

V2973

REPORT NUMBER: 8479-1

FUEL SYSTEM INTEGRITY

**70 PERCENT OVERLAP, 81.1 KPH IMPACT
OF A MOVING DEFORMABLE BARRIER
INTO THE REAR OF A STATIONARY
1998 CHEVROLET CAVALIER 4-DOOR SEDAN**

NHTSA NUMBER: RW0122

CALSPAN TEST NUMBER: A266-1-1790

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



November 13, 1998

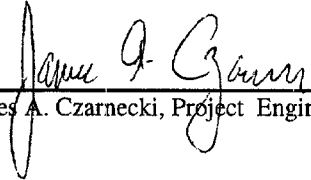
FINAL REPORT

PREPARED FOR:

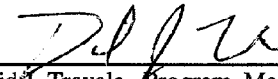
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4. Title and Subtitle Final Report of a 81.1 kph vehicle to vehicle 70 percent overlap impact test of a moving deformable barrier into the rear of a 1998 Chevrolet Cavalier 4-Door Sedan, NHTSA No. RW0122.		5. Report Date November 13, 1998																			
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16. Abstract This 81.1 kph vehicle to vehicle 70 percent overlap impact test of a moving deformable barrier into the rear of a 1998 Chevrolet Cavalier 4-Door Sedan was performed at the Calspan Transportation Sciences Center crash test facility in Buffalo, New York on November 13, 1998. The subject vehicle was prepared following the Office of Vehicle Safety Compliance (OVSC) Procedure TP-301-01 as a guideline. Two instrumented Part 572E, 50th percentile male anthropomorphic test devices were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the OVSC Procedure TP-208-10. The Moving Deformable Barrier (MDB) impact face mounting plate was lowered 2 inches below that used in OVSC Procedure TP-214D-4 and was instrumented with 5 load cells. The MDB was configured to track parallel to the guide rail and to the subject vehicle's longitudinal centerline. The occupant injury data is summarized as follows: <table border="0"> <thead> <tr> <th></th> <th>DRIVER</th> <th>PASSENGER</th> </tr> </thead> <tbody> <tr> <td>HIC:</td> <td>1063.1</td> <td>2545.2</td> </tr> <tr> <td>CLIP (3ms):</td> <td>23.5 G</td> <td>32.6 G</td> </tr> <tr> <td>Chest Defl.:</td> <td>-1.4 mm</td> <td>-4.4 mm</td> </tr> <tr> <td>Left Femur:</td> <td>-1978.6 N</td> <td>-574.9 N</td> </tr> <tr> <td>Right Femur:</td> <td>-629.4 N</td> <td>-704.1 N</td> </tr> </tbody> </table> The test vehicle did not comply with the fuel system requirements of FMVSS 301 "Fuel System Integrity."					DRIVER	PASSENGER	HIC:	1063.1	2545.2	CLIP (3ms):	23.5 G	32.6 G	Chest Defl.:	-1.4 mm	-4.4 mm	Left Femur:	-1978.6 N	-574.9 N	Right Femur:	-629.4 N	-704.1 N
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TABLE OF CONTENTS

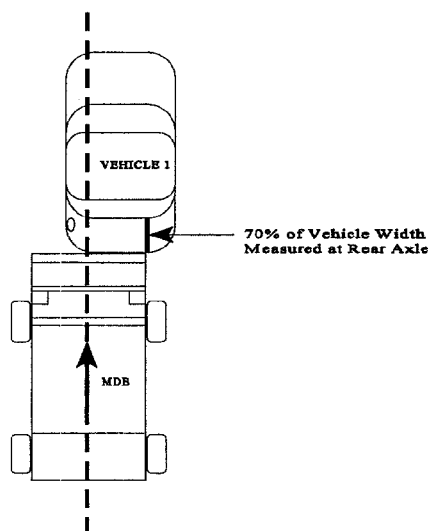
<u>Section</u>	<u>Page No.</u>
1 PURPOSE AND TEST PROCEDURE	1-1
2 SUMMARY OF TEST RESULTS	2-1
3 VEHICLE ONE AND OCCUPANT DATA	3-1
DATA SHEET NO. DESCRIPTION	
1 GENERAL TEST AND VEHICLE PARAMETER DATA	3-2
2 POST IMPACT DATA	3-4
3 FRONT SEAT OCCUPANT MEASUREMENTS	3-5
4 DUMMY INJURY CRITERIA VALUES	3-7
5 VEHICLE ACCELEROMETER MOUNTING LOCATIONS	3-8
6 VEHICLE ACCELEROMETER VALUES	3-10
7 VEHICLE REFERENCE PHOTO TARGET LOCATIONS	3-11
8 TEST VEHICLE MEASUREMENTS	3-12
9 TEST VEHICLE REAR PROFILE MEASUREMENTS	3-14
10 FMVSS NO. 301 "FUEL SYSTEM INTEGRITY" POST IMPACT TEST DATA	3-16
11 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET	3-17
4 MOVING DEFORMABLE BARRIER (MDB) DATA	4-1
DATA SHEET NO. DESCRIPTION	
12 MOVING DEFORMABLE BARRIER (MDB) PARAMETER DATA	4-2
13 MOVING DEFORMABLE BARRIER (MDB) INSTRUMENTATION	4-3
14 EXTERIOR STATIC CRUSH FOR IMPACTOR FACE	4-4
15 CAMERA POSITIONS FOR REAR IMPACTS	4-5
16 HIGH SPEED CAMERA LOCATIONS	4-6
APPENDIX A OVERALL TEST SETUP PHOTOGRAPHS	A-1
APPENDIX B VEHICLE 1 AND OCCUPANTS PHOTOGRAPHS	B-1
APPENDIX C MOVING DEFORMABLE BARRIER (MDB) PHOTOGRAPHS	C-1
APPENDIX D VEHICLE AND DUMMY RESPONSE DATA	D-1
APPENDIX E PART 572E DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA SHEETS	E-1

SECTION 1

PURPOSE AND TEST PROCEDURE

This 81.1 kph rear moving barrier 70 percent overlap impact test was performed to evaluate and compare vehicle and occupant responses in a rear impact designed to duplicate car-to-car-collisions. This test was conducted for the Research and Special Programs Administration by Calspan Corporation under Contract No. DTRS57-95-C-00009 on November 13, 1998. The purpose of this test was to determine how the subject vehicle performs under the fuel system integrity requirements of FMVSS 301 when impacted from the rear, with partial engagement, by a Moving Deformable Barrier traveling at 81 kph..

This test was performed using a stationary 1998 Chevrolet Cavalier 4-Door Sedan (Vehicle 1) and a Moving Deformable Barrier (MDB or Vehicle 2). Vehicle 1 and the MDB were aligned so that MDB would strike Vehicle 1 from the rear with both vehicles facing the same direction and their longitudinal centerlines parallel to the guide rail. Vehicle 1 was positioned with the MDB offset to the fuel filler side such that it would overlap 70% of Vehicle 1's width measured at the rear axle. (Note: Figure below is a general test layout, Cavalier fuel filler was on passenger side of vehicle.



The aluminum honeycomb barrier used on the MDB was the DSL-1285 barrier specified for FMVSS 214D side impact testing. The barrier face mounting plate was lowered 2 inches below that used in FMVSS 214D and was instrumented with 5 load cells. The MDB was configured to track parallel to the guide rail and weighed 1370.5 kg.

Two instrumented Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the OVSC Laboratory Test Procedure. Prior to the impact, both ATDs were restrained using the vehicle's 3-point belt systems and the supplemental restraint system was armed.

SECTION 2

SUMMARY OF TEST RESULTS

A 1468 kilogram 1998 Chevrolet Cavalier 4-Door Sedan (Vehicle 1) was impacted from the rear by a 1370.5 kg Moving Deformable Barrier (MDB or Vehicle 2) at a velocity of 81.1 kph. The MDB was offset to the left as to engage 70% of the Vehicle 1's width measured at the rear axle. This test was performed by Calspan Corporation under Contract No. DTR57-95-C-00009 on November 13, 1998.

The 15.2 liter fuel tank was filled to 92.5 percent capacity with orange Stoddard fluid prior to the impact. After the impact, there was fluid leakage for the first 30 minutes which exceeded the maximum allowed. The rollover phase was not necessary after impact. The vehicle did not appear to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

From film analysis, it was determined that the vehicles struck 0.25 inches off the nominal target point as to create slightly less overlap. Structural damage to the 1998 Chevrolet Cavalier consisted of severe deformation of the right rear quarter of the vehicle. The right rear portion of the fuel tank was punctured and deformed forward of the rear suspension cross member. Fuel filler cap and tube were detached from rear quarter panel but intact.

Two instrumented Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the OVSC Laboratory Test Procedure. Both ATDs were instrumented with head, chest and pelvis three axis (x, y, and z) accelerometers, chest displacement potentiometers, upper neck force and moment load cells, and left/right femur load cells and were certified before this test series. Prior to the impact, both ATDs were restrained using the vehicle's 3-point belt systems and the supplemental restraint system was armed.

The 53 channels of data were recorded on a Kayser-Threde Minidau data acquisition system. The data was reduced, filtered and processed as required by the appropriate test procedures using PC based software. Appendix D contains the vehicle and ATD response data in plotted format. The following table summarizes the ATD injury data for this test.

Injury Criteria	Driver ATD	Passenger ATD
HIC	1063.1	2545.2
Chest Clip (g)	23.5	32.6
Chest Deflection (mm)	-1.4	-4.4
Femur Load (N)	Left: -1978.6 Right: -629.4	Left: -574.9 Right: -704.1

Pre- and post-test photographs of the vehicles and ATDs can be found in appendix A, B and C. The impact event was documented by one real-time and nine high-speed cameras. Vehicle photographic target locations can be found in Data Sheet No. 7 and camera location can be found in Data Sheet No. 16.

SECTION 3

VEHICLE ONE AND OCCUPANT INFORMATION

DATA SHEET NO. 1 GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style:				1998 Chevrolet Cavalier 4-Door Sedan			
NHTSA No.:		RW0122		VIN:		1G1JF5241W7258410	
Body Color:		White		Date of Manufacture:		3/98	
Date Received:		8/11/98		Odometer Reading:		26 km	
Engine Data:		4	Cylinders;	-	CID;	2.2	Liters;
		x	Gas;	-	Diesel;	-	Turbocharged
Placement:		-	Longitudinal;		x	Transverse	
Transmission:		4	Speed;	-	Manual;	x	Automatic;
						x	Overdrive
Final Drive:		x	Front Wheel;	-	Rear Wheel;	-	Four Wheel;
Accessories:		x	A/C;	x	P/S;	x	P/B;
		x	Tilt Wheel	-	P/seats;	x	Cruise Control;
						-	Other
Type of Occupant Restraint:				Driver - Frontal Next Generation Airbag with 3-point belt system			
				Passenger - Frontal Next Generation Airbag with 3-point belt system			

DATA RECORDED FROM THE VEHICLE'S TIRE PLACARD:

Location of Placard on Vehicle:		Driver Door	
* Tire Pressure with Maximum Capacity Vehicle Load:	Front	240 kPa,	Rear 240 kPa
Recommended Tire Size:	P195/65R15		
Recommended Cold Tire Pressure:	Front	210 kPa,	Rear 210 kPa
Tires on Test Vehicle:	P195/65R15		Manufacturer: BF Goodrich

VEHICLE CAPACITY DATA:

Number of Occupants:	2	Front;	3	Rear;	-	3rd Seat;	5	TOTAL
Type of Front Seats:	x	Bucket;	-	Bench;	-	Split Bench		
Type of Front Seat Back:	-	Fixed;	x	Adj. with	x	Lever;	-	Rot. Knob
Vehicle Capacity Weight (VCW)		=	400.0	kg				
No. of Occupants x 68 kg		=	340.2	kg				
Rated Cargo/Luggage Weight (RCLW)		=	59.8	kg				
GVWR: 1765 kg	GAWR: Front:	925	kg	Rear:	750	kg		

*Tire pressure used for test

DATA SHEET NO. 1 GENERAL TEST AND VEHICLE PARAMETER DATA (continued)

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

Right Front	=	<u>404</u>	kg	Right Rear	=	<u>222</u>	kg
Left Front	=	<u>403</u>	kg	Left Rear	=	<u>222</u>	kg
TOTAL FRONT WEIGHT	=	<u>807.0</u>	kg	(	<u>64.5</u>	% of Total Vehicle Weight)	
TOTAL REAR WEIGHT	=	<u>444.0</u>	kg	(	<u>35.5</u>	% of Total Vehicle Weight)	
TOTAL DELIVERED WEIGHT =		<u>1,251.0</u>	kg				

CALCULATION FOR TARGET TEST WEIGHT:

Total Unloaded Delivered Weight (UDW)	=	<u>1251.0</u>	kg
Vehicle Capacity Weight (VCW)	=	<u>400.0</u>	kg
Designated Seating Capacity (DSC)	=	<u>5</u>	
Rated Cargo/Luggage Weight (RCLW)	=	<u>59.8</u>	kg
Weight of two P572E Dummies, (74.4 kg each)	=	<u>148.8</u>	kg
TARGET TEST WEIGHT	=	<u>1459.6</u>	kg

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 68 KG OF CARGO WEIGHT:

Right Front	=	<u>266</u>	kg	Right Rear	=	<u>465</u>	kg
Left Front	=	<u>263</u>	kg	Left Rear	=	<u>474</u>	kg
TOTAL FRONT WEIGHT	=	<u>529.0</u>	kg	(	<u>36.0</u>	% of Total Vehicle Weight)	
TOTAL REAR WEIGHT	=	<u>939.0</u>	kg	(	<u>64.0</u>	% of Total Vehicle Weight)	
TOTAL TEST WEIGHT =		<u>1,468.0</u>	kg ** COTR requested this weight				

* Weight of Ballast Secured in Vehicle = 0 kg

VEHICLE ATTITUDE (all dimension in millimeters):

Delivered Attitude:	RF	<u>692</u>	LF	<u>692</u>	RR	<u>724</u>	LR	<u>724</u>
Test Attitude:	RF	<u>675</u>	LF	<u>676</u>	RR	<u>705</u>	LR	<u>707</u>
Wheel Base:	<u>2644</u>	mm;	C.G.	<u>1691</u>	mm rearward of front wheel C/L			
Remarks:	<u>None</u>							

* 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 and hardware.

DATA SHEET NO. 2 POST IMPACT DATA

POST IMPACT DATA:

Type of Test: 81.0 kph 70 % Overlap Rear Barrier Impact Angle: 0°
 Date of Test: November 13, 1998 Time of Test: 13:30
 Ambient Temperature: 20.5 °C at impact Area
 Required Impact Velocity Range: 79.5 to 82.5 kph
 Impact Velocity: primary = 81.1 kph, secondary = 81.1 kph
 Average Impact Speed = 81.1 kph

VISIBLE DUMMY CONTACT POINTS:

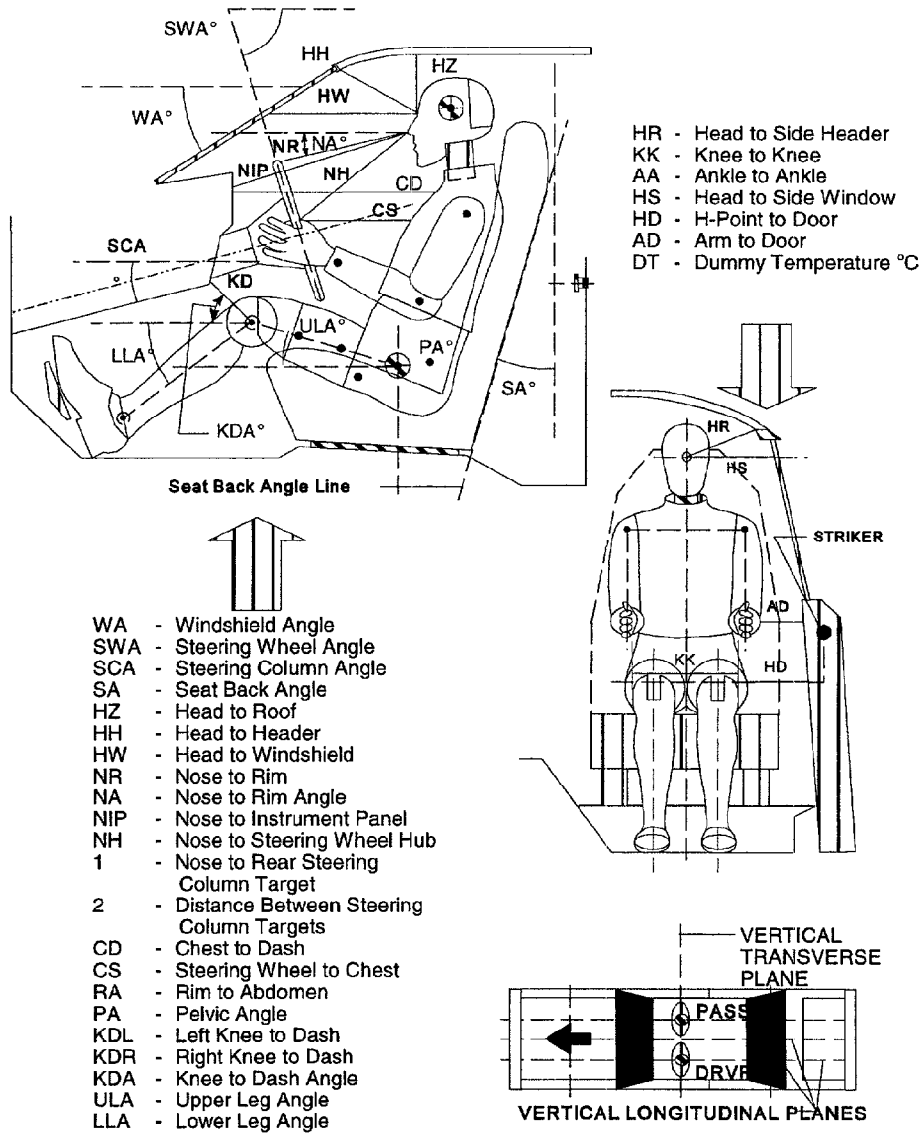
	<u>Driver</u>	<u>Passenger</u>
Head	<u>Back of head to headrest and rear seat backrest</u>	<u>Back of head to headrest and rear seat backrest</u>
Chest	<u>Back to driver seat backrest</u>	<u>Back to passenger seat backrest</u>
Abdomen	<u>-</u>	<u>-</u>
Left Knee	<u>Steering Wheel</u>	<u>-</u>
Right Knee	<u>Steering Wheel</u>	<u>-</u>
	<u>Front</u>	<u>Rear</u>
	<u>Left</u> <u>Right</u>	<u>Left</u> <u>Right</u>
Door Opening	<u>closed/operable</u> <u>closed/inoperable</u>	<u>closed/operable</u> <u>open/unlatched</u>
	<u>Front</u>	<u>Rear</u>
	<u>Left</u> <u>Right</u>	<u>Left</u> <u>Right</u>
Seat Movement	<u>Fully reclined</u> <u>Fully reclined</u>	<u>-</u> <u>-</u>
Seat Back Failure	<u>12 mm rearward</u> <u>12 mm rearward</u>	<u>-</u> <u>-</u>
Seat Shift (mm)	<u>12 mm rearward</u> <u>12 mm rearward</u>	<u>-</u> <u>-</u>

GLAZING DAMAGE:

Backlight/Windshield: None
 Other Notable Impact Effects: Rear windshield shattered during impact

DATA SHEET NO. 3 FRONT SEAT OCCUPANT MEASUREMENTS

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



DATA SHEET NO. 3 FRONT SEAT OCCUPANT MEASUREMENTS

(All dimensions, excluding angles, are in millimeters)

	DRIVER (Serial # 061)			PASS. (Serial # 150)		
WA ^o	27 deg.			-		
SWA ^o	60 deg.			-		
SCA ^o	30 deg.			-		
SA ^o	19 deg.			19 deg.		
HZ	153			162		
HH	259			265		
HW	575			596		
HR	197			185		
NR	420	Angle (NA)	-7.7 deg.	-		
NIP	517			564		
NH	399			-		
1	548			-		
2	54			-		
CD	504			480		
CS	338			-		
RA	193			-		
KDL	154	Angle (KDA)	43 deg.	98		
KDR	142			137	Angle (KDA)	35 deg.
PA ^o	22.9 deg.			24.6 deg.		
ULA ^o	16 deg.			20.2 deg.		
LLA ^o	-41 deg.			-42.4 deg.		
KK	280			252		
AA	259			212		
HS	283			298		
HD	141			144		
AD	131			130		
DT	20.5 °C			20.5 °C		

DISTANCE OF H-POINT FROM TARGET POSITION (mm)		
	DRIVER (Serial # 061)	PASS. (Serial # 150)
Longitudinal	8 behind	0
Vertical	6 above	4 above

DATA SHEET NO. 4 DUMMY INJURY CRITERIA VALUES

NHTSA Test No.: RW0122 Vehicle: 1998 Chevrolet Cavalier 4-Door Sedan

HEAD INJURY CRITERIA (HIC)				
	HIC*	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	1063.1	112.1	126.5	-
Position #2 - Passenger	2545.2	111.3	118.6	-

* HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds.

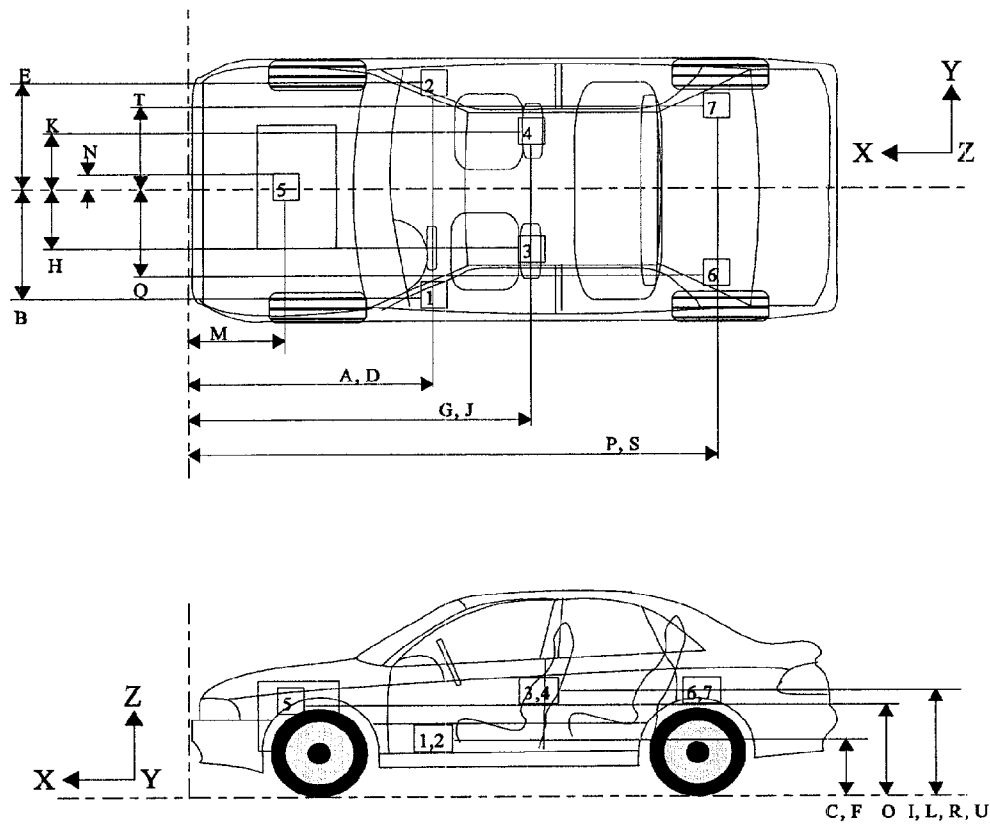
CLIP SUMMARY**				
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #1 - Driver	23.5	125.3	128.3	-
Position #2 - Passenger	32.6	98.6	101.6	-

** The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

MAXIMUM CHEST COMPRESSION (mm)	
Position #1 - Driver	-1.4
Position #2 - Passenger	-4.4

MAXIMUM FEMUR COMPRESSIVE LOAD (N)		
	Right Femur	Left Femur
Position #1 - Driver	-629.4	-1978.6
Position #2 - Passenger	-704.1	-574.9

DATA SHEET NO. 5 VEHICLE ACCELEROMETER MOUNTING LOCATIONS



DATA SHEET NO. 5 VEHICLE ACCELEROMETER MOUNTING LOCATIONS (continued)

NHTSA Test No.: RW0122

Vehicle: 1998 Chevrolet Cavalier 4-Door Sedan

No.	Dimension	Axis	Pre-Test	Post-Test	Change
1	A Left Front Rocker Panel	X	-1980	-1959	20
	B Left Front Rocker Panel	Y	-566	-609	-43
	C Left Front Rocker Panel	Z	272	265	-7
2	D Right Front Rocker Panel	X	-1978	-2022	-44
	E Right Front Rocker Panel	Y	545	559	14
	F Right Front Rocker Panel	Z	275	232	-43
3	G Left Front Seatback	X	-2507	-2692	-185
	H Left Front Seatback	Y	-339	-370	-31
	I Left Front Seatback	Z	674	493	-181
4	J Right Front Seatback	X	-2572	-2638	-66
	K Right Front Seatback	Y	316	335	19
	L Right Front Seatback	Z	675	598	-76
5	M Top of Engine	X	-762	-769	-7
	N Top of Engine	Y	91	84	-7
	O Top of Engine	Z	770	722	-48
6	P Left Rear Wheel Axle	X	-3618	-3396	222
	Q Left Rear Wheel Axle	Y	-393	-253	141
	R Left Rear Wheel Axle	Z	479	661	182
7	S Right Rear Wheel Axle	X	-3621	-3189	431
	T Right Rear Wheel Axle	Y	394	348	-46
	U Right Rear Wheel Axle	Z	478	728	250

NOTE: All dimensions are in millimeters with a tolerance of ± 3 mm

X axis measurements referenced to a plane at the front bumper, positive forward.

Y axis referenced to the vehicle centerline, positive to the right.

Z axis referenced to the ground, positive up.

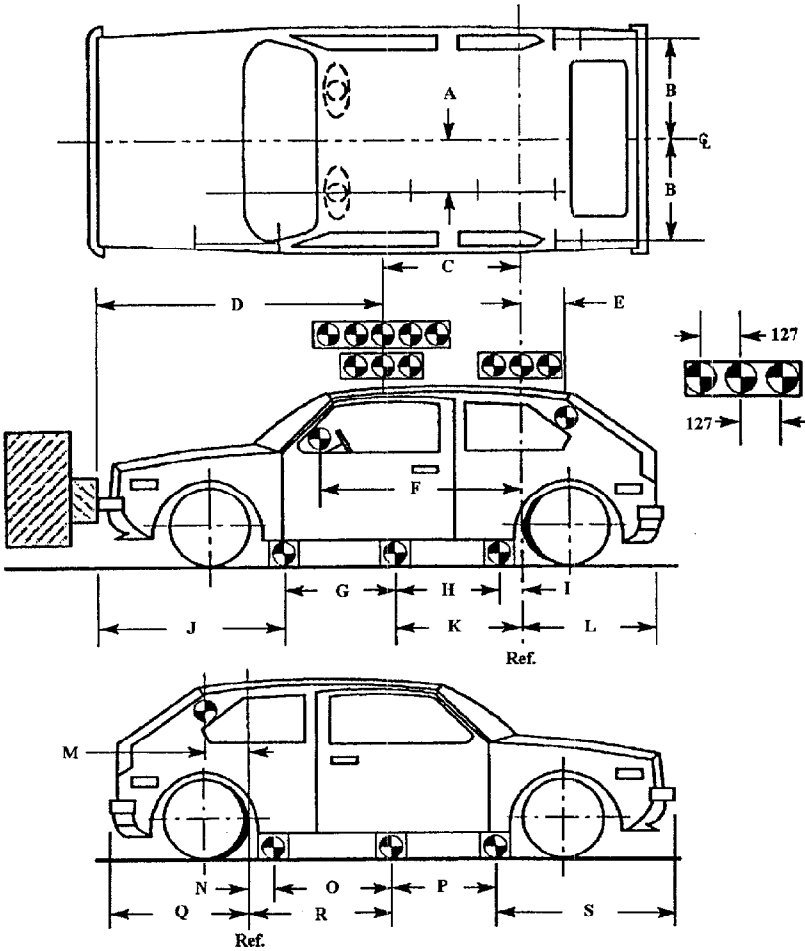
DATA SHEET NO. 6 VEHICLE ACCELEROMETER VALUES

Location Number	Accelerometer Description	Maximum Value (g's)			
		Pos.	msec	Neg.	Msec
1	Left Front Rocker Panel	19.2	51.2	-1.8	13.4
2	Right Front Rocker Panel	18.3	3.1	-2.2	10.3
3	Left Front Seat Back	62.4	68.9	-16.8	73.8
4	Right Front Seat Back	18.9	79.0	-3.4	246.7
5	Top of Engine	19.0	31.1	-2.3	203.9
6	Left Rear Wheel Axle	59.0	31.4	-27.7	12.7
7	Right Rear Wheel Axle	102.7	40.3	-49.0	9.4

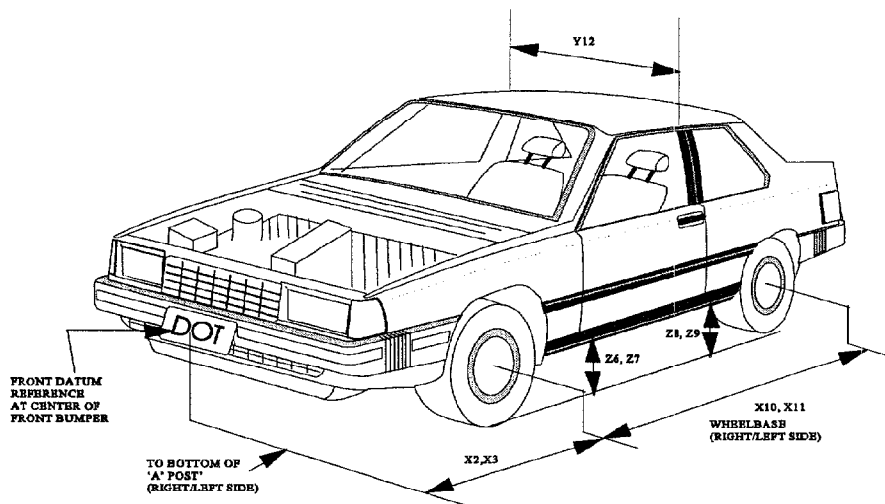
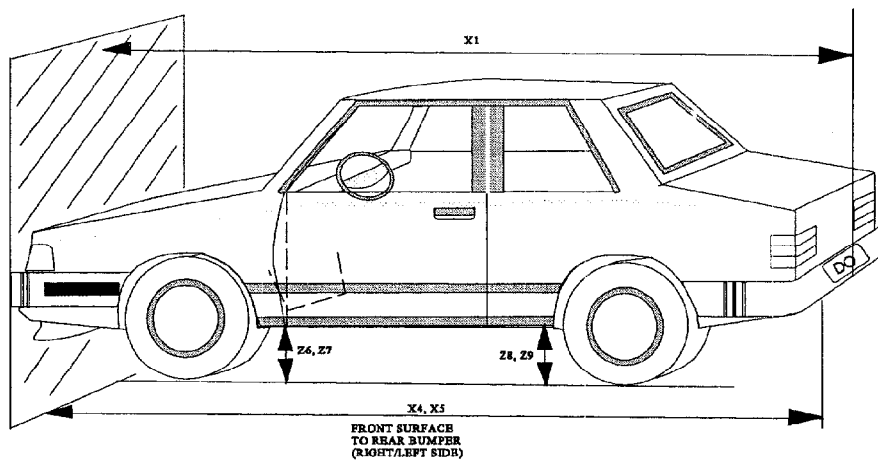
DATA SHEET NO. 7 VEHICLE REFERENCE PHOTO TARGET LOCATIONS

(Dimensions in millimeters)

A	333
B	670
C	807
D	2500
E	320
F	1509
G	850
H	850
I	158
J	1449
K	1008
L	1273
M	320
N	158
O	850
P	850
Q	1273
R	1008
S	1449



DATA SHEET NO. 8 TEST VEHICLE MEASUREMENTS

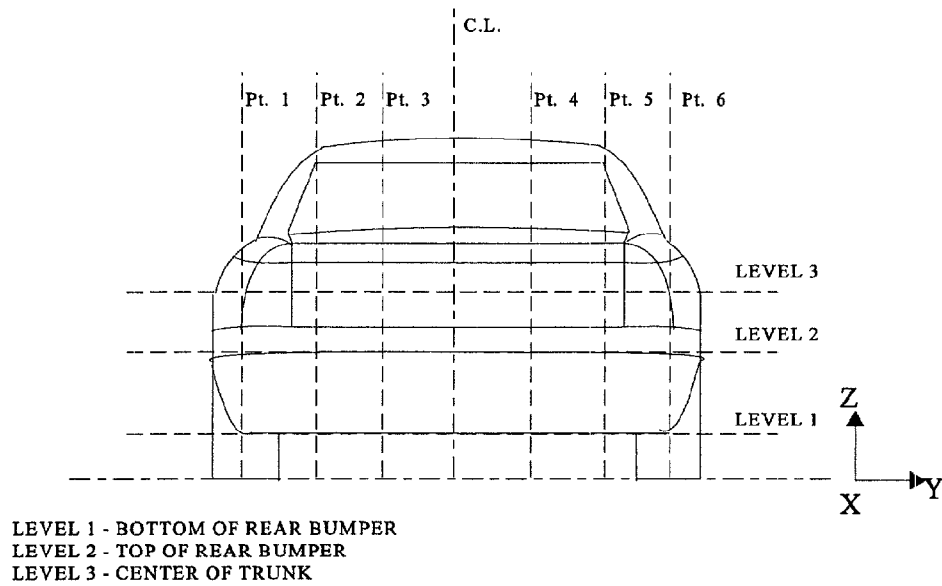


DATA SHEET NO. 8 TEST VEHICLE MEASUREMENTS (continued)

No.	Description of Measurement	Pre-Test	Post-Test	Change
X1	Total Length of Vehicle at Centerline	4580	3758	-822
X2	Front Surface of Vehicle to Bottom of "A" Post of Right Side	1501	1517	16
X3	Front Surface of Vehicle to Bottom of "A" Post of Left Side	1502	1490	-12
X4	Front Surface of Vehicle to Right Side of Rear Bumper	4528	3575	-953
X5	Front Surface of Vehicle to Left Side of Rear Bumper	4528	3950	-578
Z6	Right Front Sill to Ground Plane	189	156	-33
Z7	Left Front Sill to Ground Plane	193	173	-20
Z8	Right Rear Sill to Ground Plane	211	254	43
Z9	Left Rear Sill to Ground Plane	209	258	48
X10	Vehicle Wheelbase at Right Side	2643	2166	-477
X11	Vehicle Wheelbase at Left Side	2637	2636	-1
Y12	Width of Vehicle at Maximum Width Point	1714	1864	150

NOTE: All dimensions are in millimeters with a tolerance of ± 3 mm

DATA SHEET NO. 9 TEST VEHICLE REAR PROFILE MEASUREMENTS



X-axis measurements are referenced to a plane 500 mm rearward of the rear bumper.

DATA SHEET NO. 9 TEST VEHICLE REAR PROFILE MEASUREMENTS (continued)

NHTSA Test No.: RW0122

Vehicle: 1998 Chevrolet Cavalier 4-Door Sedan

NOTE: All dimensions are in millimeters with a tolerance of ± 3 mm

Level	Axis	PRE-TEST PROFILE						POST-TEST PROFILE						CHANGE					
		Vehicle Left			Vehicle Right			Vehicle Left			Vehicle Right			Vehicle Left			Vehicle Right		
		pt. 1	pt. 2	pt. 3	pt. 4	pt. 5	pt. 6	pt. 1	pt. 2	pt. 3	pt. 4	pt. 5	pt. 6	pt. 1	pt. 2	pt. 3	pt. 4	pt. 5	pt. 6
Bottom of Rear Bumper	X	610	541	519	525	541	610	1027	1195	1318	1407	1501	1661	417	654	799	883	960	1052
	Y	-611	-369	-123	122	364	609	-308	-126	-17	207	426	621	303	243	106	84	63	12
	Z	369	367	364	365	365	366	463	497	513	520	536	576	94	130	149	155	171	211
Top of Rear Bumper	X	602	535	508	508	534	599	1023	1205	1272	1347	1433	1563	421	671	764	839	898	964
	Y	-609	-365	-123	123	367	611	-363	-183	-15	223	453	669	245	182	107	100	86	58
	Z	553	550	550	550	548	550	624	670	678	699	709	723	71	119	128	149	161	173
Center of Trunk	X	697	638	615	616	637	701	942	1066	1178	1247	1315	1423	245	428	563	631	678	722
	Y	-611	-367	-121	125	369	610	-418	-182	-18	212	448	616	193	186	103	87	78	6
	Z	795	793	792	791	790	792	723	836	898	842	823	775	-71	42	106	51	33	-17

X axis measurements referenced to a plane 500 mm rear of the rear bumper, positive forward.

Y axis referenced to the vehicle centerline, positive to the right.

Z axis referenced to the ground, positive up.

DATA SHEET NO. 10 FMVSS NO. 301 "FUEL SYSTEM INTEGRITY" POST IMPACT TEST DATA

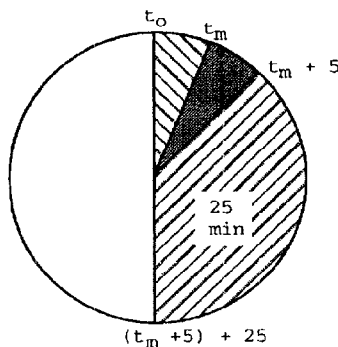
NHTSA TEST No.: RW0122 TEST DATE: November 13, 1998
VEHICLE MAKE/MODEL: 1998 Chevrolet Cavalier

The test vehicle was filled from 92% to 94% of the manufacture's "usable" capacity. The electric fuel pump was operating if it will operate without engine operation. Two Part 572E anthropomorphic test devices were located at each of the front designated seating positions.

=====

TEST VEHICLE IMPACT TYPE: - Frontal (56 kph)
- Oblique (48 kph) with deg. barrier face first contacting
- (driver/passenger) side
X Rear Moving Barrier (80.5 kph)
- Lateral Moving Barrier (32.2 kph)

FUEL SPILLAGE MEASUREMENT:



1. From impact until vehicle motion ceases
2. For 5 minute period after vehicle motion ceases
3. For next 25 minutes

ACTUAL	MAX ALLOWED
0 g	28 g
12247 g	141 g
5863 g	28 g/min.

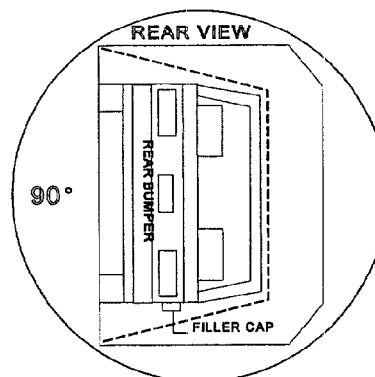
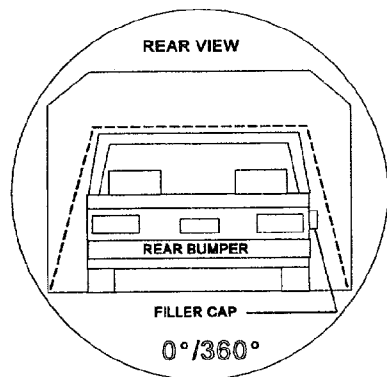
SOLVENT SPILLAGE DETAILS:

Fluid leakage started before vehicle came to a full stop. Stoddard solvent leaked from a puncture located on the rear right portion on the fuel tank. Rollover not required when fluid leakage occurring during impact event exceeds maximum allowed fuel spillage.

DATA SHEET NO. 11 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE :
0-90 Deg.

Vehicle NHTSA ID No. :
RW0122



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 0 minutes 0 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 00 seconds

TOTAL 5 minutes 0 seconds

Next whole minute interval 6 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

141 g	28 g	28 g	28 g
-------	------	------	------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

n/a	n/a	n/a	n/a
-----	-----	-----	-----

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

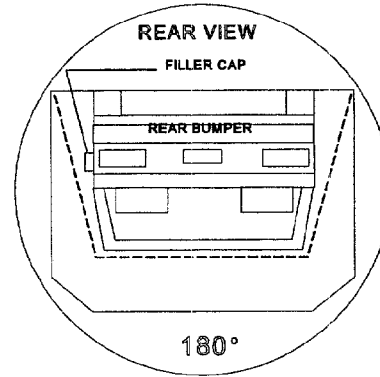
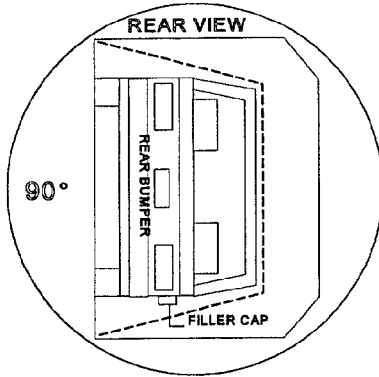
IV. SOLVENT SPILLAGE LOCATION(S):

Fluid leakage from a puncture located on the rear right portion on the fuel tank. Rollover not required when fluid leakage occurring during impact event exceeds maximum allowed fuel spillage.

DATA SHEET NO. 11 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (continued)

TEST PHASE :
90-180 Deg.

Vehicle NHTSA ID No. :
RW0122



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	<u>0</u>	minutes	<u>0</u>	seconds
FMVSS 301 Position Hold Time +	<u>5</u>	minutes	<u>00</u>	seconds
TOTAL	<u>5</u>	minutes	<u>0</u>	seconds
Next whole minute interval	<u>6</u>	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

141 g	28 g	28 g	28 g
-------	------	------	------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

n/a	n/a	n/a	n/a
-----	-----	-----	-----

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

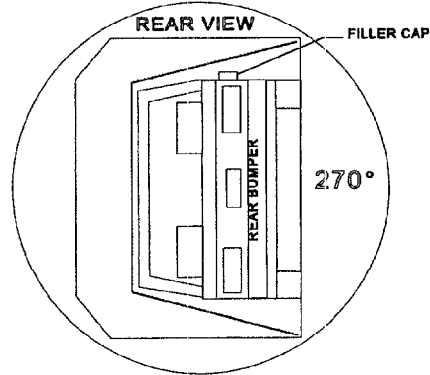
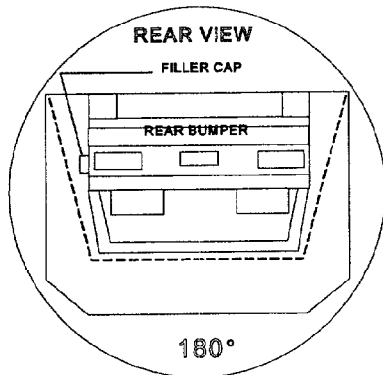
IV. SOLVENT SPILLAGE LOCATION(S):

Fluid leakage from a puncture located on the rear right portion on the fuel tank. Rollover not required when fluid leakage occurring during impact event exceeds maximum allowed fuel spillage.

DATA SHEET NO. 11 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (continued)

TEST PHASE :
180-270 Deg.

Vehicle NHTSA ID No. :
RW0122



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	<u>0</u>	minutes	<u>0</u>	seconds
FMVSS 301 Position Hold Time +	<u>5</u>	minutes	<u>00</u>	seconds
TOTAL	<u>5</u>	minutes	<u>0</u>	seconds
Next whole minute interval	<u>6</u>	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

141 g	28 g	28 g	28 g
-------	------	------	------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

n/a	n/a	n/a	n/a
-----	-----	-----	-----

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

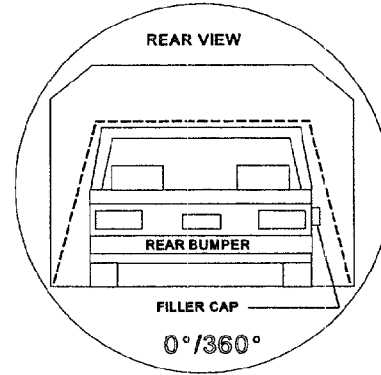
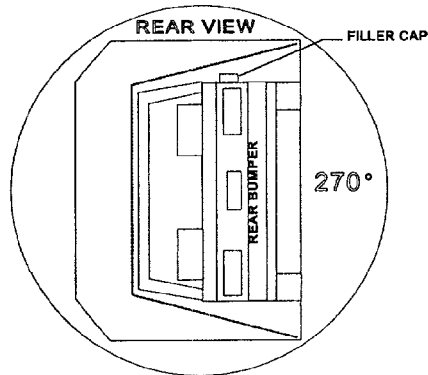
IV. SOLVENT SPILLAGE LOCATION(S):

Fluid leakage from a puncture located on the rear right portion on the fuel tank. Rollover not required when fluid leakage occurring during impact event exceeds maximum allowed fuel spillage.

DATA SHEET NO. 11 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (continued)

TEST PHASE :
270-360 Deg.

Vehicle NHTSA ID No. :
RW0122



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time	<u>0</u>	minutes	<u>0</u>	seconds
(Spec. Range = 1 to 3 minutes)				
FMVSS 301 Position Hold Time +	<u>5</u>	minutes	<u>00</u>	seconds
	<u>5</u>	minutes	<u>0</u>	seconds
TOTAL	<u>6</u>	minutes		
Next whole minute interval				

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

141 g	28 g	28 g	28 g
-------	------	------	------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

n/a	n/a	n/a	n/a
-----	-----	-----	-----

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

IV. SOLVENT SPILLAGE LOCATION(S):

Fluid leakage from a puncture located on the rear right portion on the fuel tank. Rollover not required when fluid leakage occurring during impact event exceeds maximum allowed fuel spillage.

DATA SHEET NO. 12 MOVING DEFORMABLE BARRIER (MDB) PARAMETER DATA

ORIENTATION OF MDB LONGITUDINAL CENTERLINE TO GUIDE RAIL:

0° from guide rail (uncrabbed)

MDB DETAILS:

Overall Width of Framework Carriage	=	<u>1251</u>
Overall Length of MDB (incl. honeycomb impact face)	=	<u>4102</u>
Wheelbase of Framework Carriage	=	<u>2598</u>
Tread of Framework Carriage (Front & Rear)	=	<u>1880</u>
C.G. Location Rearward of Front Axle	=	<u>964</u>

WEIGHT OF MDB:

Right Front	=	<u>405.5</u> kg	Right Rear	=	<u>278.0</u> kg
Left Front	=	<u>456.5</u> kg	Left Rear	=	<u>230.5</u> kg
TOTAL FRONT WEIGHT	=	<u>862.0</u> kg	(	<u>62.9</u>	% of Total Vehicle Weight)
TOTAL REAR WEIGHT	=	<u>508.5</u> kg	(	<u>37.1</u>	% of Total Vehicle Weight)
TOTAL WEIGHT =		<u>1,370.5</u> kg			

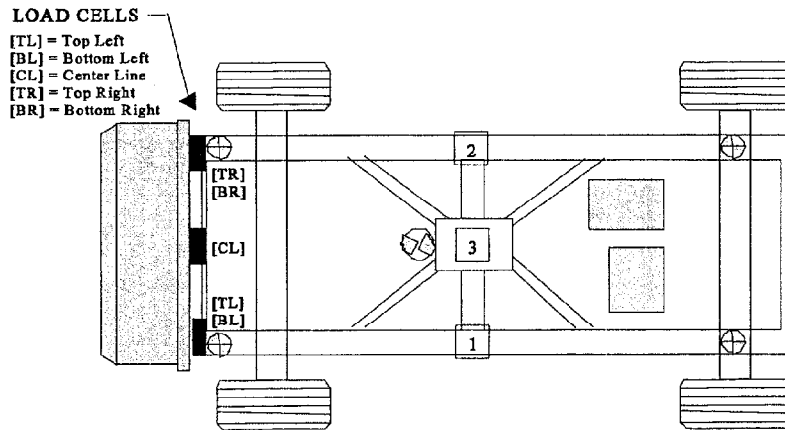
MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE:

Level 4: Top Stack Level	=	<u>125</u> millimeters
Level 3: Middle Stack Level	=	<u>187</u> millimeters
Level 2: Top of Bumper Plate	=	<u>167</u> millimeters
Level 1: Bottom of Bumper Plate	=	<u>155</u> millimeters

MDB INSTRUMENTATION:

Number of MDB Data Channels	=	<u>10</u>
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DATA SHEET NO. 13 MOVING DEFORMABLE BARRIER (MDB) INSTRUMENTATION



LOCATION	TYPE	X	Y	Z
1	Accelerometer	✓		
2	Accelerometer	✓		
3	Accelerometer	✓	✓	✓
4	Load Cells	✓		

DESCRIPTION	Maximum Value			
	Pos.	msec	Neg.	msec.
Accelerometer 1 X (g's)	1.7	-40.0	-18.2	39.1
Accelerometer 2 X (g's)	2.0	-40.0	-19.1	36.2
Accelerometer 3 X (g's)	1.3	-13.0	-19.7	35.8
Accelerometer 3 Y (g's)	6.1	10.7	-5.0	17.2
Accelerometer 3 Z (g's)	34.4	126.2	-31.7	23.2
Load Cell [Top Left] X (N)	58729.4	19.1	-4860.1	324.6
Load Cell [Bottom Left] X (N)	28237.0	42.7	-24530.0	3.1
Load Cell [Center Line] X (N)	79318.8	36.7	-423.0	-7.6
Load Cell [Top Right] X (N)	54760.6	5.0	-4808.7	212.8
Load Cell [Bottom Right] X (N)	24479.0	4.6	-17733.8	23.8

DATA SHEET NO. 14 EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

NHTSA Test No.: RW0122

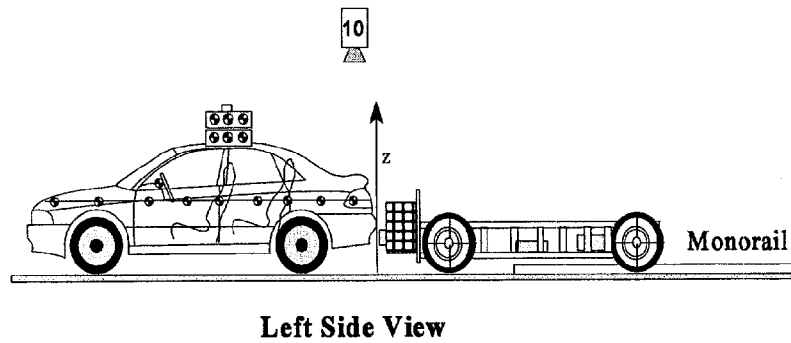
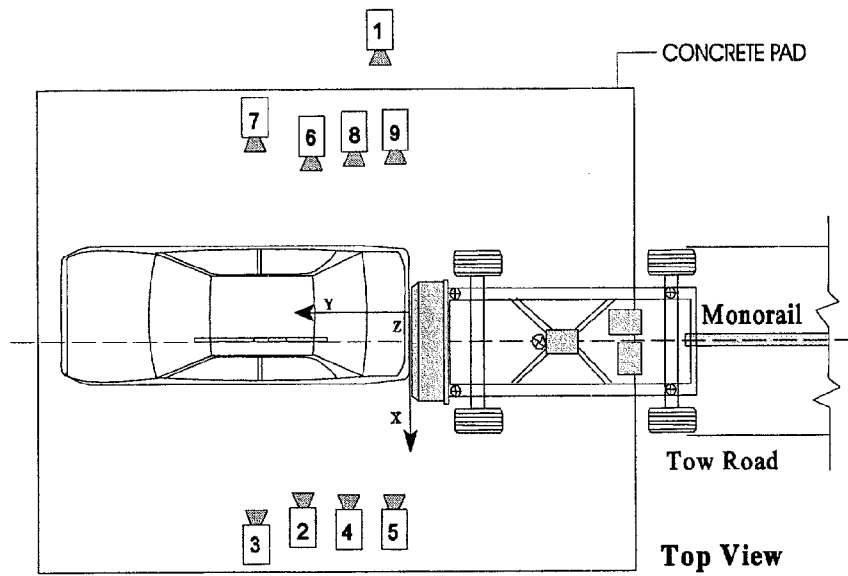
Vehicle: 1998 Chevrolet Cavalier 4-Door Sedan

NOTE: All dimensions are in millimeters with a tolerance of ± 3 mm

			DISTANCE RIGHT OF CENTER (mm)								DISTANCE LEFT OF CENTER (mm)								
LEVEL	HEIGHT AT CL (mm)*		800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
LEVEL 4		PRE	619	619	619	619	619	619	619	619	619	619	619	619	619	619	619	619	619
TOP	736	POST	612	610	615	621	622	641	641	643	638	628	628	632	632	636	658	698	743
STACK		CRUSH	-7	-8	-4	3	4	23	25	25	19	9	9	14	13	17	40	79	125
LEVEL 3		PRE	619	619	619	619	619	619	619	619	619	619	619	619	619	619	619	619	619
MID	635	POST	608	612	608	613	614	619	619	634	643	639	653	667	659	684	714	759	805
LEVEL		CRUSH	-10	-6	-10	-5	-4	0	15	15	25	20	35	49	40	66	95	140	187
LEVEL 2		PRE	535	519	518	518	518	518	518	518	518	518	518	518	518	518	518	519	535
TOP OF	450	POST	510	504	518	529	537	555	568	565	573	573	585	596	607	628	625	652	702
BUMPER		CRUSH	-25	-15	0	11	18	37	47	47	55	55	67	78	89	110	106	133	167
LEVEL 1		PRE	535	519	518	518	518	518	518	518	518	518	518	518	518	518	518	519	535
BOT. OF	302	POST	503	496	508	517	528	557	556	546	534	538	541	550	550	564	578	592	690
BUMPER		CRUSH	-32	-23	-10	-2	10	39	27	27	16	20	23	32	32	46	60	73	155

*Heights measured above ground level.

DATA SHEET NO. 15 CAMERA POSITIONS FOR REAR IMPACTS



DATA SHEET NO. 16 HIGH-SPEED CAMERA LOCATIONS

NHTSA Test No.:		RW0122		Vehicle:		1998 Chevrolet Cavalier 4-Door Sedan				
CAMERA NO.	VIEW	CAMERA POSITIONS (mm)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)	Camera No.	Lens No.
1	Real-Time Camera	-	-	-	-	-	-	24	-	-
2	Overall Left Side	7175	1950	1086	-1	6816	12.5	1000	1692	117186
3	Left Side Vehicle #1	7751	2367	1110	-2	7392	25	1010	1650	c15033
4	Close-up Left Side	9085	483	1069	-1	8726	35	1005	762	c15034
5	Left Side MDB	8529	554	628	-1	-	25	1000	1663	c28302
6	Overall Right Side	-7688	1420	1089	-5	-7329	12.5	1005	1326	117184
7	Right Side Vehicle #1	-9080	1823	1088	-2	-8721	25	1010	1627	c7477
8	Close-up Right Side	-9672	387	1040	-2	-9313	35	1005	1330	112
9	Right Side MDB	-8809	322	557	0	-	25	1000	758	c7914
10	Overhead	616	706	4880	90	-	13	1010	1328	c9836

*X = film plane to Vehicle 1 centerline, positive left of Vehicle 1 centerline ** = referenced to horizontal plane
 Y = film plane to impact location, positive forward of impact location N.T. indicates No Timing
 Z = film plane to ground

LIST OF PHOTOGRAPHS

<u>Figure</u>	<u>Photograph Title</u>	<u>Page No.</u>
A-1	PRE-TEST TOP VIEW	A-3
A-2	PRE-TEST LEFT SIDE VIEW	A-4
A-3	PRE-TEST RIGHT SIDE VIEW	A-5
A-4	IMPACT VIEW	A-6

Figure A-1 PRE-TEST TOP VIEW



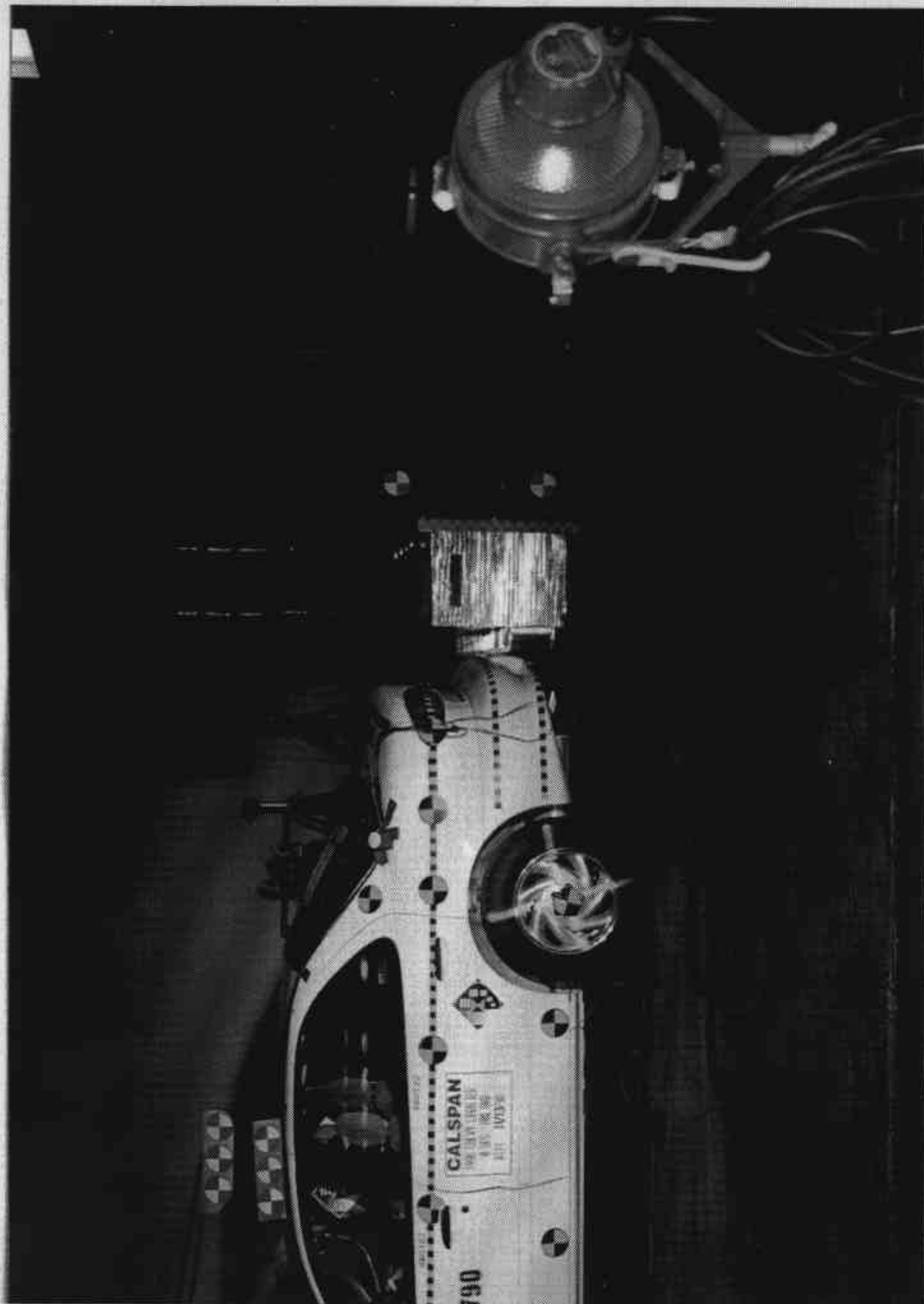


Figure A-2 PRE-TEST LEFT SIDE VIEW

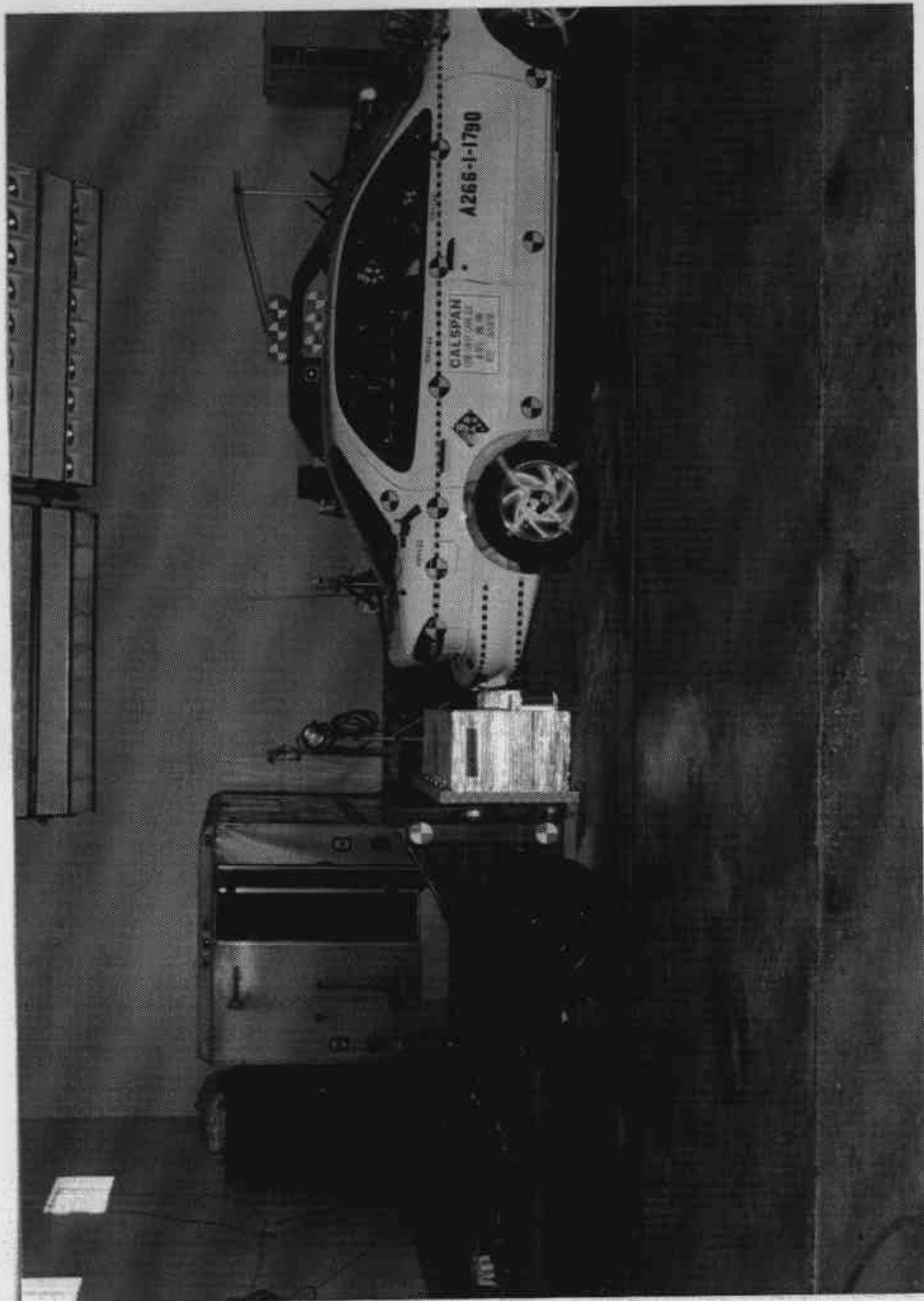


Figure A-3 PRE-TEST RIGHT SIDE VIEW

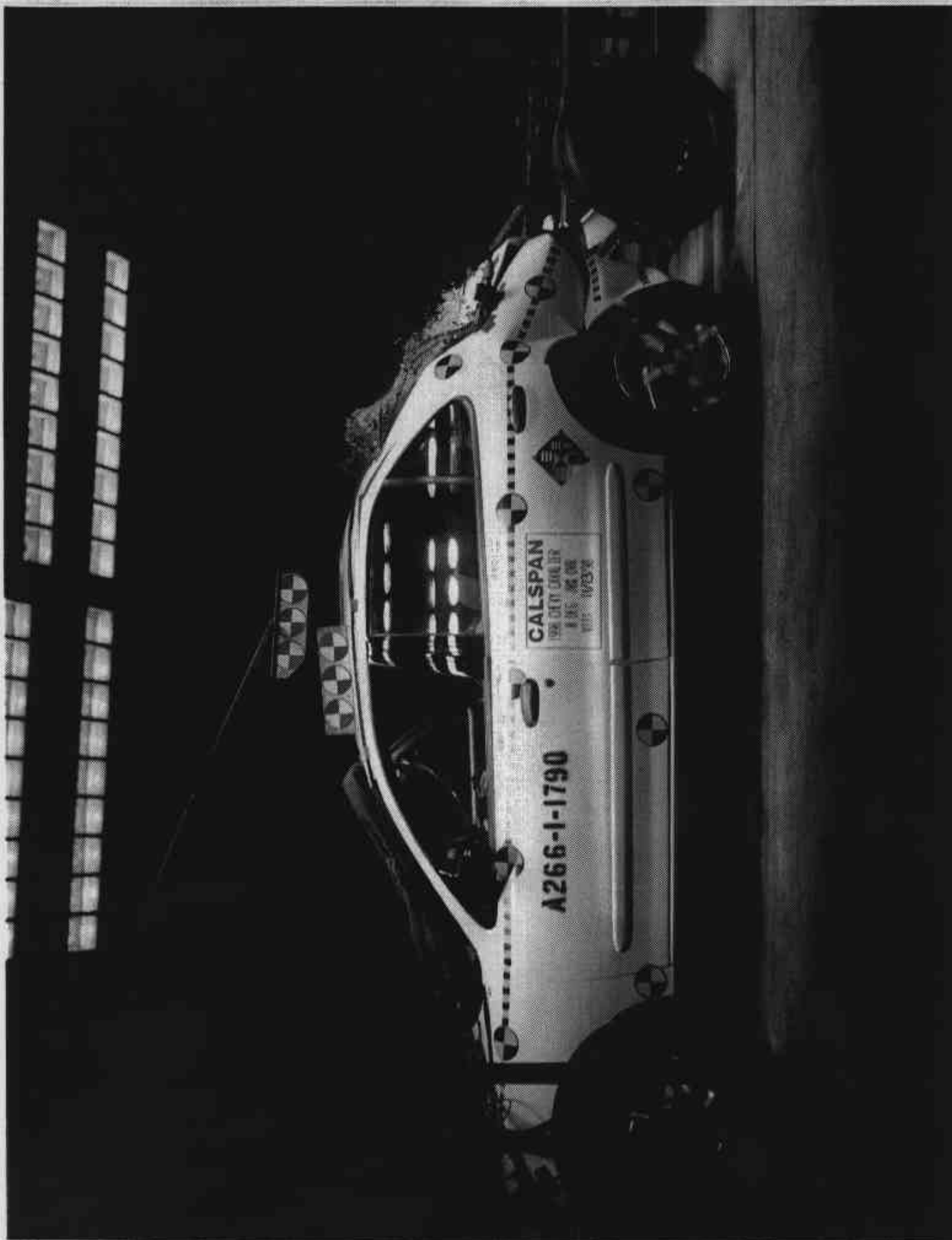


Figure A-4 IMPACT VIEW

APPENDIX B

VEHICLE 1 AND OCCUPANTS PHOTOGRAPHS

LIST OF PHOTOGRAPHS

<u>Figure</u>	<u>Photograph Title</u>	<u>Page No.</u>
B-1	PRE-TEST FRONT VIEW	B-3
B-2	POST-TEST FRONT VIEW	B-4
B-3	PRE-TEST LEFT SIDE VIEW	B-5
B-4	POST-TEST LEFT SIDE VIEW	B-6
B-5	PRE-TEST RIGHT SIDE VIEW	B-7
B-6	POST-TEST RIGHT SIDE VIEW	B-8
B-7	PRE-TEST REAR VIEW	B-9
B-8	POST-TEST REAR VIEW	B-10
B-9	PRE-TEST TOP VIEW	B-11
B-10	POST-TEST TOP VIEW	B-12
B-11	PRE-TEST REAR UNDERBODY VIEW	B-13
B-12	POST-TEST REAR UNDERBODY VIEW	B-14
B-13	PRE-TEST REAR SIDE UNDERBODY VIEW	B-15
B-14	POST-TEST REAR SIDE UNDERBODY VIEW	B-16
B-15	PRE-TEST FRONT UNDERBODY VIEW	B-17
B-16	POST-TEST FRONT UNDERBODY VIEW	B-18
B-17	PRE-TEST LEFT FRONT THREE-QUARTER VIEW	B-19
B-18	POST-TEST LEFT FRONT THREE-QUARTER VIEW	B-20
B-19	PRE-TEST RIGHT FRONT THREE-QUARTER VIEW	B-21
B-20	POST-TEST RIGHT FRONT THREE-QUARTER VIEW	B-22
B-21	PRE-TEST LEFT REAR THREE-QUARTER VIEW	B-23
B-22	POST-TEST LEFT REAR THREE-QUARTER VIEW	B-24
B-23	PRE-TEST RIGHT REAR THREE-QUARTER VIEW	B-25
B-24	POST-TEST RIGHT REAR THREE-QUARTER VIEW	B-26
B-25	PRE-TEST WINDSHIELD VIEW	B-27
B-26	POST-TEST WINDSHIELD VIEW	B-28
B-27	PRE-TEST FUEL FILLER CAP VIEW	B-29
B-28	POST-TEST FUEL FILLER CAP VIEW	B-30
B-29	PRE-TEST DRIVER POSITION VIEW	B-31
B-30	POST-TEST DRIVER POSITION VIEW	B-32
B-31	PRE-TEST PASSENGER POSITION VIEW	B-33
B-32	POST-TEST PASSENGER POSITION VIEW	B-34
B-33	PRE-TEST DRIVER AND INTERIOR VIEW	B-35
B-34	POST-TEST DRIVER AND INTERIOR VIEW	B-36
B-35	PRE-TEST PASSENGER AND INTERIOR VIEW	B-37
B-36	POST-TEST PASSENGER AND INTERIOR VIEW	B-38
B-37	ROLLOVER 90°	B-39
B-38	ROLLOVER 180°	B-40
B-39	ROLLOVER 270°	B-41
B-40	ROLLOVER 360°	B-42



Figure B-1 PRE-TEST FRONT VIEW

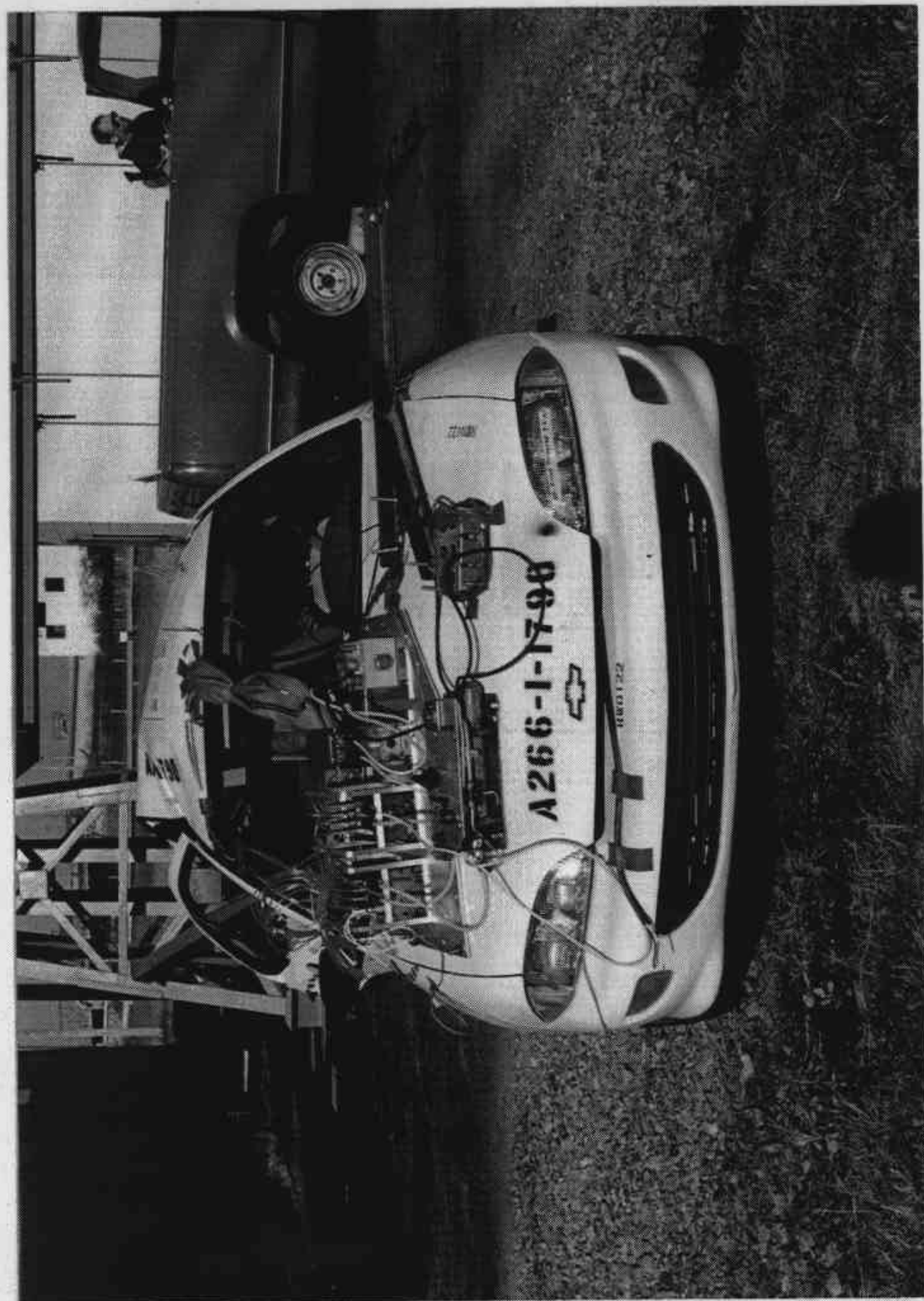


Figure B-2 POST-TEST FRONT VIEW

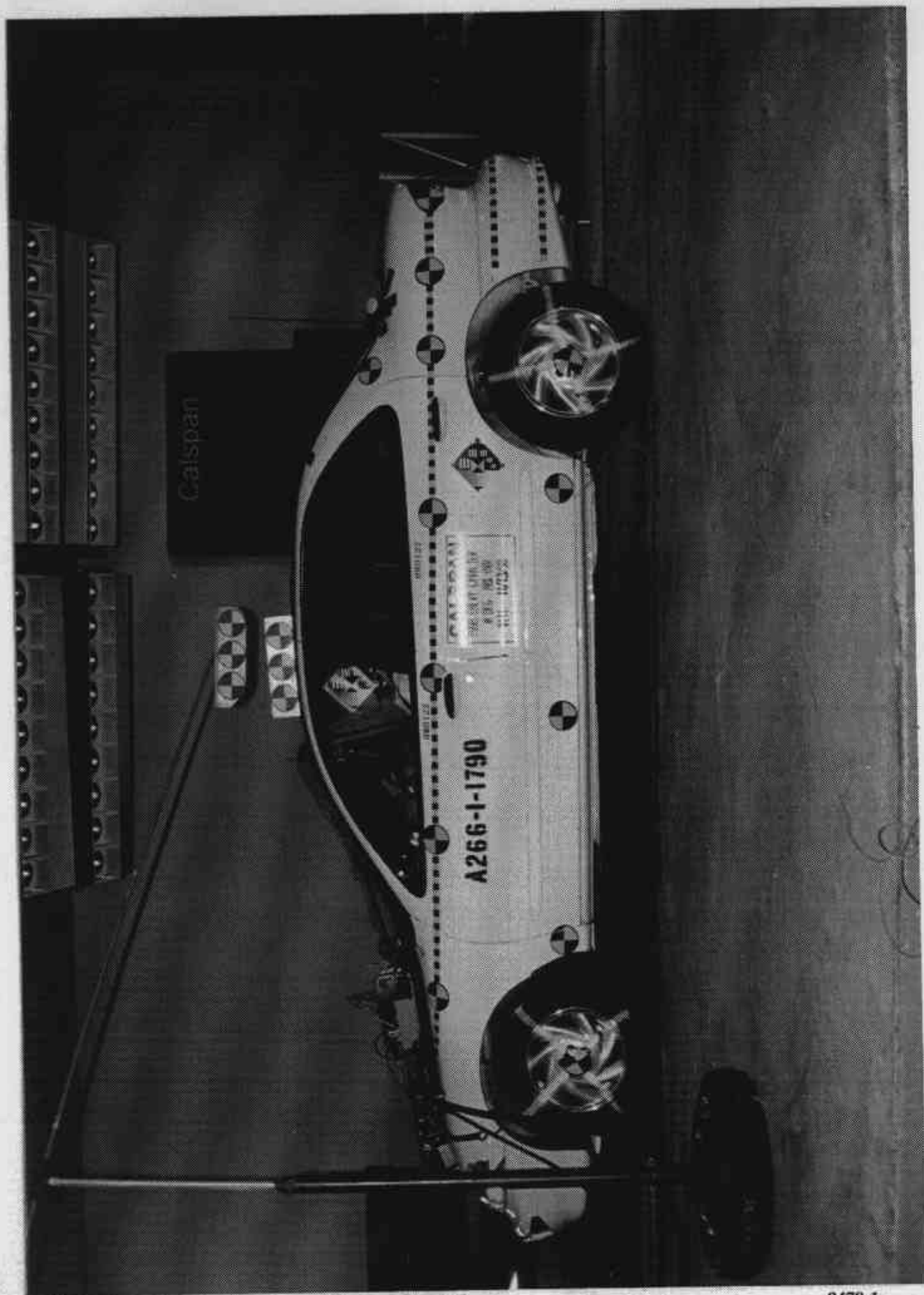


Figure B-3 PRE-TEST LEFT SIDE VIEW



Figure B-4 POST-TEST LEFT SIDE VIEW



Figure B-5 PRE-TEST RIGHT SIDE VIEW



Figure B-6 POST-TEST RIGHT SIDE VIEW

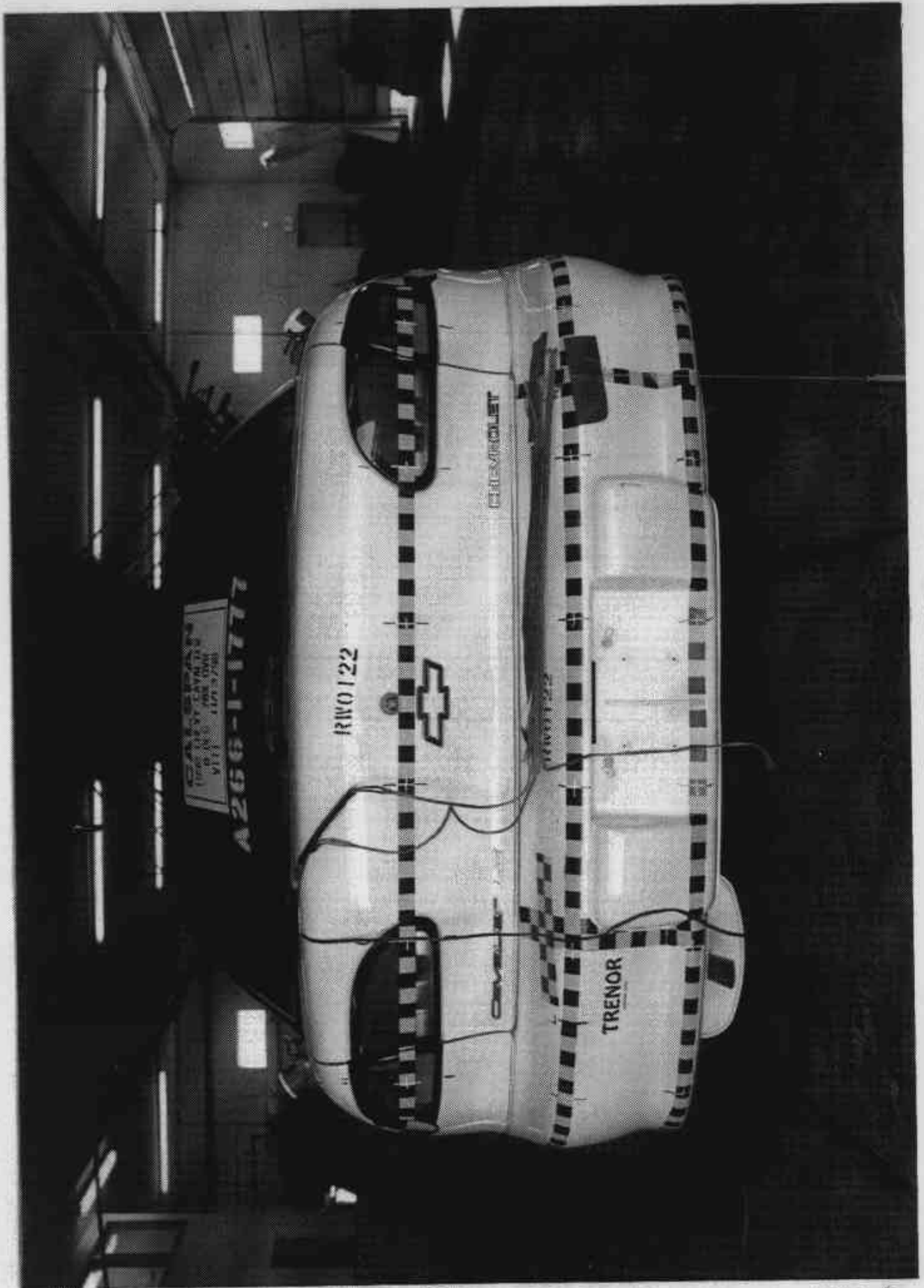


Figure B-7 PRE-TEST REAR VIEW



Figure B-8 POST-TEST REAR VIEW



Figure B-9 PRE-TEST TOP VIEW

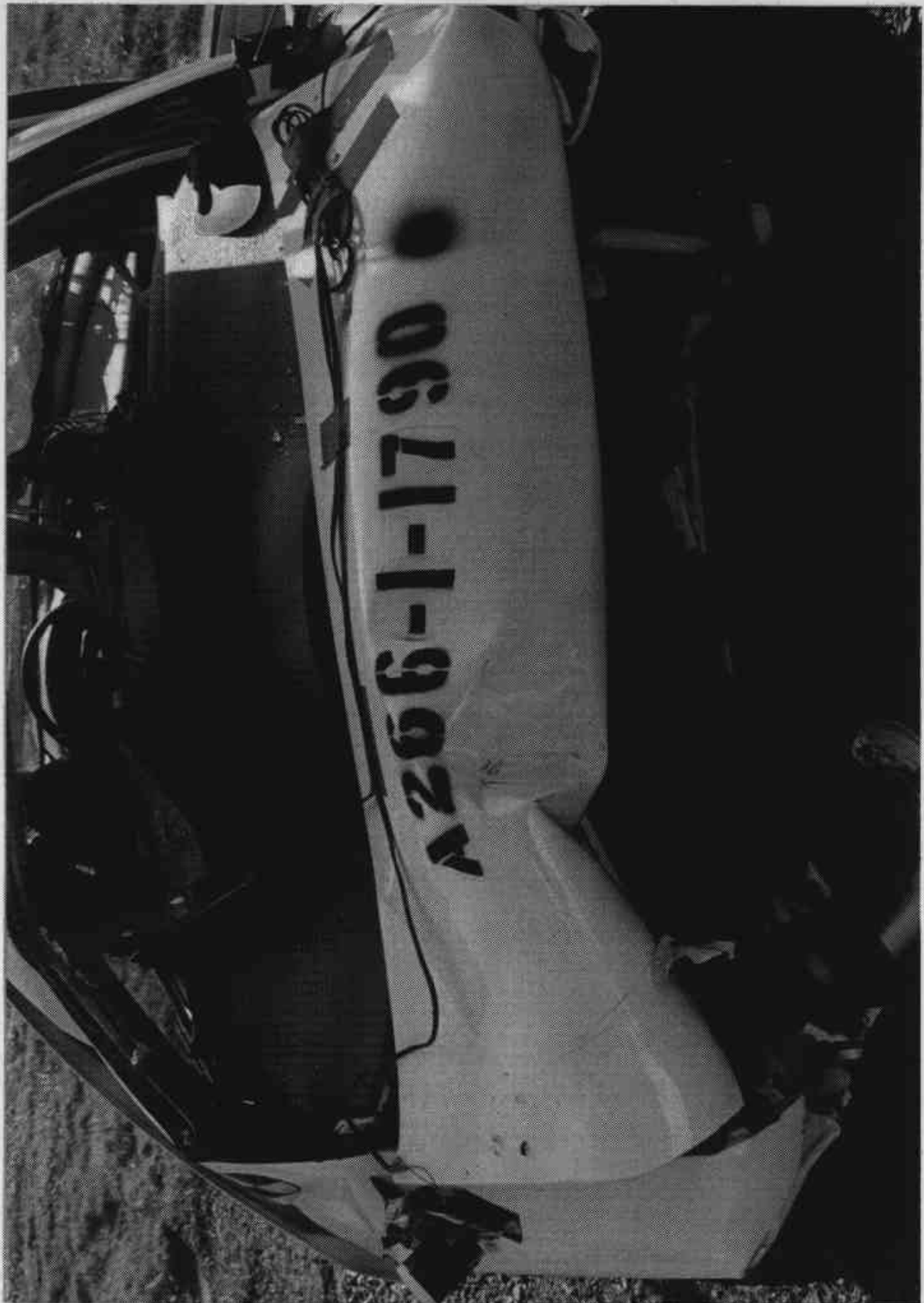


Figure B-10 POST-TEST TOP VIEW

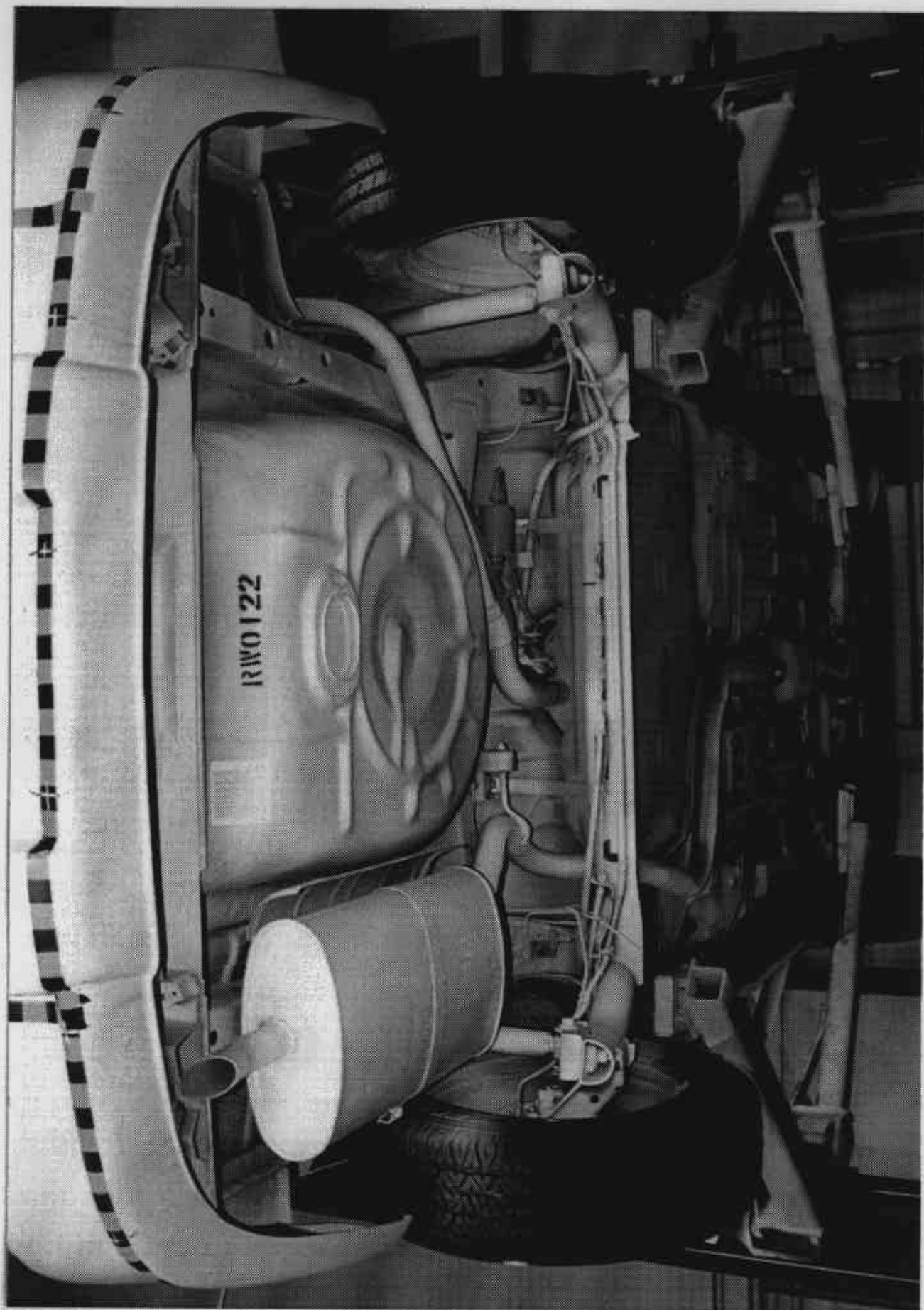


Figure B-11 PRE-TEST REAR UNDERBODY VIEW



Figure B-12 POST-TEST REAR UNDERBODY VIEW

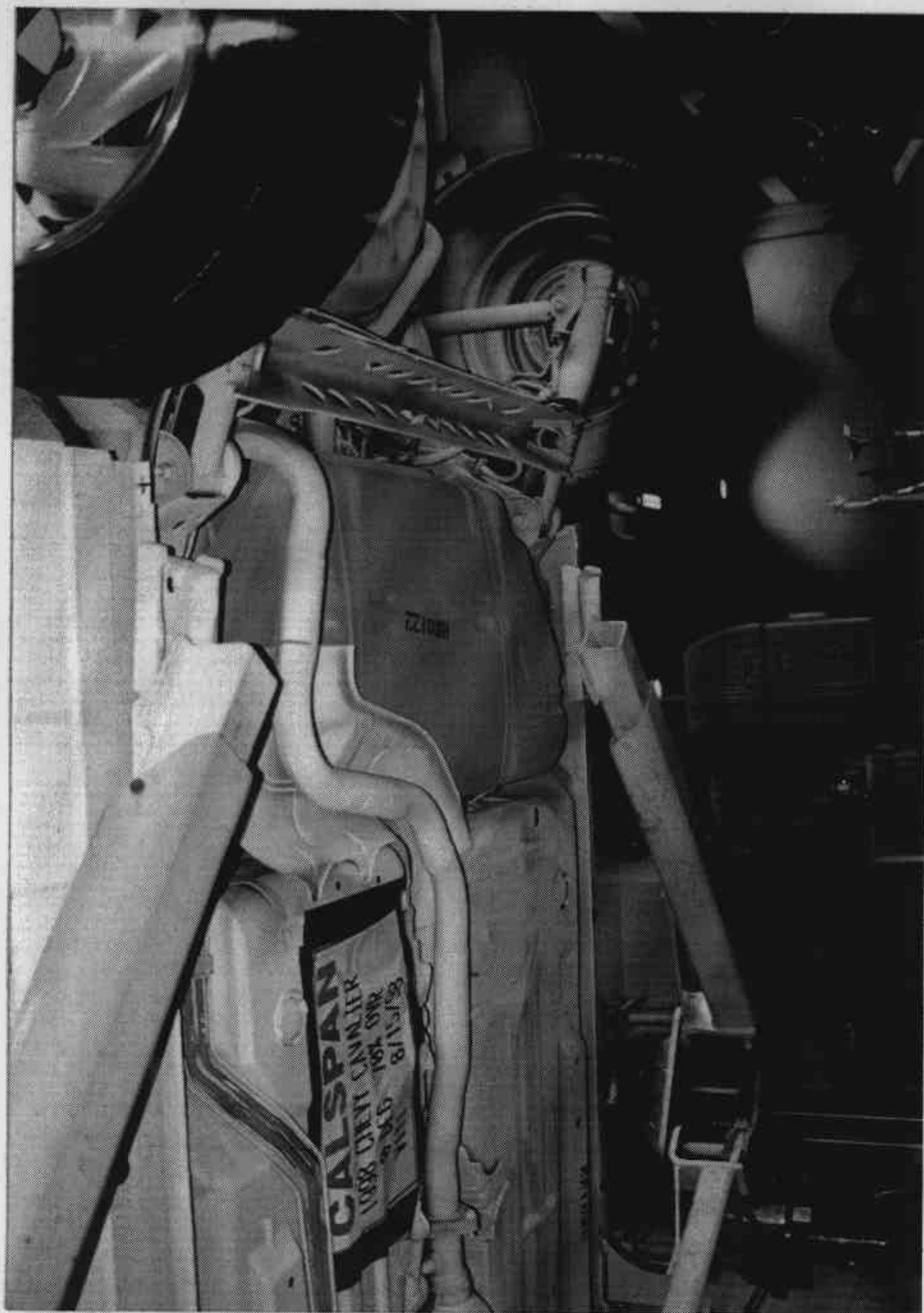


Figure B-13 PRE-TEST REAR SIDE UNDERBODY VIEW



Figure B-14 POST-TEST REAR SIDE UNDERBODY VIEW

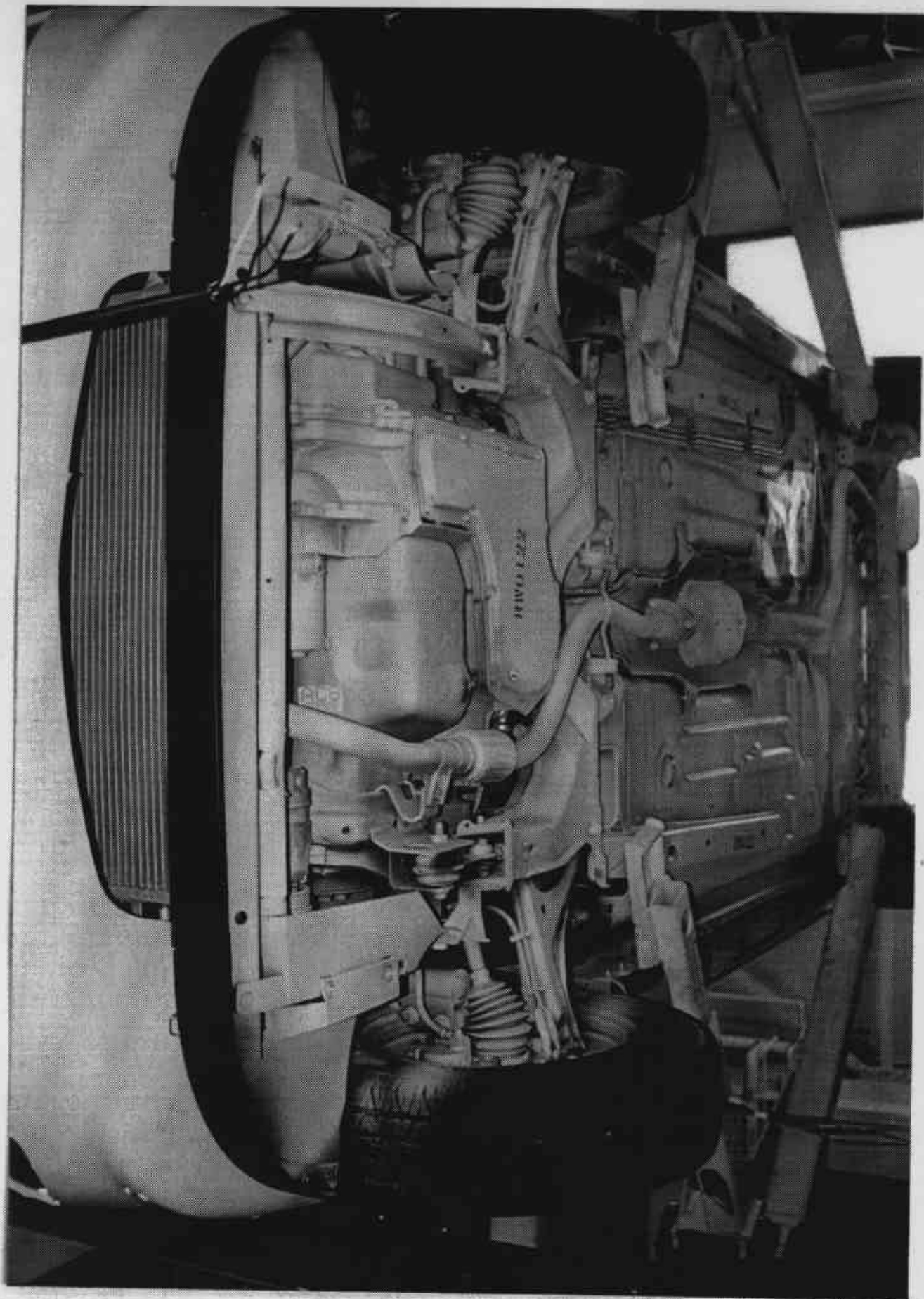


Figure B-15 PRE-TEST FRONT UNDERBODY VIEW



Figure B-16 POST-TEST FRONT UNDERBODY VIEW

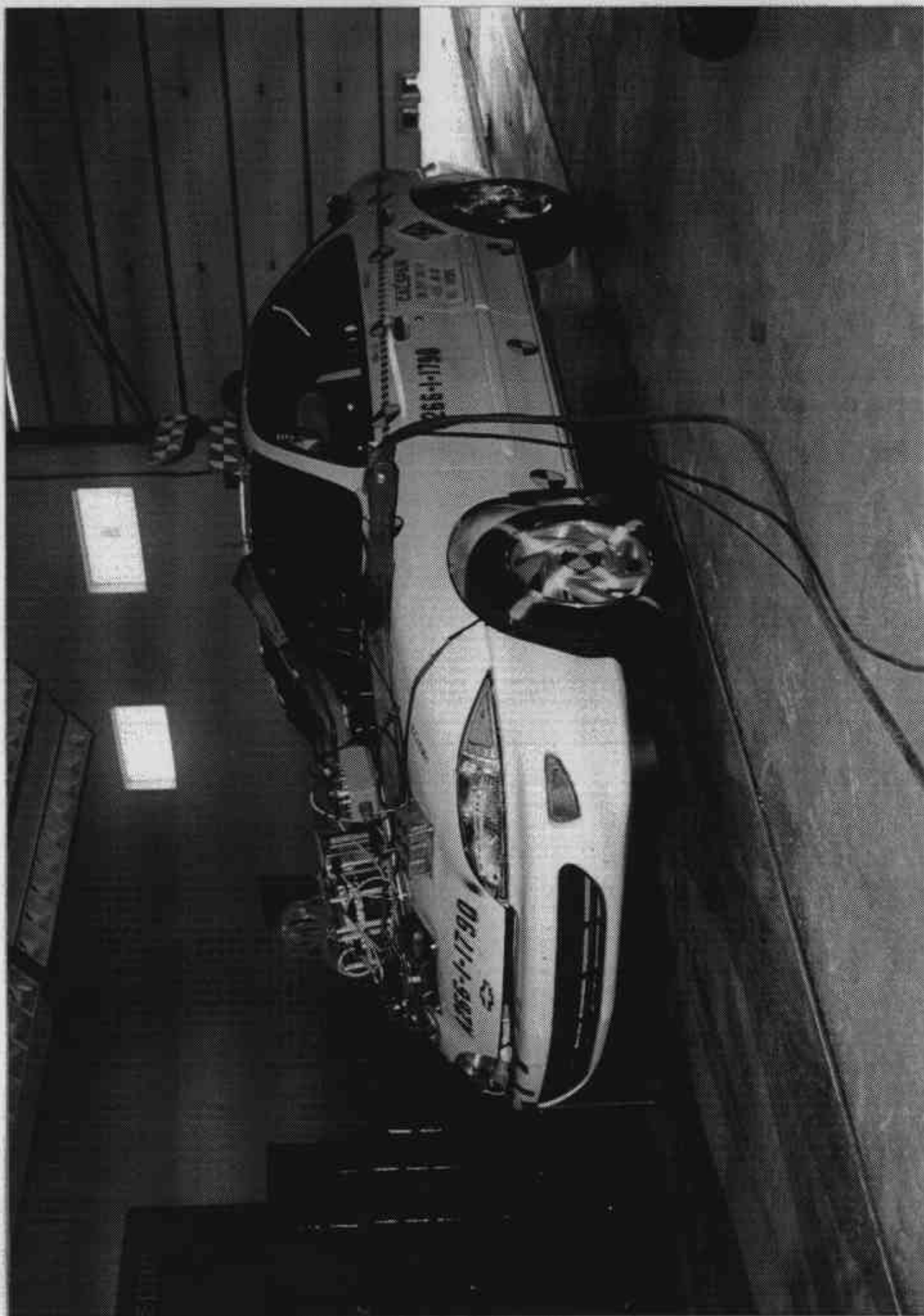


Figure B-17 PRE-TEST LEFT FRONT THREE-QUARTER VIEW

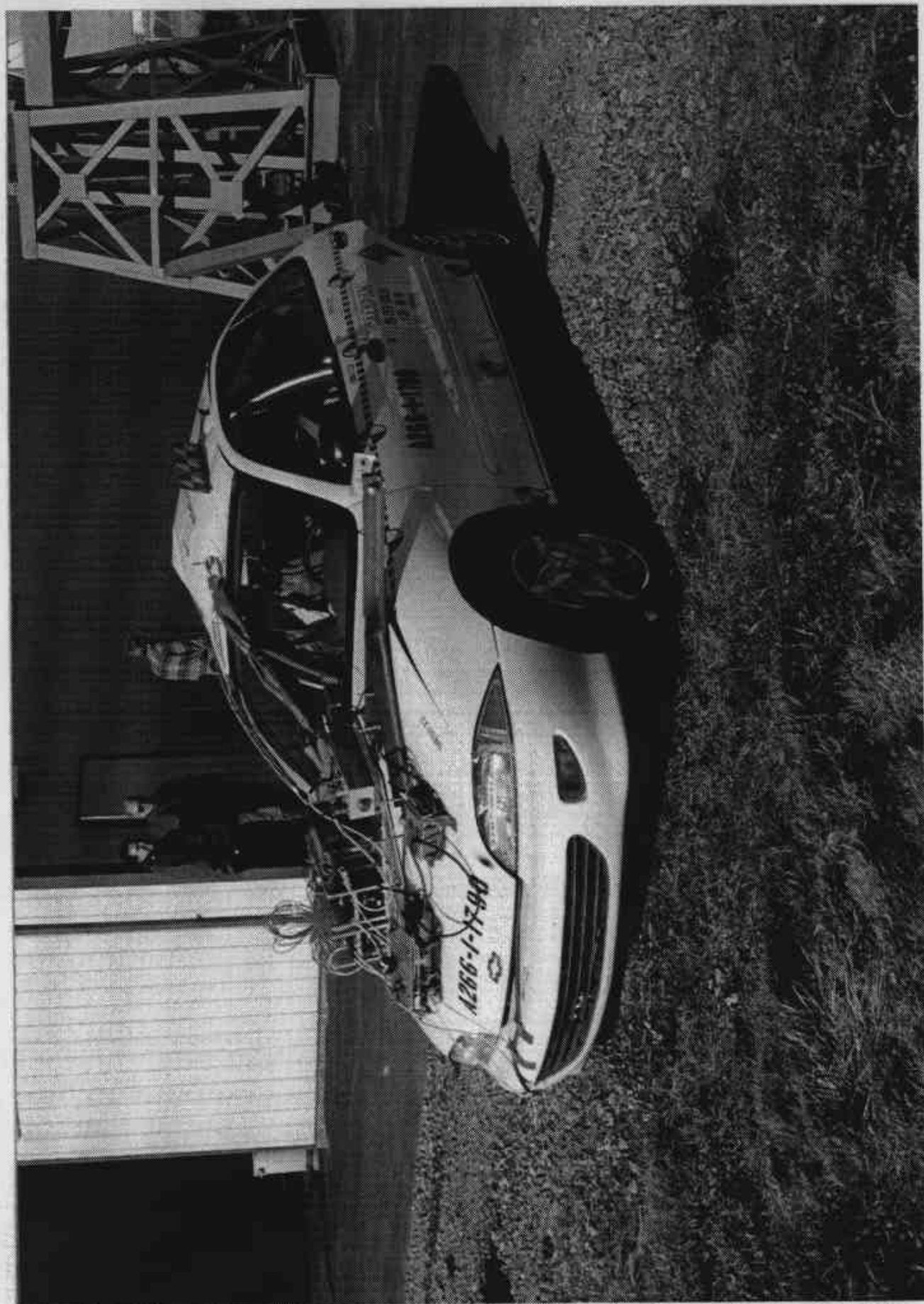


Figure B-18 POST-TEST LEFT FRONT THREE-QUARTER VIEW



Figure B-19 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



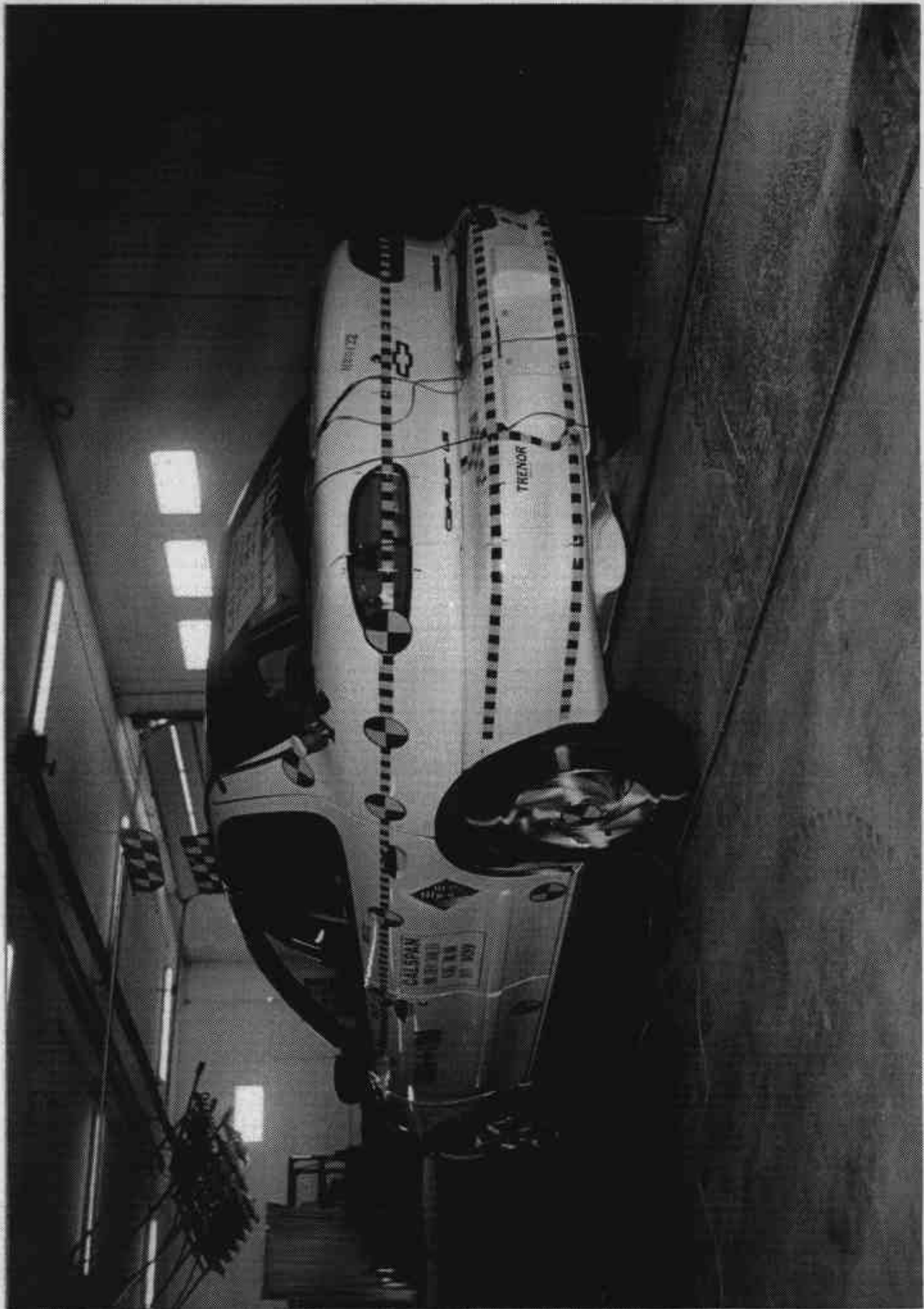


Figure B-21 PRE-TEST LEFT REAR THREE-QUARTER VIEW

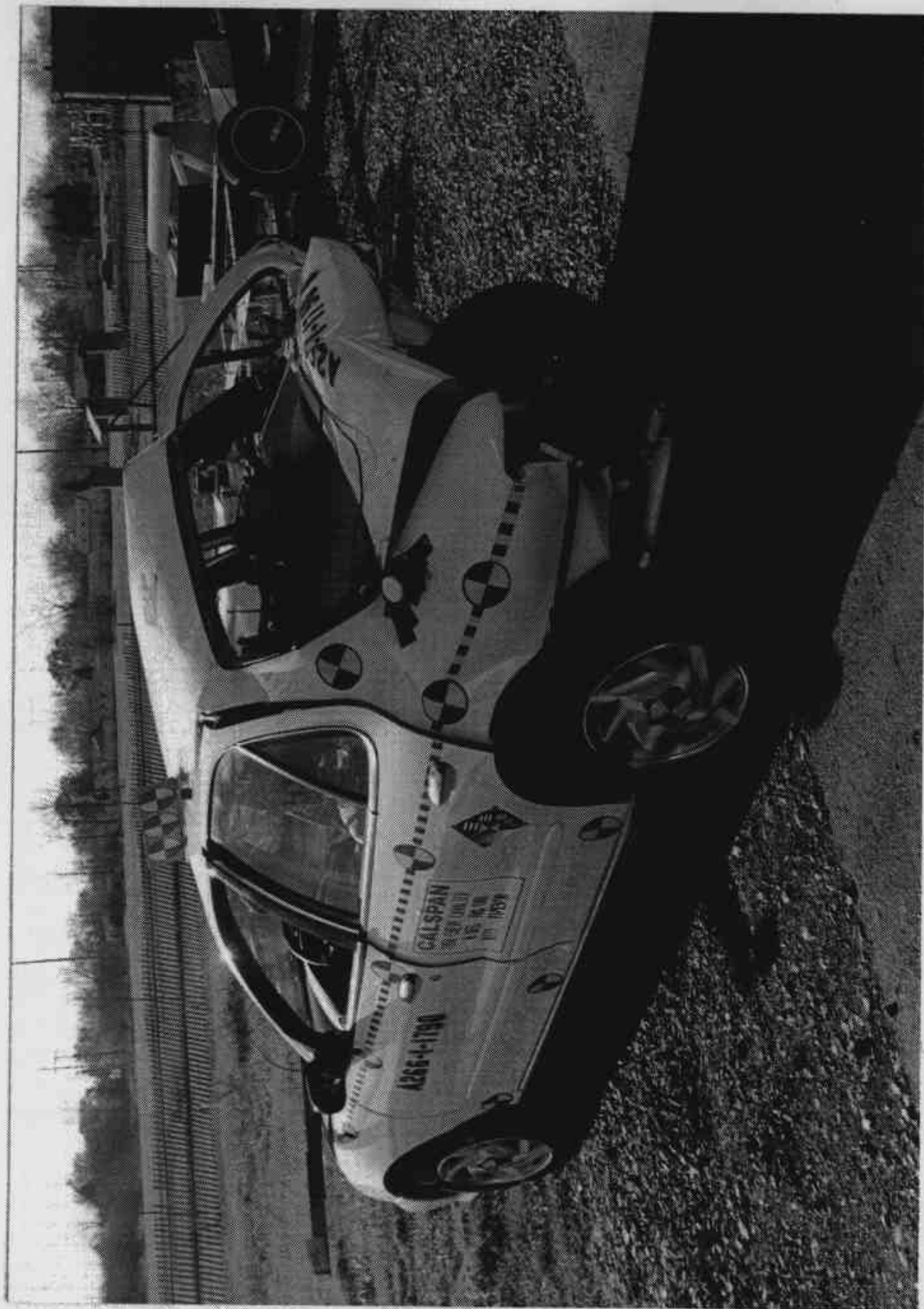


Figure B-22 POST-TEST LEFT REAR THREE-QUARTER VIEW

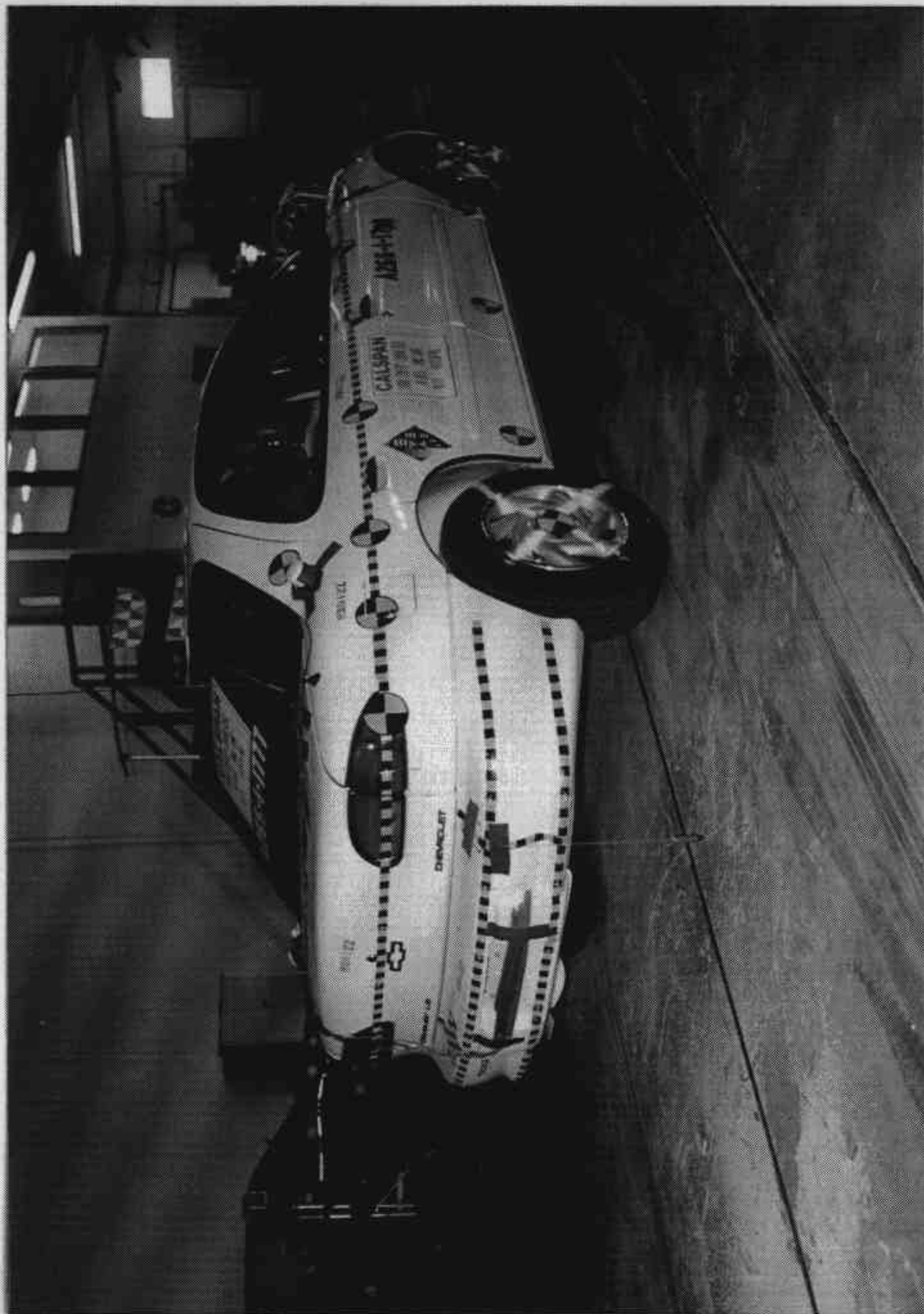


Figure B-23 PRE-TEST RIGHT REAR THREE-QUARTER VIEW



Figure B-24 POST-TEST RIGHT REAR THREE-QUARTER VIEW

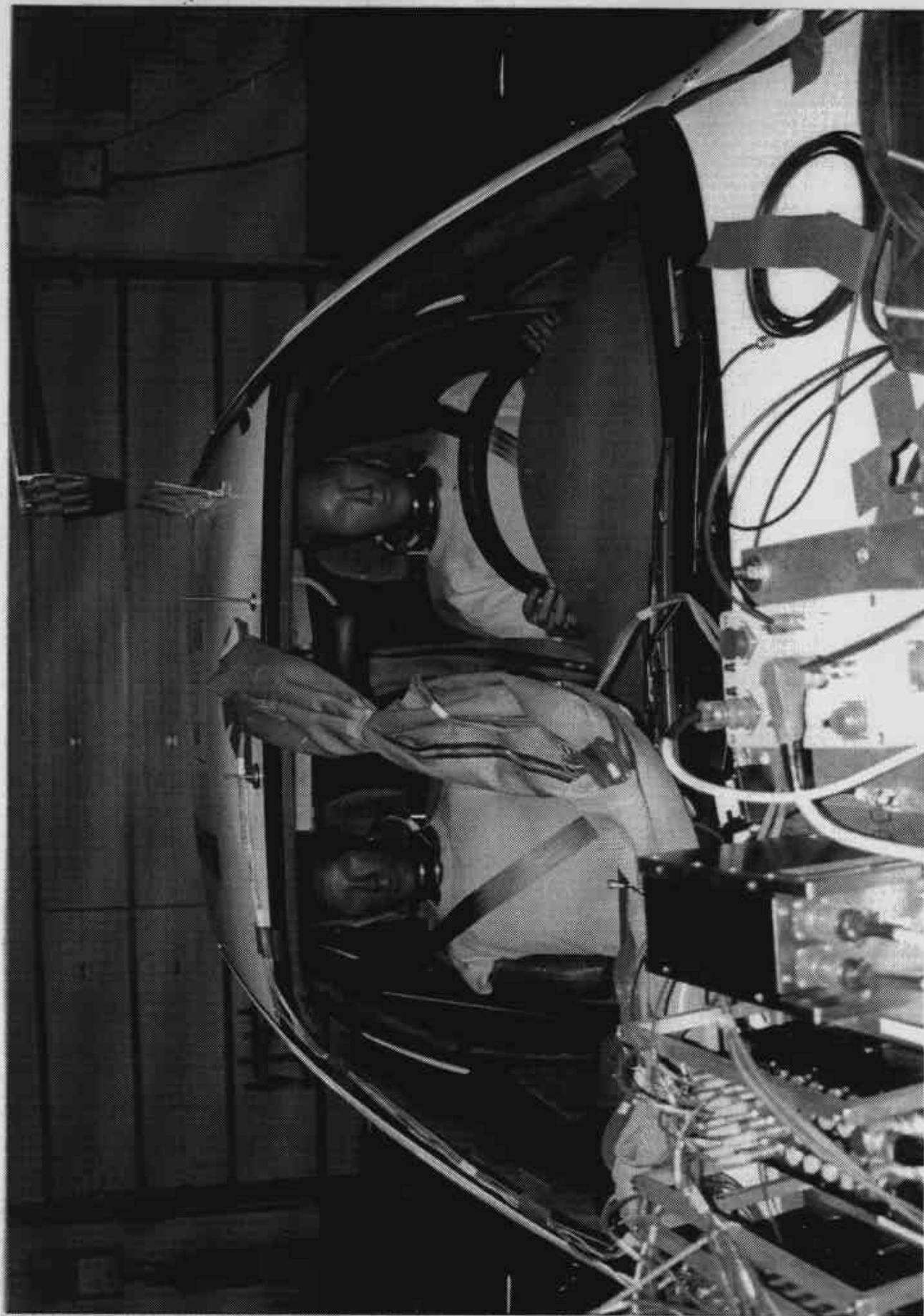


Figure B-25 PRE-TEST WINDSHIELD VIEW

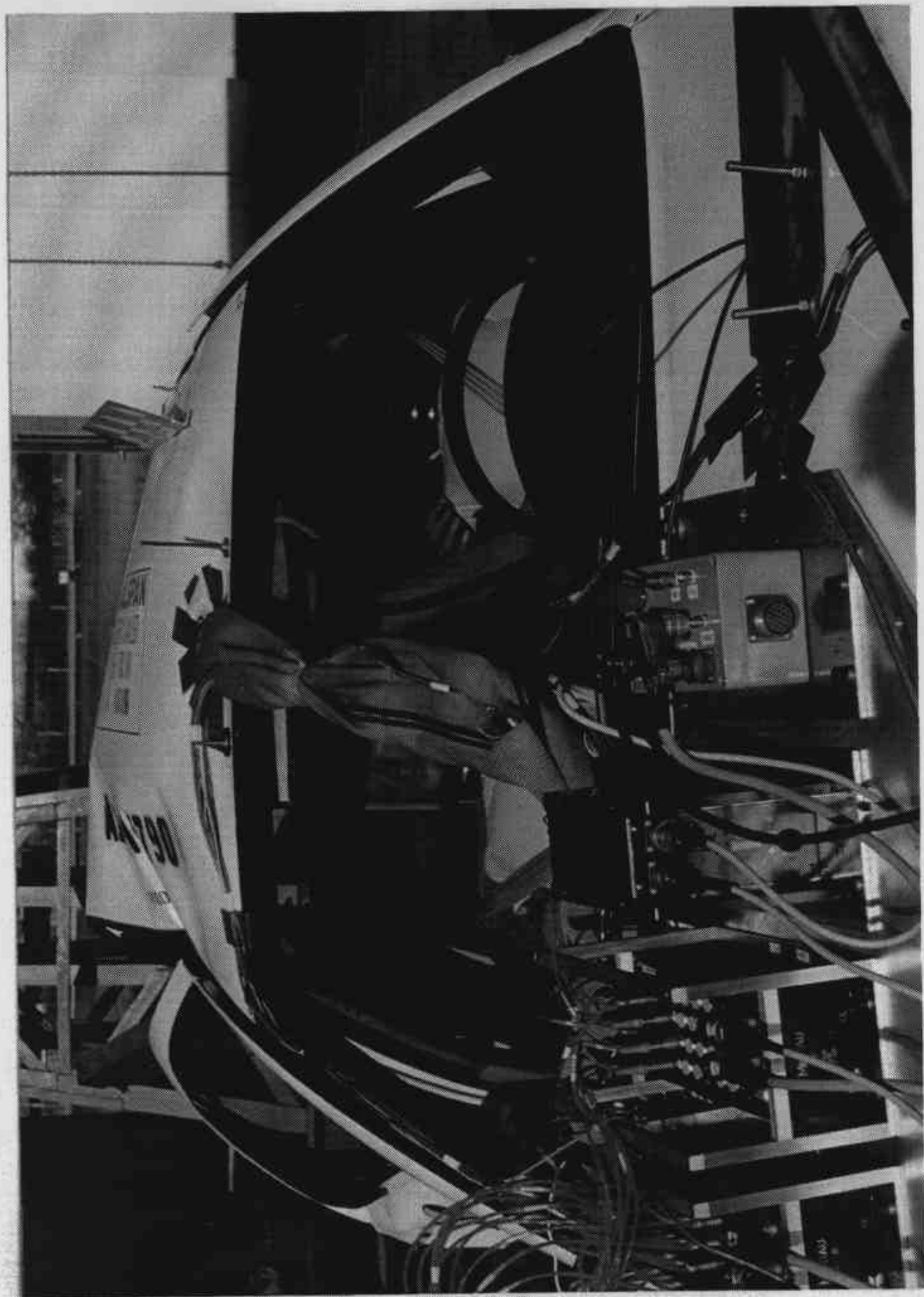


Figure B-26 POST-TEST WINDSHIELD VIEW

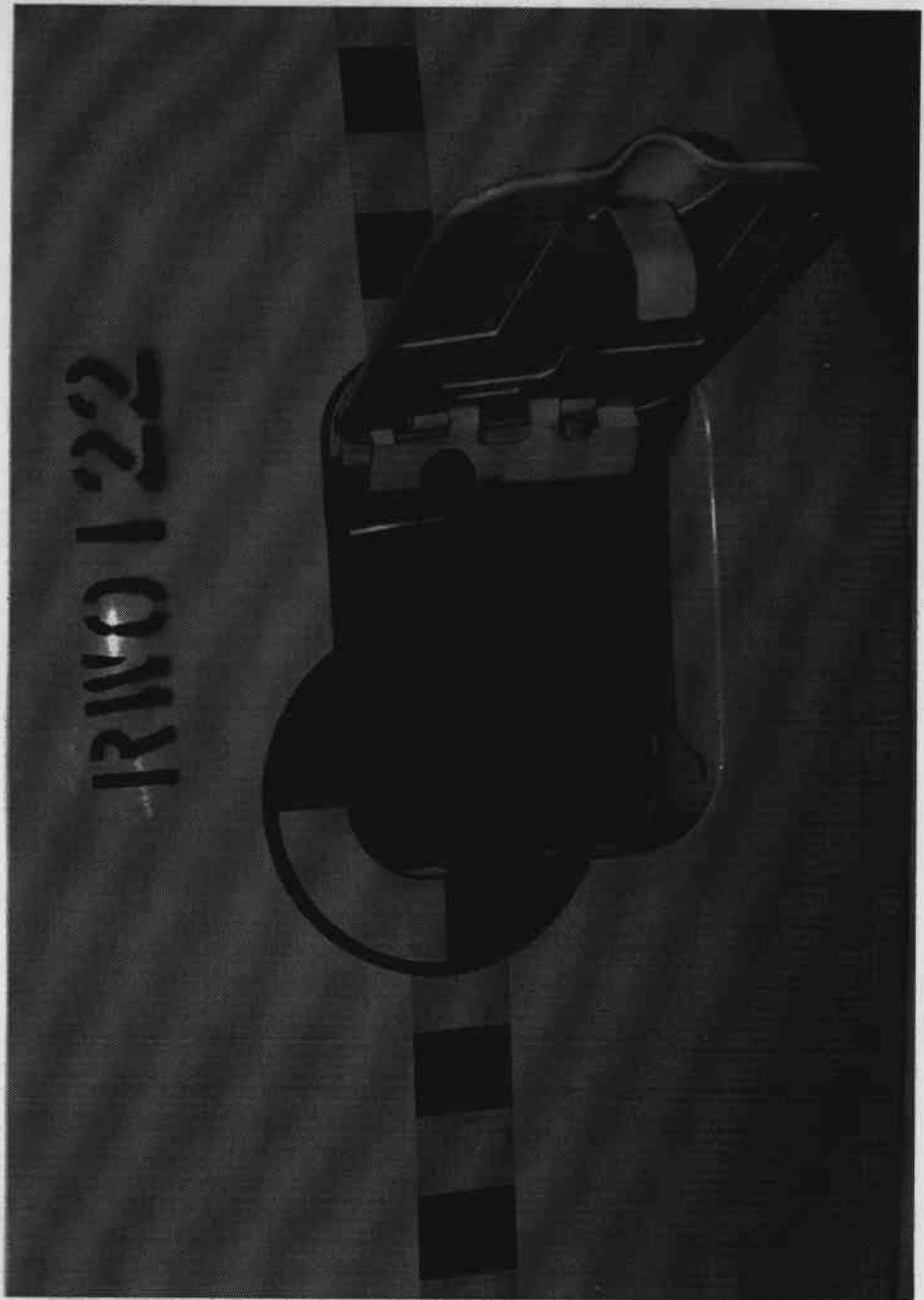


Figure B-27 PRE-TEST FUEL FILLER CAP VIEW



Figure B-28 POST-TEST FUEL FILLER CAP VIEW

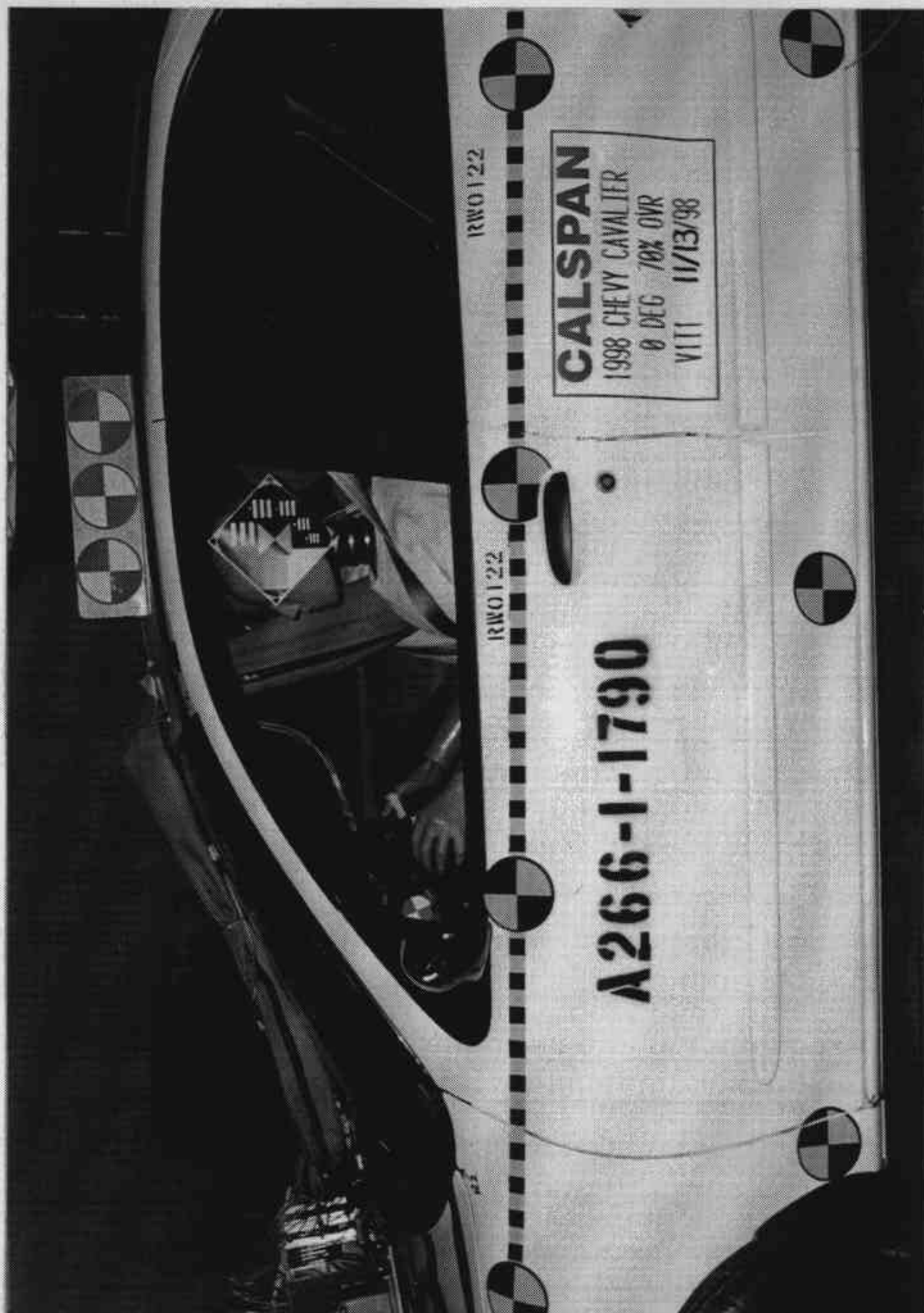


Figure B-29 PRE-TEST DRIVER POSITION VIEW

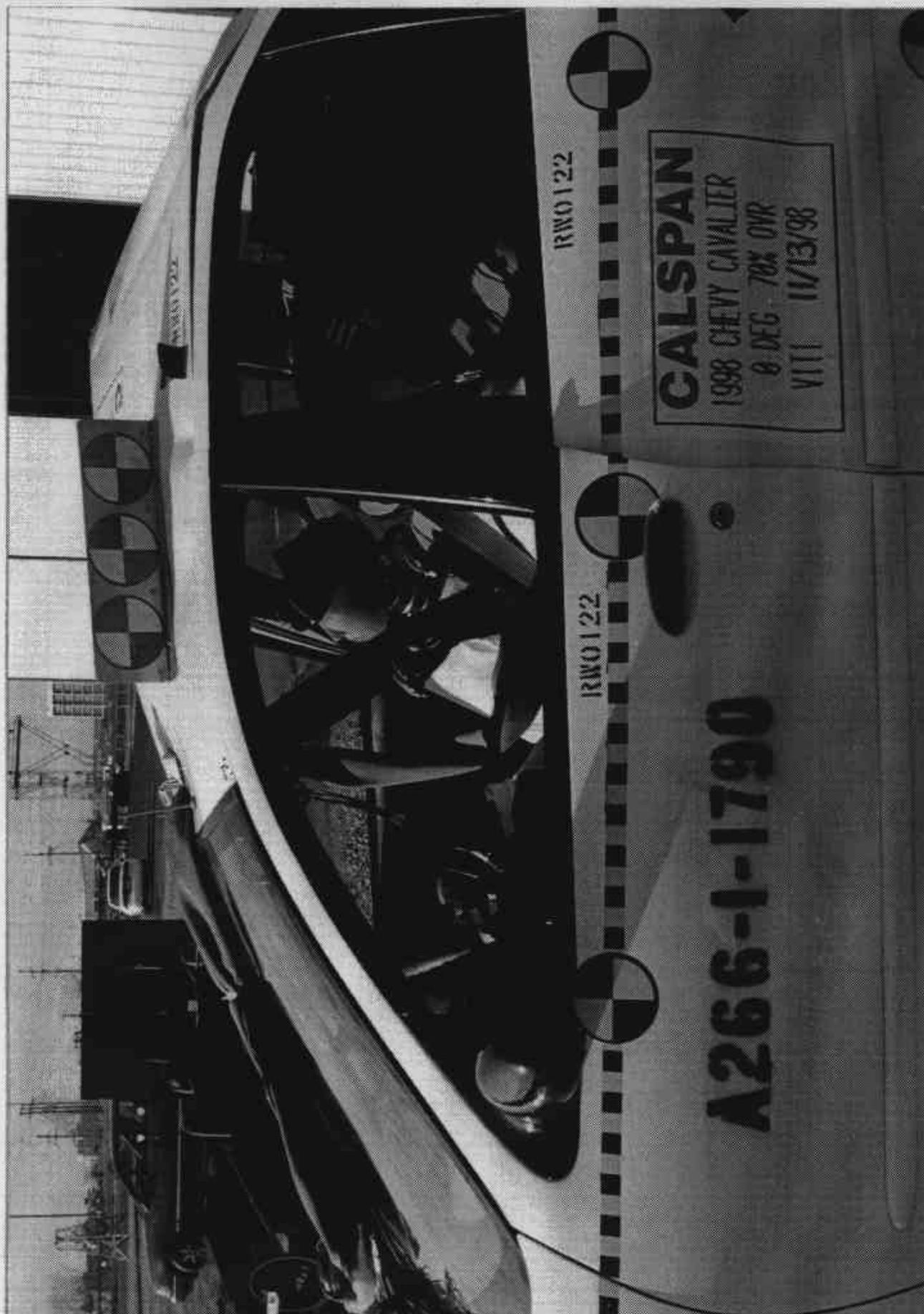


Figure B-30 POST-TEST DRIVER POSITION VIEW

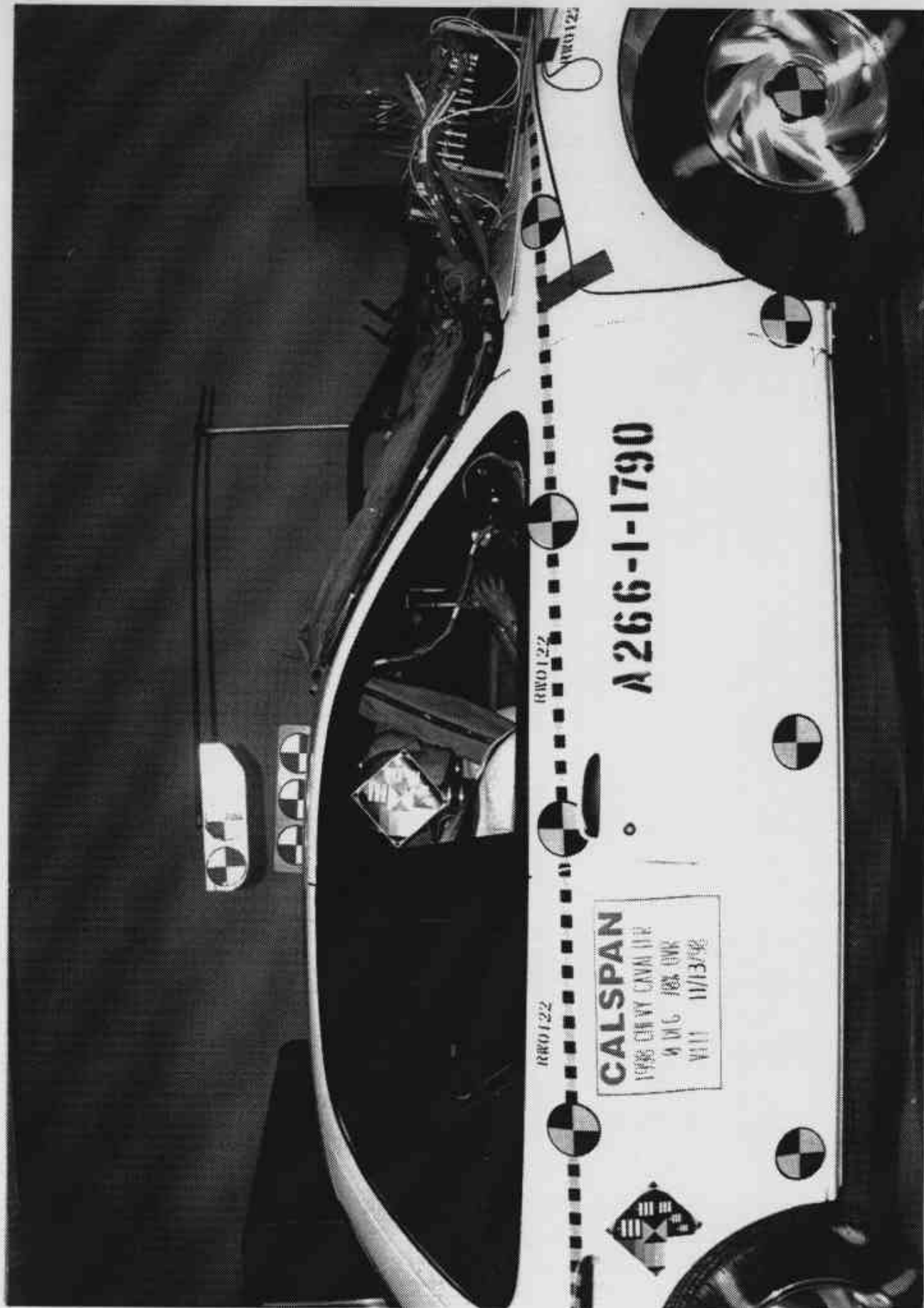


Figure B-31 PRE-TEST PASSENGER POSITION VIEW



Figure B-32. POST-TEST PASSENGER POSITION VIEW



Figure B-33 PRE-TEST DRIVER AND INTERIOR VIEW



Figure B-34 POST-TEST DRIVER AND INTERIOR VIEW



Figure B-35 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure B-36 POST-TEST PASSENGER AND INTERIOR VIEW

PHOTO NOT NEEDED

Figure B-37 ROLLOVER 90°

PHOTO NOT NEEDED

Figure B-38 ROLLOVER 180°

PHOTO NOT NEEDED

Figure B-39 ROLLOVER 270°

PHOTO NOT NEEDED

Figure B-40 ROLLOVER 360°

APPENDIX C

MOVING DEFORMABLE BARRIER (MDB) PHOTOGRAPHS

LIST OF PHOTOGRAPHS

<u>Figure</u>	<u>Photograph Title</u>	<u>Page No.</u>
C-1	PRE-TEST MDB FACE FRONT VIEW	C-3
C-2	POST-TEST MDB FACE FRONT VIEW	C-4
C-3	PRE-TEST MDB FACE TOP VIEW	C-5
C-4	POST-TEST MDB FACE TOP VIEW	C-6
C-5	PRE-TEST MDB FACE LEFT SIDE VIEW	C-7
C-6	POST-TEST MDB FACE LEFT SIDE VIEW	C-8
C-7	PRE-TEST MDB FACE RIGHT SIDE VIEW	C-9
C-8	POST-TEST MDB FACE RIGHT SIDE VIEW	C-10

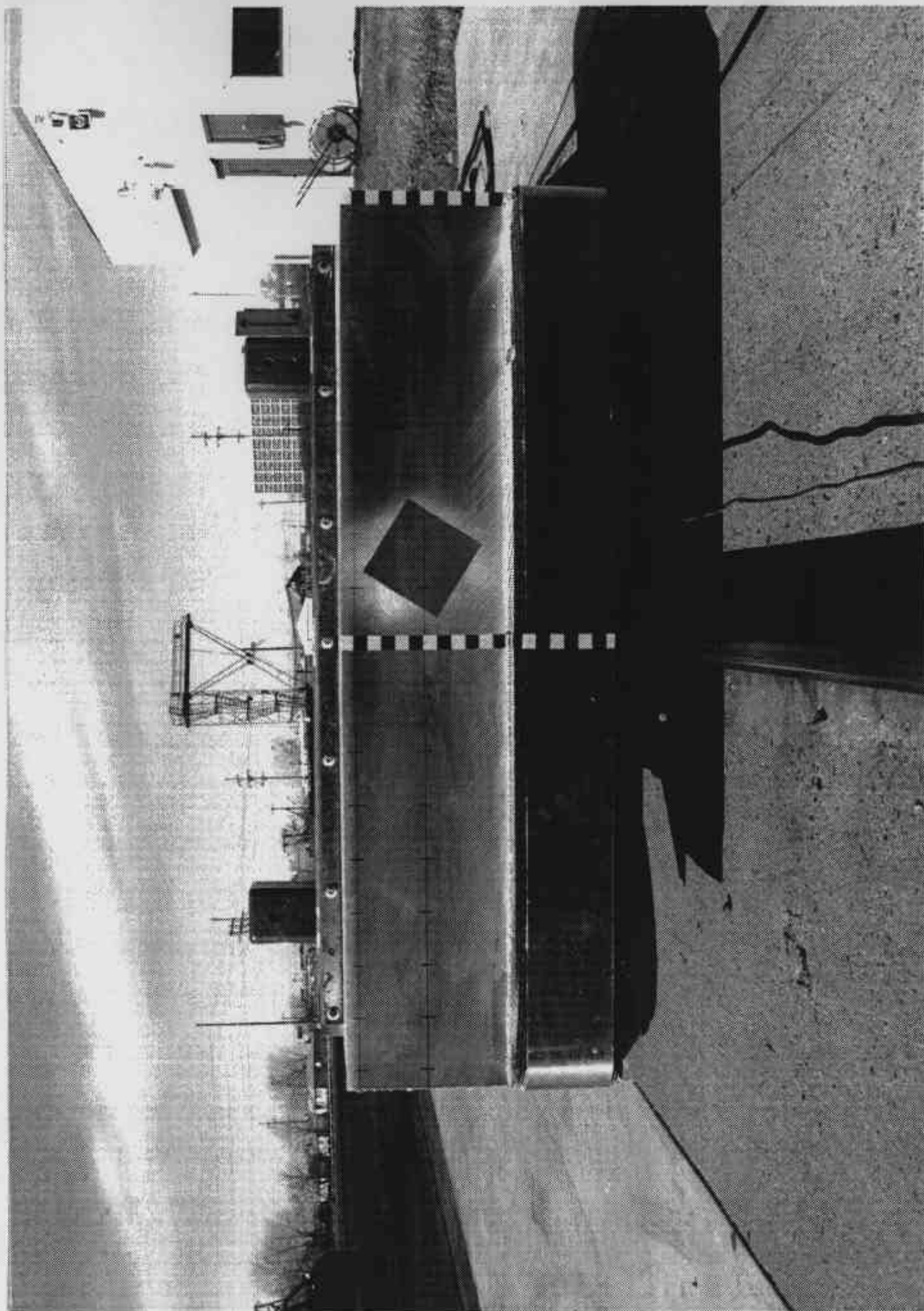


Figure C-1 PRE-TEST MDB FACE FRONT VIEW

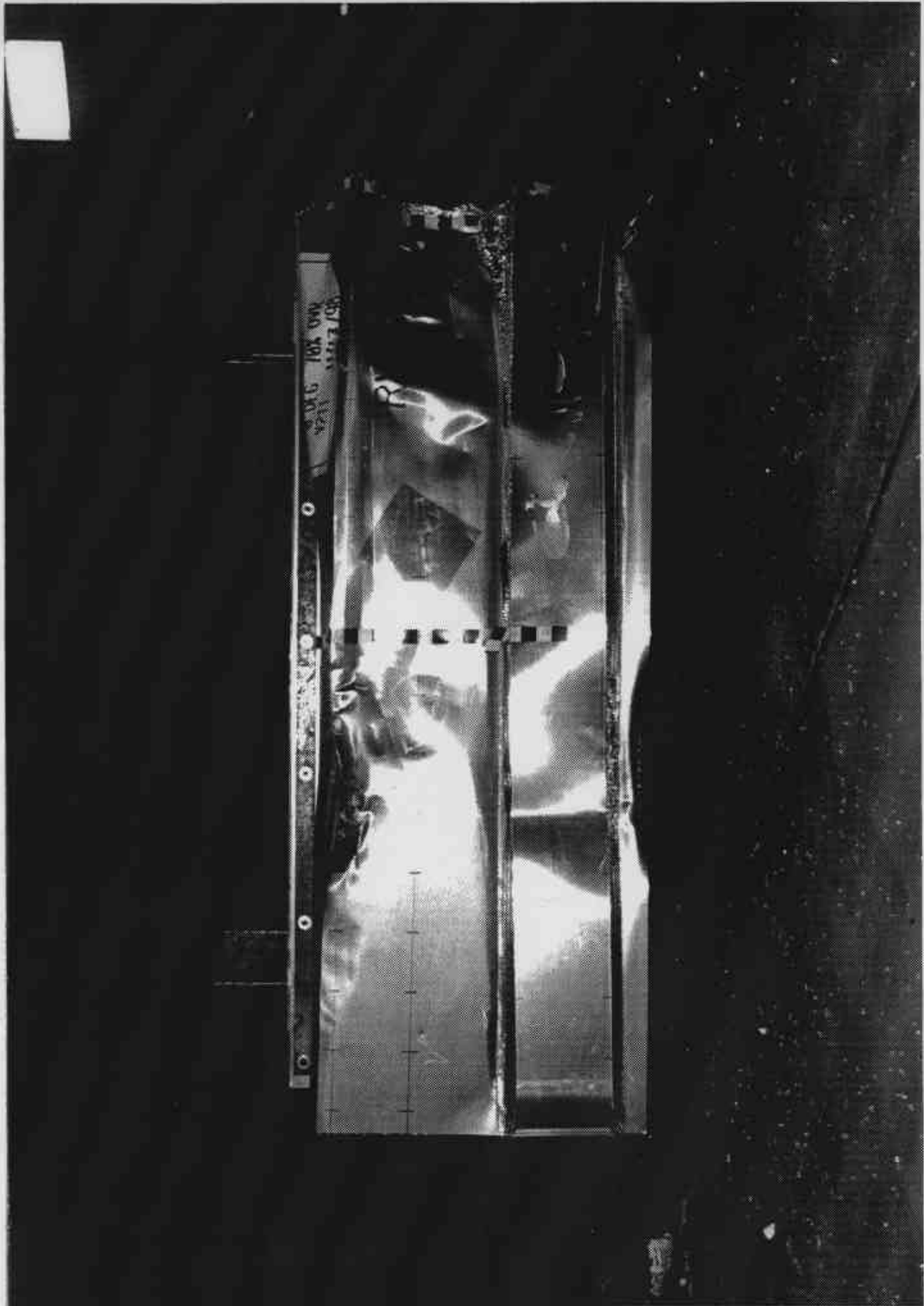


Figure C-2 POST-TEST MDB FACE FRONT VIEW

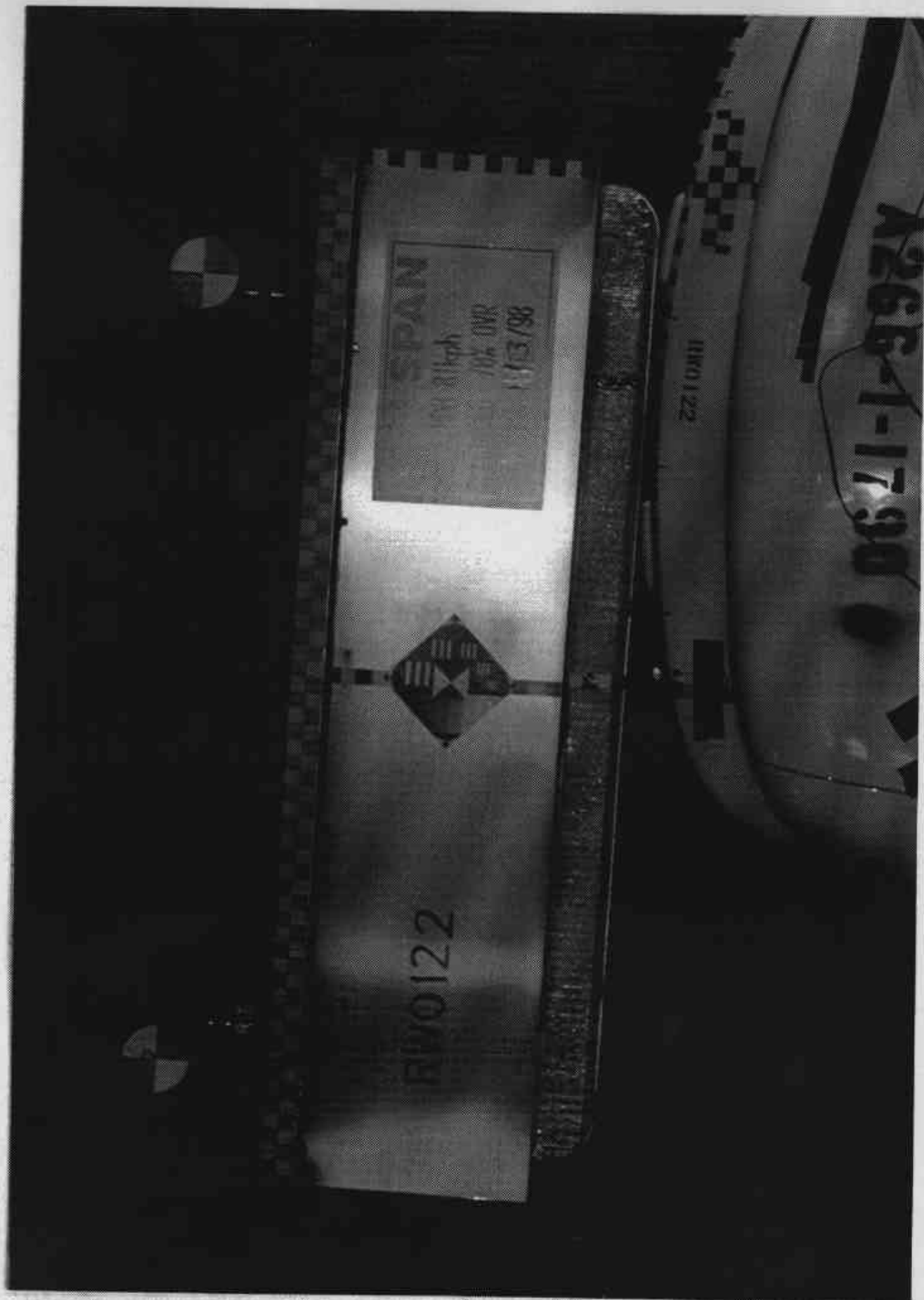


Figure C-3 PRE-TEST MDB FACE TOP VIEW



Figure C-4 POST-TEST MDB FACE TOP VIEW

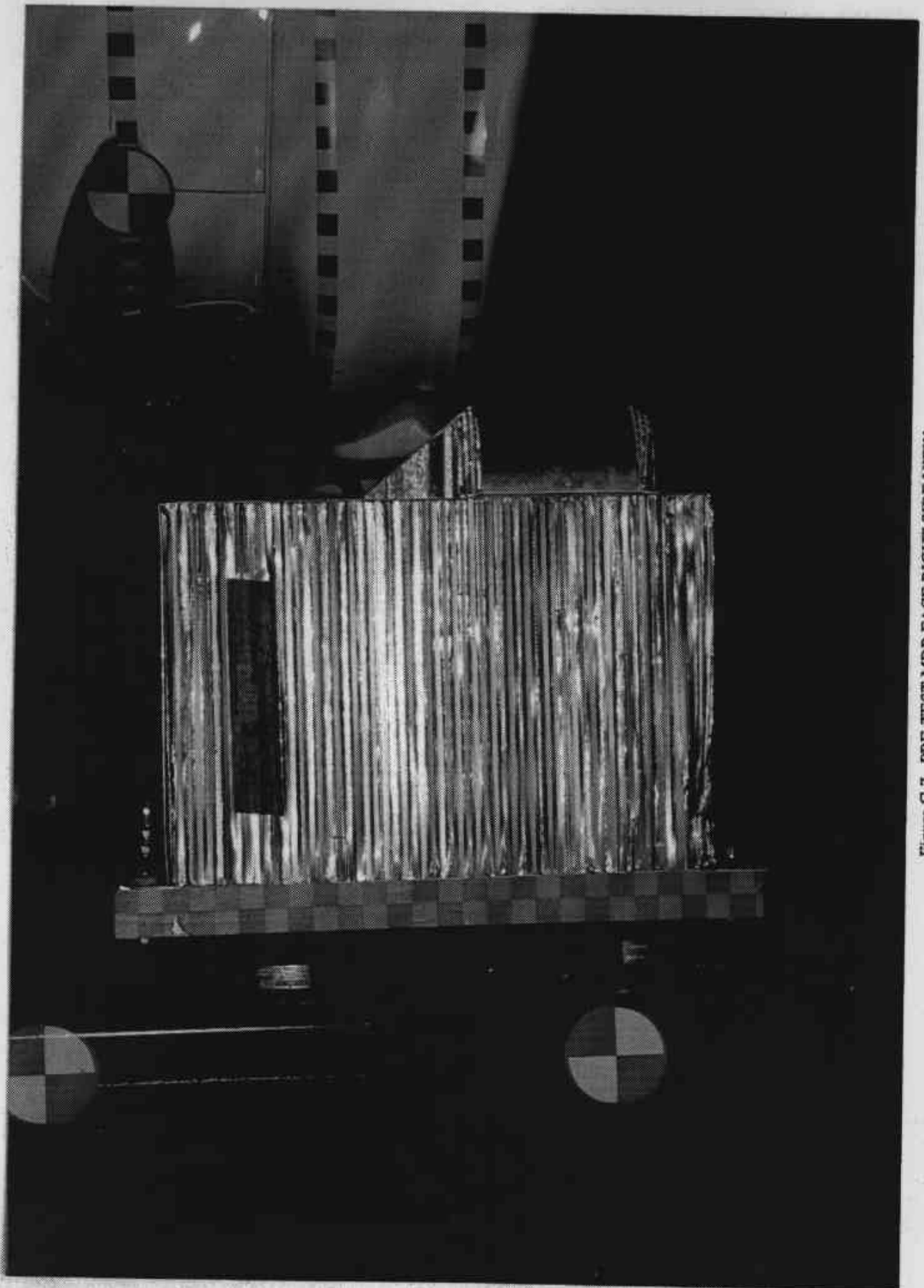
Figure C-5 PRE-TEST MDB FACE LEFT SIDE VIEW





Figure C-6 POST-TEST MDB FACE LEFT SIDE VIEW

Figure C-7 PRE-TEST MDB FACE RIGHT SIDE VIEW



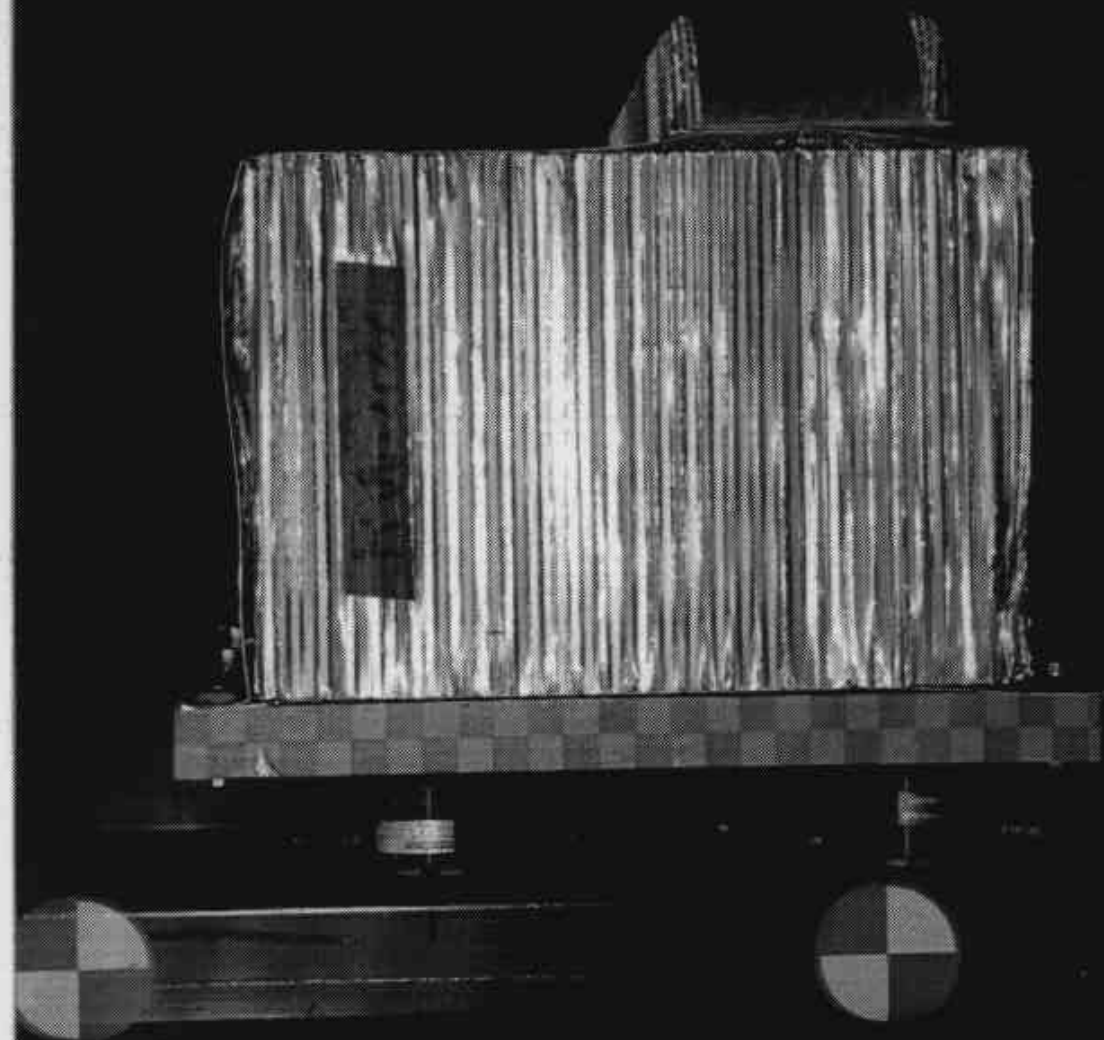


Figure C-8 POST-TEST MDB FACE RIGHT SIDE VIEW

APPENDIX D

VEHICLE AND DUMMY RESPONSE DATA

TEST NO. RW0122

VEHICLE 1

SAE FILTER CHANNEL CLASS

Accelerations
Integrations

60
180

FACILITY: VEF

DATE: 13 November 1998

TEST#: A266-1-1790

TITLE: 81 kph Rear Impact - 1998 Chevy Cavalier RW0122

Version 2.00

P1 HIC(36ms): 1063.1

t1: 112.1 msec

t2: 126.5 msec

Duration: 14.4 msec

Input channels: Driver Head X (2) CFC_1000

Driver Head Y (3) CFC_1000

Driver Head Z (4) CFC_1000

P1 CLIP(3ms): 23.5 g

t1: 125.3 msec

t2: 128.3 msec

Duration: 3.0 msec

Input channels: Driver Chest X (5) CFC_180

Driver Chest Y (6) CFC_180

Driver Chest Z (7) CFC_180

P1 CHEST DISP: Max: 1.5 mm 147.8 msec

Min: -1.4 mm 131.7 msec

Input channel: Driver Chest Displacement (11) CFC_600

P1 LEFT FEMUR: Max: 121.2 N 118.1 msec

Min: -1978.6 N 206.4 msec

Input channel: Driver Left Femur Z (12) CFC_600

P1 RIGHT FEMUR: Max: 375.0 N 205.8 msec

Min: -629.4 N 123.3 msec

Input channel: Driver Right Femur Z (13) CFC_600

P2 HIC(36ms): 2545.2

t1: 111.3 msec

t2: 118.6 msec

Duration: 7.3 msec

Input channels: Passenger Head X (20) CFC_1000

Passenger Head Y (21) CFC_1000

Passenger Head Z (22) CFC_1000

P2 CLIP(3ms): 32.6 g

t1: 98.6 msec

t2: 101.6 msec

Duration: 3.0 msec

Input channels: Passenger Chest X (23) CFC_180

Passenger Chest Y (24) CFC_180

Passenger Chest Z (25) CFC_180

P2 CHEST DISP: Max: 0.1 mm 265.0 msec

Min: -4.4 mm 114.6 msec

Input channel: Passenger Chest Displacement (29) CFC_600

P2 LEFT FEMUR: Max: 313.9 N 366.8 msec

Min: -574.9 N 64.6 msec

Input channel: Passenger Left Femur Z (30) CFC_600

P2 RIGHT FEMUR: Max: 204.4 N 234.9 msec

Min: -704.1 N 107.2 msec

Input channel: Passenger Right Femur Z (31) CFC_600

FACILITY: VERF

DATE: 13 November 1998

TEST#: A266-1-1790

TITLE: 81 kph Rear Impact - 1998 Chevy Cavalier RW0122

CHN NAME	Unit	Max	msec	Min	msec	Filt
45 Driver Head X	g	110.6	118.4	-8.1	354.1	1000
46 Driver Head Y	g	23.0	353.7	-40.6	118.3	1000
47 Driver Head Z	g	36.8	114.6	-2.3	354.3	1000
48 Driver Head Resultant	g	121.6	118.3	0.0	-74.6	1000
49 Driver Upper Neck Load Cell Fx	N	403.9	121.4	-194.5	327.3	1000
50 Driver Upper Neck Load Cell Fy	N	103.2	162.8	-289.5	119.4	1000
51 Driver Upper Neck Load Cell Fz	N	1763.5	113.5	-403.0	126.1	1000
52 Driver Upper Neck Load Cell F Resultant	N	1780.9	113.5	0.1	-99.4	1000
53 Driver Upper Neck Load Cell Mx	N-m	24.7	120.3	-15.0	371.7	600
54 Driver Upper Neck Load Cell My	N-m	65.4	122.5	-11.1	239.6	600
55 Driver Upper Neck Load Cell Mz	N-m	11.4	151.1	-5.8	216.9	600
56 Driver Upper Neck Load Cell M Resultant	N-m	69.0	122.1	0.0	-7.7	600
57 Driver Chest X	g	21.6	114.5	-2.2	223.7	180
58 Driver Chest Y	g	2.4	394.9	-6.7	103.8	180
59 Driver Chest Z	g	12.5	126.5	-2.2	346.7	180
60 Driver Chest Resultant	g	24.8	126.7	0.0	-68.3	180
61 Driver Chest Displacement	mm	1.5	147.8	-1.4	131.7	600
62 Driver Pelvic X	g	17.9	63.7	-5.3	202.0	1000
63 Driver Pelvic Y	g	4.3	162.7	-5.2	63.5	1000
64 Driver Pelvic Z	g	13.5	125.4	-2.2	351.9	1000
65 Driver Pelvic Resultant	g	19.9	63.7	0.0	-78.3	1000
66 Driver Left Femur Z	N	121.2	118.1	-1978.6	206.4	600
67 Driver Right Femur Z	N	375.0	205.8	-629.4	123.3	600
68 Passenger Head X	g	220.0	115.5	-3.8	180.9	1000
69 Passenger Head Y	g	5.9	469.9	-33.4	114.3	1000
70 Passenger Head Z	g	51.1	115.6	-2.3	381.6	1000
71 Passenger Head Resultant	g	227.9	115.5	0.0	-99.7	1000
72 Passenger Neck Load Cell Fx	N	288.7	105.2	-159.6	195.4	1000
73 Passenger Neck Load Cell Fy	N	139.4	112.1	-138.2	117.9	1000
74 Passenger Neck Load Cell Fz	N	2653.0	111.5	-104.6	381.7	1000
75 Passenger Neck Load Cell F Resultant	N	2659.9	111.5	0.1	-56.7	1000
76 Passenger Neck Load Cell Mx	N-m	19.7	118.6	-6.9	112.3	600
77 Passenger Neck Load Cell My	N-m	34.2	105.5	-7.9	478.3	600
78 Passenger Neck Load Cell Mz	N-m	4.6	188.4	-5.9	132.4	600
79 Passenger Neck Load Cell M Resultant	N-m	35.5	105.3	0.0	-100.0	600
80 Passenger Chest X	g	32.7	99.8	-1.9	288.0	180
81 Passenger Chest Y	g	4.5	462.1	-10.3	98.9	180
82 Passenger Chest Z	g	14.3	118.2	-3.0	397.1	180
83 Passenger Chest Resultant	g	35.5	99.7	0.0	-90.6	180
84 Passenger Chest Displacement	mm	0.1	265.0	-4.4	114.6	600
85 Passenger Pelvic X	g	15.3	78.8	-2.1	238.9	1000
86 Passenger Pelvic Y	g	4.1	145.3	-6.0	68.5	1000
87 Passenger Pelvic Z	g	16.7	119.1	-3.4	379.0	1000
88 Passenger Pelvic Resultant	g	19.3	118.7	0.0	-53.4	1000
89 Passenger Left Femur Z	N	313.9	366.8	-574.9	64.6	600
90 Passenger Right Femur Z	N	204.4	234.9	-704.1	107.2	600
91 Acc #1 LF Rocker Panel X	g	19.2	51.2	-1.8	13.4	60
94 Acc #2 RF Rocker Panel X	g	18.3	3.1	-2.2	10.3	60
97 Acc #3 LF Seat Back X	g	62.4	68.9	-16.8	73.8	60
100 Acc #4 RF Seat Back X	g	18.9	79.0	-3.4	246.7	60
103 Acc #5 Engine Top X	g	19.0	31.1	-2.3	203.9	60
106 Acc #6 LR Axle X	g	59.0	31.4	-27.7	12.7	60
109 Acc #7 RR Axle X	g	102.7	40.3	-49.0	9.4	60

FACILITY: VERF

DATE: 13 November 1998

TEST#: A266 - 1 - 1790

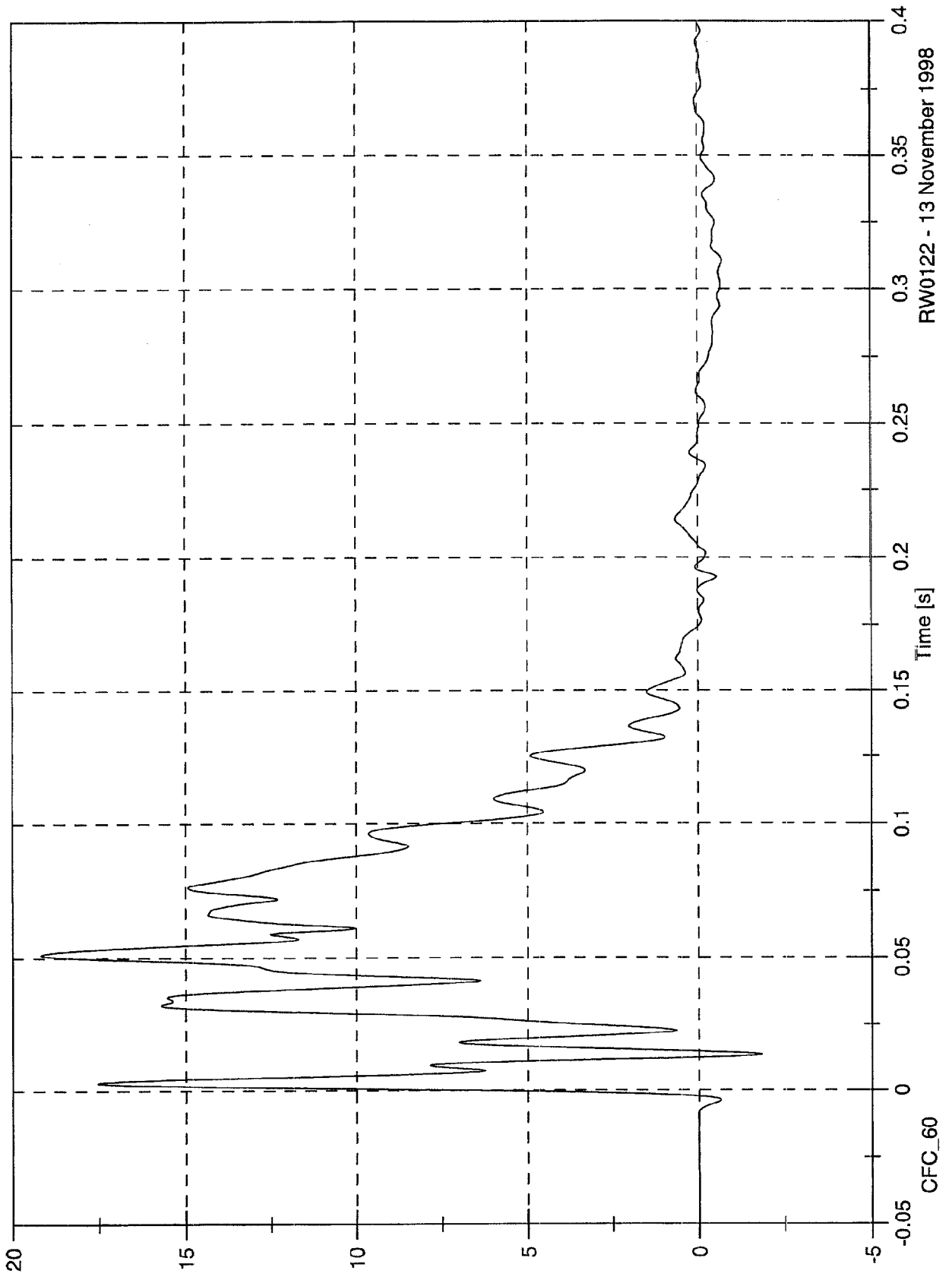
TITLE: 81 kph Rear Impact - 1998 Chevy Cavalier RW0122

CHN NAME	Unit	Max	msec	Min	msec	Filt
12 Acc 1 MDB Left Rail X	g	1.7	-40.0	-18.2	39.1	60
15 Acc 2 MDB Right Rail X	g	2.0	-40.0	-19.1	36.2	60
18 Acc 3 MDB C/G X	g	1.3	-13.0	-19.7	35.8	60
21 Acc 3 MDB C/G Y	g	6.1	10.7	-5.0	17.2	60
24 Acc 3 MDB C/G Z	g	34.4	126.2	-31.7	23.2	60
27 Acc 3 MDB C/G Resultant	g	35.8	30.8	0.1	302.4	60
28 Barrier Load Cell [N, CFC_60]	TL] [	58729.4	19.1	-4860.1	324.6	60
29 Barrier Load Cell [N, CFC_60]	TR] [	28237.0	42.7	-24530.0	3.1	60
30 Barrier Load Cell [N, CFC_60]	CL] [	79318.8	36.7	-423.0	-7.6	60
31 Barrier Load Cell [N, CFC_60]	BL] [	54760.6	5.0	-4808.7	212.8	60
32 Barrier Load Cell [N, CFC_60]	BR] [	24479.0	4.6	-17733.8	23.8	60
33 Barrier Load Cell Sum	N	199401.0	36.7	-2017.2	-7.8	60

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 19.2 [g] at 0.051 [s]
Min: -1.8 [g] at 0.013 [s]

Acc #1 LF Rocker Panel X

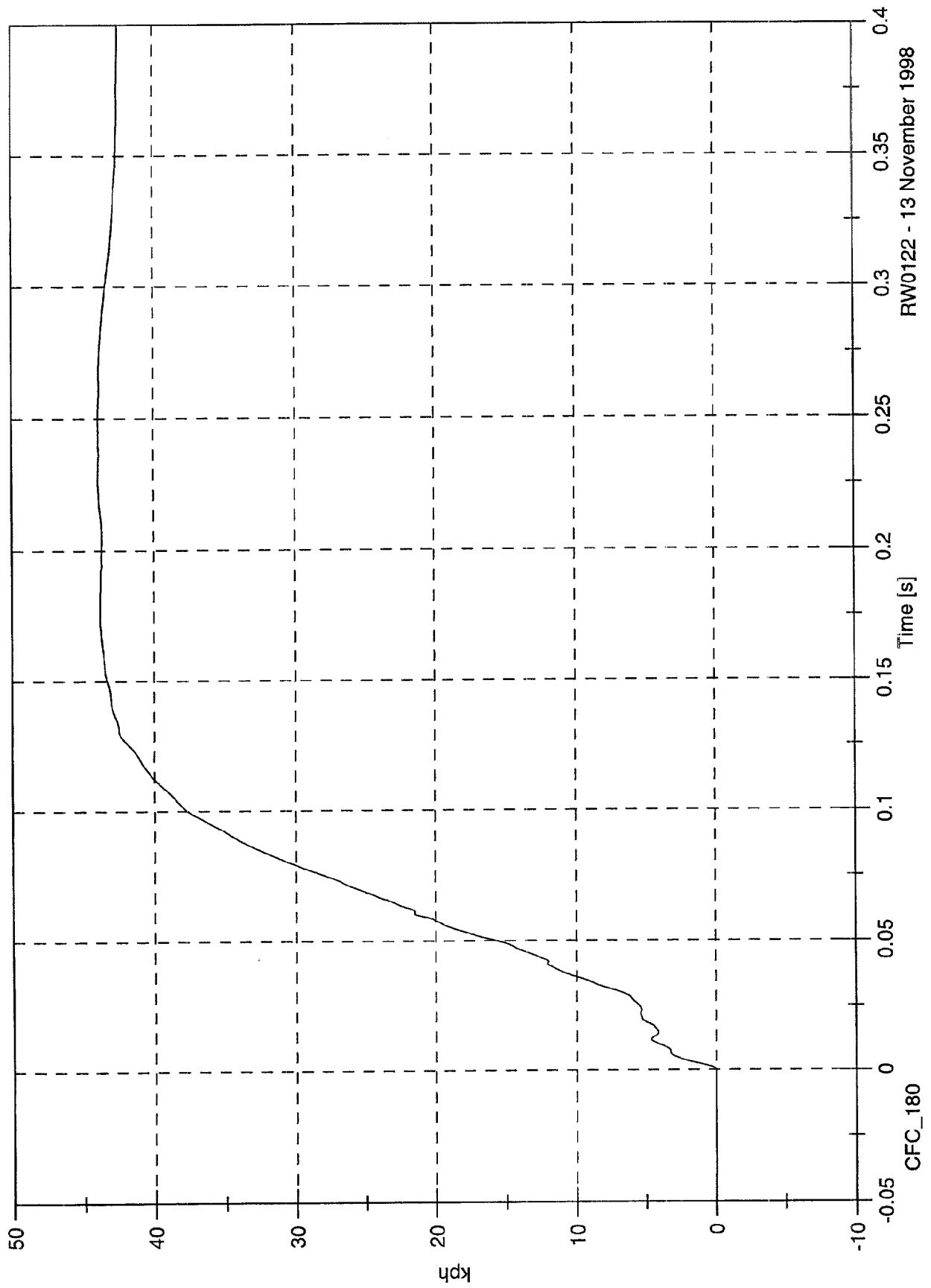


RW0122 - 13 November 1998

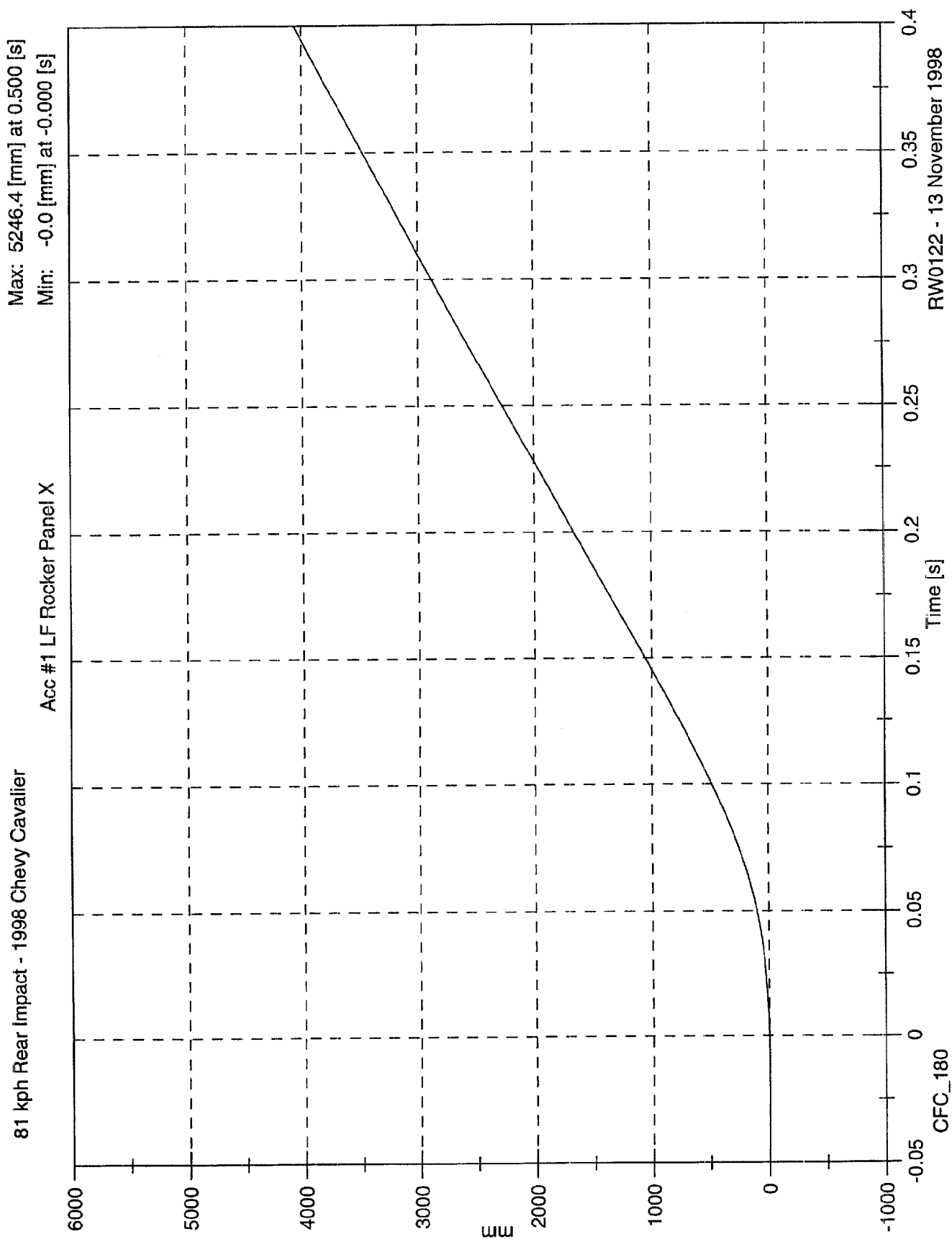
81 kph Rear Impact - 1998 Chevy Cavalier

Max: 43.9 [kph] at 0.226 [s]
Min: -0.0 [kph] at -0.000 [s]

Acc #1 LF Rocker Panel X



RW0122 - 13 November 1998



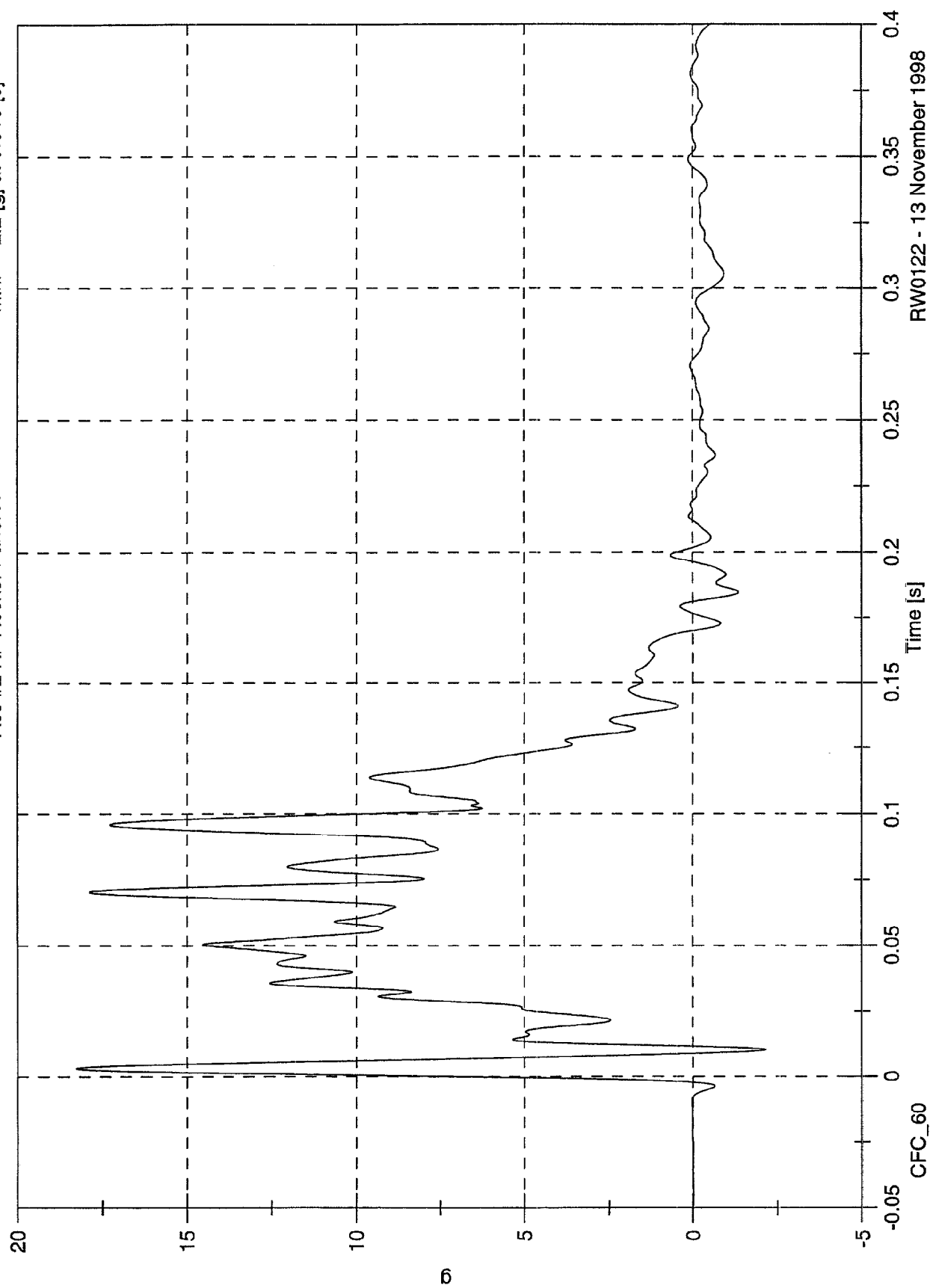
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

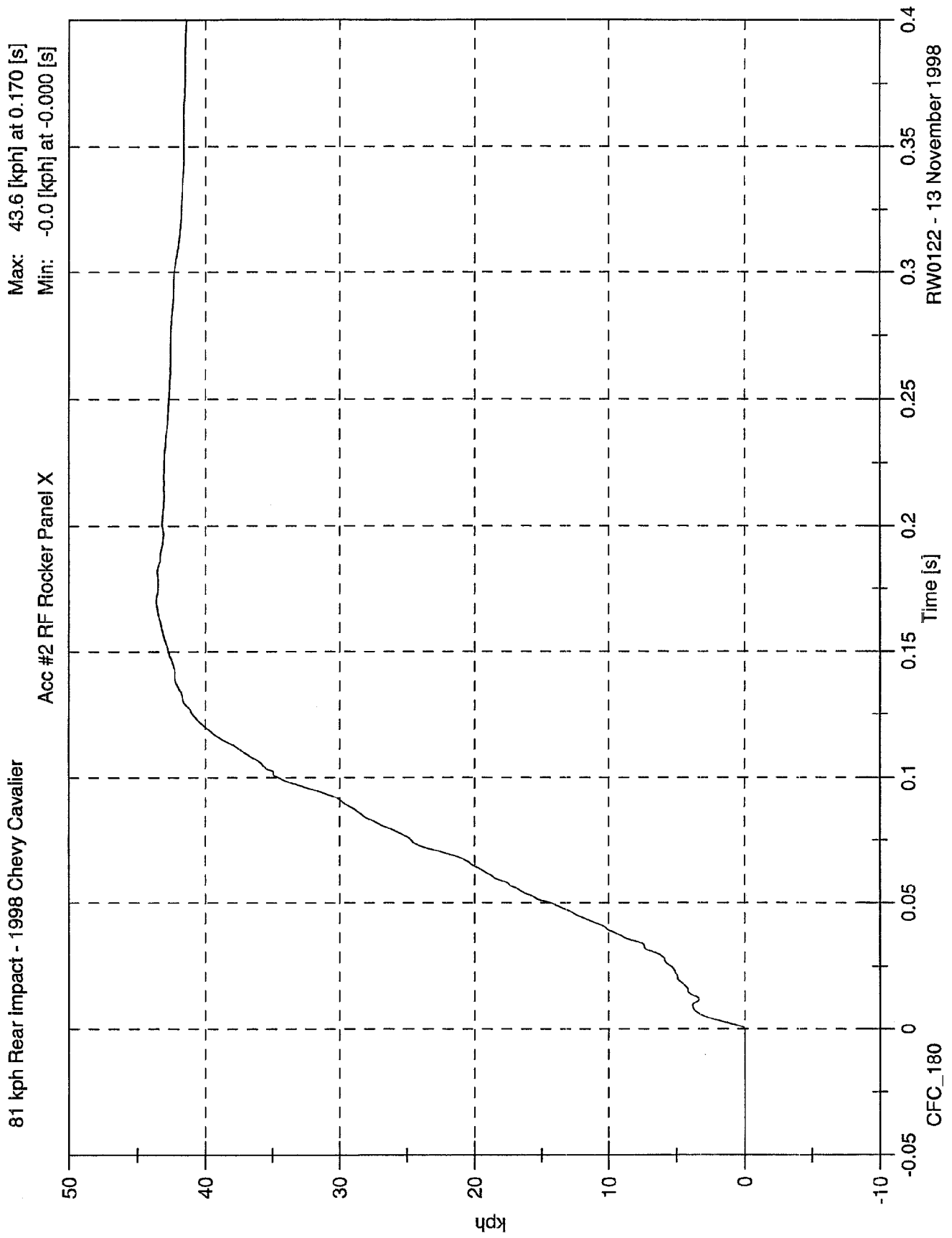
Max: 18.3 [g] at 0.003 [s]

Min: -2.2 [g] at 0.010 [s]

Acc #2 RF Rocker Panel X



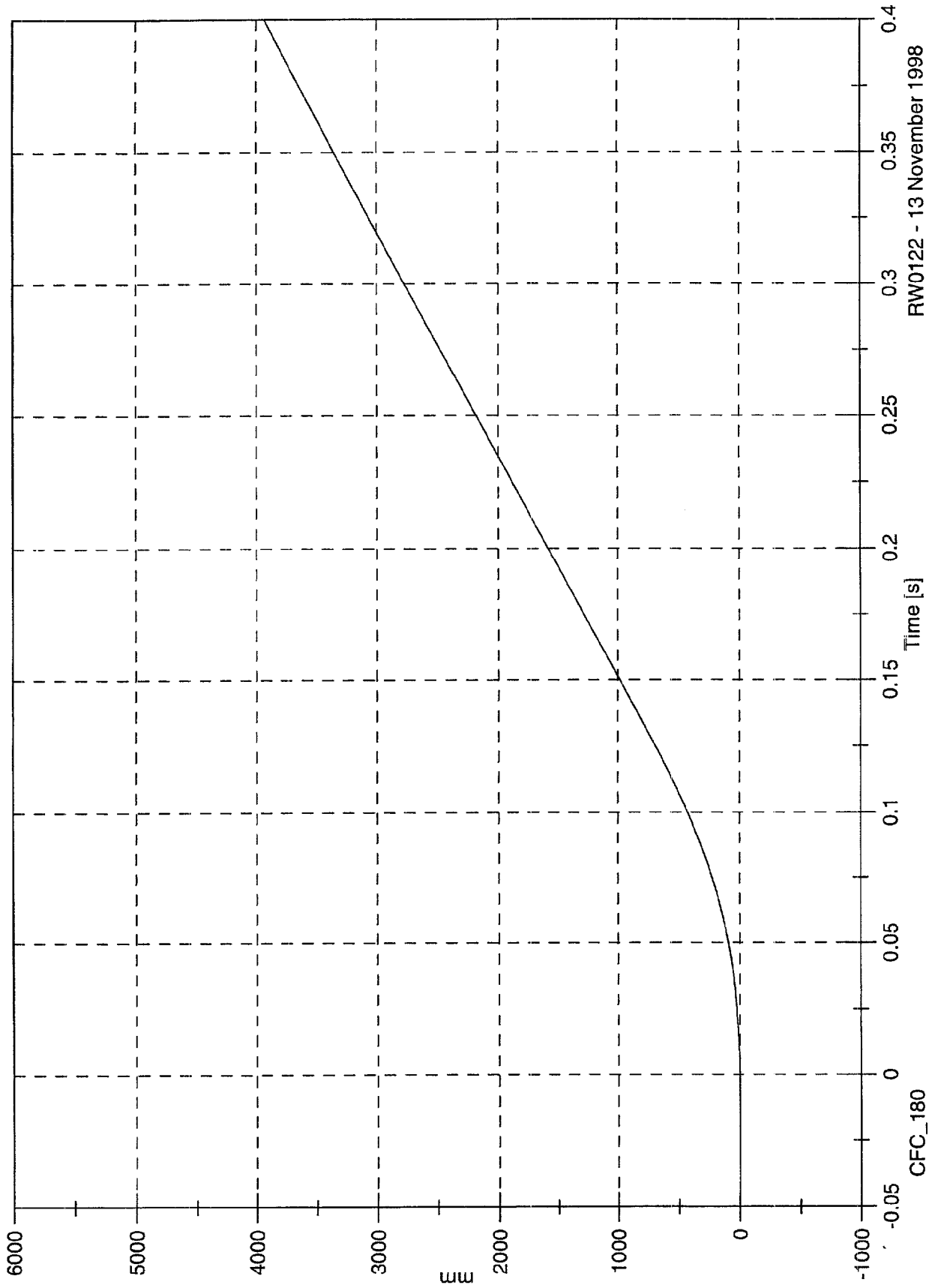
RW0122 - 13 November 1998



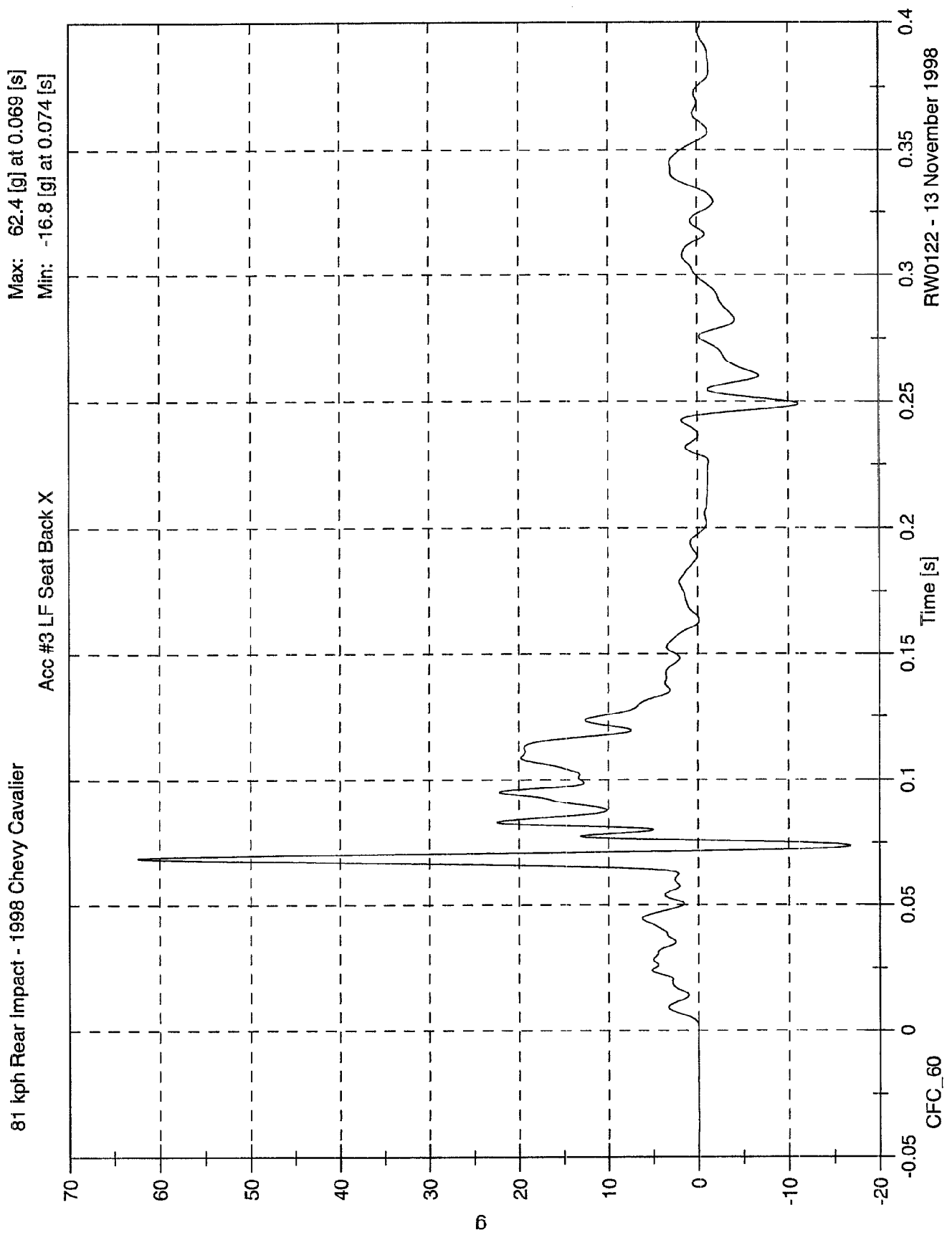
81 kph Rear Impact - 1998 Chevy Cavalier

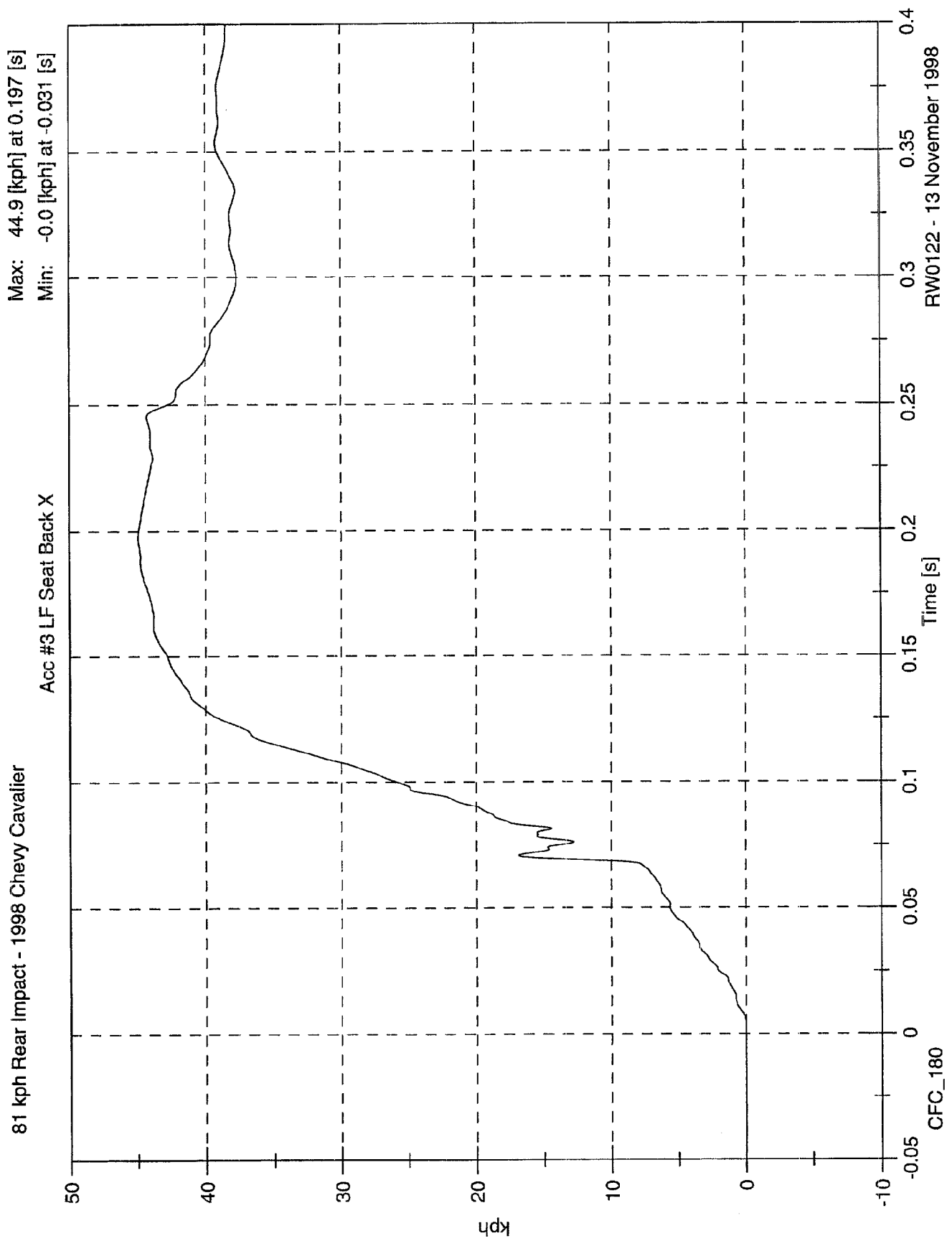
Max: 5067.7 [mm] at 0.500 [s]
Min: -0.0 [mm] at -0.000 [s]

Acc #2 RF Rocker Panel X



RW0122 - 13 November 1998



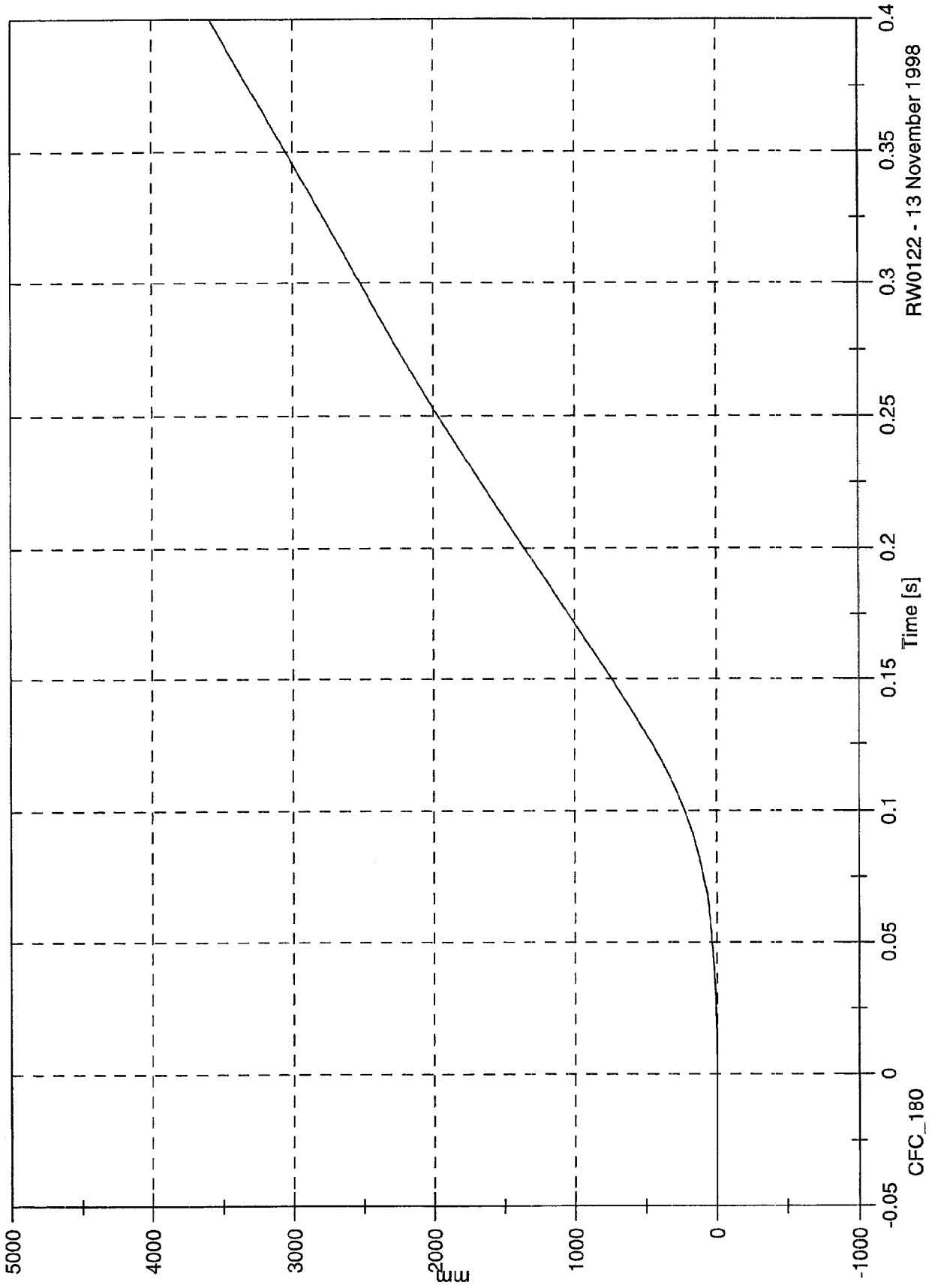


81 kph Rear Impact - 1998 Chevy Cavalier

Acc #3 LF Seat Back X

Max: 4642.6 [mm] at 0.500 [s]

Min: -0.0 [mm] at 0.000 [s]

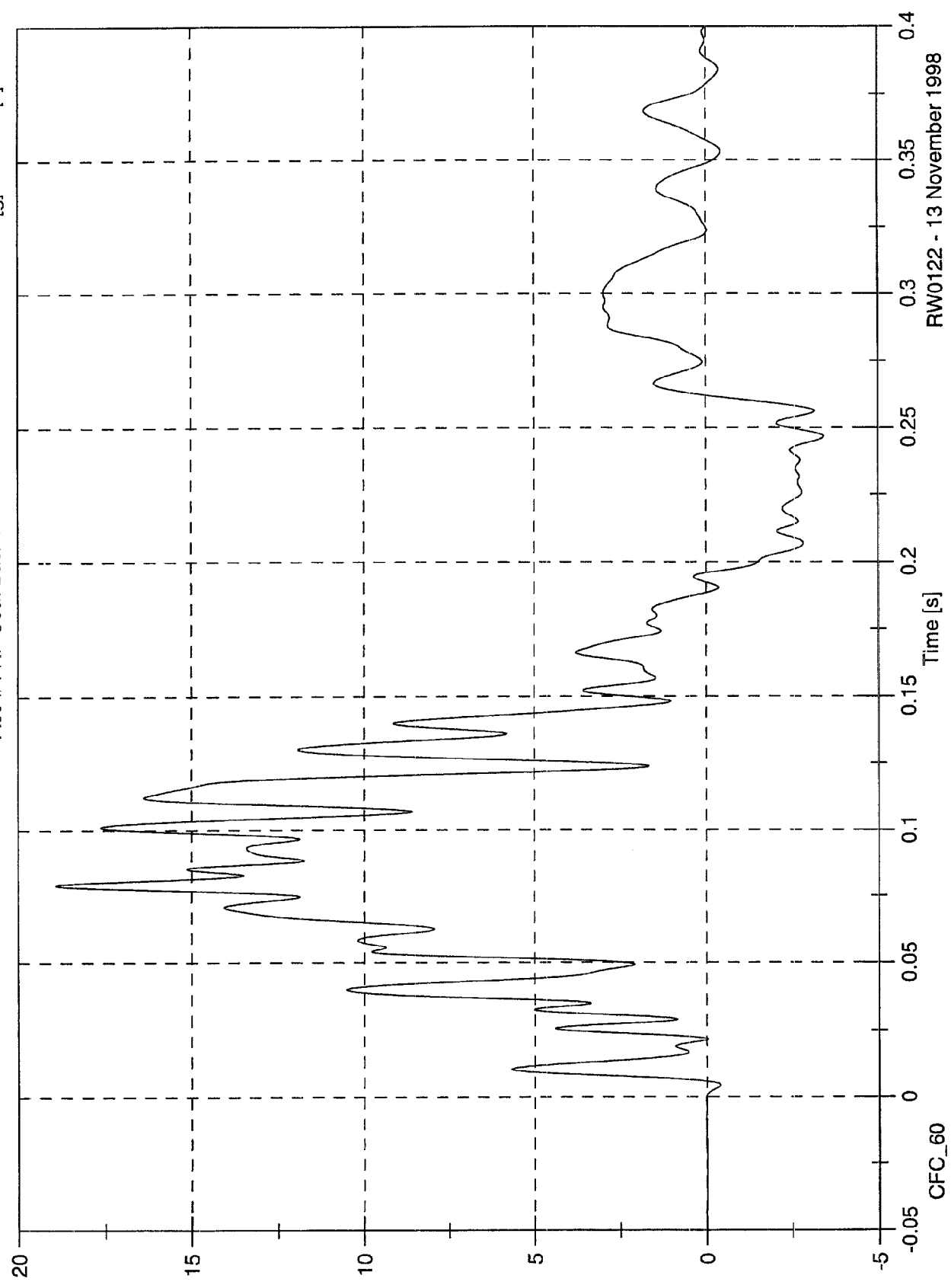


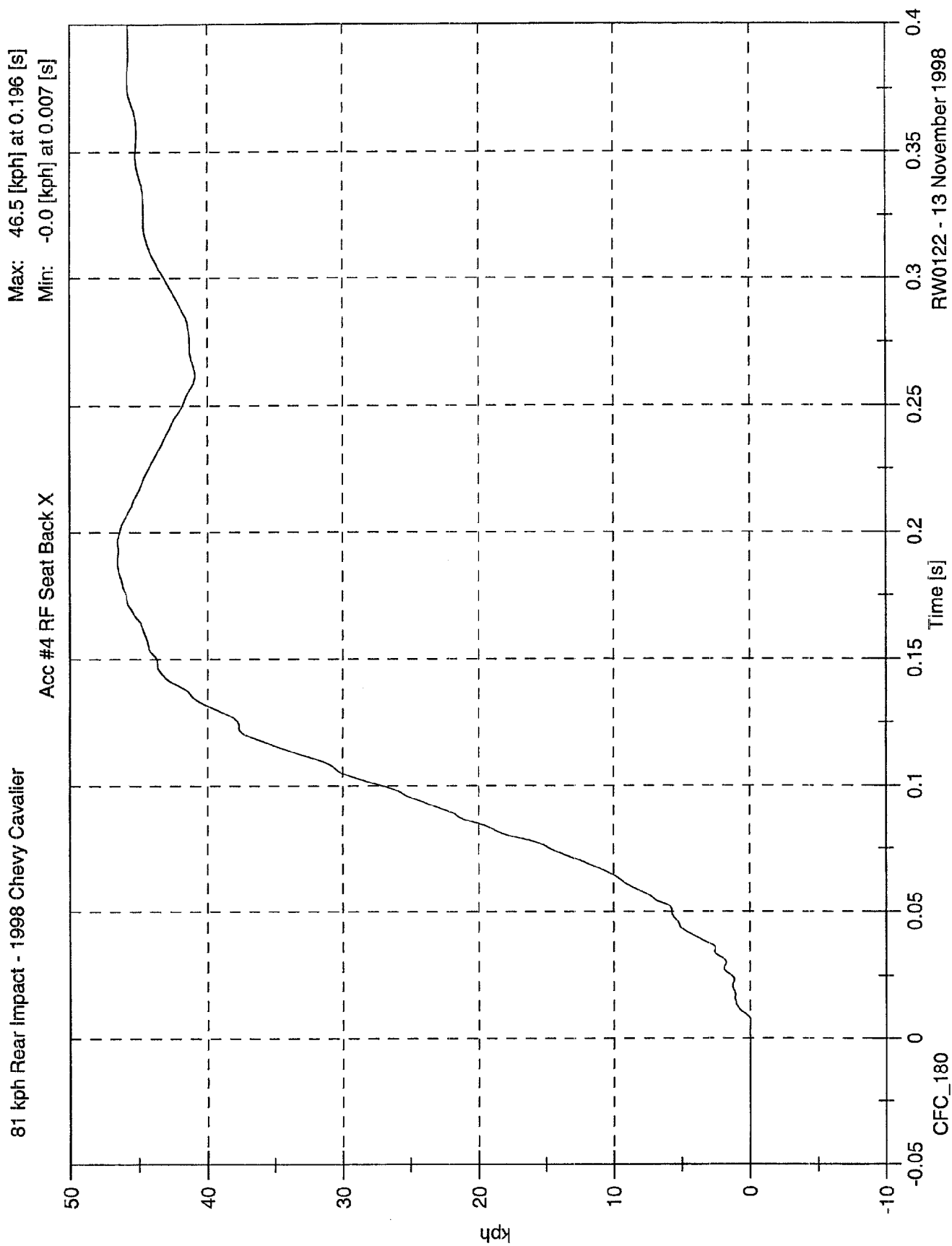
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 18.9 [g] at 0.079 [s]
Min: -3.4 [g] at 0.247 [s]

Acc #4 RF Seat Back X

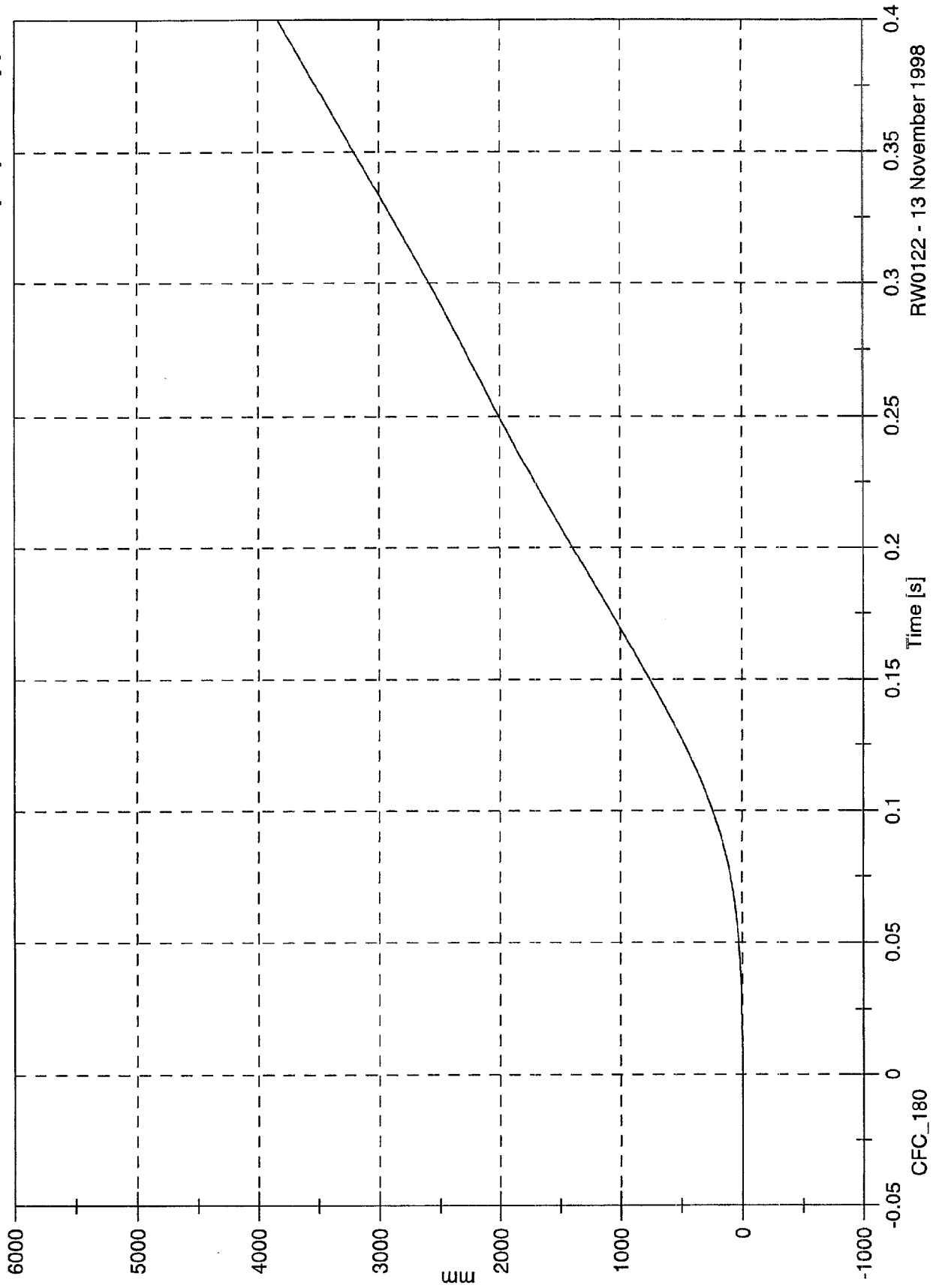




81 kph Rear Impact - 1998 Chevy Cavalier

Acc #4 RF Seat Back X

Max: 5104.1 [mm] at 0.500 [s]
Min: -0.0 [mm] at 0.008 [s]

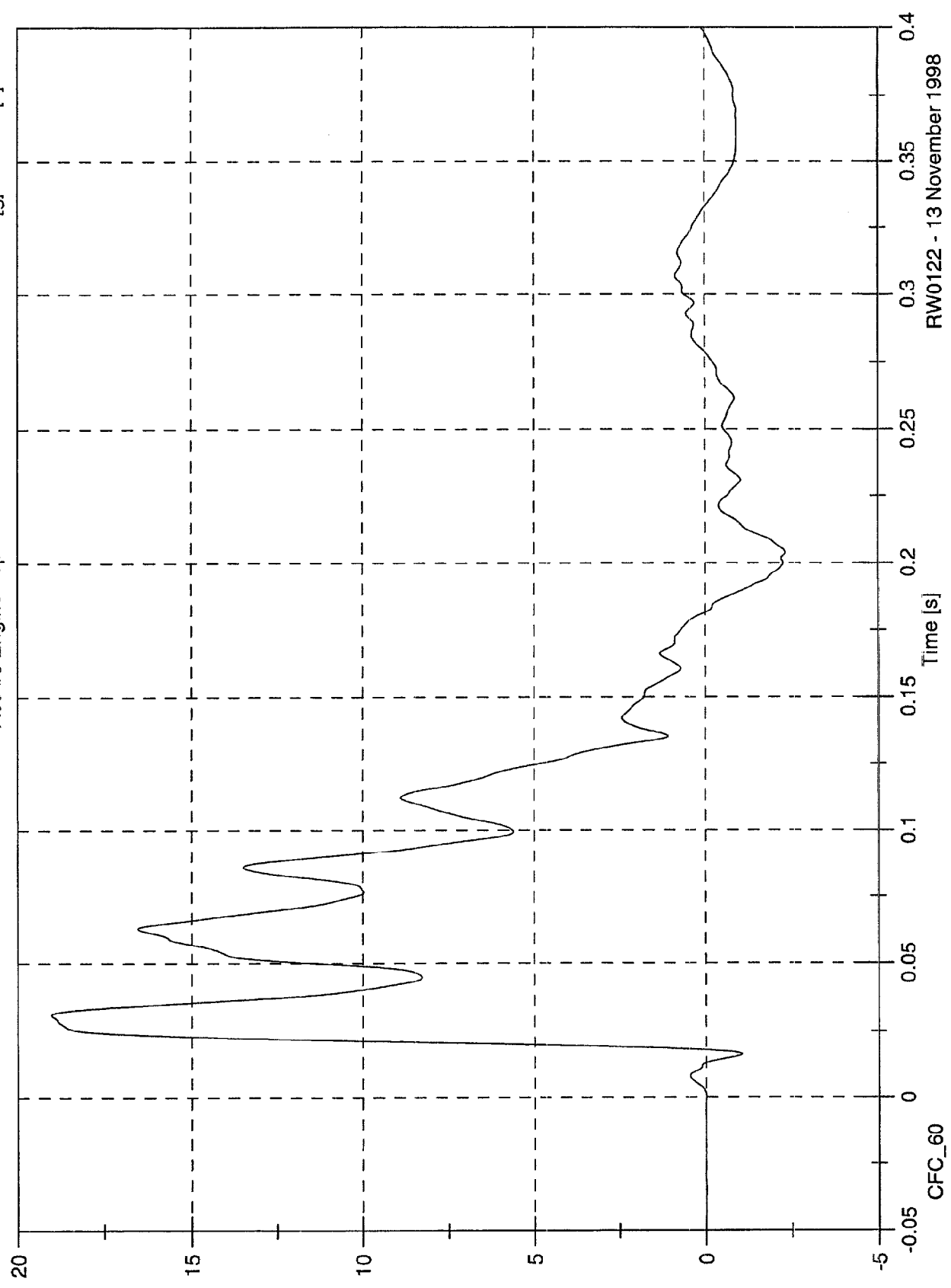


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 19.0 [g] at 0.031 [s]
Min: -2.3 [g] at 0.204 [s]

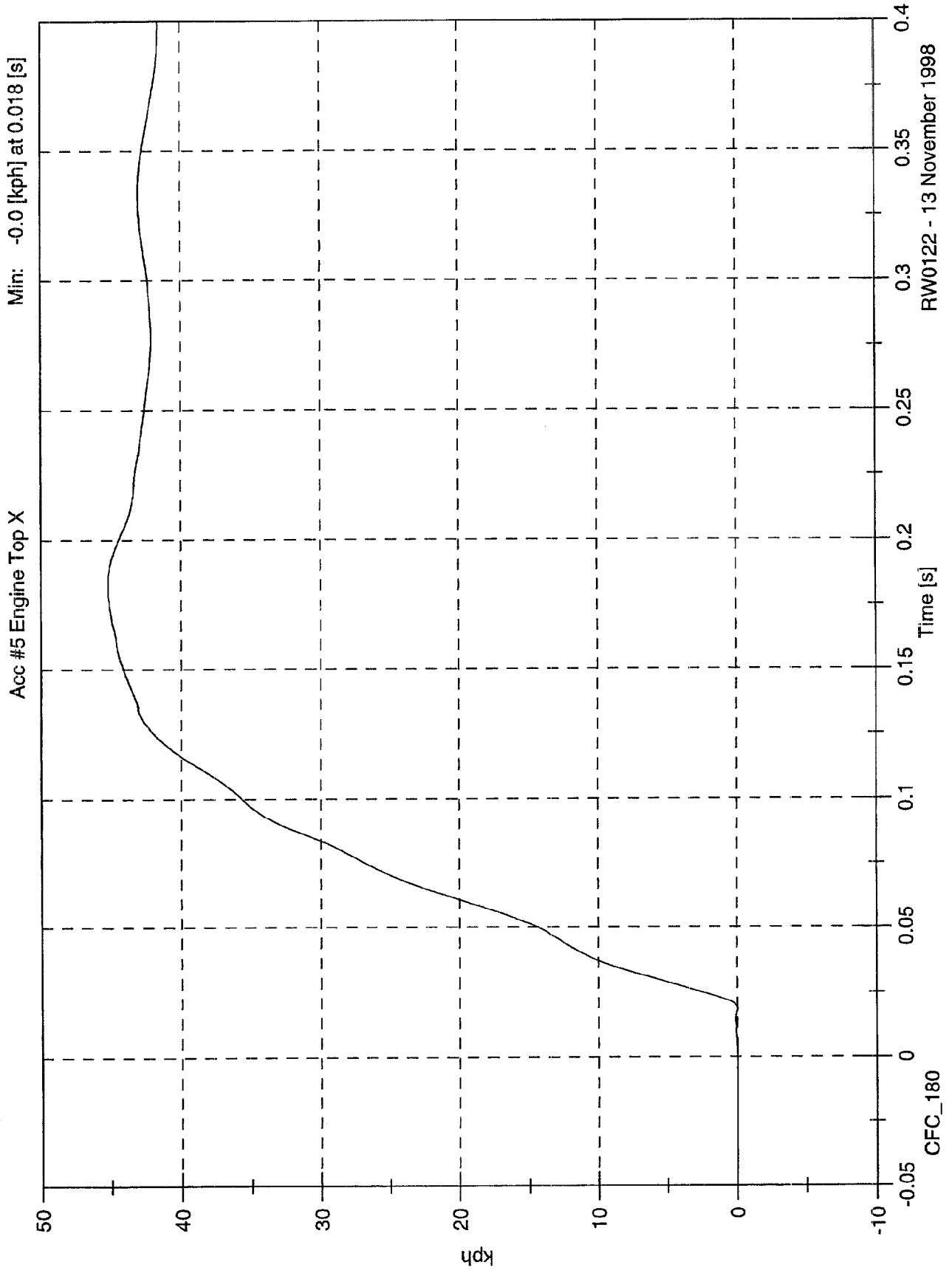
Acc #5 Engine Top X



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 45.2 [kph] at 0.181 [s]
Min: -0.0 [kph] at 0.018 [s]

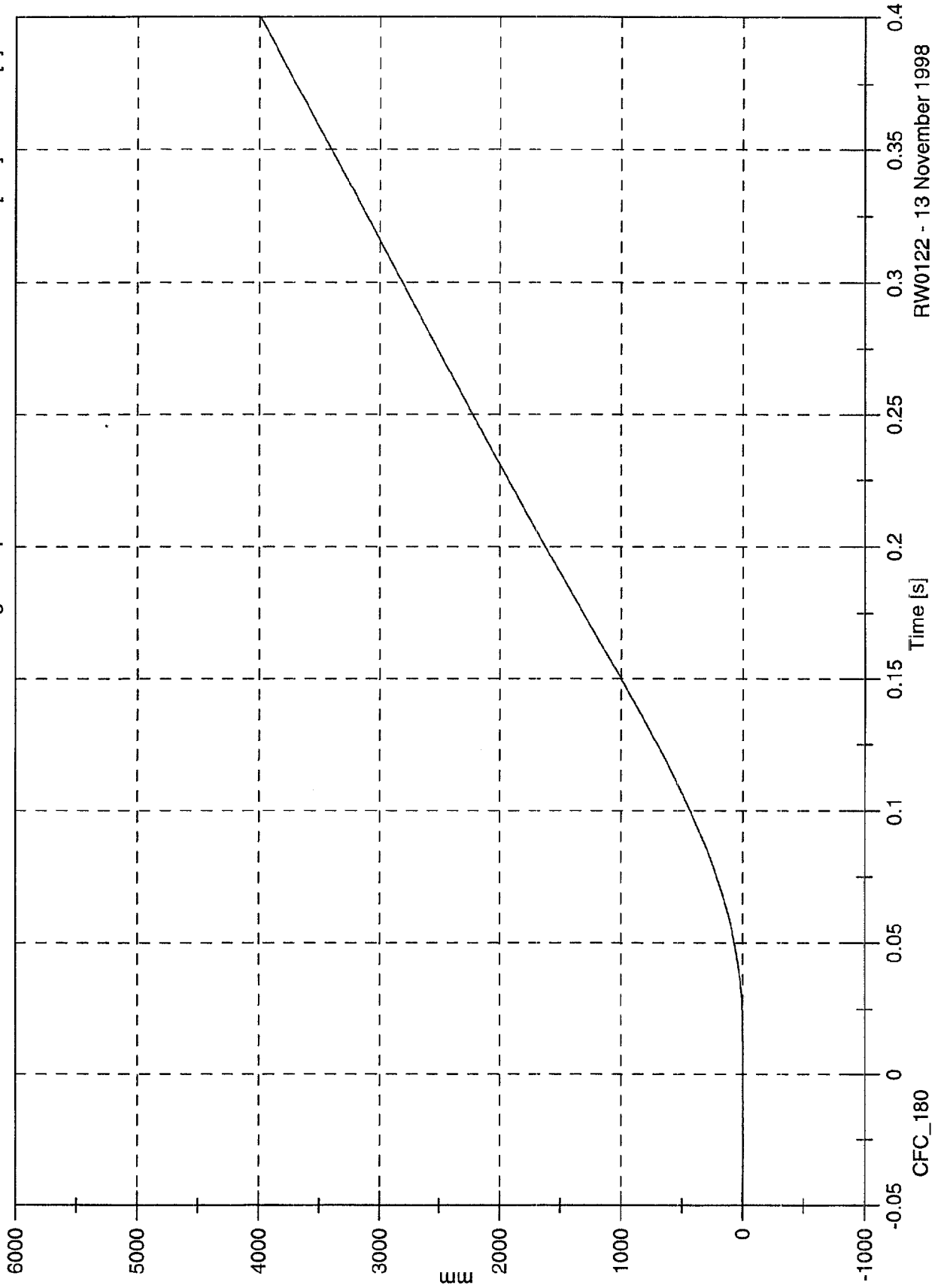


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Acc #5 Engine Top X

Max: 5137.0 [mm] at 0.500 [s]
Min: -0.0 [mm] at 0.001 [s]

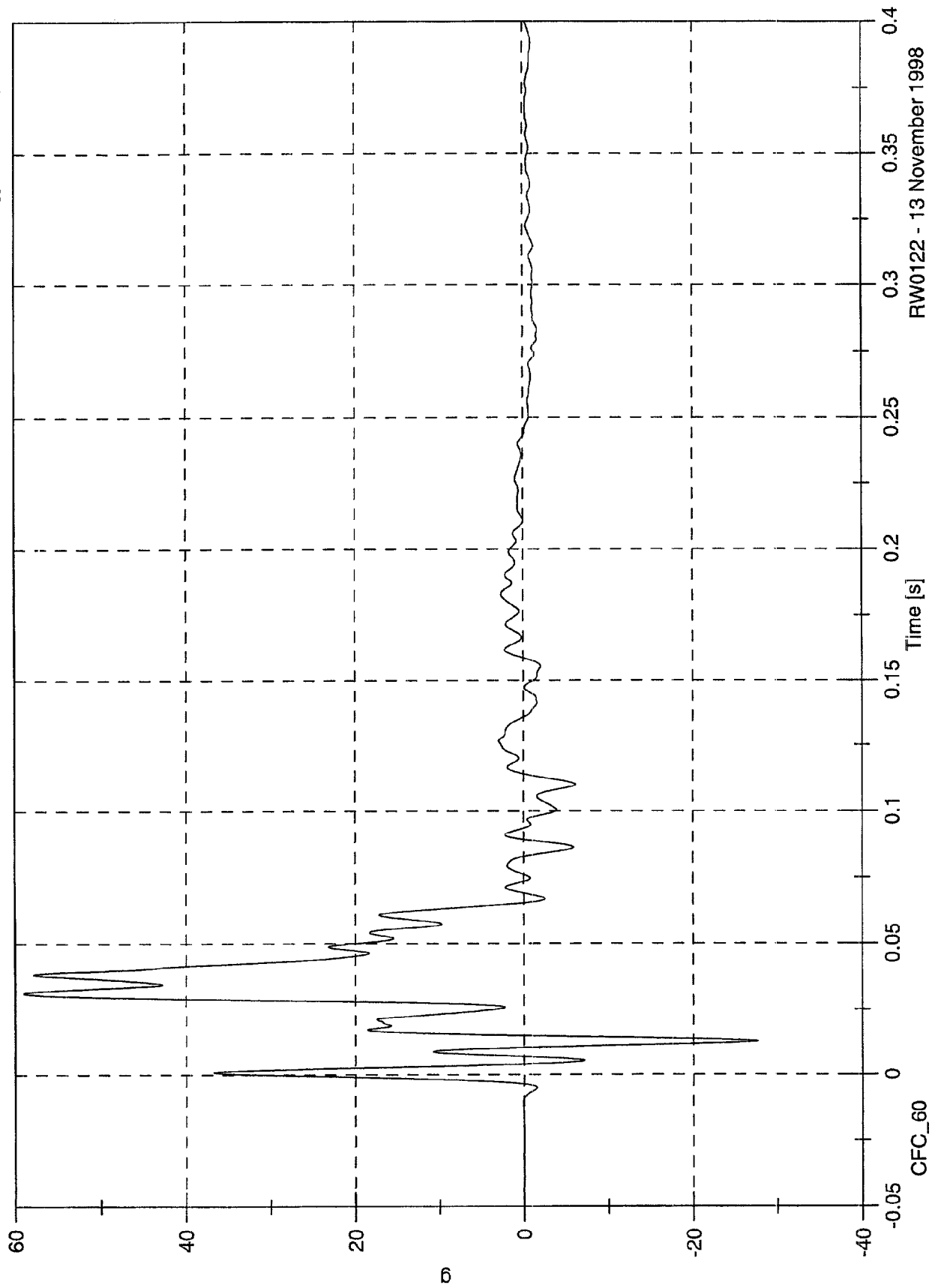


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 59.0 [g] at 0.031 [s]
Min: -27.7 [g] at 0.013 [s]

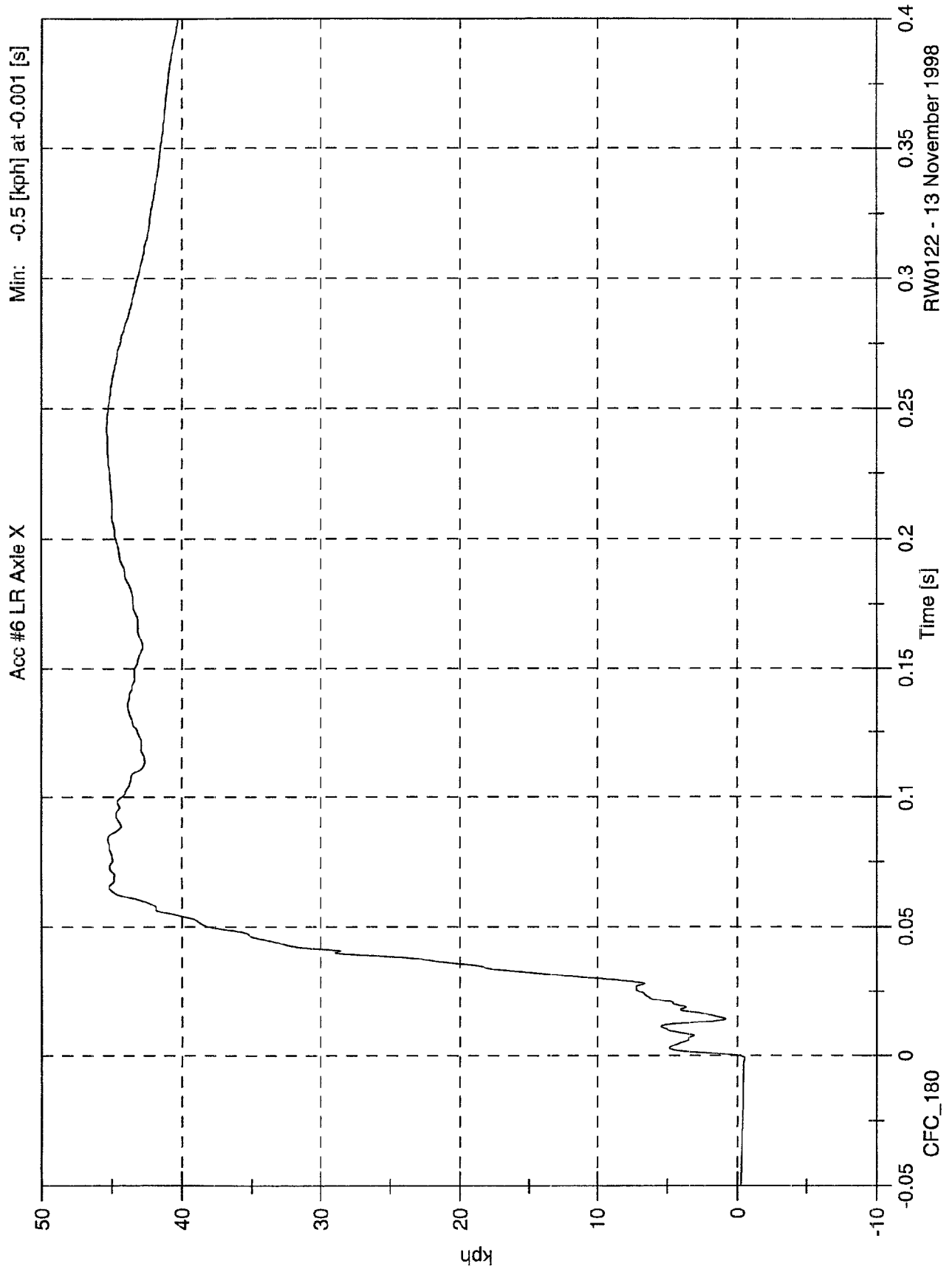
Acc #6 LR Axle X



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 45.4 [kph] at 0.242 [s]
Min: -0.5 [kph] at -0.001 [s]

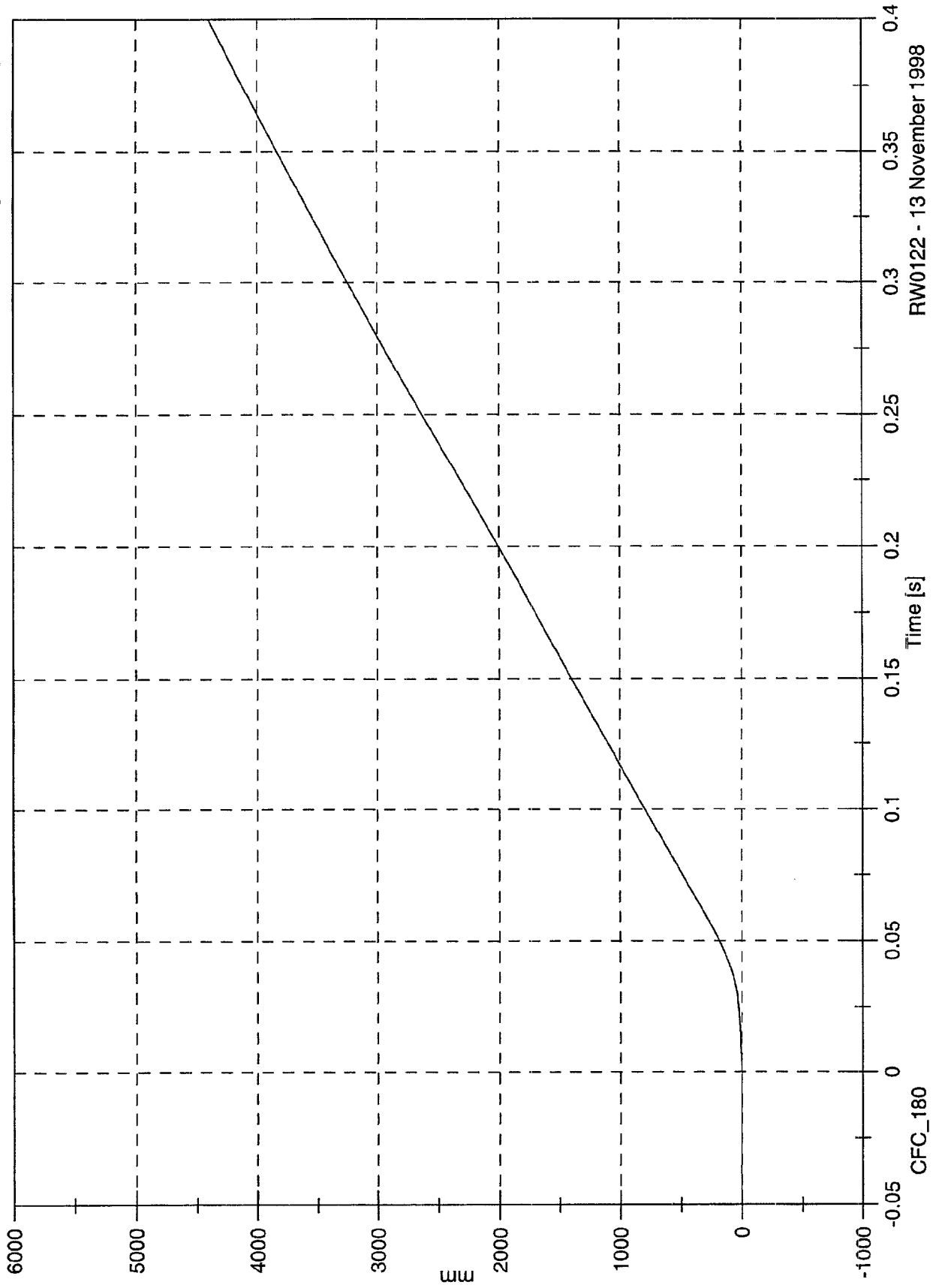


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 5513.3 [mm] at 0.500 [s]
Min: -0.0 [mm] at -0.000 [s]

Acc #6 LR Axle X

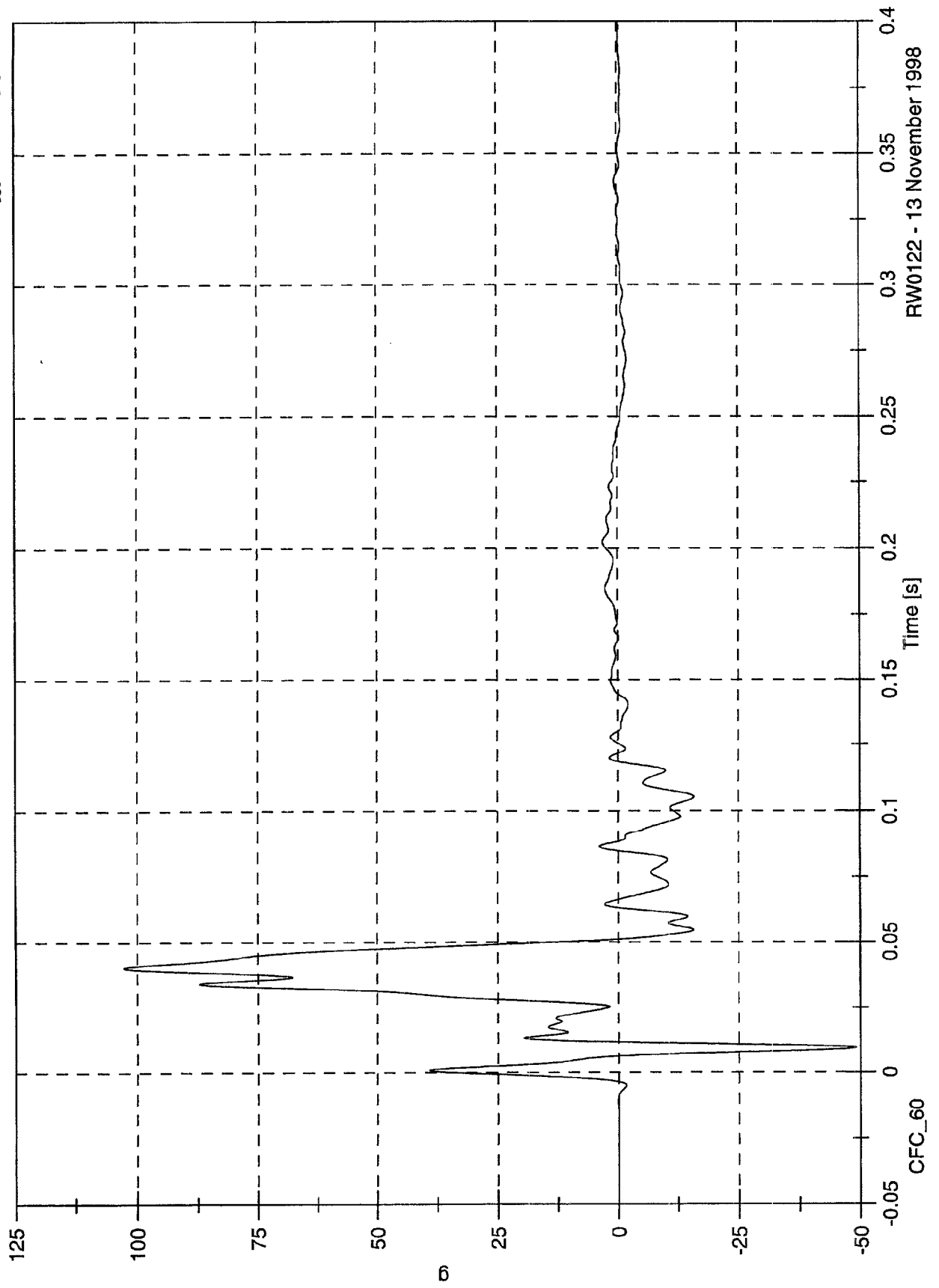


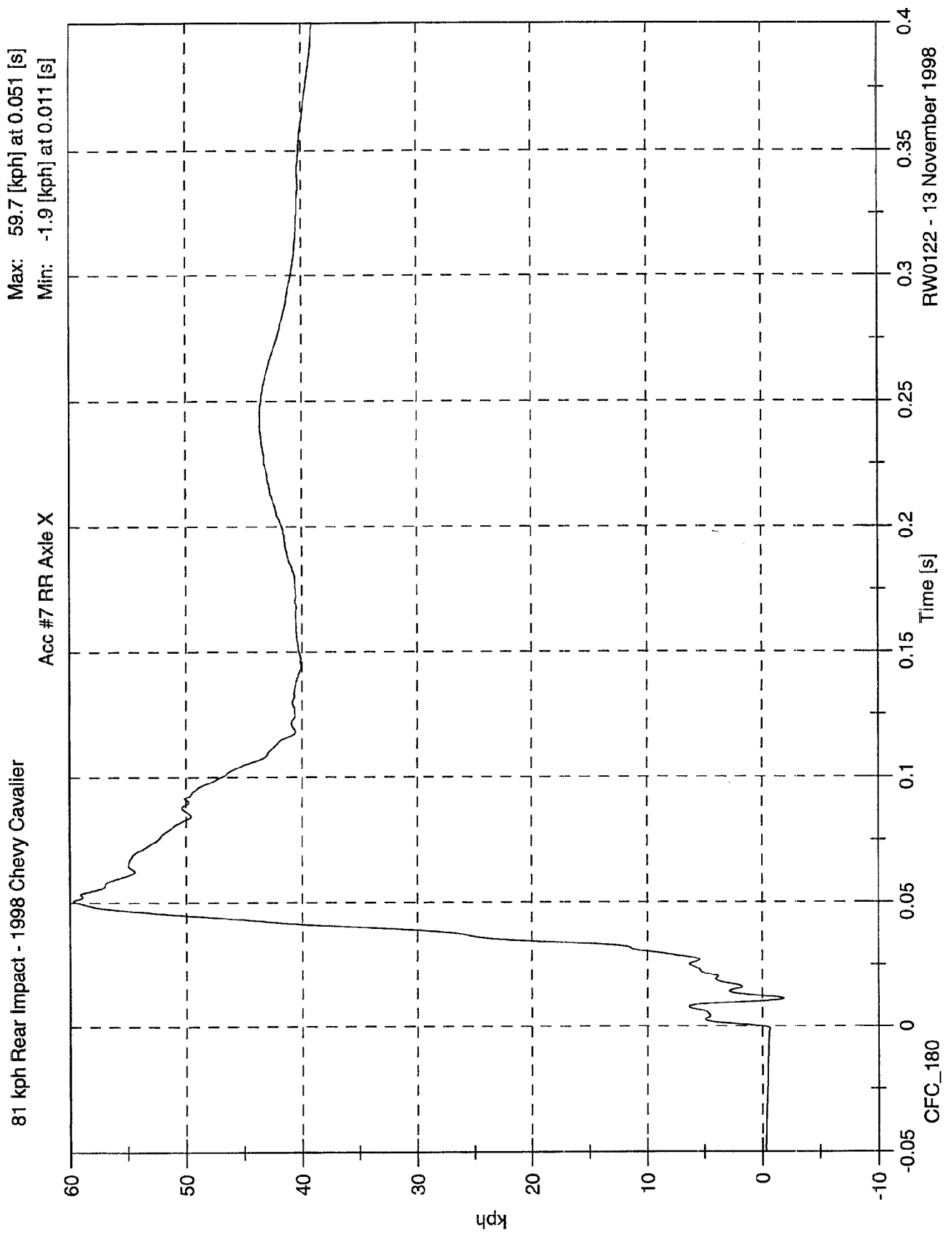
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 102.7 [g] at 0.040 [s]
Min: -49.0 [g] at 0.009 [s]

Acc #7 R/R Axle X

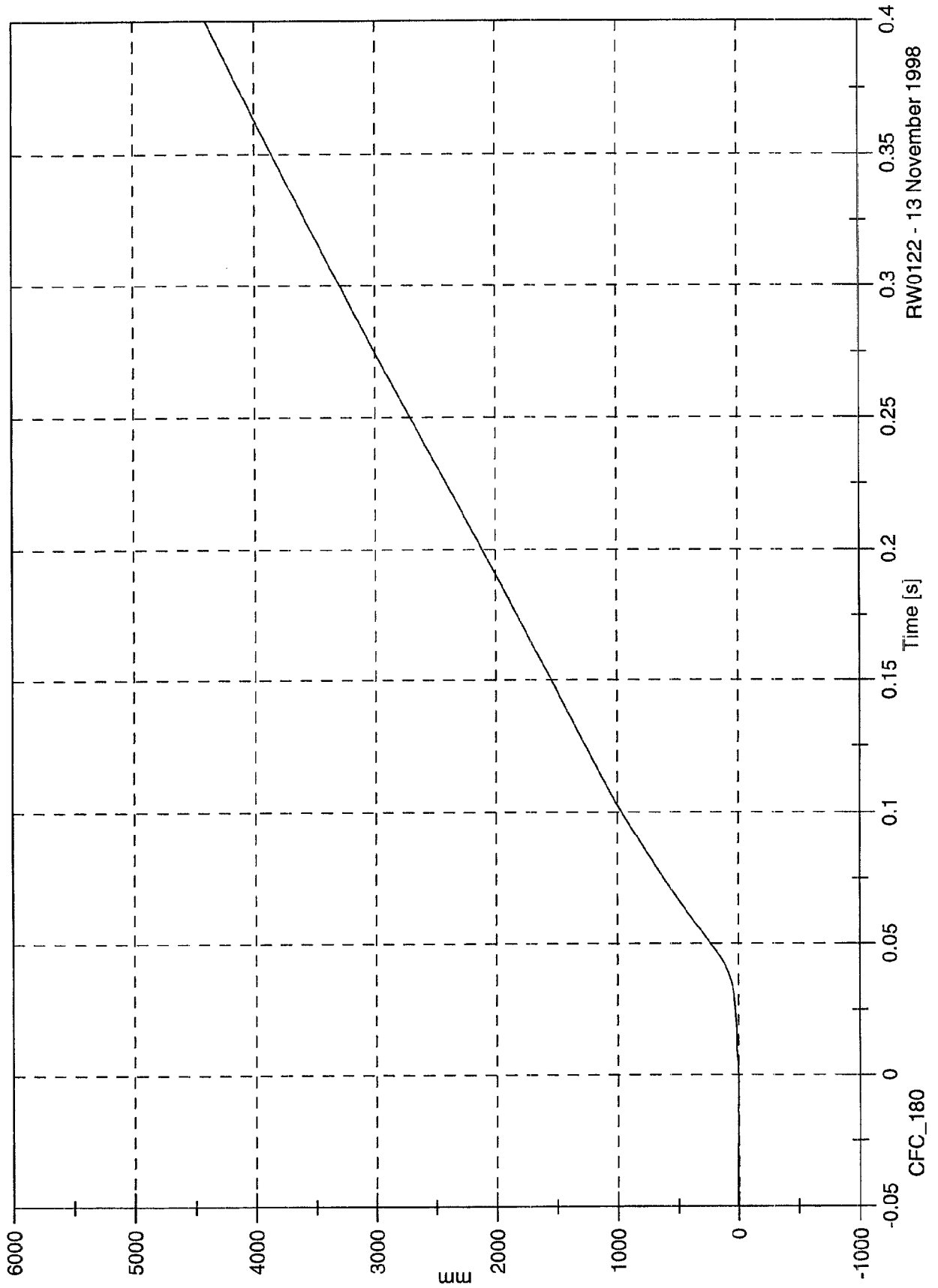




81 kph Rear Impact - 1998 Chevy Cavalier

Max: 5454.9 [mm] at 0.500 [s]
Min: -0.0 [mm] at -0.000 [s]

Acc #7 RR Axle X



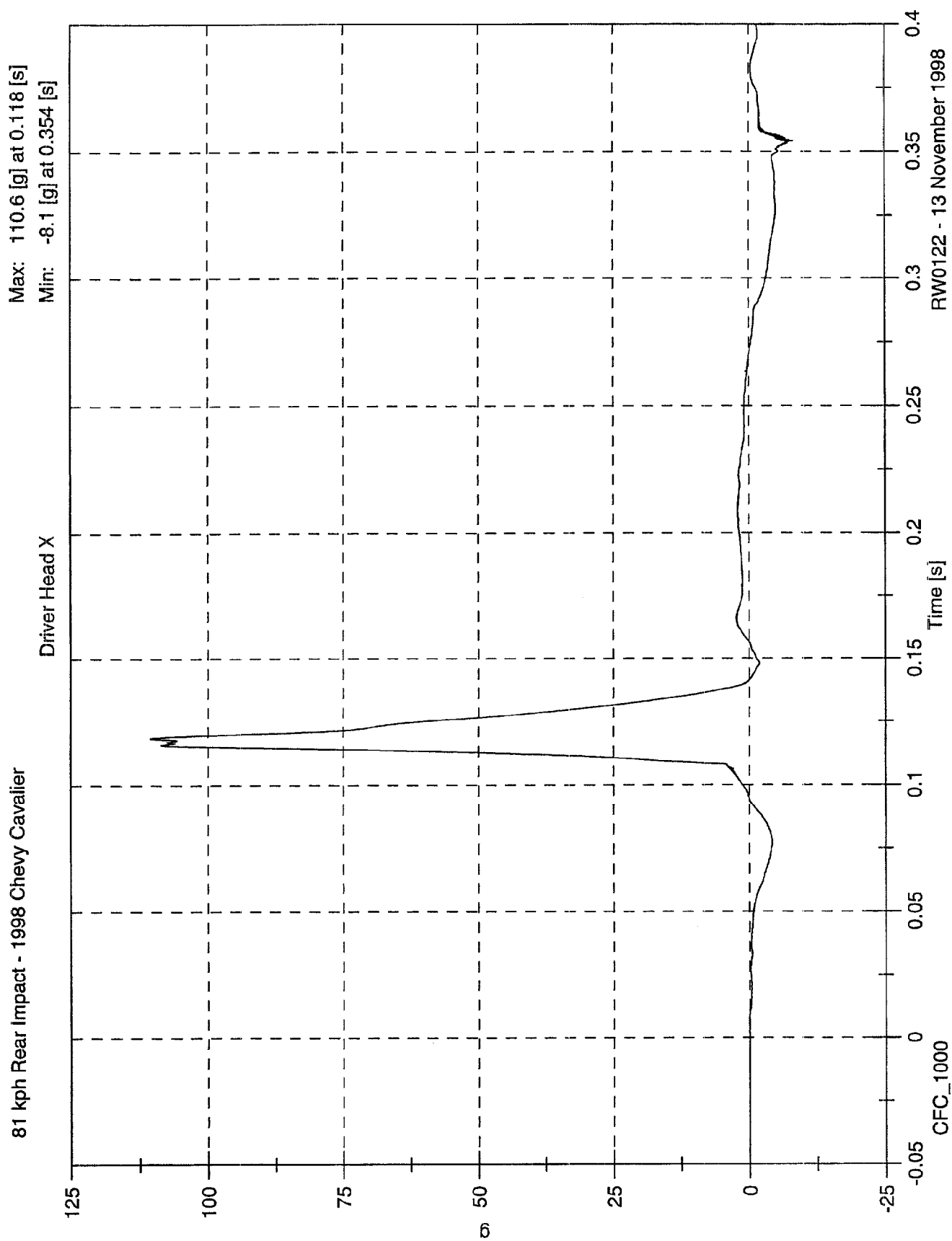
RW0122 - 13 November 1998

TEST NO. RW0122

VEHICLE 1 OCCUPANTS

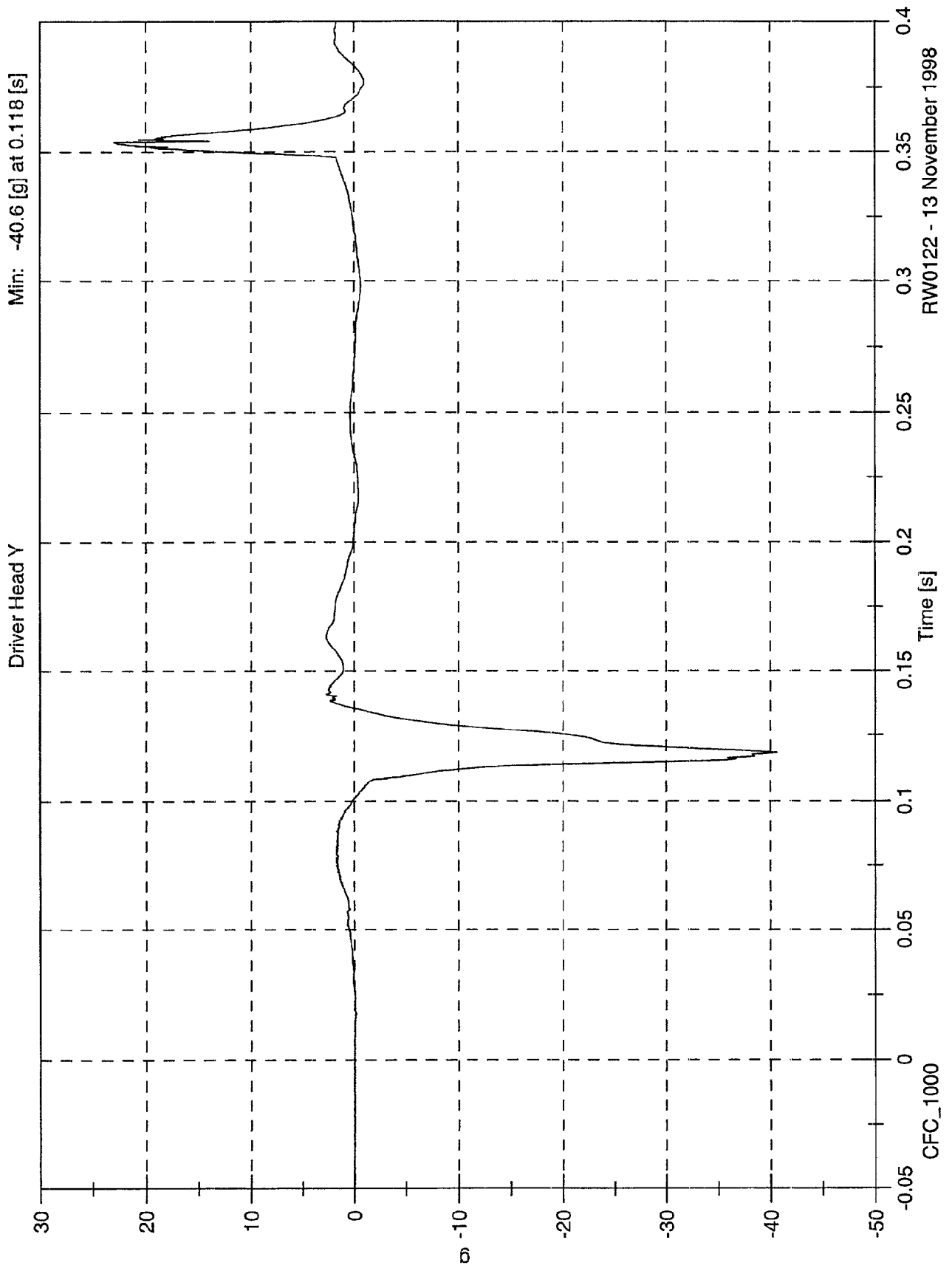
SAE FILTER CHANNEL CLASS

Head Accelerations	1000
Chest Accelerations	180
Chest Compression	180
Pelvic Accelerations	1000
Upper Neck Forces	1000
Upper Neck Moments	600
Femur Forces	600



81 kph Rear Impact - 1998 Chevy Cavalier

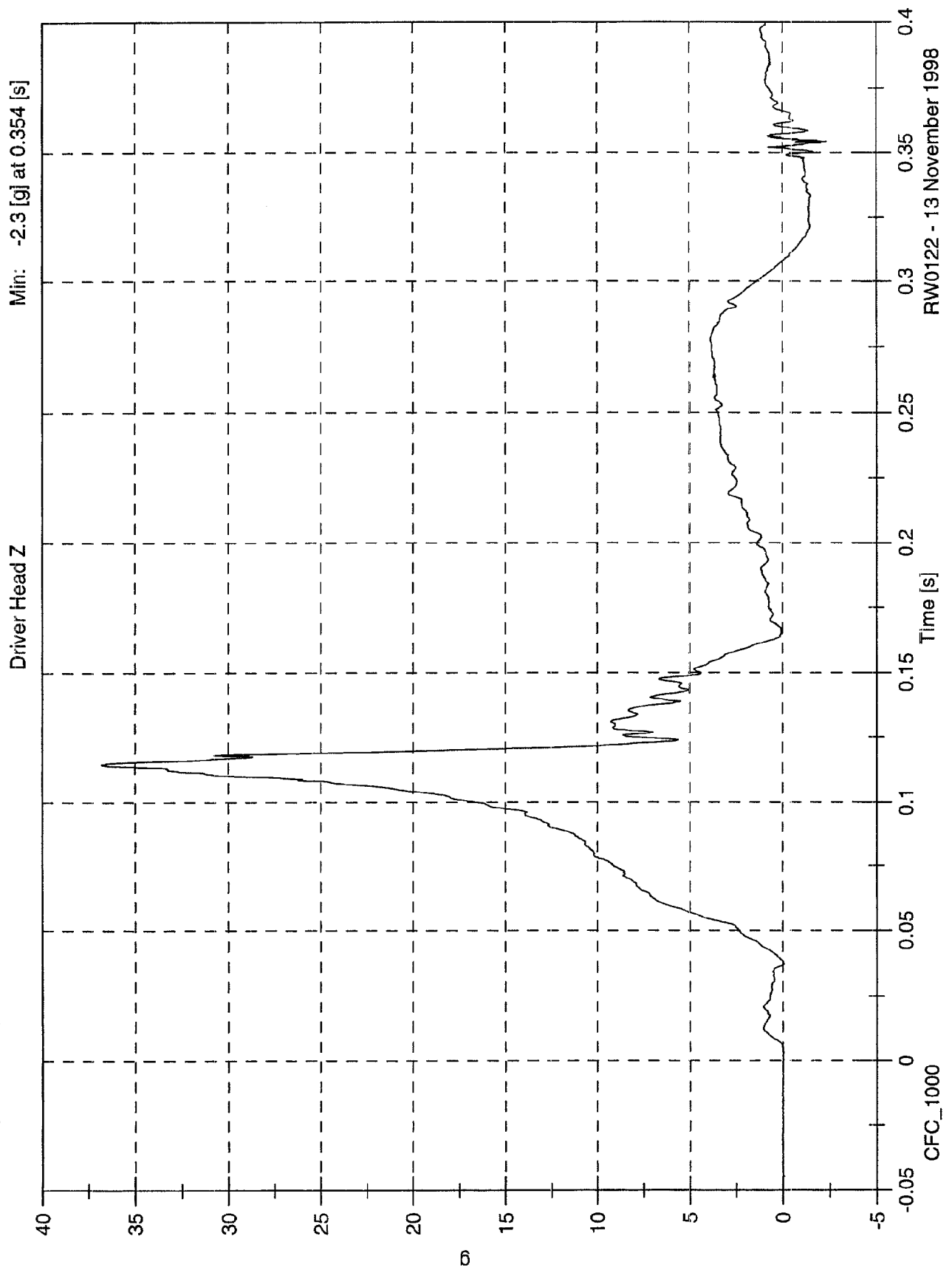
Max: 23.0 [g] at 0.354 [s]
 Min: -40.6 [g] at 0.118 [s]



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 36.8 [g] at 0.115 [s]
Min: -2.3 [g] at 0.354 [s]



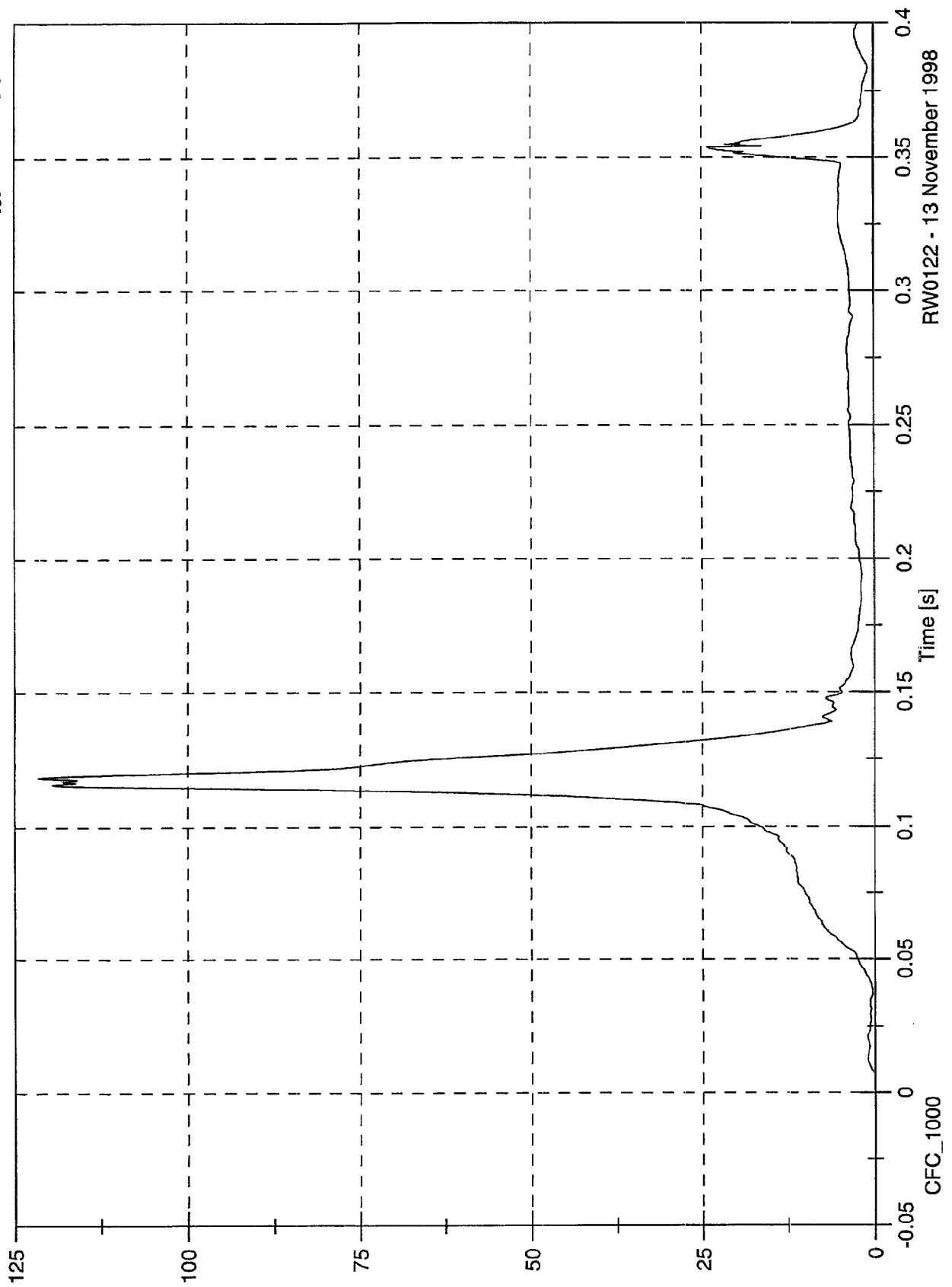
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

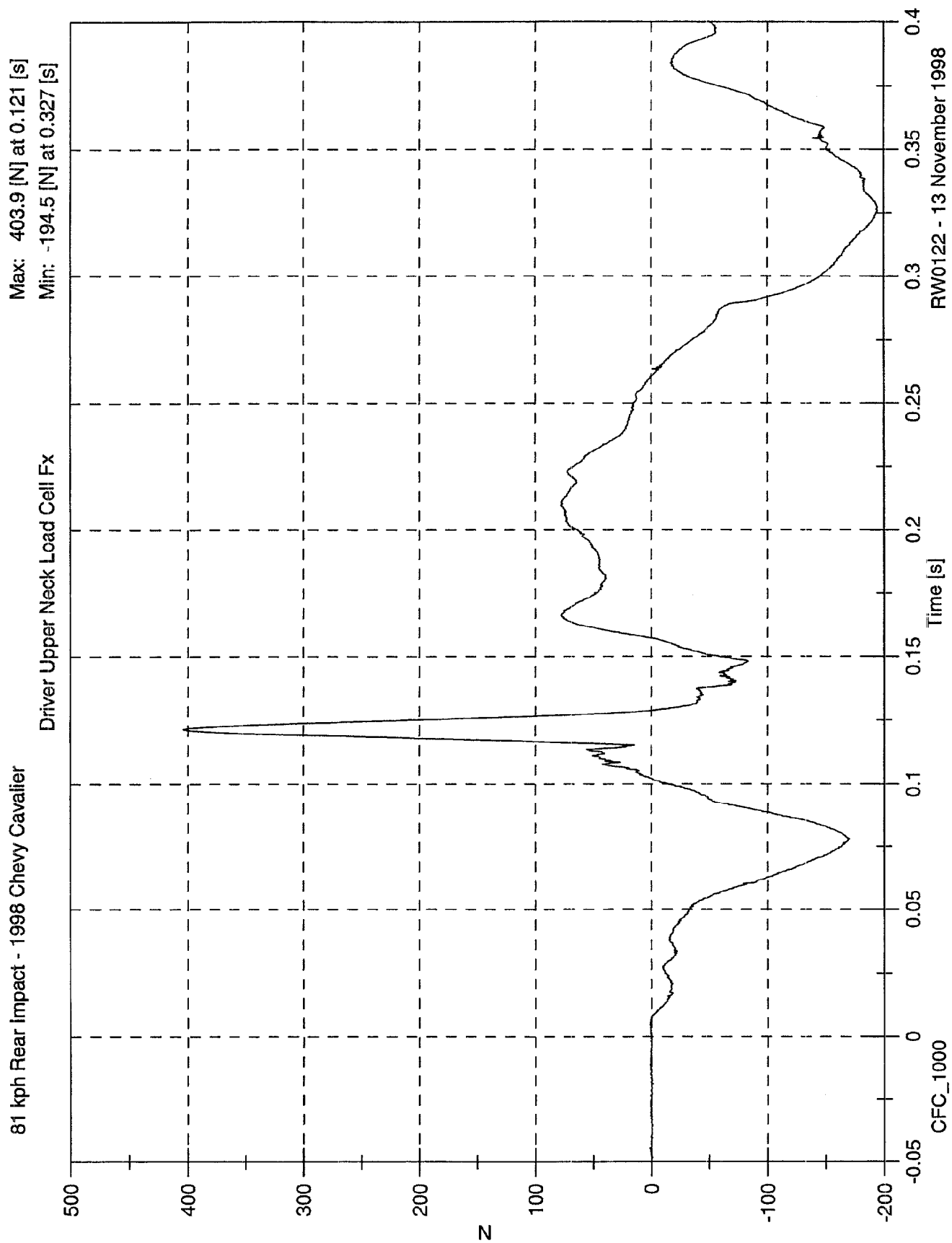
Max: 121.6 [g] at 0.118 [s]

Min: 0.0 [g] at -0.075 [s]

Driver Head Resultant



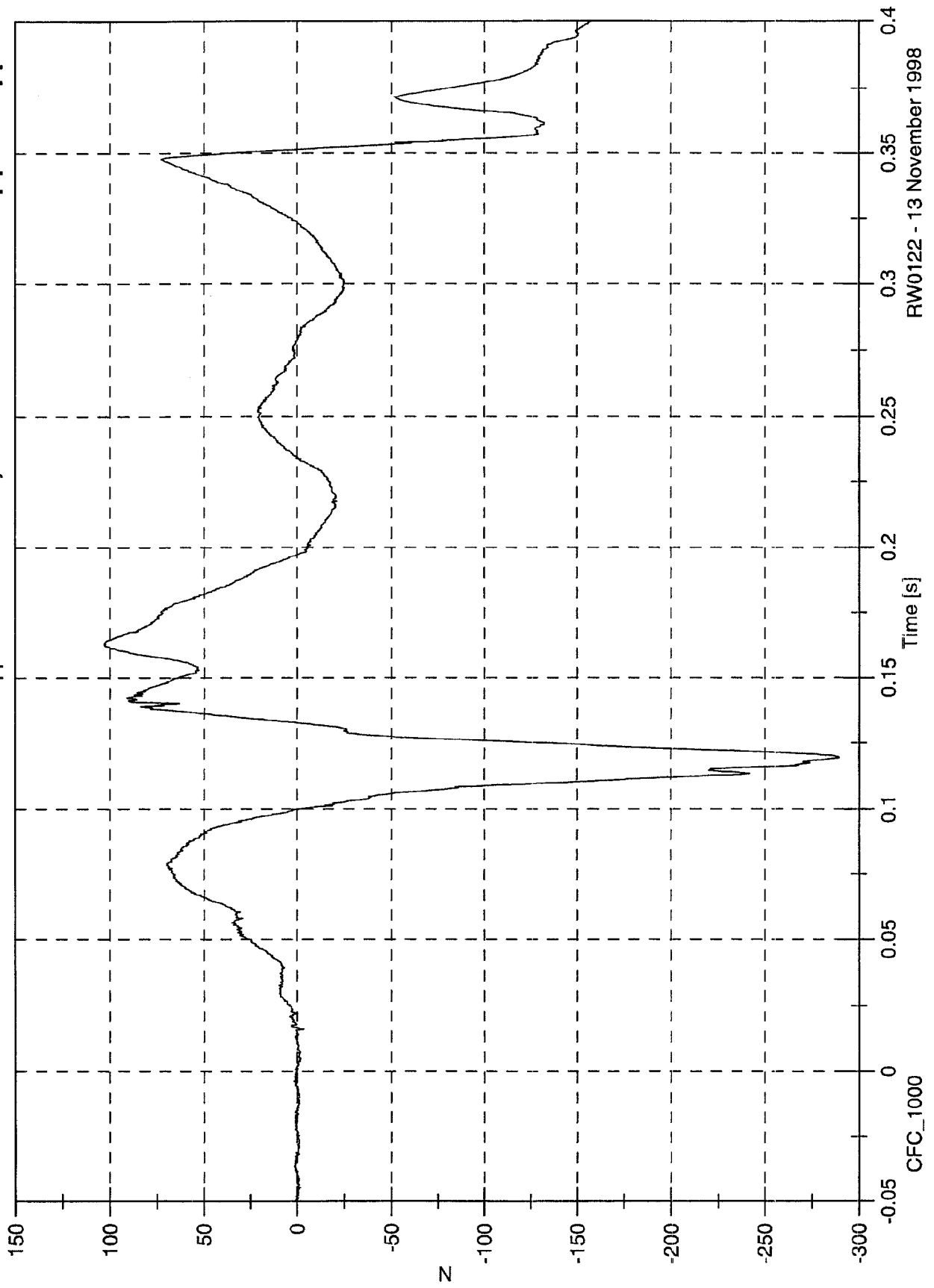
RW0122 - 13 November 1998



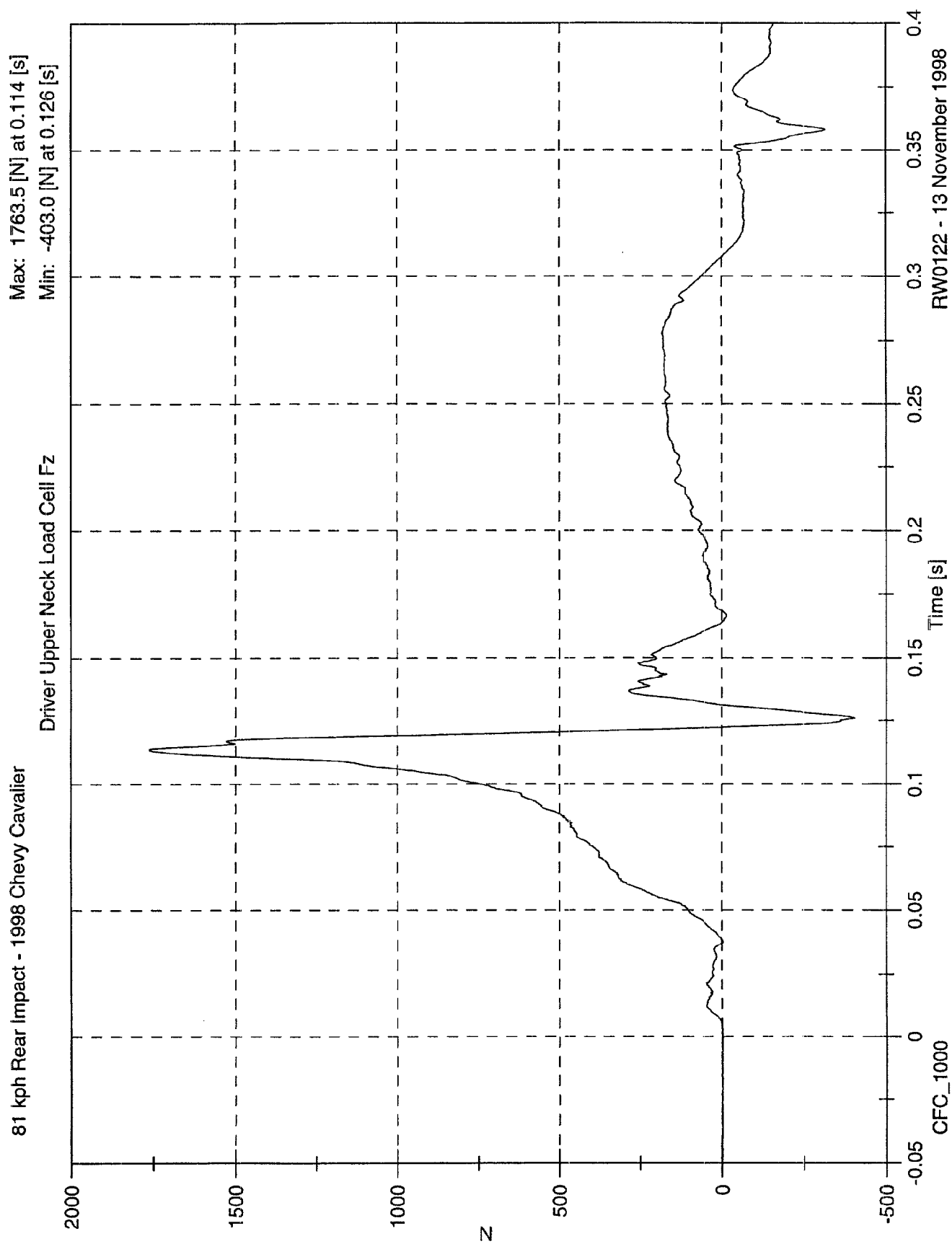
81 kph Rear Impact - 1998 Chevy Cavalier

Max: 103.2 [N] at 0.163 [s]
Min: -289.5 [N] at 0.119 [s]

Driver Upper Neck Load Cell Fy



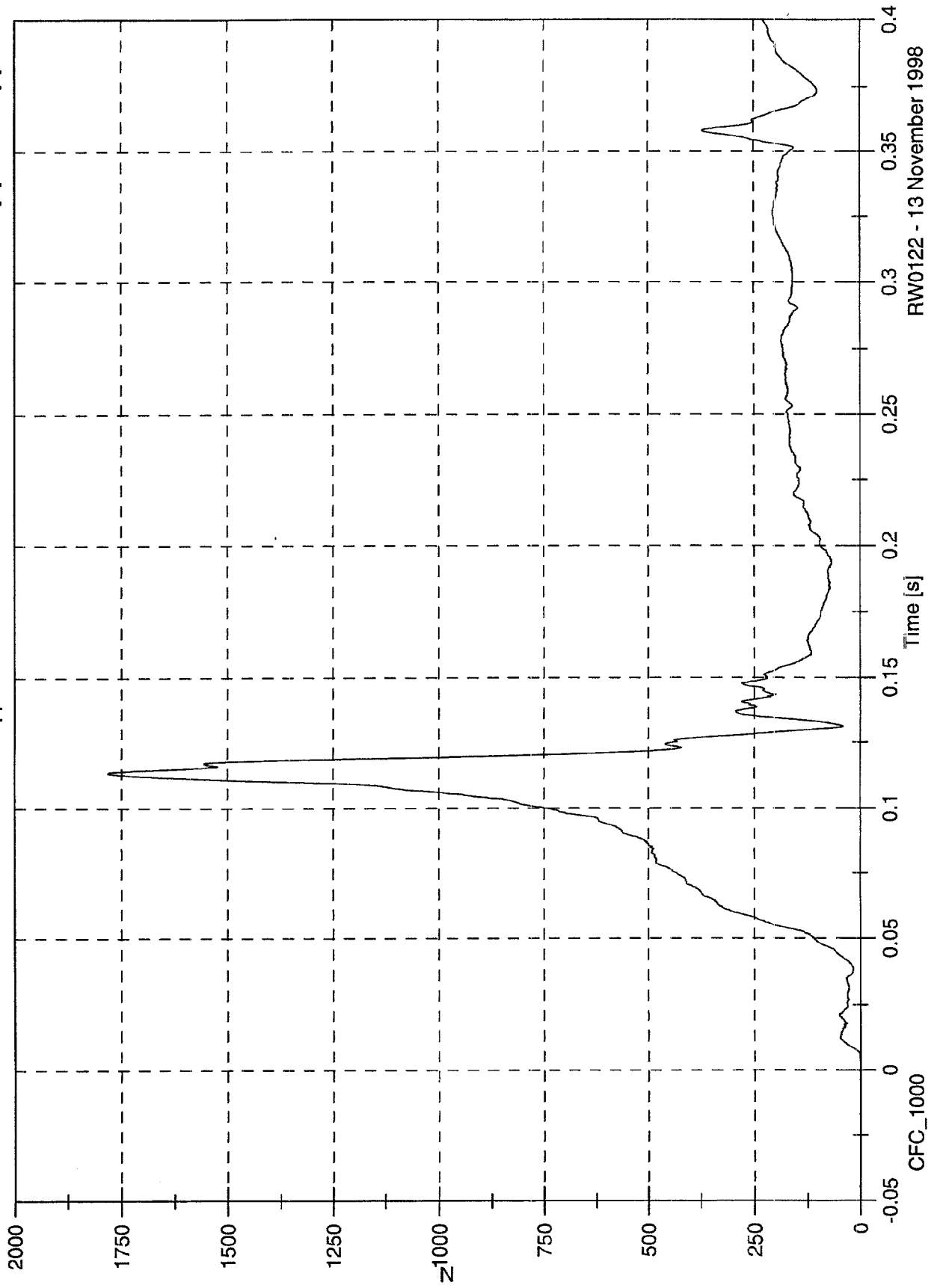
RW0122 - 13 November 1998



81 kph Rear Impact - 1998 Chevy Cavalier

Max: 1780.9 [N] at 0.114 [s]
Min: 0.1 [N] at -0.099 [s]

Driver Upper Neck Load Cell F Resultant

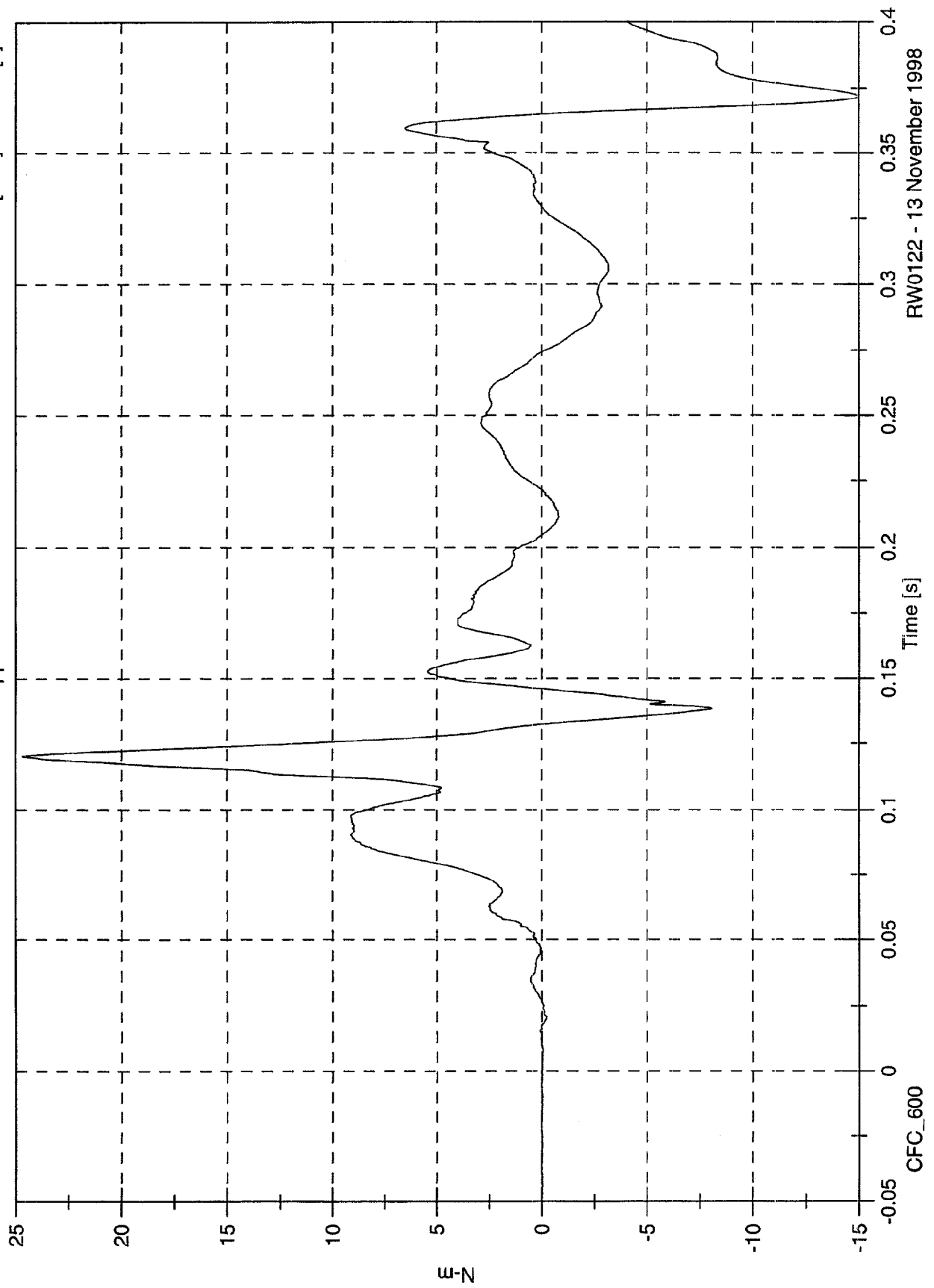


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 24.7 [N-m] at 0.120 [s]
Min: -15.0 [N-m] at 0.372 [s]

Driver Upper Neck Load Cell Mx

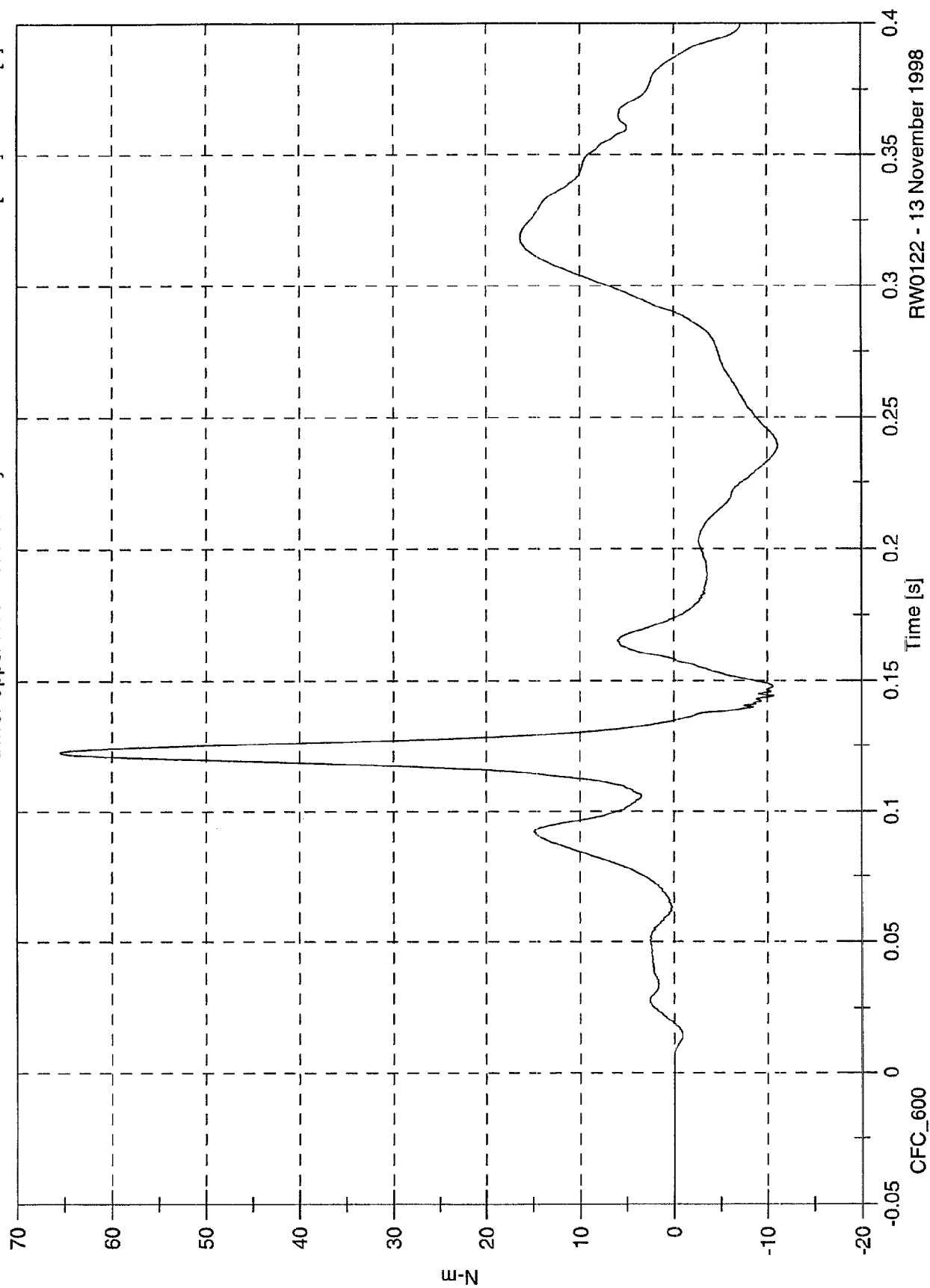


81 kph Rear Impact - 1998 Chevy Cavalier

Driver Upper Neck Load Cell My

Max: 65.4 [N-m] at 0.122 [s]

Min: -11.1 [N-m] at 0.240 [s]

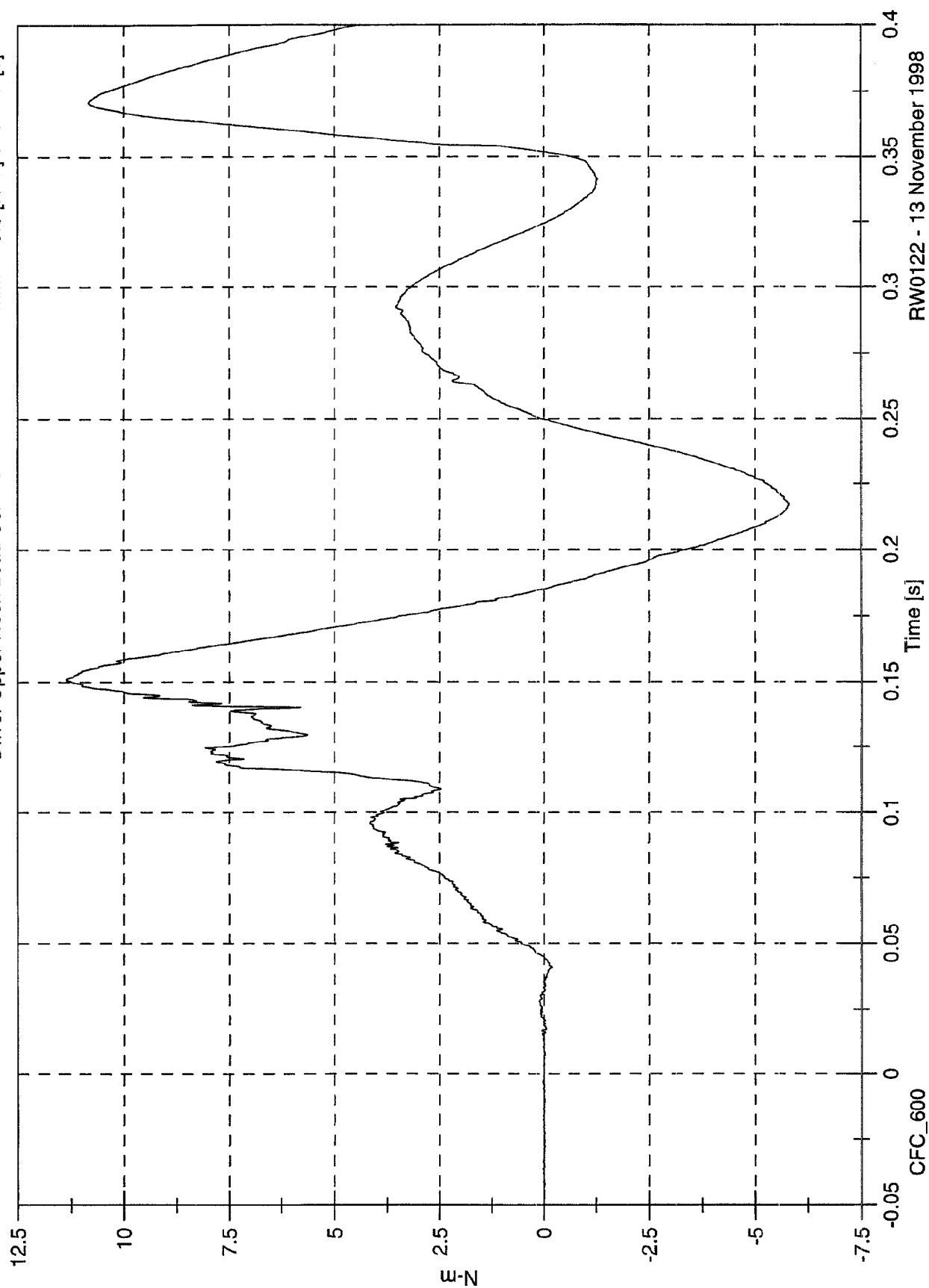


81 kph Rear Impact - 1998 Chevy Cavalier

Max: 11.4 [N-m] at 0.151 [s]

Min: -5.8 [N-m] at 0.217 [s]

Driver Upper Neck Load Cell Mz



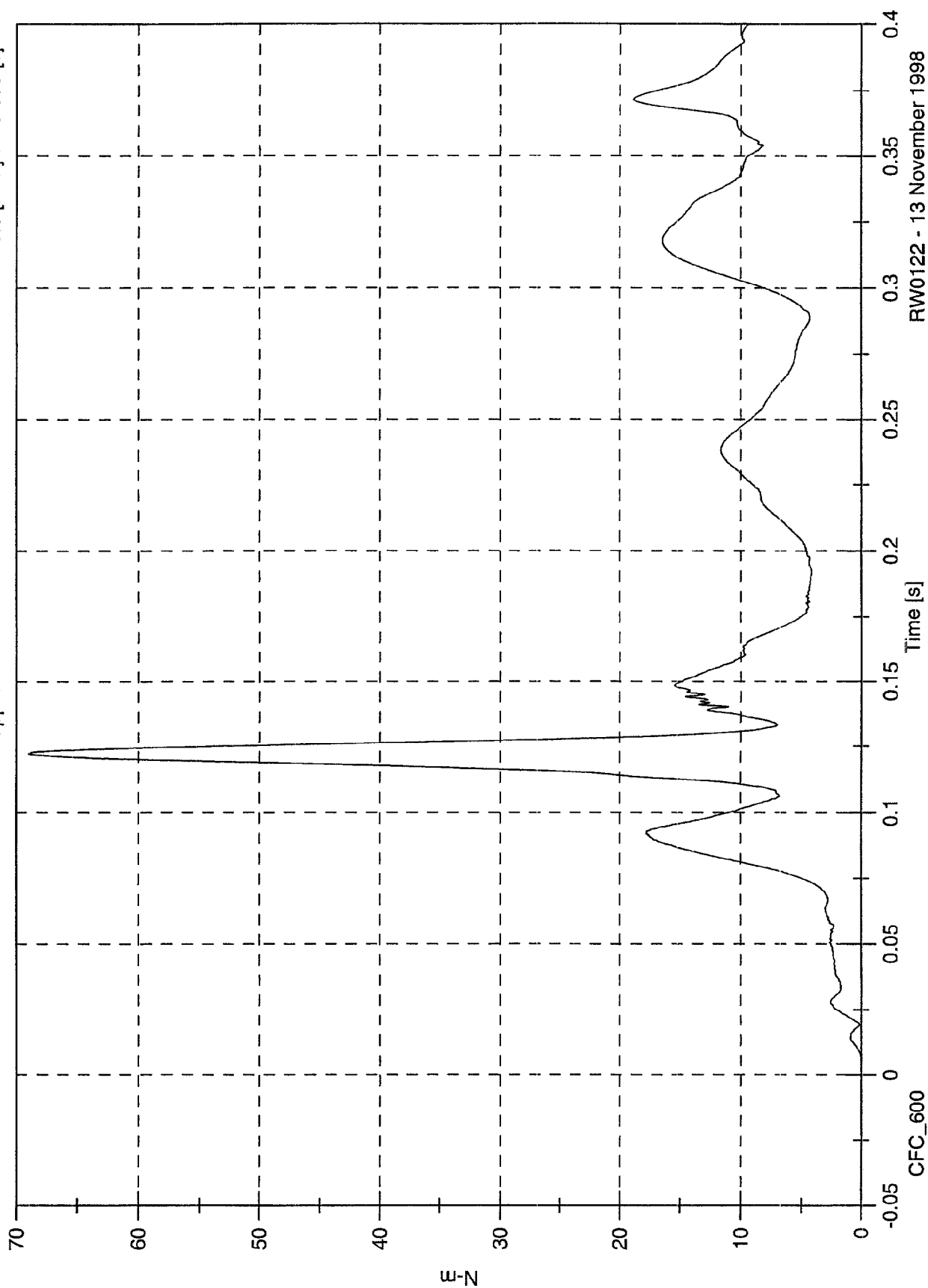
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 69.0 [N-m] at 0.122 [s]

Min: 0.0 [N-m] at -0.008 [s]

Driver Upper Neck Load Cell M Resultant



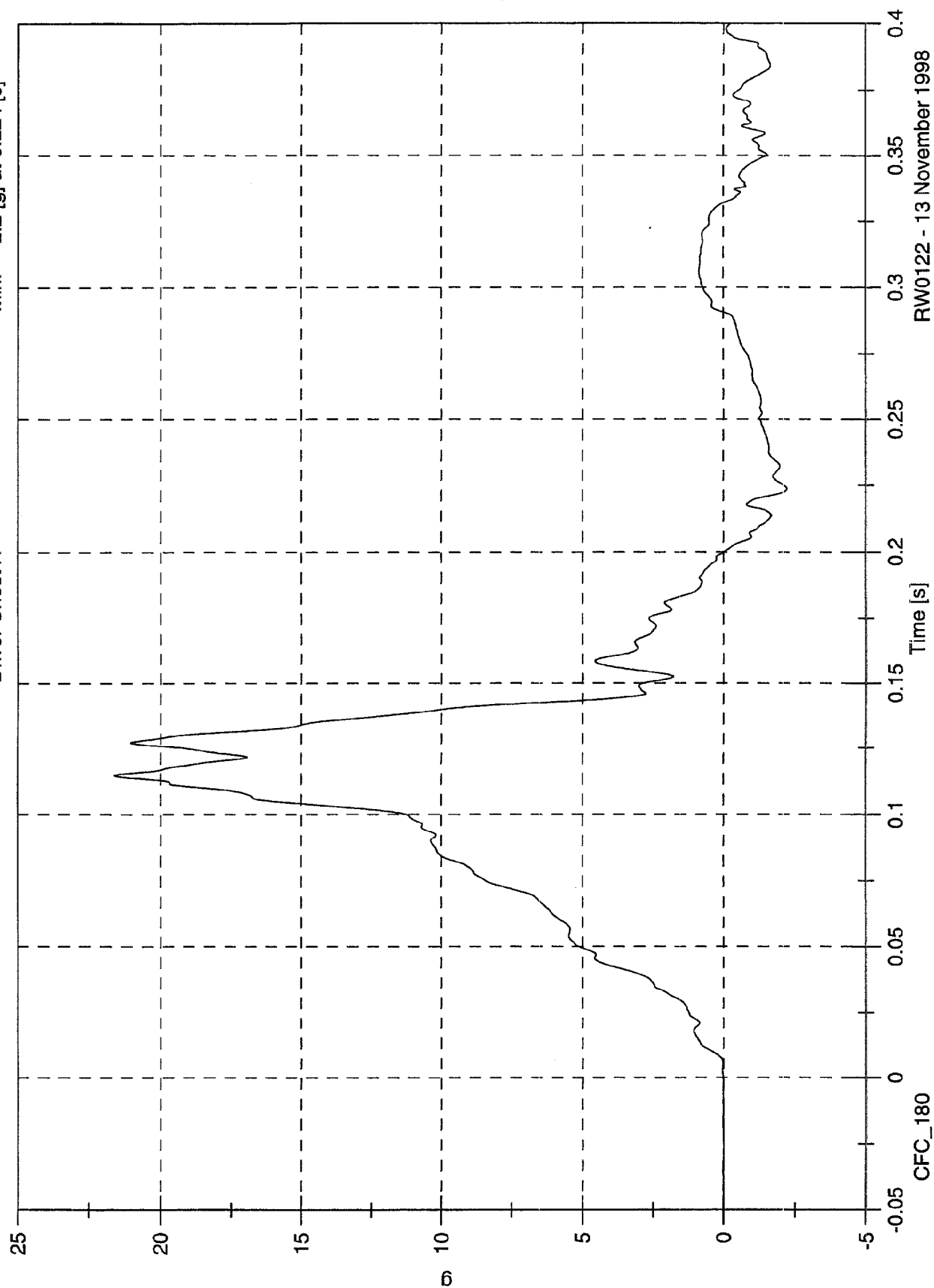
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 21.6 [g] at 0.115 [s]

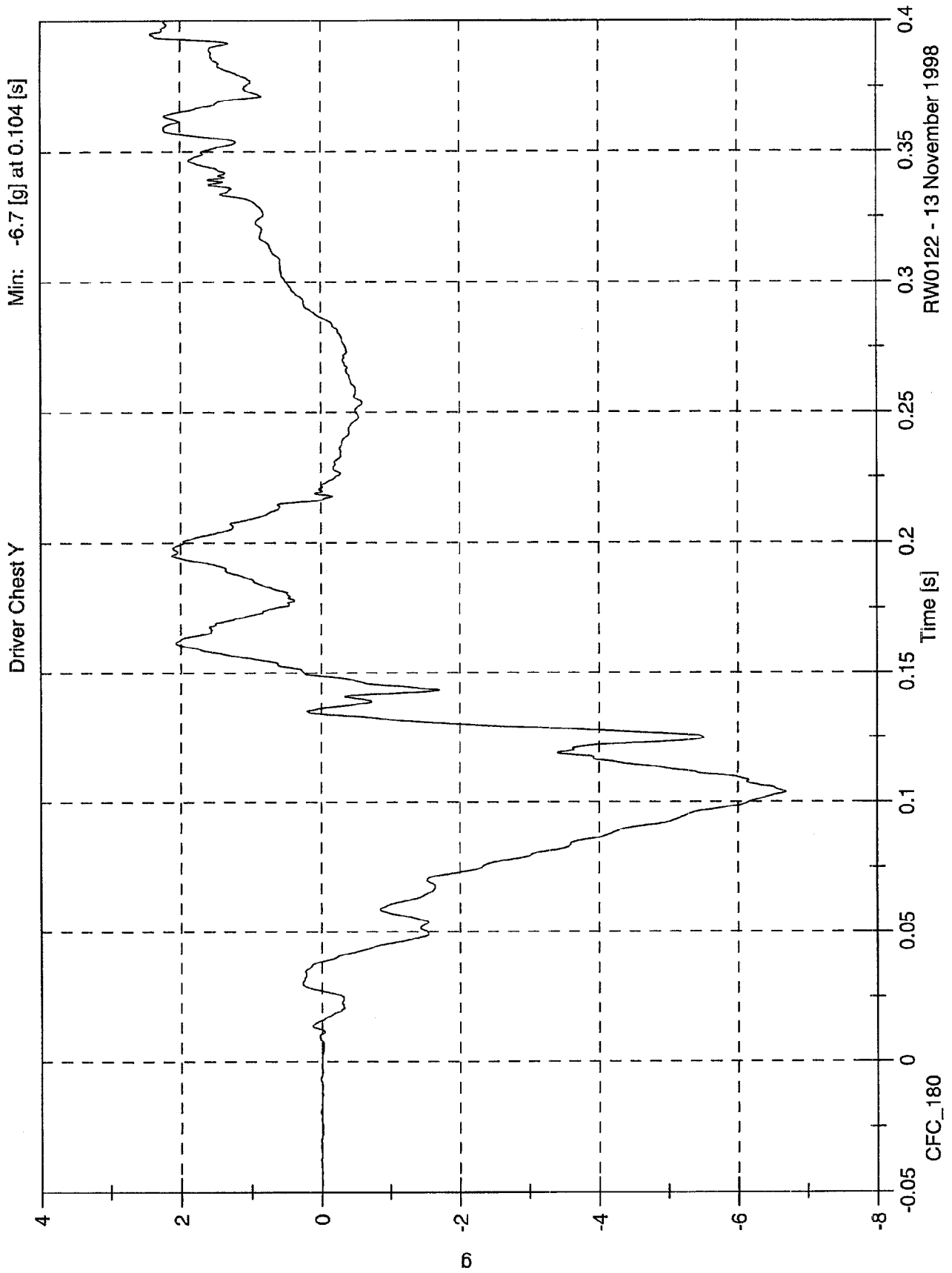
Min: -2.2 [g] at 0.224 [s]

Driver Chest X



81 kph Rear Impact - 1998 Chevy Cavalier

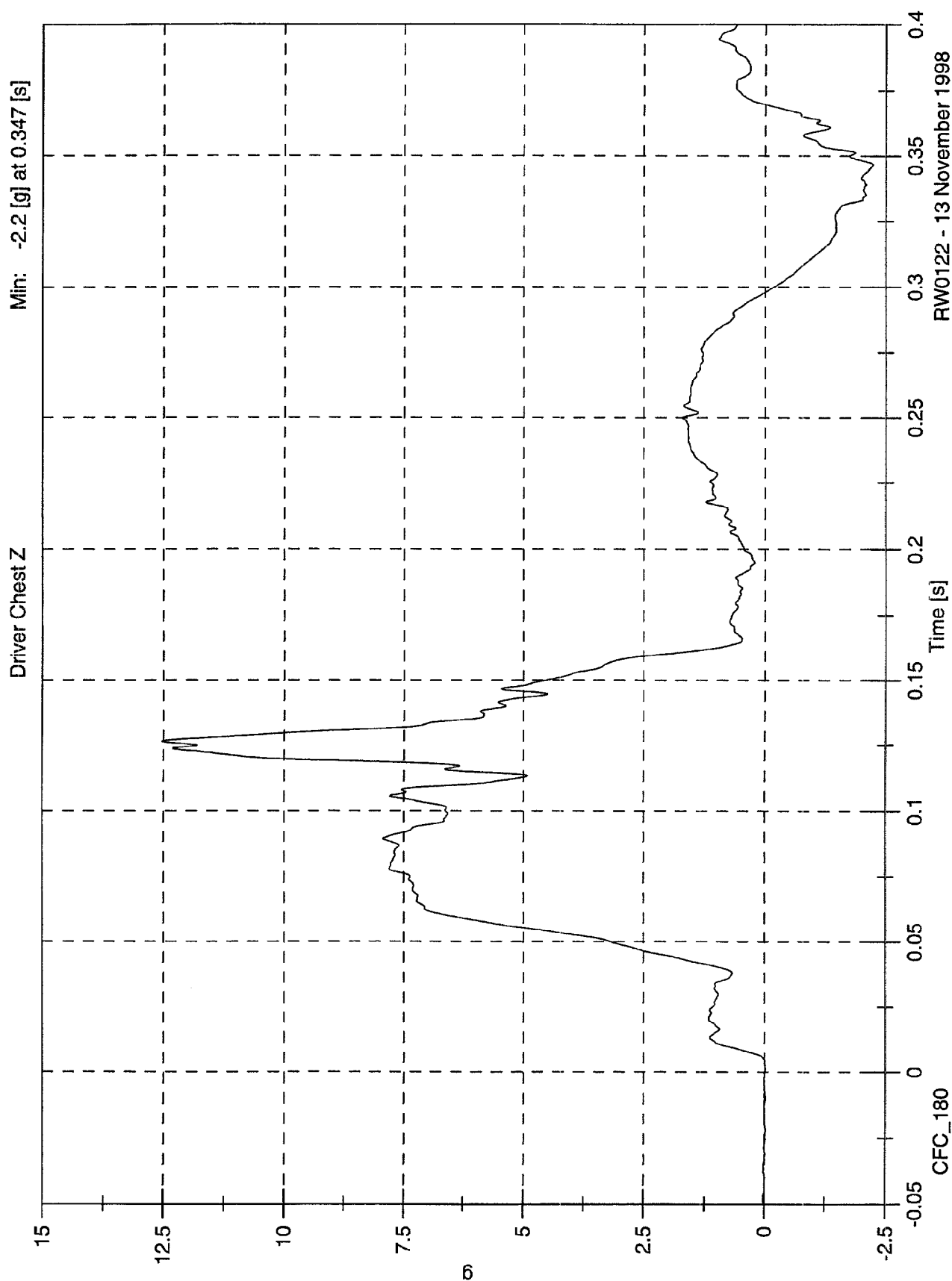
Max: 2.4 [g] at 0.395 [s]
Min: -6.7 [g] at 0.104 [s]



RW0122 - 13 November 1998

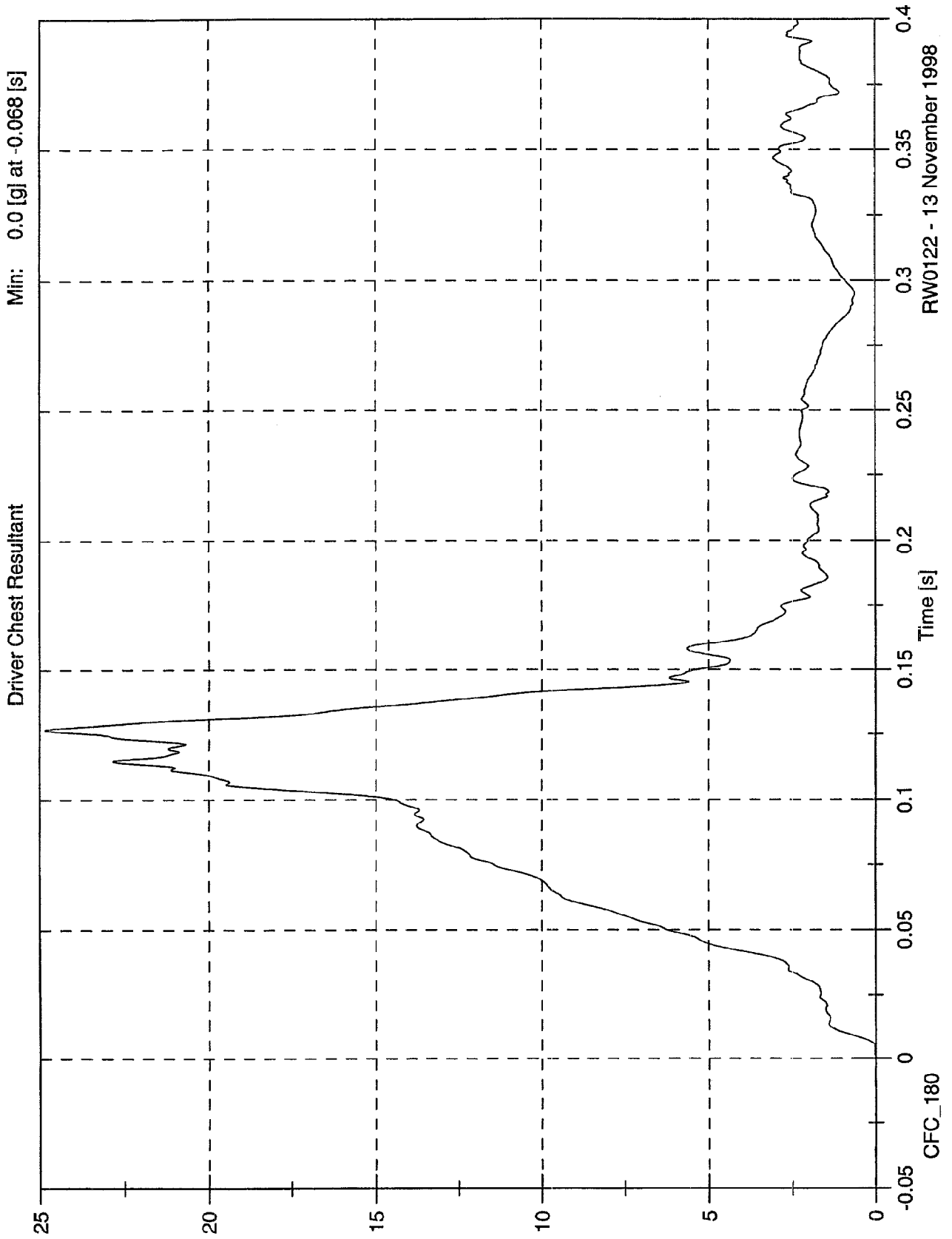
81 kph Rear Impact - 1998 Chevy Cavalier

Max: 12.5 [g] at 0.127 [s]
Min: -2.2 [g] at 0.347 [s]



81 kph Rear Impact - 1998 Chevy Cavalier

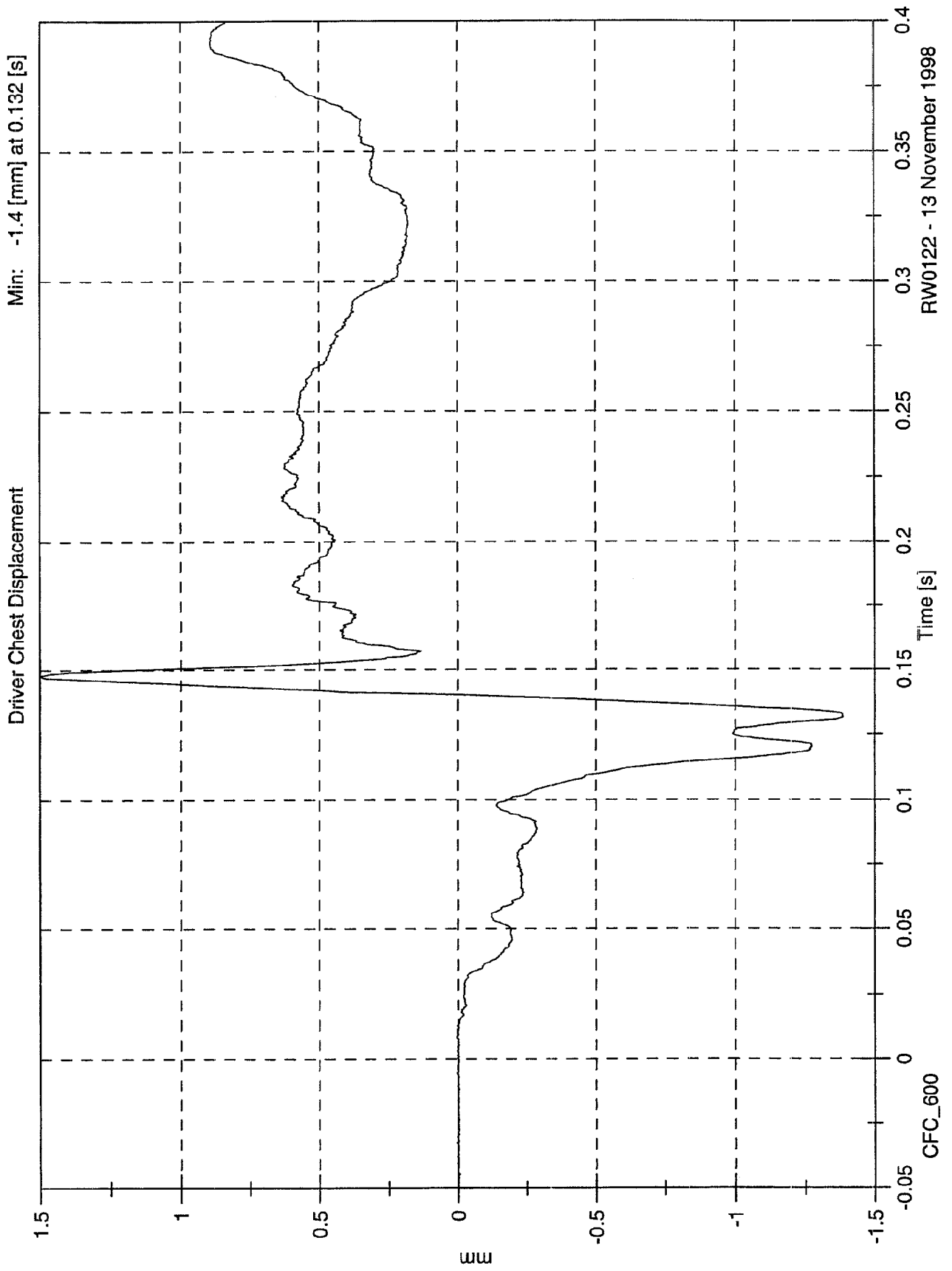
Max: 24.8 [g] at 0.127 [s]
Min: 0.0 [g] at -0.068 [s]



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

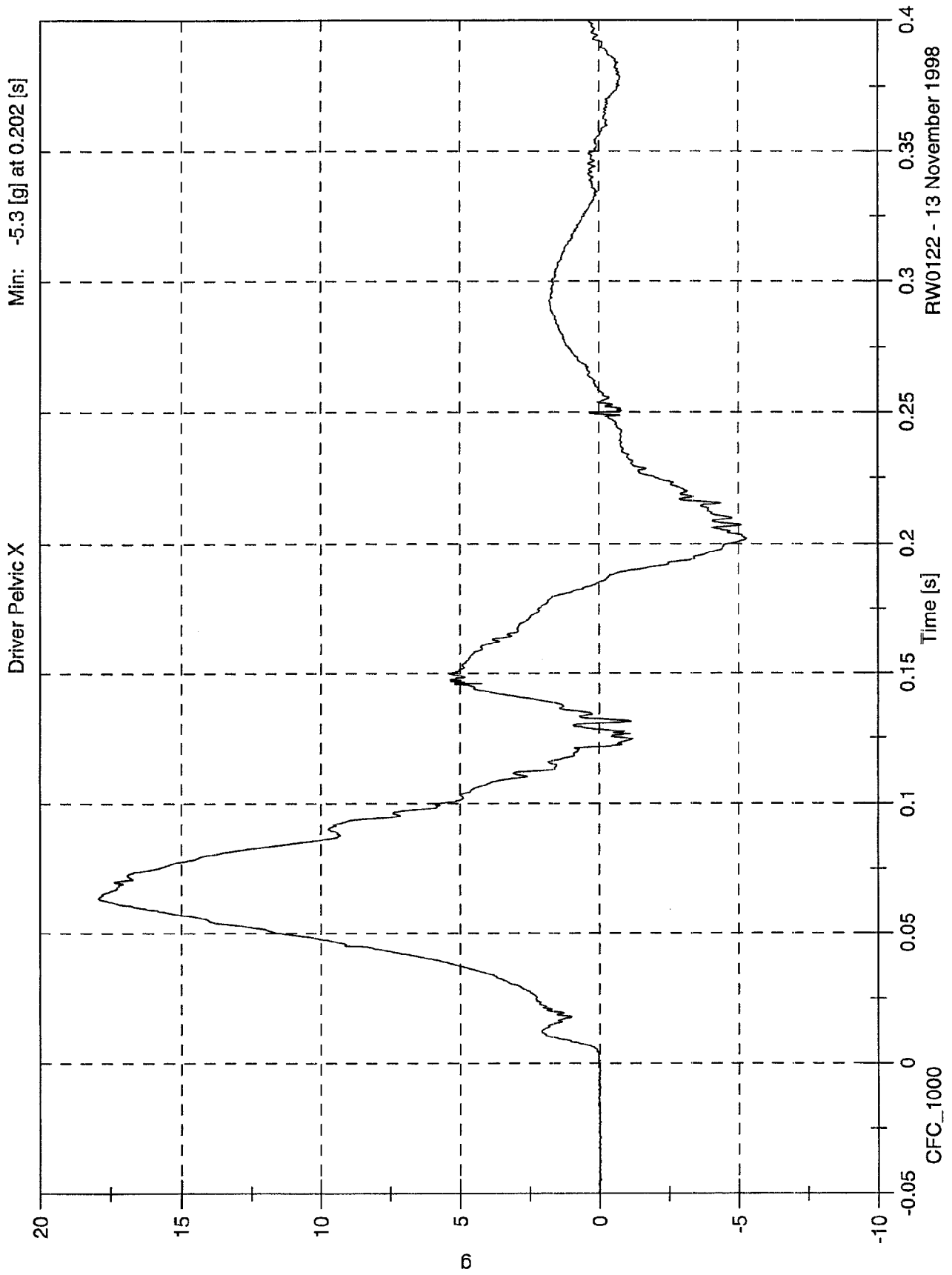
Max: 1.5 [mm] at 0.148 [s]
Min: -1.4 [mm] at 0.132 [s]



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

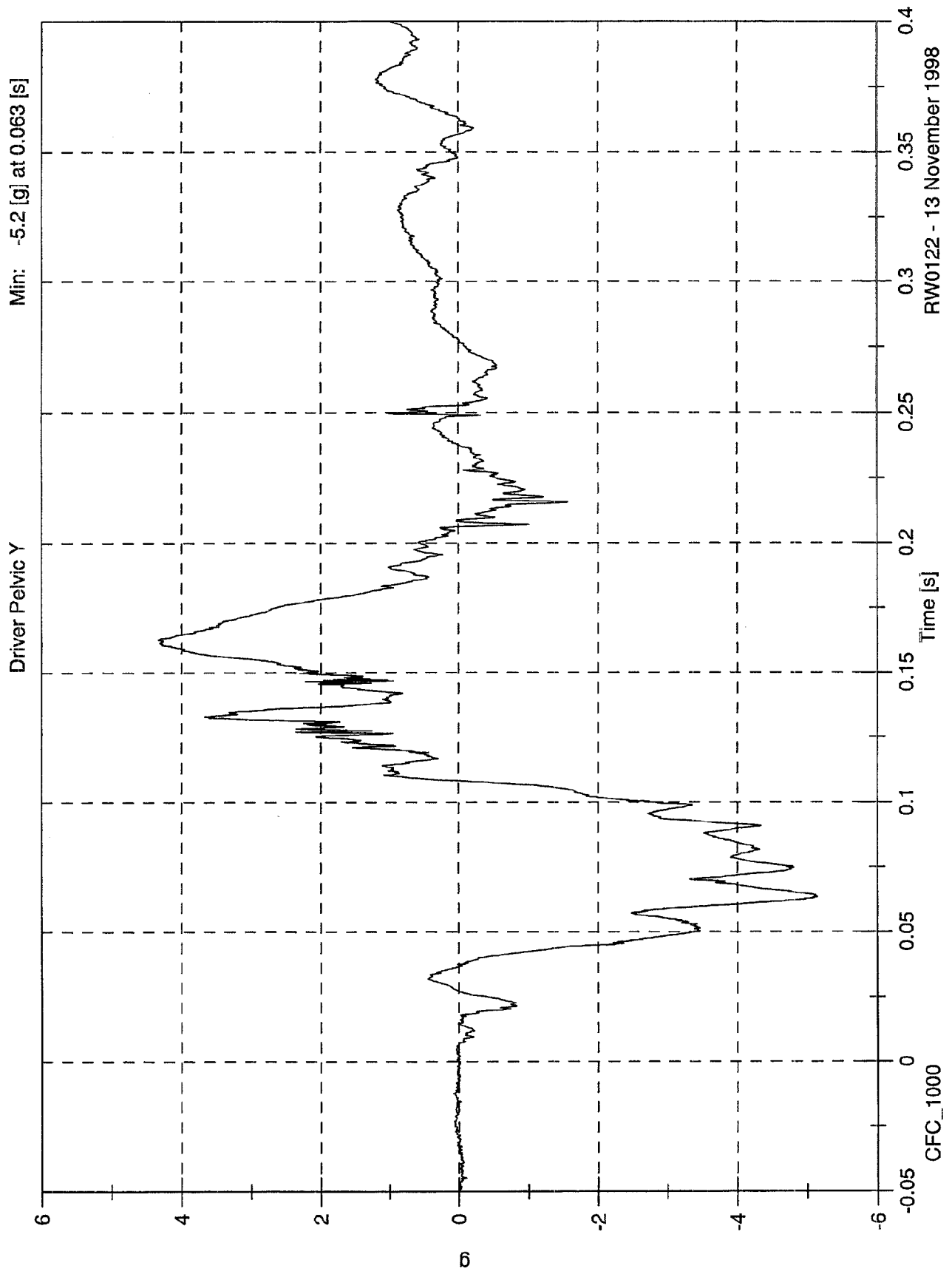
Max: 17.9 [g] at 0.064 [s]
Min: -5.3 [g] at 0.202 [s]



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

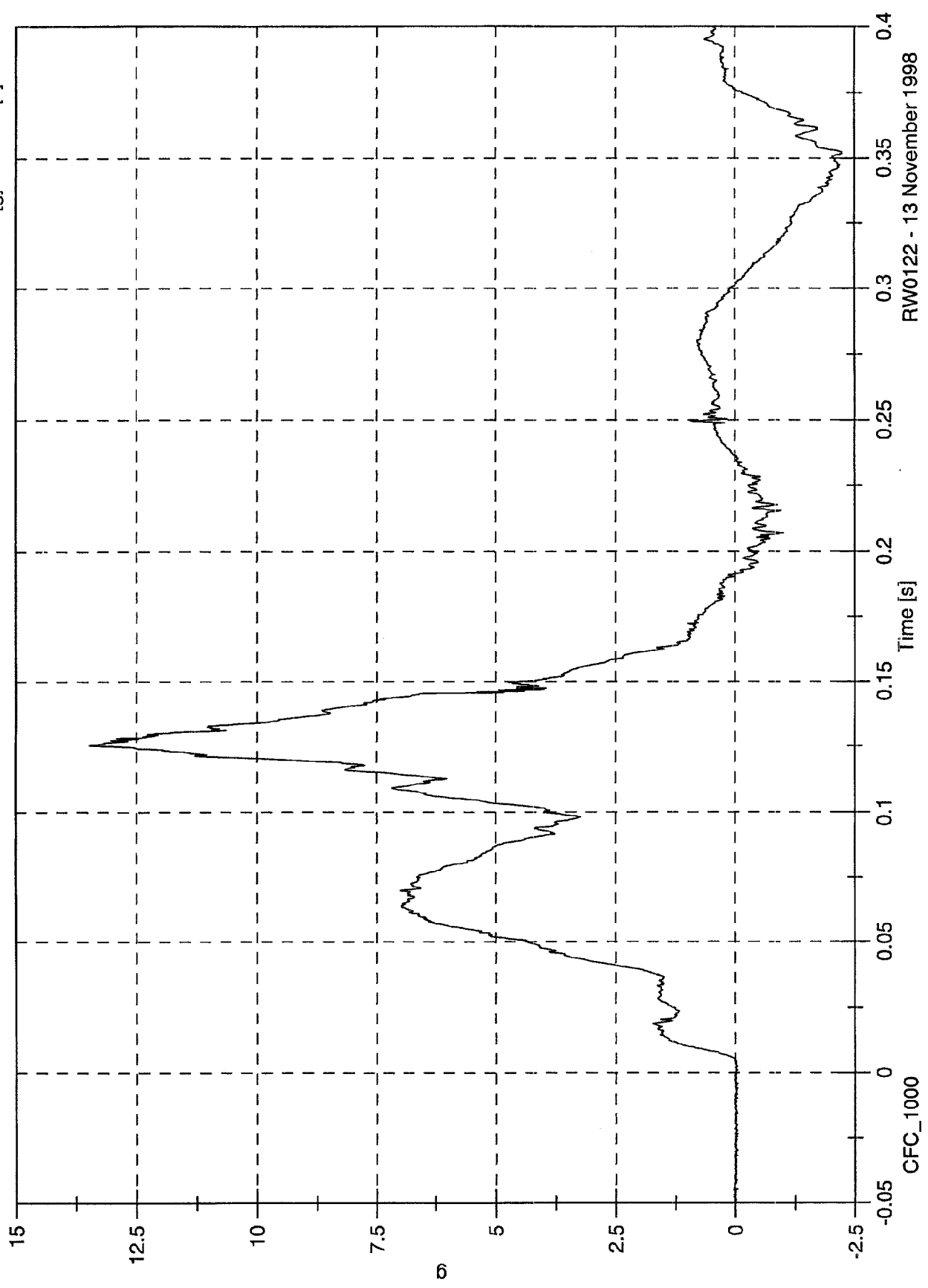
Max: 4.3 [g] at 0.163 [s]
Min: -5.2 [g] at 0.063 [s]



81 kph Rear Impact - 1998 Chevy Cavalier

Max: 13.5 [g] at 0.125 [s]
Min: -2.2 [g] at 0.352 [s]

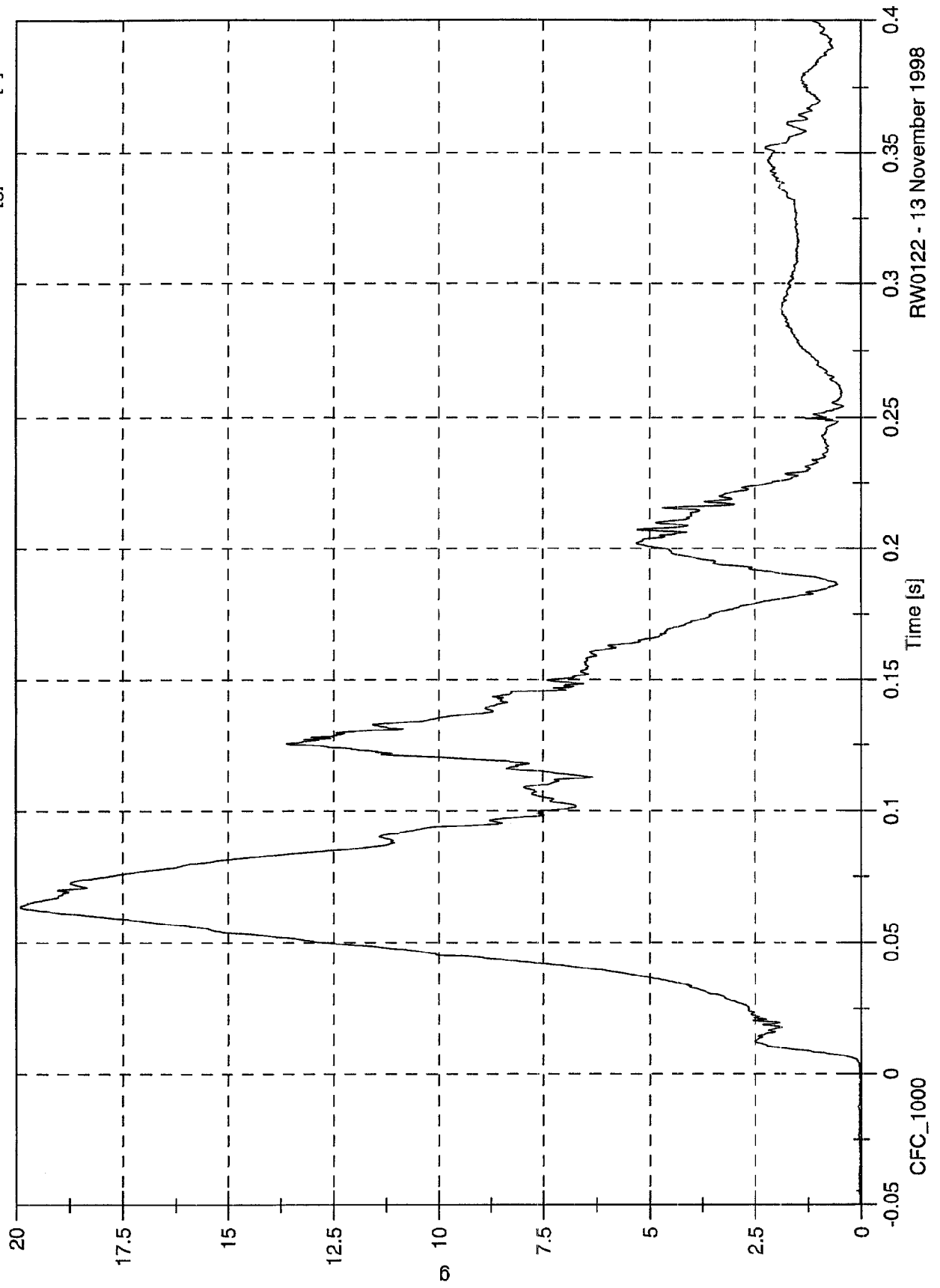
Driver Pelvic Z



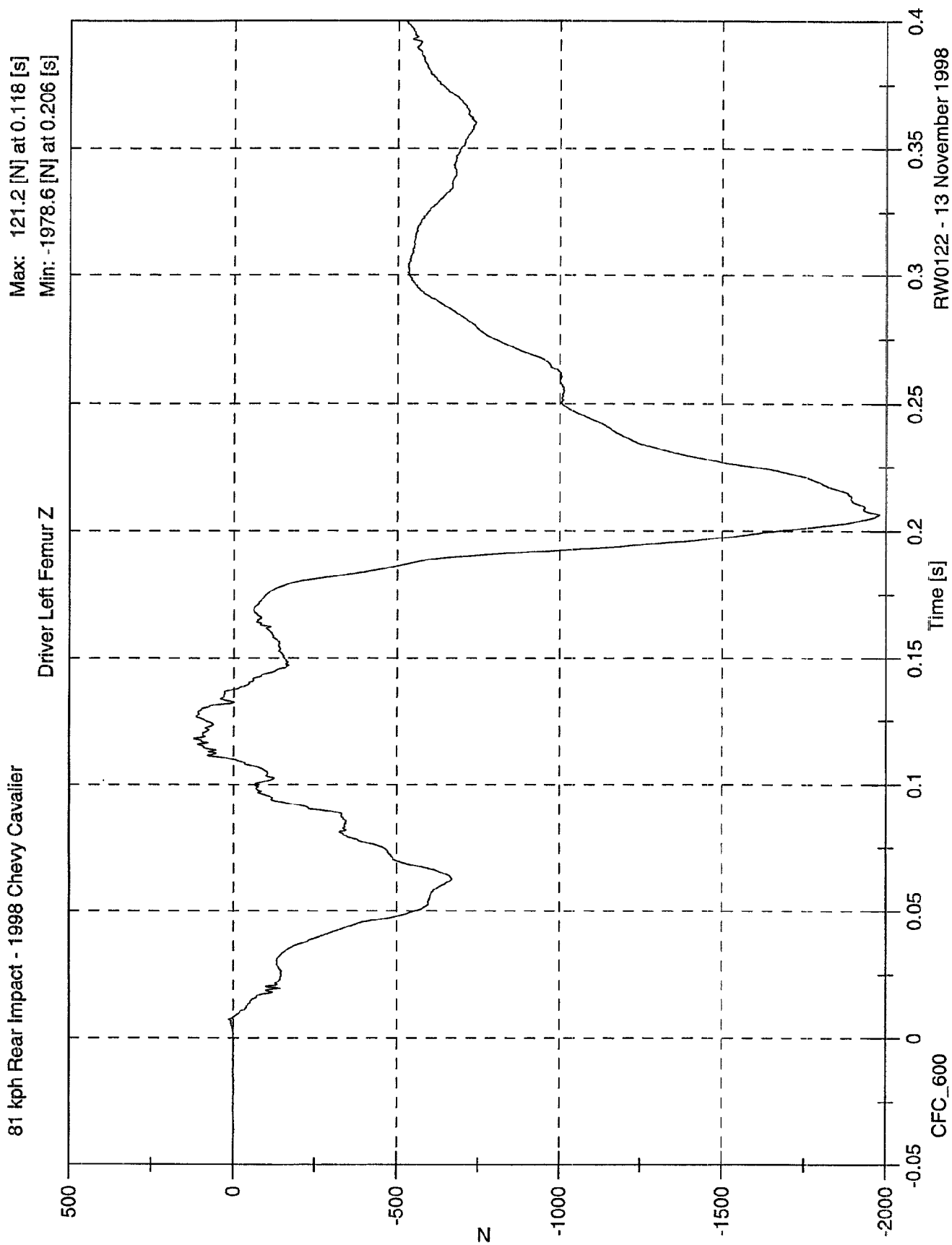
81 kph Rear Impact - 1998 Chevy Cavalier

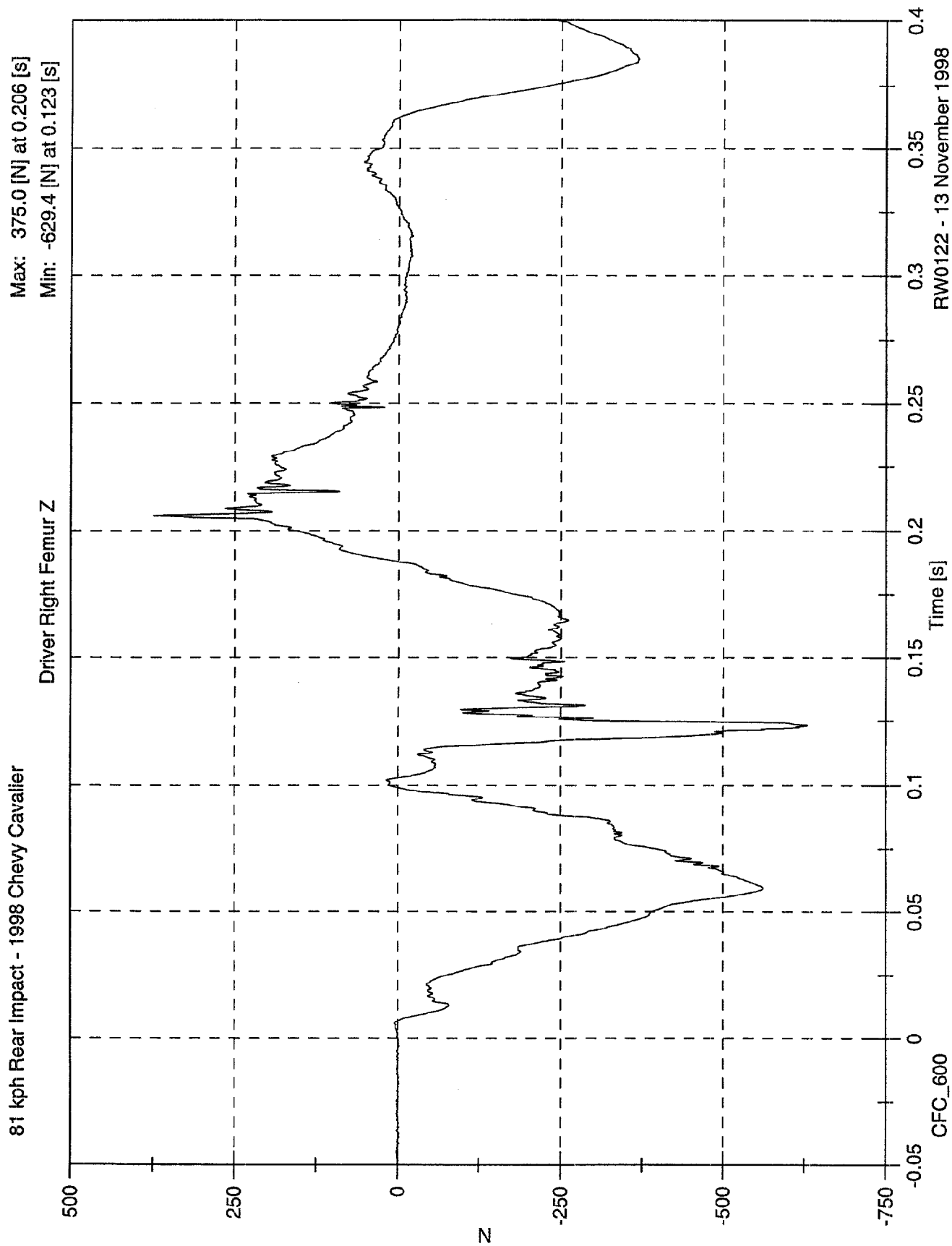
Max: 19.9 [g] at 0.064 [s]
Min: 0.0 [g] at -0.078 [s]

Driver Pelvic Resultant



RW0122 - 13 November 1998



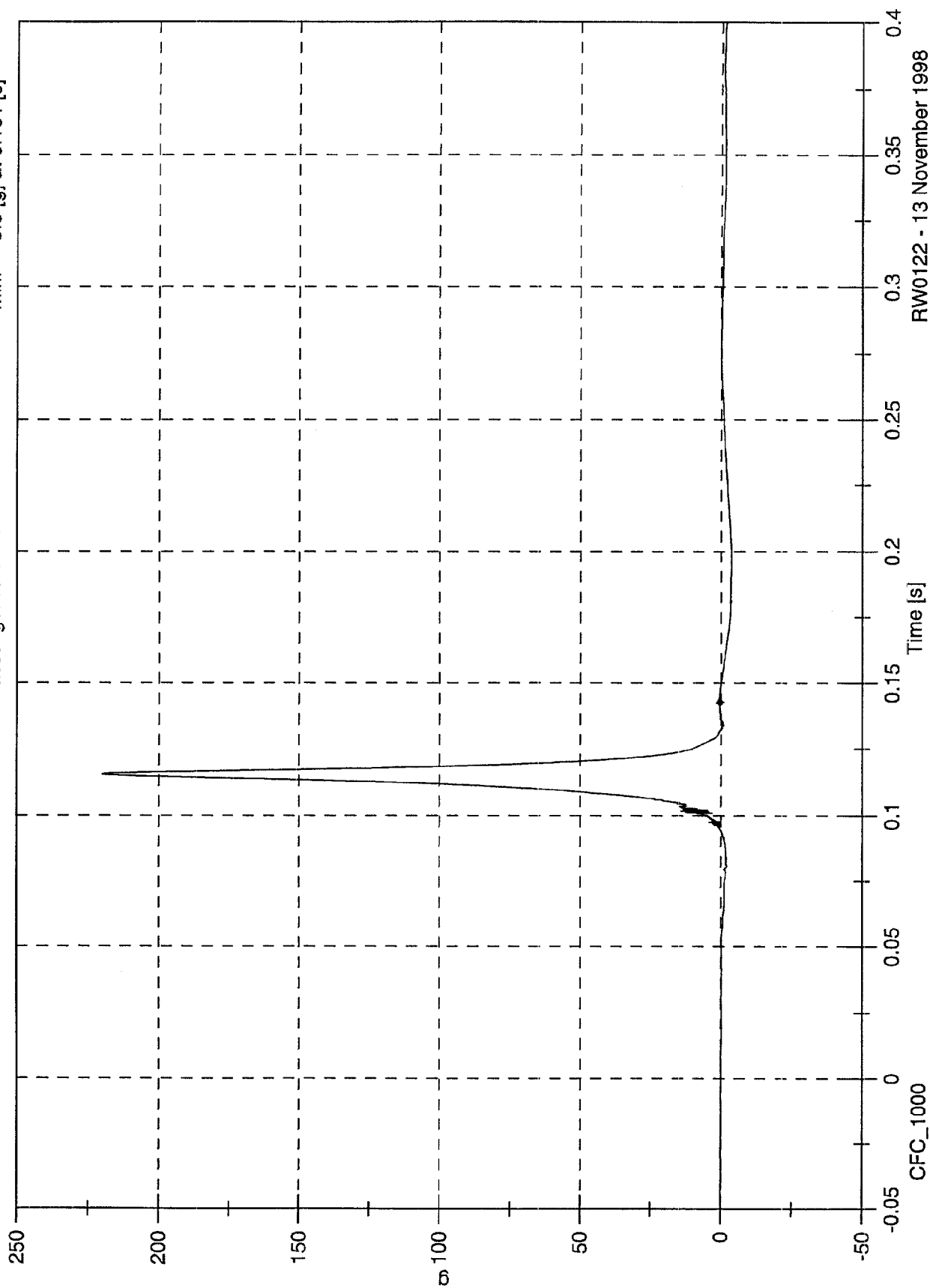


81 kph Rear Impact - 1998 Chevy Cavalier

Max: 220.0 [g] at 0.115 [s]

Min: -3.8 [g] at 0.181 [s]

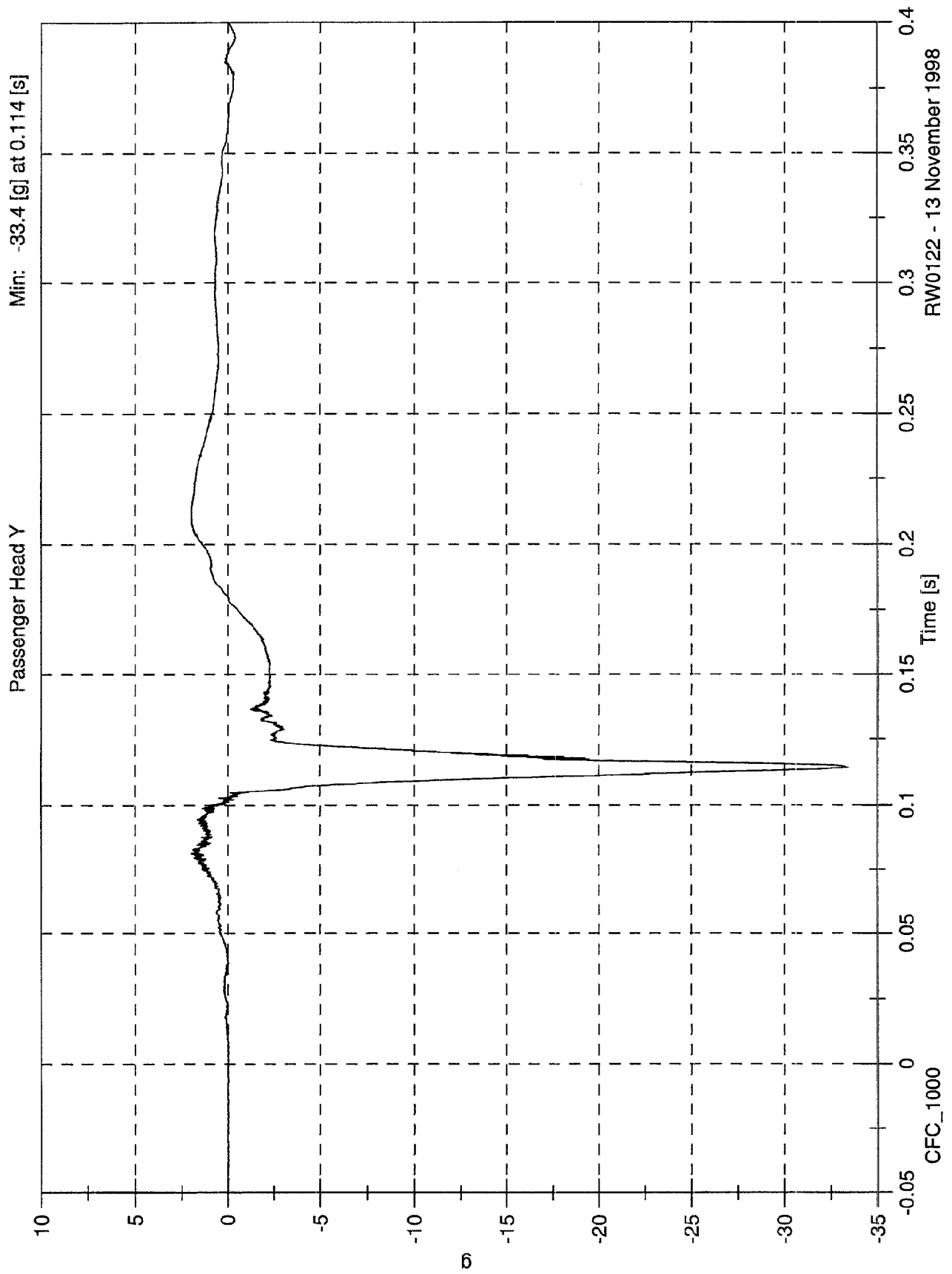
Passenger Head X



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 5.9 [g] at 0.470 [s]
Min: -33.4 [g] at 0.114 [s]



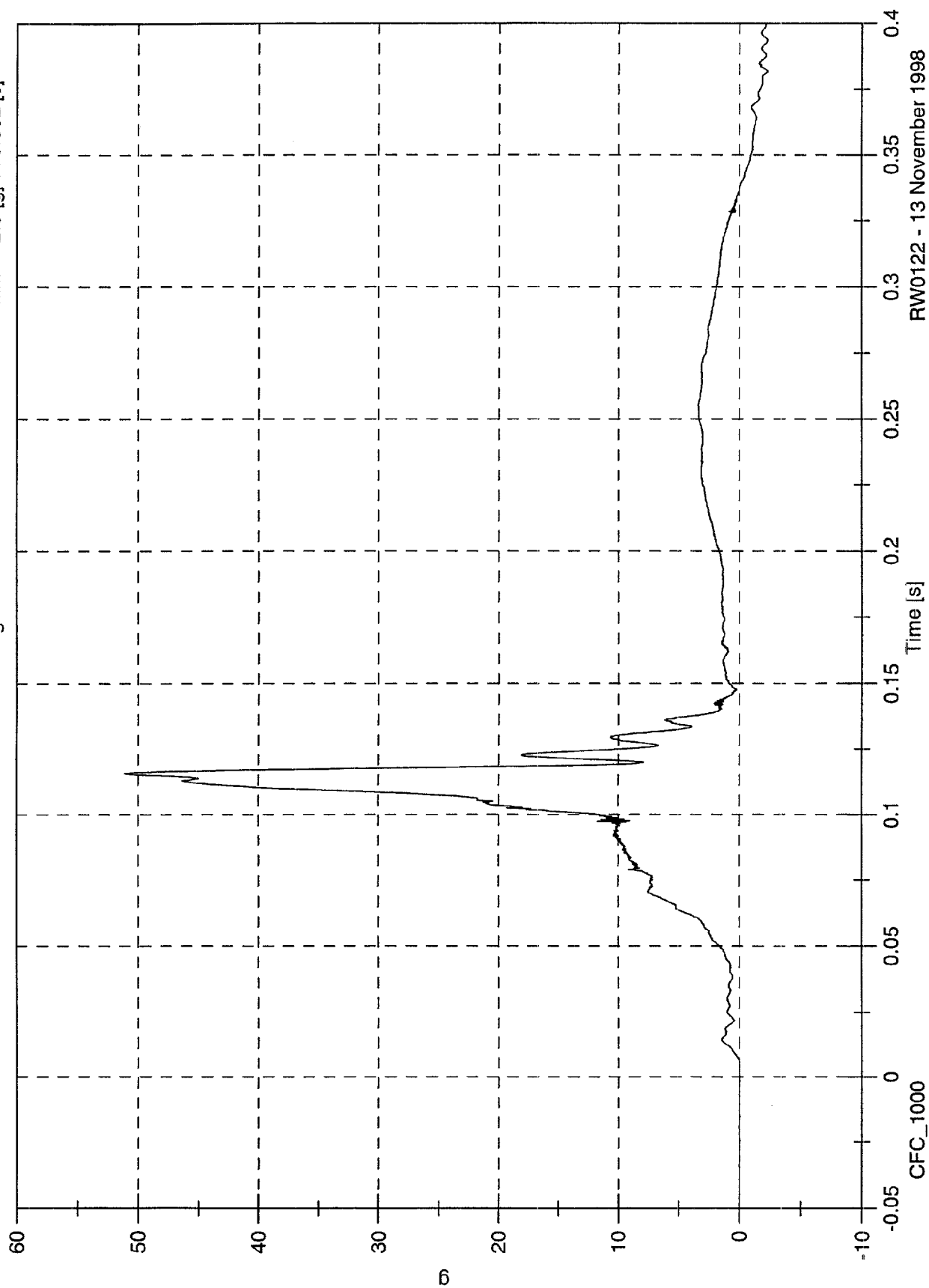
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 51.1 [g] at 0.116 [s]

Min: -2.3 [g] at 0.382 [s]

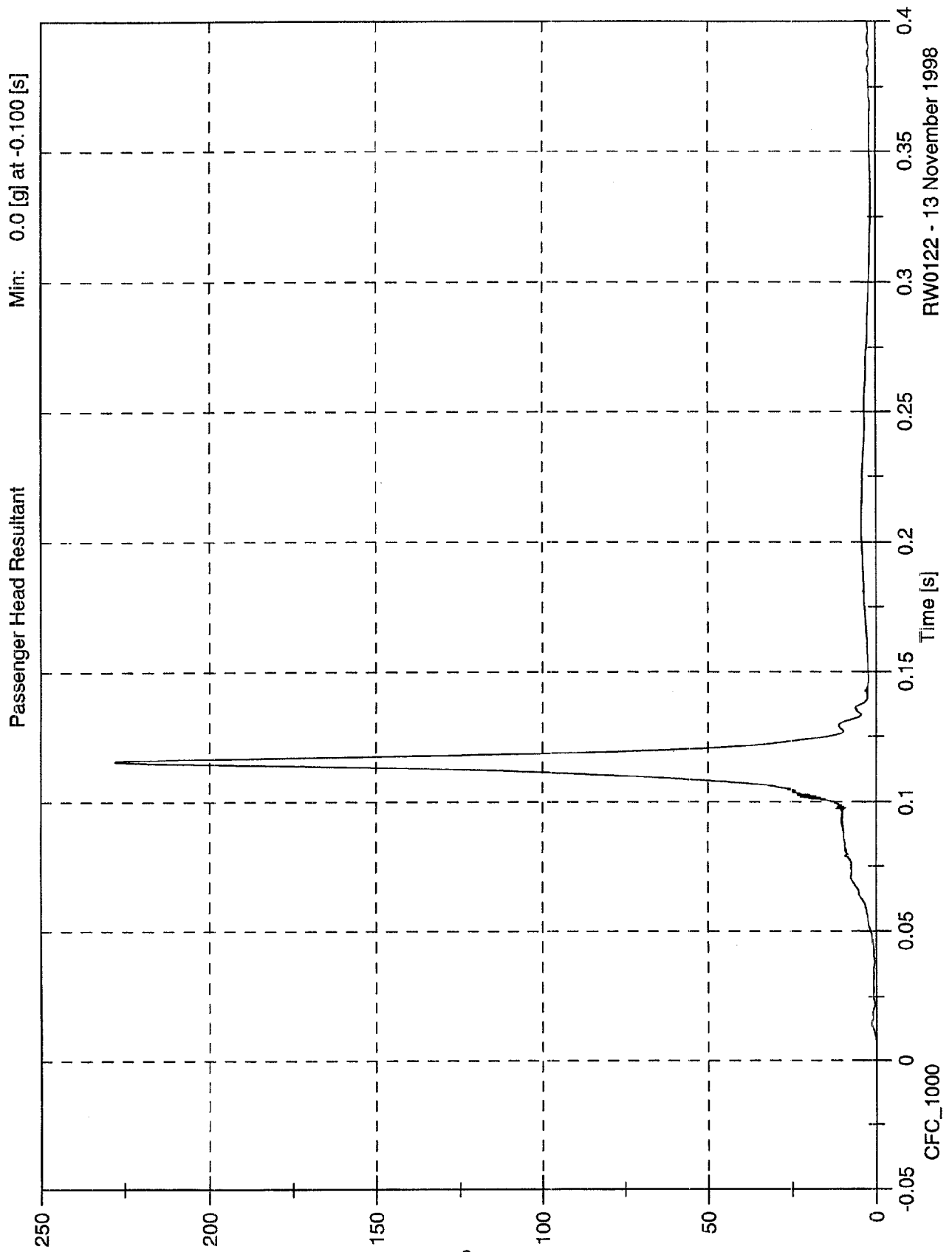
Passenger Head Z

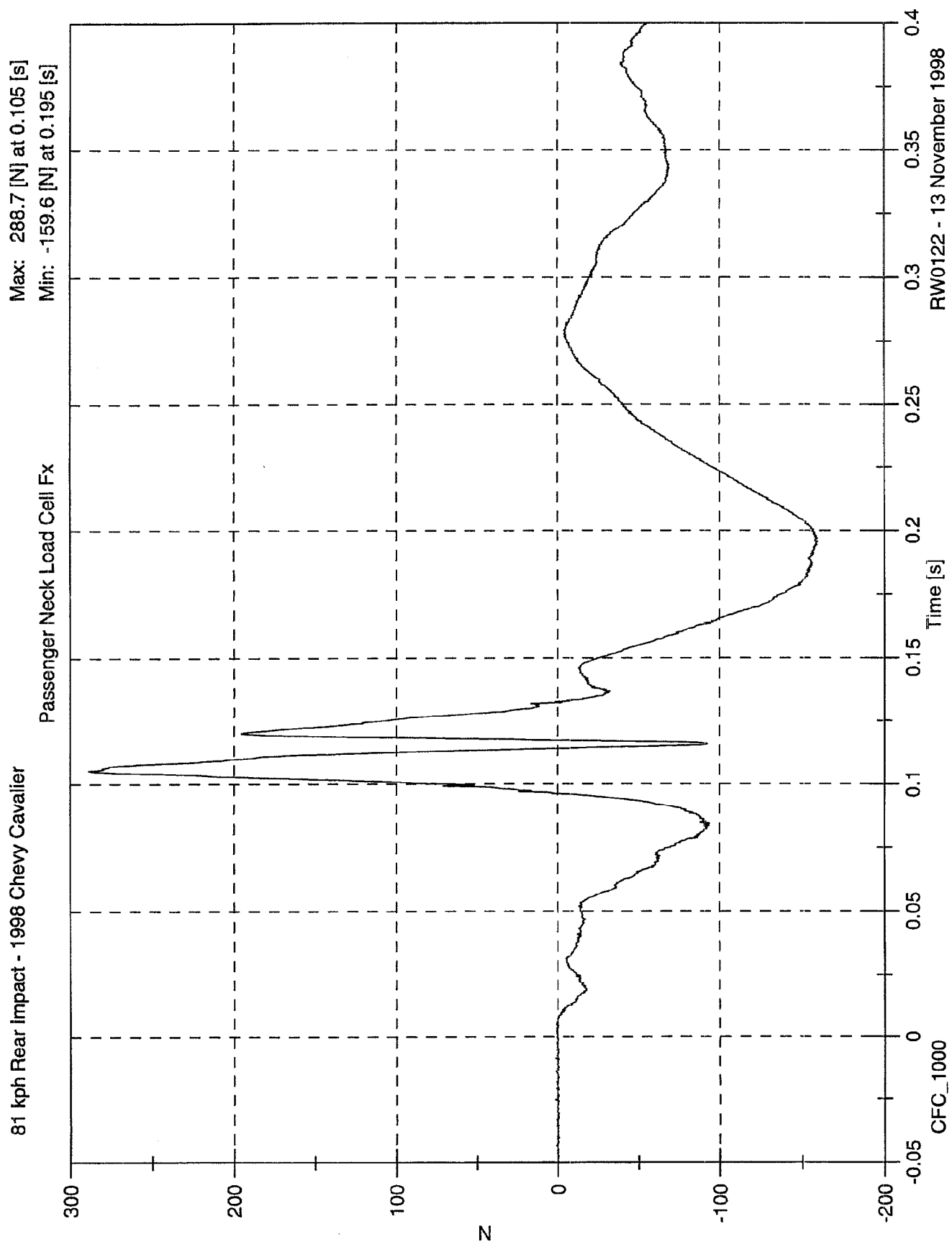


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 227.9 [g] at 0.115 [s]
Min: 0.0 [g] at -0.100 [s]

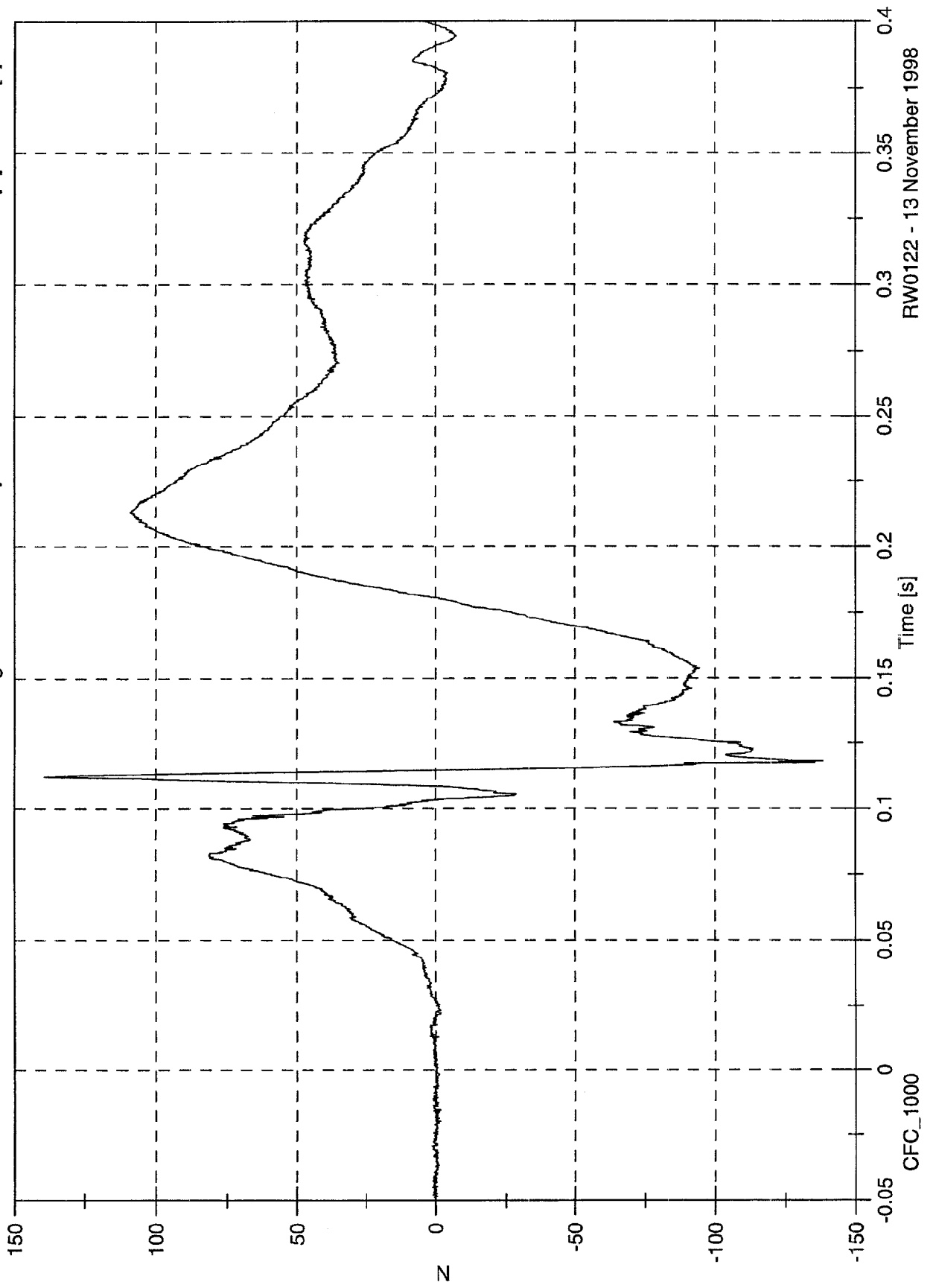




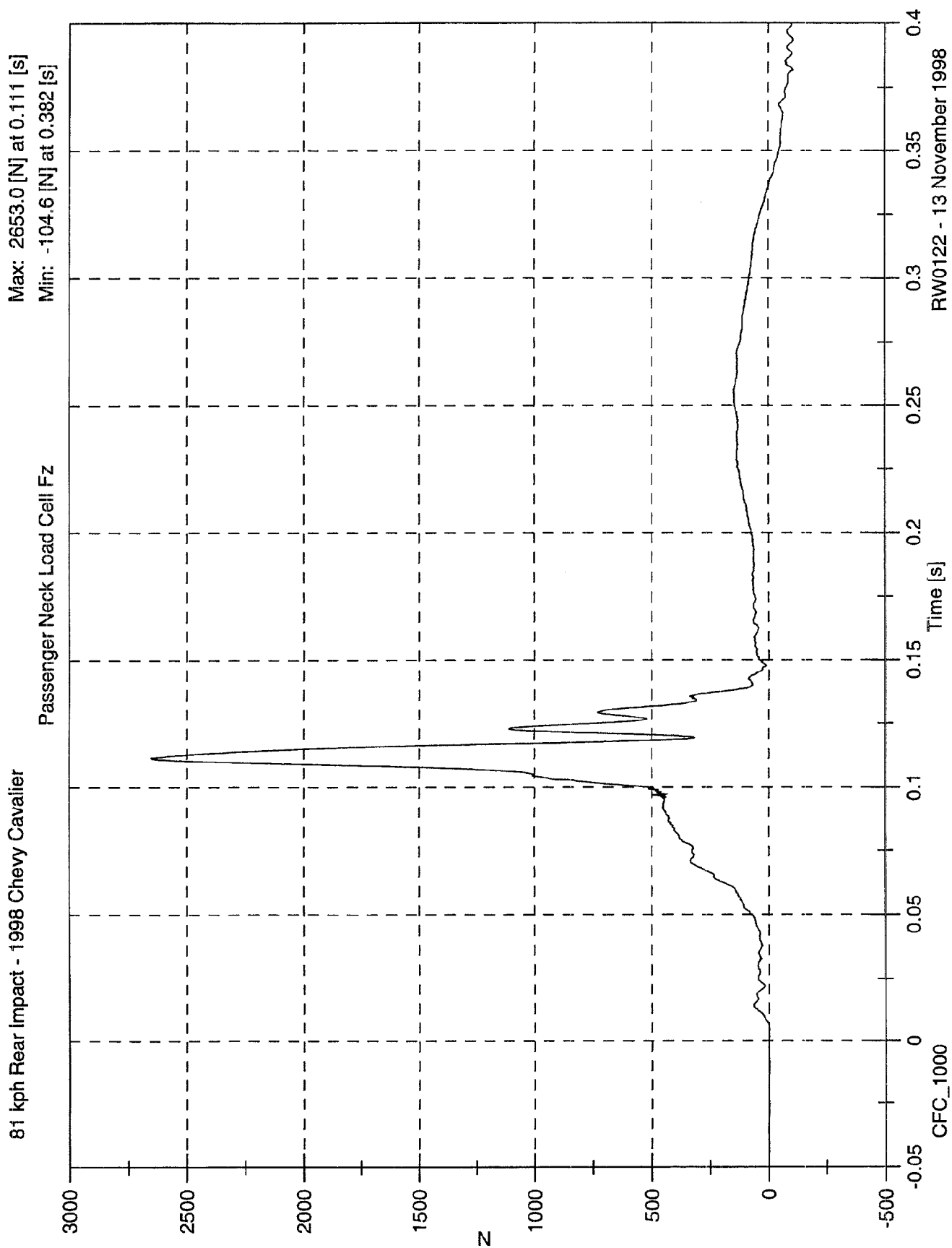
81 kph Rear Impact - 1998 Chevy Cavalier

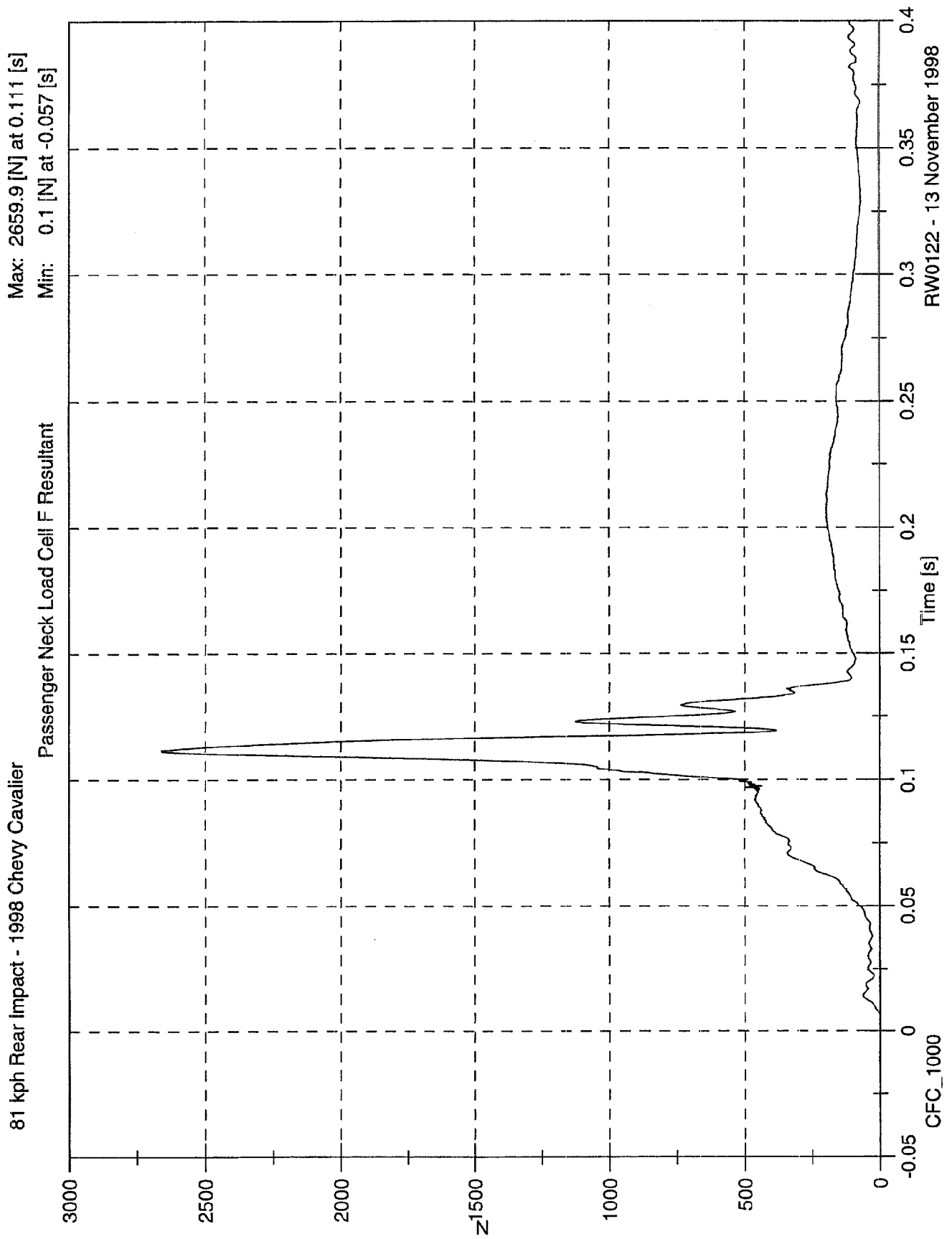
Max: 139.4 [N] at 0.112 [s]
Min: -138.2 [N] at 0.118 [s]

Passenger Neck Load Cell Fy



RW0122 - 13 November 1998



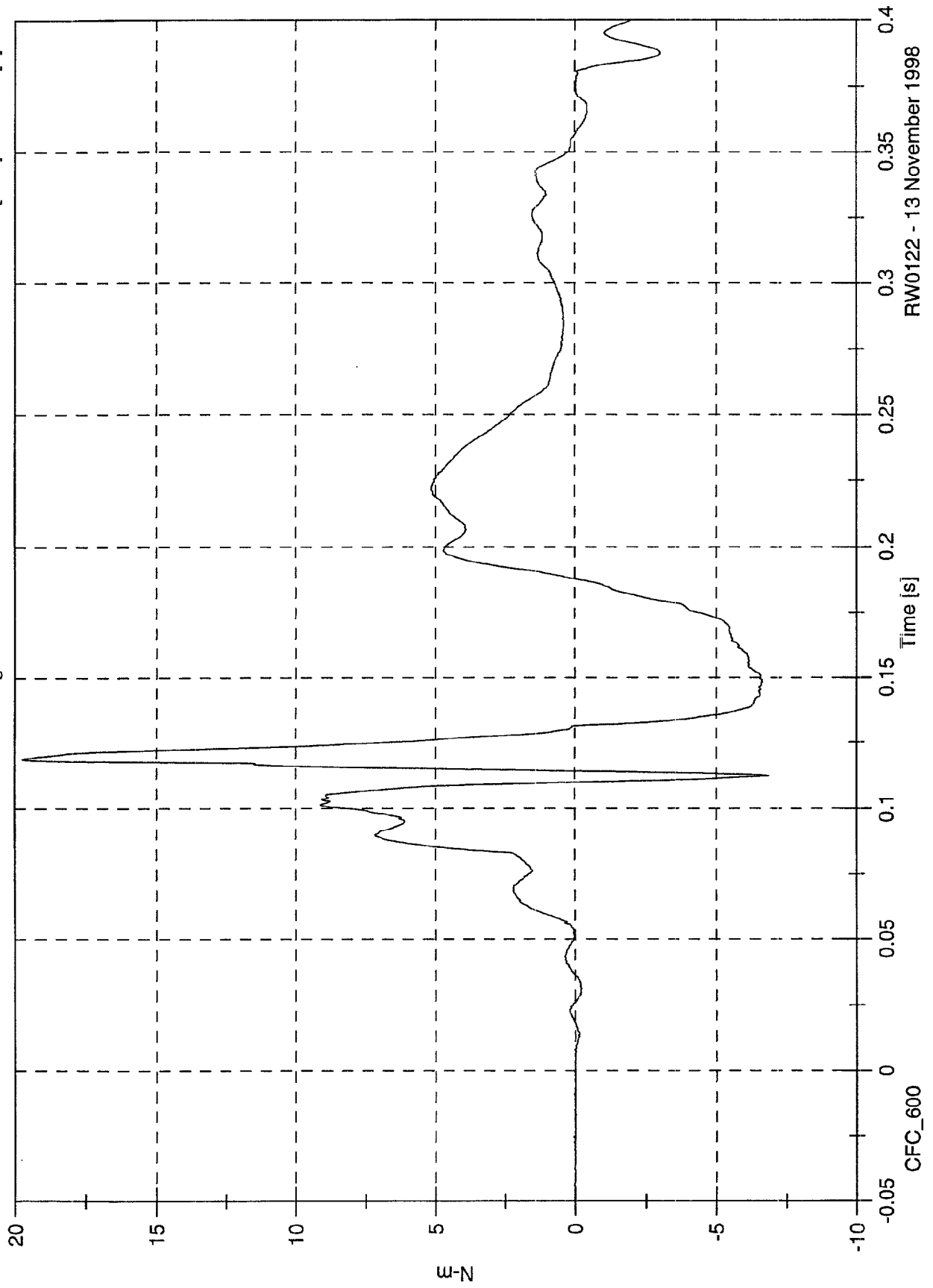


81 kph Rear Impact - 1998 Chevy Cavalier

Max: 19.7 [N-m] at 0.119 [s]

Min: -6.9 [N-m] at 0.112 [s]

Passenger Neck Load Cell Mix

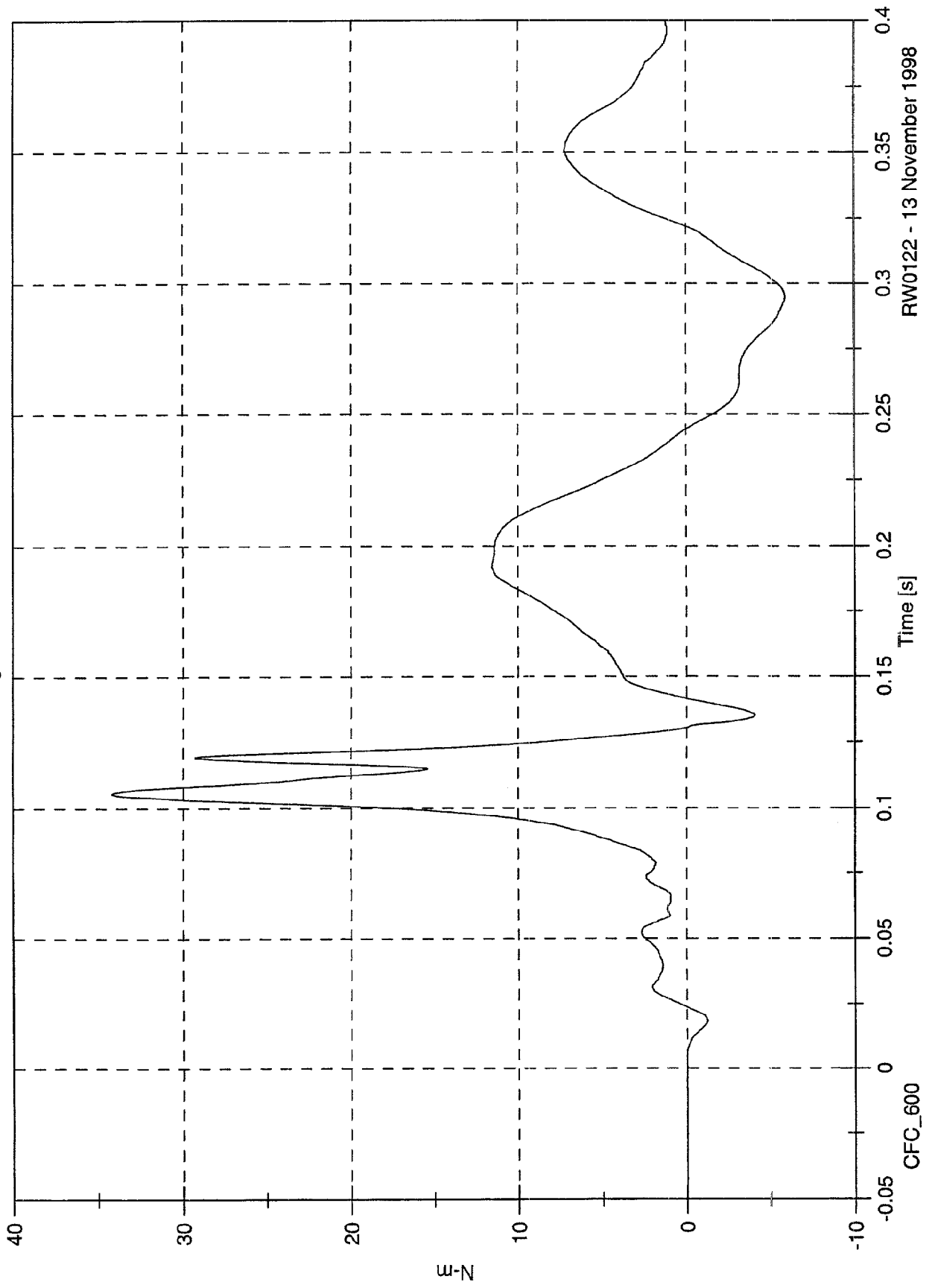


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 34.2 [N-m] at 0.106 [s]
Min: -7.9 [N-m] at 0.478 [s]

Passenger Neck Load Cell My



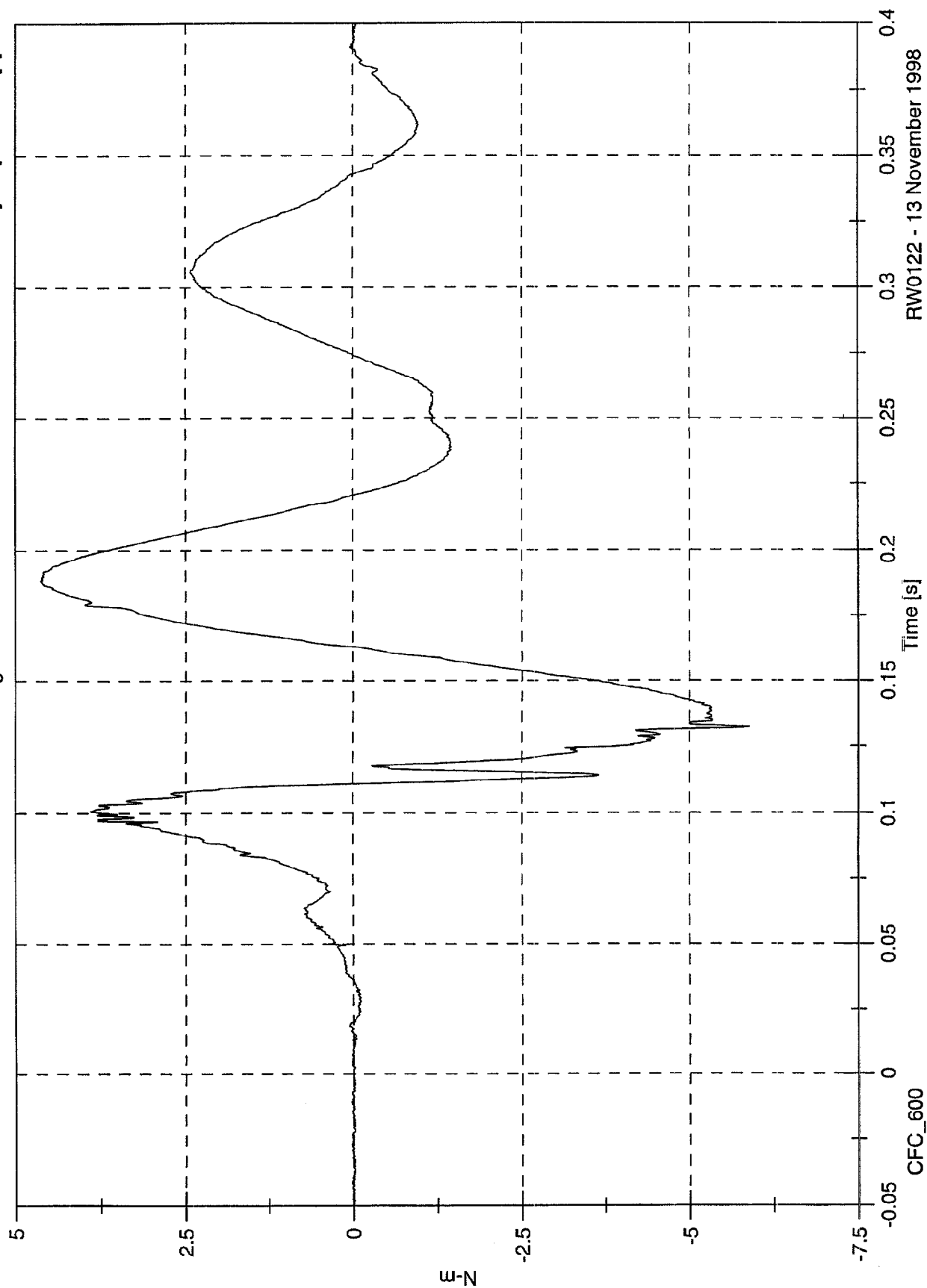
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 4.6 [N-m] at 0.188 [s]

Min: -5.9 [N-m] at 0.132 [s]

Passenger Neck Load Cell Mz



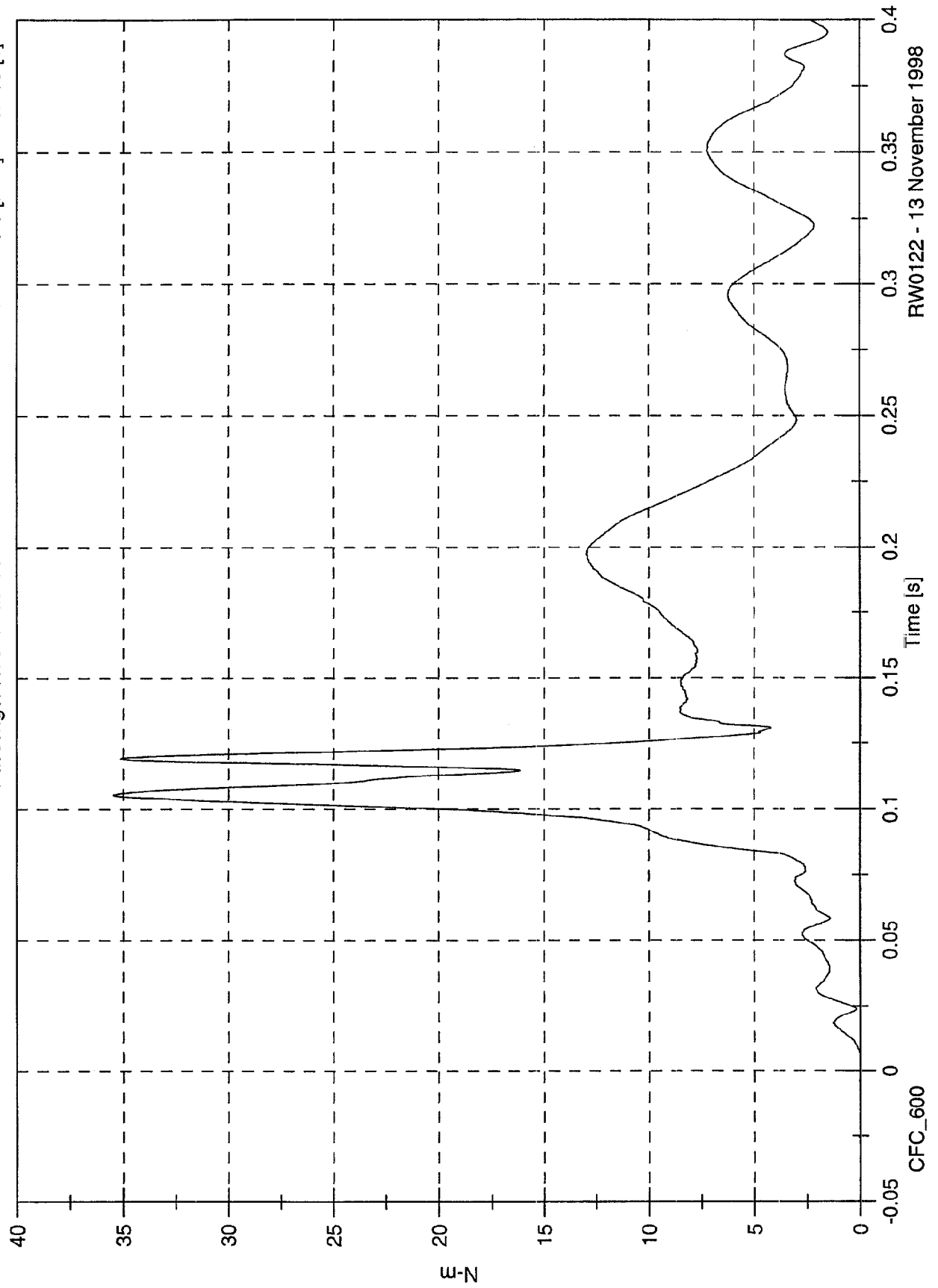
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Passenger Neck Load Cell M Resultant

Max: 35.5 [N-m] at 0.105 [s]

Min: 0.0 [N-m] at -0.100 [s]



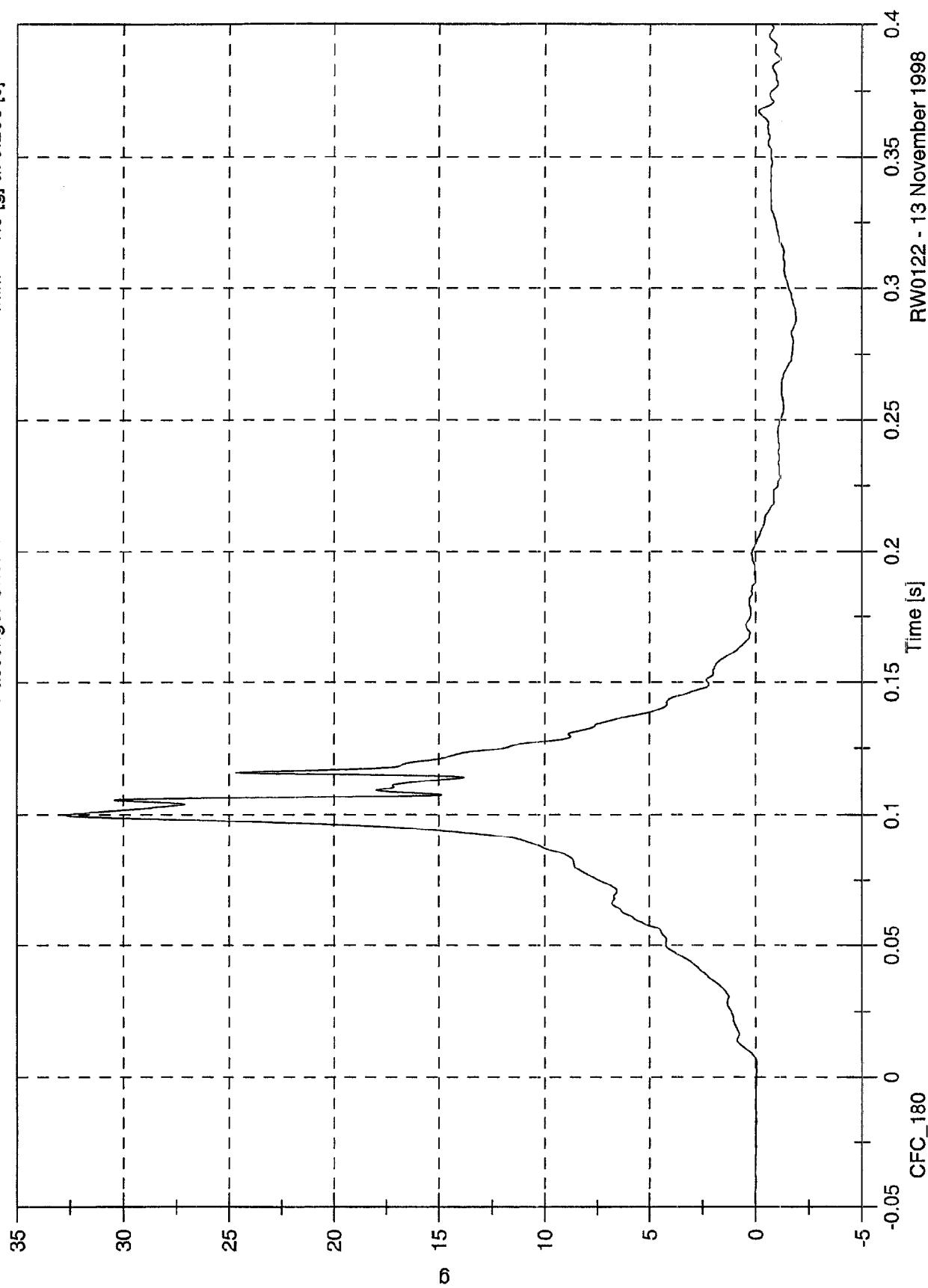
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 32.7 [g] at 0.100 [s]

Min: -1.9 [g] at 0.288 [s]

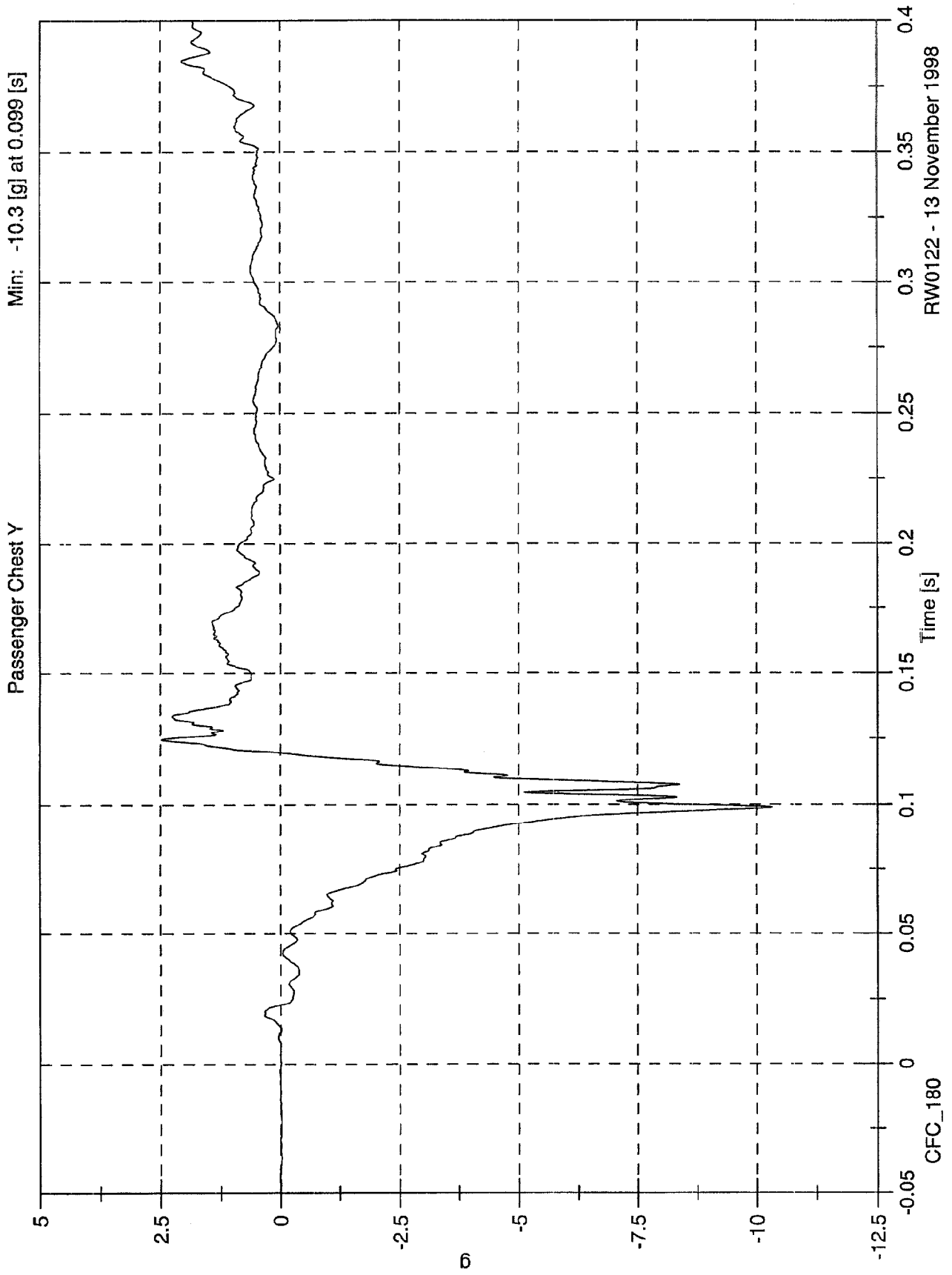
Passenger Chest X



RW0122 - 13 November 1998

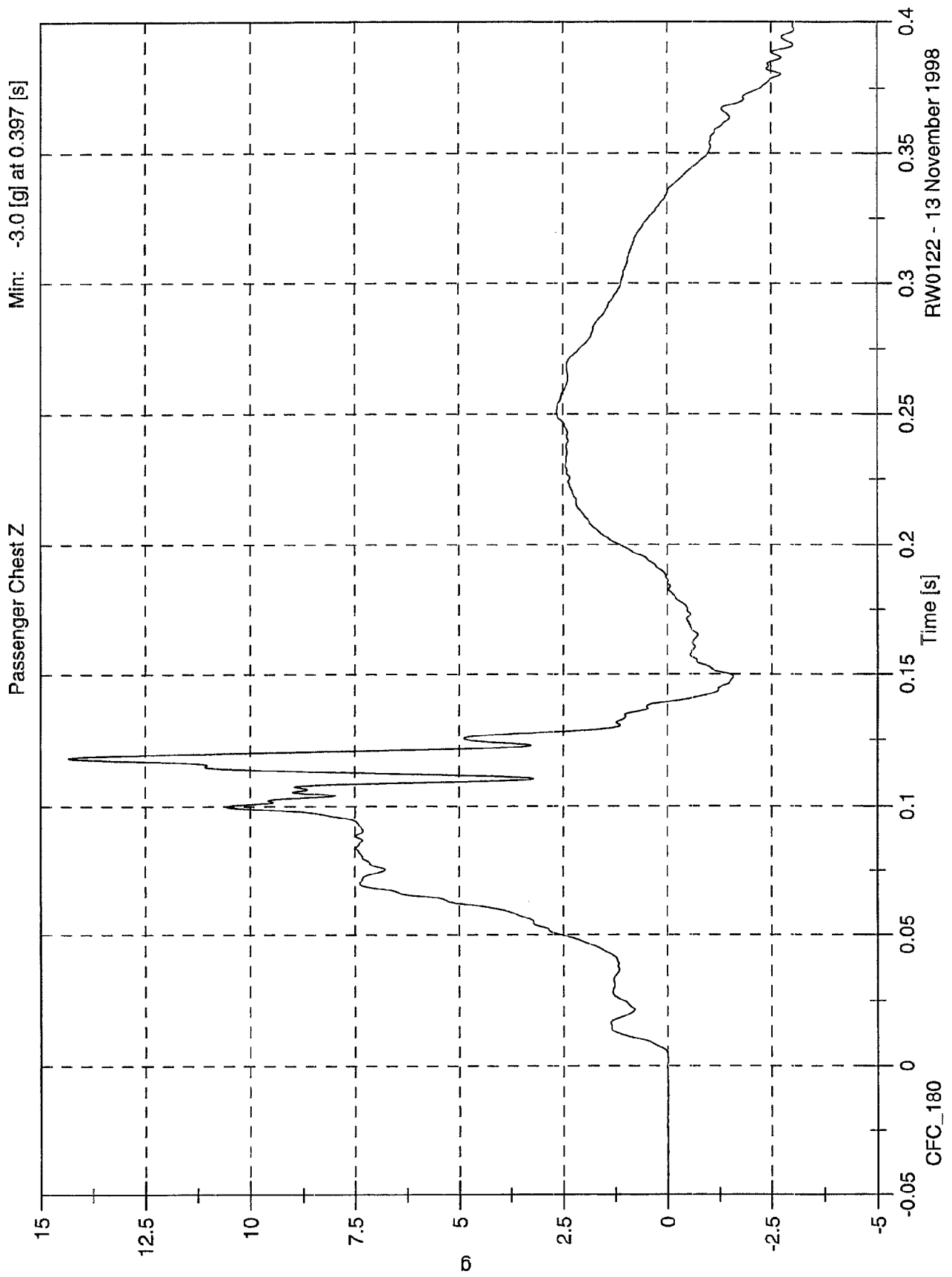
81 kph Rear Impact - 1998 Chevy Cavalier

Max: 4.5 [g] at 0.462 [s]
Min: -10.3 [g] at 0.099 [s]



81 kph Rear Impact - 1998 Chevy Cavalier

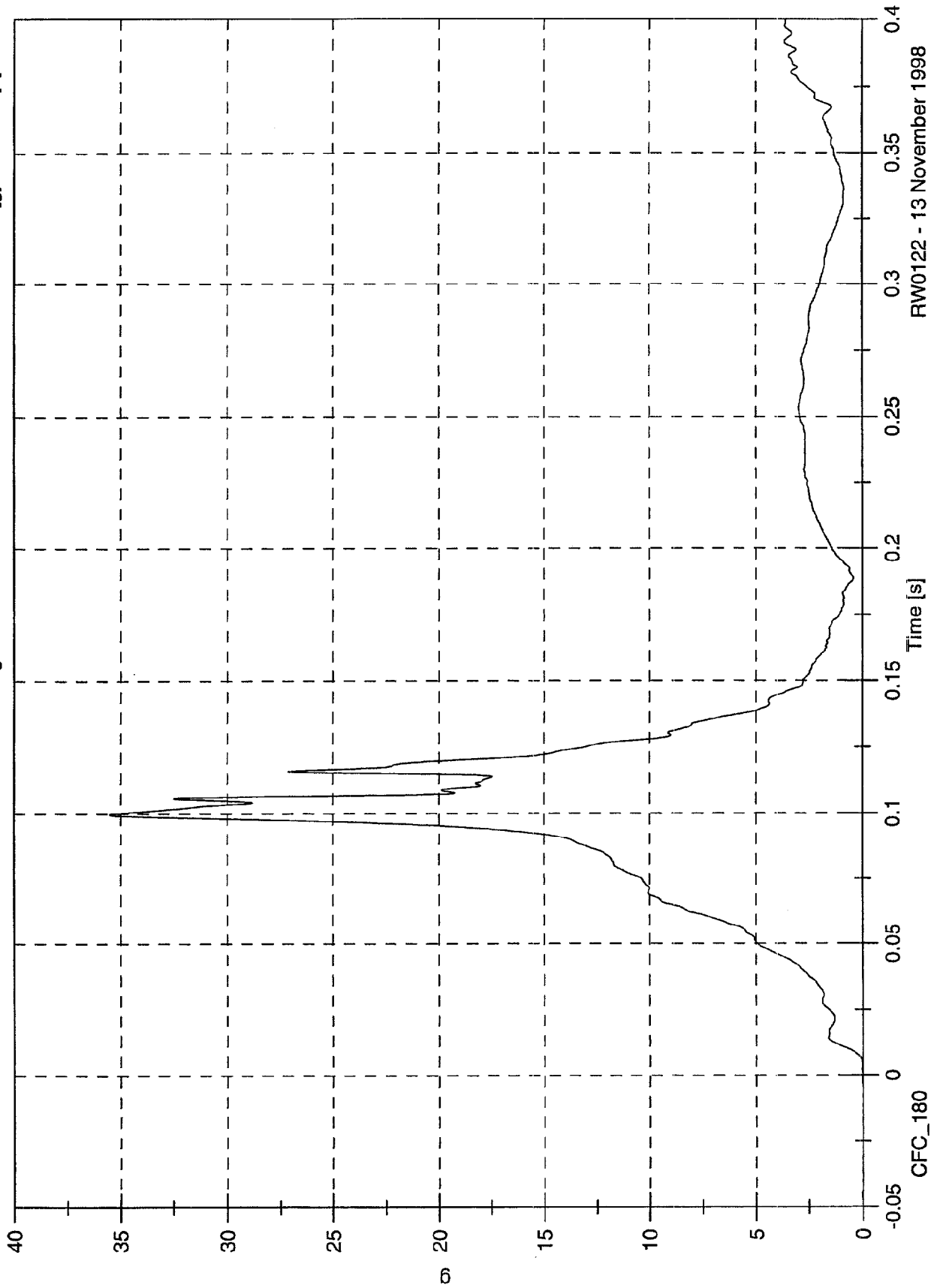
Max: 14.3 [g] at 0.118 [s]
Min: -3.0 [g] at 0.397 [s]



81 kph Rear Impact - 1998 Chevy Cavalier

Max: 35.5 [g] at 0.100 [s]
Min: 0.0 [g] at -0.091 [s]

Passenger Chest Resultant



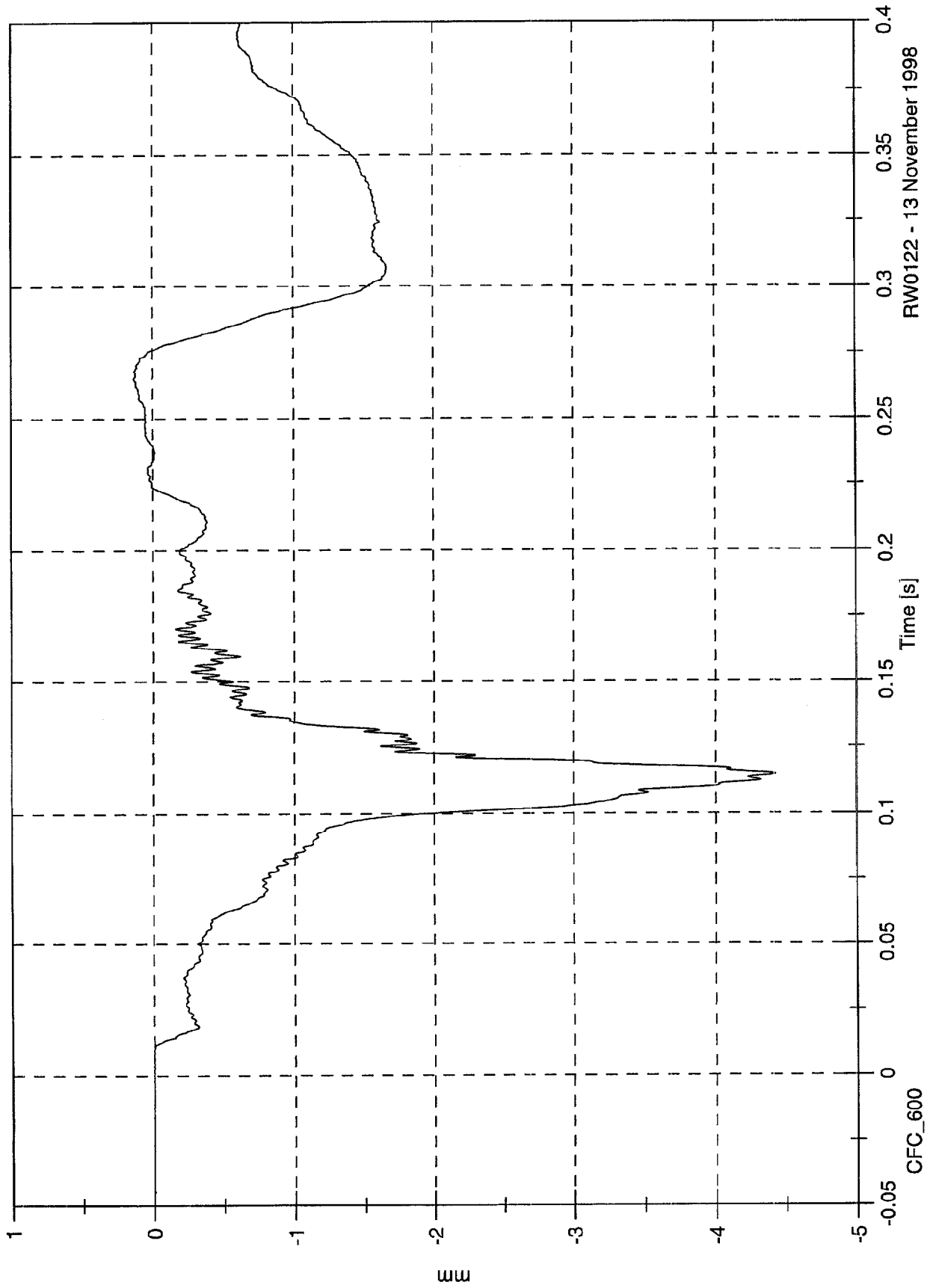
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 0.1 [mm] at 0.265 [s]

Min: -4.4 [mm] at 0.115 [s]

Passenger Chest Displacement

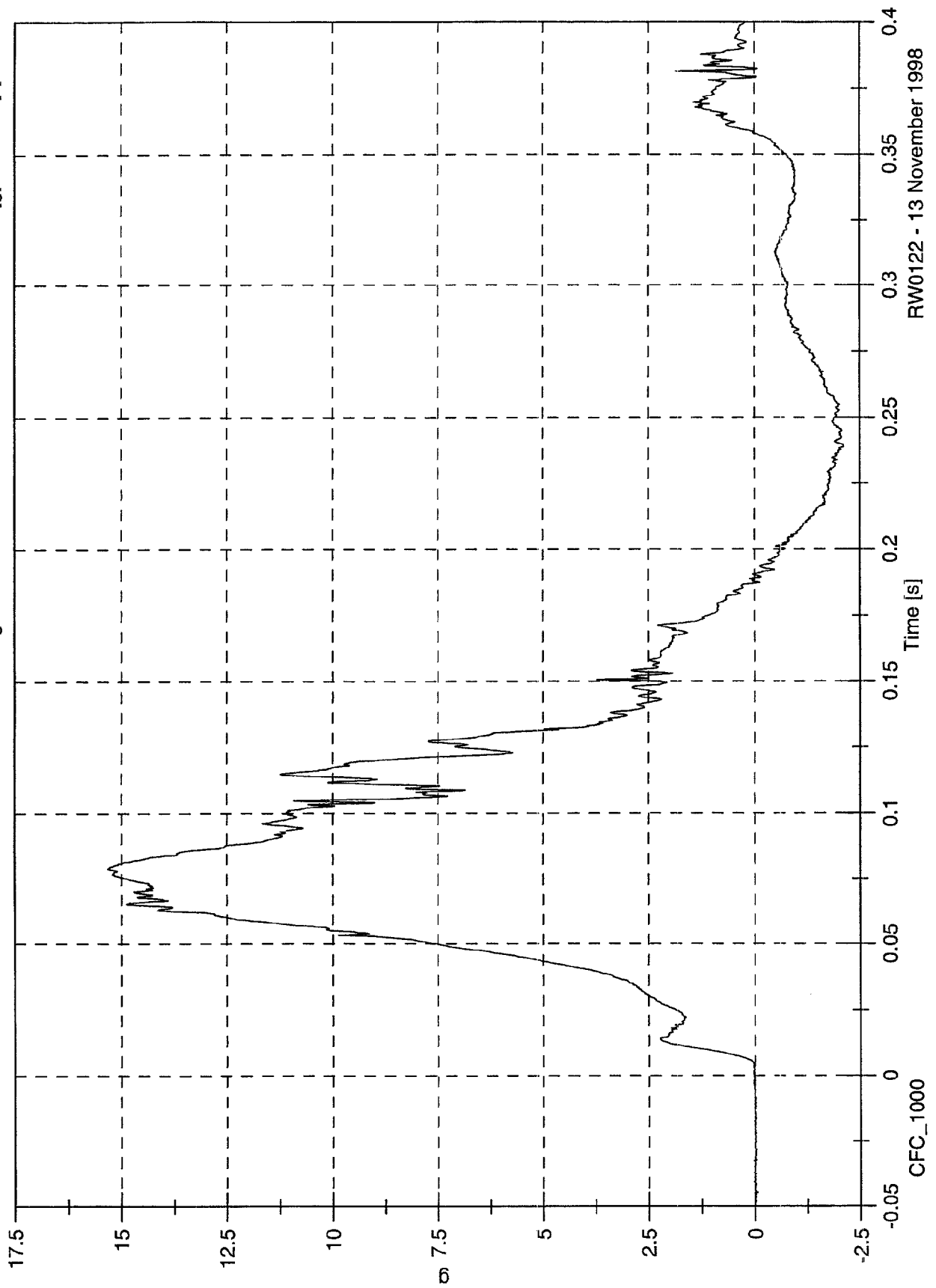


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 15.3 [g] at 0.079 [s]
Min: -2.1 [g] at 0.239 [s]

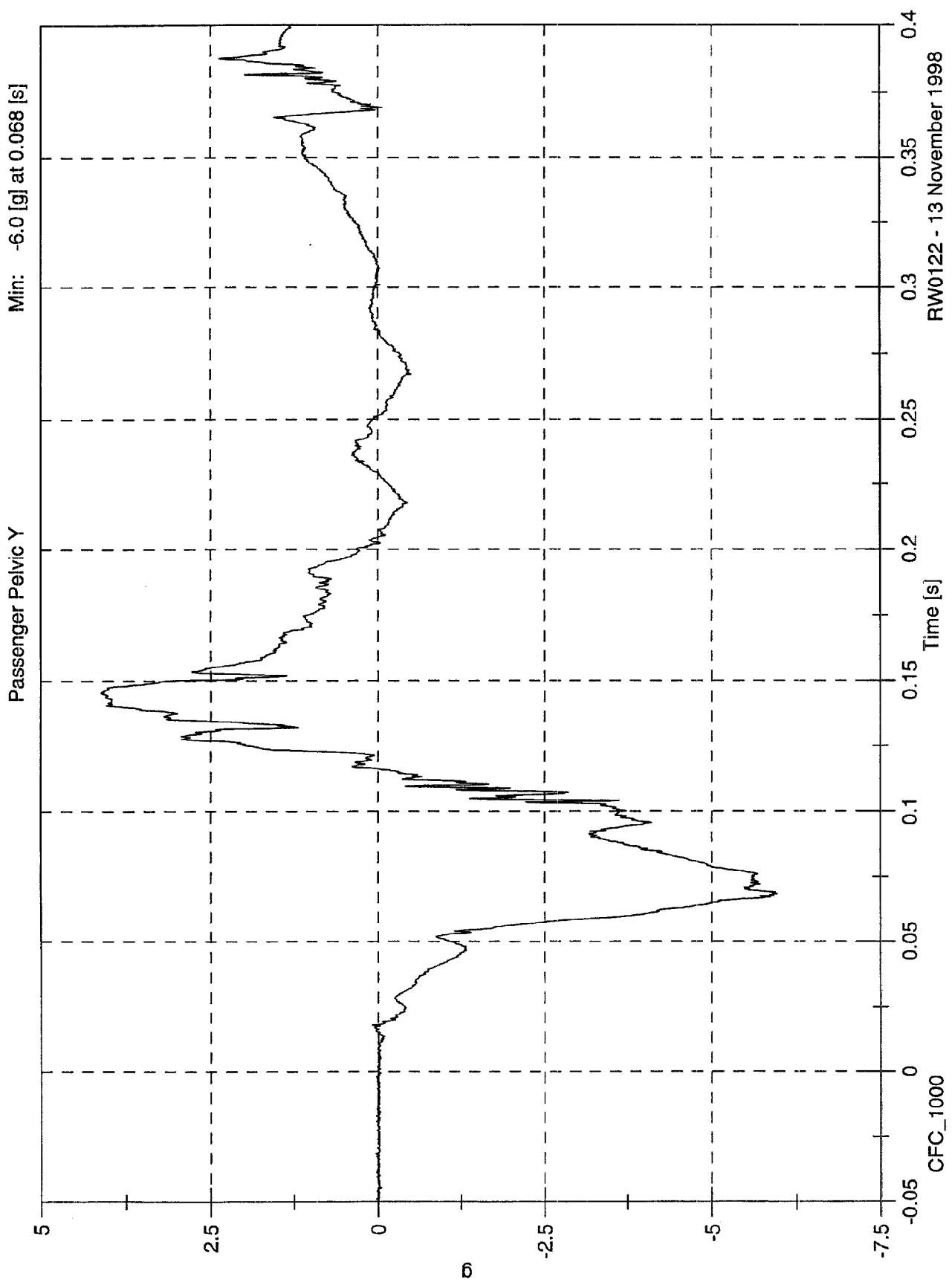
Passenger Pelvic X



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 4.1 [g] at 0.145 [s]
Min: -6.0 [g] at 0.068 [s]

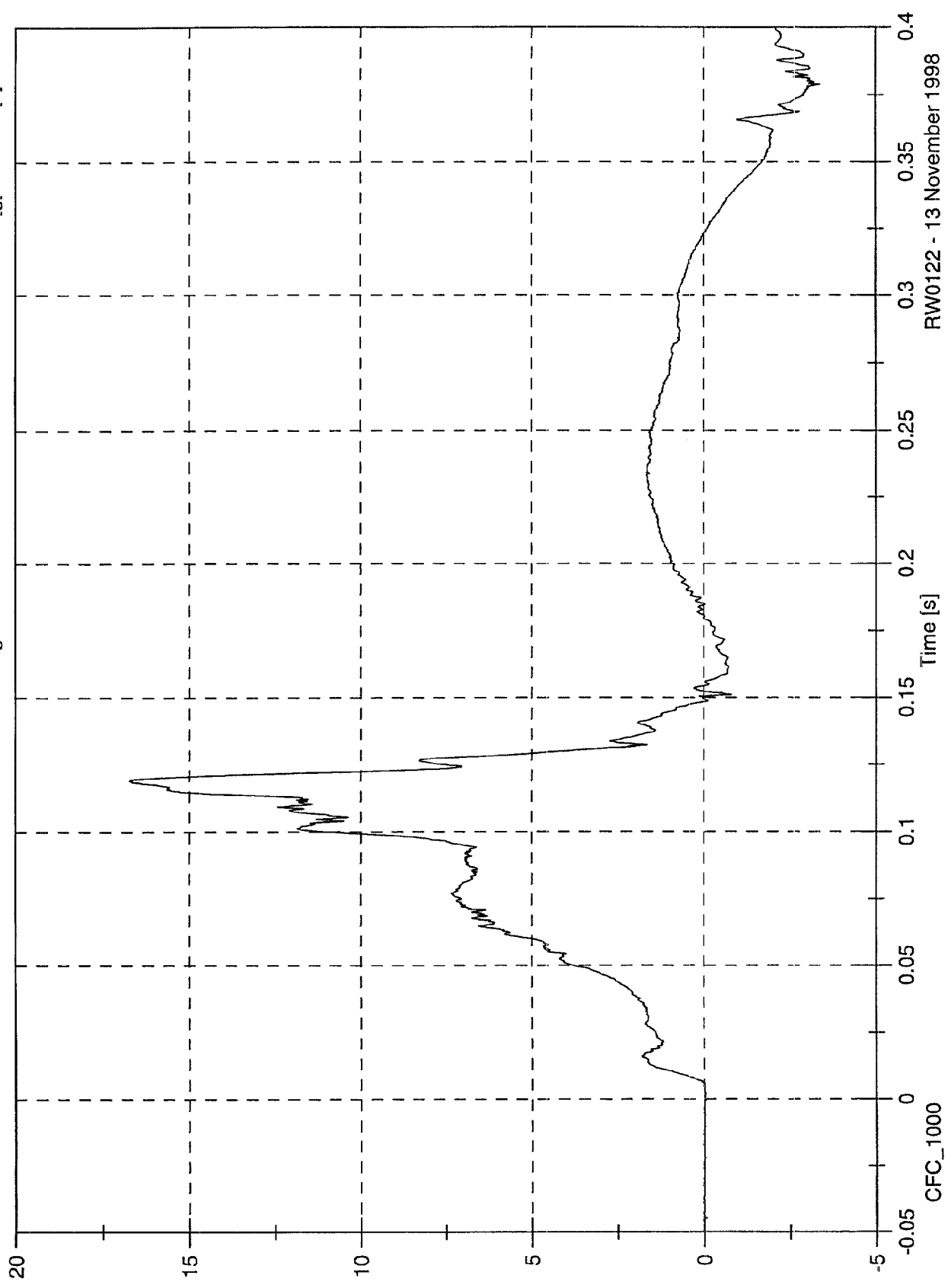


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 16.7 [g] at 0.119 [s]
Min: -3.4 [g] at 0.379 [s]

Passenger Pelvic Z

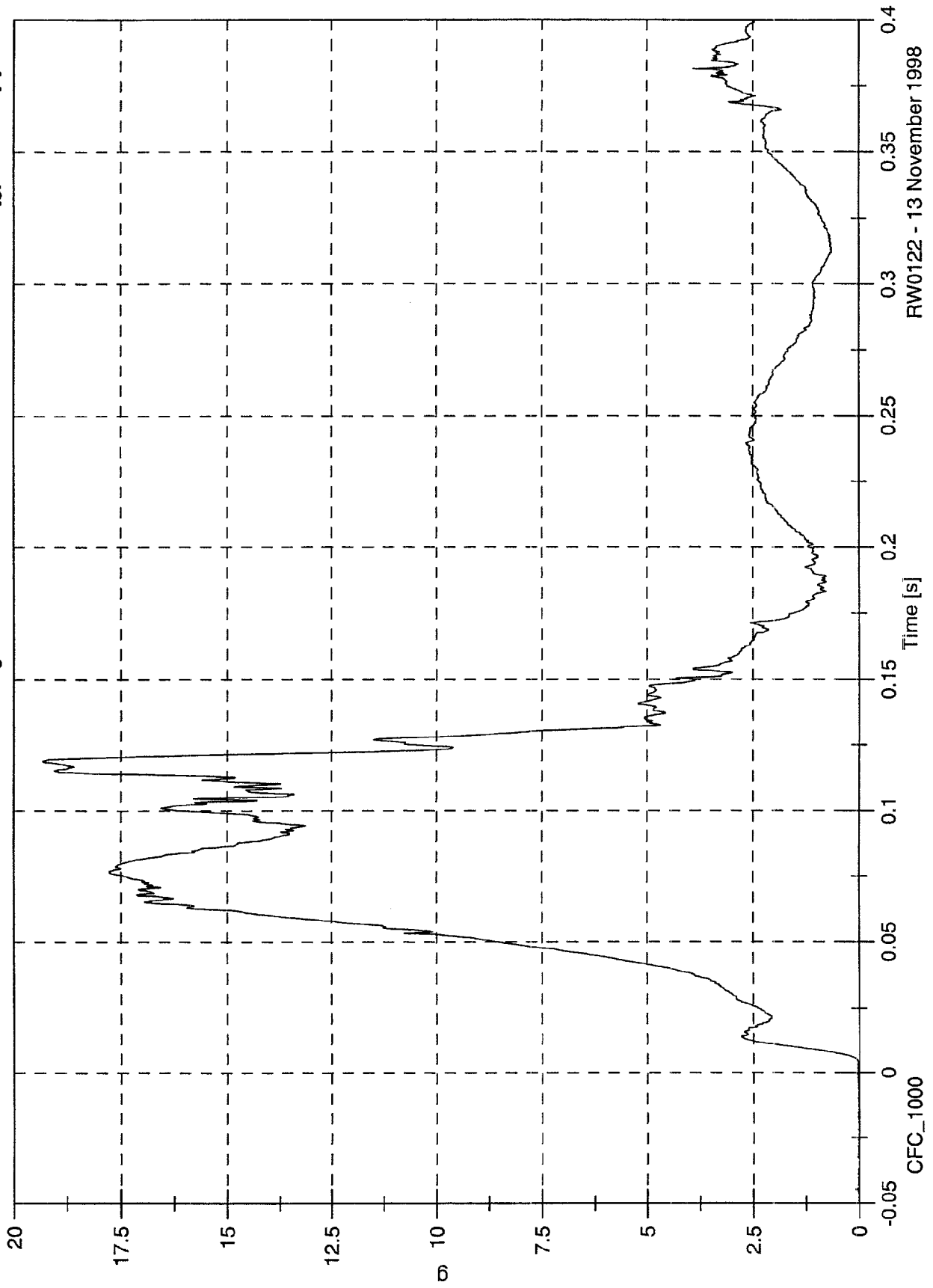


RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 19.3 [g] at 0.119 [s]
Min: 0.0 [g] at -0.053 [s]

Passenger Pelvic Resultant



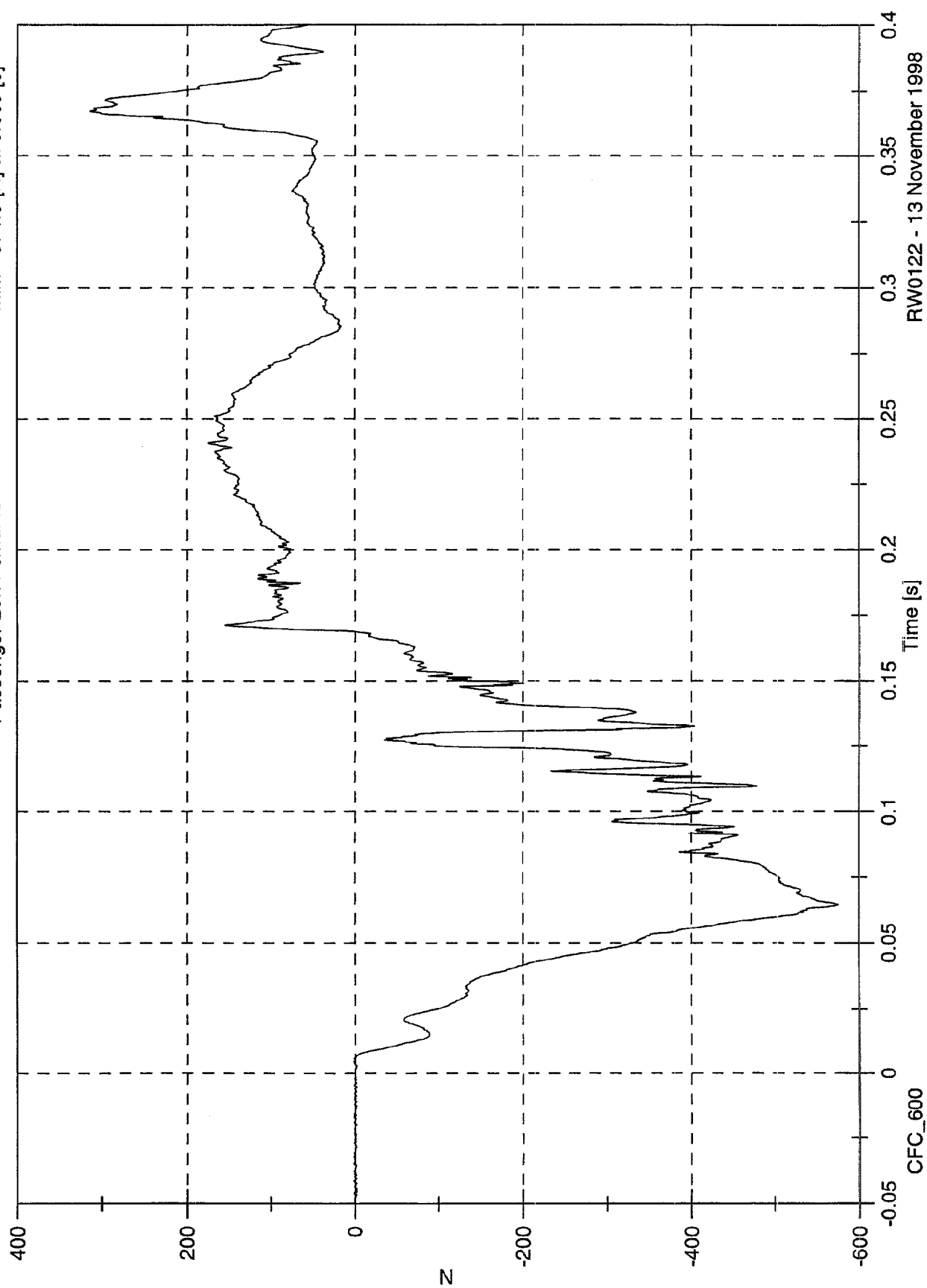
RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 313.9 [N] at 0.367 [s]

Min: -574.9 [N] at 0.065 [s]

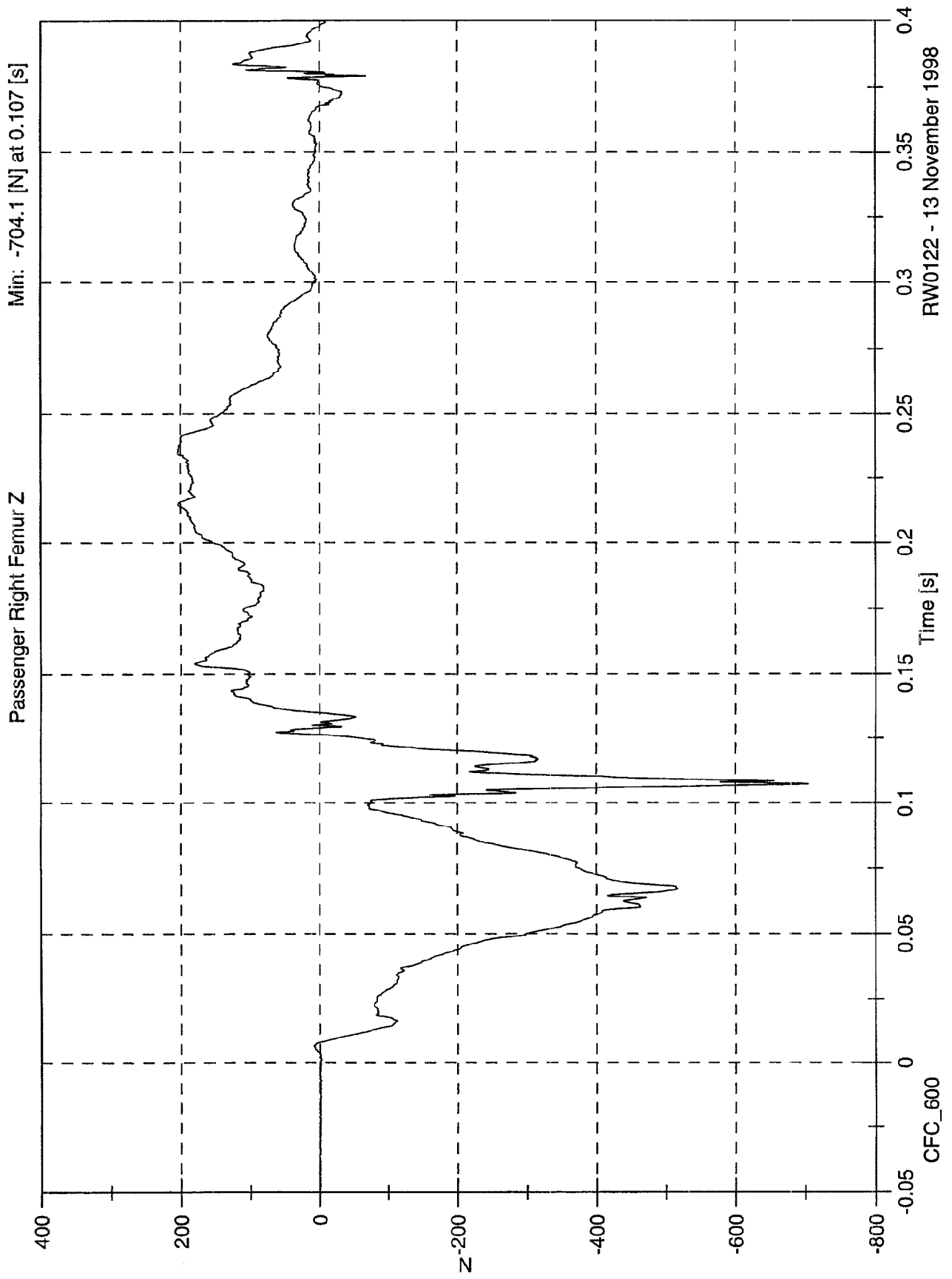
Passenger Left Femur Z



RW0122 - 13 November 1998

81 kph Rear Impact - 1998 Chevy Cavalier

Max: 204.4 [N] at 0.235 [s]
Min: -704.1 [N] at 0.107 [s]



RW0122 - 13 November 1998

TEST NO. RW0122

VEHICLE 2 (MDB)

SAE FILTER CHANNEL CLASS

Accelerations

60

Integrations

180

Barrier Forces

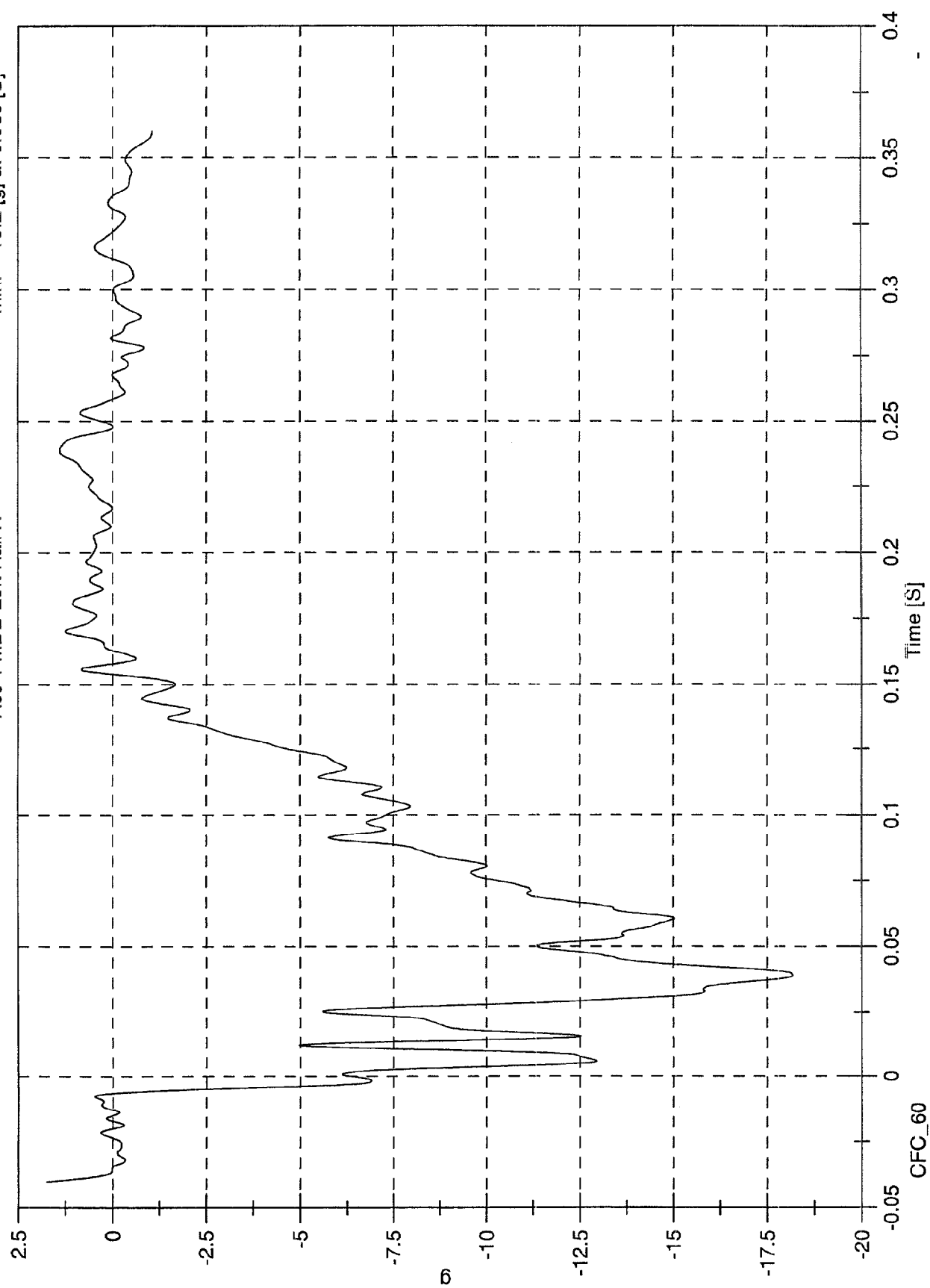
60

301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 1.7 [g] at -0.040 [S]

Min: -18.2 [g] at 0.039 [S]

Acc 1 MDB Left Rail X

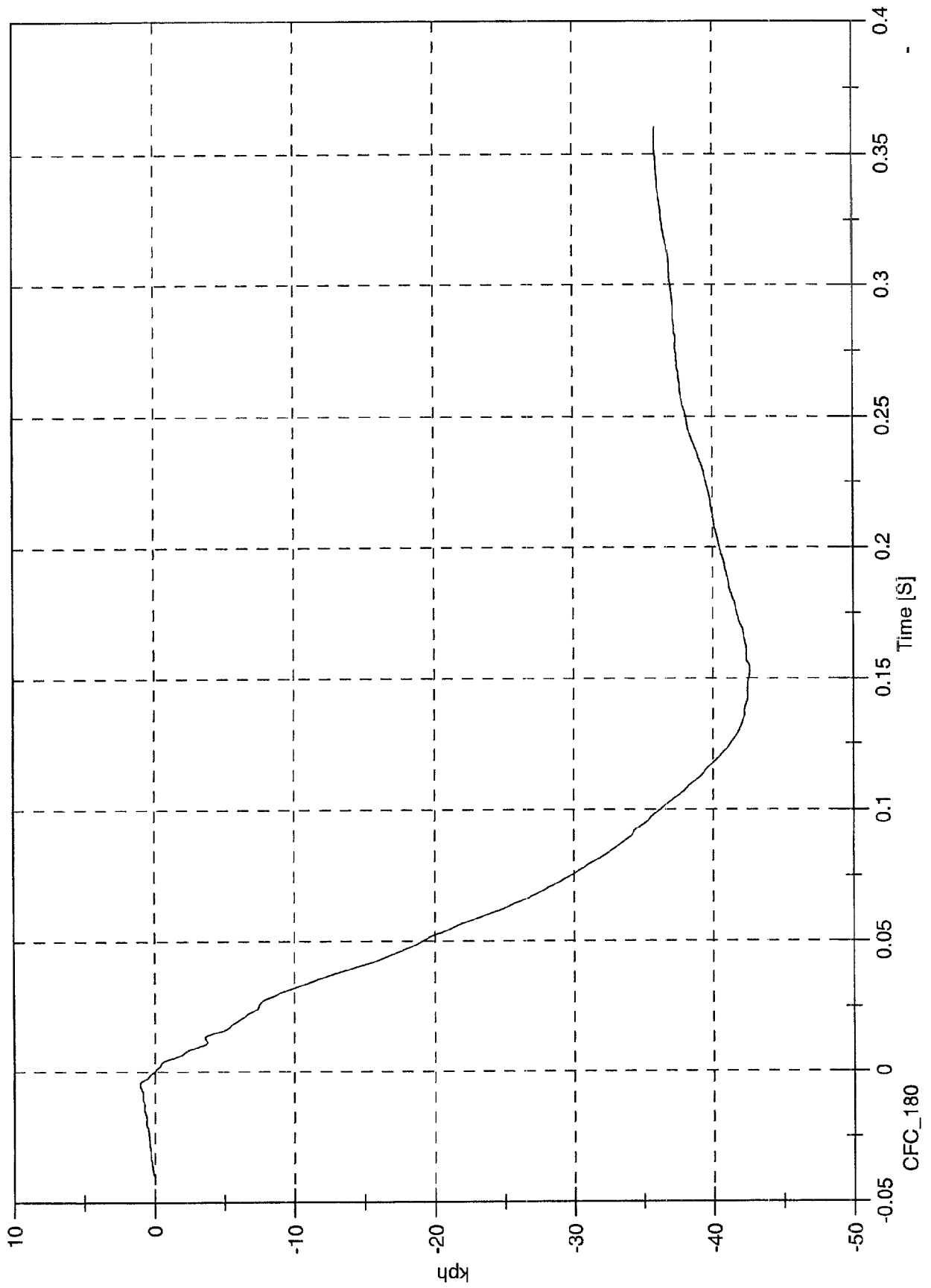


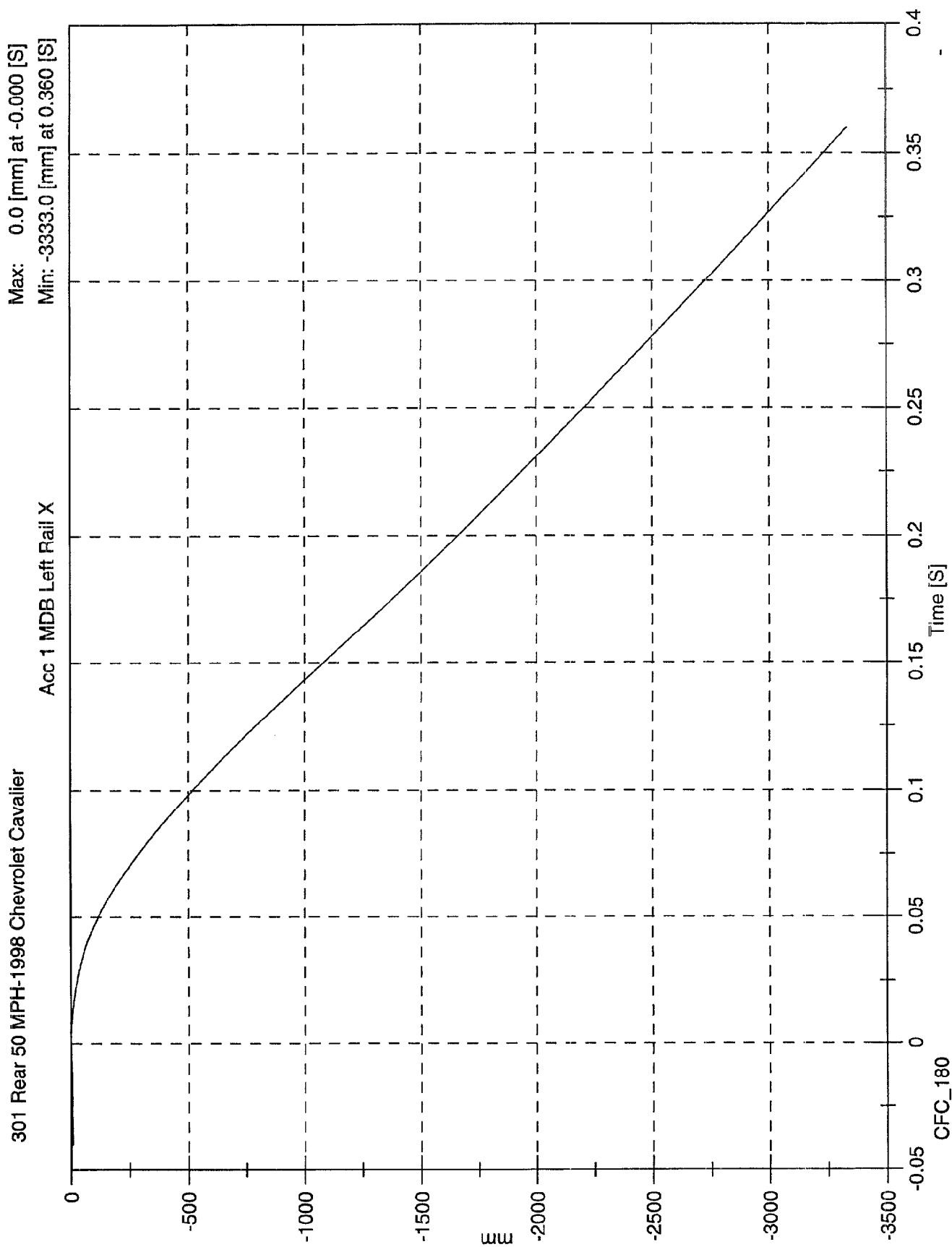
301 Rear 50 MPH-1998 Chevrolet Cavalier

Acc 1 MDB Left Rail X

Max: 1.1 [kph] at -0.005 [S]

Min: -42.6 [kph] at 0.153 [S]



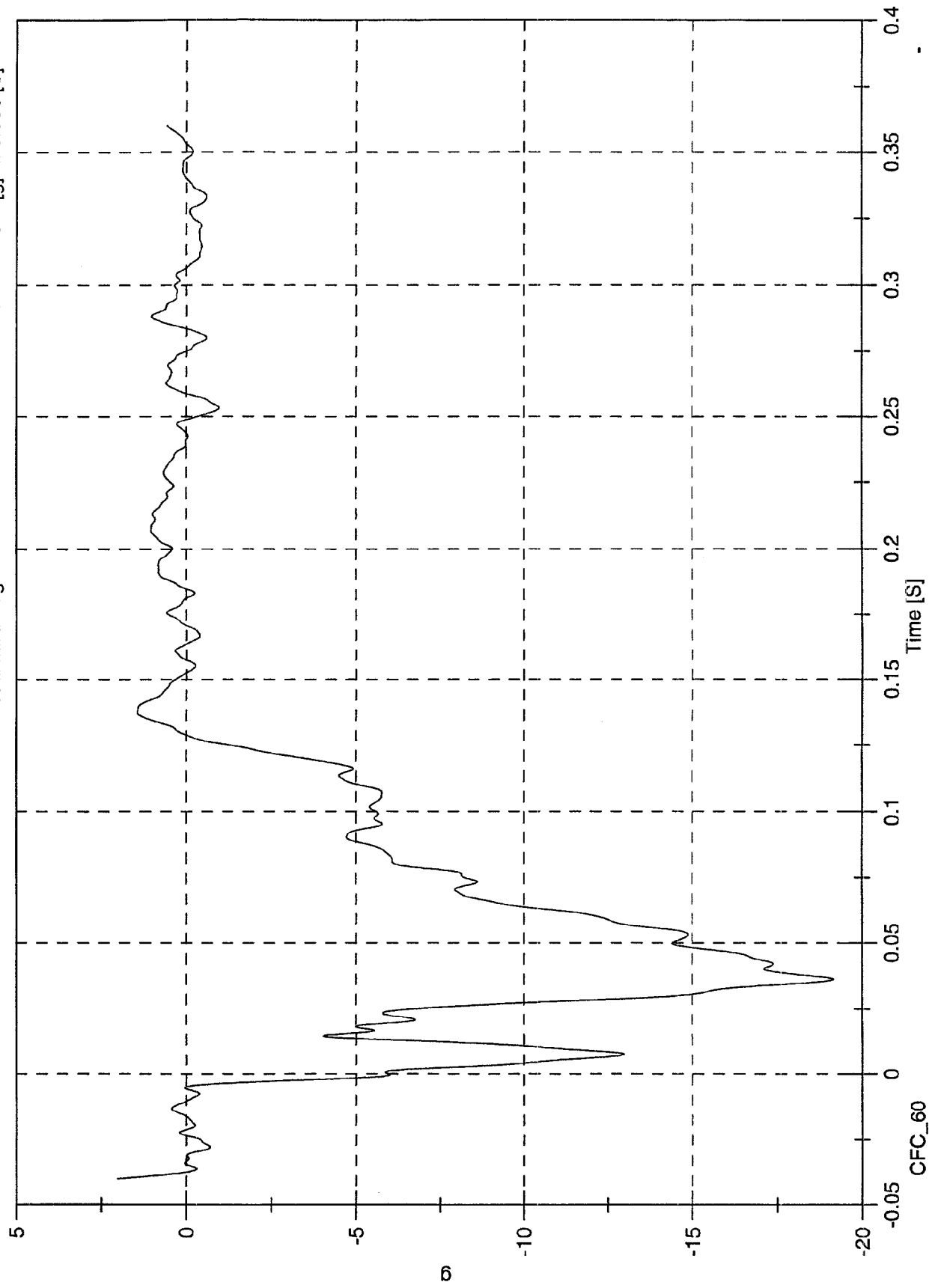


301 Rear 50 MPH-1998 Chevrolet Cavalier

Acc 2 MDB Right Rail X

Max: 2.0 [g] at -0.040 [S]

Min: -19.1 [g] at 0.036 [S]

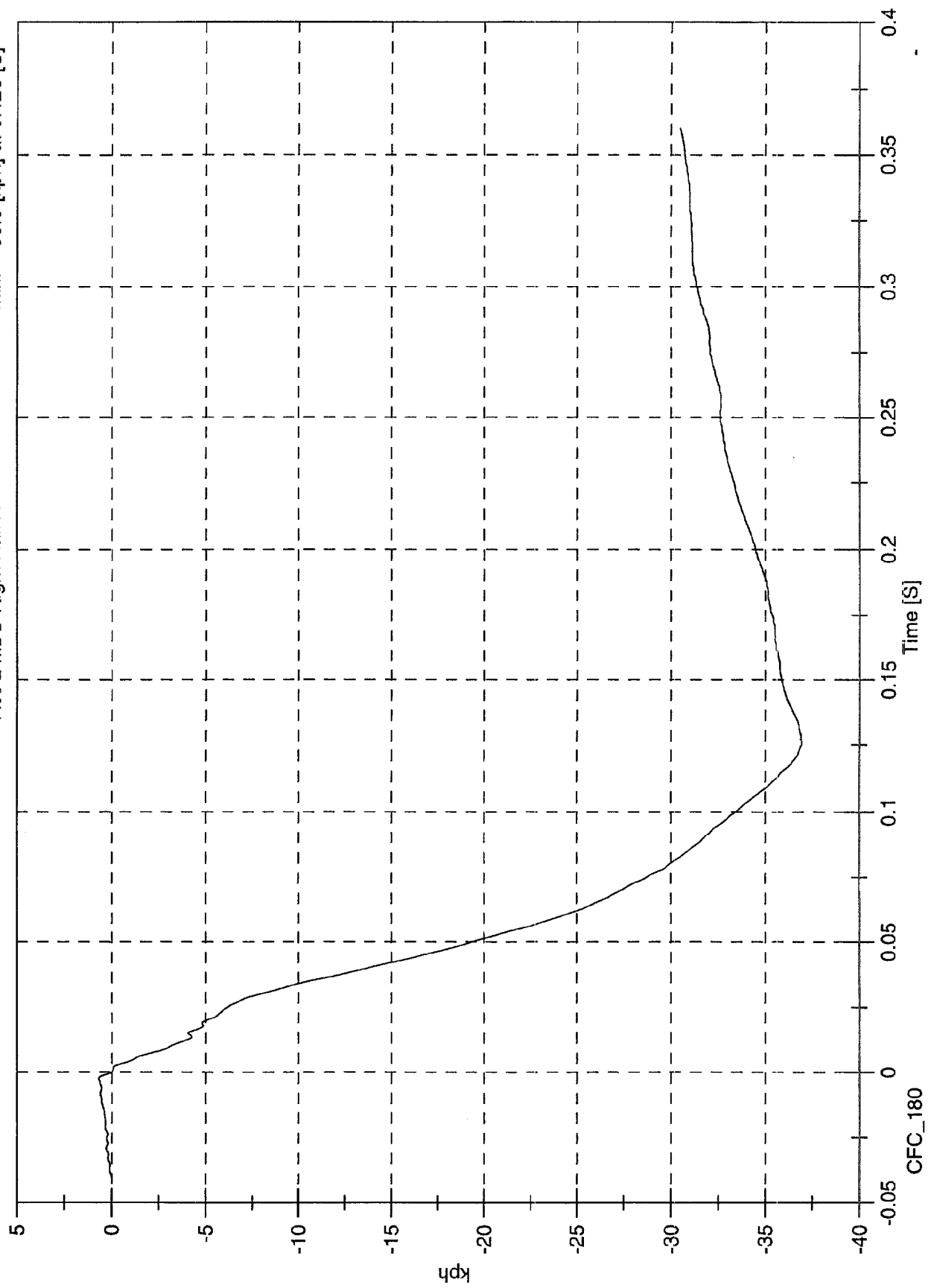


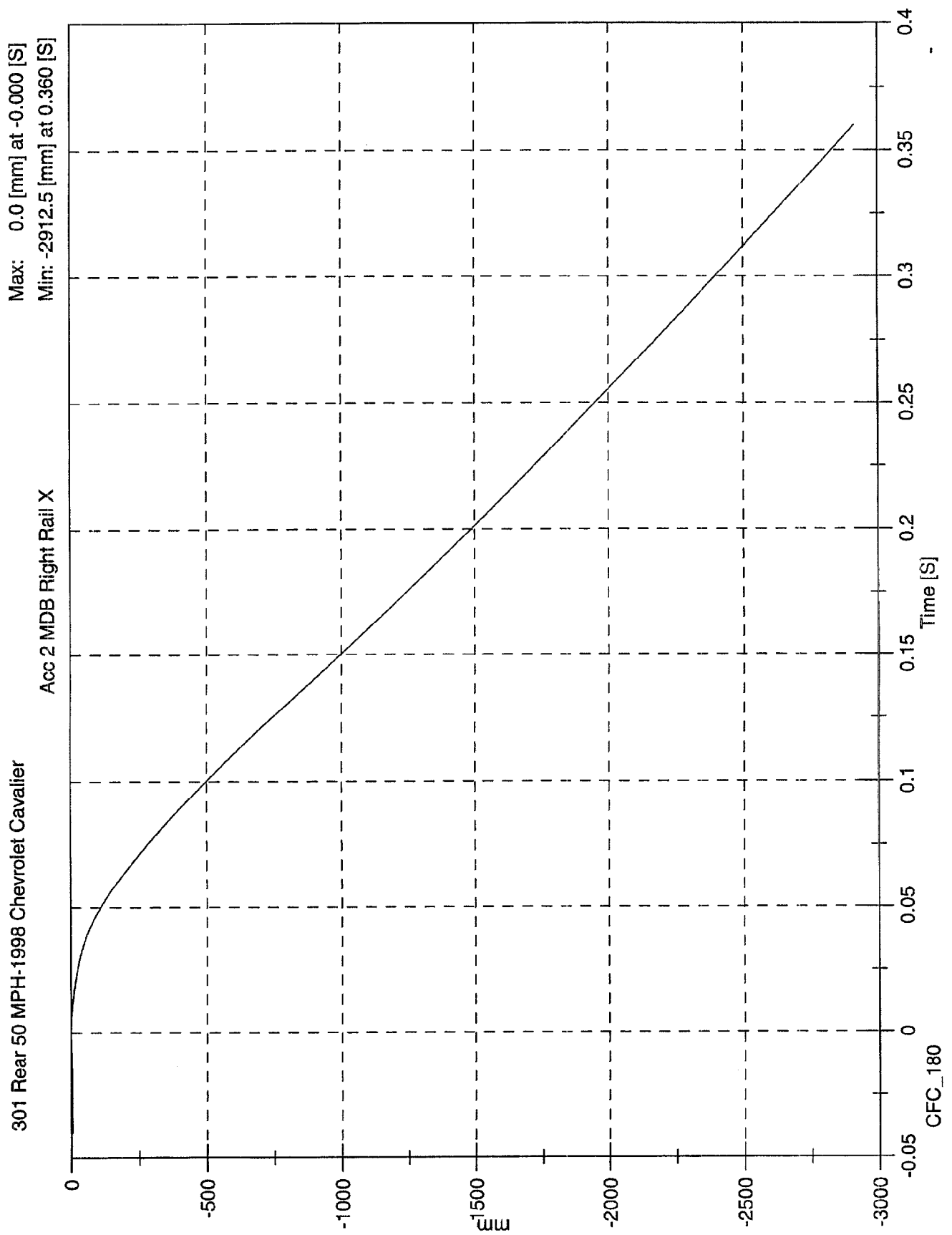
301 Rear 50 MPH-1998 Chevrolet Cavalier

Acc 2 MDB Right Rail X

Max: 0.7 [kph] at -0.003 [S]

Min: -36.9 [kph] at 0.126 [S]

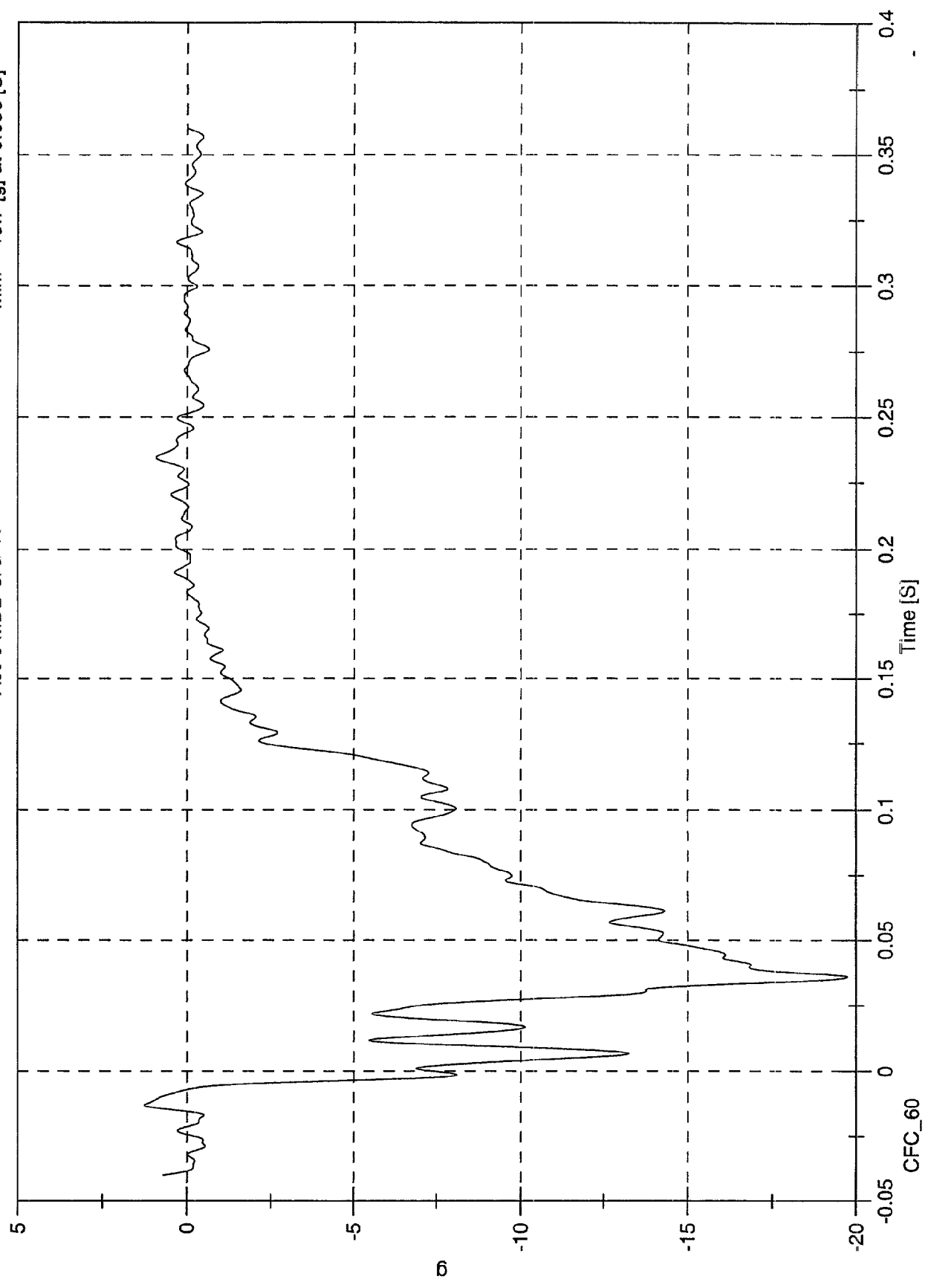




301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 1.3 [g] at -0.013 [S]
Min: -19.7 [g] at 0.036 [S]

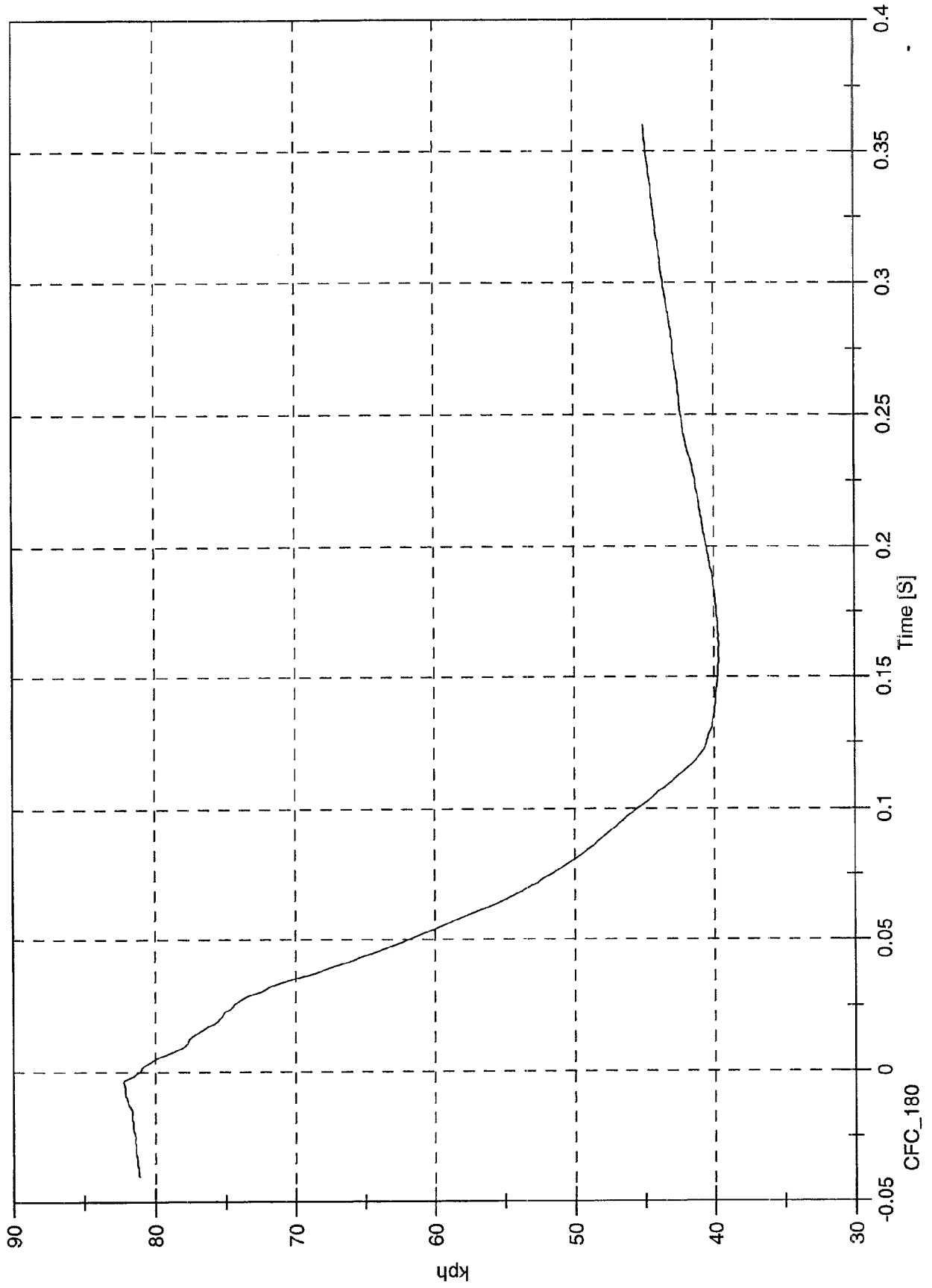
Acc 3 MDB C/G X



301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 82.2 [kph] at -0.004 [S]
Min: 39.7 [kph] at 0.162 [S]

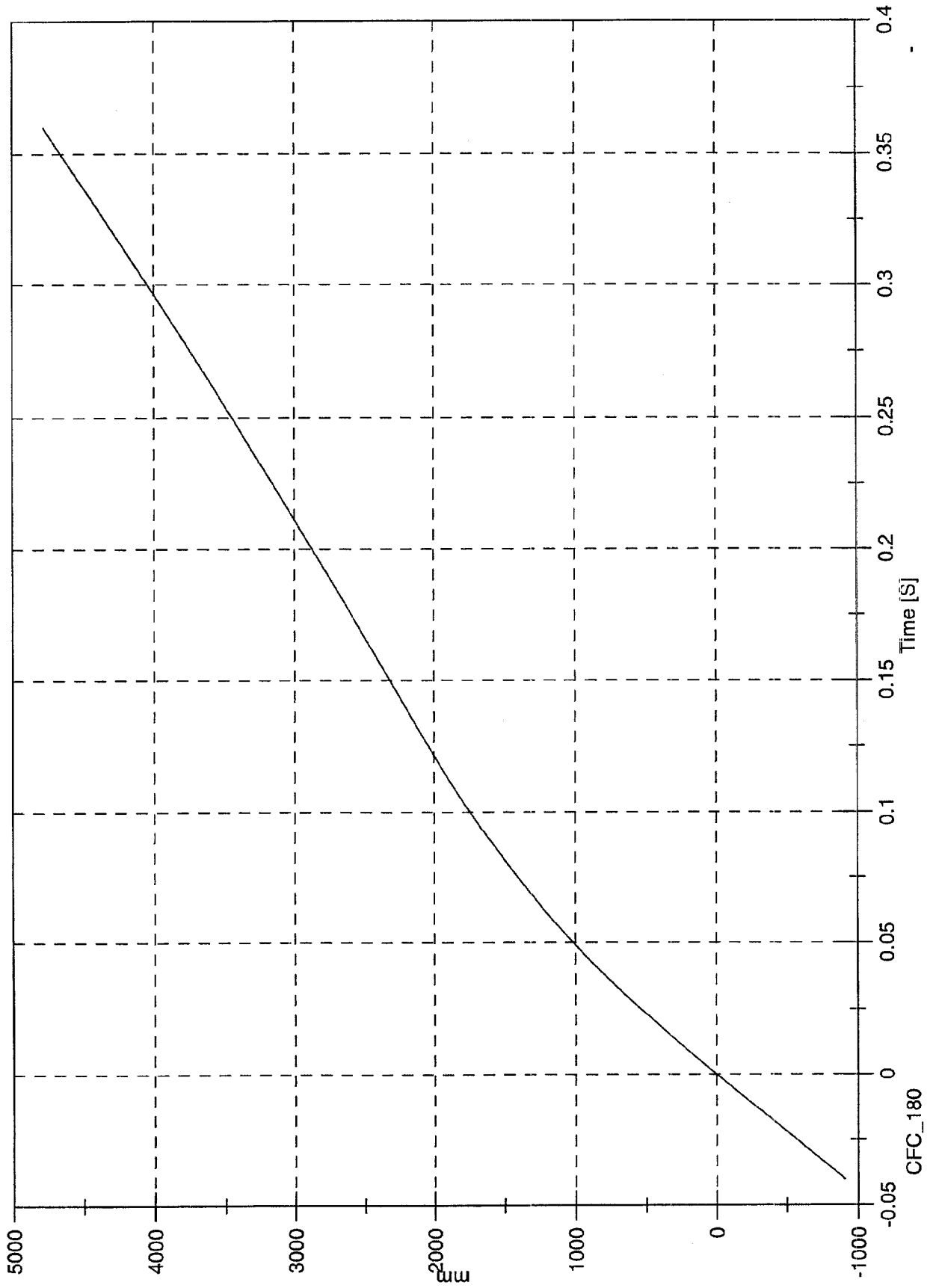
Acc 3 MDB C/G X



301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 4779.6 [mm] at 0.360 [S]
Min: -906.5 [mm] at -0.040 [S]

Acc 3 MDB C/G X

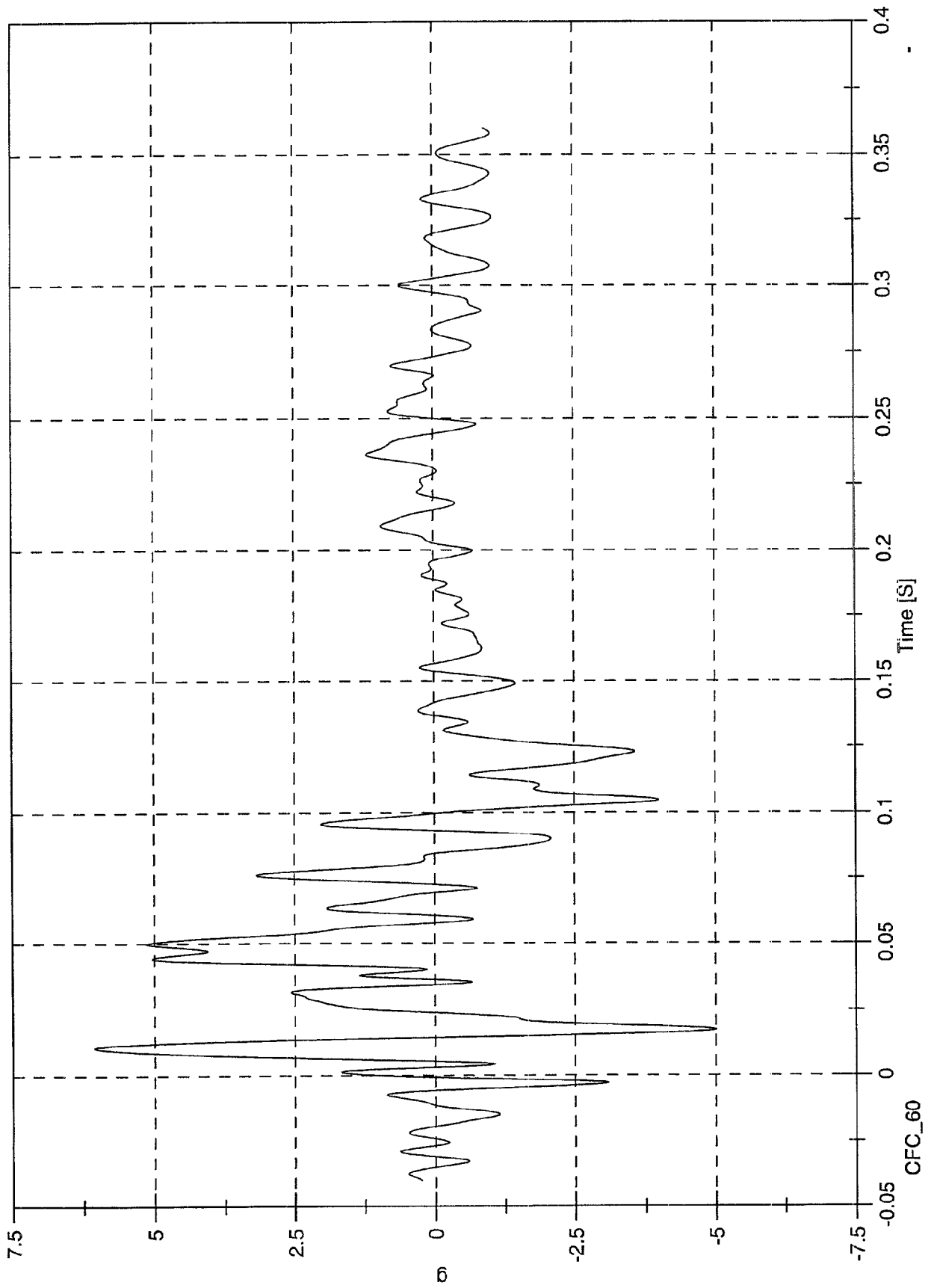


301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 6.1 [g] at 0.011 [S]

Min: -5.0 [g] at 0.017 [S]

Acc 3 MDB C/G Y

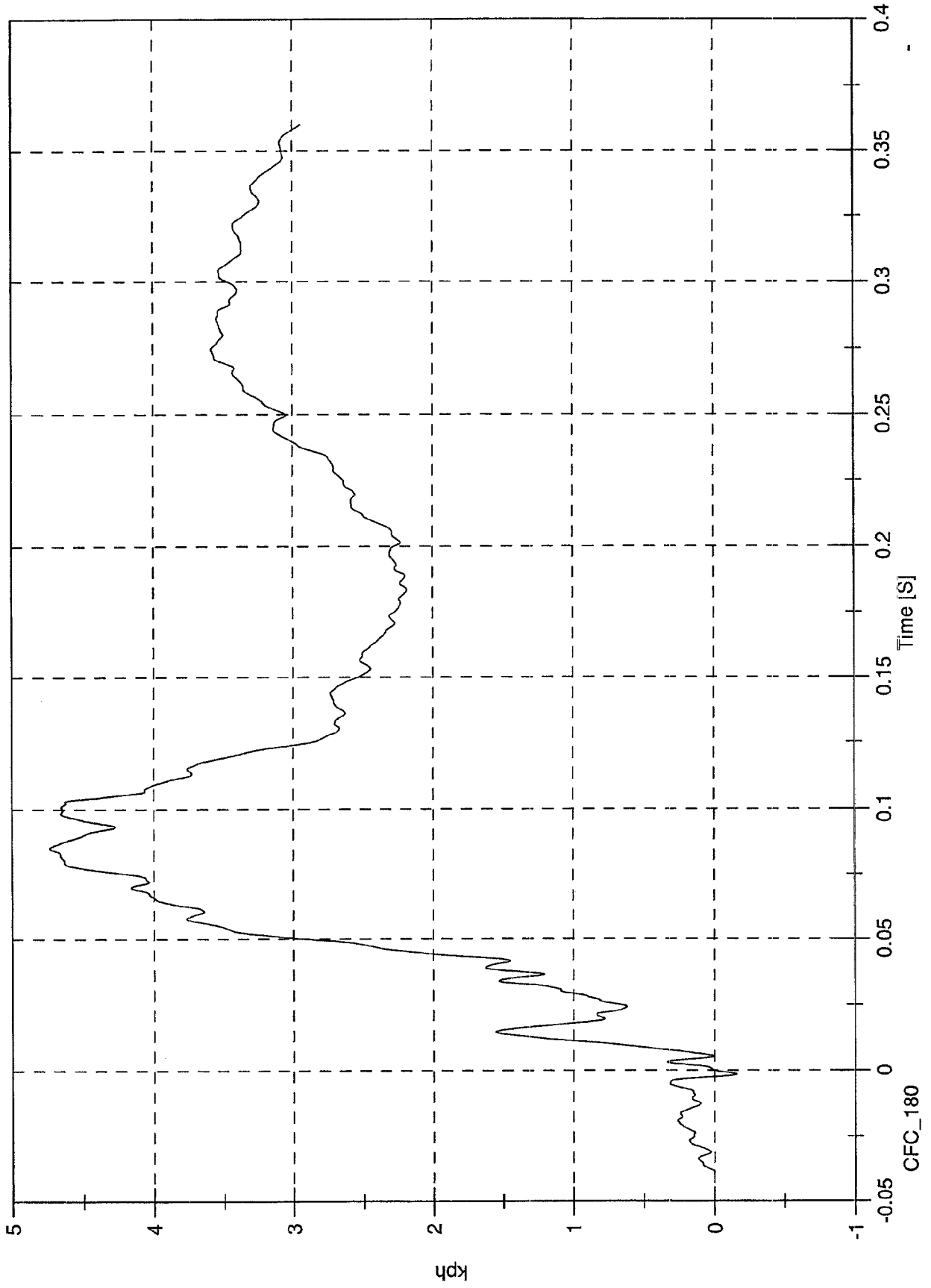


301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 4.7 [kph] at 0.085 [S]

Min: -0.2 [kph] at -0.002 [S]

Acc 3 MDB C/G Y

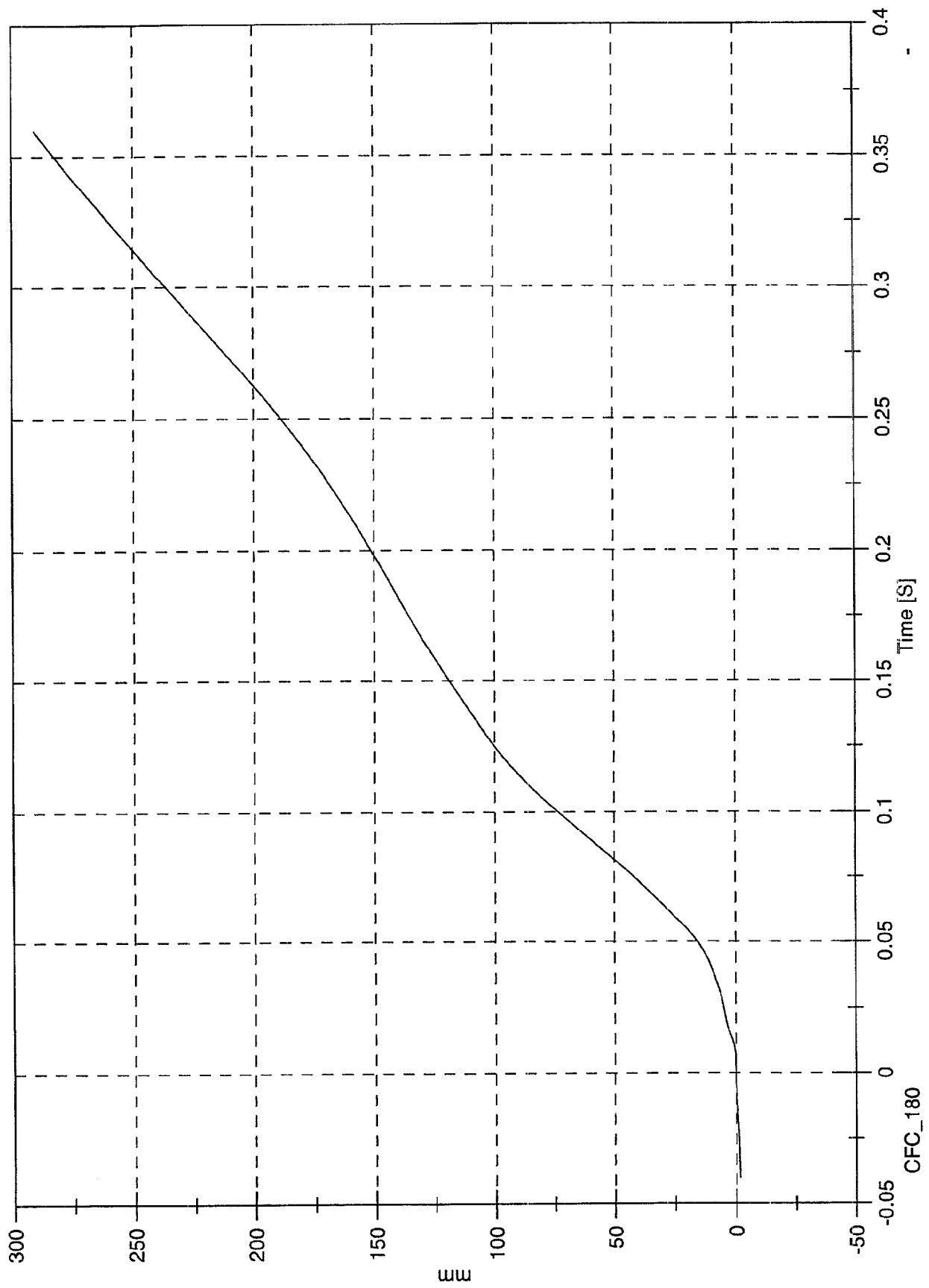


301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 290.7 [mm] at 0.360 [S]

Min: -1.5 [mm] at -0.040 [S]

Acc 3 MDB C/G Y

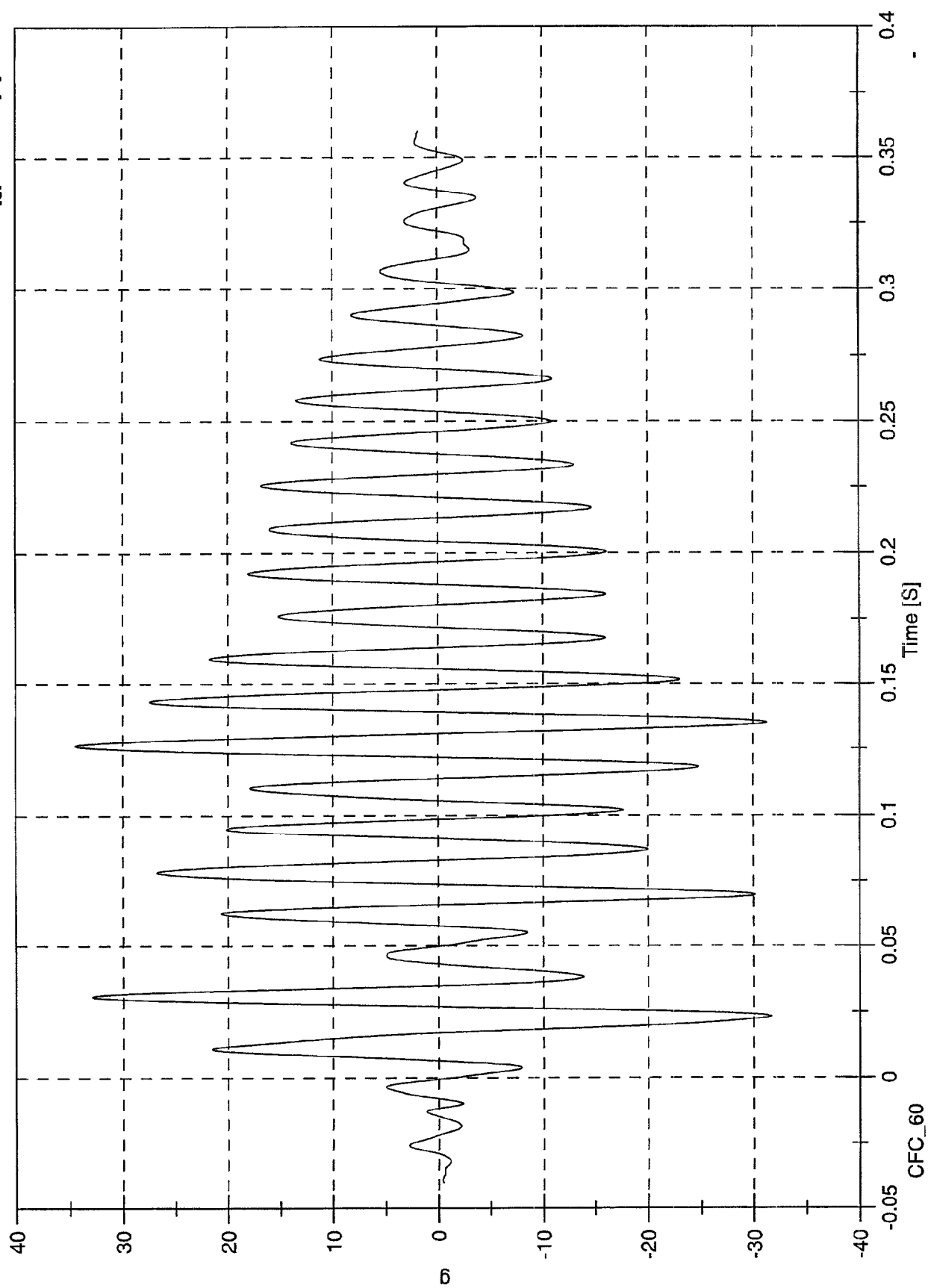


301 Rear 50 MPH-1998 Chevrolet Cavalier

Acc 3 MDB C/G Z

Max: 34.4 [g] at 0.126 [S]

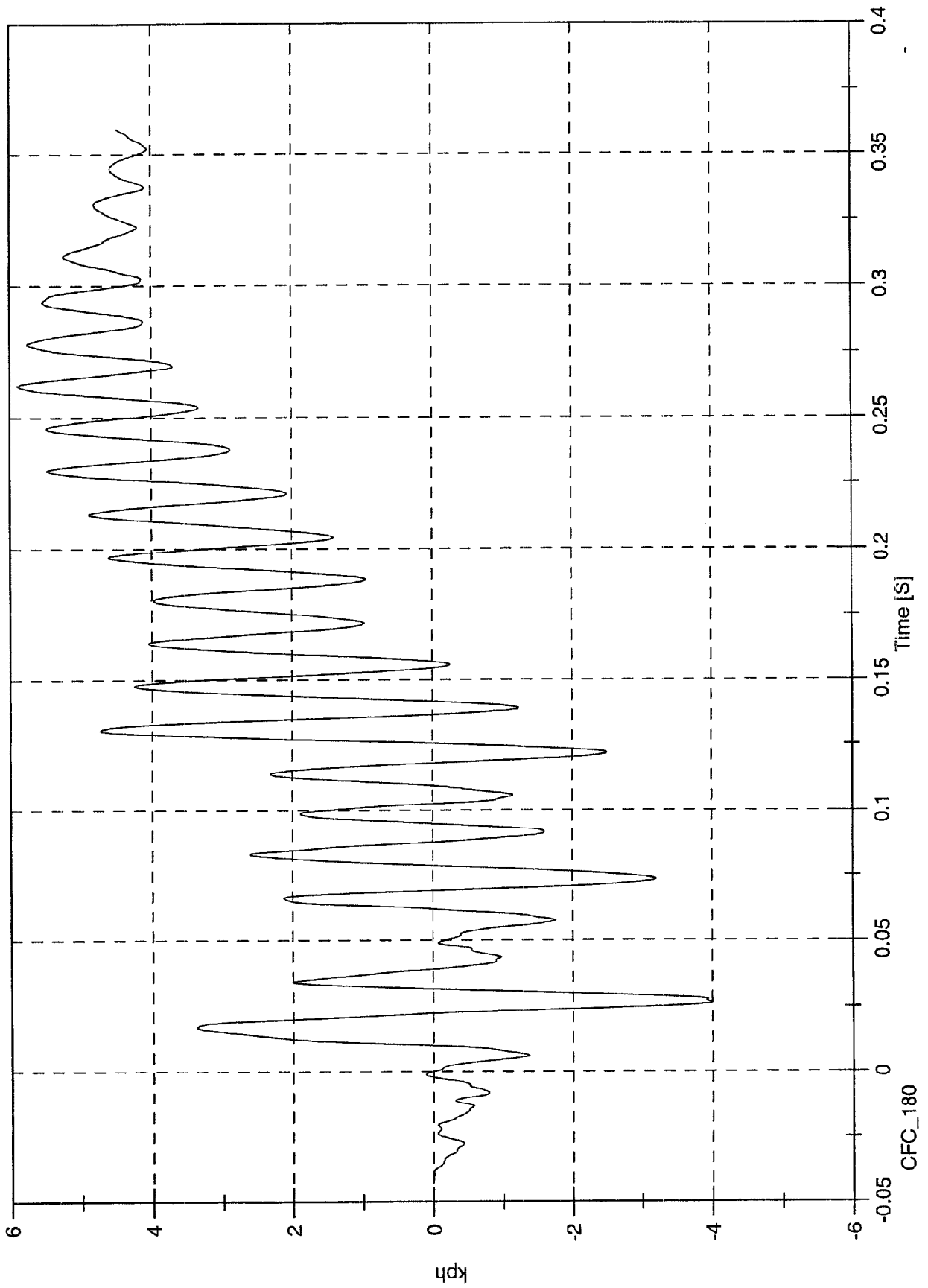
Min: -31.7 [g] at 0.023 [S]



301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 5.9 [kph] at 0.262 [S]
Min: -4.0 [kph] at 0.026 [S]

Acc 3 MDB C/G Z

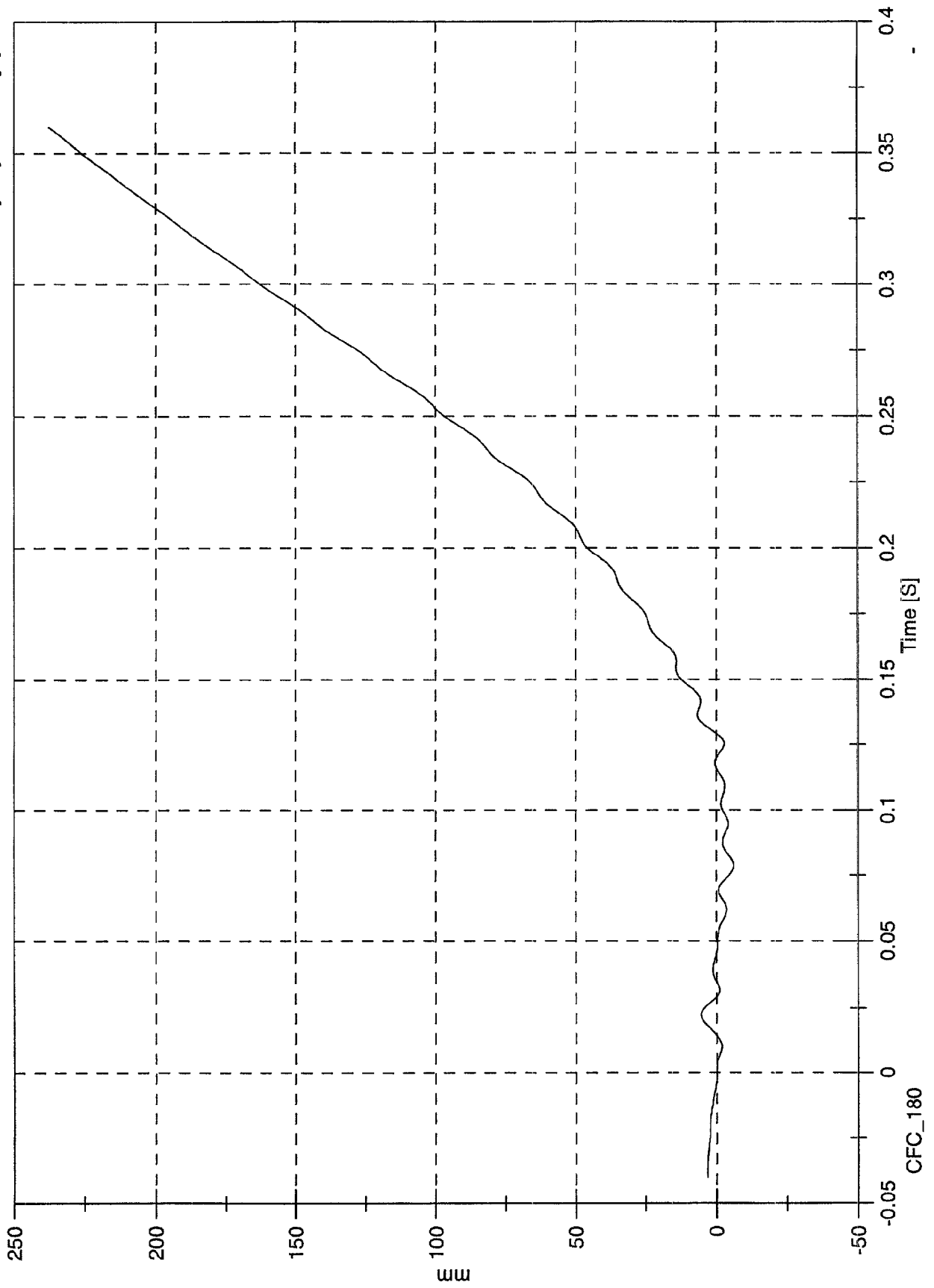


301 Rear 50 MPH-1998 Chevrolet Cavalier

Acc 3 MDB C/G Z

Max: 237.5 [mm] at 0.360 [S]

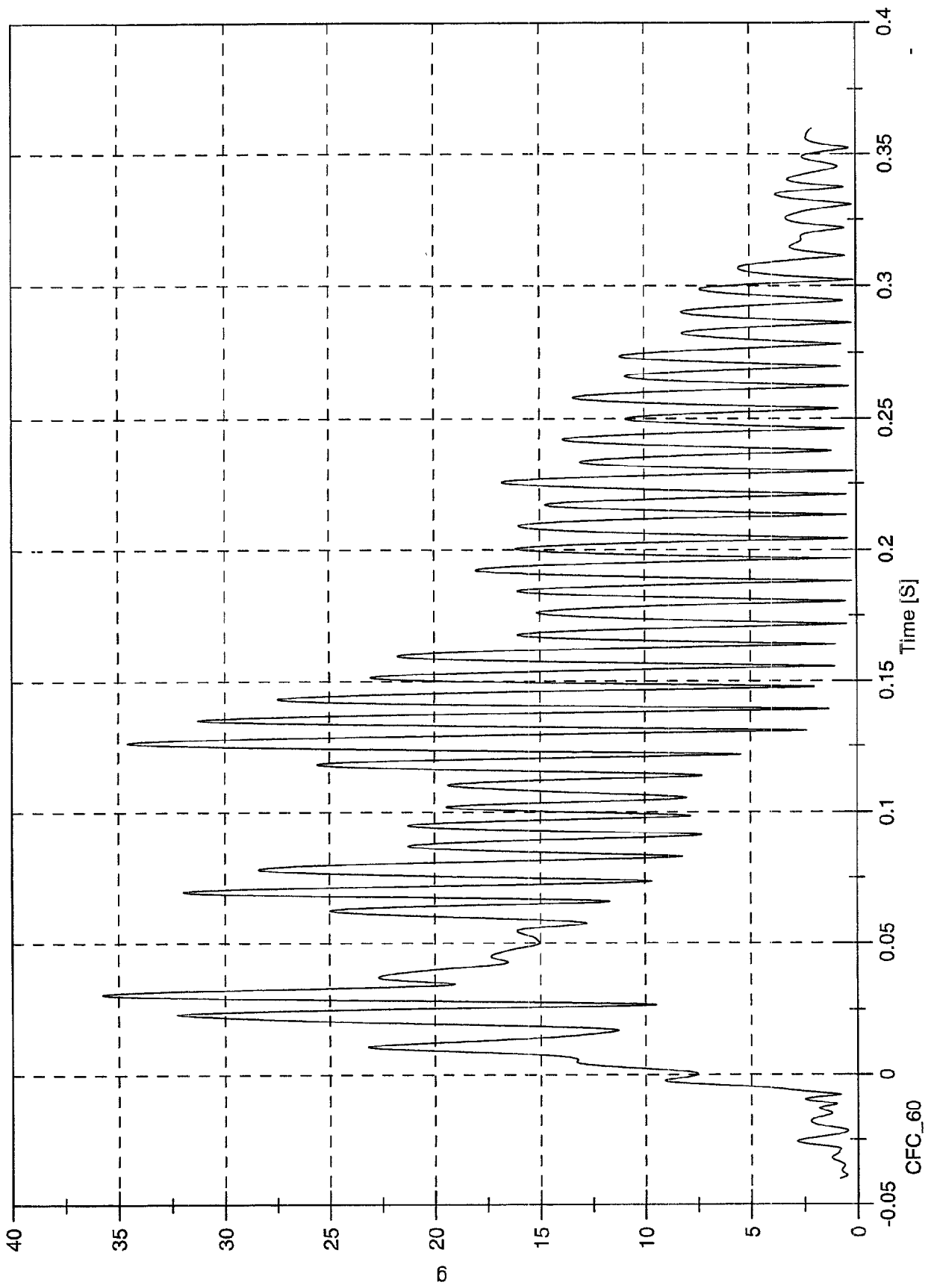
Min: -6.1 [mm] at 0.079 [S]

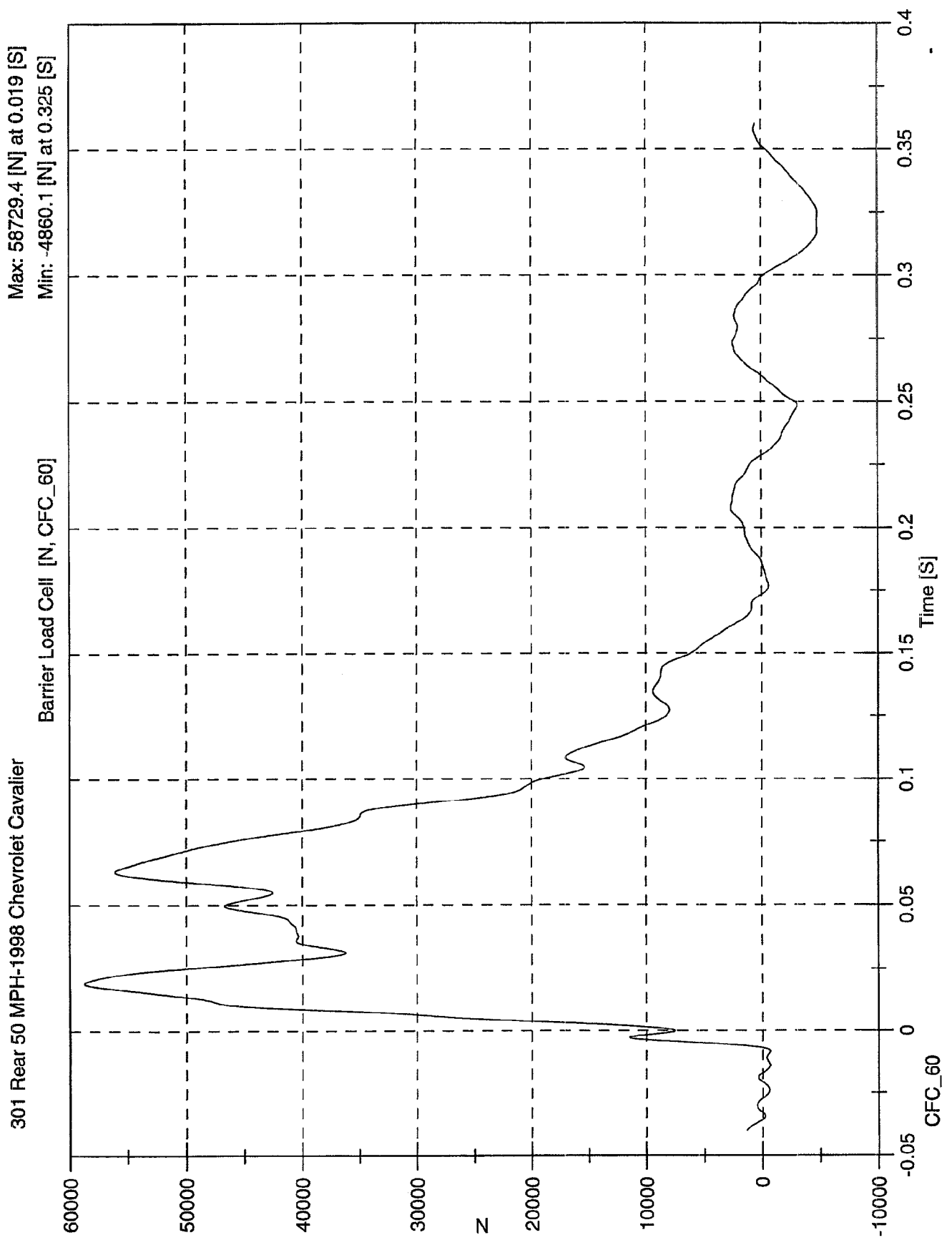


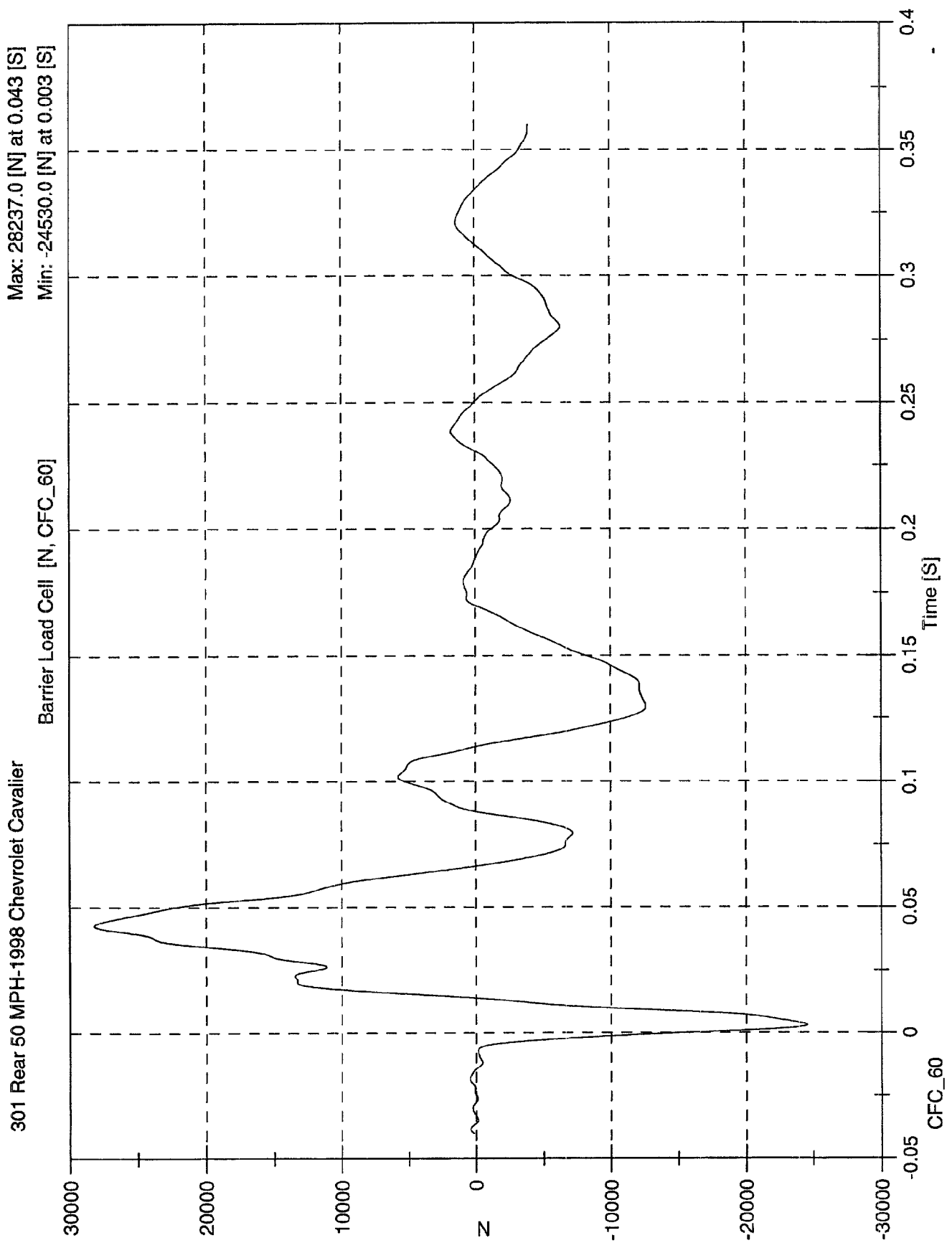
301 Rear 50 MPH-1998 Chevrolet Cavalier

Max: 35.8 [g] at 0.031 [S]
Min: 0.1 [g] at 0.302 [S]

Acc 3 MDB C/G Resultant





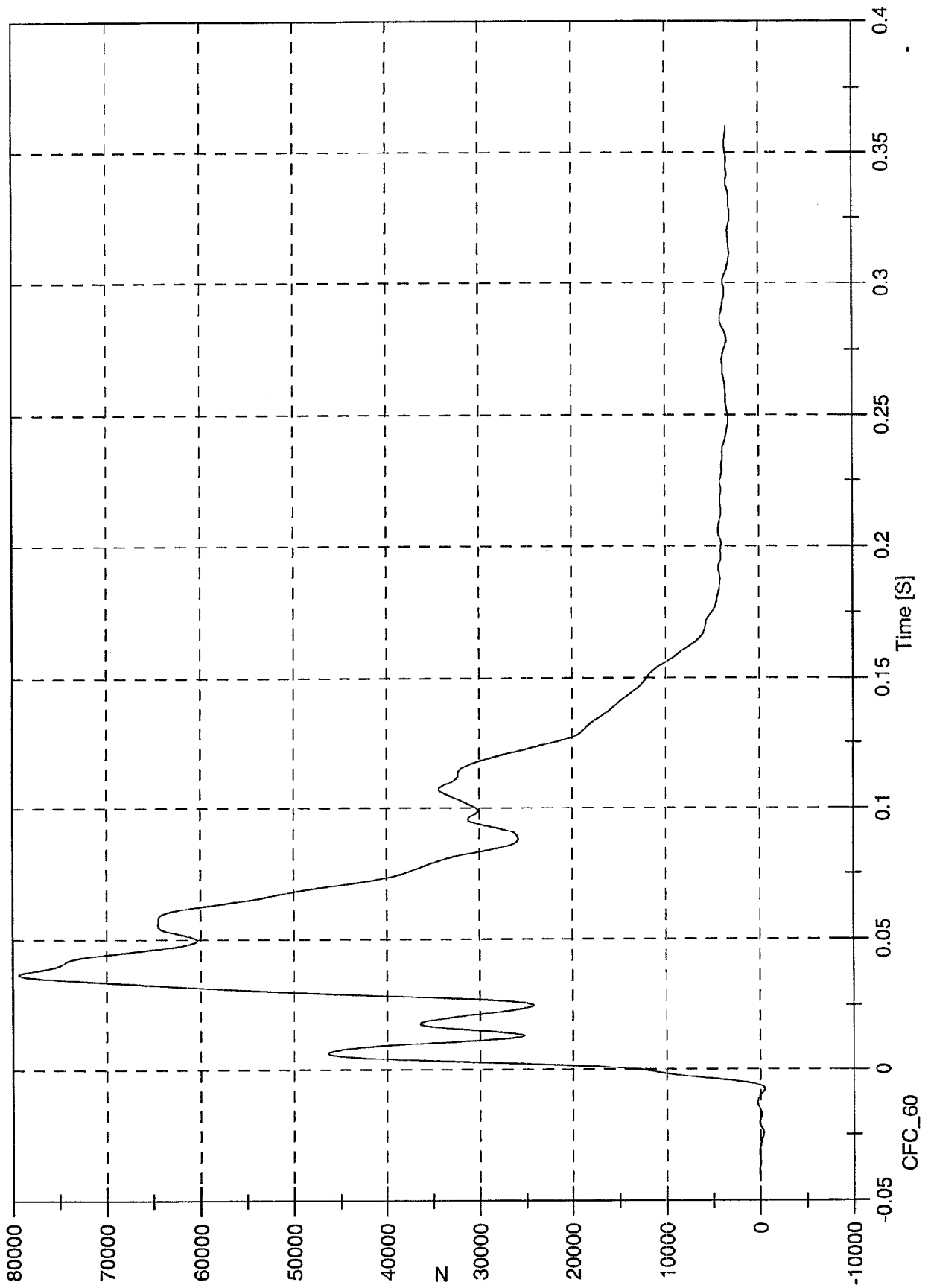


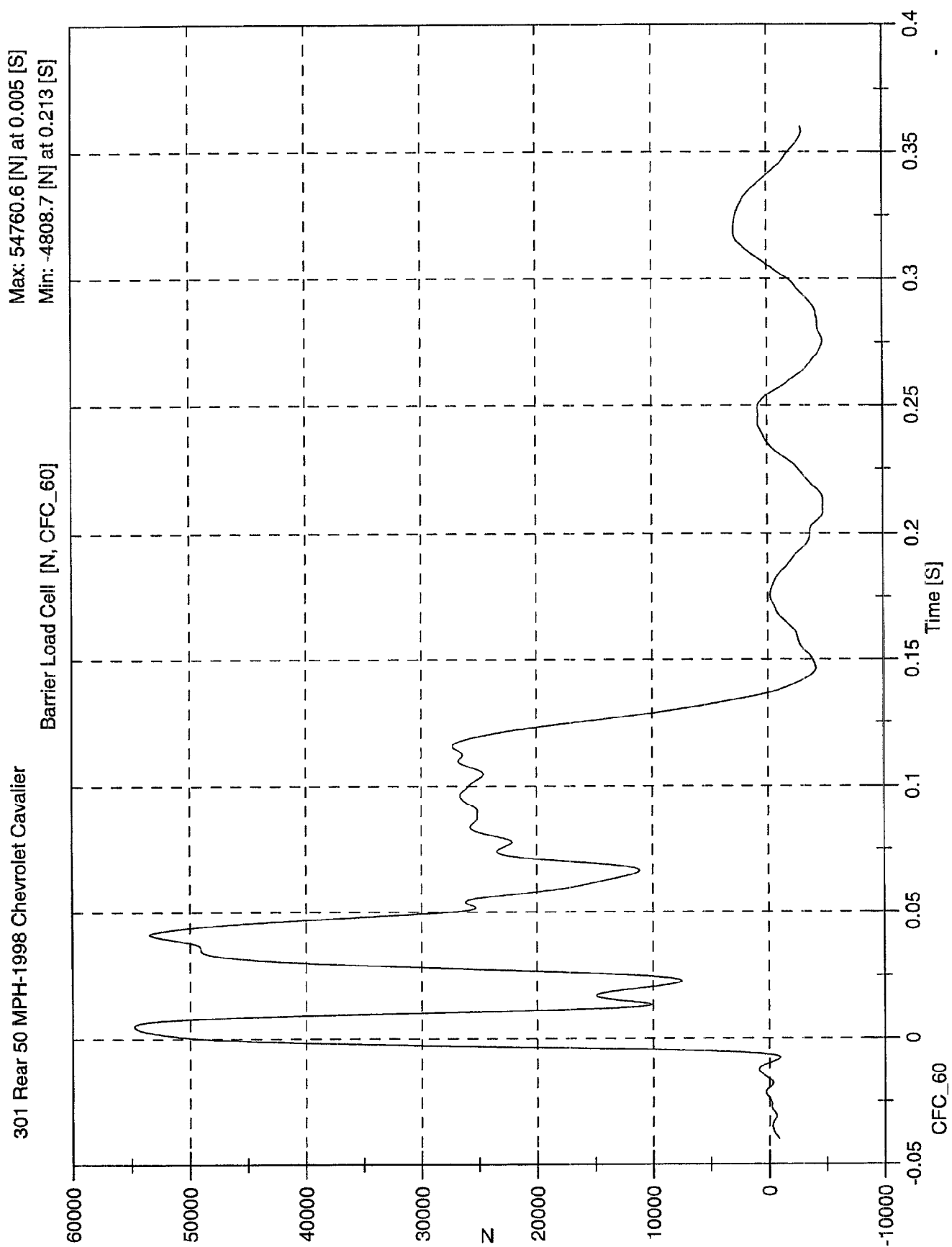
301 Rear 50 MPH-1998 Chevrolet Cavalier

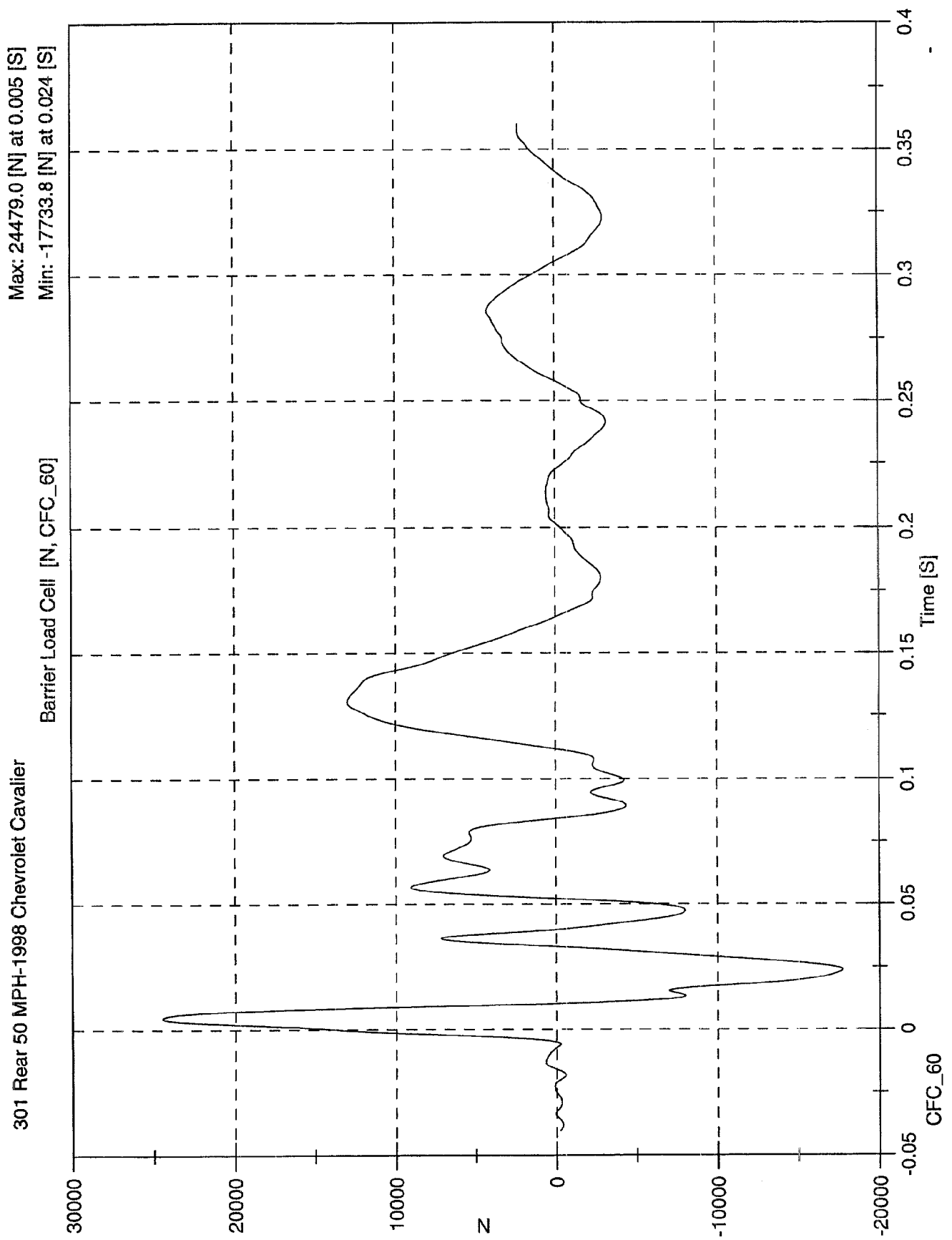
Max: 79318.8 [N] at 0.037 [S]

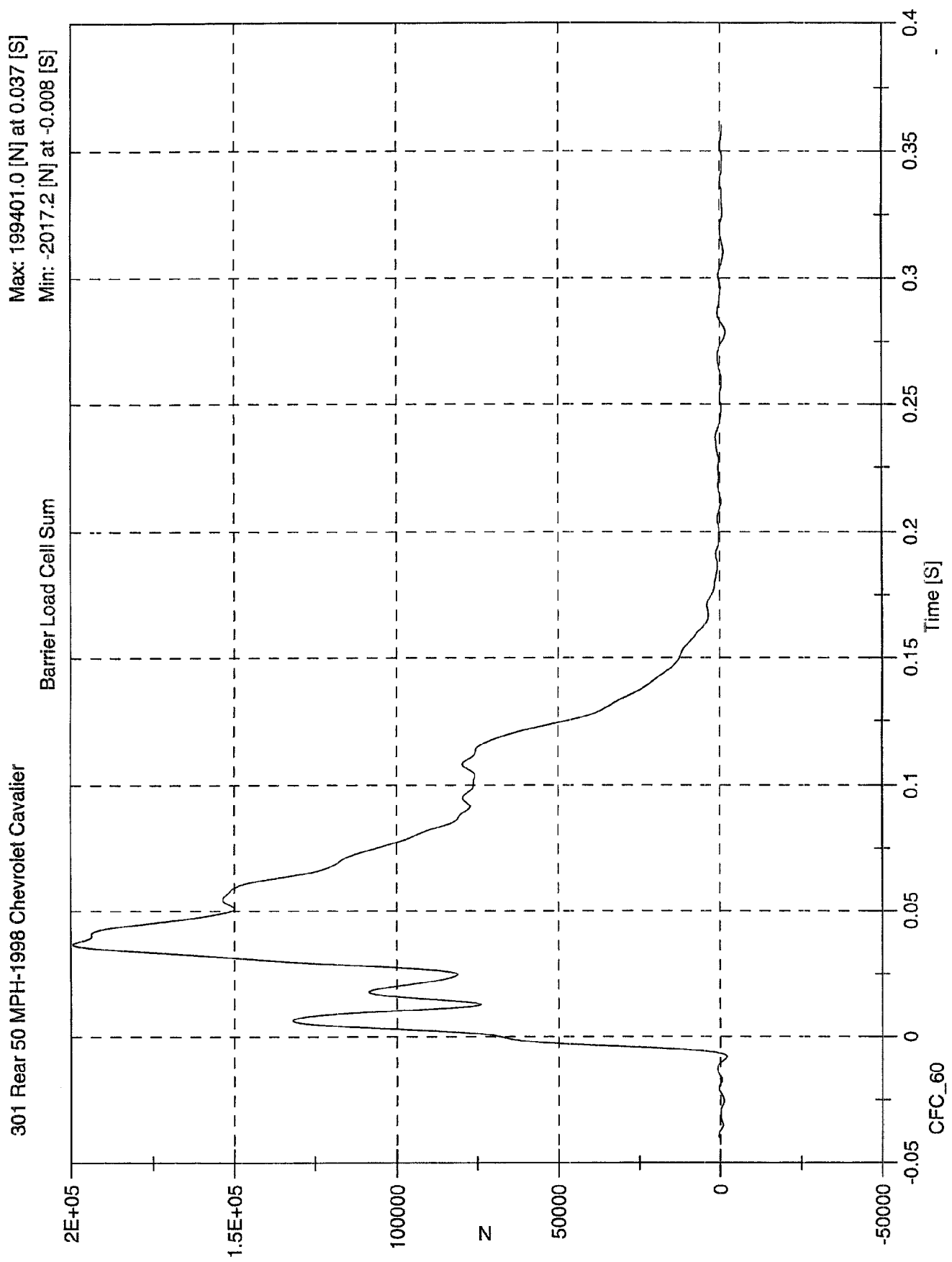
Min: -423.0 [N] at -0.008 [S]

Barrier Load Cell [N, CFC_60]









APPENDIX E
PART 572E DUMMY CONFIGURATION
AND PERFORMANCE VERIFICATION DATA SHEETS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropomorphic test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Volume 42, No. 25, dated February 7, 1977.

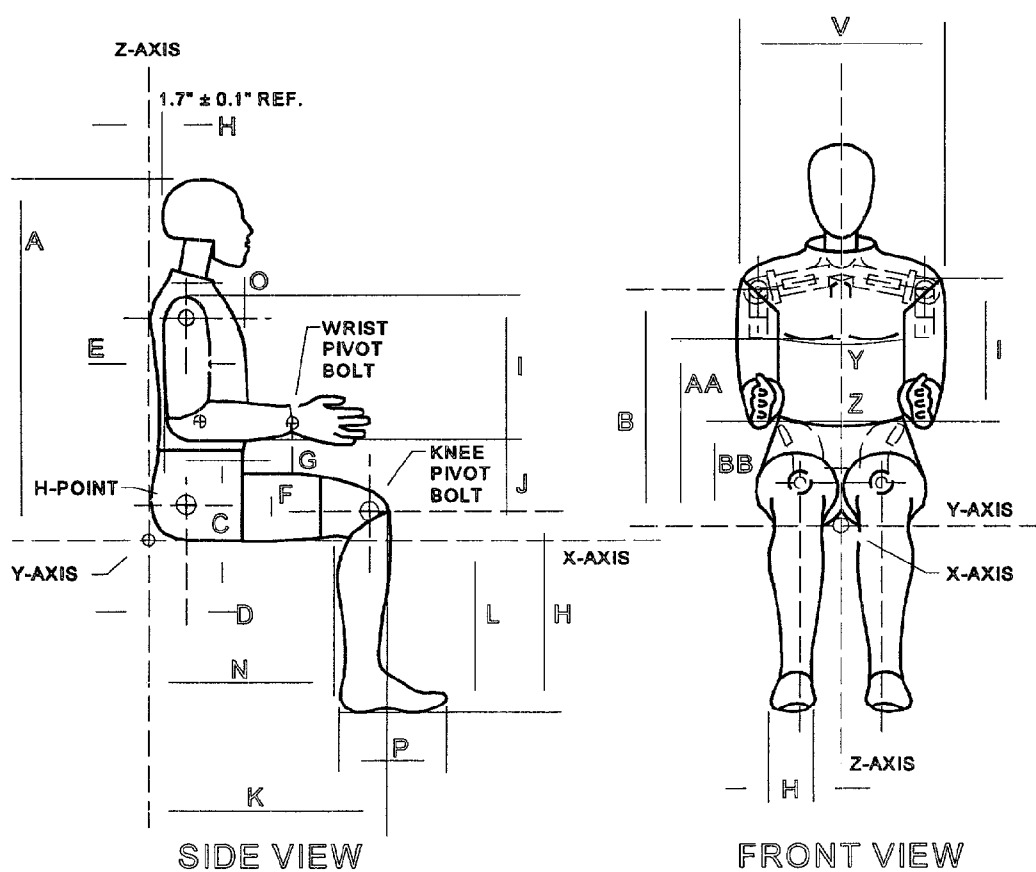
The tests were conducted at the Dummy Certification Test Facility of Calspan Corporation. A summary of the test results, and Part 572 specifications are included in this Appendix.

Dummy serial numbers and certification dates are:

<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	064	10/5/98
#2/Right Front Passenger	150	10/5/98

DUMMY CONFIGURATION DIMENSIONS

EXTERNAL DIMENSIONS SPECIFICATIONS



NOTE: Figure is referenced to the erect seated position. The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.
(REF: S572.31(A)(6))

PART 572E
HEAD DROP TEST

Dummy Serial Number 061
Calspan Sequential Test Number 4
Date 9/9/98
Workfile 061498.hdp

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	45
Peak Resultant Acceleration	225-275 G's	245.3
Peak Lateral Acceleration	15 G's Max	3.1
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number 061
 Calspan Sequential Test Number 4
 Date 9/9/98
 Workfile 061498.nfl

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	45
Impact Velocity		22.60 - 23.40 Ft/s	23.20
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	25.68
	20 ms	17.60 - 22.60 G's	20.86
	30 ms	12.50 - 18.50 G's	15.11
Max Pendulum G's Above 30 ms		29 G's Max	15.11
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	39.13
D Plane Rotation	Max	64 - 78 Deg	64.13
	Time	57 - 64 ms	62.00
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	68.41
	Time	47 - 58 ms	54.25
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	125.63
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	104.38

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number 061
 Calspan Sequential Test Number 4
 Date 9/9/98
 Workfile 061498.nex

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	45
Impact Velocity		19.50 - 20.30 Ft/s	19.95
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	20.11
	20 ms	14.00 - 19.00 G's	16.06
	30 ms	11.00 - 16.00 G's	12.28
Max Pendulum G's Above 30 ms		22 G's Max	13.42
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	43.75
D Plane Rotation	Max	81 - 106 Deg	88.08
	Time	72 - 82 ms	76.00
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-50.99
	Time	65 - 79 ms	70.00
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	149.25
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	144.38

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 061
Calspan Sequential Test Number 4
Date 10/5/98
Workfile 061498.th3

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70
Relative Humidity	10% - 70%	32
Pendulum Velocity	21.6 - 22.4 Ft/s	21.68
Maximum Deflection	2.50 - 2.86 in	2.51
Maximum Resistive Force	1160 - 1325 Lbs	1290.39
Internal Hysteresis	69 - 85 %	73.5

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 061
Calspan Sequential Test Number 4
Date 10/6/98
Workfile 061498

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	70
Relative Humidity	10% - 70%	35
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1219.00
RIGHT KNEE		
Temperature	66 - 78 Deg F	70
Relative Humidity	10% - 70%	35
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1248.00

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 061
Calspan Sequential Test Number 4
Date 10/5/98

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			32
Location for Chest Circumference	AA	16.9 - 17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.4
Waist Circumference	Z	32.9 - 34.1 in	33.5
Chest Depth	O	8.4 - 9.0 in	8.6
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Total Sitting Height	A	34.6 - 35.0 in	34.8
Thigh Clearance	F	5.5 - 6.1 in	6.1
Buttock Knee Length	K	22.8 - 23.8 in	23.3
Buttock Popliteal Length	N	17.8 - 18.8 in	18.3
Popliteal Height	L	16.9 - 17.9 in	17.7
Knee Pivot Height	M	19.1 - 19.7 in	19.4
Foot Length	P	9.9 - 10.5 in	10.1
Foot Breadth	W	3.6 - 4.2 in	3.8
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.5
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.1
Elbow Rest Height	J	7.5 - 8.3 in	7.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.4
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.6

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
HEAD DROP TEST

Dummy Serial Number 150
Calspan Sequential Test Number 3
Date 9/9/98
Workfile 150398.hdp

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	45
Peak Resultant Acceleration	225-275 G's	253.0
Peak Lateral Acceleration	15 G's Max	1.50
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number 150
Calspan Sequential Test Number 3
Date 9/11/98
Workfile 150398.nfl

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	45
Impact Velocity		22.60 - 23.40 Ft/s	23.38
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	24.83
	20 ms	17.60 - 22.60 G's	20.53
	30 ms	12.50 - 18.50 G's	14.92
Max Pendulum G's Above 30 ms		29 G's Max	14.92
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	40.38
D Plane Rotation	Max	64 - 78 Deg	69.38
	Time	57 - 64 ms	59.38
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	79.15
	Time	47 - 58 ms	54.00
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	122.88
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	105.63

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number 150
 Calspan Sequential Test Number 3
 Date 9/11/98
 Workfile 150398.nex

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	45
Impact Velocity		19.50 - 20.30 Ft/s	19.76
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	19.16
	20 ms	14.00 - 19.00 G's	16.86
	30 ms	11.00 - 16.00 G's	13.81
Max Pendulum G's Above 30 ms		22 G's Max	13.81
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	42.13
D Plane Rotation	Max	81 - 106 Deg	93.09
	Time	72 - 82 ms	80.75
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-42.86
	Time	65 - 79 ms	73.00
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	158.13
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	148.00

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 150
Calspan Sequential Test Number 3
Date 10/5/98
Workfile 150398.th3

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70
Relative Humidity	10% - 70%	32
Pendulum Velocity	21.6 - 22.4 Ft/s	21.70
Maximum Deflection	2.50 - 2.86 in	2.77
Maximum Resistive Force	1160 - 1325 Lbs	1243.53
Internal Hysteresis	69 - 85 %	72.6

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 150
Calspan Sequential Test Number 3
Date 10/6/98
Workfile 150398

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	70
Relative Humidity	10% - 70%	35
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1246.00
RIGHT KNEE		
Temperature	66 - 78 Deg F	70
Relative Humidity	10% - 70%	35
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1167.00

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 150
Calspan Sequential Test Number 3
Date 10/5/98

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			32
Location for Chest Circumference	AA	16.9 - 17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.2
Waist Circumference	Z	32.9 - 34.1 in	34.0
Chest Depth	O	8.4 - 9.0 in	8.4
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Total Sitting Height	A	34.6 - 35.0 in	34.8
Thigh Clearance	F	5.5 - 6.1 in	5.7
Buttock Knee Length	K	22.8 - 23.8 in	23.4
Buttock Popliteal Length	N	17.8 - 18.8 in	18.4
Popliteal Height	L	16.9 - 17.9 in	17.8
Knee Pivot Height	M	19.1 - 19.7 in	19.6
Foot Length	P	9.9 - 10.5 in	10.1
Foot Breadth	W	3.6 - 4.2 in	3.8
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.7
Shoulder Breadth	V	16.6 - 17.2 in	16.9
Shoulder Pivot Height	B	19.9 - 20.5 in	20.2
Elbow Rest Height	J	7.5 - 8.3 in	8.1
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.2
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.5

Remarks:

Laboratory Technician: B. Swiecicki