V1520

VEHICLE AND DUMMY KINEMATICS IN A CONTROLLED ROLLOVER CRASH 1988 FORD RANGER PICKUP TRUCK

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

SEPTEMBER - OCTOBER, 1990
TEST REPORT

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

ERRATA (as of Nov 93)
Test Number 900905

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

2. All neck load cell moments should be labeled lb-ft, instead of lb-in, including:

   Dummy Data Summary Sheet, page 4-5.
   Plots, Appendix B
   - Driver Neck Moment About X Axis
   - Driver Neck Moment About Y Axis
   - Driver Neck Moment About Z Axis

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 articie. 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.

Report Prepared By:

Najib A. ElHabash Date 10/4/1990

N.A. El Habash
Project Engineer

Report Approved By:

John C Stultz Date 10-4-90

J.C. Stultz
Chief Engineer Impact Laboratory

John F Shultis by JCS Date 10-4-90

J.F. Shultis
Manager Impact Laboratory

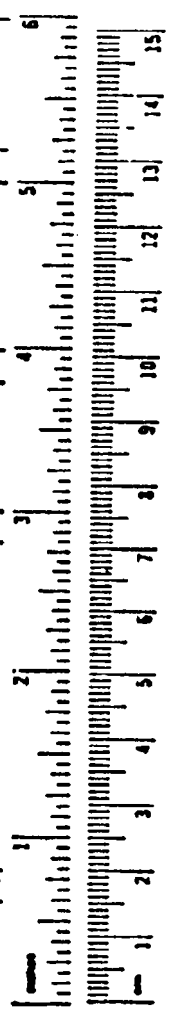
Teri Elliot /KL Date 10-5-90

T.E. Elliot
Project Manager

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

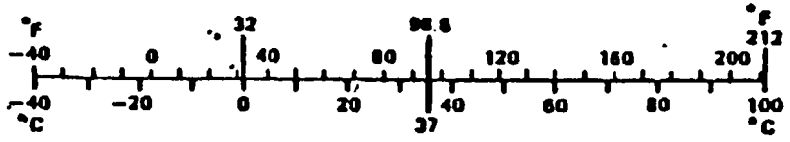


TABLE OF CONTENTS

LIST OF PHOTOGRAPHS

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 by placing a 1988 Ford Ranger pickup truck on the NHTSA rollover cart moving at 30 mph, releasing the vehicle with it's roll axis perpendicular to direction of rollover cart motion, and first contacting the vehicle's passenger side. The test vehicle contained an instrumented Part 572E dummy restrained with a three-point unibelt.

SECTION 2.0

SUMMARY OF ROLLOVER CRASH TEST

A 1988 Ford Ranger pickup truck, containing one instrumented Part 572E 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. 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 right side. The vehicle made one-half of a roll and came to rest on its roof. The rollover crash test was conducted by the Transportation Research Center of Ohoi in East Liberty, Ohio on September 5, 1990.

The Part 572E 50th percentile adult male anthropomorphic test device (dummy) was placed in the driver's designated seating postion 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 pre-test and post-test IPMD vehicle data sheets.

ROLLOVER CART INSTRUMENTATION LOCATIONS AND DATA SUMMARY

TEST NUMBER 900905

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX	POSITIVE DIRECTION SEC	NEGATIVE DIRECTION MAX	NEGATIVE DIRECTION SEC
1	CENTER OF GRAVITY	39.2	-3.5	8.2				
	ACCELERATION (g)							
	LONGITUDINAL				5.6	0.3	123.2	0.7
	LATERAL				92.3	0.7	6.0	0.4
	VERTICAL				123.3	0.7	20.2	0.3
	RESULTANT				190.4	0.7		
2	PLATFORM DISPLACEMENT (in)	68.4	27.0	27.5				
	LEFT SIDE				21.9	1.4	0.1	0.2
	RIGHT SIDE				21.7	1.1	0.1	0.5
3	VEHICLE/ROLLOVER CART SEPARATION TIMES (sec)	16.2	3.2	5.0				
	UPPER SWITCH				0.8			
	LOWER SWITCH				0.8			

* ALL MEASUREMENTS OF INSTRUMENTATION LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM ROLLOVER CART
Y: + LEFTWARD FROM ROLLOVER CART CENTERLINE
Z: + UPWARD FROM THE GROUND LEVEL
DISPLACEMENT: + OUTWARD

FINAL RESTING PLACE OF VEHICLE AND PARTS

DESCRIPTION OF VEHICLE	X. DISTANCE *	Y. DISTANCE *
1988 Ford Ranger:		
Left rear corner	120.7	-5.0
Right rear corner	118.0	-0.6
Left front corner	132.7	2.4
Right front corner	130.4	6.5
DESCRIPTION OF PARTS		
Car window molding	67.7	-2.8
DESCRIPTION OF CART		
Left rear corner	55.9	6.8
Right rear corner	54.8	3.1
Left front corner	62.5	7.7
Right front corner	60.8	5.4

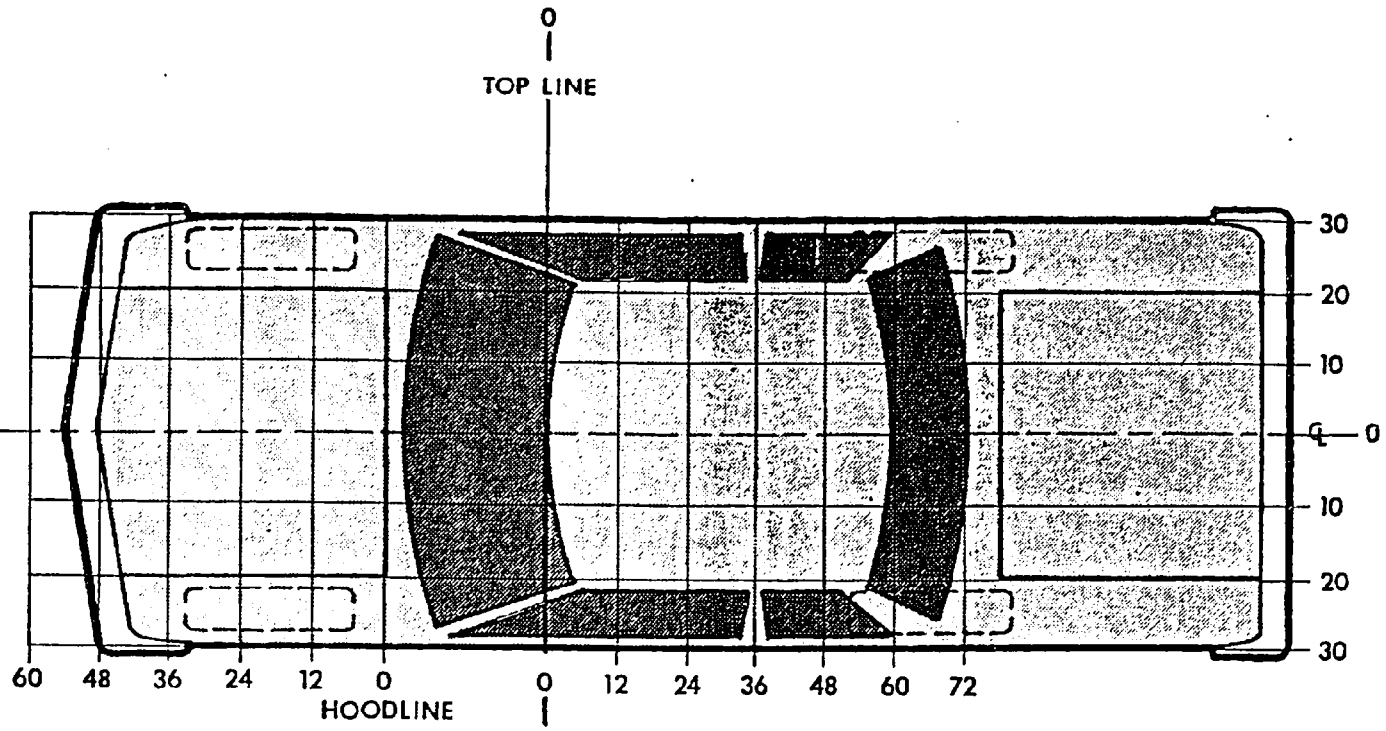
*REFERENCE: +X: FORWARD FROM RELEASE BLOCK
+Y: LEFTWARD FROM CENTER RELEASE BLOCK

ALL MEASUREMENTS ARE IN FEET.

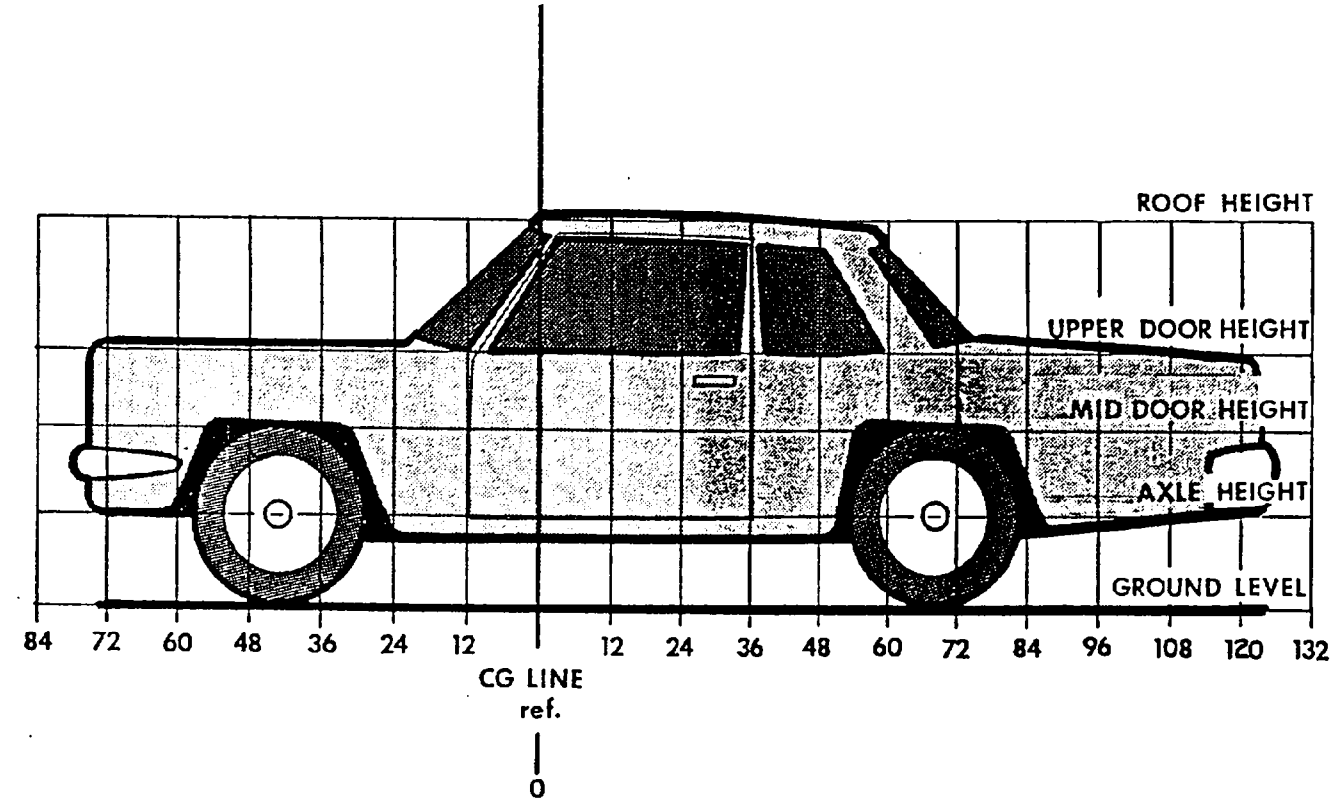
VEHICLE INTERIOR MEASUREMENTS

DESCRIPTION	PRE	POST	DIFF
Floor board to top of left "A" post	42.4	25.9	-16.5
Floor board to top of right "A" post	42.4	28.4	-14.0
Door sill to top of left "B" post	43.5	28.4	-15.1
Door sill to top of right "B" post	43.1	NA	NA
Door sill to top of left door opening	43.6	26.3	-17.3
Door sill to top of right door opening	43.6	28.8	-14.8
Floor tunnel to windshield header	37.5	18.8	-18.7
Floor tunnel to center of roof	37.9	17.8	-20.1
Rear of floor tunnel to roof	36.8	24.5	-12.3
Maximum width at "B" post	50.8	NA	NA
Maximum width at "A" post	50.4	48.2	-2.2
Maximum width at top of door opening	50.9	43.5	-7.4

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	43.5	44.1	44.3	44.1	43.9	X
Trailing edge of cowl + 12 inches***	X	43.1	43.2	43.8	43.3	42.8	X
Trailing edge of cowl + 24 inches	X	41.2	42.1	42.2	42.0	41.4	X
Trailing edge of cowl + 36 inches	X	37.7	38.2	38.7	38.5	38.3	X
Trailing edge of cowl + 48 inches	X	X	X	X	X	X	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)							
Trailing edge of cowl at centerline	X	43.6	43.5	43.5	42.8	41.8	X
Trailing edge of cowl + 12 inches	X	42.9	43.5	43.2	42.2	41.4	X
Trailing edge of cowl + 24 inches	X	41.9	42.1	42.4	41.6	40.4	X
Trailing edge of cowl + 36 inches	X	38.6	38.9	38.8	38.5	37.9	X
Trailing edge of cowl + 48 inches	X	X	X	X	X	X	X
STATIC CRUSH (IN)							
Trailing edge of cowl at centerline	X	0.1	-0.6	-0.8	-1.3	-2.1	X
Trailing edge of cowl + 12 inches	X	-0.2	0.3	-0.6	-1.1	-1.4	X
Trailing edge of cowl + 24 inches	X	0.7	0.0	0.2	-0.4	-1.0	X
Trailing edge of cowl + 36 inches	X	0.9	0.7	0.1	0.0	-0.4	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.
***Longutudinal 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.

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	X	X	61.6	X	X
Longitudinal Center of Gravity + 12 inches***	62.6	63.3	63.3	63.2	62.5
Longitudinal Center of Gravity + 24 inches	63.0	63.4	63.4	63.4	62.8
Longitudinal Center of Gravity + 36 inches	X	X	X	X	X
Longitudinal Center of Gravity + 48 inches	X	X	X	X	X
Longitudinal Center of Gravity + 60 inches	X	X	X	X	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)					
Longitudinal Center of Gravity	X	X	45.8	X	X
Longitudinal Center of Gravity + 12 inches	41.1	44.9	44.8	47.4	50.0
Longitudinal Center of Gravity + 24 inches	45.5	43.5	47.5	49.8	50.7
Longitudinal Center of Gravity + 36 inches	X	X	X	X	X
Longitudinal Center of Gravity + 48 inches	X	X	X	X	X
Longitudinal Center of Gravity + 60 inches	X	X	X	X	X
STATIC CRUSH (IN)					
Longitudinal Center of Gravity	X	X	-15.8	X	X
Longitudinal Center of Gravity + 12 inches	-21.5	-18.4	-18.5	-15.8	-12.5
Longitudinal Center of Gravity + 24 inches	-17.5	-19.9	-15.9	-13.6	-12.1
Longitudinal Center of Gravity + 36 inches	X	X	X	X	X
Longitudinal Center of Gravity + 48 inches	X	X	X	X	X
Longitudinal Center of Gravity + 60 inches	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 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
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Roof Height	61.8	X	X	X	X	X	X	21.1	21.4	X	X	X	X	X	X	X
Upper Door	42.2	X	18.4	17.7	17.5	17.2	17.6	17.4	16.9	17.4	17.2	17.1	17.2	17.0	16.9	X
Mid Door	29.6	17.0	15.8	15.0	15.5	15.5	15.5	15.4	15.1	15.6	15.2	14.9	14.8	15.3	15.5	X
Axle Height	15.2	X	X	X	X	18.1	18.1	18.1	17.9	18.2	17.8	X	X	X	X	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Roof Height	61.8	X	X	X	X	X	X	28.5	32.8	X	X	X	X	X	X	X
Upper Door	42.2	X	19.0	18.1	17.6	17.1	18.2	17.0	16.2	19.0	18.9	18.5	18.4	17.9	18.0	X
Mid Door	29.6	16.8	15.9	15.6	15.8	15.1	15.4	15.7	14.6	15.9	15.5	14.8	14.6	15.4	15.8	X
Axle Height	15.2	X	X	X	X	19.1	18.2	19.6	19.9	17.9	18.0	X	X	X	X	X
STATIC CRUSH (IN)																
Roof Height	61.8	X	X	X	X	X	X	7.4	11.4	X	X	X	X	X	X	X
Upper Door	42.2	X	0.6	0.4	0.1	-0.1	0.6	-0.4	-0.7	1.6	1.7	1.4	1.2	0.9	1.1	X
Mid Door	29.6	-0.2	0.1	0.6	0.3	-0.4	-0.1	0.3	-0.5	0.3	0.3	-0.1	-0.2	0.1	0.3	X
Axle Height	15.2	X	X	X	X	1.0	0.1	1.5	2.0	-0.3	0.2	X	X	X	X	X

* Center of gravity is located 51.0 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	61.8	X	X	X	X	X	X	23.1	22.6	X	X	X	X	X	X	X
Upper Door	42.2	X	19.4	19.0	18.2	18.1	17.5	17.5	17.2	17.4	17.6	17.1	17.0	17.4	17.4	X
Mid Door	29.6	17.3	16.1	16.0	15.9	15.9	15.4	15.3	15.5	15.6	15.4	15.1	14.6	15.6	15.9	X
Axle Height	15.2	X	X	X	X	18.1	18.0	18.0	18.1	18.3	18.2	X	X	X	X	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Roof Height	61.8	X	X	X	X	X	X	25.1	NA	X	X	X	X	X	X	X
Upper Door	42.2	X	19.6	18.7	18.0	14.8	12.2	13.4	14.2	17.2	17.1	17.1	16.8	16.8	17.1	X
Mid Door	29.6	17.8	16.5	15.7	15.4	15.1	15.1	15.1	15.1	15.4	15.1	14.9	14.7	15.2	15.7	X
Axle Height	15.2	X	X	X	X	18.0	18.2	18.1	18.4	18.3	17.9	X	X	X	X	X
STATIC CRUSH (IN)																
Roof Height	61.8	X	X	X	X	X	X	2.0	NA	X	X	X	X	X	X	X
Upper Door	42.2	X	0.2	-0.3	-0.2	-3.3	-5.3	-4.1	-3.0	-0.2	-0.5	0.0	-0.2	-0.6	-0.3	X
Mid Door	29.6	0.5	0.4	-0.3	-0.5	-0.8	-0.3	-0.2	-0.4	-0.2	-0.3	-0.2	0.1	-0.4	-0.2	X
Axle Height	15.2	X	X	X	X	-0.1	0.2	0.1	0.3	0.0	-0.3	X	X	X	X	X

* Center of gravity is located 51.0 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.,

IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Ford Ranger TEST NUMBER: 900905

ALL MEASUREMENTS ARE IN INCHES

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	182.4	182.0	0.4
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	160.6	160.1	0.5
X3	REAR SURFACE OF VEHICLE TO FIREWALL	142.9	140.6	2.3
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	128.5	127.6	0.9
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	128.5	127.0	1.5
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	128.0	128.0	0.0
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	128.0	127.5	0.5
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	86.9	87.5	-0.6
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	86.2	85.6	0.6
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	86.2	86.2	0.0
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	86.2	85.9	0.3
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	127.5	127.1	0.4
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	127.5	126.8	0.7
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	138.5	139.0	-0.5
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	139.8	138.6	1.2
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	113.0	110.5	2.5
X17	CENTER OF STEERING COLUMN TO "A" POST	11.6	6.0	5.6
X18	CENTER OF STEERING COLUMN TO HEADLINER	17.8	1.4	16.4
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	180.0	180.0	0.0
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	180.0	180.1	-0.1
X21	LENGTH OF ENGINE BLOCK	19.2	19.2	0.0

TEST ANOMALIES

The driver's neck shear force X-axis, NEKXF1, data was lost between 1.50 and 1.58 seconds.

EVENT TIMES

TEST DATE: 09/05/90

EVENT DESCRIPTION	TIME, SEC.
CONTACT RELEASE BLOCK	0.0
START COLLECTING DATA	-1.2
STOP COLLECTING DATA	5.8
ZERO TIME FOR DATA	0.0
STROBE LIGHTS FLASH	0.0
CAMERA L E D GOES OFF	0.0*
PIN RELEASES (ROLLOVER CART)	-0.202**
CYLINDERS START (ROLLOVER CART)	0.63

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

**Release time as setup on rollover cart control panel and as setup by position of rollover cart cycle start switch and release block. Cycle start switch was 10 feet in front of release block.

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: Ford Motor Company

MAKE/MODEL: Ford/Ranger VIN: 1FTBR10C9JUC25946

BODY STYLE: Pickup truck MODEL YEAR: 1988

NHTSA NO.: NA COLOR: Black

ENGINE DATA: TYPE: inline CYLINDERS: 4 DISPLACEMENT: 2.0 liter

TRANSMISSION DATA: _5_ SPEED, _X_ MANUAL, ___ AUTOMATIC, ___ FWD, _X_ RWD, ___ 4WD

DATE VEHICLE RECEIVED: 08/15/90 ODOMETER READING: 24,719

DEALER'S NAME AND ADDRESS: NA

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	Yes	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	No
OTHER	None		

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: Ford Motor Company

DATE OF MANUFACTURE: 5/88 VIN: 1FTBR10C9JUC25946

GVWR: 3900 LBS

GAWR: FRONT: 1835 LBS., REAR: 2215 LBS.

TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Firestone FR480 P195/70R14MS

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

SPARE TIRE (MFR., LINE, SIZE): Goodyear Polyspare P185/80D14

TYPE OF SEATS: FRONT: Bucket

TYPE OF FRONT SEAT BACKS: Non-adjustable

MAXIMUM WIDTH: 67.1 INCHES

WHEELBASE: 108.2 INCHES

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

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P195/70R14SL

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	27.3	;RF	27.5	;LR	28.6	;RR	29.0
FULLY LOADED ATTITUDE:	LF	26.6	;RF	27.1	;LR	26.4	;RR	27.0
PRE-TEST ATTITUDE:	LF	27.0	;RF	27.2	;LR	27.2	;RR	27.4
POST-TEST ATTITUDE:	LF	**	;RF	**	;LR	**	;RR	**

*THE VEHICLE DID NOT CONTAIN CAPACITY DATA.
**THE VEHICLE CAME TO REST ON ITS ROOF.

TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE AS RECEIVED (EMPTY):

RIGHT FRONT	743 LBS.	RIGHT REAR	554 LBS.
LEFT FRONT	783 LBS.	LEFT REAR	528 LBS.
TOTAL FRONT WEIGHT	1526 LBS.	(58.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1082 LBS.	(41.5% OF TOTAL VEHICLE WEIGHT)	

TOTAL DELIVERED WEIGHT 2608 LBS.

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

UDW = UNLOADED DELIVERED WEIGHT (2608 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 X 167 LBS/DUMMY)

TARGET TEST WEIGHT = 2608 + 300 + 167

TARGET TEST WEIGHT = 3075 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 305 LBS. OF CARGO WEIGHT:

RIGHT FRONT	769 LBS.	RIGHT REAR	733 LBS.
LEFT FRONT	853 LBS.	LEFT REAR	725 LBS.
TOTAL FRONT WEIGHT	1622 LBS.	(52.7% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1458 LBS.	(47.3% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3080 LBS.	(0.2% OVER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: 75 LBS.

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 51.0 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: 900905 TEST DATE: 9/05/90

TEST TEMPERATURES:
IMPACT AREA: 90°F; OCCUPANT COMPARTMENT 80°F
DRIVER DUMMY 78°F; PASSENGER DUMMY: NA°F

VEHICLE AND ROLL CART DATA

	ACTUAL	INTENDED
VEHICLE TEST WEIGHT (lbs.):	3080	3075
VEHICLE ORIENTATION (deg.): ROLL	30	30
IMPACT SIDE:	Right	Right
ROLL CART WEIGHT (lbs.):	3347	3347
ROLL CART CRABBED ANGLE (deg.):	0	0
ROLL CART VELOCITY (mph):	30	30

VEHICLE MEASUREMENTS

MAXIMUM LENGTH: 182.4 WHEELBASE: 108.0
MAXIMUM WIDTH: 67.1 TOP WIDTH: 52.5
C.G. REARWARD OF FRONT WHEEL CENTERLINE: 51.0
C.G. HEIGHT ABOVE GROUND LEVEL: 24.5

VEHICLE TEST CONDITIONS

LEFT FRONT:	DOOR - LOCKED	WINDOW - UP
LEFT REAR:	DOOR - NA	WINDOW - NA
RIGHT FRONT:	DOOR - UNLOCKED	WINDOW - UP
RIGHT REAR:	DOOR - NA	WINDOW - NA
EMERGENCY BRAKE:	OFF	TRANSMISSION: NEUTRAL
HEADRESTS:	DRIVER - NA	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 unibelt

REMARKS:
ALL DISTANCE MEASUREMENTS ARE IN INCHES.

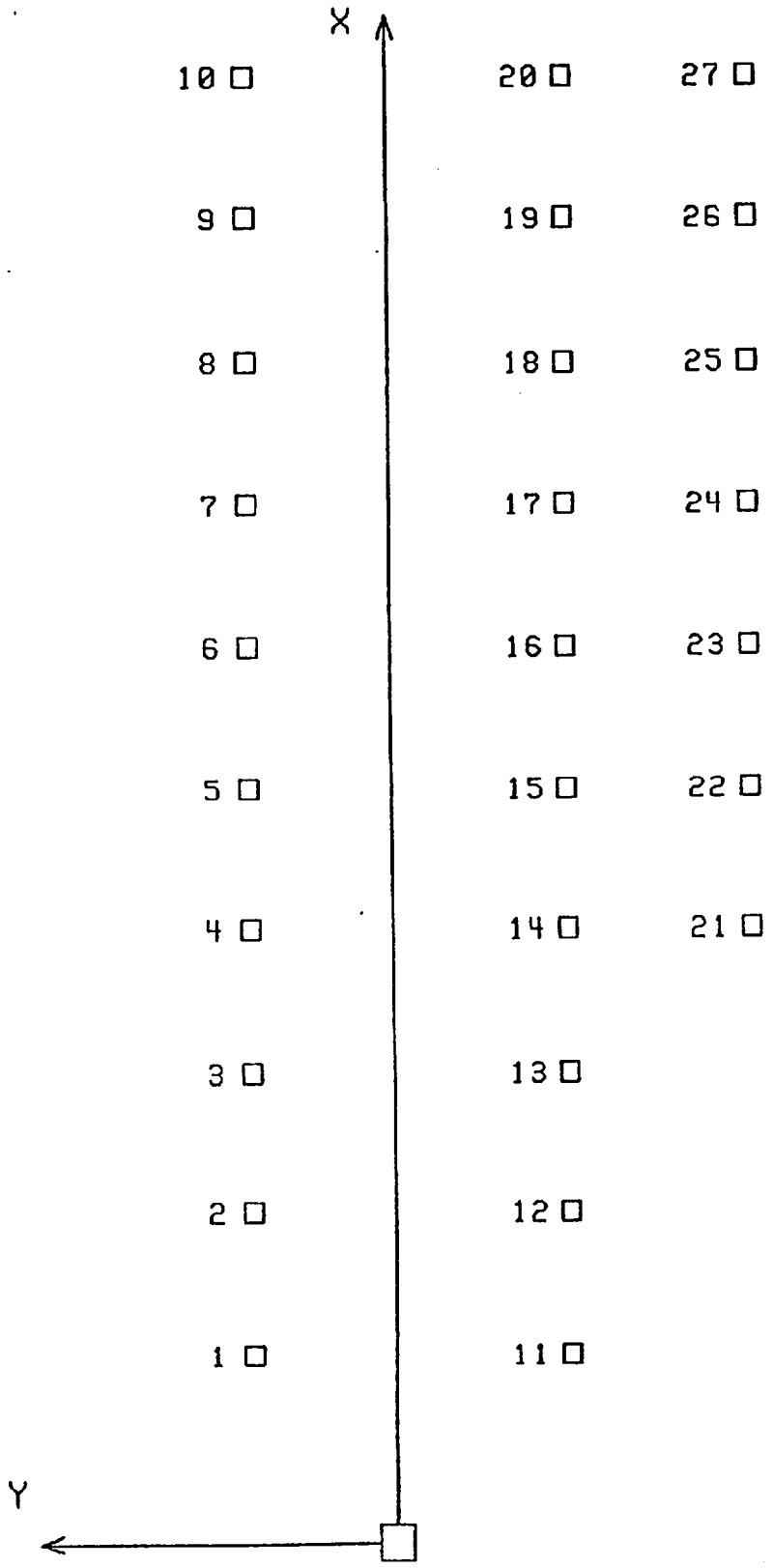
VEHICLE INSTRUMENTATION LOCATIONS AND DATA SUMMARY

TEST NUMBER 900905

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX	POSITIVE DIRECTION SEC	NEGATIVE DIRECTION MAX	NEGATIVE DIRECTION SEC
1	CENTER OF GRAVITY	84.9	1.2	28.9				
	ACCELERATION (g)							
	LONGITUDINAL				51.2	1.5	22.2	1.5
	LATERAL				17.7	1.5	14.5	1.5
	VERTICAL				15.0	1.4	21.4	1.5
	RESULTANT				52.1	1.5		
2	CENTER OF GRAVITY	84.9	1.0	27.8				
	ANGULAR VELOCITY (deg/sec)							
	ROLL (X-AXIS)				149.1	1.5	226.4	1.5
	PITCH (Y-AXIS)				14.3	2.2	50.3	1.5
	YAW (Z-AXIS)				81.2	1.4	42.0	0.6
3	LEFT FRONT SUSPENSION	153.4	21.4	34.2				
	DISPLACEMENT (in)							
	VERTICAL				0.7	0.6	8.2	1.6
4	RIGHT FRONT SUSPENSION	153.6	-22.4	34.8				
	DISPLACEMENT (in)							
	VERTICAL				0.3	0.6	2.3	1.5
5	LEFT REAR SUSPENSION	44.6	22.4	35.8				
	DISPLACEMENT (in)							
	VERTICAL				0.3	0.7	10.3	1.6
6	RIGHT REAR SUSPENSION	44.6	-21.6	36.2				
	DISPLACEMENT (in)							
	VERTICAL				2.4	1.6	4.3	2.2
7	SHOULDER BELT	86.6	24.0	26.2				
	DISPLACEMENT (in)							
	DRIVER				2.1	1.5	2.6	1.6

* 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: + NOSE DOWNWARD
YAW: + COUNTERCLOCKWISE
DISPLACEMENT: + OUTWARD



STADIA POLE LAYOUT AND NUMBERING SYSTEM

STADIA POLE LOCATIONS

POLE NO.	X DISTANCE, *	Y DISTANCE, *
1	35.0	8.0
2	43.0	8.0
3	51.0	8.0
4	59.0	8.0
5	67.0	8.0
6	75.0	8.0
7	83.0	8.0
8	91.0	8.0
9	99.0	8.0
10	107.0	8.0
11	35.0	-10.0
12	43.0	-10.0
13	51.0	-10.0
14	59.0	-10.0
15	67.0	-10.0
16	75.0	-10.0
17	83.0	-10.0
18	91.0	-10.0
19	99.0	-10.0
20	107.0	-10.0
21	59.0	-20.0
22	67.0	-20.0
23	75.0	-20.0
24	83.0	-20.0
25	91.0	-20.0
26	99.0	-20.0
27	107.0	-20.0

*REFERENCE: +X: FORWARD FROM RELEASE BLOCK

+Y: LEFTWARD FROM CENTER RELEASE BLOCK

ALL MEASURMENTS ARE IN FEET.

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Left panning	Kodak	25	24	Real-time documentation
2	Left	Photosonic 1B	13	500	Vehicle dynamics
3	Left angle	Photosonic 1B	25	498	Vehicle dynamics
4	Downstream	Photosonic 1B	50	495	Vehicle dynamics
5	Right	Photosnoic 1B	13	495	Vehicle dynamics
6	Overhead	Photosonic 1B	8	498	Dummy kinematics
7	Onboard	Photosonic 1B	8	500	Dummy kinematics
8	Documentary	Beaulieu	12-120	24	Pre & post-test documentation

HIGH SPEED CAMERA LOCATION

OFFBOARD

CAMERA NO.	X*	Y*	Z*
2	96.0	195.1	5.7
3	248.1	124.5	3.8
4	210.9	0.0	2.8
5	56.1	-72.1	3.5

*Reference:

+X: Forward from release block

+Y: Leftward from the centerline of the release block

+Z: Upward from the ground level

ONBOARD

CAMERA NO.	X**	Y**	Z**
7	1.5	-0.9	1.0

**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 FEET.

SECTION 4.0

OCCUPANT INFORMATION

POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #907	PASSENGER #NA
HEAD	Roof	NA
CHEST	Roof	NA
ABDOMEN	None	NA
LEFT KNEE	Left door	NA
RIGHT KNEE	Steering column	NA

DOOR OPENING:

	LEFT	RIGHT
FRONT	Easy	Easy
REAR	NA	NA

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	None	None
REAR	NA	NA

GLAZING DAMAGE:

The entire windshield was cracked upon impact. The left and right door windows and the rear window were shattered upon impact.

OTHER NOTABLE IMPACT EFFECTS:

None

DUMMY KINEMATIC SUMMARY

Driver Dummy

Upon the vehicle's impact with the ground, the driver dummy's head struck the roof. The upper torso struck the roof and the left leg contacted the left front door and the right leg contacted the steering column. As the vehicle rolled onto its roof, the dummy's head remained in contact with the roof and the dummy's upper torso remained near the right door. The vehicle came to rest on its roof with the driver dummy's head resting against the roof. The dummy was restrained with a three-point unibelt.

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. The temperature was controlled to the last minute before launching of 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 unibelt.

DUMMY DATA SUMMARY

TEST NUMBER 900905

DRIVER DUMMY
SN: 907

	POSITIVE DIRECTION MAX	SEC	NEGATIVE DIRECTION MAX	SEC
HEAD ACCELERATION (g)				
LONGITUDINAL	87.7	2.6	175.9	2.3
LATERAL	119.3	2.1	246.9	1.5
VERTICAL	83.3	2.1	122.3	1.5
RESULTANT	254.3	1.5		
HIC 36 MSEC	937.5 FROM 1451.0 TO 1476.0			
NECK FORCES (lbs)				
LONGITUDINAL	469.6	2.1 Y	3054.5	2.1 Y
LATERAL	157.5	1.5	716.1	2.1
VERTICAL	330.3	1.4	2807.5	1.5
NECK MOMENT (in-lbs)				
ABOUT LONG.	280.1	1.5	51.8	2.1
ABOUT LATERAL	37.1	2.1	252.8	1.5
ABOUT VERTICAL	2.8	1.4	79.5	1.5
CHEST ACCELERATION (g)				
LONGITUDINAL	16.7	2.1	28.1	2.1
LATERAL	45.5	1.5	24.6	1.5
VERTICAL	16.8	1.5	51.6	1.5
RESULTANT	61.1	1.5		
3 MSEC	47.5 FROM 1457.0 TO 1460.0			
CHEST DISPLACEMENT (in)				
LONGITUDINAL	0.7	1.5	0.1	1.5
PELVIS ACCELERATION (g)				
LONGITUDINAL	5.7	2.1	13.2	1.5
LATERAL	10.4	1.6	9.1	1.5
VERTICAL	9.4	2.1	32.5	1.5
RESULTANT	32.7	1.5		

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

See APPENDIX D for neck load cell polarities.

Y See TEST ANOMALIES

DUMMY IN-VEHICLE POSITION RECORDING SHEET

MFR./MAKE/MODEL: Ford Motor Company/Ford/Ranger

SEAT TYPE: X Bench
_____Bucket
_____Split bench

ADJUSTER TYPE: X Manual
_____Power
_____Non-adjustable

STEERING COLUMN: X Non-adjustable

BUCKET SEAT BACK TYPE: X Non-adjustable
_____Adjustable reclining

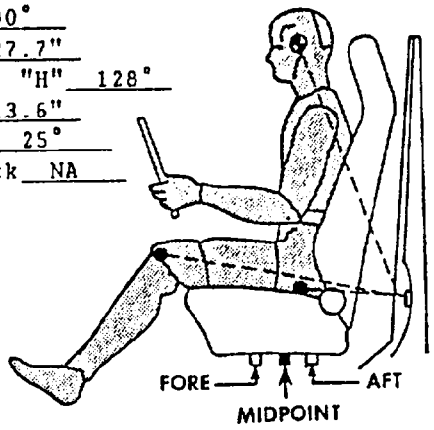
POSITIONING DATE: 9/05/90

AMBIENT TEMP. 75° F TIME: 0900

TECHNICIANS:
1. B. Miller
2. _____
3. _____
4. _____

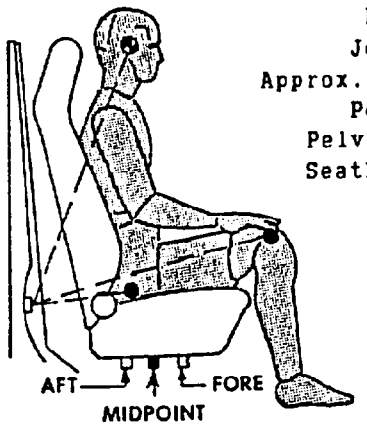
DRIVER DUMMY* # 907 TYPE: HIII

Head 65°
Target 20.9"
Knee 100°
Joint 27.7"
Approx. "H" 128°
Point 13.6"
Pelvis 25°
Seatback NA

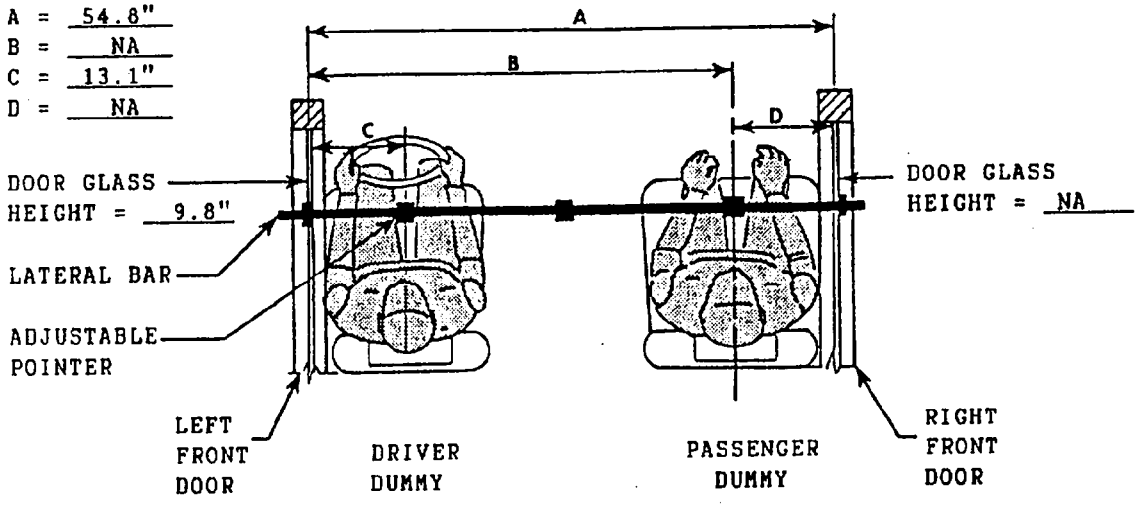


PASSENGER DUMMY* # NA TYPE: _____

Head _____
Target _____
Knee _____
Joint _____
Approx. "H" _____
Point _____
Pelvis _____
Seatback _____



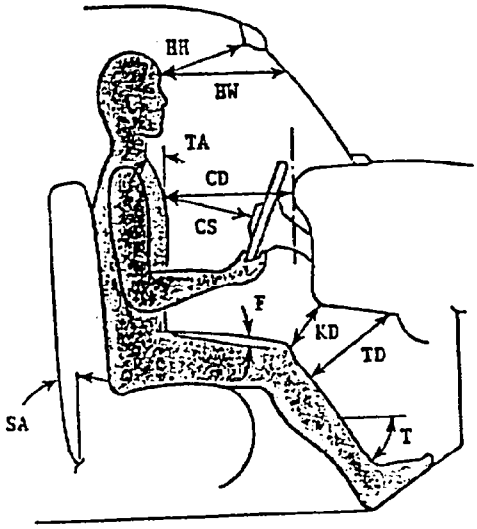
A = 54.8"
B = NA
C = 13.1"
D = NA

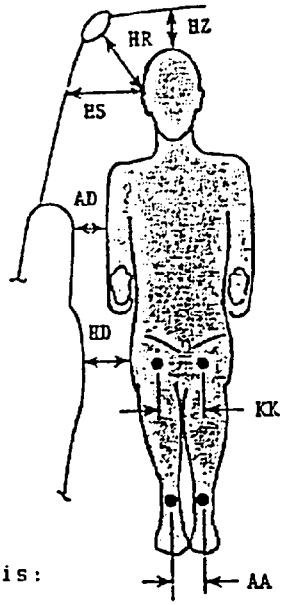


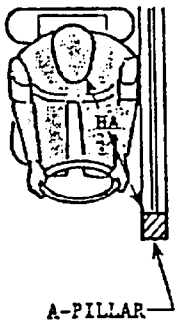
*Dummy measurements are referenced to top of striker bolt and all angles are referenced to vertical.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER	PASSENGER
HH	17.2	NA
HW	22.0	NA
CD	21.0	NA
CS	10.9	NA
KDL	6.0	NA
KDR	5.8	NA
TA	19°	NA
SA	NA°	NA
HA	18.2	NA
FL	15°	NA
FR	14°	NA
TDL	3.4	NA
TDR	3.6	NA
TL	35°	NA
TR	37°	NA
HZ	5.0	NA
HR	8.4	NA
HS	9.9	NA
AD	4.2	NA
HD	5.8	NA
KK	9.0	NA
AA	11.6	NA





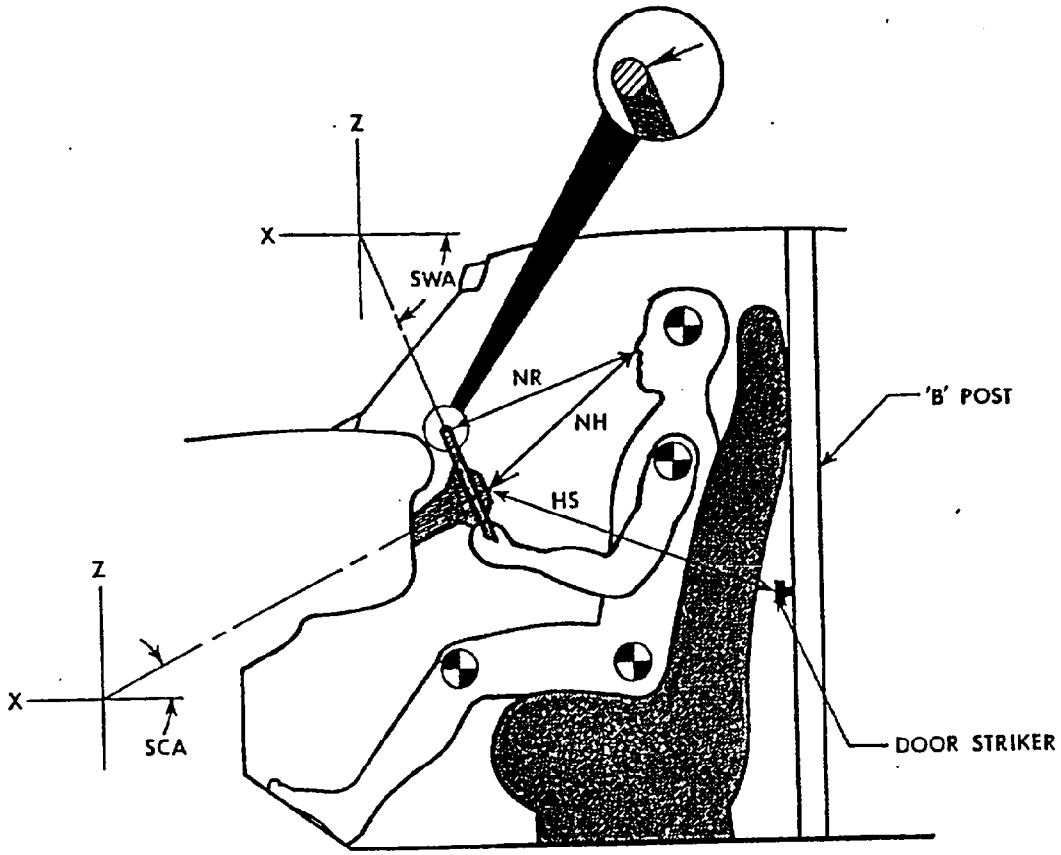


Knee outer clevis to outer clevis:
Driver = 10.6" Passenger = NA

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

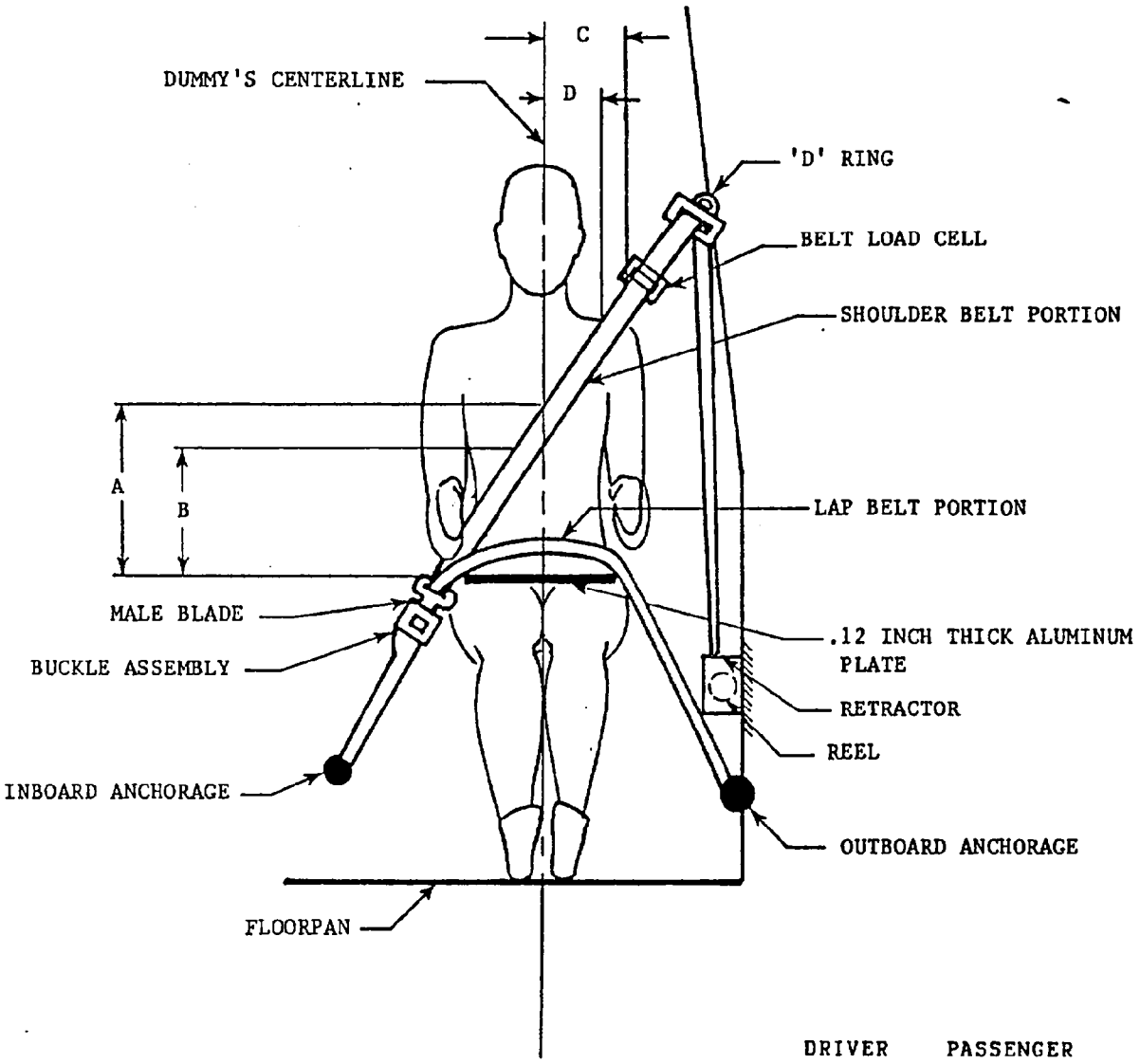


POSITION OF STEERING COLUMN TILTING AND TELESCOPING ADJUSTMENTS, IF ANY:
Non-adjustable

	MEASUREMENTS
NR - DISTANCE FROM TIP OF DUMMY'S NOSE TO TOP REAR SURFACE OF STEERING WHEEL RIM.	13.9
NH - DISTANCE FROM TIP OF DUMMY'S NOSE TO CENTER OF STEERING COLUMN HUB.	14.6
HS - DISTANCE FROM CENTER OF STEERING COLUMN HUB TO THE FORWARD SURFACE OF THE DOOR LOCK STRIKER PIN.	24.5
SCA - ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS	24°
SWA - ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS	66°

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - TOP SURFACE OF ALUMINUM PLATE TO BELT UPPER EDGE	10.2	NA
B - TOP SURFACE OF ALUMINUM PLATE TO BELT LOWER EDGE	6.1	NA
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	5.0	NA
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	3.1	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

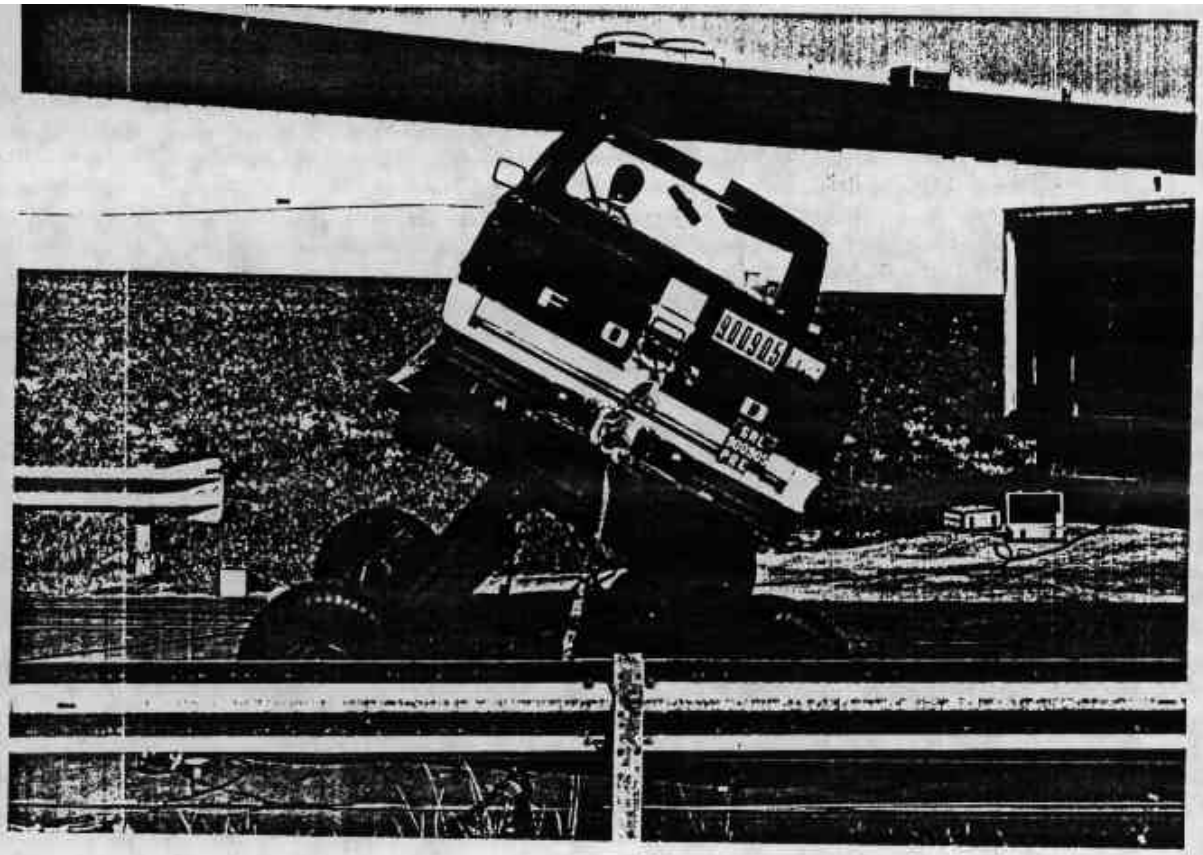


Figure A-3. PRE-TEST REAR VIEW

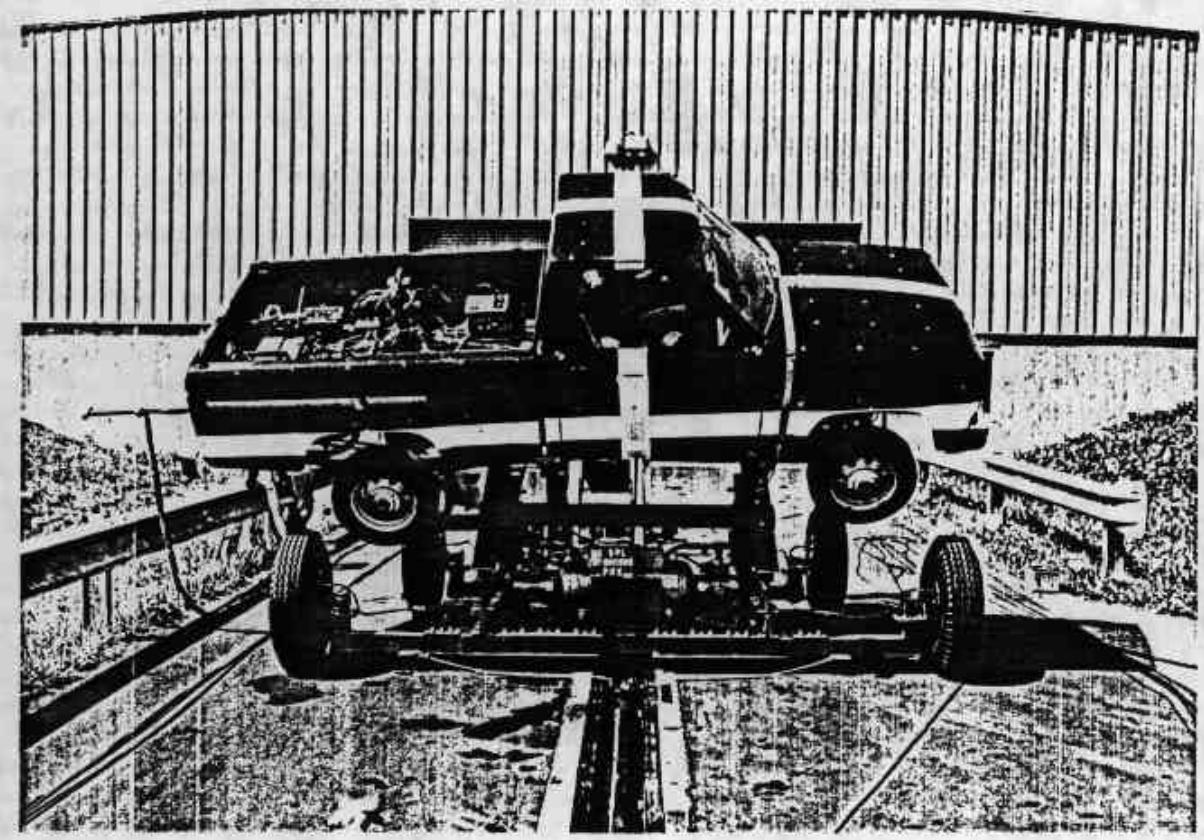


Figure A-4. PRE-TEST RIGHT SIDE VIEW

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

Figure A-6. PRE-TEST DRIVER DUMMY VIEW

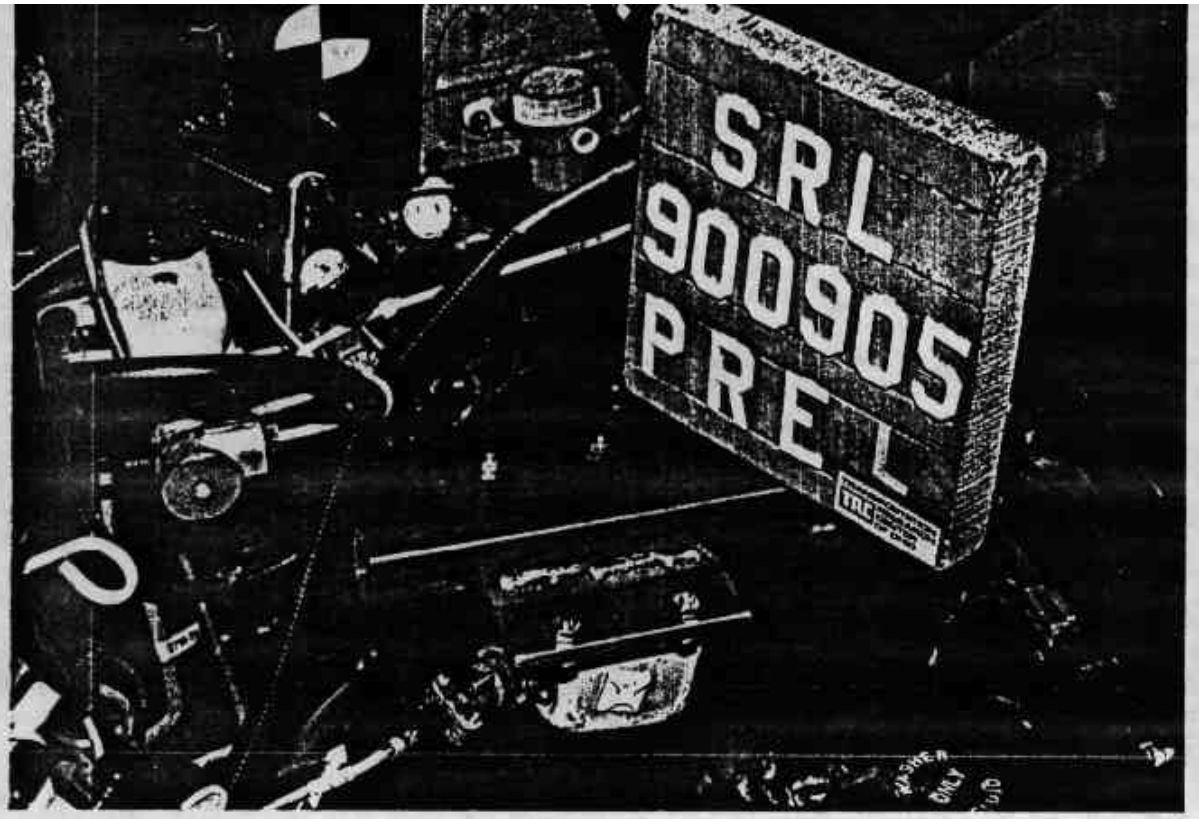


Figure A-7. PRE-TEST LEFT FRONT SUSPENSION STRING POTENTIOMETER - VIEW 1

Figure A-8. PRE-TEST LEFT FRONT SUSPENSION STRING POTENTIOMETER - VIEW 2

Figure A-9. PRE-TEST RIGHT FRONT SUSPENSION STRING POTENTIOMETER - VIEW 1

Figure A-10. PRE-TEST RIGHT FRONT SUSPENSION STRING POTENTIOMETER - VIEW 2

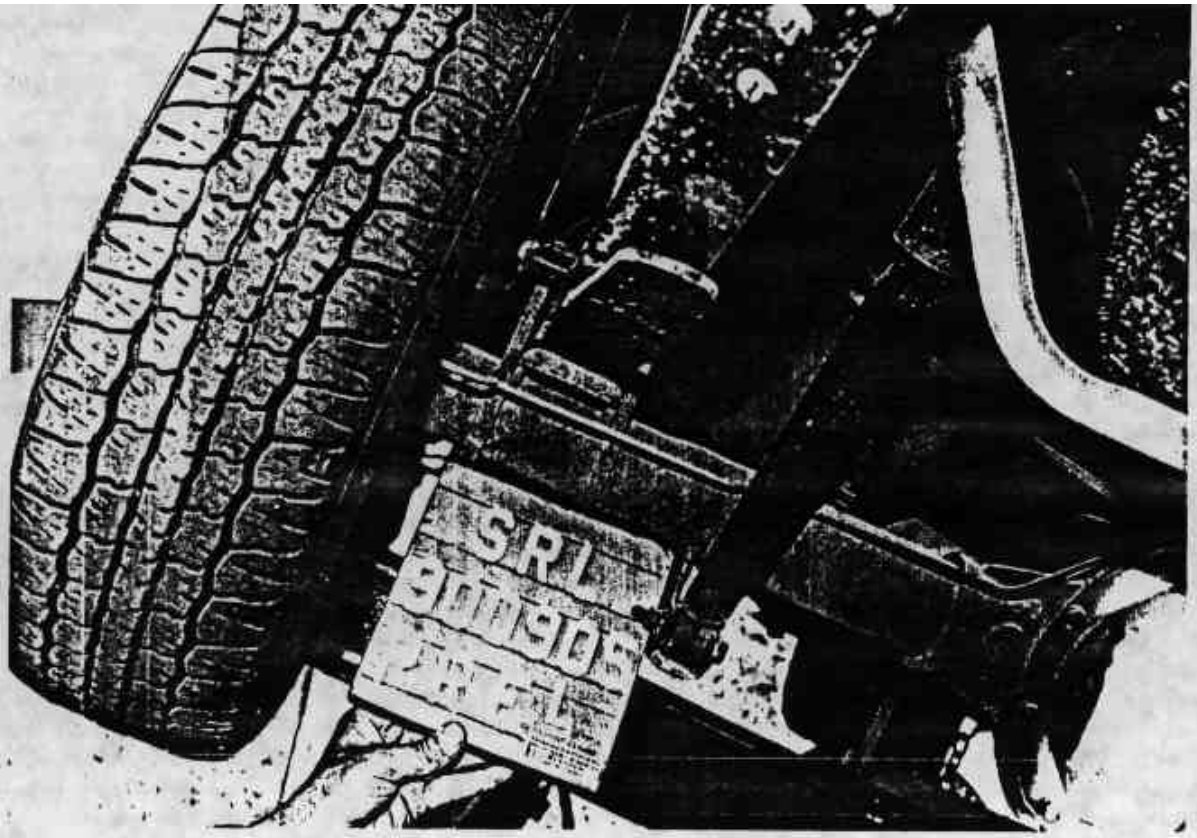


Figure A-11. PRE-TEST LEFT REAR SUSPENSION STRING POTENTIOMETER VIEW

Figure A-12. PRE-TEST RIGHT REAR SUSPENSION STRING POTENTIOMETER VIEW

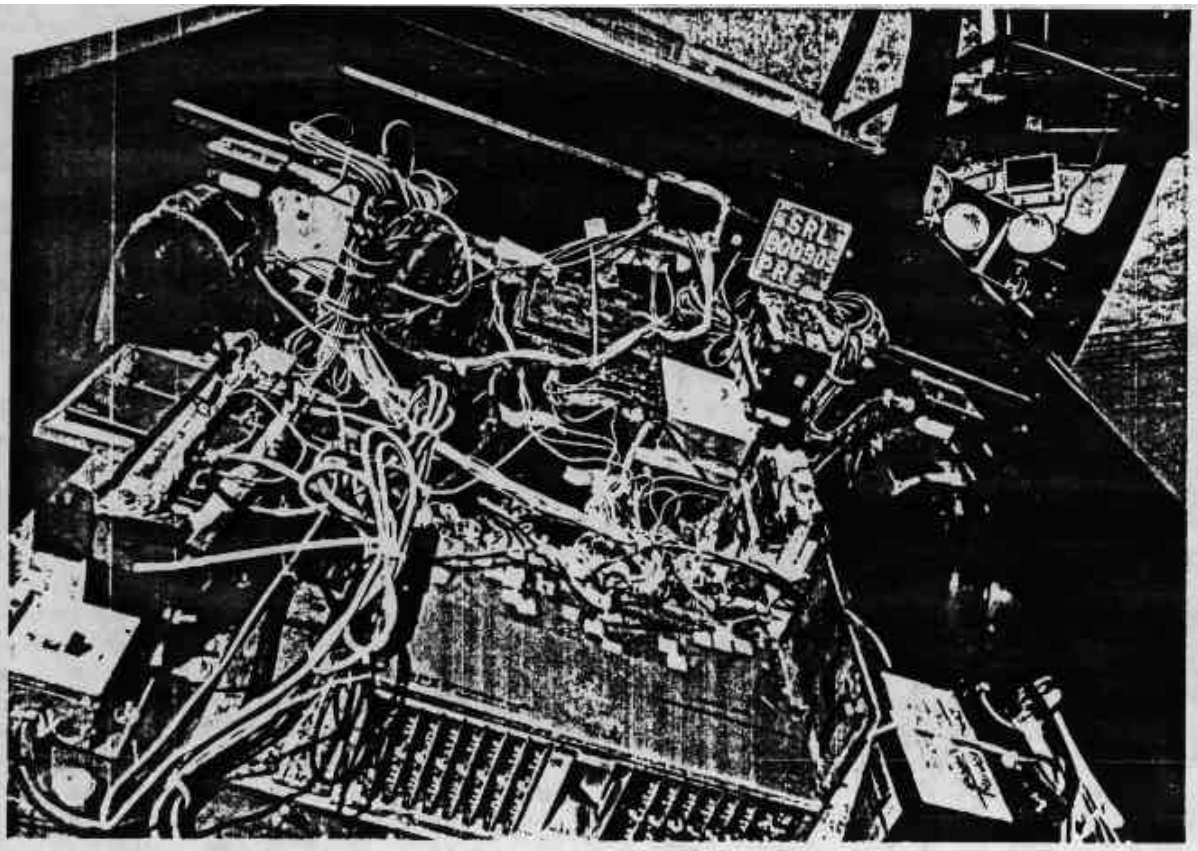


Figure A-13. PRE-TEST VEHICLE INSTRUMENTATION AND BALLAST LOCATION

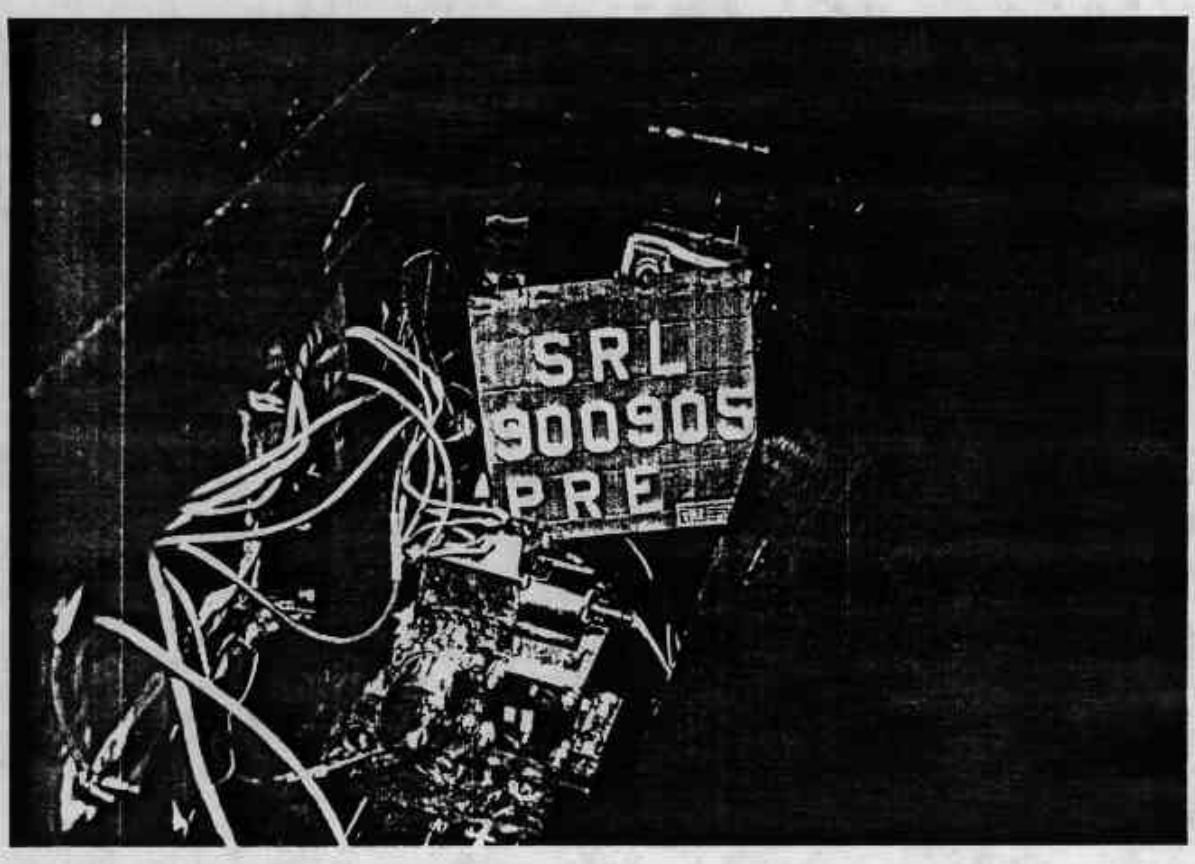


Figure A-14. PRE-TEST GYROSCOPE PLACEMENT VIEW

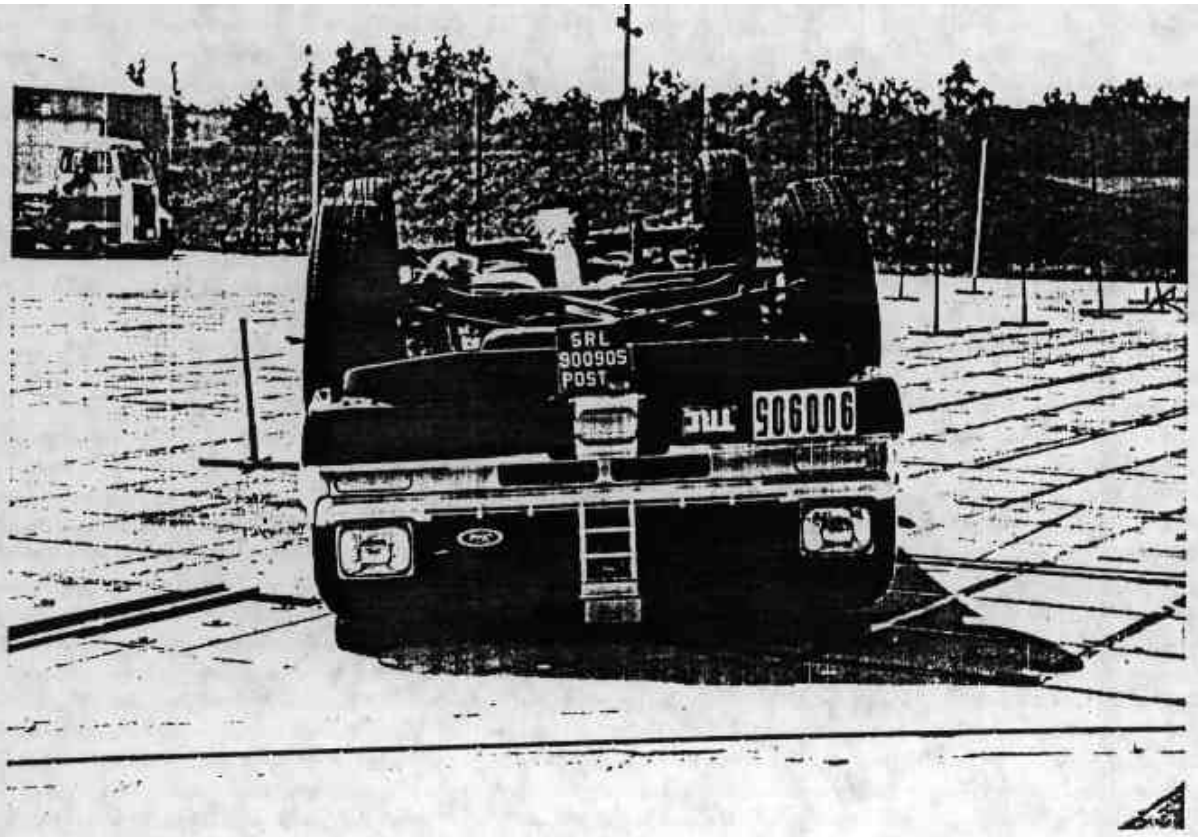


Figure A-15. POST-TEST FRONT - VIEW 1

Figure A-16. POST-TEST FRONT VIEW - VIEW 2

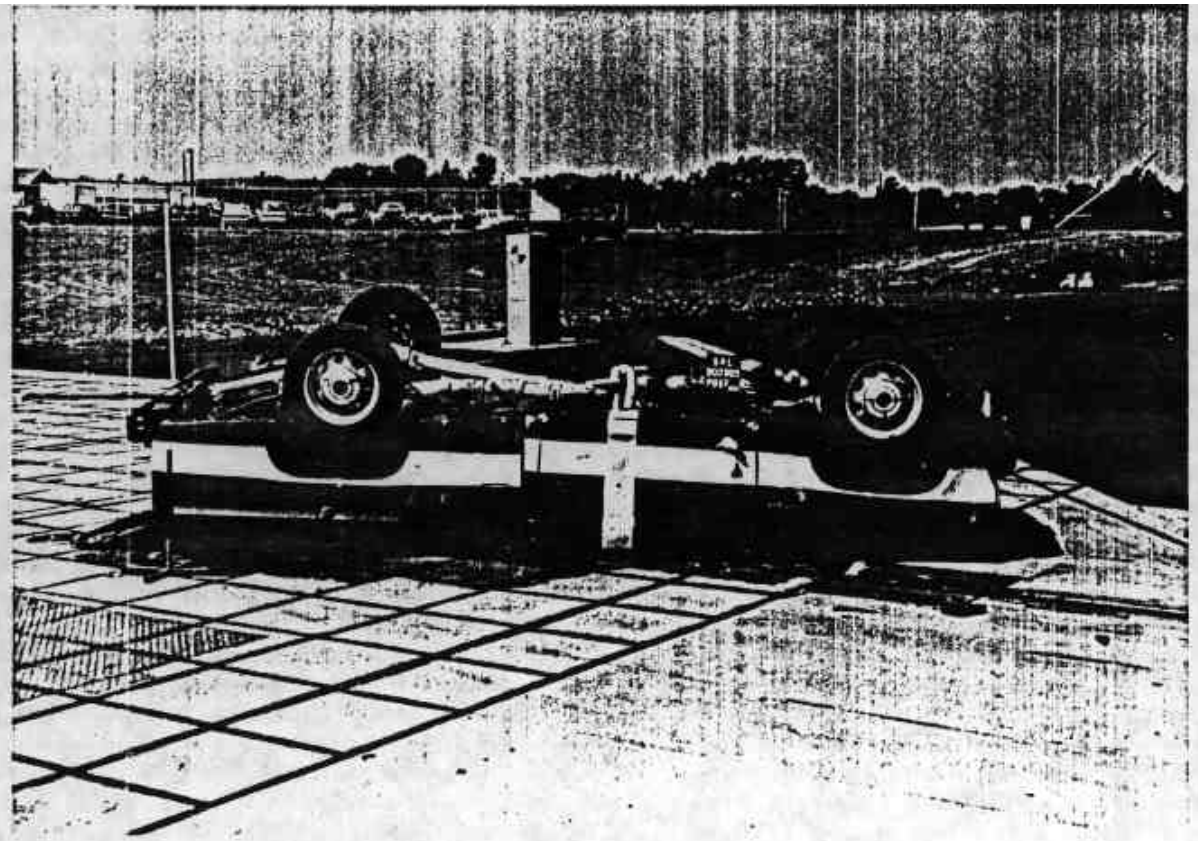


Figure A-17. POST-TEST LEFT SIDE - VIEW 1

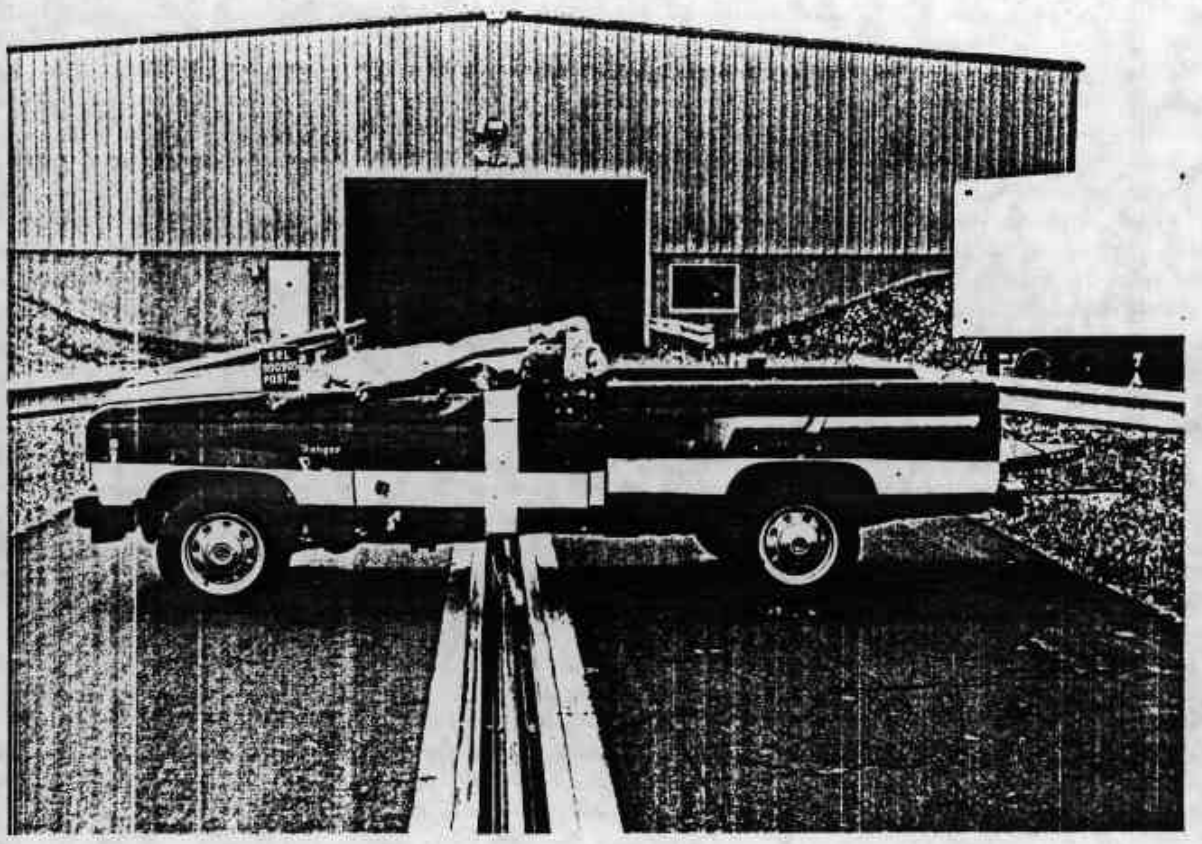


Figure A-18. POST-TEST LEFT SIDE - VIEW 2

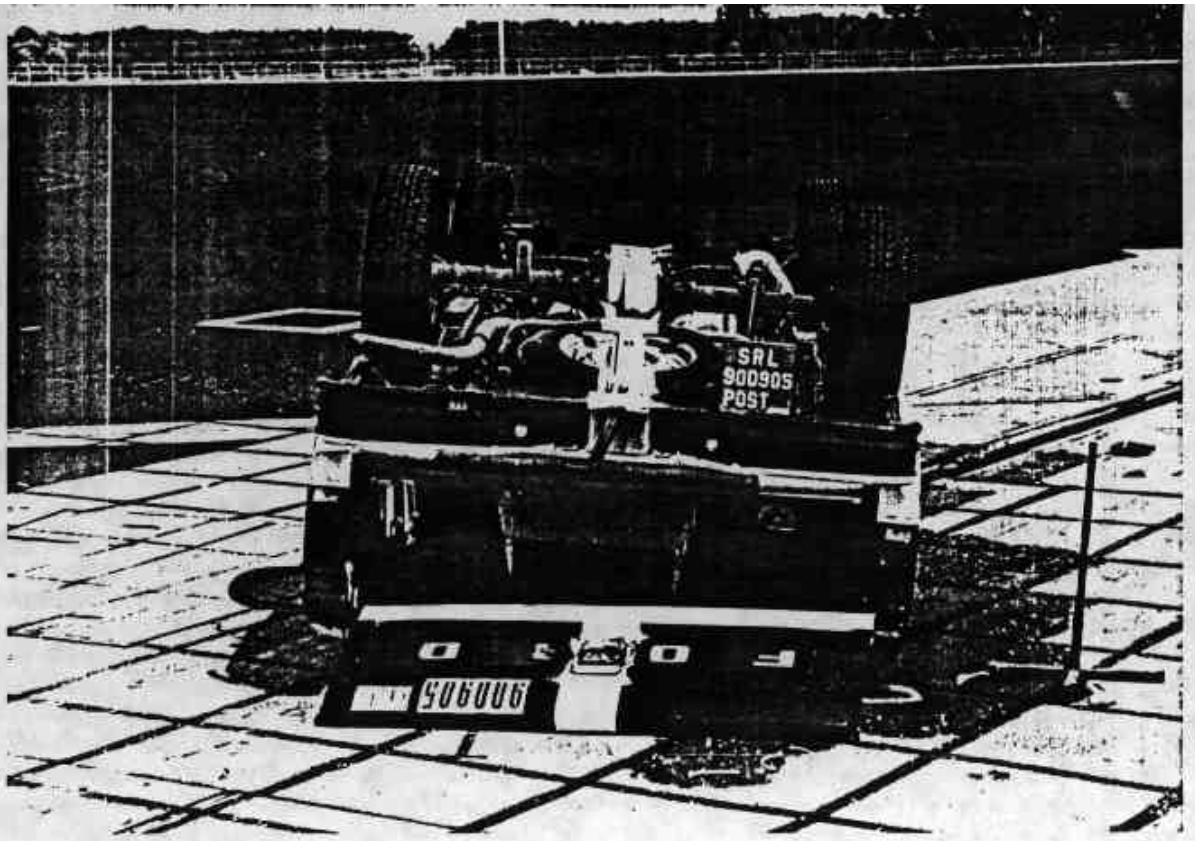


Figure A-19. POST-TEST REAR - VIEW 1

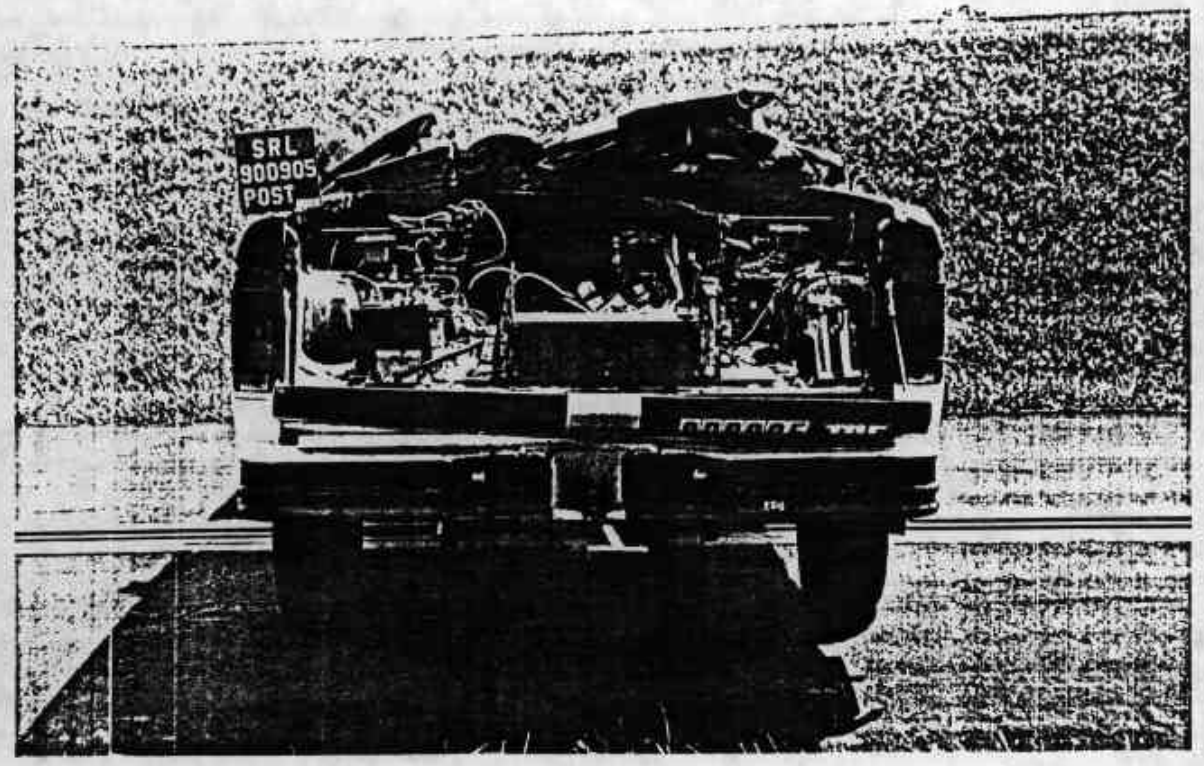


Figure A-20. POST-TEST REAR - VIEW 2

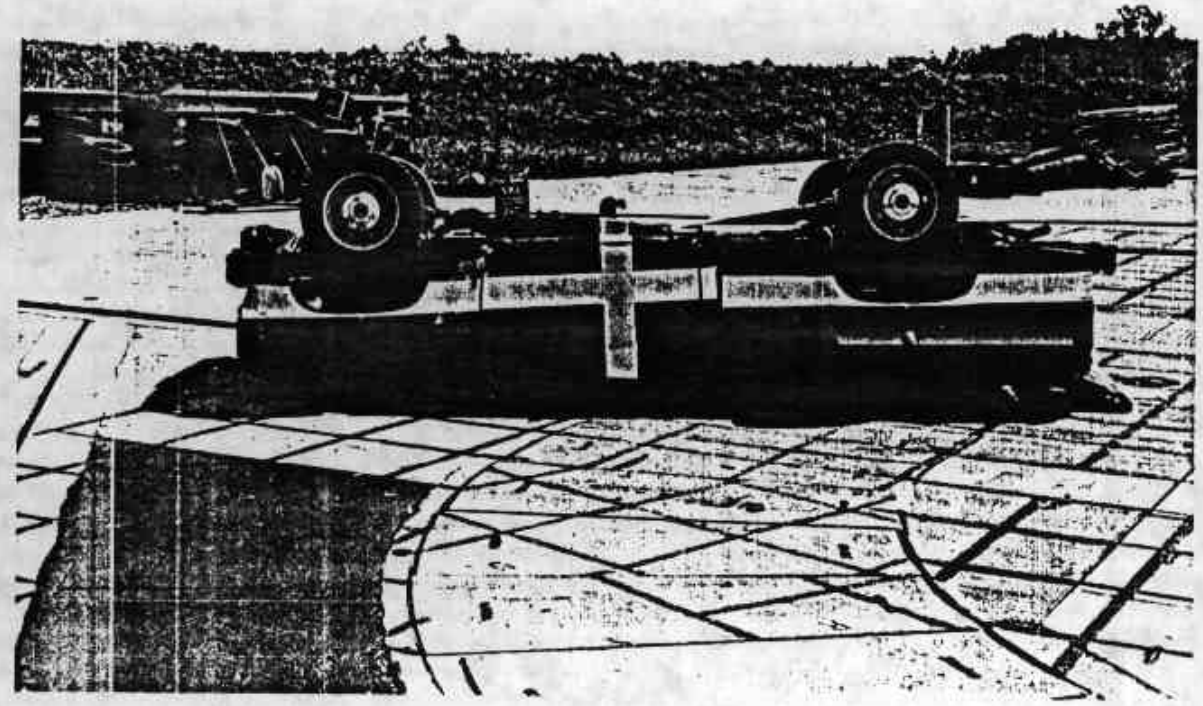


Figure A-21. POST-TEST RIGHT SIDE - VIEW 1

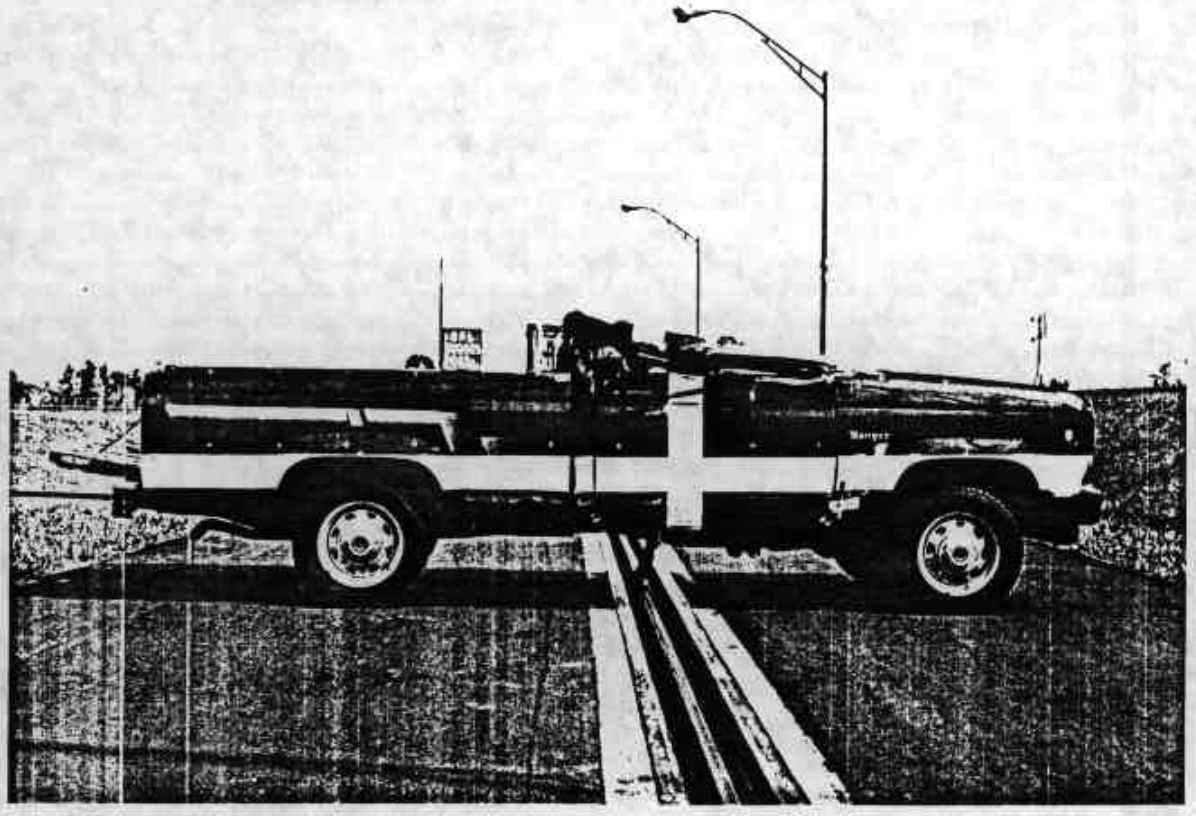


Figure A-22. POST-TEST RIGHT SIDE - VIEW 2

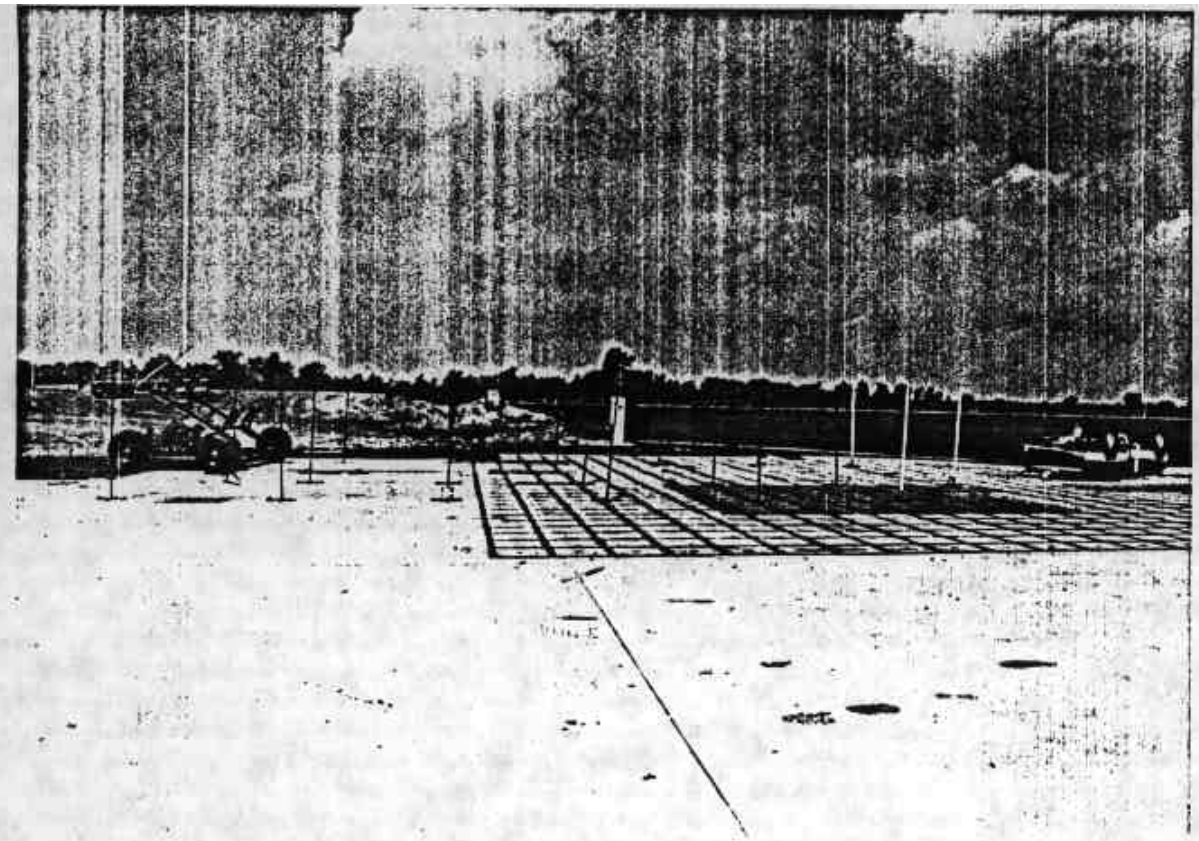


Figure A-23. POST-TEST OVERALL - VIEW 1

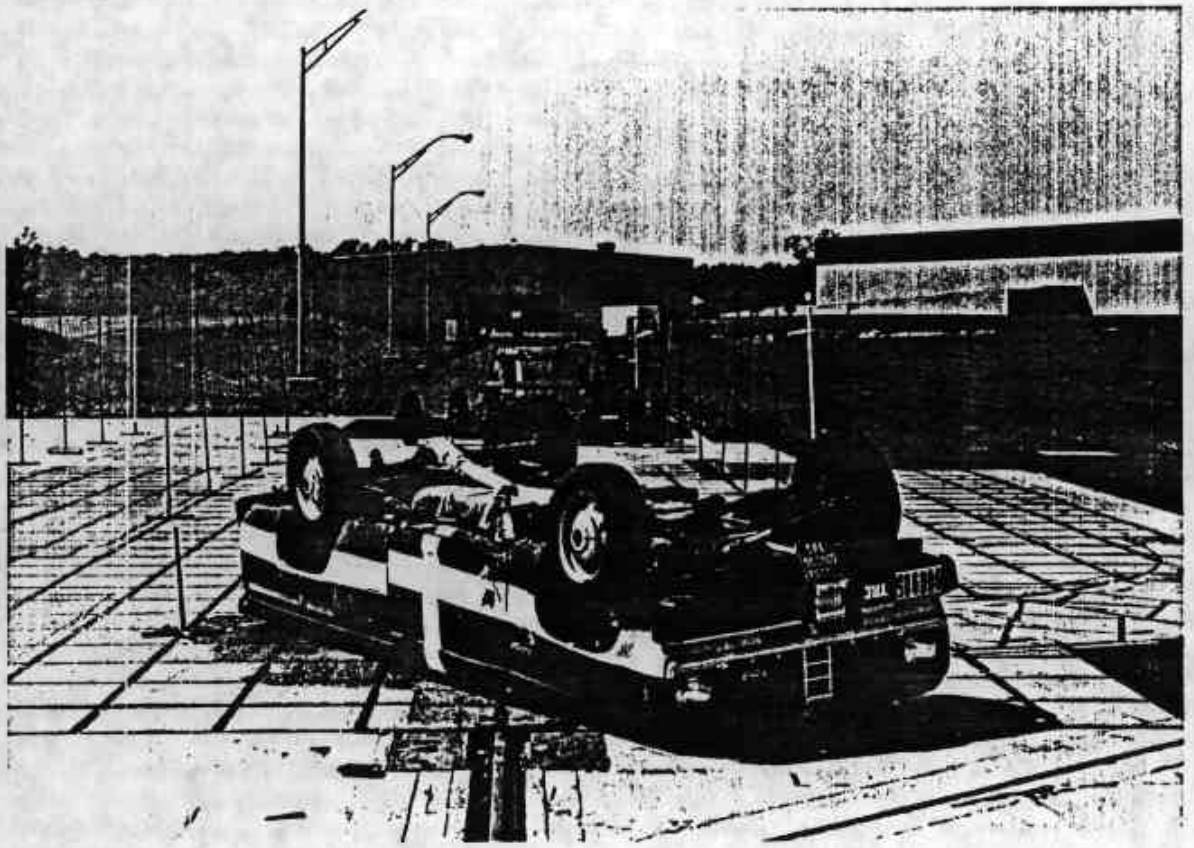


Figure A-24. POST-TEST OVERALL - VIEW 2

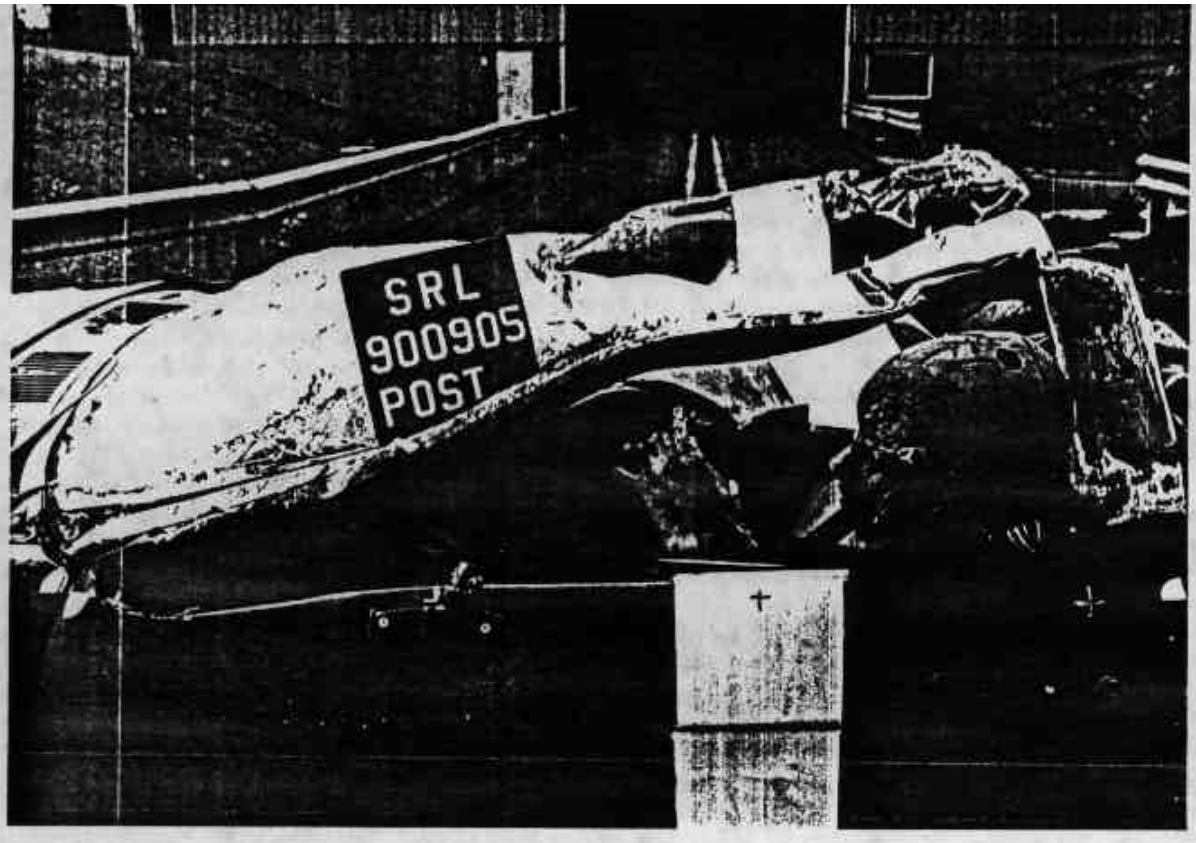
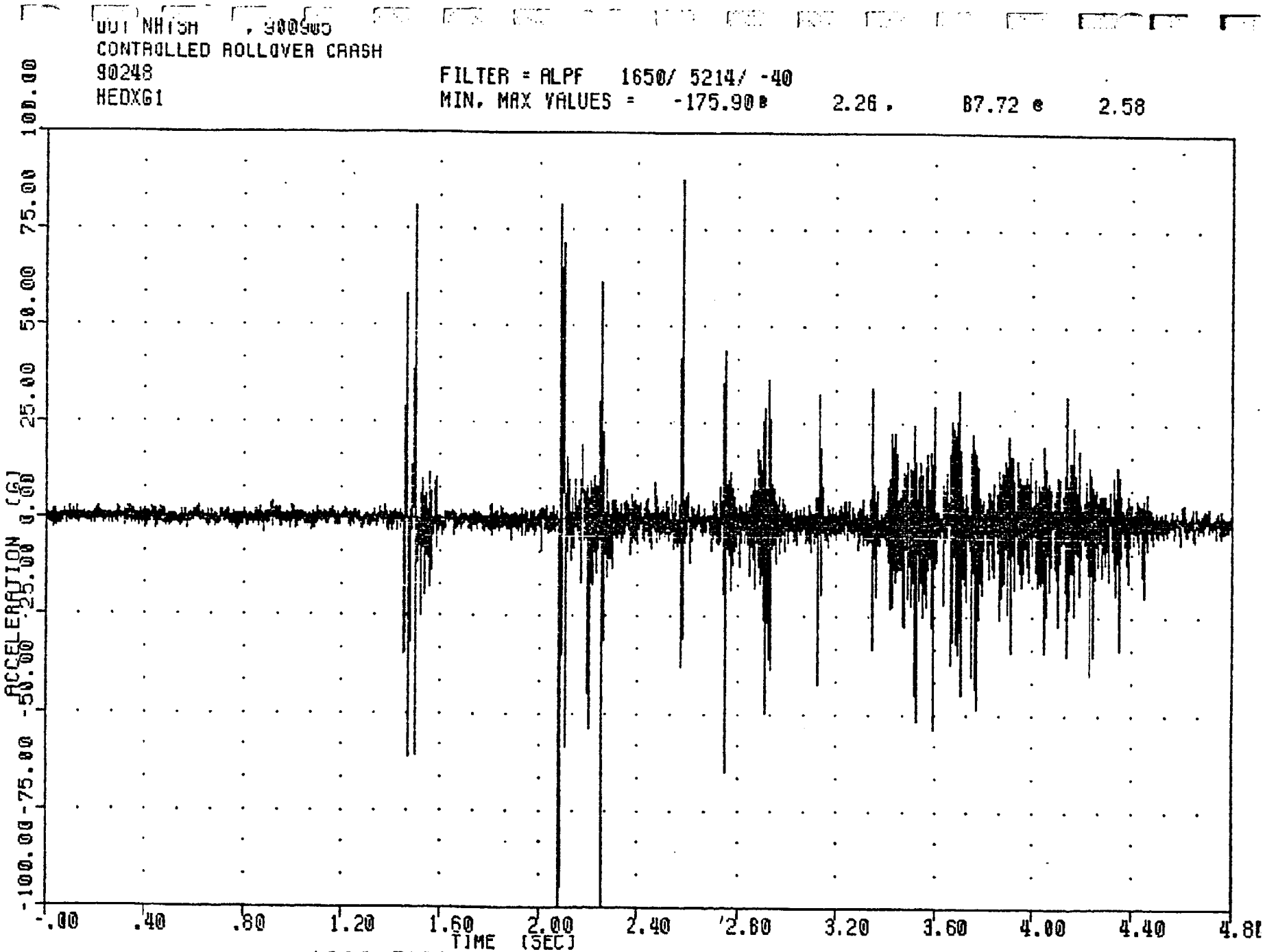


Figure A-25. POST-TEST DUMMY AND VEHICLE VIEW

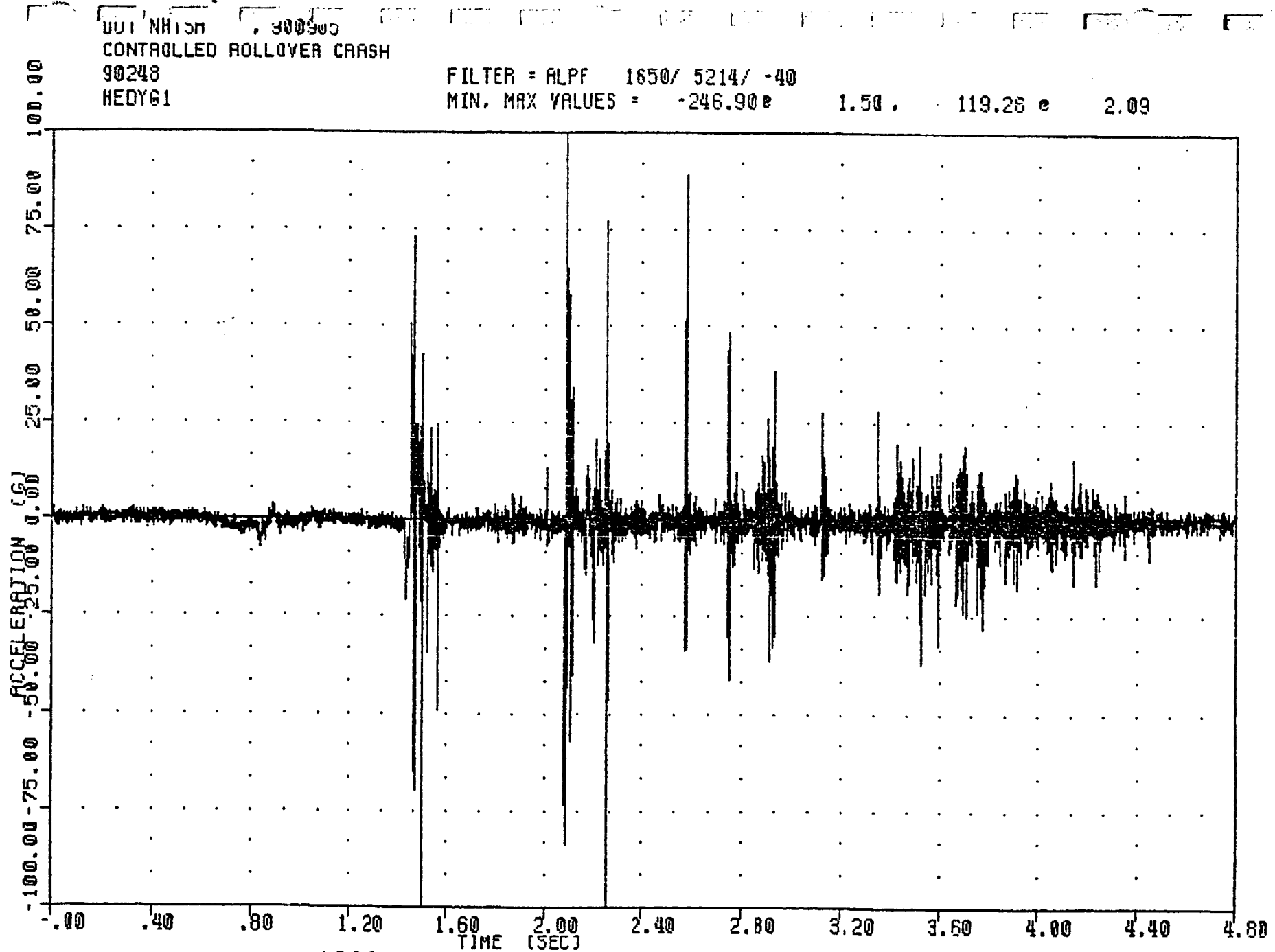
Figuer A-26. POST-TEST CLOSE-UP VEHICLE VIEW

APPENDIX B

DATA PLOTS

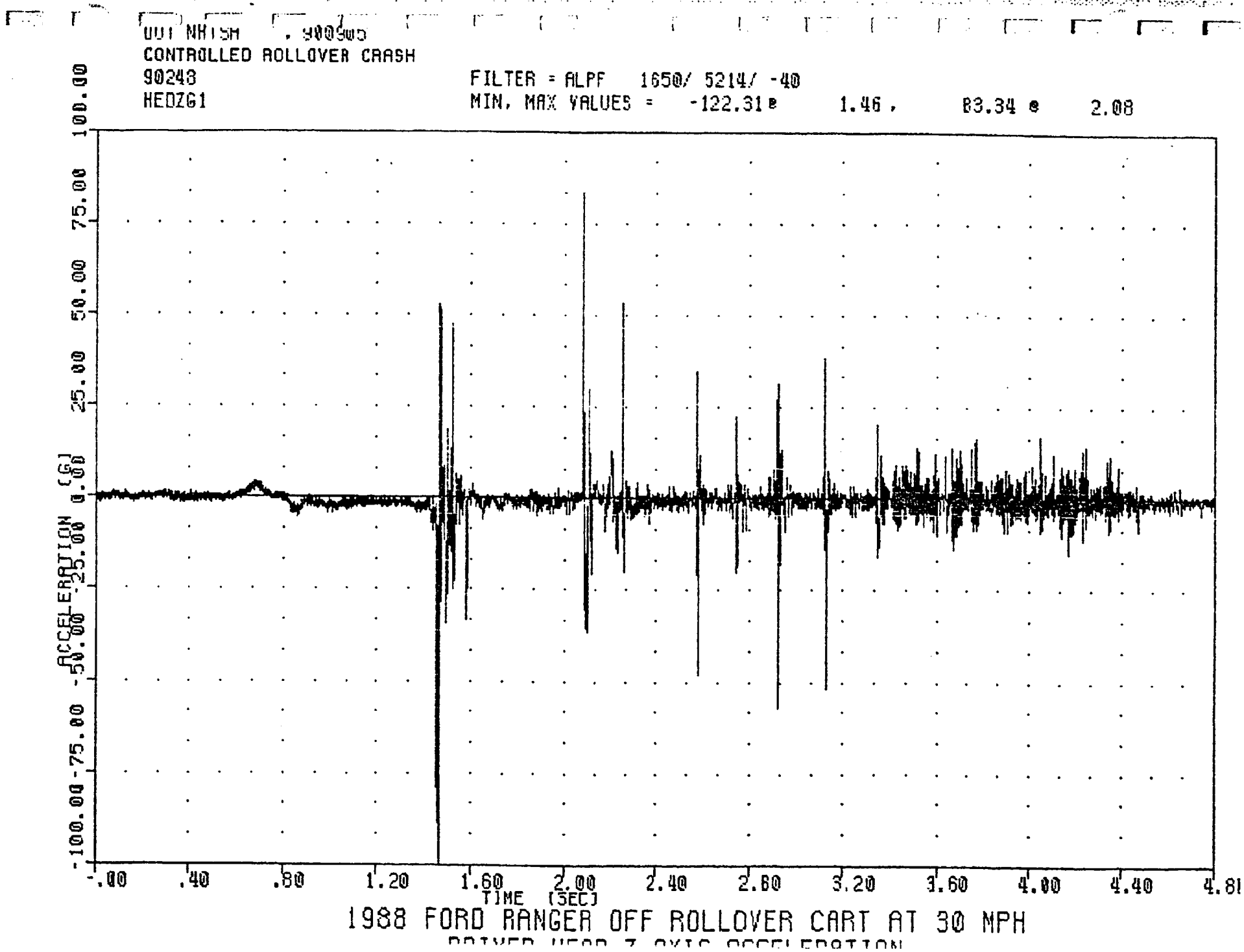


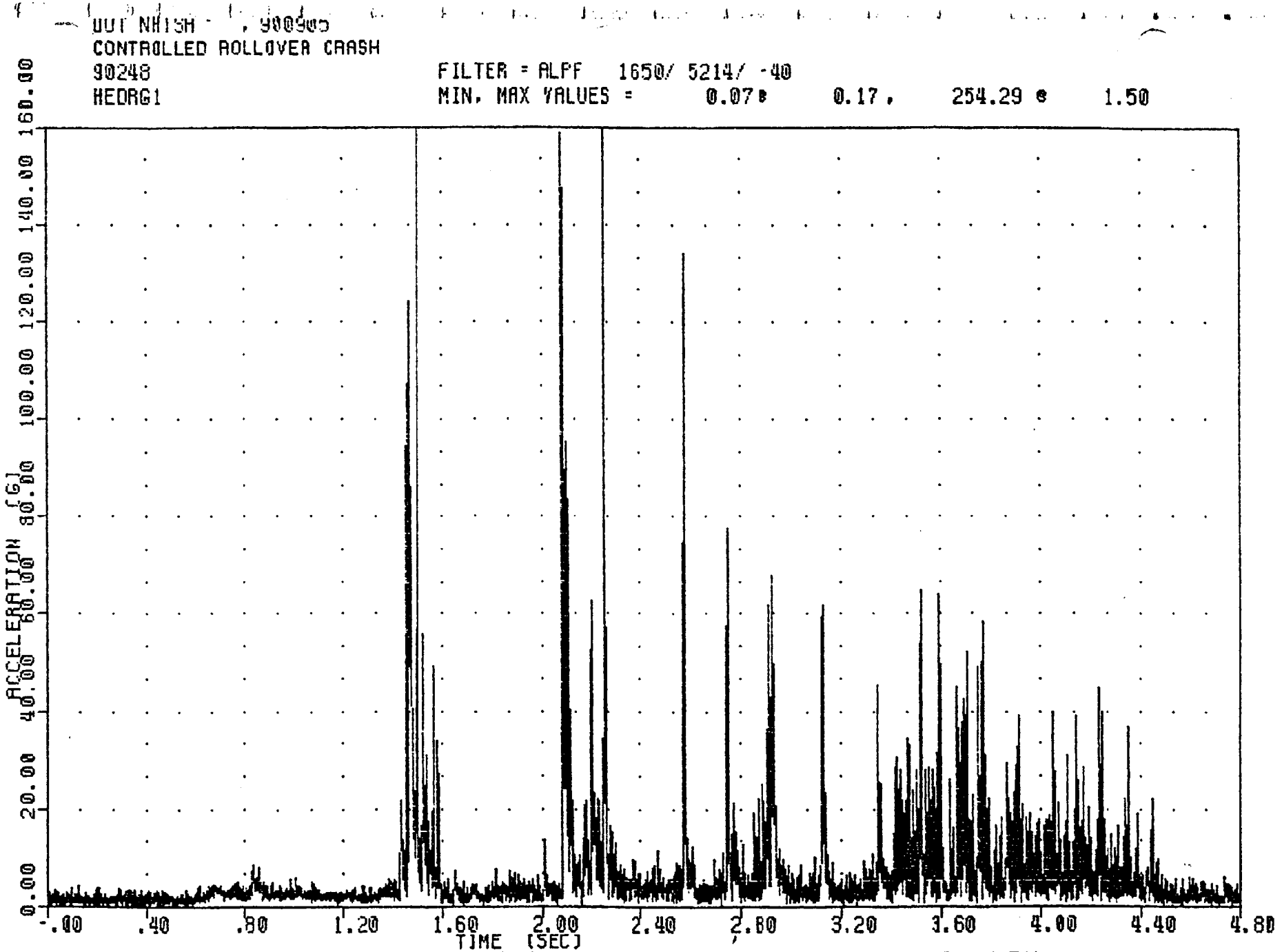
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER HEAD X AXIS ACCELERATION



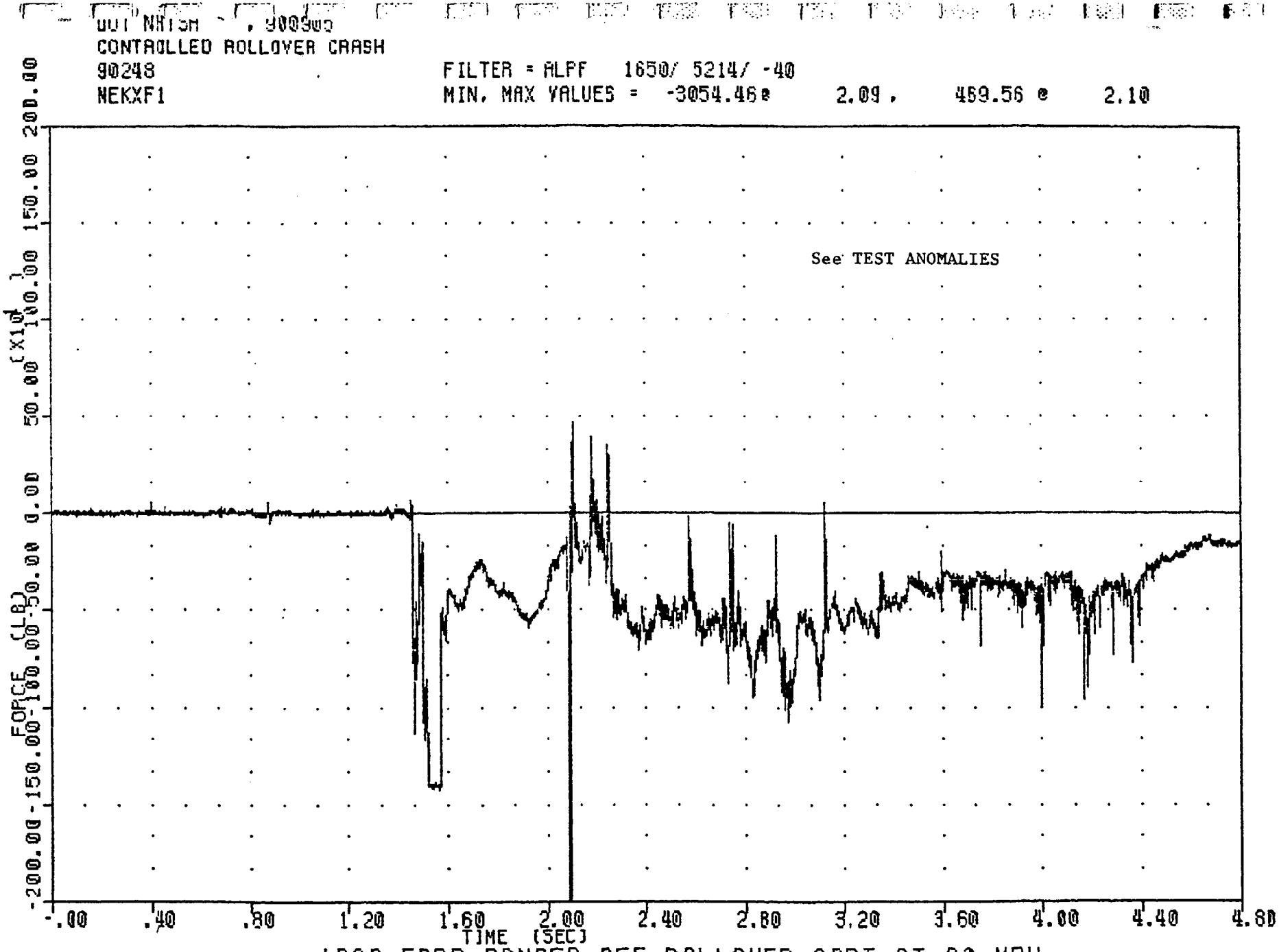
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH

DRIVER HEAD Y AXIS ACCELERATION


CONTROLLED ROLLOVER CRASH
90248
HEDZG1
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -122.31 @ 1.46 , 83.34 @ 2.08
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
4.81
TIME (SEC)
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH

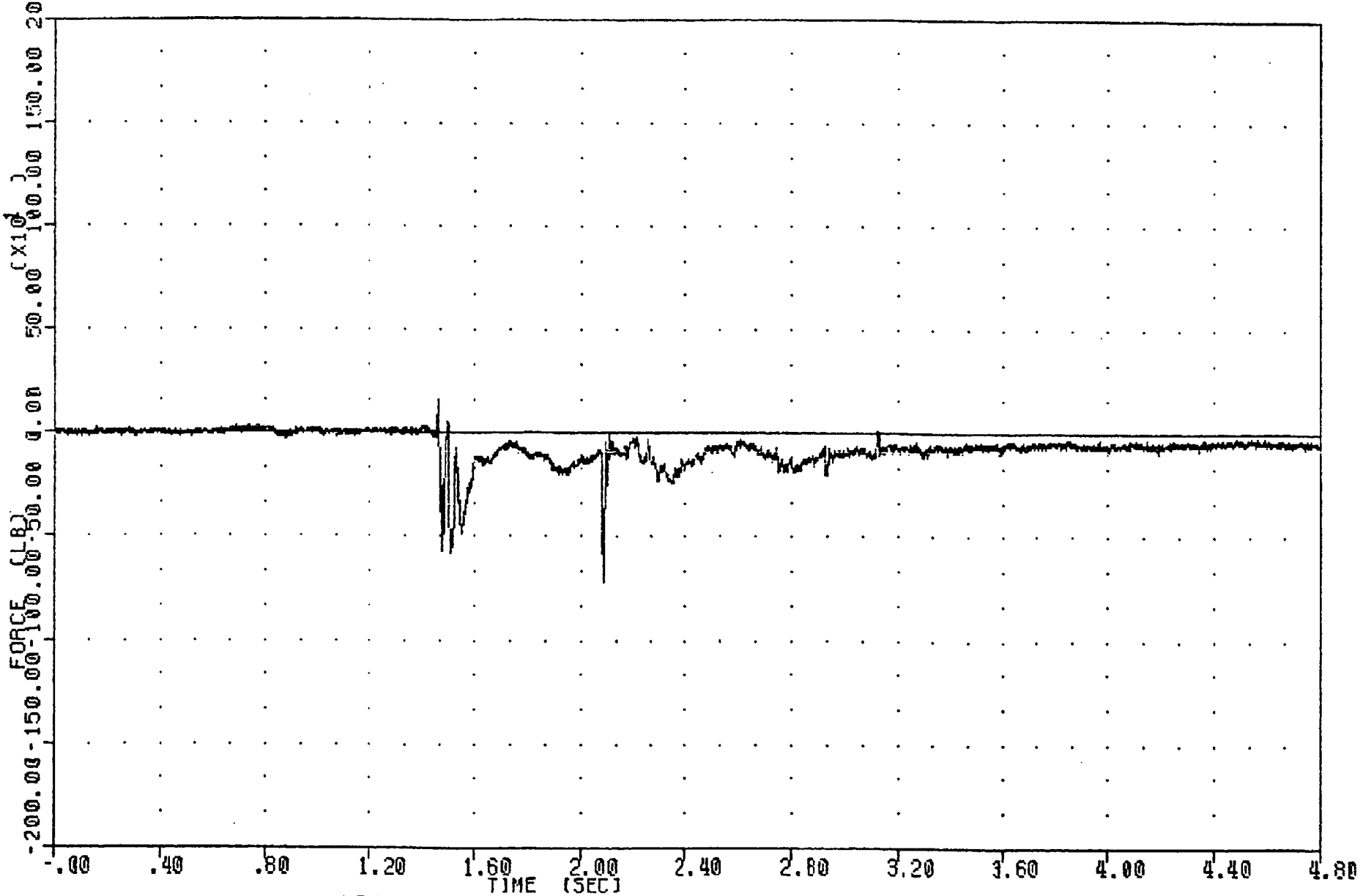


1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER HEAD RESULTANT ACCELERATION

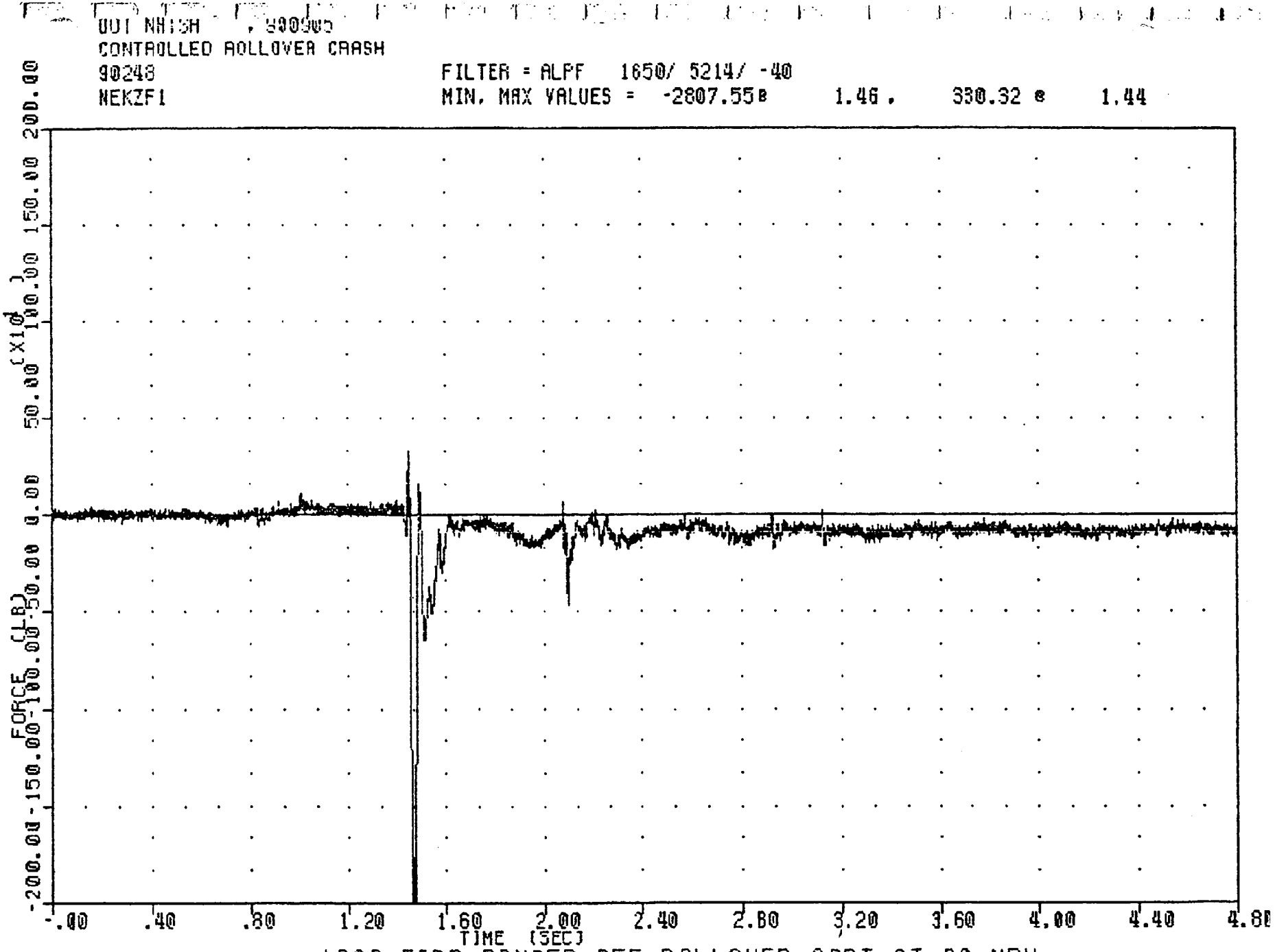


1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER NECK SHEAR FORCE X AXIS

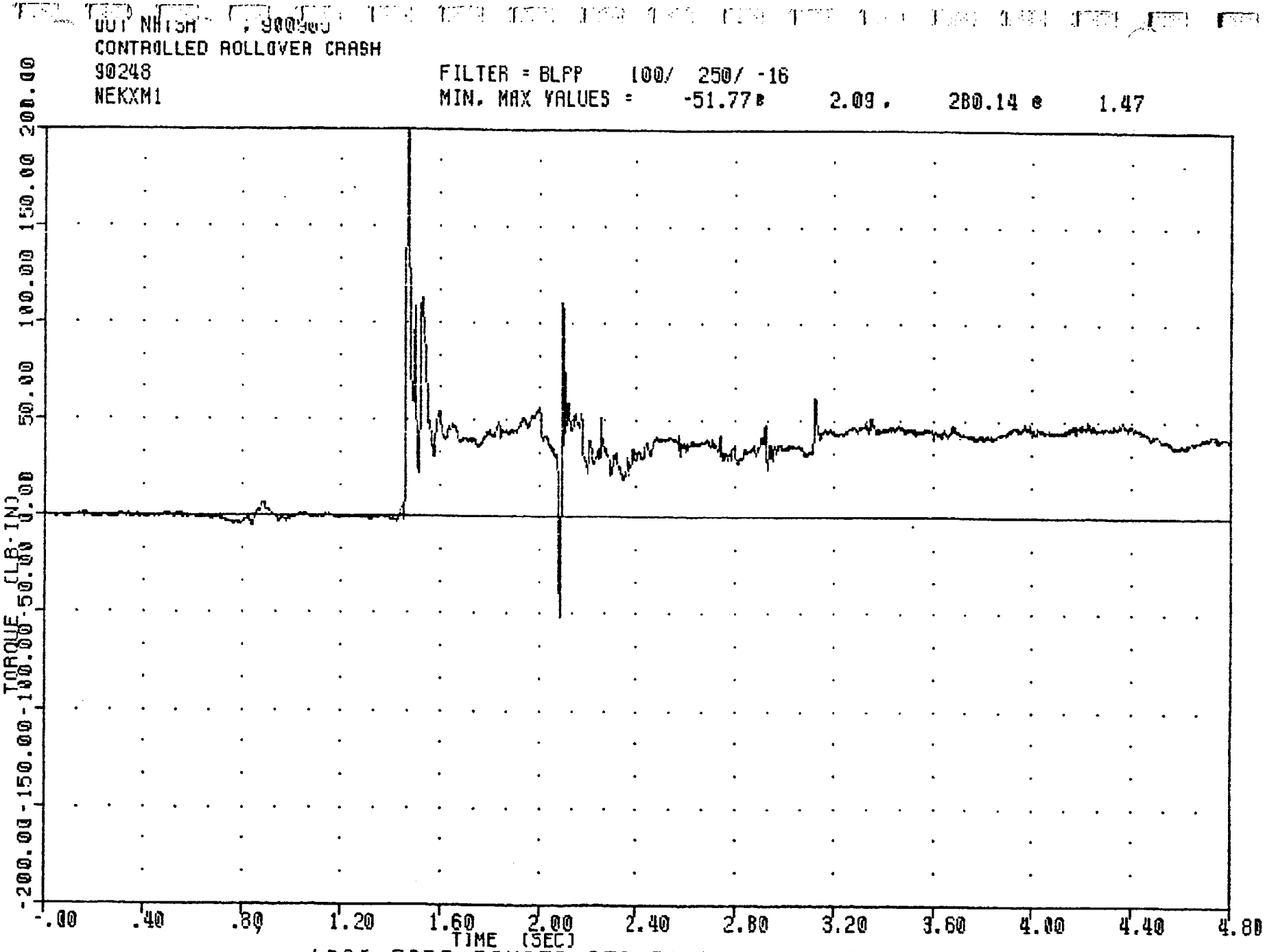
DOT NHTSA - , 900905
CONTROLLED ROLLOVER CRASH
90248
NEKYF1
FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -716.06@ 2.08 , 157.54 @ 1.46



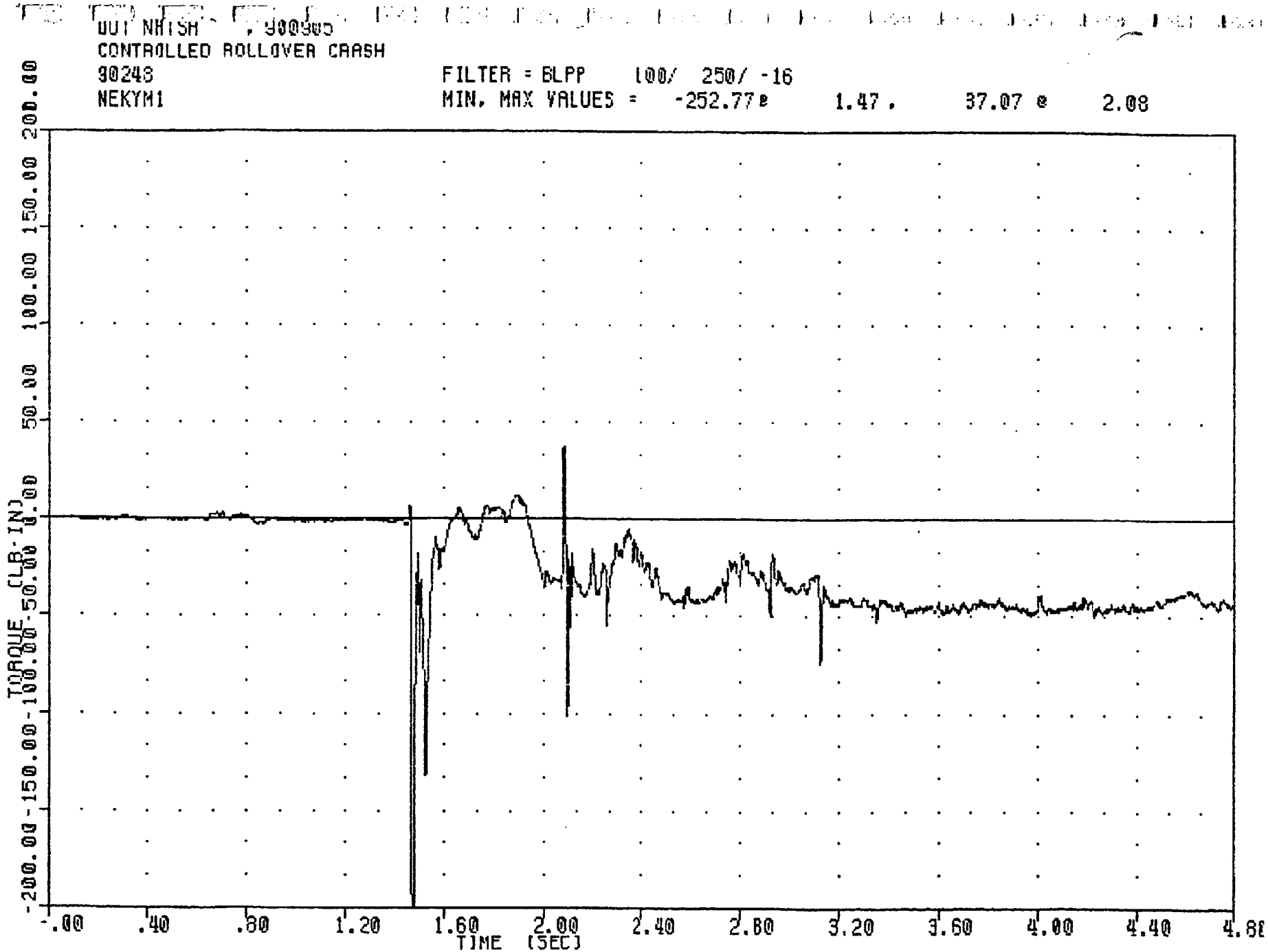
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER NECK SHEAR FORCE Y AXIS



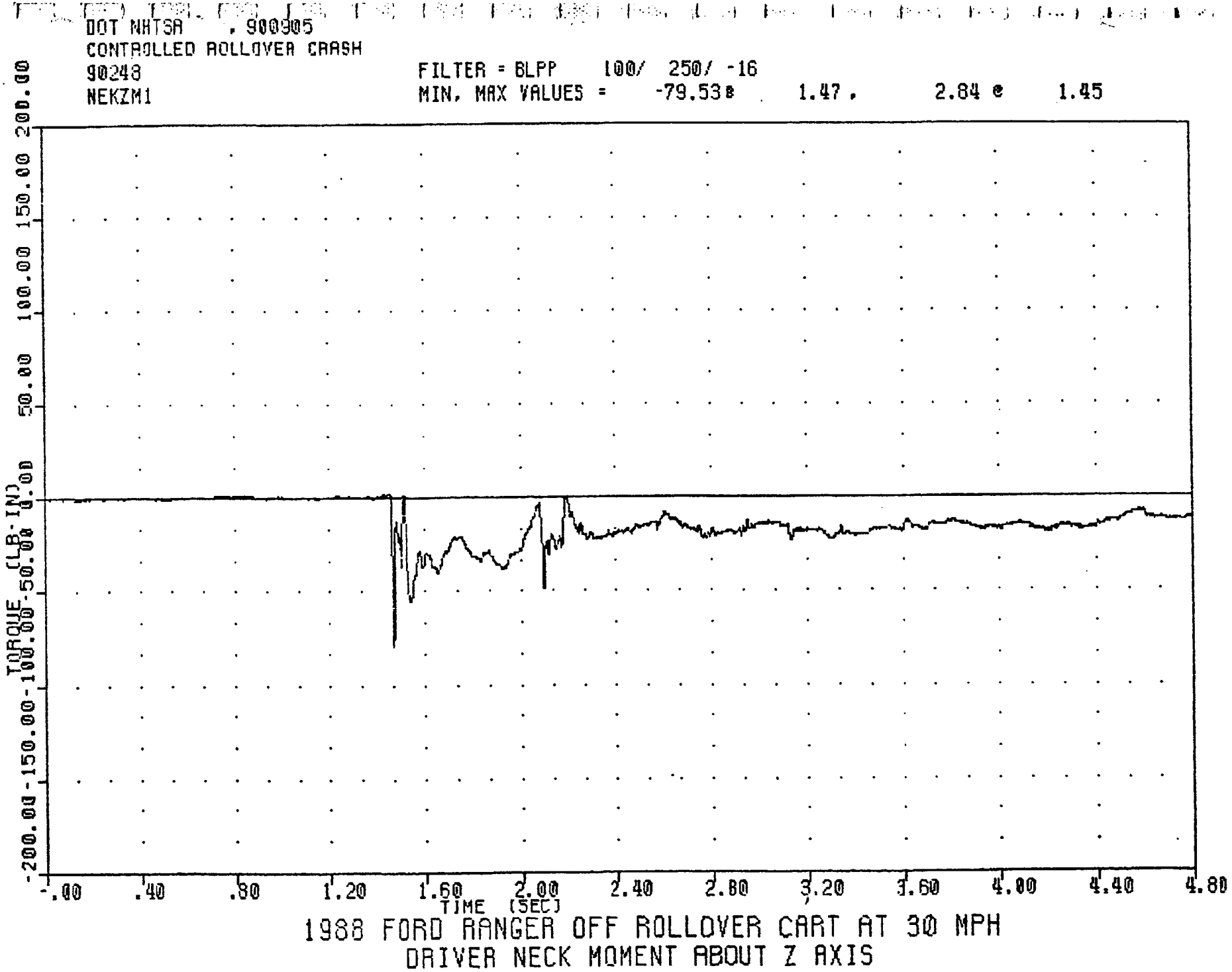
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER NECK AXIAL FORCE Z AXIS



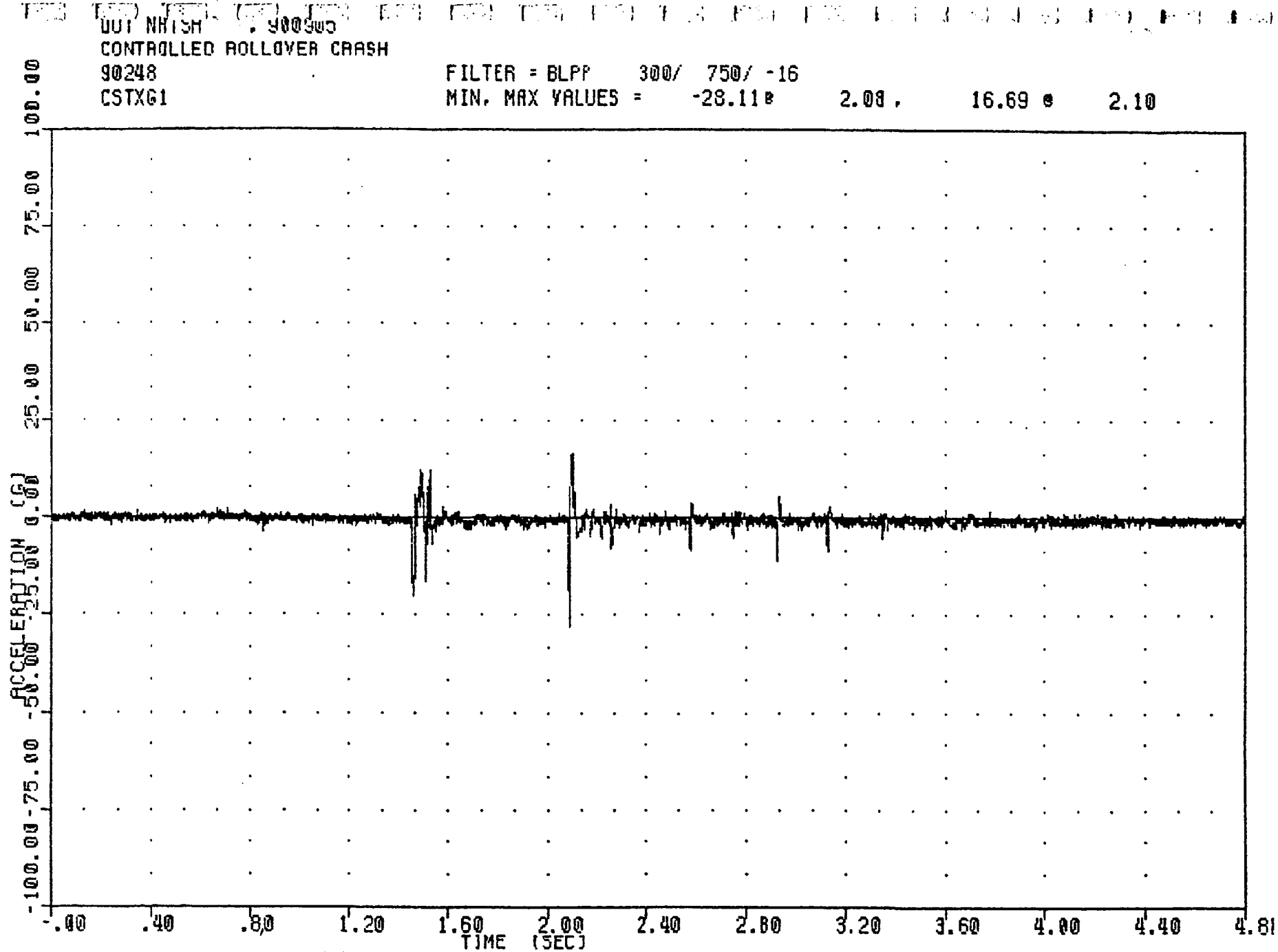
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER NECK MOMENT ABOUT X AXIS



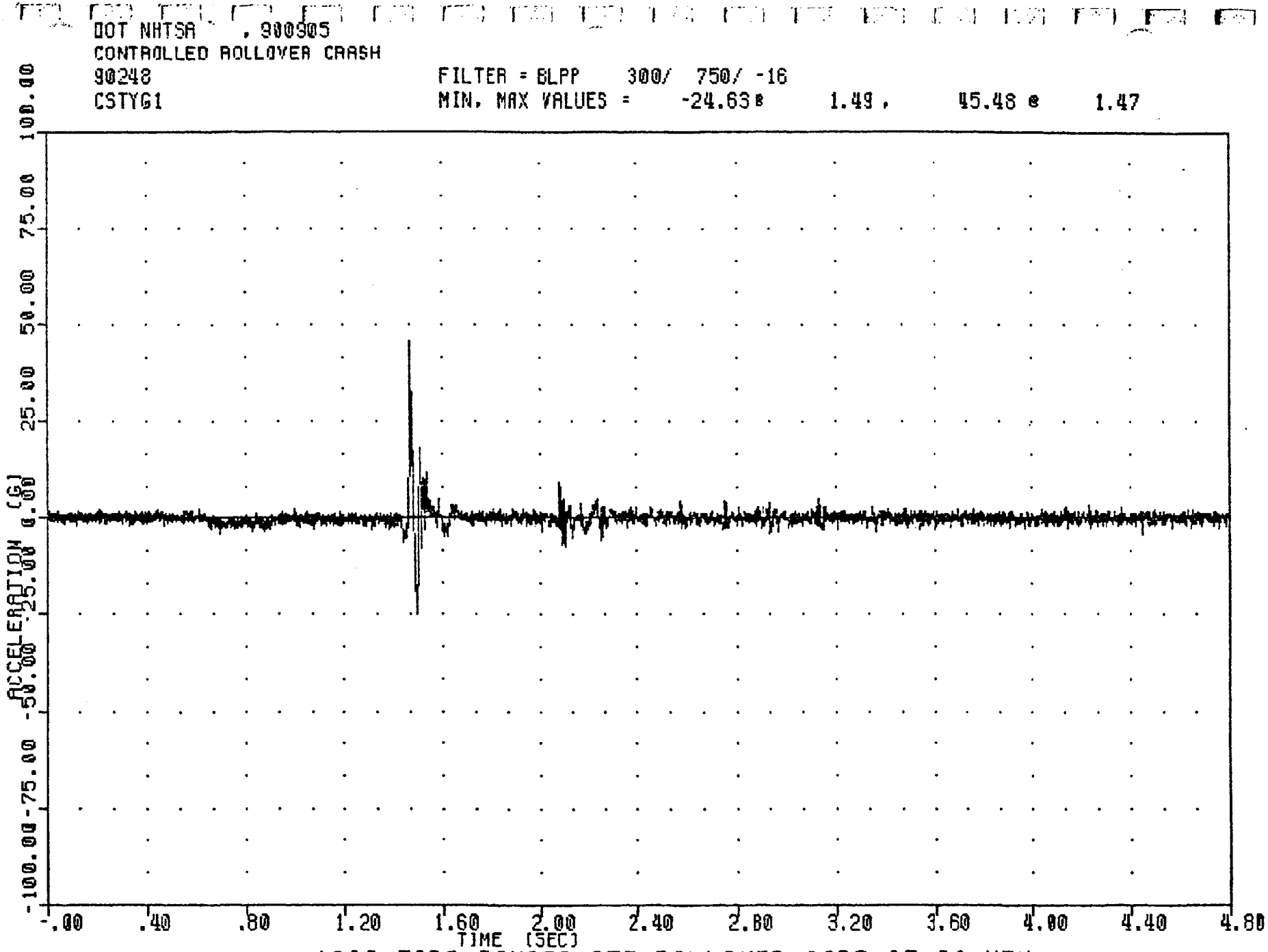
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER NECK MOMENT ABOUT Y AXIS



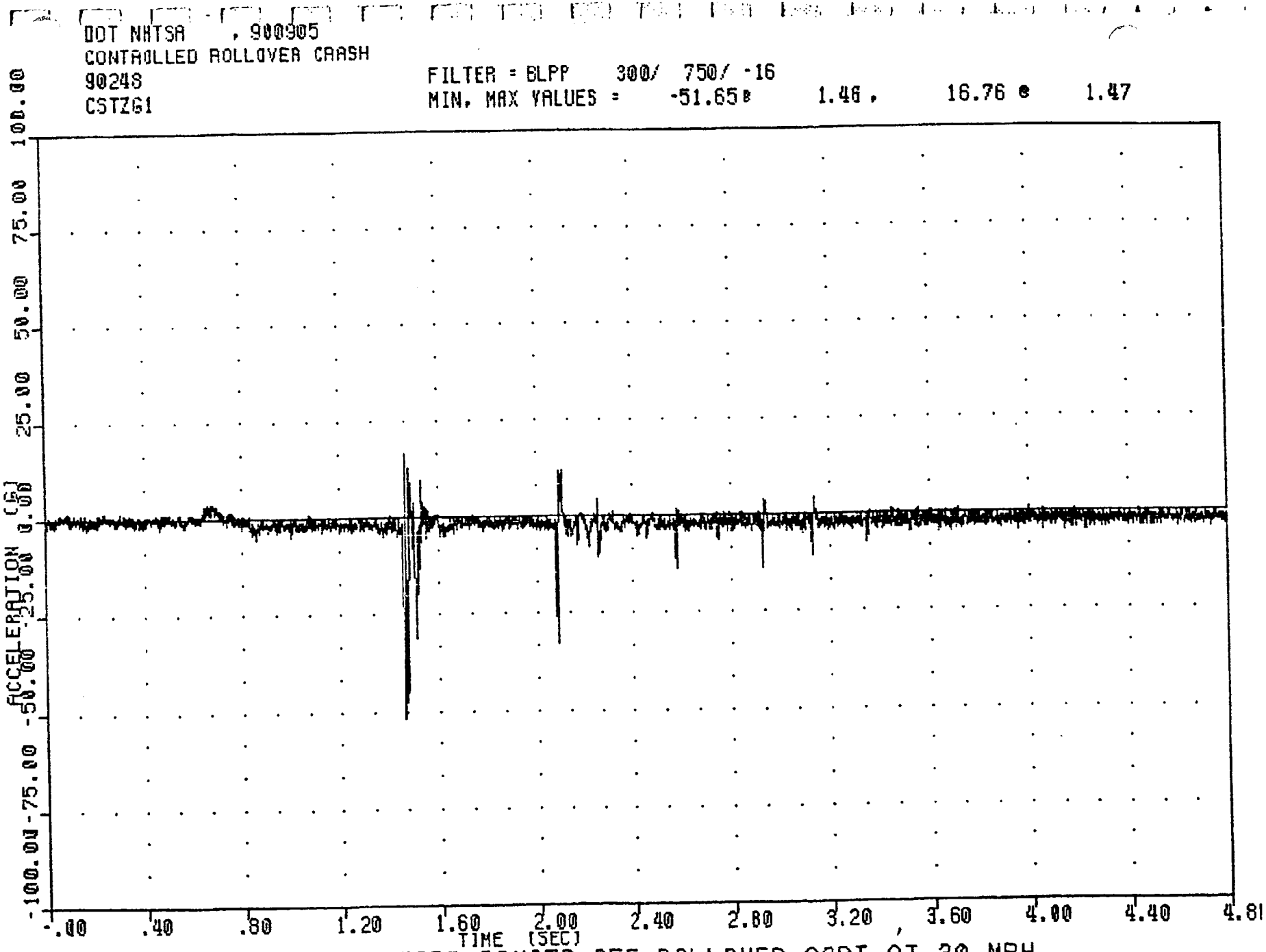
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER NECK MOMENT ABOUT Z AXIS



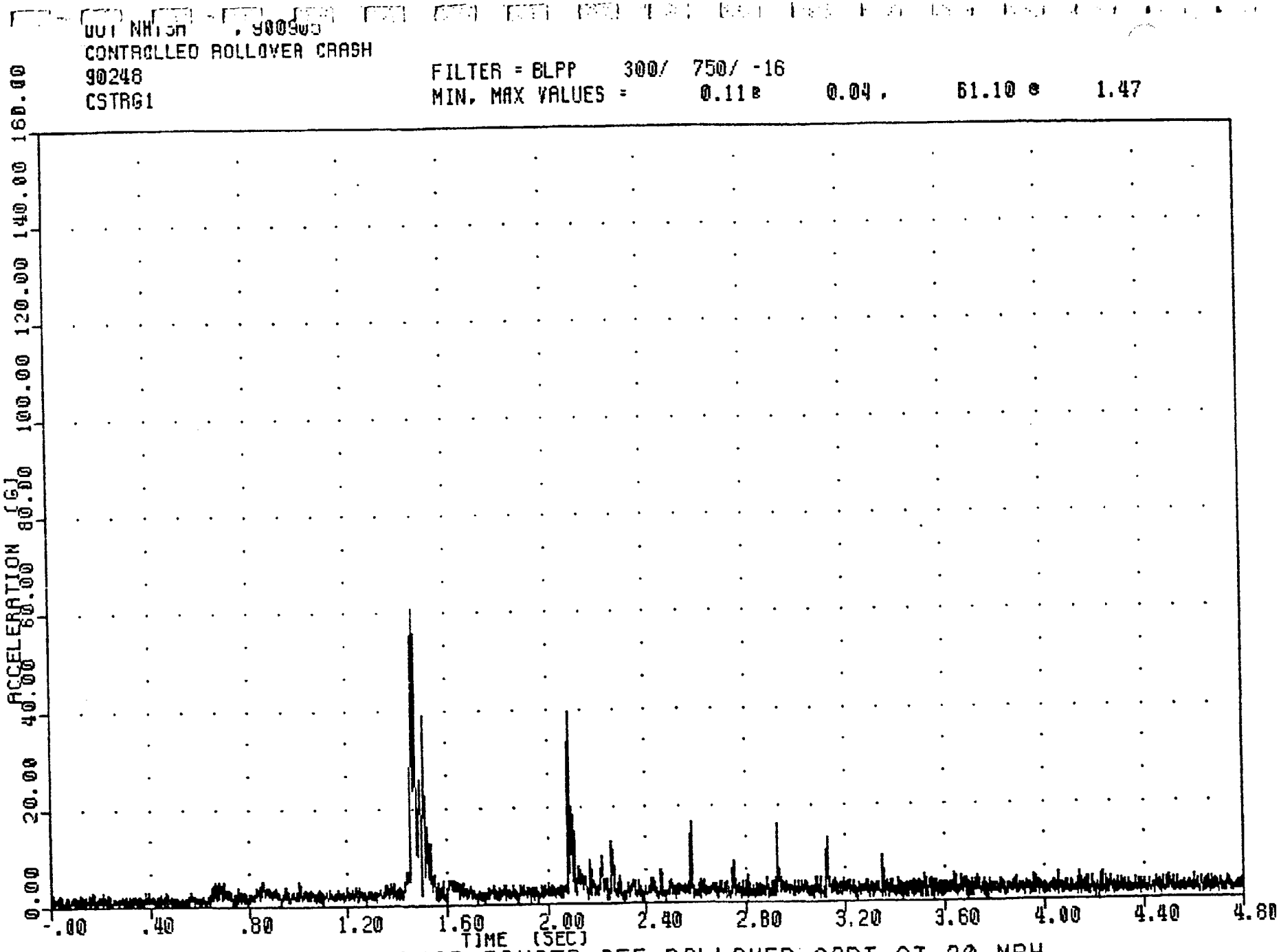
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER CHEST X AXIS ACCELERATION



1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER CHEST Y AXIS ACCELERATION



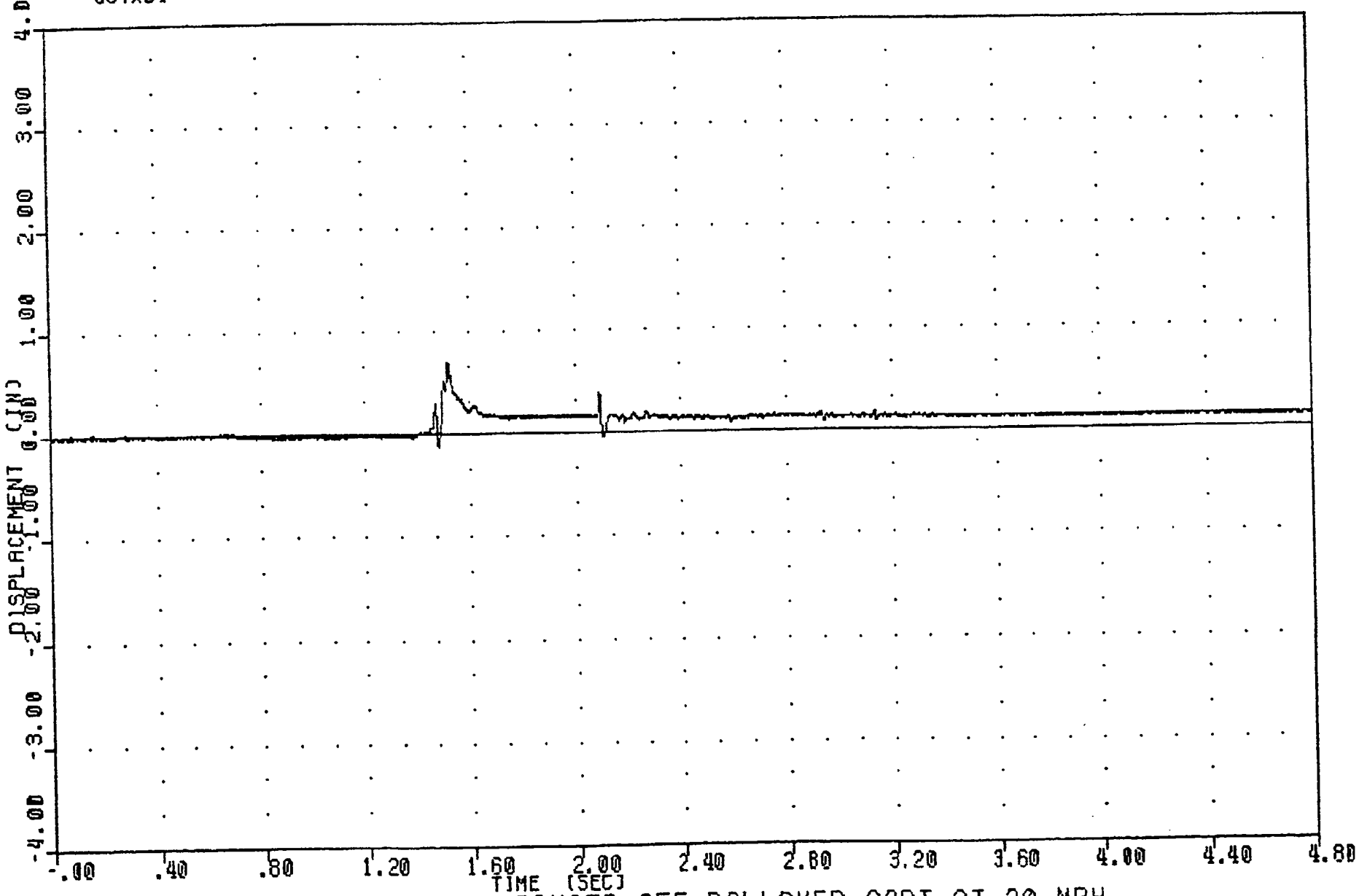
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER CHEST Z AXIS ACCELERATION



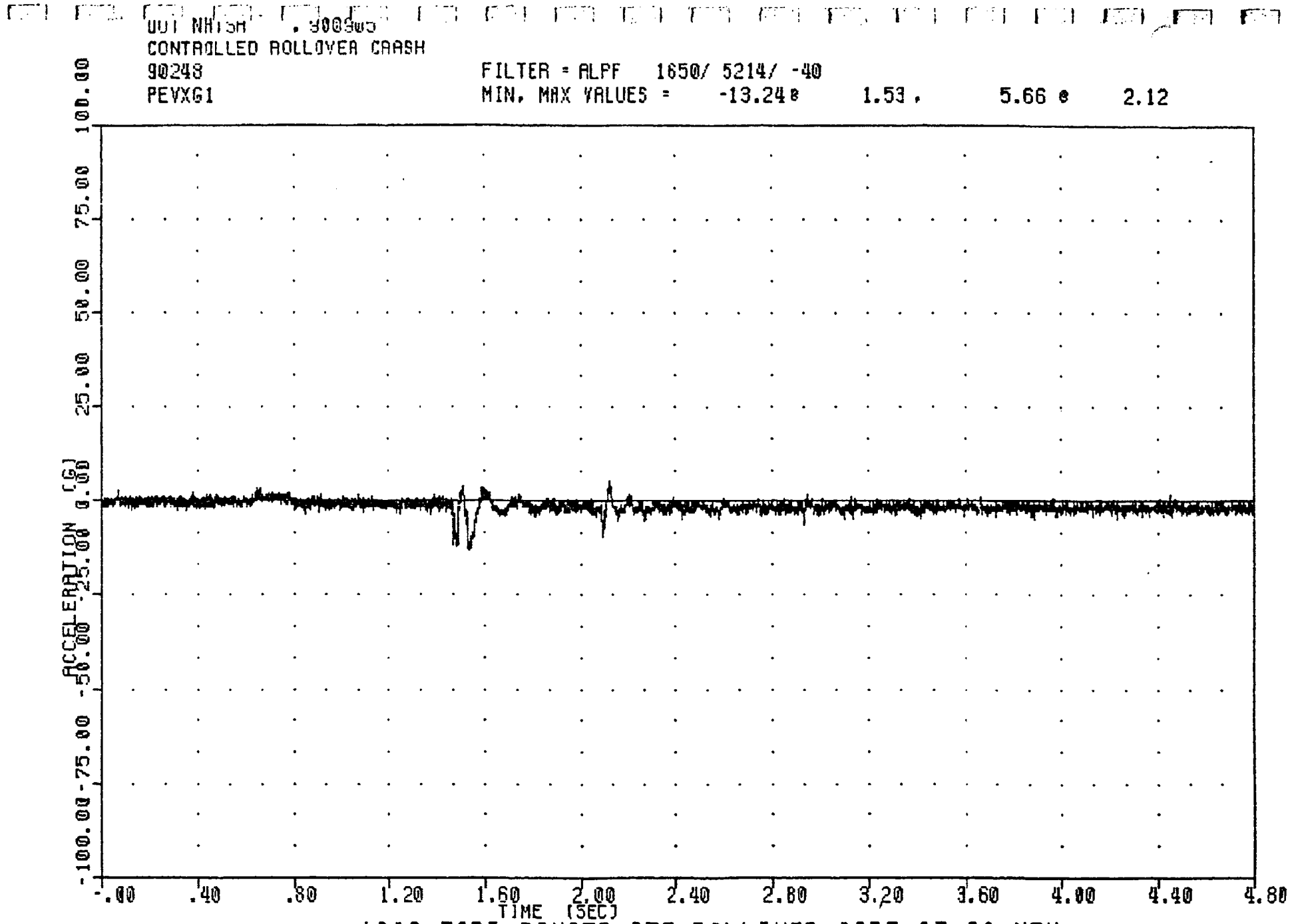
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER CHEST RESULTANT ACCELERATION

DOT NHT3A , 900905
CONTAGLLED ROLLOVER CRASH
90248
CSTXD1

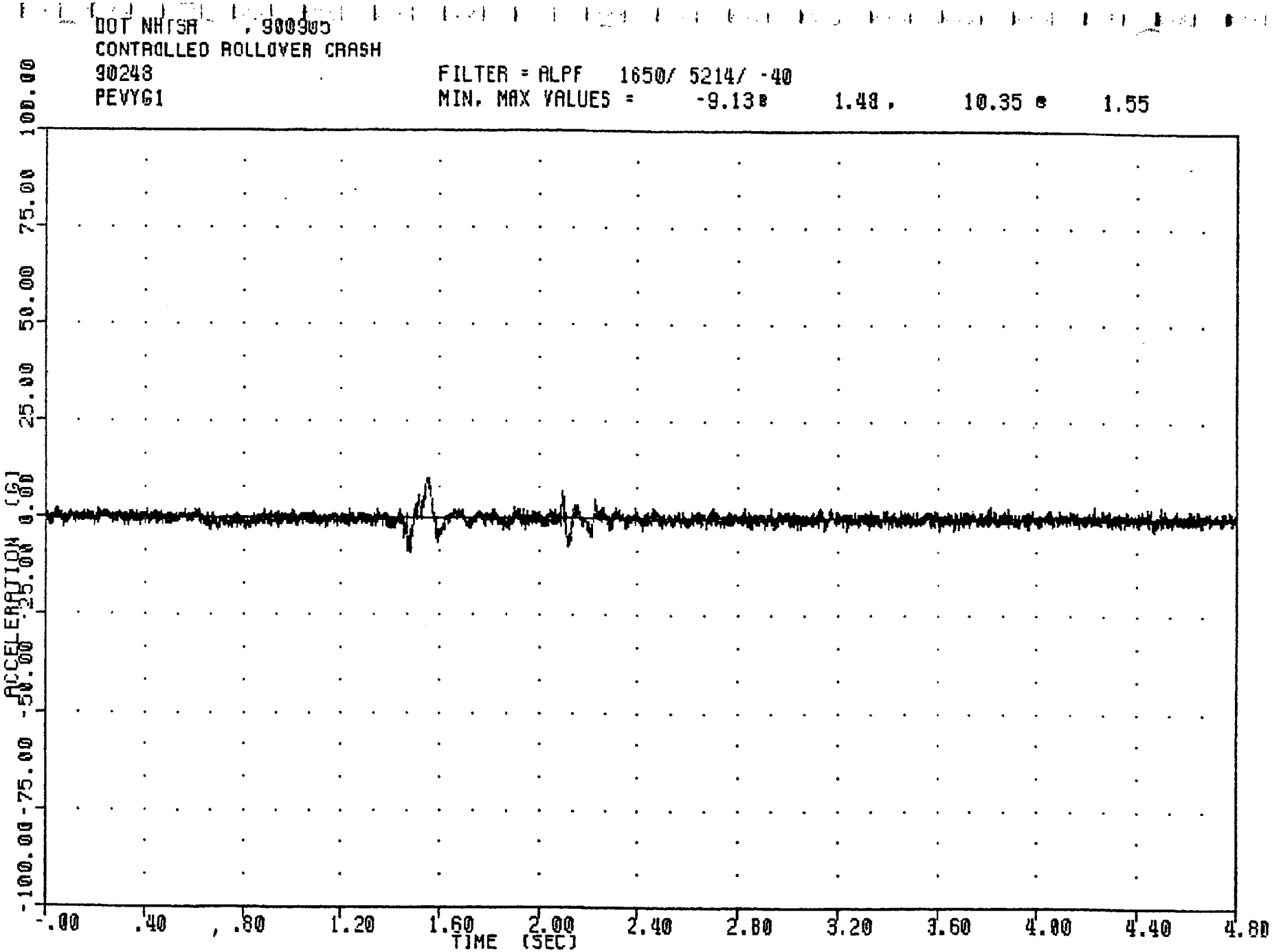
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -0.13 @ 1.48 , 0.71 @ 1.52



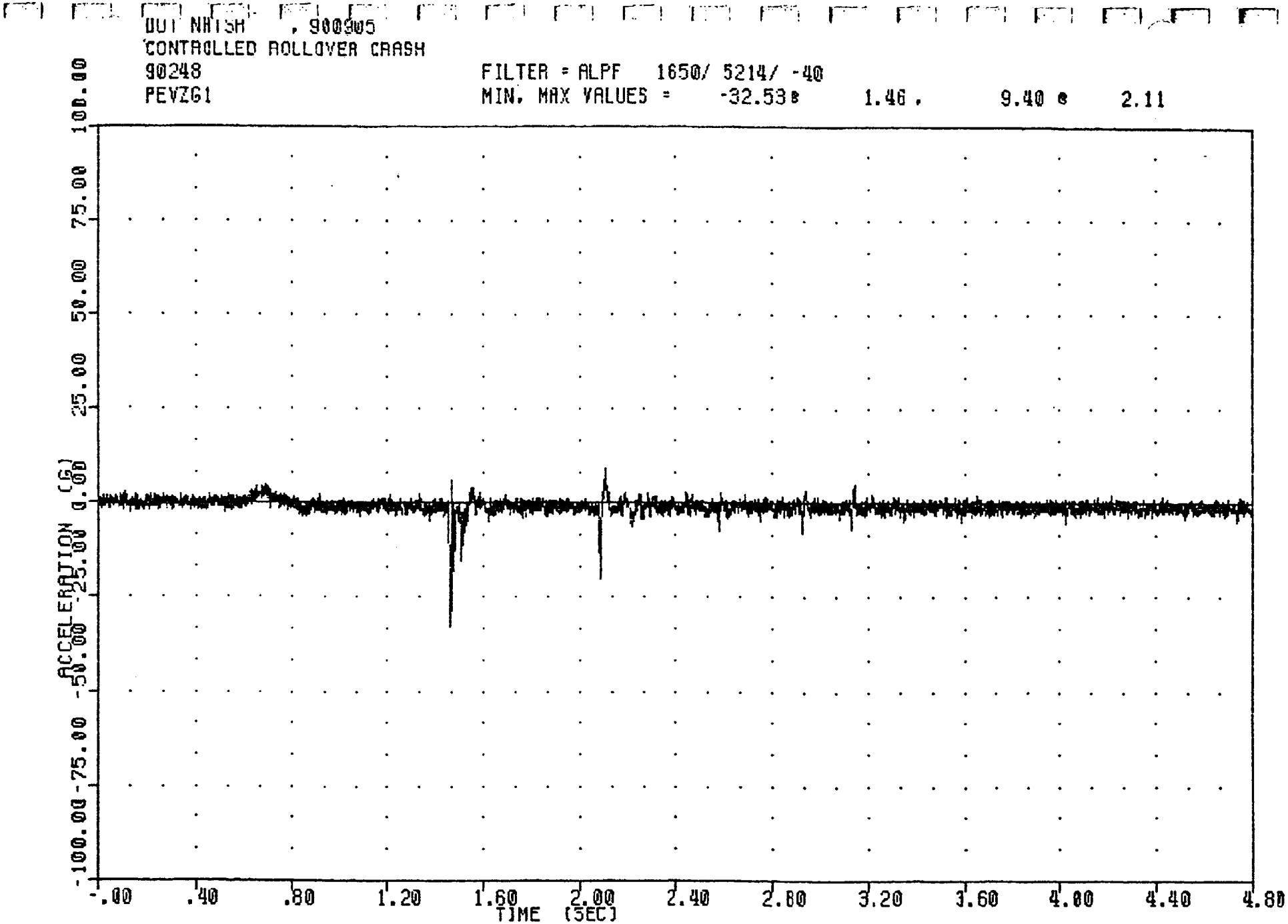
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER CHEST X AXIS DISPLACEMENT



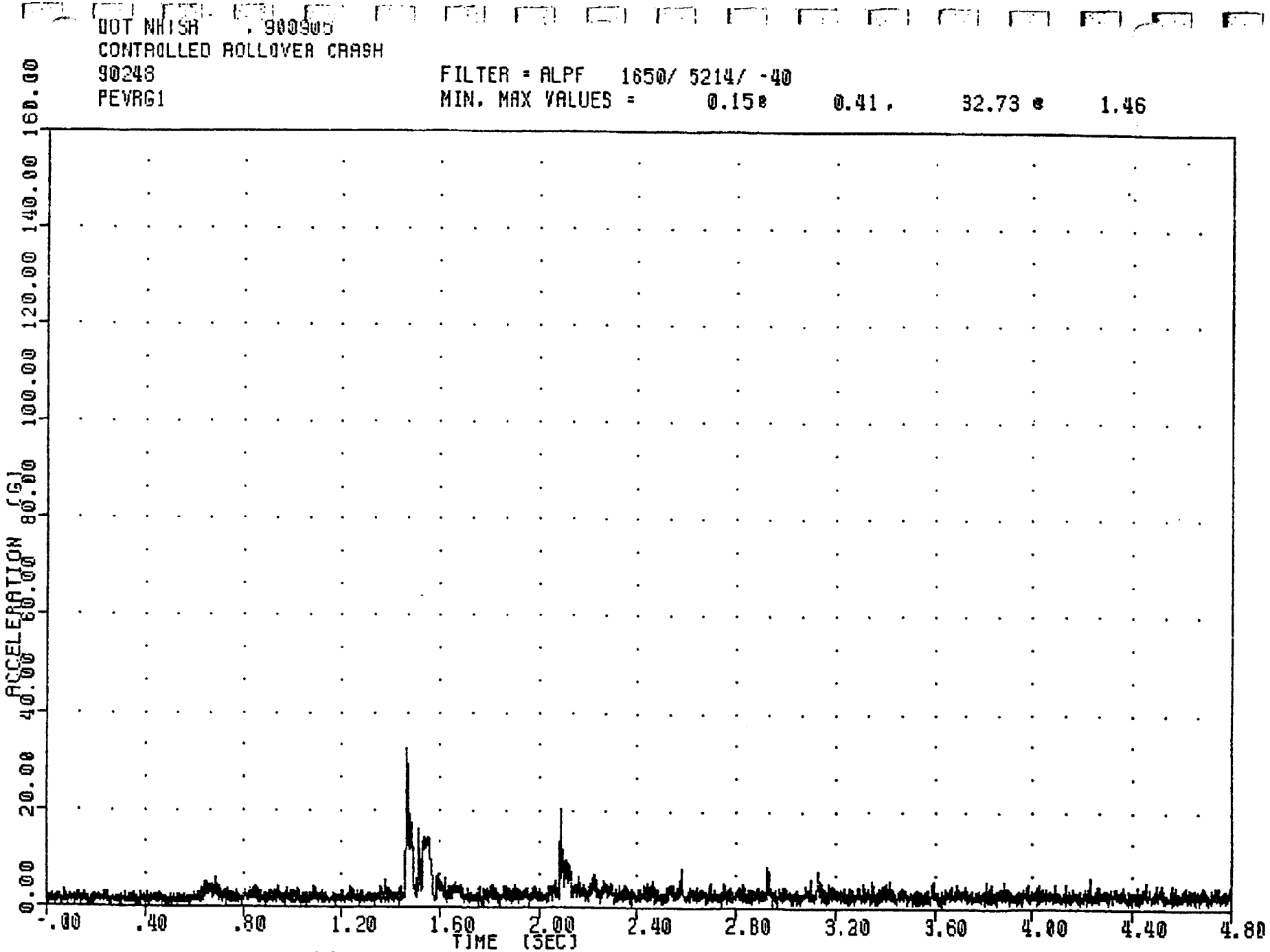
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER PELVIS X AXIS ACCELERATION



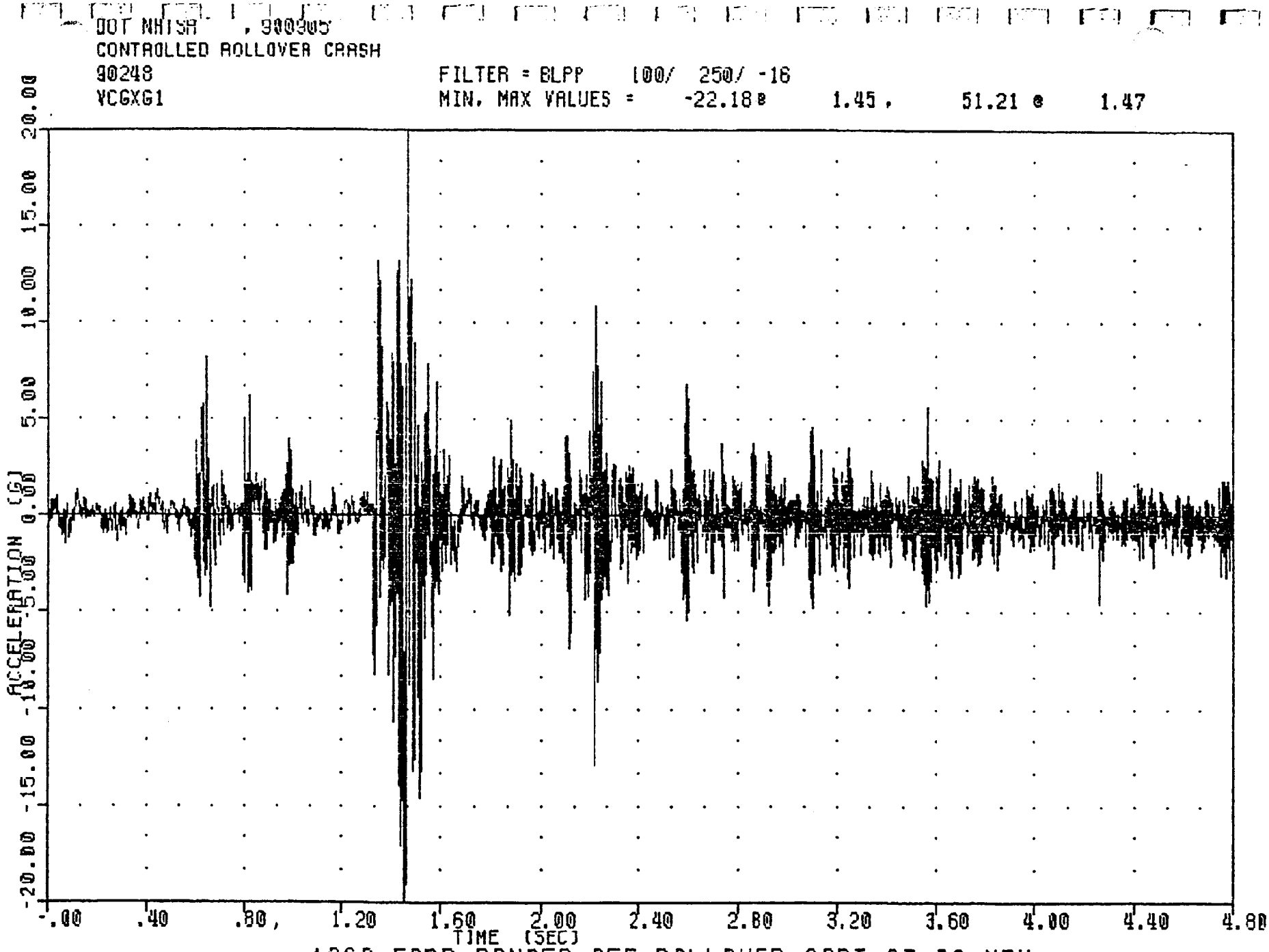
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER PELVIS Y AXIS ACCELERATION



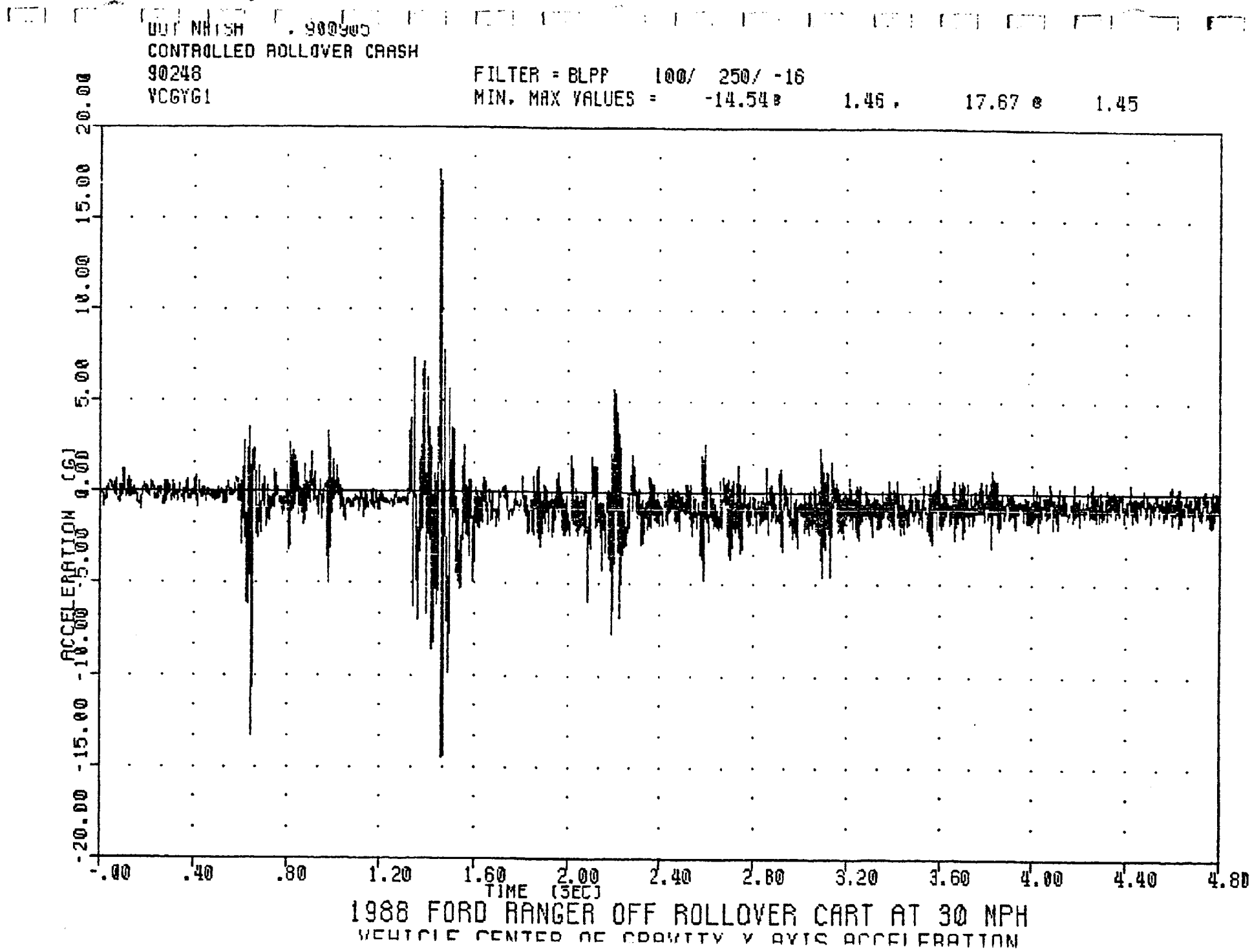
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER PELVIS Z AXIS ACCELERATION



1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER PELVIS RESULTANT ACCELERATION

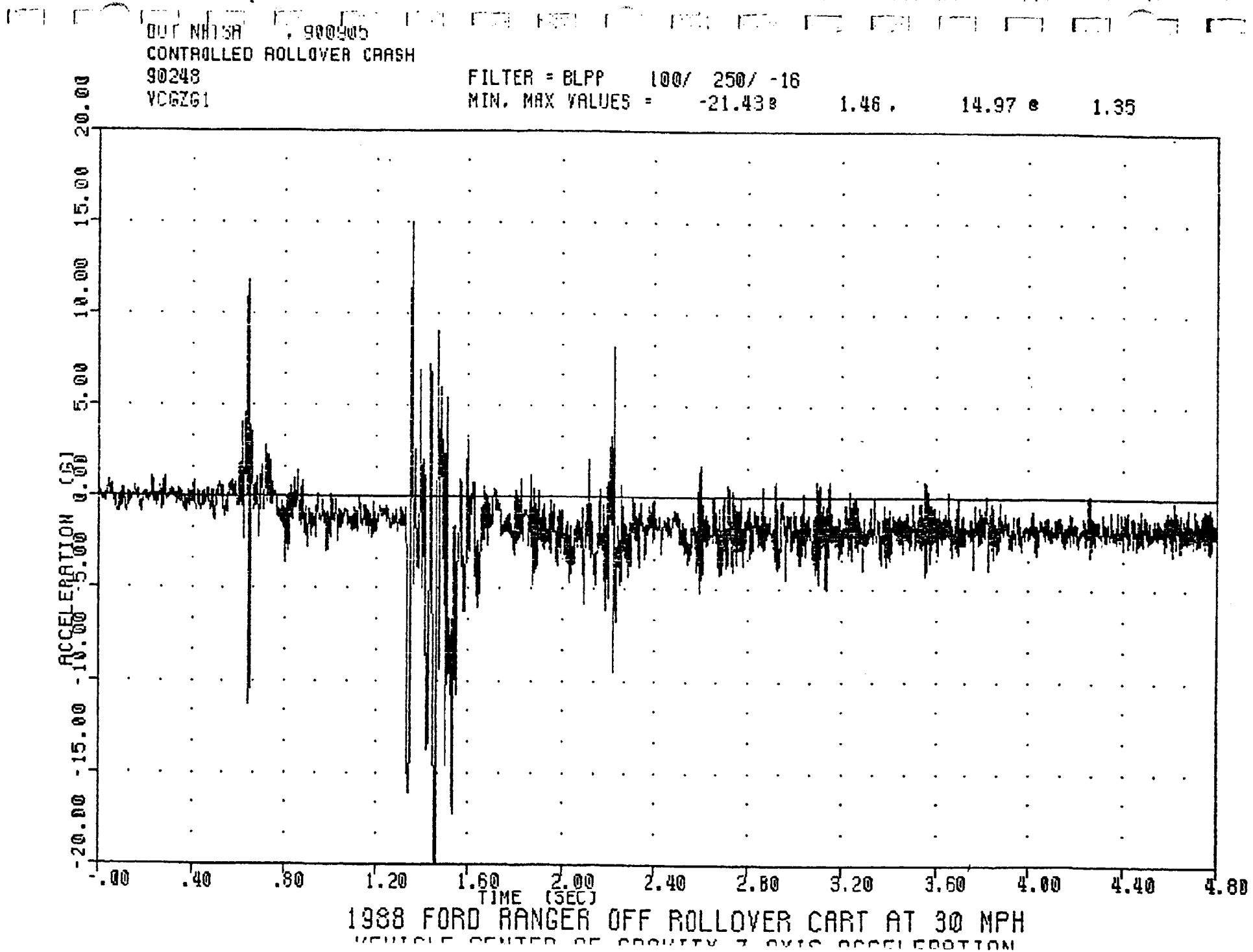


1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
VEHICLE CENTER OF GRAVITY X AXIS ACCELERATION



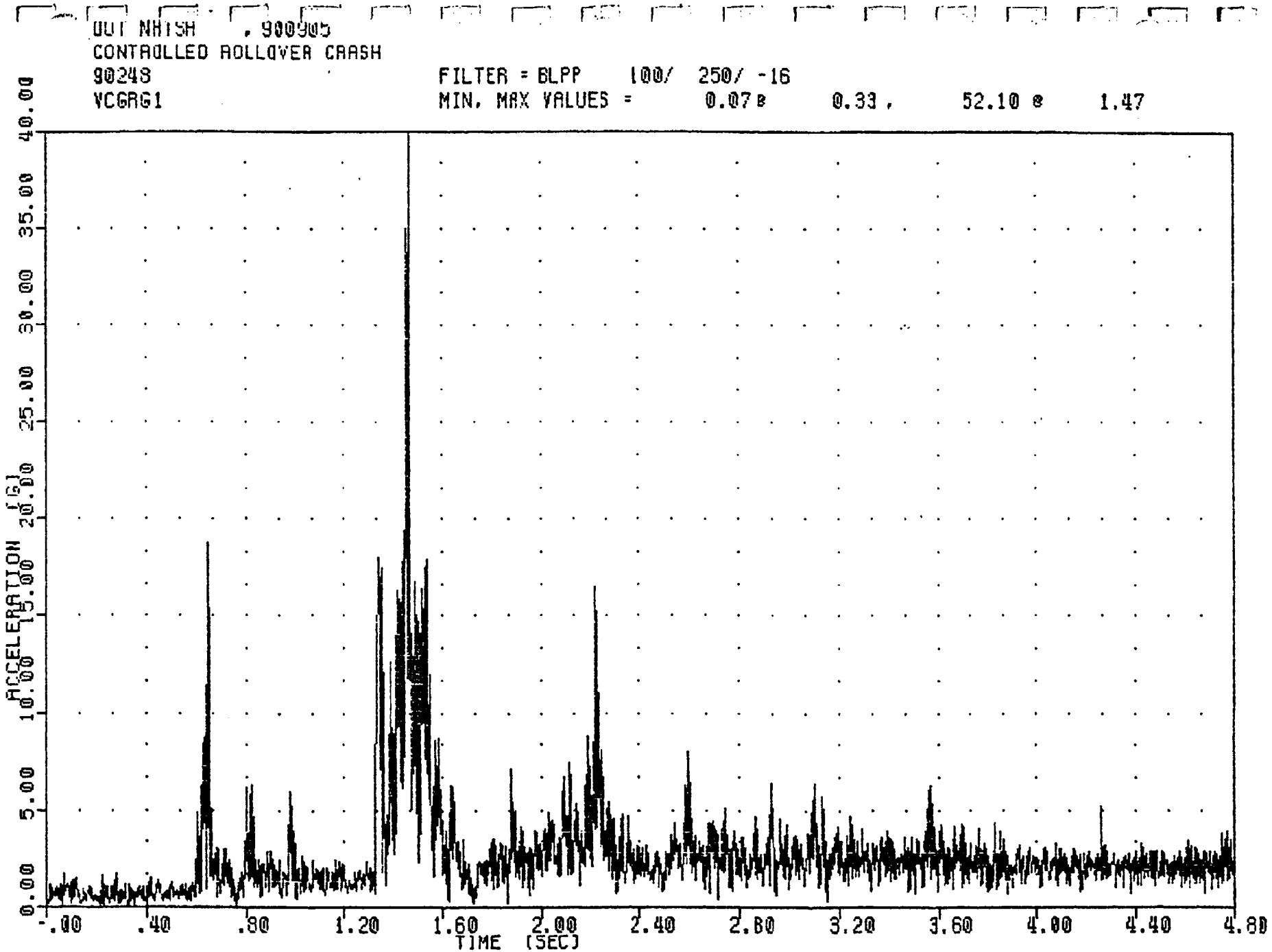
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH

VEHICLE CENTER OF GRAVITY Y AXIS ACCELERATION

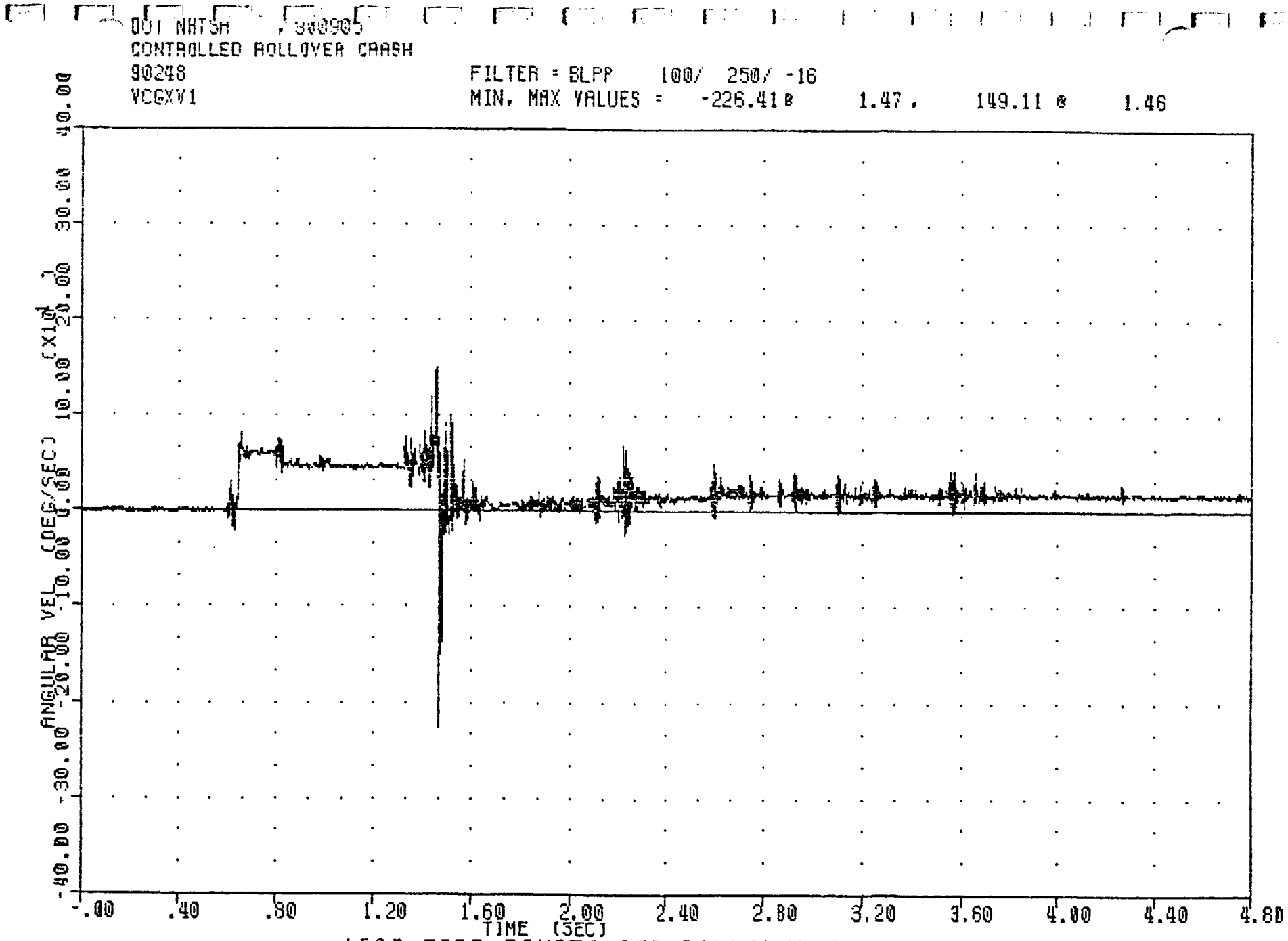


1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH

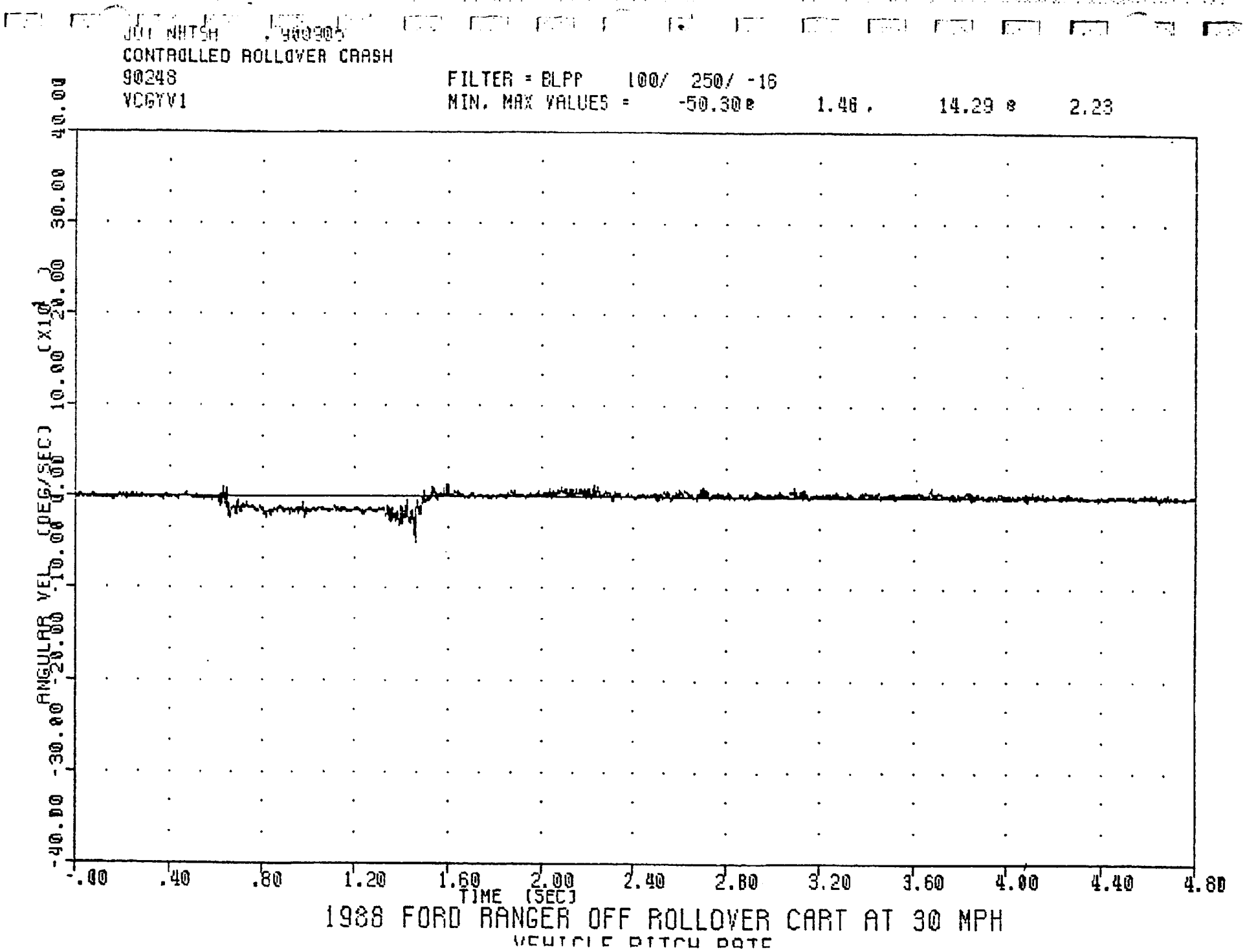
VEHICLE CENTER OF GRAVITY Z AXIS ACCELERATION

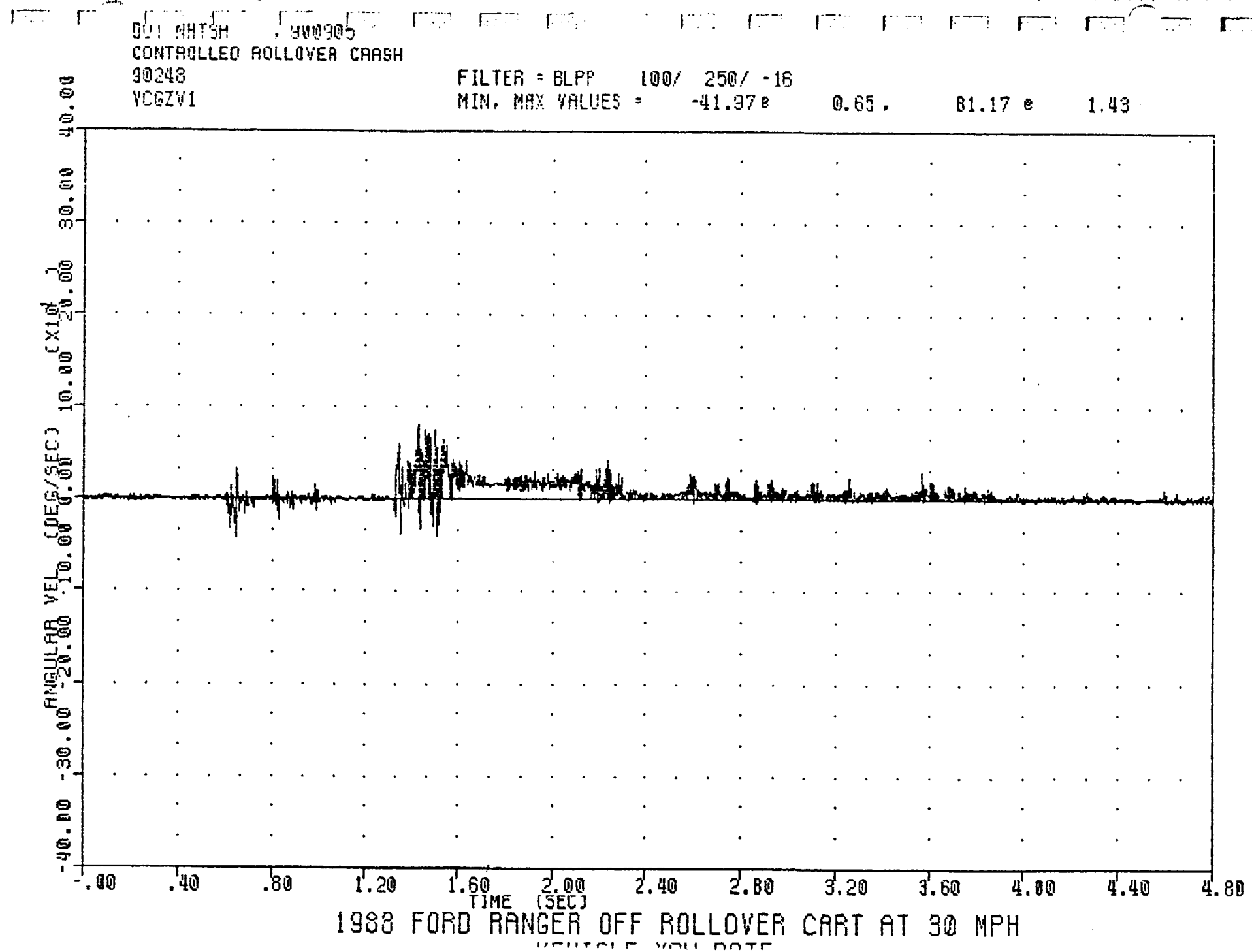


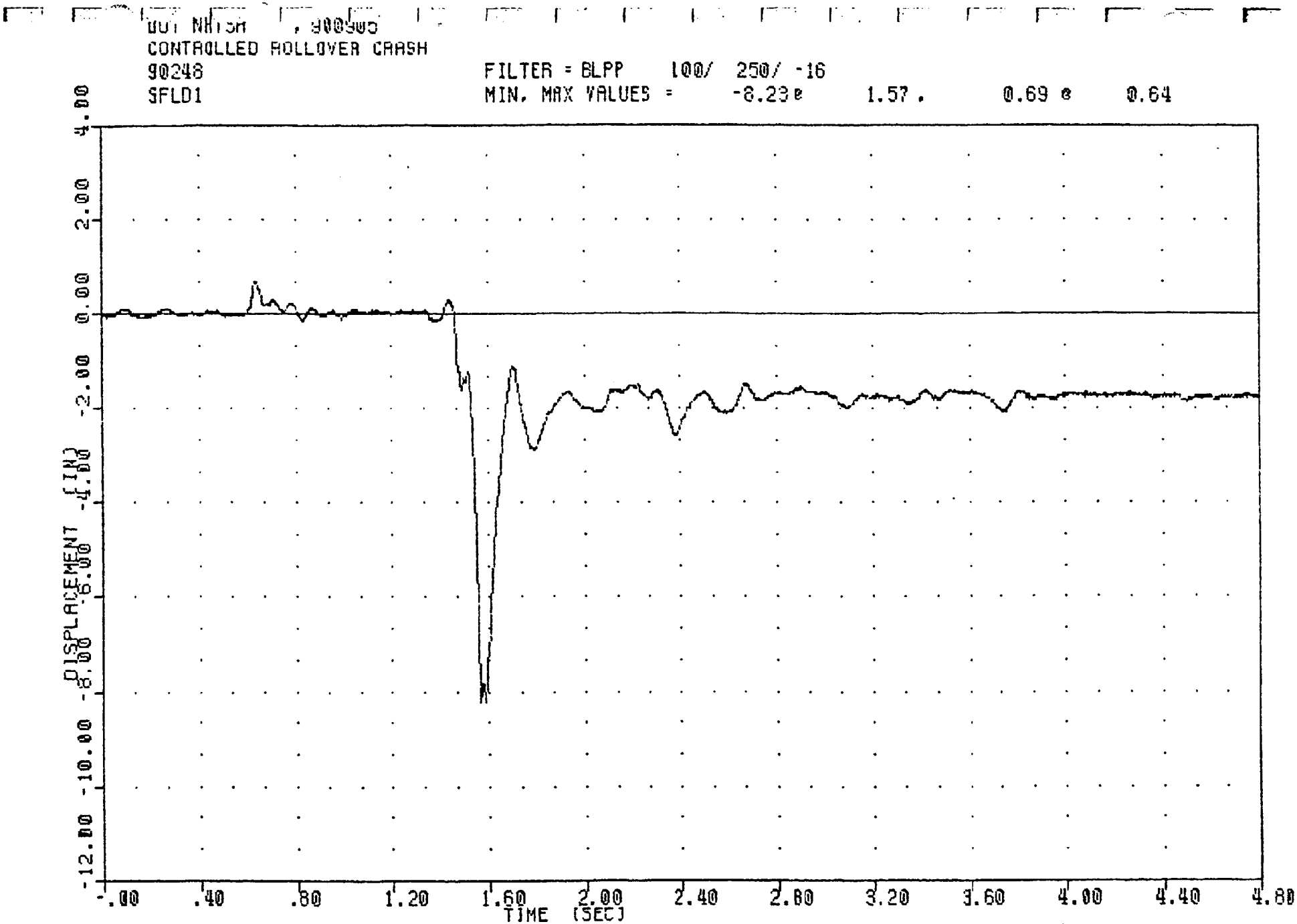
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
VEHICLE CENTER OF GRAVITY RESULTANT ACCELERATION



1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
VEHICLE ROLL RATE


JJT NHTSH .900905
CONTROLLED ROLLOVER CRASH
90248
VCGYV1
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -50.30 @ 1.46 , 14.29 @ 2.23
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
4.80
TIME (SEC)
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
VEHICLE PITCH RATE

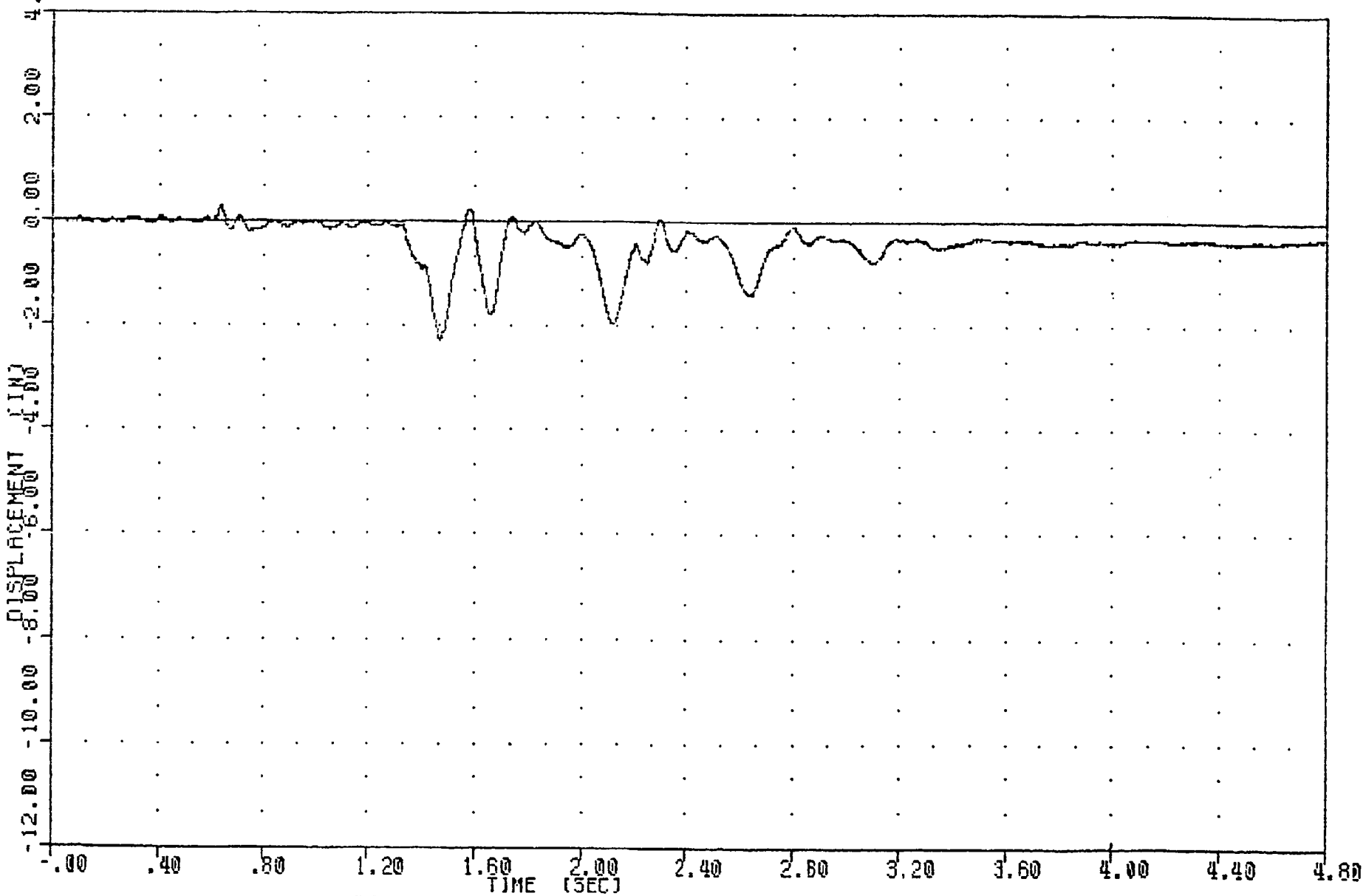

001 MATSH , 900905
CONTROLLED ROLLOVER CRASH
90248
YCGZV1
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -41.97 @ 0.65 , 81.17 @ 1.43
ANGULAR VEL (DEG/SEC) (X10^1)
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.80
TIME (SEC)
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH



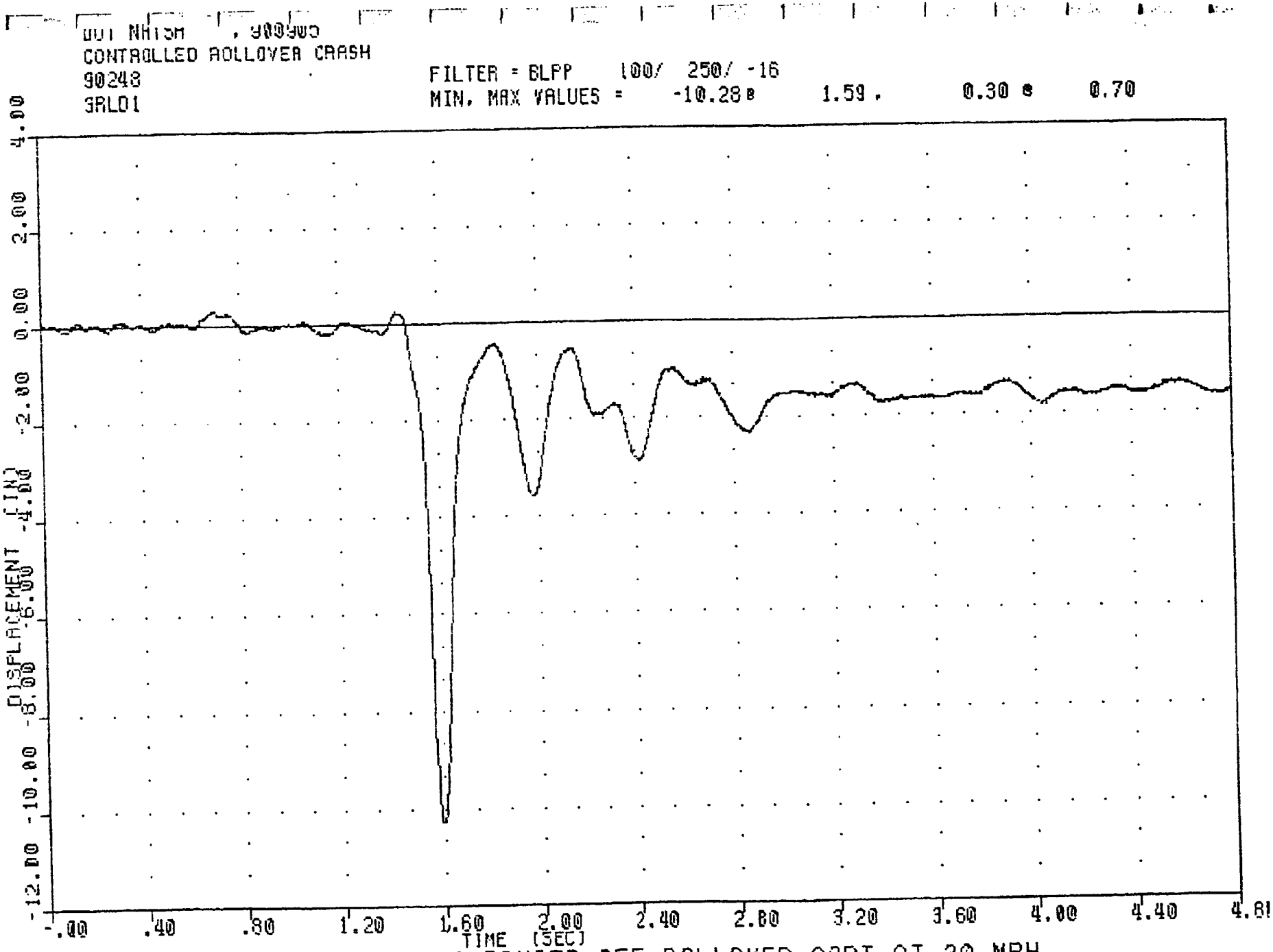
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
VEHICLE LEFT FRONT SUSPENSION DISPLACEMENT

CONTROLLED ROLLOVER CRASH
90248
SFR01

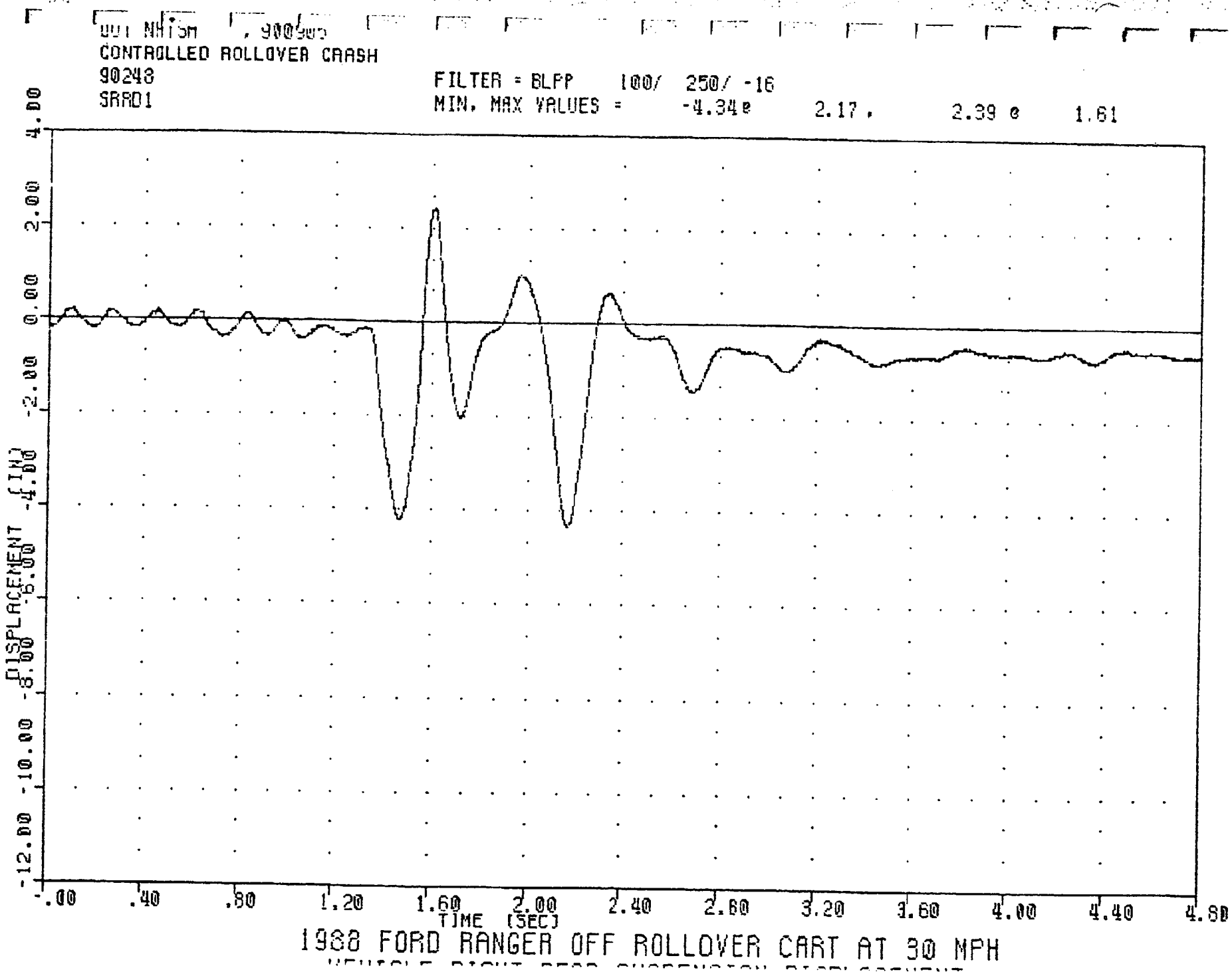
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -2.30@ 1.47 , 0.29 @ 0.64

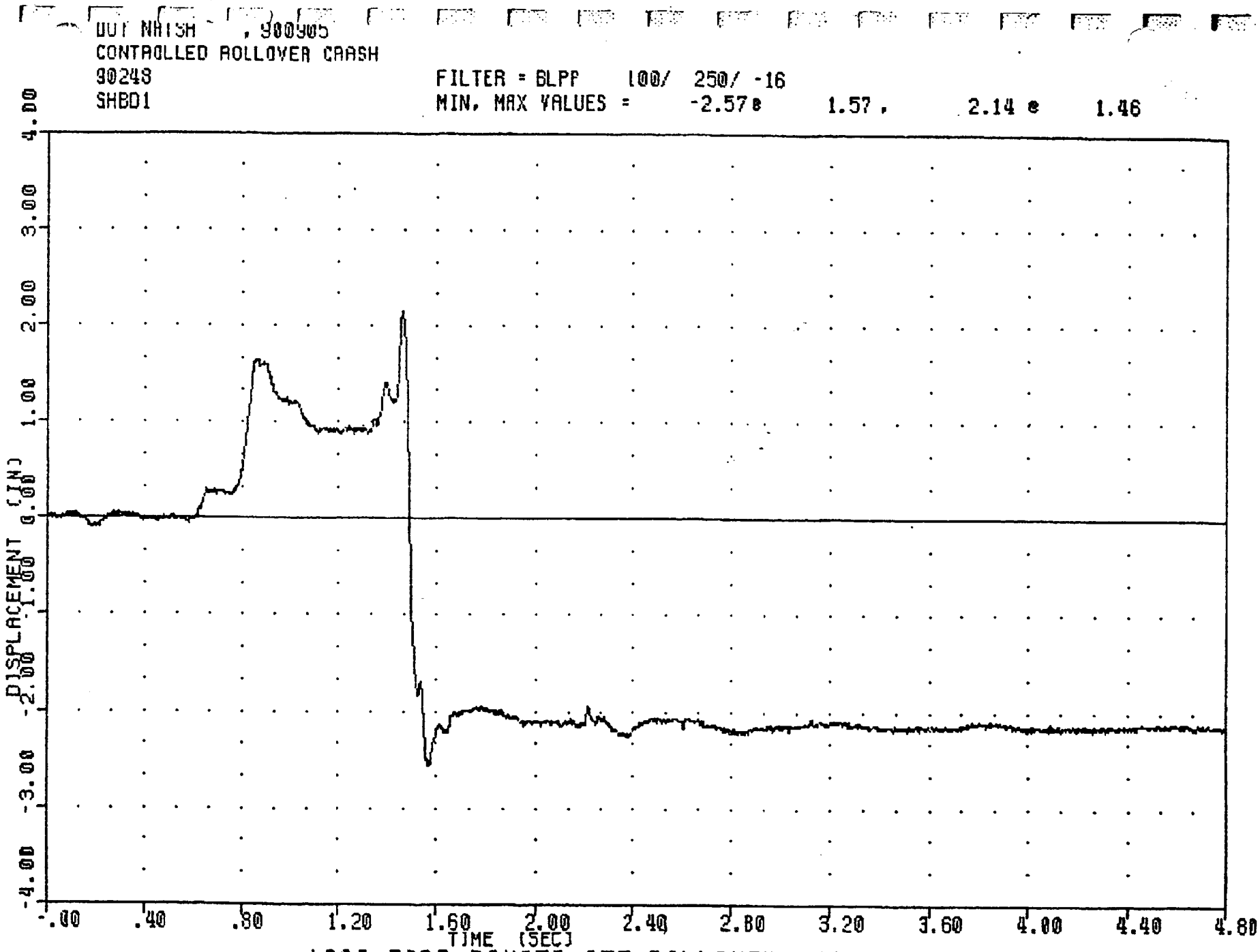


1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH

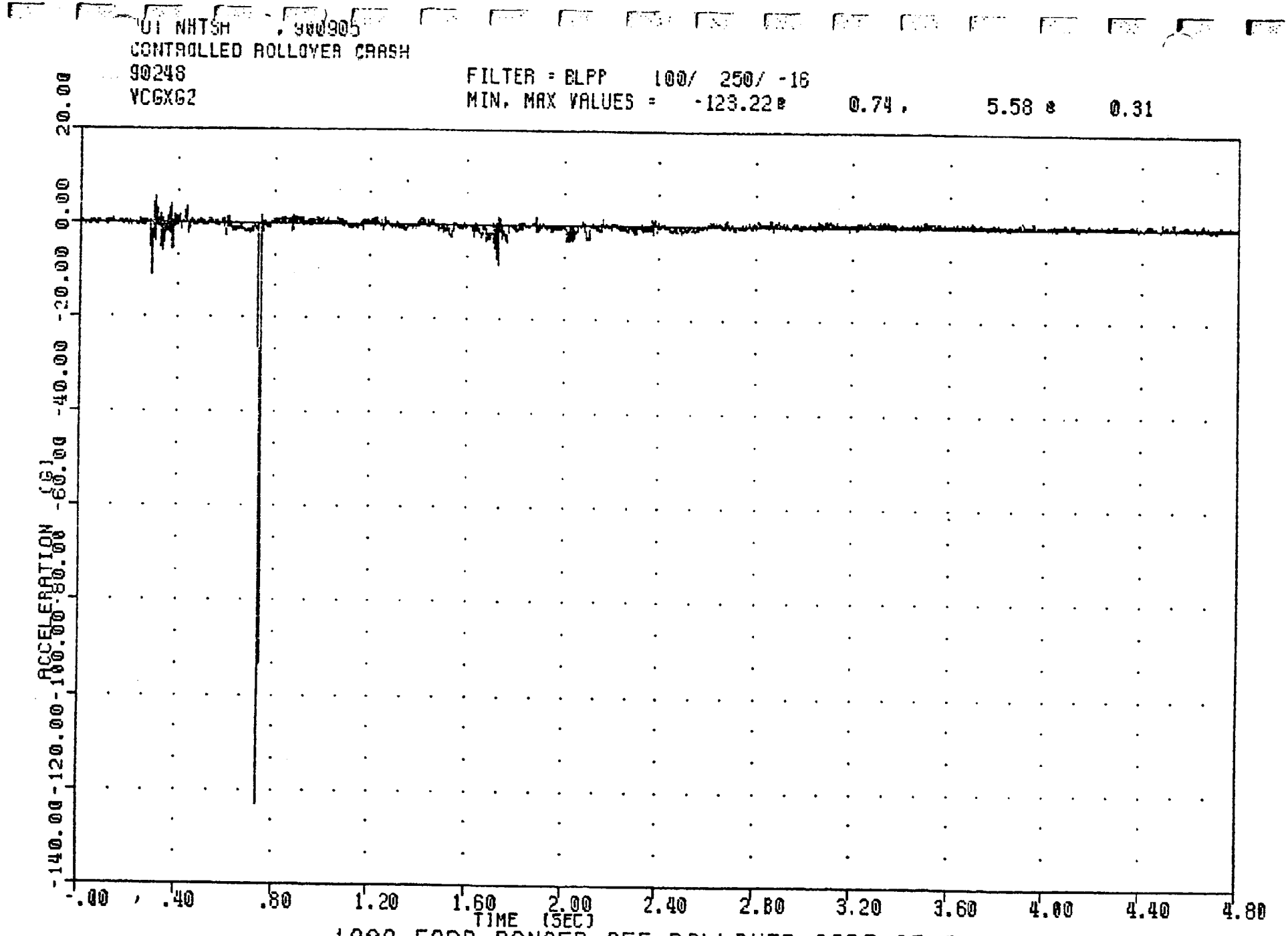


1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
VEHICLE LEFT REAR SUSPENSION DISPLACEMENT

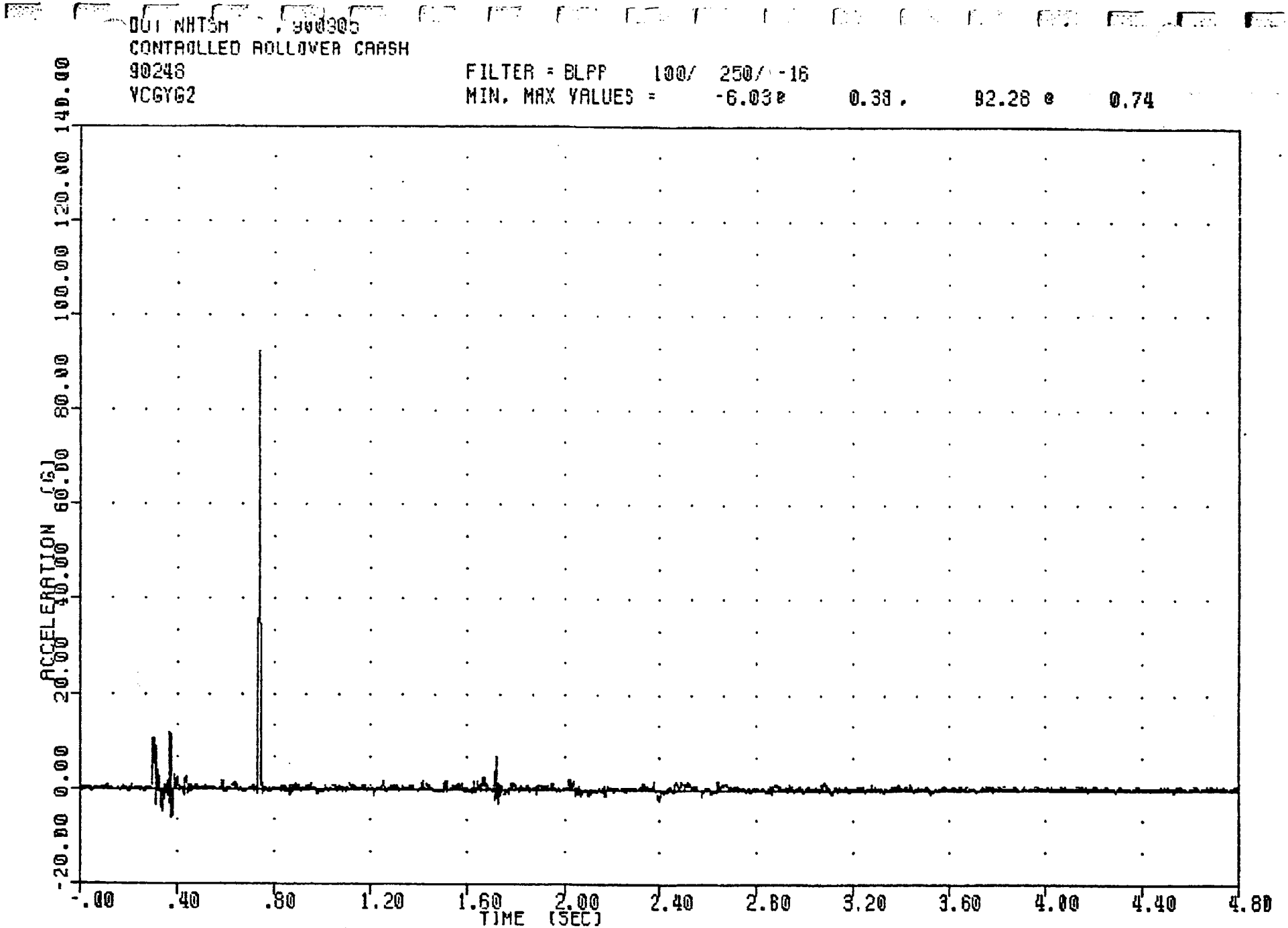

CONTROLLED ROLLOVER CRASH
90248
SRRD1
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -4.34 @ 2.17 , 2.39 @ 1.61
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
DISPLACEMENT (IN)
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.80
TIME (SEC)
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH



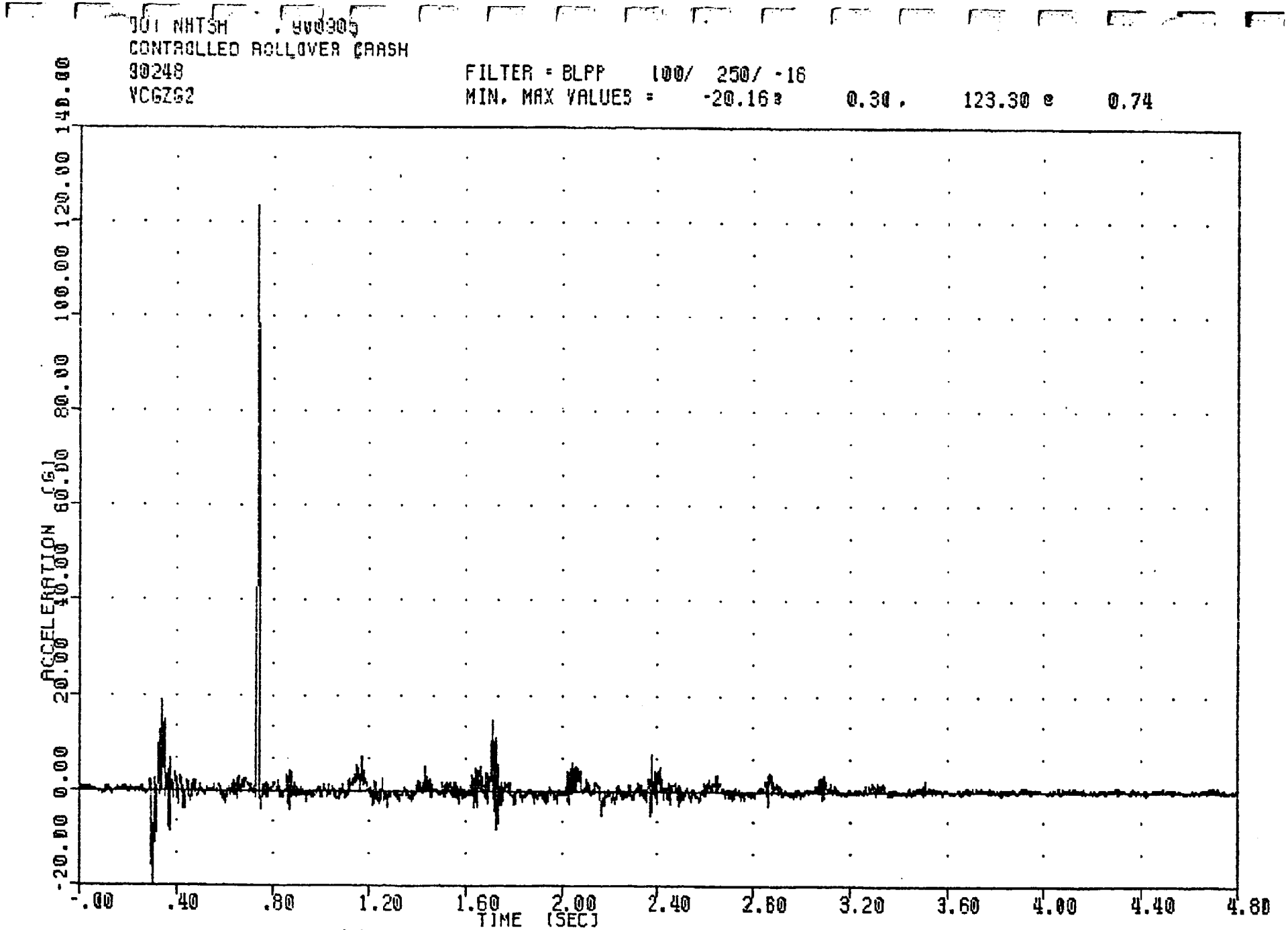
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
DRIVER SHOULDER BELT DISPLACEMENT



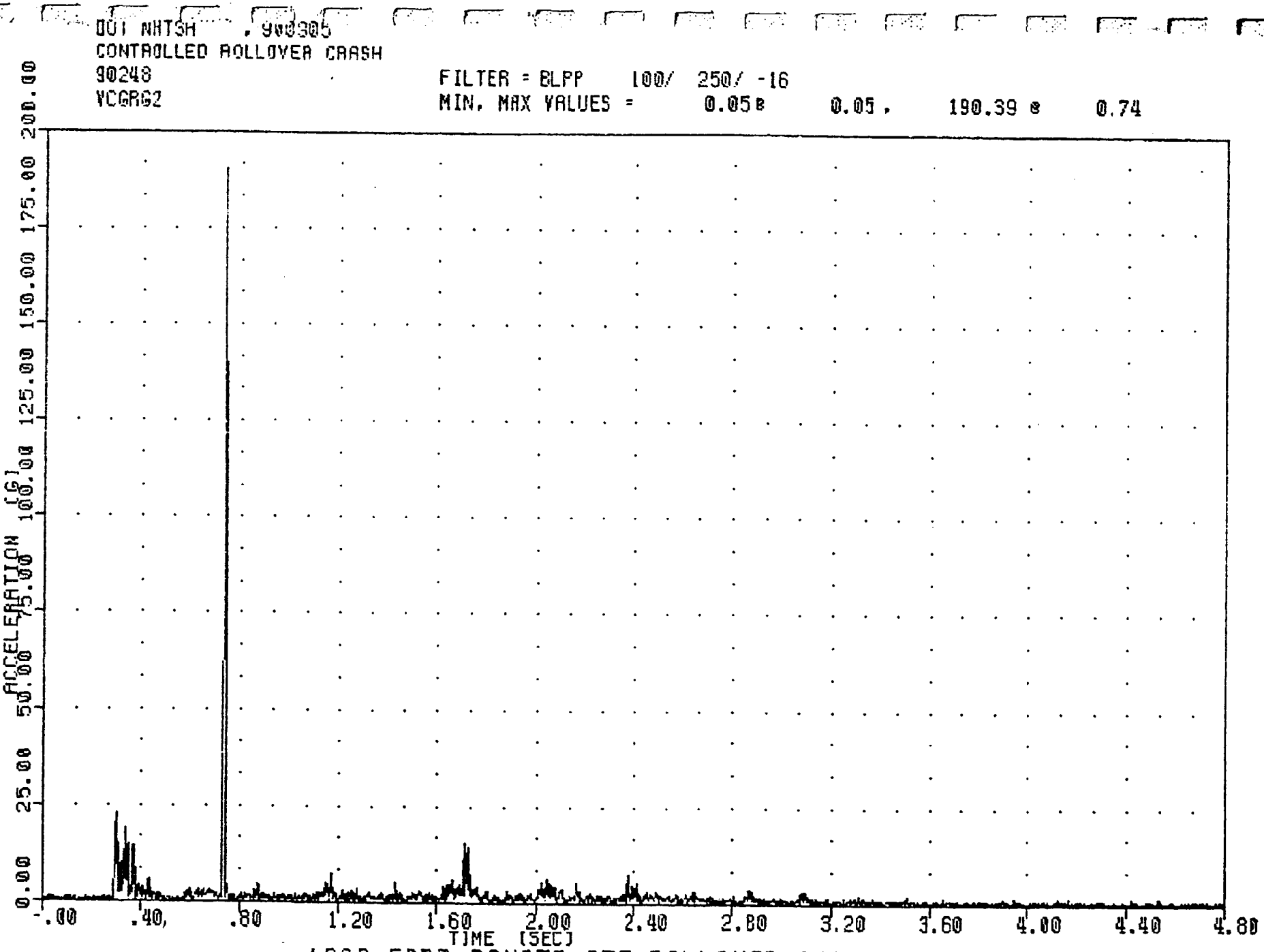
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY ACCELEROMETER X-AXIS



1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY ACCELEROMETER Y-AXIS



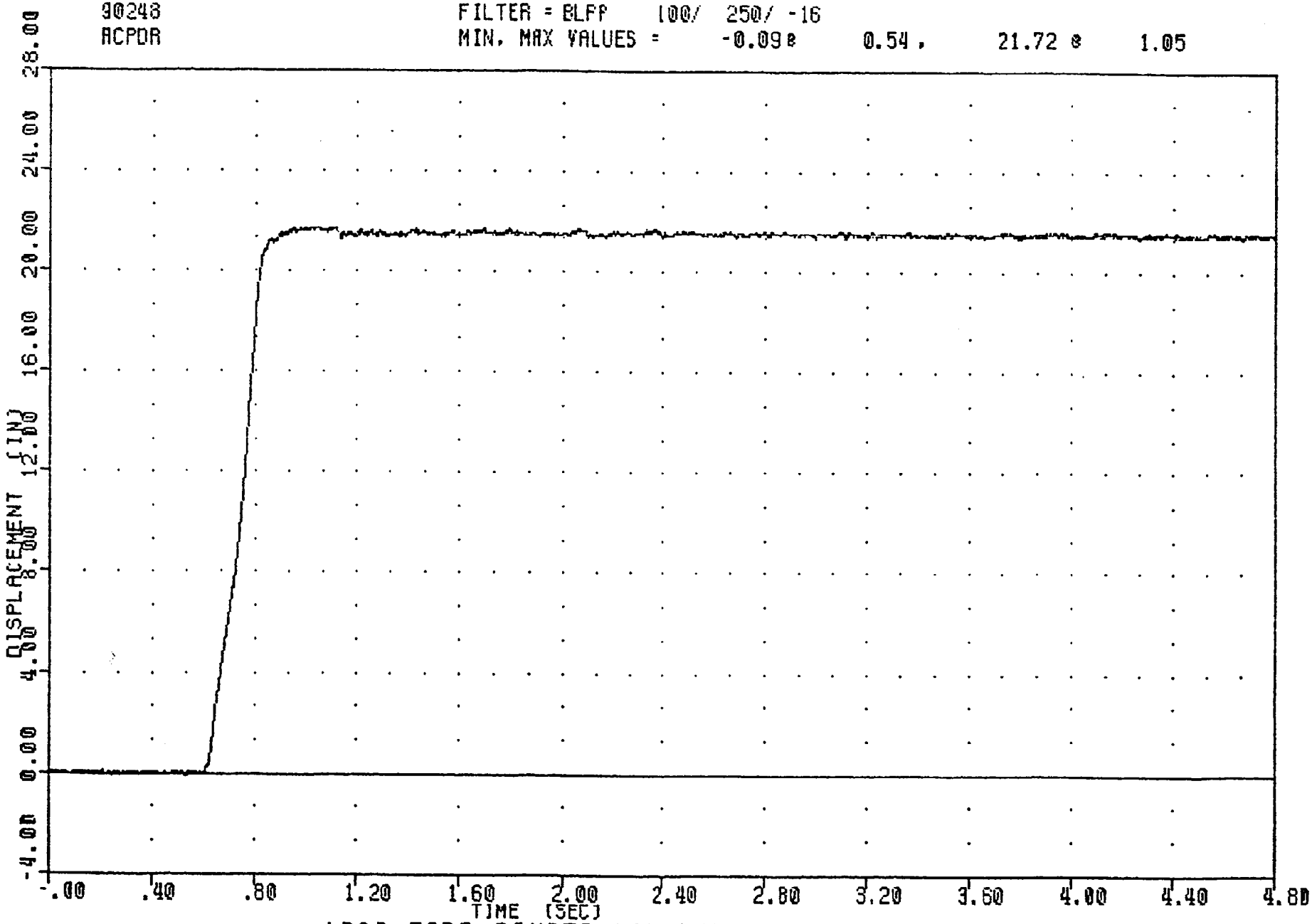
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY ACCELEROMETER Z-AXIS



1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY ACCELEROMETER RESULTANT

DOT NHTSA - 900305
CONTROLLED ROLLOVER CRASH
90248
RCPDR

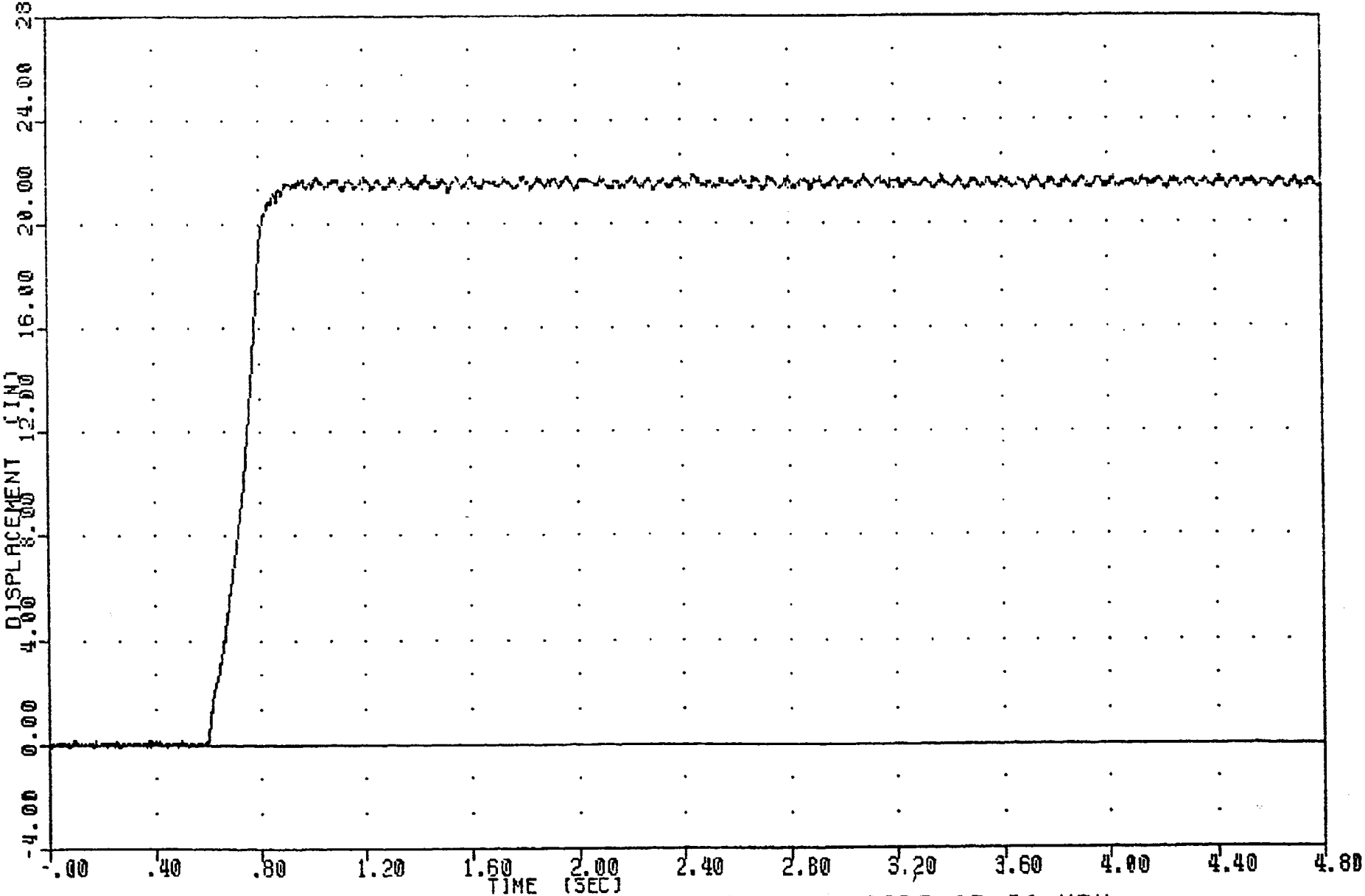
FILTER = BLPF 100/ 250/ -16
MIN, MAX VALUES = -0.09 @ 0.54 , 21.72 @ 1.05



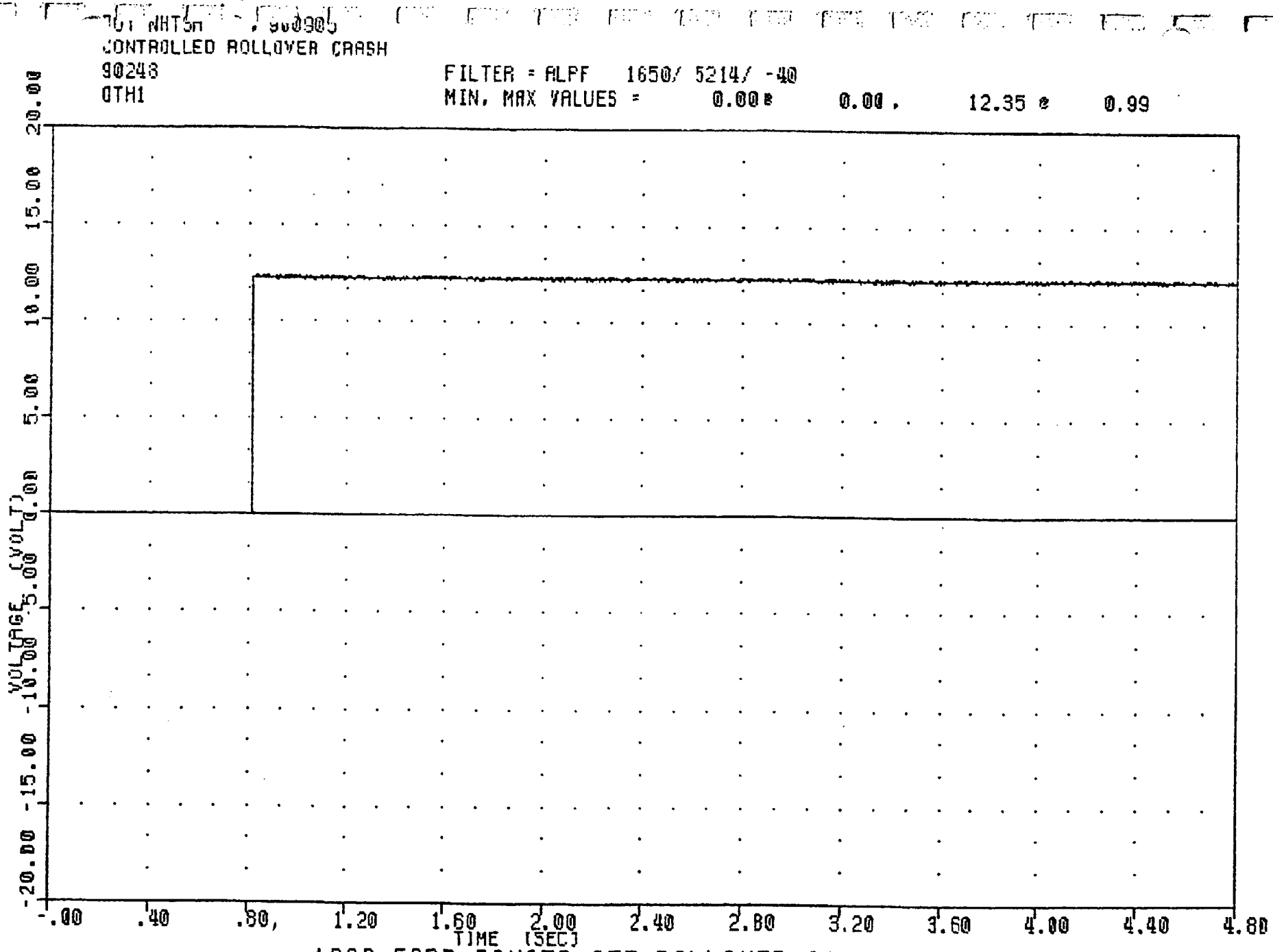
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
ROLL CART RIGHT CYLINDER DISPLACEMENT

CONTROLLED ROLLOVER CRASH
90248
RCPDL

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -0.12 @ 0.24 , 21.90 @ 1.43



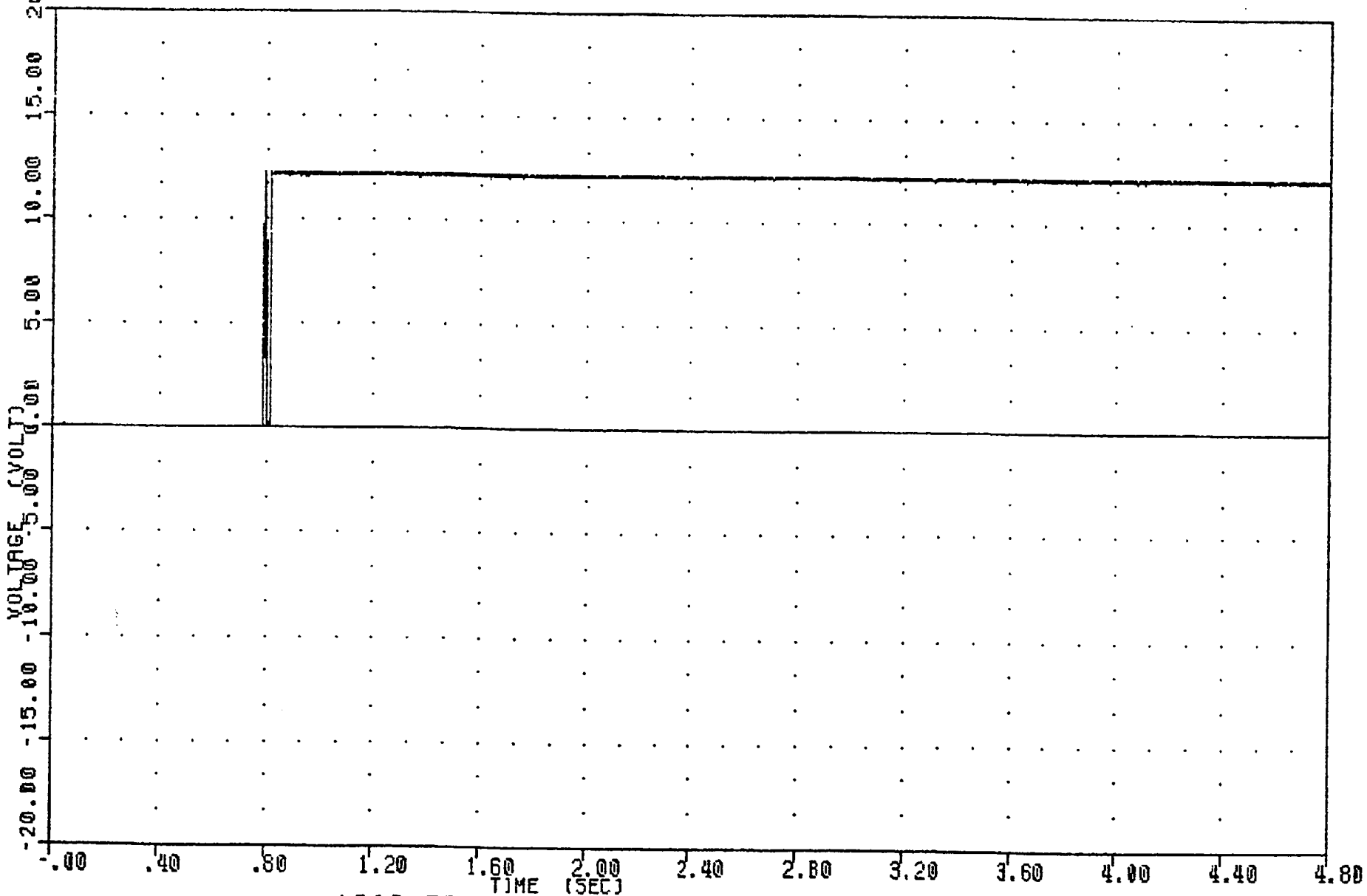
1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
ROLL CART LEFT CYLINDER DISPLACEMENT



1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
VEHICLE/ROLL CART SEPARATION TIME - UPPER SWITCH

DOT NHTSA 90090b
CONTROLLED ROLLOVER CRASH
90248
DTH2

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -0.01 @ 0.00 , 12.27 @ 1.69



1988 FORD RANGER OFF ROLLOVER CART AT 30 MPH
VEHICLE/ROLL CART SEPARATION TIME - LOWER SWITCH

APPENDIX C

MISCELLANEOUS TEST INFORMATION

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: HUMANOID #907

SEATING POSITION: DRIVER

LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
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	87313-91	OUTWARD
PELVIS ACCELERATION	X	ENDEVCO	7264	BD88J	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	LEFT
CENTER OF GRAVITY PITCH	Y	HUMPHREY	RG28-0128-1	H-16	UP
CENTER OF GRAVITY YAW	Z	HUMPHREY	RG28-0128-1	H-21	RIGHT
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

ROLL CART INSTRUMENTATION PLACEMENT

LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
CENTER OF GRAVITY	X	ENDEVCO	7264	BJ99J	REAR
CENTER OF GRAVITY	Y	ENDEVCO	7264	CK09H	LEFT
CENTER OF GRAVITY	Z	ENDEVCO	7264	BT08J	UP
LEFT CYLINDER DISPLACEMENT		CELESCO	PT-101-60A	A23305	
RIGHT CYLINDER DISPLACEMENT		CELESCO	PT-101-60A	A23306	

IPMD VEHICLE DATA SHEET

Filled Out By: Bob Leib Date: 8/24/90

Checked By: _____ Date: _____

VEHICLE DATA

Vehicle Make and Model (written out): Ford Ranger Pickup Truck

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

Vehicle Make (2 characters): 02

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): PU

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): 1FTBR10C9JUC25946

Odometer Reading: 24722.0 Thousands of Miles: 24.722

Overall Length: 179.0 (in) x 25.4 =: 4547 (mm)

Wheelbase: 108.0 (in) x 25.4 =: 2743 (mm)

Front Track: 54.7 (in) x 25.4 =: 1389 (mm)

Rear Track: 54.0 (in) x 25.4 =: 1372 (mm)

Roof Height: 63.0 (in) x 25.4 =: 1600 (mm)

IPMD VEHICLE DATA SHEET

G.V.W.R.: 3900 (lbs) x 4.45 =: 17355 (N)

FRONT G.A.W.R.: 1835 (lbs) x 4.45 =: 8166 (N)

REAR G.A.W.R.: 2215 (lbs) x 4.45 =: 9857 (N)

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

Weight on RF Tire: 794 (lbs) x 4.45 =: 3533 (N)

Weight on LF Tire: 816 (lbs) x 4.45 =: 3631 (N)

Weight on LR Tire: 720 (lbs) x 4.45 =: 3204 (N)

Weight on RR Tire: 718 (lbs) x 4.45 =: 3195 (N)

Vehicle Test Weight: 3084 (lbs) x 4.45 =: 13564 (N)

Lateral and Longitudinal Center of Gravity Location.

From Front Axle: 50.95 (in) x 25.4 =: 1294 (mm)

From Center Line: -0.21 (in) x 25.4 =: -5.0 (mm)

Engine Displacement: 122.0 (cu in) x 0.0164 =: 2.0 (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): L

L = Longitudinal T = Transverse

Transmission Type: (1 character): M

M = Manual A = Automatic

Drive Axle (1 character): R

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): I

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): CO

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

Brake Type (2 characters): DI

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

FRONT SUSPENSION

Tire Manufacturer (10 characters): Firestone

Tire Size Code (10 characters): P195/70R14M&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 =: 140 (mm)

Axle Height: 11.5 (in) X 25.4 =: 292 (mm)

Tire Pressure: 35.0 (psi) X 6.897 =: 241 (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): Firestone

Tire Size Code (10 characters): P195/70R14M&S

Tire Construction (2 characters): _____

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 =: 140 (mm)

Axle Height: 11.5 (in) X 25.4 =: 292 (mm)

Tire Pressure: 35.0 (psi) X 6.897 =: 136 (kpa)

IPMD MEASURED DATA

VEHICLE # AND RUN # 300 DATE: 08-24-90 TIME: 15:26:55

Pitch Inertia:

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Pitch Calc. (Ft. Lb. Sec²)
1	4.100	10.00	0.183	1867.4
2	4.105	10.20	0.184	1875.3
3	4.105	10.13	0.185	1874.1
Average Pitch Inertia:				1872.3

Roll Inertia:

Distance between ramps (in.): 44.40

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Roll Calc. (Ft. Lb. Sec²)
1	2.400	8.04	0.131	322.5
2	2.400	7.83	0.129	322.2
3	2.400	8.06	0.138	321.2
Average Roll Inertia:				322.0

Yaw Inertia:

String Pot Offset from platform center (in.): 72.00

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Yaw Calc. (Ft. Lb. Sec²)
1	2.385	10.38	0.14	1976.7
2	2.380	9.99	0.13	1968.2
3	2.380	10.10	0.13	1968.3
Average Yaw Inertia:				1971.0

IPMD MEASURED DATA

Vehicle # and Run #: 300 Date: 08-24-90 Time: 15:26:54

Vehicle Weight: 3048 Roof Height: 63.00 Load Config: CURB+DR

Fuel Load: empty Vehicle Type: pu

IPMD Calibration Check (no vehicle)

Applied Weight (lbs.)	Schaevitz Output (Deg.)	System C.G. Pivot (In.)
0	-0.20	0.00
100	-5.59	33.23
200	-10.89	33.26
0	-0.19	0.00
-100	5.19	33.20
-200	10.50	33.22
0	-0.20	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	0.03	0.000	0.00
100	-3.83	0.068	24.76
200	-7.66	0.167	24.55
0	0.02	0.016	0.00
-100	3.83	-0.075	24.31
-200	7.76	-0.196	24.47
0	0.08	-0.035	0.00
Average calculated C.G. Height:			24.52

IPMD VEHICLE DATA SHEET

Filled Out By: B. Dotson Date: 10/02/90

Checked By: _____ Date: _____

VEHICLE DATA

Vehicle Make and Model (written out): Ford Ranger

NHTSA ID Code (7 characters): V90300 / Model Year (2 digits): 88

Vehicle Make (2 characters): 02

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): PU

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): 1FTBR10C9JUC25946

Odometer Reading: 24,722.0 Thousands of Miles: 24.722

Overall Length: 179.0 (in) x 25.4 =: 4547 (mm)

Wheelbase: 108.0 (in) x 25.4 =: 2743 (mm)

Front Track: 54.7 (in) x 25.4 =: 1389 (mm)

Rear Track: 54.0 (in) x 25.4 =: 1372 (mm)

Roof Height: 54.0 (in) x 25.4 =: 1372 (mm)

IPMD VEHICLE DATA SHEET

G.V.W.R.: 3900 (lbs) x 4.45 =: 17355 (N)

FRONT G.A.W.R.: 1835 (lbs) x 4.45 =: 8166 (N)

REAR G.A.W.R.: 2215 (lbs) x 4.45 =: 9857 (N)

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

Weight on RF Tire: 759 (lbs) x 4.45 =: 3378 (N)

Weight on LF Tire: 829 (lbs) x 4.45 =: 3689 (N)

Weight on LR Tire: 712 (lbs) x 4.45 =: 3168 (N)

Weight on RR Tire: 720 (lbs) x 4.45 =: 3204 (N)

Vehicle Test Weight: 3020 (lbs) x 4.45 =: 13439 (N)

Lateral and Longitudinal Center of Gravity Location.

From Front Axle: 51.21 (in) x 25.4 =: 1301 (mm)

From Center Line: -0.55 (in) x 25.4 =: 14 (mm)

Engine Displacement: 122.0 (cu in) x 0.0164 =: 2 (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): L

L = Longitudinal T = Transverse

Transmission Type: (1 character): M

M = Manual A = Automatic

Drive Axle (1 character): R

F = Front R = Rear 4 = Four Wheel Drive

Vehicle Comments (30 characters): Post-crash 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): I

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): CO

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

Brake Type (2 characters): DI

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

FRONT SUSPENSION

Tire Manufacturer (10 characters): Firestone

Tire Size Code (10 characters): P195/70R14

Tire Construction (2 charactrs): 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 =: 140 (mm)

Axle Height: 11.5 (in) X 25.4 =: 292 (mm)

Tire Pressure: 35.0 (psi) X 6.897 =: 241 (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): Firestone

Tire Size Code (10 characters): P195/70R14

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 =: 140 (mm)

Axle Height: 11.5 (in) X 25.4 =: 292 (mm)

Tire Pressure: 35.0 (psi) X 6.897 =: 241 (kpa)

IPMD MEASURED DATA

VEHICLE # AND RUN # 3002 DATE: 10-02-90 TIME: 15:32:51

Pitch Inertia:

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Pitch Calc. (Ft. Lb. Sec^2)
1	3.980	10.29	0.117	1841.3
2	3.975	10.33	0.120	1833.8
3	3.975	10.16	0.114	1836.1
Average Pitch Inertia:				1837.1

Roll Inertia:

Distance between ramps (in.): 44.20

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Roll Calc. (Ft. Lb. Sec^2)
1	2.310	8.02	0.134	278.8
2	2.330	7.31	0.122	293.6
3	2.330	7.81	0.129	293.9
Average Roll Inertia:				288.8

Yaw Inertia:

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Yaw Calc. (Ft. Lb. Sec^2)
1	2.365	9.86	0.11	1944.3
2	2.370	10.01	0.11	1953.2
3	2.370	10.18	0.12	1952.9
Average Yaw Inertia:				1950.1

IPMD MEASURED DATA

Vehicle # and Run #: 3002 Date: 10-02-90 Time: 15:32:50

Vehicle Weight: 3020 Roof Height: 54.00 Load Config: driver

Fuel Load: empty Vehicle Type: pu

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	0.12	0.000	0.00
100	-3.50	0.027	23.78
200	-7.17	0.094	23.68
0	0.09	-0.016	0.00
-100	3.73	-0.061	23.14
-200	7.42	-0.118	23.51
0	0.14	-0.026	0.00
Average calculated C.G. Height:			23.53

SIGN CONVENTION

ACCELEROMETERS:

+X: FORWARD

+Y: LEFTWARD

+Z: UPWARD

POTENTIOMETERS:

+CHEST DISPLACEMENT:	OUTWARD
+SEAT BELT DISPLACEMENT:	OUTWARD
+SEAT BELT EXTENSION:	ENLONGATION
+VEHICLE DISPLACMENT:	OUTWARD

LOAD CELLS:

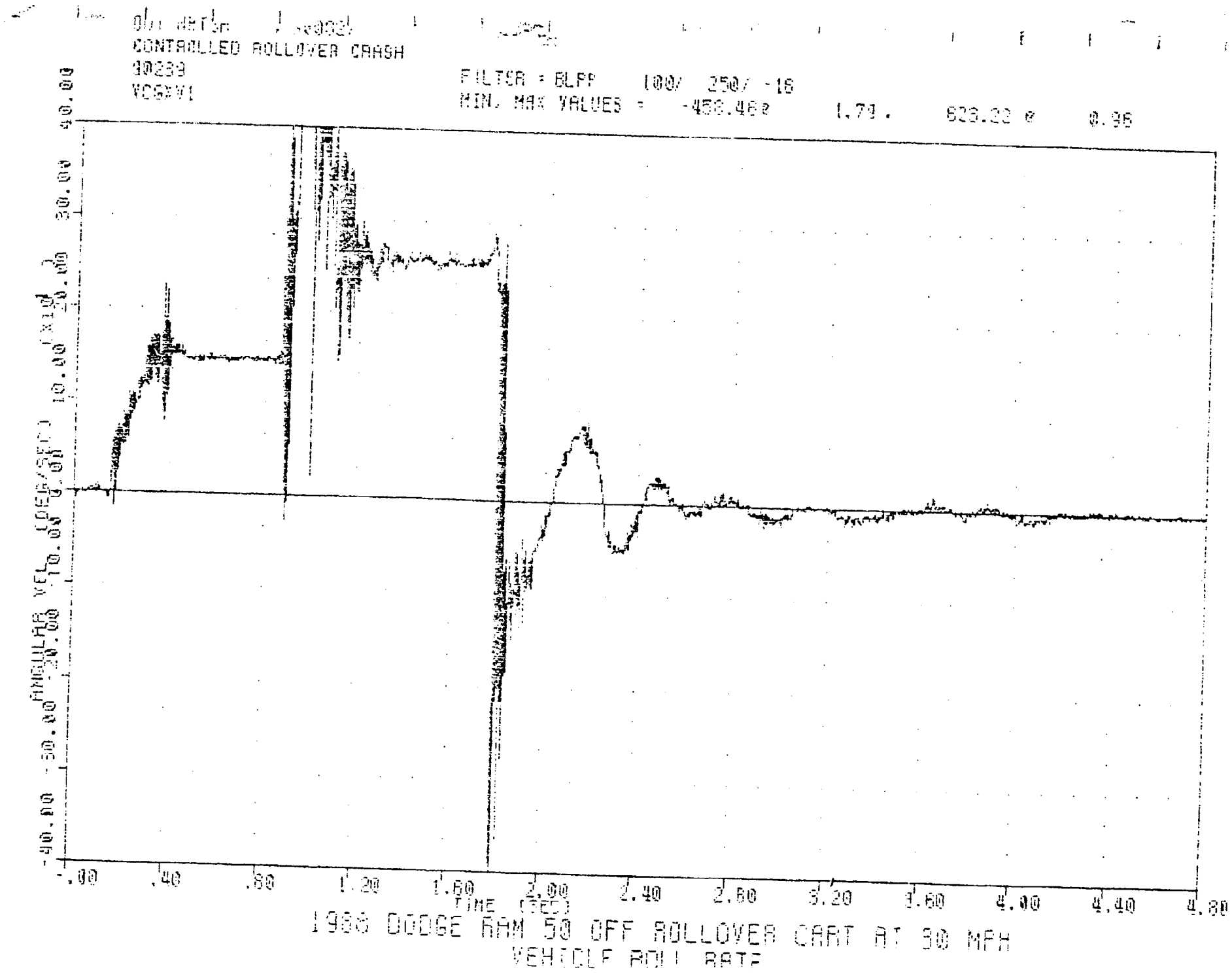
+FEMUR FORCE:	TENSION
+SEAT BELT FORCE:	TENSION
+BARRIER FORCE:	TENSION

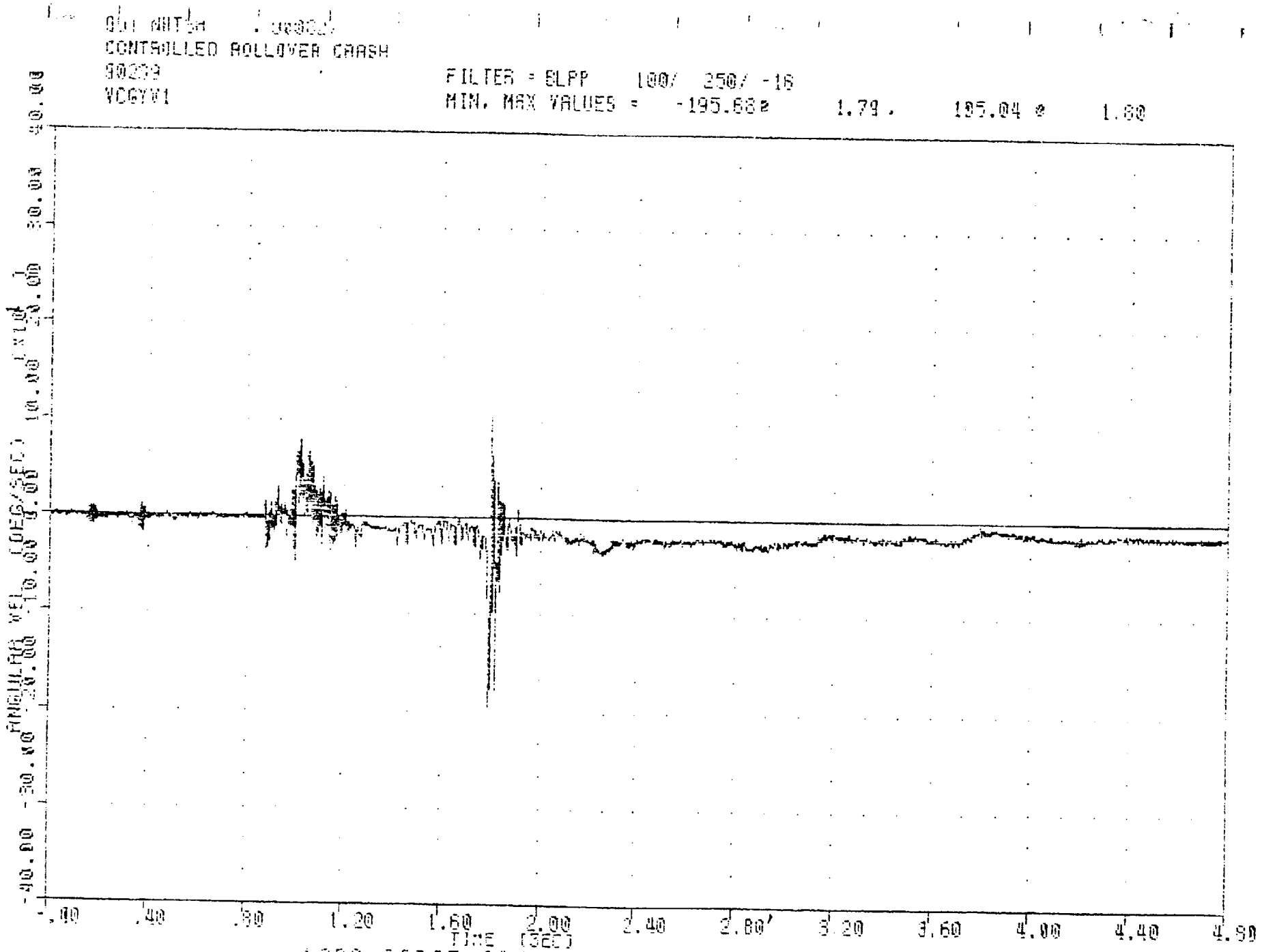
NECK LOAD CELLS:

+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

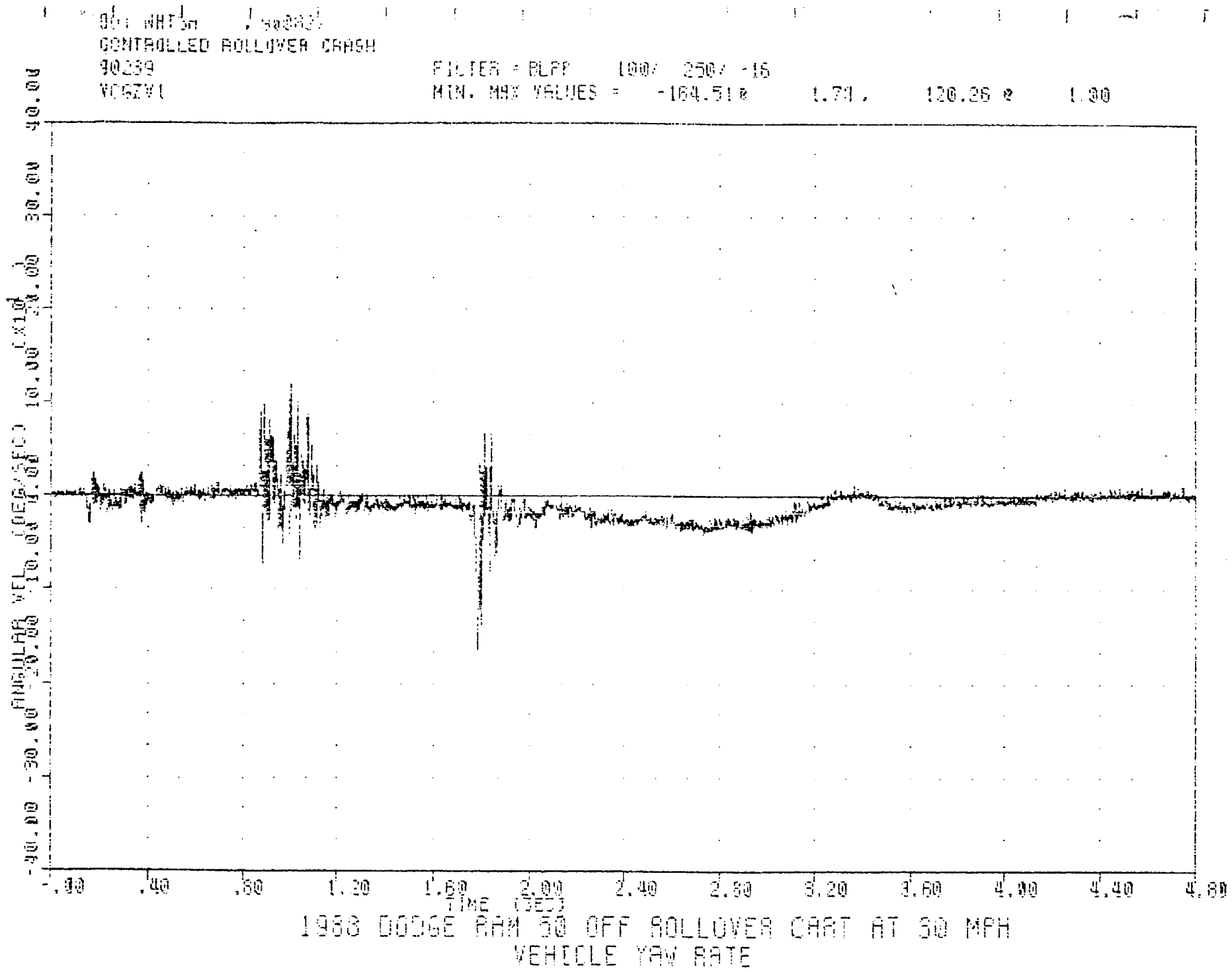
GYROSCOPES:

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

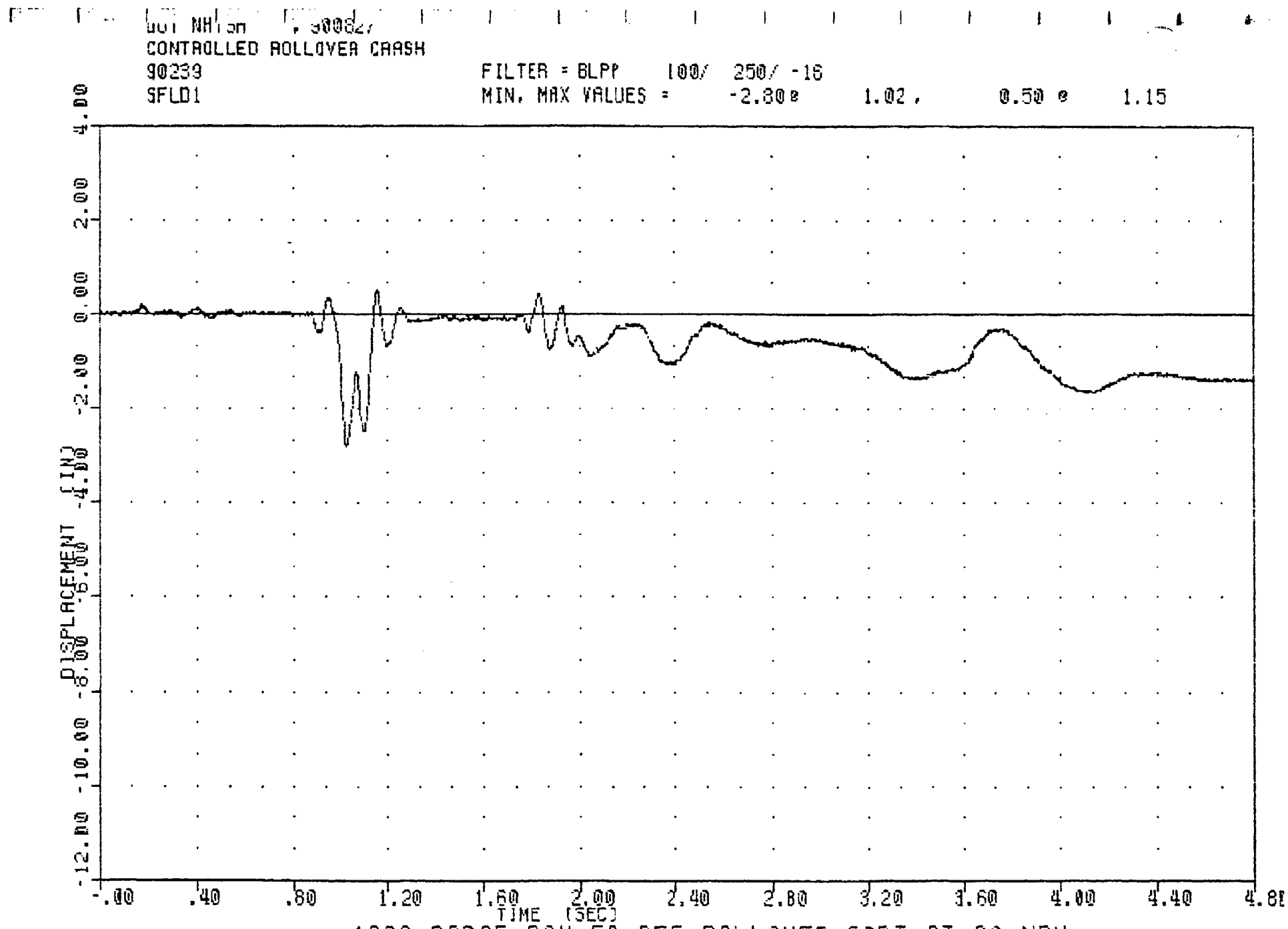

CONTROLLED ROLLOVER CRASH
30239
VCG#V1
FILTER = BLPF 100/ 250/ -18
MIN, MAX VALUES = -458.48@ 1.79 , 629.33 @ 0.36
ANGULAR VEL (DEG/SEC)
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
.00
.40
.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.80
TIME (SEC)
1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
VEHICLE ROLL RATE



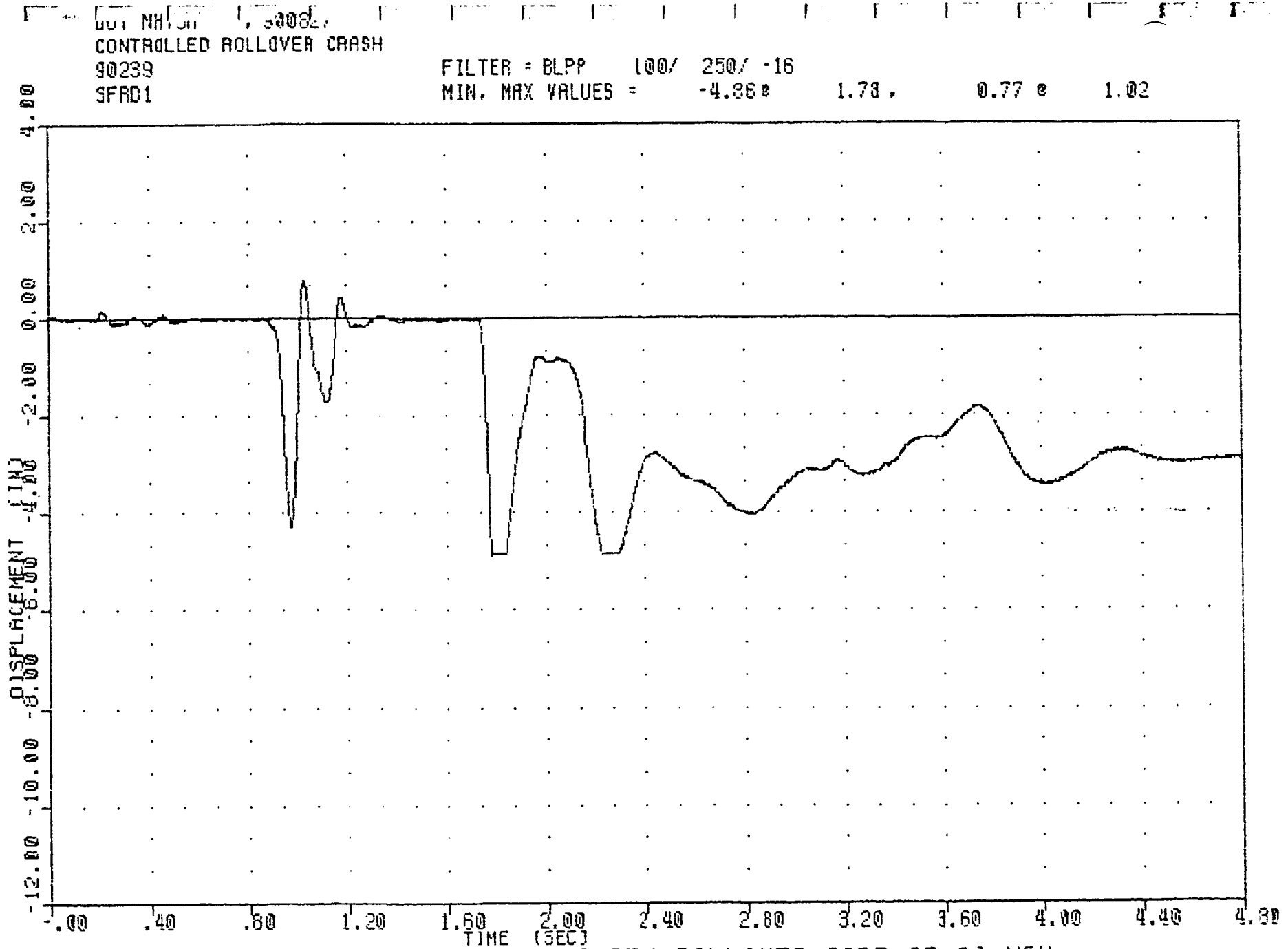
1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
VEHICLE PITCH RATE



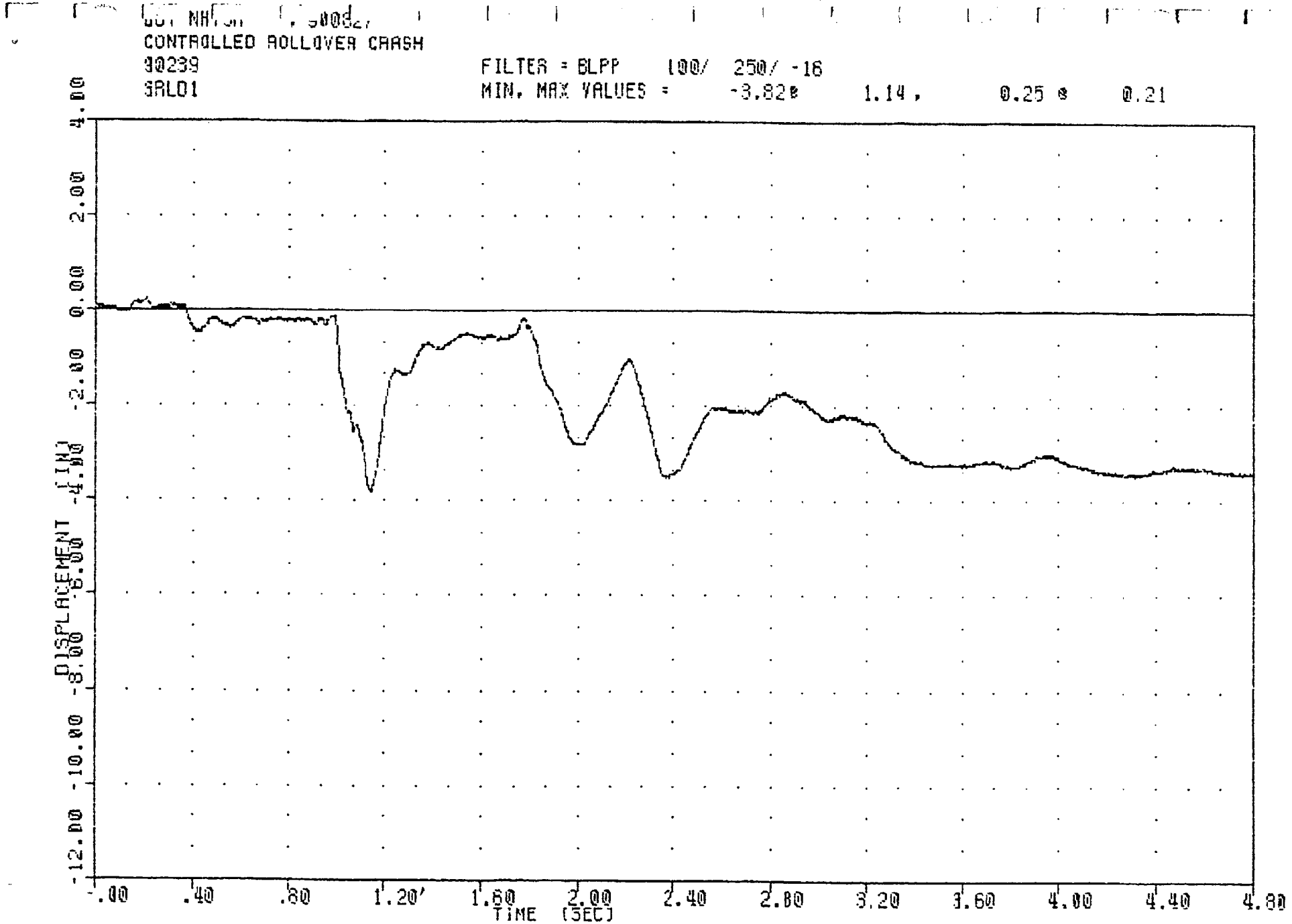
1988 DODGE RAM 50 OFF ROLLOVER CART AT 50 MPH
VEHICLE YAW RATE



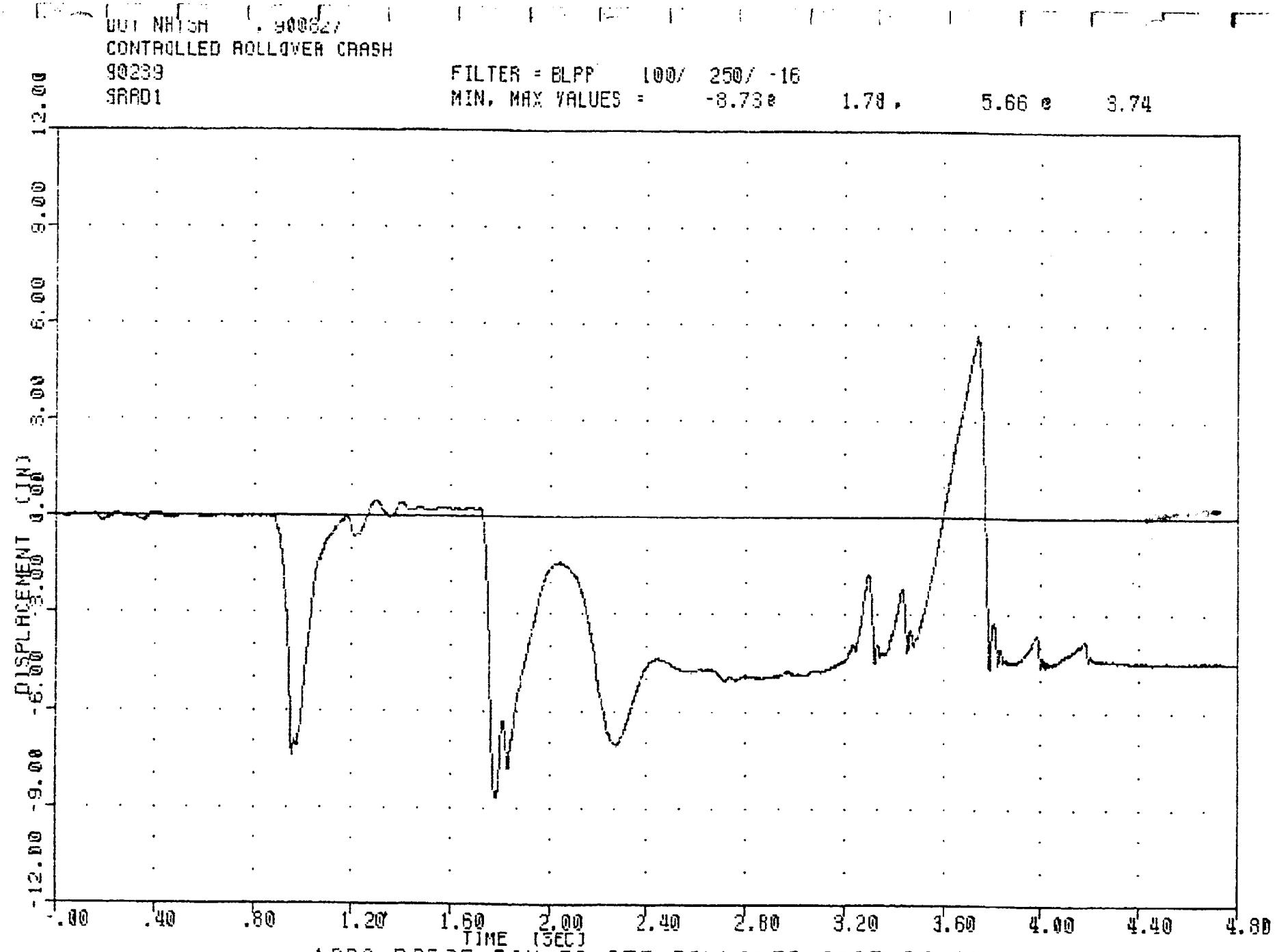
1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
VEHICLE LEFT FRONT SUSPENSION DISPLACEMENT



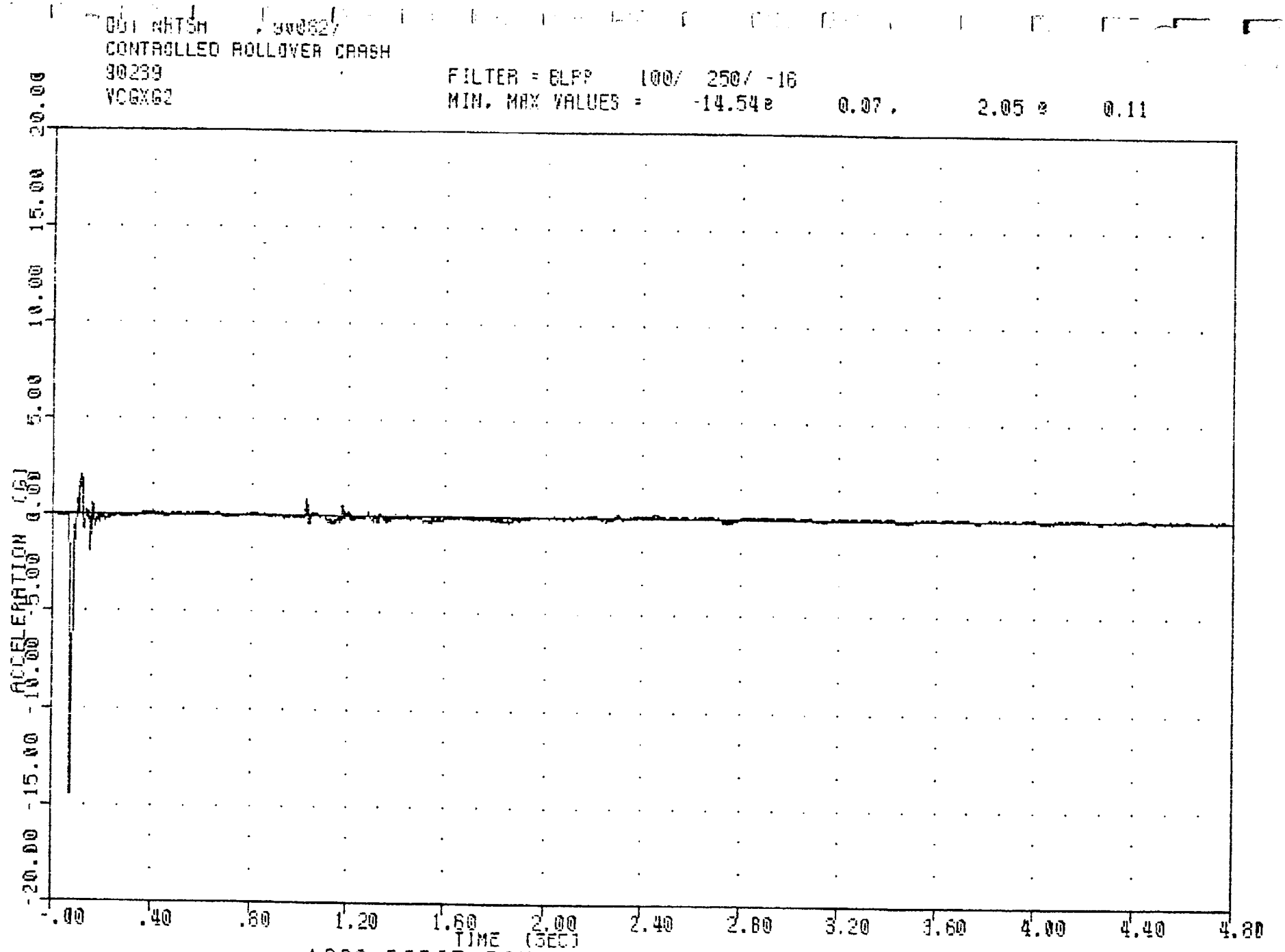
1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
VEHICLE RIGHT FRONT SUSPENSION DISPLACEMENT



1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
VEHICLE LEFT REAR SUSPENSION DISPLACEMENT



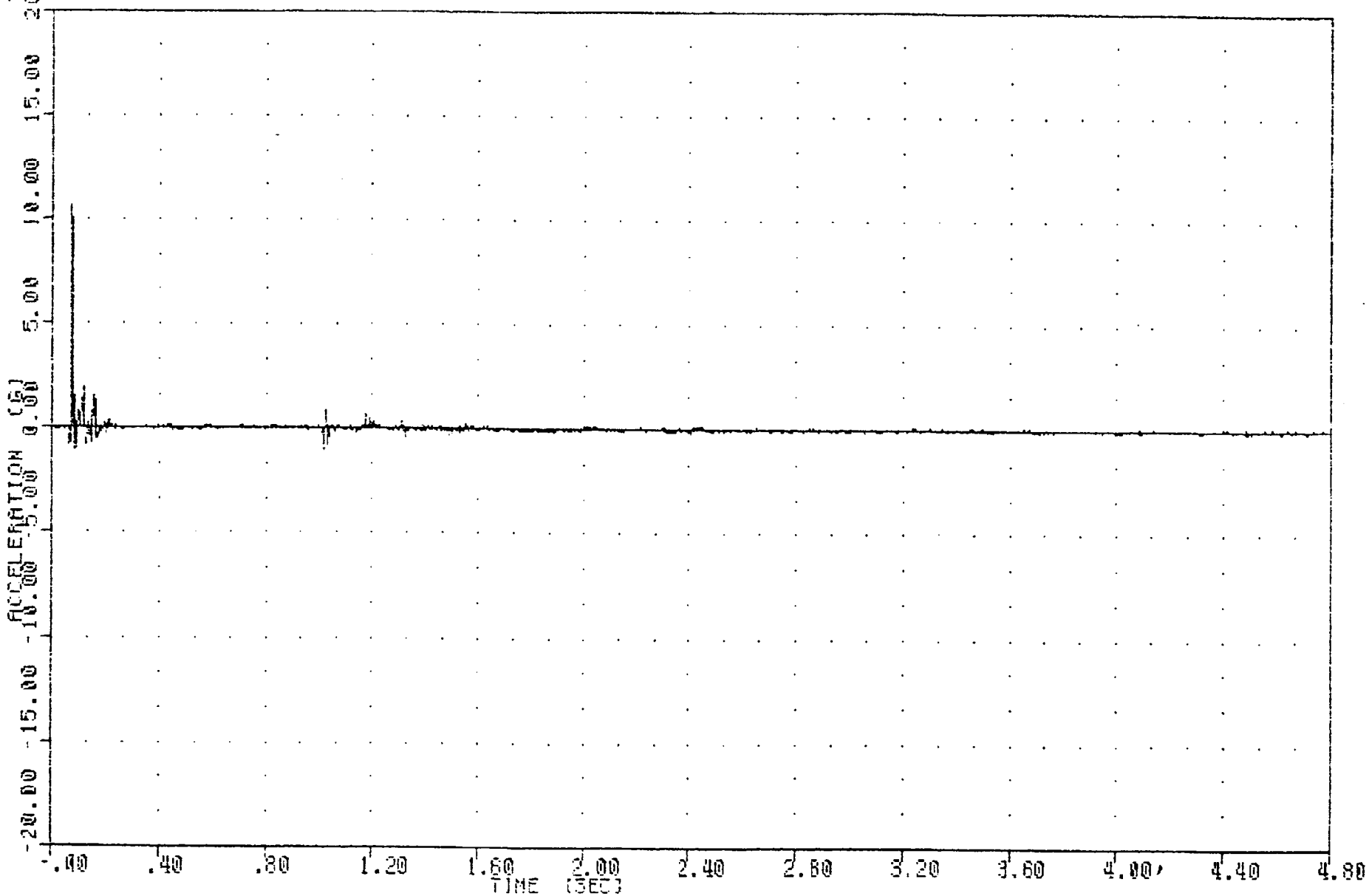
1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
VEHICLE RIGHT REAR SUSPENSION DISPLACEMENT



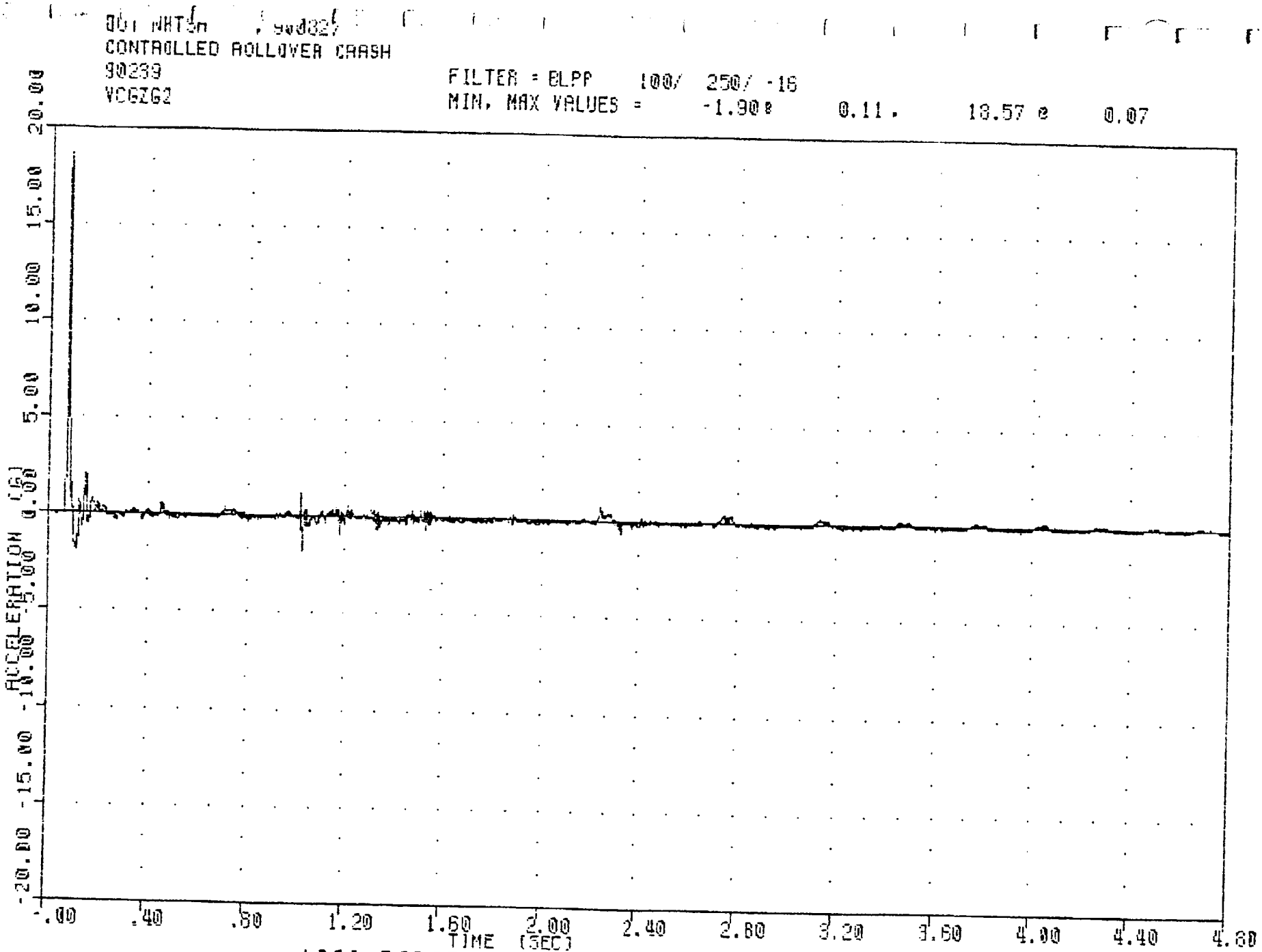
1986 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY ACCELEROMETER X-AXIS

CONTROLLED ROLLOVER CRASH
90239
VCGY62

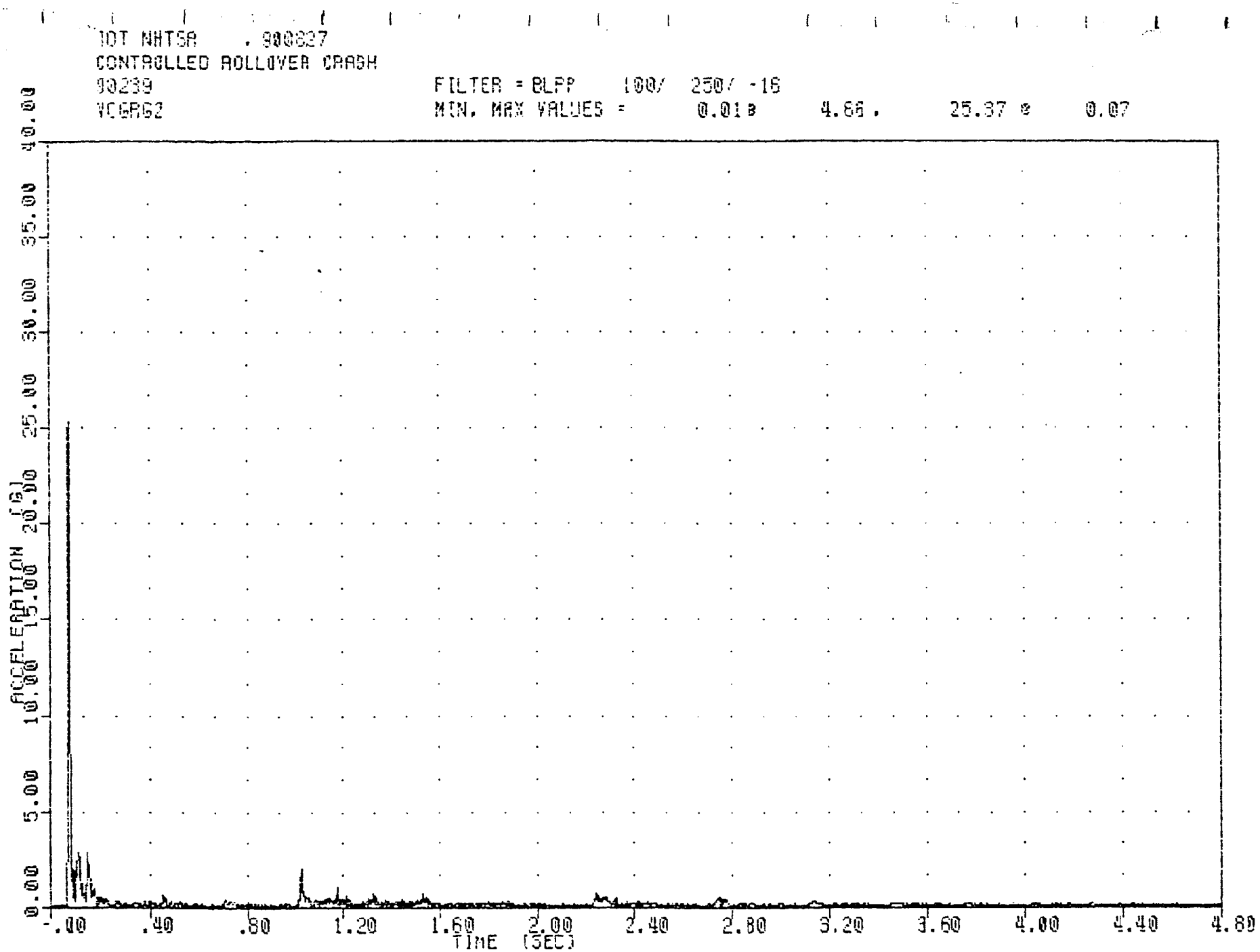
FILTER = BLPP 100/ 350/ -16
MIN. MAX VALUES = -1.06 @ 1.02 , 10.60 @ 0.07



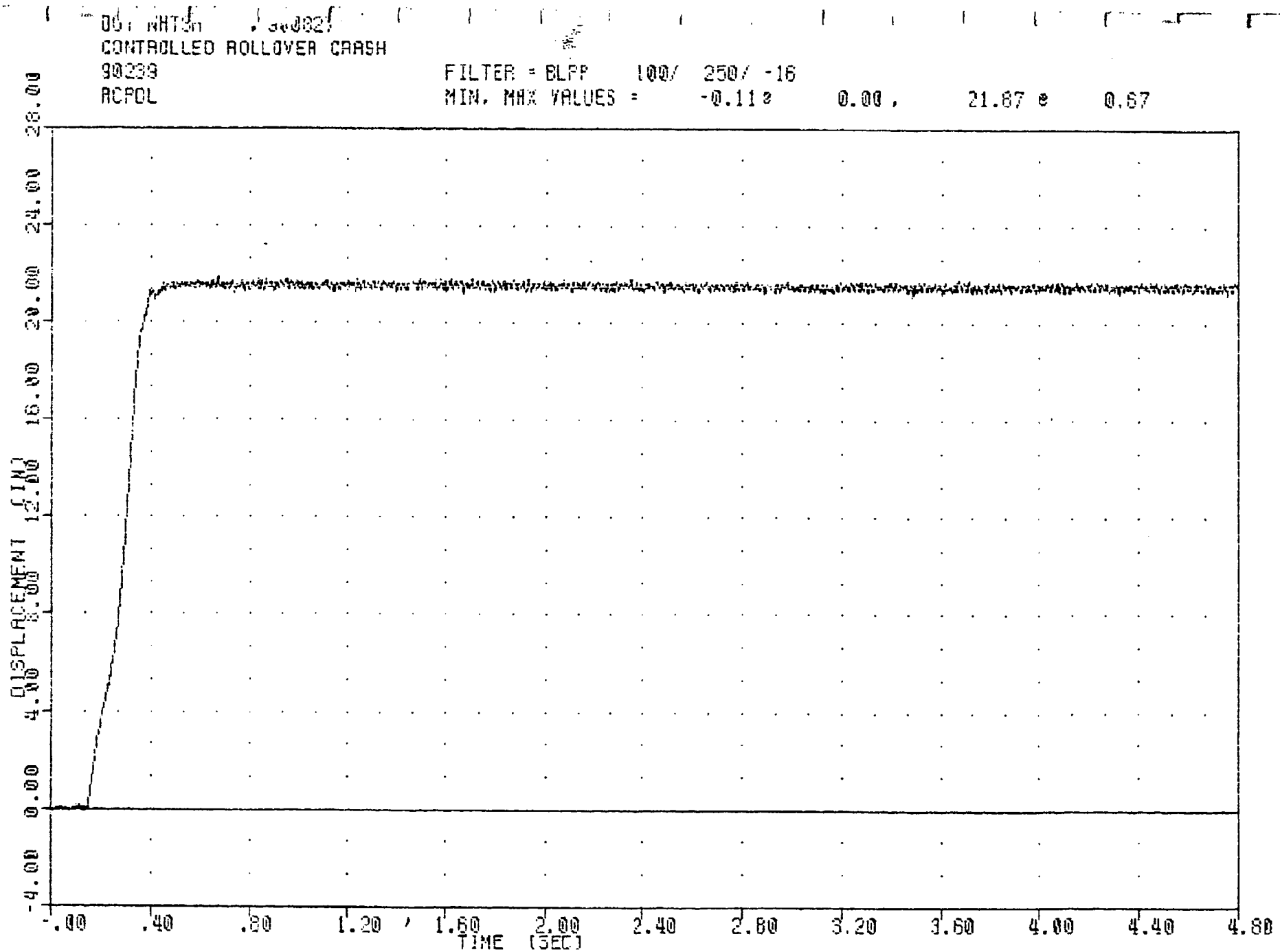
1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY ACCELEROMETER Y-AXIS



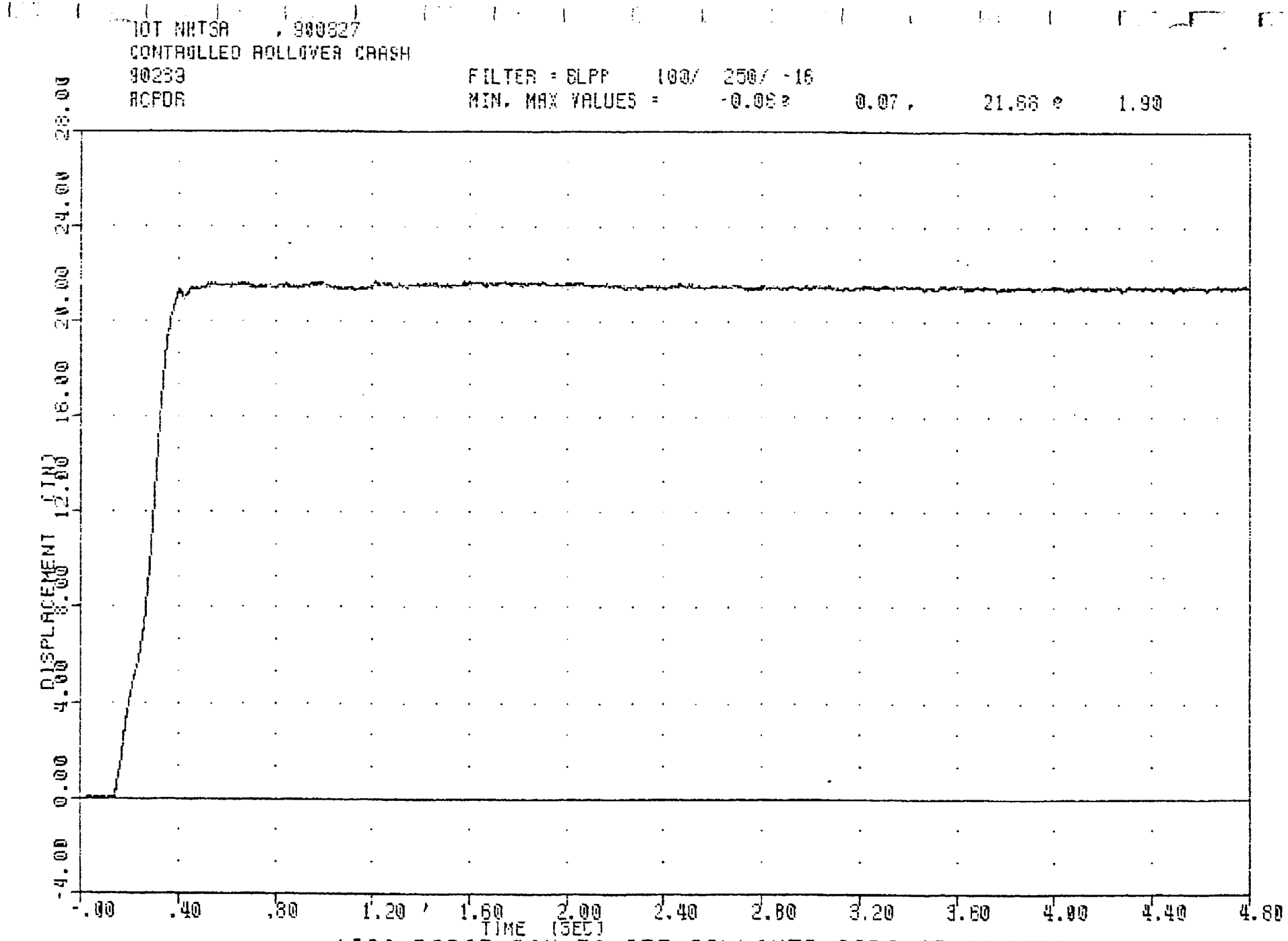
1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY ACCELEROMETER 7-AXIS



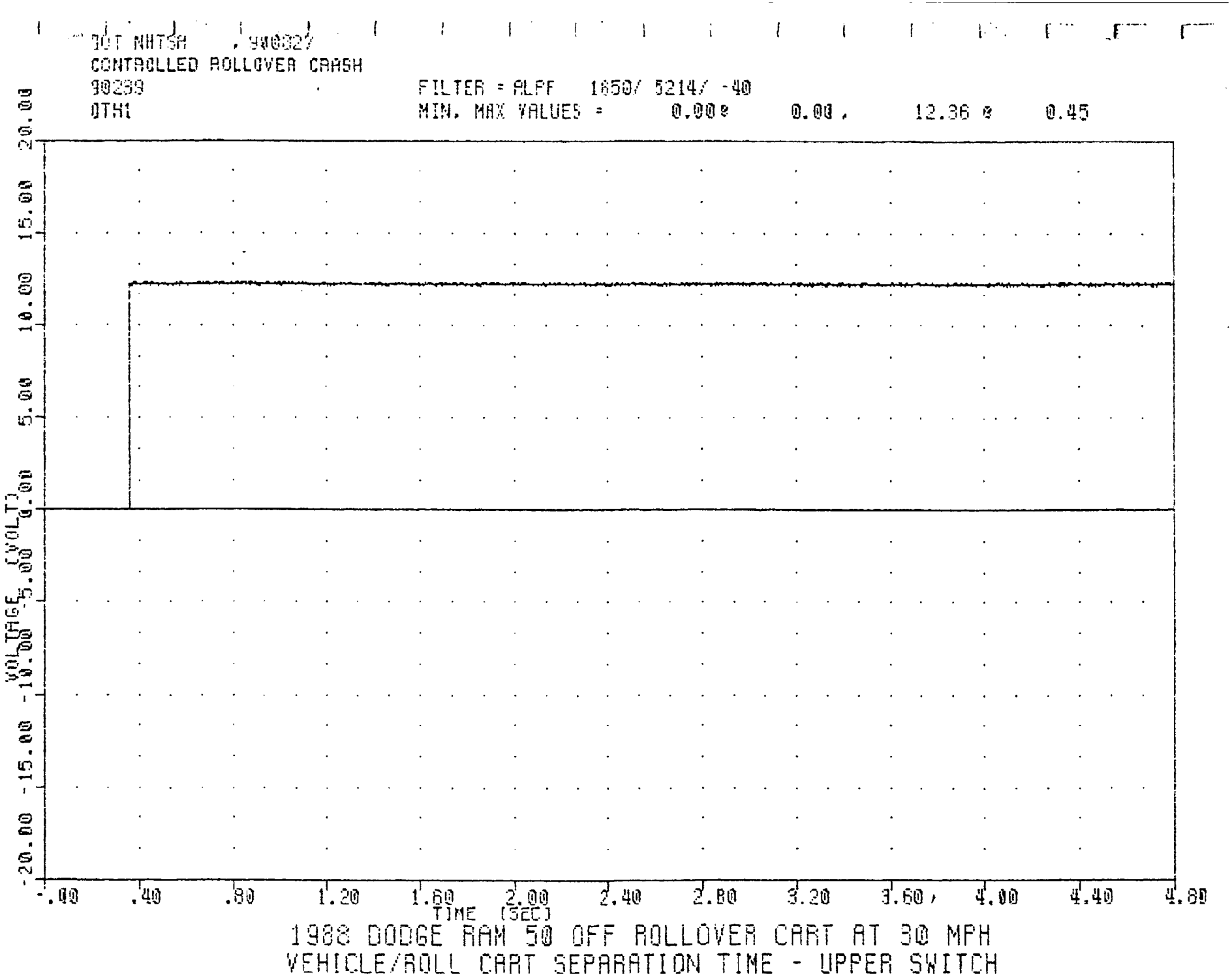
1986 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY ACCELEROMETER RESULTANT



1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
ROLL CART LEFT CYLINDER DISPLACEMENT



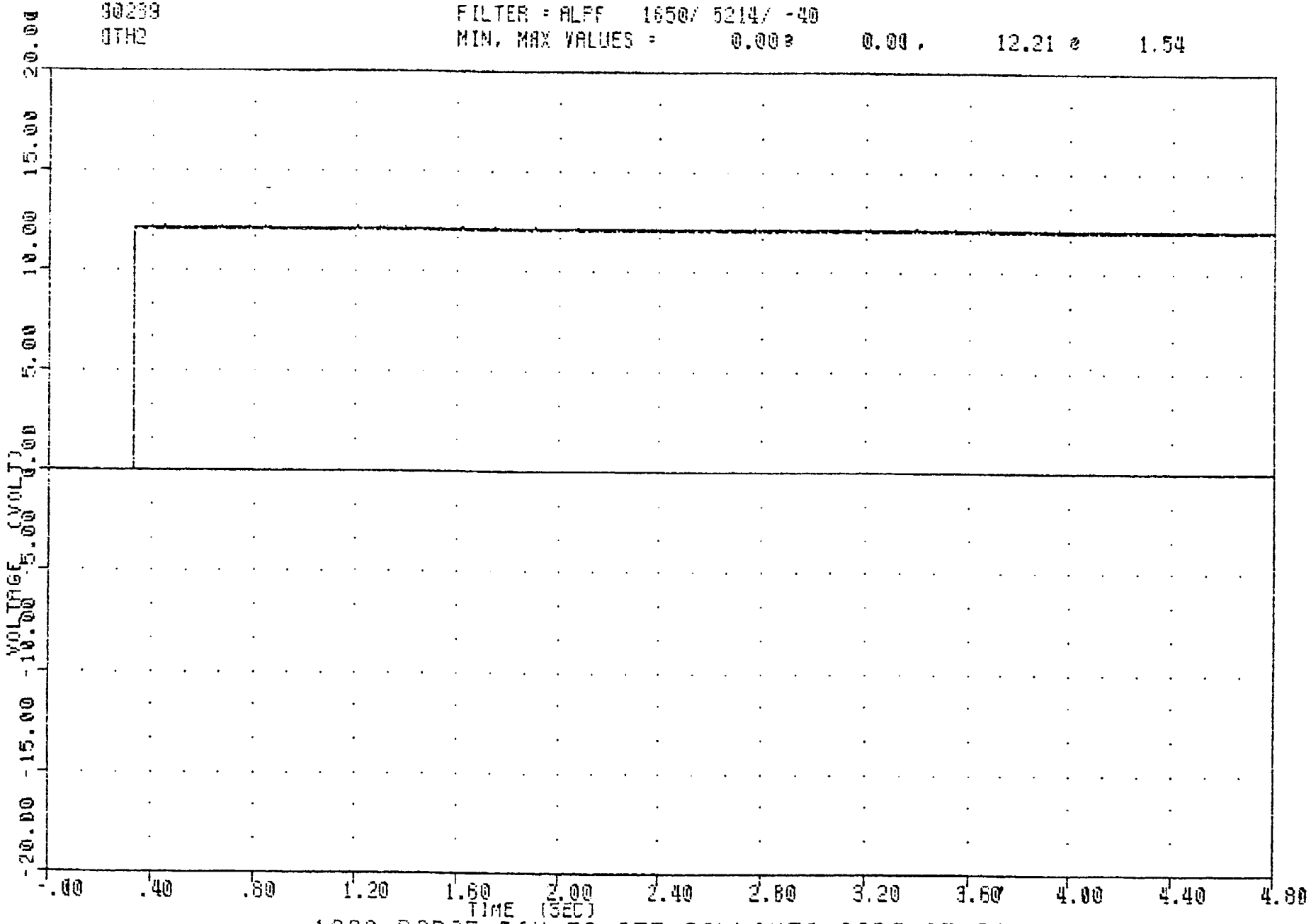
1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
ROLL CART RIGHT CYLINDER DISPLACEMENT



1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
VEHICLE/ROLL CART SEPARATION TIME - UPPER SWITCH

CONTROLLED ROLLOVER CRASH
90299
0TH2

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.00@ 0.00 , 12.21 @ 1.54



1988 DODGE RAM 50 OFF ROLLOVER CART AT 30 MPH
VEHICLE/ROLL CART SEPARATION TIME - LOWER SWITCH

APPENDIX C

MISCELLANEOUS TEST INFORMATION

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: HUMANOID #907

SEATING POSITION: DRIVER

LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
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	87313-91	OUTWARD
PELVIS ACCELERATION	X	ENDEVCO	7264	BD88J	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	LEFT
CENTER OF GRAVITY PITCH	Y	HUMPHREY	RG28-0128-1	H-16	UP
CENTER OF GRAVITY YAW	Z	HUMPHREY	RG28-0128-1	H-21	RIGHT
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

ROLL CART INSTRUMENTATION PLACEMENT

LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
CENTER OF GRAVITY	X	ENDEVCO	7264	BJ99J	REAR
CENTER OF GRAVITY	Y	ENDEVCO	7264	CK09H	LEFT
CENTER OF GRAVITY	Z	ENDEVCO	7264	BT08J	UP
LEFT CYLINDER DISPLACEMENT		CELESCO	PT-101-60A	A23305	OUTWARD
RIGHT CYLINDER DISPLACEMENT		CELESCO	PT-101-60A	A23306	OUTWARD

IPMD VEHICLE DATA SHEET

Filled Out By: Bob Leib Date: 8/20/90

Checked By: _____ Date: _____

VEHICLE DATA

Vehicle Make and Model (written out): Dodge Ram 50

NHTSA ID Code (7 characters): _____ / 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): PU

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): JB7FL24DXJP014121

Odometer Reading: 45371.0 Thousands of Miles: 45.731

Overall Length: 180.3 (in) x 25.4 =: 4580 (mm)

Wheelbase: 105.3 (in) x 25.4 =: 2675 (mm)

Front Track: 55.5 (in) x 25.4 =: 1410 (mm)

Rear Track: 55.9 (in) x 25.4 =: 1420 (mm)

Roof Height: 59.8 (in) x 25.4 =: 1519 (mm)

IPMD VEHICLE DATA SHEET

G.V.W.R.: 4165 (lbs) x 4.45 =: 18534 (N)

FRONT G.A.W.R.: 2000 (lbs) x 4.45 =: 8900 (N)

REAR G.A.W.R.: 2540 (lbs) x 4.45 =: 11303 (N)

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

Weight on RF Tire: 742 (lbs) x 4.45 =: 3302 (N)

Weight on LF Tire: 802 (lbs) x 4.45 =: 3569 (N)

Weight on LR Tire: 784 (lbs) x 4.45 =: 3489 (N)

Weight on RR Tire: 781 (lbs) x 4.45 =: 3475 (N)

Vehicle Test Weight: 3109 (lbs) x 4.45 =: 13835 (N)

Lateral and Longitudinal Center of Gravity Location.

From Front Axle: 53.01 (in) x 25.4 =: 1346 (mm)

From Center Line: -0.56 (in) x 25.4 =: -14 (mm)

Engine Displacement: 121.9 (cu in) x 0.0164 =: 2 (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): L

L = Longitudinal T = Transverse

Transmission Type: (1 character): A

M = Manual A = Automatic

Drive Axle (1 character): R

F = Front R = Rear 4 = Four Wheel Drive

Vehicle Comments (30 characters): Pre-test rollover

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): A

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): CO

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

Brake Type (2 characters): DI

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

FRONT SUSPENSION

Tire Manufacturer (10 characters): Yokohama

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

Tire Construction (2 charactrs): SB

BB = Bias Belted
BP = Bias Ply
OT = Other: _____
GP = Glass Belted Radial
SB = Steel Belted Radial

Tire Rim width: 6.0 (in) X 25.4 =: 152 (mm)

Axle Height: 11.8 (in) X 25.4 =: 300 (mm)

Tire Pressure: 26.0 (psi) X 6.897 =: 179 (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): Yokohama

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

Tire Construction (2 characters): _____

BB = Bias Belted
BP = Bias Ply
OT = Other: _____

GP = Glass Belted Radial
SB = Steel Belted Radial

Tire Rim Width: 6.0 (in) X 25.4 =: 152 (mm)

Axle Height: 12.0 (in) X 25.4 =: 305 (mm)

Tire Pressure: 35.0 (psi) X 6.897 =: 241 (kpa)

IPMD MEASURED DATA

VEHICLE # AND RUN # VAN DATE: 08-22-90 TIME: 08:33:00

Pitch Inertia:

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Pitch Calc. (Ft. Lb. Sec^2)
1	3.890	8.74	0.080	1935.6
2	3.895	9.80	0.114	1929.1
3	3.895	9.18	0.094	1936.4
Average Pitch Inertia:				1933.7

Roll Inertia:

Distance between ramps (in.): 45.70

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Roll Calc. (Ft. Lb. Sec^2)
1	2.305	7.79	0.115	328.6
2	2.300	7.64	0.115	324.1
3	2.310	7.74	0.114	332.8
Average Roll Inertia:				328.5

Yaw Inertia:

String Pot Offset from platform center (in.): 73.60

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Yaw Calc. (Ft. Lb. Sec^2)
1	2.395	10.91	0.11	2001.8
2	2.395	11.05	0.11	2000.8
3	2.400	10.70	0.10	2011.4
Average Yaw Inertia:				2004.7

IPMD MEASURED DATA

Vehicle # and Run #: VAN Date: 08-22-90 Time: 08:33:00

Vehicle Weight: 3109 Roof Height: 59.80 Load Config: Roll-ov

Fuel Load: empty Vehicle type: pu

IPMD Calibration Check (no Vehicle)

Applied Weight (Lbs.)	Schaevitz Output (Deg.)	System C.G. Pivot (In.)
0	-0.21	0.00
100	-5.58	33.30
200	-10.88	33.32
0	-0.21	0.00
-100	5.17	33.32
-200	10.47	33.29
0	-0.20	0.00
Average System C.G. Pivot:		33.31

C.G. Height:

Applied Weight (lbs.)	Schaevitz Output (Deg.)	Resultant Longitudinal Movement (In.)	Individual C.G. Values (In.)
0	-0.14	0.000	0.00
100	-3.48	0.036	21.76
200	-6.82	0.105	21.52
0	-0.16	-0.006	0.00
-100	3.20	-0.053	21.46
-200	6.56	-0.124	21.46
0	-0.12	-0.026	0.00
Average calculated C.G. Height:			21.55

IPMD VEHICLE DATA SHEET

Filled Out By: Bob Leib Date: 9/24/90

Checked By: _____ Date: _____

VEHICLE DATA

Vehicle Make and Model (written out): Dodge Ram 50

NHTSA ID Code (7 characters): V90312 / 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): PU

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): JB7FL24DXJP014121

Odometer Reading: 45371.0 Thousands of Miles: 45.731

Overall Length: 180.3 (in) x 25.4 =: 4580 (mm)

Wheelbase: 105.3 (in) x 25.4 =: 2675 (mm)

Front Track: 55.5 (in) x 25.4 =: 1410 (mm)

Rear Track: 55.9 (in) x 25.4 =: 1420 (mm)

Roof Height: 59.8 (in) x 25.4 =: 1519 (mm)

IPMD VEHICLE DATA SHEET

G.V.W.R.: 4165 (lbs) x 4.45 =: 18534 (N)

FRONT G.A.W.R.: 2000 (lbs) x 4.45 =: 8900 (N)

REAR G.A.W.R.: 2540 (lbs) x 4.45 =: 11303 (N)

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

Weight on RF Tire: 790 (lbs) x 4.45 =: 3516 (N)

Weight on LF Tire: 716 (lbs) x 4.45 =: 3186 (N)

Weight on LR Tire: 735 (lbs) x 4.45 =: 3271 (N)

Weight on RR Tire: 806 (lbs) x 4.45 =: 3587 (N)

Vehicle Test Weight: 3047 (lbs) x 4.45 =: 13559 (N)

Lateral and Longitudinal Center of Gravity Location.

From Front Axle: 53.25 (in) x 25.4 =: 1353 (mm)

From Center Line: 1.33 (in) x 25.4 =: 33 (mm)

Engine Displacement: 121.9 (cu in) x 0.0164 =: 2 (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): L

L = Longitudinal T = Transverse

Transmission Type: (1 character): A

M = Manual A = Automatic

Drive Axle (1 character): R

F = Front R = Rear 4 = Four Wheel Drive

Vehicle Comments (30 characters): Post-test rollover

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): A

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): CO

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

Brake Type (2 characters): DI

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

FRONT SUSPENSION

Tire Manufacturer (10 characters): Yokohama

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

Tire Construction (2 charactrs): SB

BB = Bias Belted
BP = Bias Ply
OT = Other: _____
GP = Glass Belted Radial
SB = Steel Belted Radial

Tire Rim width: 6.0 (in) X 25.4 =: 152 (mm)

Axle Height: 11.8 (in) X 25.4 =: 300 (mm)

Tire Pressure: 26.0 (psi) X 6.897 =: 179 (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): Yokohama

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

Tire Construction (2 characters): _____

BB = Bias Belted
BP = Bias Ply
OT = Other: _____

GP = Glass Belted Radial
SB = Steel Belted Radial

Tire Rim Width: 6.0 (in) X 25.4 =: 152 (mm)

Axle Height: 12.0 (in) X 25.4 =: 305 (mm)

Tire Pressure: 35.0 (psi) X 6.897 =: 241 (kpa)

IPMD MEASURED DATA

VEHICLE # AND RUN # 312 DATE: 09-25-90 TIME: 09:11:58

Pitch Inertia:

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Pitch Calc. (Ft. Lb. Sec²)
1	3.705	10.51	0.106	1845.0
2	3.705	10.40	0.108	1843.7
3	3.700	10.41	0.107	1837.0
Average Pitch Inertia:				1841.9

Roll Inertia:

Distance between ramps (in.): 45.80

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Roll Calc. (Ft. Lb. Sec²)
1	2.225	7.50	0.026	315.9
2	2.220	7.33	0.025	311.7
3	2.220	7.55	0.025	311.9
Average Roll Inertia:				313.1

Yaw Inertia:

String Pot Offset from platform center (in.): 72.50

Run #	Period (Sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Yaw Calc. (Ft. Lb. Sec²)
1	2.380	9.60	0.06	1980.7
2	2.375	8.33	0.05	1971.5
3	2.380	8.97	0.05	1981.6
Average Yaw Inertia:				1977.9

IPMD MEASURED DATA

Vehicle # and Run #: 312 Date: 09-25-90 Time: 09:11:58

Vehicle Weight: 3047 Roof Height: 47.00 Load Config: Roll-ov

Fuel Load: empty Vehicle type: pu

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	0.14	0.000	0.00
100	-2.92	0.036	19.26
200	-5.98	0.105	19.17
0	0.11	-0.006	0.00
-100	3.23	-0.053	18.81
-200	6.37	-0.124	19.09
0	0.24	-0.026	0.00
Average calculated C.G. Height			19.08

SIGN CONVENTION

ACCELEROMETERS:

+X: FORWARD

+Y: LEFTWARD

+Z: UPWARD

POTENTIOMETERS:

+CHEST DISPLACEMENT: OUTWARD

+SEAT BELT DISPLACEMENT: OUTWARD

+SEAT BELT EXTENSION: ENLONGATION

+VEHICLE DISPLACMENT: 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