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REPORT NUMBER: 301-CAL-99-09

SAFETY COMPLIANCE TESTING FOR FMVSS 301
FUEL SYSTEM INTEGRITY

Mazda Motor Corporation
1999 Mazda Protege DX
4-door sedan

NHTSA NUMBER: CX5400

VERIDIAN TEST NUMBER: 8480-9

VERIDIAN ENGINEERING
P.O. BOX 400
BUFFALO, NEW YORK 14225

June 8, 1999

FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
ENFORCEMENT
Office of Vehicle Safety Compliance
400 Seventh Street, S. W.
Room No. 6115 (NEF-30)
Washington, DC 20590

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Approval Date: August 4, 1999

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Accepted By: _____

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15. Supplementary Notes

16. Abstract

Compliance tests were conducted on the subject 1999 Mazda Protege DX 4-door sedan in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301-01 for the determination of FMVSS 301 compliance. Test failures identified were as follows:

The test vehicle appeared to comply with all requirements of FMVSS 301 "Fuel System Integrity."

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Section 1

PURPOSE OF COMPLIANCE TEST

This 30 mph rear moving barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 301 Compliance Test Program conducted for the National Highway Traffic Safety Administration (NHTSA) by Veridian Engineering under Contract No. DTNH22-95-D-11000. The purpose of this test was to determine if the subject vehicle, a 1999 Mazda Protege DX 4-door sedan, meets the performance requirements of FMVSS No. 301, "Fuel System Integrity." This compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-301-01, dated March 28, 1994.

Section 2

COMPLIANCE TEST RESULTS SUMMARY

A 2889 pound 1999 Mazda Protege DX 4-door sedan was impacted from the rear by a 3961 pound moving barrier at a velocity of 29.8 mph. The test was performed by Veridian Engineering on June 8, 1999.

One instrumented Part 572 E and non-instrumented Part 572 B, 50th percentile male Anthropomorphic Test Device (ATD) were placed in the driver and right-front passenger seating positions respectively.

Average longitudinal crush was 14.8 inches. Pre- and post-test photographs of the vehicle can be found in appendix A.

The 13.2 gallon fuel tank was filled to 92 percent capacity with orange Stoddard fluid prior to the impact. After the impact, there was no fluid leakage for the first 30 minutes nor during any phase of the rollover test. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity." Section 3 presents the results of these tests.

The crash event was recorded by one real-time and eight high-speed cameras. Camera locations and other pertinent camera information are found on pages 3-9 and 3-10 of this report.

Table 1

CRASH TEST SUMMARY

Vehicle NHTSA No.: CX5400 Test Mode: 30 mph Rear Barrier

Test Date: June 8, 1999 Time: 15:10 Temperature : 79 °F

Vehicle Make/Model/Body Style: 1999 Mazda Protege DX 4-door sedan

Vehicle Test Weight: 2889 lbs Impact Velocity: 29.3 mph

Static Crush: Left Side = 14.5 inches

Right Side = 14.3 inches

Centerline = 15.6 inches

Average Crush: 14.8 inches

TYPE OF FRONT OCCUPANT RESTRAINT SYSTEM INSTALLED IN TEST VEHICLE:

Driver's DSP: Air Bag with 3 point belt system

Right Passenger's DSP: Air Bag with 3 point belt system

VISIBLE DUMMY CONTACT POINTS:

Driver: Rear of head with headrest.

Passenger: Rear of head with headrest

DOOR OPENING DATA: closed-operable - Left Front

closed-operable - Right Front

Stoddard Solvent Spillage from Vehicle's Fuel System: None

Remarks: Both front seatbacks reclined but not fully. Each upper seat bent and rotated inward creating a different angle at the top than the bottom. All doors opened but right rear was difficult. Rear window shattered. Air bags did not deploy.

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1999 Mazda Protege DX 4-door sedan

NHTSA No.: CX5400 ; VIN: JM1BJ2229X0114248 ; Color: sand mica

Engine Data: 4 cylinders; ____ CID; 1.6 Liters; ____ cc

Placement: ____ Longitudinal or In-Line; X Transverse or Lateral

Transmission Data: 5 speeds; X Manual; ____ Automatic; ____ Overdrive

Final Drive: ____ Rear Wheel Drive; X Front Wheel Drive; ____ Four Wheel Drive

Major Options: X A/C; X Pwr.Strg.; X Pwr. Brakes

____ Pwr. Windows; ____ Pwr. Door Locks; X Tilt Wheel

Date Received: 3/2/99 ; Odometer Reading 96 miles

Selling Dealer: Brown's Mazda

& Address: 7400 Richmond Highway, Alexandria, VA 22306

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Mazda Motor Corporation

Date of Manufacture: 9/98

GVWR: 3472 lbs.; GAWR: 1830 lbs. FRONT; 1653 lbs. REAR

DATA FROM TIRE PLACARD:

Location of Placard on Vehicle: Left front door

Tire Pressure with Maximum Capacity Vehicle Load: 32 psi FRONT 32 psi REAR

Recommended Tire Size: P185/65R14 85S

* Recommended Cold Tire Pressure: 32 psi FRONT; 32 psi REAR

Size of Tires on Test Vehicle: P185/65R14 85S

Type of Spare Tire: temporary

Vehicle Capacity Data:

Type of Front Seats: ____ Bench; X Bucket; ____ Split Bench

Number of Occupants: 2 Front; 3 Rear; 5 Total

Vehicle Capacity Weight (VCW) = 850 lbs.

No. of Occupants x 150 lbs. = 750 lbs.

Rated Cargo/Luggage Weight (RCLW) = 100

*Tire pressure used for test

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids)= UDW:

Right Front =	750 lbs.	Right Rear =	485 lbs.
Left Front =	752 lbs.	Left Rear =	489 lbs.
TOTAL FRONT =	1,502 lbs.	TOTAL REAR =	974 lbs.

TOTAL DELIVERED WEIGHT = 2,476 lbs.

% of Total Front of Vehicle Weight = 61 % of Total Rear Weight = 39 %

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight =	2,476 lbs.
Rated Cargo/Luggage Weight (RCLW) =	100 lbs.
Weight of 2 p.572 Dummies, 167 & 164 lbs =	331 lbs.
TARGET TEST WEIGHT =	2,907 lbs.

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 82 POUNDS OF CARGO WEIGHT:

Right Front =	870 lbs.	Right Rear =	573 lbs.
Left Front =	861 lbs.	Left Rear =	585 lbs.
TOTAL FRONT =	1,731 lbs.	TOTAL REAR =	1,158 lbs.

TOTAL TEST WEIGHT = 2,889.0 lbs.

% of Total Front Weight = 59.9 % % of Total Rear Weight = 40.1 %

* Weight of Ballast Secured in Vehicle Trunk Area = 0 lbs.

Type of Ballast: none

Method of Securing Ballast: not applicable

Vehicle Components Removed for Weight Reduction: none

VEHICLE ATTITUDE (all dimension in inches):

AS DELIVERED:	RF	29.9	LF	25.9	RR	25.9	LR	25.9
AS TESTED:	RF	25.2	LF	25.3	RR	25.4	LR	25.4

Vehicle's Wheel Base: 102.5 in.

Location of Vehicle's C.G.: 41.1 inches rearward of front wheel center.

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual = 13.2 gallons

Usable Capacity Figure Furnished by COTR = 50 liters gallons

Test Volume Range (91 to 94% of Usable Capacity) = 12.0 to 12.4 gallons

ACTUAL TEST VOLUME= 12.1 gallons (with entire fuel system filled)

* Ballast weight includes the RCLW, the weight of drained vehicle fluids and the weight of any removed vehicle components less the weight of onboard instrumentation, cameras, and hardware.

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)

FUEL SYSTEM DATA (continued):

Test Fluid Type: Stoddard Solution

Test Fluid Specific Gravity: 0.764

Test Fluid Kinematic Viscosity: 0.96 centistokes

Test Fluid Color: Orange ("red" is preferred)

Type of Vehicle Fuel Pump: Electric

Electric Fuel Pump Operation with Ignition Switch ON and Engine OFF - Fuel pump operated.

Details of Fuel System: Fuel filler in left rear quarter panel. Fuel lines run along left inside frame rail. Fuel tank lcated in front of rear "axle" and centered laterally.

Table 3

MOVING BARRIER PARAMETER DATA

WEIGHT OF MOVING BARRIER:

Right Front =	1113 lbs.	Right Rear =	868 lbs.
Left Front =	1102 lbs.	Left Rear =	878 lbs.
TOTAL FRONT =	2,215 lbs.	TOTAL REAR =	1,746 lbs.

TOTAL BARRIER WEIGHT = 3,961 lbs.

MOVING BARRIER DIMENSIONS:

Barrier Face Height: 60.0 in.

Barrier Face Width: 78.0 in.

Barrier Face Ground Clearance: 5.0 in.

Tread Width: 59.5 in.

Wheel Base: 120.0 in.

Location of C.G.:

X: 52.9 inches rearward of front wheel center.

Y: 0.0 inches from longitudinal-vertical plane of symmetry.

Z: 16.3 inches above ground.

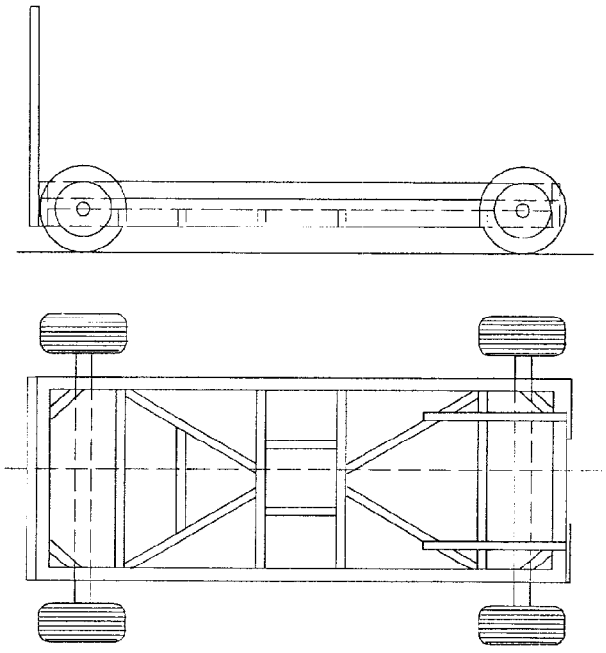


Table 4

POST IMPACT DATA

TYPE OF TEST:

Type of Test: Rear Barrier Impact Angle: 0°

Test Date: June 8, 1999 Time: 15:10 Temperature: 79 °F

Vehicle NHTSA No.: CX5400

Required Impact Velocity Range: 28.9 to 29.9 mph

BARRIER IMPACT VELOCITY: (Speed traps within 5 feet of impact plane.)

Trap No. 1 = 29.8 mph; Trap No. 2 = 29.8 mph

Average Impact Speed = 0.0 mph

VEHICLE STATIC CRUSH: (For frontal and rear impacts only.)

Vehicle Length:

Pre-Test	Right =	170.7	; C/L =	174.7	;Left =	170.6
Post-Test	Right =	156.4	; C/L =	159.1	;Left =	156.1
Crush	Right =	14.3	; C/L =	15.6	;Left =	14.5
AVERAGE	=	14.8	inches			

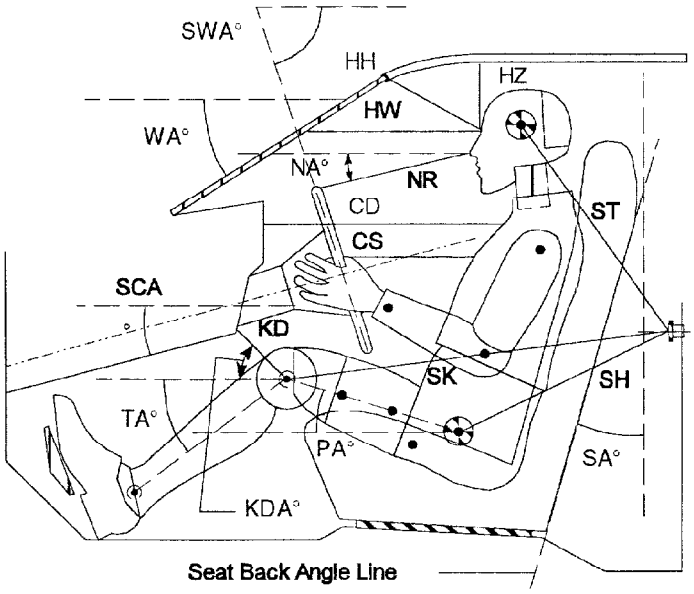
Section 3

COMPLIANCE TEST DATA

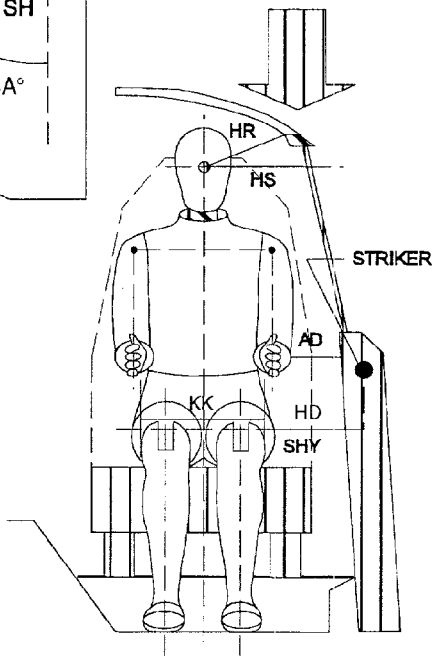
Figure 1

PART 572 DUMMY IN-VEHICLE POSITION
(FOR REAR IMPACTS ONLY)

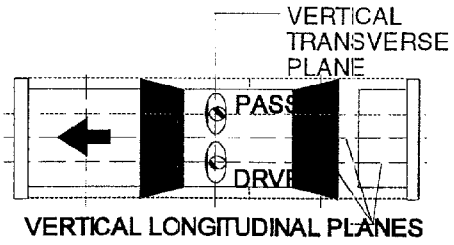
DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



AD - Arm to Door
HD - H-Point to Door
HR - Head to Side Header
HS - Head to Side Window
KK - Knee to Knee
SHY- Striker to H-Point (Y Direction)



CD - Chest to Dash
CS - Steering Wheel to Chest
HH - Head to Header
HW - Head to Windshield
HZ - Head to Roof
KDA - Knee to Dash Angle
KDL - Left Knee to Dash
KDR - Right Knee to Dash
NA - Nose to Rim Angle
NR - Nose to Rim
PA - Pelvic Angle
RA - Rim to Abdomen
SA - Seat Back Angle
SCA - Steering Column Angle
SH - Striker to H-Point
SK - Striker to Knee
ST - Striker to Head
SWA - Steering Wheel Angle
TA - Tibial Angle
WA - Windshield Angle



VERTICAL LONGITUDINAL PLANES

Table 5

FRONT SEAT OCCUPANT MEASUREMENTS
(FOR REAR IMPACT ONLY)

	DRIVER (Serial #152)		
WA°	29 deg.		
SWA°	26 deg.		
SCA°	64 deg.		
SA°	14 deg.		
HZ	7.4		
HH	11.5		
HW	19.8		
HR	8.0		
NR	14.0	Angle	9 deg.
CD	20.1		
CS	11.6		
RA	6.3		
KDL	4.8	Angle (KDA)	29 deg.
KDR	3.9		
PA°	23 deg.		
TA°	42 deg.		
KK	10.2		
ST	19.0	Angle	16 deg.
SK	24.4	Angle	91 deg.
SH	10.9	Angle	133 deg.
SHY	8.7		
HS	12.5		
HD	5.3		
AD	3.8		

Table 6
FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO.: CX5400 TEST DATE: June 8, 1999

Vehicle Mfgr./Make/Model: 1999 Mazda Protege DX 4-door sedan

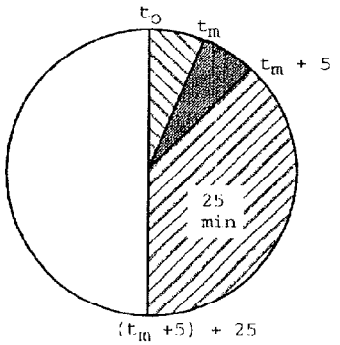
Test vehicle fuel tank filled to 91% to 94% of manufacturer's "usable" capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

****

TEST VEHICLE IMPACT TYPE:

- \- Frontal (30 mph)
- \- Oblique (30 mph) with - °barrier face first contacting - (driver/passenger) side
- X Rear Moving Barrier (30 mph)
- \- Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT:



1. From impact until vehicle motion ceases
2. For five minute period after vehicle motion ceases
3. For next 25 minutes

ACTUAL	MAX ALLOWED
0	1 oz.
0	5 oz.
0	1 oz./1 min.

SOLVENT SPILLAGE DETAILS:

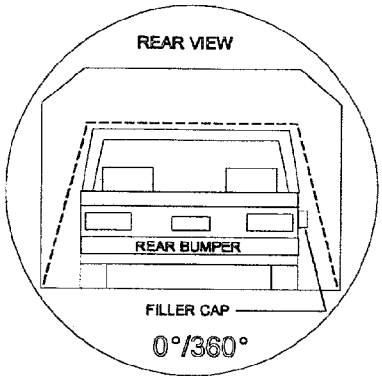
None

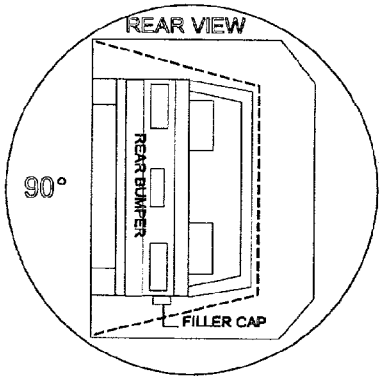
Table 7

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE :
0-90 Deg.

Vehicle NHTSA ID No. :
CX5400





I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	1	minutes	10	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	6	minutes	10	seconds
Next whole minute interval	7	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 minutes FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

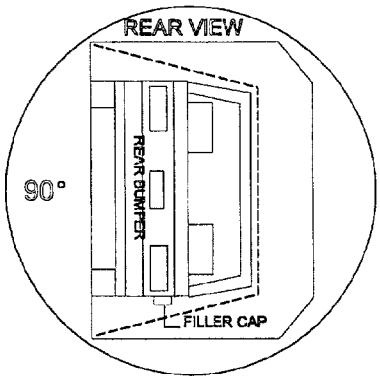
None

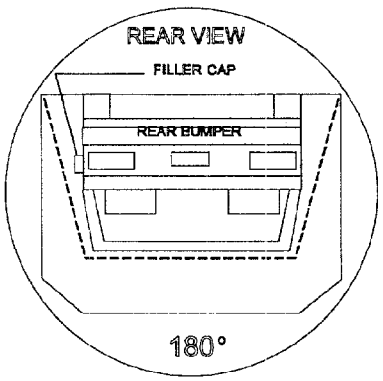
Table 7

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
90-180 Deg.

Vehicle NHTSA ID No. :
CX5400





I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)		1	minutes	20	seconds
FMVSS 301 Position Hold Time +		5	minutes	00	seconds
	TOTAL	6	minutes	20	seconds
Next whole minute interval		7	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 minutes FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

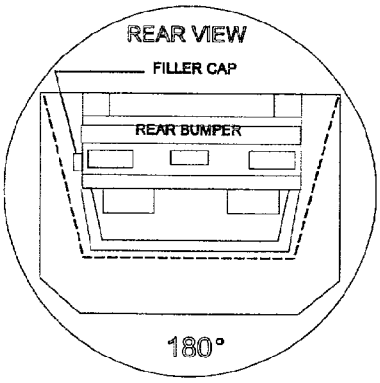
None

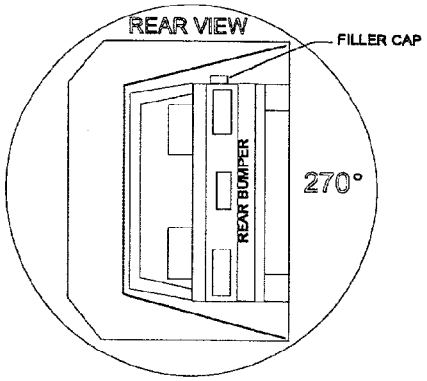
Table 7

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
180-270 Deg.

Vehicle NHTSA ID No. :
CX5400





I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)		1	minutes	10	seconds
FMVSS 301 Position Hold Time +		5	minutes	00	seconds
	TOTAL	6	minutes	10	seconds
Next whole minute interval		7	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 minutes FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

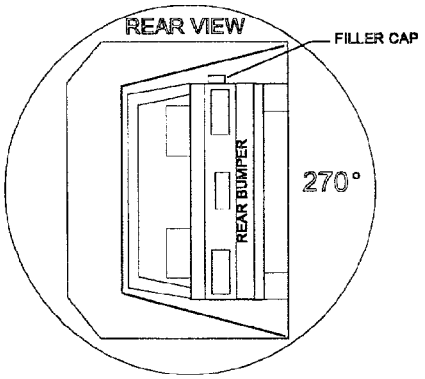
None

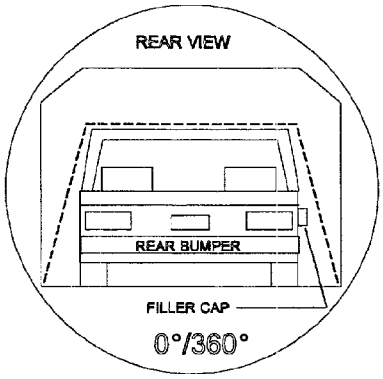
Table 7

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
270-360 Deg.

Vehicle NHTSA ID No. :
CX5400





I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)		1	minutes	08	seconds
FMVSS 301 Position Hold Time +		5	minutes	00	seconds
	TOTAL	6	minutes	8	seconds
Next whole minute interval		7	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 minutes FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

None

Figure 2

CAMERA POSITIONS FOR REAR IMPACTS

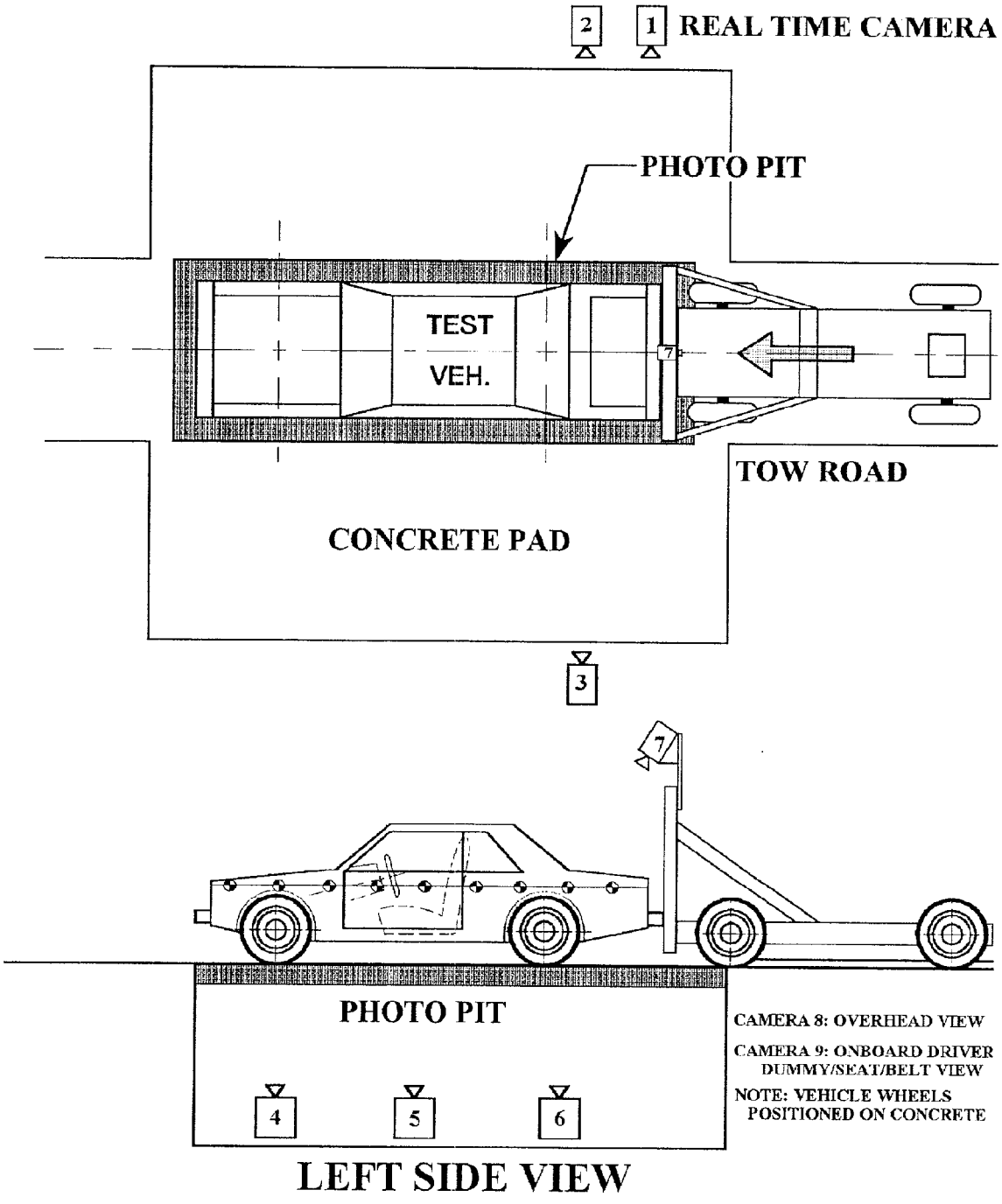


Table 8

HIGH-SPEED CAMERA LOCATIONS

NHTSA No. : CX5400 Vehicle : 1999 Mazda Protege DX 4-door sedan

CAMERA NO.	VIEW	CAMERA POSITIONS (inches)*			ANGLE** (degrees)	LENS (mm)	SPEED (fps)
		X	Y	Z			
1	Real-Time Camera	-	-	-	-	-	24
2	Right Side View	-540	75	44	-2	25	1000
3	Left Side View	510	79	49	-1	25	1000
4	Vehicle Front Underbody View	0	130	-77	90	13	600
5	Vehicle Mid-Section Underbody View	0	84	-77	90	13	610
6	Vehicle Rear Underbody View	0	40	-77	90	13	610
7	Moving Barrier View	0	0	99	-105	13	1000
8	Overhead Overall View	-20	0	386	-90	13	1010
9	Onboard Driver Dummy/Seat/Belt View	-	-	-	-	13	700

* X = film plant to monorail centerline (+ to left of rail)
Y = film plane to impact location (+ ahead of impact location)
Z = film plane to ground (+ above ground)
** = referenced to horizontal plane

Appendix A

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

Figure A-1 PRE-TEST FRONT VIEW

Figure A-3 PRE-TEST LEFT SIDE VIEW

Figure A-4 POST-TEST LEFT SIDE VIEW

Figure A-5 PRE-TEST RIGHT SIDE VIEW

Figure A-6 POST-TEST RIGHT SIDE VIEW

Figure A-7 PRE-TEST REAR VIEW

Figure A-8 POST-TEST REAR VIEW

PHOTOGRAPH NOT AVAILABLE

Figure A-9 PRE-TEST LEFT FRONT THREE-QUARTER VIEW

PHOTOGRAPH NOT AVAILABLE

Figure A-10 POST-TEST LEFT FRONT THREE-QUARTER VIEW

Figure A-11 PRE-TEST RIGHT REAR THREE-QUARTER VIEW

Figure A-12 POST-TEST RIGHT REAR THREE-QUARTER VIEW

PHOTOGRAPH NOT AVAILABLE

Figure A-13 PRE-TEST FRONT UNDERBODY VIEW

Figure A-14 POST-TEST FRONT UNDERBODY VIEW

PHOTOGRAPH NOT AVAILABLE

Figure A-15 PRE-TEST REAR UNDERBODY VIEW

Figure A-16 POST-TEST REAR UNDERBODY VIEW

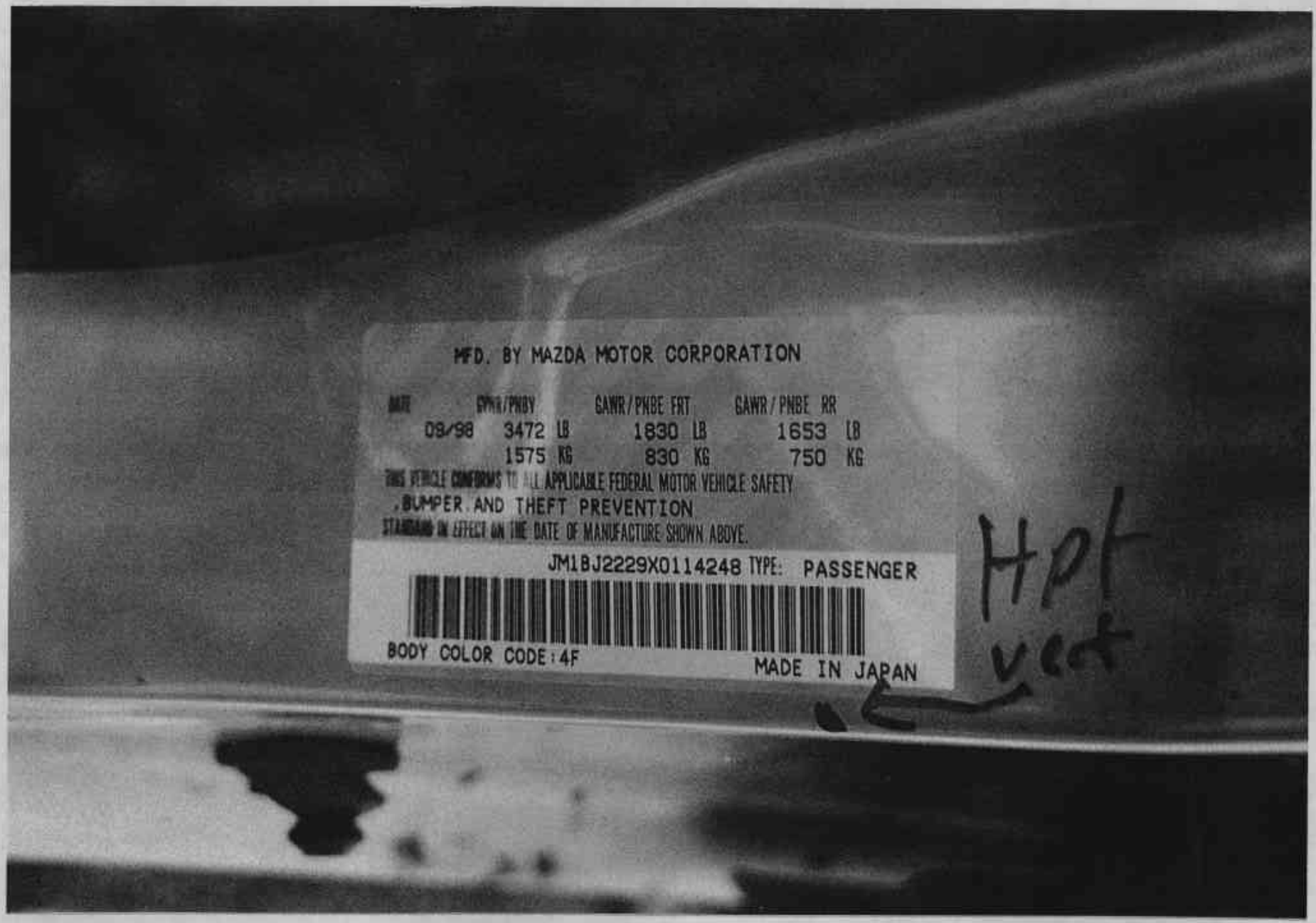


Figure A-17 CERTIFICATION PLACARD

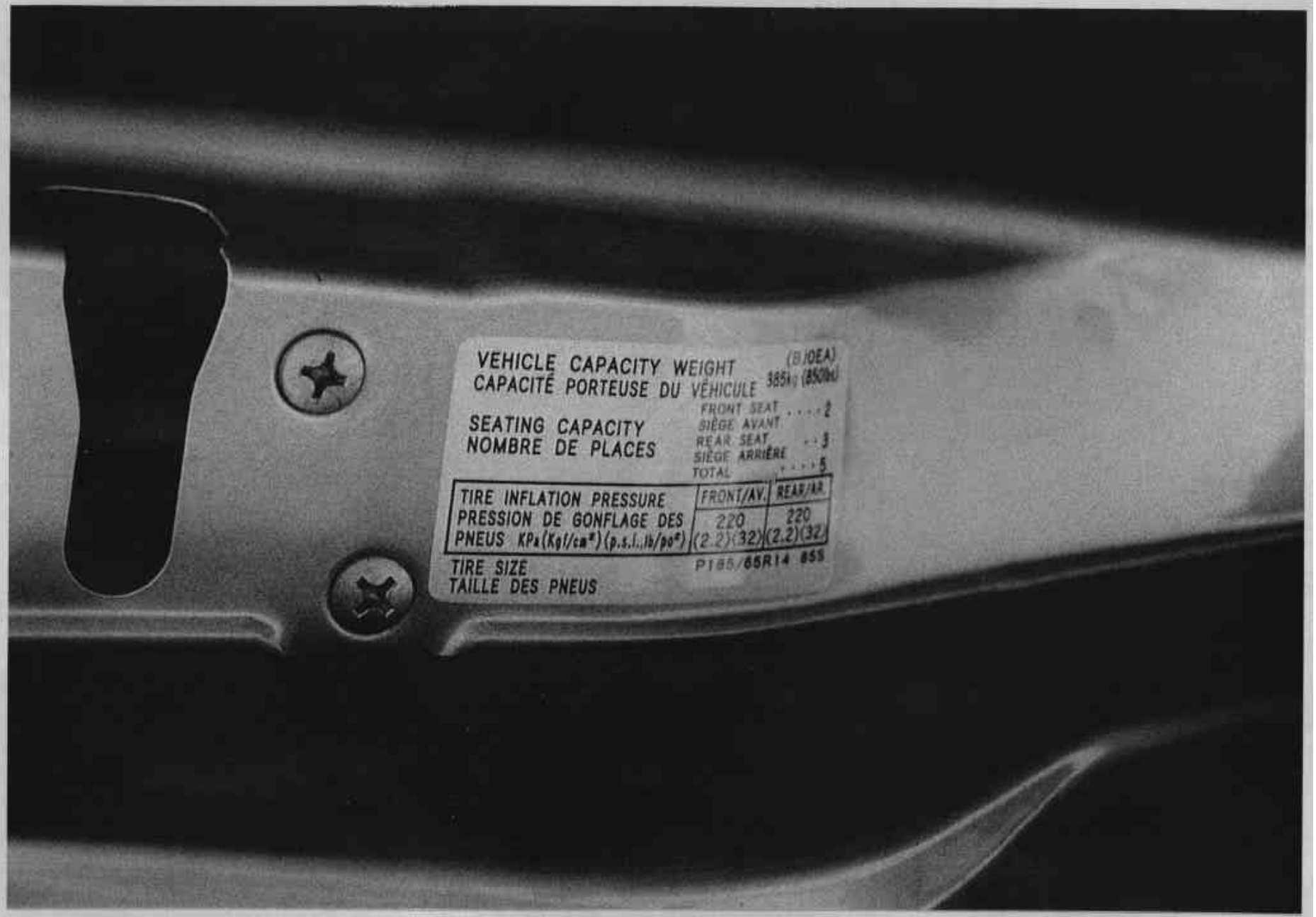


Figure A-18 TIRE PLACARD

Figure A-19 ROLLOVER 90°

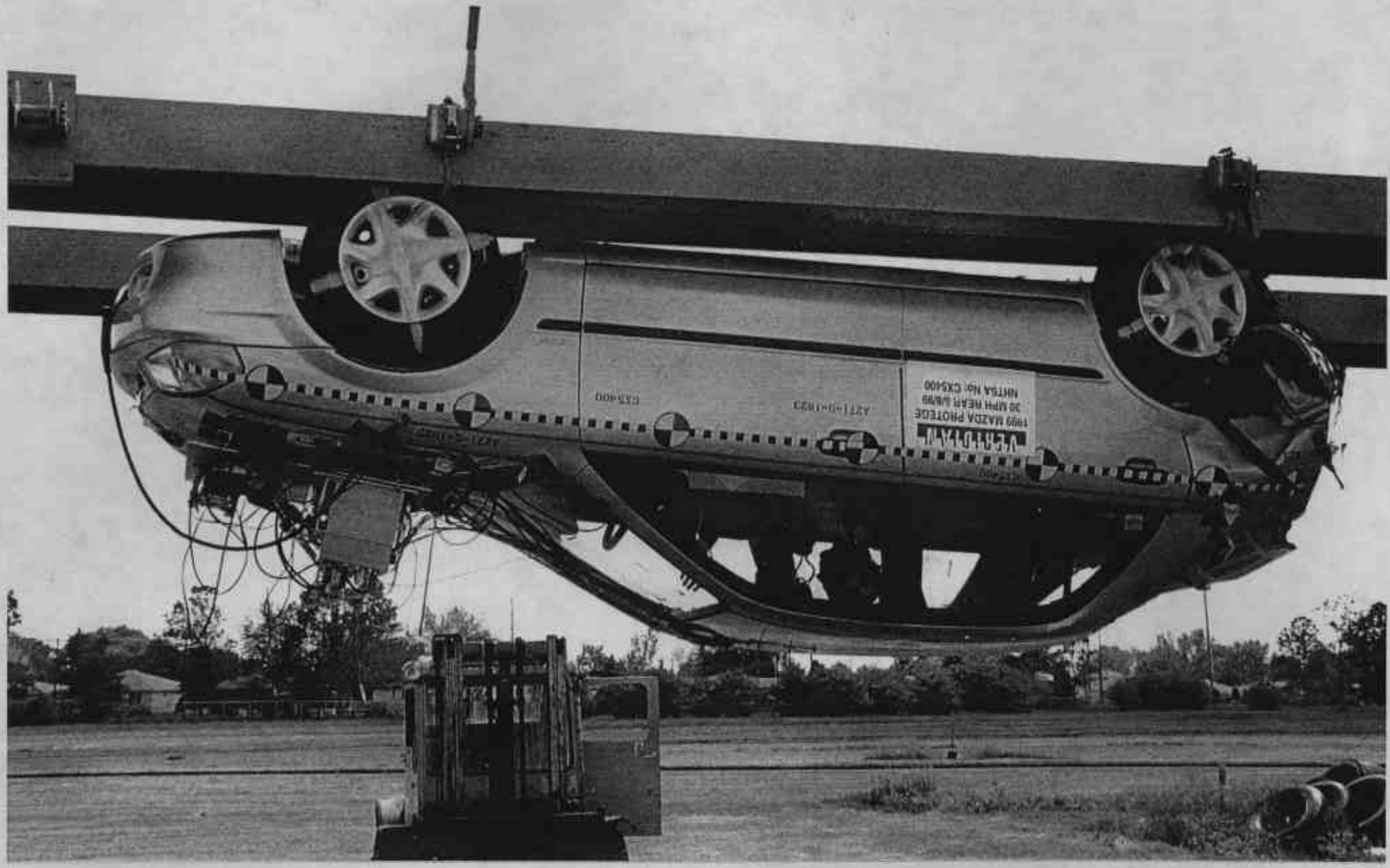


Figure A-20 ROLLOVER 180°

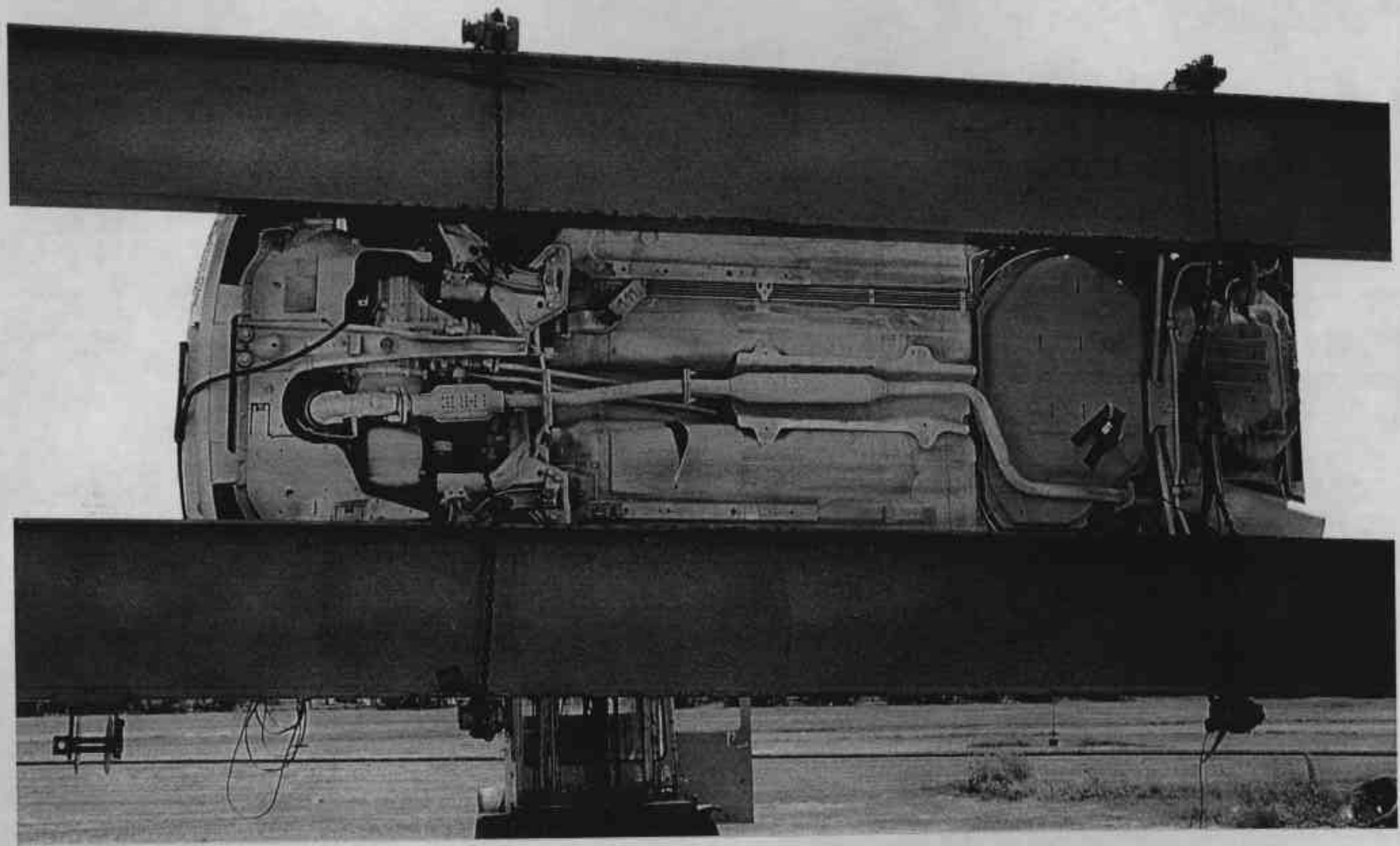


Figure A-21 ROLLOVER 270°

Figure A-22 ROLLOVER 360°

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

(REAR IMPACT ONLY)

FACILITY: VERF DATE: June 08, 1999
TEST#: A271-0090-1823
TITLE: 301 test #9 1999 Mazda Protoge CX5400

CHN	NAME	Unit	Max	msec	Min	msec	Filt
24	Acc #3(X) Upper Seat Back X	g	30.9	98.6	-18.4	42.1	60
25	Acc #4(X) Lower Seat Back X	g	22.8	97.9	-5.5	41.6	60
29	Acc #1(X) Left Rear Xmember	g	17.5	7.6	-3.8	122.3	60
32	Acc #2(X) Right Rear Xmember	g	19.1	7.4	-1.0	124.5	60
35	Driver Head X	g	26.5	128.2	-3.0	499.9	1000
36	Driver Head Y	g	1.4	284.0	-4.4	173.8	1000
37	Driver Head Z	g	14.4	113.8	-0.4	48.0	1000
38	Driver Head Resultant	g	28.1	127.5	0.0	-90.8	1000
39	Driver Upper Neck Fx	lbf	49.6	130.1	-26.0	499.9	1000
40	Driver Upper Neck Fy	lbf	11.2	281.4	-23.8	211.9	1000
41	Driver Upper Neck Fz	lbf	254.8	119.7	-7.0	49.0	1000
42	Driver Upper Neck F Resultant	lbf	256.0	119.7	0.0	-80.7	1000
43	Driver Upper Neck Mx	in-lb	33.1	285.7	-50.3	222.9	600
44	Driver Upper Neck My	in-lb	243.2	131.4	-25.8	206.6	600
45	Driver Upper Neck Mz	in-lb	29.0	273.4	-96.6	194.2	600
46	Driver Upper Neck M Resultant	in-lb	247.9	131.4	0.0	-28.4	600
47	Driver Chest X	g	11.8	89.8	-2.0	492.5	180
48	Driver Chest Y	g	1.1	44.4	-1.8	202.6	180
49	Driver Chest Z	g	6.7	81.2	-1.1	492.0	180
50	Driver Chest Resultant	g	13.0	81.9	0.0	-32.4	180
51	Driver Chest Displacement	in	0.1	224.3	0.0	112.0	600
52	Driver Pelvic X	g	16.9	80.2	-1.2	150.2	1000
53	Driver Pelvic Y	g	3.6	61.5	-1.6	113.8	1000
54	Driver Pelvic Z	g	9.4	66.0	-1.5	492.9	1000
55	Driver Pelvic Resultant	g	19.2	71.2	0.0	-43.9	1000
56	Driver Lap Belt	lbf	19.2	40.8	-14.7	29.1	60
57	Driver Belt Spoolout	in	3.9	278.4	0.0	-100.0	180

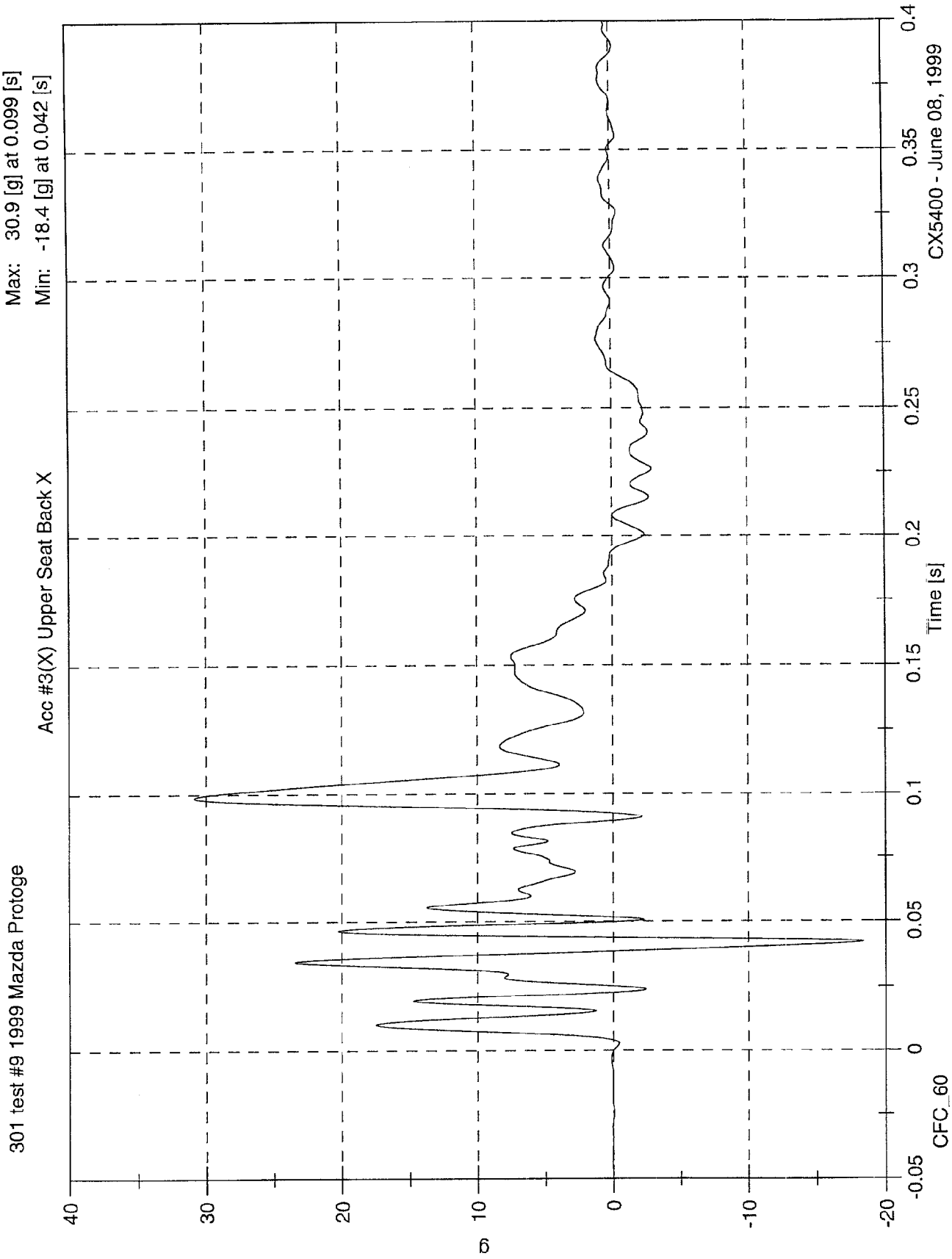
P1 HIC(36ms): 94.7
t1: 109.8 msec
t2: 145.8 msec
Duration: 36.0 msec
Average Acceleration: 23.3 g
Input channels: Driver Head X (2) CFC_1000
Driver Head Y (3) CFC_1000
Driver Head Z (4) CFC_1000

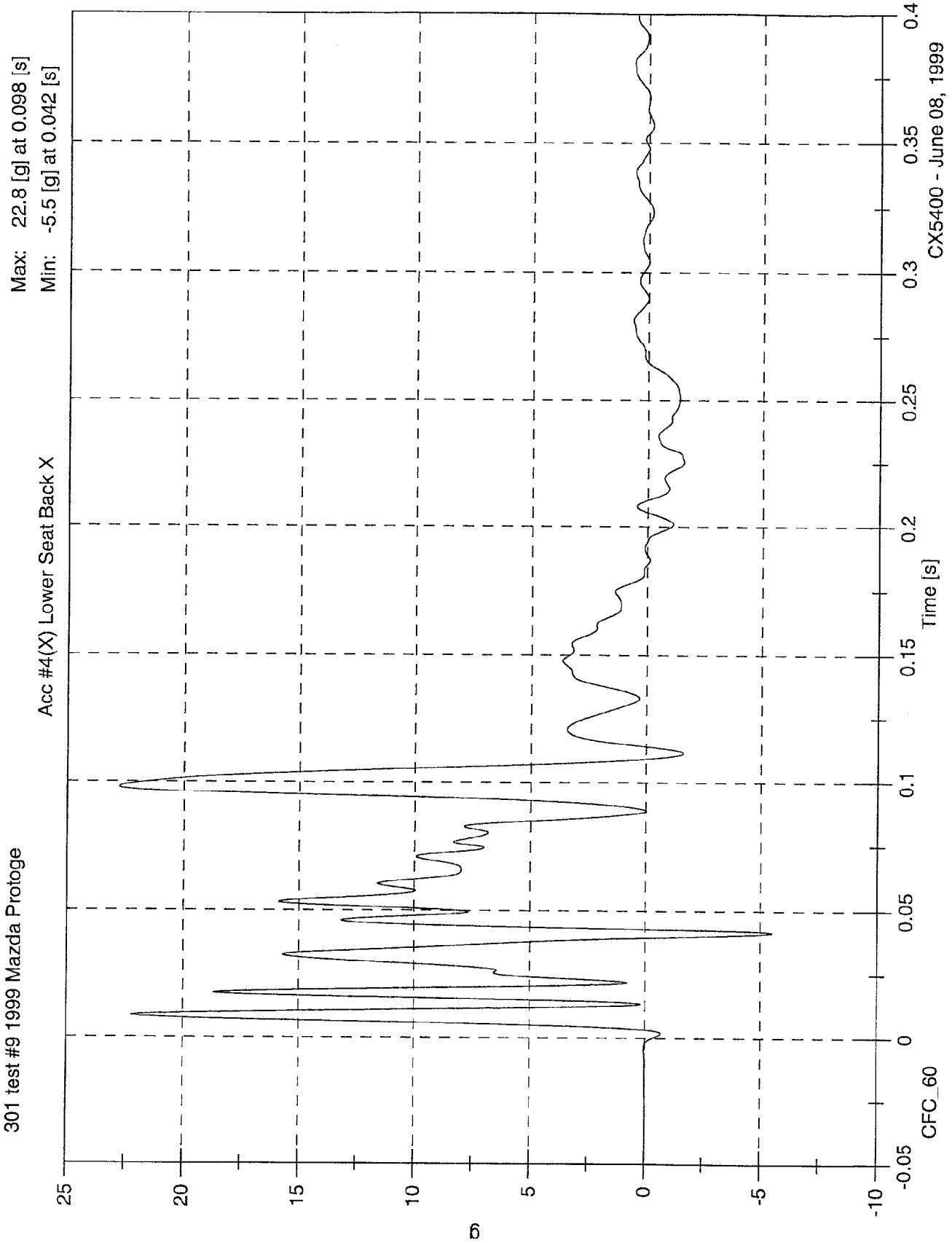
P1 CLIP(3ms): 12.9 g
t1: 80.6 msec
t2: 83.6 msec
Duration: 3.0 msec
P1 CSI: 32.5
Input channels: Driver Chest X (5) CFC_180
Driver Chest Y (6) CFC_180
Driver Chest Z (7) CFC_180

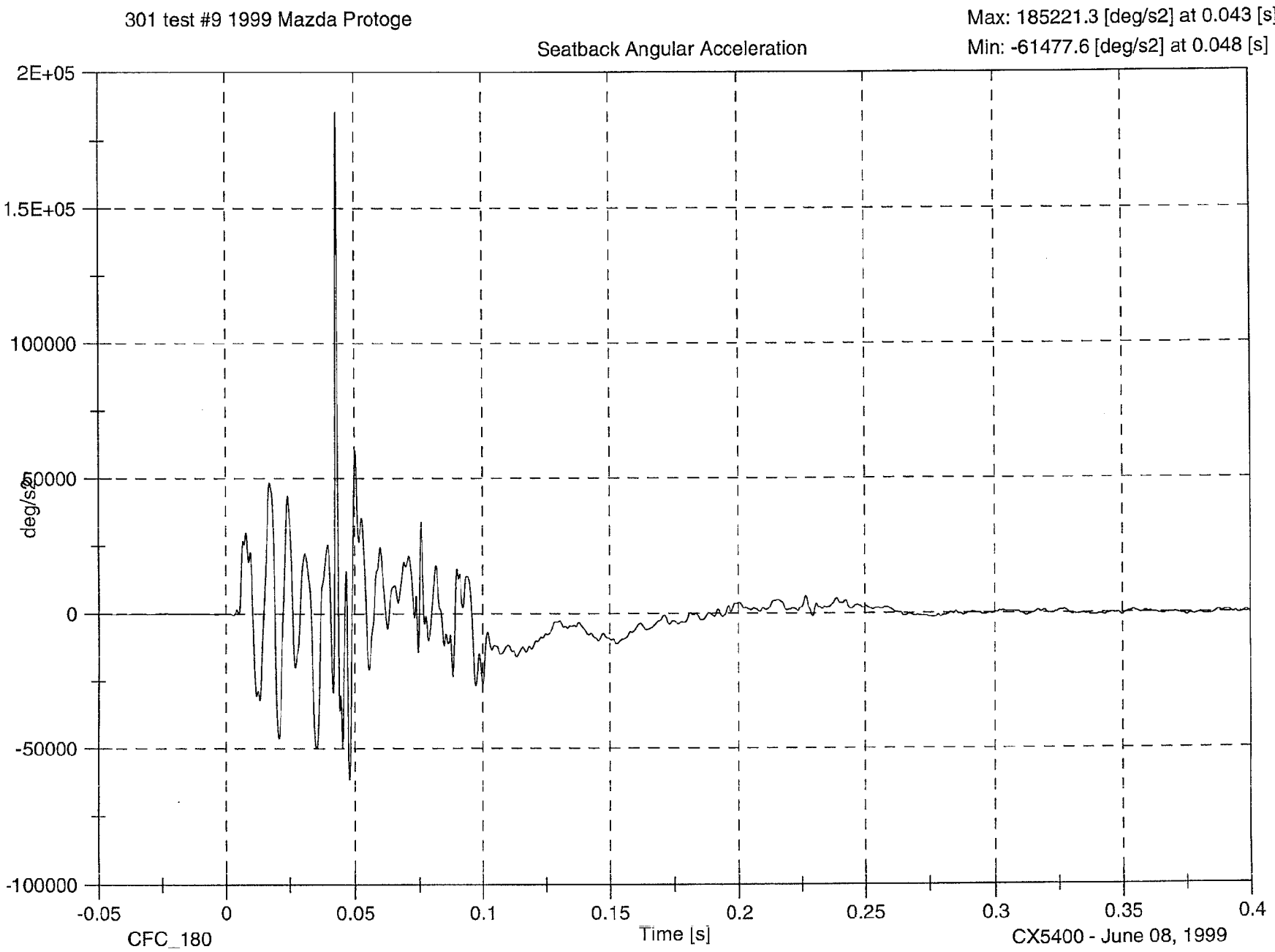
TEST NO. CX5400

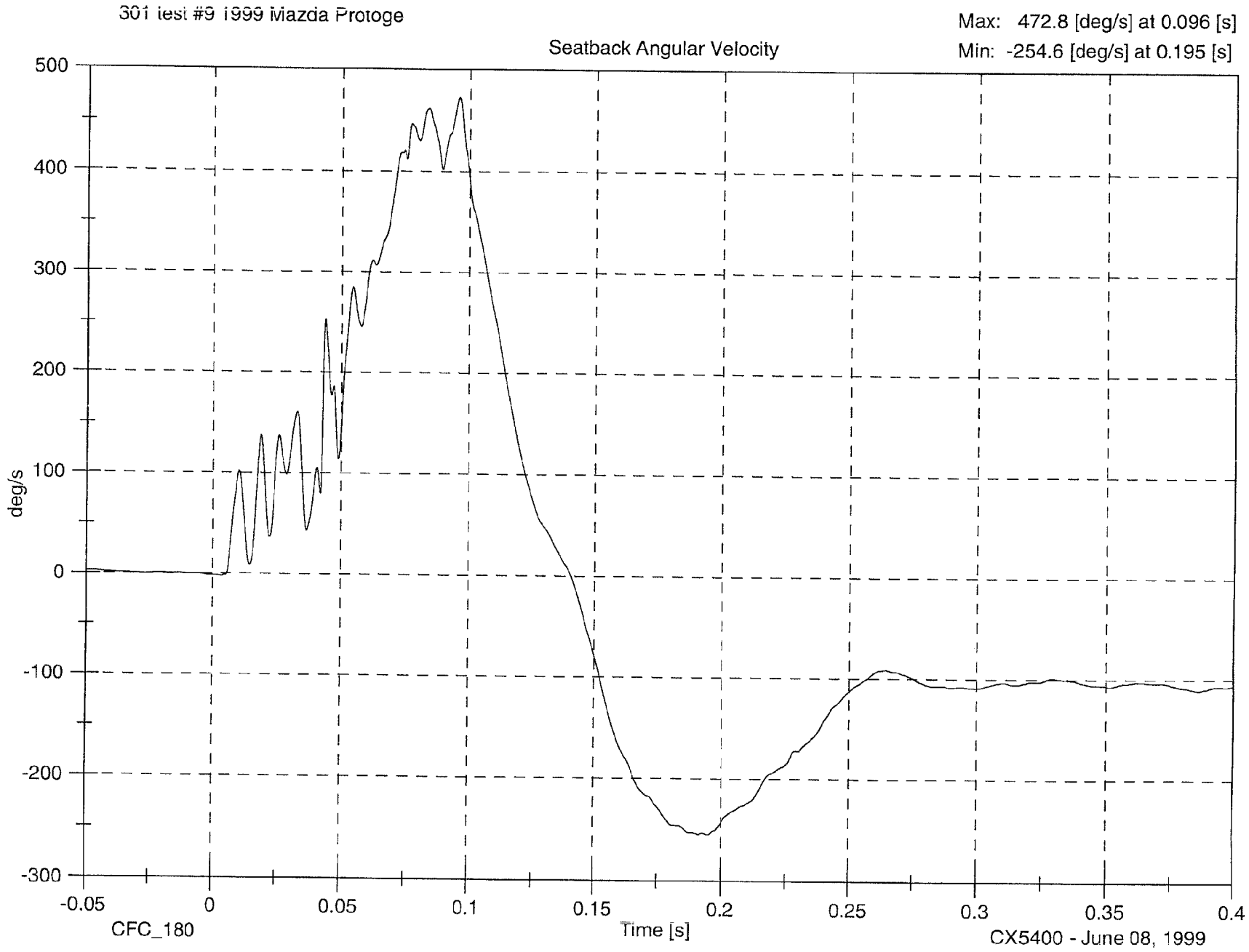
VEHICLE	SAE FILTER CHANNEL CLASS
	60

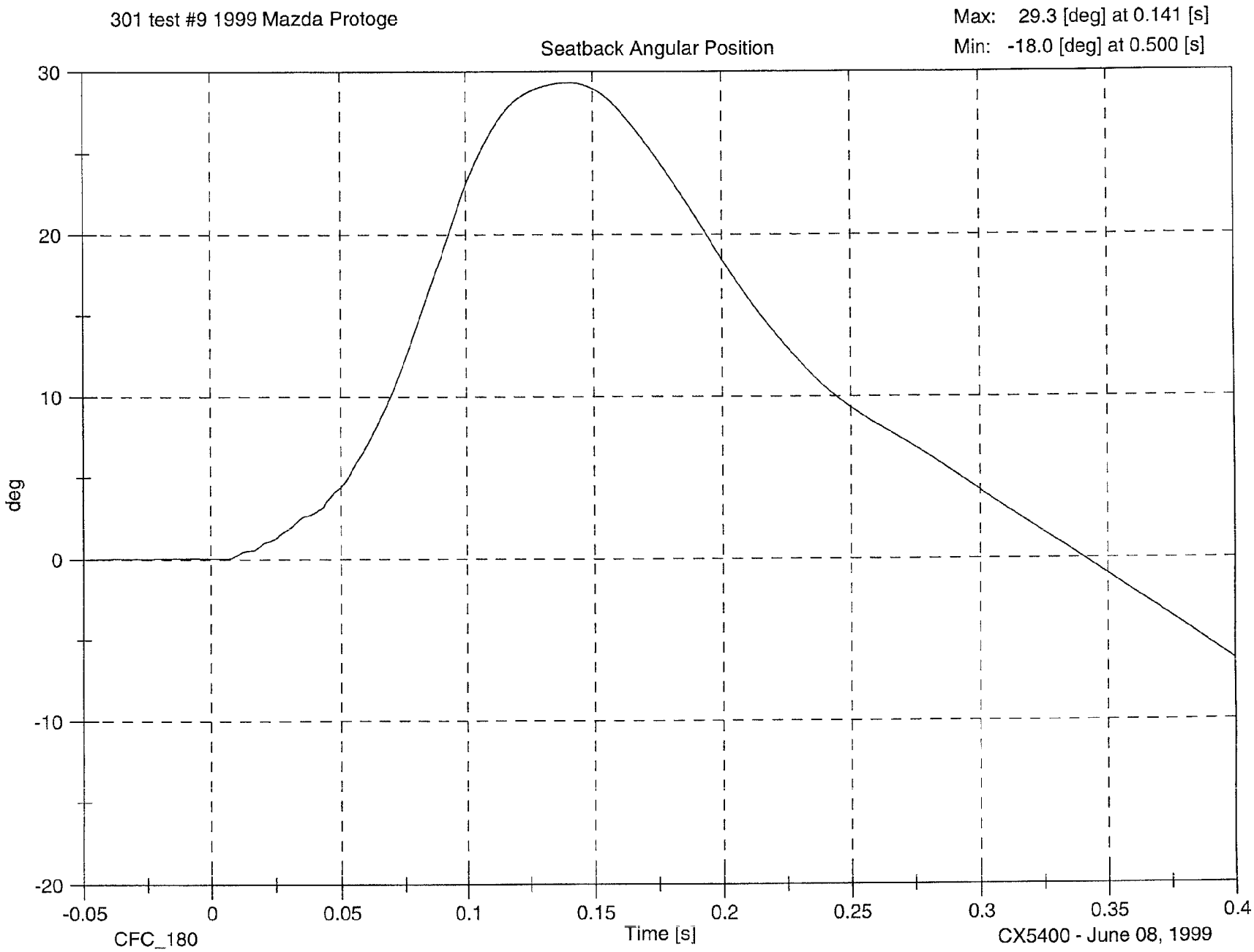
Note: Angular seatback position is measured in degrees of rotation from the initial (design) position.

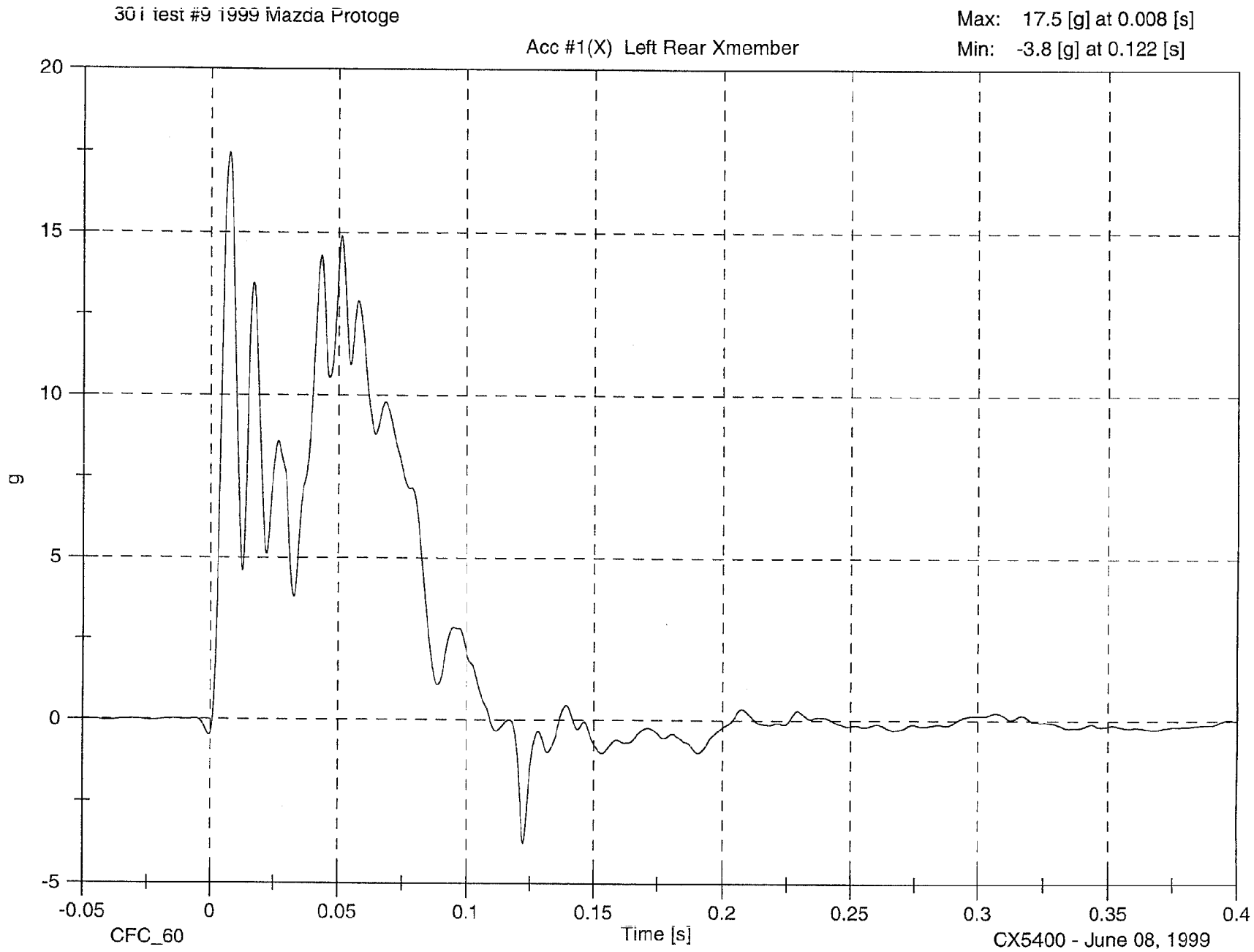

301 test #9 1999 Mazda Protoge
Acc #3(X) Upper Seat Back X
Max: 30.9 [g] at 0.099 [s]
Min: -18.4 [g] at 0.042 [s]
CX5400 - June 08, 1999
CFC_60
Time [s]
g
40
30
20
10
0
-10
-20
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

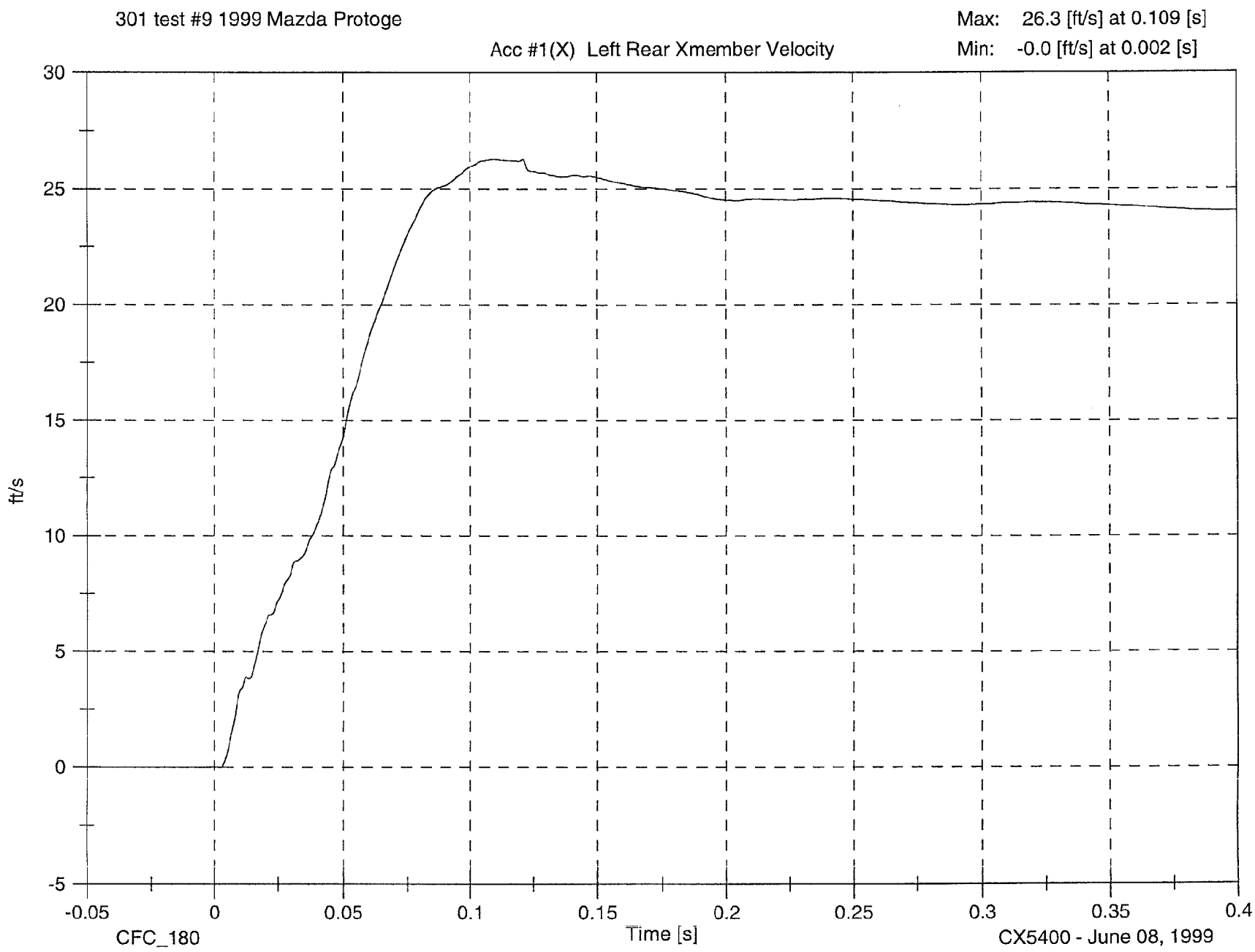

301 test #9 1999 Mazda Protoge
Acc #4(X) Lower Seat Back X
Max: 22.8 [g] at 0.098 [s]
Min: -5.5 [g] at 0.042 [s]
CX5400 - June 08, 1999
CFC_60
Time [s]
g
25
20
15
10
5
0
-5
-10
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

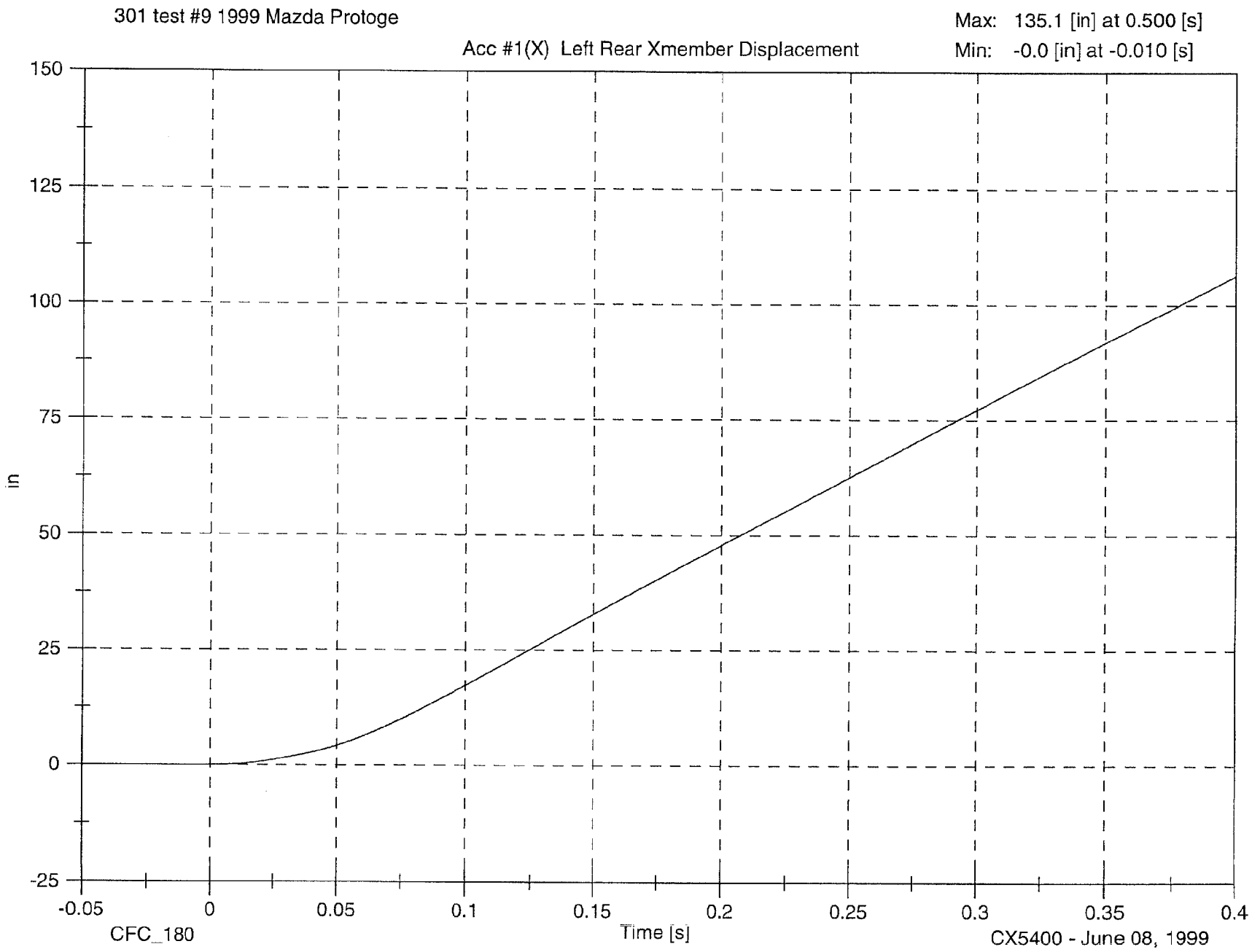

301 test #9 1999 Mazda Protoge
Seatback Angular Acceleration
Max: 185221.3 [deg/s2] at 0.043 [s]
Min: -61477.6 [deg/s2] at 0.048 [s]
2E+05
1.5E+05
100000
50000
0
-50000
-100000
deg/s2
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX5400 - June 08, 1999

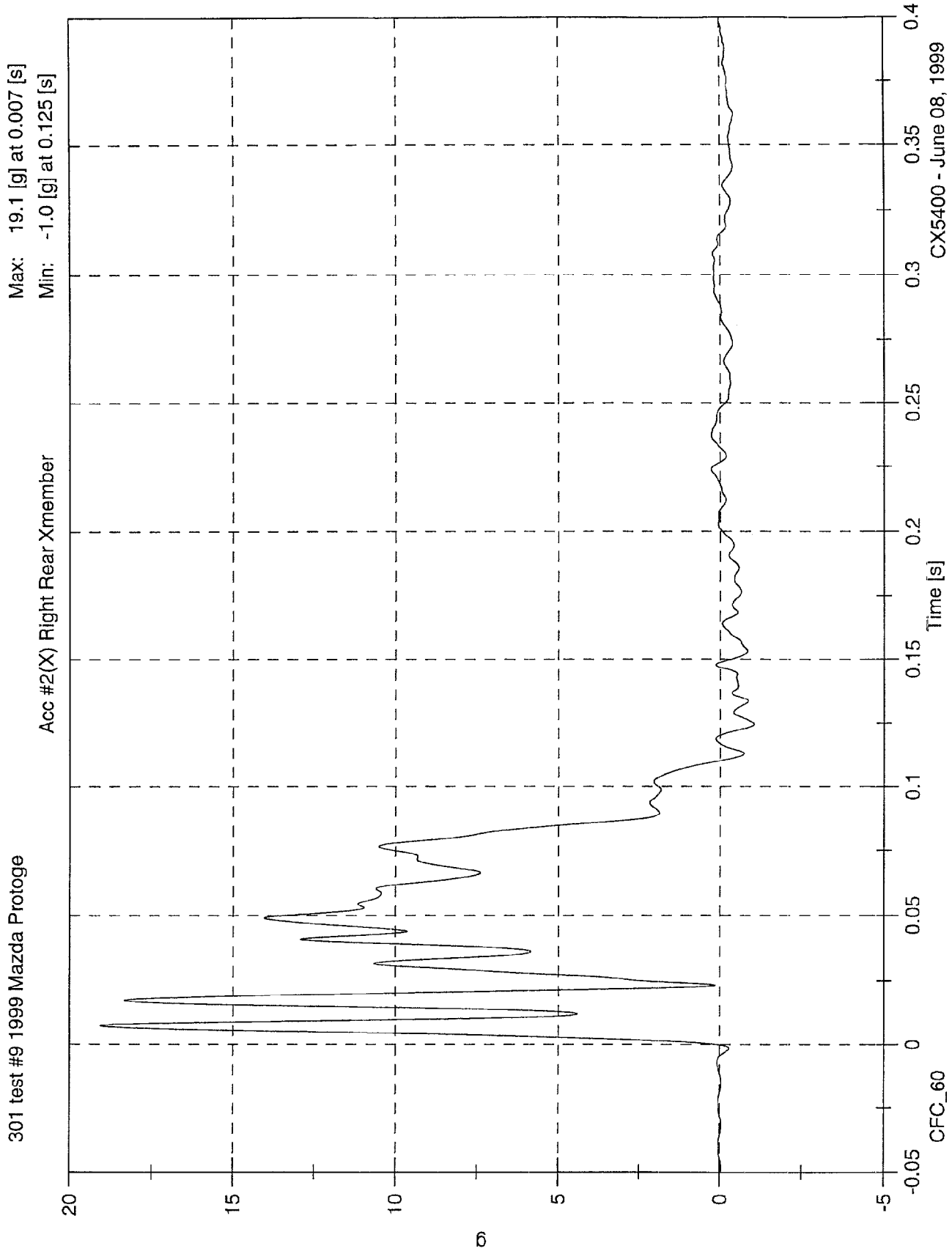

301 test #9 1999 Mazda Protoge
Seatback Angular Velocity
Max: 472.8 [deg/s] at 0.096 [s]
Min: -254.6 [deg/s] at 0.195 [s]
500
400
300
200
100
0
-100
-200
-300
deg/s
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX5400 - June 08, 1999

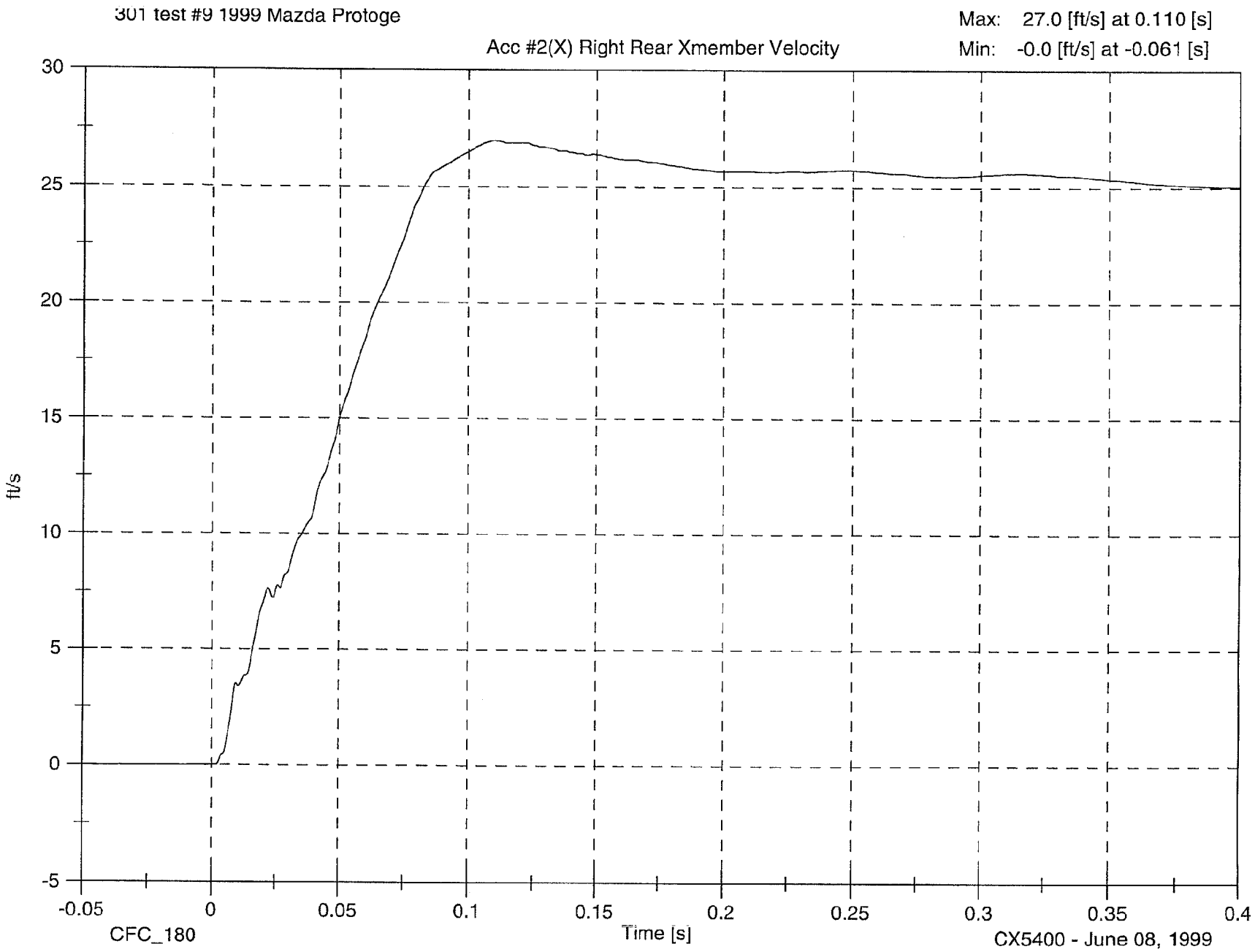

301 test #9 1999 Mazda Protoge
Seatback Angular Position
Max: 29.3 [deg] at 0.141 [s]
Min: -18.0 [deg] at 0.500 [s]
30
20
10
0
-10
-20
deg
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX5400 - June 08, 1999

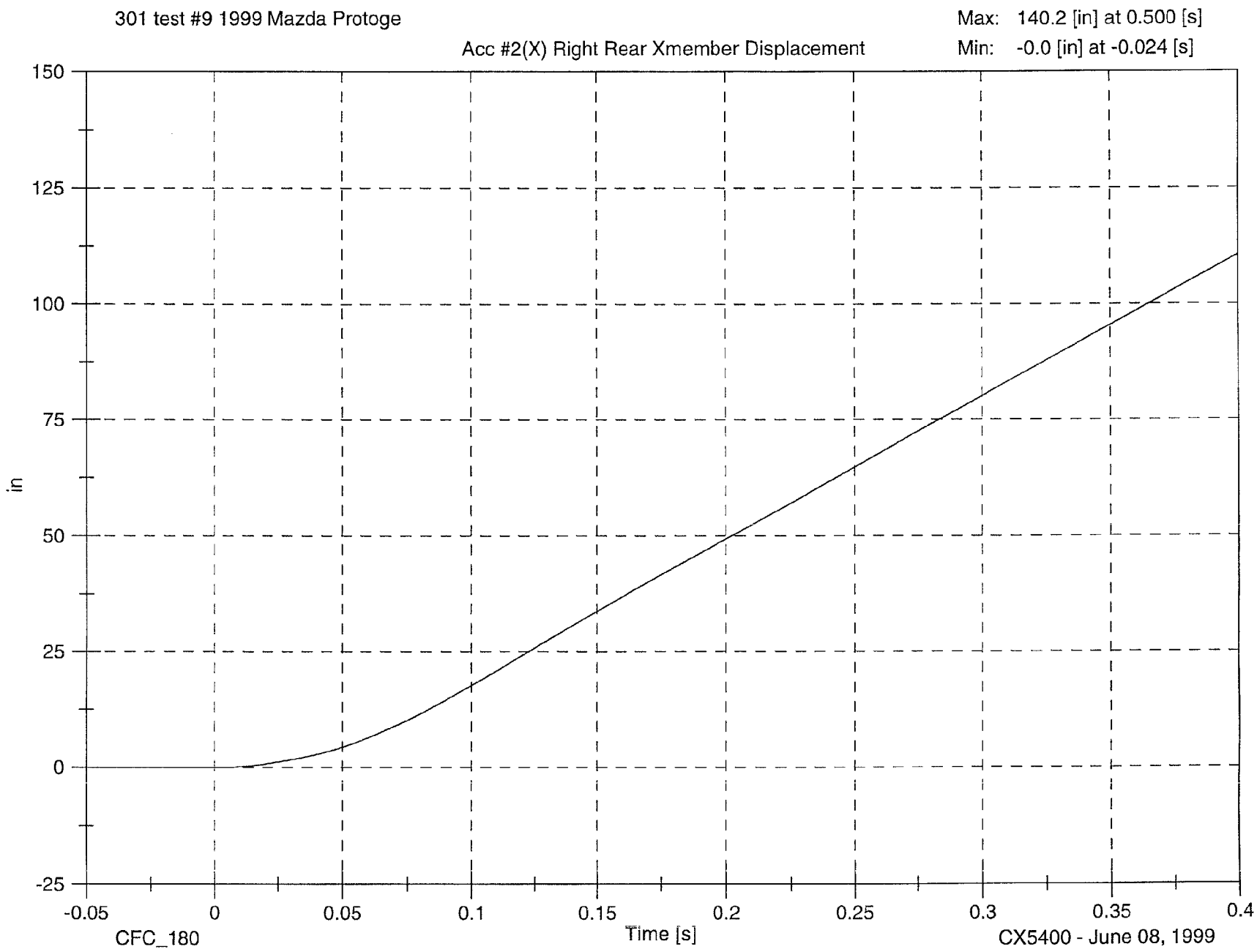

30 Test #9 1999 Mazda Protoge
Acc #1(X) Left Rear Xmember
Max: 17.5 [g] at 0.008 [s]
Min: -3.8 [g] at 0.122 [s]
20
15
10
5
0
-5
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_60
CX5400 - June 08, 1999


301 test #9 1999 Mazda Protoge
Acc #1(X) Left Rear Xmember Velocity
Max: 26.3 [ft/s] at 0.109 [s]
Min: -0.0 [ft/s] at 0.002 [s]
30
25
20
15
10
5
0
-5
ft/s
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX5400 - June 08, 1999


301 test #9 1999 Mazda Protoge
Acc #1(X) Left Rear Xmember Displacement
Max: 135.1 [in] at 0.500 [s]
Min: -0.0 [in] at -0.010 [s]
150
125
100
75
50
25
0
-25
in
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX5400 - June 08, 1999

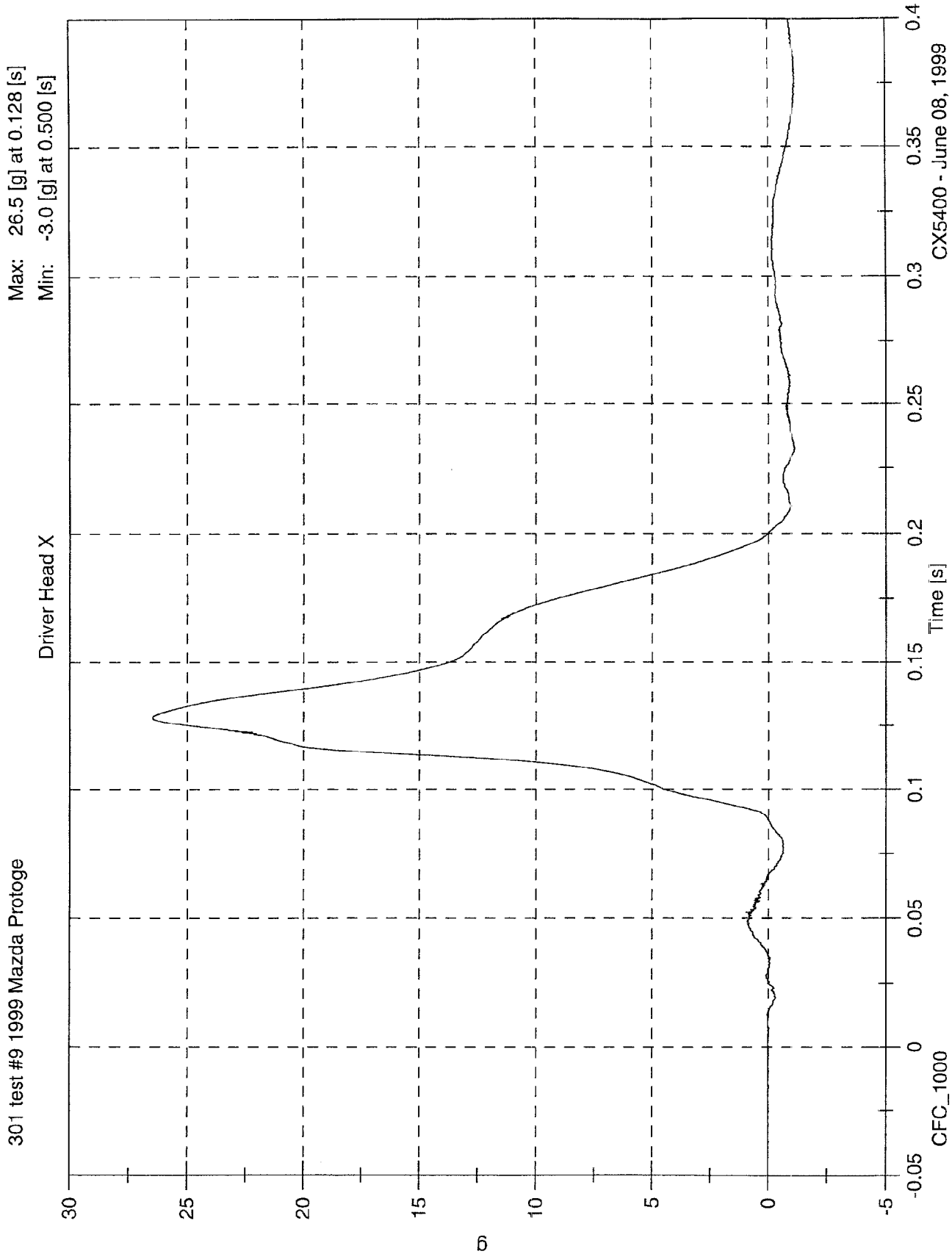

301 test #9 1999 Mazda Protoge
Acc #2(X) Right Rear Xmember
Max: 19.1 [g] at 0.007 [s]
Min: -1.0 [g] at 0.125 [s]
CX5400 - June 08, 1999
CFC_60
Time [s]
g
20
15
10
5
0
-5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

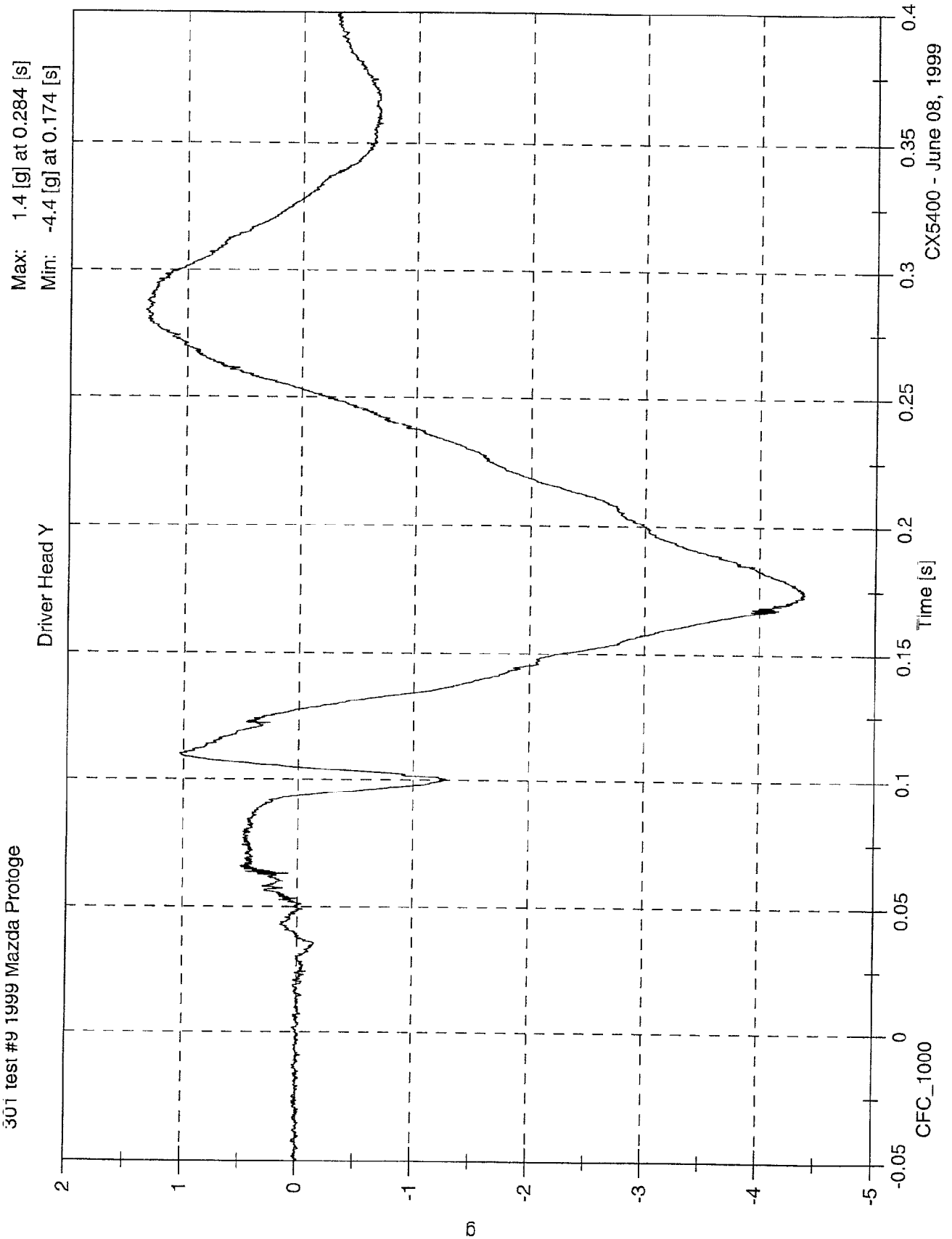

301 test #9 1999 Mazda Protoge
Acc #2(X) Right Rear Xmember Velocity
Max: 27.0 [ft/s] at 0.110 [s]
Min: -0.0 [ft/s] at -0.061 [s]
30
25
20
15
10
5
0
-5
ft/s
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX5400 - June 08, 1999

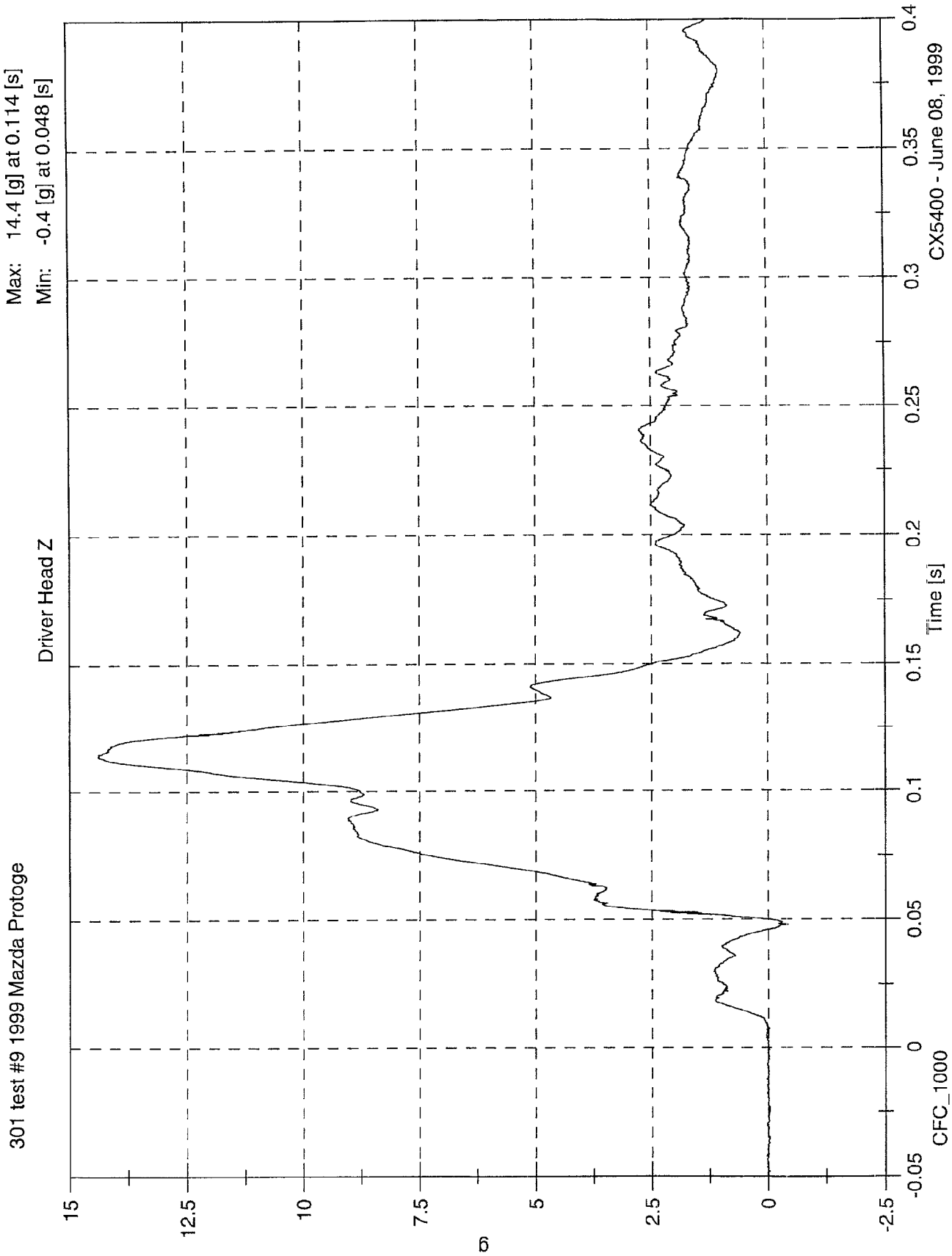

301 test #9 1999 Mazda Protoge
Acc #2(X) Right Rear Xmember Displacement
Max: 140.2 [in] at 0.500 [s]
Min: -0.0 [in] at -0.024 [s]
150
125
100
75
50
25
0
-25
in
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX5400 - June 08, 1999

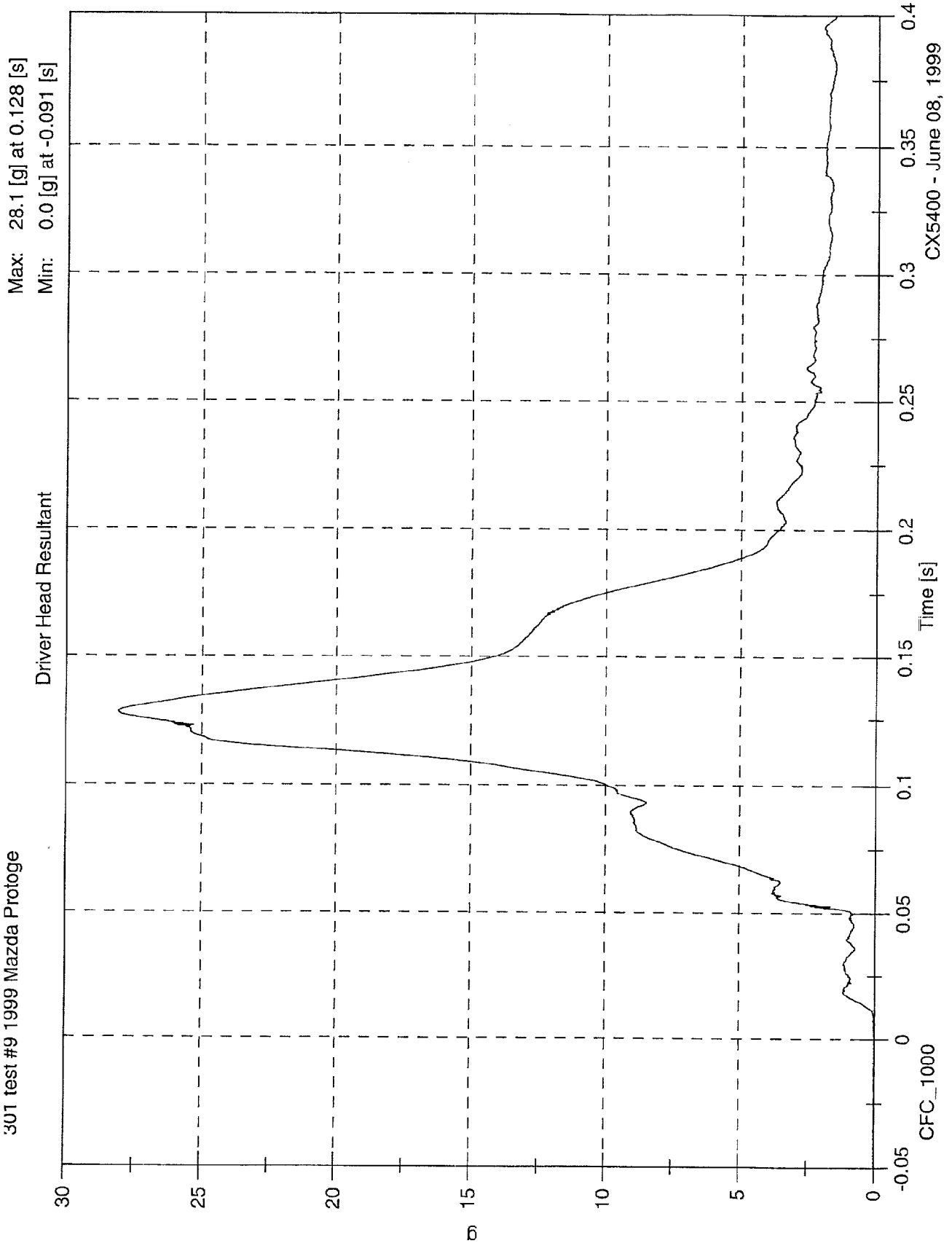
TEST NO. CX5400

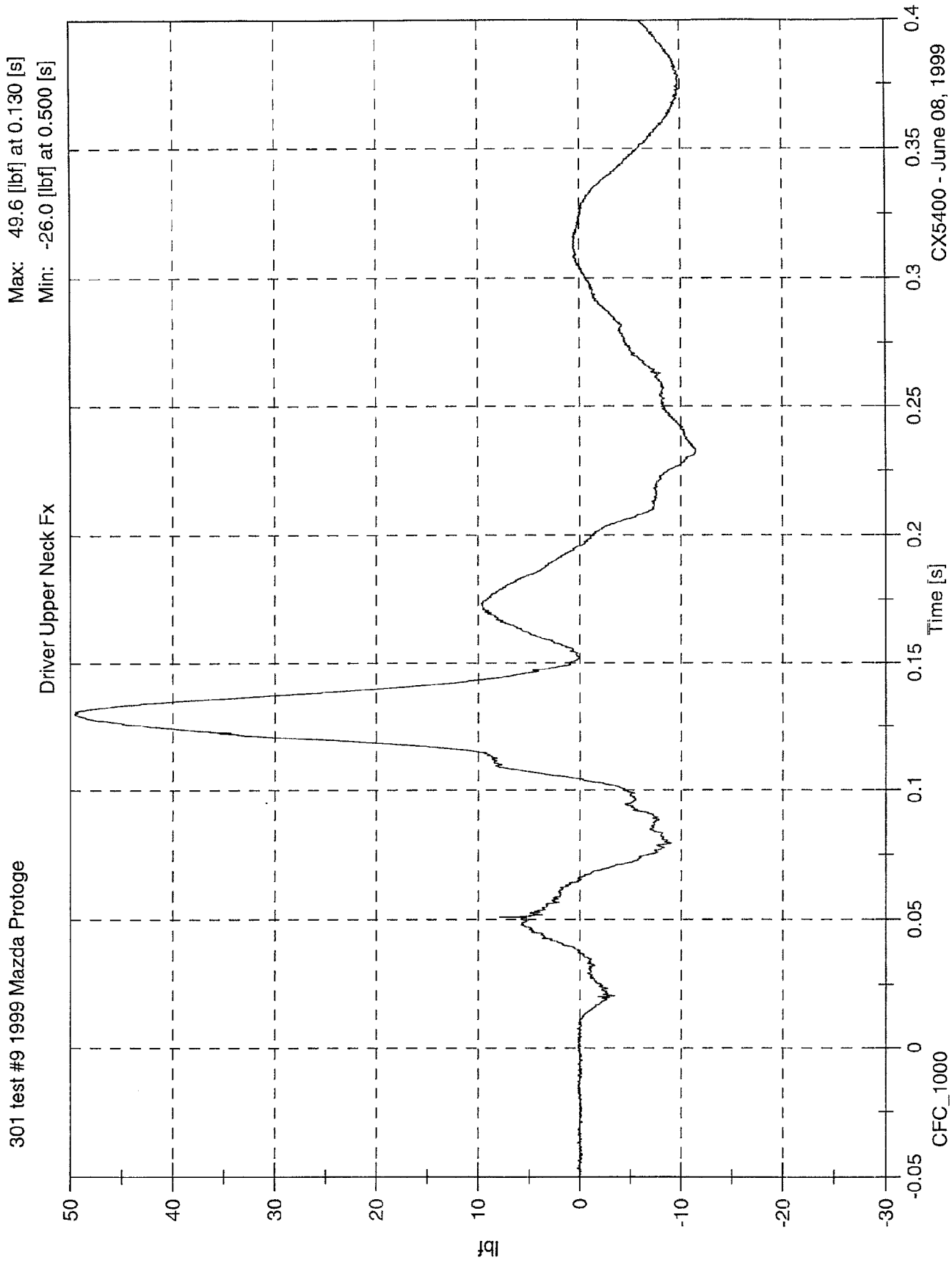
DRIVER DUMMY (Pos. 1)	SAE FILTER CHANNEL CLASS
Head Accelerations	1000
Chest Accelerations	180
Pelvic Accelerations	1000
Upper Neck Forces	1000
Upper Neck Moments	600
Belt Forces	60
Belt Spoolout	60

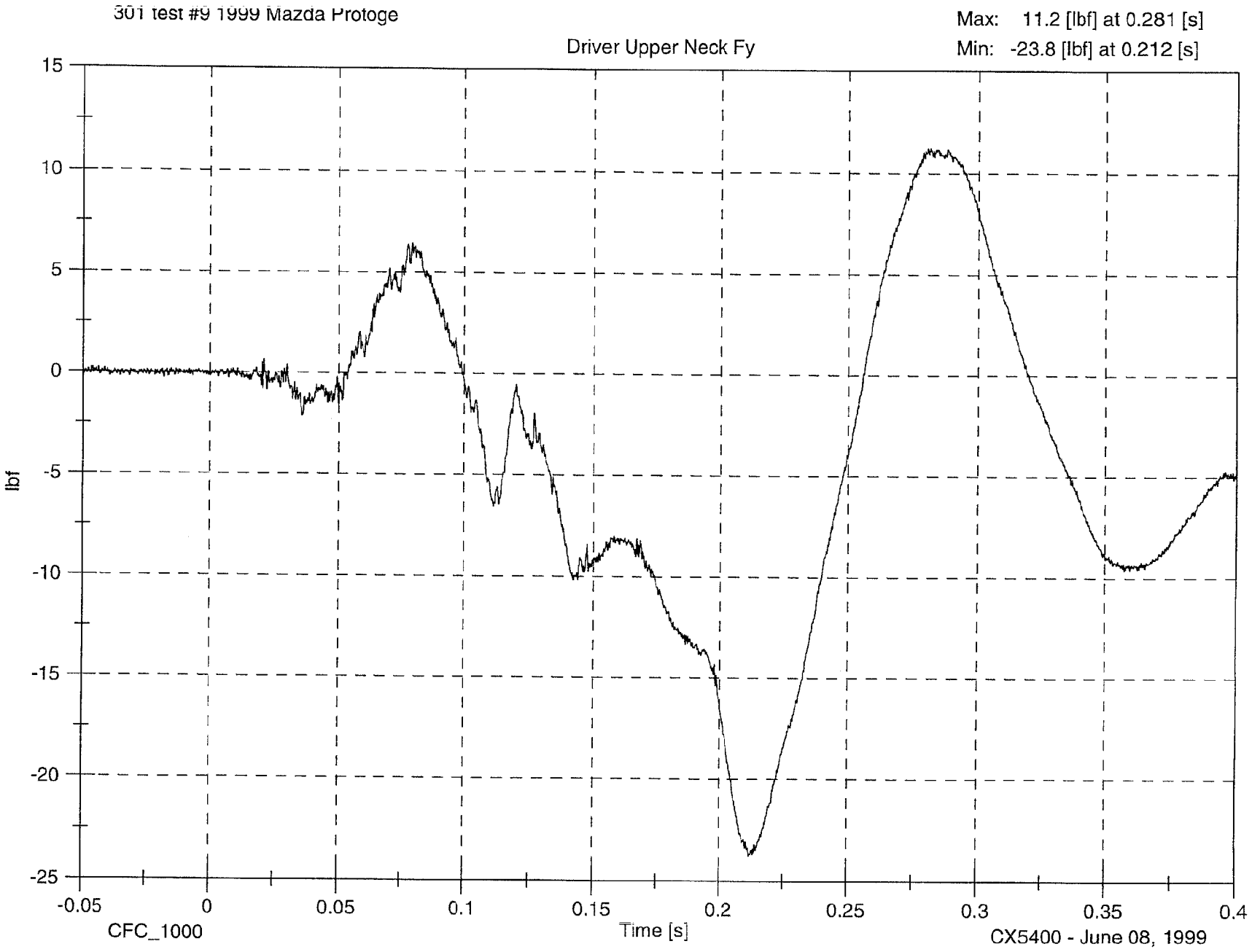

301 test #9 1999 Mazda Protoge
Max: 26.5 [g] at 0.128 [s]
Min: -3.0 [g] at 0.500 [s]
Driver Head X
CX5400 - June 08, 1999
CFC_1000
Time [s]
g
30
25
20
15
10
5
0
-5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

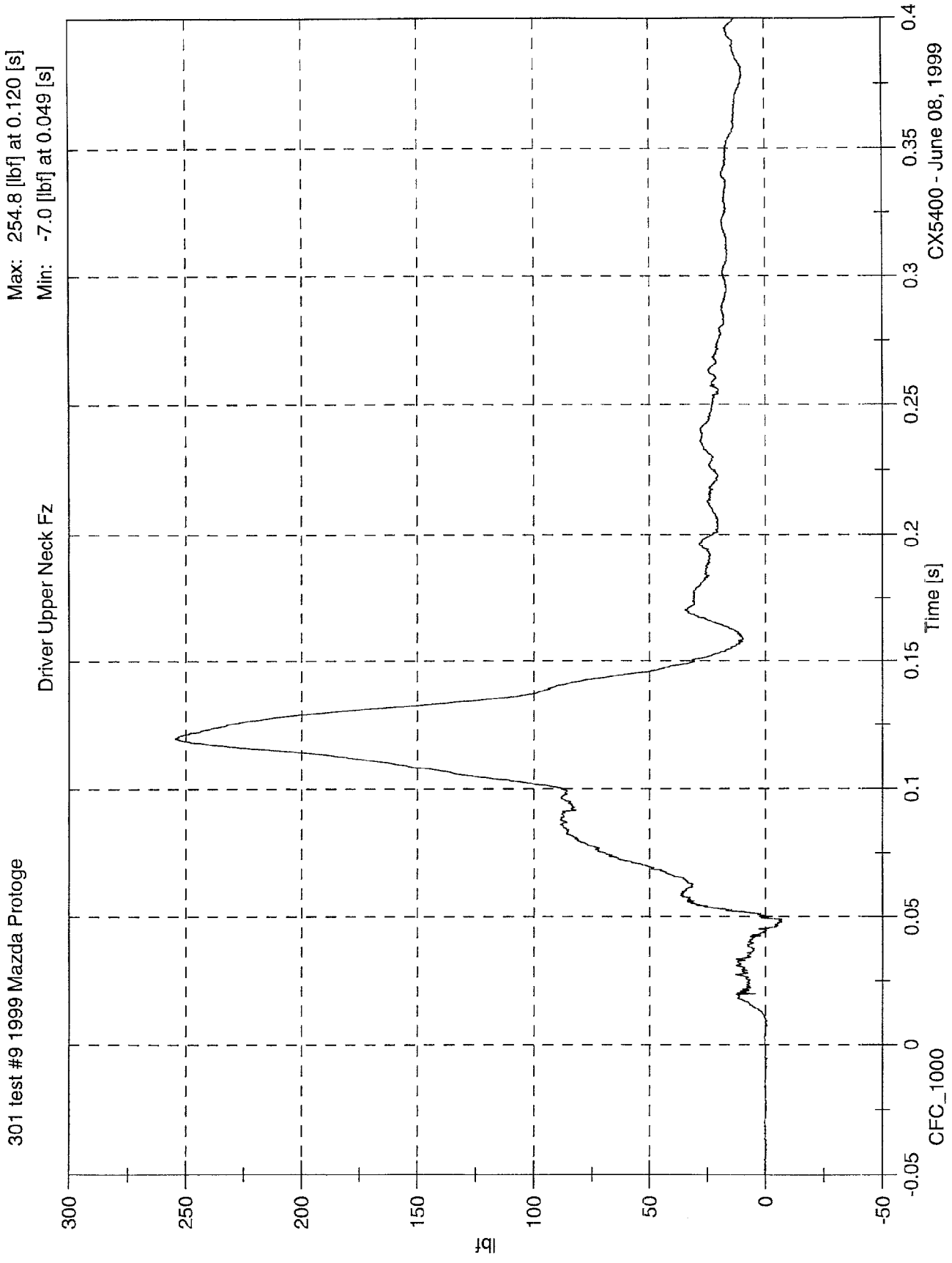

301 test #9 1999 Mazda Protoge
Max: 1.4 [g] at 0.284 [s]
Min: -4.4 [g] at 0.174 [s]
Driver Head Y
CX5400 - June 08, 1999
CFC_1000
Time [s]
g
2
1
0
-1
-2
-3
-4
-5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

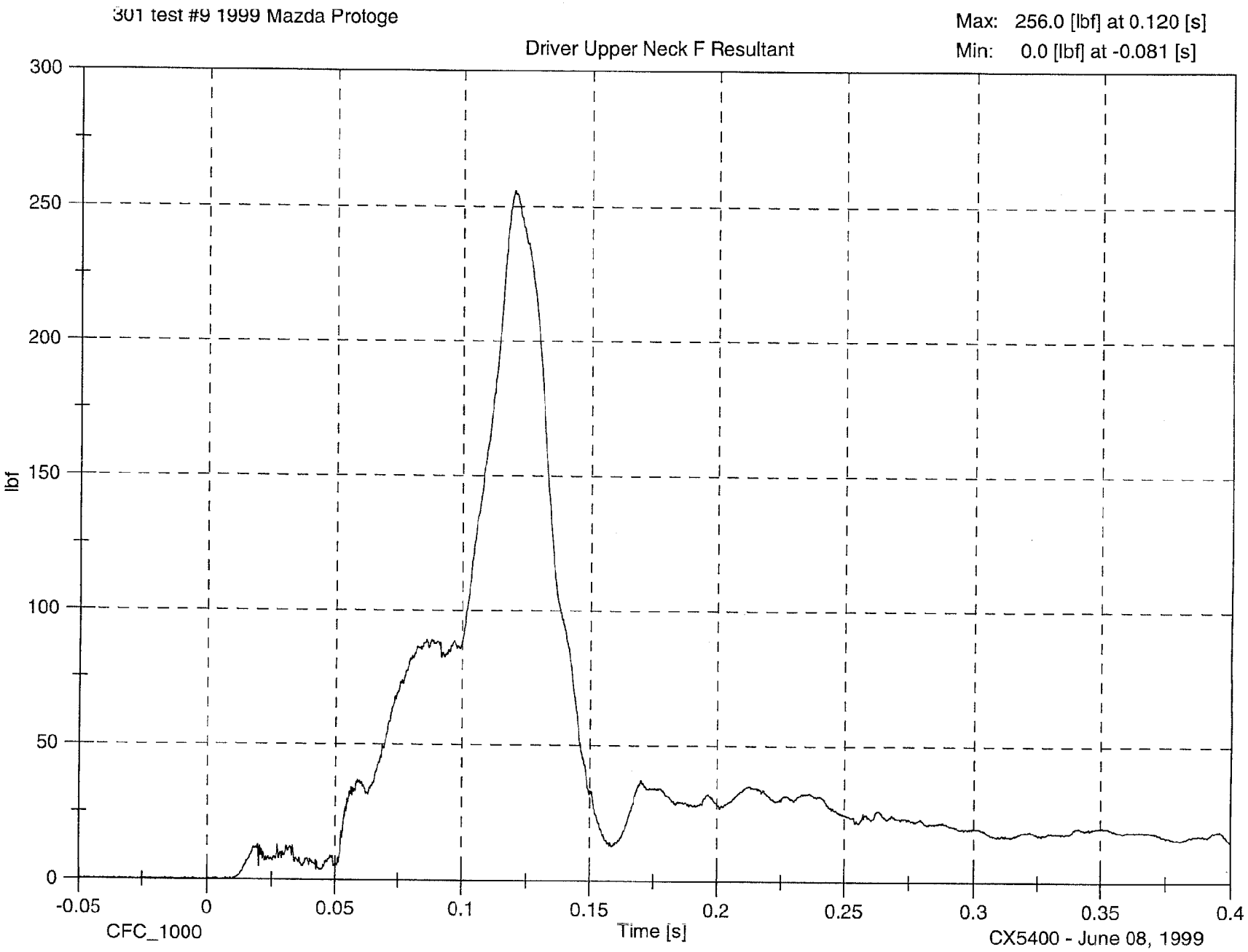

301 test #9 1999 Mazda Protoge
Max: 14.4 [g] at 0.114 [s]
Min: -0.4 [g] at 0.048 [s]
Driver Head Z
CX5400 - June 08, 1999
CFC_1000
Time [s]
g
15
12.5
10
7.5
5
2.5
0
-2.5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

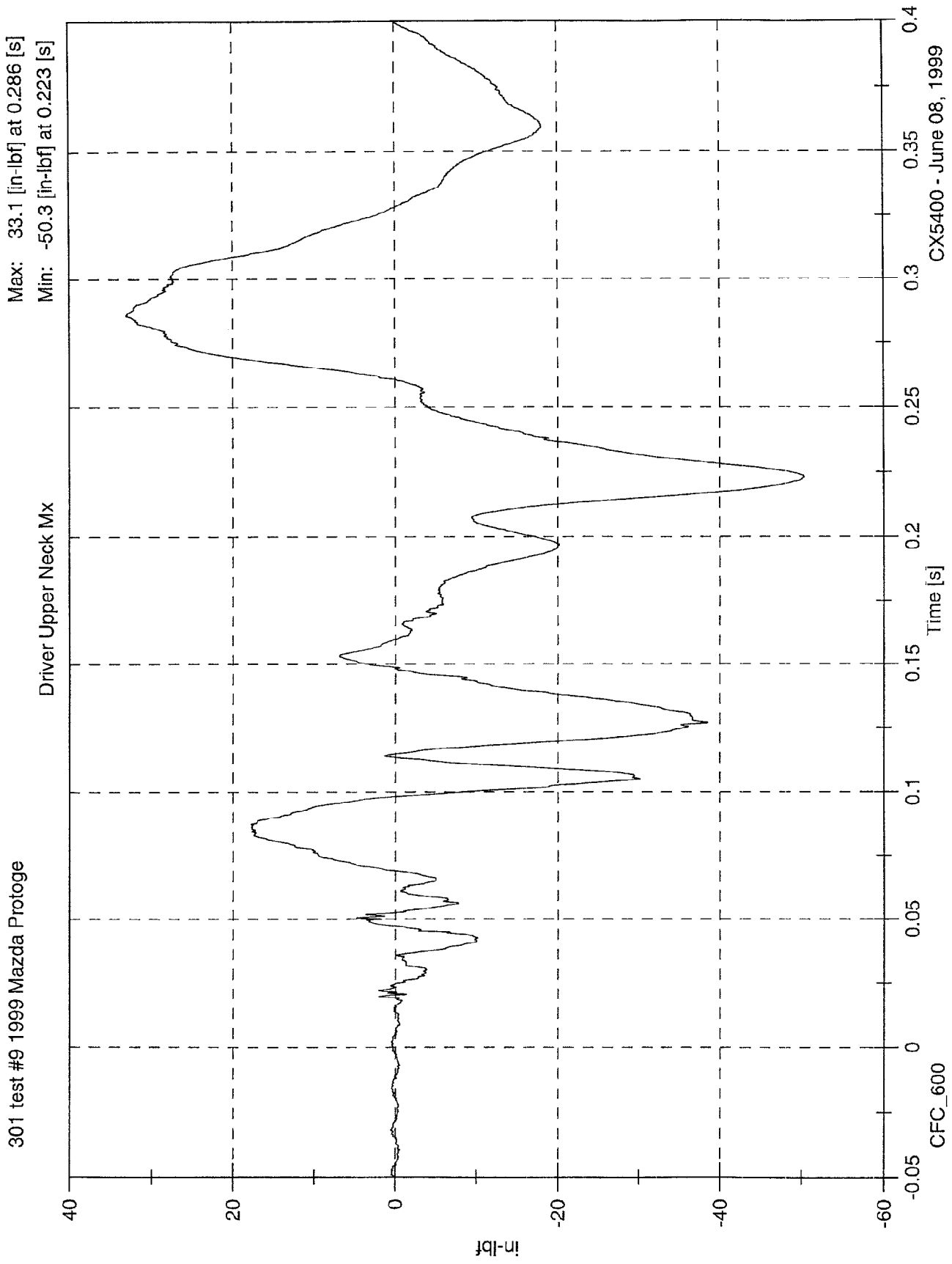

301 test #9 1999 Mazda Protoge
Max: 28.1 [g] at 0.128 [s]
Min: 0.0 [g] at -0.091 [s]
Driver Head Resultant
CX5400 - June 08, 1999
CFC_1000
Time [s]
g
30
25
20
15
10
5
0
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

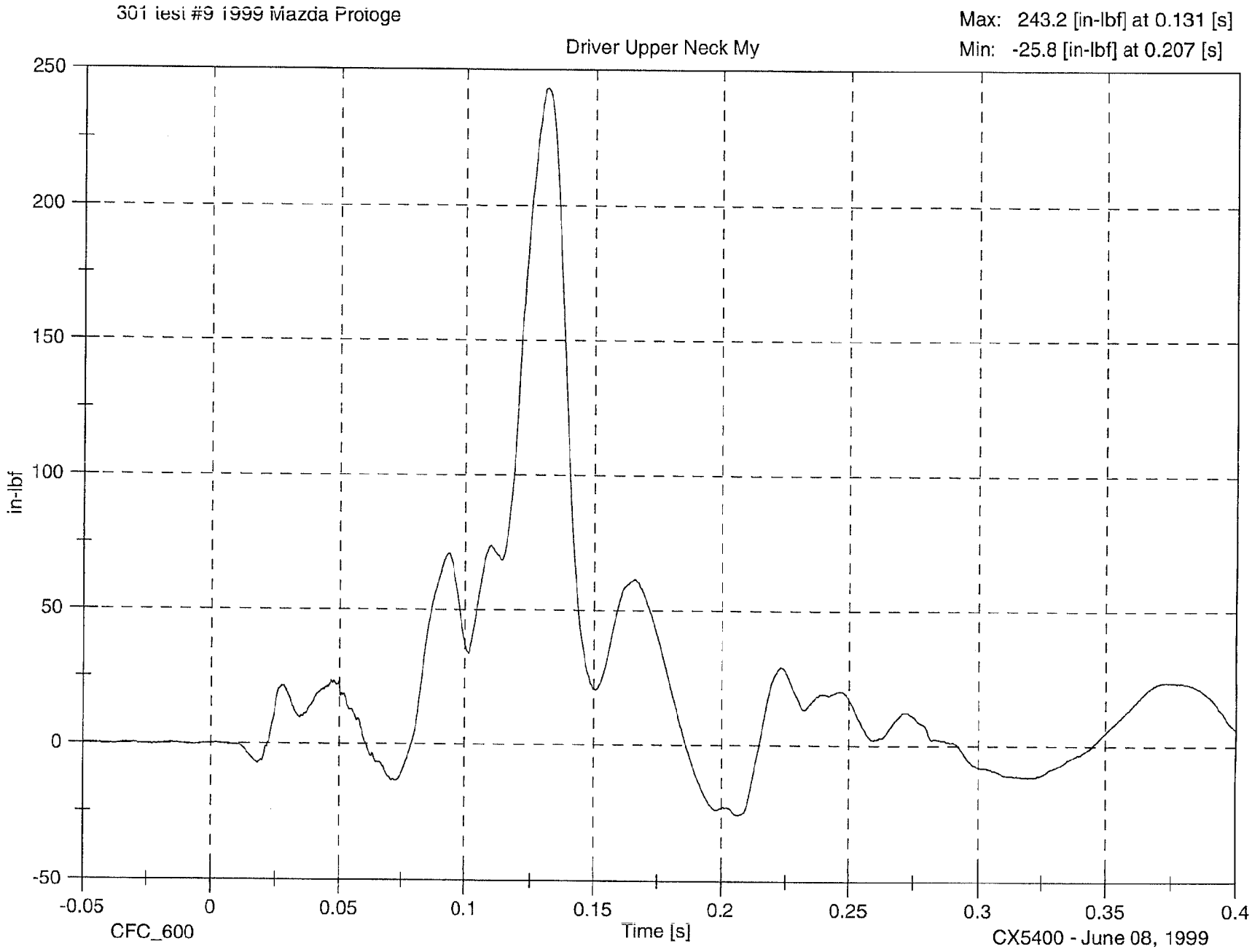

301 test #9 1999 Mazda Protoge
Max: 49.6 [lbf] at 0.130 [s]
Min: -26.0 [lbf] at 0.500 [s]
Driver Upper Neck Fx
CFC_1000
CX5400 - June 08, 1999
Time [s]
lbf
50
40
30
20
10
0
-10
-20
-30
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

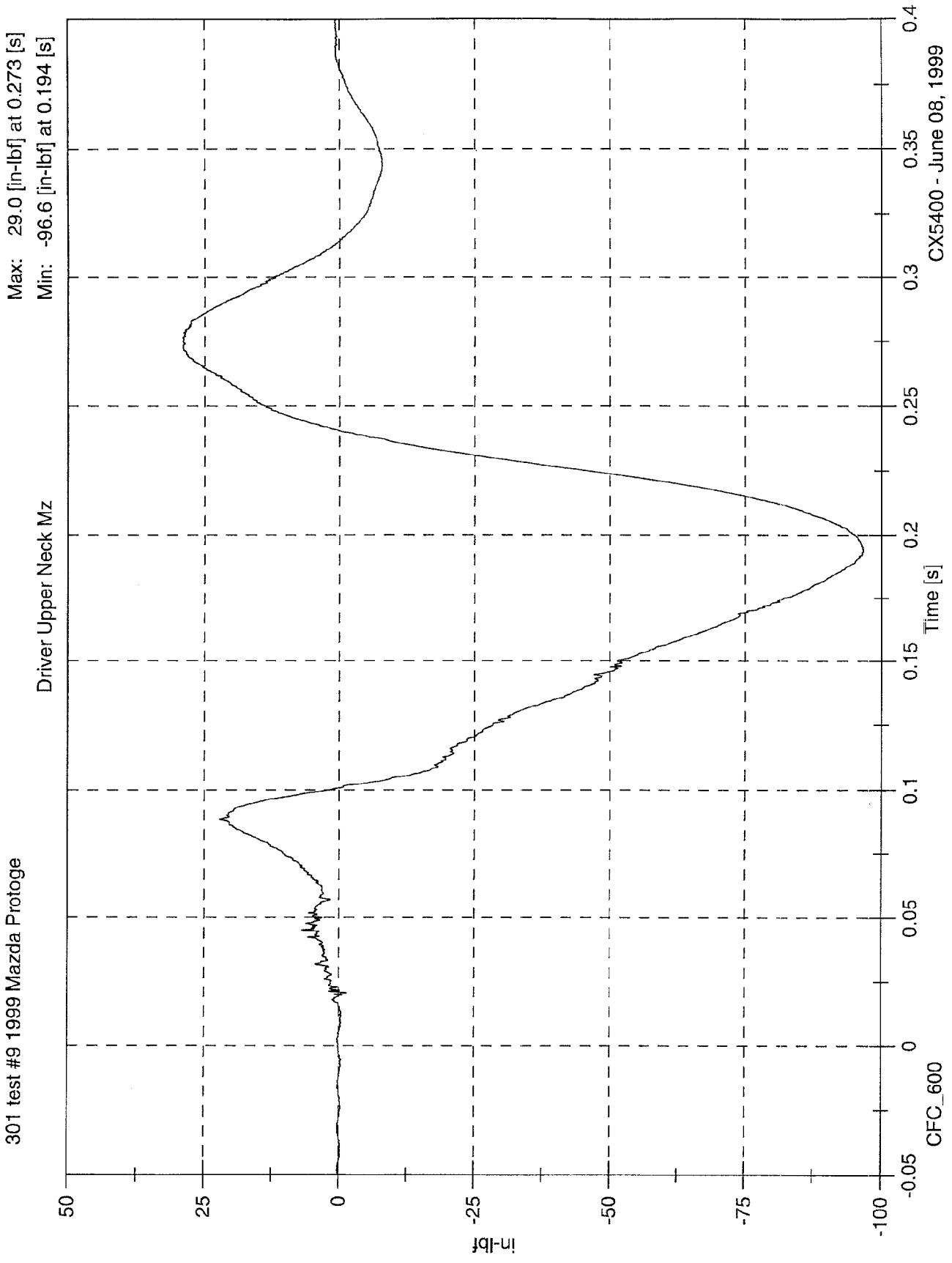

301 Test #9 1999 Mazda Protoge
Driver Upper Neck Fy
Max: 11.2 [lbf] at 0.281 [s]
Min: -23.8 [lbf] at 0.212 [s]
15
10
5
0
-5
-10
-15
-20
-25
lbf
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_1000
CX5400 - June 08, 1999

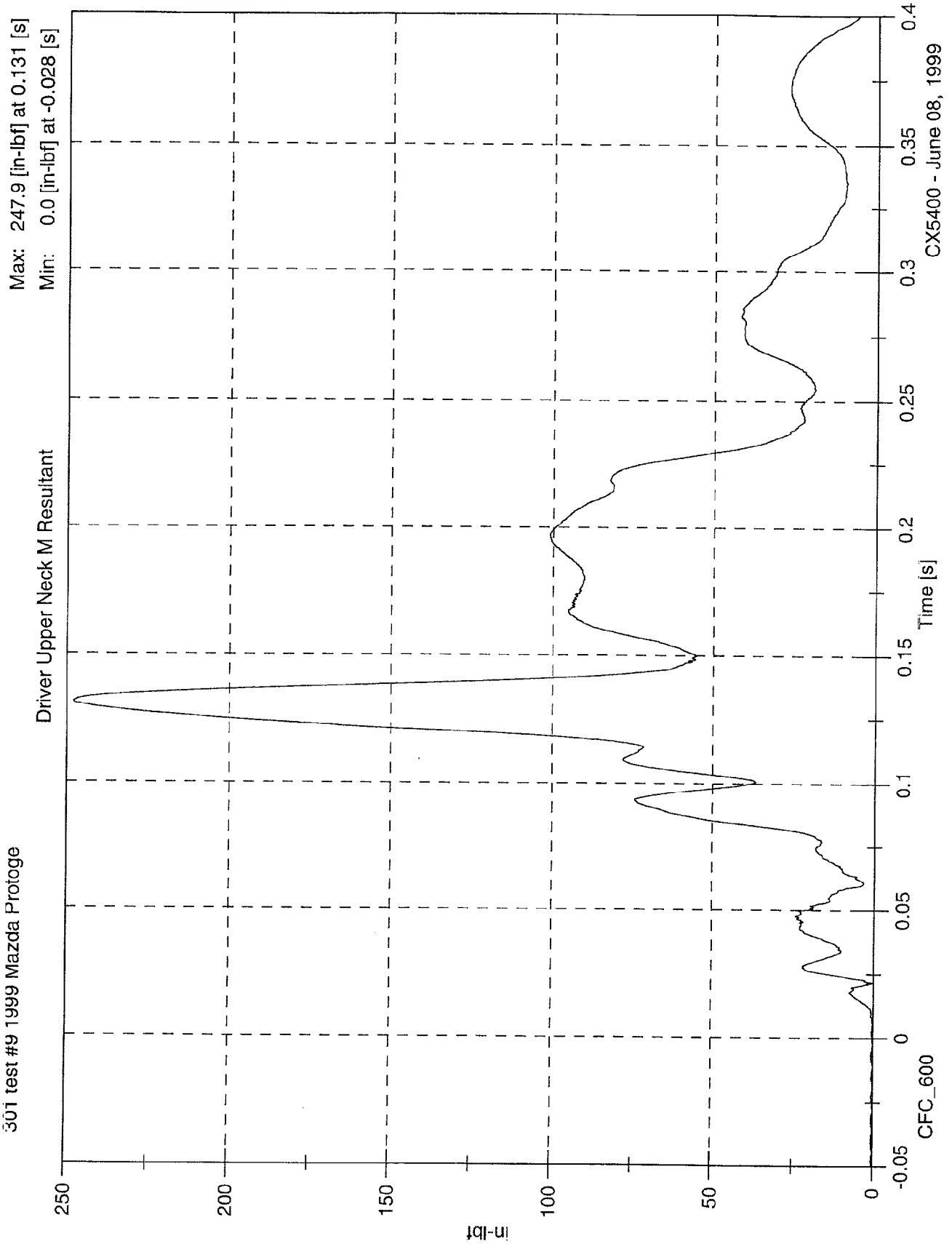

301 test #9 1999 Mazda Protoge
Max: 254.8 [lbf] at 0.120 [s]
Min: -7.0 [lbf] at 0.049 [s]
Driver Upper Neck Fz
CX5400 - June 08, 1999
CFC_1000
lbf
Time [s]
300
250
200
150
100
50
0
-50
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

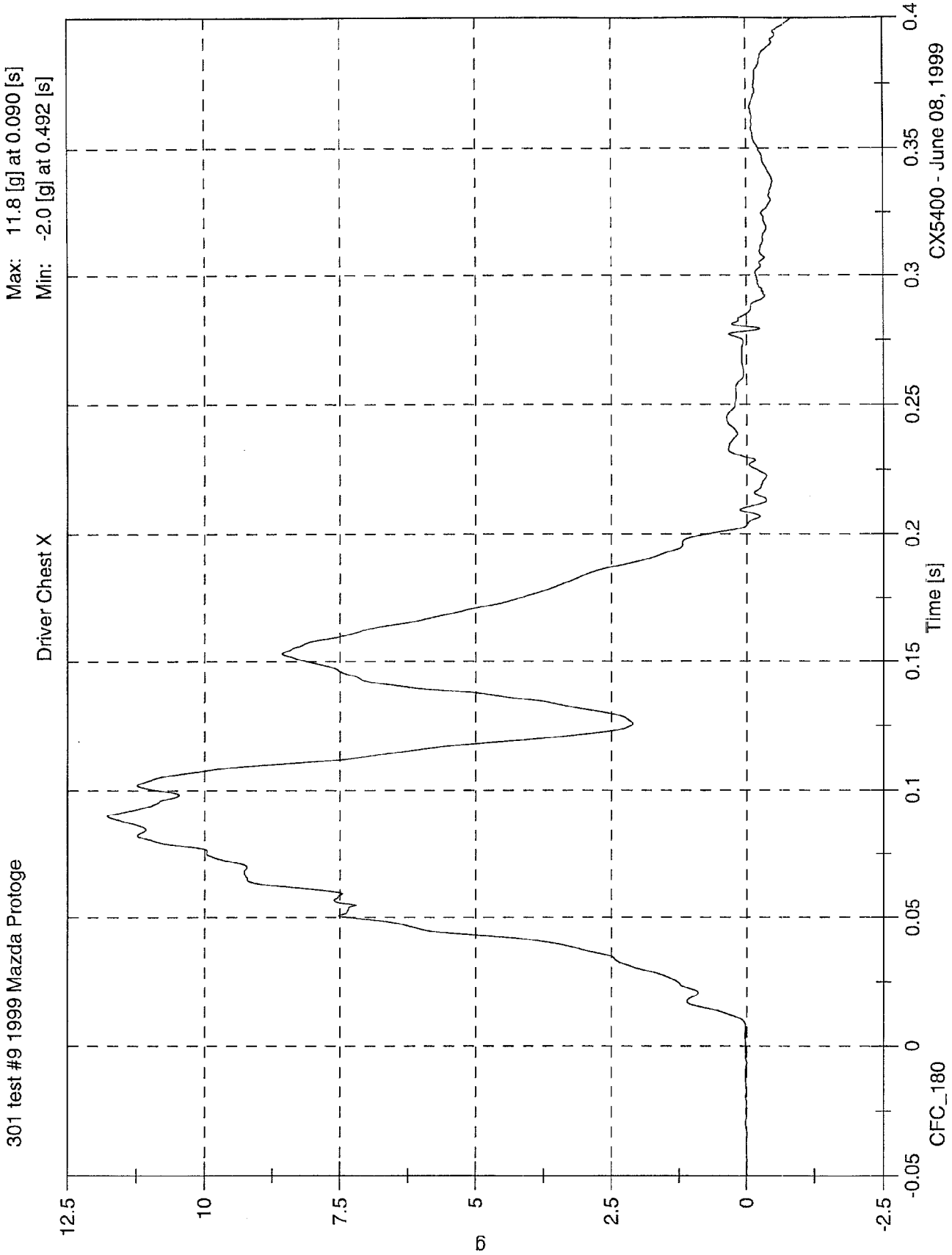

301 test #9 1999 Mazda Protoge
Driver Upper Neck F Resultant
Max: 256.0 [lbf] at 0.120 [s]
Min: 0.0 [lbf] at -0.081 [s]
300
250
200
150
100
50
0
lbf
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_1000
CX5400 - June 08, 1999

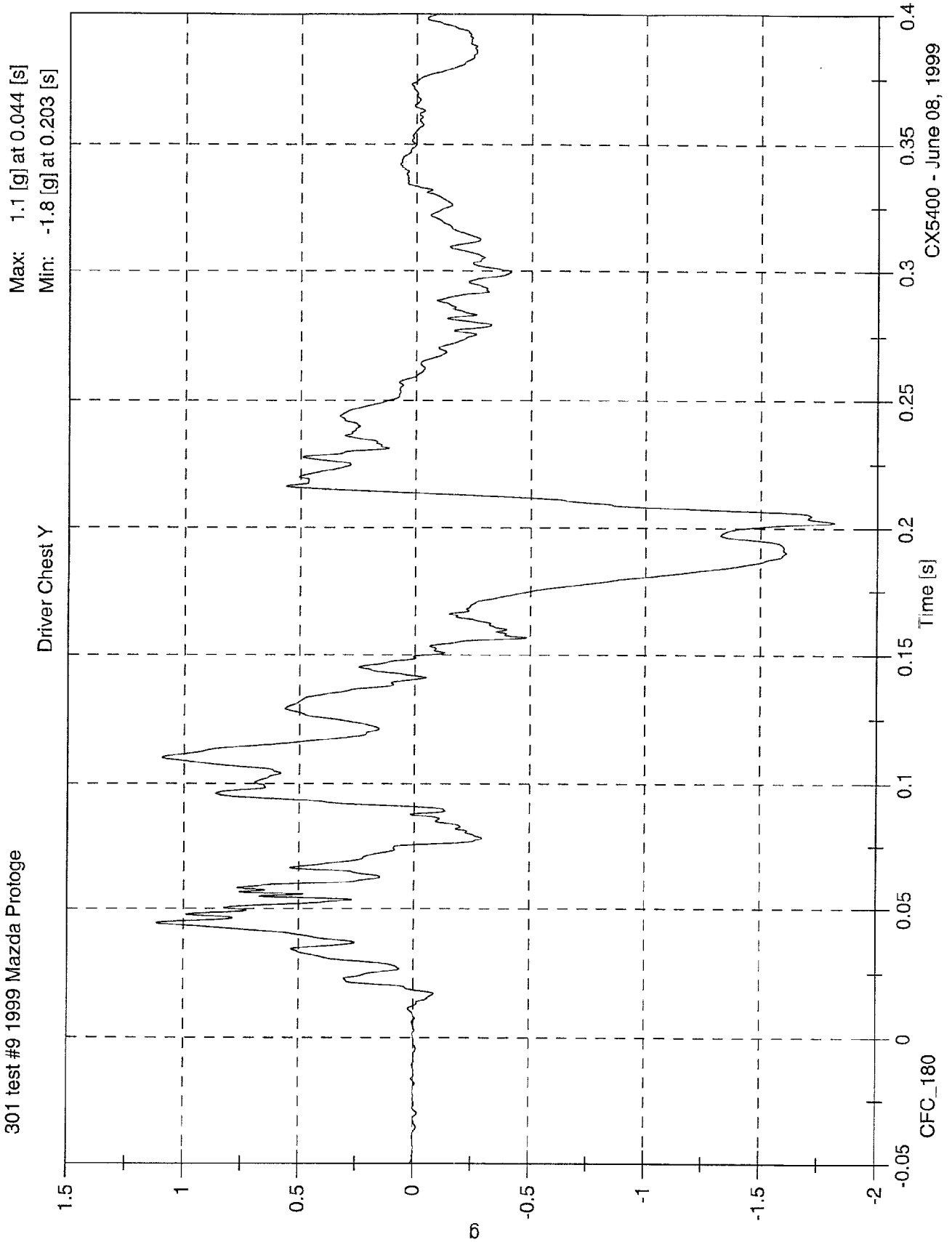

301 test #9 1999 Mazda Protoge
Max: 33.1 [in-lbf] at 0.286 [s]
Min: -50.3 [in-lbf] at 0.223 [s]
Driver Upper Neck Mx
in-lbf
40
20
0
-20
-40
-60
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_600
CX5400 - June 08, 1999

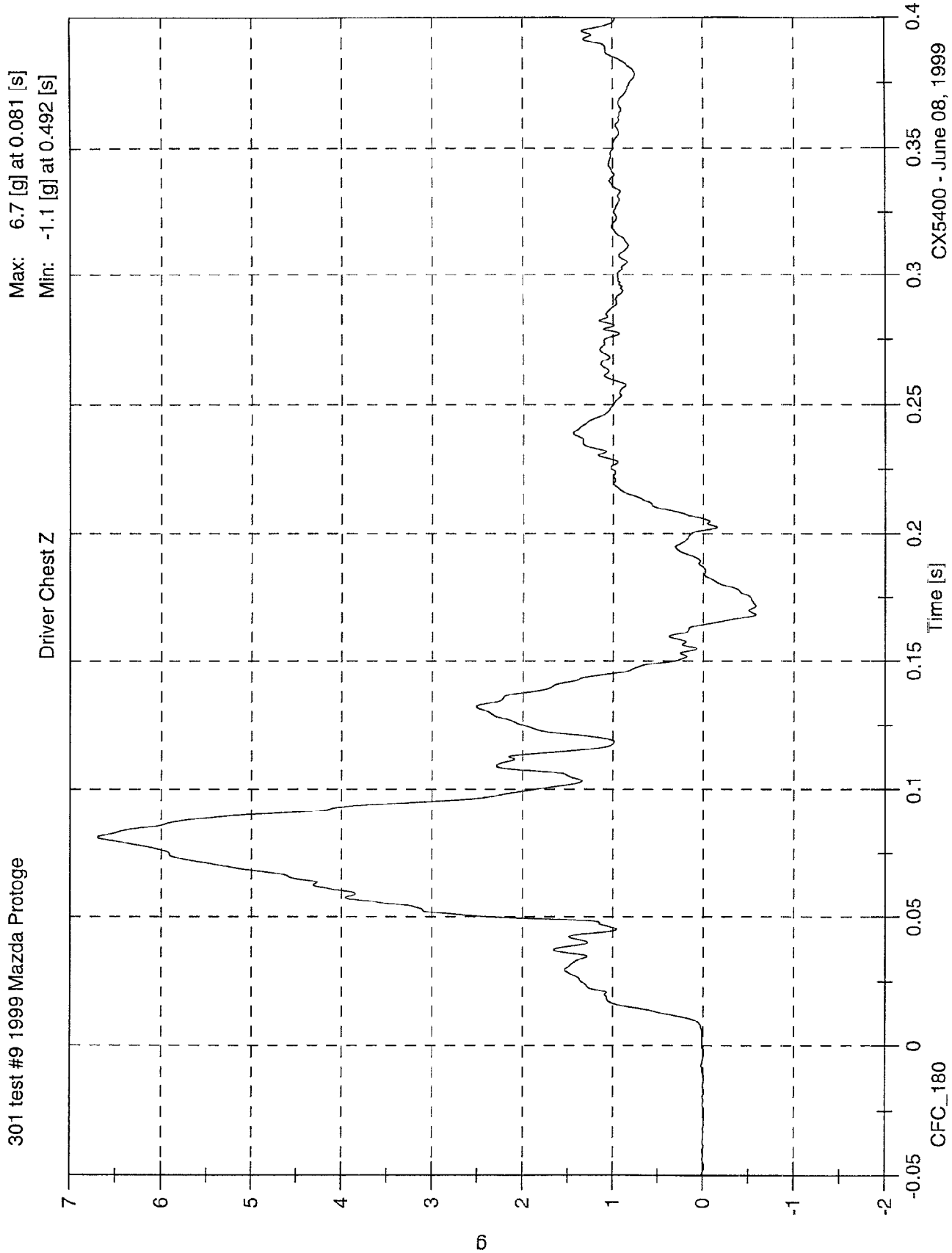

301 Test #9 1999 Mazda Protoge
Driver Upper Neck My
Max: 243.2 [in-lbf] at 0.131 [s]
Min: -25.8 [in-lbf] at 0.207 [s]
250
200
150
100
50
0
-50
in-lbf
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_600
CX5400 - June 08, 1999

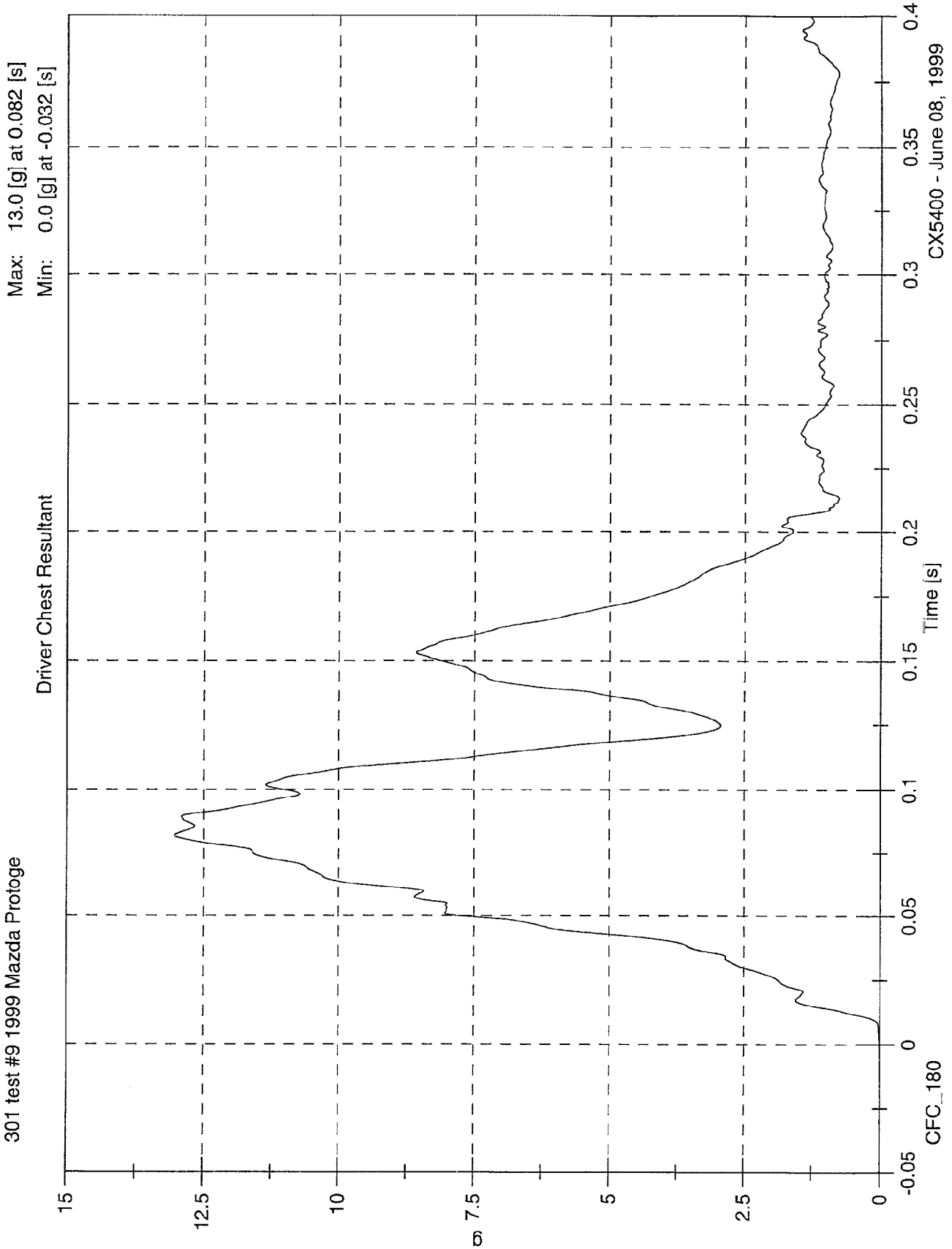

301 test #9 1999 Mazda Protoge
Max: 29.0 [in-lbf] at 0.273 [s]
Min: -96.6 [in-lbf] at 0.194 [s]
Driver Upper Neck Mz
in-lbf
50
25
0
-25
-50
-75
-100
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_600
CX5400 - June 08, 1999

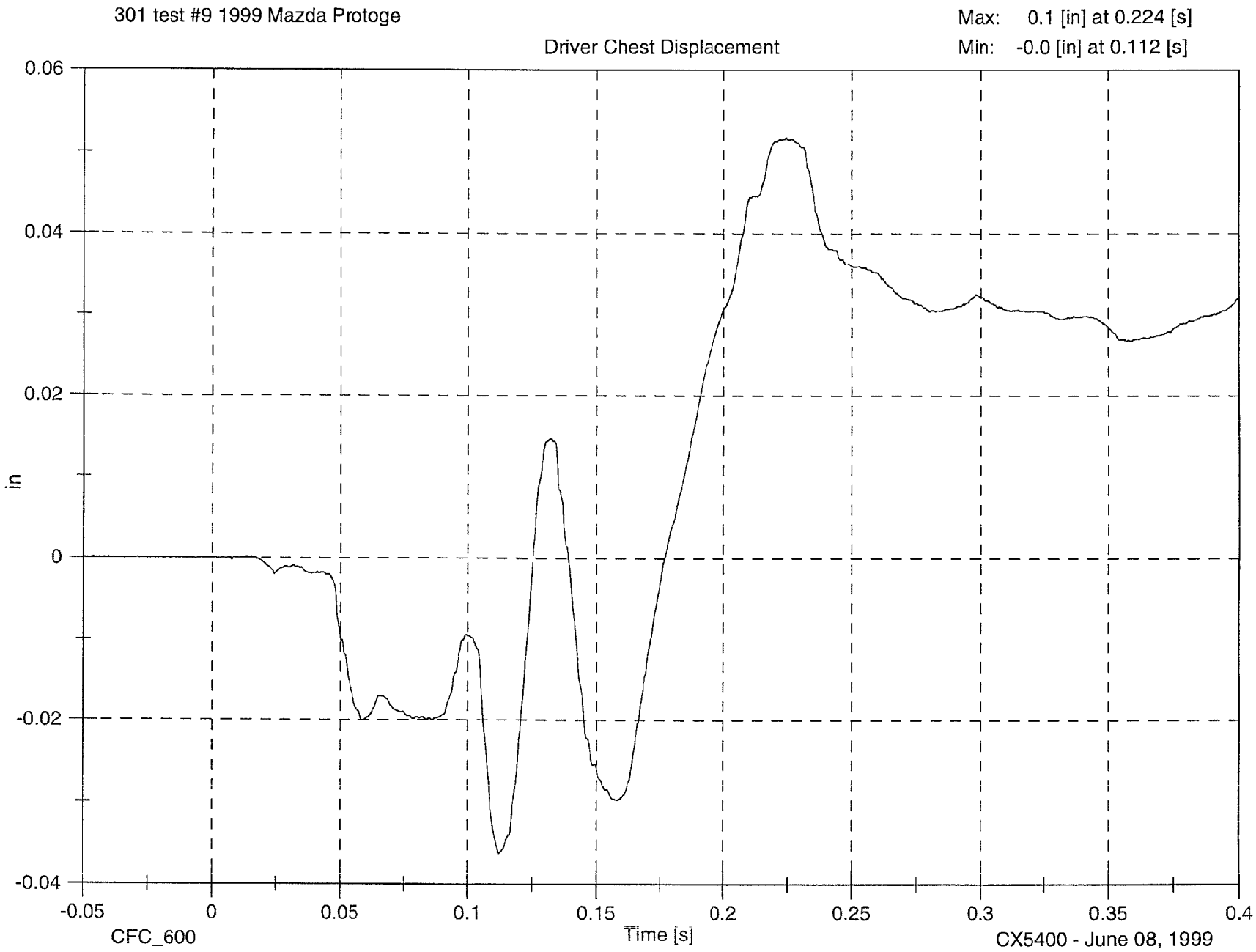

301 test #9 1999 Mazda Protoge
Max: 247.9 [in-lbf] at 0.131 [s]
Min: 0.0 [in-lbf] at -0.028 [s]
Driver Upper Neck M Resultant
CX5400 - June 08, 1999
CFC_600
Time [s]
in-lbf
250
200
150
100
50
0
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

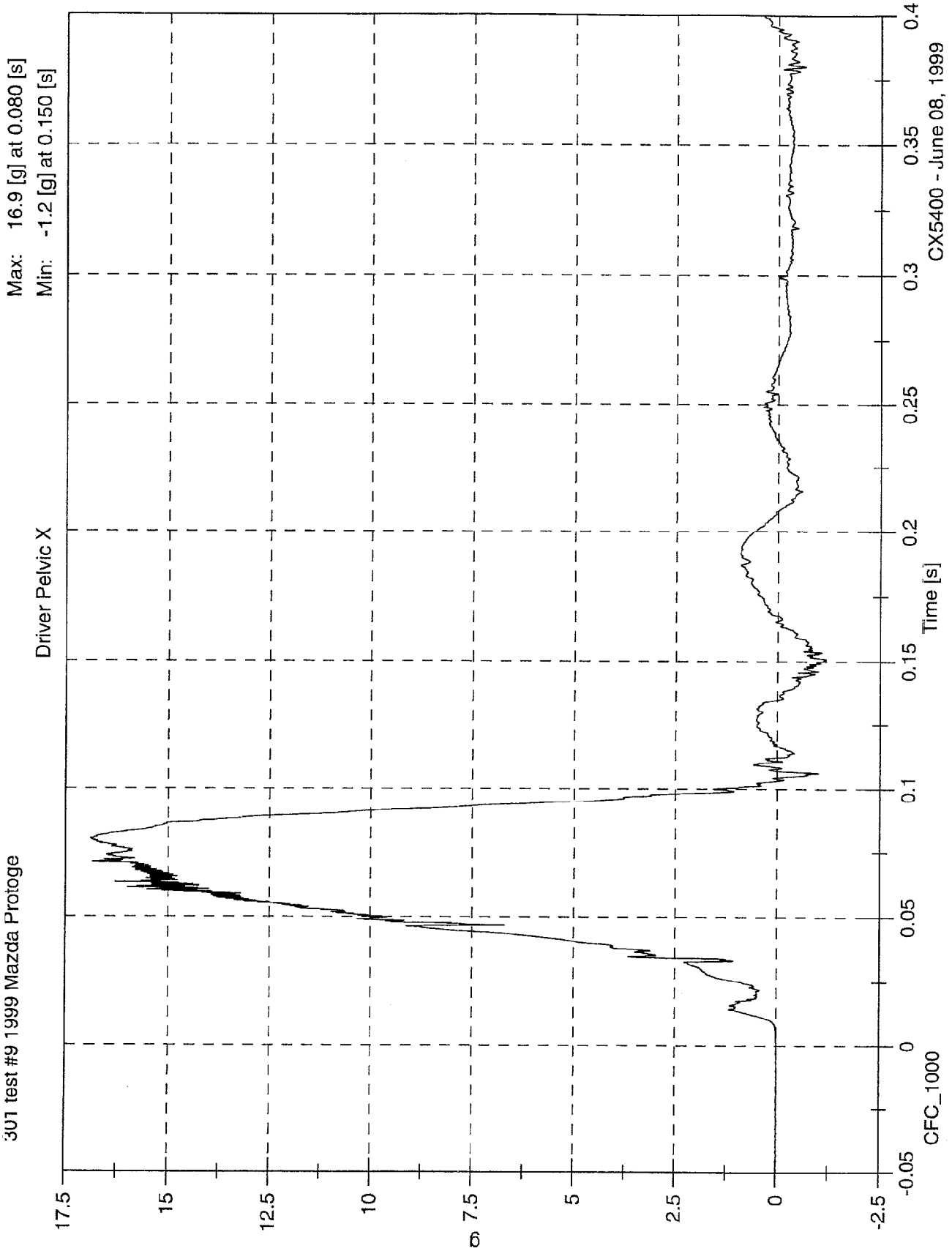

301 test #9 1999 Mazda Protoge
Max: 11.8 [g] at 0.090 [s]
Min: -2.0 [g] at 0.492 [s]
Driver Chest X
CFC_180
CX5400 - June 08, 1999
Time [s]
g
12.5
10
7.5
5
2.5
0
-2.5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

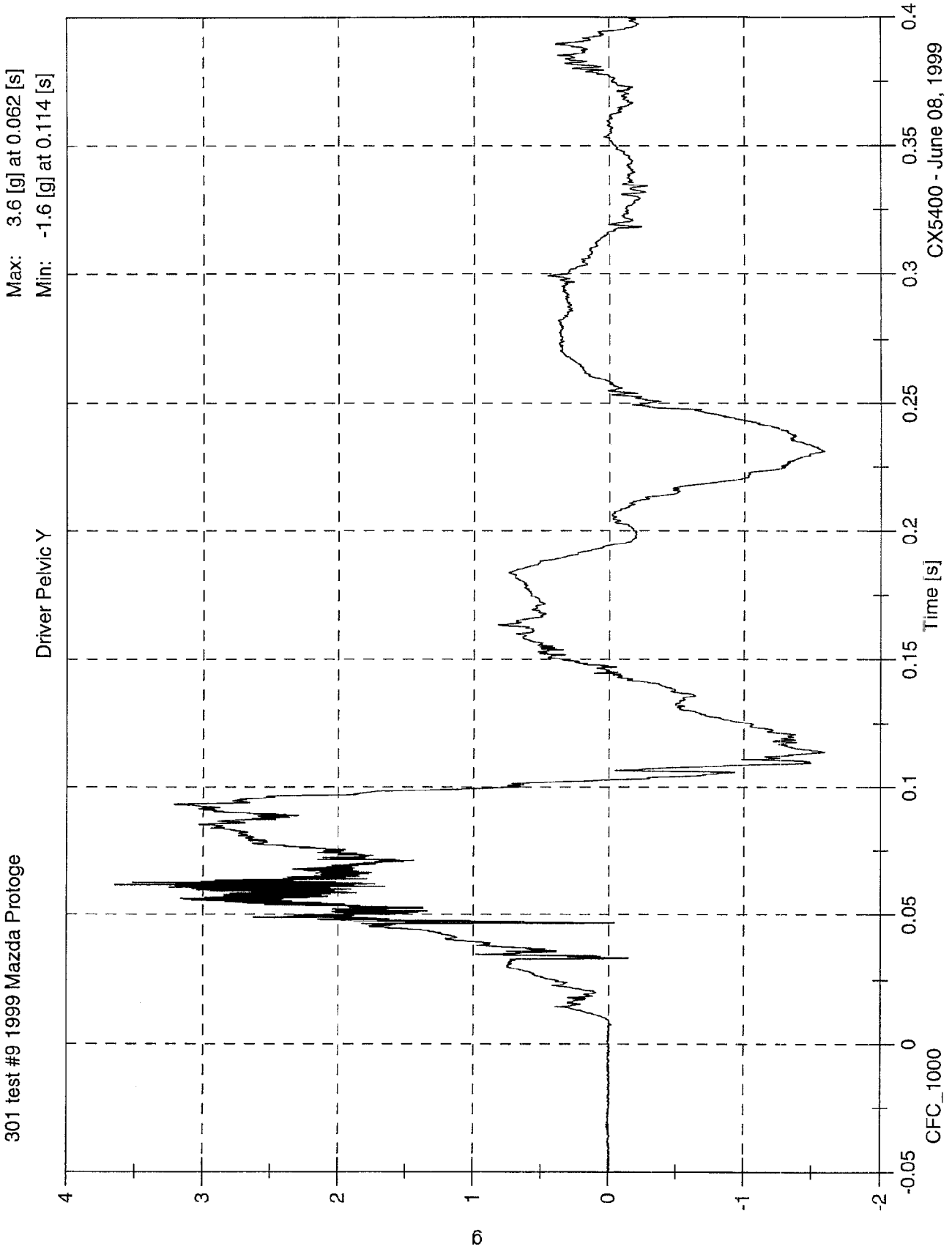

301 test #9 1999 Mazda Protoge
Max: 1.1 [g] at 0.044 [s]
Min: -1.8 [g] at 0.203 [s]
Driver Chest Y
CFC_180
CX5400 - June 08, 1999
Time [s]
g
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

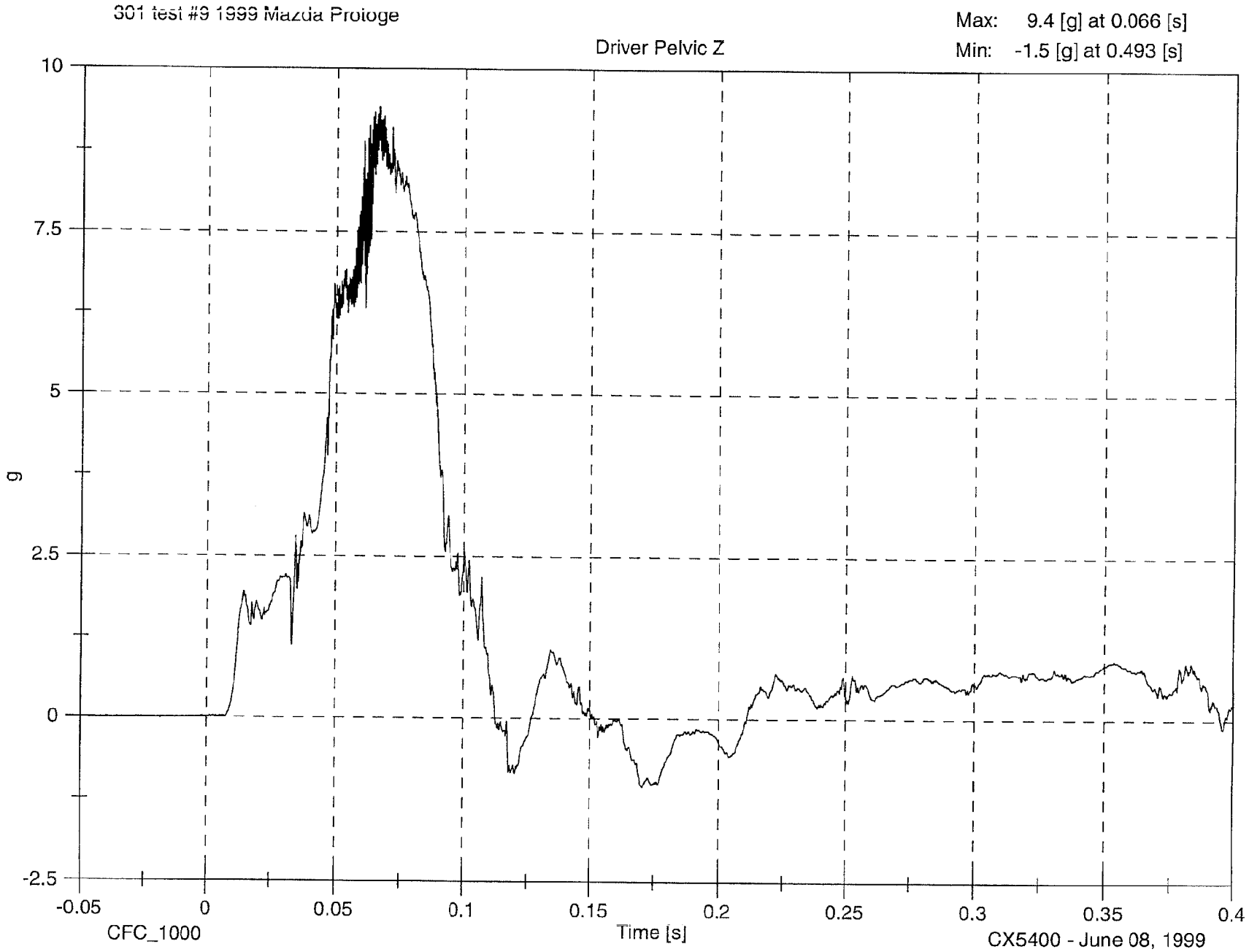

301 test #9 1999 Mazda Protoge
Max: 6.7 [g] at 0.081 [s]
Min: -1.1 [g] at 0.492 [s]
Driver Chest Z
CFC_180
CX5400 - June 08, 1999
Time [s]
g
7
6
5
4
3
2
1
0
-1
-2
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

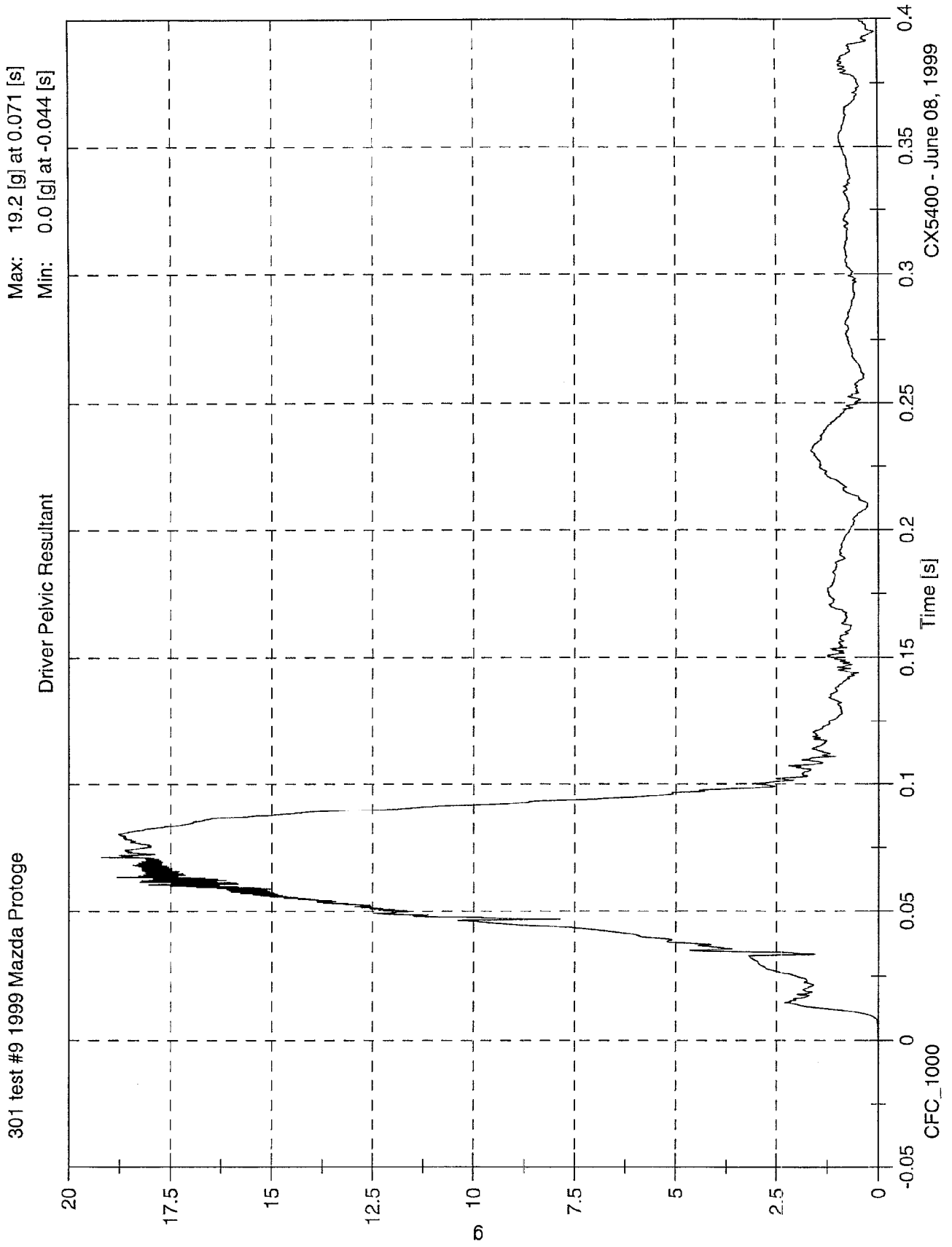

301 test #9 1999 Mazda Protoge
Driver Chest Resultant
Max: 13.0 [g] at 0.082 [s]
Min: 0.0 [g] at -0.032 [s]
CX5400 - June 08, 1999
CFC_180
Time [s]
g
15
12.5
10
7.5
5
2.5
0
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

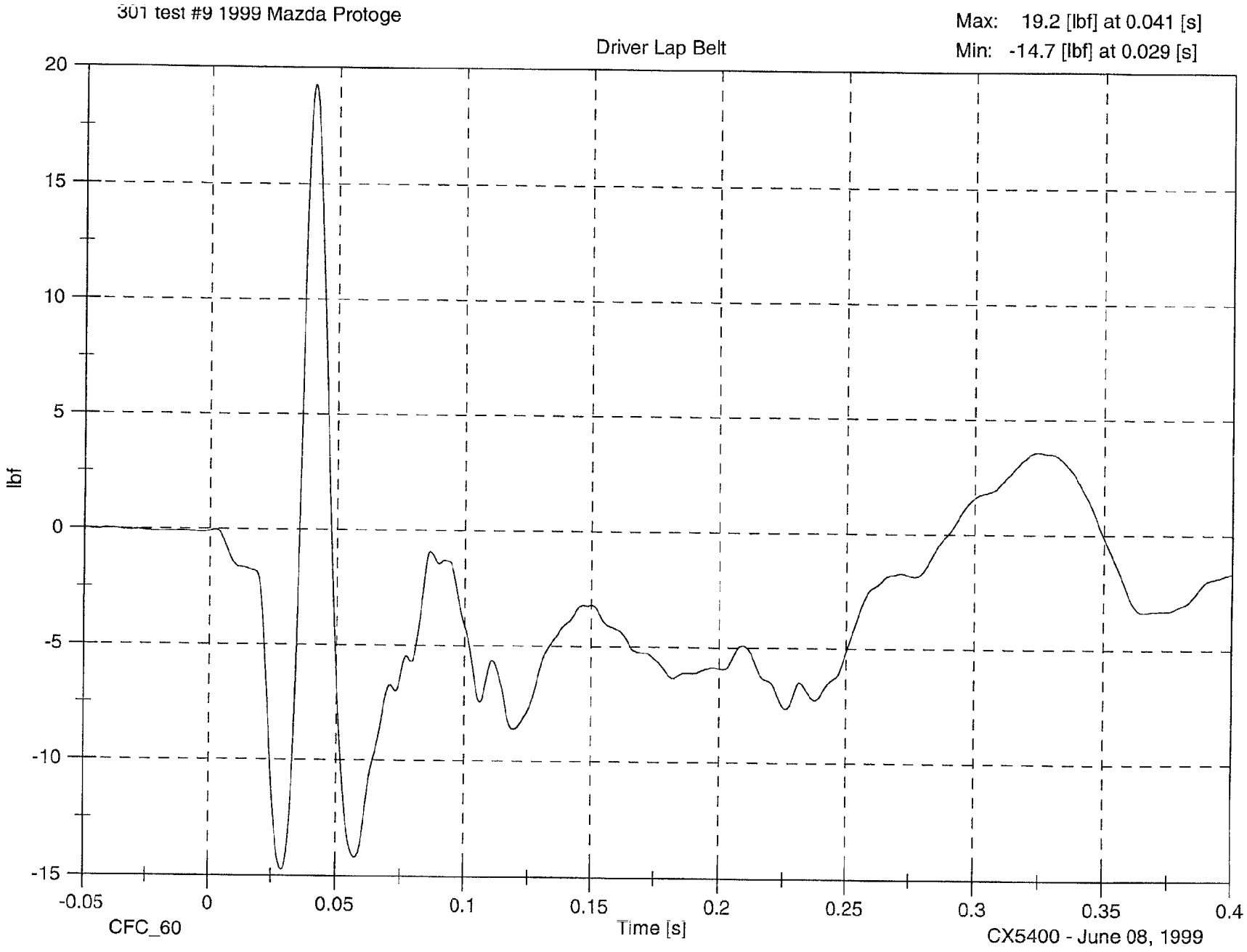

301 test #9 1999 Mazda Protoge
Driver Chest Displacement
Max: 0.1 [in] at 0.224 [s]
Min: -0.0 [in] at 0.112 [s]
0.06
0.04
0.02
0
-0.02
-0.04
in
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_600
CX5400 - June 08, 1999

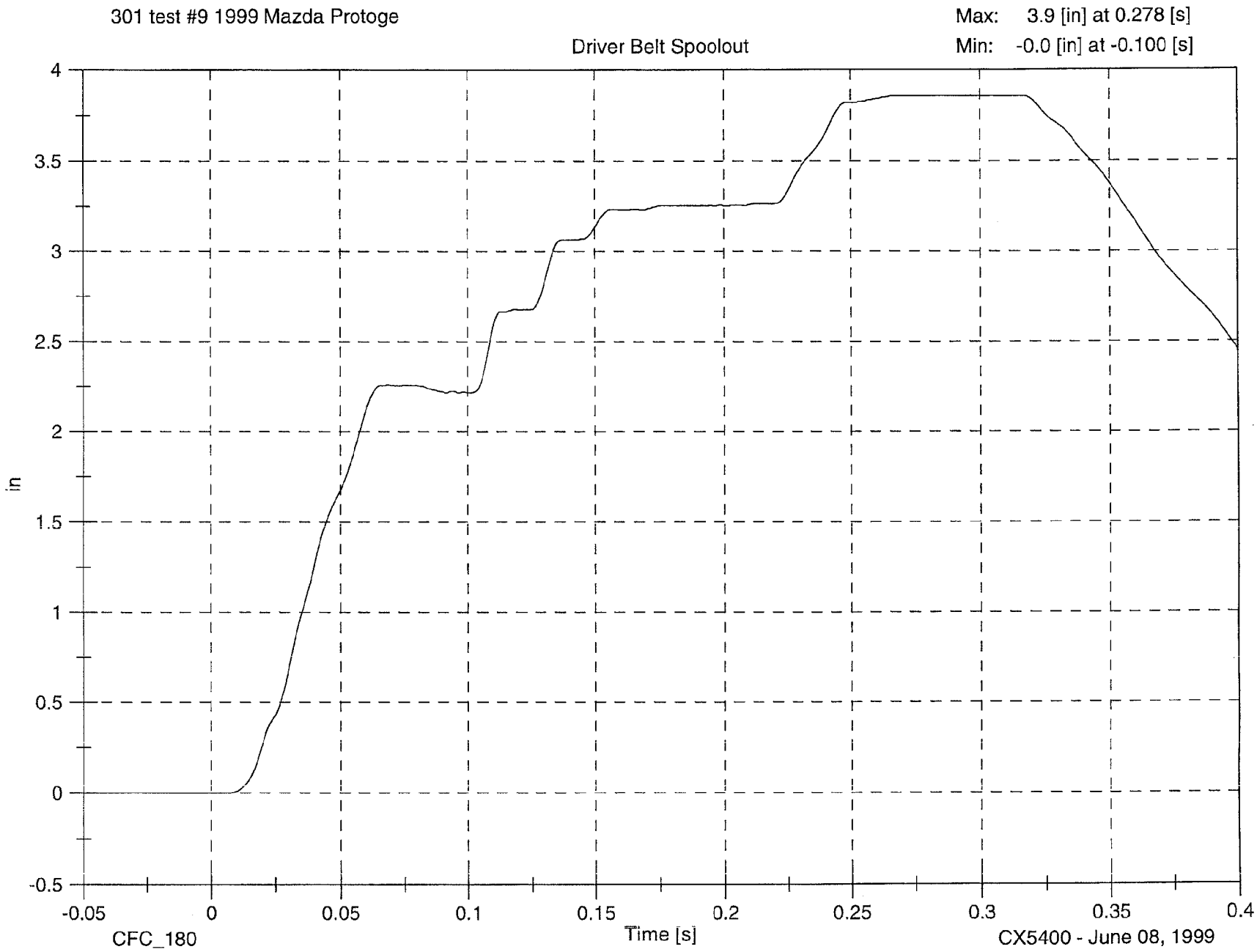

301 test #9 1999 Mazda Protoge
Max: 16.9 [g] at 0.080 [s]
Min: -1.2 [g] at 0.150 [s]
Driver Pelvic X
CX5400 - June 08, 1999
CFC_1000
Time [s]
g
17.5
15
12.5
10
7.5
5
2.5
0
-2.5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4


301 test #9 1999 Mazda Protoge
Max: 3.6 [g] at 0.062 [s]
Min: -1.6 [g] at 0.114 [s]
Driver Pelvic Y
CFC_1000
CX5400 - June 08, 1999
Time [s]
g
4
3
2
1
0
-1
-2
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4


301 test #9 1999 Mazda Prologe
Driver Pelvic Z
Max: 9.4 [g] at 0.066 [s]
Min: -1.5 [g] at 0.493 [s]
10
7.5
5
2.5
0
-2.5
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_1000
Time [s]
CX5400 - June 08, 1999


301 test #9 1999 Mazda Protoge
Max: 19.2 [g] at 0.071 [s]
Min: 0.0 [g] at -0.044 [s]
Driver Pelvic Resultant
CFC_1000
CX5400 - June 08, 1999
Time [s]
g
20
17.5
15
12.5
10
7.5
5
2.5
0
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4


301 test #9 1999 Mazda Protoge
Driver Lap Belt
Max: 19.2 [lbf] at 0.041 [s]
Min: -14.7 [lbf] at 0.029 [s]
lbf
20
15
10
5
0
-5
-10
-15
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_60
CX5400 - June 08, 1999


301 test #9 1999 Mazda Protoge
Driver Belt Spoolout
Max: 3.9 [in] at 0.278 [s]
Min: -0.0 [in] at -0.100 [s]
in
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX5400 - June 08, 1999