

REPORT NUMBER: SLED-MGA-2001-015

**CHILD RESTRAINT SYSTEM IN
DYNAMIC SLED TEST**

TEST NUMBER: H01264

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



August 20, 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 20, 2001 at a speed of 47.0 kph (29.2 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: H01264

Test Date: August 20, 2001

Child Restraint Type (forward-facing, rear-facing, booster)	Forward-Facing
LATCH or NON-LATCH	Non-Latch
Child Restraint Manufacturer	Cosco
Child Restraint Model	Olympian Overhead Shield
Child Restraint Age Limits	Toddler
Child Restraint Weight Limits (kg)	18.1
Weight of Child Restraint (kg)	6.4

SECTION 3
POST-TEST OBSERVATIONS

Test No: H01264

Test Date: August 20, 2001

Child Seat	Cosco Olympian Overhead Shield
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: H01264

Test Date: August 20, 2001

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	40.9	204	48.4	104
Head CG	Y	G's	2.0	200	6.6	106
Head CG	Z	G's	39.8	79	0.9	40
Head CG Resultant	N/A	G's	54.1	104		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	13.6	218	32.1	51
Chest CG	Y	G's	4.0	218	6.9	88
Chest CG	Z	G's	6.1	207	17.6	51
Chest CG Resultant	N/A	G's	36.6	51		

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	1031	105		
Shoulder Belt	N/A	Newtons	96	44		
Lap Belt*	N/A	Newtons	3343	75		

* No Valid Data After Approximately 230 msec.

HEAD INJURY CRITERIA (HIC)

Location	Left Rear Passenger			
	HIC	Avg G's	T ¹	T ²
Head CG Primary (36 msec)	357	39.7	71.8	107.8
Head CG Primary (15 msec)	170	41.8	73.4	88.4

CHEST CLIP (3 MSEC)

Location	Left Rear Passenger		
	Clip	T ¹	T ²
Chest CG Primary	34.7	49.1	52.1

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

Test No: H01264

Test Date: August 20, 2001

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	24.8	167	55.4	49
Pelvis	Y	G's	5.1	161	8.1	102
Pelvis	Z	G's	9.4	167	22.0	47

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	43	242	653	98
Neck Force	Y	Newtons	9	242	78	84
Neck Force	Z	Newtons	1037	81	34	40
Neck Moment	X	Nm	2.4	152	4.0	177
Neck Moment	Y	Nm	8.5	89	7.7	56
Neck Moment	Z	Nm	2.4	158	3.3	190

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Left Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	310	202	798	103
Neck Force	Y	Newtons	235	95	52	178
Neck Force	Z	Newtons	599	198	341	103
Neck Moment	X	Nm	1.4	245	13.5	87
Neck Moment	Y	Nm	94.5	103	17.6	200
Neck Moment	Z	Nm	2.5	156	3.9	103

CHEST PEAK DISPLACEMENTS

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

* No Valid Data Collected

SECTION 5

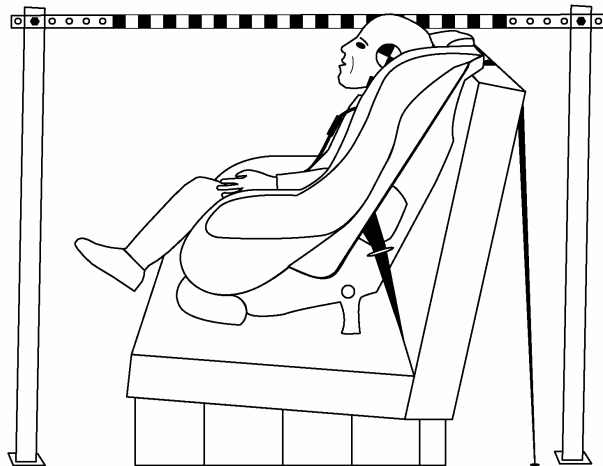
SLED TEST SET-UP

Test No: H01264

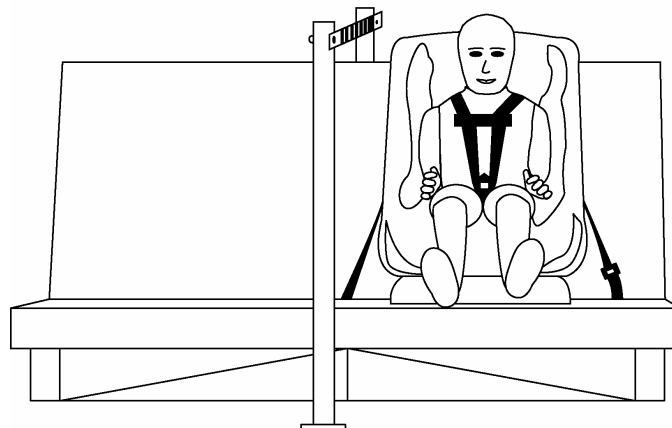
Test Date: August 20, 2001

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



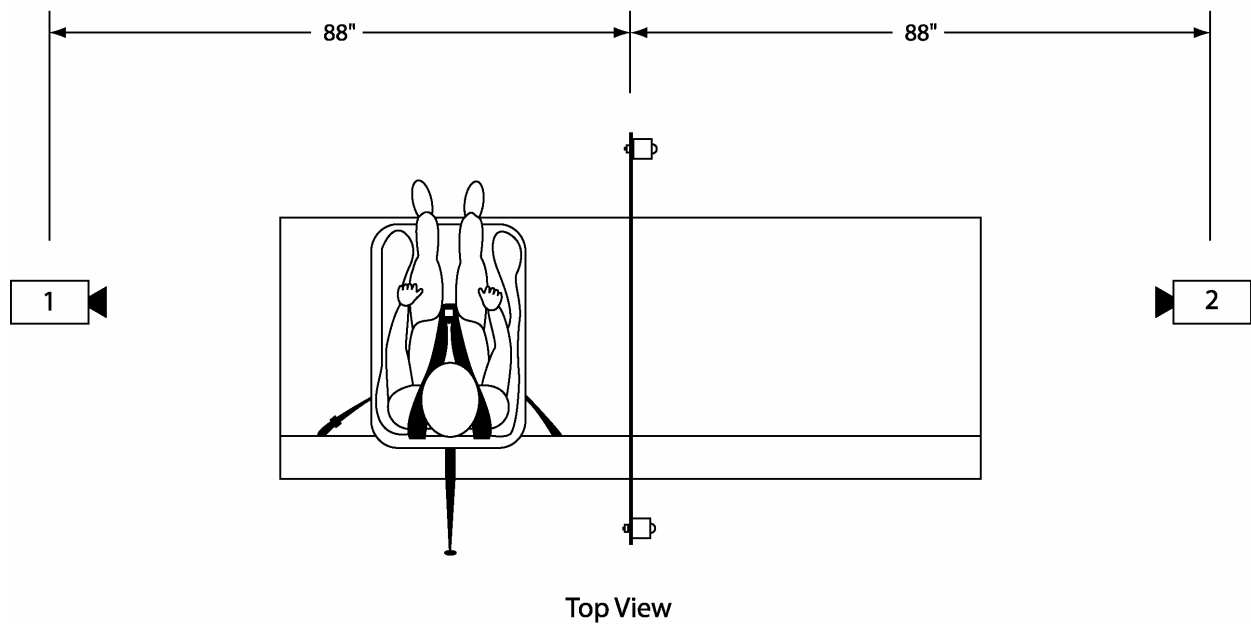
Front View

SECTION 6
CAMERA LOCATION

Test No: H01264

Test Date: August 20, 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

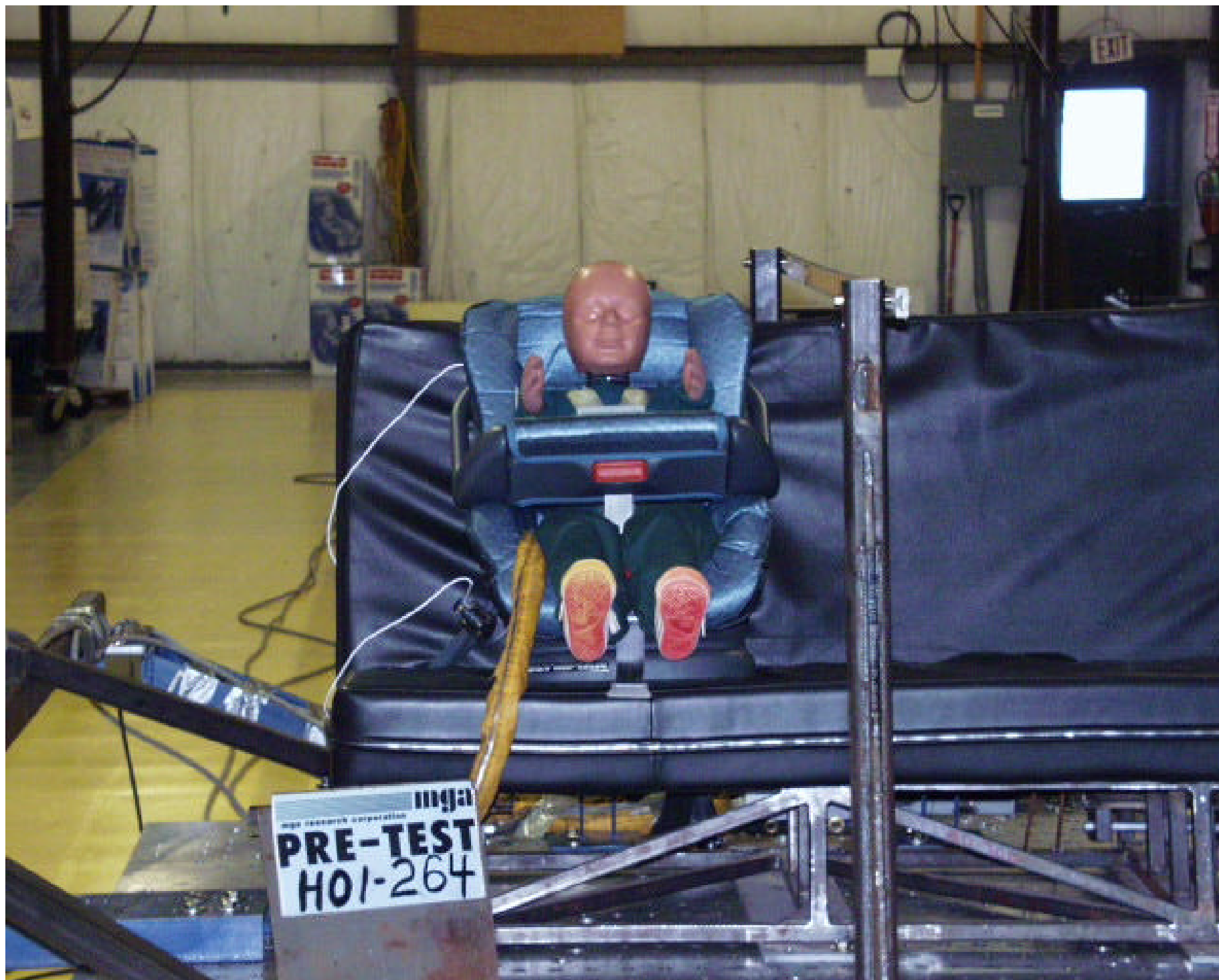


Photo 1 - Pre-Test Front View



Photo 2 - Post-Test Front View

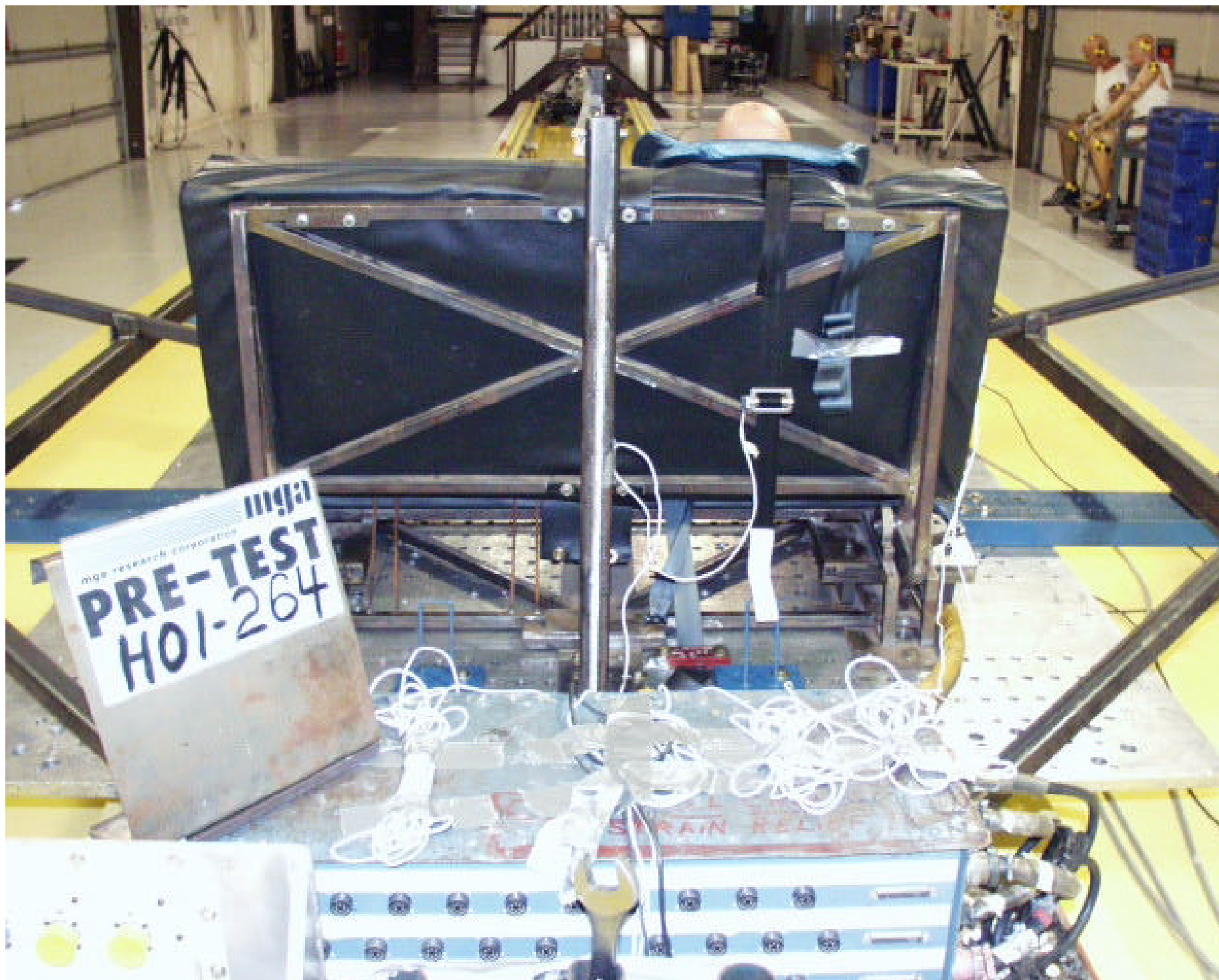


Photo 3 - Pre-Test Rear View

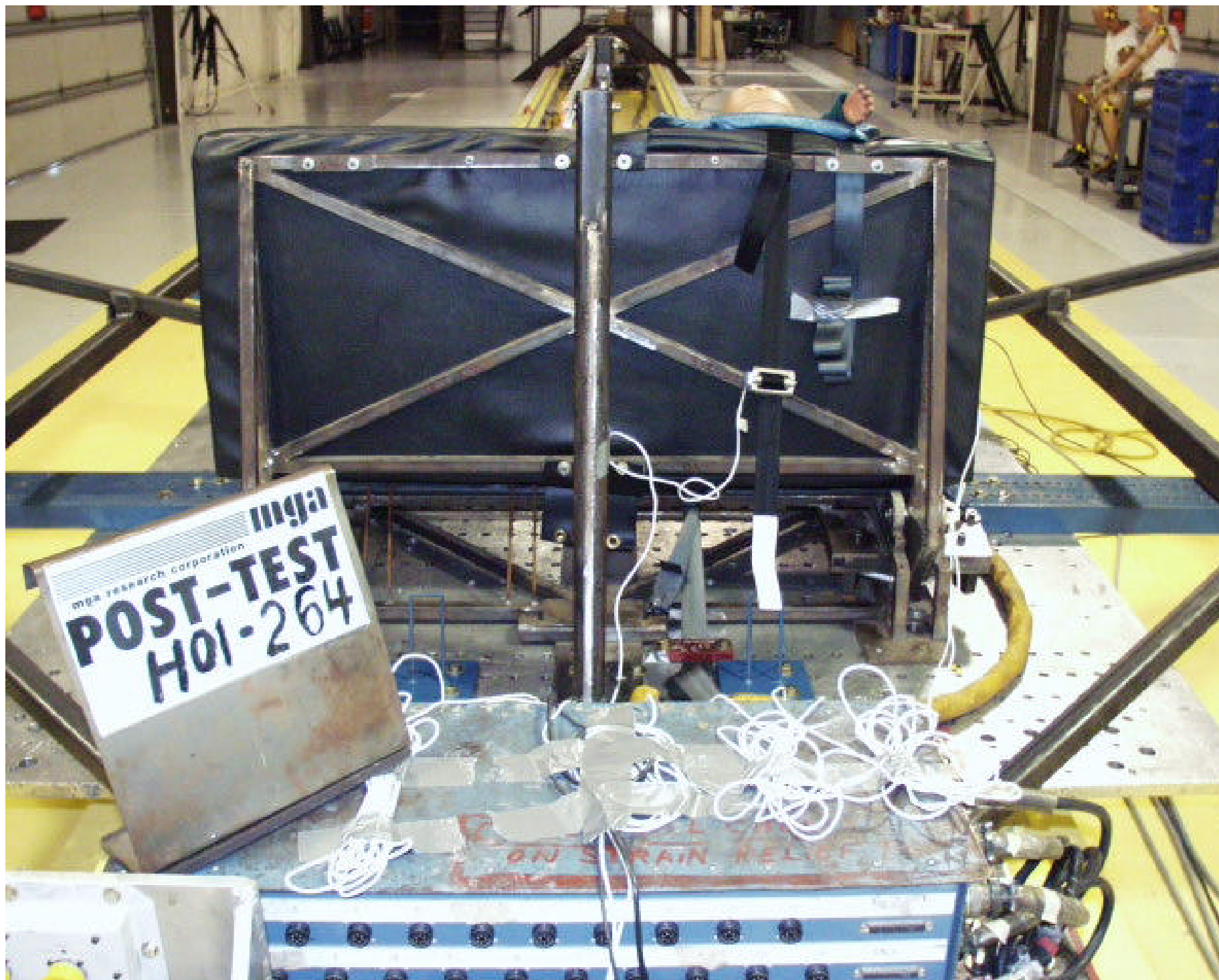


Photo 4 - Post-Test Rear View



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

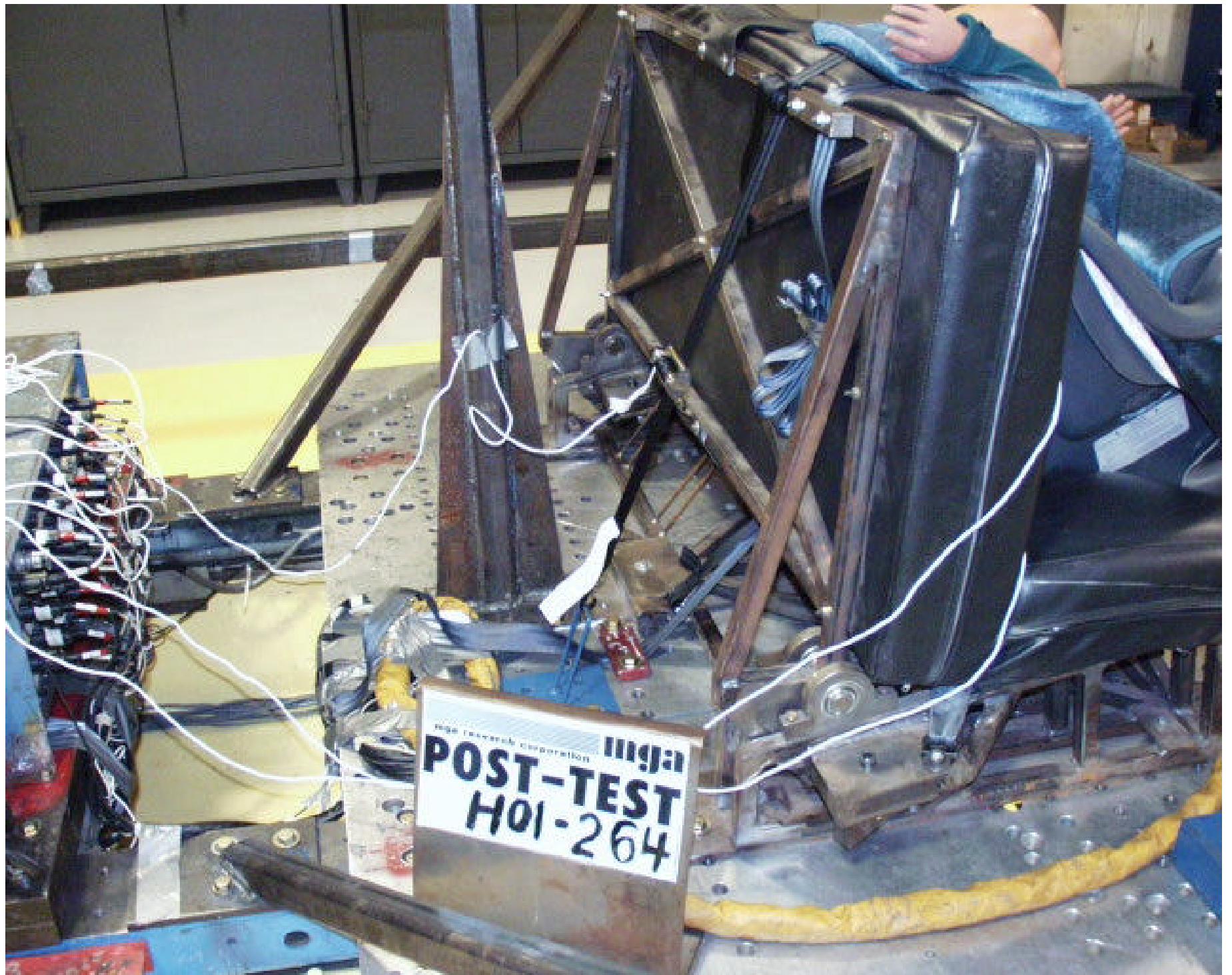


Photo 10 - Post-Test Fixture



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

* No Valid Data After Approximately 230 msec.



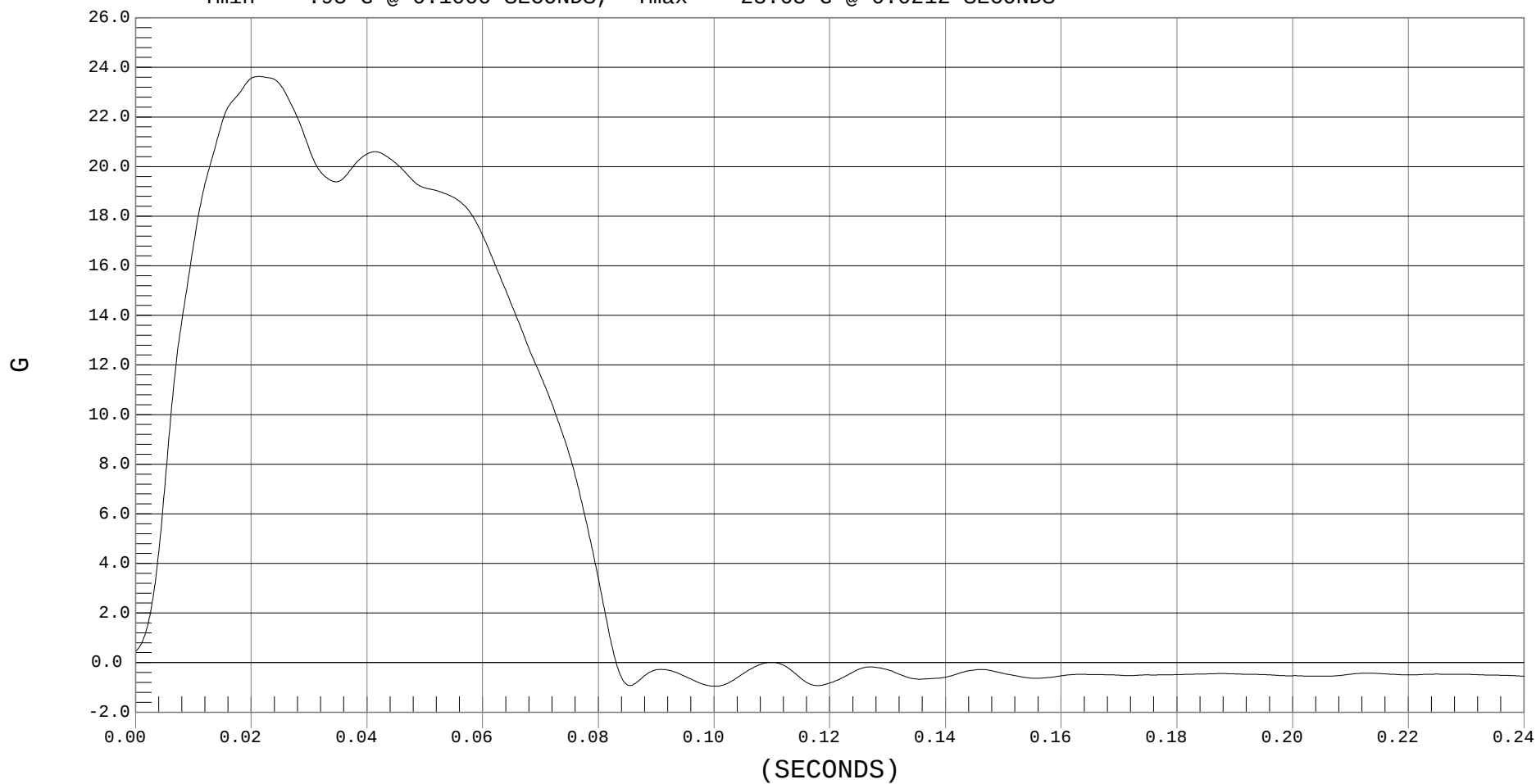
SLED X ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 60

— 1 SLED X ACCELERATION, H01264AF.A01

Ymin = -.95 G @ 0.1000 SECONDS, Ymax = 23.63 G @ 0.0212 SECONDS





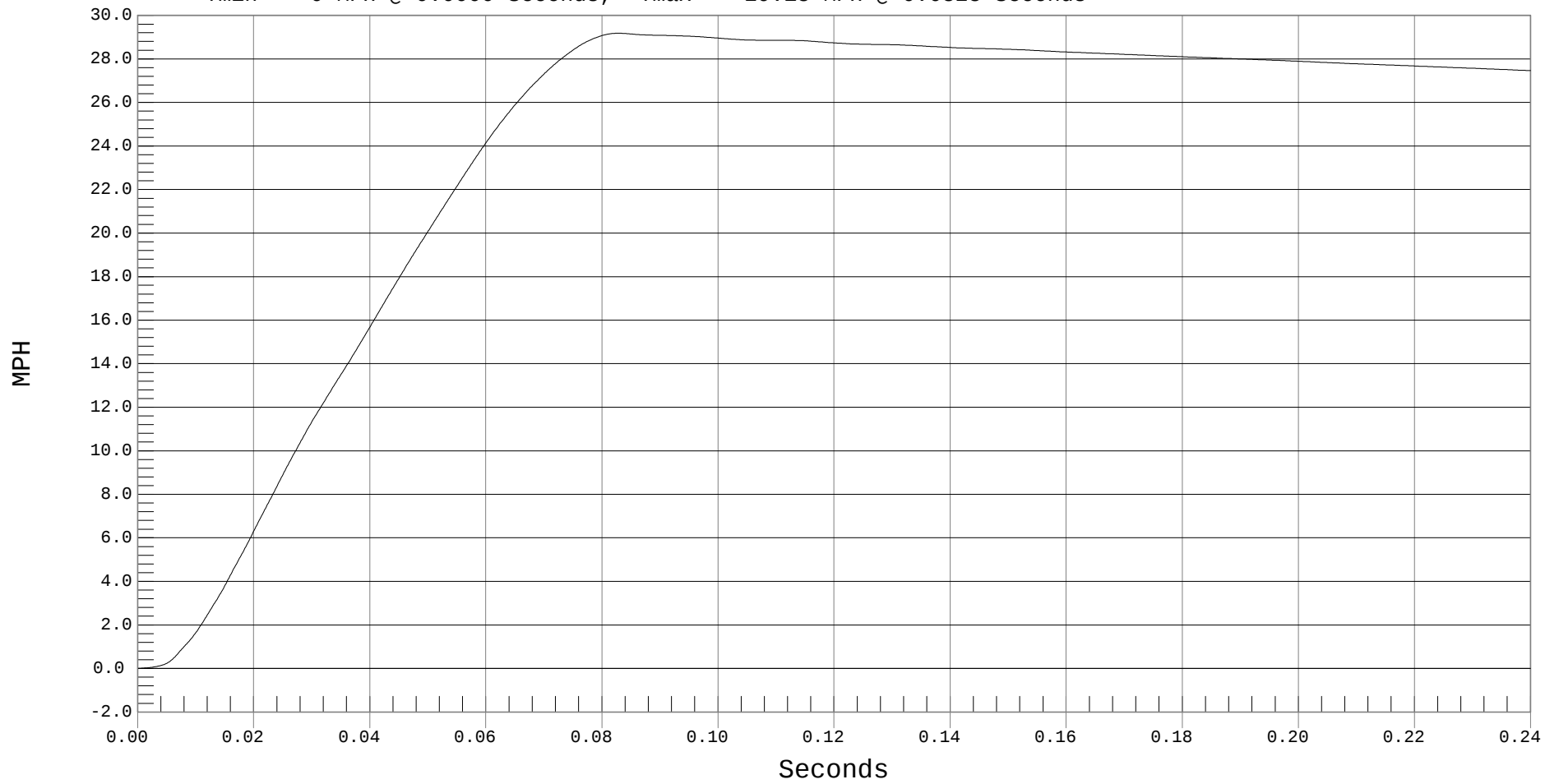
SLED X VELOCITY

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 SLED X VELOCITY, H01264AI.V01

Ymin = 0 MPH @ 0.0000 Seconds, Ymax = 29.18 MPH @ 0.0828 Seconds





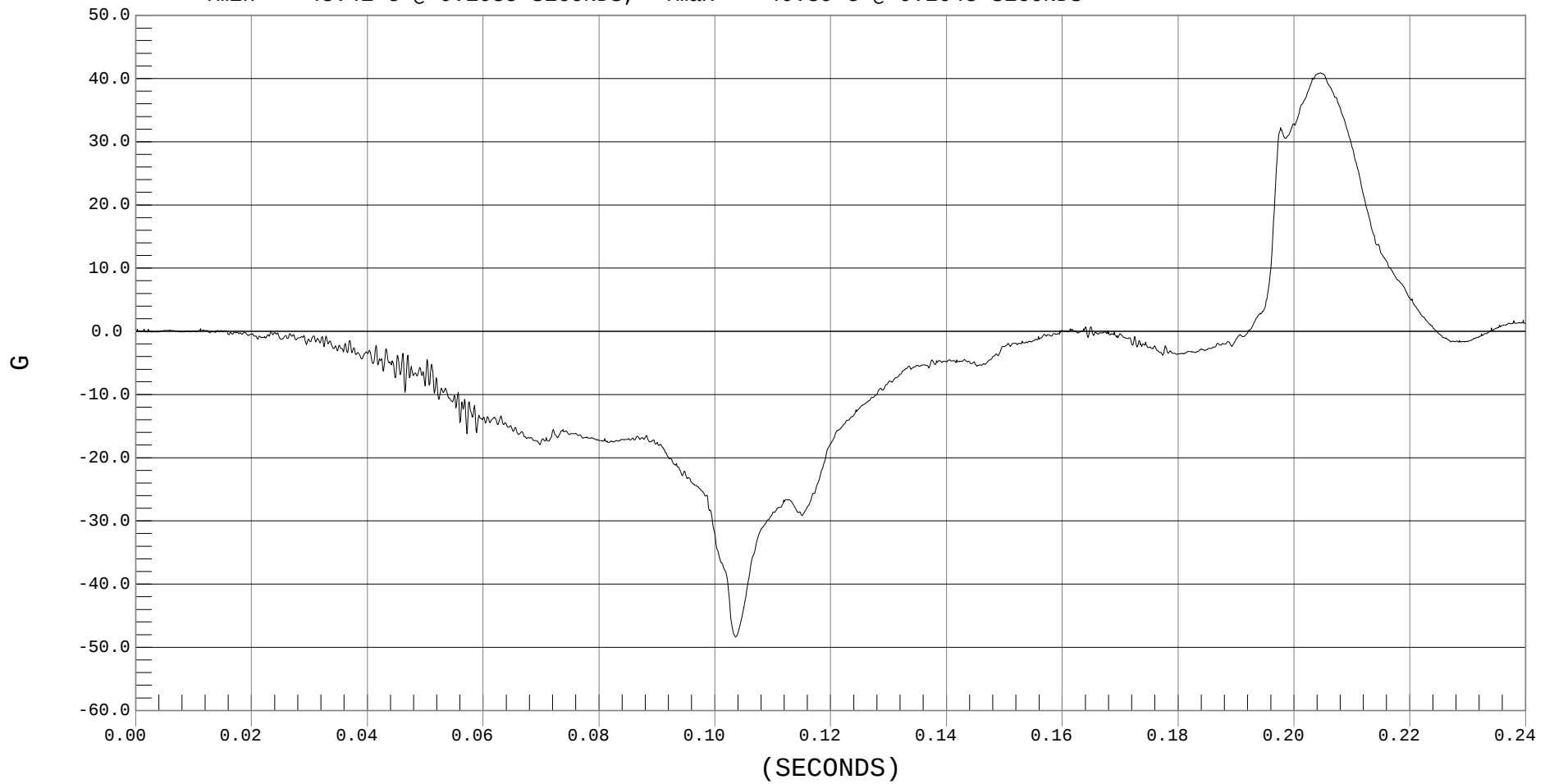
HEAD X ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 HEAD X, H01264AT.A03

Ymin = -48.41 G @ 0.1035 SECONDS, Ymax = 40.89 G @ 0.2043 SECONDS





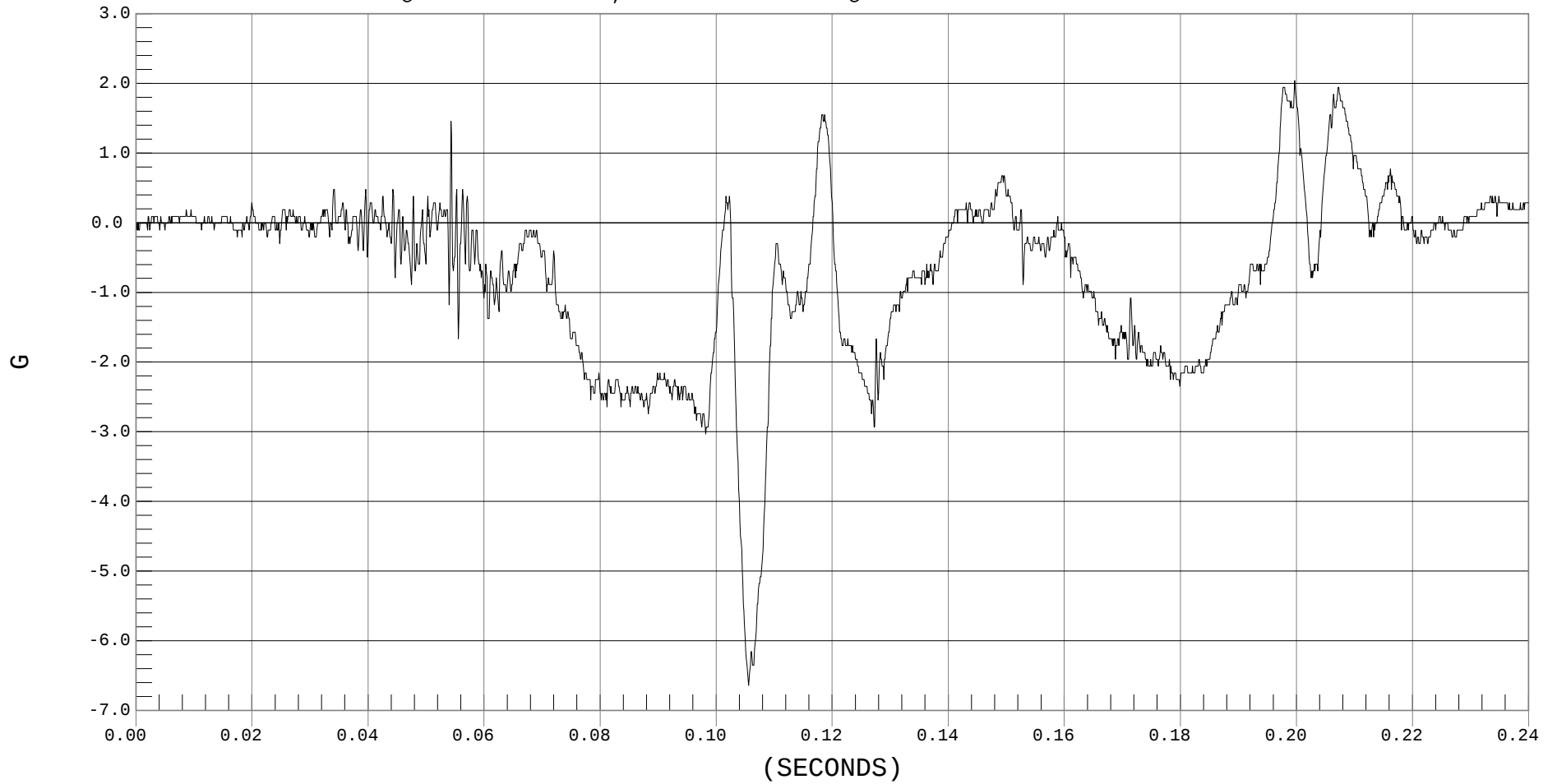
HEAD Y ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 HEAD Y, H01264AT.A05

Ymin = -6.64 G @ 0.1055 SECONDS, Ymax = 2.04 G @ 0.1996 SECONDS





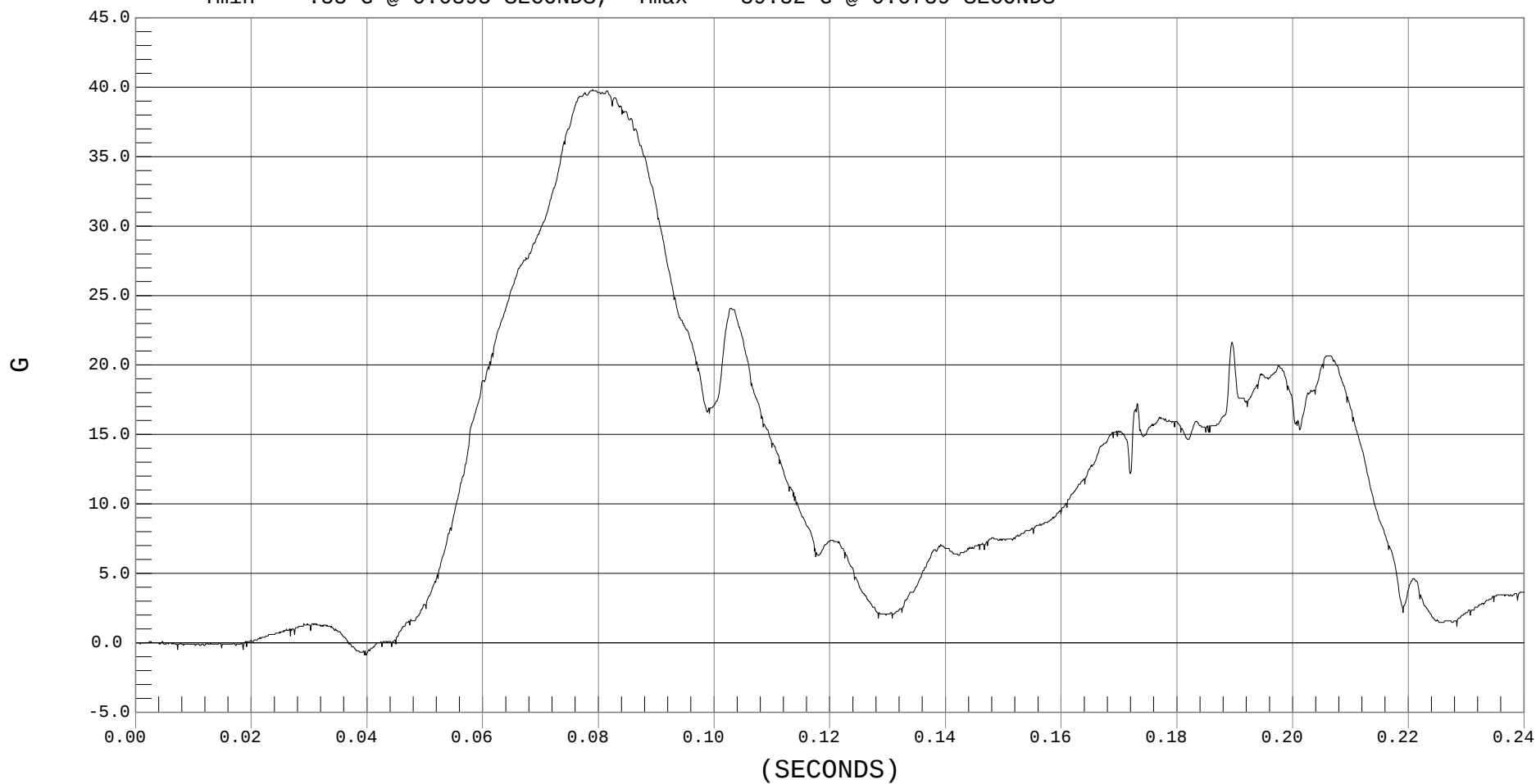
HEAD Z ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 HEAD Z, H01264AT.A06

Ymin = -.88 G @ 0.0395 SECONDS, Ymax = 39.82 G @ 0.0789 SECONDS





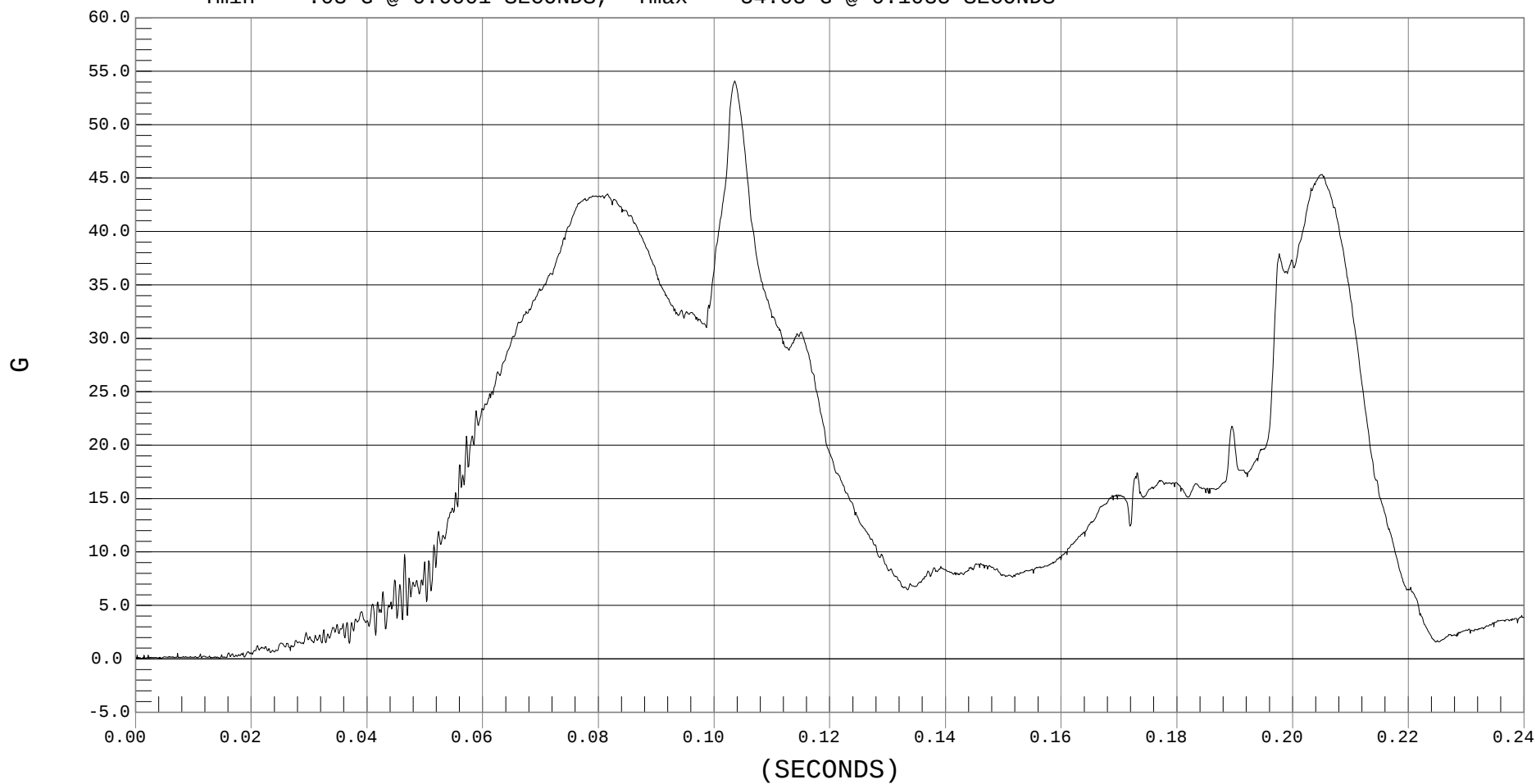
HEAD RESULTANT ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 HEAD RESULTANT ACCELERATION, H01264AV.A03

Ymin = .03 G @ 0.0001 SECONDS, Ymax = 54.08 G @ 0.1035 SECONDS





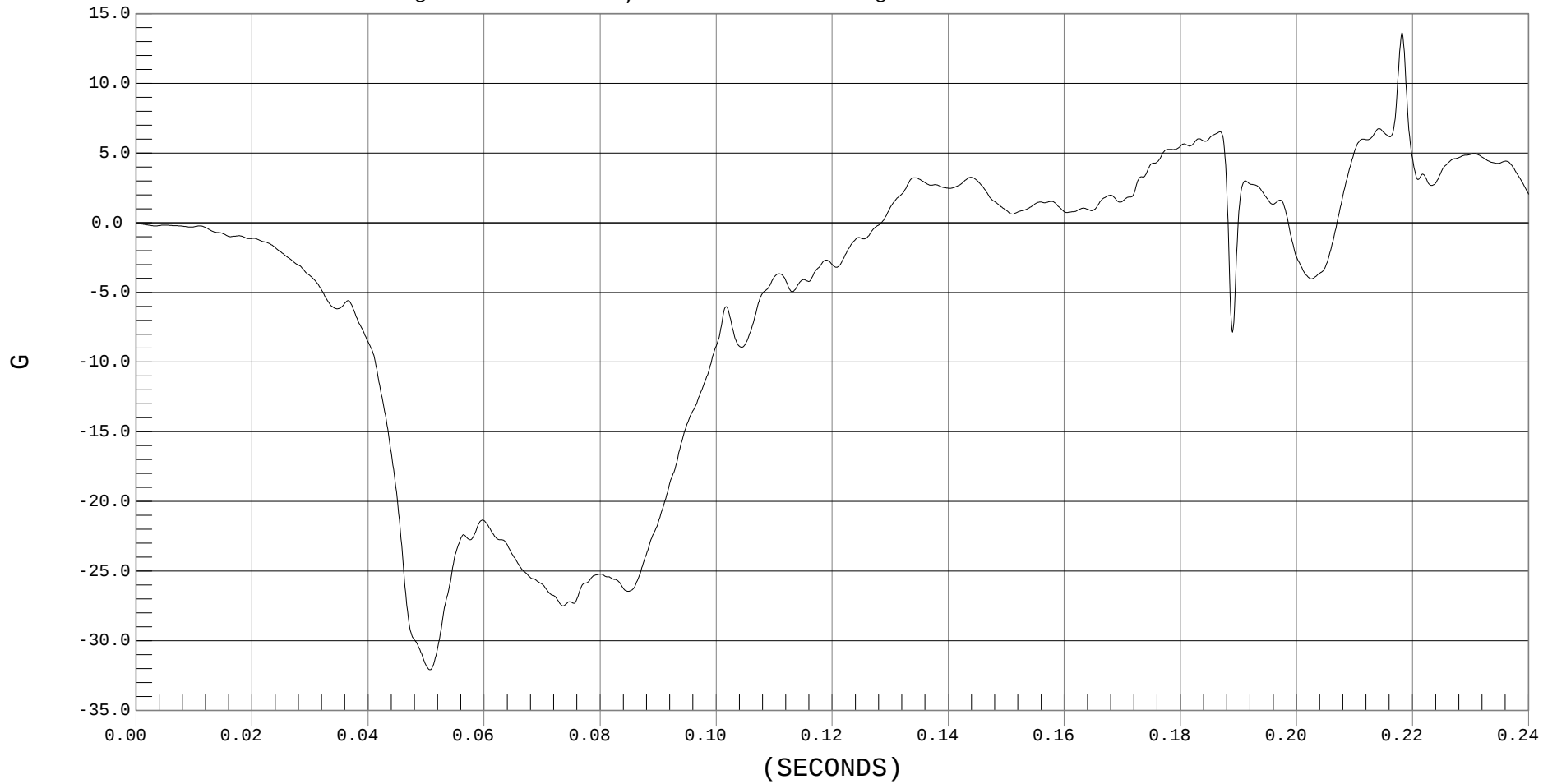
CHEST X ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 CHEST X, H01264AF.A08

Ymin = -32.08 G @ 0.0506 SECONDS, Ymax = 13.64 G @ 0.2181 SECONDS





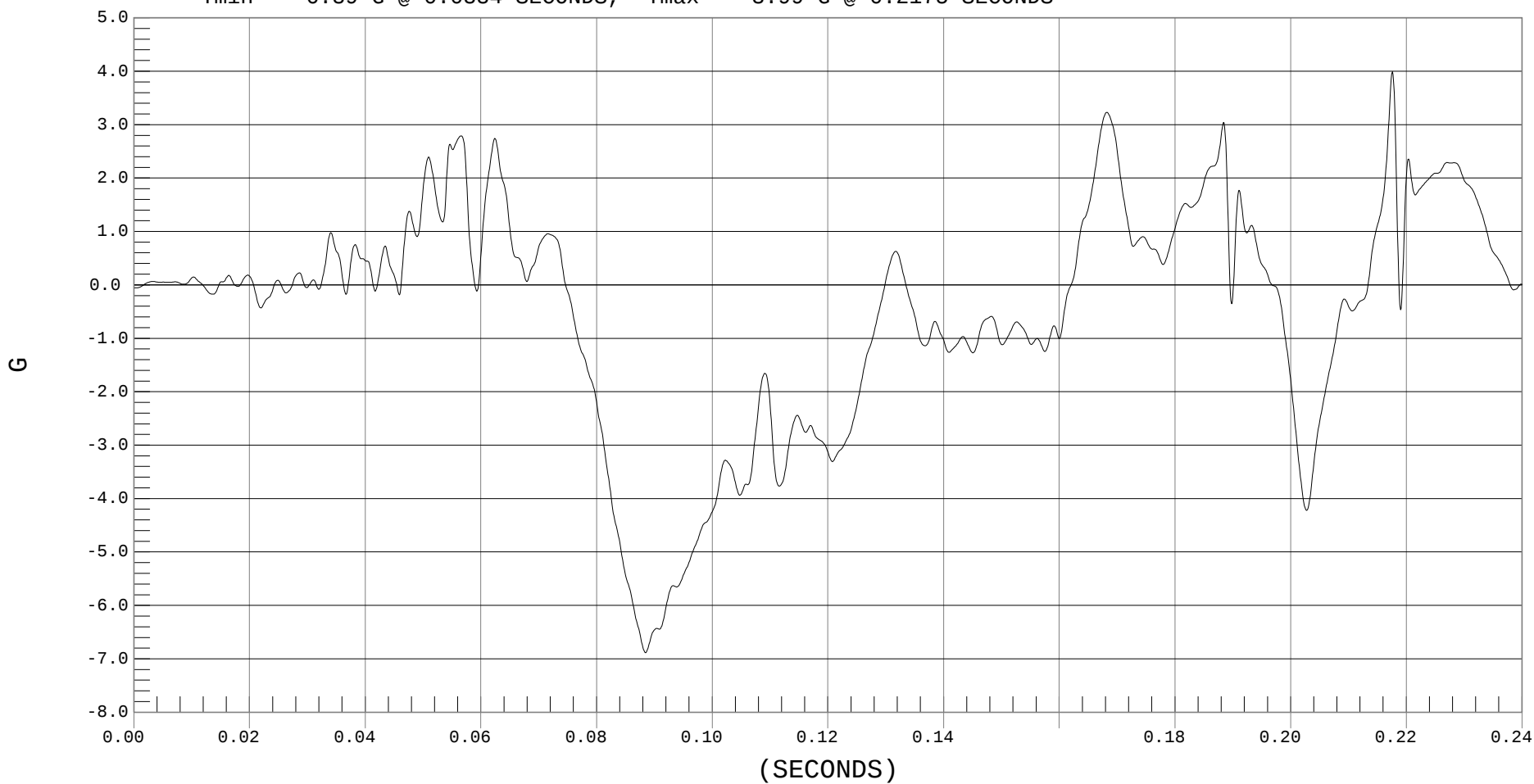
CHEST Y ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 CHEST Y, H01264AF.A09

Ymin = -6.89 G @ 0.0884 SECONDS, Ymax = 3.99 G @ 0.2175 SECONDS





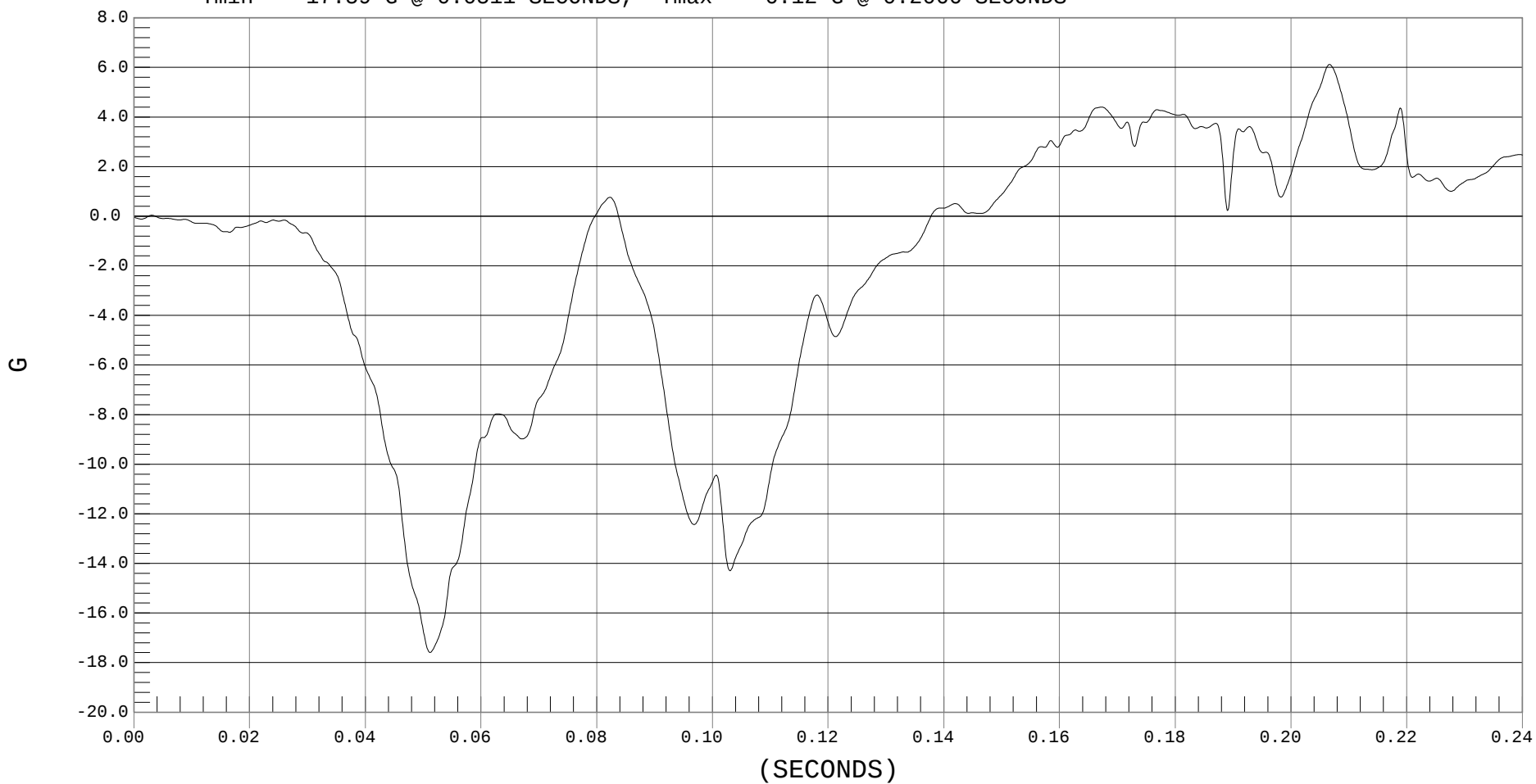
CHEST Z ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 CHEST Z, H01264AF.A12

Ymin = -17.59 G @ 0.0511 SECONDS, Ymax = 6.12 G @ 0.2066 SECONDS





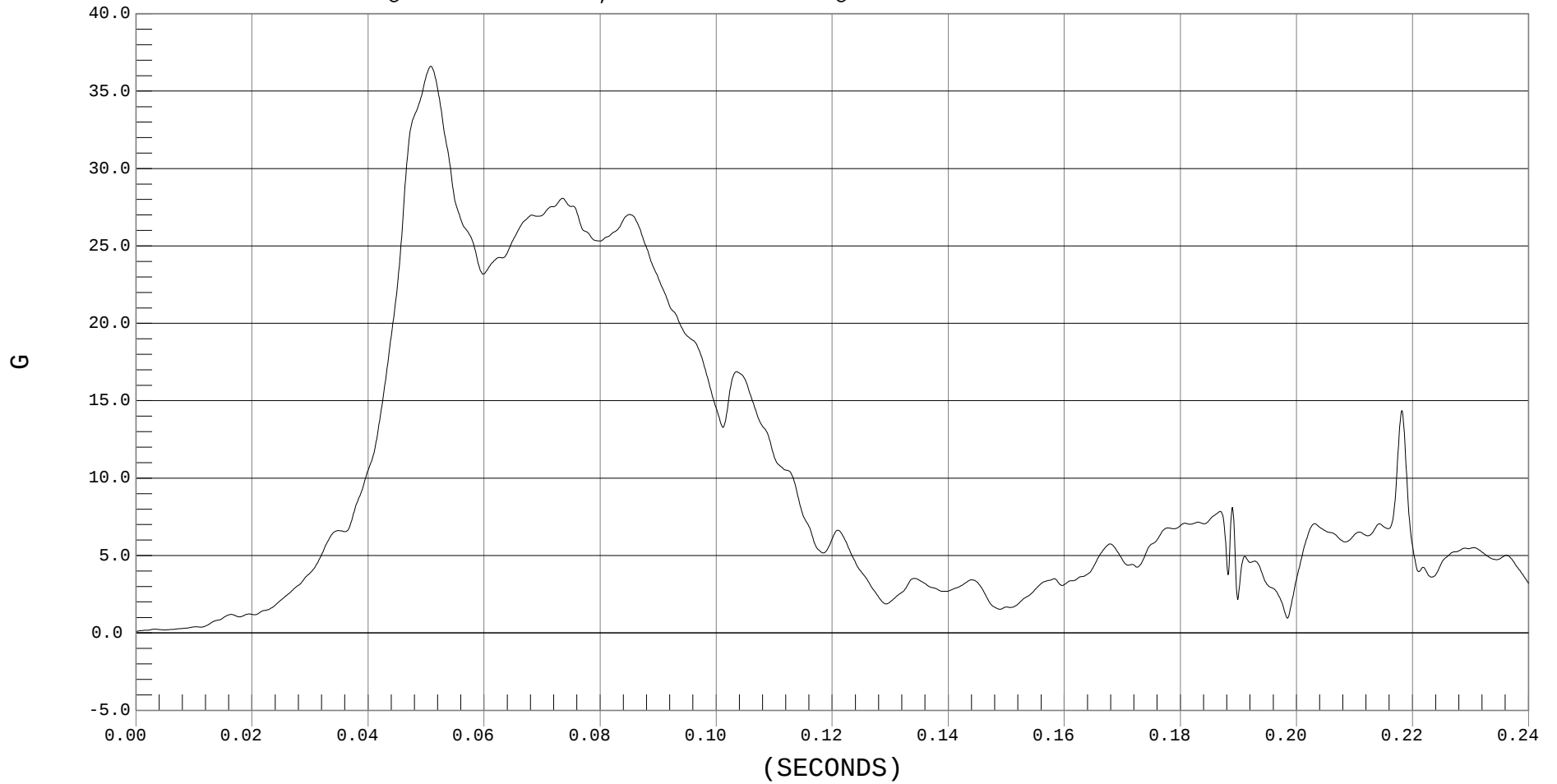
CHEST RESULTANT ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 180

— 1 CHEST RESULTANT ACCELERATION, H01264AV.A08

Ymin = .11 G @ 0.0000 SECONDS, Ymax = 36.6 G @ 0.0507 SECONDS





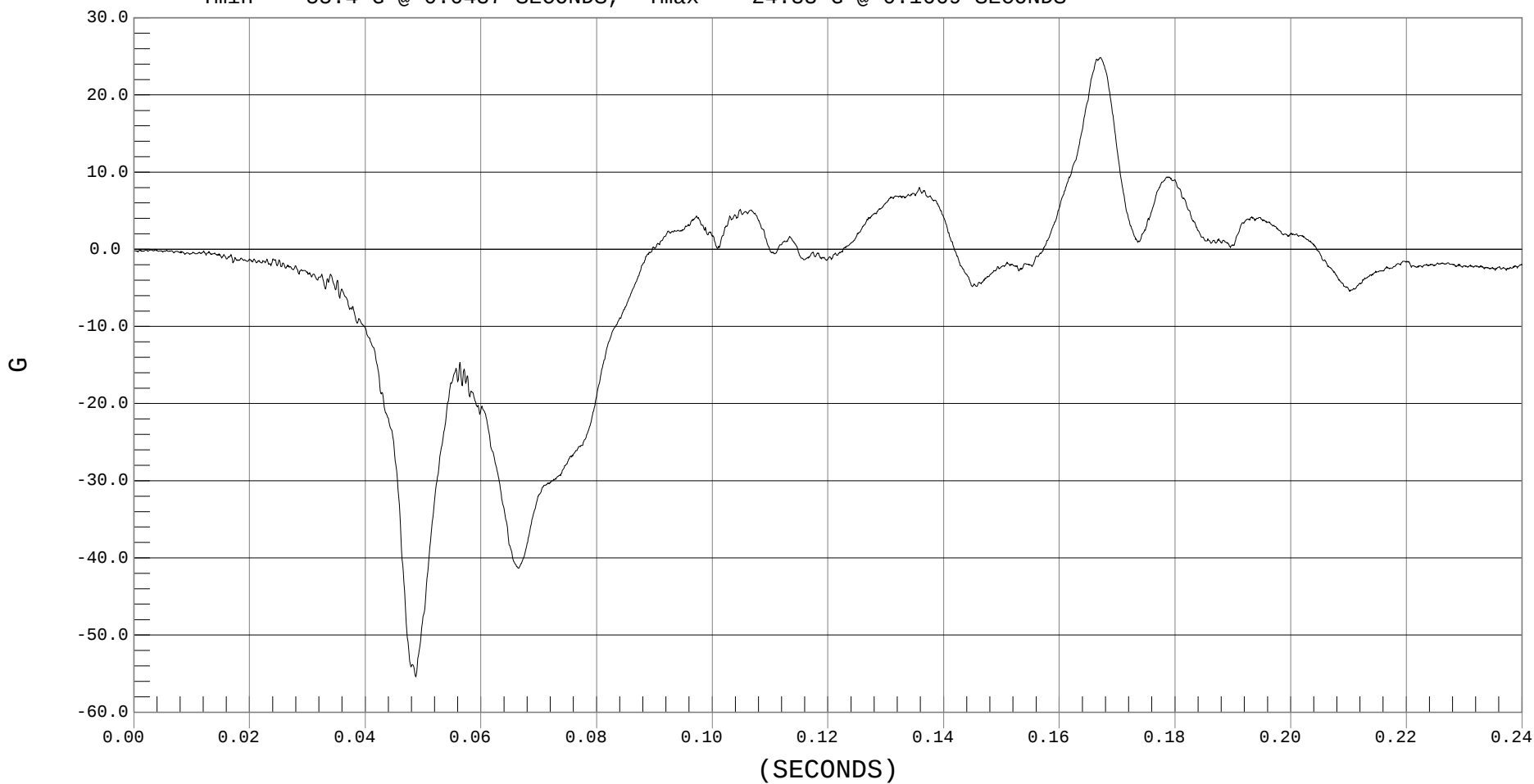
PELVIS X ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 PELVIS X, H01264AT.A27

Ymin = -55.4 G @ 0.0487 SECONDS, Ymax = 24.83 G @ 0.1669 SECONDS





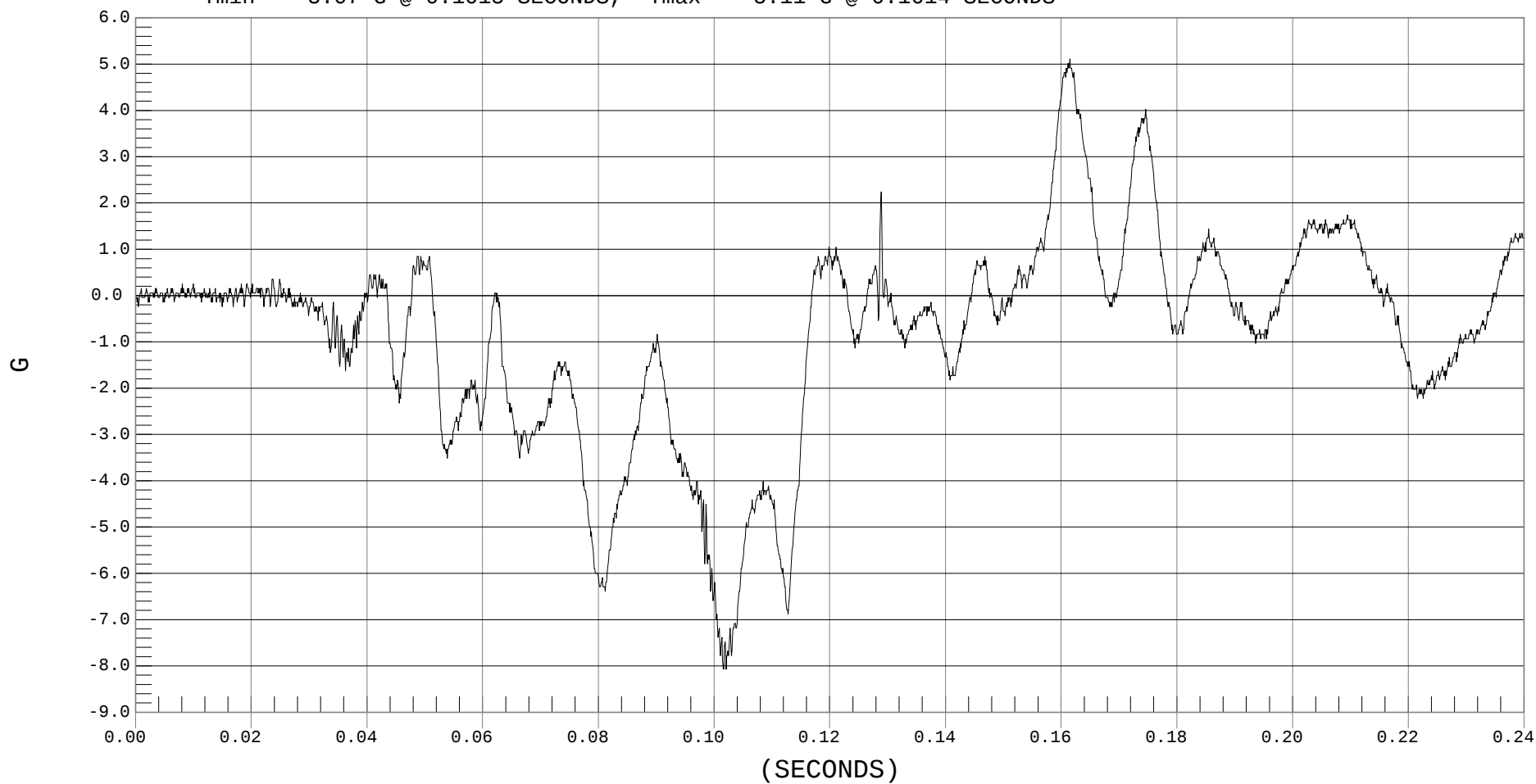
PELVIS Y ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 PELVIS Y, H01264AT.A28

Ymin = -8.07 G @ 0.1015 SECONDS, Ymax = 5.11 G @ 0.1614 SECONDS





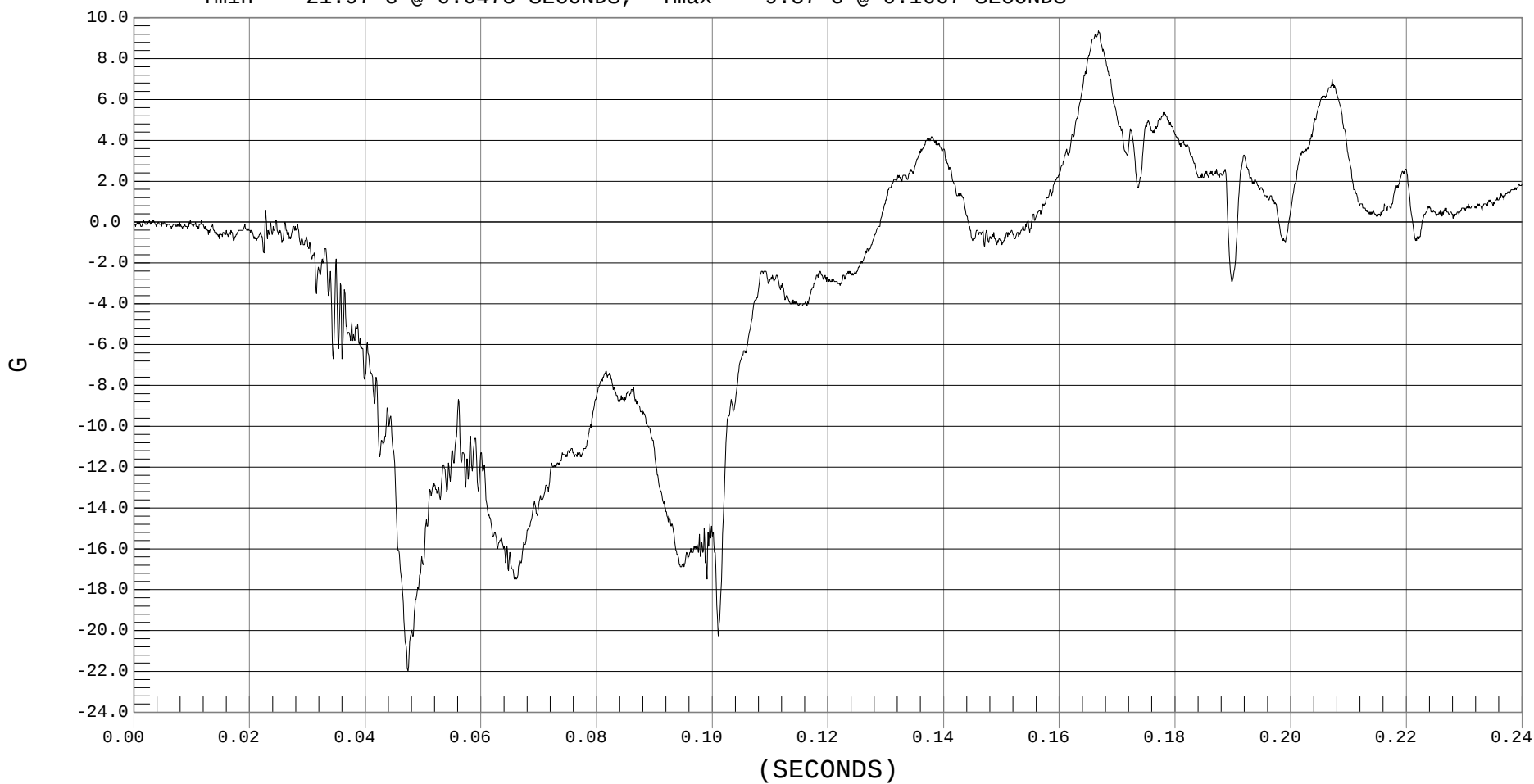
PELVIS Z ACCELERATION

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 PELVIS Z, H01264AT.A29

Ymin = -21.97 G @ 0.0473 SECONDS, Ymax = 9.37 G @ 0.1667 SECONDS





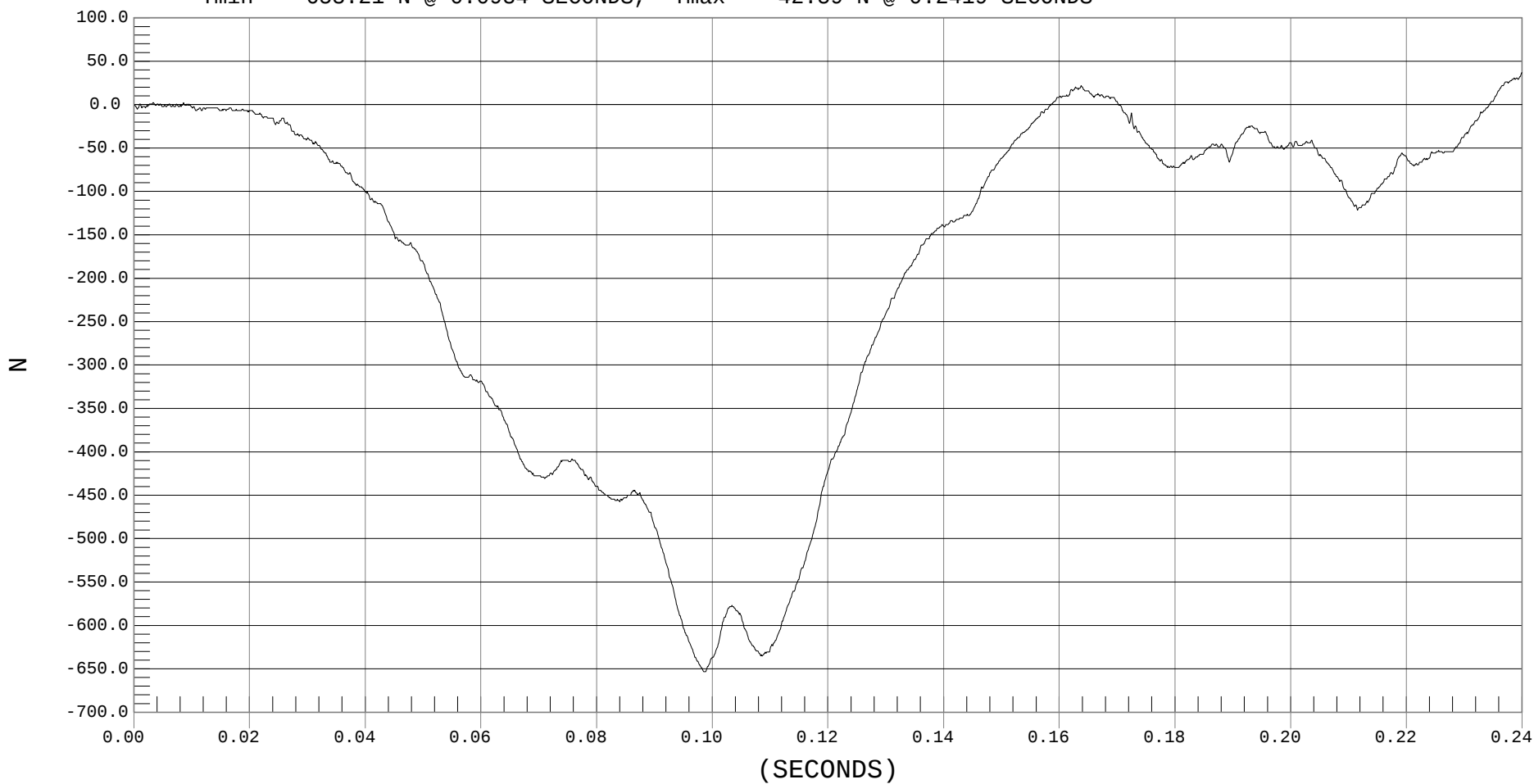
UPPER NECK FORCE X

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

1 UPPER NECK FX, H01264FT.F13

Ymin = -653.21 N @ 0.0984 SECONDS, Ymax = 42.59 N @ 0.2419 SECONDS





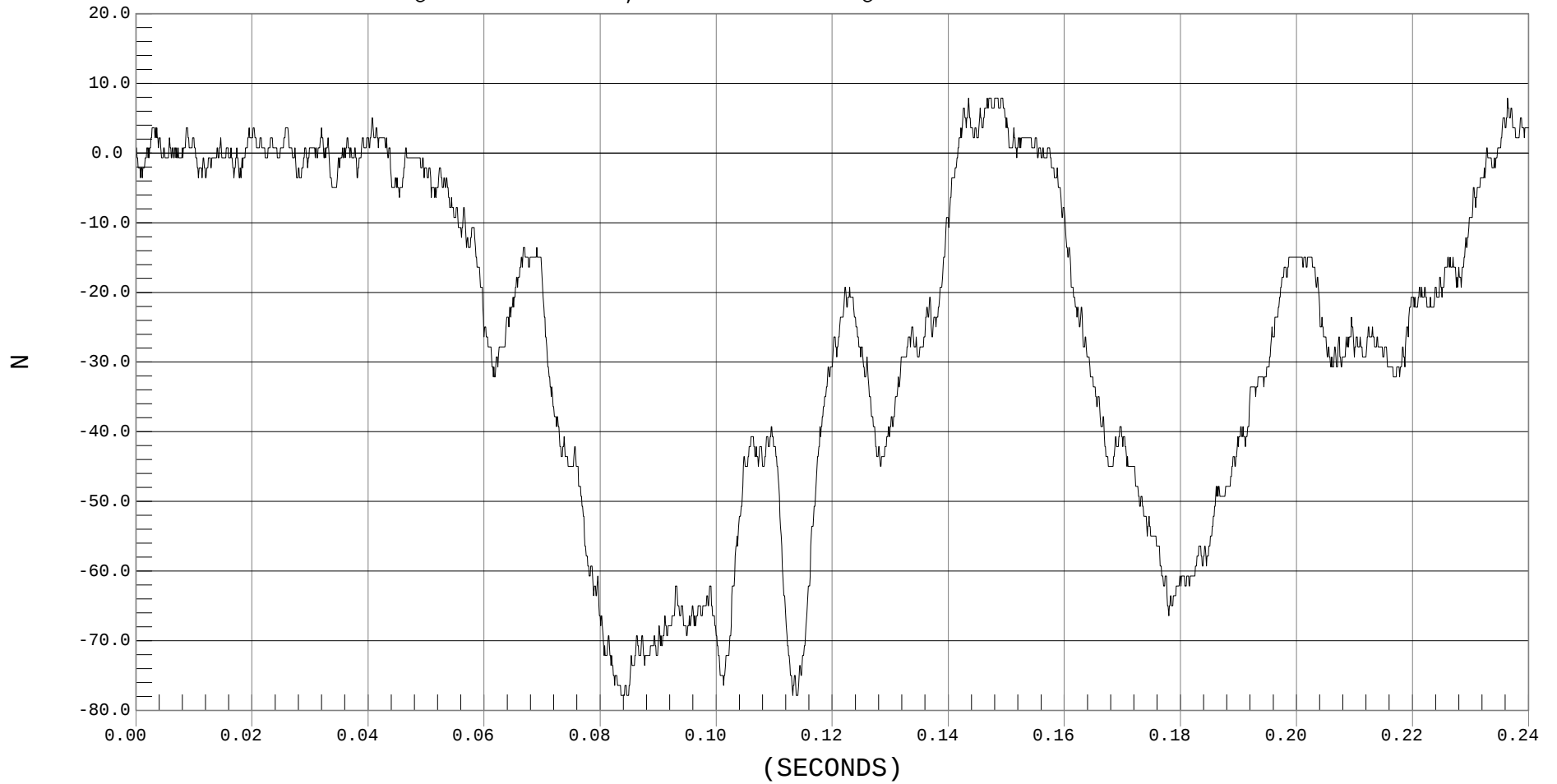
UPPER NECK FORCE Y

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 UPPER NECK FY, H01264FT.F14

Ymin = -77.86 N @ 0.0835 SECONDS, Ymax = 9.33 N @ 0.2421 SECONDS





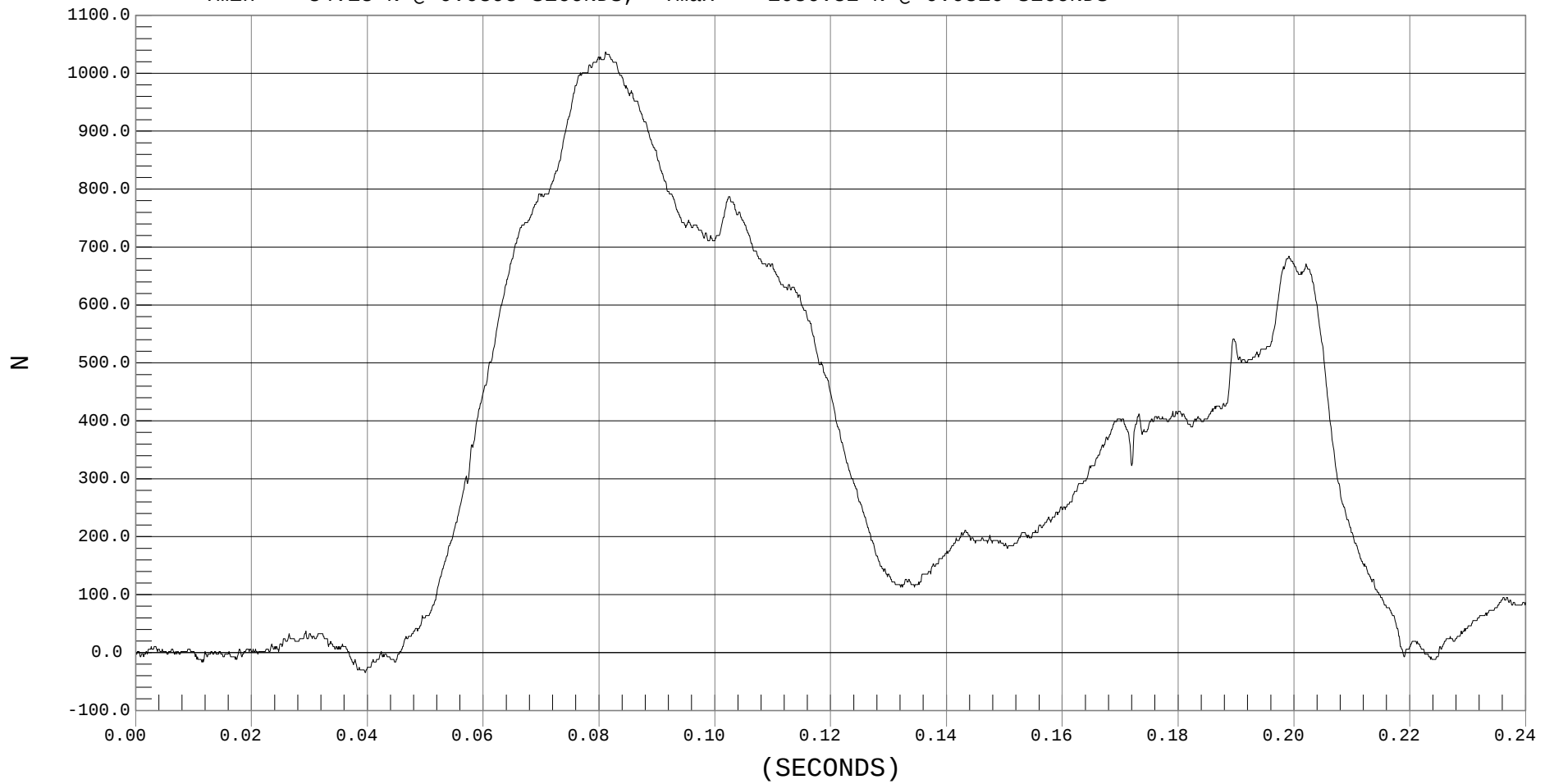
UPPER NECK FORCE Z

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 UPPER NECK FZ, H01264FT.F15

Ymin = -34.18 N @ 0.0395 SECONDS, Ymax = 1036.82 N @ 0.0810 SECONDS





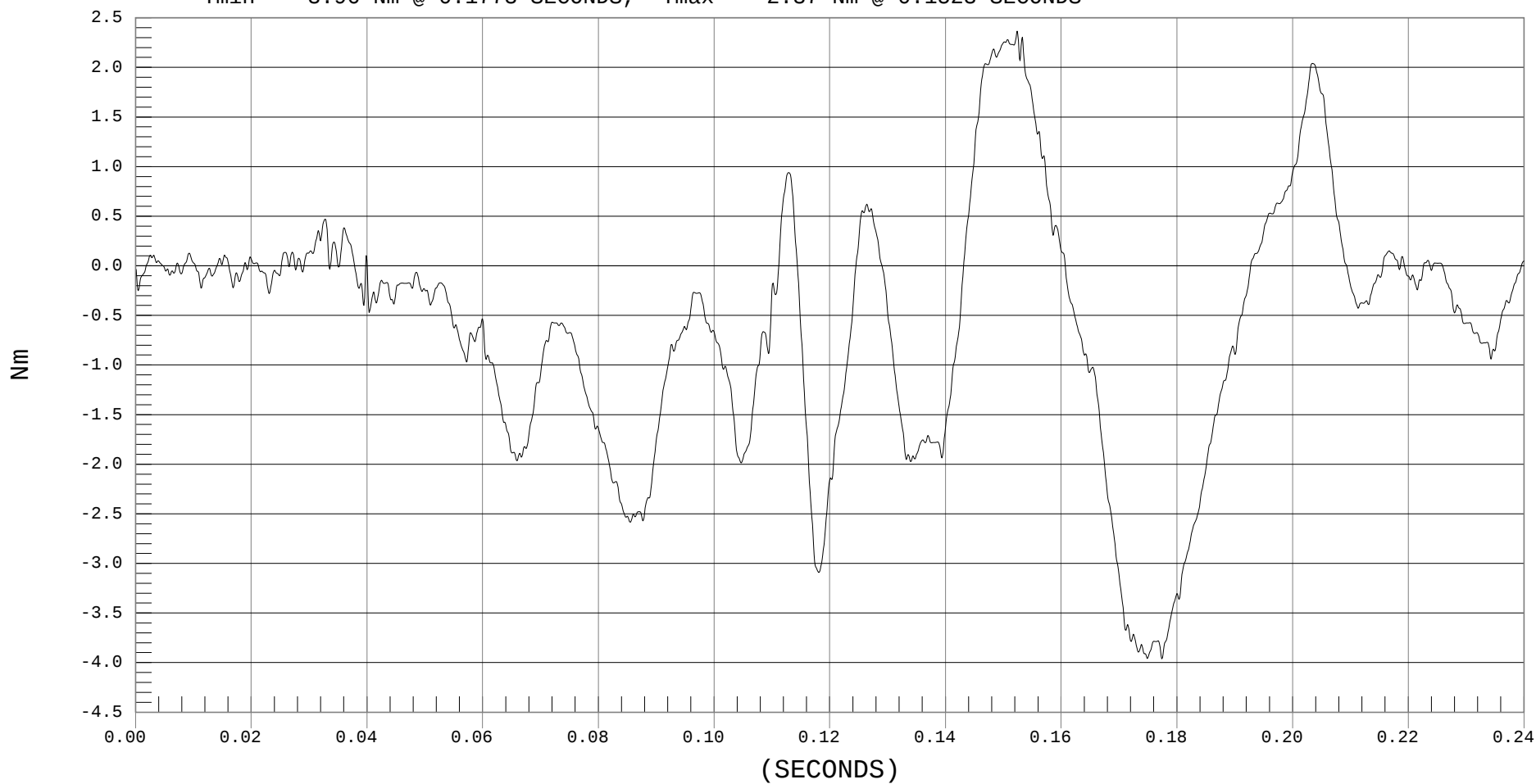
UPPER NECK MOMENT X

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

1 UPPER NECK MX, H01264MF.M16

Ymin = -3.96 Nm @ 0.1773 SECONDS, Ymax = 2.37 Nm @ 0.1523 SECONDS





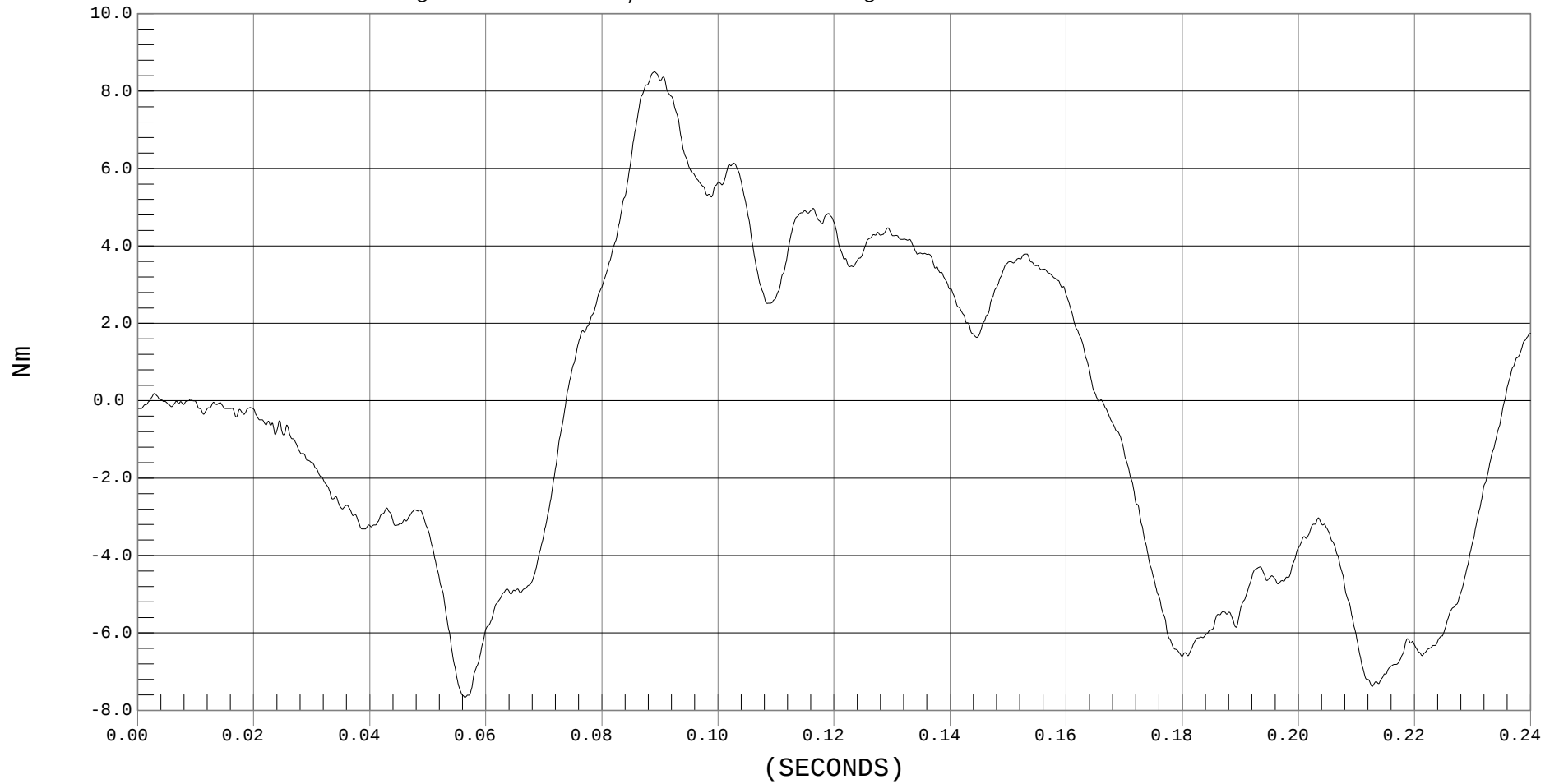
UPPER NECK MOMENT Y

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 UPPER NECK MY, H01264MF.M17

Ymin = -7.67 Nm @ 0.0563 SECONDS, Ymax = 8.5 Nm @ 0.0889 SECONDS





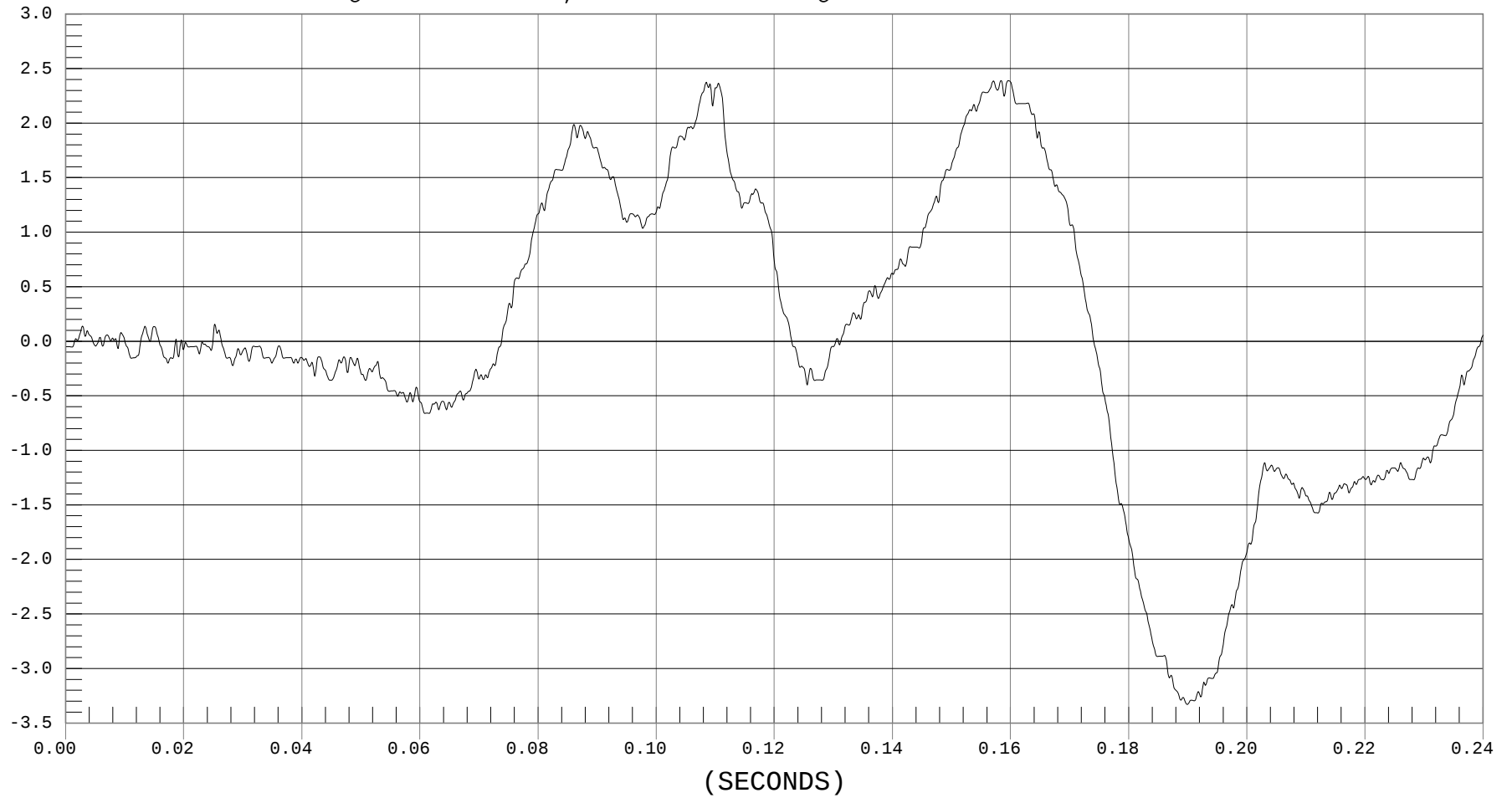
UPPER NECK MOMENT Z

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 UPPER NECK MZ, H01264MF.M18

Ymin = -3.33 Nm @ 0.1898 SECONDS, Ymax = 2.39 Nm @ 0.1583 SECONDS





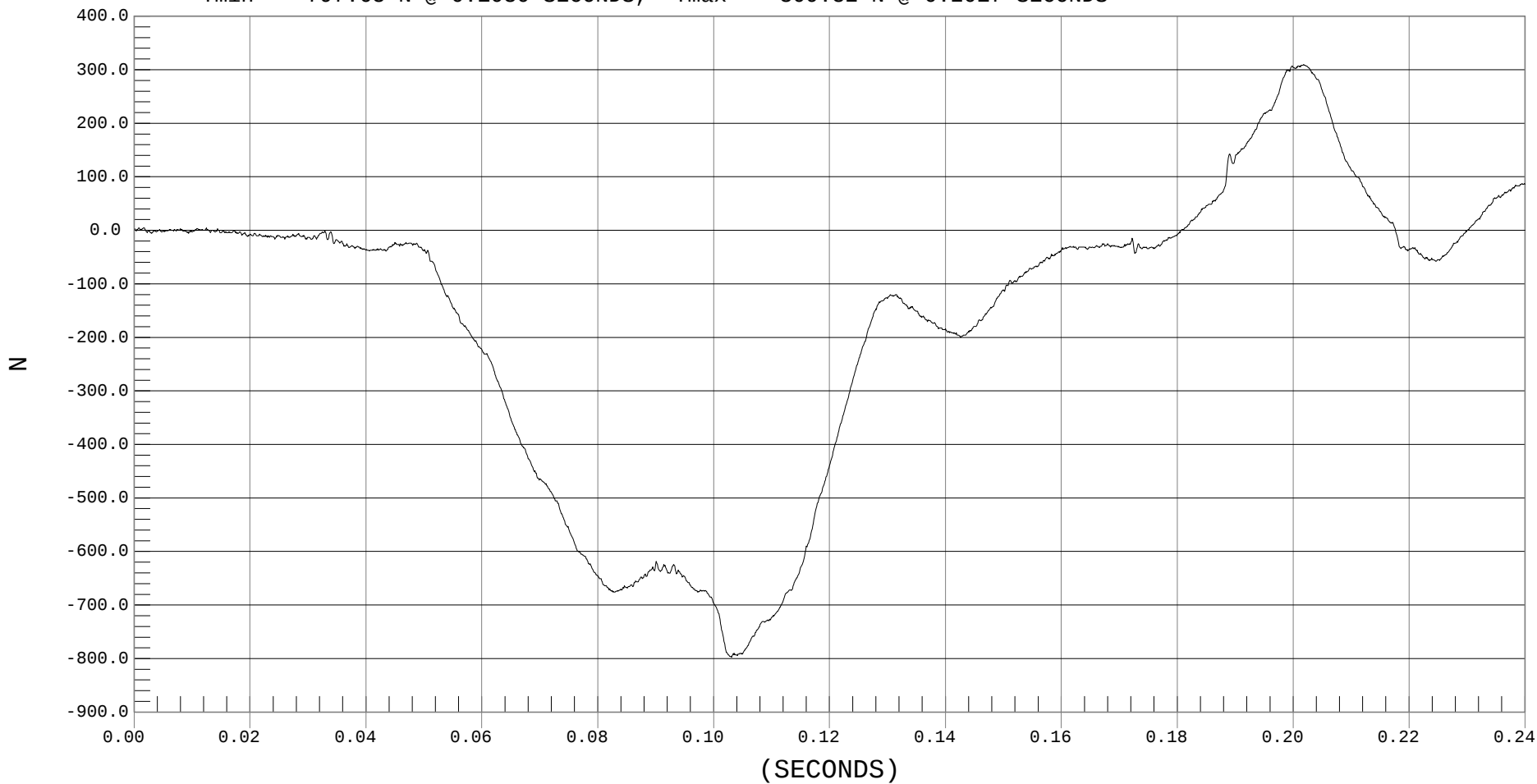
LOWER NECK FORCE X

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 LOWER NECK FX, H01264FT.F21

Ymin = -797.68 N @ 0.1030 SECONDS, Ymax = 309.82 N @ 0.2017 SECONDS





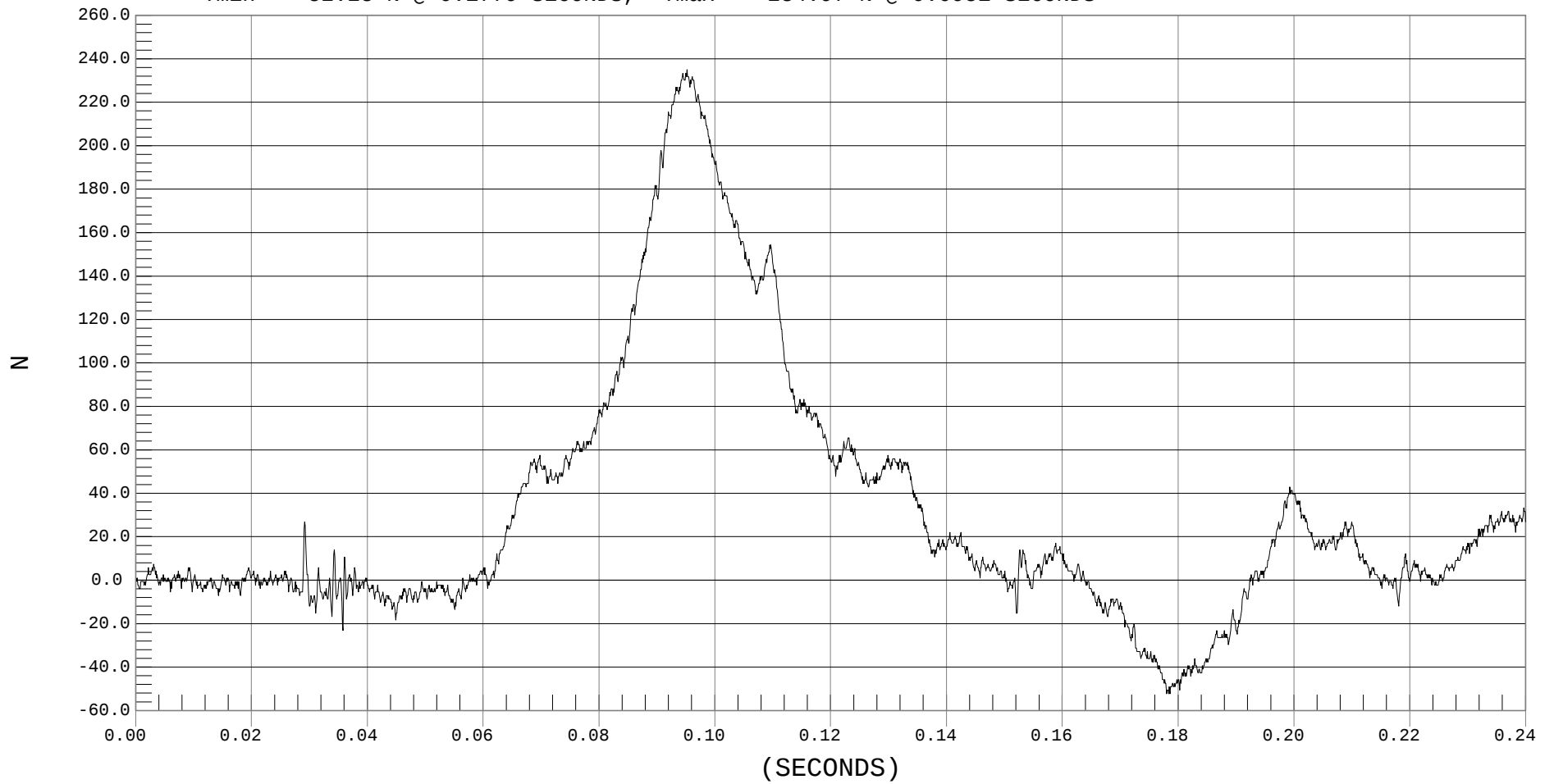
LOWER NECK FORCE Y

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 LOWER NECK FY, H01264FT.F22

Ymin = -52.28 N @ 0.1779 SECONDS, Ymax = 234.97 N @ 0.0951 SECONDS





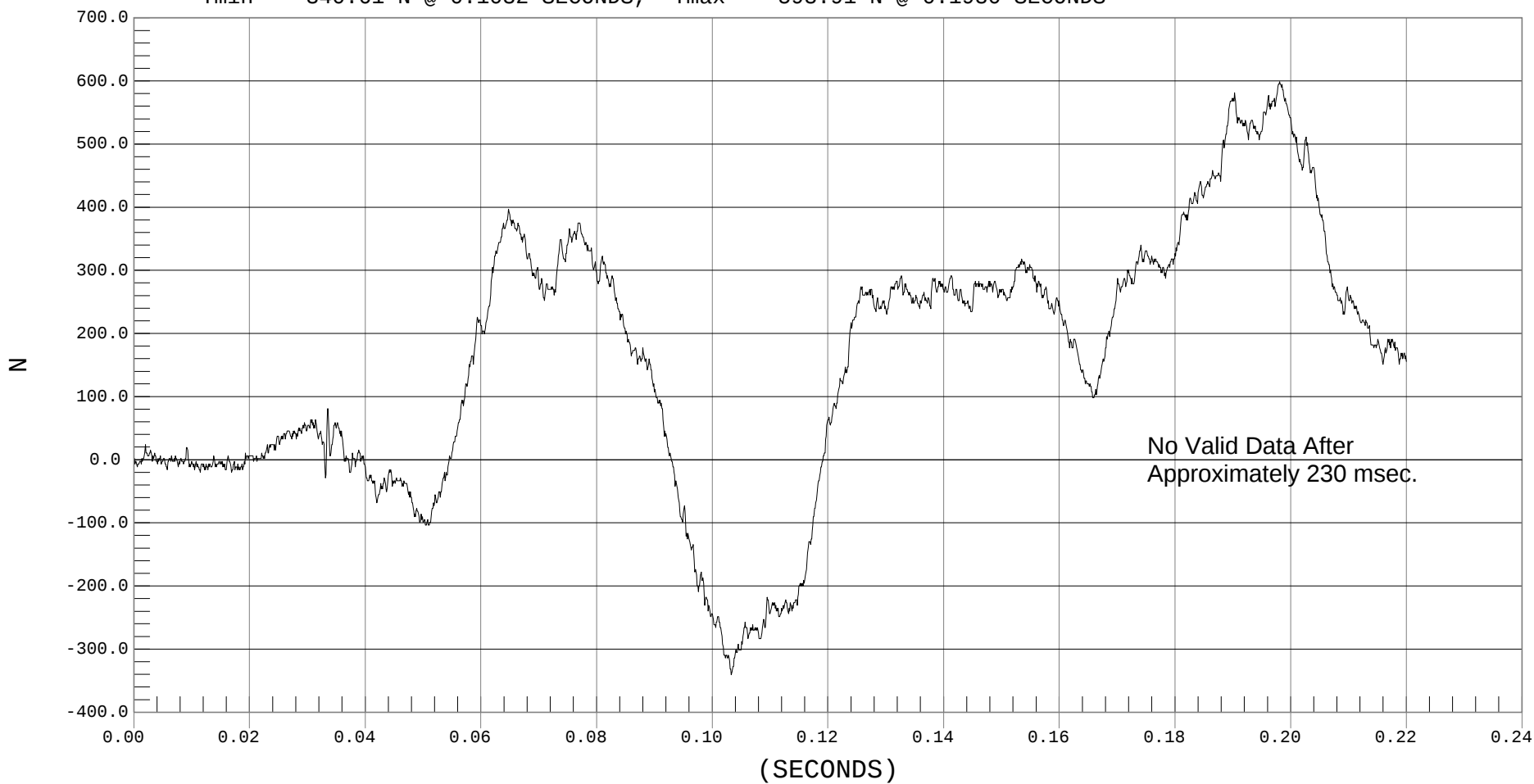
LOWER NECK FORCE Z

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 1000

— 1 LOWER NECK FZ, H01264FT.F23

Ymin = -340.61 N @ 0.1032 SECONDS, Ymax = 598.91 N @ 0.1980 SECONDS





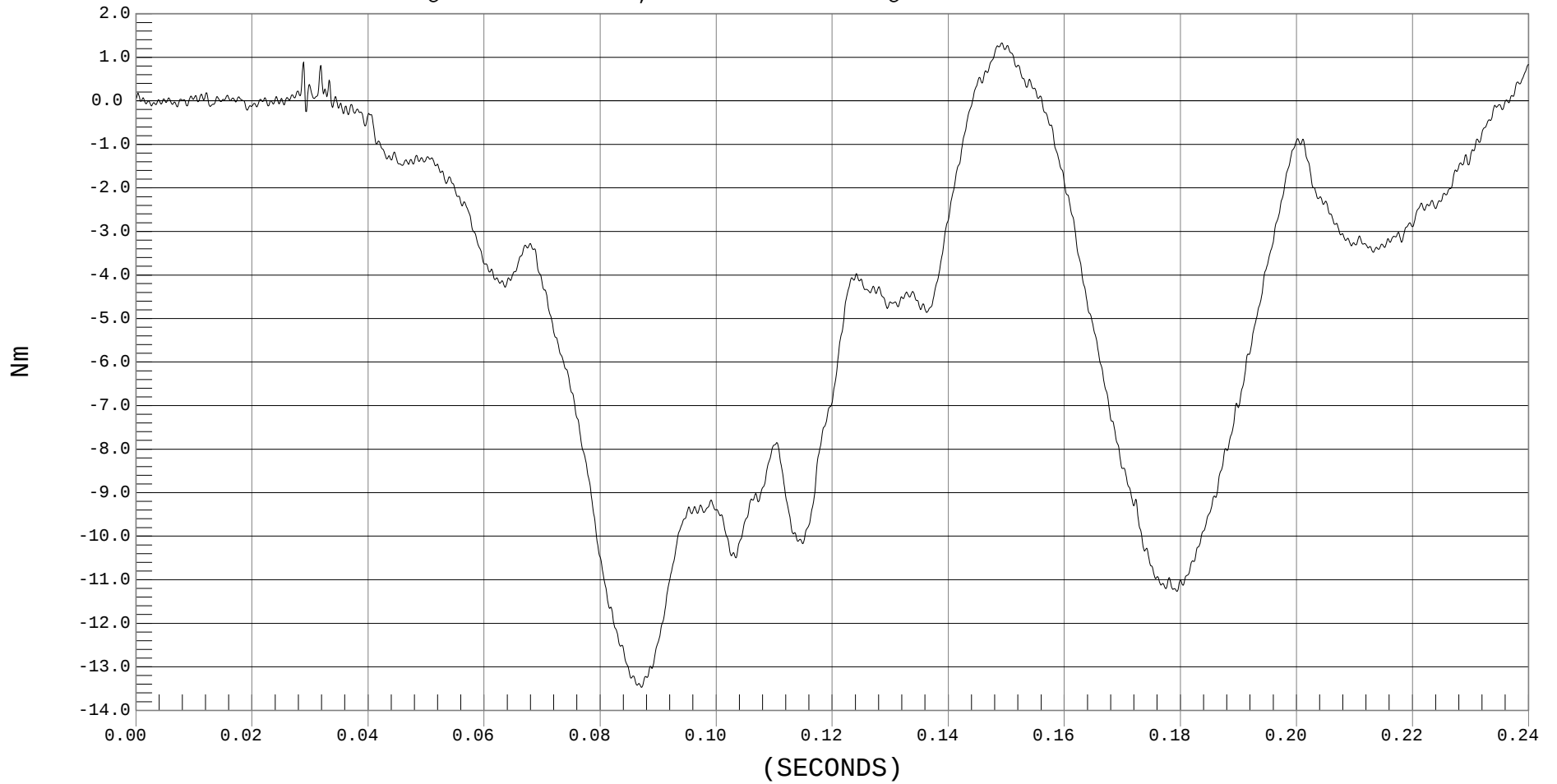
LOWER NECK MOMENT X

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 LOWER NECK MX, H01264MF.M24

Ymin = -13.47 Nm @ 0.0870 SECONDS, Ymax = 1.44 Nm @ 0.2447 SECONDS





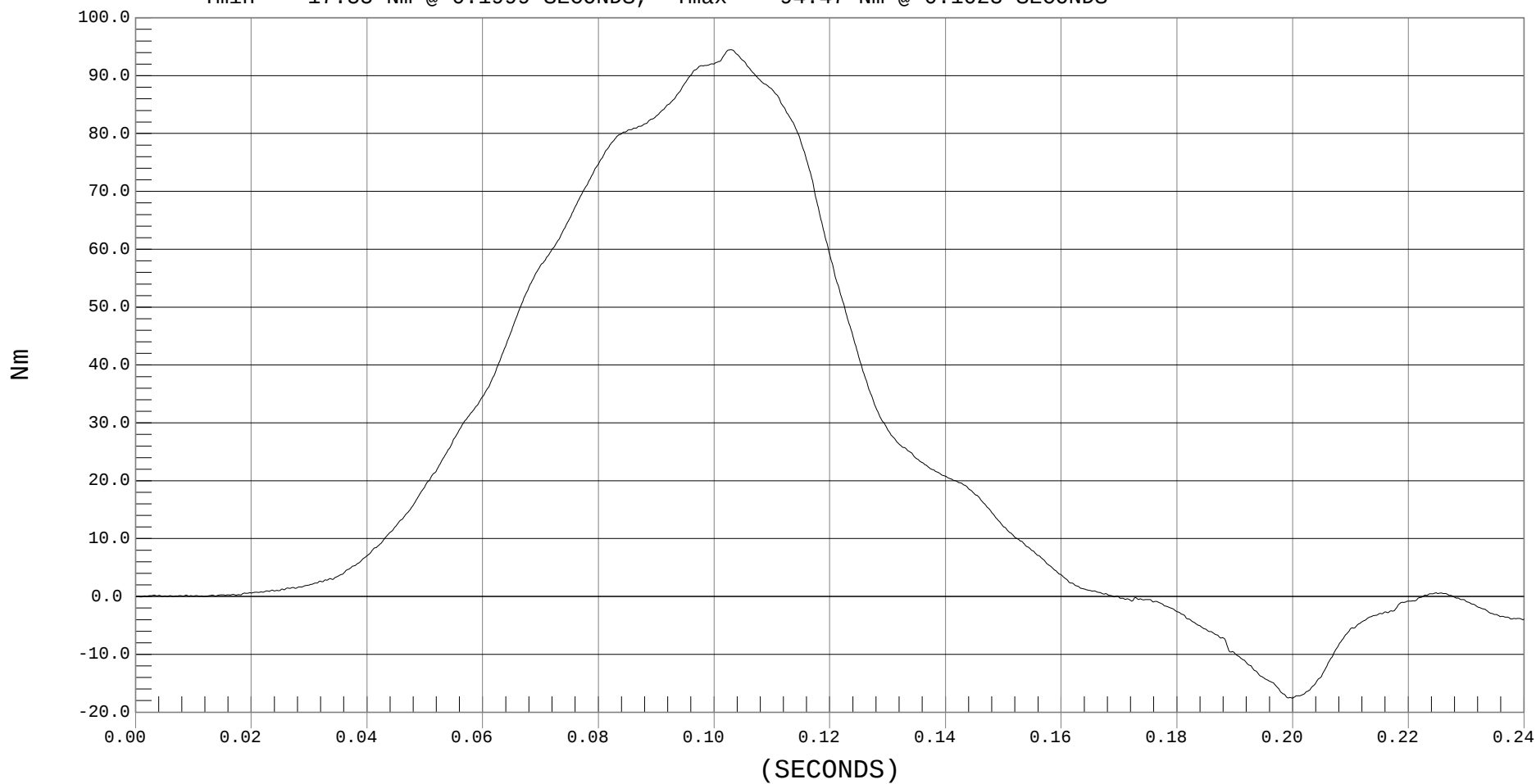
LOWER NECK MOMENT Y

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 LOWER NECK MY, H01264MF.M25

Ymin = -17.55 Nm @ 0.1999 SECONDS, Ymax = 94.47 Nm @ 0.1028 SECONDS





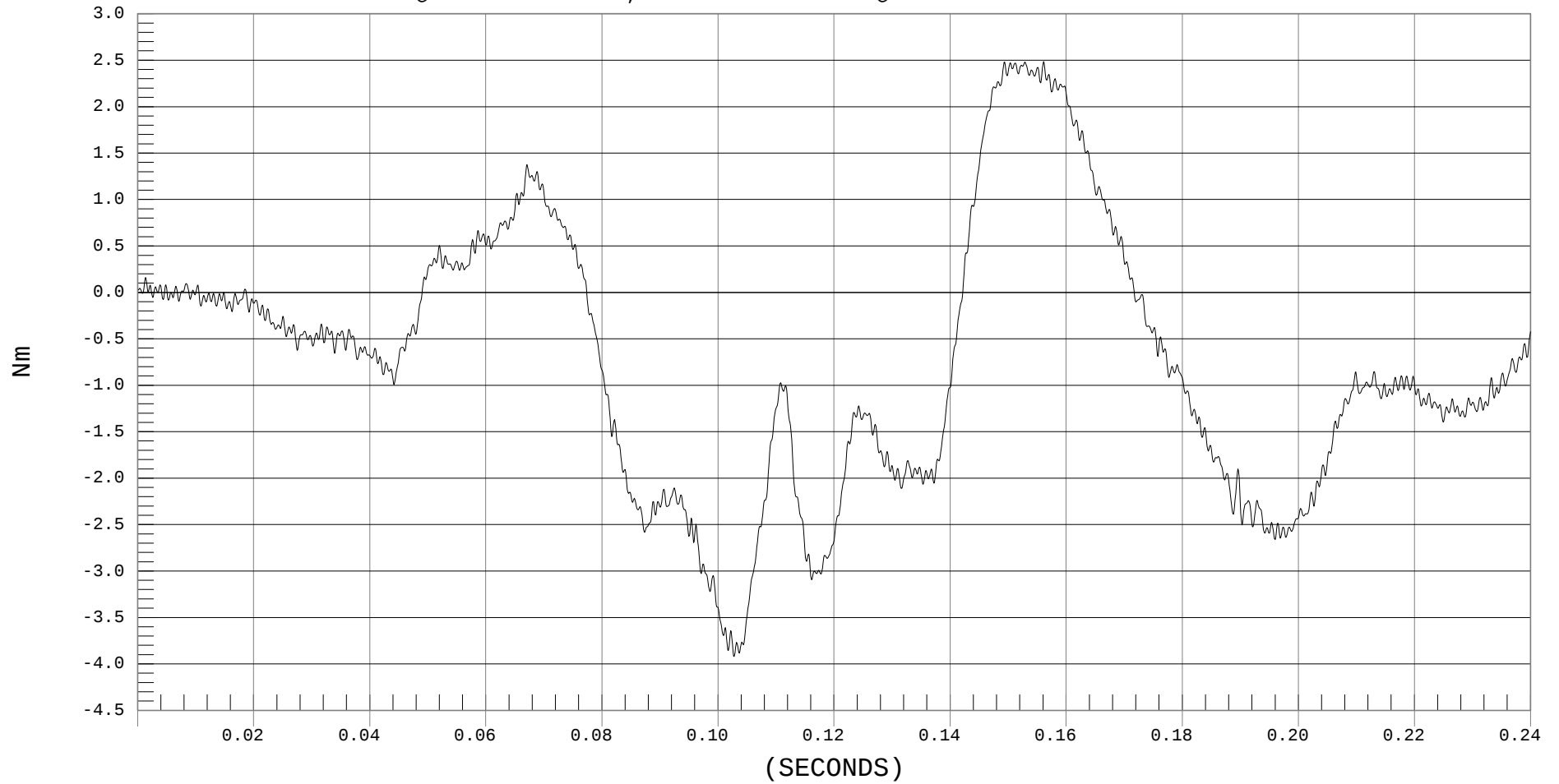
LOWER NECK MOMENT Z

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 600

— 1 LOWER NECK MZ, H01264MF.M26

Ymin = -3.92 Nm @ 0.1027 SECONDS, Ymax = 2.48 Nm @ 0.1560 SECONDS





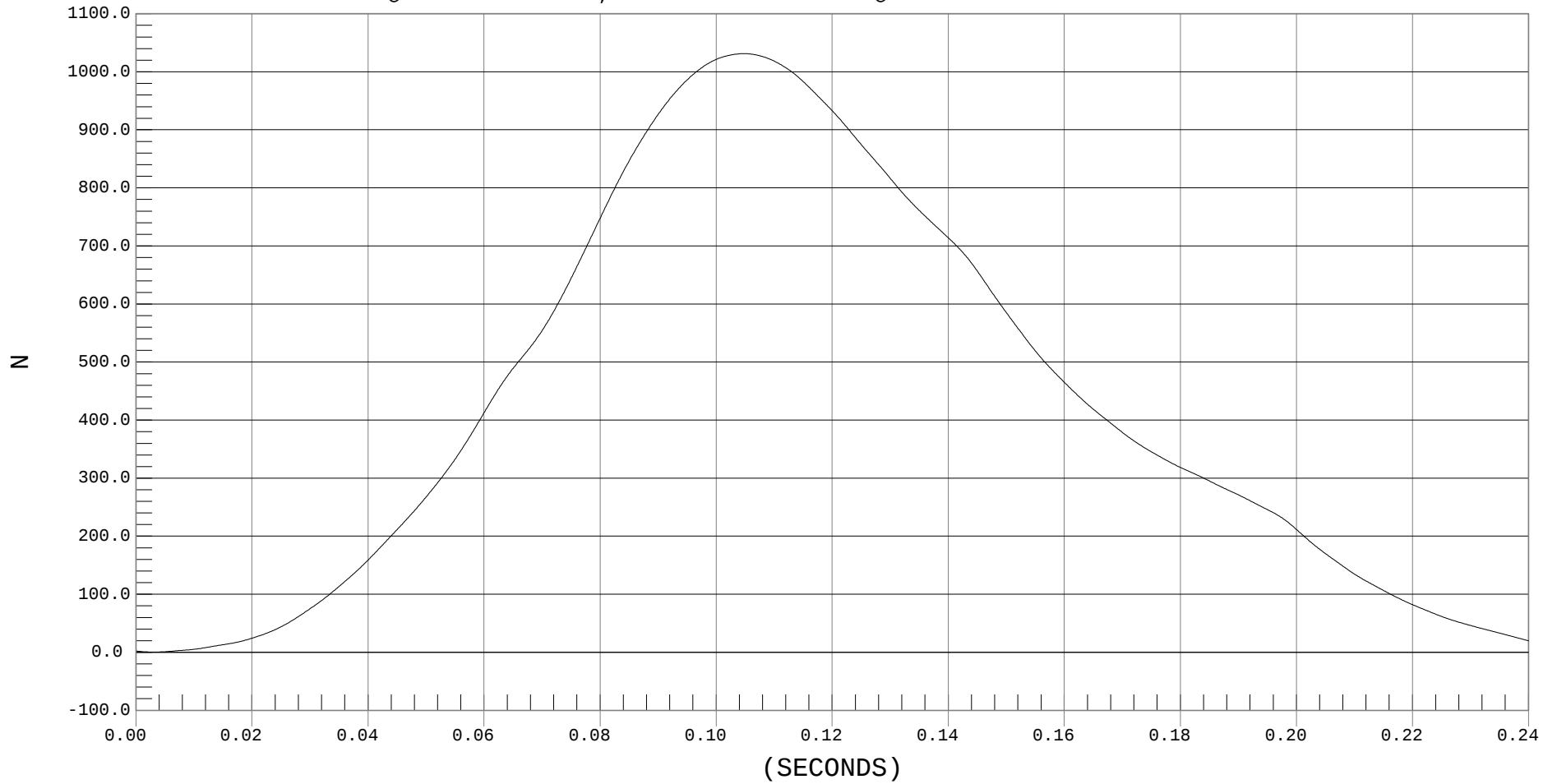
TETHER BELT FORCE

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 60

— 1 TETHER BELT, H01264FF.F19

Ymin = .34 N @ 0.0030 SECONDS, Ymax = 1031.29 N @ 0.1047 SECONDS





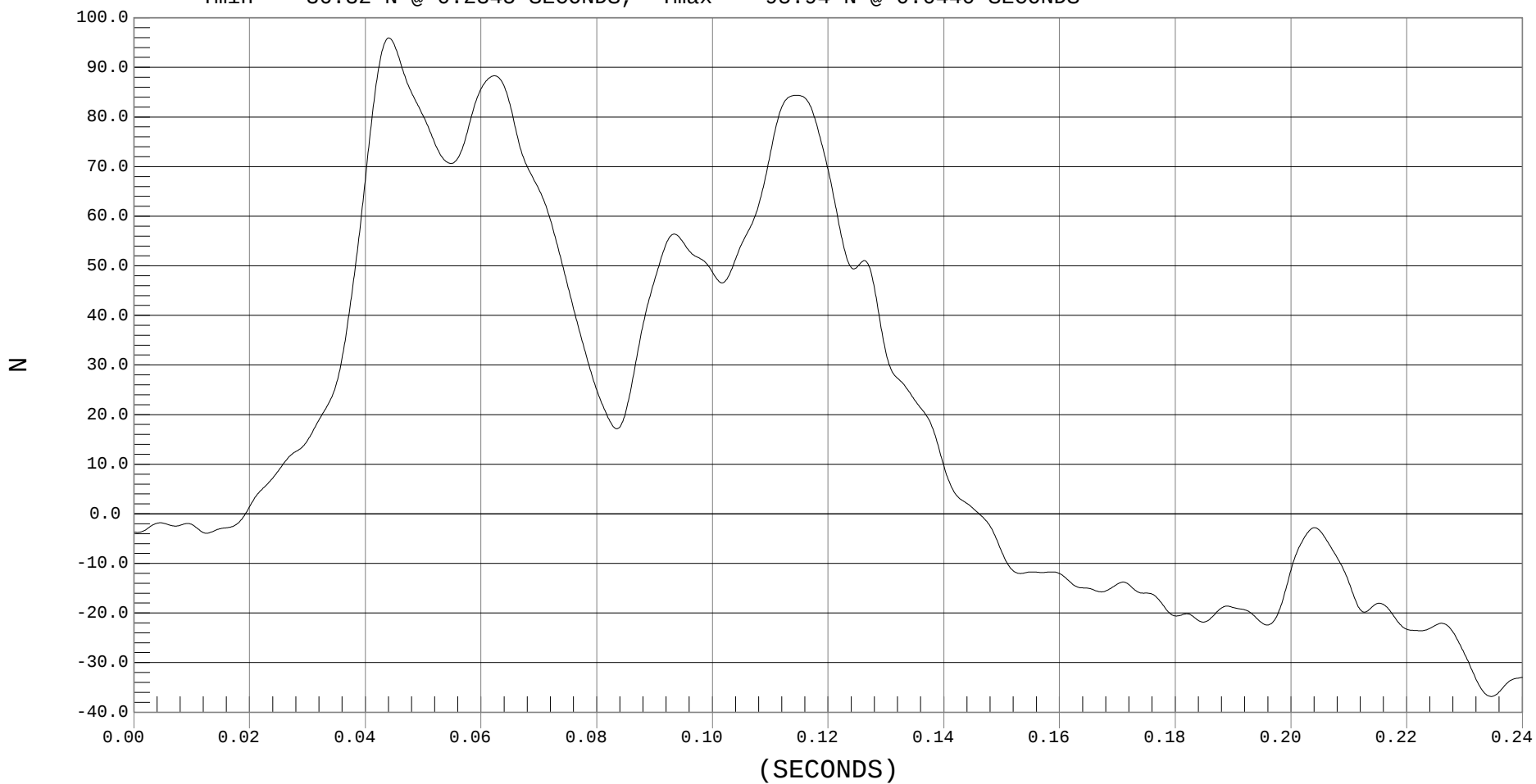
SHOULDER BELT FORCE

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 60

— 1 SHOULDER BELT, H01264FF.F31

Ymin = -36.82 N @ 0.2345 SECONDS, Ymax = 95.94 N @ 0.0440 SECONDS





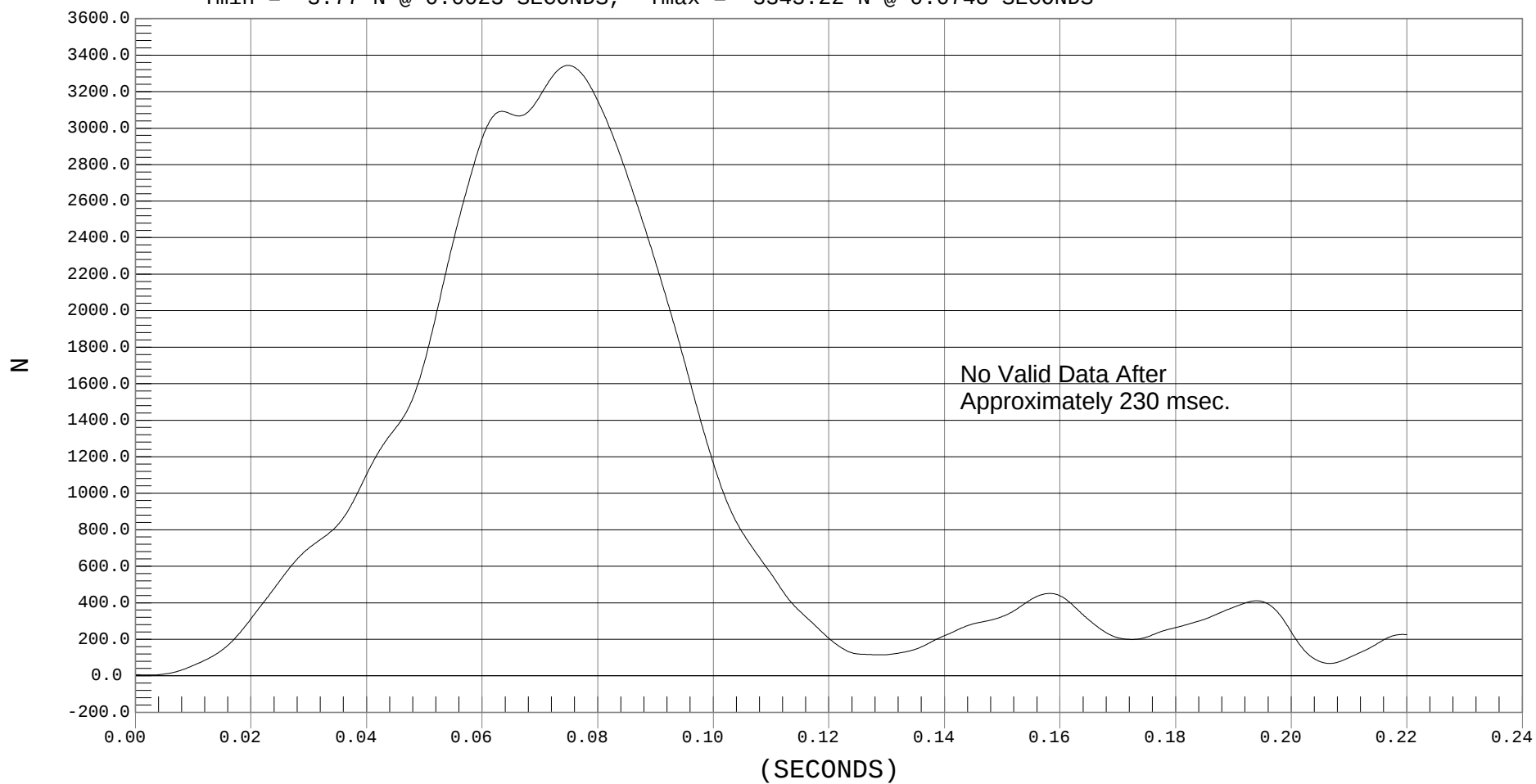
LAP BELT FORCE

Test Desc.: FMVSS 213 29 MPH (H01264)
Component: COSCO OLYMPIAN OVERHEAD SHIELD
Other Info:

Test Date: 08-20-01
Speed: 0.0 MPH, 0.0 KPH
Filter Class: 60

— 1 LAP BELT, H01264FF.F32

Ymin = 3.77 N @ 0.0023 SECONDS, Ymax = 3343.22 N @ 0.0748 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: _____



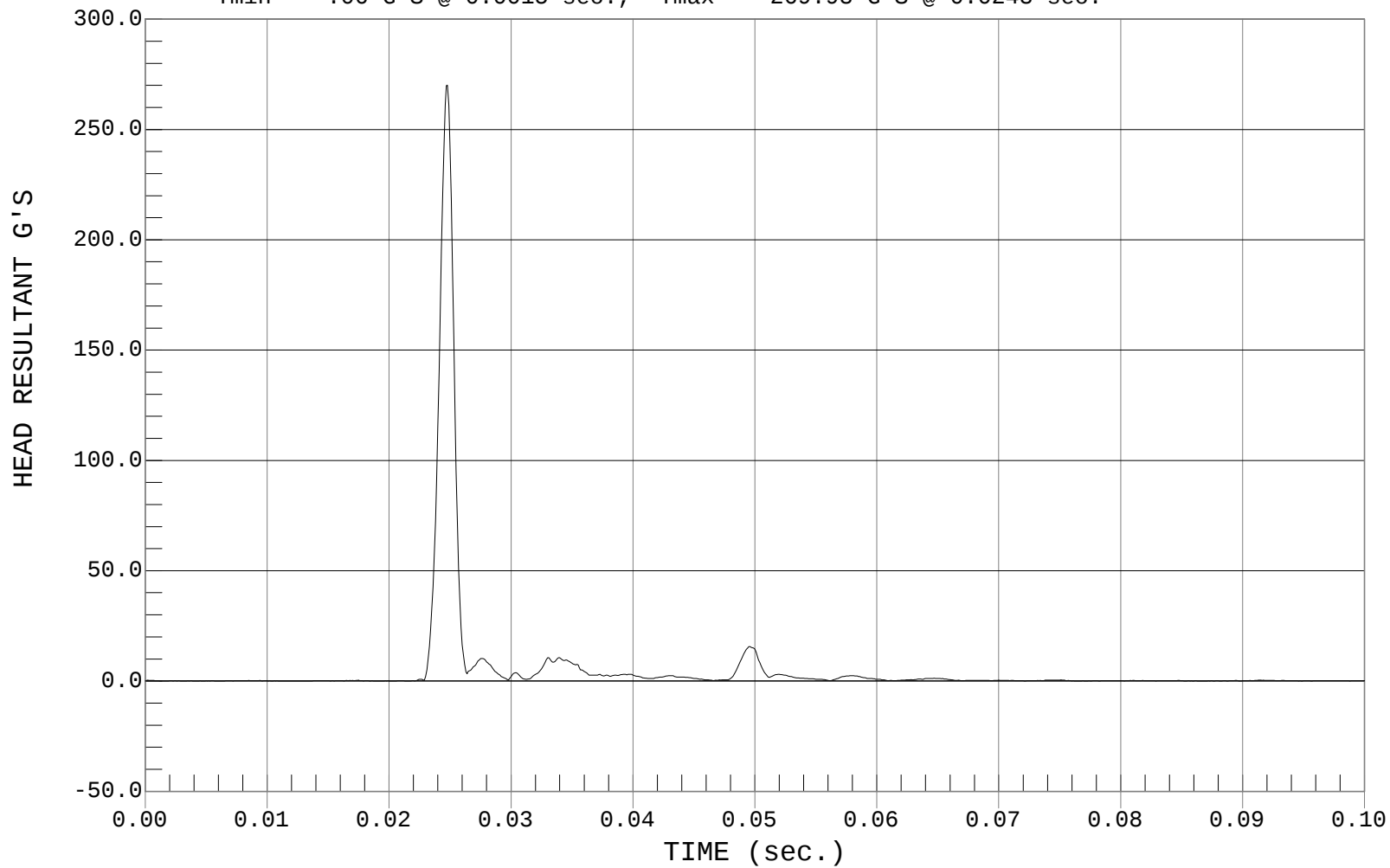
PEAK RESULTANT ACCELERATION

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.





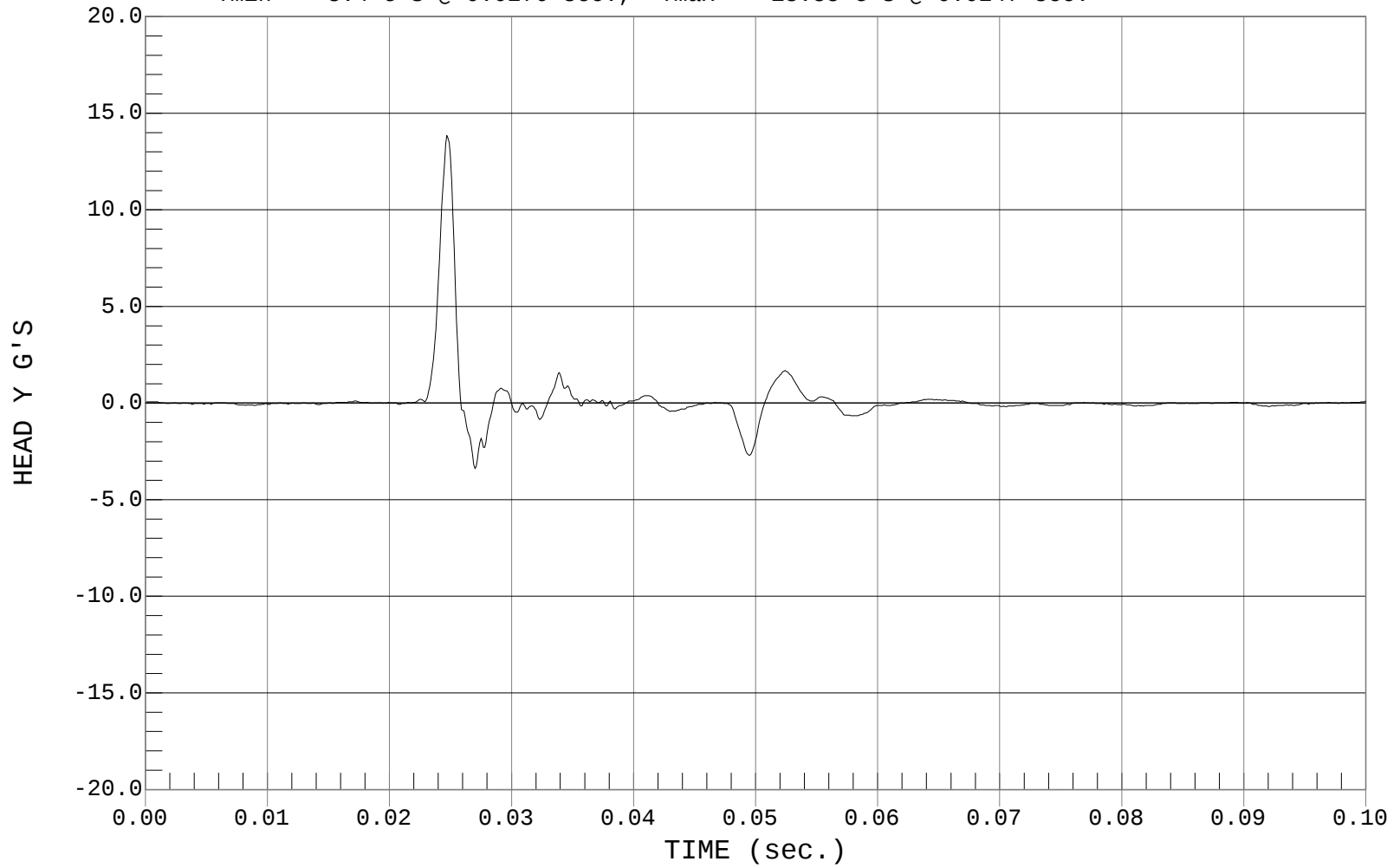
PEAK LATERAL ACCELARATION

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: _____



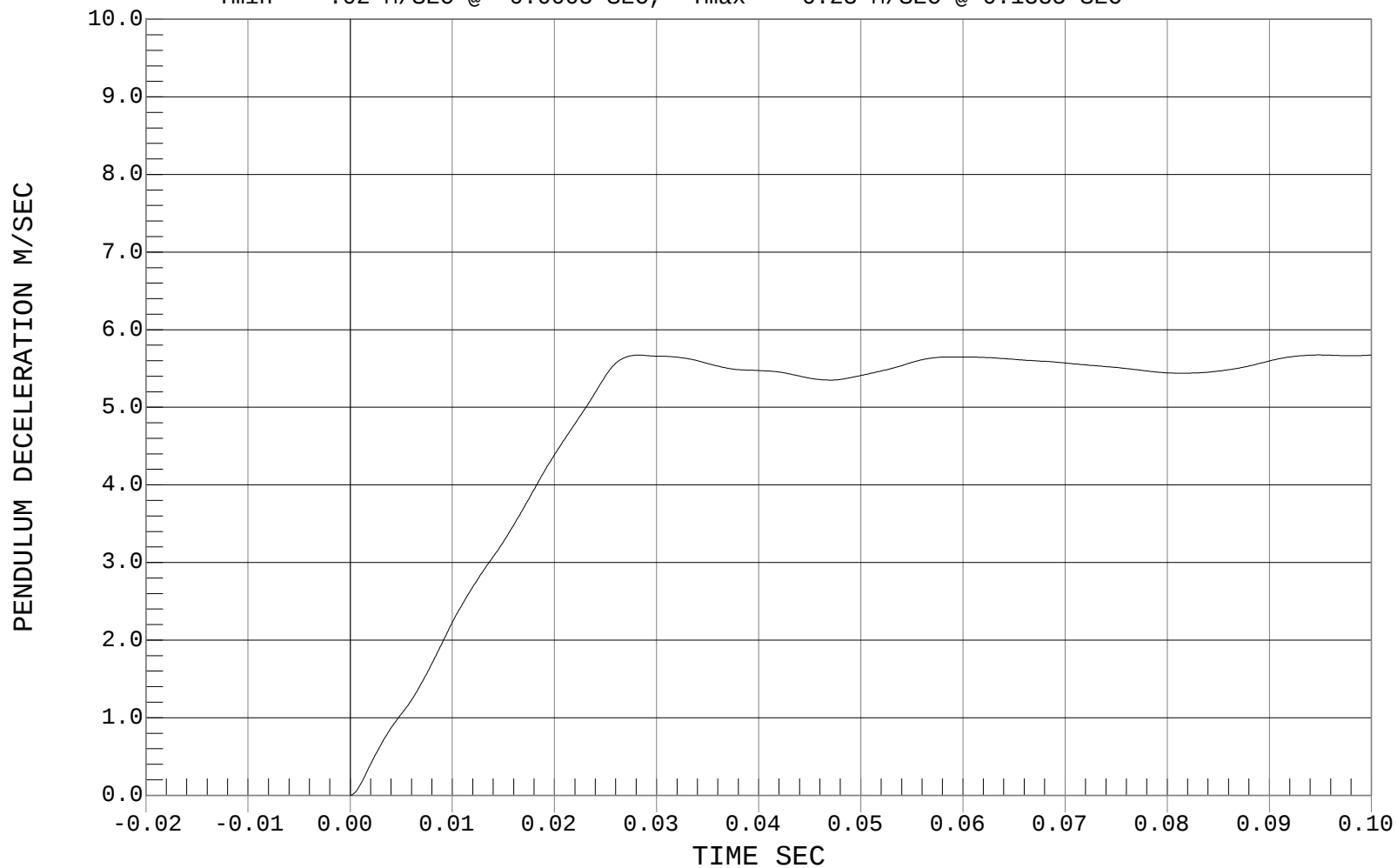
PENDULUM DECELERATION

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





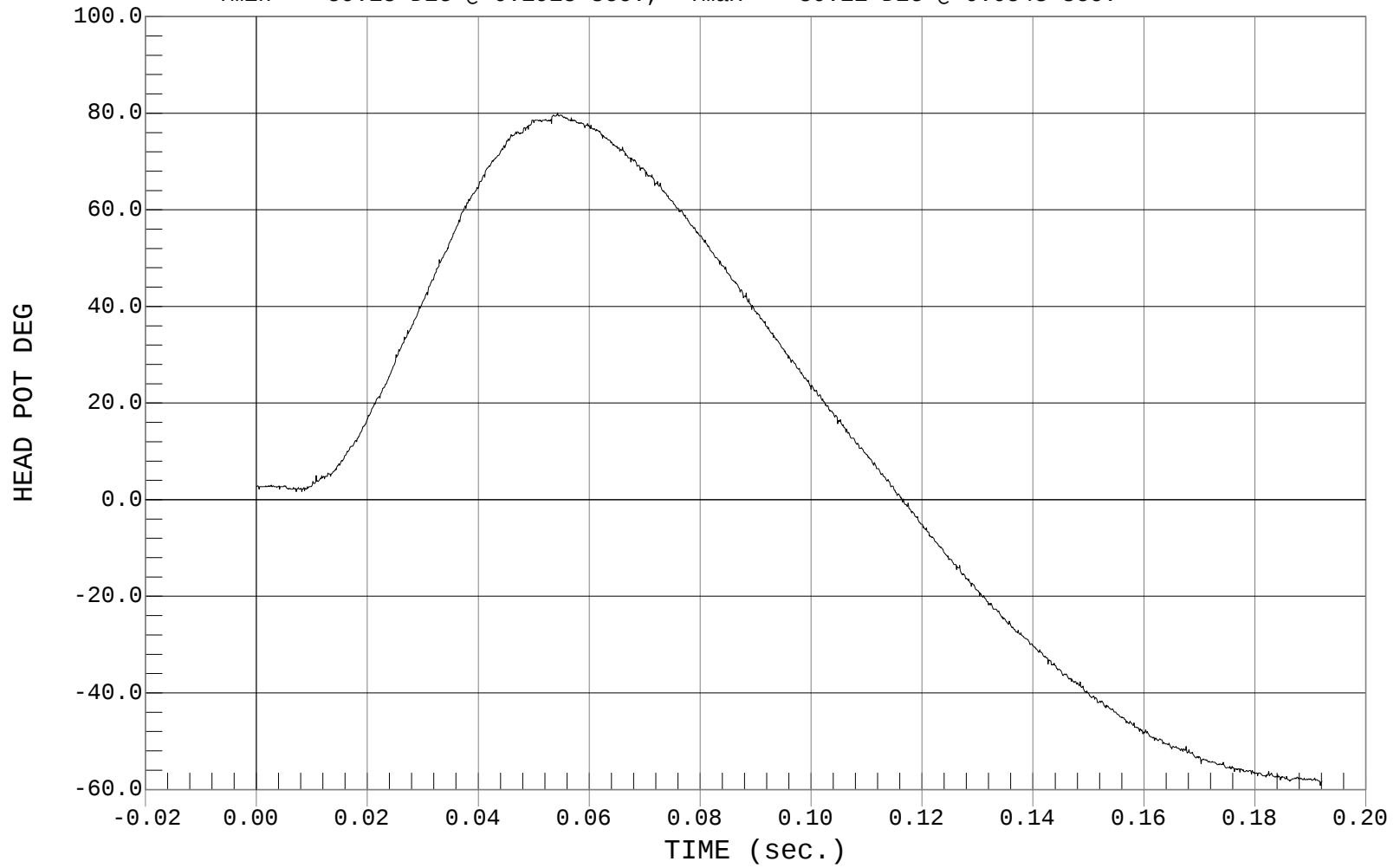
NECK ROTATION

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.





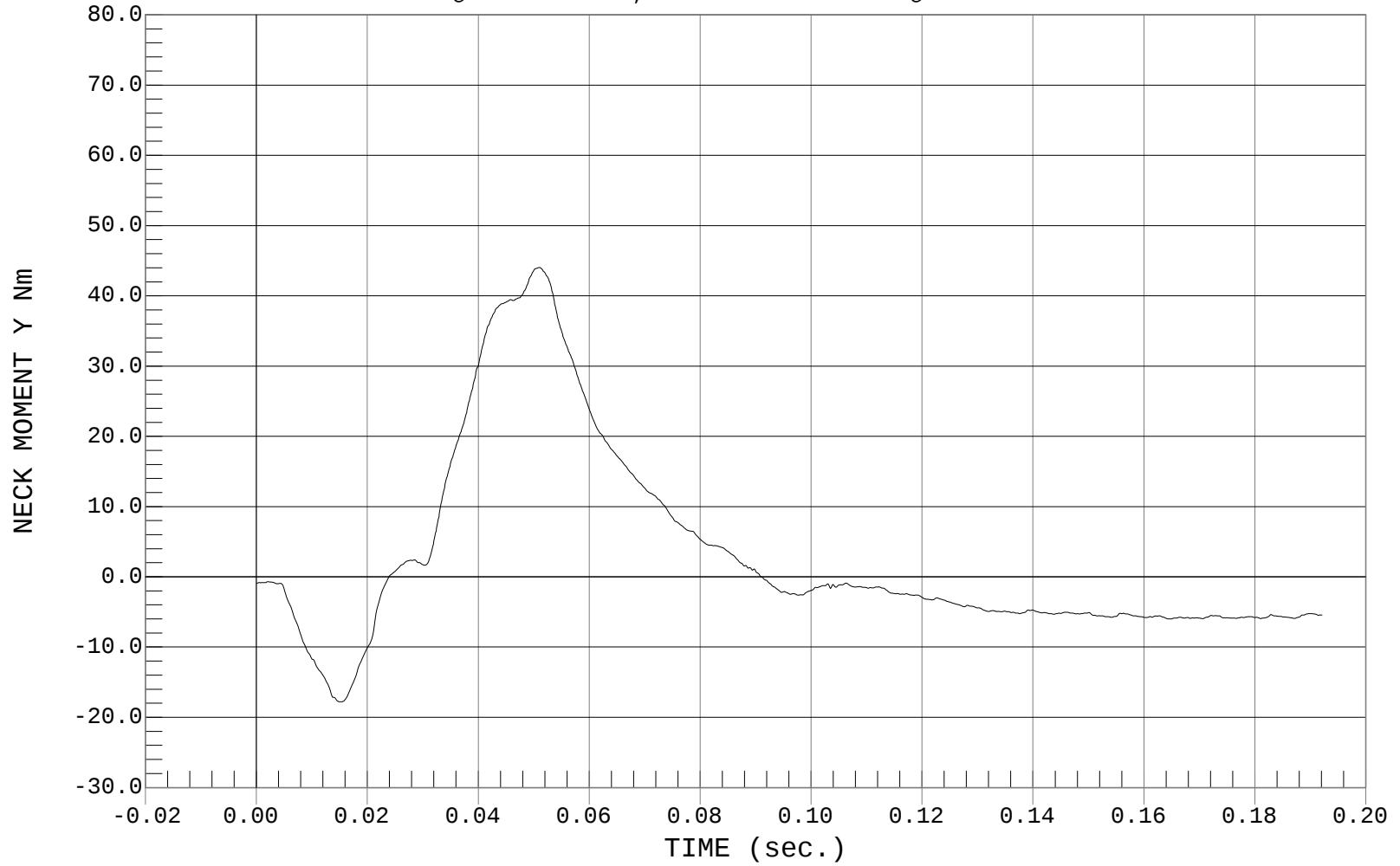
OCCIPITAL MOMENT

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: _____



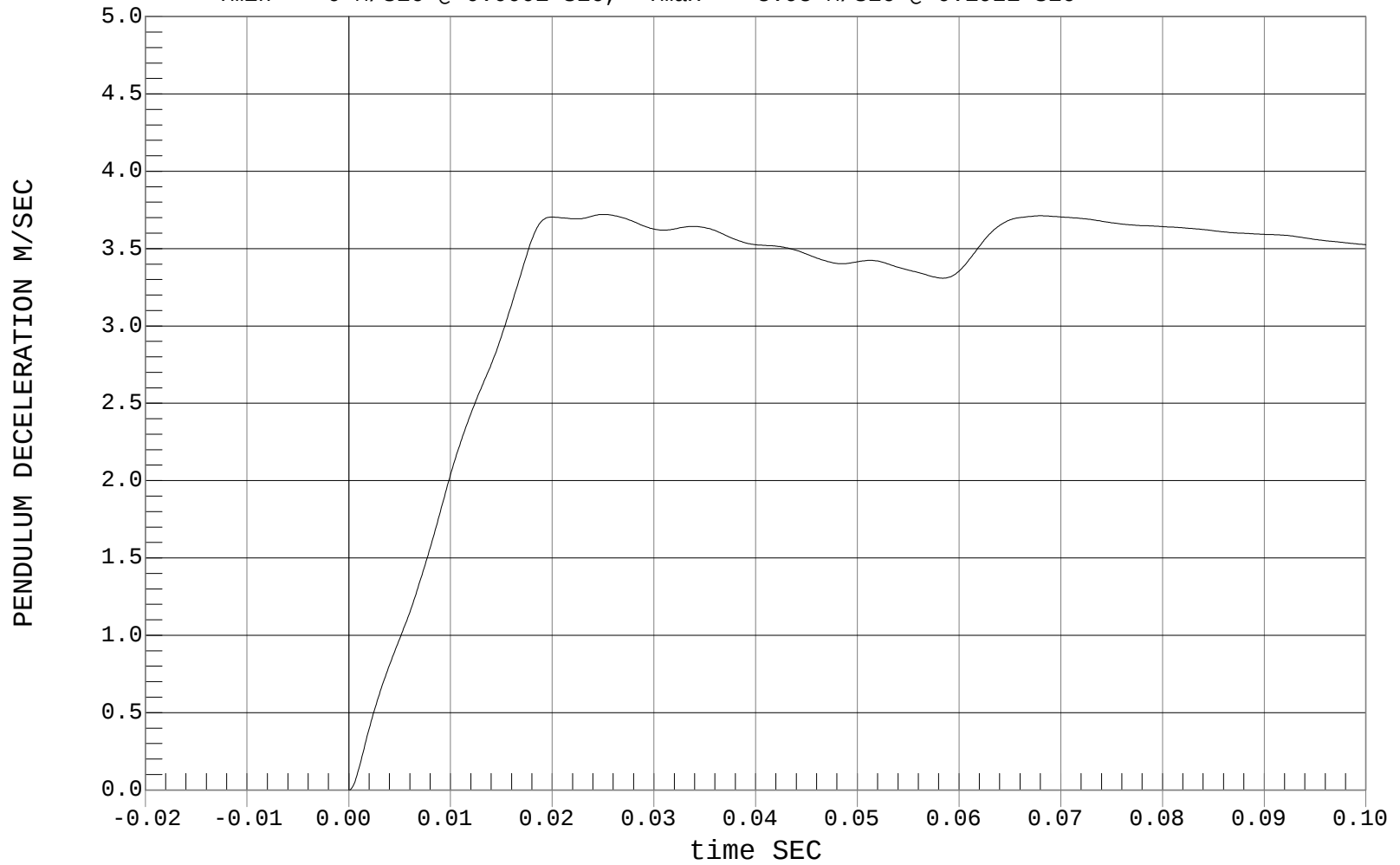
PENDULUM DECELERATION

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





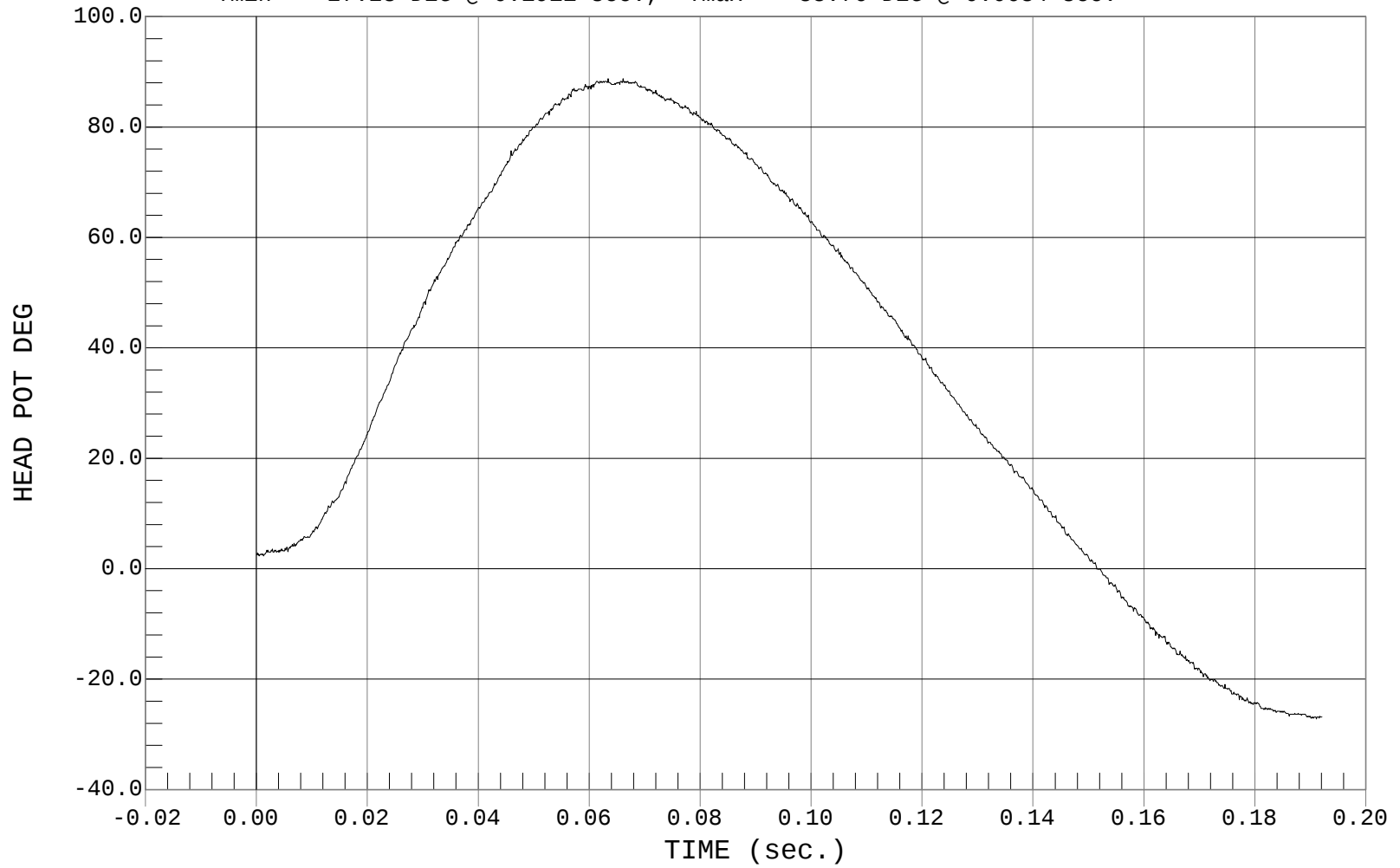
NECK ROTATION

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.





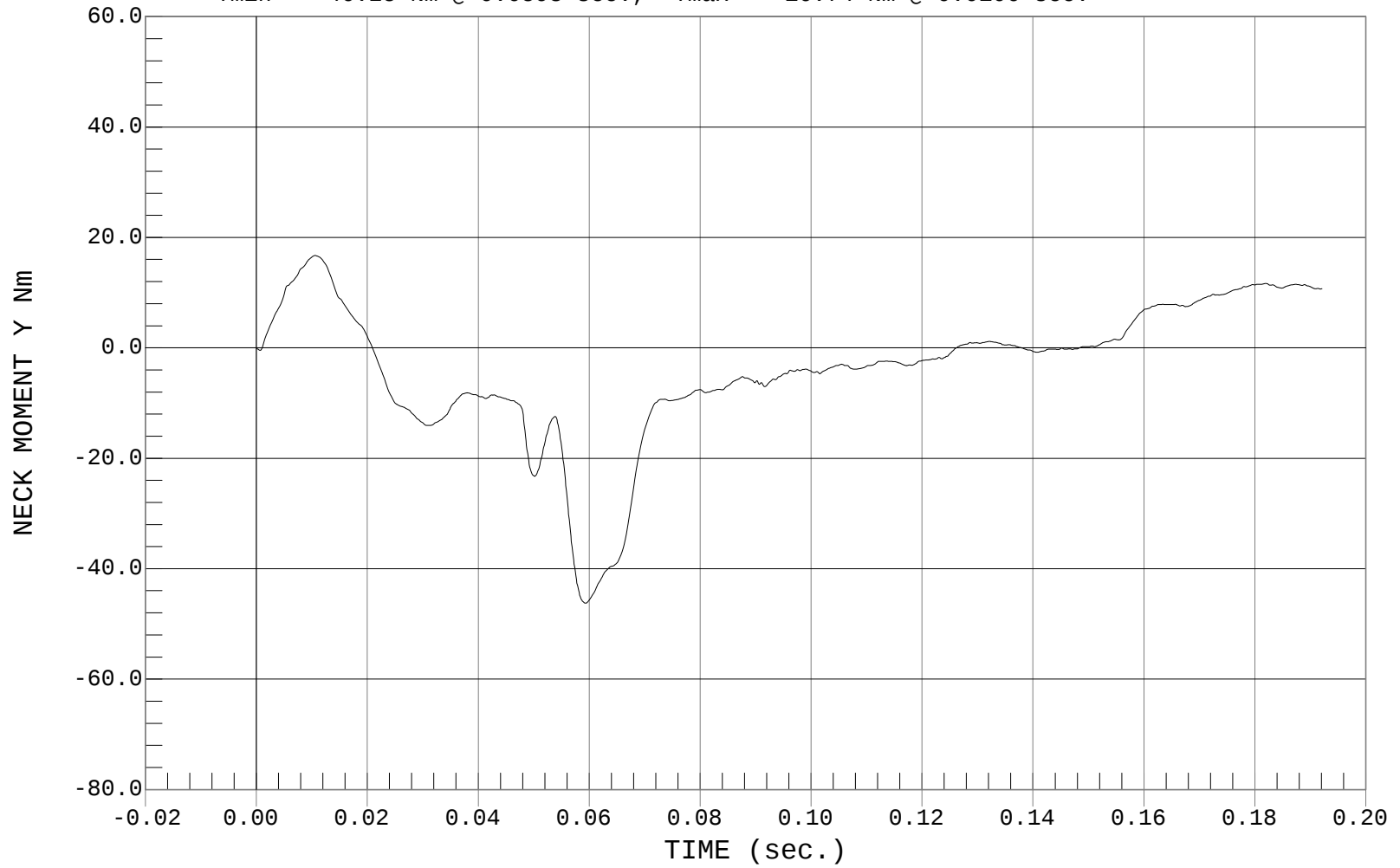
OCCIPITAL MOMENT

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: _____



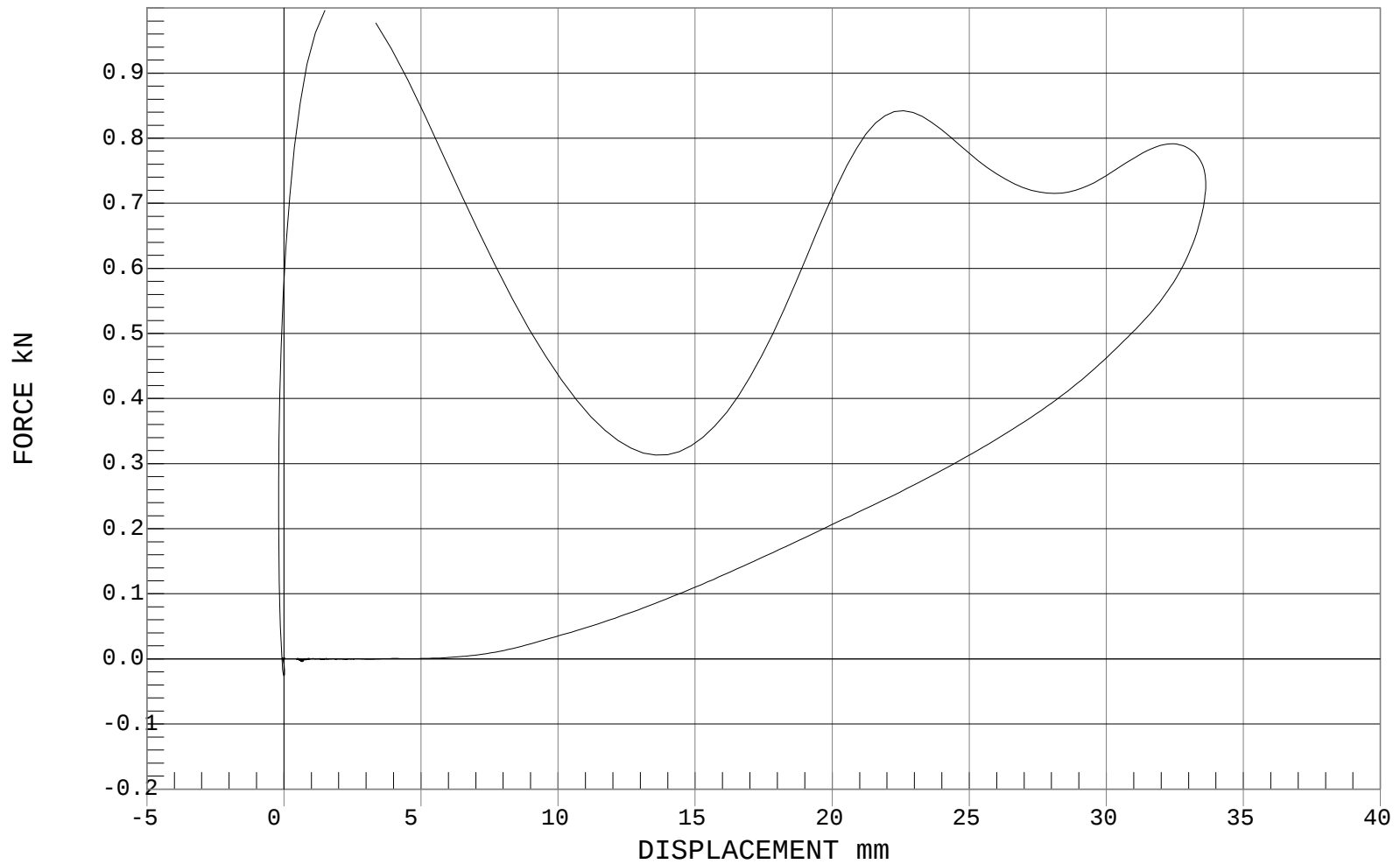
THORAX IMPACT

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