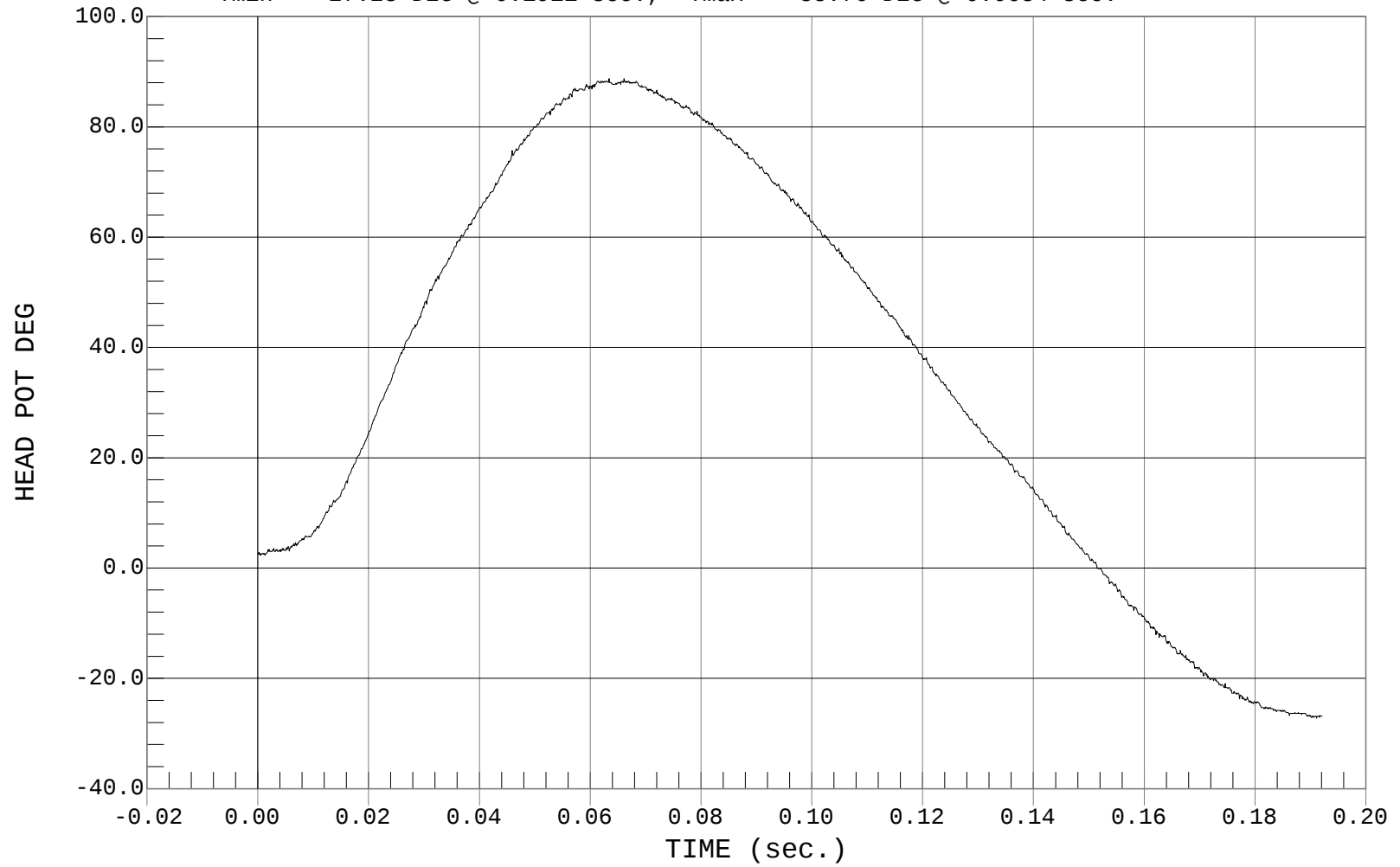
NECK ROTATION

Test Desc.: Dummy Calibration - Neck Extension
Component: Dummy #139

Test Date: 06-22-01
Speed: 12.00 FT/SEC, 3.66 M/SEC

— 1 HEAD POT, D01913DU.D05

Ymin = -27.23 DEG @ 0.1911 sec., Ymax = 88.76 DEG @ 0.0634 sec.





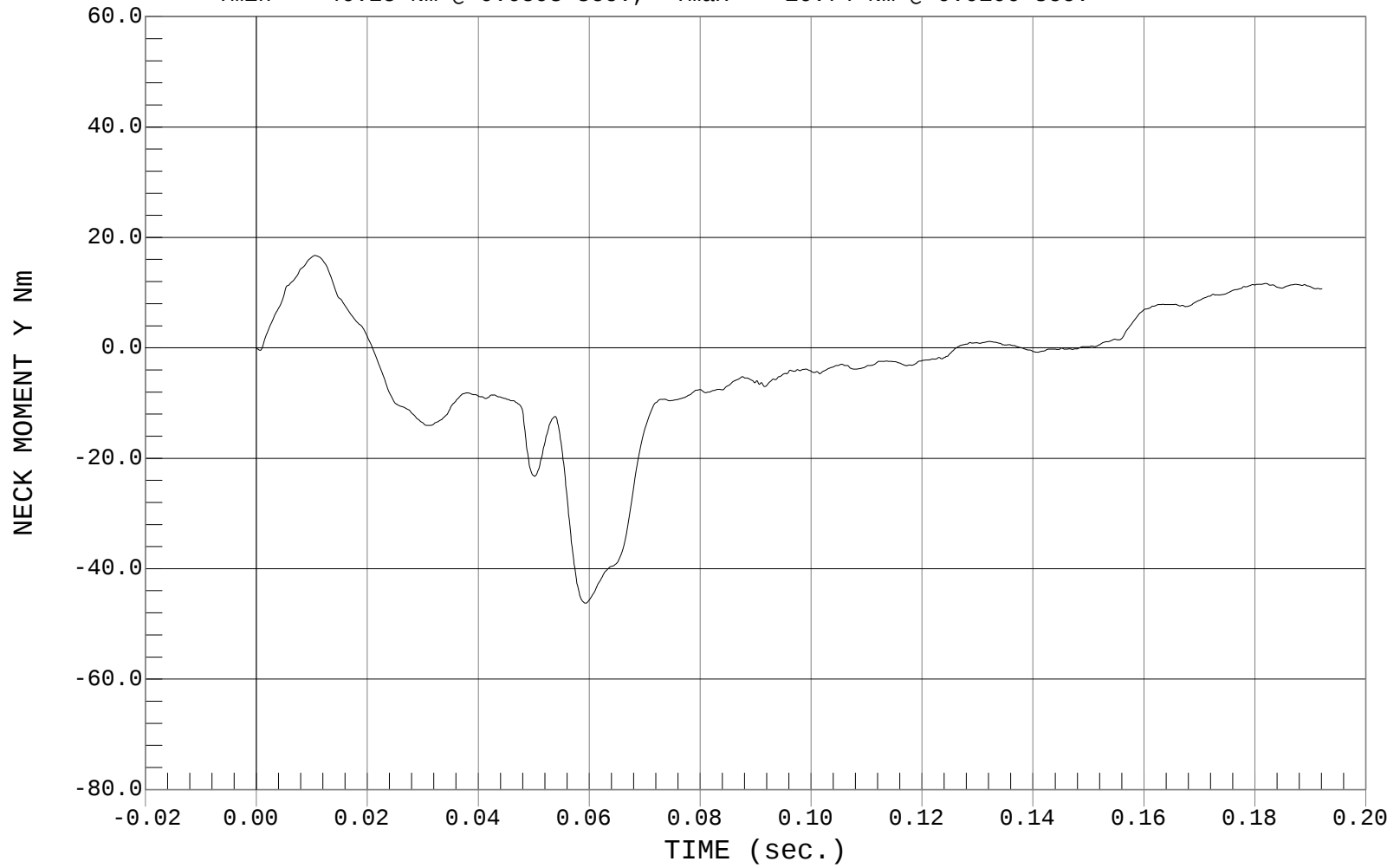
OCCIPITAL MOMENT

Test Desc.: Dummy Calibration - Neck Extension
Component: Dummy #139

Test Date: 06-22-01
Speed: 12.00 FT/SEC, 3.66 M/SEC

— 1 NECK MOMENT Y, D01913MF.M01

Ymin = -46.25 Nm @ 0.0593 sec., Ymax = 16.74 Nm @ 0.0106 sec.



MGA RESEARCH CORPORATION
THORAX IMPACT TEST
HYBRID III 3 YEAR OLD

Date: 6/22/01

Dummy Serial Number: 139

Test Number: D01914

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6 – 22.2	21.6
Relative Humidity (%)	10 – 70%	45
Probe Speed (m/s)	5.9 – 6.1 m/sec	6.0
Peak Deflection	32 – 38 mm	34
Peak Resistive Force Within Deflection Corridor	.68 - .81 KN	.78
Internal Hysteresis	65 – 85%	72
Max Force 12.5 mm- 32mm Deflection	Max .86 KN	.84

TEST MEETS SPECIFICATIONS

Technician: _____

Approved By: _____



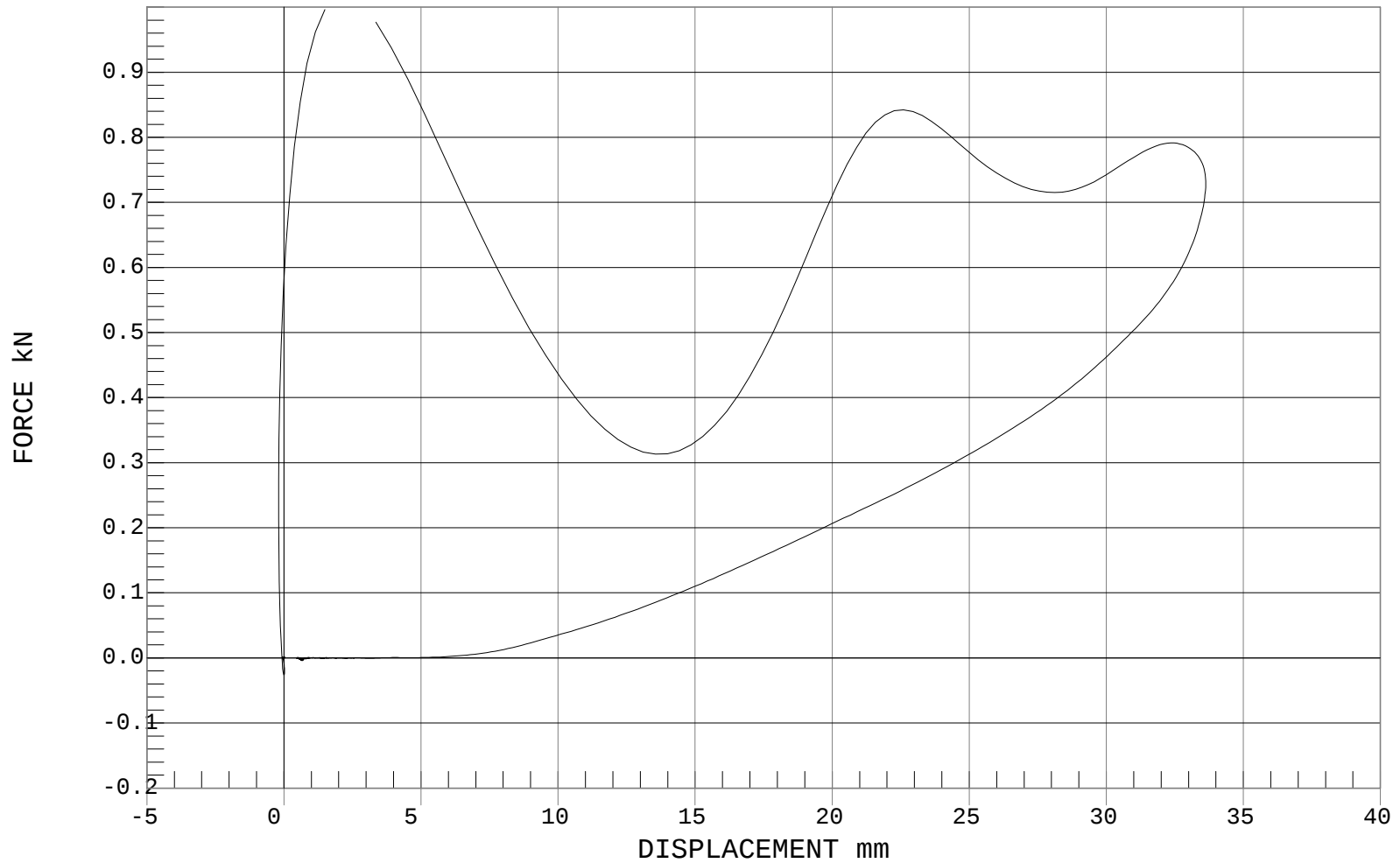
THORAX IMPACT

Test Desc.: Dummy Calibration - Chest Impact
Component: Dummy #139

Test Date: 06-22-01
Speed: 19.72 FT/SEC, 6.01 M/SEC

— 1 FORCE, D01914CH.FVD

Ymin = -.03 kN @ 0.0003 mm, Ymax = 1.02 kN @ 2.3281 mm



MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 3 YEAR OLD

Date: 6/22/01

Dummy Serial Number: 139

Test Number: D01915

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.9 – 25.6	21.6
Relative Humidity (%)	10 – 70	46
Force @ 45°	130 – 180 N	167
Initial Angle (deg)	0 – 15	6
Return Angle (deg)	0 – 10	4

TEST MEETS SPECIFICATIONS

Technician: _____

Approved By: _____

DUMMY INSPECTION CHECKLIST

Type: Hybrid III 3 year old

Dummy Serial Number: 139

Inspected By: Tim Michnay

Date: 6/22/01

<u>Part</u>	<u>Items Checked</u>	<u>Comments</u>
Skin	visual inspection	OK
Head	visual, ballast, accelerometer mount	OK
Neck	visual, cable torque, nodding blocks	OK
Clavicles	visual, bumpers, range of motion	OK
Arms/Hands	visual, bumpers, range of motion	OK
Spine box	visual, ballast, weldment, accelerometer mount	OK
Rib cage	visual, measure, stiffeners	OK
Sternum	visual, bumpers	OK
Lumbar spine	visual, cable torque	OK
Abdomen	visual	OK
Pelvis	visual, palpate, accelerometer mount	OK
Upper legs	visual, load cell bolts	OK
Knees	visual, stops, inserts, sliders	OK
Lower legs	visual, range of motion	OK
Ankles	visual, range of motion	OK
Feet	visual, range of motion	OK
Joints	1 to 2 g range	OK
Other		

Notes (include component/problem/action/reason):

SECTION 10
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

	SERIAL NO.	MANUFACTUERER	CALIBRATION DATE
Head X	AJ7F6	Endevco	6/20/01
Head Y	J19843	Endevco	6/20/01
Head Z	J19244	Endevco	6/20/01
Chest X	AJ7F7	Endevco	6/20/01
Chest Y	AJ454	Endevco	6/20/01
Chest Z	J23757	Endevco	6/20/01
Pelvis X	AJ8C0	Endevco	6/20/01
Pelvis Y	J14189	Endevco	6/20/01
Pelvis Z	J23943	Endevco	6/20/01
Upper Neck Force X	114	FTSS	6/20/01
Upper Neck Force Y	114	FTSS	6/20/01
Upper Neck Force Z	114	FTSS	6/20/01
Upper Neck Moment X	114	FTSS	6/20/01
Upper Neck Moment Y	114	FTSS	6/20/01
Upper Neck Moment Z	114	FTSS	6/20/01
Lower Neck Force X	119	FTSS	6/20/01
Lower Neck Force Y	119	FTSS	6/20/01
Lower Neck Force Z	119	FTSS	6/20/01
Lower Neck Moment X	119	FTSS	6/20/01
Lower Neck Moment Y	119	FTSS	6/20/01
Lower Neck Moment Z	119	FTSS	6/20/01
Chest Deflection Gauge	139	Servo	7/11/01
Lap Belt Load Cell	192	Denton	5/03/01
Shoulder Belt Load Cell	191	Denton	5/14/01
Tether Load Cell	190	Entran	5/14/01
Sled Carriage Accelerometer	764077	Sensotec	4/14/01
Sled Carriage Accelerometer (R)	764058	Sensotec	4/14/01