

NH750 7-2-90
1530



VEHICLE AND OCCUPANT ROLLOVER DYNAMICS
1988 DODGE CARAVAN MINI VAN INTO GUARDRAIL
OFFSET 15 INCHES FROM THE VEHICLE'S
CENTERLINE TO THE DRIVER'S SIDE

PREPARED BY:
THE TRANSPORTATION RESEARCH CENTER OF OHIO
10820 STATE ROUTE 347
EAST LIBERTY, OHIO 43319

OCTOBER - NOVEMBER, 1990
TEST REPORT

PREPARED FOR:
SYSTEMS RESEARCH LABORATORIES, INC.
2800 INDIAN RIPPLE ROAD
DAYTON, OHIO 45440

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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
in ³	cubic inches	16	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C

Approximate Conversions From Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
km	kilometers	1.1	yards	yd
		0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10 000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
	metric ton (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
ml	milliliters	0.06	cubic inches	in ³
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	degrees Celsius	9/5 (then add 32)	degrees Fahrenheit	°F

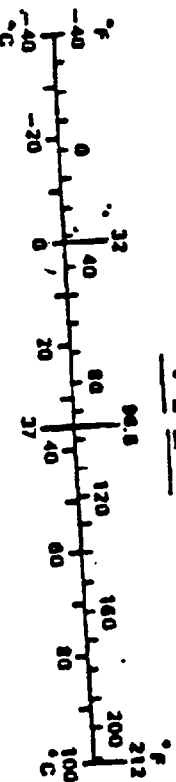


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SECTION 1.0

PURPOSE AND TEST SUMMARY

This rollover crash test has the main objective to investigate both vehicle and occupant dynamics during automobile rollover crashes.

This test was conducted with a 1988 Dodge Caravan Mini Van travelling parallel to a guardrail at 60 mph. The guardrail was offset fifteen inches toward the driver's side from the vehicle's centerline. The test vehicle contained an instrumented Part 572E dummy restrained with a three-point unbelt.

SECTION 2.0

SUMMARY OF ROLLOVER CRASH TEST

A 1988 Dodge Caravan Mini Van, containing one instrumented Part 572E test dummy was towed parallel to the guardrail at 60 mph. The guardrail was offset fifteen inches from the vehicle's centerline to the driver's side. The vehicle did not roll. The rollover crash test was conducted by the Transportation Research Center of Ohio in East Liberty, Ohio on October 10, 1990.

The Part 572E 50th percentile adult male anthropomorphic test device (dummy) was placed in the driver's designated seating position according to the seating procedure in FMVSS 208 Notice 60. The dummy was instrumented with head, chest, and pelvis triaxial accelerometers, a six-axis neck load cell, and a chest displacement potentiometer. The crash event was recorded by thirty-four channels of data on one 14-track tape drive. The analog data was digitally sampled at 8000 samples per second. The data was digitally filtered per SAE J211 OCT88.

The crash event was filmed by six high-speed motion picture cameras operating at approximately 500 frames per second and one real-time panning motion picture camera.

Section 1.0 contains the purpose and test summary. Section 2.0 contains a summary of the rollover crash test. Section 3.0 contains the general test and vehicle parameter data. Section 4.0 contains the occupant information. Appendix A contains the pre-test and post-test still photographs. Appendix B contains the final data plots. Appendix C contains the post-test dummy calibrations. Appendix D contains the pre-test and post-test IPMD vehicle data sheets.

VEHICLE CONTACT DATA SUMMARY

TEST NUMBER 901010

No. LOCATION	INITIAL CONTACT
1 FIRST CONTACT SWITCH (sec)	-0.077
2 SECOND CONTACT SWITCH (sec)	-0.064
3 THIRD CONTACT SWITCH (sec)	-0.052
4 FOURTH CONTACT SWITCH (sec)	-0.040
5 FIFTH CONTACT SWITCH (sec)	-0.027
6 SIXTH CONTACT SWITCH (sec)	-0.013
7 SEVENTH CONTACT SWITCH (sec)	0.00

NOTE: There were one foot intervals between each contact switch.
Seventh contact switch was at release block.

FINAL RESTING PLACES OF VEHICLE

<u>DESCRIPTION OF VEHICLE</u>	<u>X. DISTANCE*</u>	<u>Y. DISTANCE*</u>
Left rear corner	156.9	-20.2
Right rear corner	152.1	-24.1
Left front corner	162.6	-31.1
Right front corner	159.0	-34.3

*REFERENCE: +X: FORWARD FROM RELEASE BLOCK

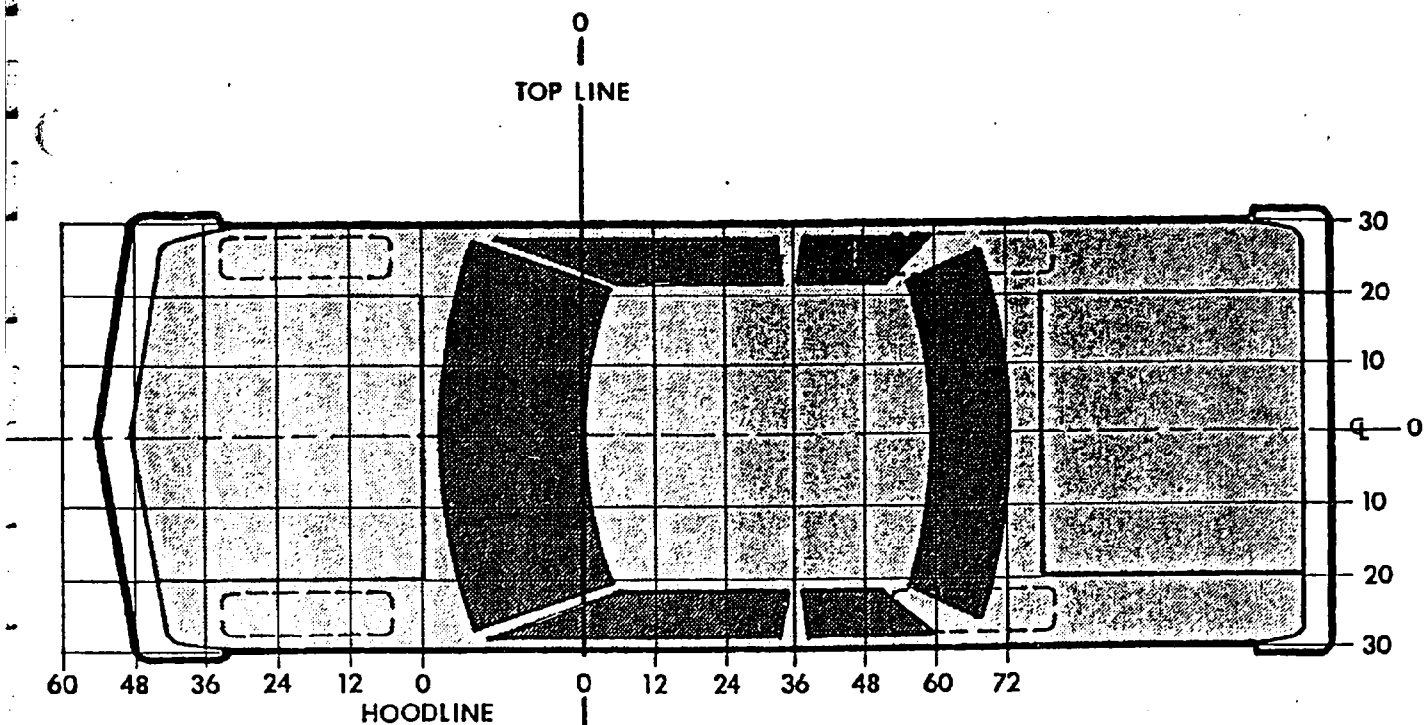
+Y: LEFTWARD FROM CENTER RELEASE BLOCK

ALL MEASUREMENTS ARE IN FEET.

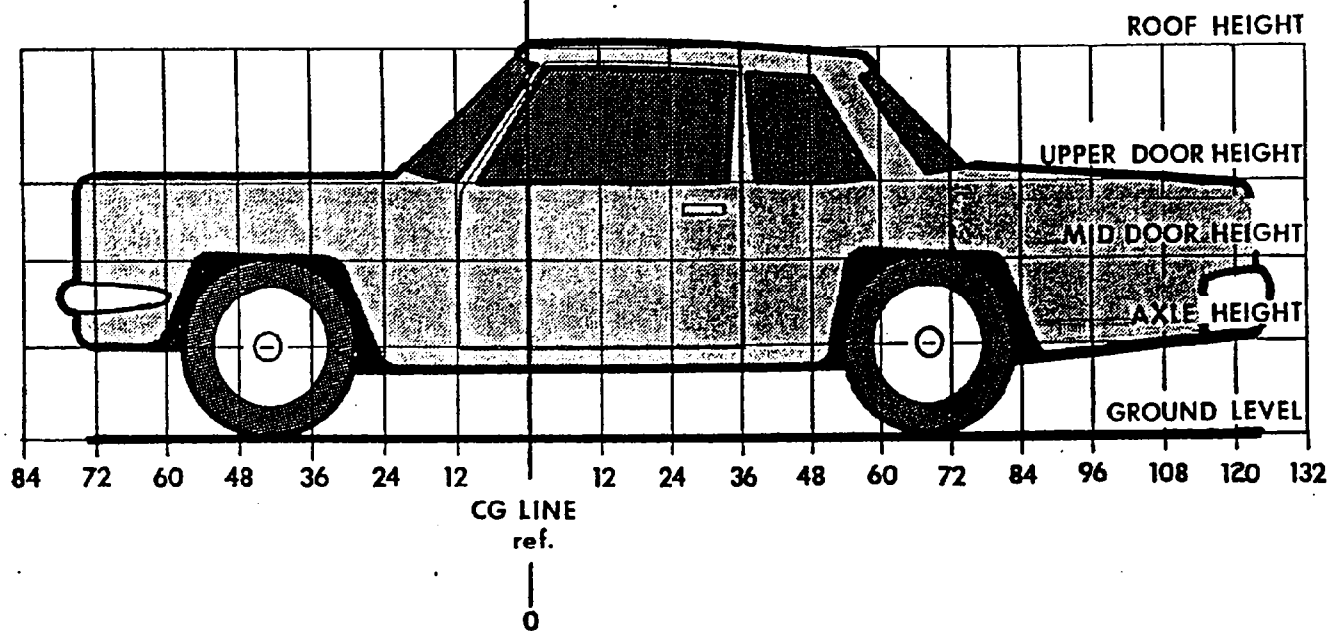
VEHICLE INTERIOR MEASUREMENTS

<u>DESCRIPTION</u>	<u>PRE</u>	<u>POST</u>	<u>DIFF</u>
Floor board to top of left "A" post	43.3	43.3	0.0
Floor board to top of right "A" post	44.8	44.8	0.0
Door sill to top of left "B" post	46.8	46.8	0.0
Door sill to top of right "B" post	47.1	47.1	0.0
Door sill to top of left door opening	46.8	46.8	0.0
Door sill to top of right door opening	47.0	47.0	0.0
Floor tunnel to windshield header	45.5	45.5	0.0
Floor tunnel to center of roof	48.3	48.3	0.0
Rear of floor tunnel to roof	45.1	45.1	0.0
Maximum width at "B" post	58.2	58.2	0.0
Maximum width at "A" post	54.8	54.8	0.0
Maximum width at top of door opening	54.6	54.6	0.0

ALL MEASUREMENTS ARE IN INCHES.



HOOD AND ROOF STATIC CRUSH LOCATIONS



LEFT AND RIGHT SIDE STATIC CRUSH LOCATIONS

VEHICLE HOOD EXTERIOR PROFILES
ZERO DISTANCE AT VEHICLE HOOD CENTERLINE*

LOCATION	30	20	10	0	10	20	30
<u>PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)</u>							
Trailing edge of cowl at centerline	X	44.2	44.5	44.6	44.1	44.1	X
Trailing edge of cowl + 12 inches***	X	41.4	42.5	42.1	41.9	41.4	X
Trailing edge of cowl + 24 inches	X	38.4	38.9	39.1	39.1	38.6	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 48 inches	X	X	X	X	X	X	X
<u>POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)</u>							
Trailing edge of cowl at centerline	X	41.2	41.4	41.2	41.2	41.0	X
Trailing edge of cowl + 12 inches	X	38.1	38.5	38.8	38.4	38.0	X
Trailing edge of cowl + 24 inches	X	35.0	35.2	34.9	35.1	35.0	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 48 inches	X	X	X	X	X	X	X
<u>STATIC CRUSH (IN)</u>							
Trailing edge of cowl at centerline	X	-3.0	-3.1	-3.4	-2.9	-3.1	X
Trailing edge of cowl + 12 inches	X	-3.3	-4.0	-3.3	-3.5	-3.4	X
Trailing edge of cowl + 24 inches	X	-3.4	-3.7	-4.2	-4.0	-3.6	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 48 inches	X	X	X	X	X	X	X

* Column readings are left to right from left to right on vehicle.

** Reference plane is a horizontal plane at ground level.

***Longitudinal distance from trailing edge of cowl at centerline forward to measurement plane.

+ Static crush means vehicle structure is bowed upward.

- Static crush means vehicle structure is crushed.

NOTE: THERE WAS NO CRUSH ON THE HOOD, BUT THE APPARENT STATIC CRUSH RESULTS FROM THE TWO FRONT TIRES BEING FLATTENED DURING THE TEST.

VEHICLE ROOF EXTERIOR PROFILES
ZERO DISTANCE AT VEHICLE ROOF CENTERLINE*

LOCATION	20	10	0	10	20
<u>PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)</u>					
Longitudinal Center of Gravity	64.6	64.9	65.4	65.1	64.8
Longitudinal Center of Gravity + 12 inches***	65.2	65.1	65.0	65.4	65.1
Longitudinal Center of Gravity + 24 inches	65.2	65.0	65.8	64.9	65.0
Longitudinal Center of Gravity + 36 inches	65.2	65.1	64.9	65.1	65.2
Longitudinal Center of Gravity + 48 inches	65.0	65.0	65.0	65.0	65.1
Longitudinal Center of Gravity + 60 inches	65.2	65.1	64.6	64.6	64.8
<u>POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)</u>					
Longitudinal Center of Gravity	63.1	63.6	63.5	63.5	63.1
Longitudinal Center of Gravity + 12 inches	64.2	64.1	64.1	64.4	64.2
Longitudinal Center of Gravity + 24 inches	64.8	64.9	64.2	64.2	64.4
Longitudinal Center of Gravity + 36 inches	65.1	65.0	64.4	64.5	64.8
Longitudinal Center of Gravity + 48 inches	65.0	64.4	64.4	64.8	64.9
Longitudinal Center of Gravity + 60 inches	65.1	65.0	64.9	64.9	64.9
<u>STATIC CRUSH (IN)</u>					
Longitudinal Center of Gravity	-1.5	-1.3	-1.9	-1.6	-1.7
Longitudinal Center of Gravity + 12 inches	-1.0	-1.0	-0.9	-1.0	-0.9
Longitudinal Center of Gravity + 24 inches	-0.4	-0.1	-1.6	-0.7	-0.6
Longitudinal Center of Gravity + 36 inches	-0.1	-0.1	-0.5	-0.6	-0.4
Longitudinal Center of Gravity + 48 inches	0.0	-0.6	-0.6	-0.2	-0.2
Longitudinal Center of Gravity + 60 inches	-0.1	-0.1	0.3	0.3	0.1

- * Column readings are left to right from left to right on vehicle.
 ** Reference plane is a horizontal plane at ground level.
 ***Longitudinal distance from center of gravity rearward to measurement plane.
 + Static crush means vehicle structure is bowed upward.
 - Static crush means vehicle structure is crushed.

VEHICLE LEFT SIDE EXTERIOR PROFILES AND STATIC CRUSH
ZERO DISTANCE AT VEHICLE LONGITUDINAL CENTER OF GRAVITY*

LOCATION	HEIGHT(IN)	72	60	48	36	24	12	0	12	24	36	48	60	72	84	96
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PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)

Roof Height	64.5	X	X	X	X	X	22.4	22.0	22.1	22.1	22.1	22.1	22.2	22.4	22.4	X
Upper Door	41.0	X	17.9	16.4	15.3	14.8	14.7	14.4	14.4	14.4	14.4	14.4	14.5	14.6	14.9	15.1
Mid Door	28.0	16.6	15.1	X	14.1	13.7	13.4	13.2	13.2	13.1	13.1	13.1	13.1	X	12.6	13.8
Axle Height	12.8	19.0	X	X	X	16.2	16.2	15.9	15.9	15.9	15.9	X	X	X	X	X

POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)

Roof Height	64.5	X	X	X	X	X	22.0	21.6	21.8	21.8	21.9	22.0	22.1	22.1	22.1	X
Upper Door	41.0	X	17.5	16.1	15.1	14.7	14.4	14.2	14.2	14.1	14.0	14.2	14.2	14.6	14.6	X
Mid Door	28.0	17.1	14.8	X	14.0	13.5	13.2	13.0	13.0	12.9	12.8	12.9	X	12.4	13.2	X
Axle Height	12.8	19.1	X	X	X	16.5	16.2	16.0	15.8	15.9	15.6	X	X	X	X	X

STATIC CRUSH (IN)

Roof Height	64.5	X	X	X	X	X	-0.4	-0.4	-0.3	-0.3	-0.2	-0.2	-0.3	-0.3	-0.5	X
Upper Door	41.0	X	-0.4	-0.3	-0.3	-0.1	-0.3	-0.2	-0.2	-0.3	-0.4	-0.3	-0.4	-0.3	-0.6	X
Mid Door	28.0	0.5	-0.3	X	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.2	X	-0.2	X	X
Axle Height	12.8	0.1	X	X	X	0.3	0.0	0.1	-0.1	-0.0	-0.3	X	X	X	X	X

* Center of gravity is located 49.3 inches rearward of vehicle front wheels. Column readings are left to right from front to rear on vehicle.

** Reference plane is parallel to and 48 inches from the vehicle longitudinal centerline.

+ Static crush means that vehicle structure is crushed.

- Static crush means that vehicle structure is bowed outward.

VEHICLE RIGHT SIDE EXTERIOR PROFILES AND STATIC CRUSH
ZERO DISTANCE AT VEHICLE LONGITUDINAL CENTER OF GRAVITY*

LOCATION	HEIGHT(IN)	72	60	48	36	24	12	0	12	24	36	48	60	72	84	96
----------	------------	----	----	----	----	----	----	---	----	----	----	----	----	----	----	----

PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)

Roof Height	64.5	X	X	X	X	X	22.6	22.1	22.0	22.0	21.8	21.8	21.8	21.8	X	X
Upper Door	41.0	X	17.8	16.4	15.5	14.9	14.8	14.6	14.1	14.4	14.4	14.4	14.4	14.0	15.0	X
Mid Door	28.0	17.0	15.0	X	14.2	13.6	13.6	13.2	13.3	13.1	13.1	13.1	X	12.5	14.2	X
Axle Height	12.8	19.9	X	X	X	16.4	16.0	15.9	15.7	15.6	15.7	X	X	X	X	X

POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)

Roof Height	64.5	X	X	X	X	X	22.2	21.6	21.6	21.6	21.6	21.6	21.5	21.3	21.3	X
Upper Door	41.0	X	17.5	16.1	15.4	14.8	14.5	14.2	14.2	14.1	14.1	14.1	14.2	14.1	14.0	15.0
Mid Door	28.0	18.9	17.1	X	14.4	13.6	13.1	12.9	13.0	12.9	12.9	12.9	12.9	X	12.5	14.2
Axle Height	12.8	20.1	X	X	X	16.4	16.1	15.7	15.5	15.4	15.5	X	X	X	X	X

STATIC CRUSH (IN)

Roof Height	64.5	X	X	X	X	X	-0.4	-0.5	-0.4	-0.4	-0.2	-0.3	-0.5	-0.5	X	X
Upper Door	41.0	X	-0.3	-0.3	-0.1	-0.1	-0.3	-0.4	0.1	-0.3	-0.3	-0.2	-0.3	0.0	0.0	X
Mid Door	28.0	1.9	2.1	X	0.2	0.0	-0.5	-0.3	-0.3	-0.2	-0.2	-0.2	X	0.0	0.0	X
Axle Height	12.8	0.2	X	X	X	0.0	0.1	-0.2	-0.2	-0.2	-0.2	X	X	X	X	X

* Center of gravity is located 49.3 inches rearward of vehicle front wheels. Column readings are left to right from front to rear on vehicle.

** Reference plane is parallel to and 48 inches from the vehicle longitudinal centerline.

+ Static crush means that vehicle structure is crushed.

- Static crush means that vehicle structure is bowed outward.

IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Dodge Caravan Mini-Van TEST NUMBER: 901010

NO.	TYPE OF MEASUREMENT	ALL MEASUREMENTS ARE IN INCHES		
		PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	176.1	176.1	0.0
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	150.2	150.1	0.1
X3	REAR SURFACE OF VEHICLE TO FIREWALL	136.2	136.1	0.1
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	127.4	127.9	-0.5
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	127.5	127.9	-0.4
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	124.9	124.0	0.9
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	124.8	124.7	0.1
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	84.5	85.2	-0.7
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	84.8	85.2	-0.4
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	84.4	84.3	0.1
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	84.8	84.6	0.2
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	125.2	125.9	-0.7
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	125.6	125.7	-0.1
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	137.8	137.0	0.8
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	136.8	138.0	-1.2
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	108.8	109.4	-0.6
X17	CENTER OF STEERING COLUMN TO "A" POST	13.0	13.2	-0.2
X18	CENTER OF STEERING COLUMN TO HEADLINER	19.9	18.2	1.7
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	171.6	170.8	0.8
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	171.6	171.6	0.0
X21	LENGTH OF ENGINE BLOCK	19.4	19.4	0.0

EVENT TIMES

TEST DATE: 10/10/90

EVENT DESCRIPTION	TIME, SEC.
CONTACT RELEASE BLOCK	0.0
START COLLECTING DATA	-1.0
STOP COLLECTING DATA	5.0
ZERO TIME FOR DATA	0.0
STROBE LIGHTS FLASH	0.0
CAMERA L E D GOES OFF	0.0*
PIN RELEASES (ROLLOVER CART)	NA
CYLINDERS START (ROLLOVER CART)	NA

*Locate frame where event strobe lights ends. Put projector into reverse mode and go backwards 4 frames. This frame is T-zero for the data.

SECTION 3.0

GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test and Vehicle Parameter Data.

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Chrysler Canada Ltd.

MAKE/MODEL: Dodge Caravan

VIN: 2B4FK41K5JR652788

BODY STYLE: Mini Van

MODEL YEAR: 1988

NHTSA NO.: NA

COLOR: Blue

ENGINE DATA: TYPE: Transverse CYLINDERS: 4 DISPLACEMENT: 2.5 liter

TRANSMISSION DATA: 3 SPEED, MANUAL, X AUTOMATIC, X FWD, RWD, 4WD

DATE VEHICLE RECEIVED: 8/28/90

ODOMETER READING: 65,542

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING Yes
POWER BRAKES Yes
POWER SEATS No
POWER WINDOWS No
TINTED GLASS Yes
RADIO Yes
CLOCK Yes
OTHER None

AUTOMATIC TRANSMISSION Yes
AUTOMATIC SPEED CONTROL Yes
TILTING STEERING WHEEL Yes
TELESCOPING STEERING WHEEL No
AIR CONDITIONING Yes
ANTI-SKID BRAKE No
REAR WINDOW DEFROSTER Yes

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? Yes
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Chrysler Canada Ltd.

DATE OF MANUFACTURE: 2/88

VIN: 2B4FK41K5JR652788

GVWR: 4700 LBS

GAWR: FRONT: 2425 LBS., REAR: 2450 LBS.

TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear/Invicta GL P195/75R14

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 35 PSI
REAR: 35 PSI

SPARE TIRE (MFR., LINE, SIZE): Goodyear Temp. T135/70D16

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Adjustable

MAXIMUM WIDTH: 71.9 INCHES

WHEELBASE: 112.2 INCHES

LOCATION OF "RECOMMENDED TIRE PRESSURE" LABEL: ON THE LEFT B-PILLAR

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P195/75R14

RECOMMENDED COLD TIRE PRESSURE: FRONT: 35 PSI; REAR: 35 PSI

SEATING CAPACITY: ____FRONT ____REAR ____TOTAL*

CARGO LOAD: _____ LBS. VEHICLE CAPACITY WEIGHT: _____ LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE:	LF	29.7	;RF	29.7	;LR	30.0	;RR	29.6
FULLY LOADED ATTITUDE:	LF	28.5	;RF	28.5	;LR	28.8	;RR	28.4
PRE-TEST ATTITUDE:	LF	29.1	;RF	29.5	;LR	28.7	;RR	28.5
POST-TEST ATTITUDE:	LF	25.8	;RF	26.5	;LR	30.2	;RR	30.5

*VEHICLE DID NOT CONTAIN CAPACITY DATA.

TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE AS RECEIVED (EMPTY):

RIGHT FRONT	975 LBS.	RIGHT REAR	654 LBS.
LEFT FRONT	991 LBS.	LEFT REAR	642 LBS.
TOTAL FRONT WEIGHT	1966 LBS.	(60.3% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1296 LBS.	(39.7% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT 3262 LBS.			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

UDW = UNLOADED DELIVERED WEIGHT (3262 LBS)

VCW = VEHICLE CAPACITY WEIGHT (NA LBS)

DSC = DESIGNATED SEATING CAPACITY (NA)

$RCLW^* = VCW - 150 (DSC) = 300$

TARGET TEST WEIGHT = $UDW + RCLW^* + (NO. OF HYBRID III DUMMIES \times 167 \text{ LBS/DUMMY})$

TARGET TEST WEIGHT = $3262 + 300 + 167$

TARGET TEST WEIGHT = 3729 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 306 LBS. OF CARGO WEIGHT:

RIGHT FRONT	995 LBS.	RIGHT REAR	818 LBS.
LEFT FRONT	1081 LBS.	LEFT REAR	841 LBS.
TOTAL FRONT WEIGHT	2076 LBS.	(55.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1659 LBS.	(44.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3735 LBS.	(6 POUNDS OVER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: 125 LBS.

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 49.3 INCHES REARWARD OF FRONT WHEEL CENTERLINE

*Cargo weight for multi-purpose passenger vehicles, trucks, and buses is the vehicle's rated cargo and luggage weight from the vehicle's label or 300 pounds, whichever is less.

TEST CONDITIONS

TEST NUMBER: 901010

TEST DATE: 10/10/90

TEST TEMPERATURES:

IMPACT AREA: 58° F;
DRIVER DUMMY 60° F;

OCCUPANT COMPARTMENT: 60° F
PASSENGER DUMMY: NA° F

VEHICLE, GUARDRAIL DATA

	ACTUAL	INTENDED
VEHICLE TEST WEIGHT (lbs.):	3735	3729
VEHICLE VELOCITY (mph)*:	50.5	60
IMPACT ANGLE (deg.):	0	0
GUARDRAIL LENGTH (in.):	1246	1246

VEHICLE MEASUREMENTS

MAXIMUM LENGTH: 175.3	WHEELBASE: 112.2
MAXIMUM WIDTH: 71.9	TOP WIDTH: 54.6
C.G. REARWARD OF FRONT WHEEL CENTERLINE: 49.3	
C.G. HEIGHT ABOVE GROUND LEVEL: 24.2	

VEHICLE TEST CONDITIONS

LEFT FRONT:	DOOR - LOCKED	WINDOW - UP
LEFT REAR:	DOOR - UNLOCKED	WINDOW - NA
RIGHT FRONT:	DOOR - UNLOCKED	WINDOW - UP
RIGHT REAR:	DOOR - NA	WINDOW - NA
EMERGENCY BRAKE:	OFF	TRANSMISSION: NEUTRAL
HEADRESTS:	DRIVER - MOST UP	PASSENGER - NA
TIRE PRESSURE:	FRONT - 35 PSI;	REAR - 35 PSI

DUMMY INFORMATION

TYPE:	Part 572E
POSITION:	Driver
SERIAL NO.:	907
INSTRUMENTATION:	
HEAD ACCELEROMETERS:	3
NECK LOAD CELLS:	6
CHEST ACCELEROMETERS:	3
CHEST DISPLACEMENT	
POTENTIOMETER:	1
PELVIS ACCELEROMETERS:	3
RIB DISPLACEMENT	
POTENTIOMETER:	--
RESTRAINT SYSTEM:	Three-point unbelt

REMARKS:

ALL DISTANCE MEASUREMENTS ARE IN INCHES.
*AS MEASURED OVER FINAL SEVEN FEET OF TRAVEL.

SUMMARY OF RESULTS

Test No.: 901010	Test Vehicle: 1988 Dodge Caravan
Test Date: 10/10/90	Test Weight: 3735
Impact Angle: 0	Impact Speed: 50.5 mph
Beam Rail Height: 12	Beam Rail Section Length: 162.5
Beam Rail Width: 3.5	Beam Rail Gauge: 12
Total Beam Rail Length: 1246	

Anchor No.	Height	Material	Dimensions	Embedment	Spacing
0	0	Concrete pad	34X34	36	0
1	26	Wooden post	6X8 spacer	44	244.5
2	32	Wooden post	6X8 spacer	44	76
3	32	Wooden post	7.5 diameter	44	73
4	32	Wooden post	7.5 diameter	44	77
5	32	Wooden post	7.5 diameter	44	73
6	32	Wooden post	7.5 diameter	44	74
7	32	Wooden post	7.5 diameter	44	76
8	32	Wooden post	7.5 diameter	44	75
9	32	Wooden post	7.5 diameter	44	74
10	32	Wooden post	7.5 diameter	44	76
11	32	Wooden post	7.5 diameter	44	76
12	32	Wooden post	7.5 diameter	44	74
13	32	Wooden post	7.5 diameter	44	75
14	32	Wooden post	7.5 diameter	44	74

RELEASE BLOCK TO FIRST POINT OF GUARDRAIL: 62.5 LONGITUDINAL
15.0 LATERAL

FOUR (4) BOLTS AT ANCHOR NO. 0: 7/8 DIAMETER, 12" LENGTH
ALL MEASUREMENTS ARE IN INCHES.

VEHICLE INSTRUMENTATION LOCATIONS AND DATA SUMMARY

TEST NUMBER 901010

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX	SEC	MAX	SEC
1	CENTER OF GRAVITY	92.0	0.0	20.0				
	ACCELERATION (g)							
	LONGITUDINAL				18.4	0.3	13.3	0.3
	LATERAL				15.0	0.4	15.4	0.4
	VERTICAL				13.5	0.3	14.8	0.3
	RESULTANT				23.7	0.3		
2	CENTER OF GRAVITY	92.0	0.0	16.0				
	ANGULAR VELOCITY (deg/sec)							
	ROLL (X-AXIS)				137.1	2.3	161.9	2.2
	PITCH (Y-AXIS)				43.0	2.2	46.0	0.4
	YAW (Z-AXIS)				154.7	0.3	150.0	0.3
3	LEFT FRONT SUSPENSION	147.8	20.5	38.0				
	DISPLACEMENT (in)							
	VERTICAL				0.9	2.1	1.6	2.2
4	RIGHT FRONT SUSPENSION	150.2	-22.8	38.5				
	DISPLACEMENT (in)							
	VERTICAL				1.0	0.6	1.8	1.5
5	LEFT REAR SUSPENSION	30.5	22.8	24.0				
	DISPLACEMENT (in)							
	VERTICAL				5.4	1.4	4.7	2.2
6	RIGHT REAR SUSPENSION	30.5	-22.8	23.7				
	DISPLACEMENT (in)							
	VERTICAL				4.9	1.6	4.8	0.4
7	SHOULDER BELT	83.0	26.5	16.5				
	DISPLACEMENT (in)							
	DRIVER				1.9	0.4	3.5	3.2

* ALL MEASUREMENTS OF INSTRUMENTATION LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM VEHICLE'S REAR BUMPER
Y: + LEFTWARD FROM VEHICLE'S CENTERLINE
Z: + UPWARD FROM GROUND LEVEL
ROLL: + TO RIGHT
PITCH: + FRONT DOWNWARD
YAW: + COUNTERCLOCKWISE
DISPLACEMENT: + OUTWARD

STADIA POLE LAYOUT

20.	.40
19.	.39
18.	.38
17.	.37
16.	.36
15.	.35
14.	.34
13.	.33
12.	.32
11.	.31
10.	.30
9.	.29
8.	.28
7.	.27
6.	.26
5.	.25
4.	.24
3.	.23
2.	.22
1.	.21

GUARDRAIL

RELEASE BLOCK

STADIA POLE LOCATIONS

<u>POLE NO.</u>	<u>X DISTANCE. *</u>	<u>Y DISTANCE. *</u>
1	5.2	5.0
2	17.2	5.0
3	29.2	5.0
4	41.2	5.0
5	53.2	5.0
6	65.2	5.0
7	77.2	5.0
8	89.2	5.0
9	101.2	5.0
10	113.2	5.0
11	125.2	5.0
12	137.2	5.0
13	149.2	5.0
14	161.2	5.0
15	173.2	5.0
16	185.2	5.0
17	197.2	5.0
18	209.2	5.0
19	221.2	5.0
20	233.2	5.0
21	5.2	-20.0
22	17.2	-20.0
23	29.2	-20.0
24	41.2	-20.0
25	53.2	-20.0
26	65.2	-20.0
27	77.2	-20.0
28	89.2	-20.0
29	101.2	-20.0
30	113.2	-20.0
31	125.2	-20.0
32	137.2	-20.0
33	149.2	-20.0

STADIA POLE LOCATIONS. CONT'D.

<u>POLE NO.</u>	<u>X DISTANCE, *</u>	<u>Y DISTANCE, *</u>
34	161.2	-20.0
35	173.2	-20.0
36	185.2	-20.0
37	197.2	-20.0
38	209.2	-20.0
39	221.2	-20.0
40	233.2	-20.0

*REFERENCE: +X: FORWARD FROM RELEASE BLOCK

+Y: LEFTWARD FROM CENTER RELEASE BLOCK

ALL MEASUREMENTS ARE IN FEET.

HIGH SPEED CAMERA LOCATION

OFFBOARD

CAMERA NO.	X*	Y*	Z*
2	74.8	-262.0	3.5
3	213.3	-231.0	4.5
4	416.7	0.0	4.1

CRANE

5	NA	0.0	33.6
---	----	-----	------

*Reference:

- +X: Forward from release block
- +Y: Leftward from the centerline of the release block
- +Z: Upward from the ground level

ALL MEASUREMENTS ARE IN FEET.

ONBOARD

CAMERA NO.	X**	Y**	Z**
6	57.2	6.5	23.0
7	22.0	-10.0	11.5

**Reference:

- +X: Forward from the C.G. of vehicle
- +Y: Leftward from centerline of vehicle
- +Z: Upward from floor of vehicle

ALL MEASUREMENTS ARE IN INCHES.

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right panning	Kodak	25	*	Real-time documentation
2	Right	Photosonic 1B	13	495	Vehicle dynamics
3	Right	Photosonic 1B	13	500	Vehicle dynamics
4	Downstream	Photosonic 1B	50	500	Vehicle dynamics
5	Overhead	Photosonic 1B	25	500	Dummy kinematics
6	Onboard	Photosonic 1B	8	500	Dummy kinematics
7	Onboard	Photosonic 1B	8	500	Dummy kinematics
8	Documentary	Beaulieu	12-120	24	Pre- & post-test documentation

*Real-time panning camera did not run due to mechanical problems in start lever.

SECTION 4.0

OCCUPANT INFORMATION

POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #907	PASSENGER #NA
HEAD	<u>Left front door glass</u>	<u>NA</u>
CHEST	<u>Left front door and driver seat arm rest</u>	<u>NA</u>
ABDOMEN	<u>None</u>	<u>NA</u>
LEFT KNEE	<u>Left front door</u>	<u>NA</u>
RIGHT KNEE	<u>Center console</u>	<u>NA</u>

DOOR OPENING:

	LEFT	RIGHT
FRONT	<u>Easy</u>	<u>Easy</u>
REAR	<u>NA</u>	<u>Easy</u>

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	<u>None</u>	<u>None</u>
REAR	<u>NA</u>	<u>NA</u>

GLAZING DAMAGE:

None

OTHER NOTABLE IMPACT EFFECTS:

The two front tires were flattened upon test.

DUMMY KINEMATIC SUMMARY

Driver Dummy

Upon the vehicle's impact with the ground, the driver dummy's head struck the left front door glass, the chest contacted the left front door and the driver's seat arm rest, the left knee contacted the left front door and the right knee contacted the center console. The vehicle came to rest on its tires with the driver dummy upright. The dummy was restrained by the three-point unbelt.

DUMMY TEMPERATURE CONTROL AND POSITIONING

The vehicle and dummy were left inside the temperature controlled building eight hours prior to the time the dummy was loaded into the vehicle.

One Part 572E dummy was instrumented for this test. The dummy instrumentation consisted of triaxial accelerometers in the head, chest, and pelvis, a displacement potentiometer in the chest, and six (6) load cells in the neck. Prior to seating the dummy, the driver's seat was positioned in the mid-adjustment notch of the seat track. The seat back angle was non-adjustable. The dummy was positioned in the seat using NHTSA's Notice #60 seating procedure. The H-point location of the seat was obtained by using the SAE J211 OCT88 H-point machine as specified in the Notice #60. The driver dummy was restrained with a three-point unbelt.

DUMMY DATA SUMMARY

TEST NUMBER 901010

DRIVER DUMMY
SN: 907

	POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	SEC	MAX	SEC
HEAD ACCELERATION (g)				
LONGITUDINAL	9.0	3.8	23.3	2.3
LATERAL	13.1	1.1	46.1	2.3
VERTICAL	11.2	2.3	30.3	2.3
RESULTANT	56.7	2.3		
HIC 36 MSEC	154.2 FROM 2292.0 TO 2317.0			
NECK FORCES (lbs)				
LONGITUDINAL	82.4	2.3	42.4	2.0
LATERAL	113.8	2.3	85.8	1.1
VERTICAL	157.4	2.3	259.9	2.3
NECK MOMENT (in-lbs)				
ABOUT LONG.	13.4	1.1	26.9	2.3
ABOUT LATERAL	14.9	2.3	5.4	2.4
ABOUT VERTICAL	15.3	2.3	4.7	2.4
CHEST ACCELERATION (g)				
LONGITUDINAL	3.6	2.3	9.3	1.1
LATERAL	10.6	1.6	21.9	2.3
VERTICAL	18.7	2.3	8.2	1.6
RESULTANT	26.4	2.3		
3 MSEC	19.7 FROM 2274.0 TO 2278.0			
CHEST DISPLACEMENT (in)				
LONGITUDINAL	0.1	2.3	0.6	1.1
PELVIS ACCELERATION (g)				
LONGITUDINAL	6.4	1.4	11.3	1.1
LATERAL	8.8	1.1	12.8	2.3
VERTICAL	18.0	2.3	6.5	0.4
RESULTANT	19.7	2.3		

POSITIVE DIRECTION

LONGITUDINAL: FORWARD
LATERAL: LEFTWARD
VERTICAL: UPWARD

NEGATIVE DIRECTION

LONGITUDINAL: REARWARD
LATERAL: RIGHTWARD
VERTICAL: DOWNWARD

See APPENDIX D for neck load cell polarities.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

MFR./MAKE/MODEL: Chrysler/Dodge/Caravan

SEAT TYPE: Bench

 X Bucket

 Split bench

ADJUSTER TYPE: X Manual

 Power

 Non-adjustable

STEERING COLUMN: X Adjustable

TECHNICIANS:

BUCKET SEAT BACK TYPE: X Non-adjustable

 Adjustable reclining

1. B. Miller

2. R. Benavides

3. D. Ledley

4. R. Cribley

POSITIONING DATE: 10/10/90

AMBIENT TEMP. 66° F TIME: 1000

DRIVER DUMMY* # 907 TYPE: HIII

Head 7°

Target 24.2"

Knee 89°

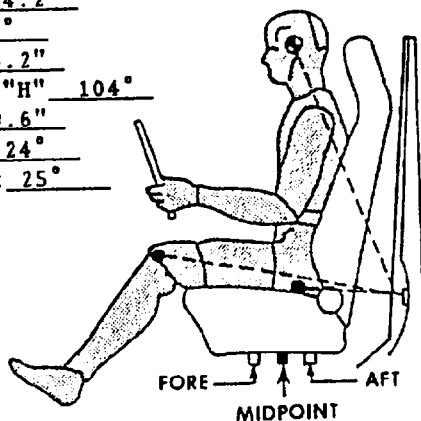
Joint 24.2"

Approx. "H" 104°

Point 9.6"

Pelvis 24°

Seatback 25°



PASSENGER DUMMY* # NA TYPE:

Head

Target

Knee

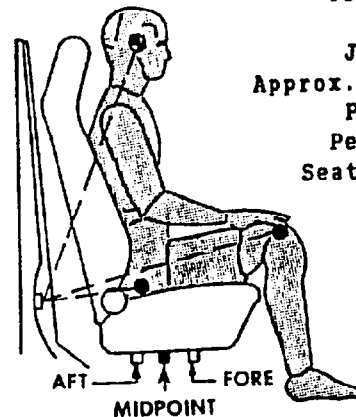
Joint

Approx. "H"

Point

Pelvis

Seatback



A = 58.0"

B = NA

C = 13.8"

D = NA

DOOR GLASS
HEIGHT = 11.4"

LATERAL BAR

ADJUSTABLE
POINTER

LEFT
FRONT
DOOR

DRIVER
DUMMY

PASSENGER
DUMMY

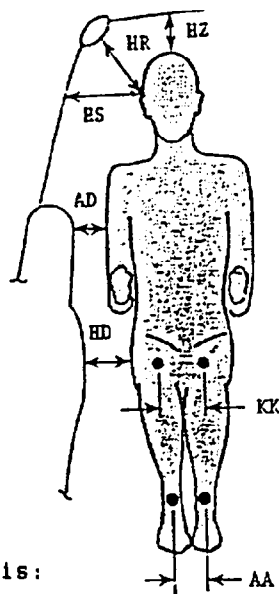
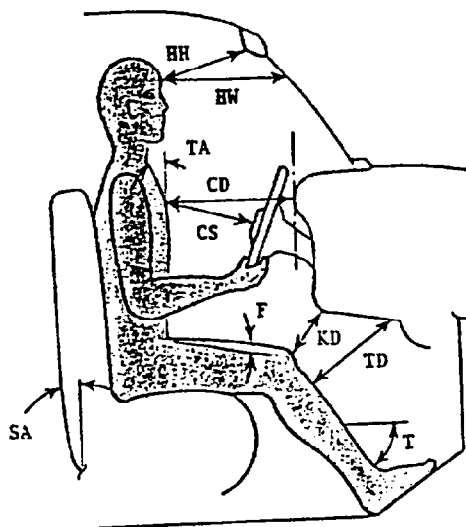
DOOR GLASS
HEIGHT = NA

RIGHT
FRONT
DOOR

*Dummy measurements are referenced to top of striker bolt and all angles are referenced to vertical. 4-6

DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER	PASSENGER
HH	18.5	NA
HW	25.2	NA
CD	21.5	NA
CS	12.0	NA
KDL	4.0	NA
KDR	4.2	NA
TA	17°	NA
SA	25°	NA
HA	19.4	NA
FL	15°	NA
FR	16°	NA
TDL	4.2	NA
TDR	4.0	NA
TL	52°	NA
TR	47°	NA
HZ	4.8	NA
HR	7.6	NA
HS	10.0	NA
AD	4.1	NA
HD	6.0	NA
KK	9.2	NA
AA	11.5	NA



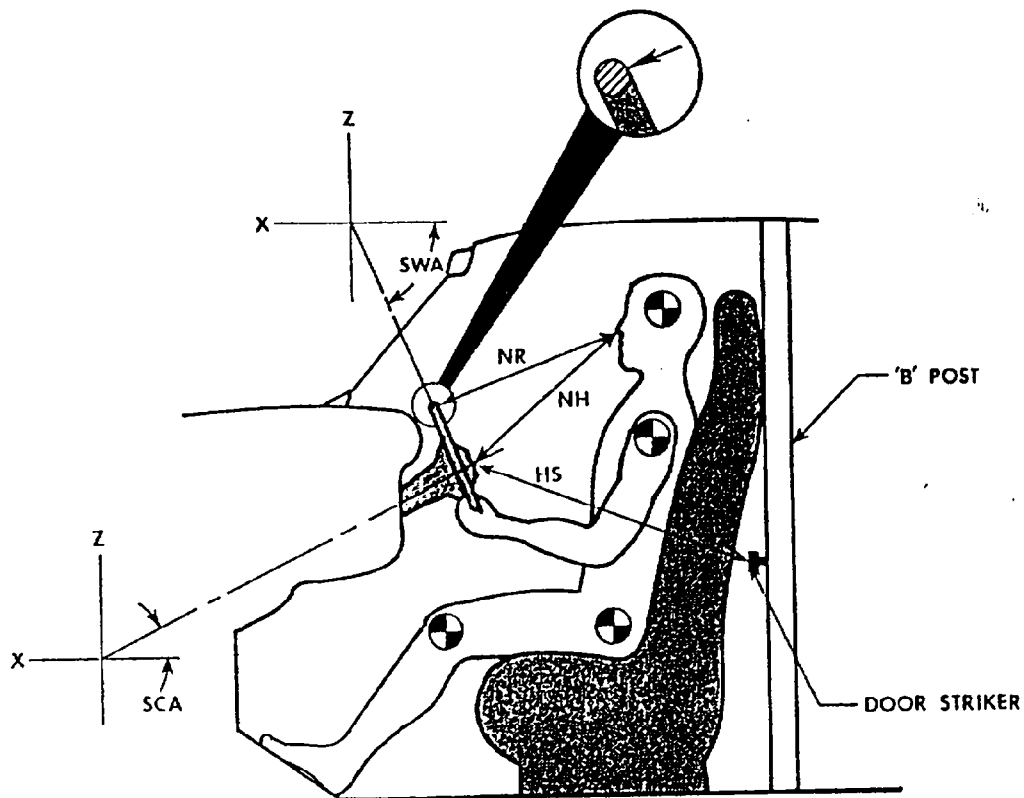
Knee outer clevis to outer clevis:
Driver = 10.6" Passenger = NA

HH = Head to Windshield Header
HW = Head to Windshield
CD = Chest to Dash
CS = Chest to Steering Wheel
KD = Knee to Dash
TA = Torso Angle
SA = Seat Back Angle
HA = Head to A-Pillar
FL = Femur Left
FR = Femur Right
TDL = Tibia Dash Left

TDR = Tibia Dash Right
TL = Tibia Left
TR = Tibia Right
HZ = Head to Roof
HR = Head to Side Roof
HS = Head to Side Window
AD = Arm to Door
HD = Hip to Door
KK = Knee to Knee
AA = Ankle to Ankle

Torso and seat back angles are relative to vertical.
Femur and tibia angles are relative to horizontal.
ALL DISTANCE MEASUREMENTS ARE IN INCHES.

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY DATA



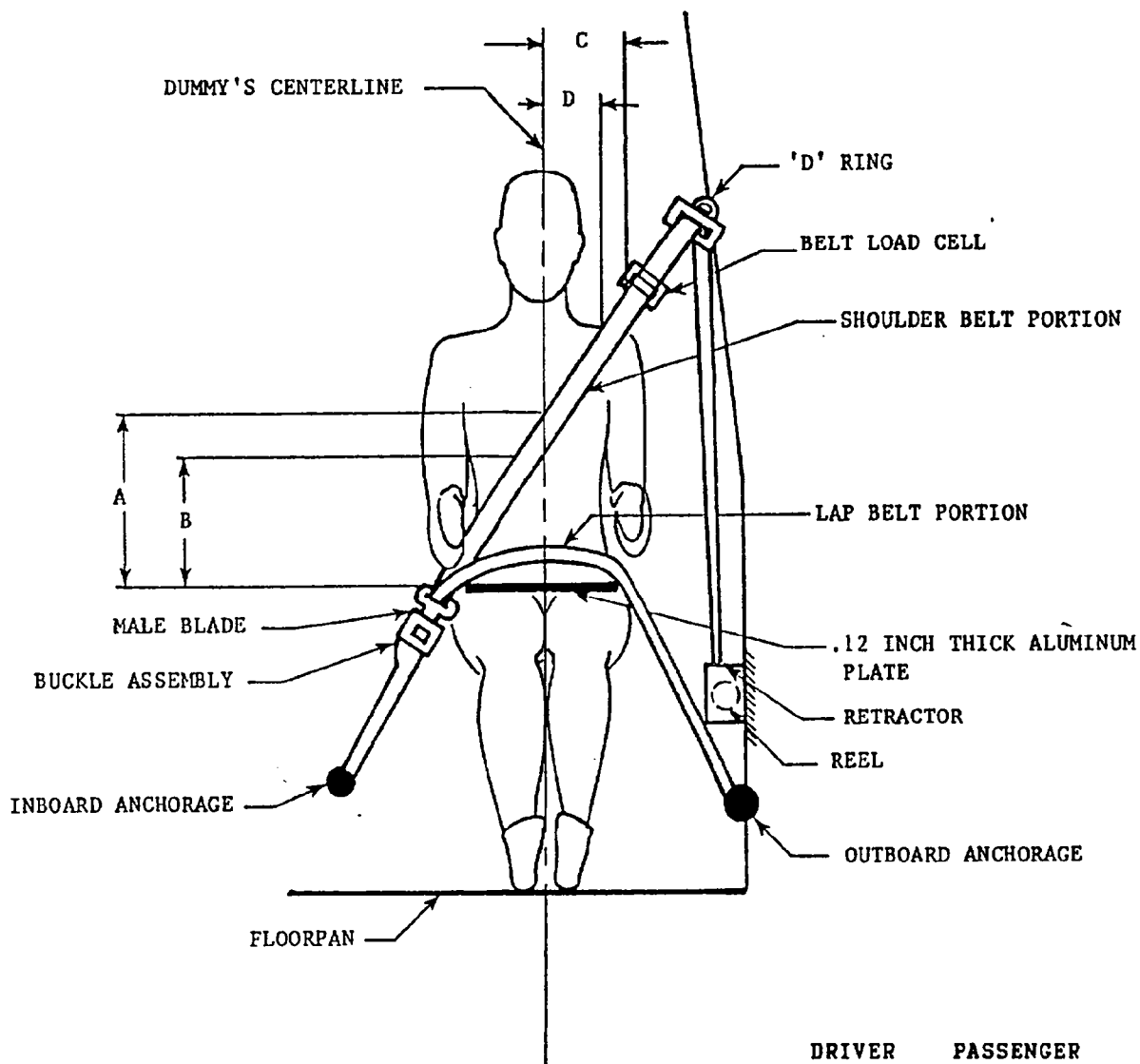
POSITION OF STEERING COLUMN TILTING AND TELESCOPING ADJUSTMENTS, IF ANY:
Mid position

MEASUREMENTS

NR	- DISTANCE FROM TIP OF DUMMY'S NOSE TO TOP REAR SURFACE OF STEERING WHEEL RIM.	17.8
NH	- DISTANCE FROM TIP OF DUMMY'S NOSE TO CENTER OF STEERING COLUMN HUB.	17.4
HS	- DISTANCE FROM CENTER OF STEERING COLUMN HUB TO THE FORWARD SURFACE OF THE DOOR LOCK STRIKER PIN.	23.8
SCA	- ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS	37°
SWA	- ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS	53°

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - TOP SURFACE OF ALUMINUM PLATE TO BELT UPPER EDGE	12.5	NA
B - TOP SURFACE OF ALUMINUM PLATE TO BELT LOWER EDGE	9.0	NA
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	5.2	NA
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	3.0	NA

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

APPENDIX A

PHOTOGRAPHS



Figure A-1. PRE-TEST FRONT VIEW

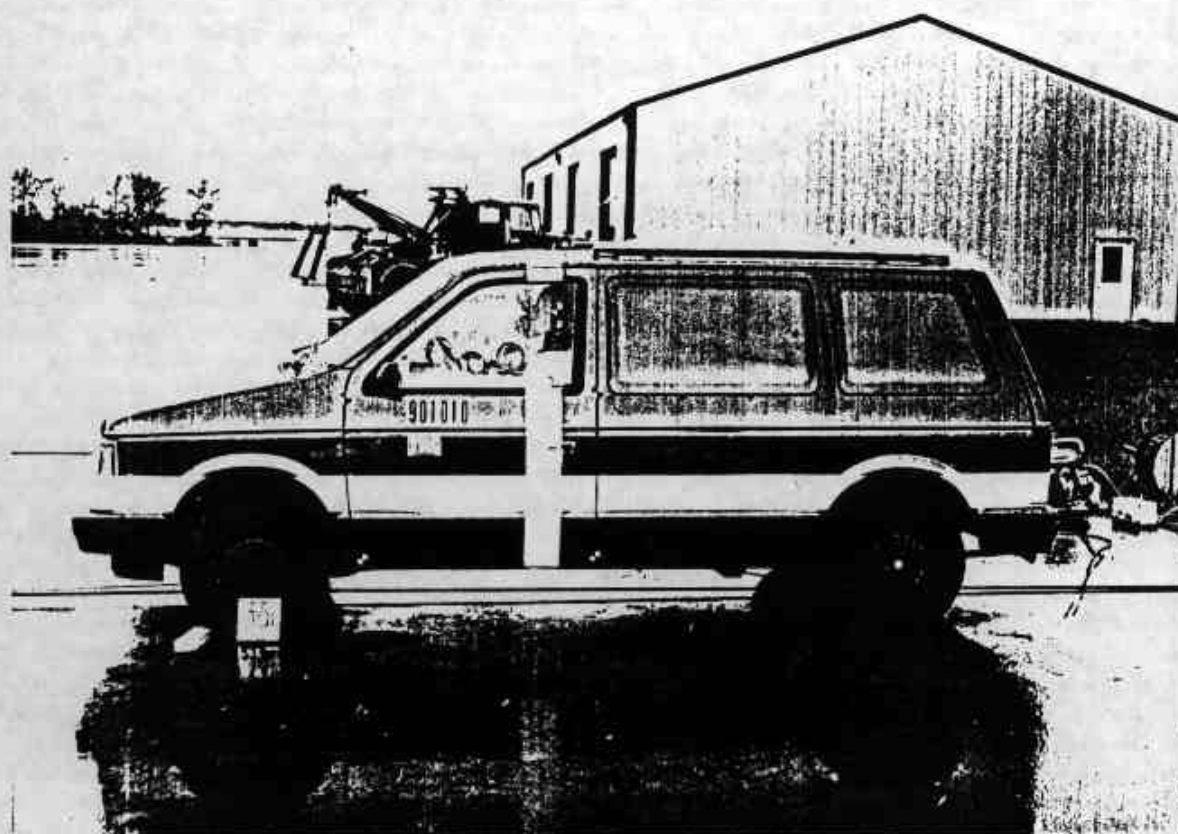


Figure A-2. PRE-TEST LEFT SIDE VIEW

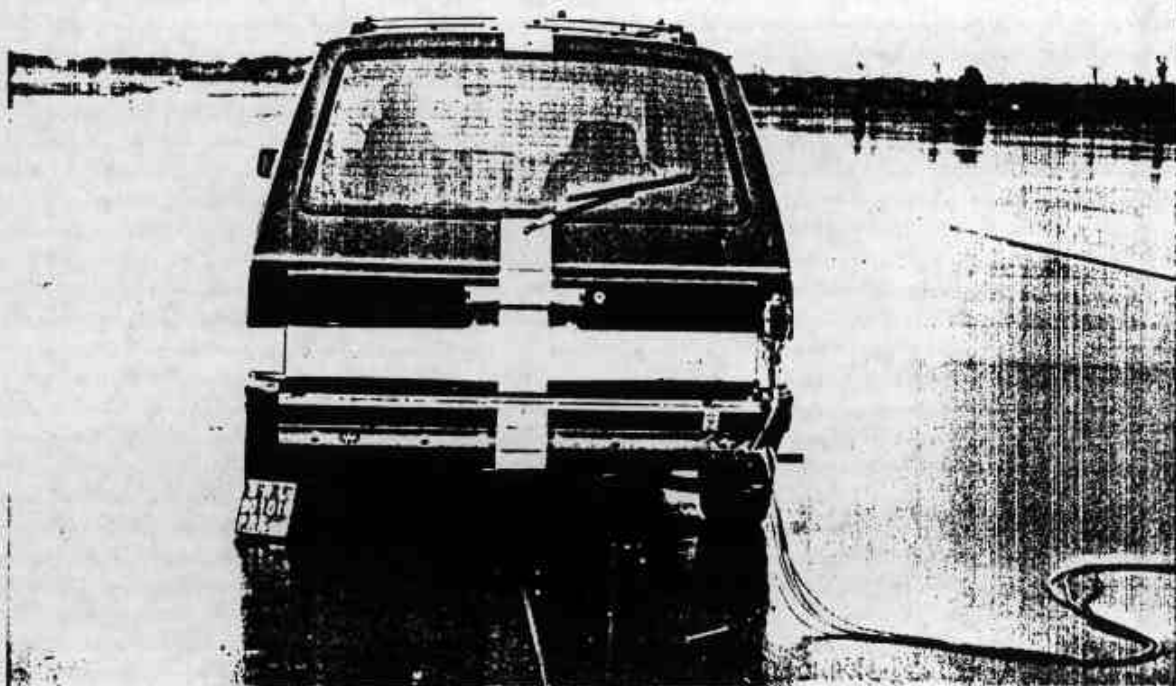


Figure A-3. PRE-TEST REAR VIEW



Figure A-4. PRE-TEST RIGHT SIDE VIEW



Figure A-5. PRE-TEST WINDSHIELD VIEW



Figure A-6. PRE-TEST DRIVER DUMMY - VIEW 1



Figure A-7. PRE-TEST DRIVER DUMMY - VIEW 2

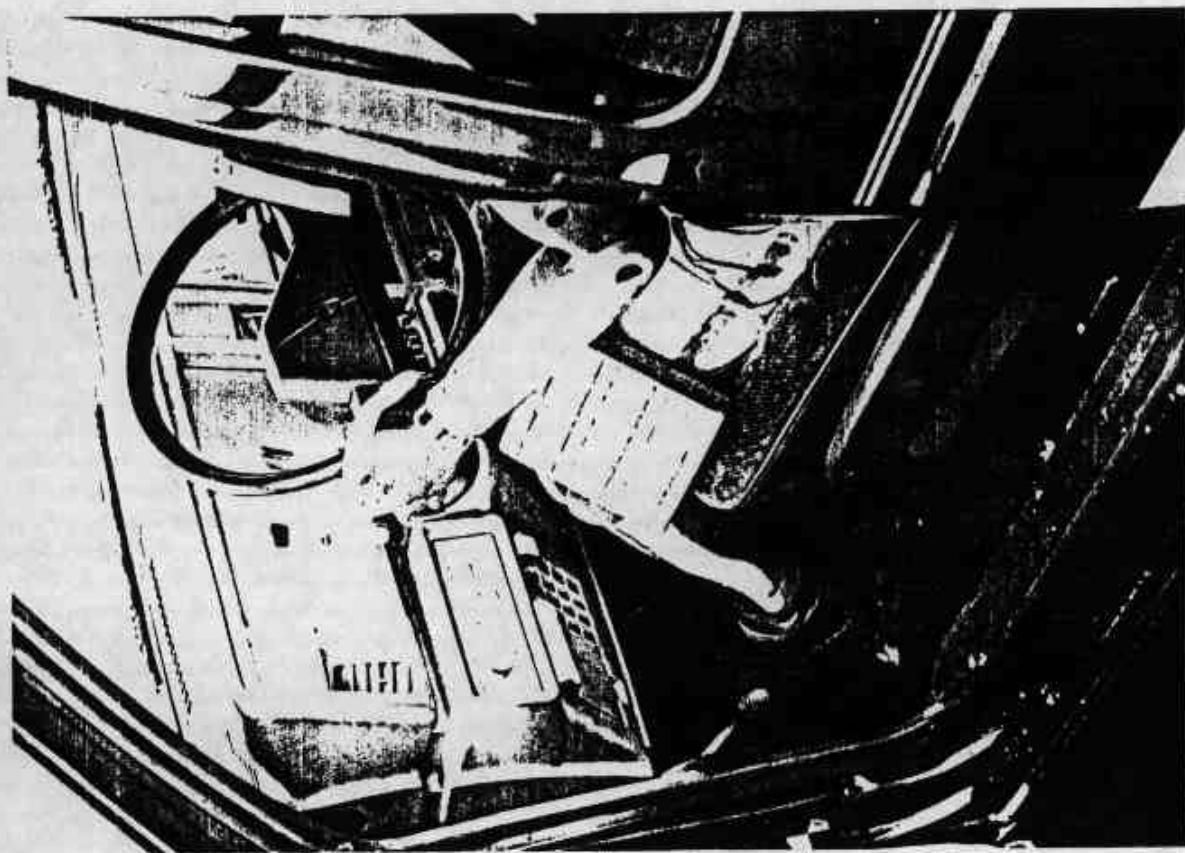


Figure A-8. PRE-TEST DRIVER DUMMY - VIEW 3

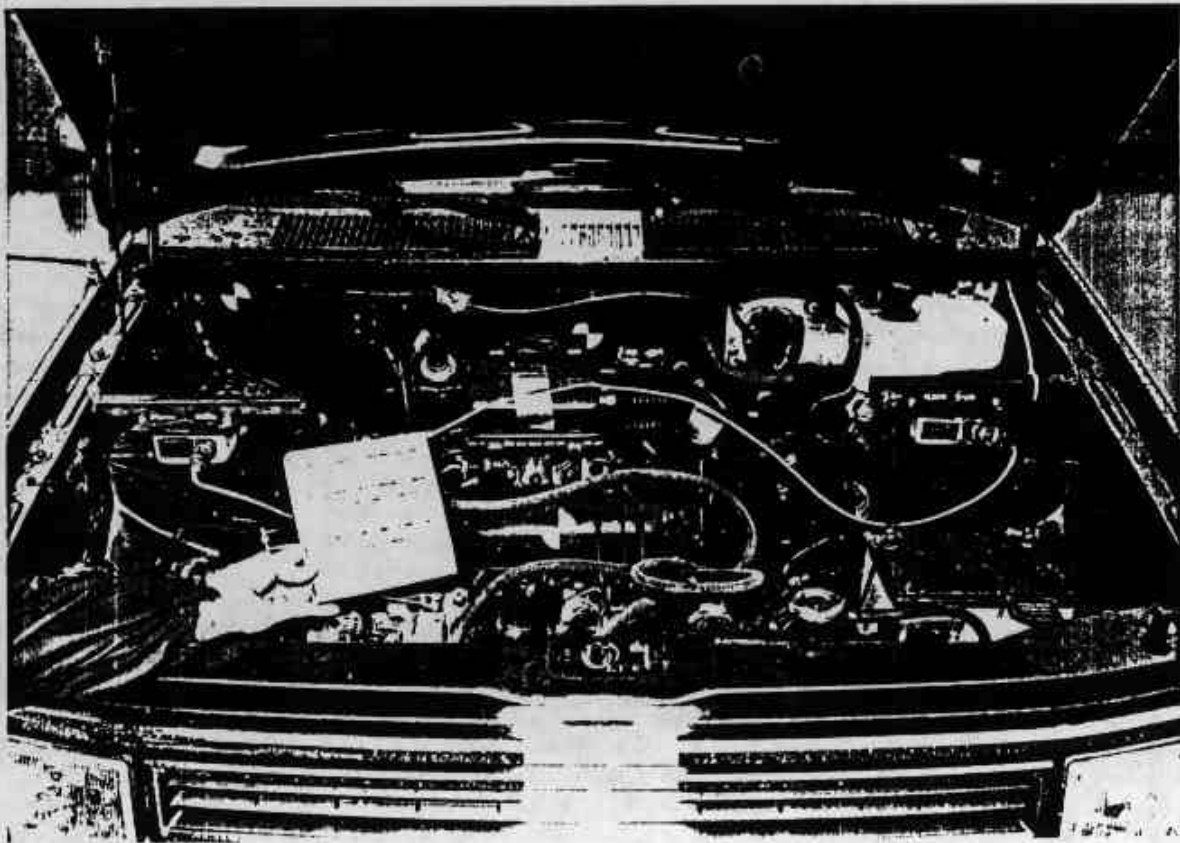


Figure A-9. PRE-TEST LEFT & RIGHT FRONT SUSP. STRING POTENTIOMETER VIEW

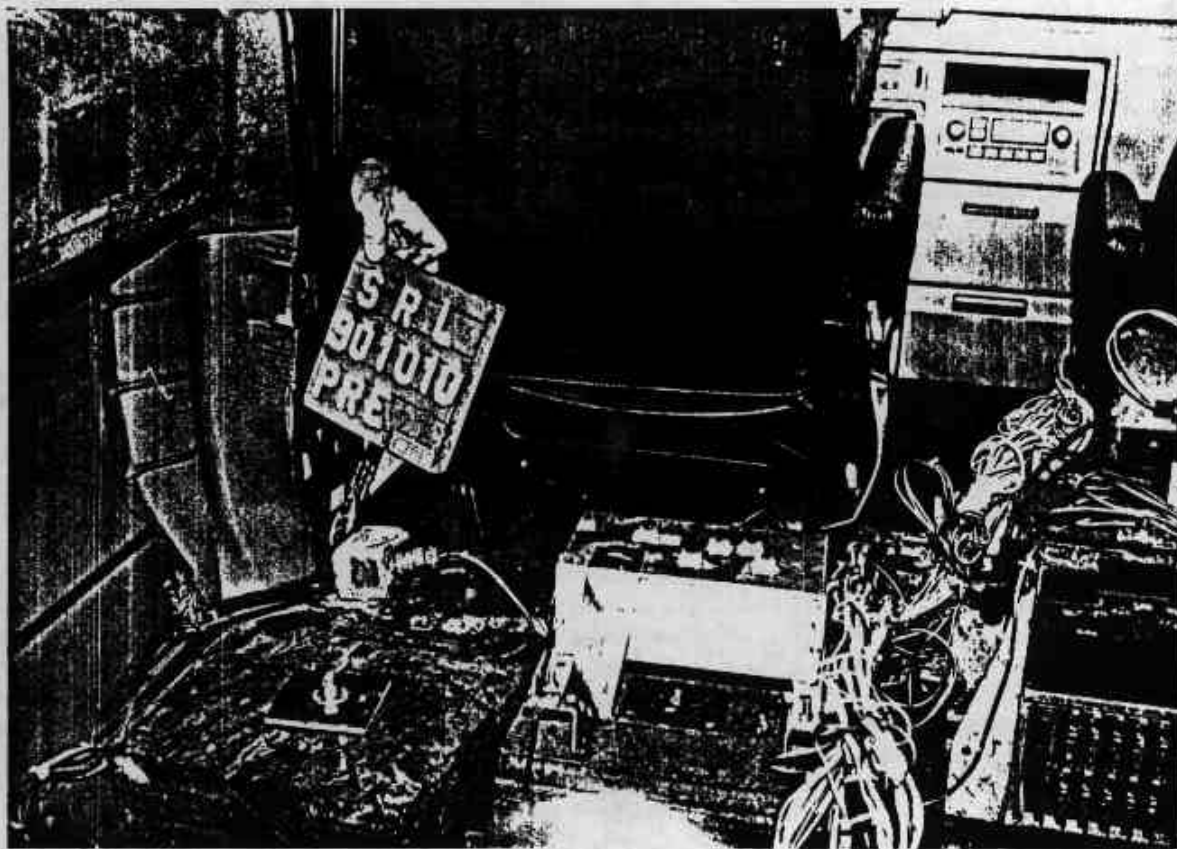


Figure A-10. PRE-TEST SEAT BELT STRING POTENTIOMETER VIEW

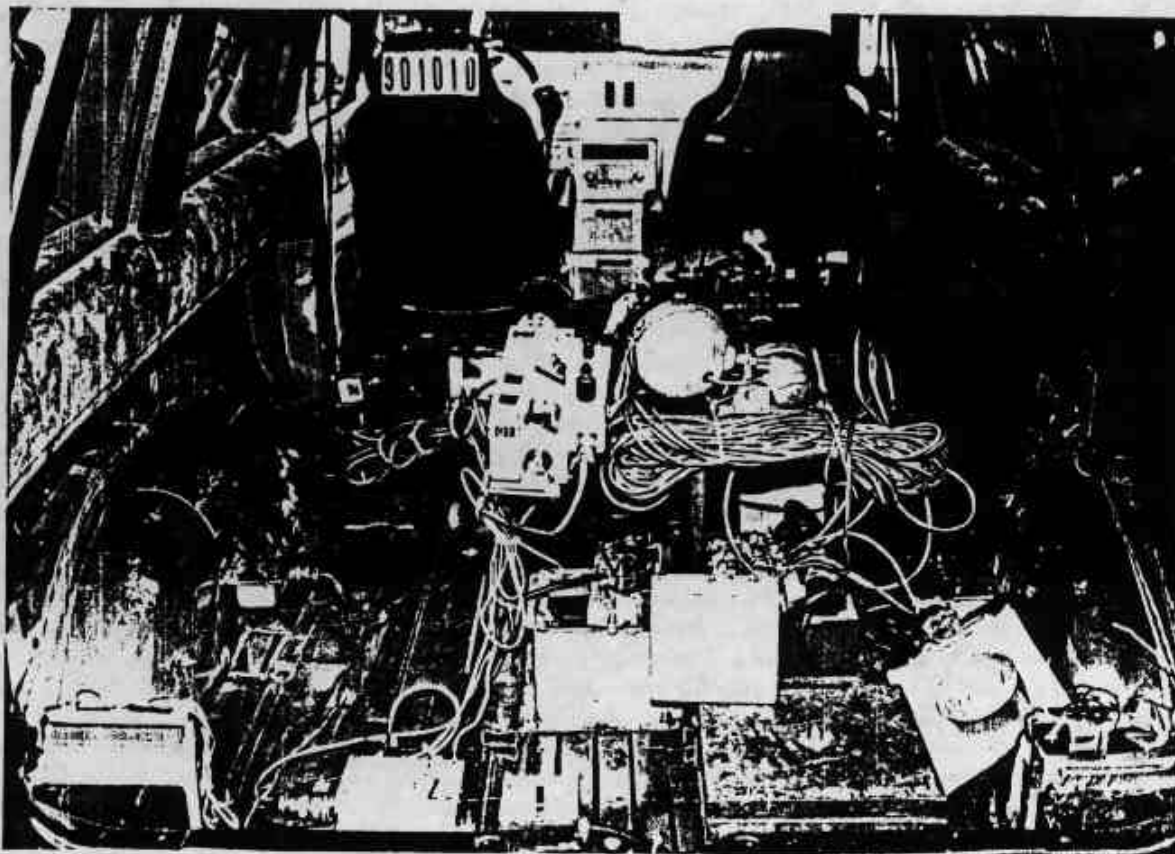


Figure A-11. PRE-TEST VEHICLE INSTRUMENTATION AND BALLAST LOCATION

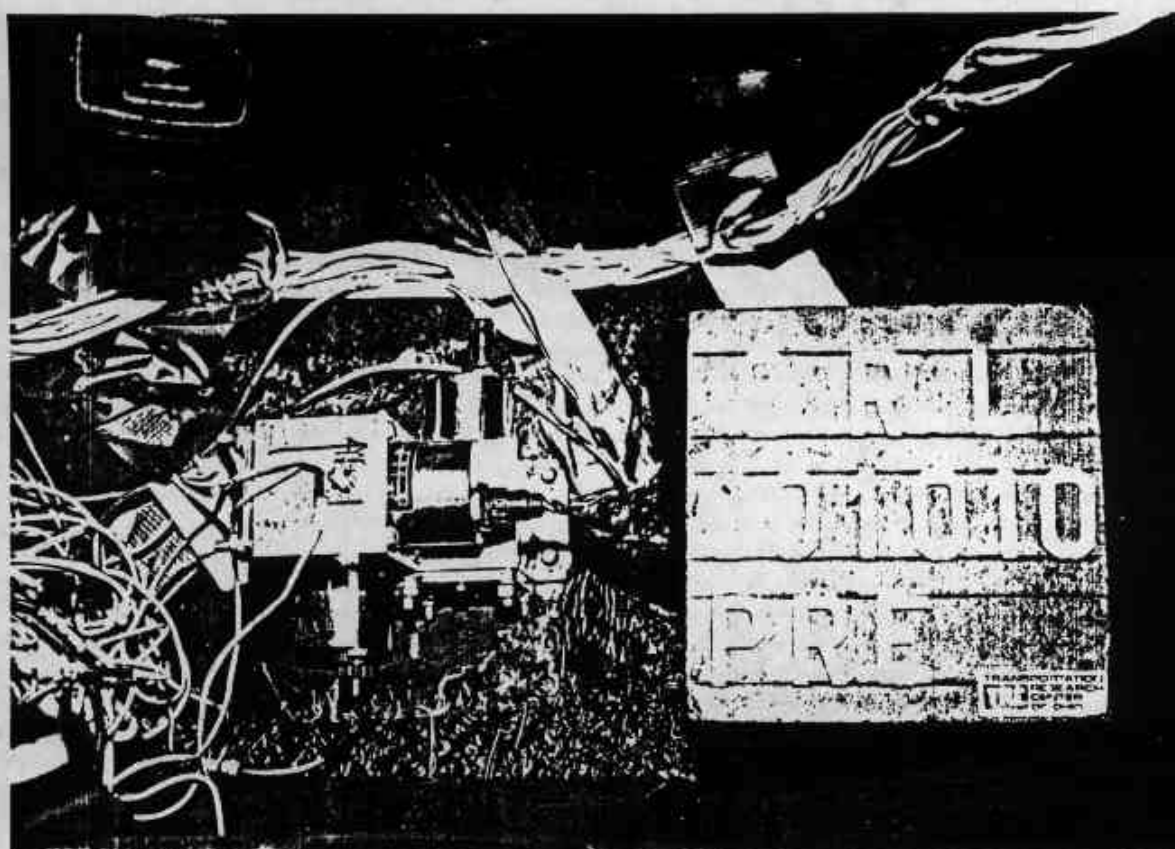


Figure A-12. PRE-TEST GYROSCOPE PLACEMENT VIEW



Figure A-13. POST-TEST FRONT VIEW

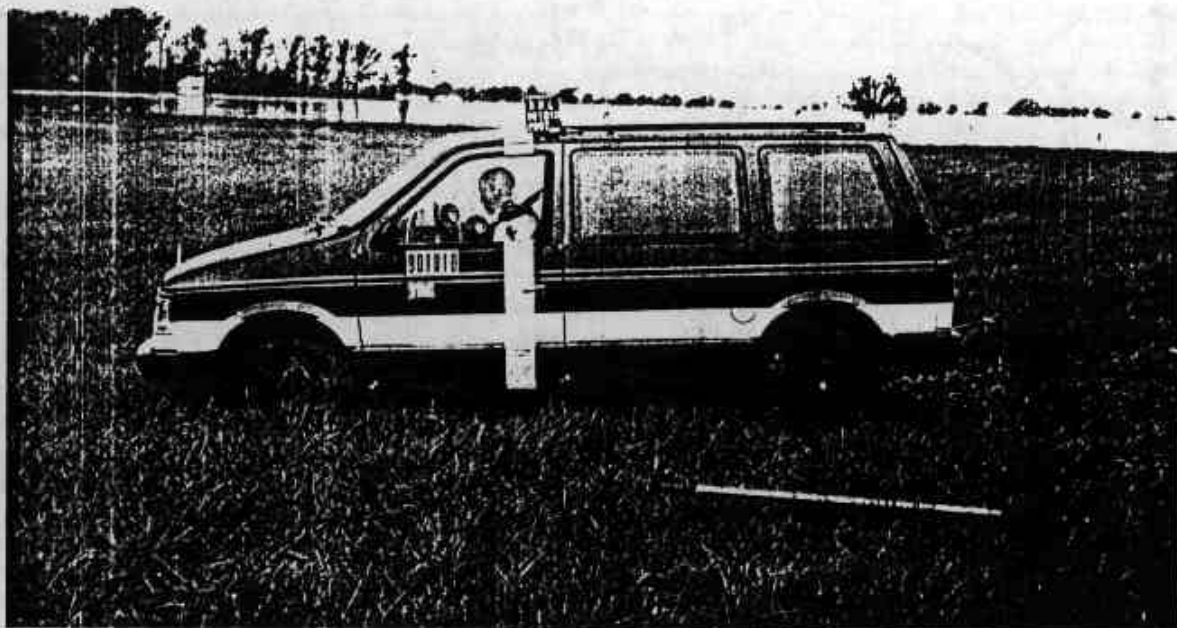


Figure A-14. POST-TEST LEFT SIDE VIEW

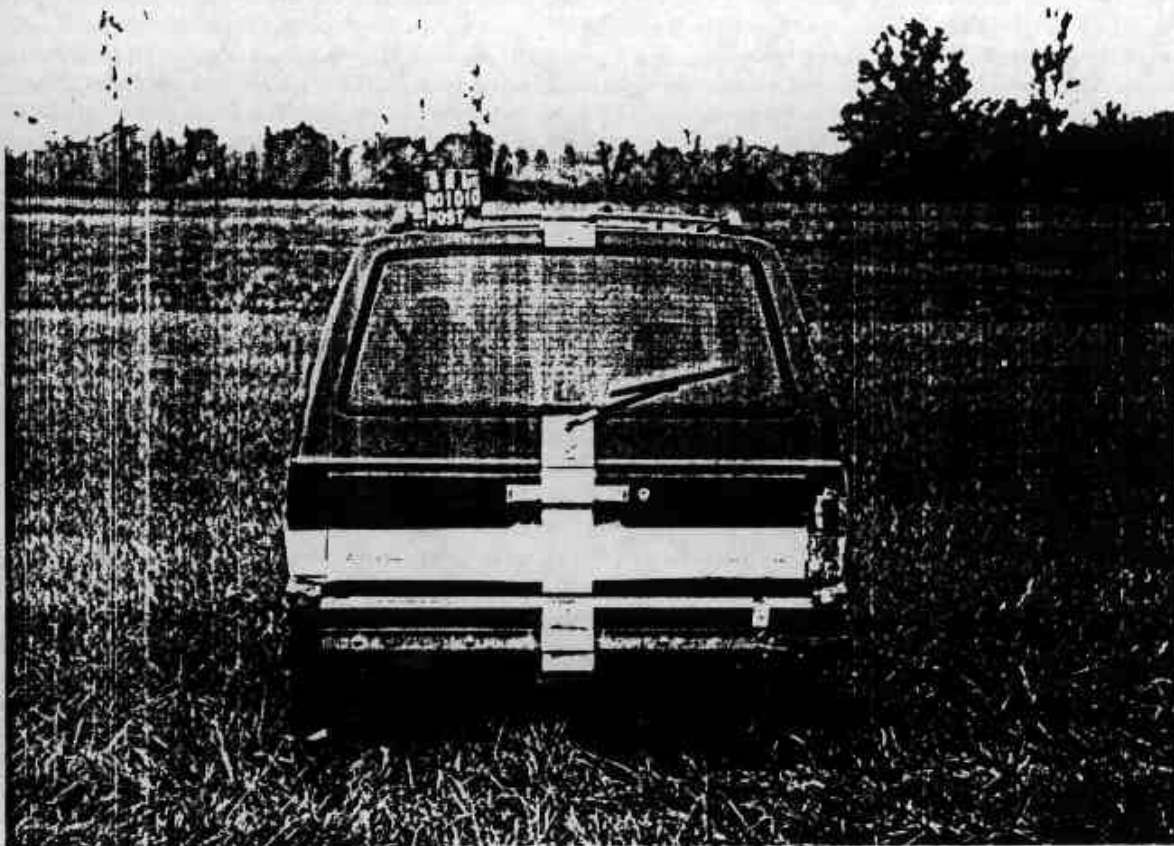


Figure A-15. POST-TEST REAR SIDE VIEW

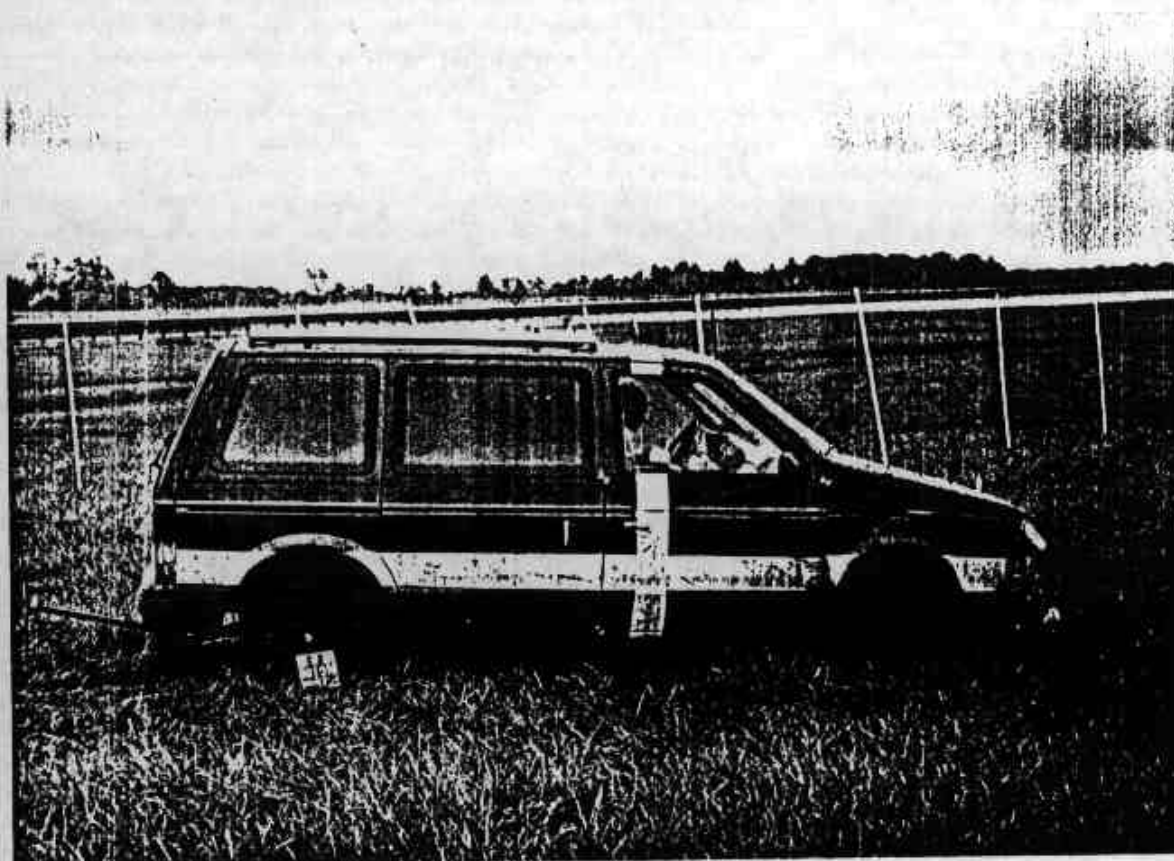


Figure A-16. POST-TEST RIGHT SIDE VIEW

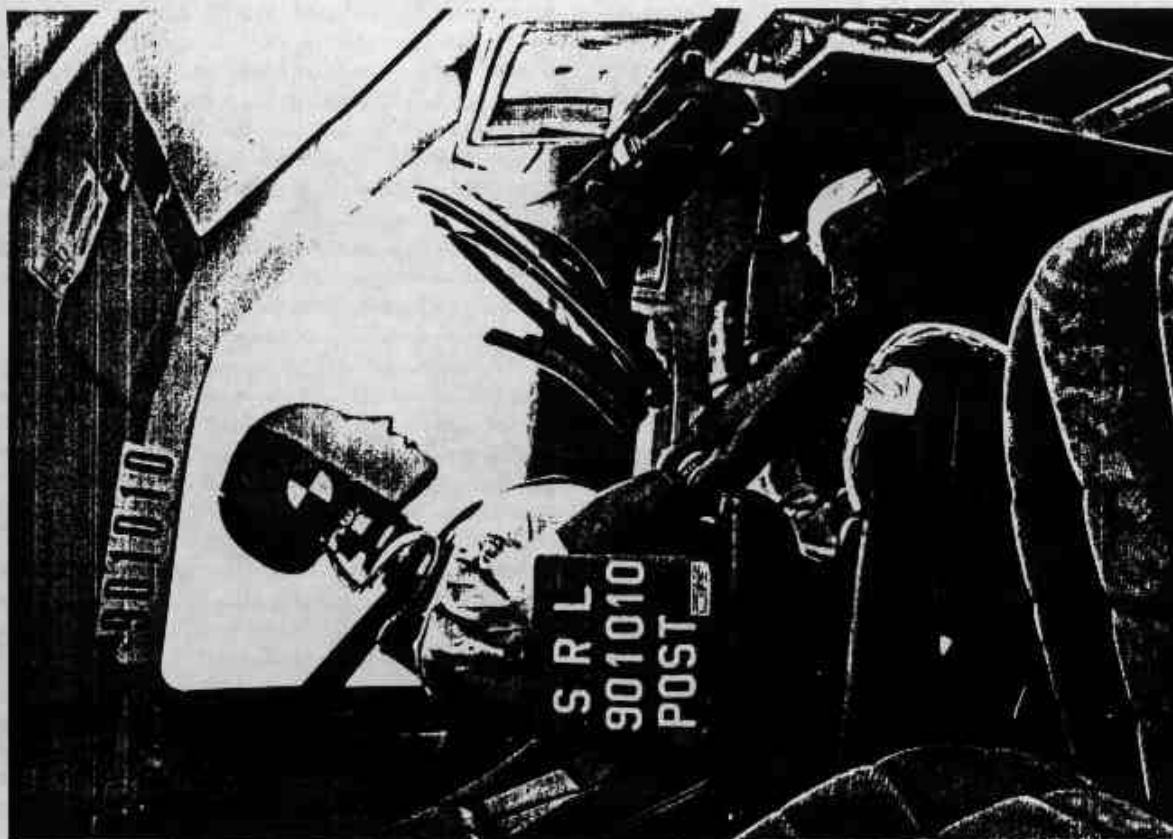


Figure A-17. POST-TEST DUMMY AND VEHICLE VIEW

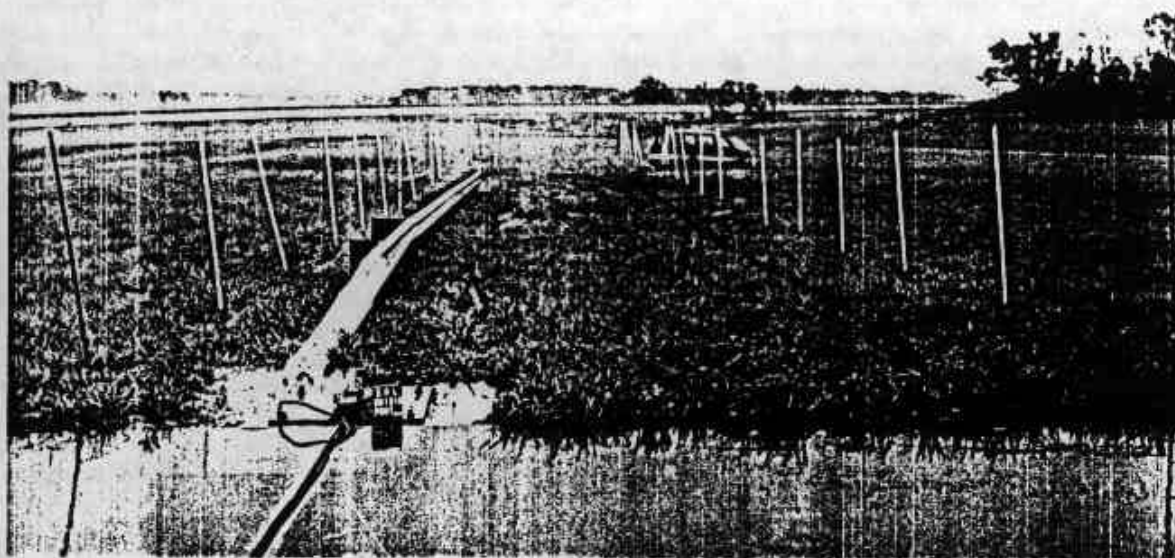


Figure A-18. POST-TEST VEHICLE AND GUARDRAIL - VIEW 1

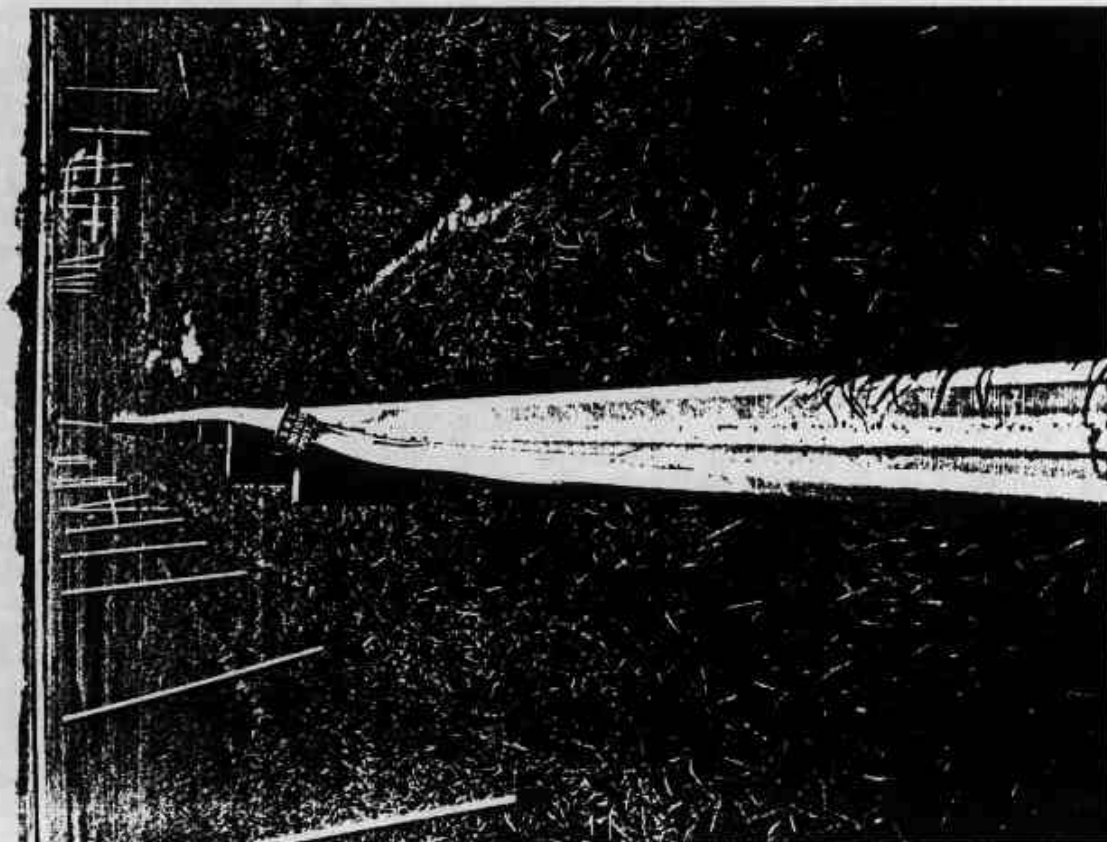


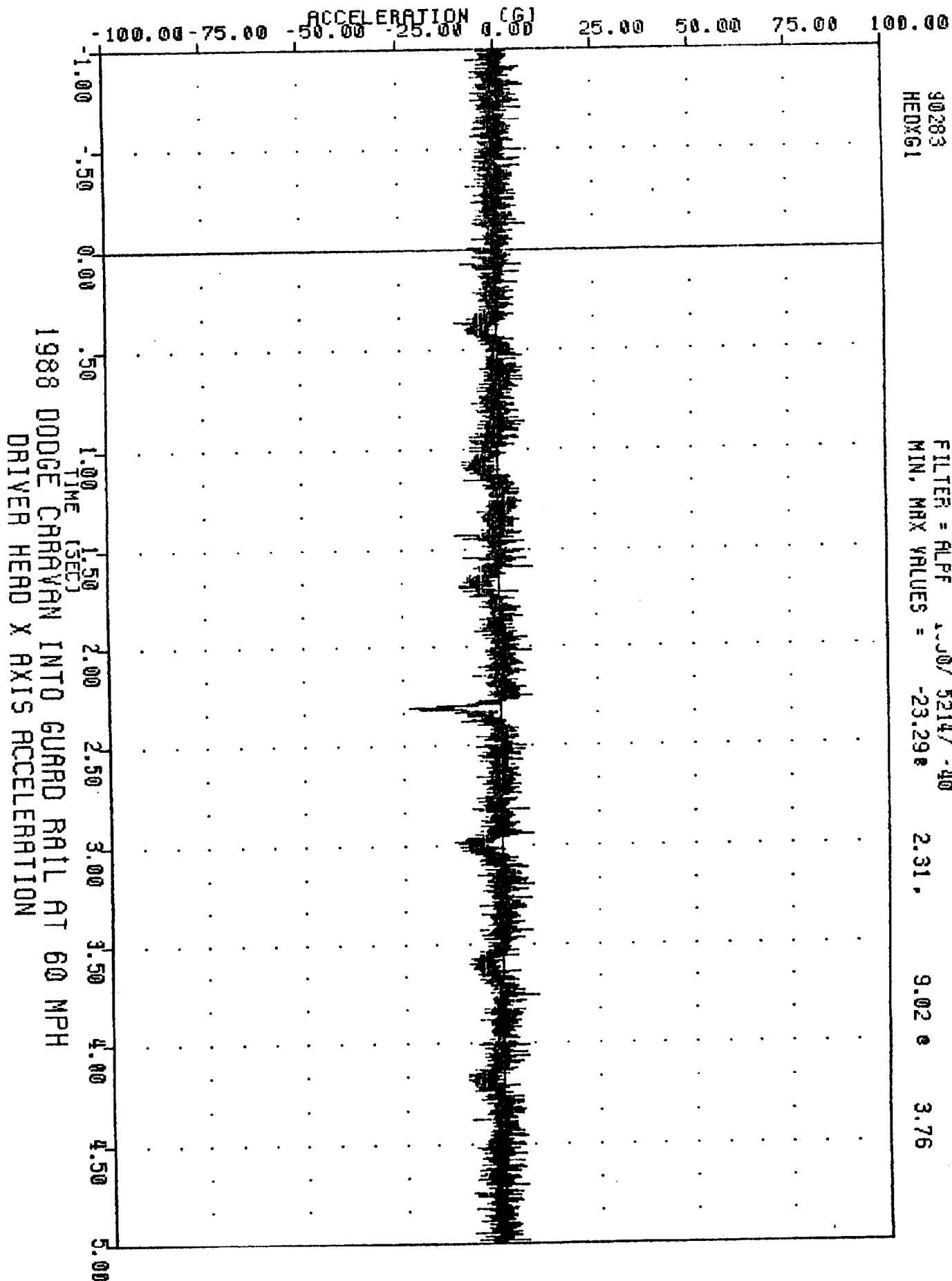
Figure A-19. POST-TEST VEHICLE AND GUARDRAIL - VIEW 2

APPENDIX B

DATA PLOTS

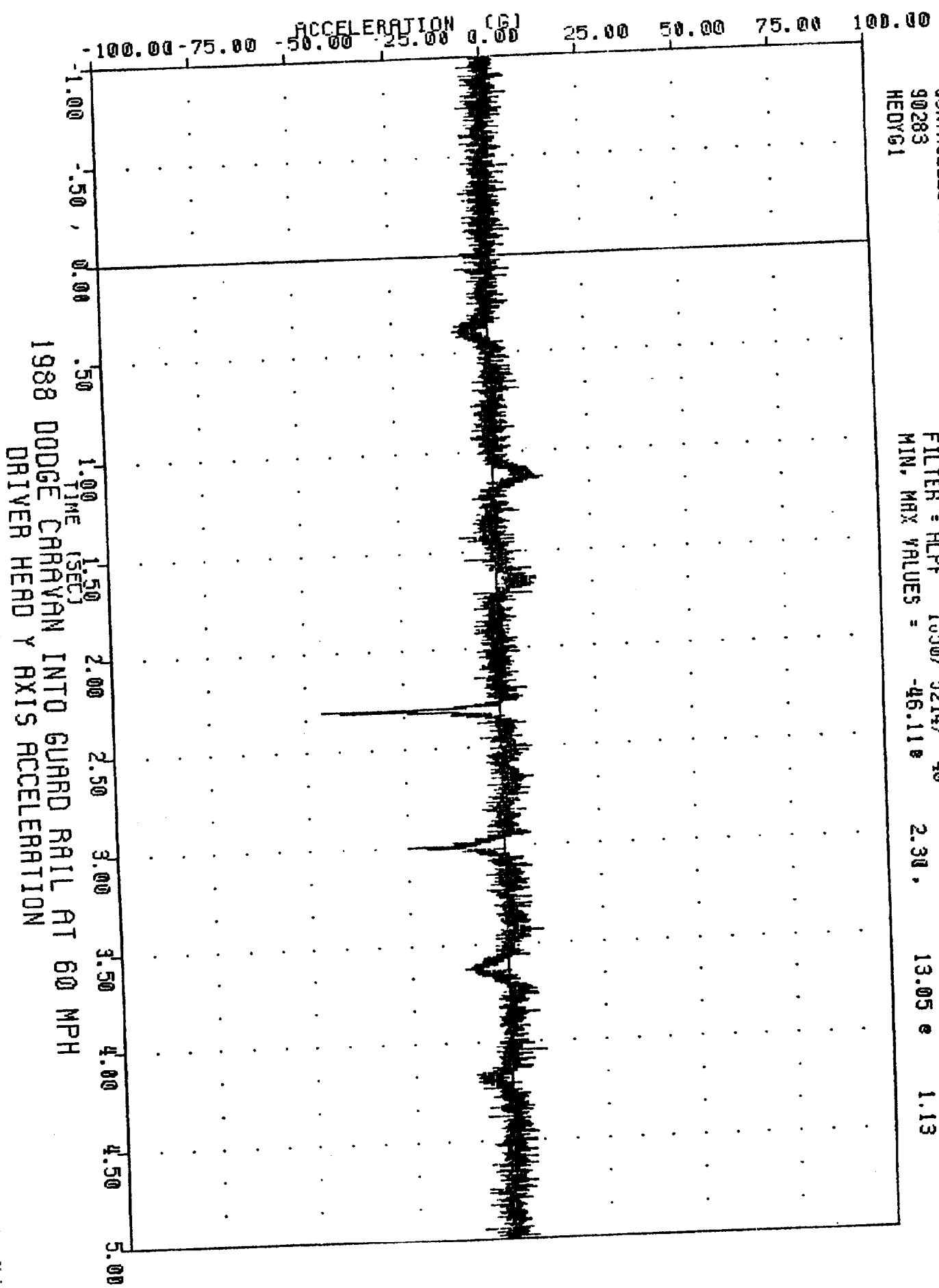
CONTROLLED ROLLOVER CRASH
90283
HEDXG1

FILTER = FLPF 100/ 5214/ -40
MIN, MAX VALUES = -23.29 2.31 9.02 3.76



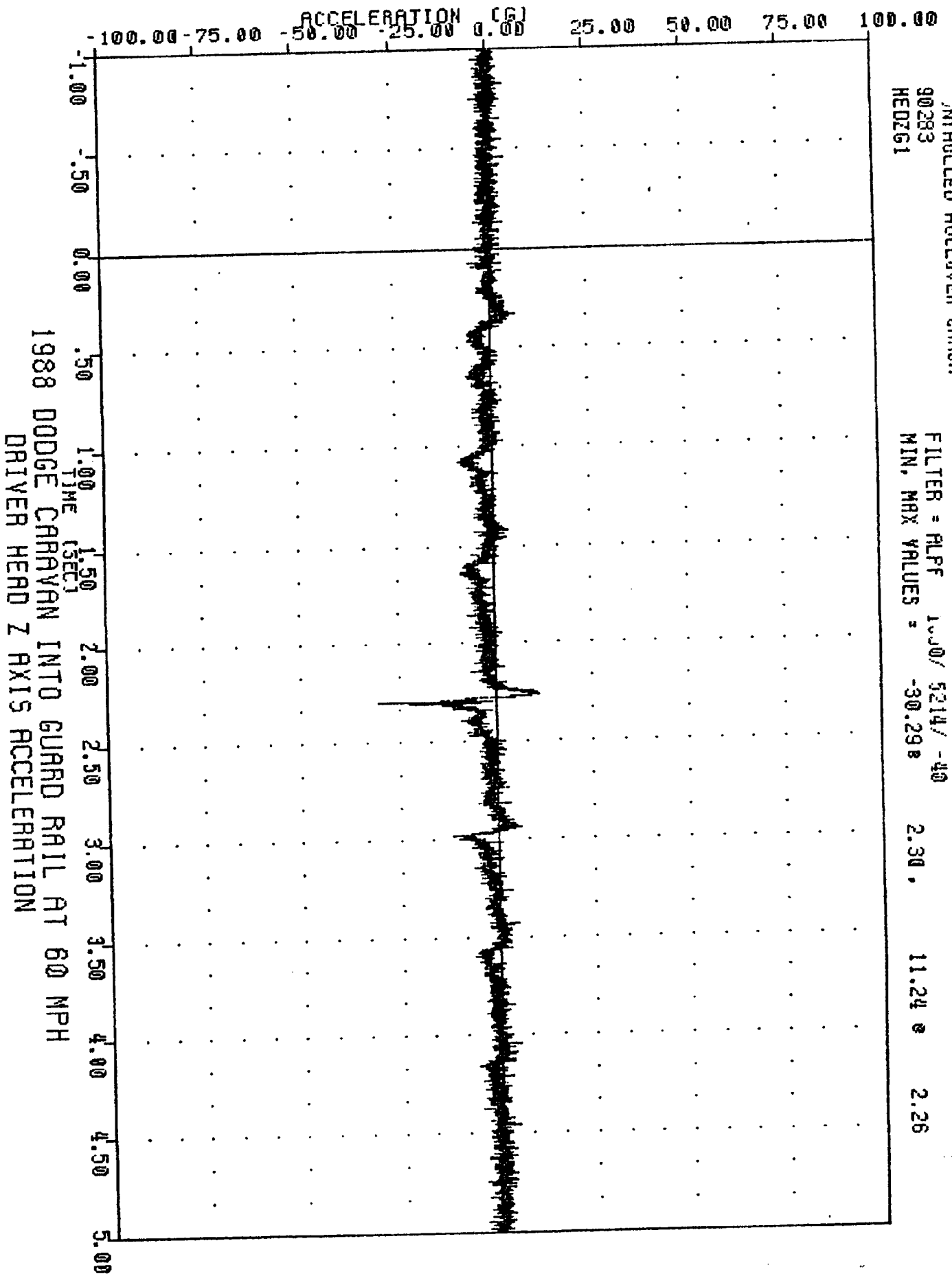
UP INJECTION
CONTROLLED ROLLOVER CRASH
90283
HEDY61

FILTER = RLPF 1030/ 5214/ -40
MIN, MAX VALUES = -46.11 e 2.30 e 13.05 e 1.13



CONTROLLED ROLLOVER CRASH
90283
HED261

FILTER = ALPF 10.00/ 5214/-40
MIN, MAX VALUES = -30.298 2.30 11.24 2.26



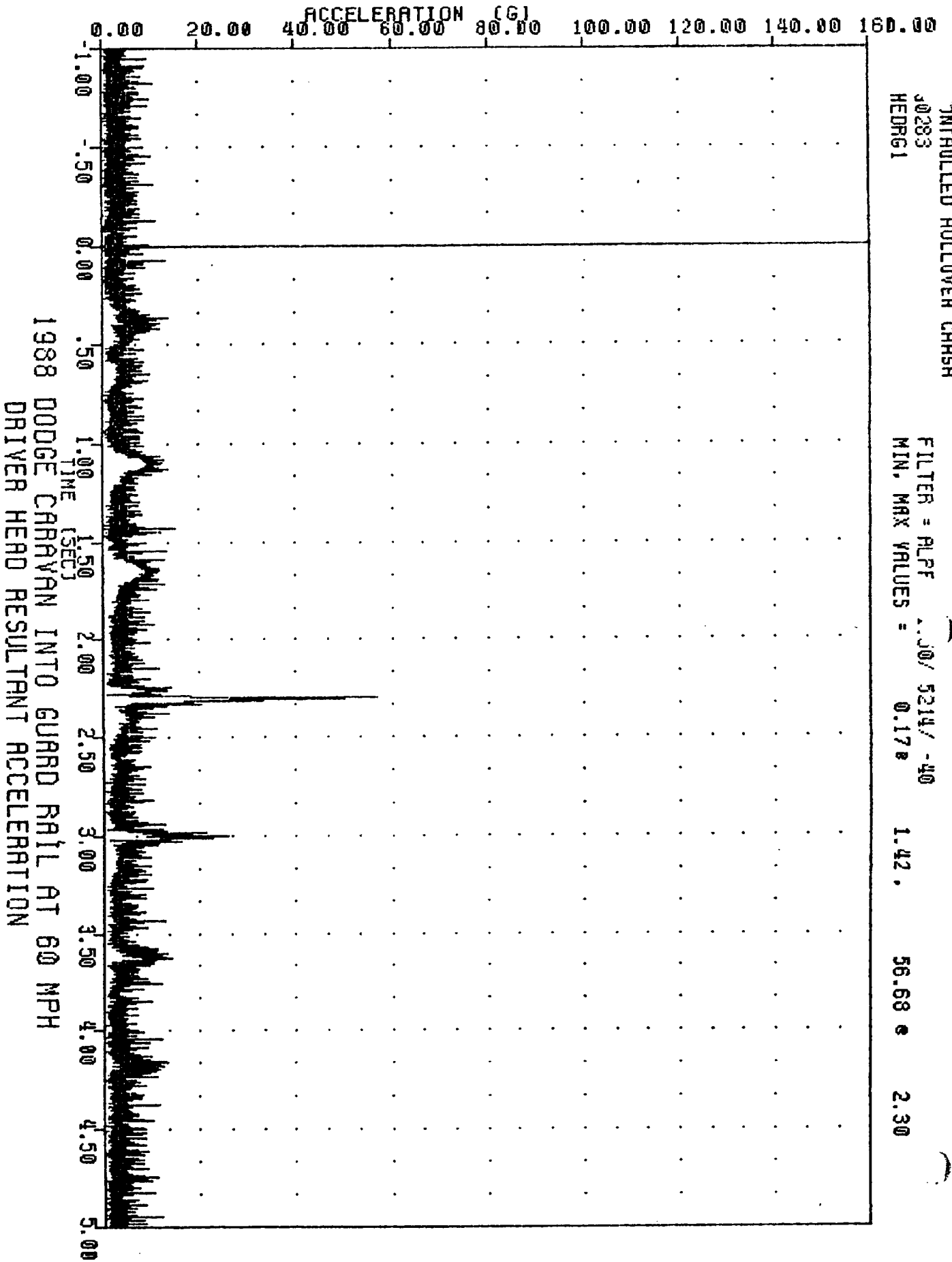
CONTROLLED HOLLOWAY CHMSH
J0283
HEDRG1

FILTER = RLPF 50/ 5214/ -40
MIN, MAX VALUES = 0.17 1.42

1.42

56.68

2.30



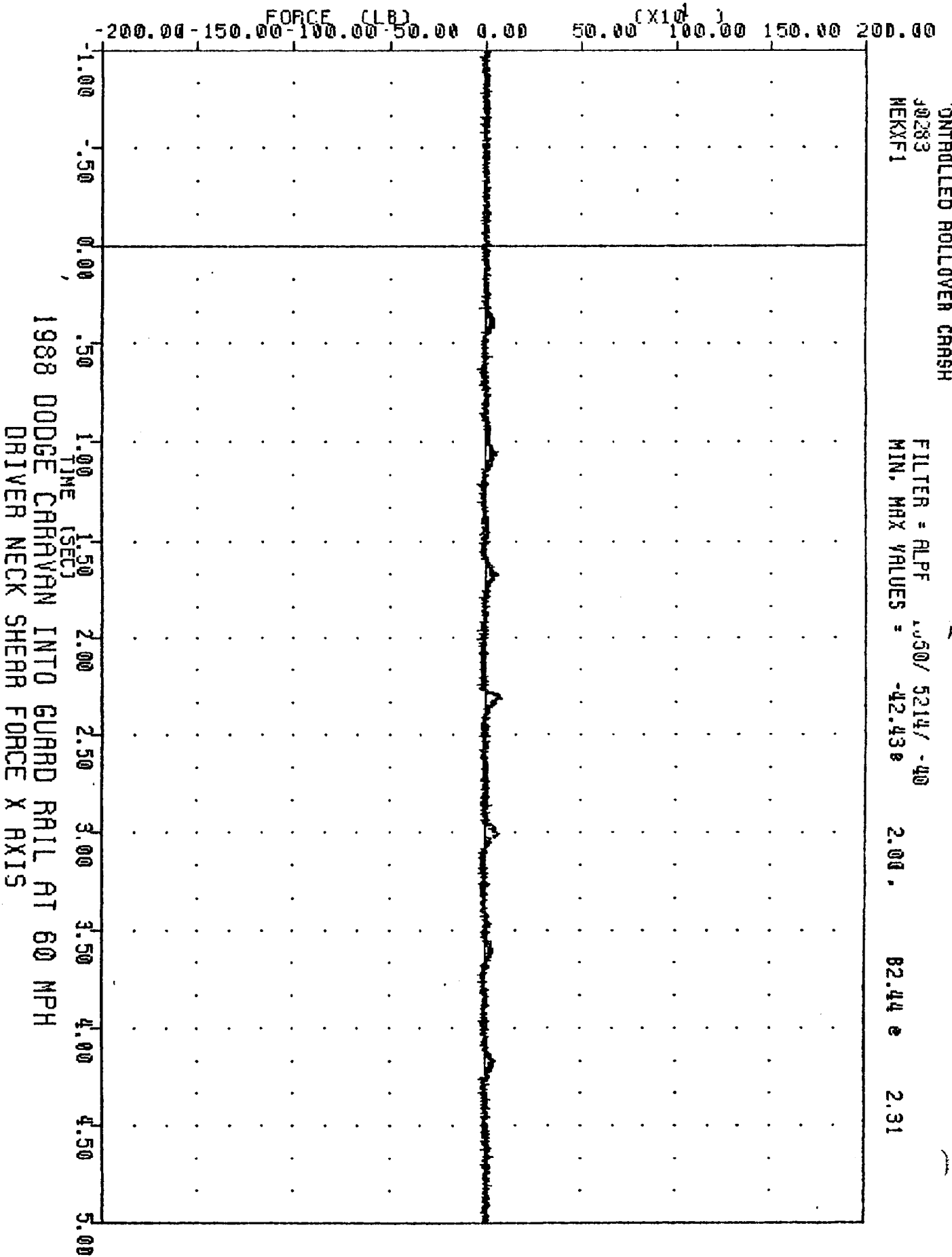
CONTROLLED ROLLOVER CRASH
J0283
HEKXF1

FILTER = ALPF 1.050/ 5214/ -40
MIN. MAX VALUES = -42.438

2.00

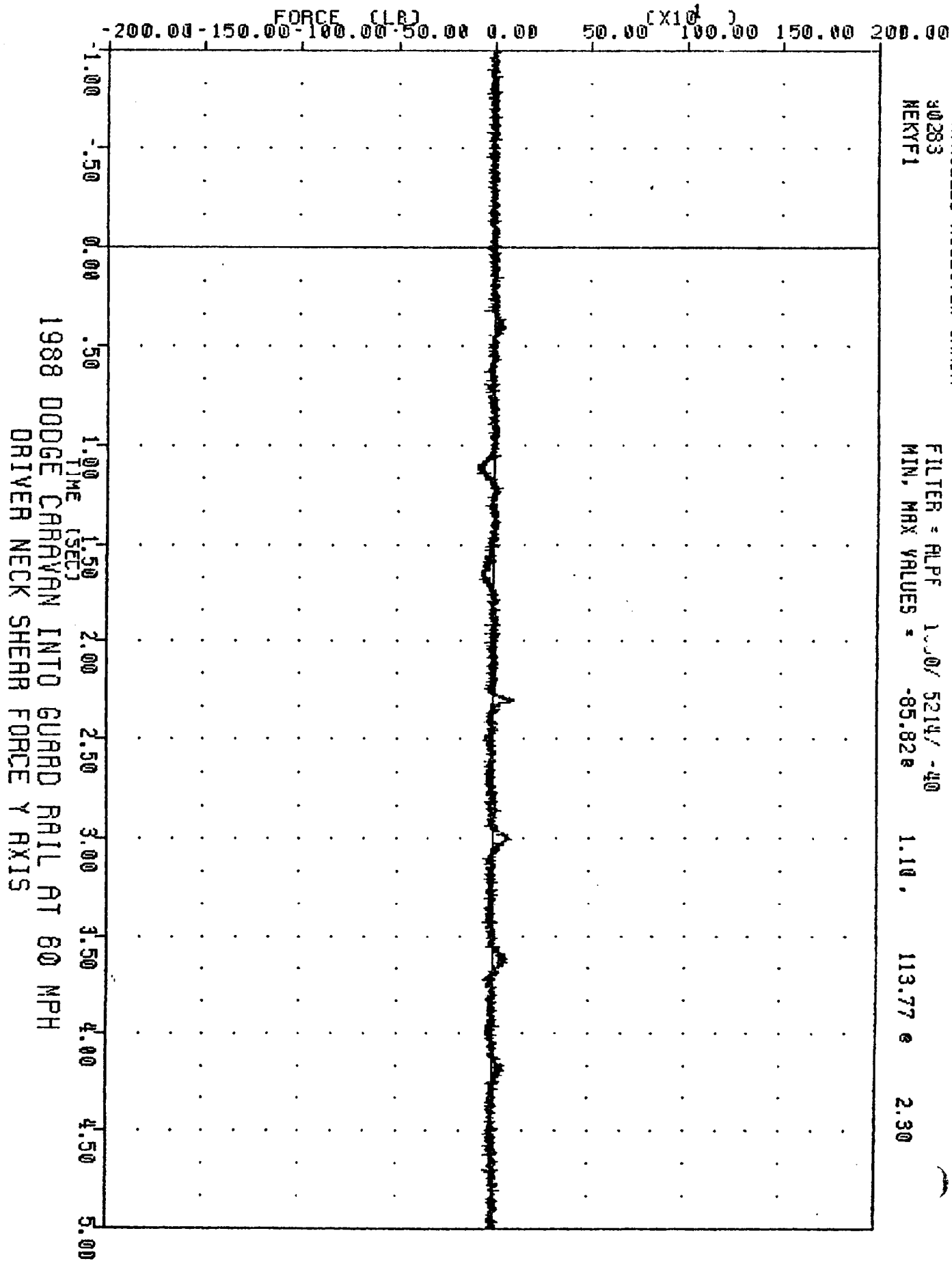
82.44

2.31



INFLATED ROLLOVER CRASH
30283
MEKF1

FILTER = ALPF 1.00/ 5214/ -40
MIN, MAX VALUES = -85.82e 1.10 , 113.77 e 2.30



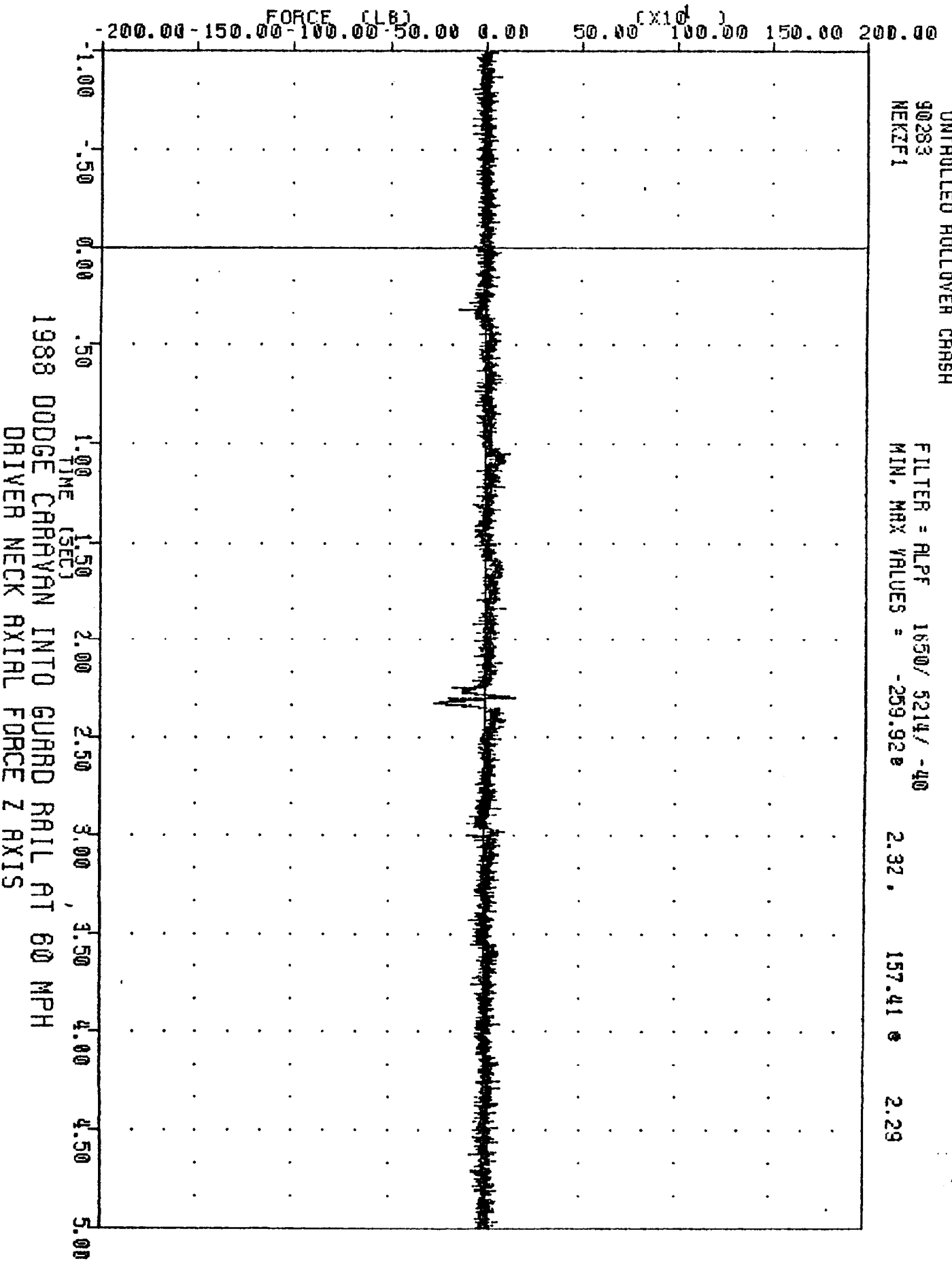
CONTROLLED ROLLOVER CRASH
90283
NEZF1

FILTER = RLPF 1650/ 5214/ -40
MIN, MAX VALUES = -259.92 e

2.32 .

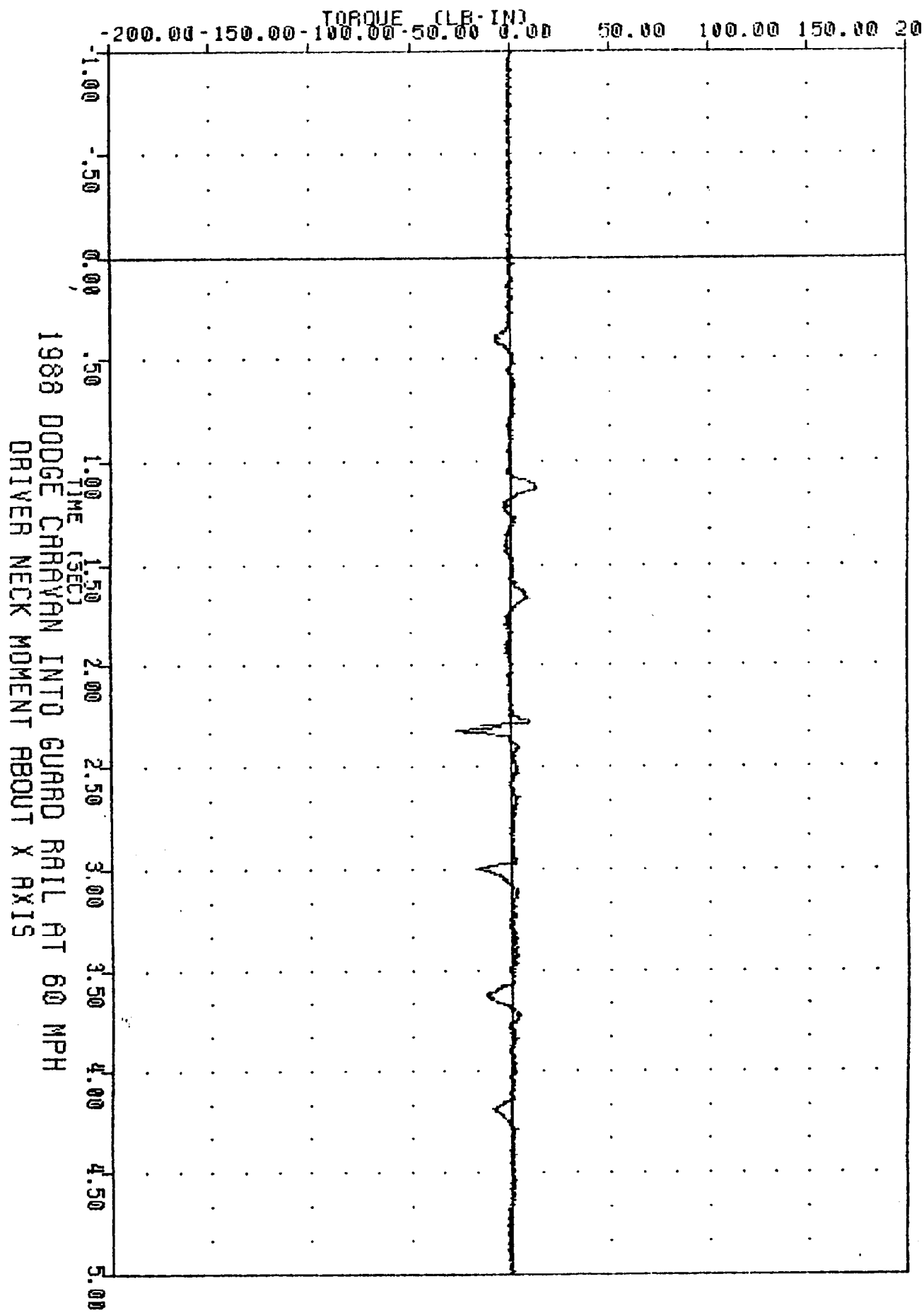
157.41 e

2.29



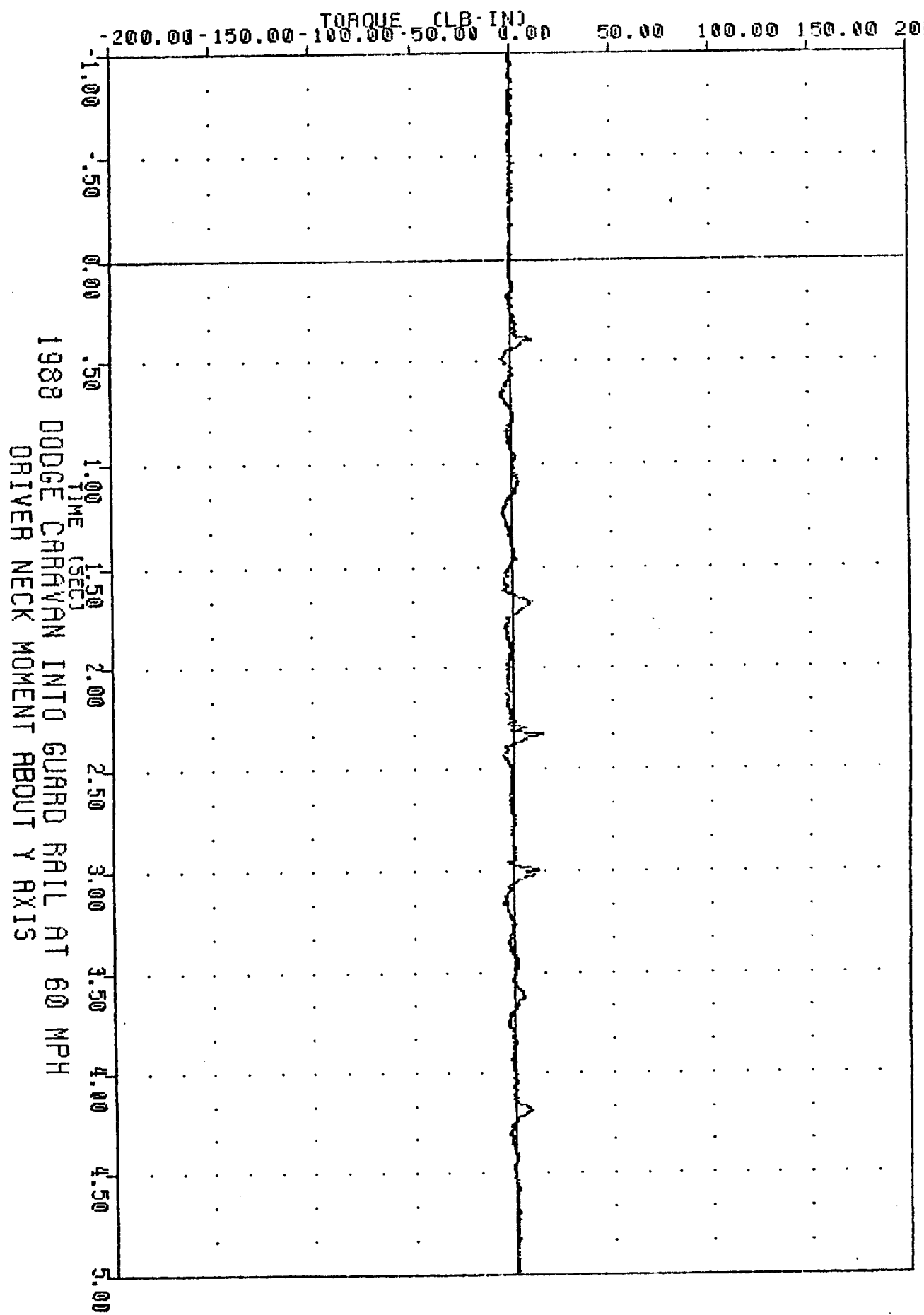
INTRADLED ROLLOVER CRASH
30283
HEKX01

FILTER = BLPF 40/ 250/ -16
MIN, MAX VALUES = -26.88 2.32 13.44 1.12



CONTROLLED ROLLOVER CRASH
 30283
 HEKYM1

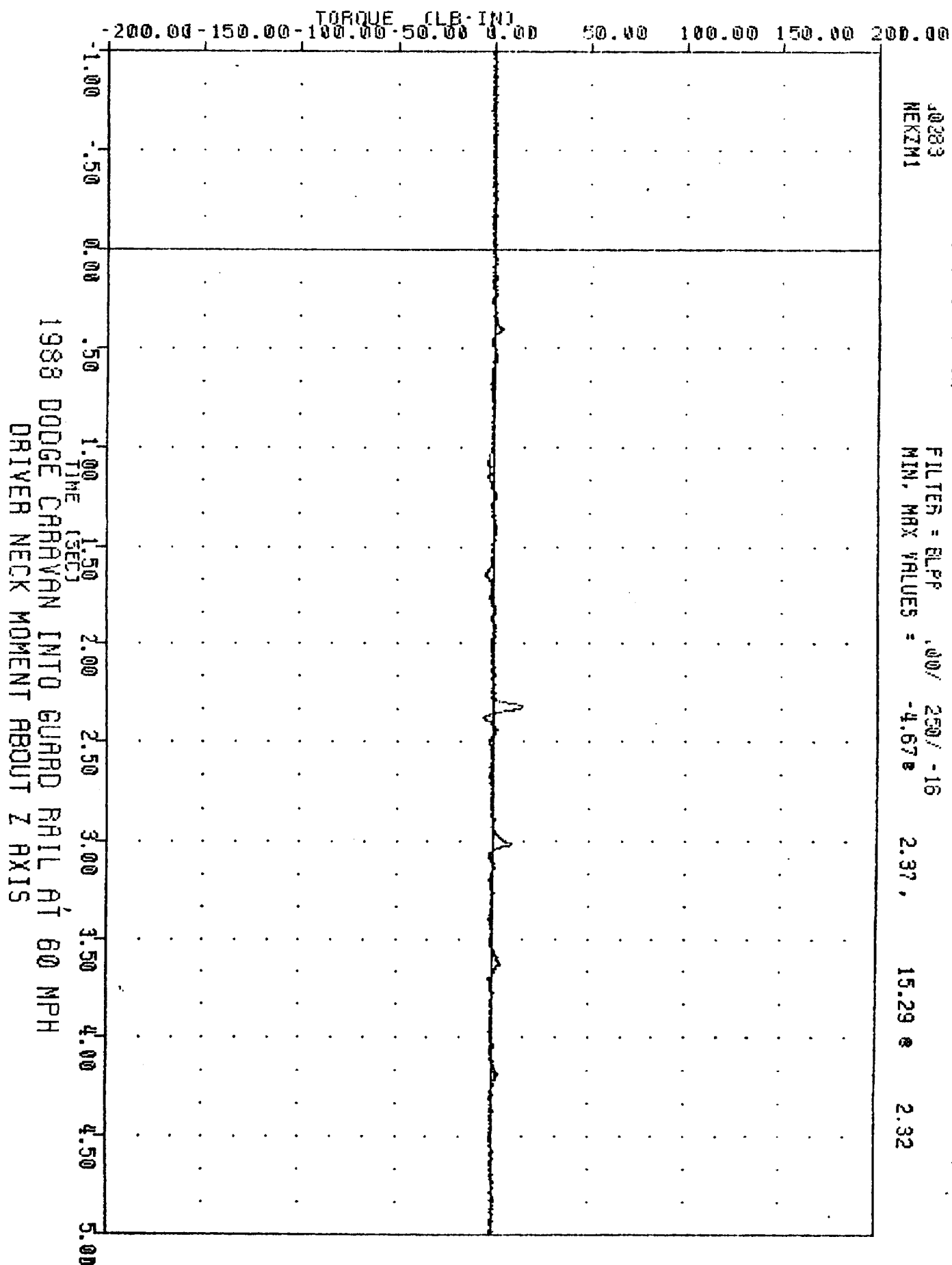
FILTER = BLPP
 MIN, MAX VALUES =
 .40 / 250 / -16
 -5.35 e
 2.43 , 14.87 e 2.33



1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
 DRIVER NECK MOMENT ABOUT Y AXIS

UNHOLDED HOLLANDER CMHSH
J0283
NEKZM1

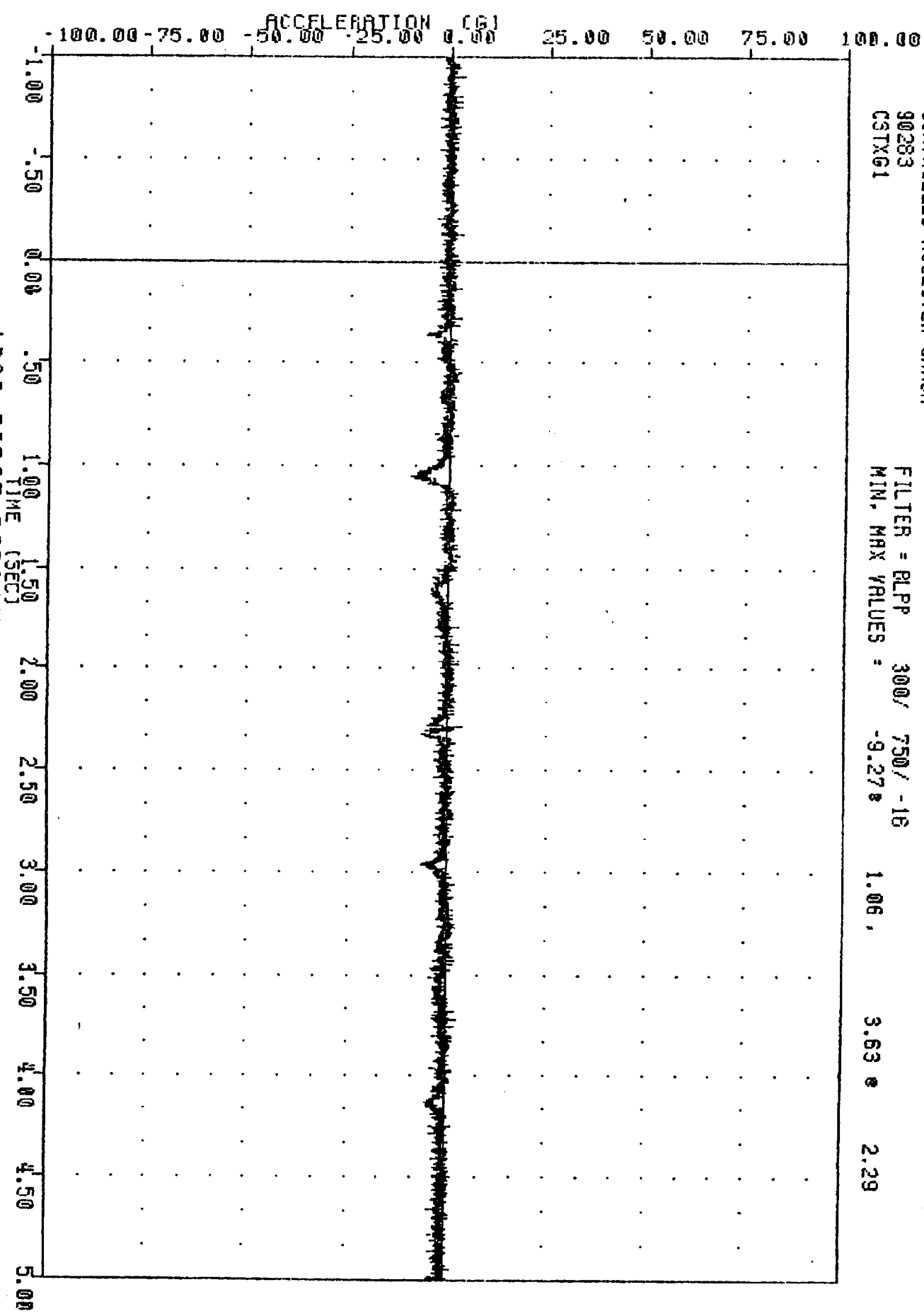
FILTER = BLPF .00/ 250/ -16
MIN, MAX VALUES = -4.67 e 2.37 , 15.29 e 2.32



CONTROLLED ROLLOVER CRASH

90283
CSTX61

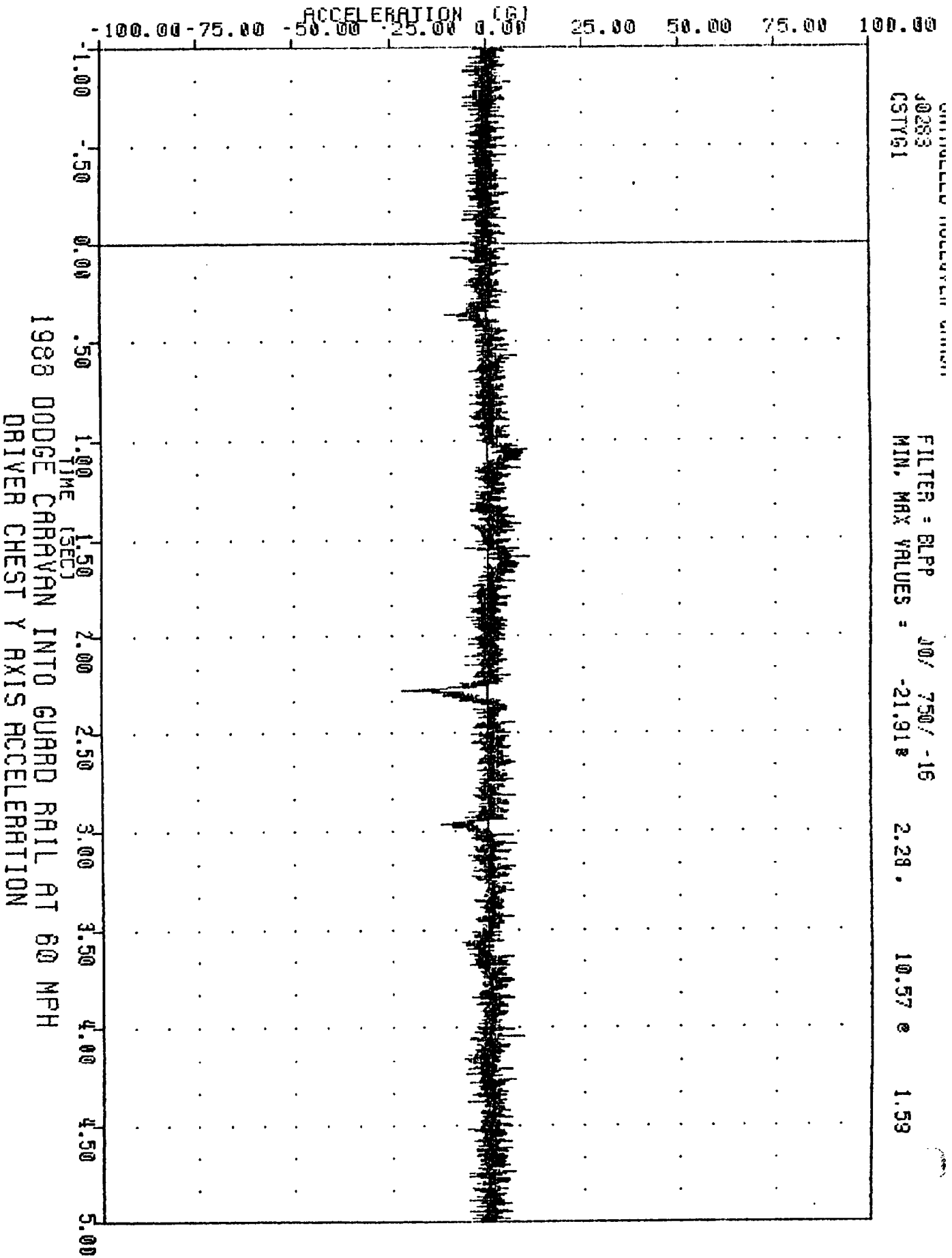
FILTER = RLPP 300/ 750/ -16
MIN, MAX VALUES = -9.27 1.06 3.63 2.29



1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
DRIVER CHEST X AXIS ACCELERATION

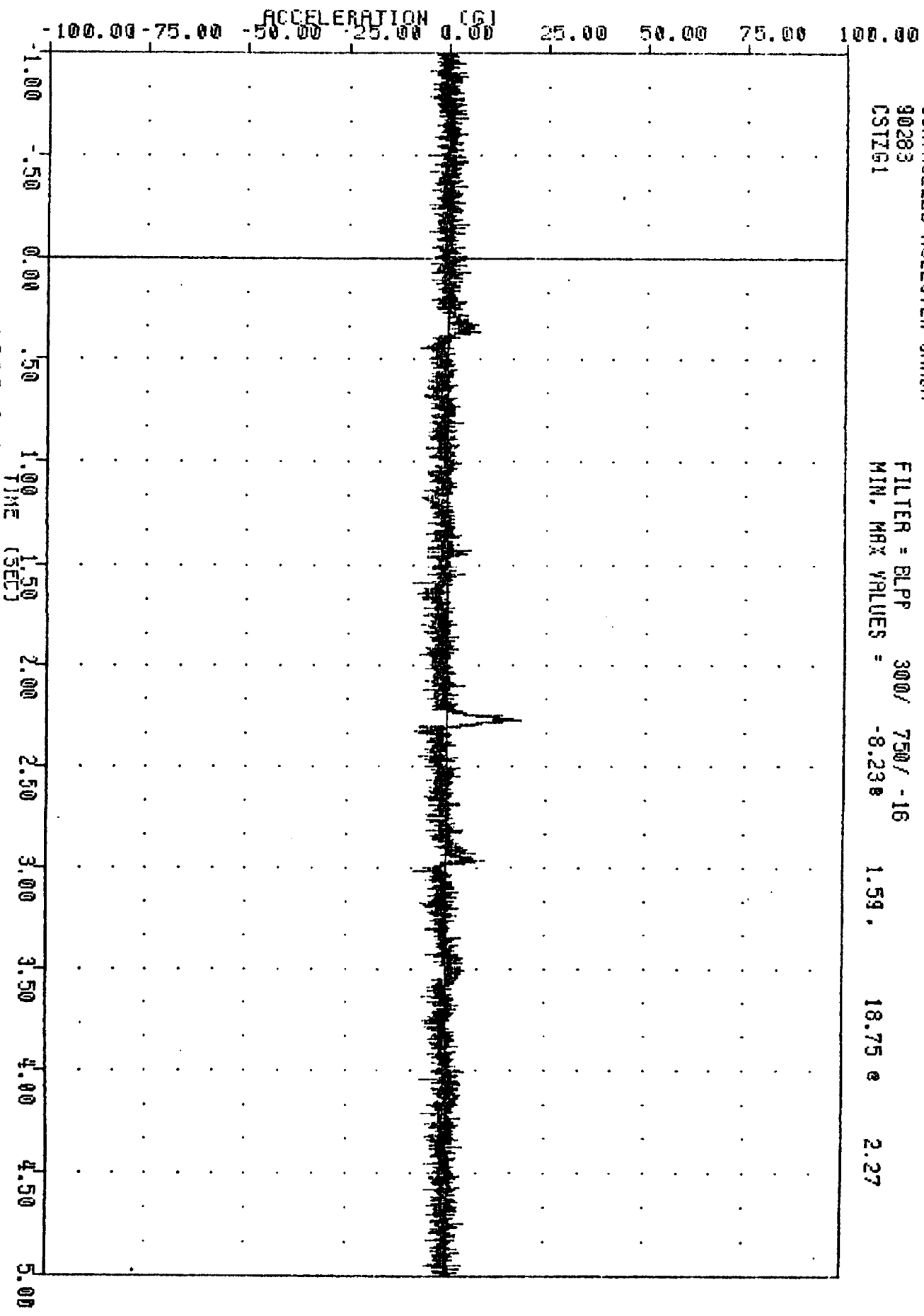
UNIMULED HOLETESTER VEHICLE
J0283
CSTY61

FILTER = BLPP J0/ 750/ -16
MIN, MAX VALUES = -21.91g 2.28g 10.57g 1.59g



CONTROLLED ROLLOVER CRASH
90283
CS1ZG1

FILTER = BLPF 300/ 750/ -16
MIN, MAX VALUES = -8.23e 1.59, 18.75 e 2.27



1988 DODGE CARRIVAN INTO GUARD RAIL AT 60 MPH
DRIVER CHEST Z AXIS ACCELERATION

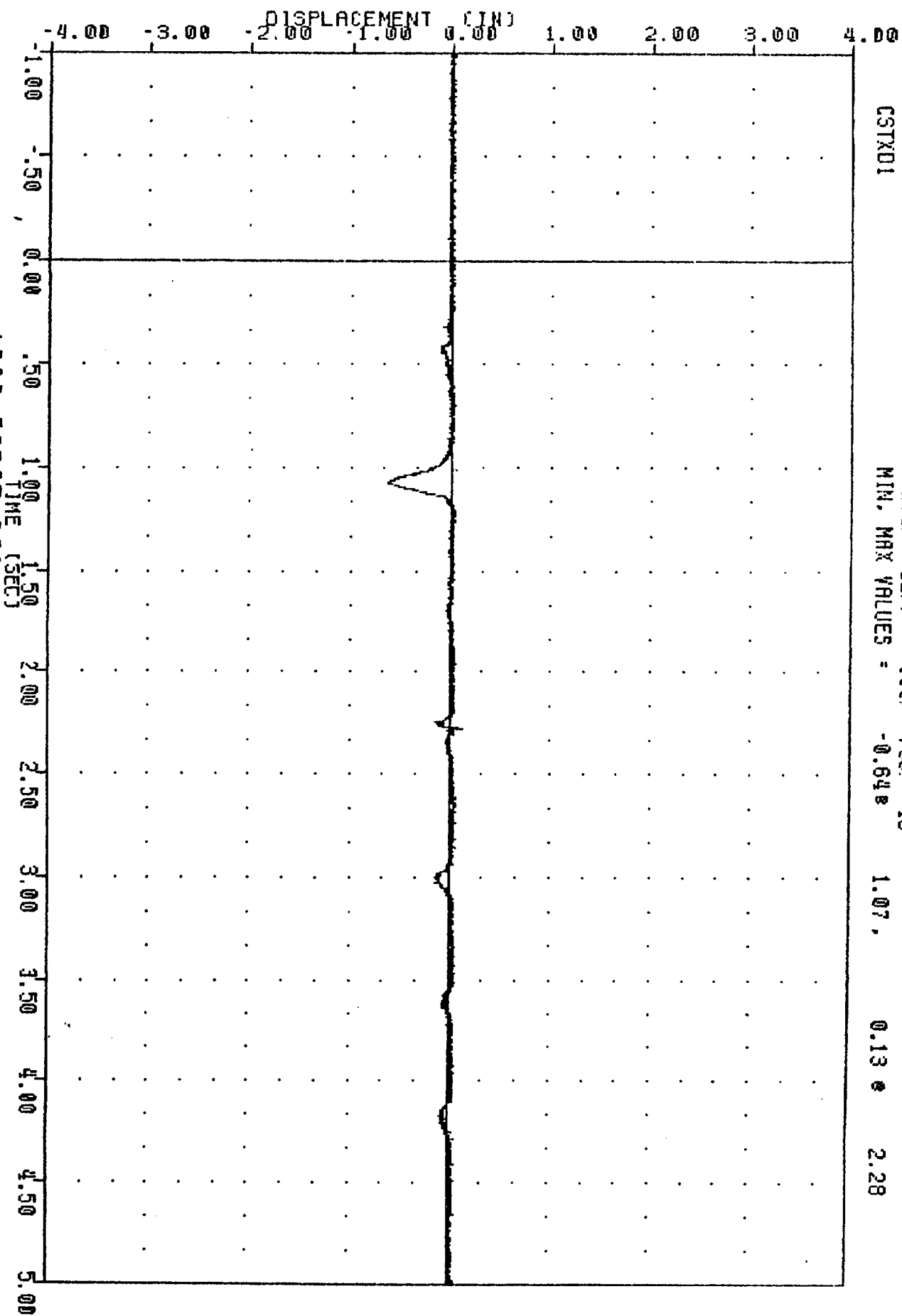
CONTROLLED ROLLOVER CRASH
90283
CSTXD1

FILTER = BLP 300 / 750 / -16
MIN. MAX VALUES = -0.64 e

1.07,

0.13 e

2.28



1988 DODGE CHRYSLER INTO GUARD RAIL AT 60 MPH
DRIVER CHEST X AXIS DISPLACEMENT

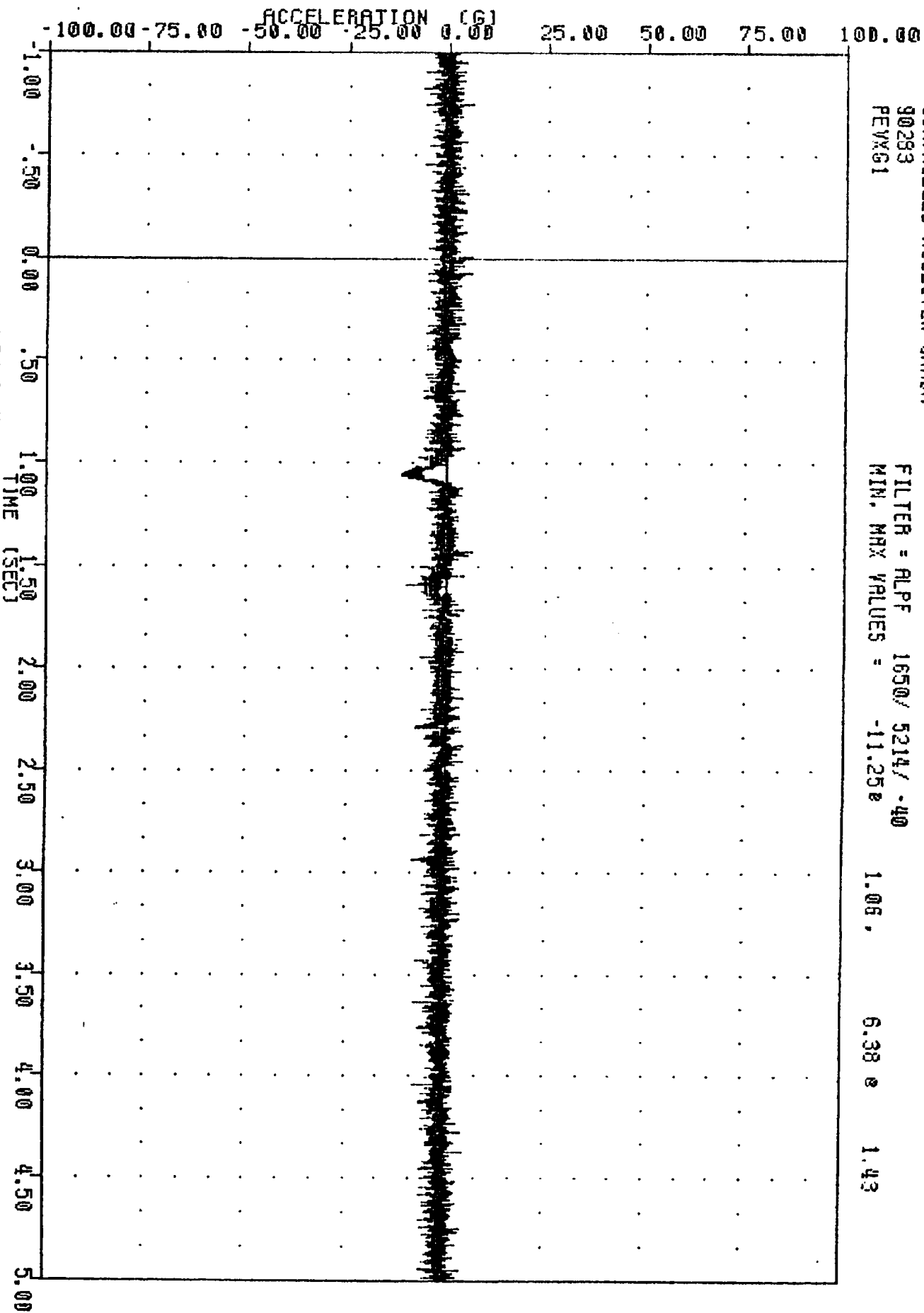
CONTROLLED ROLLOVER CRASH
90283
PEVX61

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -11.25e

1.06,

6.38 e

1.43



1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
DRIVER PELVIS X AXIS ACCELERATION

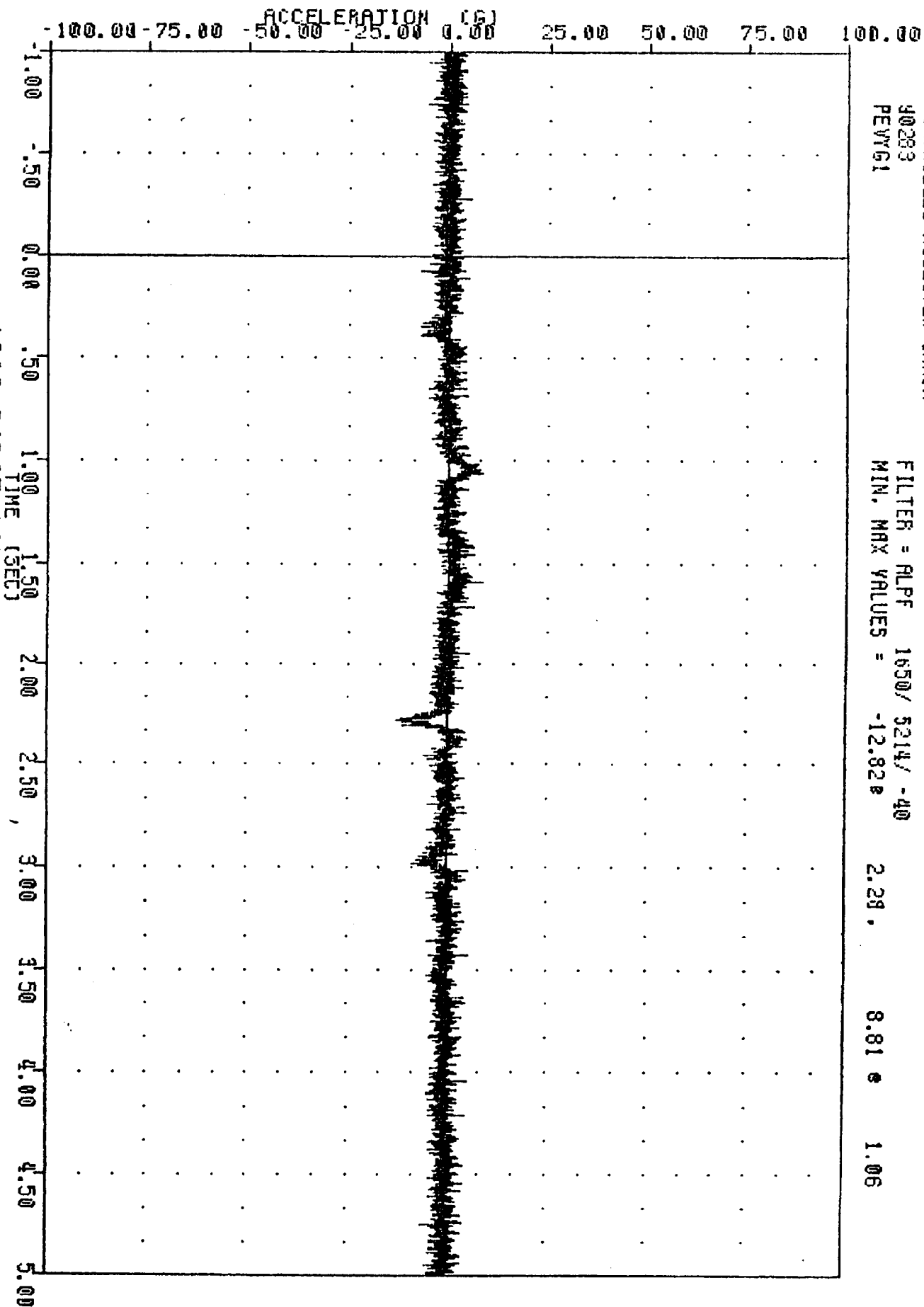
CONTROLLED ROLLOVER CRASH
J0283
PEV61

FILTER = RLPF 1650/ 5214/ -40
MIN. MAX VALUES = -12.82g

2.28

8.81 g

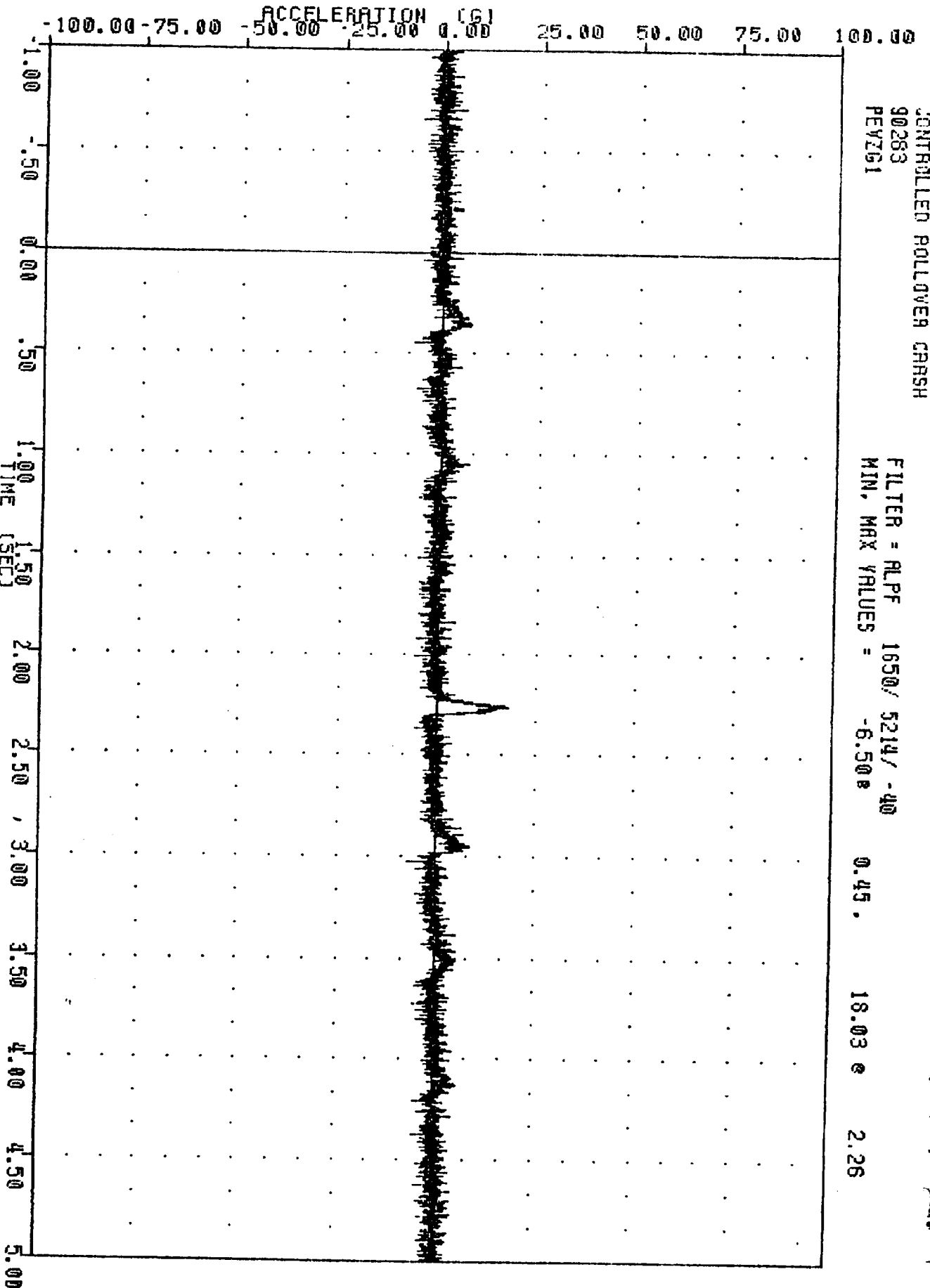
1.06



CONTROLLED ROLLOVER CRASH
90283
PEVZG1

FILTER = RLPF 1650/ 5214/ -40
MIN, MAX VALUES = -6.508

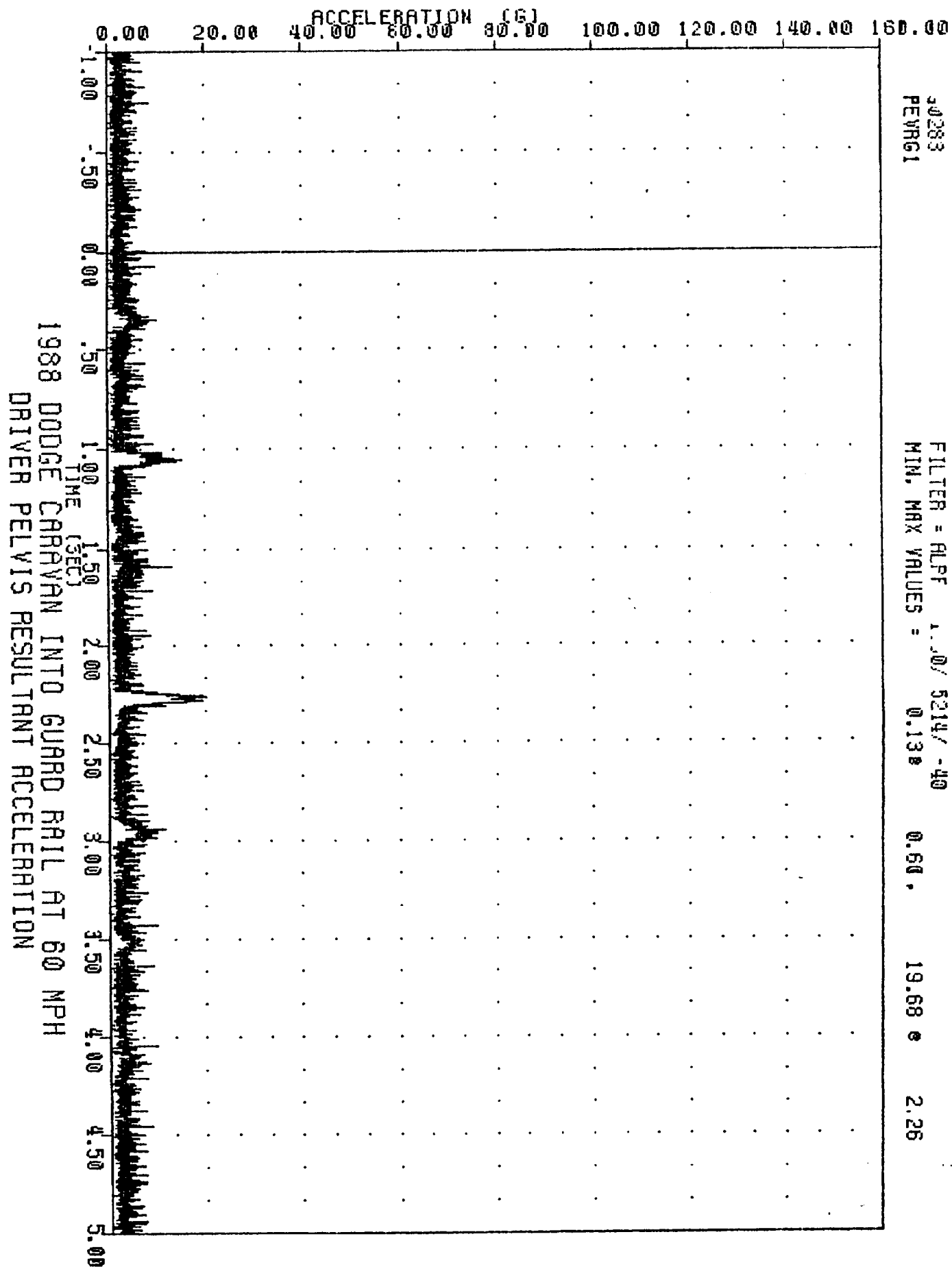
0.45 . 18.03 e 2.26



1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
DRIVER PELVIS Z AXIS ACCELERATION

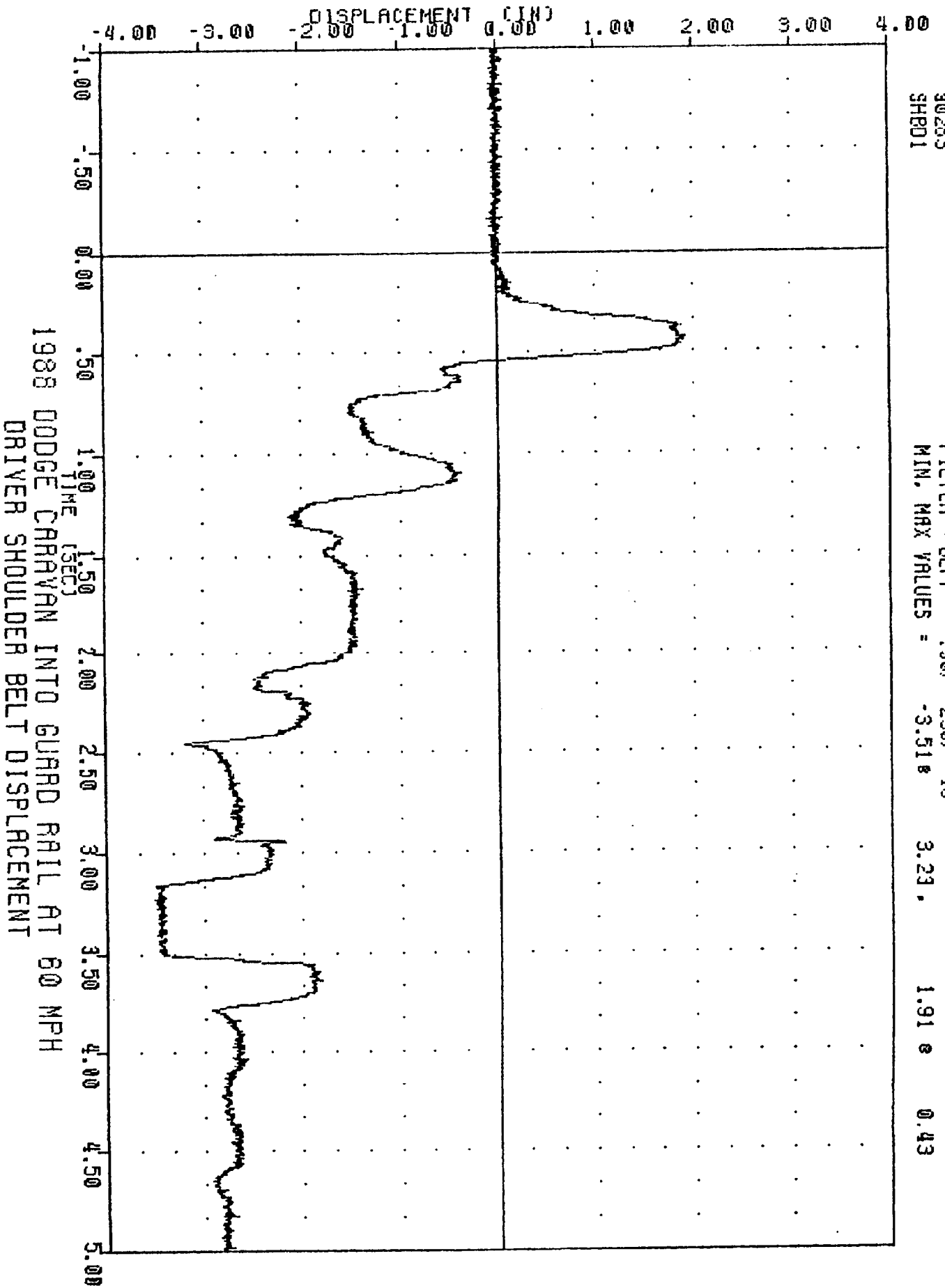
IN HULLED HULLYVEN LHMSP
J0283
PEVRG1

FILTER = ALPF 1.00/ 5214/-40
MIN. MAX VALUES = 0.13 0.60 19.68 2.26



MITROLLED ROLLOVER CMHSH
30283
SHBD1

FILTER = BLPP .00/ 250/ -16
MIN, MAX VALUES = -3.51 3.23 1.91 0.43



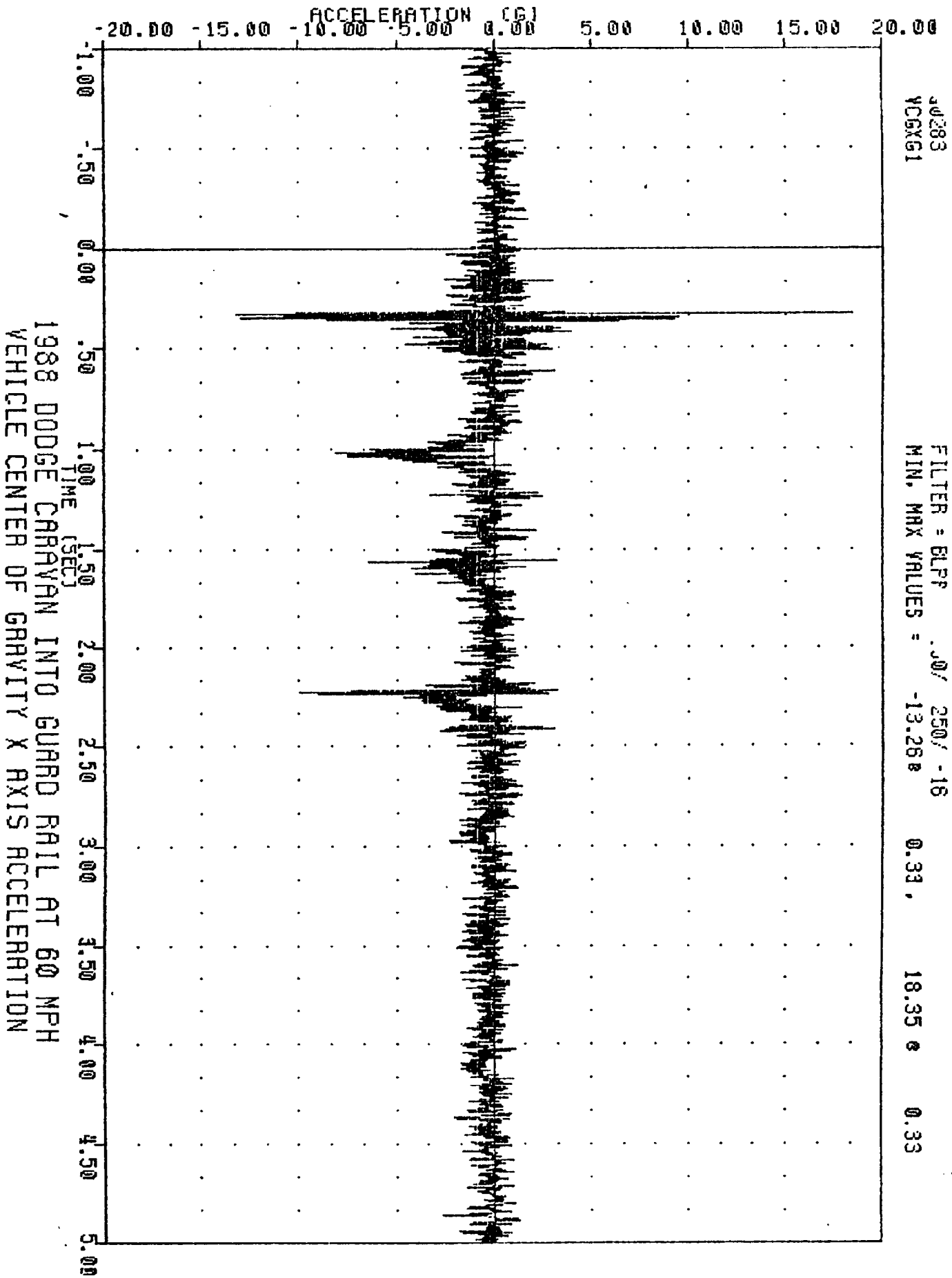
MINIMUMS MAXIMUMS
J0283
VCGXG1

FILTER = BLPF .30/ 250/ -16
MIN. MAX VALUES = -13.26 8

0.33 ,

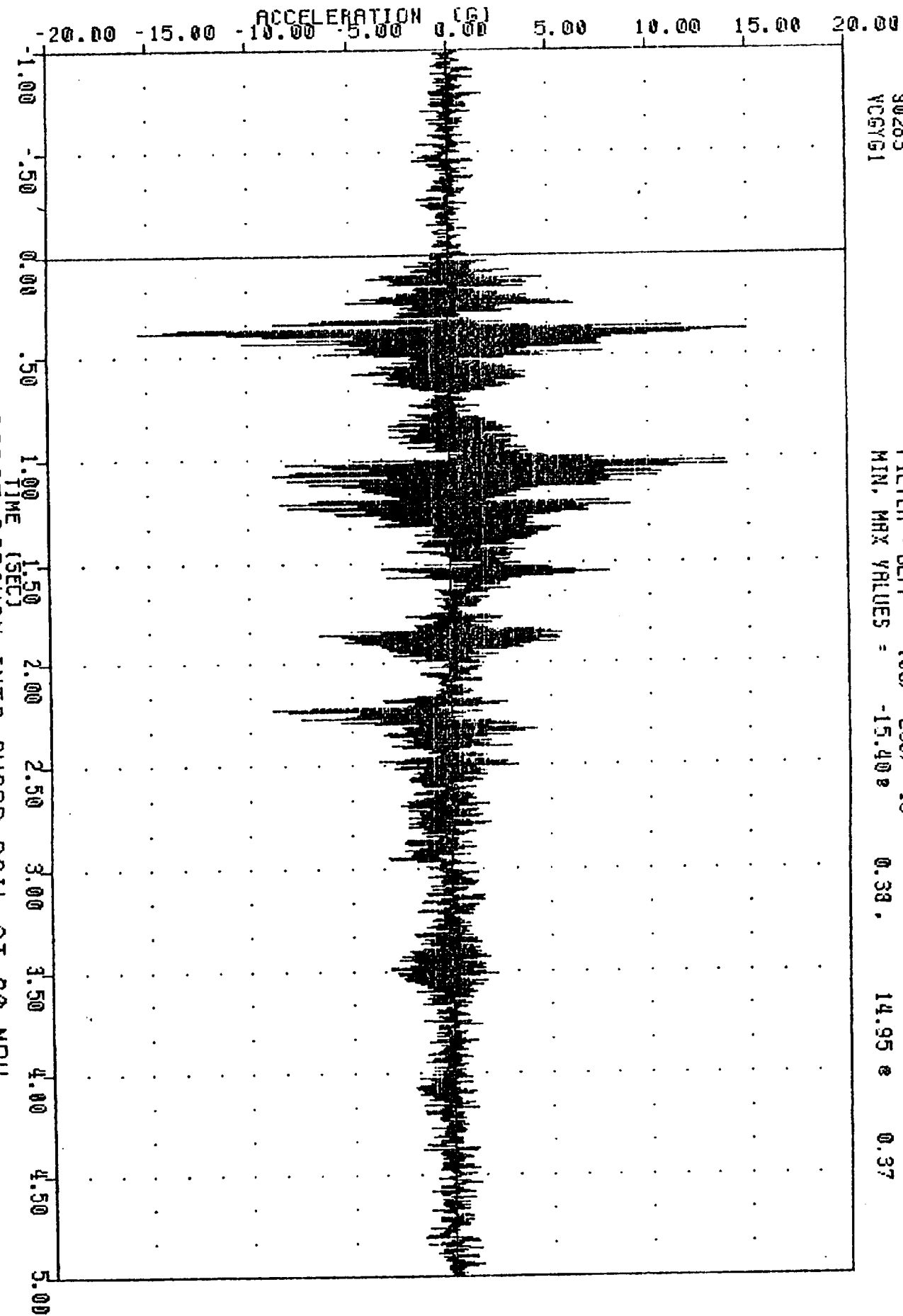
18.35 8

0.33



CONTROLLED ROLLOVER CRASH
90283
VCGY61

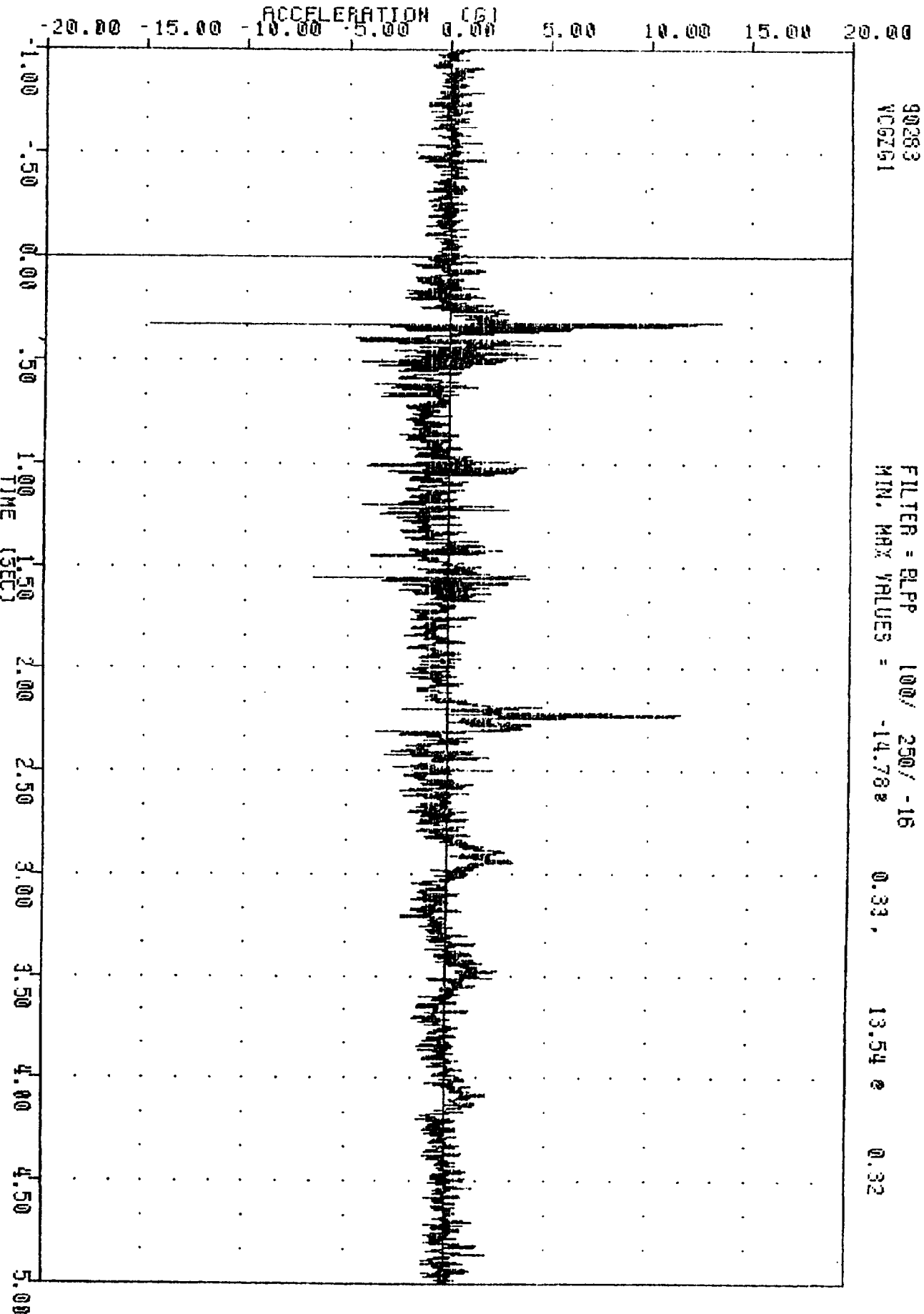
FILTER = BLPF 100/ 250/ -16
MIN, MAX VALUES = -15.40 0.38 14.95 0.37



101 TSP 91101
CONTROLLED ROLLOVER CRASH
90283
WCGZ61

FILTER = BLP 100/ 250/ -16
MIN. MAX VALUES = -14.78 0.33

0.33 13.54 0.32

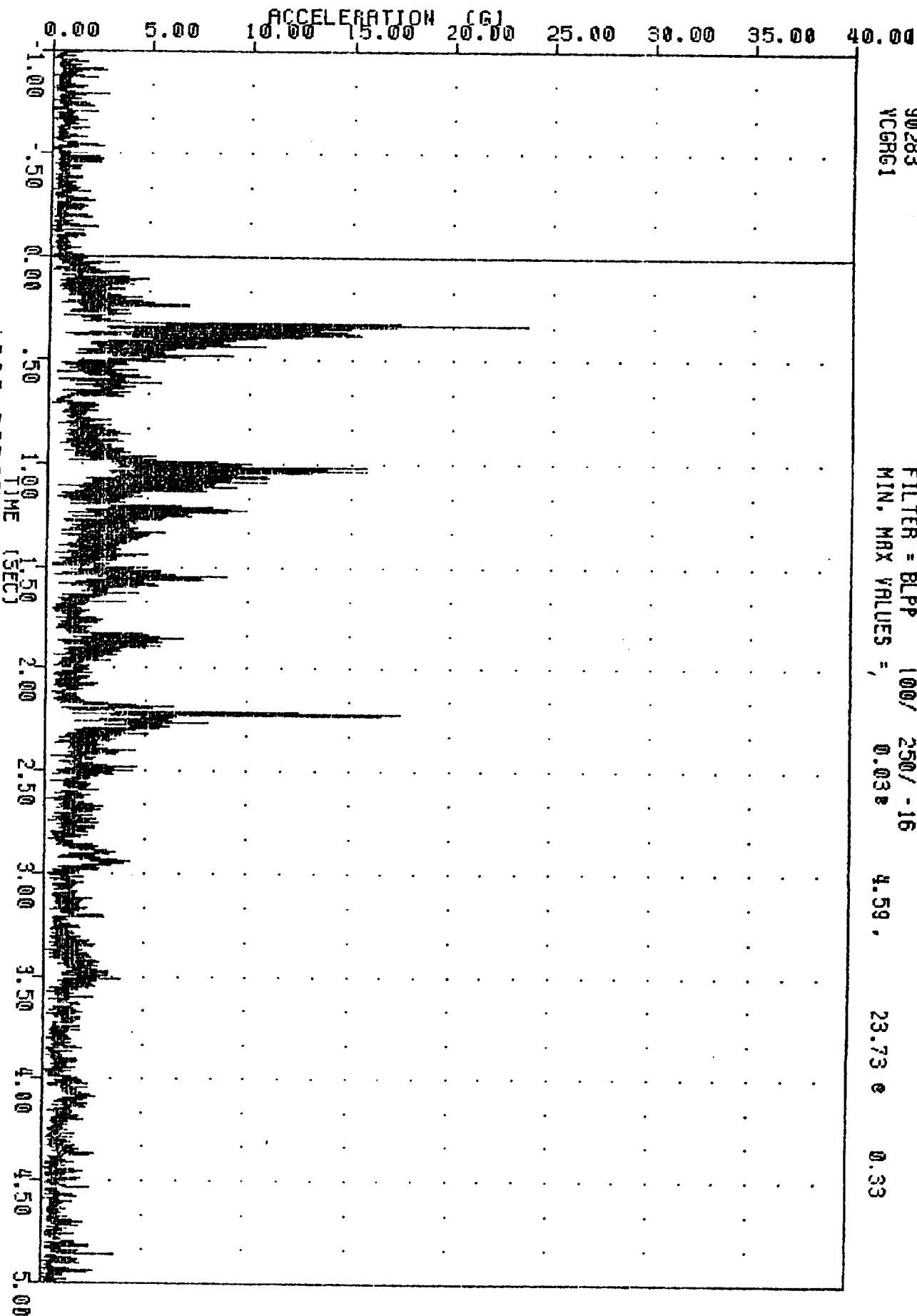


1983 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
VEHICLE CENTER OF GRAVITY Z AXIS ACCELERATION

CONTROLLED ROLLOVER CRASH
90283
VCGRG1

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = 0.03 4.59

23.73 0.33

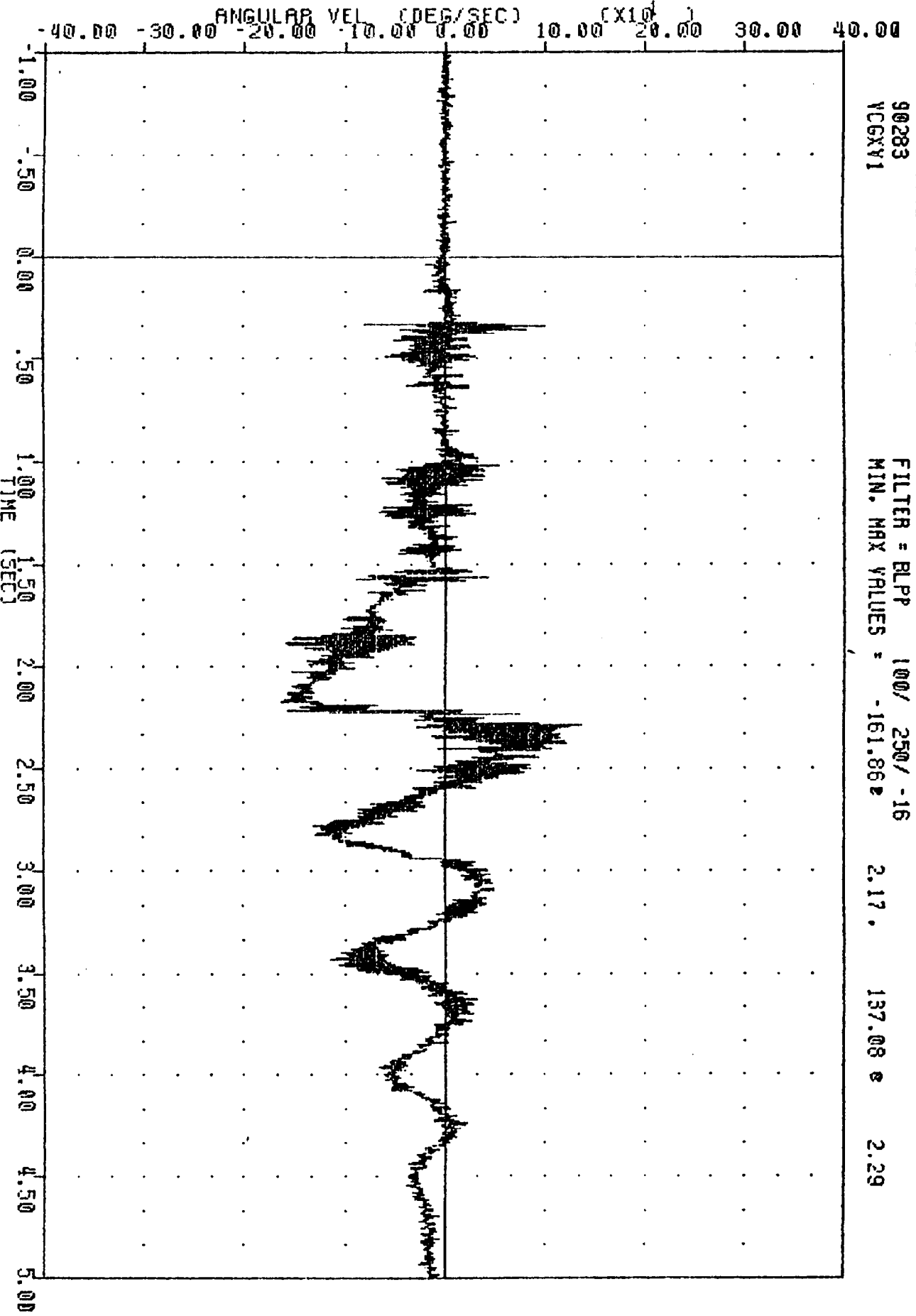


1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
VEHICLE CENTER OF GRAVITY RESULTANT ACCELERATION

CONTROLLED ROLLOVER CRASH
90283
VCGXV1

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -161.86 2.17

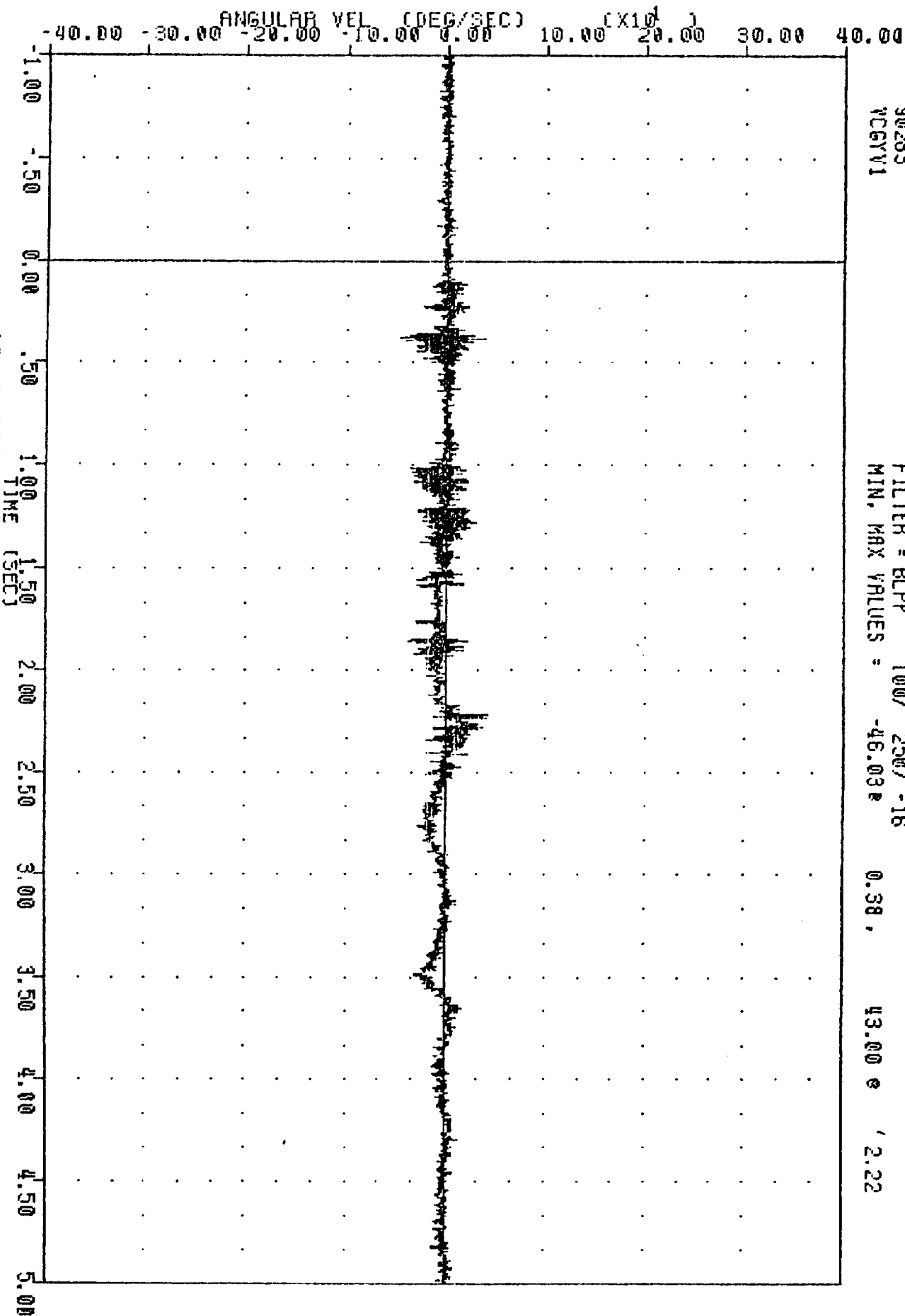
2.17 137.08 2.29



1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
VEHICLE ROLL RATE

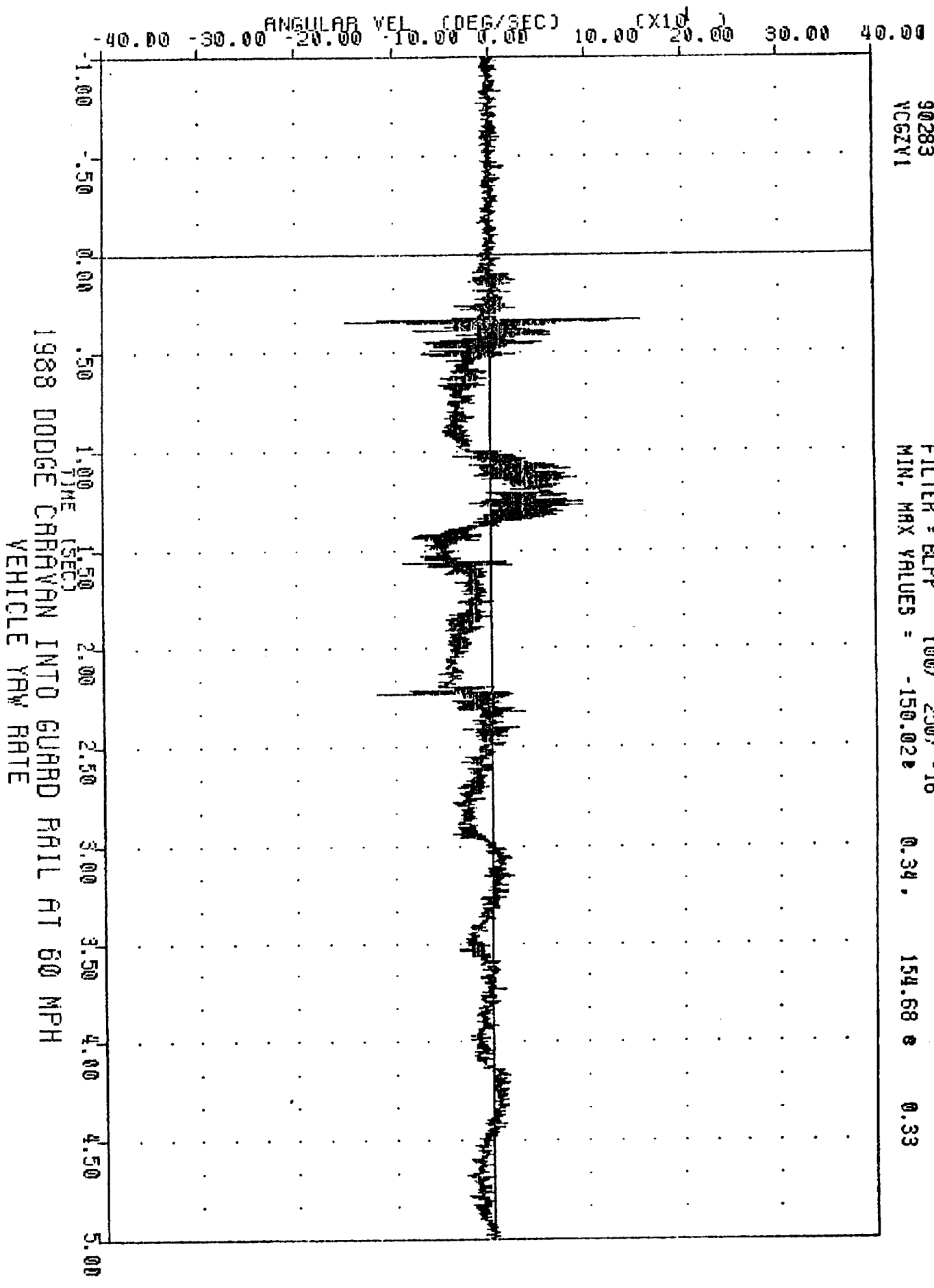
OUTPOST, 3010
CONTROLLED ROLLOVER CRASH
90283
WCEYV1

FILTER = BLP 100/ 250/ -16
MIN, MAX VALUES = -46.03 e 0.38 , 43.00 e 2.22



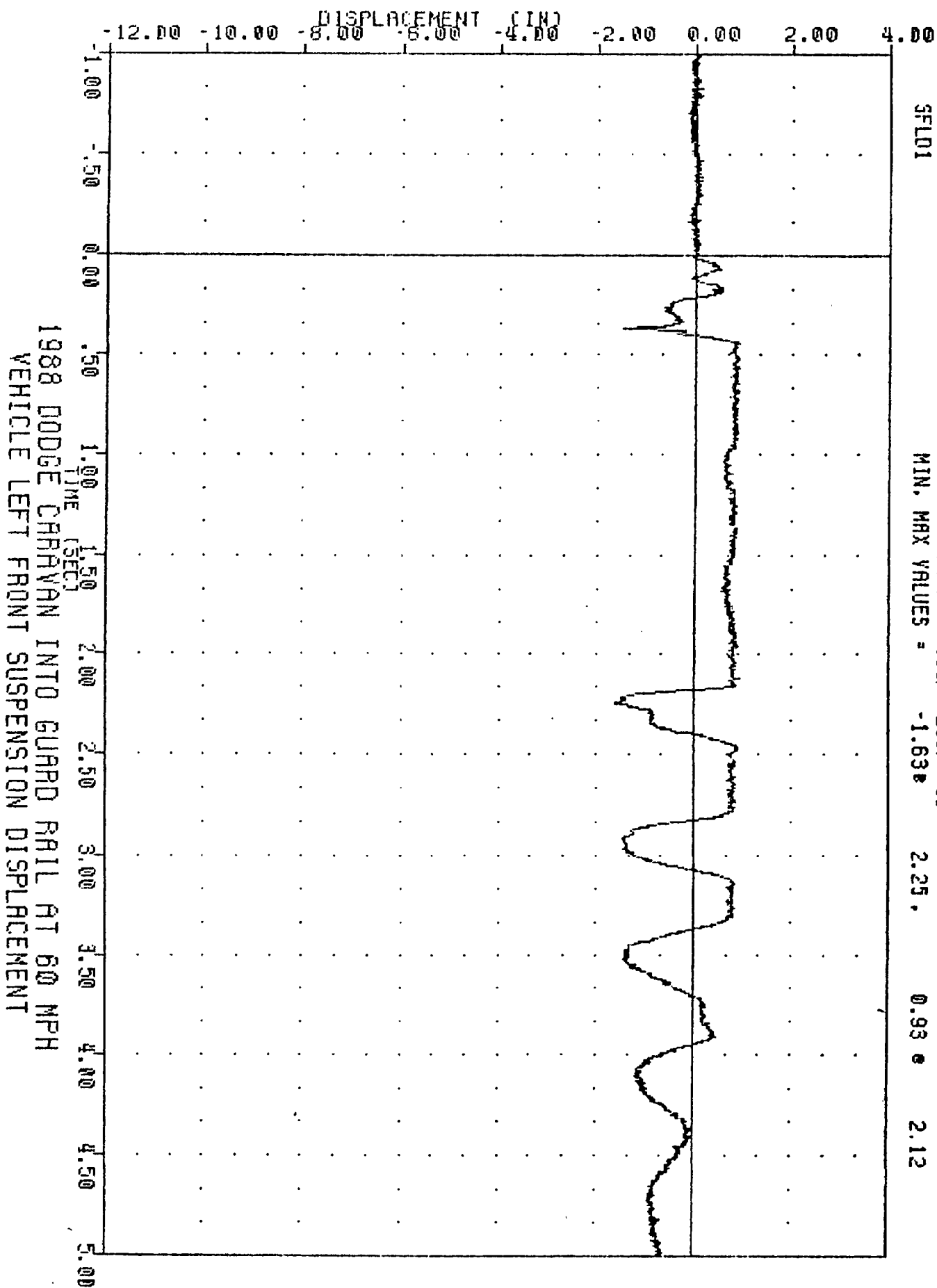
C. ROLLED ROLLOVER CRASH
90283
VCGZY1

FILTER = ELP 100/ 250/ -16
MIN, MAX VALUES = -150.02 0.34 154.68 0.33



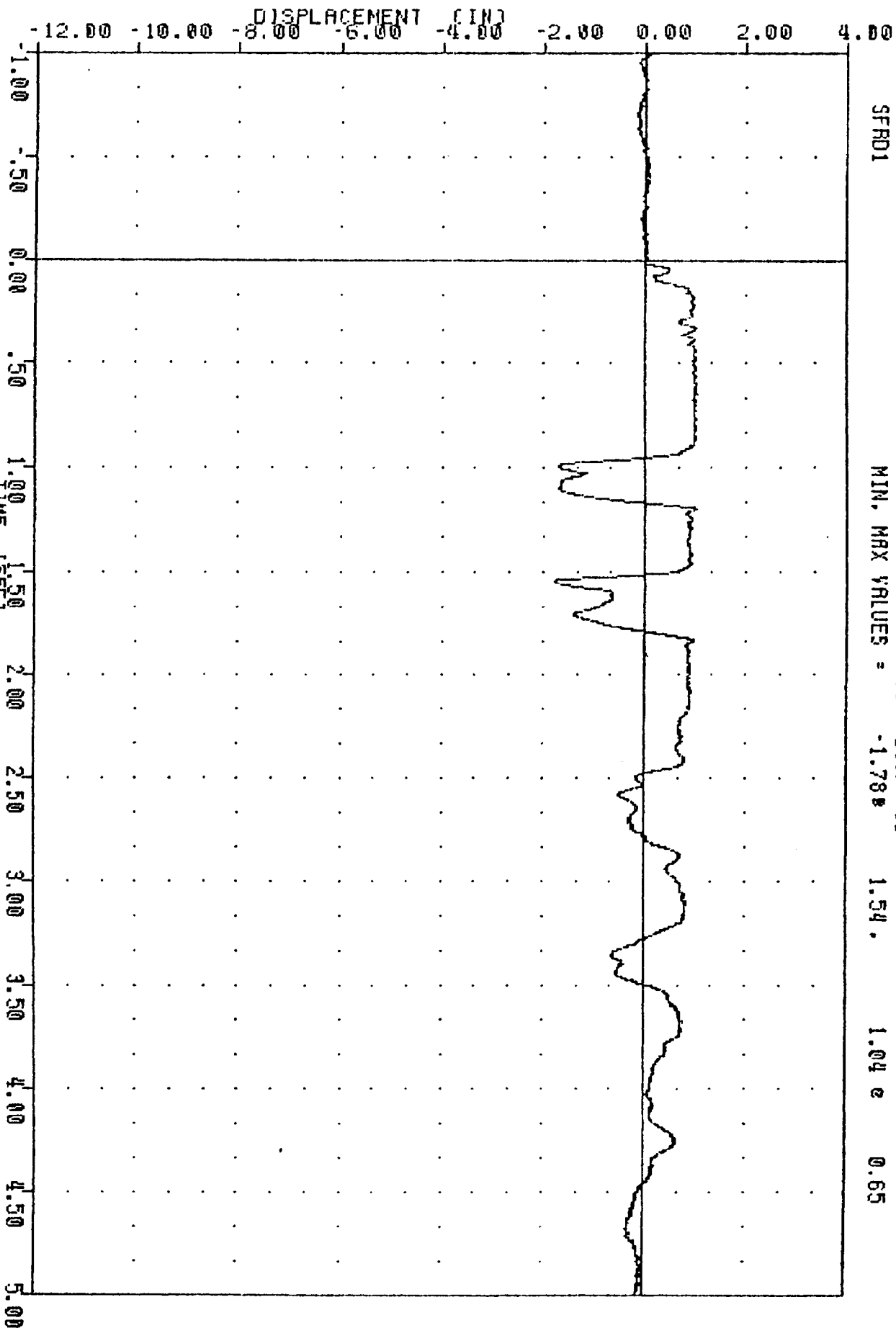
TROLLED ROLLOVER CRASH
9W283
5FLD1

FILTER = BLPP 1W0/ 250/-16
MIN. MAX VALUES = -1.63e 2.25, 0.93e 2.12



DOT NHTSA, SA1010
 CONTROLLED ROLLOVER CRASH
 30283
 SFRD1

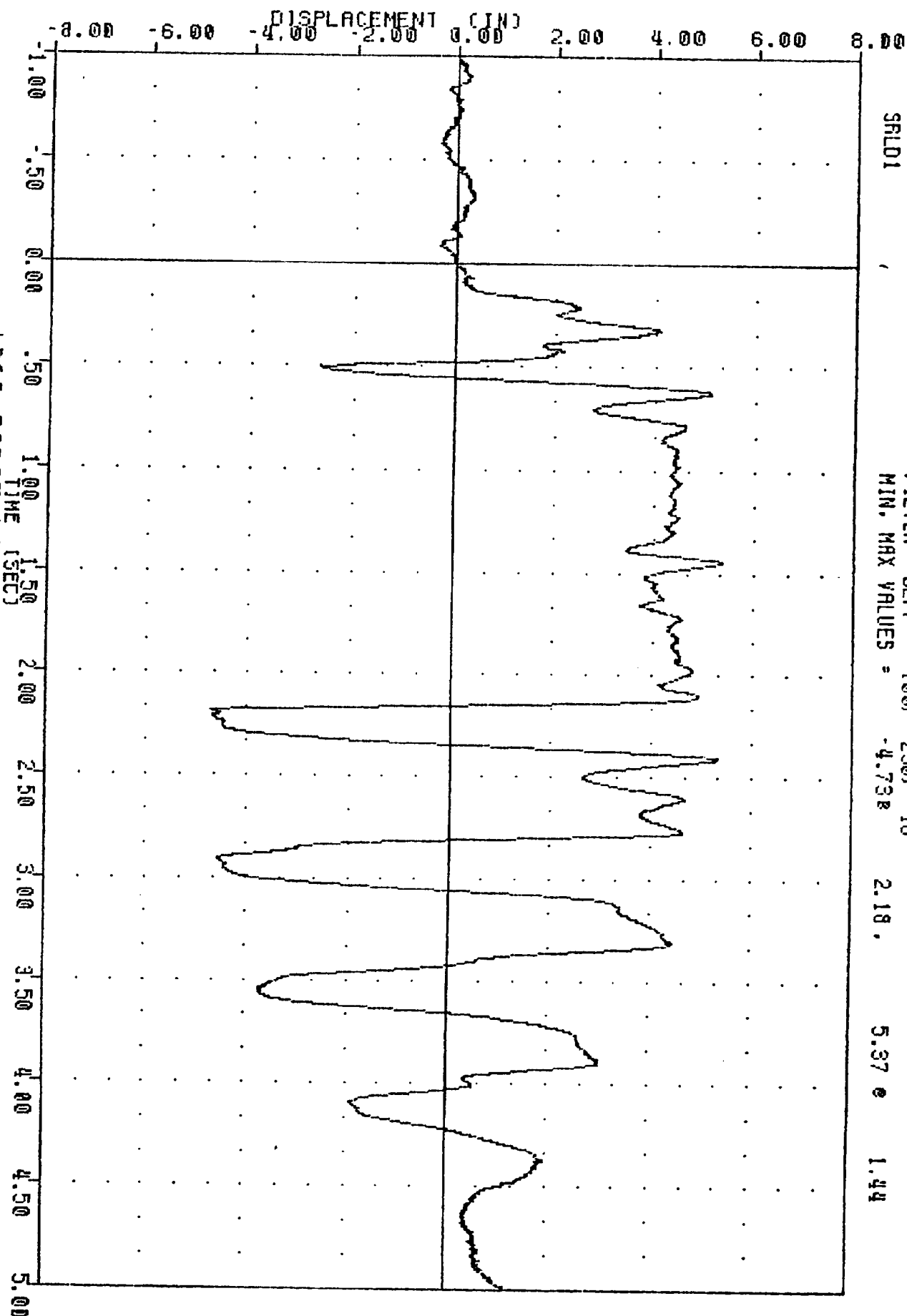
FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -1.78 1.54, 1.04 e 0.65



1988 DODGE CARRAVAN INTO GUARD RAIL AT 60 MPH
 VEHICLE RIGHT FRONT SUSPENSION DISPLACEMENT

NHTSA 901010
CONTROLLED ROLLOVER CRASH
90283
SRLO1

FILTER = BLFP 100/ 250/-16
MIN. MAX VALUES = -4.738 2.18 5.37 1.44

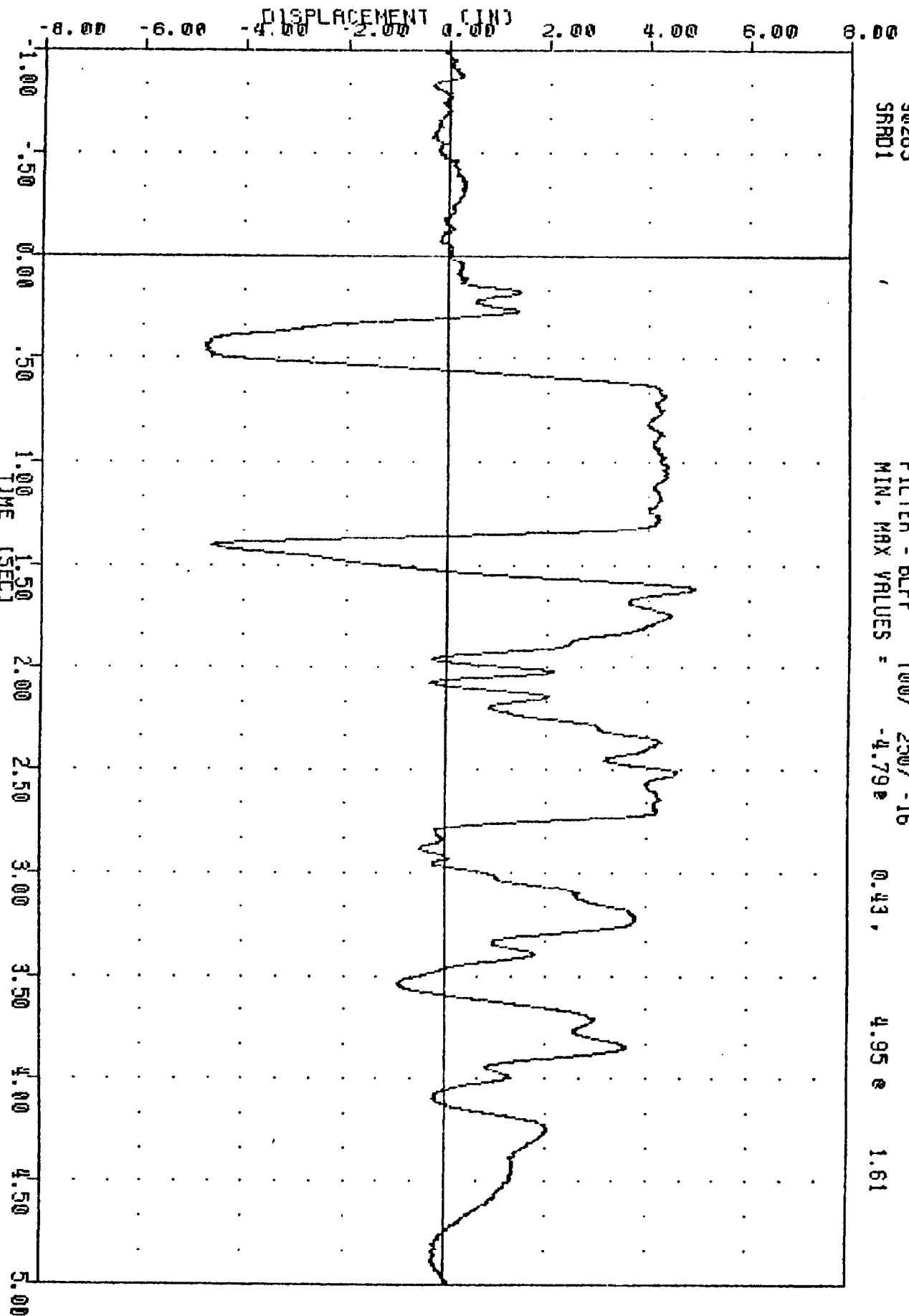


1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
VEHICLE LEFT REAR SUSPENSION DISPLACEMENT

U. INTSR 901010
CONTROLLED ROLLOVER CRASH
90283
SNRD1

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -4.79e

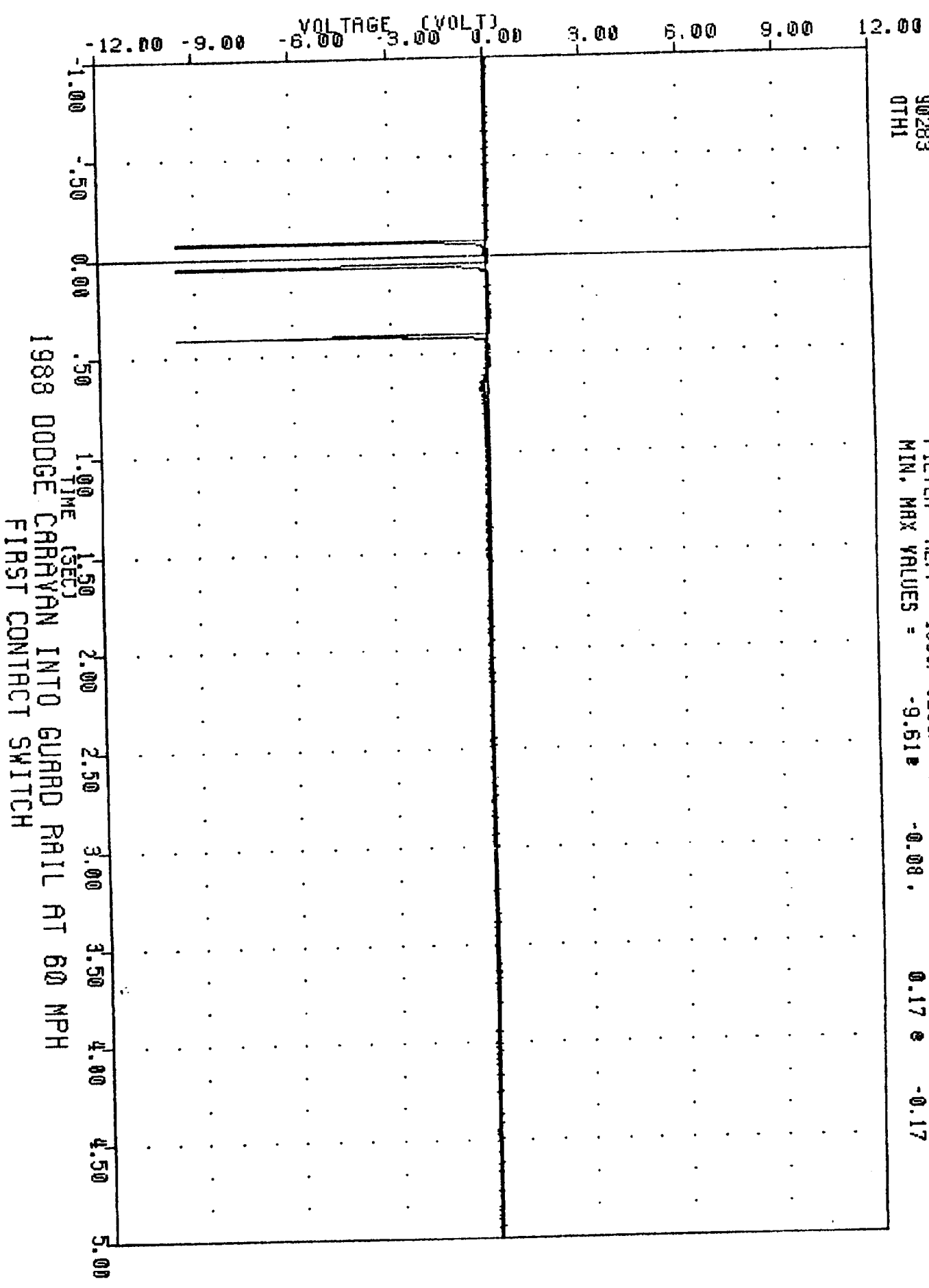
0.43, 4.95e 1.61



1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
VEHICLE RIGHT REAR SUSPENSION DISPLACEMENT

CONTROLLED ROLLOVER CRASH
90283
0TH1

FILTER = ALPF 1600/ 5214/ -40
MIN, MAX VALUES = -9.61e -0.08, 0.17 e -0.17



CONTROLLED ROLLOVER CRASH

30283

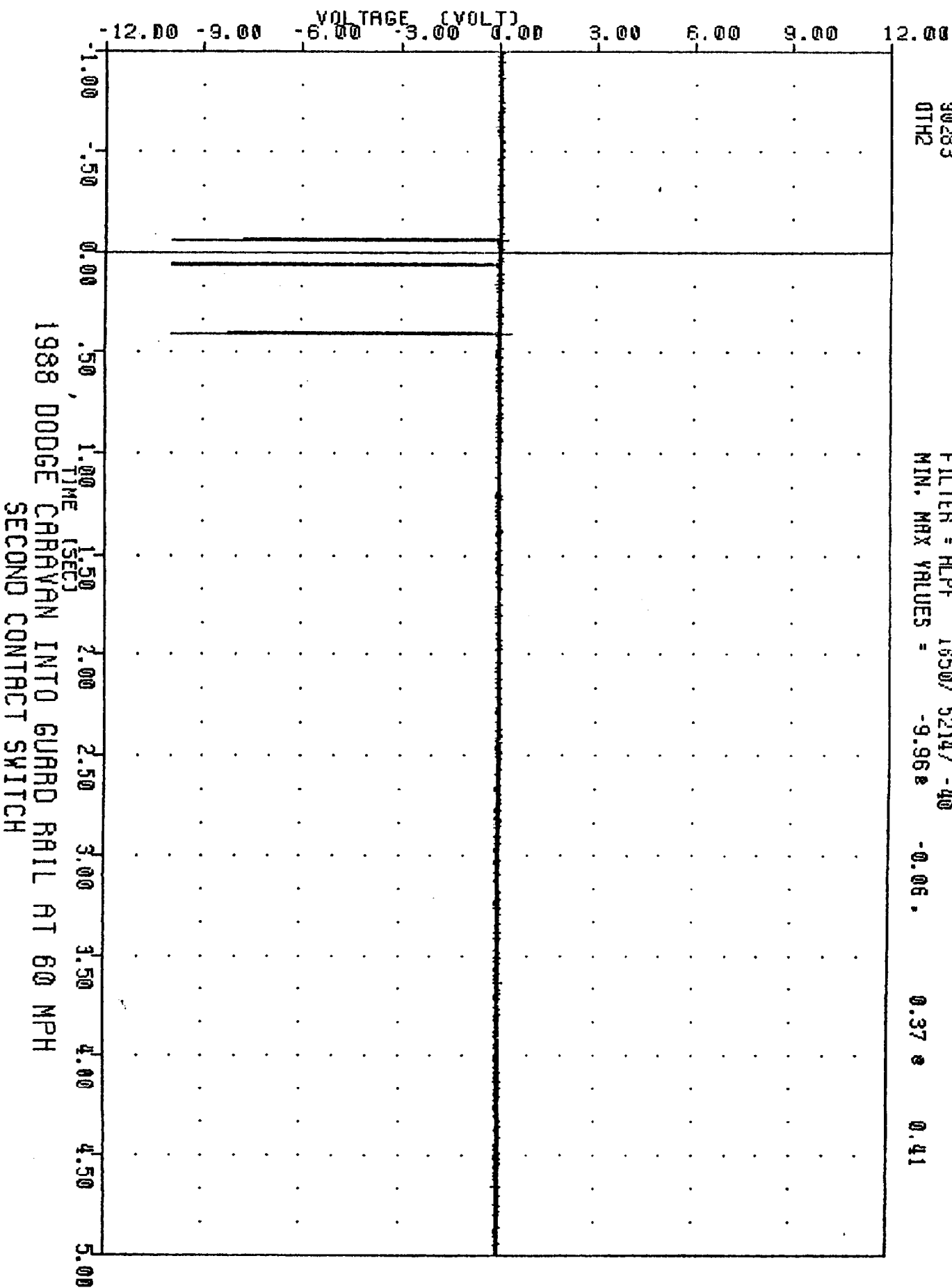
01H2

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -9.968

-0.06

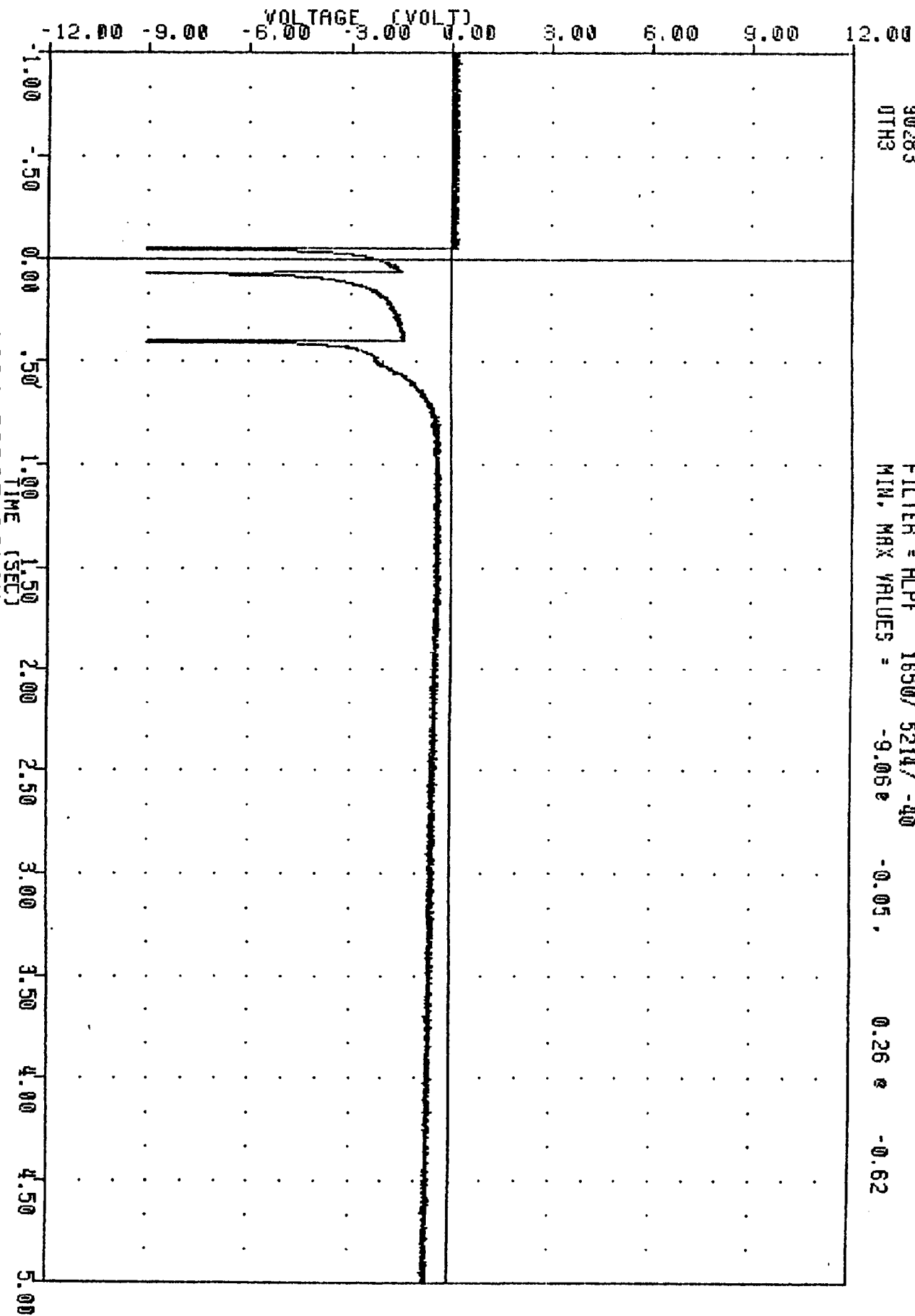
0.37

0.41



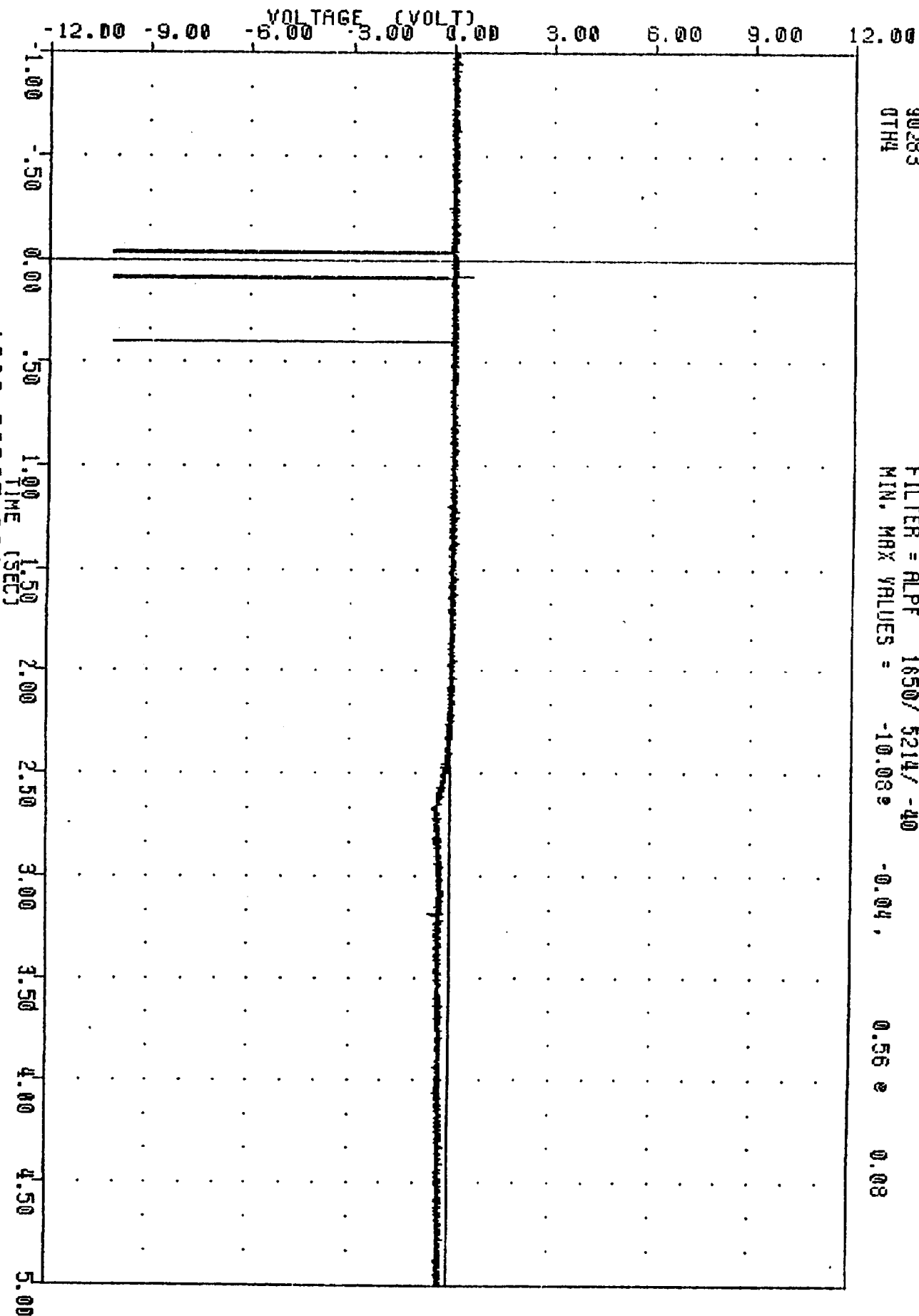
DT NHTR 901010
CONTROLLED ROLLOVER CRASH
90283
DTH3

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -9.06e -0.05, 0.26 e -0.62



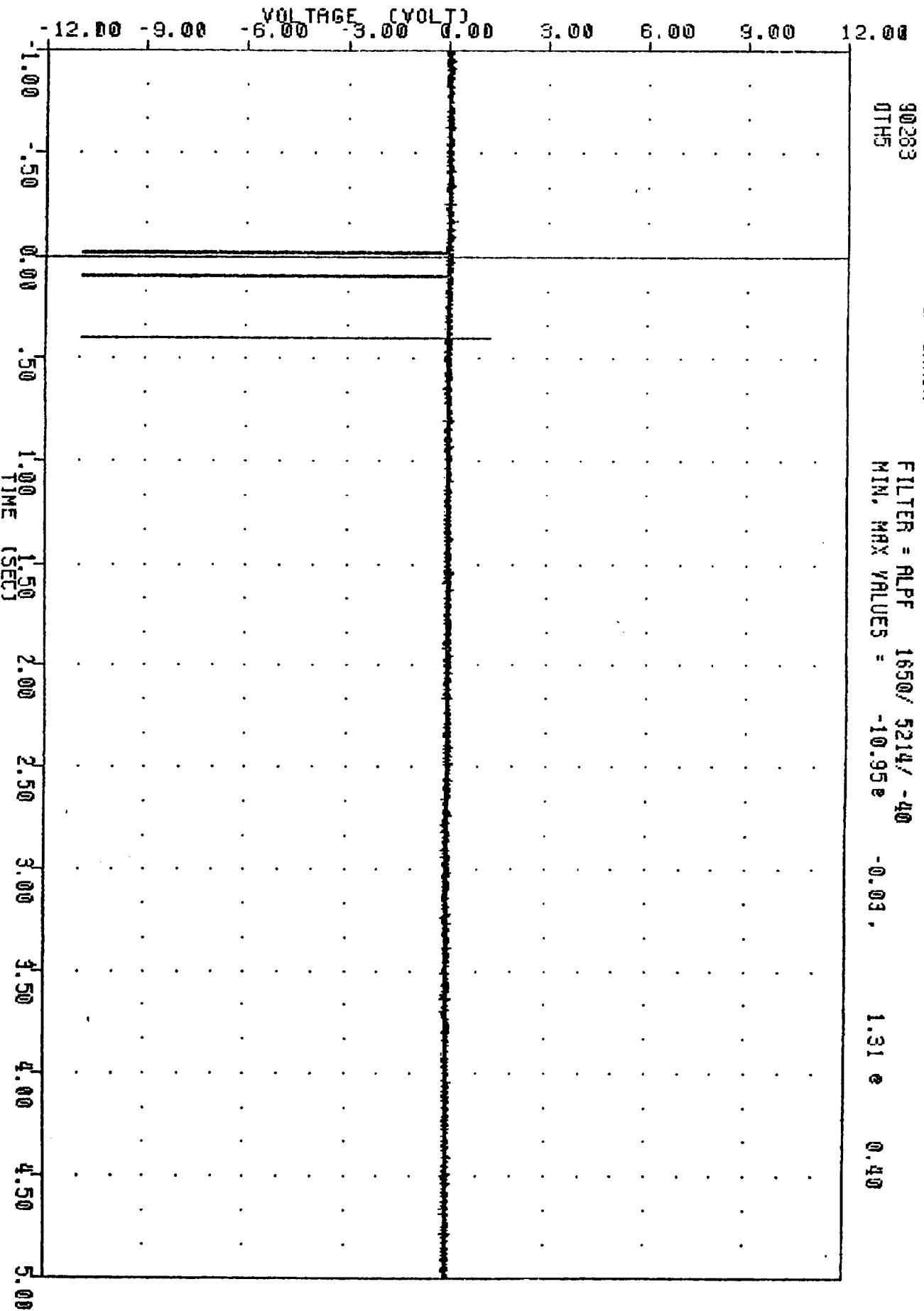
JI N113H 301010
CONTROLLED ROLLOVER CRASH
90283
0TH4

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -10.08 0.56 0.08



DT NHTSA 901010
CONTROLLED ROLLOVER CRASH
90283
DTH5

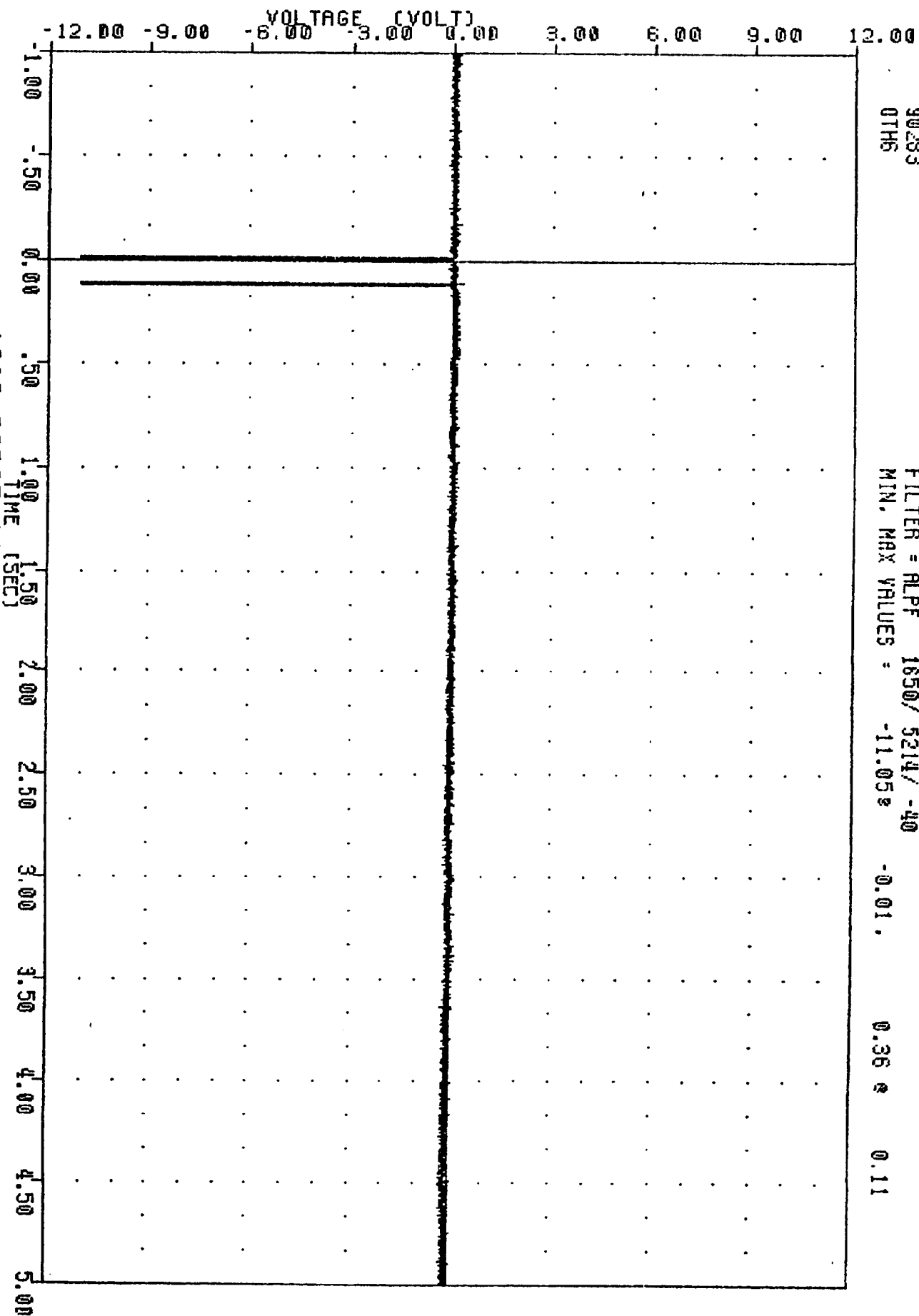
FILTER = RLPF 1650/ 5214/ -40
MIN. MAX VALUES = -10.95e -0.03, 1.31 e 0.40



1988 DODGE CARRAVAN INTO GUARD RAIL AT 60 MPH
FIFTH CONTACT SWITCH

DOT NHTSA 901010
CONTROLLED ROLLOVER CRASH
90283
0TH6

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -11.05 0.01 0.36 0.11

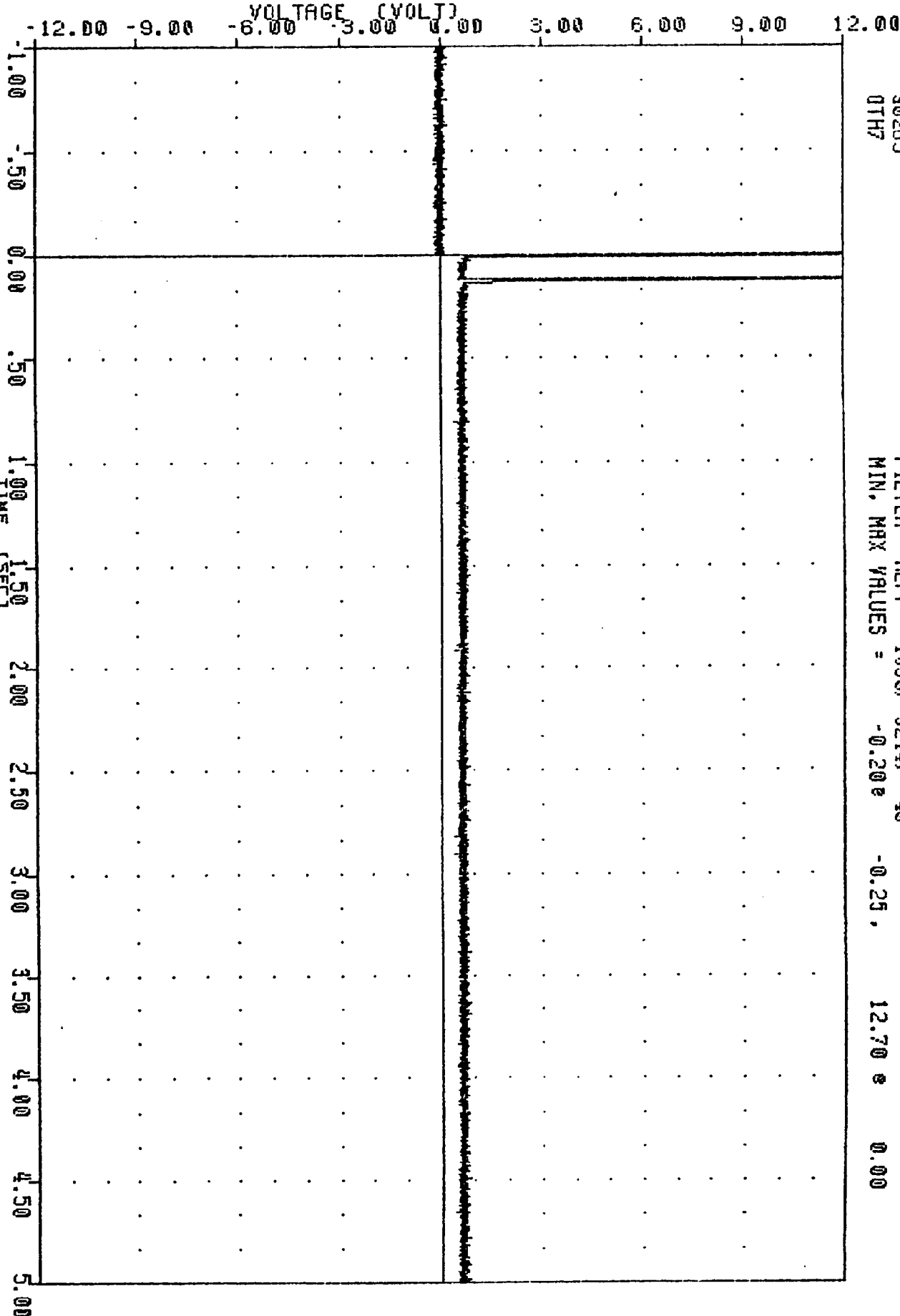


CONTROLLED ROLLOVER CRASH

90283

0TH7

FILTER = RLPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.20e -0.25, 12.70e 0.00



1988 DODGE CARAVAN INTO GUARD RAIL AT 60 MPH
SEVENTH CONTACT SWITCH

APPENDIX C

DUMMY CERTIFICATION

TRANSPORTATION RESEARCH CENTER OF OHIO
HYBRID III EXTERNAL DIMENSIONS
907 HUMANOID

17-OCT-90

SRL 907C3ED1 572E SN907 EXT. DIMENSION CAL03

TEST PARAMETER	(DIMEN.)	SPECIFICATION	TEST RESULTS
TEMPERATURE			71.0 DEG. F
RELATIVE HUMIDITY			54.0 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)		16.9-17.1 IN	17.0 IN
LOCATION FOR WAIST CIRCUMFERENCE (BB)		8.9- 9.1 IN	9.0 IN
CHEST CIRCUMFERENCE (Y)		38.2-39.4 IN	38.7 IN
WAIST CIRCUMFERENCE (Z)		32.9-34.1 IN	33.6 IN
CHEST DEPTH (O)		8.4- 9.0 IN	8.7 IN
H-POINT HEIGHT (C)		3.3- 3.5 IN	3.5 IN
H-POINT FROM SEATBACK (D)		5.3- 5.5 IN	5.4 IN
SKULL CAP TO BACKLINE (H)		1.6- 1.8 IN	1.7 IN
TOTAL SITTING HEIGHT (A)		34.6-35.0 IN	34.9 IN
THIGH CLEARANCE (F)		5.5- 6.1 IN	6.0 IN
BUTTOCK KNEE LENGTH (K)		22.8-23.8 IN	23.6 IN
BUTTOCK POPLITEAL LENGTH (N)		17.8-18.8 IN	18.5 IN
POPLITEAL HEIGHT (L)		16.9-17.9 IN	17.5 IN
KNEE PIVOT HEIGHT (M)		19.1-19.7 IN	19.4 IN
FOOT LENGTH (P)		9.9-10.5 IN	10.1 IN
FOOT BREADTH (W)		3.6- 4.2 IN	3.8 IN
SHOULDER PIVOT FROM BACKLINE (E)		3.3- 3.7 IN	3.7 IN
SHOULDER BREADTH (V)		16.6-17.2 IN	16.7 IN
SHOULDER PIVOT HEIGHT (B)		19.9-20.5 IN	20.4 IN
ELBOW REST HEIGHT (J)		7.5- 8.3 IN	8.1 IN
SHOULDER-ELBOW LENGTH (I)		13.0-13.6 IN	13.4 IN
BACK OF ELBOW TO WRIST PIVOT (G)		11.4-12.0 IN	11.5 IN

TEST MEETS SPECIFICATIONS

TECHNICIAN

Chas. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III

17-Oct-90

SRL

907C3HD1

572E SN907 HEAD DROP CAL 03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	58.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	270.59 G
PEAK LATERAL ACCELERATION	15 G MAX	-4.27 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN

Chas. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

17-Oct-90

6 AXIS NECK TRANSDUCER
SRL 907C3NE1

572E SN907 NECK EXT. CAL03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	70.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	60.00 %
IMPACT VELOCITY	19.50-20.30 FT/SEC	19.51 FT/SEC
PENDULUM	10 MS 17.20 - 21.20 G	20.07 G
DECELERATION	20 MS 14.00 - 19.00 G	15.61 G
	30 MS 11.00 - 16.00 G	12.39 G
MAX PENDULUM G ABOVE 30 MS	22 G MAX	12.30 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	38 - 46 MS	40.00 MS
D PLANE	MAX 81 - 106 DEG.	104.59 DEG.
ROTATION	TIME 72 - 82 MS	78.63 MS
MOMENT ABOUT OCCIPITAL	MIN -59.0/-39.0 FT.LBS	-49.89 FT.LBS
CONDYLE	TIME 65 - 79 MS	75.75 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	147 - 174 MS	166.13 MS
NEGATIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	120 - 148 MS	147.00 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN

Ch. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

17-Oct-90

6 AXIS NECK TRANSDUCER
SRL 907C3NF1

572E SN907 NECK FLEXION CAL03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	58.00 %
IMPACT VELOCITY	22.6-23.4 FT/SEC	22.86 FT/SEC
PENDULUM	10 MS 22.50 - 27.50 G	23.84 G
DECELERATION	20 MS 17.60 - 22.60 G	18.26 G
	30 MS 12.50 - 18.50 G	15.31 G
MAX PENDULUM G ABOVE 30 MS	29 G MAX	15.29 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	34 - 42 MS	37.88 MS
D PLANE	MAX 64 - 78 DEG.	77.43 DEG.
ROTATION	TIME 57 - 64 MS	60.50 MS
MOMENT ABOUT OCCIPITAL	MAX 65 - 80 FT.LBS	70.37 FT.LBS
CONDYLE	TIME 47 - 58 MS	52.88 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	113 - 128 MS	117.88 MS
POSITIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	97 - 107 MS	105.13 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN *Chris. Middleton*

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III

18-Oct-90

SRL

907C3TH1

572E SN907 H.S. THORAX CAL03

TEST PARAMETER	HIGH SPEED TEST	
	SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	71.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	49.00 %
PENDULUM VELOCITY	21.6-22.4 FT/SEC	22.22 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 IN	2.51 IN
MAXIMUM RESISTIVE FORCE	1160 - 1325 LBS	1271.4 LBS
INTERNAL HYSTERESIS	69% - 85%	75.4%

TEST MEETS SPECIFICATIONS

TECHNICIAN

Chas. Maddlet

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

17-Oct-90

RIGHT KNEE
SRL 907C3RK1

572E SN907 R.KNEE 11LB CAL03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	58.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.97 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1229.45 LBS
PROBE WEIGHT	11.0 LBS	

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

17-Oct-90

LEFT
SRLKNEE
907C3LK1

572E SN907 L.KNEE 11LB CAL03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	58.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.96 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1278.13 LBS
PROBE WEIGHT	11.0 LBS	

TEST MEETS SPECIFICATIONS

TECHNICIAN

Chas. Middleton

APPENDIX D

MISCELLANEOUS INFORMATION

DUMMY INSTRUMENTATION PLACEMENT
DUMMY MANUFACTURER & S/N: HUMANOID #907
SEATING POSITION: DRIVER

<u>LOCATION</u>	<u>AXIS</u>	<u>MFR</u>	<u>MODEL</u>	<u>S/N</u>	<u>ORIENTATION</u> <u>(+ SENSING)</u>
HEAD ACCELERATION	X	ENDEVCO	7264	BG96J	FRONT
HEAD ACCELERATION	Y	ENDEVCO	7264	AA05	LEFT
HEAD ACCELERATION	Z	ENDEVCO	7264	BG94J	UP
NECK FORCE	X	DENTON	1716	085-FX	**
NECK FORCE	Y	DENTON	1716	085-FY	**
NECK FORCE	Z	DENTON	1716	085-FZ	**
NECK MOMENT	X	DENTON	1716	085-MX	**
NECK MOMENT	Y	DENTON	1716	085-MY	**
NECK MOMENT	Z	DENTON	1716	085-MZ	**
CHEST ACCELERATION	X	ENDEVCO	7264	AA19	REAR
CHEST ACCELERATION	Y	ENDEVCO	7264	AN03	LEFT
CHEST ACCELERATION	Z	ENDEVCO	7264	BF28J	DOWN
CHEST DISPLACEMENT		VERNITECH	81422-A	87313-96	OUTWARD
PELVIS ACCELERATION	X	ENDEVCO	7264	BD88H	REAR
PELVIS ACCELERATION	Y	ENDEVCO	7264	AC44	LEFT
PELVIS ACCELERATON	Z	ENDEVCO	7264	BD75J	UP

**See SIGN CONVENTION sheet for positive sensing orientation of neck load channels.

VEHICLE INSTRUMENTATION PLACEMENT

LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
CENTER OF GRAVITY ACCEL	X	ENDEVCO	7264	DB14H	REAR
CENTER OF GRAVITY ACCEL	Y	ENDEVCO	7264	BP26J	LEFT
CENTER OF GRAVITY ACCEL	Z	ENDEVCO	7264	CY23H	UP
CENTER OF GRAVITY ROLL	X	HUMPHREY	RG28-0128-1	H-14	RIGHT
CENTER OF GRAVITY PITCH	Y	HUMPHREY	RG28-0128-1	H-16	UP
CENTER OF GRAVITY YAW	Z	HUMPHREY	RG28-0128-1	H-21	LEFT
DRIVER'S SHOULDER BELT DISPLACEMENT		CELESCO	PT-101-50A	A02465	OUTWARD
LEFT FRONT SUSPENSION DISPLACEMENT		CELESCO	PT-101-40A	A12898	OUTWARD
RIGHT FRONT SUSPENSION DISPLACEMENT		CELESCO	PT-101-40A	A12899	OUTWARD
LEFT REAR SUSPENSION DISPLACEMENT		CELESCO	PT-101-50A	0275534	OUTWARD
RIGHT REAR SUSPENSION DISPLACEMENT		CELESCO	PT-101-40A	0586135	OUTWARD

IPMD VEHICLE DATA SHEET

Filled Out By: Bob Dotson Date: 9/26/90

Checked By: _____ Date: _____

VEHICLE DATA

Vehicle Make and Model (written out): Dodge Caravan SE

NHTSA ID Code (7 characters): V90313 / Model Year (2 digits): 88

Vehicle Make (2 characters): 07

11 - American	02 - Ford	64 = Nissan
12 = Audi	40 = GMC	48 = Odyssey
53 = Battronics	23 = Honda	06 = Oldsmobile
27 = BMW	34 = Hyundai	14 = Peugeot
04 = Buick	41 = IH	05 = Plymouth
10 = Cadillac	42 = Isuzu	03 = Pontiac
35 = Champion	44 = Jeep	17 = Renault
36 = Checker	54 = Jet	30 = Saab
01 = Chevrolet	22 = Lectra	26 = Subaru
37 = Chinook	59 = Lectric	33 = Suzuki
21 = Chrysler	13 = Lincoln	16 = Toyota
29 = Comuta	18 = Mazda	31 = Triumph
15 = Datsun	28 = Mercedes	56 = UM
38 = Delorean	09 = Mercury	08 = Volkswagen
07 = Dodge	25 = MG	20 = Volvo
58 = Eva	62 = Mitsubishi	60 = Winnebago
19 = Fiat	32 = NHTSA	24 = Yugo
99 = Other: _____		

Vehicle Model (2 characters = see appendix B): _____

Body Style (2 characters): VN

2C = 2 Door Coupe
2S = 2 Door Sedan
3H = 3 Door Hatchback
4S = 4 Door Sedan
5H = 5 Door Hatchback
OH = Other: _____

SW = Stationwagon
PU = Pickup Truck
TR = Truck
VN = Van
BU = Bus
MP = Multipurpose
UT = Utility

VIN Number (20 characters): 2B4FK41K5JR652788

Odometer Reading: 65543.0

Thousands of Miles: 65.543

Overall Length: 174.5

(in) x 25.4 =: 4432 (mm)

Wheelbase: 112.0

(in) x 25.4 =: 2845 (mm)

Front Track: 59.8

(in) x 25.4 =: 1520 (mm)

Rear Track: 62.0

(in) x 25.4 =: 1575 (mm)

Roof Height: 66.5

(in) x 25.4 =: 1689 (mm)

IPMD VEHICLE DATA SHEET

G.V.W.R.: 4700 (lbs) x 4.45 =: 20915 (N)
FRONT G.A.W.R.: 2425 (lbs) x 4.45 =: 10791 (N)
REAR G.A.W.R.: 2450 (lbs) x 4.45 =: 10902 (N)

The following tire loadings are measured with vehicle at Curb Weight.

Weight on RF Tire: 986 (lbs) x 4.45 =: 4388 (N)
Weight on LF Tire: 1081 (lbs) x 4.45 =: 4810 (N)
Weight on LR Tire: 838 (lbs) x 4.45 =: 3729 (N)
Weight on RR Tire: 786 (lbs) x 4.45 =: 3498 (N)
Vehicle Test Weight: 3691 (lbs) x 4.45 =: 16425 (N)

Lateral and Longitudinal Center of Gravity Location.

From Front Axle: 49.28 (in) x 25.4 =: 1251.7 (mm)
From Center Line: -1.23 (in) x 25.4 =: -31.2 (mm)
Engine Displacement: 153.0 (cu in) x 0.0164 =: 2.5 (L)

Engine Type (2 characters): L4
L3 F4 L4
V4 F6 L6
V6 V8 RT = Rotary
L5 OT = Other: _____

Engine Location (1 character): F

F = Front M = Mid R = Rear

Engine Orientation (1 character): T

L = Longitudinal T = Transverse

Transmission Type: (1 character): A

M = Manual A = Automatic

Drive Axle (1 character): F

F = Front R = Rear 4 = Four Wheel Drive

Vehicle Comments (30 characters): Pre-test IPMD

IPMD VEHICLE DATA SHEET

FRONT SUSPENSION

Suspension Number (4 digits): _____

Front/Rear Flag (1 character): _____ F _____

Axle Type (1 character): _____ I _____
I = Independent S = Solid

Suspension Type (1 character): _____ S _____

A = Unequal A Arm	T = Semi-Trailing Arm
L = Leaf	W = Twist
M = Multiple Link	4 = 4 Link
Q = Torque Arm	3 = 3 Link
S = Strut	I = Twin I Beam
O = Other: _____	

Spring Type (2 characters): _____ CO _____

CO = Coil	TB = Torsion Bar
LL = Longitudinal Leaf	TL = Transverse Leaf
OT = Other: _____	

Brake Type (2 characters): _____ DI _____

DI = Disk	LT = Leading-Trailer Shoe
DS = Duo-Servo Shoe	
OT = Other: _____	

Suspension Modified (1 character): _____ N _____

N = No Y = Yes

Suspension Modification

R = Raised	L = Lowered
S = Stiffened	W = Widened
O = Other	

1 = _____
2 = _____

IPMD VEHICLE DATA SHEET

FRONT SUSPENSION

Tire Manufacturer (10 characters): Goodyear

Tire Size Code (10 characters): P195/75R14 M&S

Tire Construction (2 charactrs): SB

BB = Bias Belted

GP = Glass Belted Radial

BP = Bias Ply

SB = Steel Belted Radial

OT = Other: _____

Tire Rim width: 5.5 (in) X 25.4 =: 139.7 (mm)

Axle Height: 11.5 (in) X 25.4 =: 292.1 (mm)

Tire Pressure: 35.0 (psi) X 6.897 =: 241.4 (kpa)

IPMD VEHICLE DATA SHEET

REAR SUSPENSION

Suspension Number (4 digits): _____

Front/Rear Flag (1 character): _____ R _____

Axle Type (1 character): _____ S _____
I = Independent S = Solid

Suspension Type (1 character): _____ L _____

A = Unequal A Arm	T = Semi-Trailing Arm
L = Leaf	W = Twist
M = Multiple Link	4 = 4 Link
Q = Torque Arm	3 = 3 Link
S = Strut	I = Twin I Beam
O = Other: _____	

Spring Type (2 characters): _____ LL _____

CO = Coil	TB = Torsion Bar
LL = Longitudinal Leaf	TL = Transverse Leaf
OT = Other: _____	

Brake Type (2 characters): _____ DS _____

DI = Disk	LT = Leading-Trailer Shoe
DS = Duo-Servo Shoe	
OT = Other: _____	

Suspension Modified (1 character): _____ N _____

N = No Y = Yes

Suspension Modification

R = Raised	L = Lowered
S = Stiffened	W = Widened
O = Other	

1 = _____
2 = _____

IPMD VEHICLE DATA SHEET

REAR SUSPENSION

Tire Manufacturer (10 characters): Goodyear

Tire Size Code (10 characters): P195/75R14 M&S

Tire Construction (2 characters): SB

BB = Bias Belted

GP = Glass Belted Radial

BP = Bias Ply

SB = Steel Belted Radial

OT = Other: _____

Tire Rim Width: 5.5

(in) X 25.4 =: 139.7 (mm)

Axle Height: 11.7

(in) X 25.4 =: 297.2 (mm)

Tire Pressure: 35.0

(psi) X 6.897 =: 241.4 (kpa)

IPMD MEASURED DATA

Vehicle # and Run #: 3131 Date: 09-26-90 Time: 15:24:45

Vehicle Weight: 3691 Roof Height: 66.50 Load Config: Driver

Fuel Load: empty Vehicle Type: van

IPMD Calibration Check (no vehicle)

Applied Weight (lbs.)	Schaevitz Output (deg.)	System C.G. Pivot (in.)
0	-0.22	0.00
100	-5.62	33.15
200	-10.91	33.23
0	-0.22	0.00
-100	5.18	33.17
-200	10.50	33.16
0	-0.22	0.00
Average System C.G. Pivot		33.18

C.G. Height:

Applied Weight (lbs.)	Schaevitz Output (Deg.)	Resultant Longitudinal Movement (In.)	Individual C.G. Values (In.)
0	0.09	0.000	0.00
100	-3.46	0.052	24.59
200	-7.10	0.132	24.72
0	0.07	0.001	0.00
-100	3.70	-0.055	24.99
-200	7.50	-0.177	25.06
0	0.29	-0.069	0.00
Average calculated C.G. Height:			24.84

IPMD MEASURED DATA

VEHICLE # AND RUN # 3131 DATE: 09-26-90 TIME: 15:24:46

Pitch Inertia:

Run No.	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Pitch Calculation (Ft. Lb. Sec ²)
1	4.430	10.38	0.149	2489.2
2	4.425	10.30	0.149	2481.7
3	4.425	10.16	0.148	2480.1
Average Pitch Inertia:				2483.7

Roll Inertia:

Distance between ramps (in.): 50.80

Run No.	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Roll Calculation (Ft. Lb. Sec ²)
1	2.650	7.97	0.127	565.9
2	2.650	7.91	0.117	569.4
3	2.650	7.93	0.116	569.6
Average Roll Inertia:				568.3

Yaw Inertia:

String Pot Offset from platform center (in.): 71.00

Run No.	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Yaw Calculation (Ft. Lb. Sec ²)
1	2.675	10.74	0.12	2552.0
2	2.670	10.80	0.12	2541.5
3	2.675	10.67	0.12	2552.0
Average Yaw Inertia:				2548.5

IPMD VEHICLE DATA SHEET

Filled Out By: B. Dotson Date: 10/12/90

Checked By: _____ Date: _____

VEHICLE DATA

Vehicle Make and Model (written out): Dodge Caravan SE

NHTSA ID Code (7 characters): T90313 / Model Year (2 digits): 88

Vehicle Make (2 characters): 07

11 - American	02 - Ford	64 = Nissan
12 = Audi	40 = GMC	48 = Odyssey
53 = Battronics	23 = Honda	06 = Oldsmobile
27 = BMW	34 = Hyundai	14 = Peugeot
04 = Buick	41 = IH	05 = Plymouth
10 = Cadillac	42 = Isuzu	03 = Pontiac
35 = Champion	44 = Jeep	17 = Renault
36 = Checker	54 = Jet	30 = Saab
01 = Chevrolet	22 = Lectra	26 = Subaru
37 = Chinook	59 = Lectric	33 = Suzuki
21 = Chrysler	13 = Lincoln	16 = Toyota
29 = Comuta	18 = Mazda	31 = Triumph
15 = Datsun	28 = Mercedes	56 = UM
38 = Delorean	09 = Mercury	08 = Volkswagen
07 = Dodge	25 = MG	20 = Volvo
58 = Eva	62 = Mitsubishi	60 = Winnebago
19 = Fiat	32 = NHTSA	24 = Yugo
99 = Other: _____		

Vehicle Model (2 characters = see appendix B): _____

Body Style (2 characters): VN

2C = 2 Door Coupe	SW = Stationwagon
2S = 2 Door Sedan	PU = Pickup Truck
3H = 3 Door Hatchback	TR = Truck
4S = 4 Door Sedan	VN = Van
5H = 5 Door Hatchback	BU = Bus
OH = Other: _____	MP = Multipurpose
	UT = Utility

VIN Number (20 characters): 2B4FK41K5JR652788

Odometer Reading: <u>65,545.0</u>	Thousands of Miles: <u>65,545.0</u>
Overall Length: <u>174.5</u>	(in) x 25.4 =: <u>4432</u> (mm)
Wheelbase: <u>112.5</u>	(in) x 25.4 =: <u>2858</u> (mm)
Front Track: <u>59.8</u>	(in) x 25.4 =: <u>1519</u> (mm)
Rear Track: <u>62.0</u>	(in) x 25.4 =: <u>1575</u> (mm)
Roof Height: <u>64.5</u>	(in) x 25.4 =: <u>1638</u> (mm)

IPMD VEHICLE DATA SHEET

G.V.W.R.: 4700 (lbs) x 4.45 =: 20915 (N)
FRONT G.A.W.R.: 2425 (lbs) x 4.45 =: 10791 (N)
REAR G.A.W.R.: 2450 (lbs) x 4.45 =: 10902 (N)

The following tire loadings are measured with vehicle at Curb Weight.

Weight on RF Tire: 1049 (lbs) x 4.45 =: 4668 (N)
Weight on LF Tire: 1042 (lbs) x 4.45 =: 4637 (N)
Weight on LR Tire: 833 (lbs) x 4.45 =: 3707 (N)
Weight on RR Tire: 766 (lbs) x 4.45 =: 3409 (N)
Vehicle Test Weight: 3690 (lbs) x 4.45 =: 16420 (N)

Lateral and Longitudinal Center of Gravity Location.

From Front Axle: 48.75 (in) x 25.4 =: 1238.2 (mm)
From Center Line: -.50 (in) x 25.4 =: -12.7 (mm)
Engine Displacement: 153.00 (cu in) x 0.0164 =: 2.5 (L)

Engine Type (2 characters): L4

L3	F4	L4
V4	F6	L6
V6	V8	RT = Rotary
L5	OT = Other: _____	

Engine Location (1 character): F

F = Front M = Mid R = Rear

Engine Orientation (1 character): T

L = Longitudinal T = Transverse

Transmission Type: (1 character): A

M = Manual A = Automatic

Drive Axle (1 character): F

F = Front R = Rear 4 = Four Wheel Drive

Vehicle Comments (30 characters): Post-test IPMD

IPMD VEHICLE DATA SHEET

FRONT SUSPENSION

Suspension Number (4 digits): _____

Front/Rear Flag (1 character): _____ F _____

Axle Type (1 character): _____ I _____
I = Independent S = Solid

Suspension Type (1 character): _____ S _____

A = Unequal A Arm

T = Semi-Trailing Arm

L = Leaf

W = Twist

M = Multiple Link

4 = 4 Link

Q = Torque Arm

3 = 3 Link

S = Strut

I = Twin I Beam

O = Other: _____

Spring Type (2 characters): _____ CO _____

CO = Coil

TB = Torsion Bar

LL = Longitudinal Leaf

TL = Transverse Leaf

OT = Other: _____

Brake Type (2 characters): _____ DI _____

DI = Disk

LT = Leading-Trailer Shoe

DS = Duo-Servo Shoe

OT = Other: _____

Suspension Modified (1 character): _____ N _____

N = No

Y = Yes

Suspension Modification

R = Raised

L = Lowered

S = Stiffened

W = Widened

O = Other

1 = _____

2 = _____

IPMD VEHICLE DATA SHEET

FRONT SUSPENSION

Tire Manufacturer (10 characters): Goodyear

Tire Size Code (10 characters): P195/75R14

Tire Construction (2 charactrs): SB

BB = Bias Belted

GP = Glass Belted Radial

BP = Bias Ply

SB = Steel Belted Radial

OT = Other: _____

Tire Rim width: 5.5 (in) X 25.4 =: 139.7 (mm)

Axle Height: 7.5 (in) X 25.4 =: 190.5 (mm)

Tire Pressure: 0.0 (psi) X 6.897 =: 0.0 (kpa)

IPMD VEHICLE DATA SHEET

REAR SUSPENSION

Suspension Number (4 digits): _____

Front/Rear Flag (1 character): _____ R

Axle Type (1 character): _____ S

I = Independent S = Solid

Suspension Type (1 character): _____ L

A = Unequal A Arm

L = Leaf

M = Multiple Link

Q = Torque Arm

S = Strut

O = Other: _____

T = Semi-Trailing Arm

W = Twist

4 = 4 Link

3 = 3 Link

I = Twin I Beam

Spring Type (2 characters): _____ LL

CO = Coil

LL = Longitudinal Leaf

OT = Other: _____

TB = Torsion Bar

TL = Transverse Leaf

Brake Type (2 characters): _____ DS

DI = Disk

DS = Duo-Servo Shoe

OT = Other: _____

LT = Leading-Trailer Shoe

Suspension Modified (1 character): _____ N

N = No

Y = Yes

Suspension Modification

R = Raised

L = Lowered

S = Stiffened

W = Widened

O = Other

1 = _____

2 = _____

IPMD VEHICLE DATA SHEET

REAR SUSPENSION

Tire Manufacturer (10 characters): Goodyear

Tire Size Code (10 characters): P195/75R14

Tire Construction (2 characters): SB

BB = Bias Belted

BP = Bias Ply

OT = Other: _____

GP = Glass Belted Radial

SB = Steel Belted Radial

Tire Rim Width: 5.5

(in) X 25.4 =: 139.7 (mm)

Axle Height: 11.7

(in) X 25.4 =: 297.2 (mm)

Tire Pressure: 35.0

(psi) X 6.897 =: 241.4 (kpa)

IPMD MEASURED DATA

Vehicle # and Run #: 3132 Date: 10-12-90 Time: 14:26:20

Vehicle Weight: 3689 Roof Height: 64.50 Load Config: Driver

Fuel Load: empty Vehicle Type: Van

IPMD Calibration Check (no vehicle)

Applied Weight (lbs.)	Schaevitz Output (deg.)	System C.G. Pivot (in.)
0	-0.22	0.00
100	-5.61	33.22
200	-10.91	33.27
0	-0.22	0.00
-100	5.16	33.26
-200	10.49	33.18
0	-0.22	0.00
Average System C.G. Pivot		33.23

C.G. Height:

Applied Weight (lbs.)	Schaevitz Output (Deg.)	Resultant Longitudinal Movement (In.)	Individual C.G. Values (In.)
0	-0.05	0.000	0.00
100	-3.31	0.041	22.84
200	-6.80	0.191	22.81
0	-0.30	0.088	0.00
-100	3.08	-0.051	21.74
-200	6.45	-0.184	21.96
0	-0.03	-0.049	0.00
Average calculated C.G. Height:			22.34

IPMD MEASURED DATA

VEHICLE # AND RUN # 3132 DATE: 10-12-90 TIME: 14:26:21

Pitch Inertia:

Run No.	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Pitch Calculation (Ft. Lb. Sec ²)
1	4.200	9.31	0.179	2440.3
2	4.190	9.23	0.175	2427.4
3	4.200	8.78	0.171	2438.4
Average Pitch Inertia:				2435.4

Roll Inertia:

Distance between ramps (in.): 54.00

Run No.	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Roll Calculation (Ft. Lb. Sec ²)
1	2.540	7.80	0.076	580.2
2	2.540	7.93	0.079	579.6
3	2.545	8.06	0.080	584.5
Average Roll Inertia:				581.4

Yaw Inertia:

Run No.	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Yaw Calculation (Ft. Lb. Sec ²)
1	2.670	10.81	0.07	2553.6
2	2.670	10.31	0.06	2553.4
3	2.675	10.10	0.06	2564.5
Average Yaw Inertia:				2557.2

SIGN CONVENTION

ACCELEROMETERS:

+X: FORWARD
+Y: LEFTWARD
+Z: UPWARD

POTENTIOMETERS:

+CHEST DISPLACEMENT: OUTWARD
+SEAT BELT DISPLACEMENT: OUTWARD
+SEAT BELT EXTENSION: ELONGATION
+VEHICLE DISPLACEMENT: OUTWARD

LOAD CELLS:

+FEMUR FORCE: TENSION
+SEAT BELT FORCE: TENSION
+BARRIER FORCE: TENSION

NECK LOAD CELLS:

+X FORCE: HEAD FORWARD
+Y FORCE: HEAD RIGHTWARD
+Z FORCE: HEAD UPWARD (TENSION ON NECK)
+X MOMENT: RIGHT EAR TO RIGHT SHOULDER
+Y MOMENT: HEAD ROTATING FORWARD
+Z MOMENT: HEAD ROTATING LEFTWARD

GYROSCOPES:

+X ROLL: TO RIGHT
+Y PITCH: FRONT DOWN
+Z YAW: COUNTERCLOCKWISE