V3247

REPORT NUMBER: 301-CAL-99-1

SAFETY COMPLIANCE TESTING FOR FMVSS 301
FUEL SYSTEM INTEGRITY

GENERAL MOTORS CORPORATION
1999 PONTIAC GRAND AM
4 DOOR SEDAN

NHTSA NUMBER: CX0101

CALSPAN TEST NUMBER: 8480-1

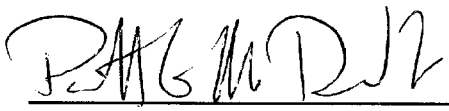
CALSPAN CORPORATION
P.O. BOX 400
BUFFALO, NEW YORK 14225

October 13, 1998

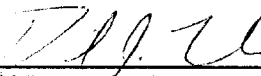
FINAL REPORT

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

Prepared By: 

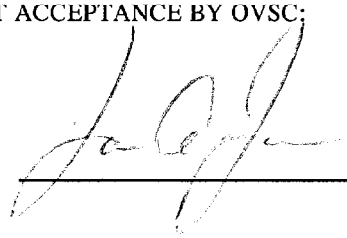
Patrick G. MacDiarmid, Jr., Project Engineer

Approved By: 

David J. Travale, Program Manager
Transportation Sciences Center

Approval Date: October 29, 1998

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: 

Acceptance Date: 12-10-98

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4. Title and Subtitle	5. Report Date
Final Report of FMVSS 301 Compliance Testing of a 1999 Pontiac Grand Am 4 Door Sedan NHTSA No. CX0101	October 13, 1998
	6. Performing Organization Code: CAL
7. Author(s): Patrick G. MacDiarmid, Jr., Project Engineer; David J. Travale, Program Manager	8. Performing Organization Report No.: 8480-1
9. Performing Organization Name and Address: Calspan Corporation, 4455 Genesee Street, Buffalo, New York 14225	10. Work Unit No.
	11. Contract or Grant No.: DTNH22-95-D-11000
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15. Supplementary Notes

16. Abstract

Compliance tests were conducted on the subject 1999 Pontiac Grand Am 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."

17. Key Words	18. Distribution Statement
Compliance Testing Safety Engineering FMVSS 301	Copies of this report are available from: NHTSA Technical Reference Division Room 5108 (NAD-52), 400 Seventh , S.W., Washington, D.C. 20590 Telephone No. (202) 366-4946

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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 Calspan Corporation under Contract No. DTNH22-95-D-11000. The purpose of this test was to determine if the subject vehicle, a 1999 Pontiac Grand Am 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 3537 pound 1999 Pontiac Grand Am 4 Door Sedan was impacted from the rear by a 3961 pound moving barrier at a velocity of 29.9 mph. The test was performed by the Calspan Corporation on October 13, 1998.

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. Additional ballast (38 pounds) was secured in the vehicle cargo area.

Average longitudinal crush was 13.6 inches. Pre- and post-test photographs of the vehicle can be found in appendix A.

The 15.2 gallon fuel tank was filled to 92.5 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.: CX0101 Test Mode: 30 mph Rear Barrier

Test Date: October 13, 1998 Time: 14:00 Temperature : 67 °F

Vehicle Make/Model/Body Style: 1999 Pontiac Grand Am 4 Door Sedan

Vehicle Test Weight: 3537 lbs Impact Velocity: 29.9 mph

Static Crush: Left Side = 13.3 inches

Right Side = 14.2 inches

Centerline = 13.3 inches

Average Crush: 13.6 inches

TYPE OF FRONT OCCUPANT RESTRAINT SYSTEM INSTALLED IN TEST VEHICLE:

Driver's DSP: 3-Point Seatbelt, Airbag, Knee Bolster

Right Passenger's DSP: 3-Pont Seatbelt, Airbag, Knee Bolster

VISIBLE DUMMY CONTACT POINTS:

Driver: The back of the driver's head contacted to the right of the center of the headrest.

Passenger: The back of the passenger's head contacted to the right of the center of the headrest. The top right side of the passenger's head contacted the roof liner above the passenger door.

DOOR OPENING DATA: Closed/Inoperable - Left Front

Closed/Inoperable - Right Front

Stoddard Solvent Spillage from Vehicle's Fuel System: There was no Stoddard leakage from the vehicle fuel system at impact, for 30 minutes after the vehicle impact, nor during any phase of the rollover.

Remarks: The rear window shattered upon impact and the rear bumper cover and bumper foam fell off after the impact. The vehicle's rear doors locked during the impact. The doors had to be pried open.

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1999 Pontiac Grand Am 4 Door Sedan

NHTSA No.: CX0101 ; VIN: 1G2NE52T3XC515499 ; Color: Red

Engine Data: 4 cylinders; - CID; 2.4 Liters; - cc

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

Transmission Data: 4 speeds; - Manual; X Automatic; X 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; X Pwr. Door Locks; X Tilt Wheel

Date Received: 9-25-98 ; Odometer Reading 44 miles

Selling Dealer: Jack Hayes Oldsmobile-Pontiac

& Address: PO Box 320 Akron, New York 14001

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: General Motors Corporation

Date of Manufacture: 7/98

GVWR: 3981 lbs.; GAWR: 2244 lbs. FRONT; 1737 lbs. REAR

DATA FROM TIRE PLACARD:

Location of Placard on Vehicle: Driver's Door

Tire Pressure with Maximum Capacity Vehicle Load: 33 psi FRONT 33 psi REAR

Recommended Tire Size: P215/60R15

* Recommended Cold Tire Pressure: 30 psi FRONT; 30 psi REAR

Size of Tires on Test Vehicle: P215/60R15 ; Tire Manufacturer: BF Goodrich

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) = 899 lbs.

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

Rated Cargo/Luggage Weight (RCLW) = 149

*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 =	976 lbs.	Right Rear =	556 lbs.
Left Front =	993 lbs.	Left Rear =	548 lbs.
TOTAL FRONT =	1,969 lbs.	TOTAL REAR =	1,104 lbs.

TOTAL DELIVERED WEIGHT = 3,073 lbs.

% of Total Front of Vehicle Weight = 64 % of Total Rear Weight = 36 %

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight	=	3,073 lbs.
Rated Cargo/Luggage Weight (RCLW)	=	149 lbs.
Weight of 2 p.572 Dummies, 167 & 164 lbs	=	331 lbs.
TARGET TEST WEIGHT	=	3,553 lbs.

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 133 POUNDS OF CARGO WEIGHT:

Right Front =	1143 lbs.	Right Rear =	621 lbs.
Left Front =	1146 lbs.	Left Rear =	627 lbs.
TOTAL FRONT =	2,289 lbs.	TOTAL REAR =	1,248 lbs.

TOTAL TEST WEIGHT = 3,537.0 lbs.

% of Total Front Weight = 64.7 % % of Total Rear Weight = 35.3 %

* Weight of Ballast Secured in Vehicle Trunk Area = 38 lbs.

Type of Ballast: Lead Shot

Method of Securing Ballast: Secured to Floor

Vehicle Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in inches):

AS DELIVERED:	RF	26.9	LF	27.3	RR	27.7	LR	27.8
AS TESTED:	RF	26.3	LF	26.5	RR	27.0	LR	27.3

Vehicle's Wheel Base: 107 in.

Location of Vehicle's C.G.: 37.8 inches rearward of front wheel center.

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual = 15.2 gallons

Usable Capacity Figure Furnished by COTR = 15.2 gallons

Test Volume Range (91 to 94% of Usable Capacity) = 13.8 to 14.3 gallons

ACTUAL TEST VOLUME= 14.0 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 -
The Powertrain Control Module (PCM) activates the fuel pump relay for 2 seconds when the vehicle ignition is turned to the "ON" position without the engine running.

Details of Fuel System: The filler neck is located on the left side of the vehicle behind the rear axle. The fuel tank is located in the center of the vehicle, ahead of the rear axle. The fuel lines run along the inside of the left frame rail.

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.

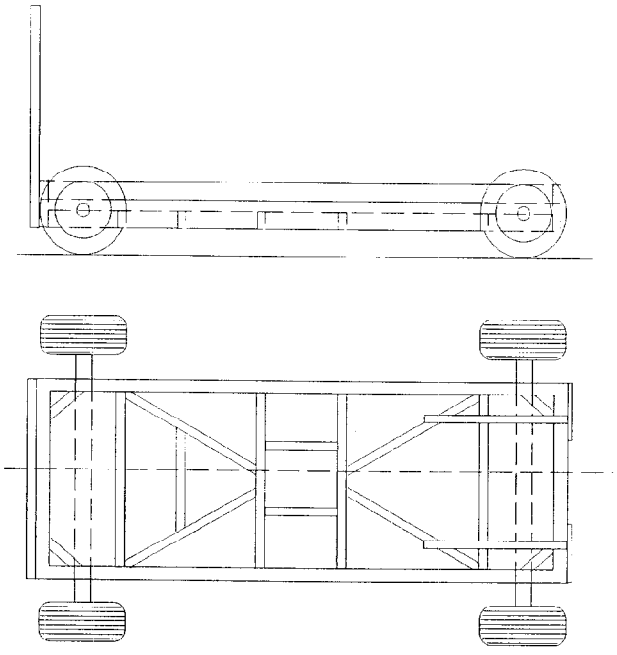


Table 4

POST IMPACT DATA

TYPE OF TEST:

Type of Test: Rear Barrier Impact Angle: 0°

Test Date: October 13, 1998 Time: 14:00 Temperature: 67 °F

Vehicle NHTSA No.: CX0101

Required Impact Velocity Range: 28.9 to 29.9 mph

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

Trap No. 1 = 29.9 mph; Trap No. 2 = 29.9 mph

Average Impact Speed = 29.9 mph

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

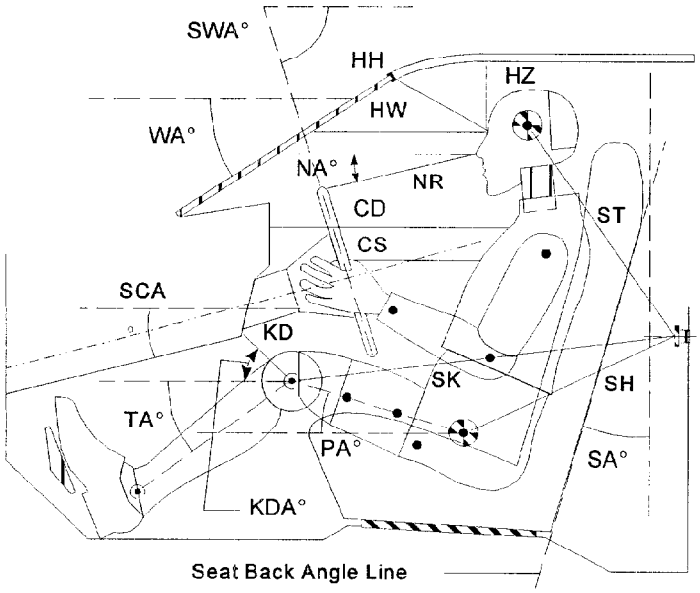
Vehicle Length:

Pre-Test	Right =	182.4	; C/L =	185.9	;Left =	181.9
Post-Test	Right =	169.1	; C/L =	171.7	;Left =	168.6
Crush	Right =	13.3	; C/L =	14.2	;Left =	13.3
AVERAGE	=	13.6	inches			

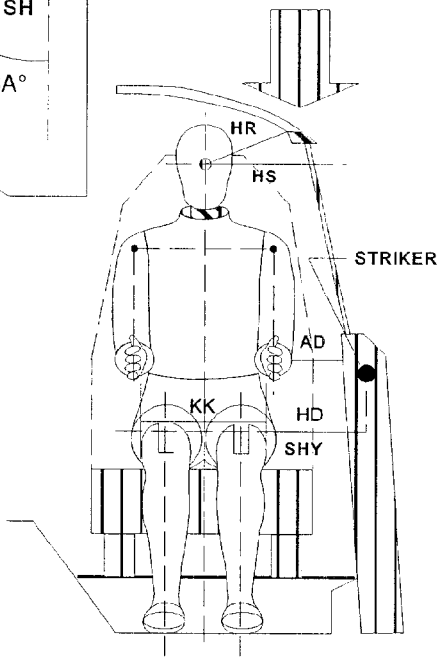
Figure 1

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

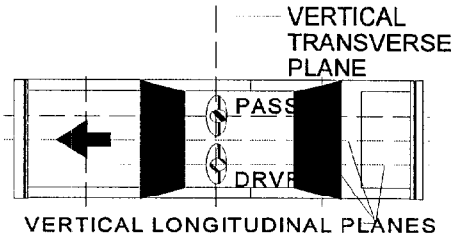


Table 5

FRONT SEAT OCCUPANT MEASUREMENTS
(FOR REAR IMPACT ONLY)

	DRIVER (Serial #150		
WA°	25 deg.		
SWA°	69 deg.		
SCA°	21 deg.		
SA°	27 deg.		
HZ	6.4		
HH	10.9		
HW	21.5		
HR	6.2		
NR	14.3	Angle	-10 deg.
CD	19.6		
CS	11.0		
RA	7.4		
KDL	6.0	Angle (KDA)	39 deg.
KDR	5.7		
PA°	23 deg.		
TA°	42 deg.		
KK	11.1		
ST	19.9	Angle	8 deg.
SK	23.7	Angle	92 deg.
SH	10.3	Angle	120 deg.
SHY	9.6		
HS	12.8		
HD	5.9		
AD	5.1		

Table 6
FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO.: CX0101 TEST DATE: October 13, 1998

Vehicle Mfgr./Make/Model: 1999 Pontiac Grand Am 4 Door Sedan

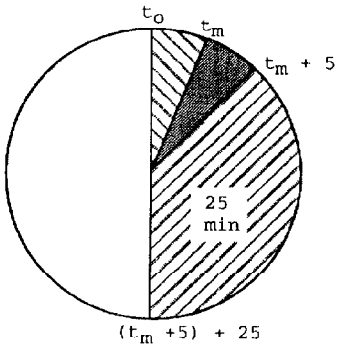
Test vehicle fuel tank filled to 91% to 94% of manufacturer's "usable" capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

****

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:

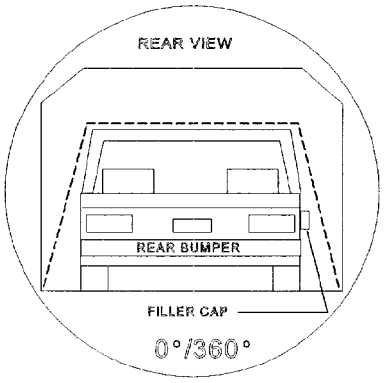
None

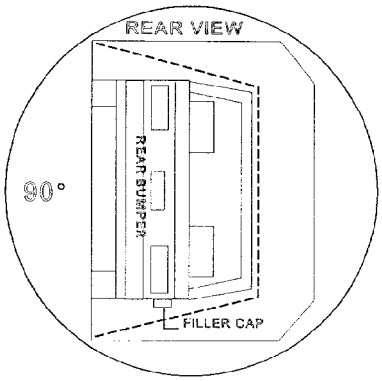
Table 7

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE :
0-90 Deg.

Vehicle NHTSA ID No. :
CX0101





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):

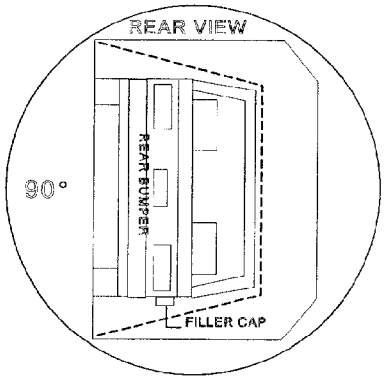
None

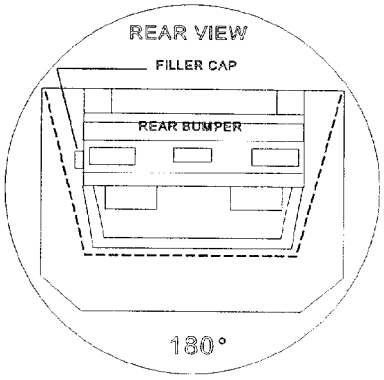
Table 7

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

TEST PHASE :
90-180 Deg.

Vehicle NHTSA ID No. :
CX0101





I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)		1	minutes	07	seconds
FMVSS 301 Position Hold Time +		5	minutes	00	seconds
	TOTAL	6	minutes	7	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):

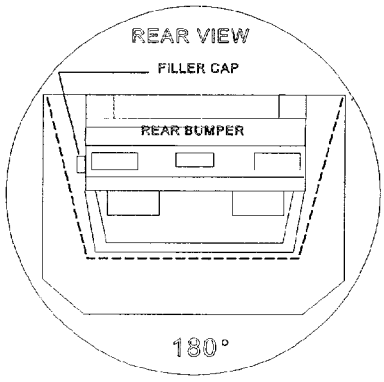
None

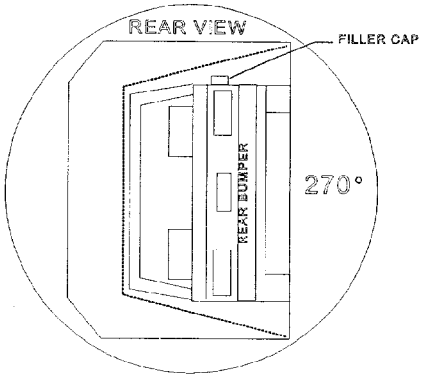
Table 7

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

TEST PHASE :
180-270 Deg.

Vehicle NHTSA ID No. :
CX0101





I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)		1	minutes	02	seconds
FMVSS 301 Position Hold Time +		5	minutes	00	seconds
	TOTAL	6	minutes	2	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):

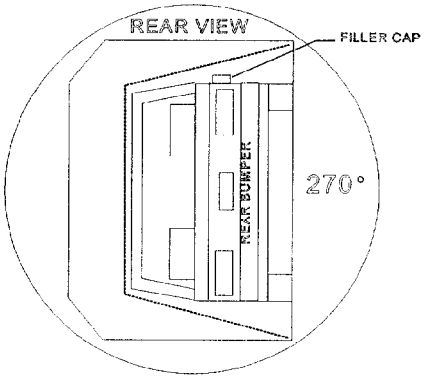
None

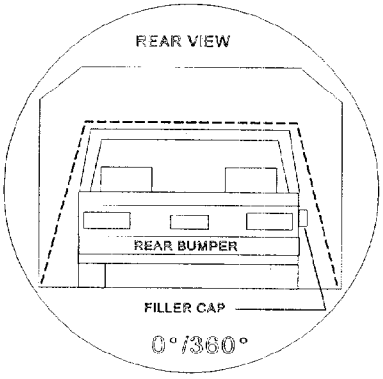
Table 7

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

TEST PHASE :
270-360 Deg.

Vehicle NHTSA ID No. :
CX0101





I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	1	minutes	12	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	6	minutes	12	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

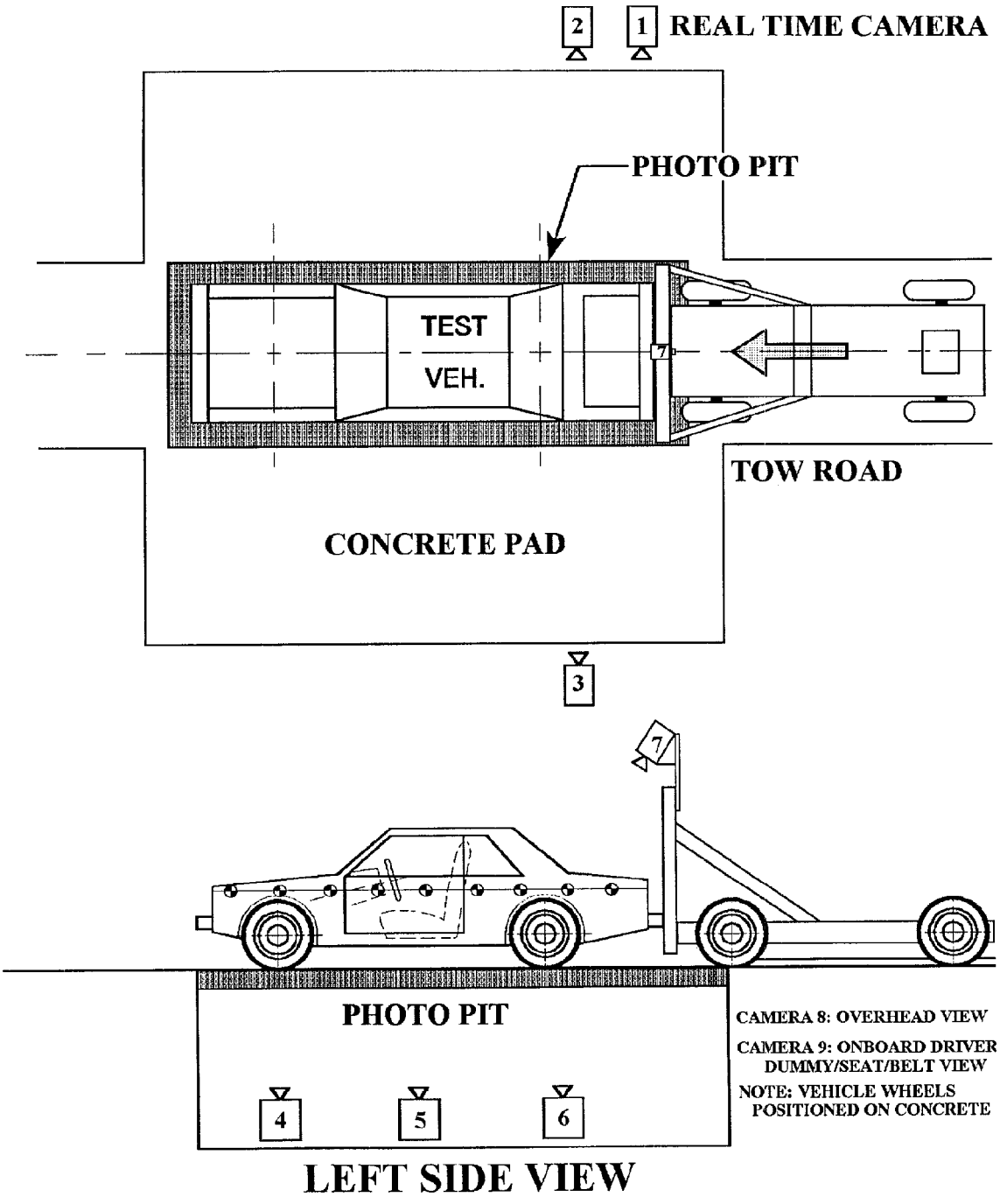


Table 8

HIGH-SPEED CAMERA LOCATIONS

NHTSA No. : CX0101 Vehicle : 1999 Pontiac Grand Am 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	-506.5	47	41.9	2	25	1000
3	Left Side View	507	76.5	48.5	1	25	800
4	Vehicle Front Underbody View	0	75	-77	90	13	650
5	Vehicle Mid-Section Underbody View	0	125	-77	90	13	650
6	Vehicle Rear Underbody View	0	17	-77	90	13	650
7	Moving Barrier View	0	0	99	-105	8	1000
8	Overhead Overall View	-20	0	386	-90	25	1000
9	Onboard Driver Dummy/Seat/Belt View	-	-	-	-	13	800

* 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

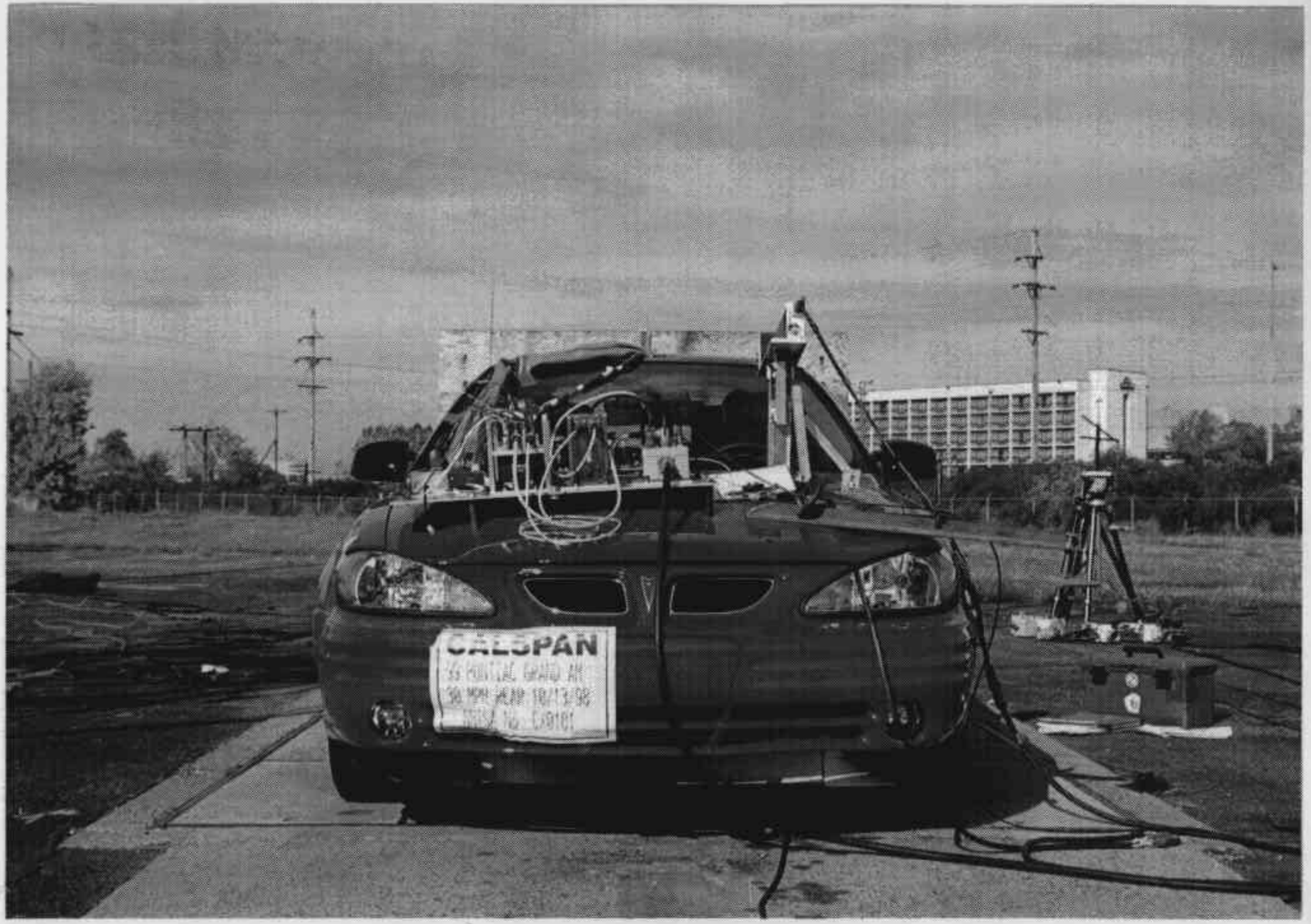


Figure A-1 PRE-TEST FRONT VIEW

Figure A-2 POST-TEST FRONT VIEW

Figure A-3 PRE-TEST LEFT SIDE VIEW

Figure A-4 POST-TEST LEFT SIDE VIEW

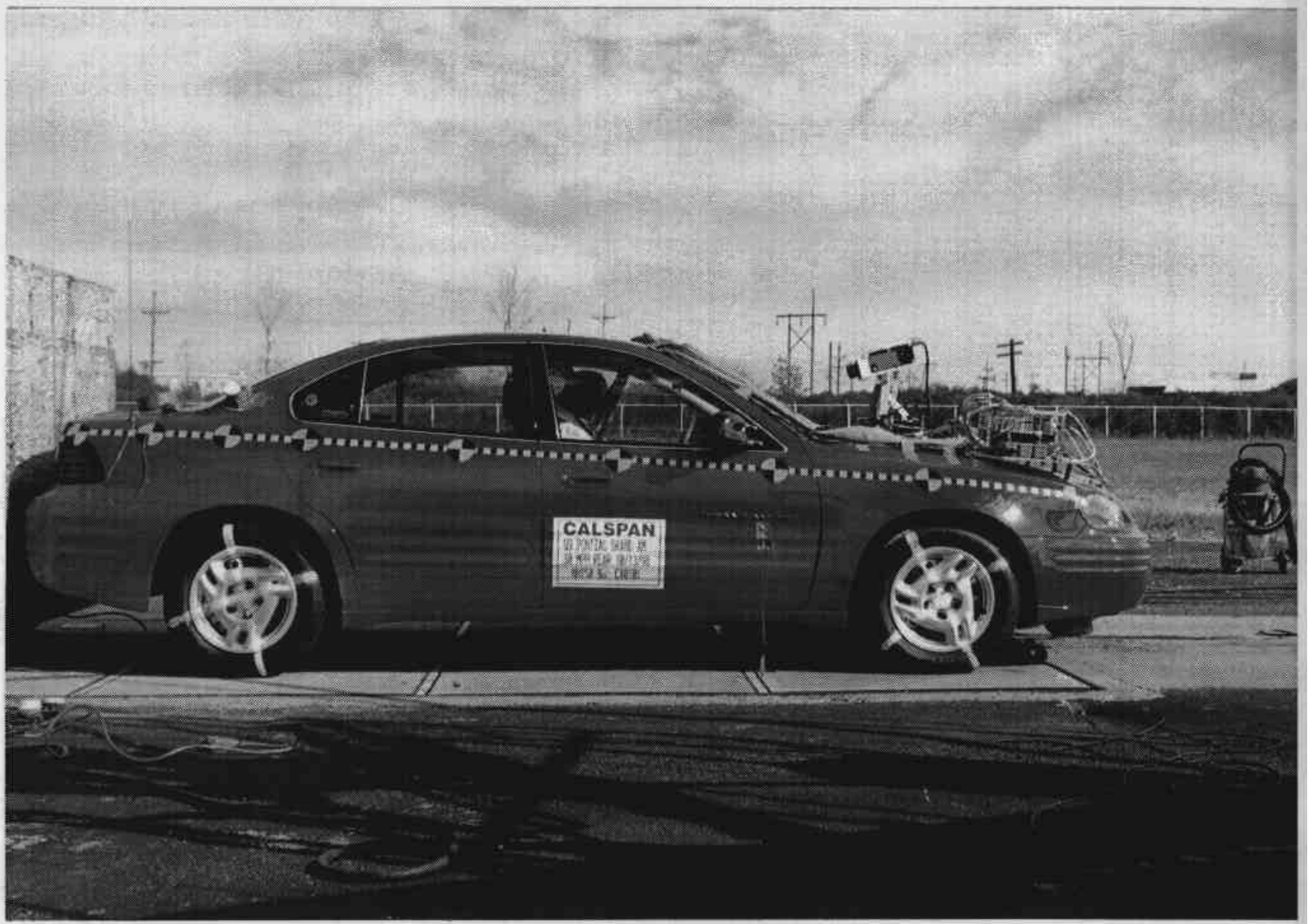


Figure A-5 PRE-TEST RIGHT SIDE VIEW

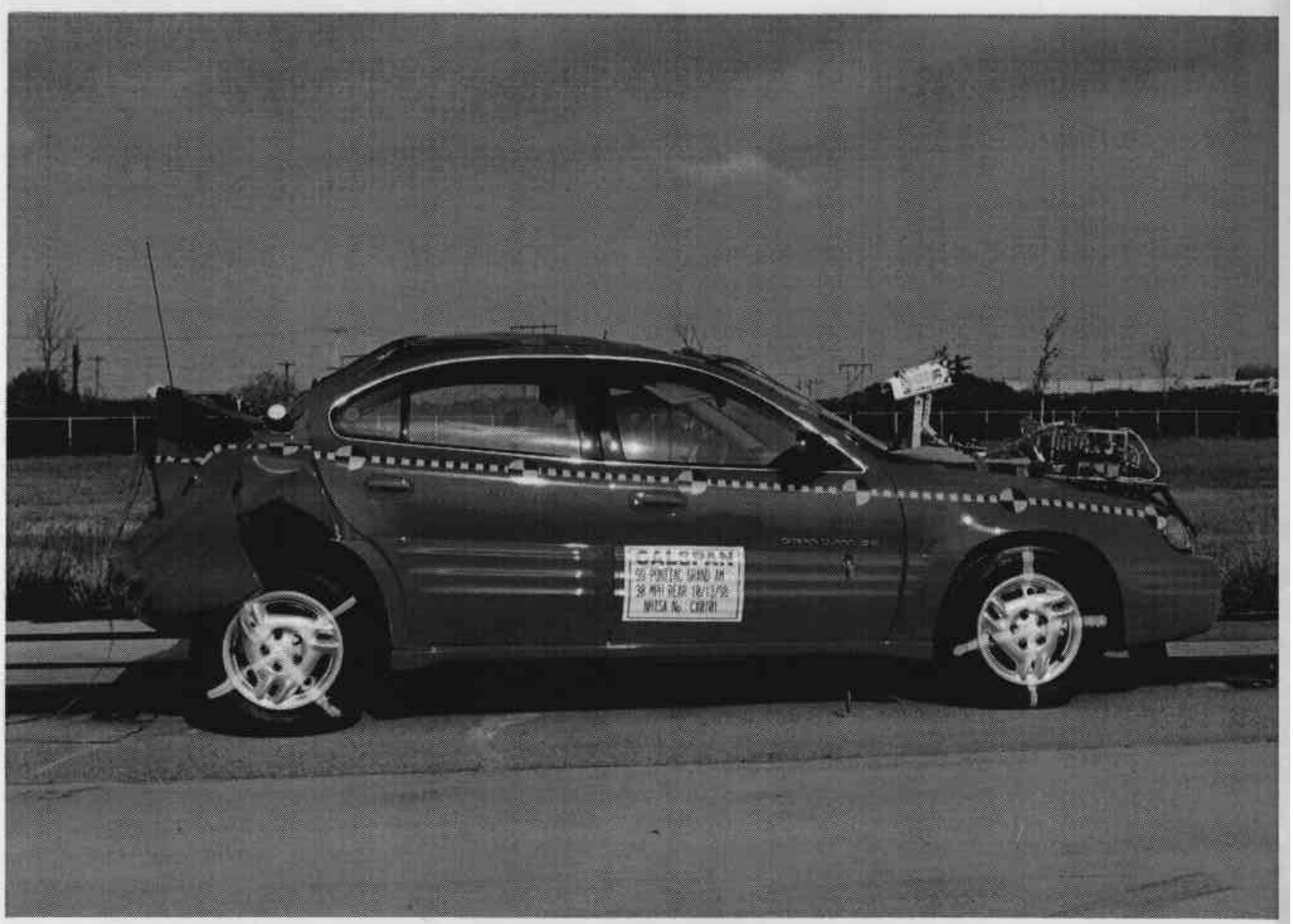


Figure A-6 POST-TEST RIGHT SIDE VIEW

Figure A-7 PRE-TEST REAR VIEW

Figure A-8 POST-TEST REAR VIEW

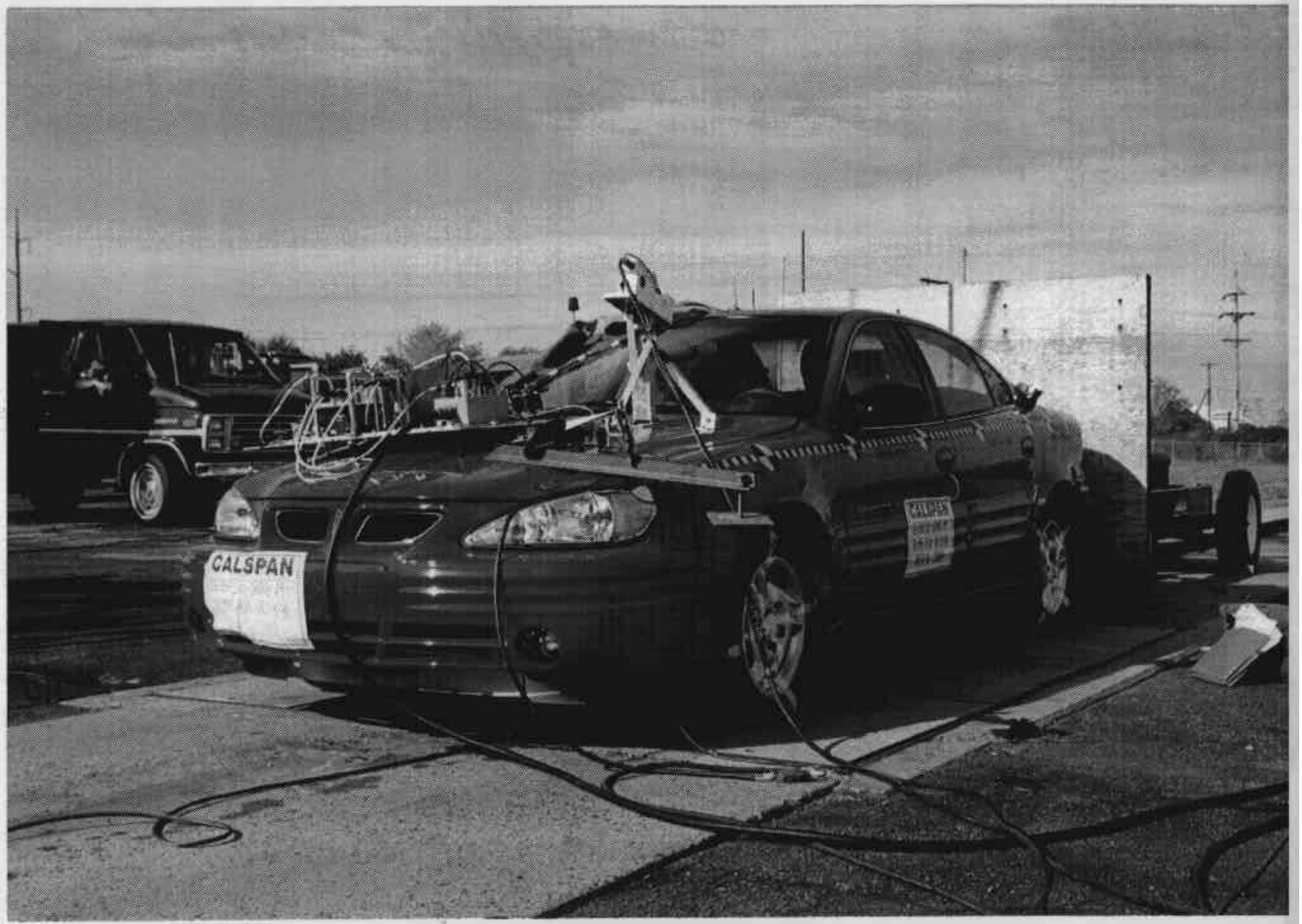


Figure A-9 PRE-TEST LEFT FRONT THREE-QUARTER VIEW

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

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

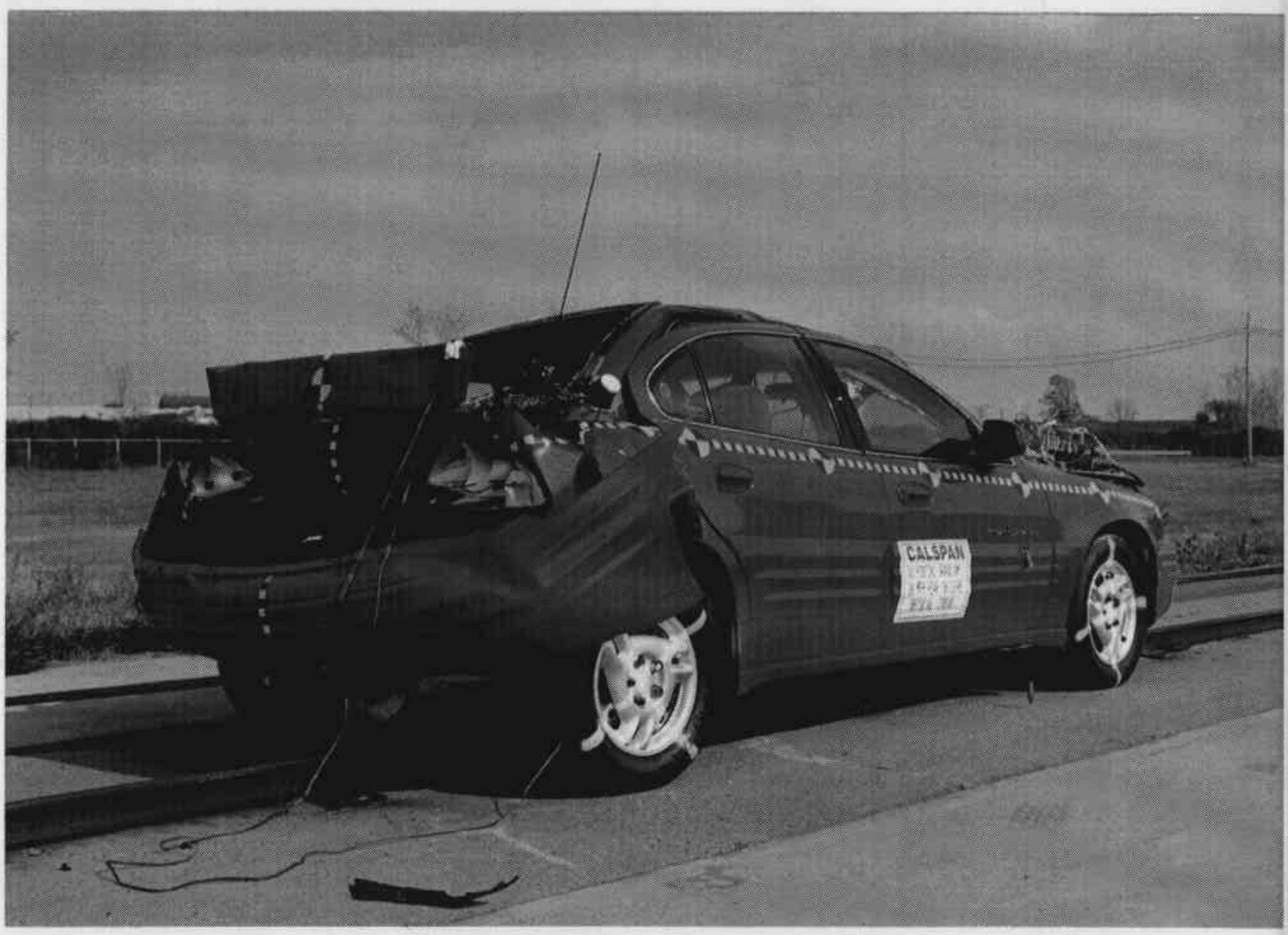


Figure A-12 POST-TEST RIGHT REAR THREE-QUARTER VIEW

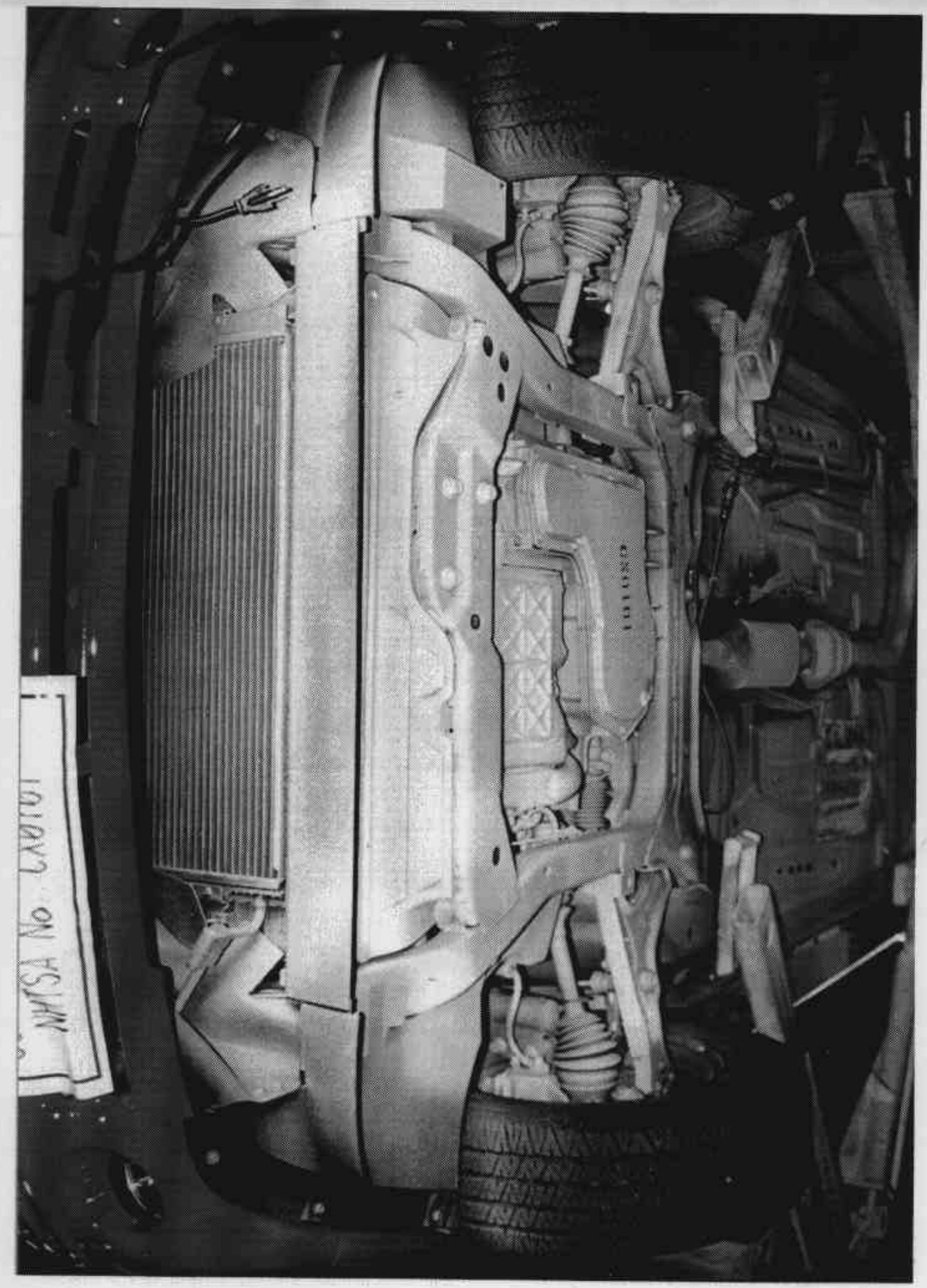


Figure A-13 PRE-TEST FRONT UNDERBODY VIEW

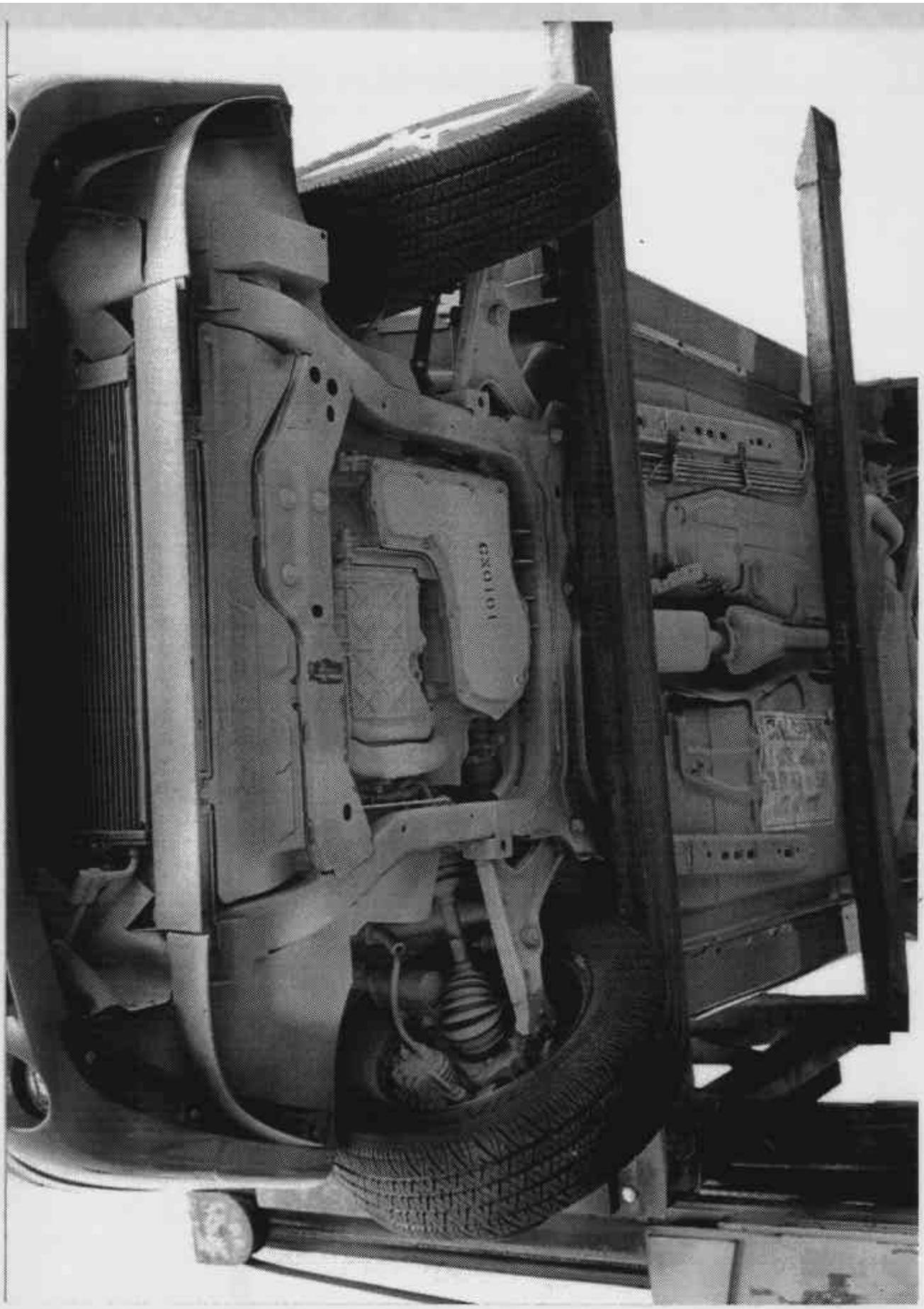


Figure A-14 POST-TEST FRONT UNDERBODY VIEW

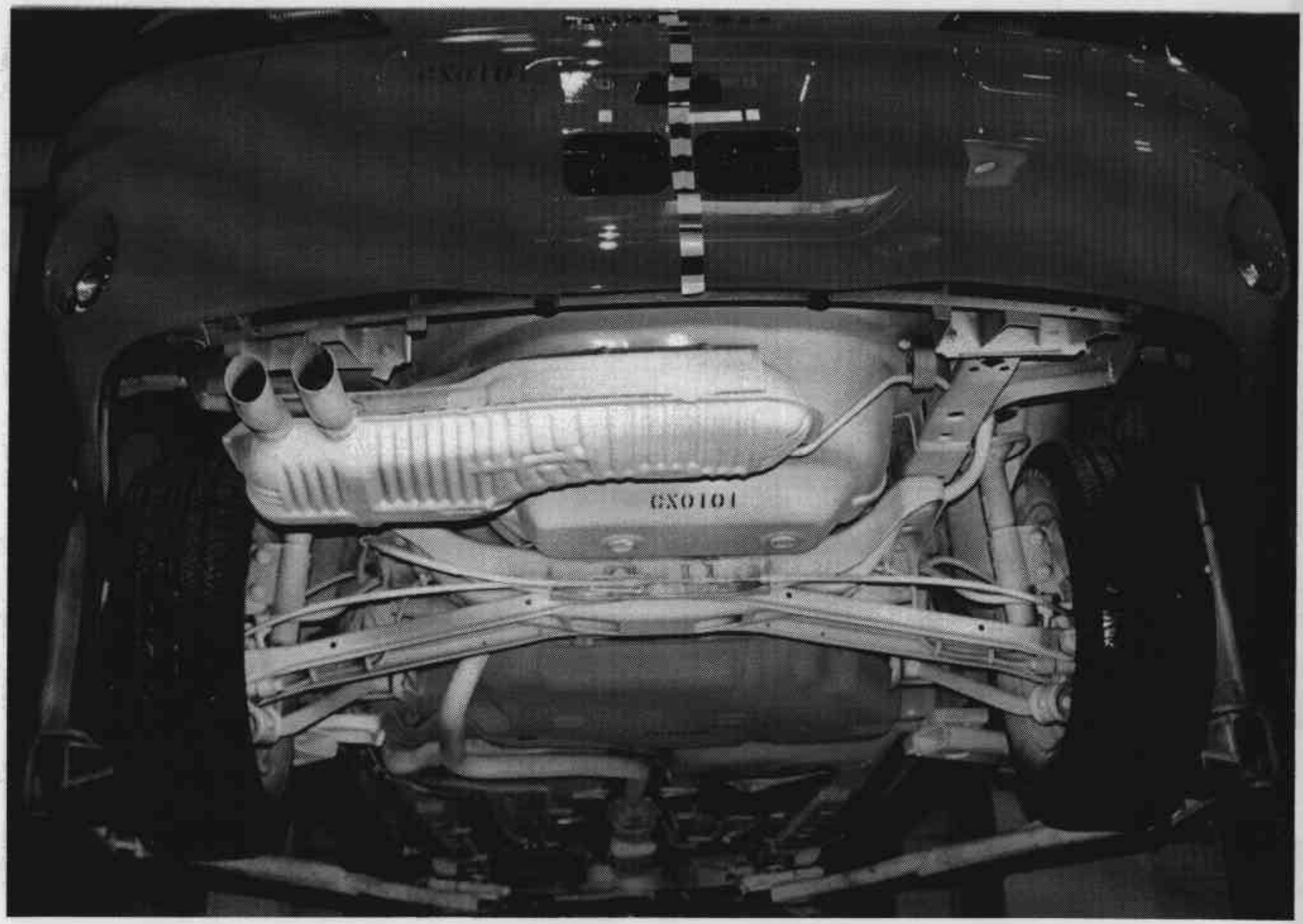


Figure A-15 PRE-TEST REAR UNDERBODY VIEW

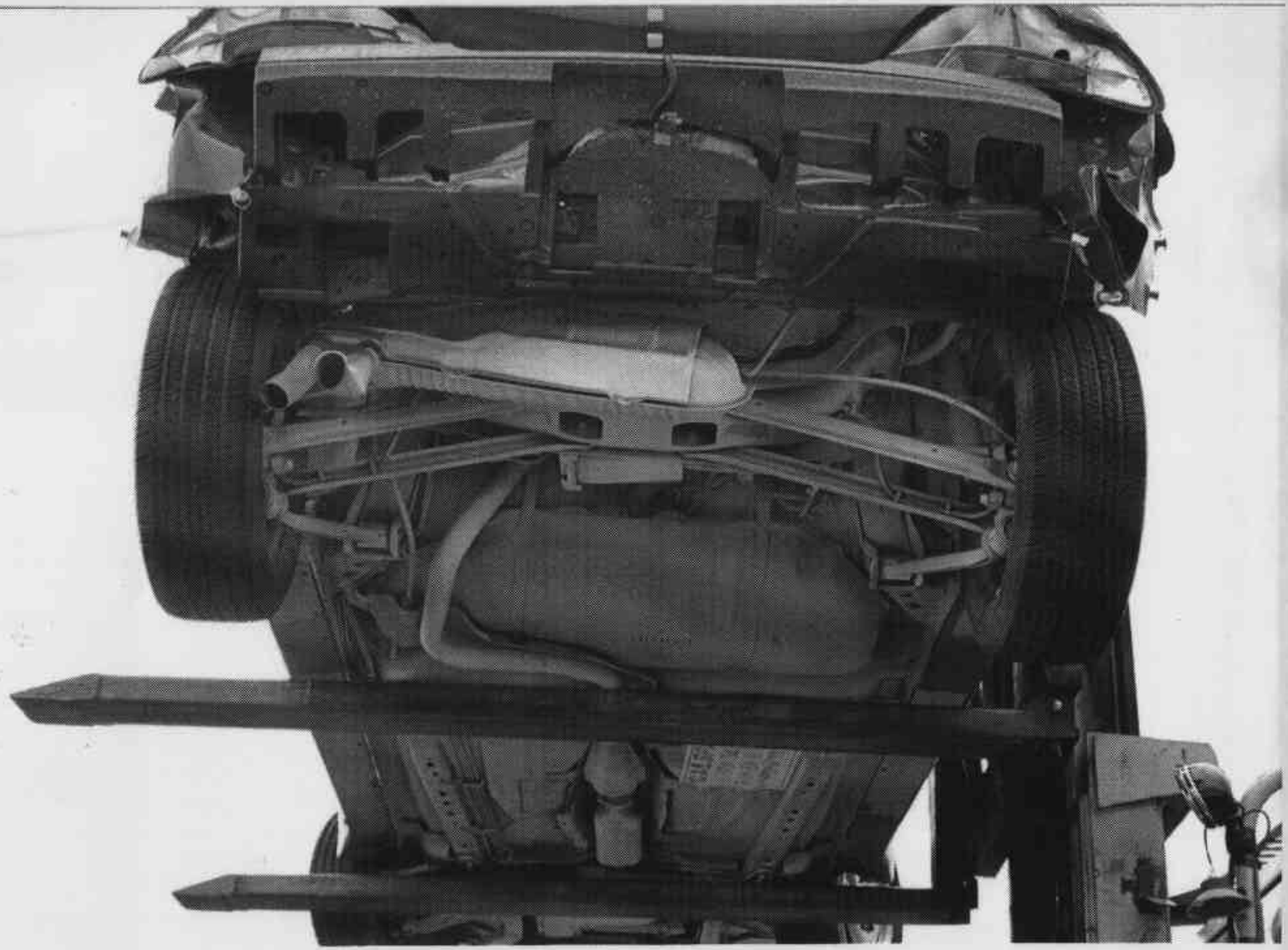


Figure A-16 POST-TEST REAR UNDERBODY VIEW

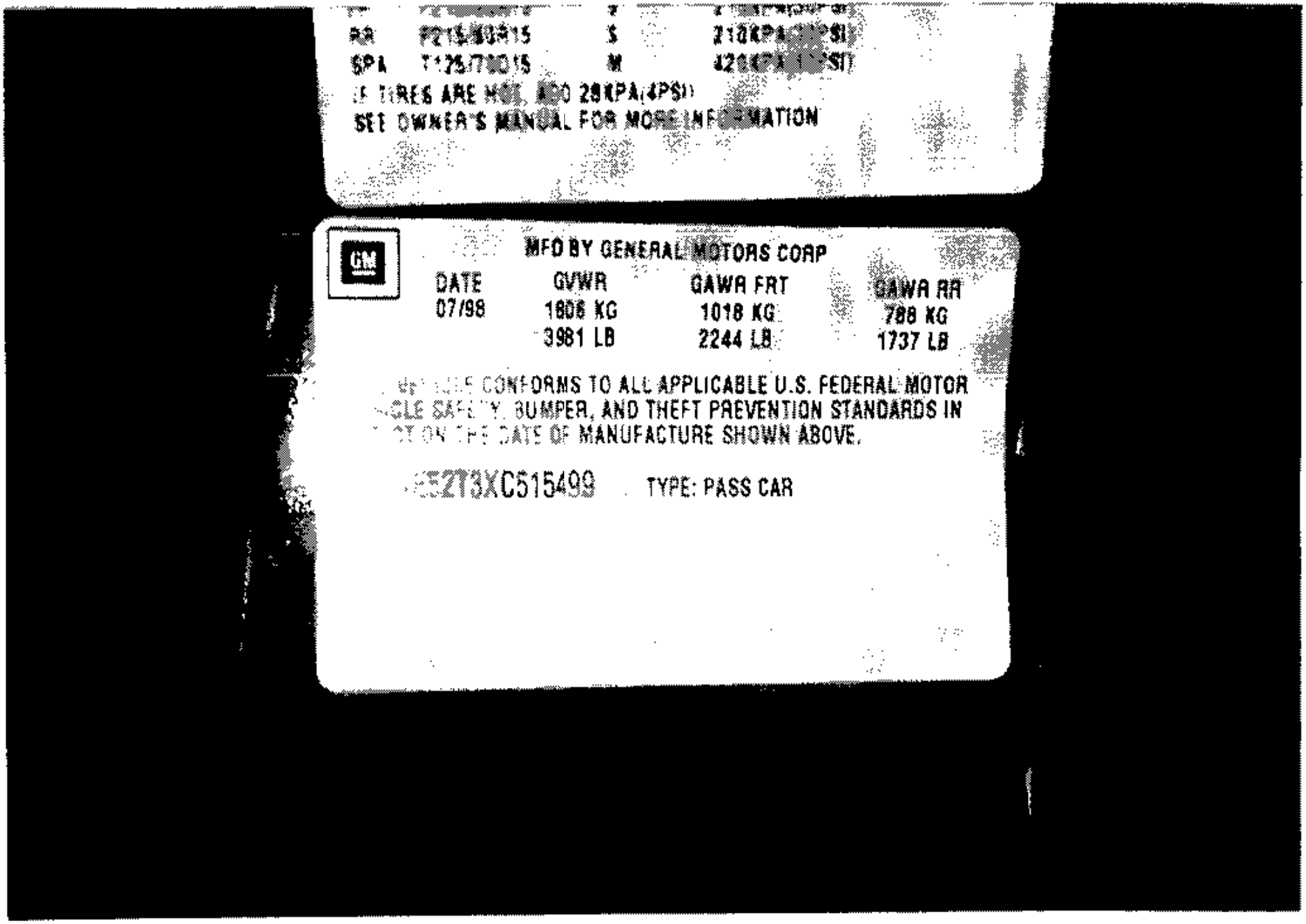


Figure A-17 CERTIFICATION PLACARD

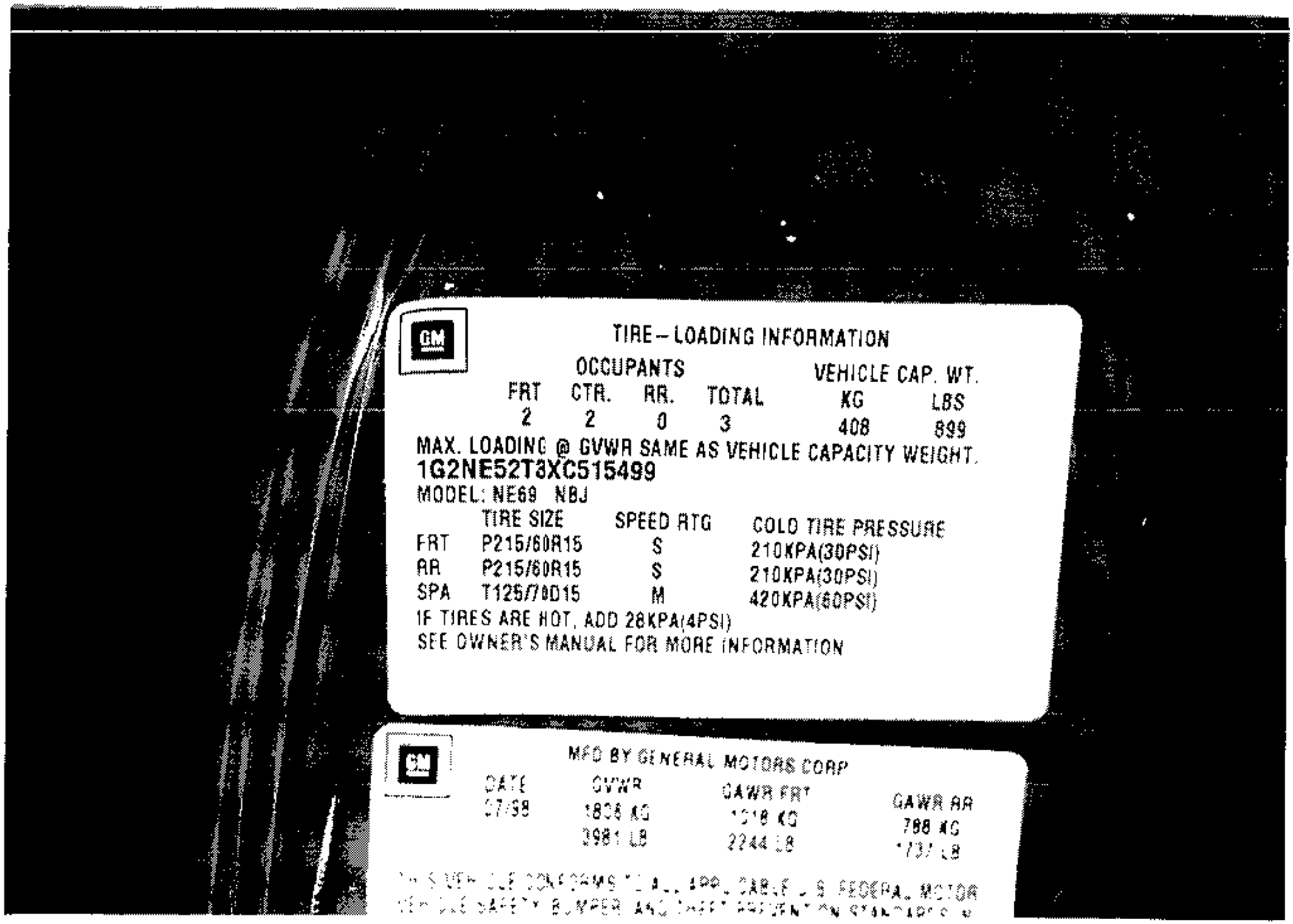


Figure A-18 TIRE PLACARD

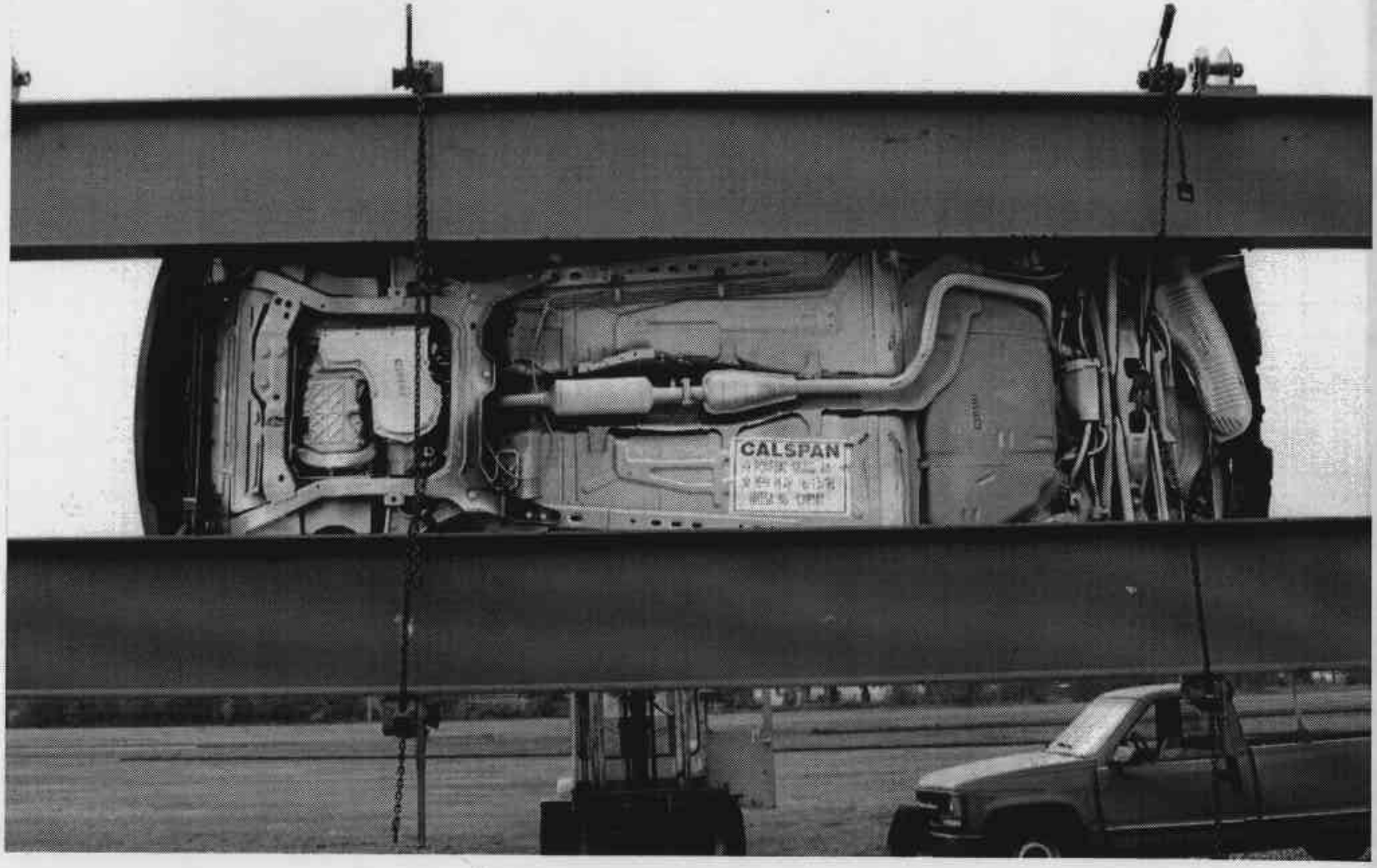


Figure A-19 ROLLOVER 90°

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)

301 Rear 30 mph Impact - 1999 Pontiac Grand Am CX0101

CHN	NAME	Max	msec	Min	msec
24	Driver Head X [g, CFC_1000]	40.66	126.10	-6.15	295.40
25	Driver Head Y [g, CFC_1000]	0.86	214.00	-8.58	129.00
26	Driver Head Z [g, CFC_1000]	23.78	107.30	-0.50	55.30
27	Driver Head X [g, CFC_1000] Resultant	43.13	126.00	0.00	-14.40
28	P1 Upper Neck Fx [Lbs, CFC_1000]	54.17	301.20	-102.38	124.90
29	P1 Upper Neck Fy [Lbs, CFC_1000]	8.36	233.10	-40.48	133.00
30	P1 Upper Neck Fz [Lbs, CFC_1000]	330.53	112.00	-5.13	55.70
31	P1 Upper Neck Fx [Lbs, CFC_1000] Resultant	333.71	112.10	0.03	-67.20
32	P1 Upper Neck Mx [In-Lbs, CFC_600]	40.12	162.40	-66.58	132.90
33	P1 Upper Neck My [In-Lbs, CFC_600]	275.79	127.80	-156.43	163.50
34	P1 Upper Neck Mz [In-Lbs, CFC_600]	55.48	212.40	-75.69	137.40
35	P1 Upper Neck Mx [In-Lbs, CFC_600] Resultant	287.75	128.00	0.02	-27.20
36	Driver Chest X [g, CFC_180]	4.70	290.50	-15.91	99.40
37	Driver Chest Y [g, CFC_180]	0.91	160.70	-2.00	82.00
38	Driver Chest Z [g, CFC_180]	1.73	110.20	-6.33	83.20
39	Driver Chest X [g, CFC_180] Resultant	16.32	84.70	0.00	-73.80
40	P1 Chest Displacement [Inches, CFC_600]	0.02	184.20	-0.39	288.00
41	Driver Pelvic X [g, CFC_1000]	18.37	76.10	-1.85	252.50
42	Driver Pelvic Y [g, CFC_1000]	0.94	319.90	-1.62	80.70
43	Driver Pelvic Z [g, CFC_1000]	7.05	81.70	-1.50	360.90
44	Driver Pelvic X [g, CFC_1000] Resultant	19.46	76.20	0.00	-42.00
45	P1 Lap Belt [Lbs, CFC_60]	61.25	260.30	-22.85	76.60
46	P1 Belt Spoolout [Inches, CFC_60]	0.04	14.00	-5.07	160.10
47	Acc #3(X) Upper Seat Back X [g, CFC_60]	19.98	102.70	-15.06	194.30
48	Acc #4(X) Lower Seat Back X [g, CFC_60]	16.27	10.60	-13.68	71.90
49	Seatback Angular Acceleration[degrees/sec^2, 131	451.71	71.90	-61901.83	64.60
50	Seatback Angular Velocity[degrees/sec, CFC_18	983.61	162.50	-285.69	62.50
51	Seatback Angular Position[degrees, CFC_180]	194.35	399.90	-6.34	71.80
52	Acc #1(X) Left Rear Xmember [g, CFC_60]	18.06	5.30	-2.70	0.00
53	Acc #1(X) Left Rear Xmember [ft/sec, CFC_180	26.95	153.90	-0.01	2.40
54	Acc #1(X) Left Rear Xmember [inches, CFC_180	110.22	399.90	-0.00	2.80
55	Acc #2(X) Right Rear Xmember [g, CFC_60]	16.18	5.60	-0.56	0.00
56	Acc #2(X) Right Rear Xmember [ft/sec, CFC_180	27.00	152.90	-0.01	-24.60
57	Acc #2(X) Right Rear Xmember [inches, CFC_180	110.98	399.90	-0.00	2.40

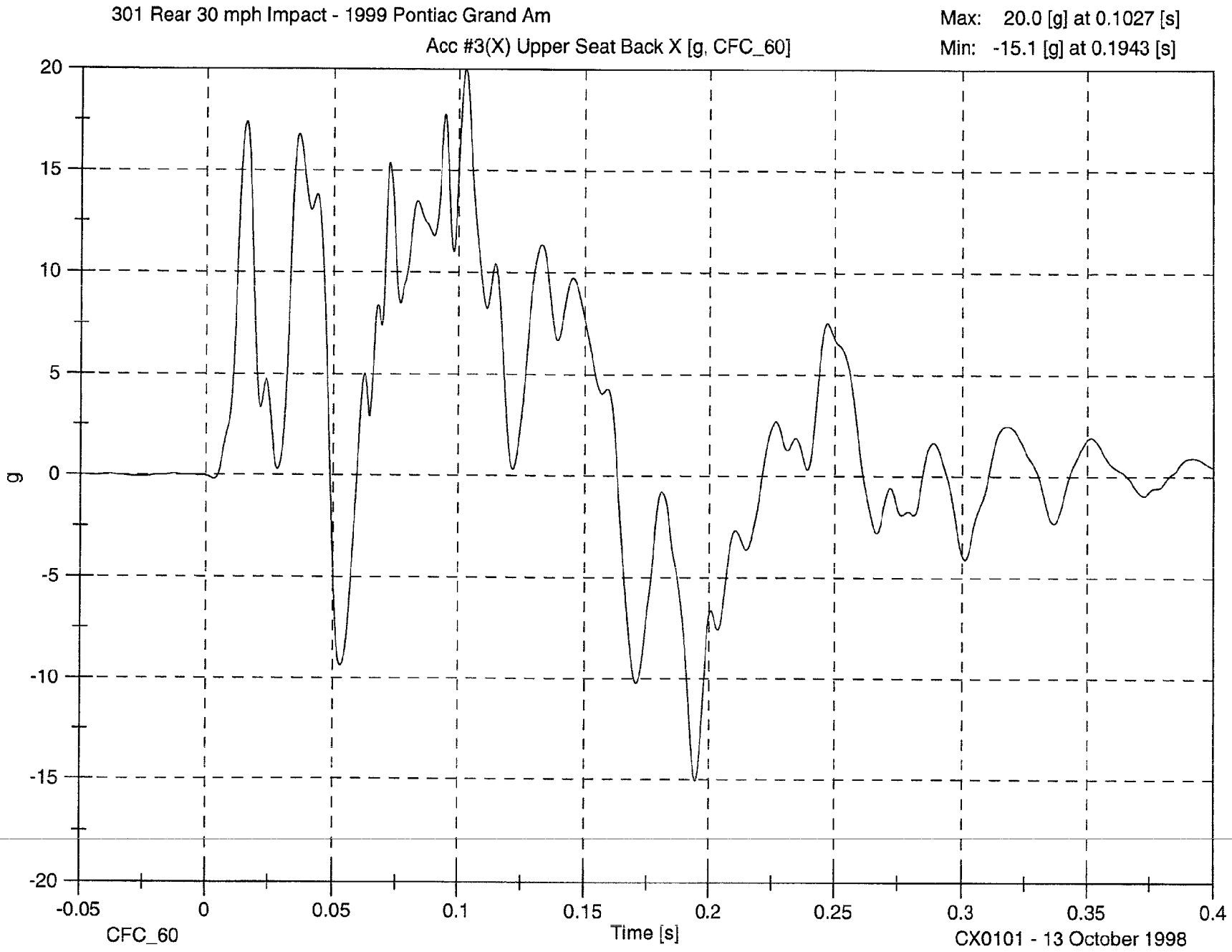
301 Rear 30 mph Impact - 1999 Pontiac Grand Am CX0101

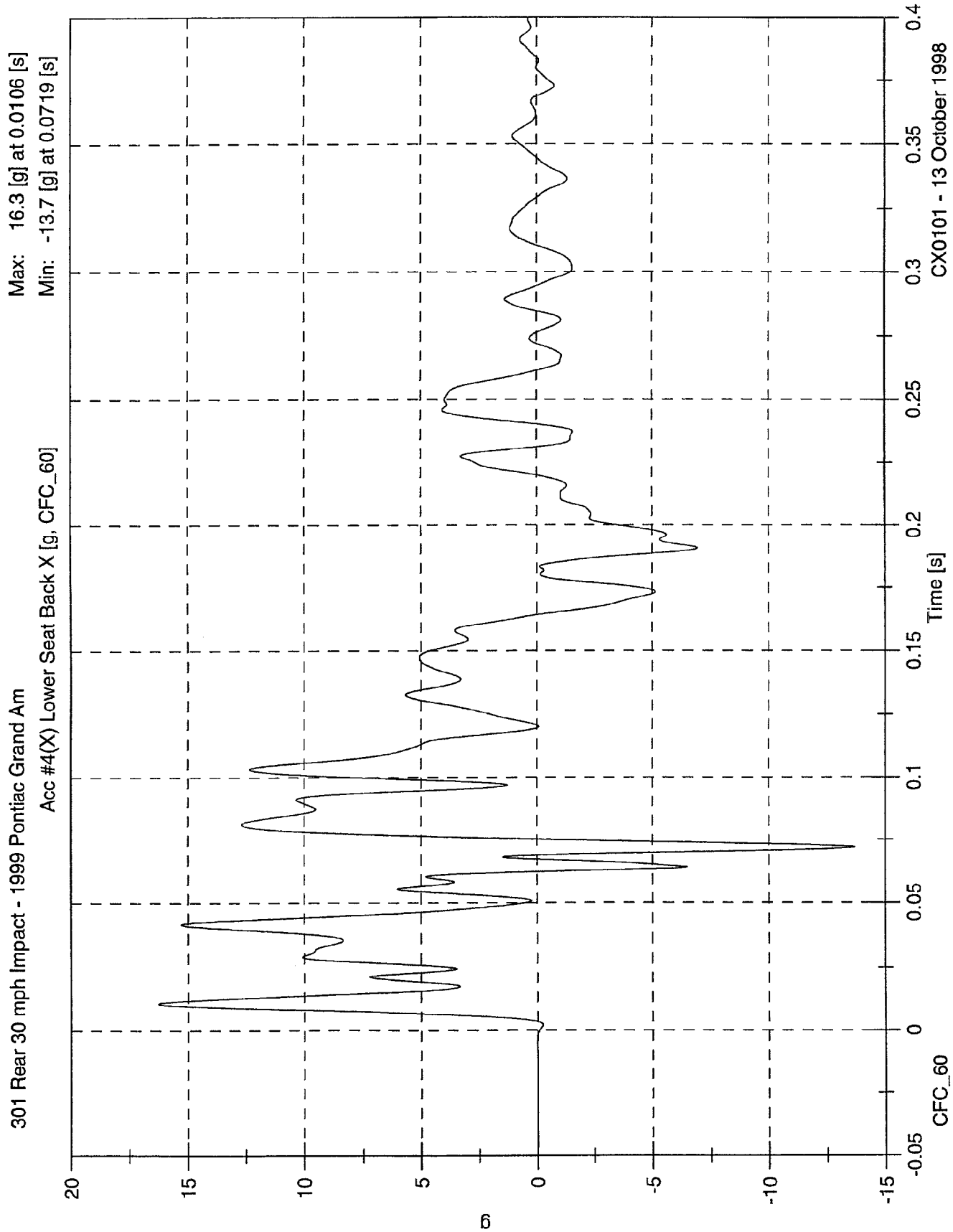
Driver
Hic: 247.0 t1: 104.7 ms t2: 140.7 ms
Clip: 16.1g t1: 83.4 ms t2: 86.4 ms

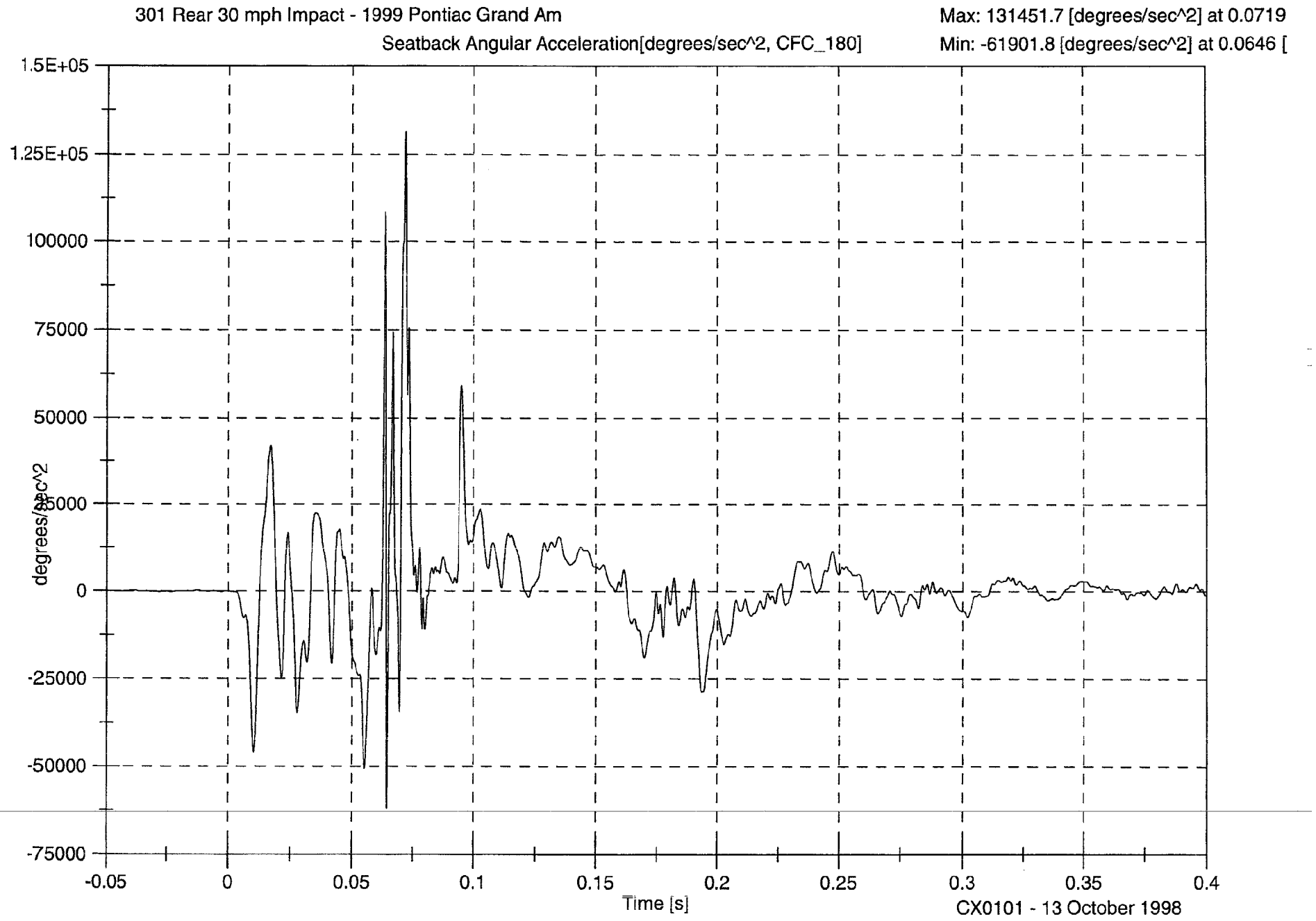
TEST NO. CX0101

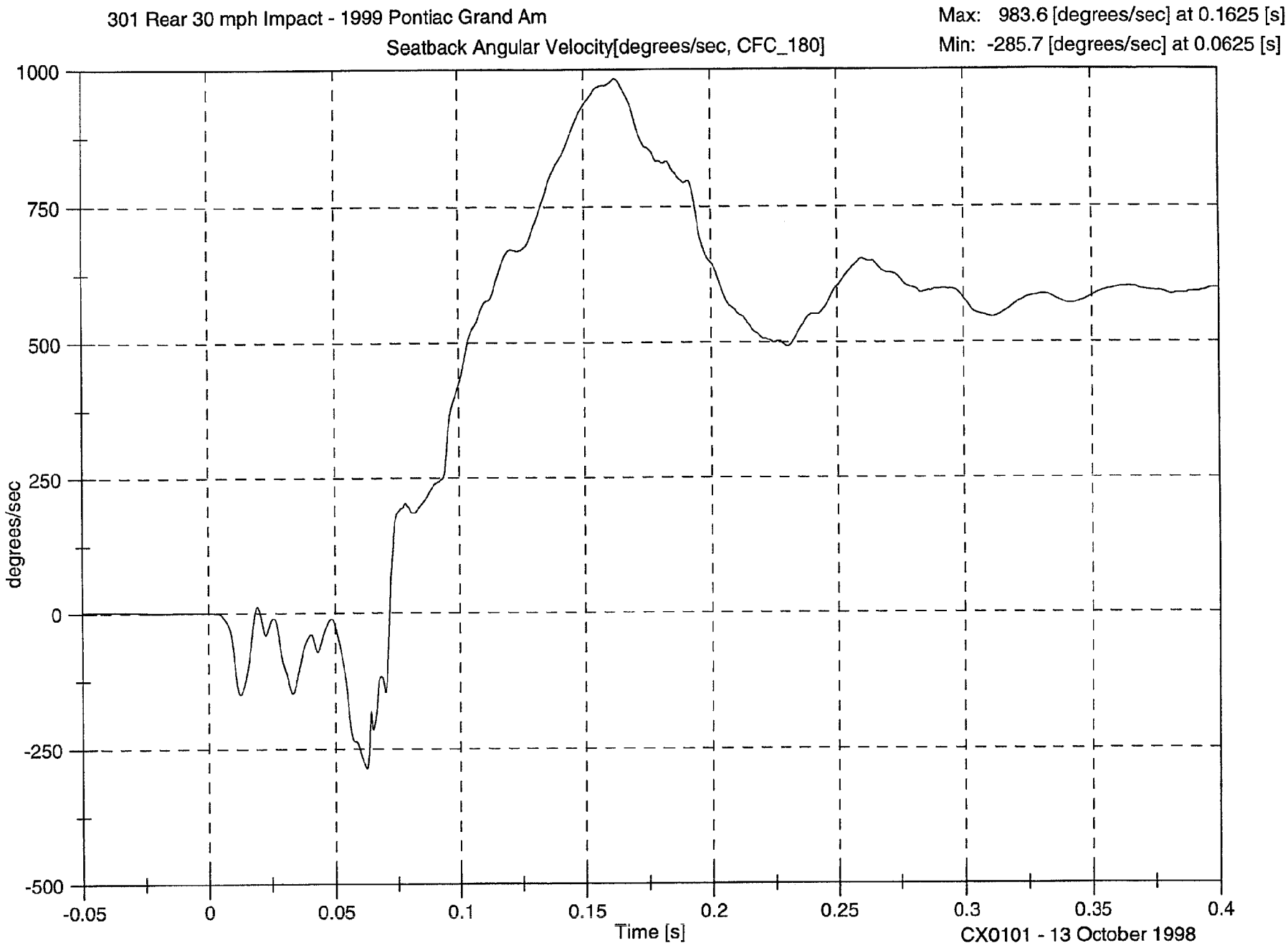
VEHICLE	SAE FILTER CHANNEL CLASS
	60

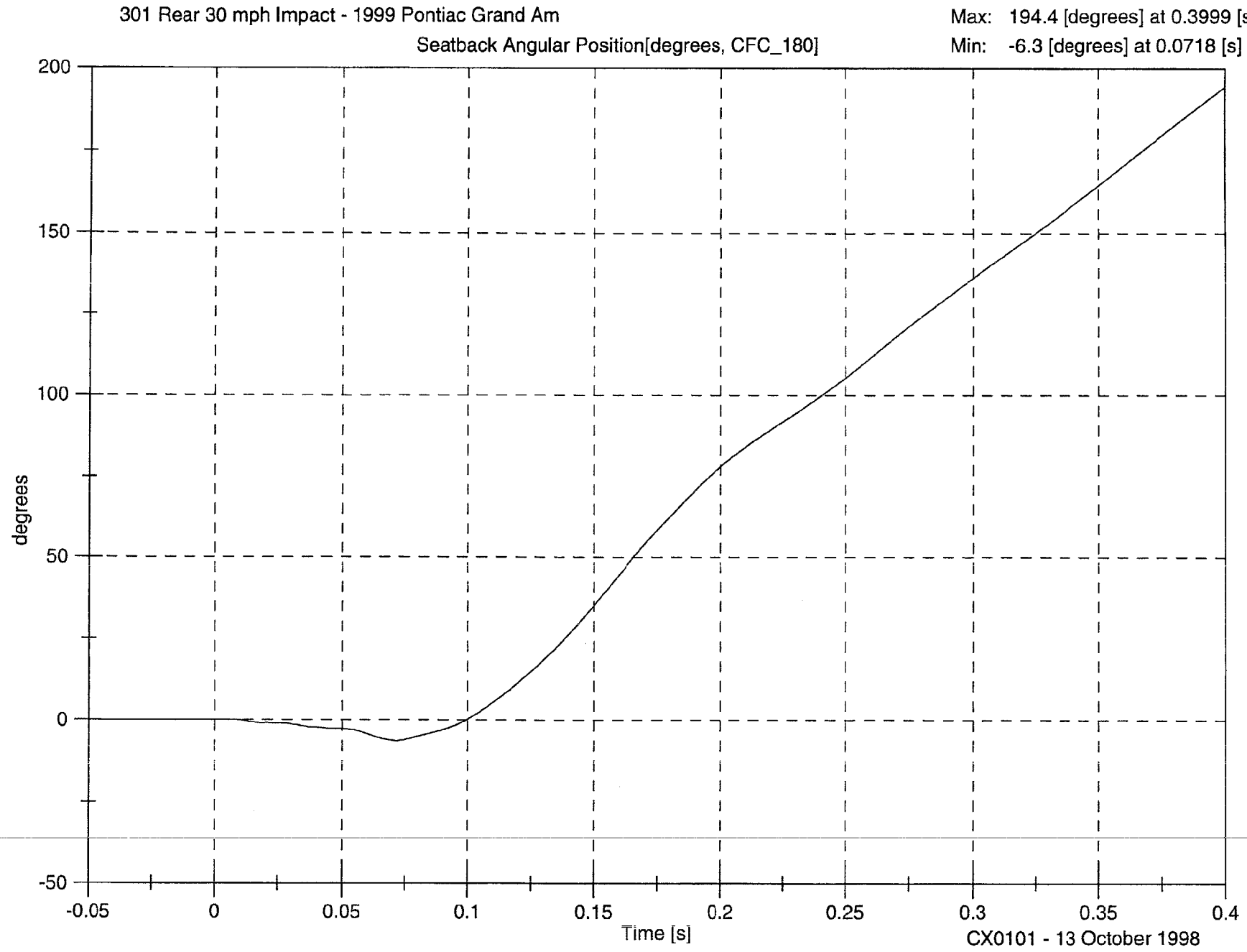
Note: Angular seatback position is measured in degrees of rotation from the initial (design) position.

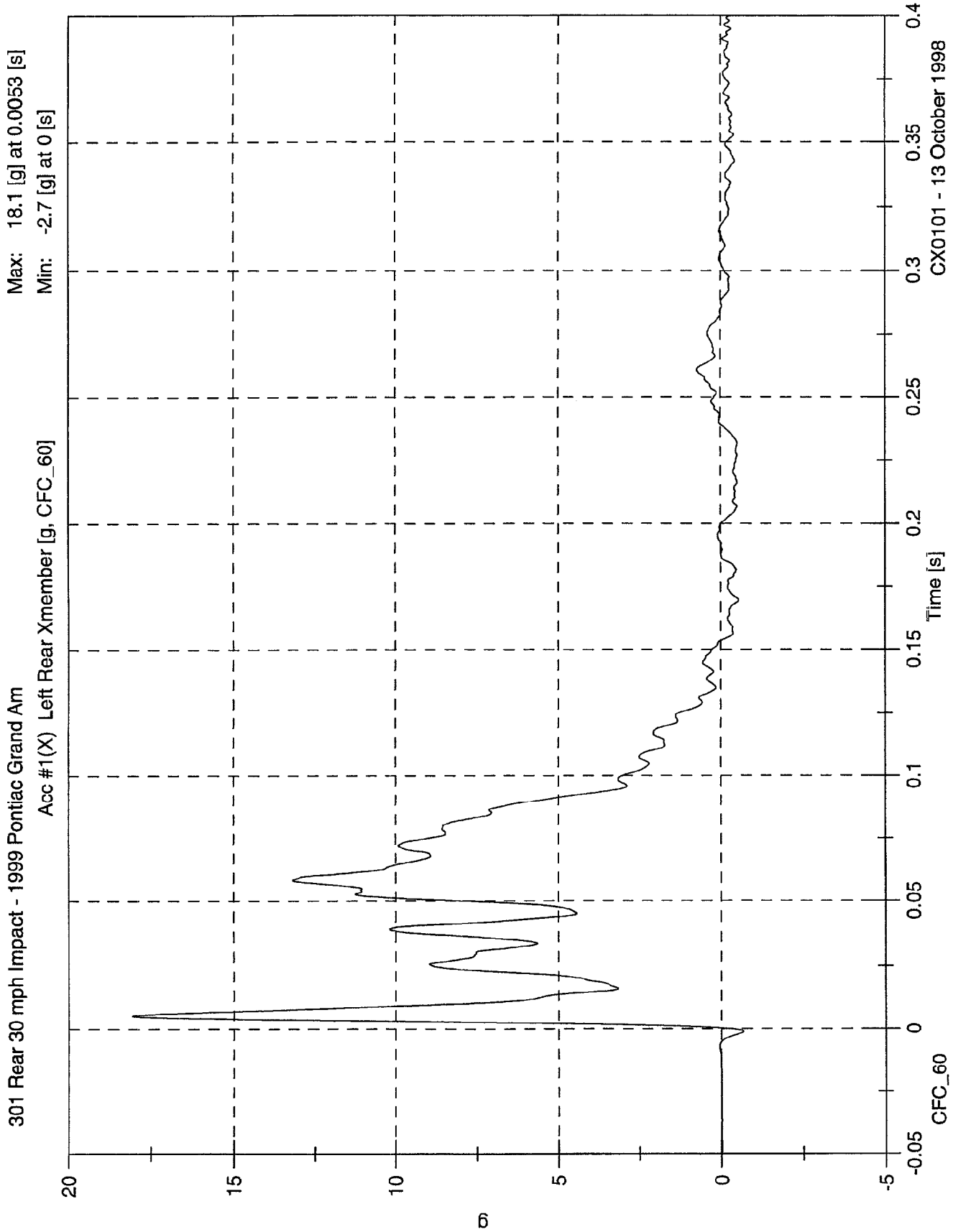

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Acc #3(X) Upper Seat Back X [g, CFC_60]
Max: 20.0 [g] at 0.1027 [s]
Min: -15.1 [g] at 0.1943 [s]
20
15
10
5
0
-5
-10
-15
-20
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_60
Time [s]
CX0101 - 13 October 1998

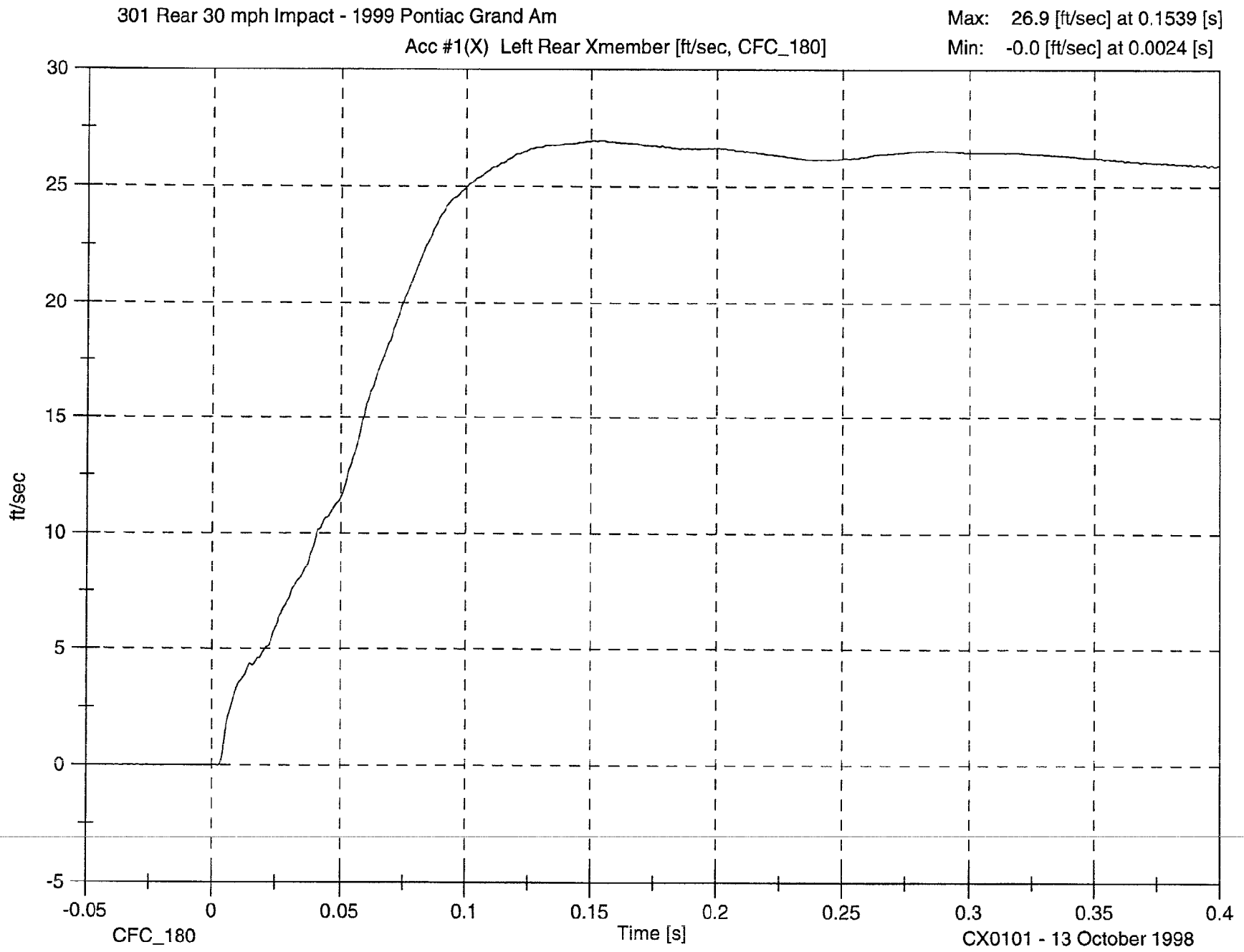

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Acc #4(X) Lower Seat Back X [g, CFC_60]
Max: 16.3 [g] at 0.0106 [s]
Min: -13.7 [g] at 0.0719 [s]
CX0101 - 13 October 1998
g
Time [s]
CFC_60
20
15
10
5
0
-5
-10
-15
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

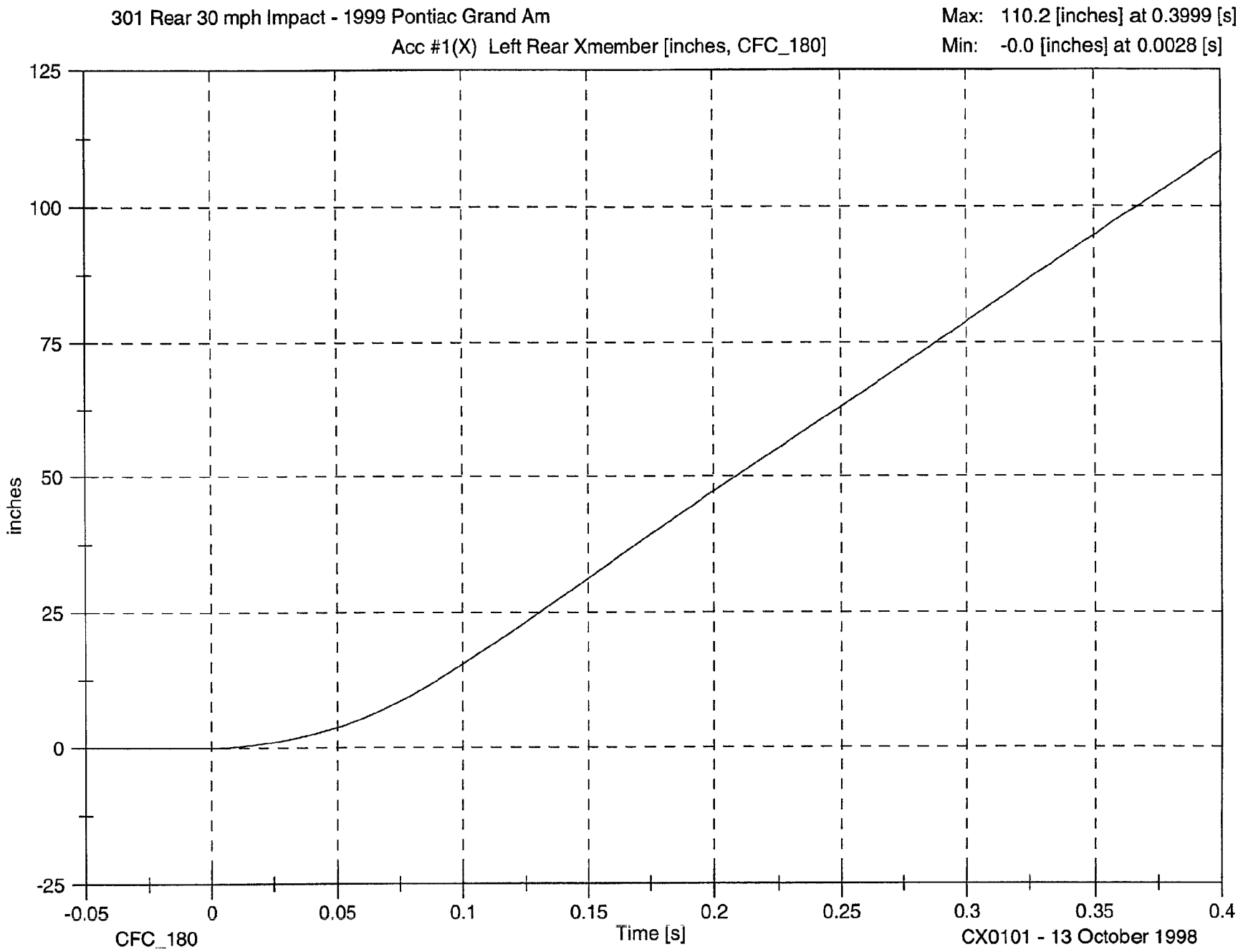

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Seatback Angular Acceleration[degrees/sec^2, CFC_180]
Max: 131451.7 [degrees/sec^2] at 0.0719
Min: -61901.8 [degrees/sec^2] at 0.0646 [
1.5E+05
1.25E+05
100000
75000
50000
25000
0
-25000
-50000
-75000
degrees/sec^2
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CX0101 - 13 October 1998

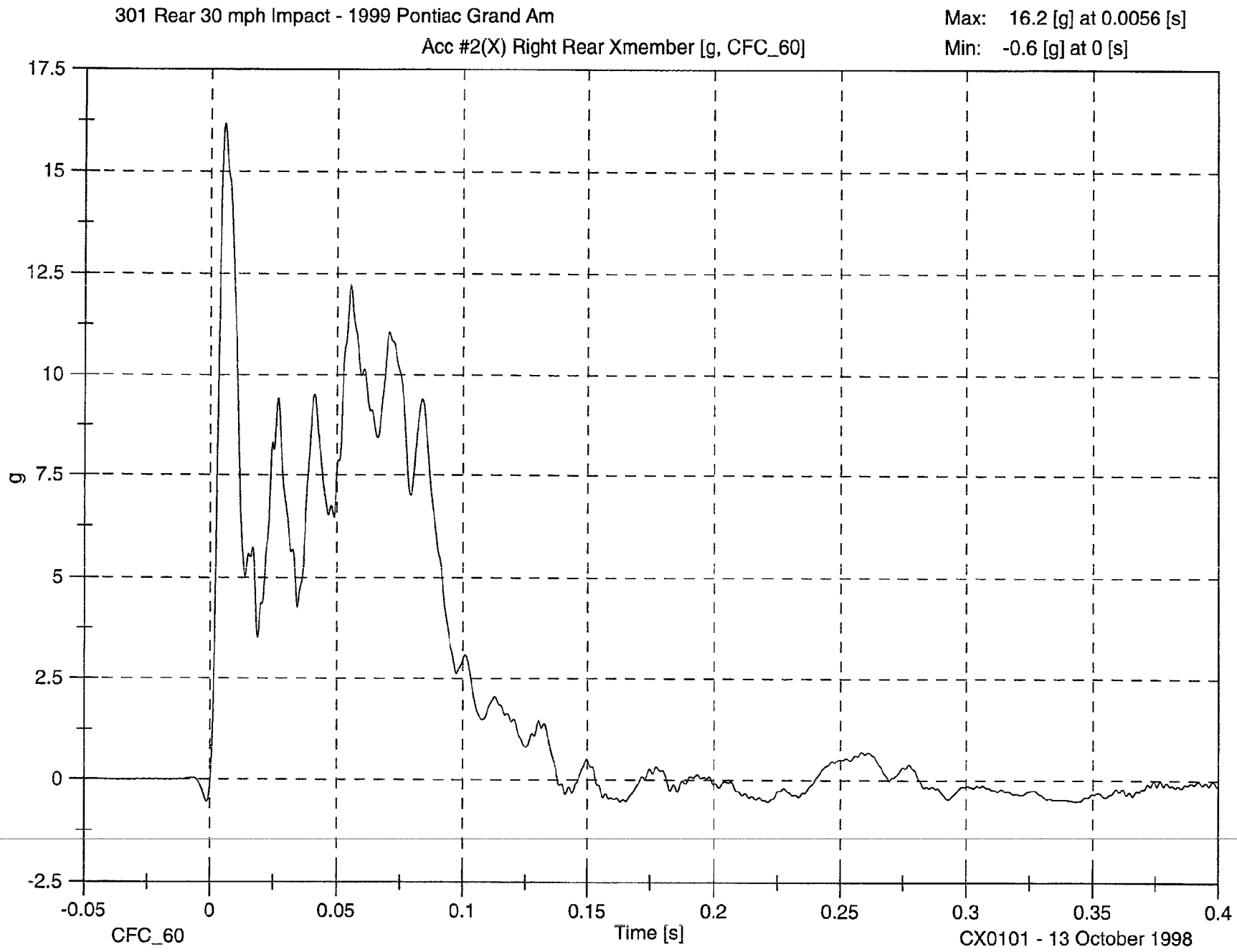

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Seatback Angular Velocity[degrees/sec, CFC_180]
Max: 983.6 [degrees/sec] at 0.1625 [s]
Min: -285.7 [degrees/sec] at 0.0625 [s]
1000
750
500
250
0
-250
-500
degrees/sec
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CX0101 - 13 October 1998

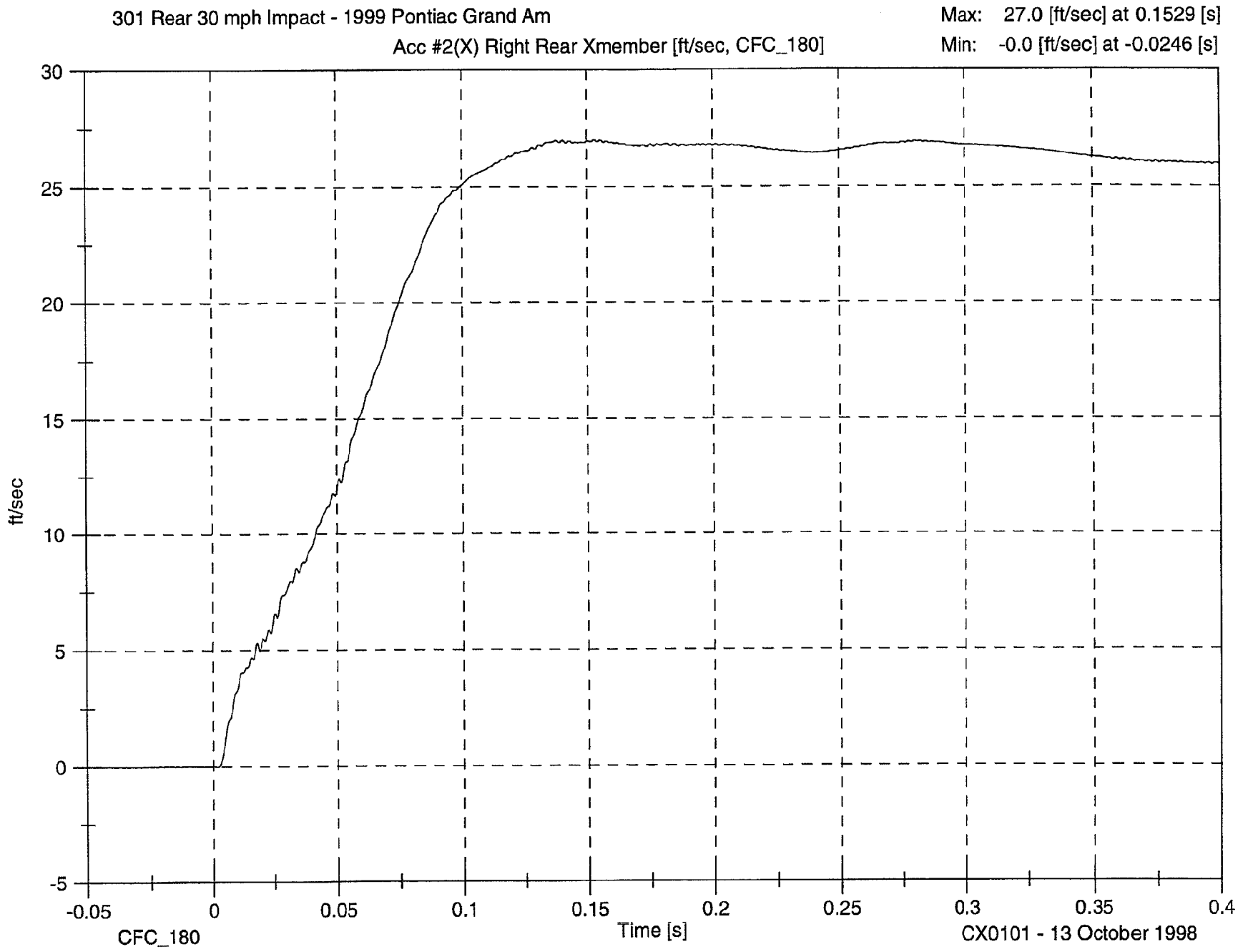

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Seatback Angular Position[degrees, CFC_180]
Max: 194.4 [degrees] at 0.3999 [s]
Min: -6.3 [degrees] at 0.0718 [s]
200
150
100
50
0
-50
degrees
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CX0101 - 13 October 1998

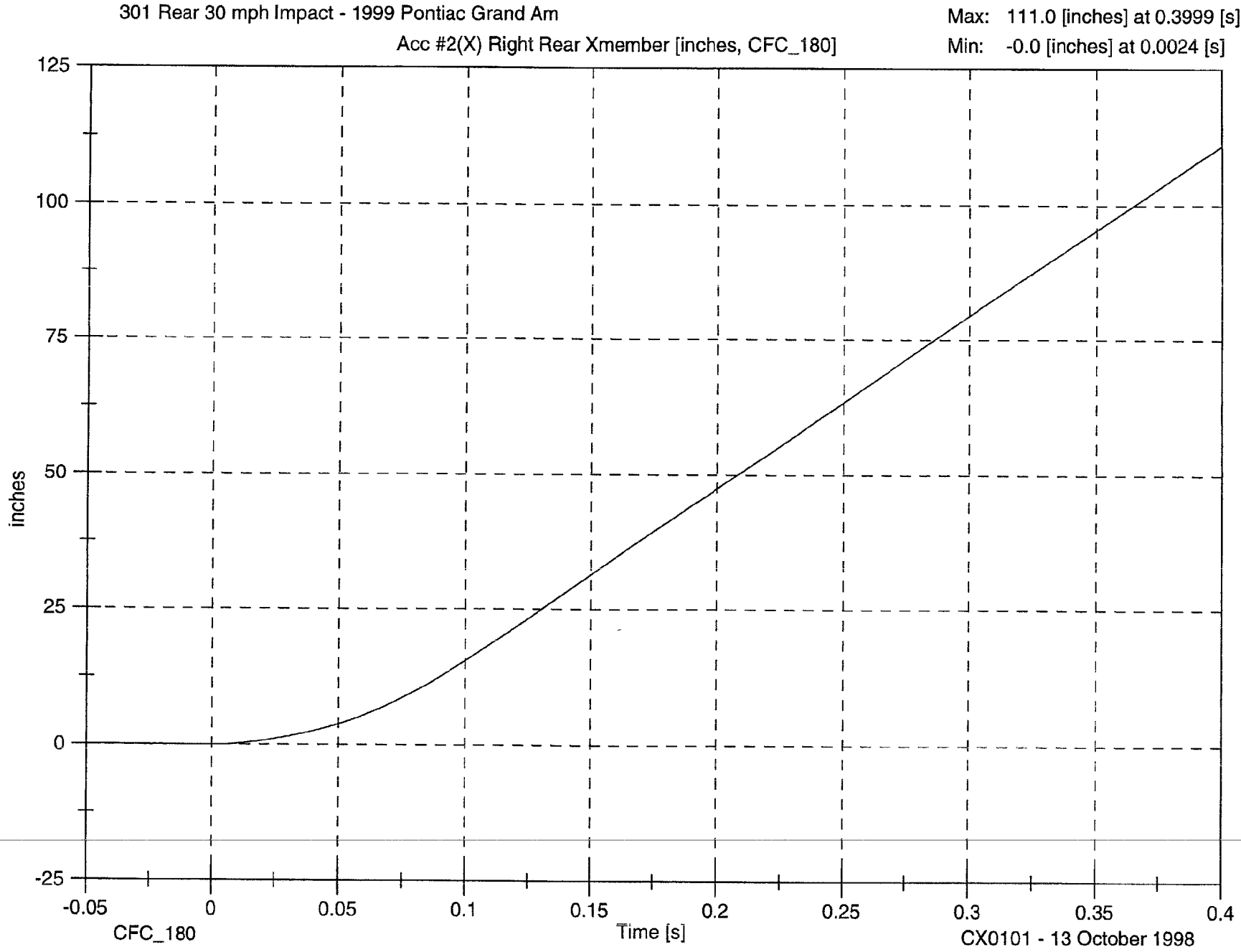

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Acc #1(X) Left Rear Xmember [g, CFC_60]
Max: 18.1 [g] at 0.0053 [s]
Min: -2.7 [g] at 0 [s]
CX0101 - 13 October 1998
CFC_60
Time [s]
g
20
15
10
5
0
-5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4


301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Acc #1(X) Left Rear Xmember [ft/sec, CFC_180]
Max: 26.9 [ft/sec] at 0.1539 [s]
Min: -0.0 [ft/sec] at 0.0024 [s]
ft/sec
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
Time [s]
CFC_180
CX0101 - 13 October 1998


301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Acc #1(X) Left Rear Xmember [inches, CFC_180]
Max: 110.2 [inches] at 0.3999 [s]
Min: -0.0 [inches] at 0.0028 [s]
125
100
75
50
25
0
-25
inches
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX0101 - 13 October 1998

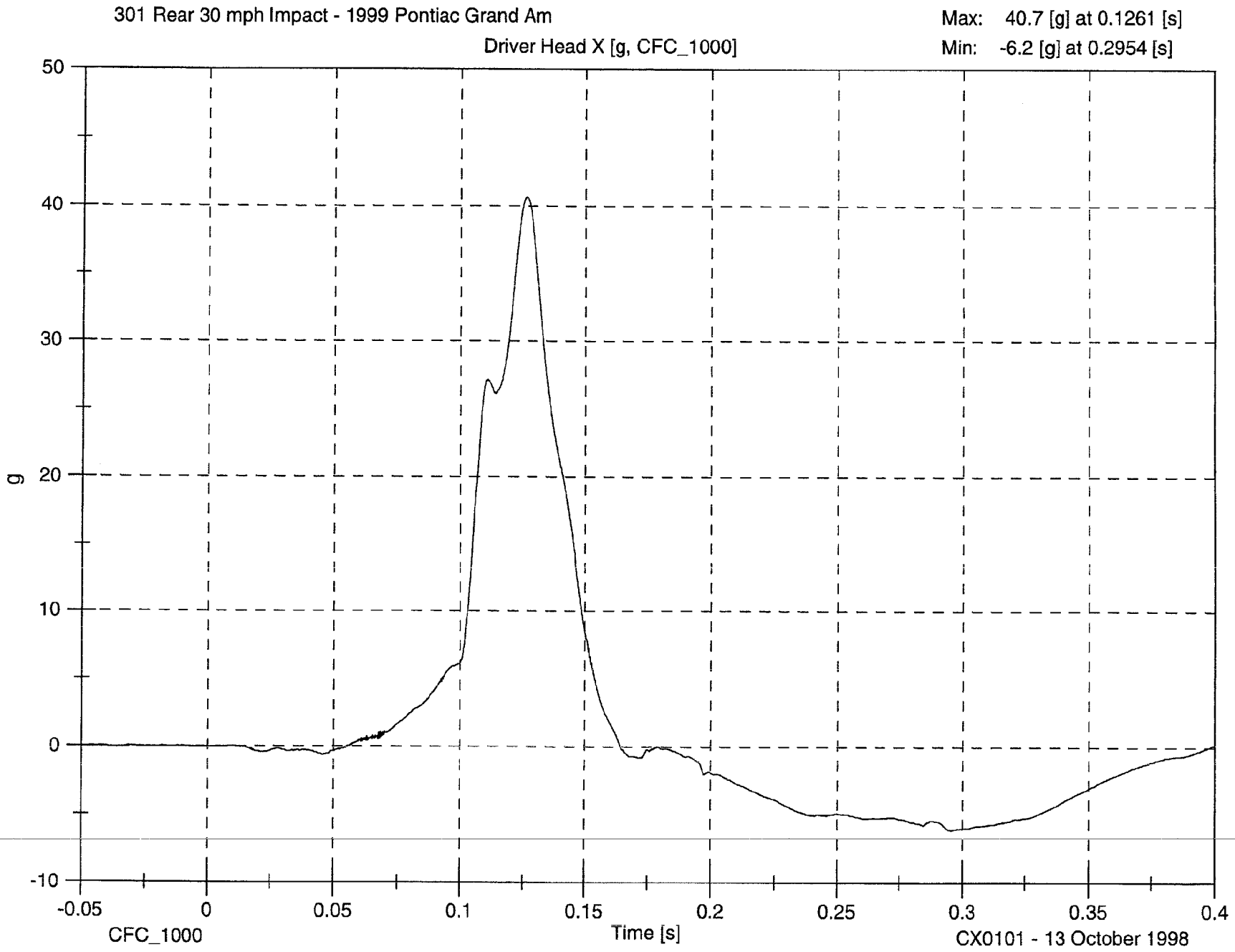

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Acc #2(X) Right Rear Xmember [g, CFC_60]
Max: 16.2 [g] at 0.0056 [s]
Min: -0.6 [g] at 0 [s]
17.5
15
12.5
10
7.5
5
2.5
0
-2.5
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_60
Time [s]
CX0101 - 13 October 1998

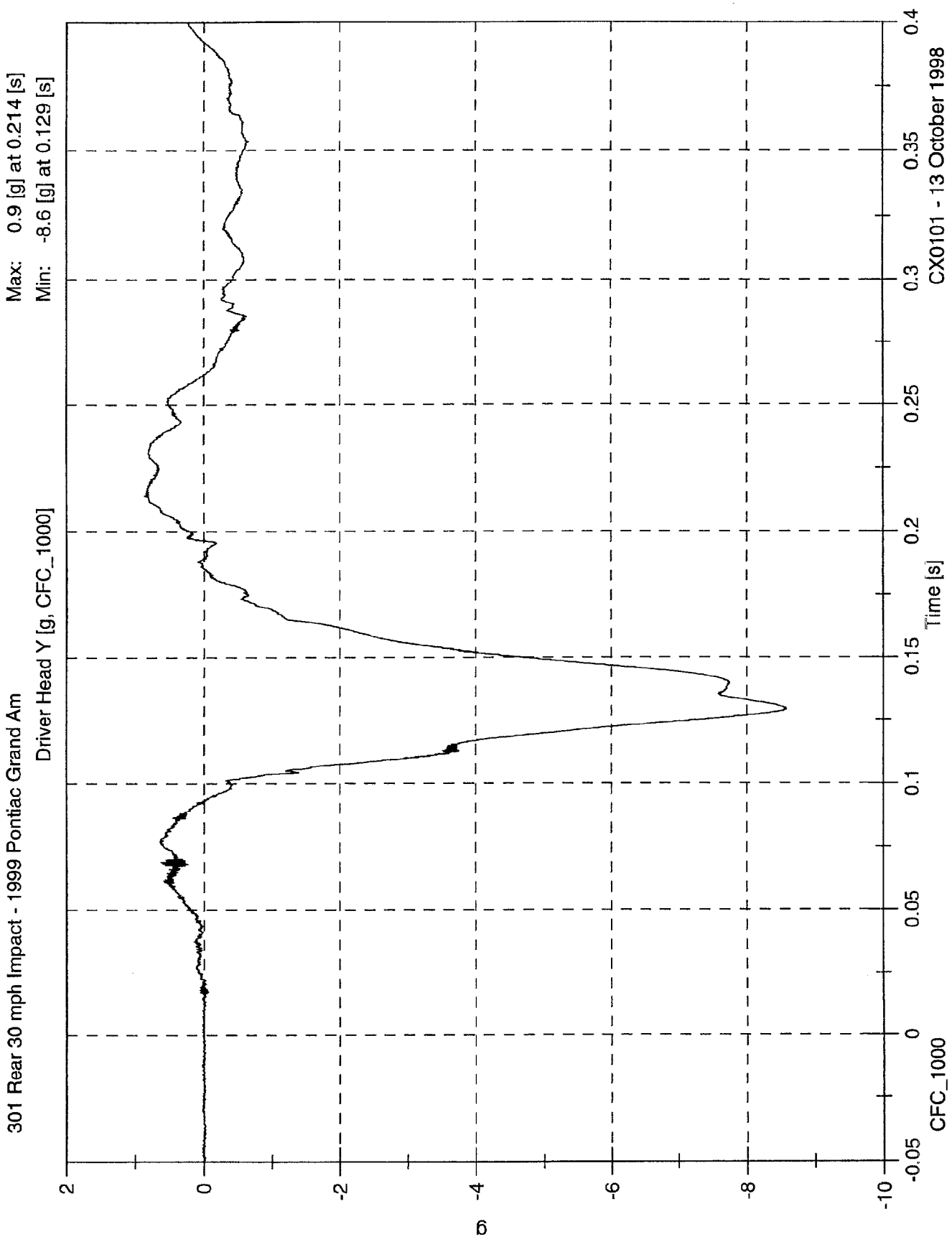

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Acc #2(X) Right Rear Xmember [ft/sec, CFC_180]
Max: 27.0 [ft/sec] at 0.1529 [s]
Min: -0.0 [ft/sec] at -0.0246 [s]
ft/sec
30
25
20
15
10
5
0
-5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX0101 - 13 October 1998

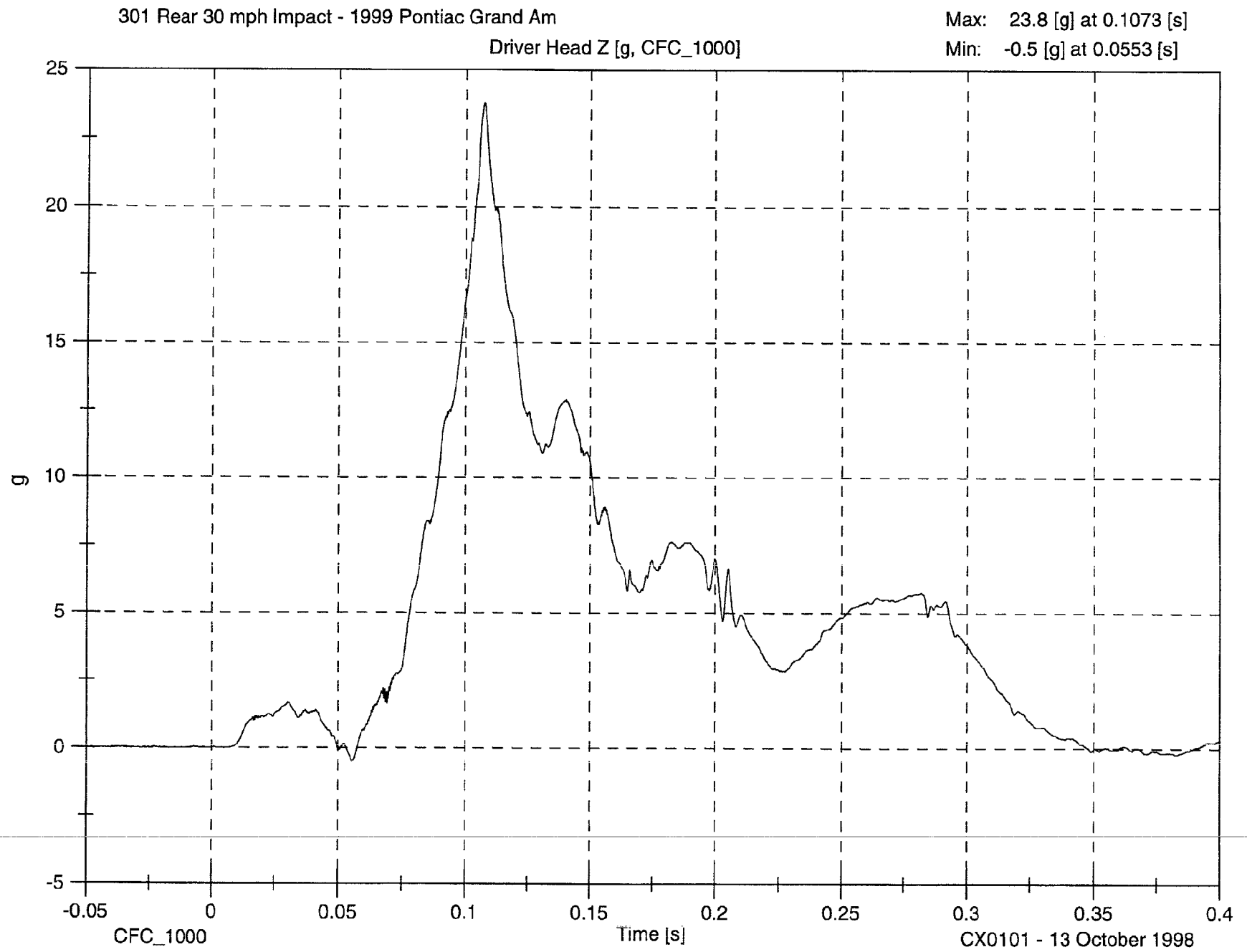

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Acc #2(X) Right Rear Xmember [inches, CFC_180]
Max: 111.0 [inches] at 0.3999 [s]
Min: -0.0 [inches] at 0.0024 [s]
125
100
75
50
25
0
-25
inches
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_180
Time [s]
CX0101 - 13 October 1998

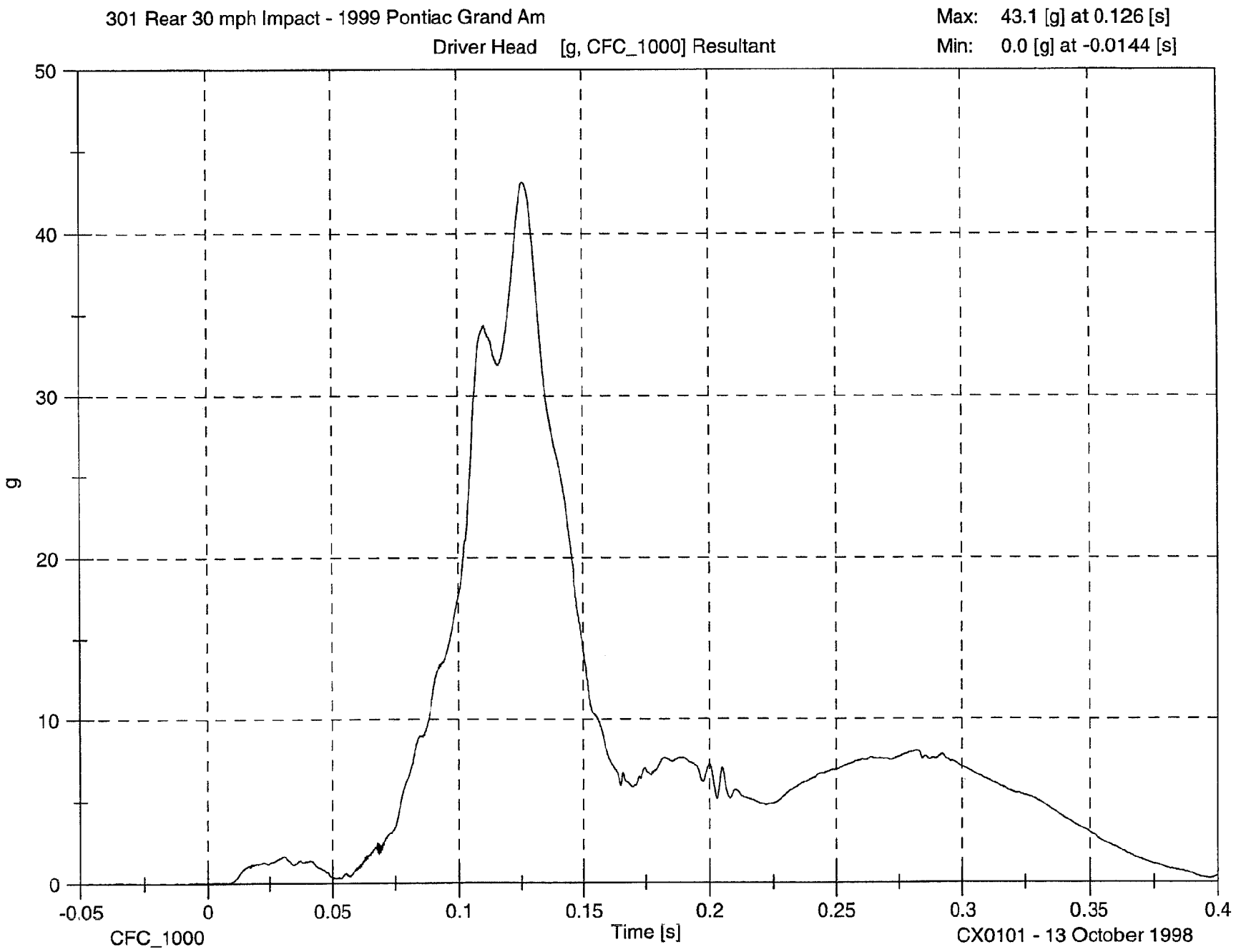
TEST NO. CX0101

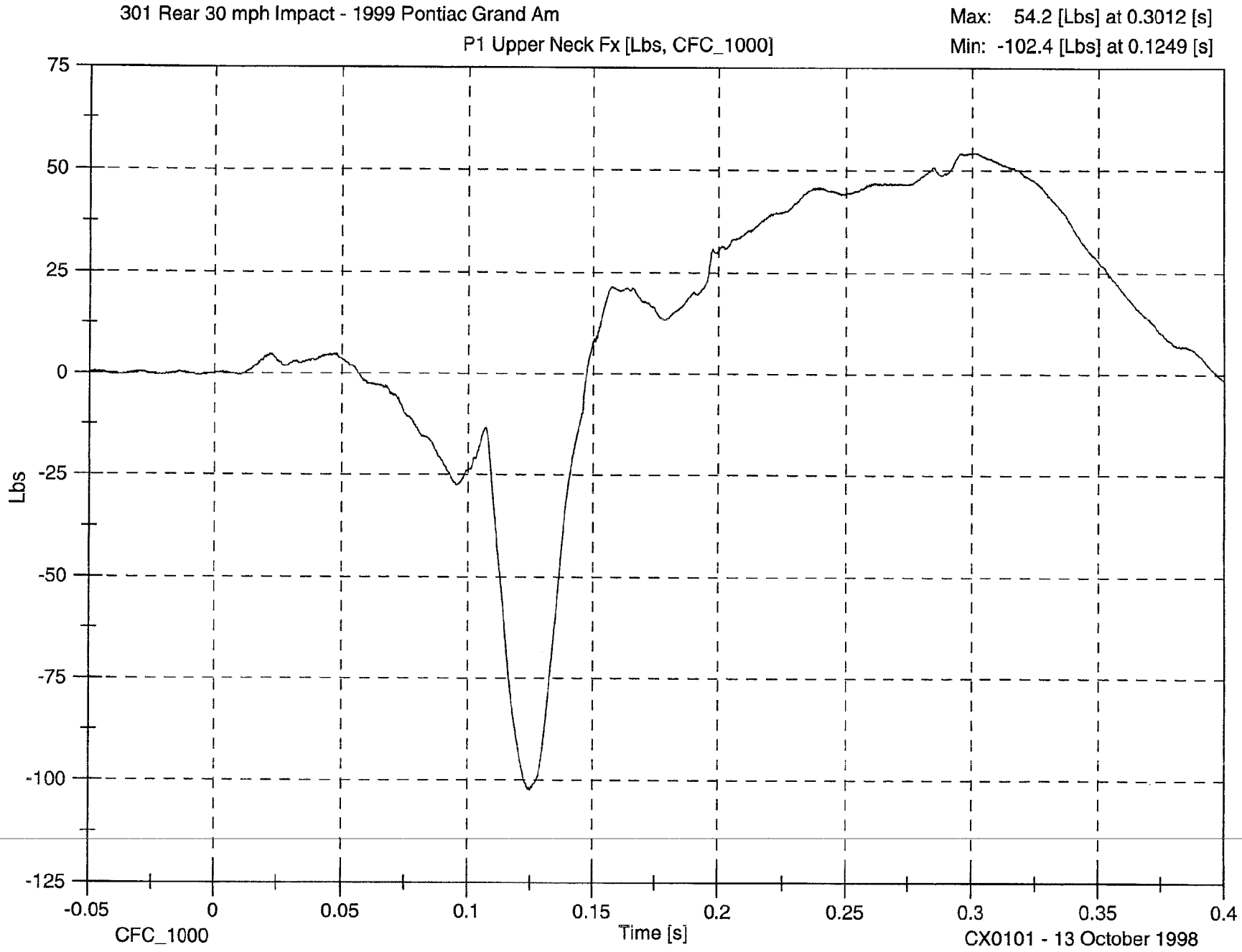
DRIVER DUMMY (Pos. 1)	SAE FILTER CHANNEL CLASS
Head Accelerations	1000
Chest Accelerations	180
Pelvic Accelerations	1000
Upper Neck Forces	1000
Upper Neck Moments	600
Belt Forces	60
Belt Spoolout	60

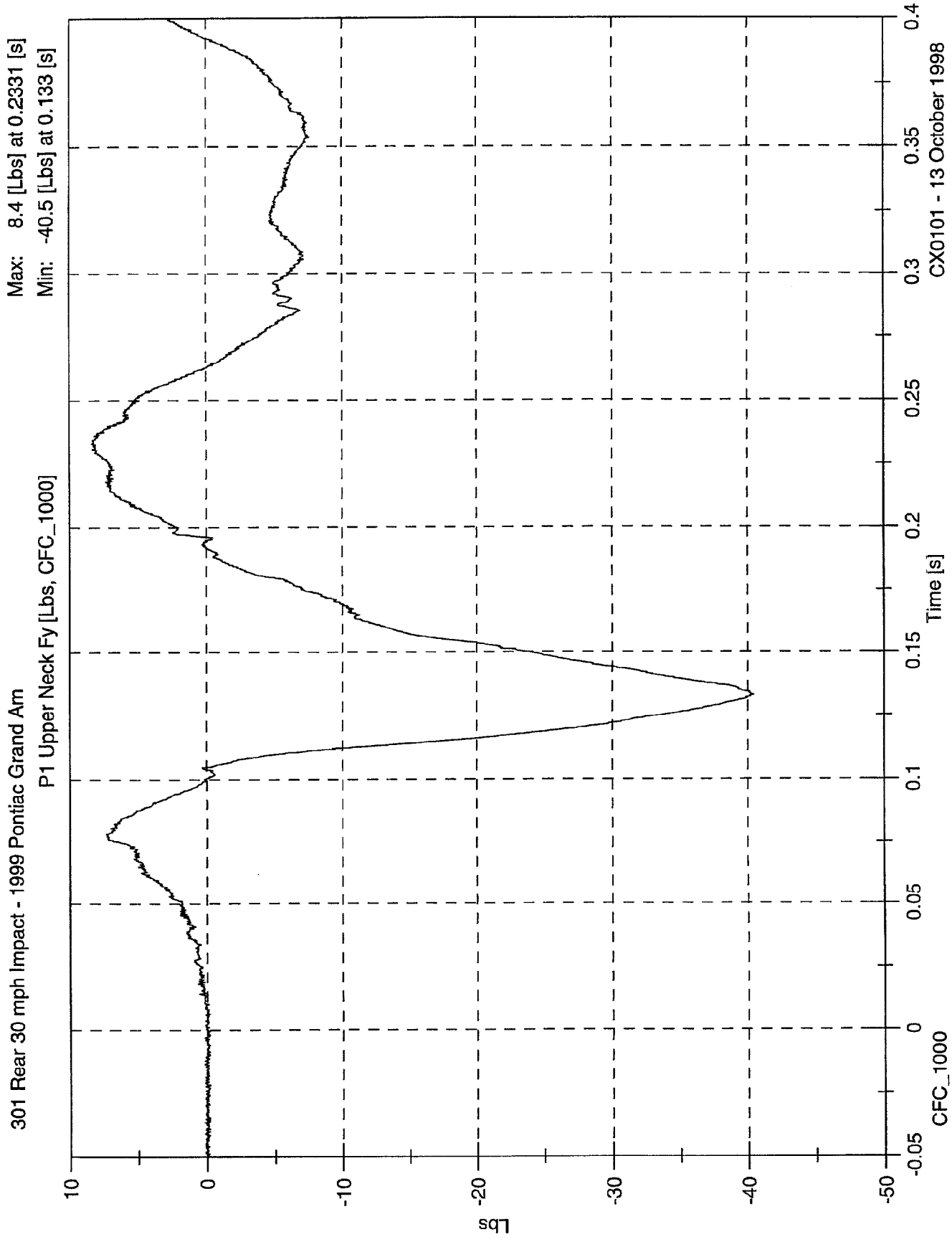

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Head X [g, CFC_1000]
Max: 40.7 [g] at 0.1261 [s]
Min: -6.2 [g] at 0.2954 [s]
50
40
30
20
10
0
-10
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_1000
Time [s]
CX0101 - 13 October 1998

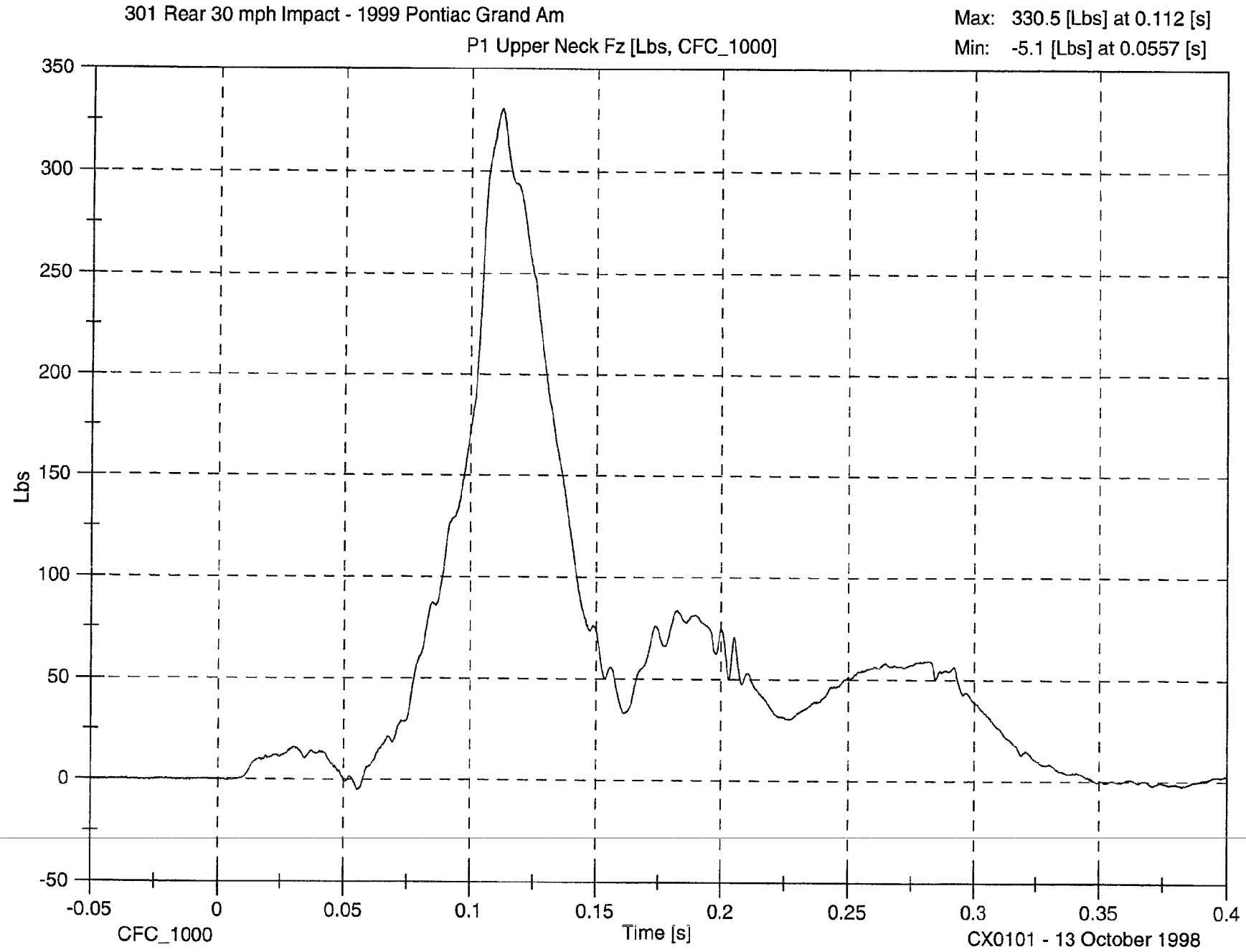

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Head Y [g, CFC_1000]
Max: 0.9 [g] at 0.214 [s]
Min: -8.6 [g] at 0.129 [s]
CX0101 - 13 October 1998
CFC_1000
Time [s]
g
2
0
-2
-4
-6
-8
-10
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

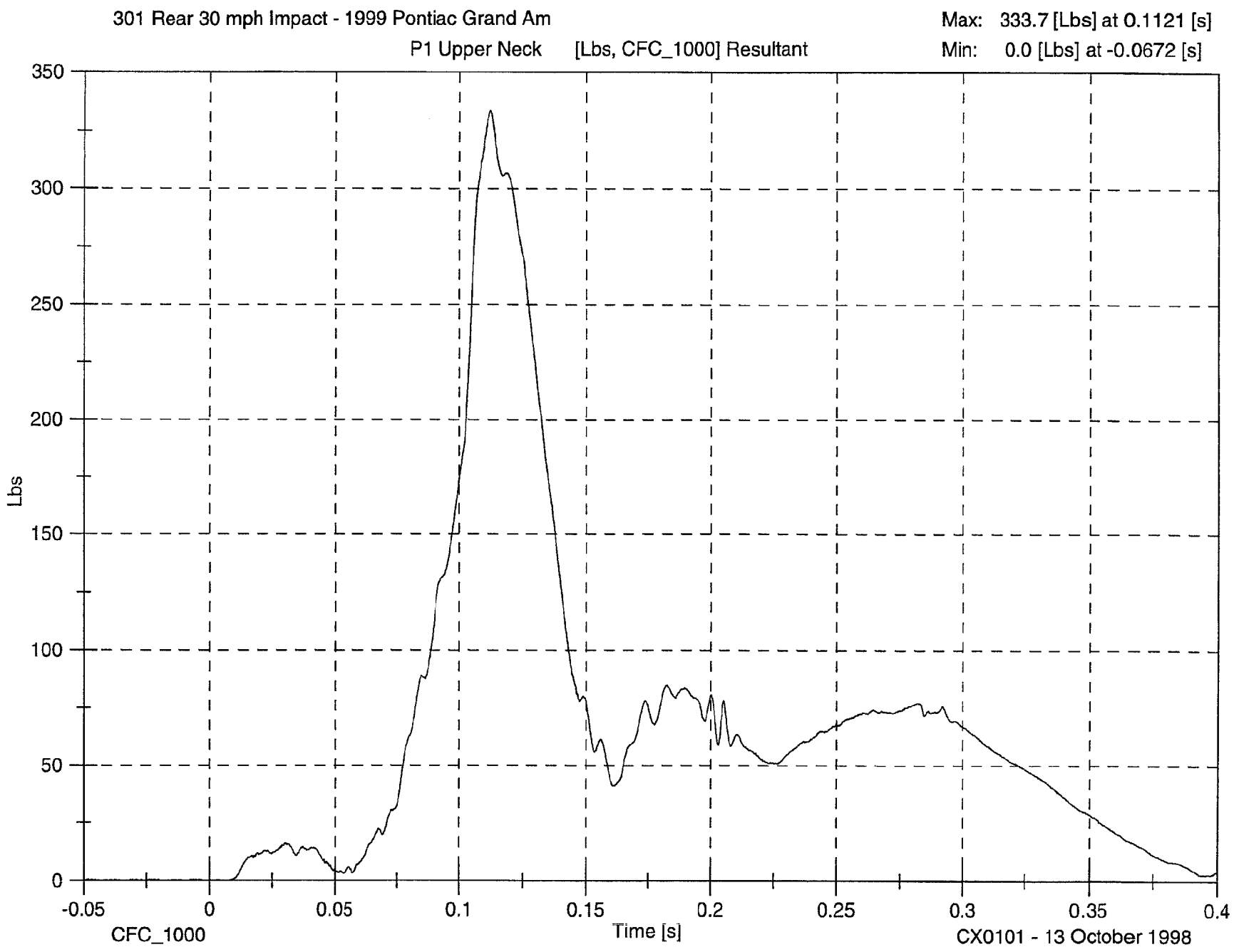

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Head Z [g, CFC_1000]
Max: 23.8 [g] at 0.1073 [s]
Min: -0.5 [g] at 0.0553 [s]
g
25
20
15
10
5
0
-5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_1000
Time [s]
CX0101 - 13 October 1998

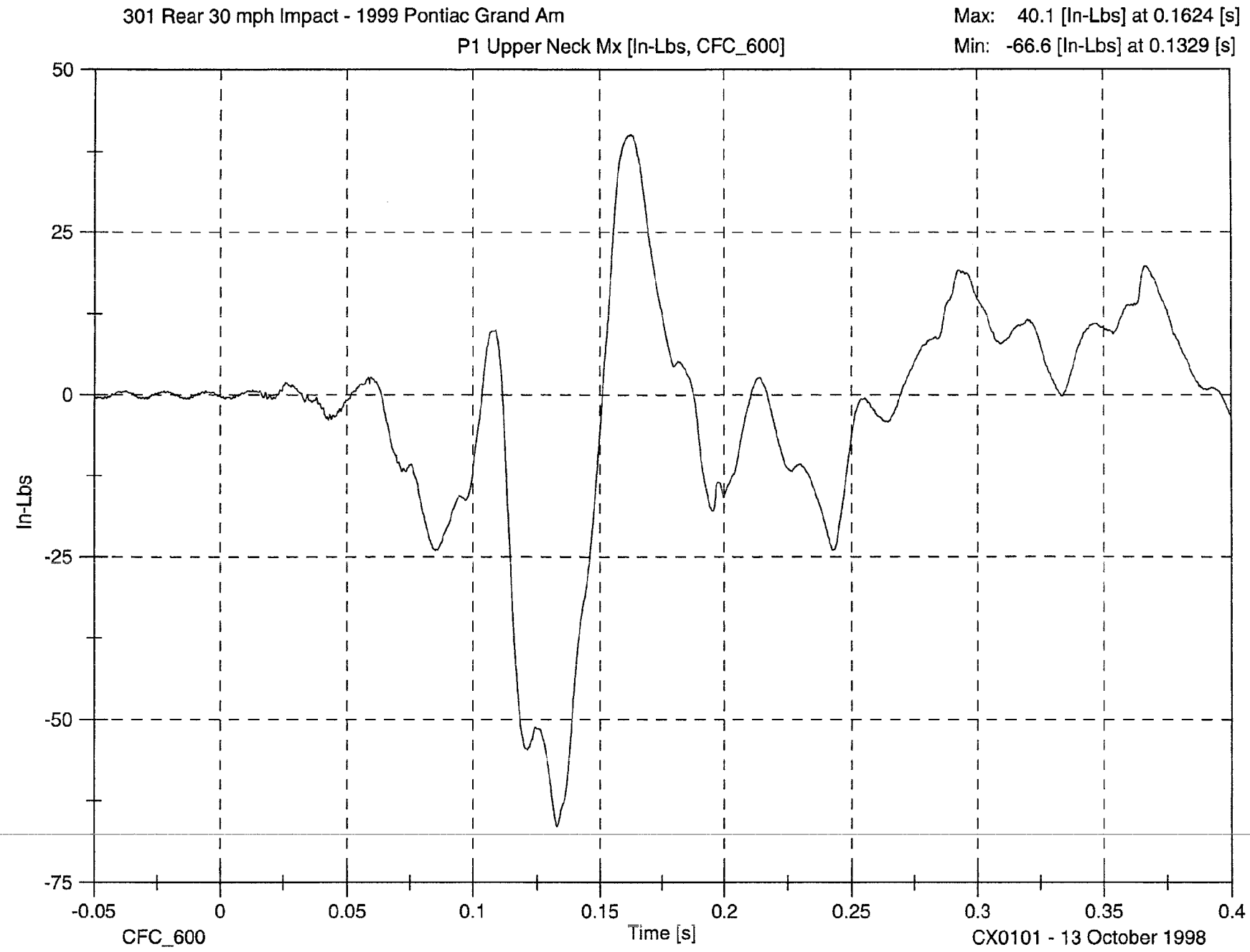

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Head [g, CFC_1000] Resultant
Max: 43.1 [g] at 0.126 [s]
Min: 0.0 [g] at -0.0144 [s]
50
40
30
20
10
0
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_1000
CX0101 - 13 October 1998

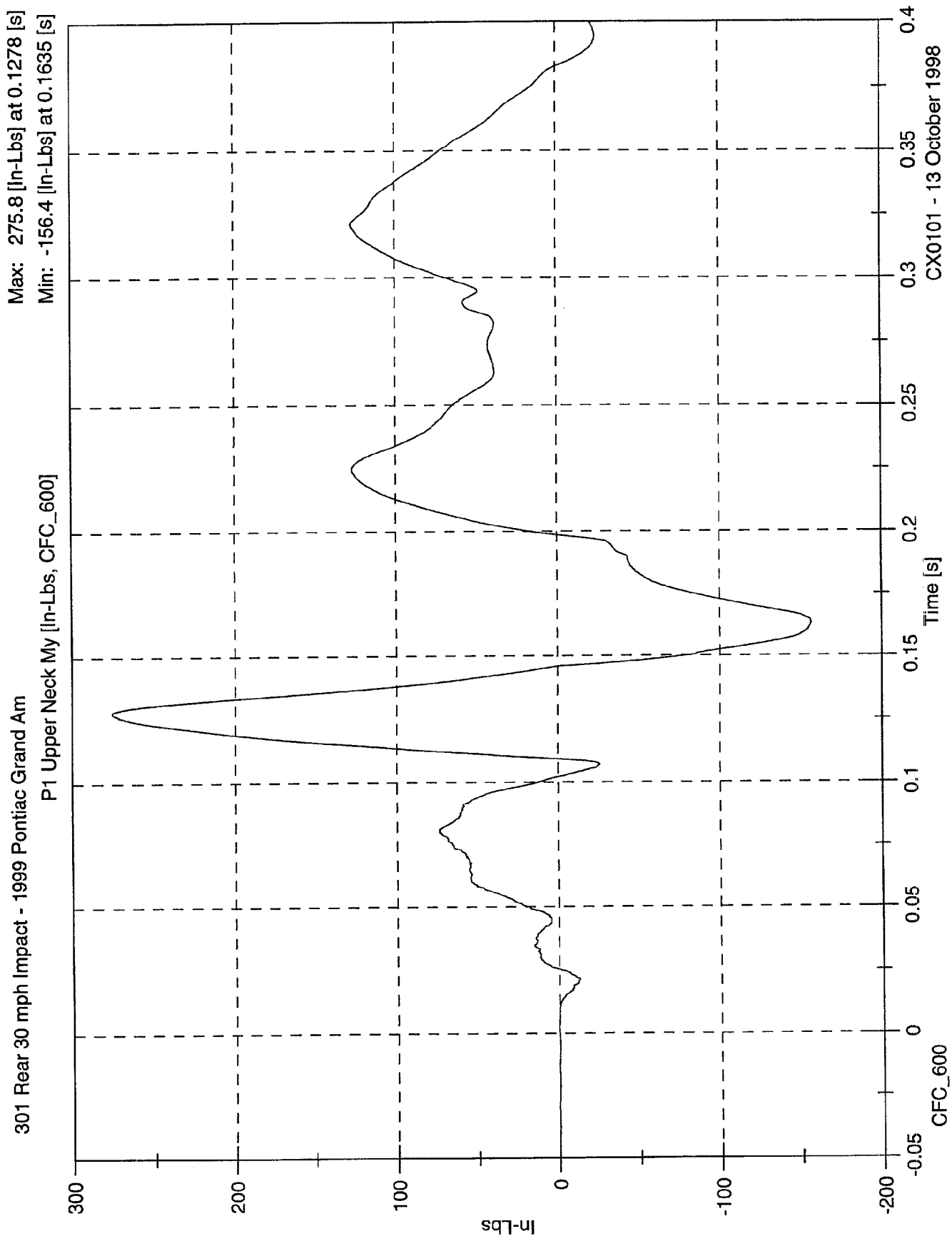

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Upper Neck Fx [Lbs, CFC_1000]
Max: 54.2 [Lbs] at 0.3012 [s]
Min: -102.4 [Lbs] at 0.1249 [s]
75
50
25
0
-25
-50
-75
-100
-125
Lbs
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_1000
Time [s]
CX0101 - 13 October 1998

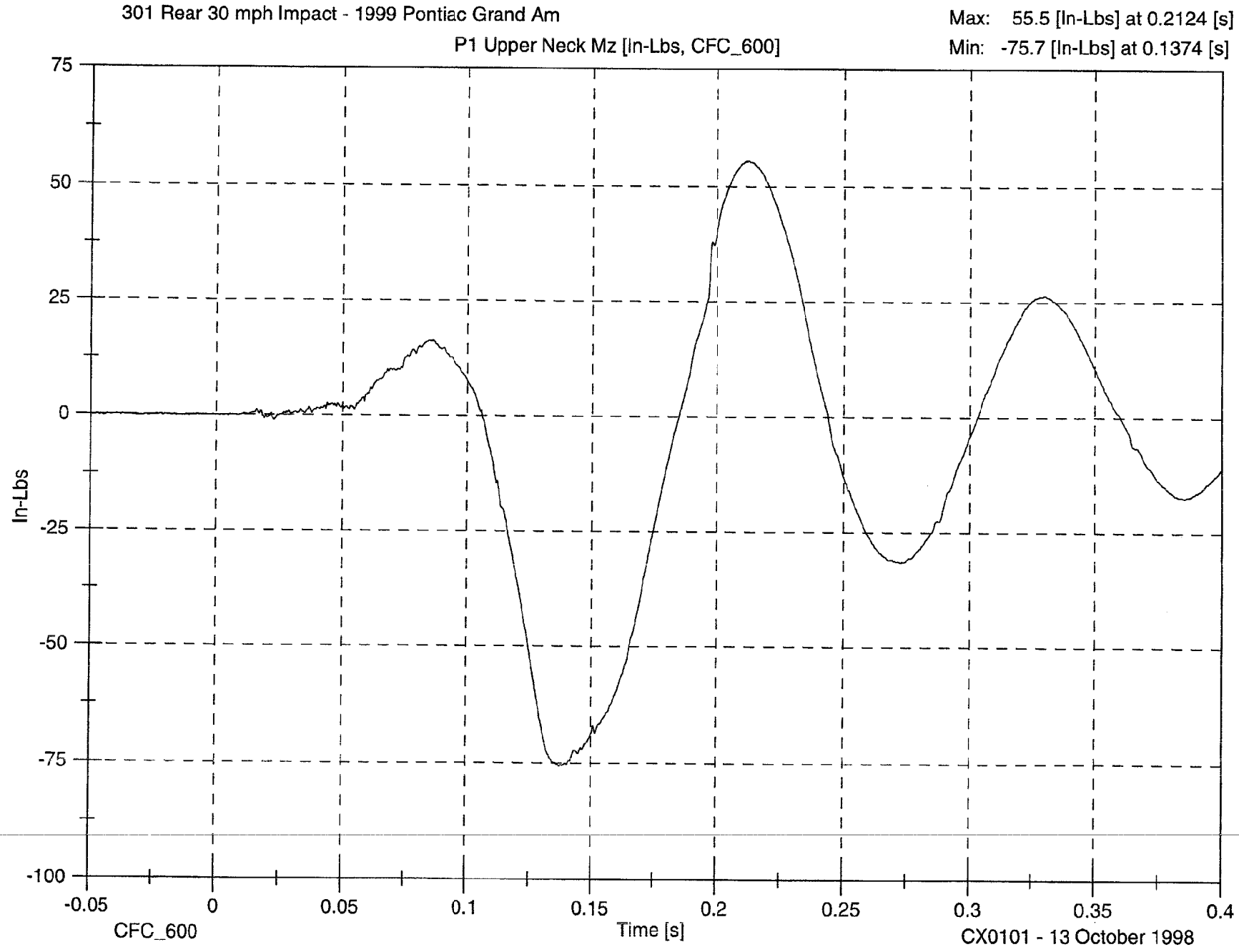

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Upper Neck Fy [Lbs, CFC_1000]
Max: 8.4 [Lbs] at 0.2331 [s]
Min: -40.5 [Lbs] at 0.133 [s]
Lbs
10
0
-10
-20
-30
-40
-50
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_1000
CX0101 - 13 October 1998

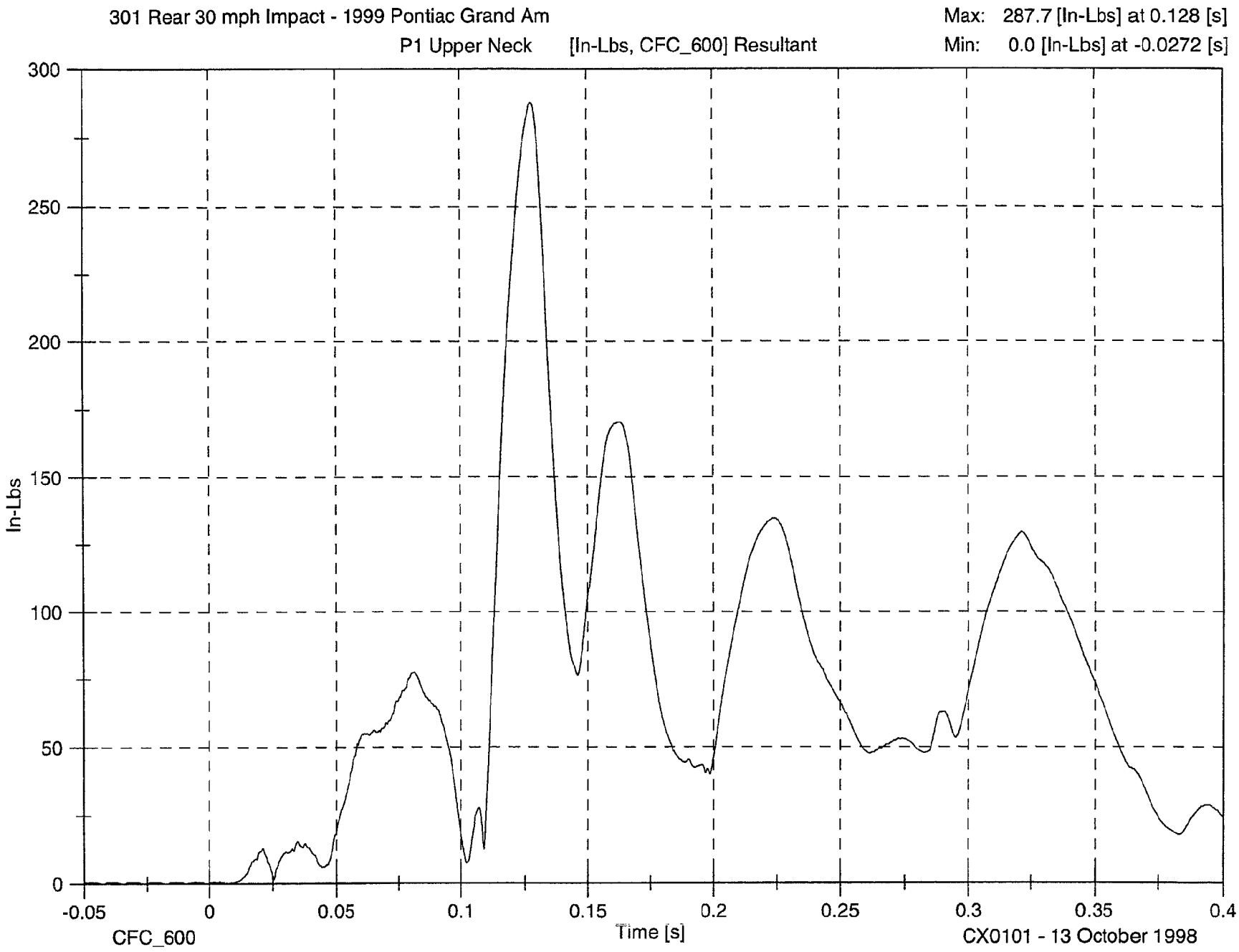

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Upper Neck Fz [Lbs, CFC_1000]
Max: 330.5 [Lbs] at 0.112 [s]
Min: -5.1 [Lbs] at 0.0557 [s]
350
300
250
200
150
100
50
0
-50
Lbs
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_1000
Time [s]
CX0101 - 13 October 1998

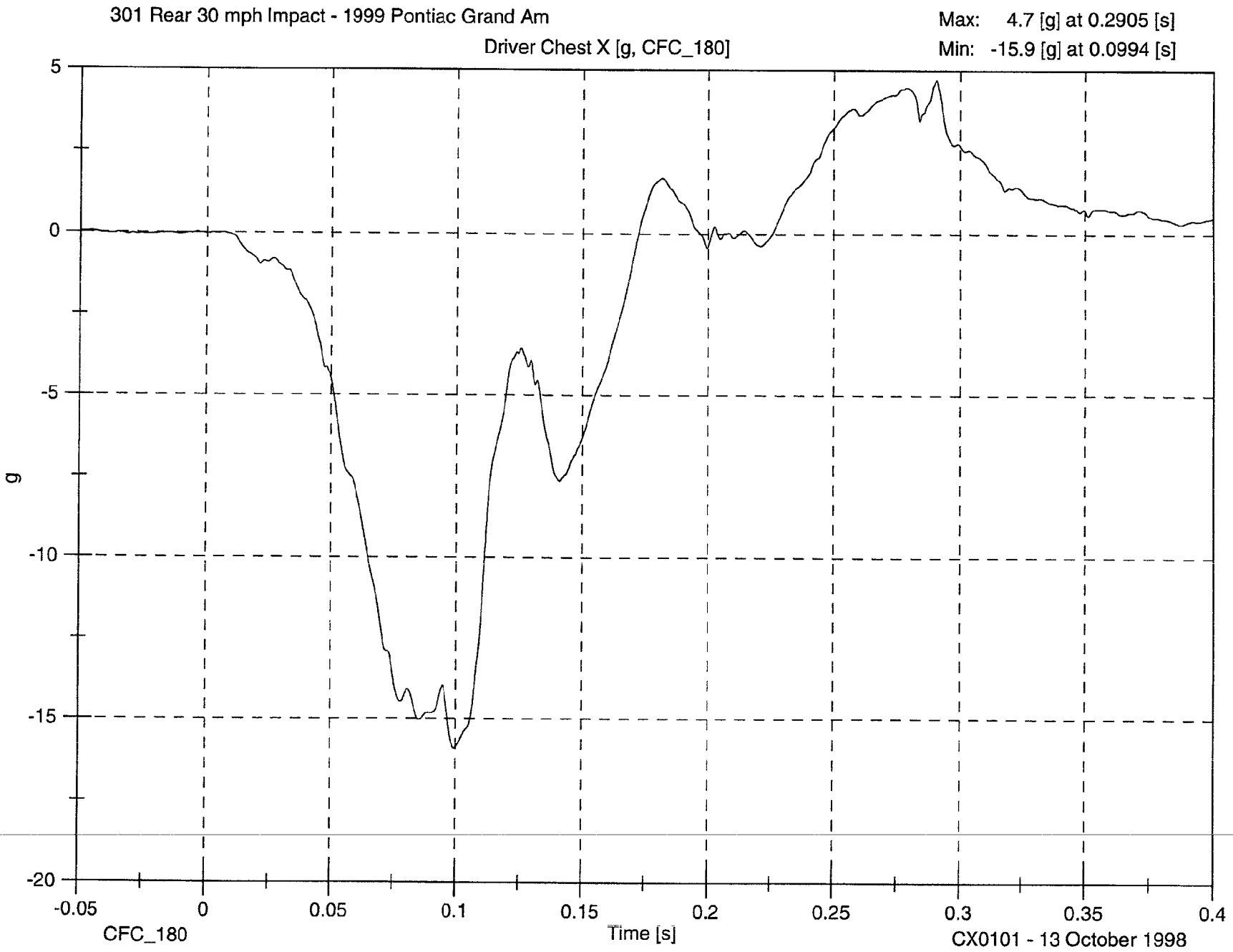

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Upper Neck [Lbs, CFC_1000] Resultant
Max: 333.7 [Lbs] at 0.1121 [s]
Min: 0.0 [Lbs] at -0.0672 [s]
Lbs
350
300
250
200
150
100
50
0
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_1000
CX0101 - 13 October 1998

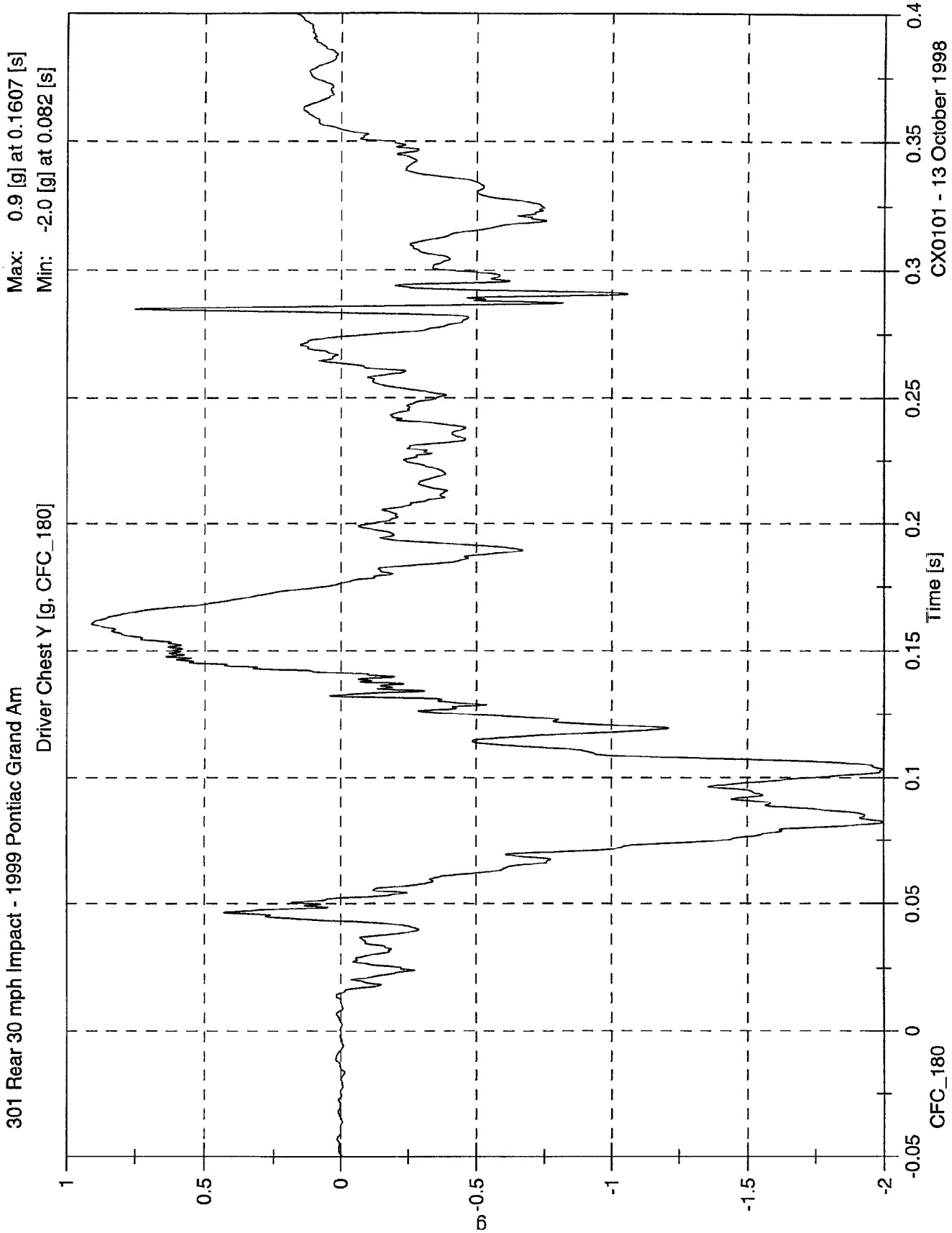

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Upper Neck Mx [In-Lbs, CFC_600]
Max: 40.1 [In-Lbs] at 0.1624 [s]
Min: -66.6 [In-Lbs] at 0.1329 [s]
50
25
0
-25
-50
-75
In-Lbs
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_600
CX0101 - 13 October 1998

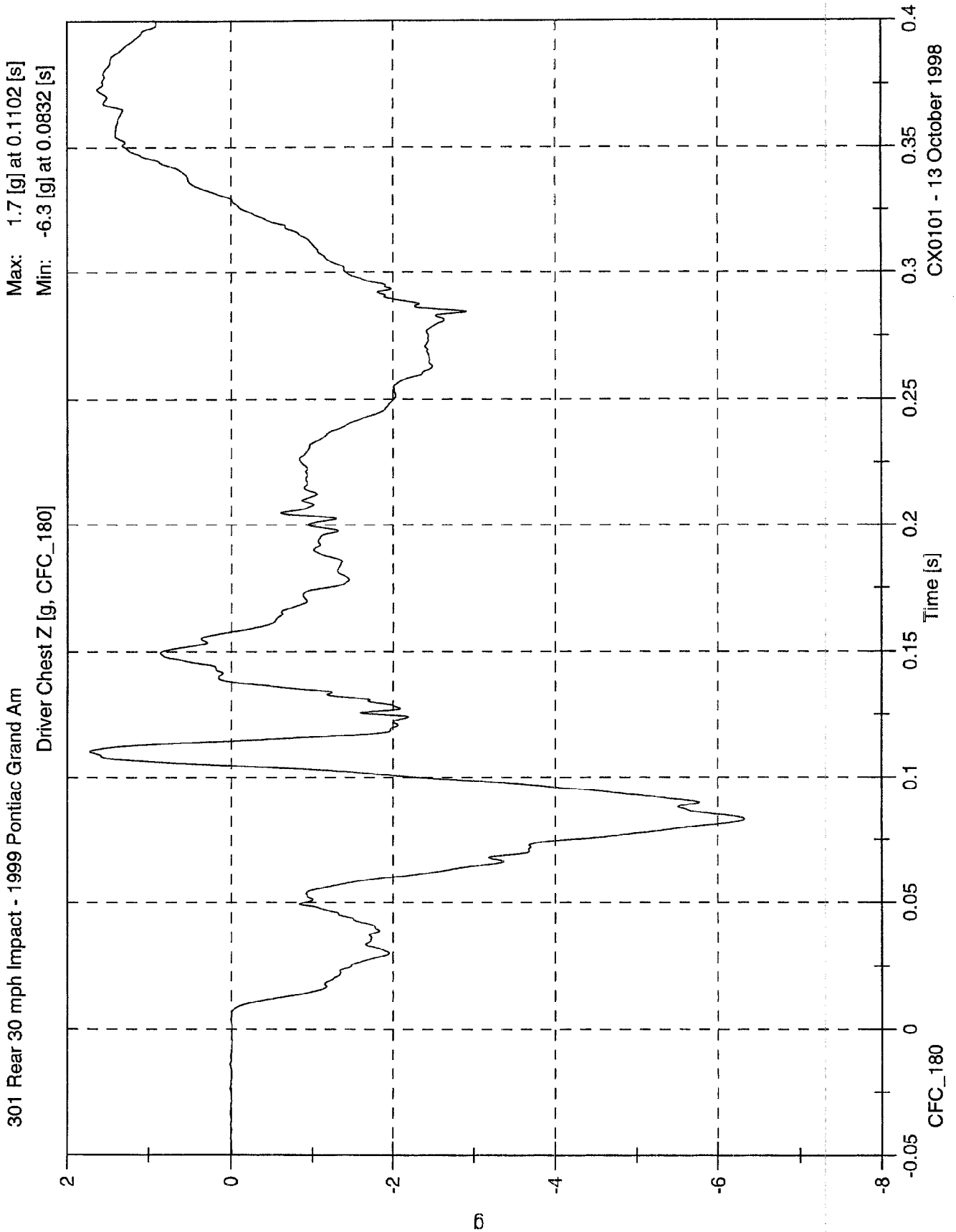

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Upper Neck My [In-Lbs, CFC_600]
Max: 275.8 [In-Lbs] at 0.1278 [s]
Min: -156.4 [In-Lbs] at 0.1635 [s]
CX0101 - 13 October 1998
In-Lbs
300
200
100
0
-100
-200
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_600

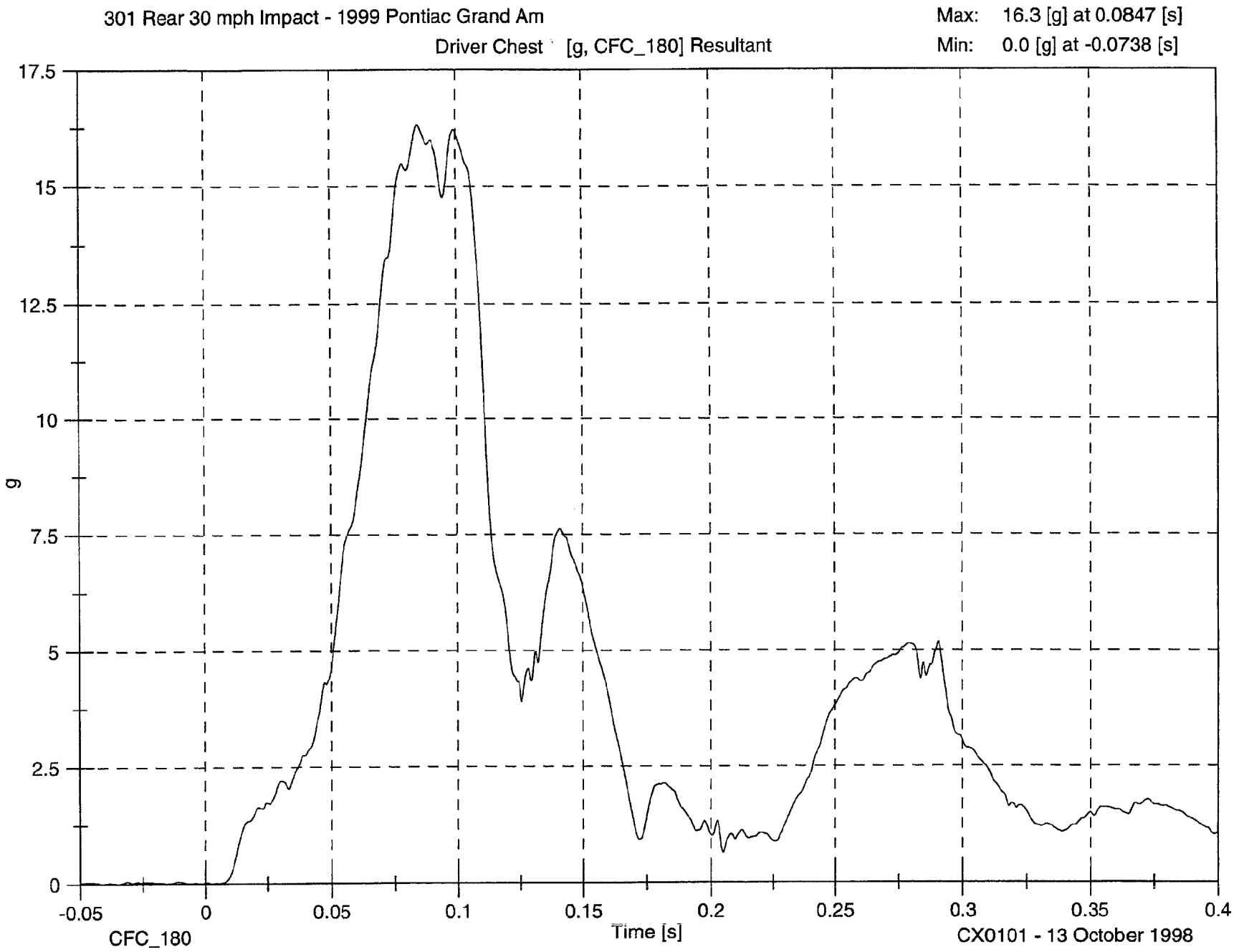

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Upper Neck Mz [In-Lbs, CFC_600]
Max: 55.5 [In-Lbs] at 0.2124 [s]
Min: -75.7 [In-Lbs] at 0.1374 [s]
75
50
25
0
-25
-50
-75
-100
In-Lbs
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_600
Time [s]
CX0101 - 13 October 1998

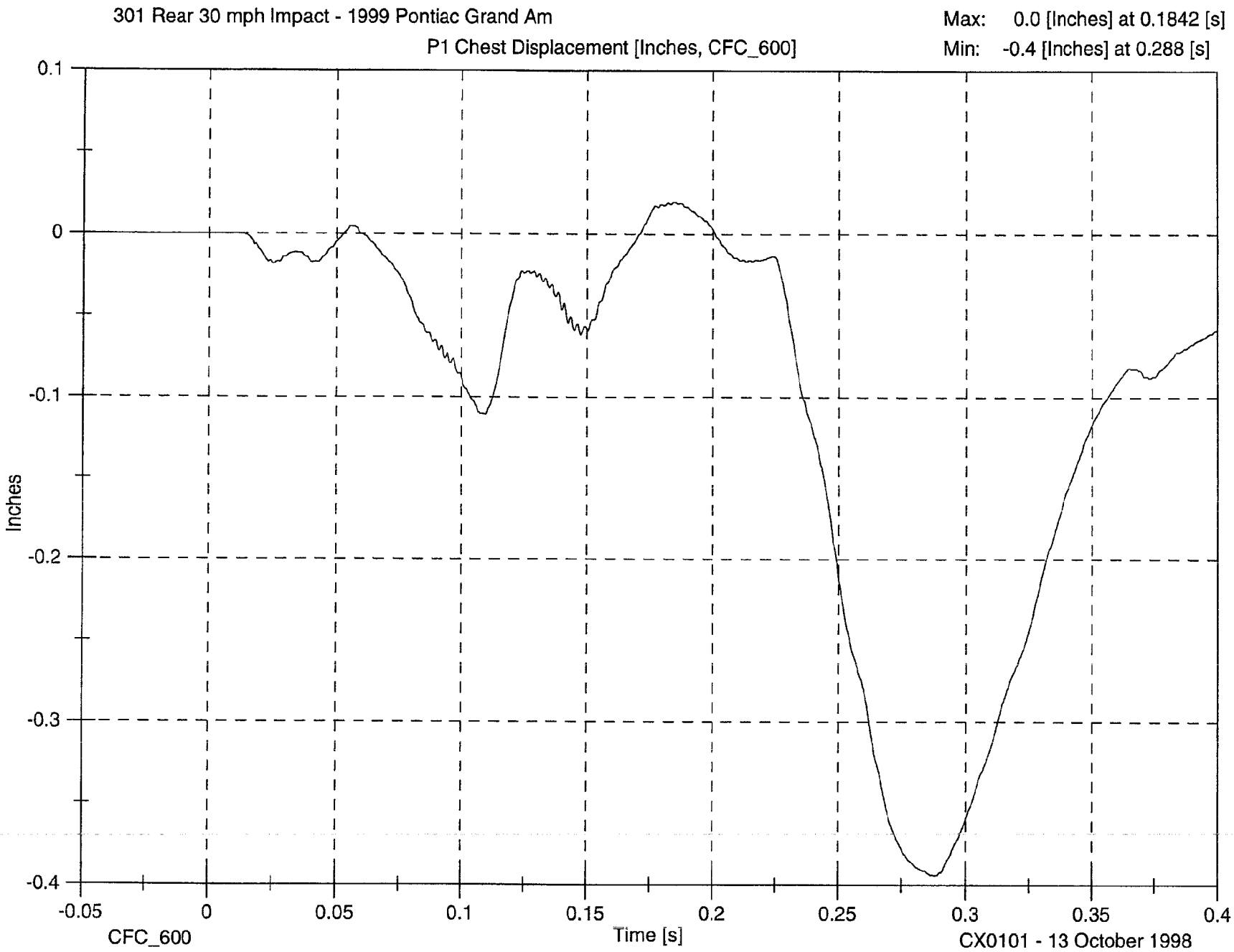

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Upper Neck [In-Lbs, CFC_600] Resultant
Max: 287.7 [In-Lbs] at 0.128 [s]
Min: 0.0 [In-Lbs] at -0.0272 [s]
300
250
200
150
100
50
0
In-Lbs
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_600
CX0101 - 13 October 1998

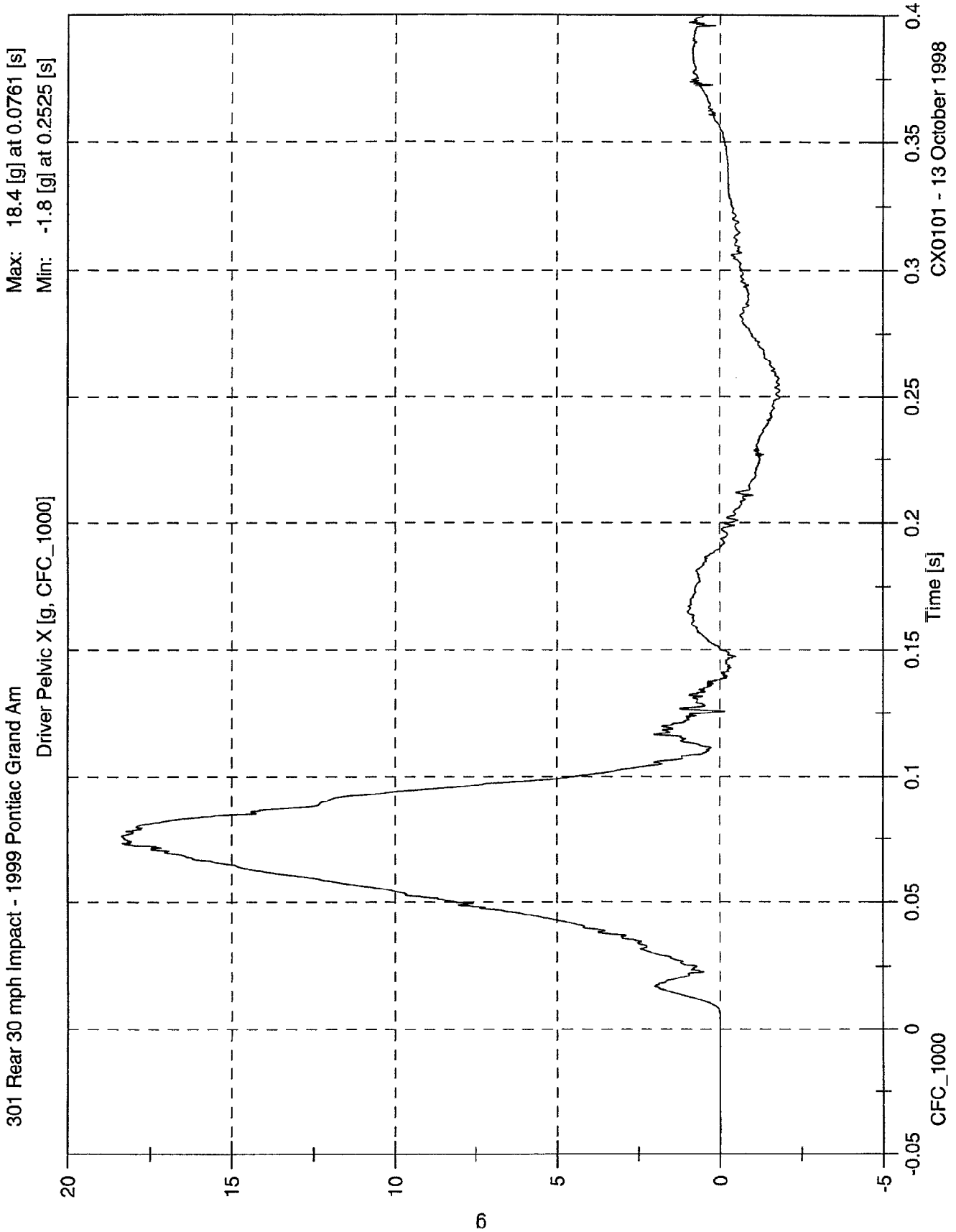

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Chest X [g, CFC_180]
Max: 4.7 [g] at 0.2905 [s]
Min: -15.9 [g] at 0.0994 [s]
5
0
-5
-10
-15
-20
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX0101 - 13 October 1998

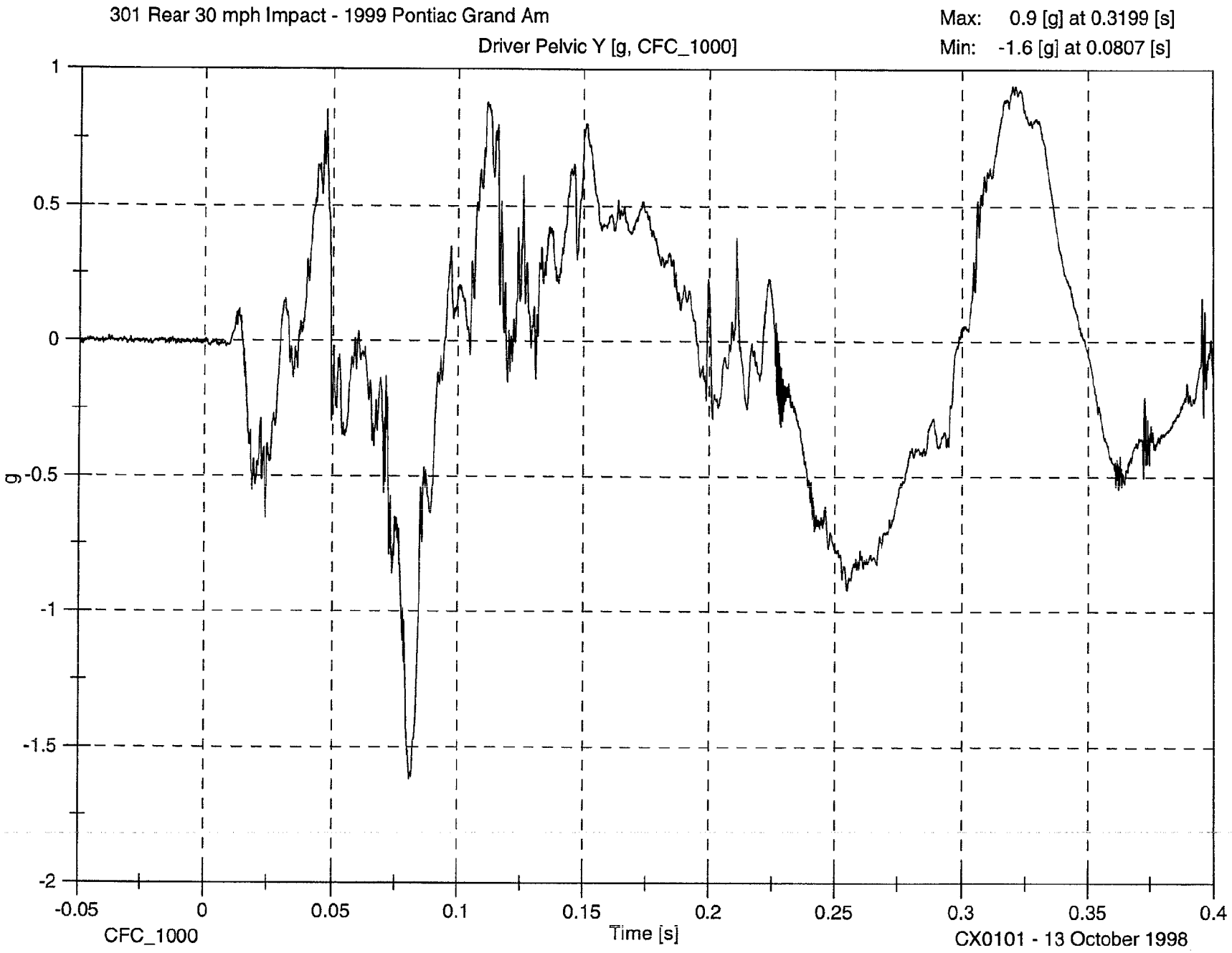

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Chest Y [g, CFC_180]
Max: 0.9 [g] at 0.1607 [s]
Min: -2.0 [g] at 0.082 [s]
CX0101 - 13 October 1998
CFC_180
Time [s]
g
1
0.5
0
-0.5
-1
-1.5
-2
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

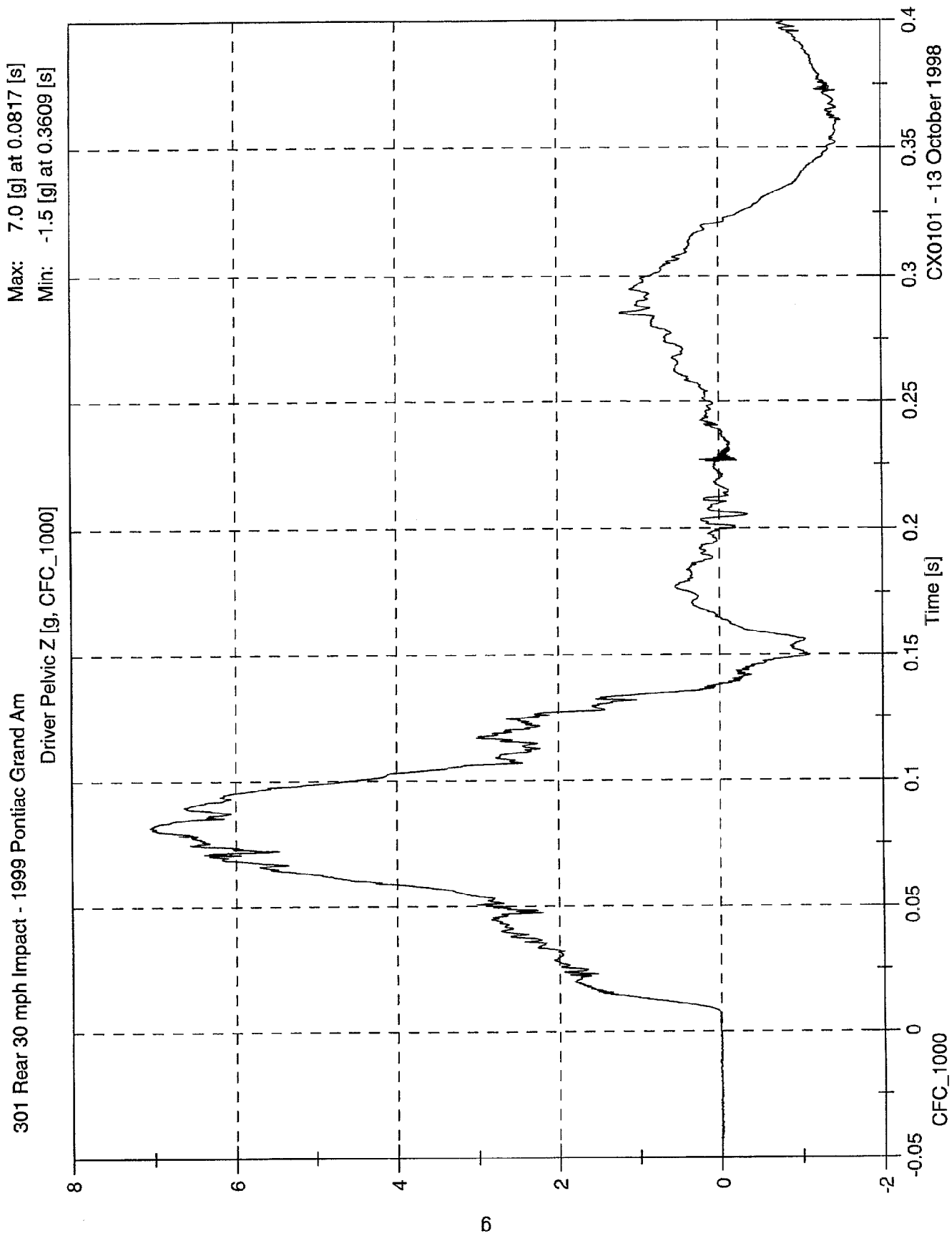

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Chest Z [g, CFC_180]
Max: 1.7 [g] at 0.1102 [s]
Min: -6.3 [g] at 0.0832 [s]
CX0101 - 13 October 1998
CFC_180
Time [s]
g
2
0
-2
-4
-6
-8
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

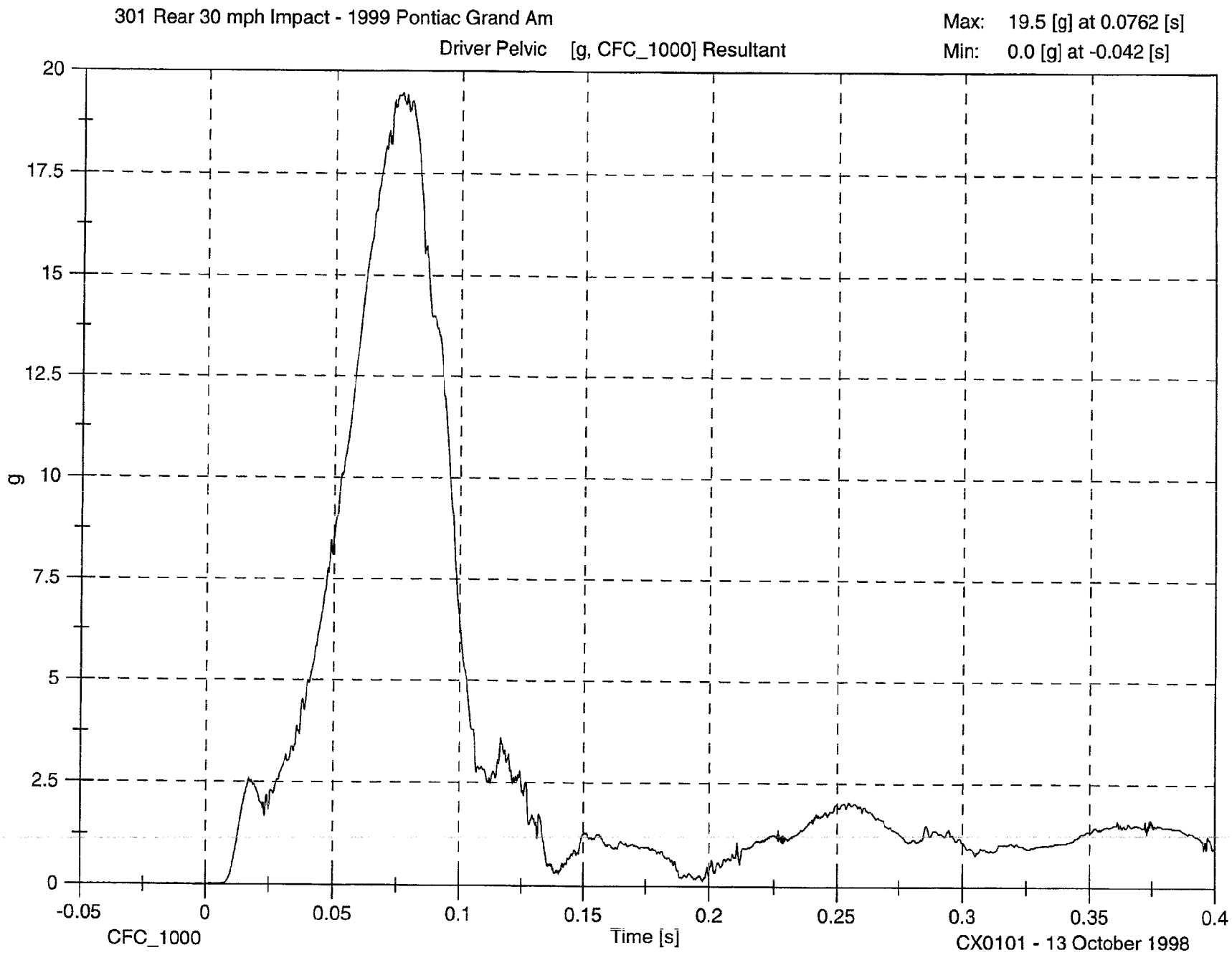

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Chest [g, CFC_180] Resultant
Max: 16.3 [g] at 0.0847 [s]
Min: 0.0 [g] at -0.0738 [s]
17.5
15
12.5
10
7.5
5
2.5
0
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_180
CX0101 - 13 October 1998

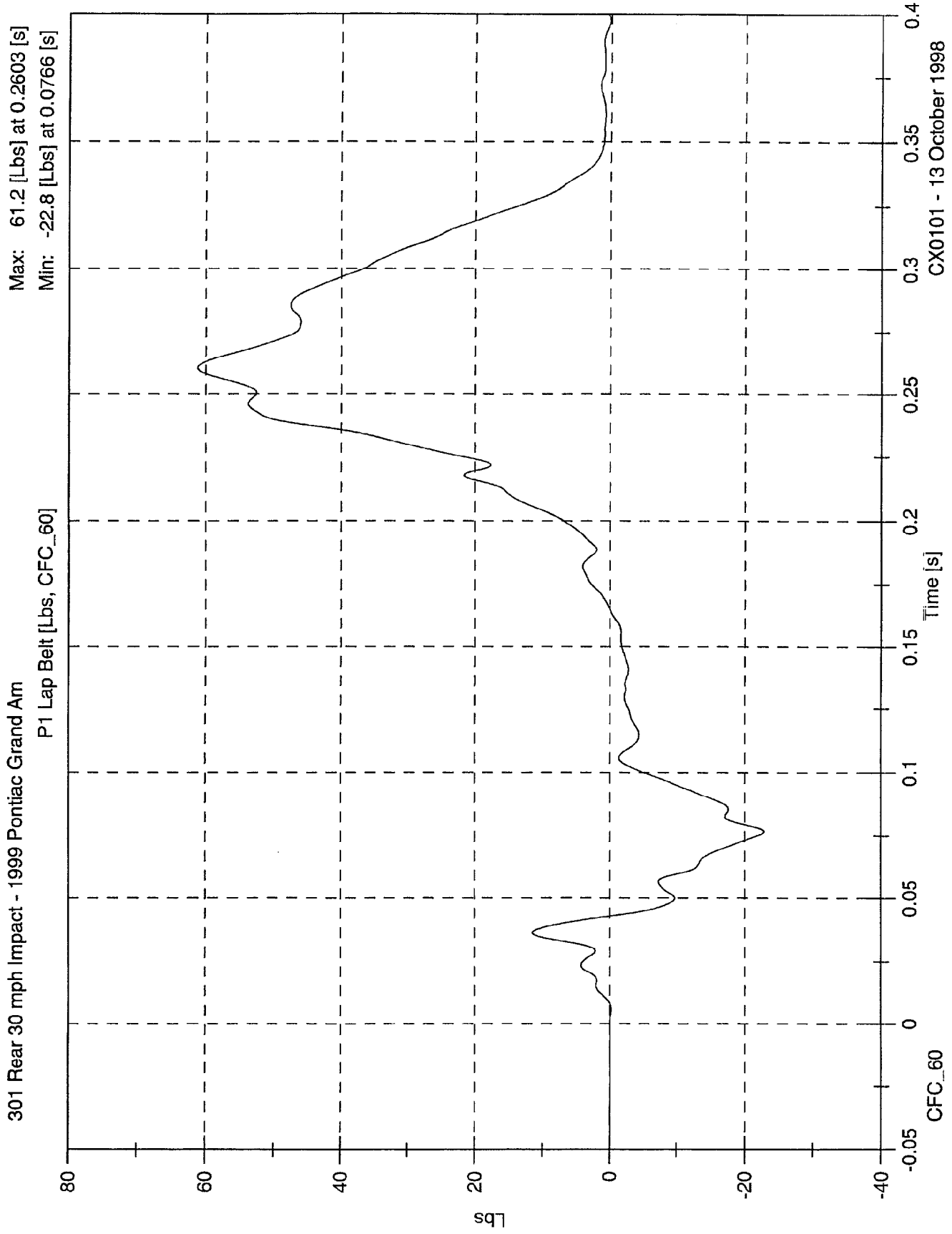

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Chest Displacement [Inches, CFC_600]
Max: 0.0 [Inches] at 0.1842 [s]
Min: -0.4 [Inches] at 0.288 [s]
0.1
0
-0.1
-0.2
-0.3
-0.4
Inches
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_600
Time [s]
CX0101 - 13 October 1998

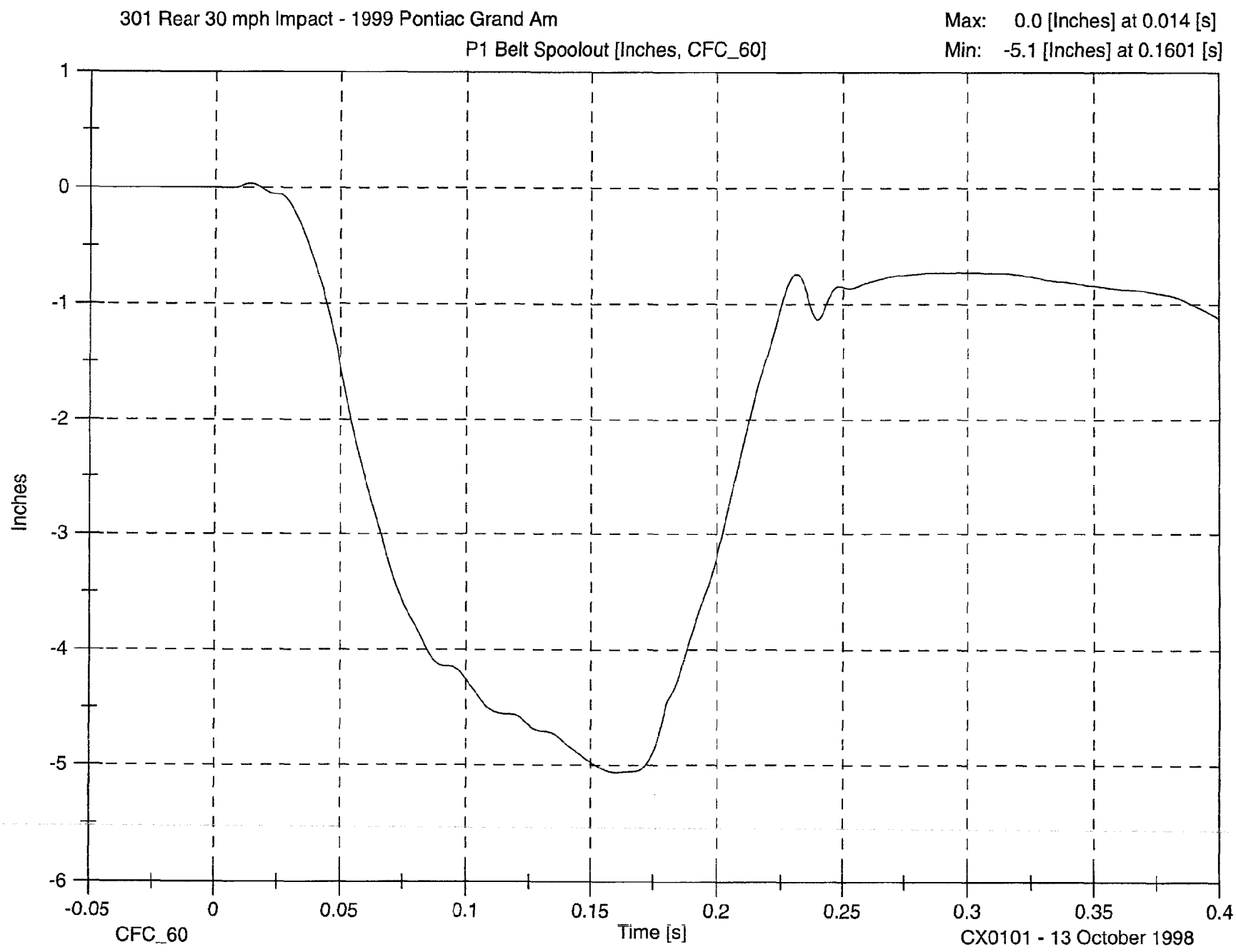

301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Pelvic X [g, CFC_1000]
Max: 18.4 [g] at 0.0761 [s]
Min: -1.8 [g] at 0.2525 [s]
CX0101 - 13 October 1998
g
Time [s]
CFC_1000
20
15
10
5
0
-5
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4


301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Pelvic Y [g, CFC_1000]
Max: 0.9 [g] at 0.3199 [s]
Min: -1.6 [g] at 0.0807 [s]
1
0.5
0
-0.5
-1
-1.5
-2
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_1000
Time [s]
CX0101 - 13 October 1998


301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Pelvic Z [g, CFC_1000]
Max: 7.0 [g] at 0.0817 [s]
Min: -1.5 [g] at 0.3609 [s]
CX0101 - 13 October 1998
CFC_1000
Time [s]
g
8
6
4
2
0
-2
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4


301 Rear 30 mph Impact - 1999 Pontiac Grand Am
Driver Pelvic [g, CFC_1000] Resultant
Max: 19.5 [g] at 0.0762 [s]
Min: 0.0 [g] at -0.042 [s]
20
17.5
15
12.5
10
7.5
5
2.5
0
g
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
CFC_1000
Time [s]
CX0101 - 13 October 1998


301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Lap Belt [Lbs, CFC_60]
Max: 61.2 [Lbs] at 0.2603 [s]
Min: -22.8 [Lbs] at 0.0766 [s]
CX0101 - 13 October 1998
Lbs
Time [s]
CFC_60
80
60
40
20
0
-20
-40
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4


301 Rear 30 mph Impact - 1999 Pontiac Grand Am
P1 Belt Spoolout [Inches, CFC_60]
Max: 0.0 [Inches] at 0.014 [s]
Min: -5.1 [Inches] at 0.1601 [s]
Inches
1
0
-1
-2
-3
-4
-5
-6
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Time [s]
CFC_60
CX0101 - 13 October 1998