V1926

HEAVY TRUCK UNDERRIDE PROTECTION

1992 HONDA CIVIC

INTO HEAVY TRUCK REAR UNDERRIDE GUARD

MOUNTED TO FRUEHAUF FBX-F2-48 SEMITRAILER

TRC TEST NO. 930428

PREPARED BY:

TRANSPORTATION RESEARCH CENTER INC.

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FINAL REPORT

APRIL - MAY 1993

PREPARED FOR:

VEHICLE RESEARCH AND TEST CENTER

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16. Abstract

A 1992 Honda Civic 3-door hatchback was impacted into a heavy truck rear underride guard at Transportation Research Center Inc. on April 28, 1993. This test was conducted to determine vehicle performance of the underride guard mounted to a Fruehauf FBX-F2-48 semitrailer in the 0°, 30 mph impact mode. The actual test speed was 30.0 mph. The ambient temperature was 68° F. At maximum vehicle displacement, the clearance from the truck rear to the vehicle's windshield was 21.4 inches.

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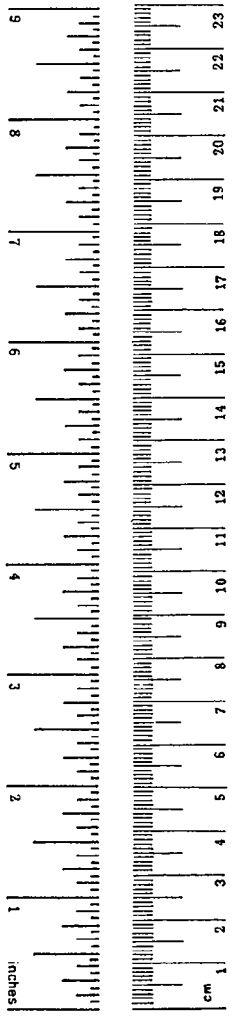
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

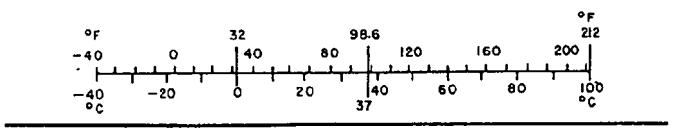
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	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	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



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	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
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	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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SECTION 1.0

PURPOSE & TEST PROCEDURE

PURPOSE

This heavy truck rear underride guard impact test was conducted for the Vehicle Research & Test Center (VRTC) by Transportation Research Center Inc. (TRC).

A rear underride guard was developed to minimally meet the proposed Federal regulatory standards for height, geometry, and static force/deflection requirements. For the initial dynamic testing, the rear underride guard was mounted to a simulated trailer rear end. This structure was a rigid test fixture (with the height and width of a semi-trailer) attached to the crash barrier wall.

This test was conducted to compare the results of the guard's performance when installed on an actual semi-trailer. The trailer was attached to a tractor unit and ballasted to simulate a loaded and parked tractor-trailer rig. Impact mode for the vehicle was 0°, 30 mph.

TEST PROCEDURE

The test vehicle was instrumented with seven (7) accelerometers to measure longitudinal, lateral, and vertical axis accelerations. The passenger's seat belt was instrumented with a load cell to measure shoulder belt force. The vehicle's specified impact velocity range was 29.5 to 30.5 mph. The vehicle impacted the heavy truck rear underride guard mounted with 1.0-inch mounting bolts to a Fruehauf FBX-F2-48 semitrailer attached to an International Harvester C0F9670 tractor at Transportation Research Center Inc.

The semitrailer was loaded with 41,620 pounds of concrete ballast weights; total pre-test tractor and semitrailer weight was 70,680 pounds. The tractor and semitrailer were parked with the parking brakes applied and transmission in neutral. The tractor and semitrailer were instrumented with one (1) and two (2) longitudinal axis accelerometers, respectively.

The test vehicle contained two (2) Part 572 E 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the dummy placement procedure specified in Appendix B and Optional Appendix C of NHTSA Laboratory Test Procedure TP-208-08.

Both dummies were instrumented with head, chest, and pelvis accelerometers to measure longitudinal, lateral, and vertical accelerations; six-axis neck load cells to measure neck moments and forces; and with left and right femur load cells to measure axial forces. Each Part 572 E dummy's instrumentation also included a chest potentiometer to measure longitudinal deflection.

The forty-seven (47) data channels were multiplexed and recorded on a 14-track tape drive. The data was digitally sampled at 8000 samples per second and processed per sections 12.8 and 12.9 of NHTSA's Laboratory Test Procedure TP-208-08.

The crash event was recorded by one (1) real-time panning motion picture camera and eleven (11) high-speed motion picture cameras.

The heavy truck underride guard test data are summarized in Section 2.0. The occupant, vehicle, & camera information are presented in Section 3.0. Appendix A contains the still photographic prints. Appendix B contains the data plots. Appendix C contains dummy certification data. Appendix D contains miscellaneous test information.

SECTION 2.0

HEAVY TRUCK REAR UNDERRIDE GUARD IMPACT TEST SUMMARY

TEST RESULTS SUMMARY

This heavy truck rear underride guard impact test was conducted at TRC on April 28, 1993

The test vehicle, a 1992 Honda Civic 3-door hatchback, was equipped with a 1.5-liter, transverse engine, automatic transmission, power steering, and power brakes. The vehicle's test weight was 2654 pounds. The vehicle's impact speed was 30.0 mph. At maximum vehicle displacement, the clearance from the truck rear to the vehicle's windshield was 21.4 inches. This value was obtained from digital analysis of the high-speed film.

The driver's head injury criteria (HIC) was 129. The driver's maximum chest resultant acceleration with three (3) milliseconds minimum duration was 28.1 g. The driver's chest deflection was 1.2 inches. The driver's maximum left and right femur forces were 1165 pounds and 1240 pounds, respectively.

The right front passenger's head injury criteria (HIC) was 118. The right front passenger's maximum chest resultant acceleration with three (3) milliseconds minimum duration was 36.4 g. The right front passenger's chest deflection was 1.4 inches. The right front passenger's maximum left and right femur forces were 276 pounds and 275 pounds, respectively.

TABLE 1 CRASH TEST SUMMARY

TEST TYPE: Heavy Truck Rear Underride Guard

TEST DATE: 04/28/93 TEST TIME: 1405 AMBIENT TEMP. (°F): 68

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1992/Honda/Civic/3-door hatchback

VEHICLE TEST WEIGHT (LBS): 2654

IMPACT ANGLE (DEG)*: 0

IMPACT VELOCITY (MPH)**: PRIMARY = 30.0 SECONDARY = 30.0

MAXIMUM STATIC CRUSH (IN): 2.3

DUMMIES:	Driver #048	Passenger #043
TYPE:	Part 572 E	Part 572 E
LOCATION:	Left front	Right front
RESTRAINT:	Driver's airbag	3-point unibelt

NUMBER OF DATA CHANNELS: 47

NUMBER OF CAMERAS: HIGH-SPEED 11 REAL-TIME 1

*With respect to tow track centerline.

**Speed trap measurement (± .05 mph accuracy). The velocity measurement system contains two (2) independent photo emitter/receiver pairs (See Figure 1) which each measure the impact velocity.

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Honda of Canada Manufacturing

MAKE/MODEL: Honda/Civic VIN: 2HGEH2457NH540787

BODY STYLE: 3-door hatchback MODEL YEAR: 1992

COLOR: Blue

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 1.5 liters

TRANSMISSION DATA: _4_SPEED, ___MANUAL, _X_AUTOMATIC, _X_FWD, ___RWD,___4WD

DATE VEHICLE RECEIVED: 04/22/93 ODOMETER READING: 9,923

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

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

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: Honda of Canada Manufacturing

DATE OF MANUFACTURE: 05/92 VIN: 2HGEH2457NH540787

GVWR: 3210 LBS

GAWR: FRONT: 1720 LBS., REAR: 1545 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear, Invicta GLR M+S, P175/70R15

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 44 PSI
REAR: 44 PSI

SPARE TIRE (MFR., LINE, SIZE): Goodyear, Temporary, T150/80D13

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manually-adjustable

MAXIMUM WIDTH: 66.5 INCHES

WHEELBASE: 101.2 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:
The label was located in the glovebox.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P175/70R13 82S

RECOMMENDED COLD TIRE PRESSURE: FRONT: 32 PSI; REAR: 32 PSI

DESIGNATED SEATING CAPACITY: 2 FRONT 3 REAR 5 TOTAL

VEHICLE CAPACITY WEIGHT: 850 LBS.

TEST VEHICLE ATTITUDE
(MEASURED AT THE TOP CENTER OF THE WHEEL WELL OPENING)

DELIVERED ATTITUDE:	LF	25.5;	RF	25.2;	LR	25.0;	RR	24.8
FULLY LOADED ATTITUDE:	LF	24.9;	RF	24.4;	LR	23.7;	RR	23.2
PRE-TEST ATTITUDE*:	LF	24.2;	RF	23.8;	LR	24.8;	RR	24.9
POST-TEST ATTITUDE:	LF	21.6;	RF	23.2;	LR	24.8;	RR	23.4

*It was determined by VRTC that under heavy braking the front of the test vehicle lowered by 2.0 inches measured at the front bumper centerline and the rear of the test vehicle raised 1.5 inches measured at the rear bumper centerline. The pre-test attitudes of the test vehicle were modified to simulate these conditions.
All measurements are in inches.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE AS RECEIVED:

RIGHT FRONT	704 LBS.	RIGHT REAR	412 LBS.
LEFT FRONT	706 LBS.	LEFT REAR	402 LBS.
TOTAL FRONT WEIGHT	1410 LBS.	(63.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	814 LBS.	(36.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT	2224 LBS.		

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

UDW = UNLOADED DELIVERED WEIGHT (2224 LBS)

VCW = VEHICLE CAPACITY WEIGHT (850 LBS)

DSC = DESIGNATED SEATING CAPACITY (5)

RCLW*= VCW - 150 (DSC) = 100

TARGET TEST WEIGHT = UDW + RCLW*+ (NO. OF HYBRID III DUMMIES X 167 LBS PER DUMMY)

TARGET TEST WEIGHT = 2224 + 334 + 100

TARGET TEST WEIGHT = 2658 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 96 LBS. OF CARGO WEIGHT:

RIGHT FRONT	779 LBS.	RIGHT REAR	534 LBS.
LEFT FRONT	801 LBS.	LEFT REAR	540 LBS.
TOTAL FRONT WEIGHT	1580 LBS.	(59.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1074 LBS.	(40.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	2654 LBS.	(0.1% UNDER TARGET TEST WEIGHT)	

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

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: Upper and lower rear hatch, exhaust system, and door glass

CG = 40.9 INCHES REARWARD OF FRONT WHEEL CENTERLINE

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

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 930428

TEST DATE: 04/28/93 TEST TIME: 1405

TEST TYPE: Heavy truck rear underride guard IMPACT ANGLE (DEG.)*: 0

AMBIENT TEMPERATURE AT IMPACT AREA: 68° F

TEMPERATURE IN OCCUPANT COMPARTMENT: 74° F

IMPACT VELOCITY**: PRIMARY = 30.0 MPH SECONDARY = 30.0 MPH

(SPECIFIED RANGE = 29.5 TO 30.5 MPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 14.0 IN.

EXITING VELOCITY TRAP = 2.0 IN.

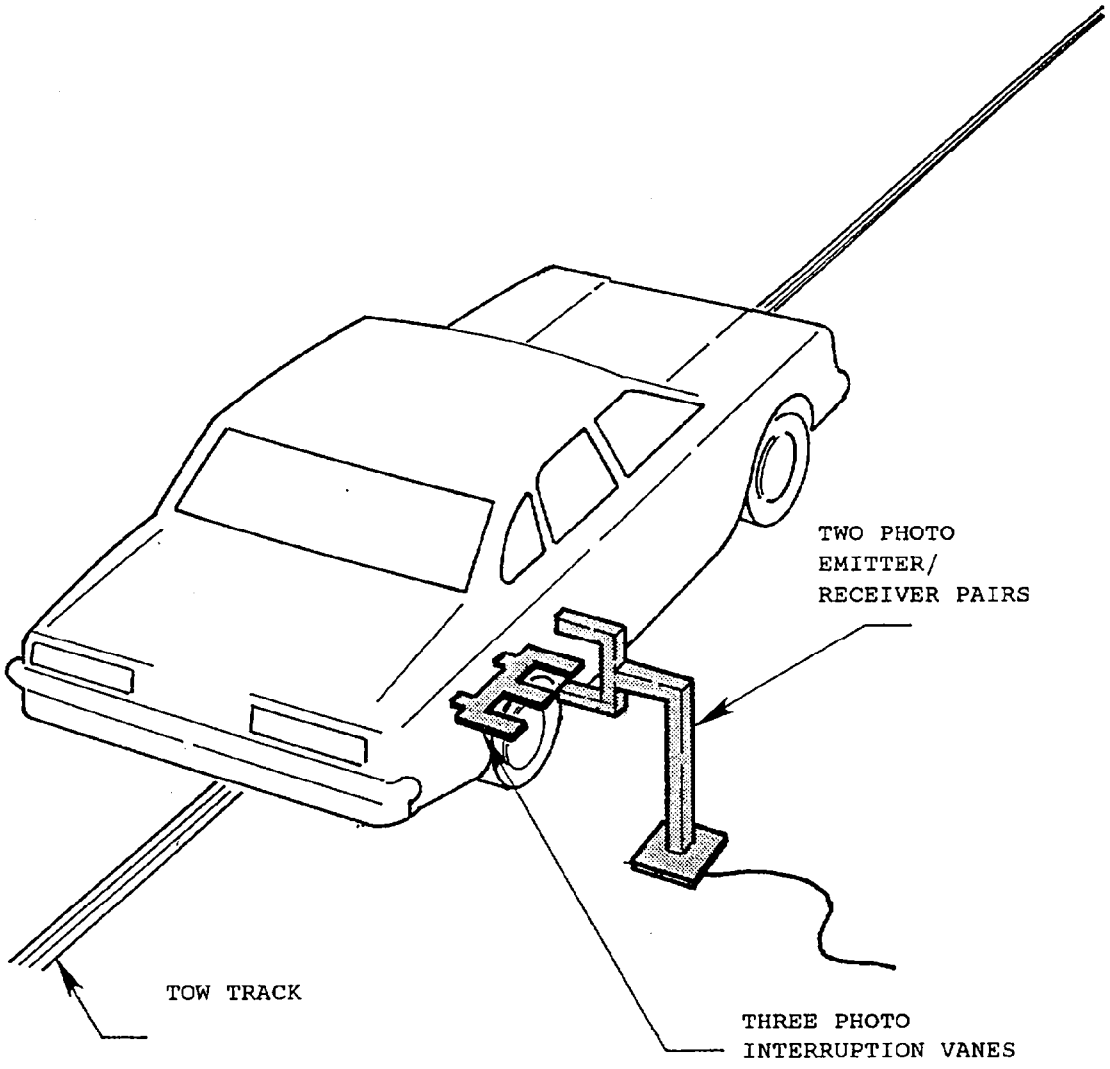
TEST VEHICLE STATIC CRUSH (ALL MEASUREMENTS ARE IN INCHES):

OVERALL LENGTH OF TEST VEHICLE:	PRE-TEST:	L	150.9;	C	157.0;	R 150.1
	POST-TEST:	L	149.1;	C	155.1;	R 149.8
	TOTAL CRUSH:	L	1.8;	C	1.9;	R 0.3
	AVERAGE CRUSH:	1.3				

*With respect to tow track centerline.

**The velocity measurement system contains two (2) independent photo emitter/receiver pairs (See Figure 1) which each measure the impact velocity.

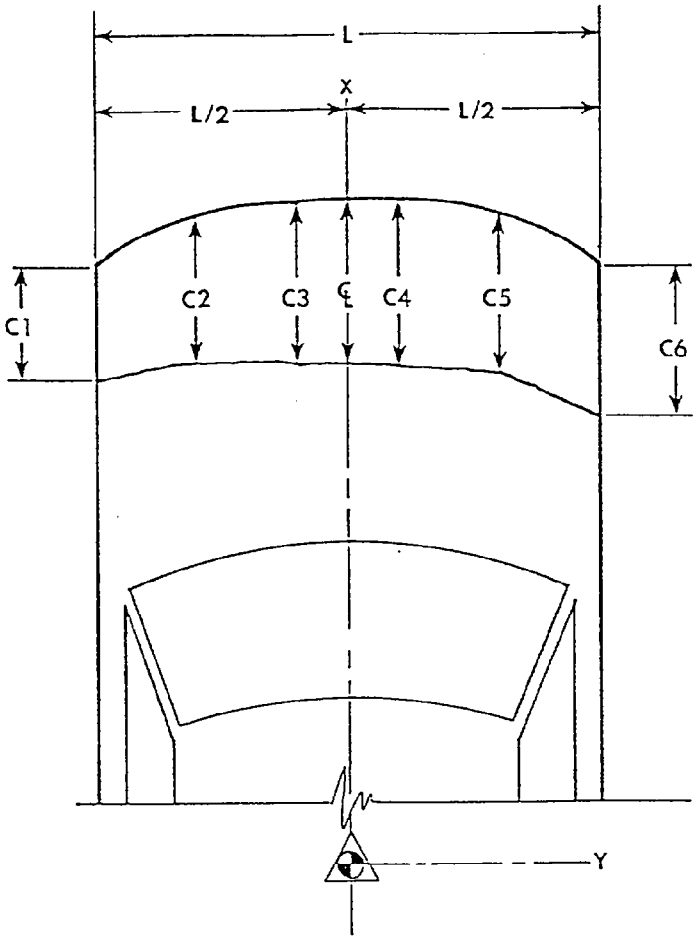
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears the final emitter/receiver pair two inches before impact.

The vanes have one foot spacing.

FIGURE 2 VEHICLE CRUSH



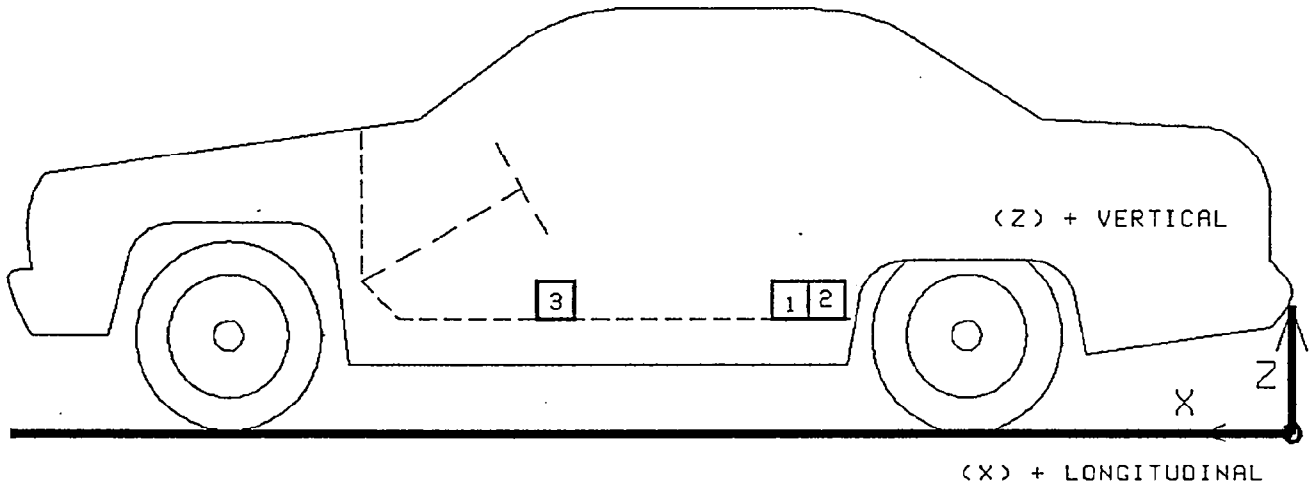
NOTES: L is pre-test length of contact surface.
C1 through C6 are spaced equally apart.
CL is vehicle centerline.
All measurements are in inches.

Vehicle Honda Civic

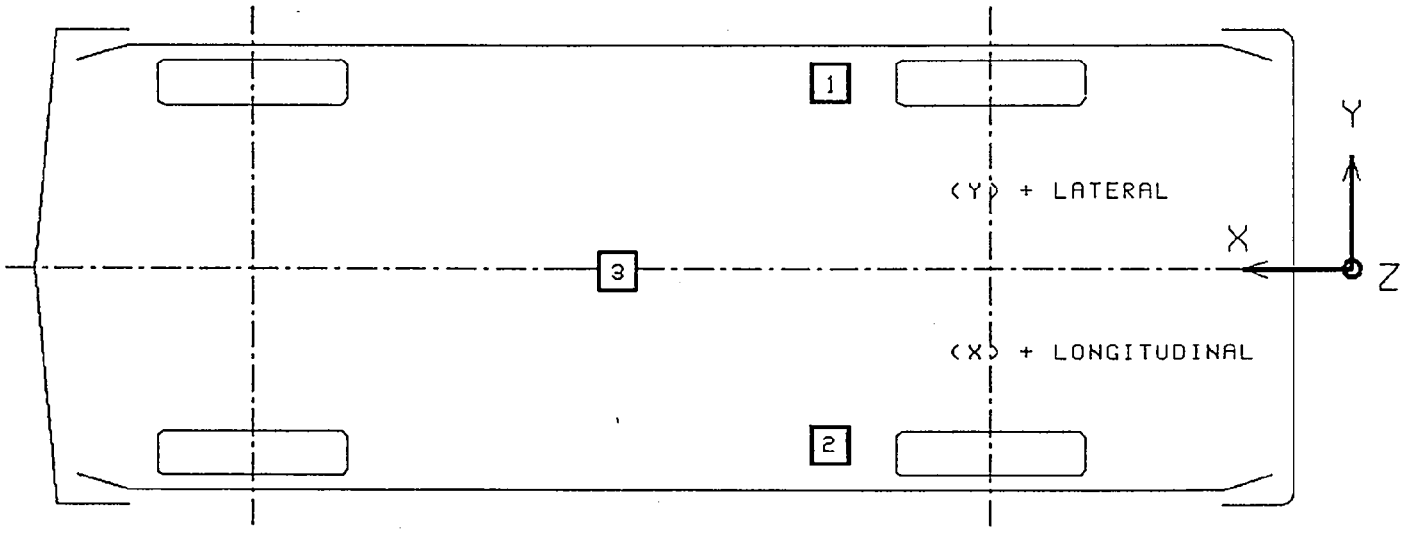
	PRE-TEST	POST-TEST	CRUSH
L	55.0		
C1	150.9	149.1	1.8
C2	155.5	153.5	2.0
C3	156.8	154.5	2.3
C4	156.0	155.6	0.4
C5	154.9	153.4	1.5
C6	150.1	149.8	0.3
CL	157.0	155.1	1.9

FIGURE 3

VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930428

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	LEFT REAR SEAT CROSSMEMBER	51.0	25.6	12.8				
	LONGITUDINAL				1.5	245.5	20.2	52.4
	LATERAL				3.1	95.4	5.0	33.4
2	RIGHT REAR SEAT CROSSMEMBER	50.4	-25.1	13.0				
	LONGITUDINAL				2.1	243.1	20.8	47.4
	LATERAL				3.9	96.0	7.6	53.0
3	VEHICLE CENTER OF GRAVITY	77.6	0.0	13.2				
	LONGITUDINAL				1.9	245.3	24.8	48.6
	LATERAL				8.5	94.3	6.3	107.6
	VERTICAL				14.3	62.3	17.0	43.4

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

TABLE 5

TRACTOR AND SEMITRAILER ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930428

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	TRAILER BED SUPPORT RAIL LONGITUDINAL	408.8	30.8	48.9	5.7	25.6	2.1	50.8
2	TRAILER RIGHT FRAME RAIL LONGITUDINAL	191.0	-22.2	37.4	1.5	38.6	0.8	72.9
3	TRACTOR FRAME LONGITUDINAL	488.0	-18.0	36.3	1.4	54.8	0.6	219.1

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM REAR BUMPER OF SEMITRAILER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

SECTION 3.0

OCCUPANT, VEHICLE, & CAMERA INFORMATION

TABLE 6

DUMMY DATA SUMMARY

TEST NUMBER 930428

	DRIVER DUMMY SN: 48				PASSENGER DUMMY SN: 43			
	POSITIVE DIRECTION		NEGATIVE DIRECTION		POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC	MAX	MSEC	MAX	MSEC
HEAD ACCELERATION (g)								
LONGITUDINAL	10.2	167.9	33.6	147.9	18.6	292.9	20.8	139.0
LATERAL	5.9	175.9	5.9	192.6	4.0	167.4	6.4	106.4
VERTICAL	8.6	109.0	18.2	119.3	3.5	32.0	25.4	74.6
RESULTANT	33.7	147.9			30.3	144.3		
HIC	129 FROM 116.8 TO 152.8				118 FROM 123.0 TO 159.0			
NECK FORCE (lb)								
LONGITUDINAL	40.8	188.0	73.9	108.6	178.7	137.6	33.4	287.5
LATERAL	34.8	148.3	20.9	280.3	124.9	74.1	18.2	14.9
VERTICAL	267.1	120.3	124.6	162.5	123.3	100.6	120.2	170.4
NECK MOMENT (in-lb)								
ABOUT X	56.8	136.4	69.1	175.4	94.0	178.3	126.6	110.4
ABOUT Y	331.4	164.3	121.1	114.0	222.7	111.4	190.9	74.6
ABOUT Z	41.1	127.8	30.3	186.5	76.2	307.1	54.4	123.1
CHEST ACCELERATION (g)								
LONGITUDINAL	0.6	218.4	28.3	99.4	1.7	306.0	35.9	73.5
LATERAL	2.3	59.6	1.5	100.5	9.8	126.1	14.2	68.0
VERTICAL	4.5	62.5	6.8	86.8	3.3	122.1	7.9	79.0
RESULTANT	28.6	99.4			37.9	73.5		
3 MSEC	28.1				36.4			

TABLE 6

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 930428

	DRIVER DUMMY SN: 48				PASSENGER DUMMY SN: 43			
	POSITIVE DIRECTION		NEGATIVE DIRECTION		POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC	MAX	MSEC	MAX	MSEC
CHEST DEFLECTION (in)								
LONGITUDINAL	0.0	40.9	1.2	113.0	0.0	8.8	1.4	150.0
PELVIS ACCELERATION (g)								
LONGITUDINAL	3.8	308.5	41.5	67.0	3.9	115.5	46.7	71.8
LATERAL	5.7	58.0	6.9	68.4	7.7	96.4	7.9	67.1
VERTICAL	12.2	85.3	4.8	275.4	15.6	119.4	7.3	64.4
RESULTANT	41.7	67.0			47.2	71.8		
FEMUR LOAD (lb)								
LEFT	311.9	49.5	1164.9	75.9	93.0	63.1	275.9	104.8
RIGHT	57.6	49.4	1240.0	67.4	72.4	57.9	274.9	75.8

POSITIVE DIRECTION	
LONGITUDINAL:	FORWARD
LATERAL:	LEFTWARD
VERTICAL:	UPWARD
FORCE:	TENSION

NEGATIVE DIRECTION	
LONGITUDINAL:	REARWARD
LATERAL:	RIGHTWARD
VERTICAL:	DOWNWARD
FORCE:	COMPRESSION

TABLE 7 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #048	PASSENGER #043
HEAD	Airbag	None
CHEST	Airbag	None
ABDOMEN	None	None
LEFT KNEE	Lower instrument panel	Glovebox door
RIGHT KNEE	Lower instrument panel	Glovebox door

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:

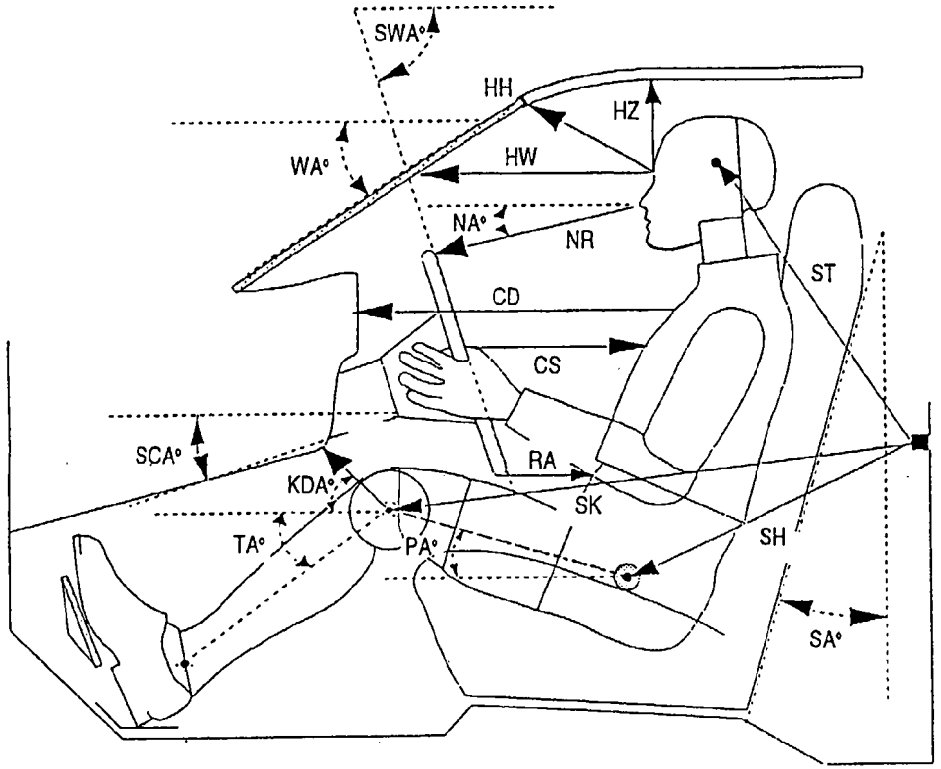
The entire windshield cracked upon impact.

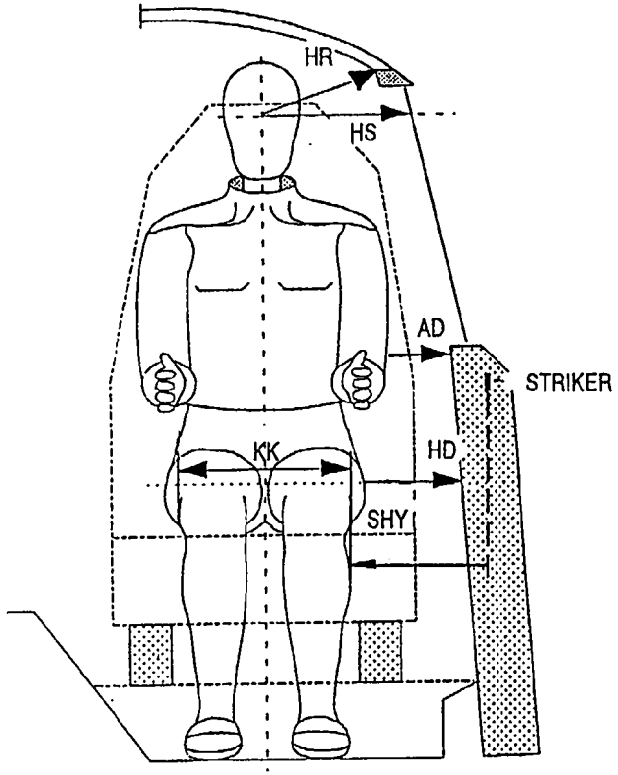
OTHER NOTABLE IMPACT EFFECTS:

None

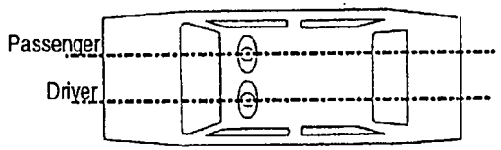
FIGURE 4

DUMMY MEASUREMENT LOCATIONS FOR FRONT SEAT OCCUPANTS





VERTICAL LONGITUDINAL PLANE



VERTICAL TRANSVERSE PLANE

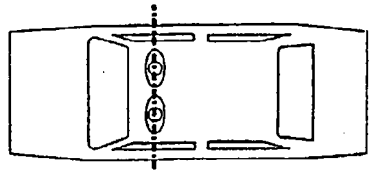


TABLE 8 DUMMY MEASUREMENT DATA FOR FRONT SEAT OCCUPANTS

DESIGNATION	TYPE OF MEASUREMENT	DRIVER (SERIAL #048	PASSENGER (SERIAL #043)
WA	WINDSHIELD ANGLE	28	28
SWA	STEERING WHEEL ANGLE	64	NA
SCA	STEERING COLUMN ANGLE	25	NA
SA	SEAT BACK ANGLE	26	26
HZ	HEAD TO ROOF	6.8	6.0
HH	HEAD TO HEADER	12.4	11.5
HW	HEAD TO WINDSHIELD	21.2	19.5
HR	HEAD TO SIDE HEADER	8.0	7.6
NR	NOSE TO RIM	17.3	NA
NA	NOSE TO RIM ANGLE	10	NA
CD	CHEST TO DASH	22.5	21.2
CS	STEERING WHEEL TO CHEST	13.3	NA
RA	RIM TO ABDOMEN	8.1	NA
KDL	LEFT KNEE TO DASH	6.0	7.1
KDR	RIGHT KNEE TO DASH	6.0	7.2
KDA	OUTBOARD KNEE TO DASH ANGLE	41	27
PA	PELVIC ANGLE	25	24
TA	TIBIAL ANGLE	37	36
KK	KNEE TO KNEE	10.2	10.2
ST*	STRIKER TO HEAD	21.6	21.9
	STRIKER TO HEAD ANGLE	-55	-57
SK*	STRIKER TO KNEE	31.8	31.9
	STRIKER TO KNEE ANGLE	6	6
SH*	STRIKER TO H-POINT	18.1	18.2
	STRIKER TO H-POINT ANGLE	25	24
SHY	STRIKER TO H-POINT (Y DIR.)	9.5	8.1
HS	HEAD TO SIDE WINDOW	11.2	9.6
HD	H-POINT TO DOOR	5.6	5.1
AD	ARM TO DOOR	5.2	1.9

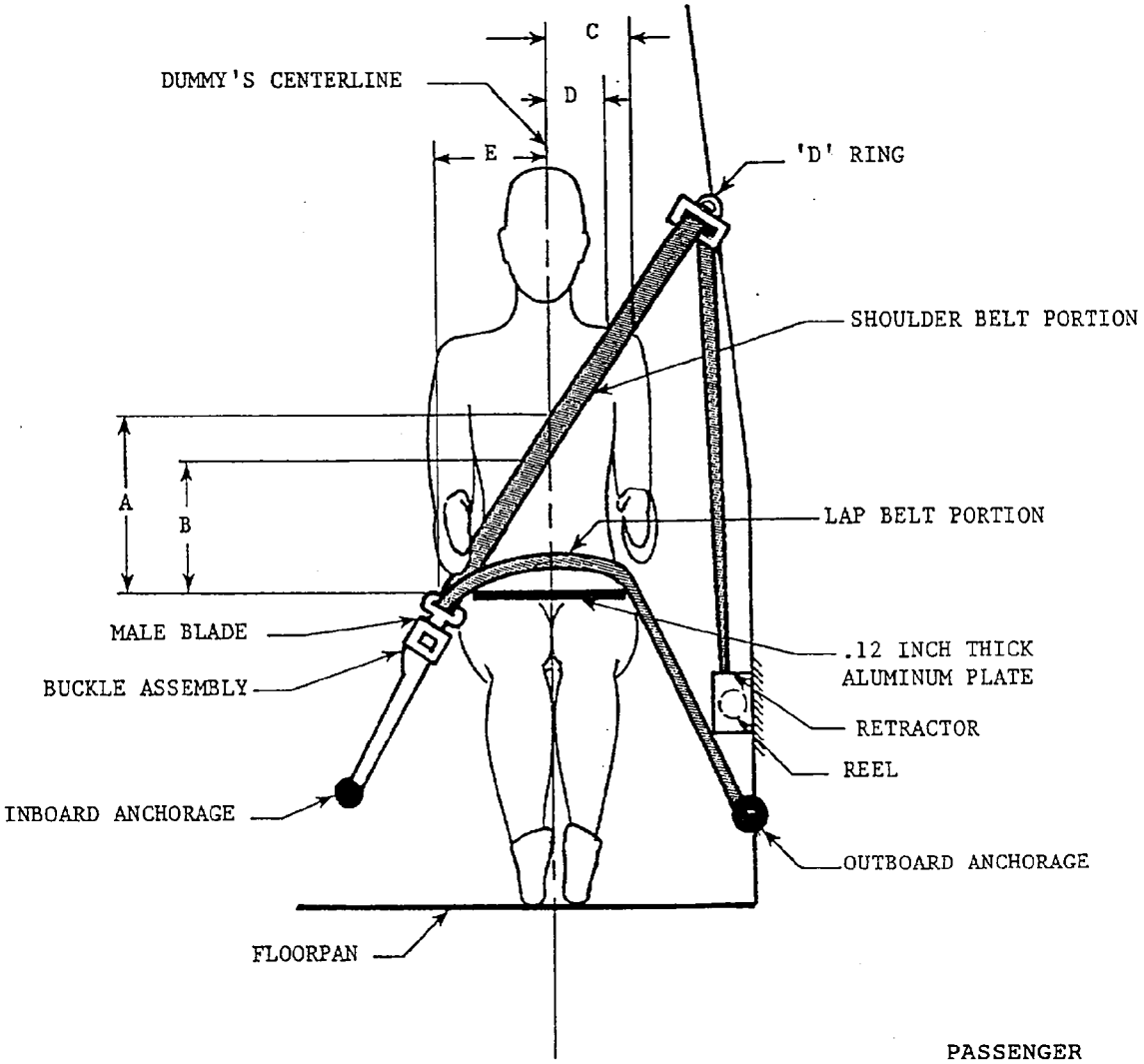
THE SEAT BACK ANGLE (SA°) IS MEASURED RELATIVE TO VERTICAL, ALL OTHER ANGLES ARE MEASURED RELATIVE TO HORIZONTAL.

*A negative angle indicates the measurement point was located above the striker.

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

ALL ANGLE MEASUREMENTS ARE IN DEGREES

FIGURE 5 SEAT BELT POSITIONING DATA



	PASSENGER DUMMY
A - TOP SURFACE OF ALUMINUM PLATE TO BELT UPPER EDGE	13.0
B - TOP SURFACE OF ALUMINUM PLATE TO BELT LOWER EDGE	9.6
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	5.6
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	3.2
E - DUMMY CENTERLINE TO INTERSECTION OF UPPER TORSO BELT AND LAP BELT	10.6

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 6

PRE-TEST AND POST-TEST MEASUREMENT POINTS

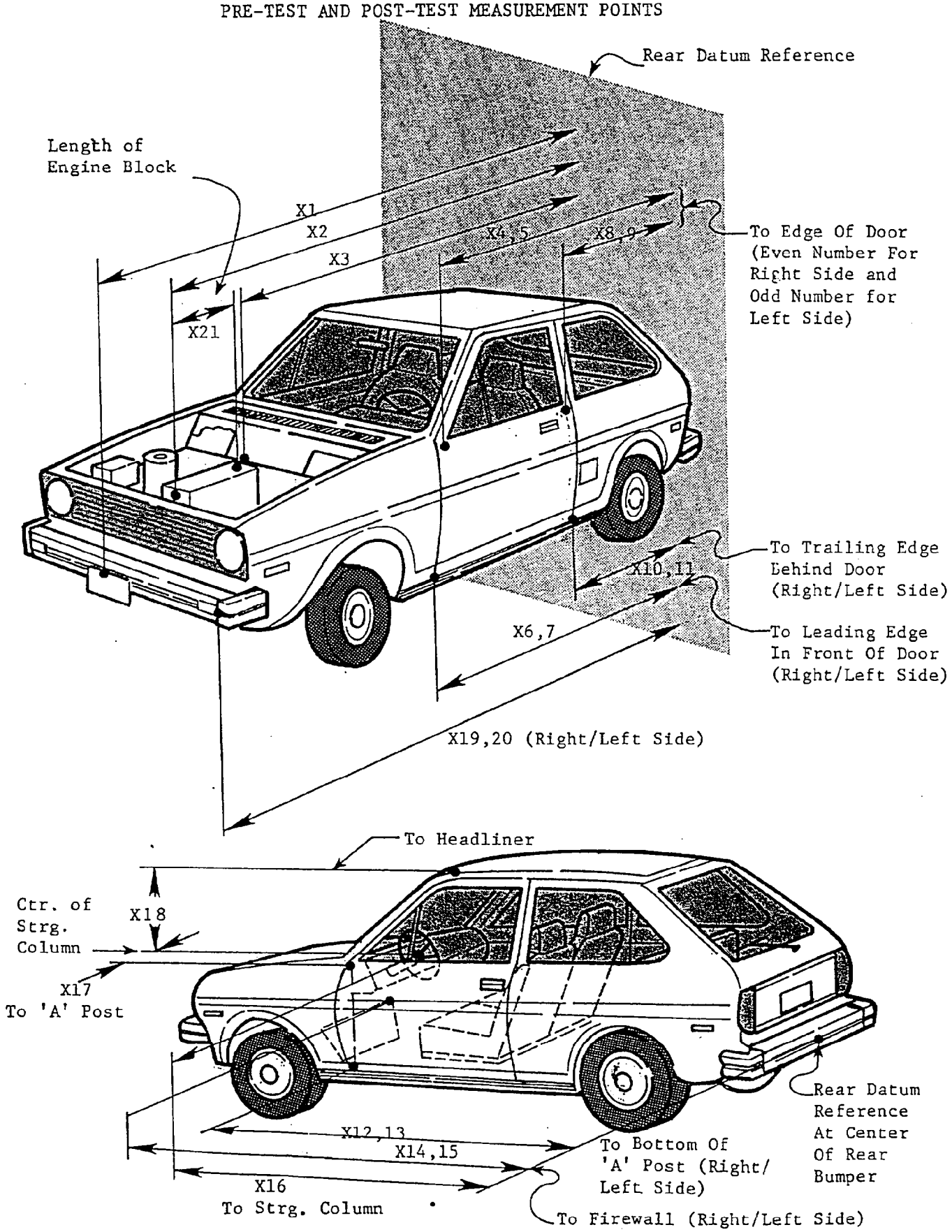


TABLE 9 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Honda/Civic TEST NUMBER: 930428

NO.	TYPE OF MEASUREMENT	ALL MEASUREMENTS ARE IN INCHES PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	157.0	155.1	1.9
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	138.0	130.9	7.1
X3	REAR SURFACE OF VEHICLE TO FIREWALL	116.6	113.4	3.2
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	104.4	103.9	0.5
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	104.9	104.9	0.0
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	104.3	103.1	1.2
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	104.6	103.0	1.6
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	54.1	55.4	-1.3
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	54.2	54.5	-0.3
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	56.5	55.1	1.4
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	56.4	55.2	1.2
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	104.2	101.6	2.6
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	104.1	103.2	0.9
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	112.0	106.9	5.1
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	113.8	112.1	1.7
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	85.5	85.5	0.0
X17	CENTER OF STEERING COLUMN TO "A" POST	11.0	9.8	1.2
X18	CENTER OF STEERING COLUMN TO HEADLINER	16.8	17.2	-0.4
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	150.1	149.8	0.3
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	150.9	149.1	1.8
X21	LENGTH OF ENGINE BLOCK	18.0	18.0	0.0

FIGURE 7 CAMERA POSITIONS

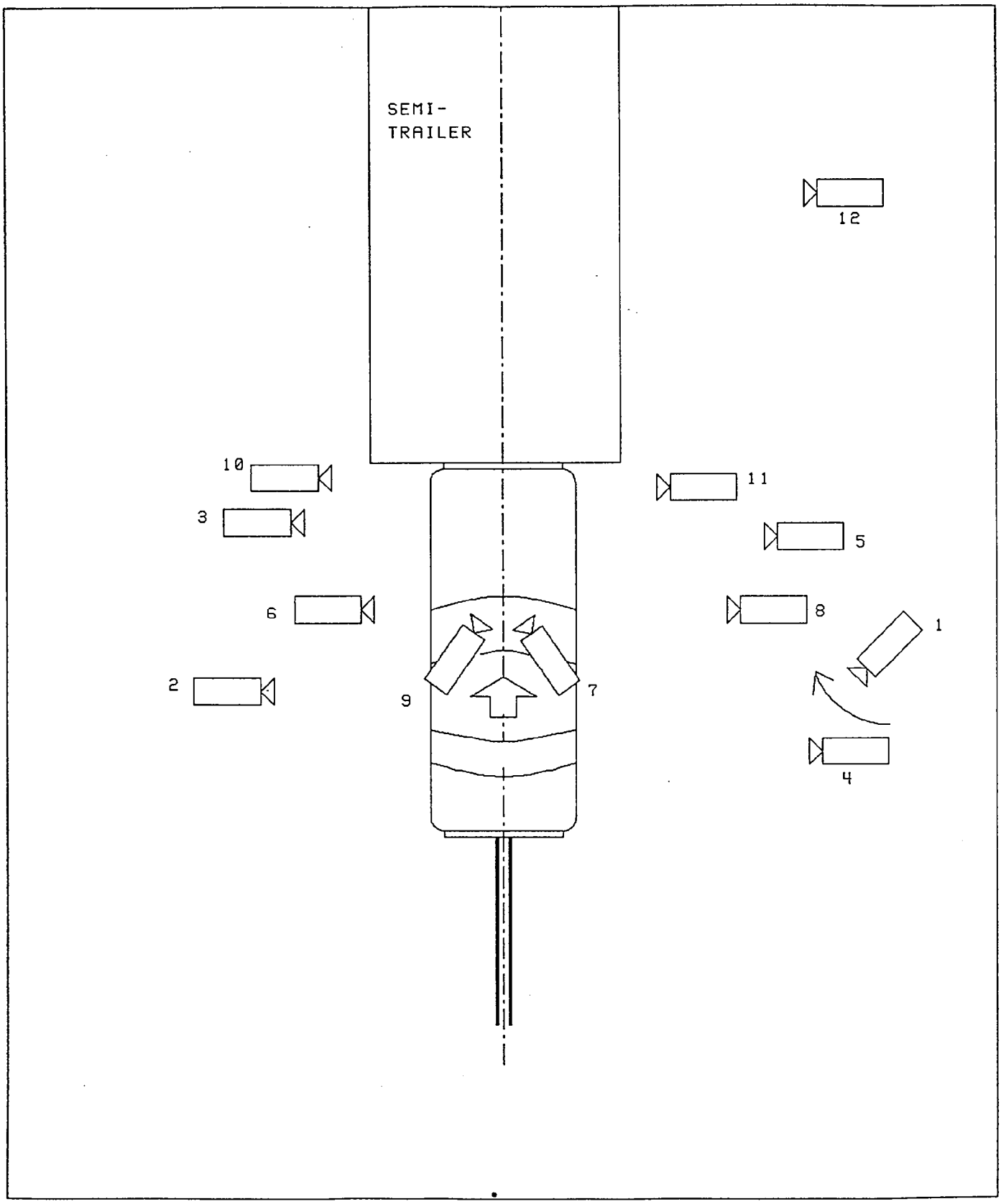


TABLE 10 CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Panning	Bolex	12-120	24	Vehicle dynamics
2	Left wide	Photosonic	13	1002	Guard deformation/crush
3	Left front close-up	Photosonic	25	1022	Guard deformation/crush
4	Right wide	Photosonic	13	1113	Guard deformation/crush
5	Right front close-up	Photosonic	25	783	Guard deformation/crush
6	Left medium tight	Photosonic	25	1000	Dummy kinematics
7	Onboard driver	Photosonic	8	998	Dummy kinematics
8	Right medium tight	Photosonic	25	498	Dummy kinematics
9	Onboard passenger view	Photosonic	8	998	Dummy kinematics
10	Left underride guard	Photosonic	75	612	Guard deformation/crush
11	Right underride guard	Photosonic	75	998	Guard deformation/crush
12	Overall wide	Photosonic	8	998	Vehicle dynamics

APPENDIX A

PHOTOGRAPHS

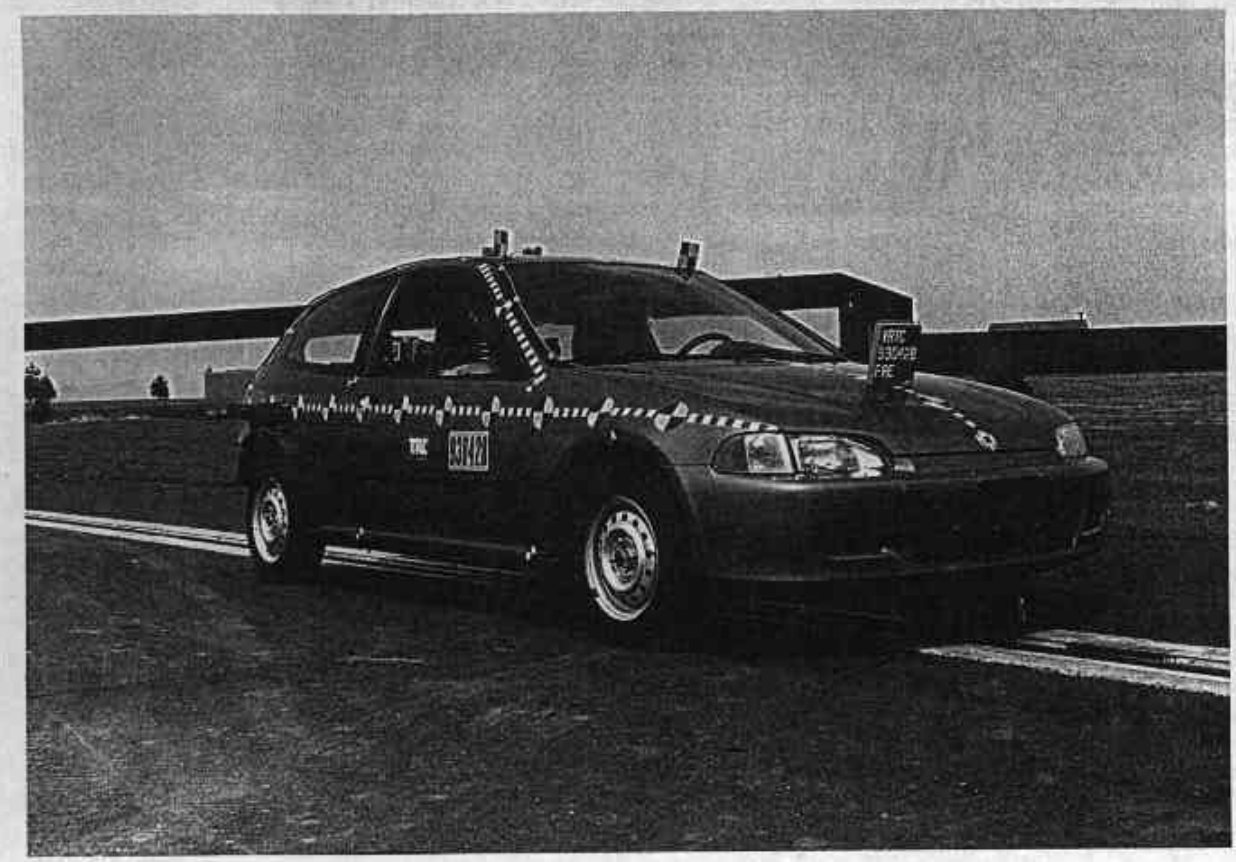


Figure A-1. PRE-TEST RIGHT FRONT VIEW

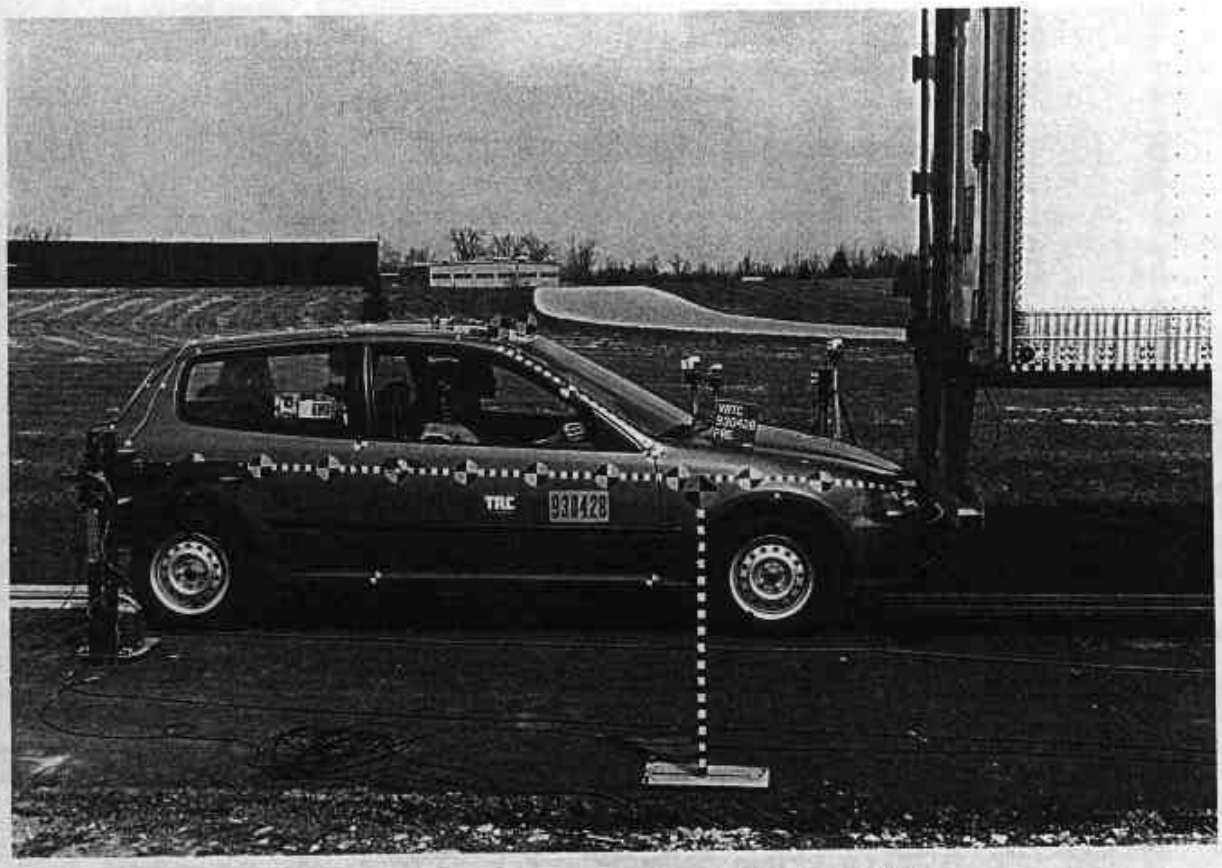


Figure A-2. PRE-TEST RIGHT SIDE VIEW

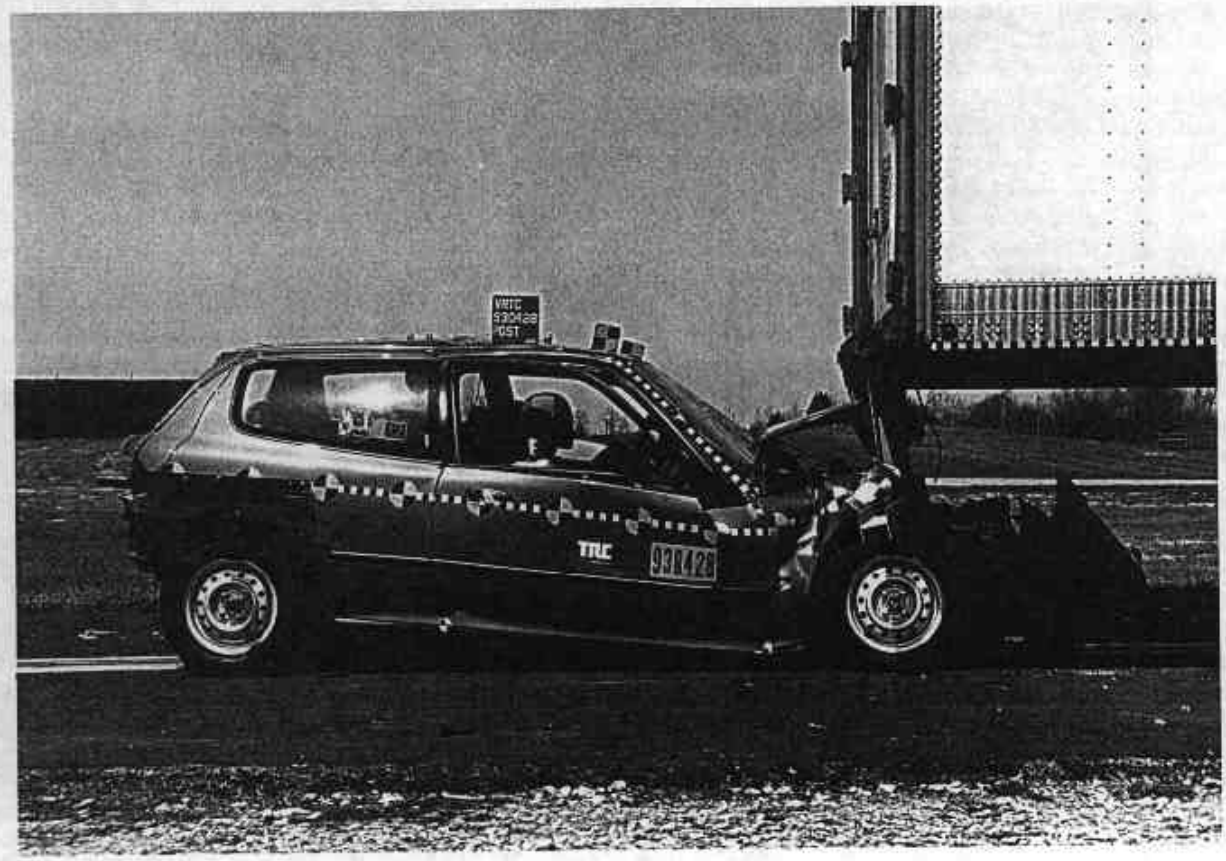


Figure A-3. POST-TEST RIGHT SIDE - VIEW 1

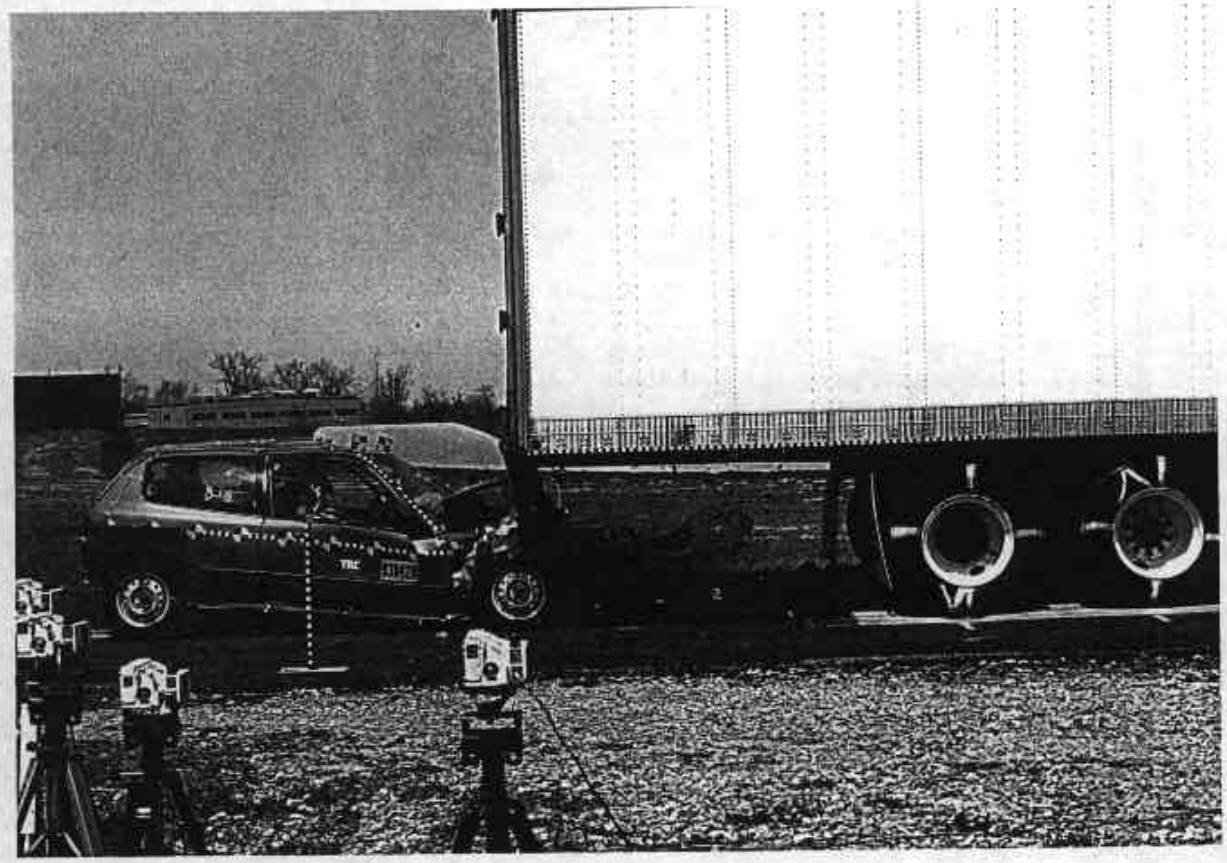


Figure A-4. IMPACT EVENT - RIGHT SIDE VIEW

Figure A-5. PRE-TEST RIGHT REAR VIEW

Figure A-6. POST-TEST RIGHT REAR VIEW

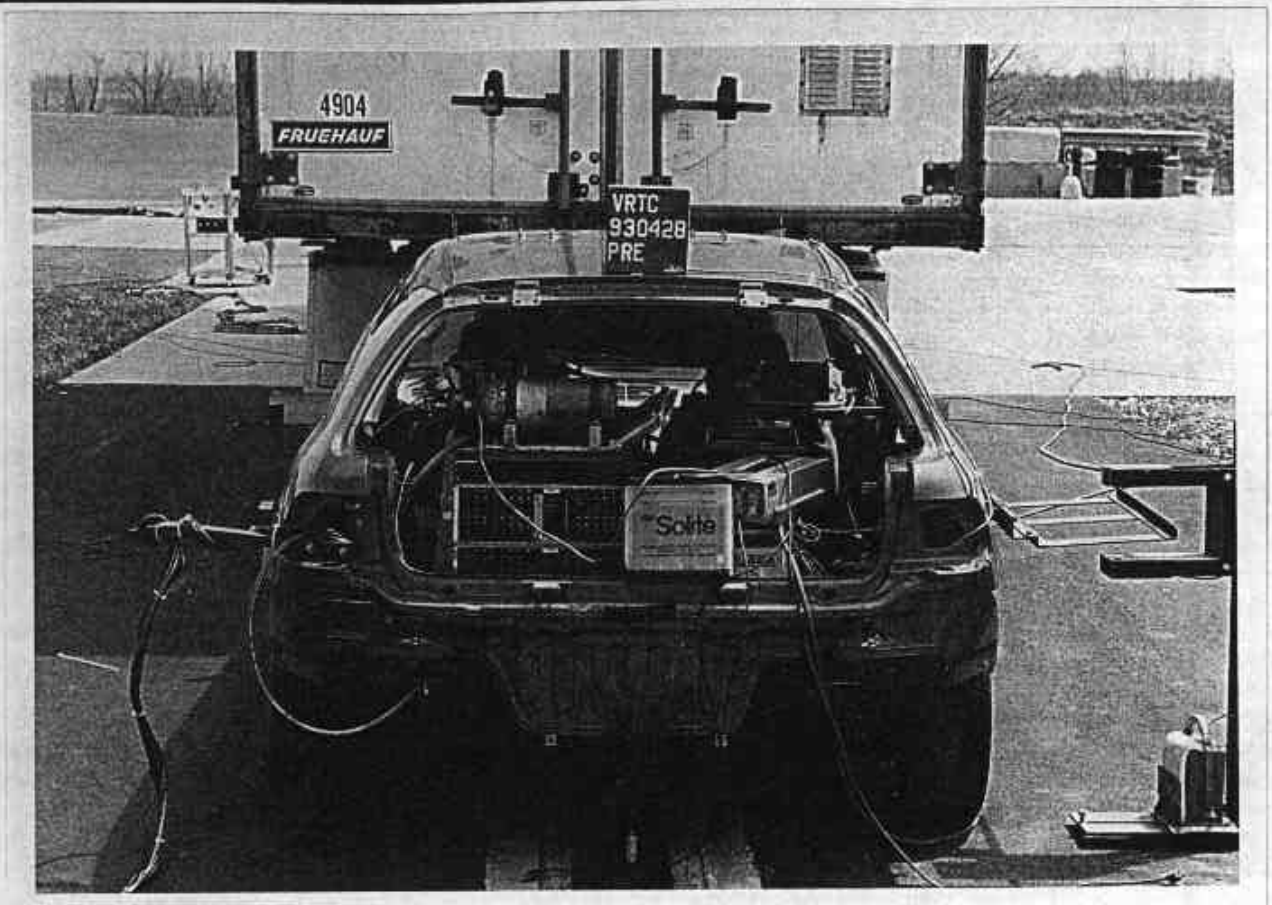


Figure A-7. PRE-TEST REAR VIEW

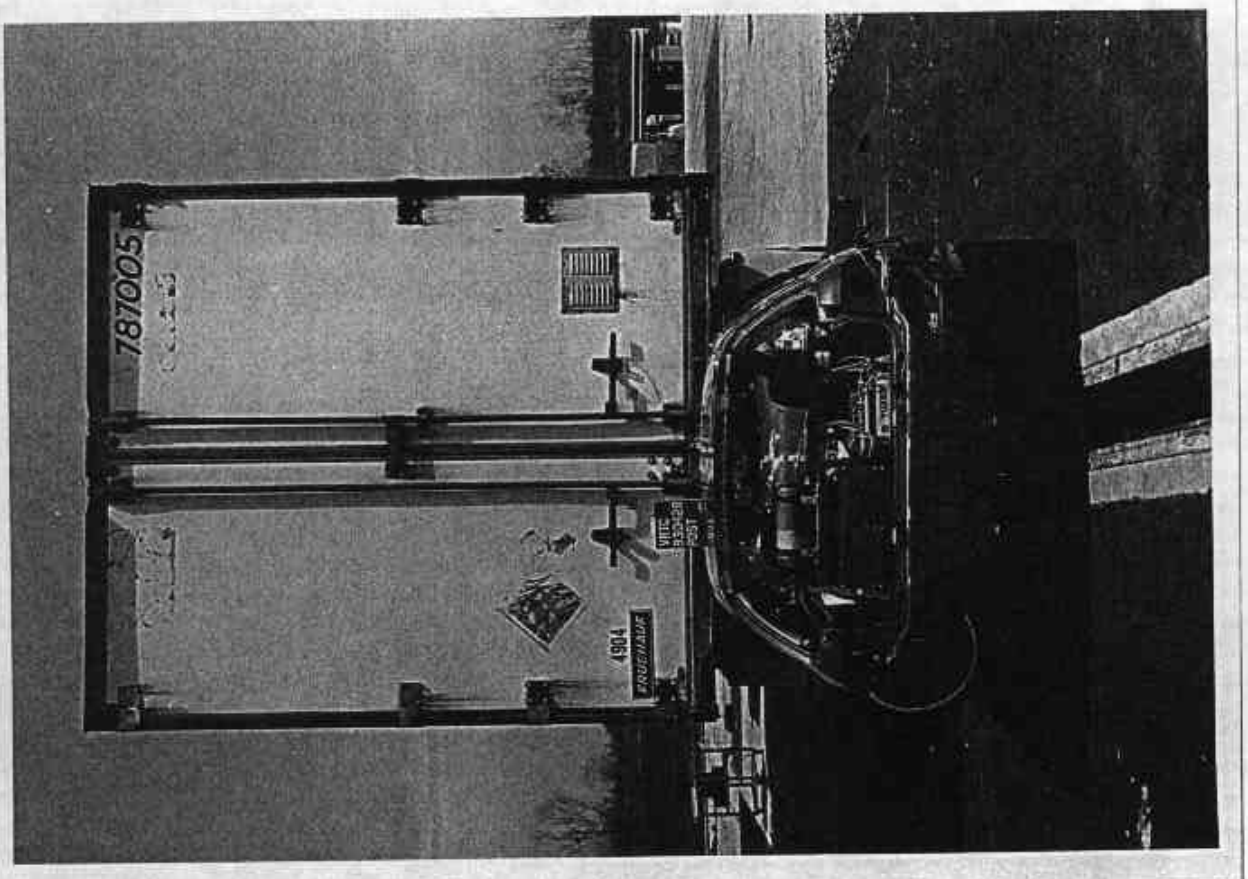


Figure A-8. POST-TEST REAR VIEW

Figure A-9. PRE-TEST LEFT REAR VIEW

Figure A-10. POST-TEST LEFT REAR VIEW

Figure A-11. PRE-TEST LEFT SIDE VIEW

Figure A-12. POST-TEST LEFT SIDE VIEW

Figure A-13. PRE-TEST LEFT FRONT VIEW

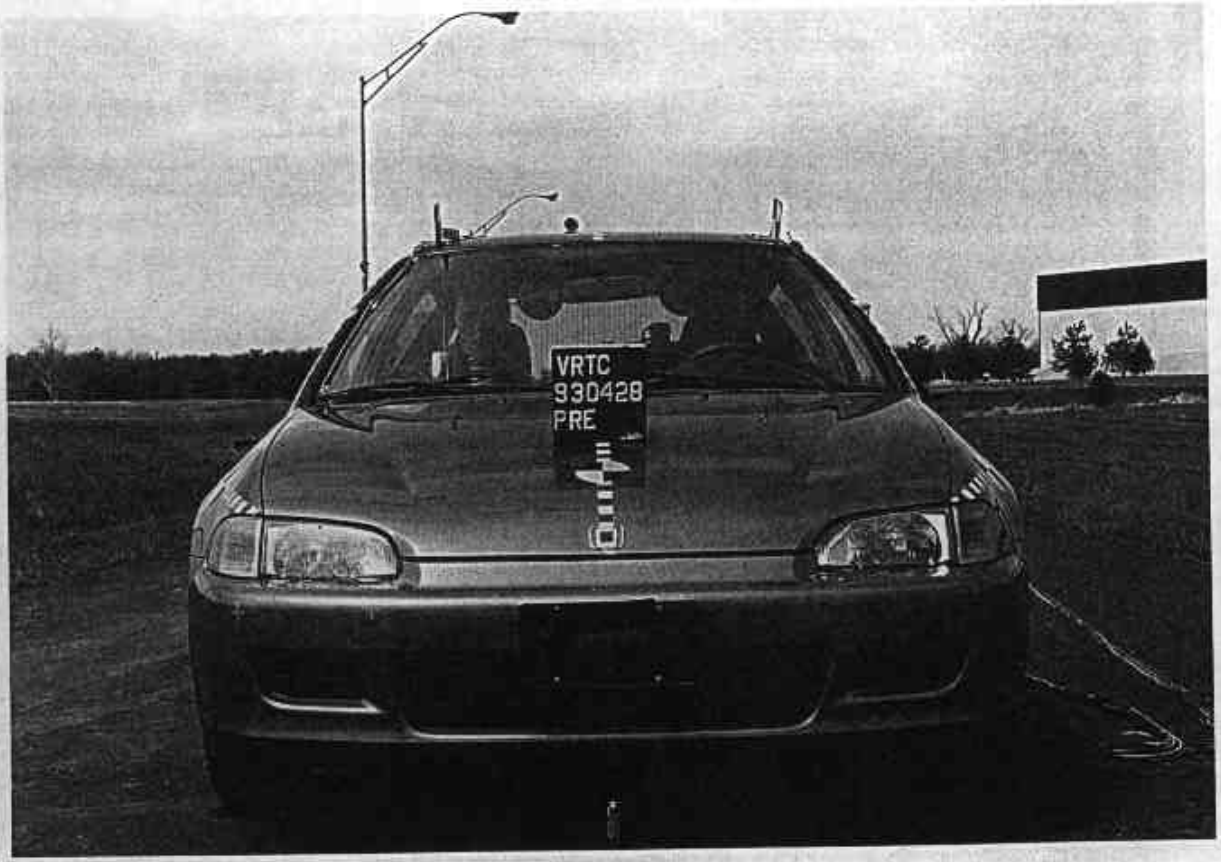


Figure A-14. PRE-TEST FRONT VIEW

Figure A-15. POST-TEST FRONT VIEW

Figure A-16. PRE-TEST WINDSHIELD VIEW

Figure A-17. POST-TEST WINDSHIELD VIEW

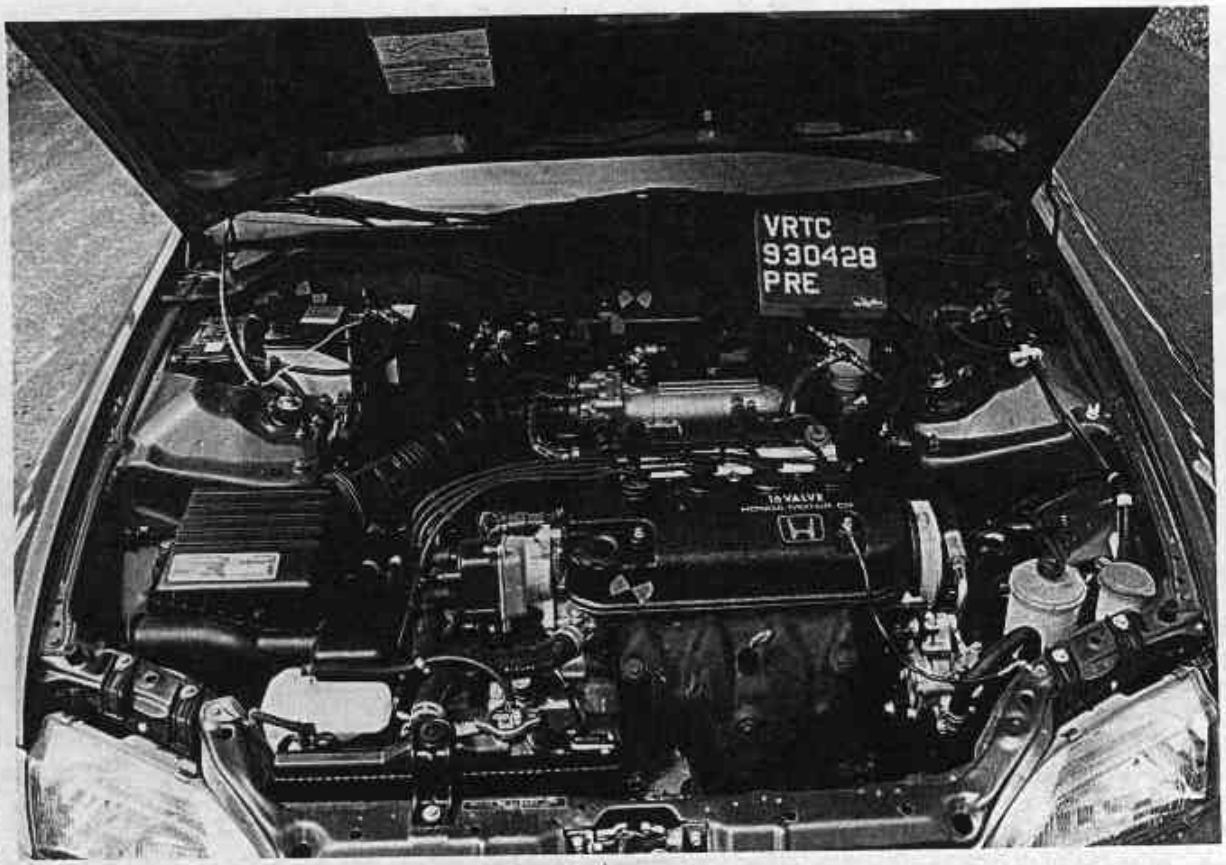


Figure A-18. PRE-TEST ENGINE COMPARTMENT VIEW

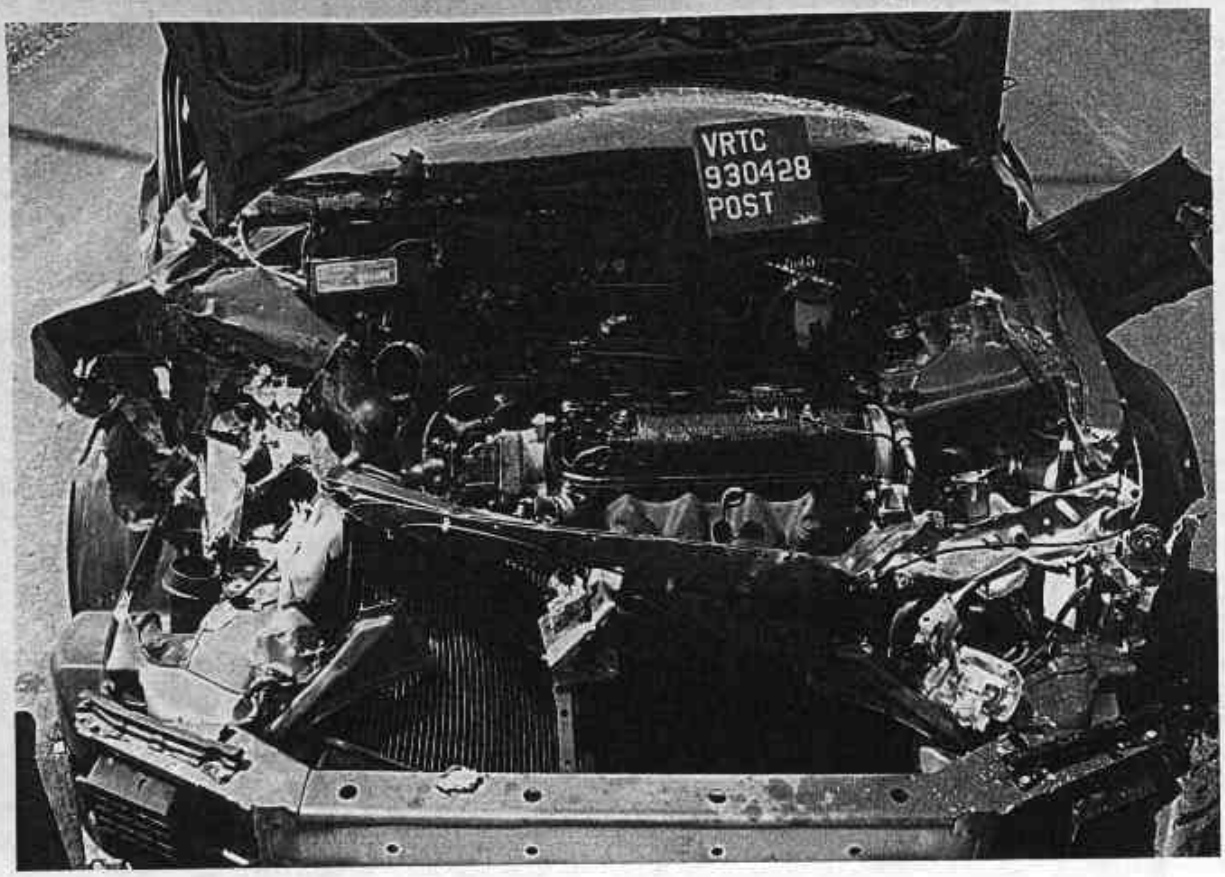


Figure A-19. POST-TEST ENGINE COMPARTMENT VIEW

Figure A-20. PRE-TEST DRIVER DUMMY POSITION VIEW

Figure A-21. POST-TEST DRIVER DUMMY POSITION VIEW

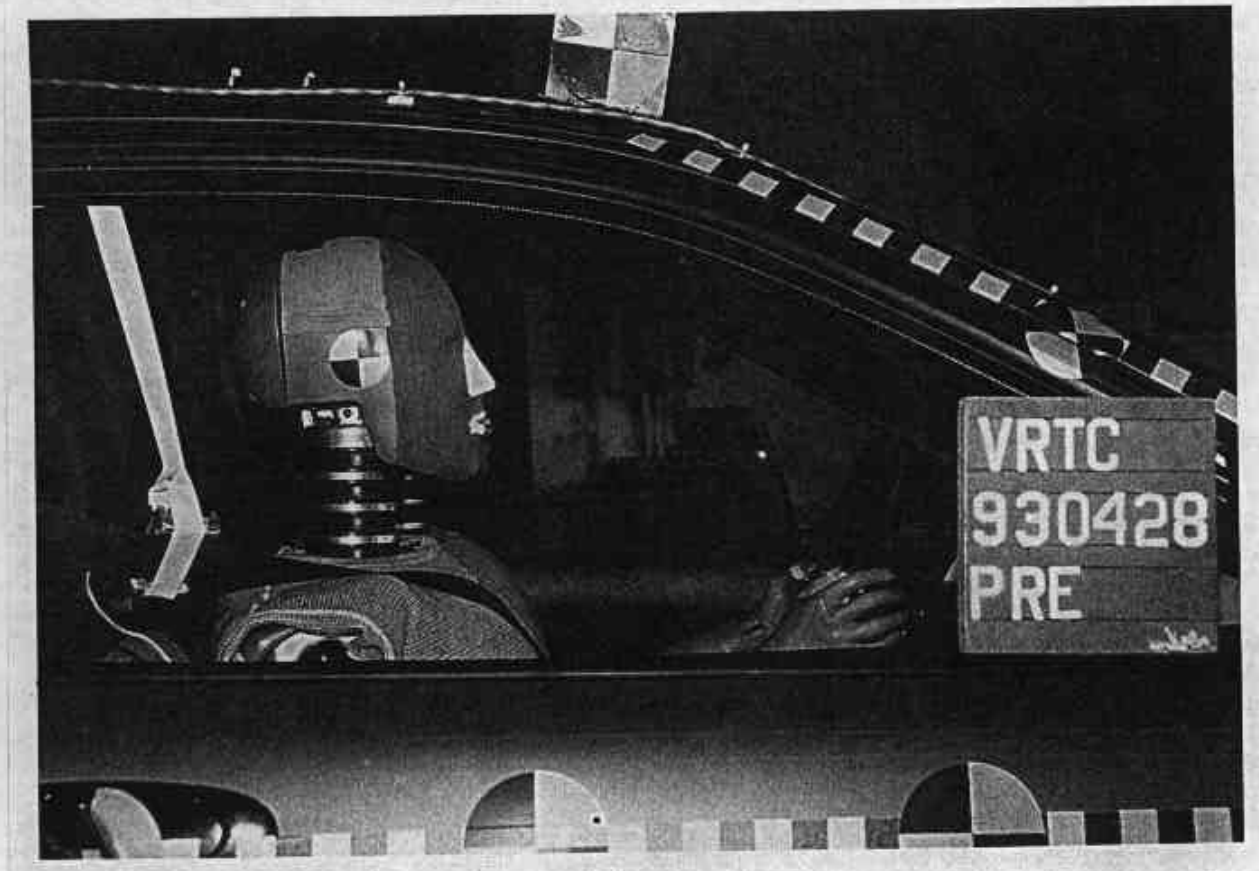


Figure A-22. PRE-TEST PASSENGER DUMMY POSITION VIEW

Figure A-23. POST-TEST PASSENGER DUMMY POSITION VIEW

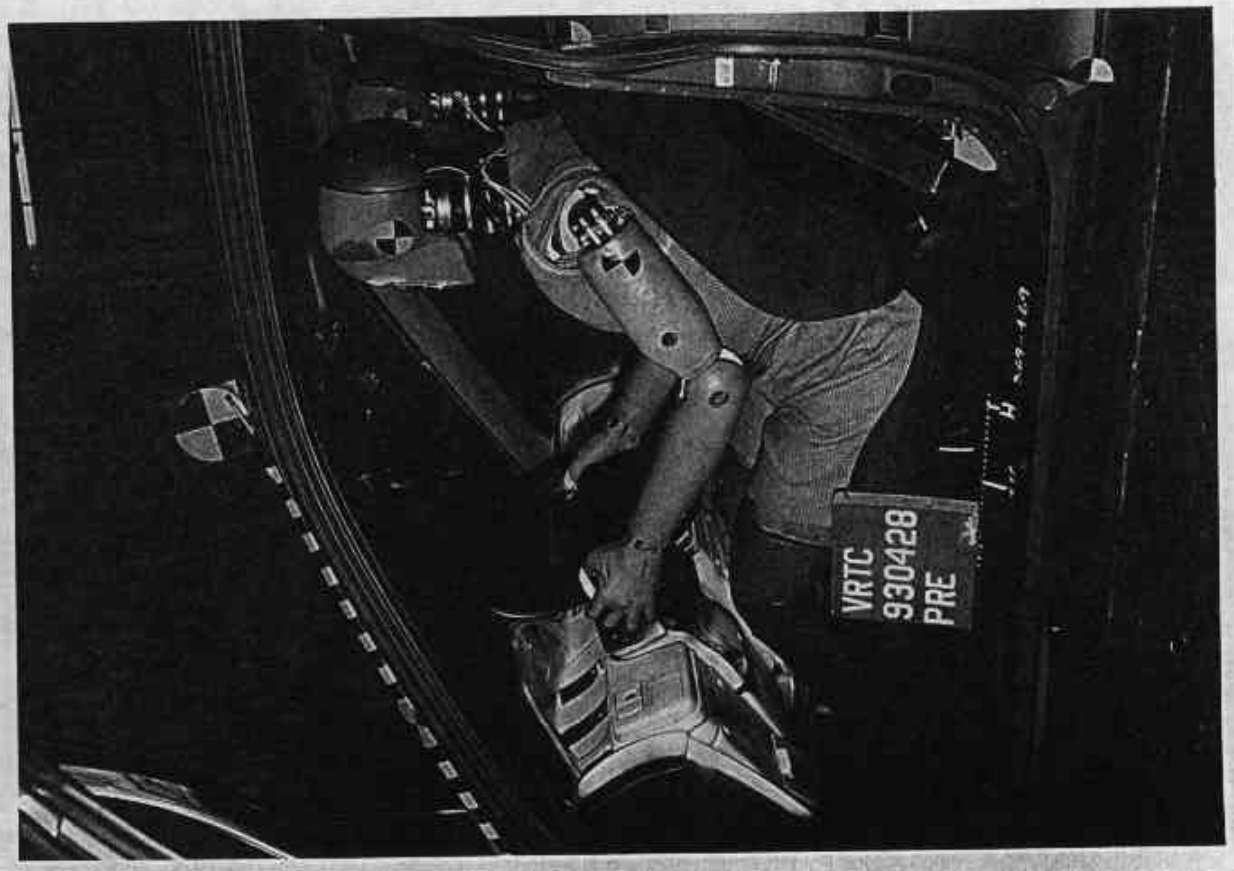


Figure A-24. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

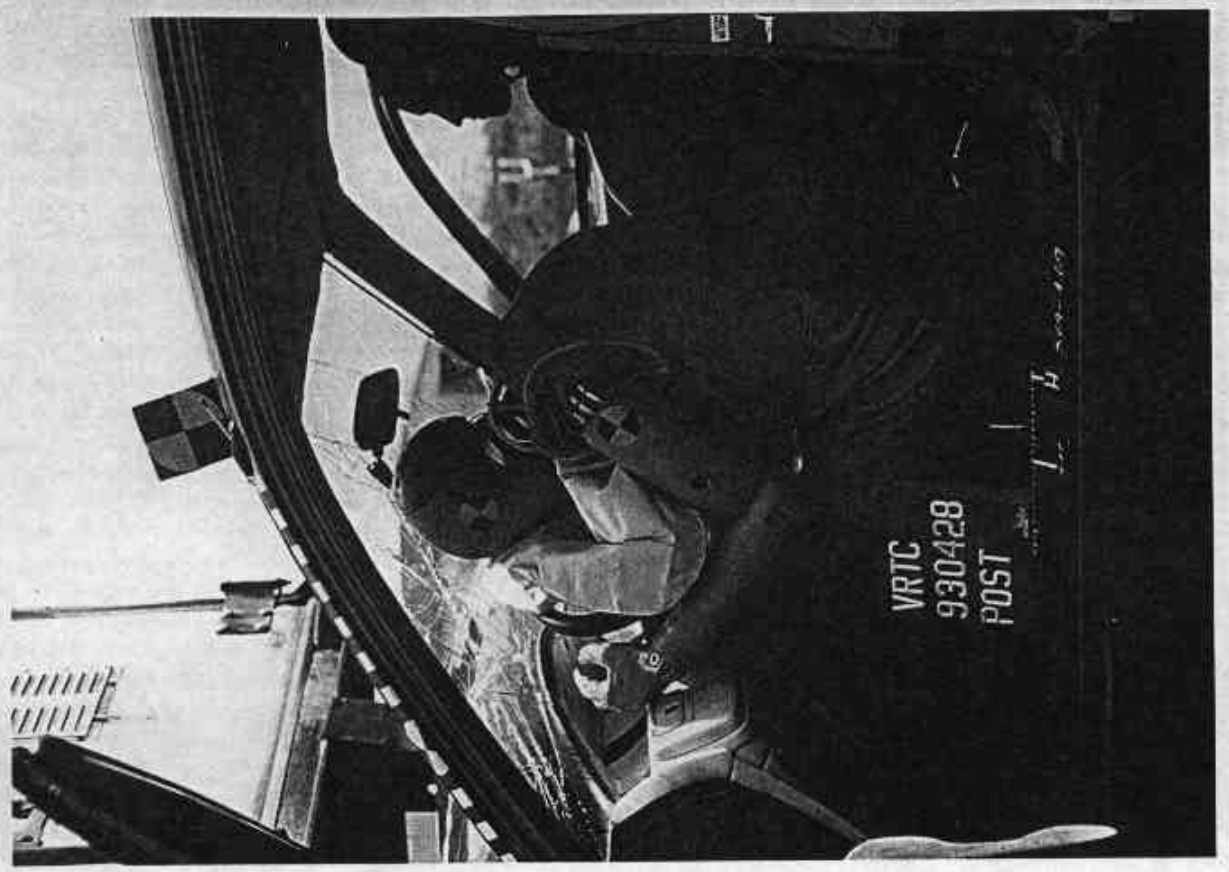


Figure A-25. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

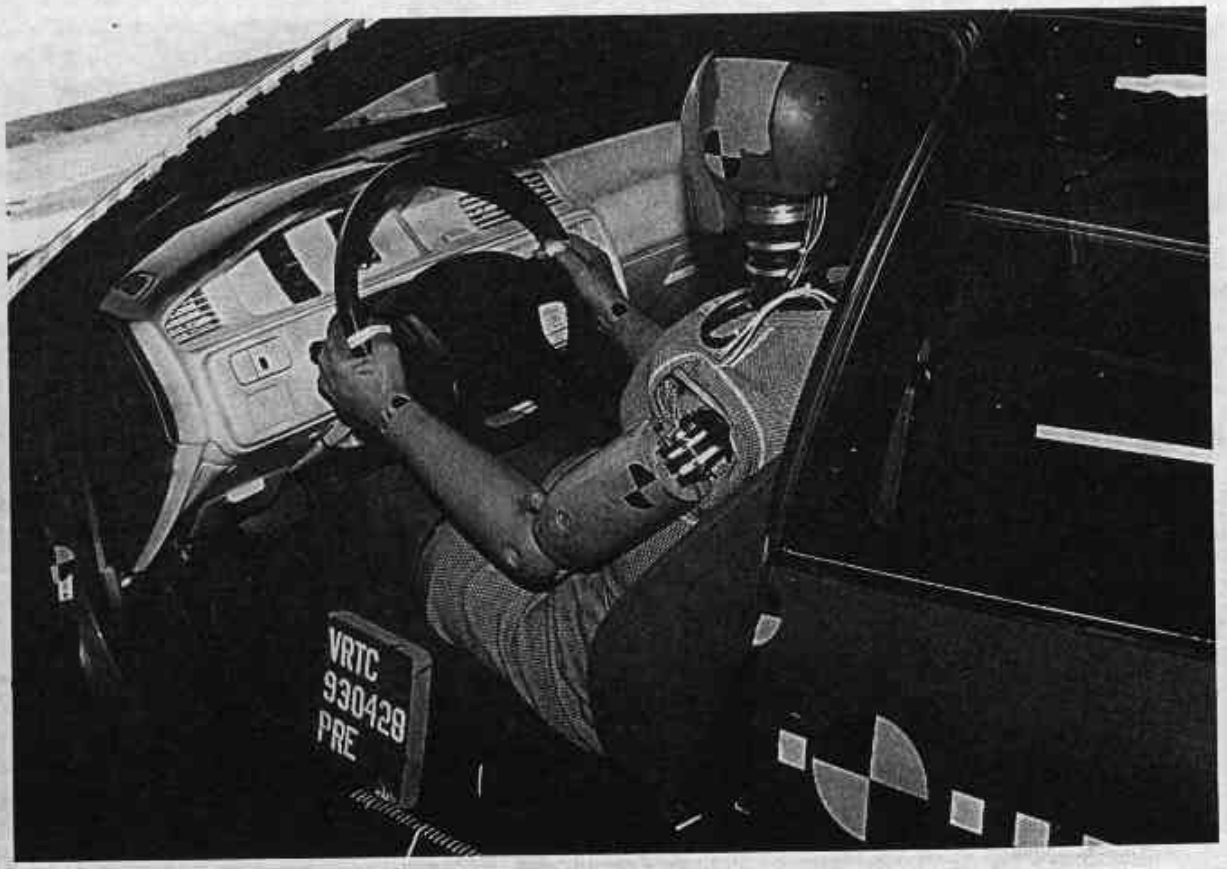


Figure A-26. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

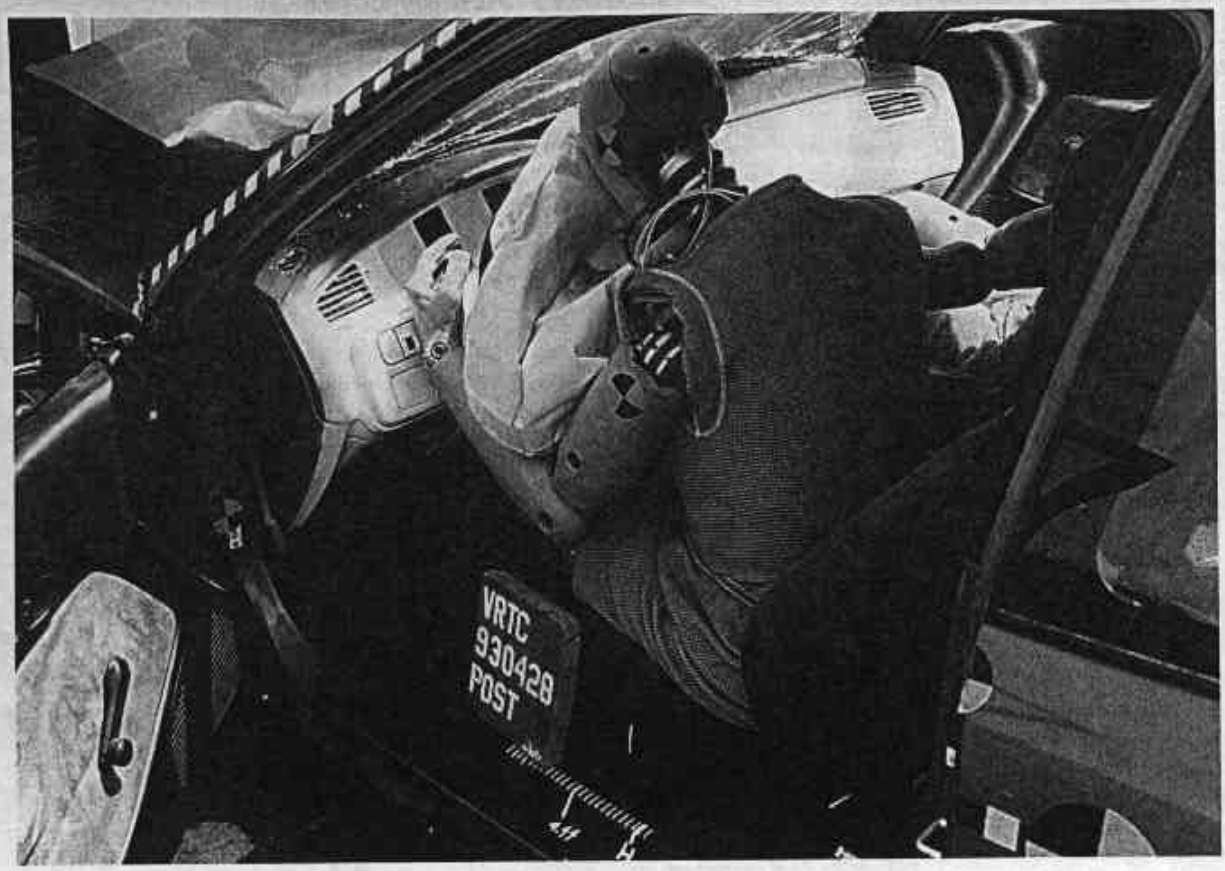


Figure A-27. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

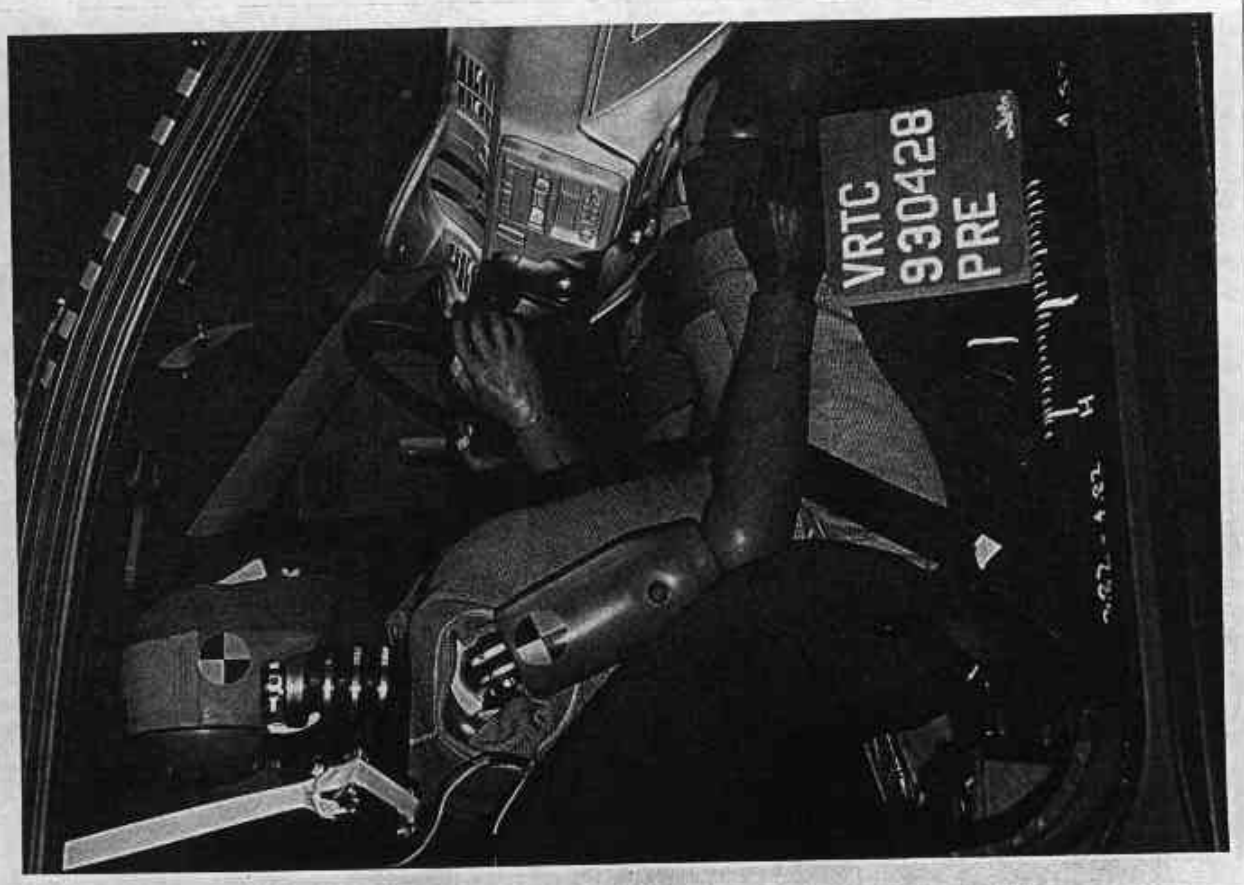


Figure A-28. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

Figure A-29. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

Figure A-30. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

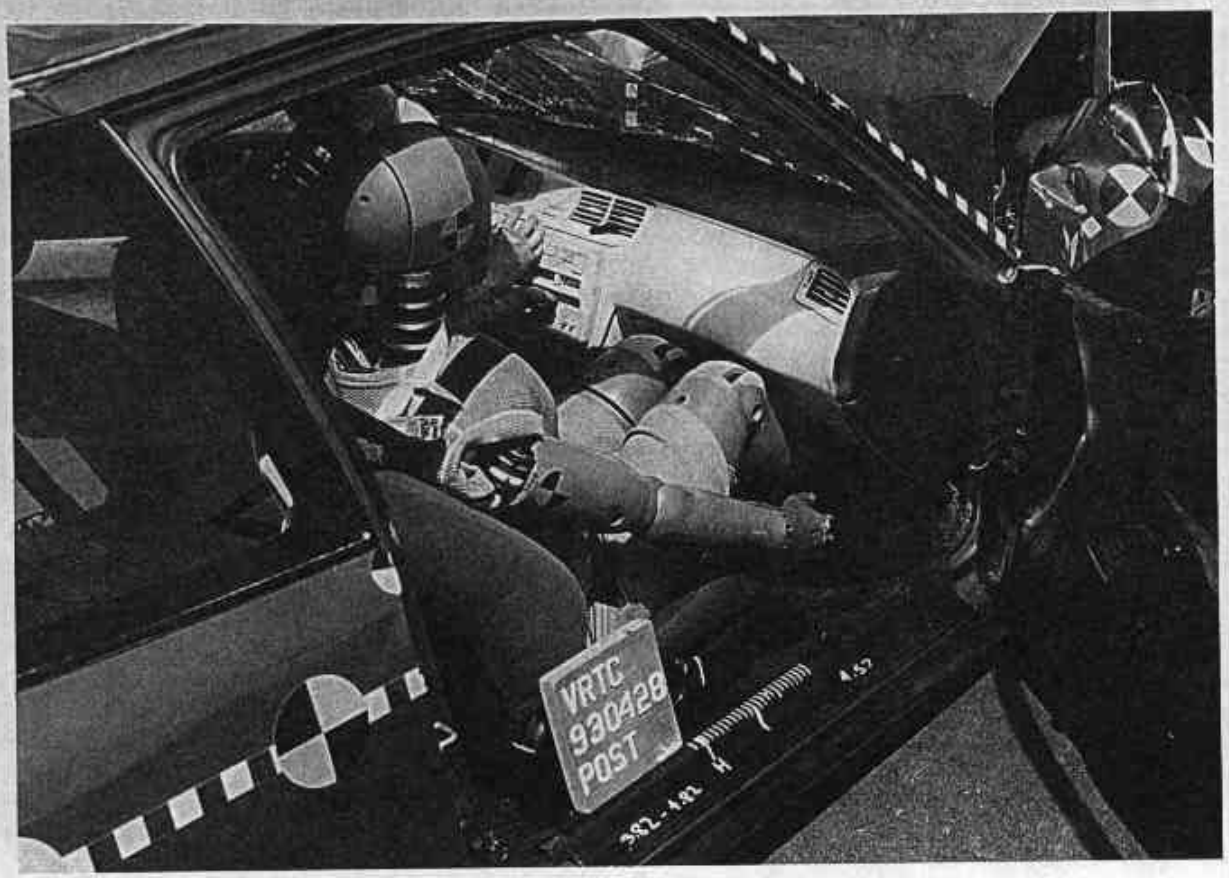


Figure A-31. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

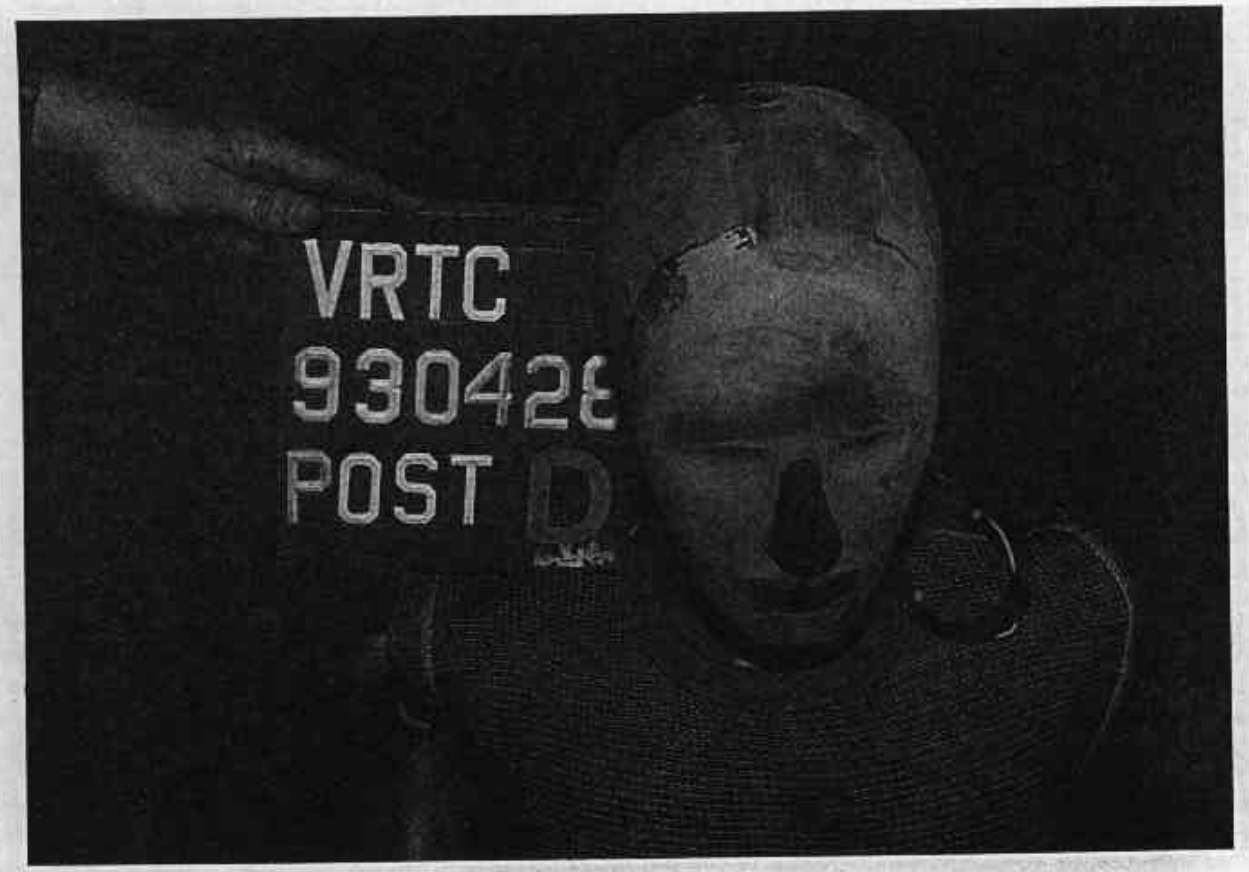


Figure A-32. POST-TEST DRIVER DUMMY HEAD CONTACT VIEW

Figure A-33. POST-TEST DRIVER DUMMY KNEE CONTACT VIEW

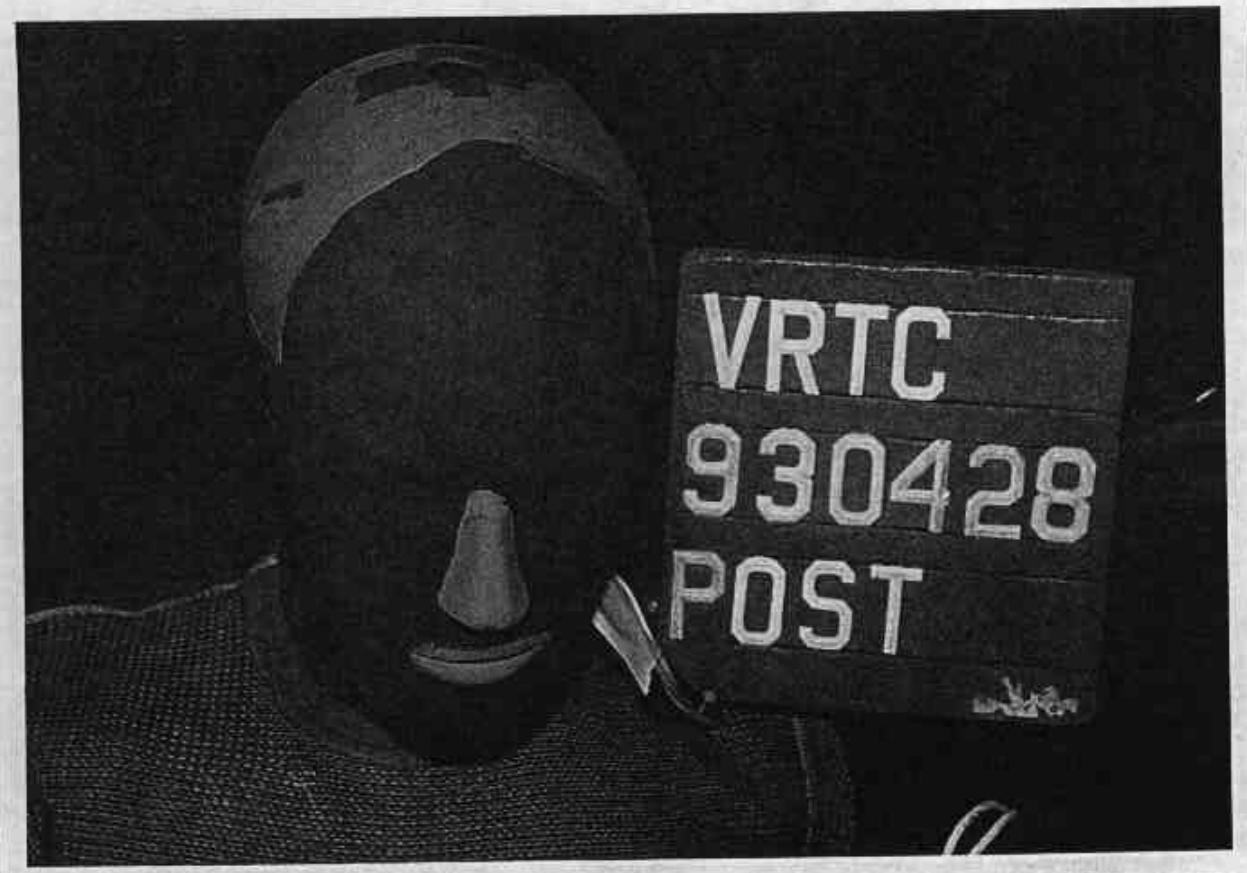


Figure A-34. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW

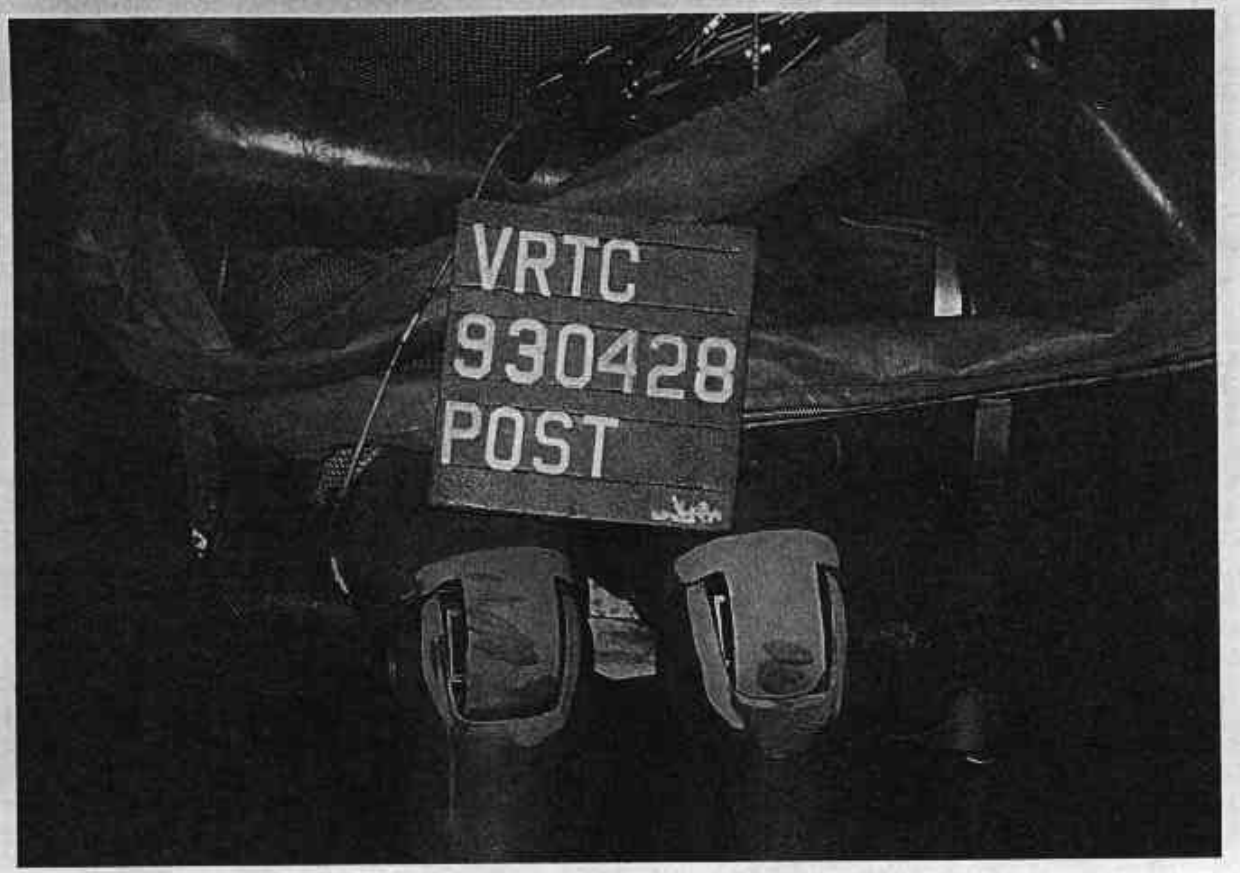


Figure A-35. POST-TEST PASSENGER DUMMY KNEE CONTACT VIEW

Figure A-36. POST-TEST VEHICLE AND UNDERRIDE GUARD ENGAGEMENT VIEW

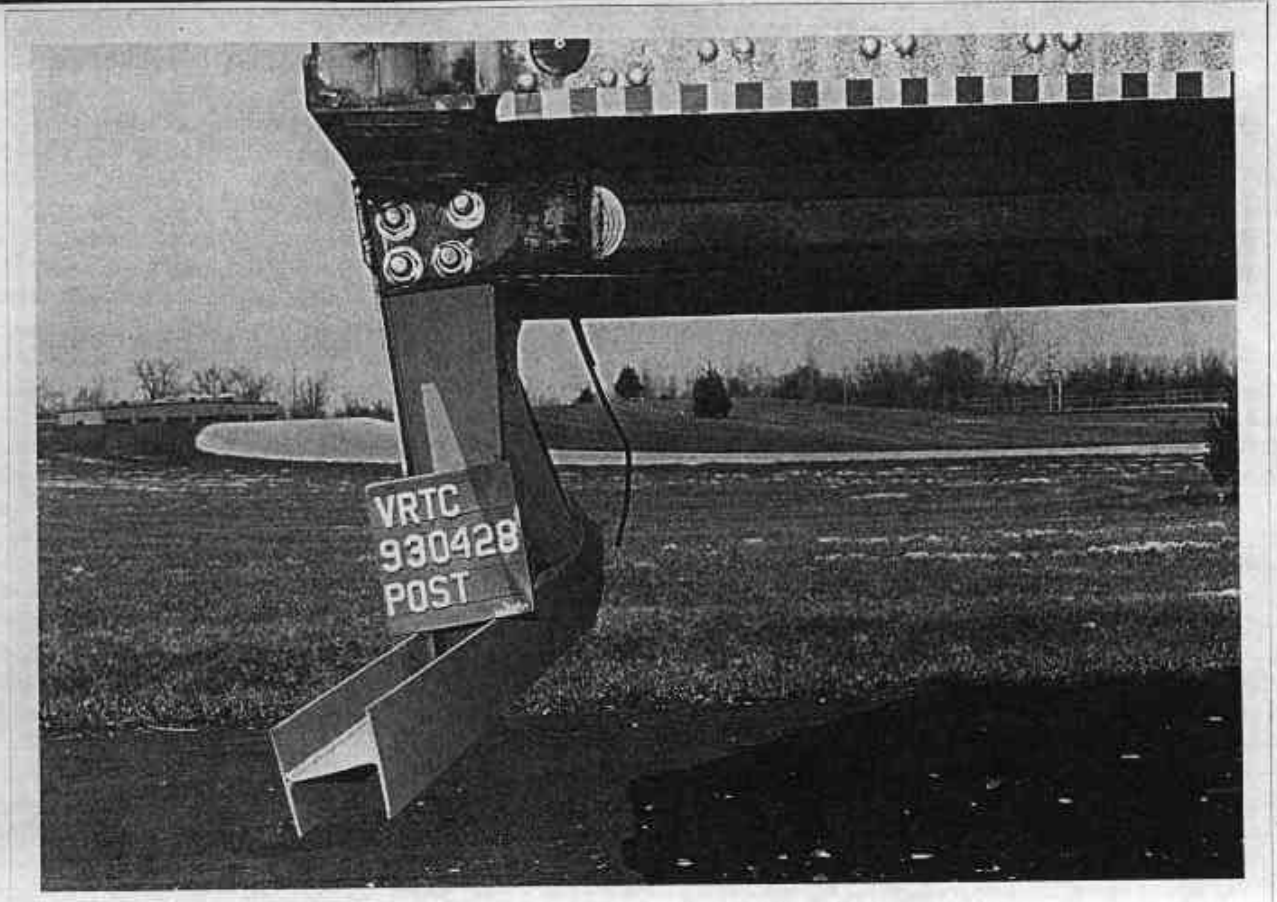


Figure A-37. POST-TEST UNDERRIDE GUARD - VIEW 1

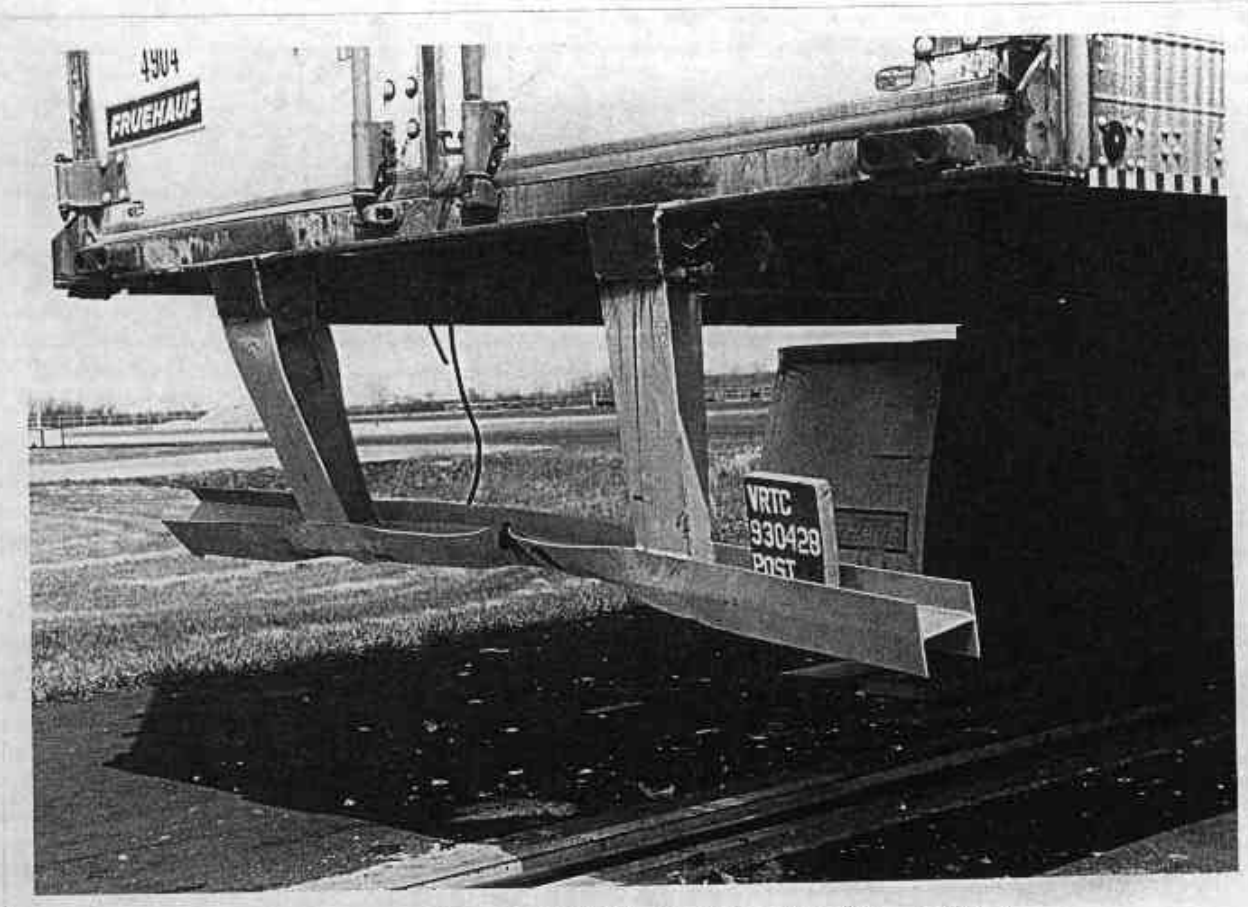


Figure A-38. POST-TEST UNDERRIDE GUARD - VIEW 2

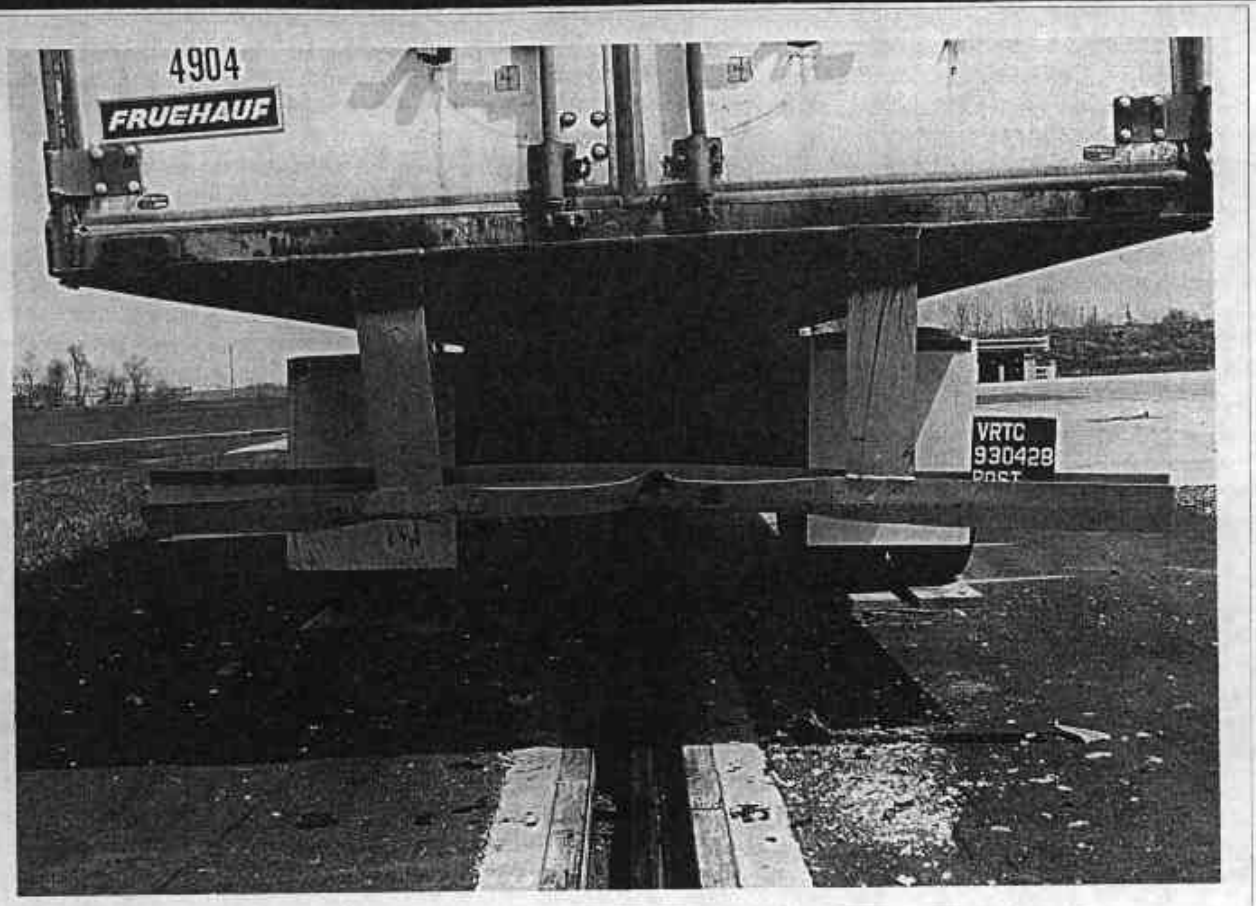


Figure A-39. POST-TEST UNDERRIDE GUARD - VIEW 3

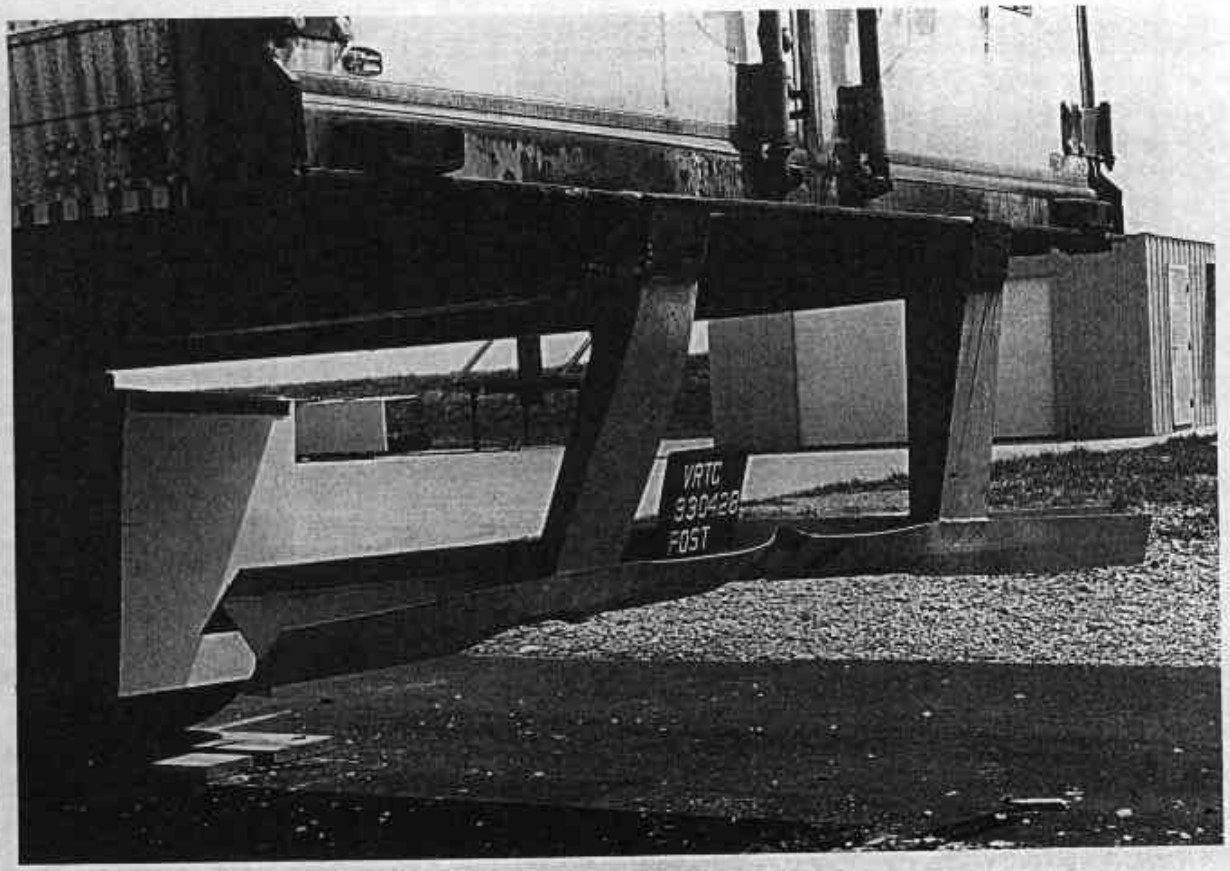


Figure A-40. POST-TEST UNDERRIDE GUARD - VIEW 4

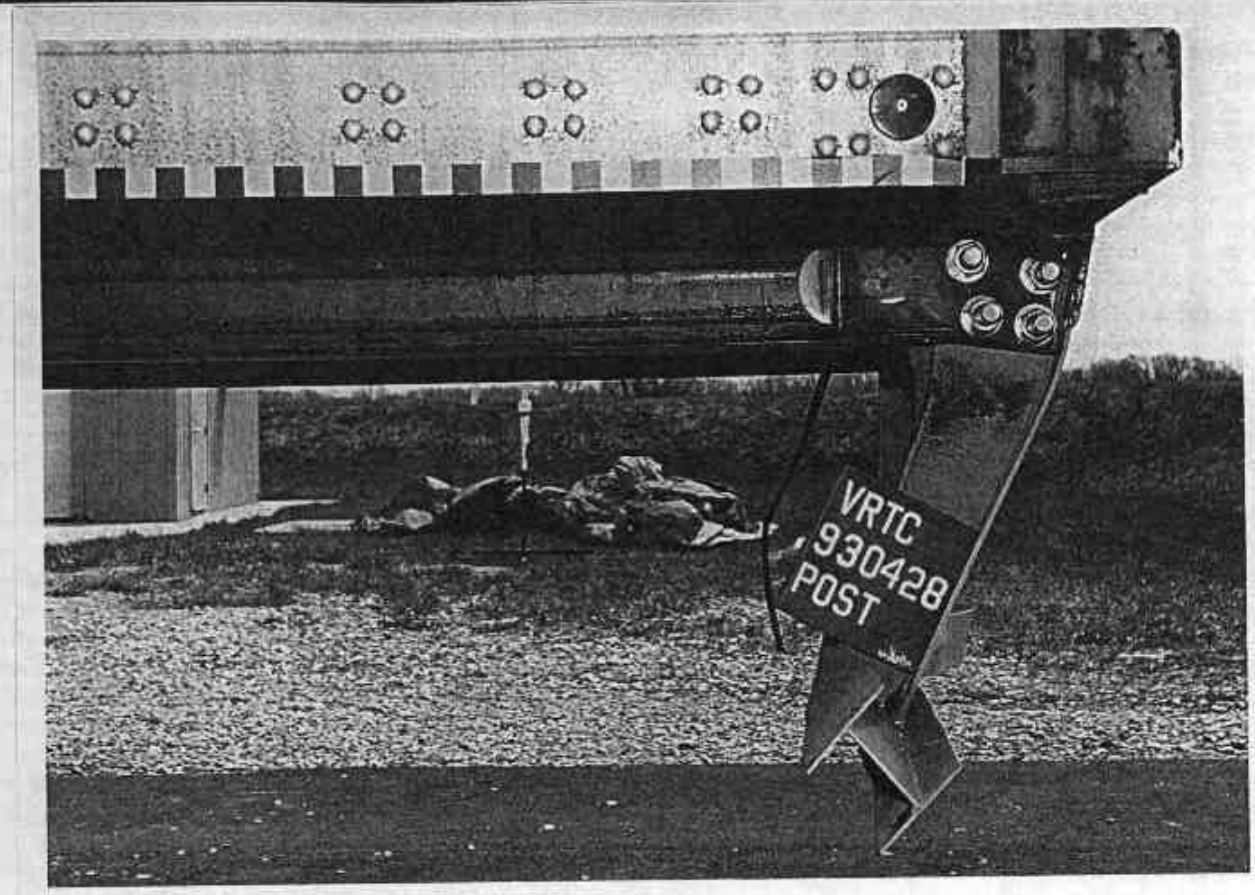


Figure A-41. POST-TEST UNDERRIDE GUARD - VIEW 5

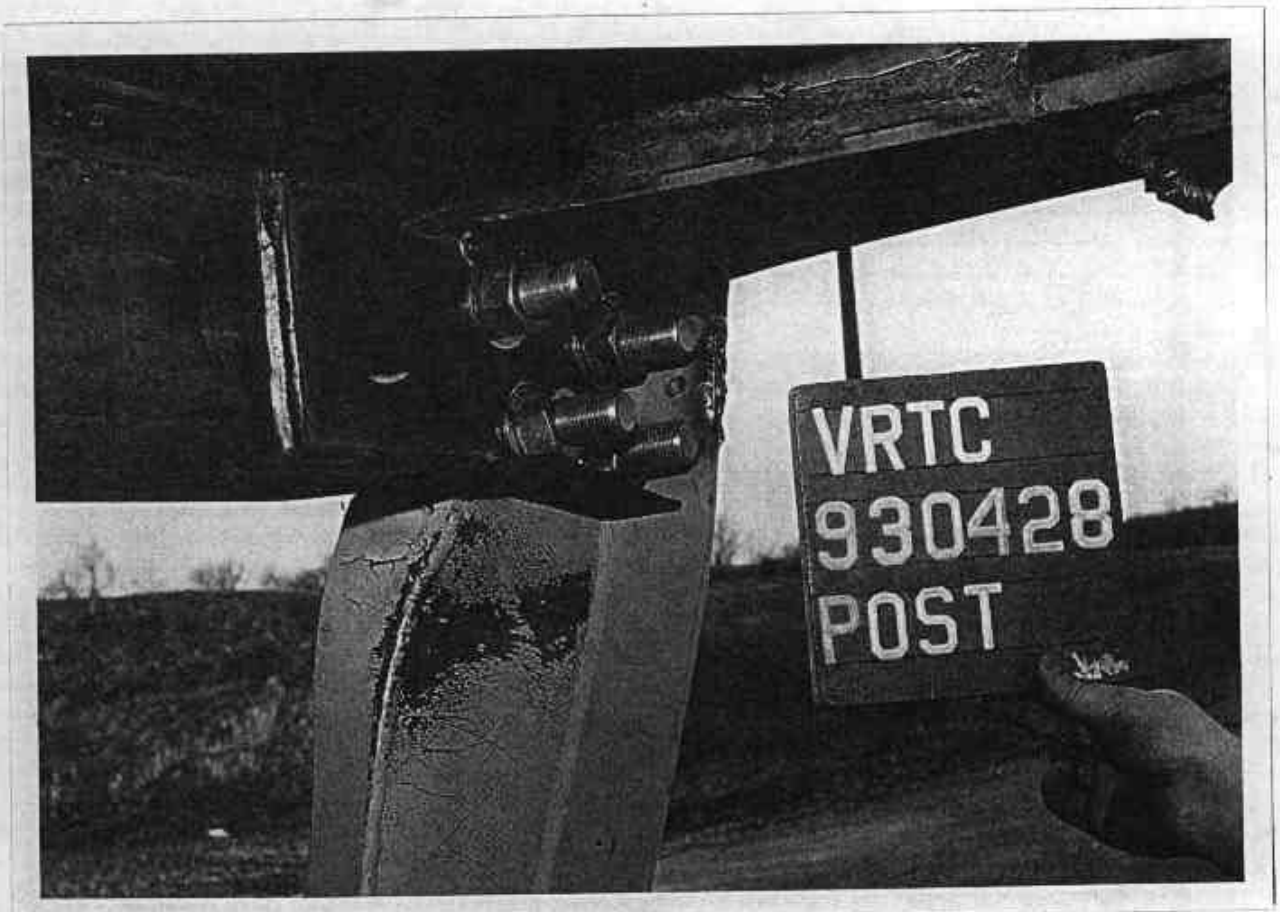


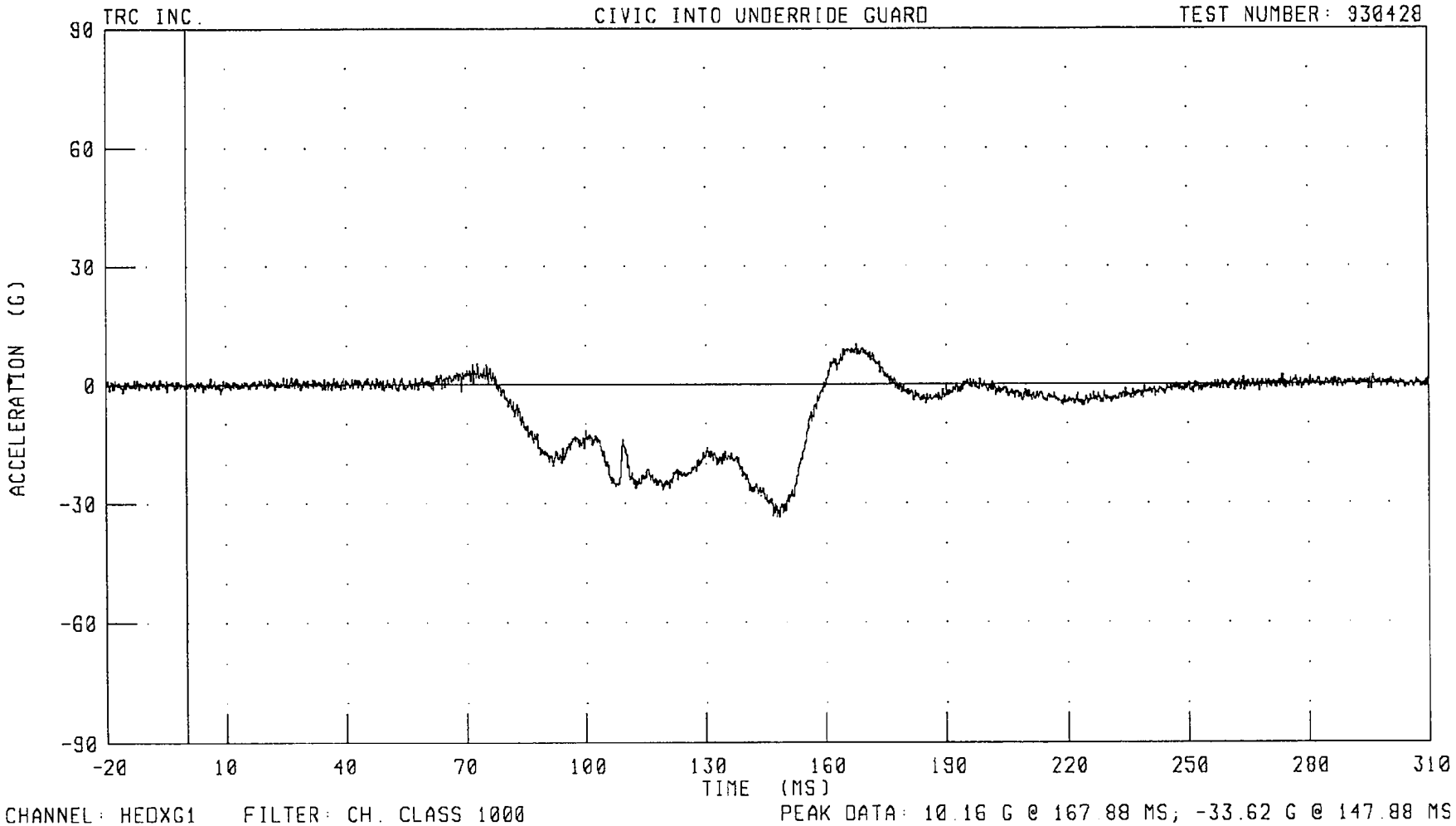
Figure A-42. POST-TEST UNDERRIDE GUARD - VIEW 6

Figure A-43. POST-TEST UNDERRIDE GUARD - VIEW 7

APPENDIX B

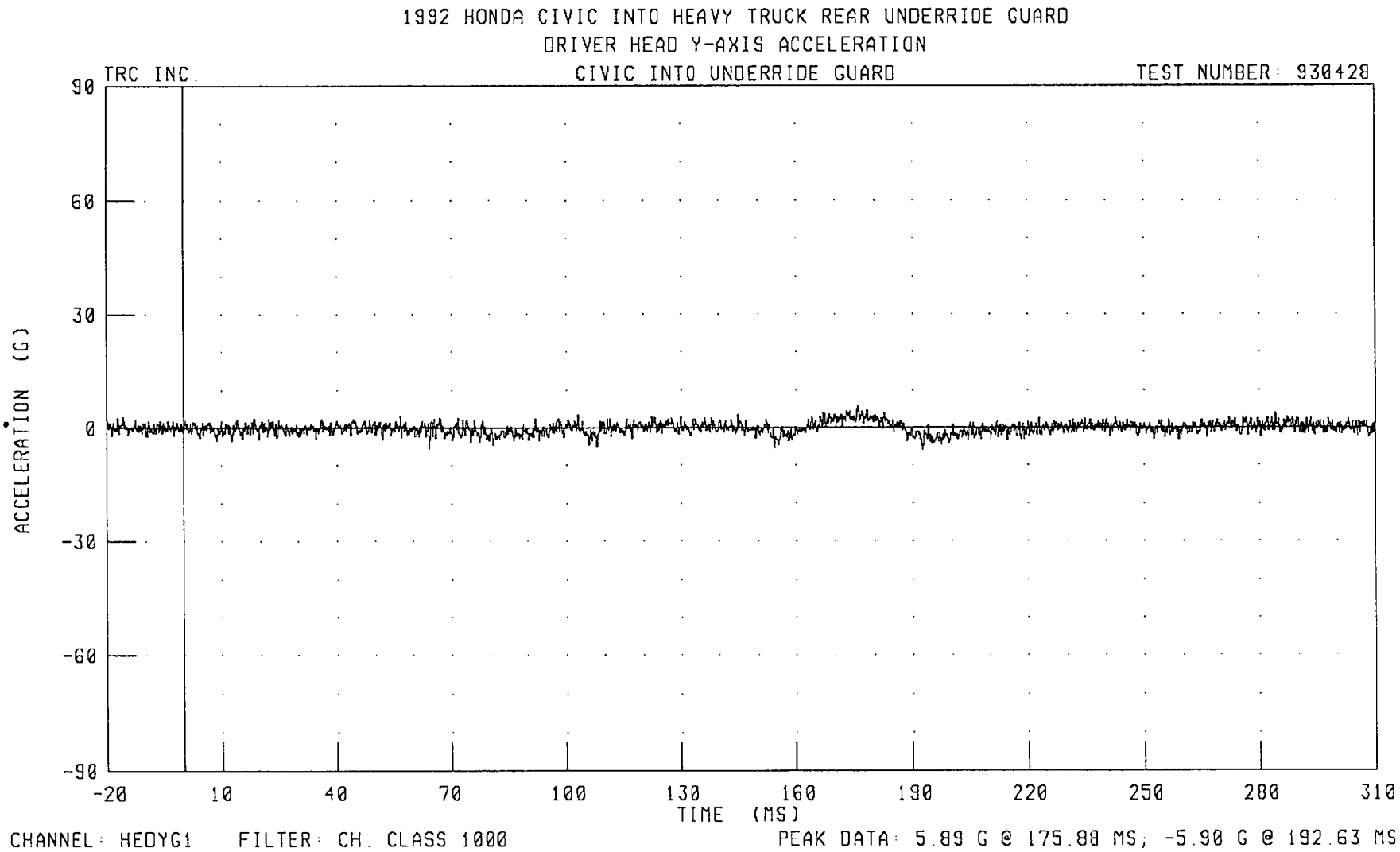
DATA PLOTS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER HEAD X-AXIS ACCELERATION

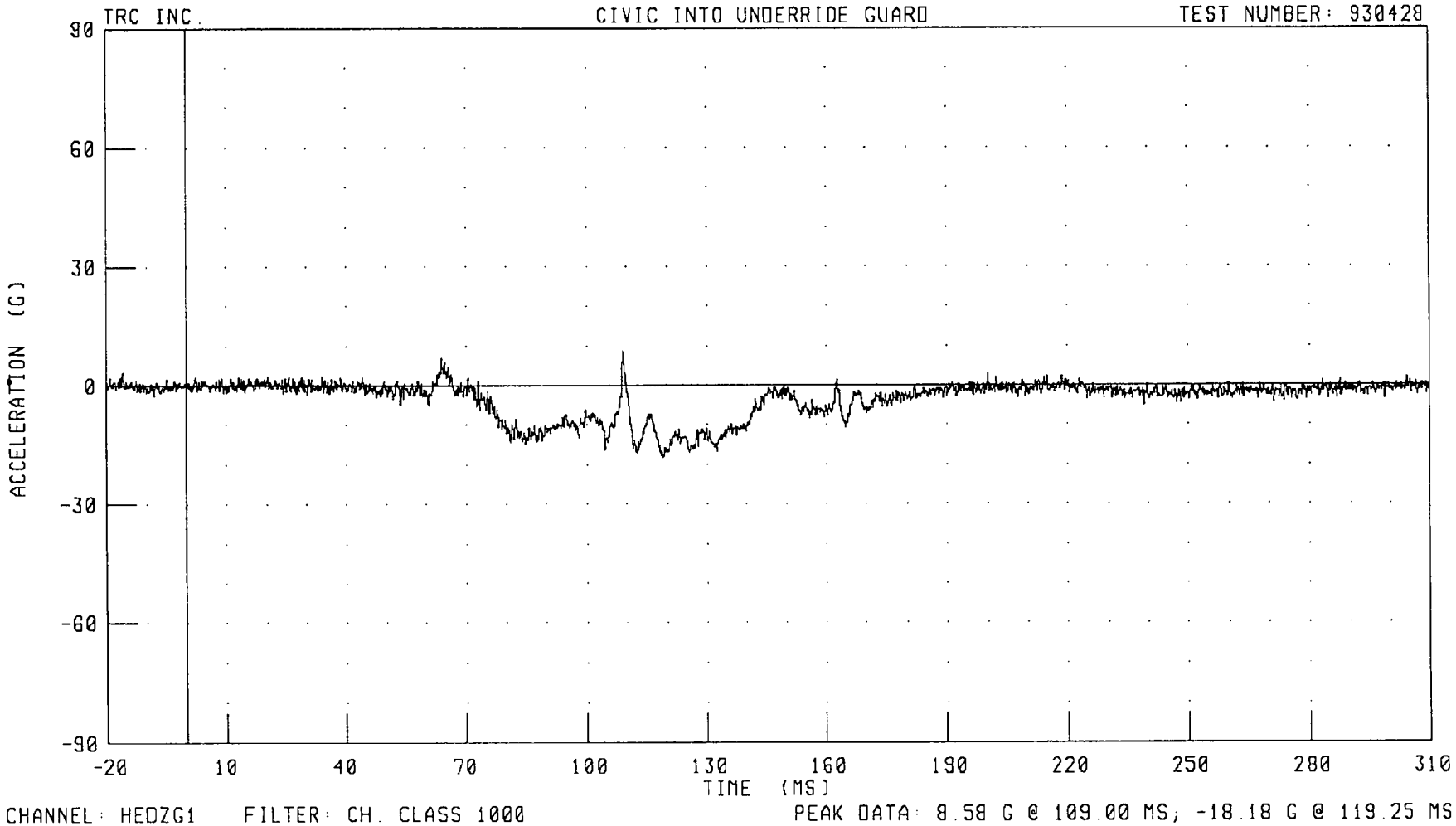


CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

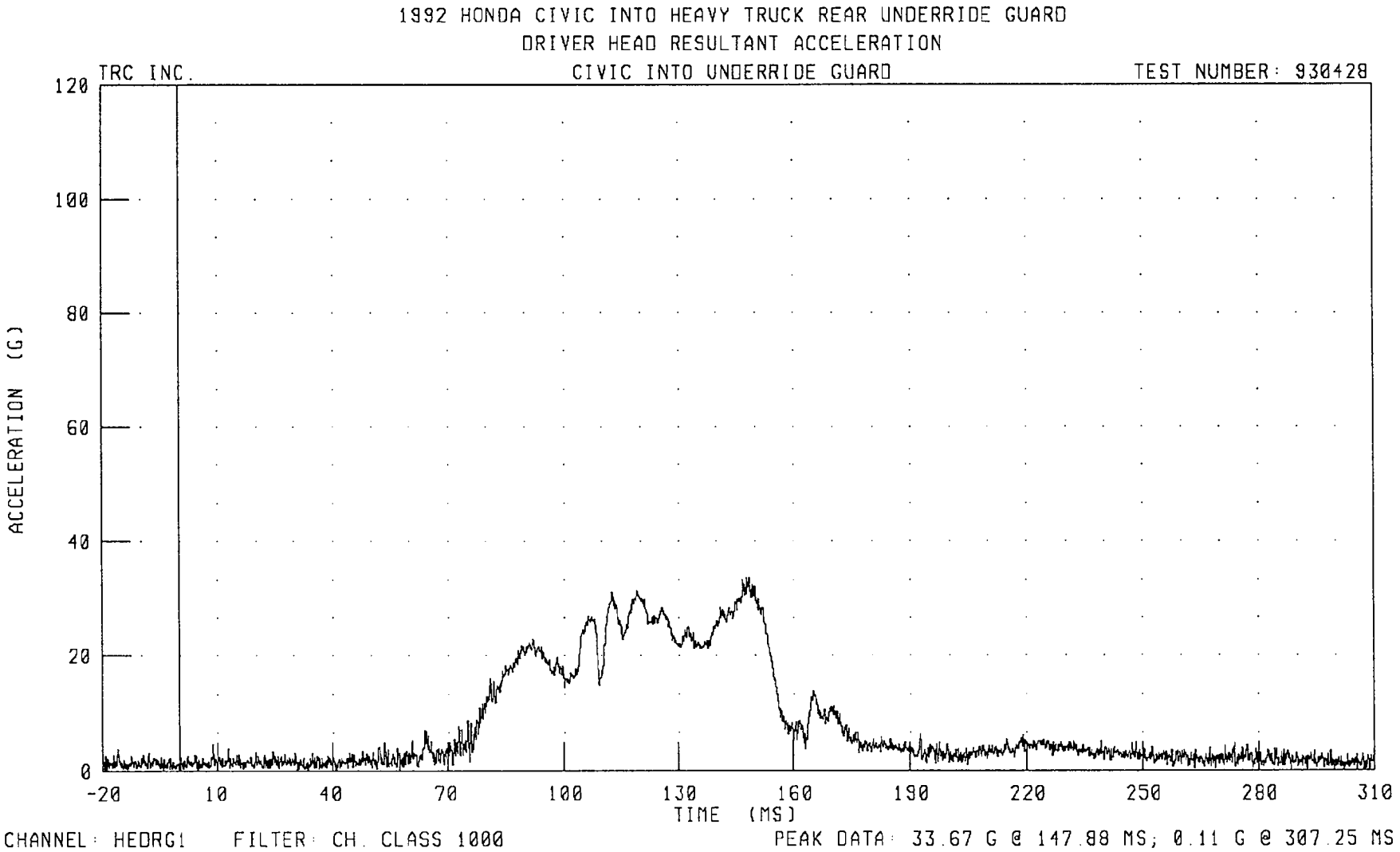
PEAK DATA: 10.16 G @ 167.88 MS; -33.62 G @ 147.88 MS

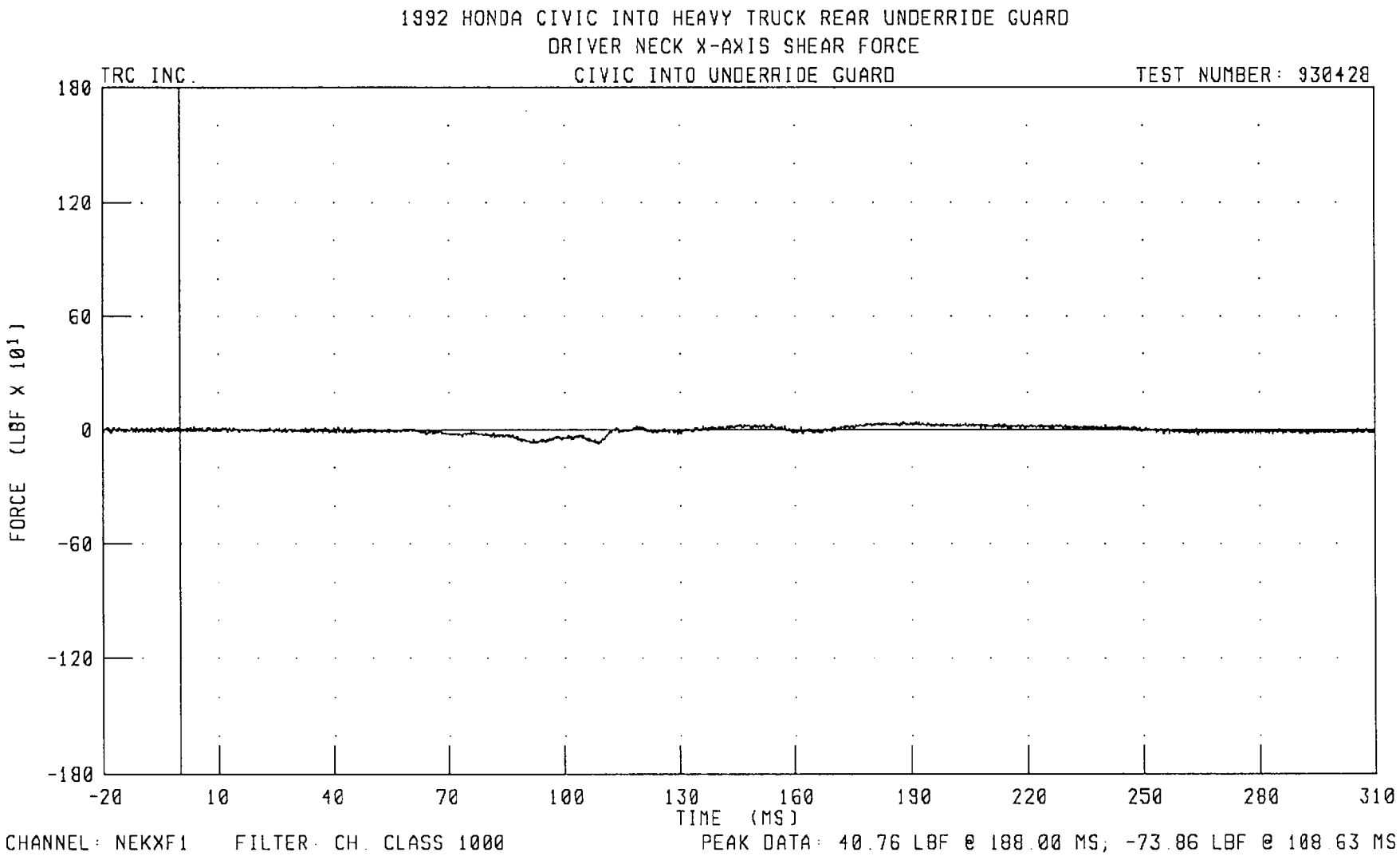

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER HEAD Y-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
90
60
30
0
-30
-60
-90
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDYG1
FILTER: CH. CLASS 1000
PEAK DATA: 5.89 G @ 175.88 MS; -5.90 G @ 192.63 MS

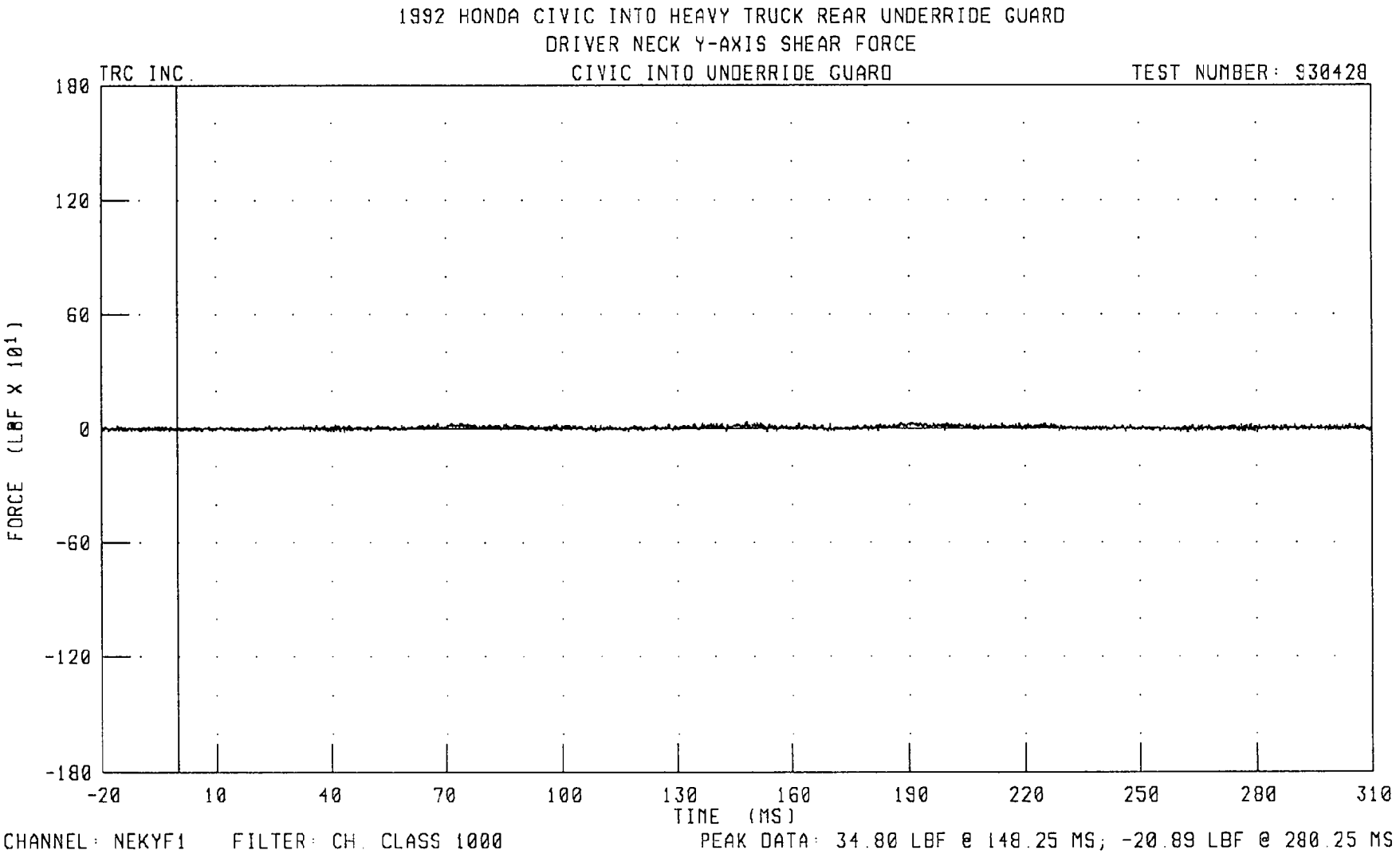
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER HEAD Z-AXIS ACCELERATION



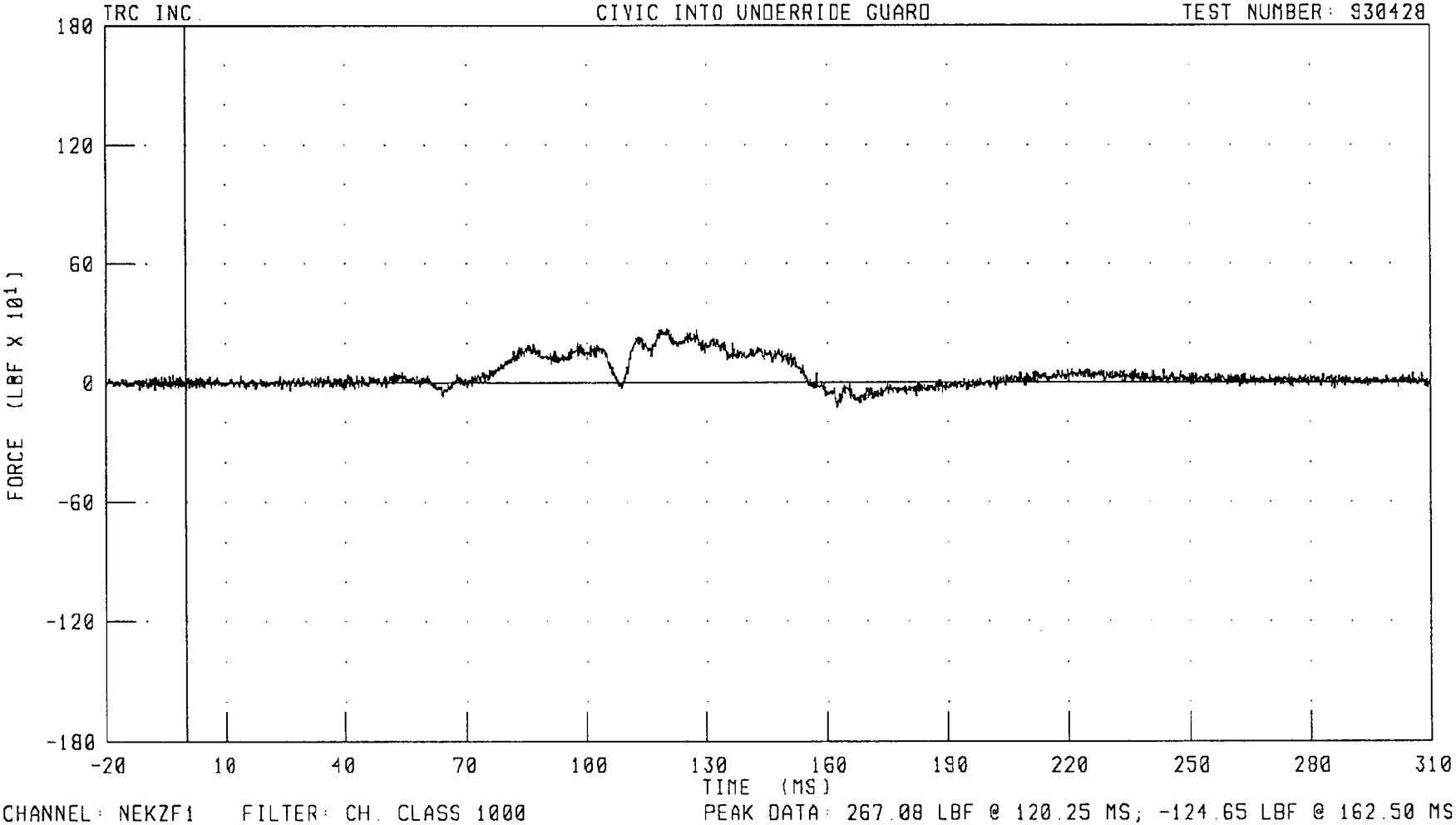
CHANNEL: HEDZG1 FILTER: CH. CLASS 1000 PEAK DATA: 8.58 G @ 109.00 MS; -18.18 G @ 119.25 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER HEAD RESULTANT ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDRG1
FILTER: CH. CLASS 1000
PEAK DATA: 33.67 G @ 147.88 MS; 0.11 G @ 307.25 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER NECK X-AXIS SHEAR FORCE
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
180
120
60
0
-60
-120
-180
FORCE (LBF X 10¹)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: NEKXF1
FILTER: CH. CLASS 1000
PEAK DATA: 40.76 LBF @ 188.00 MS; -73.86 LBF @ 108.63 MS

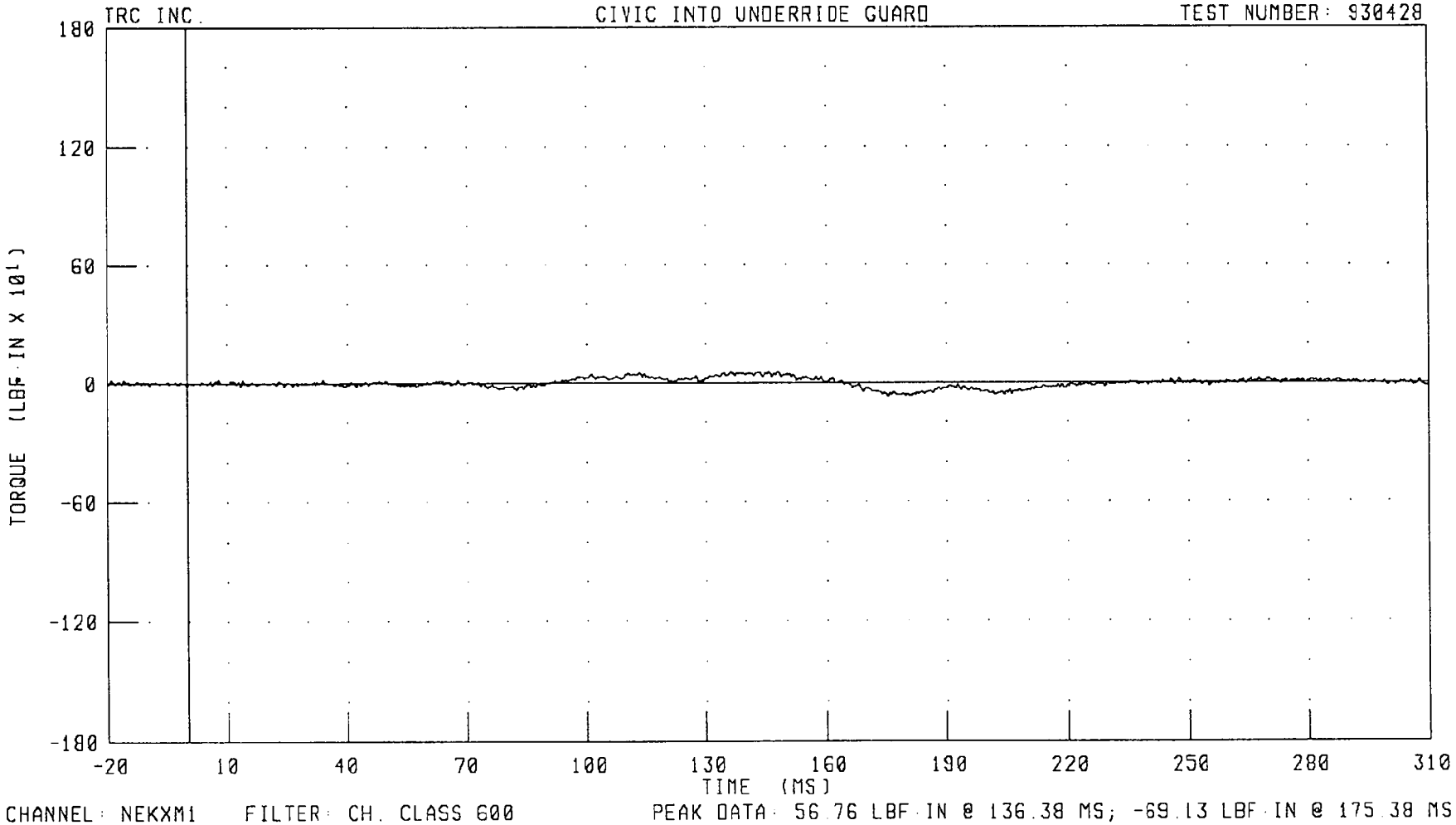

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER NECK Y-AXIS SHEAR FORCE
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
180
120
60
0
-60
-120
-180
FORCE (LBF X 10¹)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: NEKYF1
FILTER: CH. CLASS 1000
PEAK DATA: 34.80 LBF @ 148.25 MS; -20.89 LBF @ 280.25 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER NECK Z-AXIS AXIAL FORCE

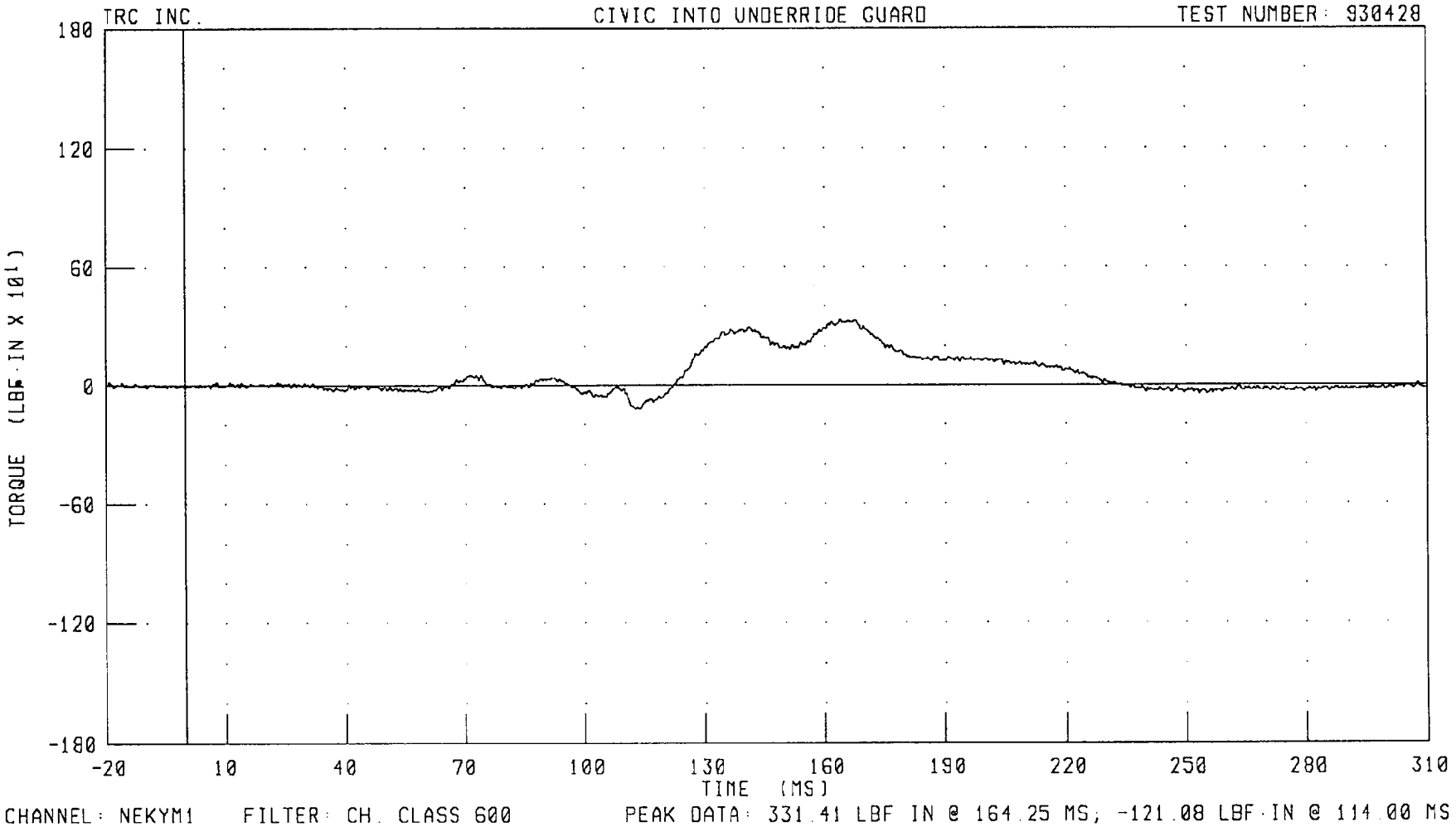


CHANNEL: NEKZF1 FILTER: CH. CLASS 1000 PEAK DATA: 267.08 LBF @ 120.25 MS; -124.65 LBF @ 162.50 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER NECK MOMENT ABOUT X AXIS

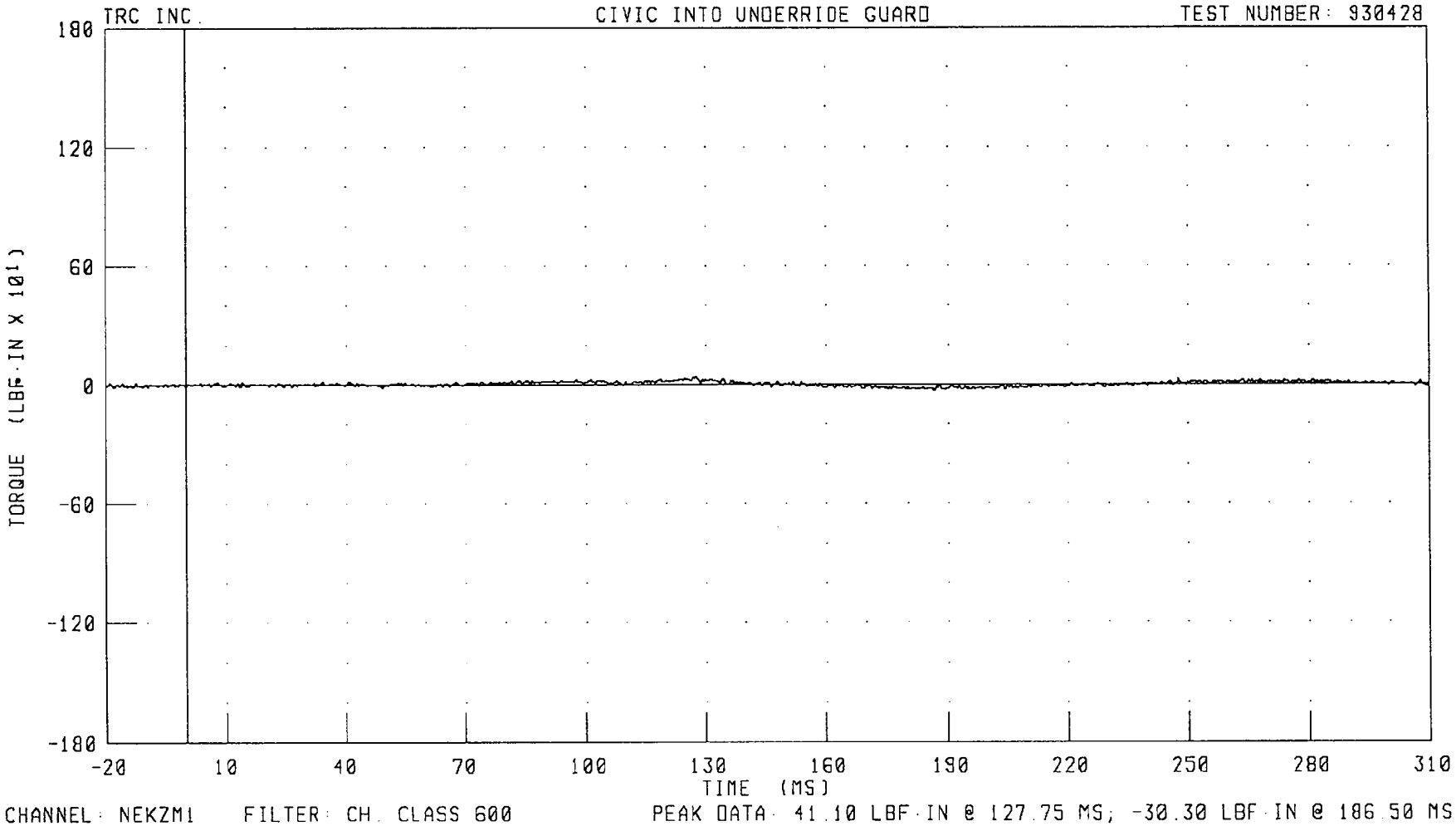


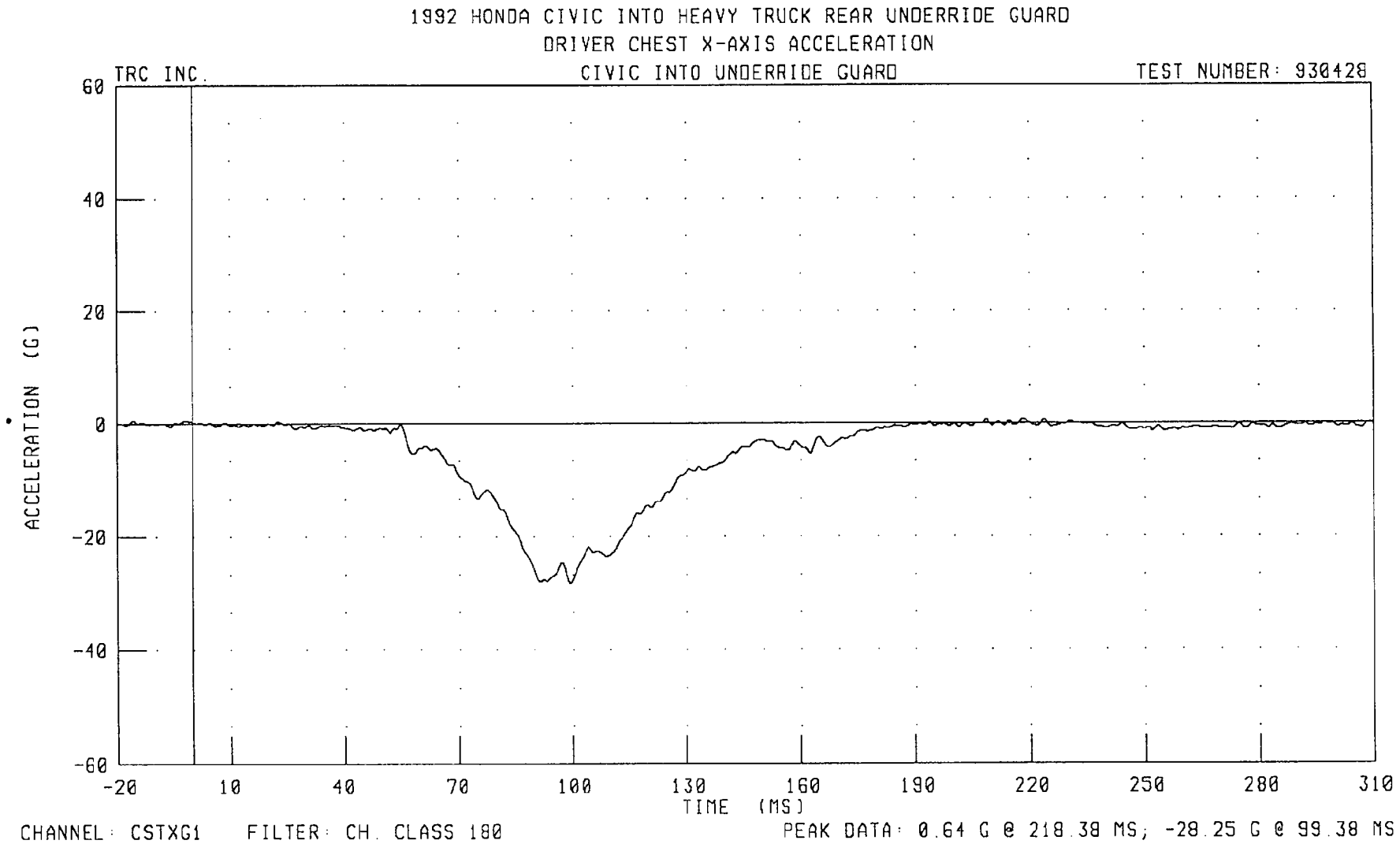
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER NECK MOMENT ABOUT Y AXIS



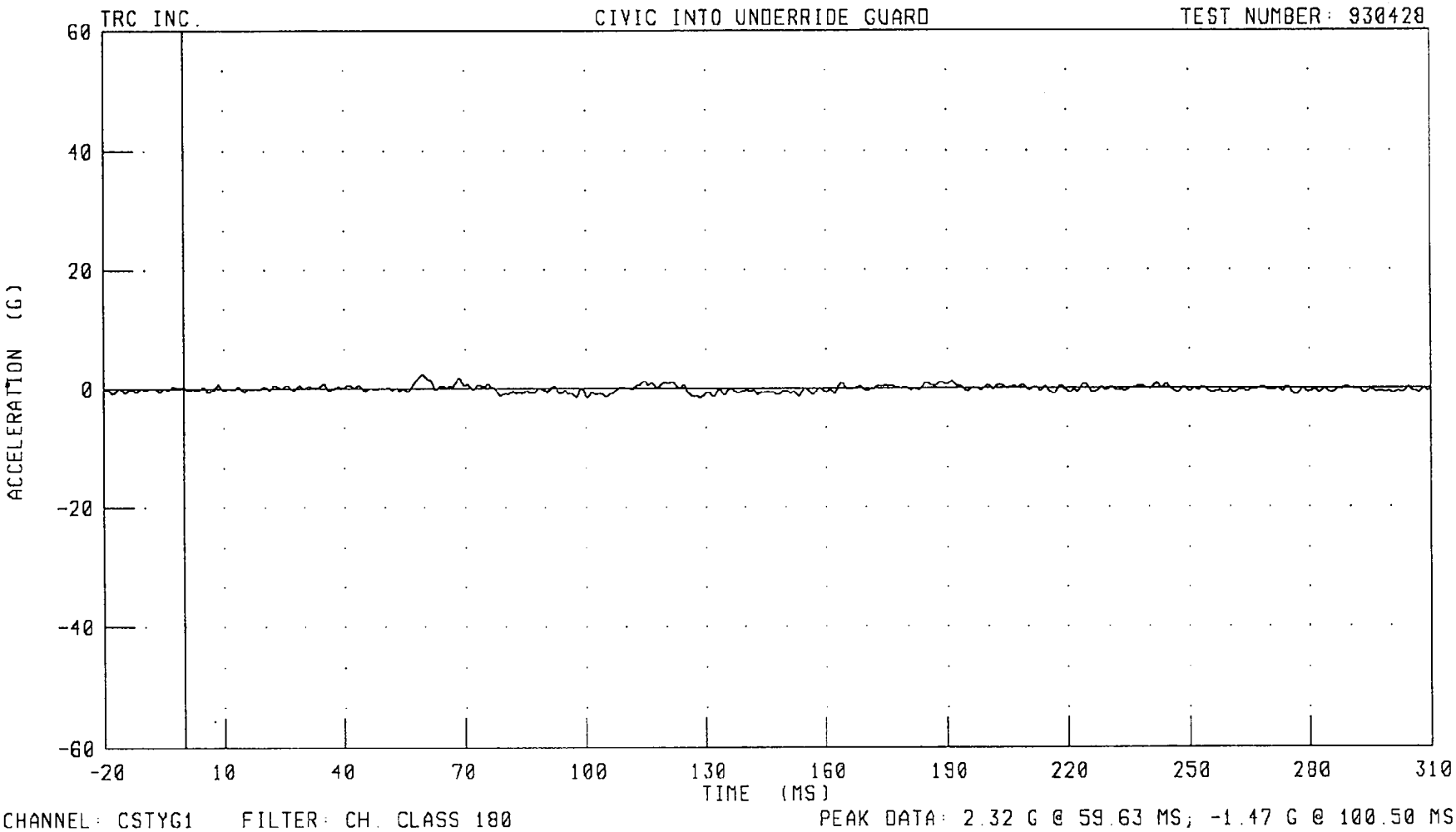
CHANNEL: NEKYM1 FILTER: CH. CLASS 600 PEAK DATA: 331.41 LBF IN @ 164.25 MS; -121.08 LBF-IN @ 114.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER NECK MOMENT ABOUT Z AXIS



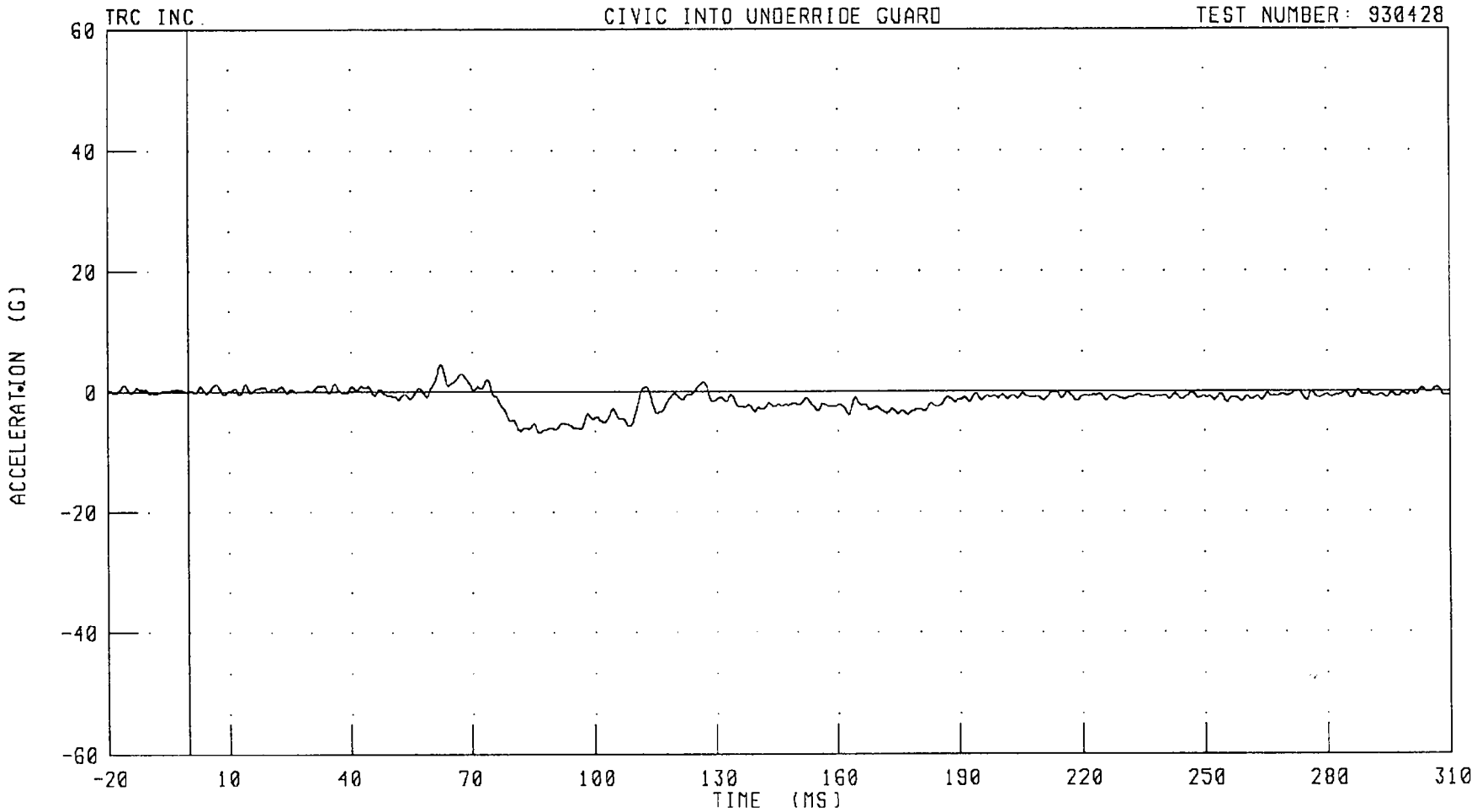

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER CHEST X-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: CSTXG1
FILTER: CH. CLASS 180
PEAK DATA: 0.64 G @ 218.38 MS; -28.25 G @ 99.38 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER CHEST Y-AXIS ACCELERATION

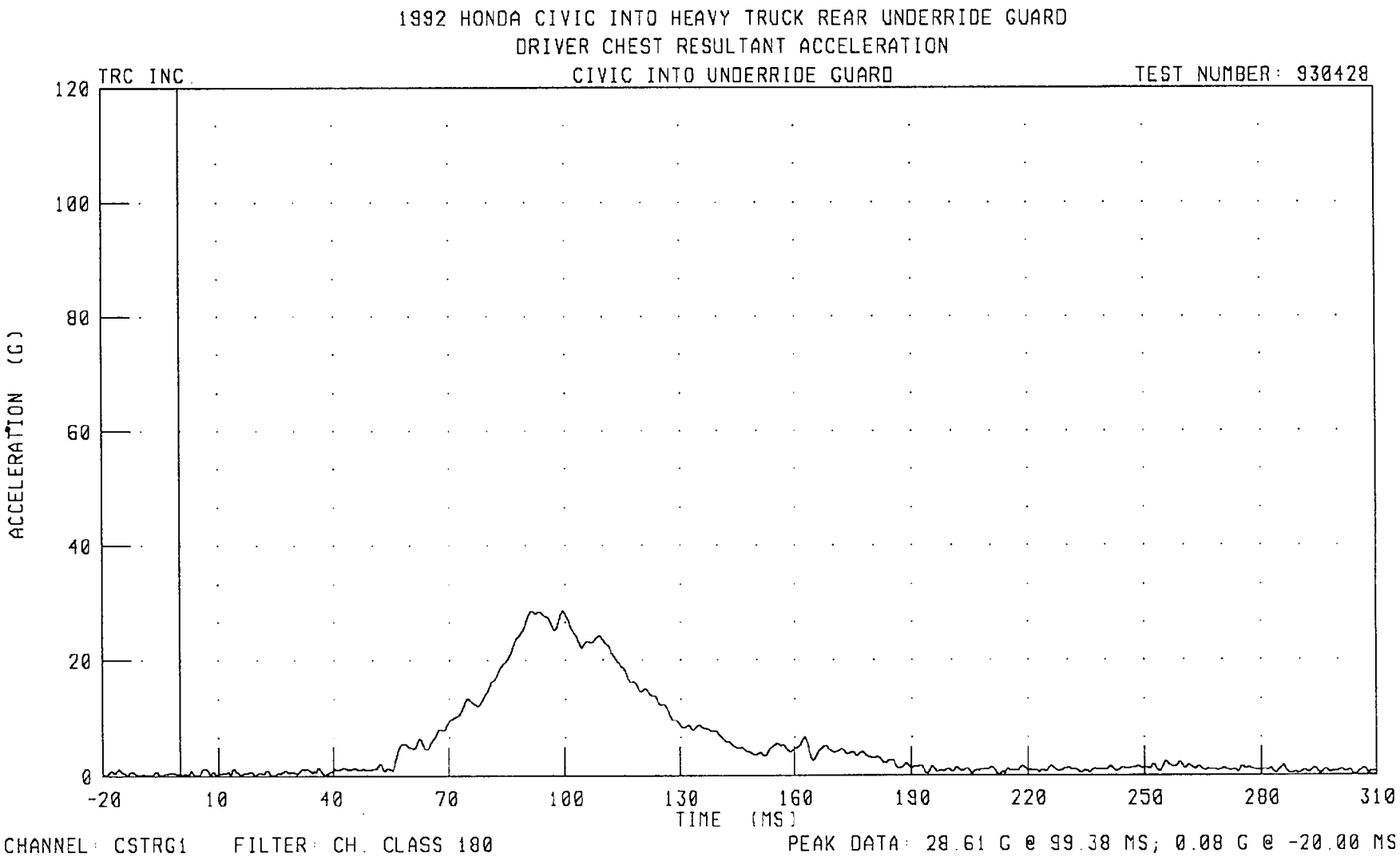


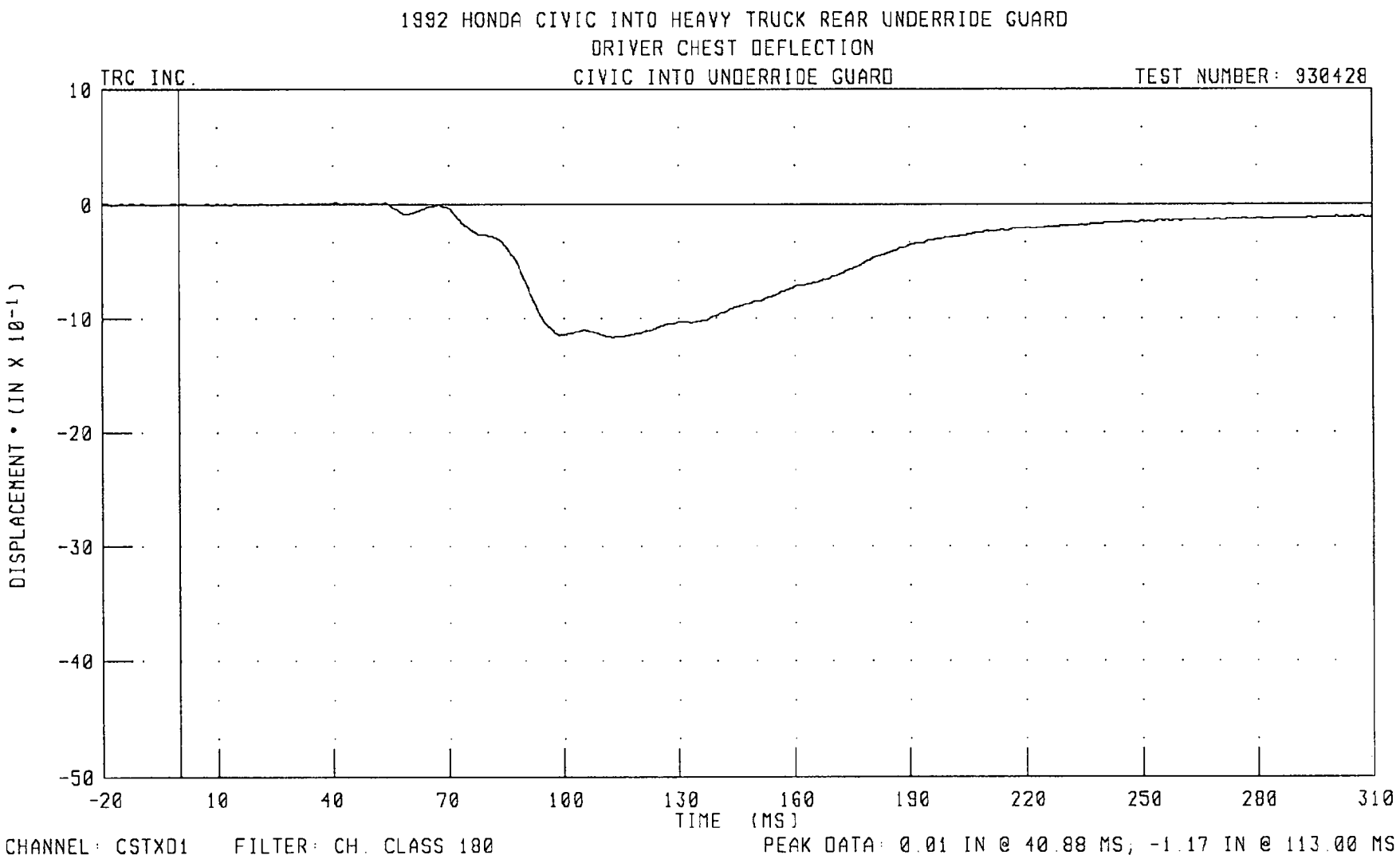
CHANNEL: CSTYG1 FILTER: CH. CLASS 180 PEAK DATA: 2.32 G @ 59.63 MS; -1.47 G @ 100.50 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER CHEST Z-AXIS ACCELERATION

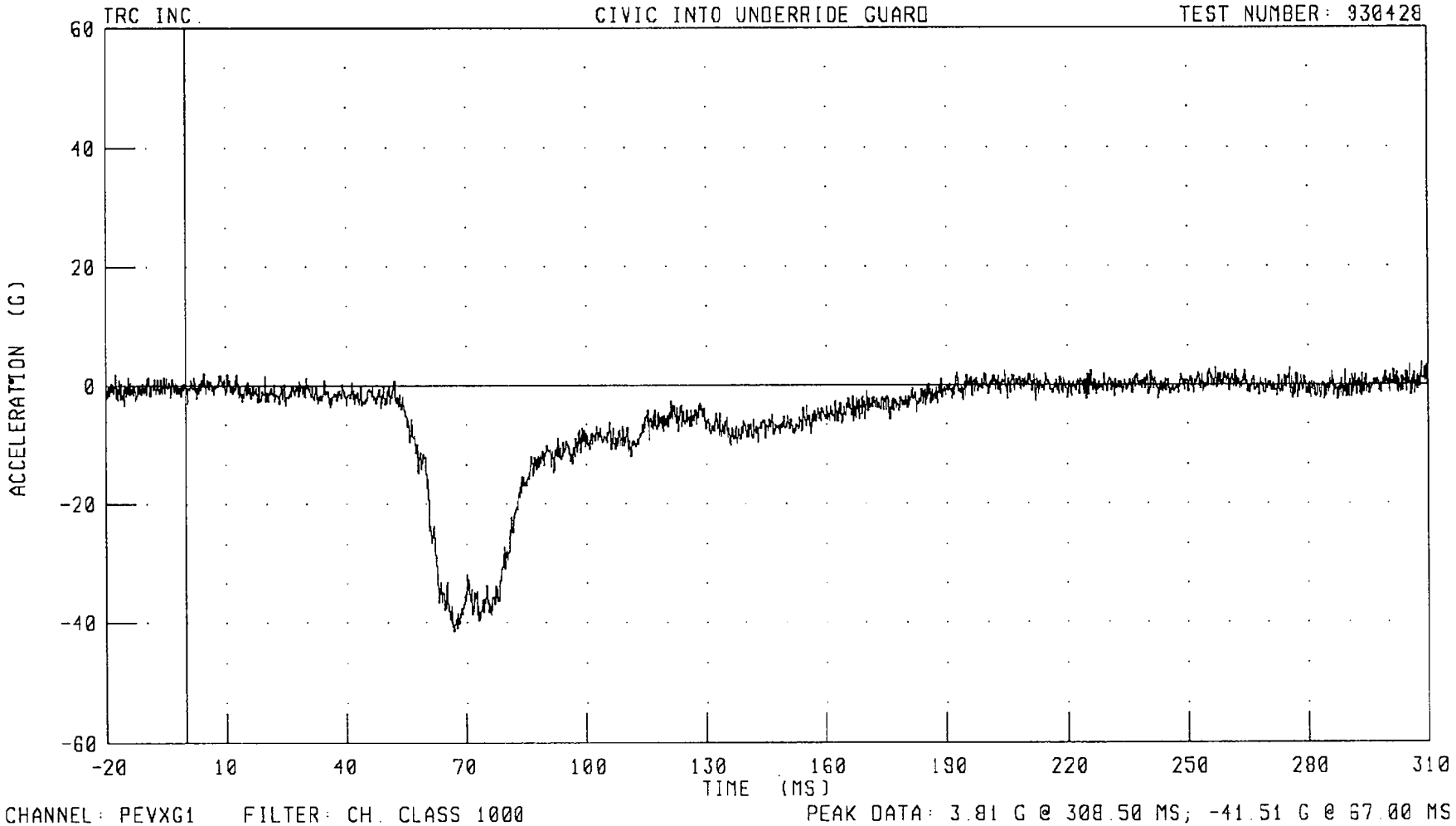


CHANNEL: CSTZG1 FILTER: CH. CLASS 180 PEAK DATA: 4.50 G @ 62.50 MS; -6.83 G @ 86.75 MS

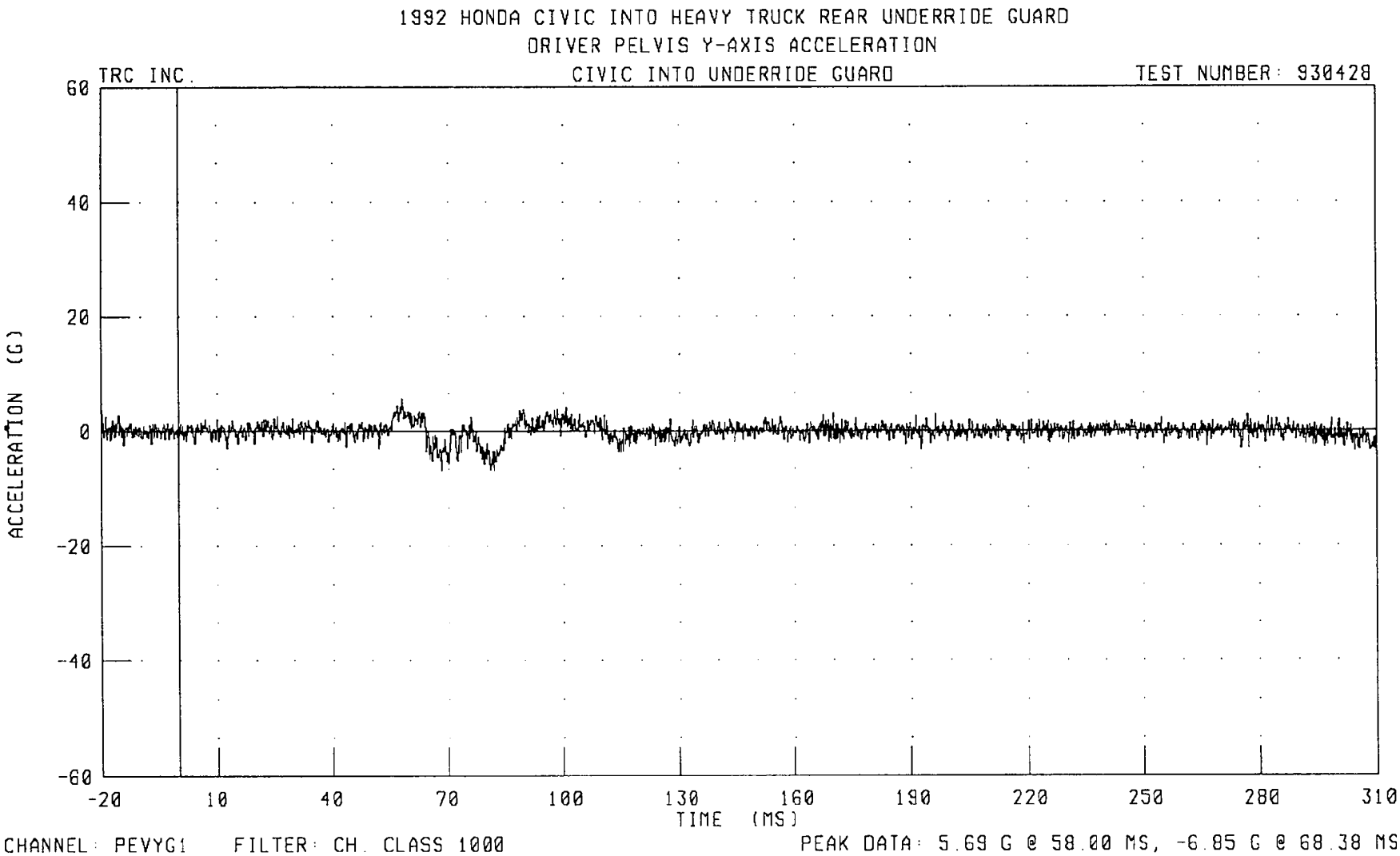

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER CHEST RESULTANT ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: CSTRG1
FILTER: CH. CLASS 180
PEAK DATA: 28.61 G @ 99.38 MS; 0.08 G @ -20.00 MS

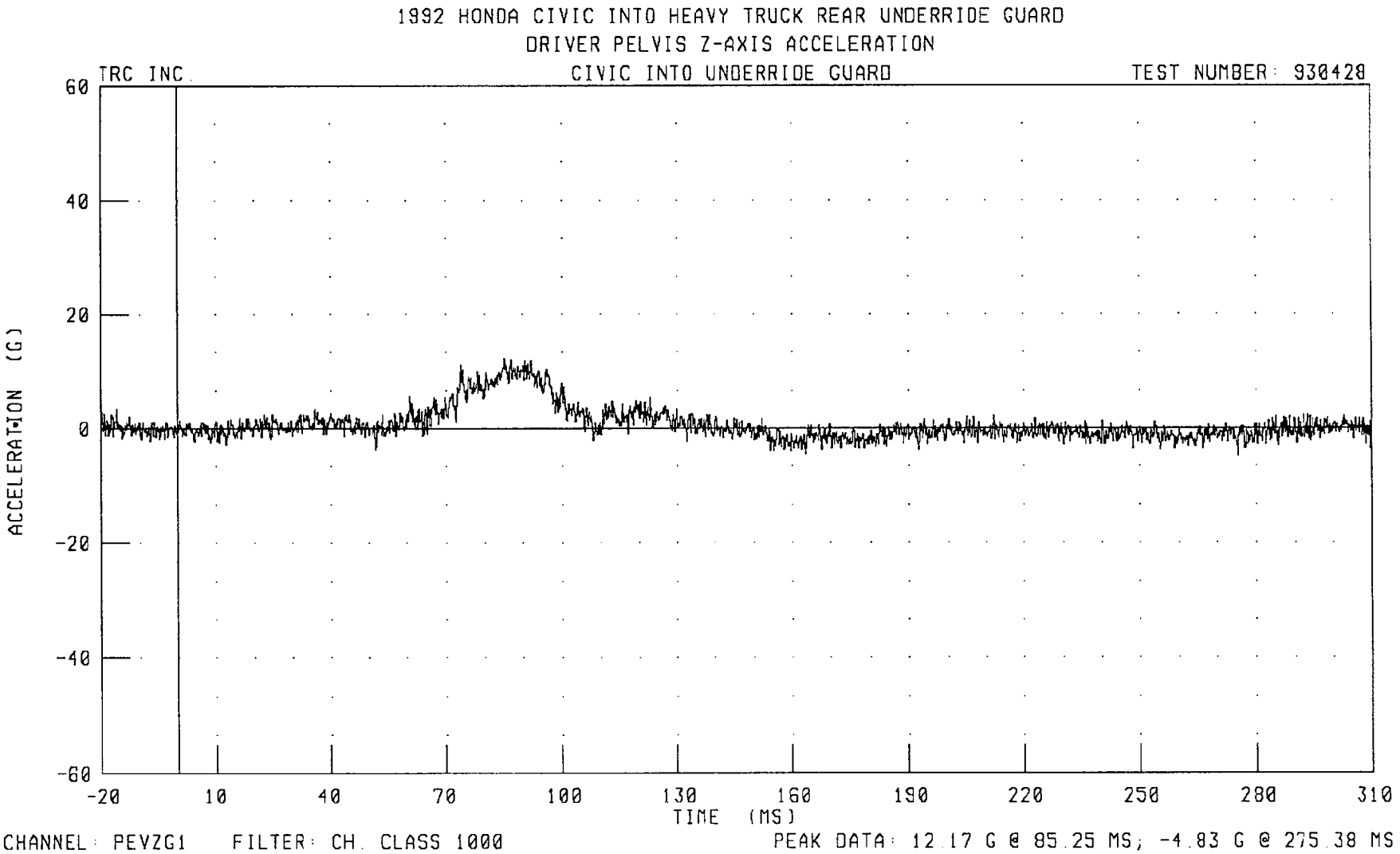

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER CHEST DEFLECTION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
DISPLACEMENT • (IN X 10-1)
10
0
-10
-20
-30
-40
-50
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: CSTXD1
FILTER: CH. CLASS 180
PEAK DATA: 0.01 IN @ 40.88 MS, -1.17 IN @ 113.00 MS

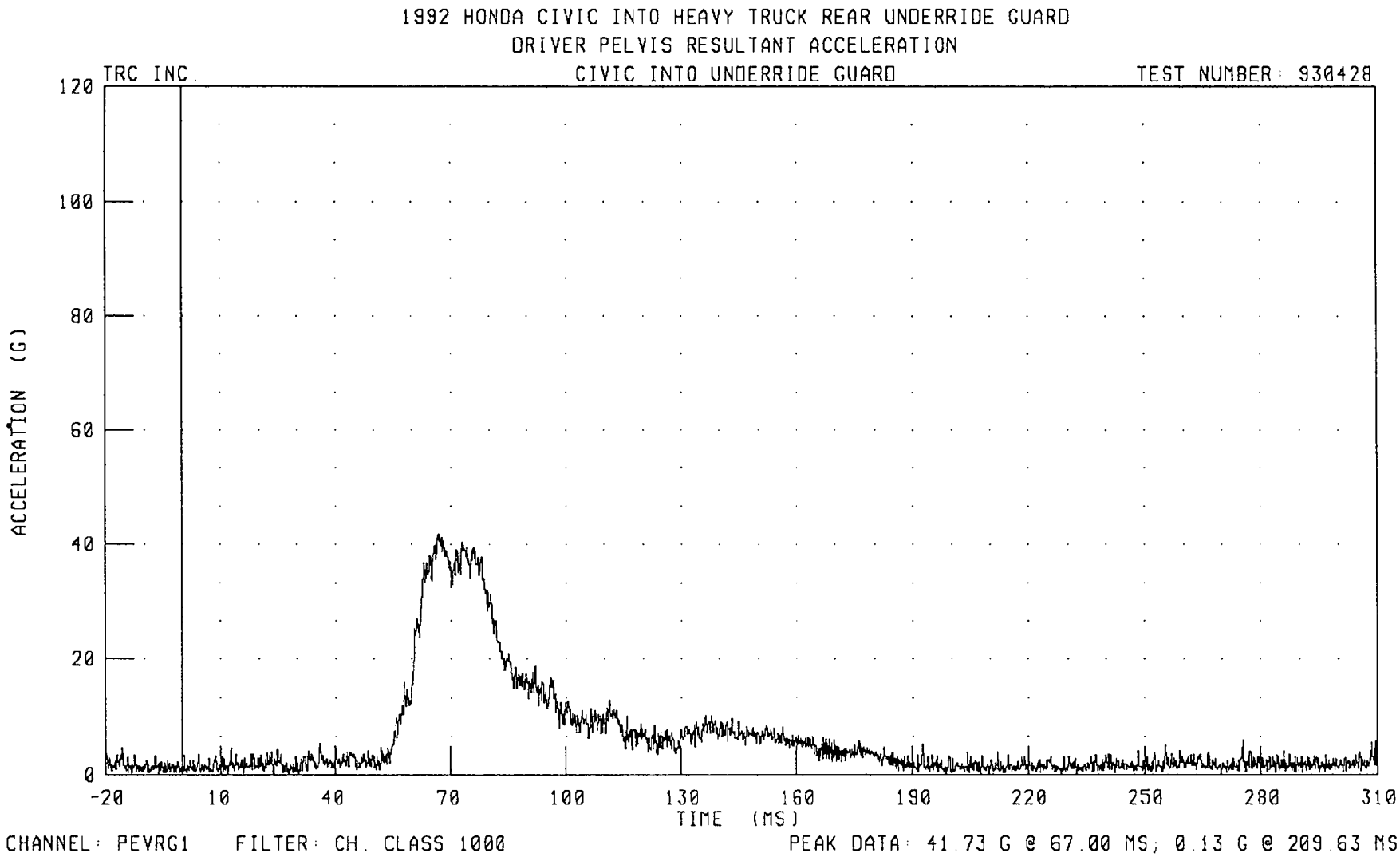
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER PELVIS X-AXIS ACCELERATION

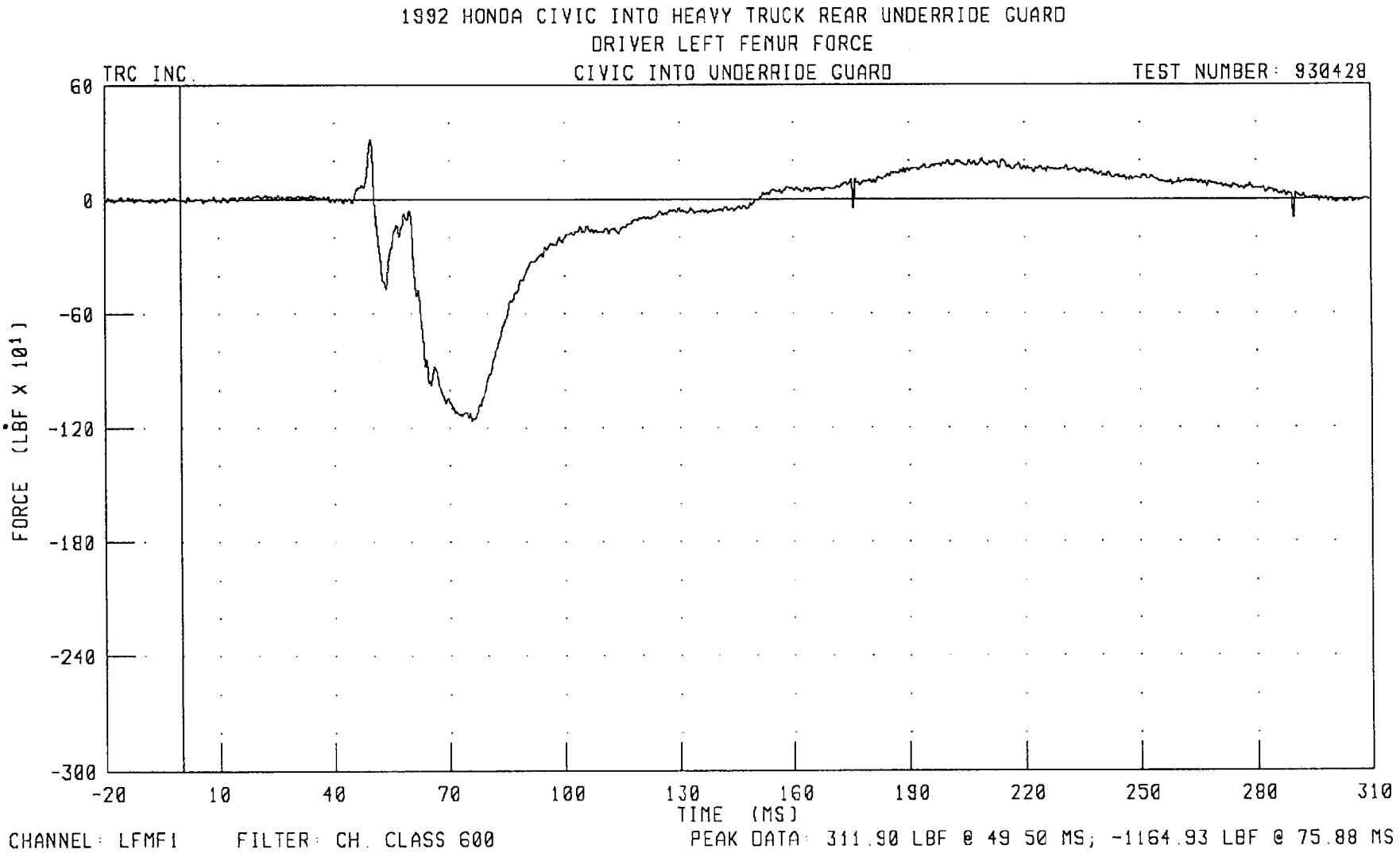


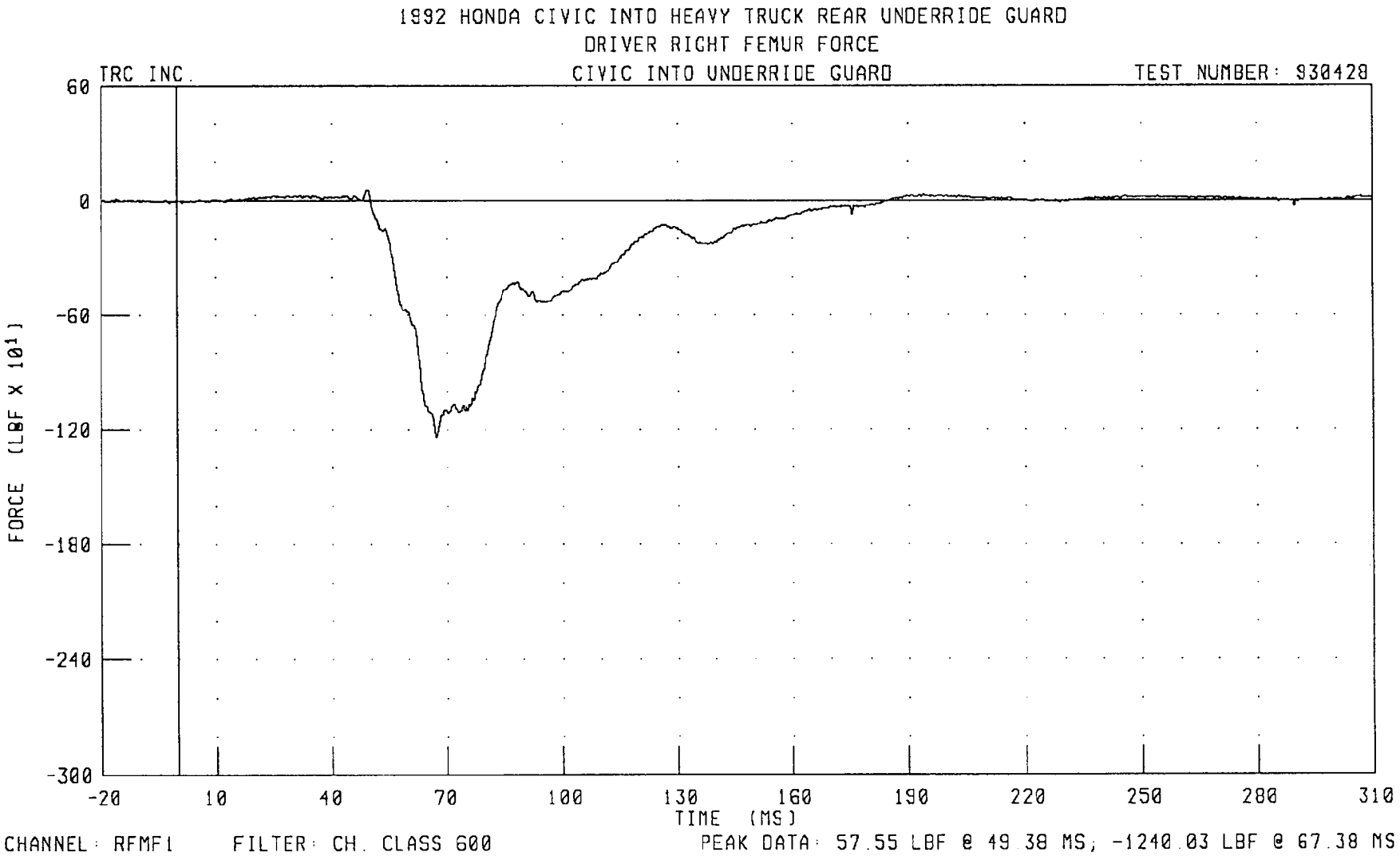
CHANNEL: PEVXG1 FILTER: CH. CLASS 1000 PEAK DATA: 3.81 G @ 308.50 MS; -41.51 G @ 67.00 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER PELVIS Y-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVYG1
FILTER: CH. CLASS 1000
PEAK DATA: 5.69 G @ 58.00 MS, -6.85 G @ 68.38 MS

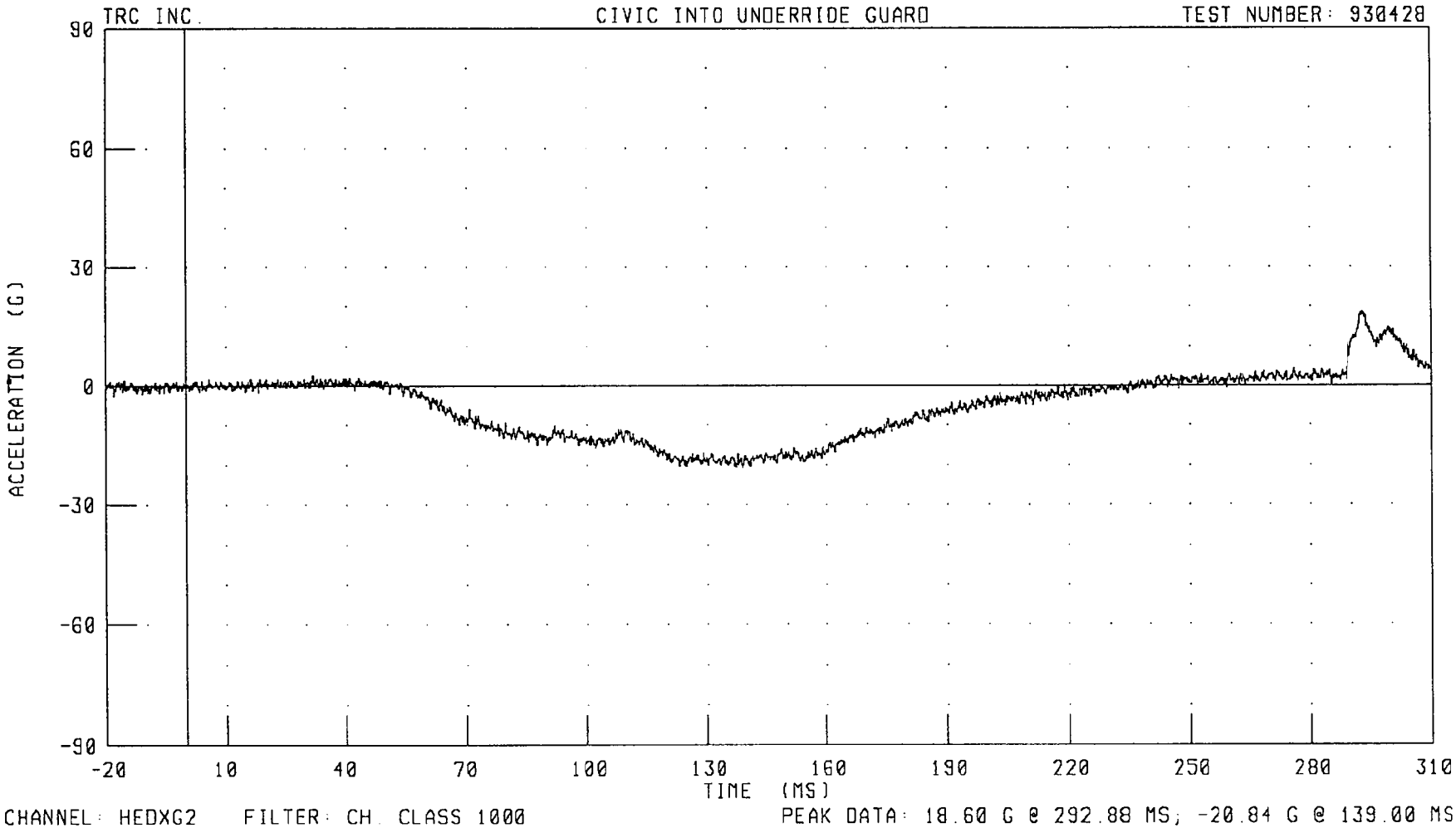

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER PELVIS Z-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVZG1
FILTER: CH. CLASS 1000
PEAK DATA: 12.17 G @ 85.25 MS; -4.83 G @ 275.38 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER PELVIS RESULTANT ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVRG1
FILTER: CH. CLASS 1000
PEAK DATA: 41.73 G @ 67.00 MS; 0.13 G @ 209.63 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER LEFT FEMUR FORCE
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
0
-60
-120
-180
-240
-300
FORCE (LBF X 10¹)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LFMF1
FILTER: CH. CLASS 600
PEAK DATA: 311.90 LBF @ 49.50 MS; -1164.93 LBF @ 75.88 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
DRIVER RIGHT FEMUR FORCE
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
0
-60
-120
-180
-240
-300
FORCE (LBF X 10¹)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: RFMF1
FILTER: CH. CLASS 600
PEAK DATA: 57.55 LBF @ 49.38 MS; -1240.03 LBF @ 67.38 MS

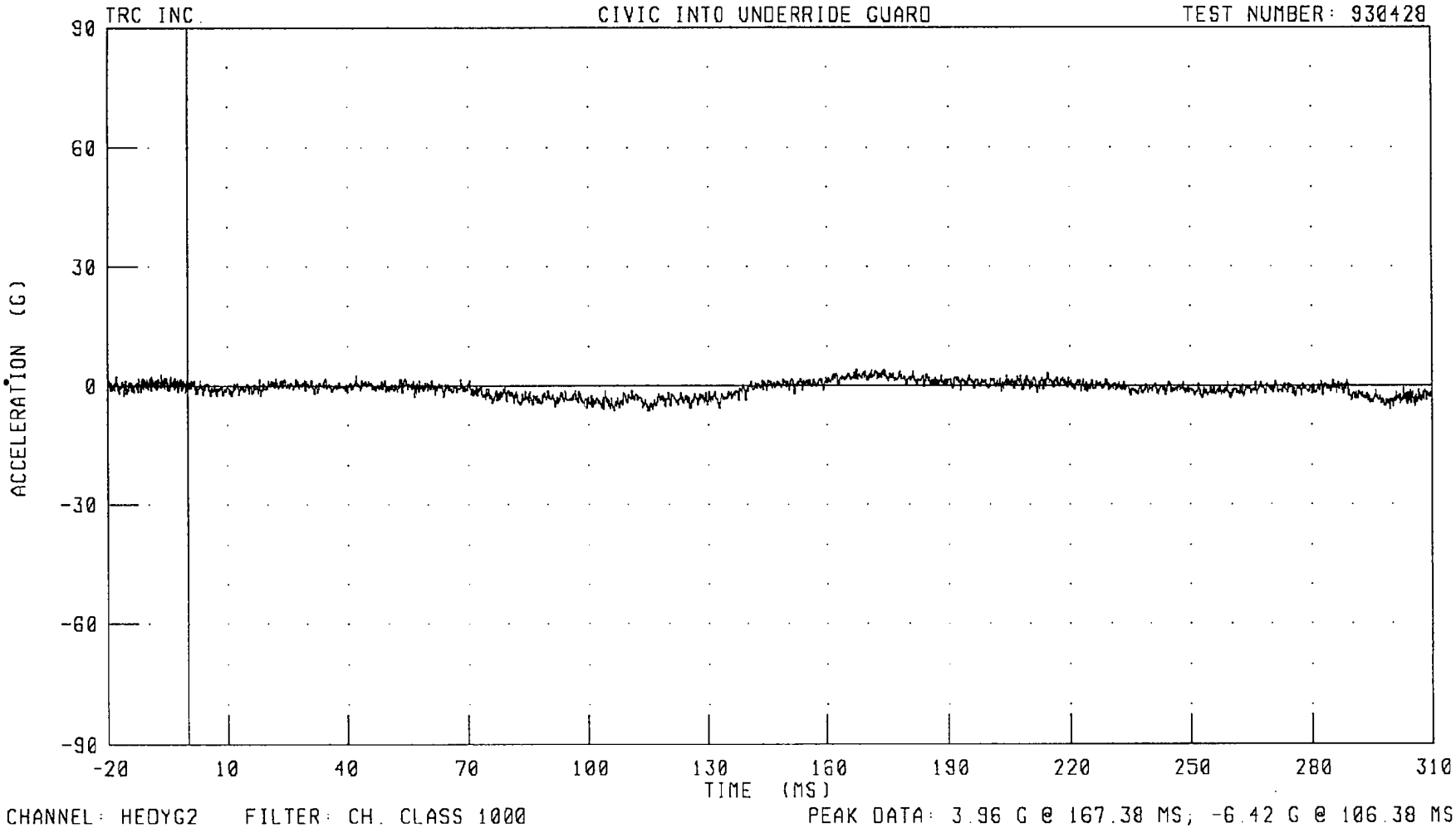
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION



CHANNEL: HEDXG2 FILTER: CH CLASS 1000

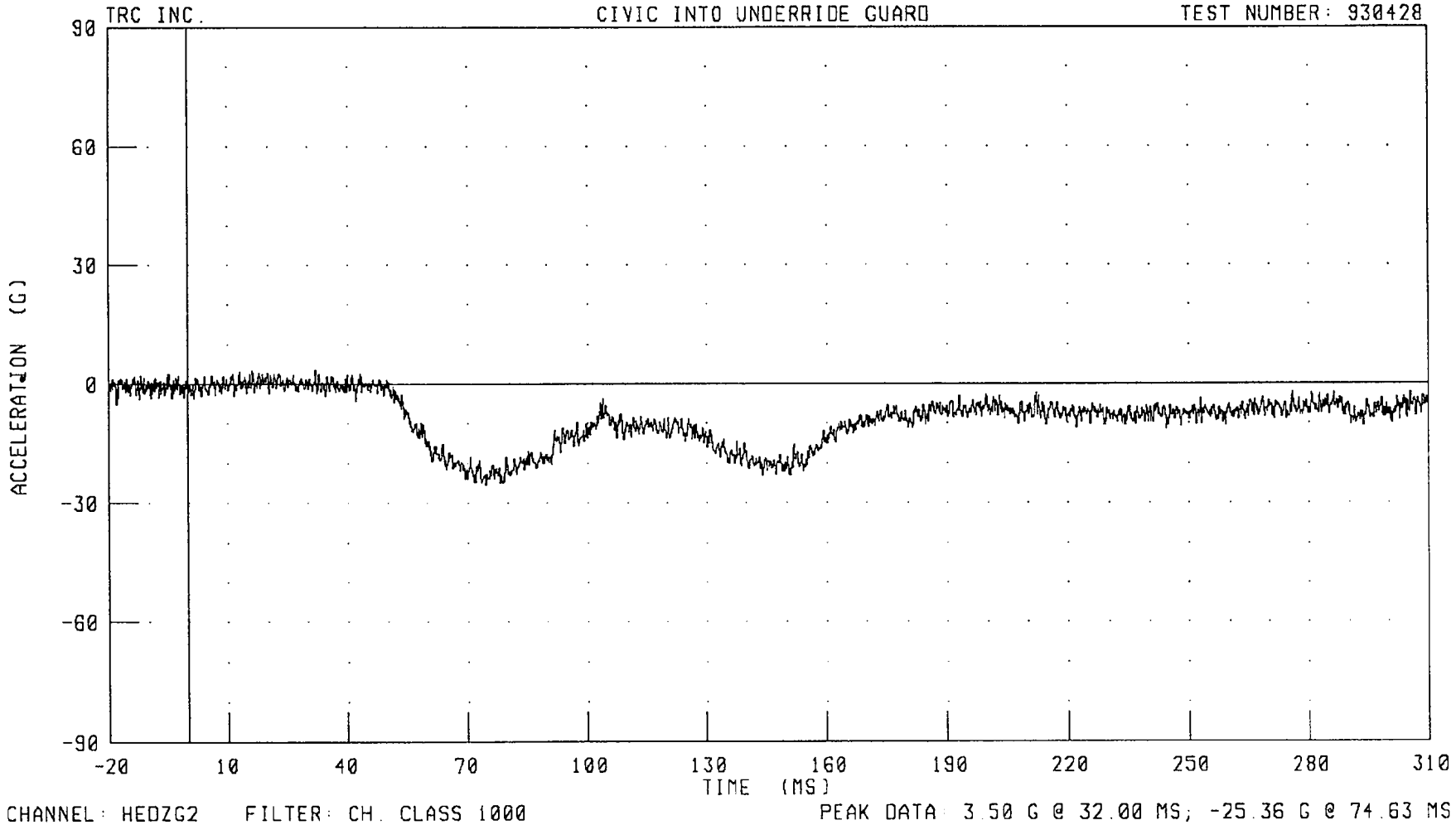
PEAK DATA: 18.60 G @ 292.88 MS; -20.84 G @ 139.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION



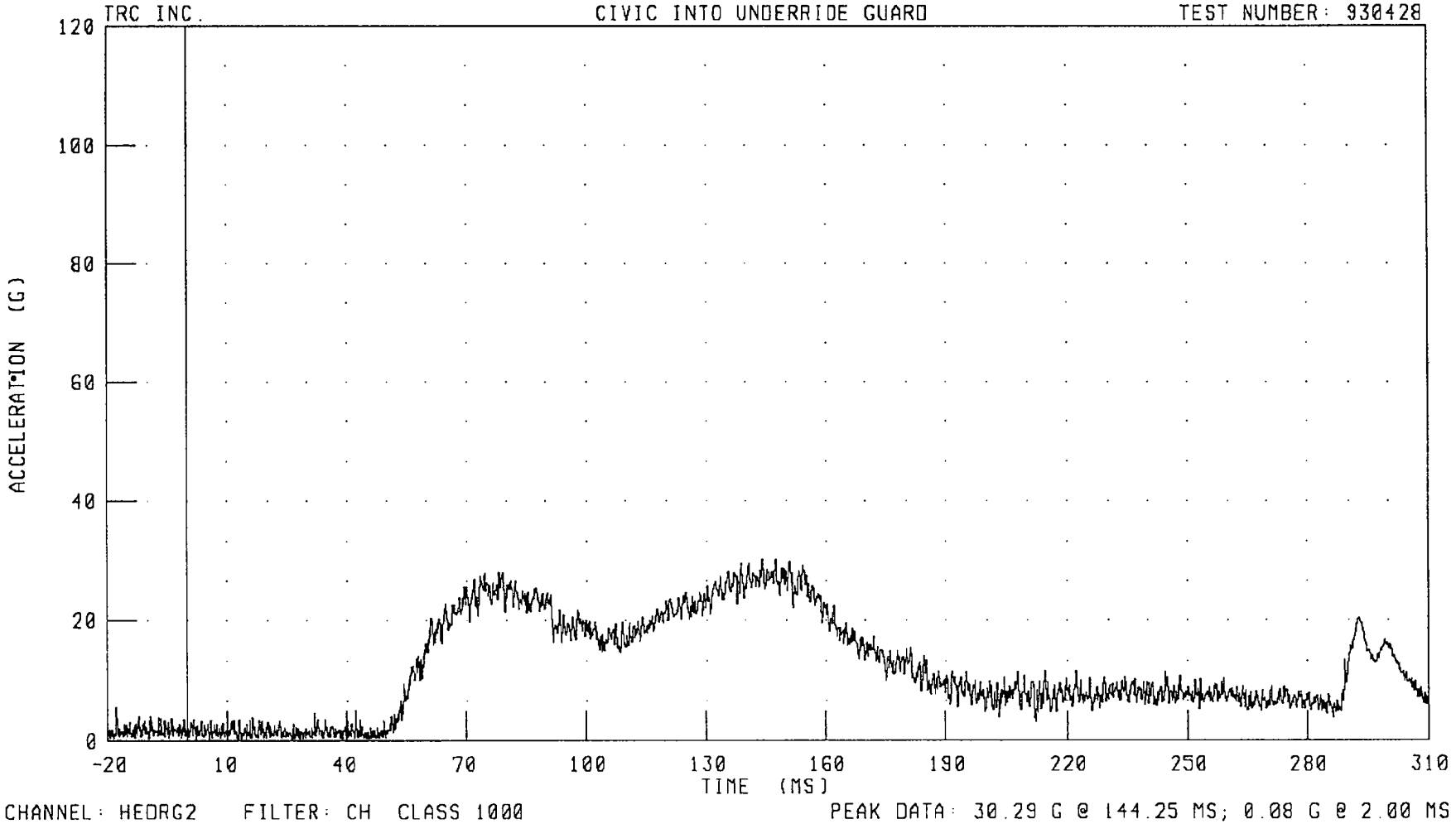
CHANNEL: HEOYG2 FILTER: CH. CLASS 1000 PEAK DATA: 3.96 G @ 167.38 MS; -6.42 G @ 106.38 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION



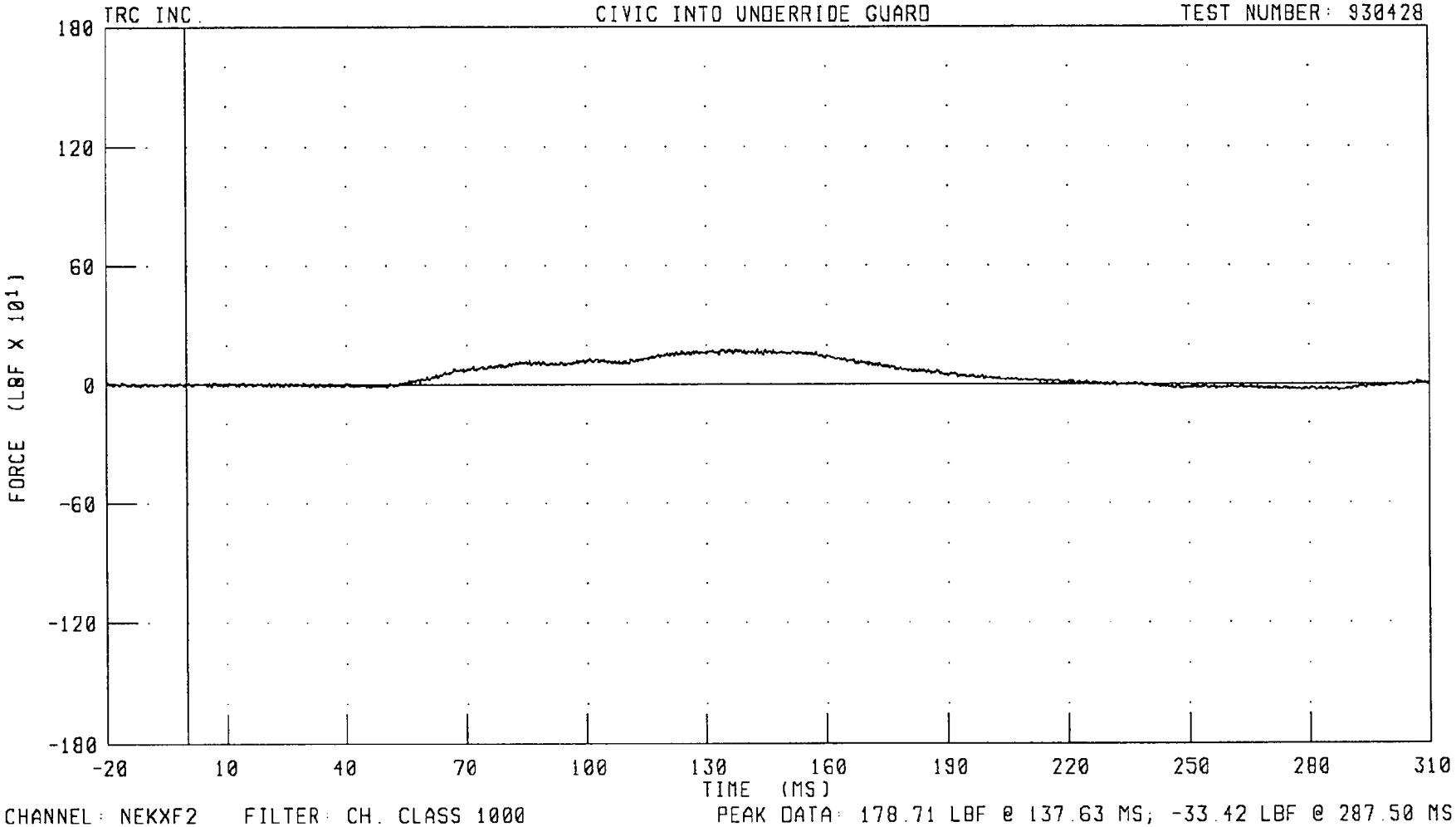
CHANNEL: HEDZG2 FILTER: CH. CLASS 1000 PEAK DATA: 3.50 G @ 32.00 MS; -25.36 G @ 74.63 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION



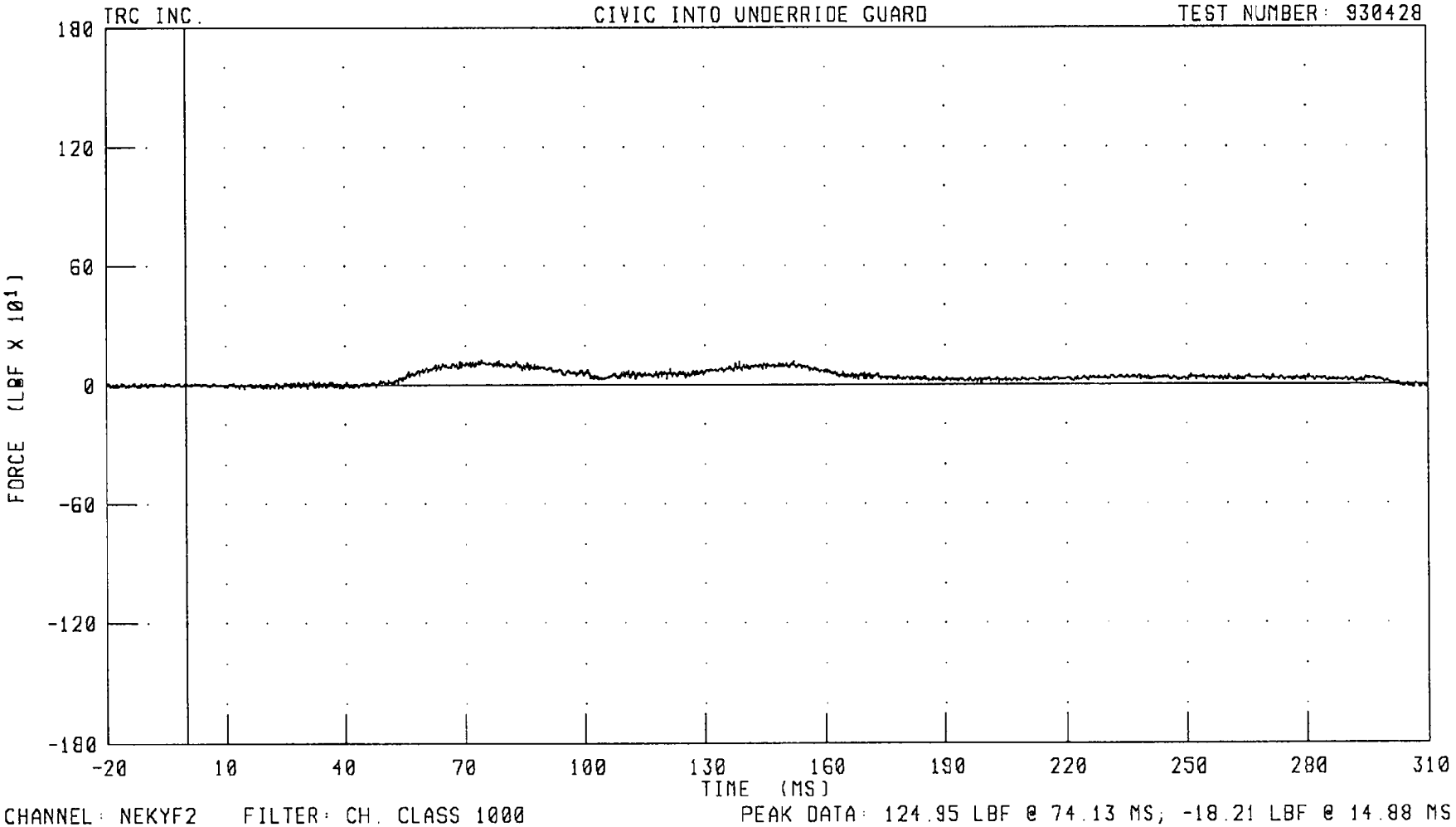
CHANNEL: HEDRG2 FILTER: CH CLASS 1000 PEAK DATA: 30.29 G @ 144.25 MS; 0.08 G @ 2.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER NECK X-AXIS SHEAR FORCE



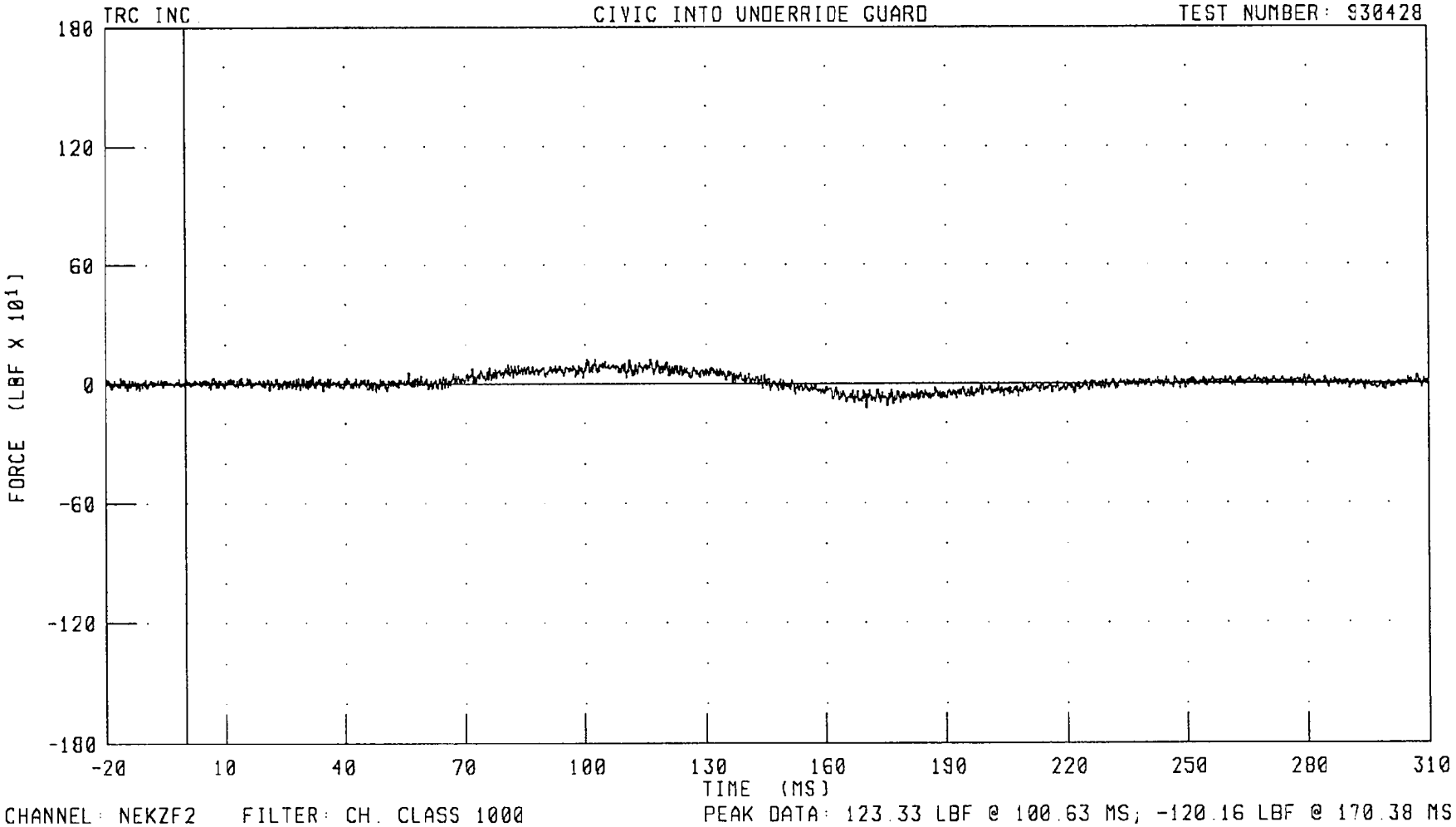
CHANNEL: NEKXF2 FILTER: CH. CLASS 1000 PEAK DATA: 178.71 LBF @ 137.63 MS; -33.42 LBF @ 287.50 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER NECK Y-AXIS SHEAR FORCE

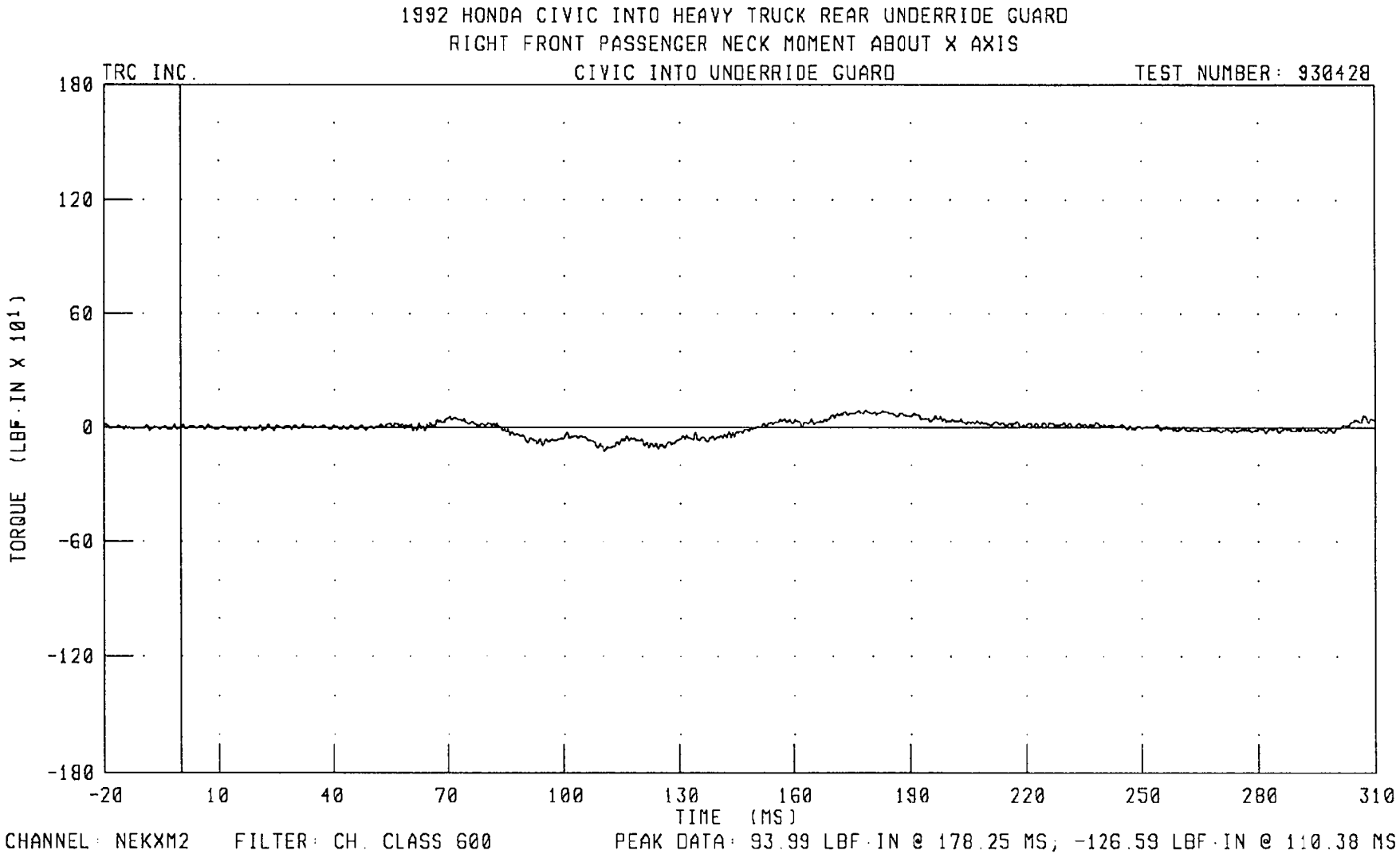


CHANNEL: NEKYF2 FILTER: CH. CLASS 1000 PEAK DATA: 124.95 LBF @ 74.13 MS, -18.21 LBF @ 14.88 MS

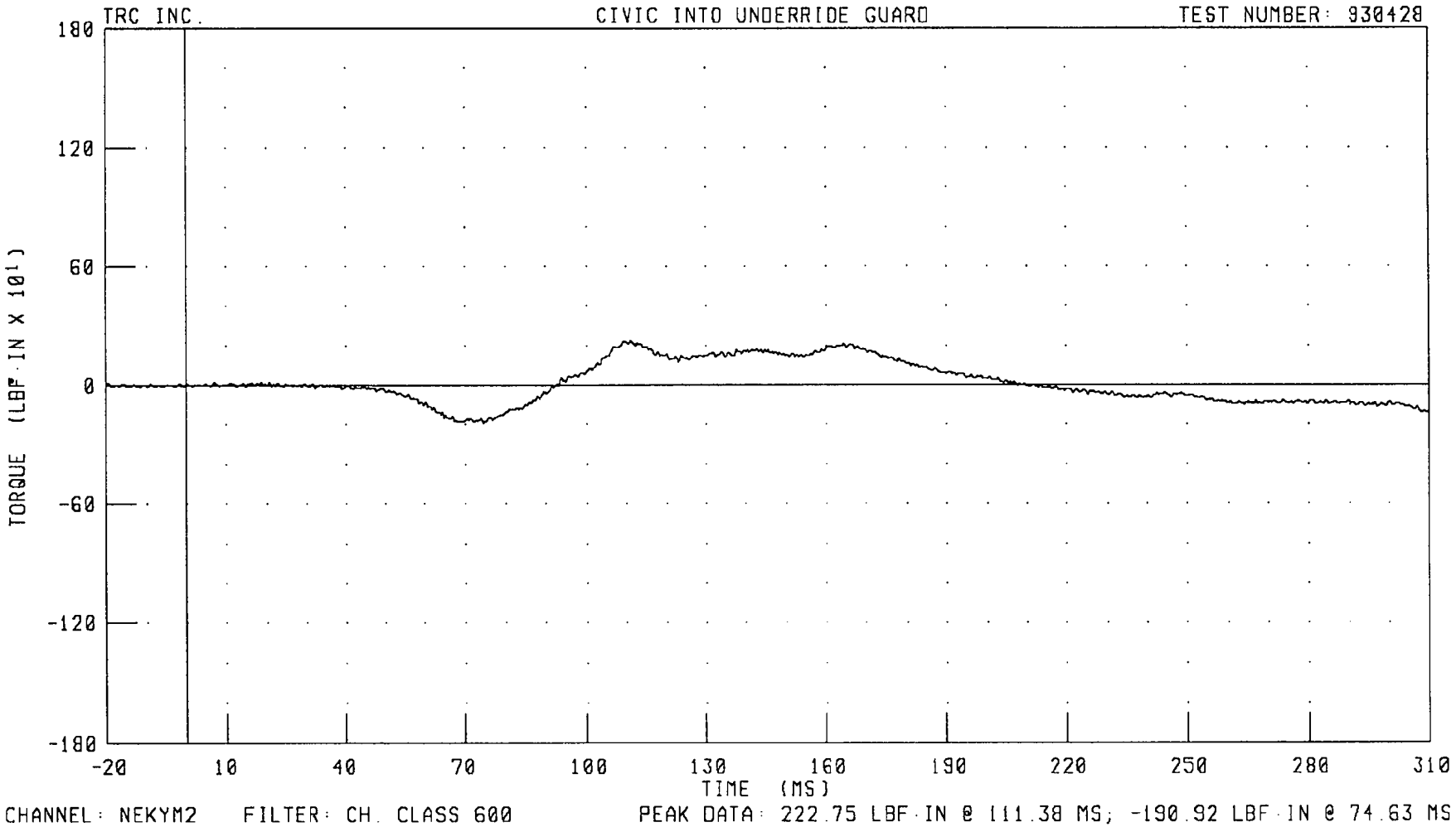
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER NECK Z-AXIS AXIAL FORCE



CHANNEL: NEKZF2 FILTER: CH. CLASS 1000
PEAK DATA: 123.33 LBF @ 100.63 MS; -120.16 LBF @ 170.38 MS

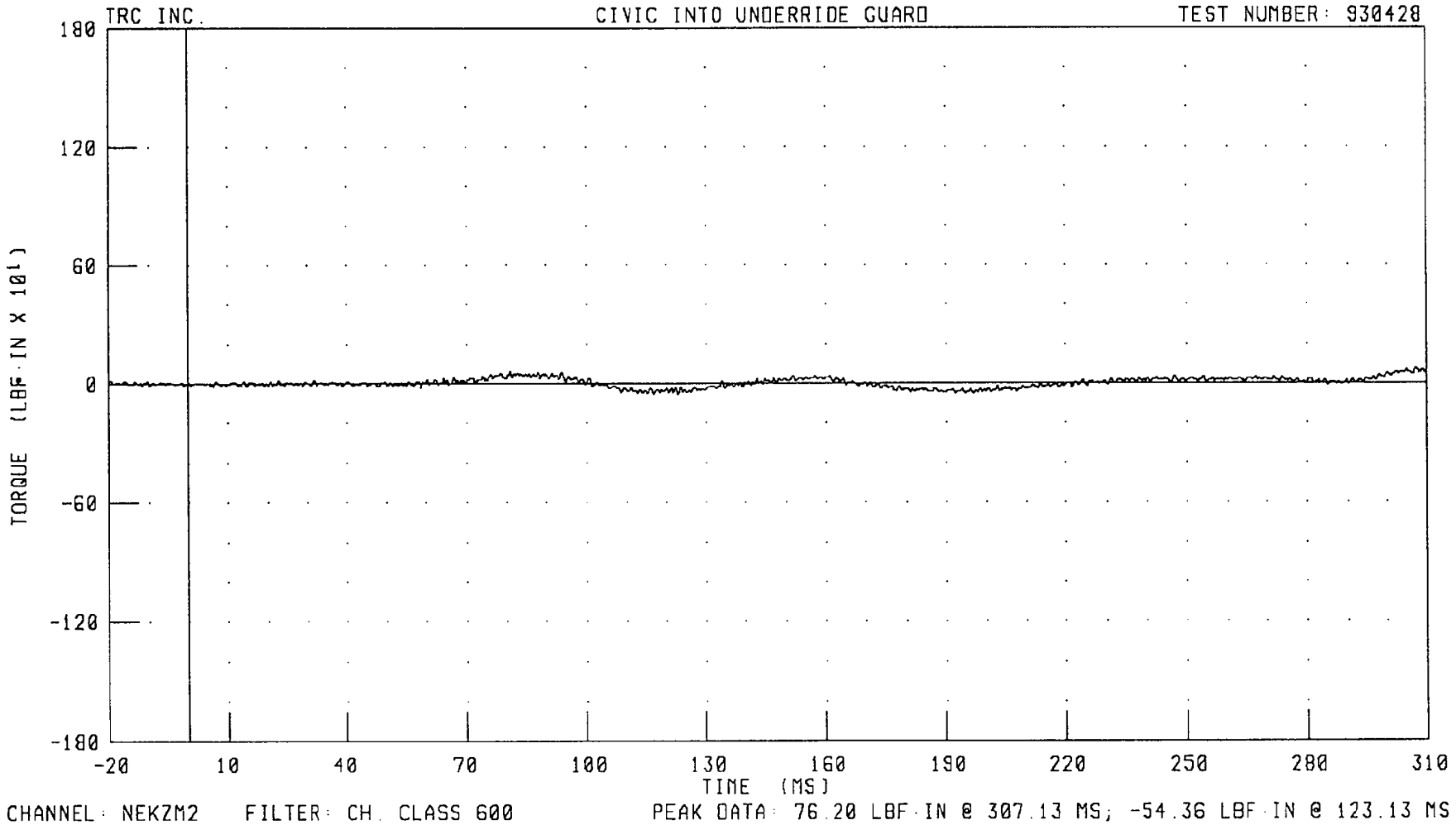

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER NECK MOMENT ABOUT X AXIS
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
TORQUE (LBF-IN X 10¹)
180
120
60
0
-60
-120
-180
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: NEKXM2
FILTER: CH. CLASS 600
PEAK DATA: 93.99 LBF-IN @ 178.25 MS; -126.59 LBF-IN @ 110.38 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER NECK MOMENT ABOUT Y AXIS



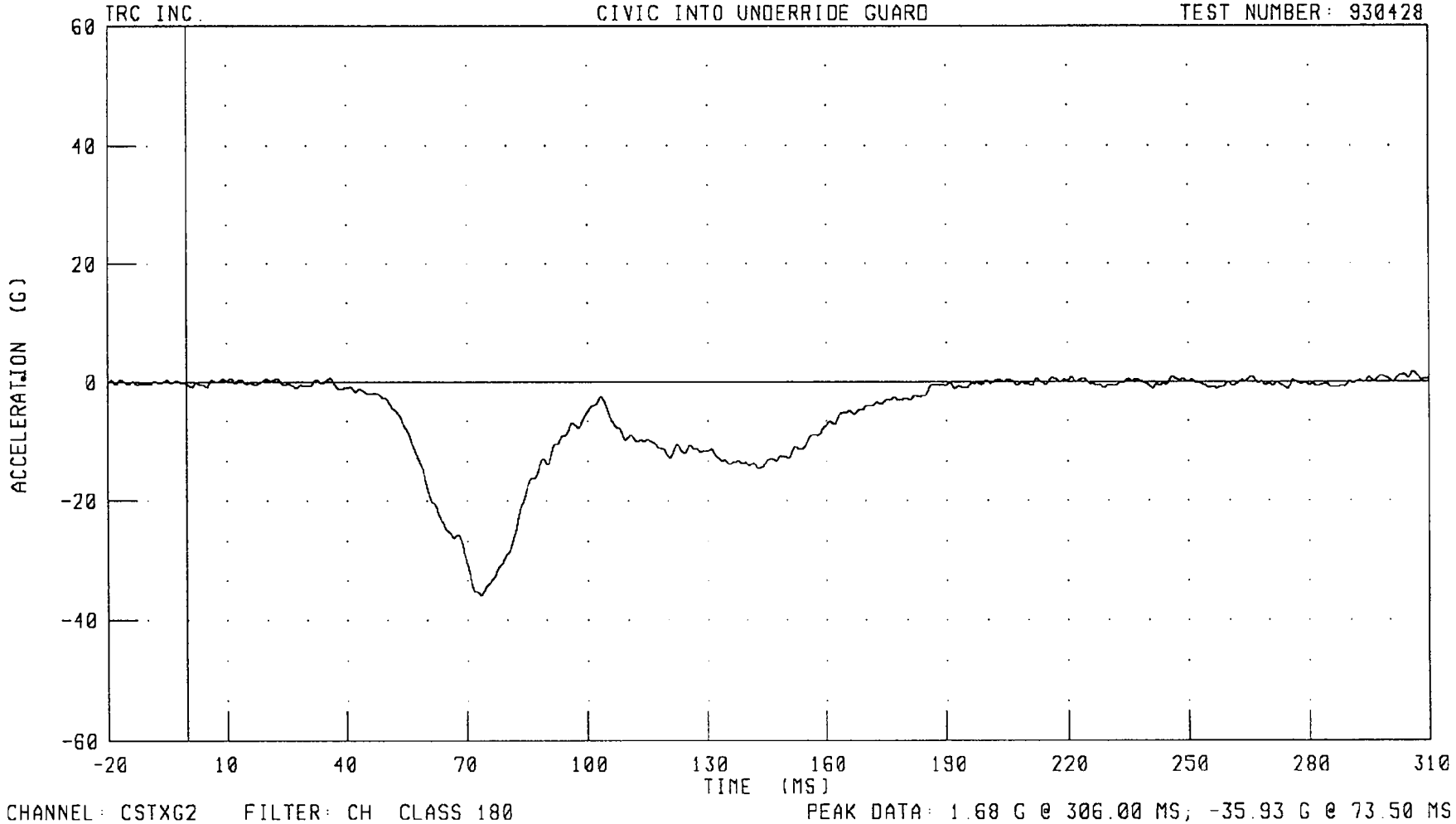
CHANNEL: NEKYM2 FILTER: CH. CLASS 600 PEAK DATA: 222.75 LBF·IN @ 111.38 MS; -190.92 LBF·IN @ 74.63 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER NECK MOMENT ABOUT Z AXIS

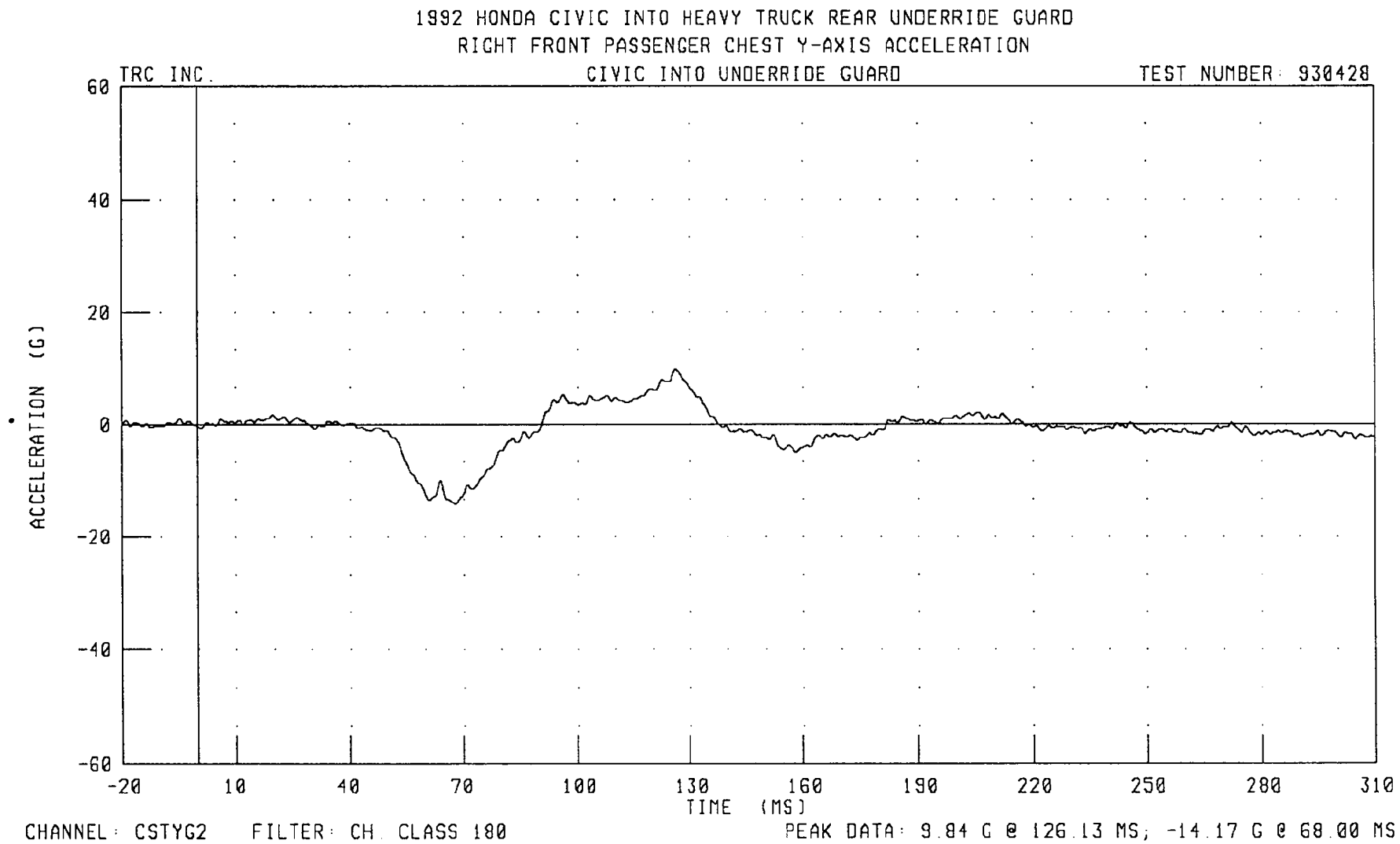


CHANNEL: NEKZM2 FILTER: CH. CLASS 600 PEAK DATA: 76.20 LBF-IN @ 307.13 MS; -54.36 LBF-IN @ 123.13 MS

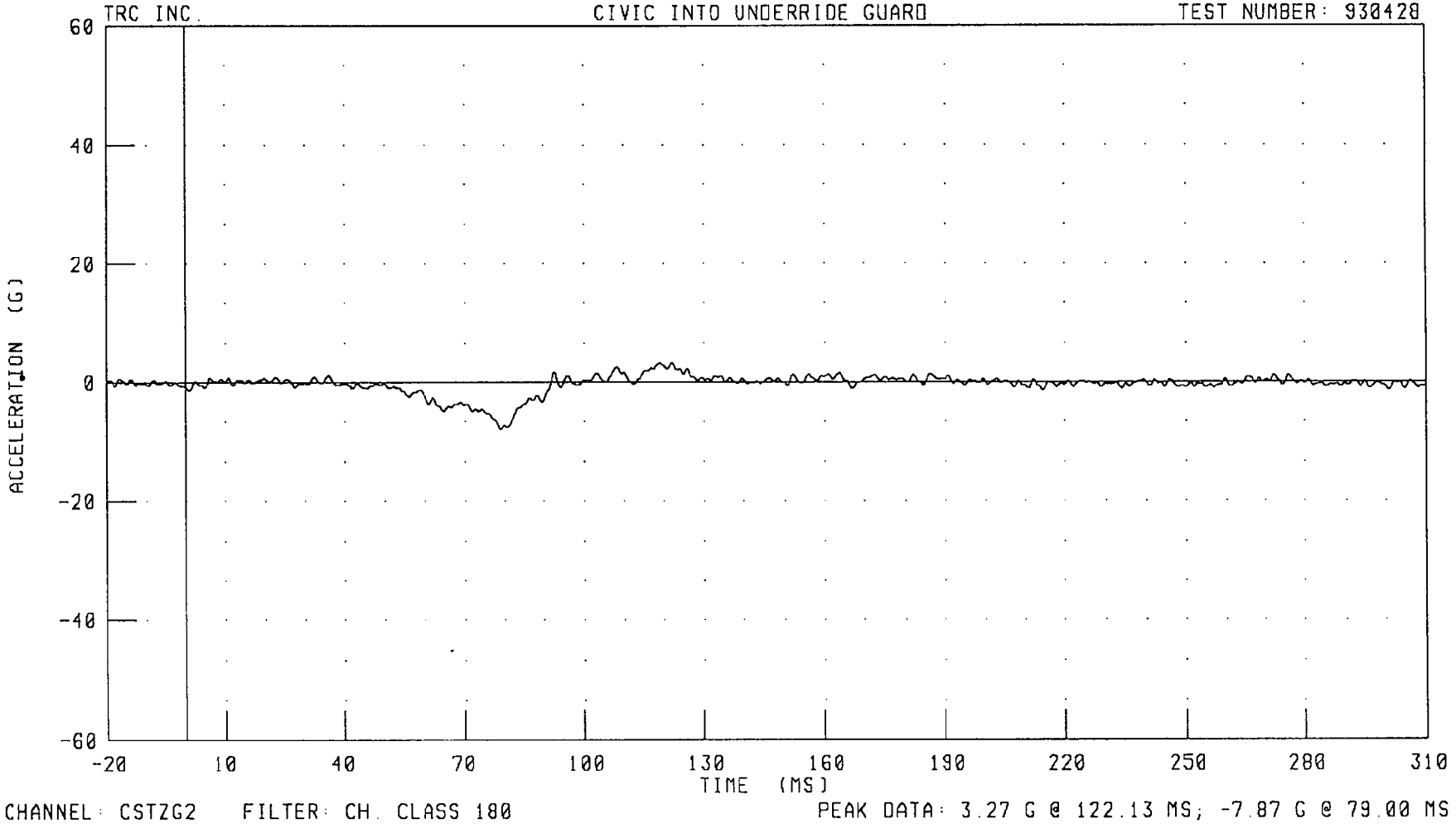
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION



CHANNEL: CSTXG2 FILTER: CH CLASS 180 PEAK DATA: 1.68 G @ 306.00 MS; -35.93 G @ 73.50 MS

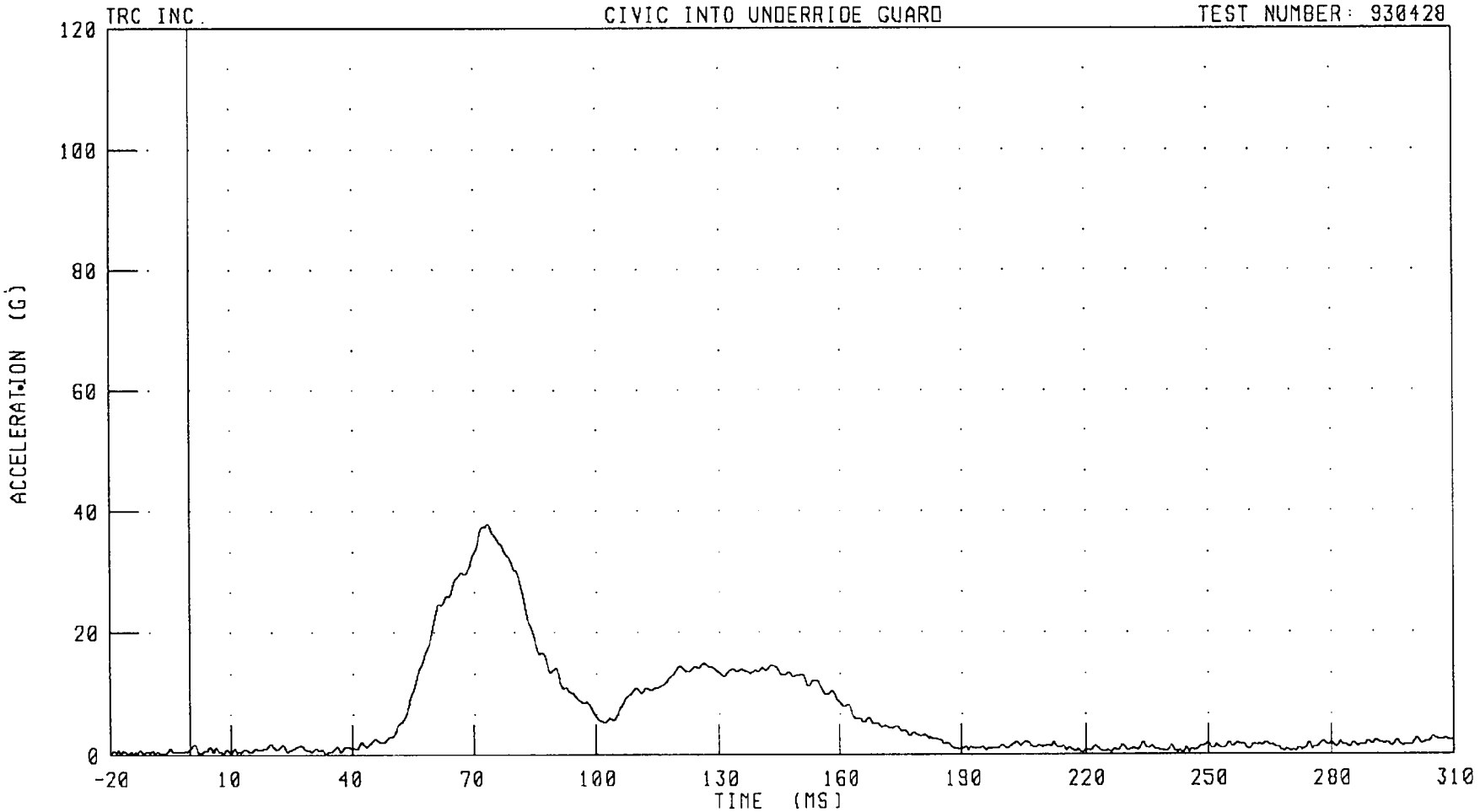

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: CSTYG2
FILTER: CH CLASS 180
PEAK DATA: 9.84 G @ 126.13 MS; -14.17 G @ 68.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION



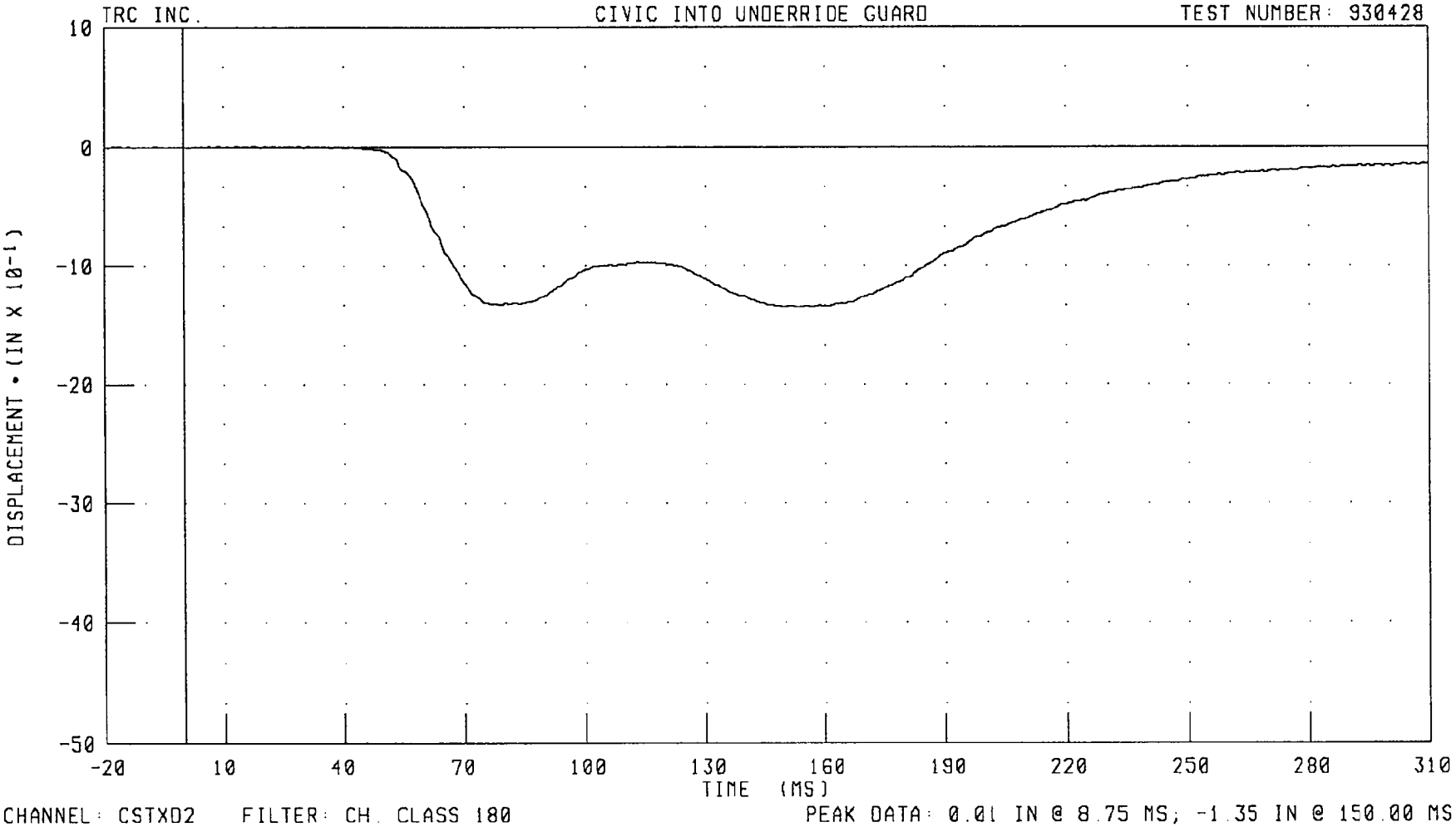
CHANNEL: CSTZG2 FILTER: CH. CLASS 180 PEAK DATA: 3.27 G @ 122.13 MS; -7.87 G @ 79.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION



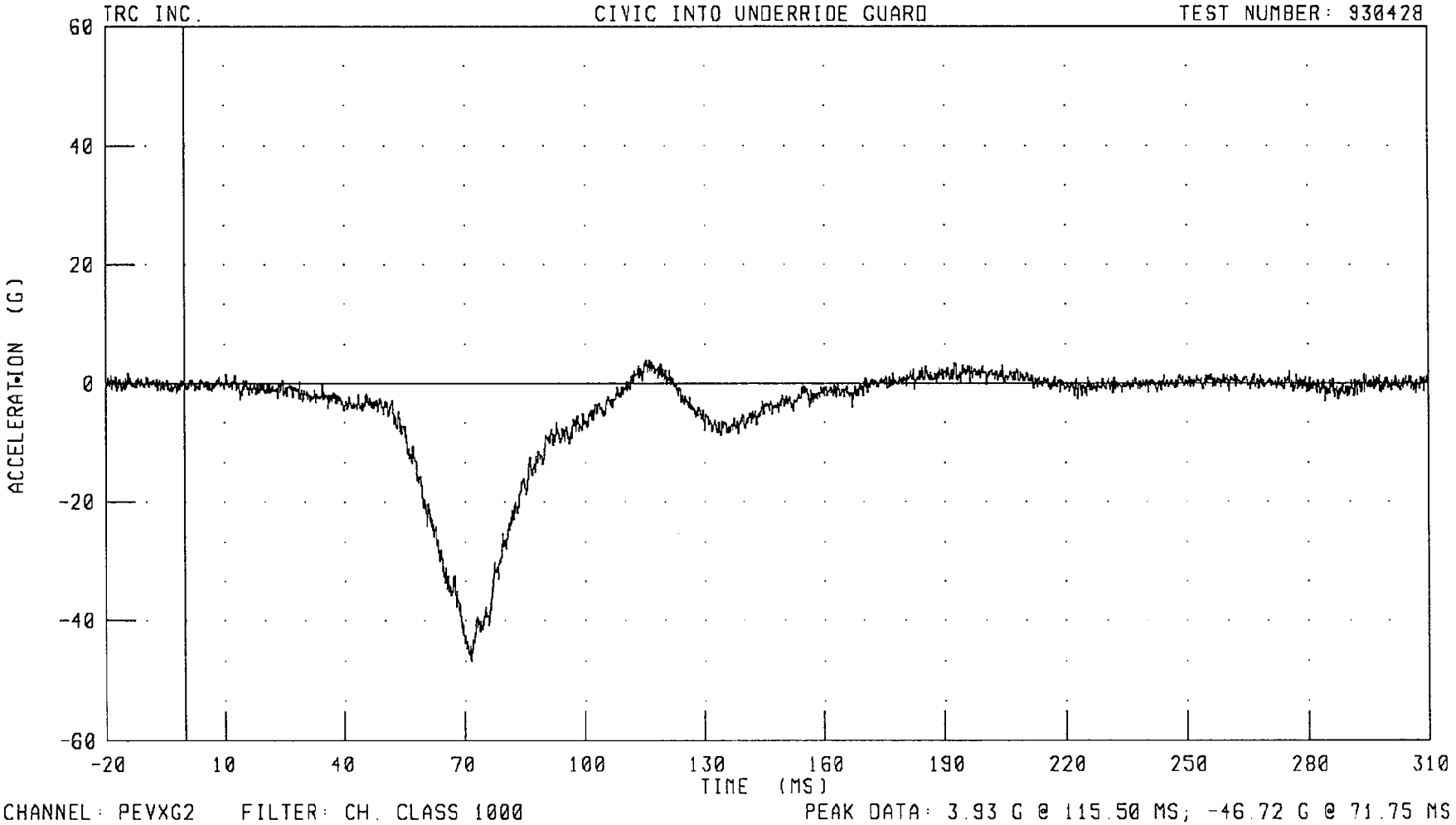
CHANNEL: CSTRG2 FILTER: CH. CLASS 180 PEAK DATA: 37.87 G @ 73.50 MS, 0.07 G @ -8.63 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER CHEST DEFLECTION



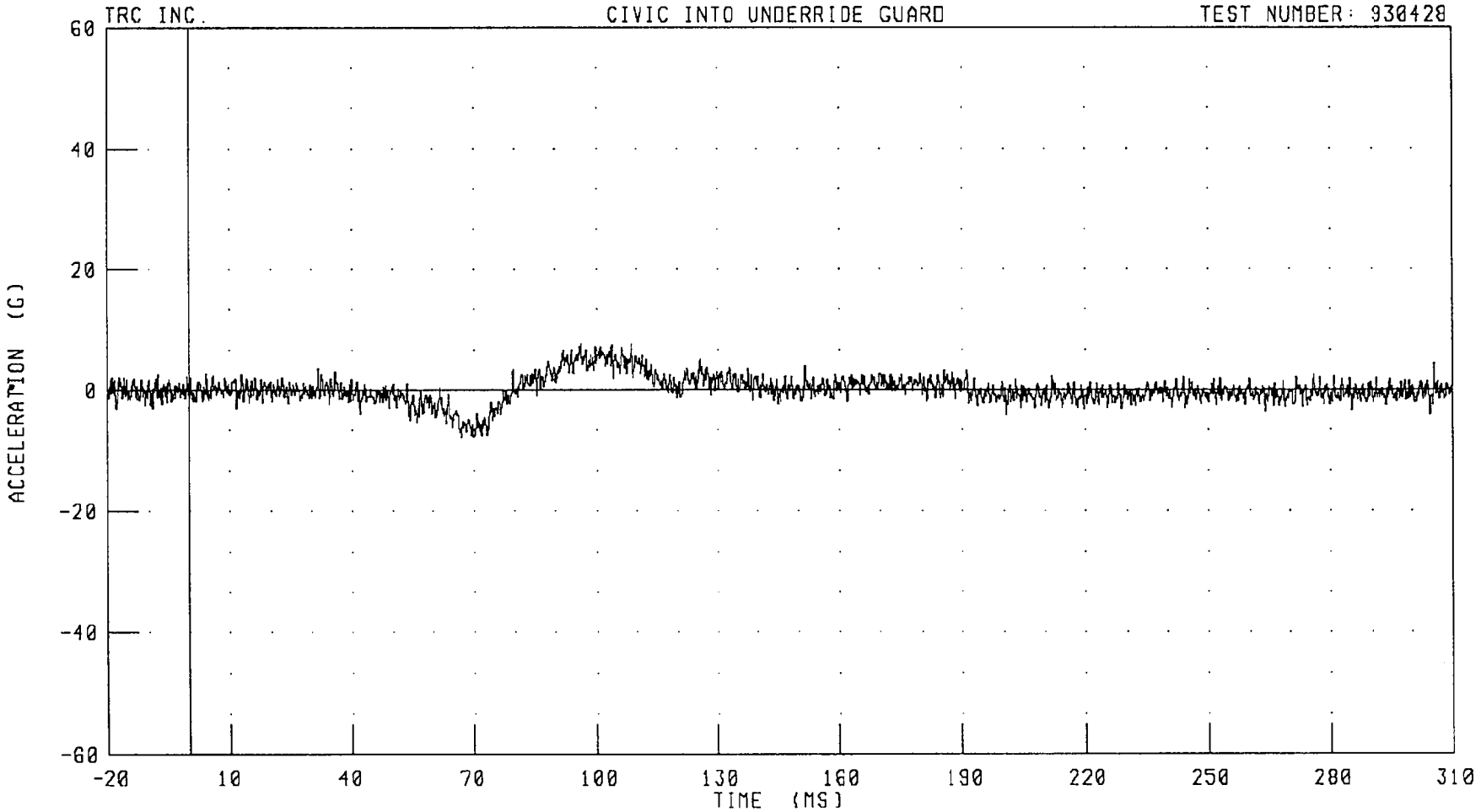
CHANNEL: CSTXD2 FILTER: CH. CLASS 180 PEAK DATA: 0.01 IN @ 8.75 MS; -1.35 IN @ 150.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER PELVIS X-AXIS ACCELERATION

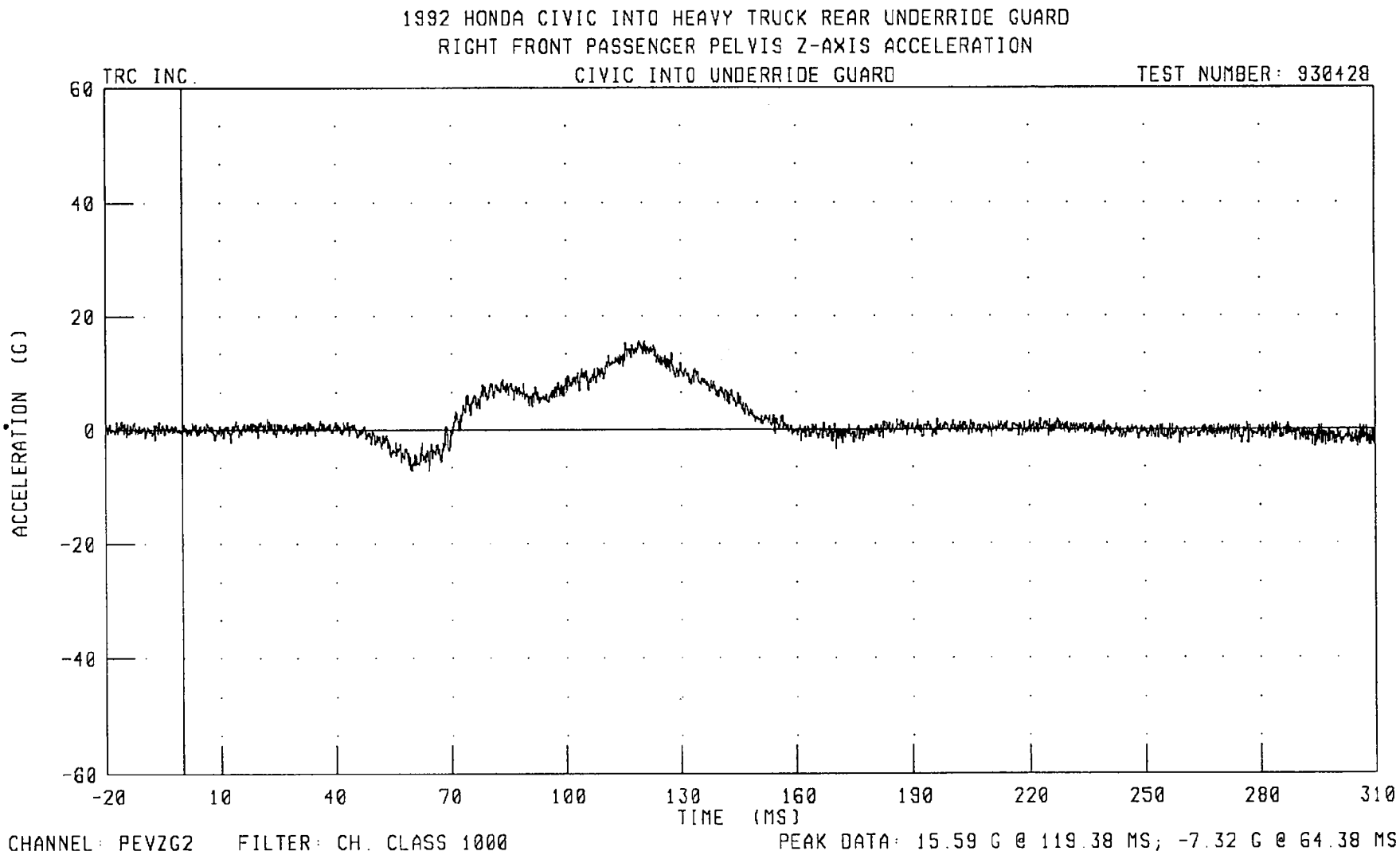


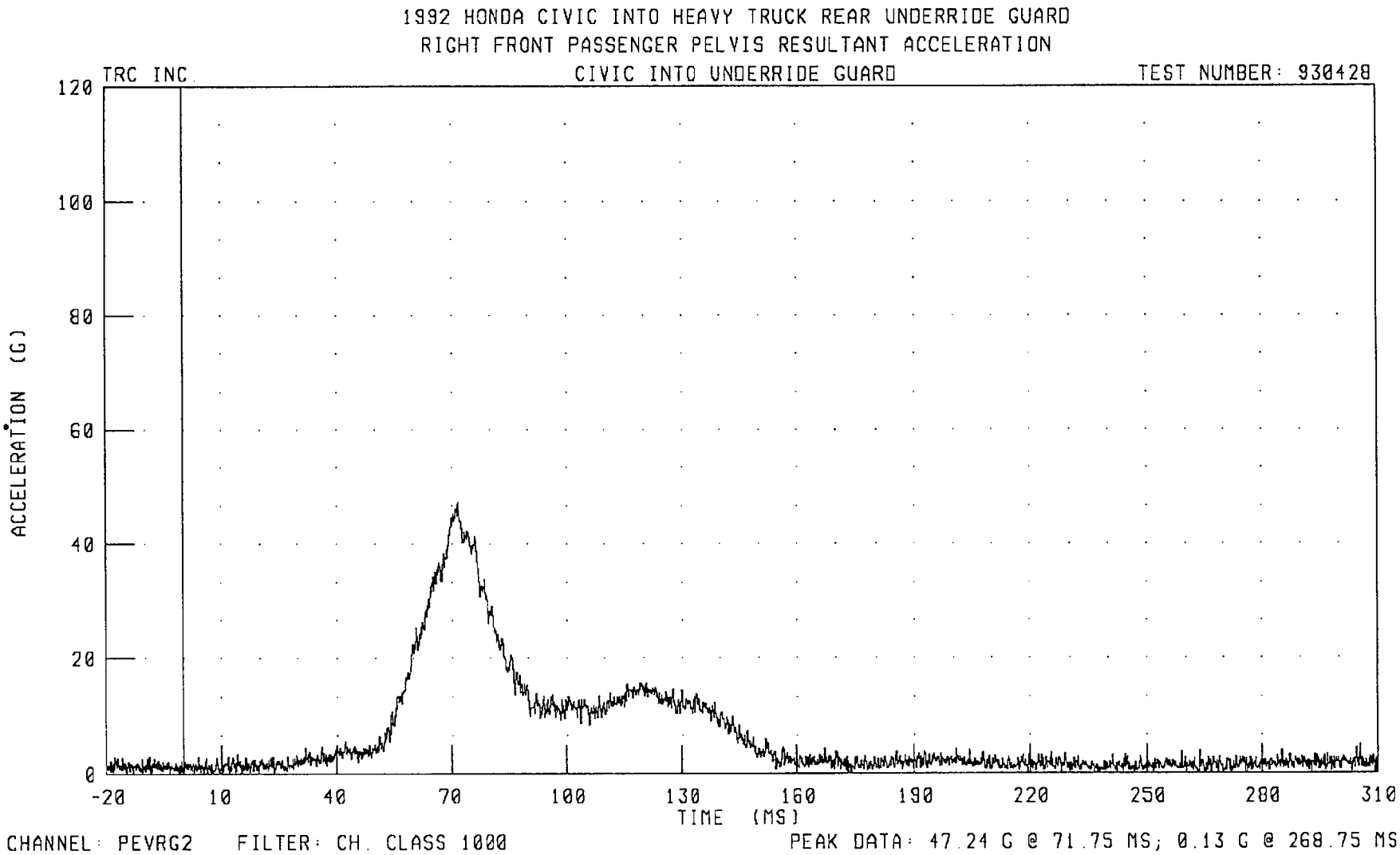
CHANNEL: PEVXG2 FILTER: CH. CLASS 1000 PEAK DATA: 3.93 G @ 115.50 MS; -46.72 G @ 71.75 MS

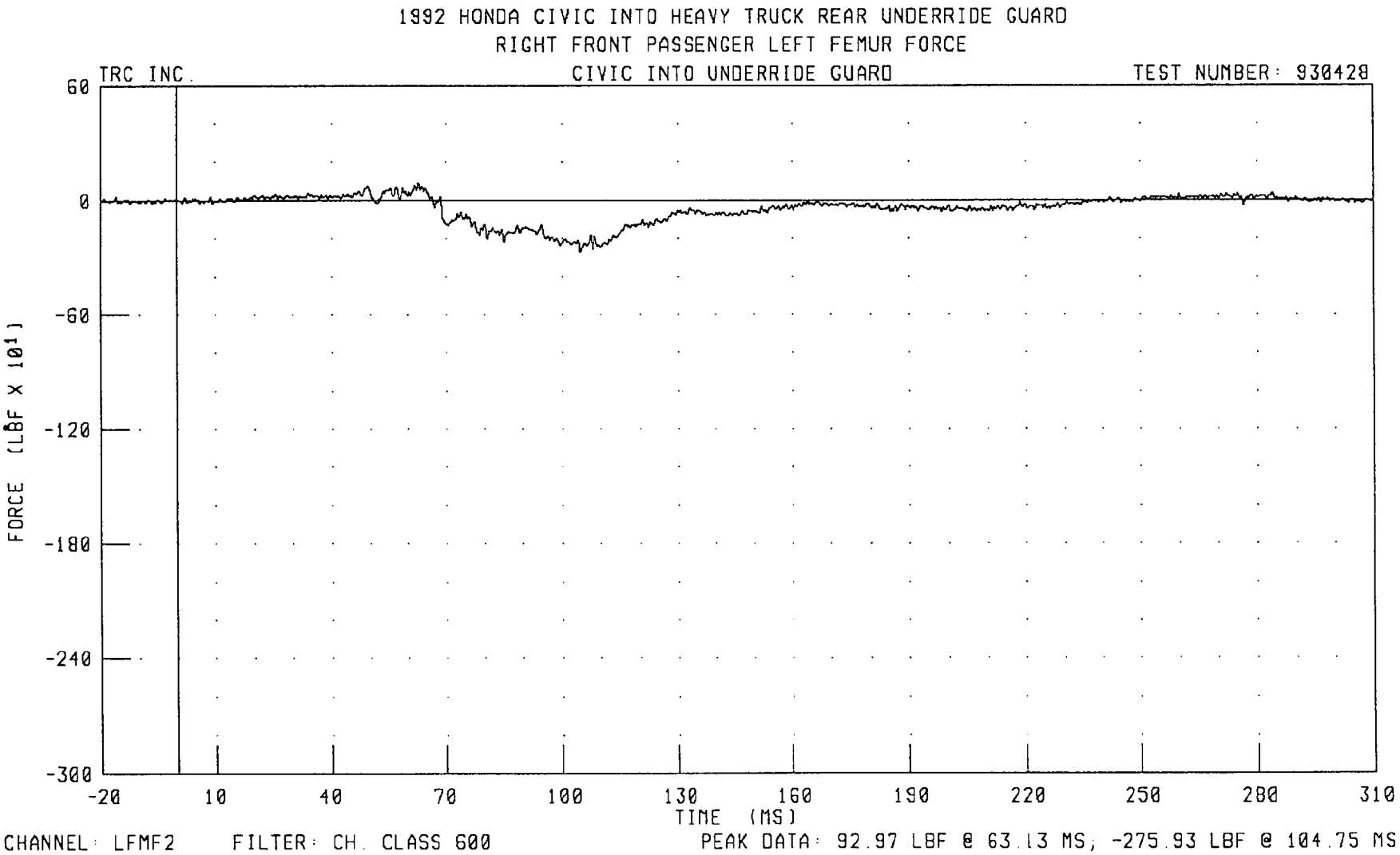
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER PELVIS Y-AXIS ACCELERATION



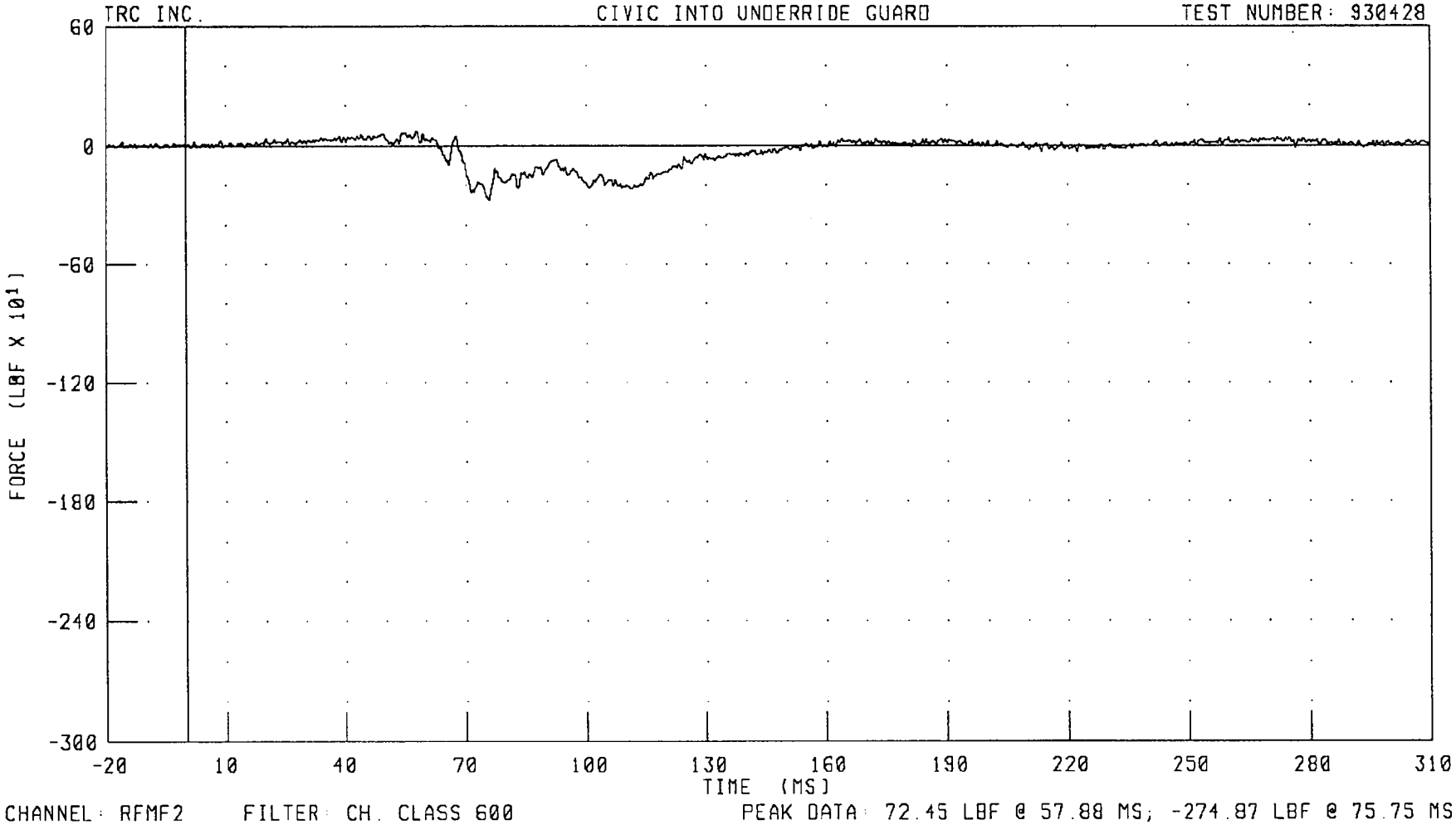
CHANNEL: PEVYG2 FILTER: CH. CLASS 1000 PEAK DATA: 7.68 G @ 96.38 MS; -7.94 G @ 67.13 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER PELVIS Z-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVZG2
FILTER: CH. CLASS 1000
PEAK DATA: 15.59 G @ 119.38 MS; -7.32 G @ 64.38 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER PELVIS RESULTANT ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVRG2
FILTER: CH. CLASS 1000
PEAK DATA: 47.24 G @ 71.75 MS; 0.13 G @ 268.75 MS

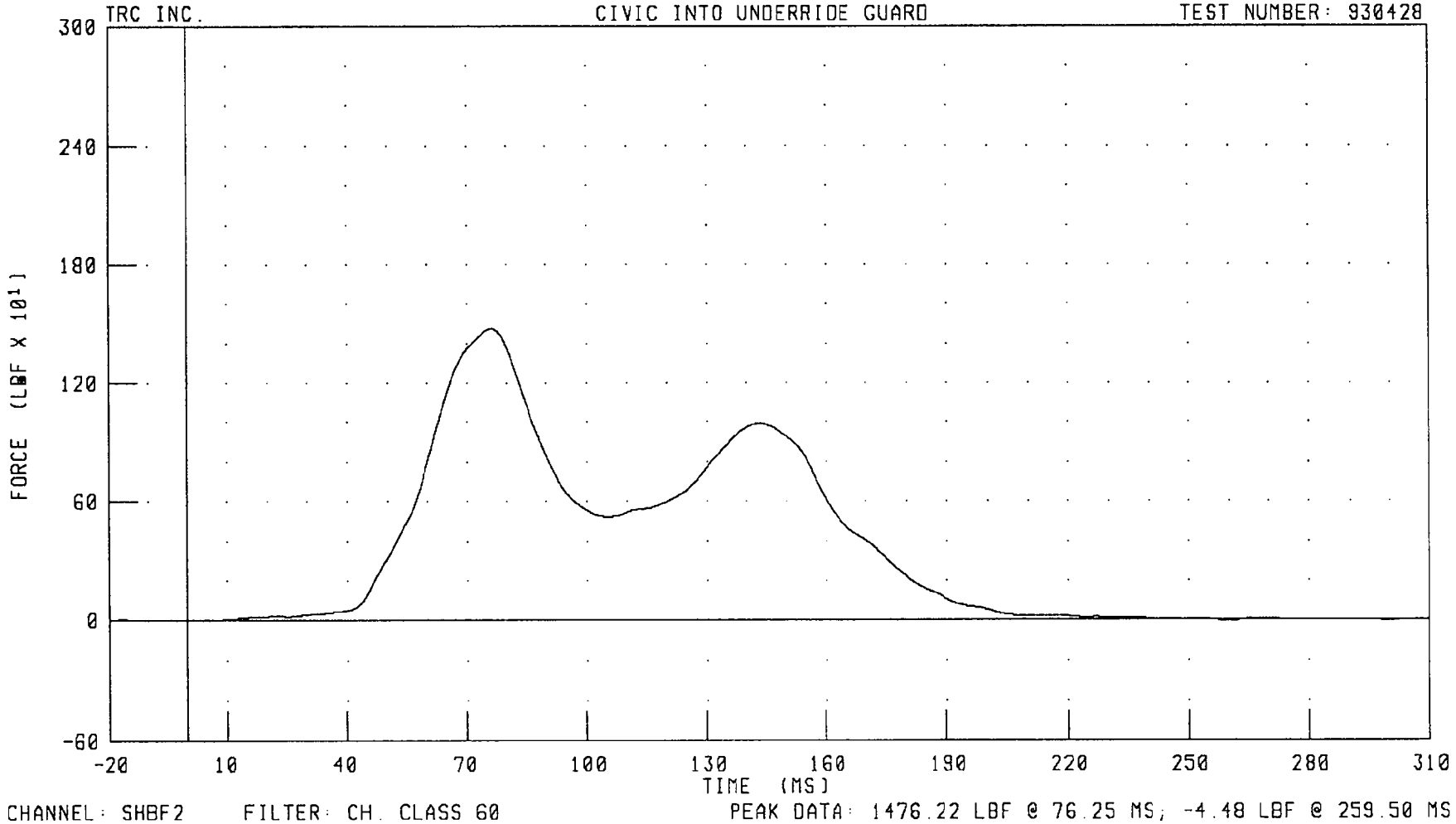

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER LEFT FEMUR FORCE
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
0
-60
-120
-180
-240
-300
FORCE (LBF X 10¹)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LFMF2
FILTER: CH. CLASS 600
PEAK DATA: 92.97 LBF @ 63.13 MS, -275.93 LBF @ 104.75 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

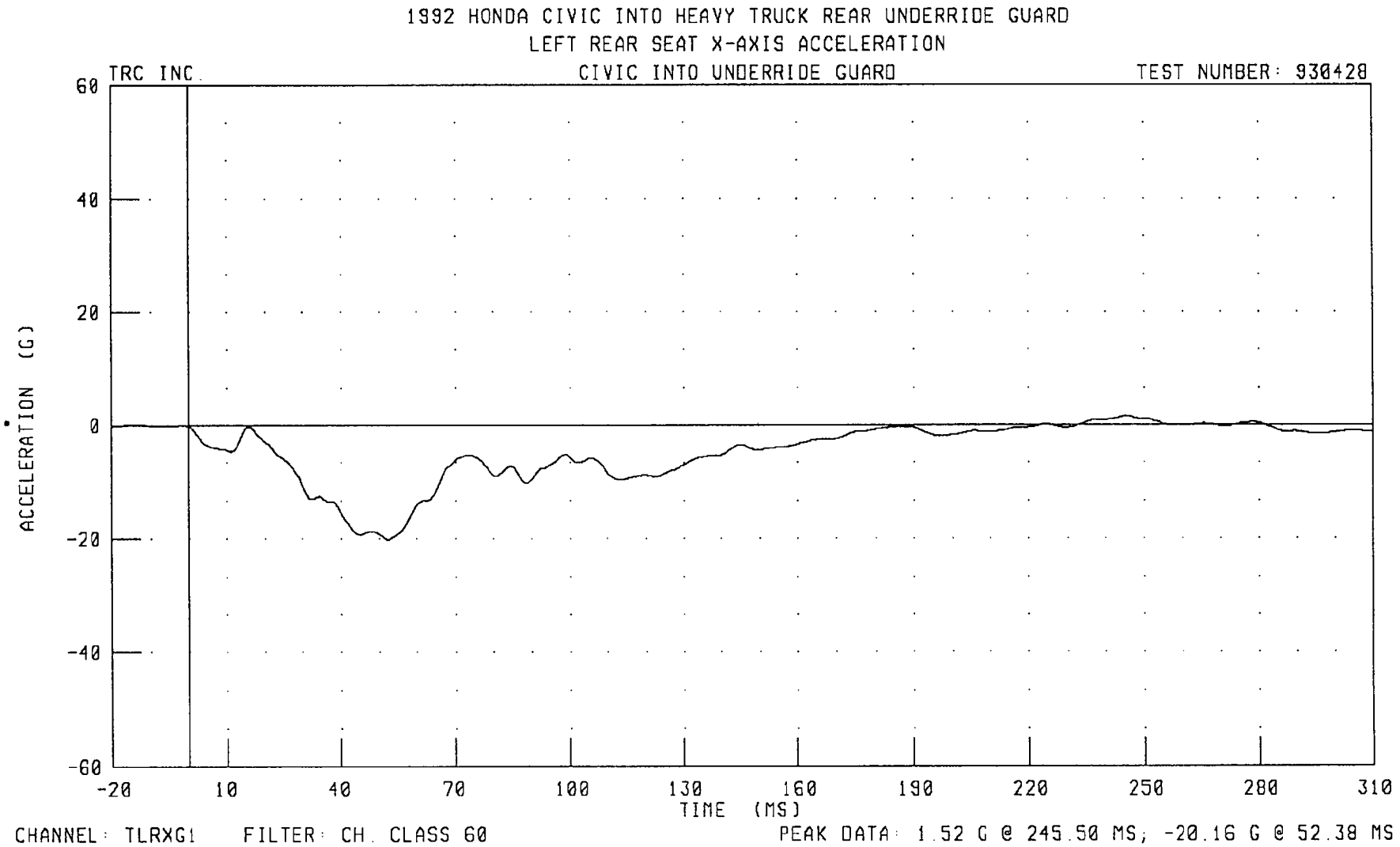


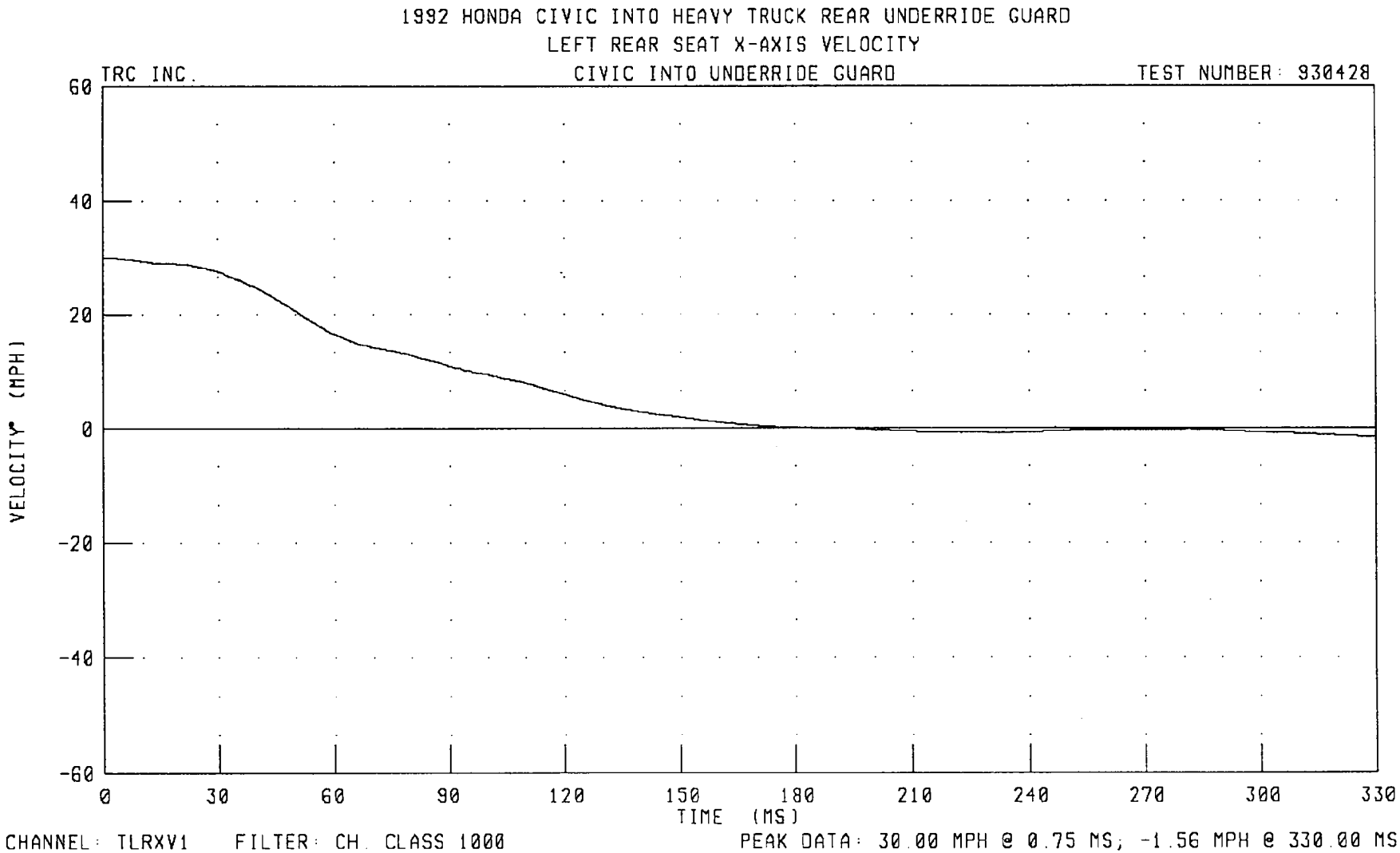
CHANNEL: RFMF2 FILTER: CH. CLASS 600 PEAK DATA: 72.45 LBF @ 57.88 MS; -274.87 LBF @ 75.75 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT FRONT PASSENGER SHOULDER BELT FORCE

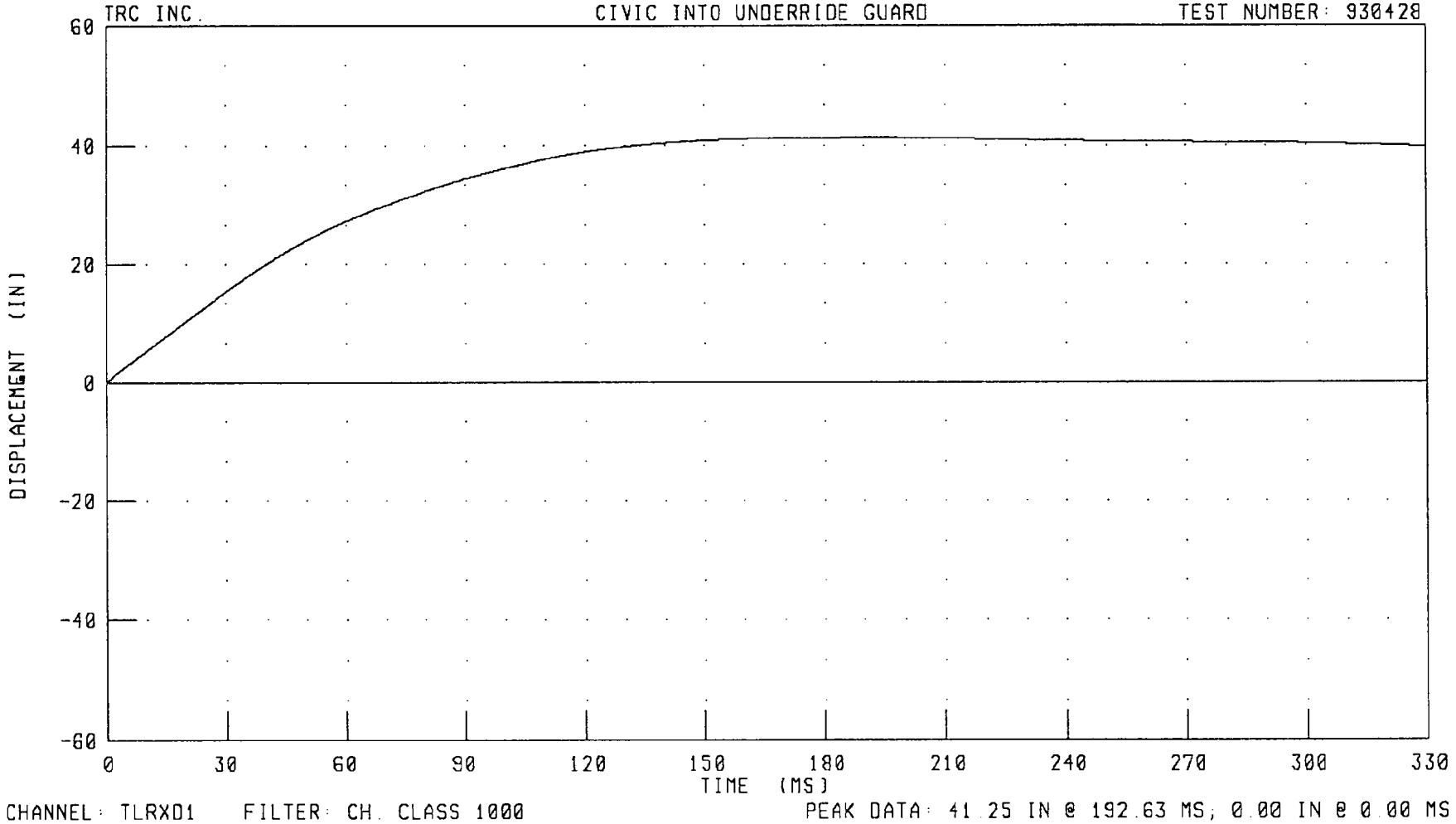


CHANNEL: SHBF2 FILTER: CH. CLASS 60 PEAK DATA: 1476.22 LBF @ 76.25 MS; -4.48 LBF @ 259.50 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
LEFT REAR SEAT X-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TLRXG1
FILTER: CH. CLASS 60
PEAK DATA: 1.52 G @ 245.50 MS; -20.16 G @ 52.38 MS

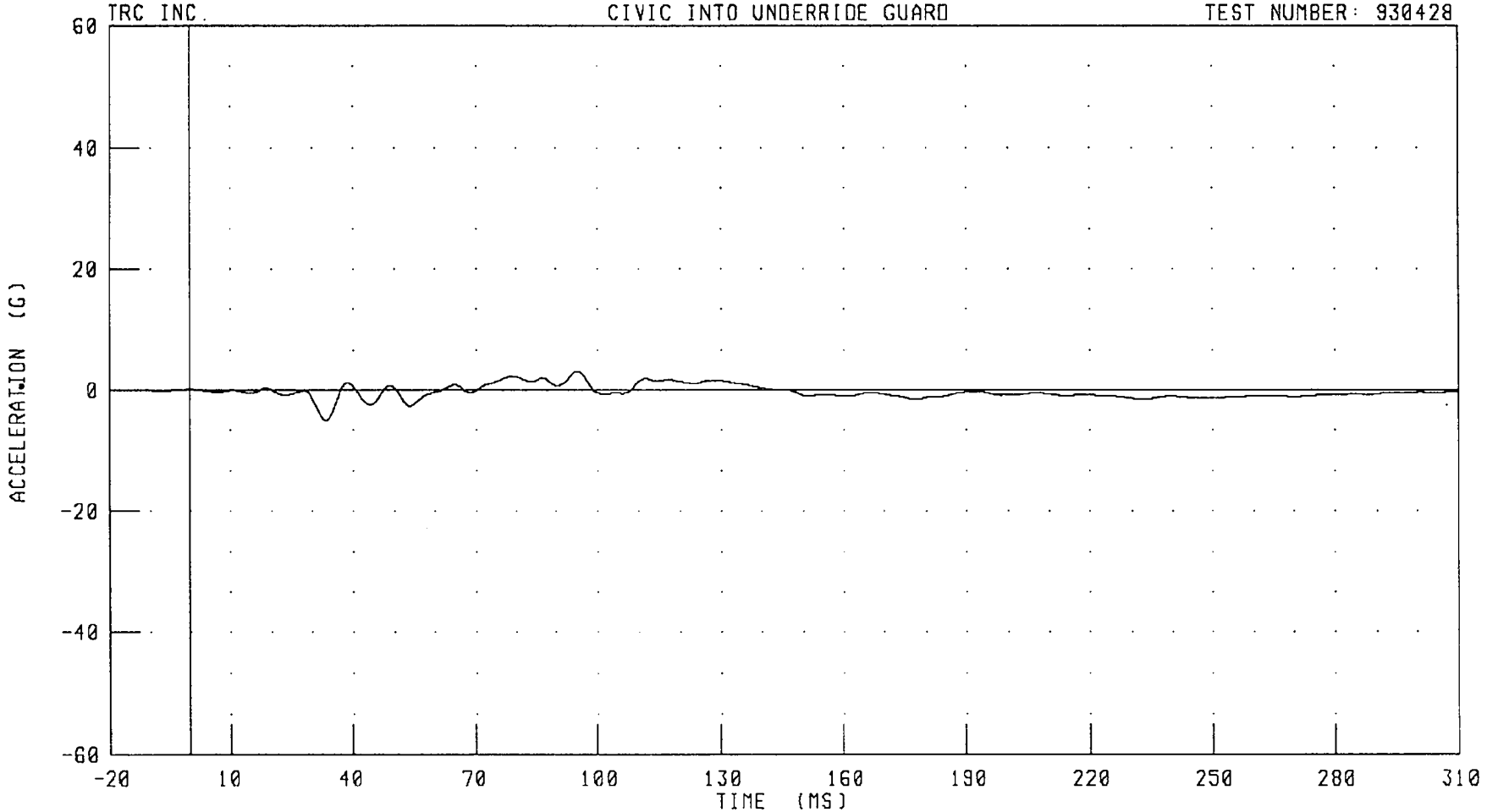

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
LEFT REAR SEAT X-AXIS VELOCITY
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
VELOCITY (MPH)
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: TLRXV1
FILTER: CH. CLASS 1000
PEAK DATA: 30.00 MPH @ 0.75 MS; -1.56 MPH @ 330.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
LEFT REAR SEAT X-AXIS DISPLACEMENT



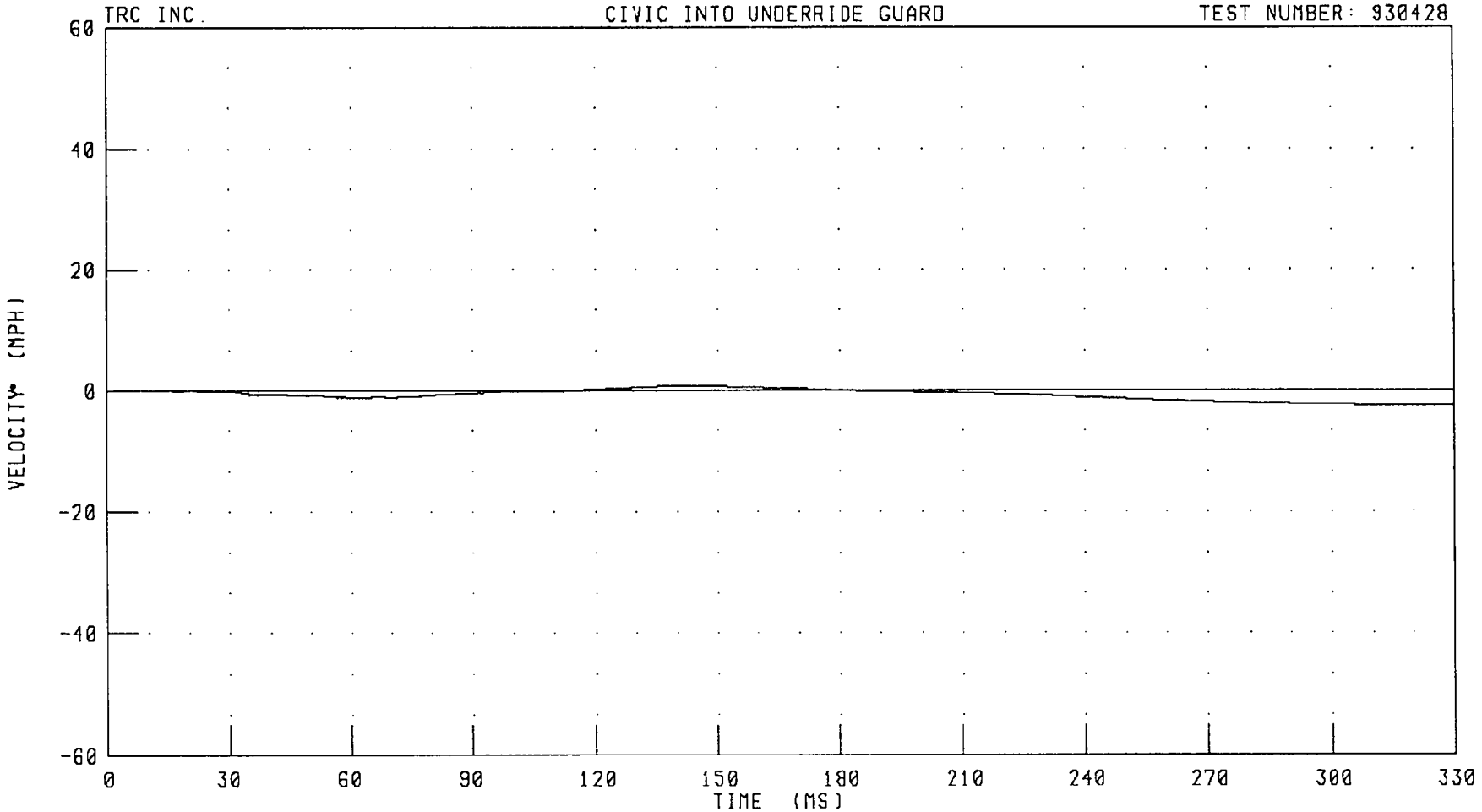
CHANNEL: TLRXD1 FILTER: CH. CLASS 1000 PEAK DATA: 41.25 IN @ 192.63 MS, 0.00 IN @ 0.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
LEFT REAR SEAT Y-AXIS ACCELERATION



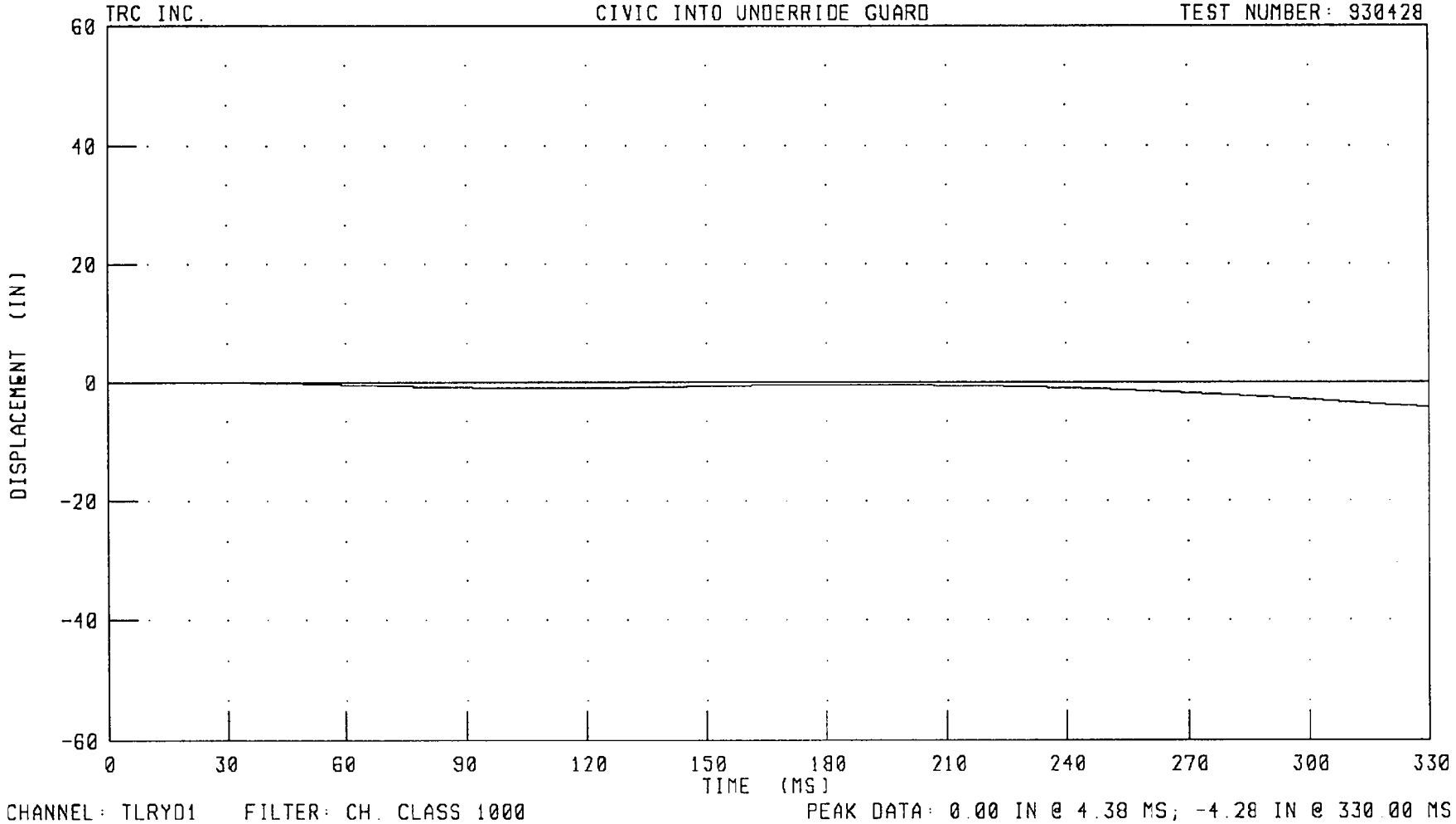
CHANNEL: TLRYG1 FILTER: CH. CLASS 60 PEAK DATA: 3.09 G @ 95.38 MS, -5.05 G @ 33.38 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
LEFT REAR SEAT Y-AXIS VELOCITY

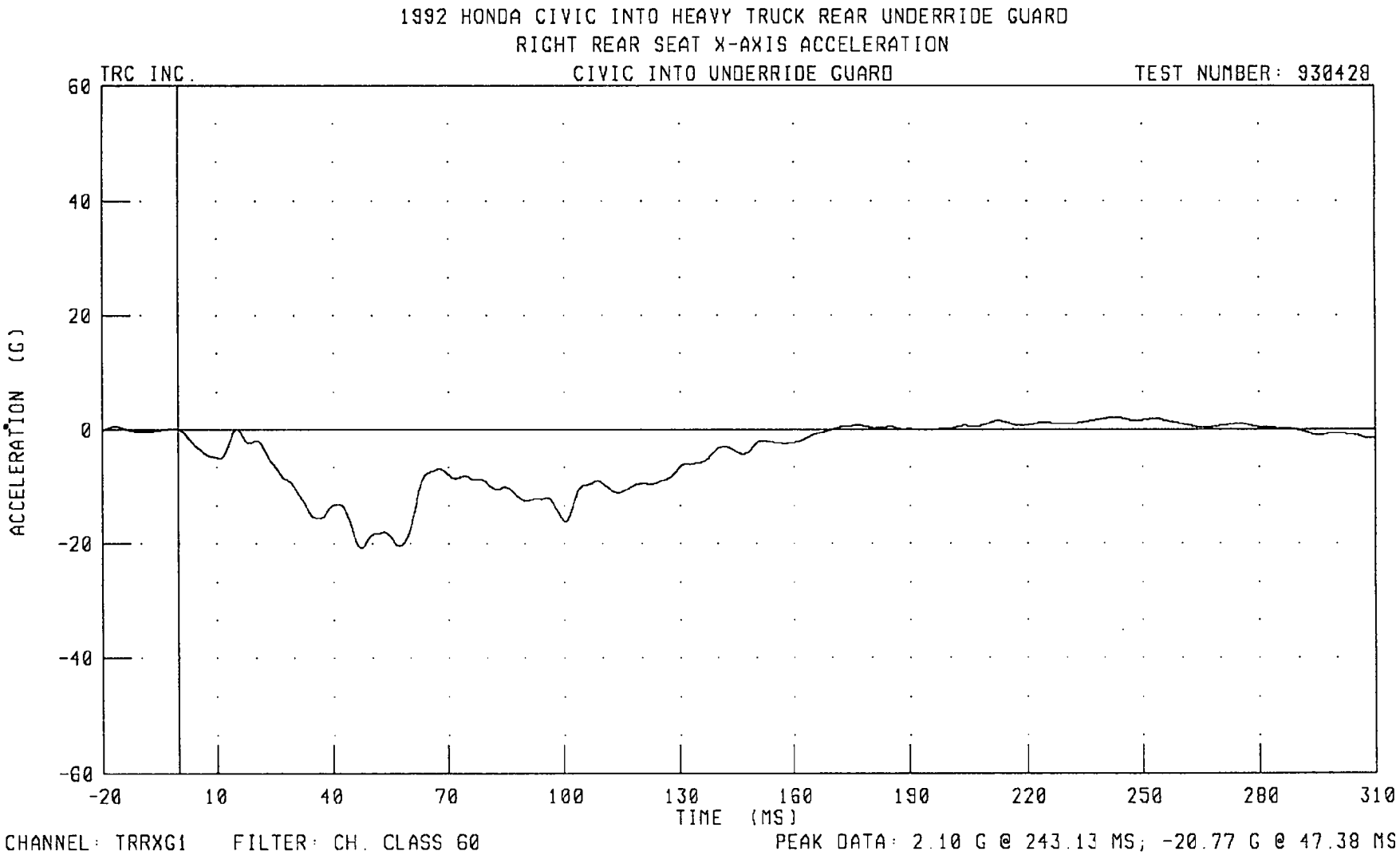


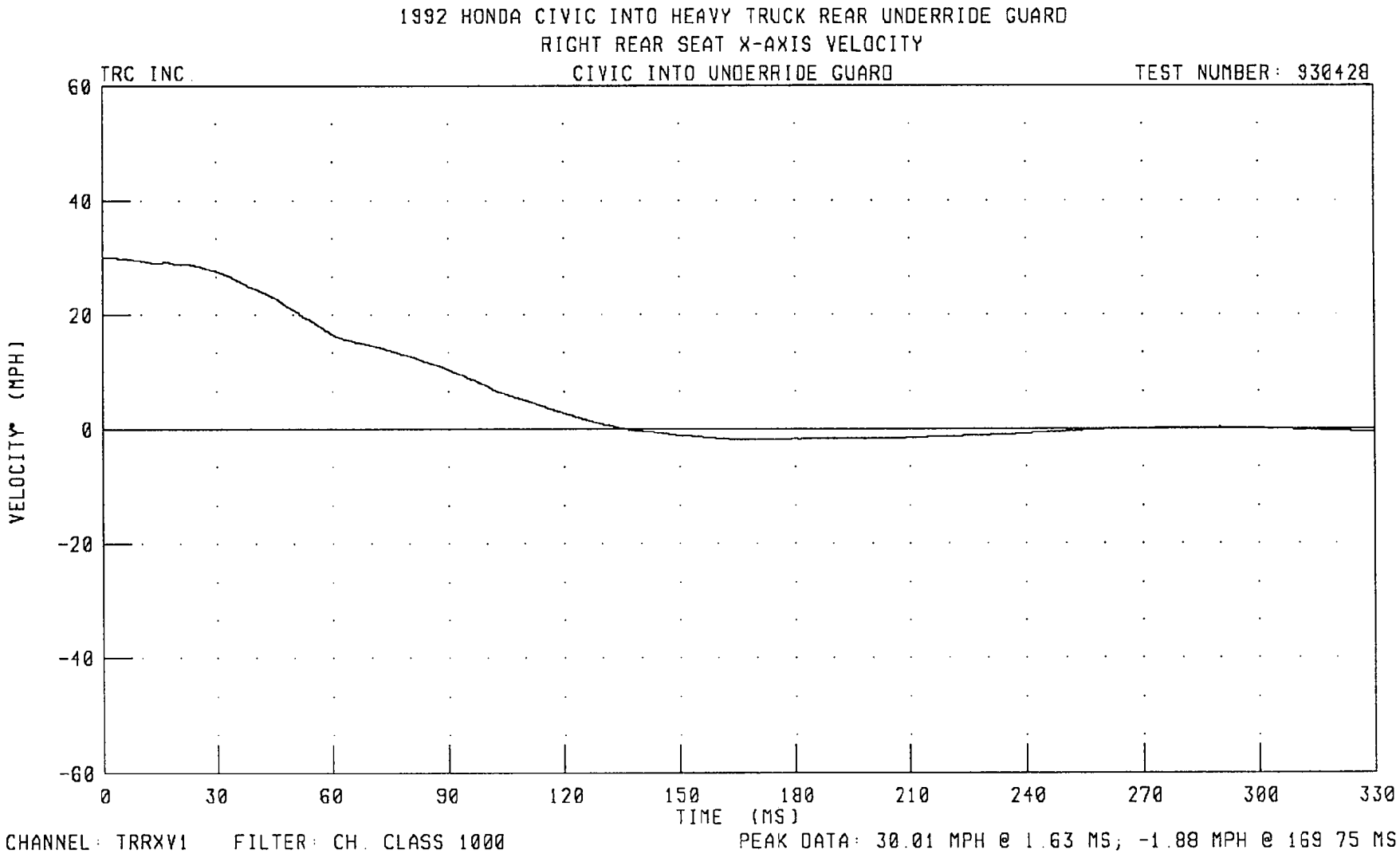
CHANNEL: TLRYV1 FILTER: CH. CLASS 1000 PEAK DATA: 0.70 MPH @ 146.75 MS; -2.53 MPH @ 324.88 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
LEFT REAR SEAT Y-AXIS DISPLACEMENT

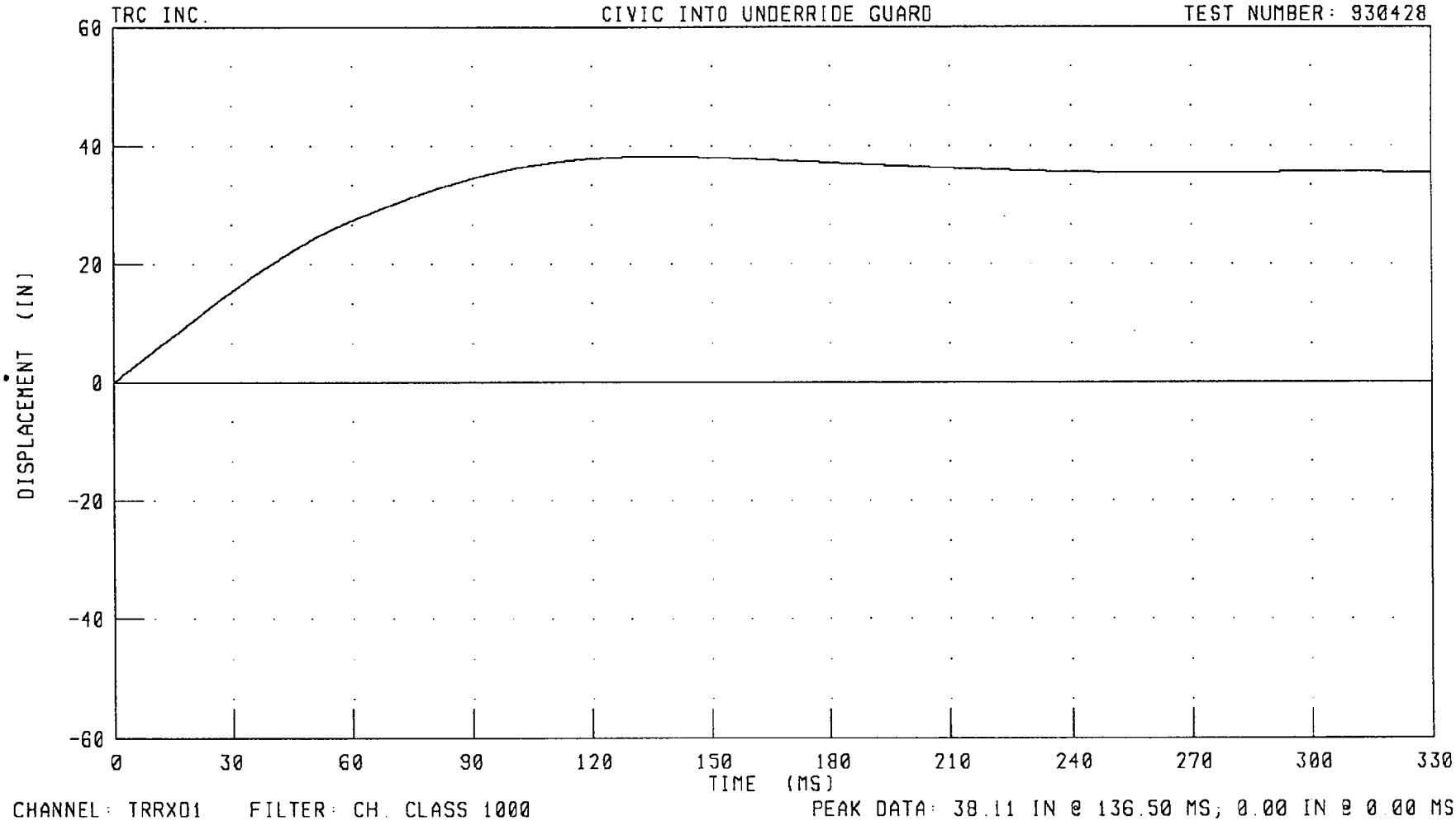


CHANNEL: TLRYD1 FILTER: CH. CLASS 1000 PEAK DATA: 0.00 IN @ 4.38 MS; -4.28 IN @ 330.00 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT REAR SEAT X-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TRRXG1
FILTER: CH. CLASS 60
PEAK DATA: 2.10 G @ 243.13 MS; -20.77 G @ 47.38 MS

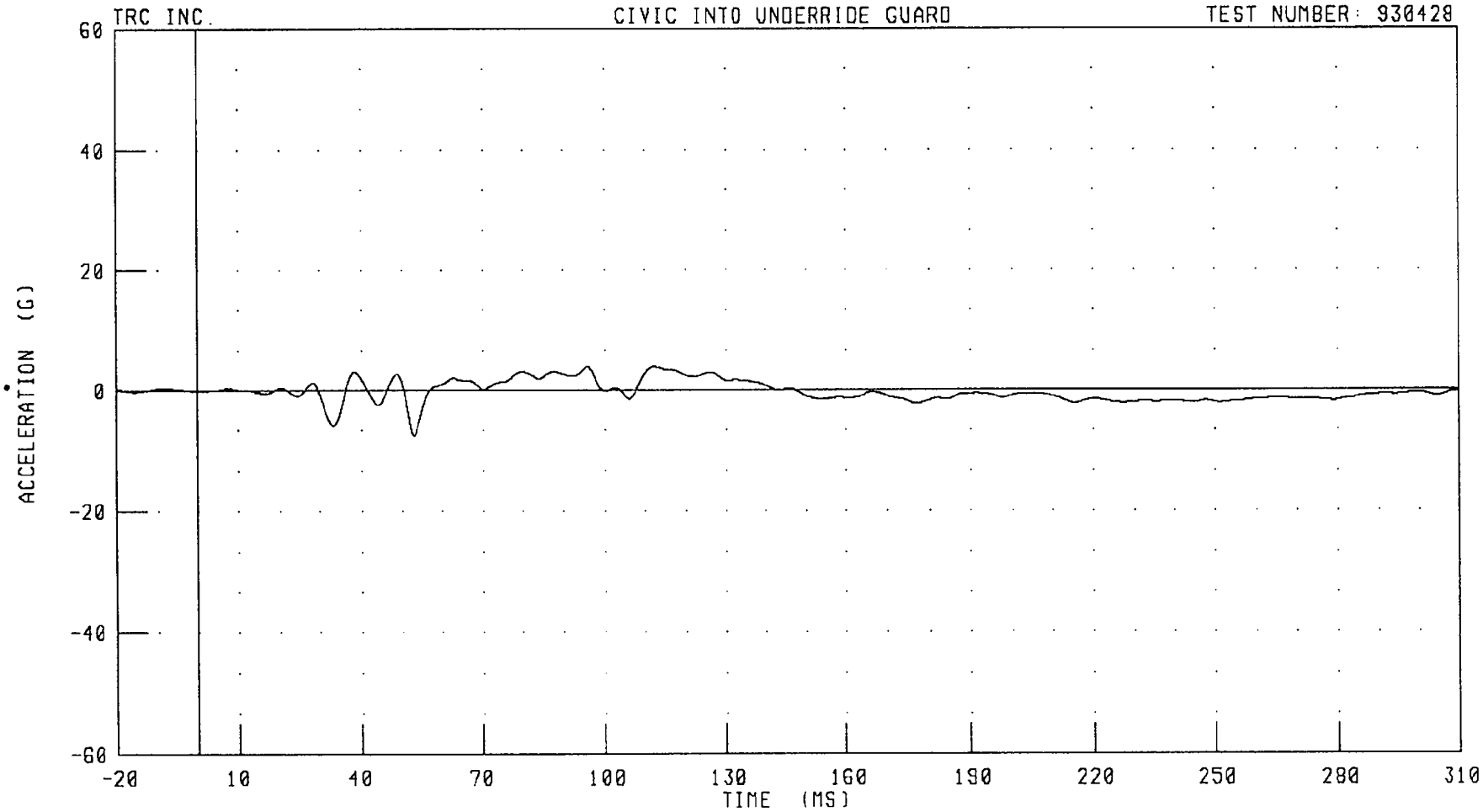

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT REAR SEAT X-AXIS VELOCITY
TRC INC
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
VELOCITY (MPH)
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: TRRXV1
FILTER: CH. CLASS 1000
PEAK DATA: 30.01 MPH @ 1.63 MS; -1.88 MPH @ 169.75 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT REAR SEAT X-AXIS DISPLACEMENT

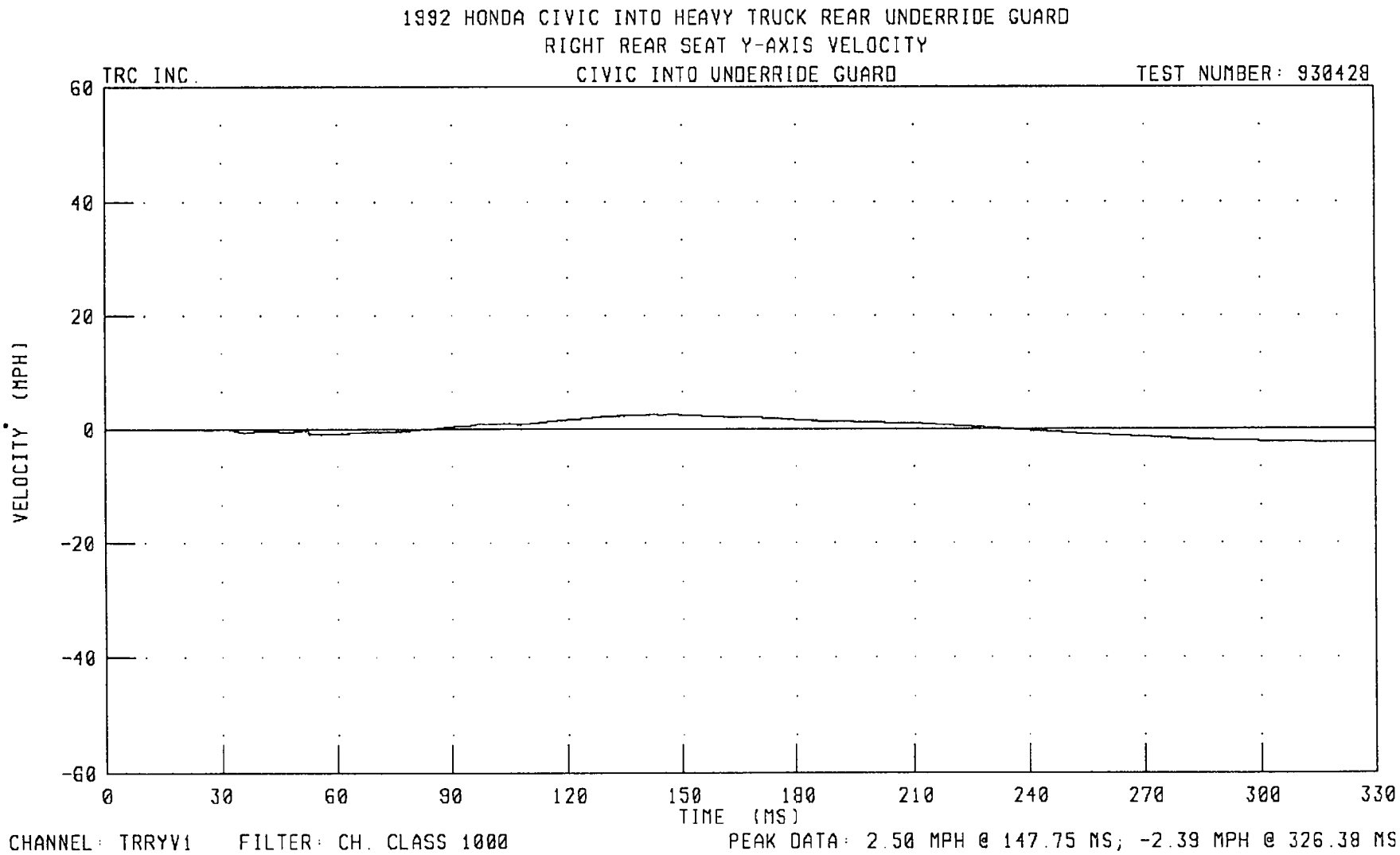


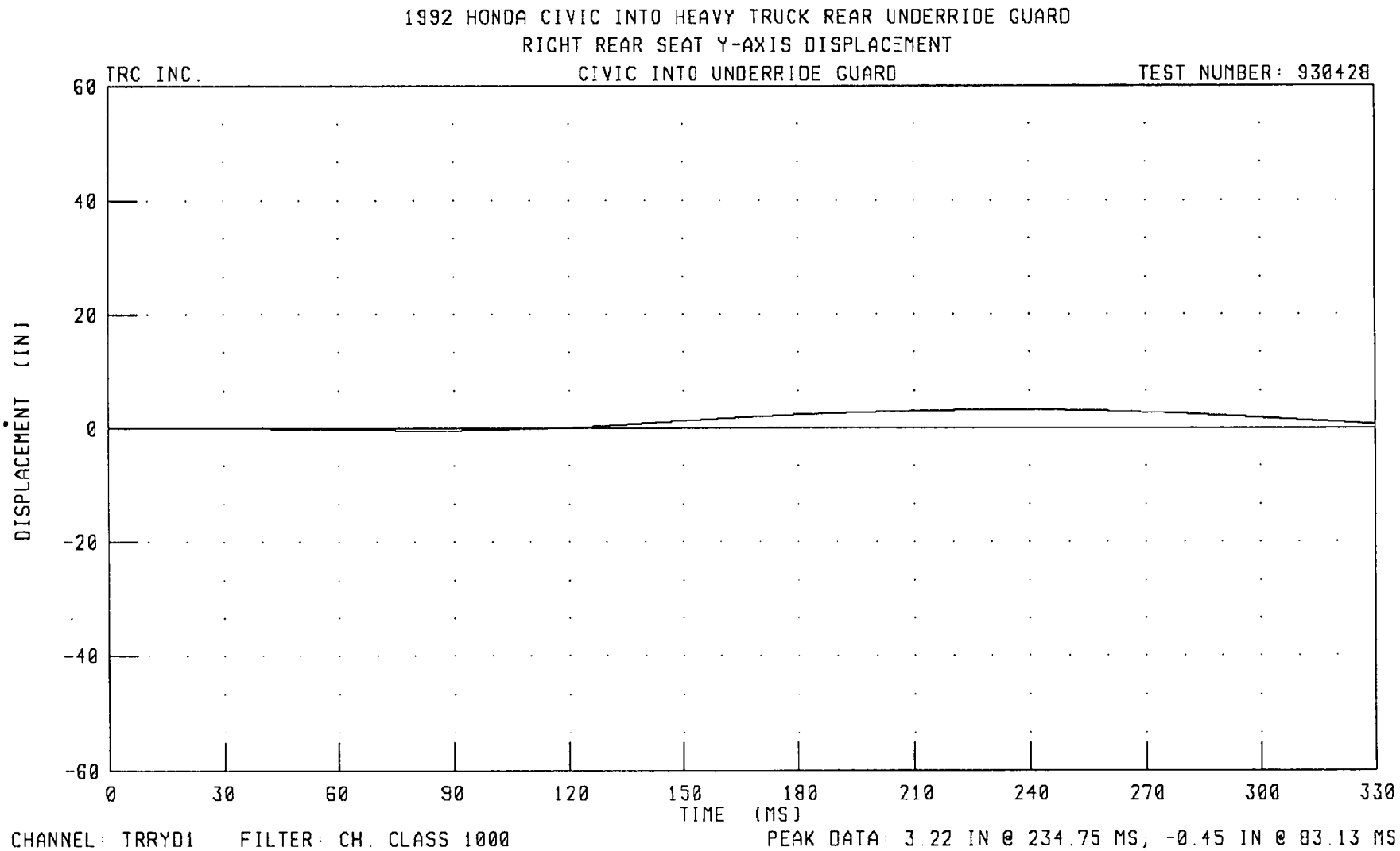
CHANNEL: TRRX01 FILTER: CH. CLASS 1000 PEAK DATA: 38.11 IN @ 136.50 MS; 0.00 IN @ 0.00 MS

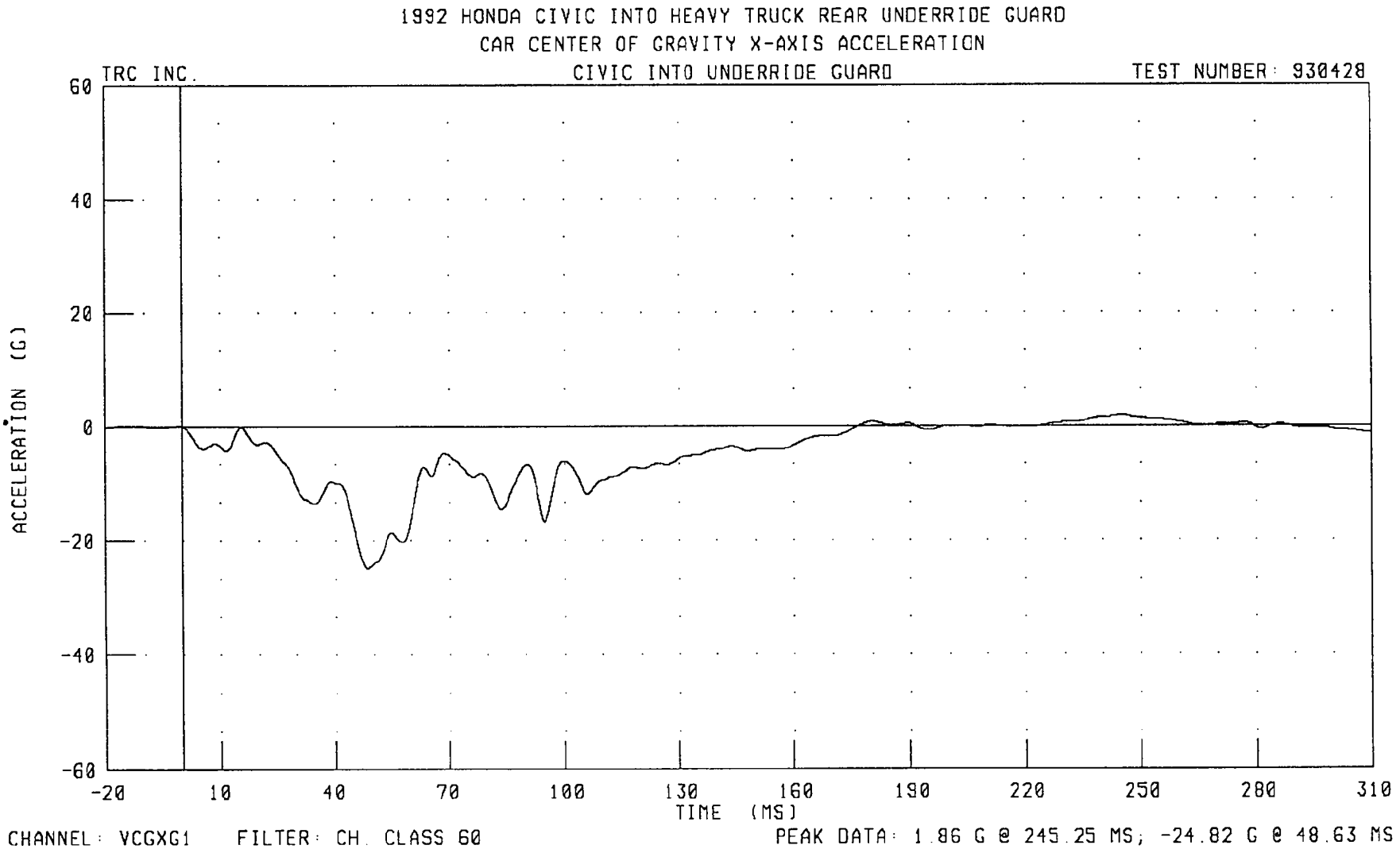
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT REAR SEAT Y-AXIS ACCELERATION

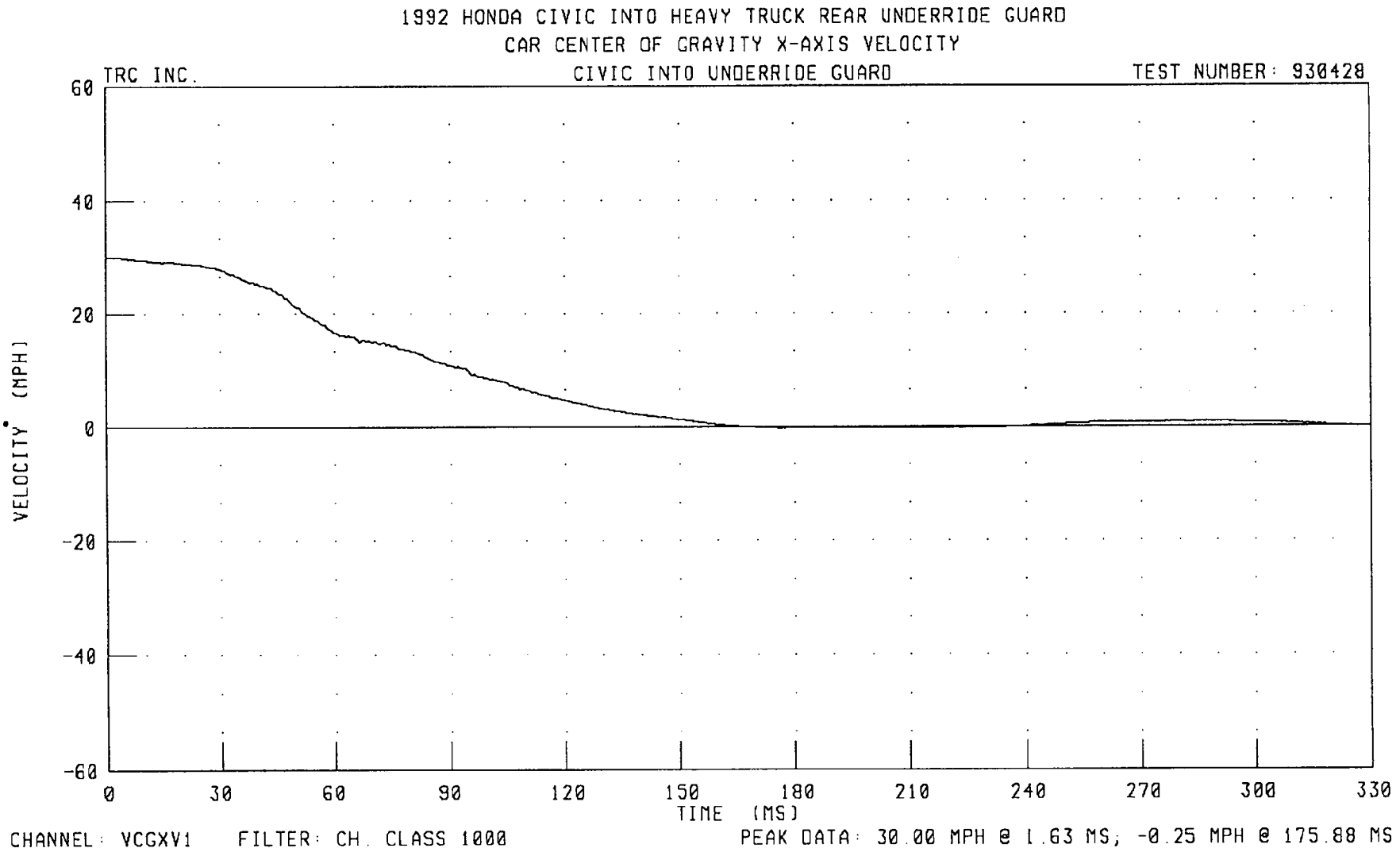


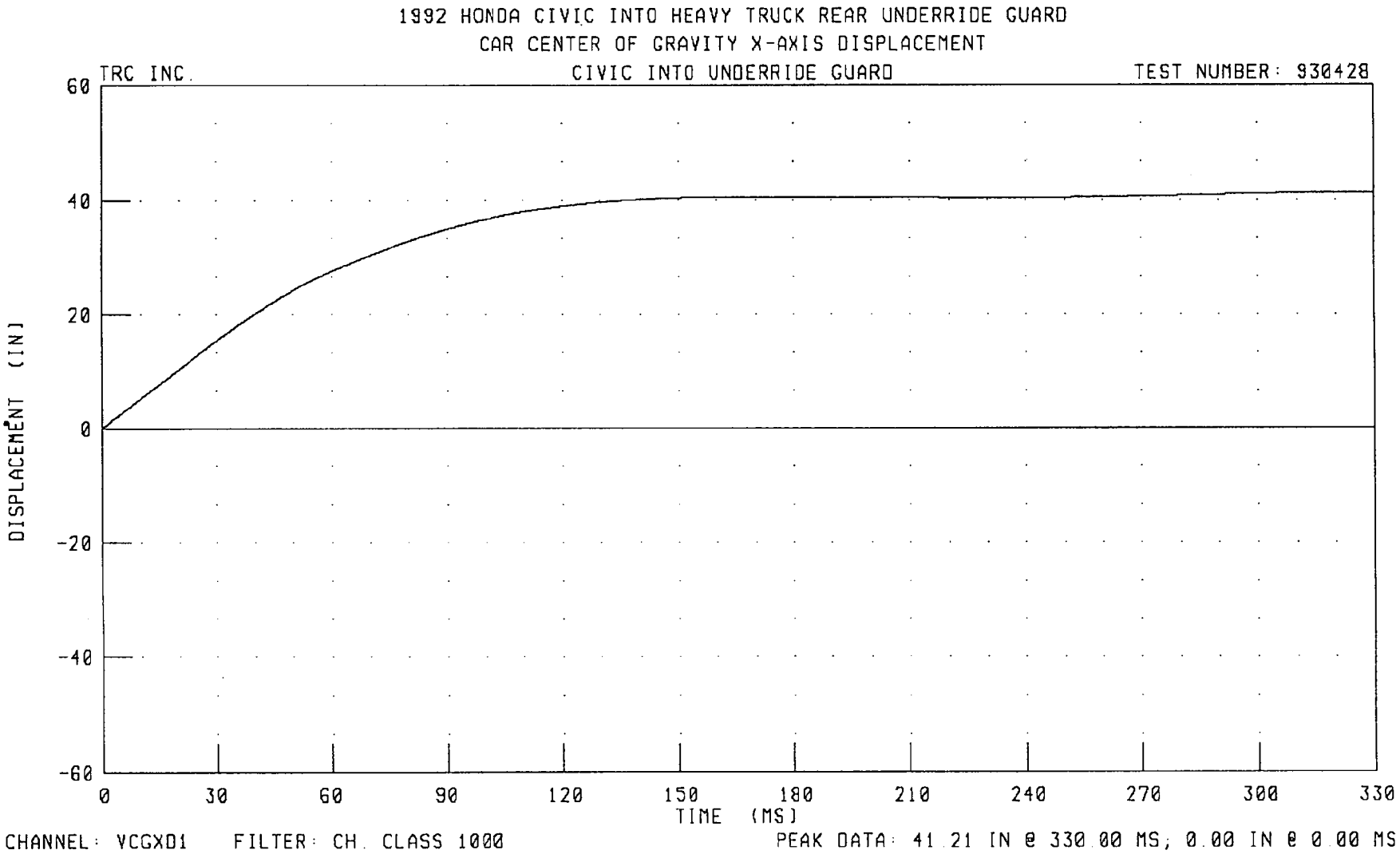
CHANNEL: TRRYG1 FILTER: CH. CLASS 60 PEAK DATA: 3.89 G @ 96.00 MS; -7.55 G @ 53.00 MS

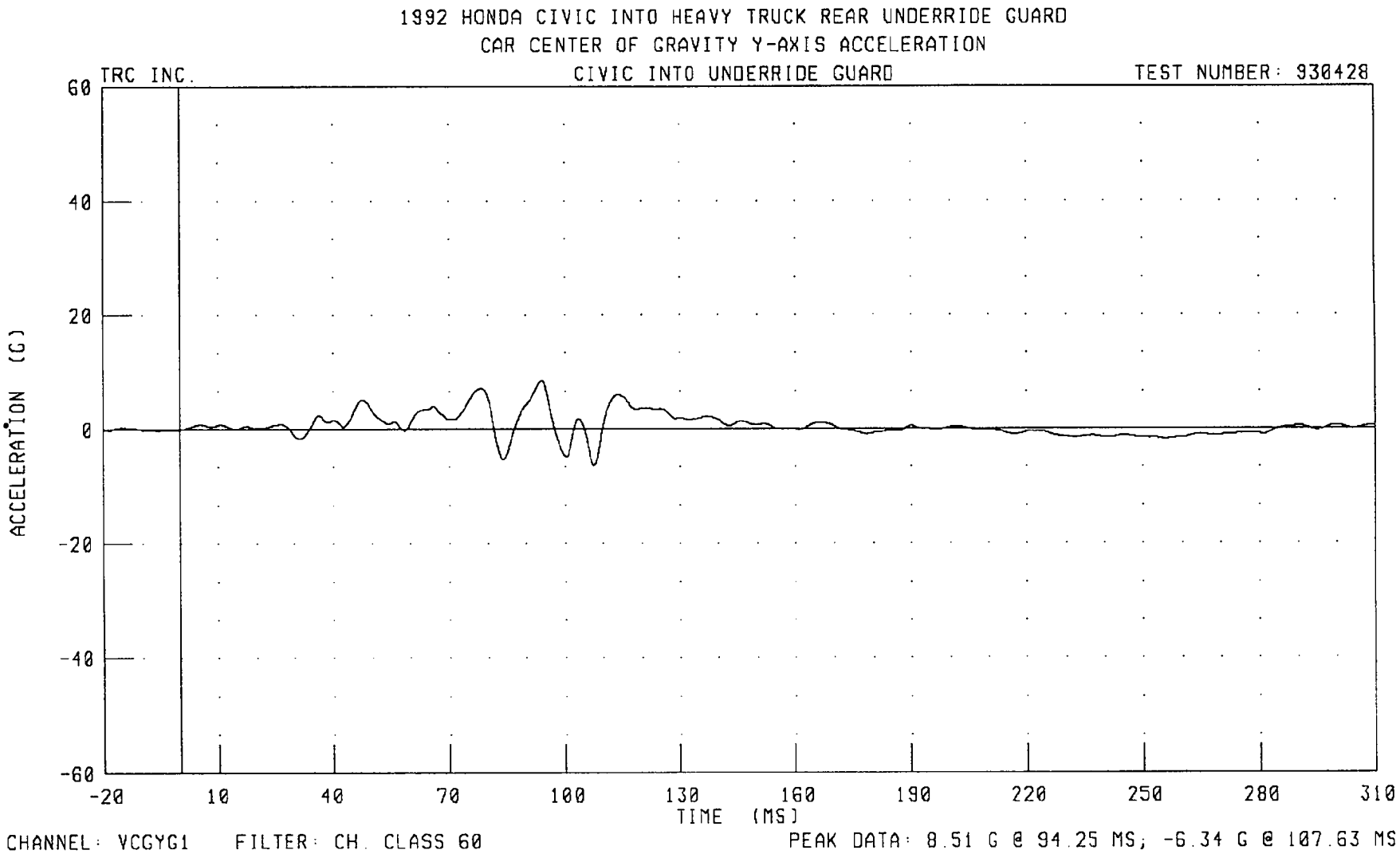

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT REAR SEAT Y-AXIS VELOCITY
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
VELOCITY (MPH)
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: TRRYV1
FILTER: CH. CLASS 1000
PEAK DATA: 2.50 MPH @ 147.75 MS; -2.39 MPH @ 326.38 MS

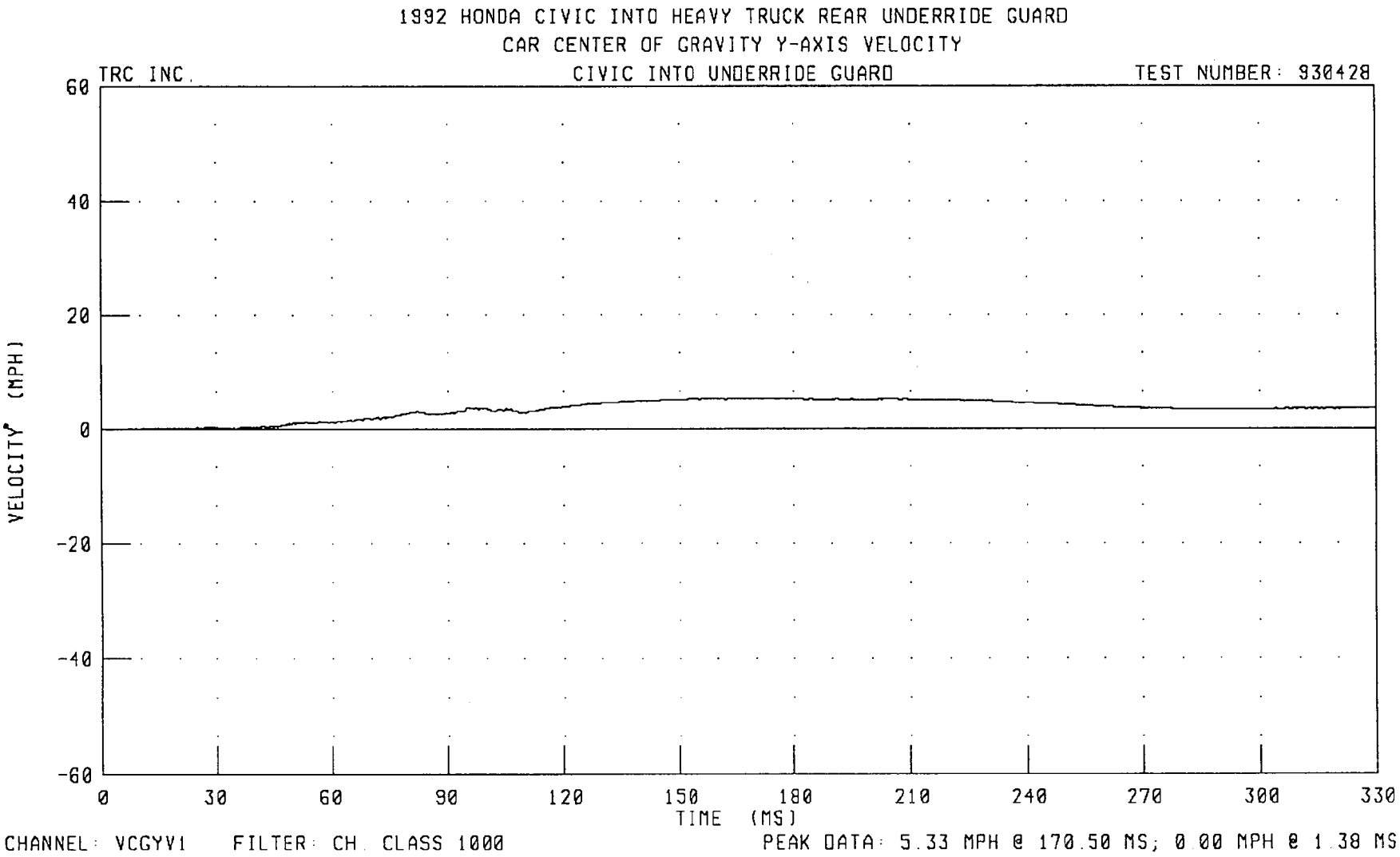

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
RIGHT REAR SEAT Y-AXIS DISPLACEMENT
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
DISPLACEMENT (IN)
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: TRRYD1
FILTER: CH. CLASS 1000
PEAK DATA: 3.22 IN @ 234.75 MS, -0.45 IN @ 83.13 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY X-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGXG1
FILTER: CH. CLASS 60
PEAK DATA: 1.86 G @ 245.25 MS; -24.82 G @ 48.63 MS

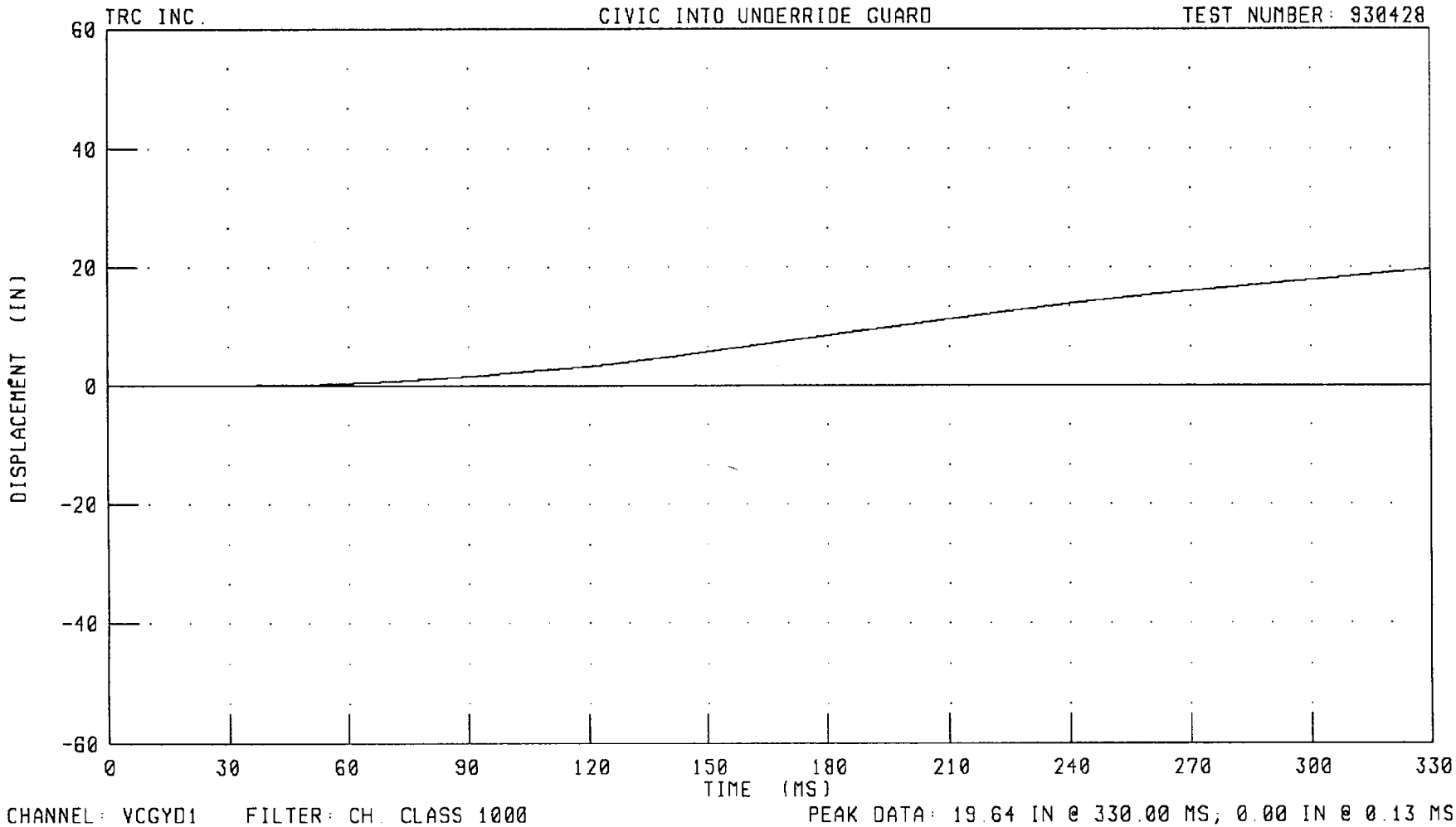

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY X-AXIS VELOCITY
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
VELOCITY (MPH)
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: VCGXV1
FILTER: CH. CLASS 1000
PEAK DATA: 30.00 MPH @ 1.63 MS; -0.25 MPH @ 175.88 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY X-AXIS DISPLACEMENT
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
DISPLACEMENT (IN)
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: VCGXD1
FILTER: CH. CLASS 1000
PEAK DATA: 41.21 IN @ 330.00 MS; 0.00 IN @ 0.00 MS

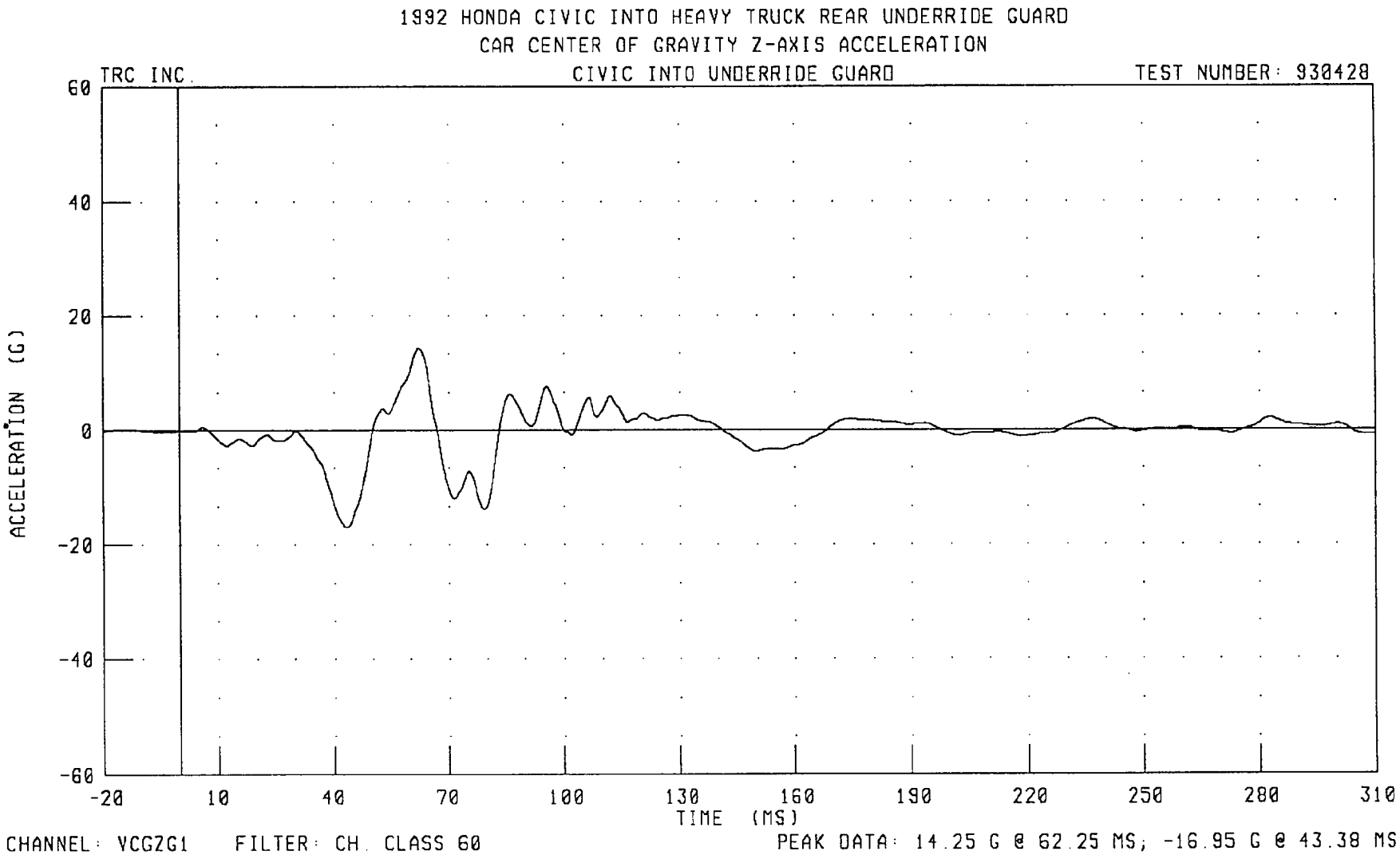

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY Y-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGYG1
FILTER: CH. CLASS 60
PEAK DATA: 8.51 G @ 94.25 MS; -6.34 G @ 107.63 MS

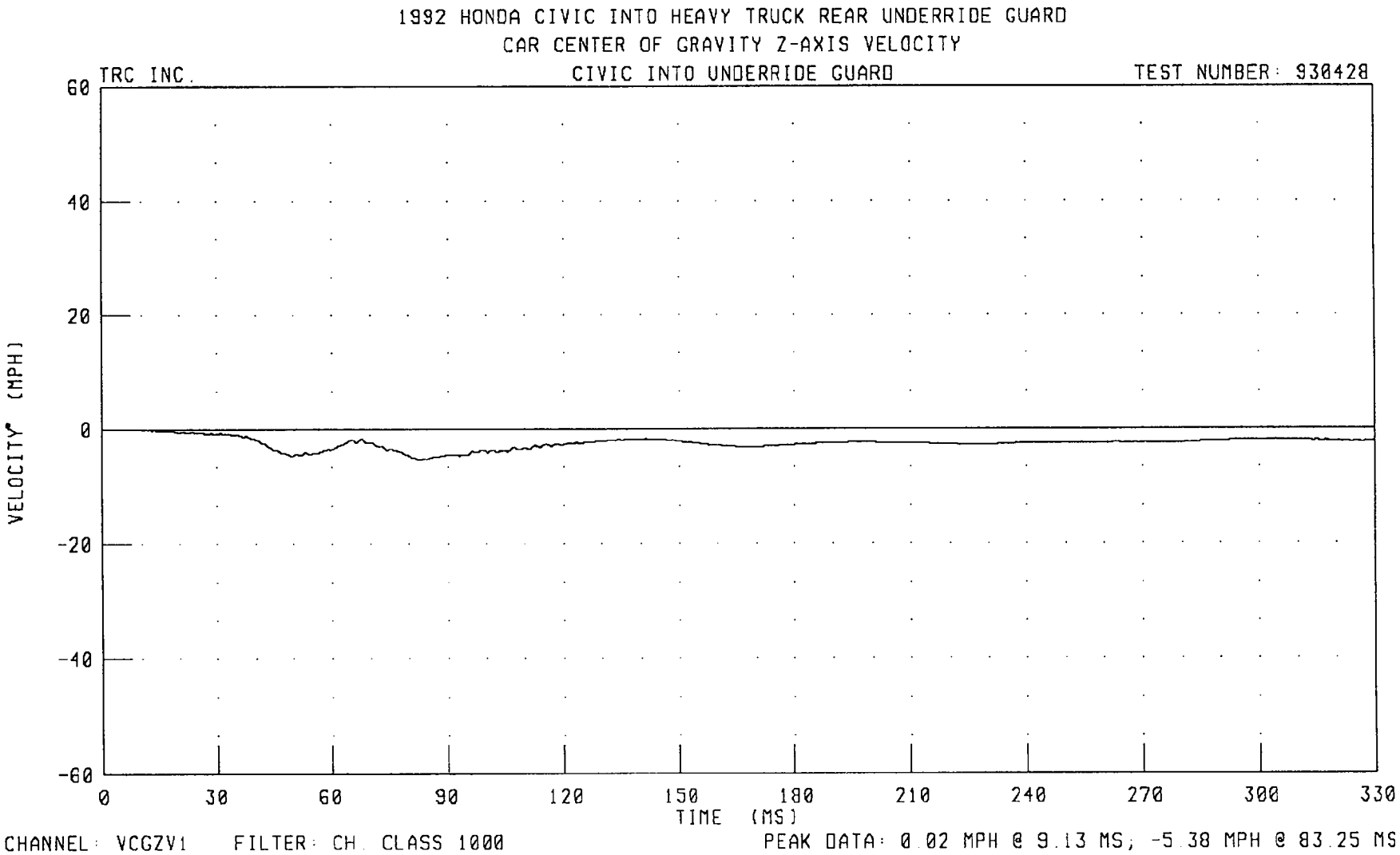

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY Y-AXIS VELOCITY
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
VELOCITY (MPH)
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: VCGYV1
FILTER: CH CLASS 1000
PEAK DATA: 5.33 MPH @ 170.50 MS; 0.00 MPH @ 1.38 MS

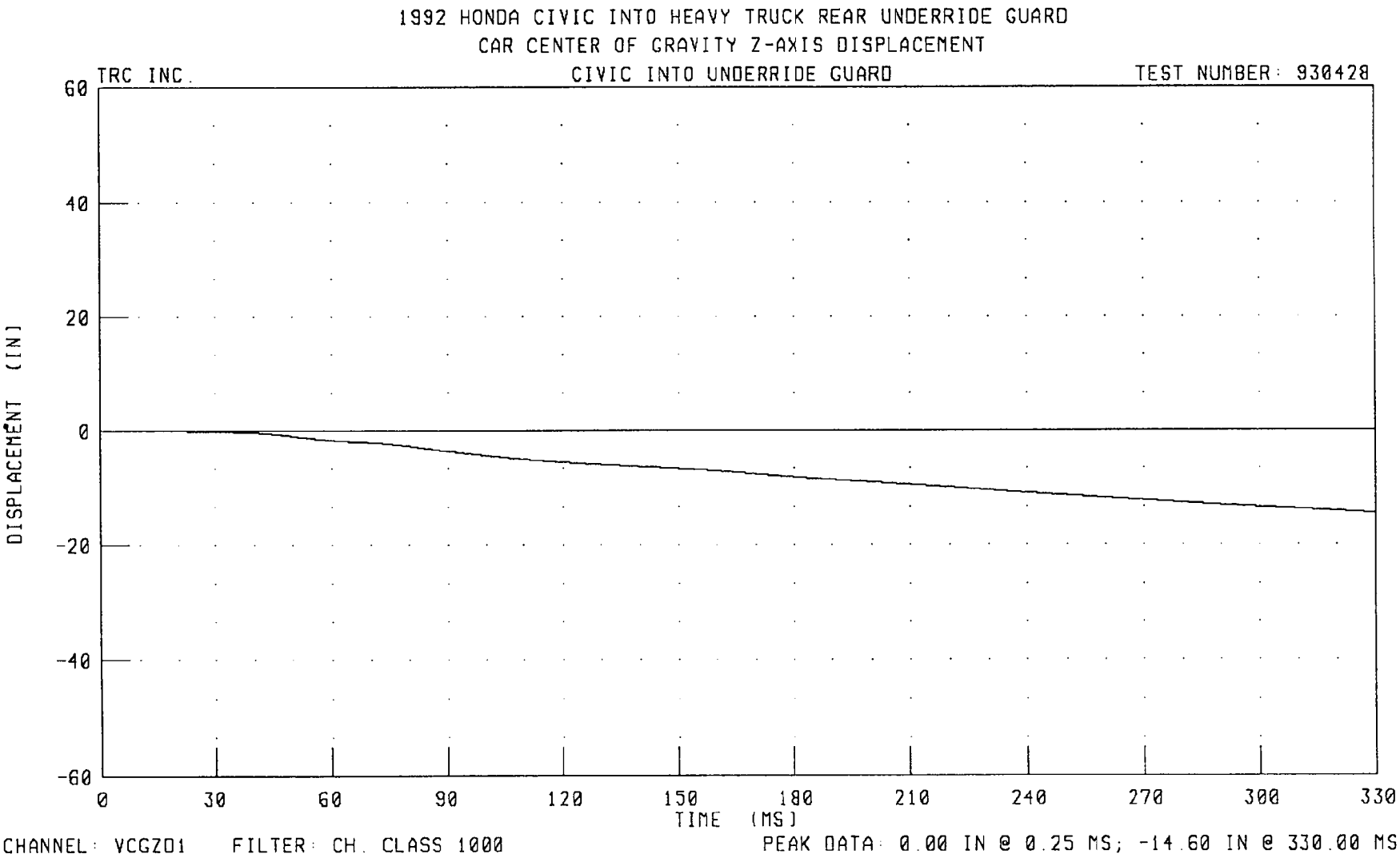
1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY Y-AXIS DISPLACEMENT



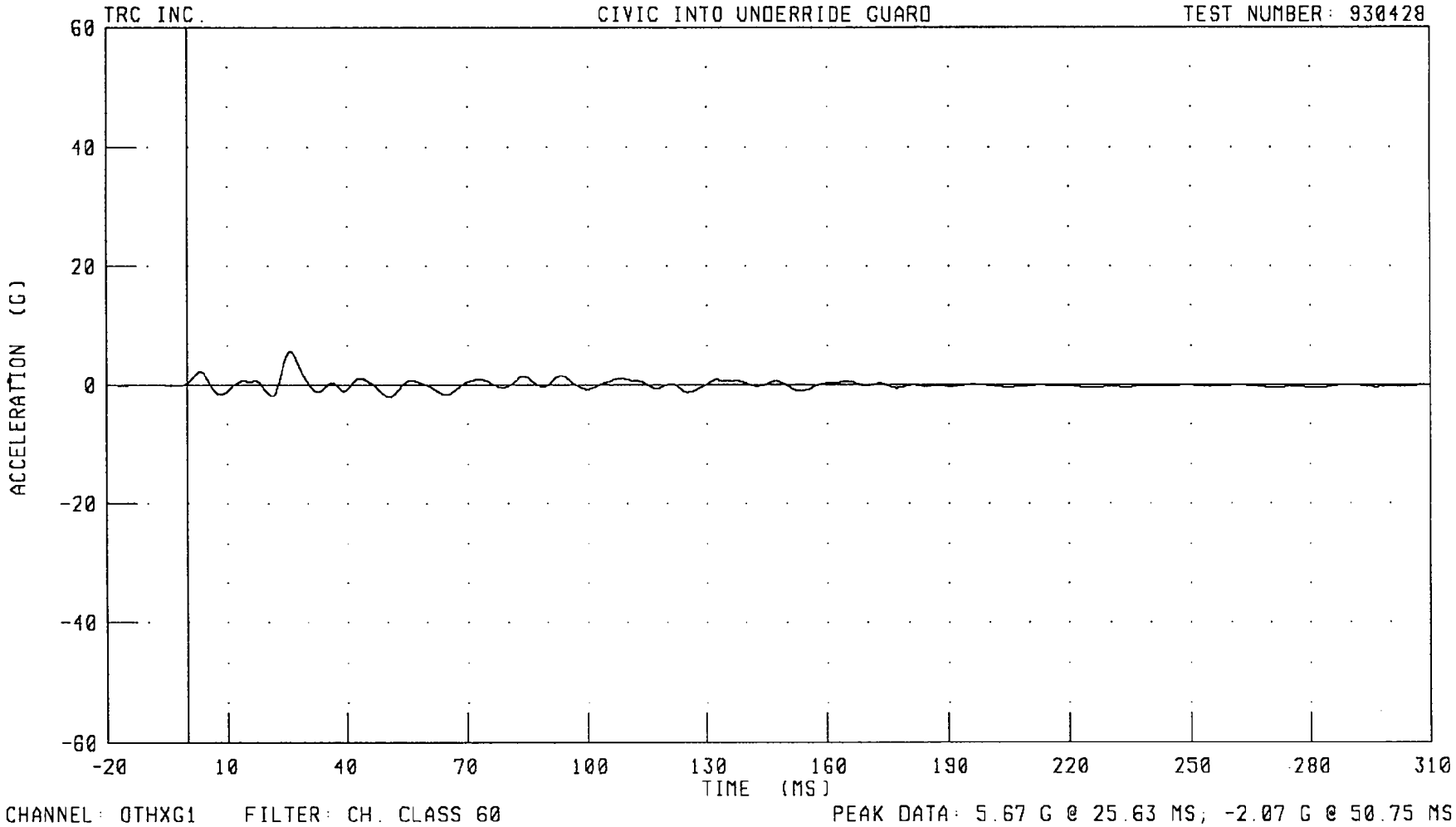
CHANNEL: VCGYD1 FILTER: CH CLASS 1000 PEAK DATA: 19.64 IN @ 330.00 MS; 0.00 IN @ 0.13 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY Z-AXIS ACCELERATION
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGZG1
FILTER: CH. CLASS 60
PEAK DATA: 14.25 G @ 62.25 MS; -16.95 G @ 43.38 MS


1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY Z-AXIS VELOCITY
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
60
40
20
0
-20
-40
-60
VELOCITY (MPH)
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: VCGZV1
FILTER: CH CLASS 1000
PEAK DATA: 0.02 MPH @ 9.13 MS; -5.38 MPH @ 83.25 MS

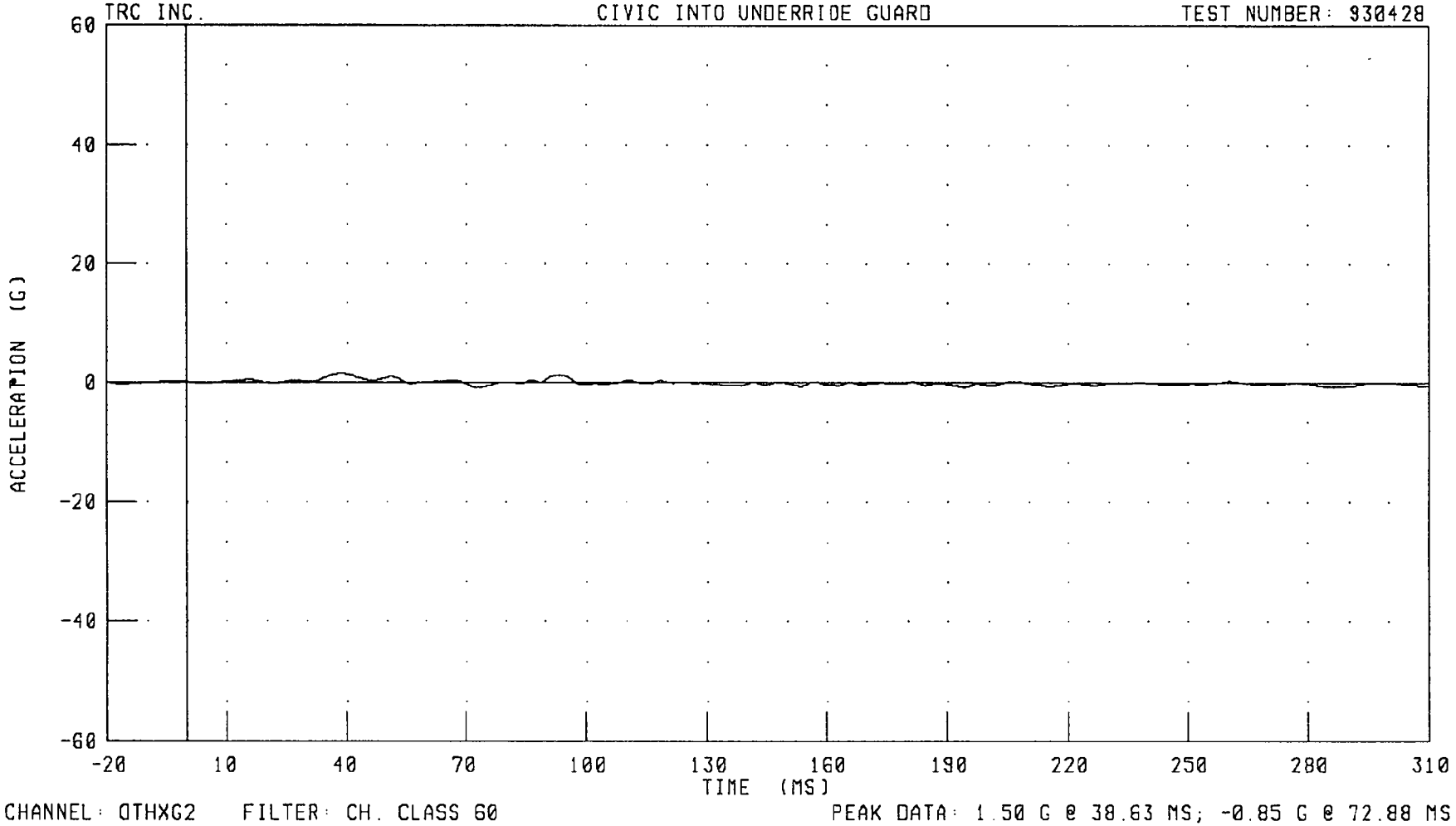

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
CAR CENTER OF GRAVITY Z-AXIS DISPLACEMENT
TRC INC.
CIVIC INTO UNDERRIDE GUARD
TEST NUMBER: 930428
DISPLACEMENT (IN)
60
40
20
0
-20
-40
-60
0
30
60
90
120
150
180
210
240
270
300
330
TIME (MS)
CHANNEL: VCGZ01
FILTER: CH. CLASS 1000
PEAK DATA: 0.00 IN @ 0.25 MS; -14.60 IN @ 330.00 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
TRAILER BED SUPPORT RAIL X-AXIS ACCELERATION



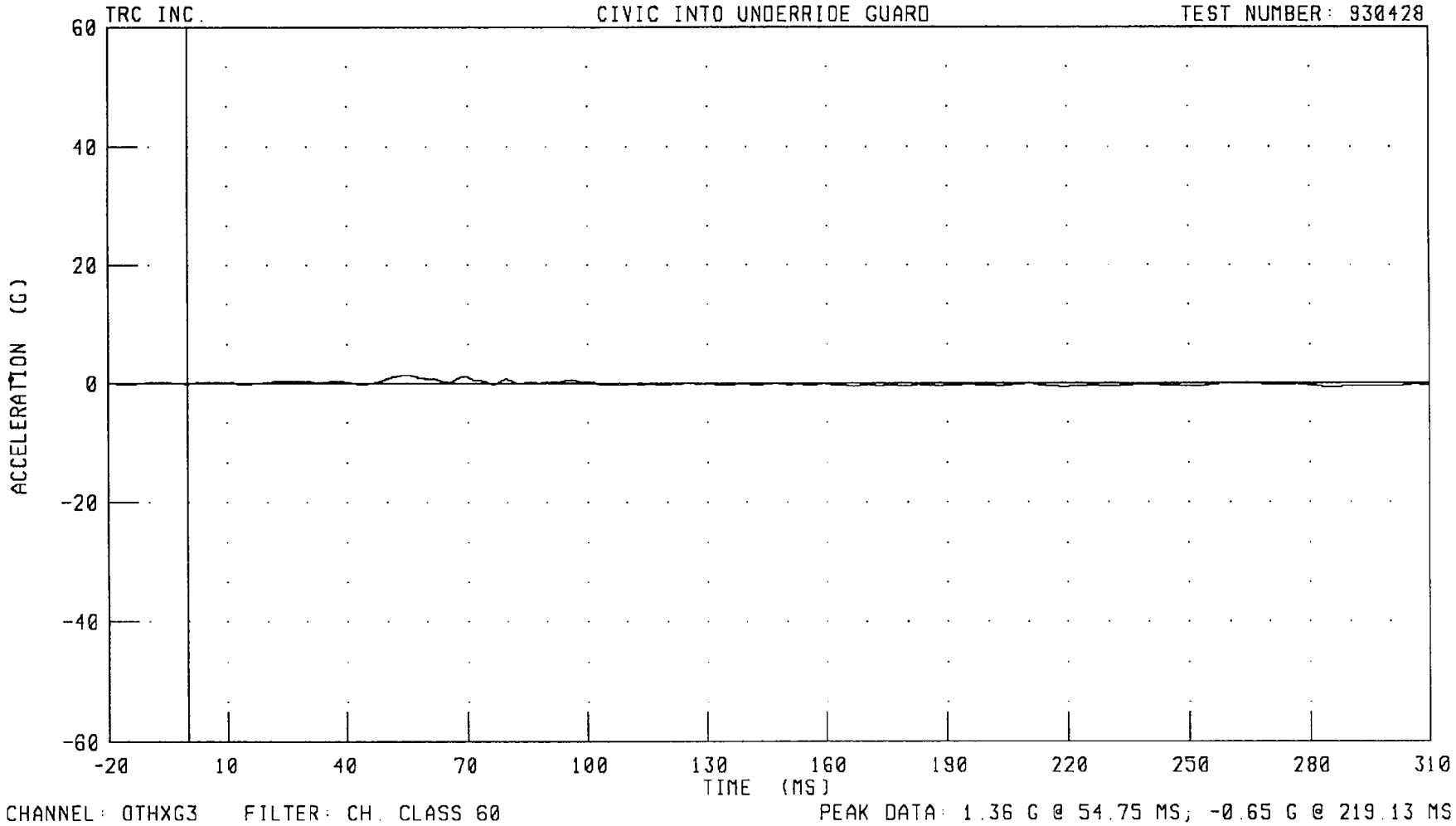
CHANNEL: OTHXG1 FILTER: CH. CLASS 60 PEAK DATA: 5.67 G @ 25.63 MS; -2.07 G @ 50.75 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
TRAILER RIGHT FRAME RAIL X-AXIS ACCELERATION



CHANNEL: 0THXG2 FILTER: CH. CLASS 60 PEAK DATA: 1.50 G @ 38.63 MS; -0.85 G @ 72.88 MS

1992 HONDA CIVIC INTO HEAVY TRUCK REAR UNDERRIDE GUARD
TRACTOR FRAME X-AXIS ACCELERATION



CHANNEL: OTHXG3 FILTER: CH. CLASS 60 PEAK DATA: 1.36 G @ 54.75 MS; -0.65 G @ 219.13 MS

APPENDIX C

DUMMY CERTIFICATION DATA

PRE-TEST CERTIFICATION DATA

DRIVER DUMMY S/N 048

TRANSPORTATION RESEARCH CENTER INC.
HYBRID III EXTERNAL DIMENSIONS
048 HUMANOID

27-APR-93

TRC 48C8ED1 572E SN048 EXT. DIMENSION CAL08

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	38.8 IN
WAIST CIRCUMFERENCE	(Z)	32.9 - 34.1 IN	33.5 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	23.5 IN
BUTTOCK POPLITEAL LENGTH	(N)	17.8 - 18.8 IN	18.5 IN
POPLITEAL HEIGHT	(L)	16.9 - 17.9 IN	17.0 IN
KNEE PIVOT HEIGHT	(M)	19.1 - 19.7 IN	19.4 IN
FOOT LENGTH	(P)	9.9 - 10.5 IN	10.2 IN
FOOT BREADTH	(W)	3.6 - 4.2 IN	3.9 IN
SHOULDER PIVOT FROM BACKLINE	(E)	3.3 - 3.7 IN	3.6 IN
SHOULDER BREADTH	(V)	16.6 - 17.2 IN	16.8 IN
SHOULDER PIVOT HEIGHT	(B)	19.9 - 20.5 IN	20.1 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	11.6 IN

TEST MEETS SPECIFICATIONS

TECHNICIAN Pete Foust

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

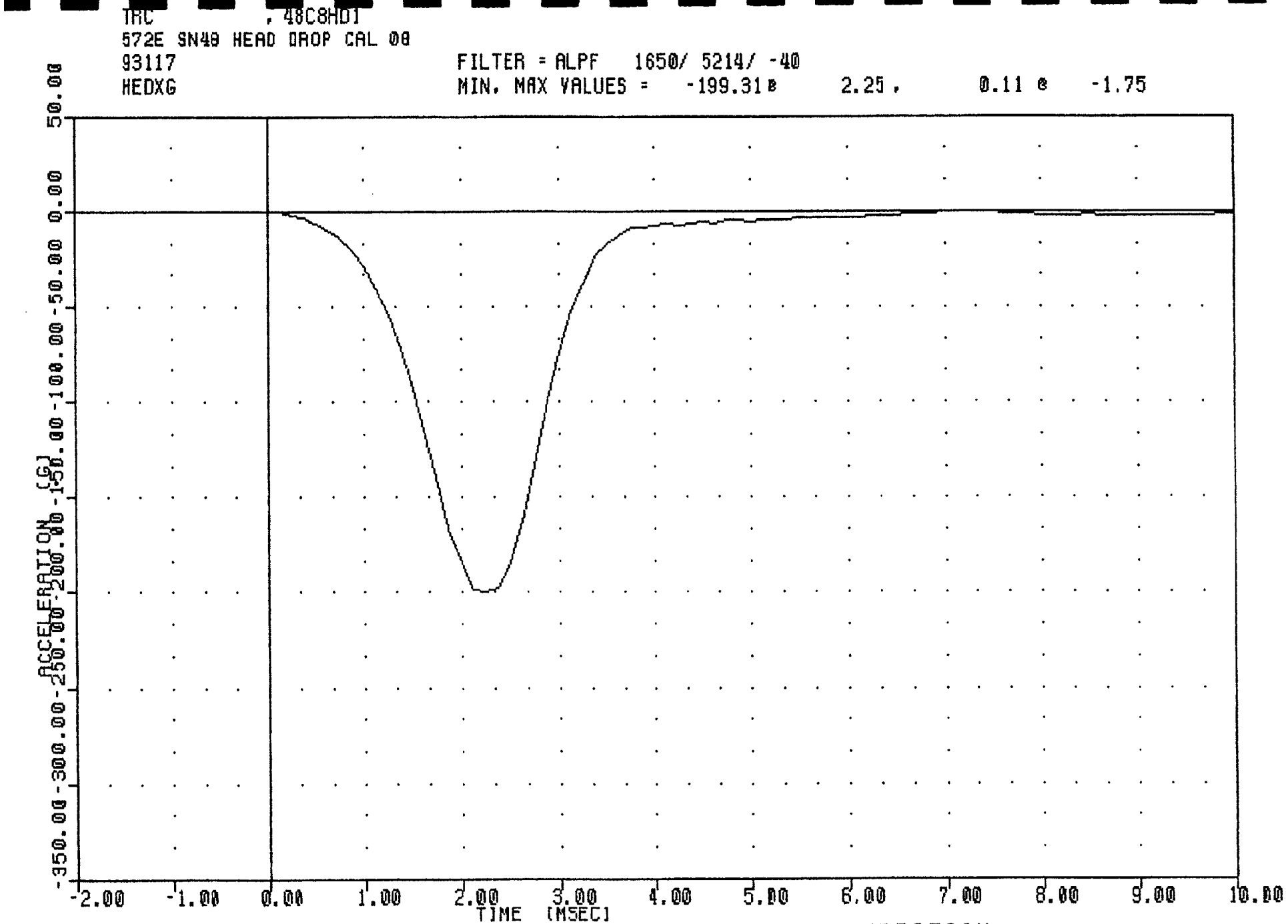
HYBRID III 27-APR-93

TRC 48C8HD1 572E SN48 HEAD DROP CAL 08

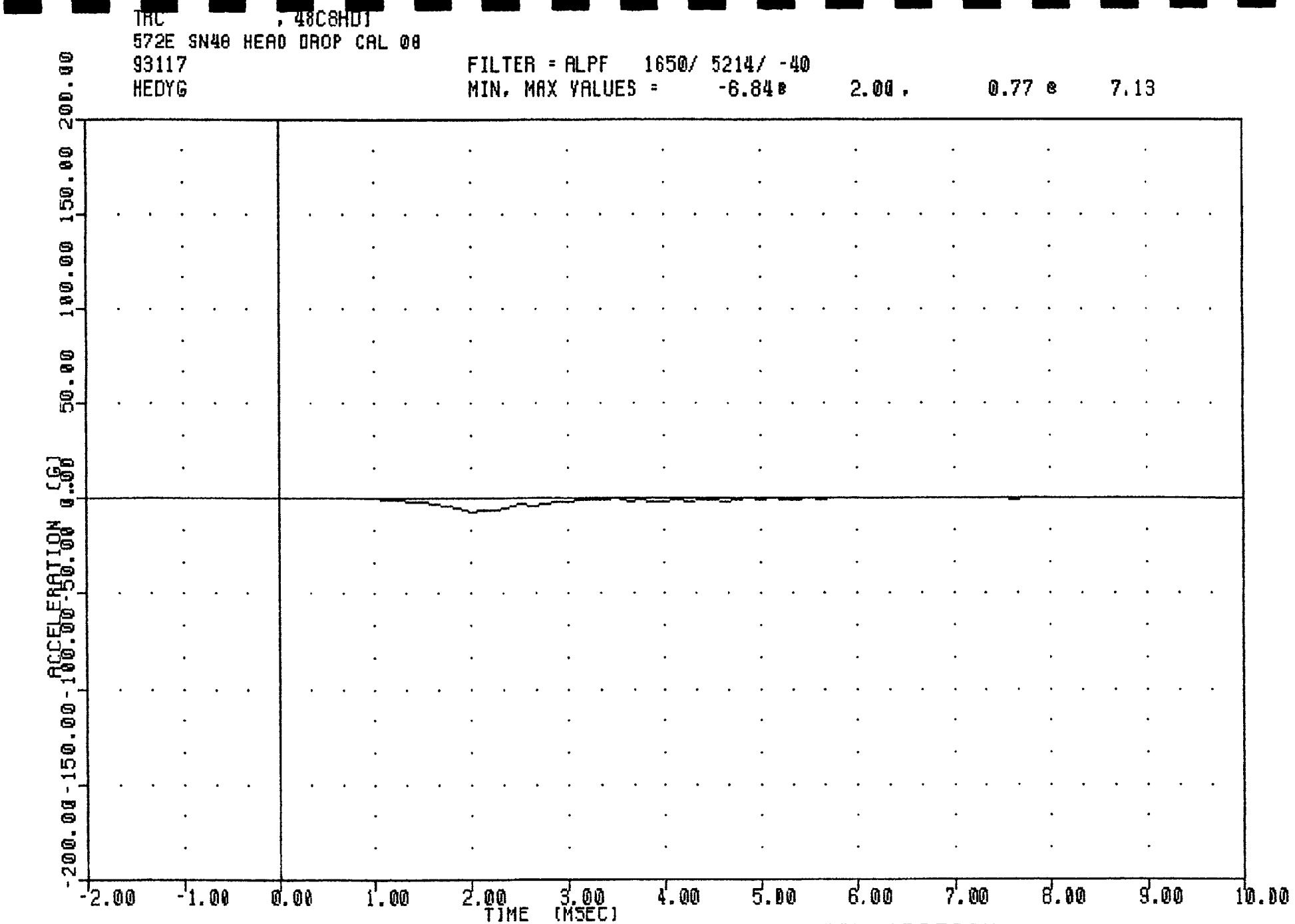
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	33.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	227.15 G
PEAK LATERAL ACCELERATION	15 G MAX	-6.84 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

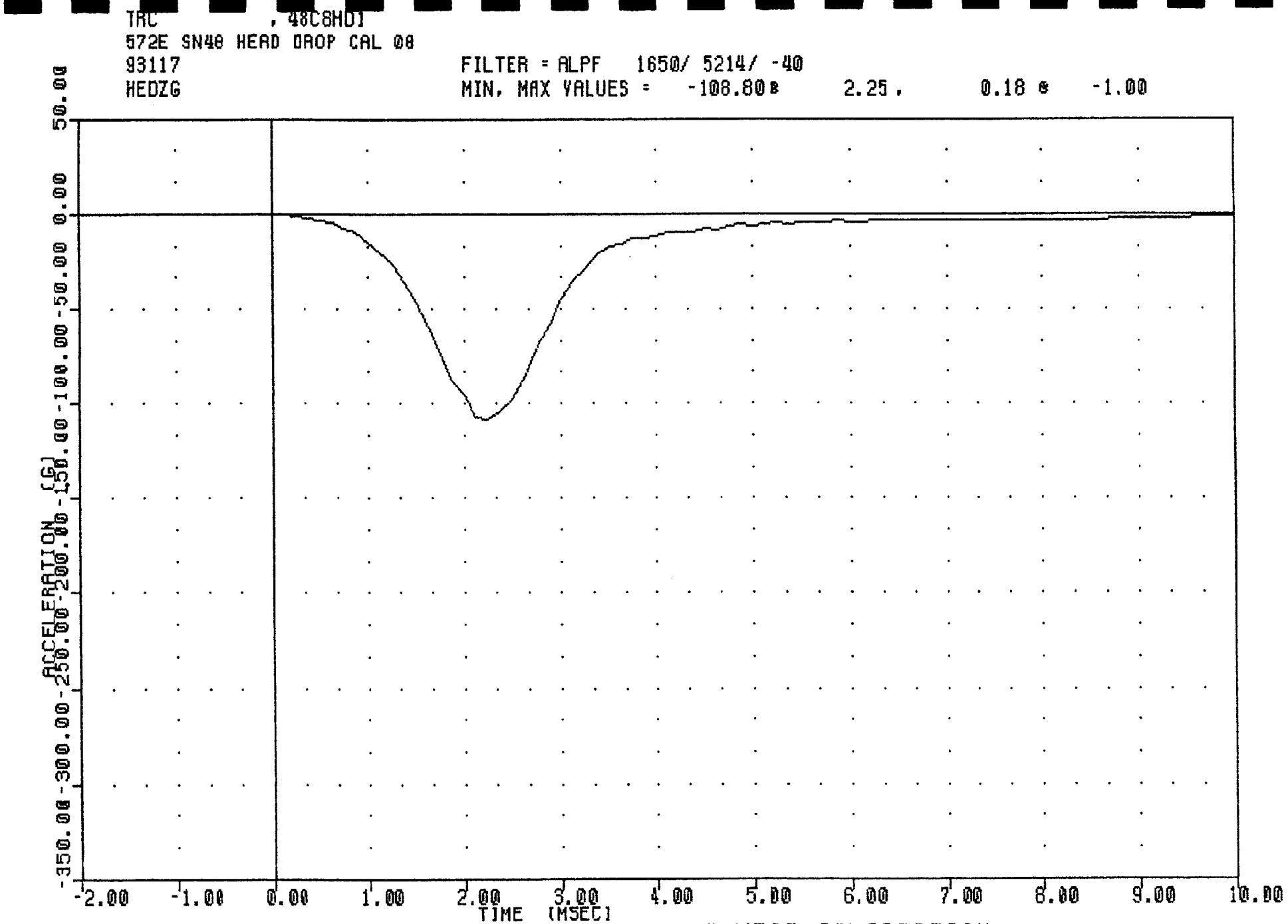
TECHNICIAN Pete Fonti



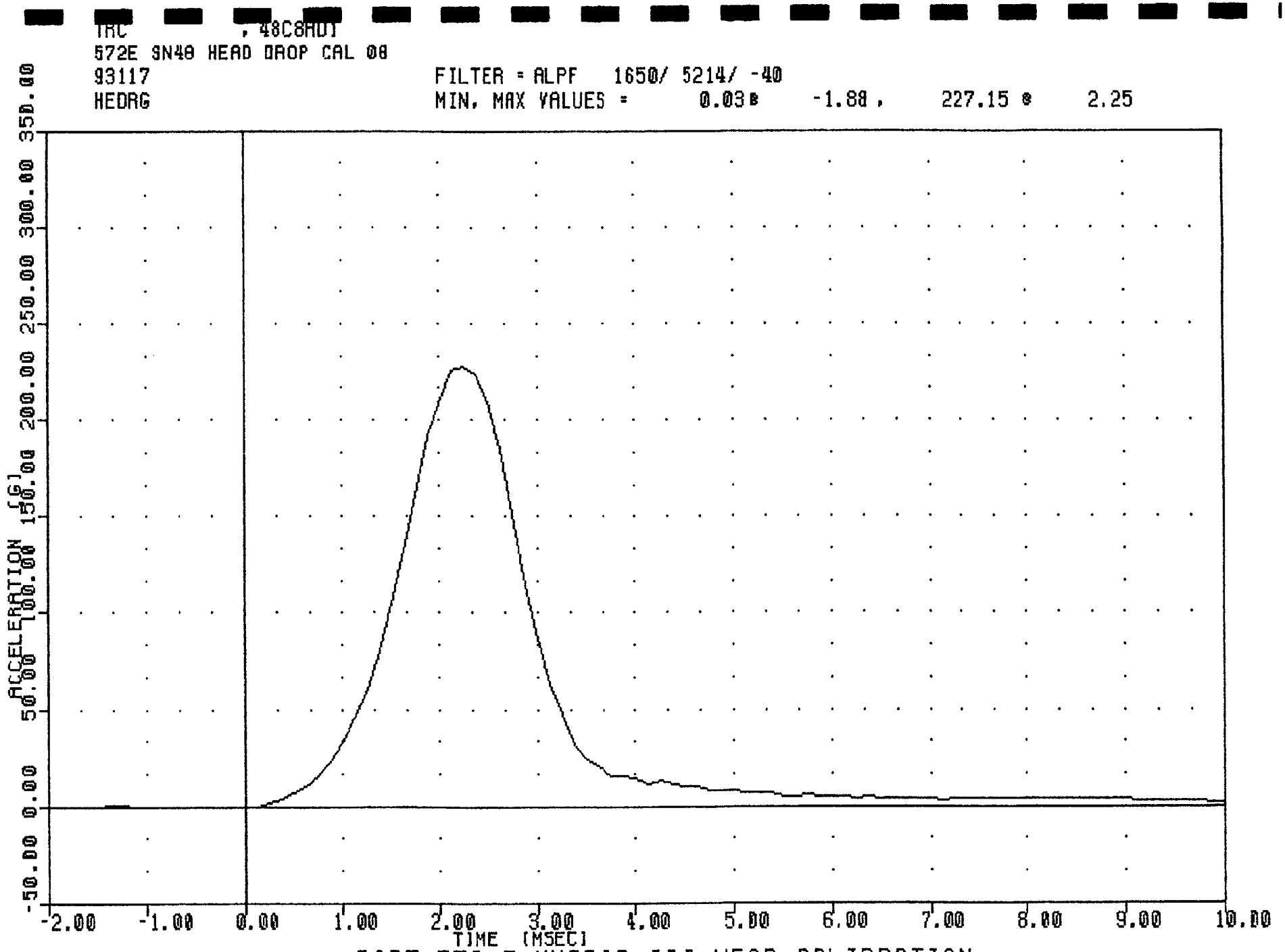
PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS



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



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



PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST

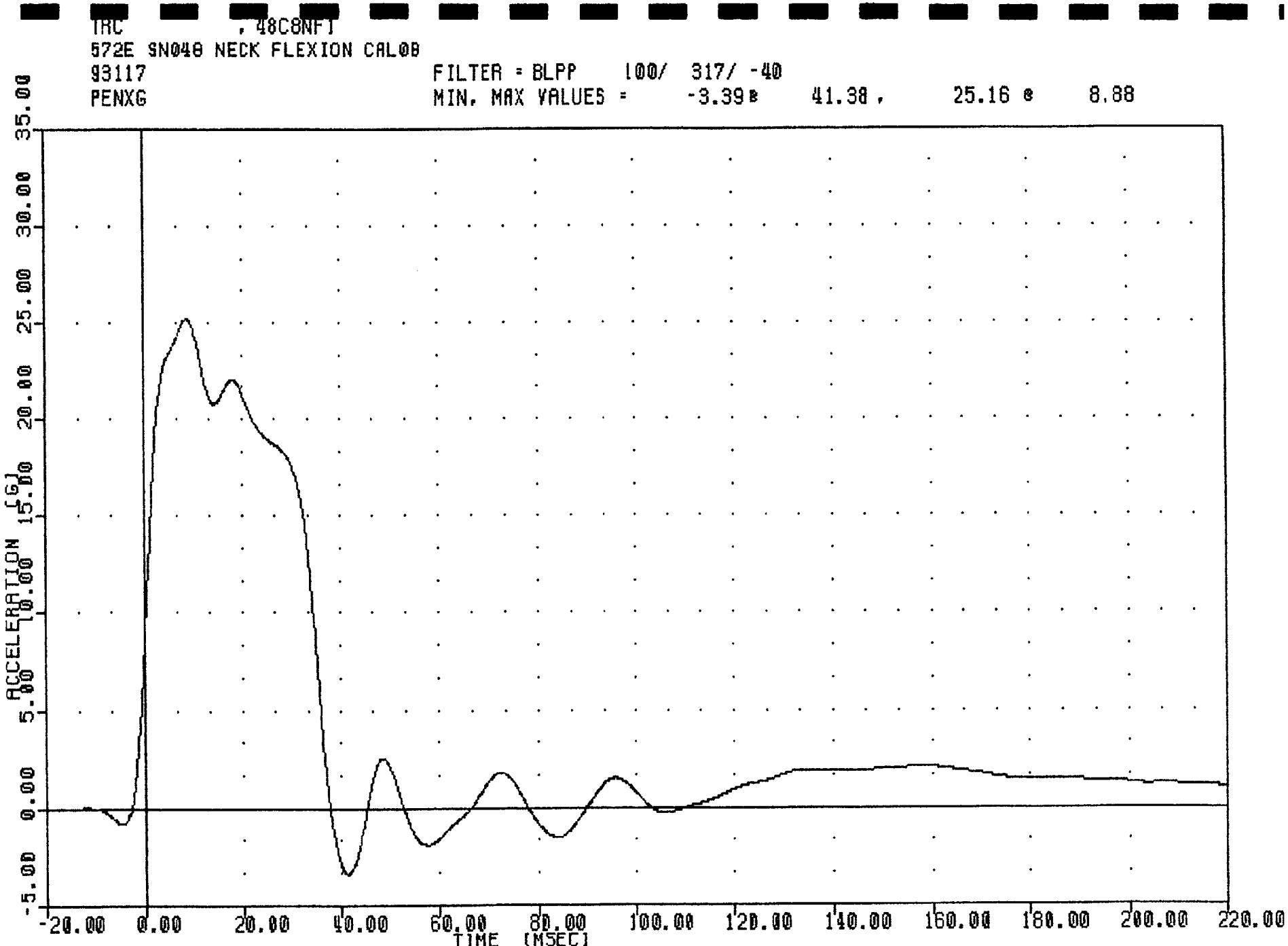
HYBRID III 27-APR-93

6 AXIS NECK TRANSDUCER
TRC 48C8NF1 572E SN048 NECK FLEXION CAL08

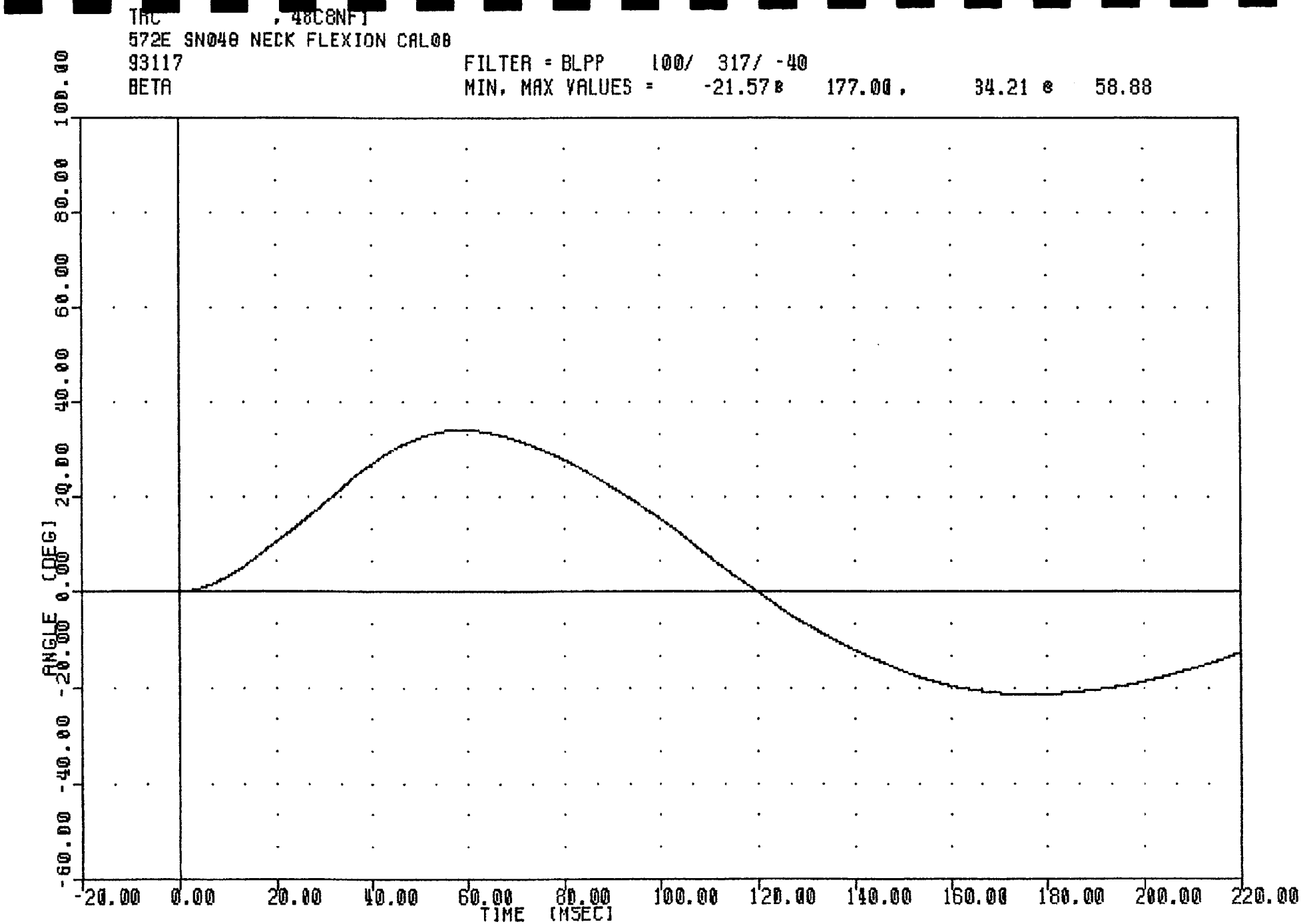
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY		10% - 70%	33.0 %
IMPACT VELOCITY		22.6 - 23.4 FT/SEC	23.08 FT/SEC
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	24.73 G
	20 MS	17.60 - 22.60 G	21.35 G
	30 MS	12.50 - 18.50 G	17.72 G
MAX PENDULUM G		29 G MAX	25.15 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	17.64 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	35.88 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	74.38 DEG.
	TIME	57 - 64 MS	59.25 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.LBS	67.97 FT.LBS
	TIME	47 - 58 MS	49.13 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	118.13 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	98.50 MS

TEST MEETS SPECIFICATIONS

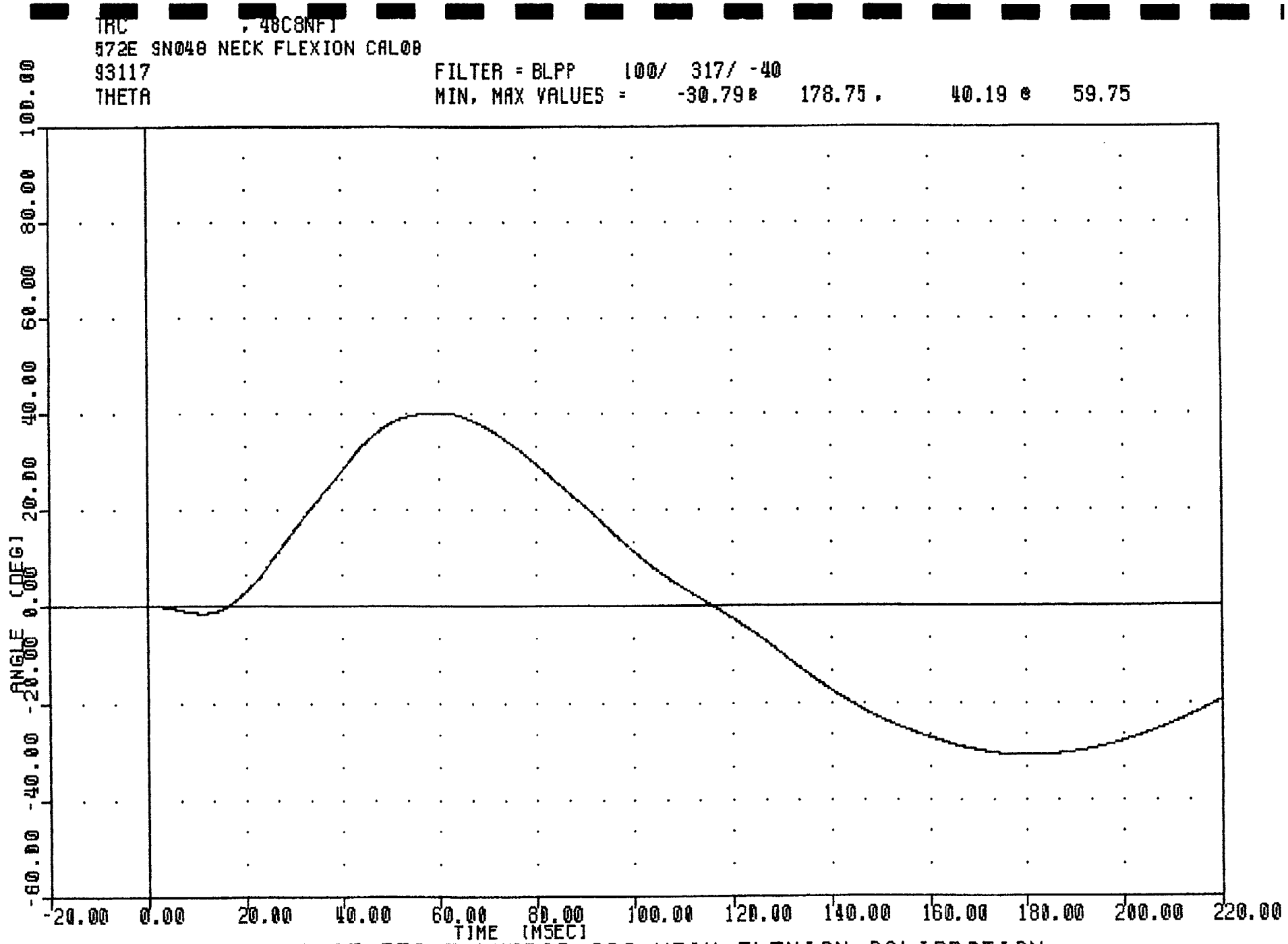
TECHNICIAN Pete Fox



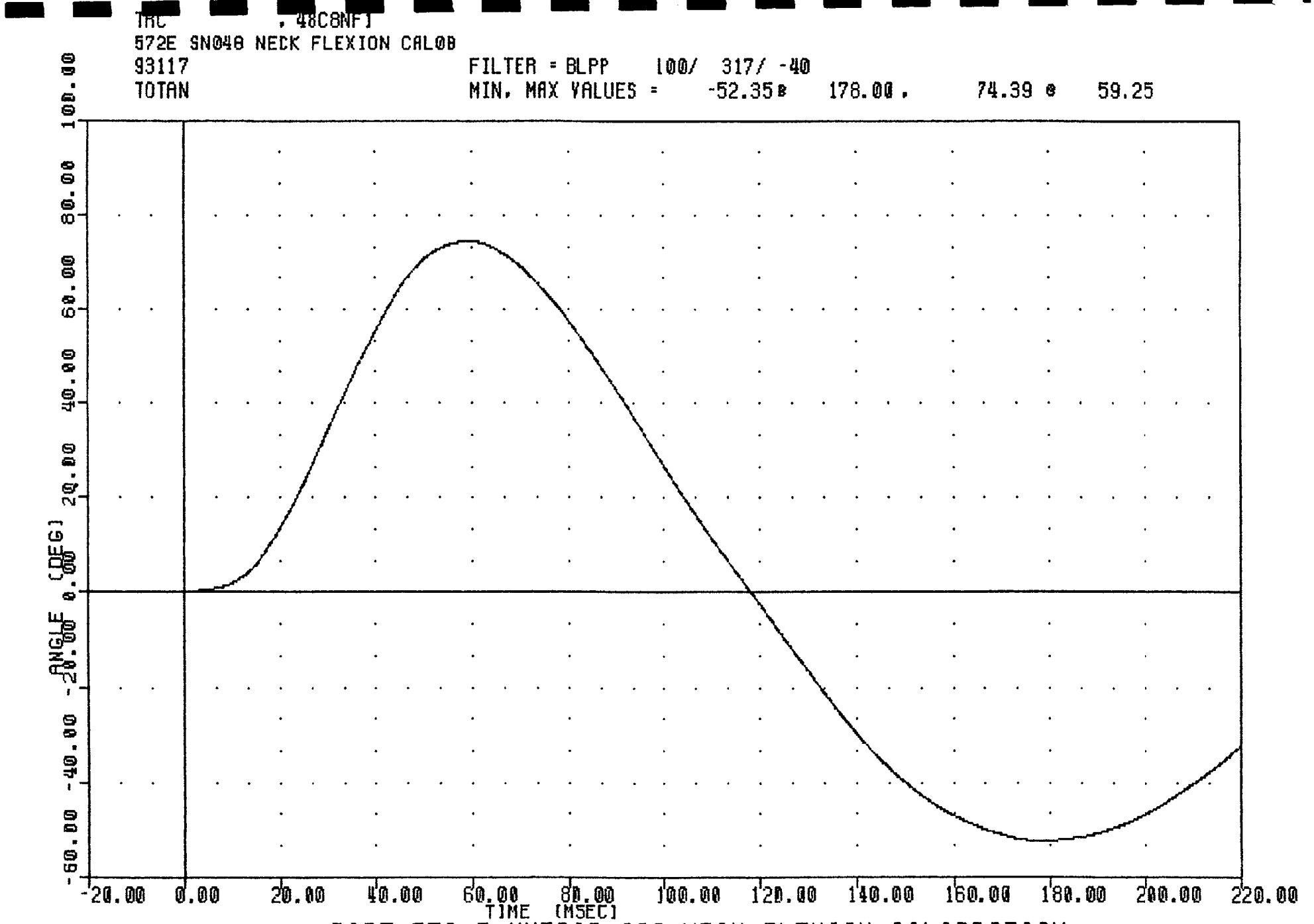
PART 572-E HYBRID III NECK FLEXION CALIBRATION
PENDULUM DECELERATION



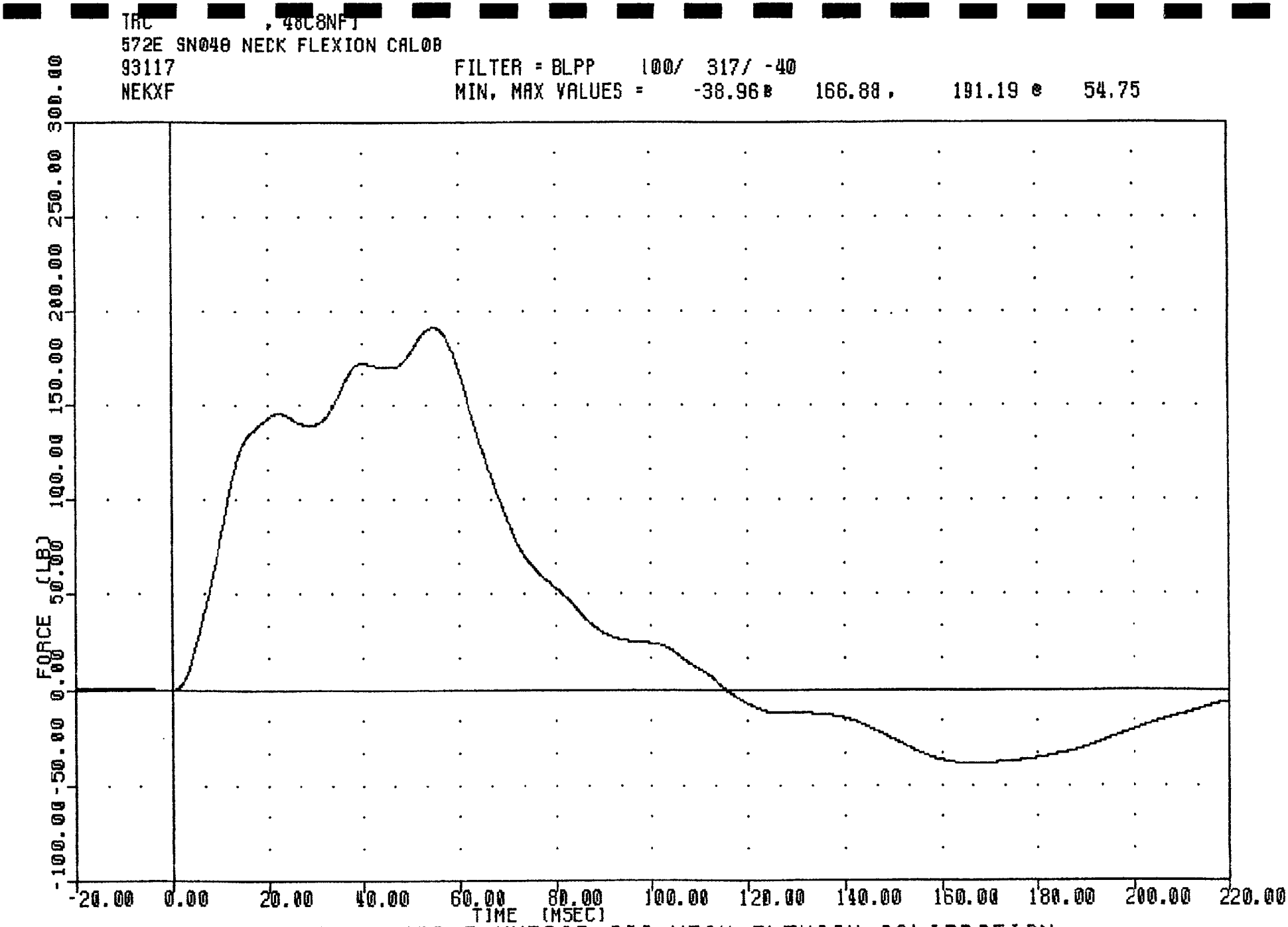
PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK



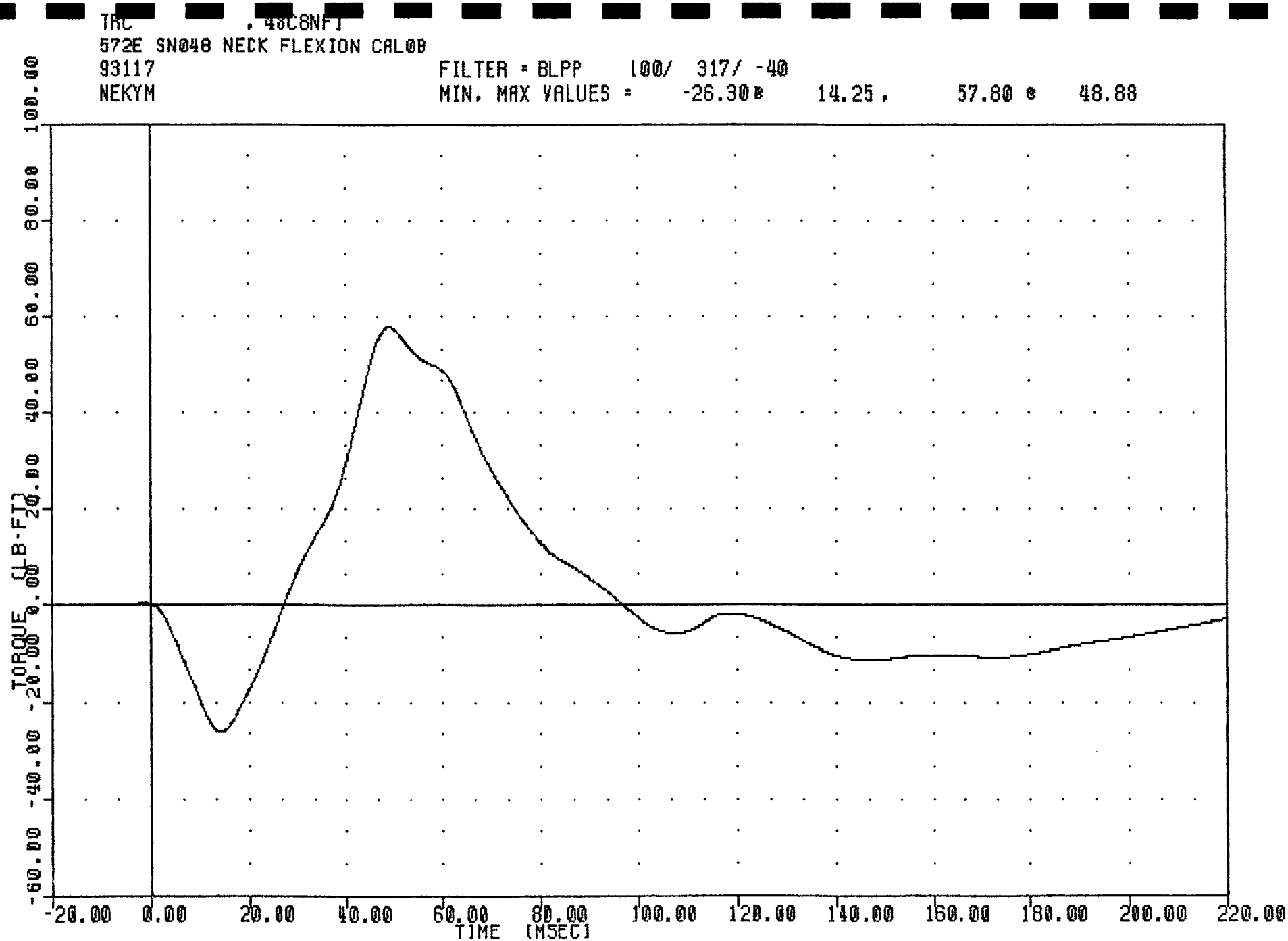
PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE



PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL ROTATION

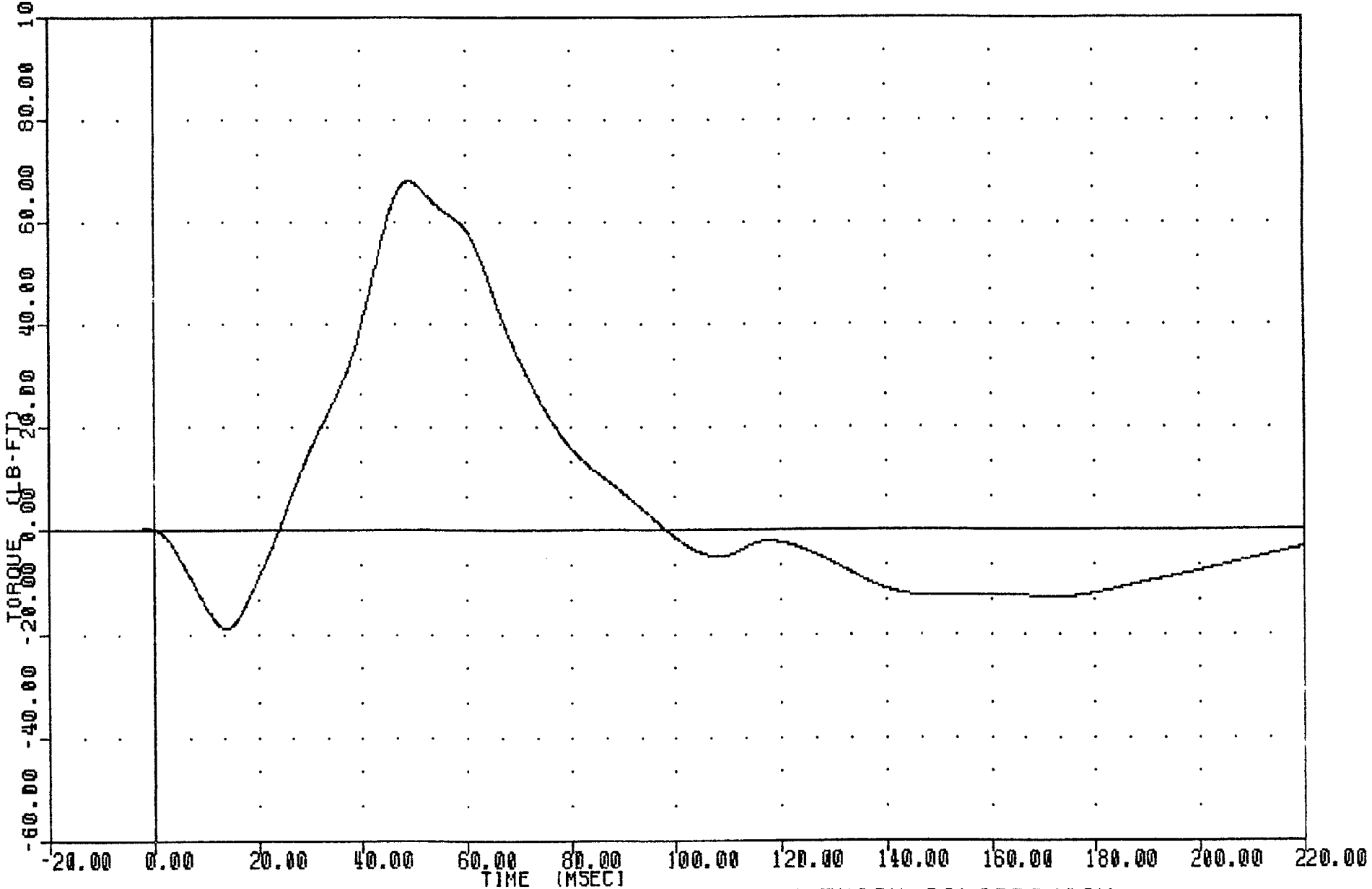


PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK FORCE X AXIS



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

TRC , 48C8NF]
572E SN048 NECK FLEXION CAL08
93117 FILTER = BLPP [00/ 317/ -40
NEKOM MIN, MAX VALUES = -19.04 @ 13.75 , 67.97 @ 49.13



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

TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST

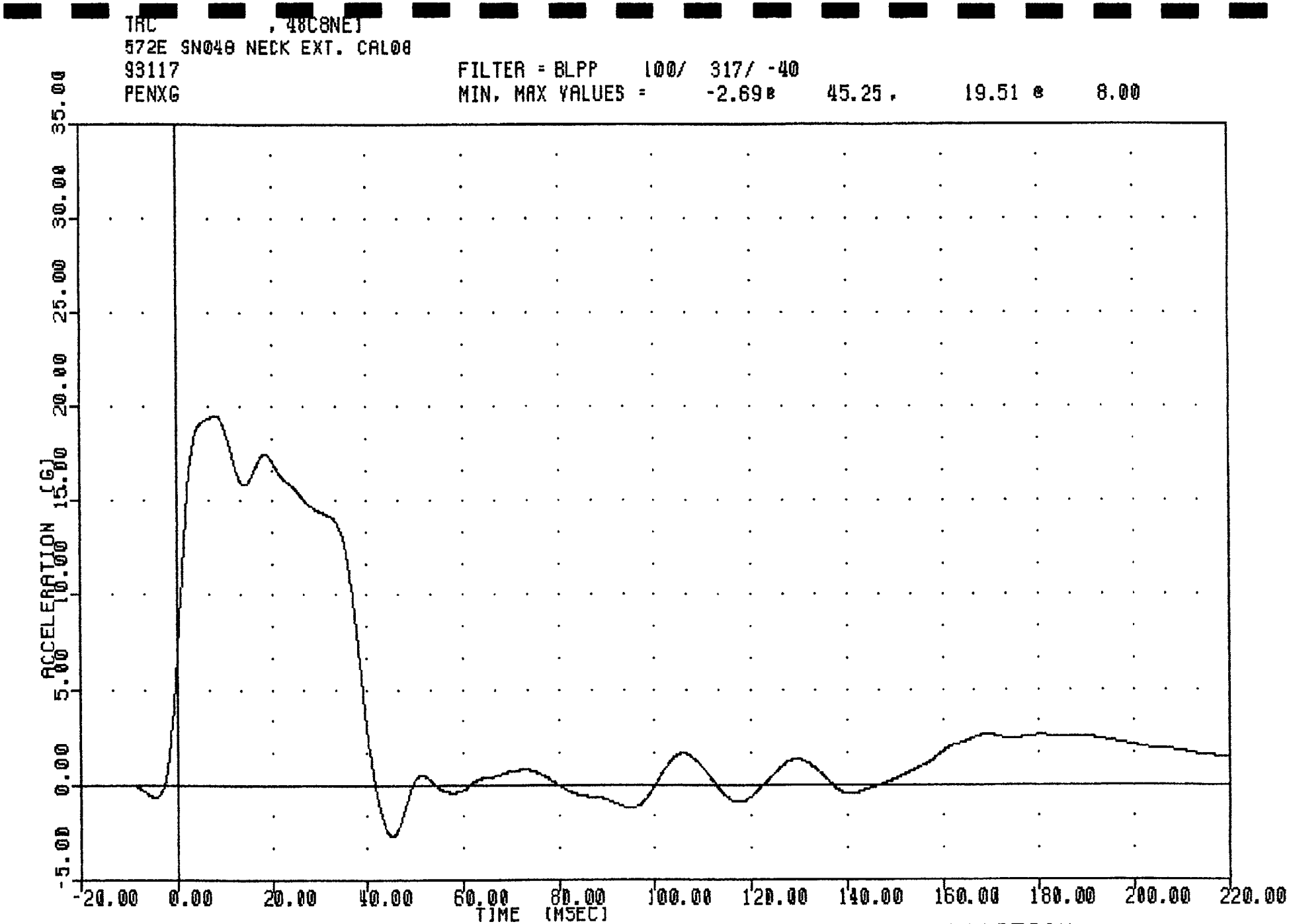
HYBRID III 27-APR-93

6 AXIS NECK TRANSDUCER
TRC 48C8NE1 572E SN048 NECK EXT. CAL08

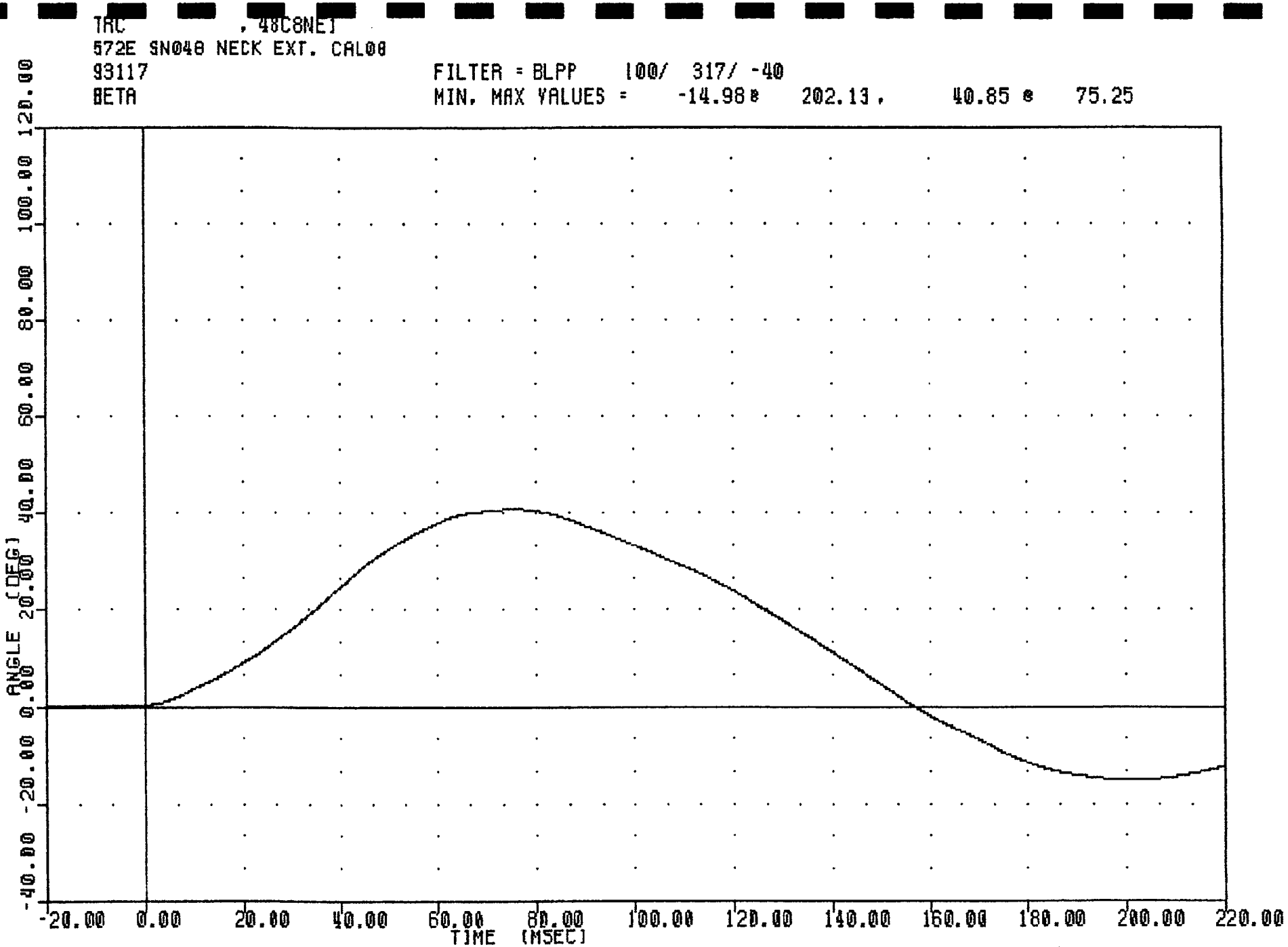
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY		10% - 70%	33.0 %
IMPACT VELOCITY		19.5-20.3 FT/SEC	19.83 FT/SEC
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.84 G
	20 MS	14.00 - 19.00 G	17.14 G
	30 MS	11.00 - 16.00 G	14.44 G
MAX PENDULUM G		22 G MAX	19.51 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	14.43 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	39.00 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	100.52 DEG.
	TIME	72 - 82 MS	75.38 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-59.0/-39.0 FT.LBS	-52.87 FT.LBS
	TIME	65 - 79 MS	69.50 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	156.38 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	141.50 MS

TEST MEETS SPECIFICATIONS

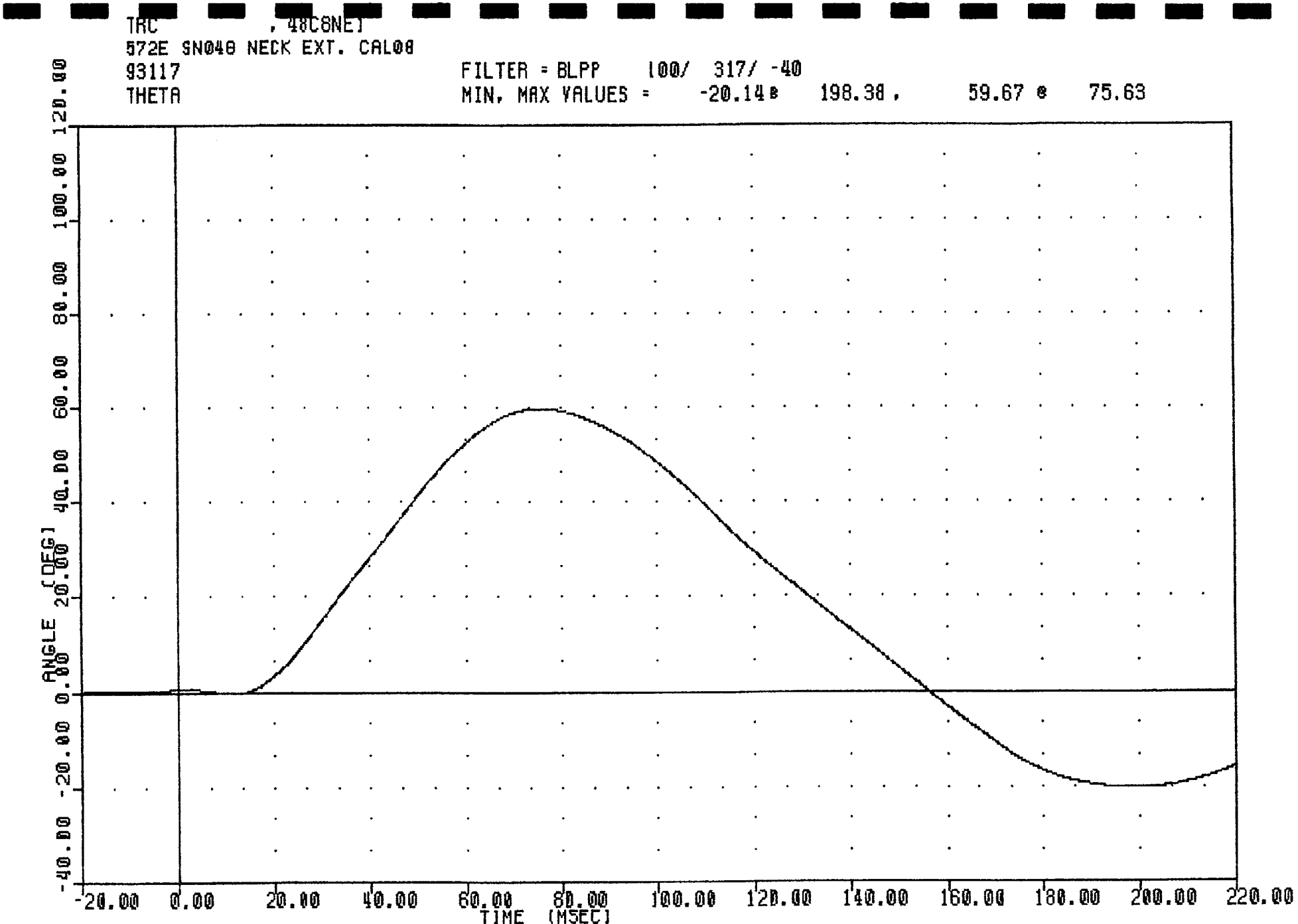
TECHNICIAN Pete Fox



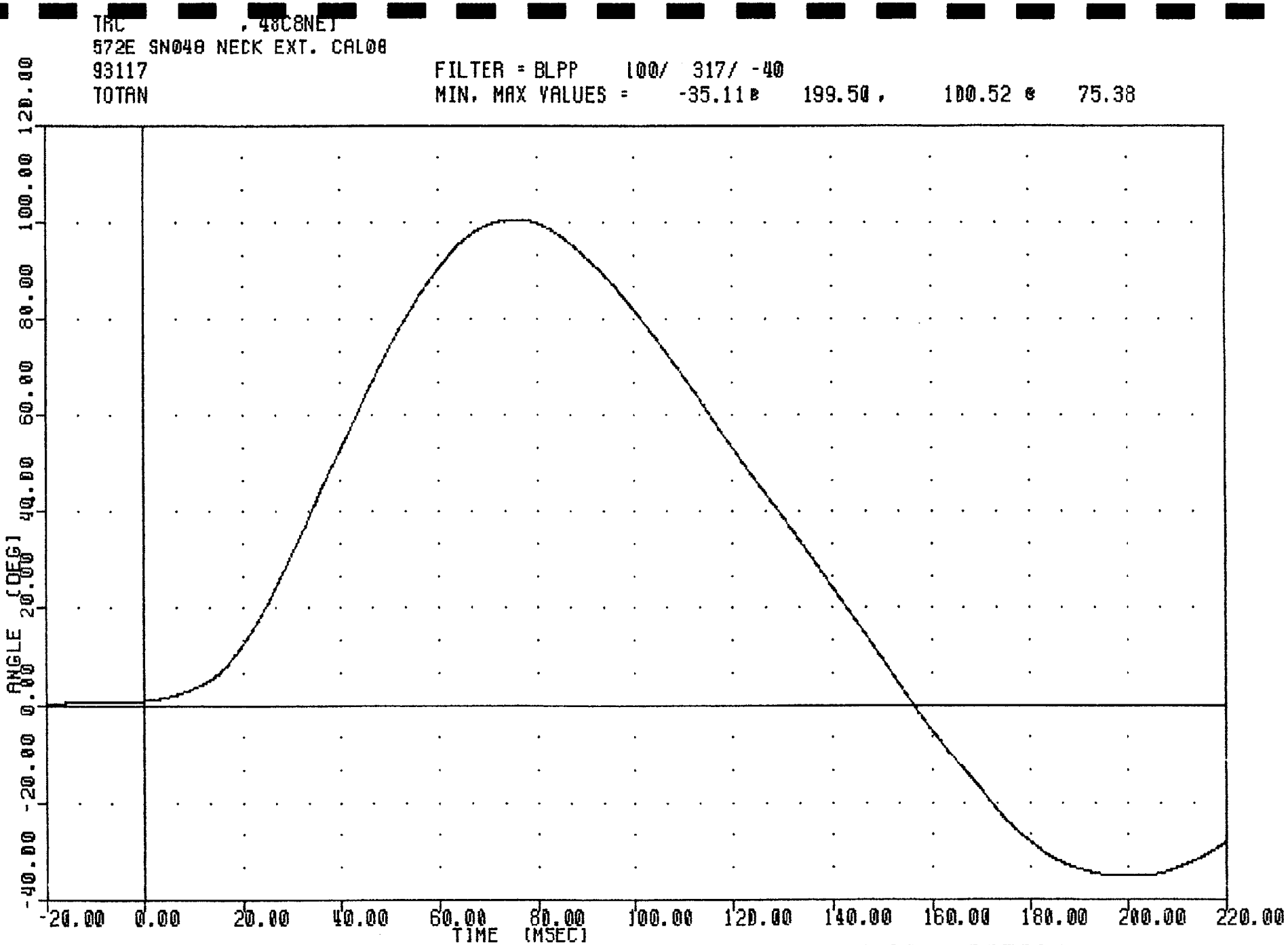
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
PENDULUM DECELERATION



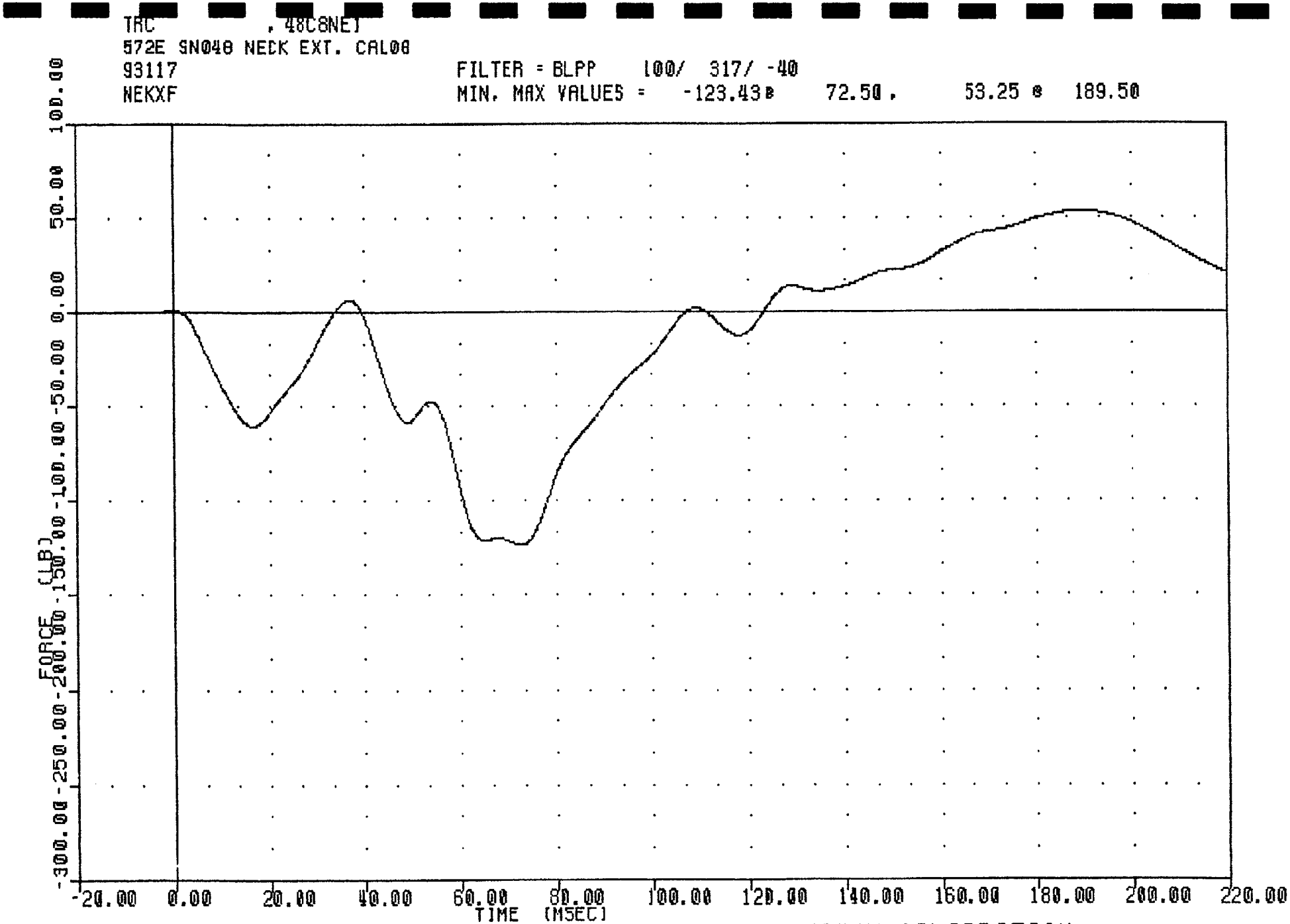
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT BASE OF NECK



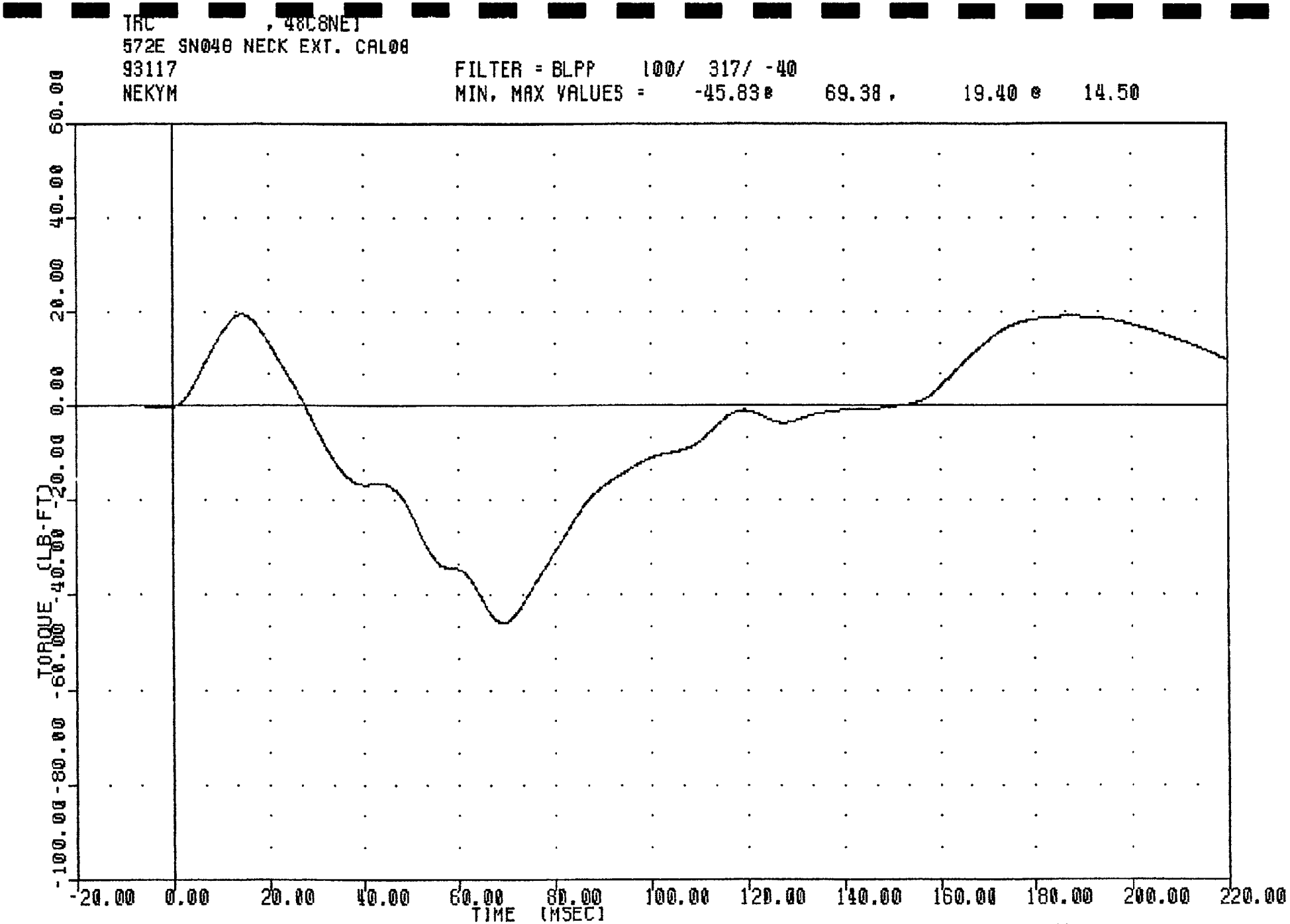
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE



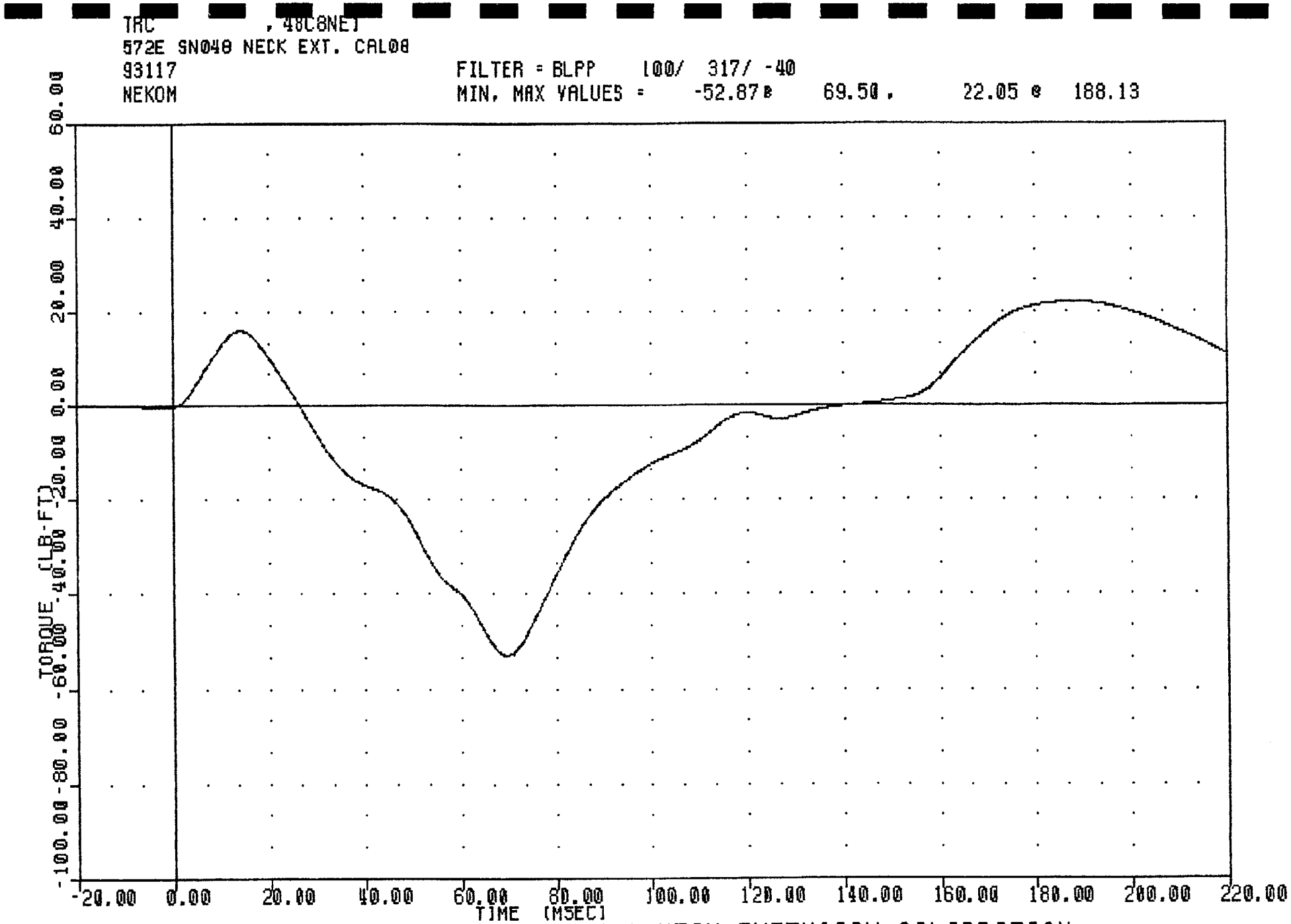
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL ROTATION



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



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



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

TRANSPORTATION RESEARCH CENTER INC.

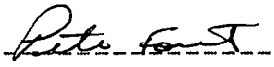
THORAX IMPACT TEST

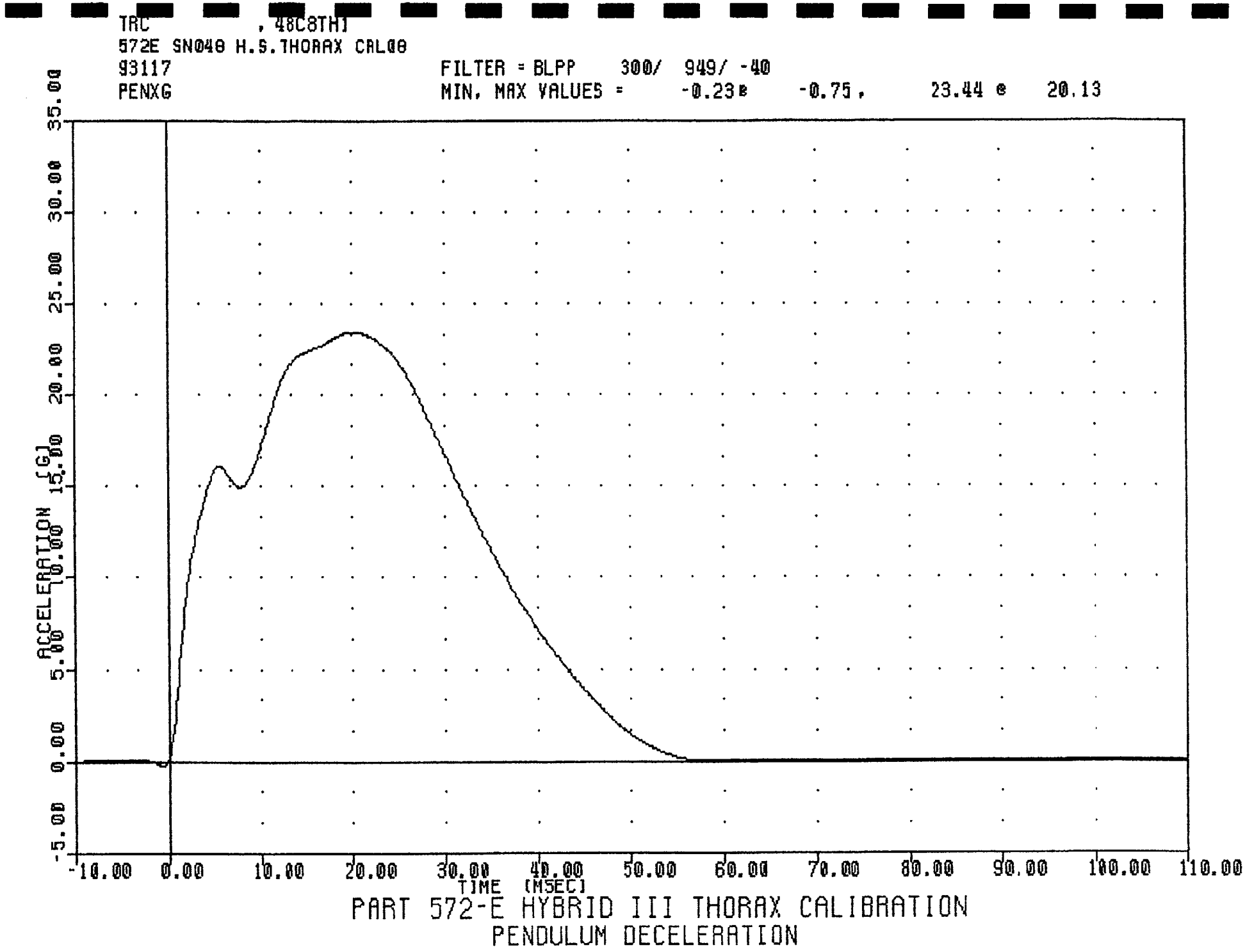
HYBRID III 27-APR-93

TRC 48C8TH1 572E SN048 H.S.THORAX CAL08

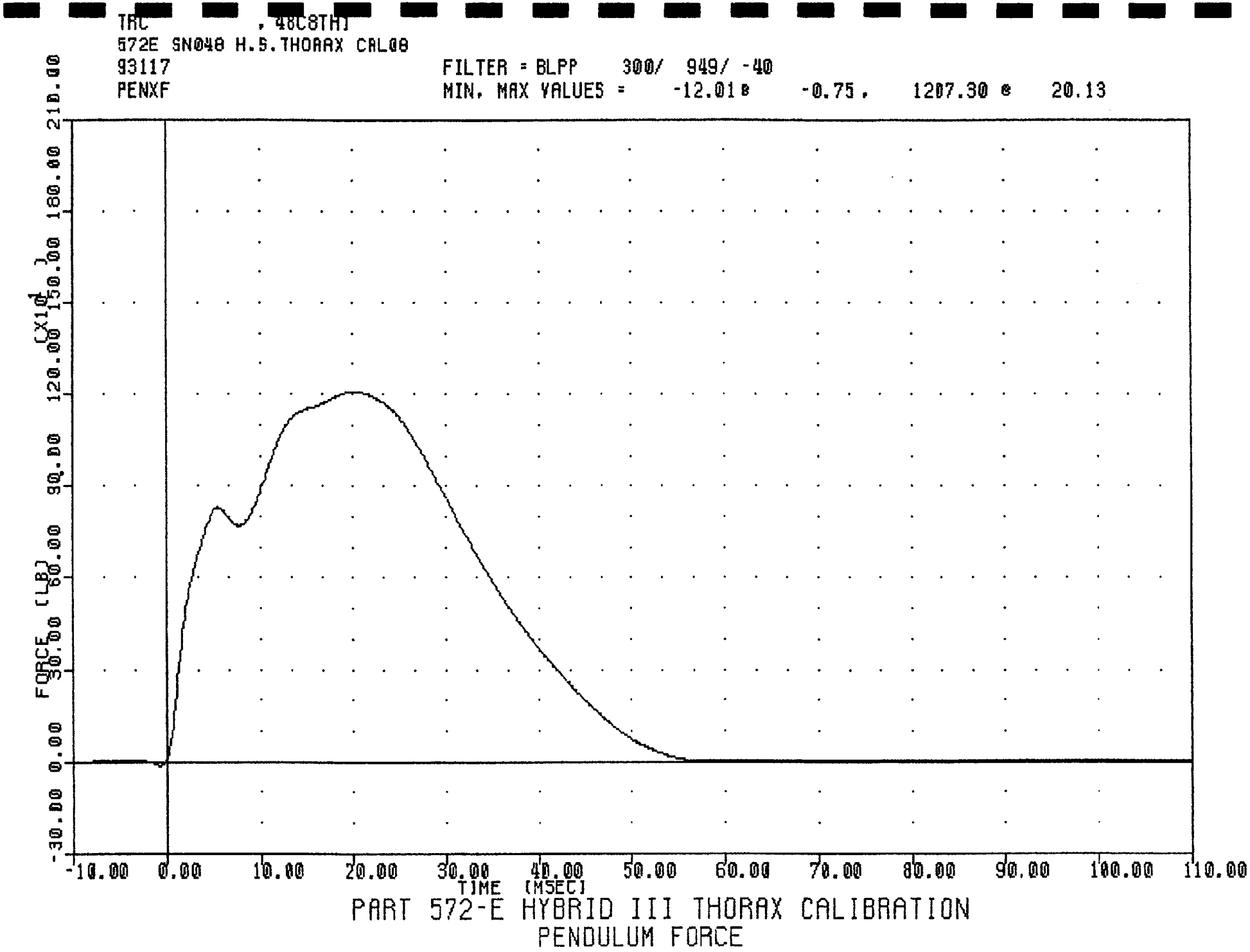
TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	33.0 %
PENDULUM VELOCITY	21.6-22.4 FT/SEC	21.91 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 IN	2.75 IN
MAXIMUM RESISTIVE FORCE	1160 - 1325 LBS	1207.3 LBS
INTERNAL HYSTERESIS	69% - 85%	71.9%

TEST MEETS SPECIFICATIONS

TECHNICIAN 

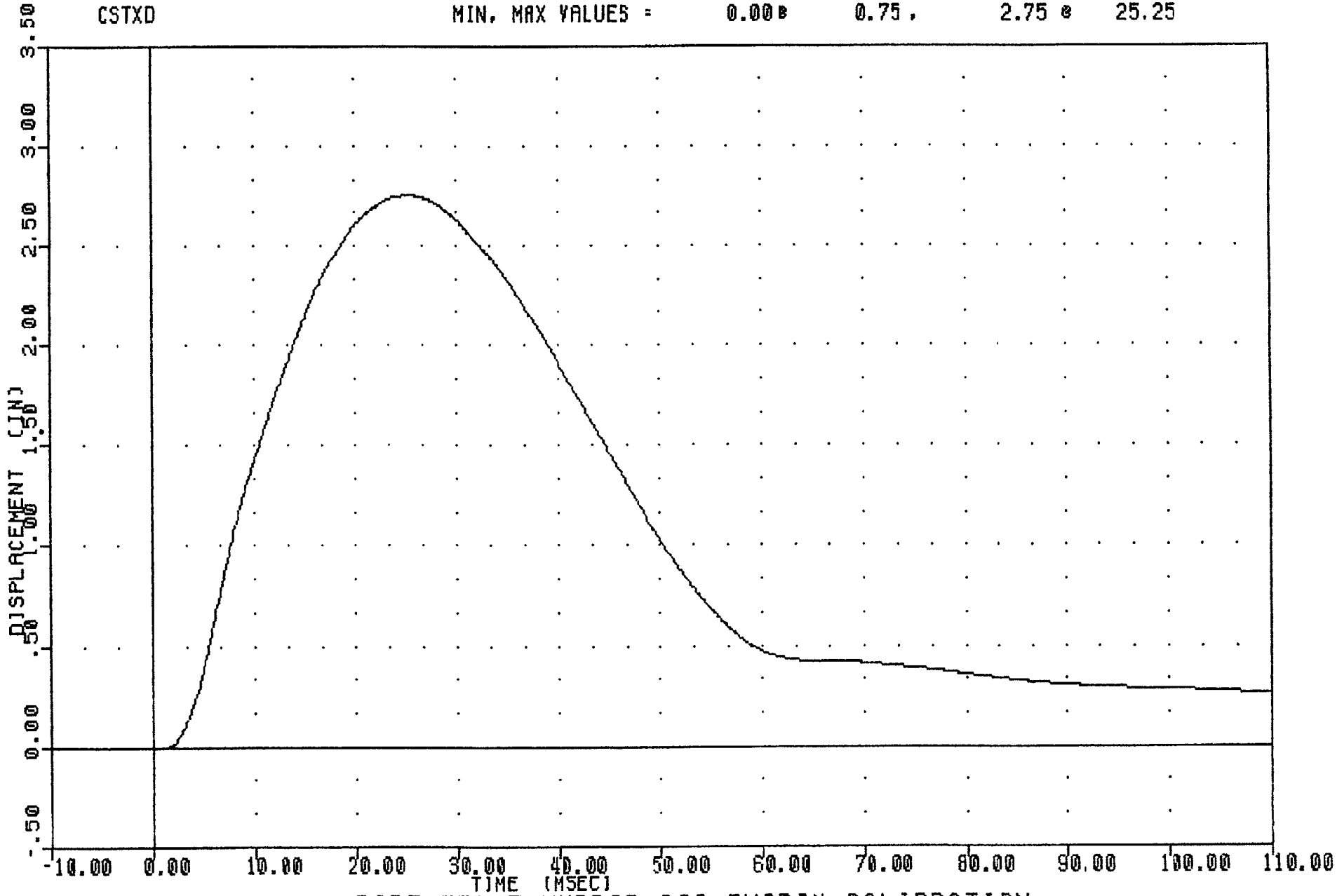


PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION

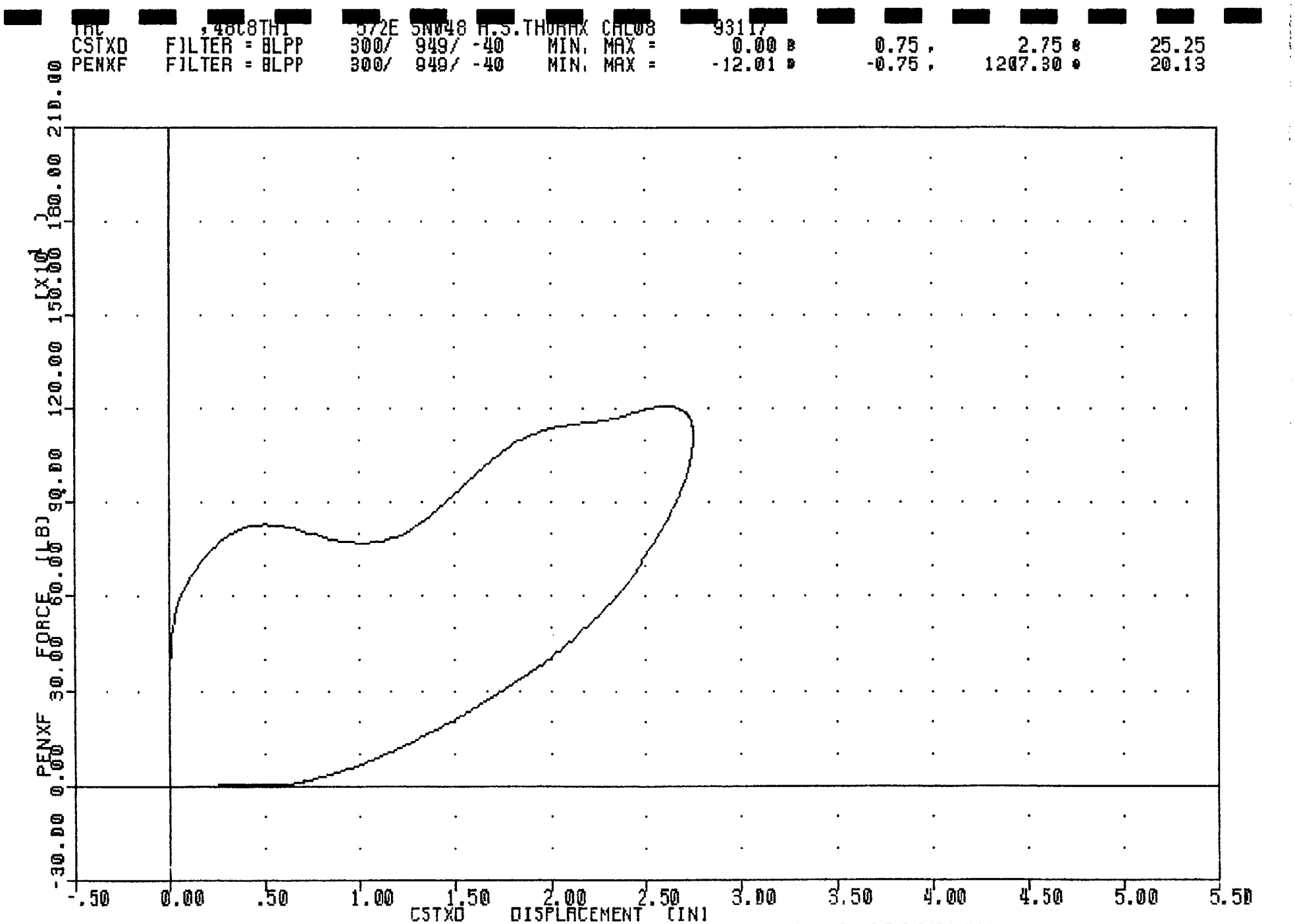


PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM FORCE

TRC , 48C8TH]
572E SN048 H.S.THORAX CAL08
93117 FILTER = BLPP 300/ 949/ -40
CSTXD MIN, MAX VALUES = 0.00 @ 0.75 , 2.75 @ 25.25



PART 572-E HYBRID III THORAX CALIBRATION
STERNUM DISPLACEMENT



PART 572-E HYBRID III THORAX CALIBRATION

CHEST DISPLACEMENT VS PENDULUM FORCE

TRANSPORTATION RESEARCH CENTER INC.

KNEE IMPACT TEST

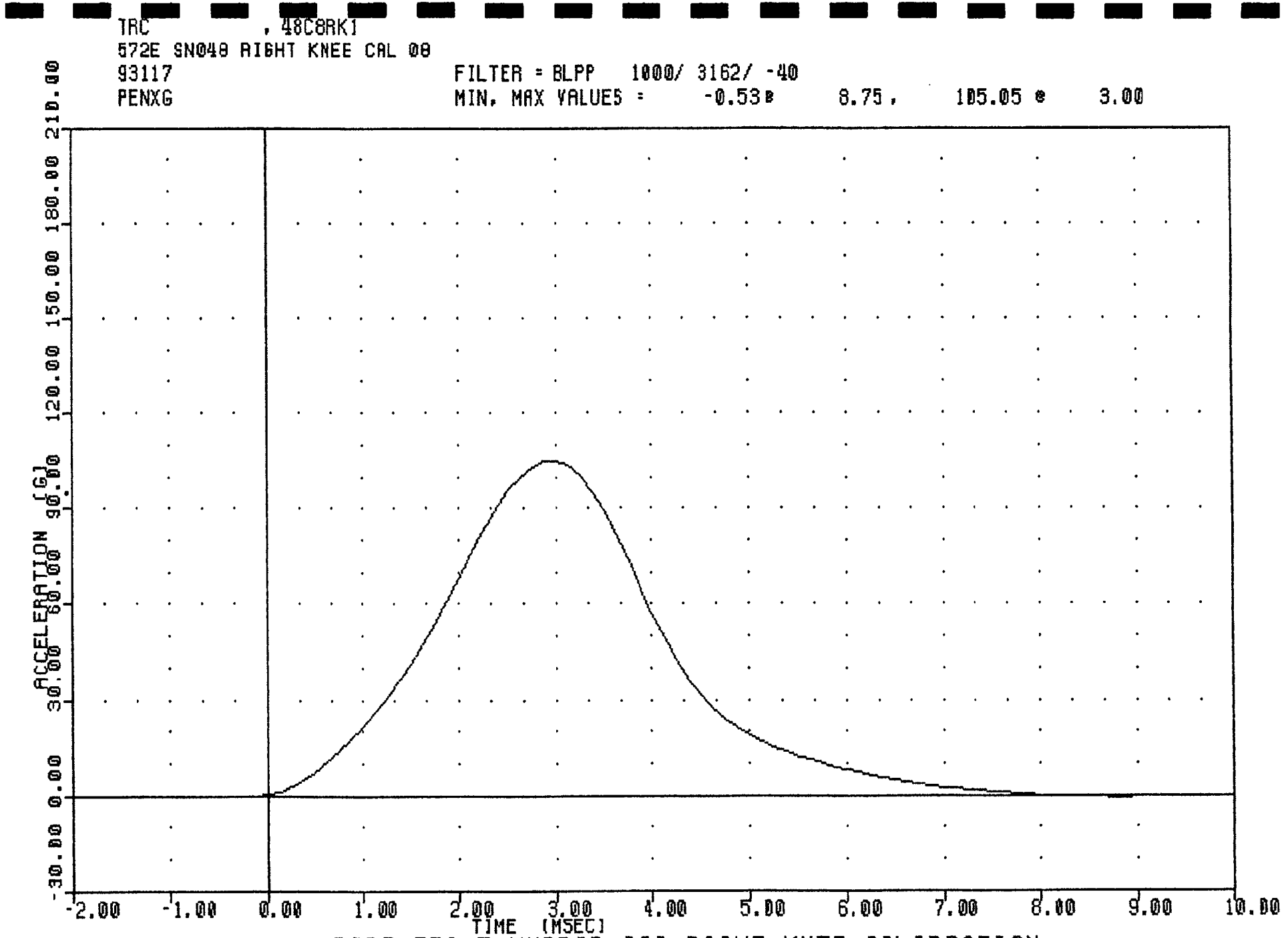
HYBRID III 27-APR-93

RIGHT KNEE
TRC 48C8RK1 572E SN048 RIGHT KNEE CAL 08

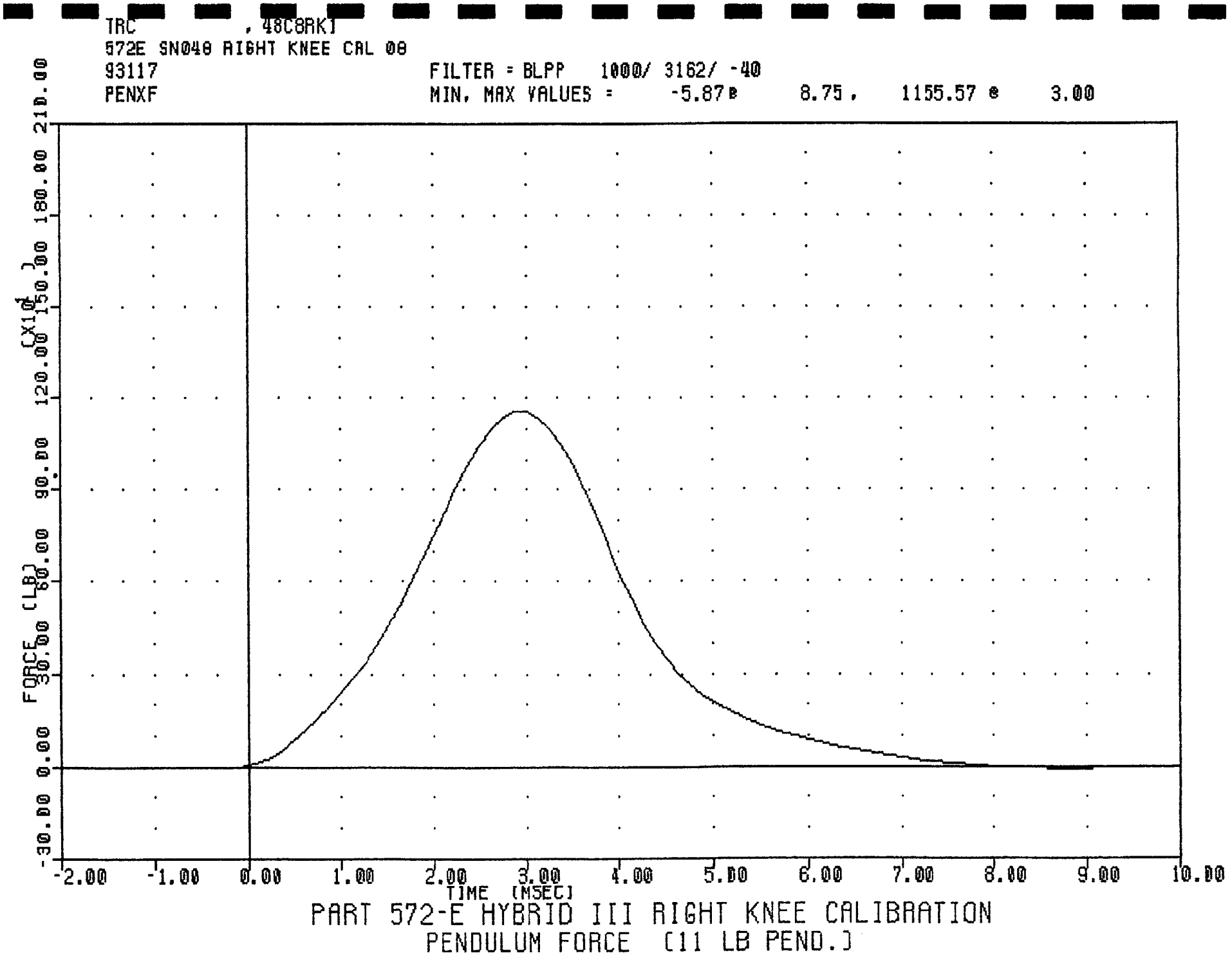
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	33.0 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.91 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1155.57 LBS
PROBE WEIGHT	11.0 LBS	

TEST MEETS SPECIFICATIONS

TECHNICIAN Lita Fouts



PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (11 LB PEND.)



PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM FORCE (11 LB PEND.)

TRANSPORTATION RESEARCH CENTER INC.

KNEE IMPACT TEST

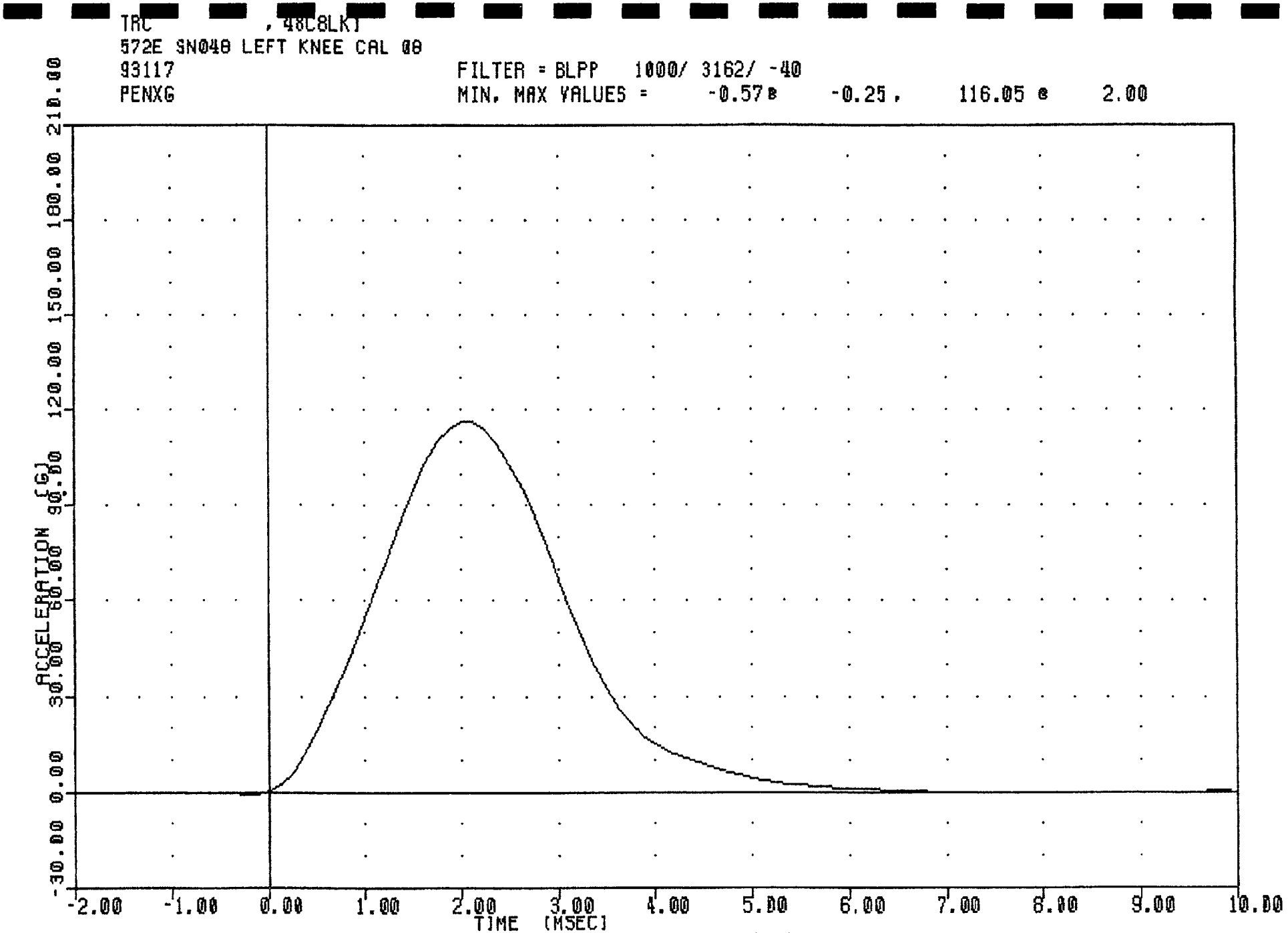
HYBRID III 27-APR-93

LEFT KNEE
TRC 48C8LK1 572E SN048 LEFT KNEE CAL 08

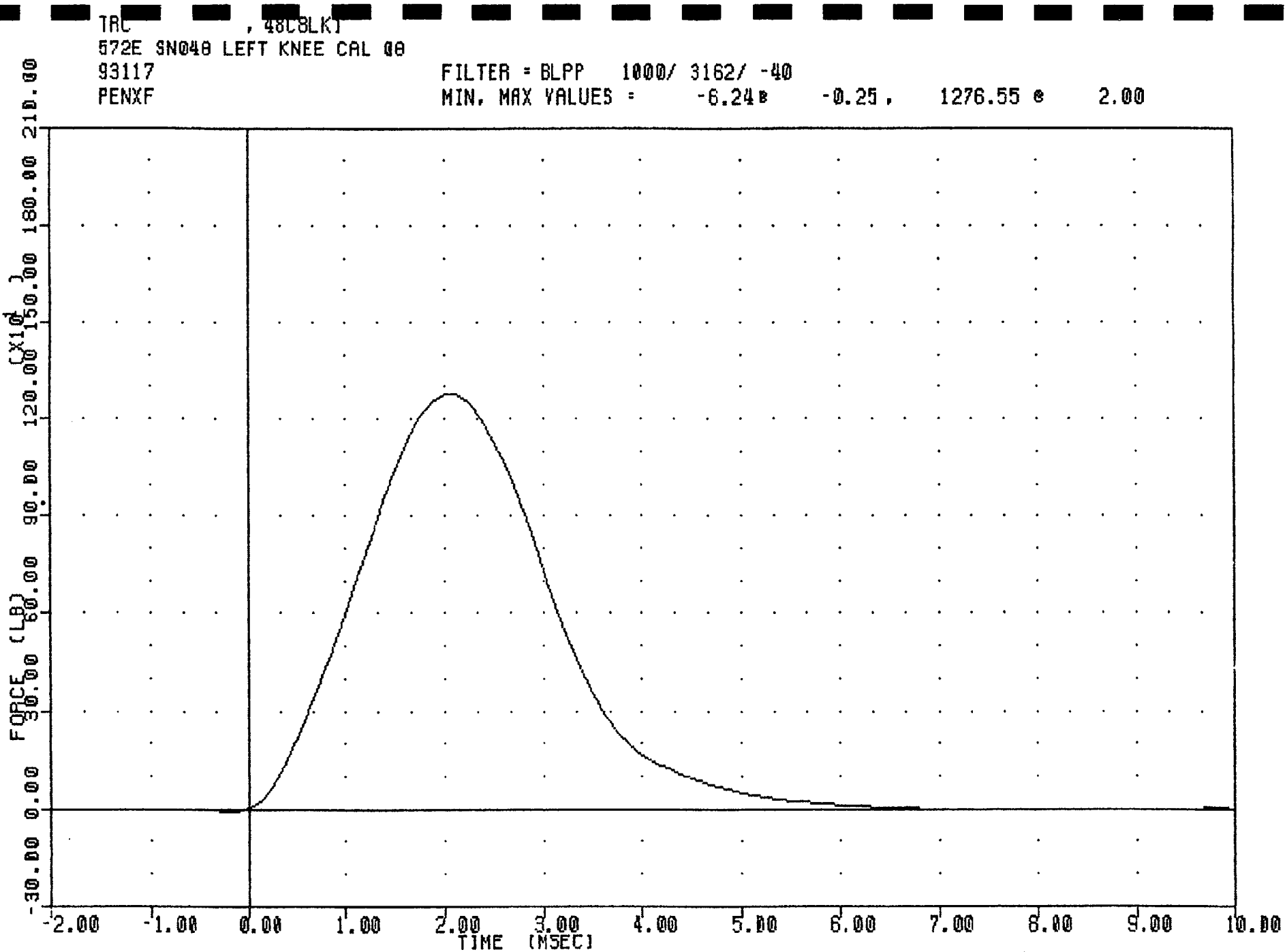
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	33.0 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.94 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1276.55 LBS
PROBE WEIGHT	11.0 LBS	

TEST MEETS SPECIFICATIONS

TECHNICIAN Peter Foster



PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (11 LB PEND.)



PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE (11 LB PEND.)

PRE-TEST CERTIFICATION DATA

PASSENGER DUMMY S/N 043

TRANSPORTATION RESEARCH CENTER INC.
HYBRID III EXTERNAL DIMENSIONS
043 HUMANOID

26-APR-93

TRC 43C4ED1 572E SN043 EXT. DIMENSION CAL04

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 Pete Foust

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III

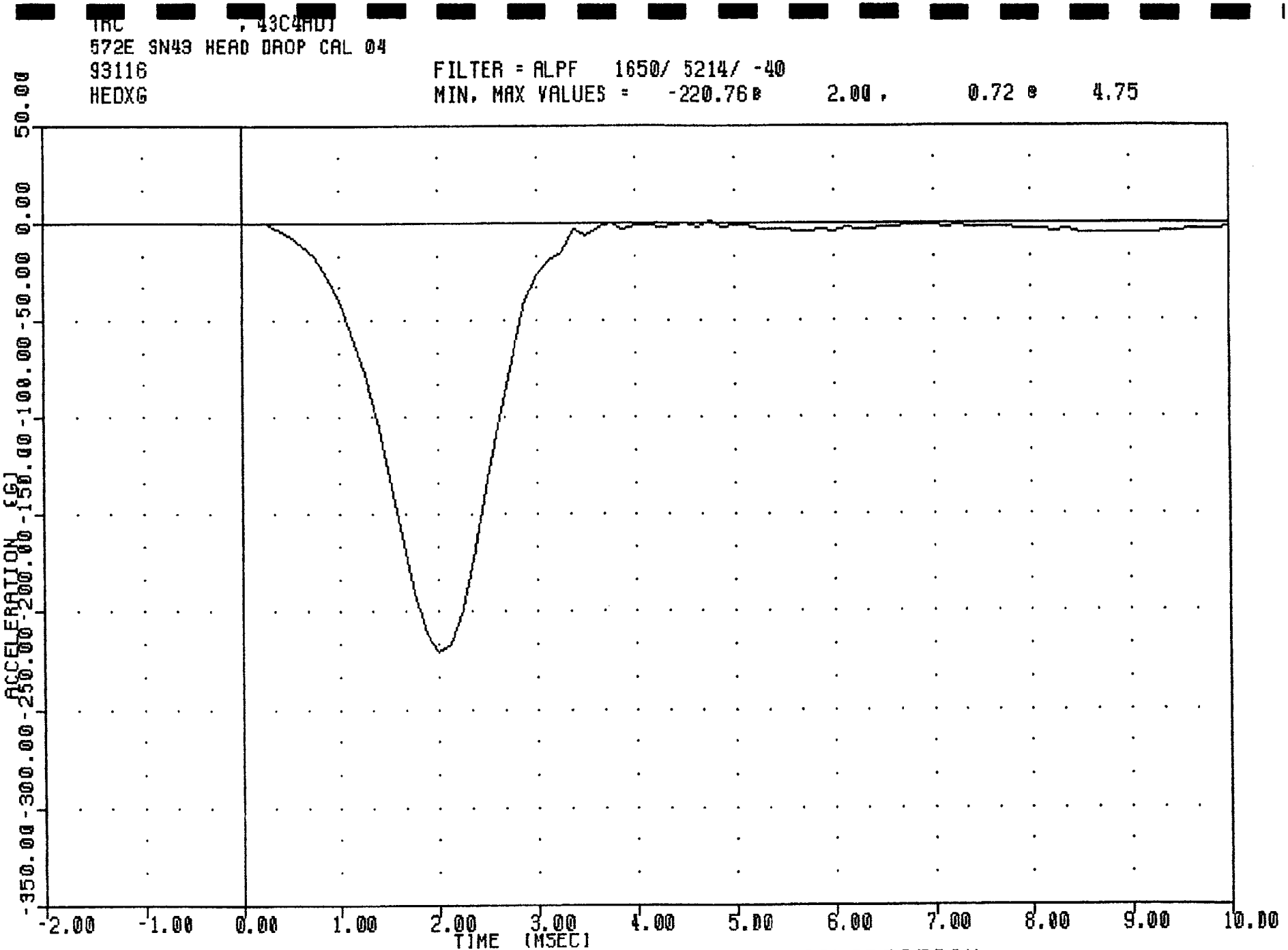
26-APR-93

TRC 43C4HD1 572E SN43 HEAD DROP CAL 04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	41.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	252.96 G
PEAK LATERAL ACCELERATION	15 G MAX	3.14 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

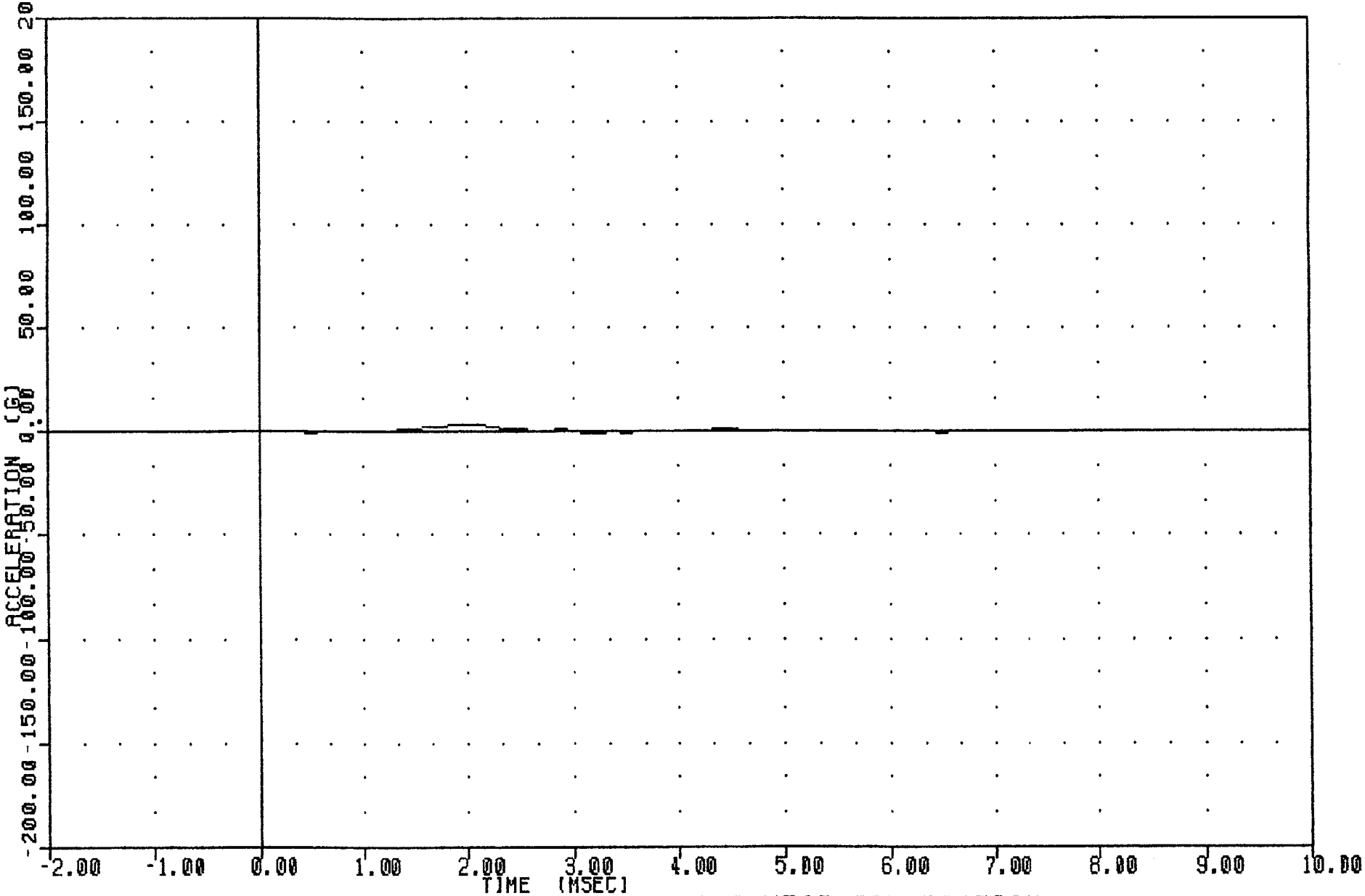
TEST MEETS SPECIFICATIONS

TECHNICIAN Peter Foust



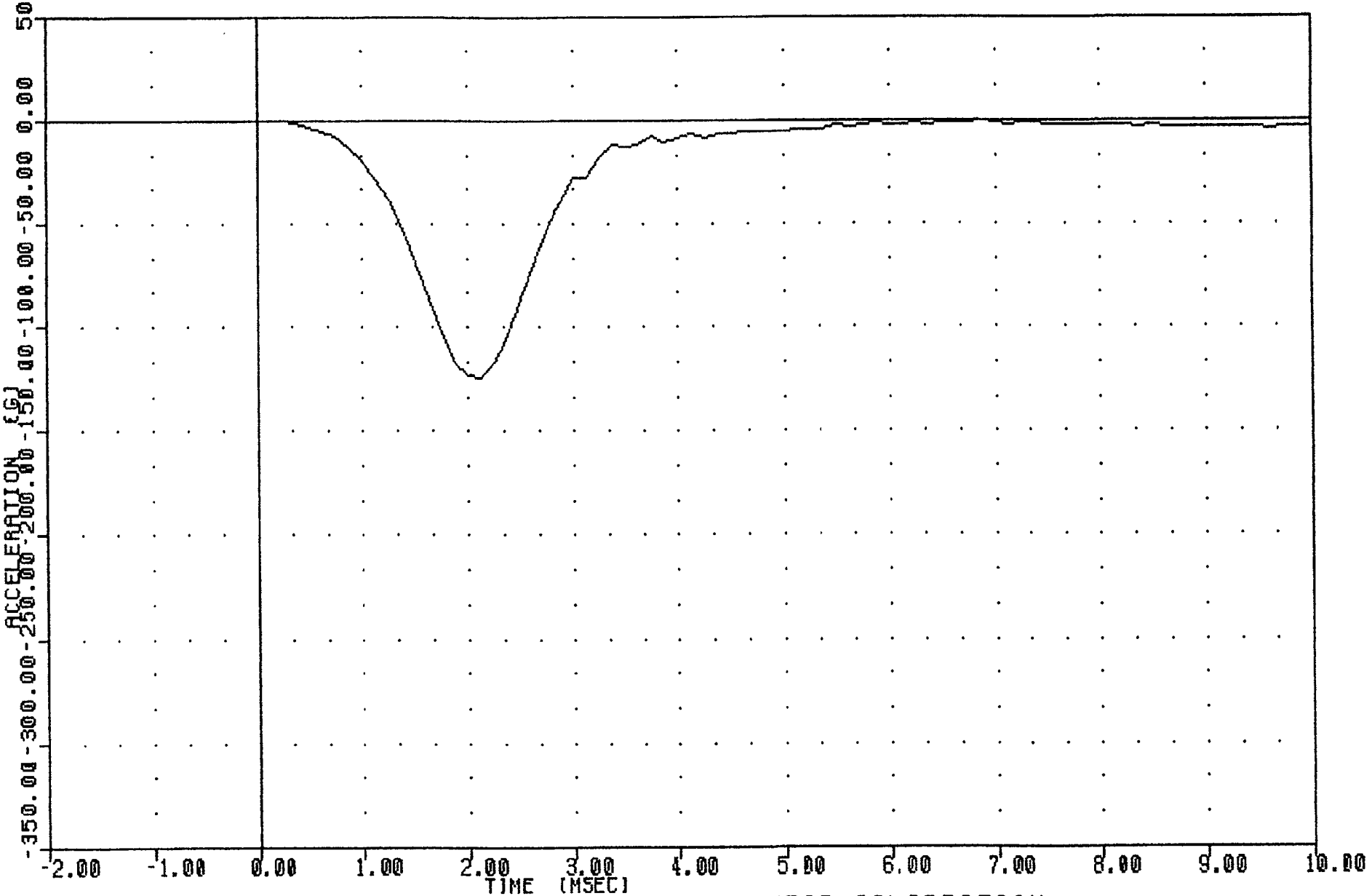
PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS

TRC , 43C4HD1
572E SN43 HEAD DROP CAL 04
93116 FILTER = ALPF 1650/ 5214/ -40
HEDYG MIN. MAX VALUES = -0.88 @ 3.13 , 3.15 @ 2.00

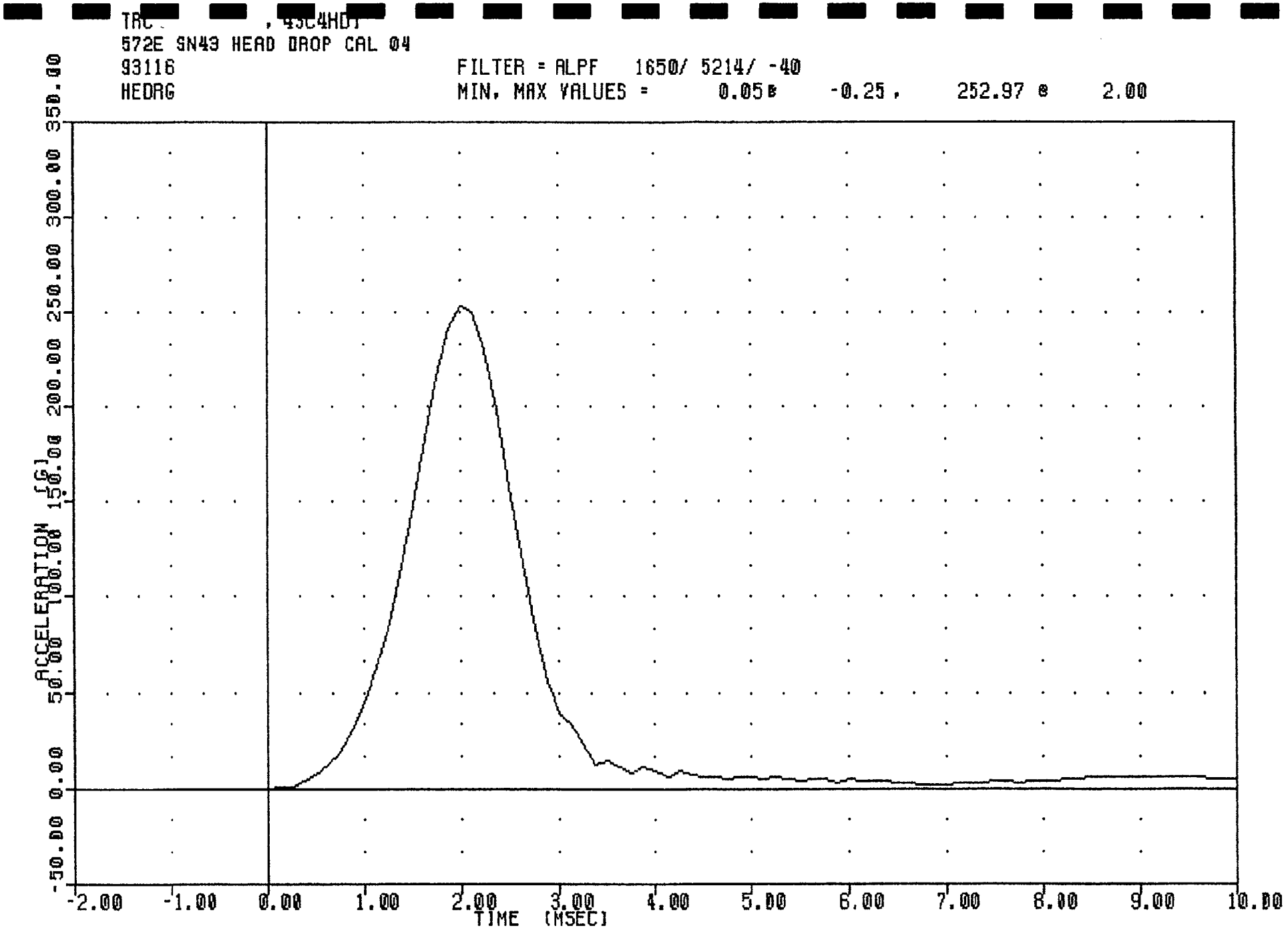


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

TRC , 43C4RD1
572E SN43 HEAD DROP CAL 04
93116
HEDZG
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -124.55 @ 2.13 , 0.02 @ -2.00



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



PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST

HYBRID III 26-APR-93

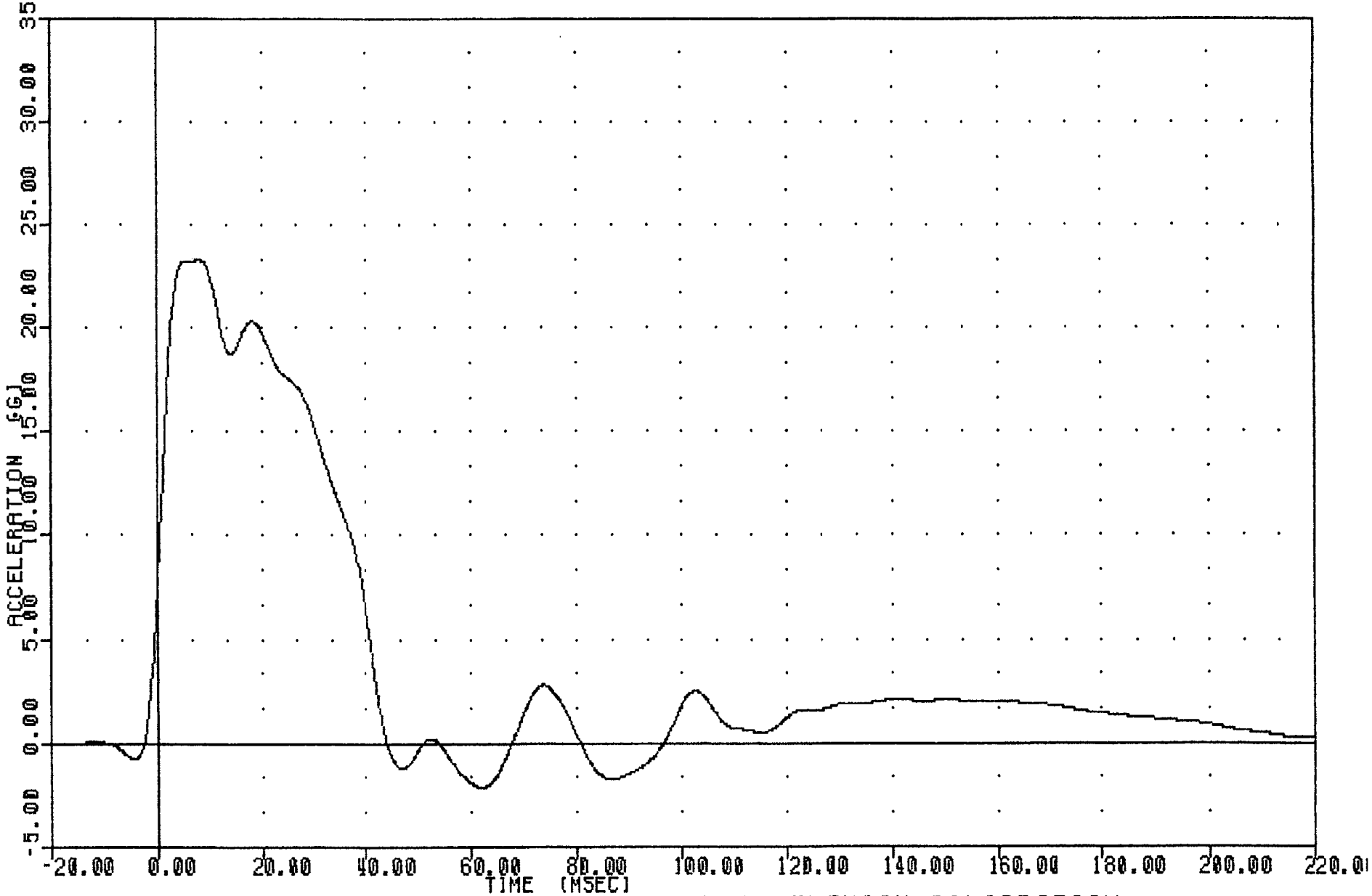
6 AXIS NECK TRANSDUCER
TRC 43C4NF1 572E SN043 NECK FLEXION CAL04

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY		10% - 70%	41.0 %
IMPACT VELOCITY		22.6 - 23.4 FT/SEC	23.08 FT/SEC
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	22.58 G
	20 MS	17.60 - 22.60 G	19.78 G
	30 MS	12.50 - 18.50 G	15.34 G
MAX PENDULUM G		29 G MAX	23.27 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	15.23 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	40.63 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	66.02 DEG.
	TIME	57 - 64 MS	59.00 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.LBS	69.57 FT.LBS
	TIME	47 - 58 MS	52.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	115.25 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	99.75 MS

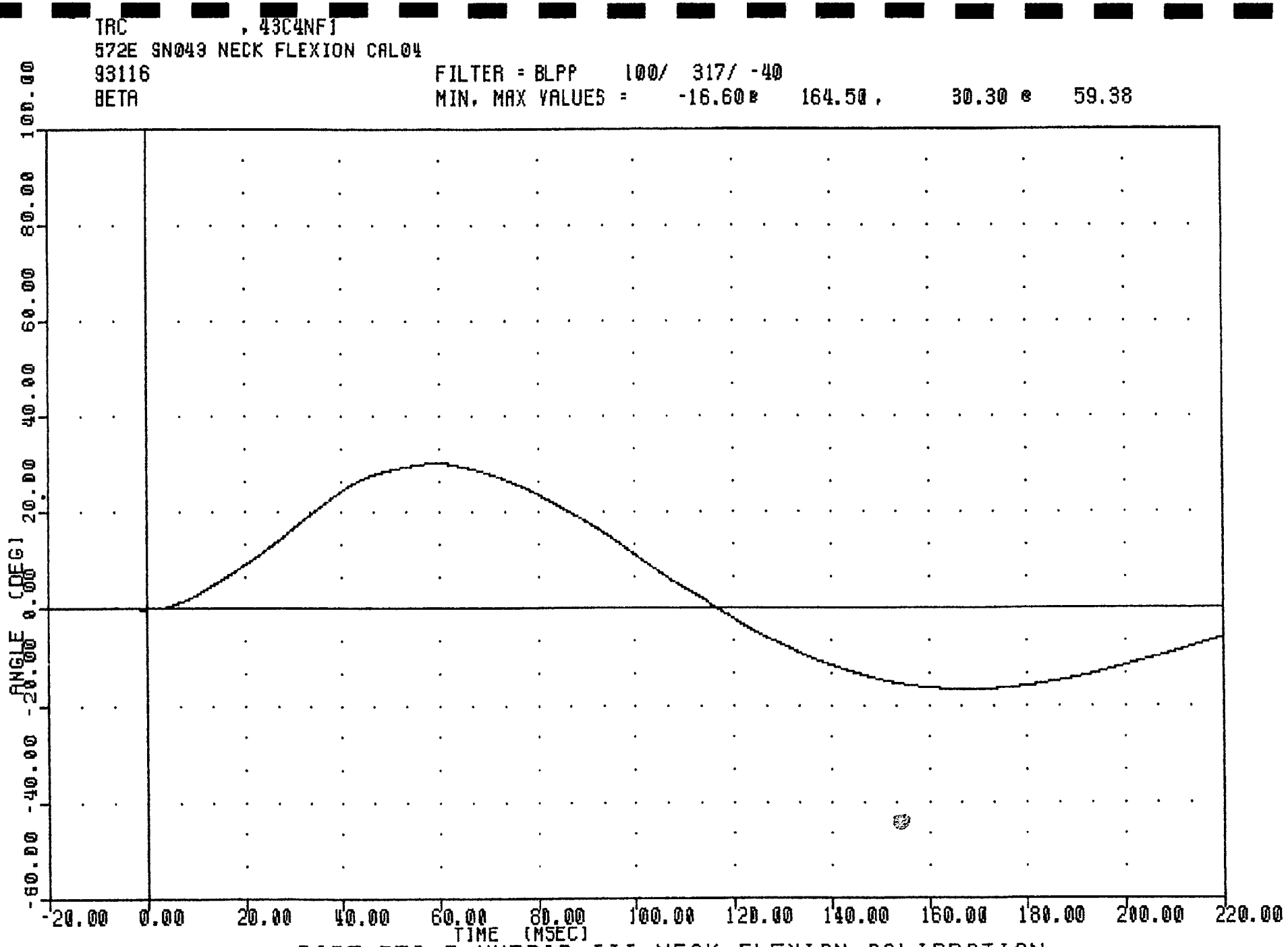
TEST MEETS SPECIFICATIONS

TECHNICIAN Pete Smith

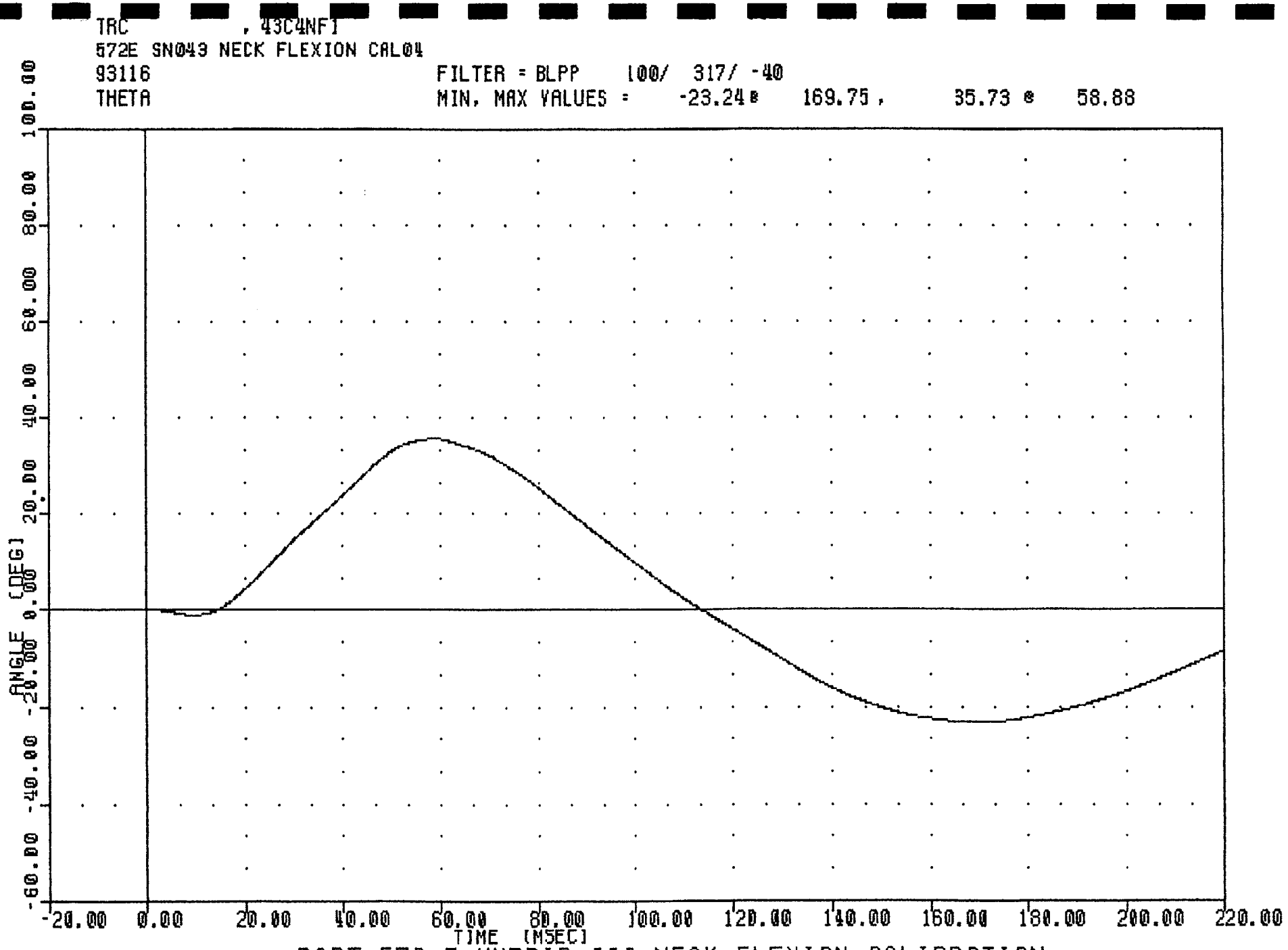
TRC , 43C4NF1
572E SN043 NECK FLEXION CAL04
93116 FILTER = BLPP 100/ 317/ -40
PENXG MIN, MAX VALUES = -2.16 @ 61.88 , 23.28 @ 8.13



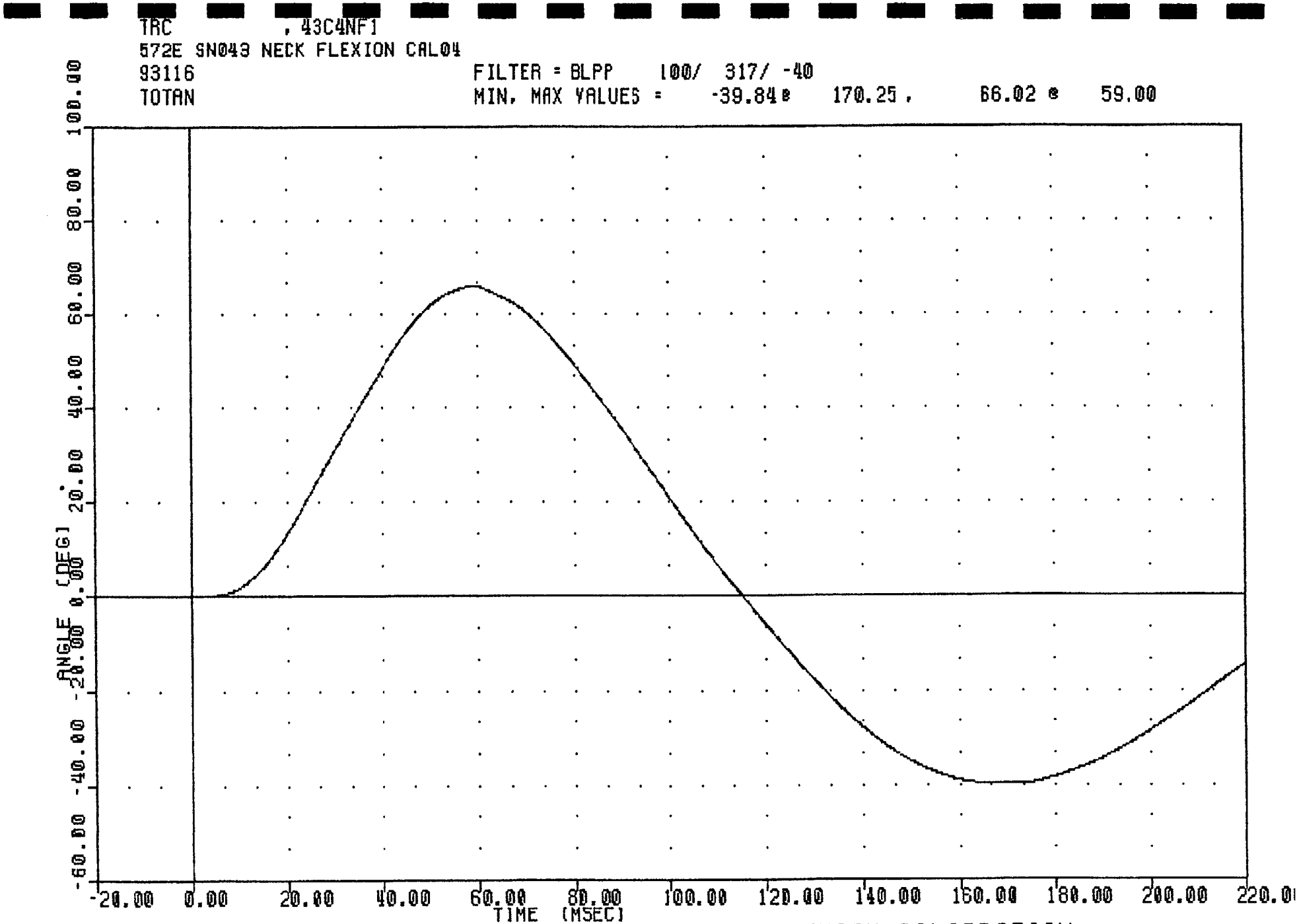
PART 572-E HYBRID III NECK FLEXION CALIBRATION
PENDULUM DECELERATION



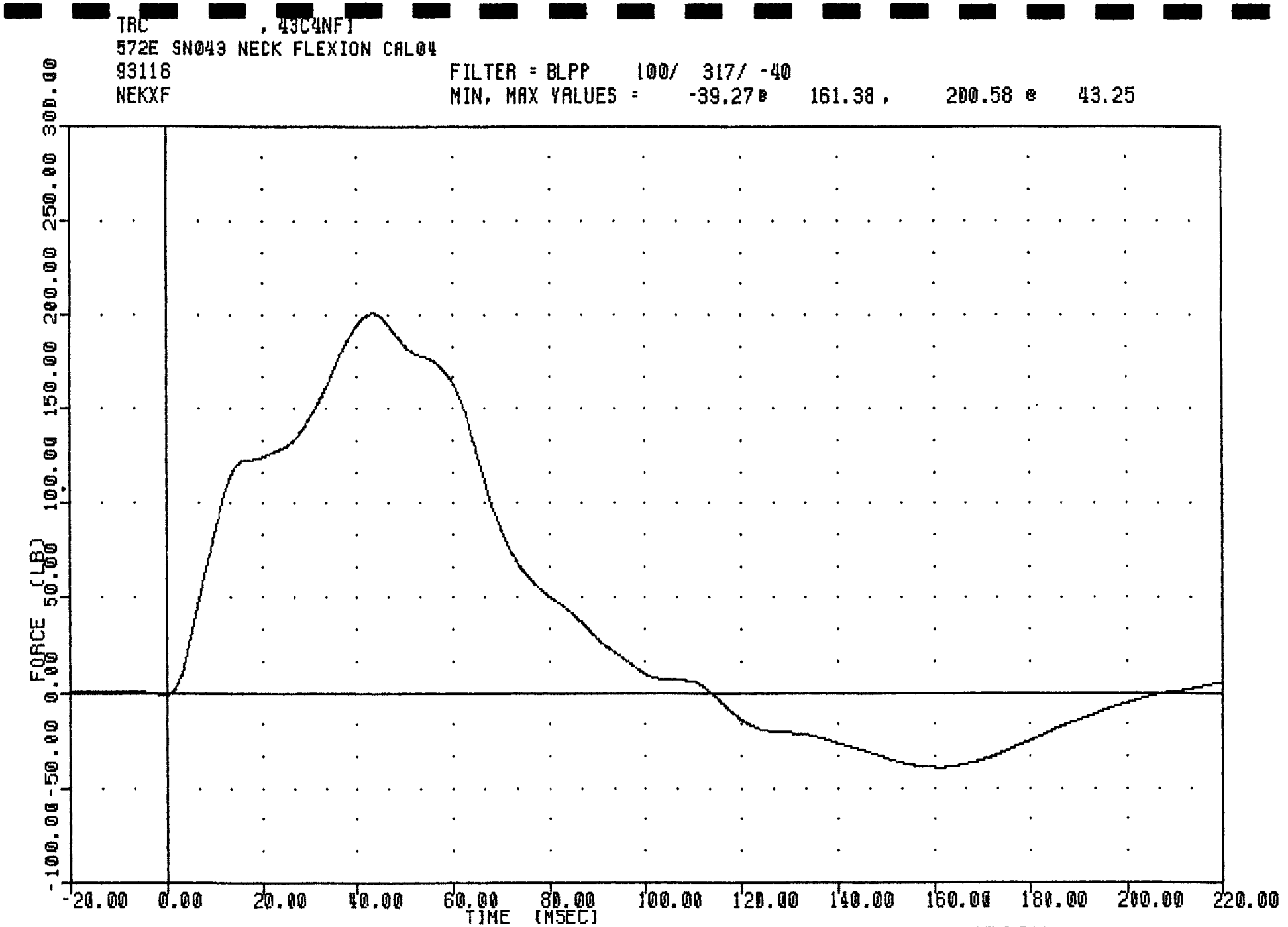
PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK



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

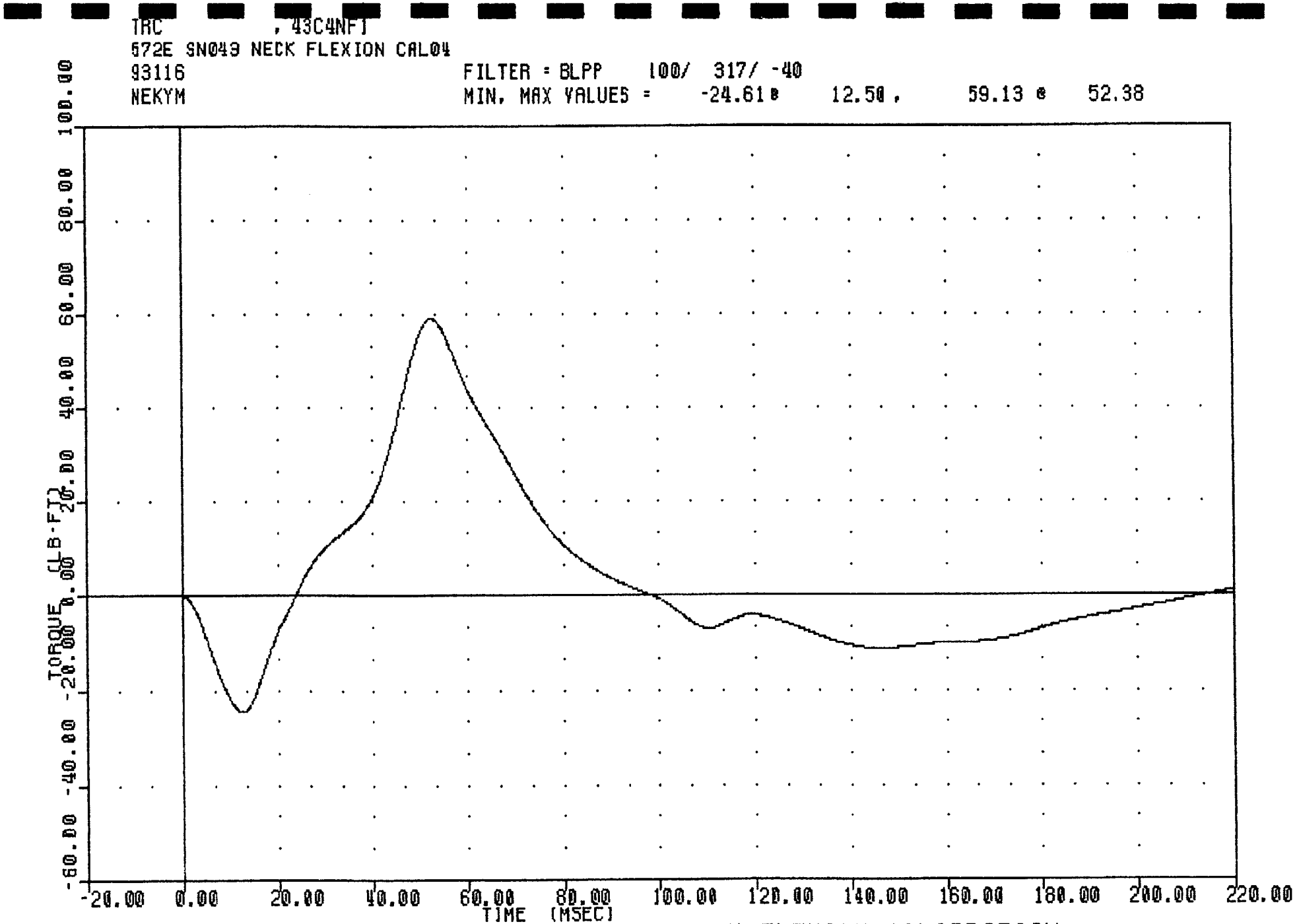


PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL ROTATION

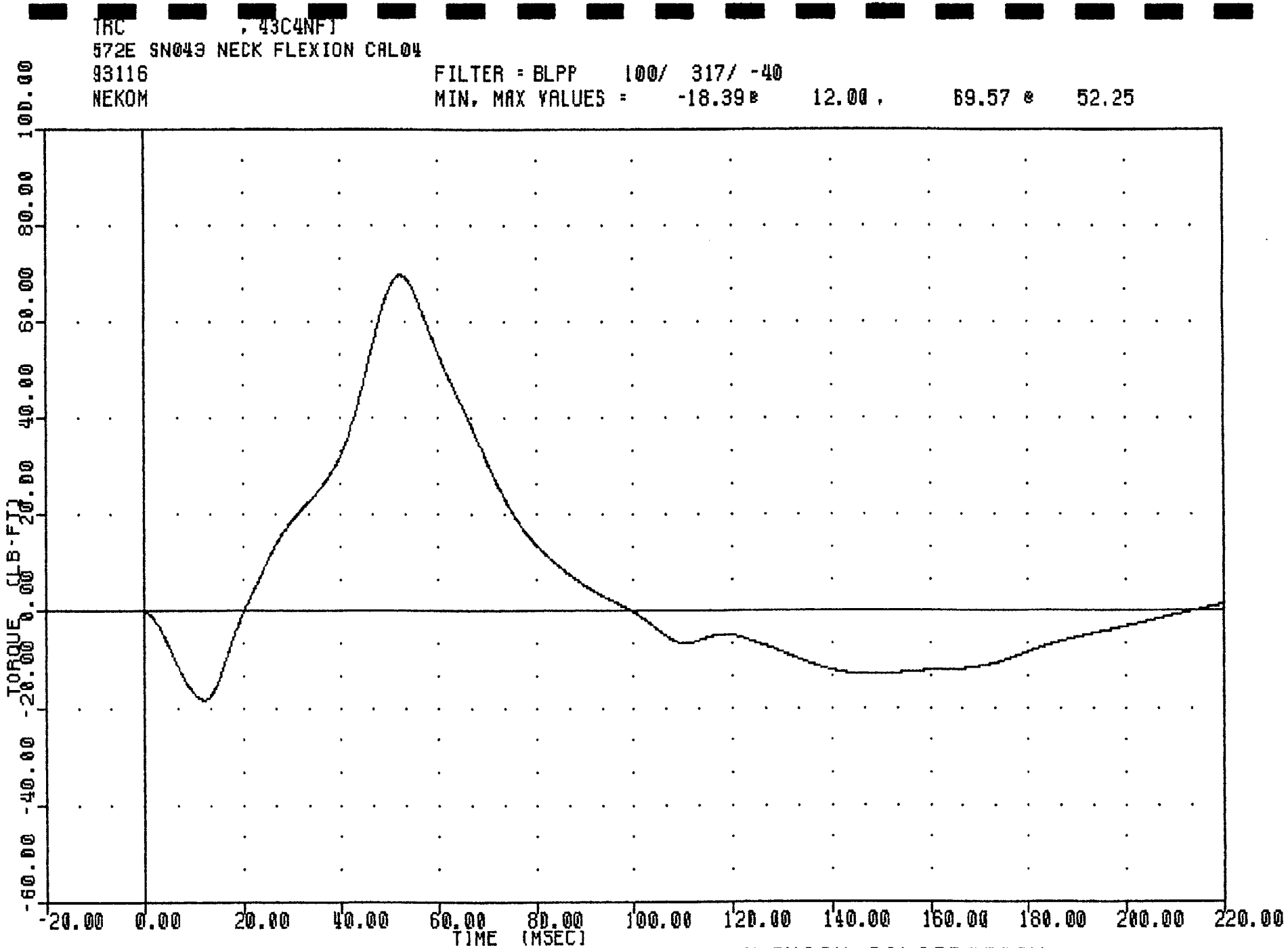


PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS



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



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

TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST

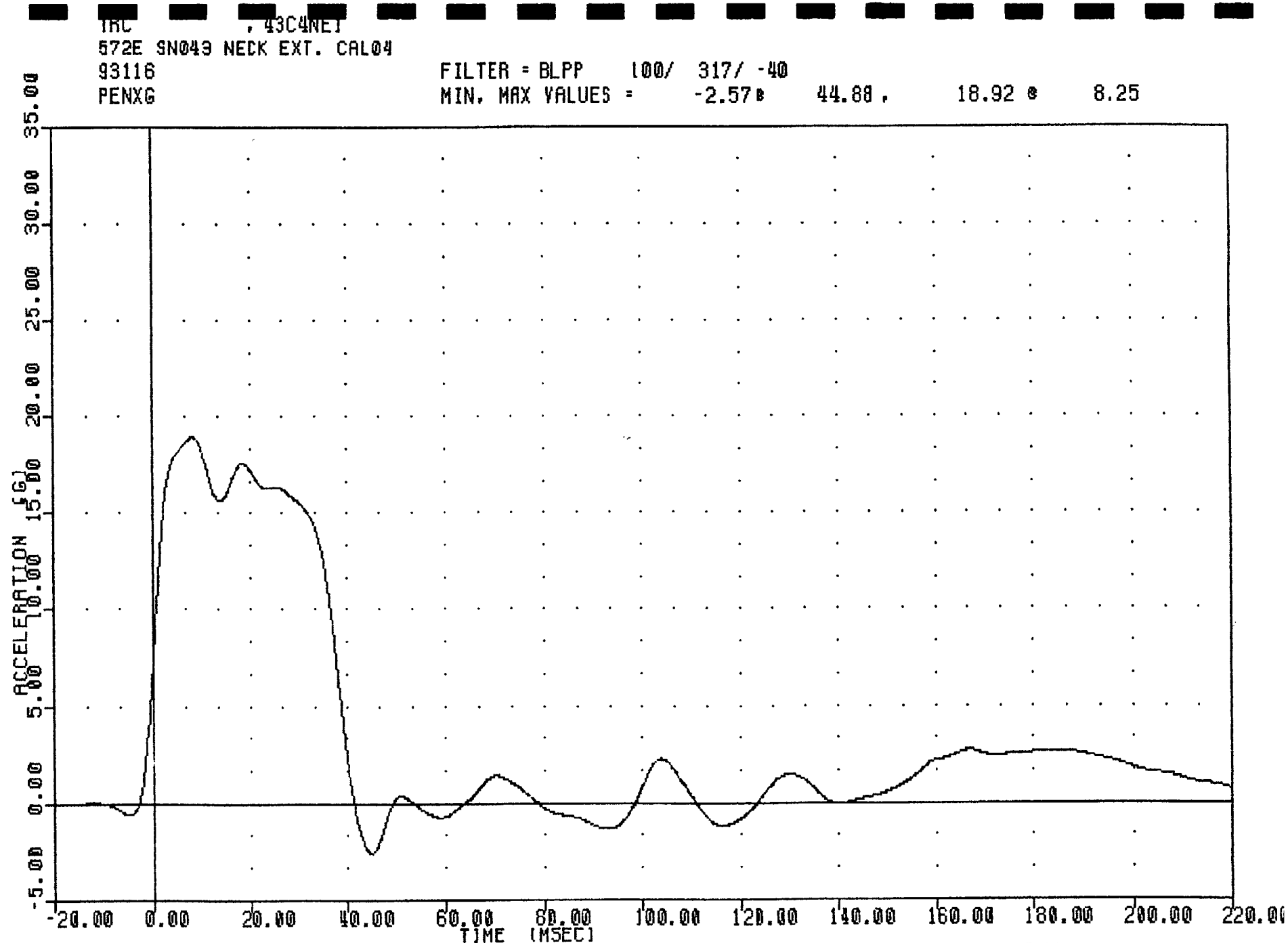
HYBRID III 26-APR-93

6 AXIS NECK TRANSDUCER
TRC 43C4NE1 572E SN043 NECK EXT. CAL04

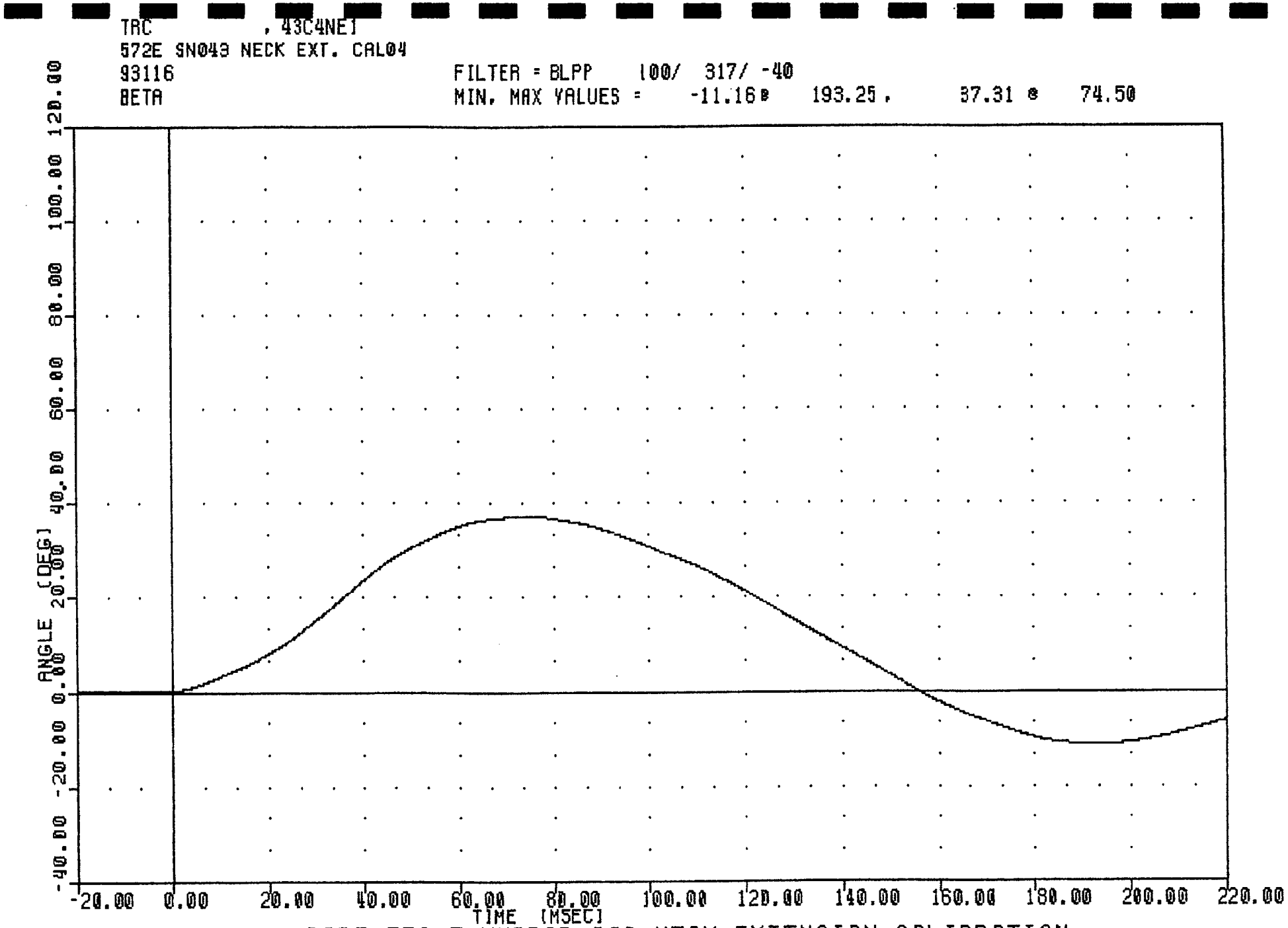
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY		10% - 70%	41.0 %
IMPACT VELOCITY		19.5-20.3 FT/SEC	19.83 FT/SEC
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.22 G
	20 MS	14.00 - 19.00 G	17.24 G
	30 MS	11.00 - 16.00 G	15.58 G
MAX PENDULUM G		22 G MAX	18.91 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	15.55 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	38.63 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	92.07 DEG.
	TIME	72 - 82 MS	74.50 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-59.0/-39.0 FT.LBS	-44.86 FT.LBS
	TIME	65 - 79 MS	68.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	156.13 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	134.38 MS

TEST MEETS SPECIFICATIONS

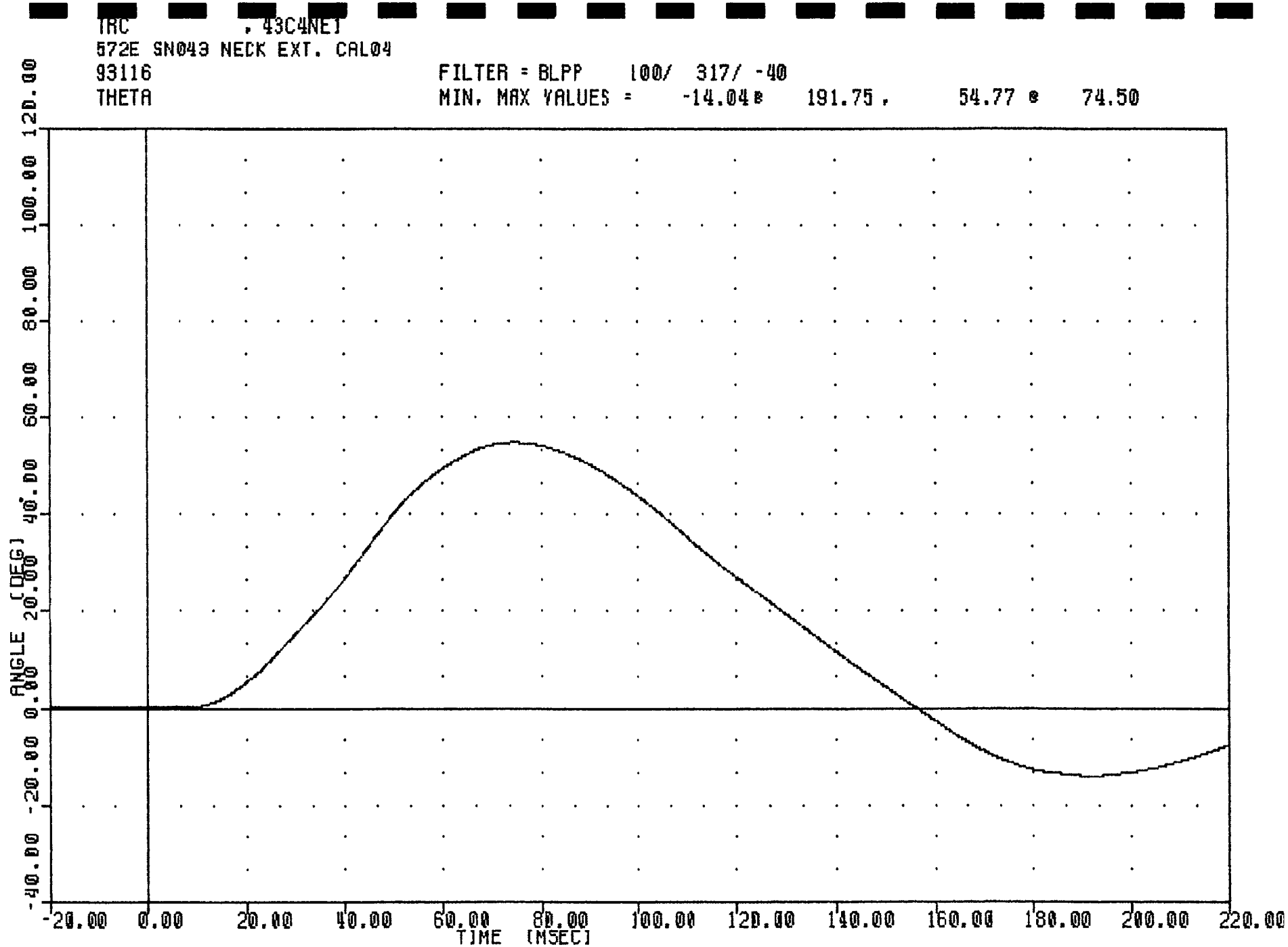
TECHNICIAN Pete Fonte



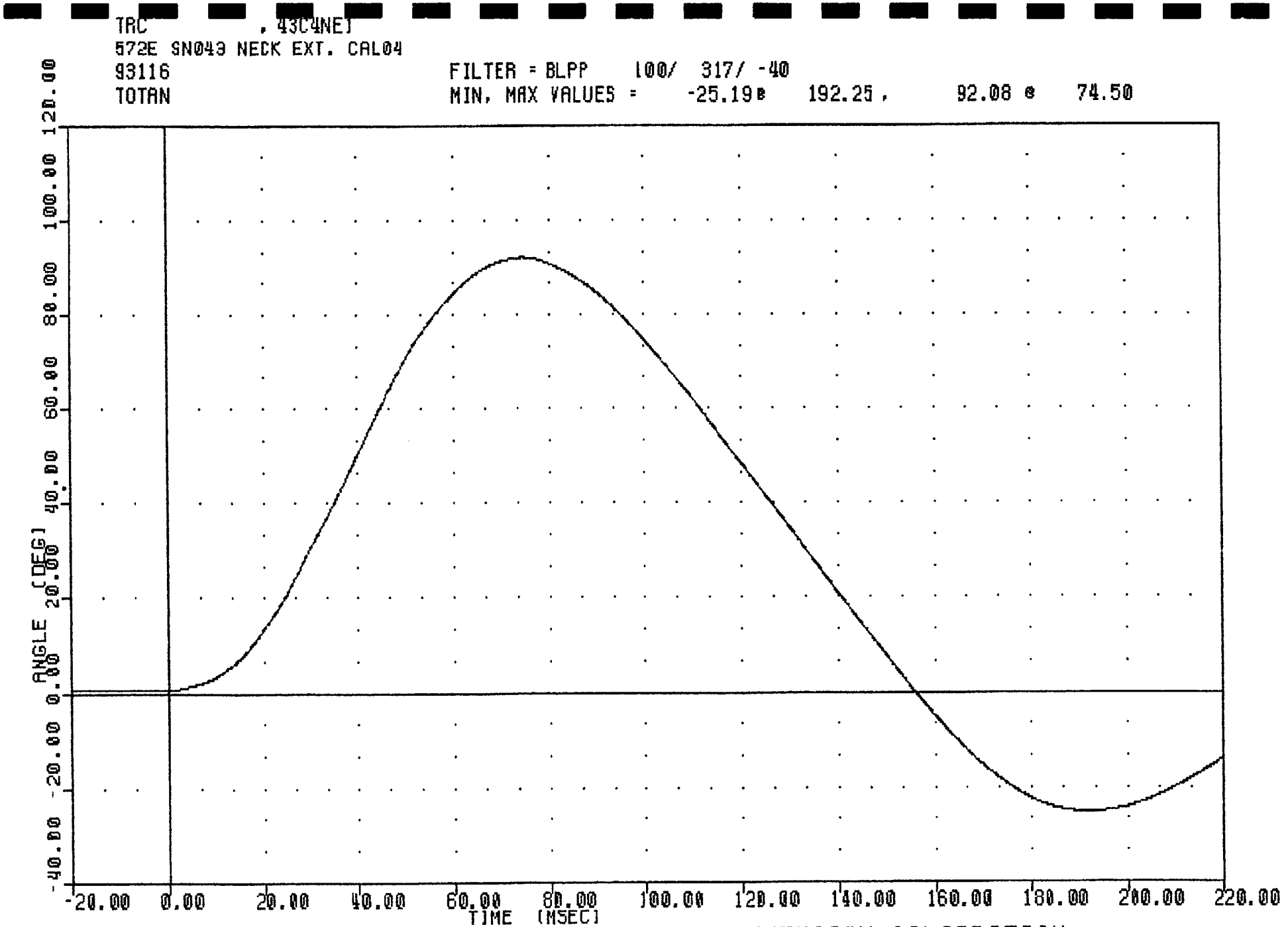
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
PENDULUM DECELERATION



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

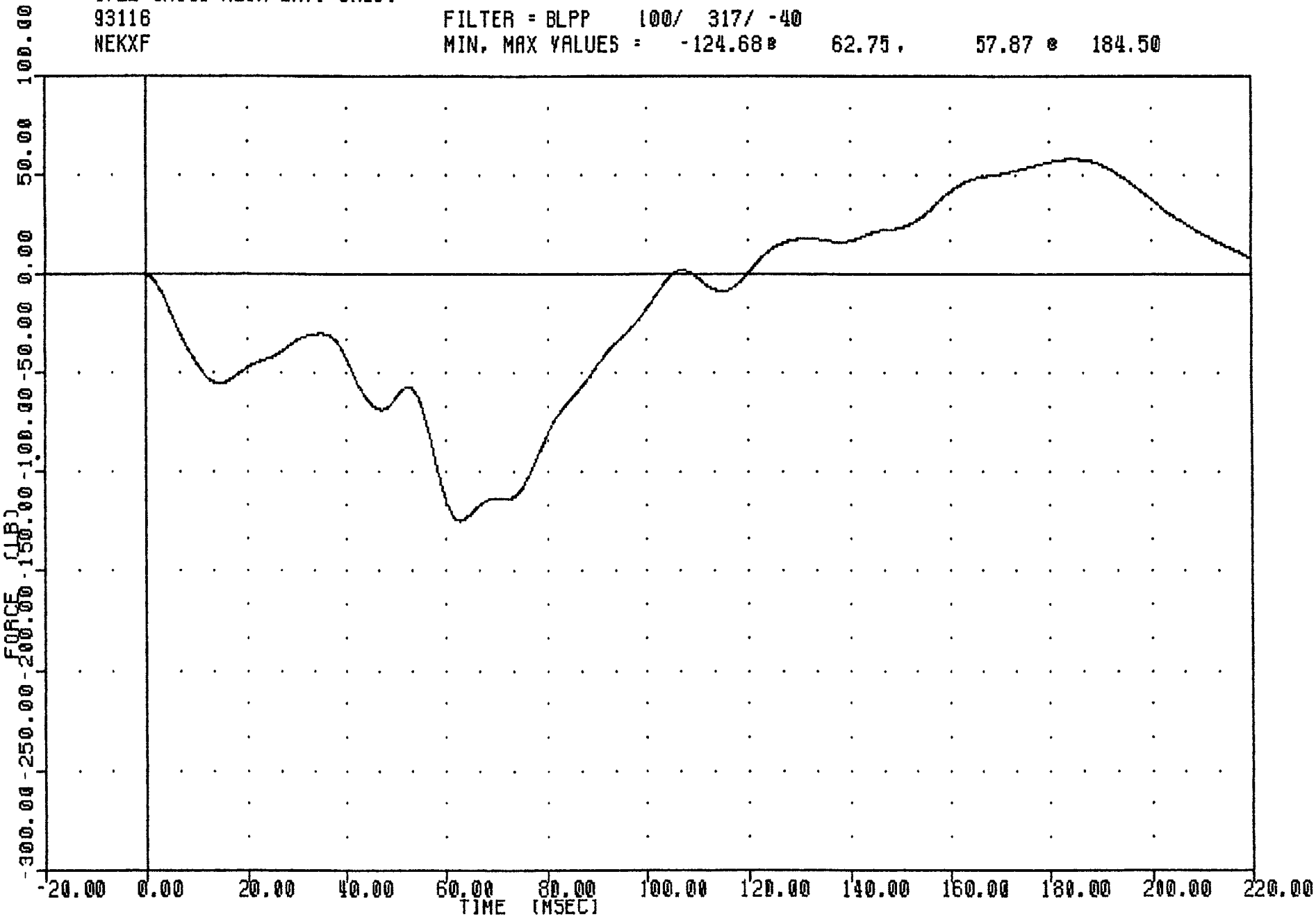


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

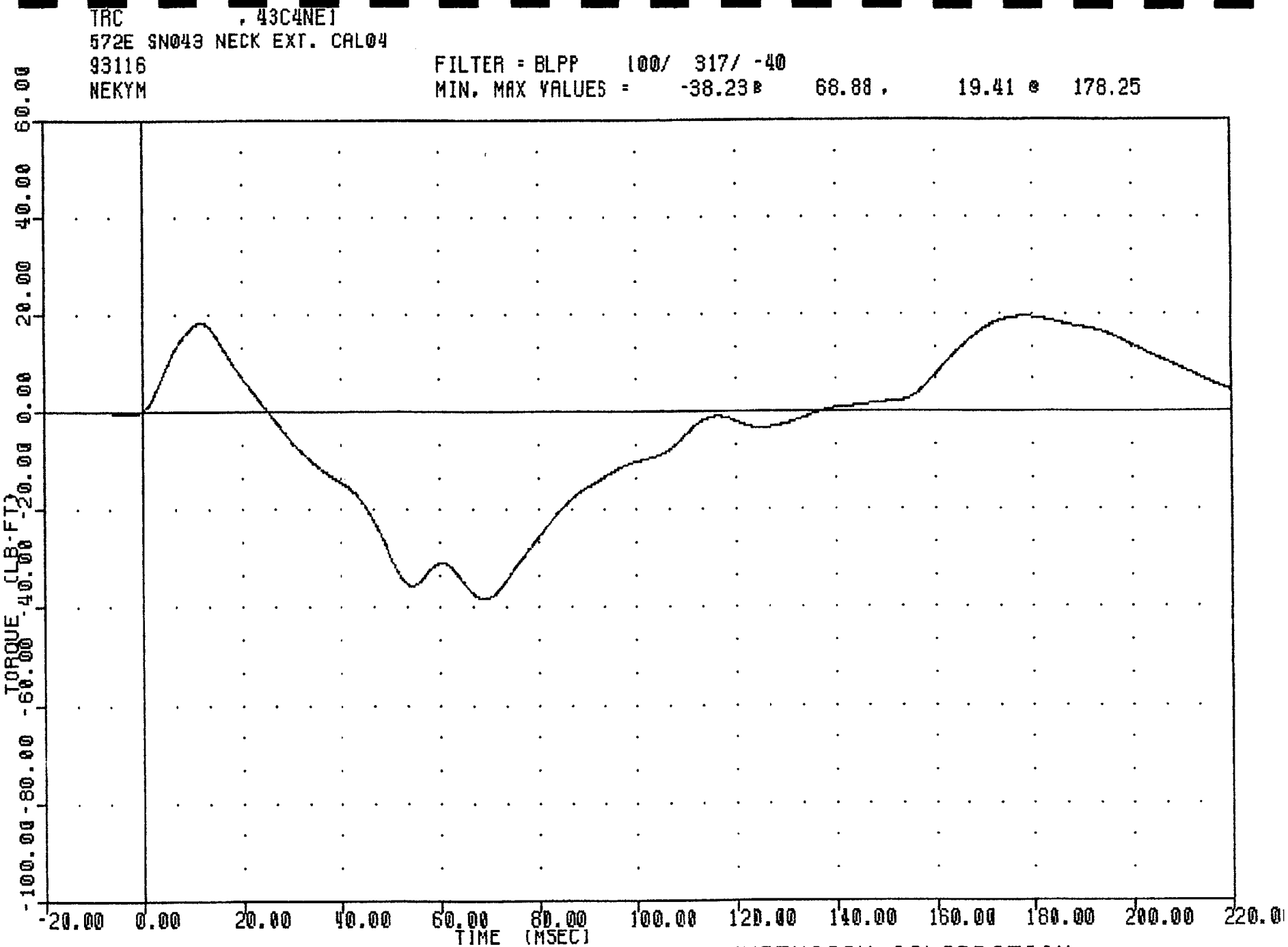


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL ROTATION

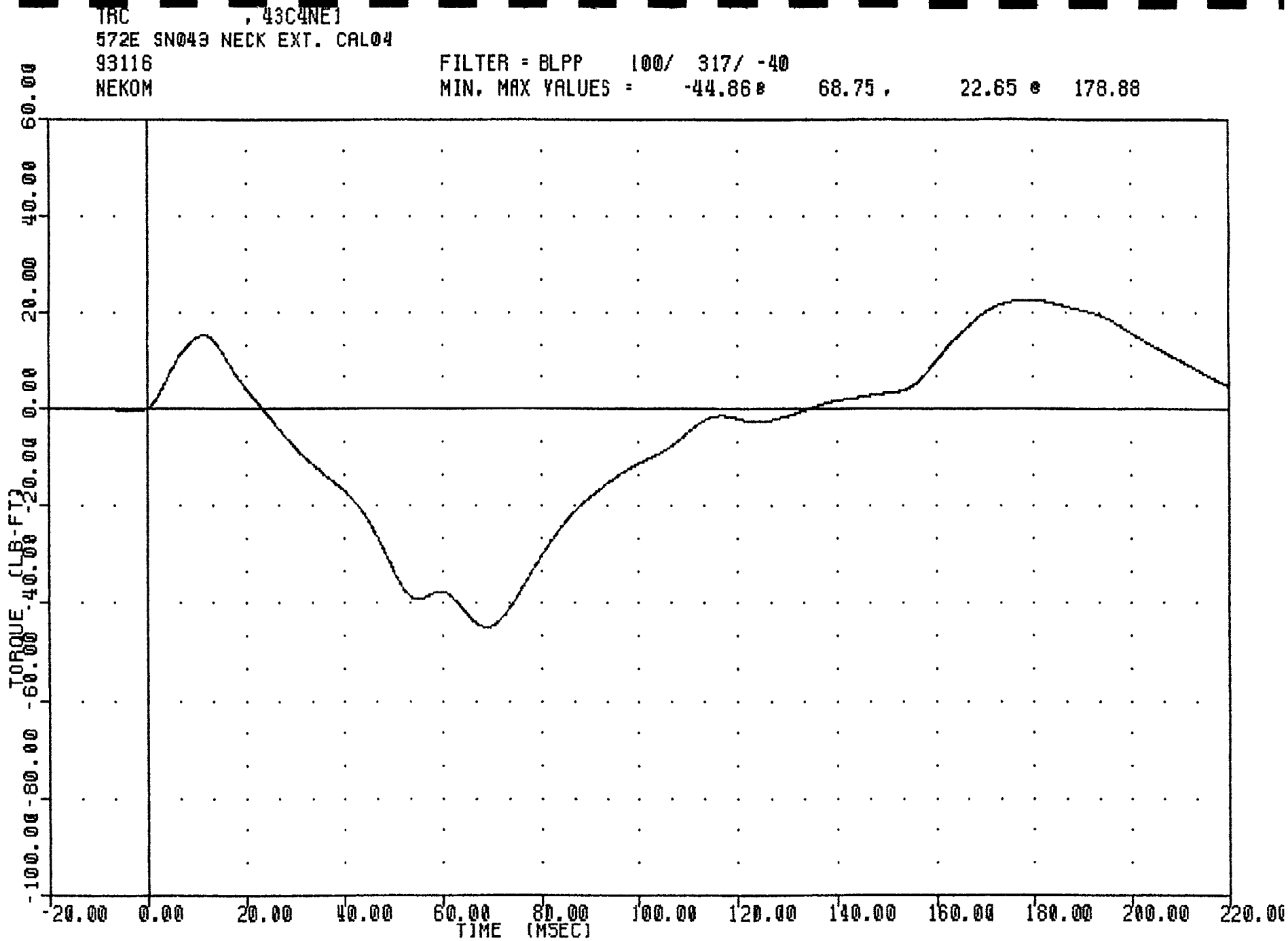
TRC , 43C4NE1
572E SN043 NECK EXT. CAL04
93116 FILTER = BLPP 100/ 317/ -40
NEKXF MIN, MAX VALUES = -124.68 @ 62.75 , 57.87 @ 184.50



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



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



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

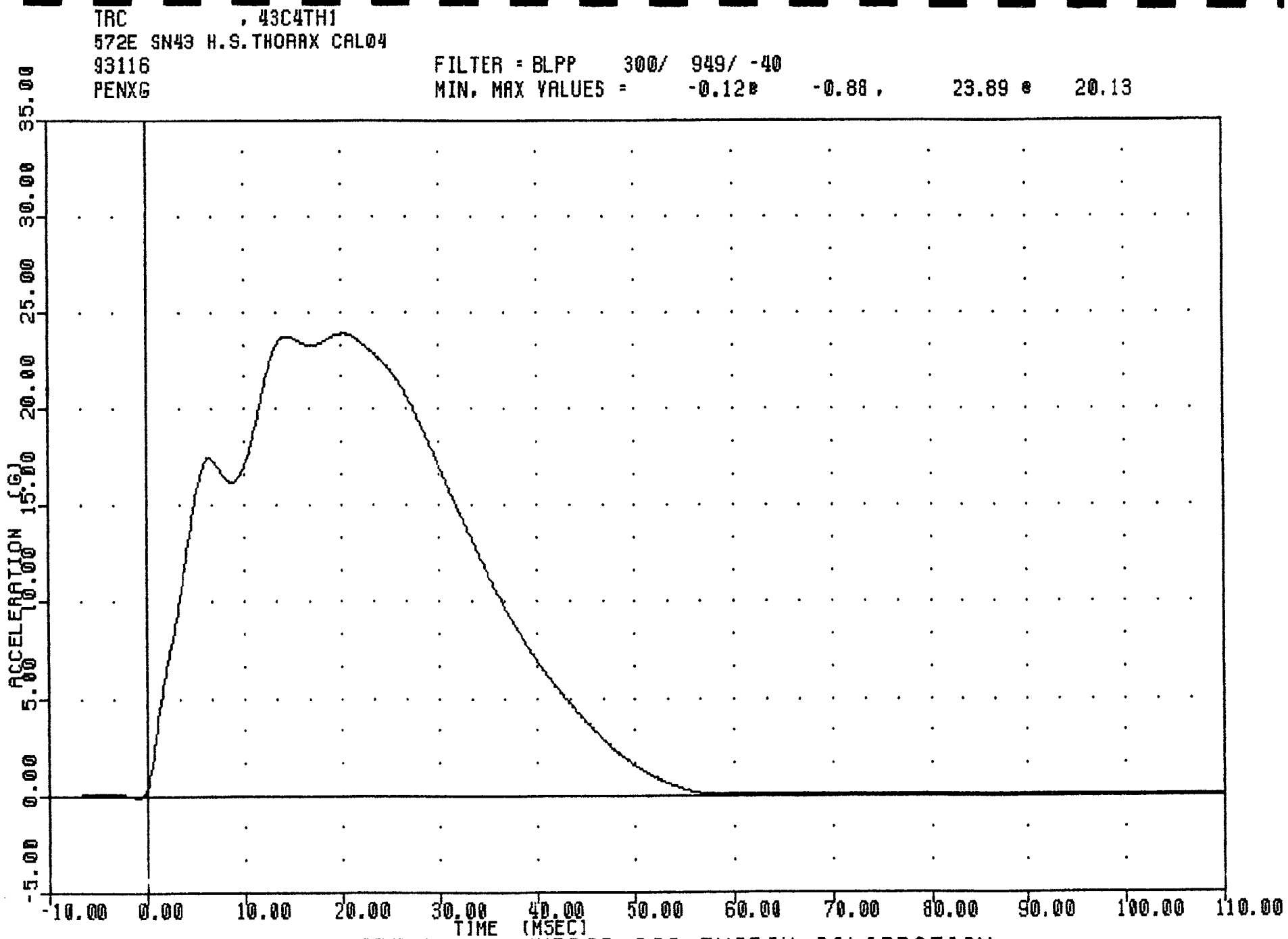
HYBRID III 26-APR-93

TRC 43C4TH1 572E SN43 H.S.THORAX CAL04

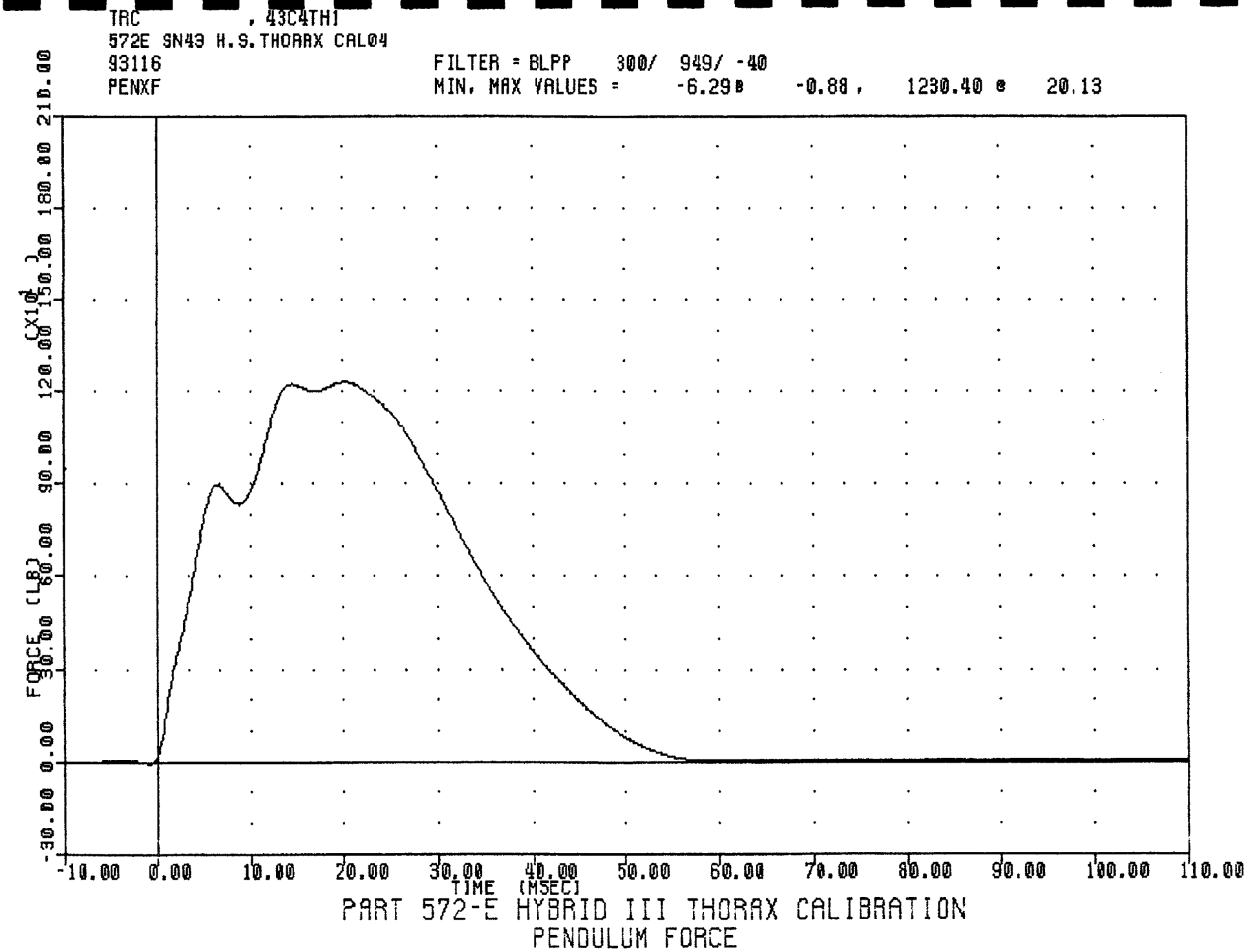
TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	41.0 %
PENDULUM VELOCITY	21.6-22.4 FT/SEC	21.76 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 IN	2.78 IN
MAXIMUM RESISTIVE FORCE	1160 - 1325 LBS	1230.4 LBS
INTERNAL HYSTERESIS	69% - 85%	73.9%

TEST MEETS SPECIFICATIONS

TECHNICIAN Peter Foust

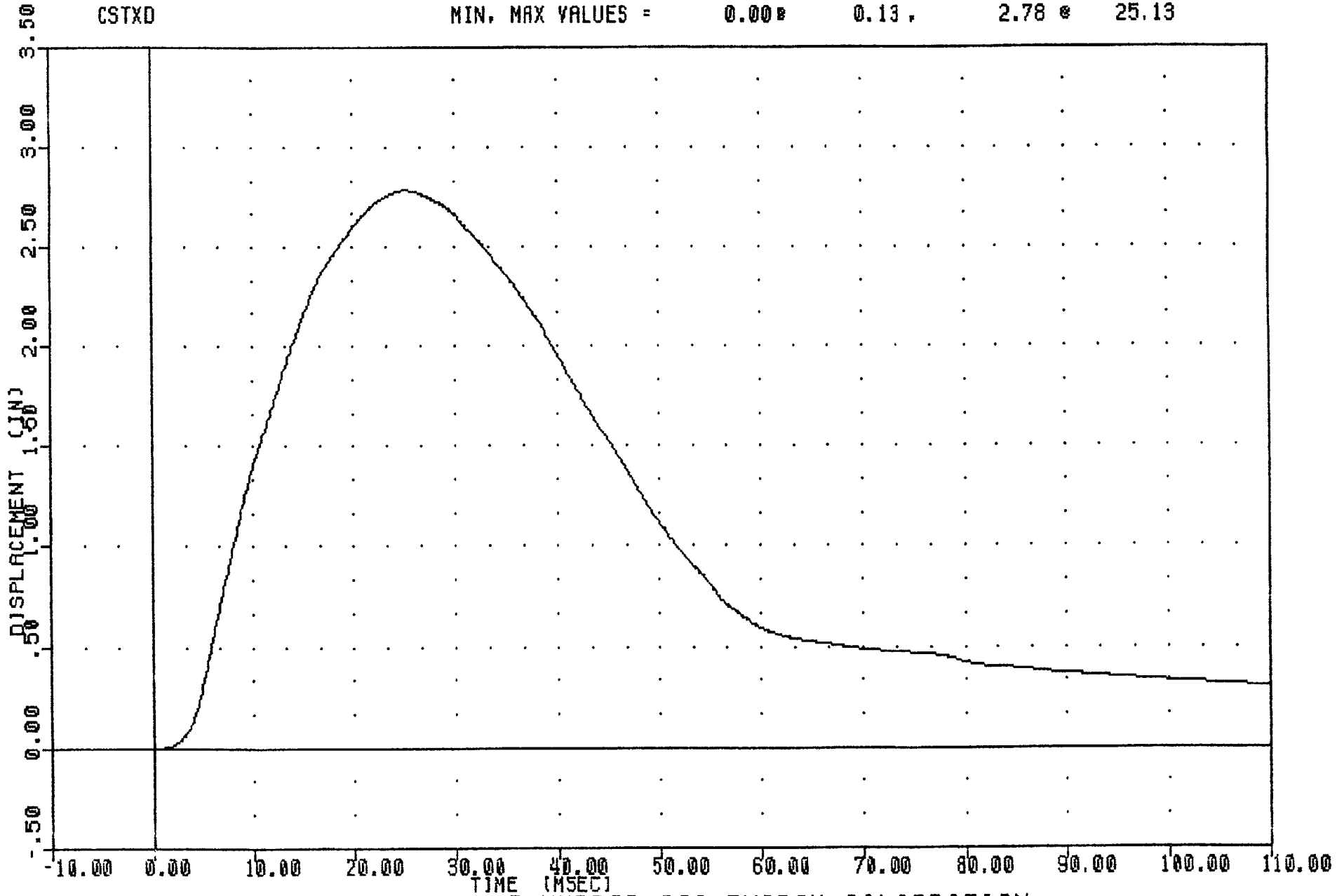


PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION

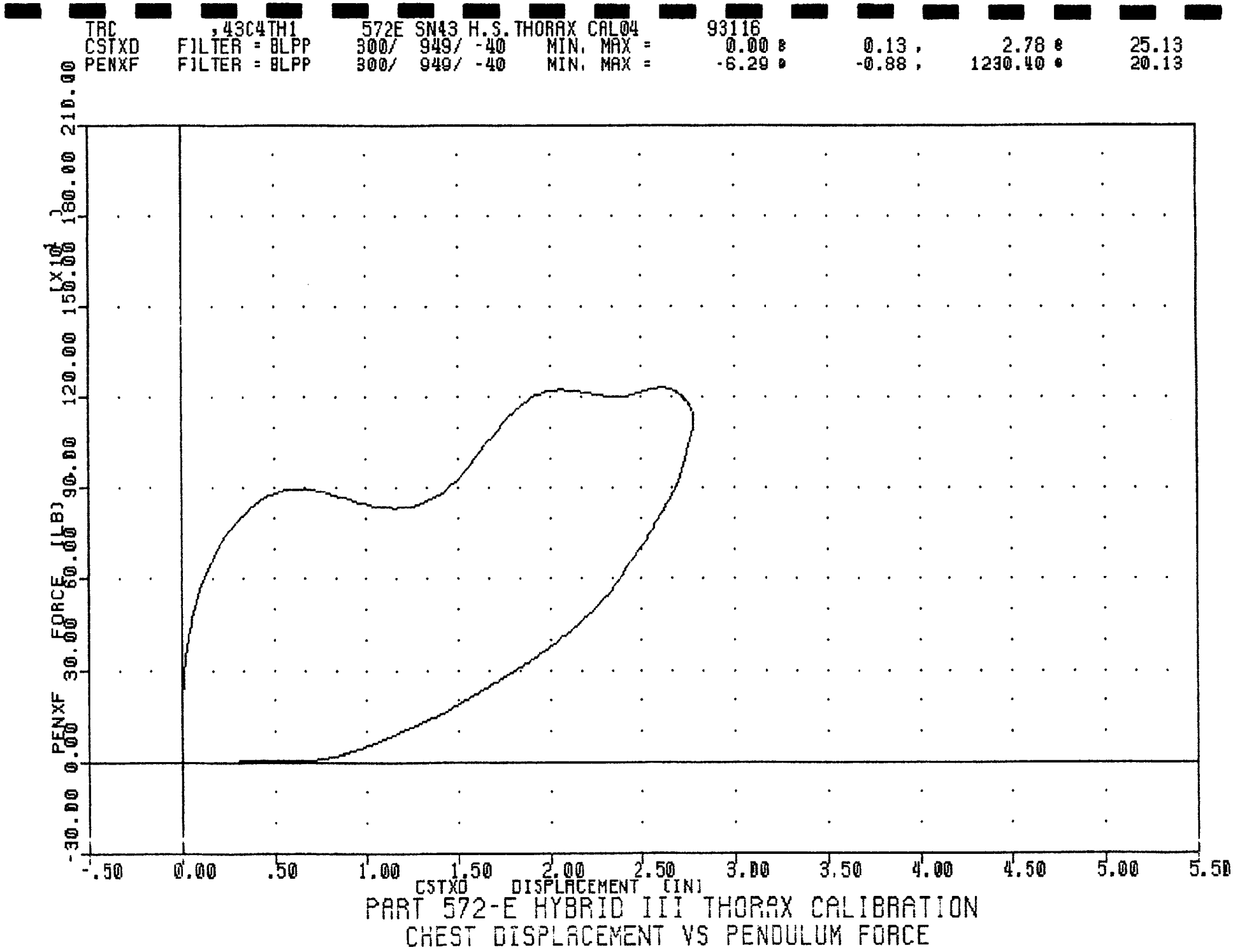


PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM FORCE

TRC , 43C4TH1
572E SN43 H.S.THORAX CAL04
93116 FILTER = BLPP 300/ 949/ -40
CSTXD MIN, MAX VALUES = 0.00 @ 0.13 , 2.78 @ 25.13



PART 572-E HYBRID III THORAX CALIBRATION
STERNUM DISPLACEMENT


TRC ,43C4TH1 572E SN43 H.S. THORAX CAL04 93116
CSTXD FILTER = BLPP 300/ 949/ -40 MIN, MAX = 0.00 @ 0.13 , 2.78 @ 25.13
PENXF FILTER = BLPP 300/ 949/ -40 MIN, MAX = -6.29 @ -0.88 , 1230.40 @ 20.13
PENXF FORCE [LB] [X 10]
210.00
180.00
150.00
120.00
90.00
60.00
30.00
0.00
-30.00
-.50
0.00
.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
CSTXD DISPLACEMENT [IN]
PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

TRANSPORTATION RESEARCH CENTER INC.

KNEE IMPACT TEST

HYBRID III 26-APR-93

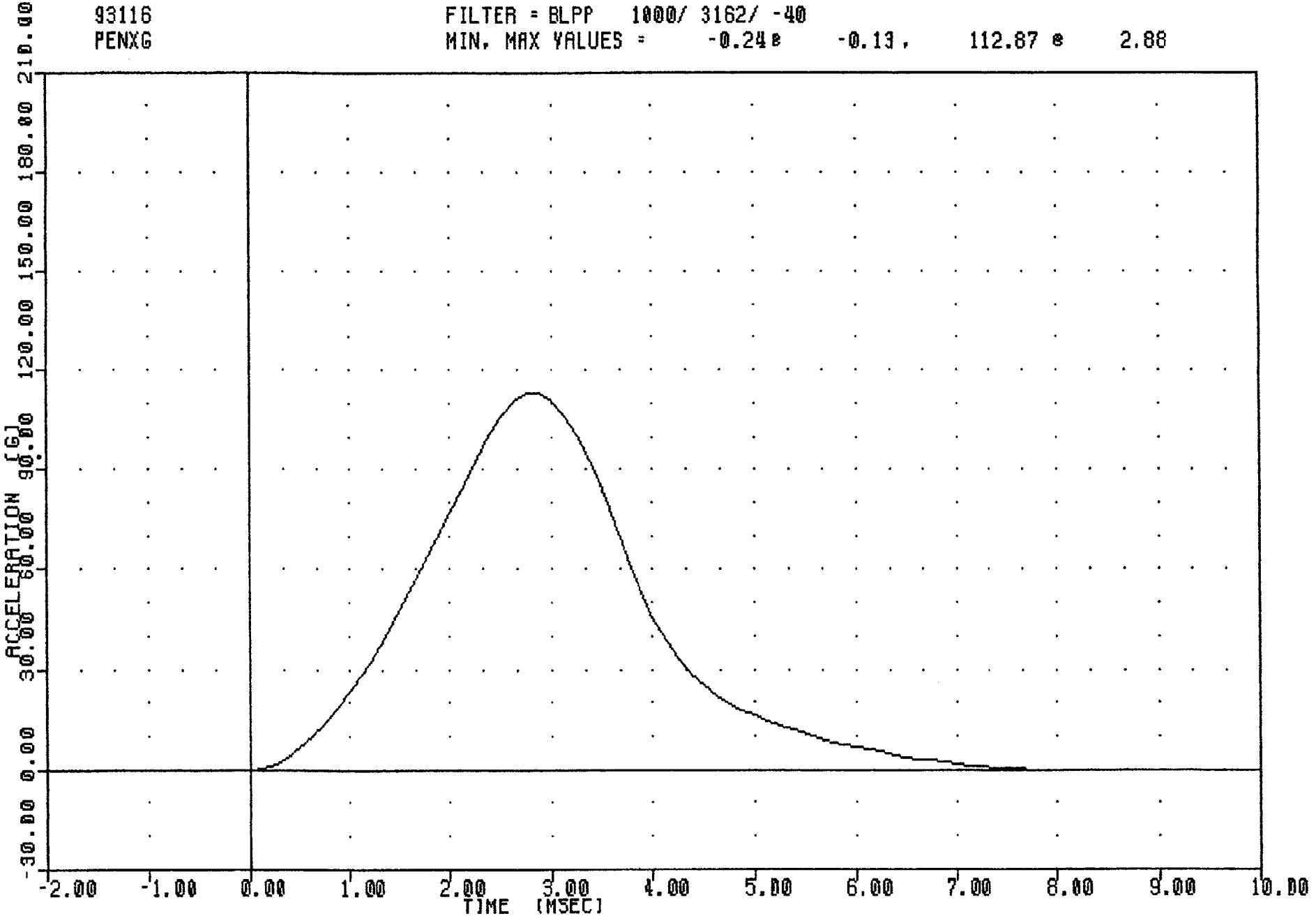
RIGHT KNEE
TRC 43C4RK1 572E SN43 RIGHT KNEE CAL 04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	41.0 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.91 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1241.57 LBS
PROBE WEIGHT	11.0 LBS	

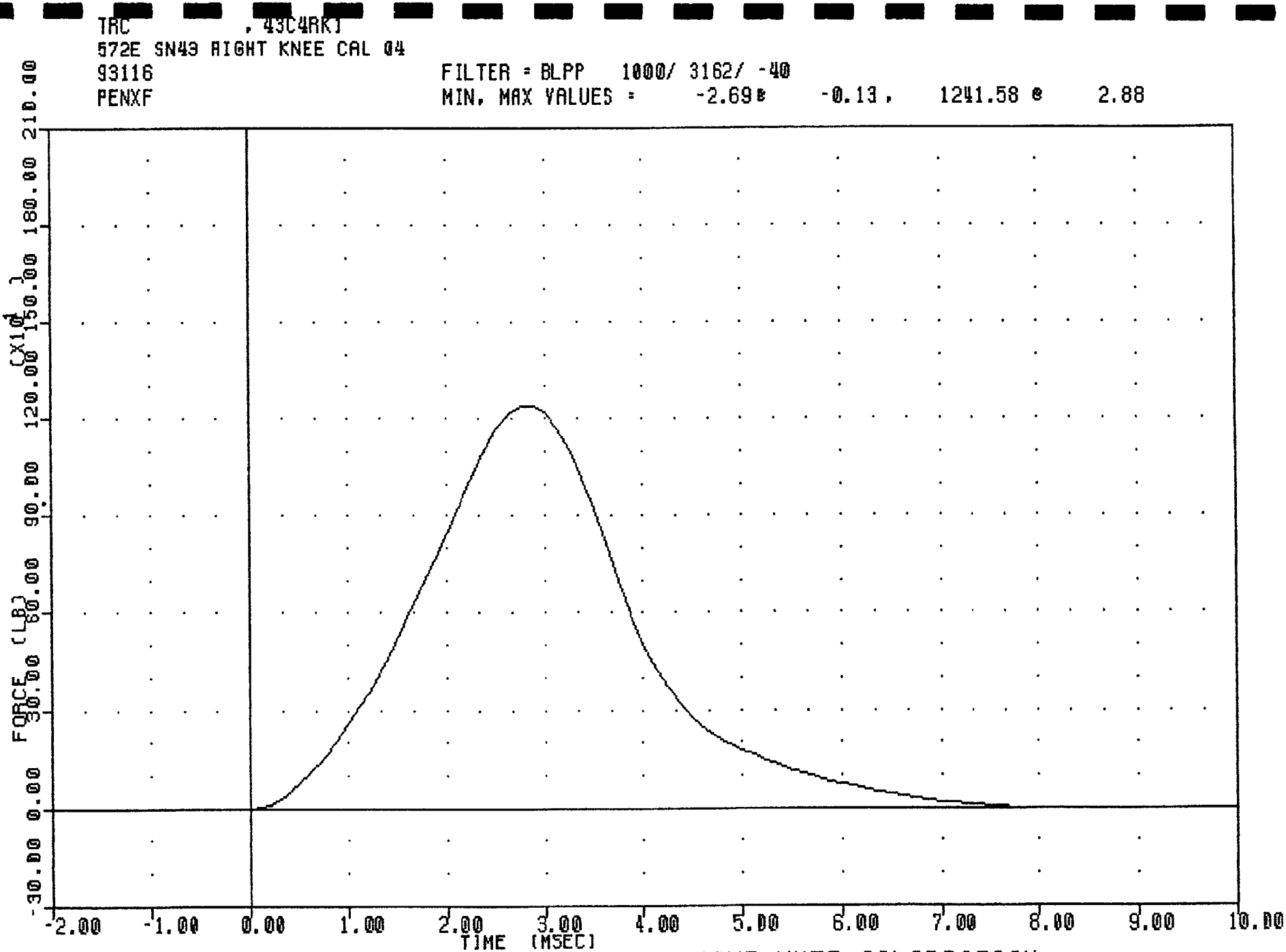
TEST MEETS SPECIFICATIONS

TECHNICIAN Pete Foss

TRC , 43C4RK]
572E SN43 RIGHT KNEE CAL 04
93116 FILTER = BLPP 1000/ 3162/ -40
PENXG MIN, MAX VALUES = -0.24 @ -0.13 , 112.87 @ 2.88



PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (11 LB PEND.)



PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM FORCE (11 LB PEND.)

TRANSPORTATION RESEARCH CENTER INC.

KNEE IMPACT TEST

HYBRID III 26-APR-93

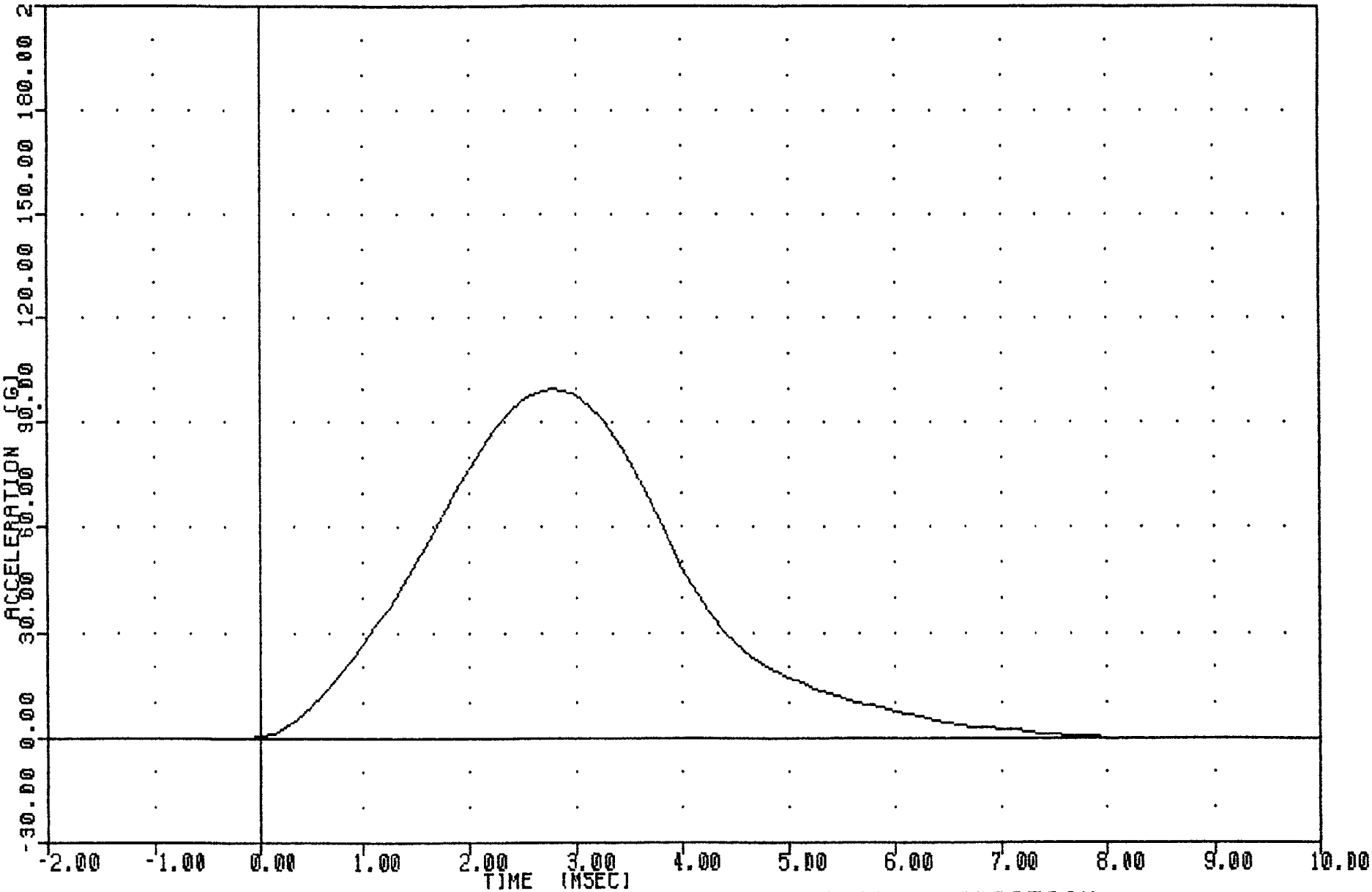
LEFT KNEE
TRC 43C4LK1 572E SN43 LEFT KNEE CAL 04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.0 DEG. F
RELATIVE HUMIDITY	10% - 70%	41.0 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.85 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1094.81 LBS
PROBE WEIGHT	11.0 LBS	

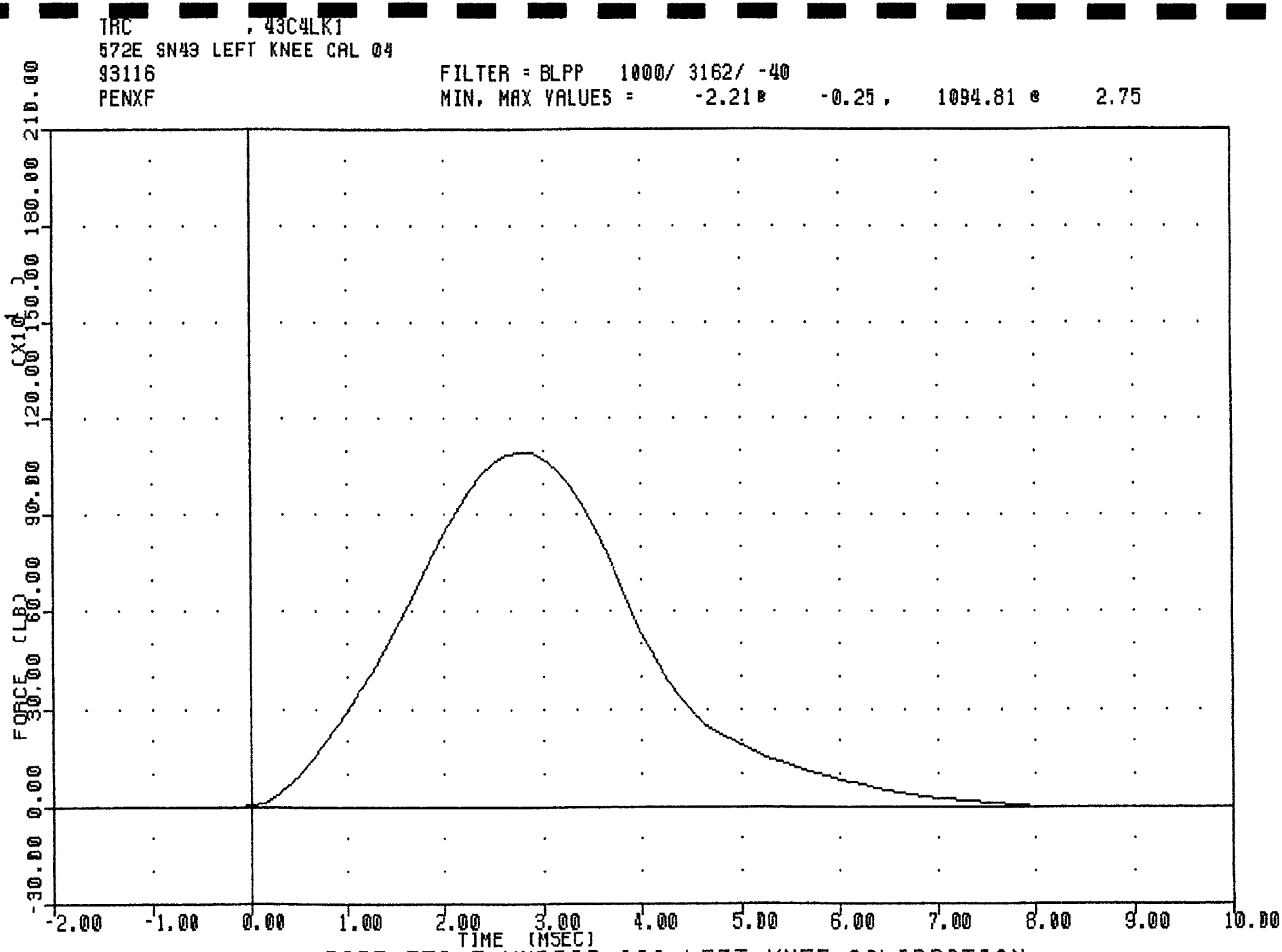
TEST MEETS SPECIFICATIONS

TECHNICIAN Peter Foust

TRC , 43C4LK1
572E SN43 LEFT KNEE CAL 04
93116
PENXG
FILTER = BLPP 1000/ 3162/ -40
MIN, MAX VALUES = -0.20 @ -0.25 , 99.53 @ 2.75



PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (11 LB PEND.)



PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE (11 LB PEND.)

APPENDIX D

MISCELLANEOUS TEST INFORMATION

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: HUMANOID SYSTEMS #048

SEATING POSITION: DRIVER

DESCRIPTION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
HEAD ACCELERATION	X	ENDEVCO	7264	EH78J	REAR
HEAD ACCELERATION	Y	ENDEVCO	7264	DH37J	LEFT
HEAD ACCELERATION	Z	ENDEVCO	7264	DD17J	UP
NECK SHEAR FORCE	X	DENTON	1716	0106	HEAD REARWARD
NECK SHEAR FORCE	Y	DENTON	1716	0106	HEAD LEFTWARD
NECK AXIAL FORCE	Z	DENTON	1716	0106	HEAD UPWARD
NECK MOMENT	X	DENTON	1716	0106	LEFT EAR TOWARD LEFT SHOULDER
NECK MOMENT	Y	DENTON	1716	0106	CHIN TO CHEST
NECK MOMENT	Z	DENTON	1716	0106	CHIN TOWARD LEFT SHOULDER
CHEST ACCELERATION	X	ENDEVCO	7264	EH92J	FRONT
CHEST ACCELERATION	Y	ENDEVCO	7264	CC24H	LEFT
CHEST ACCELERATION	Z	ENDEVCO	7264	FG28J	UP
CHEST DEFLECTION	X	SERVO	14CB1-2897	9041	OUTWARD
PELVIS ACCELERATION	X	ENDEVCO	7264	BC75J	REAR
PELVIS ACCELERATION	Y	ENDEVCO	7264	FC43J	LEFT
PELVIS ACCELERATION	Z	ENDEVCO	7264	AP87	UP
LEFT FEMUR FORCE		GSE	2430	726	TENSION
RIGHT FEMUR FORCE		GSE	2430	756	TENSION

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: HUMANOID SYSTEMS #043

SEATING POSITION: PASSENGER

DESCRIPTION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
HEAD ACCELERATION	X	ENDEVCO	7264	BG23J	FRONT
HEAD ACCELERATION	Y	ENDEVCO	7264	FG33J	RIGHT
HEAD ACCELERATION	Z	ENDEVCO	7264	DP32J	UP
NECK SHEAR FORCE	X	DENTON	1716A	0425	HEAD REARWARD
NECK SHEAR FORCE	Y	DENTON	1716A	0425	HEAD LEFTWARD
NECK AXIAL FORCE	Z	DENTON	1716A	0425	HEAD UPWARD
NECK MOMENT	X	DENTON	1716A	0425	LEFT EAR TOWARD LEFT SHOULDER
NECK MOMENT	Y	DENTON	1716A	0425	CHIN TO CHEST
NECK MOMENT	Z	DENTON	1716A	0425	CHIN TOWARD LEFT SHOULDER
CHEST ACCELERATION	X	ENDEVCO	7264	EJ01J	FRONT
CHEST ACCELERATION	Y	ENDEVCO	7264	DH31J	LEFT
CHEST ACCELERATION	Z	ENDEVCO	7264	FF79J	UP
CHEST DEFLECTION	X	BOURNS	NA	043	OUTWARD
PELVIS ACCELERATION	X	ENDEVCO	7264	DM72J	REAR
PELVIS ACCELERATION	Y	ENDEVCO	7264	BG11J	LEFT
PELVIS ACCELERATION	Z	ENDEVCO	7264	BH87J	UP
LEFT FEMUR FORCE		GSE	2430	631	TENSION
RIGHT FEMUR FORCE		GSE	2430	633	TENSION

VEHICLE INSTRUMENTATION PLACEMENT

NO.	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
1	LEFT REAR SEAT	X	ENDEVCO	2264	AR38	FORWARD
		Y	ENDEVCO	2264	AN06	RIGHT
2	RIGHT REAR SEAT	X	ENDEVCO	2264	AS95	FORWARD
		Y	ENDEVCO	2264	AU09	RIGHT
3	CAR CENTER OF GRAVITY	X	ENDEVCO	2264	AY66	FORWARD
		Y	ENDEVCO	2264	AR49	RIGHT
		Z	ENDEVCO	2264	BA68	UP
	RIGHT FRONT PASSENGER'S SHOULDER BELT		LEBOW	3419	613	TENSION

TRACTOR AND SEMITRAILER INSTRUMENTATION PLACEMENT

NO.	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
1	TRAILER BED LEFT	X	ENDEVCO	7264	AH78	REAR
2	FRAME RAIL RIGHT	X	ENDEVCO	7264	BR37J	REAR
2	TRACTOR FRAME CENTER	X	ENDEVCO	7264	AC44	REAR

SIGN CONVENTION

NHTSA DATA TAPE REFERENCE GUIDE

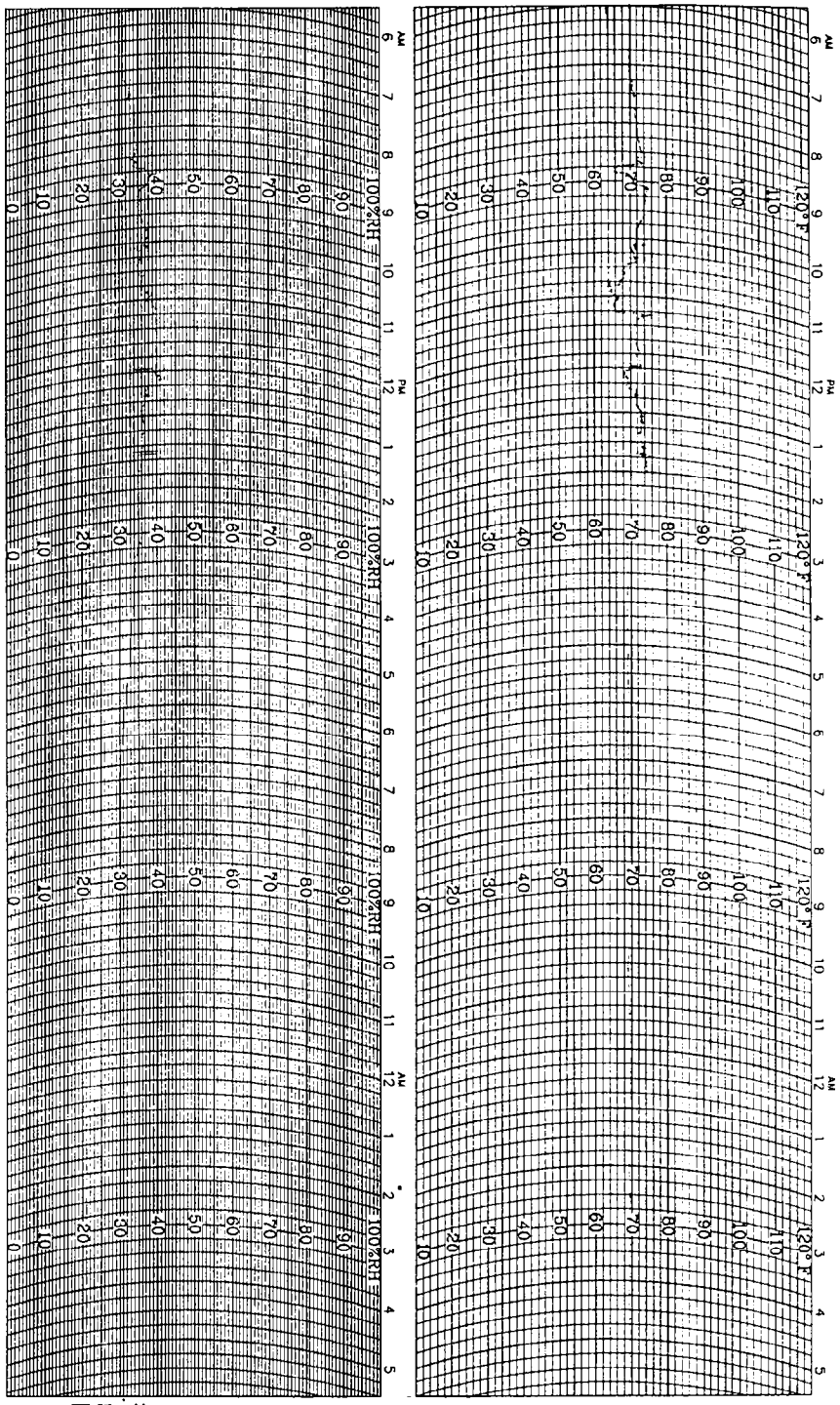
ACCELEROMETERS:	+X: FORWARD
	+Y: LEFTWARD
	+Z: UPWARD
POTENTIOMETERS:	+CHEST LONGITUDINAL DEFLECTION: OUTWARD
LOAD CELLS:	+FEMUR FORCE: TENSION
	+SEAT BELT FORCE: TENSION
NECK LOAD CELLS:	+X FORCE: HEAD PUSHED FORWARD
	+Y FORCE: HEAD PUSHED LEFTWARD
	+Z FORCE: HEAD PULLED UPWARD (TENSION ON NECK)
	+X MOMENT: RIGHT EAR ROTATING TOWARD RIGHT SHOULDER
	+Y MOMENT: CHIN ROTATING TOWARD CHEST
	+Z MOMENT: CHIN ROTATING TOWARD LEFT SHOULDER

FREQUENCY RESPONSE CLASSES

NHTSA LABORATORY PROCEDURE TP-214D-01

TYPICAL TEST MEASUREMENTS	CHANNEL CLASS
Vehicle Structural Accelerations for use in:	
Total vehicle comparison	60
Collision simulation input	60
Component analysis	600
Integration for velocity or displacement	180
Anthropomorphic Test Device	
Head accelerations (linear and angular)	1000
Thorax	
Spine accelerations	180*
Rib accelerations	180*
Deflections	180
Pelvis	
Accelerations	180*

*The Channel Class 180 data is further processed by subsampling to a 1600 Hz sample rate, removing bias, and filtering with the Finite Impulse Response (FIR100) filter program.



Weather Measure
WEATHERtronics
Division of QUALIMETRICS, Inc.

P.O. BOX 41039
SACRAMENTO, CA 95841
PHONE: (916) 923-0055

HYGROTHERMOGRAPH
1 DAY

CHART NO. M699123
C311-D-HF
ECN 2717
6-9-87

STATION_____DATE ON_____DATE OFF_____

OCCUPANT COMPARTMENT THERMOGRAPH