VEHICLE AND DUMMY KINEMATICS IN A CONTROLLED ROLLOVER CRASH 1988 DODGE CARAVAN MINI VAN

PREPARED BY:

THE TRANSPORTATION RESEARCH CENTER OF OHIO
U.S. RT. 33, LOGAN COUNTY
EAST LIBERTY, OHIO 43319

TEST REPORT

JULY - AUGUST, 1988

PREPARED FOR:

SYSTEMS RESEARCH LABORATORIES, INC.
2800 INDIAN RIPPLE ROAD
DAYTON, OH 45440

ERRATA (as of Nov 93)
Test Number 880714

1. The following channel on the Sign Convention Sheet at the end of Appendix D should read:

Neck Load Cells:	+Y Force:	Head Pushed Leftward

NOTICE

The Transportation Research Center of Ohio does not endorse or certify products of manufacturers. The manufacturer's name appears solely to identify the test article. The Transportation Research Center assumes no liability for the report or use thereof. It is responsible for the facts and the accuracy of the data presented herein. This report does not constitute a standard, specification, or regulation.

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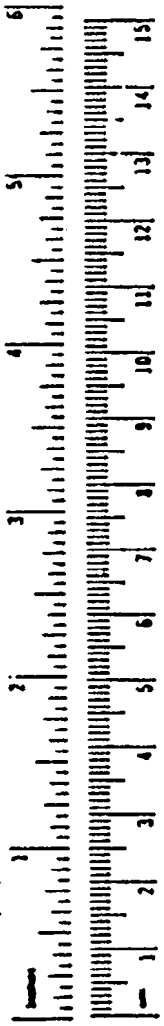
METRIC CONVERSION FACTORS

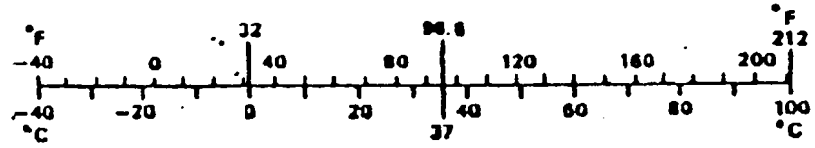
Approximate Conversions to Metric Measures

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
m	meters	1.1	yards	yd
km	kilometers	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
t	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 PROCEDURE

This rollover crash test is the second test in a four test series. The test series has the main objective to investigate both vehicle and occupant dynamics during automobile rollover crashes.

This test was conducted by placing a 1988 Dodge Caravan Mini Van on the NHTSA rollover cart at an angle of 30° above the horizontal, crabbing the rollover cart 45°, towing the rollover cart to 30 mph, and releasing the test vehicle. The test vehicle contained an instrumented Part 572E dummy restrained by a production 3-point unibelt.

SECTION 2.0

SUMMARY OF ROLLOVER CRASH TEST

A 1988 Dodge Caravan Mini Van containing one Part 572E instrumented test dummy was placed upon the rollover test device at 30 degrees above the horizontal and was released when the device had reached 30 mph. The device was attached to the tow cable of the drive system and crabbed 45° clockwise. After the vehicle had been released the device was brought to a stop with an auxiliary brake system. After release the vehicle impacted the ground on its left side, slid, and came to rest on its left side. The rollover crash test was conducted by the Transportation Research Center of Ohio in East Liberty, Ohio on July 14, 1988. Pre-test and post-test photographs of the test vehicle, dummy and device are shown in Appendix A.

The Part 572E 50th percentile adult male anthropomorphic test device (ATD) was placed in the right front passenger's designated seating position according to the seating procedure in FMVSS 208 Notice 45. The ATD was instrumented with head, chest, and pelvis triaxial accelerometers, a six-axis neck load cell, and a chest displacement potentiometer. A summary of Dummy Calibration test data can be found in Appendix C.

The crash event was recorded on 35 channels of data on one 14-track tape drive. Appendix B contains the vehicle, rollover device and dummy response data plots.

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

TEST NUMBER 880714

ROLL CART DATA SUMMARY

No.	LOCATION	POSITIVE DIRECTION MAX	POSITIVE DIRECTION SEC	NEGATIVE DIRECTION MAX	NEGATIVE DIRECTION SEC
1	CENTER OF GRAVITY ACCELERATION (g)				
	LONGITUDINAL	---	---Y	---	---Y
	LATERAL	---	---Y	---	---Y
	VERTICAL	---	---Y	---	---Y
	RESULTANT	---	---Y		
2	PLATFORM DISPLACEMENT (in)				
	LEFT SIDE	---	---Y	---	---Y
	RIGHT SIDE	---	---Y	---	---Y

VEHICLE/ROLL CART SEPARATION TIMES:

UPPER SWITCH: 0.7 SEC

LOWER SWITCH: 0.8 SEC

	POSITIVE DIRECTION	NEGATIVE DIRECTION
LONGITUDINAL:	FORWARD	REARWARD
LATERAL:	LEFTWARD	RIGHTWARD
VERTICAL:	UPWARD	DOWNWARD
DISPLACEMENT:	OUTWARD	INWARD

Y See TEST ANOMALIES

FINAL RESTING PLACES OF PARTS AND CAR

DESCRIPTION OF PART	X DISTANCE, FT*	Y DISTANCE, FT*
1988 Caravan Mini Van	123.7	7.5

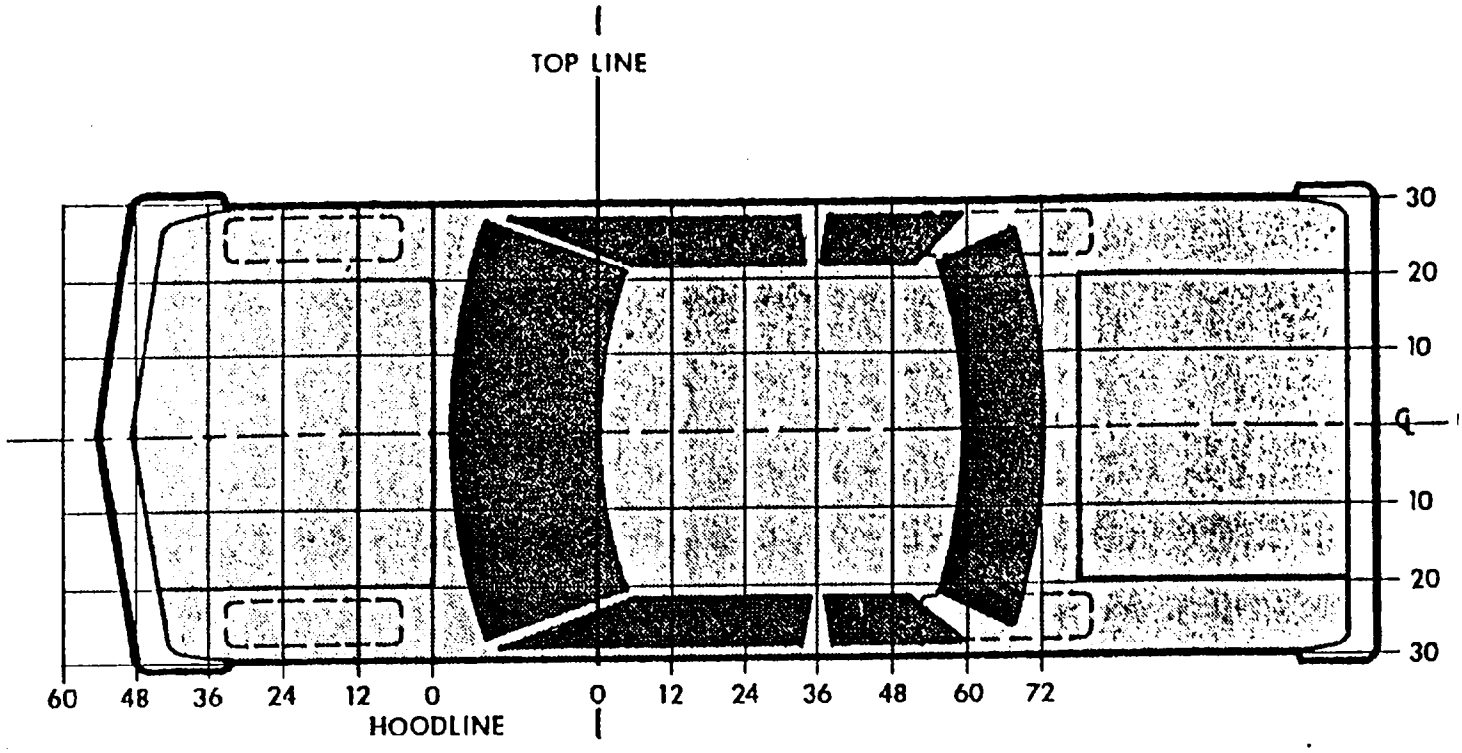
*REFERENCE: +X: FORWARD FROM RELEASE BLOCK

+Y: LEFTWARD FROM CENTER RELEASE BLOCK

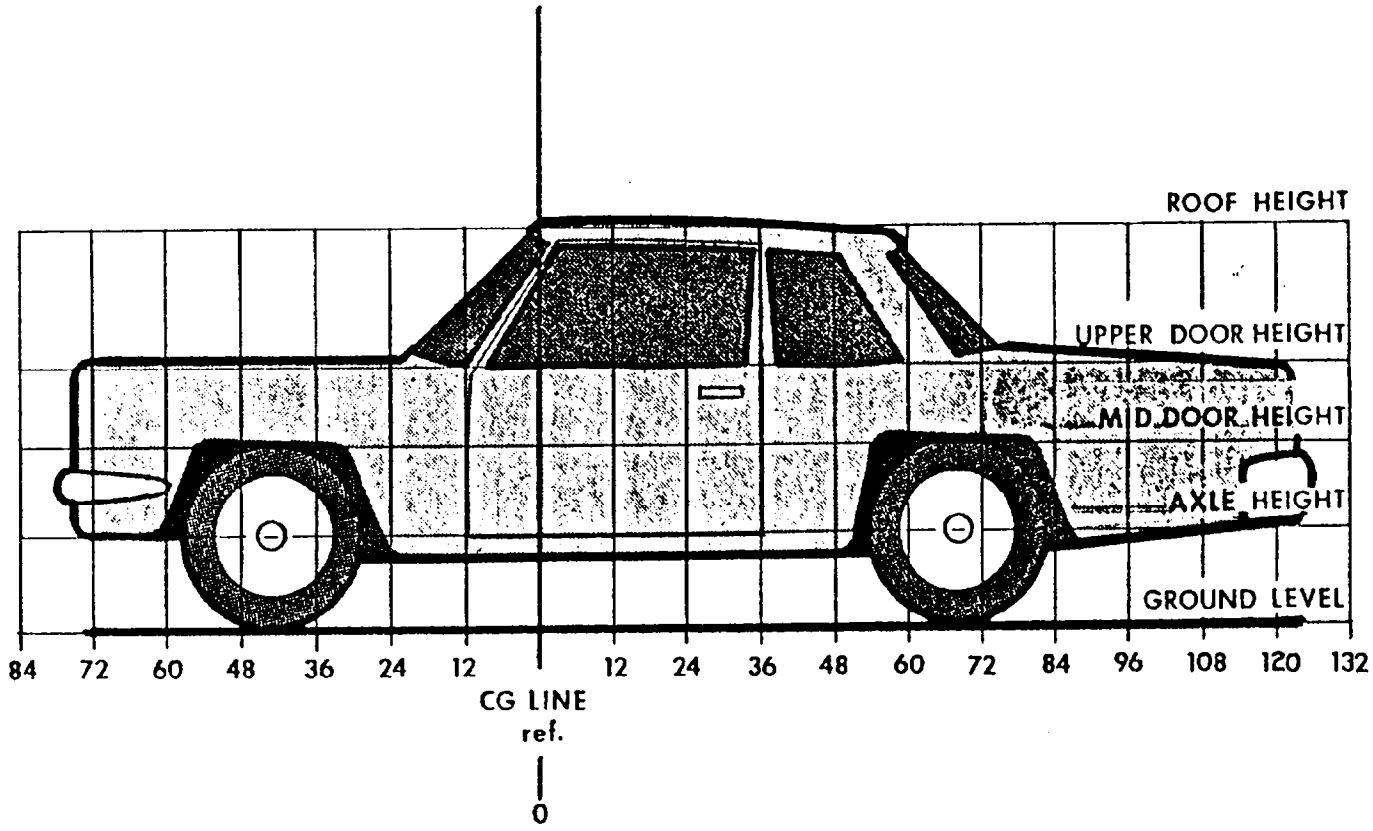
INTERIOR DIMENSIONS TAKEN

DESCRIPTION	PRE	POST	DIFF
Floor board to top of "A" post of left side	44.7	43.5	1.2
Floor board to top of "A" post of right side	44.3	43.9	0.4
Door sill to top of "B" post of left side	46.8	44.5	2.3
Door sill to top of "B" post of right side	47.0	46.8	0.2
Door sill to top of door opening of left side	44.9	43.5	1.4
Door sill to top of door opening of right side	43.6	43.6	0.0
Floor tunnel to windshield header	46.2	49.4	-3.2
Floor tunnel to center of roof	48.8	50.6	-1.8
Rear of floor tunnel to roof	46.0	46.4	-0.4
Maximum width at "B" post	69.4	54.8	14.6
Maximum width at "A" post	68.5	52.2	16.3
Maximum width at top of door opening	50.5	47.8	2.7

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
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)							
Trailing edge of cowl at centerline	X	44.9	45.1	45.1	44.9	42.6	X
Trailing edge of cowl + 12 inches	X	42.2	42.5	42.6	42.2	42.1	X
Trailing edge of cowl + 24 inches	X	39.1	39.4	39.4	39.4	38.9	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 42 inches	X	X	X	X	X	X	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE***)							
Trailing edge of cowl at centerline	X	46.8	46.9	46.4	45.8	44.9	X
Trailing edge of cowl + 12 inches	X	43.8	44.1	44.0	43.4	42.6	X
Trailing edge of cowl + 24 inches	X	40.7	40.6	40.8	40.3	39.8	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 42 inches	X	X	X	X	X	X	X
Trailing edge of cowl at centerline	X	1.9	1.8	1.3	0.9	2.3	X
Trailing edge of cowl + 12 inches	X	1.6	1.6	1.4	1.2	0.5	X
Trailing edge of cowl + 24 inches	X	1.6	1.2	1.4	0.9	0.9	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 42 inches	X	X	X	X	X	X	X

* Column reading are left to right from left to right on vehicle.
**Reference plane is a horizontal plane at ground level.
+ Static crush means vehicle structure is bowed upward.
- Static crush means vehicle structure is crushed.

VEHICLE ROOF EXTERIOR PROFILES
ZERO DISTANCE AT VEHICLE ROOF CENTERLINE*

LOCATION	20	10	0	10	20
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)					
Longitudinal Center of Gravity	65.4	65.8	65.8	65.6	65.3
Longitudinal Center of Gravity + 12	65.7	66.1	66.1	65.8	65.4
Longitudinal Center of Gravity + 24	65.8	66.1	66.2	66.0	65.5
Longitudinal Center of Gravity + 36	65.8	66.1	66.2	66.0	65.4
Longitudinal Center of Gravity + 48	65.8	66.1	66.1	65.9	65.4
Longitudinal Center of Gravity + 60	65.5	65.8	65.8	65.6	65.1
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)					
Longitudinal Center of Gravity	67.3	68.1	67.6	66.8	65.6
Longitudinal Center of Gravity + 12	67.9	68.1	67.7	66.9	65.9
Longitudinal Center of Gravity + 24	67.6	67.9	67.7	66.9	65.9
Longitudinal Center of Gravity + 36	67.2	67.4	67.4	66.8	65.9
Longitudinal Center of Gravity + 48	66.8	67.1	67.1	66.6	65.8
Longitudinal Center of Gravity + 60	65.9	66.6	66.6	66.1	65.6
STATIC CRUSH (IN)					
Longitudinal Center of Gravity	1.9	2.3	1.8	1.2	0.3
Longitudinal Center of Gravity + 12	2.2	2.1	1.6	1.1	0.5
Longitudinal Center of Gravity + 24	1.8	1.8	1.5	0.9	0.4
Longitudinal Center of Gravity + 36	1.4	1.3	1.2	0.8	0.5
Longitudinal Center of Gravity + 48	1.0	1.0	1.0	0.7	0.4
Longitudinal Center of Gravity + 60	0.4	0.8	0.8	0.5	0.5

* Column reading are left to right from left to right on vehicle.
**Reference plane is a horizontal plane at ground level.
+ 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
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Roof Height	64.1	X	X	X	X	X	22.1	22.1	22.0	22.1	22.1	22.2	22.2	22.2	X	X
Upper Door	41.2	X	16.8	15.8	15.3	14.5	14.6	14.3	14.2	14.1	14.1	14.2	14.2	14.2	14.4	X
Mid Door	27.6	16.0	14.1	X	13.9	13.5	13.2	13.1	13.1	13.0	12.9	12.9	X	12.2	13.5	X
Axle Height	11.8	17.6	X	X	X	16.9	16.2	16.1	16.0	15.8	15.9	X	X	X	16.4	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Roof Height	64.1	X	X	X	X	X	28.4	28.9	28.1	27.3	27.2	27.0	26.3	26.4	X	X
Upper Door	41.2	X	20.3	20.1	20.0	21.9	20.2	18.9	18.5	18.3	18.4	18.5	18.1	18.0	18.4	X
Mid Door	27.6	17.2	16.6	X	16.5	15.6	15.8	15.0	15.2	15.0	14.6	14.5	X	13.9	14.8	X
Axle Height	11.8	17.5	X	X	X	16.9	16.5	16.4	16.2	16.1	16.0	X	X	X	15.9	X
STATIC CRUSH (IN)																
Roof Height	64.1	X	X	X	X	X	6.3	6.8	6.1	5.2	5.1	4.8	4.1	4.2	X	X
Upper Door	41.2	X	3.5	4.3	4.7	7.4	5.6	4.6	4.3	4.2	4.3	4.2	3.9	3.8	4.0	X
Mid Door	27.6	1.2	2.5	X	2.1	2.1	2.6	1.9	2.1	2.0	1.7	1.6	X	1.7	1.8	X
Axle Height	11.8	-0.1	X	X	X	0.0	0.3	0.3	0.2	0.3	0.1	X	X	X	-0.5	X

* Center of gravity is located 49.4 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 stucture 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	64.1	X	X	X	X	X	21.9	21.6	21.6	21.5	21.6	21.6	21.4	21.5	X	X
Upper Door	41.2	X	17.1	15.9	15.1	14.8	14.5	14.2	14.2	14.1	14.1	14.2	14.2	14.3	14.6	X
Mid Door	27.6	14.8	14.1	X	13.9	13.4	13.2	13.1	13.1	12.9	12.8	12.9	X	12.5	13.3	X
Axle Height	11.8	17.0	X	X	X	16.4	16.3	16.2	15.8	15.8	15.8	X	X	X	15.9	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Roof Height	64.1	X	X	X	X	X	19.0	18.5	18.4	18.2	18.2	18.1	18.1	17.9	X	X
Upper Door	41.2	X	16.9	15.0	13.9	13.5	13.2	12.9	12.8	12.8	13.0	13.1	13.0	13.0	13.0	X
Mid Door	27.6	16.1	14.2	X	13.6	13.1	12.8	12.5	12.5	12.5	12.6	12.8	X	12.2	12.8	X
Axle Height	11.8	17.9	X	X	X	17.1	16.8	16.5	16.2	16.2	16.2	X	X	X	16.5	X
STATIC CRUSH (IN)																
Roof Height	64.1	X	X	X	X	X	-2.9	-3.1	-3.2	-3.3	-3.4	-3.5	-3.3	-3.6	X	X
Upper Door	41.2	X	-0.2	-0.9	-1.2	-1.3	-1.3	-1.3	-1.4	-1.3	-1.1	-1.1	-1.2	-1.3	-1.6	X
Mid Door	27.6	1.3	0.1	X	-0.3	-0.3	-0.4	-0.6	-0.6	-0.4	-0.2	-0.1	X	-0.3	-0.5	X
Axle Height	11.8	0.9	X	X	X	0.7	0.5	0.3	0.4	0.4	0.4	X	X	X	0.6	X

* Center of gravity is located 49.4 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 stucture is bowed outward.

TEST ANOMALIES

The rollover cart center of gravity traxial accelerometers; VCGXG2, VCGYG2, and VCGZG2; recorded anomalous spikes from .1 to .2 seconds. These spikes were caused by pieces of the tow skate striking the rollover cart after the skate had struck the release block.

The rollover cart center of gravity triaxial accelerometer; VCGXG2, VCGYG2, and VCGZG2; the rollover cart platform displacement left side, RCPDL and right side, RCPDR; and the vehicle/roll cart separation time - upper switch OTH1 and lower switch OTH2, data was lost after two (2) seconds due to a cut cable.

The right front passenger shoulder belt displacment, SHBD2, recorded anomalous spikes at 1.4 and 2.1 seconds.

The vehicle center of gravity Z axis accelerometer; VCGZG1, data did not return to zero after 1.4 seconds.

The vehicle center of gravity acceleration resultant; VCGRG1, data did not return to zero after 1.4 seconds due to VCGZG1.

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 VIN: 2BYFK21K6JR734209

BODY STYLE: Caravan Mini Van MODEL YEAR: 1988

NHTSA NO.: COLOR: Black

ENGINE DATA: TYPE: Tranverse CYLINDERS: 4 DISPLACEMENT: 2389cc

TRANSMISSION DATA: 5 SPEED, X MANUAL, ____AUTOMATIC, X FWD, ____RWD, ____4WD

DATE VEHICLE RECEIVED: 6/88 ODOMETER READING: 83

DEALER'S NAME AND ADDRESS:

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	No
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	No	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	No
OTHER	Yes		

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? No*
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: New

DATA FROM CERTIFICATION LABEL ON LEFT DOOR FACE OR "B" POST:

VEHICLE MANUFACTURED BY: Chrysler Corporation

DATE OF MANUFACTURE: 5/88

GVWR: 4550 LBS

GAWR: FRONT 2425 LBS., REAR 2280 LBS.

*The driver and front passenger seat side glazing was replaced with an experimental bilayer type designed to help prevent occupant ejection through side windows. The glazing inside surface was covered with a multilayer plastic sheet that extended beyond the window edges and was fastened to the door frame on the top and sides. During impact, the plastic acts as a stretchable barrier that prevents ejection while also limiting head and neck loading.

TEST VEHICLE INFORMATION CONT'D

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVEBOX, ETC.

VEHICLE LOAD (UP TO CAPACITY): FRONT 35 psi; REAR 35 psi

RECOMMENDED TIRE SIZE: P195/75R14 LOAD RANGE X B, C, D

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear Invicta GL P195/75R14MS

IS SPARE TIRE A "SPACE SAVER": Yes

IS SPARE TIRE STANDARD EQUIPMENT: Yes

VEHICLE CAPACITY: TYPES OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Non-adjustable

*NUMBER OF OCCUPANTS____FRONT ____REAR ____TOTAL

*CARGO LOAD_____LBS. *TOTAL_____LBS.

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS):

RIGHT FRONT	909	lbs.	RIGHT REAR	598	lbs.
LEFT FRONT	862	lbs.	LEFT REAR	615	lbs.
TOTAL FRONT WEIGHT	1771	lbs.	(59.4% OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1213	lbs.	(40.6% OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	2984	lbs.			

CALCULATION FOR TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (2683 LBS)

VCW = VEHICLE CAPACITY WEIGHT (LBS)*

DSC = DESIGNATED SEATING CAPACITY ( )*

RCLW = 300 LBS*

TARGET TEST WEIGHT = UDW + RCLW + (1 DUMMY X 167 LBS/DUMMY)

= 2984 + 300 + 167 LBS

TARGET TEST WEIGHT = 3451 LBS

*FOR MULTI PURPOSE VEHICLES, TRUCKS, AND BUSES A RATED CARGO AND LUGGAGE WEIGHT OF 300 POUNDS WAS USED.

TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 300 LBS. CARGO

RIGHT FRONT	1039 lbs.	RIGHT REAR	767 lbs.
LEFT FRONT	890 lbs.	LEFT REAR	754 lbs.

TOTAL FRONT WEIGHT 1929 lbs. (55.9% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 1521 lbs. (44.0% OF TOTAL VEHICLE WEIGHT)

TOTAL TEST WEIGHT 3450 lbs. (0.1% OVER/UNDER TARGET WEIGHT)

WEIGHT OF BALLAST SECURED IN VEHICLE BED AREA: 120 LBS.

COMPONENTS REMOVED TO MEET TARGET WEIGHT: Spare tire removed

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	LF	30.3	;RF	30.2	;LR	30.5	;RR 30.1
PRE-TEST ATTITUDE:	LF	29.5	;RF	28.8	;LR	29.2	;RR 28.1
POST-TEST ATTITUDE:	LF	29.6	;RF	28.1	;LR	29.9	;RR 28.1

WHEELBASE: 112.0 INCHES

CG = 49.4 INCHES REARWARD OF FRONT WHEEL CENTERLINE

VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES):

OVERALL LENGTH OF TEST VEHICLE:	PRE-TEST:	L	172.9	;C	176.3	;R 173.0
	POST-TEST:	L	172.6	;C	176.8	;R 173.1
	TOTAL CRUSH:	L	0.3	;C	-0.5	;R -0.1

TEST CONDITIONS

TEST NUMBER: 880714

DATE OF TEST: 7/14/88 TIME OF TEST: 1555

WIND VELOCITY: 6-11 mph @ 230°SW HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA: 90°F

TEMPERATURE IN OCCUPANT COMPARTMENT: 78°F

DRIVER DUMMY TEMPERATURE: 74°F

SUBJECT VEHICLE DATA

	ACTUAL	INTENDED
TEST WEIGHT (lbs.)	3450	3451
VEHICLE ORIENTATION (deg.) YAW*	45	45
VEHICLE ORIENTATION (deg.) ROLL**	30	30
VEHICLE VELOCITY (mph)	30	30

DUMMIES

	DRIVER	MIDDLE PASSENGER	RT. FRONT PASSENGER	LEFT REAR PASSENGER	RT. REAR PASSENGER
TYPE:			Part 572E		
SERIAL NO.:			192		
INSTRUMENTATION:					
HEAD ACCEL.:			3		
NECK L.C.'C.:			6		
CHEST ACCEL.:			3		
PELVIS ACCEL.:			3		
CHEST DISPLACEMENT POTENTIOMETER:			1		
RESTRAINT SYSTEM:			3-point unibelt		

REMARKS:

*AS MEASURED CLOCKWISE FROM THE DIRECTON OF TRAVEL.
**AS MEASURED FROM THE HORIZONTAL.

TEST NUMBER 880714

VEHICLE DATA SUMMARY

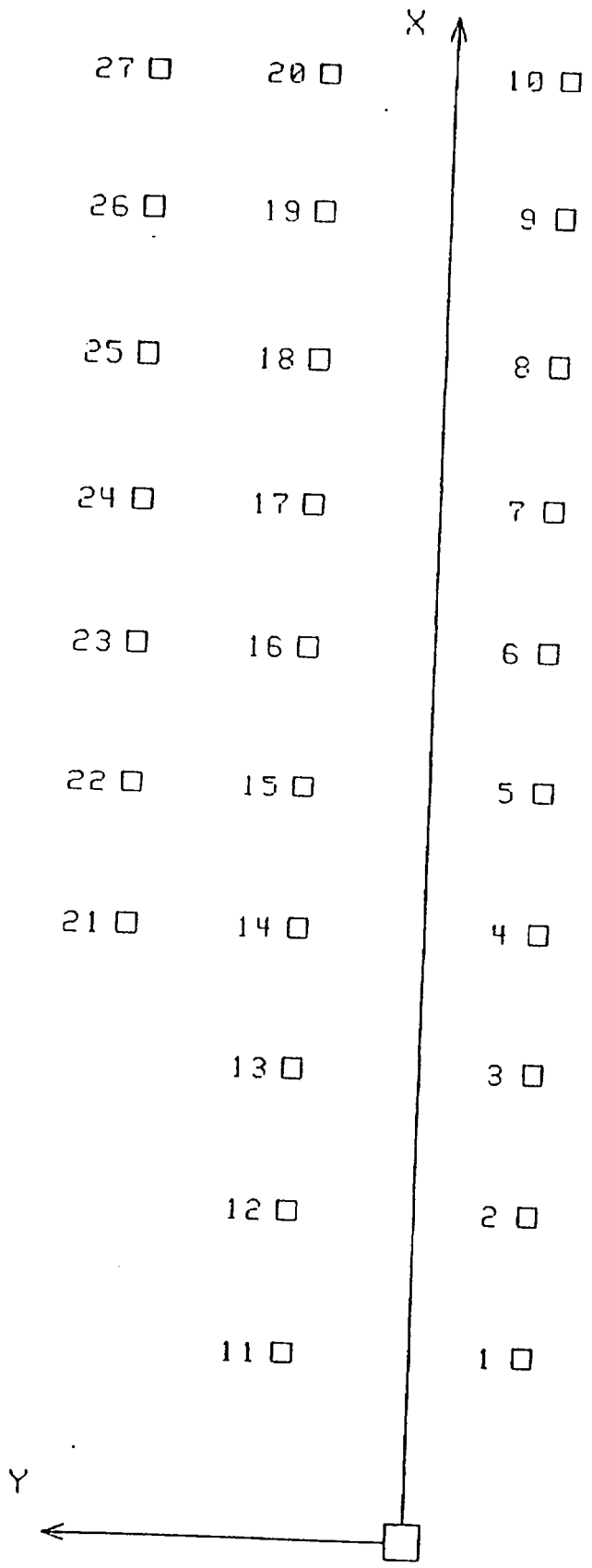
No.	LOCATION	POSITIVE DIRECTION MAX	POSITIVE DIRECTION SEC	NEGATIVE DIRECTION MAX	NEGATIVE DIRECTION SEC
1	SHOULDER BELT DISPLACEMENT (in) PASSENGER	1.7	1.4	8.1	2.1
2	CENTER OF GRAVITY ACCELERATION (g)				
	LONGITUDINAL	3.1	1.6	4.2	1.7
	LATERAL	4.8	1.4	12.9	1.3
	VERTICAL	8.9	1.4	14.1	1.3
	RESULTANT	19.4	1.3		
3	CENTER OF GRAVITY ANGULAR VELOCITY				
	ROLL (X-AXIS)	68.6	2.1	296.9	1.3
	PITCH (Y-AXIS)	203.9	1.3	192.7	1.3
	YAW (Z-AXIS)	125.3	1.3	72.9	0.6
4	LEFT FRONT SUSPENSION DISPLACEMENT (in) VERTICAL	0.1	0.1	0.4	1.3
5	RIGHT FRONT SUSPENSION DISPLACEMENT VERTICAL	0.0	0.1	0.2	1.3
6	LEFT REAR SUSPENSION DISPLACEMENT (in) VERTICAL	0.4	1.4	3.0	1.3
7	RIGHT REAR SUSPENSION DISPLACEMENT (in) VERTICAL	0.3	0.6	2.8	1.3

	POSITIVE DIRECTION	NEGATIVE DIRECTION
LONGITUDINAL:	FORWARD	REARWARD
LATERAL:	LEFTWARD	RIGHTWARD
VERTICAL:	UPWARD	DOWNWARD
ROLL:	TO RIGHT	TO LEFT
PITCH:	NOSE DOWNWARD	NOSE UPWARD
YAW:	COUNTER CLOCKWISE	CLOCKWISE
DISPLACEMENT:	OUTWARD	INWARD

IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: 1988 DODGE CARAVAN MINI VAN TEST NUMBER: 880714

NO.	TYPE OF MEASUREMENT	DIMENSIONS IN INCHES PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	176.3	176.8	-0.5
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	149.4	150.6	-1.2
X3	REAR SURFACE OF VEHICLE TO FIREWALL	139.6	141.0	-1.4
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	127.2	127.1	0.1
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	127.1	126.8	0.3
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	124.0	124.1	-0.1
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	124.0	123.8	0.2
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	84.6	84.6	0.0
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	84.5	84.4	0.1
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	84.2	84.0	0.2
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	84.2	83.9	0.3
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	123.2	123.0	0.2
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	123.4	123.2	0.2
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	138.5	138.5	0.0
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	139.1	138.4	0.5
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	109.2	110.0	-0.8
X17	CENTER OF STEERING COLUMN TO "A" POST	14.4	13.2	1.2
X18	CENTER OF STEERING COLUMN TO HEADLINING	18.6	20.5	-1.9
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	173.0	173.1	-0.1
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	172.9	172.6	0.3
X21	LENGTH OF ENGINE BLOCK	19.0	19.0	0.0



STADIA POLE LAYOUT AND NUMBERING SYSTEM

STADIA POLE LOCATIONS

POLE NO.	X DISTANCE, FT. *	Y DISTANCE, FT. *
1	34.0	-6.0
2	42.0	-6.0
3	50.0	-6.0
4	58.0	-6.0
5	66.0	-6.0
6	74.0	-6.0
7	82.0	-6.0
8	90.0	-6.0
9	98.0	-6.0
10	106.0	-6.0
11	34.0	8.0
12	42.0	8.0
13	50.0	8.0
14	58.0	8.0
15	66.0	8.0
16	74.0	8.0
17	82.0	8.0
18	90.0	8.0
19	98.0	8.0
20	106.0	8.0
21	58.0	18.0
22	66.0	18.0
23	74.0	18.0
24	82.0	18.0
25	90.0	18.0
26	98.0	18.0
27	106.0	18.0

*REFERENCE: +X: FORWARD FROM RELEASE BLOCK

+Y: LEFTWARD FROM CENTER RELEASE BLOCK

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right panning	Kodak	25	24	Real Time Documentation
2	Right wide	Photosonic 1B	25	495	Vehicle Kinematics
3	Right angle	Photosonic 1B	25	505	Vehicle Kinematics
4	Front wide	Photosonic 1B	25	493	Vehicle Kinematics
5	Onboard - floor	Photosonic 1B	8	499	Dummy Kinematics
6	Onboard - upper	Photosonic 1B	8	498	Dummy Kinematics
7	Documentary	Beaulieu	11-105	24	Pre-test & Post-test Documentation

HIGH SPEED CAMERA INFORMATION

CAMERA NO.	X* (ft.)	Y* (ft.)	Z* (ft.)
2	54.8	-297.0	3.6
3	122.6	-221.2	4.9
4	196.2	2.9	2.6

*Reference:

+X = Forward from release block

+Y = Leftward from center release block

+Z = Upward from ground level

SECTION 4.

OCCUPANT INFORMATION

VISIBLE DUMMY CONTACT POINTS:

	DRIVER	PASSENGER #192
Head		Right B-pillar
Chest		Right front door
Abdomen		None
Left knee		None
Right knee		None

DOOR OPENING:

	LEFT	RIGHT
Front	NA	Easy
Rear	NA	Easy

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	None	None
Rear	NA	NA

GLAZING DAMAGE:

Front windshield glass was cracked and separated at the top. The left rear window was shattered upon impact.

OTHER NOTABLE IMPACT EFFECTS:

Right Front Passenger Dummy

Upon the vehicle's impact with the ground, the right front passenger dummy's head struck the right side of B-pillar and the dummy's right side of the upper torso impacted the right door panel. As the vehicle slid its on left side, the dummy's head and upper torso moved away from the right door. The vehicle came to rest on its left side with the right front passenger dummy leaning to the left in his seating position, restrained by the three point unibelt's lap and shoulder belts.

DUMMY DATA SUMMARY

TEST NUMBER 880714

RIGHT FRONT PASSENGER DUMMY
SN: 192

	POSITIVE DIRECTION MAX	POSITIVE DIRECTION SEC	NEGATIVE DIRECTION MAX	NEGATIVE DIRECTION SEC
HEAD ACCELERATION (g)				
LONGITUDINAL	5.9	1.4	5.7	1.7
LATERAL	7.4	3.6	9.4	1.4
VERTICAL	6.3	0.6	18.6	1.3
RESULTANT	19.3	1.3		
HIC	17.6 FROM 1289 TO 1325 MSEC			
NECK FORCE (lbs)				
LONGITUDINAL	22.5	1.3	18.0	1.5
LATERAL	72.0	1.4	26.8	0.7
VERTICAL	155.4	1.3	21.6	0.6
NECK MOMENT (in-lbs)				
ABOUT LONGITUD.	60.9	1.3	133.4	1.4
ABOUT LATERAL	47.0	0.6	122.0	1.3
ABOUT VERTICAL	55.5	1.4	40.9	1.4
CHEST ACCELERATION (g)				
LONGITUDINAL	9.8	1.3	5.9	1.4
LATERAL	3.3	0.6	11.0	1.3
VERTICAL	4.2	0.6	14.0	1.3
RESULTANT	18.0	1.3		
3 MSEC CLIP	16.8 FROM 1300 TO 1303 MSEC			
CHEST DISPLACEMENT (in)				
LONGITUDINAL	0.1	0.8	1.0	1.3
PELVIS ACCELERATION (g)				
LONGITUDINAL	18.5	1.3	8.5	1.4
LATERAL	5.3	1.4	19.2	1.3
VERTICAL	4.4	0.6	9.1	1.3
RESULTANT	23.5	1.3		

POSITIVE DIRECTION		NEGATIVE DIRECTION	
LONGITUDINAL:	FORWARD	LONGITUDINAL:	REARWARD
LATERAL:	LEFTWARD	LATERAL:	RIGHTWARD
VERTICAL:	UPWARD	VERTICAL:	DOWNWARD
DISPLACEMENT:	OUTWARD	DISPLACEMENT:	INWARD

SEE APPEND D FOR NECK LOAD CELL POLARITIES

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. After the vehicle had been positioned on the rollover device it was towed outside for launch.

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, six (6) load cells in the neck and one displacement potentiometer attached to the driver's shoulder belt. Prior to seating the dummy, the passenger's seat was positioned in the mid-adjustment notch of the seat track. The seat back angle was fixed. The dummy was positioned in the seat using NHTSA's Notice #45 seating procedure. The H-point location of seat was obtained by using the SAE J826 H-point machine as specified in the Notice #45. The driver dummy was restrained with a three-point unibelt.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

MFR./MAKE/MODEL: Dodge/Caravan Mini Van

SEAT TYPE: ____Bench
__X__Bucket
____Split bench

ADJUSTER TYPE: __X__Manual
____Power
____Fixed

BUCKET SEAT BACK TYPE: __X__Fixed
____Adjustable reclining

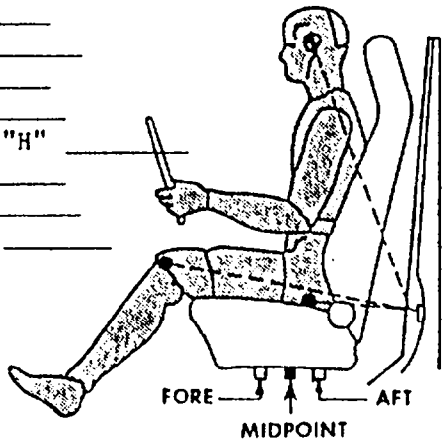
POSITIONING DATE: 7/14/88

AMBIENT TEMP. 90° F TIME: 1045

TECHNICIANS:
1. B. Crabtree
2. S. Ericksen
3. B. Miller
4. _____

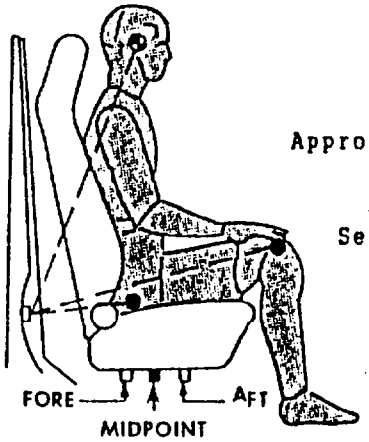
DRIVER DUMMY #NA

Head_____
Target_____
Knee_____
Joint_____
Approx. "H" _____
Point_____
Pelvis_____
Seatback_____

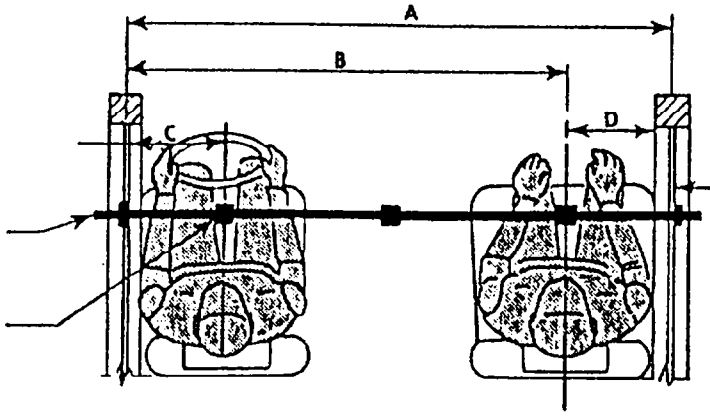


PASSENGER DUMMY #192

Head 8°
Target 23.7"
Knee 89°
Joint 24.7"
Approx. "H" 103°
Point 8.2"
Pelvis 22°
Seatback 26°



A = 58.4"
B = 45.2"
C = NA
D = 13.2"



LATERAL BAR

ADJUSTABLE POINTER

DOOR GLASS HEIGHT 12.0"

LEFT FRONT DOOR

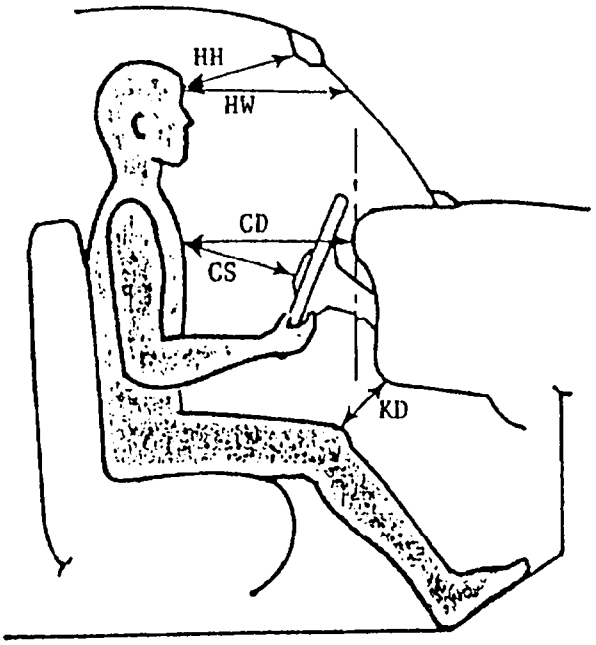
DRIVER DUMMY #NA

PASSENGER DUMMY #192

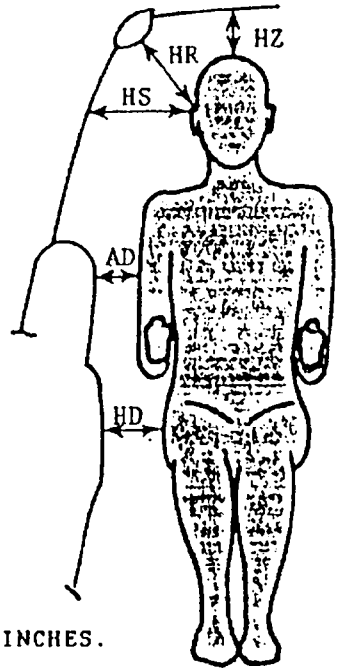
RIGHT FRONT DOOR

DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER	PASSENGER
	NA	192
HH		18.6
HW		25.1
CD		29.0
CS		NA
KDL		9.8
KDR		9.4



	DRIVER	PASSENGER
	NA	192
HR		7.6
HS		8.1
AD		2.8
HD		5.1
HZ		5.0



ALL DISTANCE MEASUREMENTS ARE IN INCHES.

APPENDIX A

PHOTOGRAPHS

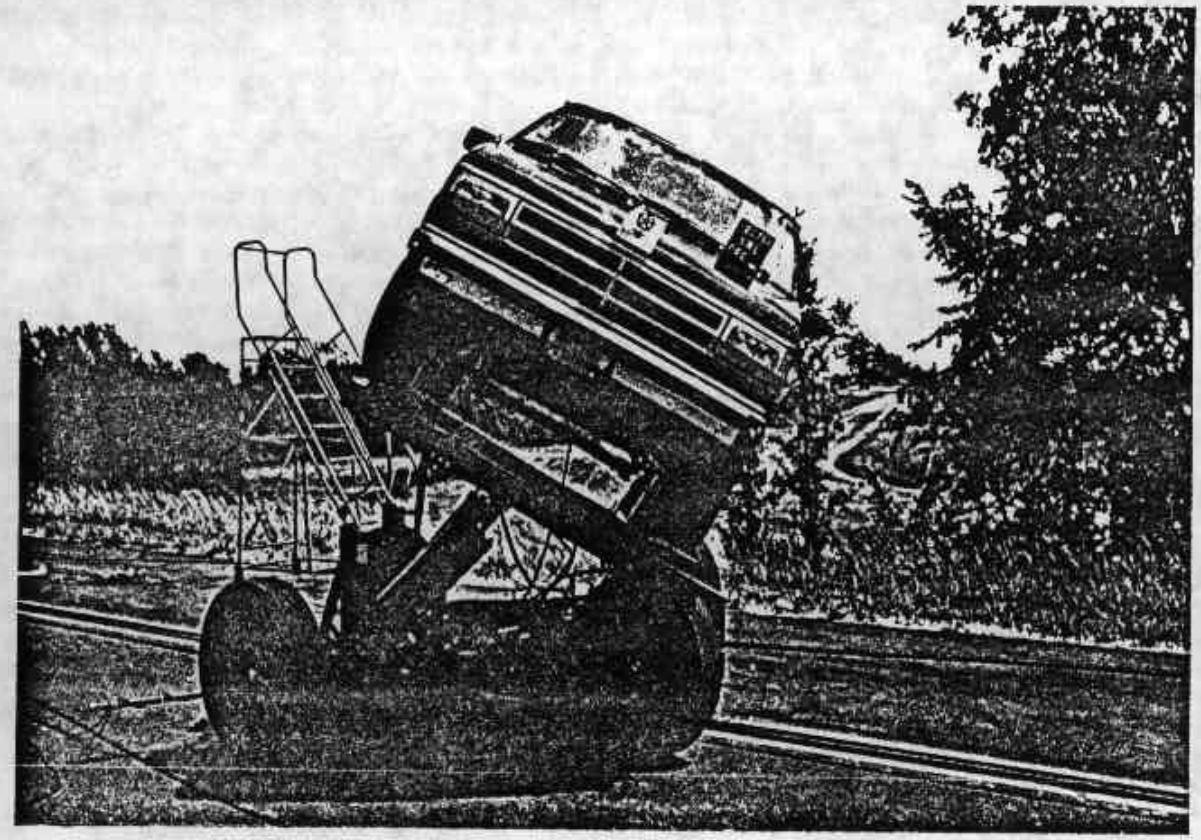


Figure A-1. PRE-TEST OVERALL FRONT VIEW

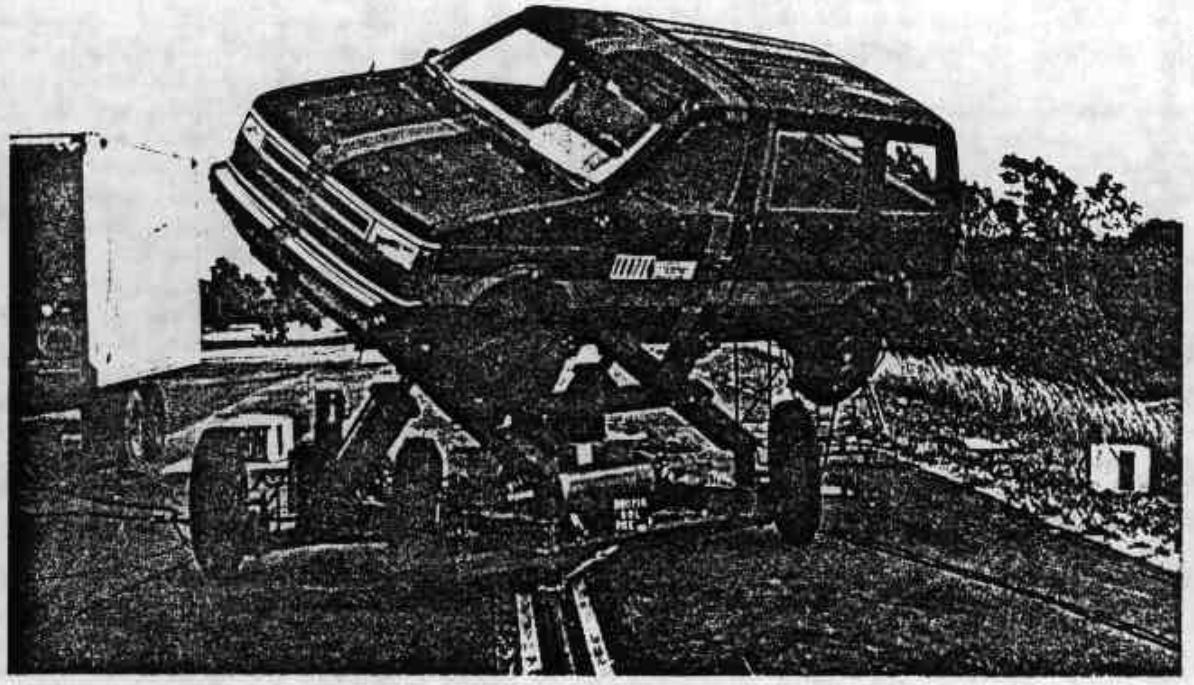


Figure A-2. PRE-TEST OVERALL LEFT SIDE VIEW

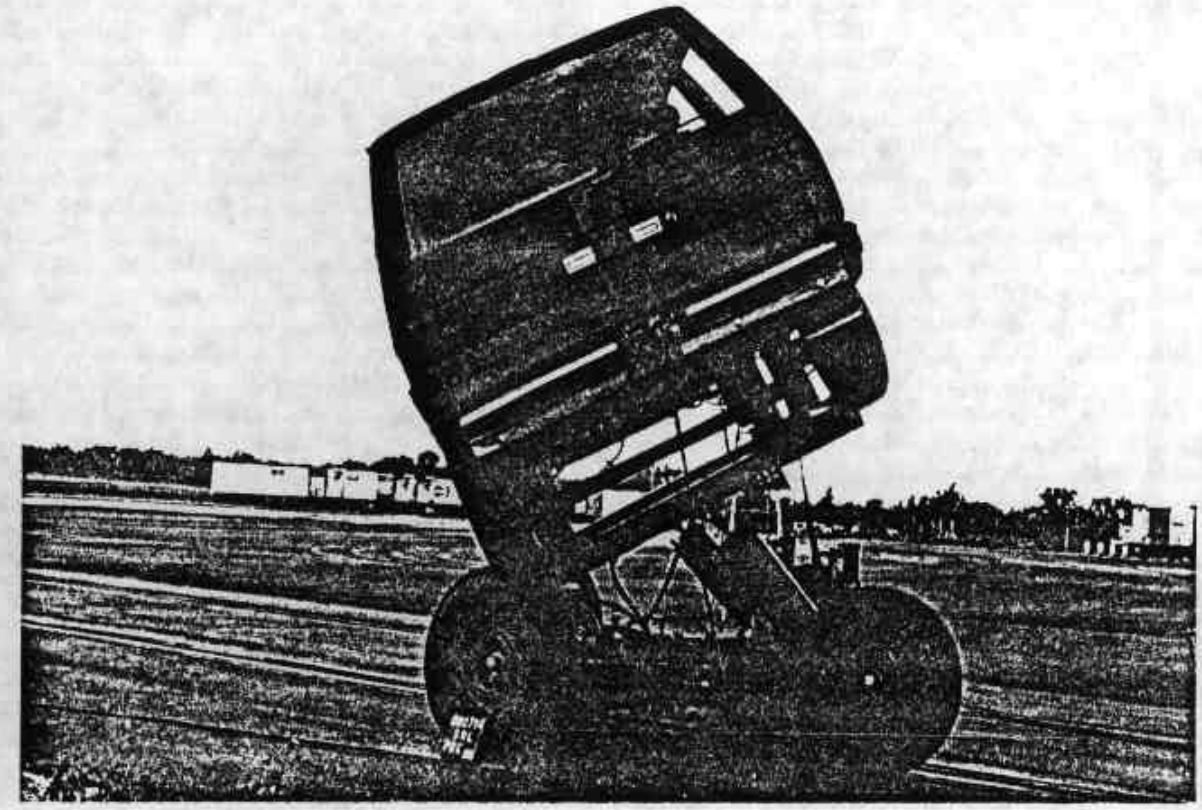


Figure A-3. PRE-TEST OVERALL REAR VIEW

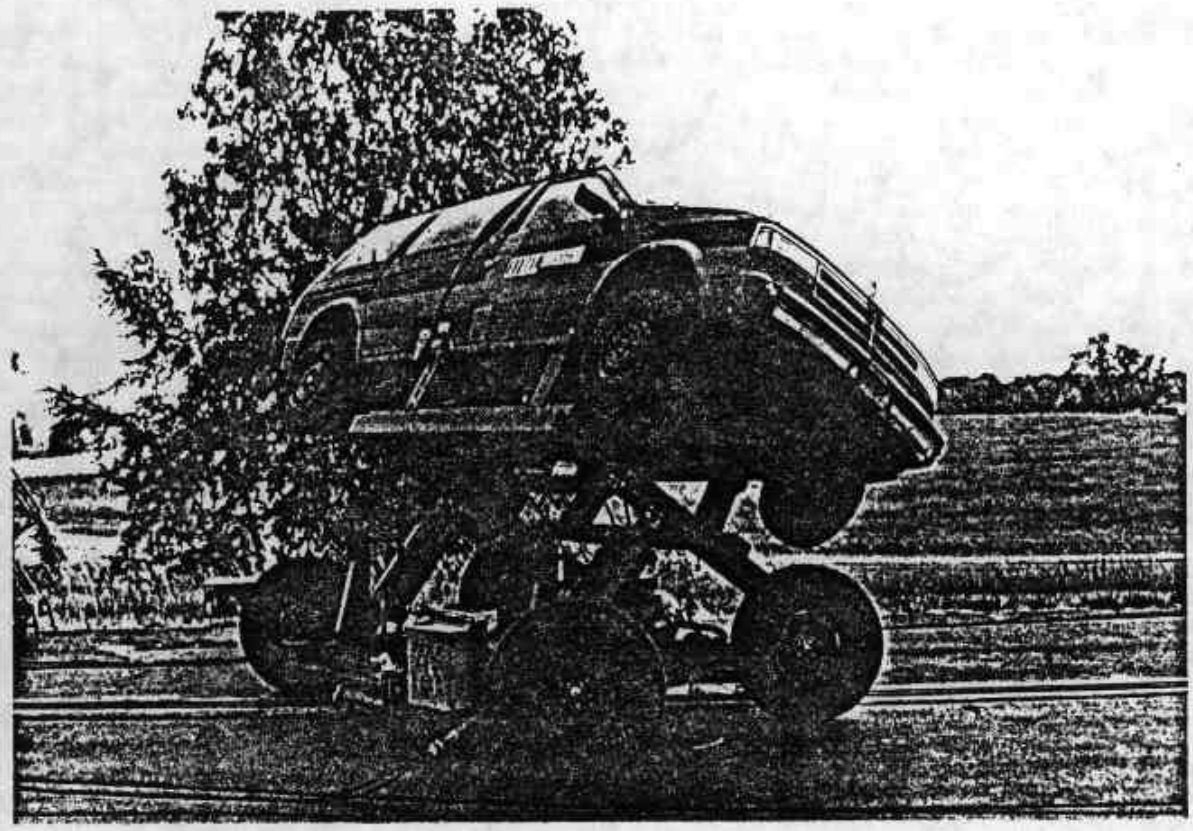


Figure A-4. PRE-TEST OVERALL RIGHT SIDE VIEW

Figure A-5. PRE-TEST CLOSE-UP FRONT VIEW

Figure A-6. PRE-TEST RIGHT FRONT PASSENGER DUMMY - VIEW 1

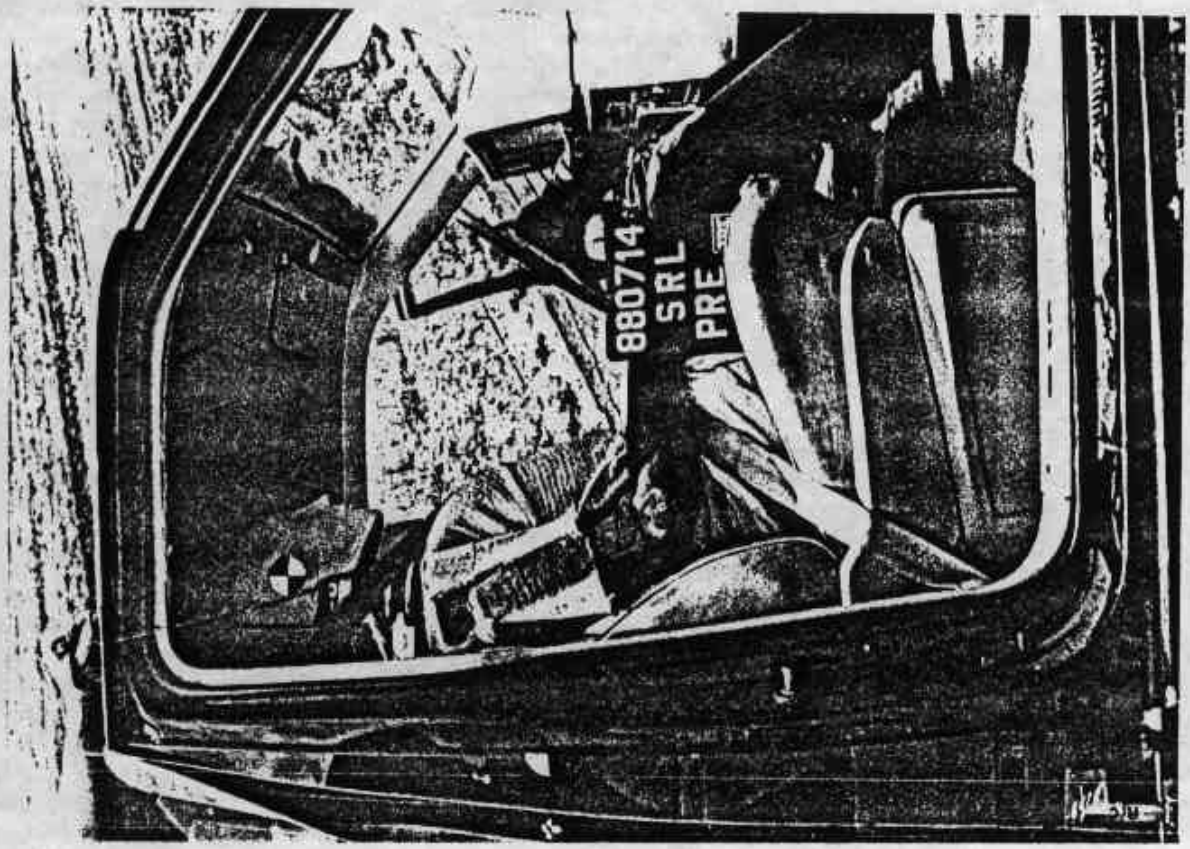


Figure A-7. PRE-TEST RIGHT FRONT PASSENGER DUMMY - VIEW 2

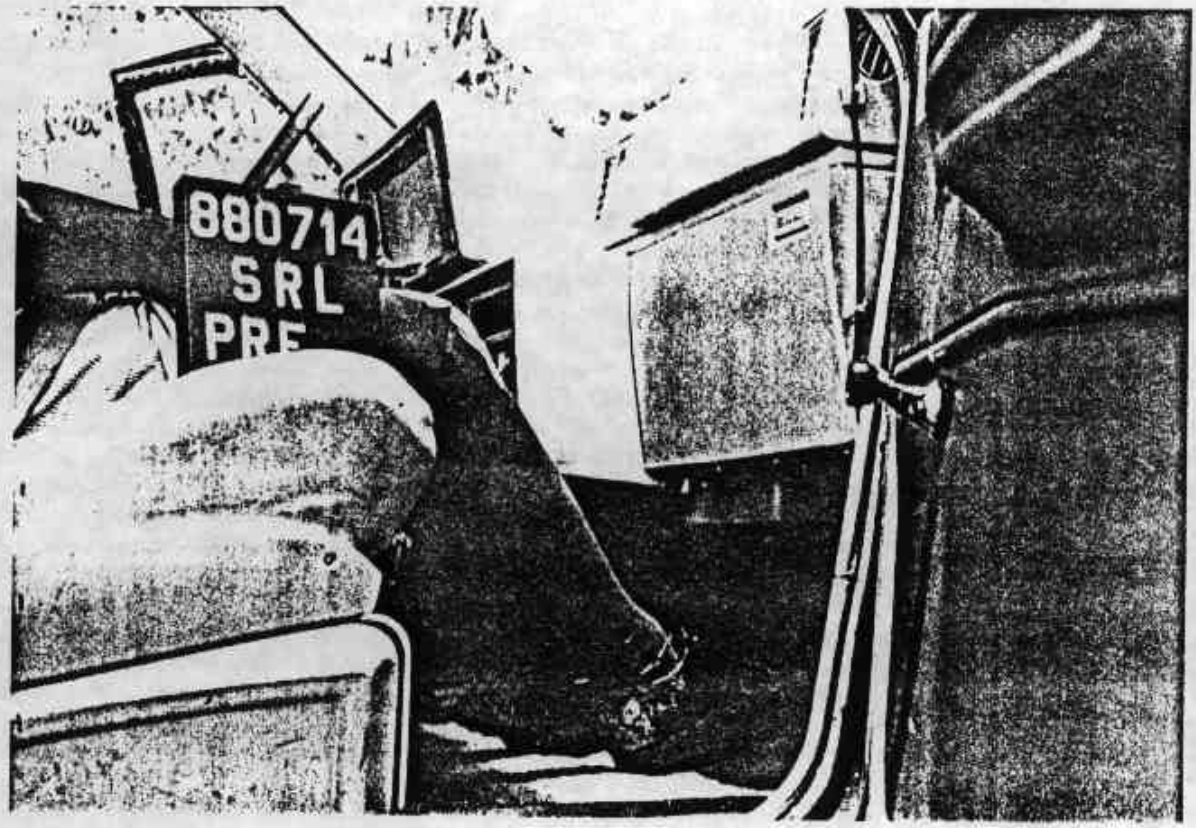


Figure A-8. PRE-TEST RIGHT FRONT PASSENGER DUMMY - VIEW 3

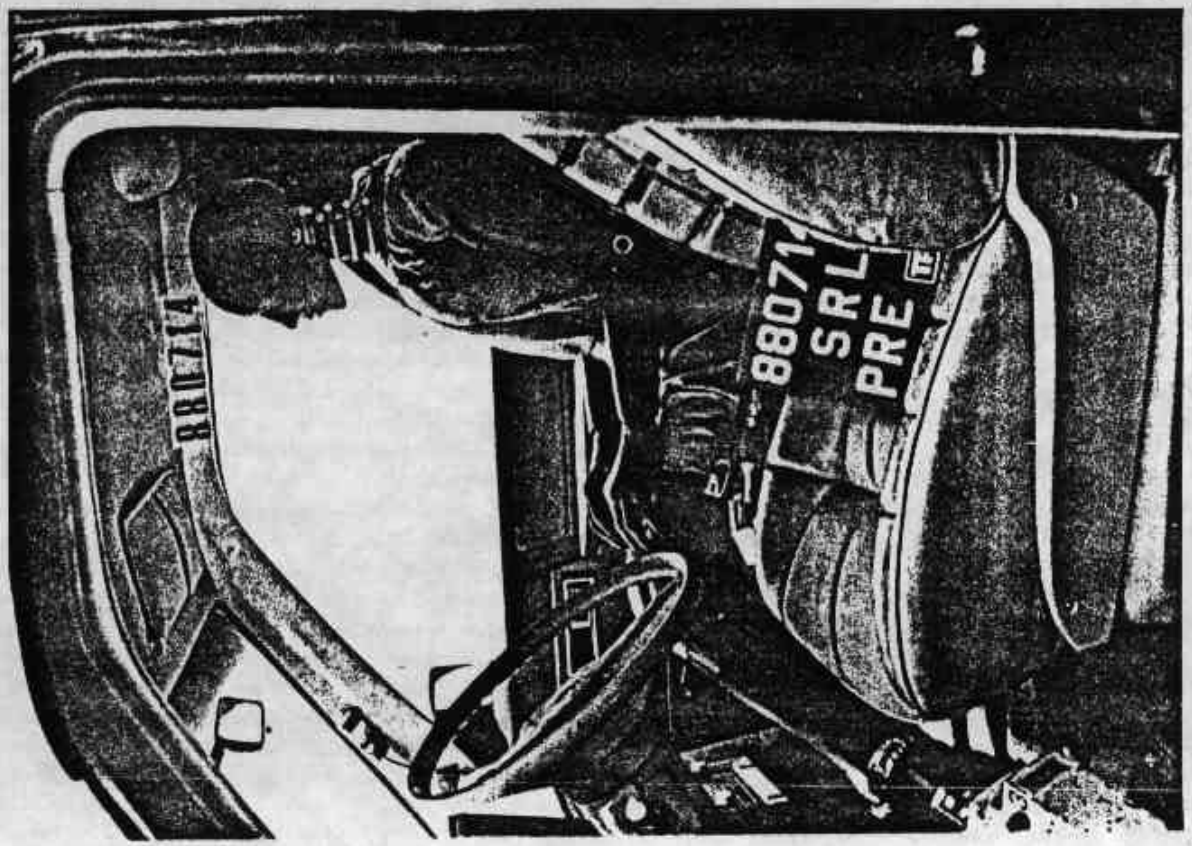


Figure A-9. PRE-TEST RIGHT FRONT PASSENGER DUMMY - VIEW 4

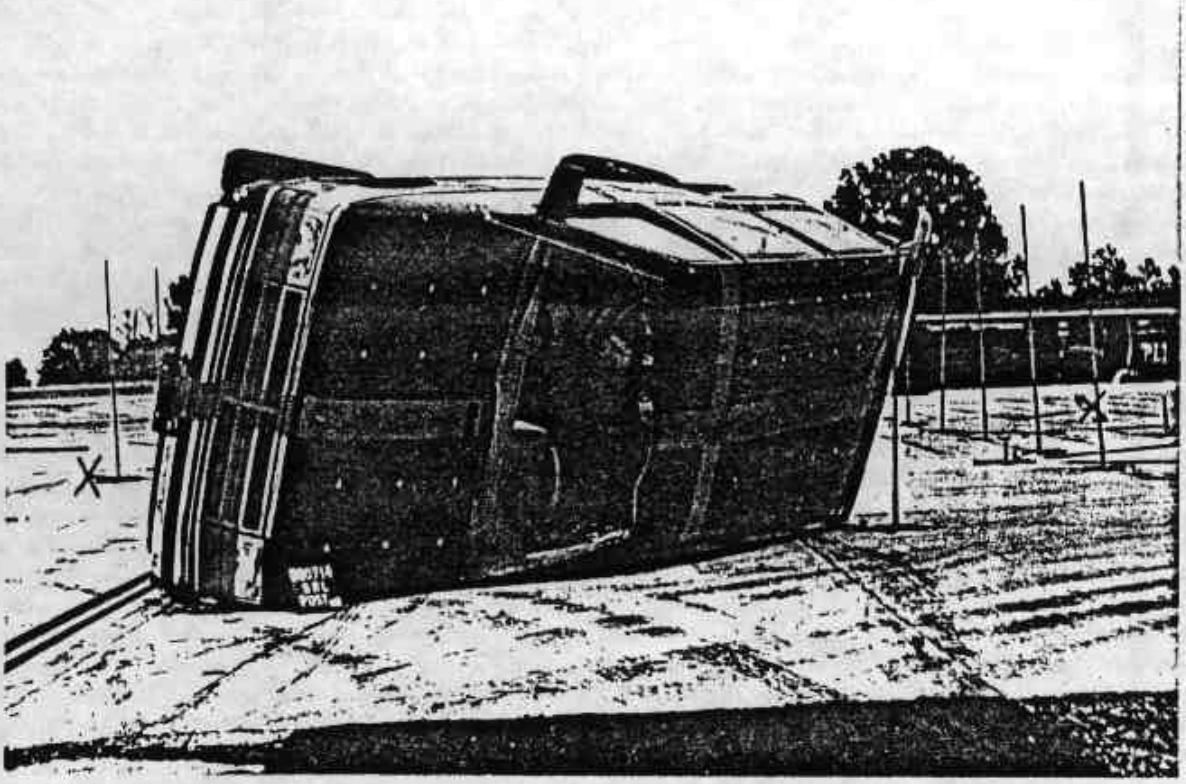


Figure A-10. POST-TEST OVERALL FRONT - VIEW 1

Figure A-11. POST TEST OVERALL FRONT - VIEW 2

Figure A-12. POST-TEST OVERALL LEFT SIDE VIEW

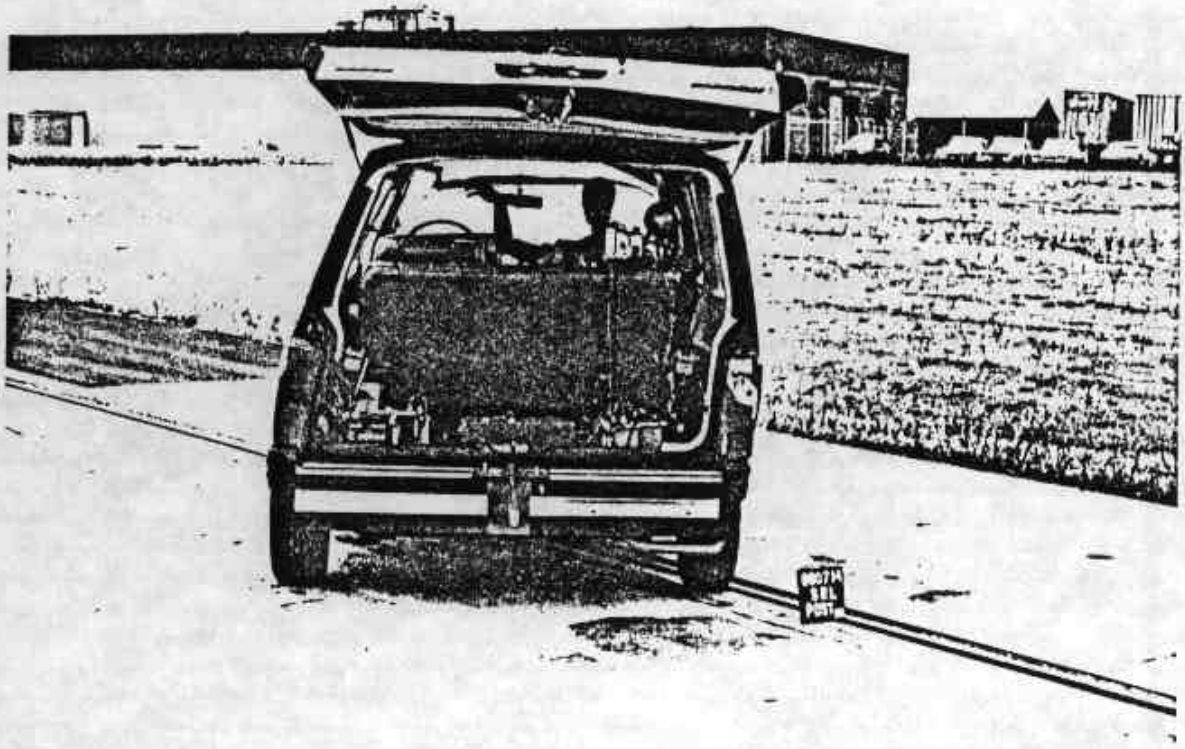


Figure A-13. POST-TEST OVERALL REAR - VIEW 1

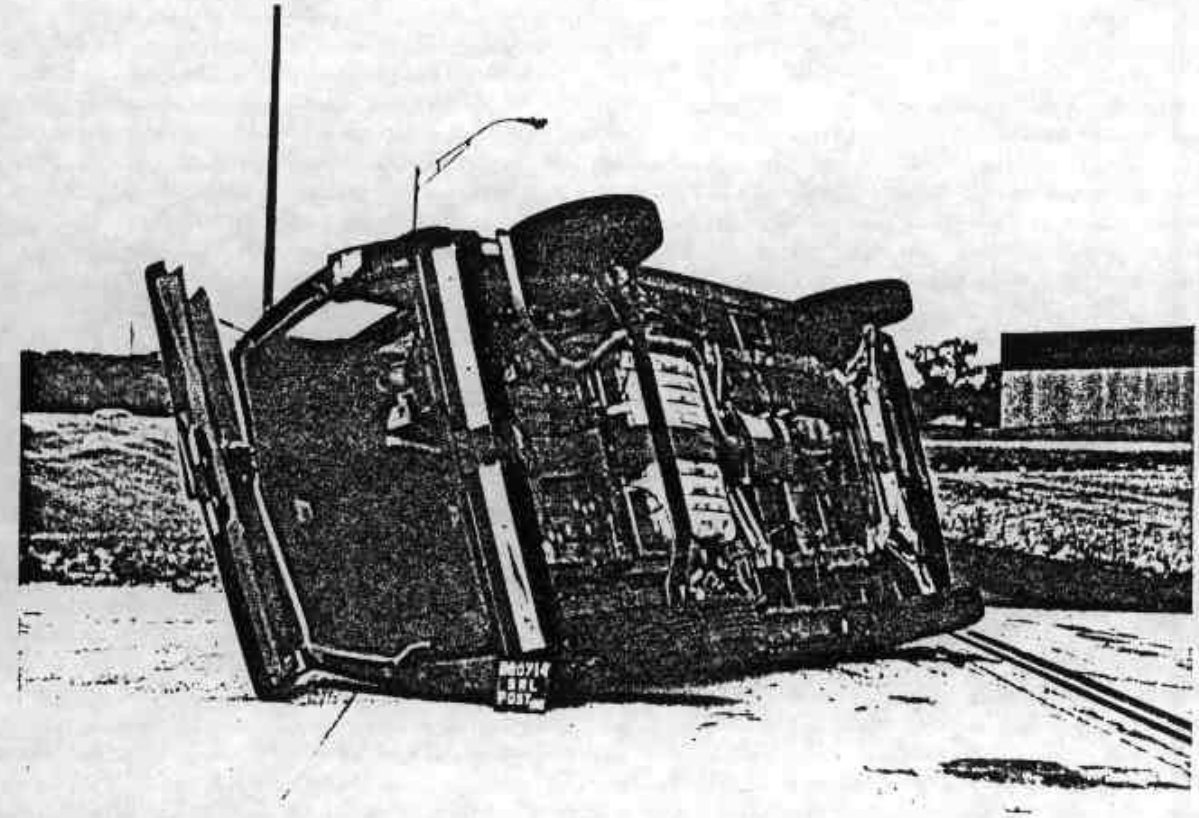


Figure A-14. POST-TEST OVERALL REAR - VIEW 2

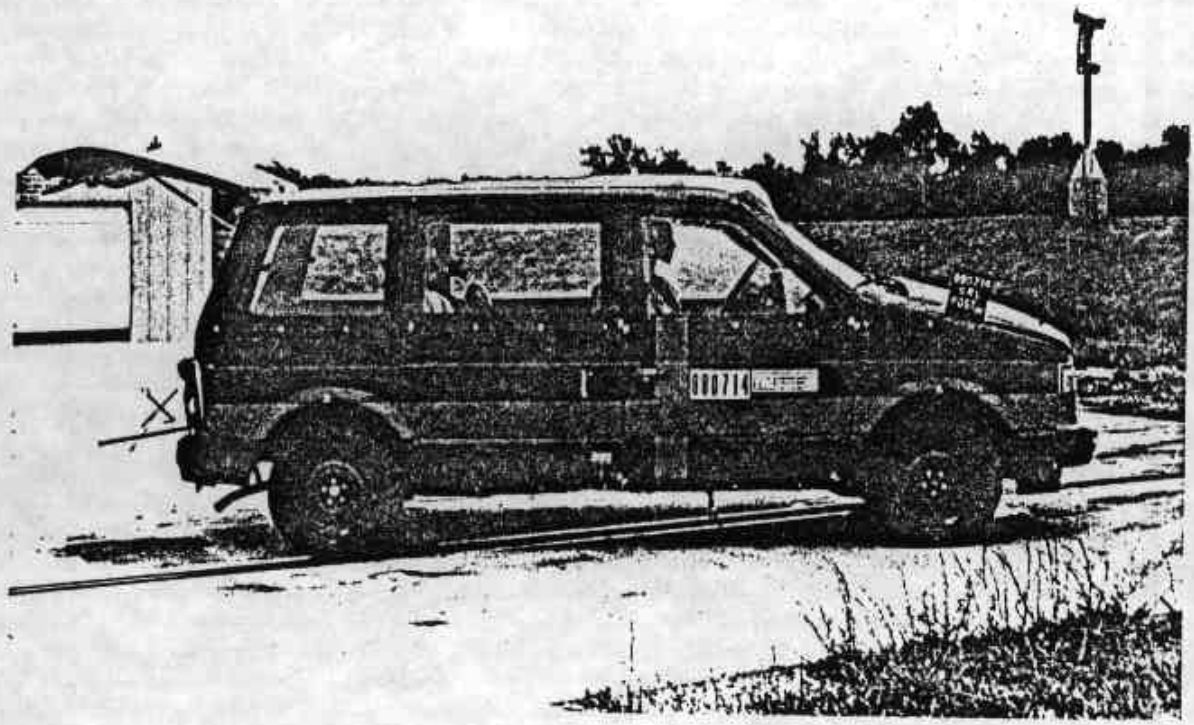


Figure A-15. POST-TEST OVERALL RIGHT SIDE VIEW

Figure A-16. POST-TEST CLOSE-UP FRONT VIEW

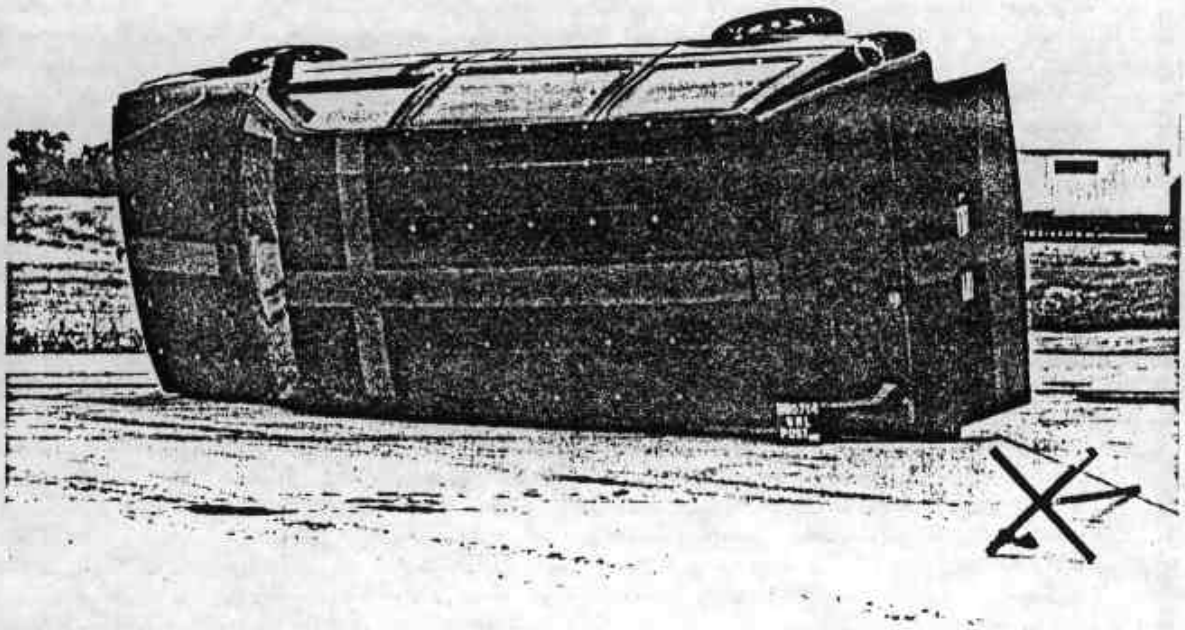


Figure A 17. POST-TEST TOP VIEW

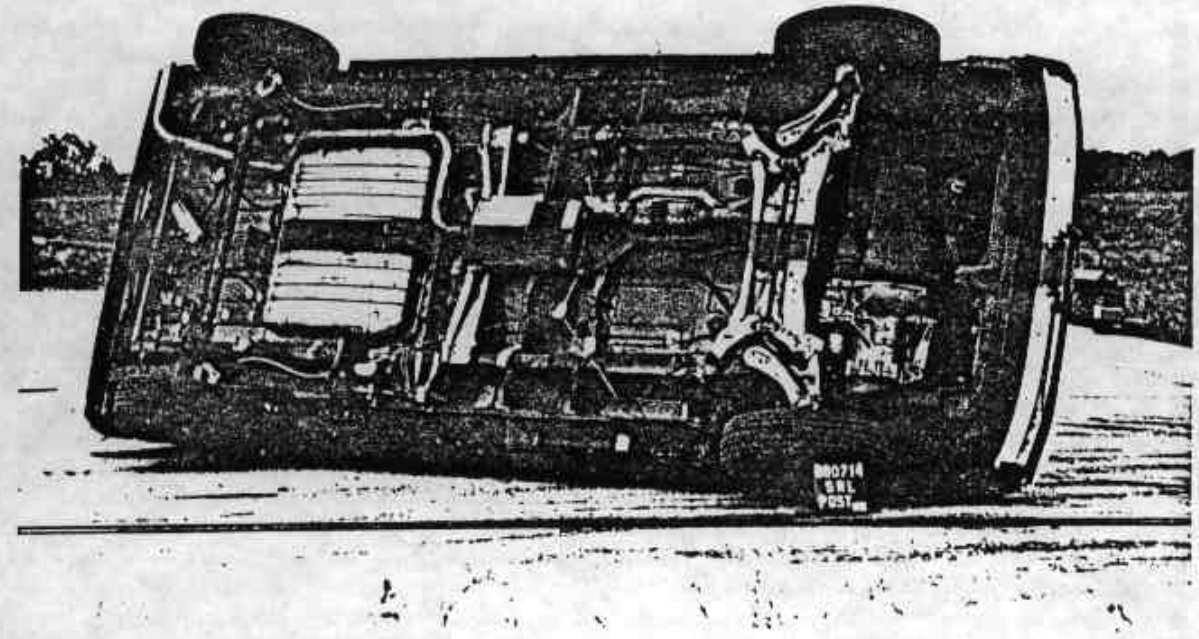


Figure A-18. POST-TEST UNDERBODY VIEW

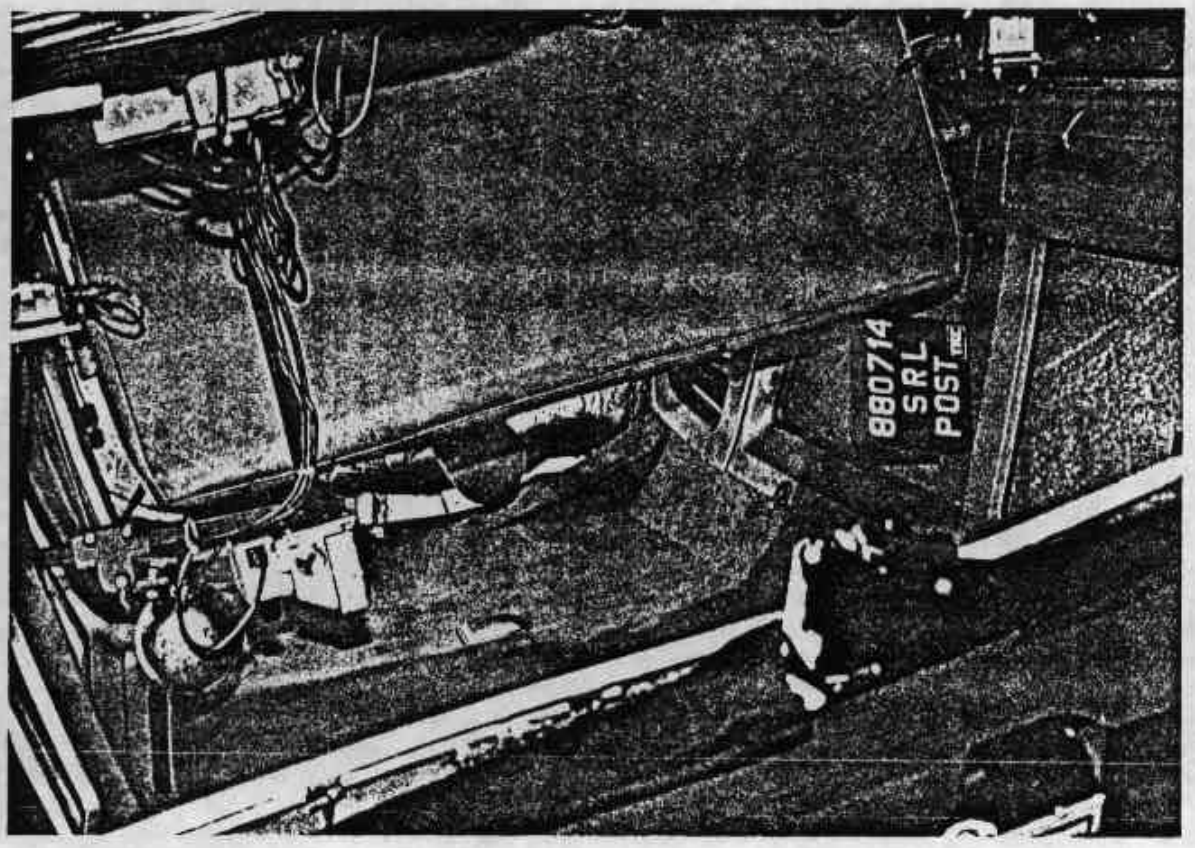


Figure A-19. POST-TEST RIGHT FRONT PASSENGER DUMMY - VIEW 1

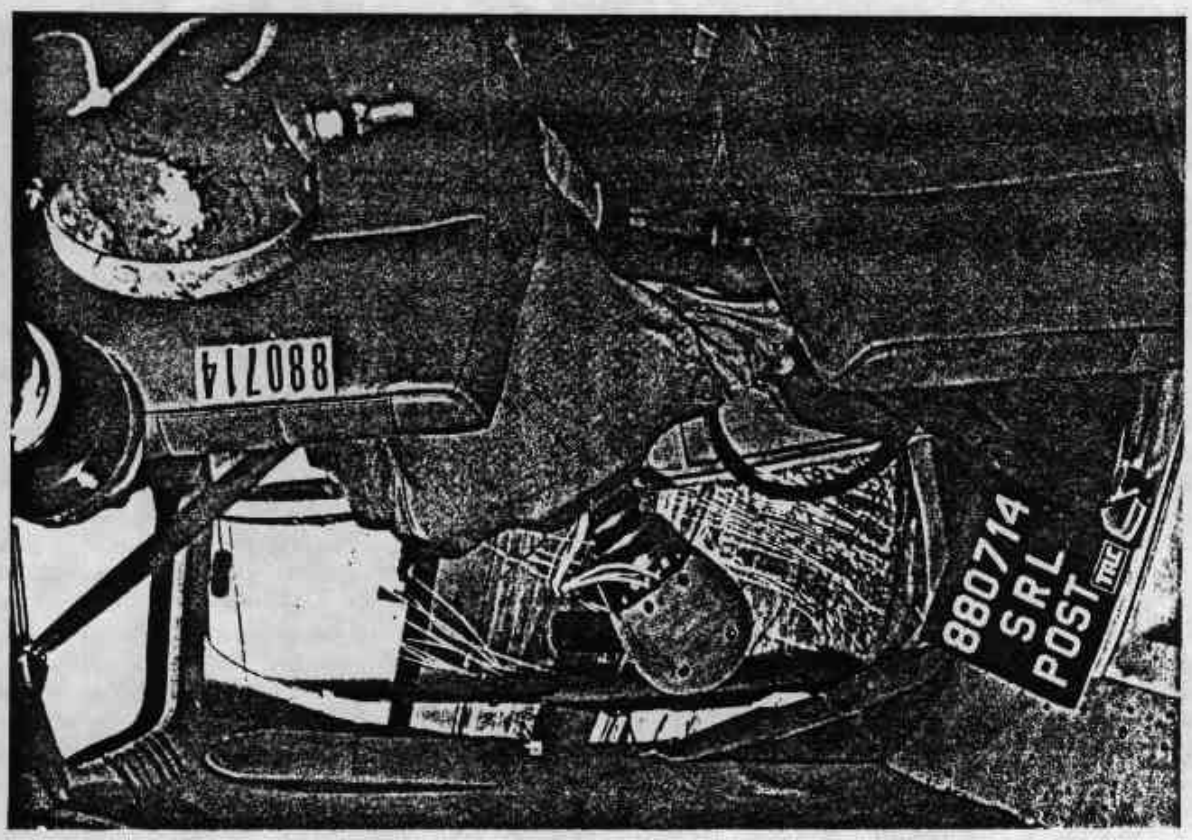


Figure A-20. POST-TEST RIGHT FRONT PASSENGER DUMMY - VIEW 2

Figure A-21. POST-TEST RIGHT FRONT DOOR - VIEW 1

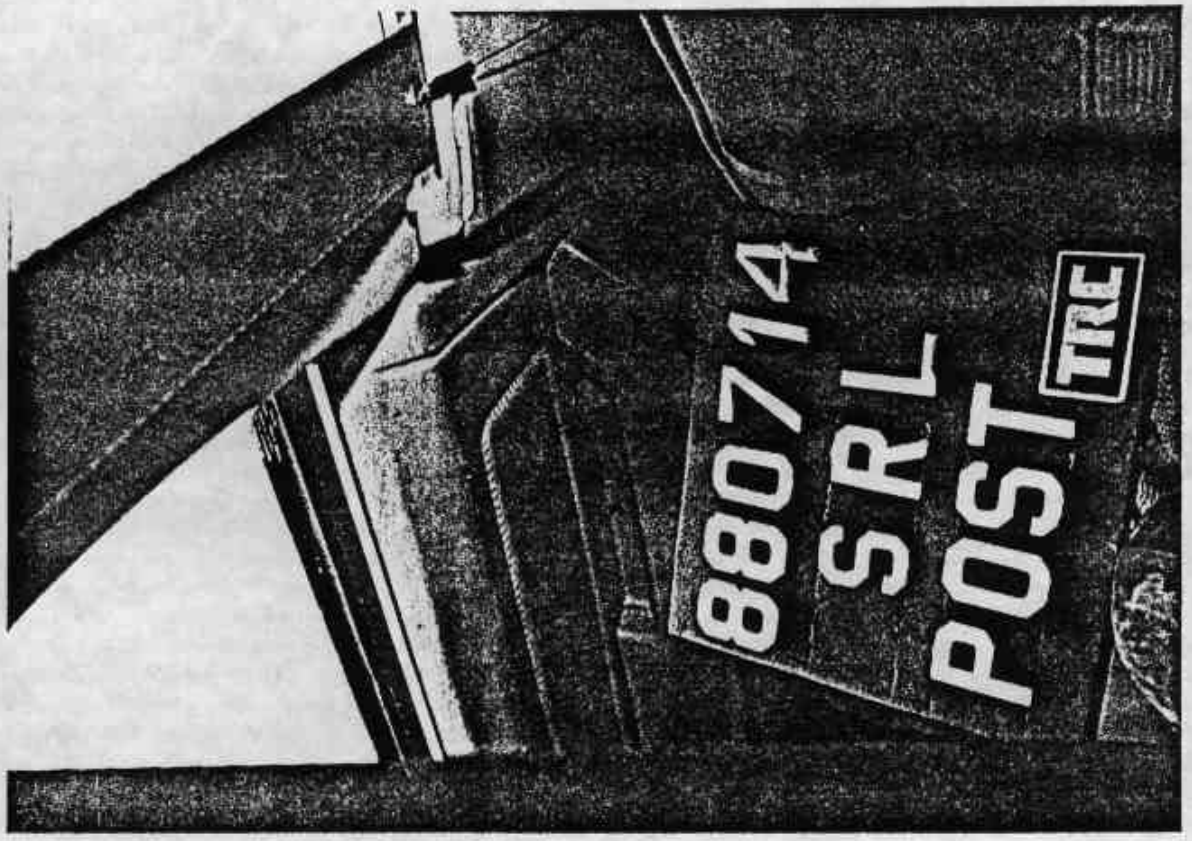
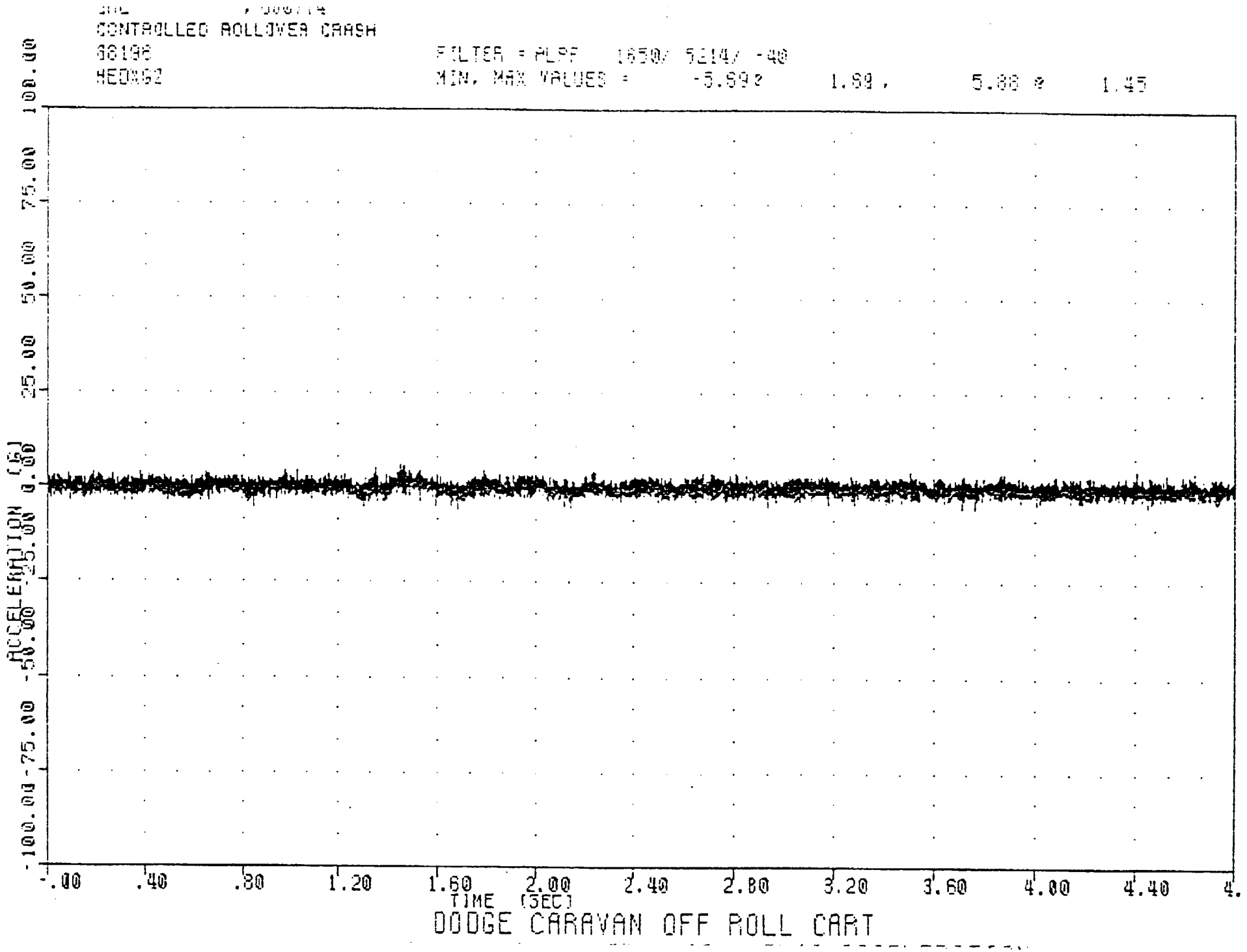
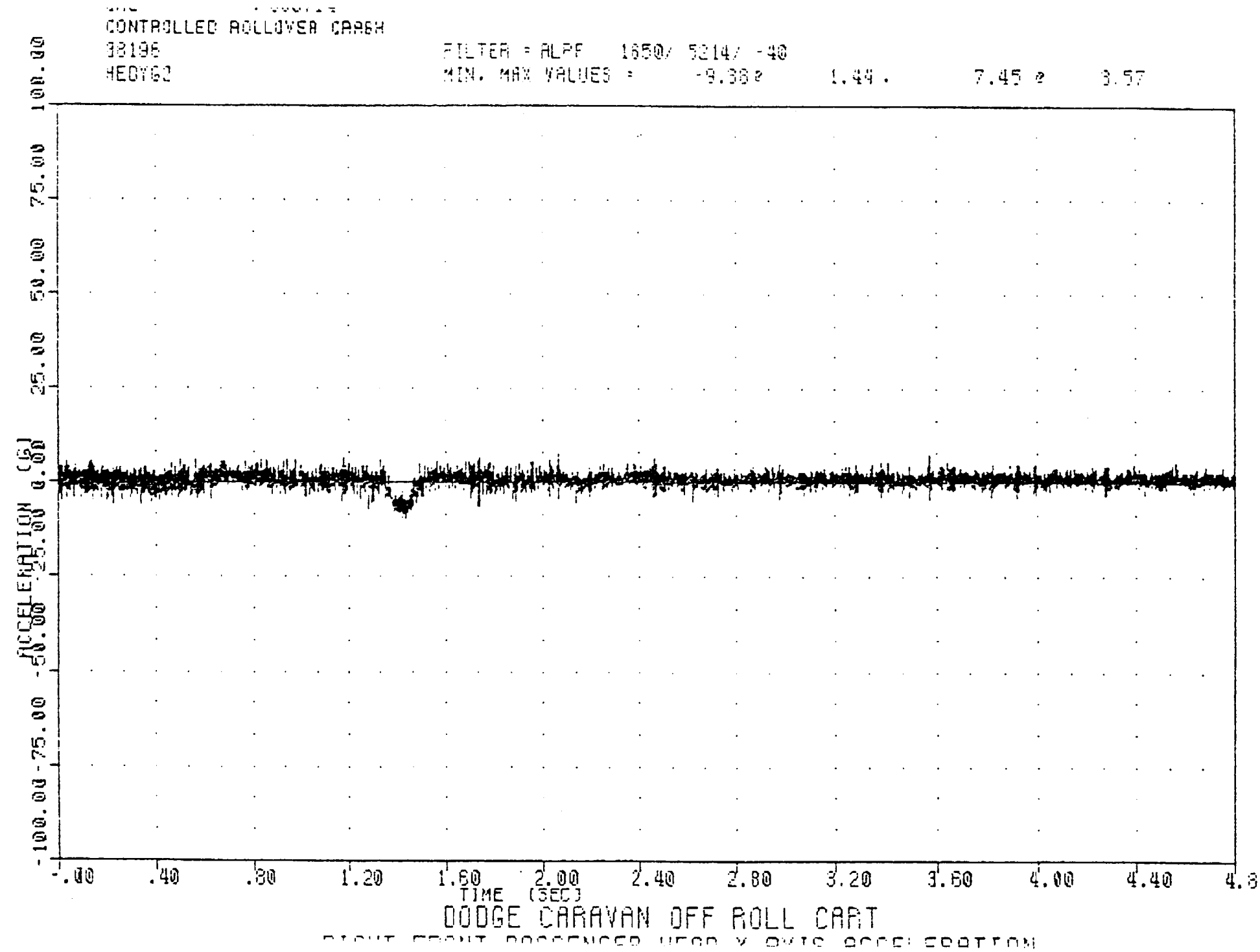


Figure A-22. POST-TEST RIGHT FRONT DOOR - VIEW 2

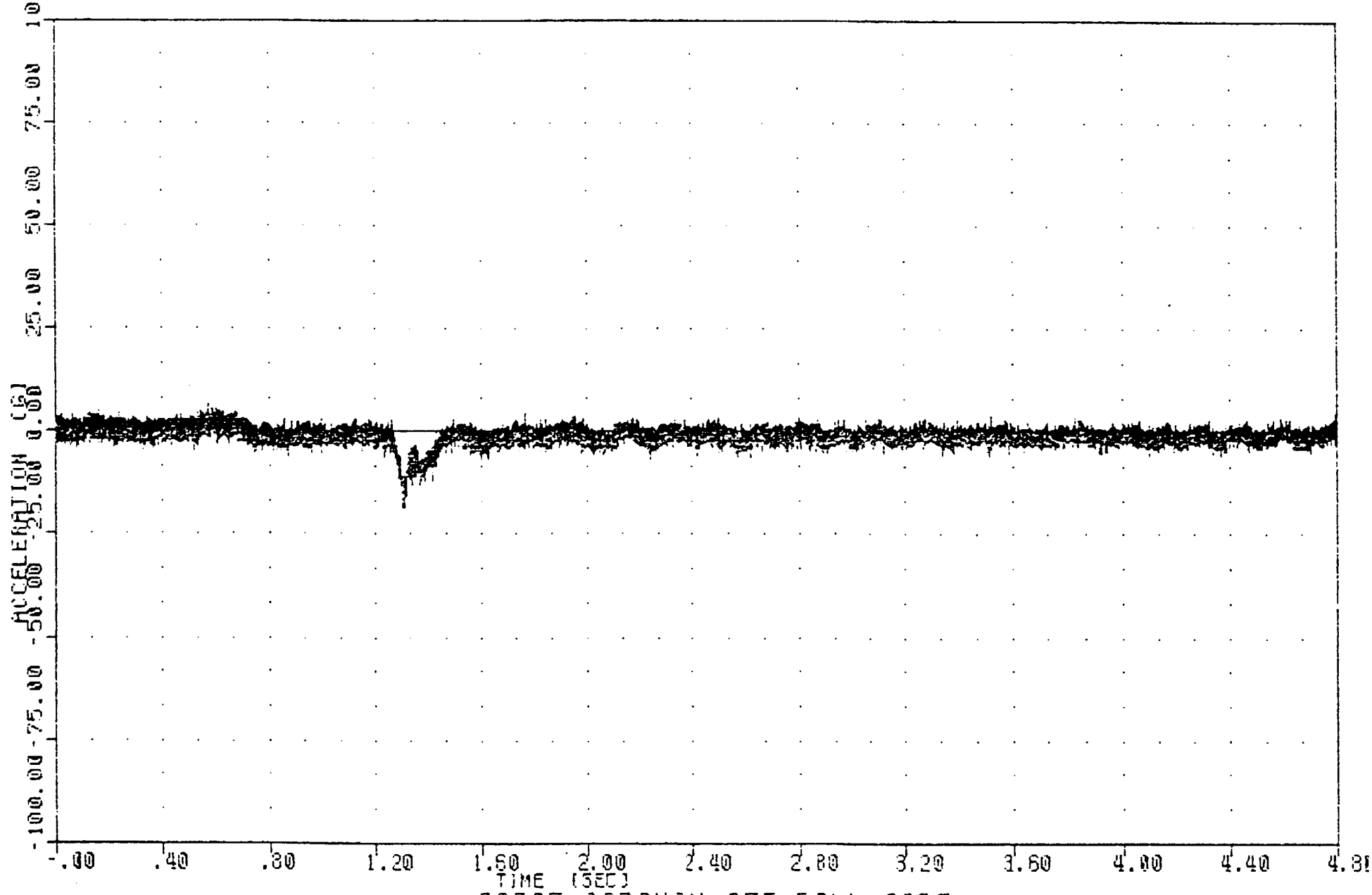
APPENDIX B

DATA PLOT PRESENTATION

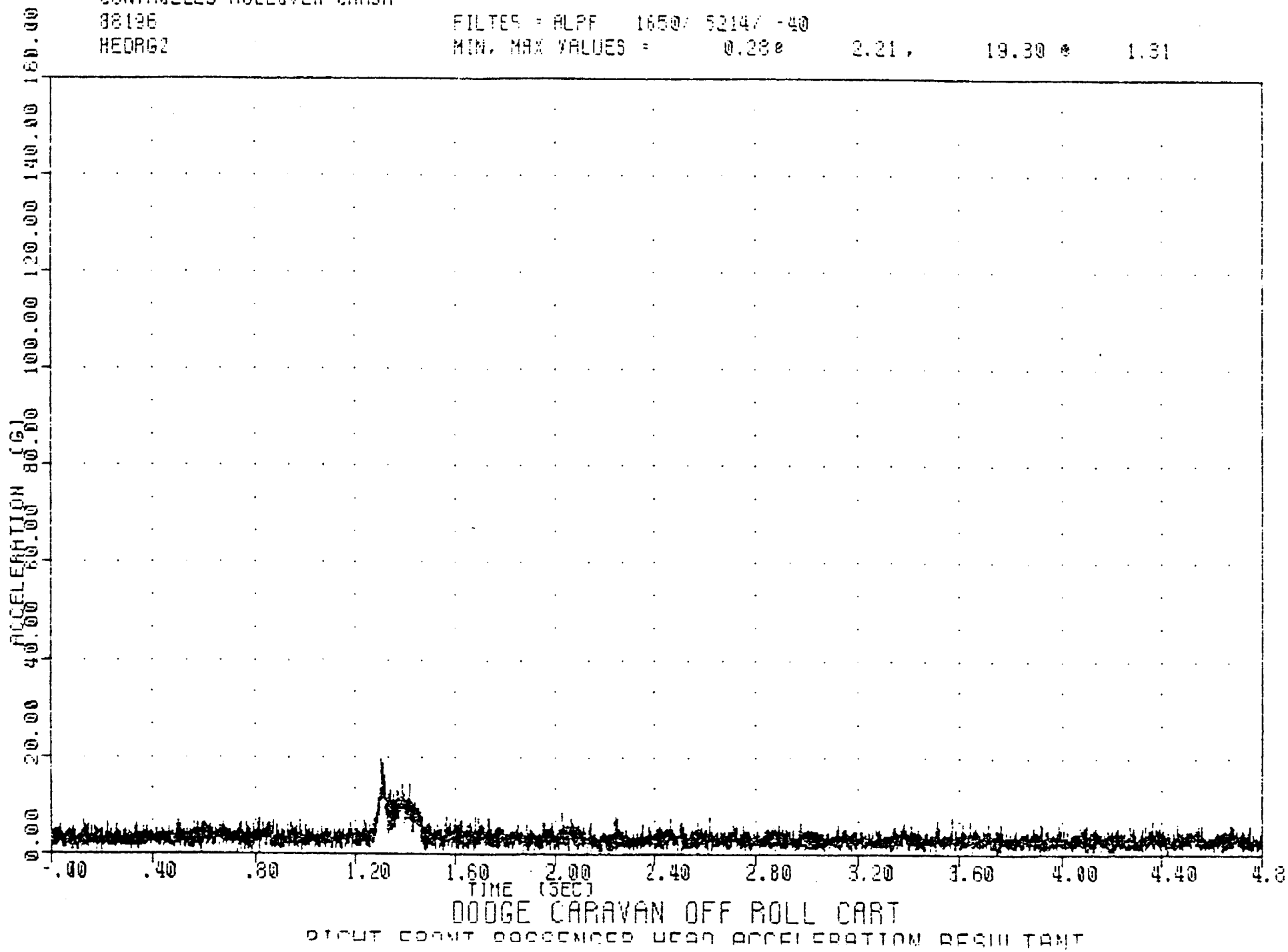

CONTROLLED ROLLOVER CRASH
68198
HEDM62
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -5.99 @ 1.89 , 5.88 @ 1.45
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
ACCELERATION (G)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

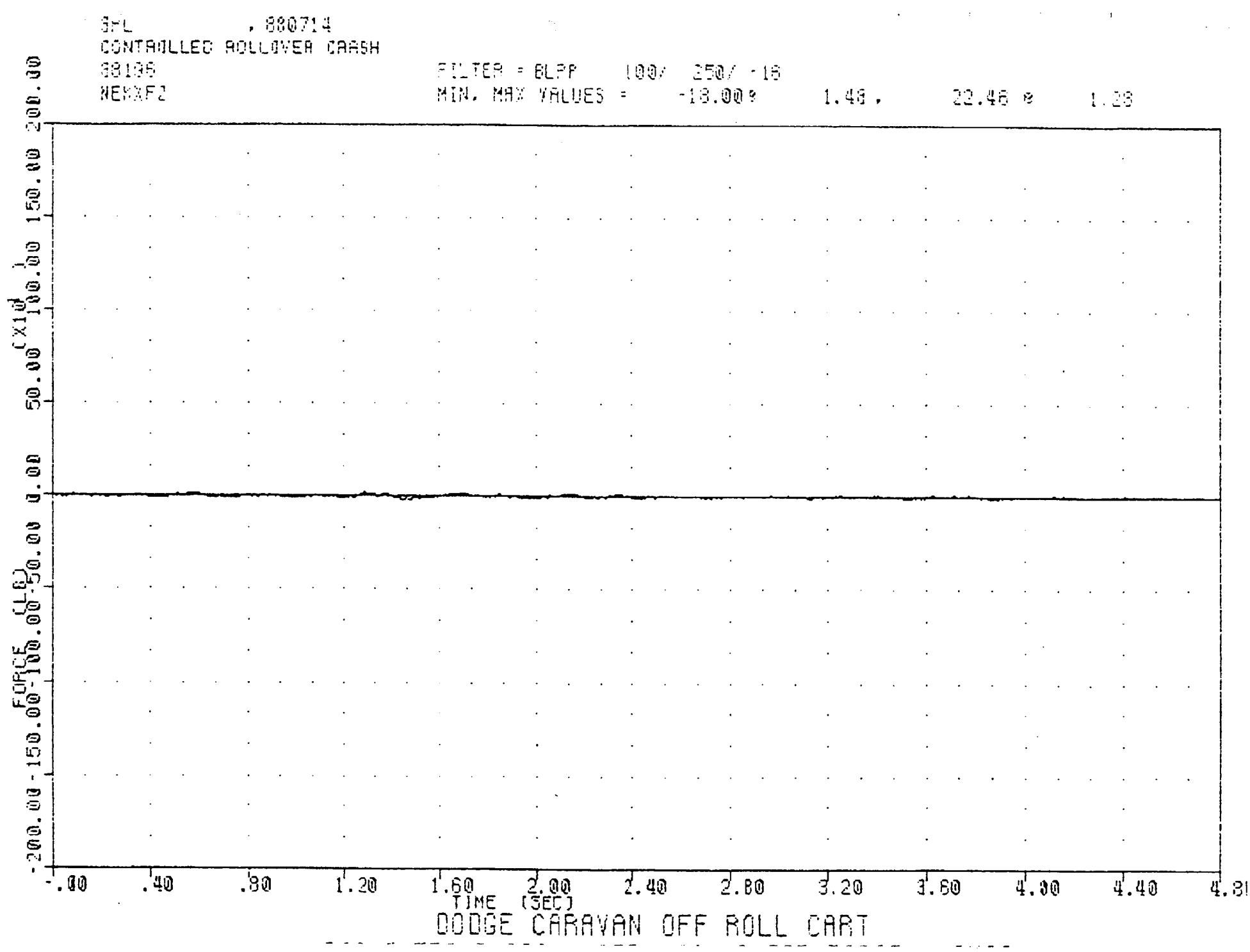

CONTROLLED ROLLOVER CRASH
88196
HEDY62
FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -9.38 @ 1.44 . 7.45 @ 3.57
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
ACCELERATION (G)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.8
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

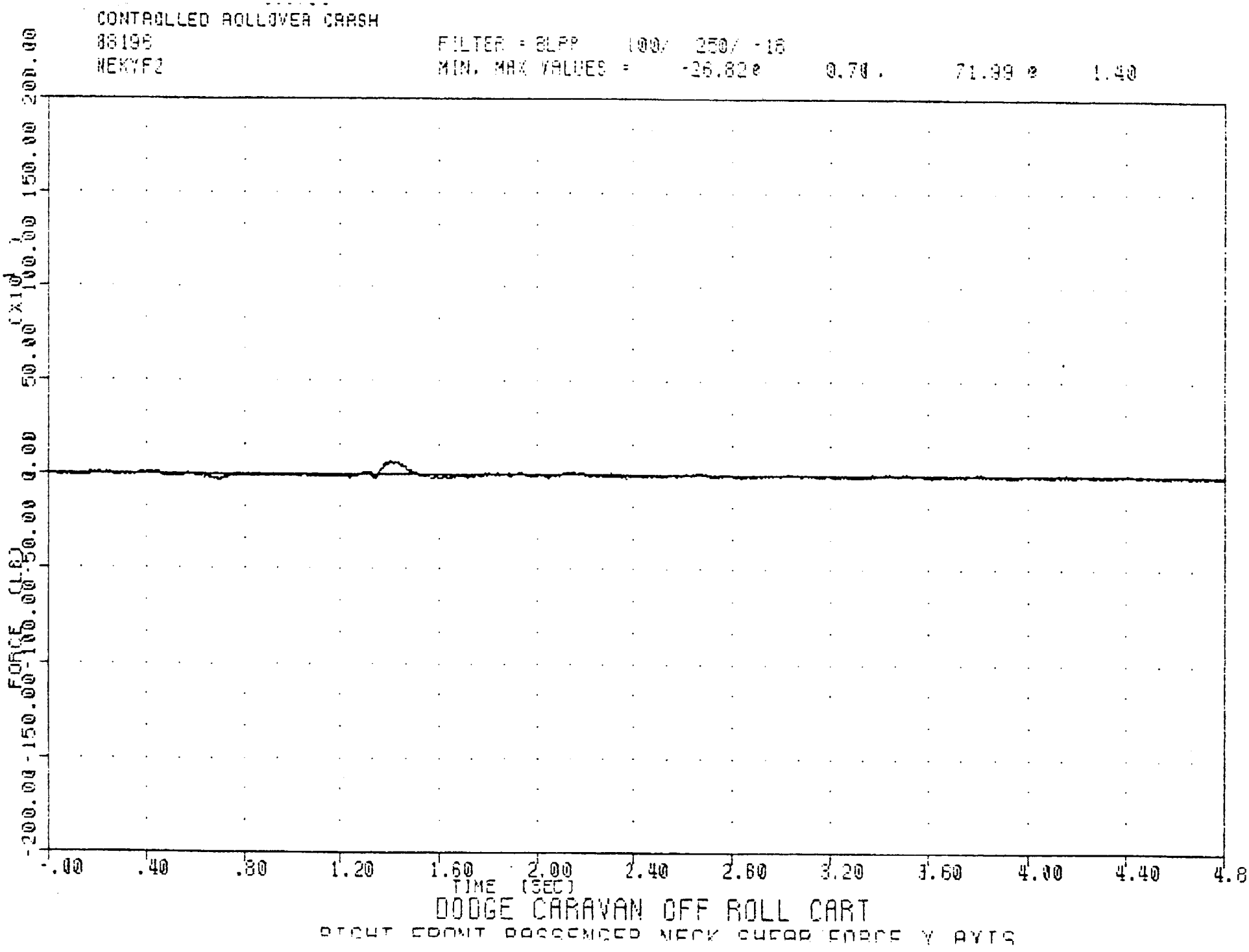
CONTROLLED ROLLOVER CRASH
88196
HEOZG1
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -18.89 1.31 , 8.25 @ 0.58

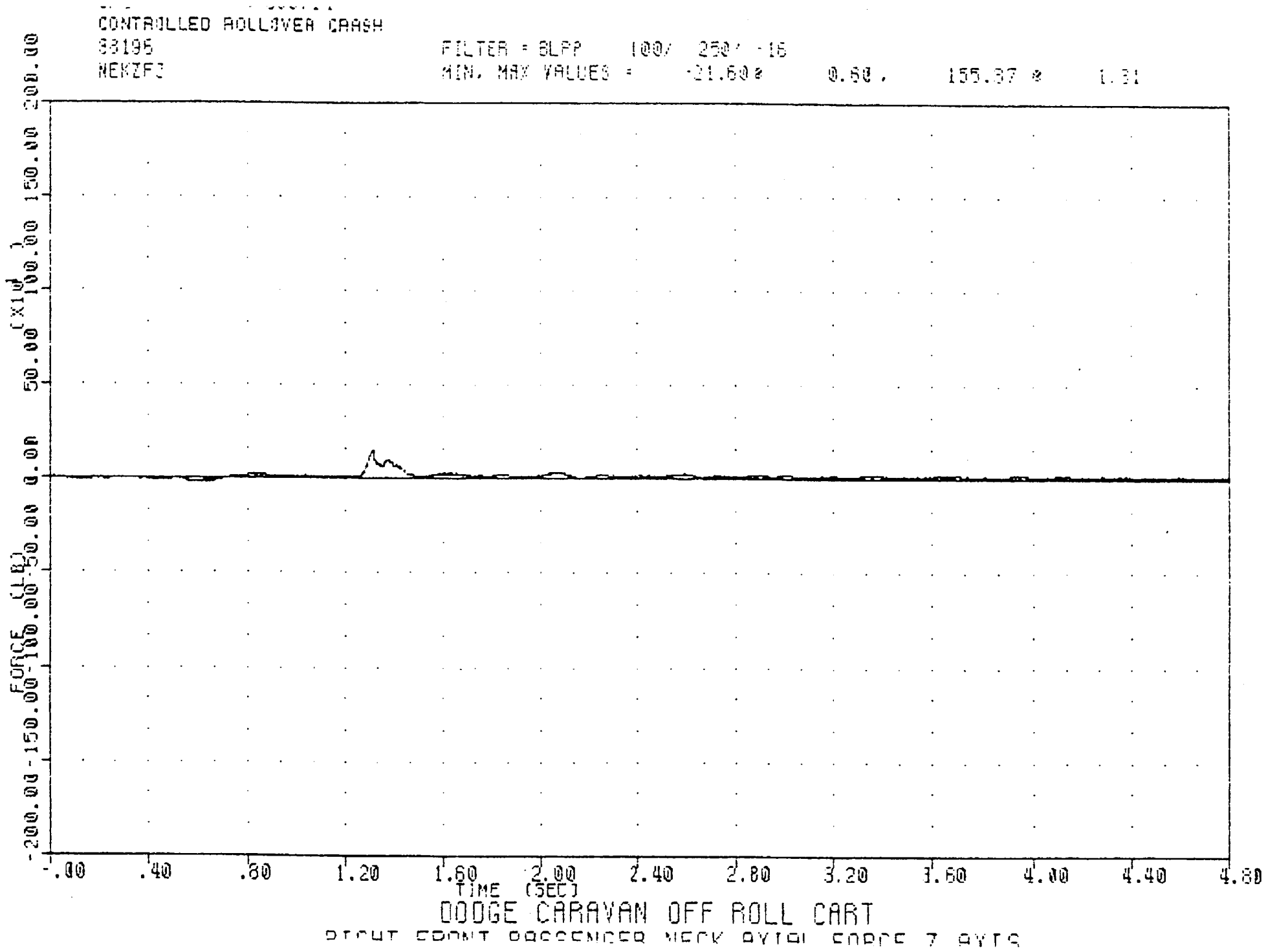


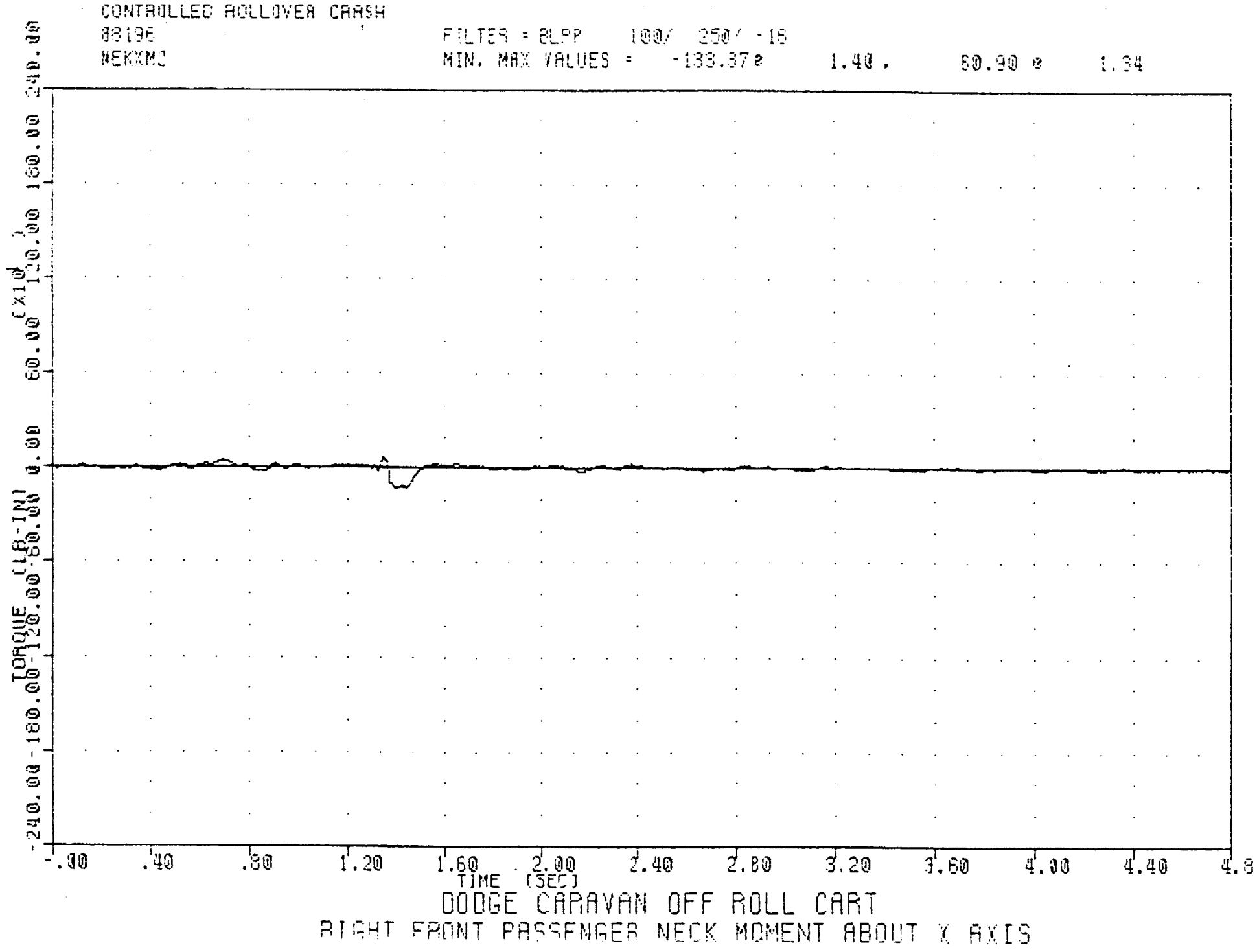
DODGE CARAVAN OFF ROLL CART

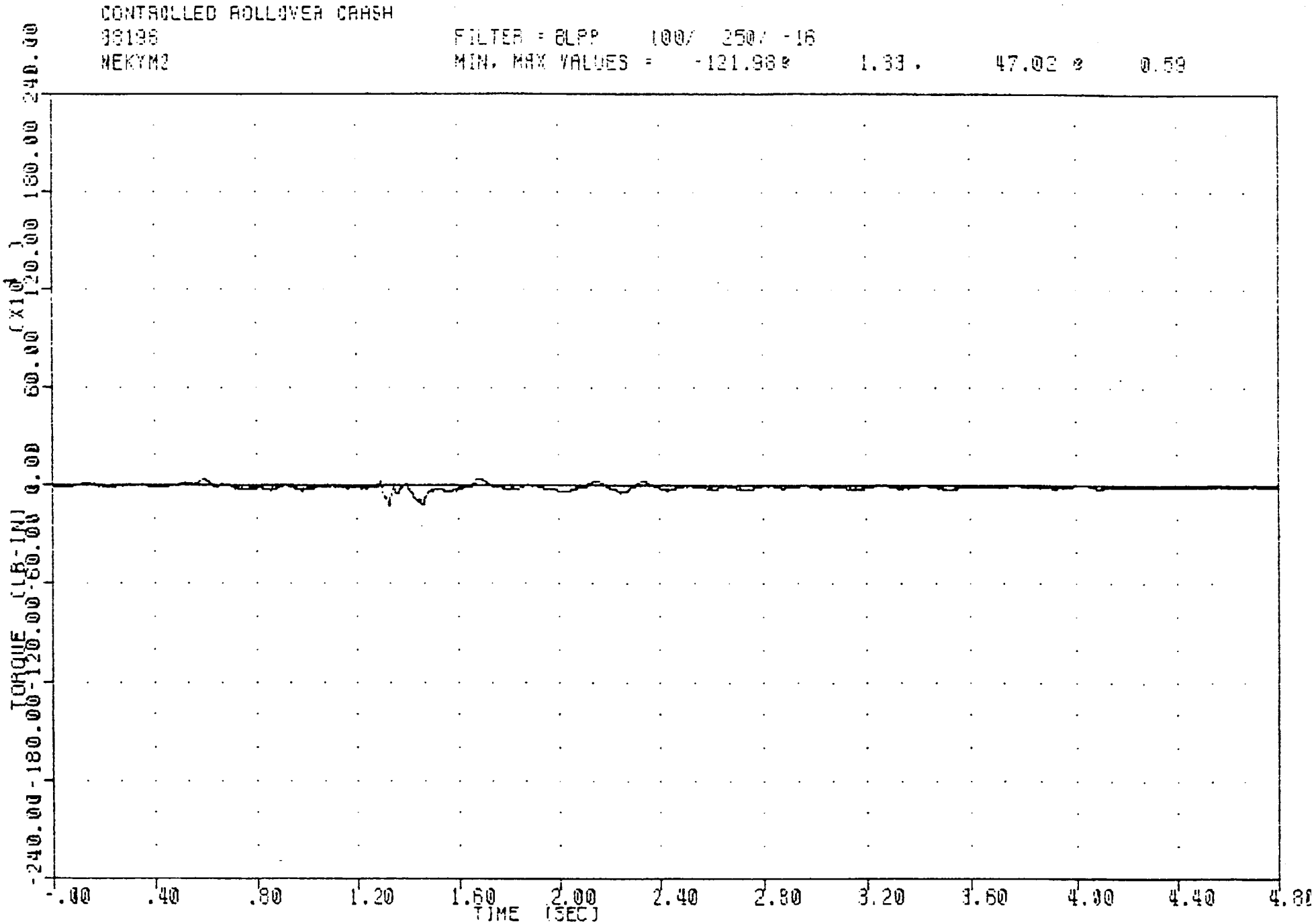

CONTROLLED ROLLOVER CRASH
88136
HEDRG2
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.280 2.21 , 19.30 @ 1.31
ACCELERATION (G)
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER HEAD ACCELERATION RESULTANT


SFL , 880714
CONTROLLED ROLLOVER CRASH
88196
MEMXF2
FILTER = BLPP 100/ 250/ -18
MIN, MAX VALUES = -18.00 @ 1.48 , 22.46 @ 1.28
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
FORCE (LB) (X10)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.81
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

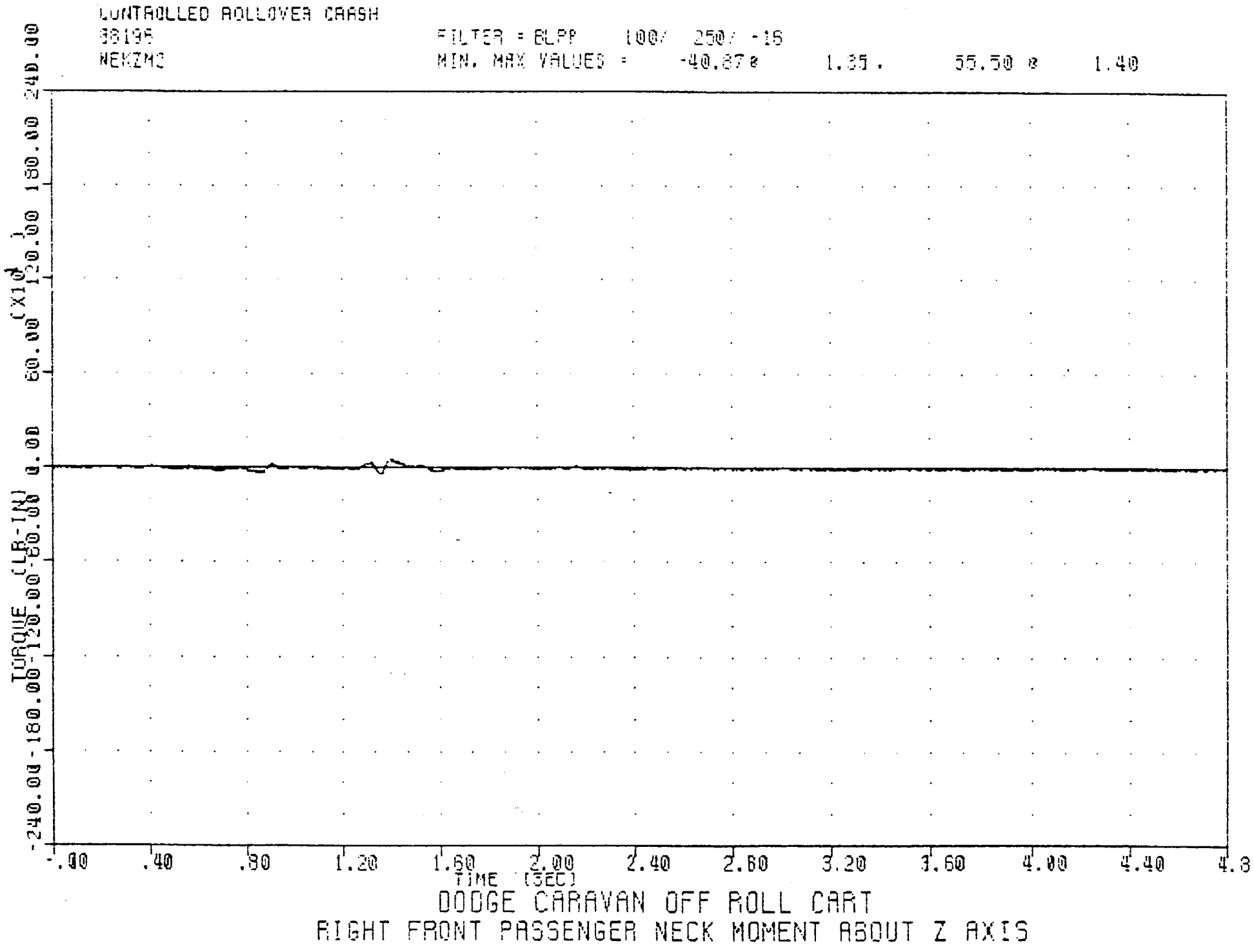

CONTROLLED ROLLOVER CRASH
88196
NEKYF2
FILTER = CFC 60 1000/ 250/ -16
MIN, MAX VALUES = -26.82@ 0.70 . 71.99@ 1.40
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
FORCE (LB)
(X10)
-.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.8
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER NECK UPPER FORCE Y AXIS


CONTROLLED ROLLOVER CRASH
88196
NEKZFC
FILTER = CLFC 100/ 250/ -16
MIN, MAX VALUES = -21.60@ 0.60, 155.37@ 1.31
FORCE (LB) (X10)
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.80
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER NECK AXIAL FORCE 7 AXIS

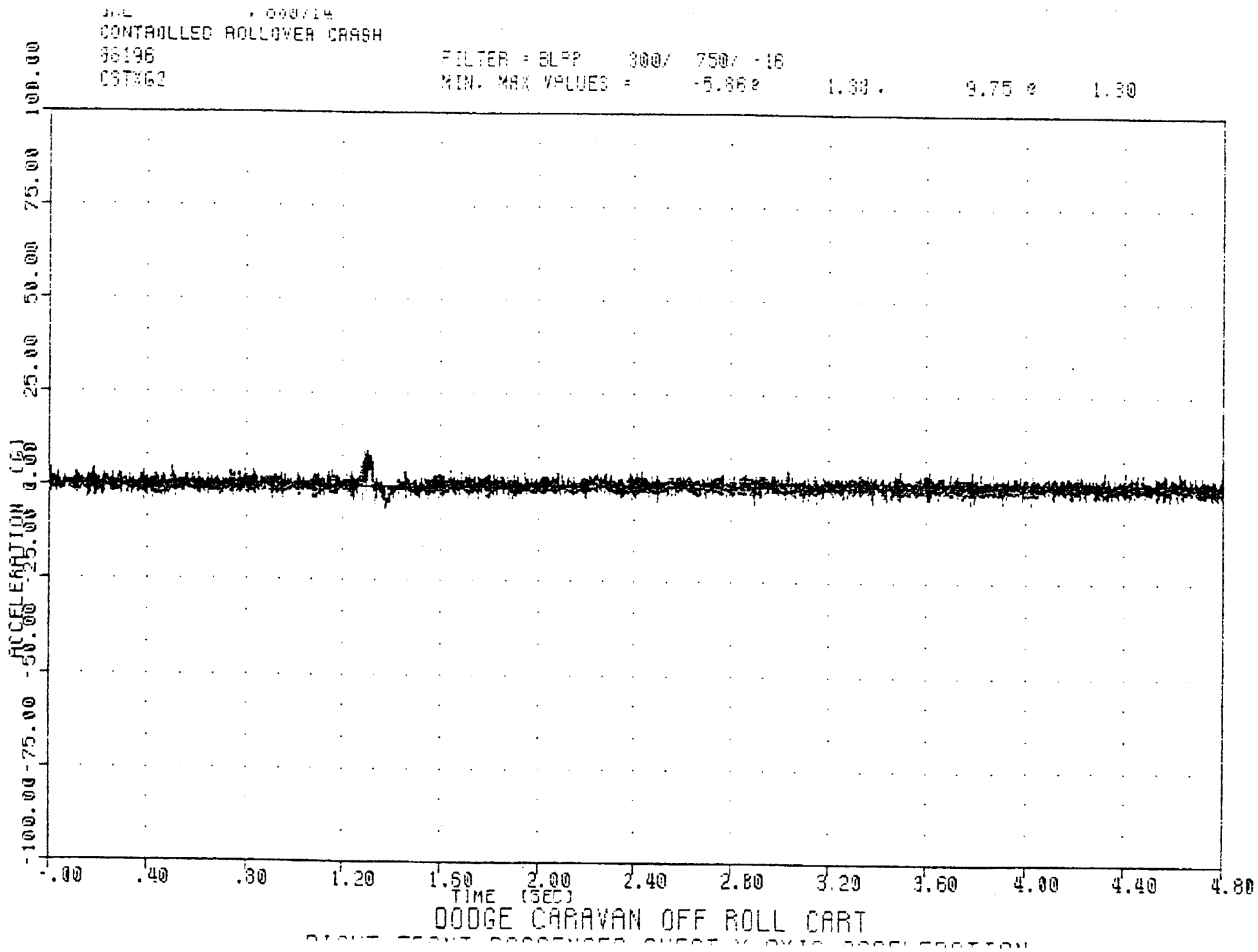

CONTROLLED ROLLOVER CRASH
88198
NEKKMJ
FILTER = BLRP 100/ 350/ -15
MIN, MAX VALUES = -133.37@ 1.40, 80.90@ 1.34
240.00
180.00
120.00
60.00
0.00
-60.00
-120.00
-180.00
-240.00
TORQUE (LB-IN) (X10)
-.80
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.8
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER NECK MOMENT ABOUT X AXIS

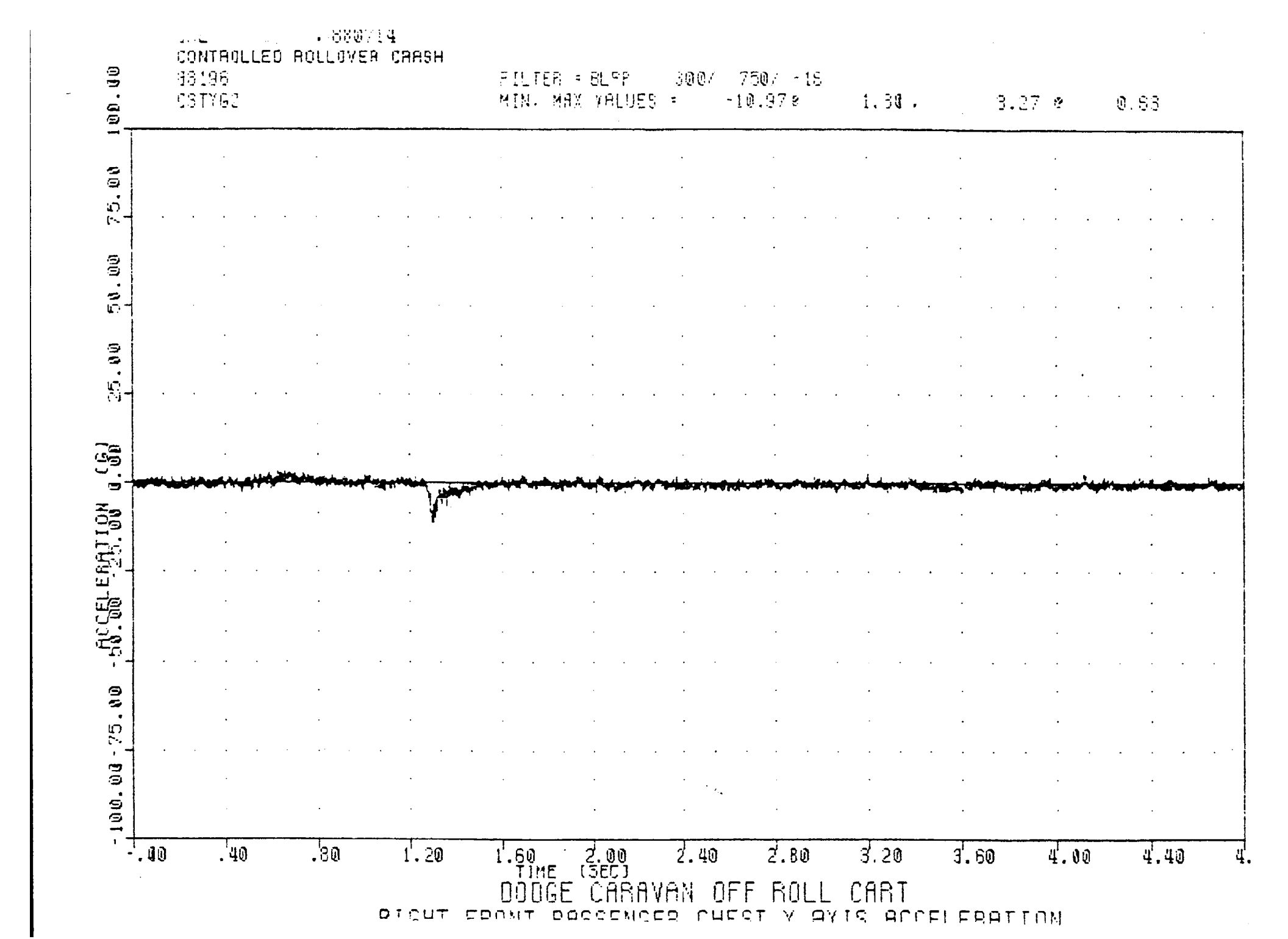


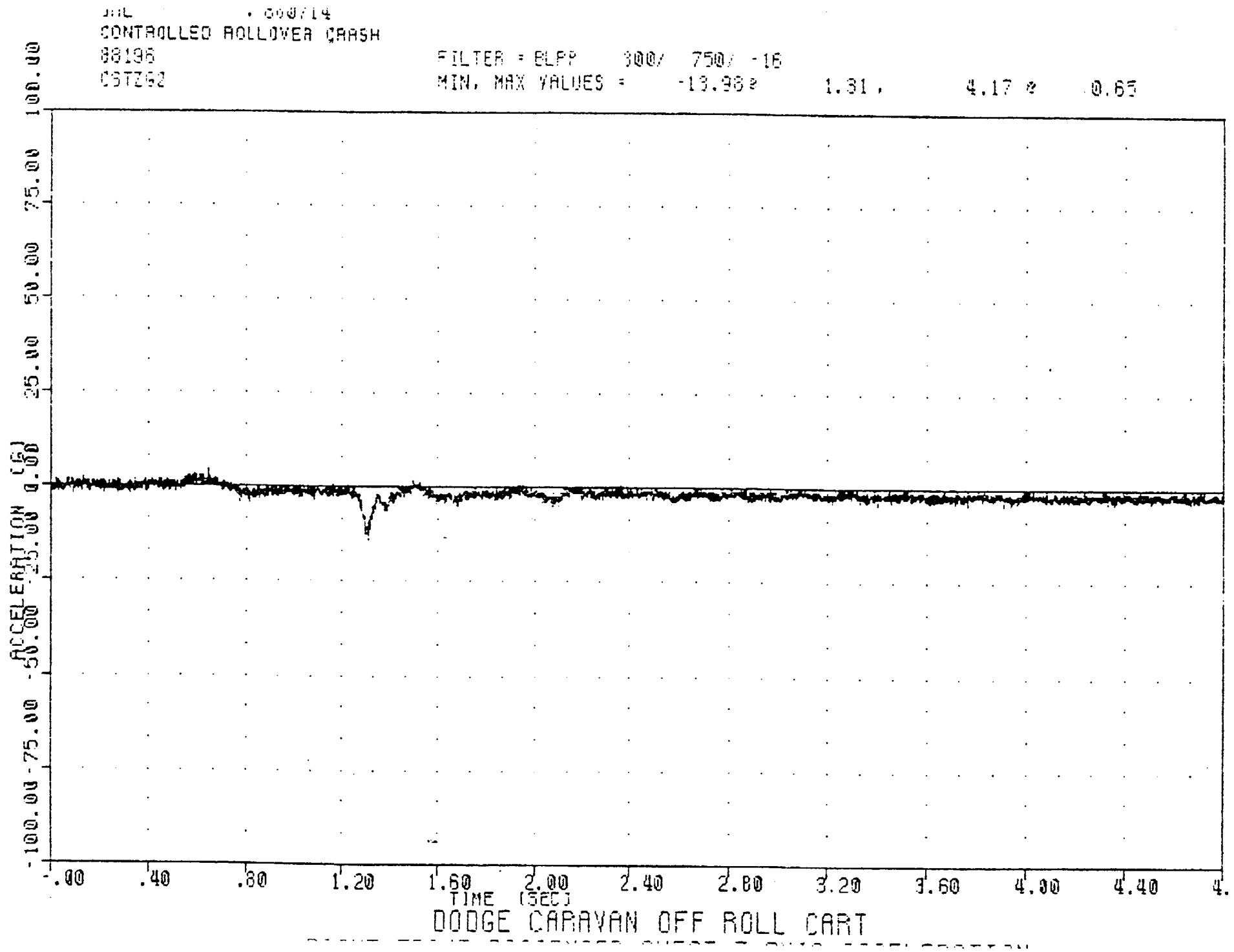
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER NECK MOMENT ABOUT Y AXIS

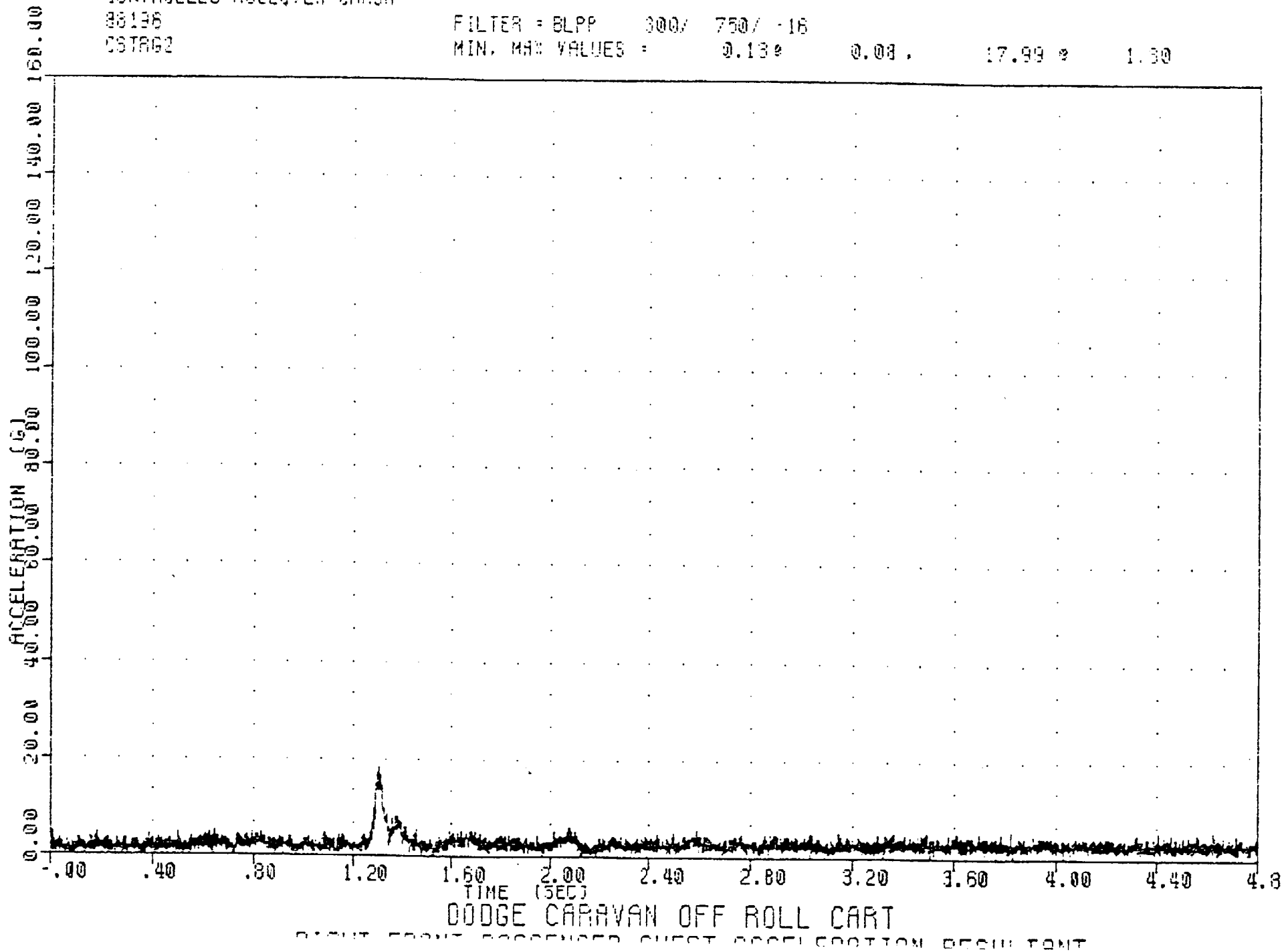


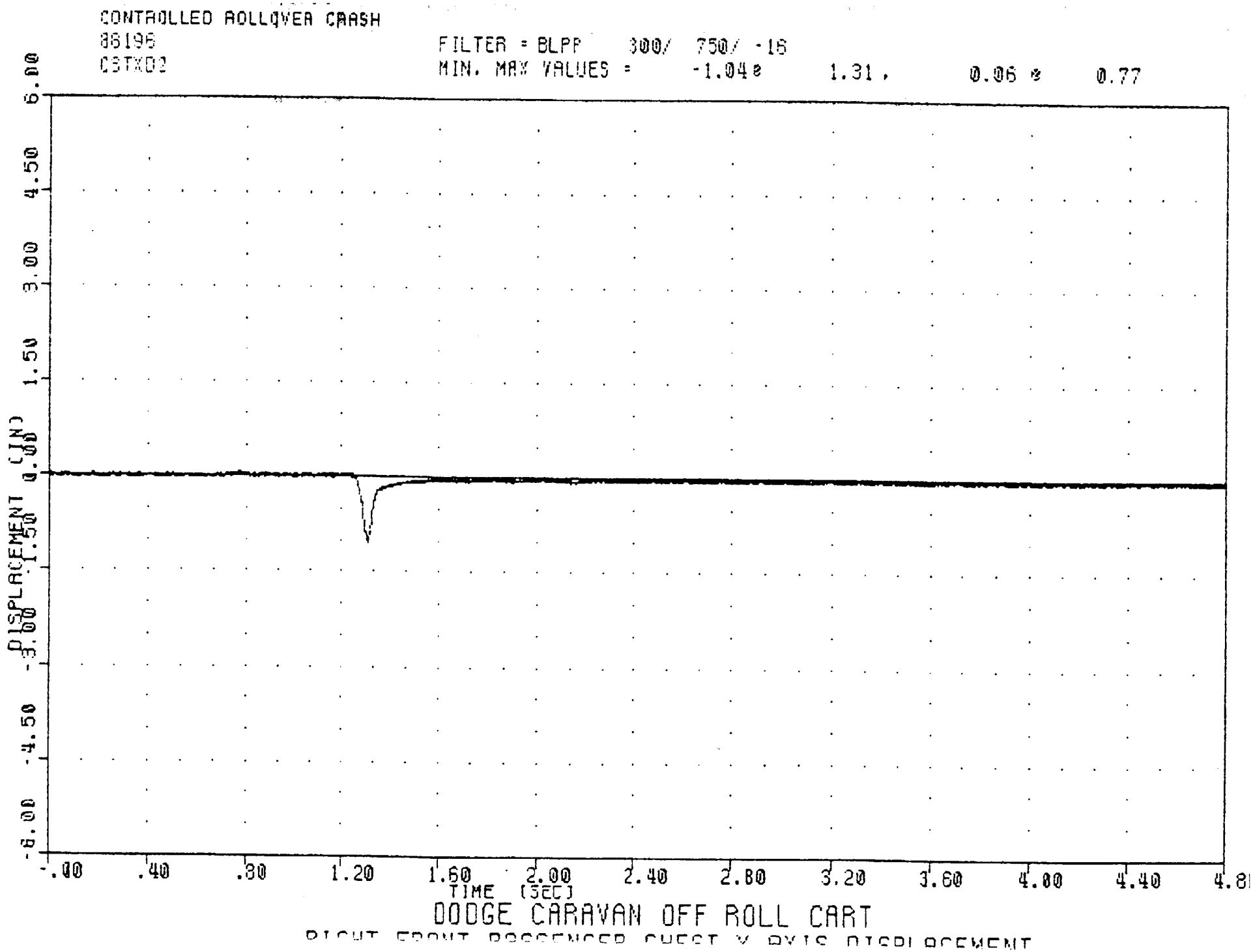
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER NECK MOMENT ABOUT Z AXIS

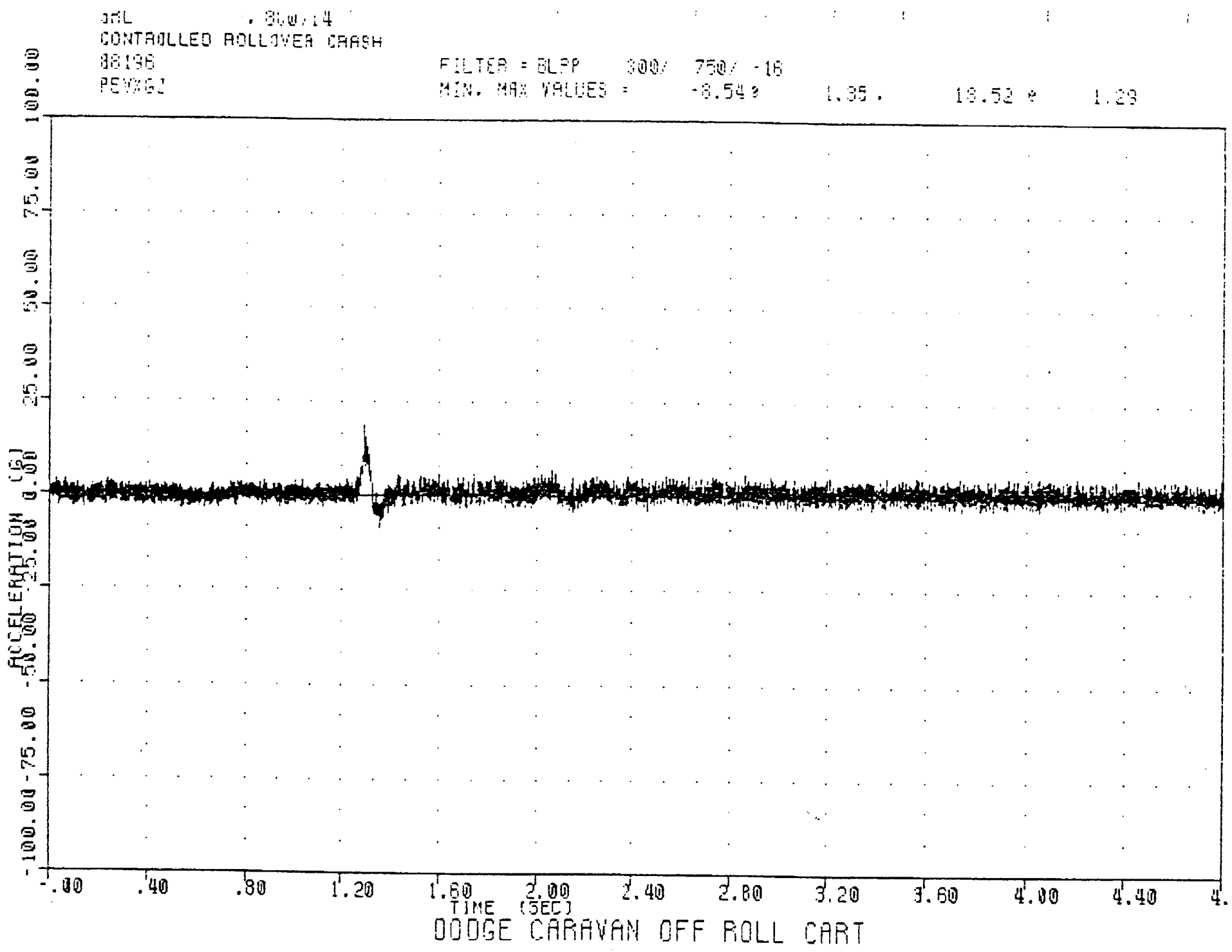

CONTROLLED ROLLOVER CRASH
86196
CST%62
FILTER = BLPP 300/ 750/ -18
MIN. MAX VALUES = -5.86 @ 1.30 , 9.75 @ 1.30
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
ACCELERATION (G)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.80
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

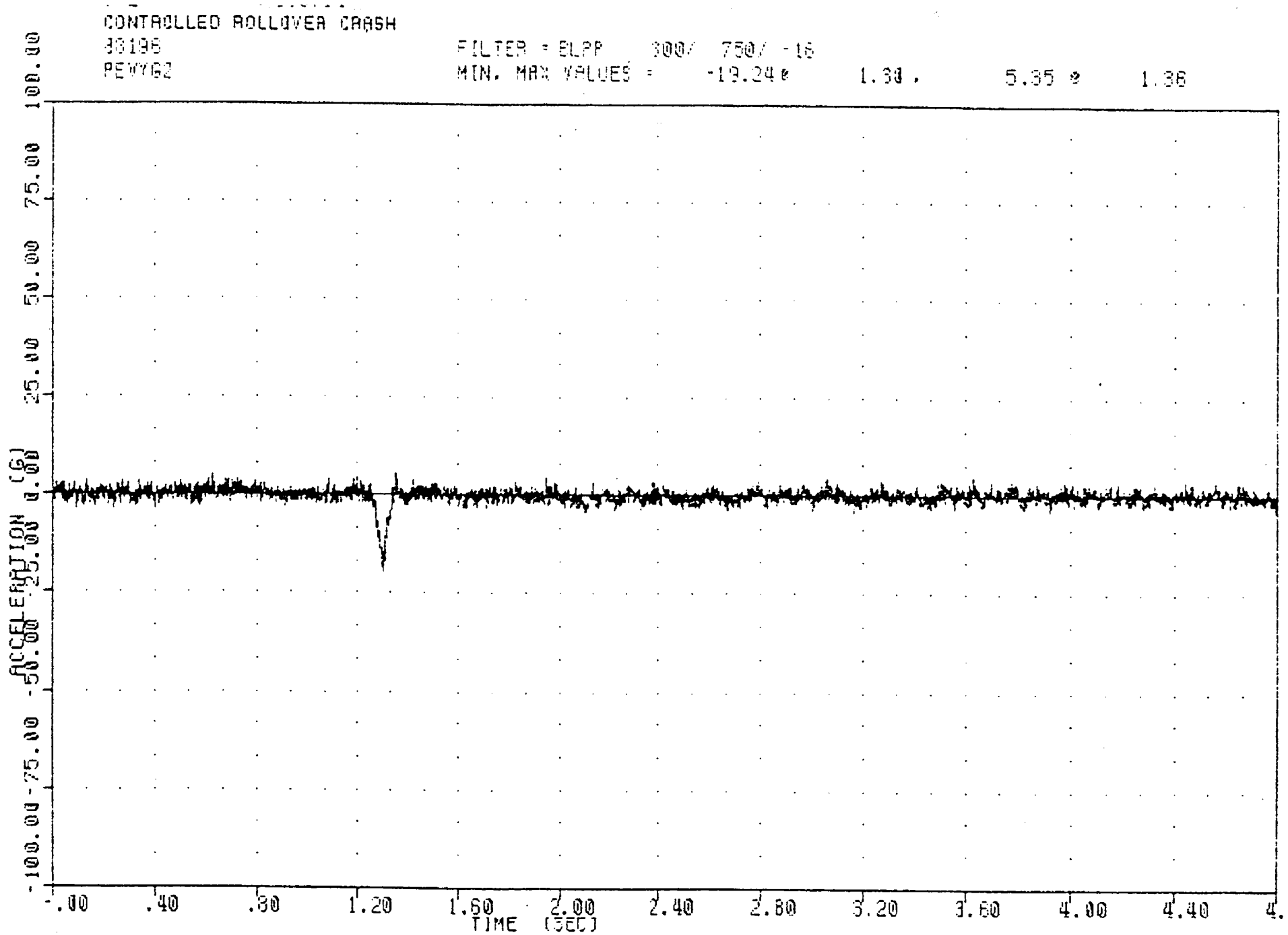

CONTROLLED ROLLOVER CRASH
88196
CSTYG2
FILTER = BLOP 300/ 750/ -15
MIN. MAX VALUES = -10.97@ 1.30 . 3.27 @ 0.53
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
ACCELERATION (G)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER CHEST Y AXIS ACCELERATION

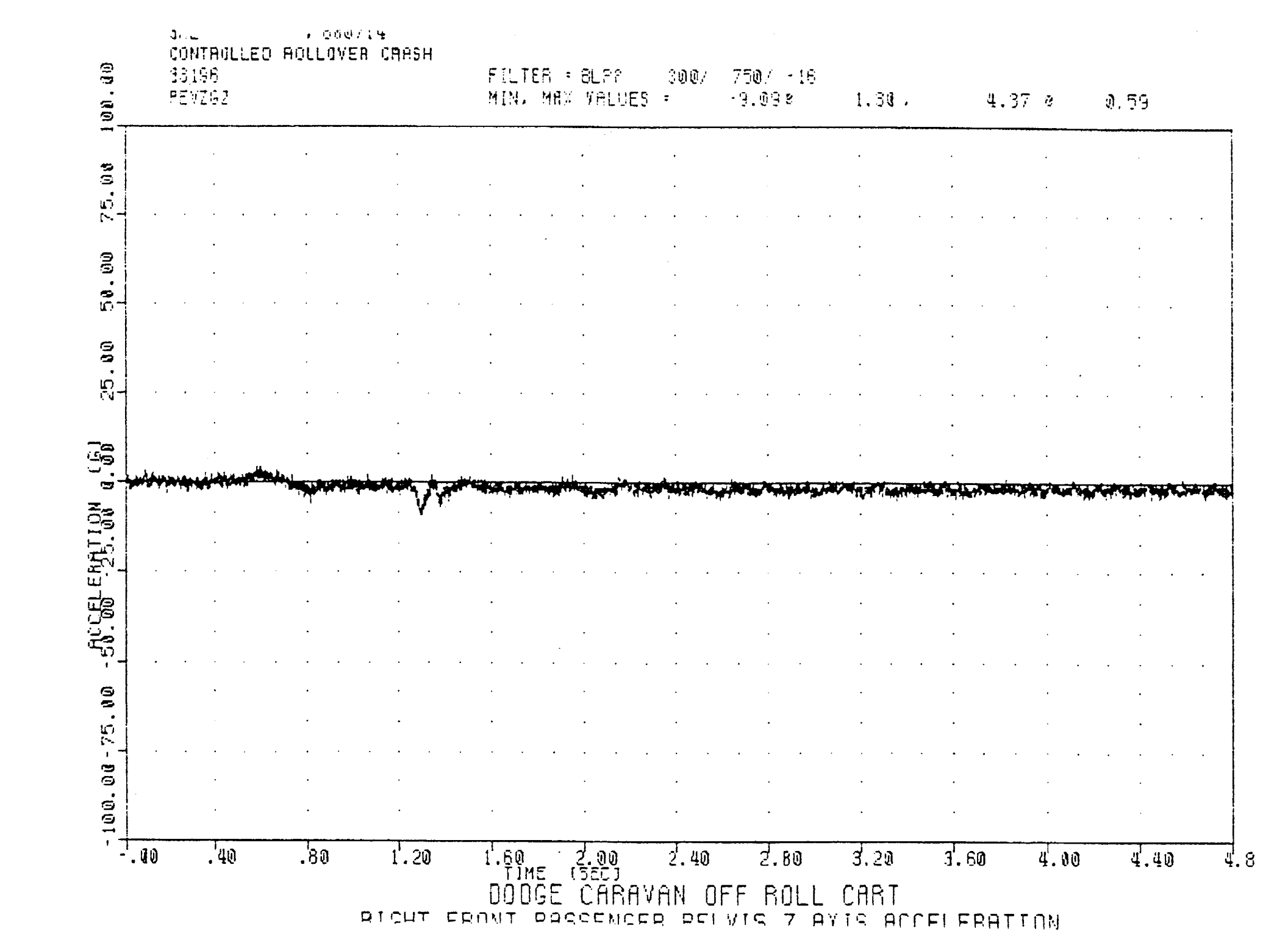

JAL • 000714
CONTROLLED ROLLOVER CRASH
88196
CSTZ62
FILTER = BLPF 300/ 750/ -16
MIN, MAX VALUES = -13.98@ 1.31, 4.17@ 0.65
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
ACCELERATION (G)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

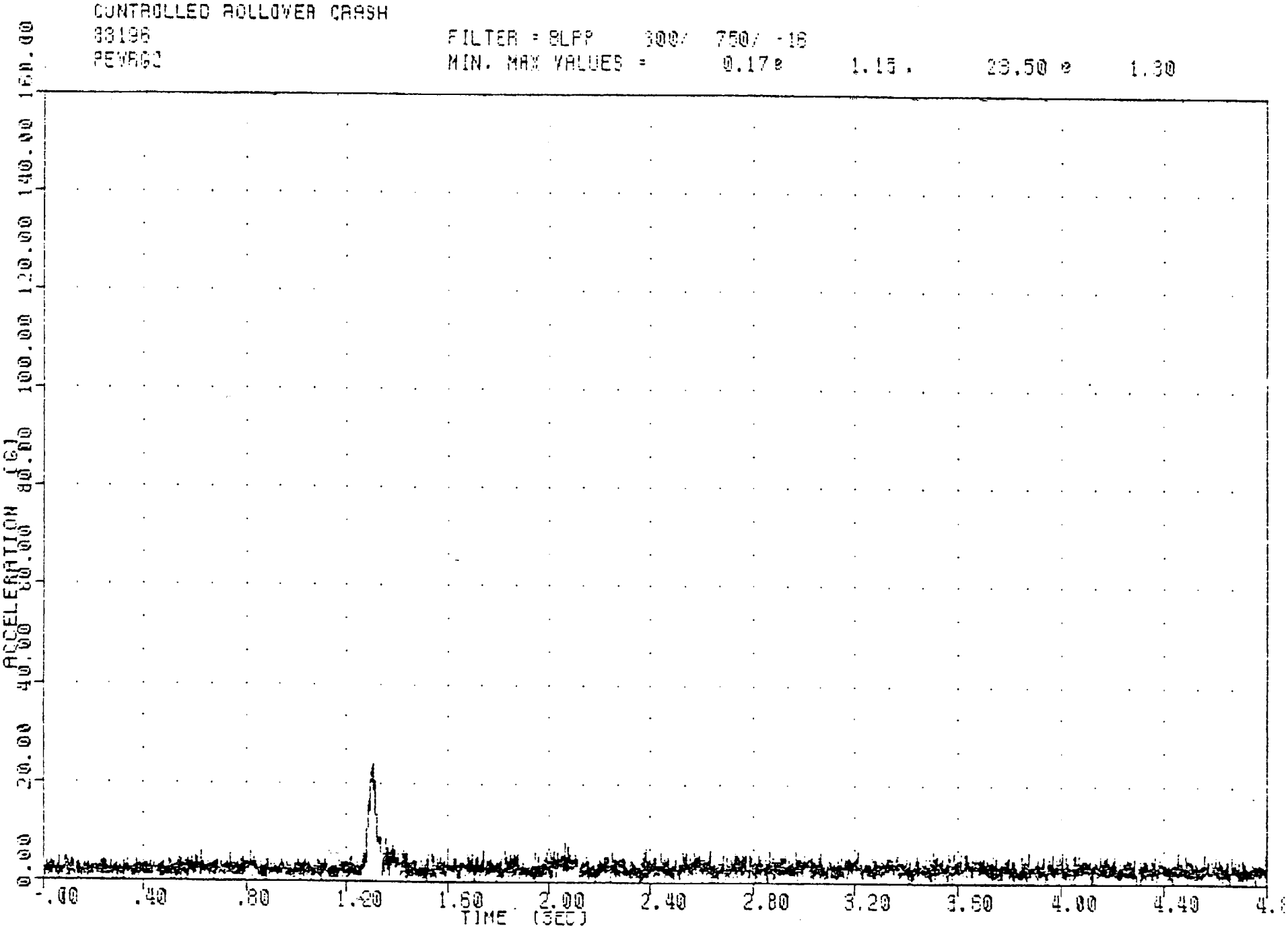

CONTROLLED ROLLOVER CRASH
88136
CSTRG2
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = 0.13@ 0.08, 17.99@ 1.30
ACCELERATION (G)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.8
TIME (SEC)
DODGE CARAVAN OFF ROLL CART


CONTROLLED ROLLOVER CRASH
86196
CSTX02
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -1.04@ 1.31 , 0.06 @ 0.77
6.00
4.50
3.00
1.50
0.00
-1.50
-3.00
-4.50
-6.00
DISPLACEMENT (IN)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER CHEST Y AXIS DISPLACEMENT


CONTROLLED ROLLOVER CRASH
88196
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -8.54 g 1.35 . 18.52 g 1.29
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
ACCELERATION (G)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

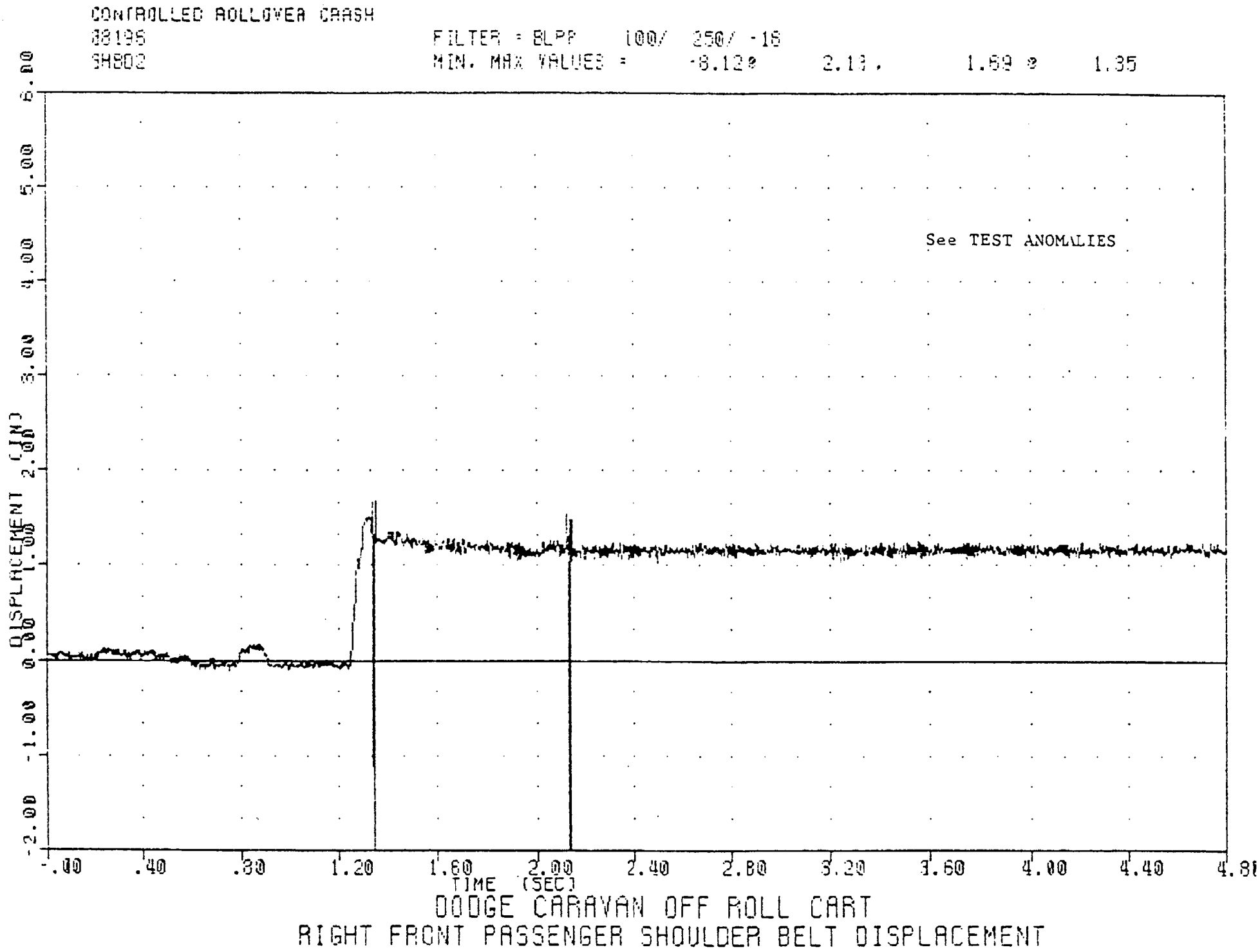

CONTROLLED ROLLOVER CRASH
33196
PEWYG2
FILTER = CLASS 300/ 750/ -16
MIN, MAX VALUES = -19.24 @ 1.38 , 5.35 @ 1.38
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
ACCELERATION (G)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER PELVIS Y AXIS ACCELERATION


CONTROLLED ROLLOVER CRASH
33198
PEVZ62
FILTER = BLPF 300/ 750/ -16
MIN, MAX VALUES = -9.09@ 1.30, 4.37 @ 0.59
ACCELERATION (G)
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.8
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
RIGHT FRONT PASSENGER PELVIS Z AXIS ACCELERATION



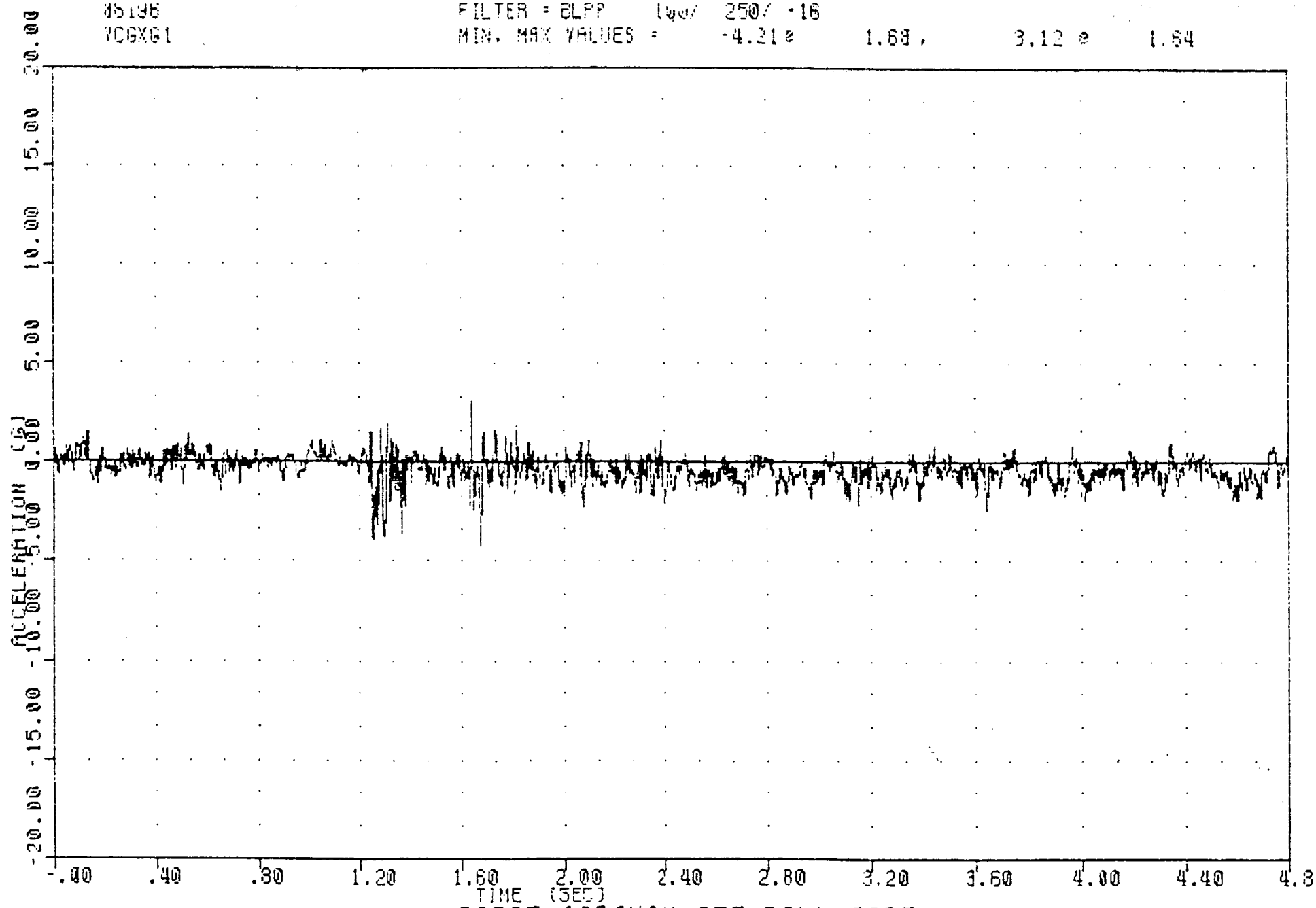
DODGE CARAVAN OFF ROLL CART

RIGHT FRONT PASSENGER PELVIS ACCELERATION RESULTANT

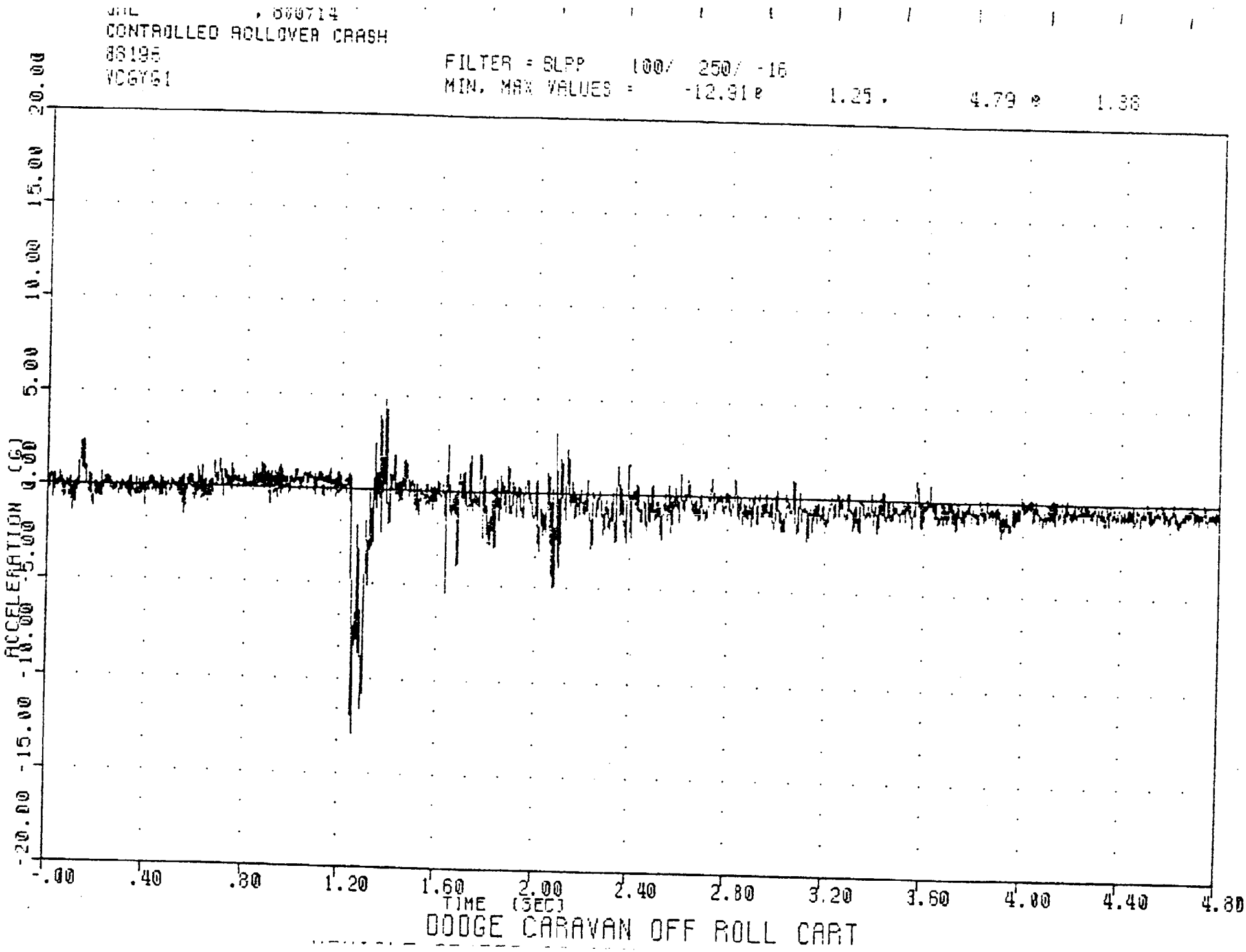


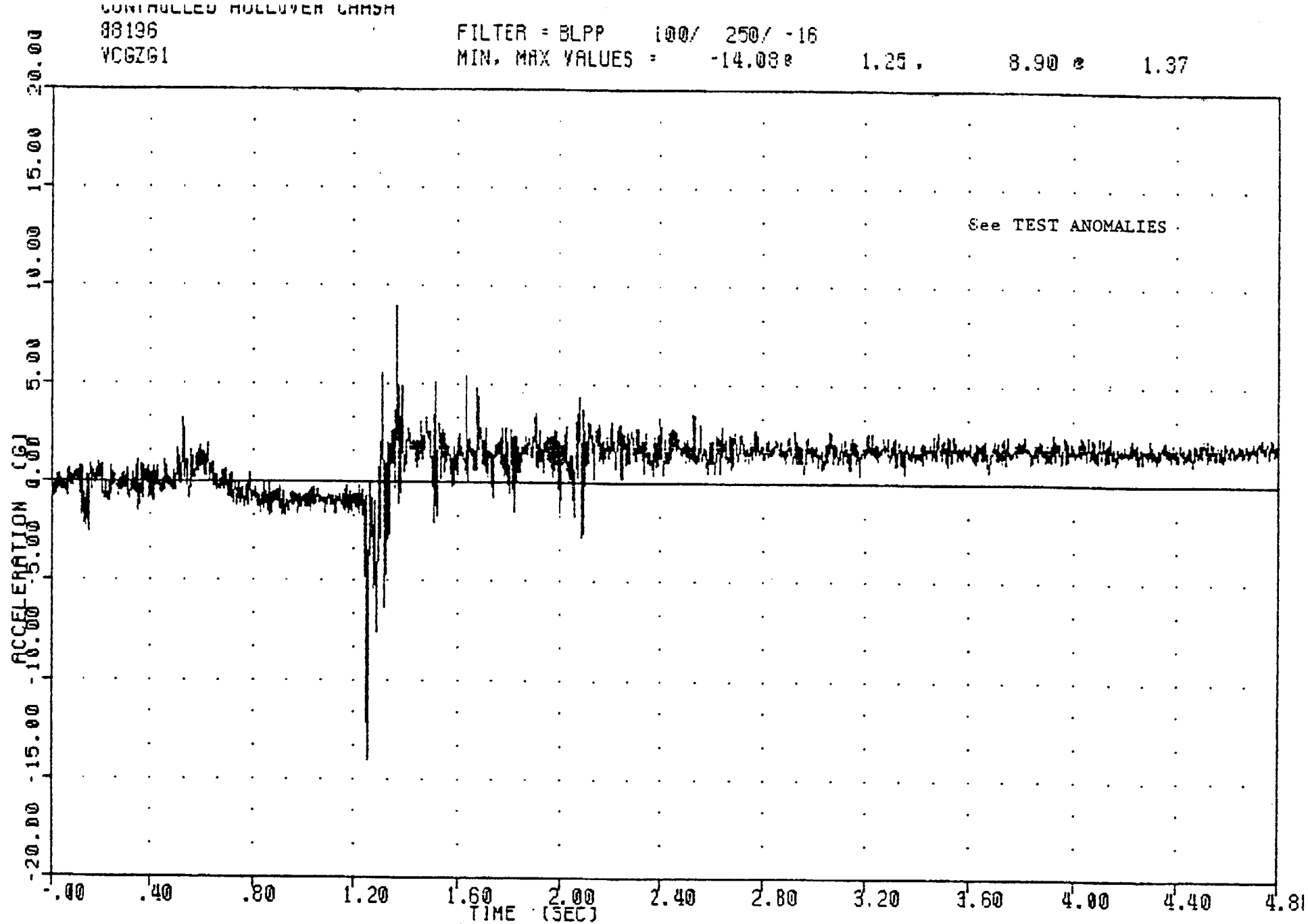
DODGE CARAVAN OFF ROLL CART

RIGHT FRONT PASSENGER SHOULDER BELT DISPLACEMENT



DODGE CARAVAN OFF ROLL CART
VEHICLE CENTER OF GRAVITY X AXIS ACCELERATION

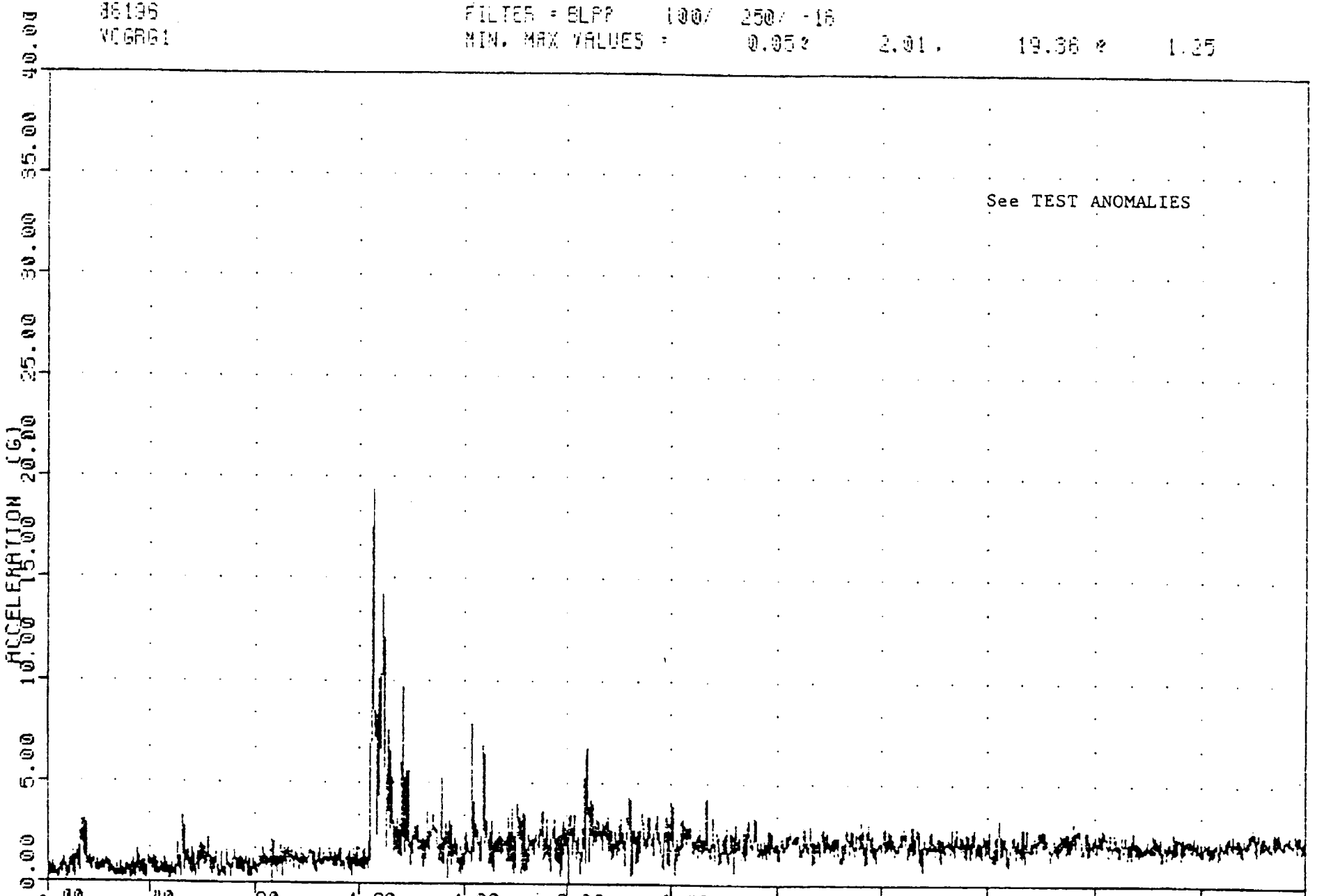

JHL , 000714
CONTROLLED ROLLOVER CRASH
88195
VDGY61
FILTER = SLPP 100/ 250/ -16
MIN, MAX VALUES = -12.91 @ 1.25 , 4.79 @ 1.36
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
ACCELERATION (G)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.80
TIME (SEC)
DODGE CARAVAN OFF ROLL CART



DODGE CARAVAN OFF ROLL CART
VEHICLE CENTER OF GRAVITY Z AXIS ACCELERATION

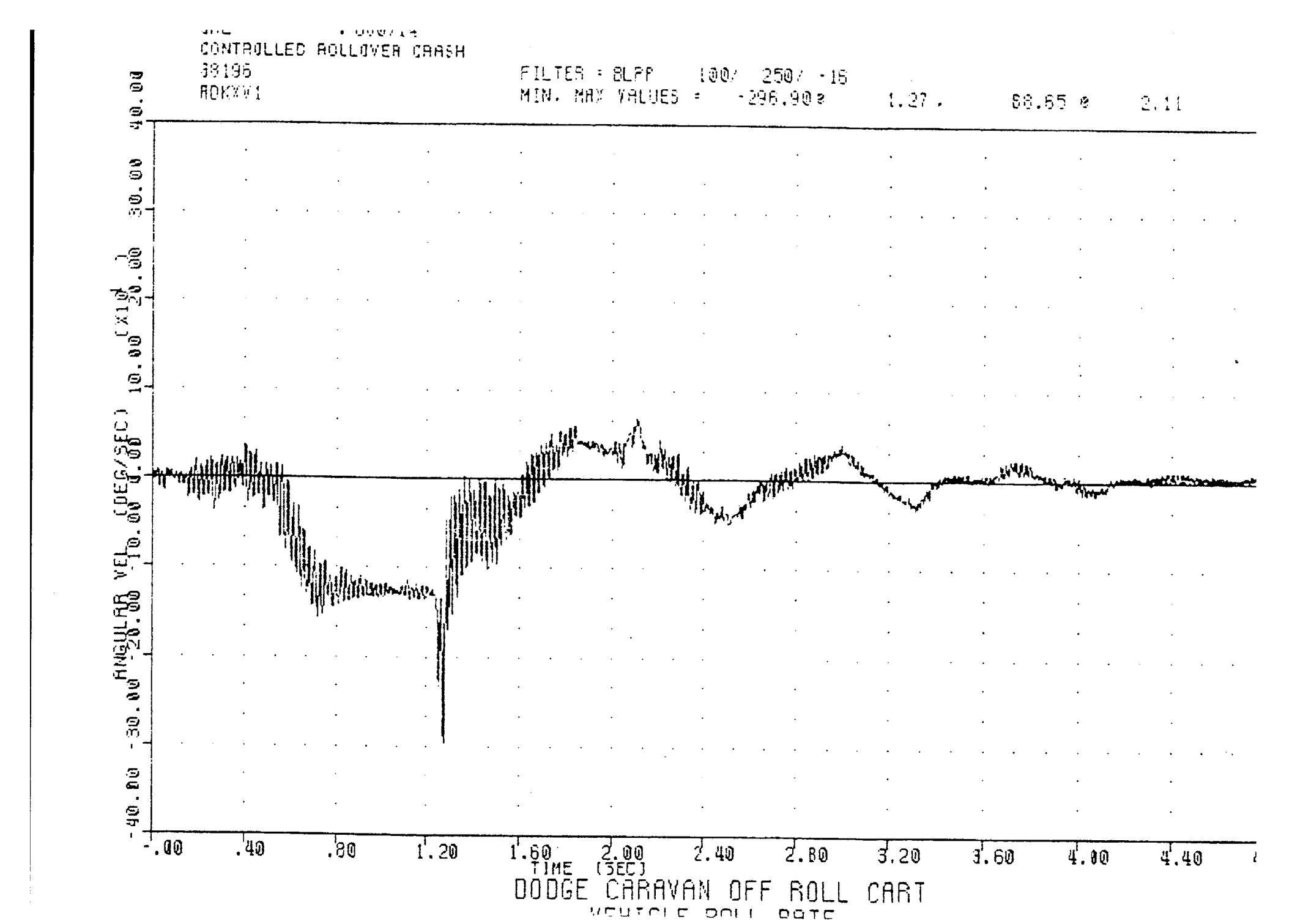
CONTROLLED ROLLOVER CRASH
86196
VCGRB1

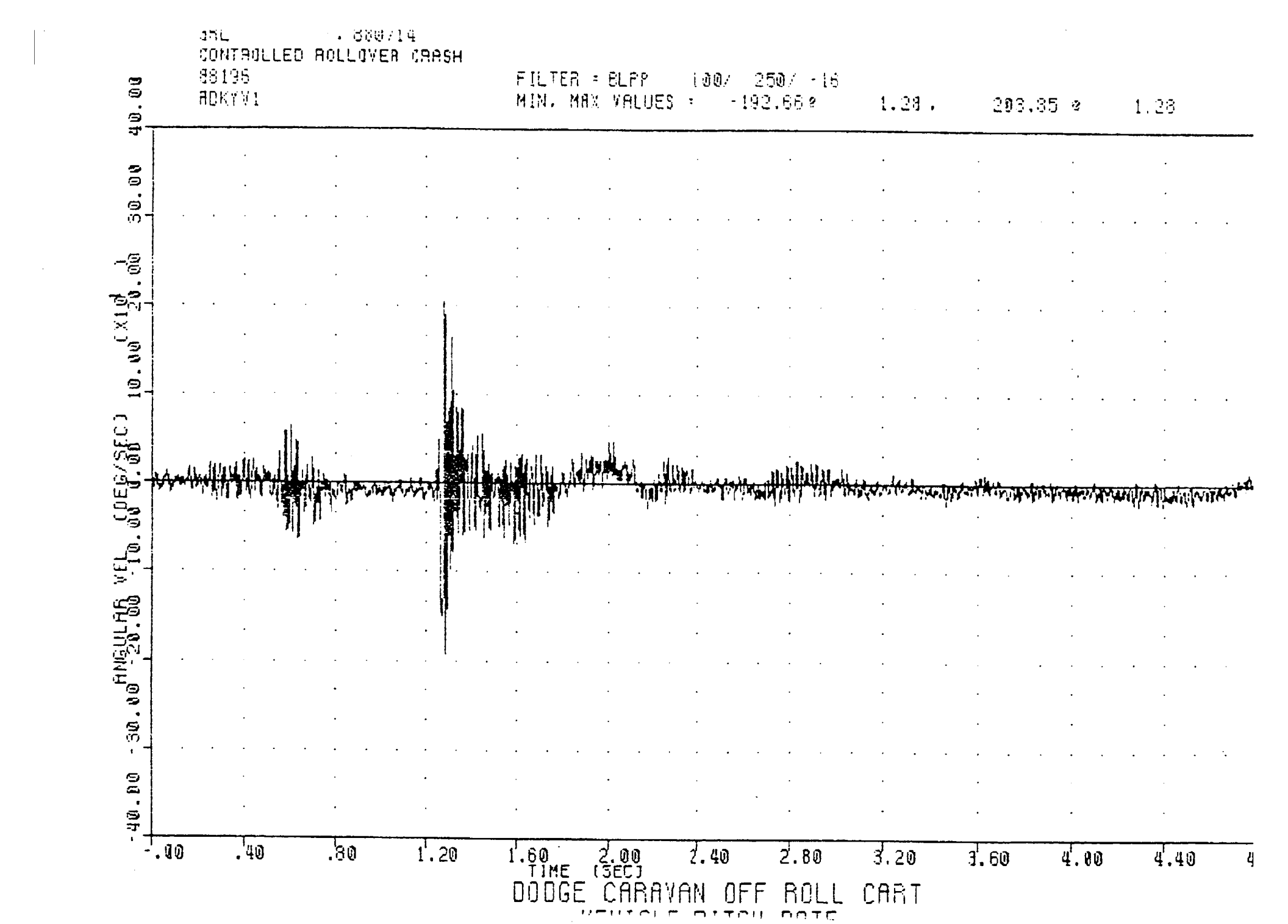
FILTER = BLPF 100/ 250/ -16
MIN, MAX VALUES = 0.05? 2.01, 19.36 @ 1.35

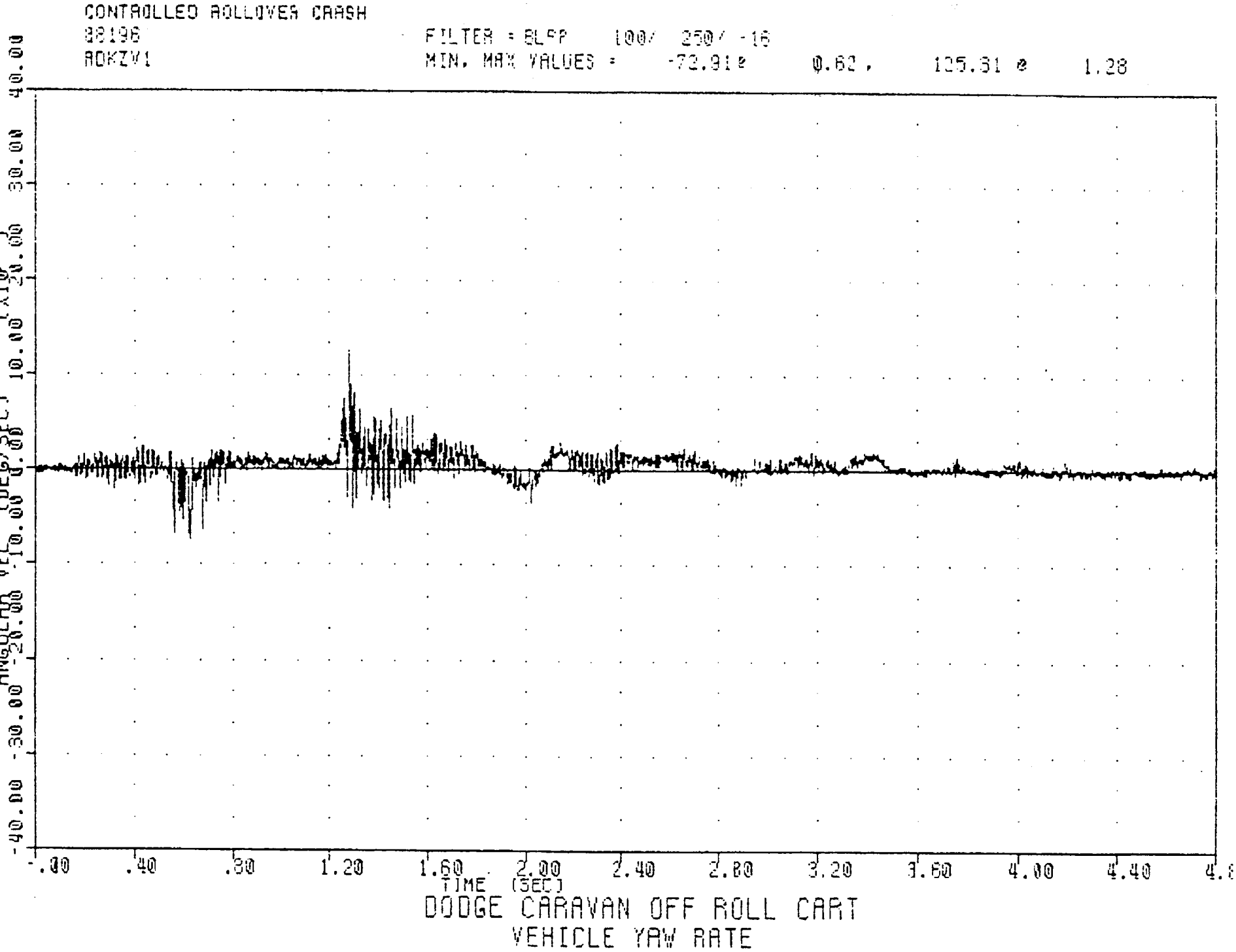


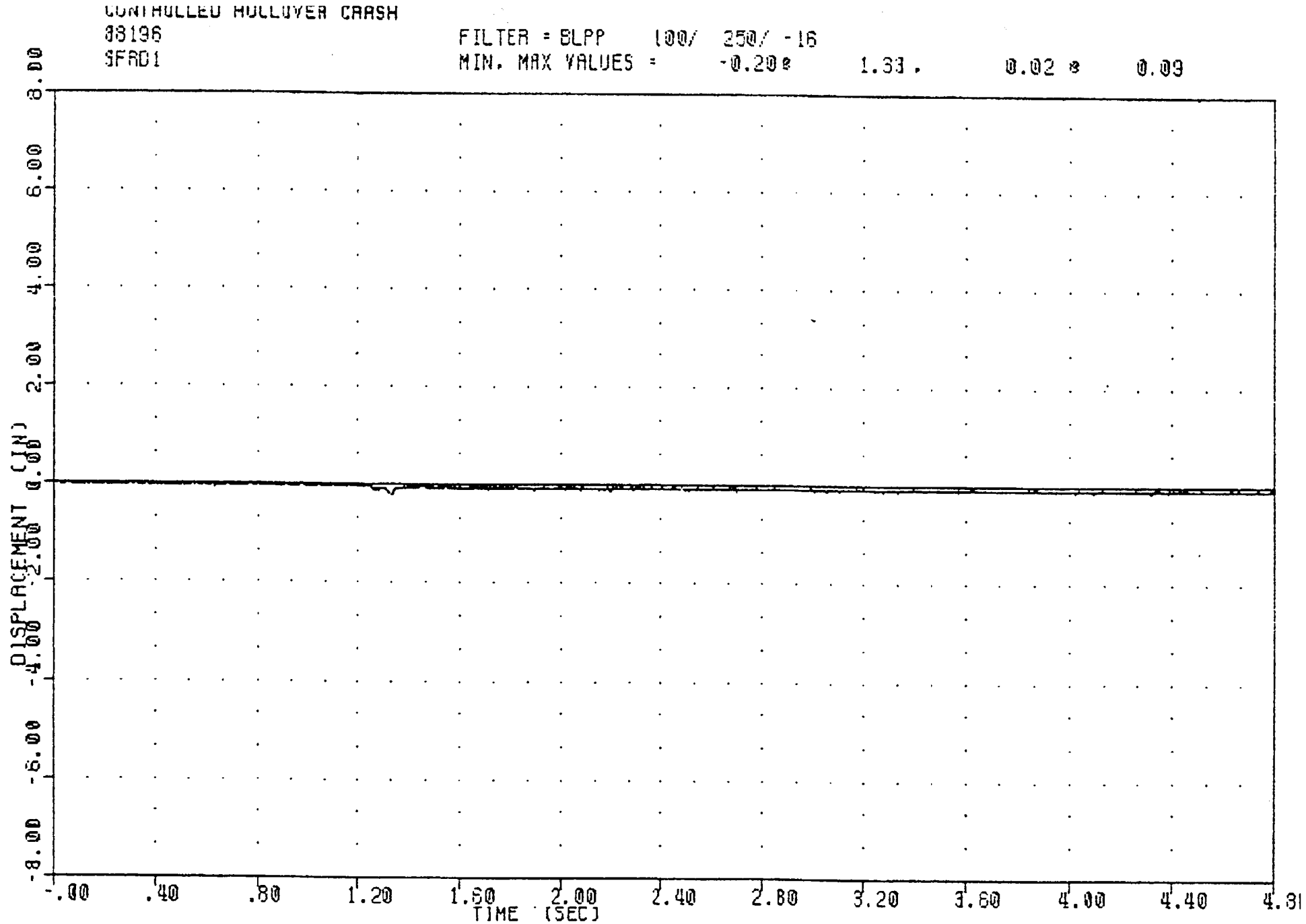
DODGE CARAVAN OFF ROLL CART

VEHICLE CENTER OF GRAVITY ACCELERATION RESULTANT


CONTROLLED ROLLOVER CRASH
88196
ROKXW1
FILTER = BLPF 100/ 250/ -15
MIN. MAX VALUES = -296.90@ 1.27 , 88.65 @ 2.11
ANGULAR VEL (DEG/SEC) (X10)
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

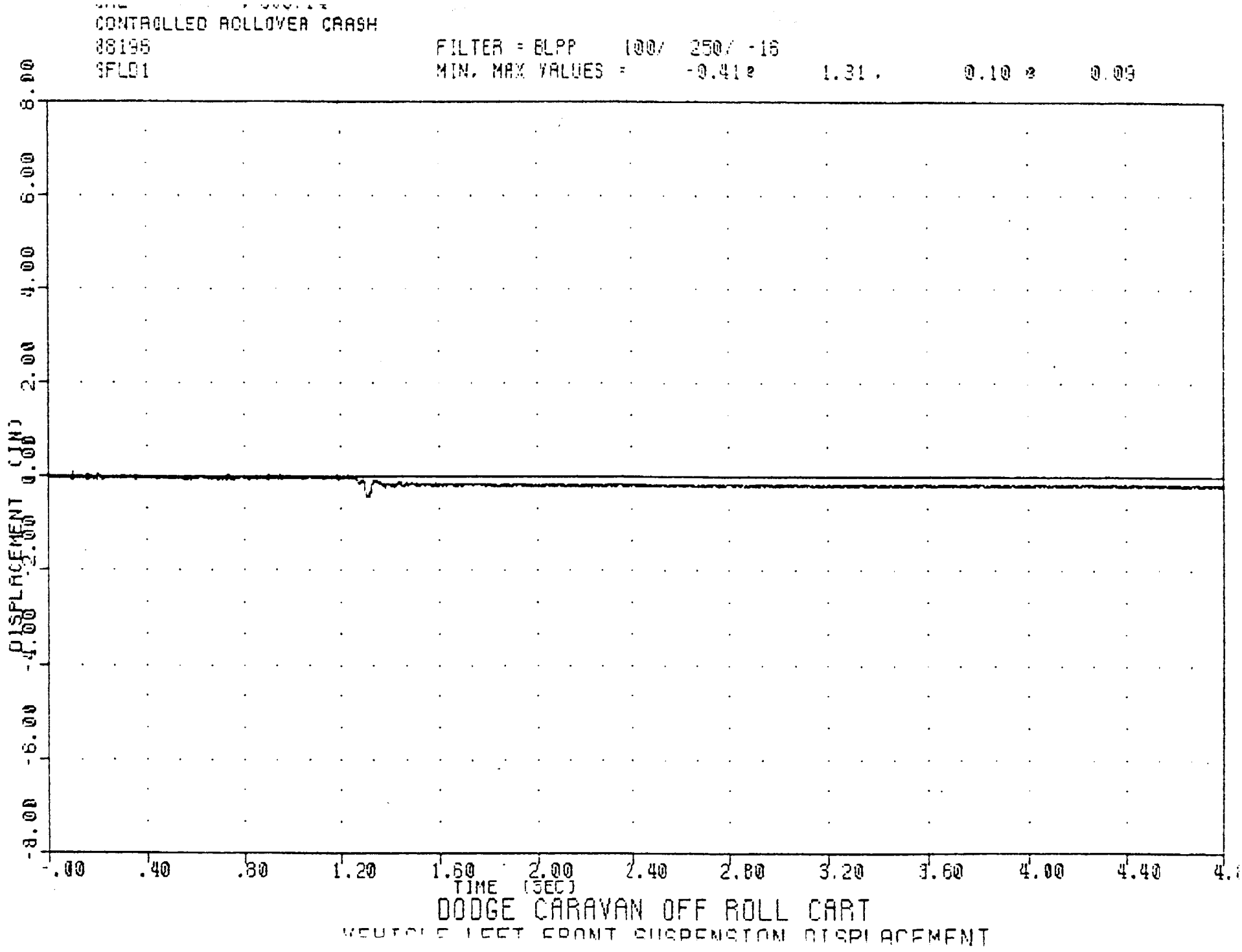

CONTROLLED ROLLOVER CRASH
88196
FILTER = ELPF 100/ 250/ -16
MIN, MAX VALUES = -192.66 @ 1.28 , 203.85 @ 1.28
ANGULAR VEL (DEG/SEC) (X10)
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

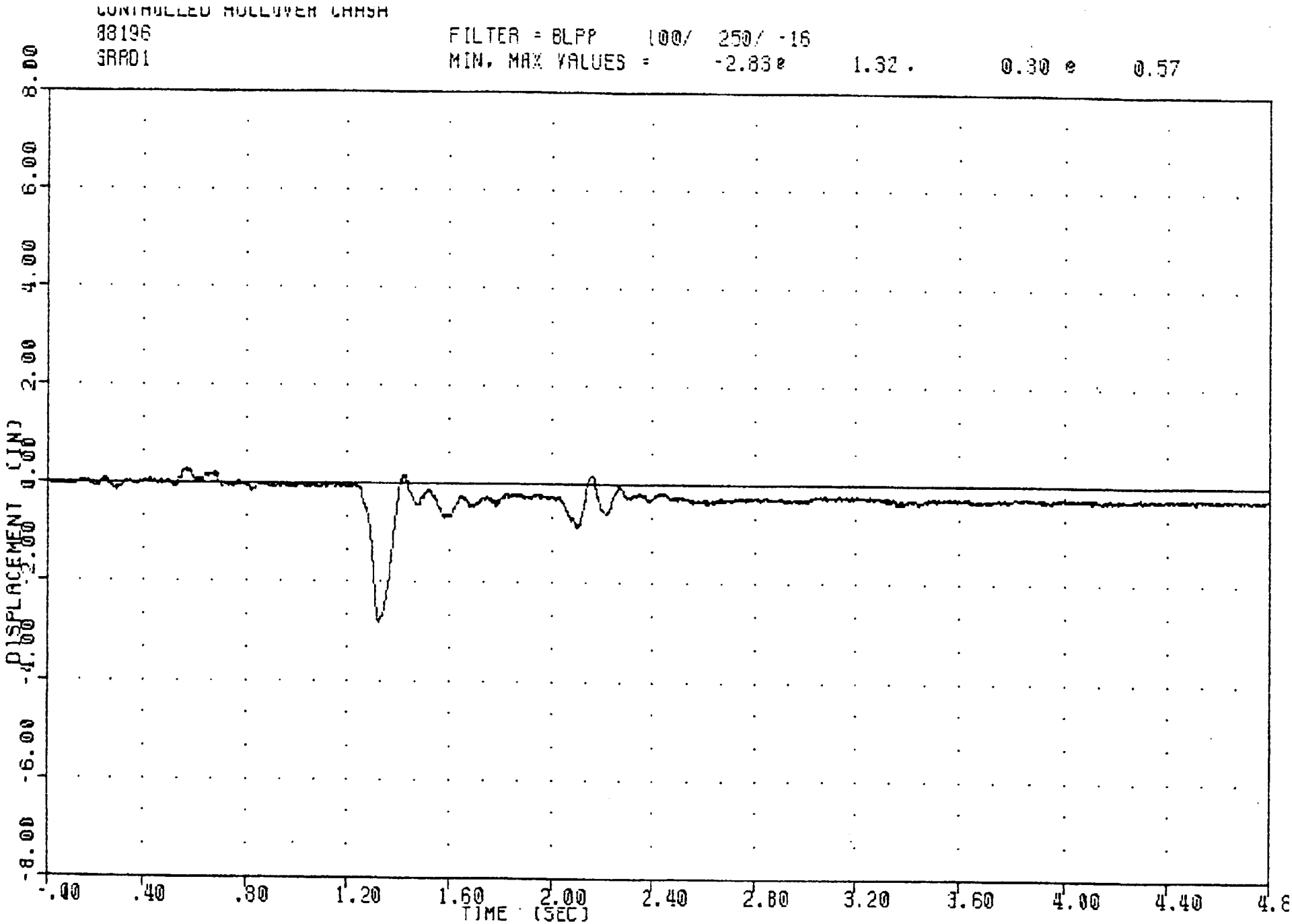

CONTROLLED ROLLOVER CRASH
88196
ROKZV1
FILTER = BLSP 100/ 250/ -16
MIN, MAX VALUES = -73.91 @ 0.62 , 125.81 @ 1.28
ANGULAR VEL (DEG/SEC) [X10]
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
VEHICLE YAW RATE



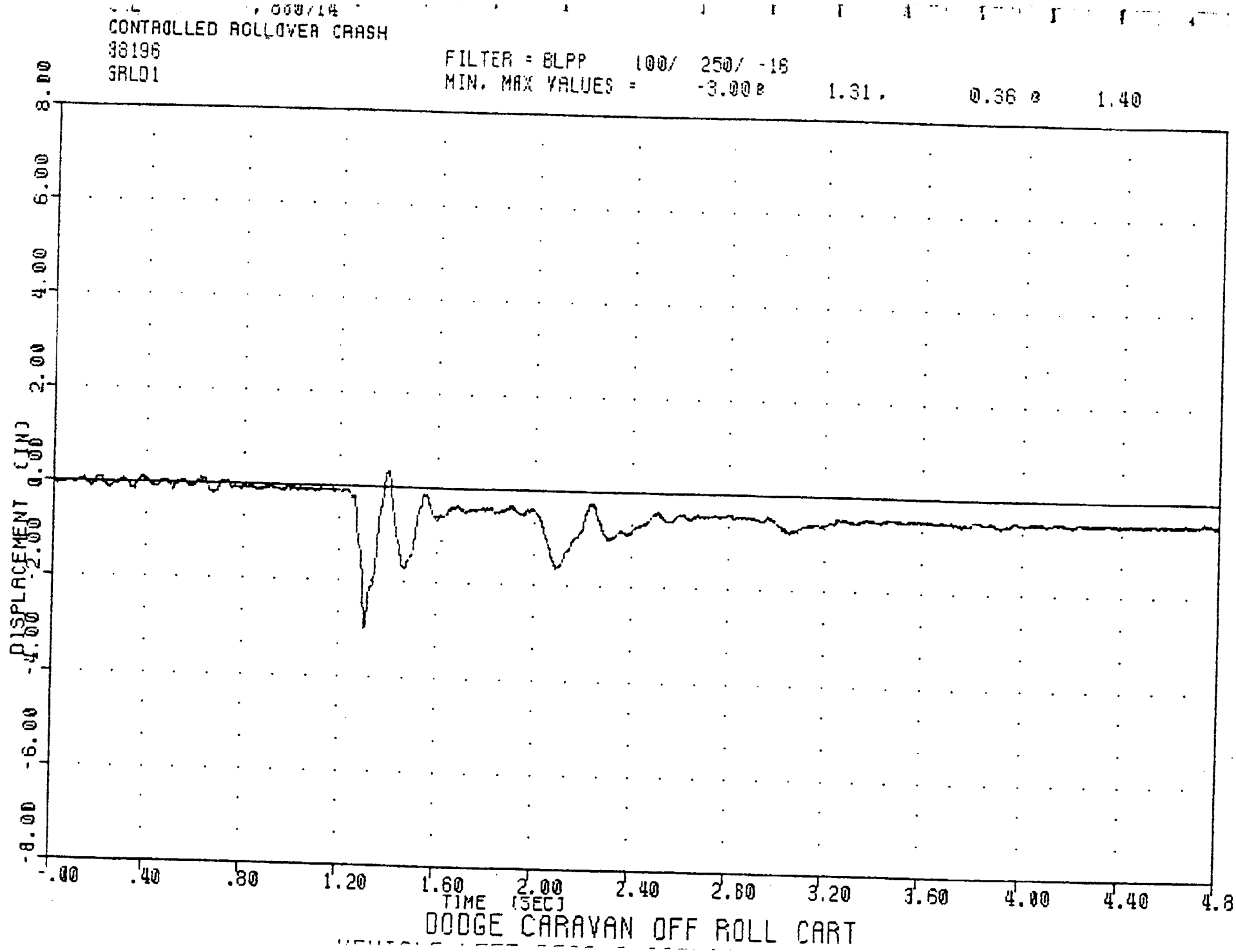
DODGE CARAVAN OFF ROLL CART

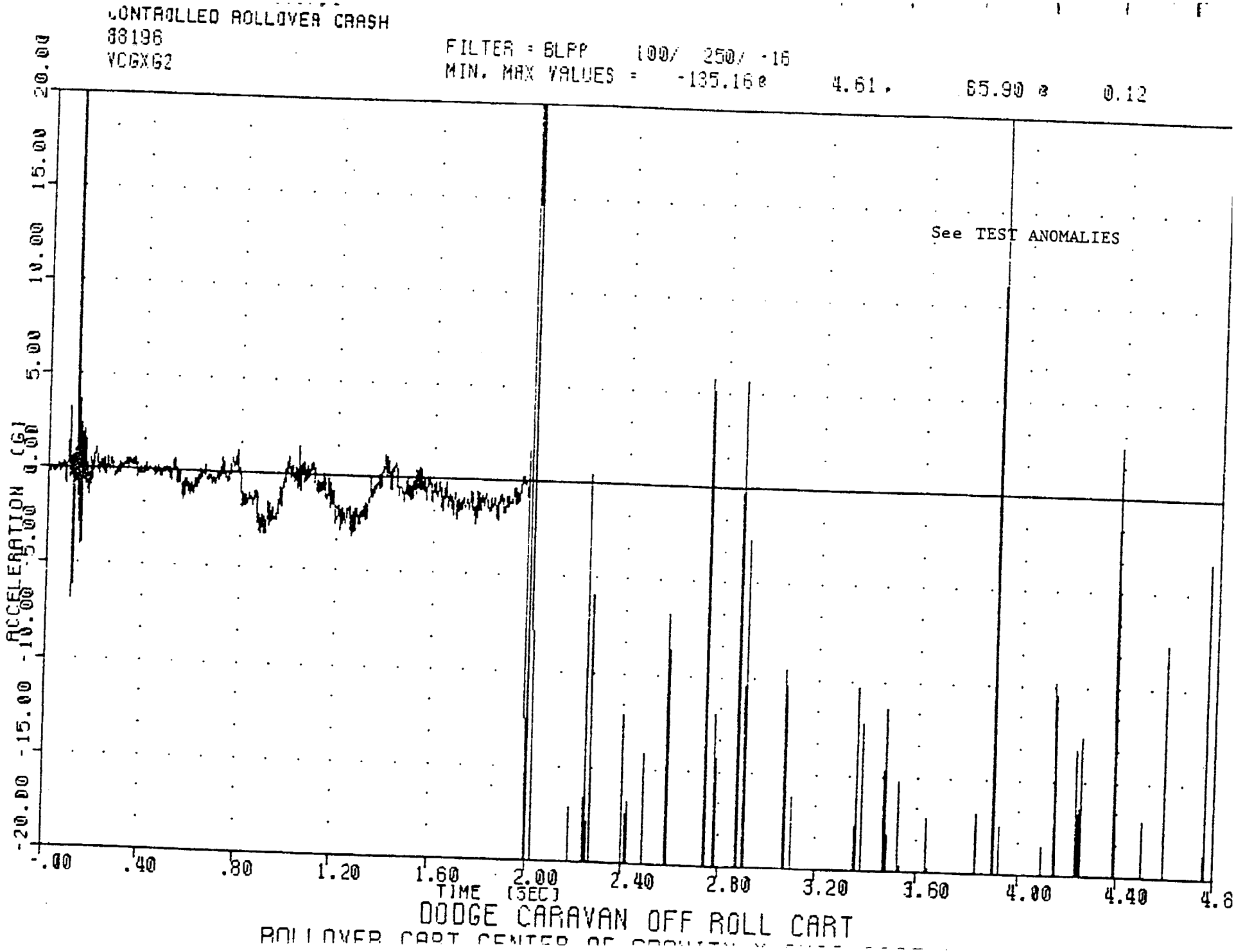
VEHICLE RIGHT FRONT SUSPENSION DISPLACEMENT

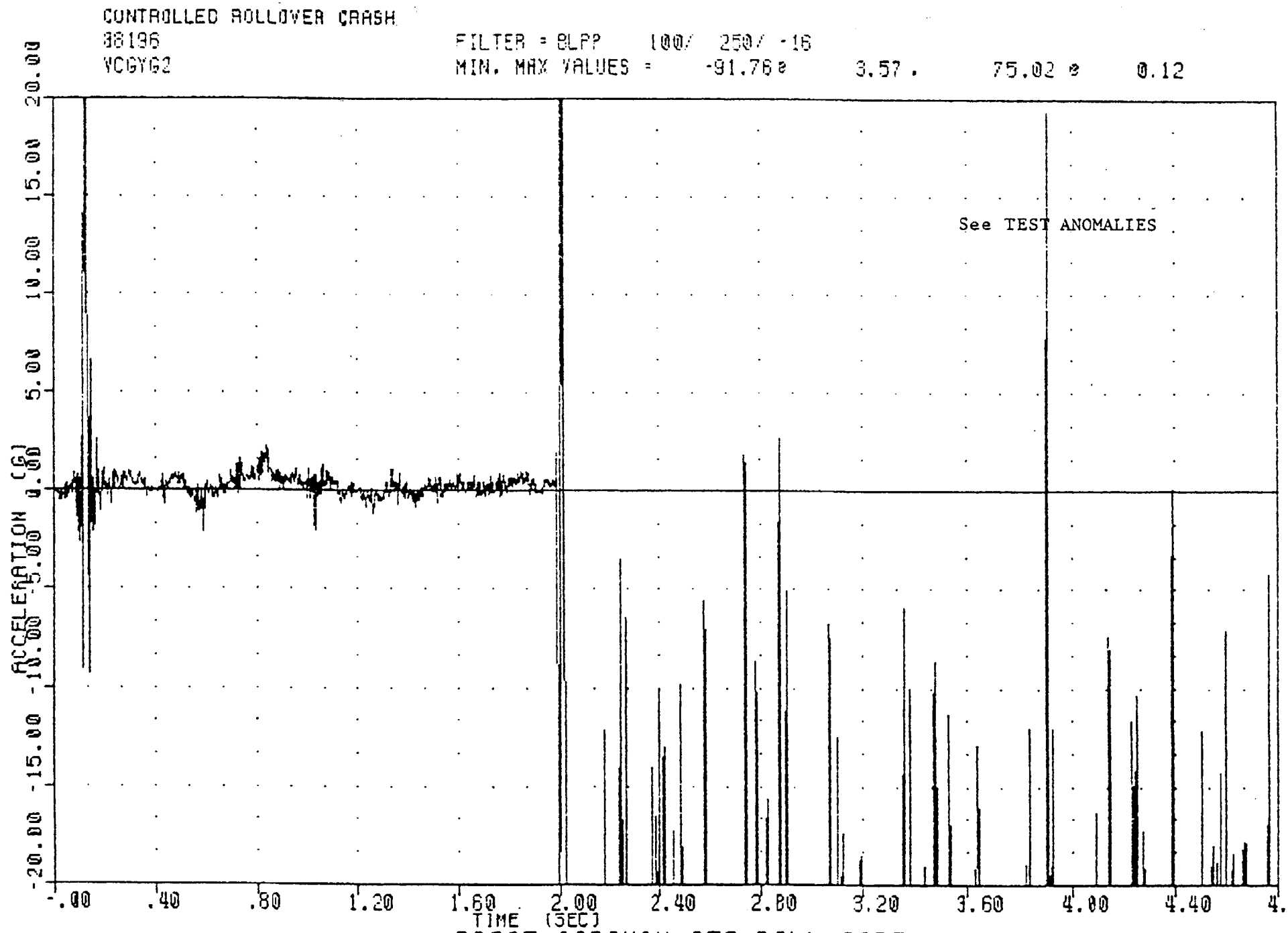

CONTROLLED ROLLOVER CRASH
88195
SFL01
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -0.41@ 1.31 , 0.10 @ 0.09
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
DISPLACEMENT (IN)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART



DODGE CARAVAN OFF ROLL CART
VEHICLE RIGHT REAR SUSPENSION DISPLACEMENT

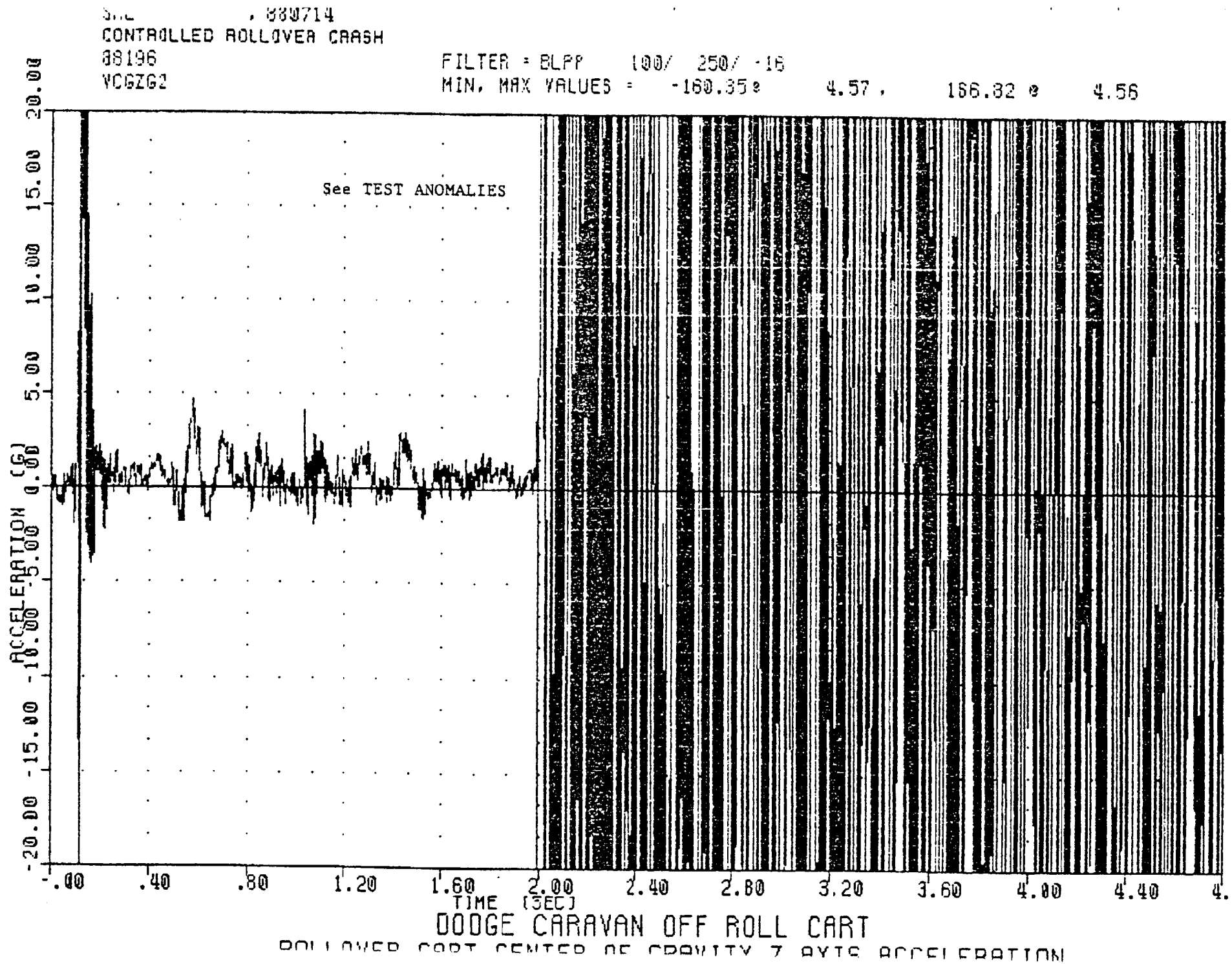

CONTROLLED ROLLOVER CRASH
98196
3RL01
FILTER = BLPP 100/ 250/ -18
MIN. MAX VALUES = -3.00 @ 1.31 , 0.36 @ 1.40
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
DISPLACEMENT (IN)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.8
TIME (SEC)
DODGE CARAVAN OFF ROLL CART

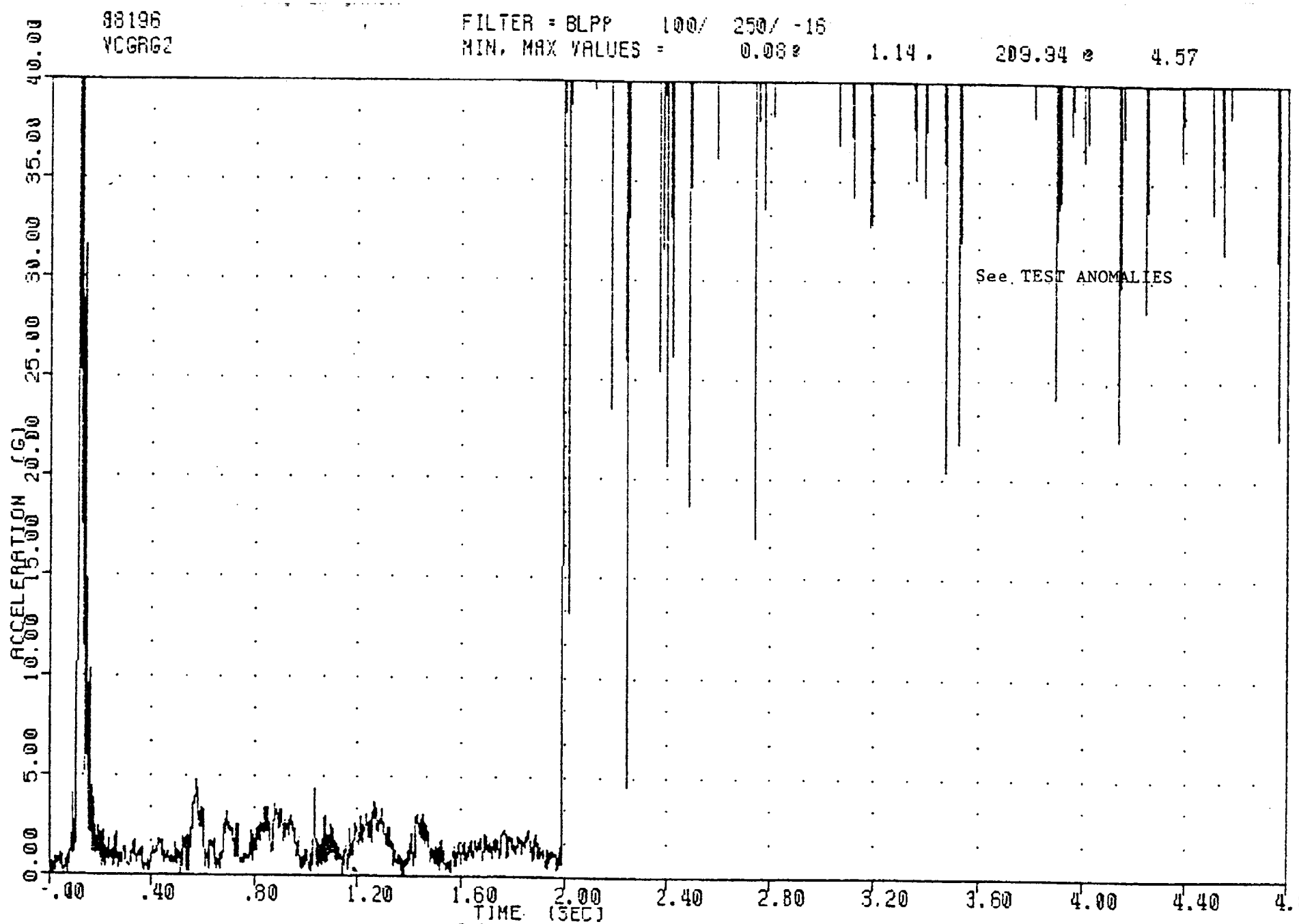

CONTROLLED ROLLOVER CRASH
88196
VCGX62
FILTER = SLPP 100/ 250/ -16
MIN, MAX VALUES = -135.16 @ 4.61 , 85.90 @ 0.12
See TEST ANOMALIES
ACCELERATION (G)
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.8
TIME (SEC)
DODGE CARAVAN OFF ROLL CART



DODGE CARAVAN OFF ROLL CART

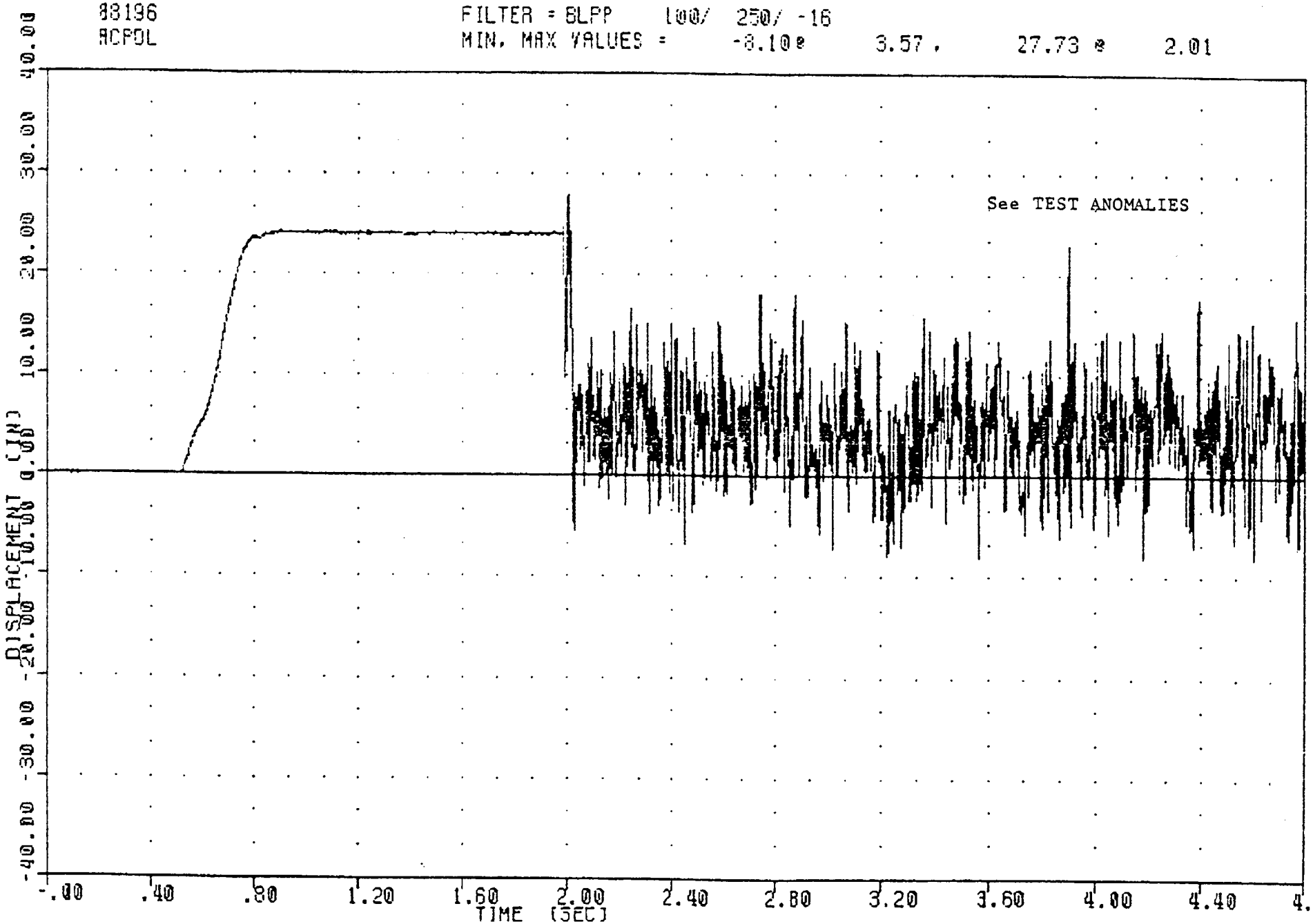
ROLLOVER CART CENTER OF GRAVITY Y AXIS ACCELERATION


, 880714
CONTROLLED ROLLOVER CRASH
88196
VCGZG2
FILTER = BLPF 100/ 250/ -16
MIN, MAX VALUES = -160.35 @ 4.57 , 166.82 @ 4.56
See TEST ANOMALIES
ACCELERATION (G)
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
ROLLOVER CART CENTER OF GRAVITY Z AXIS ACCELERATION



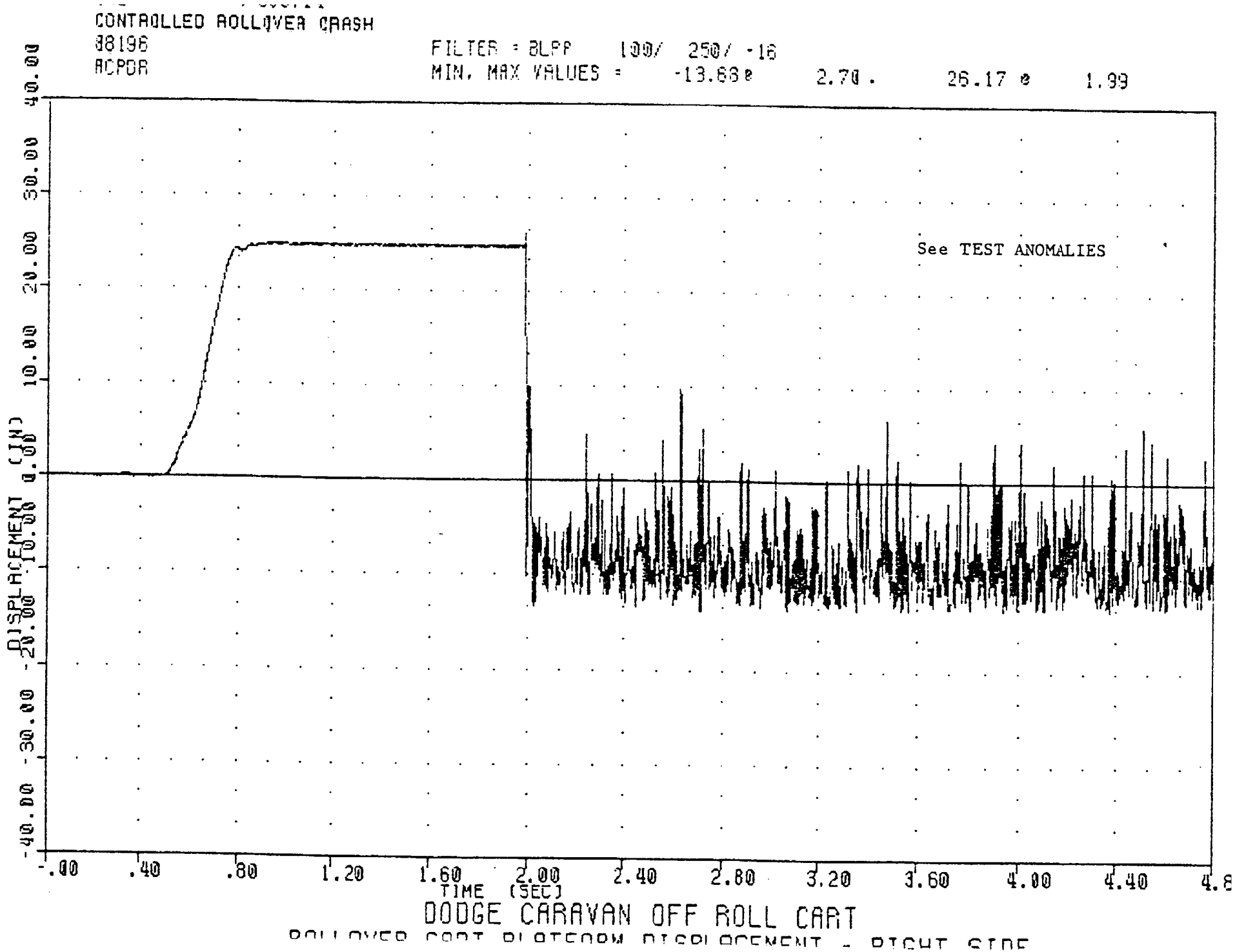
DODGE CARAVAN OFF ROLL CART

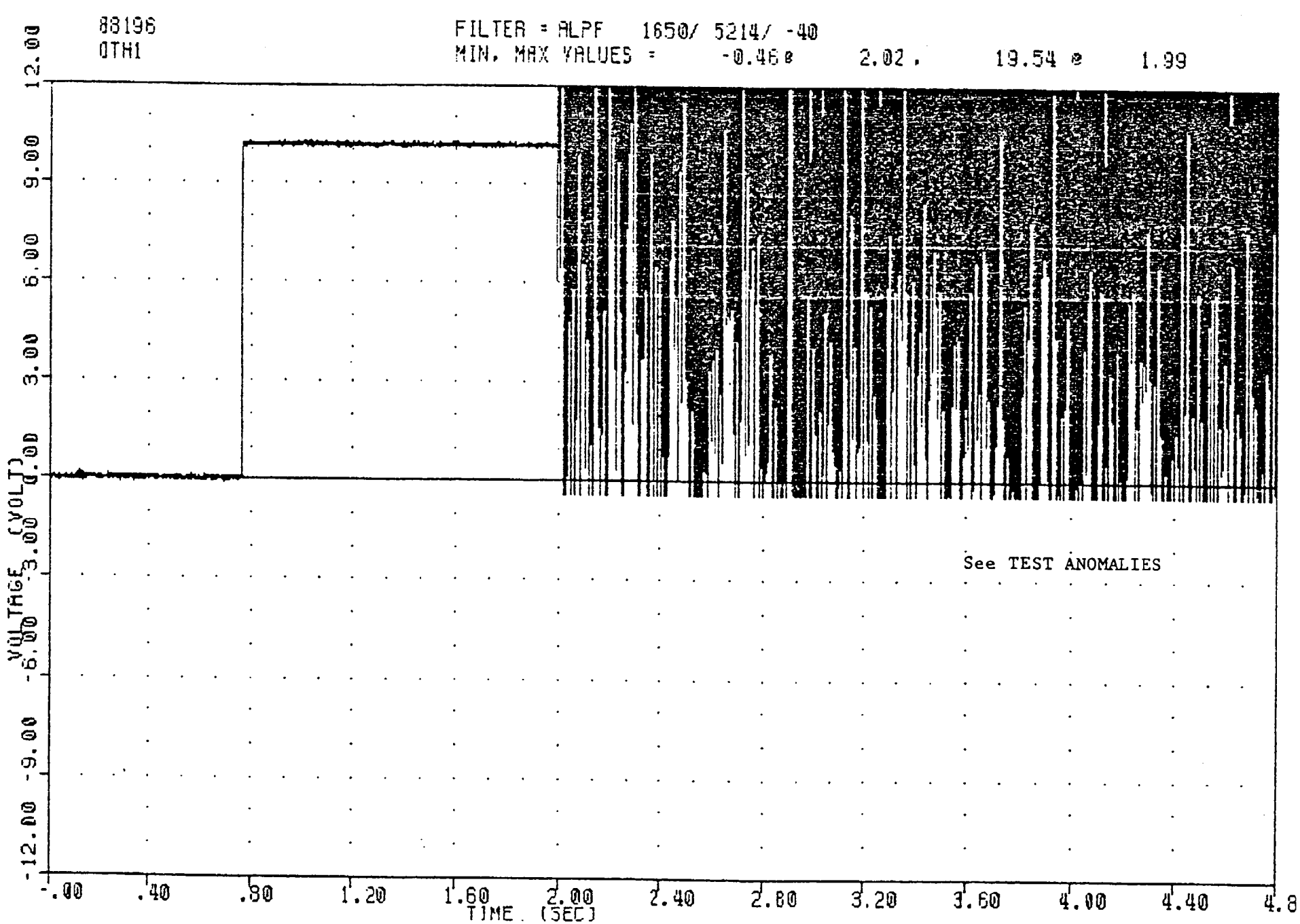
ROLLOVER CART CENTER OF GRAVITY ACCELERATION RESULTANT



DODGE CARAVAN OFF ROLL CART

ROLLOVER CART PLATFORM DISPLACEMENT - LEFT SIDE


CONTROLLED ROLLOVER CRASH
88196
RCPDR
FILTER = BLPF 100/ 250/ -16
MIN, MAX VALUES = -13.68 @ 2.70 . 26.17 @ 1.99
See TEST ANOMALIES
DISPLACEMENT (IN)
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
TIME (SEC)
DODGE CARAVAN OFF ROLL CART
ROLLOVER CART PLATFORM DISPLACEMENT - RIGHT SIDE

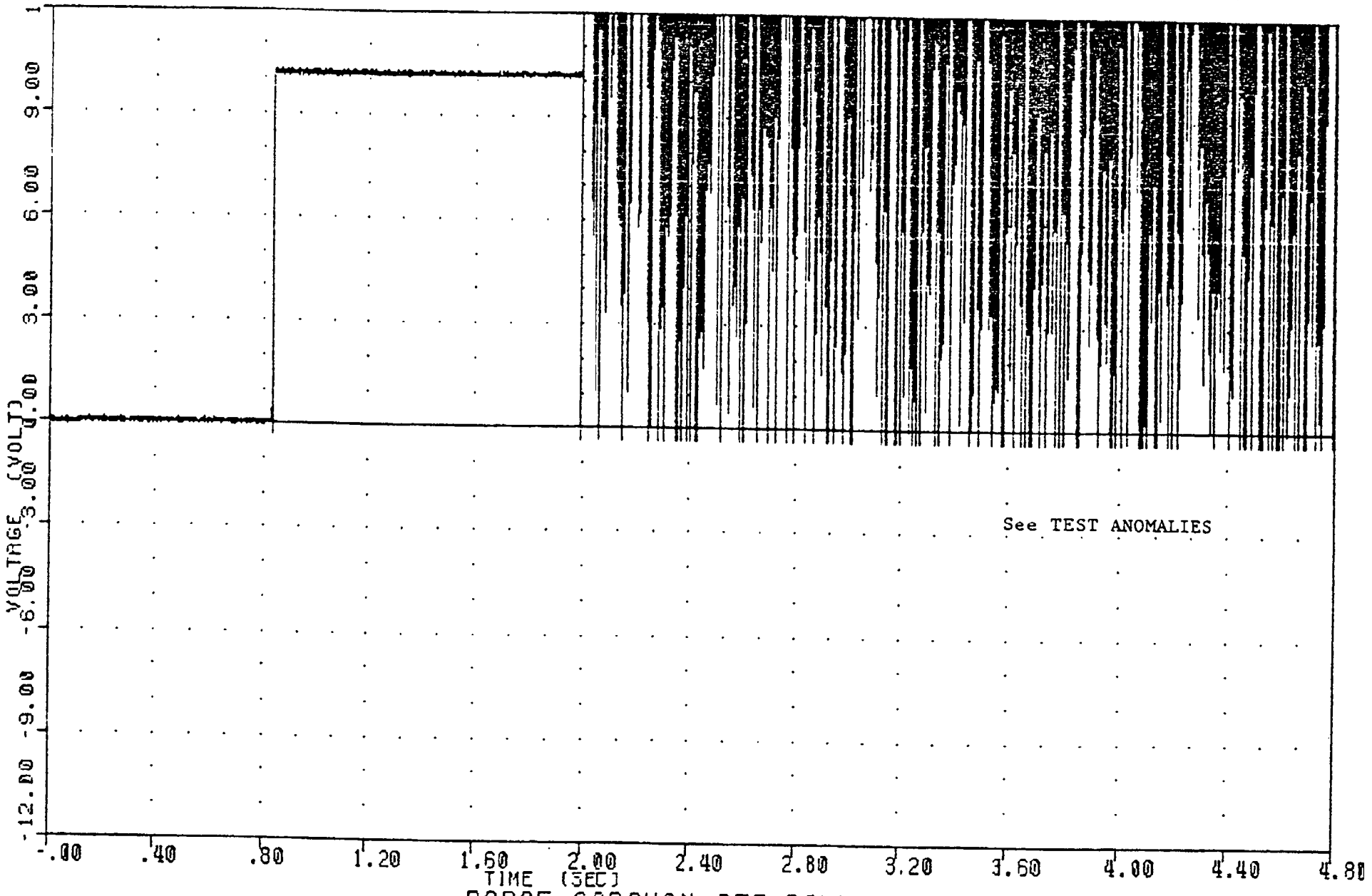


DODGE CARAVAN OFF ROLL CART

VEHICLE/ROLL CART SEPARATION TIME - UPPER SWITCH

CONTROLLED ROLLOVER CRASH
88196
0TH2

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.36 @ 1.99 , 19.64 @ 1.99



DODGE CARAVAN OFF ROLL CART

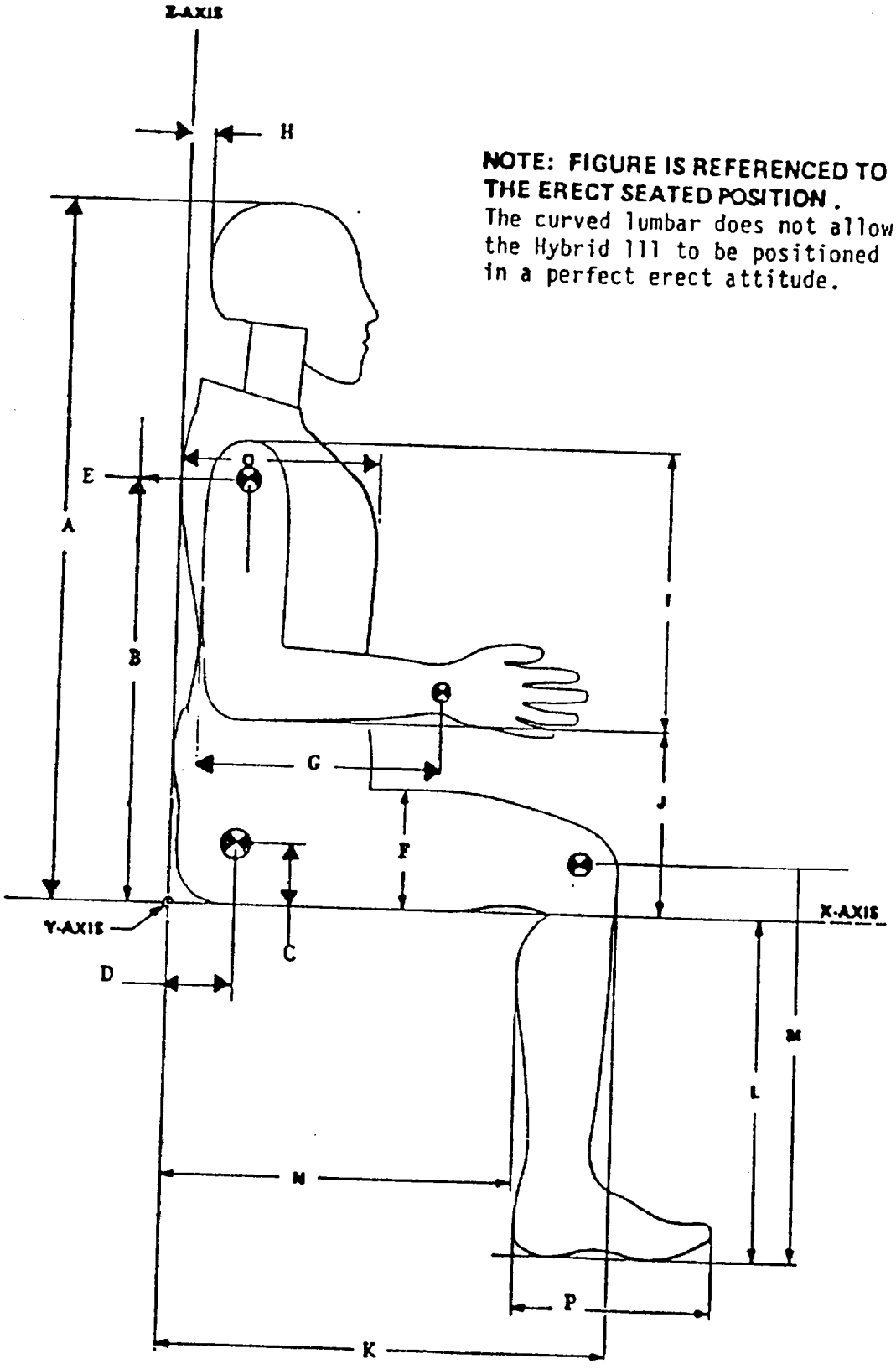
APPENDIX C

DUMMY CERTIFICATION

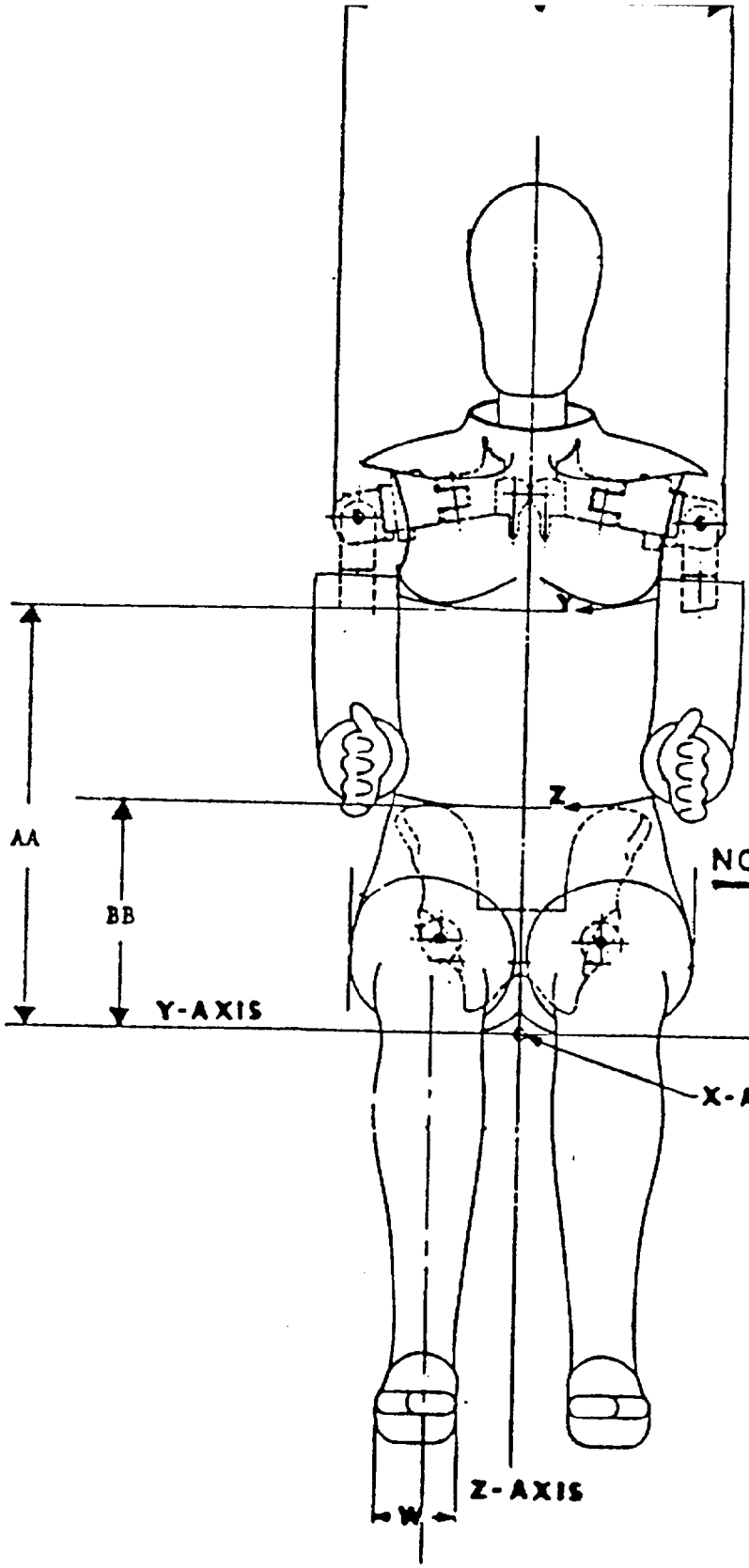
HYBRID III EXTERIOR DIMENSIONS

Dimensional Symbol	Description	Spec Dimension	Dummy Dimension S/N: 192
A	Sitting Height (Erect)	34.8 ± .2	34.7
B	Shoulder Pivot Height	20.2 ± .3	20.3
C	"H" Point Height	3.4 ref.	3.4
D	"H" Point Location from Back Line	5.4 ref.	5.4
E	Shoulder Pivot Location from Back Line	3.5 ± .2	3.7
F	Thigh Clearance	5.8 ± .3	5.7
G	Back of Elbow to Wrist Pivot	11.7 ± .3	11.5
H	Occiput to Z-Axis	1.7 ± .1	1.7
I	Shoulder - Elbow Length	13.3 ± .3	13.1
J	Elbow Rest Height	7.9 ± .4	8.2
K	Buttock Knee Length	23.3 ± .5	23.3
L	Popliteal Height	17.4 ± .5	17.3
M	Knee Pivot Height	19.4 ± .3	19.1
N	Buttock Popliteal Length	18.3 ± .5	18.3
O	Chest Depth	8.7 ± .3	8.8
P	Foot Length	10.2 ± .3	10.2
V	Shoulder Breadth	16.9 ± .3	16.8
W	Foot Breadth	3.9 ± .3	4.0
Y	Chest Circumference	38.8 ± .6	38.4
Z	Waist Circumference	33.5 ± .6	33.3
AA	Location for Measurement of Chest Circumference	17.0 ± .1	17.0
BB	Location for Measurement of Waist Circumference	9.0 ± .1	9.0

NOTE: The "H" point is located 1.83 inches forward and 2.57 inches down from the center of the pelvis angle reference hole.



HYBRID III Exterior Body Dimensions - Side View



NOTE: FIGURE REFERENCED TO THE ERECT SEATED POSITION.
The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.

HYBRID III Exterior Body Dimensions - Front View

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III

28-Jun-88

SRL 192C1HD1 572E SN192 HEAD DROP CAL 1

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	71.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	63.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	251.81 G
PEAK LATERAL ACCELERATION	15 G MAX	-3.72 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

6 AXIS NECK TRANSDUCER 16-Jun-88

SRL 192C1NF1 572E SN192 NECK FLEXION CAL1

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71.00 DEG. F
RELATIVE HUMIDITY		10% - 70%	63.00 %
IMPACT VELOCITY		22.6-23.4 FT/SEC	22.83 FT/SEC
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.42 G
	20 MS	17.60 - 22.60 G	19.23 G
	30 MS	12.50 - 18.50 G	16.51 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	16.40 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	36.38 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	69.04 DEG.
	TIME	57 - 64 MS	56.88 MS **
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.LBS	76.32 FT.LBS
	TIME	47 - 58 MS	49.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	117.00 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	92.75 MS **

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Chas. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

6 AXIS NECK TRANSDUCER 16-Jun-88

SRL 192C1NE1 572E SN192 NECK EXTENSION CAL1

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71.00 DEG. F
RELATIVE HUMIDITY		10% - 70%	63.00 %
IMPACT VELOCITY		19.50-20.30 FT/SEC	19.50 FT/SEC
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.32 G
	20 MS	14.00 - 19.00 G	15.51 G
	30 MS	11.00 - 16.00 G	14.02 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	13.97 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	41.38 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	90.01 DEG.
	TIME	72 - 82 MS	78.38 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-59.0/-39.0 FT.LBS	-44.50 FT.LBS
	TIME	65 - 79 MS	72.00 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	165.13 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	139.00 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III 16-Jun-88

SRL 192C1TH1 572E SN192 H.S.THORAX CAL1

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	70.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	63.00 %
PENDULUM VELOCITY	21.6-22.4 FT/SEC	21.86 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 IN	2.61 IN
MAXIMUM RESISTIVE FORCE	1160 - 1325 LBS	1217.9 LBS
INTERNAL HYSTERESIS	69% - 85%	76.4%

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 15-Jun-88

RIGHT KNEE
SRL 192C1RK1 572E SN192 R.KNEE 11LB CAL 1

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	57.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.77 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1265.63 LBS
PROBE WEIGHT	11.0 LBS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

15-Jun-88

LEFT KNEE
SRL 192C1LK1

572E SN192 L.KNEE 11LB CAL 1

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	57.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.77 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1265.47 LBS
PROBE WEIGHT	11.0 LBS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

APPENDIX D

MISCELLANEOUS TEST INFORMATION

INERTIA PARAMETERS DATA

IPMD VEHICLE DATA SHEET

Version 2 -- June-25, 1987

Filled Out By: B. Dotson Date: 7/12/88

Checked By: Chrstos Date: 7/26/88

VEHICLE DATA

Vehicle ID Code (7 characters): V88-187B

Vehicle 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): 11

Body Style (2 characters): VN

2C - 2Dr Coupe	SW - Stationwagon
2S - 2Dr Sedan	PU - Pickup Truck
3H - 3Dr Hatchback	TR - Truck
4S - 4Dr Sedan	VN - Van
5H - 5Dr Hatchback	BU - Bus
OH - Other: _____	

VIN Number (20 Characters): 2 B 4 F K 2 1 K 6 J R 7 3 4 2 0 9 _ _ _ _

Odometer Reading: 0.0 Thousands of Miles: 0

Wheelbase: 112.0 (in) x 25.4 -: 2845 (mm)

Front Track: 60.0 (in) x 25.4 -: 1519 (mm)

Rear Track: 62.1 (in) x 25.4 -: 1577 (mm)

Roof Height: 66.1 (in) x 25.4 -: 1679 (mm)

G.V.W.R.: 4550 (lbs) x 4.45 =: 20,248 (N)

Front G.A.W.R: 2425 (lbs) x 4.45 =: 10,791 (N)

Rear G.A.W.R: 2280 (lbs) x 4.45 =: 10,146 (N)

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

Weight on RF Tire: 970 (lbs) x 4.45 =: 4317 (N)

Weight on LF Tire: 988 (lbs) x 4.45 =: 4397 (N)

Weight on LR Tire: 762 (lbs) x 4.45 =: 3391 (N)

Weight on RR Tire: 704 (lbs) x 4.45 =: 3133 (N)

Vehicle Test Weight: 3424 (lbs) x 4.45 =: 15,237 (N)

Lateral and Longitudinal Center of Gravity Location

From Front Axle: 47.9 (in) x 25.4 =: 1218 (mm)

From Center Line: -0.64 (in) x 25.4 =: -16 (mm)

Engine Displacement: 152 (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

Transmision Type: M

M - Manual A - Automatic

Drive Axle (1 character): F

F - Front R - Rear

4 - Four Wheel Drive

Vehicle Comments (30 characters): Pre-rollover tested with driver

FRONT SUSPENSION

Suspension Number (4 digits): F187

Front/Rear Flag (1 character): F

Axle Type (1 character) I
- I - Independent
- S - Solid

Suspension Type (1 character): S
- A - Unequal A Arm
- L - Leaf
- M - Multiple Link
- Q - Torque Arm
- S - Strut
- T - Semi-Trailing Arm
- W - Twist
- 4 - 4 Link
- 3 - 3 Link
- O - Other:_____

Spring Type (2 characters): CO
- CO - Coil
- LL - Longitudinal Leaf
- TB - Torsion Bar
- TL - Transverse Leaf
- OT - Other:_____

Brake Type (2 characters): DI
- DI - Disk
- DS - Duo-Servo Shoe
- LT - Leading-Trailing Shoe
- OT - Other:_____

Suspension Modified
- N - No
- Y - Yes

N

Suspension Modification
- R - Raised
- L - Lowered
- S - Stiffened
- W - Widened
- O - Other

1 - ____
2 - ____

FRONT SUSPENSION

Tire Manufacturer (10 characters): Goodyear

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

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) * 25.4 -: 140 (mm)

Axle Height: 11.8 (in) * 25.4 -: 300 (mm)

Tire Pressure: 35.0 (psi) * 6.897 -: 240 (kpa)

REAR SUSPENSION

Suspension Number (4 digits): R178

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
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-Trailing Shoe
DS - Duo-Servo Shoe
OT - Other:_____

Suspension Modified: N
N - No Y - Yes

Suspension Modification:
R - Raised L - Lowered
S - Stiffened W - Widened
O - Other

1 - ____
2 - ____

REAR SUSPENSION

Tire Manufacturer (10 characters): Goodyear

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

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) * 25.4 -: 140 (mm)

Axle Height: 12.0 (in) * 25.4 -: 305 (mm)

Tire Pressure: 35.0 (psi) * 6.897 -: 240 (kpa)

IPMD MEASURED DATA

C.G. Height:

Applied Weight (lbs)	Resultant Angle (deg)	Resultant Lateral Movement (mv)-(in)	
0	0.0	1.366	
+100	3.9	1.541	
+200	8.1	1.907	
0	0.0	1.365	
-100	4.0	1.188	
-200	8.0	0.970	
0	0.1	1.264	

Calculated C.G. Height (in): 25.8

Pitch Inertia:

Run	Period(sec)	*Amplitude (mv)	Relative Motion Amplitude (mv)
1	4.37	259	327
2	4.37	257	333
3	4.37	270	355

Pitch Inertia (ft·lb·sec2): 2160.0

Roll Inertia:

Distance between ramps (in): 50.2

Run	Period (sec)	*Amplitude (mv)	Relative Motion Amplitude (mv)
1	2.69	217	347
2	2.69	220	360
3	2.70	212	341

Roll Inertia (ft·lb·sec2): 514.5

IPMD MEASURED DATA

Yaw Inertia:

Distance between ramps (in): 50.2

String Pot Offset from platform center (in): 68.0

Run	Period (sec)	*Amplitude (mv)	Relative Motion Amplitude (mv)
1	2.56	146	343
2	2.57	137	315
3	2.57	146	341

Yaw Inertia (ft·lb·sec2): 2288.7

IPMD VEHICLE DATA SHEET

Version 2 -- June-25, 1987

Filled Out By: B. Dotson Date: 7/15/88

Checked By: Chrystos Date: 7/26/88

VEHICLE DATA

Vehicle ID Code (7 characters): V88-187A

Vehicle 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): 11

Body Style (2 characters): VN

2C - 2Dr Coupe	SW - Stationwagon
2S - 2Dr Sedan	PU - Pickup Truck
3H - 3Dr Hatchback	TR - Truck
4S - 4Dr Sedan	VN - Van
5H - 5Dr Hatchback	BU - Bus

OH - Other: _____

VIN Number (20 Characters): 2 B 4 F K 2 1 K 6 J R 7 3 4 2 0 9 _ _ _

Odometer Reading: 0.0 Thousands of Miles: 0

Wheelbase: 112.0 (in) x 25.4 -: 2845 (mm)

Front Track: 59.8 (in) x 25.4 -: 1519 (mm)

Rear Track: 62.1 (in) x 25.4 -: 1577 (mm)

Roof Height: 68.0 (in) x 25.4 -: 1727 (mm)

G.V.W.R.: 4550 (lbs) x 4.45 -: 20,248 (N)

Front G.A.W.R: 2425 (lbs) x 4.45 -: 10,791 (N)

Rear G.A.W.R: 2280 (lbs) x 4.45 -: 10,146 (N)

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

Weight on RF Tire: 984 (lbs) x 4.45 -: 4,379 (N)

Weight on LF Tire: 906 (lbs) x 4.45 -: 4,032 (N)

Weight on LR Tire: 724 (lbs) x 4.45 -: 3,222 (N)

Weight on RR Tire: 727 (lbs) x 4.45 -: 3,235 (N)

Vehicle Test Weight: 3,341 (lbs) x 4.45 -: 14,867 (N)

Lateral and Longitudinal Center of Gravity Location

From Front Axle: 48.6 (in) x 25.4 -: 1,234 (mm)

From Center Line: +0.72 (in) x 25.4 -: 18 (mm)

Engine Displacement: 152.0 (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

Transmision Type: M

M - Manual A - Automatic

Drive Axle (1 character): F

F - Front R - Rear

4 - Four Wheel Drive

Vehicle Comments (30 characters): Post Rollover Test with driver

FRONT SUSPENSION

Suspension Number (4 digits): F187

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
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-Trailing Shoe
DS - Duo-Servo Shoe
OT - Other:_____

Suspension Modified
N - No Y - Yes N

Suspension Modification
R - Raised L - Lowered
S - Stiffened W - Widened
O - Other

1 - ____
2 - ____

FRONT SUSPENSION

Tire Manufacturer (10 characters): Goodyear

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

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) * 25.4 -: 140 (mm)

Axle Height: 11.8 (in) * 25.4 -: 300 (mm)

Tire Pressure: 35.0 (psi) * 6.897 -: 240 (kpa)

REAR SUSPENSION

Suspension Number (4 digits): R178

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
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-Trailing Shoe
DS - Duo-Servo Shoe
OT - Other:_____

Suspension Modified: 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 GP - Glass Belted Radial
BP - Bias Ply SB - Steel Belted Radial
OT - Other: _____

Tire Rim Width: 5.5 (in) * 25.4 -: 140 (mm)

Axle Height: 12.0 (in) * 25.4 -: 305 (mm)

Tire Pressure: 35.0 (psi) * 6.897 -: 240 (kpa)

IPMD MEASURED DATA

C.G. Height:

Applied Weight (lbs)	Resultant Angle (deg)	Resultant Lateral Movement (mv)-(in)	
0	0.0	1.593	
+100	3.8	1.709	
+200	7.9	1.983	
0	0.0	1.613	
-100	4.0	1.420	
-200	8.0	1.253	
0	0.1	1.518	

Calculated C.G. Height (in): 25.6

Pitch Inertia:

Run	Period(sec)	*Amplitude (mv)	Relative Motion Amplitude (mv)
1	4.34	262	306
2	4.34	264	311
3	4.34	269	312

Pitch Inertia (ft·lb·sec2): 2132.0

Roll Inertia:

Distance between ramps (in): 50.3

Run	Period (sec)	*Amplitude (mv)	Relative Motion Amplitude (mv)
1	2.71	198	244
2	2.72	202	276
3	2.72	204	277

Roll Inertia (ft·lb·sec2): 541.7

IPMD MEASURED DATA

Yaw Inertia:

Distance between ramps (in): 50.3

String Pot Offset from platform center (in): 68

Run	Period (sec)	*Amplitude (mv)	Relative Motion Amplitude (mv)
1	2.51	151	386
2	2.51	152	323
3	2.52	150	349

Yaw Inertia (ft·lb·sec2): 2183.9

SIGN CONVENTION

Compression on barrier face load cells is positive.

Compression on femur load cells is positive.

Tension on seat belt load cells is positive.

Outward chest displacement is positive.

All accelerometers:

+X: FORWARD

+Y: LEFTWARD

+Z: UPWARD

Neck load cell:

+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 ROTATIONG LEFTWARD