

TEST V-1929
JULY 26, 1993

VEHICLE AND DUMMY KINEMATICS
IN A CONTROLLED ROLLOVER CRASH
1990 NISSAN PICKUP TRUCK

PREPARED BY:
TRANSPORTATION RESEARCH CENTER INC.
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JULY - AUGUST 1993
TEST REPORT

PREPARED FOR:
SYSTEMS RESEARCH LABORATORIES
2800 INDIAN RIPPLE ROAD
DAYTON, OH 45440

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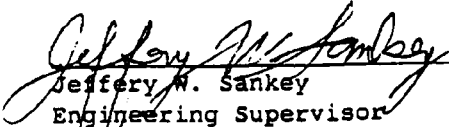
Date 8/31/93

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SECTION 1.0

PURPOSE AND TEST SUMMARY

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

This test was conducted with a 1990 Nissan pickup truck on the NHTSA rollover cart moving at 30 mph, releasing the vehicle with its roll axis perpendicular to the direction of rollover cart motion, and first contacting the passenger's side. The test vehicle contained an instrumented Part 572 E dummy restrained with a three-point unbelt.

SECTION 2.0

SUMMARY OF ROLLOVER CRASH TEST

A 1990 Nissan pickup truck, containing one instrumented Part 572 E test dummy was placed upon the rollover test device at 30 degrees above the horizontal and was released at 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 1 1/2 rolls and came to rest on its roof. The rollover crash test was conducted by Transportation Research Center Inc. (TRC) in East Liberty, Ohio, on July 26, 1993.

The Part 572 E 50th percentile adult male anthropomorphic test device (dummy) was placed in the driver's designated seating position according to the placement procedure specified in Appendix B and Optional Appendix C of Laboratory Procedure TP-208-09. The dummy was instrumented with head, chest, and pelvis triaxial accelerometers, a six-axis neck load cell, and a chest displacement potentiometer. The head and chest were also instrumented with angular velocity sensors. The head was instrumented with six (6) additional accelerometers to form a 9-accelerometer array.

The crash event was recorded by forty-eight (48) channels of data on a 14-track tape drive. The analog data was digitally sampled at 8000 samples per second. The data was digitally filtered as per SAE J211 OCT88.

The crash event was filmed by seven (7) high-speed motion picture cameras operating at approximately 500 frames per second and one (1) real-time panning motion picture camera.

Section 3.0 contains the general test and vehicle parameter data. Section 4.0 contains the occupant information. Appendix A contains the pre- and post-test still photographs. Appendix B contains the final test data plots. Appendix C contains the post-test dummy certification data. Appendix D contains miscellaneous test information which includes the pre-test and post-test IPMD vehicle data sheets.

ROLL CART INSTRUMENTATION LOCATIONS AND DATA SUMMARY

TEST NUMBER 930726

No. LOCATION	X*	Y*	Z*	POSITIVE		NEGATIVE	
				DIRECTION		DIRECTION	
				MAX G	MSEC	MAX G	MSEC
1 CENTER OF GRAVITY	39.2	3.5	8.2				
ACCELERATION (g)							
LONGITUDINAL				88.7	146.7	7.5	154.9
LATERAL				2.0	1886.0	42.8	145.9
VERTICAL				260.6	148.0	5.4	258.8
RESULTANT				272.5	147.6		
2 PLATFORM DISPLACEMENT	24.6	24.5	47.3				
(in)							
LEFT SIDE				24.8	2399.5	0.0	109.2
RIGHT SIDE				23.6	2826.0	0.0	84.3
3 VEHICLE/ROLLOVER	28.5	22.0	76.2				
UPPER SWITCH				317.0			
LOWER SWITCH ¹				NA			

* 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

¹ See DATA ACQUISITION EXPLANATIONS

FINAL RESTING PLACE OF VEHICLE, PARTS, AND ROLLOVER CART

DESCRIPTION OF VEHICLE	X, DISTANCE ¹	Y, DISTANCE ¹
Left rear corner	122.0	-14.4
Right rear corner	117.5	-14.1
Left front corner	124.1	0.2
Right front corner	119.4	1.0

DESCRIPTION OF PARTS

Tailgate	97.0	-18.5
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DESCRIPTION OF ROLLOVER CART

Left rear corner	110.9	-1.8
Right rear corner	113.7	-11.8
Left front corner	117.4	-0.8
Right front corner	116.7	-13.7

¹REFERENCE: +X: FORWARD FROM RELEASE BLOCK

+Y: LEFTWARD FROM CENTER RELEASE BLOCK

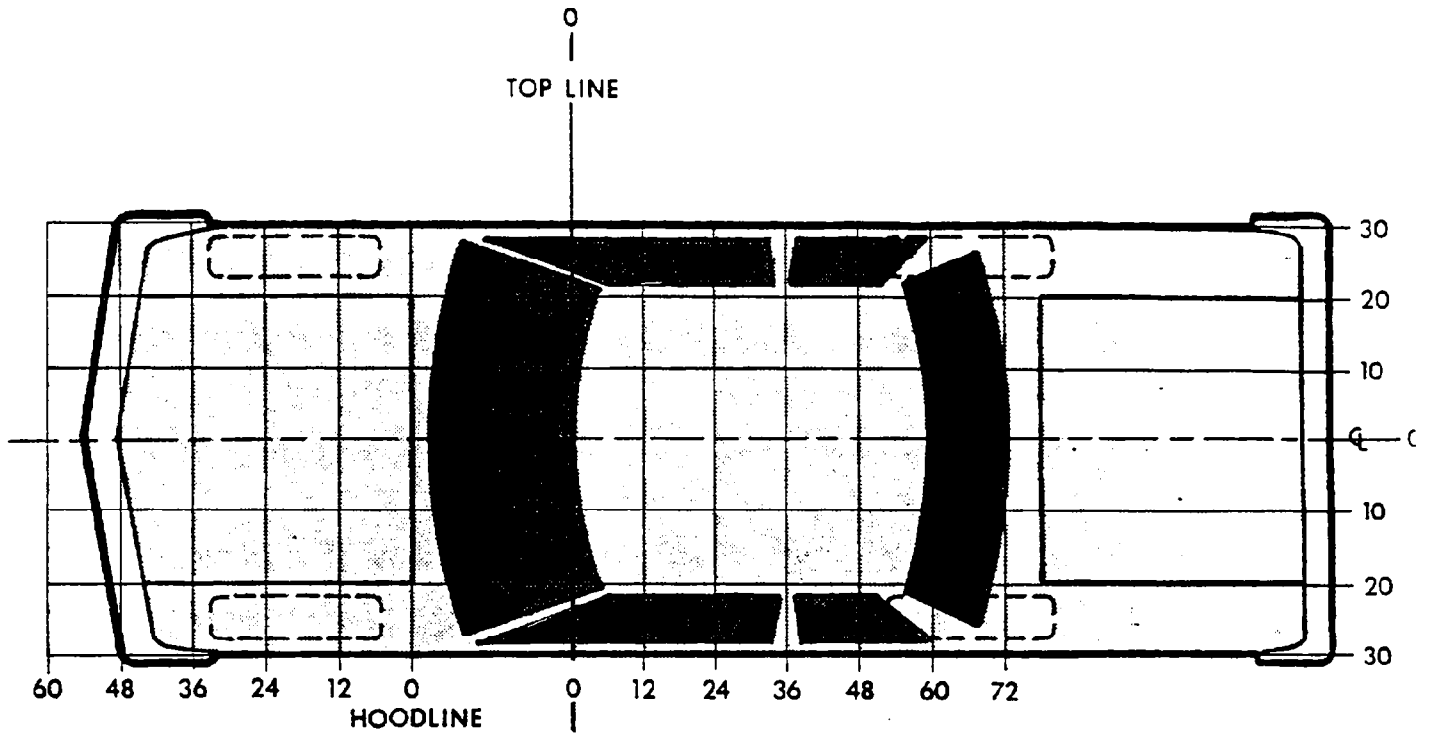
All measurements are in feet.

VEHICLE INTERIOR MEASUREMENTS

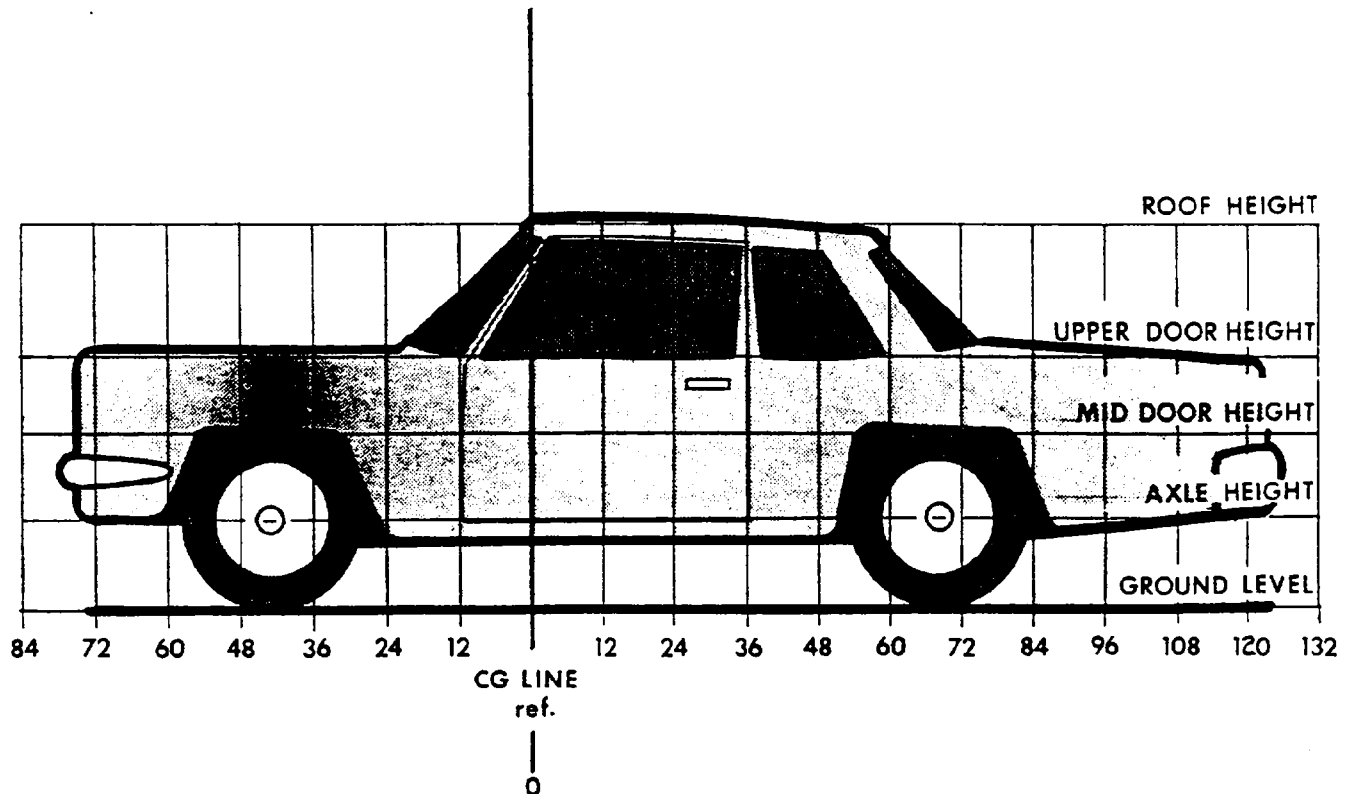
DESCRIPTION	PRE-TEST	POST-TEST	DIFFERENCE
Floor board to top of left "A" post	42.1	31.8	10.3
Floor board to top of right "A" post	42.2	38.9	3.3
Door sill to top of left "B" post	42.0	33.3	8.7
Door sill to top of right "B" post	41.5	40.0	1.5
Door sill to top of left door opening	41.8	31.1	10.7
Door sill to top of right door opening	41.5	37.3	4.2
Floor tunnel to windshield header	36.0	26.0	10.0
Floor tunnel to center of roof	X	X	X
Rear of floor tunnel to roof	39.4	34.0	5.4
Maximum width at "B" post	47.6	40.2	7.4
Maximum width at "A" post	46.6	41.1	5.5
Maximum width at top of door opening	42.5	43.0	-0.5

All measurements are in inches.

HOOD AND ROOF STATIC CRUSH LOCATIONS



HOOD AND ROOF STATIC CRUSH LOCATIONS



VEHICLE HOOD EXTERIOR PROFILES
ZERO DISTANCE AT VEHICLE HOOD CENTERLINE²

LOCATION	30	20	10	0	10	20	30
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PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE²)

Trailing edge of cowl at centerline	X	41.9	42.2	42.6	41.8	41.2	X
Trailing edge of cowl + 12 inches ³	X	39.6	40.0	40.0	40.1	39.6	X
Trailing edge of cowl + 24 inches	X	37.5	37.9	38.1	38.1	37.3	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 48 inches	X	X	X	X	X	X	X

POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE²)

Trailing edge of cowl at centerline	X	41.5	42.0	42.8	42.6	41.9	X
Trailing edge of cowl + 12 inches ³	X	40.4	40.8	41.1	40.7	40.2	X
Trailing edge of cowl + 24 inches	X	38.8	38.5	38.4	38.2	37.6	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 48 inches	X	X	X	X	X	X	X

STATIC CRUSH (IN.)

Trailing edge of cowl at centerline	X	-0.4	-0.2	0.2	0.8	0.7	X
Trailing edge of cowl + 12 inches ³	X	0.8	0.8	1.1	0.6	0.6	X
Trailing edge of cowl + 24 inches	X	1.3	0.6	0.3	0.1	-0.2	X
Trailing edge of cowl + 36 inches	X	X	X	X	X	X	X
Trailing edge of cowl + 48 inches	X	X	X	X	X	X	X

¹ Column readings are left to right from left to right on vehicle.

² Reference plane is a horizontal plane at ground level.

³ Longitudinal distance from trailing edge of cowl at centerline forward to measurement plane.

+ Static crush means vehicle structure is bowed upward.

- Static crush means vehicle structure is crushed.

VEHICLE ROOF EXTERIOR PROFILES
ZERO DISTANCE AT VEHICLE ROOF CENTERLINE²

LOCATION	20	10	0	10	20
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE ²)					
Longitudinal center of gravity	60.8	61.2	61.4	61.2	61.7
Longitudinal center of gravity + 12 inches ³	60.9	61.5	61.8	61.5	60.8
Longitudinal center of gravity + 24 inches	X	X	X	X	X
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 ²)					
Longitudinal center of gravity	43.2	44.0	47.3	51.3	54.1
Longitudinal center of gravity + 12 inches ³	X	47.5	50.8	53.2	56.0
Longitudinal center of gravity + 24 inches	X	X	X	X	X
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	-17.6	-17.2	-14.1	-9.9	-7.6
Longitudinal center of gravity + 12 inches ³	X	-14.0	-11.0	-8.3	-4.8
Longitudinal center of gravity + 24 inches	X	X	X	X	X
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

¹ Column readings are left to right from left to right on vehicle.

² Reference plane is a horizontal plane at ground level.

³ 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 GRAVITY¹

LOCATION	HEIGHT	72	60	48	36	24	12	0	12	24	36	48	60	72	84	96
<u>PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE²)</u>																
Roof height	59.2	X	X	X	X	X	X	X	X	27.0	26.2	26.2	X	X	X	X
Upper door	39.5	X	X	X	X	X	18.1	17.5	17.5	17.4	17.1	16.9	17.2	17.2	17.4	17.2
Mid door	27.5	X	X	X	X	X	X	16.1	16.1	16.0	16.0	15.8	16.0	15.9	X	X
Axle height	12.0	X	X	X	X	X	X	X	22.8	21.8	21.8	21.6	X	X	X	X

<u>POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE²)</u>																
Roof height	59.2	X	X	X	X	X	X	X	X	34.5	33.9	34.5	X	X	X	X
Upper door	39.5	X	X	X	X	X	20.5	19.2	20.0	18.8	17.8	17.8	18.4	19.4	19.9	20.5
Mid door	27.5	X	X	X	X	X	X	16.9	16.7	16.5	15.8	15.9	16.6	16.8	X	X
Axle height	12.0	X	X	X	X	X	X	X	22.3	22.3	22.2	21.6	X	X	X	X

<u>STATIC CRUSH (IN)</u>																
Roof height	59.2	X	X	X	X	X	X	X	X	7.5	7.7	8.3	X	X	X	X
Upper door	39.5	X	X	X	X	X	2.4	1.7	2.5	1.4	0.7	0.9	1.2	2.2	2.5	3.3
Mid door	27.5	X	X	X	X	X	X	0.8	0.6	0.5	-0.2	0.1	0.6	0.9	X	X
Axle height	12.0	X	X	X	X	X	X	X	-0.5	0.5	0.4	0.0	X	X	X	X

¹Center of gravity is located 52.6 inches rearward of vehicle front wheels.

Column readings are left to right from front to rear on vehicle.

²Reference plane is parallel to and 48.0 inches from the vehicle longitudinal centerline.

+ Static crush means that vehicle structure is crushed.

- Static crush means that vehicle structure is bowed outward.

VEHICLE RIGHT SIDE EXTERIOR PROFILES AND STATIC CRUSH
ZERO DISTANCE AT VEHICLE LONGITUDINAL CENTER OF GRAVITY¹

LOCATION	HEIGHT	72	60	48	36	24	12	0	12	24	36	48	60	72	84	96
<u>PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE²)</u>																
Roof height	65.2	X	X	X	X	X	X	X	X	25.6	25.0	24.9	X	X	X	X
Upper door	44.2	X	X	X	X	X	17.2	17.0	16.8	16.2	16.5	16.1	16.5	15.9	16.2	16.6
Mid door	32.1	X	X	X	X	X	X	15.5	15.5	15.2	15.2	15.1	15.2	14.9	X	X
Axle height	19.5	X	X	X	X	X	X	X	21.2	21.1	21.8	21.0	X	X	X	X

POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE²)

Roof height	65.2	X	X	X	X	X	X	X	24.4	24.8	26.6	X	X	X	X	X
Upper door	44.2	X	X	X	X	X	18.5	18.5	15.0	13.9	13.5	12.8	16.1	17.5	18.0	20.1
Mid door	32.1	X	X	X	X	X	X	15.6	14.5	13.7	13.2	12.9	15.1	15.4	X	X
Axle height	19.5	X	X	X	X	X	X	X	21.5	21.2	21.1	21.5	X	X	X	X

STATIC CRUSH (IN)

Roof height	65.2	X	X	X	X	X	X	X	-1.2	-0.2	1.7	X	X	X	X	X
Upper door	44.2	X	X	X	X	X	1.3	1.5	-1.8	-2.3	-3.0	-3.3	-0.4	1.6	1.8	3.5
Mid door	32.1	X	X	X	X	X	X	0.1	-1.0	-1.5	-2.0	-2.2	-0.1	0.5	X	X
Axle height	19.5	X	X	X	X	X	X	X	0.3	0.1	-0.7	0.5	X	X	X	X

¹Center of gravity is located 52.6 inches rearward of vehicle front wheels.

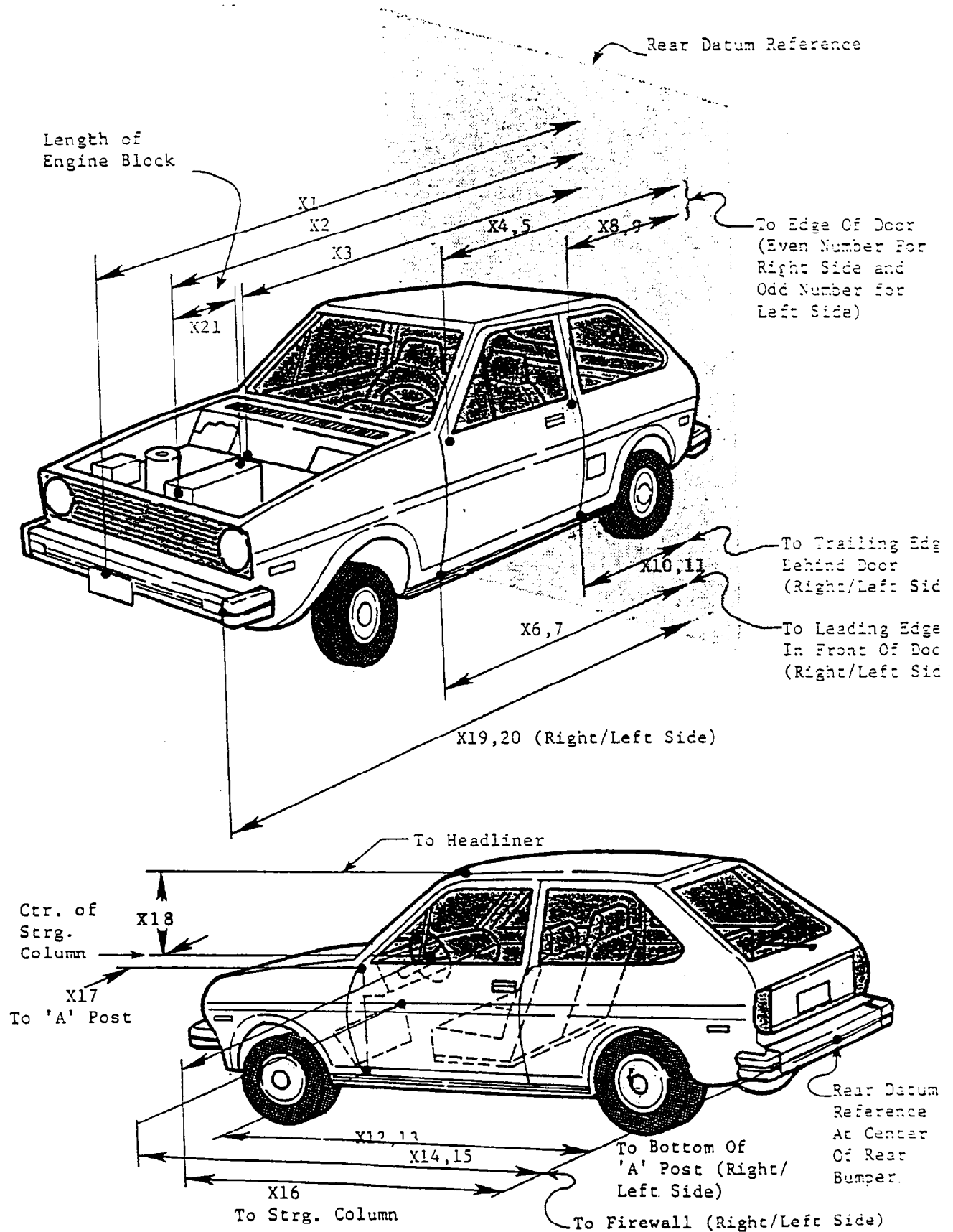
Column readings are left to right from front to rear on vehicle.

²Reference plane is parallel to and 48.0 inches from the vehicle longitudinal centerline.

+ Static crush means that vehicle structure is crushed.

- Static crush means that vehicle structure is bowed outward.

VEHICLE PRE-TEST AND POST-TEST MEASUREMENT POINTS



IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: <u>Nissan/pickup truck</u>		TEST NUMBER: <u>930623</u>		
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	180.8	181.0	-0.2
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	162.5	164.0	-1.5
X3	REAR SURFACE OF VEHICLE TO FIREWALL	142.9	143.2	-0.3
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	133.2	134.5	-1.3
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	132.6	131.9	0.7
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	130.0	132.9	-2.9
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	131.8	131.4	0.4
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	87.4	87.8	-0.4
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	87.4	87.2	0.2
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	87.6	88.6	-1.0
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	87.5	87.1	0.4
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	132.4	133.2	-0.8
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	132.1	131.4	0.7
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	141.8	142.6	-0.8
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	141.4	141.1	0.3
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	113.5	113.0	0.5
X17	CENTER OF STEERING COLUMN TO "A" POST	7.5	3.0	4.5
X18	CENTER OF STEERING COLUMN TO HEADLINER	17.9	1.2	16.7
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	179.0	179.1	-0.1
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	178.6	179.0	-0.4
X21	LENGTH OF ENGINE BLOCK	19.0	19.0	0.0

All distance measurements are in inches.

DATA ACQUISITION EXPLANATIONS

The driver head array 1 Z-axis accelerometer, HD1ZG1, lost data at 1000 milliseconds.

The driver head array 3 Y-axis accelerometer, HD3YG1, lost data at 1000 milliseconds.

The driver MHD sensors listed below recorded meaningless data throughout the crash test:

Driver head X-axis angular velocity, HDXAV1

Driver head Y-axis angular velocity, HDYAV1

Driver head Z-axis angular velocity, HDZAV1

Driver chest X-axis angular velocity, CSXAV1

Driver chest Y-axis angular velocity, CSYAV1

Driver chest Z-axis angular velocity, CSZAV1

The driver shoulder belt force, SHBF1, lost data at 970 milliseconds.

The vehicle right rear suspension displacement, SRR01, recorded meaningless data after 865 milliseconds.

The vehicle/rollcart separation time - lower switch, OTH2, recorded meaningless data.

CORRECTED

EVENT TIMES

TEST DATE: July 26, 1993

EVENT DESCRIPTION	TIME, SEC.
CONTACT RELEASE BLOCK	0.0
START COLLECTING DATA	-0.3
STOP COLLECTING DATA	3.0
ZERO TIME FOR DATA	0.0
STROBE LIGHTS FLASH	0.0
CAMERA L E D GOES OFF	0.0 ¹
PIN RELEASES (ROLLOVER CART)	-0.429 ²
CYLINDERS START (ROLLOVER CART)	0.112

- ¹ Locate frame where event LED stripe ends. Put projector into reverse mode and go backwards four frames. This frame is T-zero for the data.
- ² 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 20 feet in front of release block.

SECTION 3.0

GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test & Vehicle parameter data.

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Nissan Motor Co., Ltd.

MAKE/MODEL: Nissan/pickup truck

VIN: 1N6SD11S9LC348978

BODY STYLE: pickup truck

MODEL YEAR: 1990

COLOR: Grey

ENGINE DATA: TYPE: inline CYLINDERS: 4 DISPLACEMENT: 2.4 liters

TRANSMISSION DATA: 5 SPEED, X MANUAL, ___ AUTOMATIC, ___ FWD, X RWD, ___ 4WD

DATE VEHICLE RECEIVED: 07/14/93

ODOMETER READING: 44,132

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

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

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

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: Nissan Motor Co., Ltd.

DATE OF MANUFACTURE: 02/90

VIN: 1N6SD11S9LC348978

GVWR: 4400 LBS

GAWR: FRONT: 2200 LBS., REAR: 2544 LBS.

TEST VEHICLE INFORMATION, CONT'D.

TIRES ON VEHICLE (MFR., LINE, SIZE): Kelly, Safari AWR, P205/75R14

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

SPARE TIRE (MFR., SIZE): No spare

TYPE OF SEATS: FRONT: Bench
REAR: NA

TYPE OF FRONT SEAT BACKS: Non-adjustable

MAXIMUM WIDTH: 65.0 INCHES

WHEELBASE: 104.5 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the left B-pillar.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P195/75R14

RECOMMENDED COLD TIRE PRESSURE: FRONT: 26 PSI; REAR: 35 PSI

DESIGNATED SEATING CAPACITY: 3 FRONT 0 REAR 3 TOTAL

VEHICLE CAPACITY WEIGHT: NA LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE: LF 29.0; RF 28.9; LR 31.2; RR 30.4

TEST VEHICLE INFORMATION, CONT'D.

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

RIGHT FRONT	772 LBS.	RIGHT REAR	606 LBS.
LEFT FRONT	778 LBS.	LEFT REAR	561 LBS.
TOTAL FRONT WEIGHT	1550 LBS.	(57.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1167 LBS.	(43.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT 2717 LBS.			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW¹ = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED ELIVERED WEIGHT (2717 LBS.)

VCW¹ = VEHICLE CAPACITY WEIGHT (LBS.)

DSC¹ = DESIGNATED SEATING CAPACITY ()

RCLW¹ = VCW - 150 (DSC) = 300 LBS.

TARGET TEST WEIGHT = UDW + RCLW¹ + (NO. OF HYBRID III DUMMIES X 167 LBS./DUMMY)

TARGET TEST WEIGHT = 2717 + 300 + 167

TARGET TEST WEIGHT = 3184 LBS.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 289 LBS. OF CARGO WEIGHT:

RIGHT FRONT	753 LBS.	RIGHT REAR	818 LBS.
LEFT FRONT	823 LBS.	LEFT REAR	779 LBS.
TOTAL FRONT WEIGHT	1576 LBS.	(49.7% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1597 LBS.	(50.3% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3173 LBS.	(0.3% UNDER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: 0 LBS.

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 52.6 INCHES REARWARD OF FRONT WHEEL CENTERLINE

¹Cargo weight for multi-purpose passenger vehicles, trucks, and buses is the vehicle's calculated cargo and luggage weight or 300 pounds, whichever is less.

TEST CONDITIONS

TEST NUMBER: 930726

TEST DATE: 07/26/93

TEST TEMPERATURES:

IMPACT AREA: 83° F
OCCUPANT COMPARTMENT: 94° F
DRIVER DUMMY: 88° F

VEHICLE AND ROLL CART DATA:

	<u>ACTUAL</u>	<u>INTENDED</u>
VEHICLE TEST WEIGHT (LBS.):	3173	3184
VEHICLE ORIENTATION (DEG.) ROLL ¹ :	30	30
IMPACT SIDE:	Right	Right
ROLL CART WEIGHT (LBS.):	3347	3347
ROLL CART CRABBED ANGLE (DEG.) ² :	0	0
ROLL CART VELOCITY (MPH) ³ :	30.0	30.0

VEHICLE MEASUREMENTS:

MAXIMUM LENGTH: 180.8
MAXIMUM WIDTH: 65.0
WHEELBASE: 104.5
TOP WIDTH: 48.8
C.G. REARWARD OF
FRONT WHEEL CENTERLINE: 52.6
C.G. HEIGHT ABOVE
GROUND LEVEL: 23.5

¹ As measured on the roll cart with cylinder in rest position.

² As measured from roll cart's centerline to direction of travel
(positive is clockwise).

³ As measured over final one foot of travel.

All measurements are in inches.

VEHICLE TEST CONDITIONS

LEFT FRONT:	DOOR	-	UNLOCKED	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	-	UPMOST	PASSENGER	-	UPMOST
TIRE PRESSURE:	FRONT	-	29 PSI	REAR	-	29 PSI

DUMMY INFORMATION:

TYPE:	PART 572 E
POSITION:	LEFT FRONT
SERIAL NO.:	043

INSTRUMENTATION:

HEAD ACCELEROMETERS:	9
HEAD ANGULAR VELOCITY	
SENSORS:	3
NECK LOAD CELLS:	6
CHEST ACCELEROMETERS:	3
CHEST DISPLACEMENT	
POTENTIOMETERS:	1
CHEST ANGULAR VELOCITY	1
SENSORS:	3
PELVIS ACCELEROMETERS:	3
RIB DISPLACEMENT	
POTENTIOMETERS:	NA
RESTRAINT SYSTEM:	THREE-POINT UNIBELT

VEHICLE INSTRUMENTATION LOCATIONS AND DATA SUMMARY

TEST NUMBER 930726

No. LOCATION	X*	Y*	Z*	POSITIVE		NEGATIVE	
				DIRECTION		DIRECTION	
				MAX G MSEC		MAX G MSEC	
1 CENTER OF GRAVITY	90.5	0.0	12.5				
ACCELERATION (g)							
LONGITUDINAL				7.3	912.3	4.5	1699.2
LATERAL				10.2	911.8	13.1	1001.0
VERTICAL				14.2	916.2	36.3	908.5
RESULTANT				36.5	908.4		
2 CENTER OF GRAVITY	76.0	0.0	29.0				
ROLL (X-AXIS)				12.8	2989.7	489.7	900.1
PITCH (Y-AXIS)				48.8	824.6	119.3	1728.8
YAW (Z-AXIS)				9.2	1576.6	34.0	915.8
3 LEFT FRONT SUSPENSION	152.0	20.5	37.2				
DISPLACEMENT (in)							
VERTICAL				0.5	1749.5	4.9	1514.4
4 RIGHT FRONT SUSPENSION	154.5	-21.5	32.0				
DISPLACEMENT (in)							
VERTICAL				1.0	941.1	5.3	1690.9

VEHICLE INSTRUMENTATION LOCATIONS AND DATA SUMMARY CONTINUED

TEST NUMBER 930726

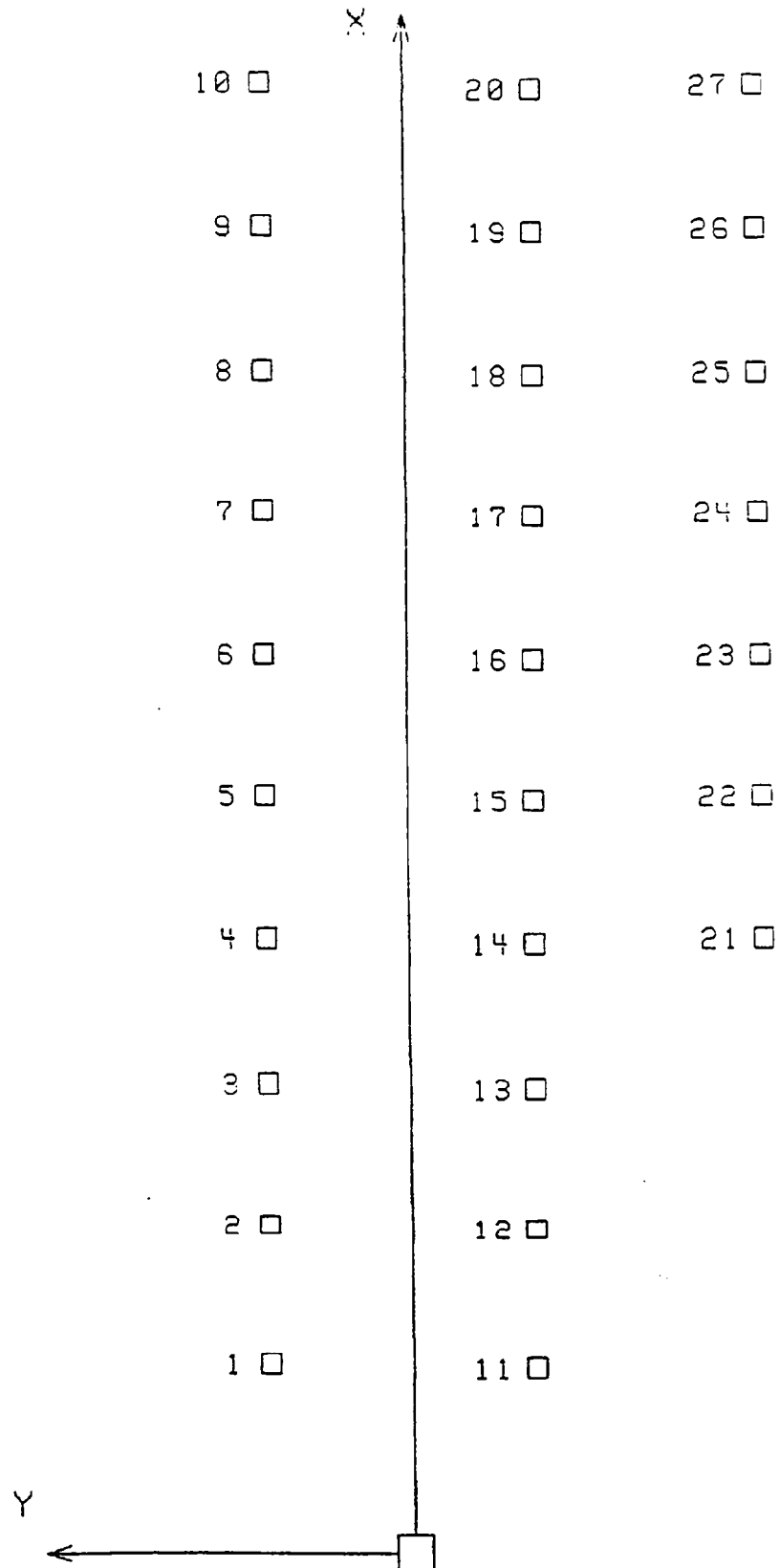
No. LOCATION	X*	Y*	Z*	POSITIVE		NEGATIVE	
				DIRECTION	MAX G MSEC	DIRECTION	MAX G MSEC
5 LEFT REAR SUSPENSION DISPLACEMENT (in) VERTICAL	49.6	23.0	38.0	1.2	1992.4	5.3	1032.1
6 RIGHT REAR SUSPENSION DISPLACEMENT (in) VERTICAL ¹	49.5	-23.5	39.2	0.0	63.7	4.3	865.6

* 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

¹ See DATA ACQUISITION EXPLANATIONS

STADIA POLE LAYOUT AND NUMBERING SYSTEM



STADIA POLE LOCATIONS

POLE NO.	X DISTANCE ¹	Y DISTANCE ¹
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	-8.0
12	43.0	-8.0
13	51.0	-8.0
14	59.0	-8.0
15	67.0	-8.0
16	75.0	-8.0
17	83.0	-8.0
18	91.0	-8.0
19	99.0	-8.0
20	107.0	-8.0
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

¹ REFERENCE: +X: FORWARD FROM RELEASE BLOCK
+Y: LEFTWARD FROM CENTER RELEASE BLOCK

All measurements are in feet.

HIGH-SPEED CAMERA LOCATIONS

<u>OFFBOARD</u>			
CAMERA NO.	X ¹	Y ¹	Z ¹
2	100.7	170.6	3.3
3	202.0	105.0	3.7
4	198.5	0.0	3.6
5	56.3	-64.6	3.3

¹REFERENCE:

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

<u>ONBOARD</u>			
CAMERA NO.	X ²	Y ²	Z ²
7	1.0	-1.2	2.5
8	0.8	-1.1	3.5

²REFERENCE:

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

All measurements are in feet.

MOTION PICTURE CAMERA INFORMATION

CAMERA NUMBER	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Left panning	Bolex	16	24	Real-time documentation
2	Left wide	Photosonic	13	500	Vehicle dynamics
3	Left angle	Photosonic	13	498	Vehicle dynamics
4	Downstream	Photosonic	25	498	Vehicle dynamics
5	Right wide	Photosonic	13	475	Vehicle dynamics
6	Overhead	Photosonic	8	498	Vehicle dynamics
7	Onboard-front	Photosonic	8	508	Dummy kinematics
8	Onboard-rear	Photosonic	8	502	Dummy kinematics

SECTION 4.0

OCCUPANT INFORMATION

POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #043	PASSENGER # NA
HEAD	<u>Head liner</u>	<u></u>
CHEST	<u>None</u>	<u></u>
ABDOMEN	<u>None</u>	<u></u>
LEFT KNEE	<u>Instrument panel</u>	<u></u>
RIGHT KNEE	<u>Instrument panel</u>	<u></u>

DOOR OPENING:

	LEFT	RIGHT
FRONT	<u>Tools required</u>	<u>Tools required</u>
REAR	<u>NA</u>	<u>NA</u>

SEAT MOVEMENT:

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

GLAZING DAMAGE:

All vehicle glazing was broken during the crash test.

OTHER NOTABLE IMPACT EFFECTS:

The truck tailgate and rear window became detached

during the crash test.

KINEMATIC SUMMARY

The vehicle struck the ground at the junction of the roof and the passenger's side A- and B-pillars. The dummy's knees then rose and struck the dash panel as the dummy's hands and arms rose and struck the roof. Simultaneously, the vehicle then rolled fully onto its top collapsing the driver's side of the roof onto the dummy's head. Both the driver and passenger side window glass broke out at this time. The vehicle next rolled onto its driver's side and then bounced onto all four wheels. The vehicle next bounced onto the passenger's side. The dummy's arms and upper torso rose and struck the roof a second time as the dummy's head moved through the now open window. The vehicle then rolled onto the roof again with the dummy's head pinned between the vehicle's roof and the ground. The rollover cart struck the passenger side of the vehicle as the vehicle slid to a stop on its roof. The vehicle rolled forward approximately 510° total. The dummy was restrained with a 3-point unbelt. The dummy's Head Injury Criteria, HIC, was 1293, its maximum chest acceleration resultant over three milliseconds was 72.

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 572 E 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 load cells in the neck. The head and chest were also instrumented with angular velocity sensors. The head was instrumented with six (6) additional accelerometers to form a 9-accelerometer array. 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 not adjustable. The dummy was positioned in the seat according to the dummy placement procedure specified in Appendix B and Optional Appendix C of Laboratory Procedure TP-208-09. The H-point location of the seat was obtained by using the SAE J211 OCT88 H-point machine. The driver dummy was restrained with a three-point unbelt.

DUMMY DATA SUMMARY

TEST NUMBER 930726

DRIVER DUMMY

SN: 043

POSITIVE DIRECTION MAX	NEGATIVE DIRECTION MAX
------------------------------	------------------------------

	MSEC	MSEC
HEAD ACCELERATION (g)		
LONGITUDINAL	136.4 2519.4	58.0 2746.4
LATERAL	145.7 917.1	85.2 943.7
VERTICAL	130.6 2519.2	253.2 2518.0
RESULTANT	273.5 2517.8	
HIC	1293 FROM 916.4 TO 920.6	

HEAD ARRAY 1 (g)		
LONGITUDINAL	84.3 2517.8	54.0 933.5
VERTICAL	155.9 955.2	428.2 1986.2

HEAD ARRAY 2 (g)		
LATERAL	100.1 917.5	129.3 944.3
VERTICAL	74.9 2519.7	202.5 2517.9

HEAD ARRAY 3 (g)		
LONGITUDINAL	74.7 2519.3	126.4 2746.1
LATERAL	330.7 917.2	394.9 2518.2

CORRECTED

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 930726

DRIVER DUMMY

SN: 043

POSITIVE DIRECTION MAX	NEGATIVE DIRECTION MAX	MSEC
------------------------------	------------------------------	------

HEAD ANGULAR VELOCITY (RAD/S)

LONGITUDINAL	4.5	2756.3	3.1	1017.4
LATERAL	2.0	937.4	3.9	1013.1
VERTICAL	8.2	945.1	3.8	1003.8

NECK FORCES (lbs)

LONGITUDINAL	473.0	963.1	626.6	924.1
LATERAL	251.9	935.9	1732.1	922.3
VERTICAL	2429.0	922.6	316.2	2538.6

NECK MOMENT (ft-lbs)

ABOUT LONG.	236.7	923.7	25.9	945.9
ABOUT LATERAL	35.1	944.8	119.8	2529.9
ABOUT VERTICAL	39.0	954.0	38.3	923.3

CHEST ACCELERATION (g)

LONGITUDINAL	9.5	957.9	23.6	921.8
LATERAL	9.9	997.4	86.8	921.9
VERTICAL	17.2	931.0	26.1	923.8
RESULTANT	92.6	921.9		
3 MSEC	72			

CORRECTED

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 930726

DRIVER DUMMY
SN: 043

POSITIVE DIRECTION MAX	MSEC	NEGATIVE DIRECTION MAX	MSEC
------------------------------	------	------------------------------	------

CHEST ANGULAR VELOCITY (RAD/S)

LONGITUDINAL ¹	1.0	1082.3	1.4	882.0
LATERAL ¹	1.1	2567.7	1.0	982.0
VERTICAL ¹	1.4	940.8	2.5	923.6

CHEST DEFLECTION (in)

LONGITUDINAL	0.3	2528.8	0.4	936.7
--------------	-----	--------	-----	-------

PELVIS ACCELERATION (g)

LONGITUDINAL	6.9	990.8	17.0	929.9
LATERAL	6.8	1796.8	10.6	959.7
VERTICAL	13.8	987.7	48.6	923.5
RESULTANT	48.6	923.5		

POSITIVE DIRECTION

LONGITUDINAL:	FORWARD
LATERAL:	LEFTWARD
VERTICAL:	UPWARD
FORCE:	OUTWARD

NEGATIVE DIRECTION

LONGITUDINAL:	REARWARD
LATERAL:	RIGHTWARD
VERTICAL:	DOWNWARD
FORCE:	INWARD

¹ See DATA ACQUISITION EXPLANATIONS

CORRECTED

DUMMY AND SEAT POSITIONING DATA

MAKE/MODEL/BODY STYLE: Nissan/Pickup truck

SEAT TYPE: X Bench
 ___ Bucket
 ___ Split bench
ADJUSTER TYPE: X Manual
 ___ Power
 ___ Non-adjustable

SEAT BACK TYPE: X Non-adjustable
 ___ Adjustable reclining

TECHNICIANS:

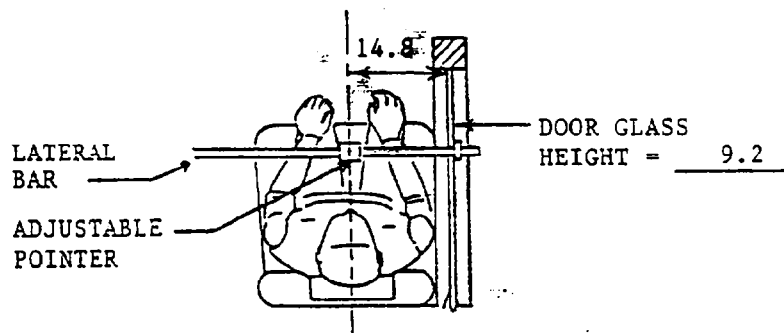
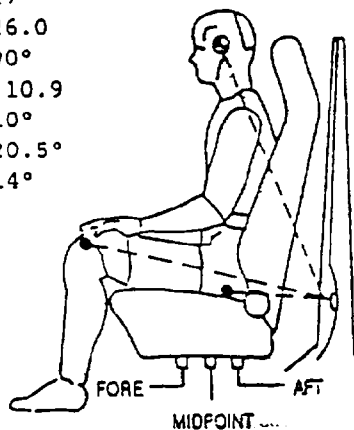
1. R. Criblev
2. _____
3. _____

POSITIONING DATE: 07/26/93

TIME: 1438 TEMPERATURE: 83° F

DRIVER DUMMY¹ # 043 TYPE: SID

HEAD	22.2
TARGET	17°
KNEE	26.0
JOINT	90°
APPROX. "H"	10.9
POINT	110°
PELVIS	20.5°
SEATBACK	14°



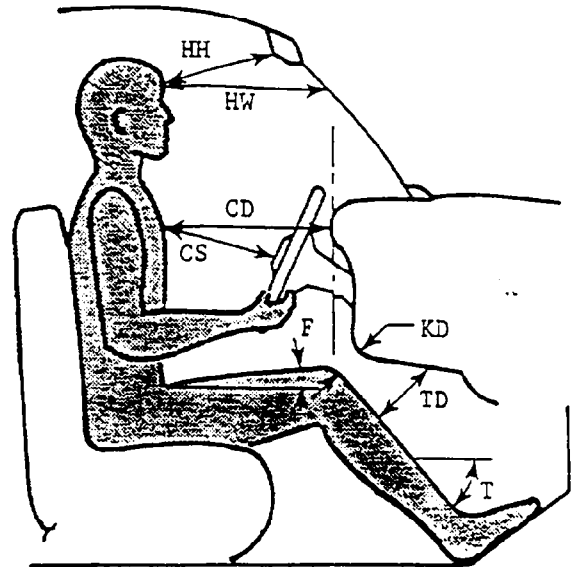
¹Driver dummy measurements are referenced to top of front door striker for 4-door vehicles.

ALL ANGLES ARE REFERENCED TO VERTICAL.

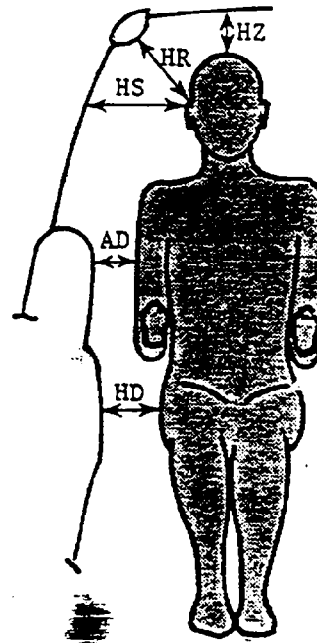
ALL DISTANCE MEASUREMENTS ARE IN INCHES.

DUMMY IN-VEHICLE POSITIONING DATA

	DRIVER	PASSENGER
	043	NA
HH	16.0	
HW	23.9	
CD	22.2	
CS	11.6	
KDL	5.8	
KDR	5.4	
FL	16°	
FR	23°	
TDL	5.1	
TDR	4.5	
TL	34°	
TR	40°	



	DRIVER	PASSENGER
	043	NA
HR	9.4	
HS	11.2	
AD	4.2	
HD	8.1	
HZ	5.2	



All distance measurements are in inches.

APPENDIX A

PHOTOGRAPHS

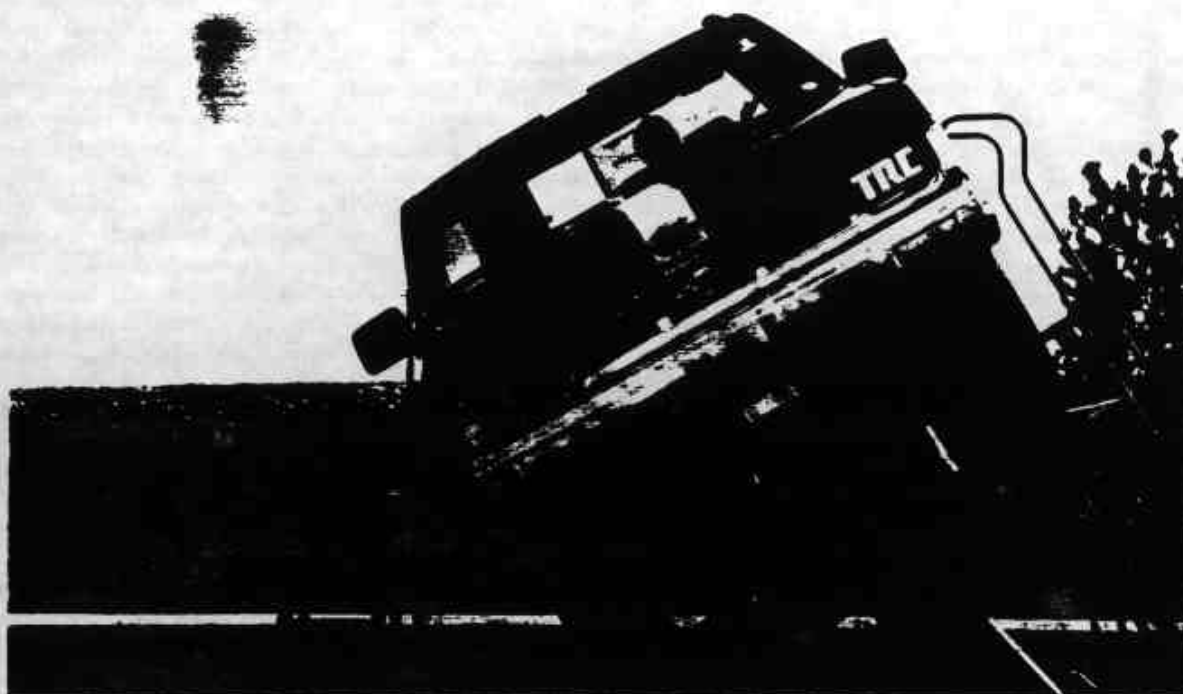


Figure A-1. PRE-TEST FRONT VIEW

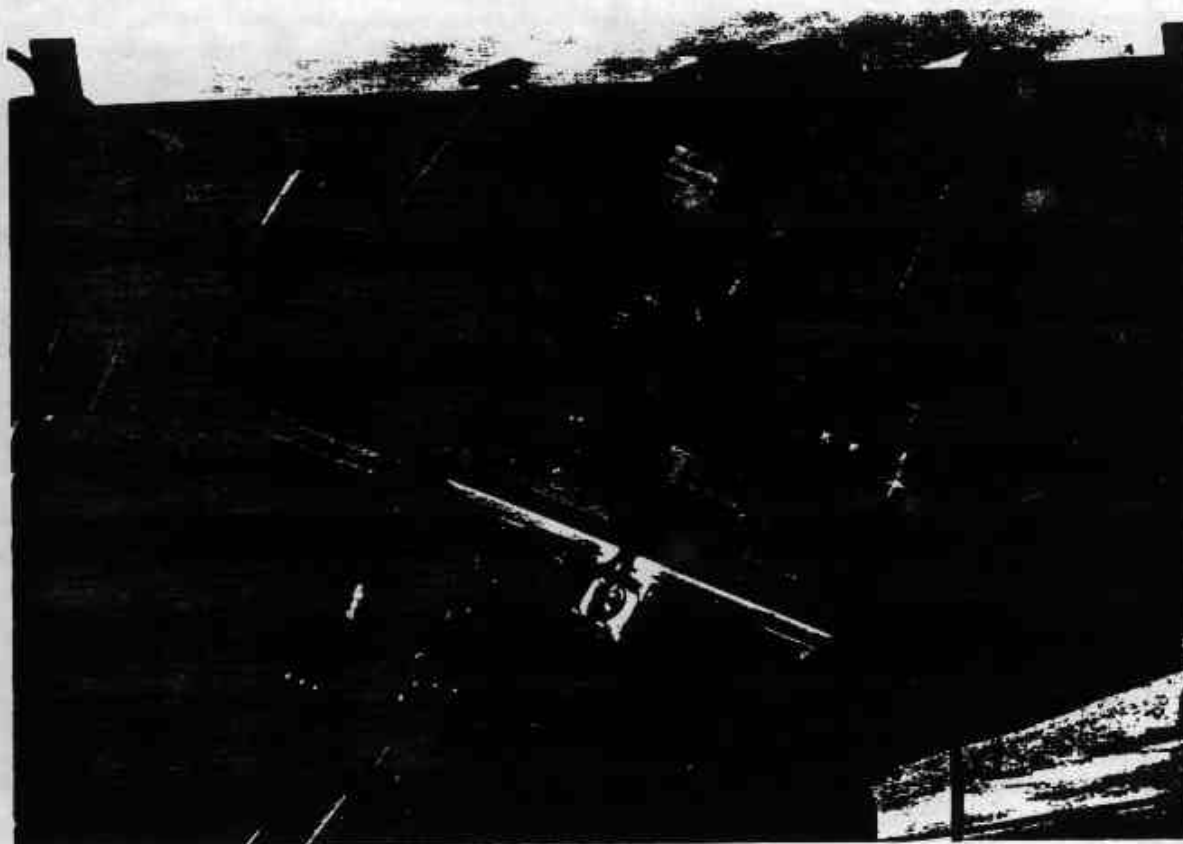


Figure A-2. PRE-TEST REAR VIEW

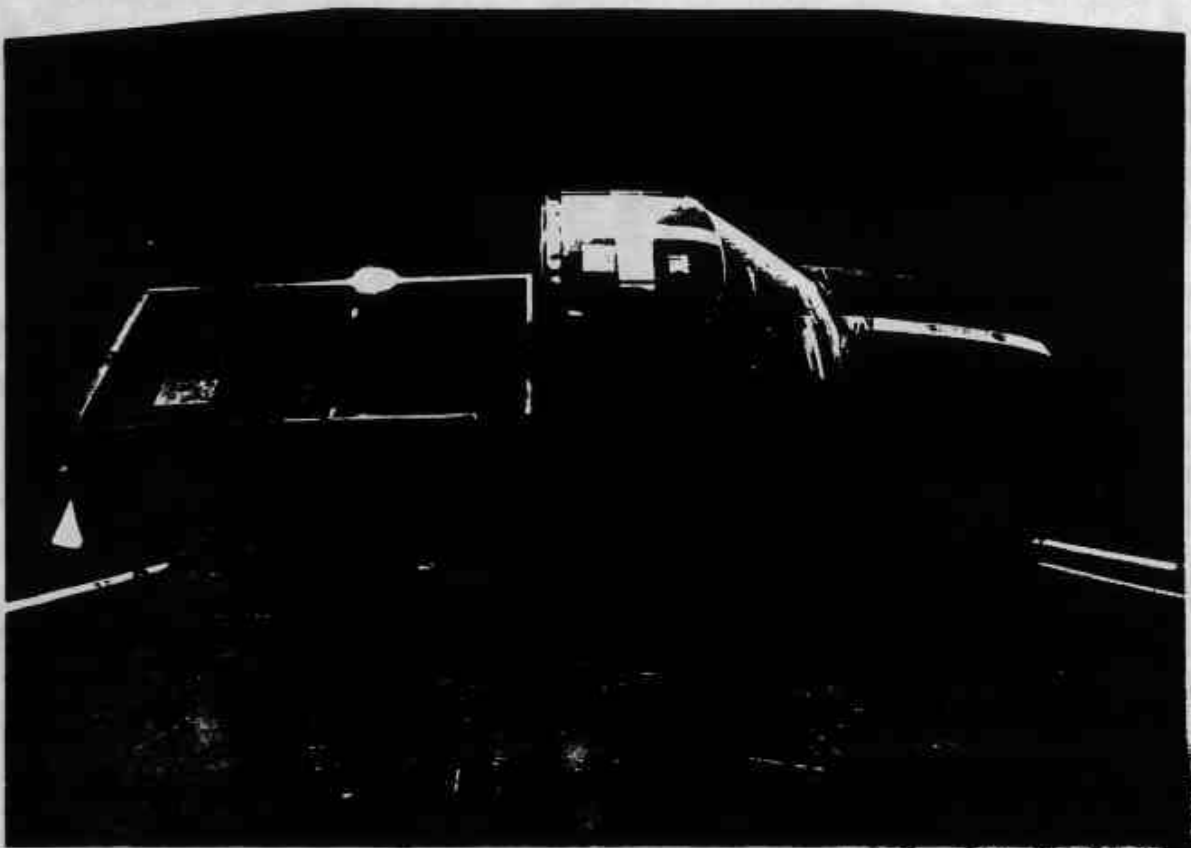




Figure A-5. PRE-TEST DRIVER DUMMY - VIEW 2



Figure A-6. PRE-TEST DRIVER DUMMY - VIEW 3



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



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

SRL
930726
PRE RF

RF

SRL
93072E
PRE LR

SRL
93072E

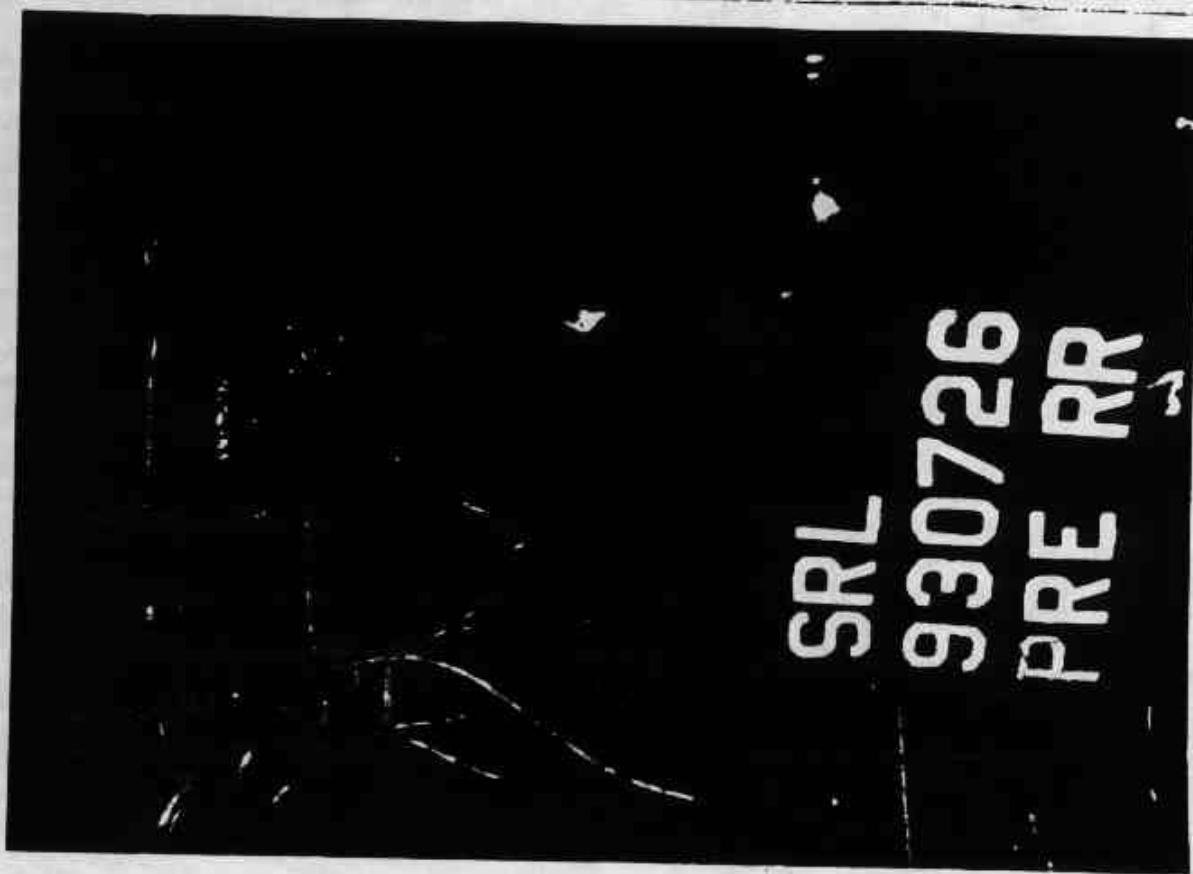


Figure A-13. PRE-TEST RIGHT REAR SUSPENSION STRING POTENTIOMETER-ITEM 2

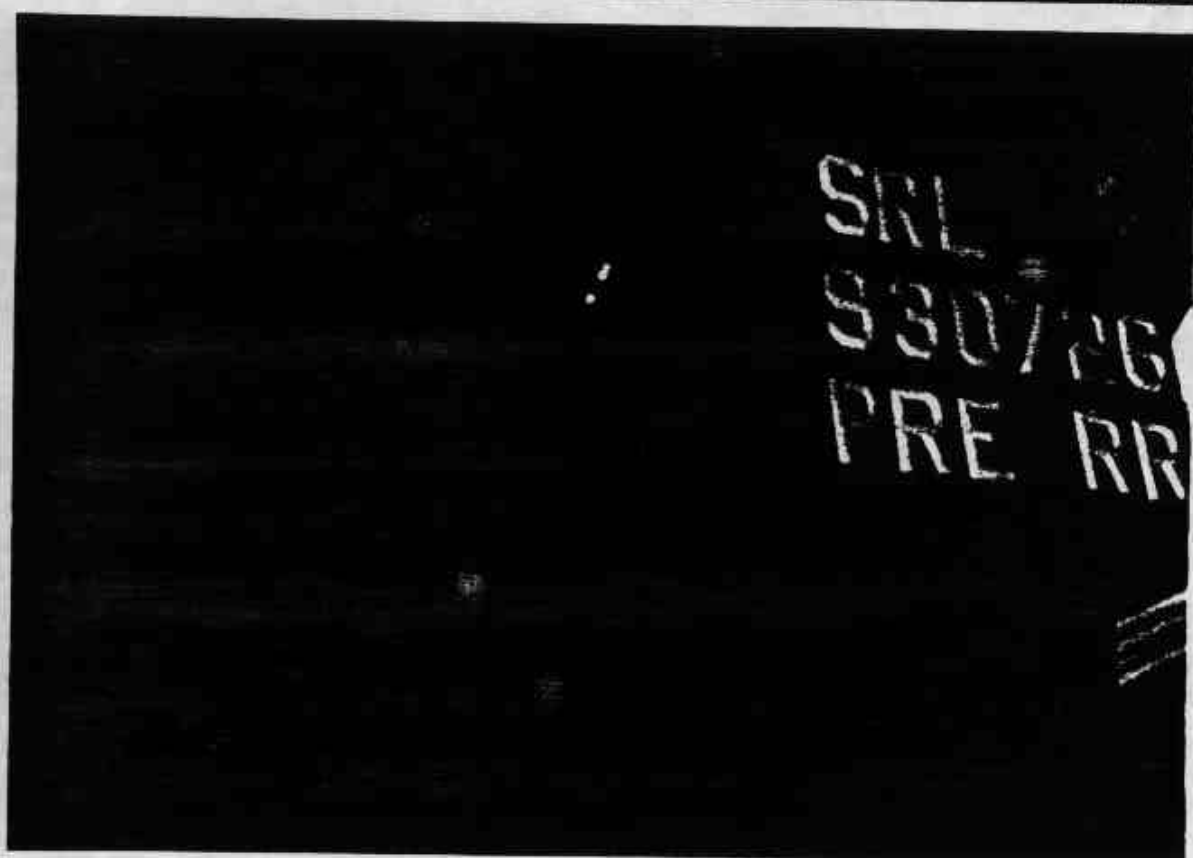


Figure A-14. PRE-TEST RIGHT REAR SUSPENSION STRING POTENTIOMETER-ITEM 2



Figure A-15: PAL-GM-2000 INSTRUMENTATION AND BALLAST LOCATION VIEW

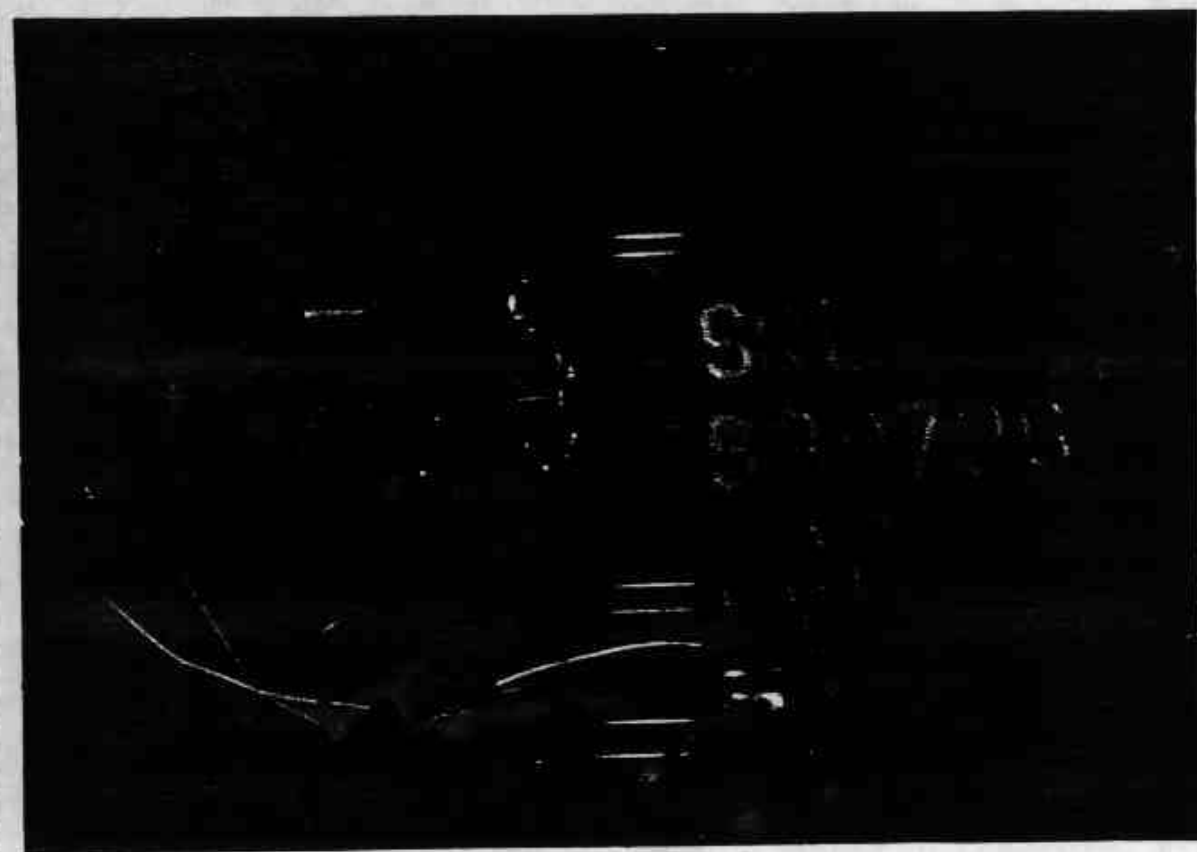


Figure A-16: PAL-GM-2000 TEST GYROSCOPE LOCATION VIEW

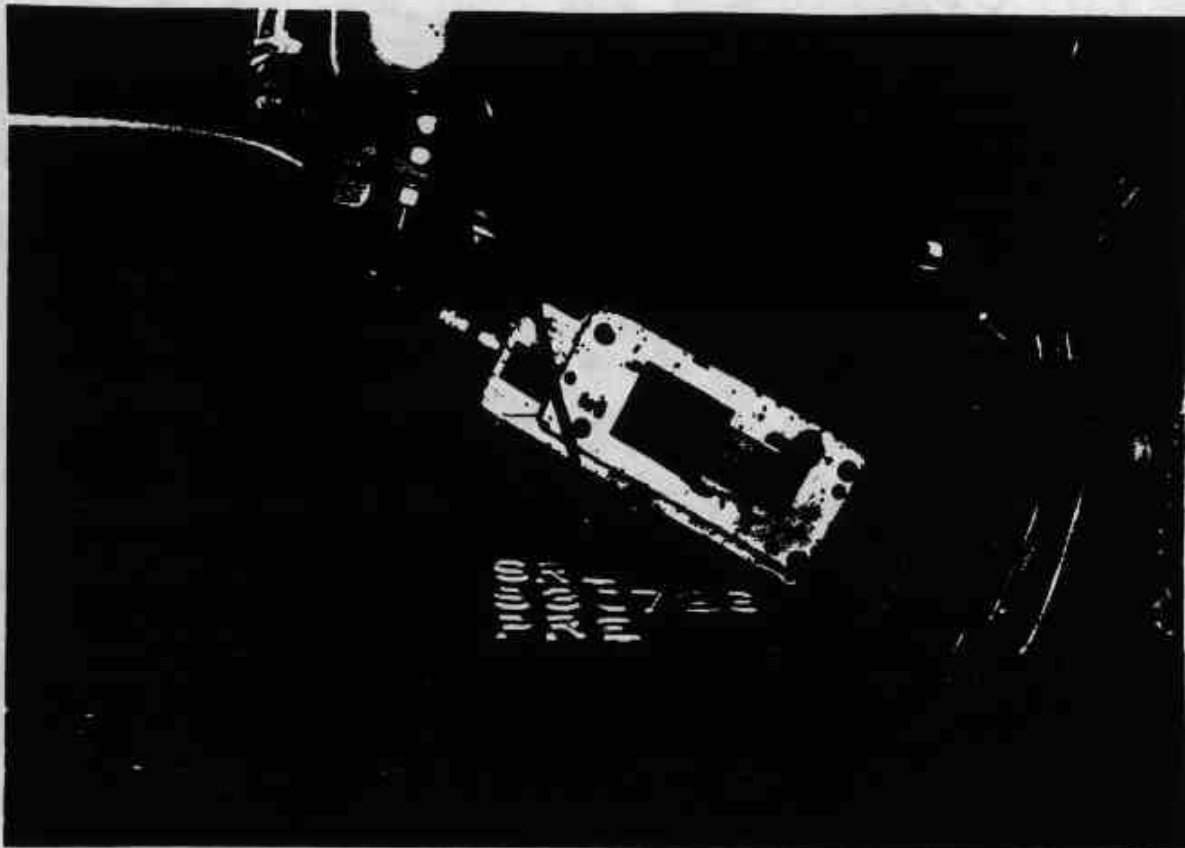


Figure A-17. PRE-TEST

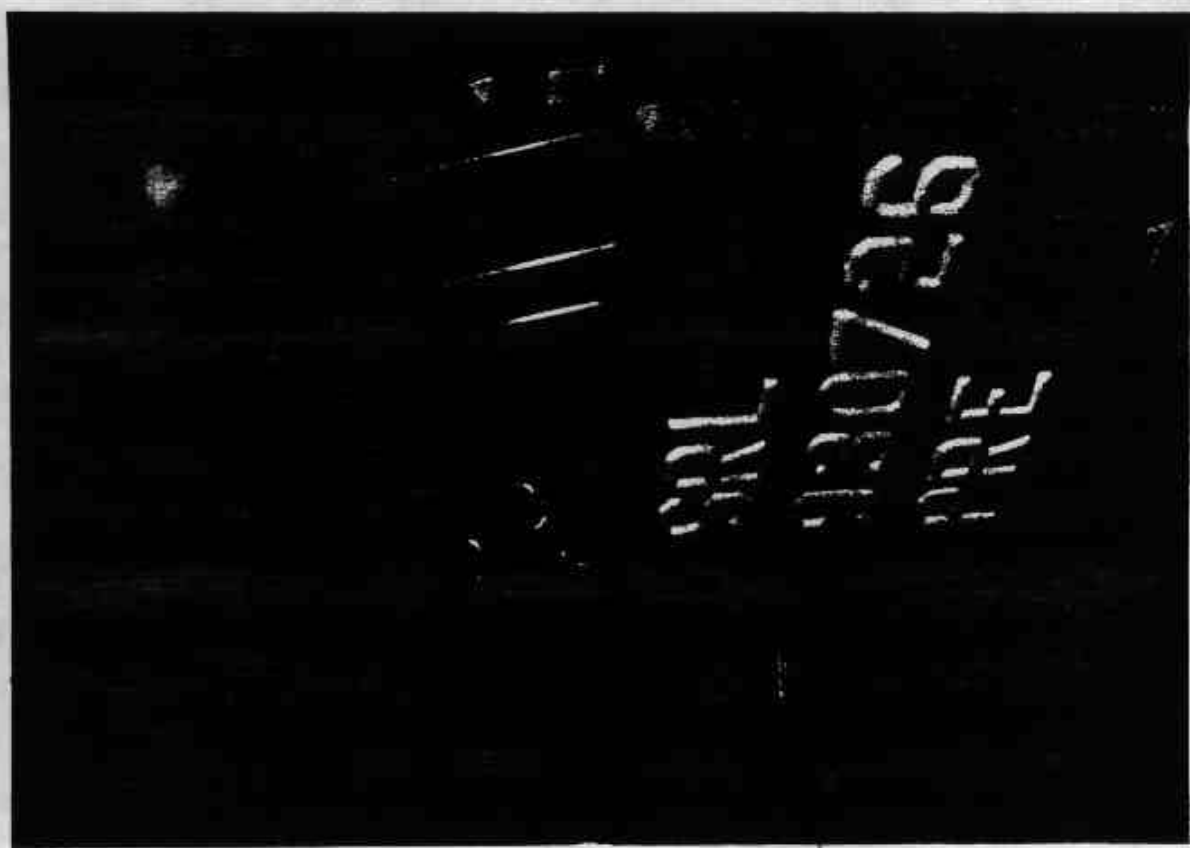


Figure A-18. PRE-TEST



Figure A-19. POST-TEST FRONT VIEW

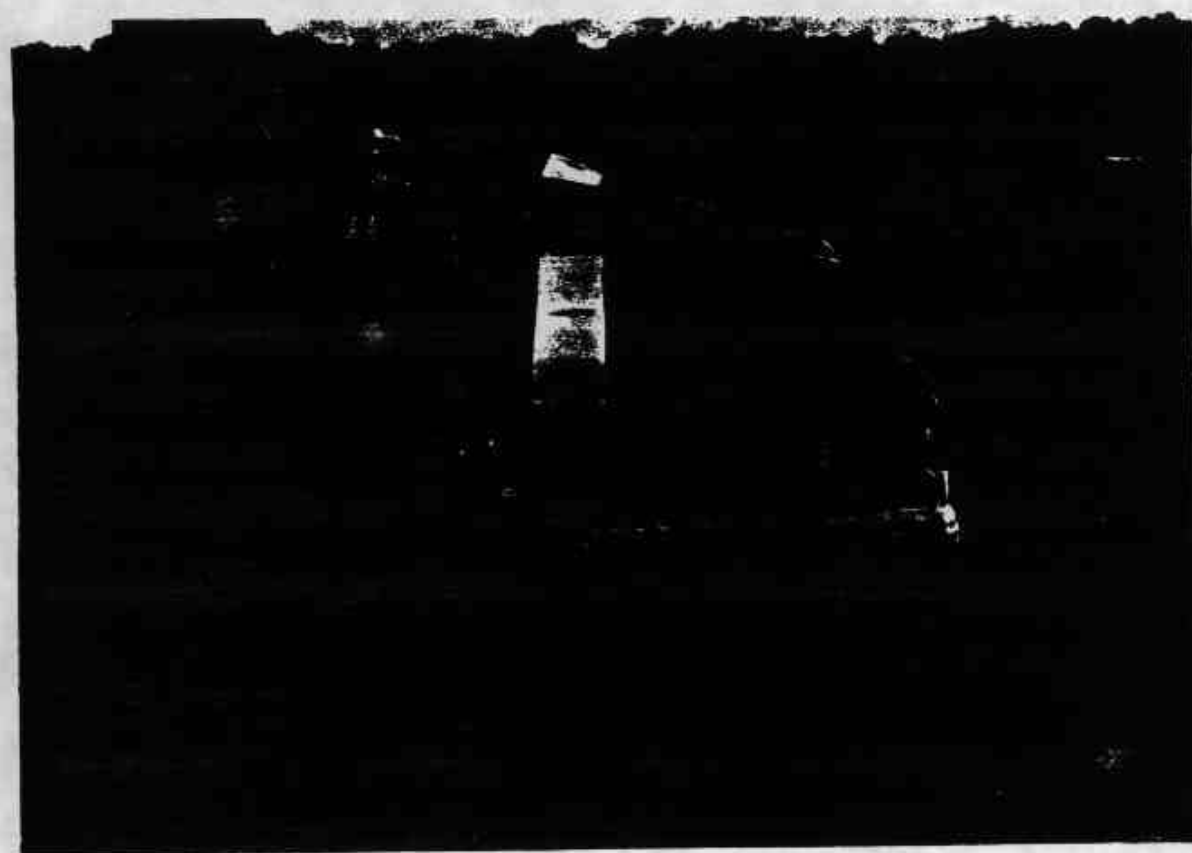


Figure A-20. POST-TEST FRONT VIEW



FIGURE X-215 POST-TEST LEFT SIDE - VIEW 1

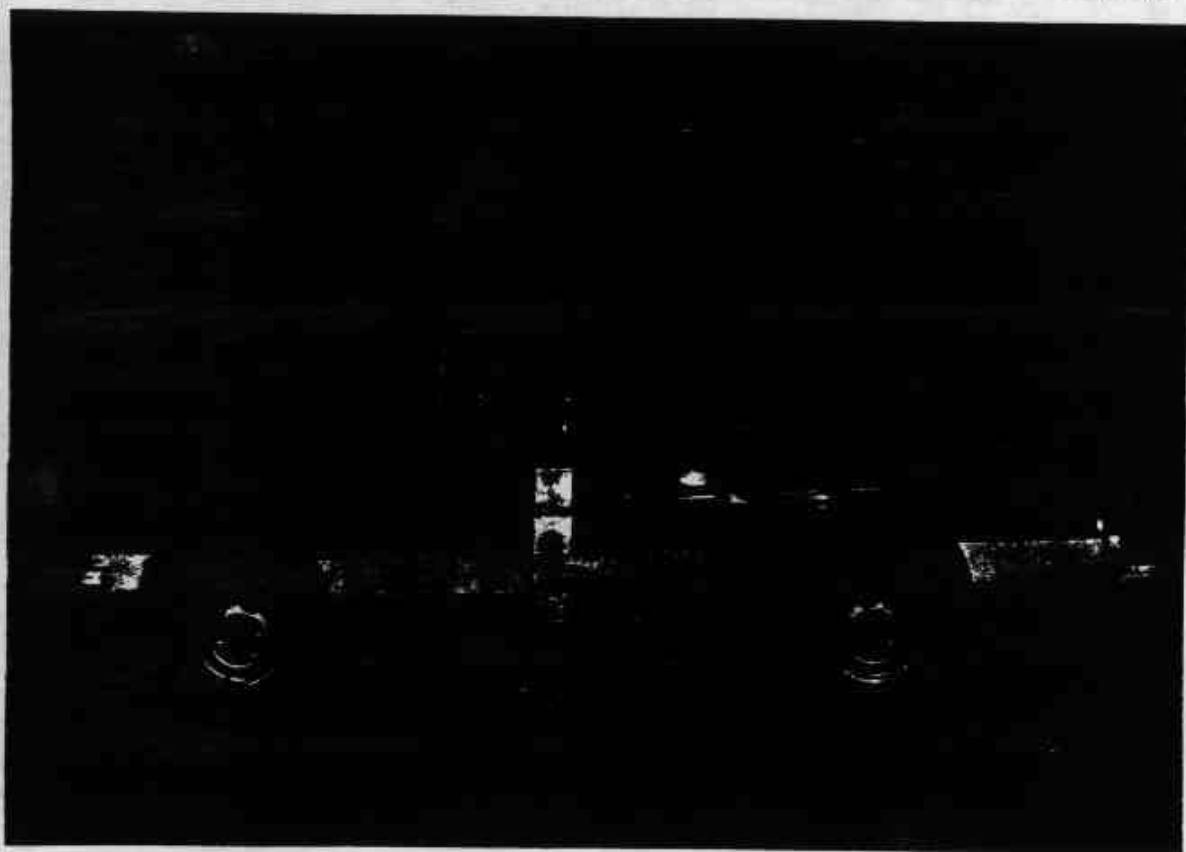


FIGURE X-216 POST-TEST LEFT SIDE - VIEW 2



Figure A-23. POST-TEST REAR VIEW

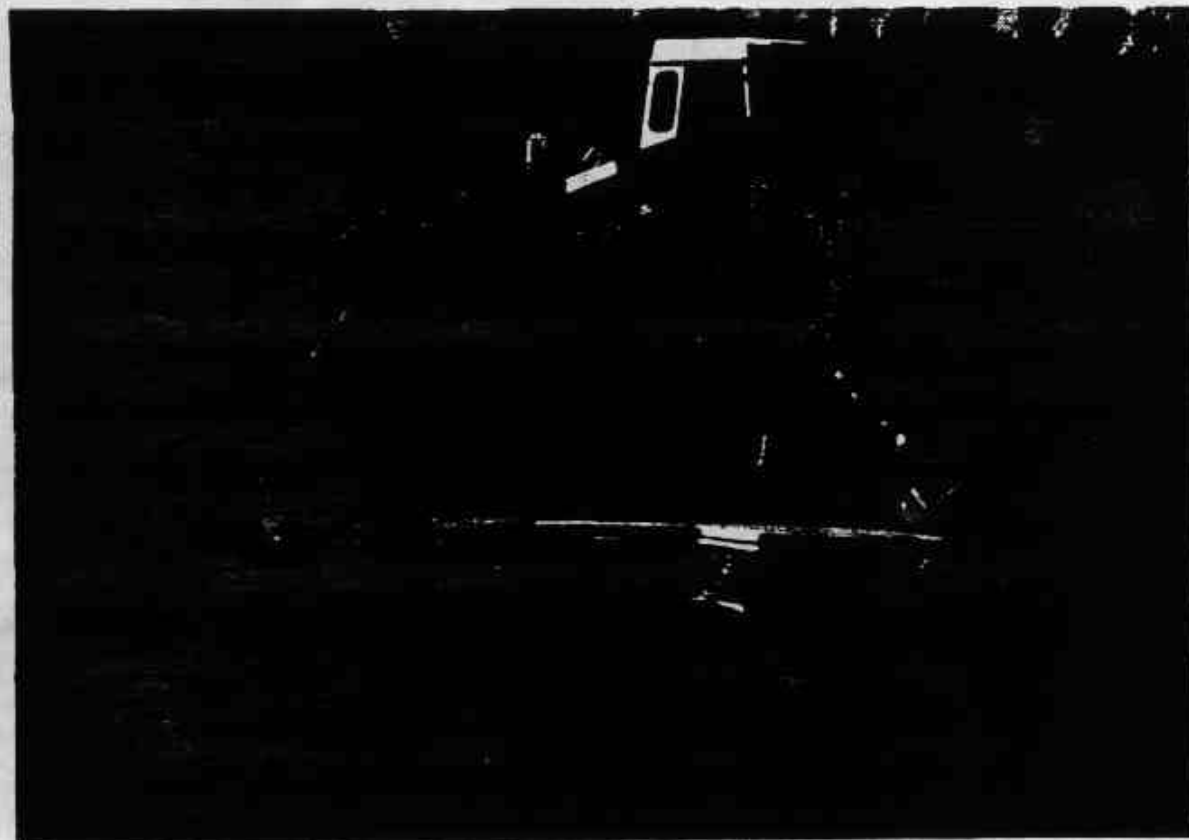


Figure A-24. POST-TEST REAR VIEW

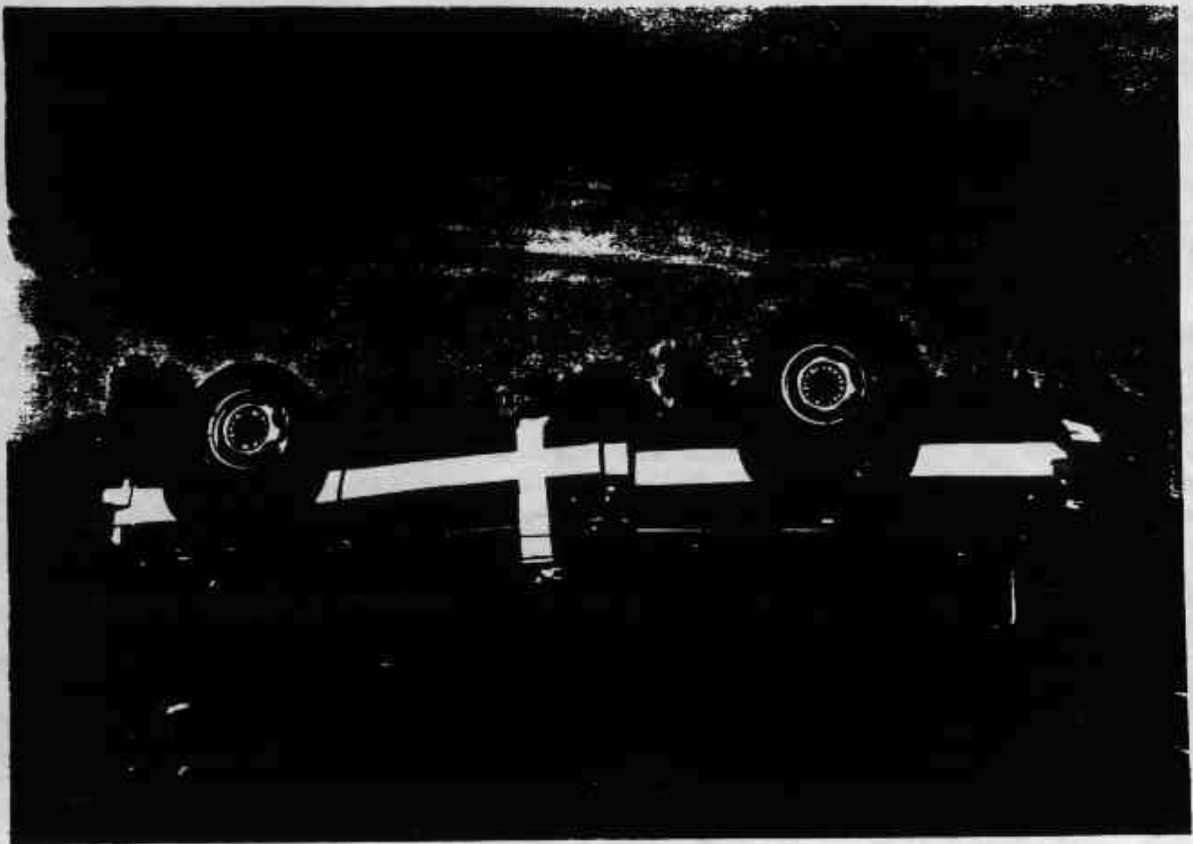


Figure A-25. POST-TEST RIGHT SIDE - VIEW 1

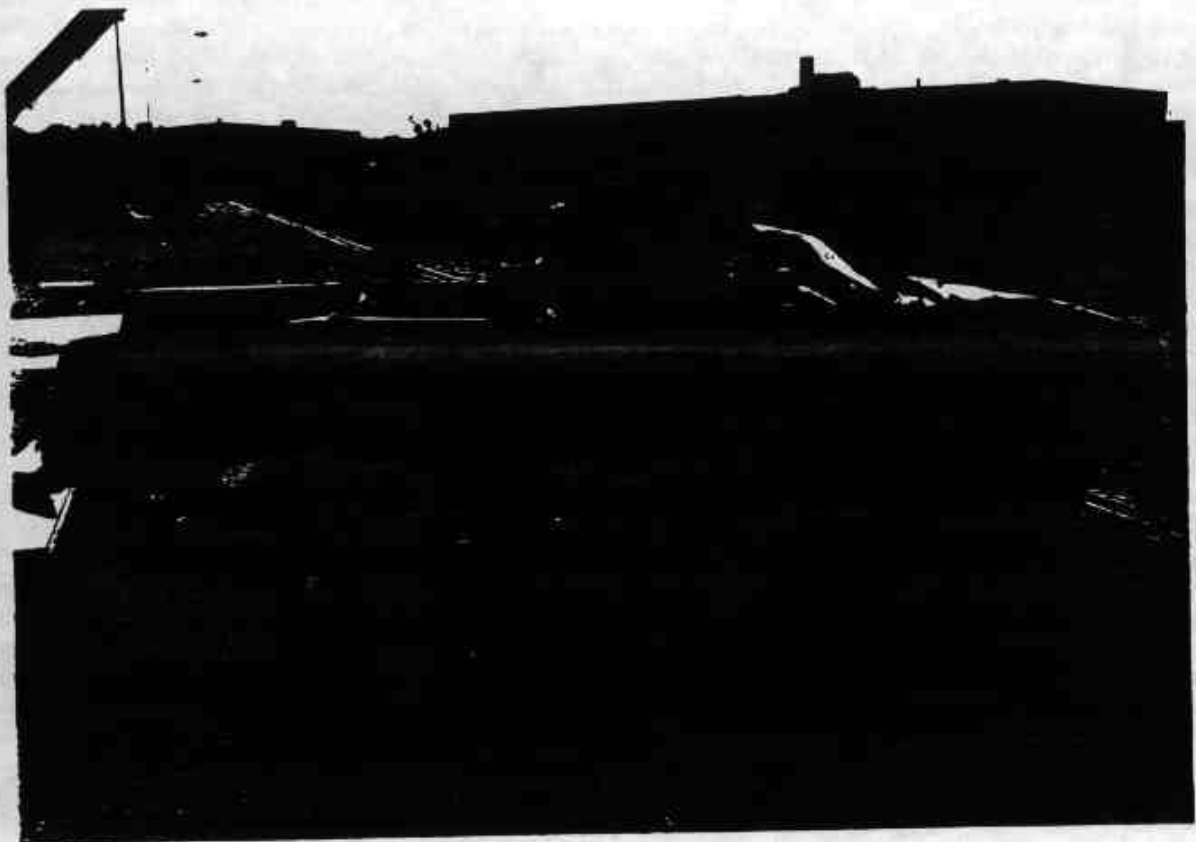


Figure A-26. POST-TEST RIGHT SIDE - VIEW 2

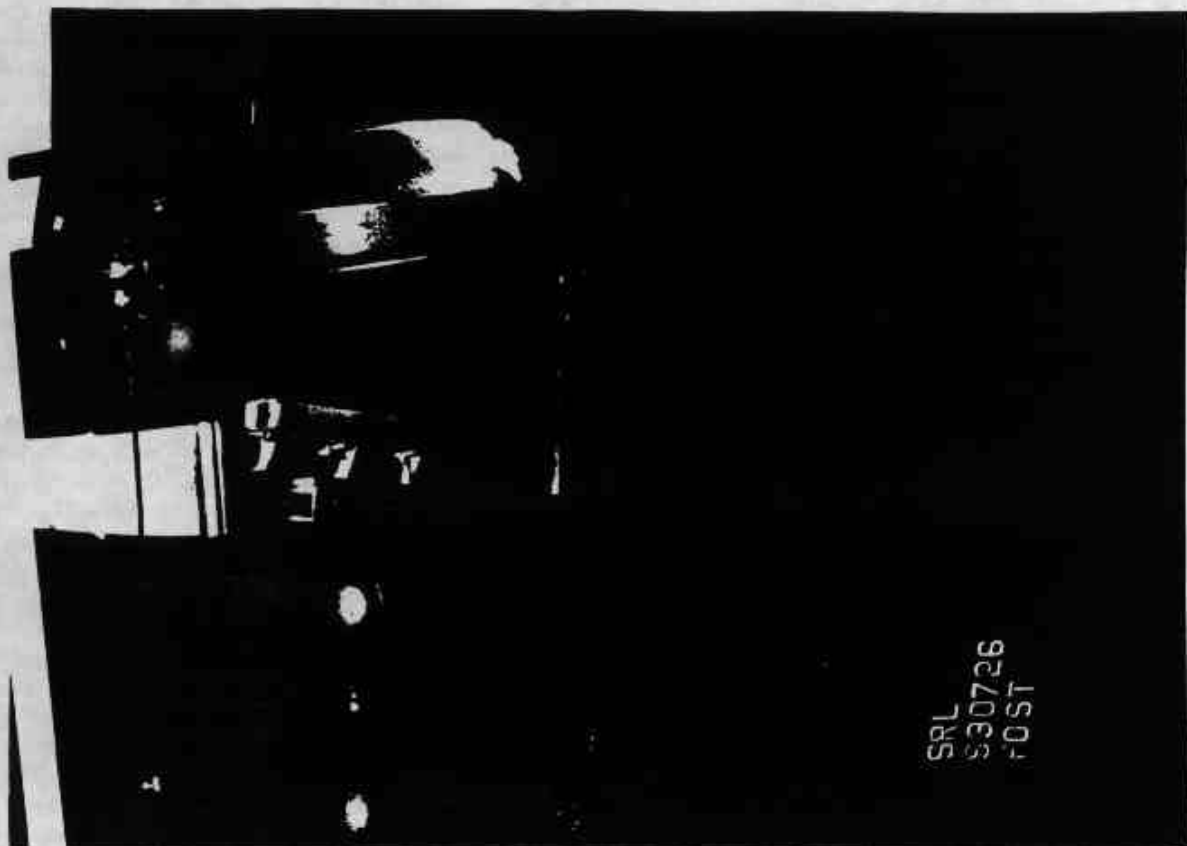


Figure A-27. POST-TEST DRIVER DORMANT AND VEHICLE VIEW 1

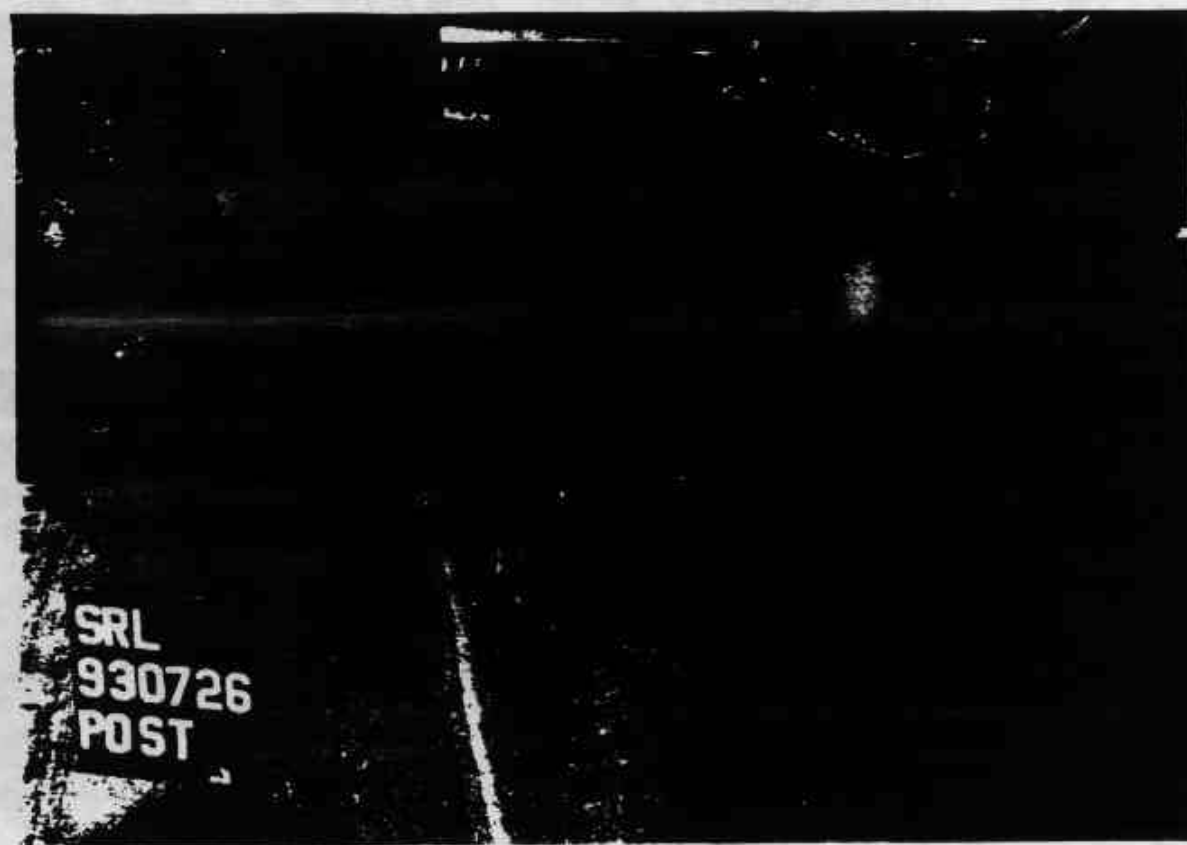


Figure A-28. POST-TEST DRIVER DORMANT AND VEHICLE VIEW 2



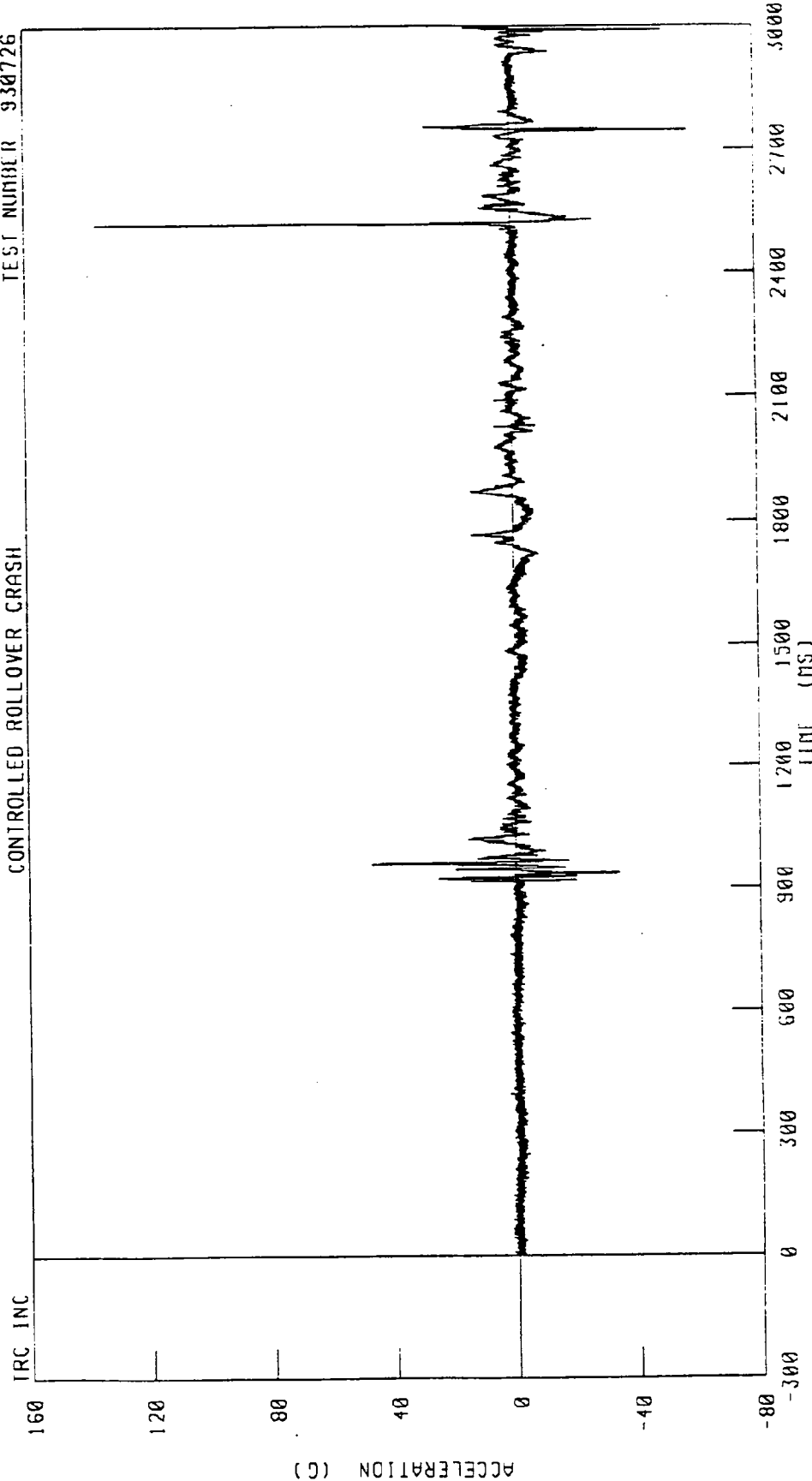
Figure A-29. POST-TEST DUMMY AND VEHICLE - VIEW 3

APPENDIX B

DATA PLOTS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD X-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

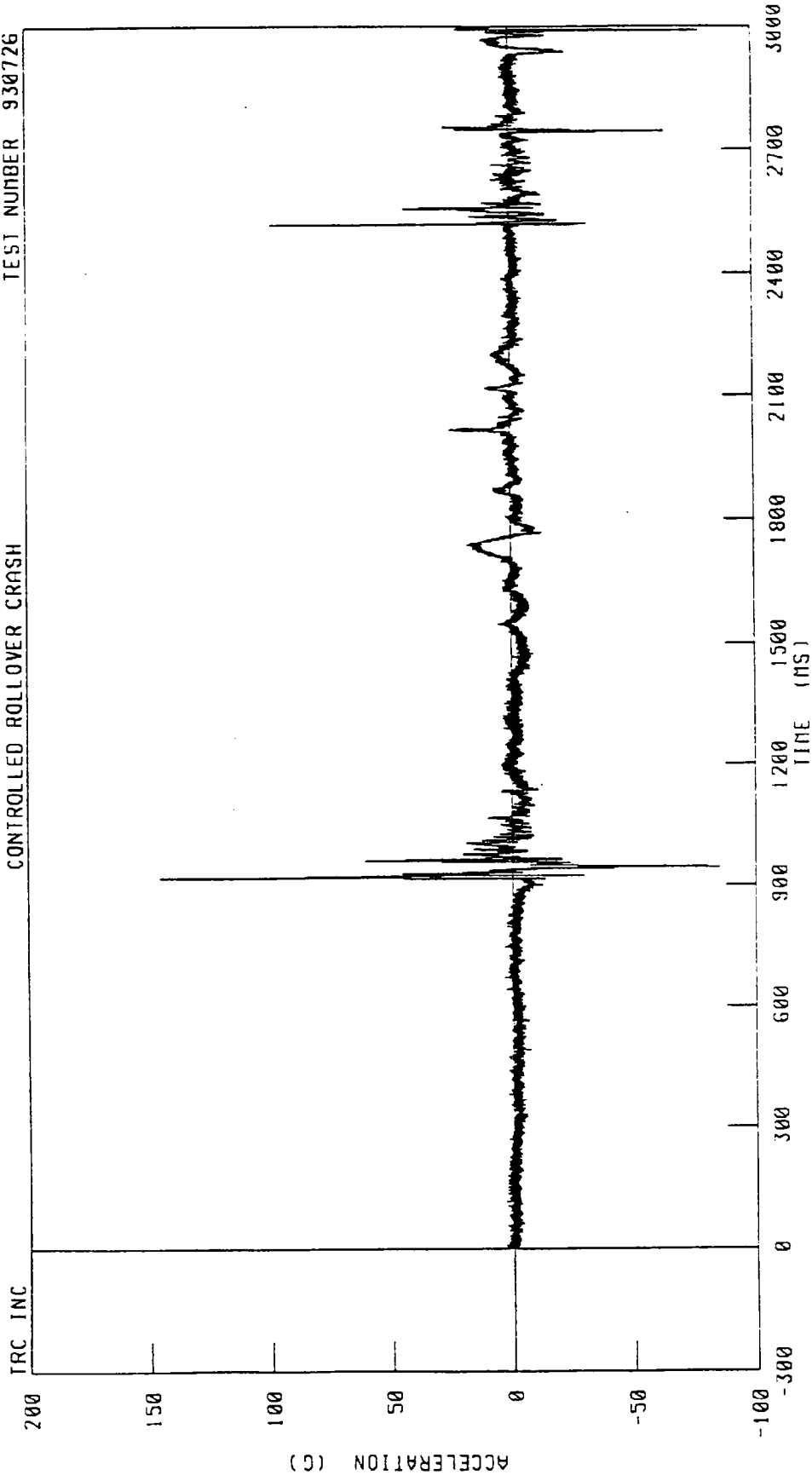


PEAK DATA 136.42 G @ 2519.40 MS, -58.02 G @ 2746.40 MS

CHANNEL HEDXC1 FILTER CH CLASS 1000

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD Y-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



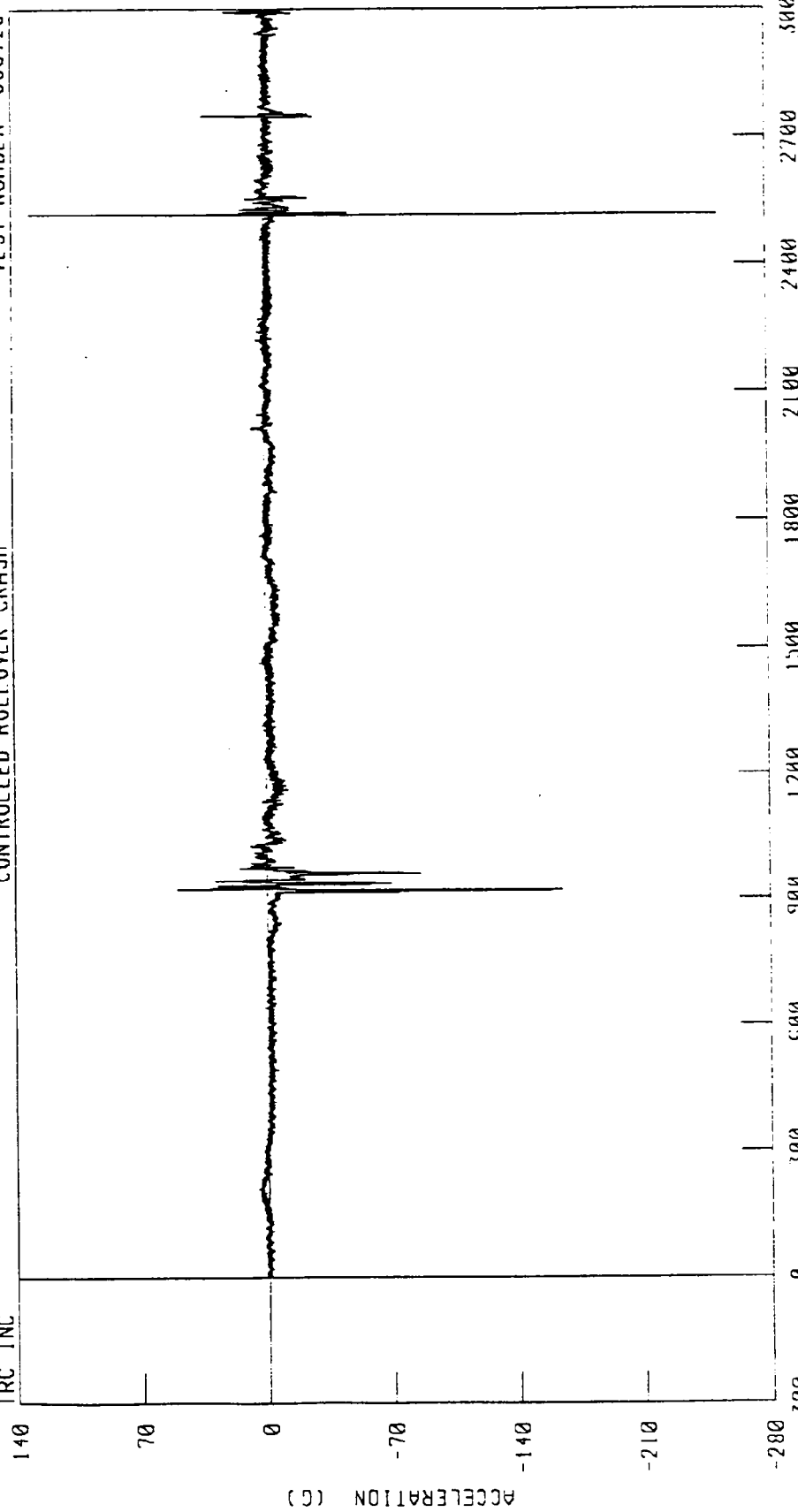
CHANNEL HEDYGI FILTER CH CLASS 1000

PEAK DATA 145 66 G @ 917 10 MS, -85 20 G @ 943 70 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD 2-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

IRC INC

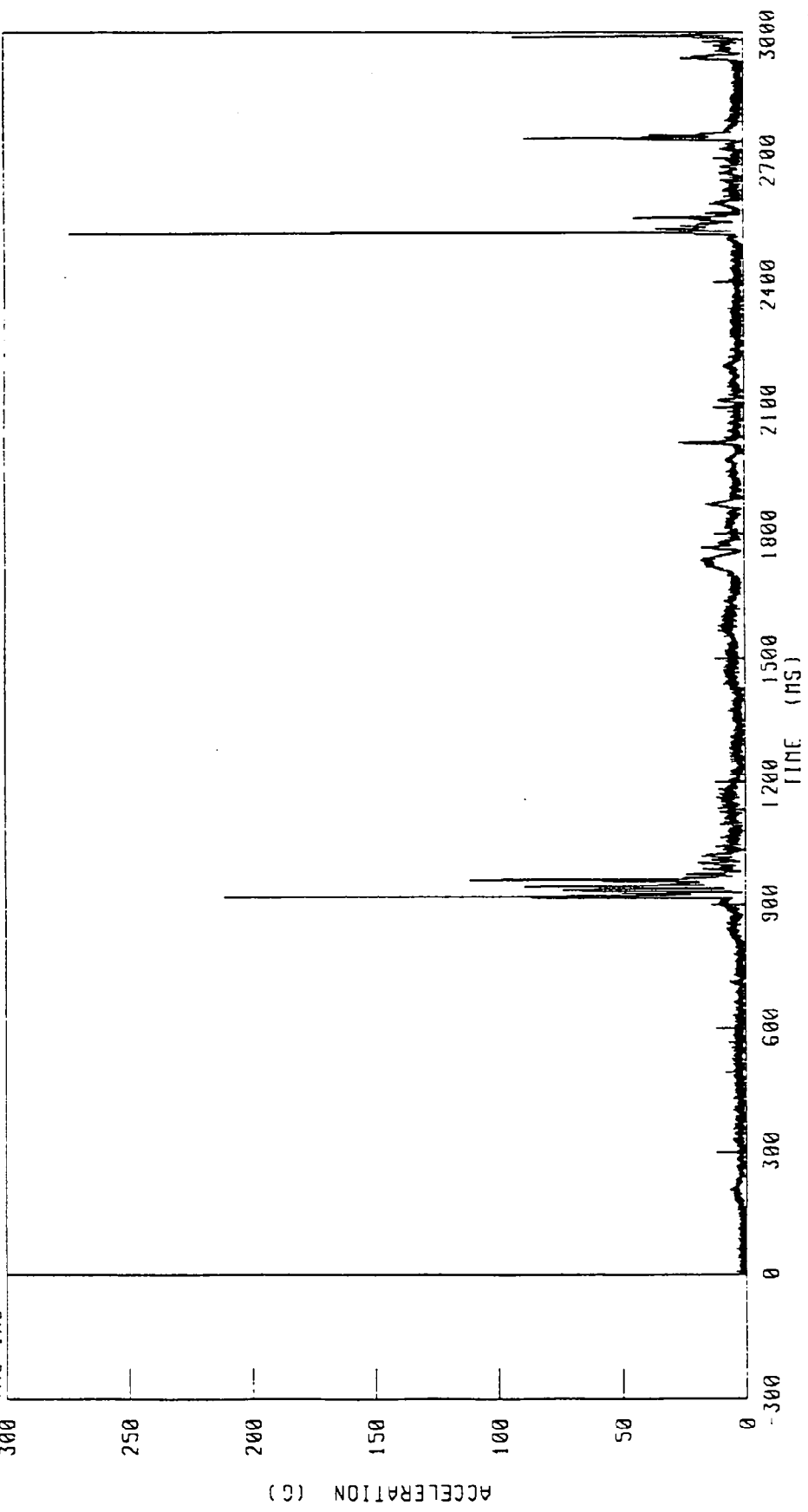


CHANNEL HEDZC1 FILTER CH CLASS 1000 PEAK DATA 130 64 G @ 2519 20 MS, -253 20 G @ 2518 00 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER HEAD RESULTANT ACCELERATION
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

TRC INC



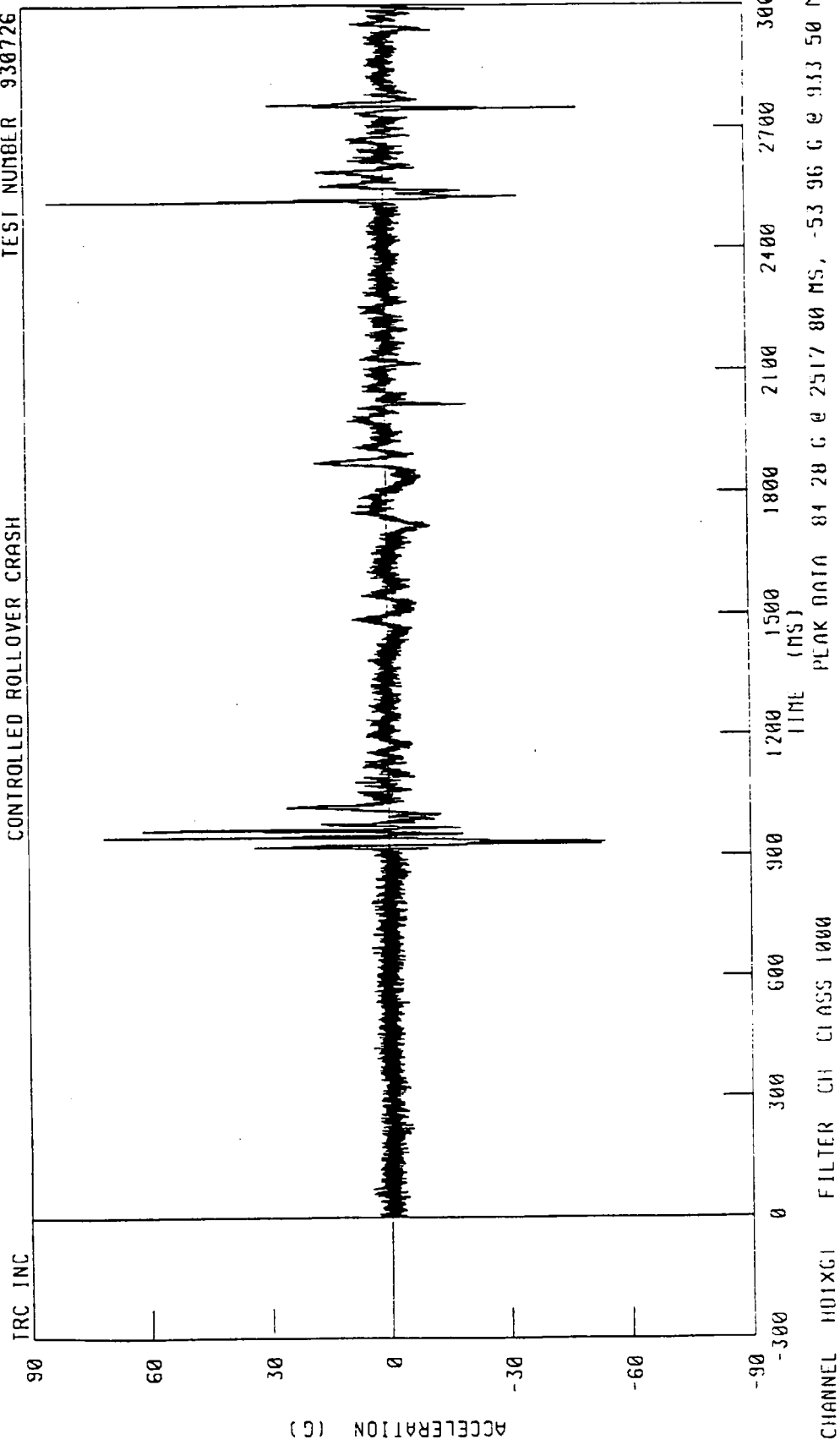
CHANNEL HEDRG1 FILTER CH CLASS 1000

PEAK DATA 273 51 G @ 2517 80 MS, 0 12 G @ 130 80 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD ARRAY 1 X-AXIS ACCELERATION

TEST NUMBER 930726

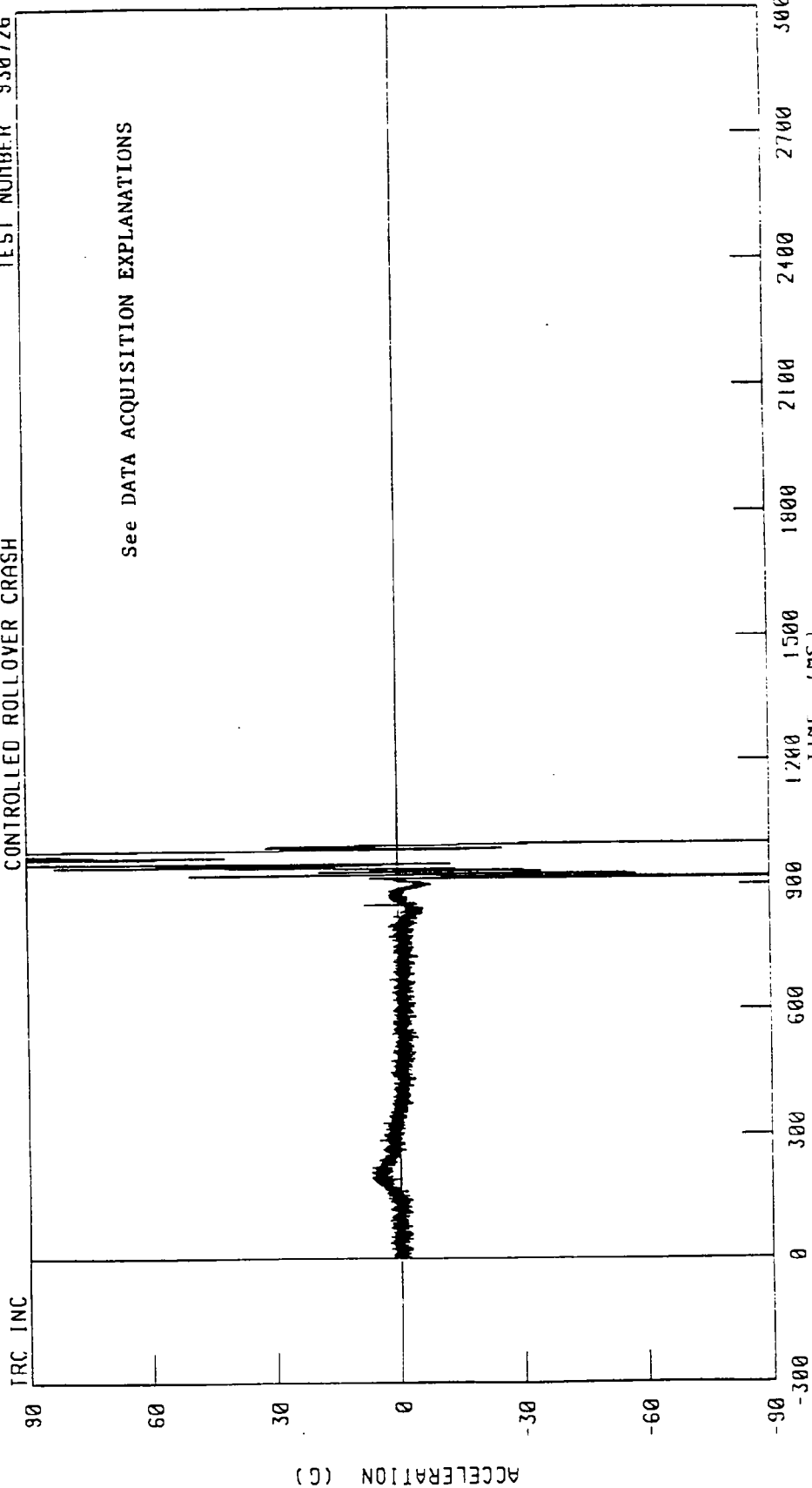
CONTROLLED ROLLOVER CRASH



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER HEAD ARRAY 1 Z-AXIS ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH



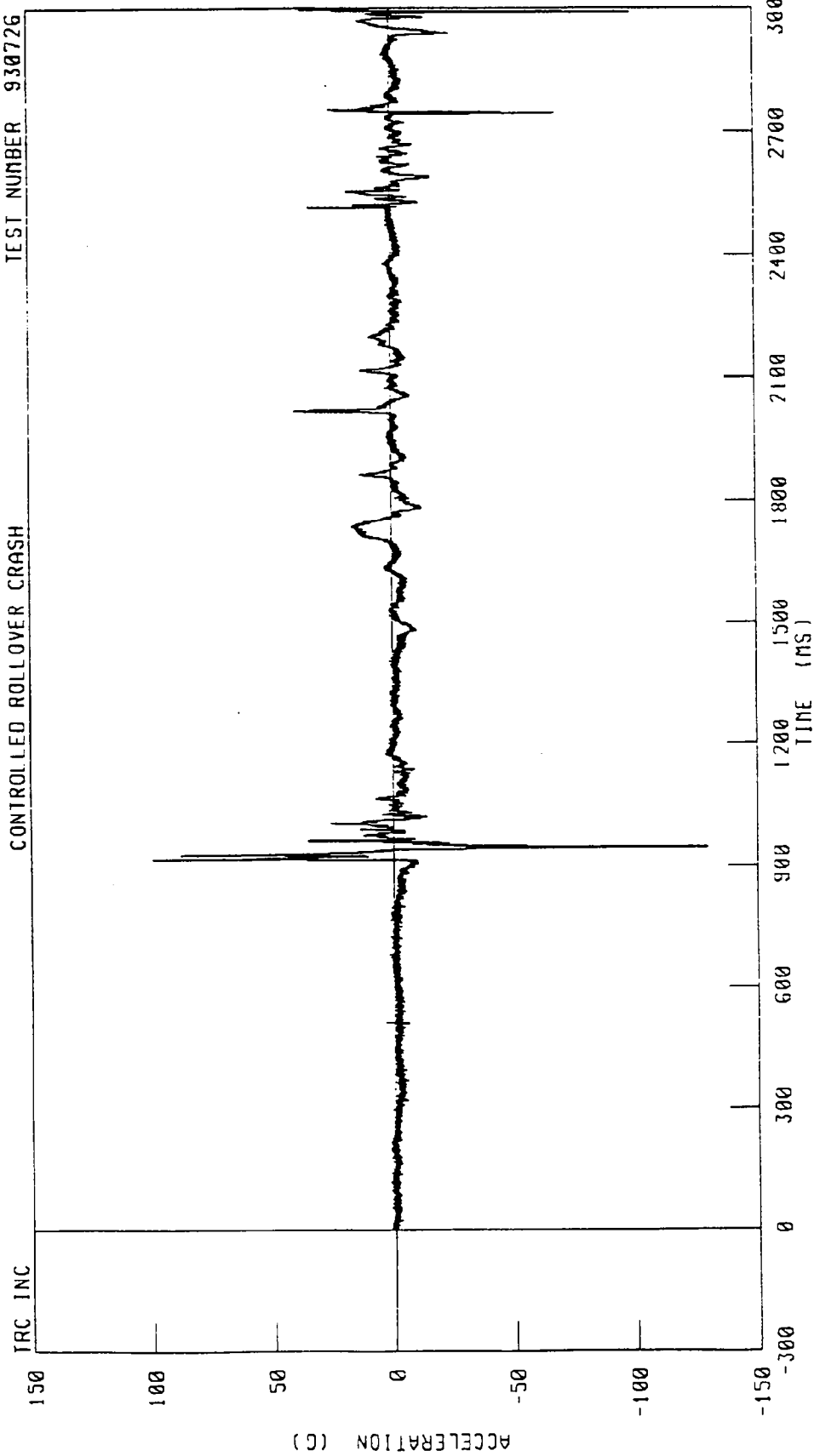
PEAK DATA 155 90 G @ 950 20 MS, -420 19 G @ 1986 20 MS

CHANNEL HD12G1 FILTER CH CLASS 1000

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD ARRAY 2 Y-AXIS ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH



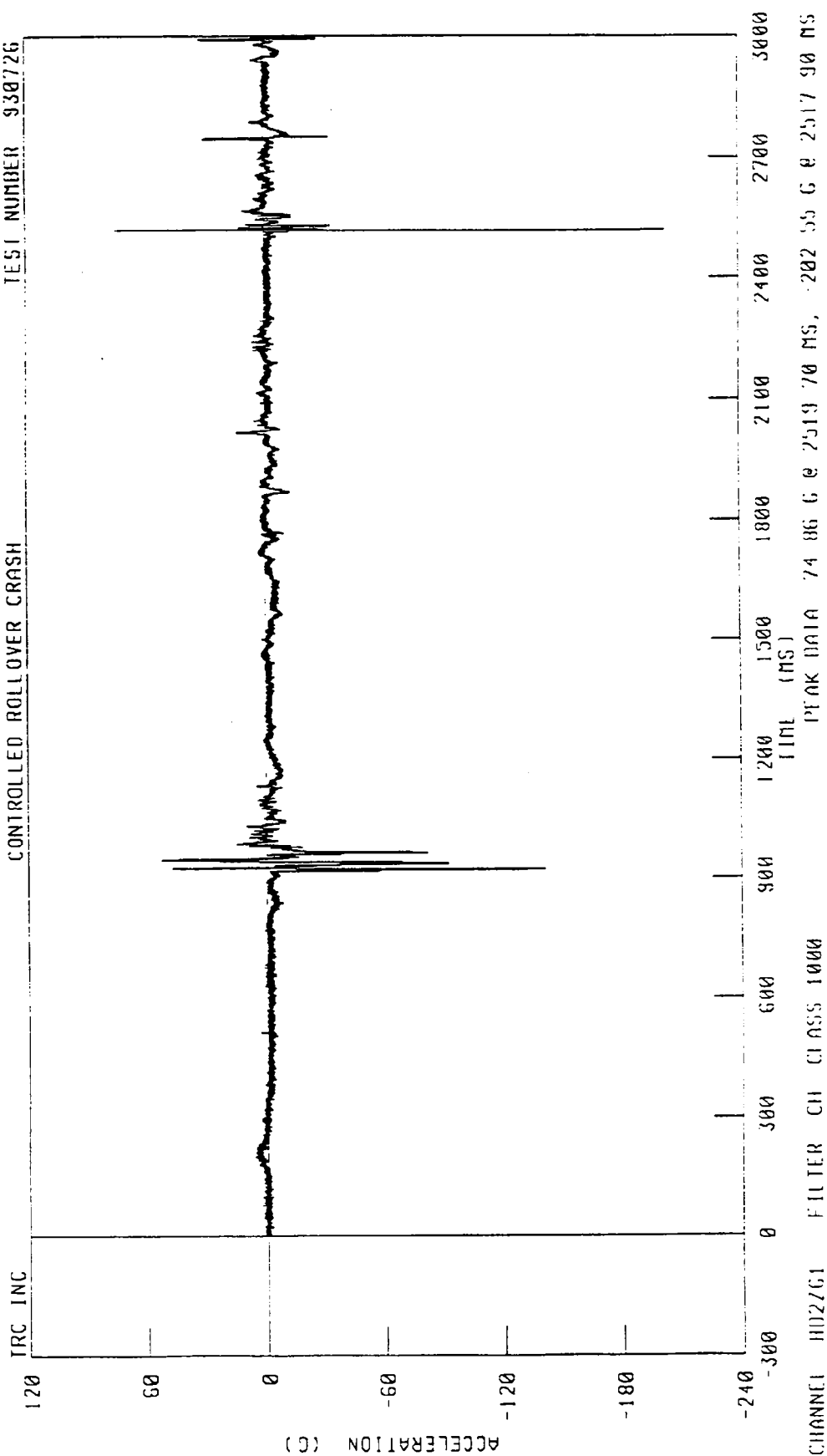
CHANNEL HD2YGI FILTER CH CLASS 1000

PEAK DATA 100 10 G @ 917 50 MS, -129 31 G @ 944 30 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD ARRAY 2 Z-AXIS ACCELERATION

CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



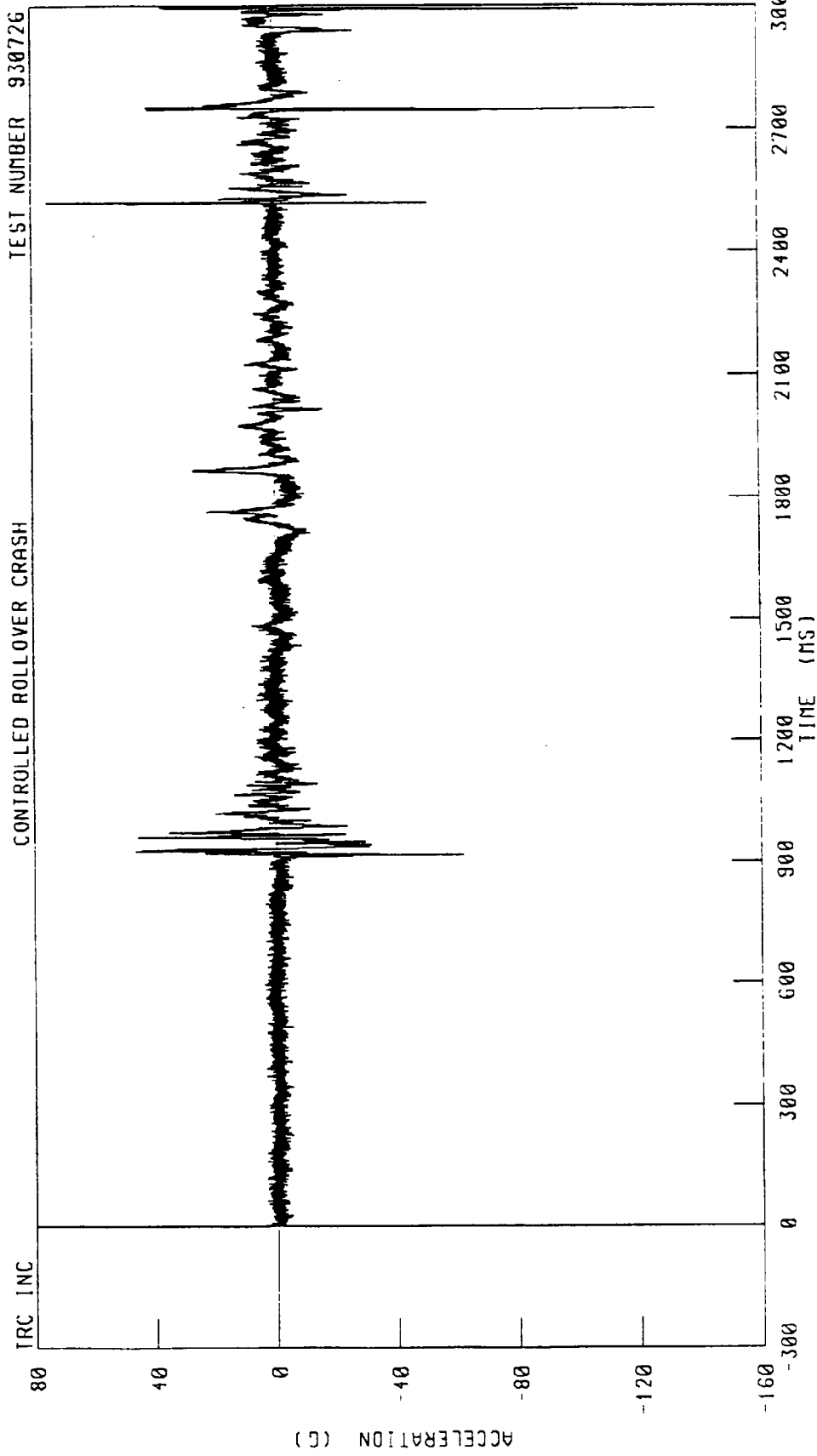
CHANNEL HD27G1 FILTER CH CLASS 1000

PEAK DATA 74.86 G @ 2519.70 MS, -202.55 G @ 2517.90 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD ARRAY 3 X-AXIS ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH

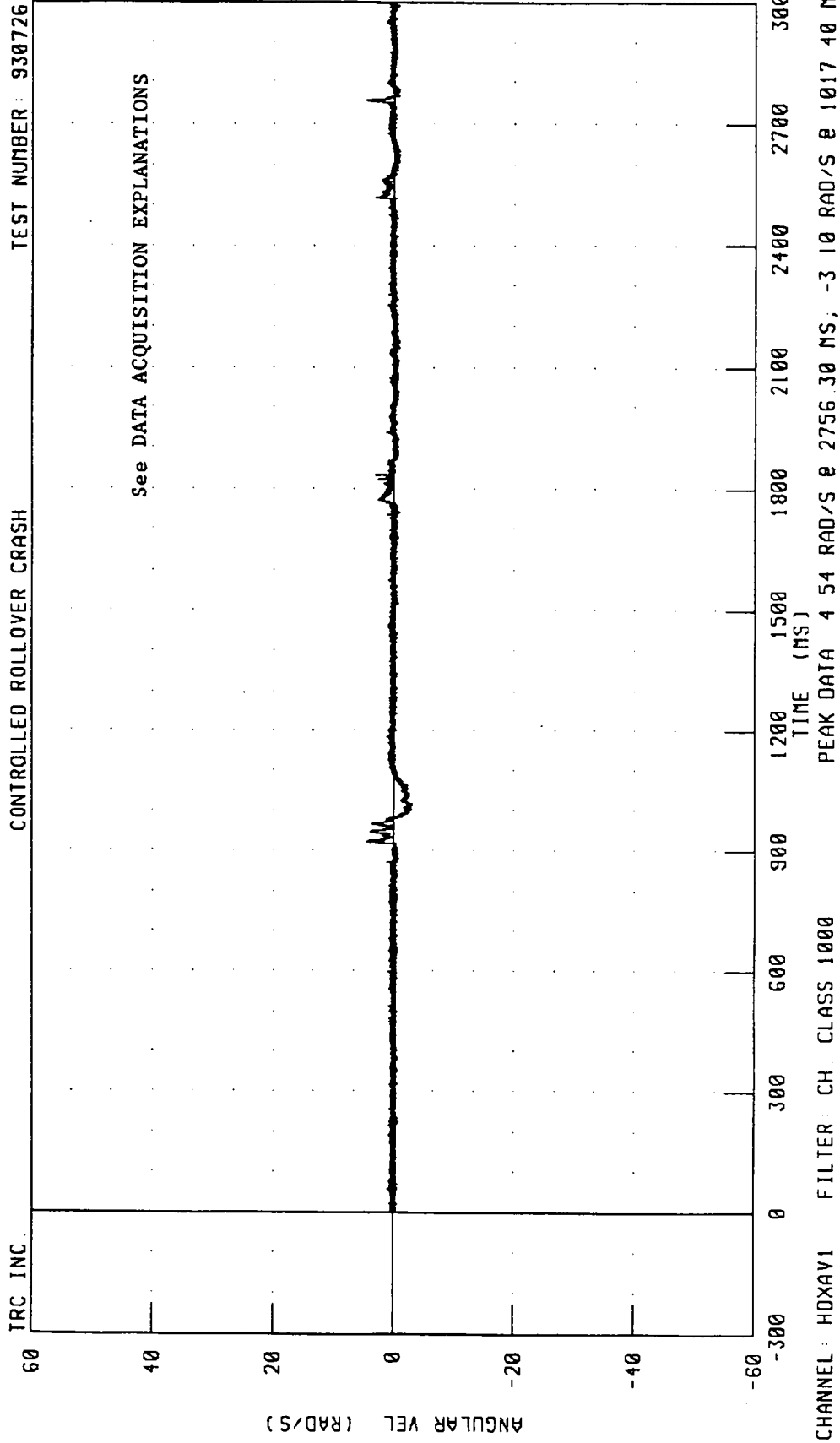


CHANNEL HD3XG1 FILTER CH1 CLASS 1000

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD X-AXIS ANGULAR VELOCITY

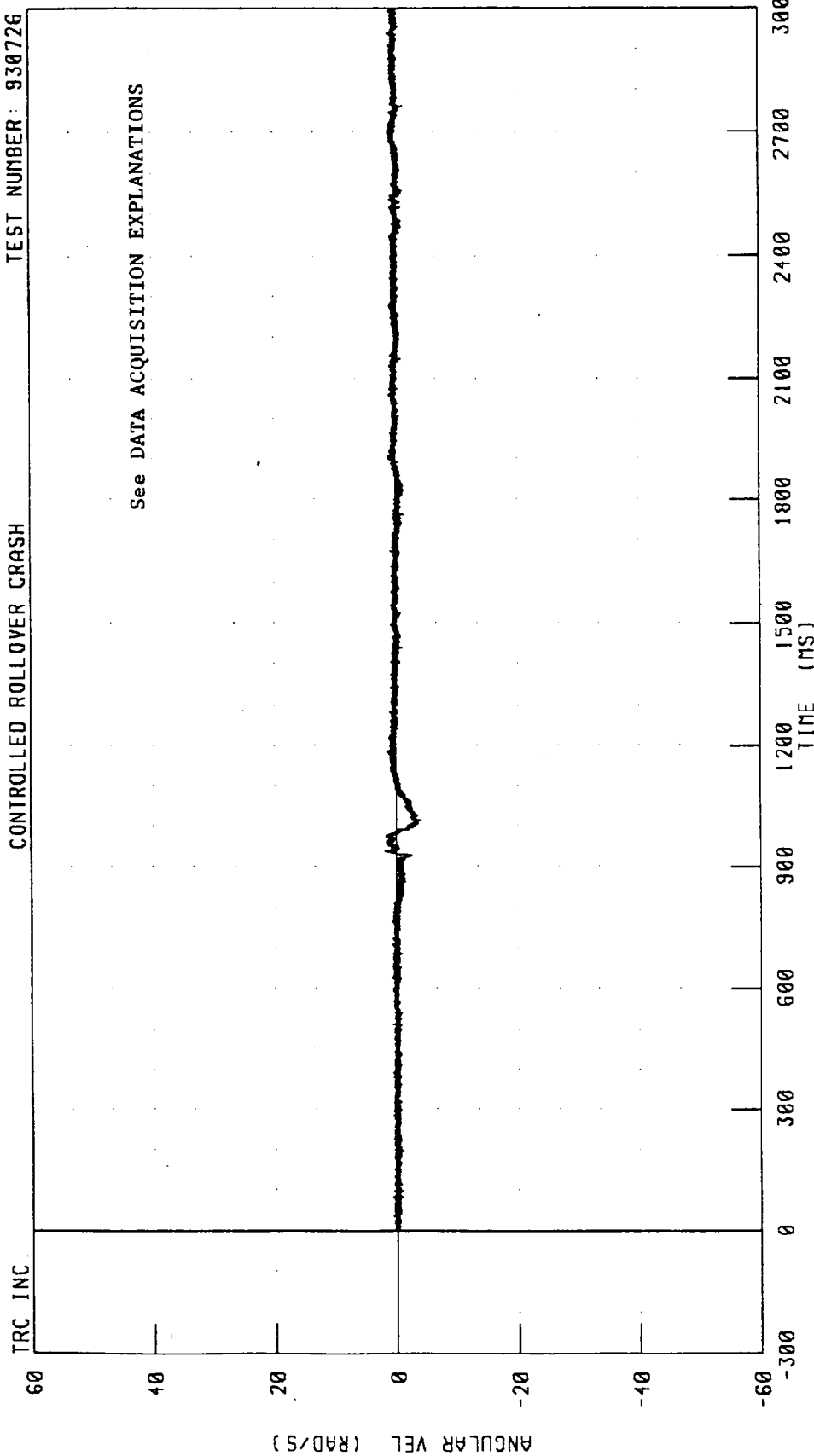
CONTROLLED ROLLOVER CRASH

TEST NUMBER: 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD Y-AXIS ANGULAR VELOCITY
CONTROLLED ROLLOVER CRASH

TEST NUMBER: 930726

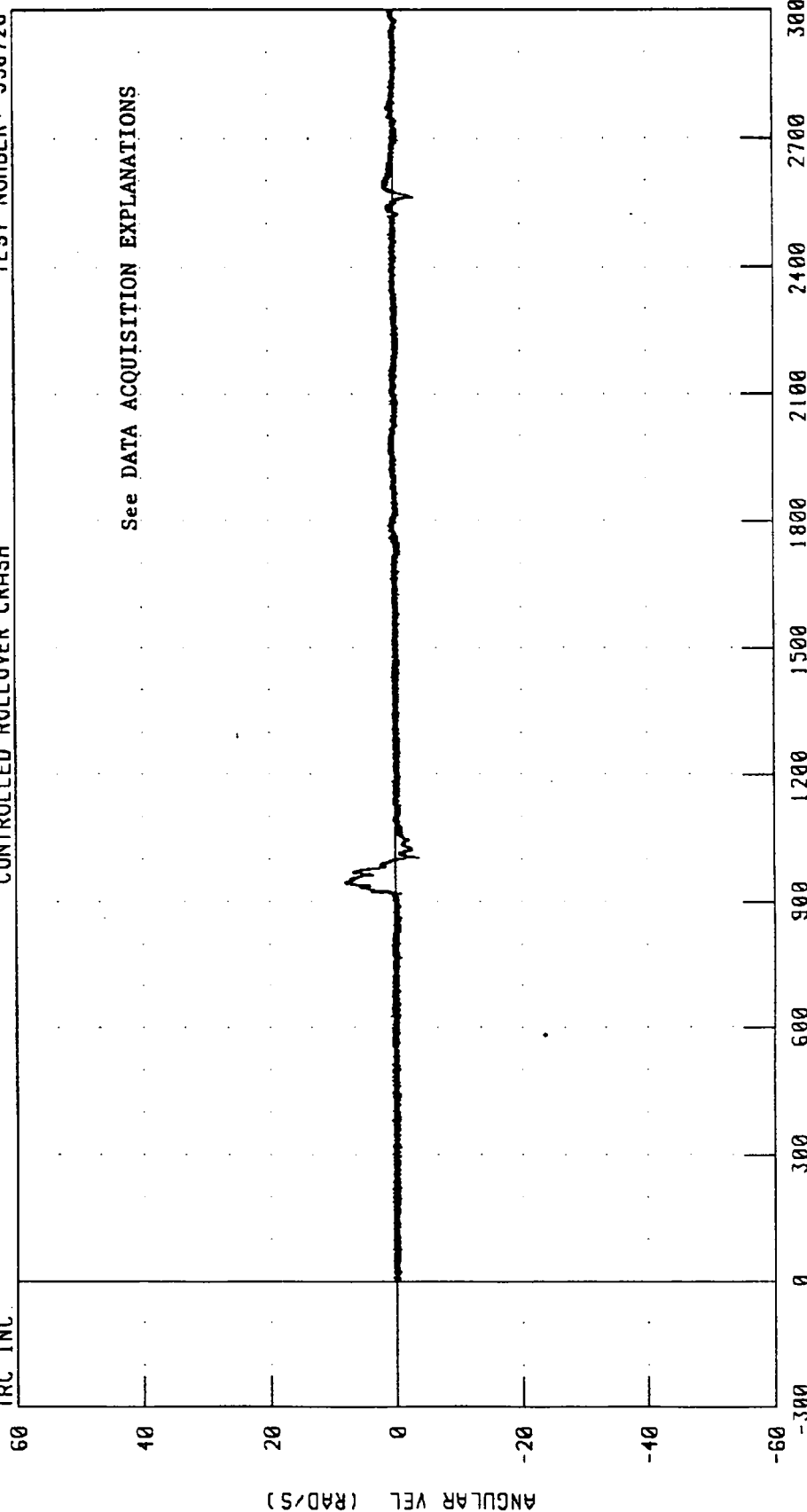


CHANNEL HDYAV1 FILTER: CH CLASS 1000 PEAK DATA: 2 02 RAD/S @ 937 40 MS, -3 87 RAD/S @ 1013 10 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER HEAD Z-AXIS ANGULAR VELOCITY
CONTROLLED ROLLOVER CRASH

TEST NUMBER : 930726

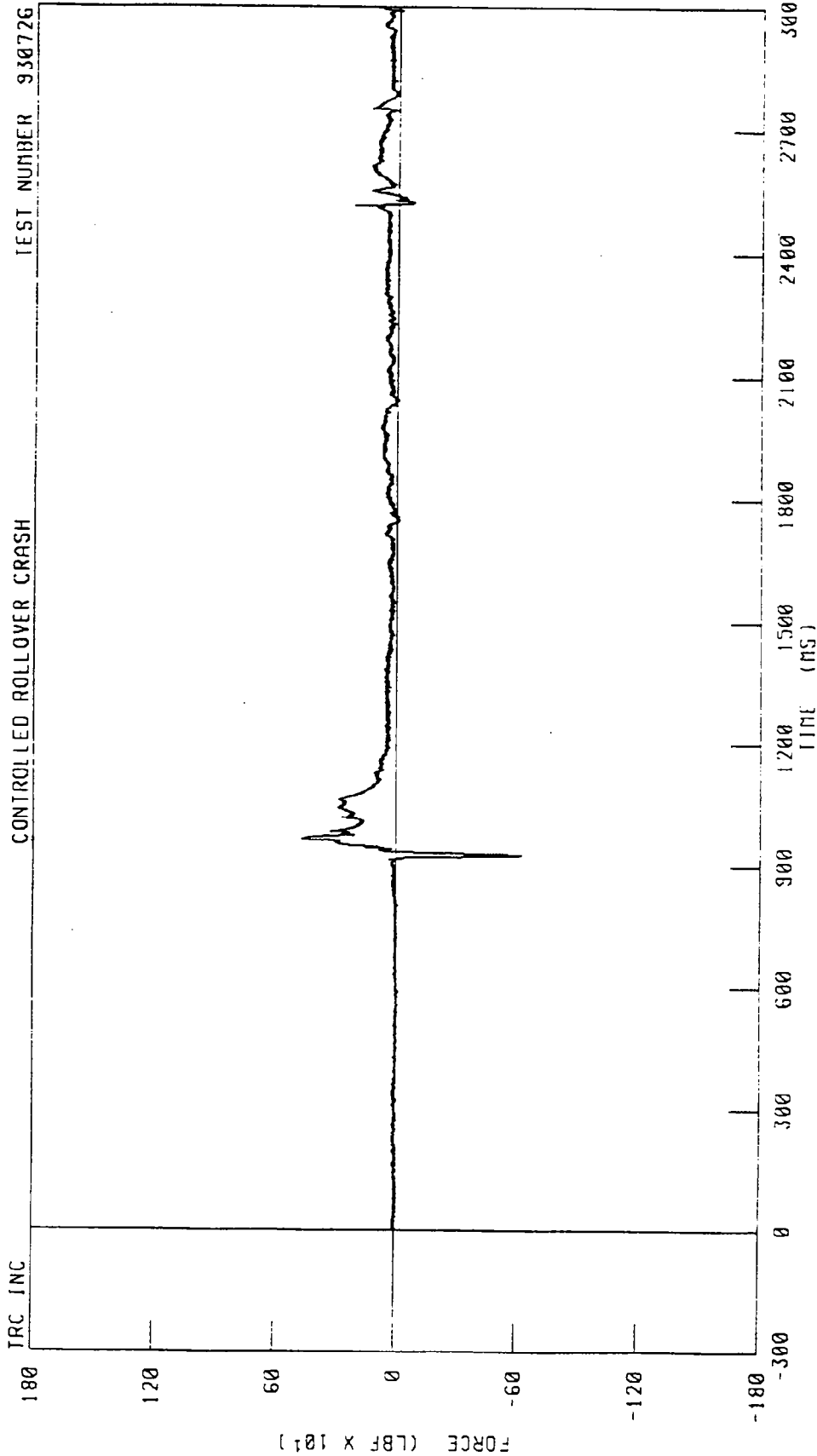
TRC INC



CHANNEL : HDZAV1 FILTER : CH CLASS 1000
PEAK DATA : 8 21 RAD/S @ 945 10 MS; -3.75 RAD/S @ 1003 80 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER NECK X-AXIS SHEAR FORCE
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

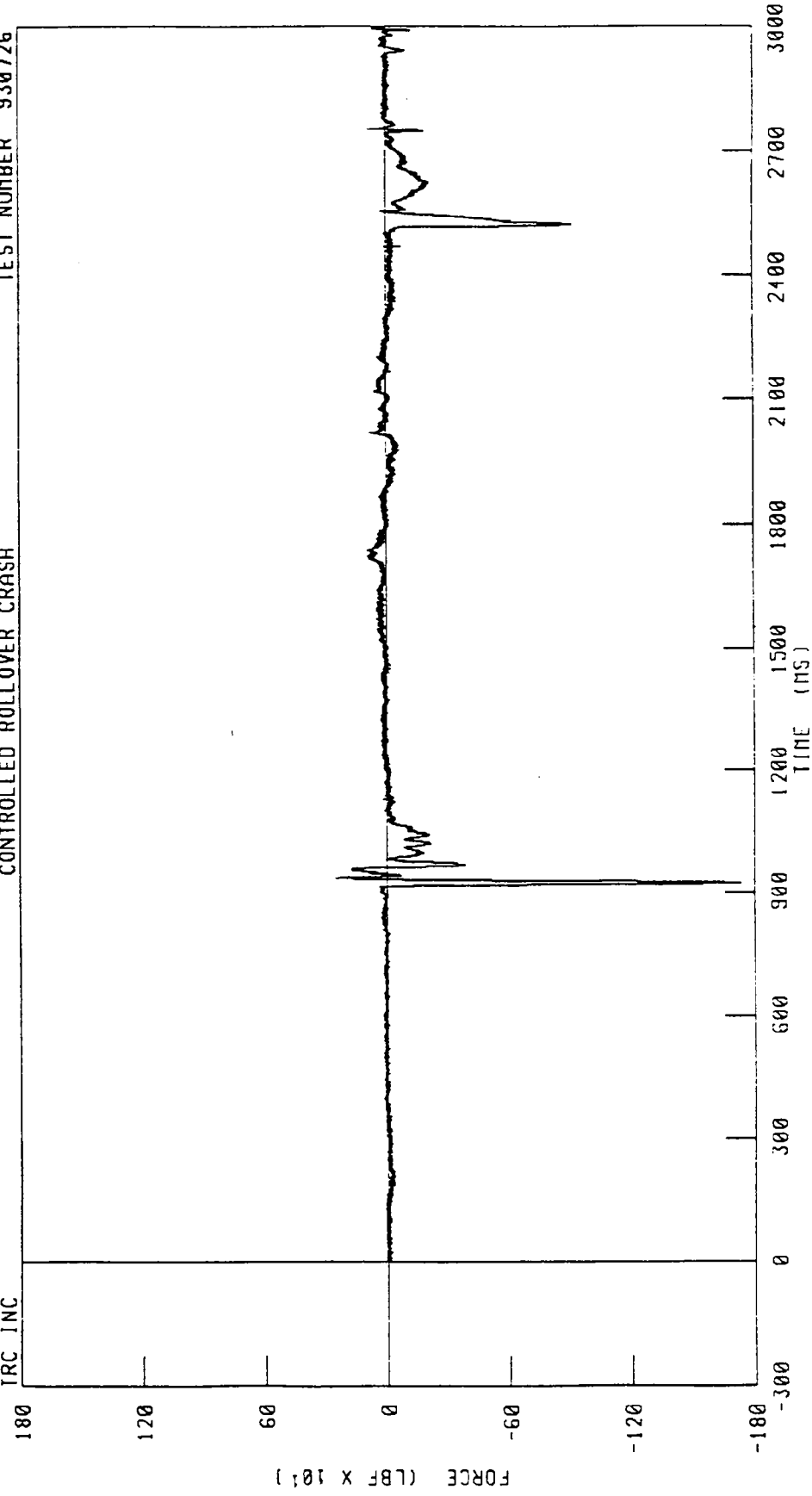


CHANNEL NEXT1 FILTER CH CLASS 1000 PEAK DATA 473 01 1BF e 963 10 MS, 626 62 1BF e 924 10 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER NECK Y-AXIS SHEAR FORCE
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

TRC INC



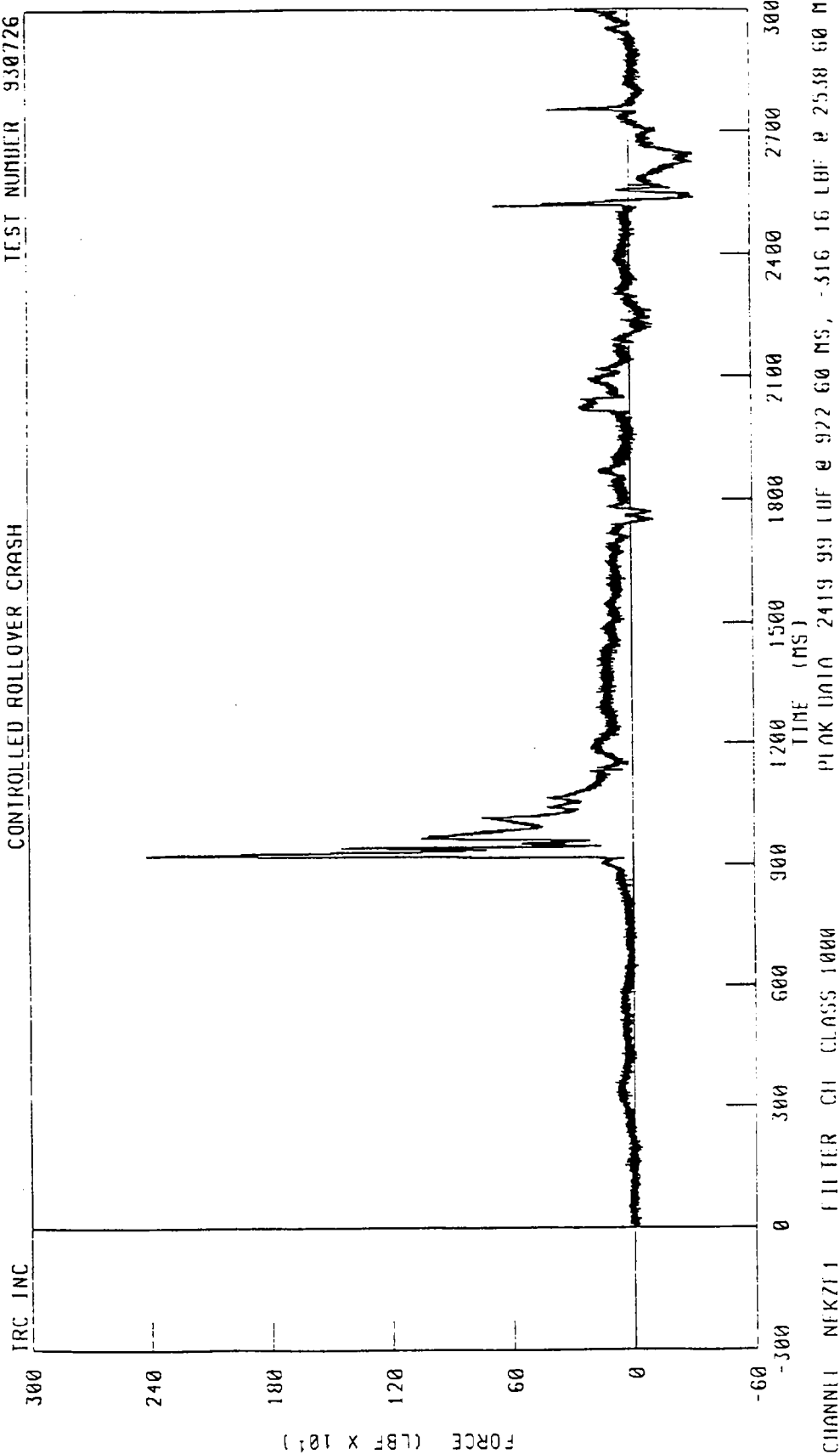
CHANNEL NEKYF1 FILTER CH CLASS 1000

TIME (MS)

PEAK DATA 251 90 LBF @ 935 90 MS, -1732 11 LBF @ 922 30 MS

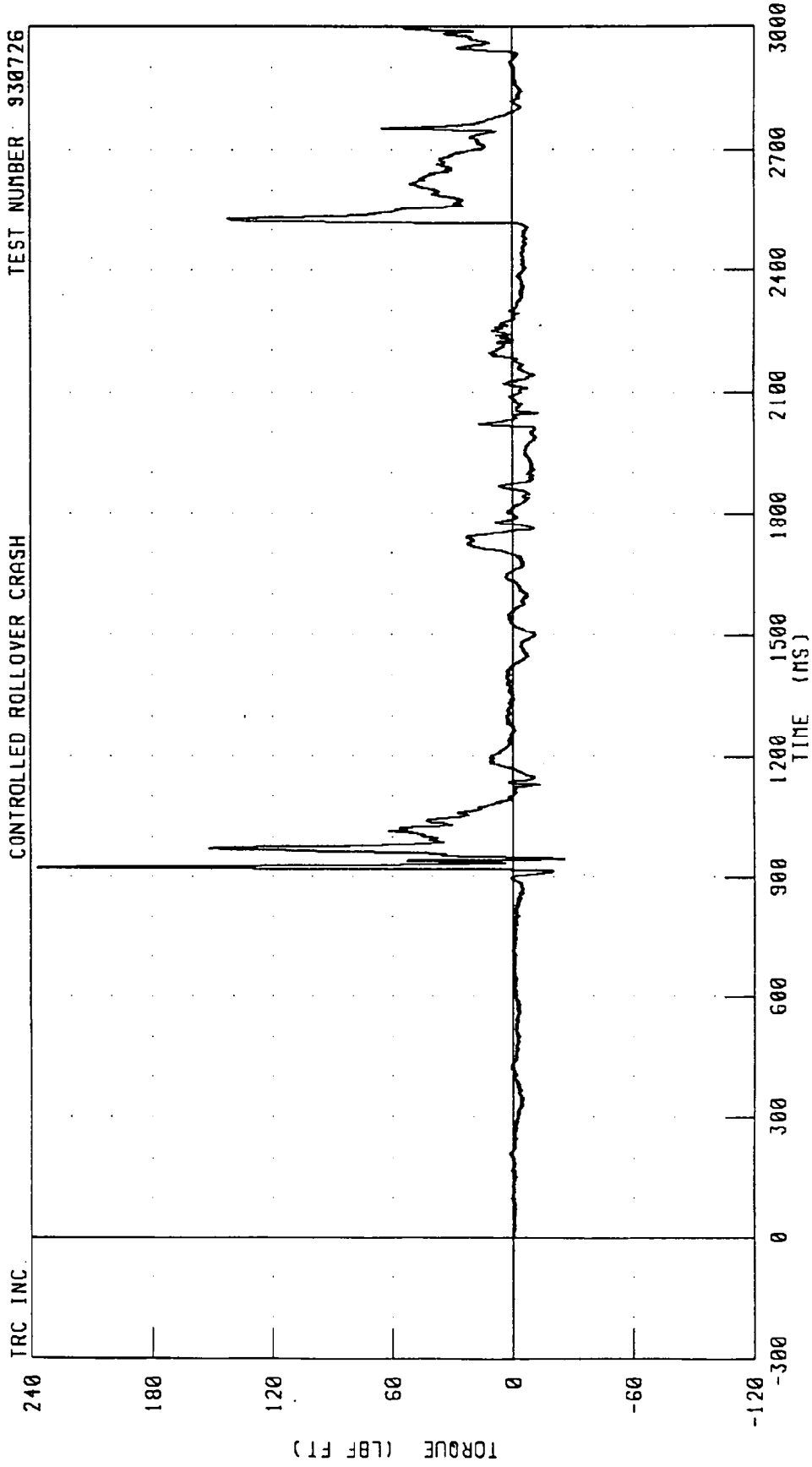
1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER NECK Z-AXIS AXIAL FORCE
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER NECK MOMENT ABOUT X-AXIS
CONTROLLED ROLLOVER CRASH
TEST NUMBER 930726

CORRECTED

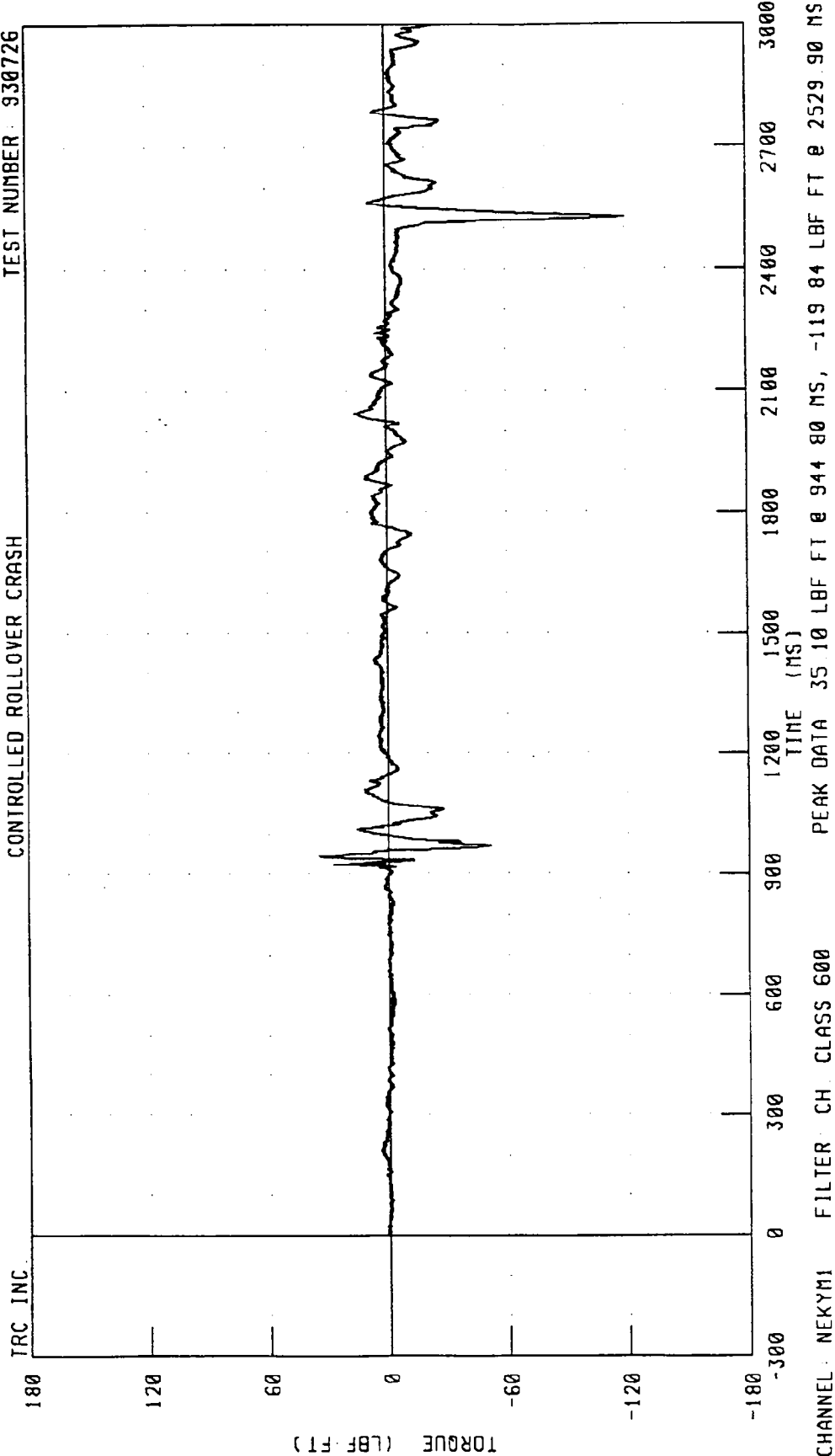


CHANNEL: NEKXM1 FILTER: CH CLASS 600 PEAK DATA: 236.71 LBF FT @ 923.70 MS, -25.88 LBF FT @ 945.90 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER NECK MOMENT ABOUT Y-AXIS
CONTROLLED ROLLOVER CRASH

CORRECTED

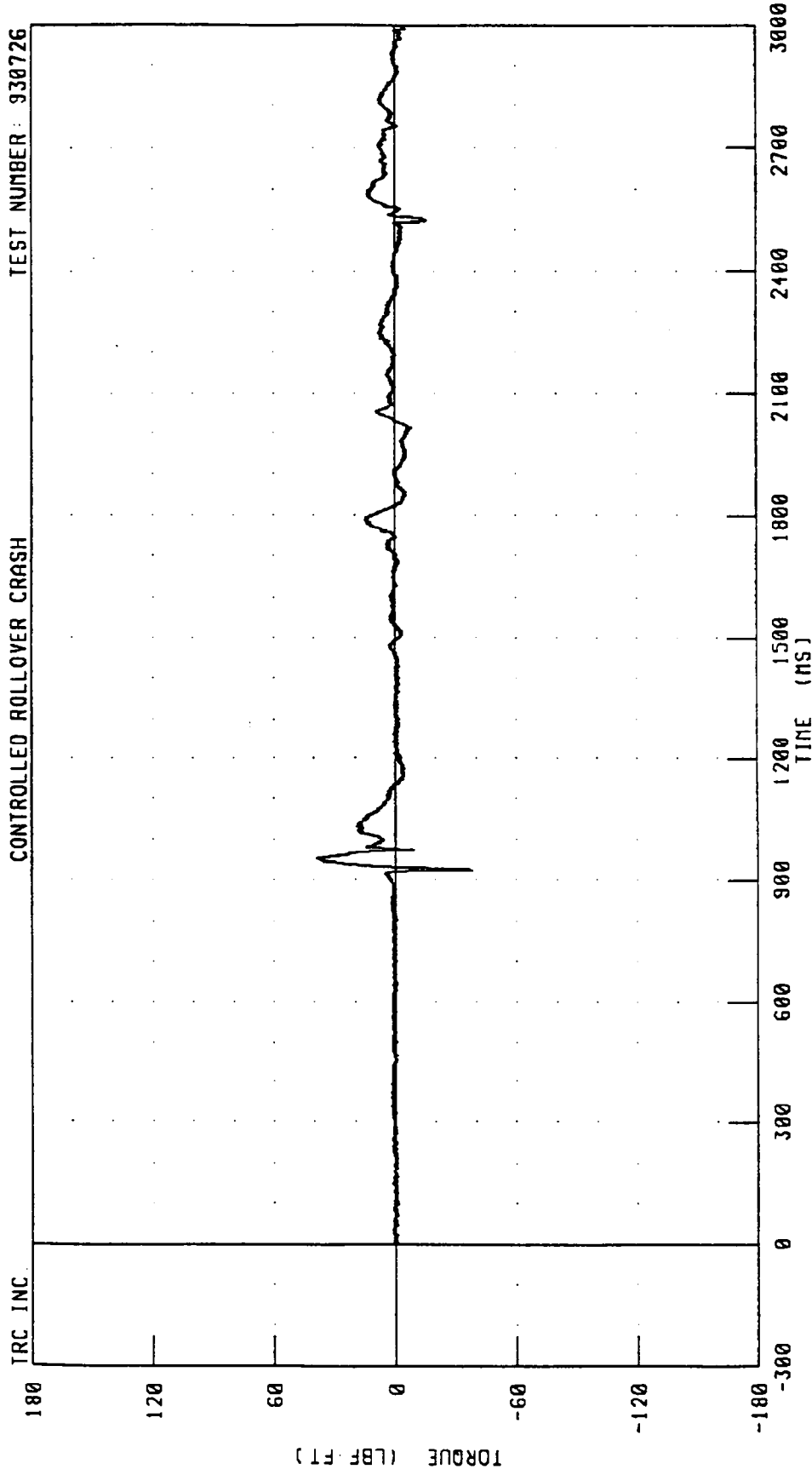
TEST NUMBER: 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER NECK MOMENT ABOUT Z-AXIS
CONTROLLED ROLLOVER CRASH

CORRECTED

TEST NUMBER: 930726

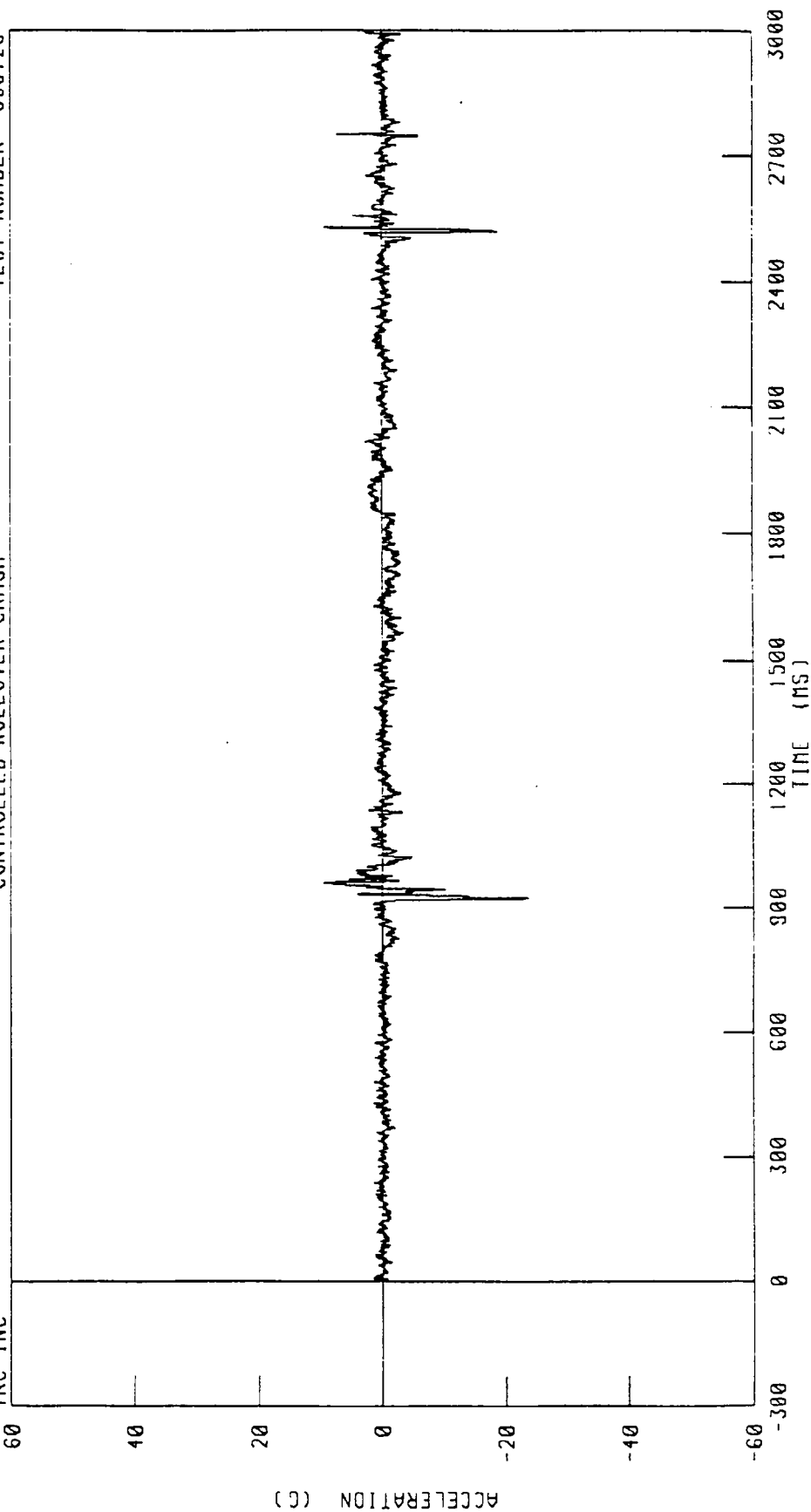


CHANNEL: NEKZM1 FILTER: CH CLASS 600 PEAK DATA: 39.05 LBF-FT @ 954.00 MS, -38.26 LBF-FT @ 923.30 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER CHEST X-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

IRC INC



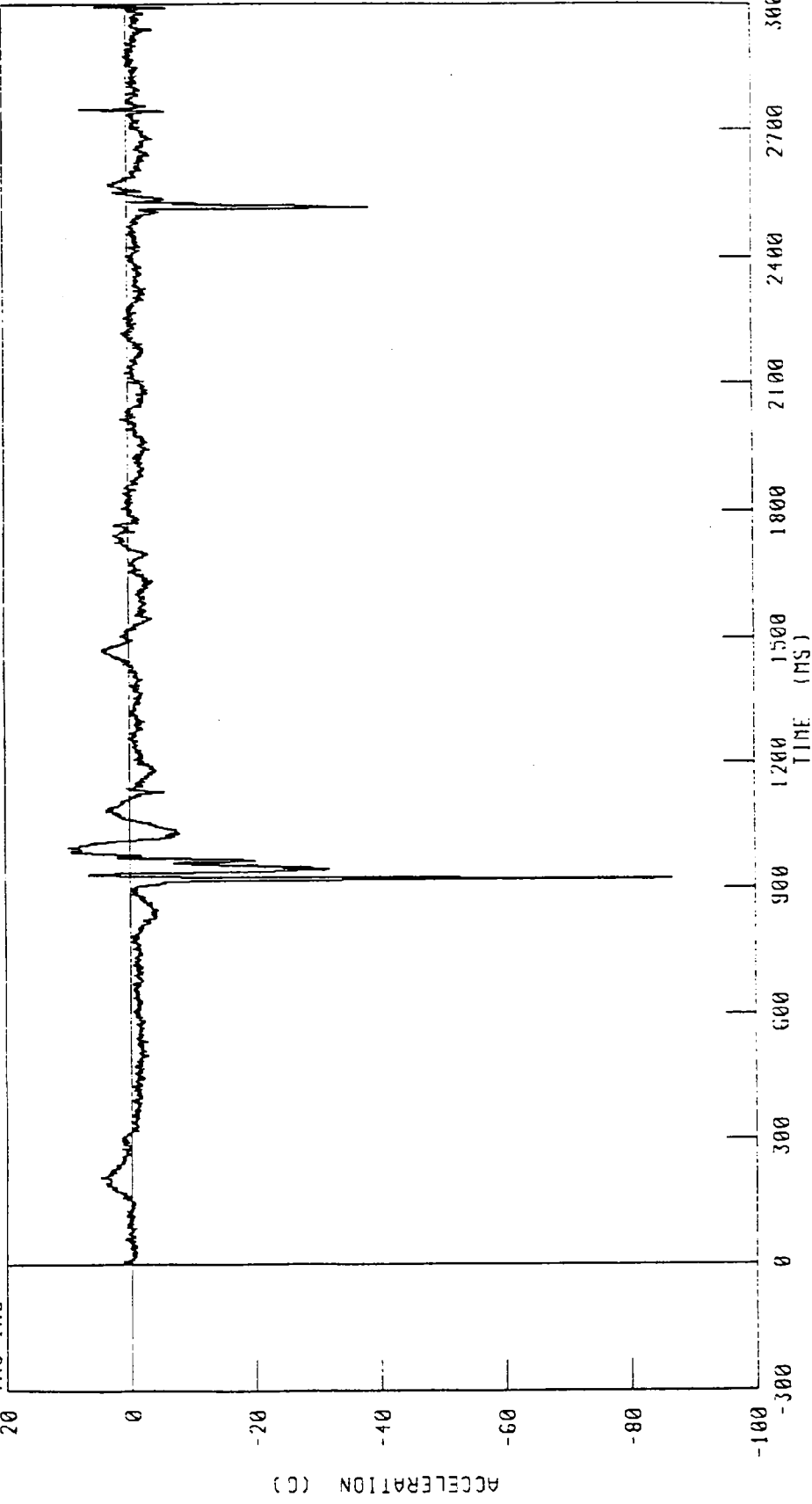
CHANNEL CSTXG1 FILTER CH CLASS 180 PEAK DATA 9 51 G @ 957 90 MS, -23 59 G @ 921 80 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER CHEST Y-AXIS ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH

TRC INC

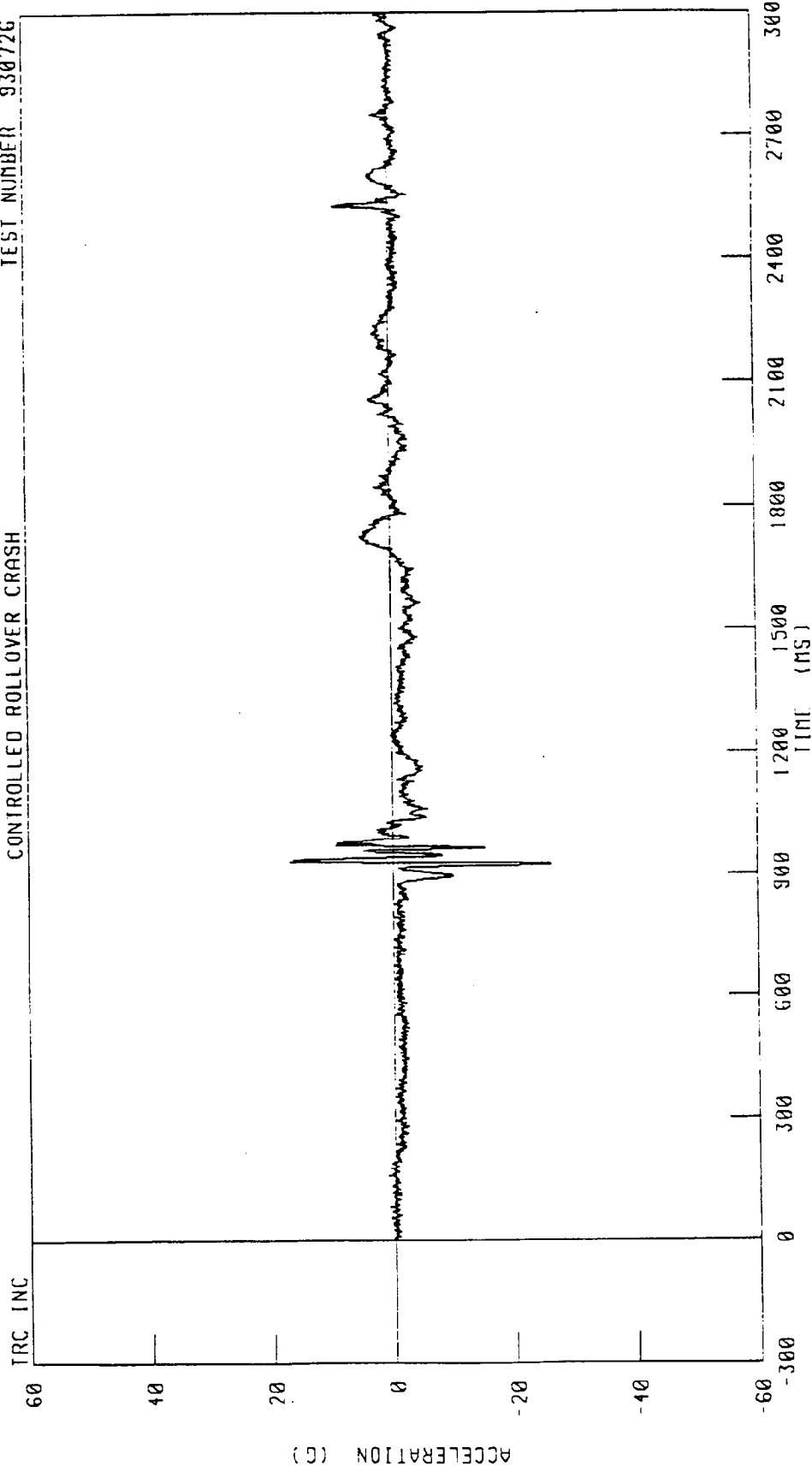


CHANNEL CSTYCI FILTER CH CLASS 180

PEAK DATA 9 89 G @ 997 10 MS, -86 78 G @ 921 90 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER CHEST Z-AXIS ACCELERATION
 CONTROLLED ROLLOVER CRASH

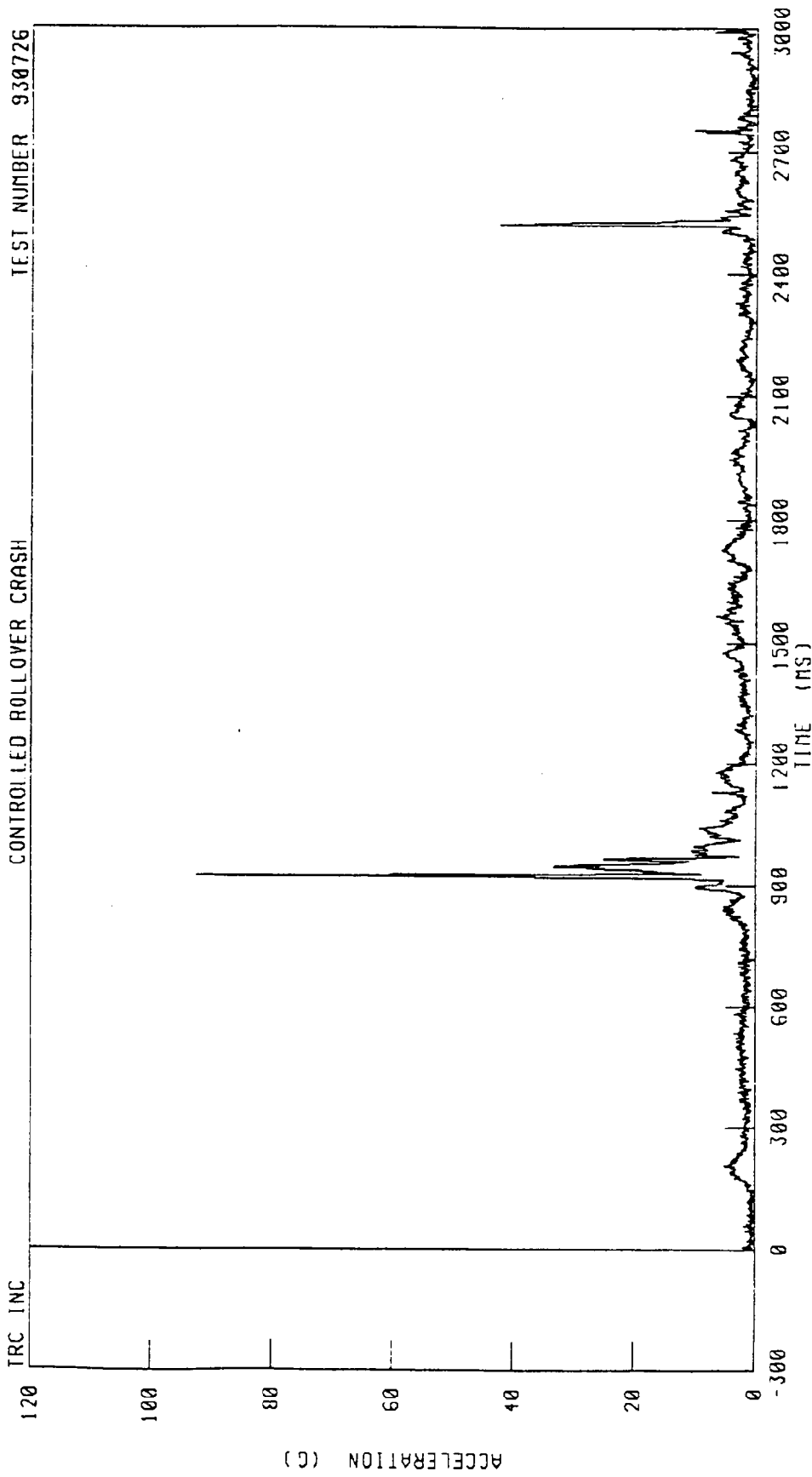
TEST NUMBER 930726



CHANNEL C512G1 FILTER CH CLASS 180

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER CHEST RESULTANT ACCELERATION
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



CHANNEL CSIRG1 FILTER CH CLASS 180

PEAK DATA 92 60 G @ 921 90 MS, 0 04 G @ 145 00 MS

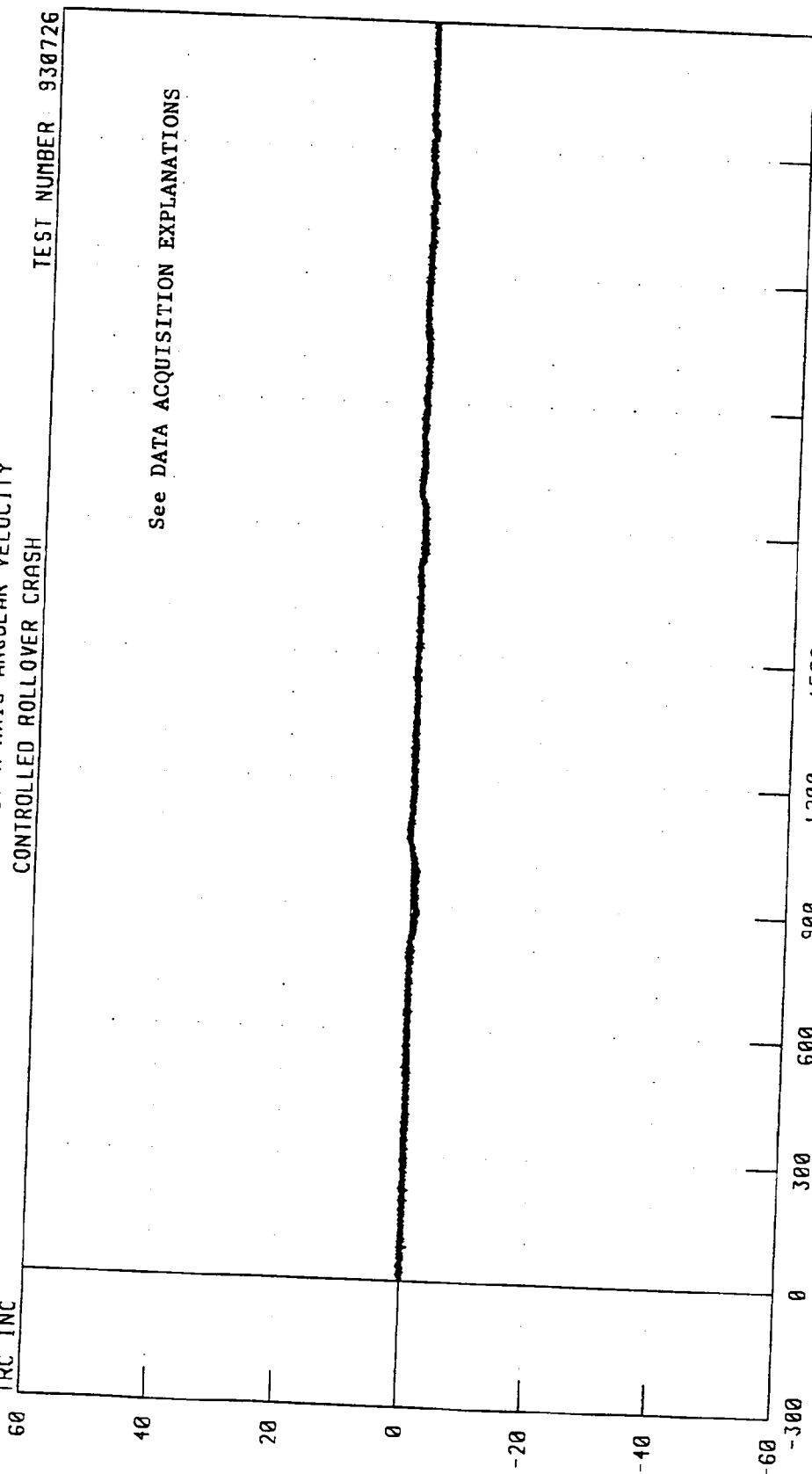
1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER CHEST X-AXIS ANGULAR VELOCITY
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

TRC INC

See DATA ACQUISITION EXPLANATIONS

ANGULAR VEL (RAD/S)

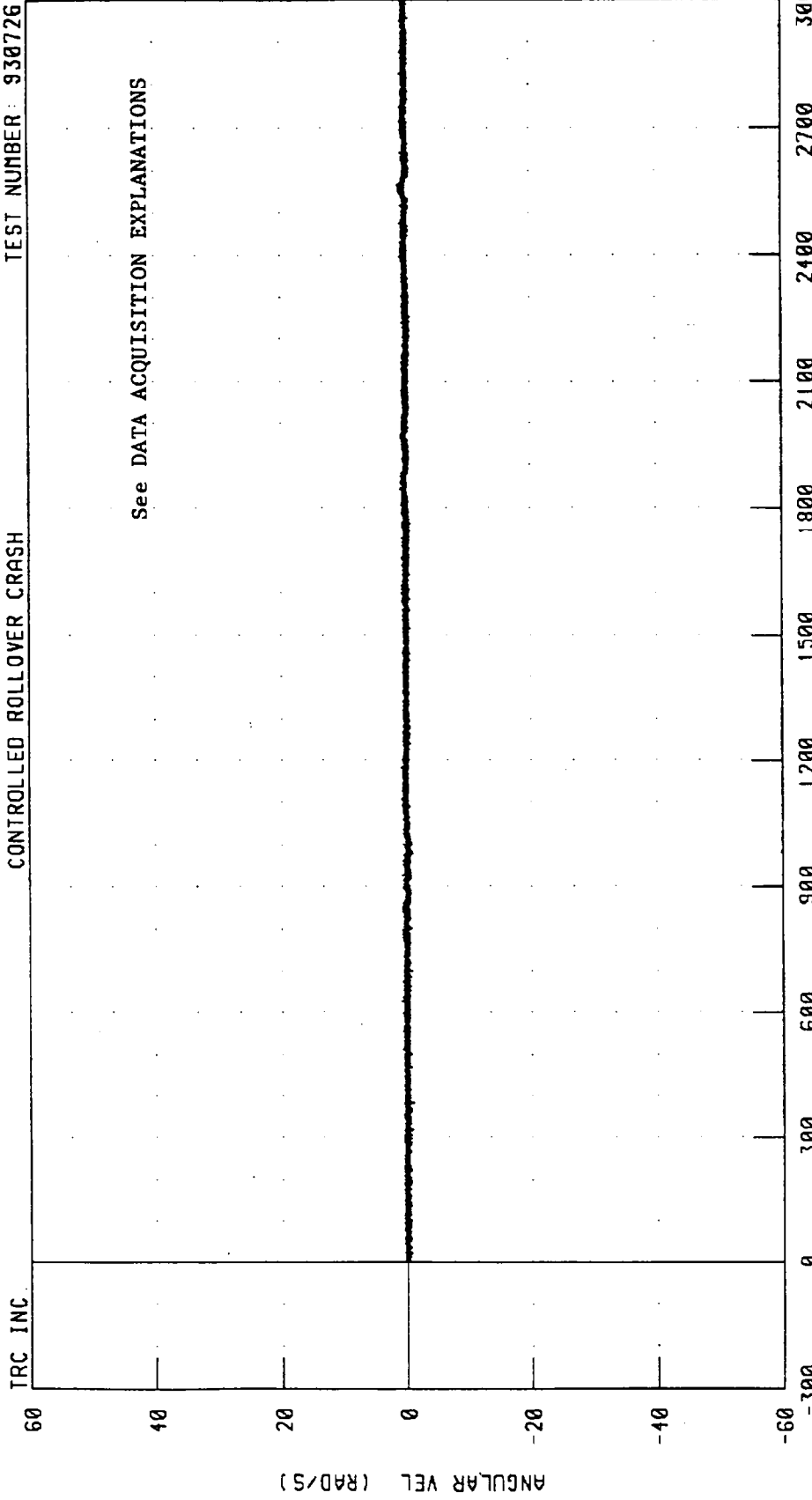


CHANNEL: CSXAV1 FILTER: CH CLASS 1000

PEAK DATA: 0.99 RAD/S @ 1082.30 MS, -1.37 RAD/S @ 882.00 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER CHEST Y-AXIS ANGULAR VELOCITY
CONTROLLED ROLLOVER CRASH

TEST NUMBER: 930726

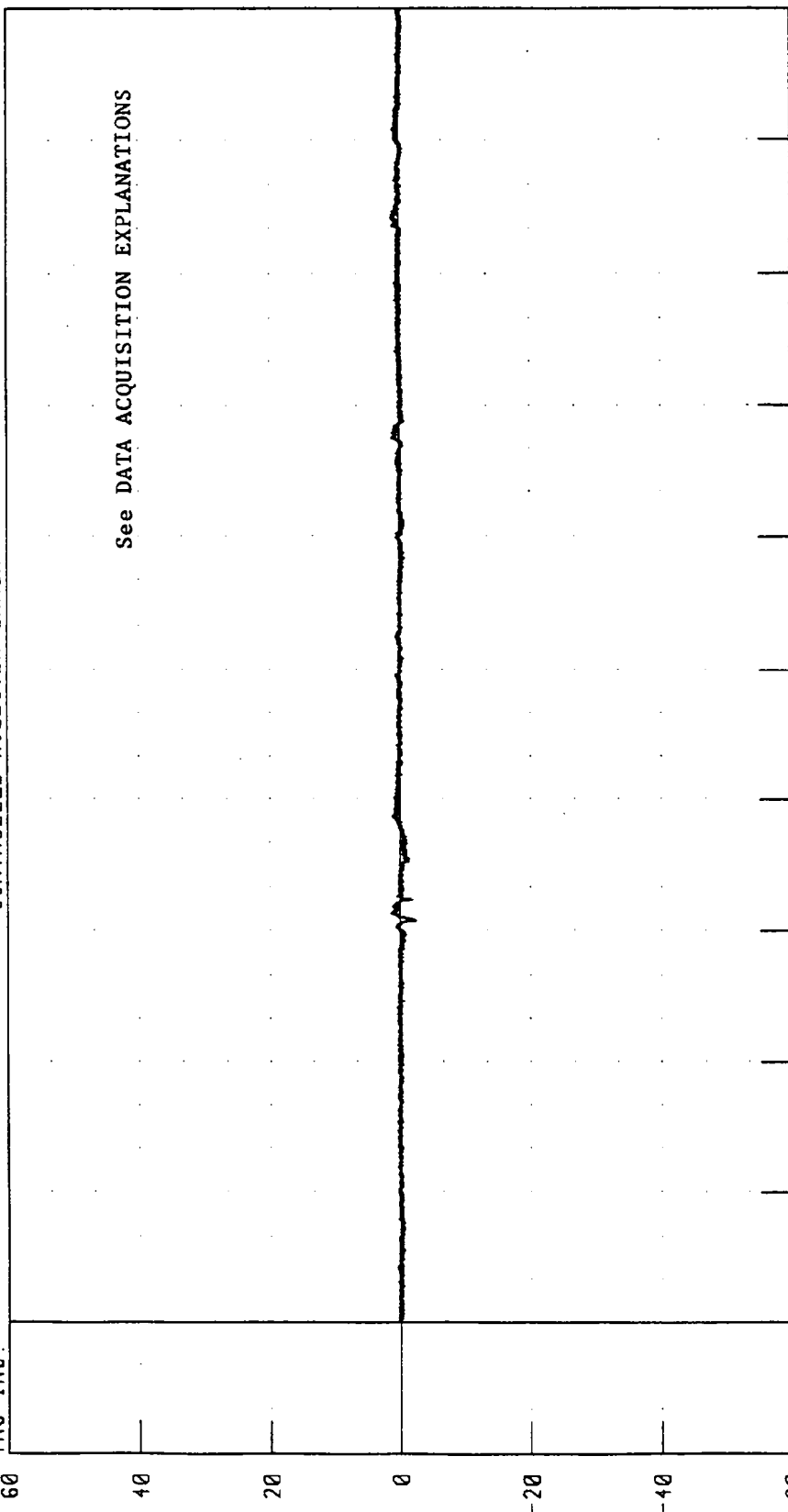


CHANNEL: CSYAV1 FILTER: CH CLASS 1000 PEAK DATA: 1 14 RAD/S @ 2567 70 MS, -0 97 RAD/S @ 982 00 NS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER CHEST Z-AXIS ANGULAR VELOCITY
CONTROLLED ROLLOVER CRASH

TEST NUMBER: 930726

TRC INC.

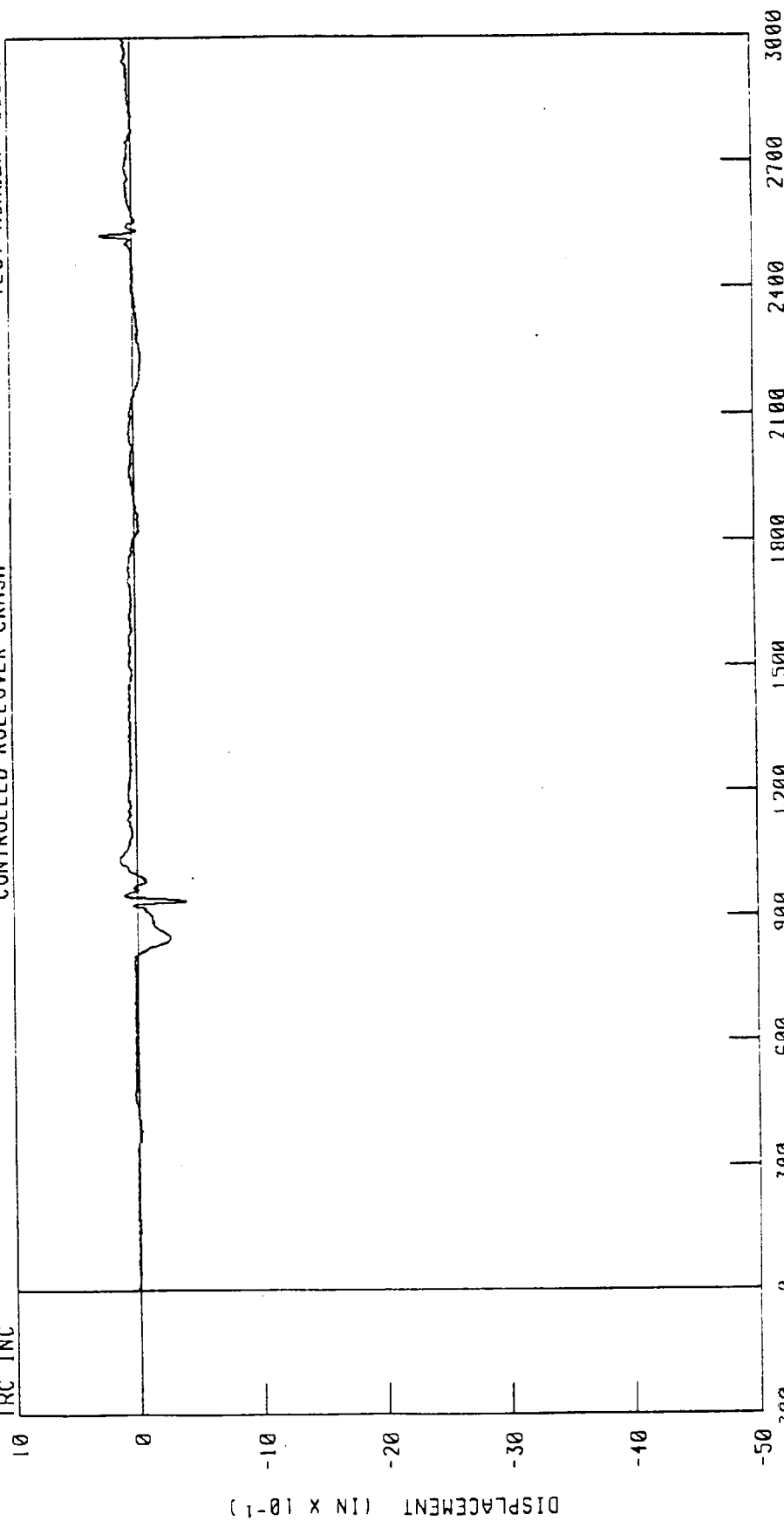


CHANNEL CSZAV1 FILTER CH CLASS 1000
TIME (MS)
PEAK DATA: 1.38 RAD/S @ 940.80 MS, -2.48 RAD/S @ 923.60 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER CHEST DEFLECTION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

TRC INC



CHANNEL CSTXD1 FILTER CH CLASS 180

PEAK DATA 0.26 IN @ 2520 MS, -0.39 IN @ 936.70 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER PELVIS X-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

IRC INC

60

40

20

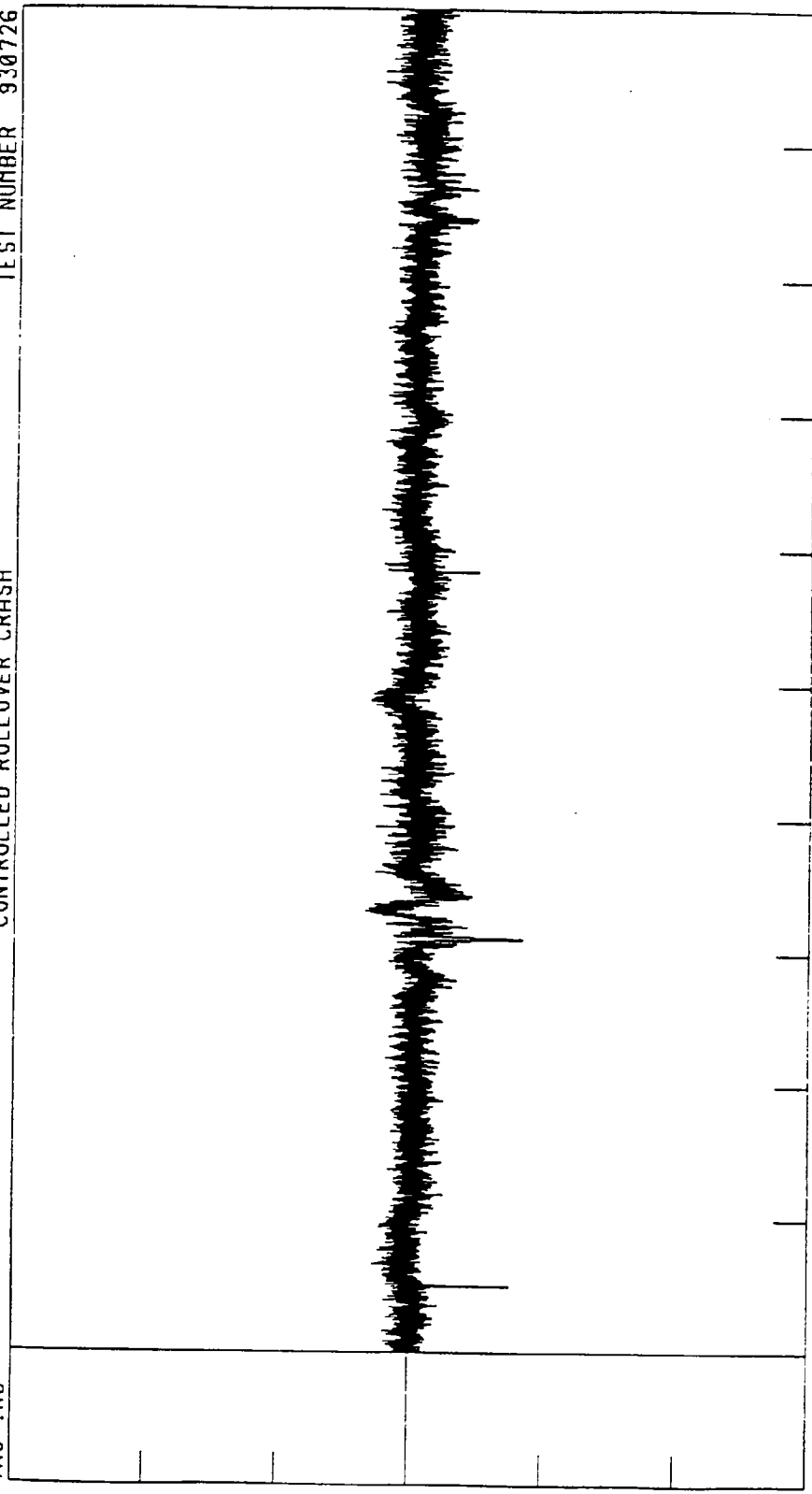
0

-20

-40

-60

ACCELERATION (G)

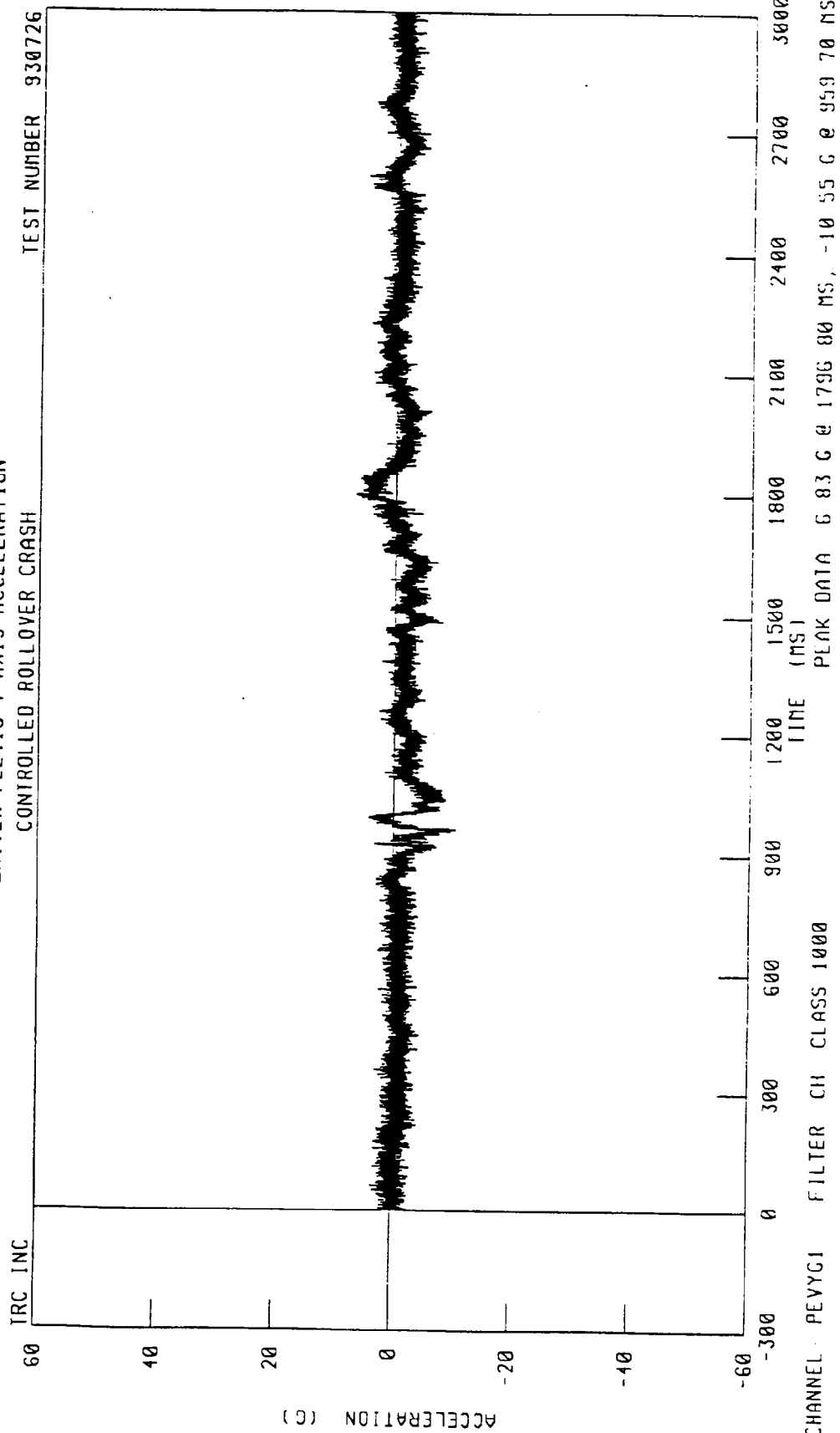


CHANNEL PEVXG1 FILTER CH CLASS 1000
TIME (MS)
PEAK DATA 6 91 G @ 990 80 MS, -17 00 G @ 929 90 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER PELVIS Y-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

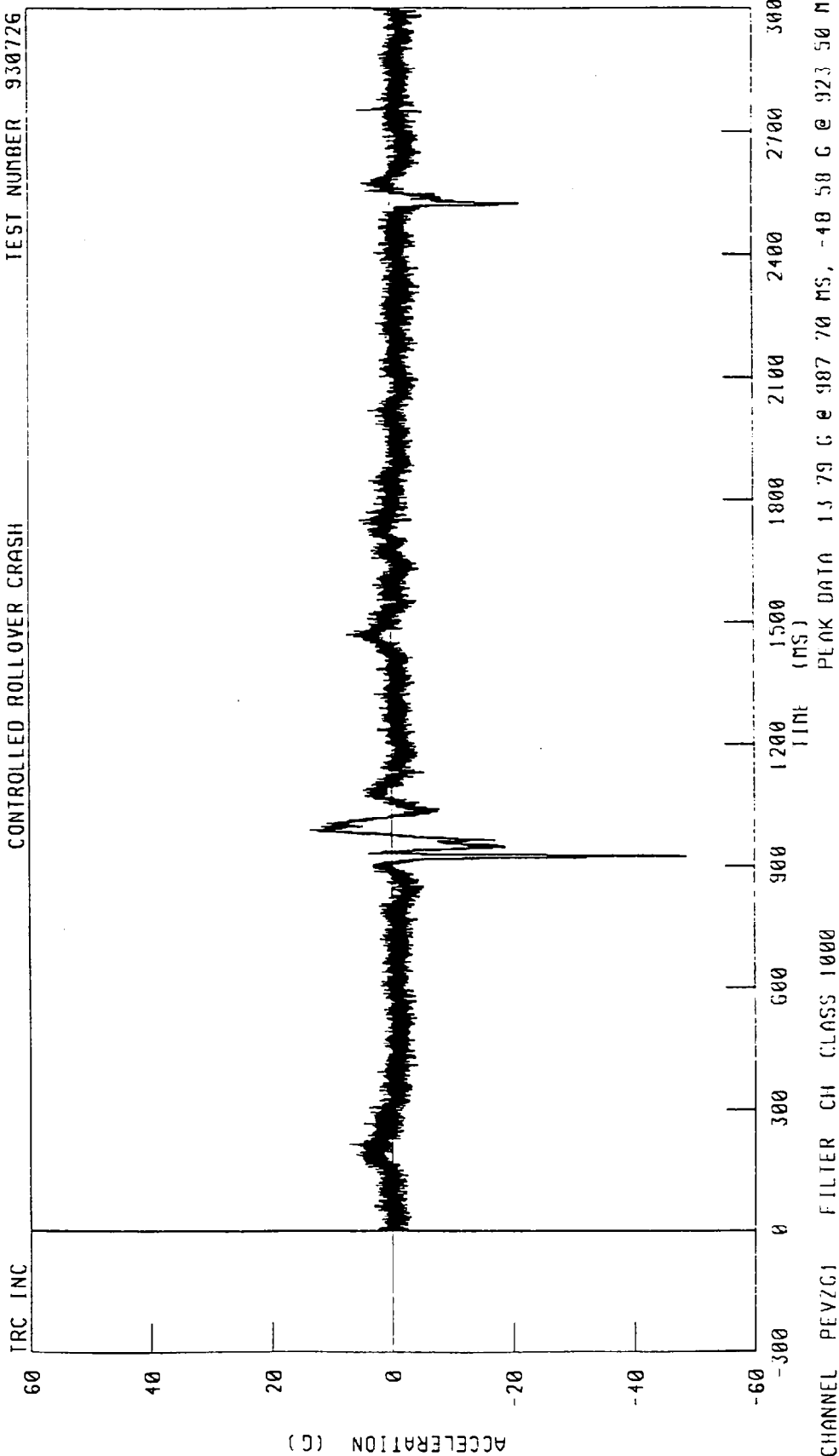
TEST NUMBER 930726

IRC INC



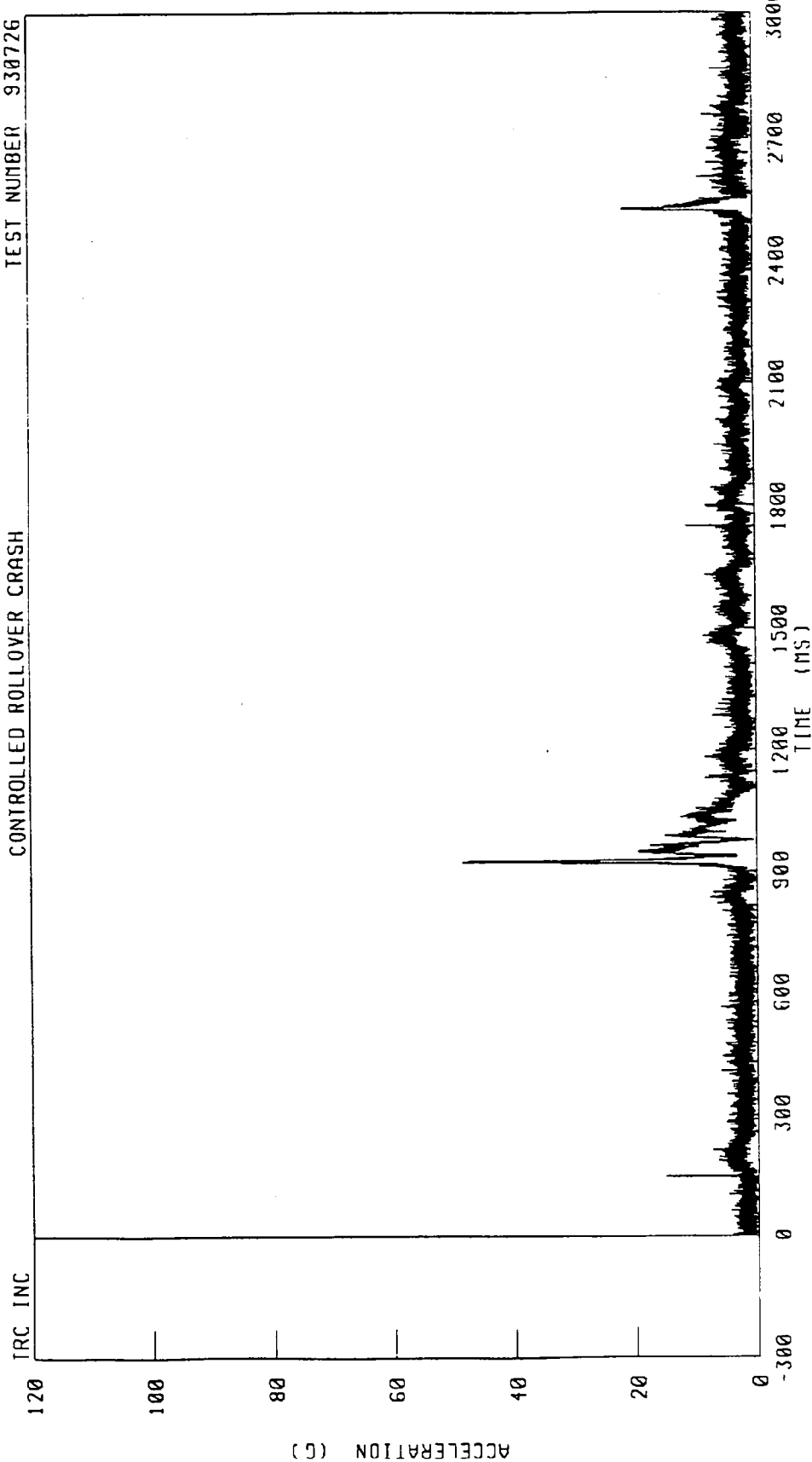
1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER PELVIS Z-AXIS ACCELERATION
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
DRIVER PELVIS RESULTANT ACCELERATION
CONTROLLED ROLLOVER CRASH

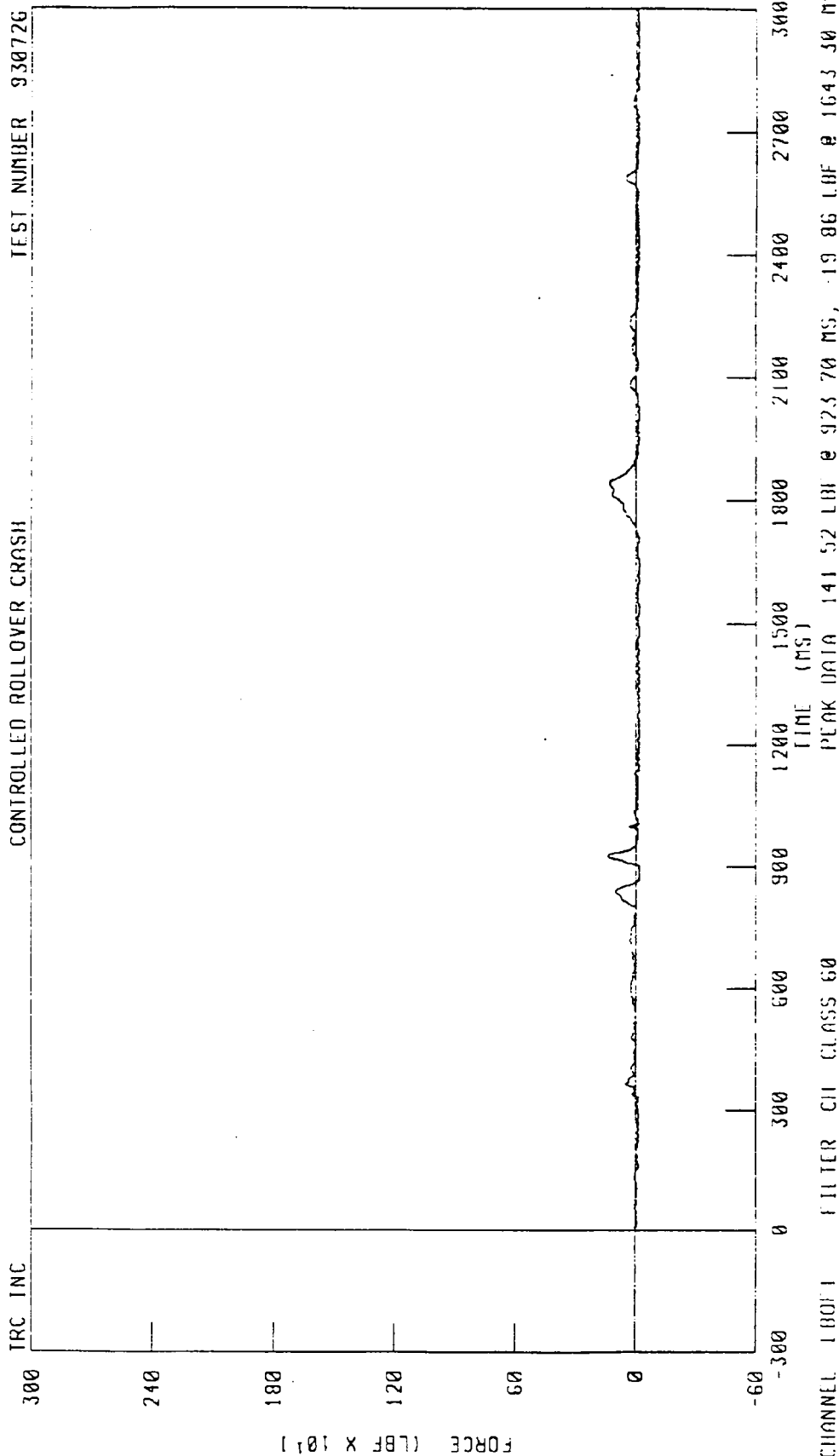
TEST NUMBER 930726



CHANNEL PELVIR1 FILTER CH CLASS 1000 PEAK DATA 48 59 G @ 923 50 MS, 0 06 G @ 129 20 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER LAP BELT FORCE
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER SHOULDER BELT FORCE
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

TRC INC

300

240

180

120

60

0

-60

FORCE (LBF X 10³)

See DATA ACQUISITION EXPLANATIONS

TIME (MS)

1200

1500

1800

2100

2400

2700

3000

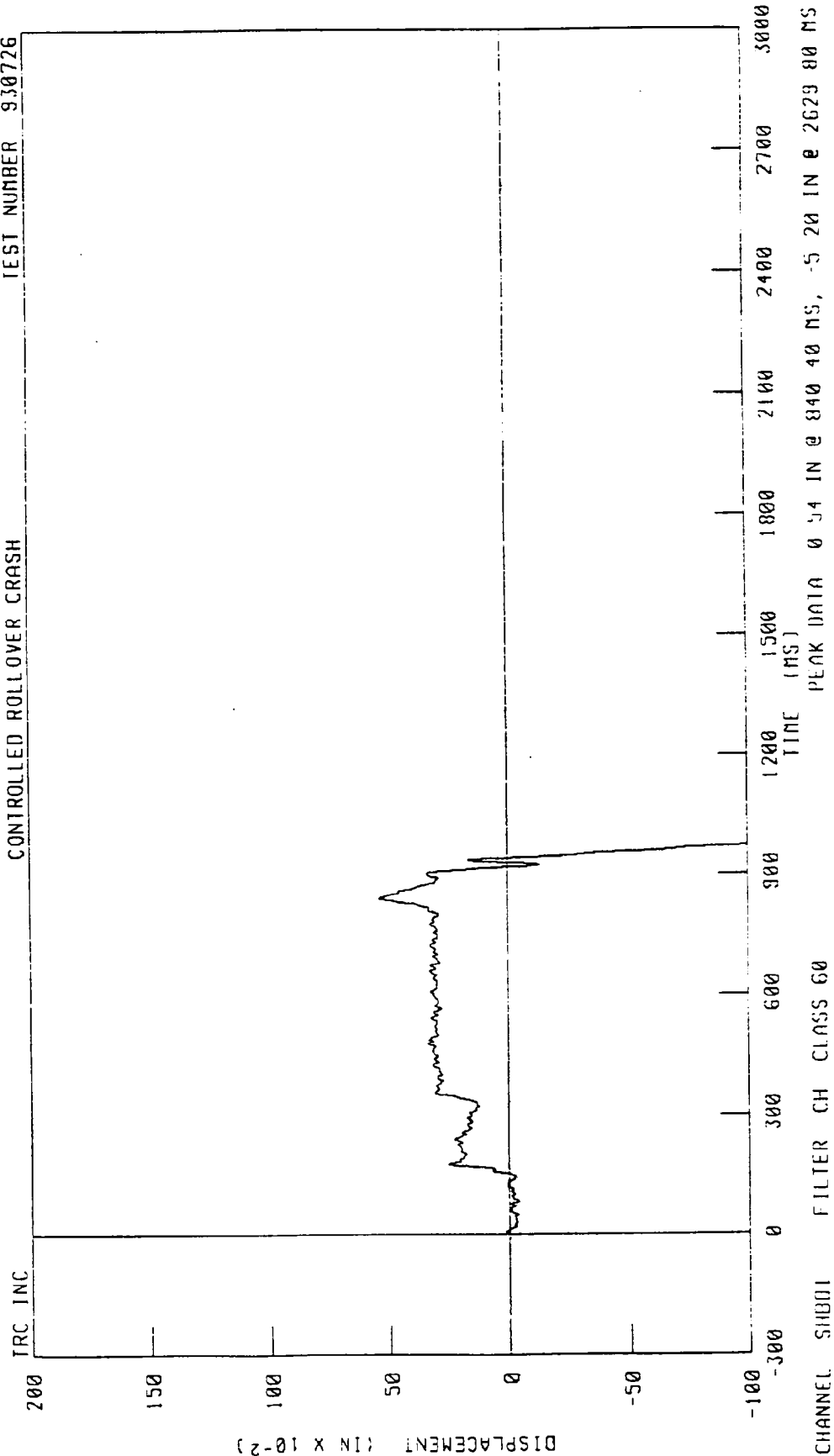
PEAK DATA 3081 51 LBF @ 2769 40 MS, -3536 10 LBF @ 2776 30 MS

CHANNEL SHOFT1

FILTER CH CLASS 60

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 DRIVER SHOULDER BELT DISPLACEMENT
 CONTROLLED ROLLOVER CRASH

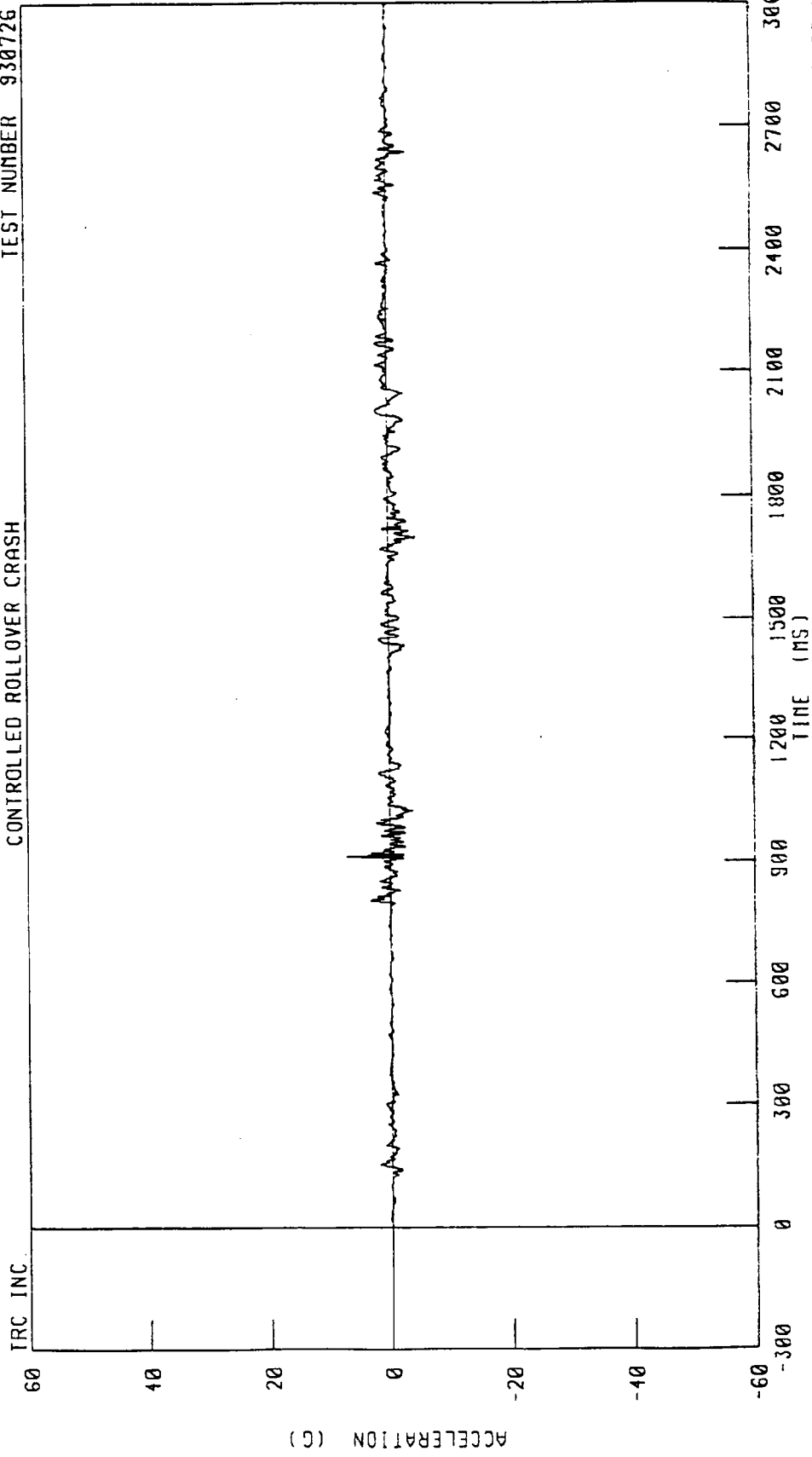
TEST NUMBER 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
VEHICLE CENTER OF GRAVITY X-AXIS ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH



CHANNEL VCCXG1 FILTER CH CLASS 60

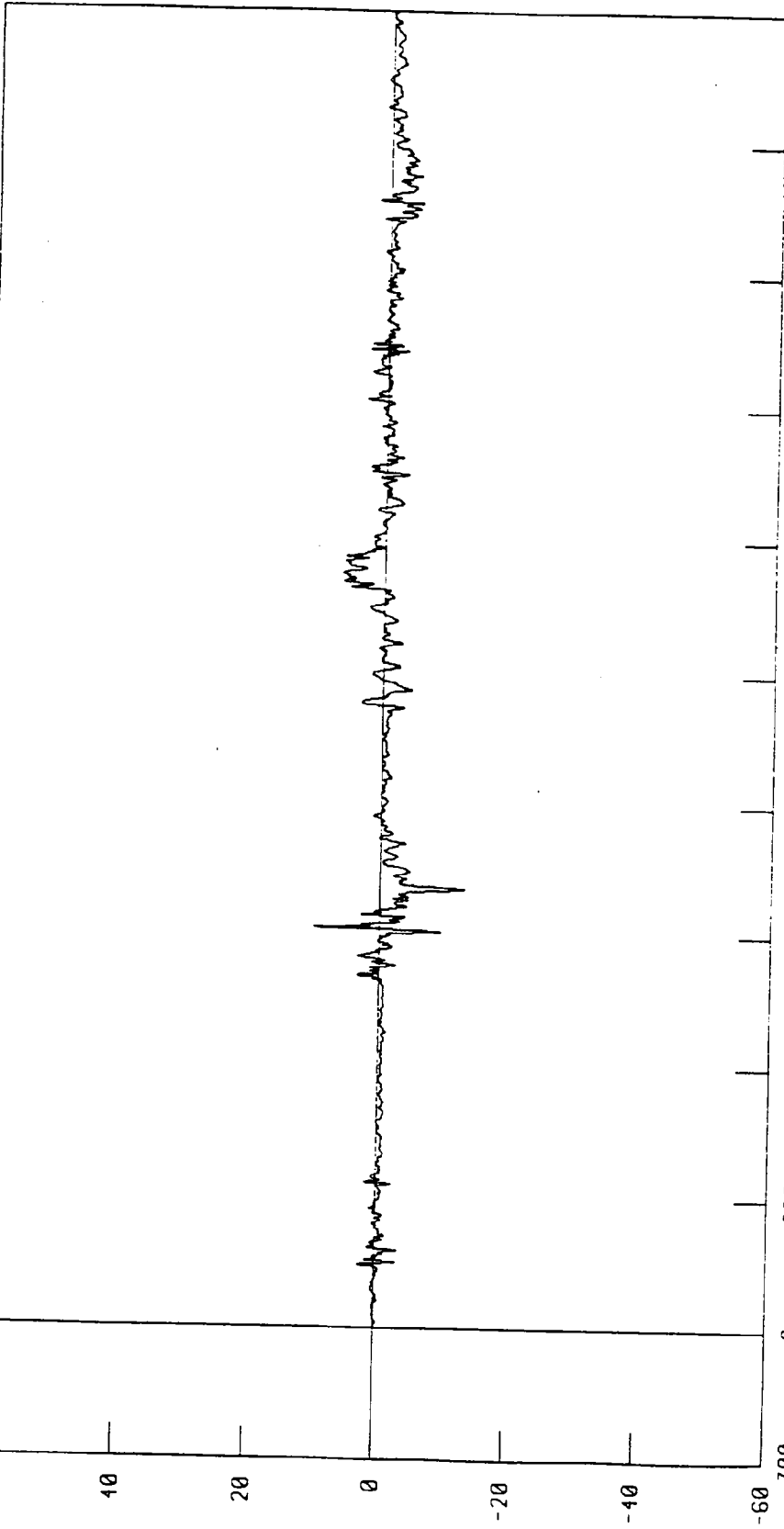
PEAK DATA 7.34 G @ 912.30 MS, -4.53 G @ 1699.20 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
VEHICLE CENTER OF GRAVITY Y-AXIS ACCELERATION

TRC INC
60
40
20
0
-20
-40
-60

CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



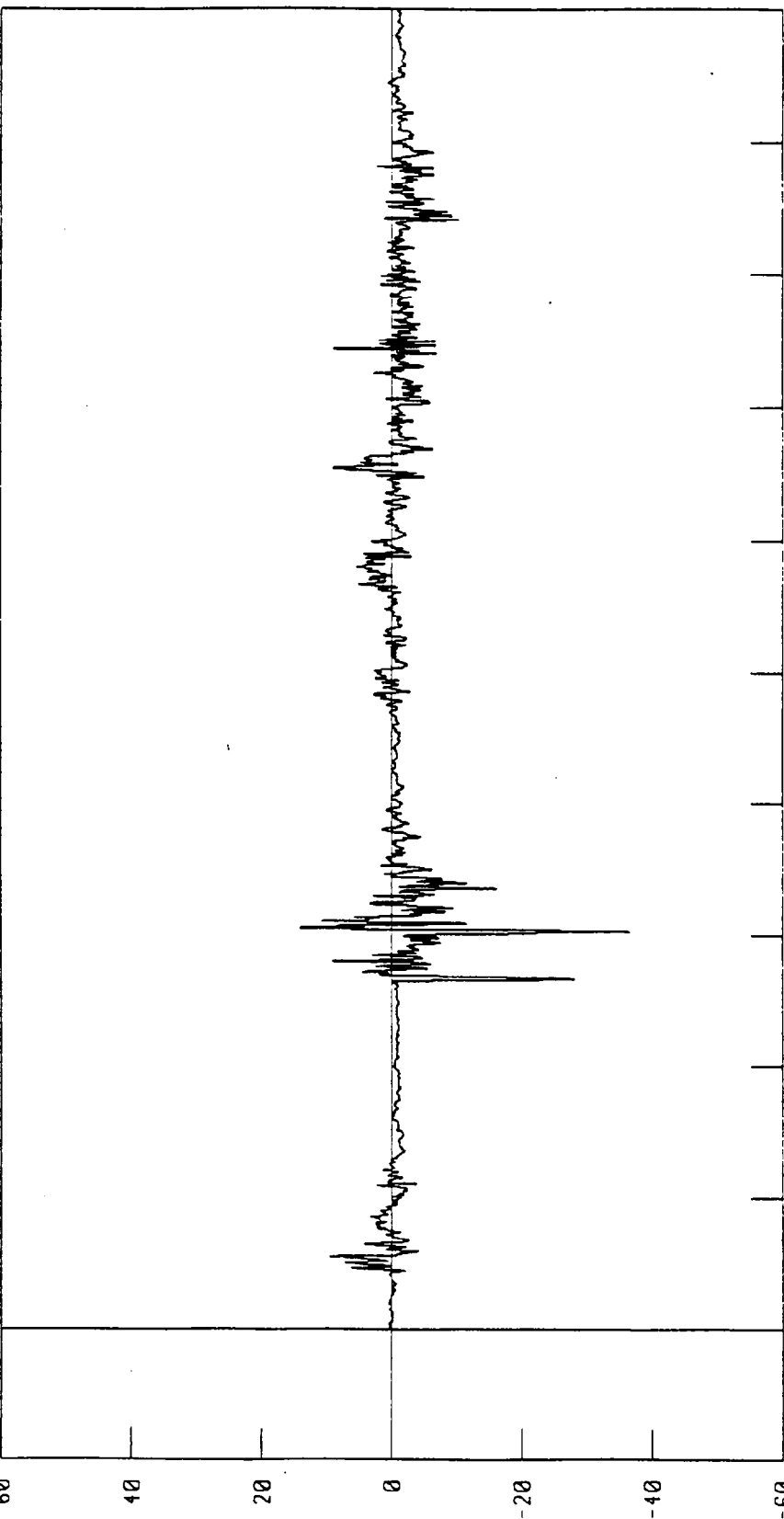
CHANNEL VCCY01 FILTER CH CLASS 60
TIME (MS)
PEAK DATA 10 17 G @ 911 80 MS, -13 05 G @ 1001 00 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
VEHICLE CENTER OF GRAVITY Z-AXIS ACCELERATION

CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

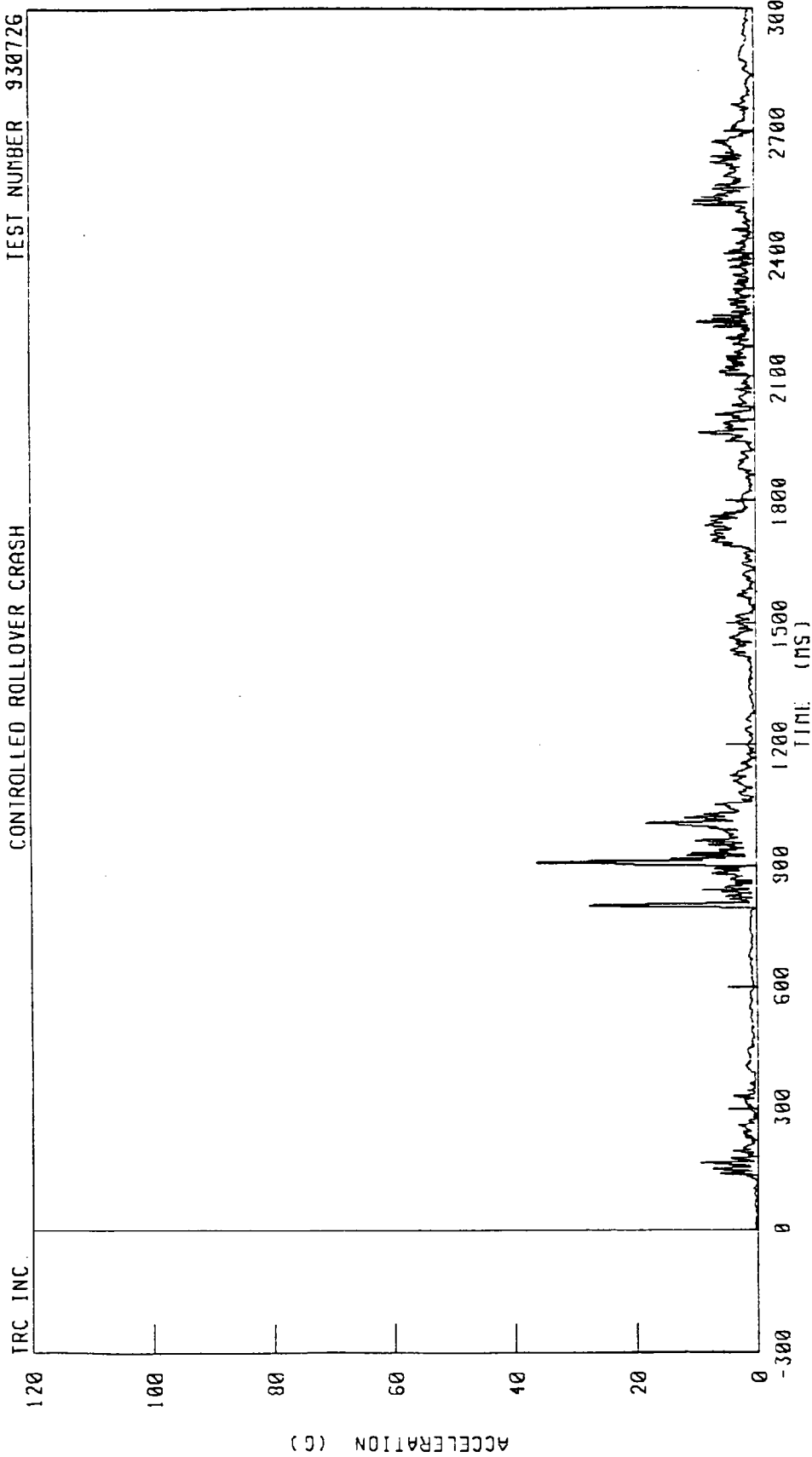
IRC INC



CHANNEL VCG2G1 FILTER CH CLASS 60
PEAK DATA 14 17 G @ 916 20 MS, -36 31 G @ 908 50 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 VEHICLE CENTER OF GRAVITY RESULTANT ACCELERATION
 CONTROLLED ROLLOVER CRASH

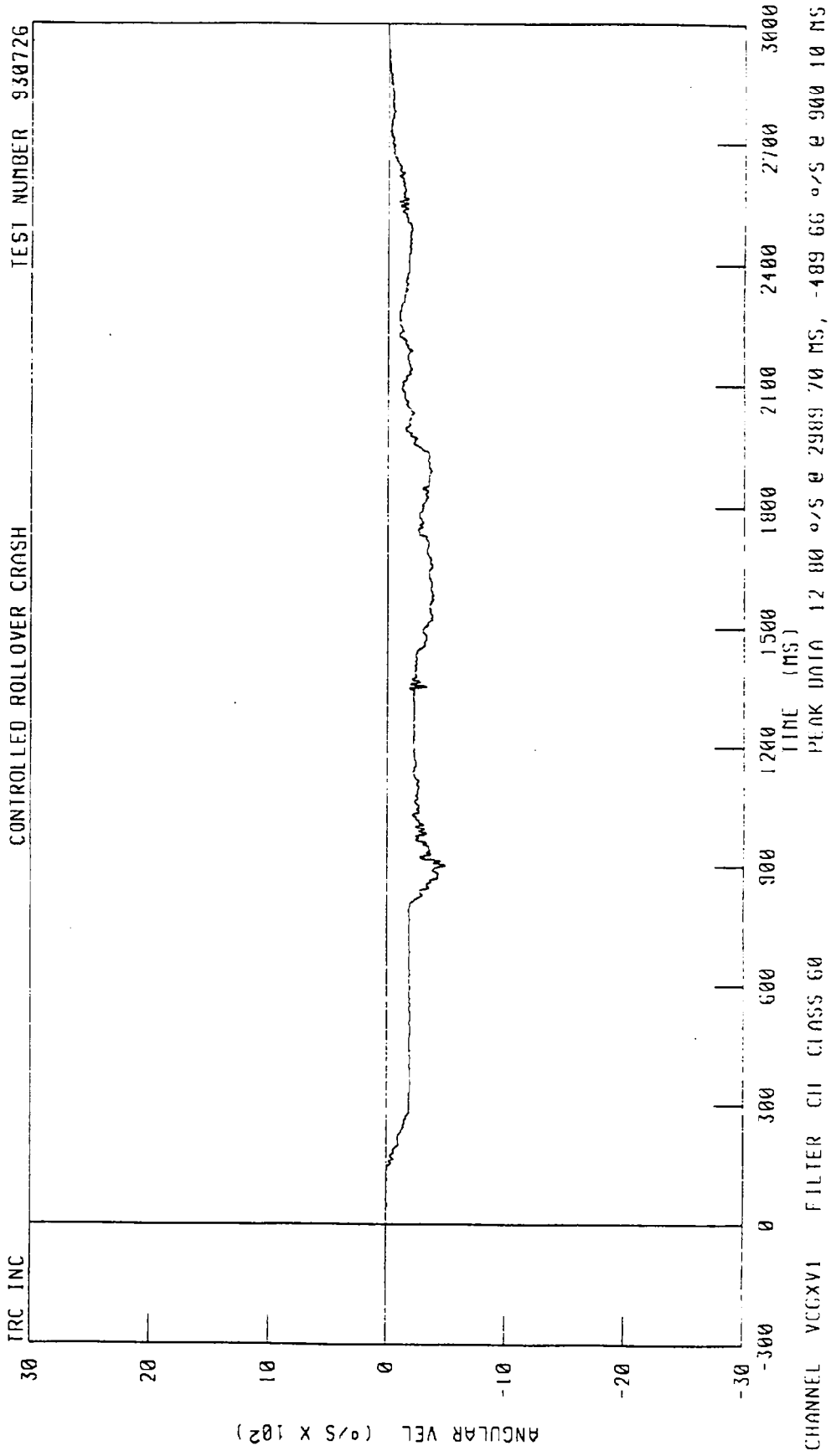
TEST NUMBER 930726



CHANNEL VCGRG1 FILTER CH1 CLASS 60 PEAK DATA 36.47 G @ 900.40 MS, 0.03 G @ 1860.40 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 VEHICLE ROLL RATE
 CONTROLLED ROLLOVER CRASH

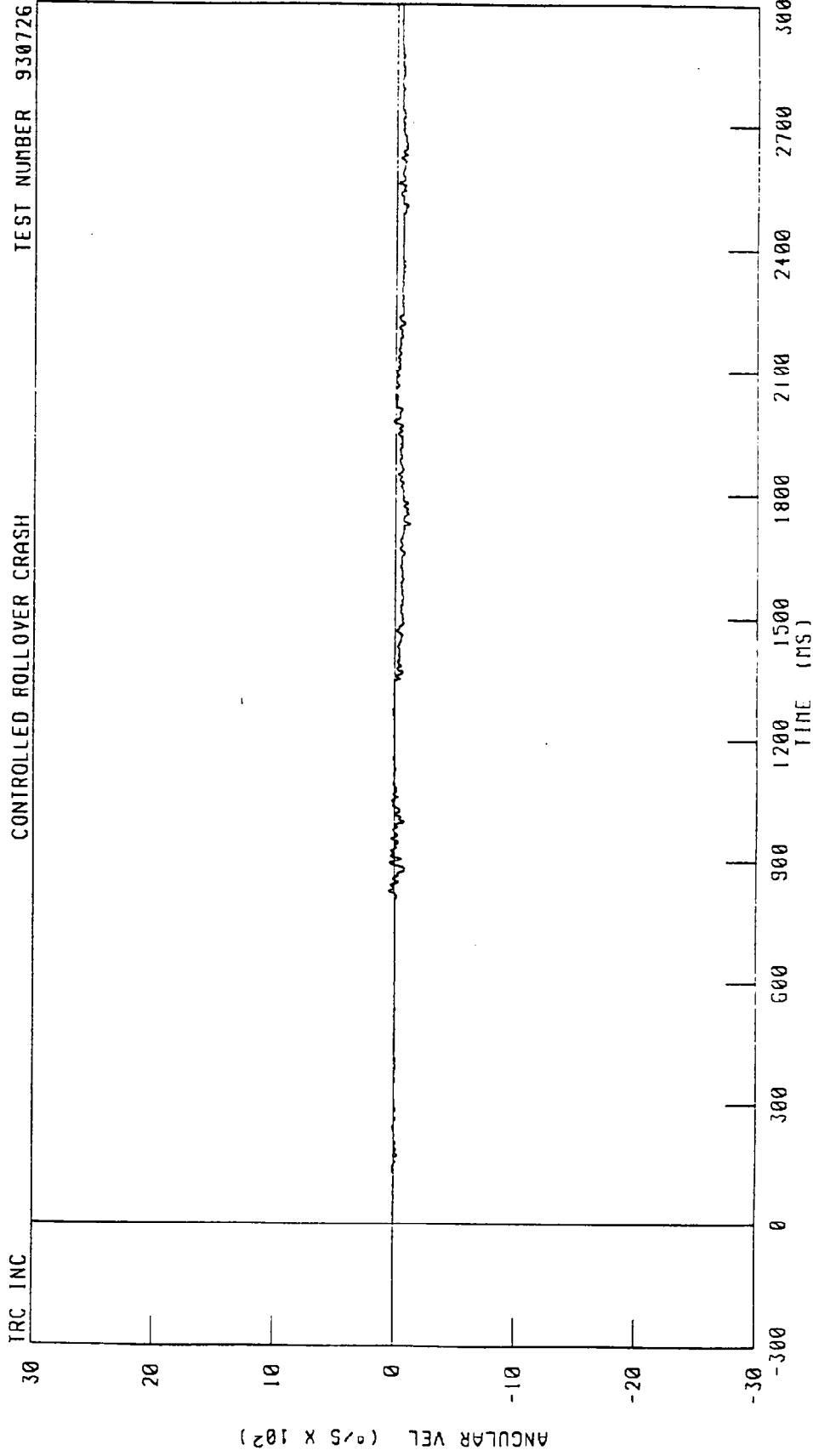
TEST NUMBER 930726



CHANNEL VCCXVI FILTER CH CLASS 60
 PEAK DATA 12 00 $^{\circ}/s$ @ 2989 70 MS, -489 60 $^{\circ}/s$ @ 900 10 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 VEHICLE PITCH RATE
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



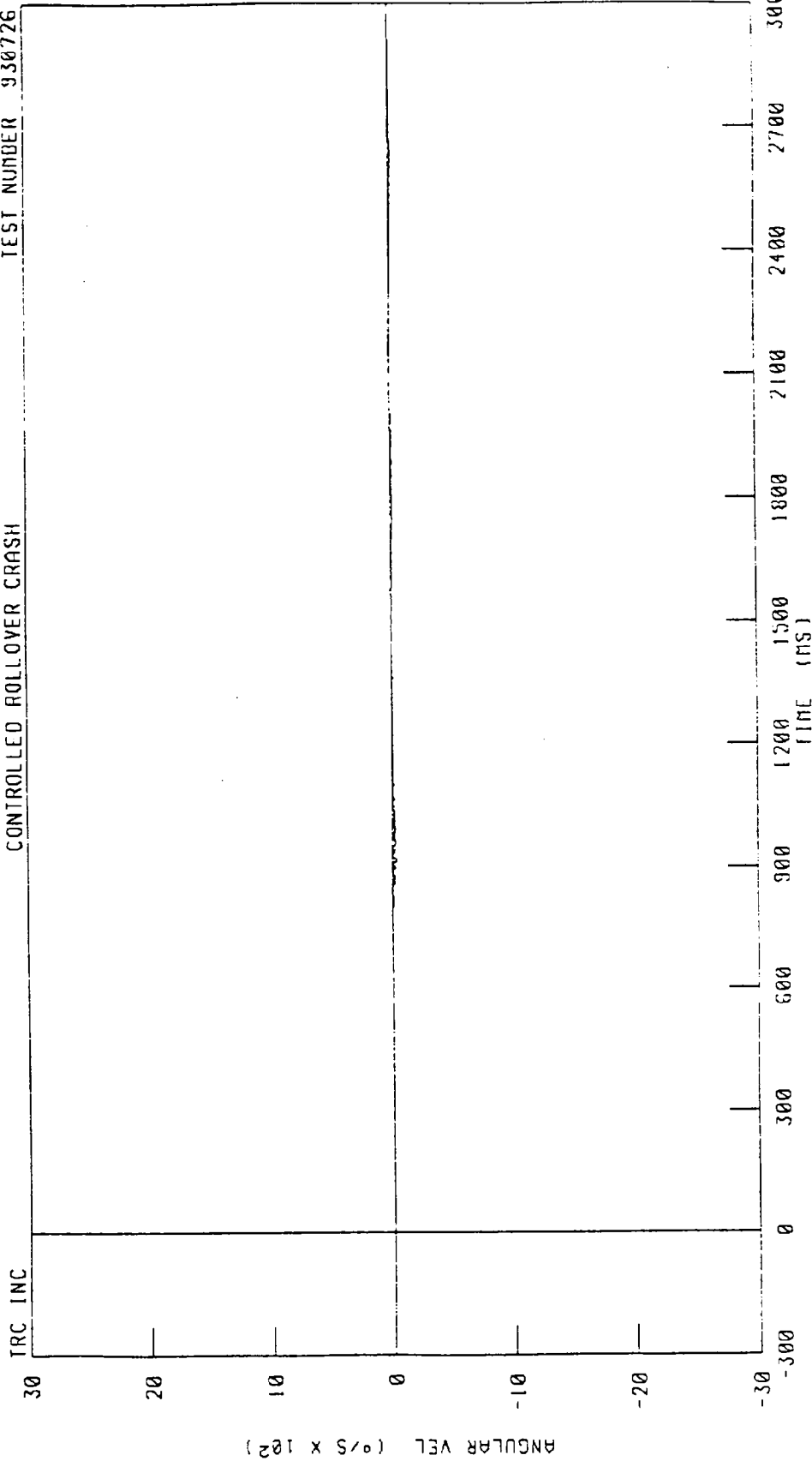
CHANNEL VCGYV1 FILTER CH CLASS 60 PEAK DATA 48 75 °/S @ 824 60 MS, -119 27 °/S @ 1728 80 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH

VEHICLE YAW RATE

CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



ANGULAR VEL (°/S X 10²)

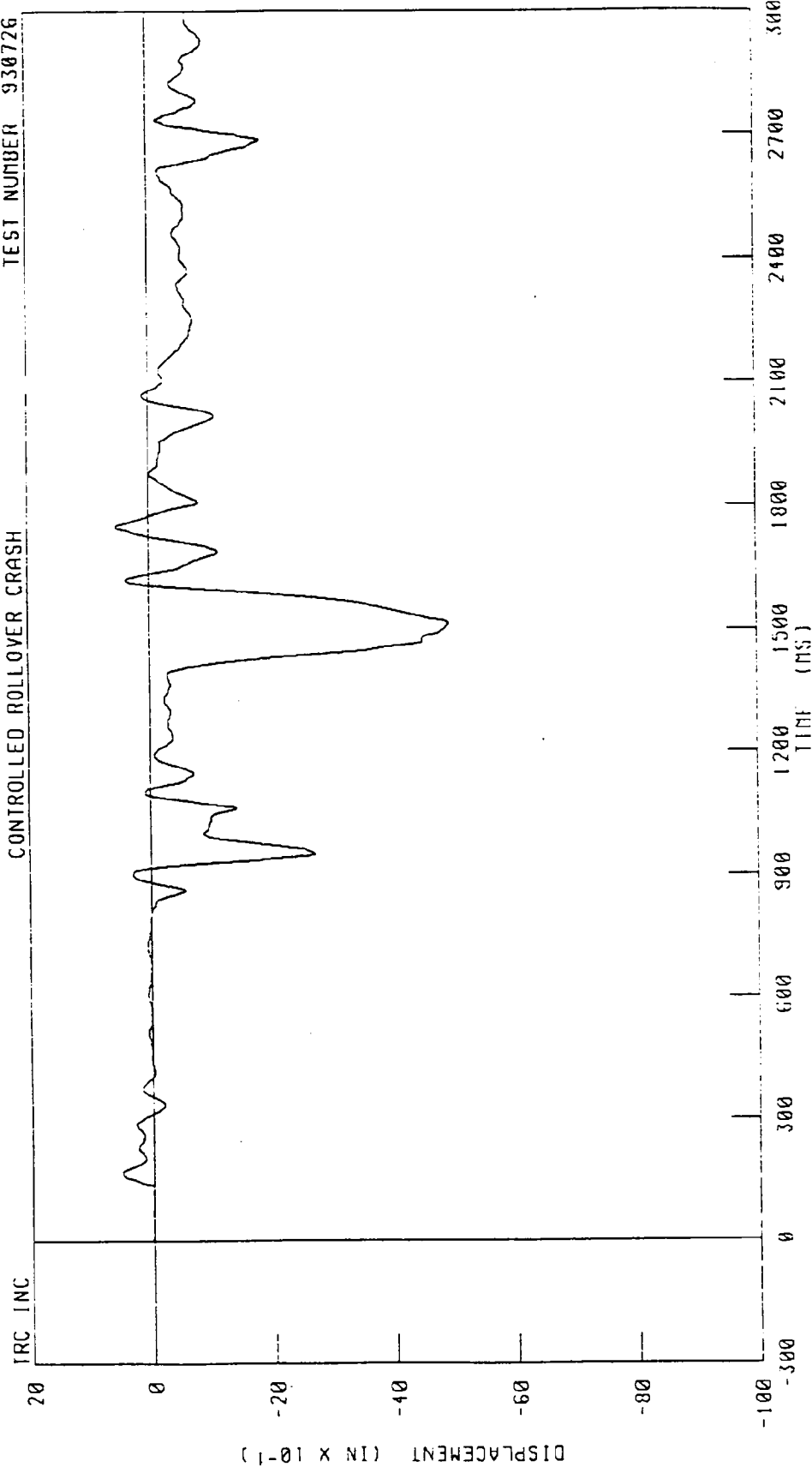
TIME (MS)

PEAK DATA 9 23 °/S @ 1576 MS, -34 02 °/S @ 915 80 MS

CHANNEL VCC2V1 FILTER CH CLASS 60

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 VEHICLE LEFT FRONT SUSPENSION DISPLACEMENT
 CONTROLLED ROLLOVER CRASH

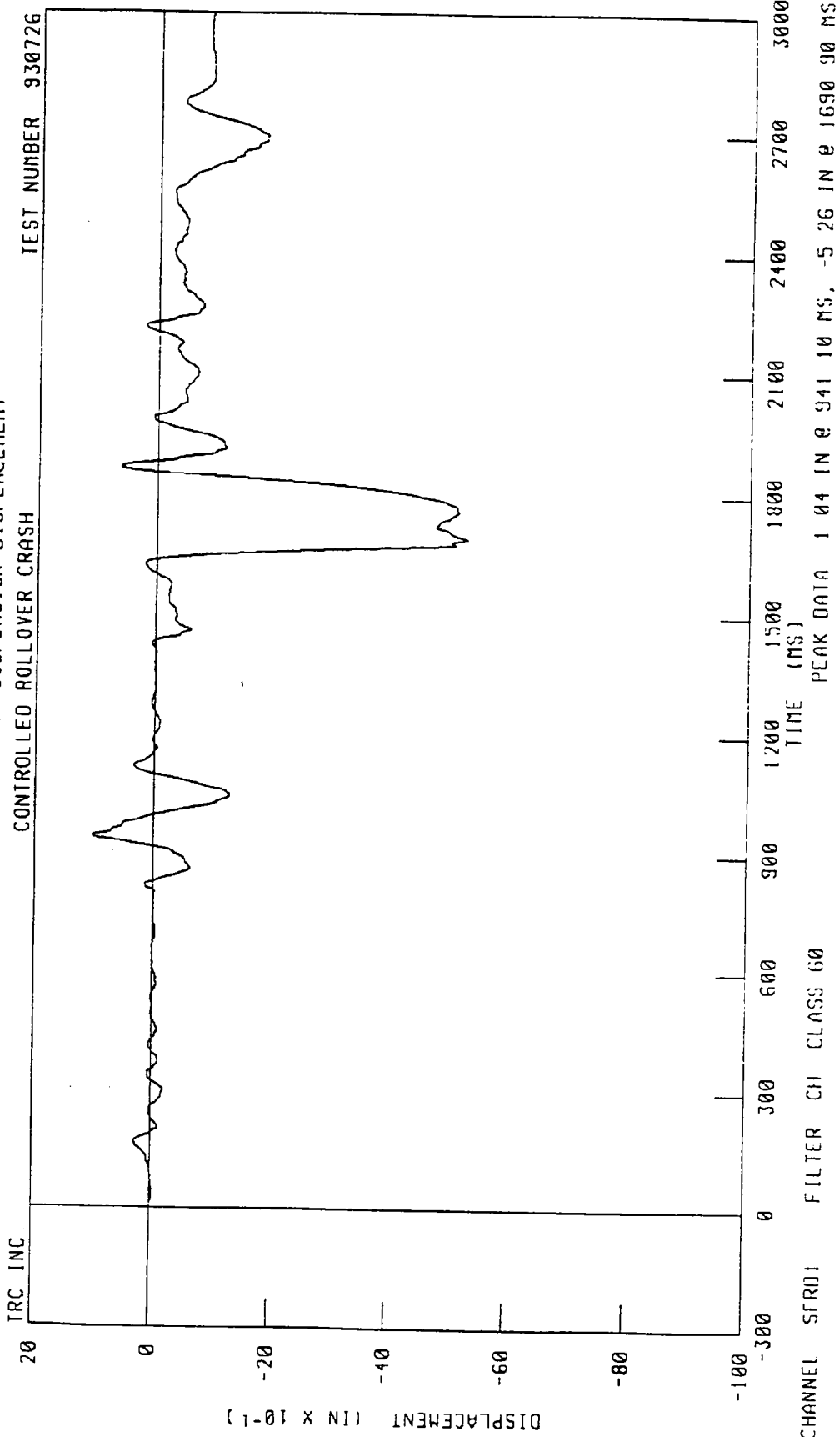
TEST NUMBER 930726



CHANNEL SFL01 FILTER CH CLASS 60 PEAK DATA 0 55 IN @ 1749 50 MS, -4 92 IN @ 1514 40 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
VEHICLE RIGHT FRONT SUSPENSION DISPLACEMENT

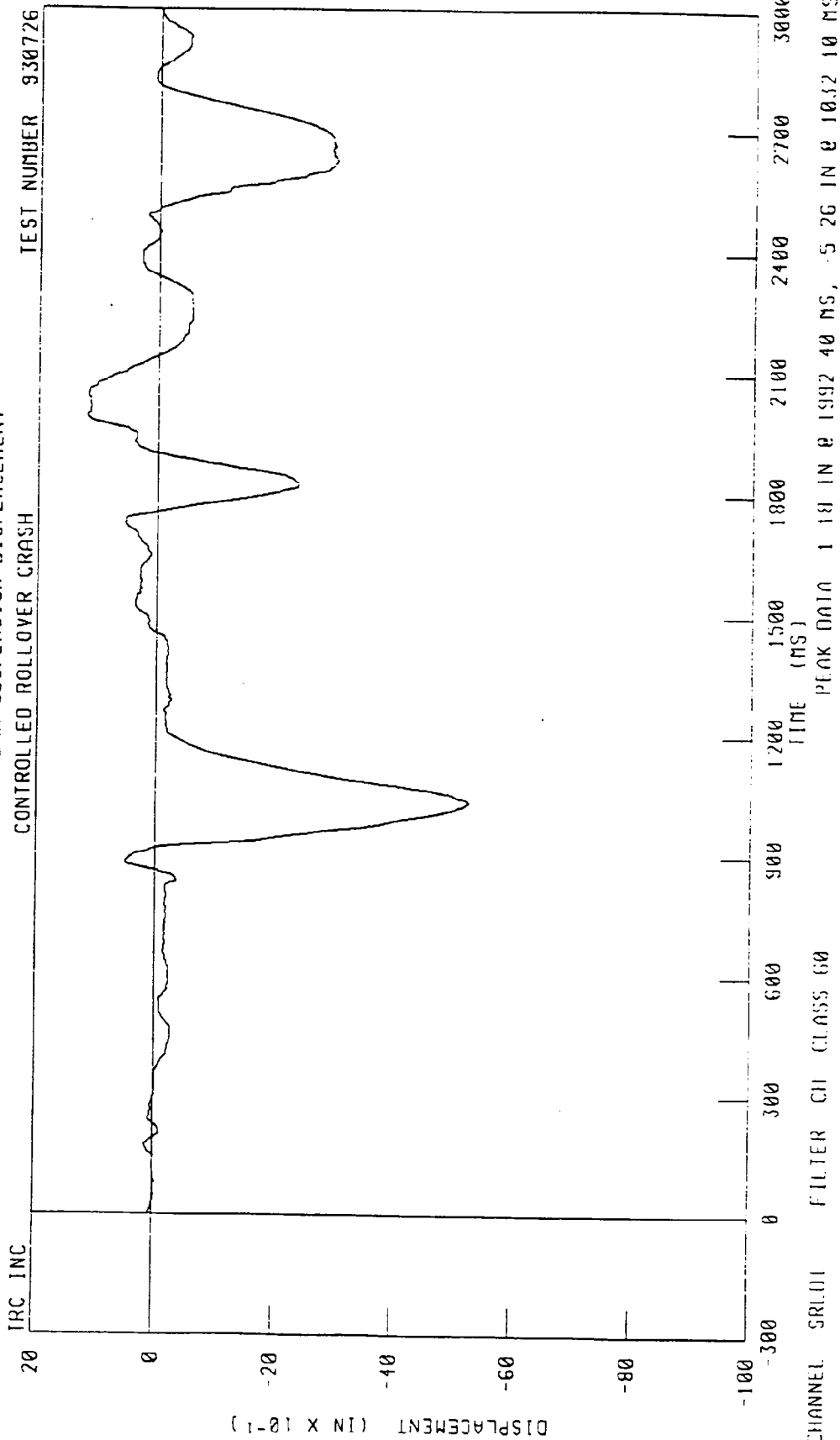
TEST NUMBER 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 VEHICLE LEFT REAR SUSPENSION DISPLACEMENT

TEST NUMBER 930726

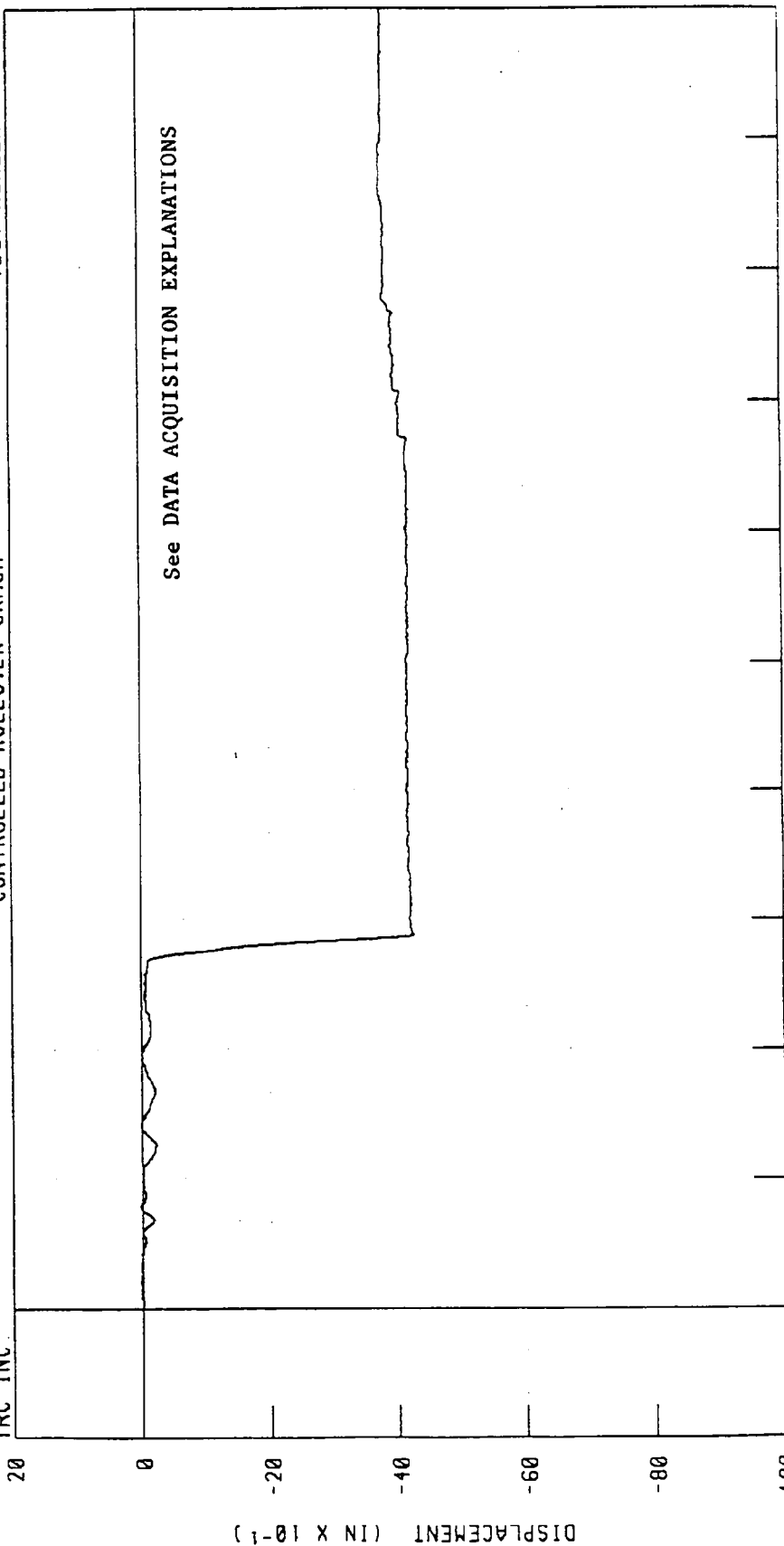
CONTROLLED ROLLOVER CRASH



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
VEHICLE RIGHT REAR SUSPENSION DISPLACEMENT
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

TRC INC.



DISPLACEMENT (IN X 10⁻¹)

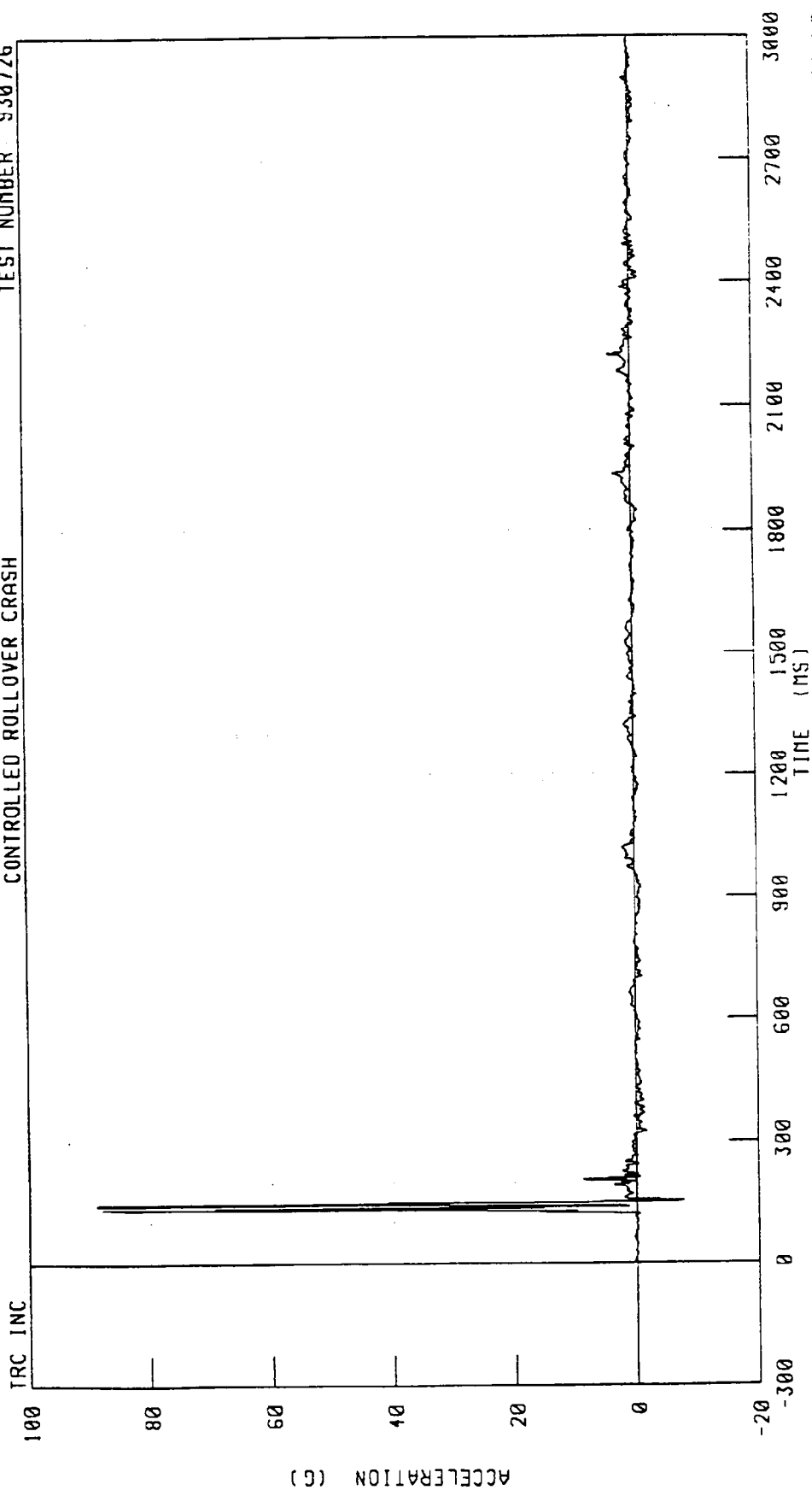
TIME (MS)

PEAK DATA 0 03 IN @ 63 70 MS, -4 25 IN @ 865 60 MS

CHANNEL SRR01 FILTER CH CLASS 60

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY X-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

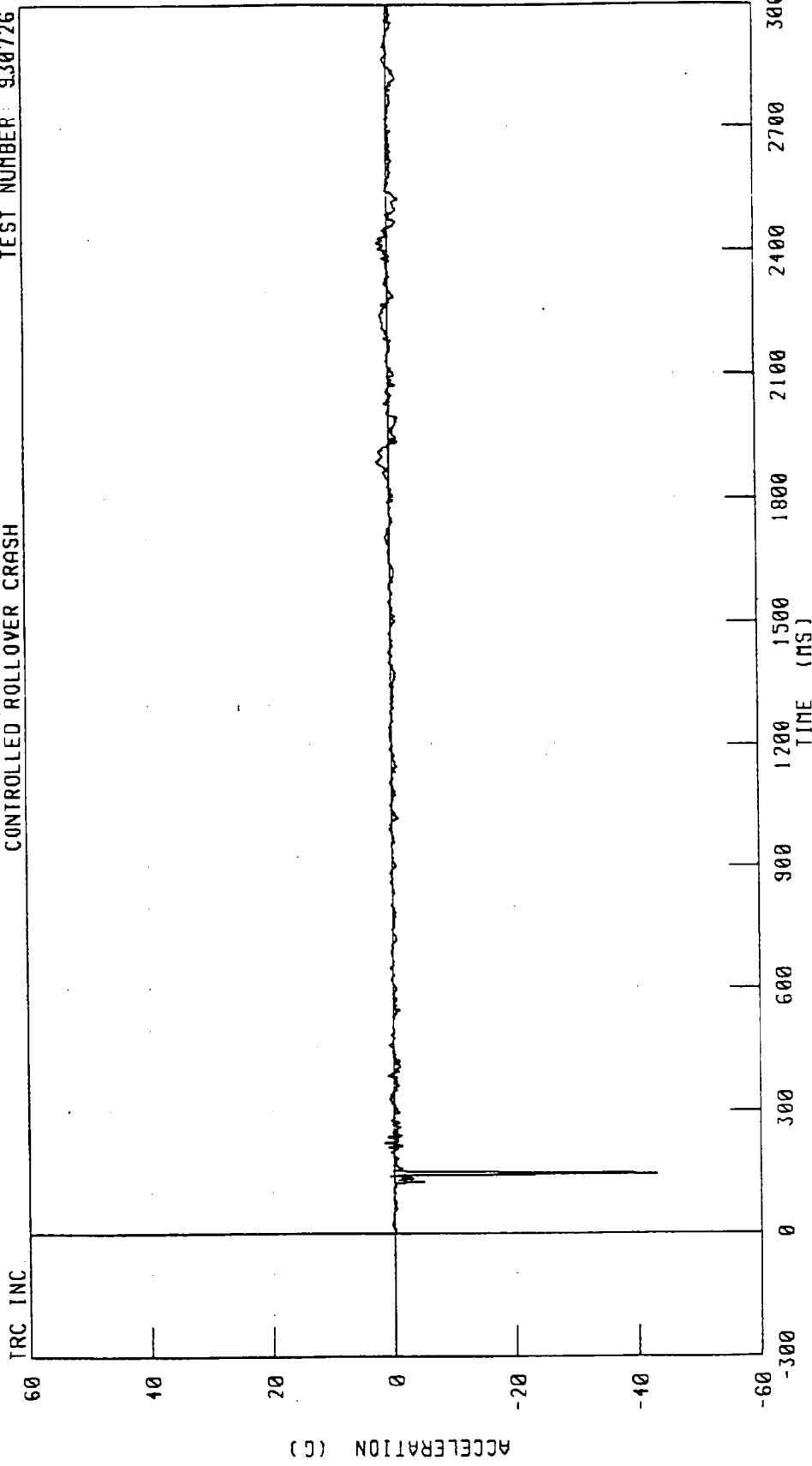


CHANNEL VCCXC2 FILTER CH CLASS 60

PEAK DATA 88 72 G @ 146 70 MS, -7 50 G @ 154 90 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY Y-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER: 930726



CHANNEL VCGYG2 FILTER CH CLASS 60

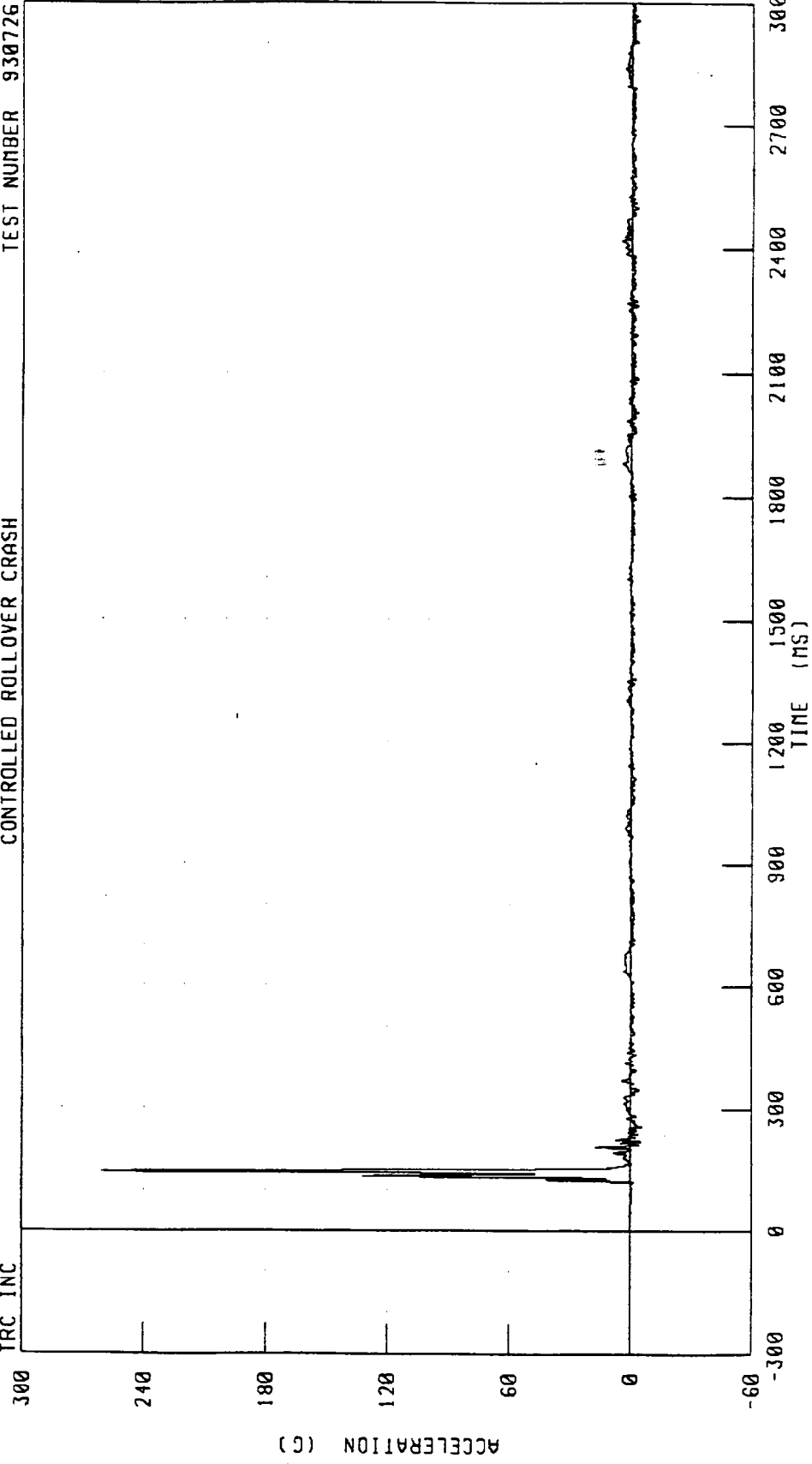
PEAK DATA 2 01 G @ 1886 00 MS, -42 75 G @ 145 90 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY Z-AXIS ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH

TRC INC

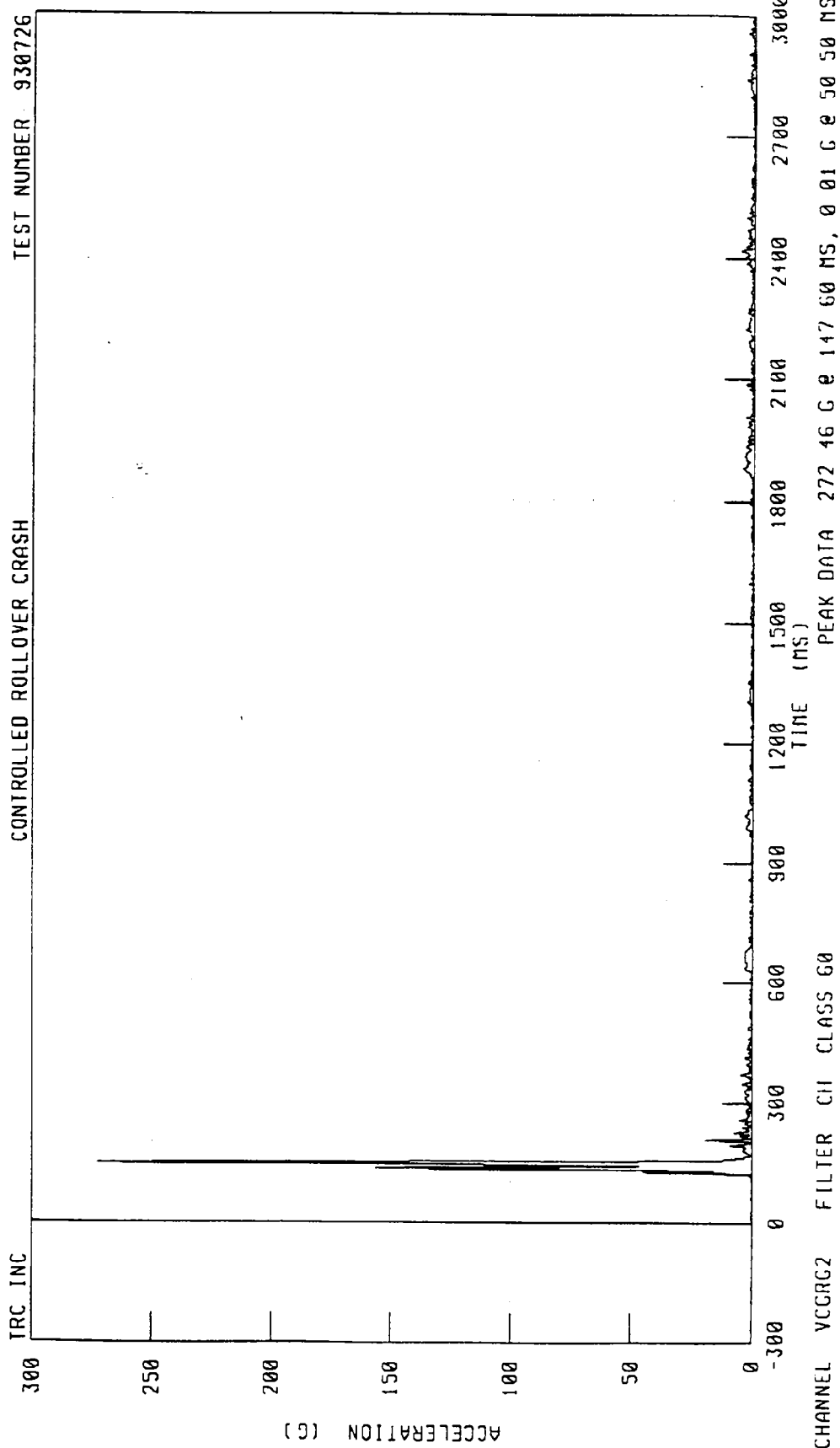


CHANNEL VCGZG2 FILTER CH CLASS 60

PEAK DATA 260 56 G @ 148 00 MS, -5 42 G @ 258 80 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
ROLL CART CENTER OF GRAVITY RESULTANT ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

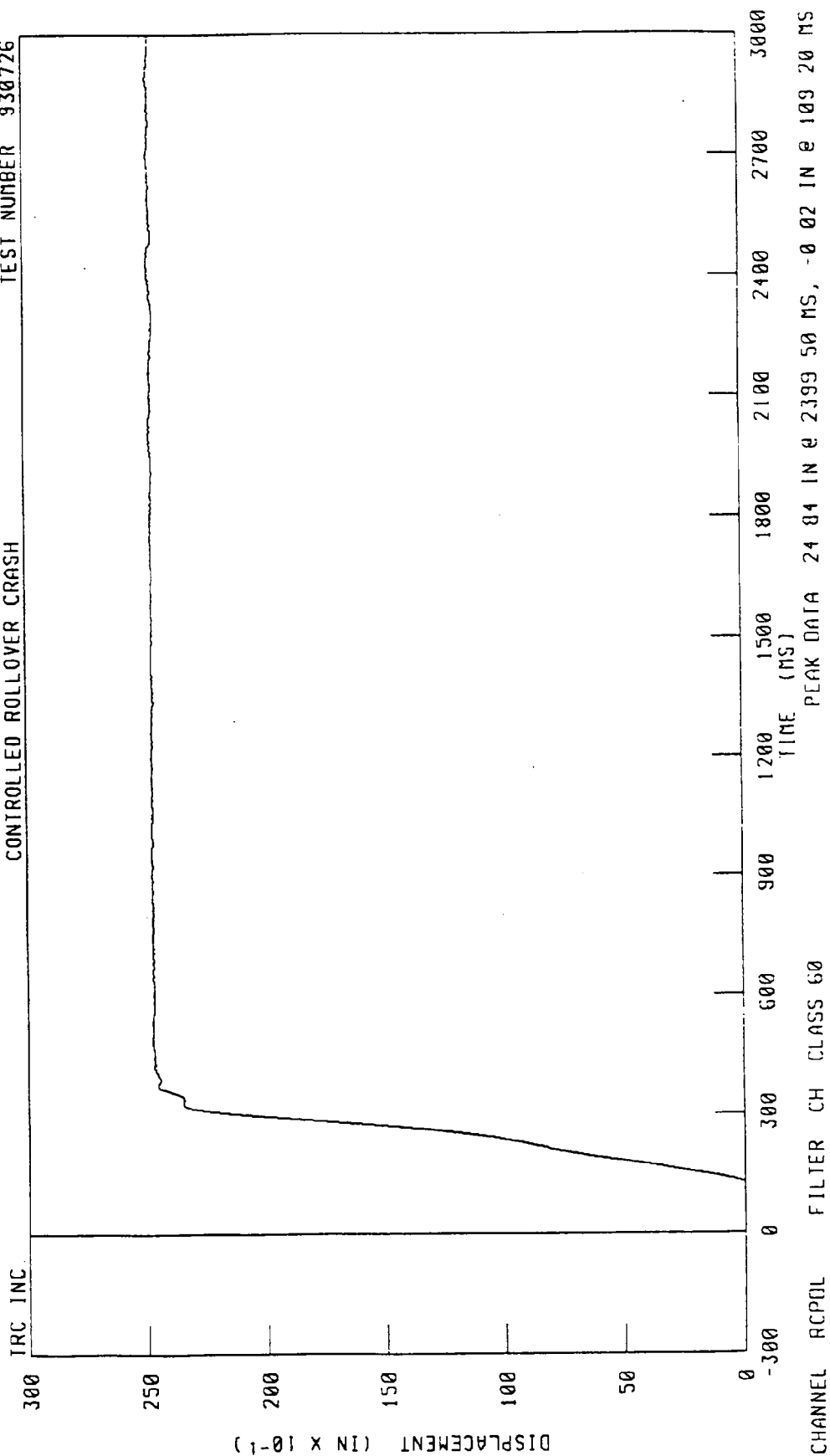


CHANNEL VCCRC2 FILTER CH CLASS 60

PEAK DATA 272 46 G @ 147 60 MS, 0 01 G @ 50 50 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 ROLL CART LEFT CYLINDER DISPLACEMENT
 CONTROLLED ROLLOVER CRASH

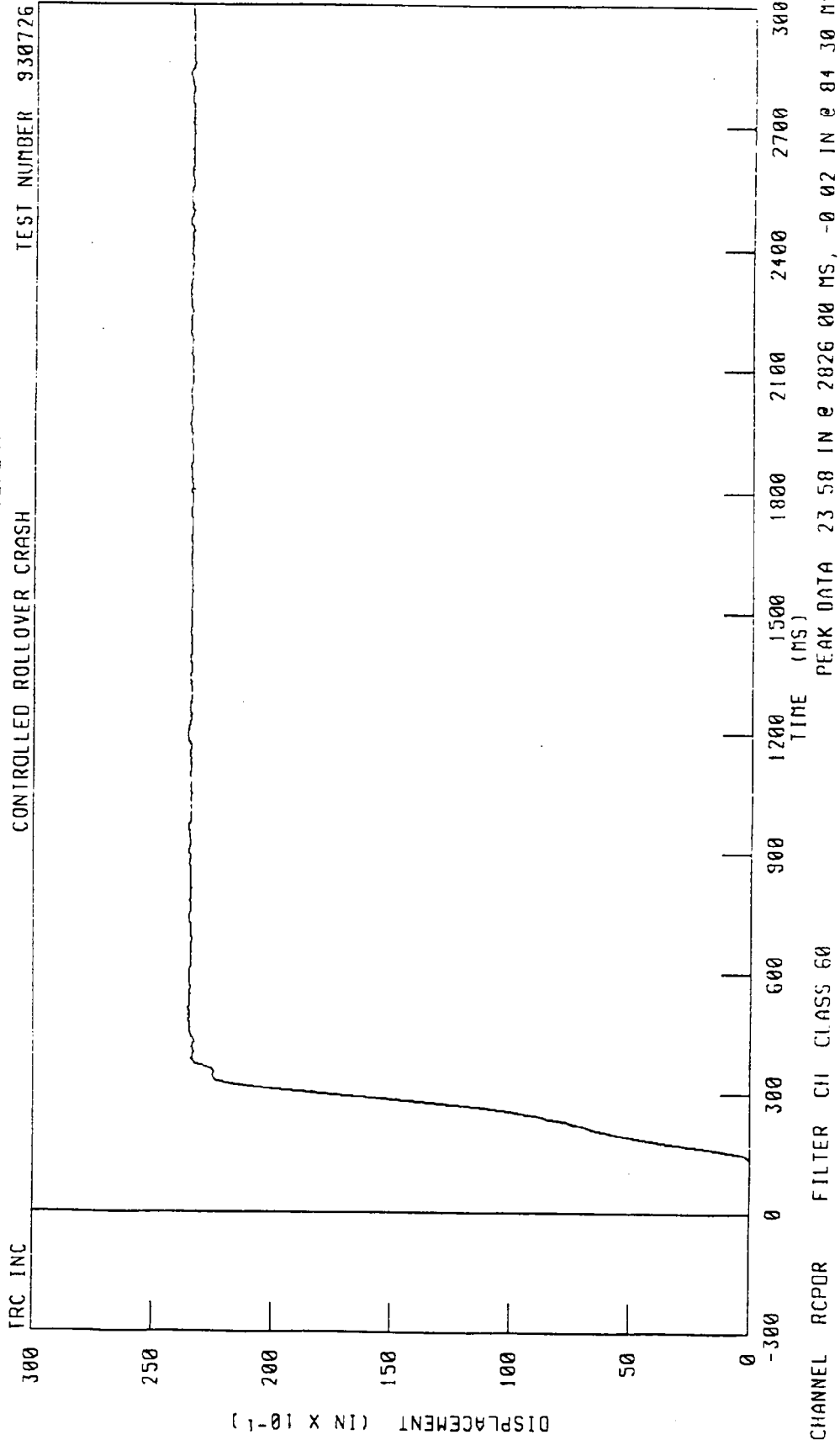
TEST NUMBER 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
ROLL CART RIGHT CYLINDER DISPLACEMENT

TEST NUMBER 930726

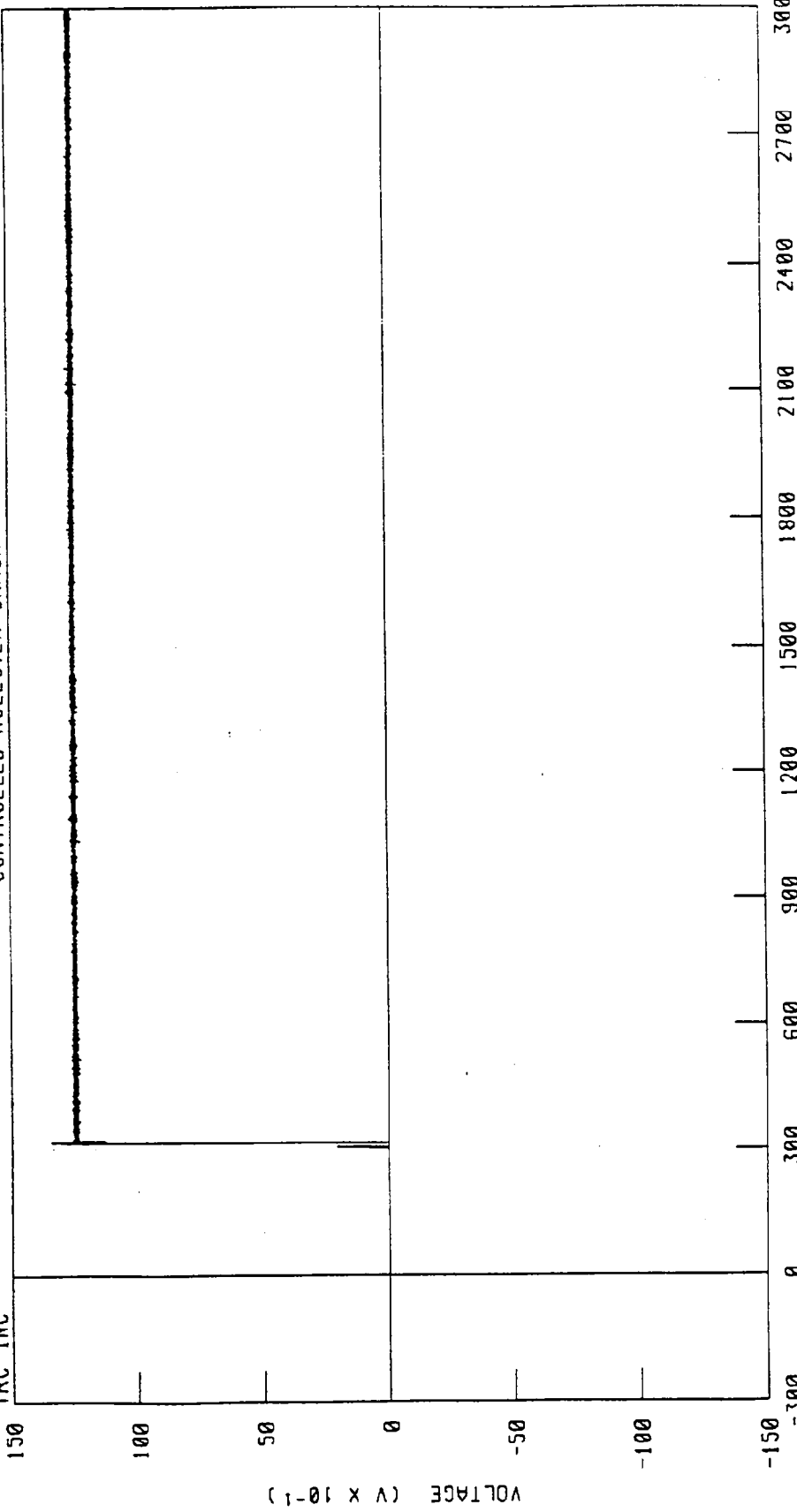
CONTROLLED ROLLOVER CRASH



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
VEHICLE/ROLL CART SEPARATION TIME - UPPER SWITCH
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

TRC INC



CHANNEL 0TH1 FILTER CH CLASS 1000

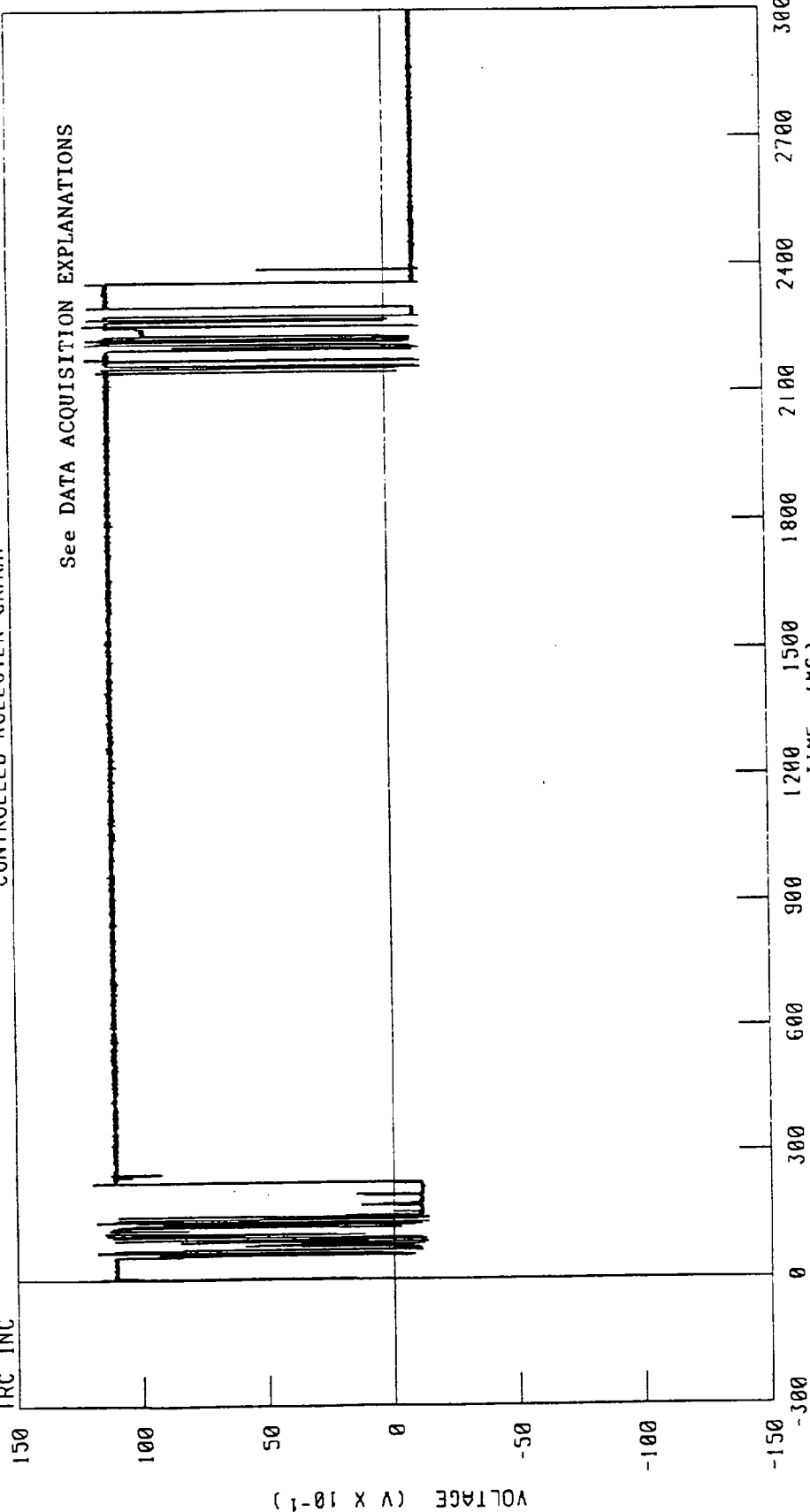
PEAK DATA 13 42 V @ 317 00 MS, 0 00 V @ -0 10 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
VEHICLE/ROLL CART SEPARATION TIME - LOWER SWITCH
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

TRC INC

See DATA ACQUISITION EXPLANATIONS



PEAK DATA 11 97 V @ 2250 MS, -1 39 V @ 20 MS

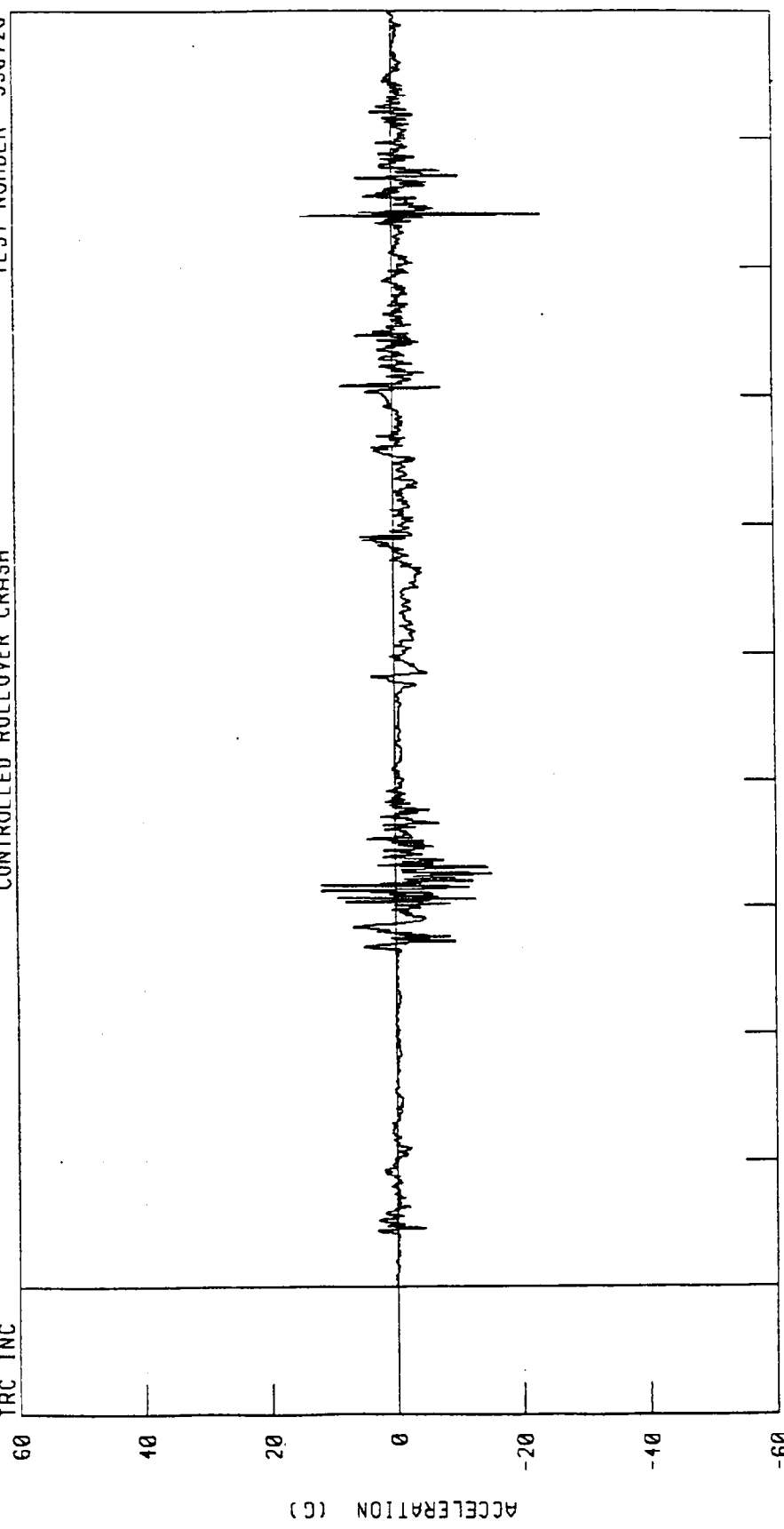
CHANNEL 0TH2 FILTER CH CLASS 1000

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
LEFT FRONT DOOR LATCH X-AXIS ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH

TRC INC



CHANNEL LFDXG1 FILTER CH CLASS 60

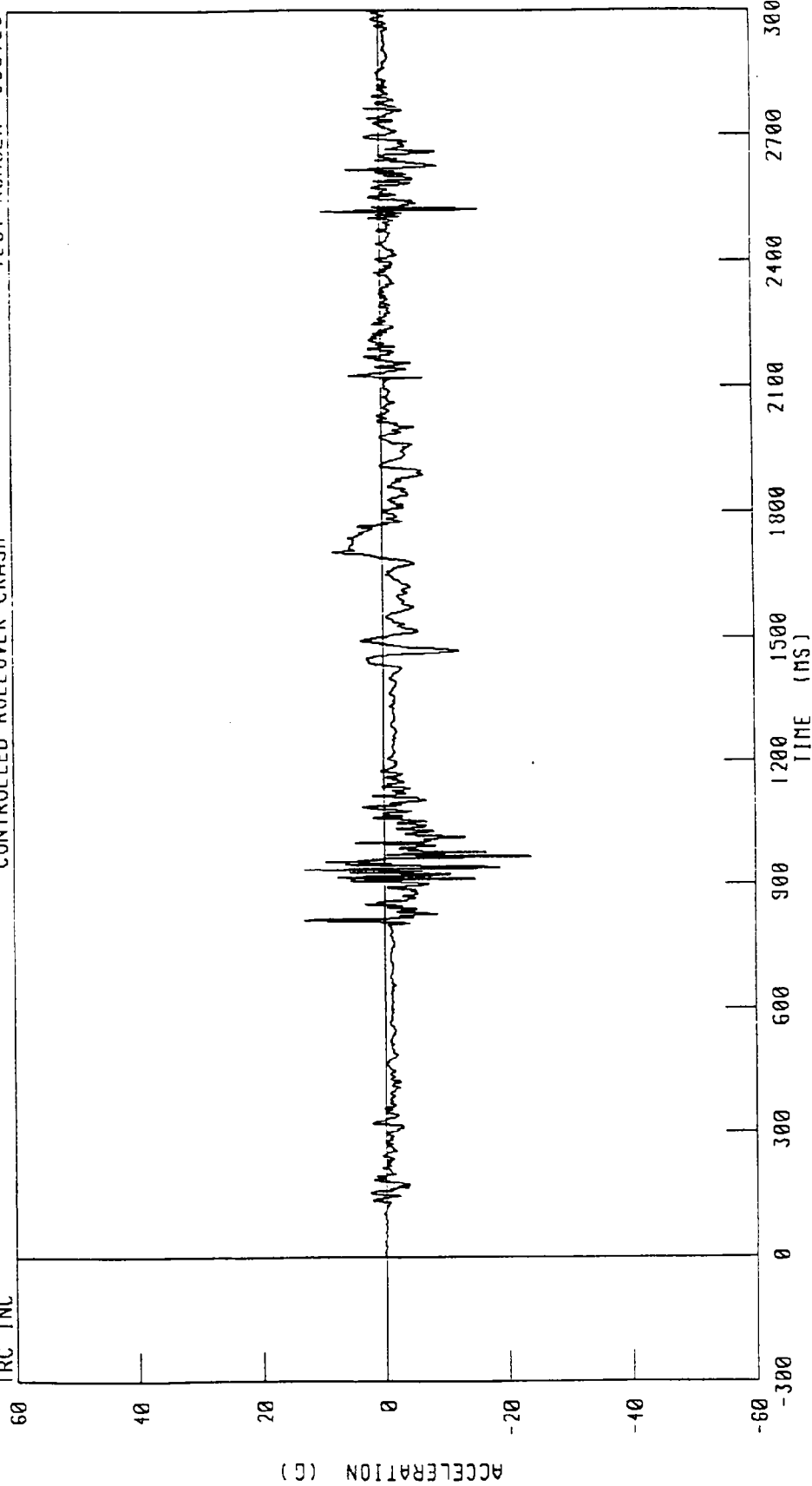
PEAK DATA 14 54 G @ 2520 90 MS, -23 45 G @ 2525 30 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
LEFT FRONT DOOR LATCH Y-AXIS ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH

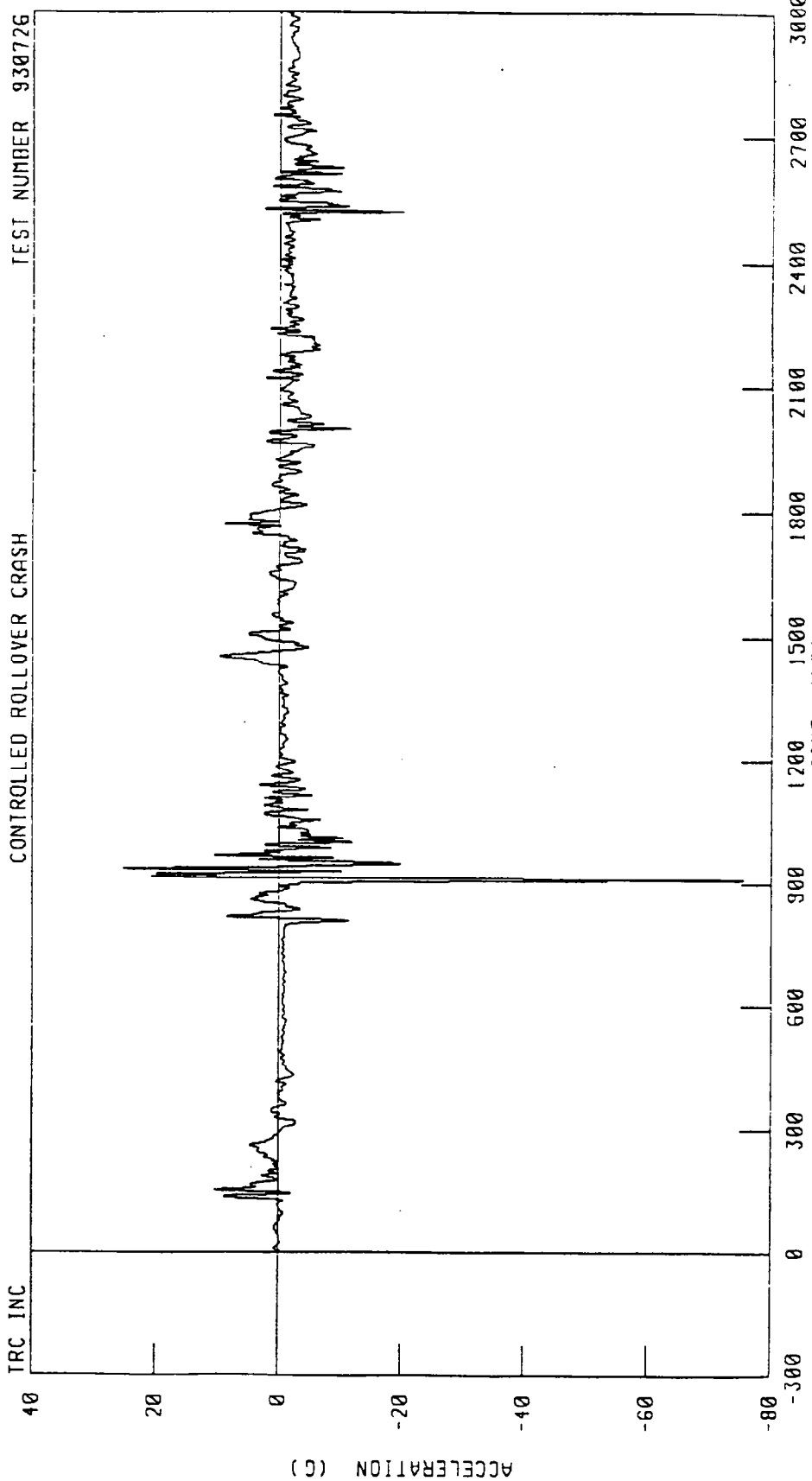
TRC INC



CHANNEL LFOYCI FILTER CH CLASS 60

PEAK DATA 13 17 G @ 813 70 MS, -23 94 G @ 966 70 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
LEFT FRONT DOOR LATCH Z-AXIS ACCELERATION



CHANNEL LFDZG1 FILTER CH CLASS 60

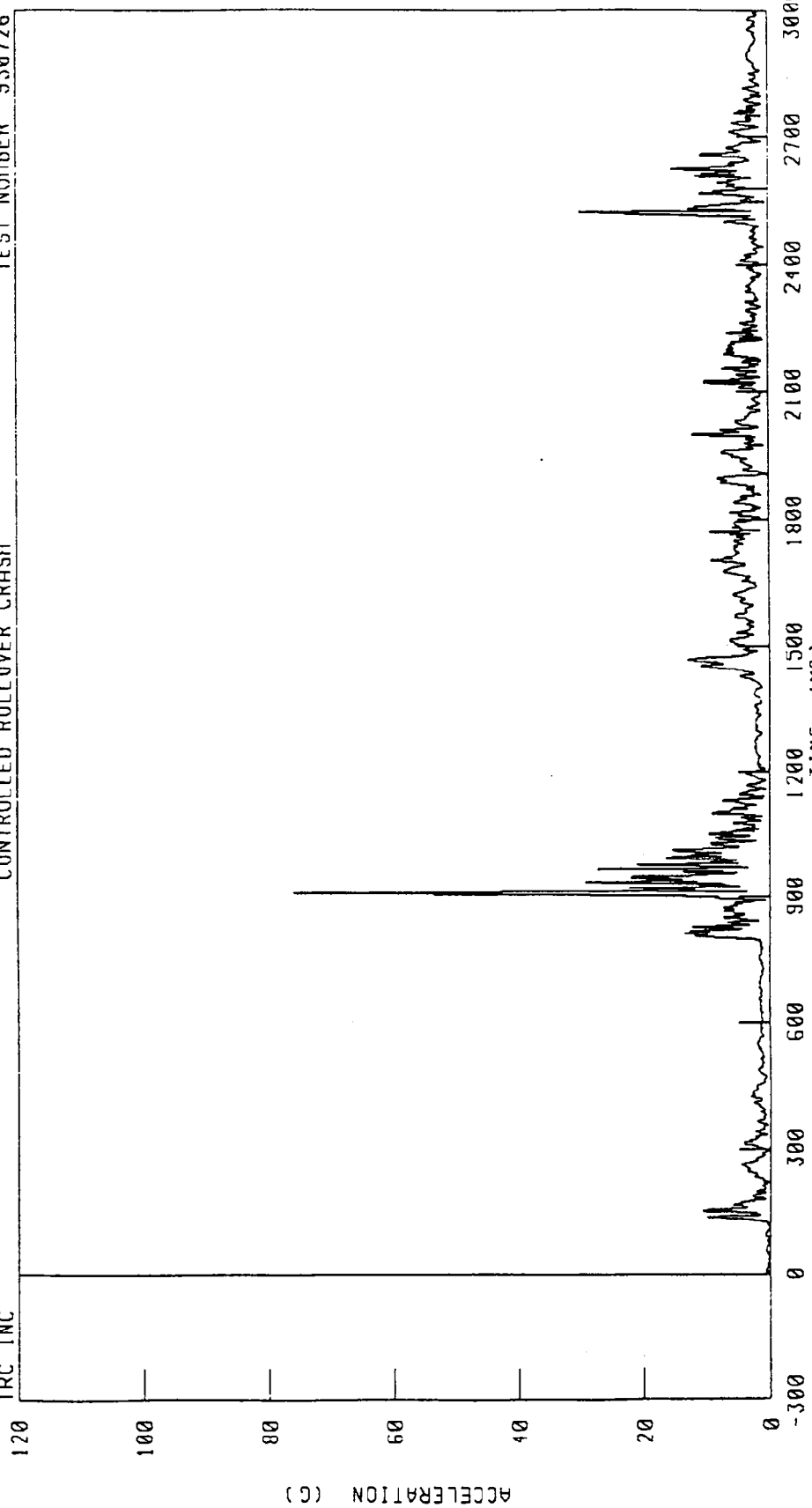
PEAK DATA 25 21 G @ 934 60 MS, -75 54 G @ 908 80 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
LEFT FRONT DOOR LATCH RESULTANT ACCELERATION

TEST NUMBER 930726

CONTROLLED ROLLOVER CRASH

IRC INC

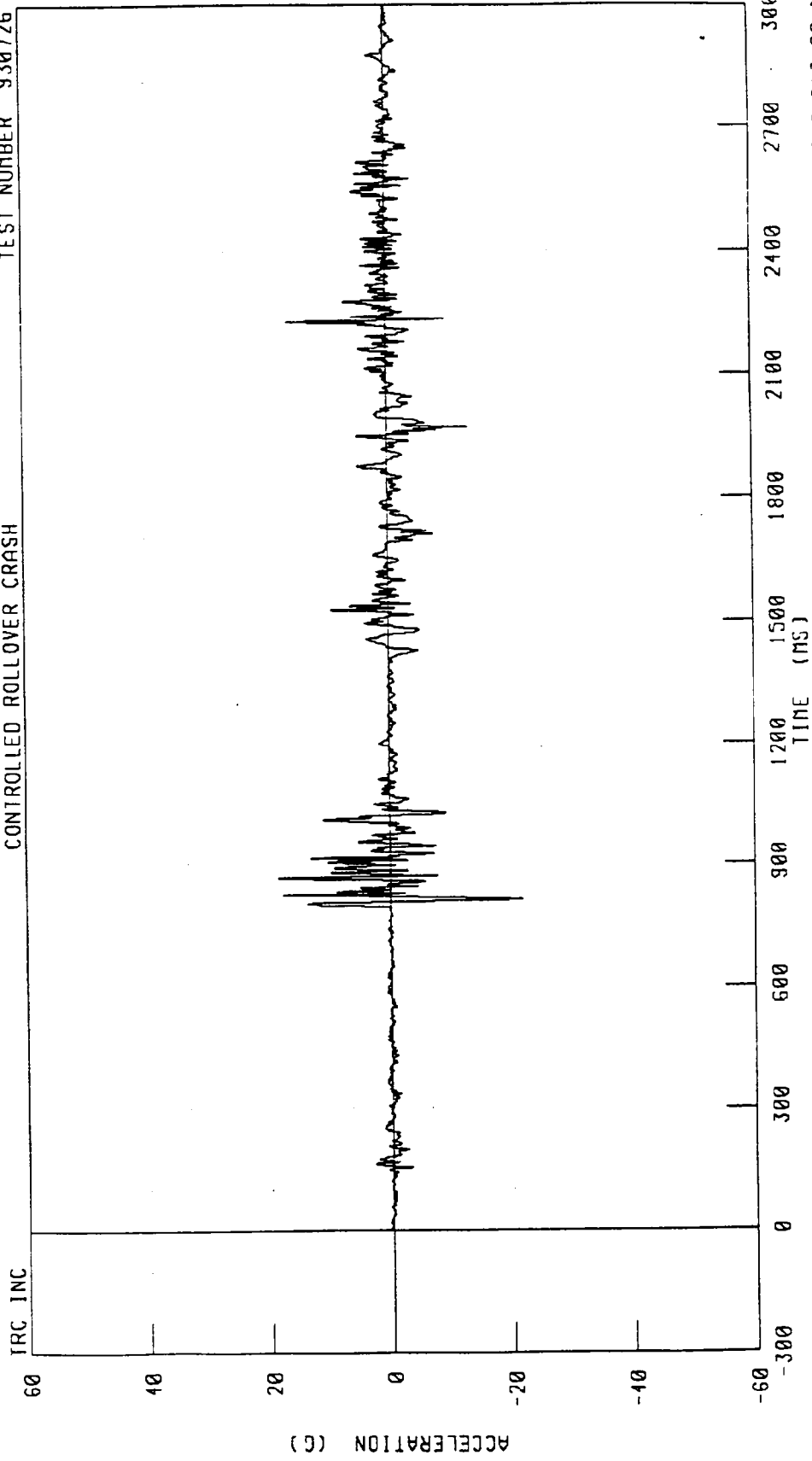


CHANNEL LFORC1 FILTER CH CLASS 60

PEAK DATA 76 06 G @ 908 80 MS, 0 02 G @ 43 80 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
 RIGHT FRONT DOOR LATCH X-AXIS ACCELERATION
 CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



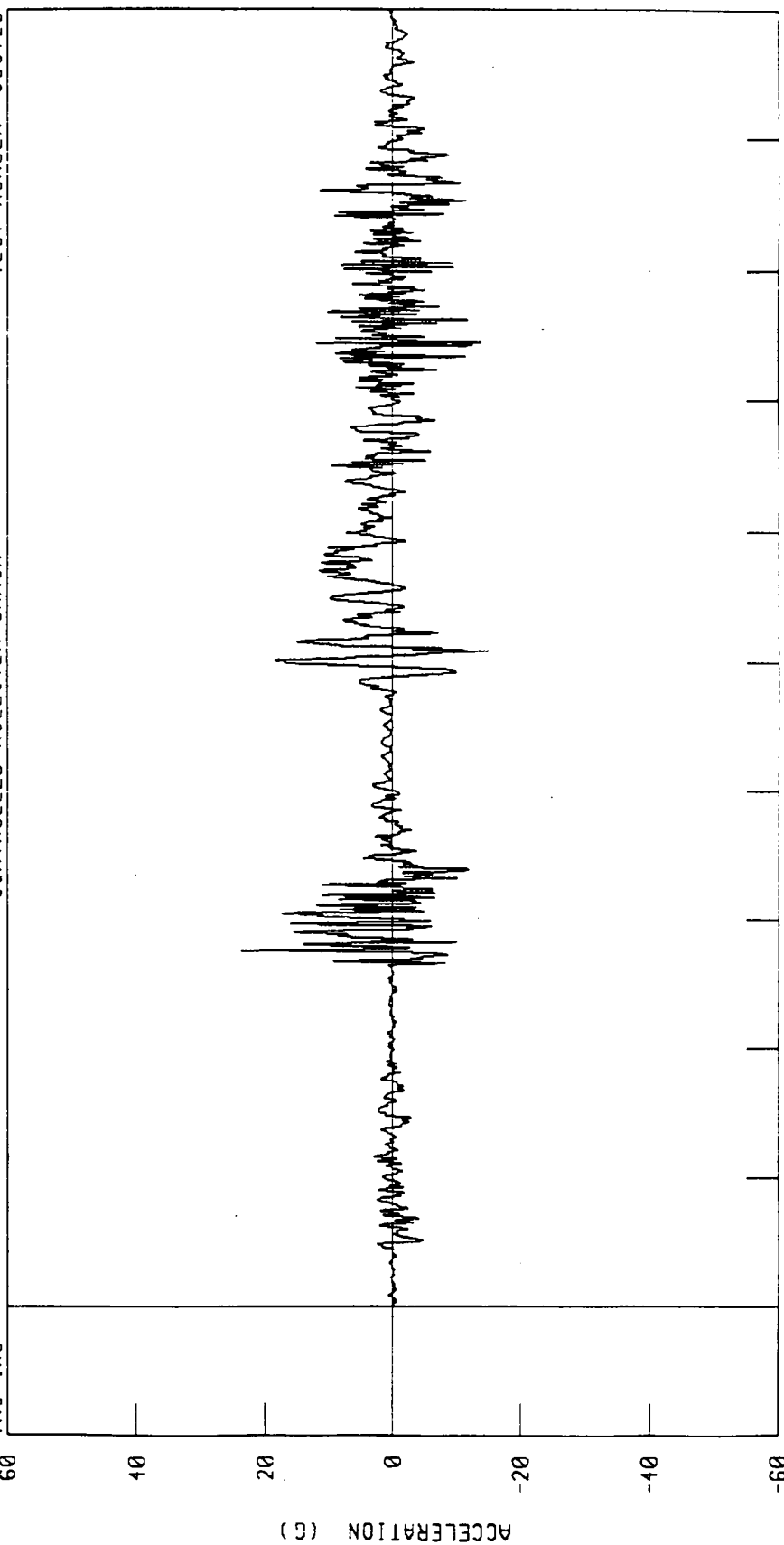
CHANNEL RFDXG1 FILTER CH CLASS 60

PEAK DATA 18 51 G @ 865 20 MS, -21 78 G @ 813 20 MS

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
RIGHT FRONT DOOR LATCH Y-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726

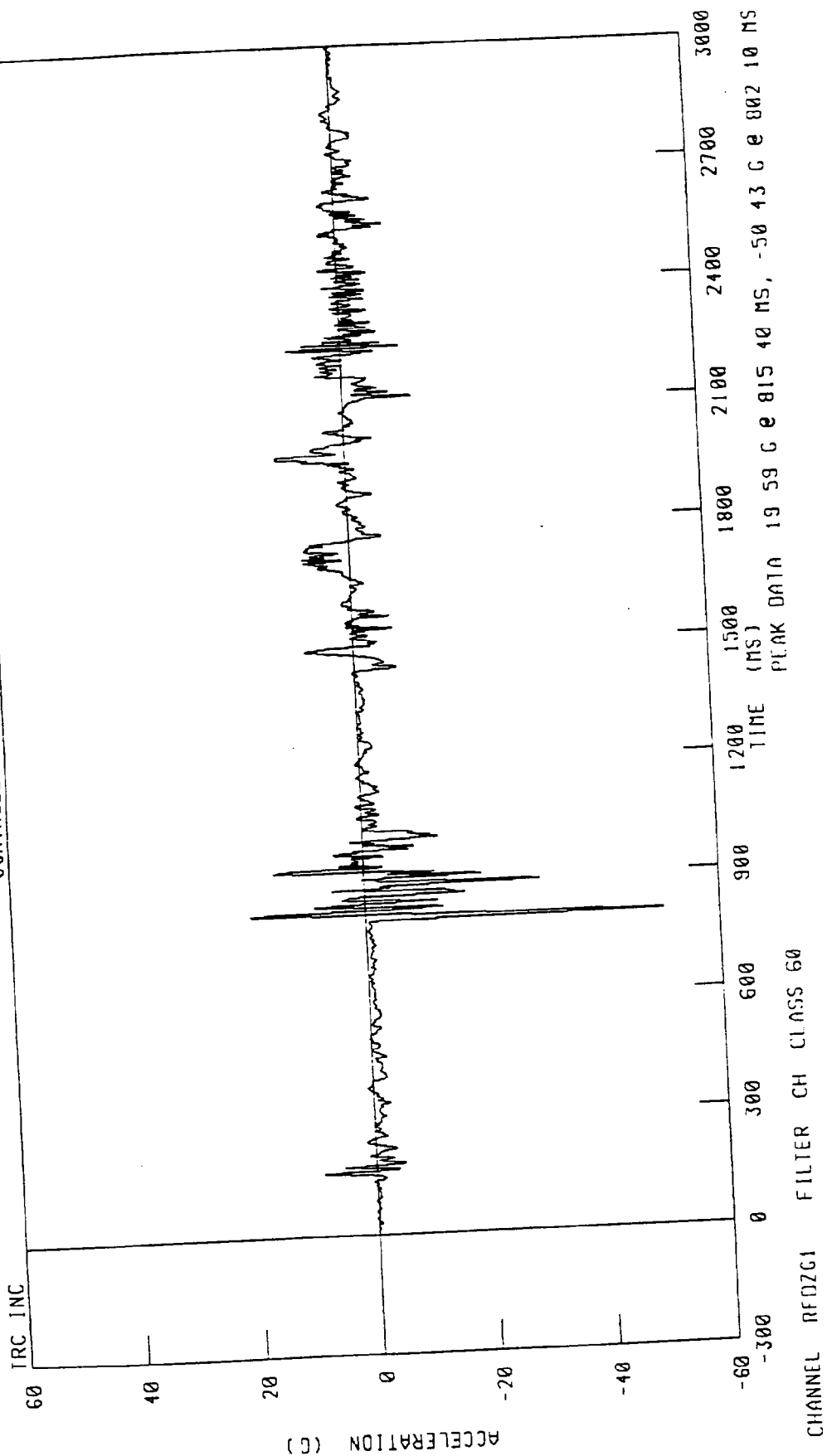
TRC INC



CHANNEL RFDYC1 FILTER CH CLASS 60
TIME (MS)
PEAK DATA 23 70 G @ 826 50 MS, -14 96 G @ 1524 60 MS

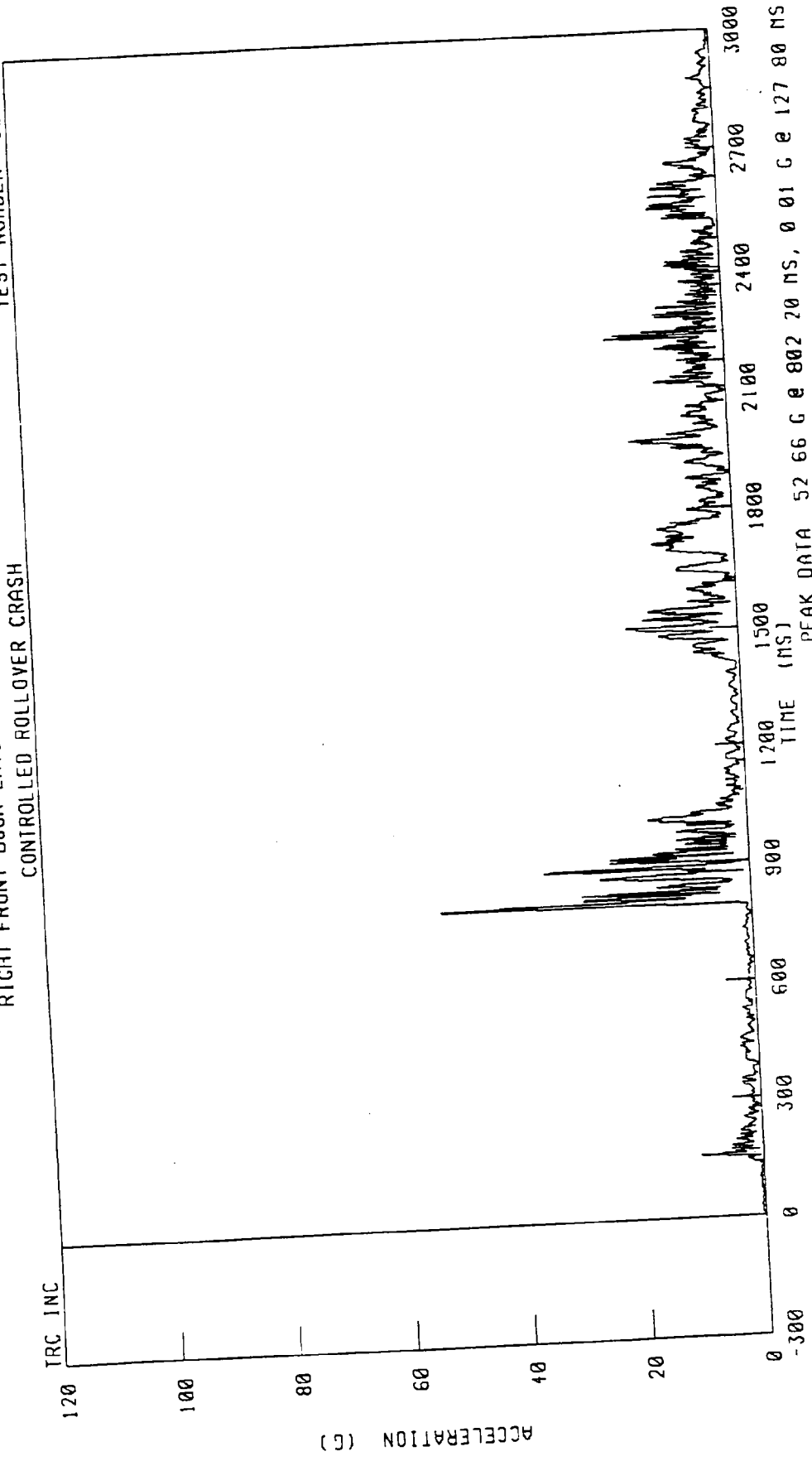
1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
RIGHT FRONT DOOR LATCH Z-AXIS ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
RIGHT FRONT DOOR LATCH RESULTANT ACCELERATION
CONTROLLED ROLLOVER CRASH

TEST NUMBER 930726



CHANNEL RF0RG1 FILTER CH1 CLASS 60

PEAK DATA 52.66 G @ 802.20 MS, 0.01 G @ 127.80 MS

APPENDIX C

DUMMY CERTIFICATION DATA

POST-TEST CERTIFICATION DATA

DRIVER DUMMY S/N 043

TRANSPORTATION RESEARCH CENTER INC.
HYBRID III EXTERNAL DIMENSIONS
43 HUMANOID

04-AUG-93

TRC 43C6ED1 572E SN43 EXT. DIMENSION CAL06

TEST PARAMETER	(DIMEN.)	SPECIFICATION	TEST RESULTS
LOCATION FOR CHEST CIRCUMFERENCE (AA)		16.9 - 17.1 IN	17.0 IN
LOCATION FOR WAIST CIRCUMFERENCE (BB)		8.9 - 9.1 IN	9.0 IN
CHEST CIRCUMFERENCE (Y)		38.2 - 39.4 IN	39.3 IN
WAIST CIRCUMFERENCE (Z)		32.9 - 34.1 IN	33.4 IN
CHEST DEPTH (O)		8.4 - 9.0 IN	8.6 IN
H-POINT HEIGHT (C)		3.3 - 3.5 IN	3.4 IN
H-POINT FROM SEATBACK (D)		5.3 - 5.5 IN	5.4 IN
SKULL CAP TO BACKLINE (H)		1.6 - 1.8 IN	1.7 IN
TOTAL SITTING HEIGHT (A)		34.6 - 35.0 IN	34.8 IN
THIGH CLEARANCE (F)		5.5 - 6.1 IN	6.1 IN
BUTTOCK KNEE LENGTH (K)		22.8 - 23.8 IN	23.8 IN
BUTTOCK POPLITEAL LENGTH (N)		17.8 - 18.8 IN	18.7 IN
POPLITEAL HEIGHT (L)		16.9 - 17.9 IN	16.9 IN
KNEE PIVOT HEIGHT (M)		19.1 - 19.7 IN	19.3 IN
FOOT LENGTH (P)		9.9 - 10.5 IN	10.1 IN
FOOT BREADTH (W)		3.6 - 4.2 IN	3.8 IN
SHOULDER PIVOT FROM BACKLINE (E)		3.3 - 3.7 IN	3.6 IN
SHOULDER BREADTH (V)		16.6 - 17.2 IN	16.7 IN
SHOULDER PIVOT HEIGHT (B)		19.9 - 20.5 IN	20.2 IN
ELBOW REST HEIGHT (J)		7.5 - 8.3 IN	7.9 IN
SHOULDER-ELBOW LENGTH (I)		13.0 - 13.6 IN	13.5 IN
BACK OF ELBOW TO WRIST PIVOT (G)		11.4 - 12.0 IN	11.4 IN

TEST MEETS SPECIFICATIONS

TECHNICIAN

Charles Middel

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III

04-AUG-93

TRC

43C6HD1

572E SN43 HEAD DROP CAL 06

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	55.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	249.22 G
PEAK LATERAL ACCELERATION	15 G MAX	12.76 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN

Charles Middleton

572E SN43 HEAD DROP CAL 06

93216

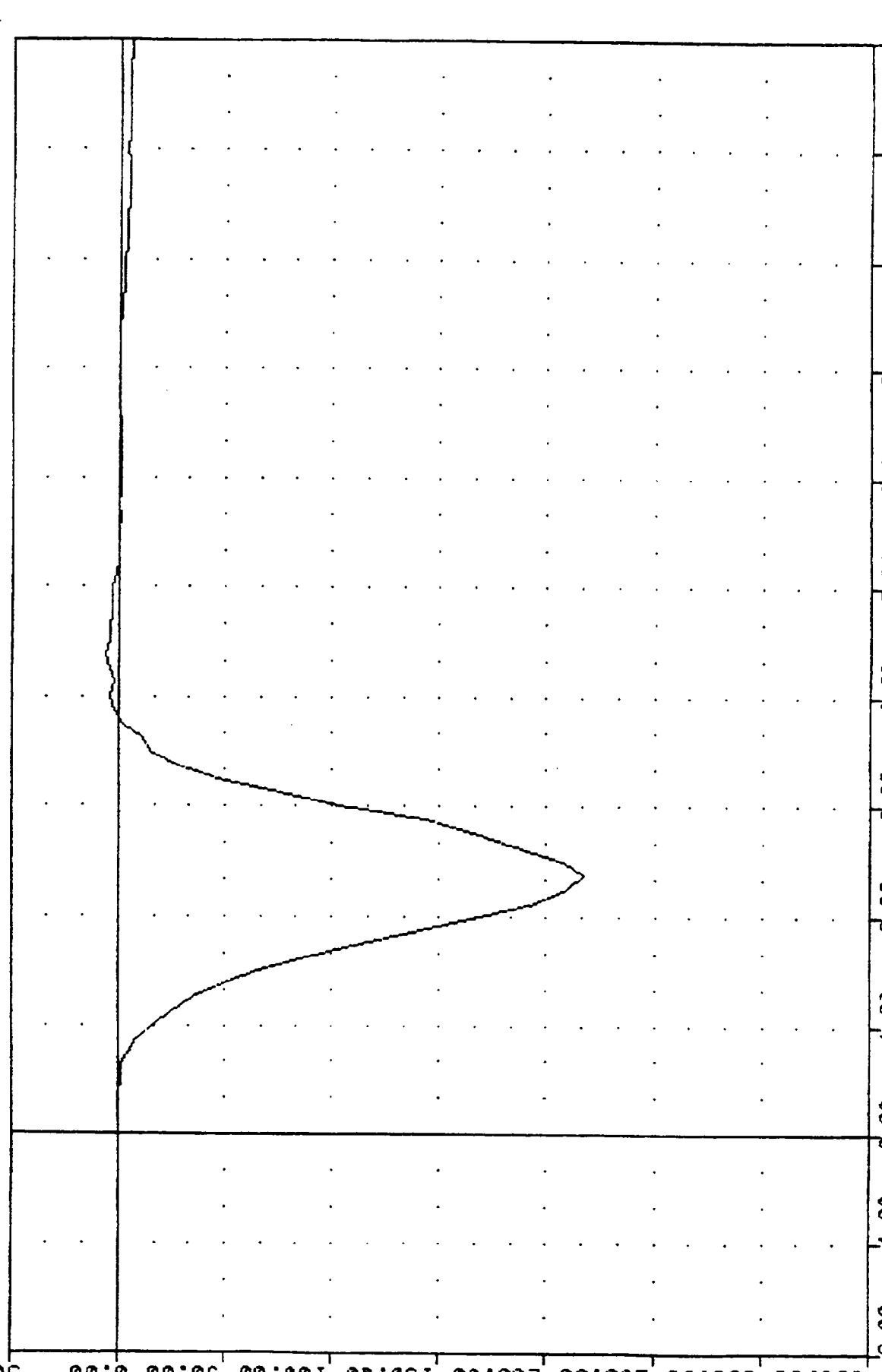
HEADX6

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -217.32 2.38

5.67 4.38

ACCELERATION (G)

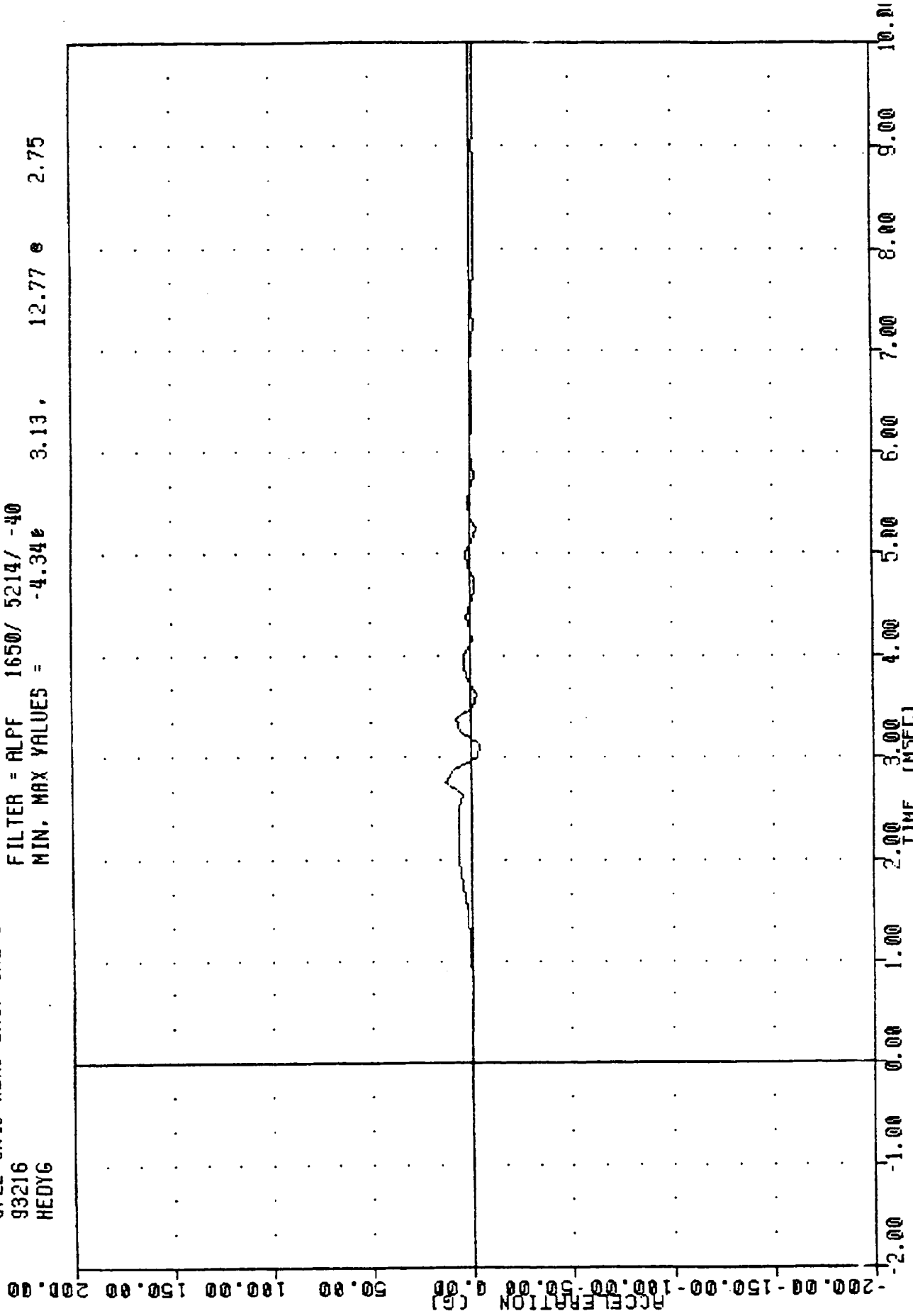


PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Y AXIS

572E SN43 HEAD DROP CAL 06
93216
HEADG

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -4.34e 3.13, 12.77 e 2.75



572E SN43 HEAD DROP CAL 06

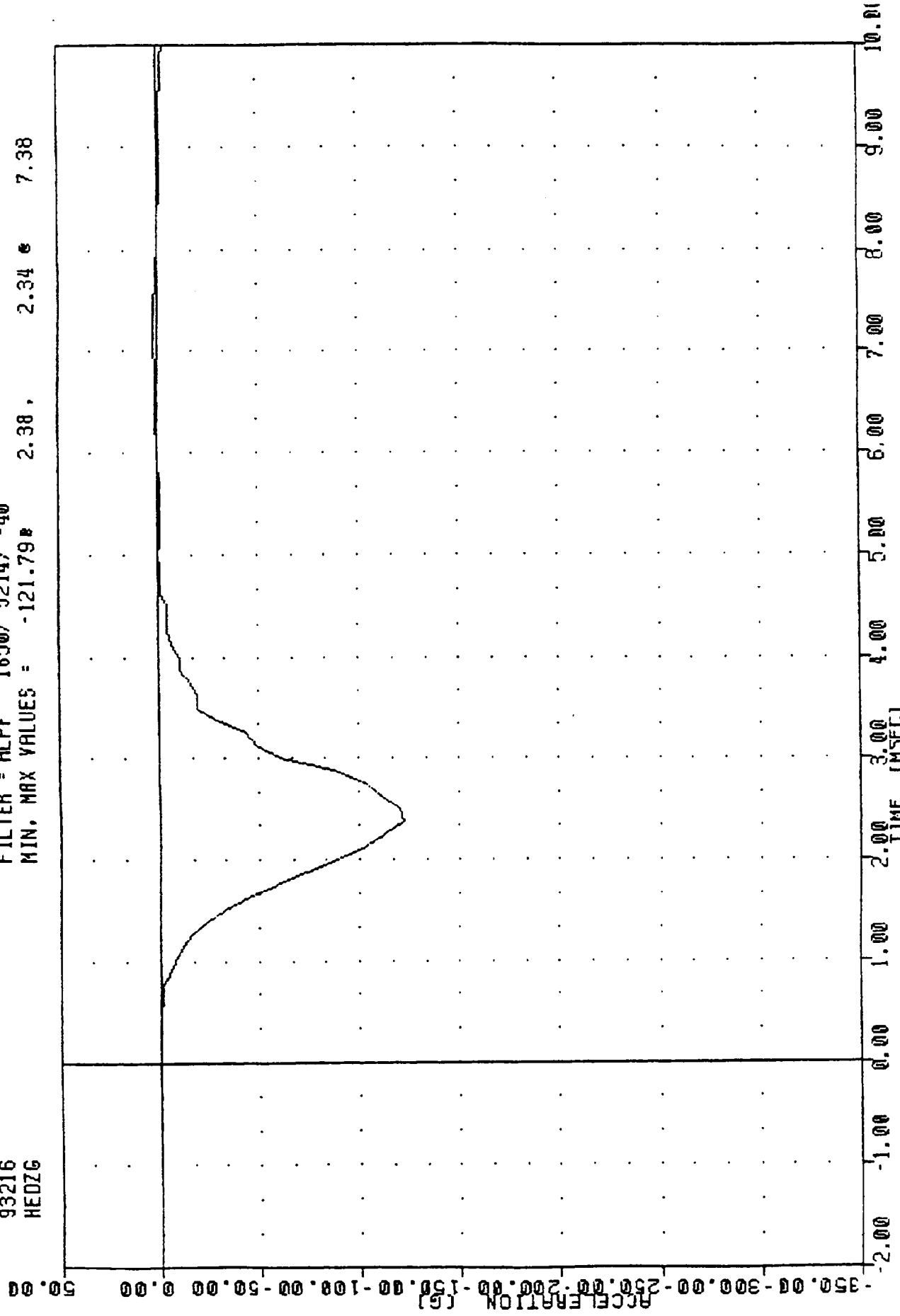
93216

HEADZG

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = -121.79

2.38 , 2.34 , 7.38

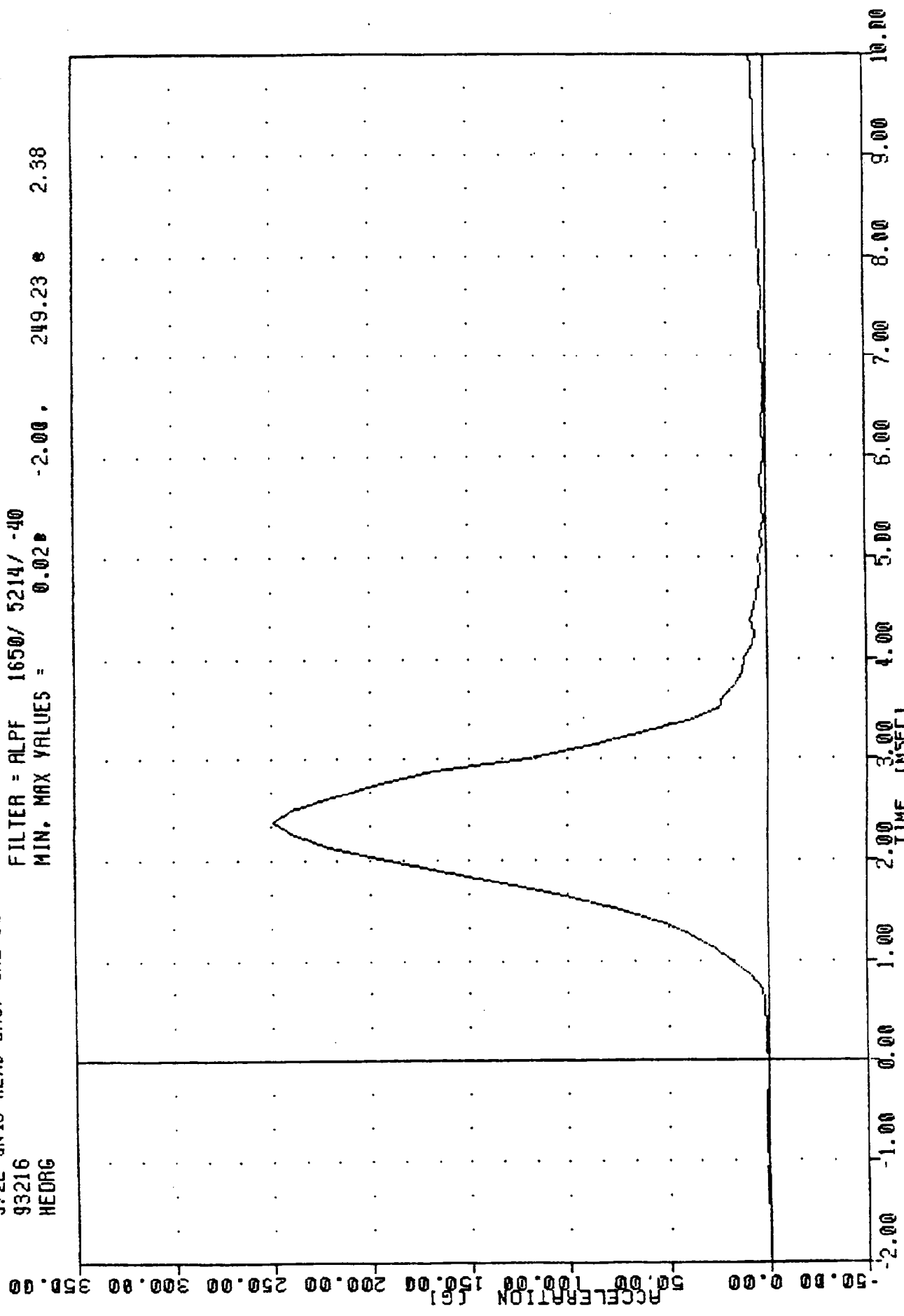


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION 7 AXIS

572E SN43 HEAD DROP CAL 06

93216
HEADRG

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = 0.02 -2.00 249.23 2.38



PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESONANT ACCELERATION

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST

HYBRID III

04-AUG-93

6 AXIS NECK TRANSDUCER
TRC 43C6NF1

572E SN43 NECK FLEXION CAL06

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	55.0 %
IMPACT VELOCITY	22.6 - 23.4 FT/SEC	23.30 FT/SEC
PENDULUM	10 MS 22.50 - 27.50 G	24.30 G
DECELERATION	20 MS 17.60 - 22.60 G	21.56 G
	30 MS 12.50 - 18.50 G	18.48 G
MAX PENDULUM G	29 G MAX	25.60 G
MAX PENDULUM G ABOVE 30 MS	29 G MAX	18.38 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	34 - 42 MS	35.38 MS
D PLANE	MAX 64 - 78 DEG.	71.24 DEG.
ROTATION	TIME 57 - 64 MS	58.50 MS
MOMENT ABOUT OCCIPITAL	MAX 65 - 80 FT.LBS	73.15 FT.LBS
CONDYLE	TIME 47 - 58 MS	48.88 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	113 - 128 MS	117.63 MS
POSITIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	97 - 107 MS	98.38 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Charles Middle

572E SN43 NECK FLEXION CAL06

93216

PENXG

FILTER = BLPP 100/ 317/ -40

MIN, MAX VALUES = -3.75 40.38 25.61 7.88

ACCELERATION (G)

35.00

30.00

25.00

20.00

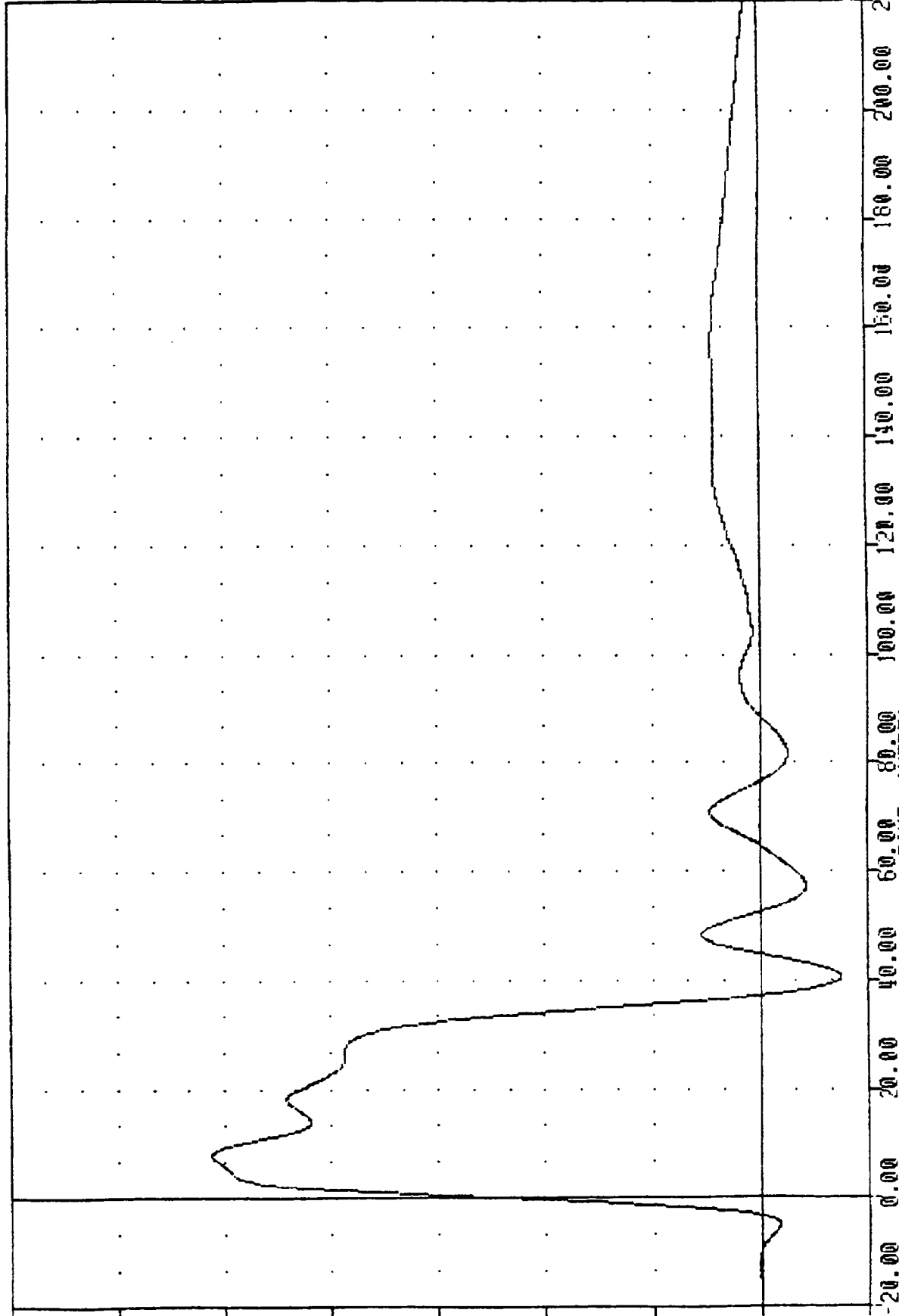
15.00

10.00

5.00

0.00

-5.00

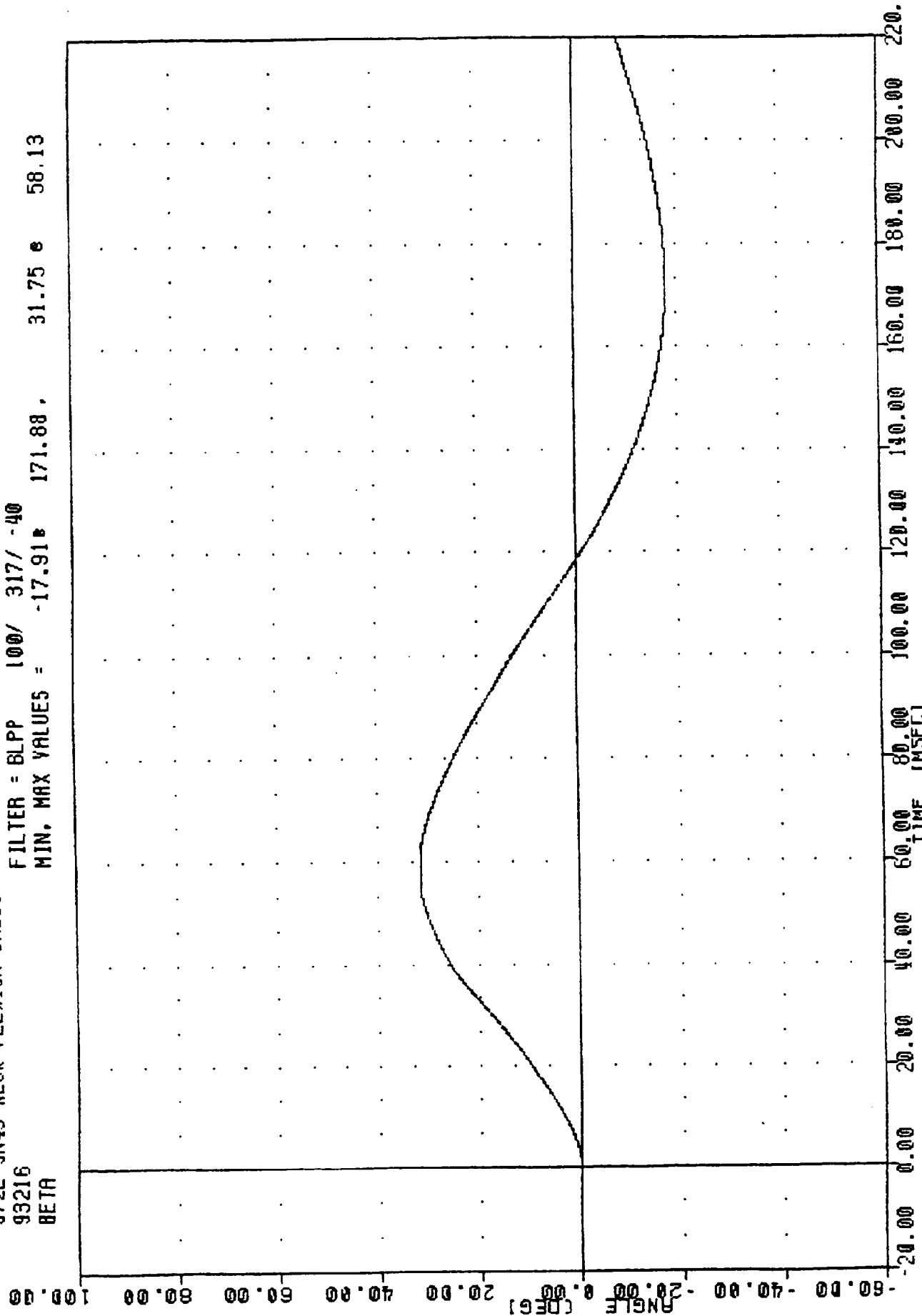


PART 572-E HYBRID III NECK FLEXION CALIBRATION

PENXG IM DECELERATION

TRC , 43C6NF1
 572E SN43 NECK FLEXION CAL06
 93216
 BETA

FILTER = BLPP 100/ 317/ -40
 MIN, MAX VALUES = -17.91° 171.88° 31.75° 58.13

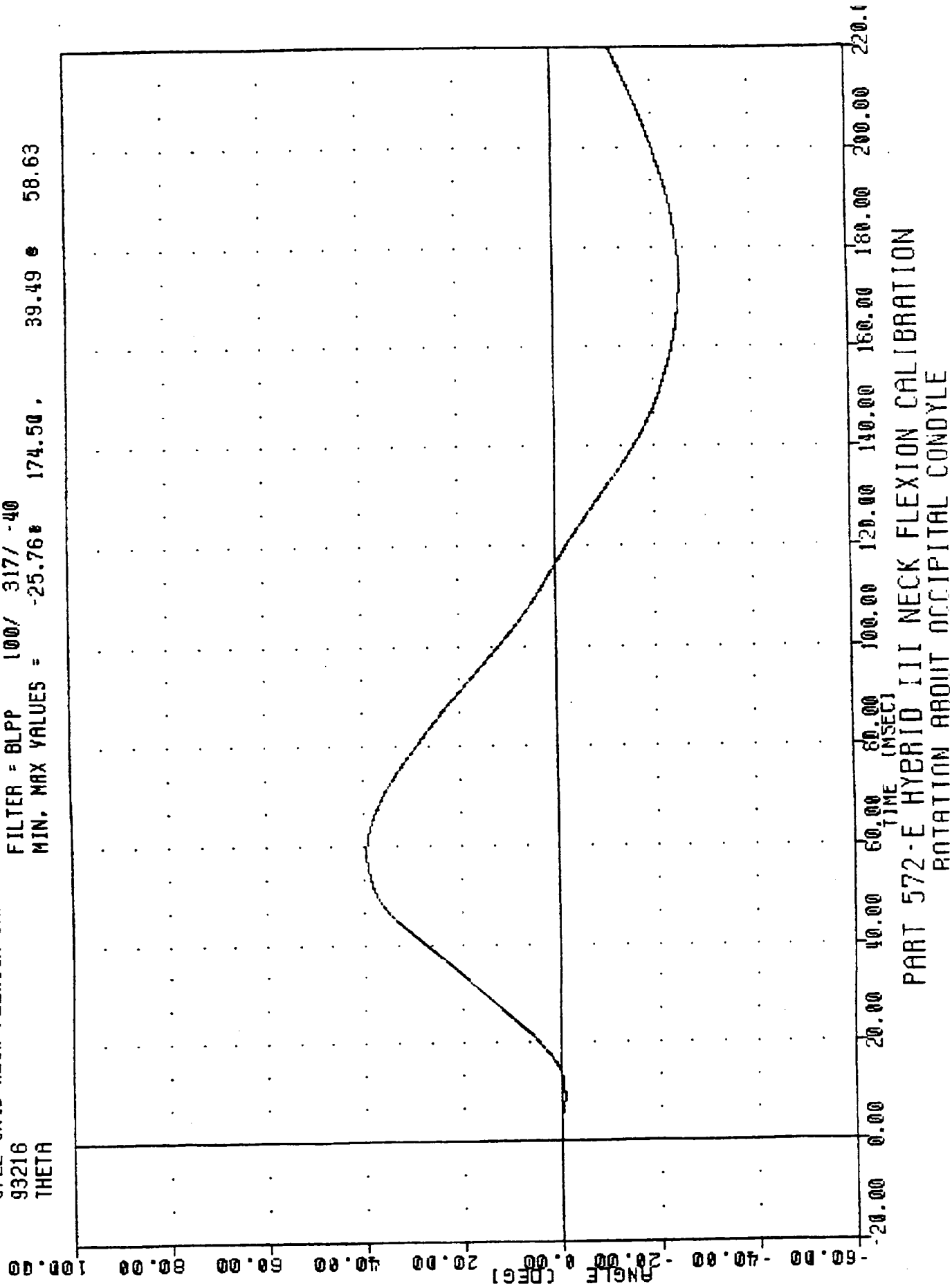


PART 572-E HYBRID III NECK FLEXION CALIBRATION
 ROTATION ABOUT BASE OF NECK

IRL
572E SN49 NECK FLEXION CAL06
93216
THETA

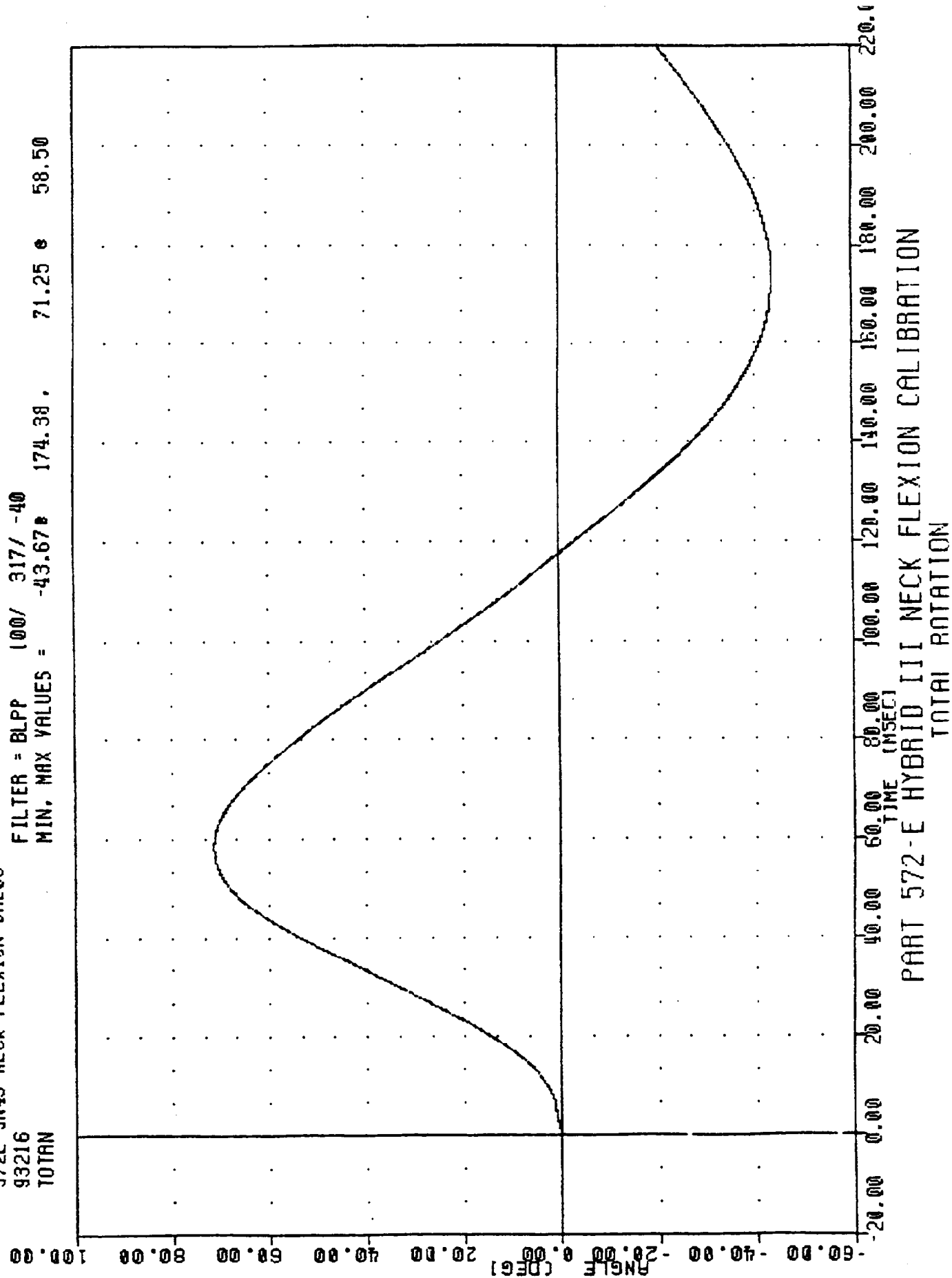
, 43UBNF

FILTER = BLPP 100/ 317/ -40
MIN. MAX VALUES = -25.76 174.50 39.49 58.63



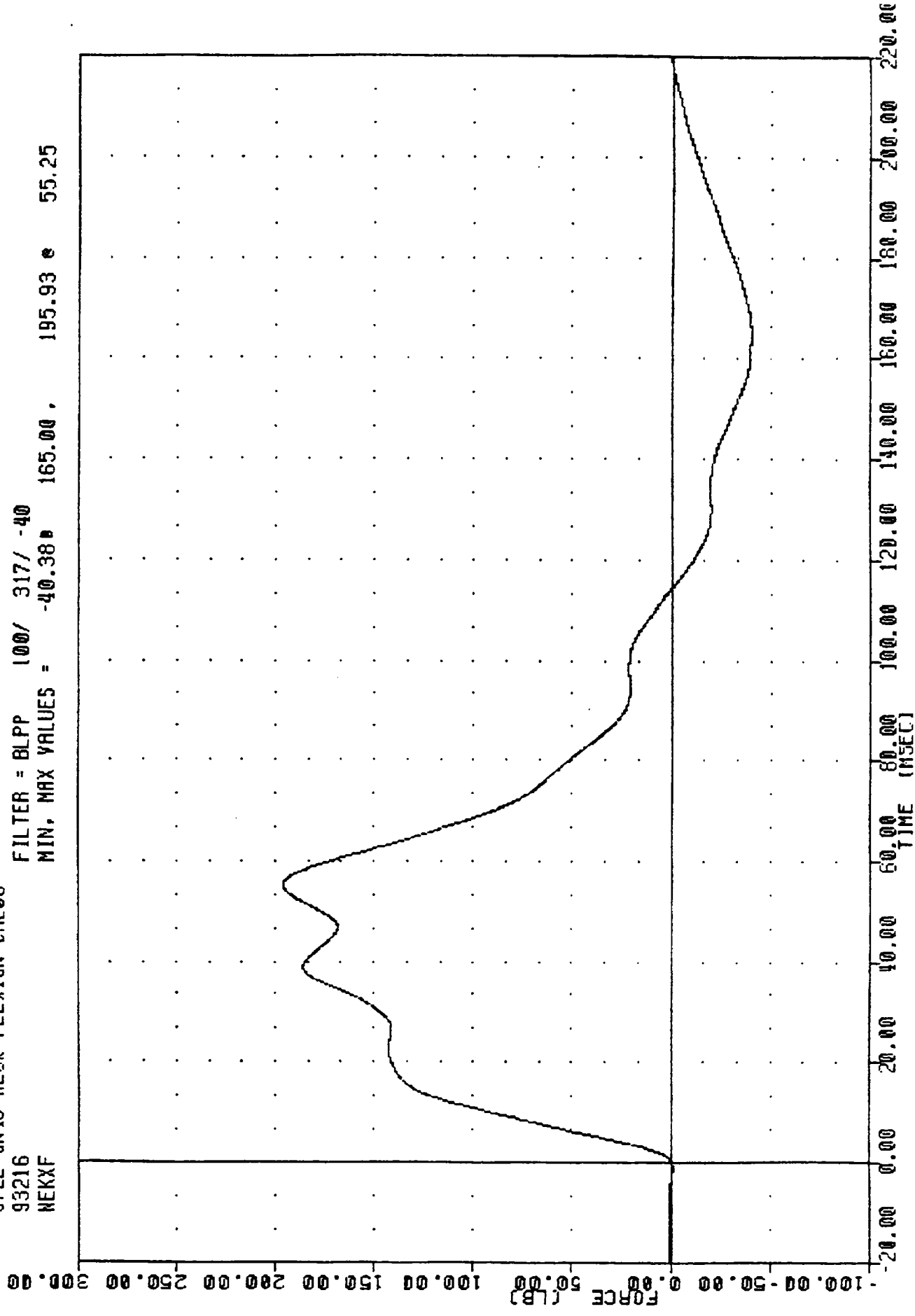
IHC
 572E SN43 NECK FLEXION CAL06
 93216
 TOTAL

FILTER = BLPP 100/ 317/ -40
 MIN. MAX VALUES = -43.67 174.38 71.25 58.50



TRC , 43C6NF J
 572E SN43 NECK FLEXION CAL06
 93216
 NEKXF

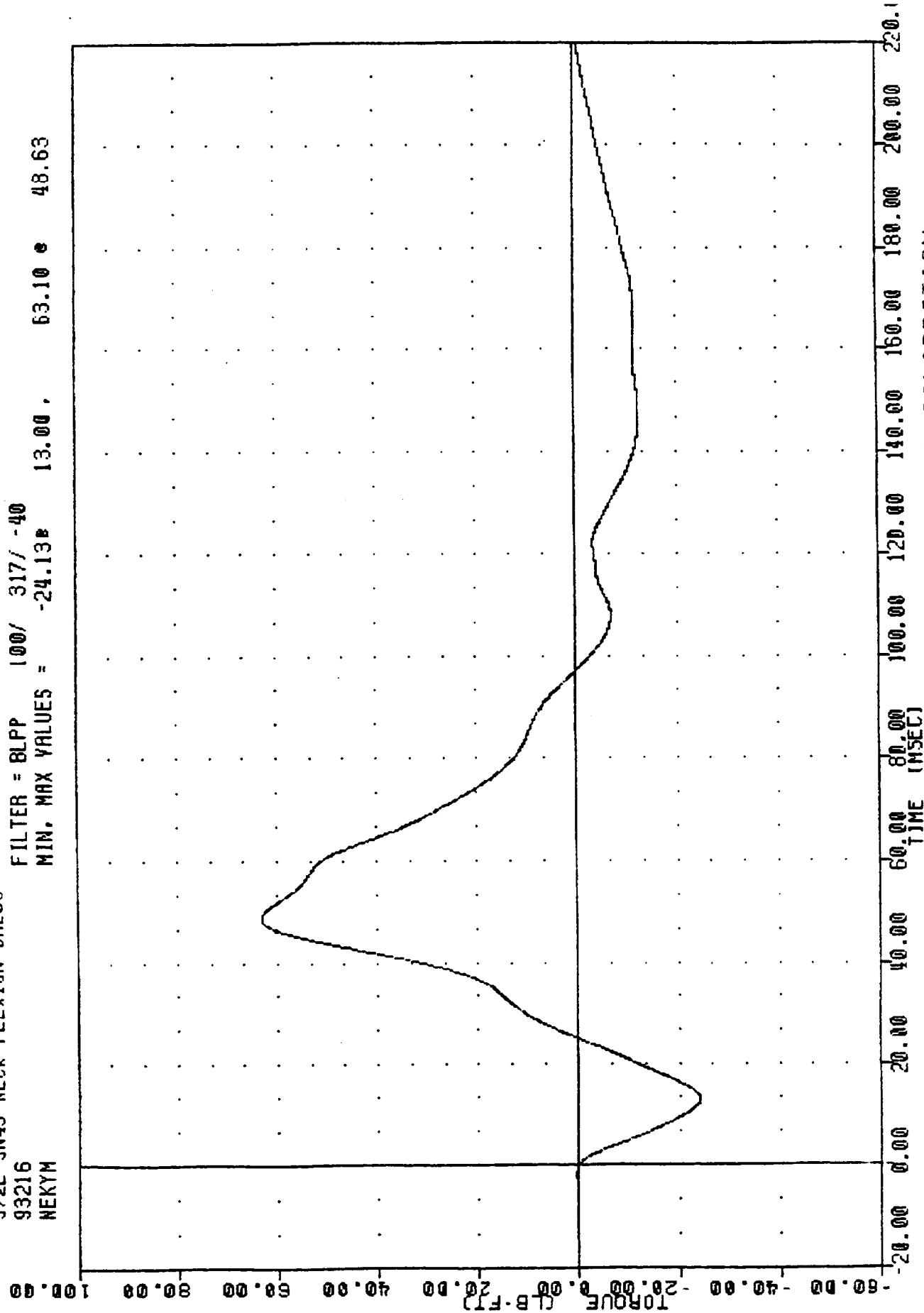
FILTER = BLPP 100/ 317/ -40
 MIN, MAX VALUES = -40.38 165.00 , 195.93 55.25



PART 572-E HYBRID III NECK FLEXION CALIBRATION
 NECK FORCE X AXIS

IHL
572E SN43 NECK FLEXION CAL06
93216
NEKYM

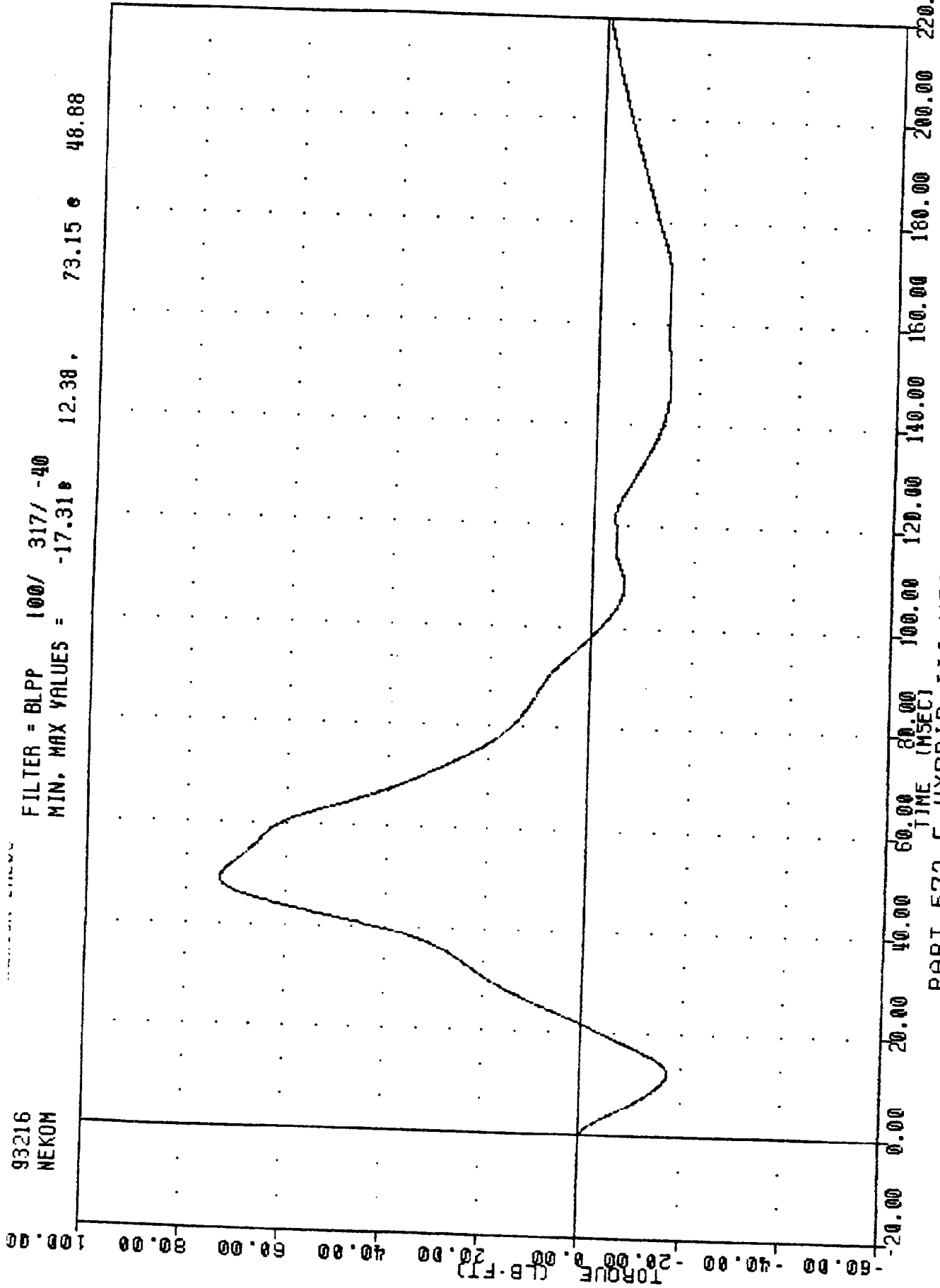
FILTER = BLPP 100/ 317/ -40
MIN. MAX VALUES = -24.13 13.00 53.10 48.63



PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK MOMENT Y AXIS

93216
NEKOM

FILTER = BLPP 100/ 317/ -40
MIN. MAX VALUES = -17.31 73.15 48.88



PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST

HYBRID III

04-AUG-93

6 AXIS NECK TRANSDUCER
TRC 43C6NE1

572E SN43 NECK EXT. CAL04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	55.0 %
IMPACT VELOCITY	19.5-20.3 FT/SEC	19.83 FT/SEC
PENDULUM	10 MS 17.20 - 21.20 G	18.35 G
DECELERATION	20 MS 14.00 - 19.00 G	17.30 G
	30 MS 11.00 - 16.00 G	14.59 G
MAX PENDULUM G	22 G MAX	18.88 G
MAX PENDULUM G ABOVE 30 MS	22 G MAX	14.50 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	38 - 46 MS	39.63 MS
D PLANE	MAX 81 - 106 DEG.	93.04 DEG.
ROTATION	TIME 72 - 82 MS	75.88 MS
MOMENT ABOUT OCCIPITAL	MIN -59.0/-39.0 FT.LBS	-46.65 FT.LBS
CONDYLE	TIME 65 - 79 MS	70.75 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	147 - 174 MS	159.75 MS
NEGATIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	120 - 148 MS	136.88 MS

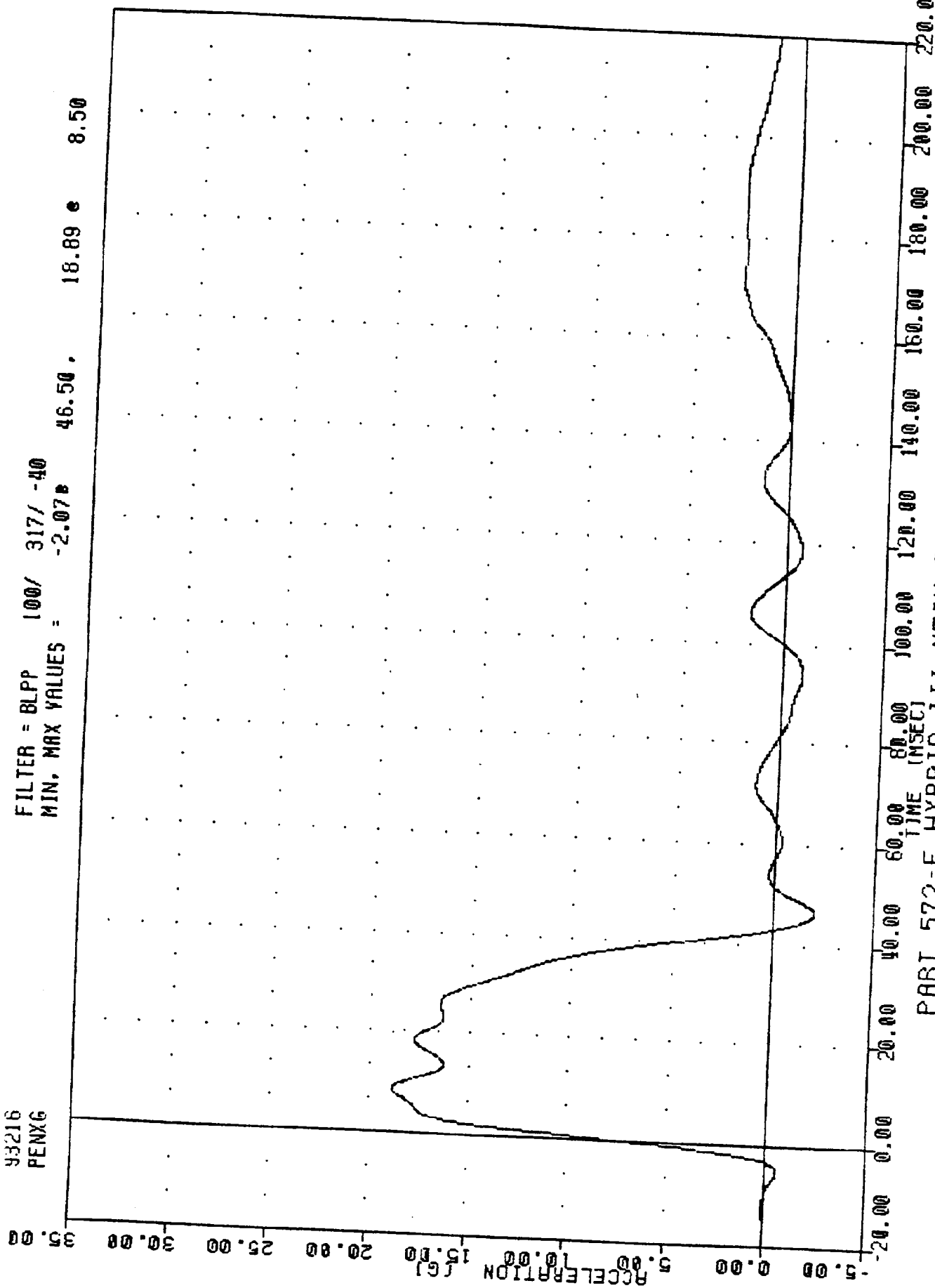
TEST MEETS SPECIFICATIONS

TECHNICIAN

Charles Middleton

93216
PENXG

FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -2.07 46.50 18.89 8.50



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
PENDULUM DECELERATION

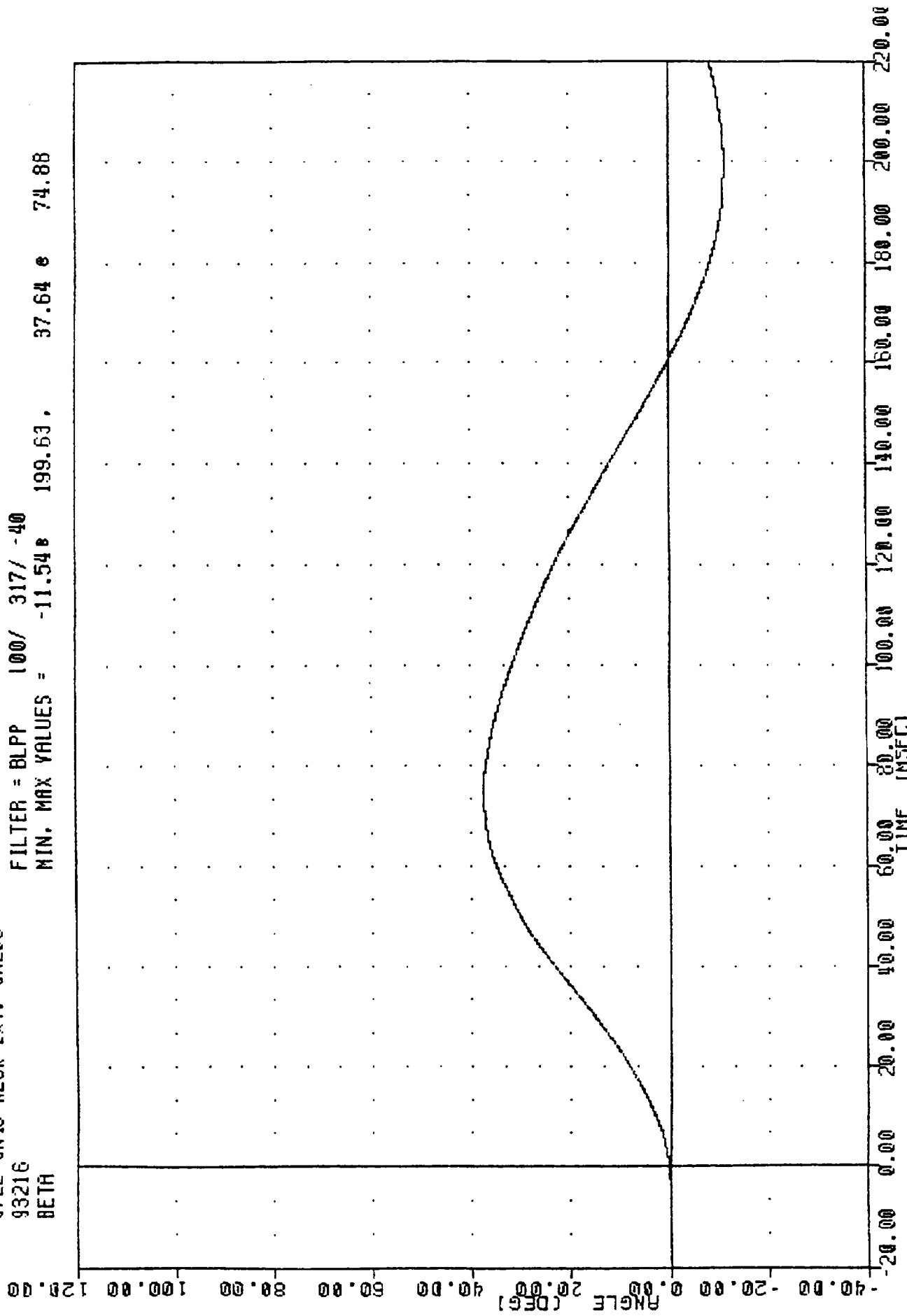
572E SN43 NECK EXT. CAL06

93216

BETA

FILTER = BLPP 100/ 317/ -40

MIN. MAX VALUES = -11.54 e 199.63 , 37.64 e 74.88



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

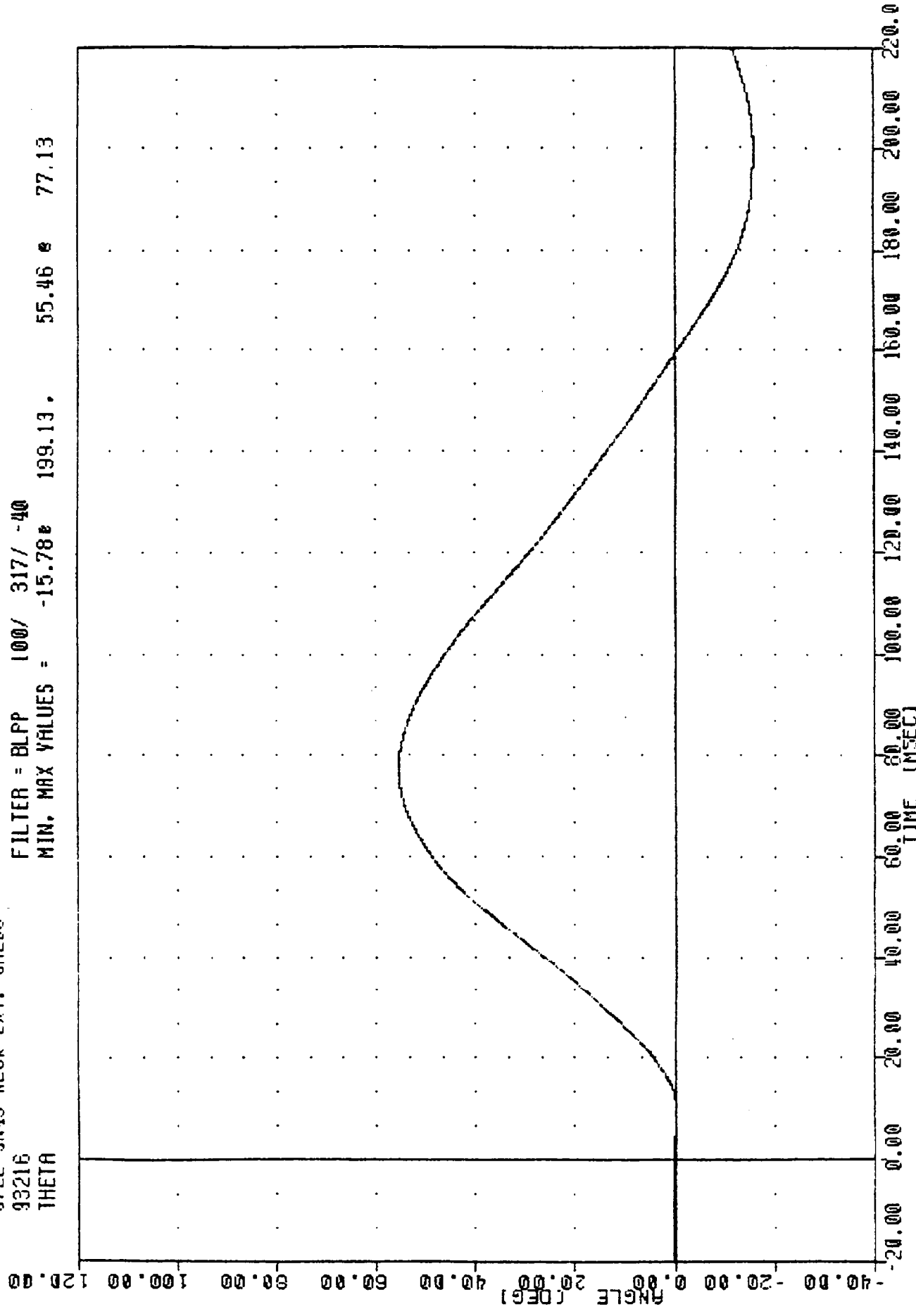
572E SN43 NECK EXT. CAL06

93216

THETA

FILTER = BLPP 100/ 317/ -40

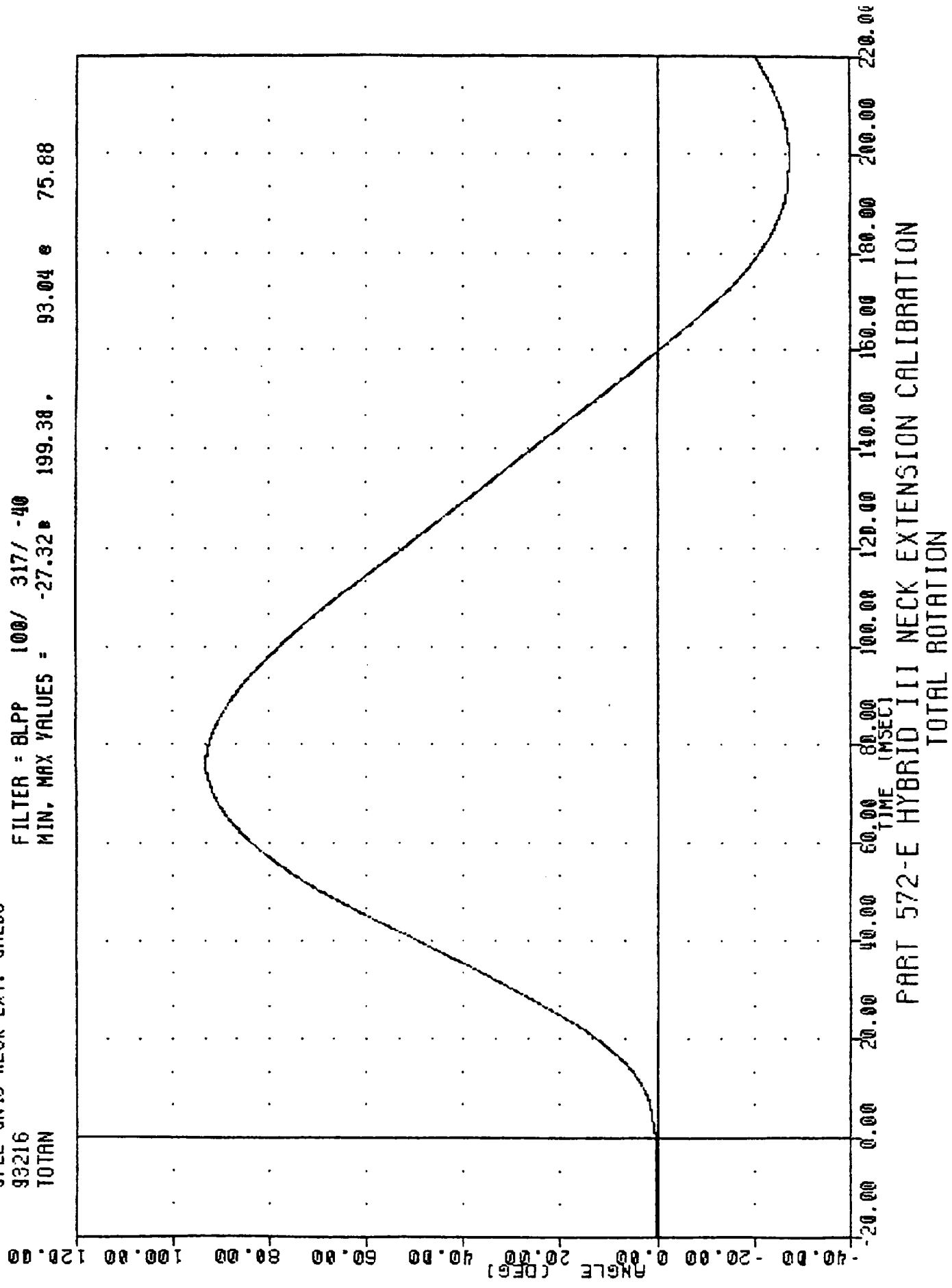
MIN. MAX VALUES = -15.78e 199.13. 55.46 e 77.13



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

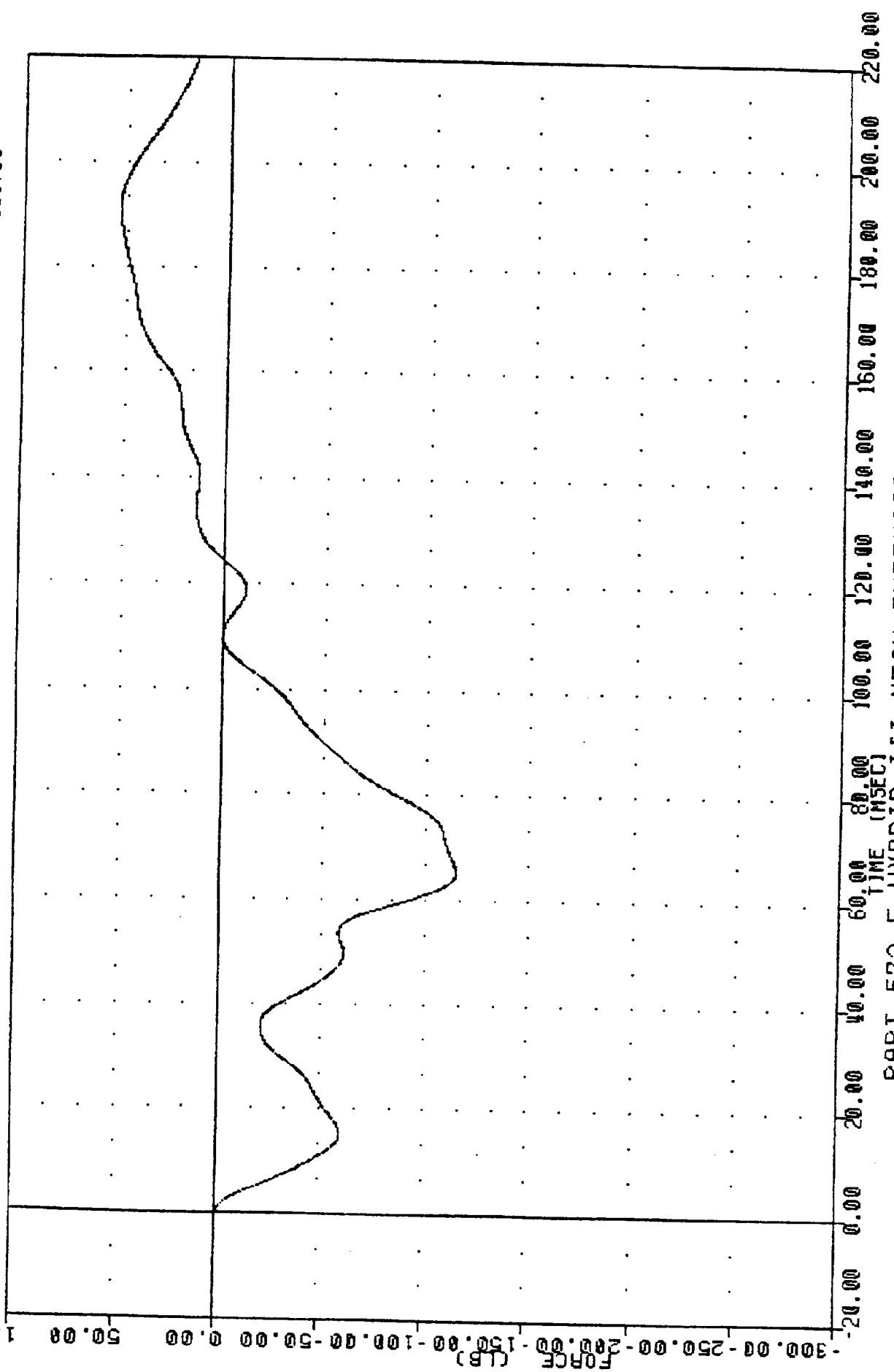
572E SN43 NECK EXT. CAL06
93216
TOTAL

FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -27.32 199.38 93.04 75.88



93216
NEKXF

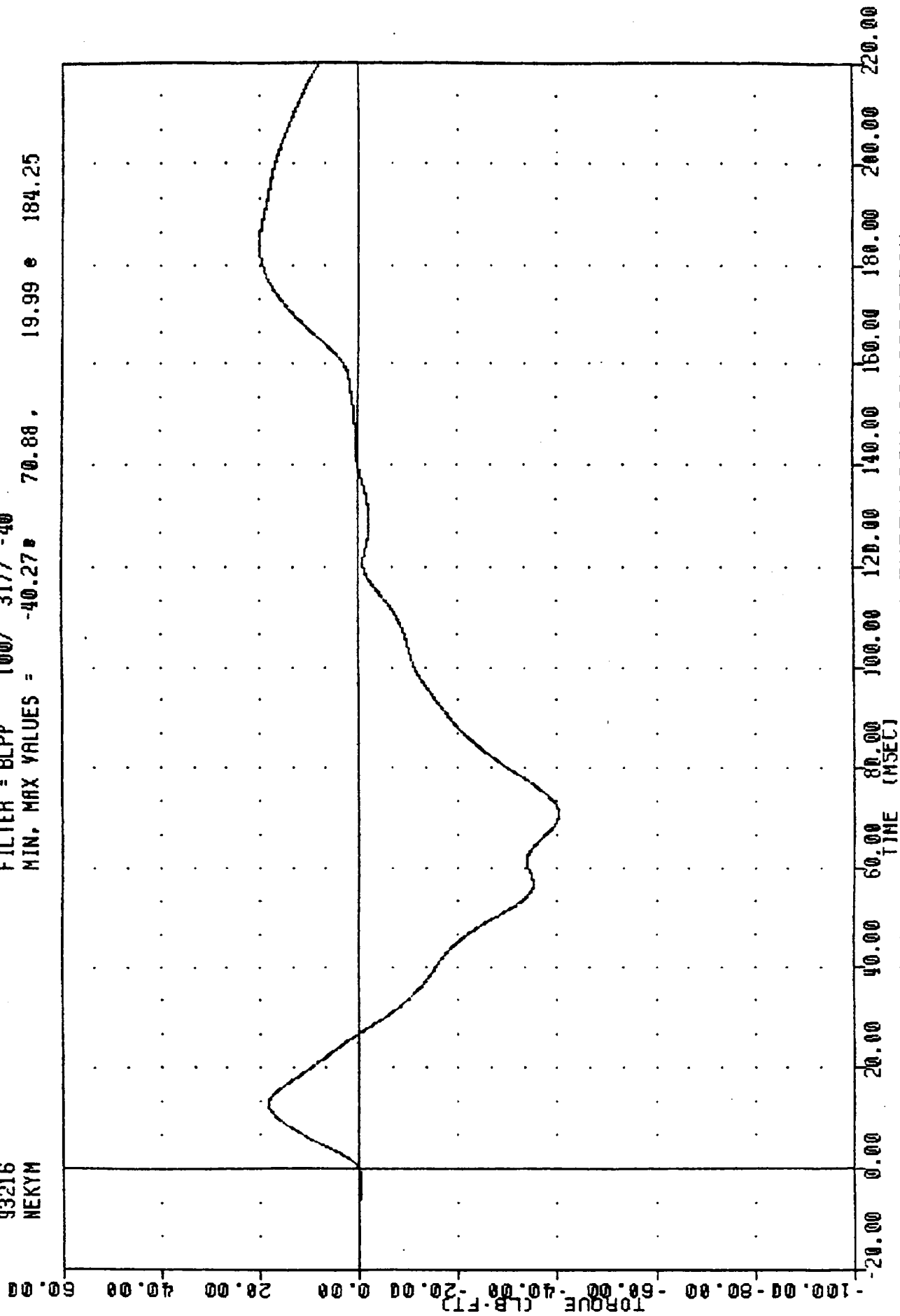
FILTER = BLPP 100/ 317/ -40
MIN. MAX VALUES = -114.59 65.25 53.37 191.00



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK FORCE X AXIS

572E SN43 NECK EXT. CALD6
93216
NEKYM

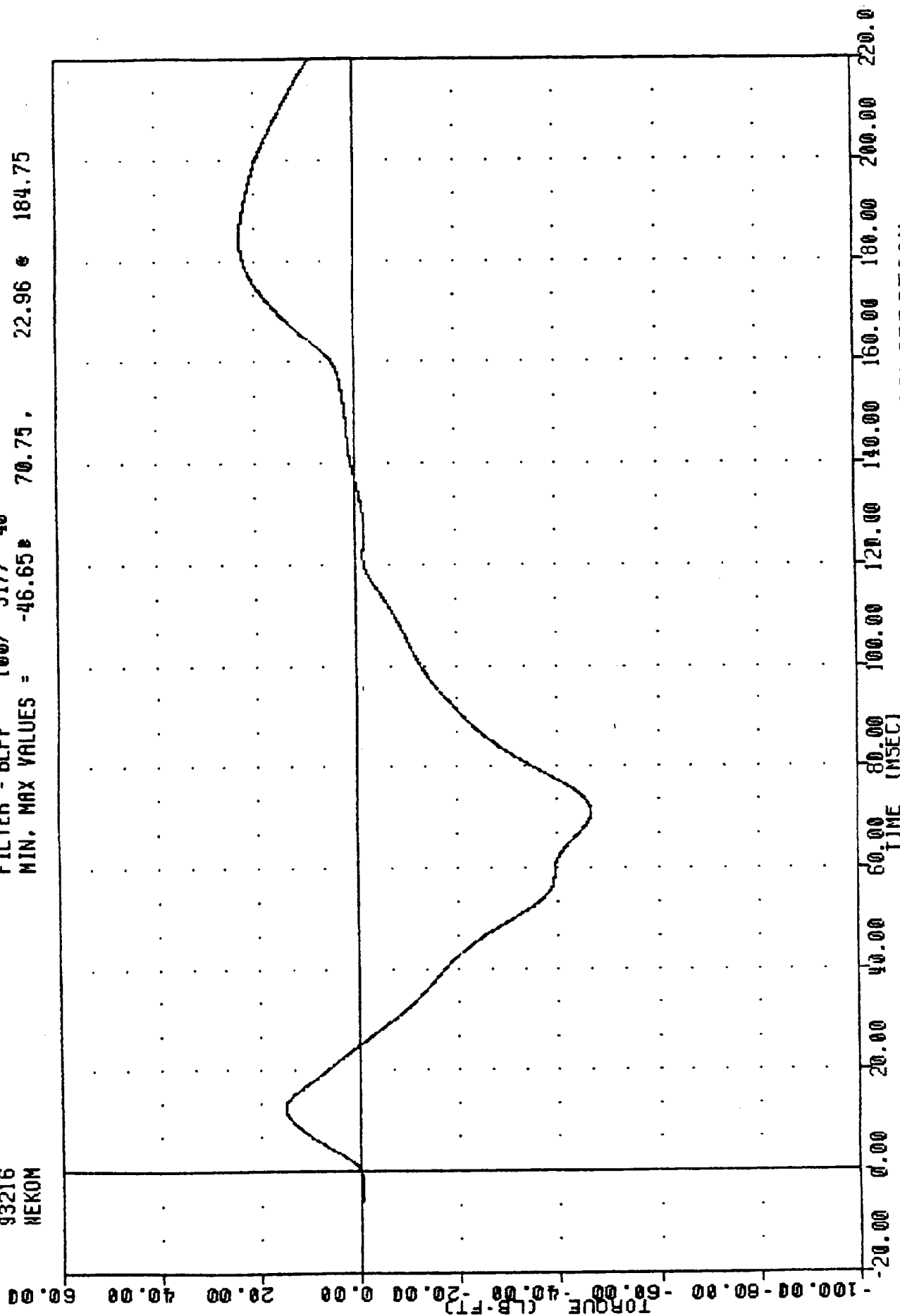
FILTER = BLPP 100/ 317/ -40
MIN. MAX VALUES = -40.27 70.88 19.99 e 184.25



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK MOMENT Y AXIS

572E SN43 NECK EXT. UNLDO
93216
NEKOM

FILTER = BLPP 100/ 317/ -40
MIN. MAX VALUES = -46.65 70.75 22.96 184.75



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III

04-AUG-93

TRC

43C6TH1

572E SN43 H.S.THORAX CAL06

	HIGH SPEED TEST	
TEST PARAMETER	SPECIFICATION	TEST RESULTS
=====		
TEMPERATURE	69 - 72 DEG. F	70.0 DEG. F

RELATIVE HUMIDITY	10% - 70%	55.0 %

PENDULUM VELOCITY	21.6-22.4 FT/SEC	21.91 FT/SEC

MAXIMUM DEFLECTION	2.50 - 2.86 IN	2.85 IN

MAXIMUM RESISTIVE FORCE	1160 - 1325 LBS	1184.6 LBS

INTERNAL HYSTERESIS	69% - 85%	73.5%

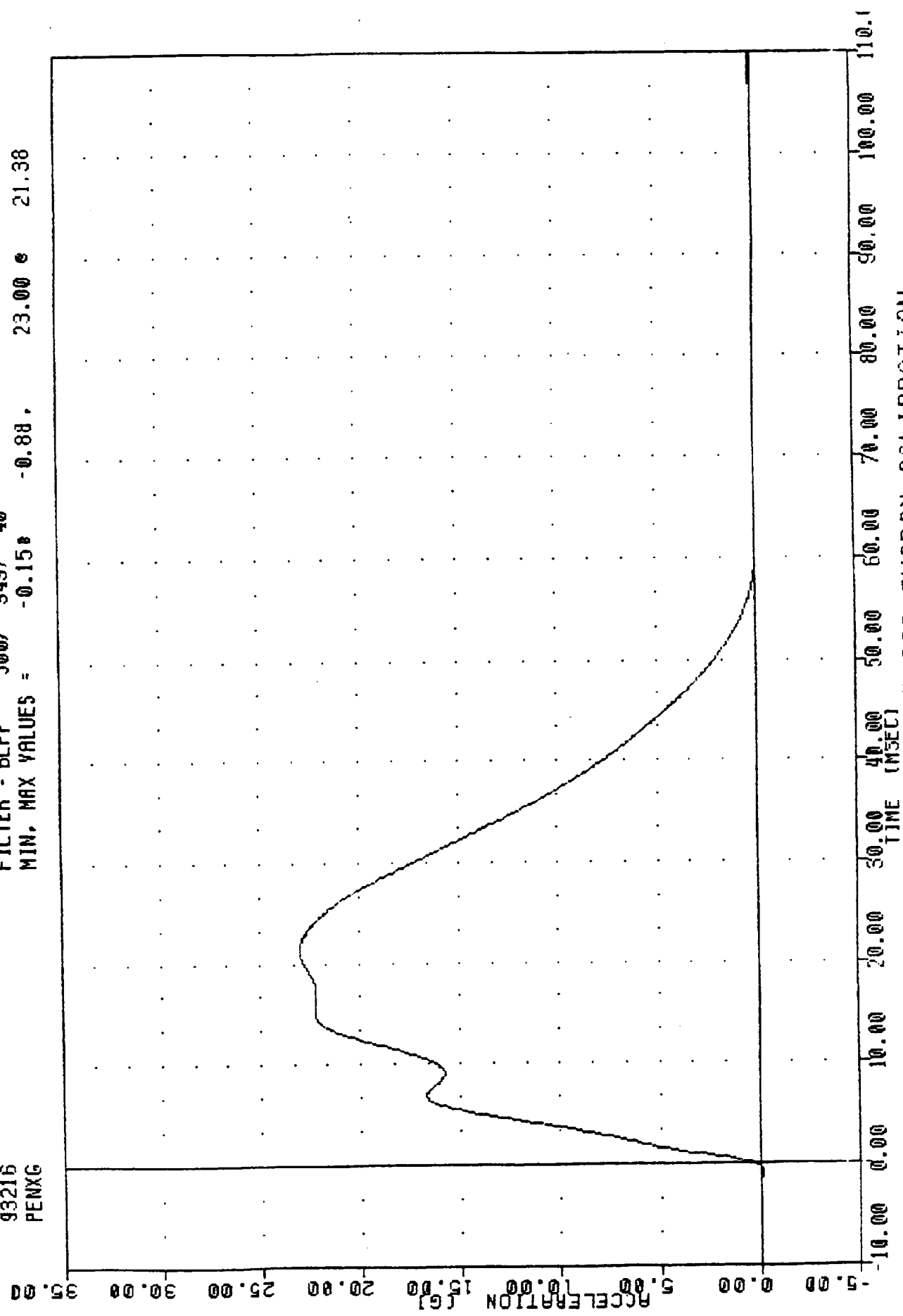
TEST MEETS SPECIFICATIONS

TECHNICIAN Charles H. Mallett

TAC
572E SN43 H.S. THORAX CAL06
93216
PENXG

, 43061H1

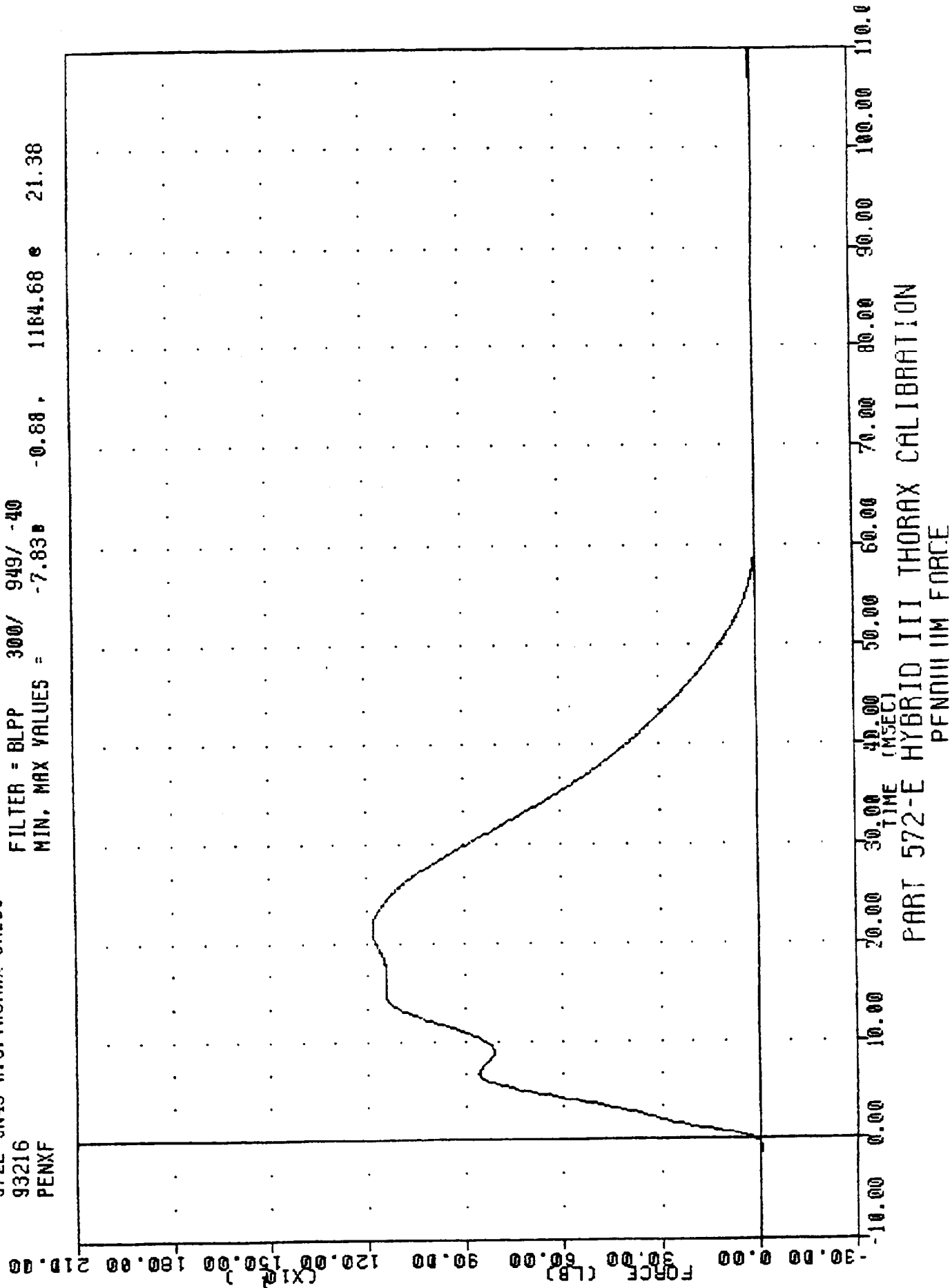
FILTER = BLPP 300/ 949/ -40
MIN. MAX VALUES = -0.15 23.00 21.38
-0.88



PART 572-E HYBRID III THORAX CALIBRATION
PENNIUM DECFIFRATION

IHC
 572E SN43 H.S. THORAX CAL06
 93216
 PENXF

FILTER = BLPP 300/ 949/ -40
 MIN. MAX VALUES = -7.83 1164.68 21.38

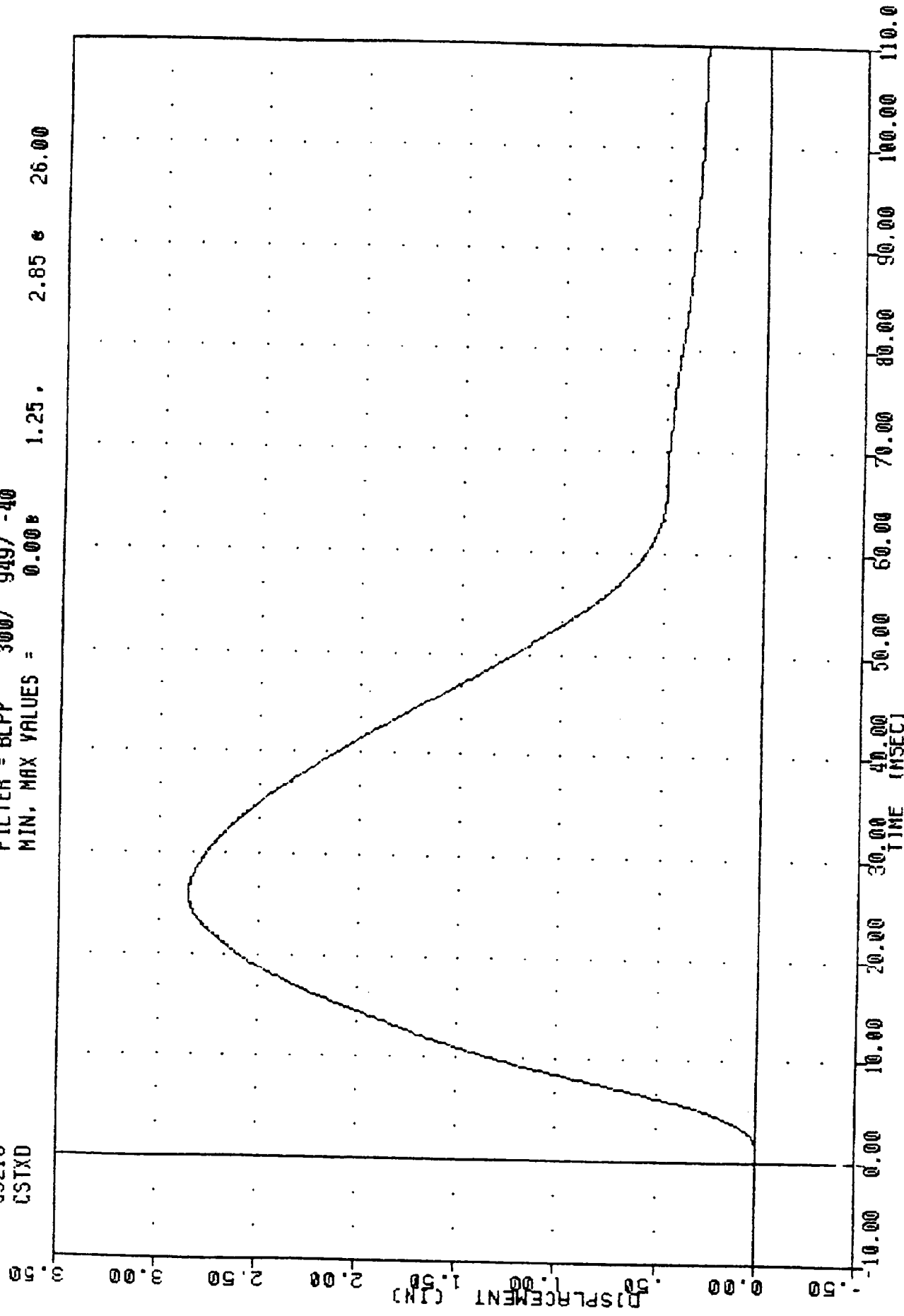


PART 572-E HYBRID III THORAX CALIBRATION
 PENNIII IIM FORCE

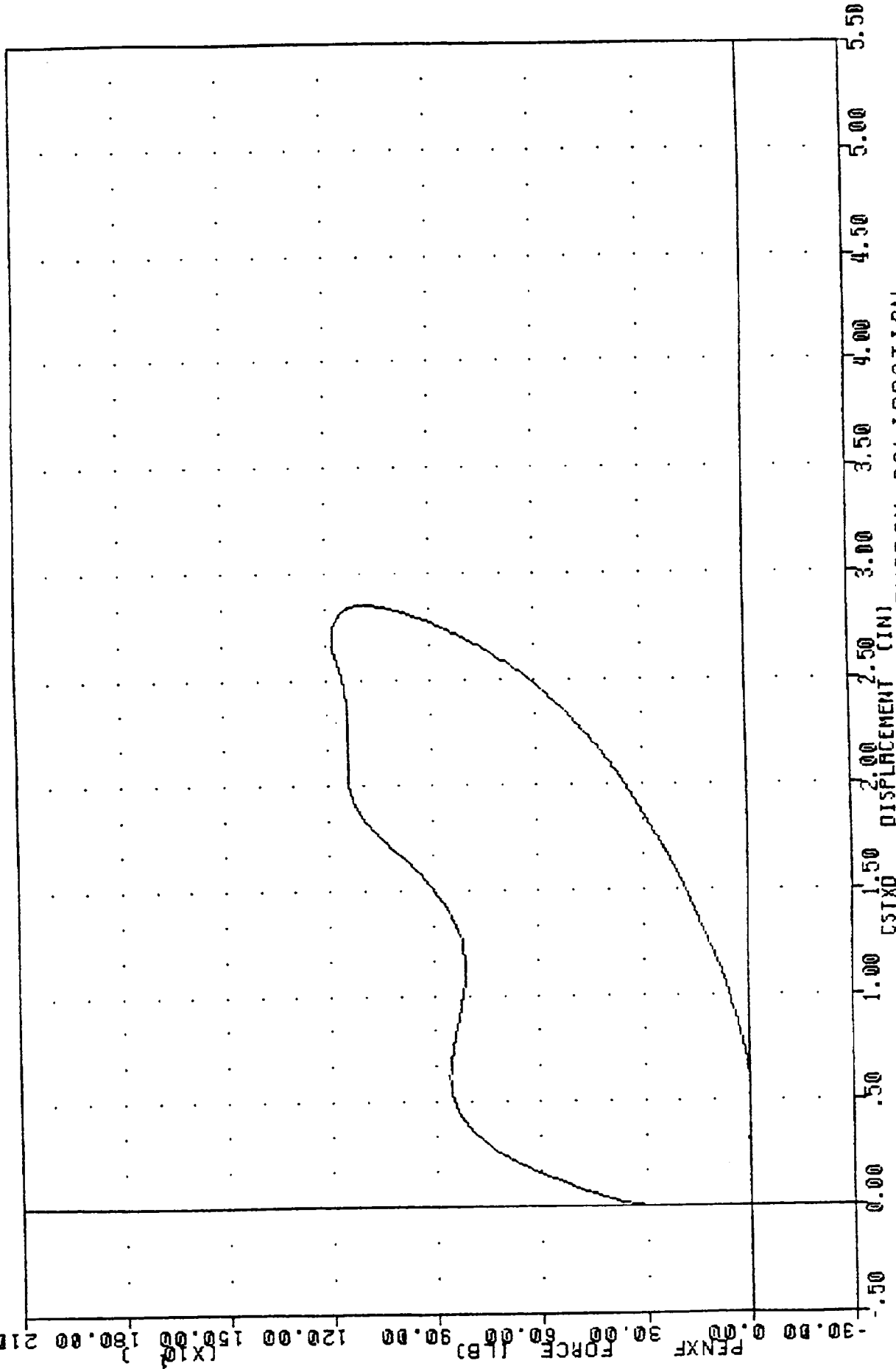
93216
CSTXD

FILTER = BLPP 300/ 949/ -40
MIN. MAX VALUES = 0.00 26.00

1.25 2.85 26.00



LOIADU FILTER = BLPP 300/ 840/ -40 MIN, MAX = -7.83 1184.68 41.58
 PENXF



PART 572-E HYBRID III THORAX CALIBRATION
 CHEST DISPLACEMENT VS PENDULUM FORCE

APPENDIX D

MISCELLANEOUS TEST INFORMATION

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MFR. & S/N: HUMANOID/043

SEATING POSITION: DRIVER

LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
HEAD ACCELERATION	X	ENDEVCO	7264	BR19J	FRONT
HEAD ACCELERATION	Y	ENDEVCO	7264	AL08	LEFT
HEAD ACCELERATION	Z	ENDEVCO	7264	BD73J	UP
HEAD 1 ACCELERATION	X	ENDEVCO	7264	BE30J	FRONT
HEAD 1 ACCELERATION	Z	ENDEVCO	7264	AM74	UP
HEAD 2 ACCELERATION	Y	ENDEVCO	7264	BF14J	LEFT
HEAD 2 ACCELERATION	Z	ENDEVCO	7264	BE04J	UP
HEAD 3 ACCELERATION	X	ENDEVCO	7264	BE47J	FRONT
HEAD 3 ACCELERATION	Y	ENDEVCO	7264	BG38J	LEFT
HEAD ANGULAR VELOCITY	X	ATA	ARS-01	177	
HEAD ANGULAR VELOCITY	Y	ATA	ARS-01	176	
HEAD ANGULAR VELOCITY	Z	ATA	ARS-01	179	
NECK FORCE	X	DENTON	1716	0452FX	*
NECK FORCE	Y	DENTON	1716	0452FY	*
NECK FORCE	Z	DENTON	1716	0452FZ	*
NECK MOMENT	X	DENTON	1716	0452MX	*
NECK MOMENT	Y	DENTON	1716	0452MY	*
NECK MOMENT	Z	DENTON	1716	0452MZ	*
CHEST ACCELERATION	X	ENDEVCO	7264	EJ01H	FRONT
CHEST ACCELERATION	Y	ENDEVCO	7264	DH31J	LEFT
CHEST ACCELERATION	Z	ENDEVCO	7264	FF79J	UP
CHEST ANGULAR VELOCITY	X	ATA	ARS-01	184	
CHEST ANGULAR VELOCITY	Y	ATA	ARS-01	167	
CHEST ANGULAR VELOCITY	Z	ATA	ARS-01	161	
CHEST DISPLACEMENT	X	VERNITECH	81422-A	043	OUTWARD
PELVIS ACCELERATION	X	ENDEVCO	7264	DM72J	REAR
PELVIS ACCELERATION	Y	ENDEVCO	7264	BG11J	LEFT
PELVIS ACCELERATION	Z	ENDEVCO	7264	BH87J	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	BK96H	REAR
CENTER OF GRAVITY ACCEL.	Y	ENDEVCO	7264	CG21H	RIGHT
CENTER OF GRAVITY ACCEL.	Z	ENDEVCO	7264	CH86H	UP
CENTER OF GRAVITY ROLL	X	HUMPHREY	RG28-0128-1	H-14	LEFT
CENTER OF GRAVITY PITCH	Y	HUMPHREY	RG28-0128-1	H-19	DOWN
CENTER OF GRAVITY YAW	Z	HUMPHREY	RG28-0128-1	H-21	RIGHT
LEFT FRONT DOOR LATCH	X	ENDEVCO	7264	AR38	REAR
	Y	ENDEVCO	7264	AY49	LEFT
	Z	ENDEVCO	7264	BA46	DOWN
RIGHT FRONT DOOR LATCH	X	ENDEVCO	7264	AG24	REAR
	Y	ENDEVCO	7264	AS95	RIGHT
	Z	ENDEVCO	7264	AY66	DOWN
DRIVER'S SHOULDER BELT DISPLACEMENT		CELESCO	PT-101-0040 111-5110	A51809	OUTWARD
DRIVER'S SHOULDER BELT FORCE		LEBOW	3419	610	TENSION
DRIVER'S LAP BELT OUTBOARD FORCE		LEBOW	3419	236	TENSION
LEFT FRONT SUSPENSION DISPLACEMENT		CELESCO	PT-101-50A	A12889	OUTWARD
RIGHT FRONT SUSPENSION DISPLACEMENT		CELESCO	PT-101-40A	A02465	OUTWARD
LEFT REAR SUSPENSION DISPLACEMENT		CELESCO	PT-101-40A	A128	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	BY03J	FRONT
CENTER OF GRAVITY	Y	ENDEVCO	7264	DA99H	RIGHT
CENTER OF GRAVITY	Z	ENDEVCO	7264	CR26H	UP
LEFT CYLINDER DISPLACEMENT		CELESCO	PT-101-60A	A23305	UP
RIGHT CYLINDER DISPLACEMENT		CELESCO	PT-101-60A	A23306	UP

PRE-TEST
IPMD VEHICLE DATA SHEET

Filled Out By: B. Queiser

Date: July 21, 1993

VEHICLE DATA

Vehicle Make and Model (written out): Nissan pickup truck

NHTSA ID Code (7 characters): 93T542 /Model Year (2 digits): 90

Vehicle Make (2 characters): 64

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

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

VIN (20 characters): 1N6SD11S9LC348978

Odometer Reading: 44135.2

Thousands of Miles: _____

Overall Length: 179.0

(in) x 25.4 =: 4547 (mm)

Wheelbase: 104.6

(in) x 25.4 =: 2657 (mm)

Front Track: 54.8

(in) x 25.4 =: 1392 (mm)

Rear Track: 54.5

(in) x 25.4 =: 1384 (mm)

Roof Height: 61.0

(in) x 25.4 =: 1549 (mm)

IPMD VEHICLE DATA SHEET

G.V.W.R.: 4400 (lbs) x 4.45 =: 19580 (N)
FRONT G.A.W.R.: 2200 (lbs) x 4.45 =: 9790 (N)
REAR G.A.W.R.: 2544 (lbs) x 4.45 =: 11321 (N)

The following tire loadings are measured with the vehicle at Test Weight.

Weight on RF Tire: 771 (lbs) x 4.45 =: 3431 (N)
Weight on LF Tire: 813 (lbs) x 4.45 =: 3618 (N)
Weight on LR Tire: 787 (lbs) x 4.45 =: 3502 (N)
Weight on RR Tire: 815 (lbs) x 4.45 =: 3627 (N)
Vehicle Test Weight: 3186 (lbs) x 4.45 =: 14178 (N)

Lateral and Longitudinal Center of Gravity Location.

From Front Axle: 52.6 (in) x 25.4 =: 1336 (mm)
From Center Line: -0.1 (in) x 25.4 =: .3 (mm)
Engine Displacement: 146.3 (cu in) x 0.0164 =: 2.4 (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): _____

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

T = Semi-Trailing Arm

L = Leaf

W = Twist

M = Multiple Link

4 = 4 Link

Q = Torque Arm

3 = 3 Link

S = Strut

I = Twin I Beam

O = Other: _____

Spring Type (2 characters): TB

CO = Coil

TB = Torsion Bar

LL = Longitudinal Leaf

TL = Transverse Leaf

OT = Other: _____

Brake Type (2 characters): DI

DI = Disk

LT = Leading-Trailer Shoe

DS = Duo-Servo Shoe

OT = Other: _____

Suspension Modified (1 character): N

N = No

Y = Yes

Suspension Modification

R = Raised

L = Lowered

S = Stiffened

W = Widened

O = Other

1 = _____

2 = _____

IPMD VEHICLE DATA SHEET

FRONT SUSPENSION

Tire Manufacturer (10 characters): Kelly

Tire Size Code (10 characters): P205/75R14

Tire Construction (2 characters): SB

BB = Bias Belted

GP = Glass Belted Radial

BP = Bias Ply

SB = Steel Belted Radial

OT = Other: _____

Tire Rim width: 5.0 (in) X 25.4 =: 127 (mm)

Axle Height: 12.1 (in) X 25.4 =: 307 (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

T = Semi-Trailing Arm

L = Leaf

W = Twist

M = Multiple Link

4 = 4 Link

Q = Torque Arm

3 = 3 Link

S = Strut

I = Twin I Beam

O = Other: _____

Spring Type (2 characters): LL

CO = Coil

TB = Torsion Bar

LL = Longitudinal Leaf

TL = Transverse Leaf

OT = Other: _____

Brake Type (2 characters): DS

DI = Disk

LT = Leading-Trailer Shoe

DS = Duo-Servo Shoe

OT = Other: _____

Suspension Modified (1 character): N

N = No

Y = Yes

Suspension Modification

R = Raised

L = Lowered

S = Stiffened

W = Widened

O = Other

1 = _____

2 = _____

IPMD VEHICLE DATA SHEET

REAR SUSPENSION

Tire Manufacturer (10 characters): Kelly

Tire Size Code (10 characters): P205/75R14

Tire Construction (2 characters): SB

BB = Bias Belted

GP = Glass Belted Radial

BP = Bias Ply

SB = Steel Belted Radial

OT = Other: _____

Tire Rim Width: 5.0

(in) X 25.4 =: 127 (mm)

Axle Height: 12.2

(in) X 25.4 =: 310 (mm)

Tire Pressure: 35.0

(psi) X 6.897 =: 241 (kpa)

I P M D M E A S U R E D D A T A Version 2.06

Vehicle # and Run # 542 Date: 07-23-1993 Time: 08:19:41
 Vehicle Type: Pickup Fuel: 1/4
 Load: Curb + Instr. + Driver
 Weight (lbs): 3186 Wheelbase (in): 104.6 Roof Height (in): 60.97
 Ramp Distance (in): 45.68 UltraSonic Offset (in): 15.75

IPMD Calibration Check (no Vehicle)

Applied Weight (lbs.)	Schaevitz Output (Deg.)	System C.G. Pivot
+0	-0.32	0.00
+100	-5.59	32.87
+200	-10.79	32.89
+0	-0.33	0.00
-100	4.95	32.87
-200	10.15	32.88
+0	-0.32	0.00
Average System C.G. Pivot (in):		32.88

C.G. Height:

Applied Weight (lbs.)	Schaevitz Output (Deg.)	Resultant Longitudinal Movement (In.)	Individual C.G. Values
+0	-0.27	0.000	0.00
+100	-3.78	0.058	23.51
+200	-7.28	0.123	23.49
+0	-0.31	0.015	0.00
-100	3.22	-0.050	23.48
-200	6.78	-0.137	23.50
+0	-0.23	-0.016	0.00
Average calculated C.G. Height (in):		23.50	

Page #2

Vehicle # and Run # 542 Date: 07-23-1993 Time: 08:22:56
Vehicle Type: Pickup Fuel: 1/4
Load: Curb + Instr. + Driver
Weight (lbs): 3186 Wheelbase (in): 104.6 Roof Height (in): 60.97
Ramp Distance (in): 45.68 UltraSonic Offset (in): 15.75

Pitch Inertia:

Run #	Period (sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Pitch Calc.
1	4.035	10.77	0.169	1941.3
2	4.020	10.59	0.153	1928.9
3	4.025	10.93	0.159	1934.8

Average Pitch Inertia (ft. lb. sec²): 1935.0

Roll Inertia:

Run #	Period (sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Roll Calc.
1	2.375	9.08	0.130	325.1
2	2.375	8.91	0.127	325.2
3	2.370	8.25	0.115	322.0

Average Roll Inertia (ft. lb. sec²): 324.1

Yaw Inertia:

Run #	Period (sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (Deg.)	Individual Yaw Calc.
1	2.455	10.01	0.12	1951.2
2	2.455	8.61	0.10	1951.5
3	2.455	9.08	0.11	1951.6

Average Yaw Inertia (ft. lb. sec²): 1951.4

POST-TEST
IPMD VEHICLE DATA SHEET

Filled Out By: B. Queiser

Date: July 28, 1993

VEHICLE DATA

Vehicle Make and Model (written out): Nissan pickup truck

NHTSA ID Code (7 characters): 93T543 /Model Year (2 digits): 90

Vehicle Make (2 characters): 64

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 (20 characters): 1N6SD11S9LC348978

Odometer Reading: 44,138.2

Thousands of Miles: _____

Overall Length: 178.8

(in) x 25.4 =: 4542 (mm)

Wheelbase: 104.5

(in) x 25.4 =: 2654 (mm)

Front Track: 54.7

(in) x 25.4 =: 1389 (mm)

Rear Track: 54.4

(in) x 25.4 =: 1382 (mm)

Roof Height: 51.6

(in) x 25.4 =: 1311 (mm)

IPMD VEHICLE DATA SHEET

G.V.W.R.: 4400 (lbs) x 4.45 =: 19580 (N)
FRONT G.A.W.R.: 2200 (lbs) x 4.45 =: 9790 (N)
REAR G.A.W.R.: 2544 (lbs) x 4.45 =: 11321 (N)

The following tire loadings are measured with the vehicle at Test Weight.

Weight on RF Tire: 789 (lbs) x 4.45 =: 3511 (N)
Weight on LF Tire: 808 (lbs) x 4.45 =: 3596 (N)
Weight on LR Tire: 743 (lbs) x 4.45 =: 3306 (N)
Weight on RR Tire: 804 (lbs) x 4.45 =: 3578 (N)
Vehicle Test Weight: 3144 (lbs) x 4.45 =: 13991 (N)

Lateral and Longitudinal Center of Gravity Location.

From Front Axle: 53.1 (in) x 25.4 =: 1349 (mm)
From Center Line: 0.4 (in) x 25.4 =: 10 (mm)
Engine Displacement: 146.3 (cu in) x 0.0164 =: 2.4 (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): _____

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

T = Semi-Trailing Arm

L = Leaf

W = Twist

M = Multiple Link

4 = 4 Link

Q = Torque Arm

3 = 3 Link

S = Strut

I = Twin I Beam

O = Other: _____

Spring Type (2 characters): TB

CO = Coil

TB = Torsion Bar

LL = Longitudinal Leaf

TL = Transverse Leaf

OT = Other: _____

Brake Type (2 characters): DI

DI = Disk

LT = Leading-Trailer Shoe

DS = Duo-Servo Shoe

OT = Other: _____

Suspension Modified (1 character): N

N = No

Y = Yes

Suspension Modification

R = Raised

L = Lowered

S = Stiffened

W = Widened

O = Other

1 = _____

2 = _____

IPMD VEHICLE DATA SHEET

FRONT SUSPENSION

Tire Manufacturer (10 characters): Kelly

Tire Size Code (10 characters): P205/75R14

Tire Construction (2 characters): SB

BB = Bias Belted

GP = Glass Belted Radial

BP = Bias Ply

SB = Steel Belted Radial

OT = Other: _____

Tire Rim width: 5.0 (in) X 25.4 =: 127 (mm)

Axle Height: 12.1 (in) X 25.4 =: 307 (mm)

Tire Pressure: Left: 35 (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

T = Semi-Trailing Arm

L = Leaf

W = Twist

M = Multiple Link

4 = 4 Link

Q = Torque Arm

3 = 3 Link

S = Strut

I = Twin I Beam

O = Other: _____

Spring Type (2 characters): LL

CO = Coil

TB = Torsion Bar

LL = Longitudinal Leaf

TL = Transverse Leaf

OT = Other: _____

Brake Type (2 characters): DS

DI = Disk

LT = Leading-Trailer Shoe

DS = Duo-Servo Shoe

OT = Other: _____

Suspension Modified (1 character): N

N = No

Y = Yes

Suspension Modification

R = Raised

L = Lowered

S = Stiffened

W = Widened

O = Other

1 = _____

2 = _____

IPMD VEHICLE DATA SHEET

REAR SUSPENSION

Tire Manufacturer (10 characters): Kelly

Tire Size Code (10 characters): P205/75R14

Tire Construction (2 characters): SB

BB = Bias Belted

GP = Glass Belted Radial

BP = Bias Ply

SB = Steel Belted Radial

OT = Other: _____

Tire Rim Width: 5.0

(in) X 25.4 =: 127 (mm)

Axle Height: 11.9

(in) X 25.4 =: 302 (mm)

Tire Pressure: Left: 35

(psi) X 6.897 =: 241 (kpa)

I P M D M E A S U R E D D A T A Version 2.06

Vehicle # and Run # 543 Date: 07-28-1993 Time: 16:00:04
 Vehicle Type: Pickup Fuel: 1/4
 Load: Curb + Driver + Instr (Post-Rollover)
 Weight (lbs): 3144 Wheelbase (in): 104.5 Roof Height (in): 51.59
 Ramp Distance (in): 45.68 UltraSonic Offset (in): 14.75

IPMD Calibration Check (no Vehicle)

Applied Weight (lbs.)	Schaevitz Output (Deg.)	System C.G. Pivot
+0	-0.36	0.00
+100	-5.63	32.91
+200	-10.83	32.89
+0	-0.37	0.00
-100	4.91	32.83
-200	10.15	32.75
+0	-0.32	0.00
Average System C.G. Pivot (in):		32.84

C.G. Height:

Applied Weight (lbs.)	Schaevitz Output (Deg.)	Resultant Longitudinal Movement (In.)	Individual C.G. Values
+0	-0.22	0.000	0.00
+100	-3.65	0.049	22.95
+200	-7.09	0.109	22.93
+0	-0.27	0.016	0.00
-100	3.20	-0.044	22.97
-200	6.69	-0.105	23.14
+0	-0.16	-0.013	0.00
Average calculated C.G. Height (in):		23.00	

Vehicle # and Run # 543 Date: 07-28-1993 Time: 16:00:05
 Vehicle Type: Pickup Fuel: 1/4
 Load: Curb + Driver + Instr (Post-Rollover)
 Weight (lbs): 3144 Wheelbase (in): 104.5 Roof Height (in): 51.59
 Ramp Distance (in): 45.68 UltraSonic Offset (in): 14.75

Pitch Inertia:

Run #	Period (sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Pitch Calc.
1	3.885	10.46	0.144	1787.6
2	3.880	10.09	0.139	1781.1
3	3.880	9.91	0.136	1781.3

Average Pitch Inertia (ft. lb. sec²): 1783.3

Roll Inertia:

Run #	Period (sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (In.)	Individual Roll Calc.
1	2.325	9.55	0.108	299.7
2	2.325	8.97	0.096	300.7
3	2.325	8.91	0.093	301.1

Average Roll Inertia (ft. lb. sec²): 300.5

Yaw Inertia:

Run #	Period (sec)	Platform Motion Amplitude (Deg.)	Relative Motion Amplitude (Deg.)	Individual Yaw Calc.
1	2.400	8.01	0.09	1847.4
2	2.405	9.01	0.10	1857.0
3	2.405	8.07	0.10	1856.6

Average Yaw Inertia (ft. lb. sec²): 1853.6

SIGN CONVENTION

ACCELEROMETERS:

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

POTENTIOMETERS:

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

LOAD CELLS:

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

NECK LOAD CELLS:

+X FORCE: HEAD PUSHED FORWARD
+Y FORCE: HEAD PUSHED LEFTWARD
+Z FORCE: HEAD PULLED UPWARD (TENSION ON NECK)
+X MOMENT: RIGHT EAR ROTATING TOWARD RIGHT SHOULDER
+Y MOMENT: HEAD ROTATING FORWARD
+Z MOMENT: CHIN ROTATING TO LEFT SHOULDER

GYROSCOPES:

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

1925
V-~~4429~~

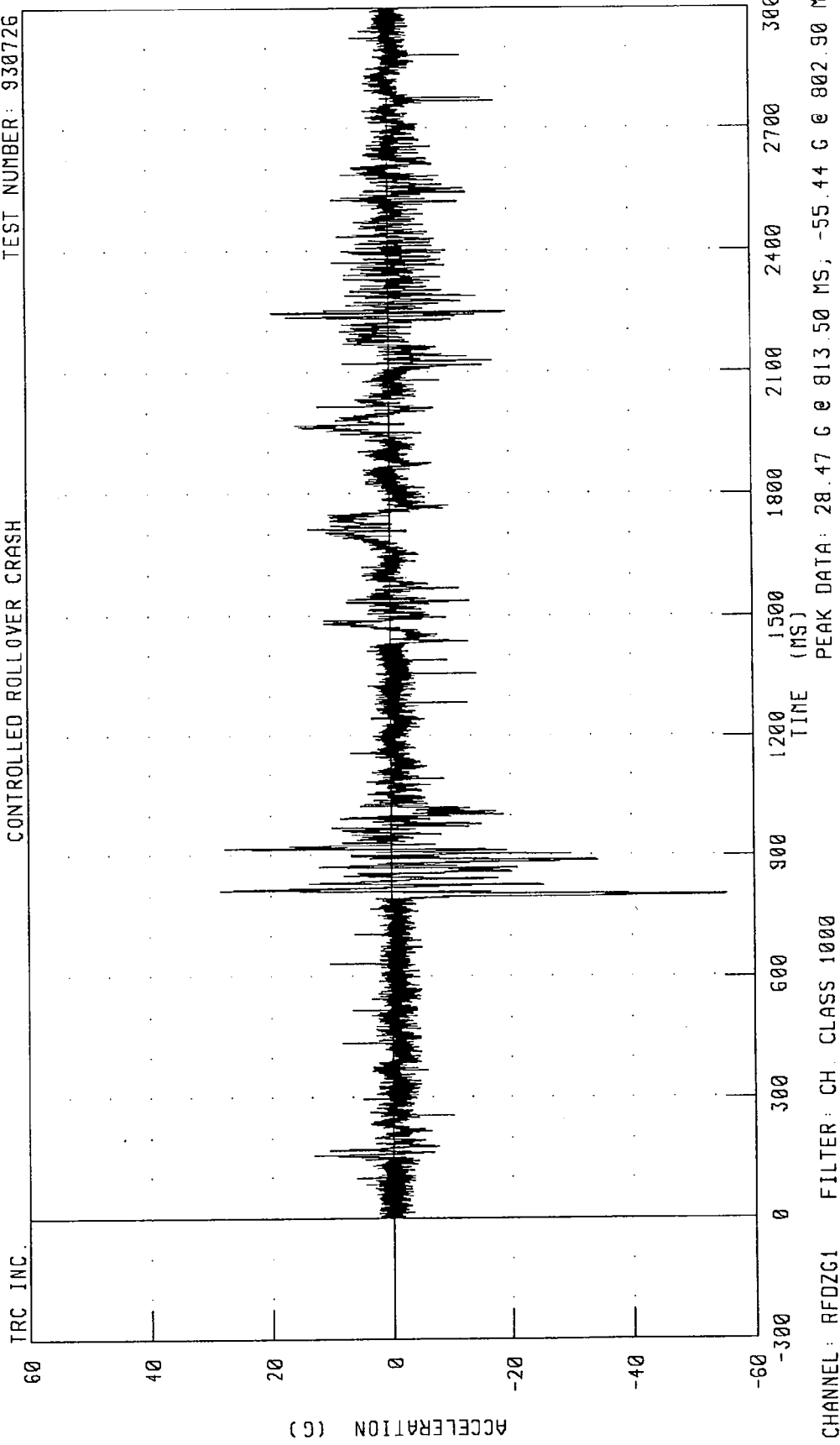
V1929

1990 NISSAN PICKUP FROM ROLLOVER CART AT 30 MPH
CURVE # 54 RIGHT FRONT DOOR LATCH Z-AXIS ACCELERATION

TEST NUMBER: 930726

CONTROLLED ROLLOVER CRASH

TRC INC.



CHANNEL: RFDZG1 FILTER: CH CLASS 1000