V1988

48/24 KPH 90° DRIVER'S SIDE IMPACT
(MOVING DEFORMABLE BARRIER)
1993 PLYMOUTH VOYAGER MINIVAN

PREPARED BY:

TRANSPORTATION RESEARCH CENTER INC.

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FINAL REPORT

SEPTEMBER - OCTOBER 1993

PREPARED FOR:

VEHICLE RESEARCH AND TEST CENTER

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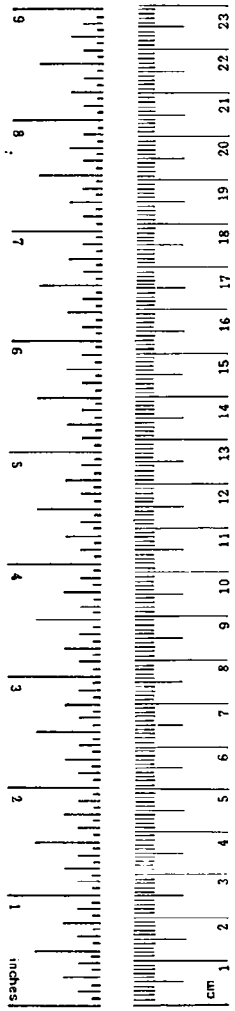
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

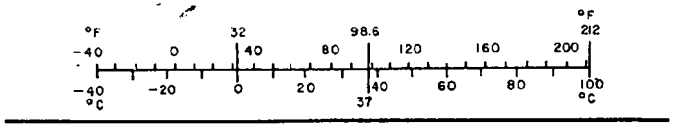
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	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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15. Supplemental Notes

16. Abstract

This 48/24 kph 90° driver's side impact test was conducted at Transportation Research Center Inc. on September 17, 1993. The test vehicle was a 1993 Plymouth Voyager minivan. This test was conducted to aid in the development of extending the test procedure for FMVSS No. 214, "Side Impact Protection - Passenger Cars," to include light trucks and vans.

The deformable barrier face was raised 235 millimeters above its standard height specified in the FMVSS No. 214 Laboratory Test Procedure and its test weight was 1363 kilograms. The impact velocity was 54.4 kph. The moving deformable barrier struck the target vehicle 916 mm forward of the vehicle's wheelbase mid-point.

Results for the driver and passenger SIDS are:

	Driver SID	Passenger SID
Left upper rib acceleration	69.2 g's	125.9 g's
Left lower rib acceleration	90.3 g's	139.3 g's
Upper spine acceleration	81.3 g's	82.2 g's
Lower spine acceleration	85.3 g's	132.2 g's
Thoracic Trauma Index (TTI)	88	136
Pelvis acceleration	133.3 g's	150.2 g's

17. Key Words	18. Distribution Statement
48/24 kph 90° Driver's Side Impact Light Trucks and Vans 1993 Plymouth Voyager Minivan	

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SECTION 1.0

PURPOSE AND TEST PROCEDURE

PURPOSE

This 48/24 kph 90° driver's side impact test was conducted for Vehicle Research and Test Center by Transportation Research Center Inc. (TRC). The purpose of this test was to aid in the development of extending the test procedure for FMVSS 214, "Side Impact Protection - Passenger Cars," to include the testing of light trucks and vans.

TEST PROCEDURE

This test was conducted using NHTSA's Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-214D-02 as a guideline. Data was obtained relative to FMVSS 214, "Side Impact Protection - Passenger Cars," performance.

The test vehicle was instrumented with ten (10) accelerometers oriented to measure longitudinal, lateral, and vertical axis accelerations. The test vehicle was positioned so that its longitudinal centerline was at an angle of 63° to the tow cable system.

The test vehicle contained two (2) Part 572 F side impact adult male anthropomorphic test devices (dummies). The dummies were positioned in the left front and rear outboard seating positions according to the dummy placement procedure specified as an attachment to the Laboratory Test Procedure. The dummies were instrumented with head, pelvis, upper spine, and lower spine accelerometers oriented to measure longitudinal, lateral, and vertical axis accelerations. Upper rib and lower rib accelerometers were oriented to measure lateral axis accelerations. Each dummy was restrained by a 3-point unibelt.

The moving deformable barrier was instrumented with five (5) accelerometers oriented to measure longitudinal, lateral, and vertical axis accelerations. The moving barrier was crabbed clockwise at a 27° angle to the tow cable system and its deformable barrier face was raised 235 mm above the standard barrier face height specified in the Laboratory Test Procedure. The bottom most edge of the deformable barrier face was 514 mm above the ground level. The moving deformable barrier's weight was 1363 kg and its specified velocity range was 53.1 to 54.7 kph.

The fifty-one (51) data channels were multiplexed and recorded on a 14-track tape deck. The data was digitally sampled at 8000 samples per second and processed per Section 12.0 of the Laboratory Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and nine (9) high-speed motion picture cameras operating at approximately 1000 frames per second.

The vehicle and occupant data are summarized in Section 2.0. The FMVSS 214 data are presented in Section 3.0. The vehicle, occupant, and camera measurements are presented in Section 4.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the dummy calibration data. Appendix D contains miscellaneous test information.

SECTION 2.0

SIDE IMPACT TEST SUMMARY

TEST RESULTS SUMMARY

This 48/24 kph 90° driver's side impact test was conducted at TRC on September 17, 1993.

The test vehicle, a 1993 Plymouth Voyager minivan, was equipped with a 2.5-liter, transverse engine, automatic transmission, and power brakes. Two Part 572 F dummies were seated in the left front and rear outboard seating positions. The vehicle's test weight was 1757 kilograms. The moving deformable barrier's impact speed was 54.4 kph. The vehicle's maximum static crush was 540 millimeters.

The driver dummy's Thoracic Trauma Index (TTI(d)) and Head Injury Criteria (HIC) were 88 and 639, respectively. Maximum pelvis lateral acceleration was 133.3 g.

The left rear passenger dummy's TTI(d) and HIC were 136 and 675, respectively. Maximum pelvis lateral acceleration was 150.2 g.

The moving barrier's leading edge of contact was 916 mm forward of the subject vehicle's wheelbase mid-point.

The door on the struck side of the test vehicle did not separate from the vehicle's main body at the hinges or latch. The doors on the opposite side did not open during the crash event.

DATA ACQUISITION EXPLANATIONS

The vehicle's left front door mid-rear Y-axis acceleration data channel, LFDYG3, recorded anomalous data spikes between 40 and 45 milliseconds.

The vehicle's rear floorpan above rear axle Y-axis acceleration data channel, RDKYG1, recorded anomalous data spikes between 39 and 42 milliseconds. This anomaly affected the computation of the vehicle's rear floorpan above rear axle resultant acceleration.

The moving barrier's center of gravity Y-axis acceleration data channel, BCGYG1, recorded questionable data after 20 milliseconds. This anomaly affected the computation of the moving barrier's center of gravity resultant acceleration.

TABLE 1 CRASH TEST SUMMARY

TEST TYPE: Moving Deformable Barrier Left Side Impact

TEST DATE: 09/17/93 TEST TIME: 1524 AMBIENT TEMP. (°C): 21

VEHICLE: 1993 Plymouth Voyager minivan

VEHICLE TEST WEIGHT (KG): 1757

MOVING BARRIER TEST WEIGHT (KG): 1363

IMPACT ANGLE[1] (DEG): 270

IMPACT VELOCITY[2] (KPH): PRIMARY = NA[3] SECONDARY = 54.4

DUMMIES:	DRIVER #903	PASSENGER #906
TYPE:	PART 572 F	PART 572 F
LOCATION:	LEFT FRONT	LEFT REAR
RESTRAINT:	3-POINT UNIBELT	3-POINT UNIBELT

NUMBER OF DATA CHANNELS: 51

NUMBER OF CAMERAS: HIGH-SPEED 9 REAL-TIME 1

[1]Measured clockwise from struck vehicle's front longitudinal centerline.
[2]Speed trap measurement (± .08 kph accuracy)
[3]The primary speed trap failed.

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Chrysler Corporation

MAKE/MODEL/BODY STYLE: Plymouth/Voyager/minivan MODEL YEAR: 1993

VIN: 2P4FH25K1PR213818 COLOR: Forrest green

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 2.5 liters

TRANSMISSION DATA: _3_SPEED, ___MANUAL, _X_AUTOMATIC, _X_FWD, ___RWD,___4WD

DATE VEHICLE RECEIVED: 09/14/93 ODOMETER READING: 142

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	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	No	AIR CONDITIONING	No
RADIO	Yes	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	No

REMARKS:

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

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Chrysler Corporation

DATE OF MANUFACTURE: 12/92 VIN: 2P4FH25K1PR213818

GVWR: 4650 LBS.

GAWR: FRONT: 2544 LBS., REAR: 2420 LBS.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear, Invicta GA, P205/70R14

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

SPARE TIRE (MFR., LINE, SIZE): Goodyear, Spacesaver, T125/70D15

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manually adjustable

MAXIMUM WIDTH: 1821 MM

WHEELBASE: 2870 MM

LOCATION OF "RECOMMENDED TIRE PRESSURE" LABEL:

The label was located on the driver's door.

DATA FROM VEHICLE'S "RECOMMENDED TIRE PRESSURE" LABEL:

RECOMMENDED TIRE SIZE: P195/75R14

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

DESIGNATED SEATING CAPACITY: 2 FRONT 3 REAR 5 TOTAL

VEHICLE CAPACITY WEIGHT: NA KG

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN MILLIMETERS):

DELIVERED ATTITUDE:	LF	755;	RF	766;	LR	762;	RR 773
PRE-TEST ATTITUDE:	LF	695;	RF	715;	LR	726;	RR 725
POST-TEST ATTITUDE:	LF	705;	RF	671;	LR	721;	RR 708

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

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

RIGHT FRONT	433 KG	RIGHT REAR	304 KG
LEFT FRONT	453 KG	LEFT REAR	290 KG
TOTAL FRONT WEIGHT	886 KG	(59.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	594 KG	(40.1% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT	1480 KG		
TARGET TEST WEIGHT[1]	1757 KG		

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 119 KG OF CARGO WEIGHT:

RIGHT FRONT	499 KG	RIGHT REAR	358 KG
LEFT FRONT	543 KG	LEFT REAR	357 KG
TOTAL FRONT WEIGHT	1042 KG	(59.3% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	715 KG	(40.7% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	1757 KG		

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: 0 KG

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: Rear hatch, exhaust system

CG = 1168 MM REARWARD OF FRONT WHEEL CENTERLINE

[1]Weight provided by VRTC to match previous test performed on September 14, 1993.

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 930917

TEST DATE: 09/17/93

TEST TIME: 1524

TEST TYPE: Moving Deformable Barrier Side Impact

IMPACT ANGLE[1]: 270°

AMBIENT TEMPERATURE AT IMPACT AREA: 21° C

TEMPERATURE IN OCCUPANT COMPARTMENT: 25° C

IMPACT VELOCITY: PRIMARY = NA[2] KPH
SECONDARY = 54.4 KPH
(SPECIFIED RANGE = 53.1 TO 54.7 KPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 356 MM

EXITING VELOCITY TRAP = 51 MM

[1]Measured clockwise from struck vehicle's front longitudinal centerline.
[2]The primary speed trap failed.

TABLE 4 TEST CONDITIONS

TEST NUMBER: 930917

DATE OF TEST: 09/17/93

TIME OF TEST: 1524

WIND VELOCITY: NA

HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA: 21° C

TEMPERATURE IN OCCUPANT COMPARTMENT: 25° C

VEHICLE DATA

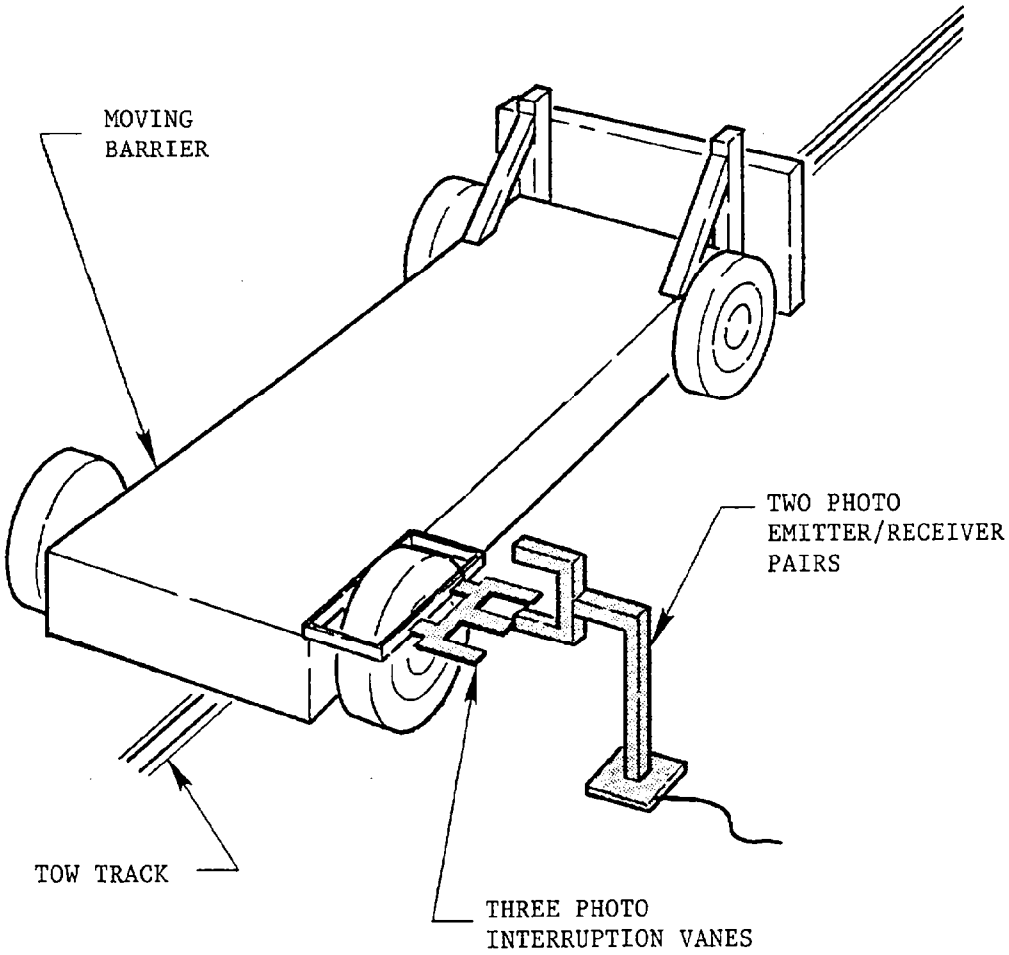
	ACTUAL	INTENDED
SUBJECT VEHICLE TEST WEIGHT (KG):	1757	1757
MOVING DEFORMABLE BARRIER TEST WEIGHT (KG):	1363	1361
MOVING DEFORMABLE BARRIER VELOCITY (KPH)[1]:	54.4	53.9
IMPACT POINT (MM)[2]:	916	940

DUMMY INFORMATION

	DRIVER	LEFT REAR PASSENGER
TYPE:	SID	SID
SERIAL NO.:	903	906
INSTRUMENTATION:		
HEAD ACCELEROMETERS:	3	3
UPPER SPINE ACCELEROMETERS:	4	4
UPPER RIB ACCELEROMETERS:	2	2
LOWER RIB ACCELEROMETERS:	2	2
LOWER SPINE ACCELEROMETERS:	4	4
PELVIS ACCELEROMETERS:	3	3
RESTRAINT SYSTEM:	3-POINT UNIBELT	3-POINT UNIBELT

[1]As measured over final 305 mm of travel.
[2]As measured forward of the subject vehicle's wheelbase mid-point.

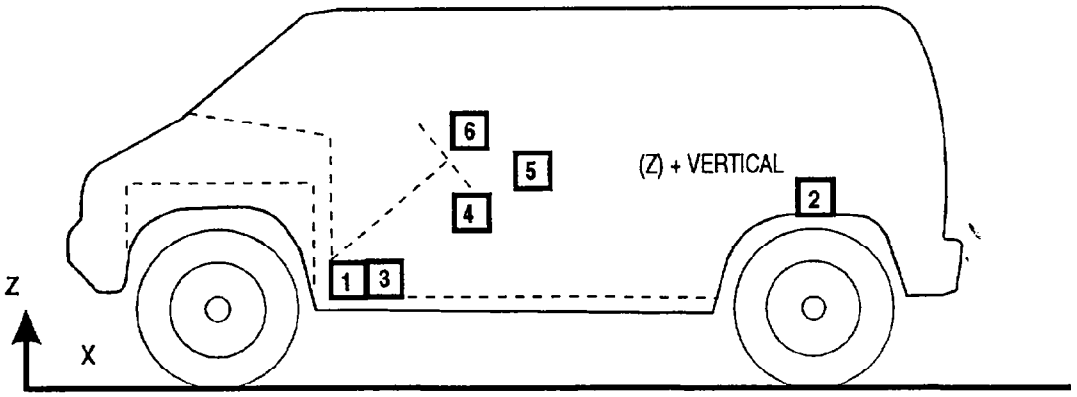
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



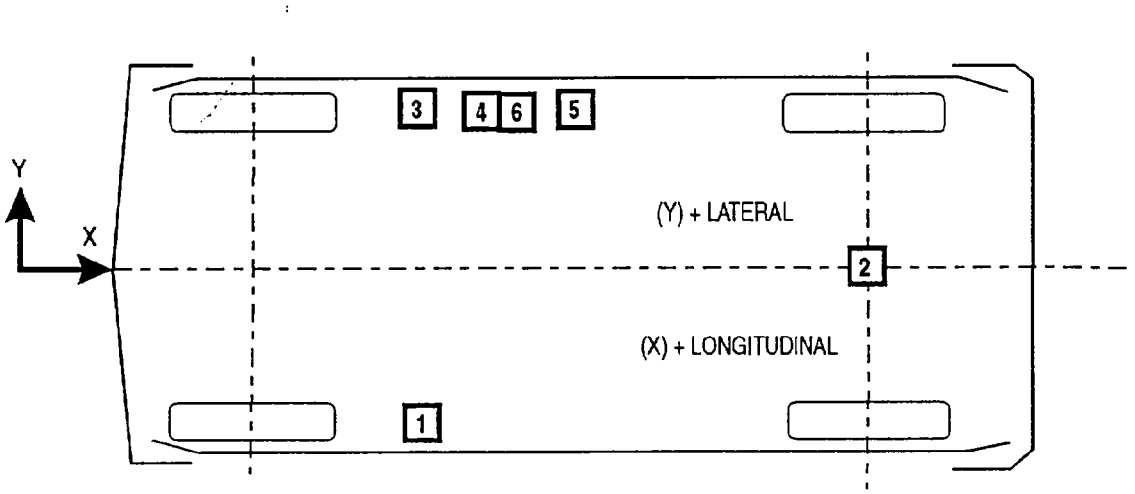
The final vane clears the final emitter/receiver pair 51 millimeters before impact.

The vanes have 305-millimeter spacing.

FIGURE 2 VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

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TABLE 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930917

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	RIGHT FRONT SILL	2746	-635	368				
	LONGITUDINAL				3.7	60.9	4.3	30.4
	LATERAL				2.0	309.1	8.2	48.4
	VERTICAL				5.7	60.6	5.5	17.8
	RESULTANT				8.6	47.9		
2	REAR FLOORPAN OVER AXLE	762	0	465				
	LONGITUDINAL				2.2	72.8	4.8	30.1
	LATERAL[1]				2.6	147.8	147.0	40.3
	VERTICAL				8.4	29.9	6.9	20.8
	RESULTANT[1]				147.0	40.3		
3	LEFT FRONT SILL	2527	654	372				
	LATERAL				16.8	48.0	42.2	27.5
4	LEFT FRONT DOOR CENTERLINE	2634	745	869				
	LATERAL				106.4	20.3	203.9	14.5

TABLE 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTINUED

TEST NUMBER 930917

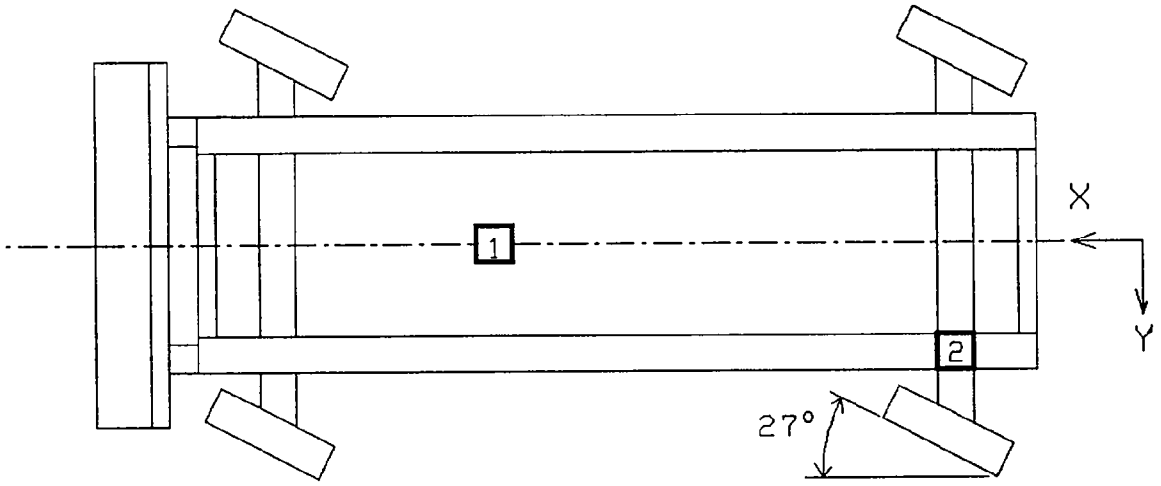
No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
5	LEFT FRONT DOOR MID-REAR LATERAL[1]	2266	739	867	156.2	26.0	423.3	43.9
6	LEFT FRONT DOOR UPPER CENTERLINE LATERAL	2664	737	1041	93.5	20.8	143.0	7.5

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN MILLIMETERS.

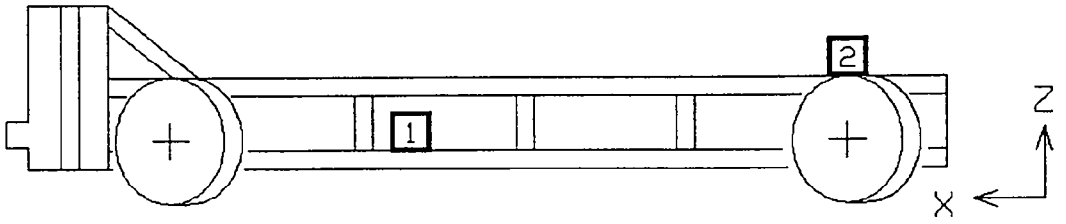
REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

[1] See DATA ACQUISITION EXPLANATIONS

FIGURE 3 MOVING DEFORMABLE BARRIER ACCELEROMETER PLACEMENT



TOP VIEW



SIDE VIEW

TABLE 6

MOVING DEFORMABLE BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930917

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	CENTER OF GRAVITY	1885	0	317				
	LONGITUDINAL				1.4	128.4	13.5	32.5
	LATERAL[1]				47.0	149.8	85.7	192.0
	VERTICAL				5.3	130.5	5.3	43.1
	RESULTANT[1]				85.7	192.0		
2	LEFT FRAME RAIL OVER REAR AXLE	384	638	625				
	LONGITUDINAL				3.2	122.8	17.6	32.4
	LATERAL				3.7	163.3	3.3	43.8

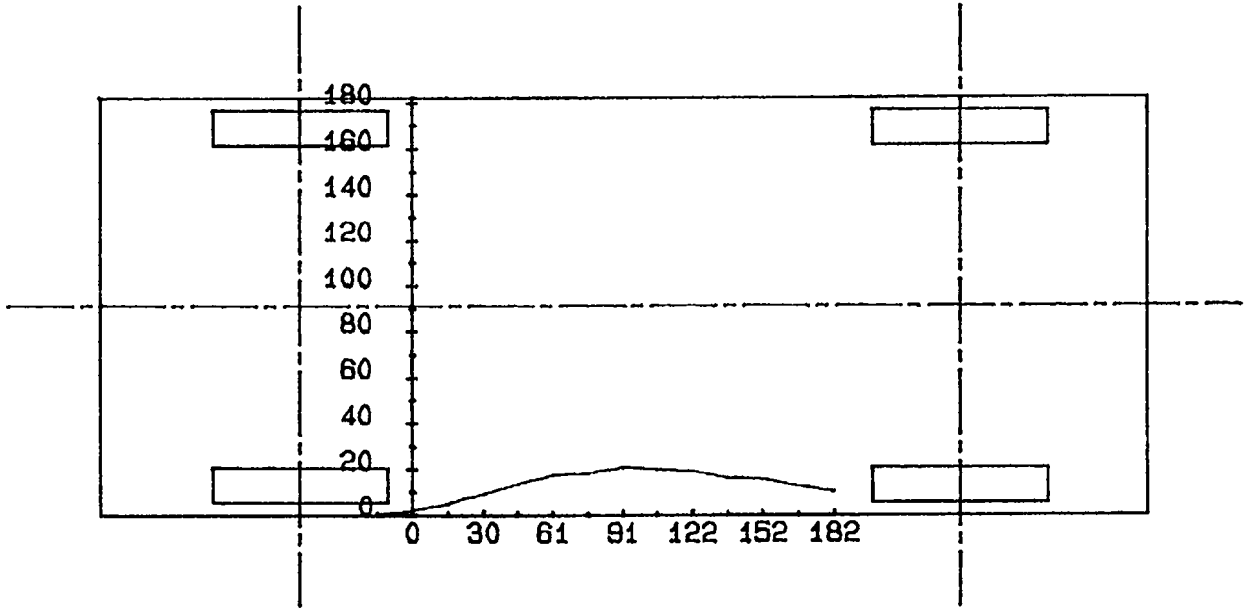
* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN MILLIMETERS.

REFERENCE: X: + FORWARD FROM REAR POINT OF FRAME
Y: + LEFTWARD FROM BARRIER CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

[1]See DATA ACQUISITION EXPLANATIONS

FIGURE 4

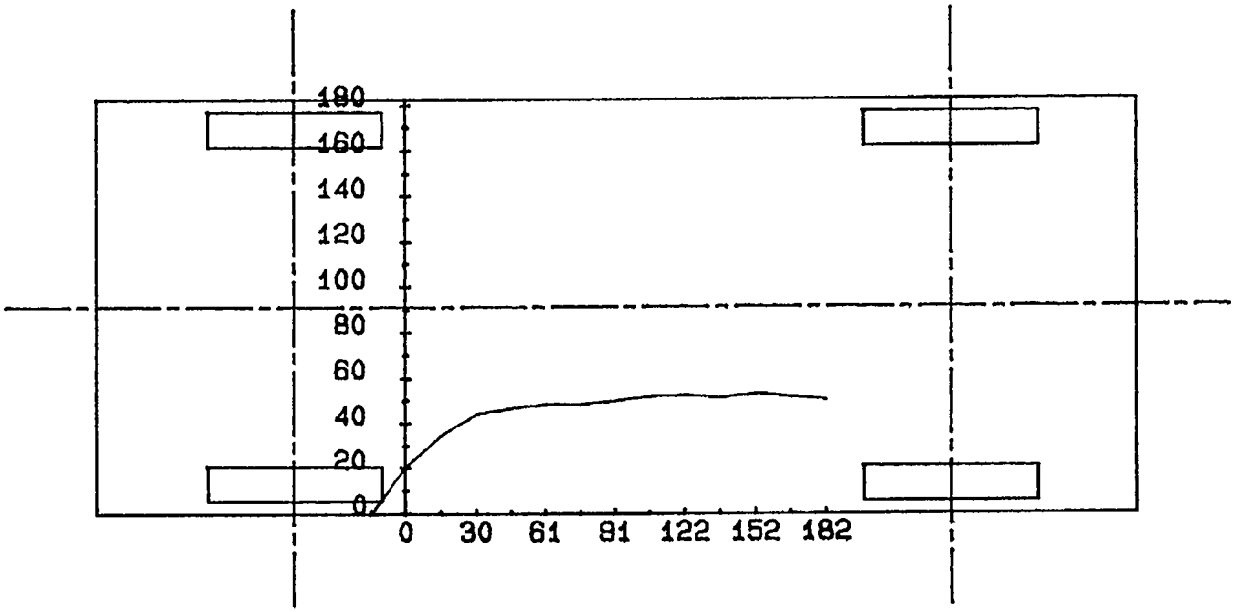
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS AXLE HEIGHT WHICH IS 32.4 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 4, CONT'D.

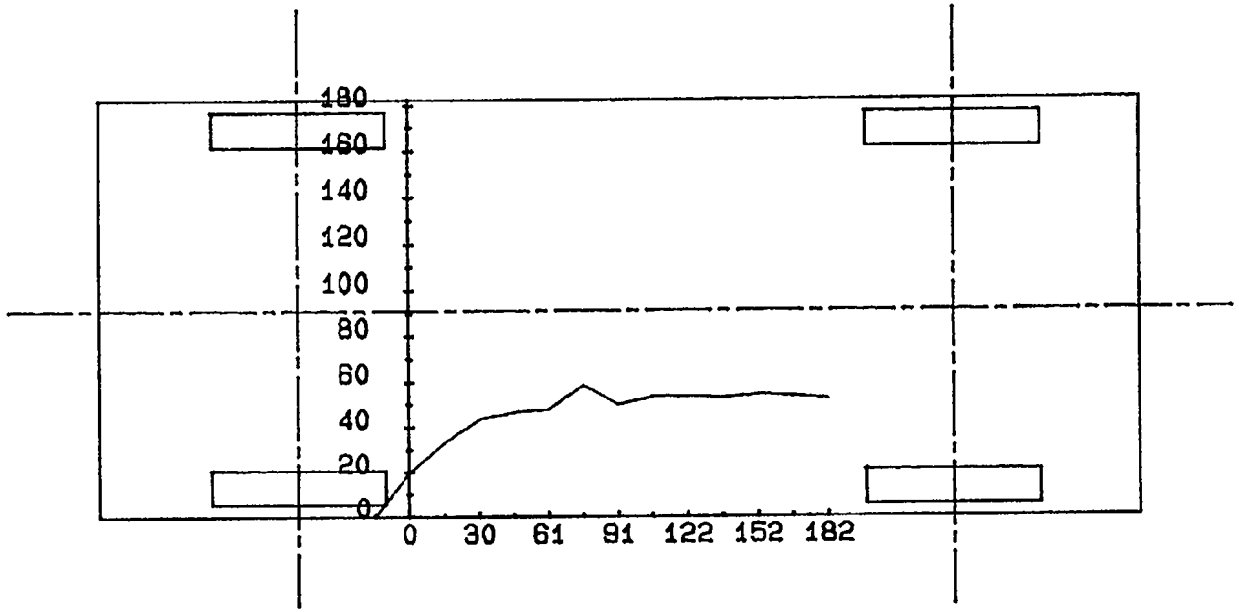
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS H-POINT HEIGHT WHICH IS 75.6 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 4, CONT'D.

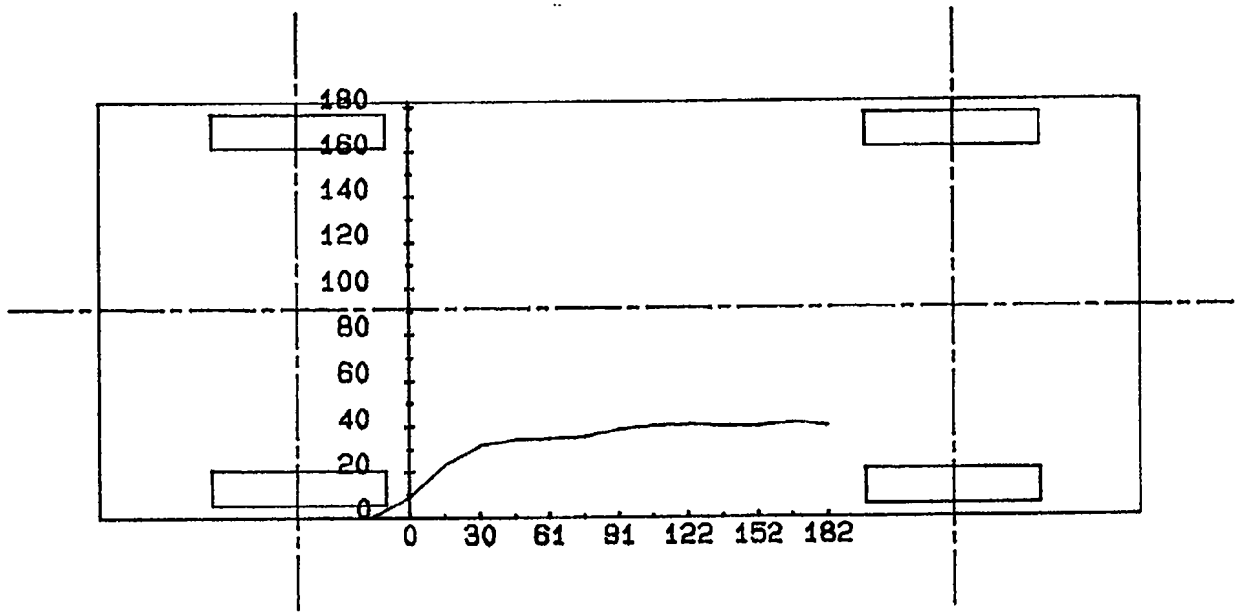
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS MID DOOR HEIGHT WHICH IS 71.1 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 4, CONT'D.

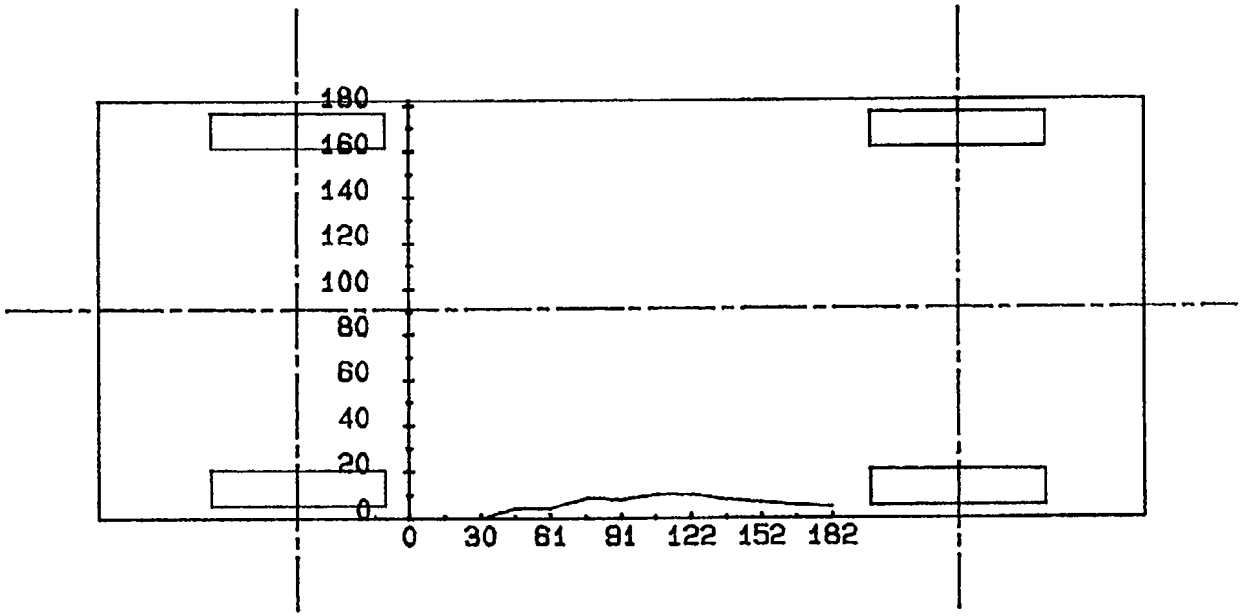
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW SILL HEIGHT WHICH IS 104.1 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 4, CONT'D.

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW TOP HEIGHT WHICH IS 160.0 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

TABLE 7 VEHICLE EXTERIOR PROFILES AND STATIC CRUSH
ZERO DISTANCE AT PROJECTED IMPACT POINT[1]

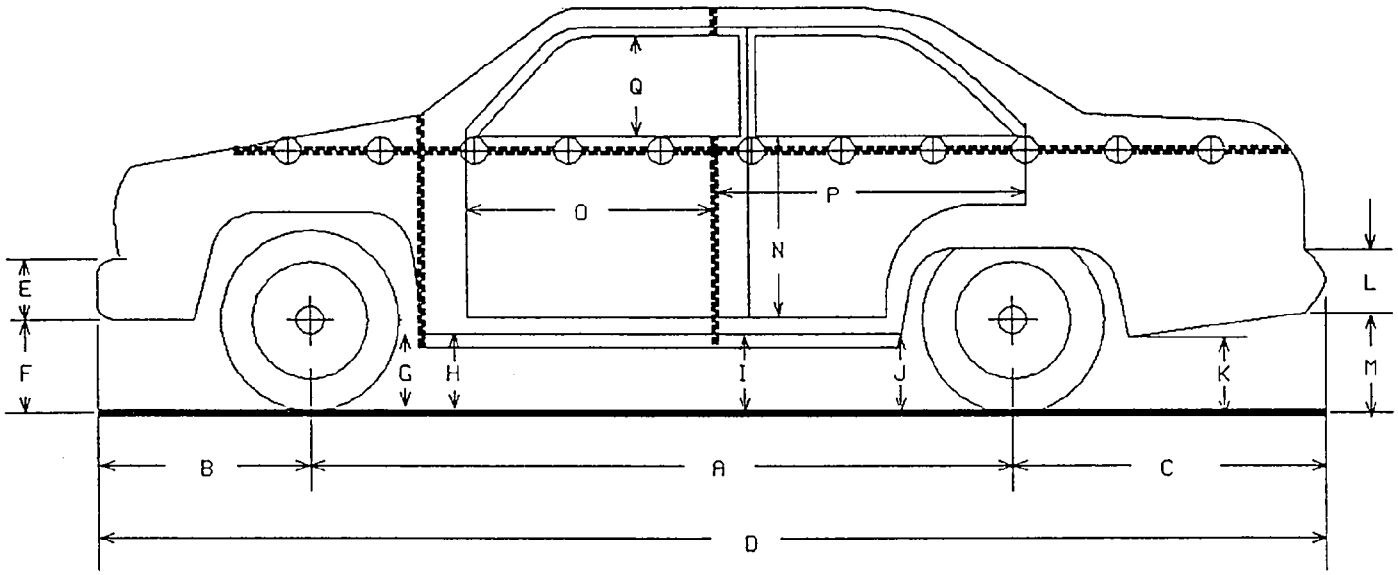
LOCATION	DELIVERED HEIGHT	-152	0	152	305	457	610	762	914	1067	1219	1372	1524	1676	1829
		PRE-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE[2])													
Axle height	324	X	406	405	400	399	399	397	396	395	392	395	386	384	386
H-point	756	342	341	332	329	331	323	322	324	330	333	332	314	312	313
Mid-door	711	342	341	332	329	331	323	322	324	330	333	332	314	312	313
Window sill	1041	383	383	359	359	359	358	354	355	374	370	363	347	345	348
Window top	1600	X	X	X	X	545	560	542	556	552	550	551	549	540	544
		POST-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE[2])													
Axle height	324	X	426	456	494	534	573	579	604	593	580	555	541	507	487
H-point	756	341	545	679	769	798	805	804	820	848	855	842	843	827	813
Mid-door	711	342	538	664	765	797	803	805	822	863	864	856	854	843	833
Window sill	1041	389	470	586	672	699	704	709	738	775	775	759	742	757	745
Window top	1600	X	X	X	X	587	602	626	631	651	652	628	615	593	590
		STATIC CRUSH (MM)													
Axle height	324	X	20	51	94	135	174	182	208	198	188	160	155	123	101
H-point	756	-1	204	347	440	467	482	482	496	518	522	510	529	515	500
Mid-door	711	0	197	332	436	466	480	483	498	533	531	524	540	531	520
Window sill	1041	6	87	227	313	340	346	355	383	401	405	396	395	412	397
Window top	1600	X	X	X	X	42	42	84	75	99	102	77	66	53	46

Column readings are front to rear from left to right.
All measurements are in millimeters.
[1]Projected impact point is 940 mm forward of the driver's side wheelbase mid-point.
[2]Reference plane is parallel to and 1219 mm from vehicle's longitudinal centerline.

FIGURE 5 PRE-TEST AND POST-TEST MEASUREMENTS

VEHICLE: 1993 Plymouth Voyager minivan

VIN: 2P4FH25K1PR213818 TEST DATE: 09/17/93

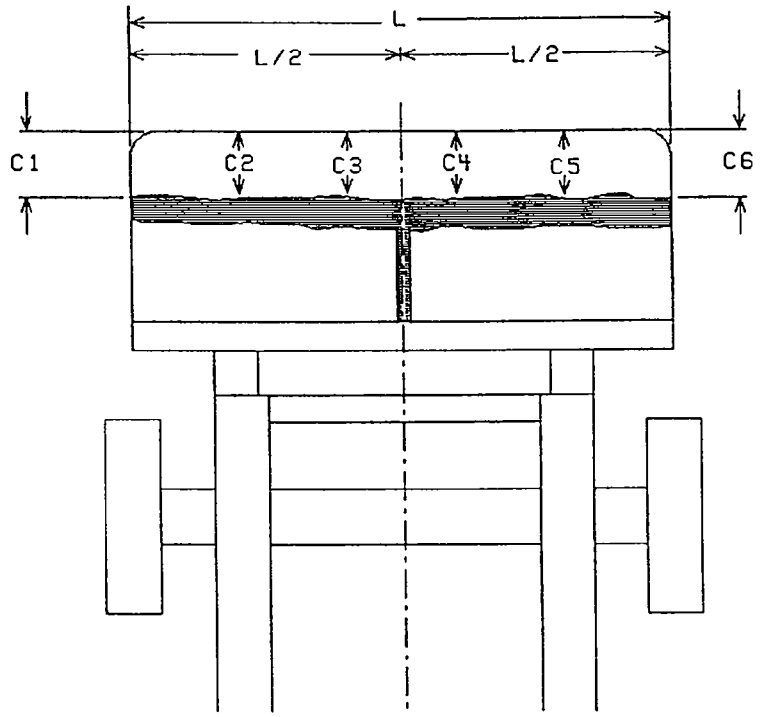


LEFT SIDE VIEW

	PRE-TEST	POST-TEST	CHANGE		PRE-TEST	POST-TEST	CHANGE
A	2864	2843	21	J	327	552	-225
B	865	842	23	K	315	320	-5
C	810	805	5	L	173	160	13
D	4539	4490	49	M	320	378	-58
E	255	255	0	N	NA	NA	NA
F	216	371	-155	O	917	902	15
G	300	295	5	P	NA	NA	NA
H	300	349	-49	Q	458	480	-22
I	308	390	-82				

All distance measurements are in millimeters.

FIGURE 6 MOVING DEFORMABLE BARRIER FACE 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 millimeters.

	PRE-TEST		POST-TEST		CRUSH
L	1665				
C1	375	C1	405	C1	30
C2	360	C2	374	C2	14
C3	360	C3	366	C3	6
C4	358	C4	359	C4	1
C5	356	C5	381	C5	25
C6	370	C6	434	C6	64
CL	360	CL	369	CL	9

TABLE 8 MOVING DEFORMABLE BARRIER FACE STATIC CRUSH
ZERO DISTANCE AT BARRIER CENTERLINE[1]

LOCATION	HEIGHT	813	711	610	508	406	305	203	102	0	102	203	305	406	508	610	711	813
PRE-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE[2])																		
Top of face	1045	460	458	456	462	460	458	460	461	462	465	461	459	458	460	460	458	460
Mid-face	791	458	460	458	461	461	458	460	460	461	463	461	459	460	460	460	457	460
Bumper	664	370	355	356	356	358	358	358	358	360	361	360	356	358	360	360	361	375
POST-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE[2])																		
Top of face	1045	507	483	459	467	467	459	448	462	453	466	461	469	461	464	460	475	507
Mid-face	791	465	462	457	465	464	458	449	464	457	463	457	460	456	458	460	454	462
Bumper	664	434	402	390	381	378	368	359	375	369	370	366	369	368	374	365	378	405
STATIC CRUSH (MM)																		
Top of face	1045	47	25	3	5	7	1	-12	1	-9	1	0	10	3	4	0	17	47
Mid-face	791	7	2	-1	4	3	0	-11	4	-4	0	-4	1	-4	-2	0	-3	2
Bumper	664	64	47	34	25	20	10	1	17	9	9	6	13	10	14	5	17	30

All measurements are in millimeters.

[1]Column readings are left to right across barrier face from left to right.

[2]Reference plane is 900 mm forward of the rear surface of the deformable barrier face.

SECTION 3.0

FMVSS 214 DATA

TABLE 9

DUMMY DATA SUMMARY

TEST NUMBER 930917

	DRIVER DUMMY SN: 903				PASSENGER DUMMY SN: 906			
	POSITIVE DIRECTION		NEGATIVE DIRECTION		POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC	MAX	MSEC	MAX	MSEC
HEAD								
LONGITUDINAL	11.9	58.5	29.2	73.1	53.8	65.4	29.7	83.5
LATERAL	14.5	146.8	48.6	46.9	27.7	72.8	56.0	53.3
VERTICAL	3.7	70.5	77.4	57.6	8.1	38.3	78.4	68.4
RESULTANT	78.5	57.6			102.0	65.6		
HIC	639 FROM 43.4 TO 77.6				675 FROM 47.4 TO 75.8			
UPPER SPINE								
LONGITUDINAL	13.0	98.1	14.8	37.5	21.1	55.6	25.1	41.9
LATERAL (P)	29.6	61.9	81.3	43.1	29.1	64.4	82.2	45.6
LATERAL (R)	29.9	61.2	80.5	43.1	29.6	64.4	79.6	45.6
VERTICAL	4.8	56.3	12.6	71.9	18.5	36.9	24.9	43.1
RESULTANT (P)	82.2	43.1			85.8	45.0		
RESULTANT (R)	81.4	43.1			83.3	45.0		

TABLE 9

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 930917

	DRIVER DUMMY SN: 903				PASSENGER DUMMY SN: 906			
	POSITIVE DIRECTION		NEGATIVE DIRECTION		POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC	MAX	MSEC	MAX	MSEC
LOWER SPINE								
LONGITUDINAL	11.9	41.9	29.4	61.2	24.2	58.8	34.8	65.0
LATERAL (P)	21.2	60.6	85.3	33.1	53.1	63.8	132.2	40.0
LATERAL (R)	21.5	60.6	85.0	32.5	53.5	63.1	132.0	40.0
VERTICAL	7.1	56.3	8.7	70.6	21.2	43.1	11.3	80.6
RESULTANT (P)	85.8	33.1			136.2	40.0		
RESULTANT (R)	85.4	33.1			136.0	40.0		
LEFT UPPER THORAX RIB								
LATERAL (P)	30.4	68.1	69.2	29.4	18.0	162.5	125.9	36.3
LATERAL (R)	30.6	68.1	70.5	28.7	19.4	163.1	123.9	36.3
LEFT LOWER THORAX RIB								
LATERAL (P)	25.8	68.8	90.3	27.5	31.5	69.4	139.3	35.0
LATERAL (R)	27.1	68.8	92.8	27.5	33.5	69.4	141.6	35.0
	TTI(d) (P) 88				TTI(d) (P) 136			
	TTI(d) (R) 89				TTI(d) (R) 137			

TABLE 9

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 930917

	DRIVER DUMMY SN: 903				PASSENGER DUMMY SN: 906			
	POSITIVE DIRECTION		NEGATIVE DIRECTION		POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC	MAX	MSEC	MAX	MSEC
PELVIS								
LONGITUDINAL	20.6	33.1	23.2	43.1	7.2	117.5	29.3	41.2
LATERAL	30.1	55.6	133.3	31.3	32.8	73.8	150.2	35.0
VERTICAL	17.9	31.9	9.6	70.6	36.8	35.6	135.1	12.5
RESULTANT	135.5	31.3			154.6	35.0		

POSITIVE DIRECTION

LONGITUDINAL:	FORWARD
LATERAL:	LEFTWARD
VERTICAL:	UPWARD

NEGATIVE DIRECTION

LONGITUDINAL:	REARWARD
LATERAL:	RIGHTWARD
VERTICAL:	DOWNWARD

NOTES:

(P) Primary Sensor
(R) Redundant Sensor

TABLE 10 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #903	PASSENGER #906
HEAD	None	None
CHEST	Door panel	Side panel
ABDOMEN	Door panel	Side panel
LEFT KNEE	Door panel	Side panel
RIGHT KNEE	Lower instr. panel	Left Leg

DOOR OPENING:

	LEFT	RIGHT
FRONT	Tools	Easy
REAR	NA	Easy

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	None	None
REAR	None	None

GLAZING DAMAGE:

The driver's door glass was broken out completely. The left side of the windshield cracked. The left middle window glass was broken out completely.

OTHER NOTABLE IMPACT EFFECTS:

None

DUMMY KINEMATIC SUMMARY

Driver Dummy

Upon impact, the driver dummy translated toward the left and impacted the door panel. The dummy's head rotated toward the left and the dummy rebounded toward the right. The dummy's head rotated toward the right and the dummy translated toward the right before being restrained by the three-point unibelt. The dummy's upper body then rotated toward the right and the dummy's head and thorax contacted the right front seat back. The dummy came to rest sitting in the driver's seat, facing forward, leaning to the right, and restrained by the three-point unibelt.

Left Rear Passenger Dummy

Upon impact, the passenger dummy translated toward the left and impacted the side panel. The dummy's head rotated toward the left and the dummy rebounded toward the right. The dummy's head rotated toward the right and the dummy translated toward the right before being restrained by the three-point unibelt. The dummy then rotated rearward into the seat back while rising out of the seat. The dummy rotated forward and came to rest facing forward, leaning to the left, and restrained by the three-point unibelt.

SECTION 4.0

VEHICLE, OCCUPANT, AND CAMERA MEASUREMENTS

FIGURE 7 DUMMY AND SEAT POSITIONING DATA

MAKE/MODEL/BODY STYLE: Plymouth/Voyager/minivan

SEAT TYPE: X Bench-Rear
X Bucket-Front
_____ Split bench

ADJUSTER TYPE: X Manual-Front
_____ Power
X Non-adjustable-rear

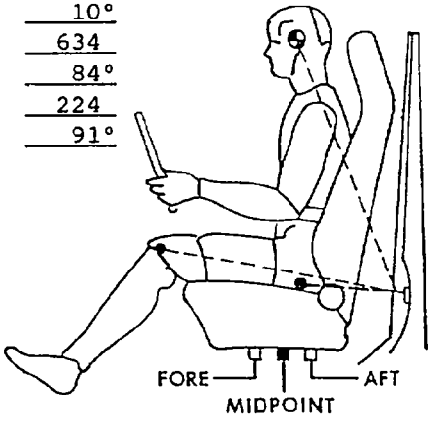
SEAT BACK TYPE: X Non-adjustable-Rear
X Adjustable reclining-Front

TECHNICIANS:
1. B. Crabtree
2. S. Ericksen
3. J. Taylor

POSITIONING DATE: 09/17/93
TIME: 1040 TEMPERATURE: 21° C

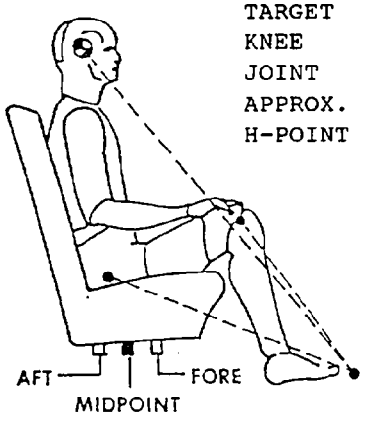
DRIVER DUMMY[1] # 903 TYPE: SID

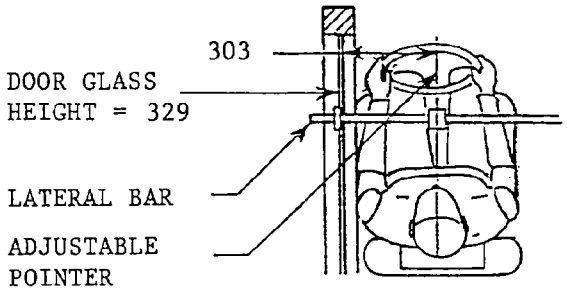
HEAD	647
TARGET	10°
KNEE	634
JOINT	84°
APPROX.	224
H-POINT	91°



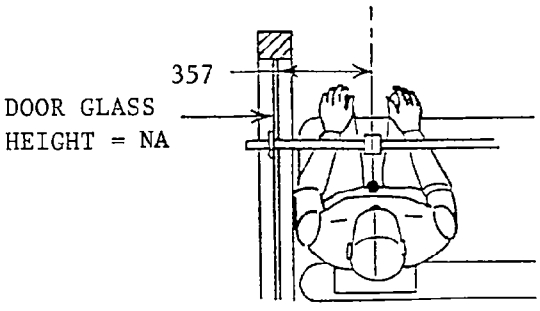
LEFT REAR
PASSENGER DUMMY[2] # 906 TYPE: SID

HEAD	1388
TARGET	41°
KNEE	610
JOINT	36°
APPROX.	NA[3]
H-POINT	NA[3]





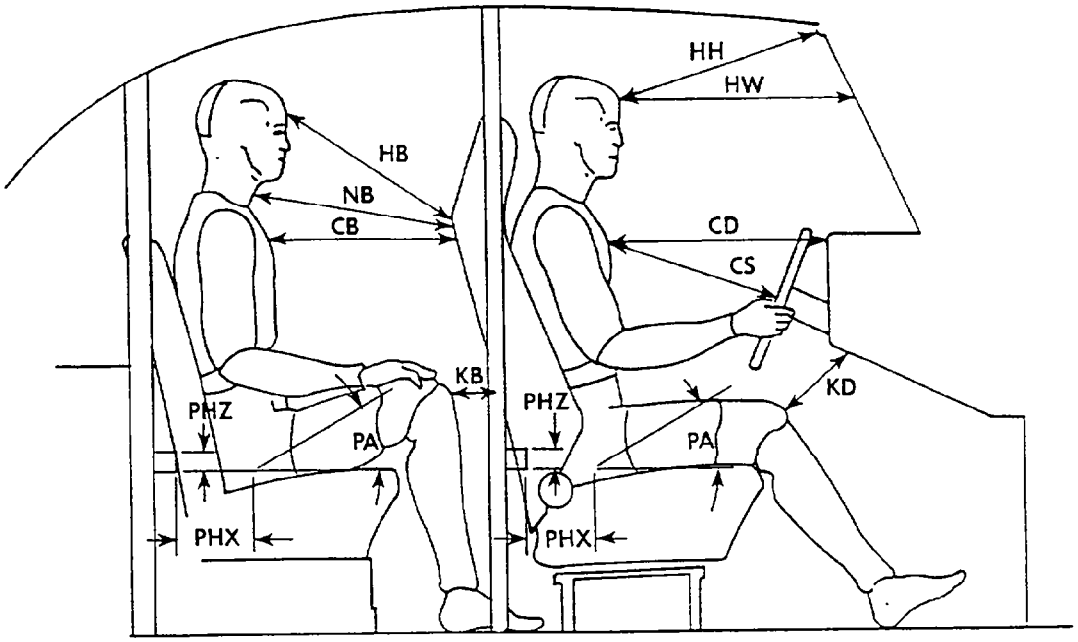
DRIVER DUMMY



LEFT REAR
PASSENGER DUMMY

[1]Driver dummy measurements are referenced to top of front door striker for 4-door vehicles.
[2]Passenger dummy measurements are referenced to top of rear door striker for 4-door vehicles. Passenger dummy measurements are referenced to front seat back latch bolt with front seat in mid-position for 2-door vehicles.
[3]The bench seat obstructed the H-point measurement.
All angles are referenced to vertical.
All distance measurements are in millimeters.

FIGURE 8 DUMMY LONGITUDINAL CLEARANCE MEASUREMENTS



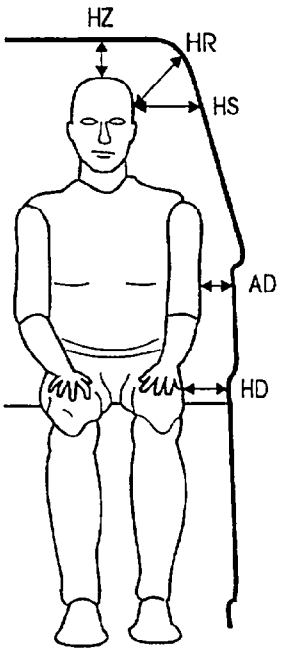
	DRIVER	LEFT REAR PASSENGER
HH	472	NA
HW	612	NA
CD	530	NA
CS	325	NA
KDL	148	NA
KDR	139	NA
PA	24	23
PHX	222	NA
PHZ	16	NA
HB	NA	630
NB	NA	740
CB	NA	648
KBL	NA	287
KBR	NA	291

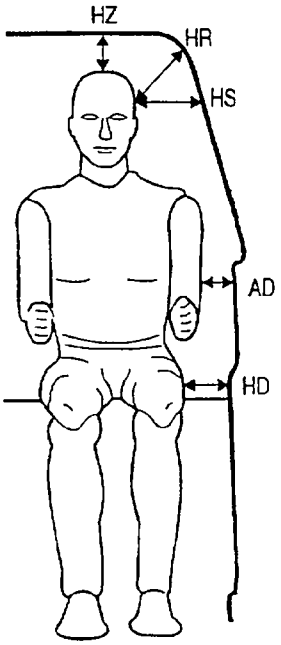
All distance measurements are in millimeters.

All angle measurements are in degrees.

NOTE: For 2-door vehicles, the rear passenger's PHX and PHZ measurements are referenced to the front door stiker.

FIGURE 9 DUMMY LATERAL CLEARANCE MEASUREMENTS





	DRIVER	LEFT REAR PASSENGER
HR	178	209
HS	229	283
AD	74	167
HD	145	144
HZ	103	92

All distance measurements are in millimeters.

FIGURE 10 CAMERA POSITIONS

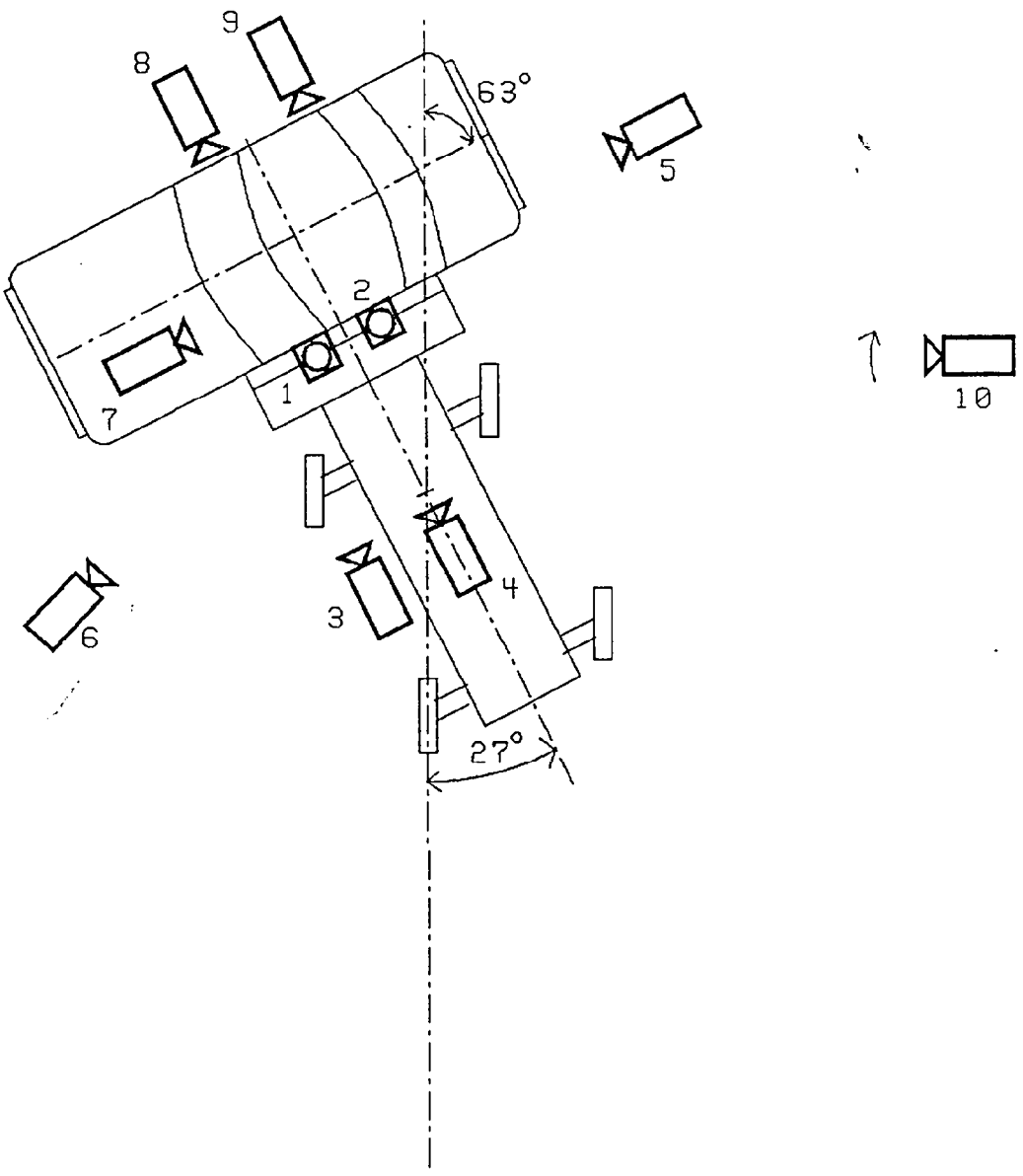


TABLE 11 CAMERA INFORMATION

TEST NO. 930917

VEHICLE: 1993 Plymouth Voyager minivan

CAMERA NO.	VIEW	CAMERA POSITIONS (CM)[1] X	Y	Z	ANGLE[2] (DEG)	LENS (MM)	FILM SPEED (FPS)
1	Overhead overall	0	0	1059	-90	8.5	1000
2	Overhead close-up	-71	0	1059	-90	25	1017
3	Onboard barrier side	NA	NA	NA	NA	25	1002
4	Onboard barrier center	NA	NA	NA	NA	13	992
5	Right side	558	-795	90	0	13	1005
6	Left side	-544	300	111	0	25	973
7	Onboard vehicle front	NA	NA	NA	NA	8	995
8	Onboard vehicle side-front	NA	NA	NA	NA	8	1000
9	Onboard vehicle side-rear	NA	NA	NA	NA	8	1000
10	Real-time panning	NA	NA	NA	NA	16	24

[1] +X = Film plane forward of impact point on target vehicle's struck side
+Y = Film plane leftward of impact point on target vehicle's struck side
+Z = Film plane above ground level

[2] +Angle = Film plane angled upward from horizontal plane.

APPENDIX A

PHOTOGRAPHS

Figure A-1. PRE-TEST FRONT VIEW

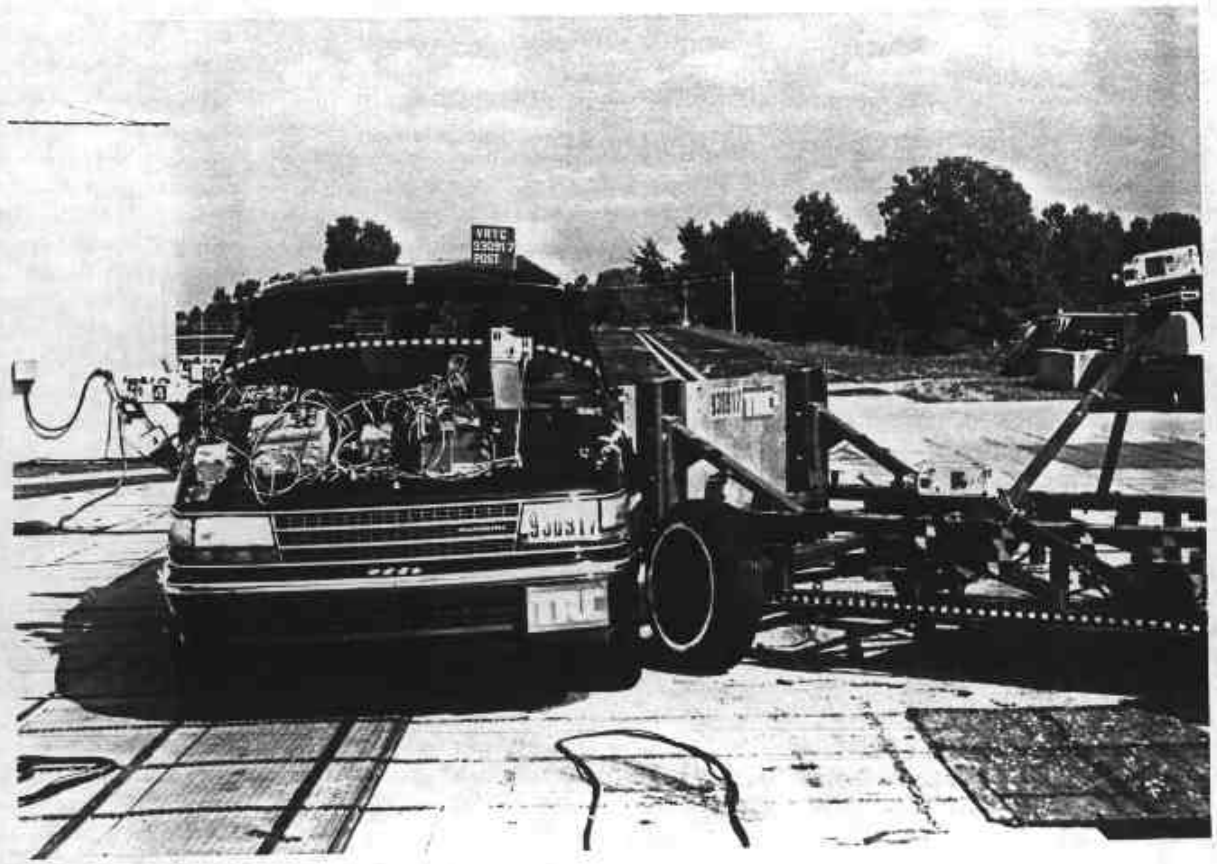


Figure A-2. POST-TEST FRONT VIEW

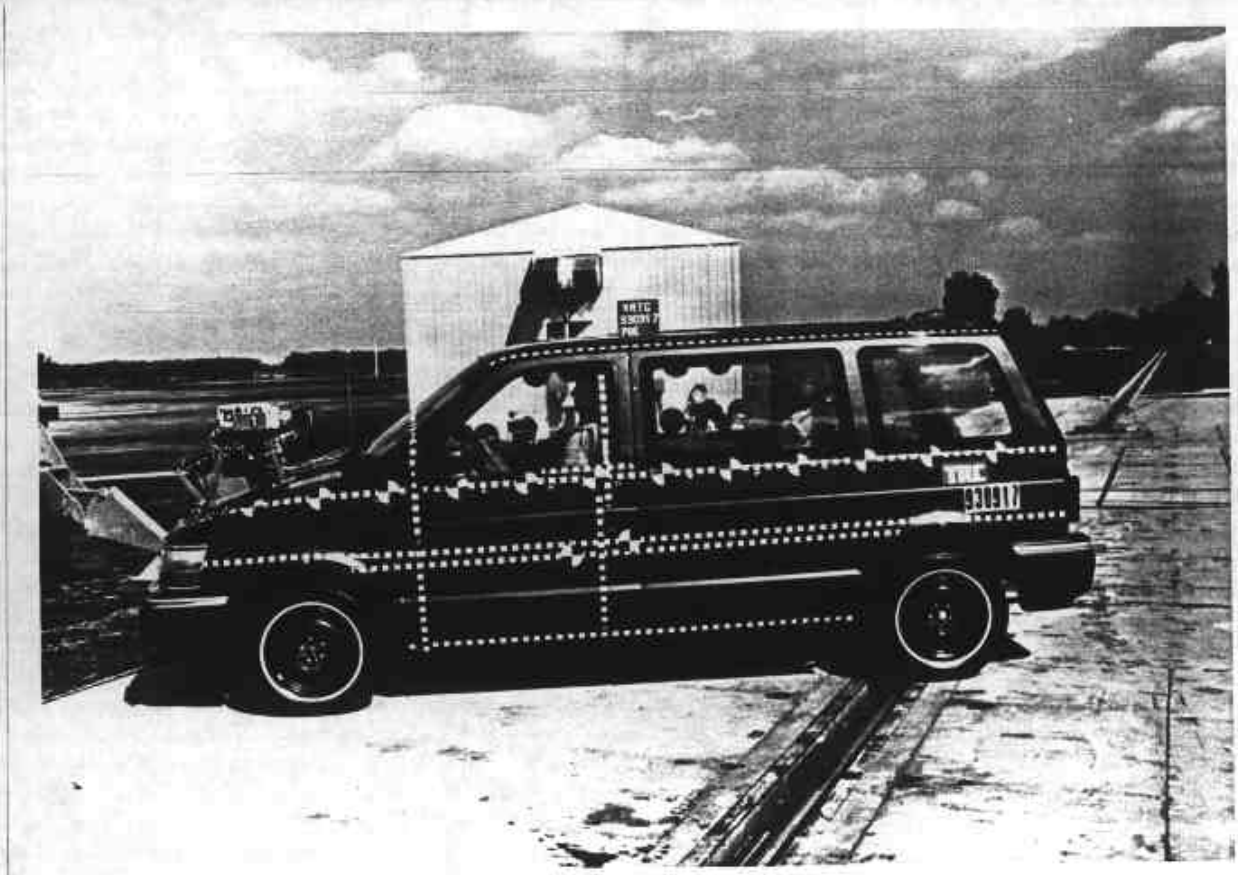


Figure A-3. PRE-TEST LEFT SIDE VIEW

Figure A-4. POST-TEST LEFT SIDE - VIEW 1

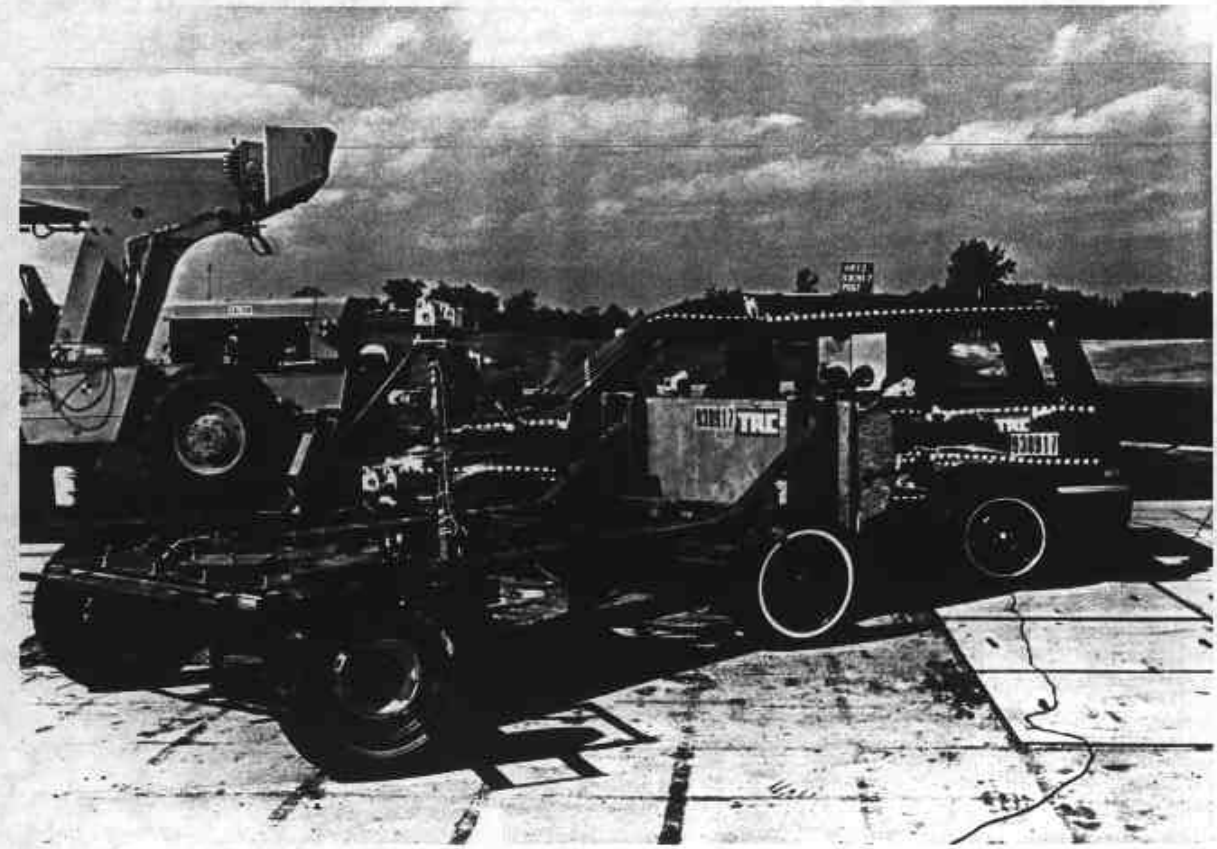


Figure A-5. POST-TEST LEFT SIDE - VIEW 2

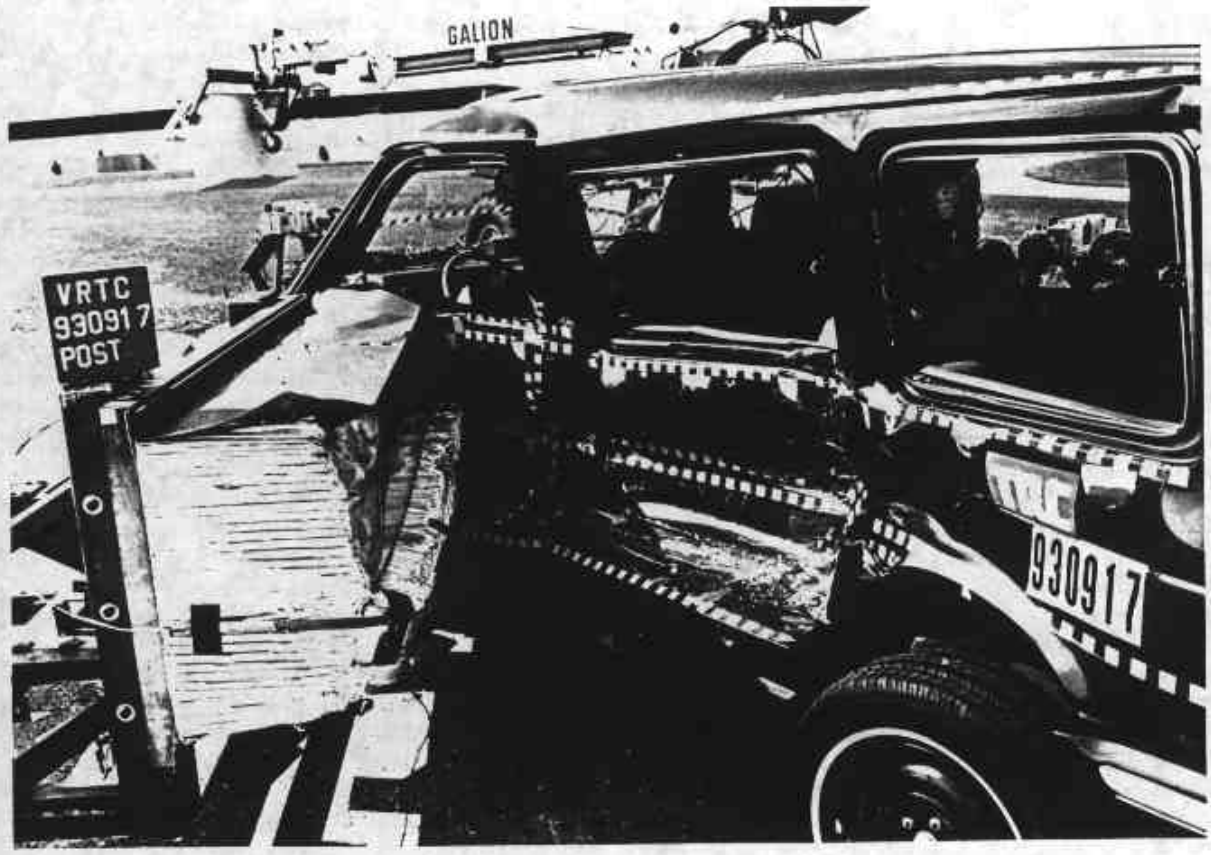


Figure A-6. POST-TEST LEFT SIDE - VIEW 3

Figure A-7. PRE-TEST RIGHT SIDE VIEW

Figure A-8. POST-TEST RIGHT SIDE VIEW

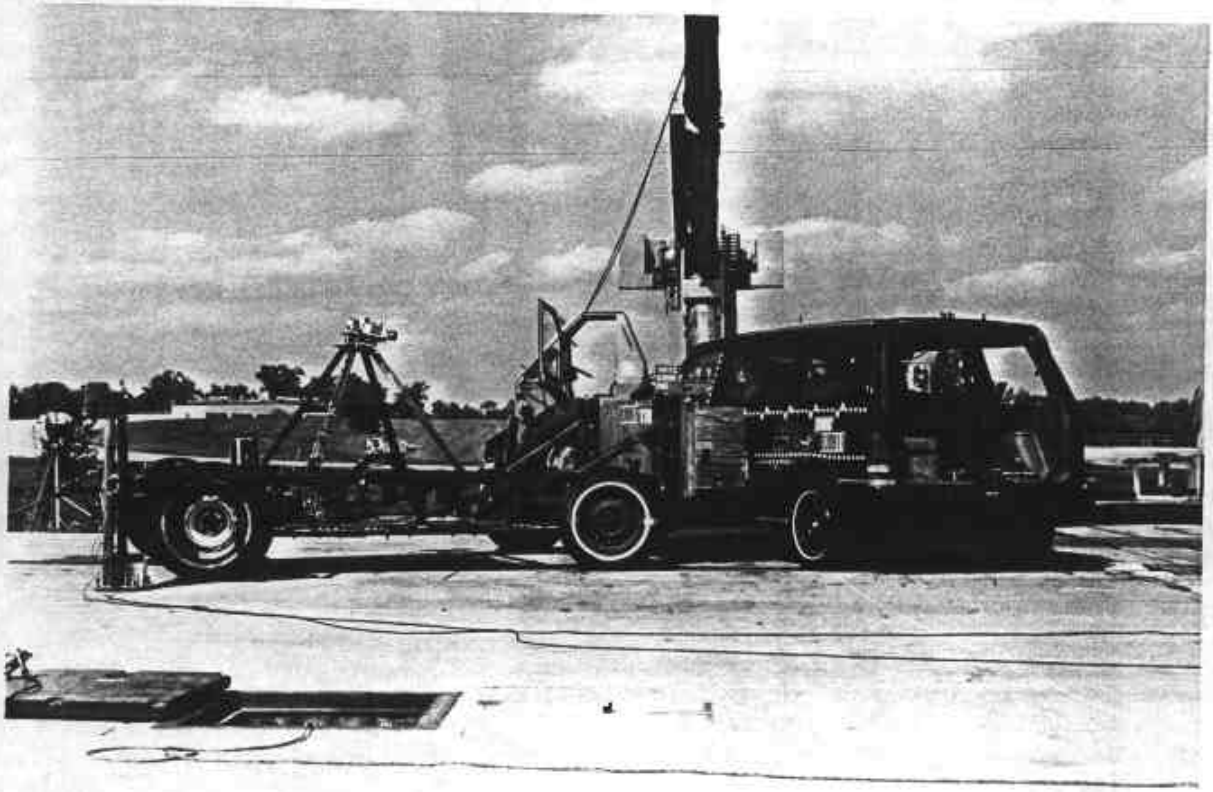


Figure A-9. PRE-TEST REAR VIEW

Figure A-10. POST-TEST REAR VIEW

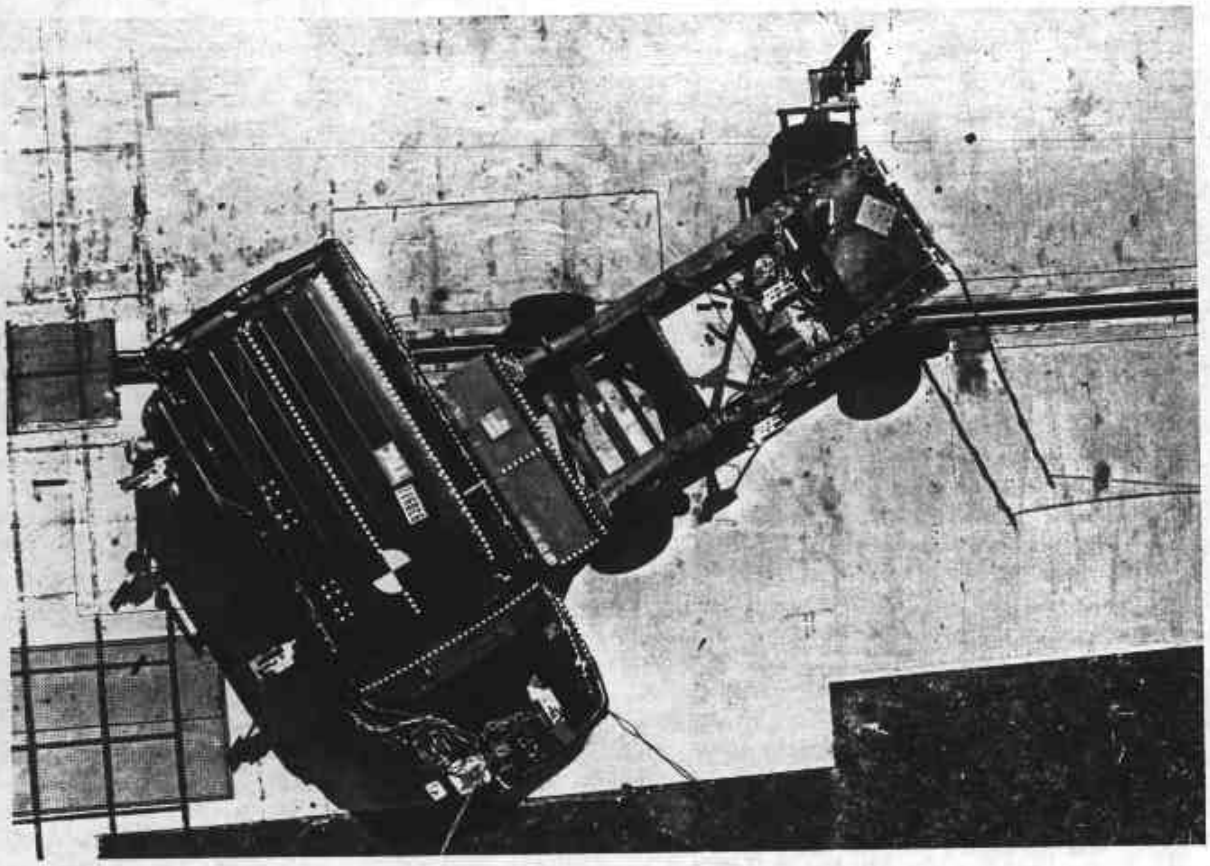


Figure A-11. PRE-TEST OVERHEAD VIEW

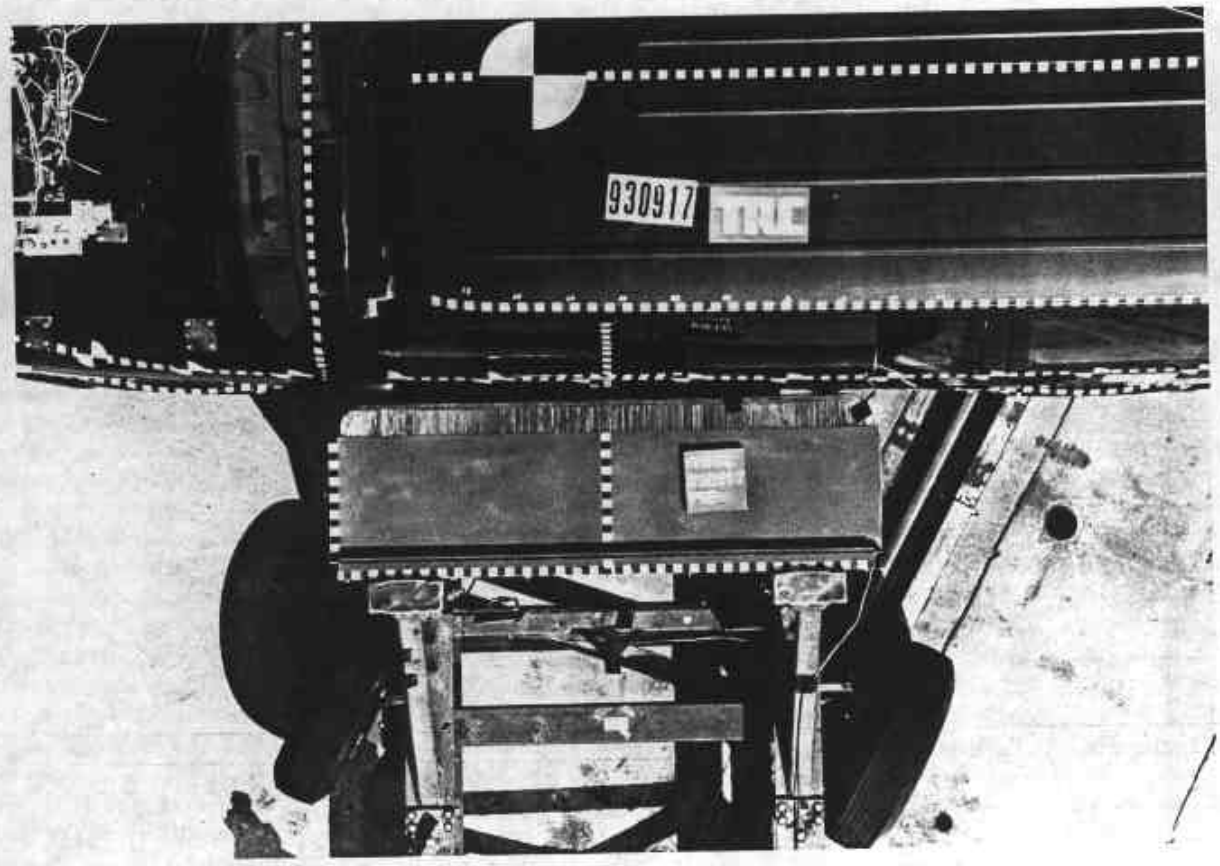


Figure A-12. PRE-TEST OVERHEAD CLOSE-UP VIEW

Figure A-13. PRE-TEST DRIVER DUMMY POSITION VIEW

Figure A-14. POST-TEST DRIVER DUMMY POSITION - VIEW 1

Figure A-15. POST-TEST DRIVER DUMMY POSITION - VIEW 2

Figure A-16. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

Figure A-17. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

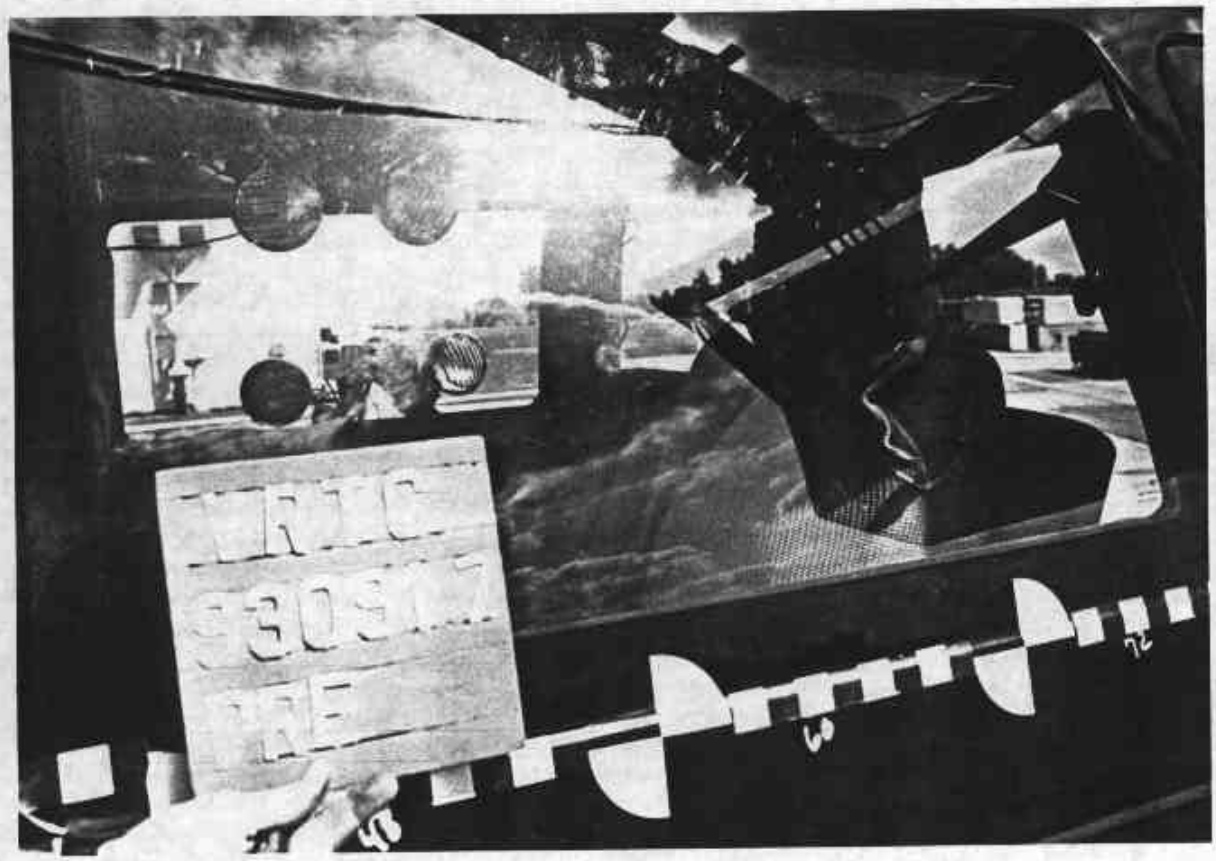


Figure A-18. PRE-TEST PASSENGER DUMMY POSITION - VIEW 1

Figure A-19. POST-TEST PASSENGER DUMMY POSITION - VIEW 1

Figure A-20. POST-TEST PASSENGER DUMMY POSITION - VIEW 2

Figure A-21. PRE-TEST PASSENGER DUMMY POSITION - VIEW 2

Figure A-22. POST-TEST DRIVER DUMMY HEAD CONTACT VIEW

Figure A-23. POST-TEST DRIVER DUMMY CONTACT VIEW

Figure A-24. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW

Figure A-25. POST-TEST PASSENGER DUMMY CONTACT VIEW

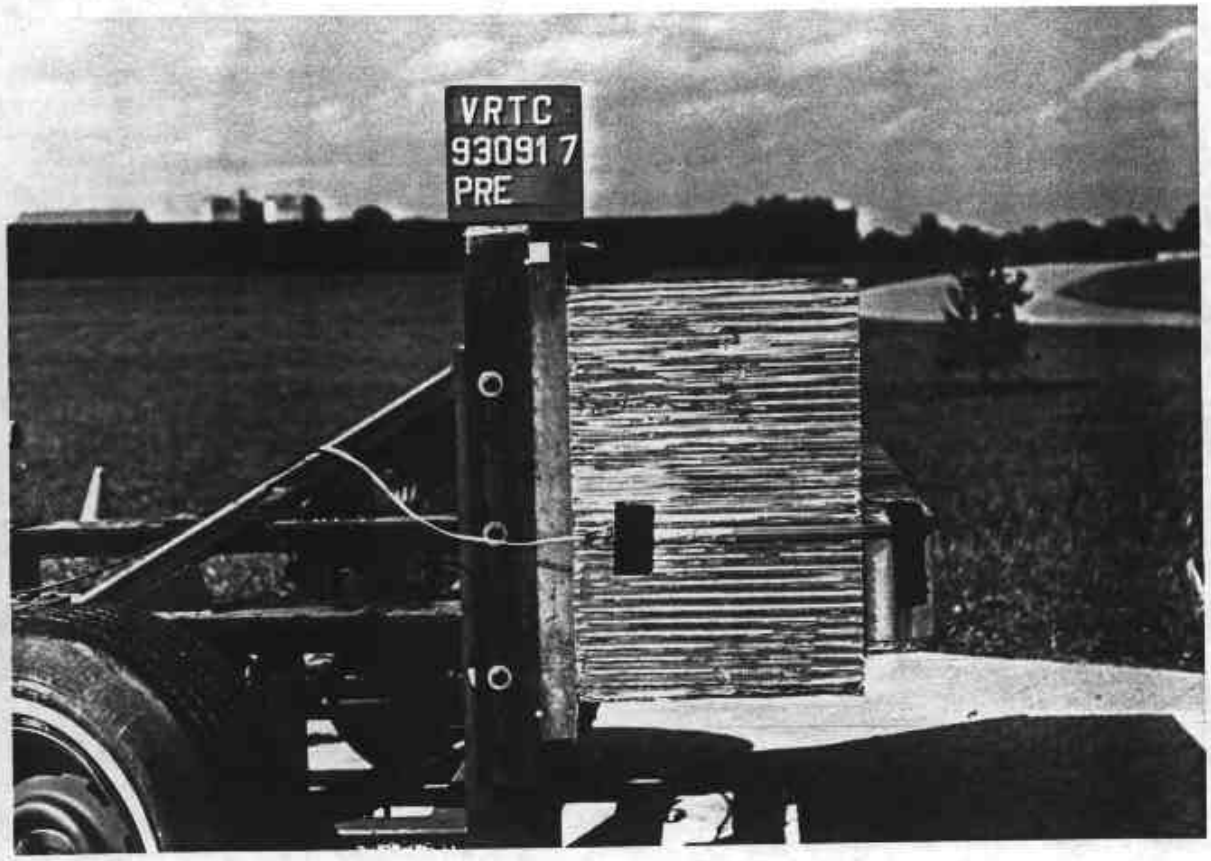


Figure A-26. PRE-TEST VEHICLE IMPACTOR FACE - RIGHT SIDE VIEW

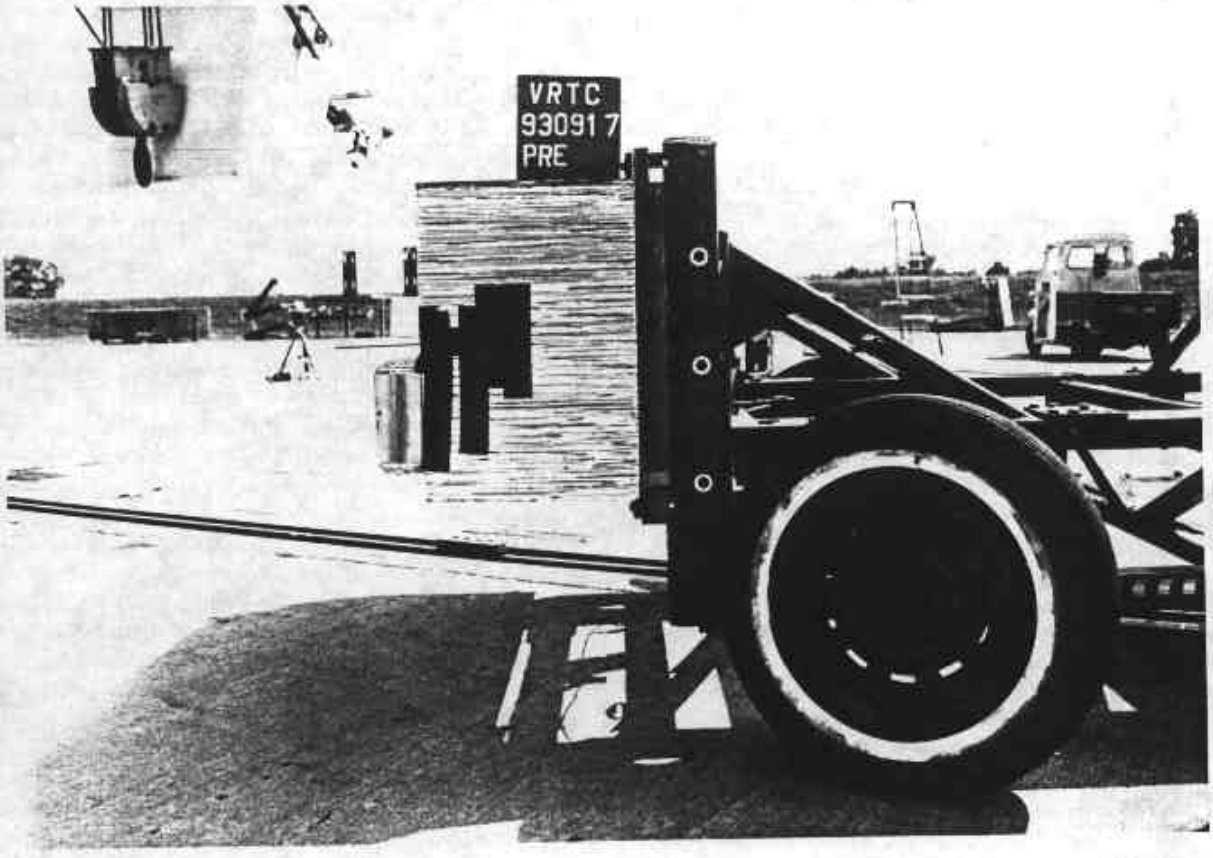


Figure A-27. PRE-TEST VEHICLE IMPACTOR FACE - LEFT SIDE VIEW

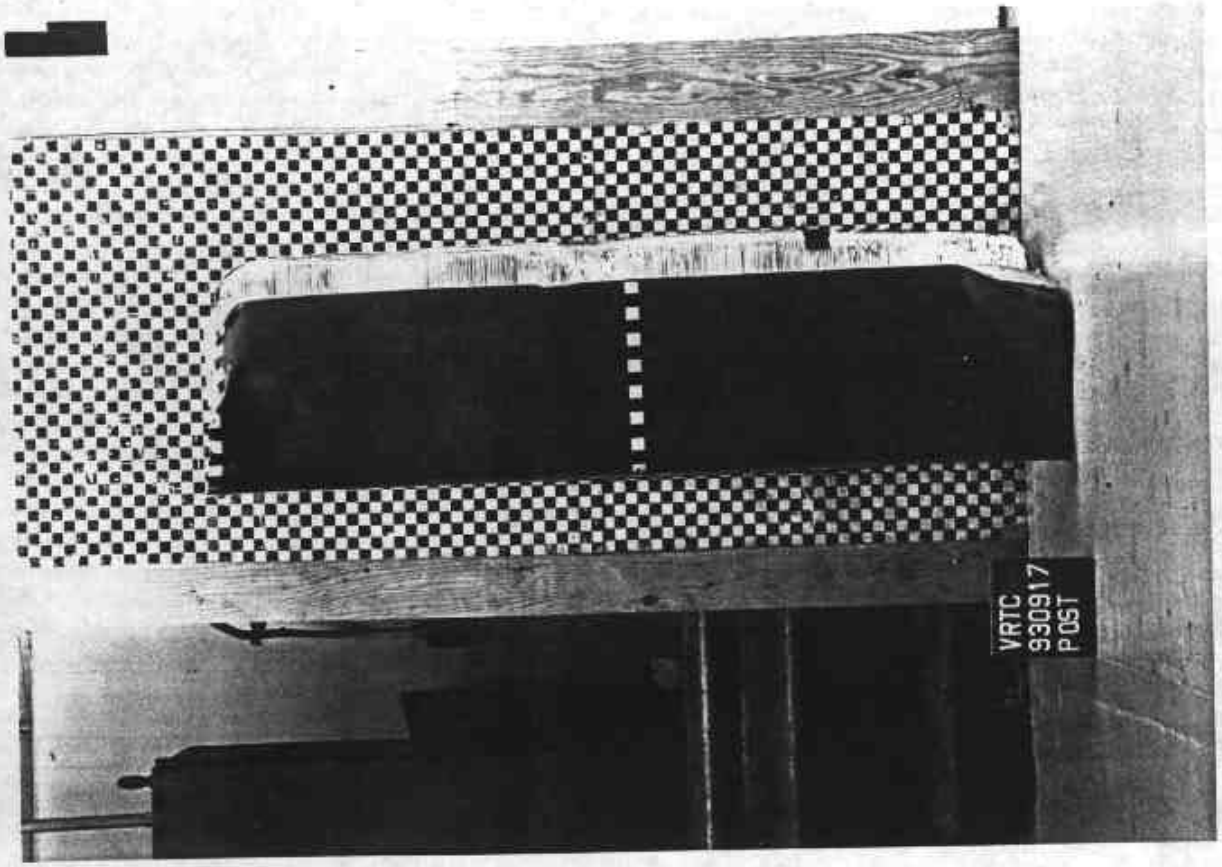


Figure A-28. POST-TEST VEHICLE IMPACTOR FACE - TOP VIEW

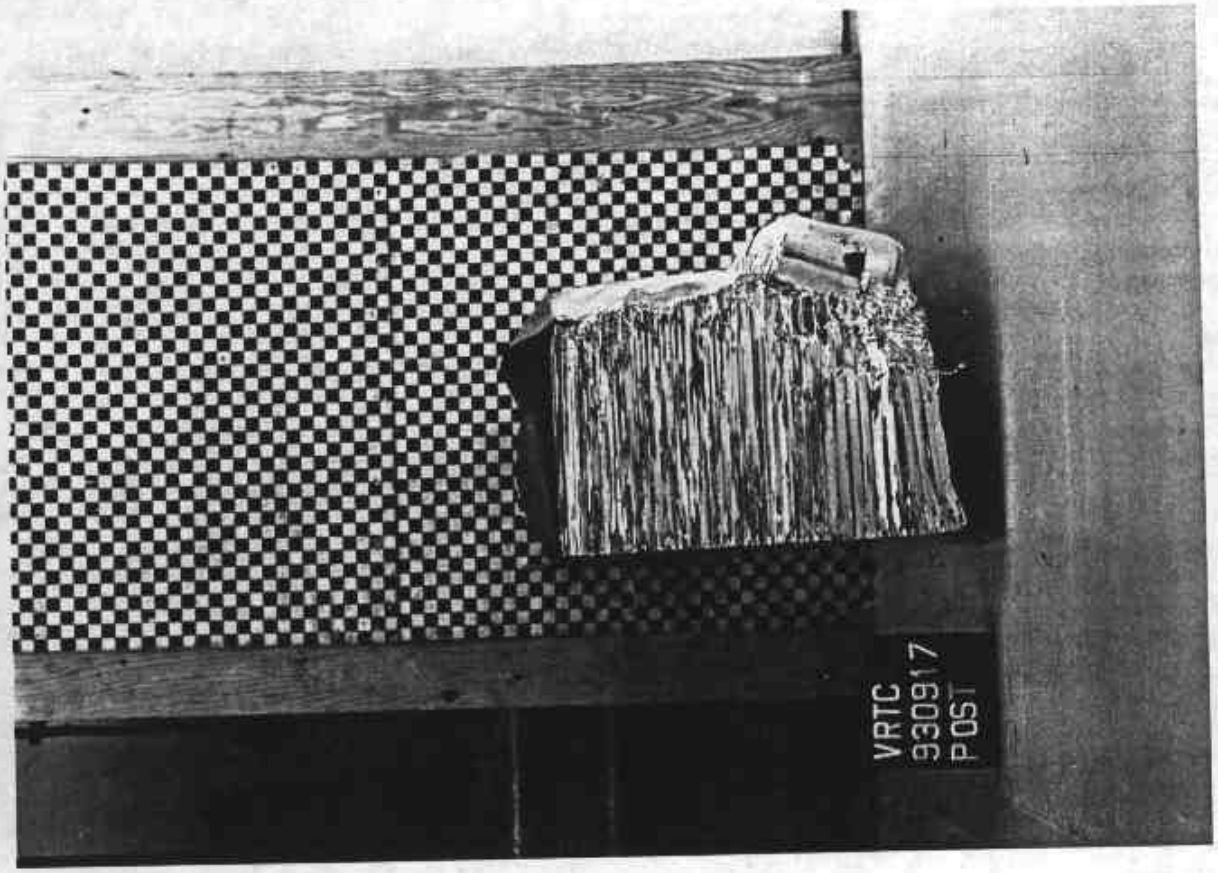


Figure A-29. POST-TEST VEHICLE IMPACTOR FACE - RIGHT SIDE VIEW

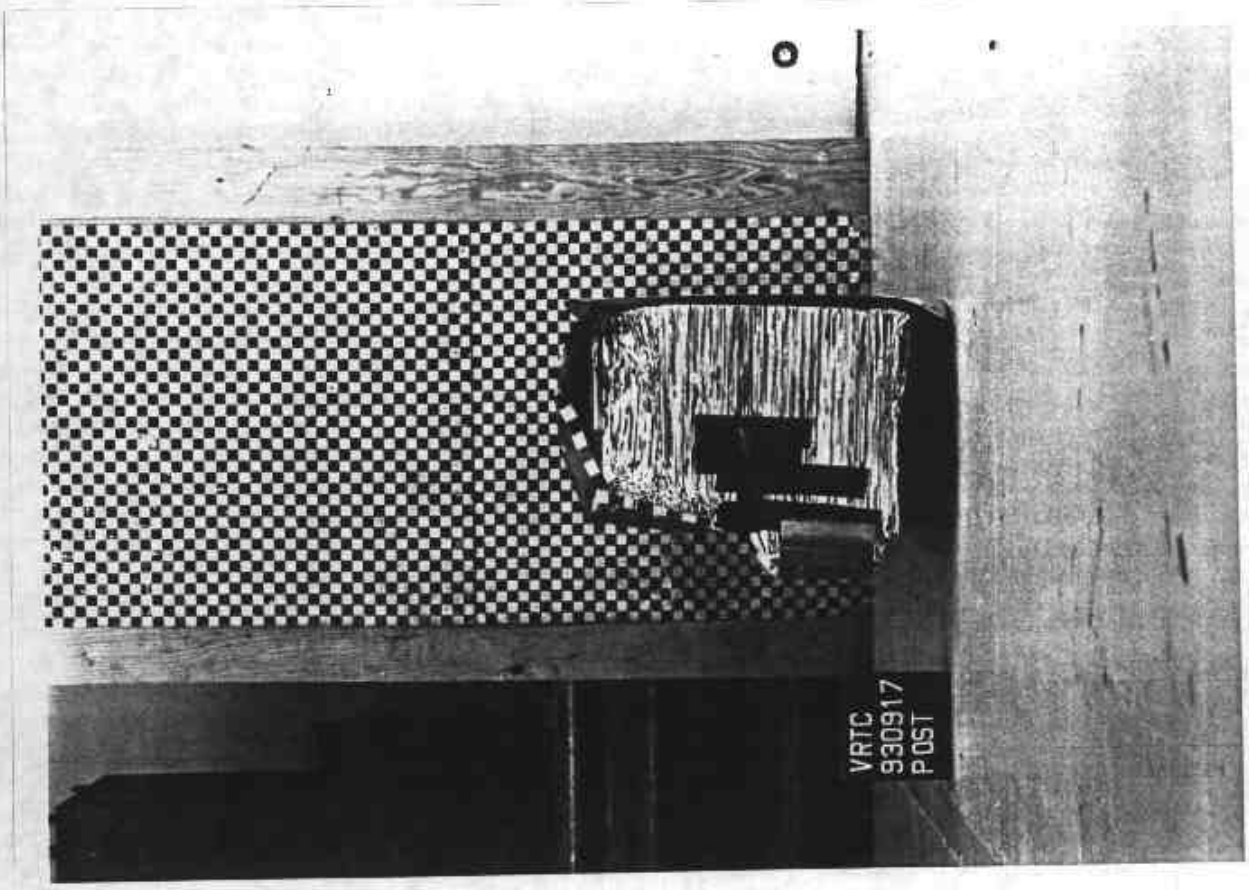


Figure A-30. POST-TEST VEHICLE IMPACTOR FACE - LEFT SIDE VIEW

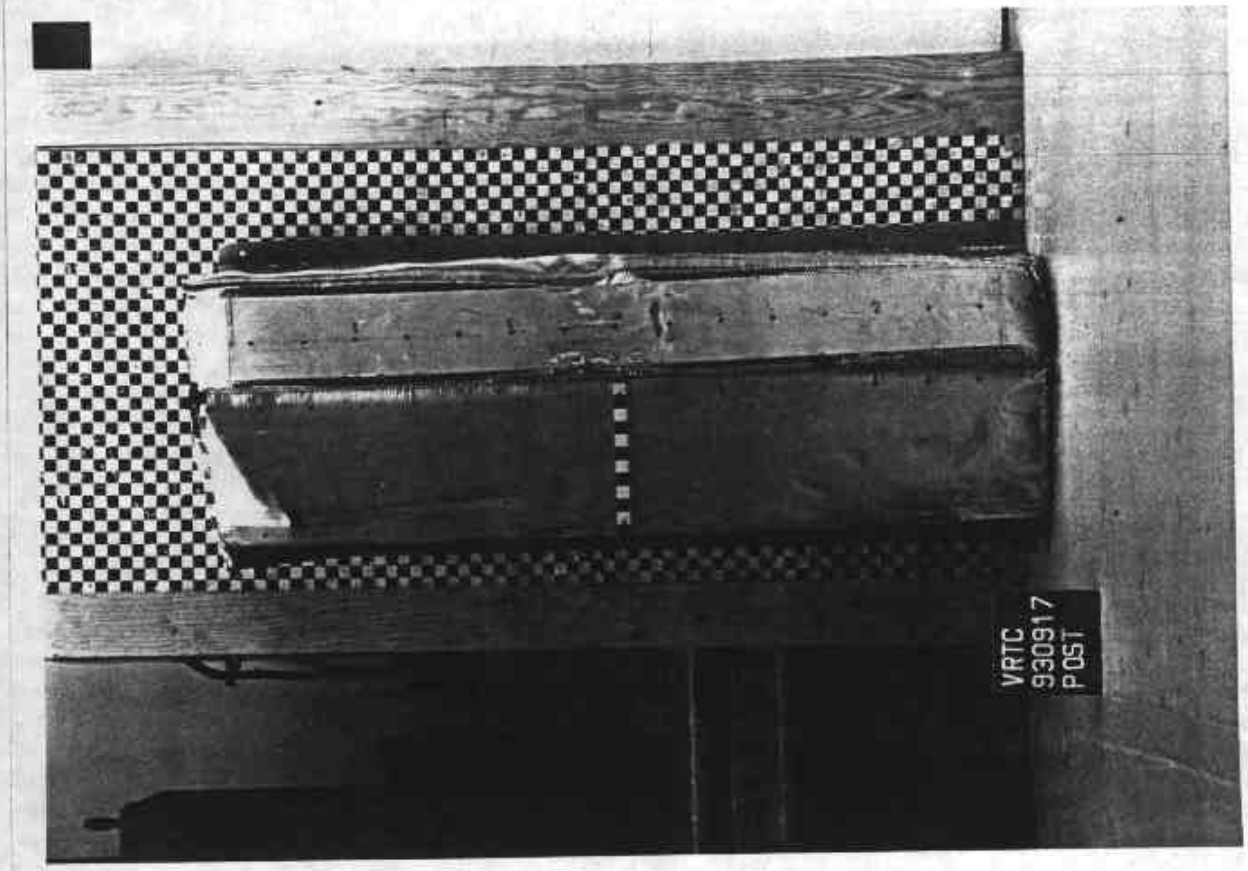
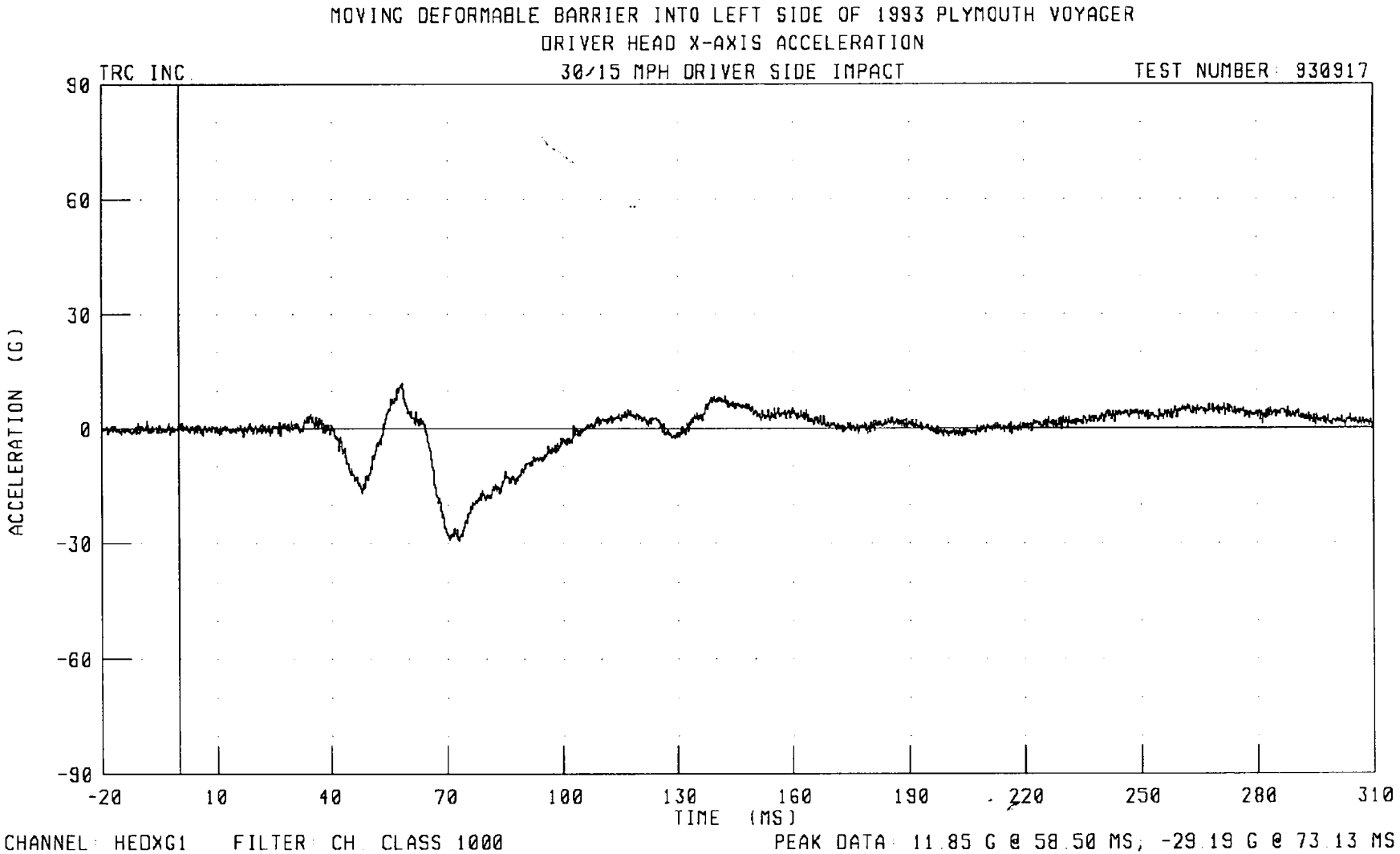
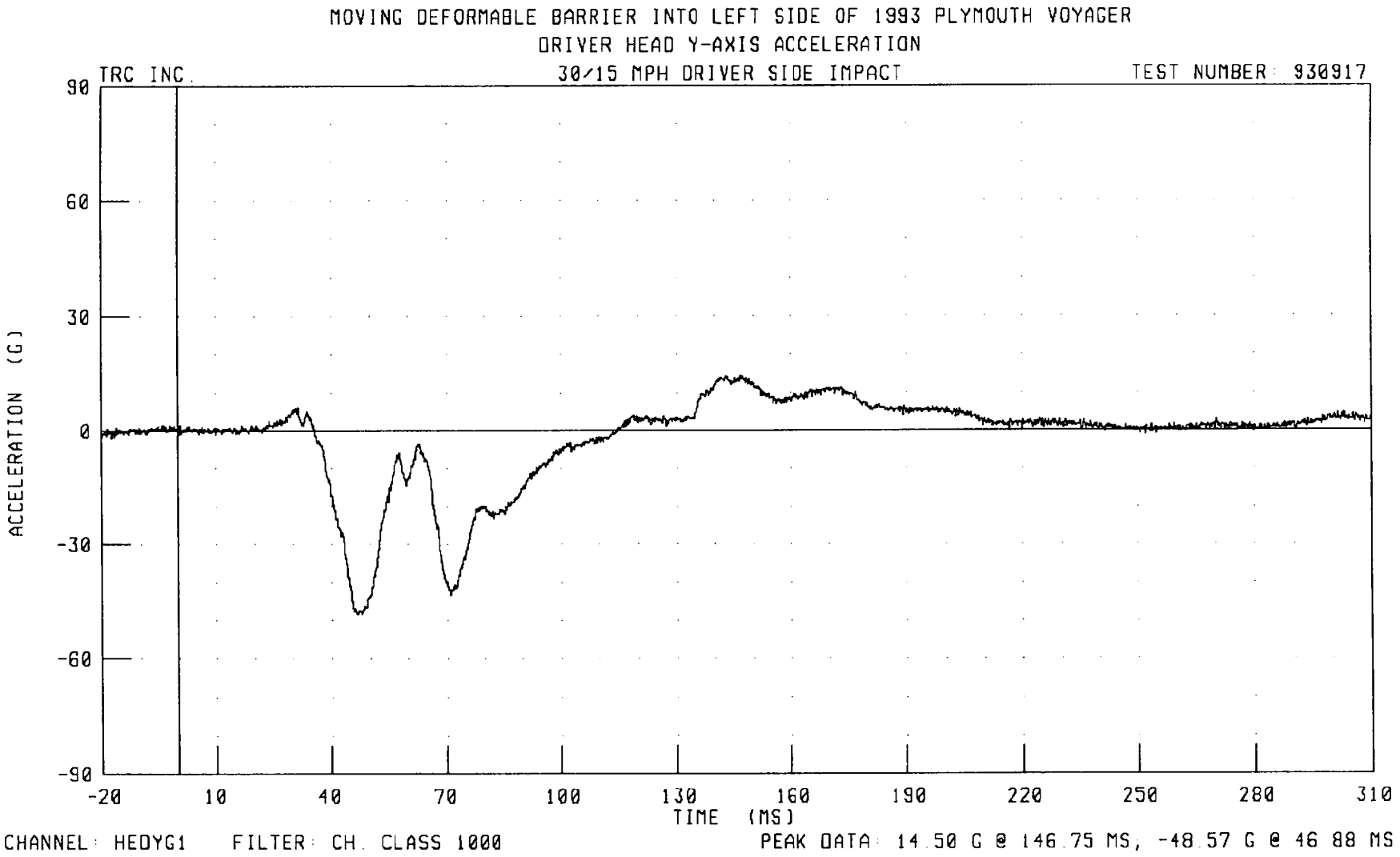


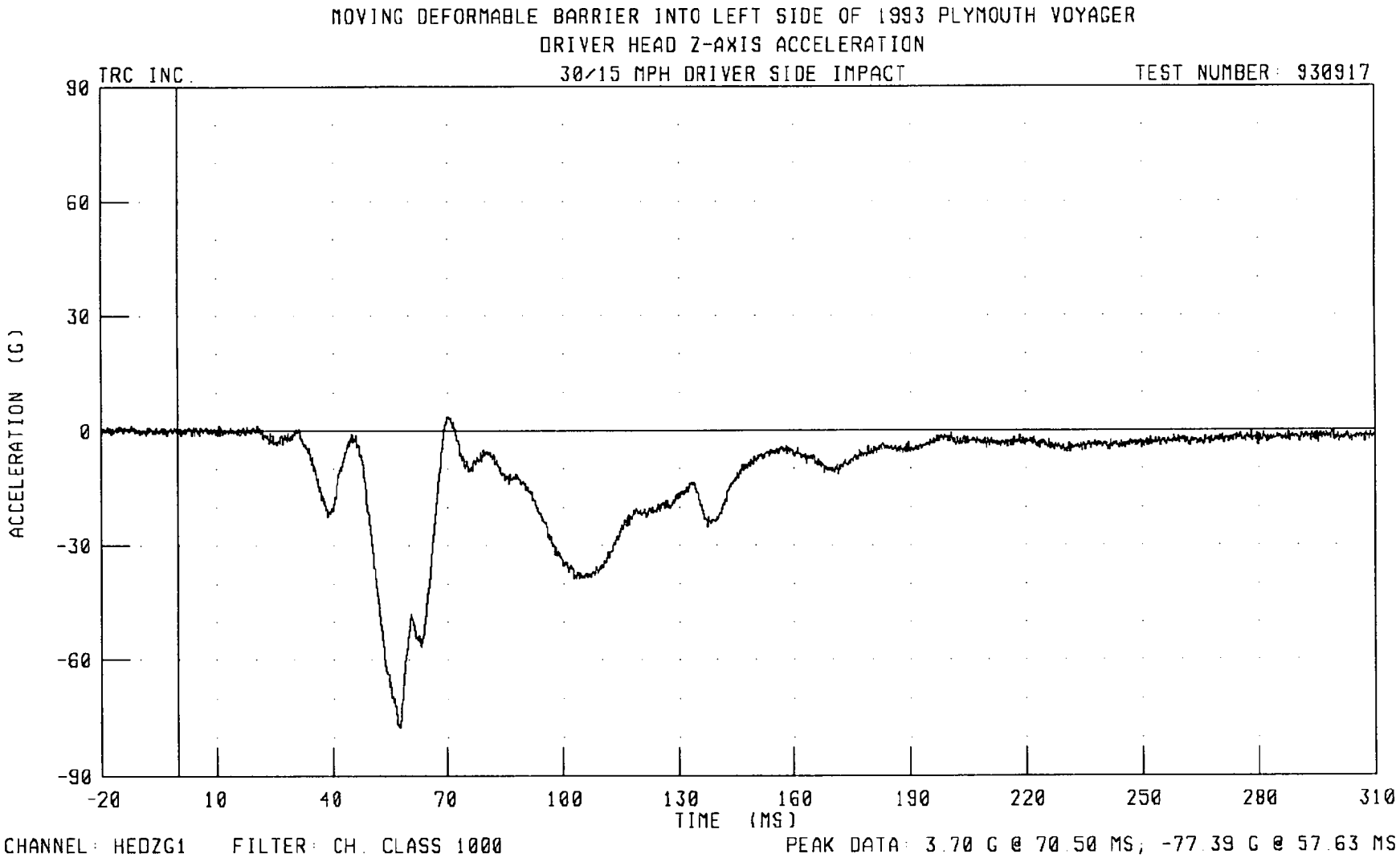
Figure A-31. POST-TEST VEHICLE IMPACTOR FACE - FRONT VIEW

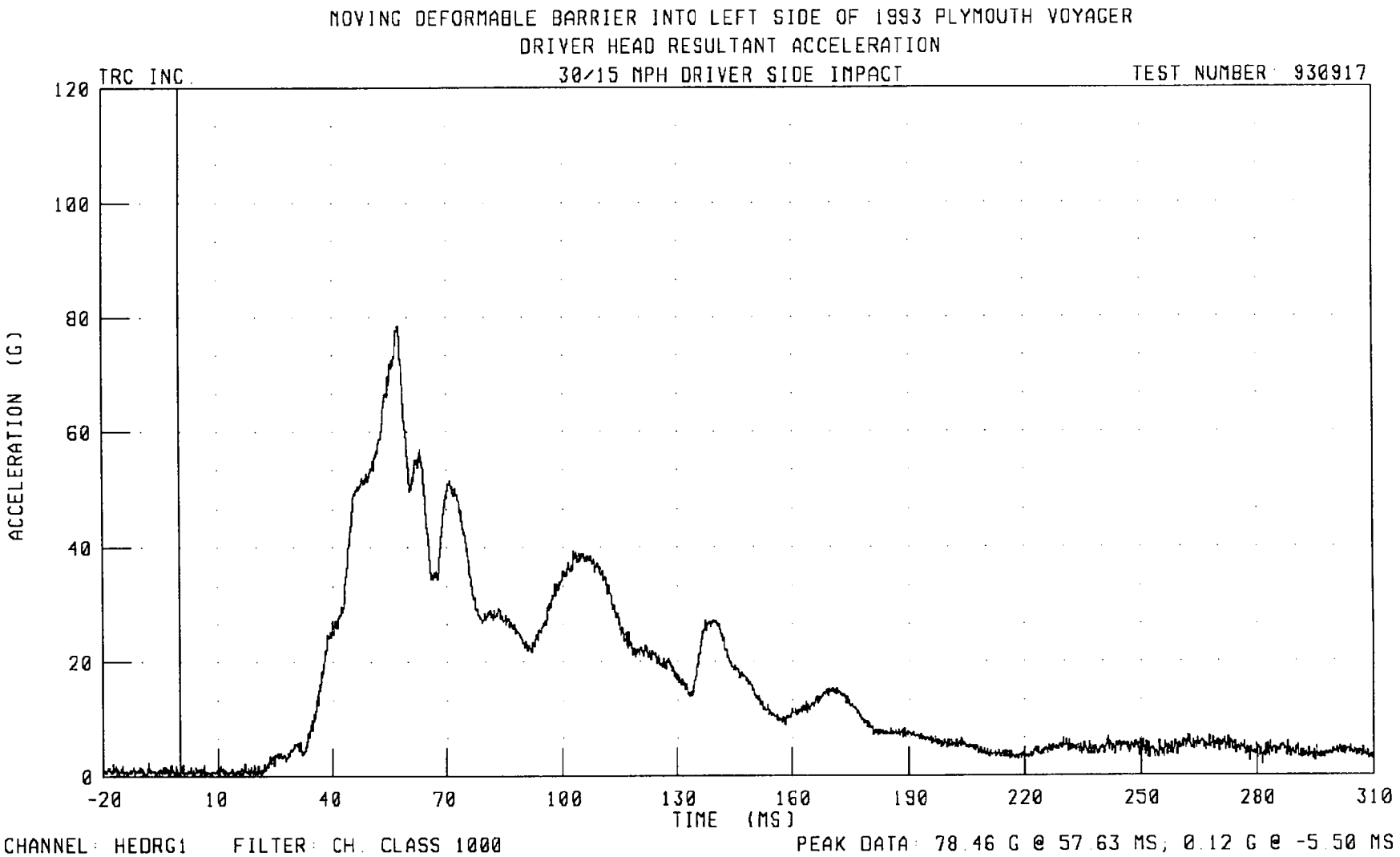
APPENDIX B

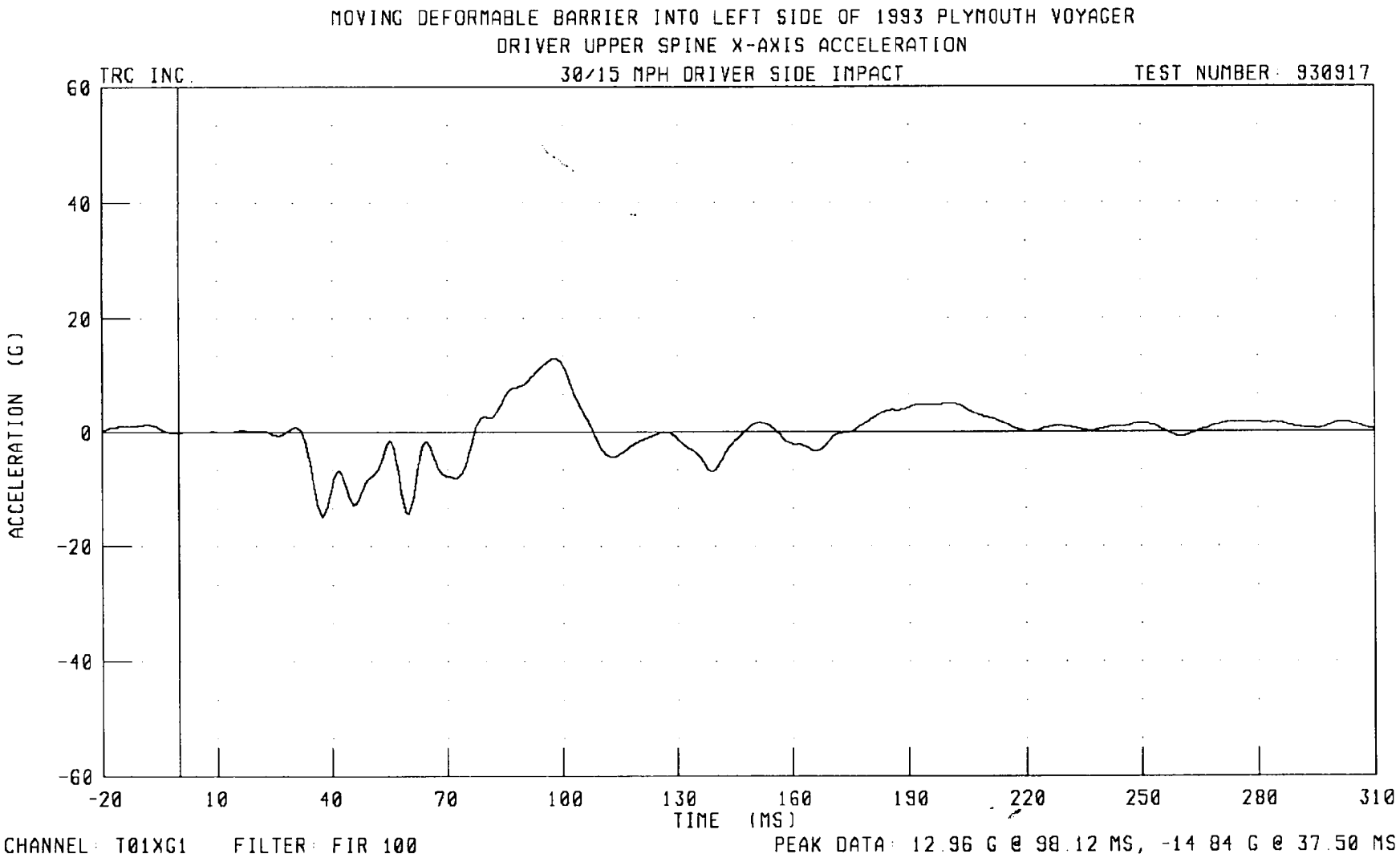
DATA PLOTS

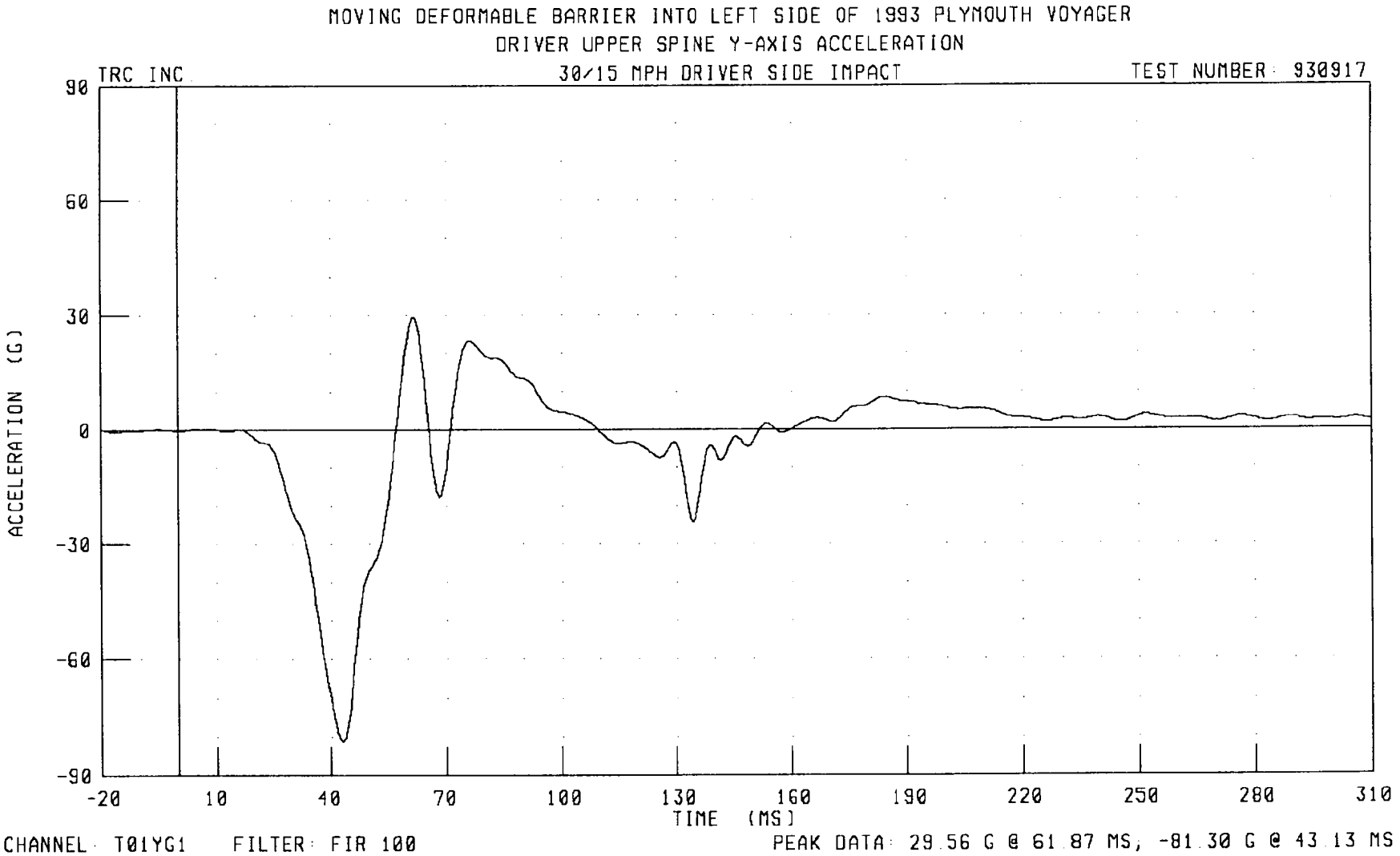

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER HEAD X-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
90
60
30
0
-30
-60
-90
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDXG1
FILTER: CH CLASS 1000
PEAK DATA: 11.85 G @ 58.50 MS, -29.19 G @ 73.13 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER HEAD Y-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDYG1
FILTER: CH. CLASS 1000
PEAK DATA: 14.50 G @ 146.75 MS, -48.57 G @ 46.88 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER HEAD Z-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
90
60
30
0
-30
-60
-90
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDZG1
FILTER: CH. CLASS 1000
PEAK DATA: 3.70 G @ 70.50 MS; -77.39 G @ 57.63 MS

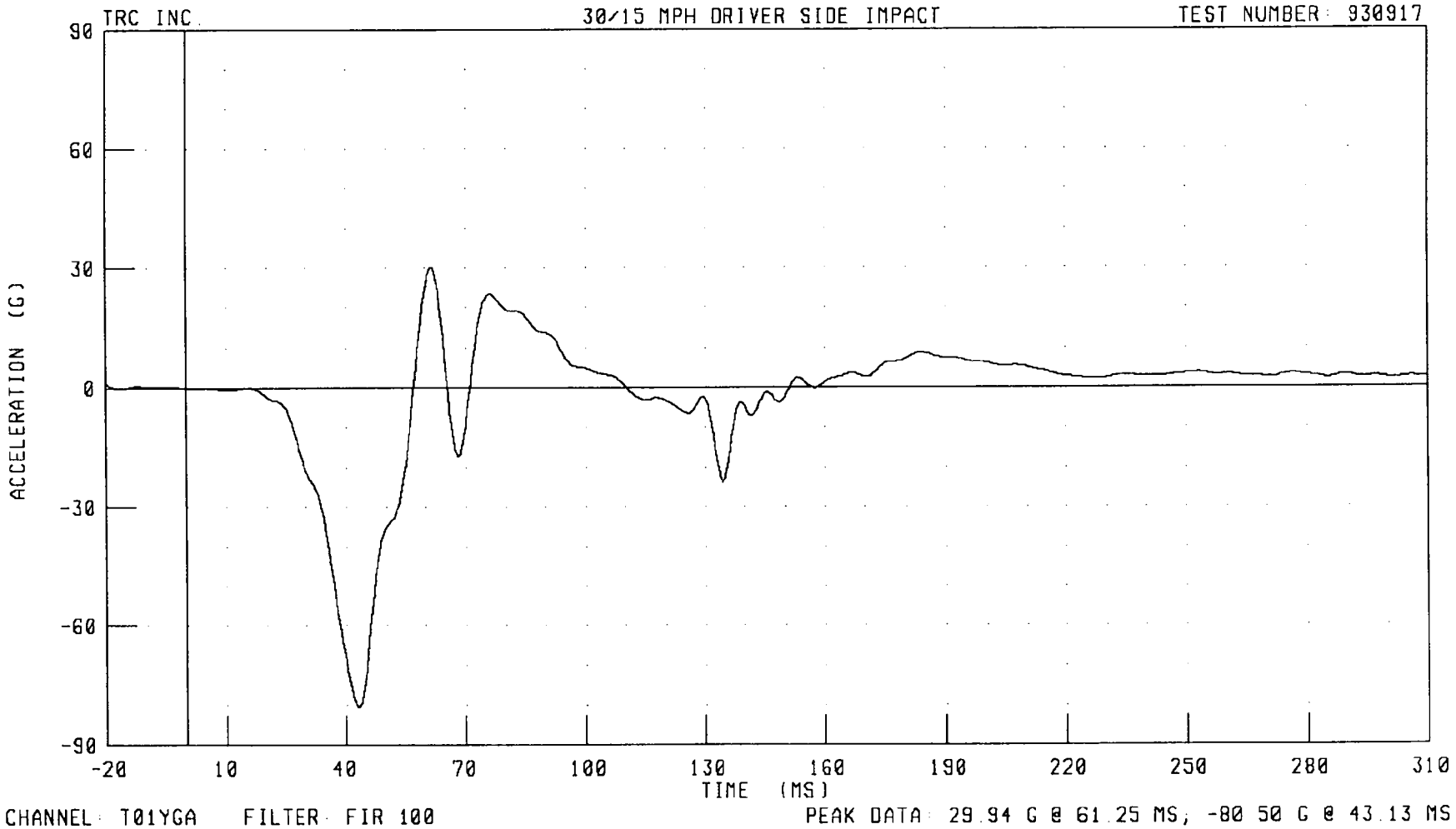

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER HEAD RESULTANT ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDRG1
FILTER: CH. CLASS 1000
PEAK DATA: 78.46 G @ 57.63 MS; 0.12 G @ -5.50 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER UPPER SPINE X-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T01XG1
FILTER: FIR 100
PEAK DATA: 12.96 G @ 98.12 MS, -14.84 G @ 37.50 MS

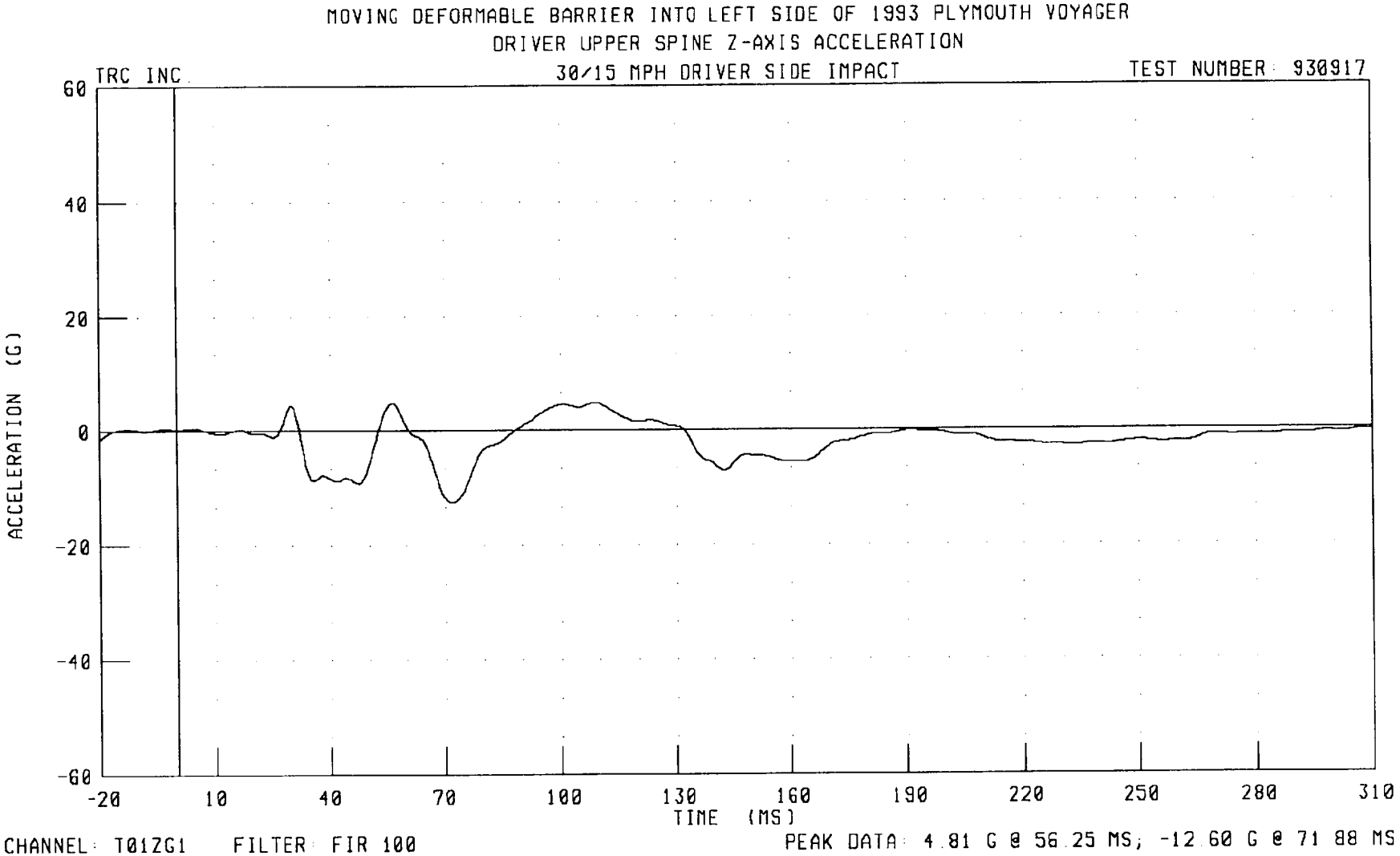

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER UPPER SPINE Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T01YG1
FILTER: FIR 100
PEAK DATA: 29.56 G @ 61.87 MS, -81.30 G @ 43.13 MS

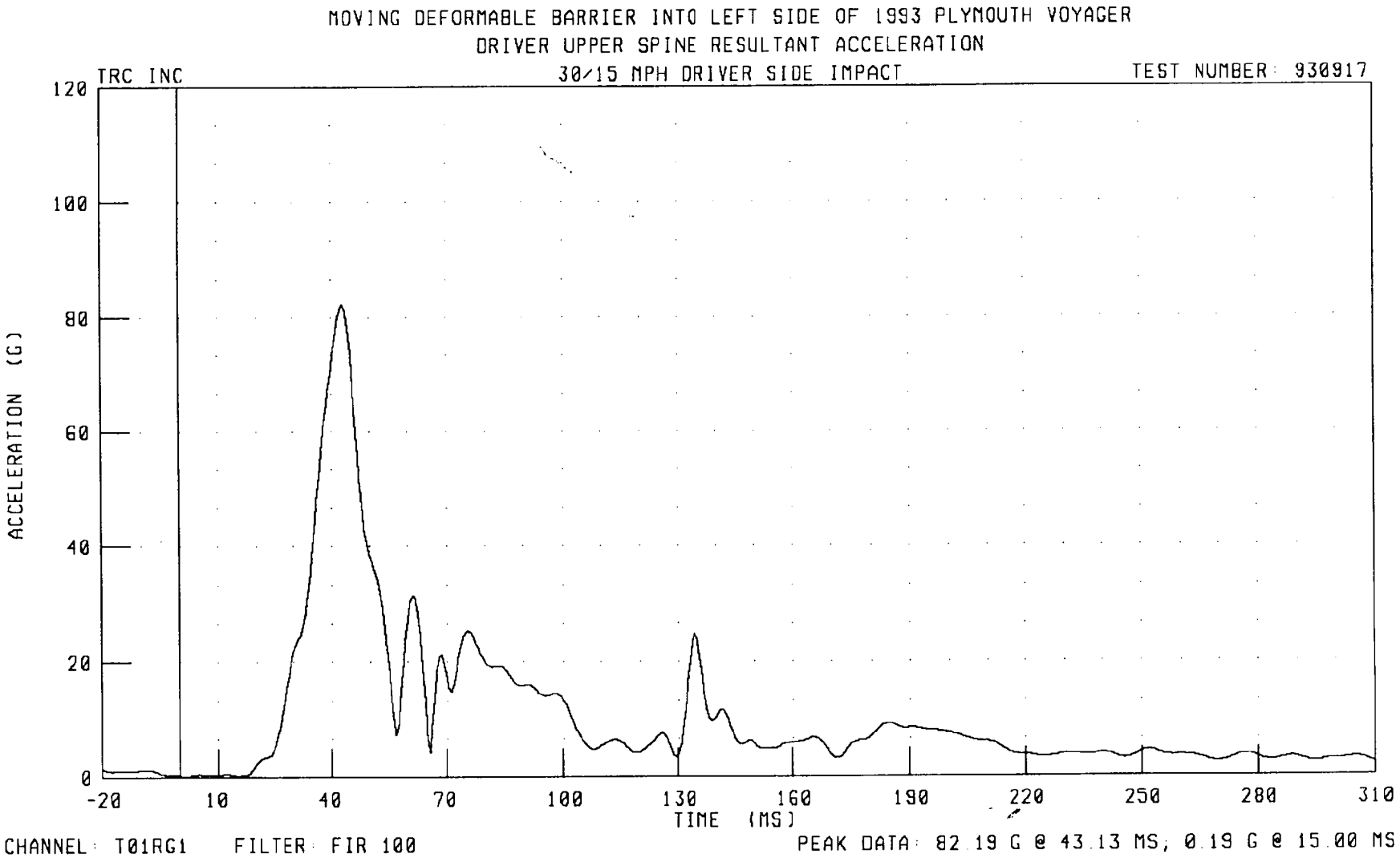
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER

DRIVER UPPER SPINE Y-AXIS REDUNDANT ACCELERATION

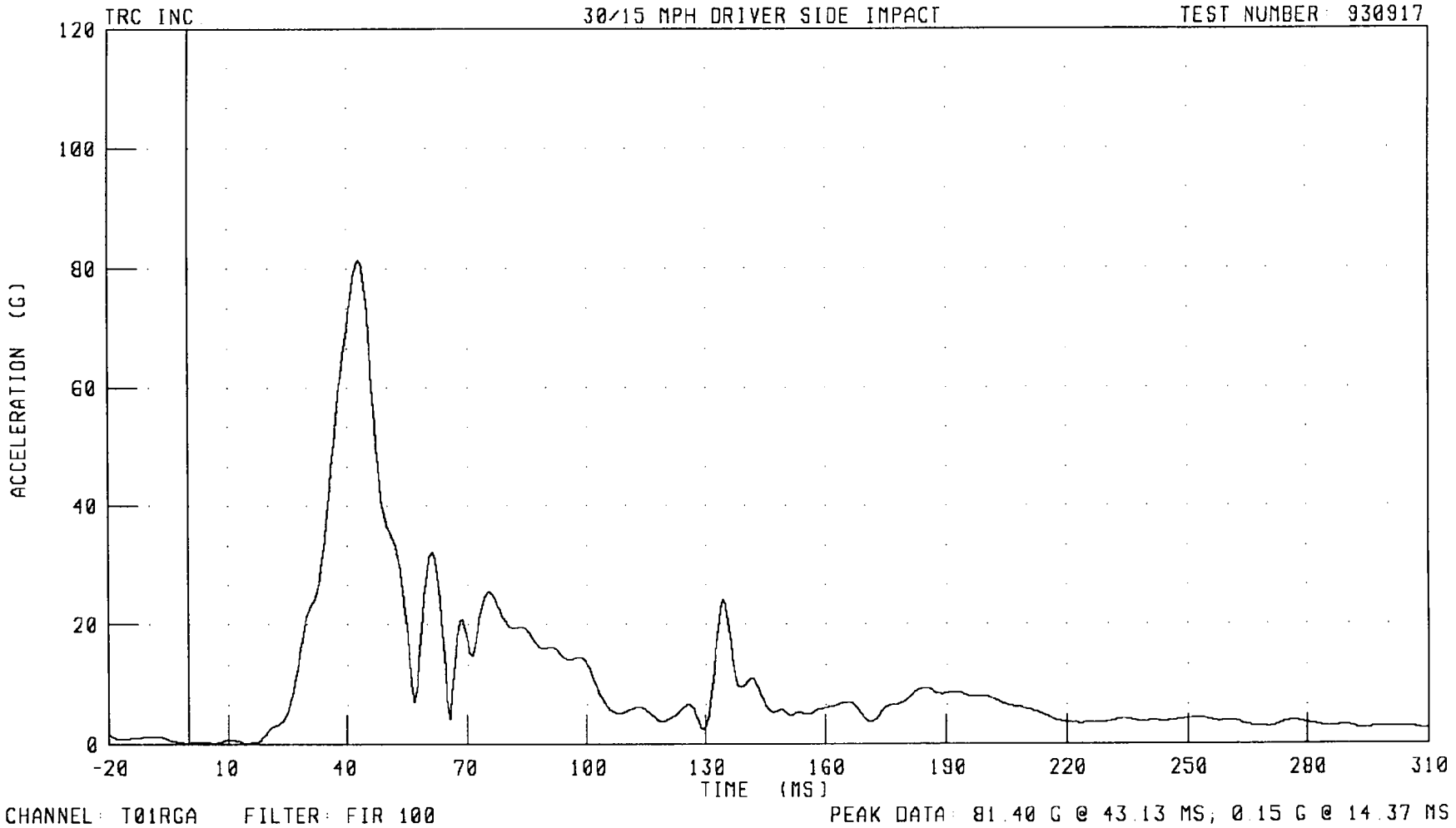


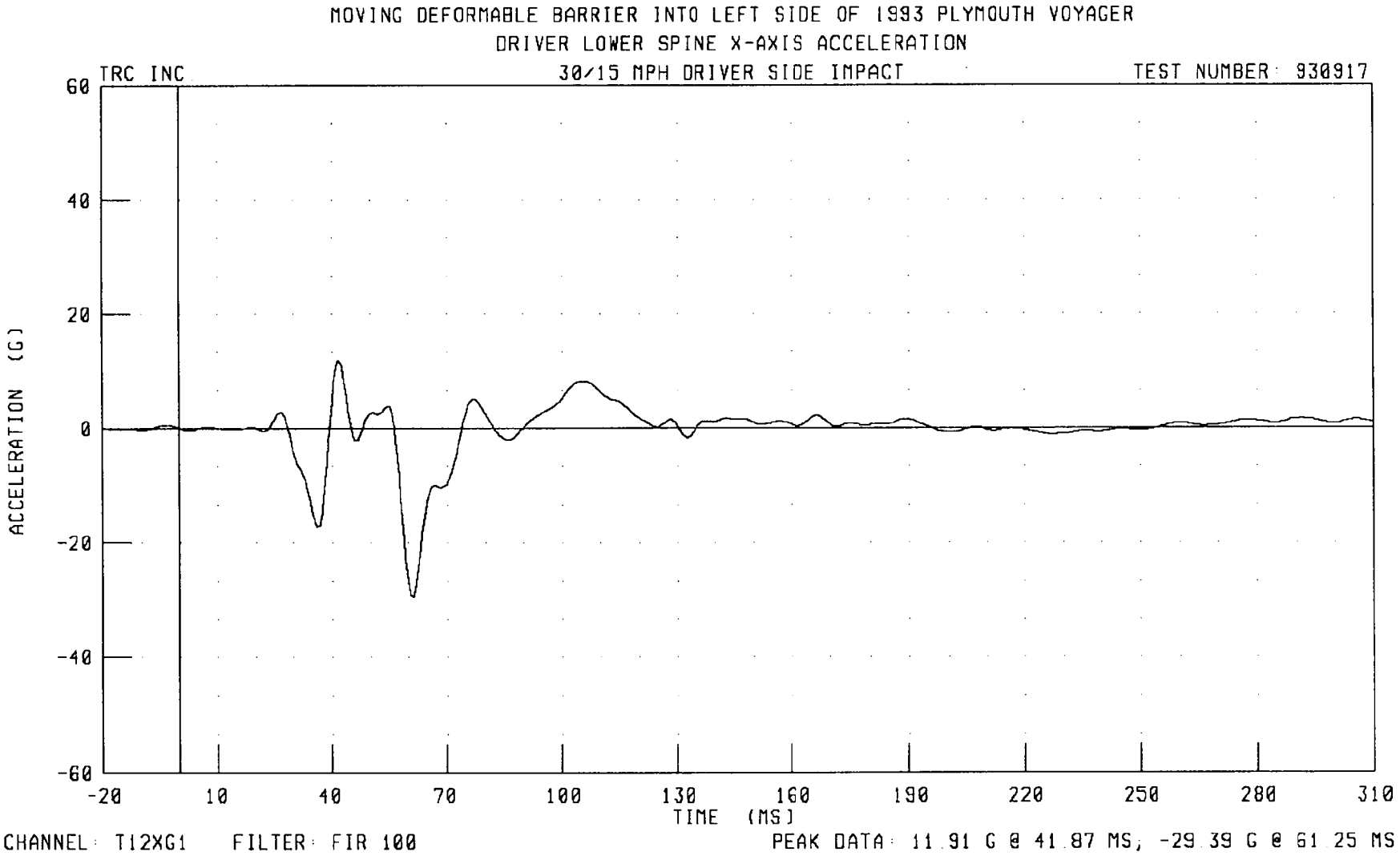
CHANNEL: T01YGA FILTER: FIR 100 PEAK DATA: 29.94 G @ 61.25 MS; -80.50 G @ 43.13 MS

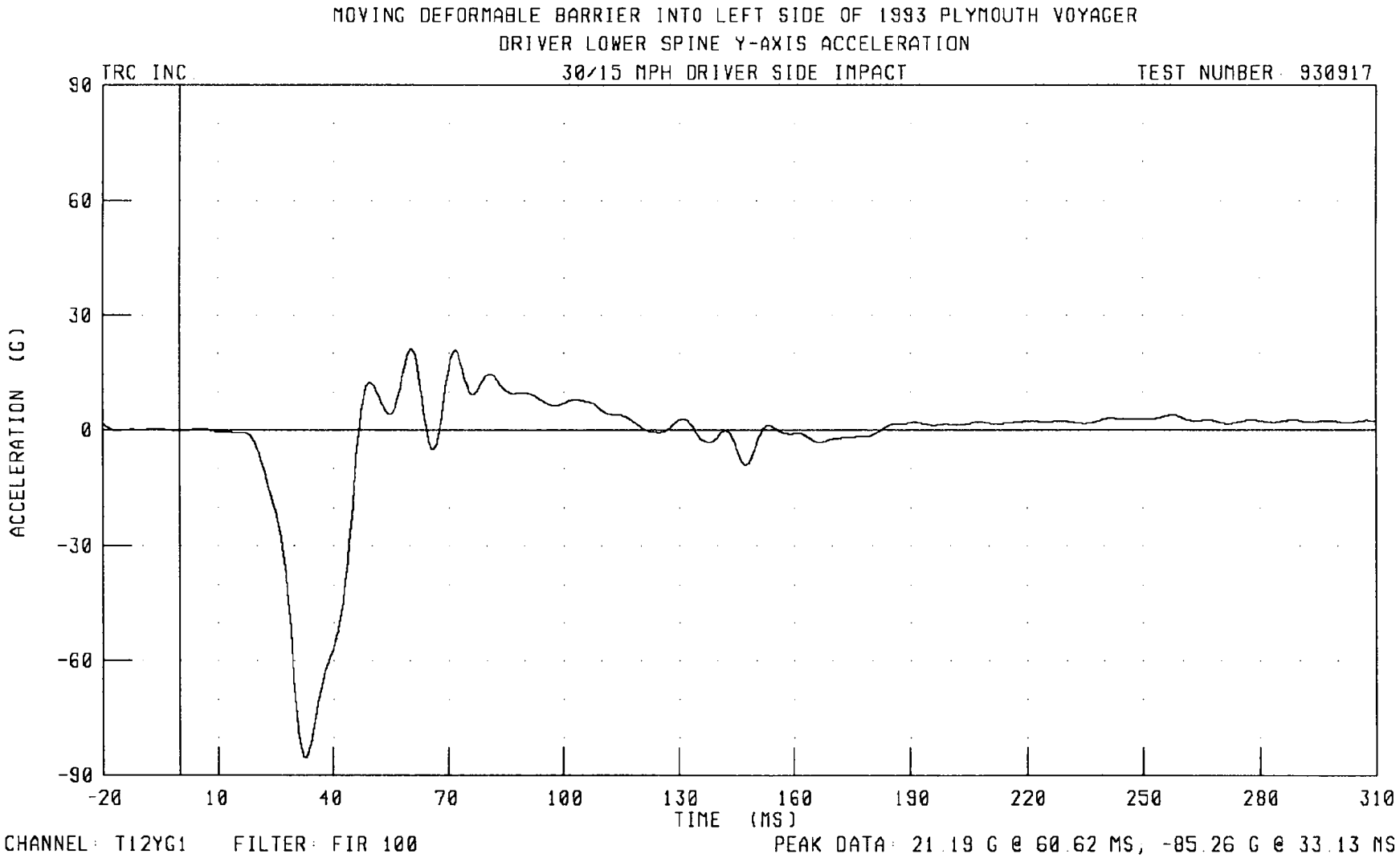

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER UPPER SPINE Z-AXIS ACCELERATION
30/15 MPH DRIVER SIDE IMPACT
TRC INC
TEST NUMBER: 930917
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T01ZG1
FILTER: FIR 100
PEAK DATA: 4.81 G @ 56.25 MS; -12.60 G @ 71.88 MS

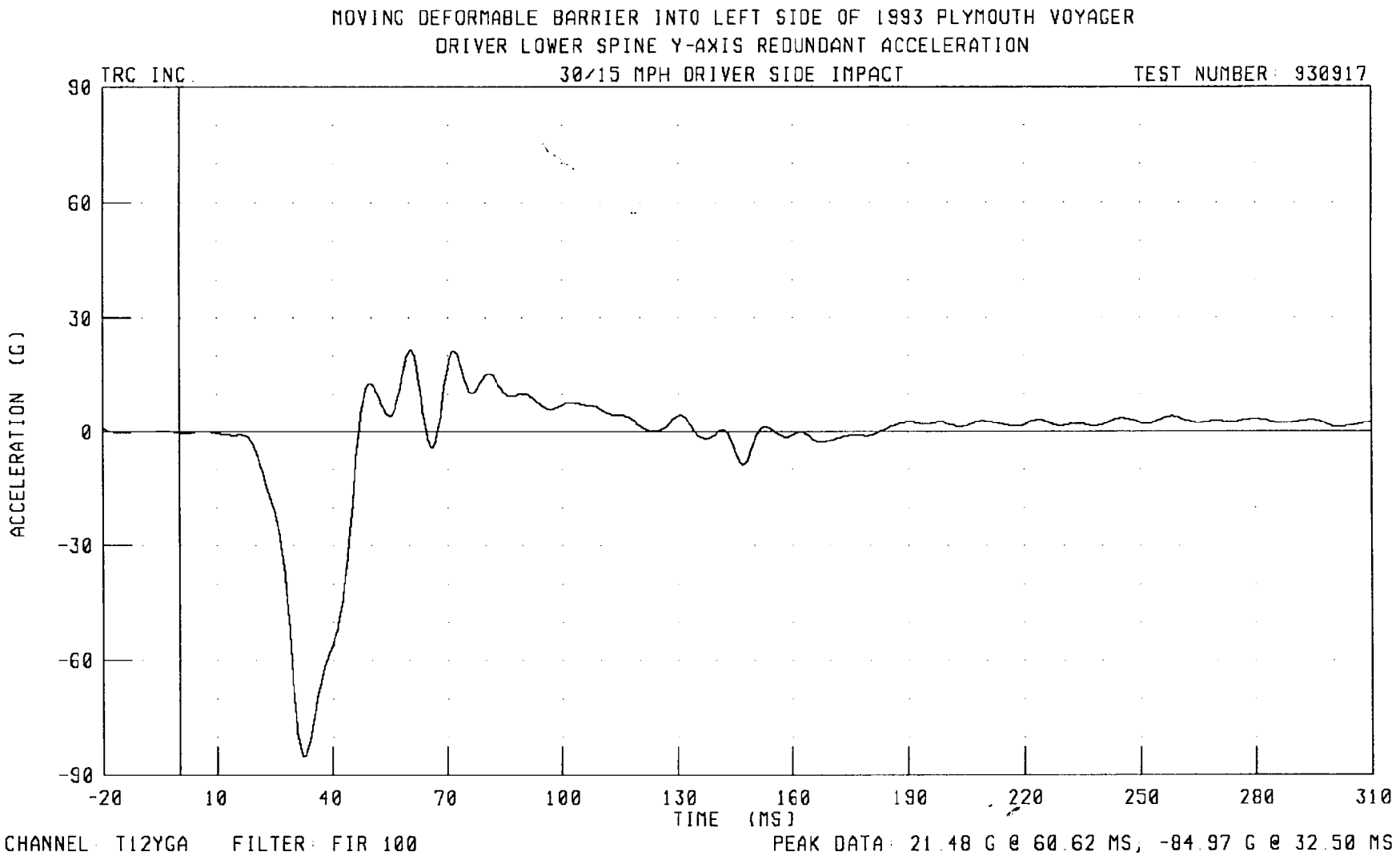

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER UPPER SPINE RESULTANT ACCELERATION
30/15 MPH DRIVER SIDE IMPACT
TRC INC
TEST NUMBER: 930917
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T01RG1
FILTER: FIR 100
PEAK DATA: 82.19 G @ 43.13 MS, 0.19 G @ 15.00 MS

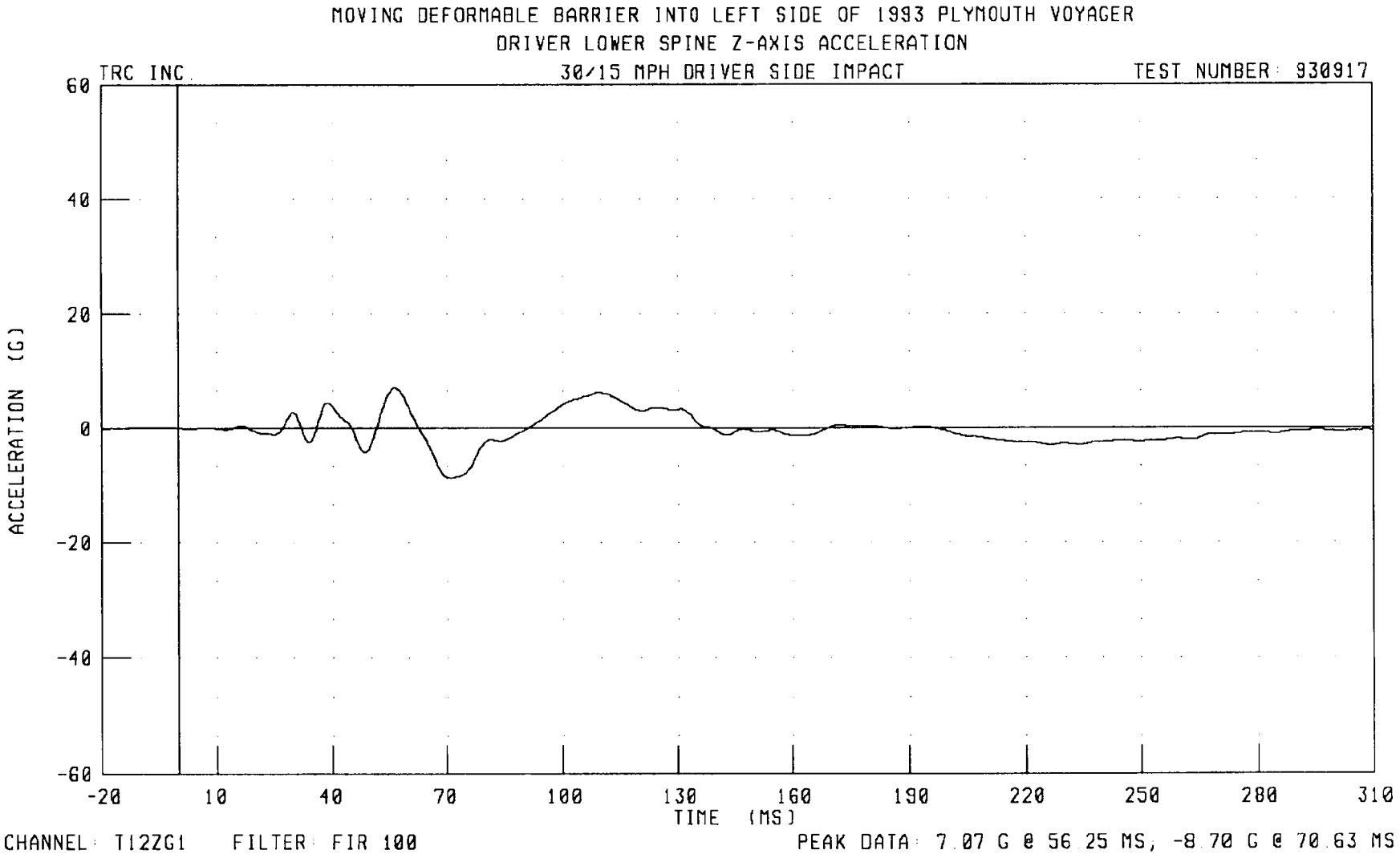
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER UPPER SPINE RESULTANT REDUNDANT ACCELERATION



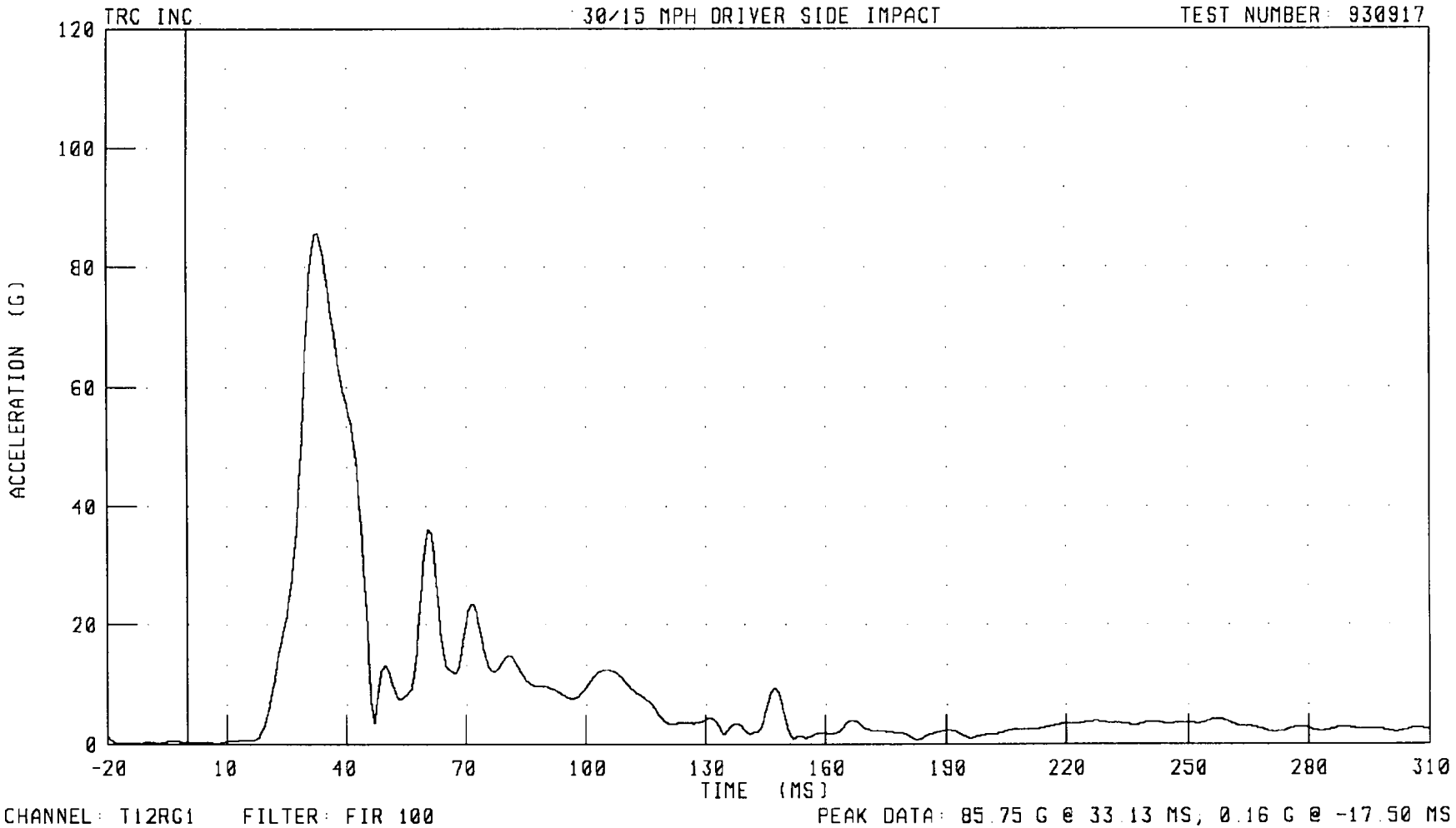

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LOWER SPINE X-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T12XG1
FILTER: FIR 100
PEAK DATA: 11.91 G @ 41.87 MS, -29.39 G @ 61.25 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LOWER SPINE Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T12YG1
FILTER: FIR 100
PEAK DATA: 21.19 G @ 60.62 MS, -85.26 G @ 33.13 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LOWER SPINE Y-AXIS REDUNDANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T12YGA
FILTER: FIR 100
PEAK DATA: 21.48 G @ 60.62 MS, -84.97 G @ 32.50 MS

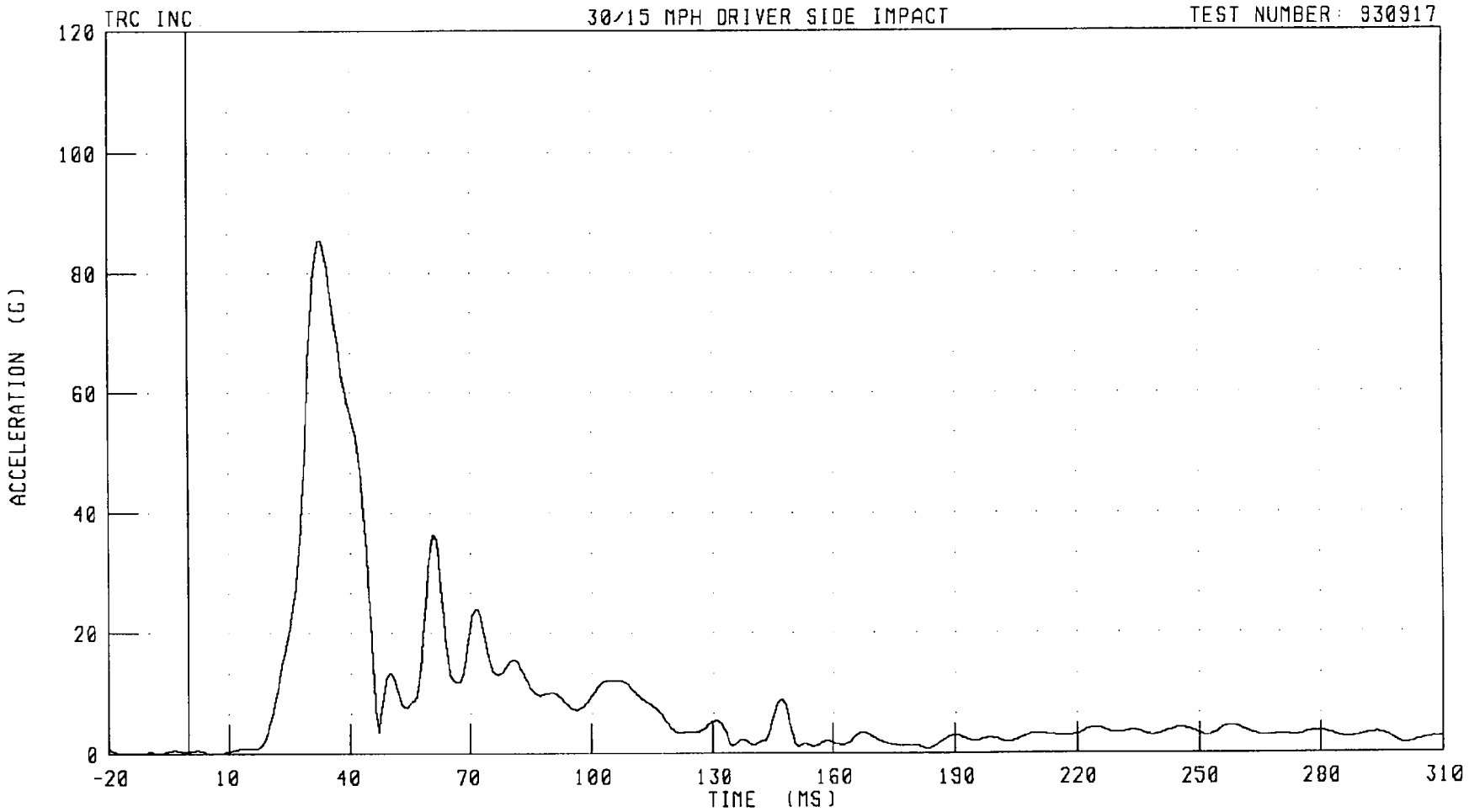

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LOWER SPINE Z-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T12ZG1
FILTER: FIR 100
PEAK DATA: 7.07 G @ 56.25 MS, -8.70 G @ 70.63 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LOWER SPINE RESULTANT ACCELERATION



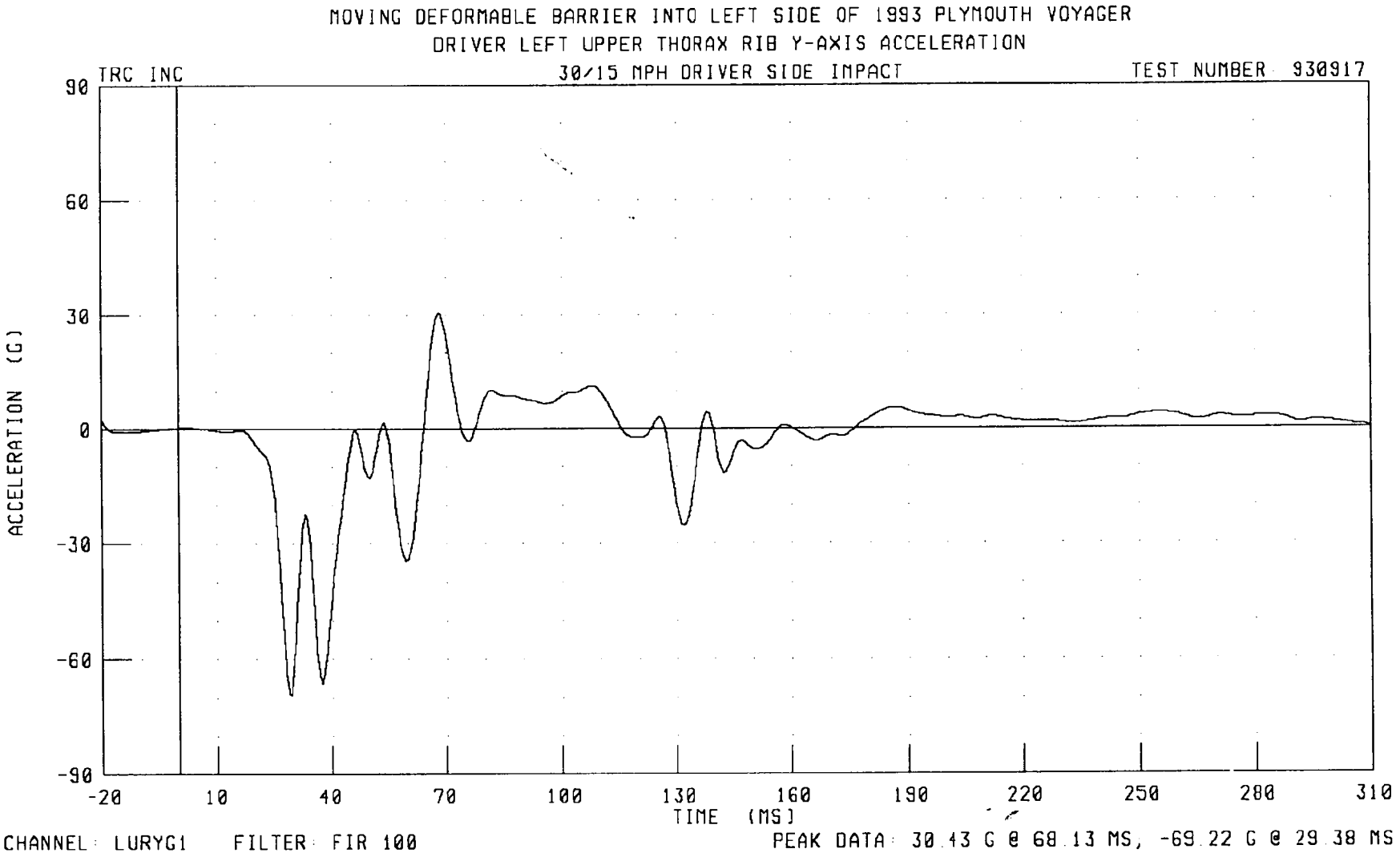
CHANNEL: T12RG1 FILTER: FIR 100 PEAK DATA: 85.75 G @ 33.13 MS, 0.16 G @ -17.50 MS

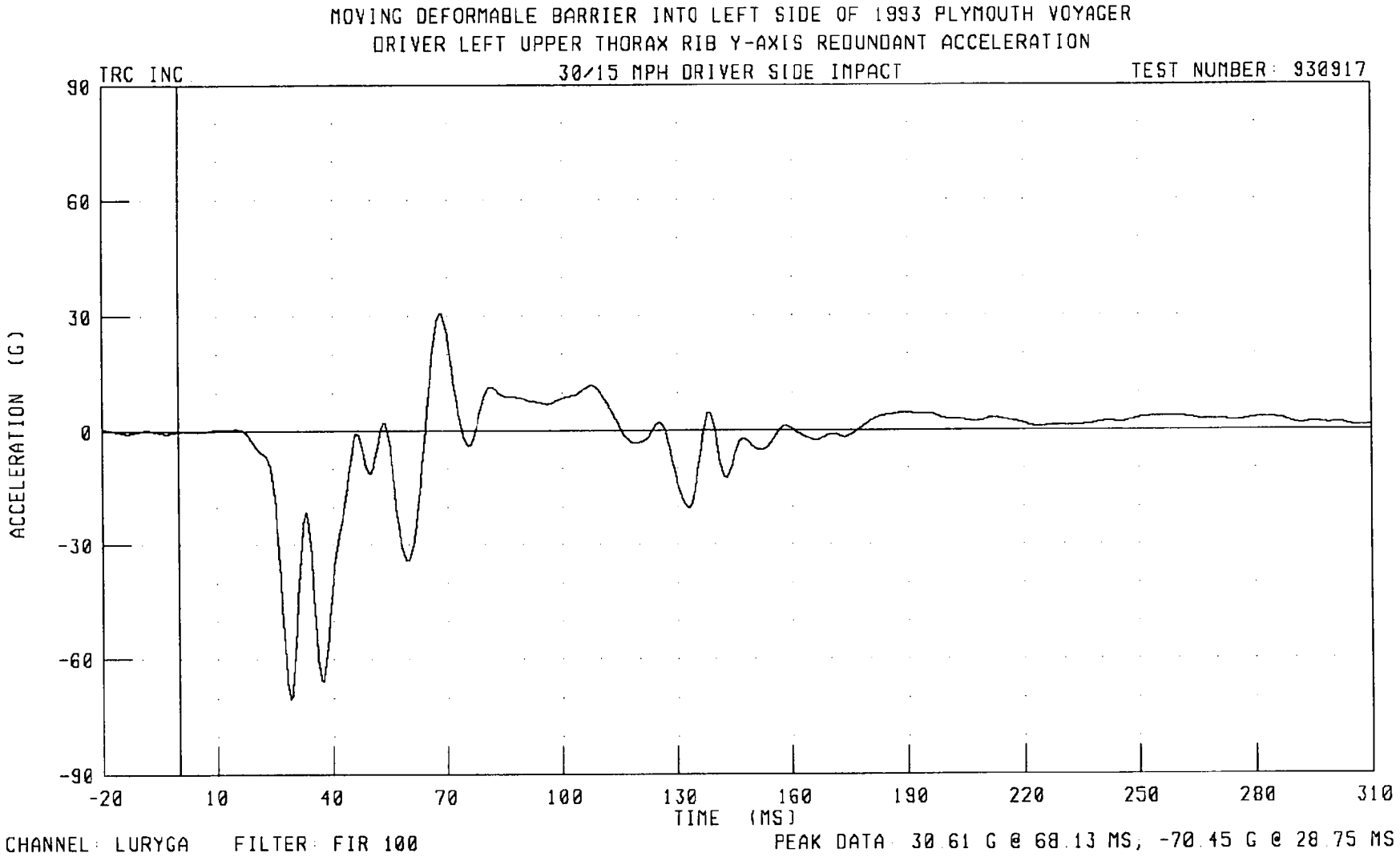
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LOWER SPINE RESULTANT REDUNDANT ACCELERATION

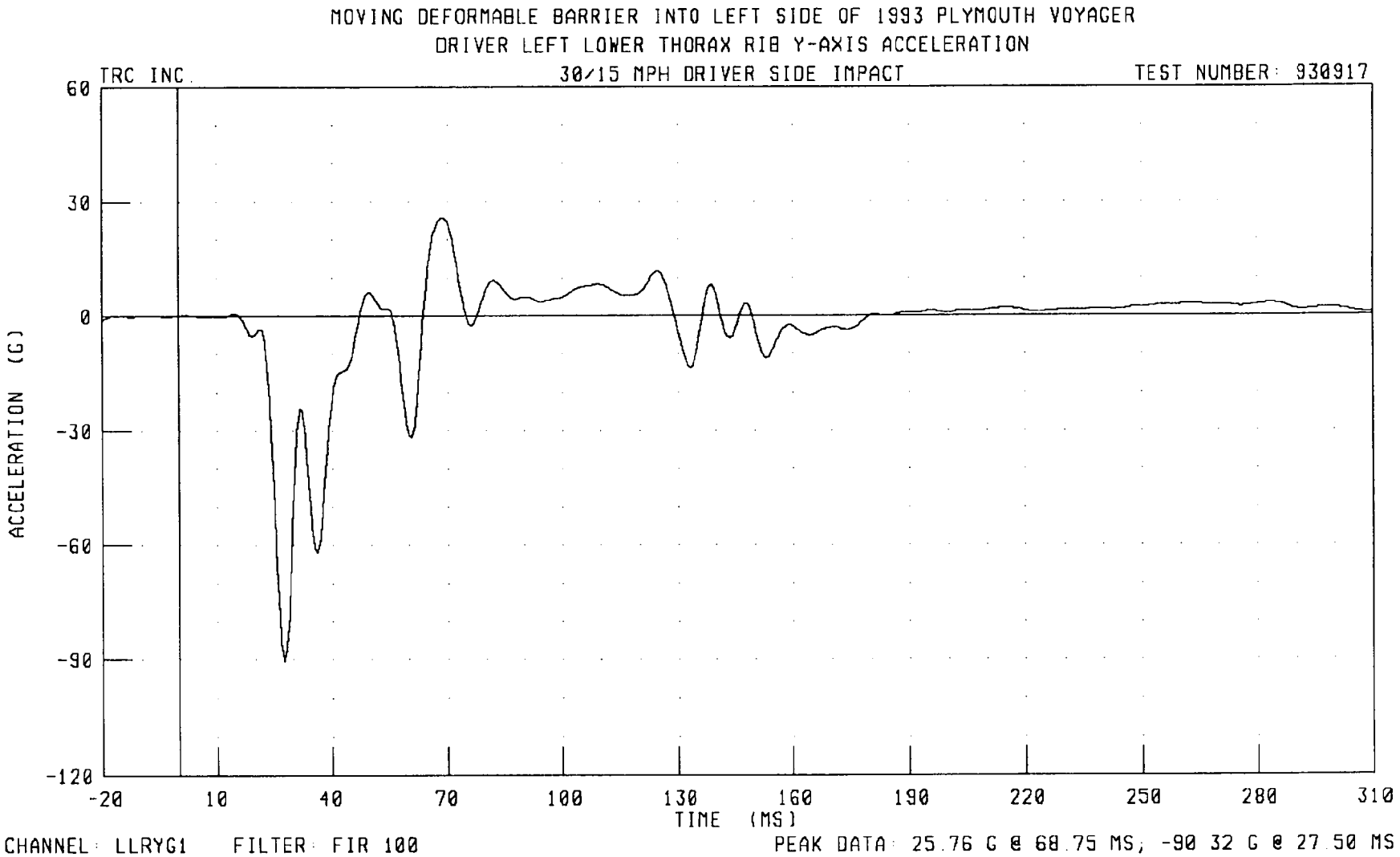


CHANNEL: T12RGA FILTER: FIR 100

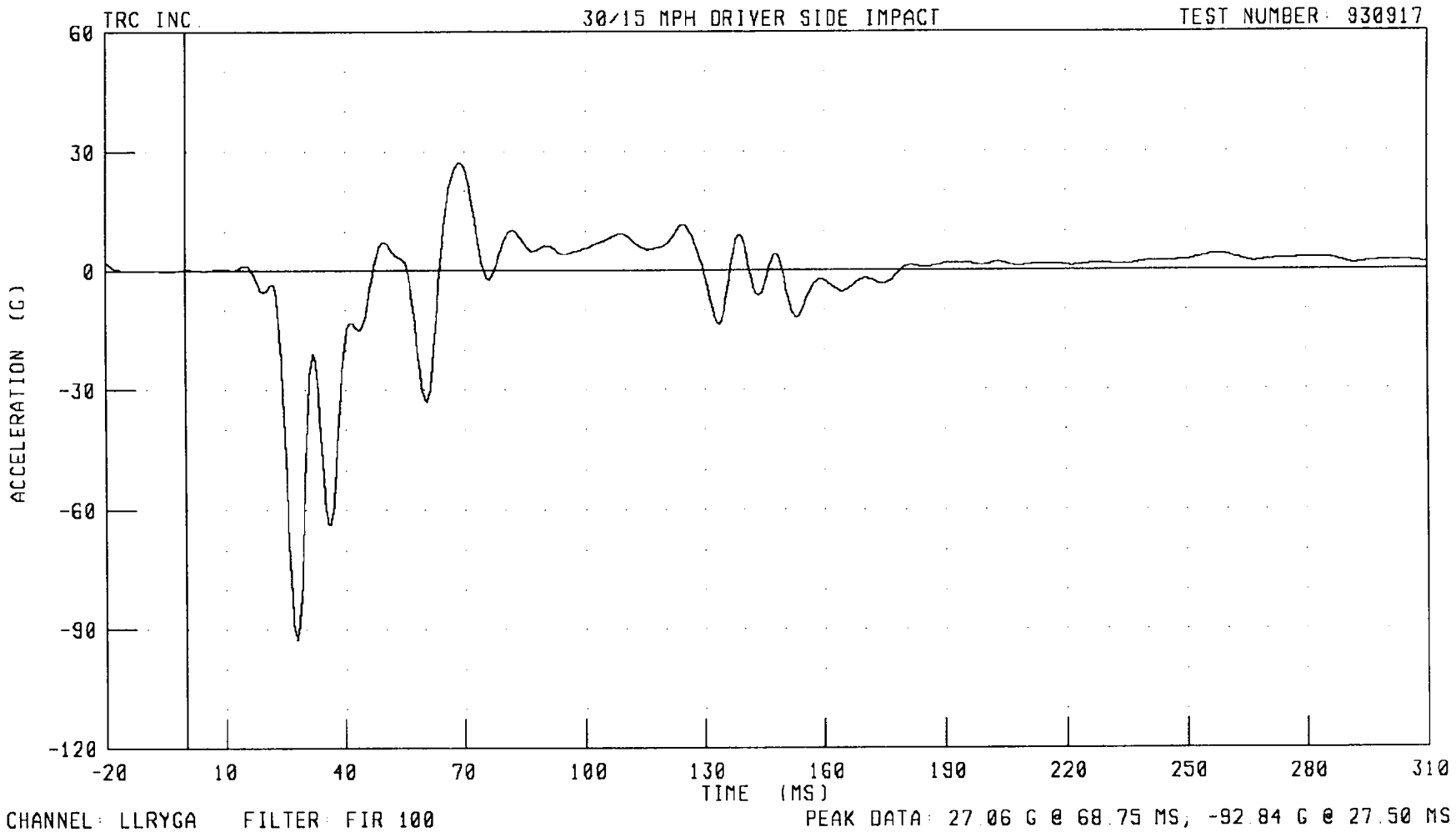
PEAK DATA: 85.38 G @ 33.13 MS, 0.11 G @ 5.00 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LEFT UPPER THORAX RIB Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL LURYG1 FILTER FIR 100
PEAK DATA 30.43 G @ 68.13 MS, -69.22 G @ 29.38 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LEFT UPPER THORAX RIB Y-AXIS REDUNDANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LURYGA
FILTER: FIR 100
PEAK DATA: 30.61 G @ 68.13 MS, -70.45 G @ 28.75 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LEFT LOWER THORAX RIB Y-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
60
30
0
-30
-60
-90
-120
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LLRYG1
FILTER: FIR 100
PEAK DATA: 25.76 G @ 68.75 MS; -90.32 G @ 27.50 MS

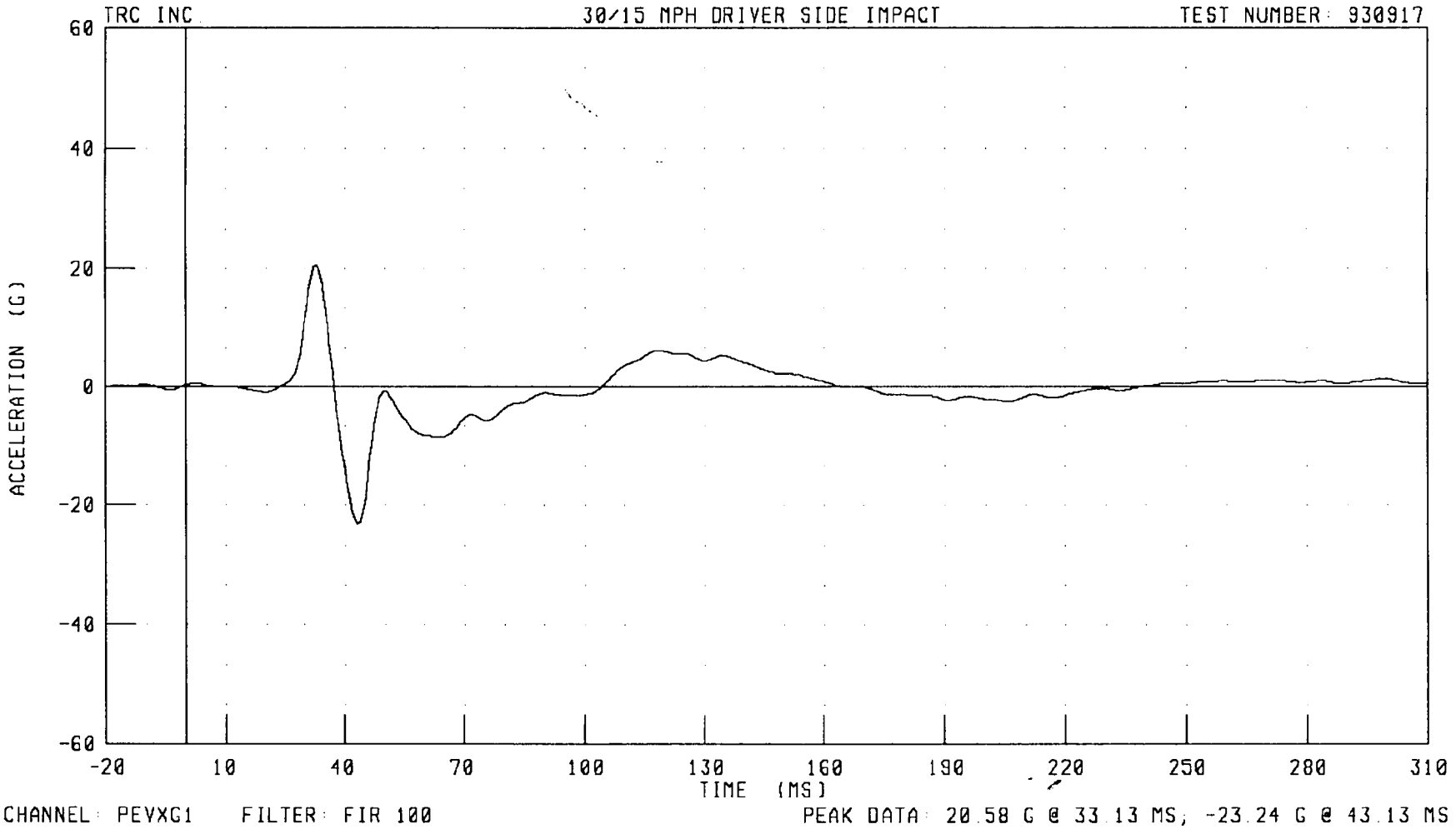
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER LEFT LOWER THORAX RIB Y-AXIS REDUNDANT ACCELERATION



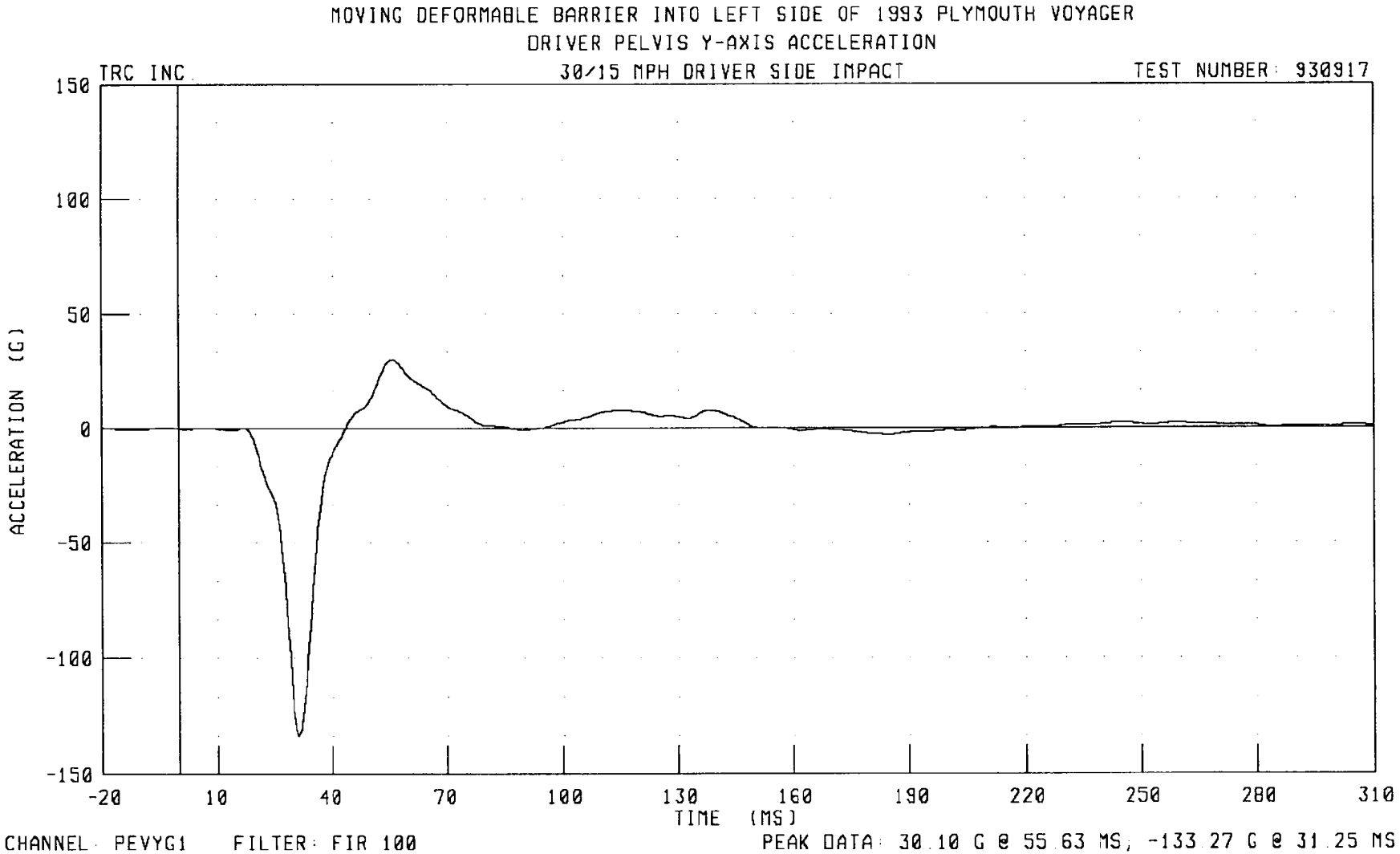
CHANNEL: LLRYGA FILTER: FIR 100 PEAK DATA: 27.06 G @ 68.75 MS, -92.84 G @ 27.50 MS

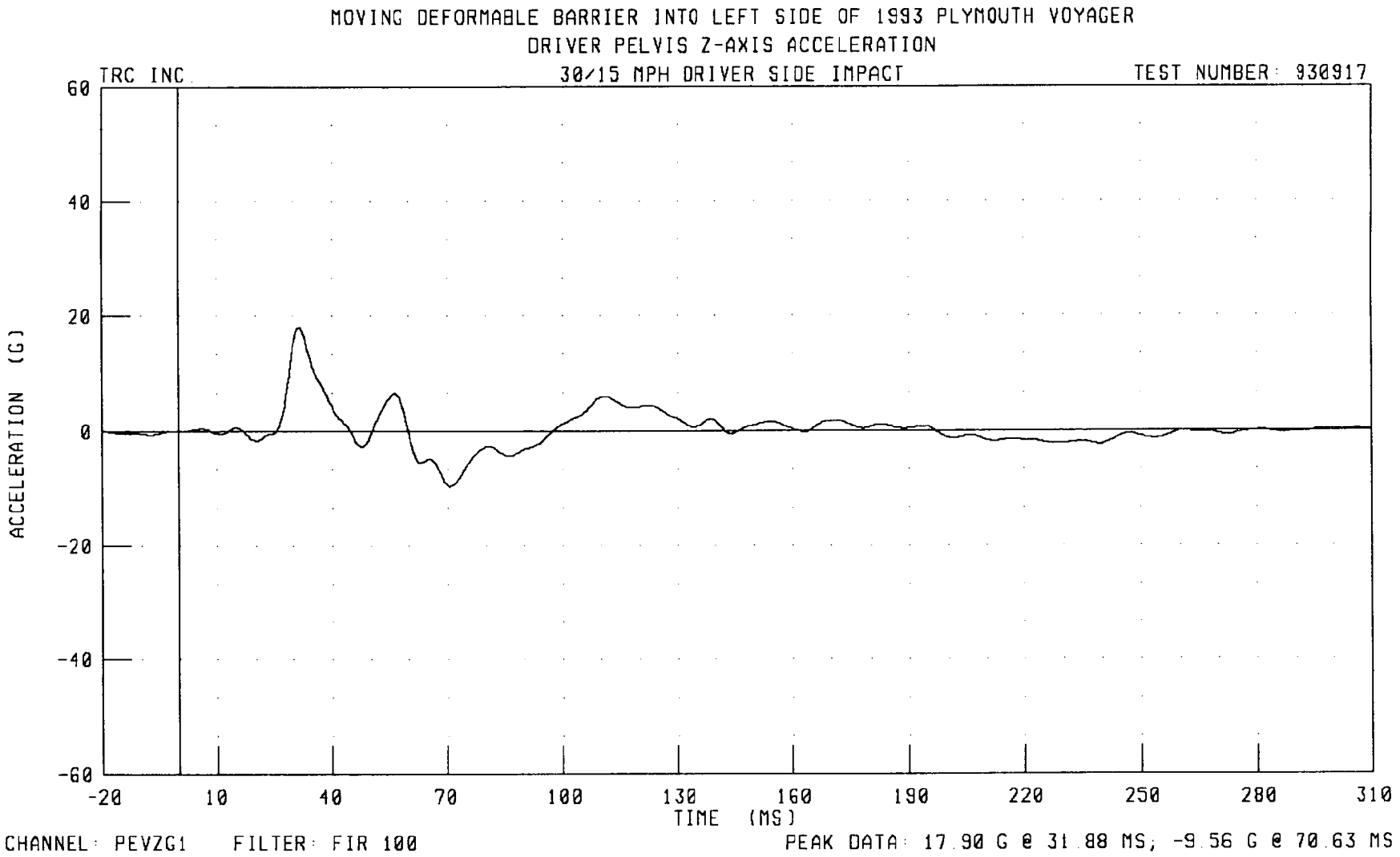
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER

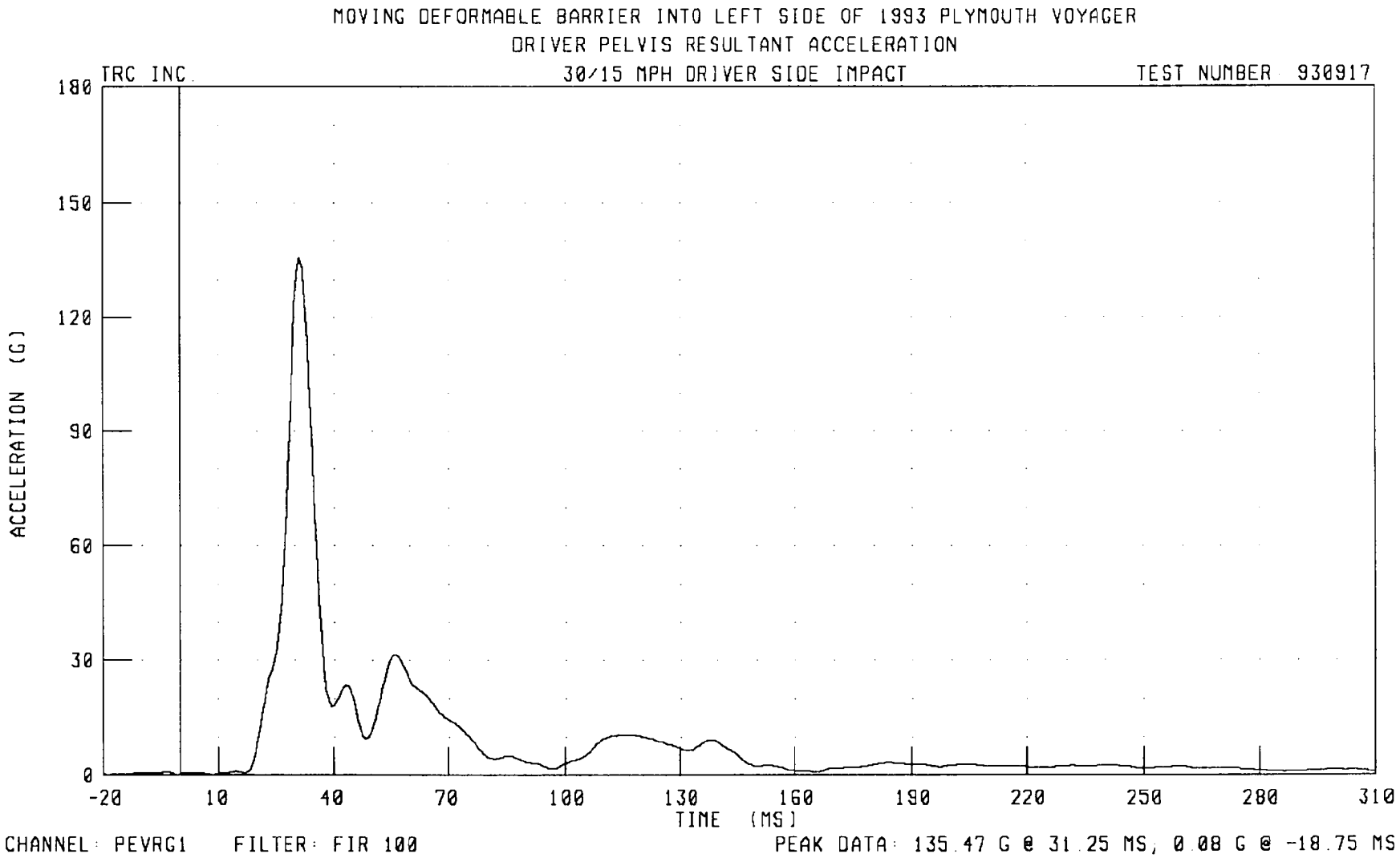
DRIVER PELVIS X-AXIS ACCELERATION

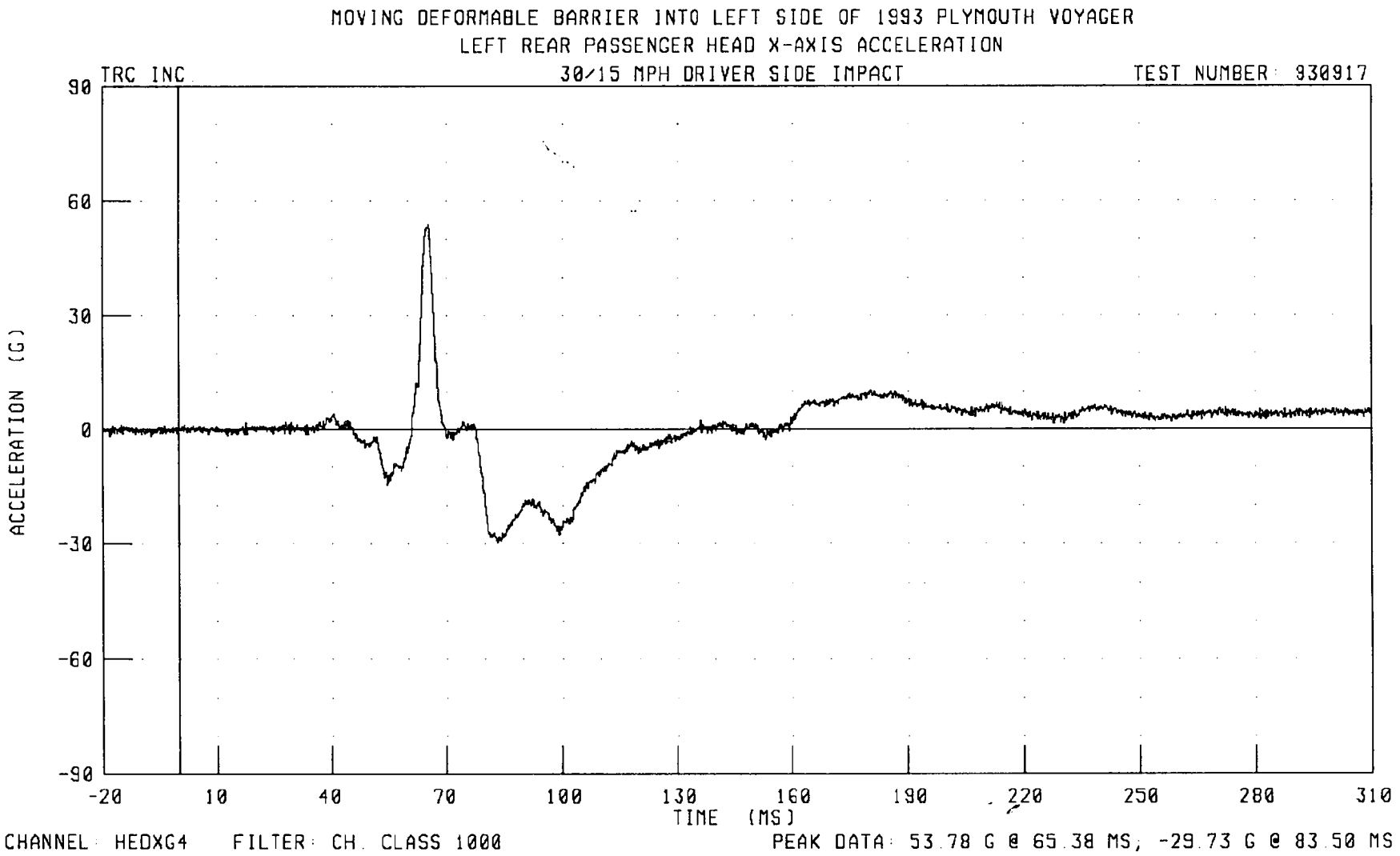


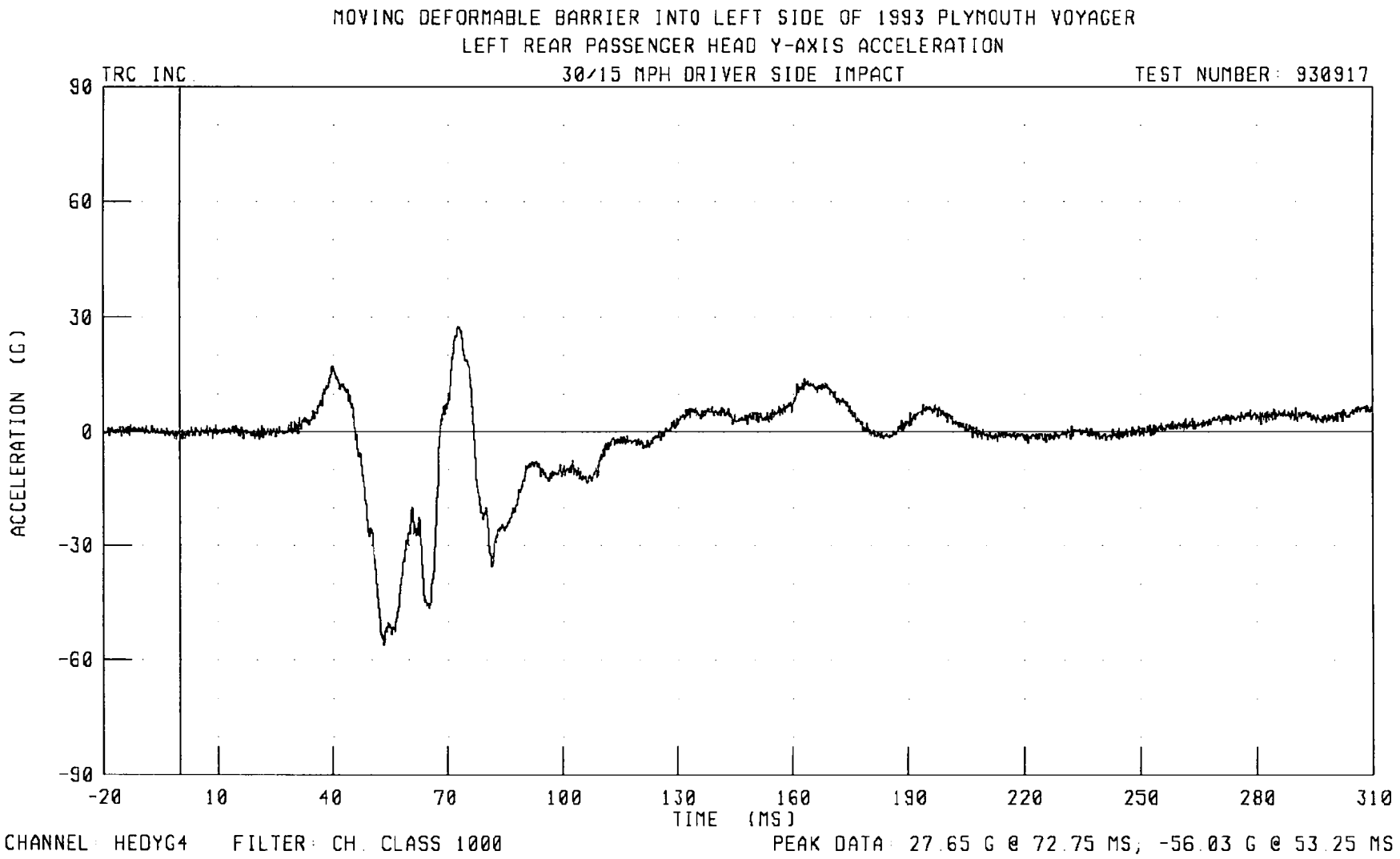
CHANNEL: PEVXG1 FILTER: FIR 100 PEAK DATA: 20.58 G @ 33.13 MS, -23.24 G @ 43.13 MS

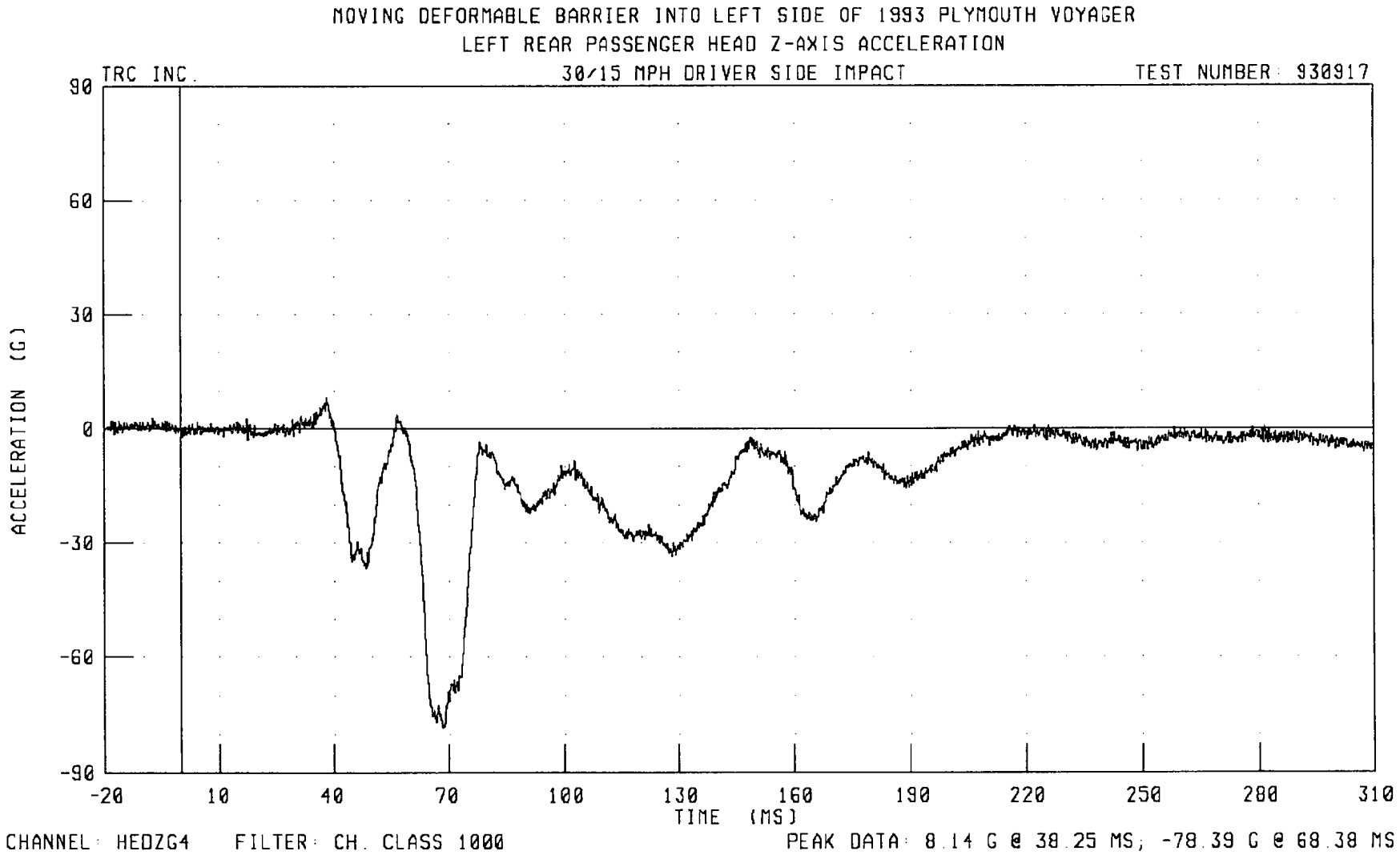

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER PELVIS Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
150
100
50
0
-50
-100
-150
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVYG1
FILTER: FIR 100
PEAK DATA: 30.10 G @ 55.63 MS, -133.27 G @ 31.25 MS

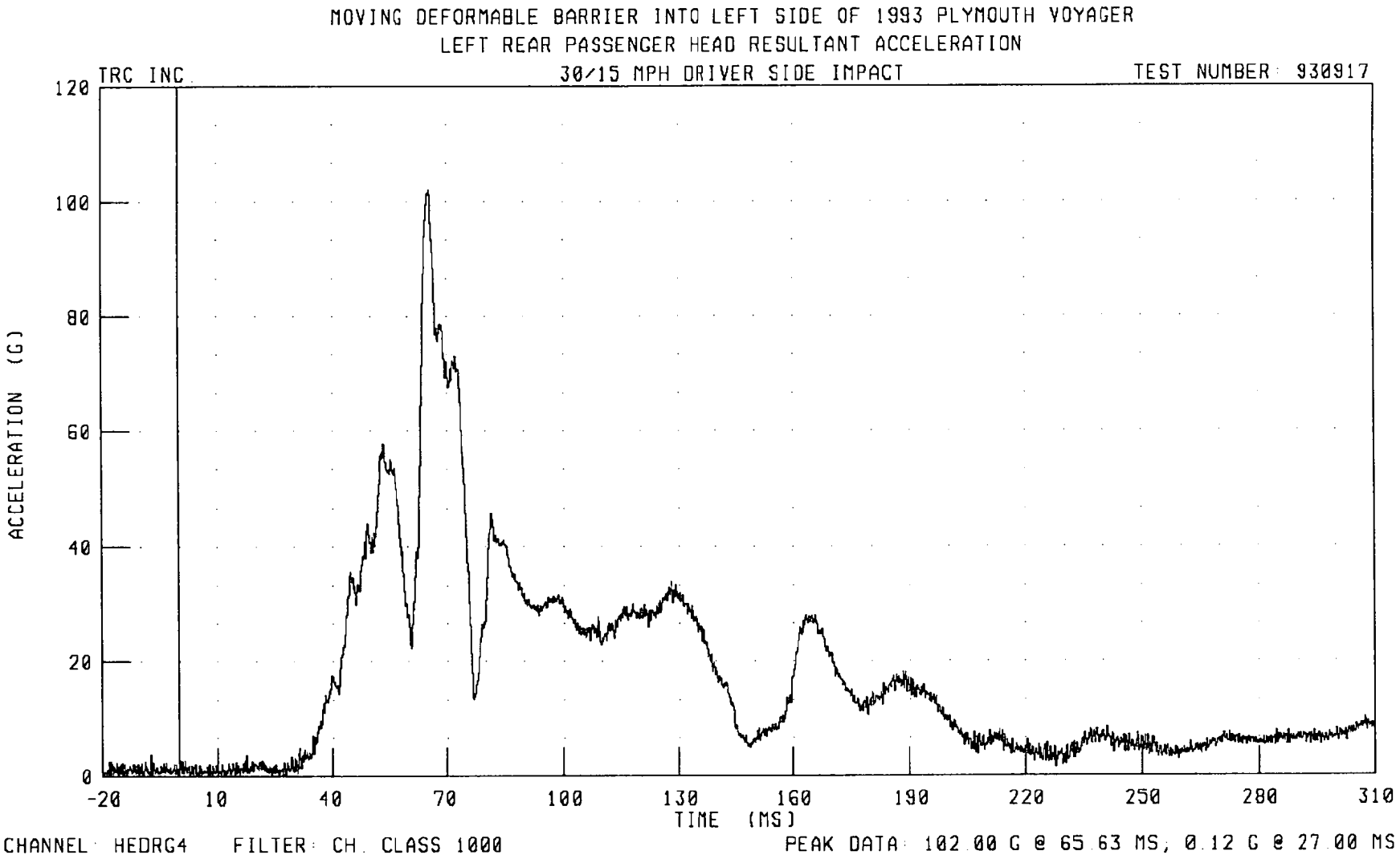

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER PELVIS Z-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVZG1
FILTER: FIR 100
PEAK DATA: 17.90 G @ 31.88 MS; -9.56 G @ 70.63 MS

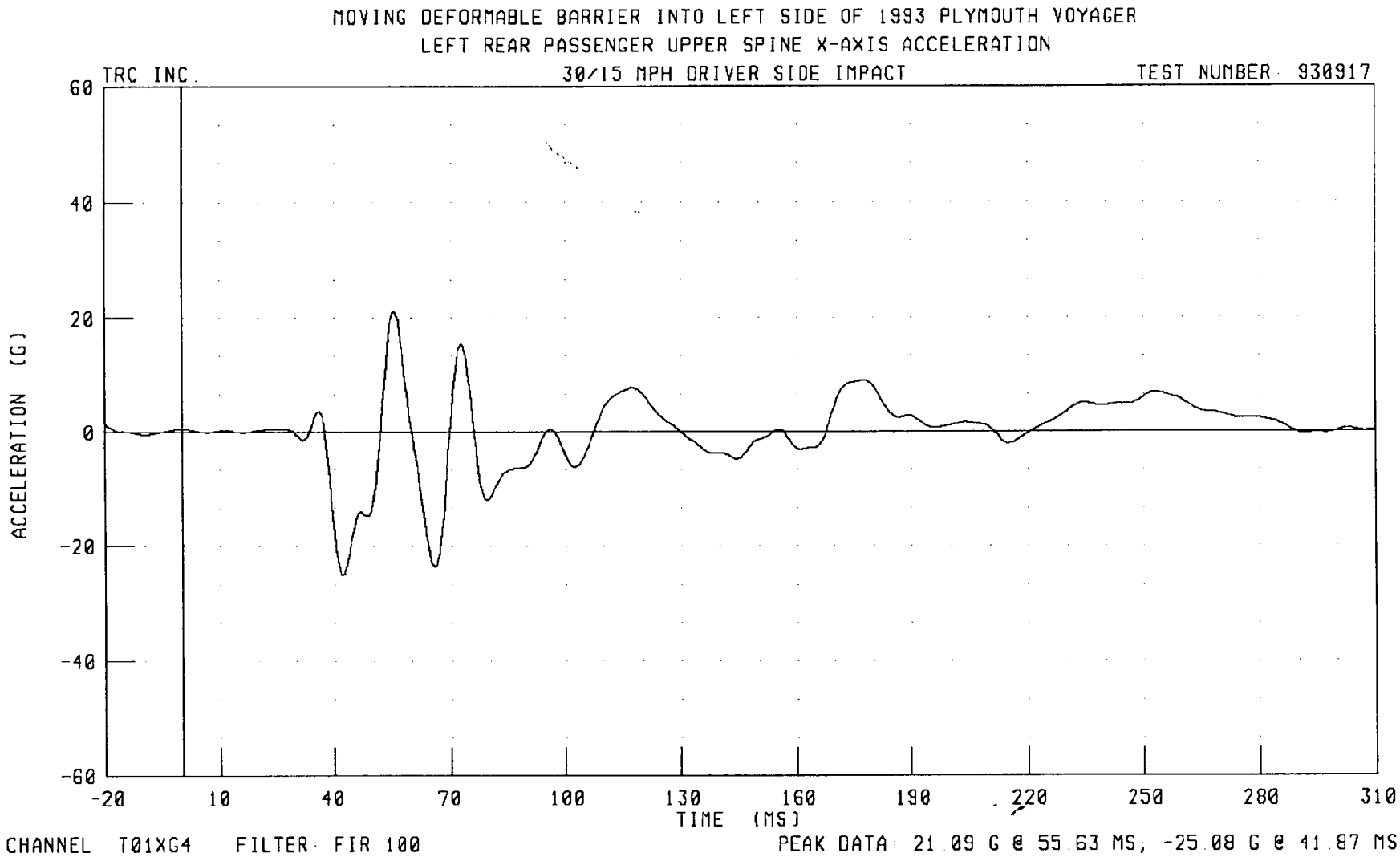

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
DRIVER PELVIS RESULTANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER 930917
ACCELERATION (G)
180
150
120
90
60
30
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVRG1
FILTER: FIR 100
PEAK DATA: 135.47 G @ 31.25 MS, 0.08 G @ -18.75 MS

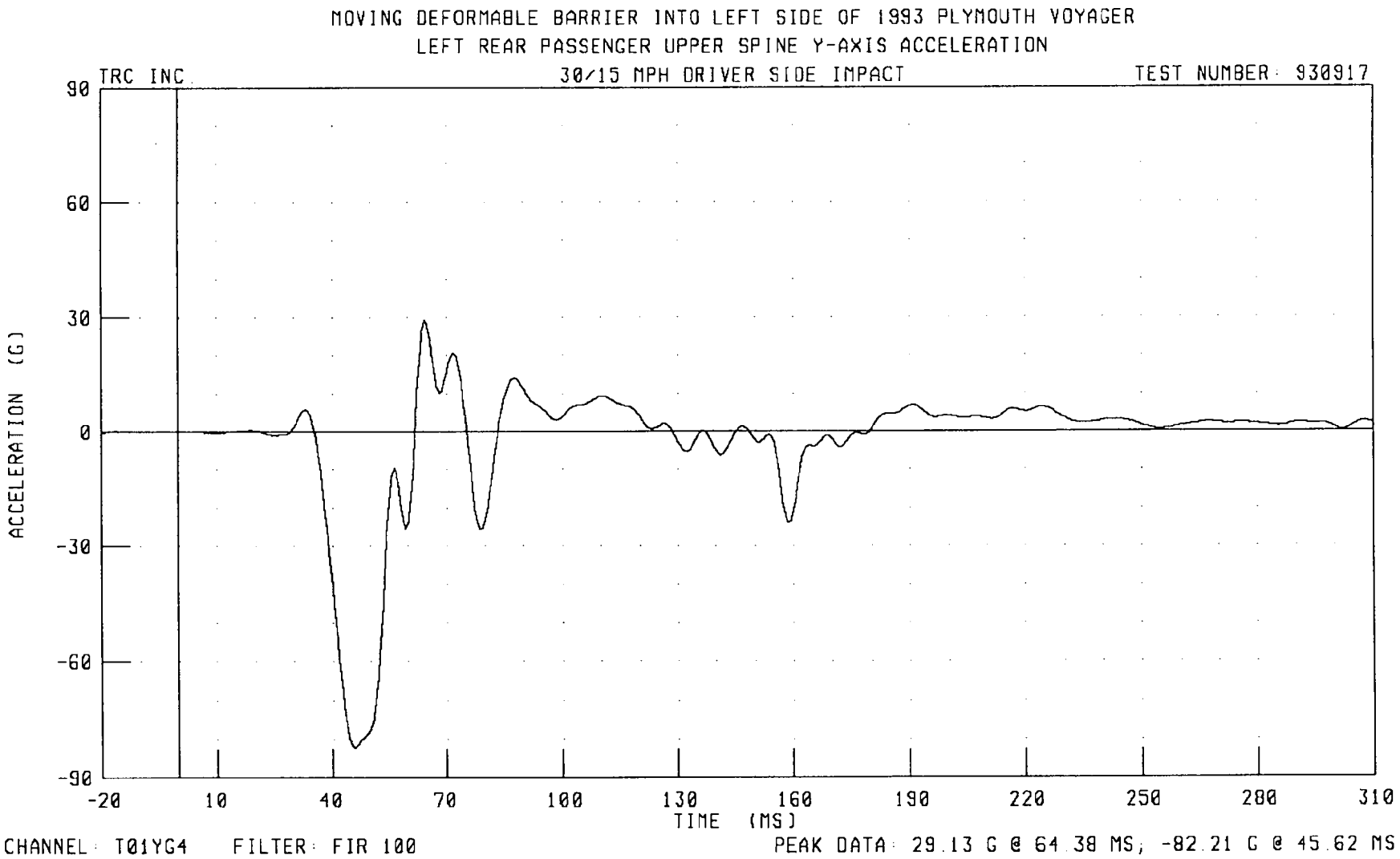

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER HEAD X-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDXG4
FILTER: CH. CLASS 1000
PEAK DATA: 53.78 G @ 65.38 MS, -29.73 G @ 83.50 MS

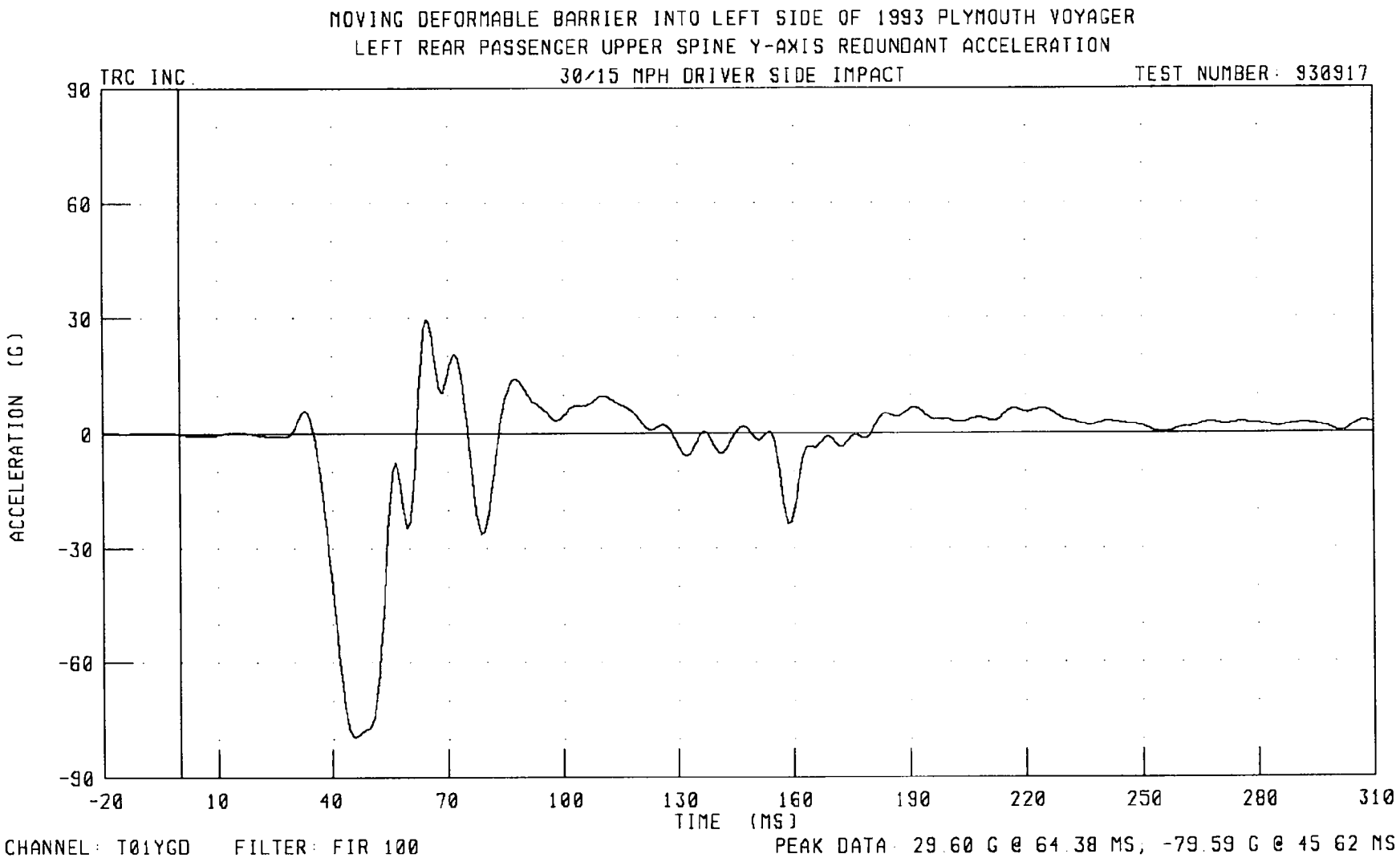

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER HEAD Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDYG4
FILTER: CH. CLASS 1000
PEAK DATA: 27.65 G @ 72.75 MS, -56.03 G @ 53.25 MS

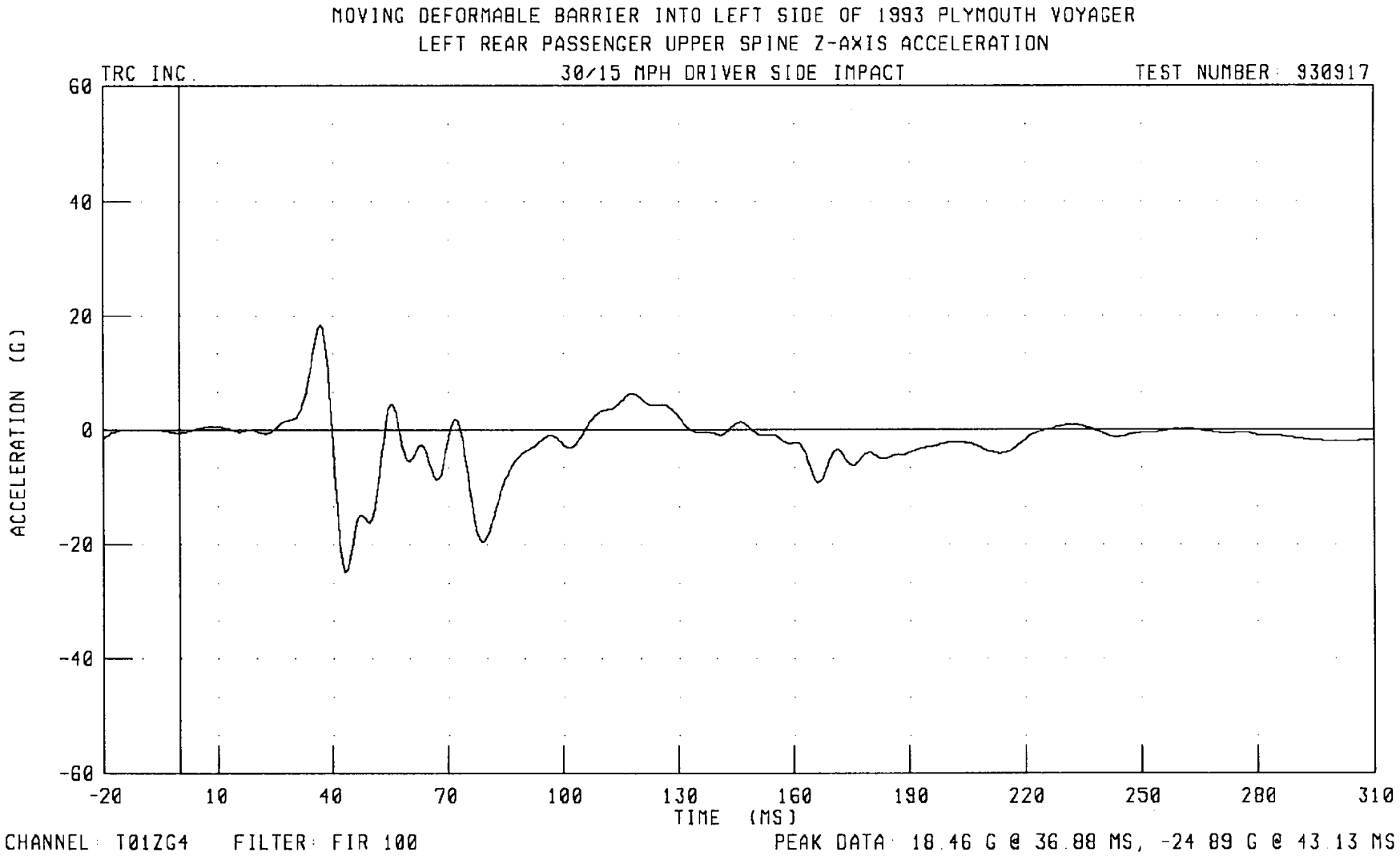

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER HEAD Z-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDZG4
FILTER: CH. CLASS 1000
PEAK DATA: 8.14 G @ 38.25 MS; -78.39 G @ 68.38 MS

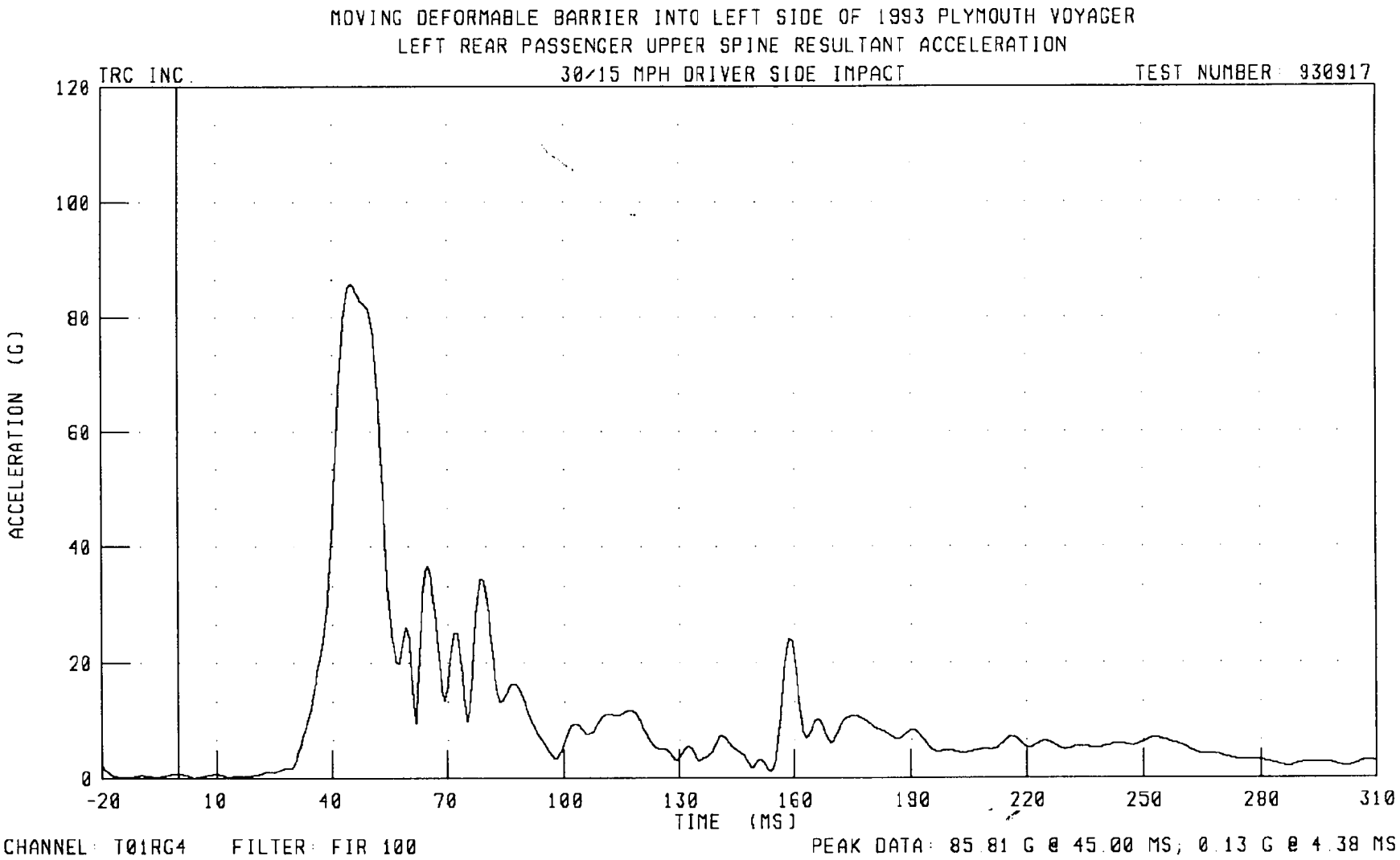

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER HEAD RESULTANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: HEDRG4
FILTER: CH. CLASS 1000
PEAK DATA: 102.00 G @ 65.63 MS, 0.12 G @ 27.00 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER UPPER SPINE X-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER 930917
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL T01XG4
FILTER FIR 100
PEAK DATA 21.09 G @ 55.63 MS, -25.08 G @ 41.87 MS

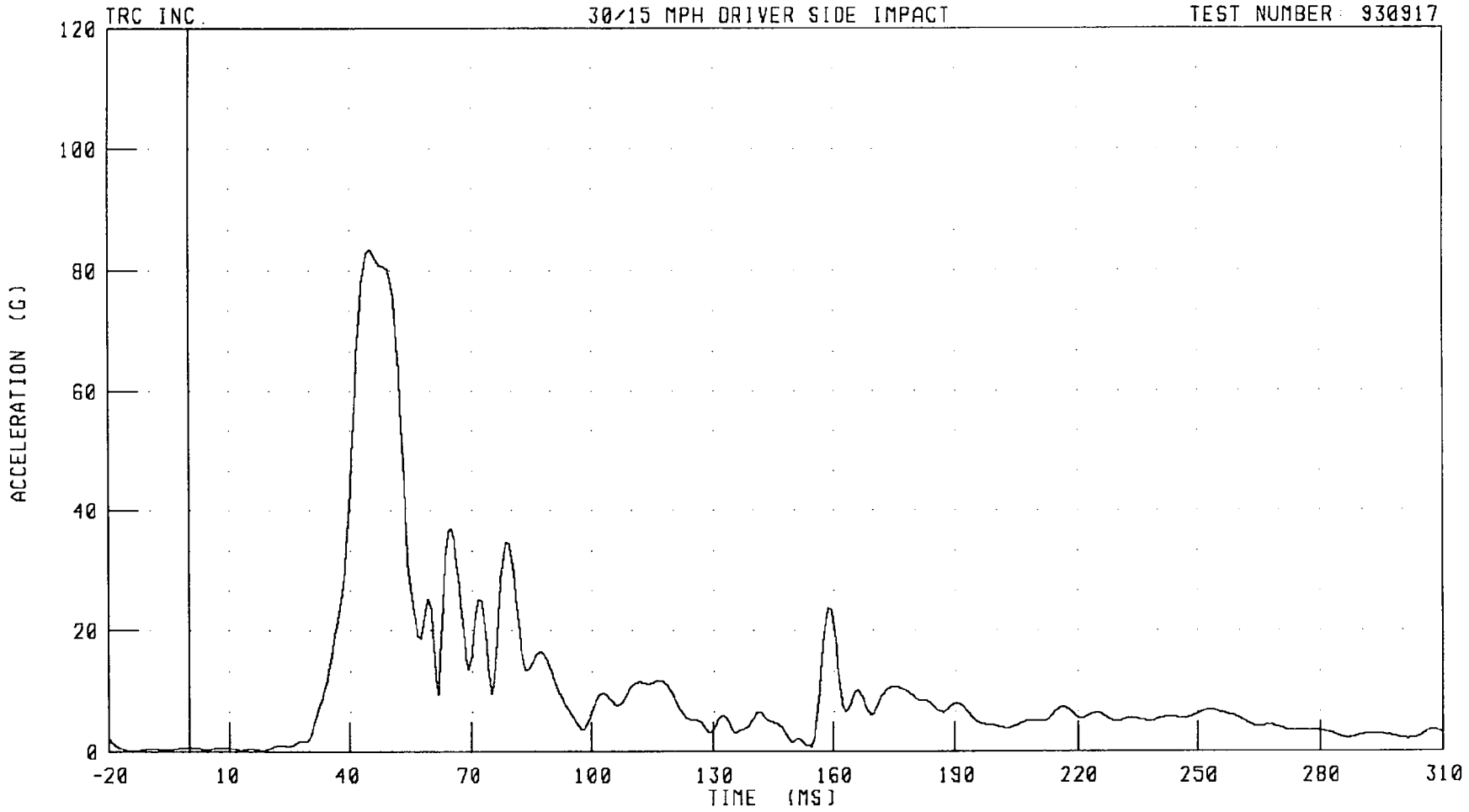

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER UPPER SPINE Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T01YG4
FILTER: FIR 100
PEAK DATA: 29.13 G @ 64.38 MS; -82.21 G @ 45.62 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER UPPER SPINE Y-AXIS REDUNDANT ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T01YGD
FILTER: FIR 100
PEAK DATA: 29.60 G @ 64.38 MS, -79.59 G @ 45.62 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER UPPER SPINE Z-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T01ZG4
FILTER: FIR 100
PEAK DATA: 18.46 G @ 36.88 MS, -24.89 G @ 43.13 MS

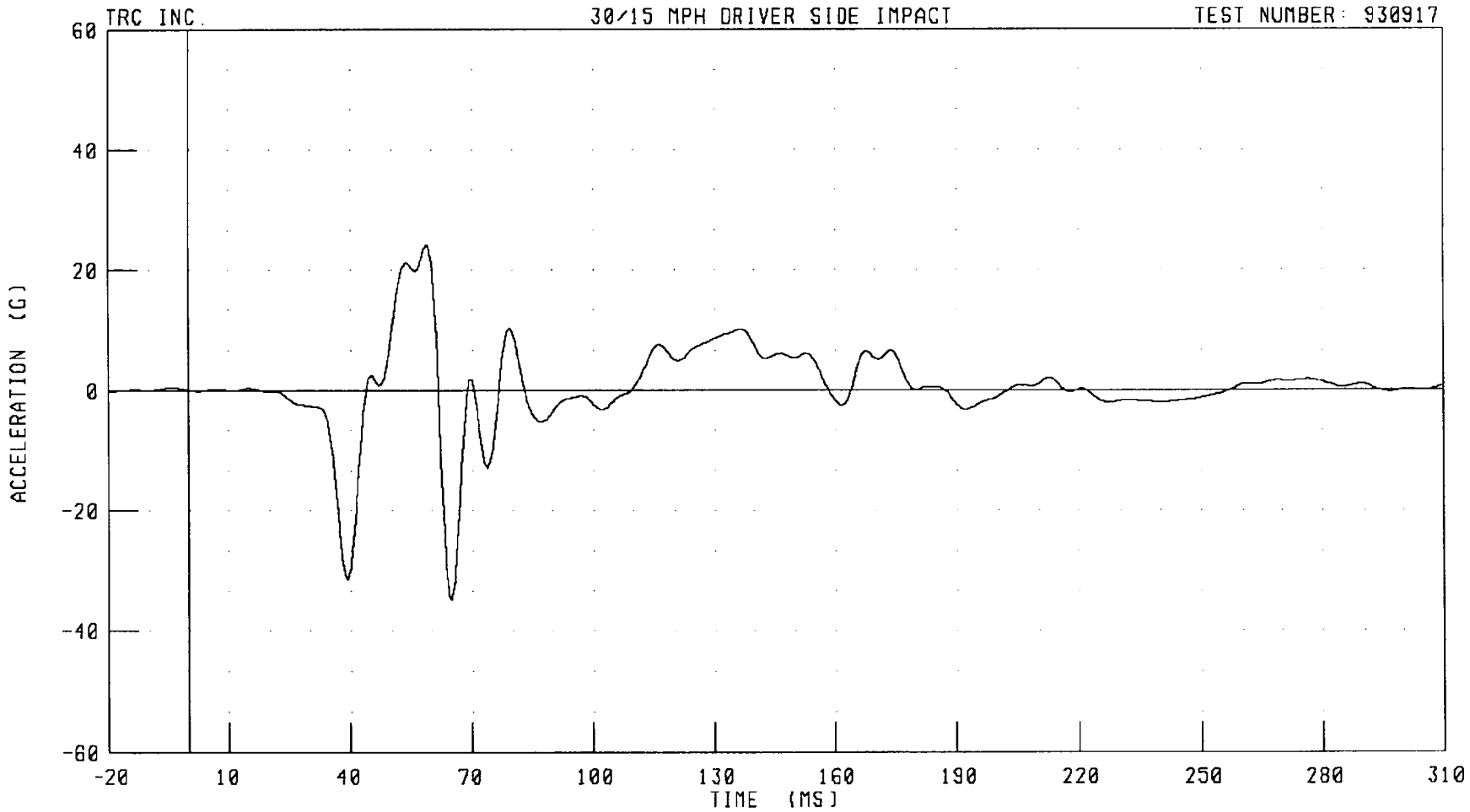

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER UPPER SPINE RESULTANT ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T01RG4
FILTER: FIR 100
PEAK DATA: 85.81 G @ 45.00 MS; 0.13 G @ 4.38 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER UPPER SPINE RESULTANT REDUNDANT ACCELERATION

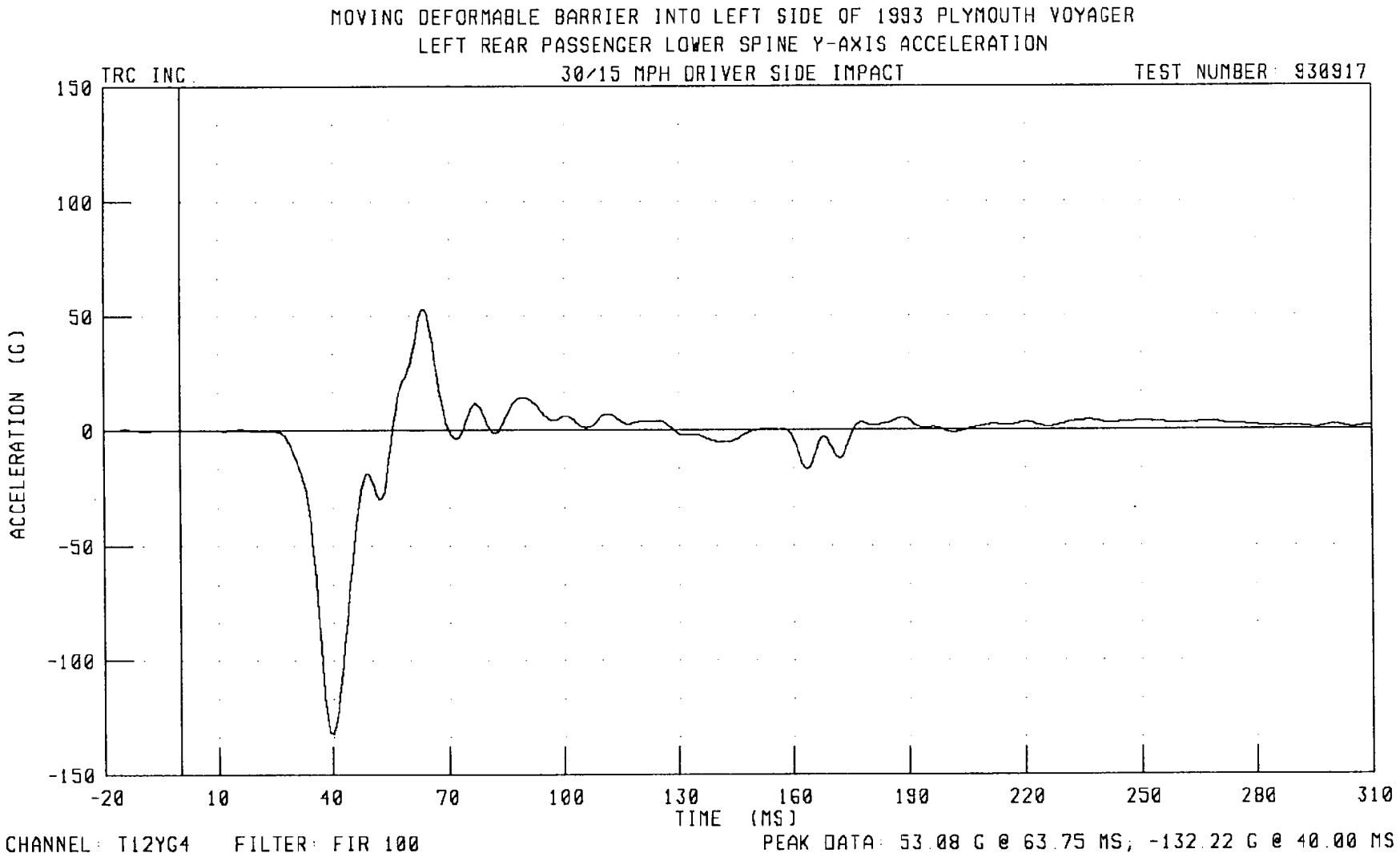


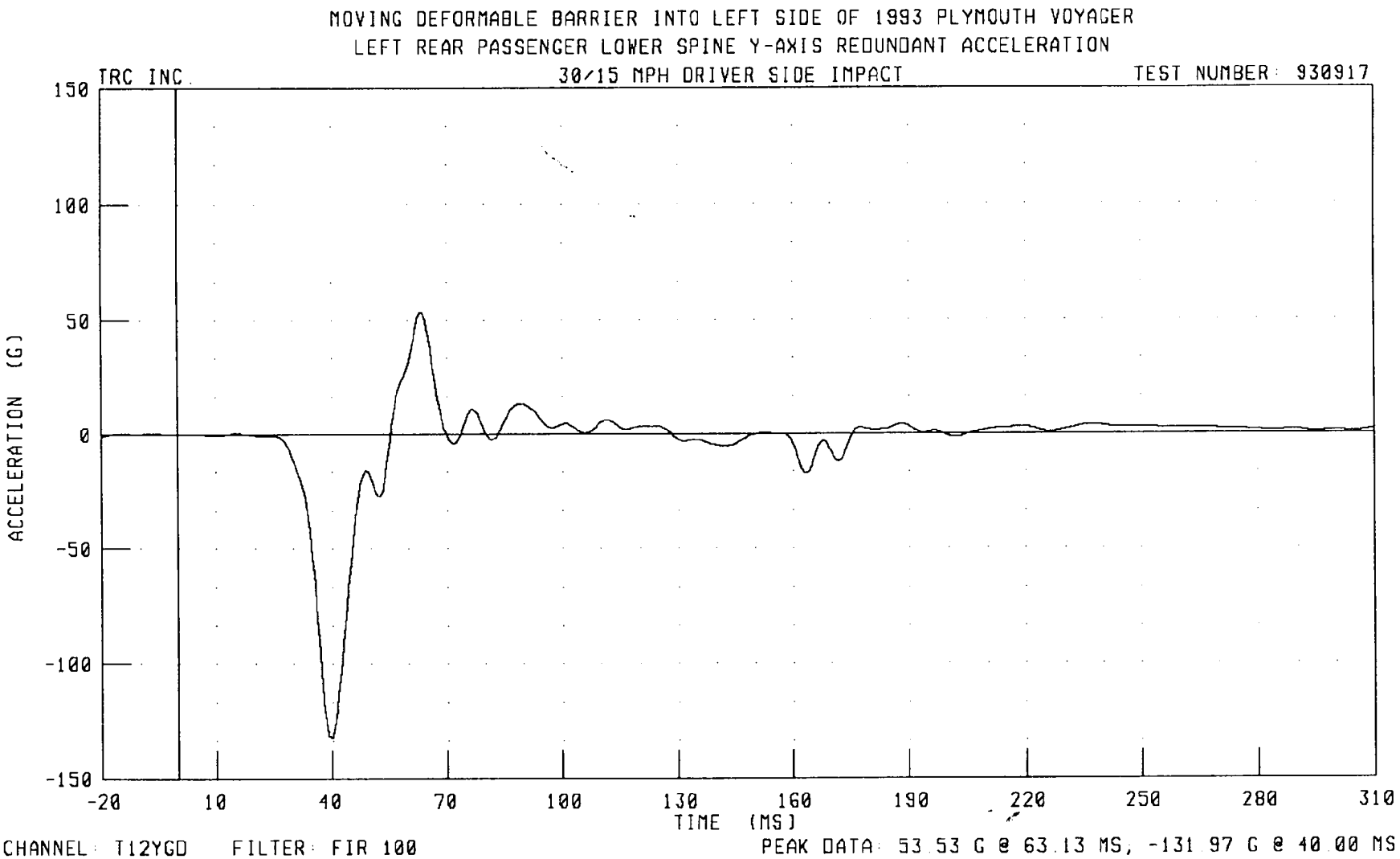
CHANNEL: T01RGD FILTER: FIR 100 PEAK DATA: 83.35 G @ 45.00 MS, 0.15 G @ -13.75 MS

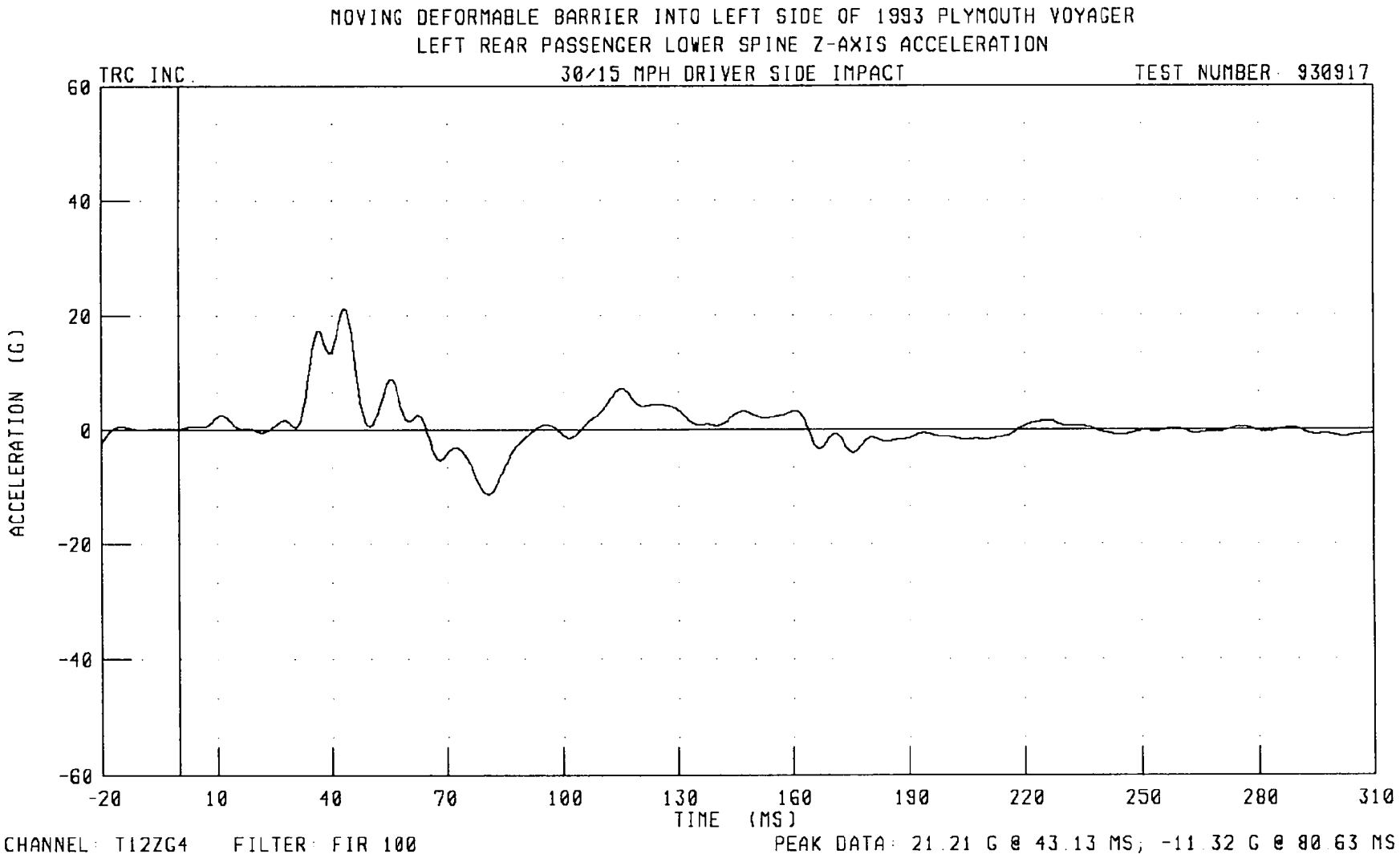
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LOWER SPINE X-AXIS ACCELERATION

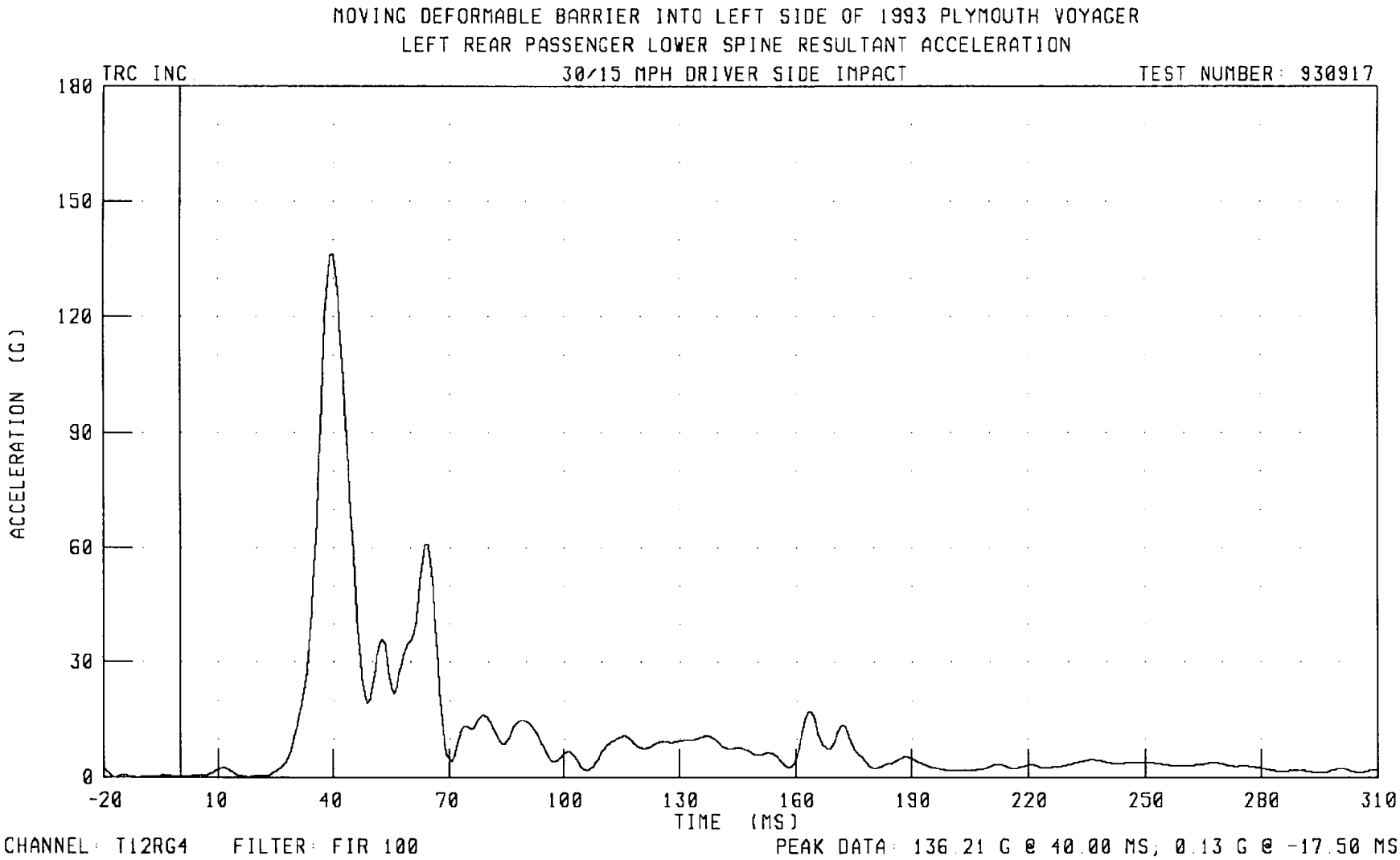


CHANNEL: T12XG4 FILTER: FIR 100 PEAK DATA: 24.24 G @ 58.75 MS, -34.80 G @ 65.00 MS

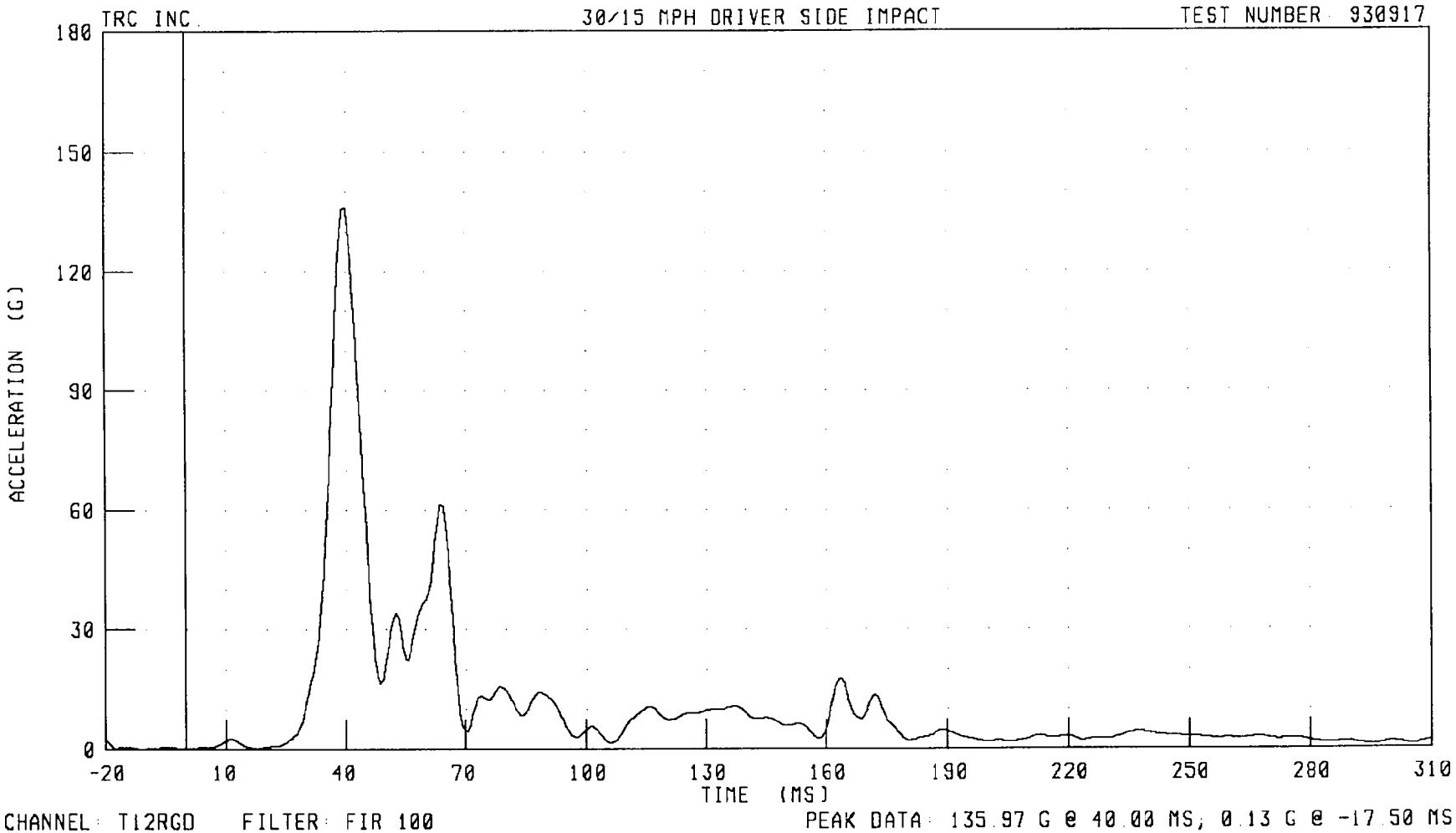

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LOWER SPINE Y-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
150
100
50
0
-50
-100
-150
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T12YG4
FILTER: FIR 100
PEAK DATA: 53.08 G @ 63.75 MS, -132.22 G @ 40.00 MS

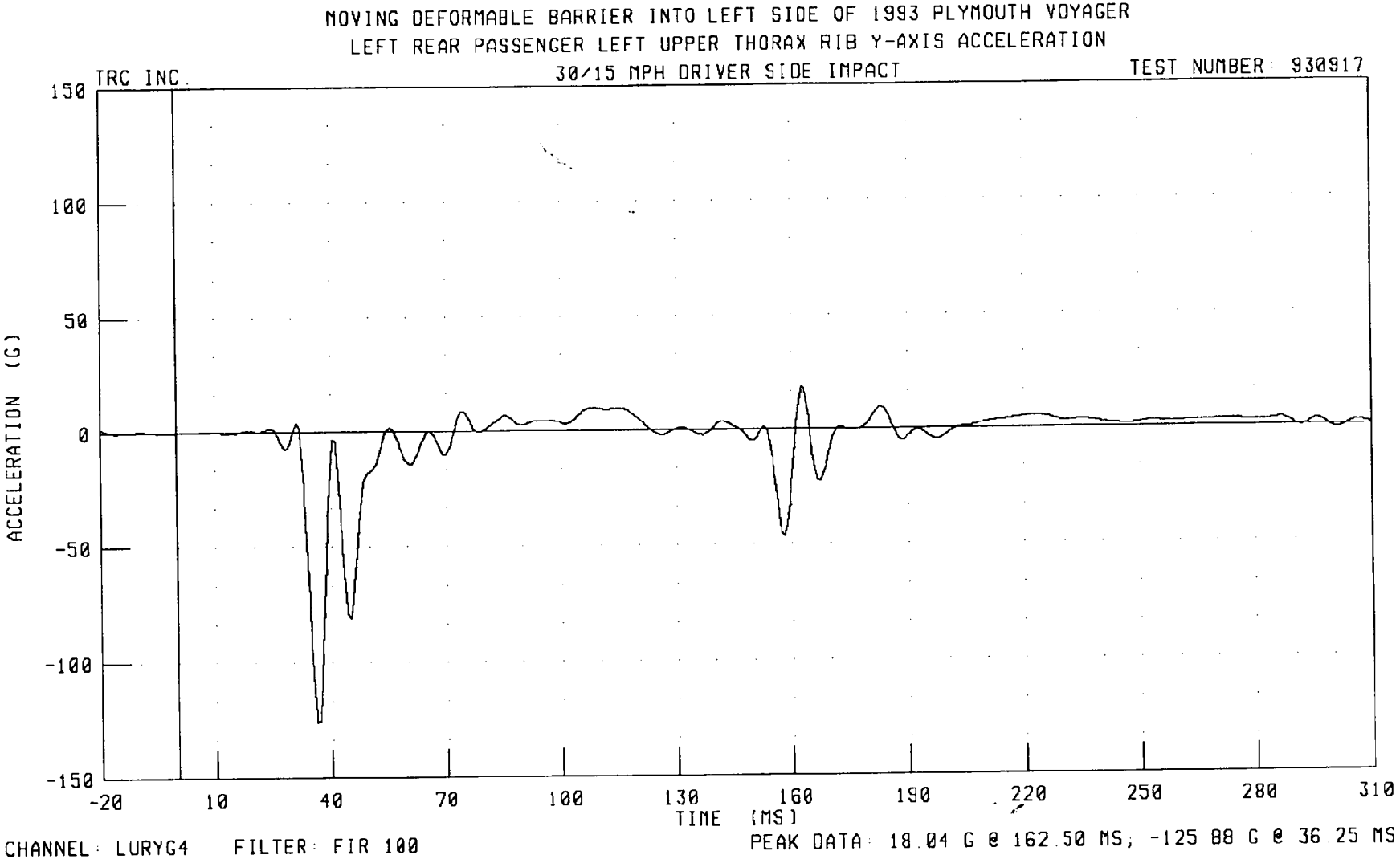

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LOWER SPINE Y-AXIS REDUNDANT ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
150
100
50
0
-50
-100
-150
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T12YGD
FILTER: FIR 100
PEAK DATA: 53.53 G @ 63.13 MS, -131.97 G @ 40.00 MS

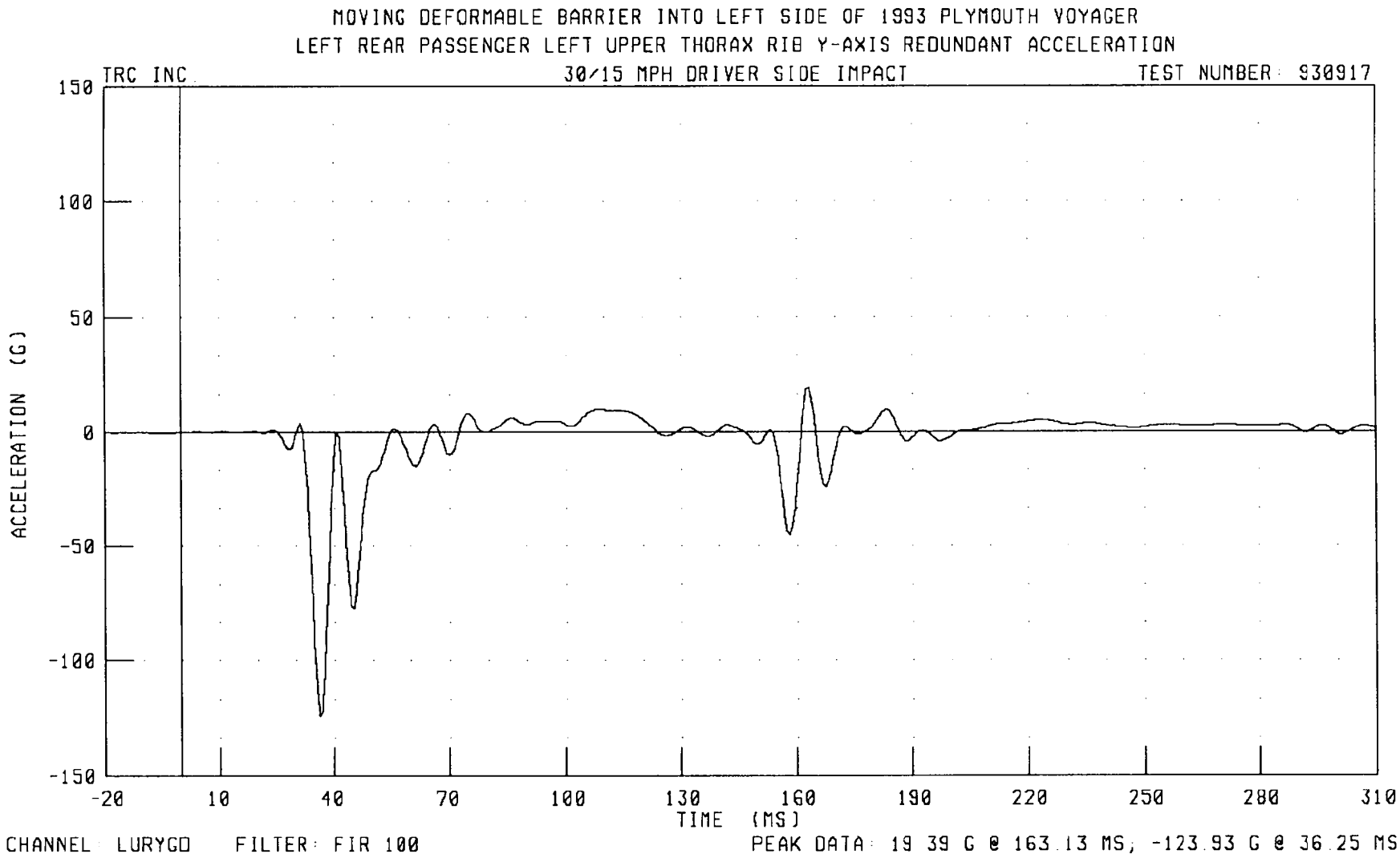

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LOWER SPINE Z-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T12ZG4
FILTER: FIR 100
PEAK DATA: 21.21 G @ 43.13 MS; -11.32 G @ 80.63 MS

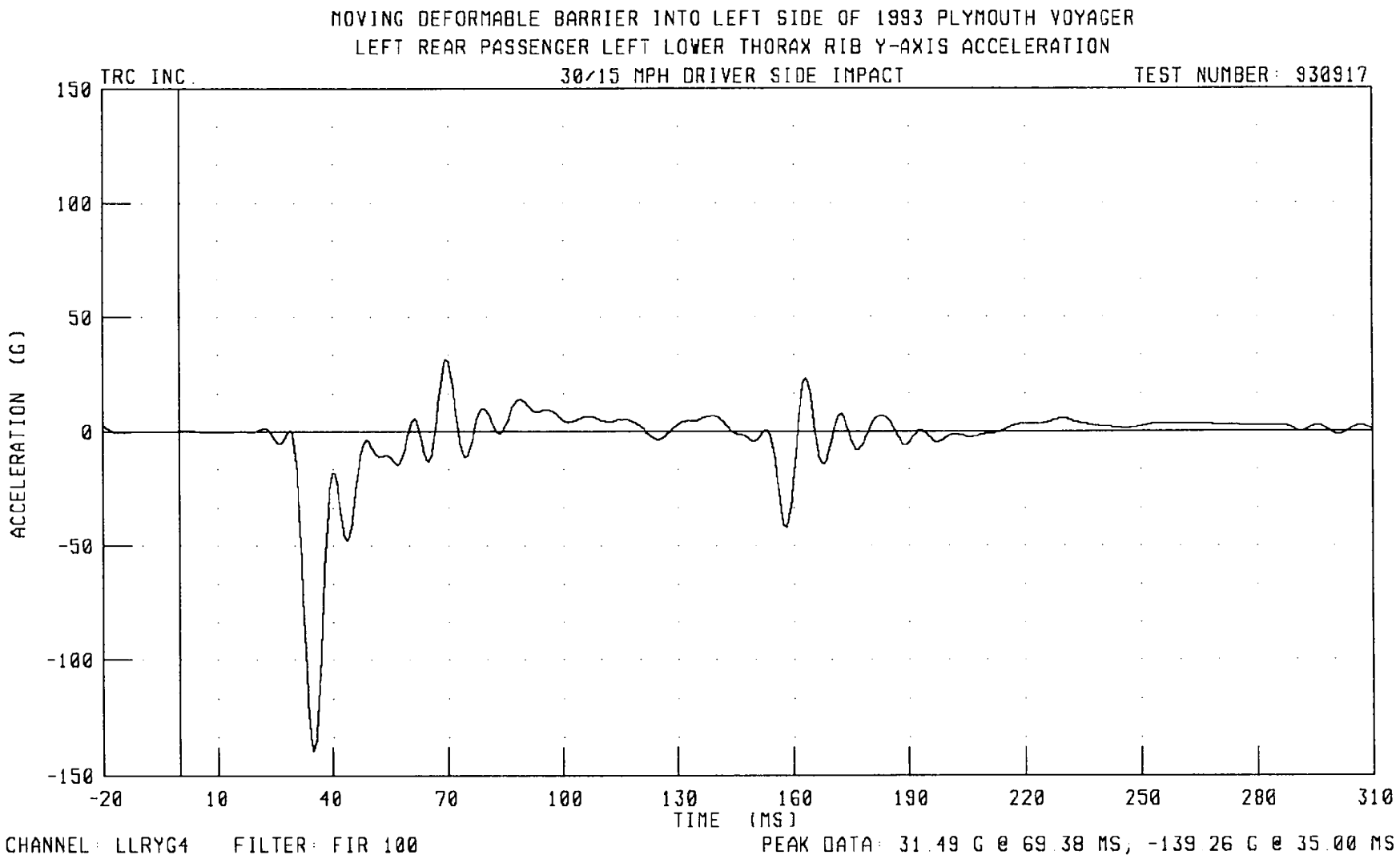

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LOWER SPINE RESULTANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
180
150
120
90
60
30
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: T12RG4
FILTER: FIR 100
PEAK DATA: 136.21 G @ 40.00 MS, 0.13 G @ -17.50 MS

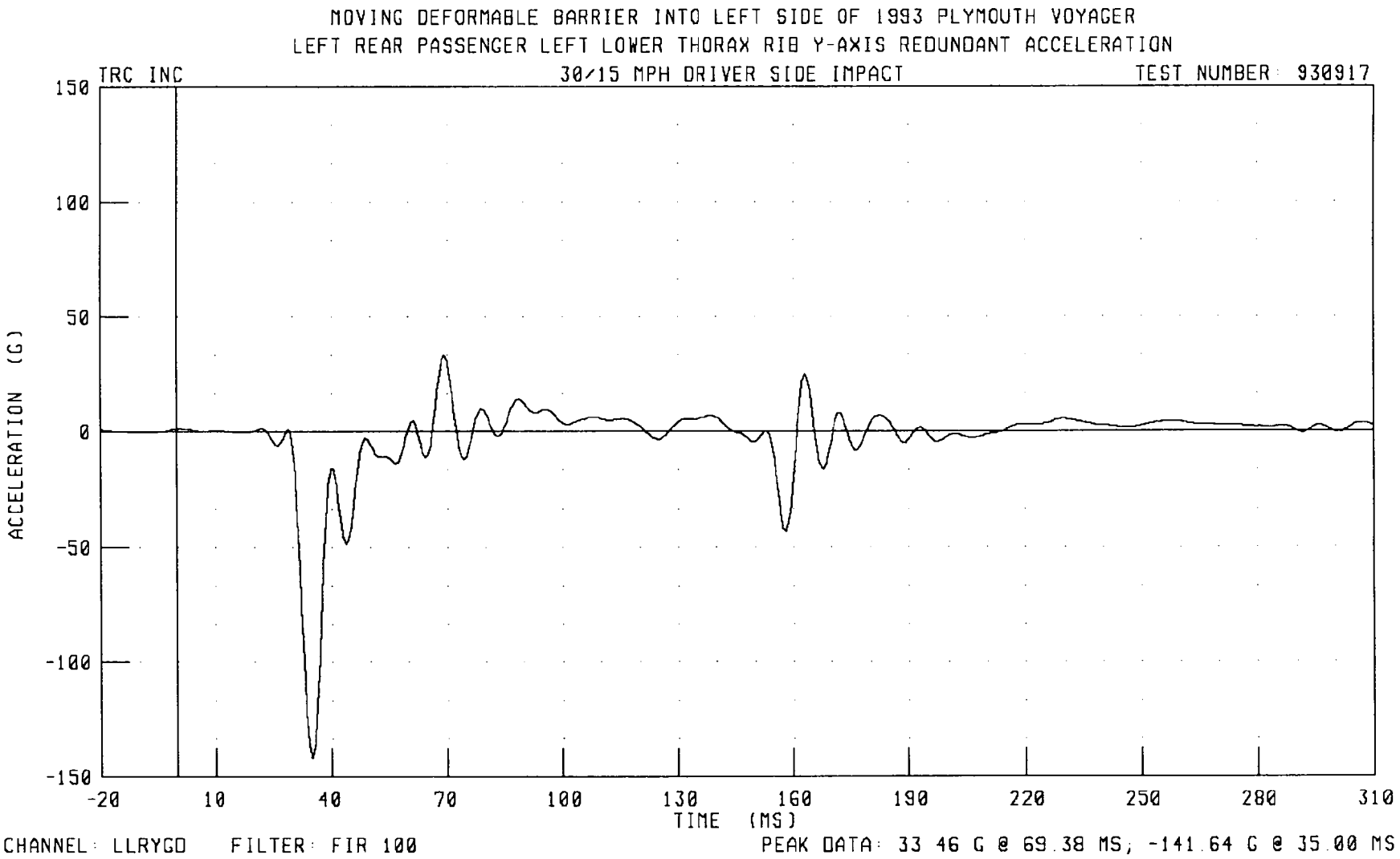
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LOWER SPINE RESULTANT REDUNDANT ACCELERATION

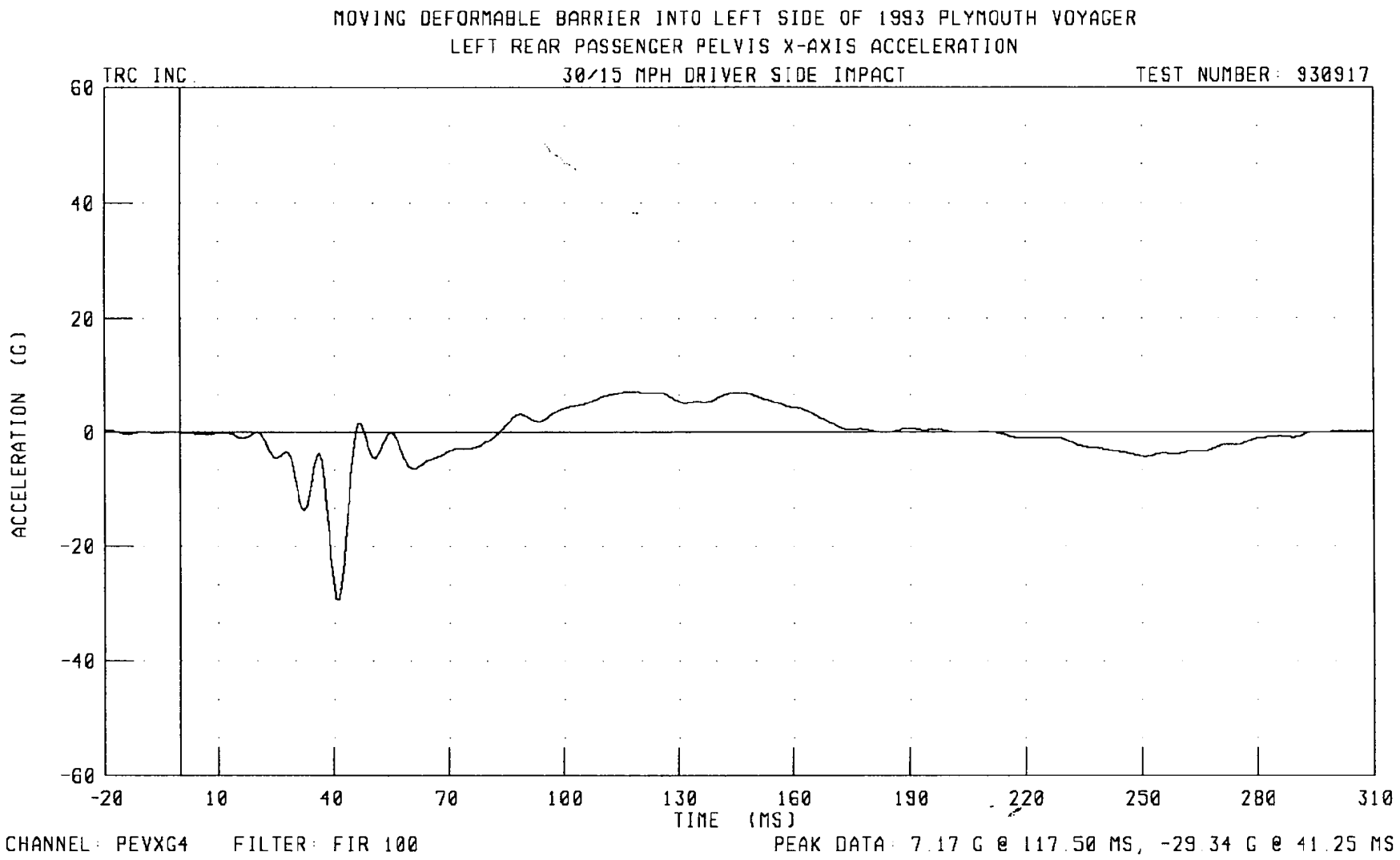


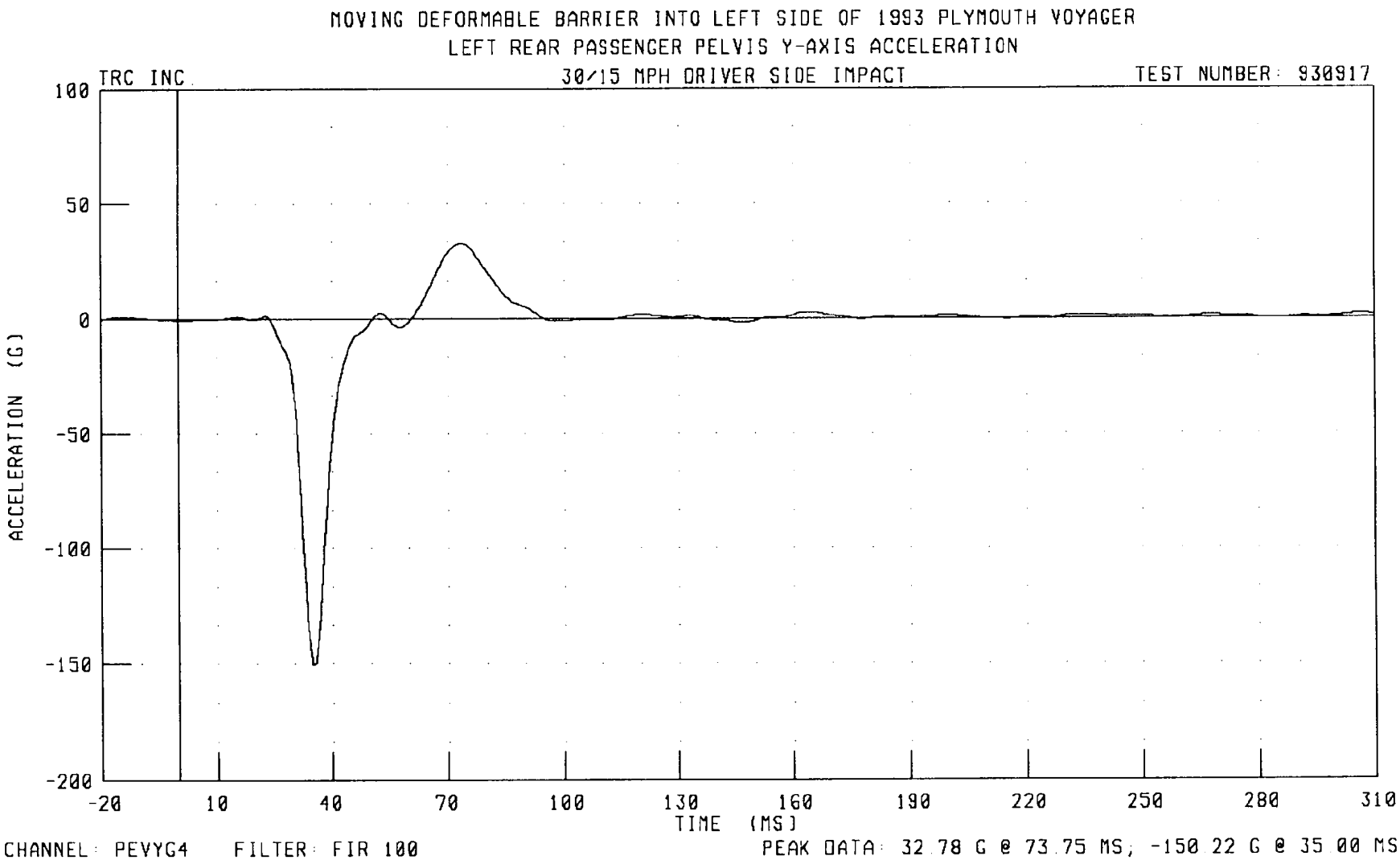

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LEFT UPPER THORAX RIB Y-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
150
100
50
0
-50
-100
-150
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LURYG4
FILTER: FIR 100
PEAK DATA: 18.04 G @ 162.50 MS; -125.88 G @ 36.25 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LEFT UPPER THORAX RIB Y-AXIS REDUNDANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
150
100
50
0
-50
-100
-150
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LURYGD
FILTER: FIR 100
PEAK DATA: 19.39 G @ 163.13 MS; -123.93 G @ 36.25 MS

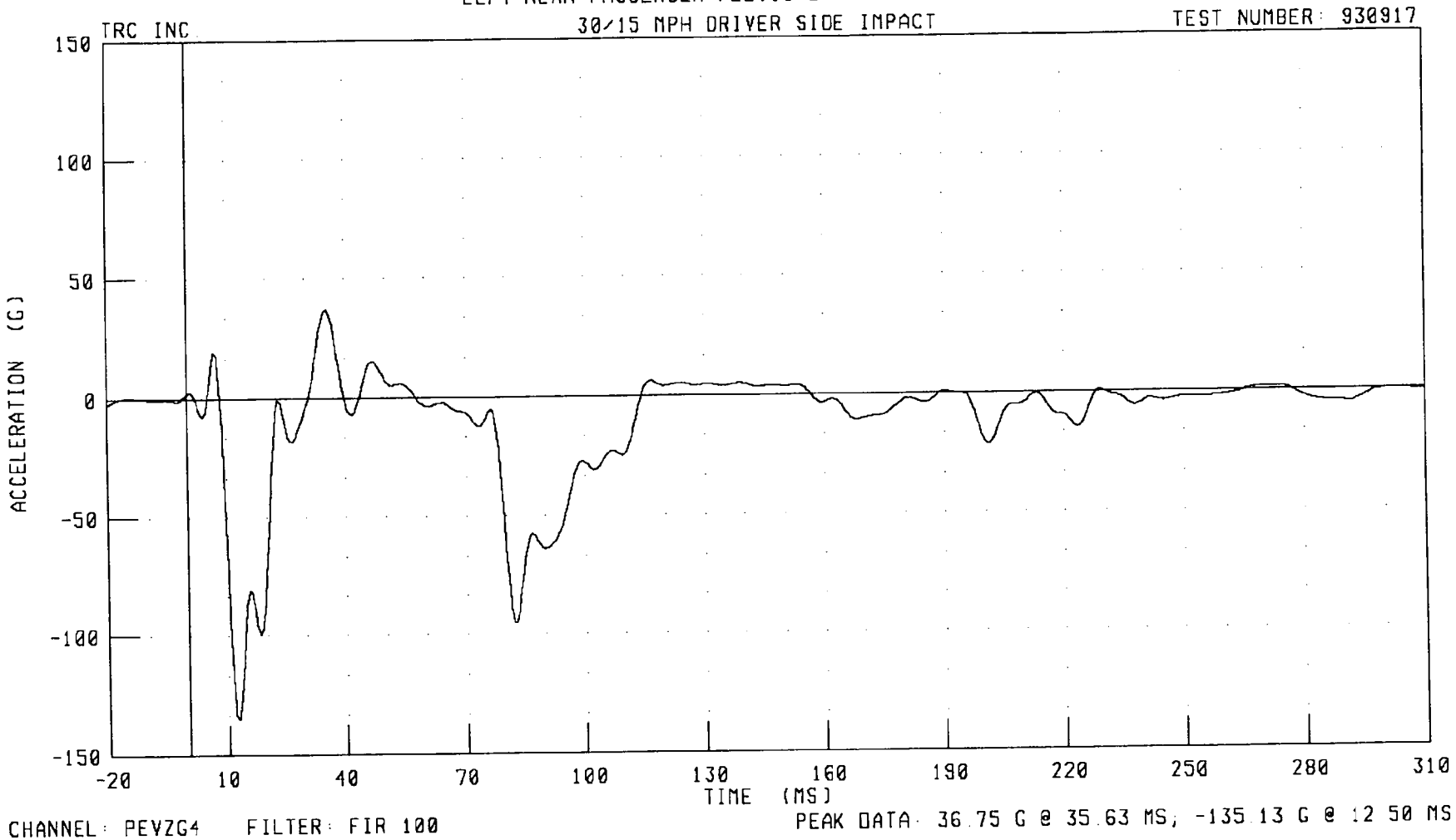

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LEFT LOWER THORAX RIB Y-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
150
100
50
0
-50
-100
-150
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LLRYG4
FILTER: FIR 100
PEAK DATA: 31.49 G @ 69.38 MS, -139.26 G @ 35.00 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER LEFT LOWER THORAX RIB Y-AXIS REDUNDANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
150
100
50
0
-50
-100
-150
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LLRYGD
FILTER: FIR 100
PEAK DATA: 33.46 G @ 69.38 MS, -141.64 G @ 35.00 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER PELVIS X-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVXG4
FILTER: FIR 100
PEAK DATA: 7.17 G @ 117.50 MS, -29.34 G @ 41.25 MS

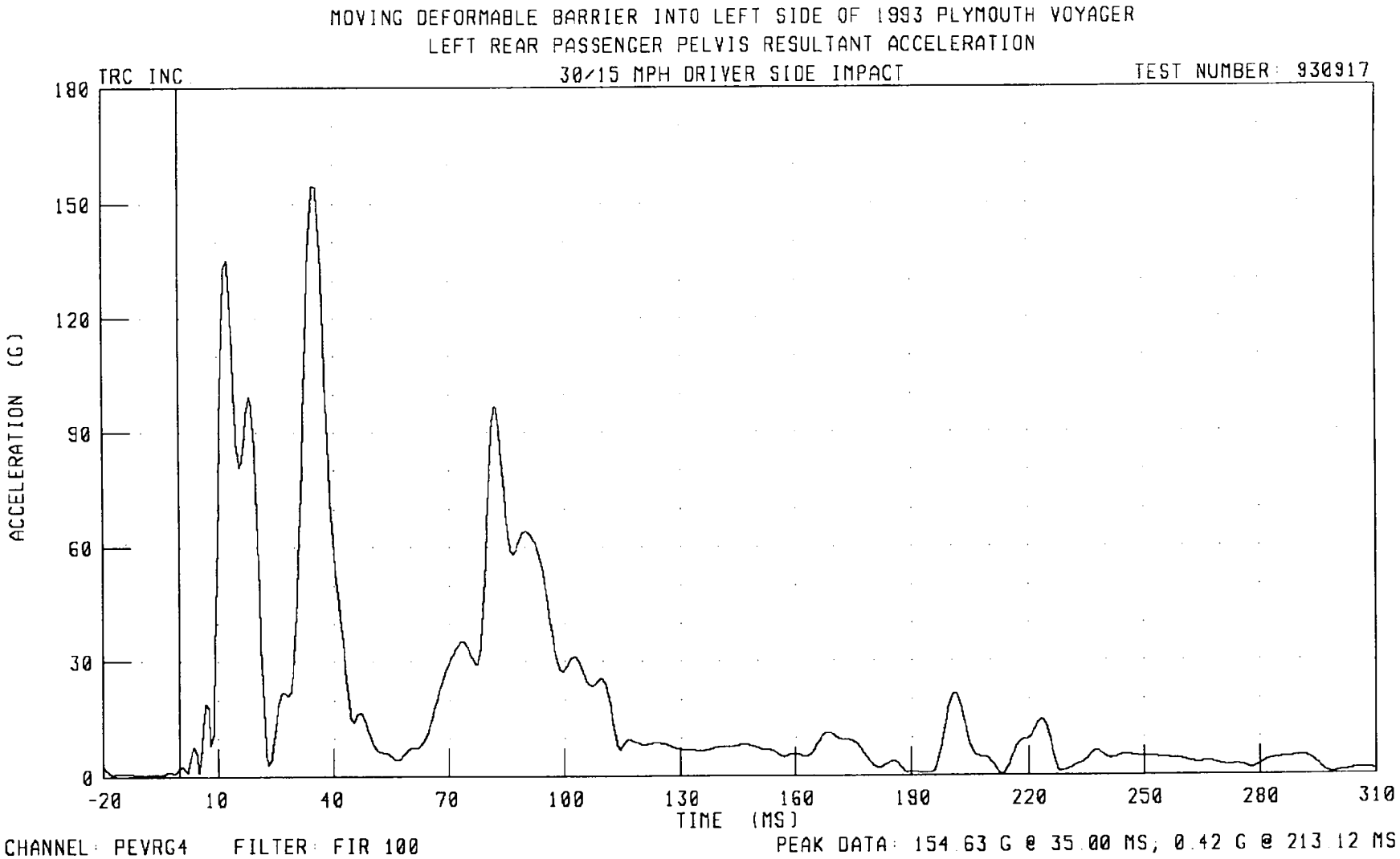

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER PELVIS Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
100
50
0
-50
-100
-150
-200
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVYG4
FILTER: FIR 100
PEAK DATA: 32.78 G @ 73.75 MS; -150.22 G @ 35.00 MS

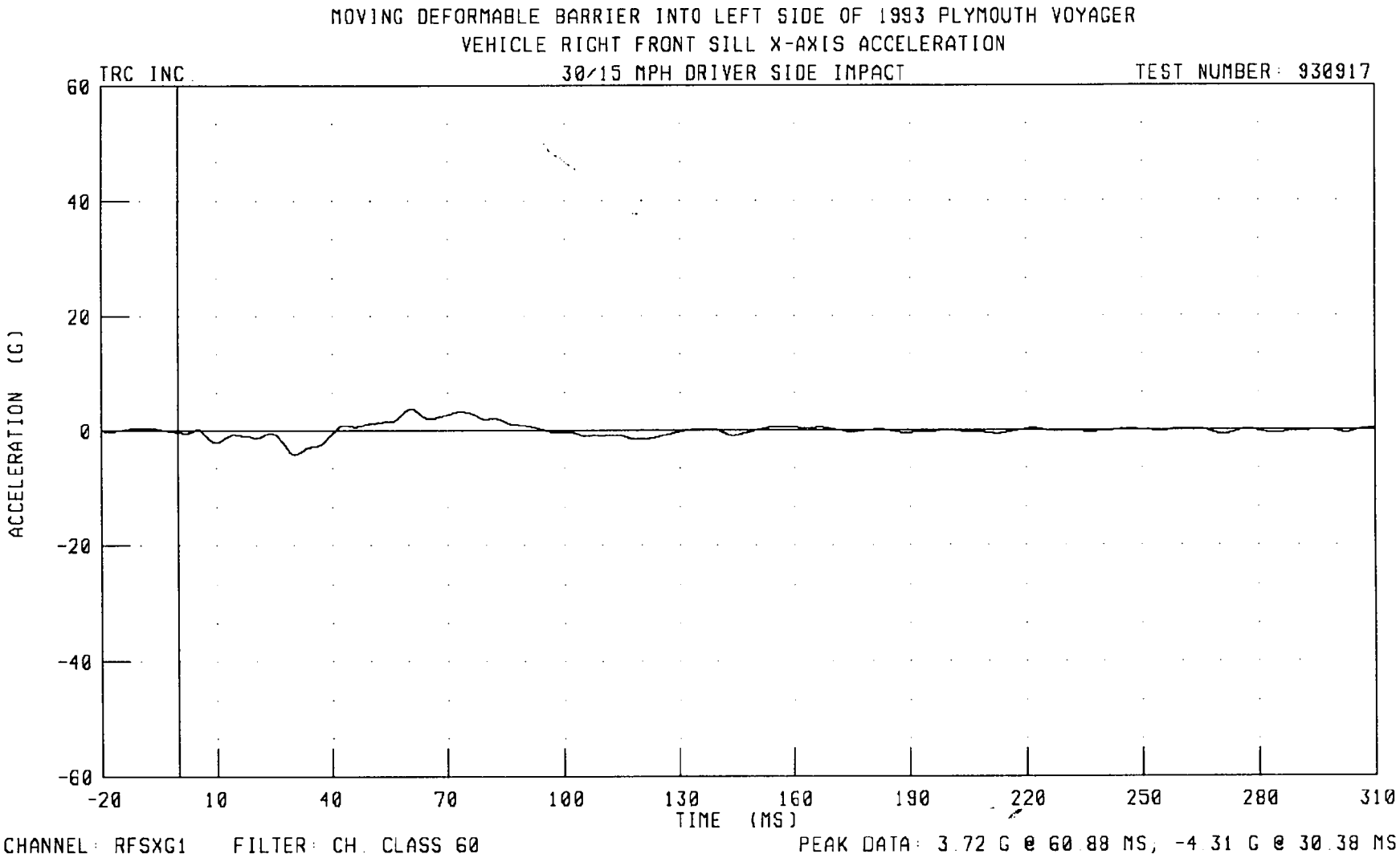
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER PELVIS Z-AXIS ACCELERATION
30/15 MPH DRIVER SIDE IMPACT



CHANNEL: PEVZG4 FILTER: FIR 100

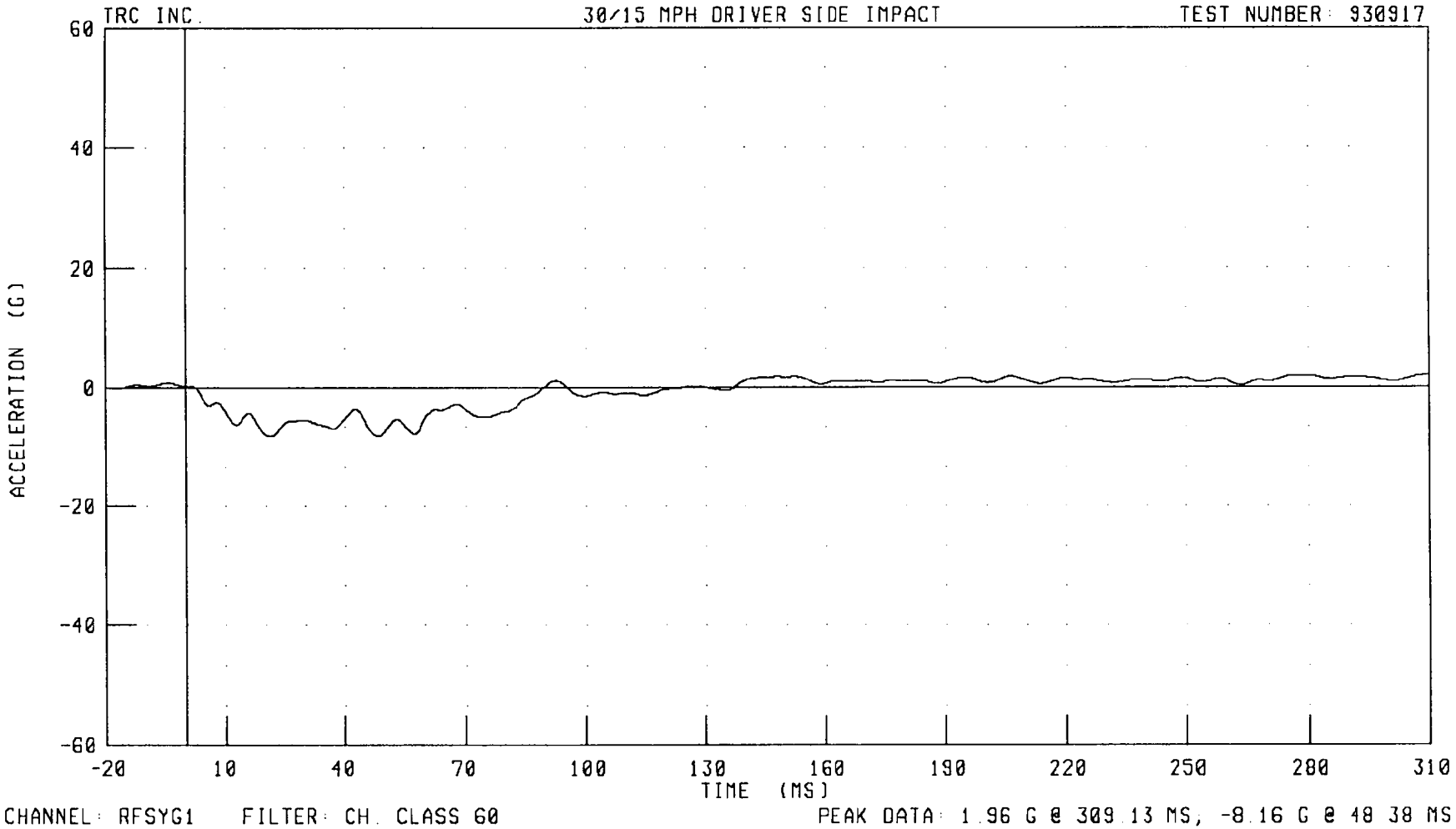
PEAK DATA: 36.75 G @ 35.63 MS; -135.13 G @ 12.50 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT REAR PASSENGER PELVIS RESULTANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
180
150
120
90
60
30
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVRG4
FILTER: FIR 100
PEAK DATA: 154.63 G @ 35.00 MS, 0.42 G @ 213.12 MS

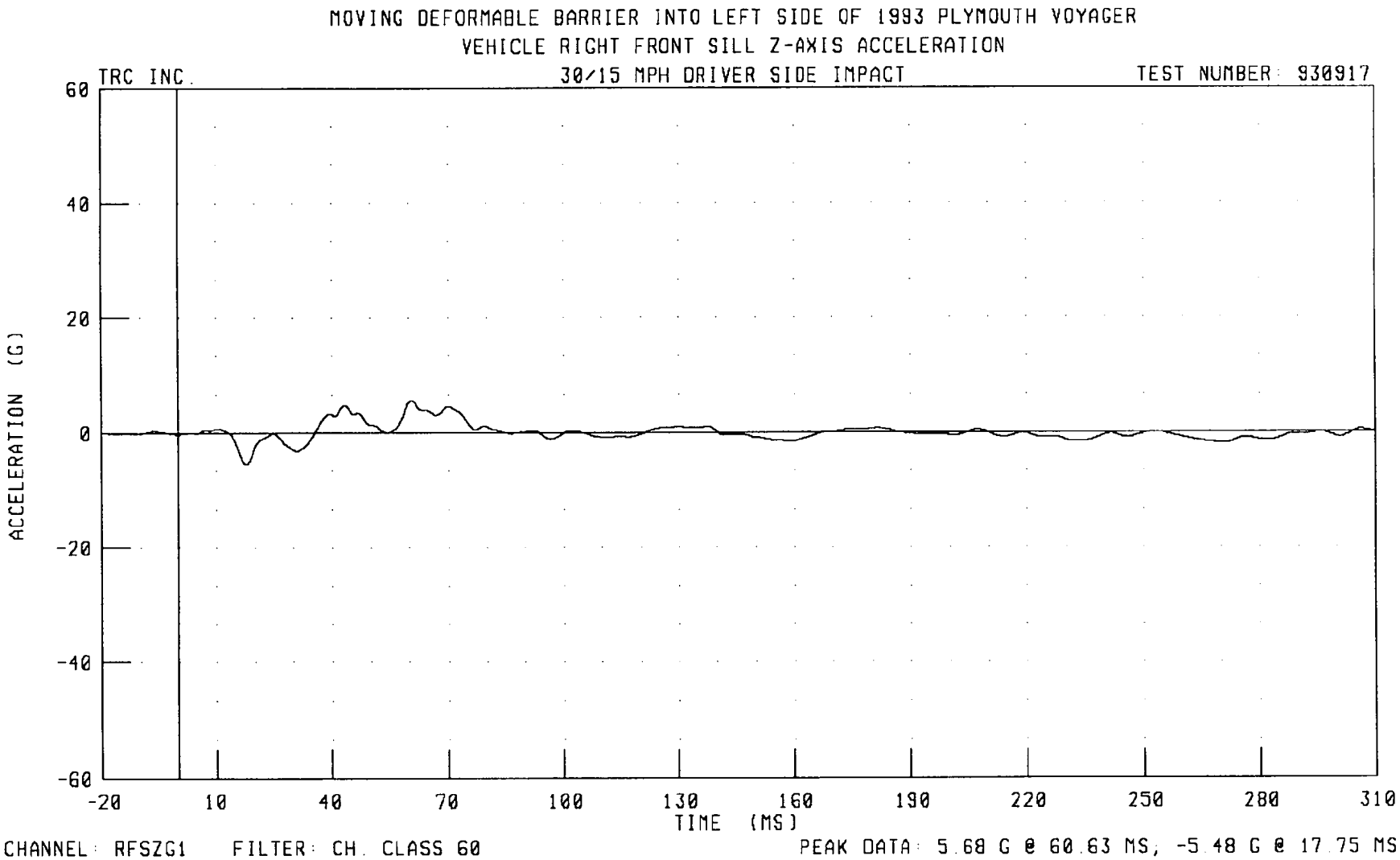

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
VEHICLE RIGHT FRONT SILL X-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: RFSXG1
FILTER: CH. CLASS 60
PEAK DATA: 3.72 G @ 60.88 MS, -4.31 G @ 30.38 MS

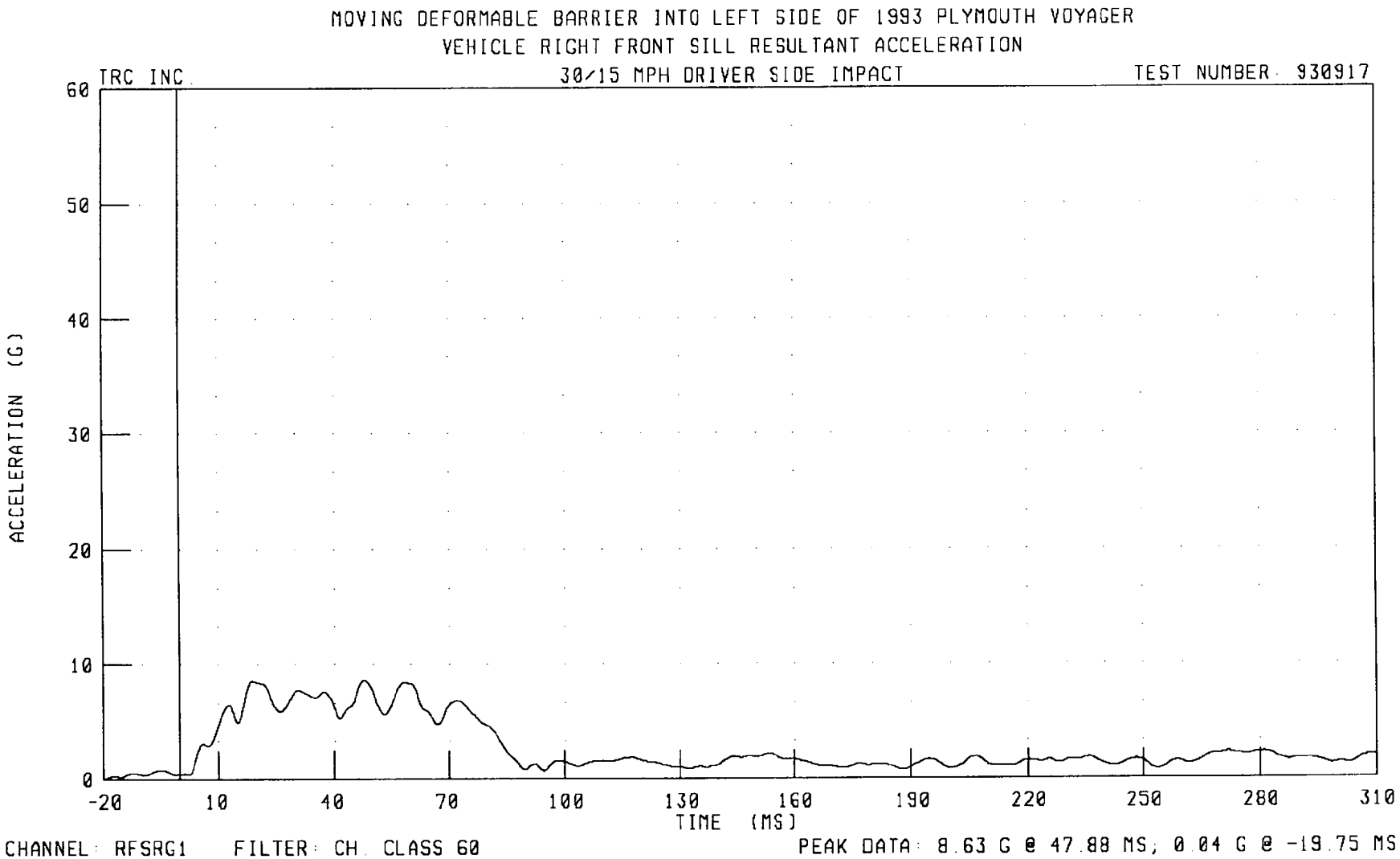
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER

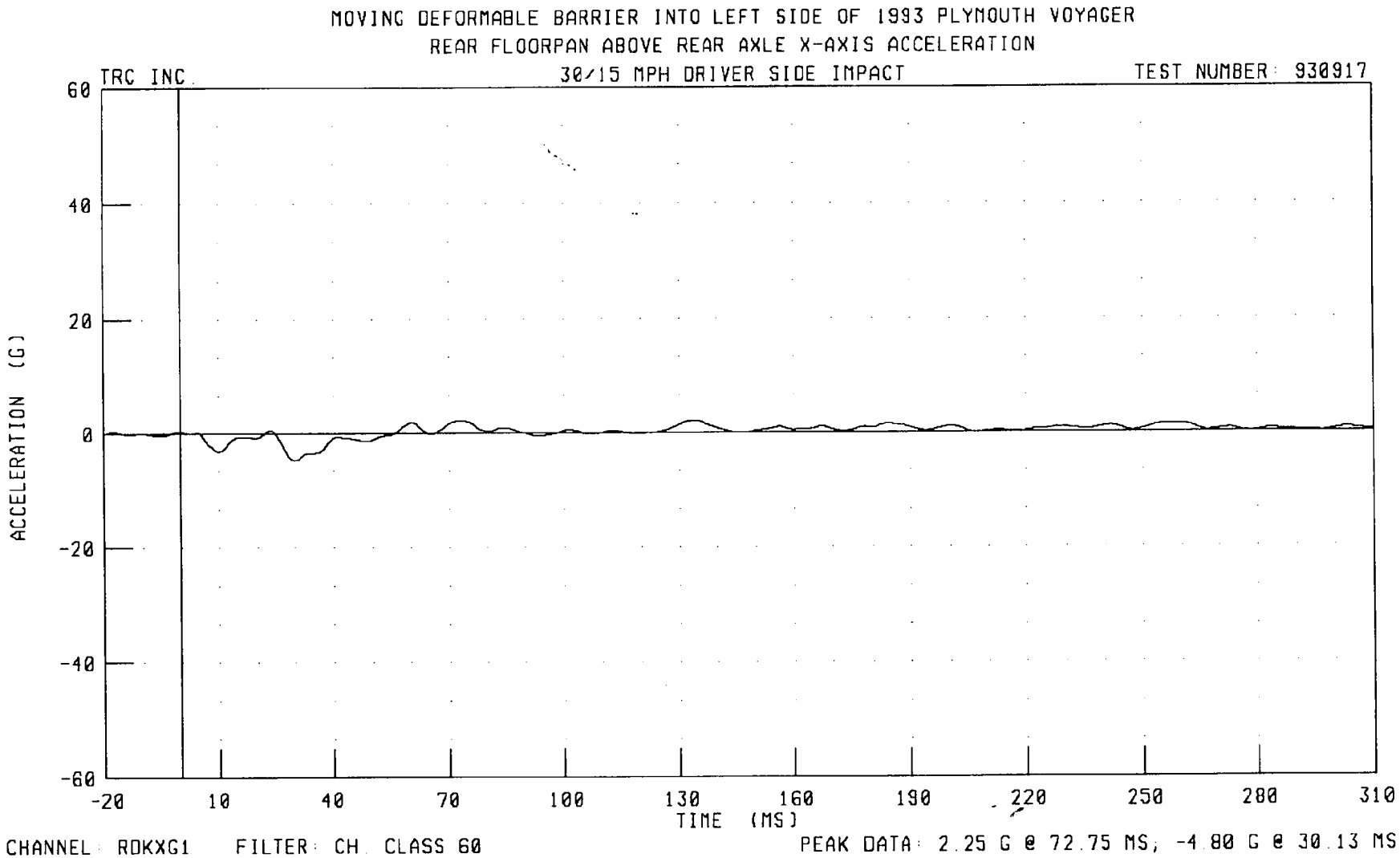
VEHICLE RIGHT FRONT SILL Y-AXIS ACCELERATION

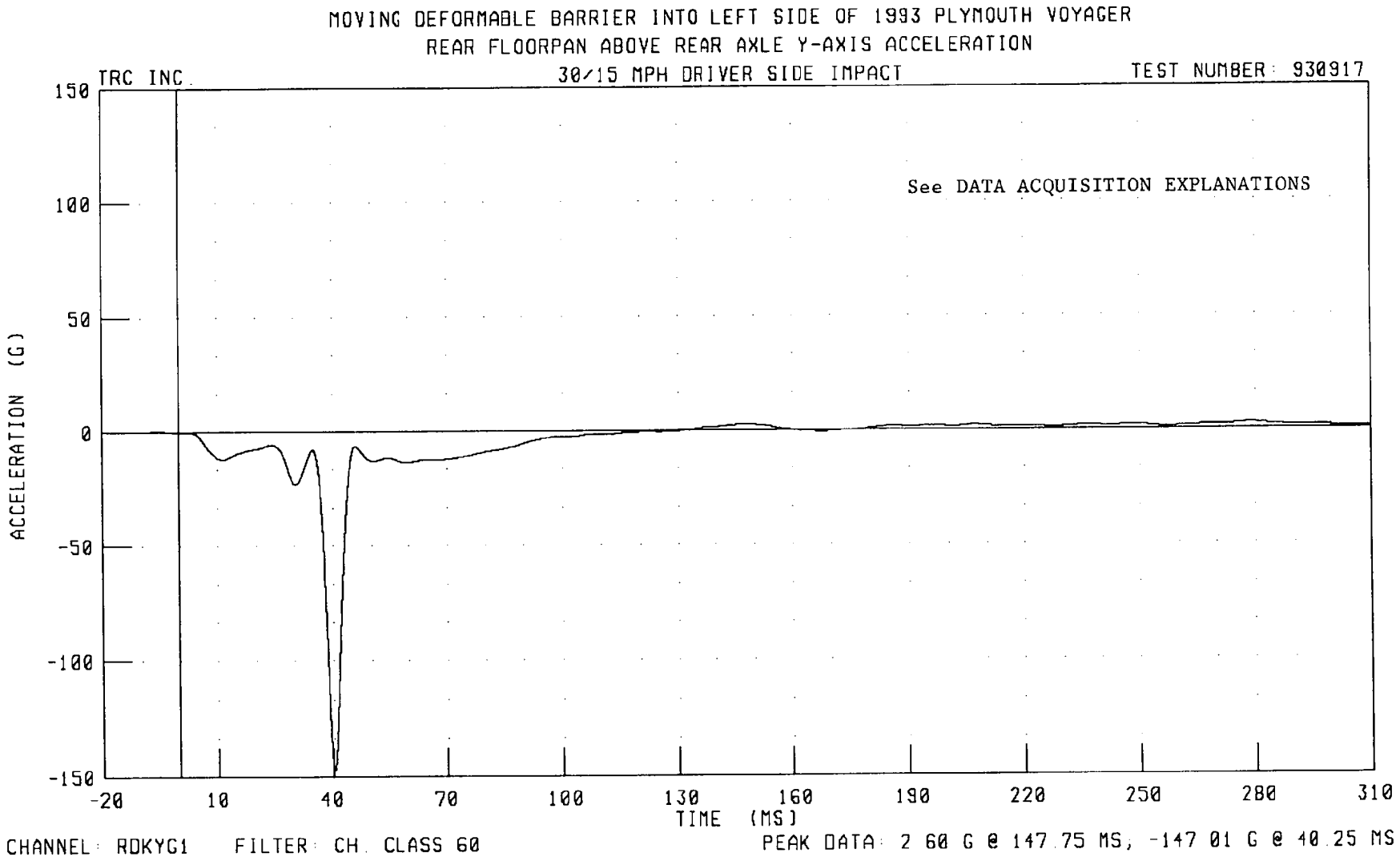


CHANNEL: RFSYG1 FILTER: CH. CLASS 60 PEAK DATA: 1.96 G @ 309.13 MS, -8.16 G @ 48.38 MS

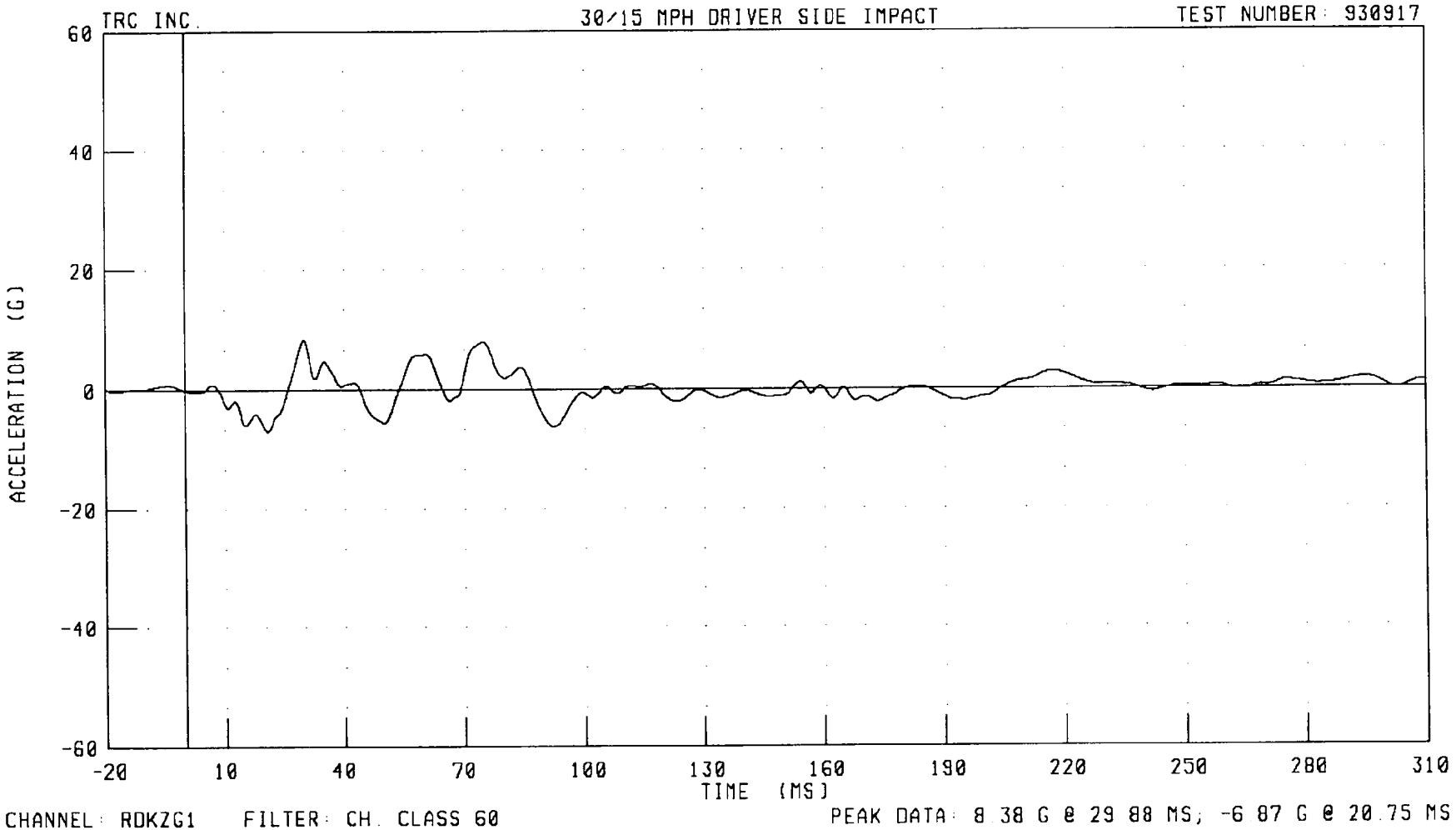

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
VEHICLE RIGHT FRONT SILL Z-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: RFSZG1
FILTER: CH. CLASS 60
PEAK DATA: 5.68 G @ 60.63 MS, -5.48 G @ 17.75 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
VEHICLE RIGHT FRONT SILL RESULTANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
50
40
30
20
10
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: RFSRG1
FILTER: CH CLASS 60
PEAK DATA: 8.63 G @ 47.88 MS; 0.04 G @ -19.75 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
REAR FLOORPAN ABOVE REAR AXLE X-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: RDKXG1
FILTER: CH CLASS 60
PEAK DATA: 2.25 G @ 72.75 MS; -4.80 G @ 30.13 MS

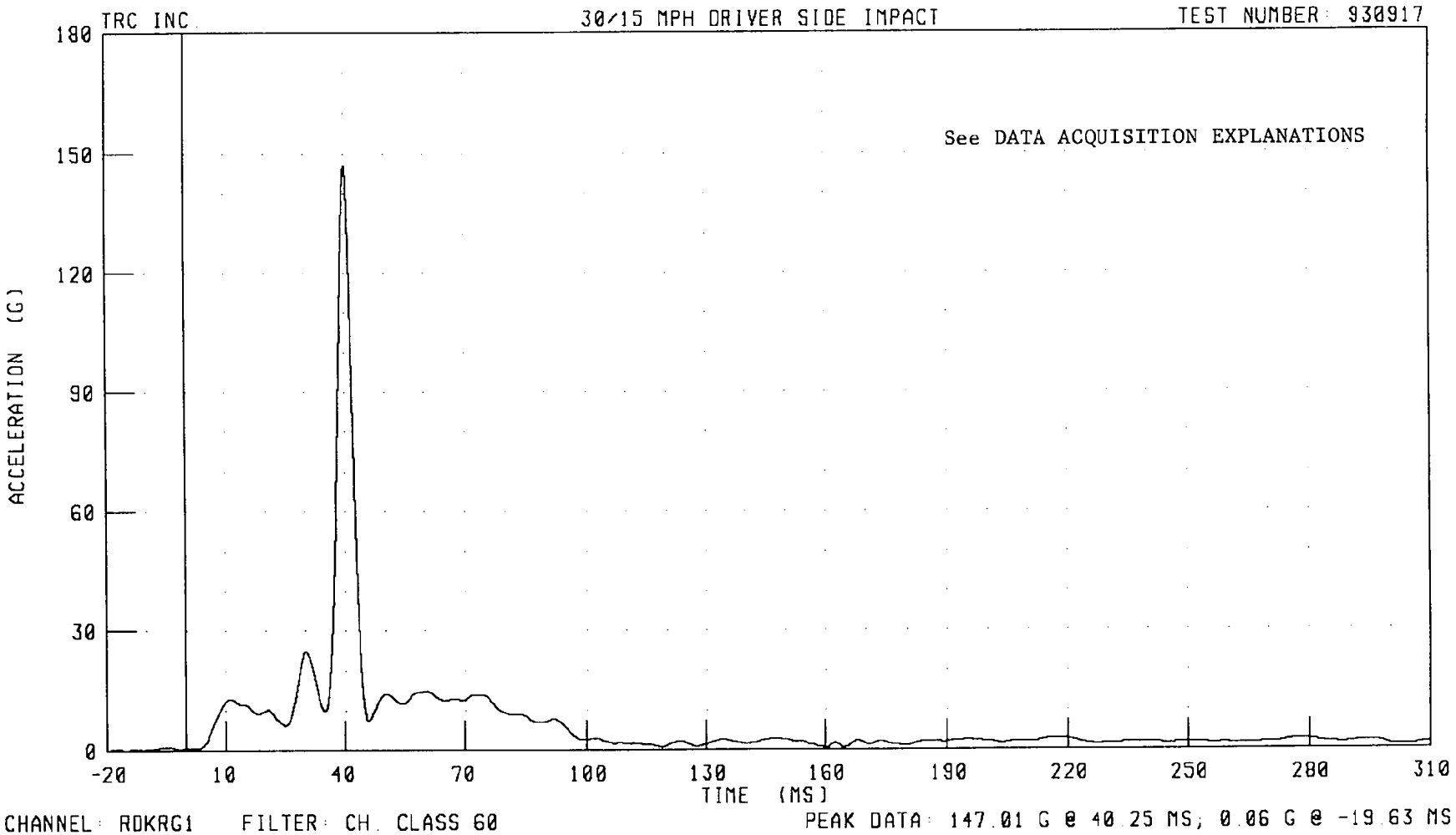

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
REAR FLOORPAN ABOVE REAR AXLE Y-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
See DATA ACQUISITION EXPLANATIONS
ACCELERATION (G)
150
100
50
0
-50
-100
-150
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: RDKYG1
FILTER: CH. CLASS 60
PEAK DATA: 2.60 G @ 147.75 MS, -147.01 G @ 40.25 MS

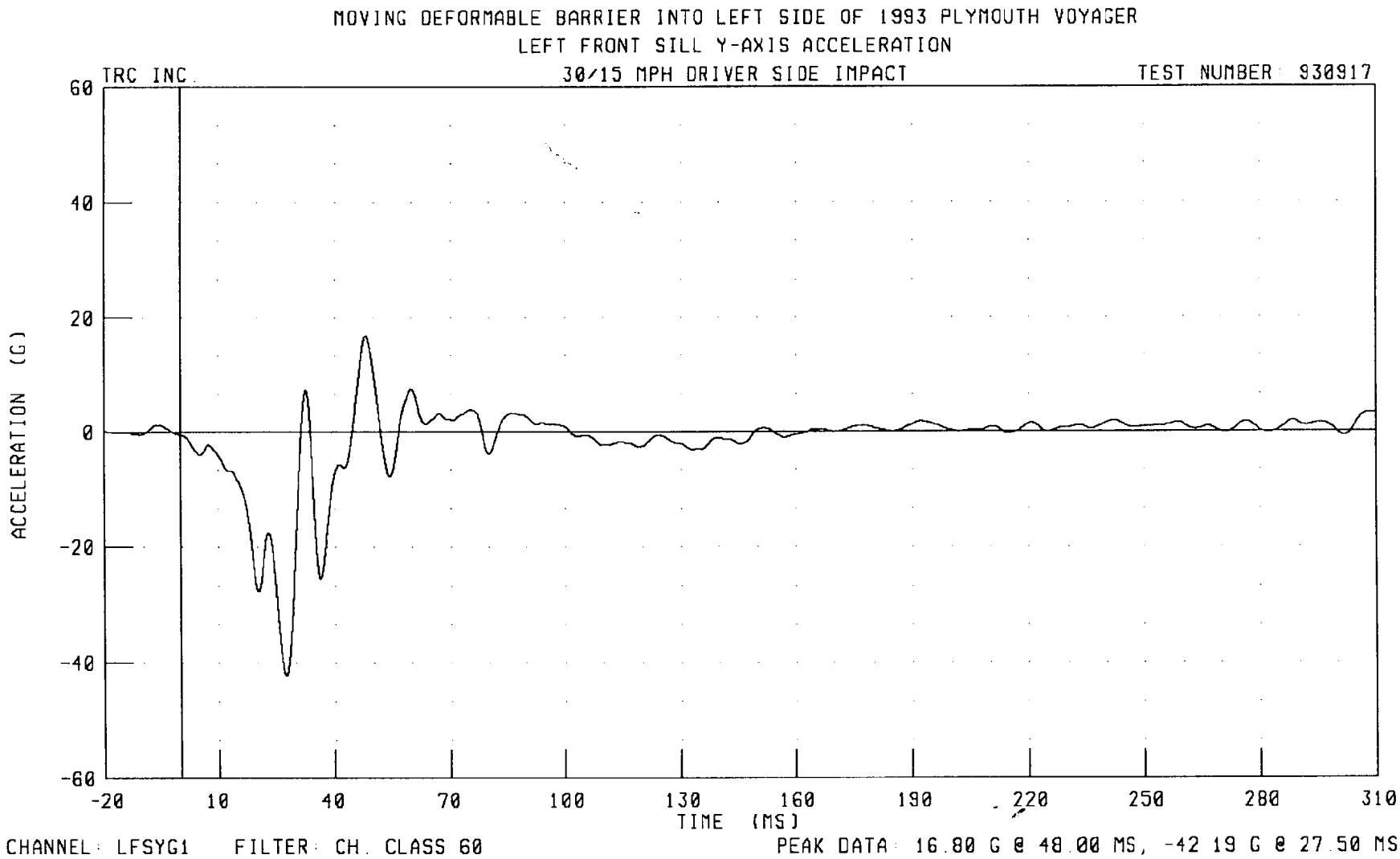
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
REAR FLOORPAN ABOVE REAR AXLE Z-AXIS ACCELERATION

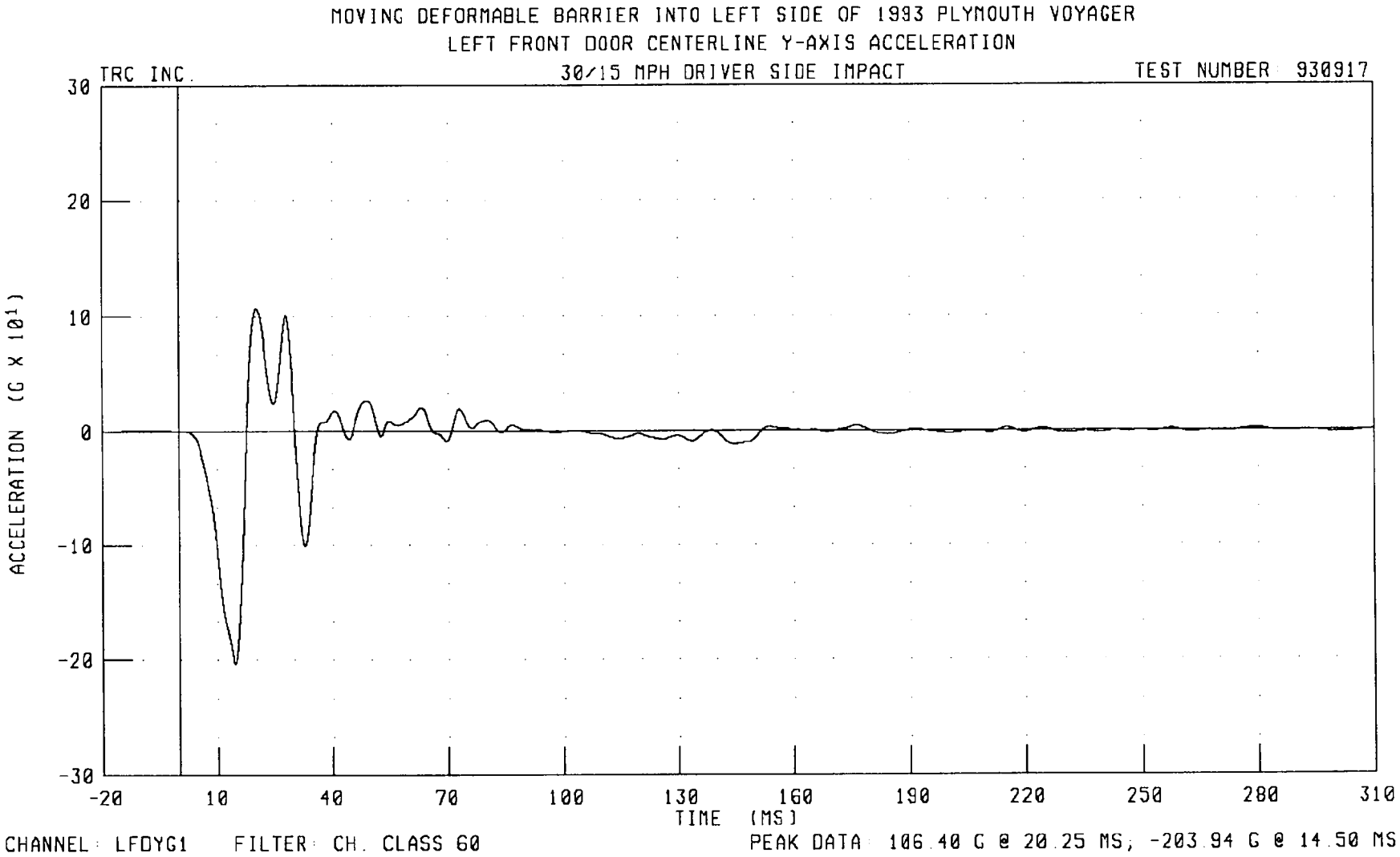


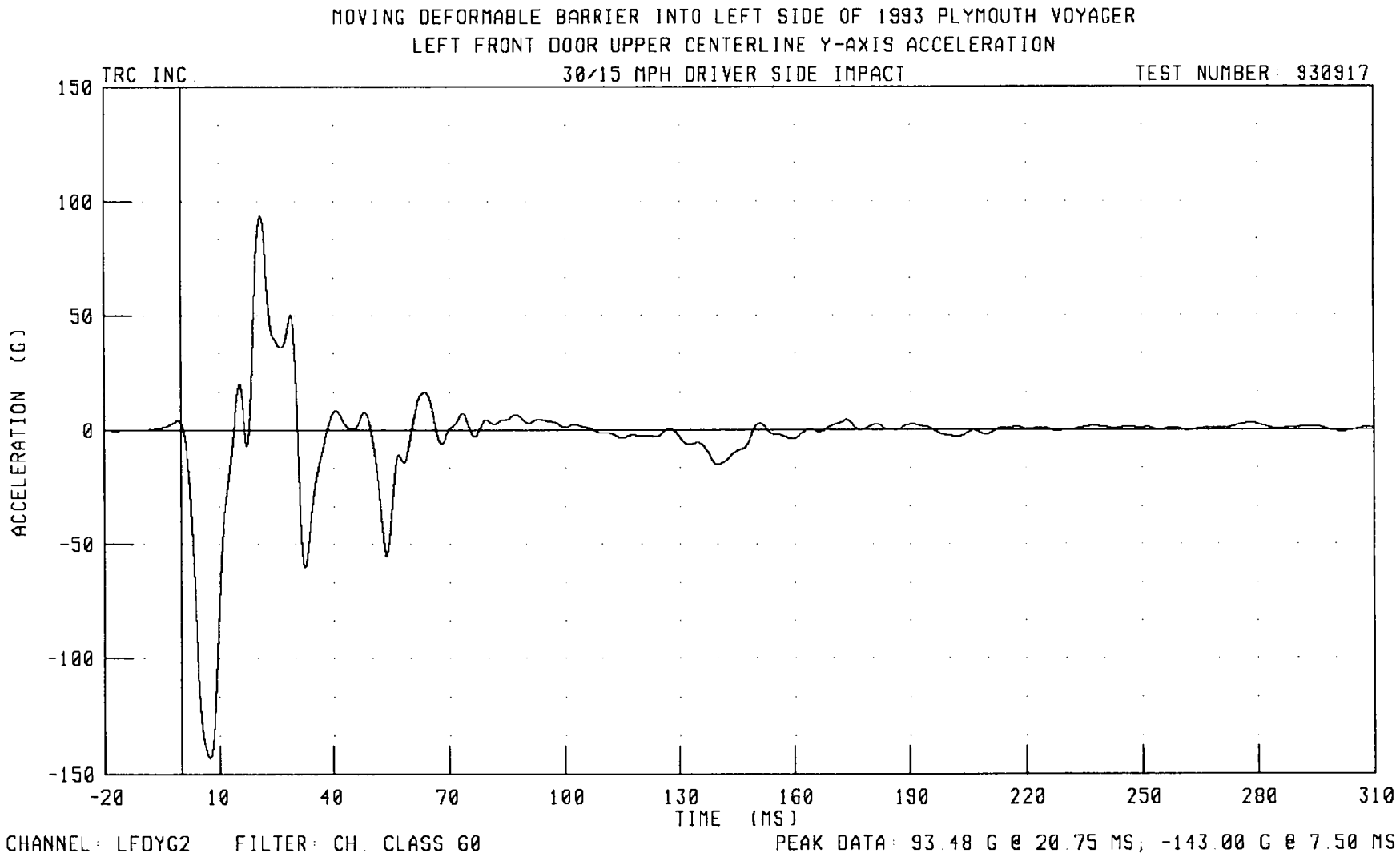
CHANNEL: RDKZG1 FILTER: CH. CLASS 60 PEAK DATA: 8.38 G @ 29.88 MS; -6.87 G @ 20.75 MS

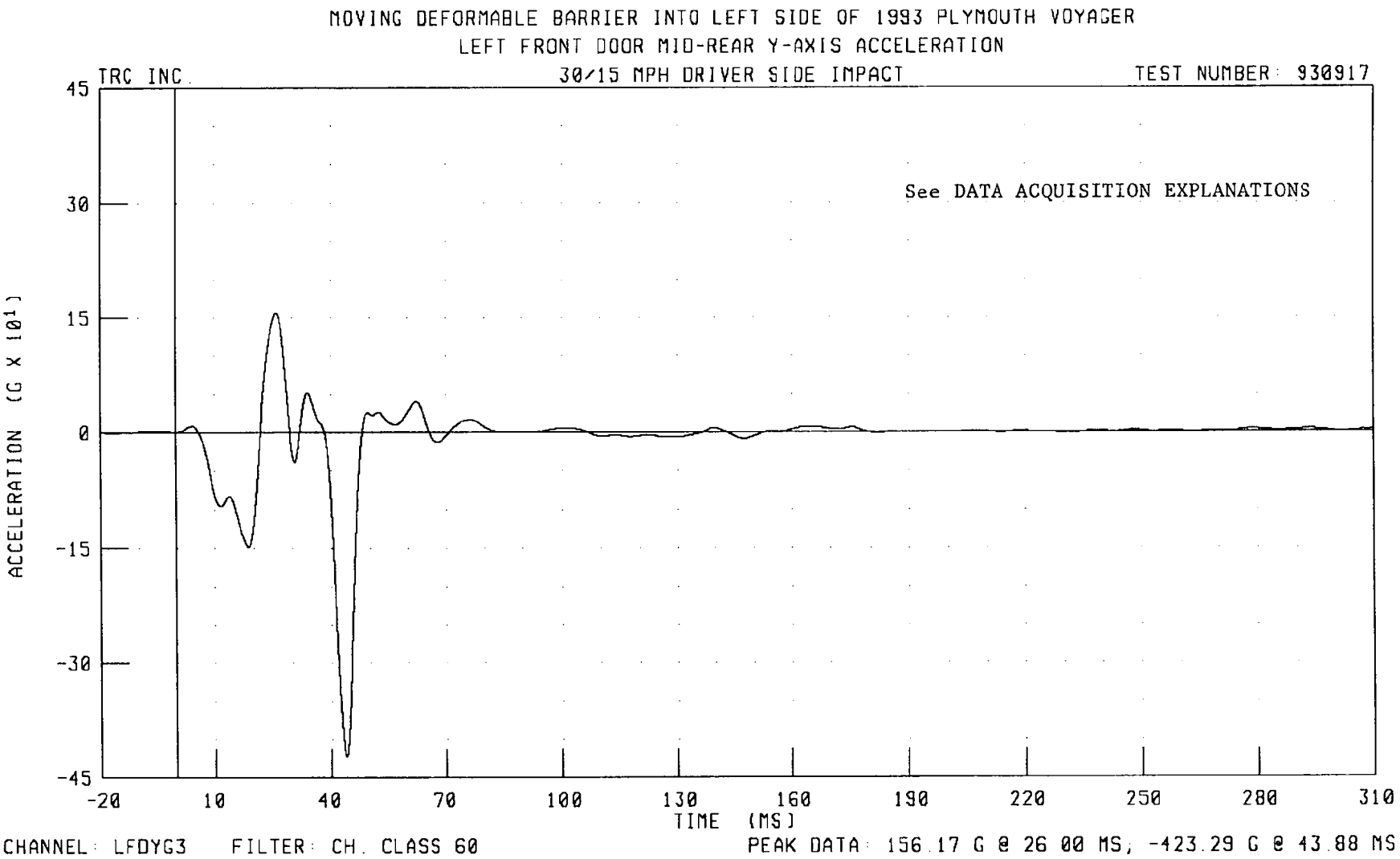
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
REAR FLOORPAN ABOVE REAR AXLE RESULTANT ACCELERATION

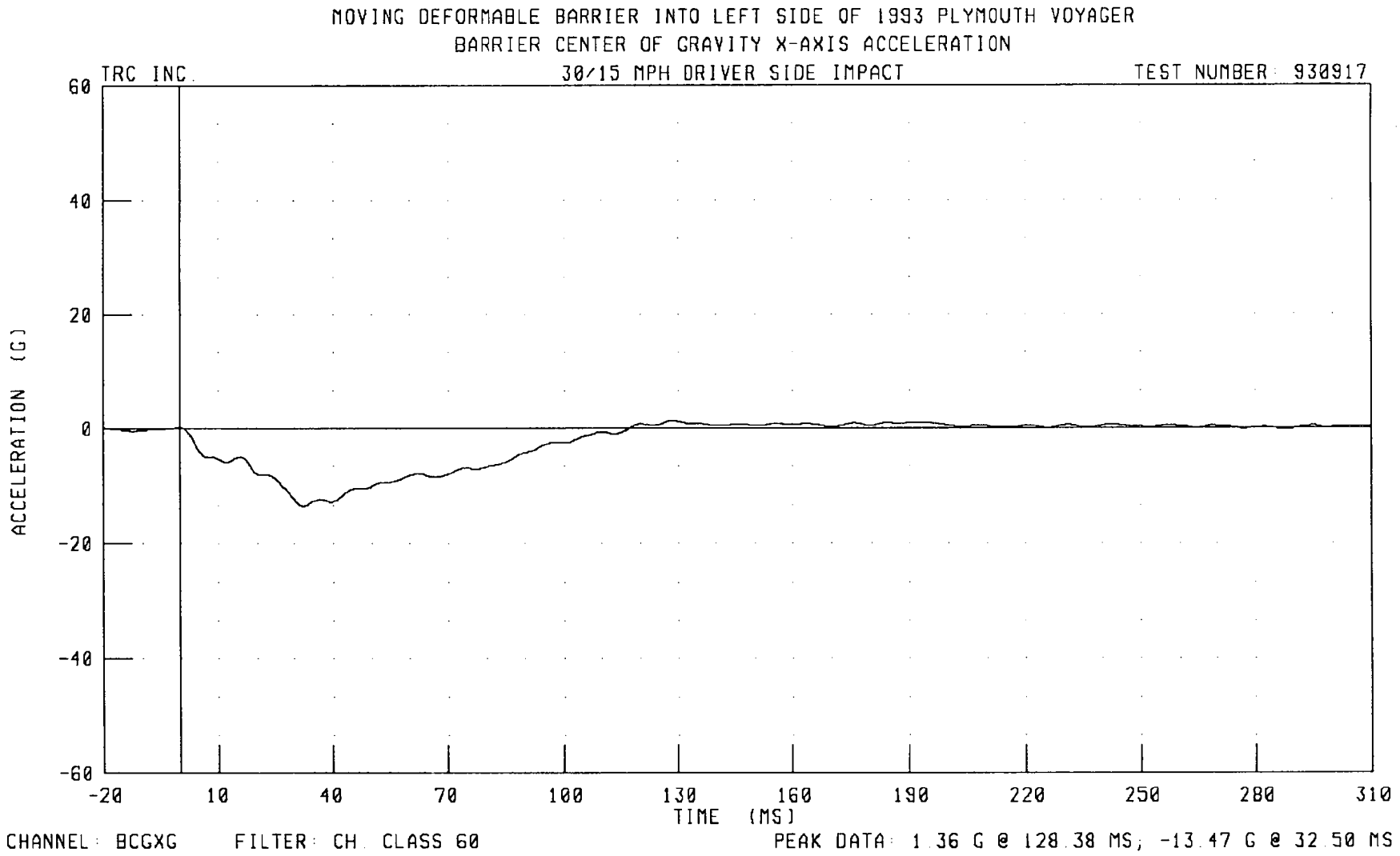


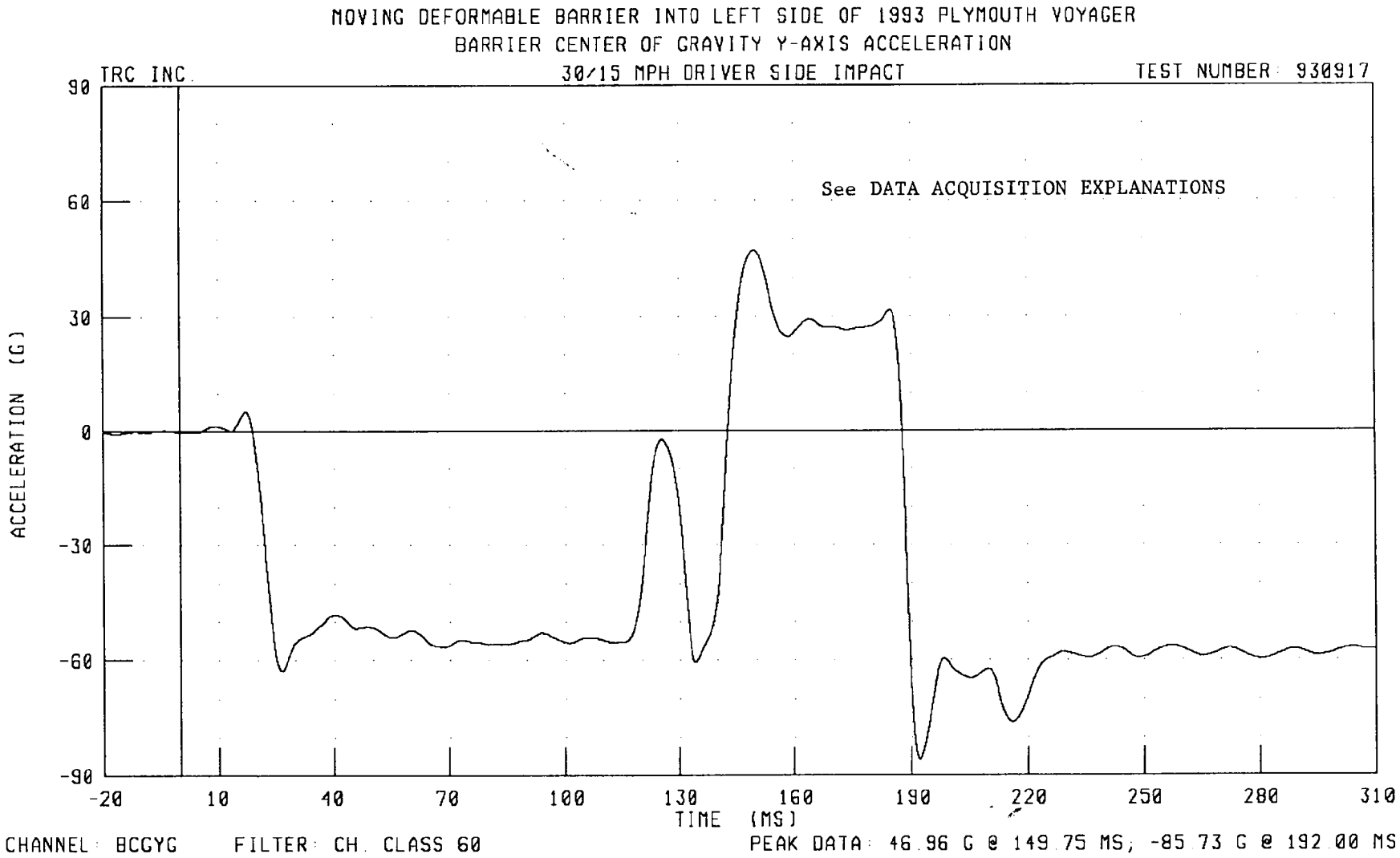

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT FRONT SILL Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER 930917
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL LFSYG1
FILTER CH. CLASS 60
PEAK DATA 16.80 G @ 48.00 MS, -42.19 G @ 27.50 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT FRONT DOOR CENTERLINE Y-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER 930917
ACCELERATION (G X 10¹)
30
20
10
0
-10
-20
-30
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LFDYG1
FILTER: CH. CLASS 60
PEAK DATA: 106.40 G @ 20.25 MS; -203.94 G @ 14.50 MS

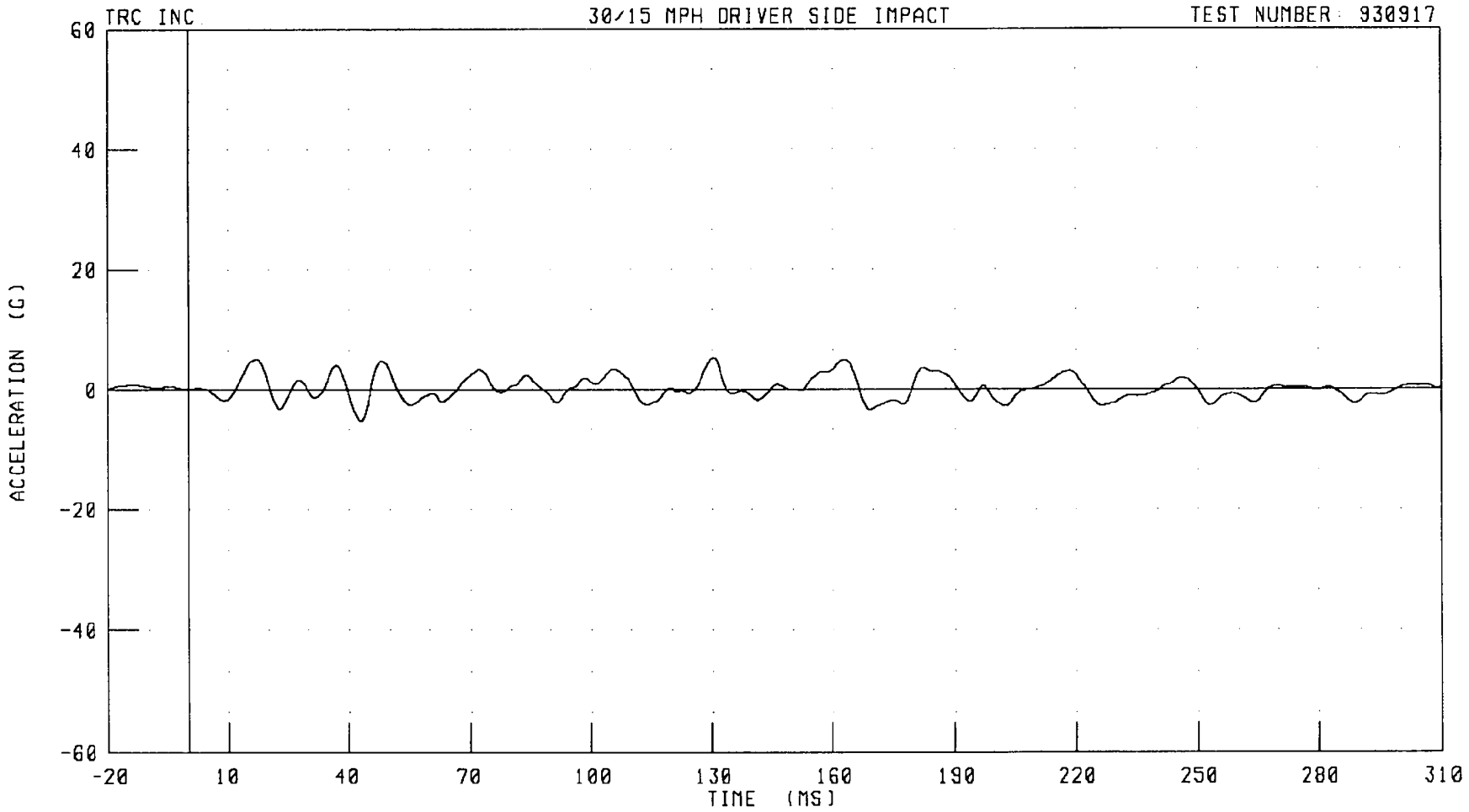

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT FRONT DOOR UPPER CENTERLINE Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
150
100
50
0
-50
-100
-150
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LFDYG2
FILTER: CH. CLASS 60
PEAK DATA: 93.48 G @ 20.75 MS; -143.00 G @ 7.50 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
LEFT FRONT DOOR MID-REAR Y-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
See DATA ACQUISITION EXPLANATIONS
ACCELERATION (G X 10¹)
45
30
15
0
-15
-30
-45
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LFDYG3
FILTER: CH. CLASS 60
PEAK DATA: 156.17 G @ 26.00 MS, -423.29 G @ 43.88 MS

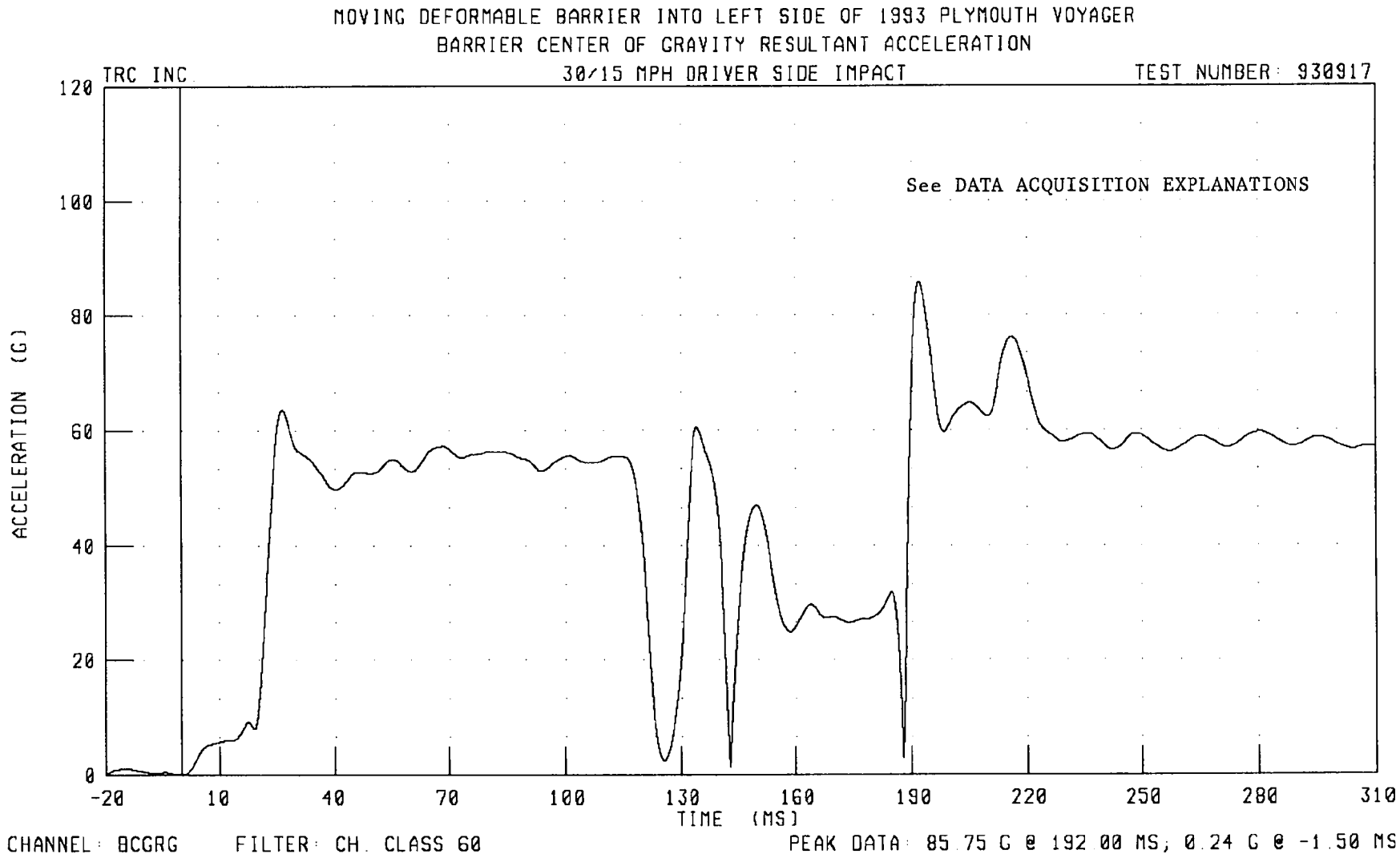

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
BARRIER CENTER OF GRAVITY X-AXIS ACCELERATION
TRC INC.
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: BCGXG
FILTER: CH. CLASS 60
PEAK DATA: 1.36 G @ 128.38 MS; -13.47 G @ 32.50 MS

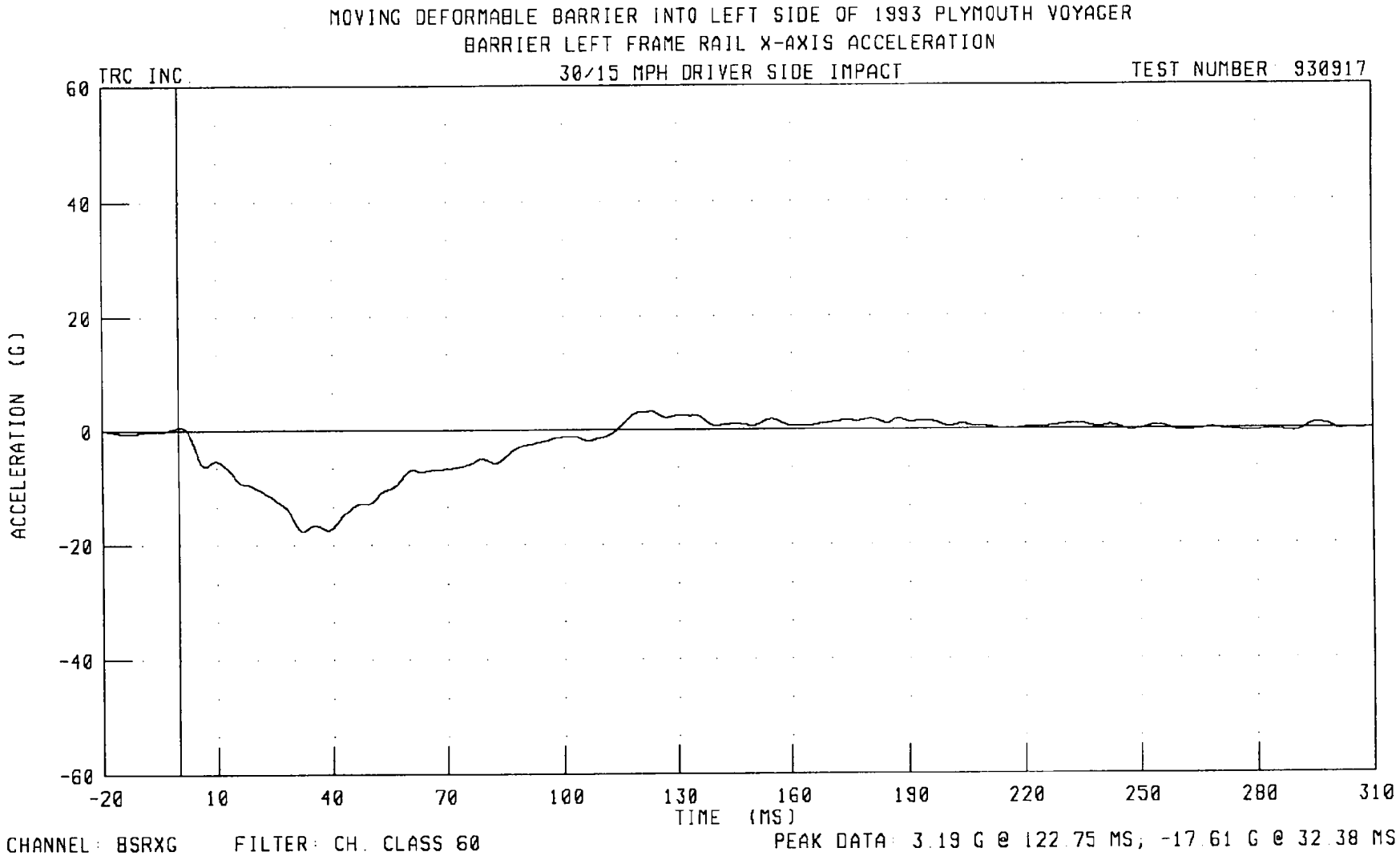

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
BARRIER CENTER OF GRAVITY Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
See DATA ACQUISITION EXPLANATIONS
ACCELERATION (G)
90
60
30
0
-30
-60
-90
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: BCGYG
FILTER: CH. CLASS 60
PEAK DATA: 46.96 G @ 149.75 MS; -85.73 G @ 192.00 MS

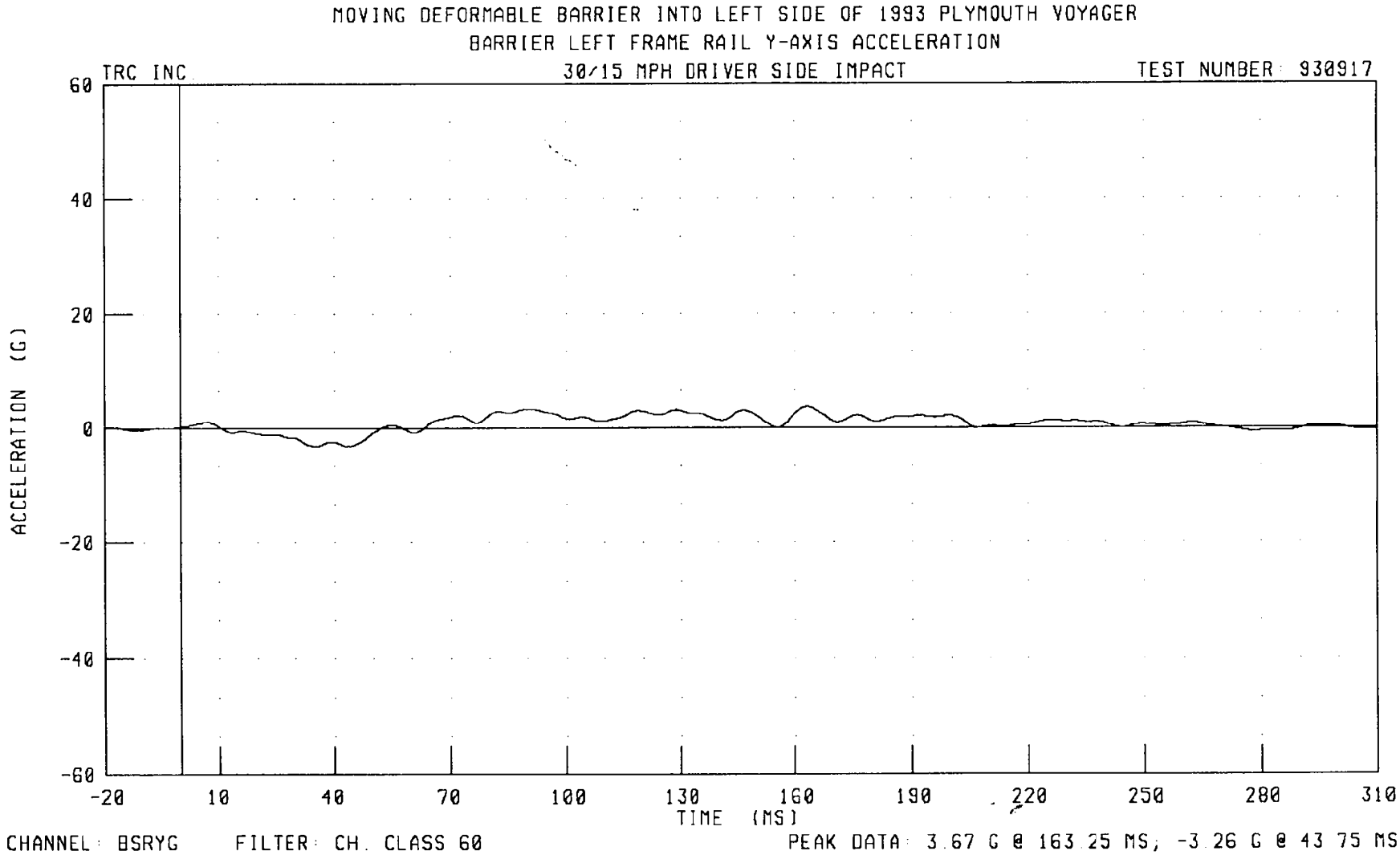
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
BARRIER CENTER OF GRAVITY Z-AXIS ACCELERATION



CHANNEL: BCGZG FILTER: CH. CLASS 60 PEAK DATA: 5.25 G @ 130.50 MS, -5.28 G @ 43.13 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
See DATA ACQUISITION EXPLANATIONS
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: 8CGRG
FILTER: CH. CLASS 60
PEAK DATA: 85.75 G @ 192.00 MS; 0.24 G @ -1.50 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
BARRIER LEFT FRAME RAIL X-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER 930917
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: BSRXG
FILTER: CH. CLASS 60
PEAK DATA: 3.19 G @ 122.75 MS, -17.61 G @ 32.38 MS


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1993 PLYMOUTH VOYAGER
BARRIER LEFT FRAME RAIL Y-AXIS ACCELERATION
TRC INC
30/15 MPH DRIVER SIDE IMPACT
TEST NUMBER: 930917
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: BSRYG
FILTER: CH. CLASS 60
PEAK DATA: 3.67 G @ 163.25 MS; -3.26 G @ 43.75 MS

APPENDIX C

DUMMY CALIBRATION INFORMATION

PRE-TEST CALIBRATION

DRIVER DUMMY S/N 903

TRANSPORTATION RESEARCH CENTER INC.
SIDE IMPACT DUMMY
EXTERNAL DIMENSIONS
LEFT SIDE CONFIGURATION

03-SEP-93

SN 903 FIRST TECH

TRC ED90312 572F SN903 EXT. DIMENSION CAL12

DIMENSIONS WITH CHEST JACKET INSTALLED			
SYMB	DESCRIPTION	SPECIFICATION	TEST RESULTS
	TEMPERATURE		20.6 DEG. C
	RELATIVE HUMIDITY		59.0 %
SH	SEATED HEIGHT	889 - 909 MM	894.1 MM
HP	HIP PIVOT HEIGHT	99 MM REF.	99.1 MM
KH	KNEE PIVOT FROM BACKLINE	511 - 526 MM	523.2 MM
KV	KNEE PIVOT FROM FLOOR	490 - 506 MM	490.2 MM
HW	HIP WIDTH	356 - 391 MM	378.5 MM

DIMENSIONS WITH CHEST JACKET REMOVED			
SYMB	DESCRIPTION	SPECIFICATION	TEST RESULTS
RH	RIB HEIGHT	501 - 520 MM	513.1 MM
RD	RIB FROM BACKLINE	229 - 241 MM	236.2 MM
RW-1	TOP RIB WIDTH FROM C/L	165. - 180 MM	168.9 MM
RW-2	BOTTOM RIB WIDTH FROM C/L	165 - 180 MM	168.9 MM
	DIFFERENCE BETWEEN TOP & BOTTOM RIB WIDTH FROM C/L	$\leq$ 2.5 MM	0.0 MM

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Pete Foss

TRANSPORTATION RESEARCH CENTER INC.

NECK PENDULUM TEST

PART 572B 03-SEP-93

TRC HN90312 572B SN 903 HEAD/NECK CAL 12

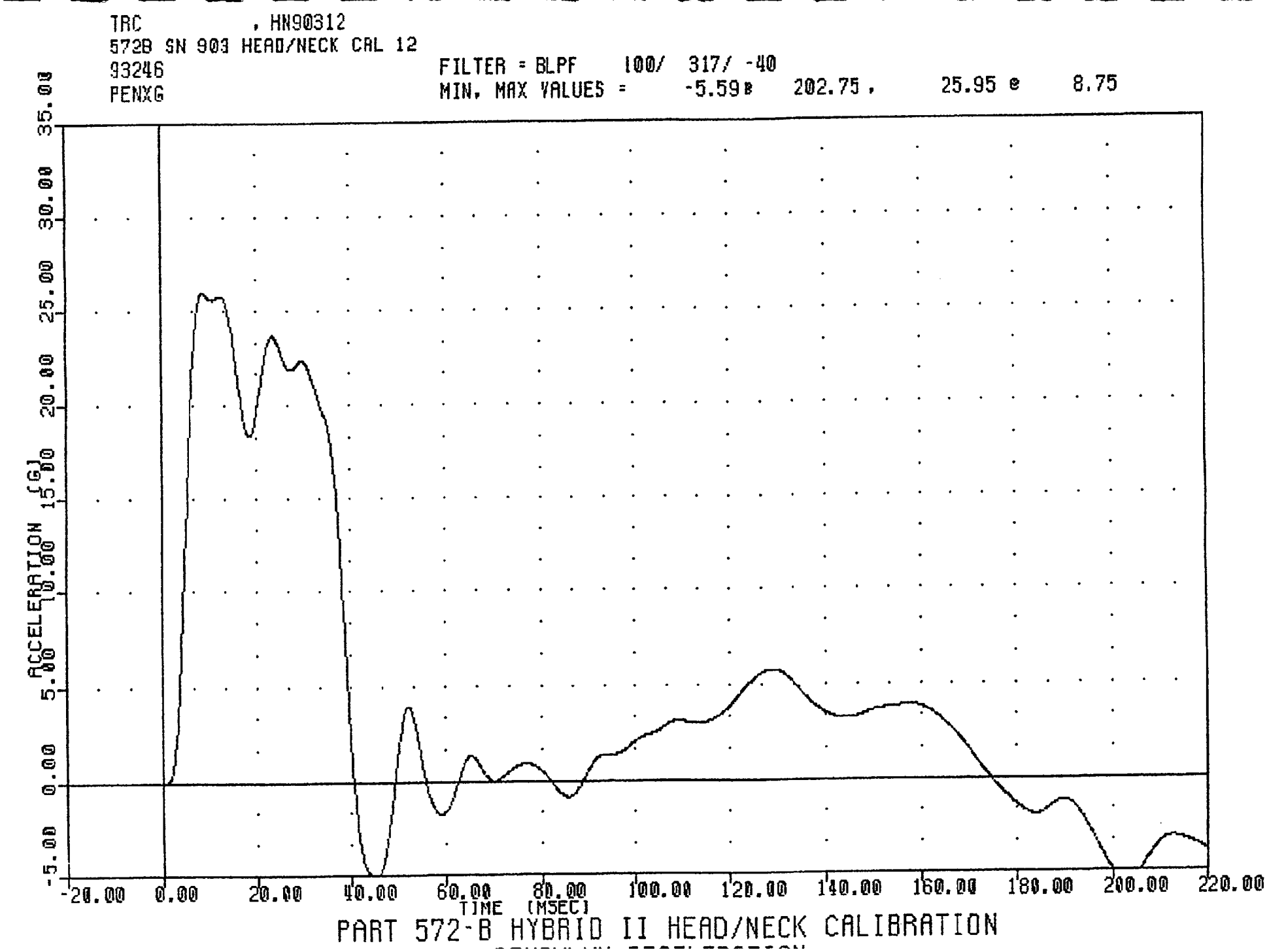
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	20.0 C
RELATIVE HUMIDITY	10 - 70 %	59 %
PENDULUM VELOCITY	6.55 TO 7.77 M/SEC	7.17 M/SEC
PENDULUM DECELERATION:		
T1 - T2 TIME (5 - 20 G)	3 MS MAX	2.59 MS
T2 - T3 TIME (20 - 20 G)	25 - 30 MS	27.57 MS
T3 - T4 TIME (20 - 5 G)	10 MS MAX	5.59 MS
AVG. G LEVEL T2 - T3	20 - 24 G	22.67 G
MAXIMUM ROTATION ANGLE	63 - 73 DEG	63.66 DEG
PEAK HEAD RESULTANT ACCEL	26 G MAX	26.33 G **

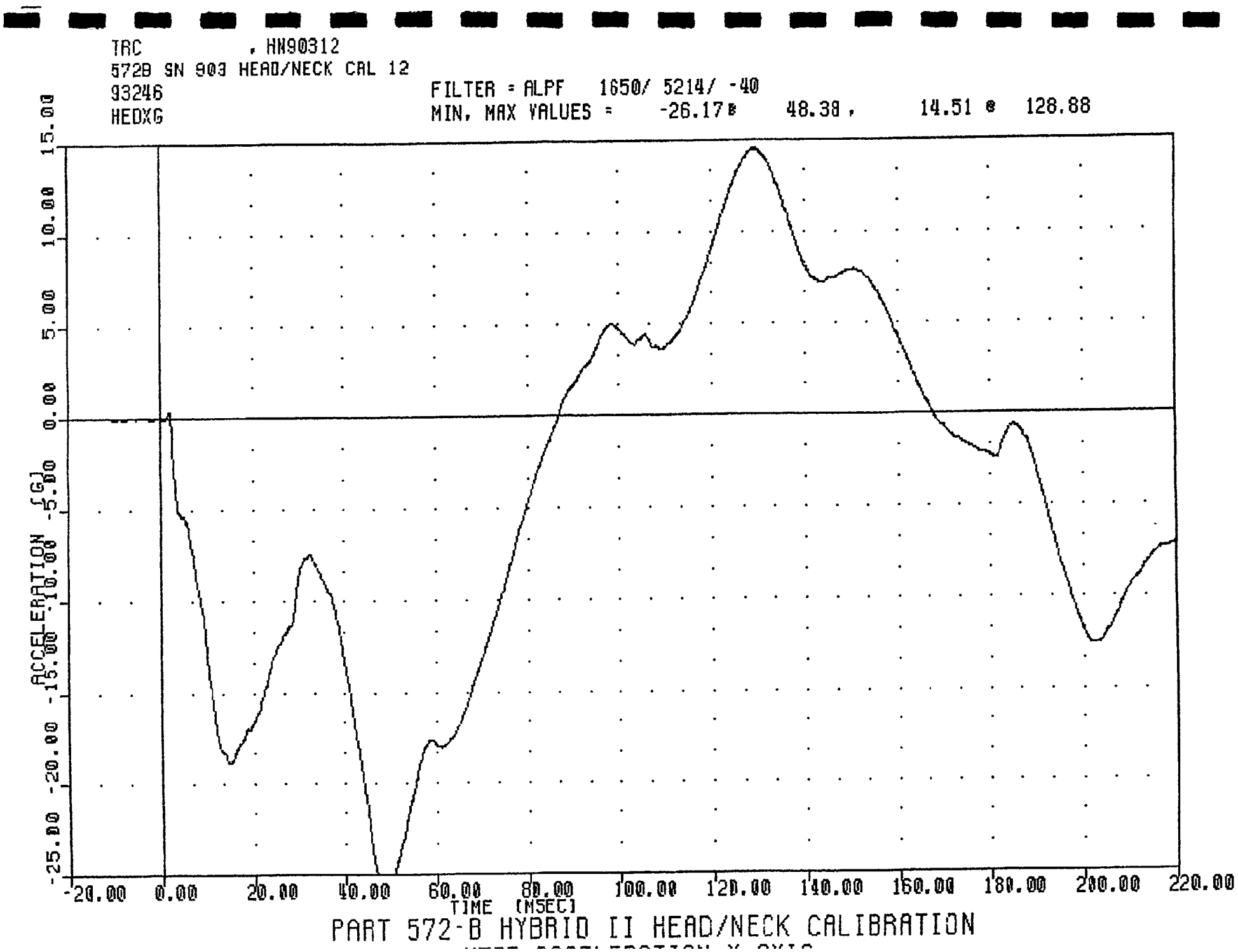
TEST PARAMETER	SPECIFICATION			TEST RESULTS	
ROTATION ANGLE (DEGREES)	TIME (MS)		CHORDAL DISP. (MM)	TIME (MS)	CHORDAL DISP. (MM)
0	-2.0 -	+2.0	-12.7 - +12.7	1.38	0.09
30	25.6 -	34.4	53.3 - 78.7	31.32	65.57
60	40.3 -	51.7	109.2 - 134.6	50.26	127.64
MAX	53.2 -	66.8	127.0 - 152.4	58.63	132.61
60	67.0 -	83.0	109.2 - 134.6	67.75	123.60
30	85.4 -	104.6	53.3 - 78.7	88.27	58.49
0	101.0 -	123.0	-12.7 - +12.7	101.99	2.90

SND: 151.13 MM

* DUMMY DOES NOT MEET SPECIFICATIONS

TECHNICIAN Pete Faust

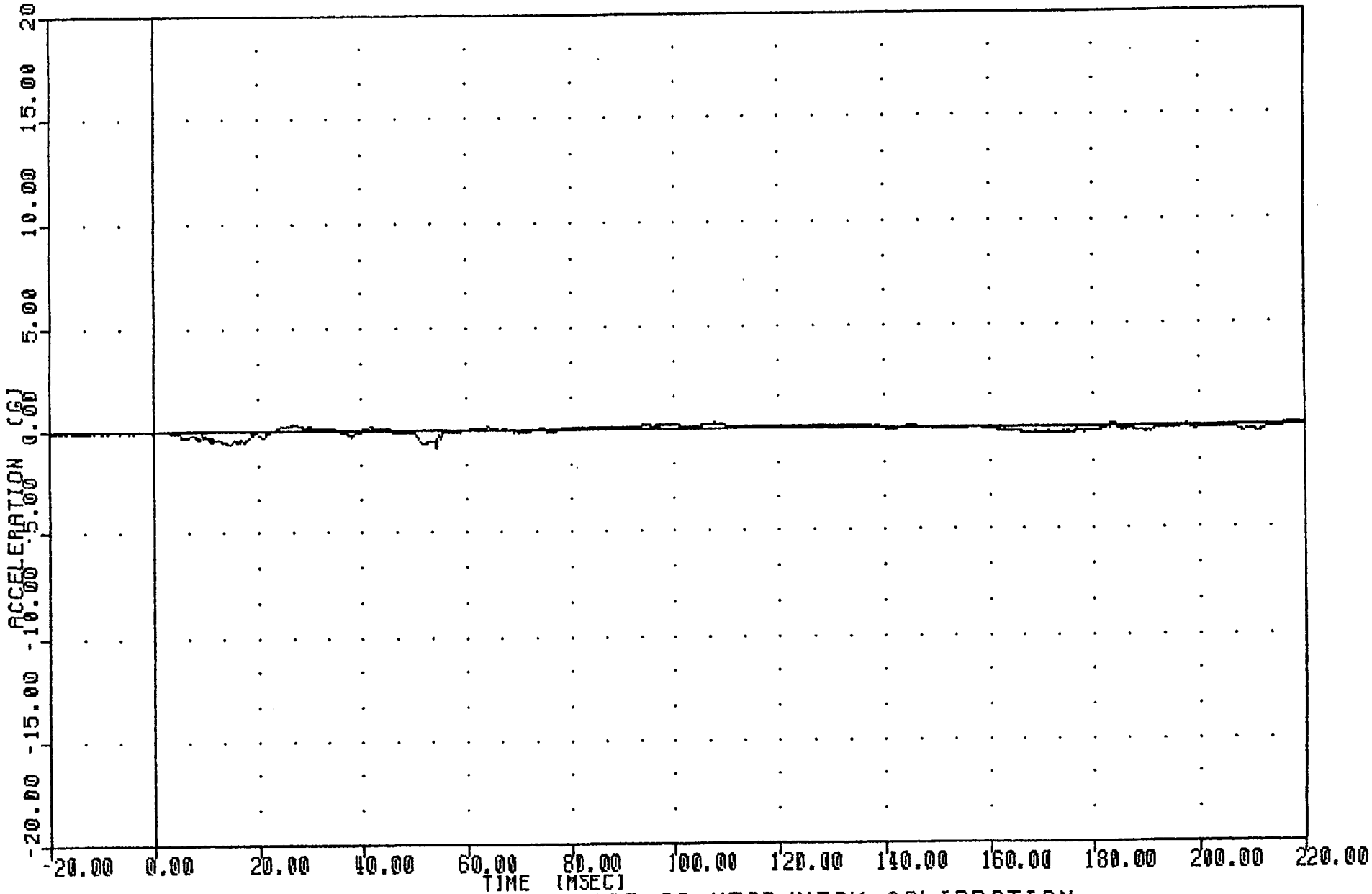

TRC , HN90312
572B SN 903 HEAD/NECK CAL 12
93246
PENXG
FILTER = BLPF 100/ 317/ -40
MIN, MAX VALUES = -5.59 @ 202.75 , 25.95 @ 8.75
ACCELERATION (G)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
TIME (MSEC)
PART 572-B HYBRID II HEAD/NECK CALIBRATION



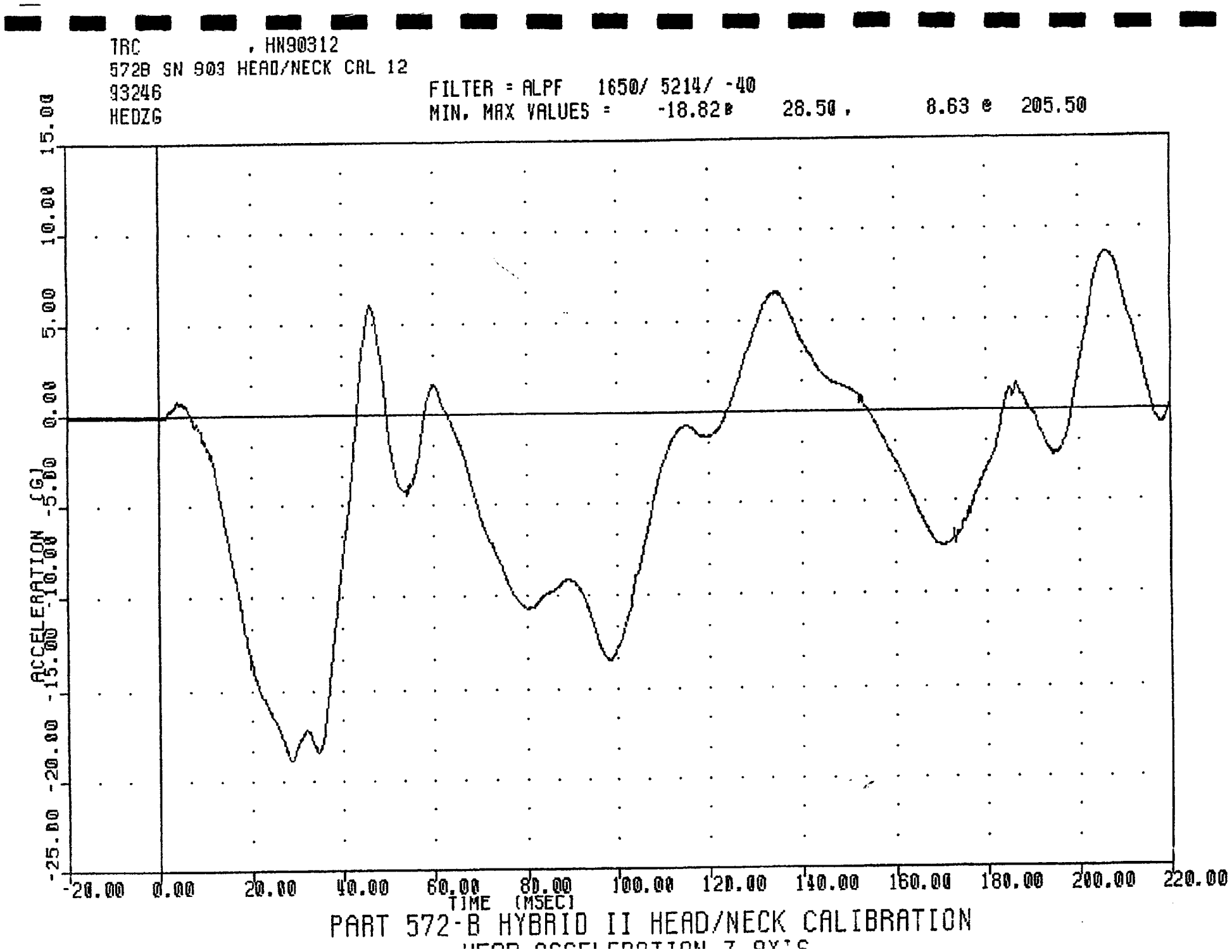
PART 572-B HYBRID II HEAD/NECK CALIBRATION

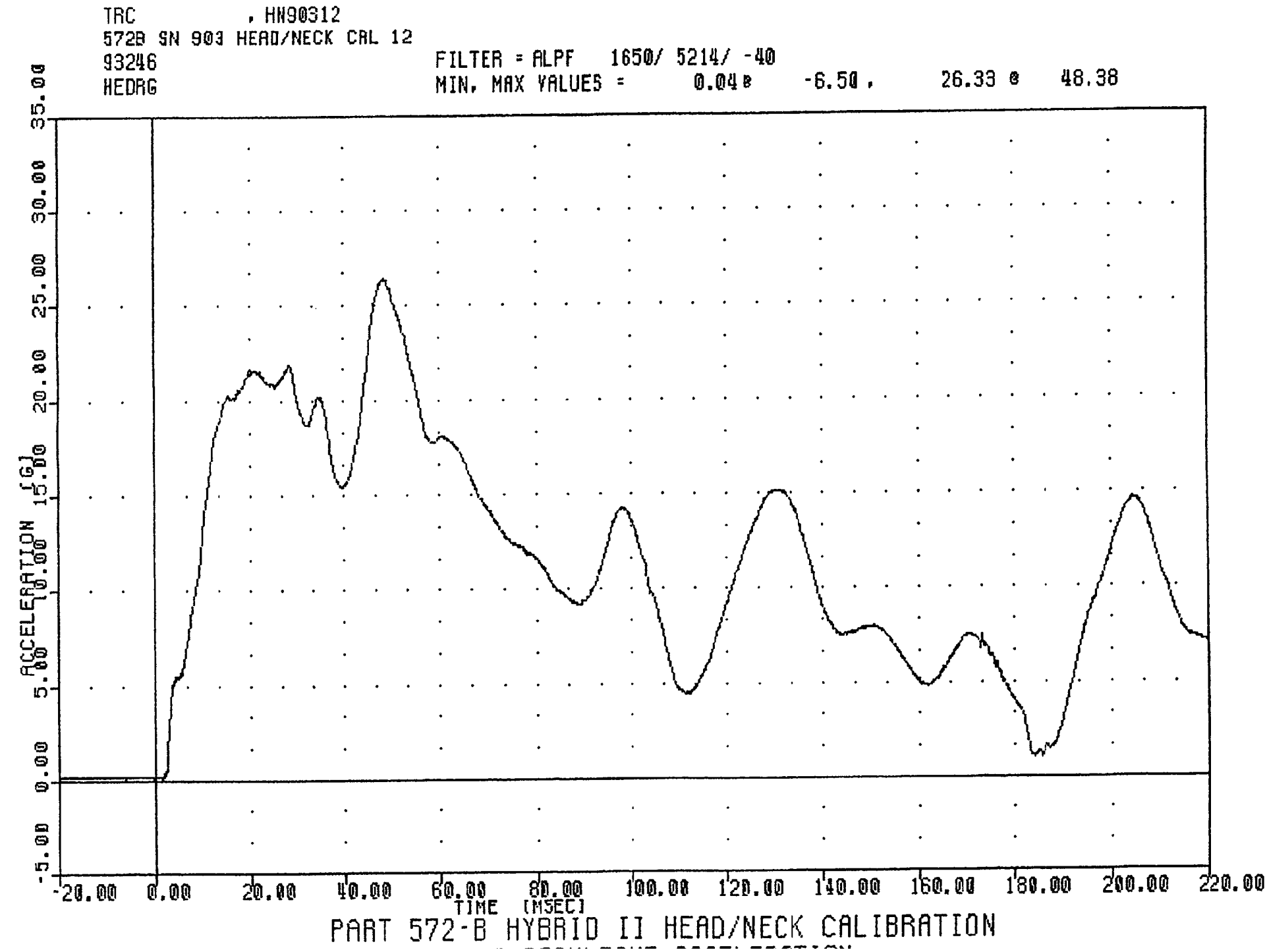
TRC , HN90312
572B SN 903 HEAD/NECK CAL 12
93246
HEDYG

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.87 @ 54.13 , 0.35 @ 26.50

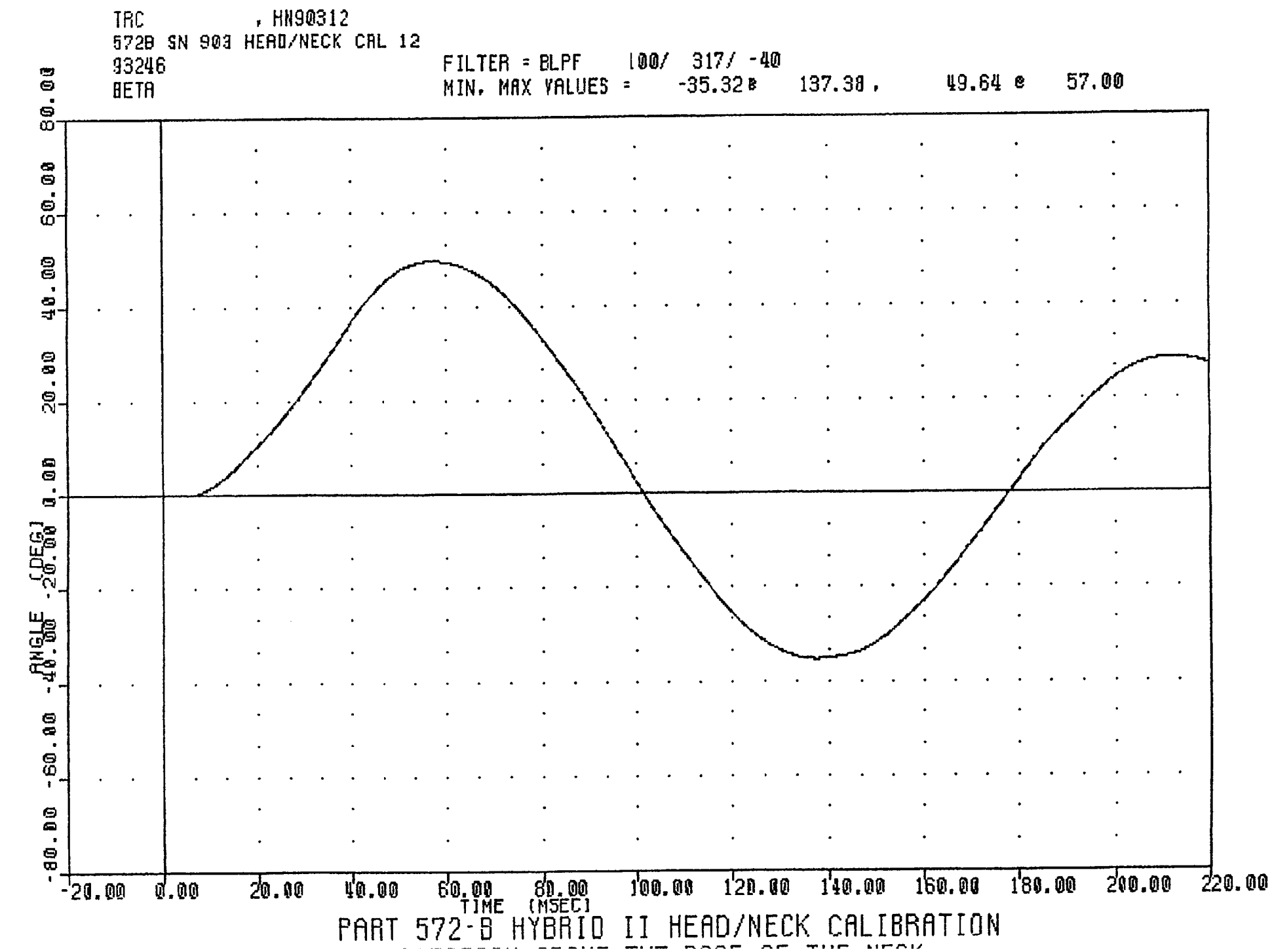


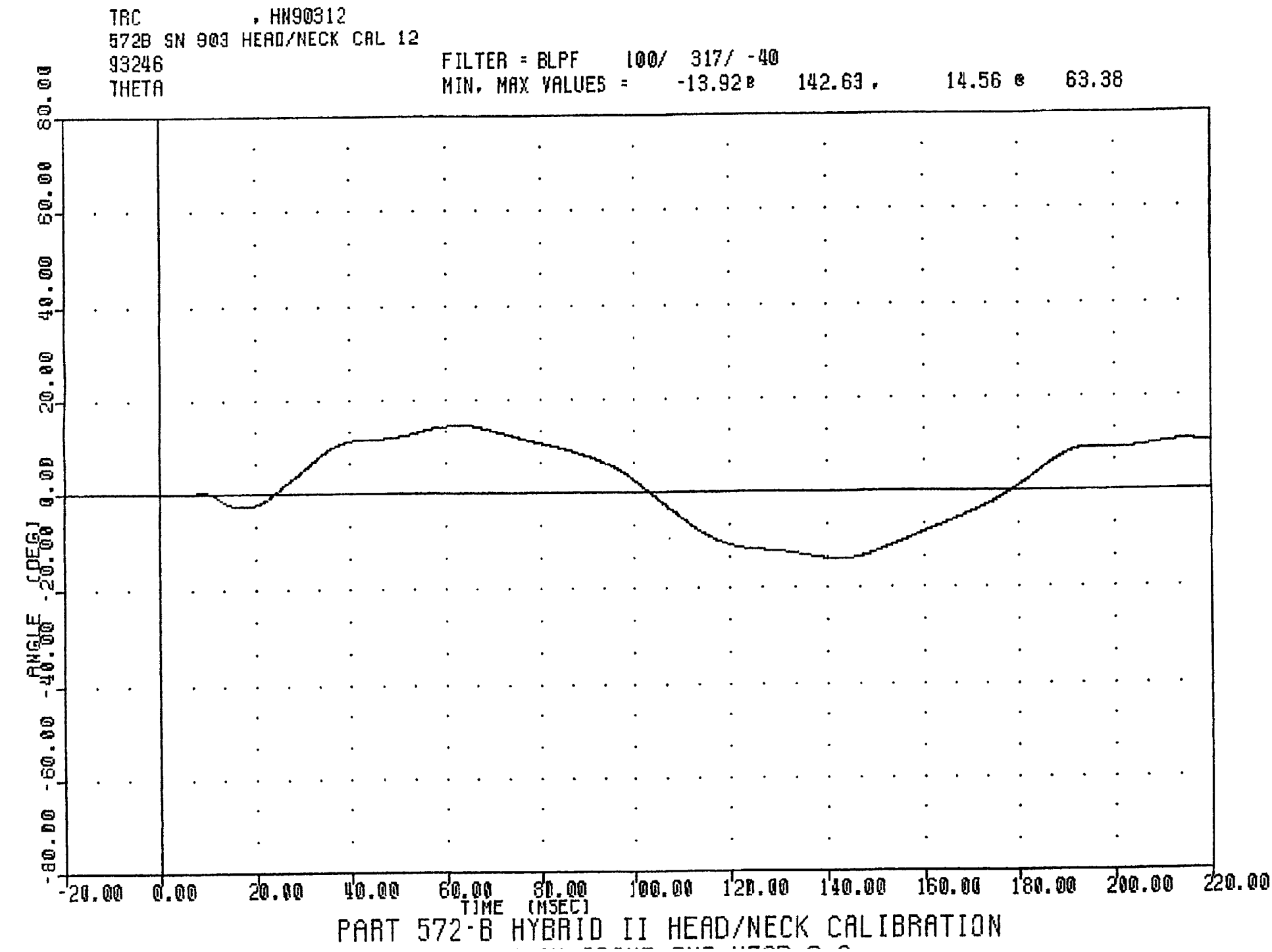
PART 572-B HYBRID II HEAD/NECK CALIBRATION


TRC , HN90312
572B SN 903 HEAD/NECK CAL 12
93246
HEDZG
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -18.82 @ 28.50 , 8.63 @ 205.50
ACCELERATION (G)
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
TIME (MSEC)
PART 572-B HYBRID II HEAD/NECK CALIBRATION

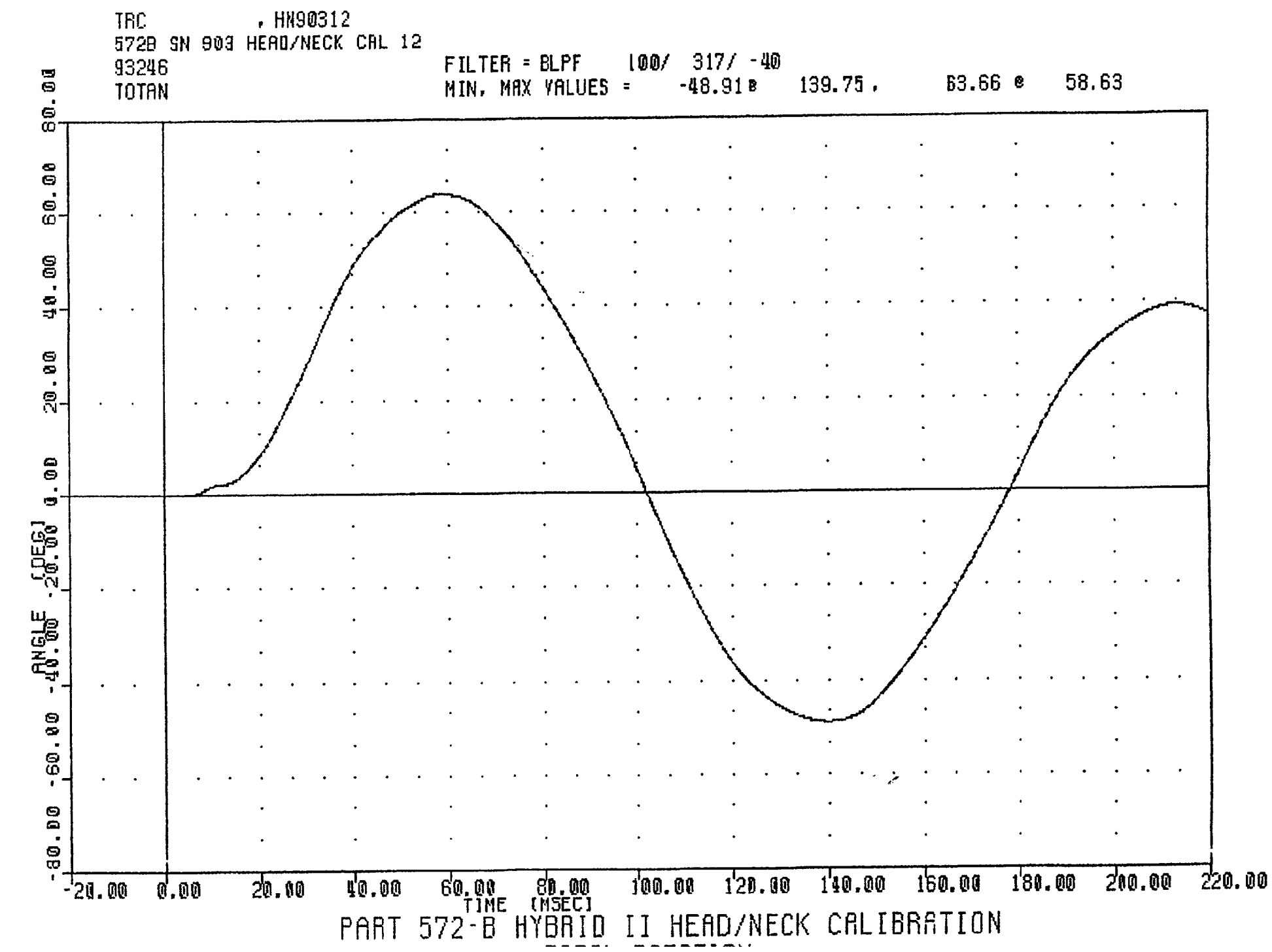


PART 572-B HYBRID II HEAD/NECK CALIBRATION

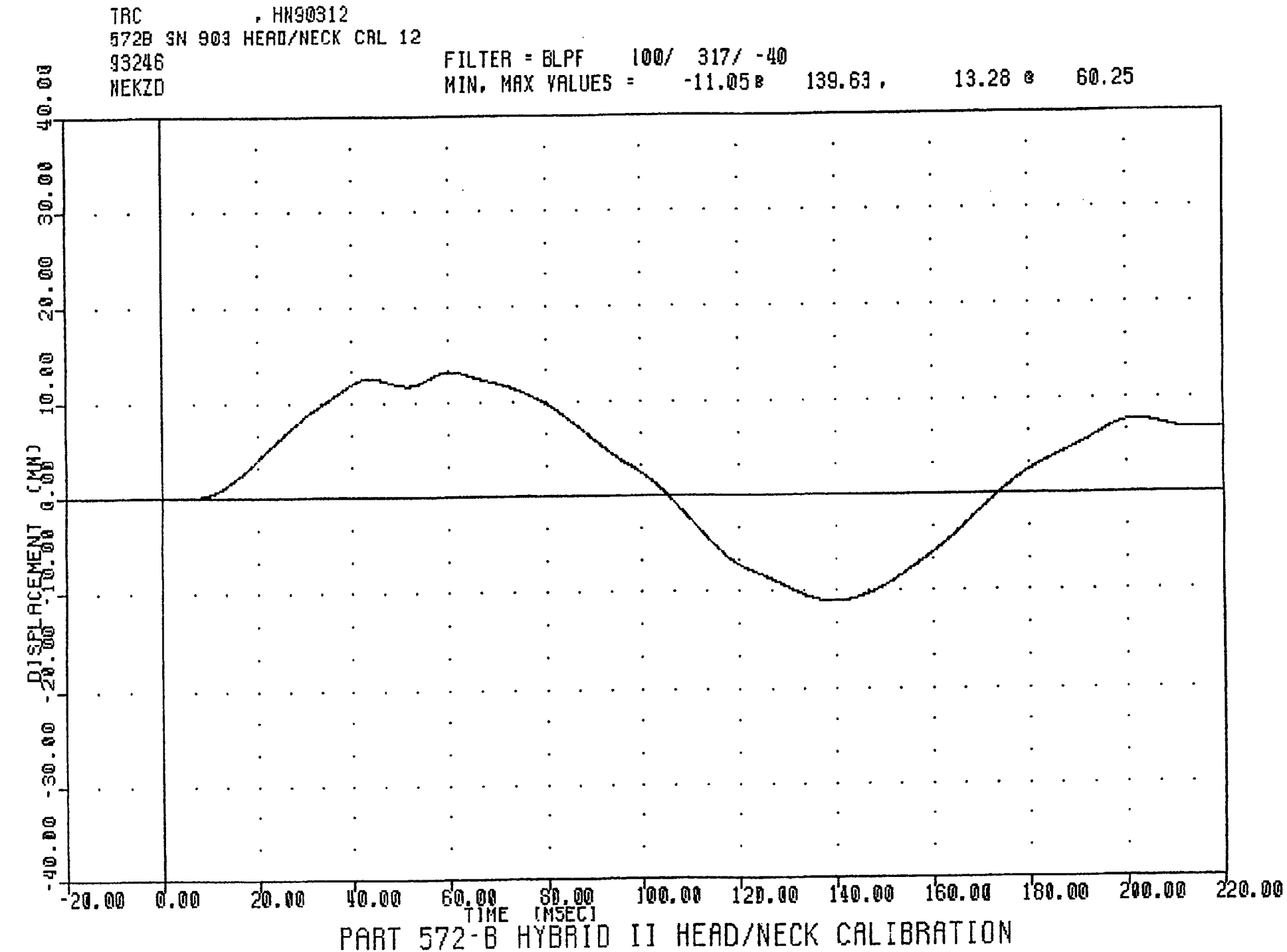

TRC , HN90312
572B SN 903 HEAD/NECK CAL 12
93246
BETA
FILTER = BLPF 100/ 317/ -40
MIN, MAX VALUES = -35.32 @ 137.38 , 49.64 @ 57.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
-80.00
ANGLE (DEG)
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
TIME (MSEC)
PART 572-B HYBRID II HEAD/NECK CALIBRATION



PART 572-B HYBRID II HEAD/NECK CALIBRATION



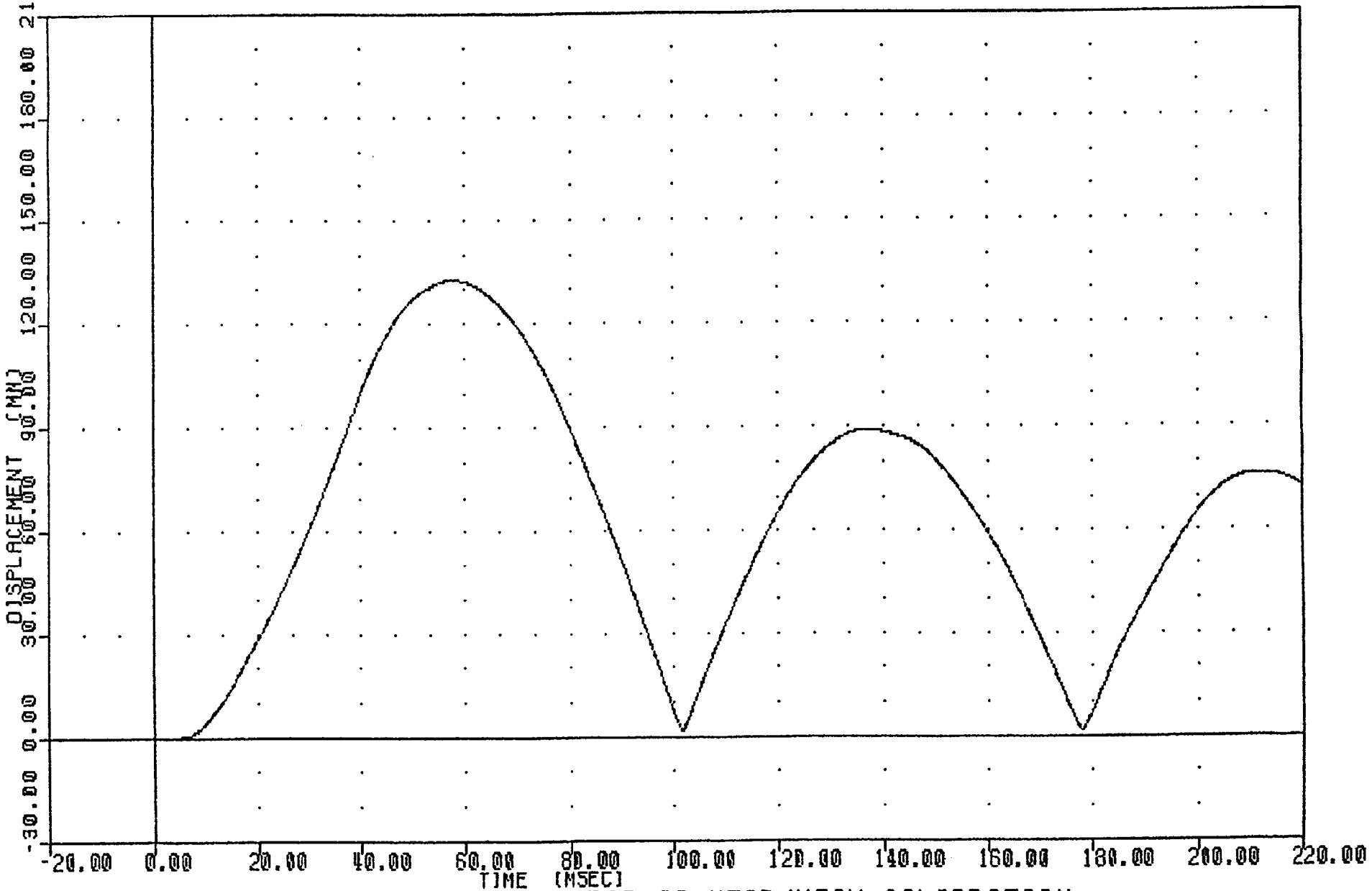
PART 572-B HYBRID II HEAD/NECK CALIBRATION



PART 572-B HYBRID II HEAD/NECK CALIBRATION

TRC , HN90312
572B SN 909 HEAD/NECK CAL 12
93246
NEKCD

FILTER = BLPF 100/ 317/ -40
MIN, MAX VALUES = 0.00 @ -18.88 , 132.75 @ 57.50



PART 572-B HYBRID II HEAD/NECK CALIBRATION

NECK SHROUD DISPLACEMENT

TRANSPORTATION RESEARCH CENTER INC.

THORACIC SHOCK ABSORBER TESTS

SIDE IMPACT DUMMY 02-Sep-93

TRC 572F SN903 DAMPER TEST CAL12

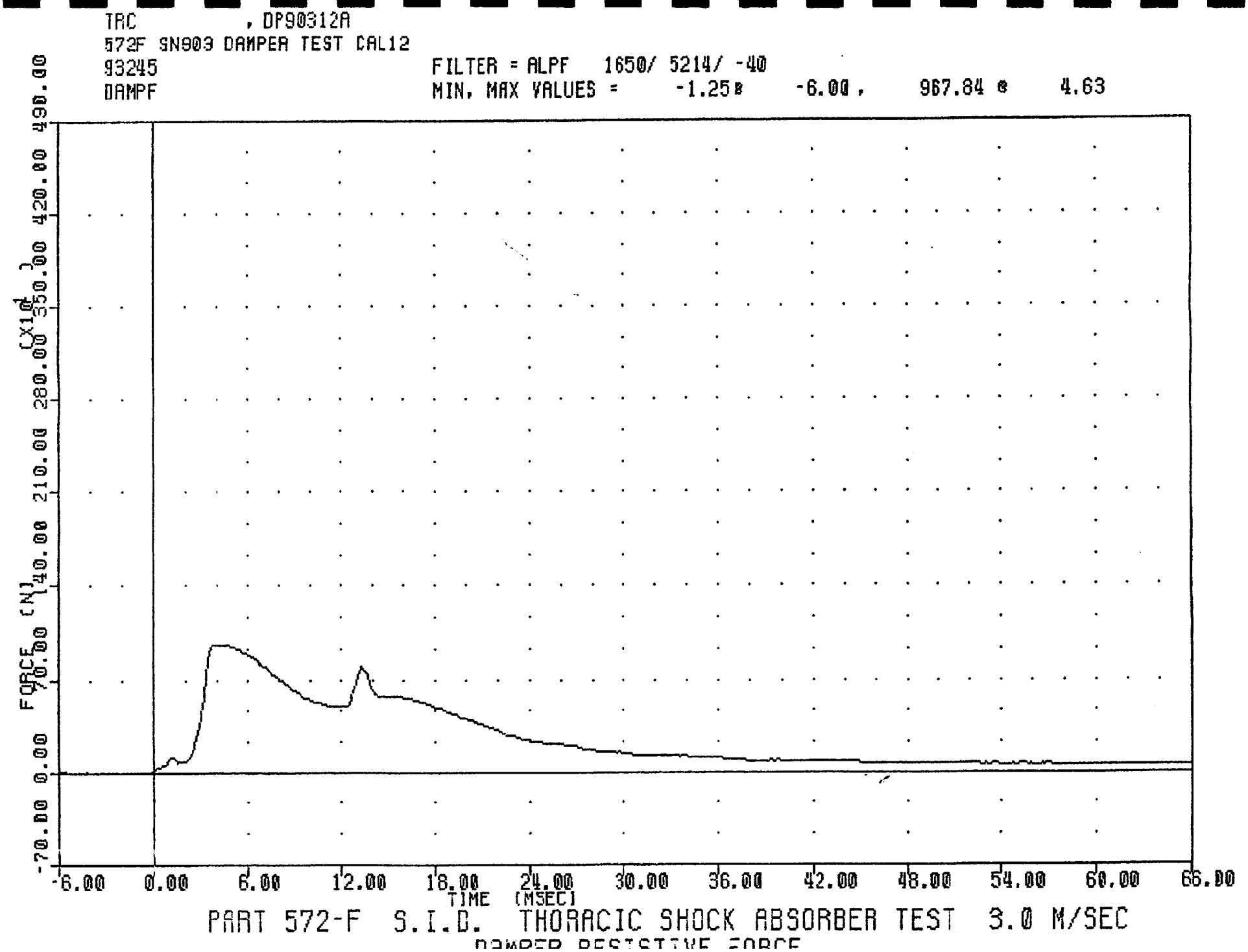
TEST NOS. DP90312A DP90312B DP90312C

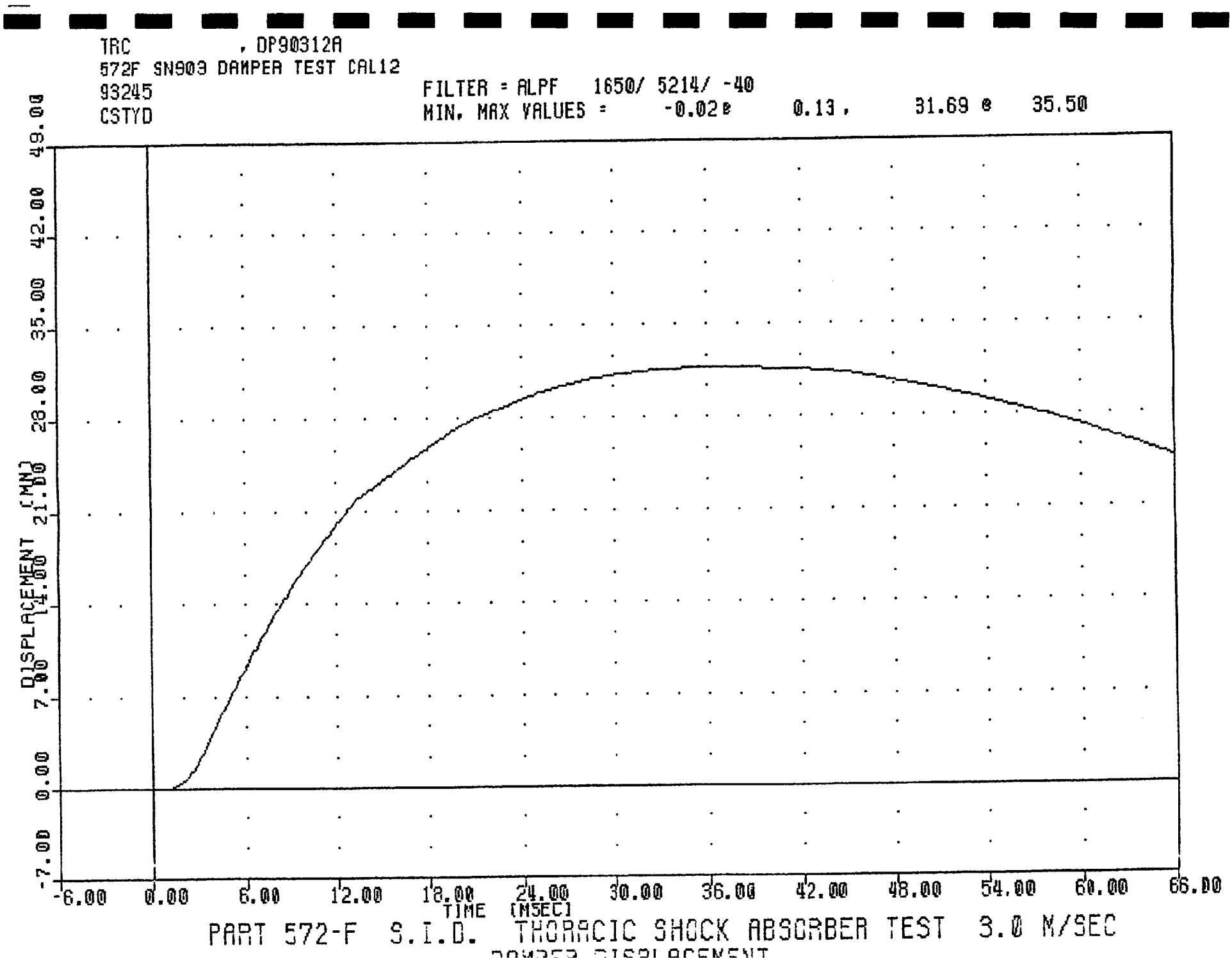
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		18.9 - 25.5 C	20.6 DEG. C
RELATIVE HUMIDITY		10 - 70 %	59.0 %
VELOCITY	FORCE	838 - 1125 N	968 N
3.05 M/S	DISPLACEMENT	31.2 - 35.2 MM	31.7 MM
VELOCITY	FORCE	1733 - 2100 N	1897 N
4.26 M/S	DISPLACEMENT	32.7 - 37.2 MM	34.5 MM
VELOCITY	FORCE	3663 - 4355 N	4183 N
6.05 M/S	DISPLACEMENT	34.4 - 39.5 MM	37.1 MM

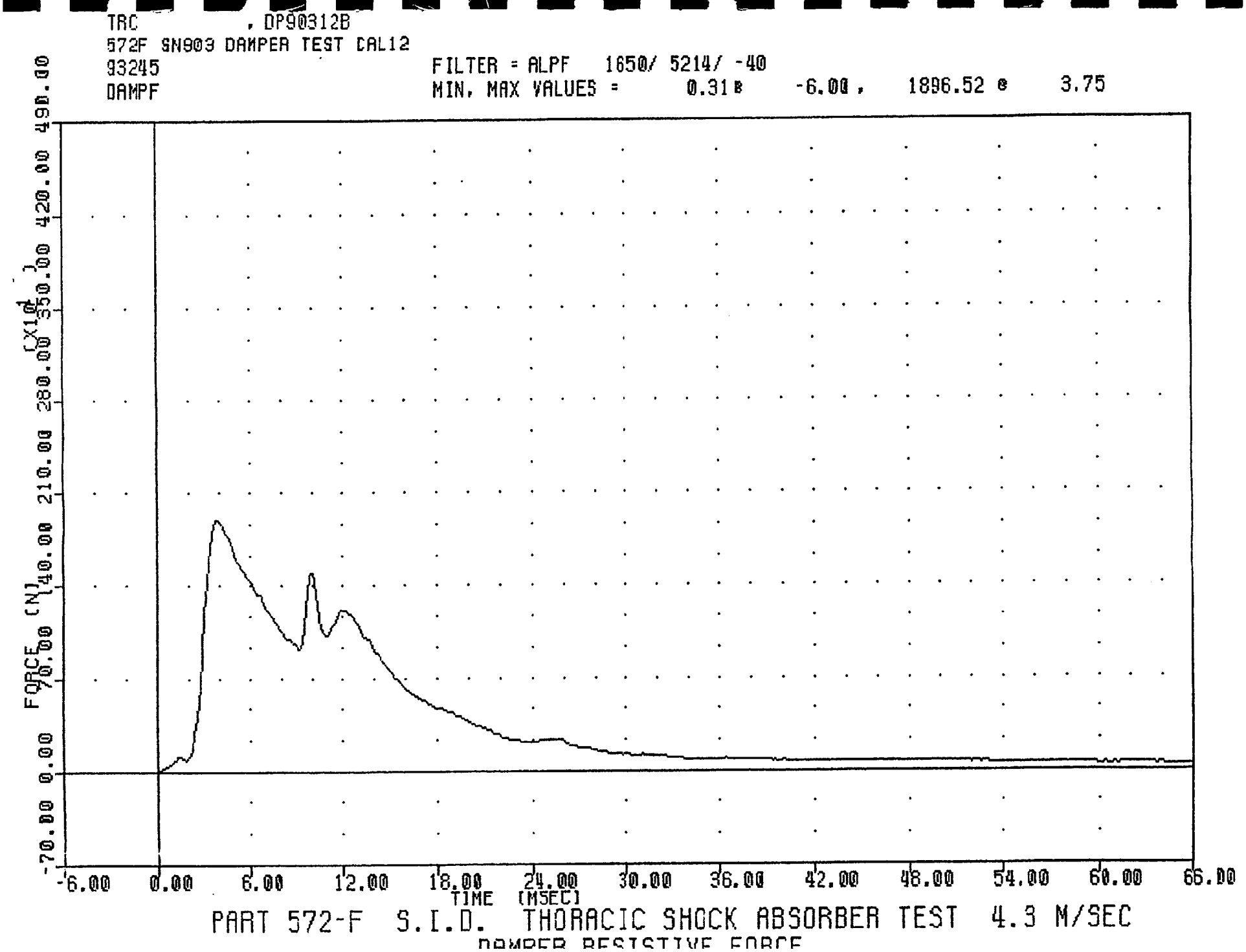
DAMPER SETTING = 5.5

TEST MEETS SPECIFICATIONS

TECHNICIAN Pete Fox

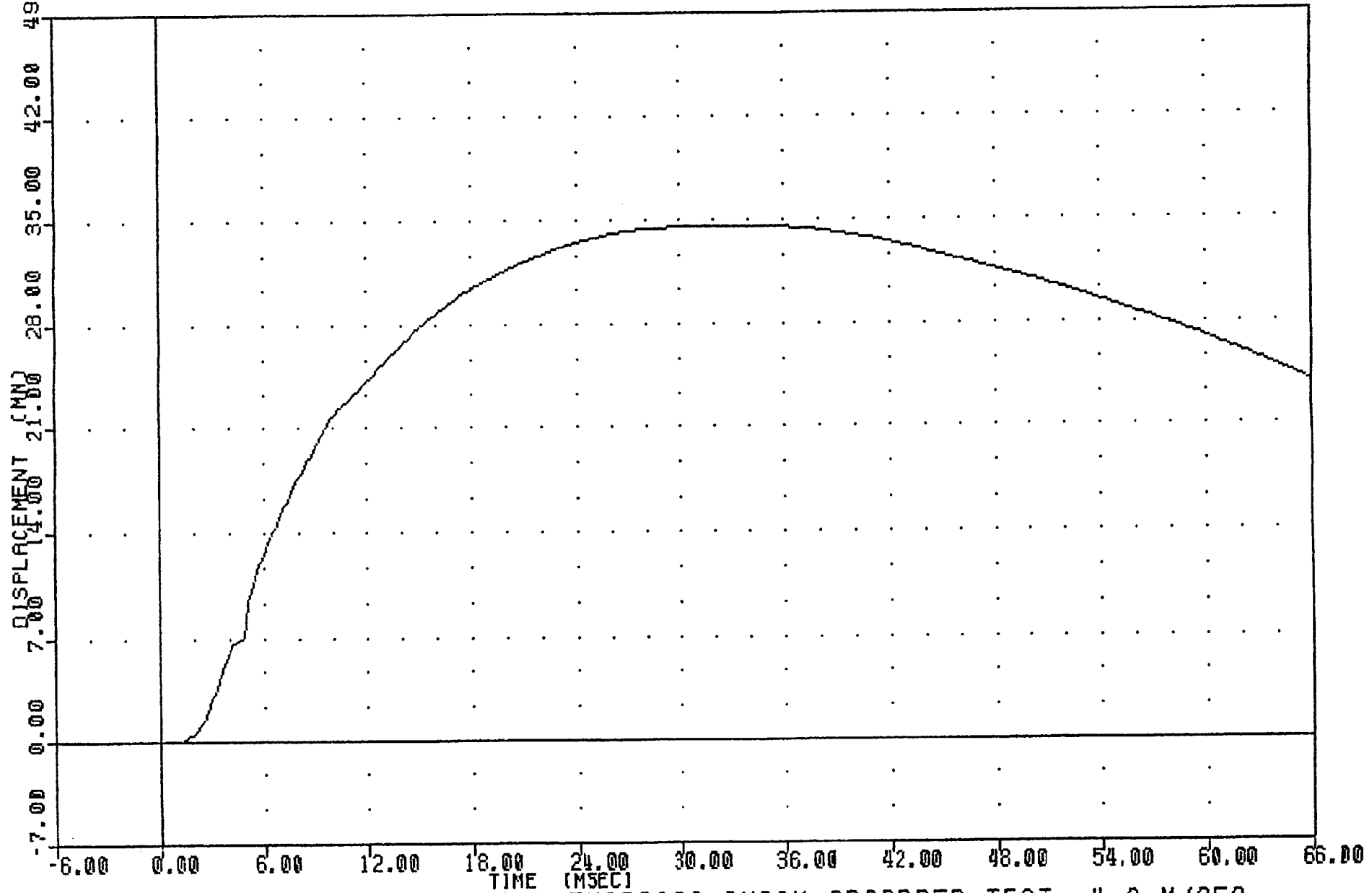

TRC , DP90312A
572F SN903 DAMPER TEST CAL12
93245
DAMPF
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -1.25 @ -6.00 , 967.84 @ 4.63
FORCE (N) (X10^1)
490.00
420.00
350.00
280.00
210.00
140.00
70.00
0.00
-70.00
-6.00
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
66.00
TIME (MSEC)
PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 3.0 M/SEC
DAMPER RESISTIVE FORCE


TRC , DP90312A
572F SN903 DAMPER TEST CAL12
93245
CSTYD
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.02 @ 0.13 , 31.69 @ 35.50
49.00
42.00
35.00
28.00
21.00
14.00
7.00
0.00
-7.00
DISPLACEMENT (MM)
-6.00
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
66.00
TIME (MSEC)
PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 3.0 M/SEC
DAMPER DISPLACEMENT


TRC , DP90312B
572F SN903 DAMPER TEST CAL12
93245
DAMPF
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.31 @ -6.00 , 1896.52 @ 3.75
FORCE (N) (X10^1)
490.00
420.00
350.00
280.00
210.00
140.00
70.00
0.00
-70.00
-6.00
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
66.00
TIME (MSEC)
PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 4.3 M/SEC
DAMPER RESISTIVE FORCE

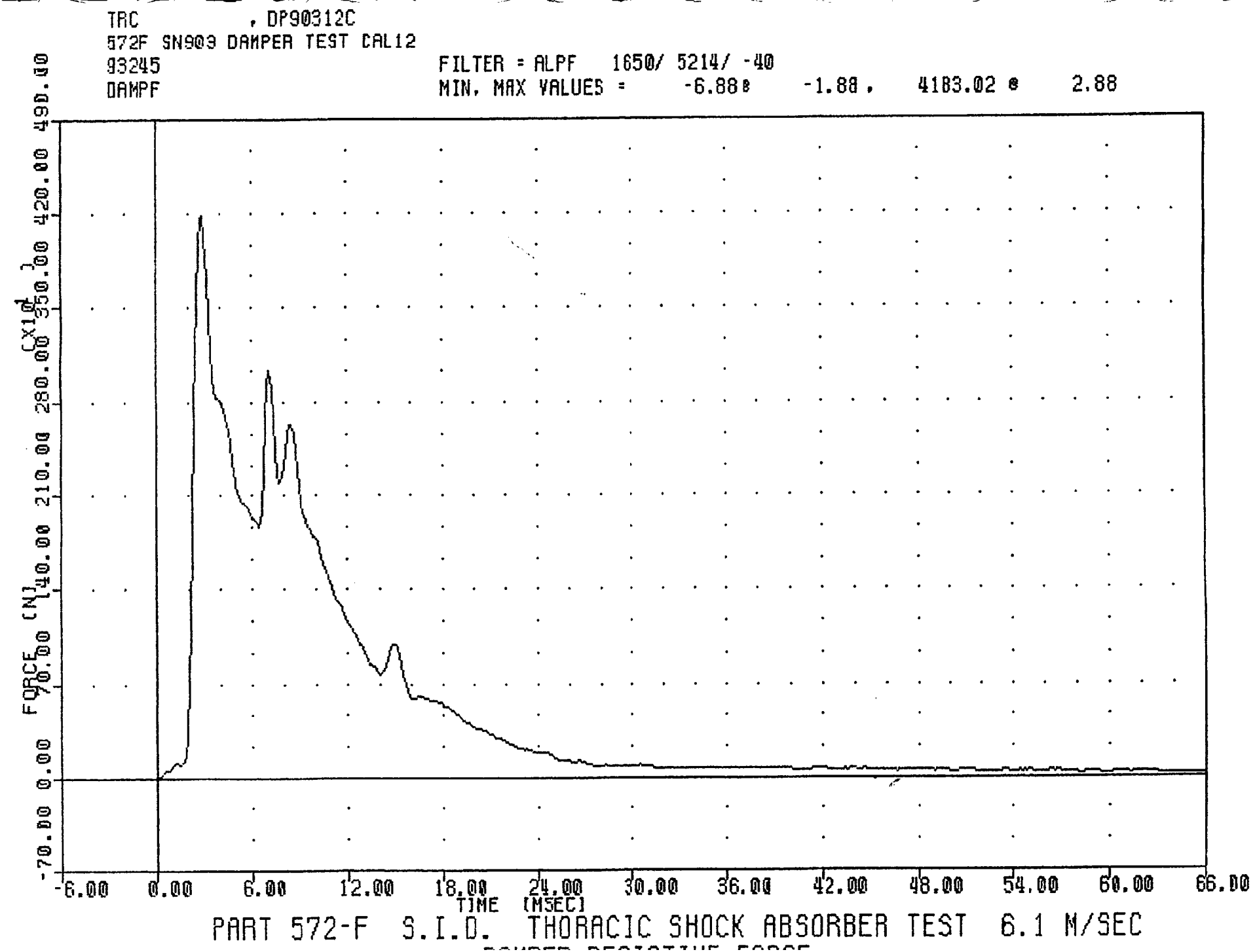
TRC , DP90312B
572F SN903 DAMPER TEST CAL12
93245
CSTYD

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.04 @ -4.13 , 34.55 @ 30.88

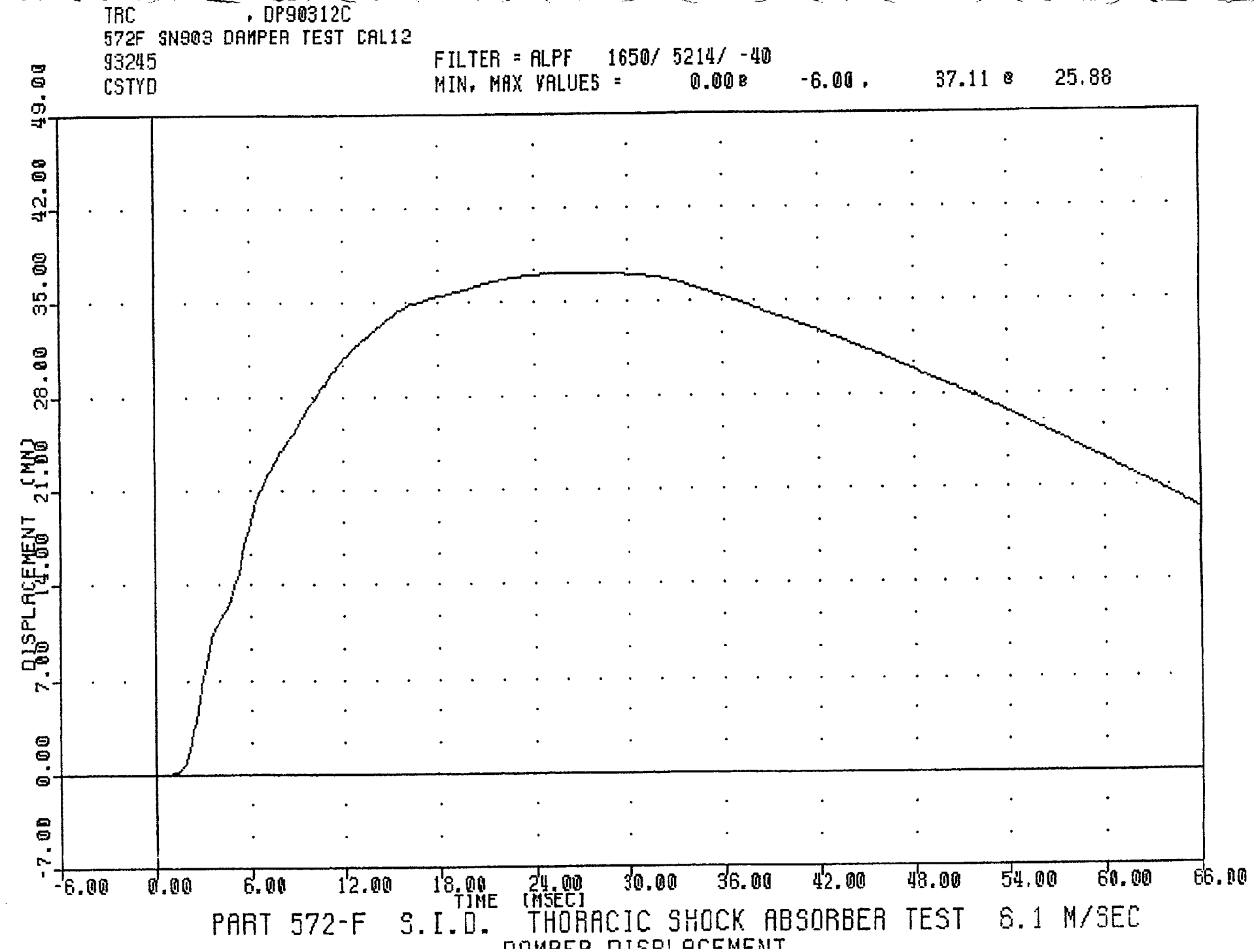


PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 4.3 M/SEC

BUMPER DISPLACEMENT



PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 6.1 M/SEC


TRC , DP90312C
572F SN003 DAMPER TEST CAL12
93245
CSTYD
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.00 @ -6.00 , 37.11 @ 25.88
49.00
42.00
35.00
28.00
21.00
14.00
7.00
0.00
-7.00
DISPLACEMENT (MM)
-6.00
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
66.00
TIME (MSEC)
PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 6.1 M/SEC
DAMPER DISPLACEMENT

TRANSPORTATION RESEARCH CENTER INC.

ABDOMEN COMPRESSION TEST

PART 572B 02-SEP-93

TRC AB90312 572B SN 903 ABDOM COMPR CAL 12

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	20.0 C
RELATIVE HUMIDITY	10 - 70 %	59 %
FORCE AT 0.00 MM DISP.	44.48 N	44.48 N
FORCE AT 12.7 MM DISP.	102.30 - 160.13 N	133.57 N
FORCE AT 19.1 MM DISP.	160.13 - 222.40 N	190.24 N
FORCE AT 25.4 MM DISP.	222.40 - 280.22 N	259.42 N
FORCE AT 33.0 MM DISP.	324.70 - 391.42 N	369.65 N

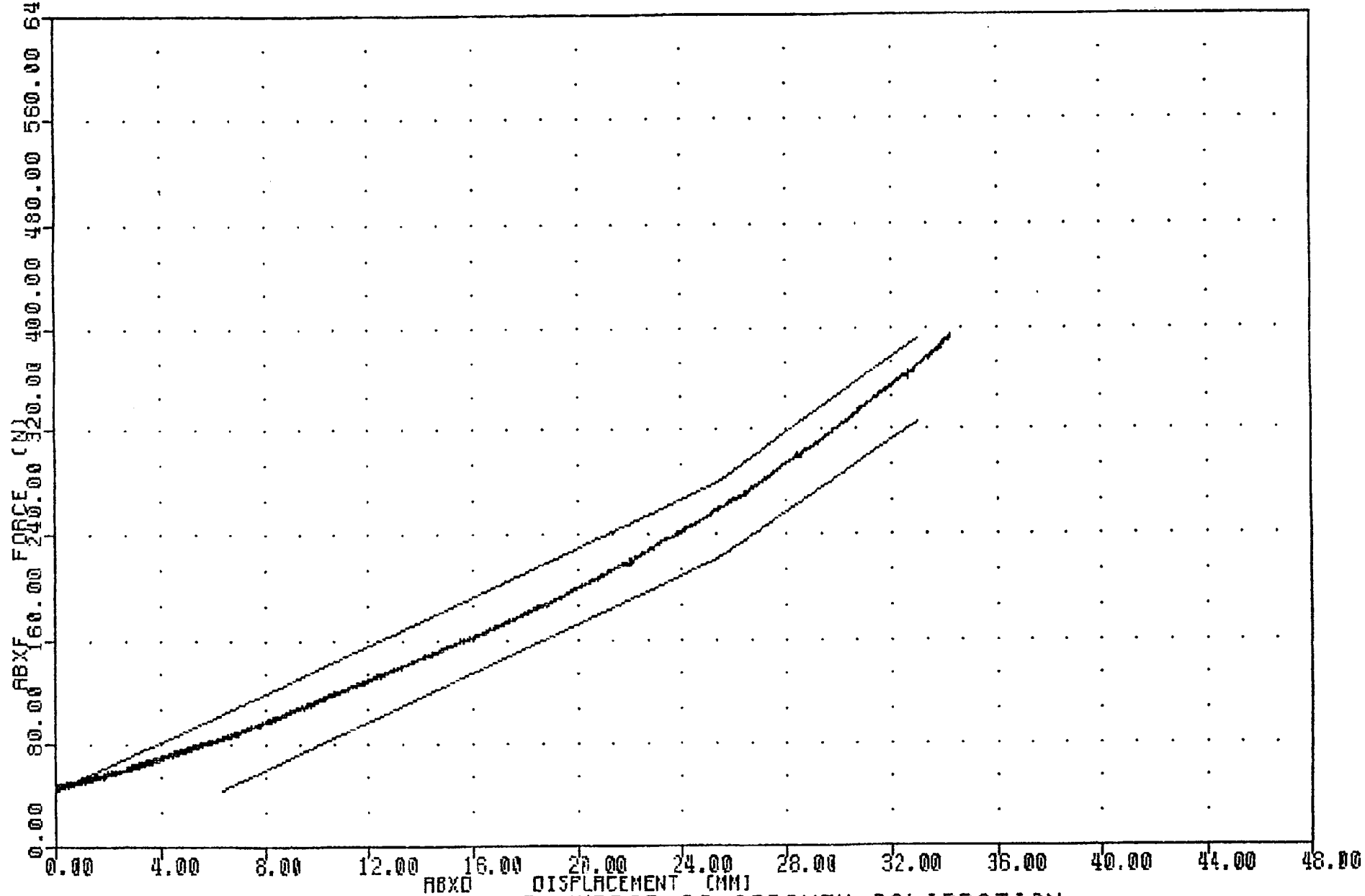
DUMMY MEETS SPECIFICATIONS

TECHNICIAN Peter Foust

[redacted]

TRC ,AB90312 572B SN 903 ABDOM COMPR CAL 12 93245

ABXD	FILTER = ALPF	1650/ 5214/ -40	MIN, MAX =	-0.01	0.00 ,	34.29	394.07
ABXF	FILTER = ALPF	1650/ 5214/ -40	MIN, MAX =	43.67	0.00 ,	394.27	34.28



PART 572-B HYBRID II ABDOMEN CALIBRATION

ABDOMEN FORCE VS DISPLACEMENT

TRANSPORTATION RESEARCH CENTER INC.

LUMBAR FLEXION TEST

PART 572B 03-SEP-93

TRC LF90312 572F SN903 LUMBAR FLEX CAL12

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	20.0 C
RELATIVE HUMIDITY	10 - 70 %	59 %
FORCE AT 0 DEG FLEXION	-26.69 - +26.69 N	0.00 N
FORCE AT 20 DEG FLEXION	97.86 - 151.24 N	142.34 N
FORCE AT 30 DEG FLEXION	151.24 - 204.62 N	195.71 N
FORCE AT 40 DEG FLEXION	204.62 - 258.00 N	240.19 N
NET RETURN ANGLE	< 12 DEG	7.94 DEG

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Pete Foss

TRANSPORTATION RESEARCH CENTER INC.

LATERAL THORAX IMPACT TEST

SIDE IMPACT DUMMY 16-Sep-93

LEFT SIDE CONFIGURATION

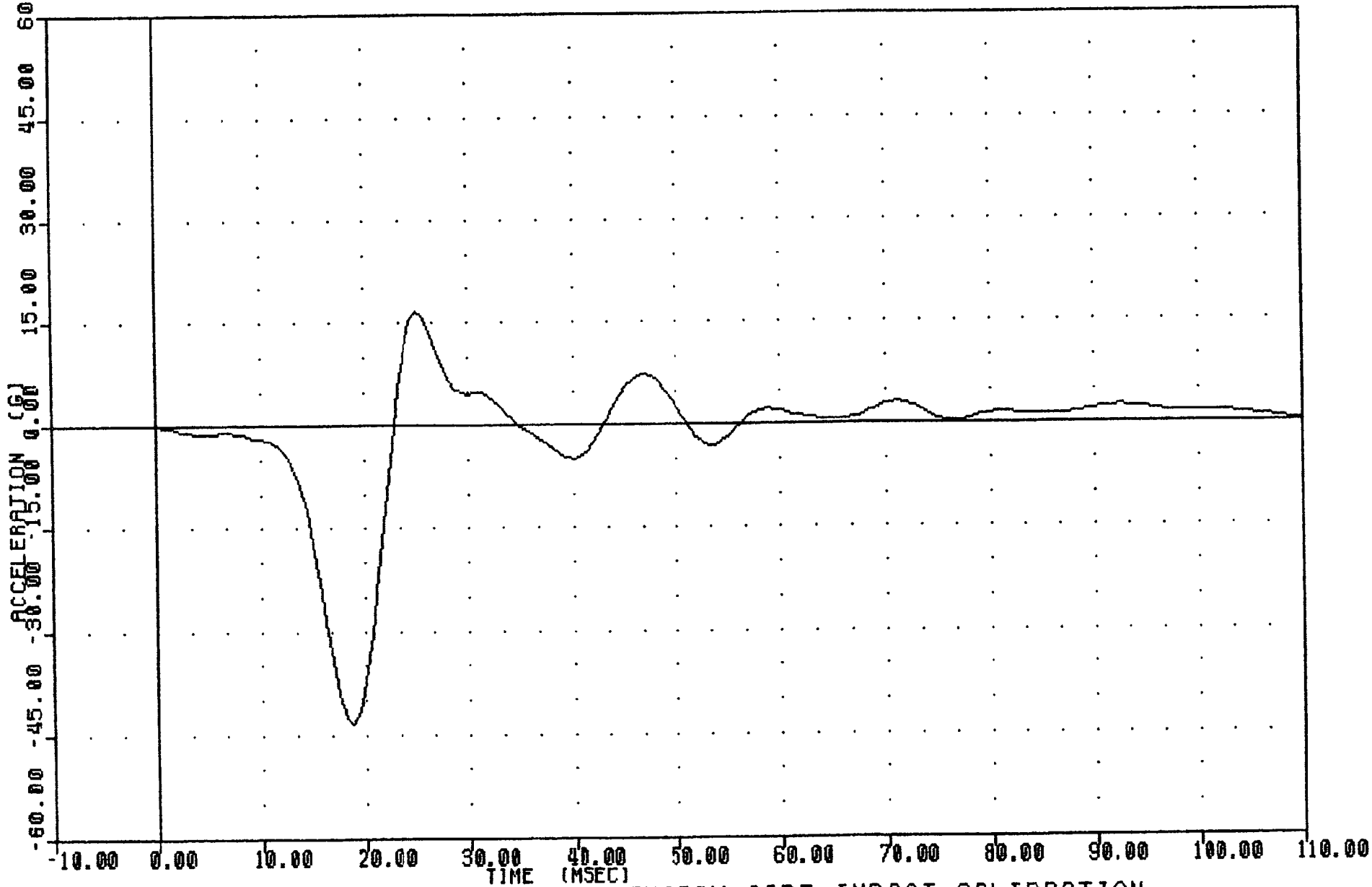
TRC ST90314 572F SN903 THORAX IMPACT CAL14

TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	47.0 %
PISTON VELOCITY	4.21 - 4.32 M/SEC	4.22 M/SEC
PEAK ACCELERATION: UPPER RIB BAR	37 - 46 G	-43.4 G
PEAK ACCELERATION: LOWER RIB BAR	37 - 46 G	-41.0 G
PEAK ACCELERATION: LOWER THORACIC SPINE	15 - 22 G	-17.9 G

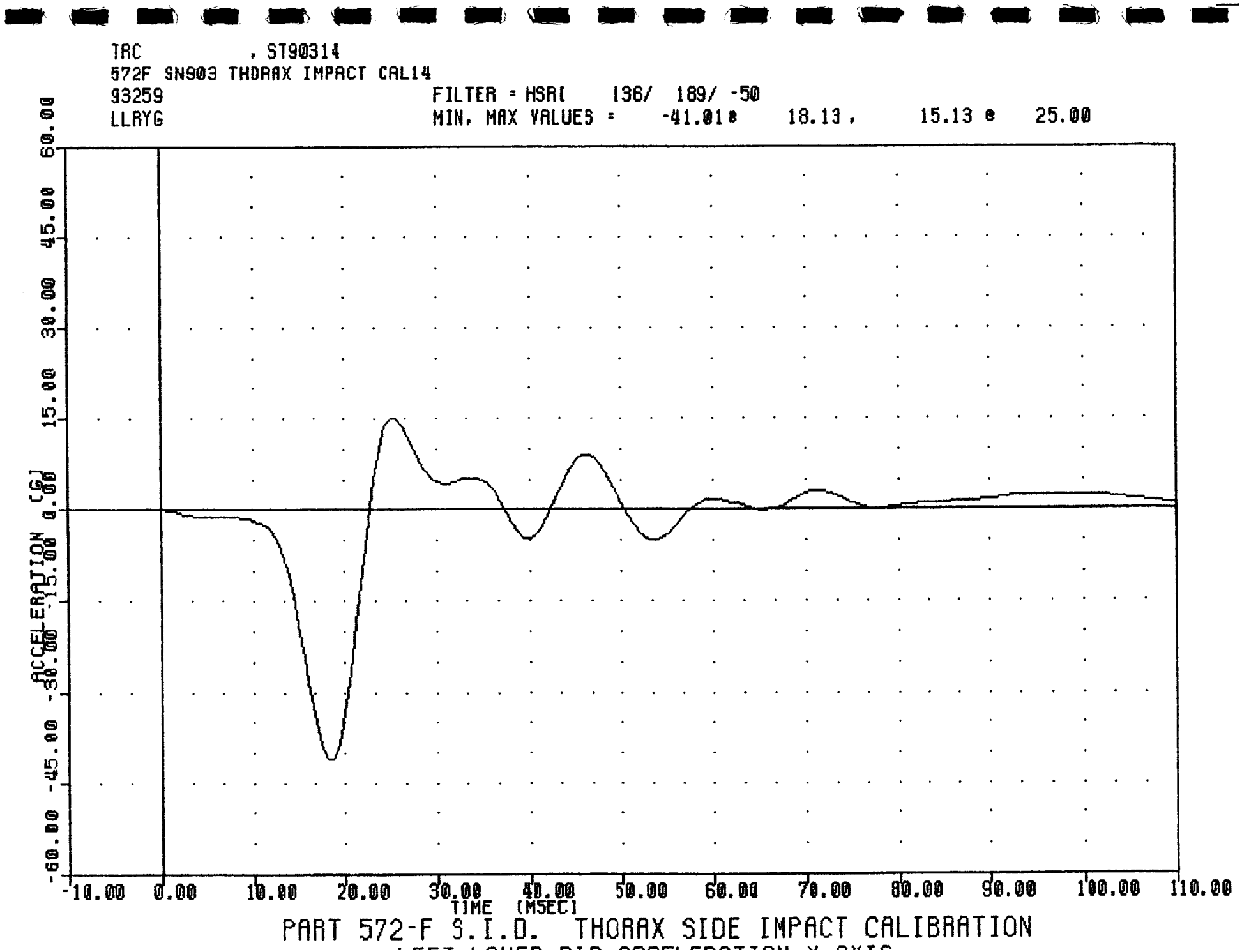
TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

TRC , ST90314
572F SN903 THORAX IMPACT CAL14
93259 FILTER = HSRI 136/ 189/ -50
LURYG MIN, MAX VALUES = -43.36 @ 18.75 , 16.61 @ 25.00

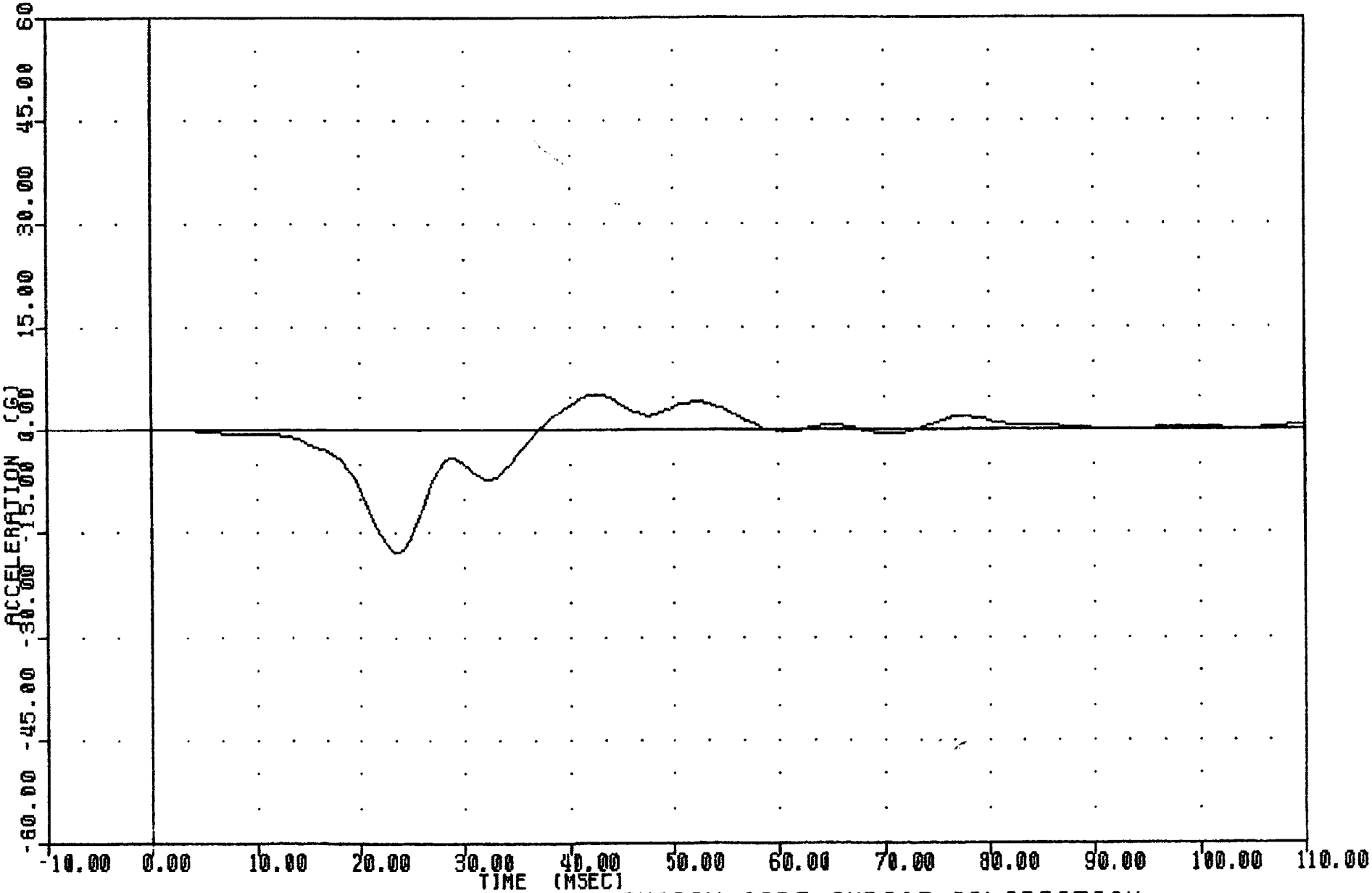


PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION
LEFT UPPER RIB ACCELERATION Y AXIS



PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION

TRC , ST90314
572F SN903 THORAX IMPACT CAL14
93259 FILTER = HSRI 136/ 189/ -50
T12YG MIN, MAX VALUES = -17.89 @ 23.75 , 5.33 @ 42.50



PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION

TRANSPORTATION RESEARCH CENTER INC.

LATERAL PELVIS IMPACT TEST

SIDE IMPACT DUMMY 16-Sep-93

LEFT SIDE CONFIGURATION

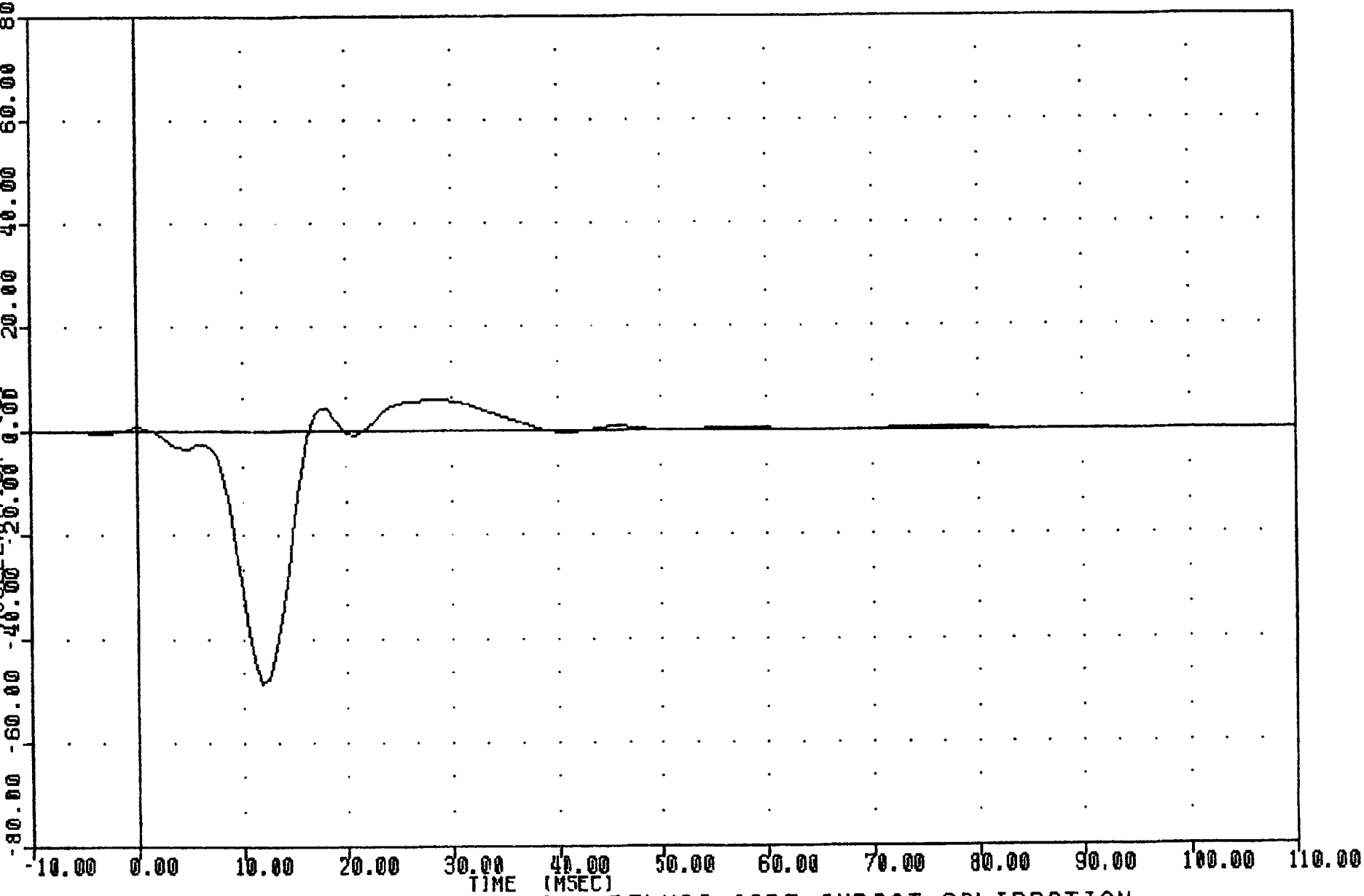
TRC SP90314 572F SN903 PELVIS IMPACT CAL14

TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	47.0 %
PISTON VELOCITY	4.21 - 4.32 M/SEC	4.27 M/SEC
PEAK PELVIC ACCELERATION	40 - 60 G	-48.5 G
TIME ABOVE 20 G LEVEL	3 - 7 MSEC	5.6 MSEC
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

TRC , SP90314
572F SN903 PELVIS IMPACT CAL14
93259 FILTER = HSRI 136/ 189/ -50
PEVYG MIN, MAX VALUES = -48.54 @ 11.88 , 6.01 @ 28.75



PART 572-F S.I.D. PELVIS SIDE IMPACT CALIBRATION

PRE-TEST CALIBRATION

LEFT REAR PASSENGER DUMMY S/N 906

TRANSPORTATION RESEARCH CENTER INC.
SIDE IMPACT DUMMY
EXTERNAL DIMENSIONS
LEFT SIDE CONFIGURATION

13-SEP-93

SN 906 FIRST TECH

TRC ED90602 572F SN906 EXT. DIMENSION CAL02

DIMENSIONS WITH CHEST JACKET INSTALLED			
SYMB	DESCRIPTION	SPECIFICATION	TEST RESULTS
	TEMPERATURE		20.6 DEG. C
	RELATIVE HUMIDITY		50.0 %
SH	SEATED HEIGHT	889 - 909 MM	894.1 MM
HP	HIP PIVOT HEIGHT	99 MM REF.	96.5 MM
KH	KNEE PIVOT FROM BACKLINE	511 - 526 MM	525.8 MM
KV	KNEE PIVOT FROM FLOOR	490 - 506 MM	490.2 MM
HW	HIP WIDTH	356 - 391 MM	370.8 MM

DIMENSIONS WITH CHEST JACKET REMOVED			
SYMB	DESCRIPTION	SPECIFICATION	TEST RESULTS
RH	RIB HEIGHT	501 - 520 MM	508.0 MM
RD	RIB FROM BACKLINE	229 - 241 MM	236.2 MM
RW-1	TOP RIB WIDTH FROM C/L	165. - 180 MM	168.9 MM
RW-2	BOTTOM RIB WIDTH FROM C/L	165 - 180 MM	168.9 MM
	DIFFERENCE BETWEEN TOP & BOTTOM RIB WIDTH FROM C/L	$\leq$ 2.5 MM	0.0 MM

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Peter Foster

TRANSPORTATION RESEARCH CENTER INC.

NECK PENDULUM TEST

PART 572B 10-SEP-93

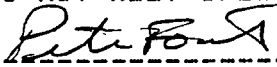
TRC HN90602B 572B SN 906 HEAD/NECK CAL 02

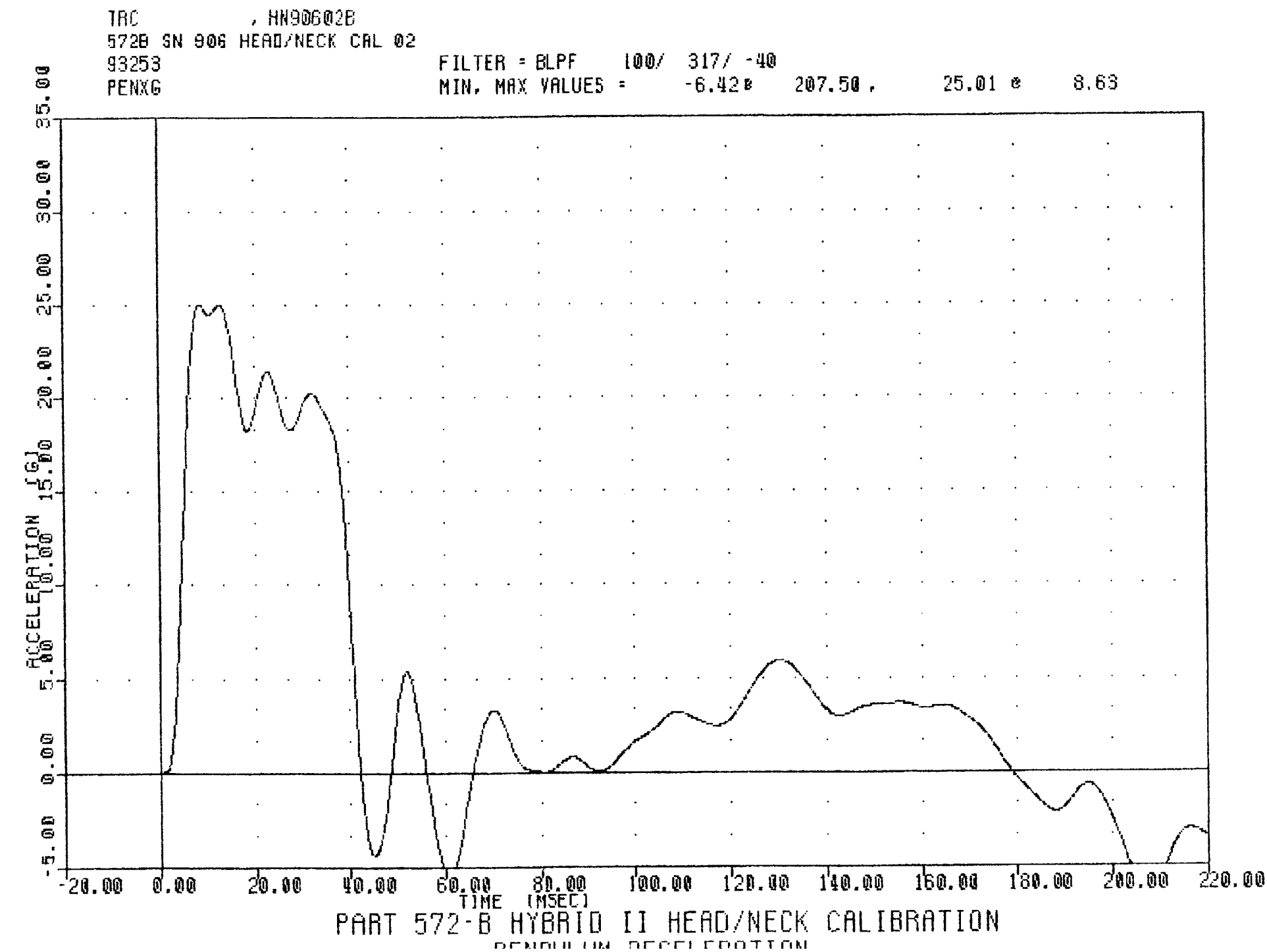
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	20.0 C
RELATIVE HUMIDITY	10 - 70 %	50 %
PENDULUM VELOCITY	6.55 TO 7.77 M/SEC	7.17 M/SEC
PENDULUM DECELERATION:		
T1 - T2 TIME (5 - 20 G)	3 MS MAX	2.62 MS
T2 - T3 TIME (20 - 20 G)	25 - 30 MS	27.05 MS
T3 - T4 TIME (20 - 5 G)	10 MS MAX	7.64 MS
AVG. G LEVEL T2 - T3	20 - 24 G	21.27 G
MAXIMUM ROTATION ANGLE	63 - 73 DEG	62.52 DEG **
PEAK HEAD RESULTANT ACCEL	26 G MAX	25.98 G

TEST PARAMETER	SPECIFICATION			TEST RESULTS	
ROTATION ANGLE (DEGREES)	TIME (MS)		CHORDAL DISP. (MM)	TIME (MS)	CHORDAL DISP. (MM)
0	-2.0 -	+2.0	-12.7 - +12.7	1.25	0.60
30	25.6 -	34.4	53.3 - 78.7	31.68	63.46
60	40.3 -	51.7	109.2 - 134.6	53.29**	128.99
MAX	53.2 -	66.8	127.0 - 152.4	60.50	132.39
60	67.0 -	83.0	109.2 - 134.6	67.18	126.42
30	85.4 -	104.6	53.3 - 78.7	89.43	57.75
0	101.0 -	123.0	-12.7 - +12.7	103.40	3.82

SND: 151.13 MM

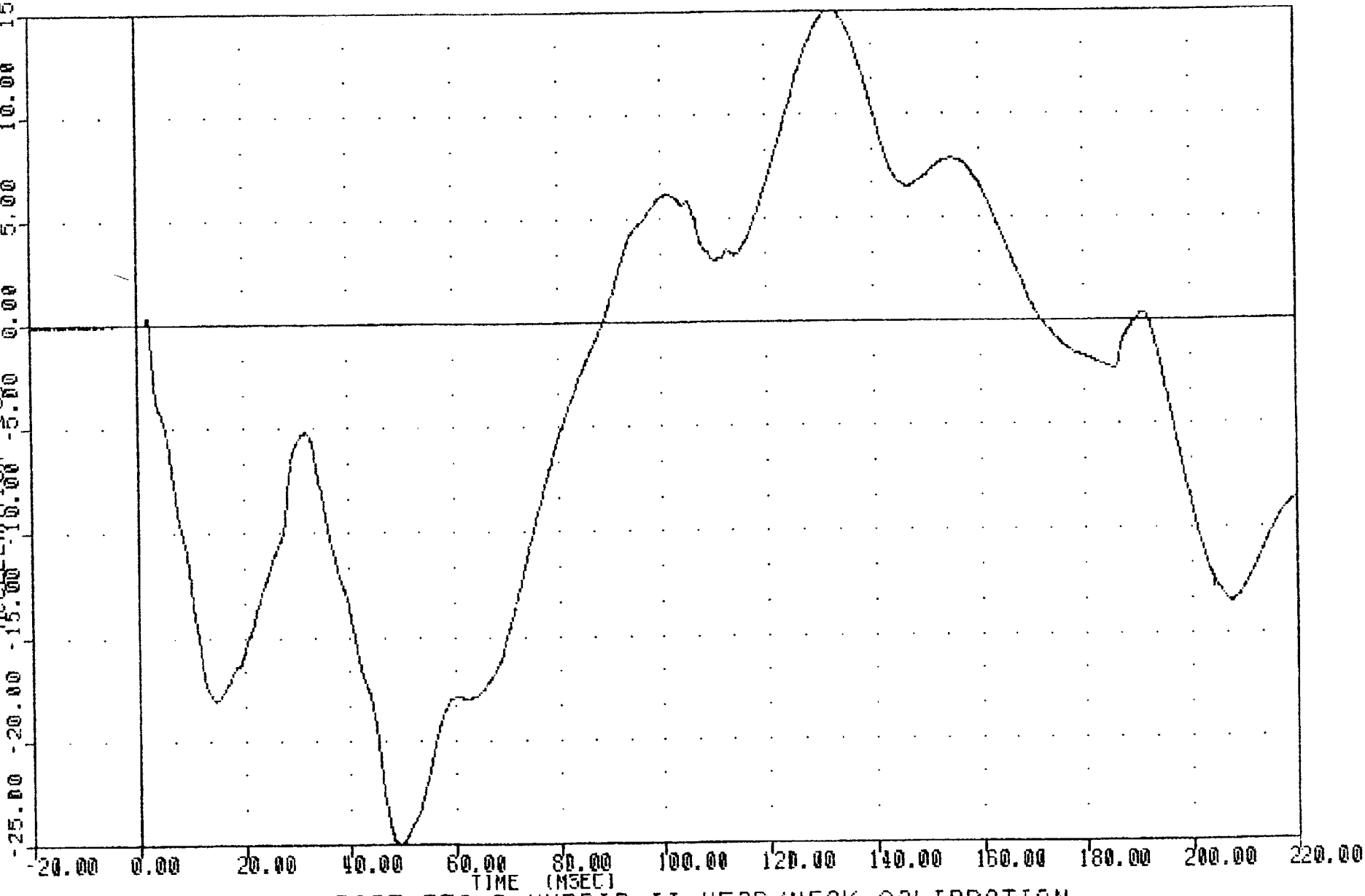
* DUMMY DOES NOT MEET SPECIFICATIONS

TECHNICIAN 


TRC , HN90602B
572B SN 906 HEAD/NECK CAL 02
93253
PENXG
FILTER = BLPF 100/ 317/ -40
MIN, MAX VALUES = -6.42 @ 207.50 , 25.01 @ 8.63
ACCELERATION [G]
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
TIME (MSEC)
PART 572-B HYBRID II HEAD/NECK CALIBRATION
PENDULUM DECELERATION

TRC , HN906026
572B SN 906 HEAD/NECK CAL 02
93253
HEDXG

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -25.13 @ 49.13 , 15.05 @ 132.00

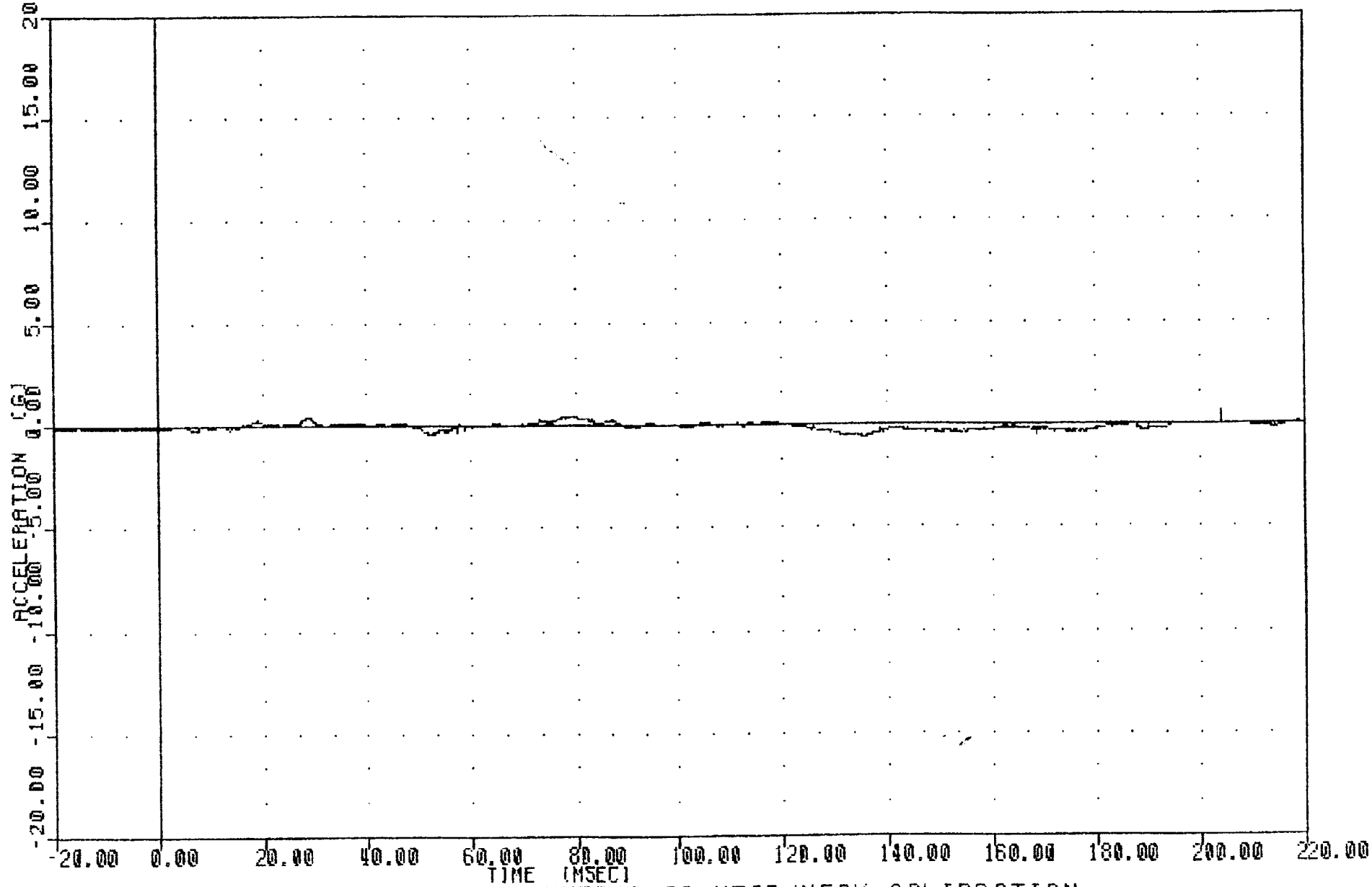


PART 572-B HYBRID II HEAD/NECK CALIBRATION

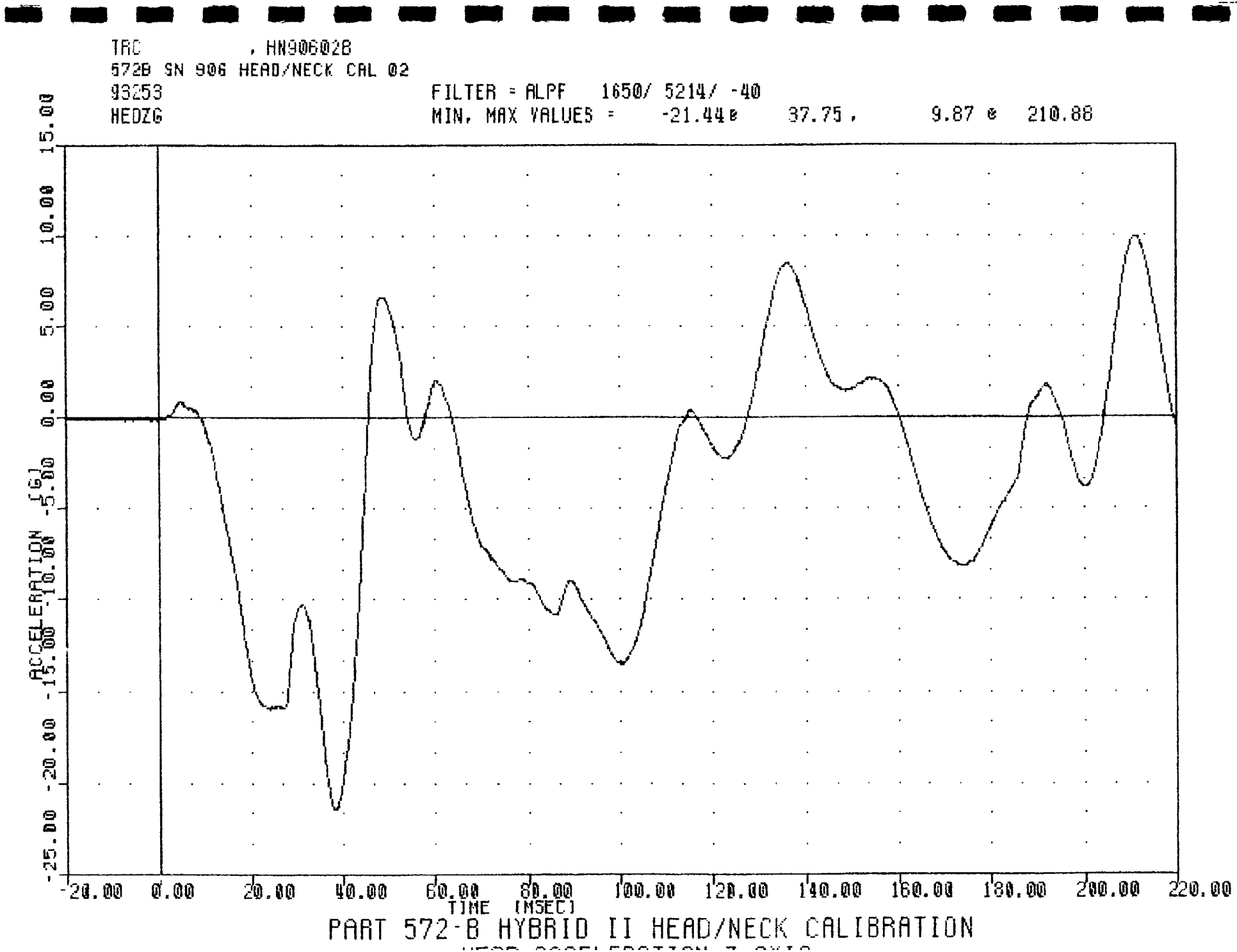
HEAD ACCELERATION X AXIS

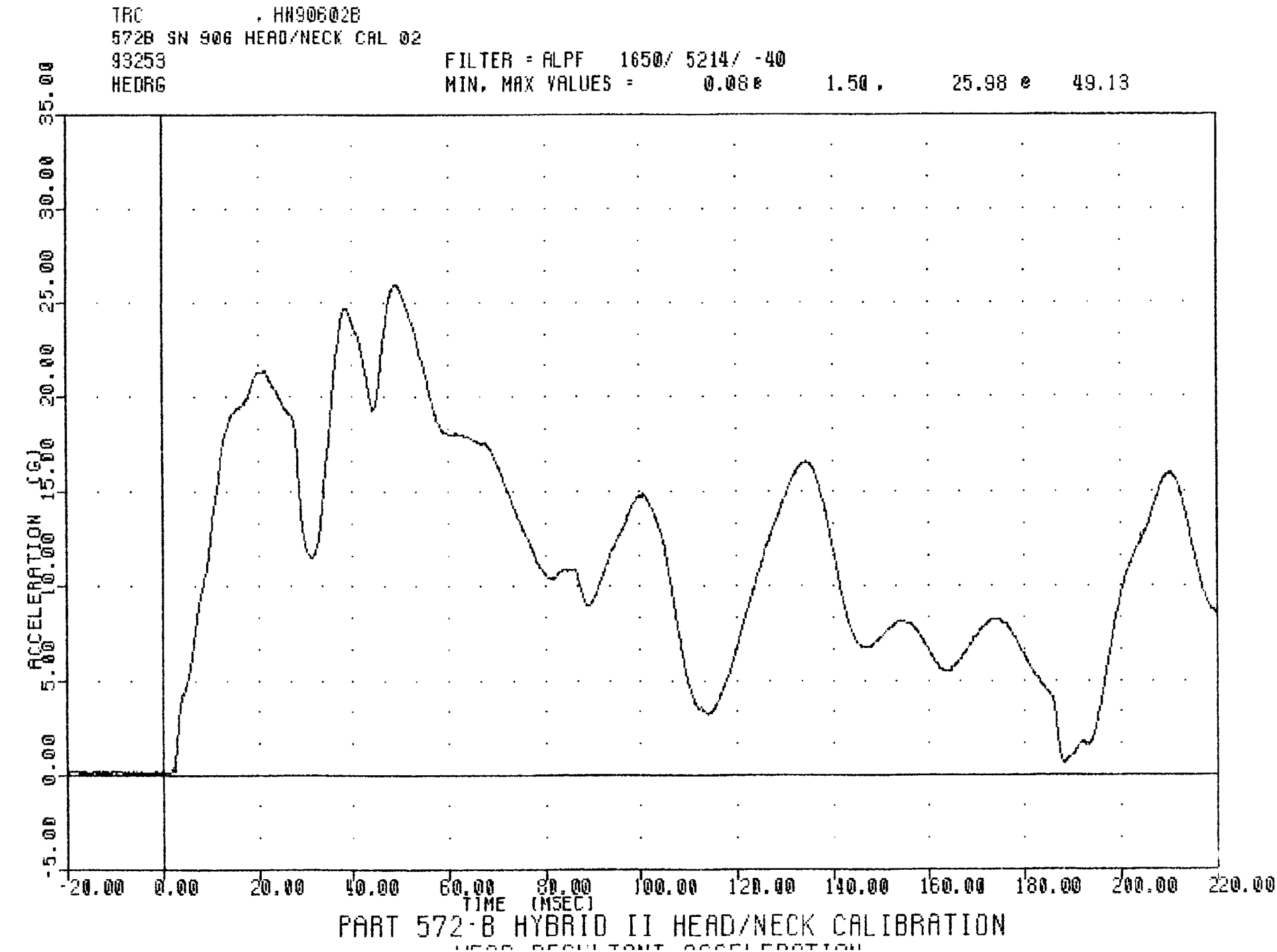
TRC , HN90602B
572B SN 906 HEAD/NECK CAL 02
93253
HEDYG

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.59 @ 135.25 , 0.67 @ 204.25

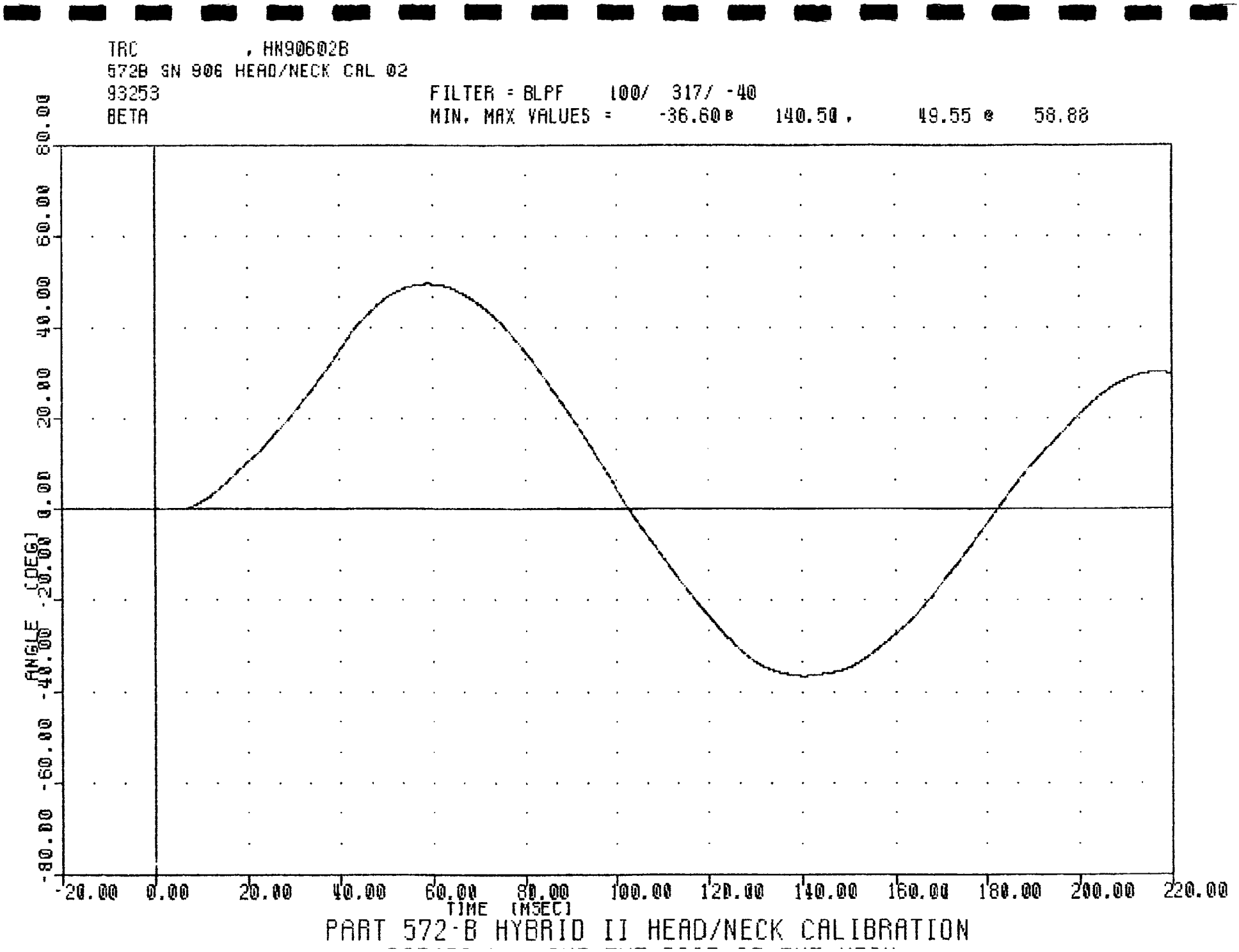


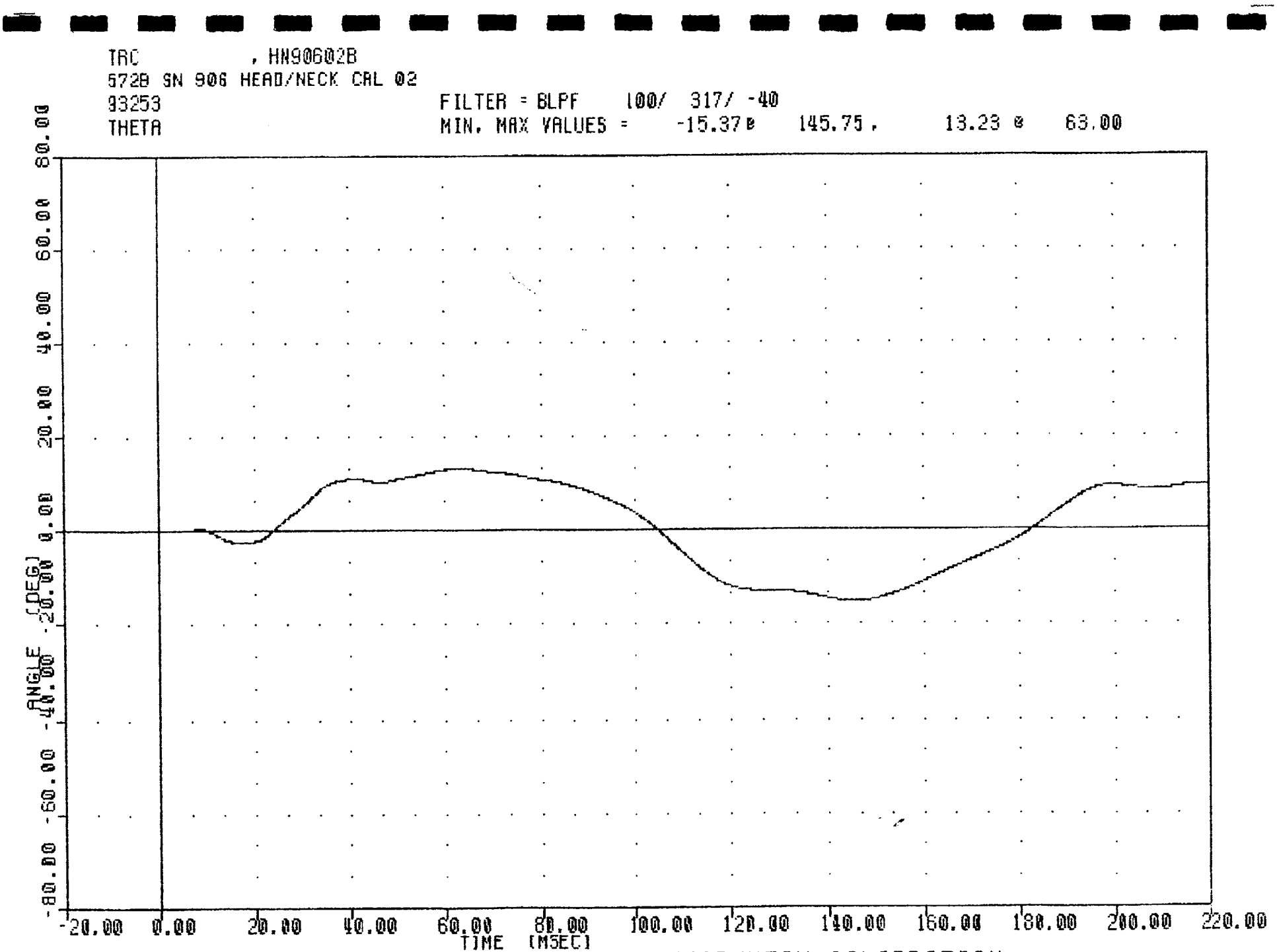
PART 572-B HYBRID II HEAD/NECK CALIBRATION


TRC , HN906028
572B SN 906 HEAD/NECK CAL 02
93253
HEDZG
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -21.44 @ 37.75 , 9.87 @ 210.88
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
ACCELERATION (G)
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
TIME (MSEC)
PART 572-B HYBRID II HEAD/NECK CALIBRATION



PART 572-B HYBRID II HEAD/NECK CALIBRATION

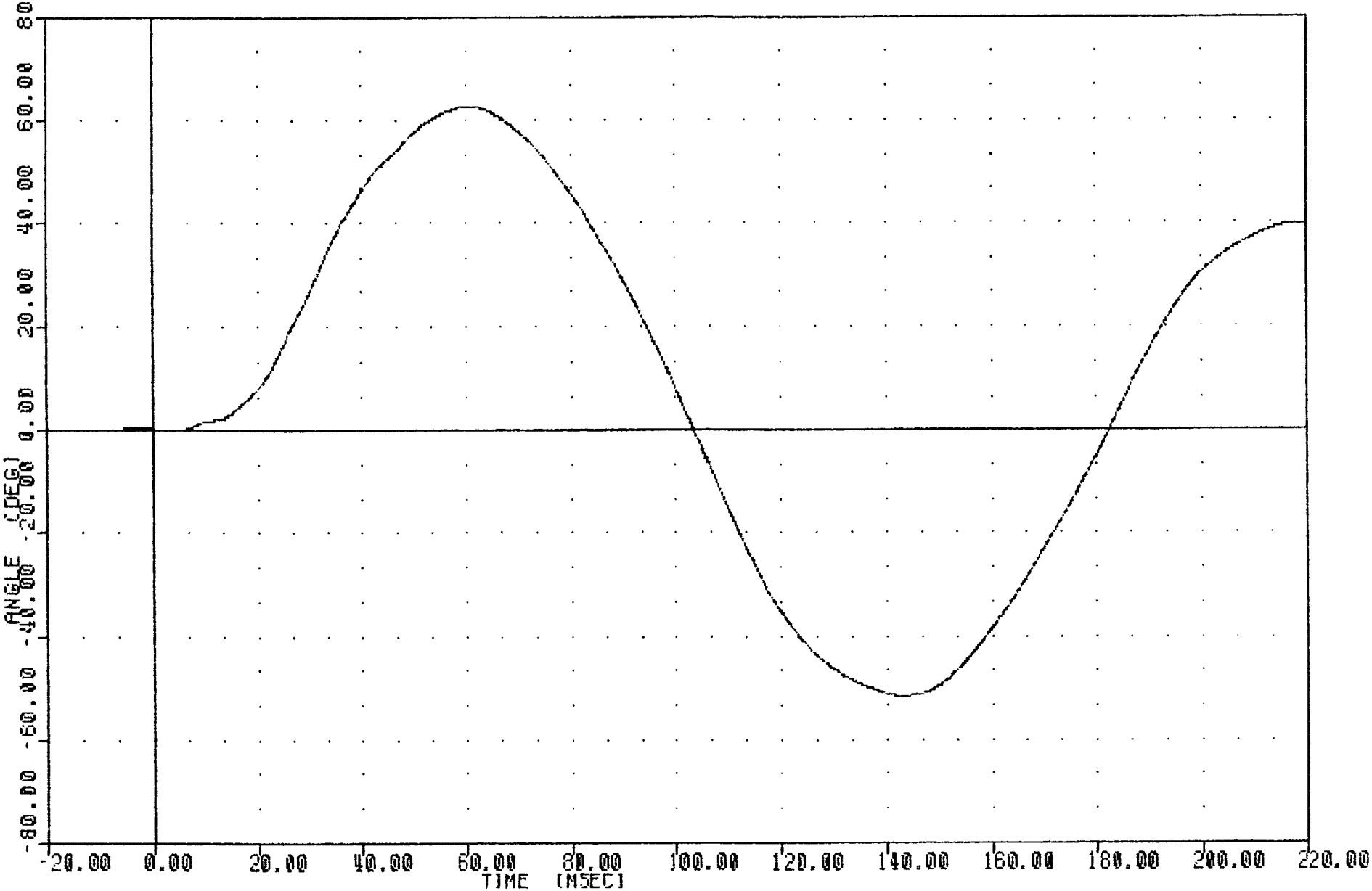

TRC , HN90602B
572B SN 906 HEAD/NECK CAL 02
93253
BETA
FILTER = BLPF 100/ 317/ -40
MIN, MAX VALUES = -36.60 @ 140.50 , 49.55 @ 58.88
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
-80.00
ANGLE (DEG)
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
TIME (MSEC)
PART 572-B HYBRID II HEAD/NECK CALIBRATION



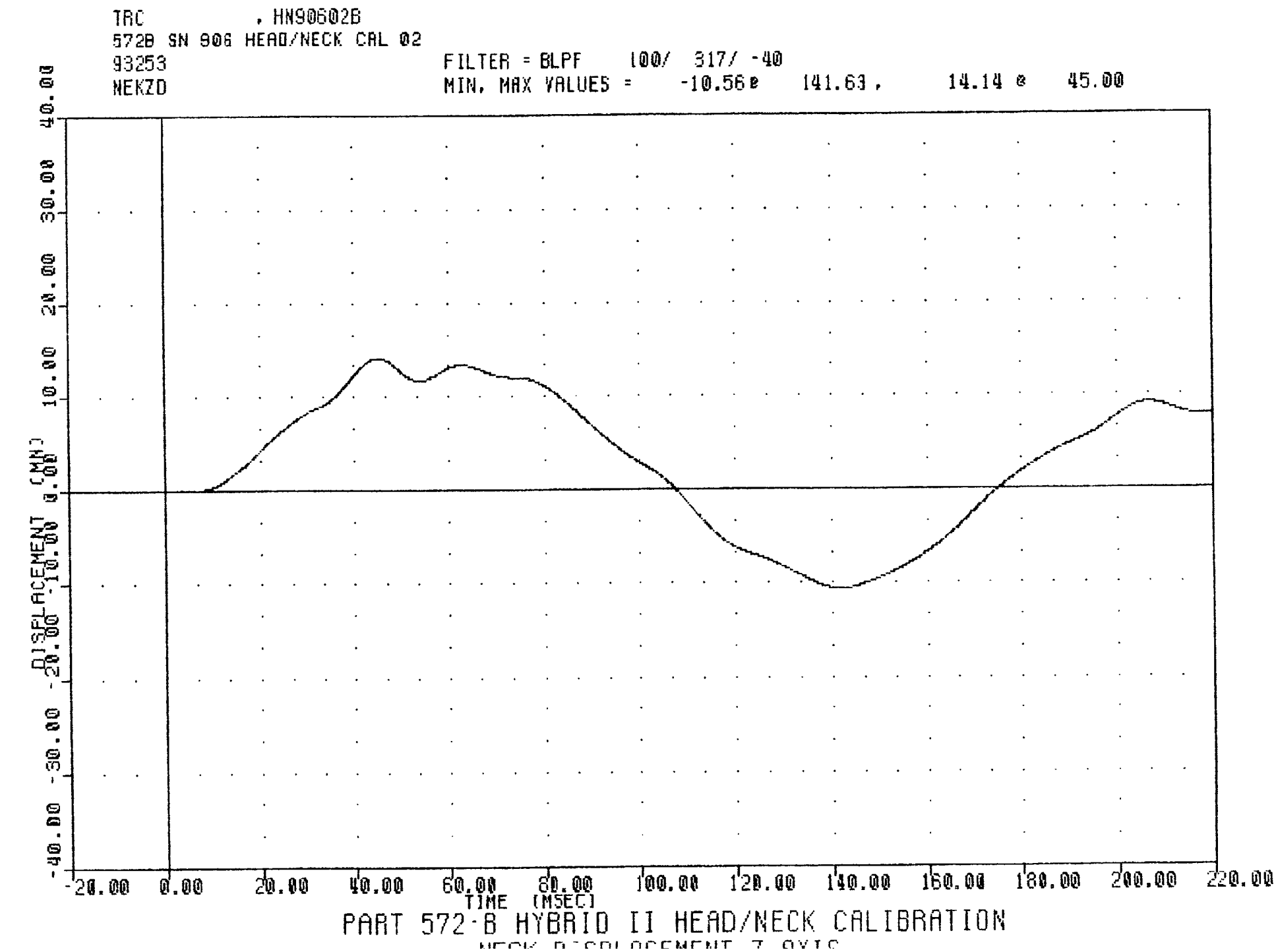
PART 572-B HYBRID II HEAD/NECK CALIBRATION

ROTATION ABOUT THE HEAD C.G.

TRC , HN90602B
572B SN 906 HEAD/NECK CAL 02
93253 FILTER = BLPF 100/ 317/ -40
TOTAN MIN, MAX VALUES = -51.50 @ 142.88 , 62.52 @ 60.50

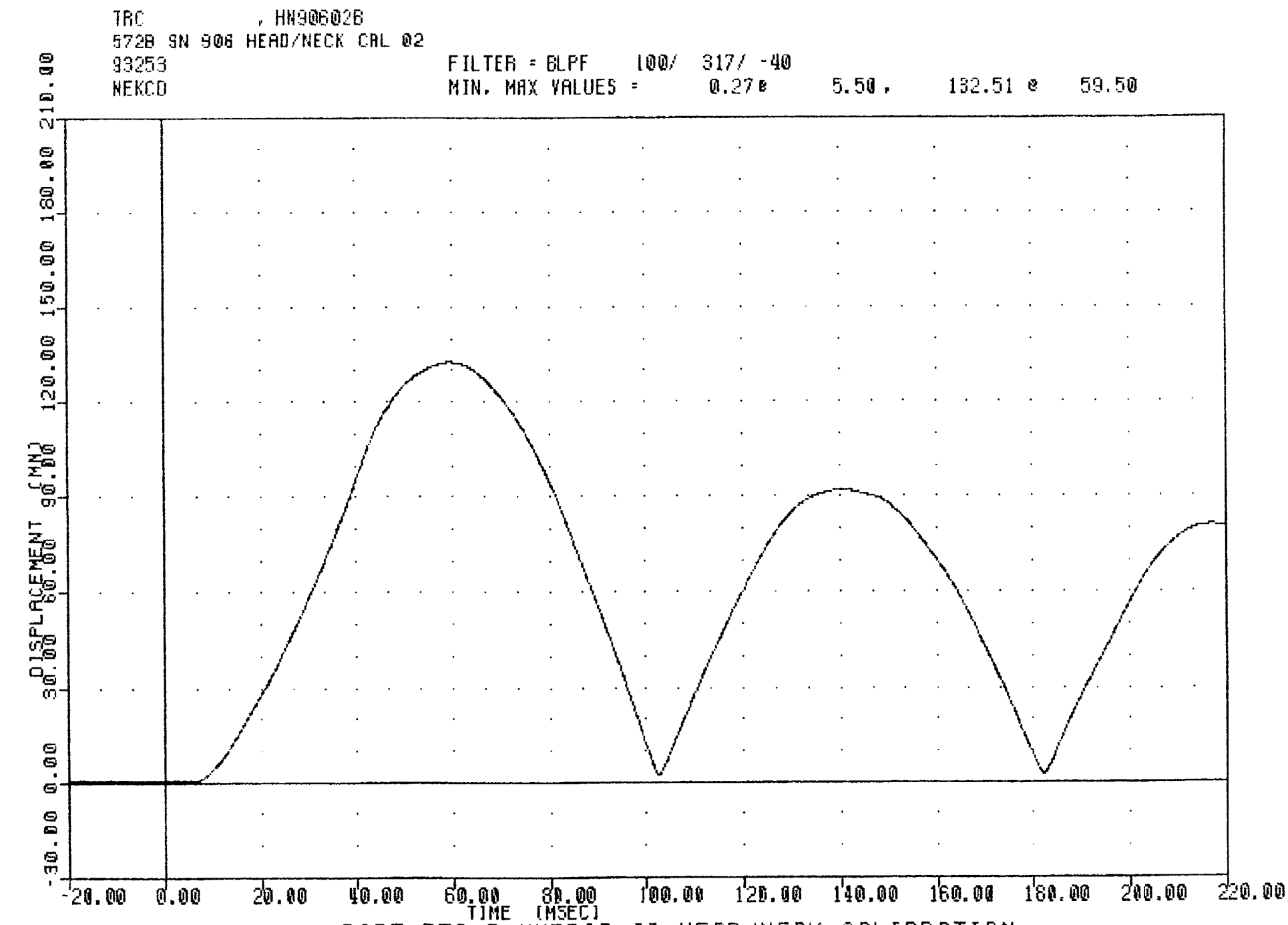


PART 572-B HYBRID II HEAD/NECK CALIBRATION



PART 572-B HYBRID II HEAD/NECK CALIBRATION

NECK DISPLACEMENT Z AXIS



PART 572-S HYBRID II HEAD/NECK CALIBRATION

NECK SHROUD DISPLACEMENT

TRANSPORTATION RESEARCH CENTER INC.

THORACIC SHOCK ABSORBER TESTS

SIDE IMPACT DUMMY

09-Sep-93

TRC

572F SN906 DAMPER TEST CAL02

TEST NOS. DP90602A, DP90602B, DP90602C

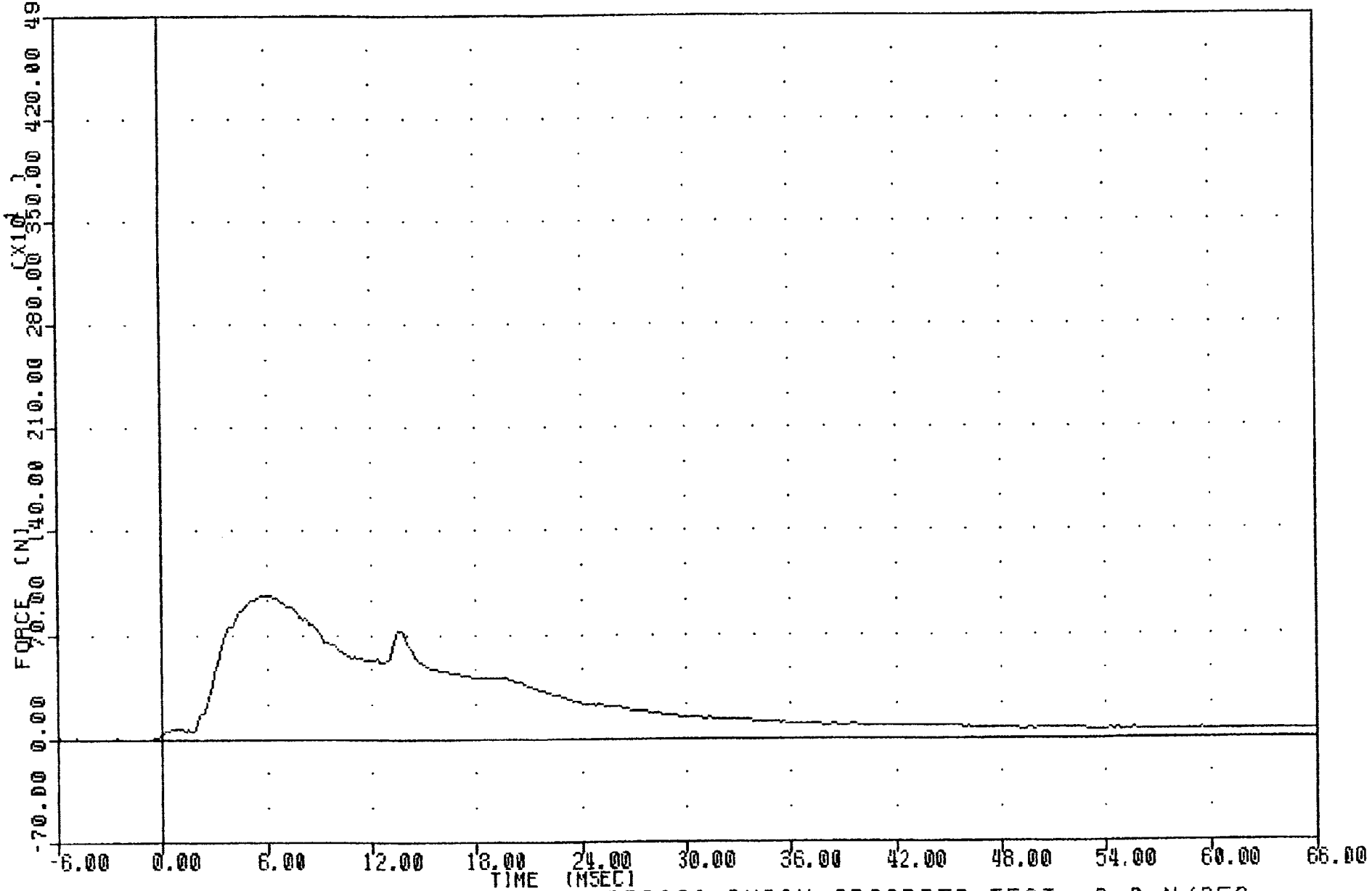
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		18.9 - 25.5 C	20.6 DEG. C
RELATIVE HUMIDITY		10 - 70 %	48.0 %
VELOCITY	FORCE	838 - 1125 N	962 N
3.04 M/S	DISPLACEMENT	31.2 - 35.2 MM	32.3 MM
VELOCITY	FORCE	1925 - 2327 N	2213 N
4.49 M/S	DISPLACEMENT	33.0 - 37.5 MM	34.7 MM
VELOCITY	FORCE	3743 - 4448 N	4164 N
6.10 M/S	DISPLACEMENT	34.4 - 39.5 MM	36.2 MM

DAMPER SETTING = 9.0

TEST MEETS SPECIFICATIONS

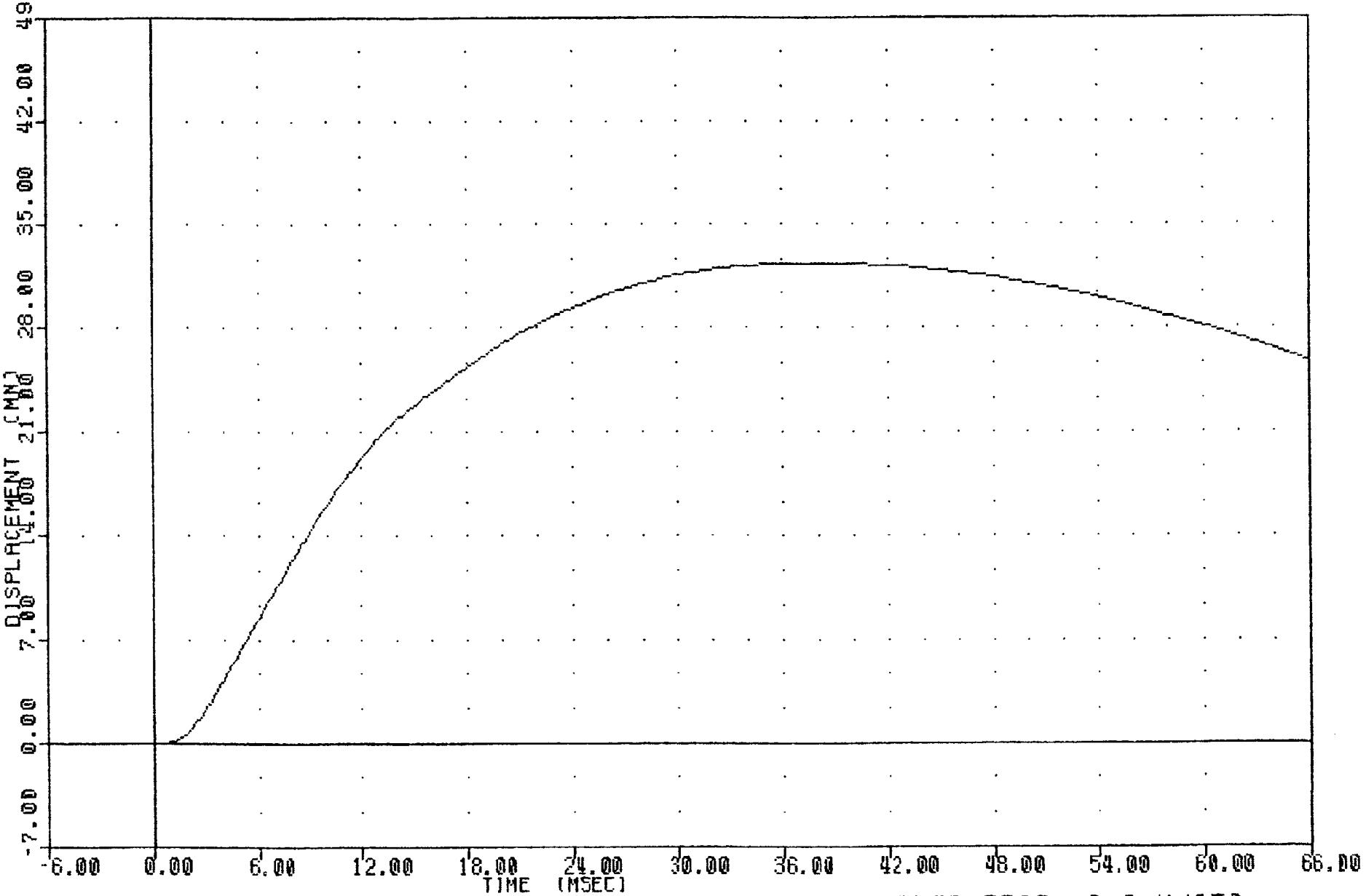
TECHNICIAN Pete Fowt

TRC , DP90602A
572F SN906 DAMPER TEST CAL02
93252 FILTER = ALPF 1650/ 5214/ -40
DAMPF MIN. MAX VALUES = -7.60 @ -5.63 , 961.77 @ 5.75

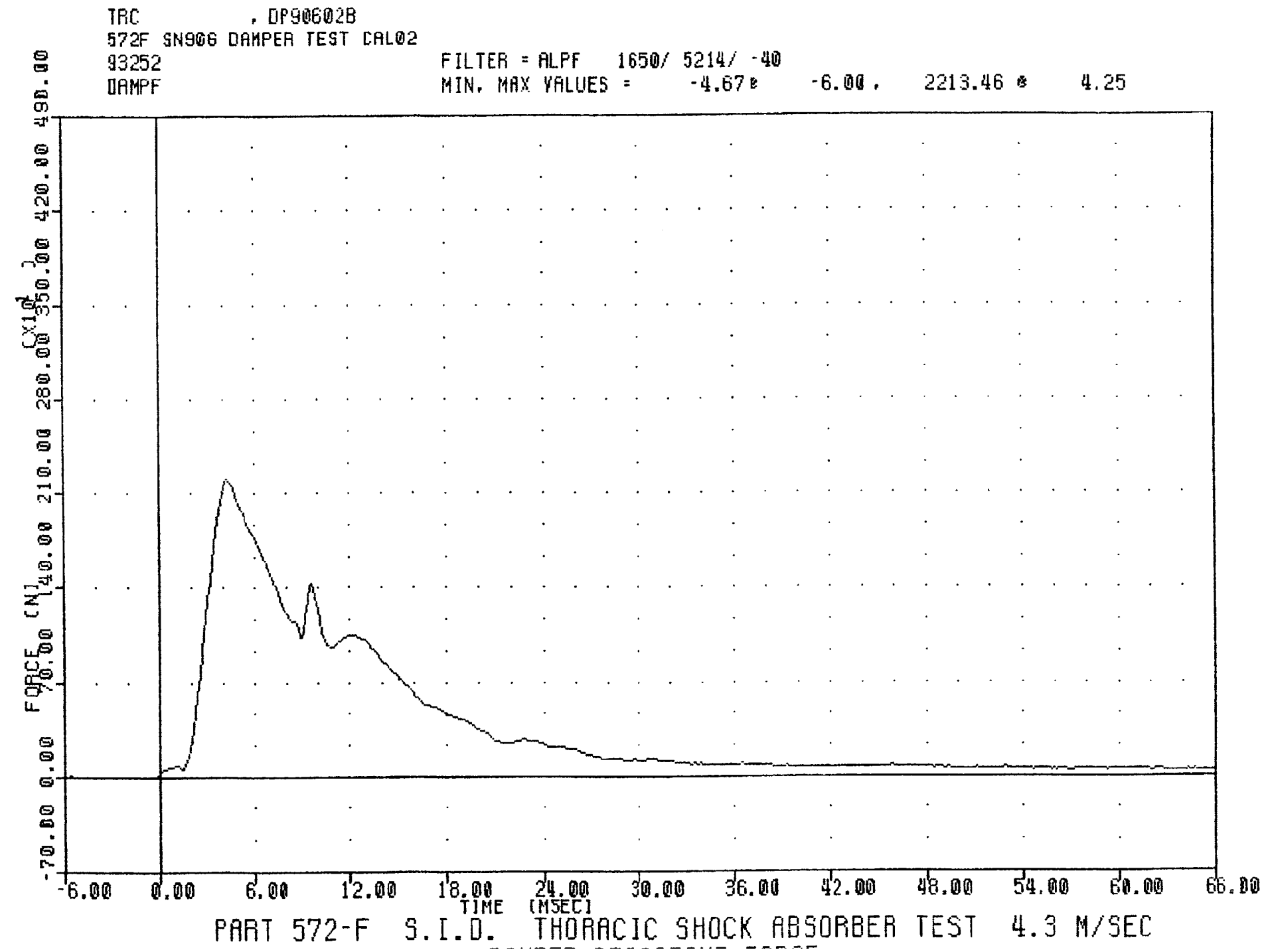


PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 3.0 M/SEC

TRC , DP90602A
572F SN906 DAMPER TEST CAL02
93252 FILTER = ALPF 1650/ 5214/ -40
CSTYD MIN, MAX VALUES = 0.00 @ -6.00 , 32.34 @ 36.50

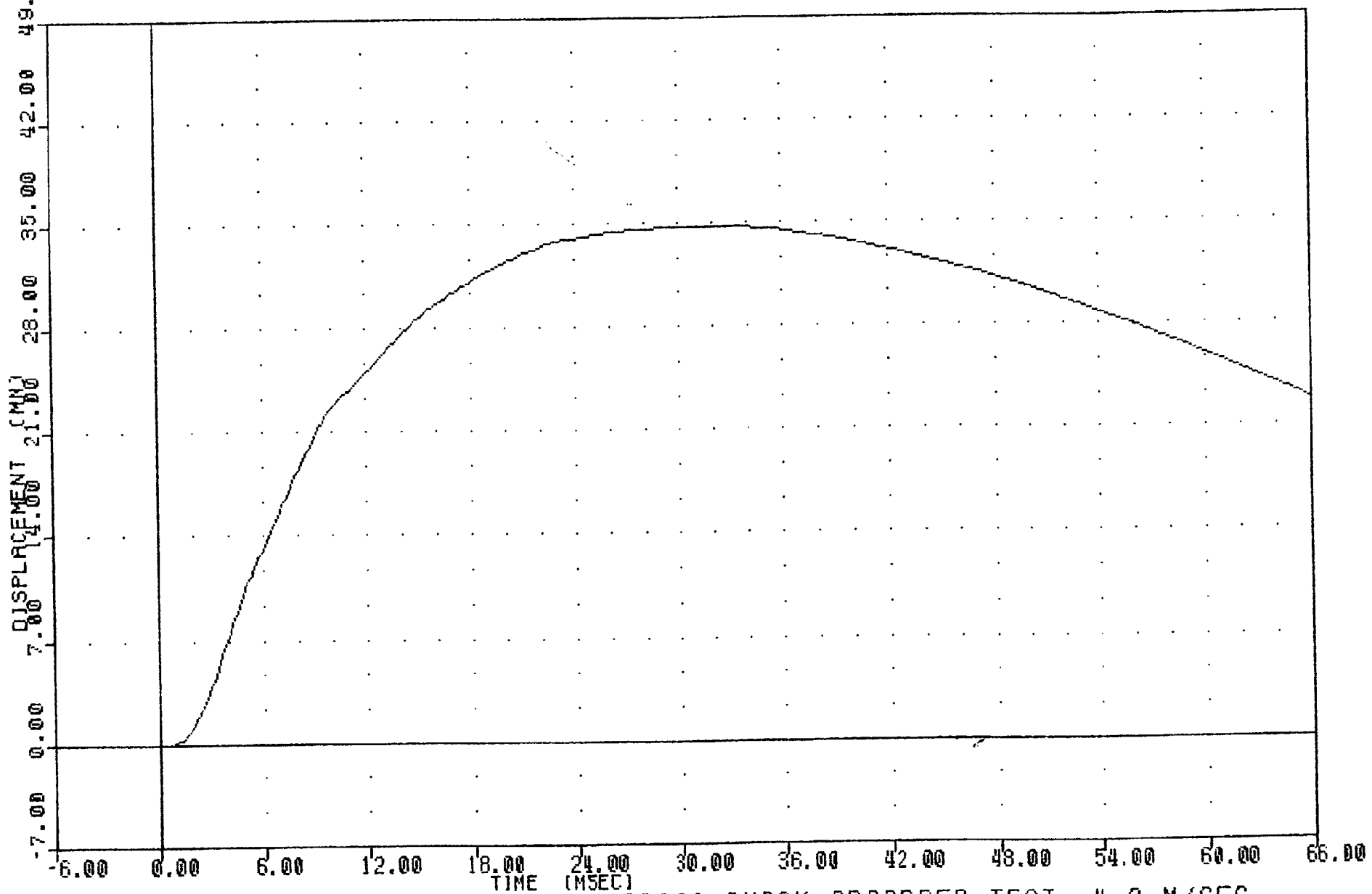


PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 3.0 M/SEC

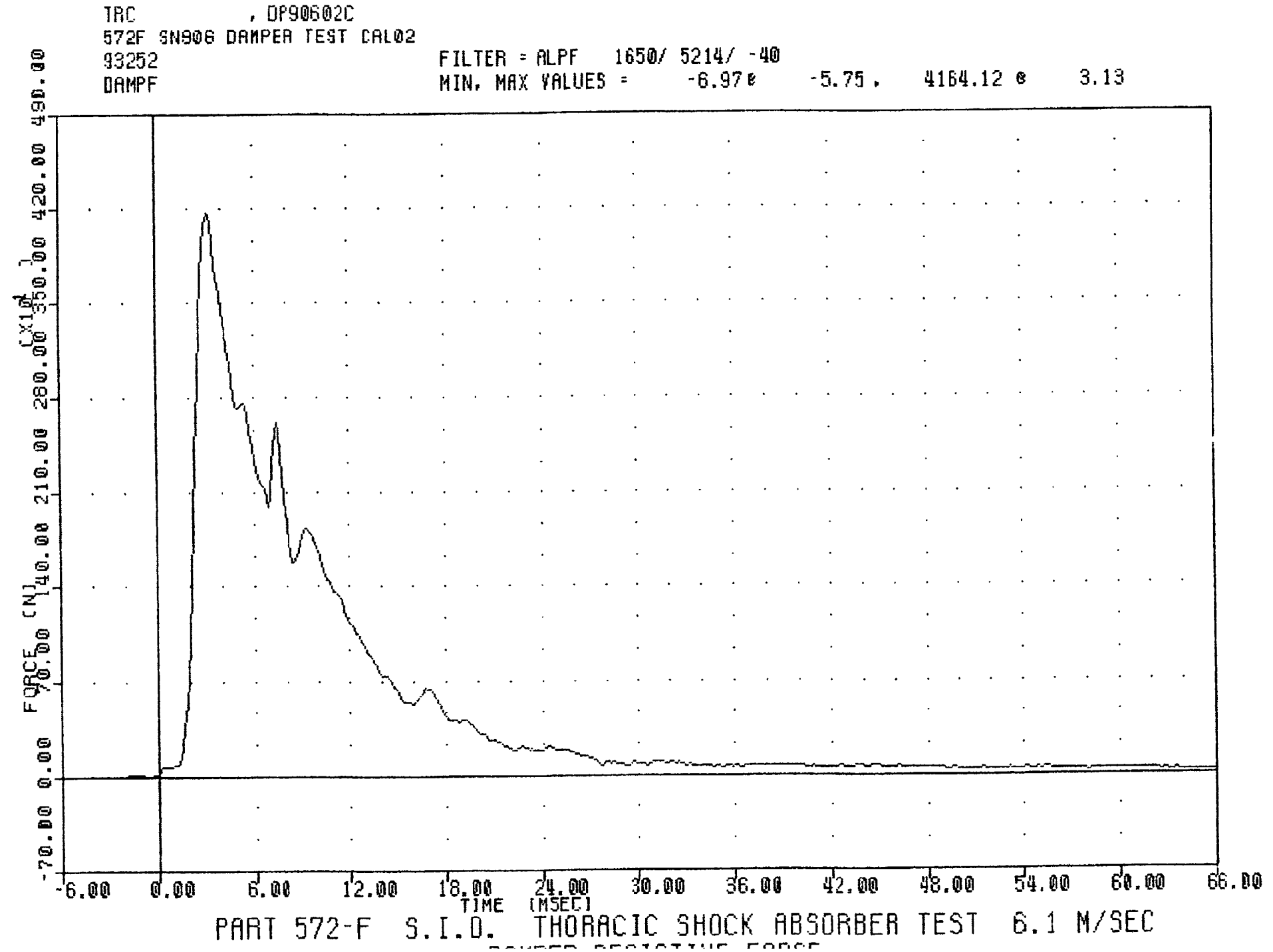

TRC , DP90602B
572F SN906 DAMPER TEST CAL02
93252
DAMPF
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -4.67 @ -6.00 , 2213.46 @ 4.25
FORCE [N] (X10^1)
490.00
420.00
350.00
280.00
210.00
140.00
70.00
0.00
-70.00
-6.00
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
66.00
TIME (MSEC)
PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 4.3 M/SEC

TRC , DP90602B
572F SN906 DAMPER TEST CAL02
93252
CSTYD

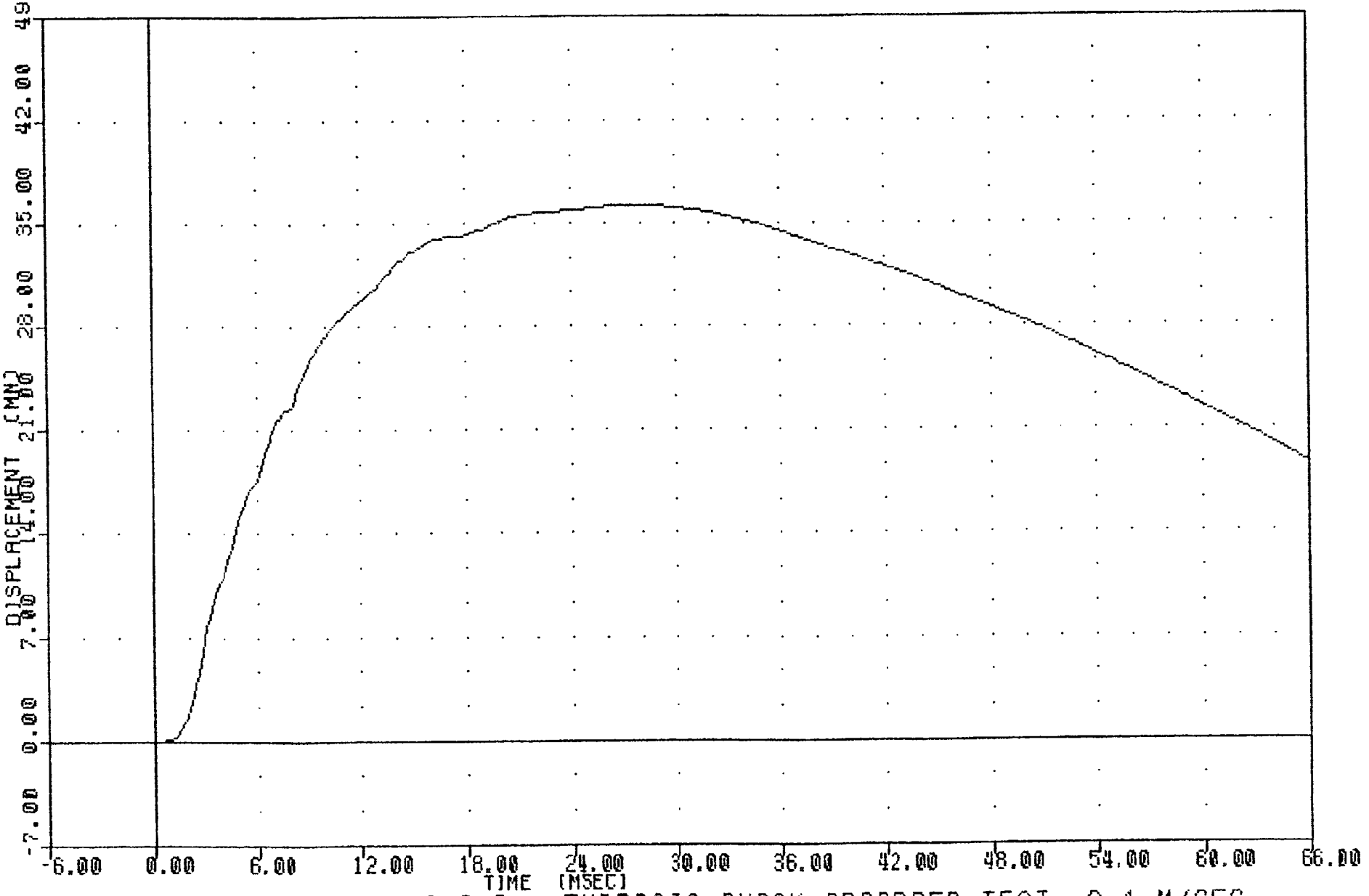
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.00 @ -6.00 , 34.66 @ 29.75



PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 4.3 M/SEC


TRC , DP90602C
572F SN906 DAMPER TEST CAL02
93252
DAMPF
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -6.97 @ -5.75 , 4164.12 @ 3.13
FORCE [N] (X10^1)
490.00
420.00
350.00
280.00
210.00
140.00
70.00
0.00
-70.00
-6.00
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
66.00
TIME [MSEC]
PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 6.1 M/SEC

TRC , DP90602C
572F SN906 DAMPER TEST CAL02
93252 FILTER = ALPF 1650/ 5214/ -40
CSTYD MIN. MAX VALUES = 0.00 @ -6.00 , 36.21 @ 27.38



PART 572-F S.I.D. THORACIC SHOCK ABSORBER TEST 6.1 M/SEC

DAMPER DISPLACEMENT

TRANSPORTATION RESEARCH CENTER INC.

ABDOMEN COMPRESSION TEST

PART 572B 08-SEP-93

TRC AB90602 572B SN 906 ABDOM COMPR CAL 02

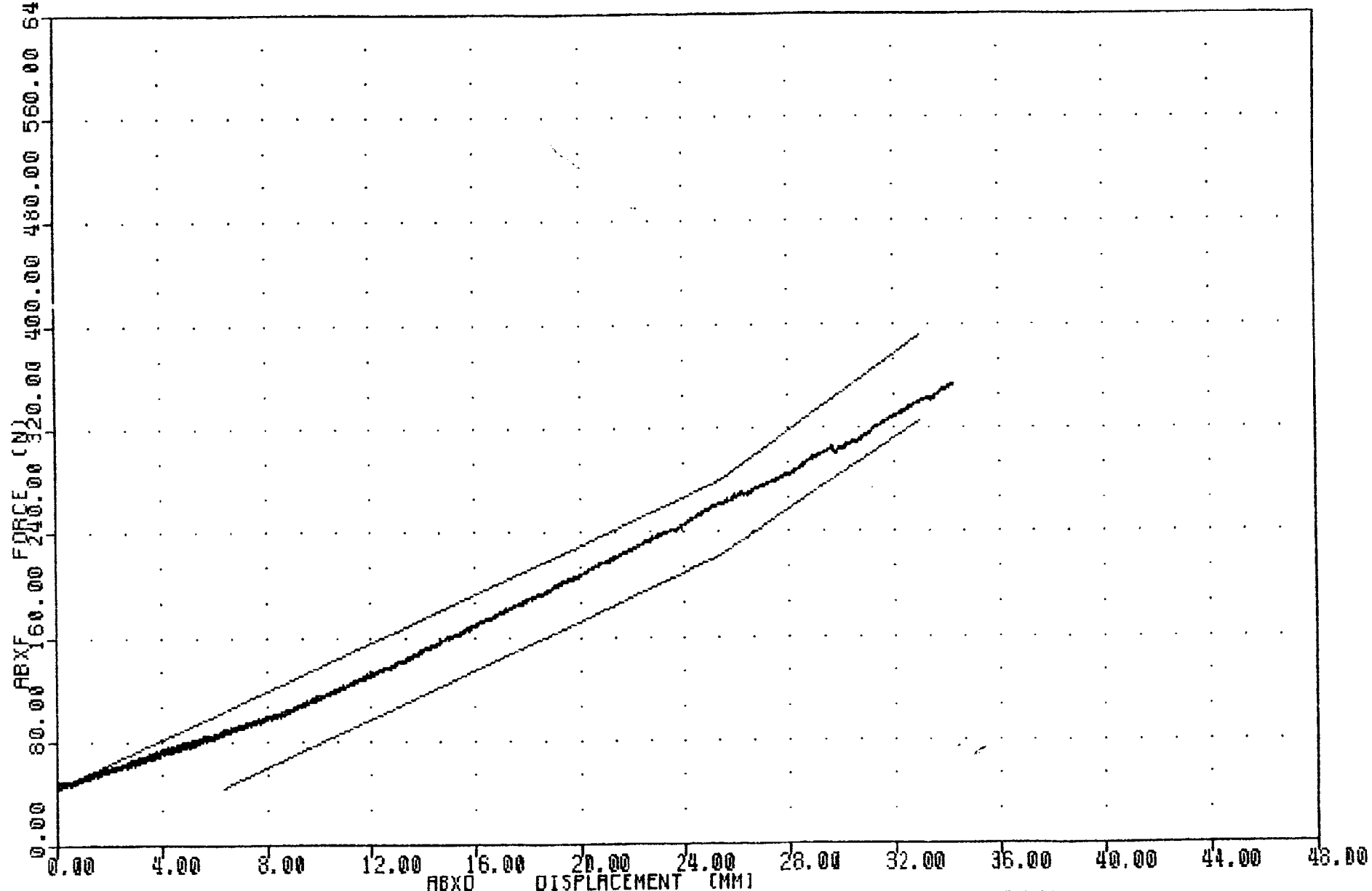
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	20.0 C
RELATIVE HUMIDITY	10 - 70 %	50 %
FORCE AT 0.00 MM DISP.	44.48 N	44.48 N
FORCE AT 12.7 MM DISP.	102.30 - 160.13 N	136.03 N
FORCE AT 19.1 MM DISP.	160.13 - 222.40 N	198.93 N
FORCE AT 25.4 MM DISP.	222.40 - 280.22 N	262.82 N
FORCE AT 33.0 MM DISP.	324.70 - 391.42 N	341.36 N

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Peter Foust

[redacted]

TRC ,AB90602 572B SN 906 ABDOM COMPR CAL 02 93251
ABXD FILTER = ALPF 1650/ 5214/ -40 MIN, MAX = -0.01 @ 0.00 , 34.30 @ 354.45
ABXF FILTER = ALPF 1650/ 5214/ -40 MIN, MAX = 43.81 @ 0.00 , 355.04 @ 34.27



PART 572-B HYBRID II ABDOMEN CALIBRATION

ABDOMEN FORCE VS DISPLACEMENT

TRANSPORTATION RESEARCH CENTER INC.

LUMBAR FLEXION TEST

PART 572B 09-SEP-93

TRC LF90602 572F SN906 LUMBAR FLEX CAL02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	20.0 C
RELATIVE HUMIDITY	10 - 70 %	48 %
FORCE AT 0 DEG FLEXION	-26.69 - +26.69 N	0.00 N
FORCE AT 20 DEG FLEXION	97.86 - 151.24 N	137.89 N
FORCE AT 30 DEG FLEXION	151.24 - 204.62 N	160.13 N
FORCE AT 40 DEG FLEXION	204.62 - 258.00 N	209.06 N
NET RETURN ANGLE	< 12 DEG	5.19 DEG

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Pete Foust

TRANSPORTATION RESEARCH CENTER INC.

LATERAL THORAX IMPACT TEST

SIDE IMPACT DUMMY 09-Sep-93

LEFT SIDE CONFIGURATION

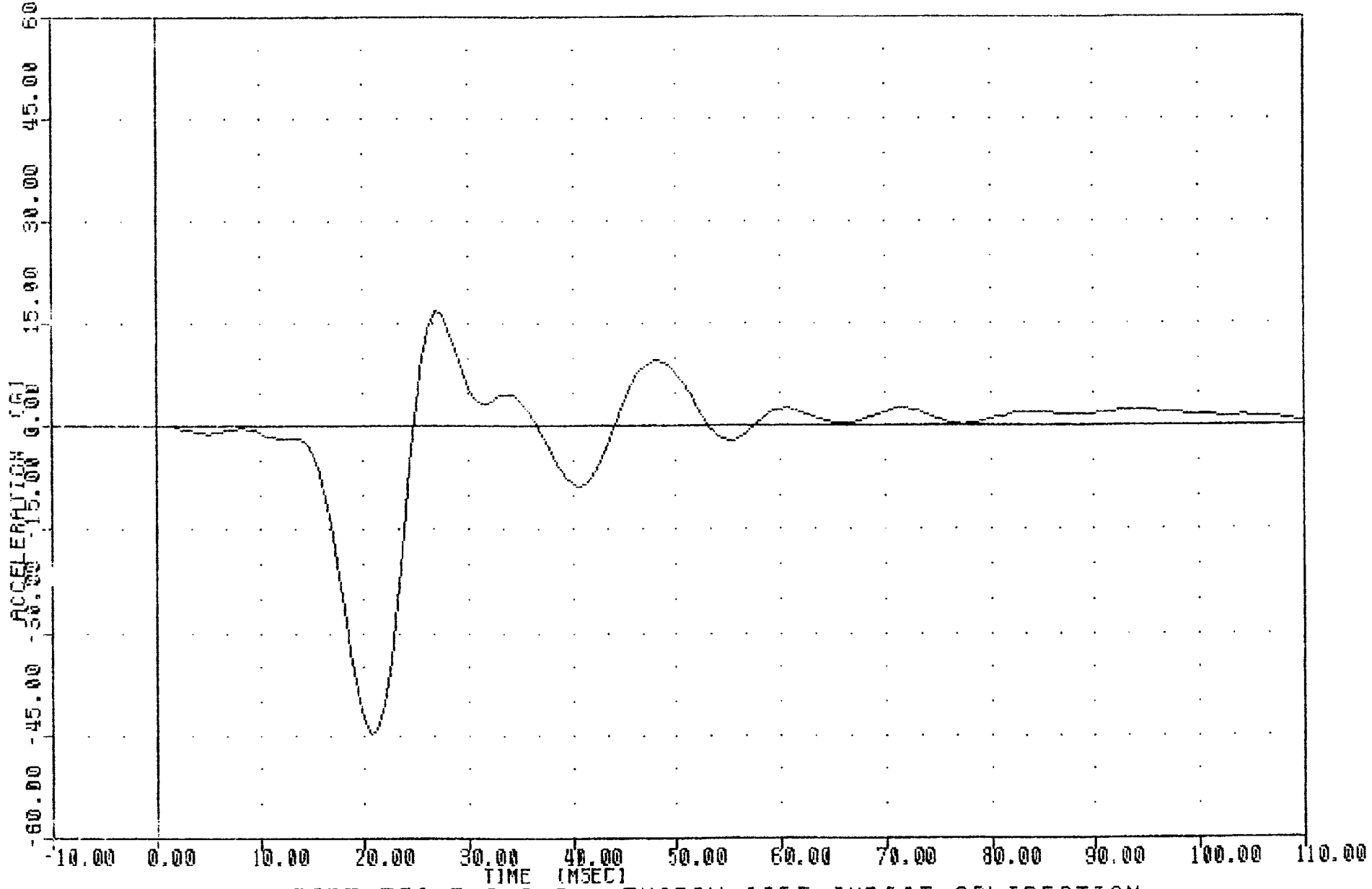
TRC ST90602 572F SN906 THORAX IMPACT CAL02

TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	48.0 %
PISTON VELOCITY	4.21 - 4.32 M/SEC	4.25 M/SEC
PEAK ACCELERATION: UPPER RIB BAR	37 - 46 G	-44.7 G
PEAK ACCELERATION: LOWER RIB BAR	37 - 46 G	-44.5 G
PEAK ACCELERATION: LOWER THORACIC SPINE	15 - 22 G	-19.2 G

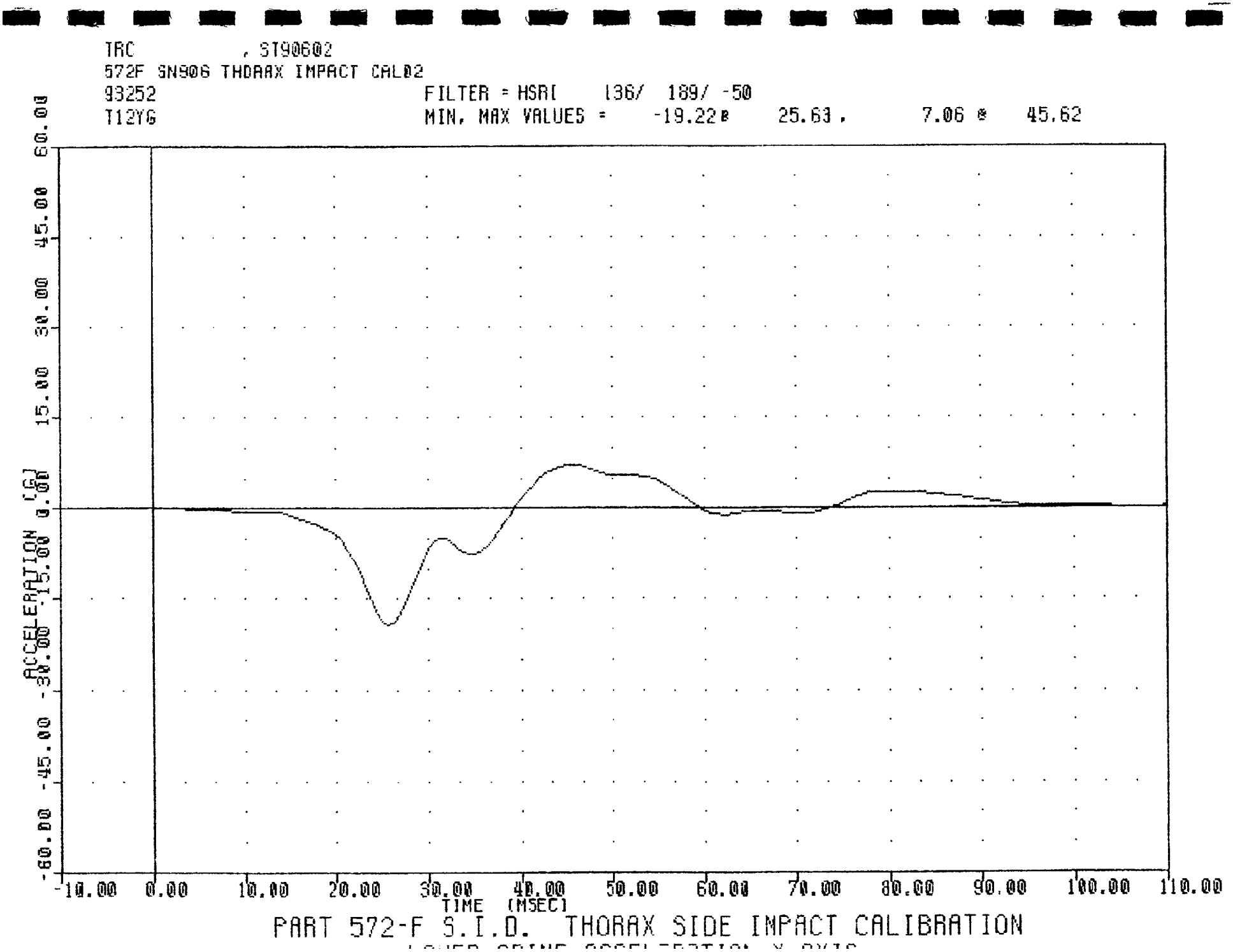
TEST MEETS SPECIFICATIONS

TECHNICIAN Peter Foust

TRC , ST90602
572F SN906 THORAX IMPACT CAL02
93252 FILTER = HSRI 136/ 189/ -50
LURYG MIN, MAX VALUES = -44.72@ 20.62 , 16.83 @ 26.87



PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION



PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION

TRANSPORTATION RESEARCH CENTER INC.

LATERAL PELVIS IMPACT TEST

SIDE IMPACT DUMMY 10-Sep-93

LEFT SIDE CONFIGURATION

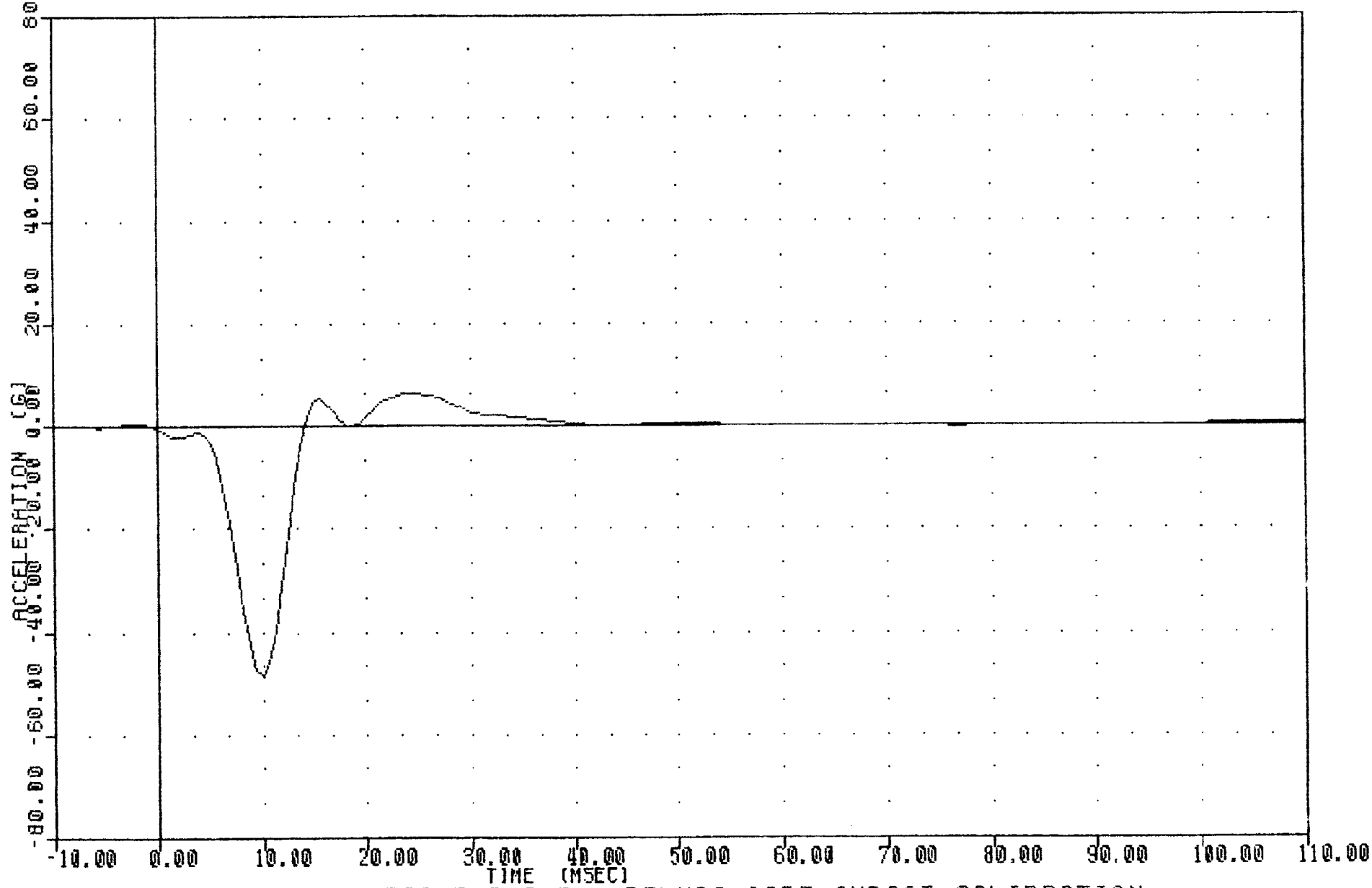
TRC SP90602 572F SN906 PELVIS IMPACT CAL02

TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	50.0 %
PISTON VELOCITY	4.21 - 4.32 M/SEC	4.31 M/SEC
PEAK PELVIC ACCELERATION	40 - 60 G	-48.5 G
TIME ABOVE 20 G LEVEL	3 - 7 MSEC	5.6 MSEC
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN Pete Foust

TRC , SP90602
572F SN906 PELVIS IMPACT CAL02
93253 FILTER = HSRI 136/ 189/ -50
PEVYG MIN, MAX VALUES = -48.52 @ 10.00 , 6.38 @ 24.38



PART 572-F S.I.D. PELVIS SIDE IMPACT CALIBRATION

PELVIS ACCELERATION Y AXIS

POST-TEST CALIBRATION

LEFT REAR PASSENGER DUMMY S/N 906

TRANSPORTATION RESEARCH CENTER INC.

LATERAL THORAX IMPACT TEST

SIDE IMPACT DUMMY

23-Sep-93

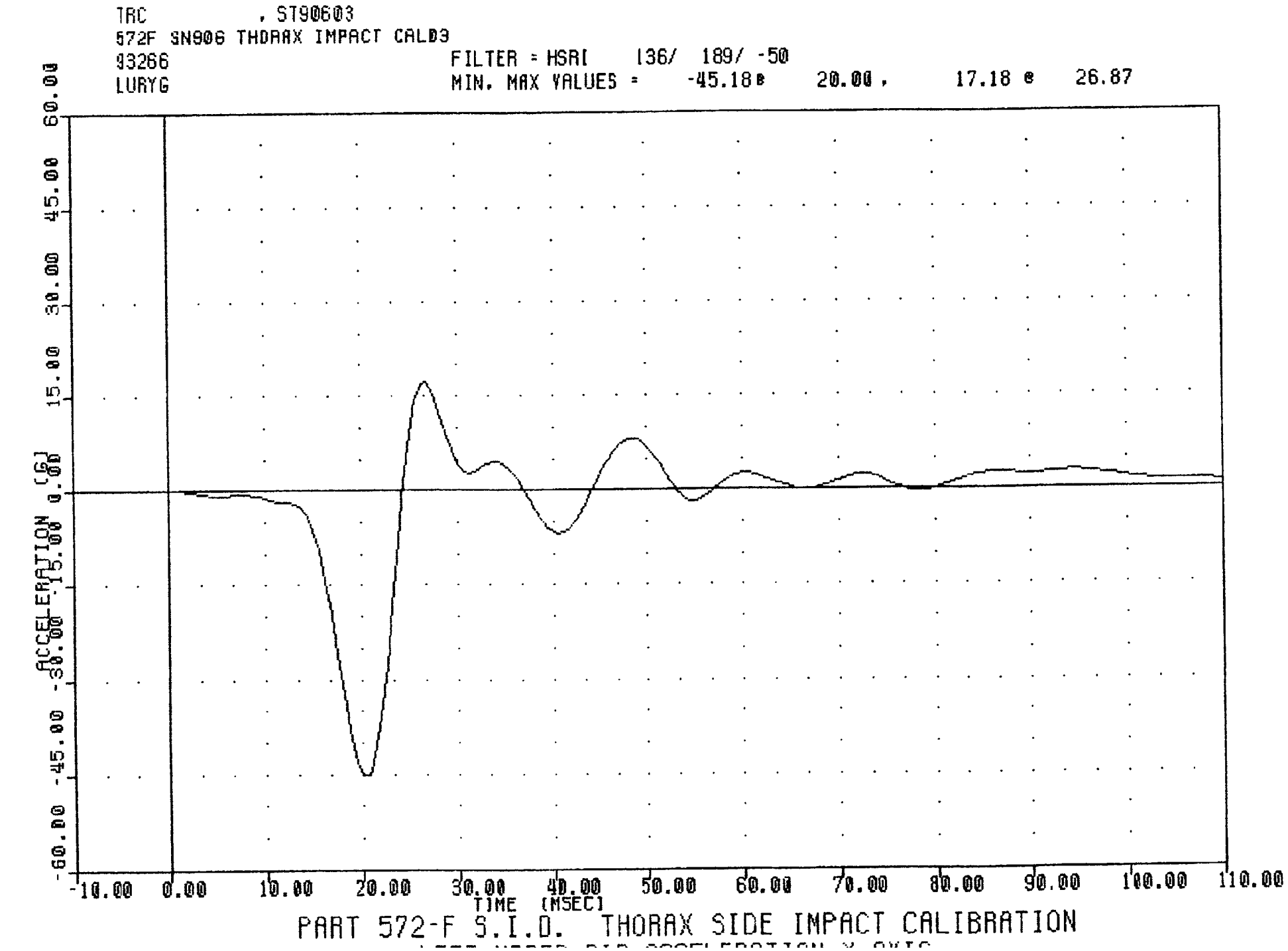
LEFT SIDE CONFIGURATION

TRC ST90603 572F SN906 THORAX IMPACT CAL03

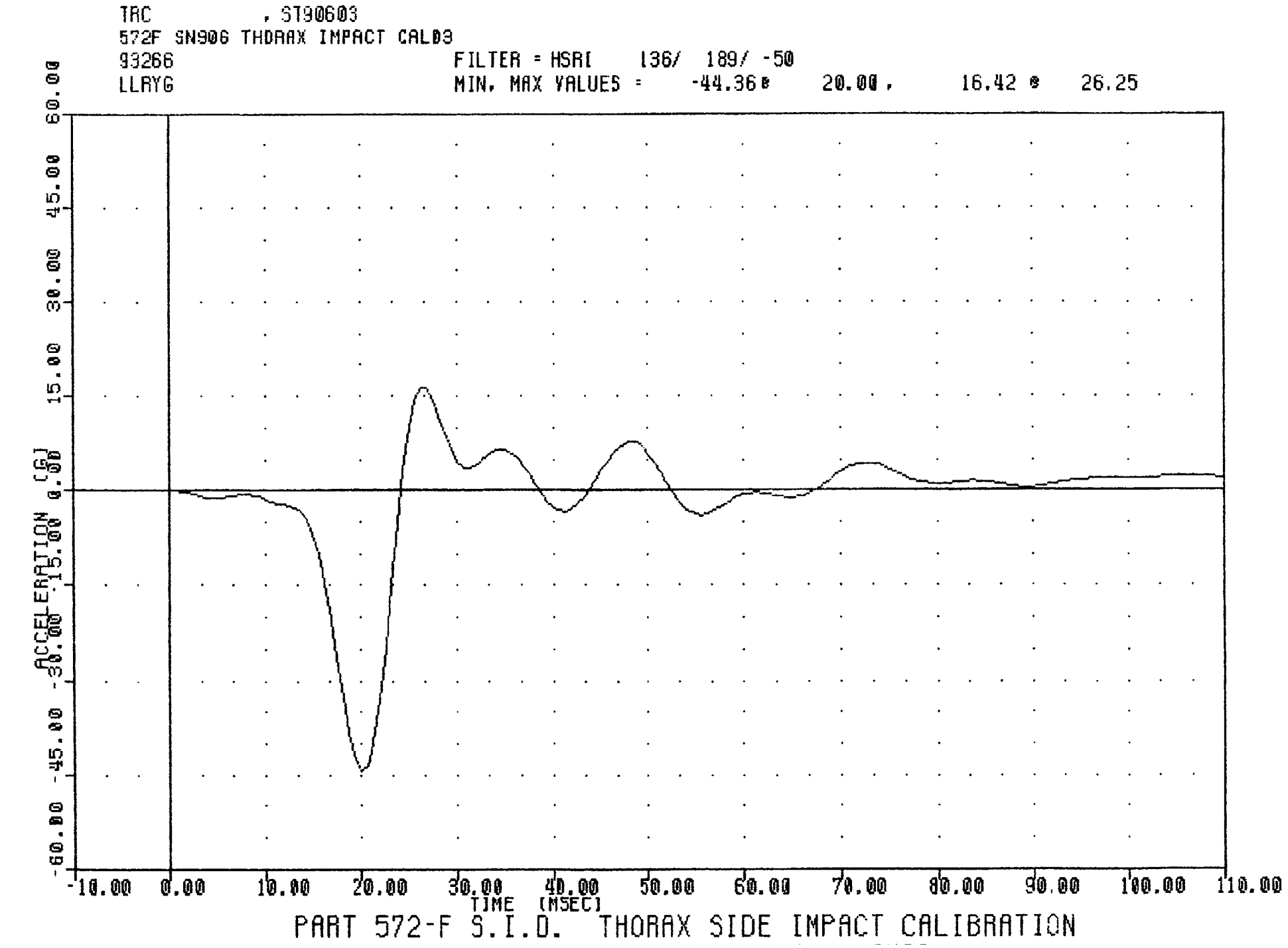
TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	61.0 %
PISTON VELOCITY	4.21 - 4.32 M/SEC	4.25 M/SEC
PEAK ACCELERATION: UPPER RIB BAR	37 - 46 G	-45.2 G
PEAK ACCELERATION: LOWER RIB BAR	37 - 46 G	-44.4 G
PEAK ACCELERATION: LOWER THORACIC SPINE	15 - 22 G	-17.8 G

TEST MEETS SPECIFICATIONS _____

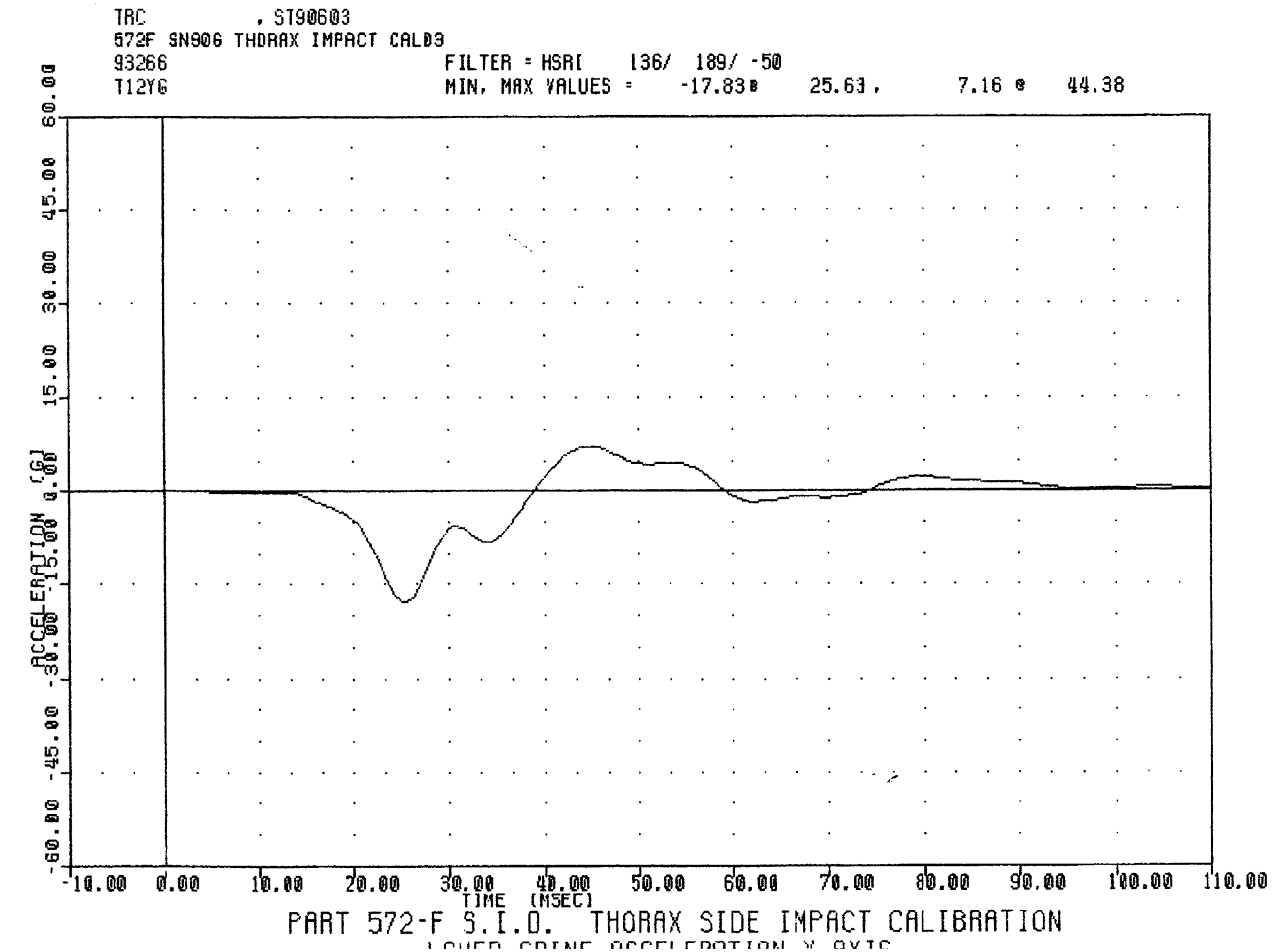
TECHNICIAN Peter Foust



PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION



PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION



PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION

LOWER SPINE ACCELERATION X AXIS

TRANSPORTATION RESEARCH CENTER INC.

LATERAL PELVIS IMPACT TEST

SIDE IMPACT DUMMY

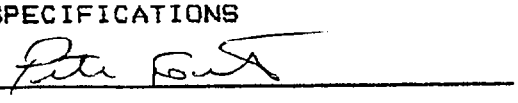
23-Sep-93

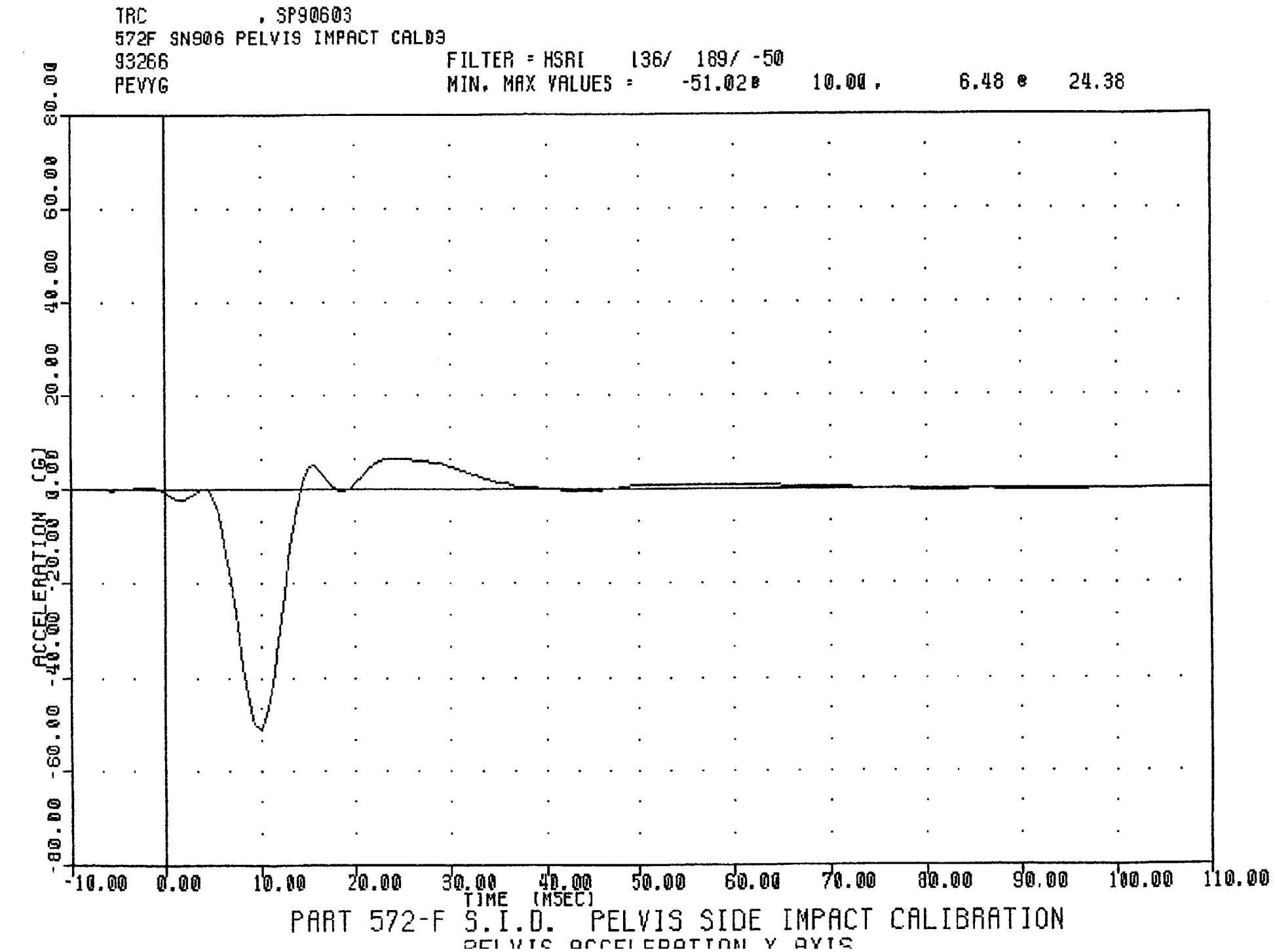
LEFT SIDE CONFIGURATION

TRC SP90603 572F SN906 PELVIS IMPACT CAL03

TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	61.0 %
PISTON VELOCITY	4.21 - 4.32 M/SEC	4.31 M/SEC
PEAK PELVIC ACCELERATION	40 - 60 G	-51.0 G
TIME ABOVE 20 G LEVEL	3 - 7 MSEC	5.7 MSEC
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN 



PART 572-F S.I.D. PELVIS SIDE IMPACT CALIBRATION

PELVIS ACCELERATION Y AXIS

APPENDIX D

MISCELLANEOUS TEST INFORMATION

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: NHTSA/903

SEATING POSITION: DRIVER

MNEMONIC	LOCATION	AXIS	MFR.	MODEL	S/N	ORIENTATION (+ SENSING)
HEDXG1	HEAD	X	ENDEVCO	7264	DC72J	REAR
HEDYG1	HEAD	Y	ENDEVCO	7264	BF42J	LEFT
HEDZG1	HEAD	Z	ENDEVCO	7264	EH75J	UP
T01XG1	UPPER SPINE	X	ENDEVCO	7264	DE99J	REAR
T01YG1	UPPER SPINE	Y	ENDEVCO	7264	FG43J	LEFT
T01YGA	UPPER SPINE REDUNDANT	Y	ENDEVCO	7264	EJ62J	LEFT
T01ZG1	UPPER SPINE	Z	ENDEVCO	7264	BE02J	UP
T12XG1	LOWER SPINE	X	ENDEVCO	7264	BF65J	FORWARD
T12YG1	LOWER SPINE	Y	ENDEVCO	7264	EJ59J	LEFT
T12YGA	LOWER SPINE REDUNDANT	Y	ENDEVCO	7264	BE24J	LEFT
T12ZG1	LOWER SPINE	Z	ENDEVCO	7264	BH31J	UP
LURYG1	LEFT UPPER RIB	Y	ENDEVCO	7264	EY99J	RIGHT
LURYGA	LEFT UPPER RIB REDUNDANT	Y	ENDEVCO	7264	DC54J	RIGHT
LLRYG1	LEFT LOWER RIB	Y	ENDEVCO	7264	FJ66J	RIGHT
LLRYGA	LEFT LOWER RIB REDUNDANT	Y	ENDEVCO	7264	FC60J	RIGHT
PEVXG1	PELVIS	X	ENDEVCO	7264	FB67J	REAR
PEVYG1	PELVIS	Y	ENDEVCO	7264	DF92J	LEFT
PEVZG1	PELVIS	Z	ENDEVCO	7264	BE50J	UP

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: NHTSA/906

SEATING POSITION: LEFT REAR PASSENGER

MNEMONIC	LOCATION	AXIS	MFR.	MODEL	S/N	ORIENTATION (+ SENSING)
HEDXG4	HEAD	X	ENDEVCO	7264	BH72J	REAR
HEDYG4	HEAD	Y	ENDEVCO	7264	AAMB4	LEFT
HEDZG4	HEAD	Z	ENDEVCO	7264	EH65J	UP
T01XG4	UPPER SPINE	X	ENDEVCO	7264	BE39J	REAR
T01YG4	UPPER SPINE	Y	ENDEVCO	7264	BE68J	LEFT
T01YGD	UPPER SPINE REDUNDANT	Y	ENDEVCO	7264	EJ94J	LEFT
T01ZG4	UPPER SPINE	Z	ENDEVCO	7264	BE56J	UP
T12XG4	LOWER SPINE	X	ENDEVCO	7264	BD91J	FORWARD
T12YG4	LOWER SPINE	Y	ENDEVCO	7264	ET59J	LEFT
T12YGD	LOWER SPINE REDUNDANT	Y	ENDEVCO	7264	CB70H	LEFT
T12ZG4	LOWER SPINE	Z	ENDEVCO	7264	DC20J	UP
LURYG4	LEFT UPPER RIB	Y	ENDEVCO	7264	CR39H	RIGHT
LURYGD	LEFT UPPER RIB REDUNDANT	Y	ENDEVCO	7264	DD92J	RIGHT
LLRYG4	LEFT LOWER RIB	Y	ENDEVCO	7264	BT29J	RIGHT
LLRYGD	LEFT LOWER RIB REDUNDANT	Y	ENDEVCO	7264	FG97J	RIGHT
PEVXG4	PELVIS	X	ENDEVCO	7264	BH95J	REAR
PEVYG4	PELVIS	Y	ENDEVCO	7264	DM66J	LEFT
PEVZG4	PELVIS	Z	ENDEVCO	7264	EH85J	UP

VEHICLE INSTRUMENTATION PLACEMENT

MNEMONIC	LOCATION	AXIS	MFR.	MODEL	S/N	ORIENTATION (+ SENSING)
RFSXG1	RIGHT FRONT SILL	X	ENDEVCO	7264	AT38	FRONT
RFSYG1	RIGHT FRONT SILL	Y	ENDEVCO	7264	AG24	LEFT
RFSZG1	RIGHT FRONT SILL	Z	ENDEVCO	7264	AU31	UP
LFSYG1	LEFT FRONT SILL	Y	ENDEVCO	7264	AR16	LEFT
LFDYG1	LEFT FRONT DOOR CENTERLINE	Y	ENDEVCO	7264	AR38	LEFT
LFDYG3	LEFT FRONT DOOR MID-REAR	Y	ENDEVCO	7264	AZ88	LEFT
LFDYG2	LEFT FRONT DOOR UPPER CENTERLINE	Y	ENDEVCO	7264	AY59	LEFT
RDKXG1	REAR FLOORPAN OVER AXLE	X	ENDEVCO	7264	AU09	REAR
RDKYG1	REAR FLOORPAN OVER AXLE	Y	ENDEVCO	7264	AS95	LEFT
RDKZG1	REAR FLOORPAN OVER AXLE	Z	ENDEVCO	7264	BA46	UP

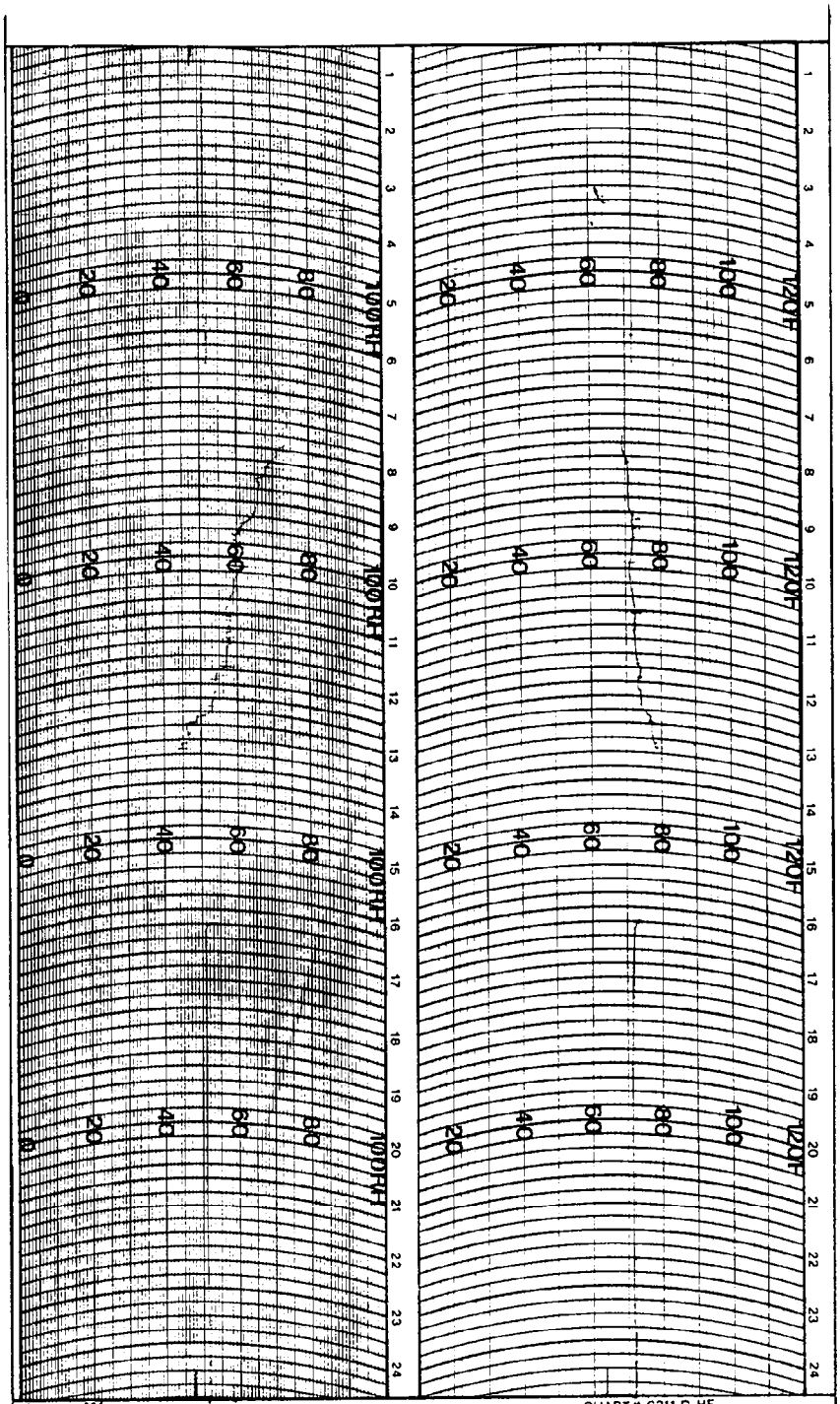
MOVING DEFORMABLE BARRIER INSTRUMENTATION PLACEMENT

MNEMONIC	LOCATION	AXIS	MFR.	MODEL	S/N	ORIENTATION (+ SENSING)
BCGXG	CENTER OF GRAVITY	X	ENDEVCO	7264	AR49	REAR
BCGYG	CENTER OF GRAVITY	Y	ENDEVCO	7264	AY66	RIGHT
BCGZG	CENTER OF GRAVITY	Z	ENDEVCO	7264	AZ67	UP
BSRXG	LEFT FRAME RAIL OVER REAR AXLE	X	ENDEVCO	7264	AY89	REAR
BSRYG	LEFT FRAME RAIL OVER REAR AXLE	Y	ENDEVCO	7264	BA68	RIGHT

FREQUENCY RESPONSE CLASSES
NHTSA LABORATORY PROCEDURE TP-214D-02

TYPICAL TEST MEASUREMENTS	CHANNEL CLASS
Vehicle structural acceleration 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 acceleration	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.


0
20
40
60
80
100
%RH
120°F
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
WEATHER MEASURE
P.O. BOX 41257
SACRAMENTO CA. 95841
PHONE (916)481-7565
HYGROTHERMOGRAPH
1 DAY
CHART # C311 D HF
PART # 699123
STATION 930917 DATE ON _____ DATE OFF _____
OCCUPANT COMPARTMENT THERMOGRAPH