V2114

1986 FORD F150 PICKUP TRUCK
INTO A RIGID POLE AT 20 MPH
TRC TEST NO. 930322

PREPARED BY:
TRANSPORTATION RESEARCH CENTER INC.
10820 STATE ROUTE 347
EAST LIBERTY, OHIO 43319

MARCH - APRIL 1993
FINAL REPORT

PREPARED FOR:
VEHICLE RESEARCH AND TEST CENTER
P. O. BOX 37
EAST LIBERTY, OH 43319

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16. Abstract

This 20 mph 270° driver's side impact test was conducted at Transportation Research Center Inc. on March 22, 1993. The test vehicle, a 1986 Ford F150 pickup truck, was propelled laterally into a rigid, vertical, 12-inch diameter pole at 20.3 mph. This test was conducted to determine the fuel tank integrity and occupant response of the truck in the 20 mph, 270°, driver's side impact mode. The truck's impact velocity was 20.3 mph. The truck's maximum static crush was 23.5 inches and no fuel leakage was observed. The ambient temperature was 72° F.

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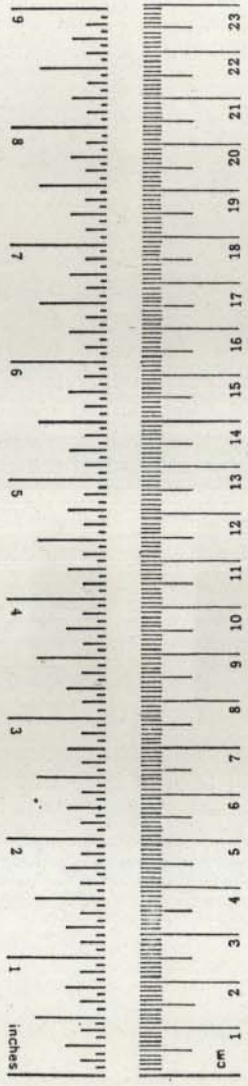
METRIC CONVERSION FACTORS

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

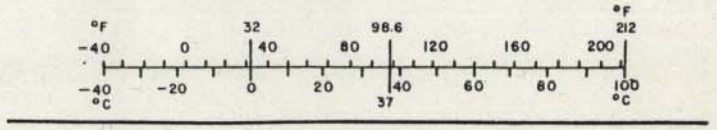


TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

SECTION 1.0

PURPOSE & TEST PROCEDURE

PURPOSE

This 20 mph 270° 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 determine the occupant response and fuel tank integrity in the 20 mph 270° driver's side rigid pole impact mode.

TEST PROCEDURE

This test measured the occupant response and fuel tank integrity of a 1986 Ford F150 pickup truck impacting a rigid 12-inch diameter pole in the 20 mph 270° driver's side impact mode.

The Ford F150 pickup truck was instrumented with six (6) accelerometers to measure lateral axis accelerations. The truck was placed at a 90° angle to the tow cable system prior to impact. The pole contacted the truck at the cab/bed intersection 9.5 inches rearward of the driver's side wheelbase mid-point. The 12-inch diameter rigid pole was attached to the rigid barrier at Transportation Research Center Inc. (TRC). The pole was instrumented with four load cells to measure forces in the truck's lateral direction.

The truck contained one (1) Part 572 F side impact adult male anthropomorphic test device (dummy). The dummy was positioned in the left front outboard designated seating position using the dummy placement procedure specified as an attachment to the FMVSS 214 Laboratory Test Procedure as a guideline. The dummy was instrumented with spine and rib accelerometers to measure lateral accelerations. Head and pelvis accelerometers were used to measure longitudinal, lateral, and vertical axis accelerations. The dummy was restrained with a three-point unibelt.

The twenty-eight (28) data channels were multiplexed and recorded on a 14-track tape drive. The data was digitally sampled at 8000 samples per second and processed per section 12 of the FMVSS 214 Laboratory Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and seven (7) high-speed motion picture cameras. The pre-test and post-test conditions were recorded by one (1) real-time motion picture camera.

The vehicle and occupant data are summarized in Section 2.0. The vehicle, occupant, and camera measurements are presented in Section 3.0. 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

TEST SUMMARY

TEST RESULTS SUMMARY

This 20 mph 270° driver's side rigid pole impact test was conducted on a 1986 Ford F150 pickup truck at TRC on March 22, 1993.

The truck was propelled laterally so that the driver's side impacted a rigid, vertical, 12-inch diameter pole at 20.3 mph. The truck was equipped with a 4.9-liter, 6-cylinder, inline engine, manual transmission, power steering, and power brakes. The truck sustained a maximum static crush of 23.5 inches and no fuel leakage was observed.

The driver's Thoracic Trauma Index (TTI) calculation and Head Injury Criteria (HIC) were 7.8 and 368 respectively; maximum pelvis lateral acceleration was 14.7 g.

SECTION 3.0

VEHICLE, OCCUPANT, AND CAMERA INFORMATION

TABLE 1 CRASH TEST SUMMARY

TEST TYPE: Vehicle into Rigid Pole

TEST DATE: 03/22/93

TEST TIME: 1130

AMBIENT TEMPERATURE AT IMPACT AREA (°F): 72

TEMPERATURE IN OCCUPANT COMPARTMENT (°F): 74

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1986/Ford/F150/pickup truck

VEHICLE TEST WEIGHT (LBS): 4137

IMPACT POINT (IN)*: 9.5

IMPACT ANGLE (DEG)**: 270

IMPACT VELOCITY (MPH): 20.3

VEHICLE MAXIMUM STATIC CRUSH (IN): 23.5

DUMMIES:	Driver #903		
TYPE:	Part 572 F		
LOCATION:	Left front		
RESTRAINT:	3-point unibelt		
NUMBER OF DATA CHANNELS:	28		
NUMBER OF CAMERAS:	HIGH-SPEED 7	REAL-TIME	2

*The point where the center of the pole meets the edge of the vehicle as measured rearward of the vehicle's wheelbase mid-point.
**Measured clockwise from vehicle's front longitudinal centerline.

TABLE 2 VEHICLE INFORMATION

VEHICLE MANUFACTURER: Ford Motor Company

MAKE/MODEL: Ford/F150 VIN: 2FTCF15Y9GCB11004

BODY STYLE: pickup truck MODEL YEAR: 1986

COLOR: Red

ENGINE DATA: TYPE: Inline CYLINDERS: 6 DISPLACEMENT: 4.9-liter

TRANSMISSION DATA: _4_SPEED, _X_MANUAL, ___AUTOMATIC, ___FWD, _X_RWD, ___4WD

DATE VEHICLE RECEIVED: 03/17/93 ODOMETER READING: 92,905

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	No
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	No
OTHER	None		

REMARKS:

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

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Ford Motor Company

DATE OF MANUFACTURE: 04/86 VIN: 2FTCF15Y9GCB11004

GVWR: 4900 LBS

GAWR: FRONT: 2500 LBS., REAR: 2684 LBS.

TABLE 2 VEHICLE INFORMATION, CONT'D.

TIRES ON VEHICLE (MFR., LINE, SIZE): Remington, XT-120, P235/70R15

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

SPARE TIRE (MFR., LINE, SIZE): None

TYPE OF SEATS: FRONT: Bench
REAR: None

TYPE OF FRONT SEAT BACKS: Not adjustable

MAXIMUM WIDTH: 78.2 INCHES

WHEELBASE: 133.5 INCHES

TEST FLUID DATA:

MEASURED FUEL TANK CAPACITY: 21.5 GAL.

TANK TEST VOLUME: 20.0 GAL.

TEST FLUID TYPE: PURPLE STODDARD SOLVENT #2

SPECIFIC GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES.

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:
The label was located on the driver's side B-pillar.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P215/75R15

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

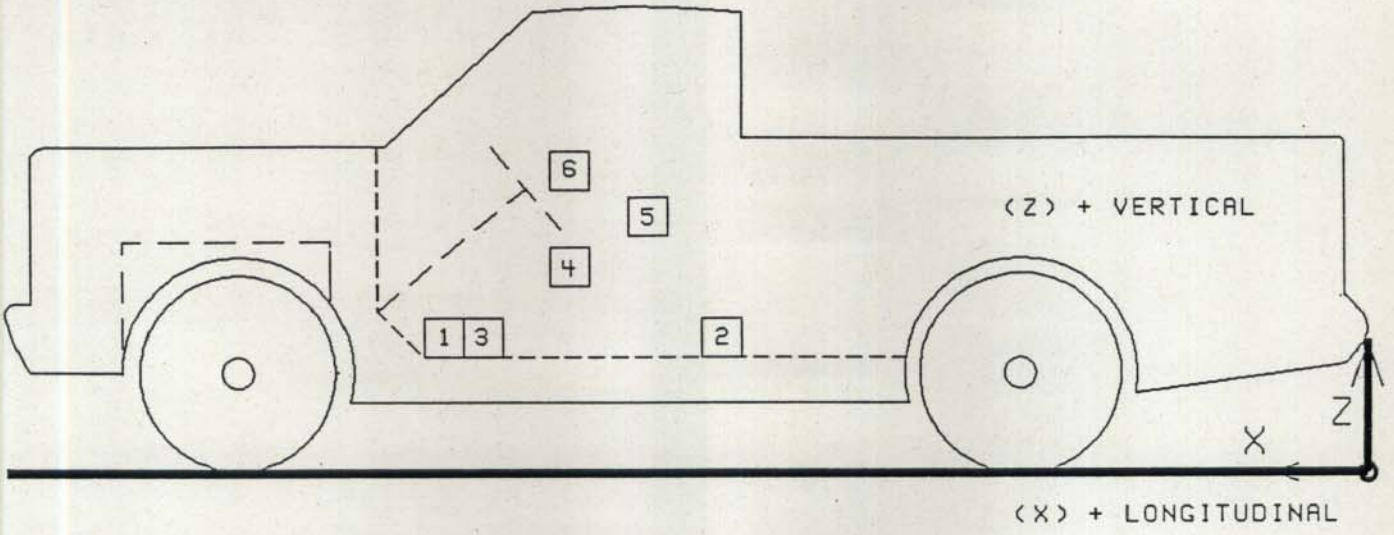
DESIGNATED SEATING CAPACITY: NA FRONT NA REAR NA TOTAL

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

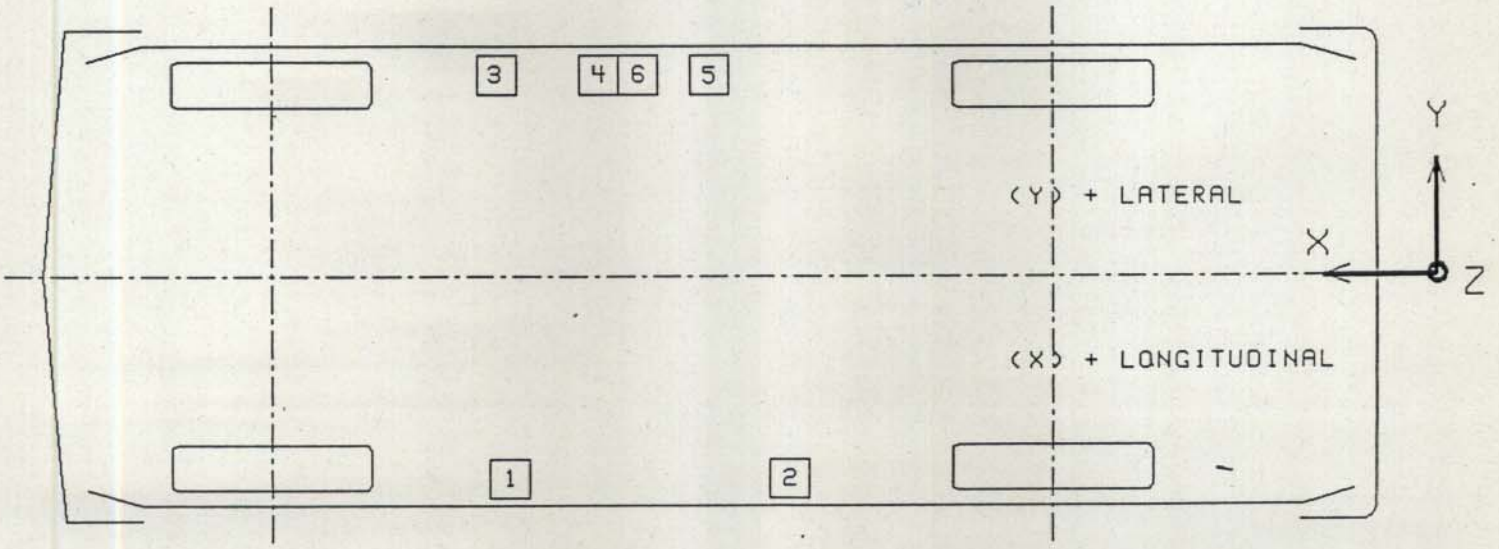
DELIVERED ATTITUDE:	LF	30.9;	RF	31.0;	LR	32.4;	RR	32.9
PRE-TEST ATTITUDE:	LF	31.1;	RF	30.6;	LR	31.4;	RR	31.2
POST-TEST ATTITUDE:	LF	32.0;	RF	26.7;	LR	31.8;	RR	29.5

FIGURE 1

VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 3

VEHICLE INSTRUMENTATION LOCATIONS AND DATA SUMMARY

TEST NUMBER 930322

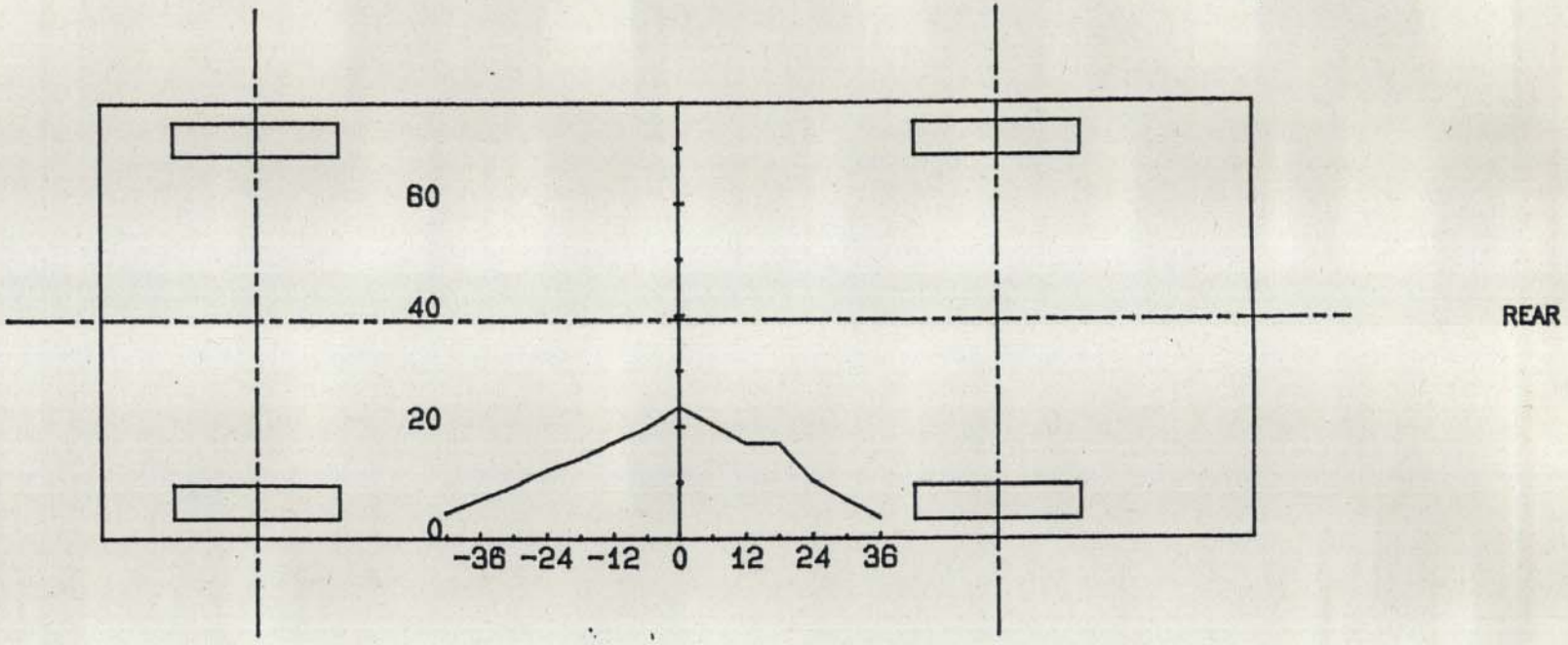
No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	RIGHT FRONT SILL ACCELERATION (G) LATERAL	134.9	-25.5	19.5	8.4	62.6	11.8	49.0
2	RIGHT REAR SILL ACCELERATION (G) LATERAL	106.4	-24.6	26.0	20.1	59.0	39.2	47.8
3	LEFT FRONT SILL ACCELERATION (G) LATERAL	135.5	25.0	19.8	12.0	56.9	21.7	49.8
4	LEFT FRONT DOOR CENTERLINE ACCELERATION (G) LATERAL	127.6	33.3	36.0	47.3	34.4	84.4	18.4
5	LEFT FRONT DOOR MID-REAR ACCELERATION (G) LATERAL	113.4	33.0	33.2	70.7	20.0	126.6	12.6
6	LEFT FRONT DOOR UPPER ACCELERATION (G) LATERAL	127.5	32.8	43.0	-18.1	34.1	49.6	21.4

* ALL MEASUREMENTS OF INSTRUMENTATION LOCATIONS ARE IN INCHES.

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

FIGURE 2

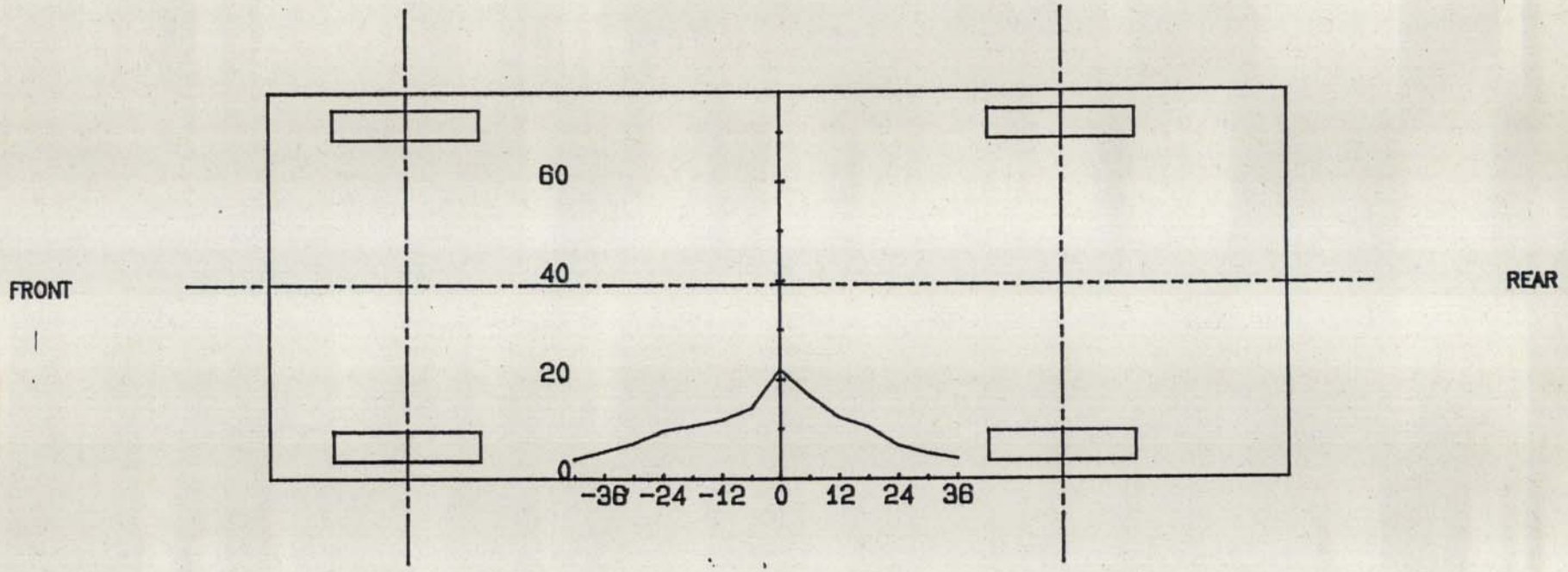
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS AXLE HEIGHT WHICH IS 13.0 IN. ABOVE GROUND LEVEL

FIGURE 2, CONT'D.

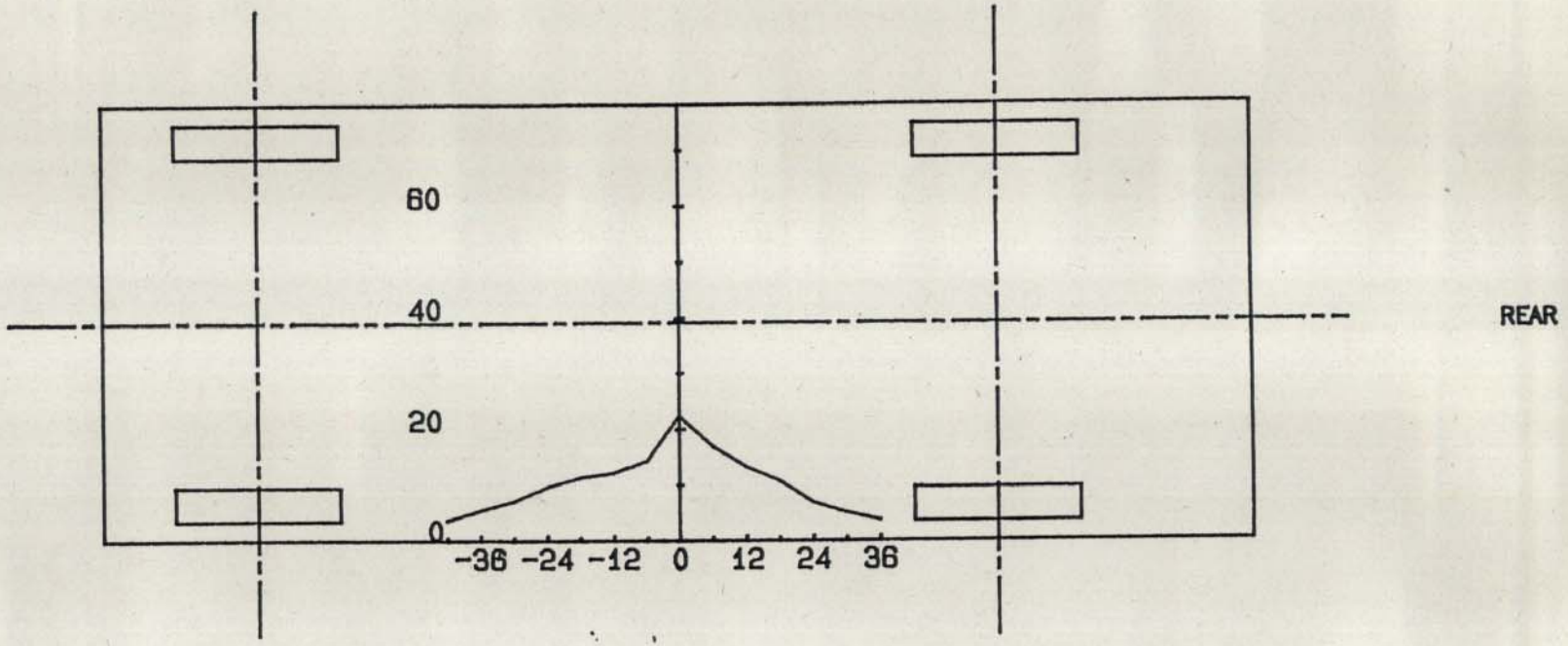
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS H-POINT HEIGHT WHICH IS 33.8 IN. ABOVE GROUND LEVEL

FIGURE 2, CONT'D.

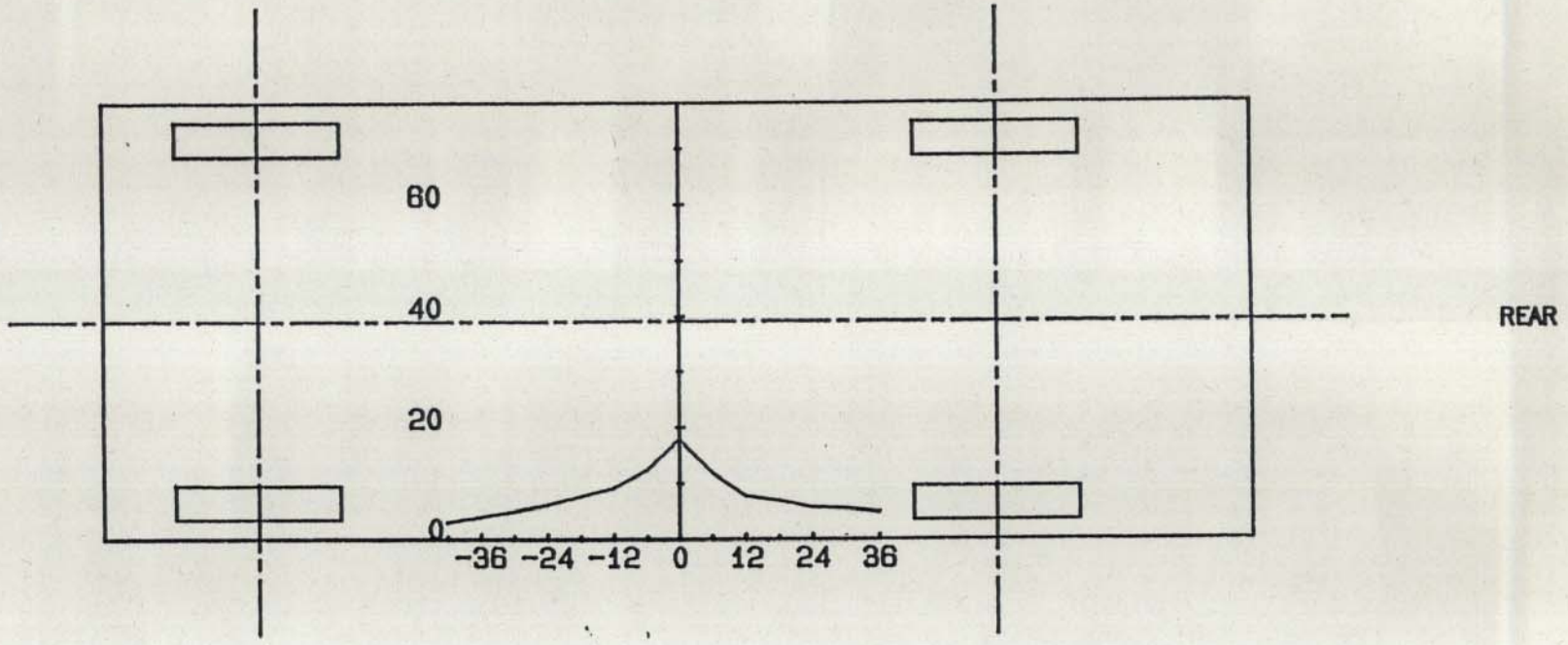
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS MID DOOR HEIGHT WHICH IS 32.3 IN. ABOVE GROUND LEVEL

FIGURE 2, CONT'D.

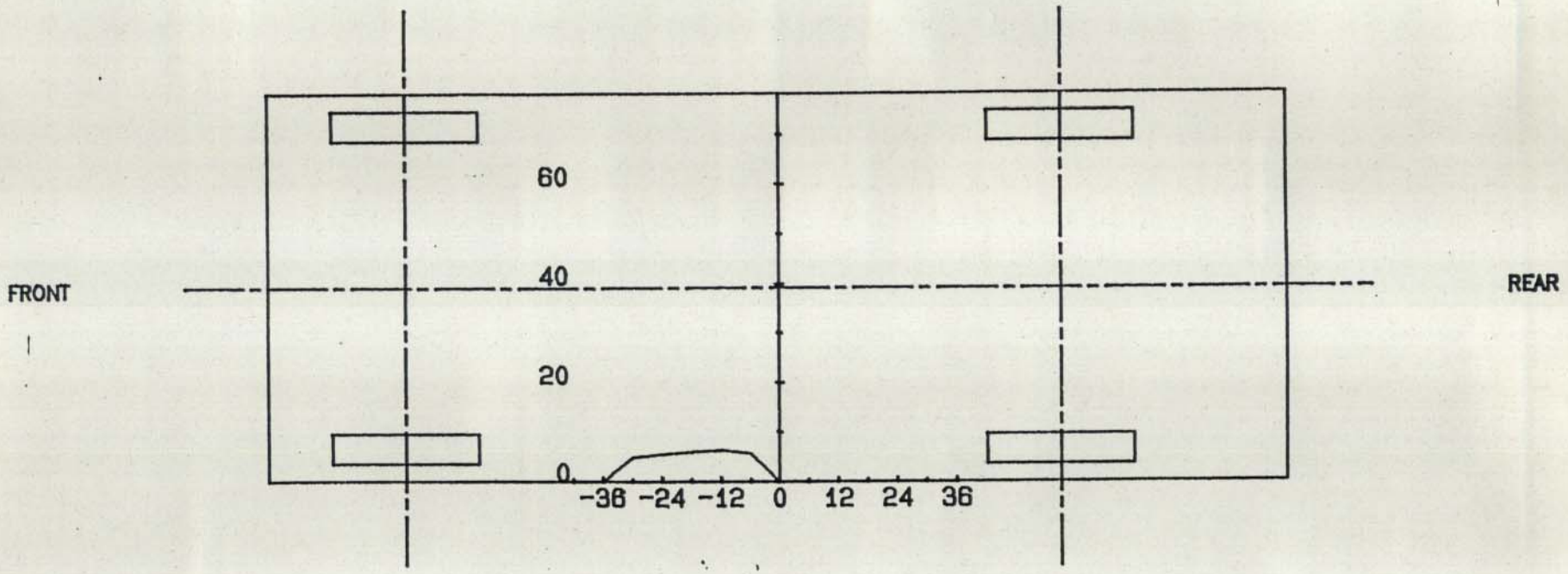
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW SILL HEIGHT WHICH IS 47.6 IN. ABOVE GROUND LEVEL

FIGURE 2, CONT'D.

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW TOP HEIGHT WHICH IS 70.0 IN. ABOVE GROUND LEVEL

TABLE 4 VEHICLE EXTERIOR PROFILES AND STATIC CRUSH

ZERO DISTANCE IS 9.5 INCHES REARWARD OF THE DRIVER'S SIDE WHEELBASE MID-POINT

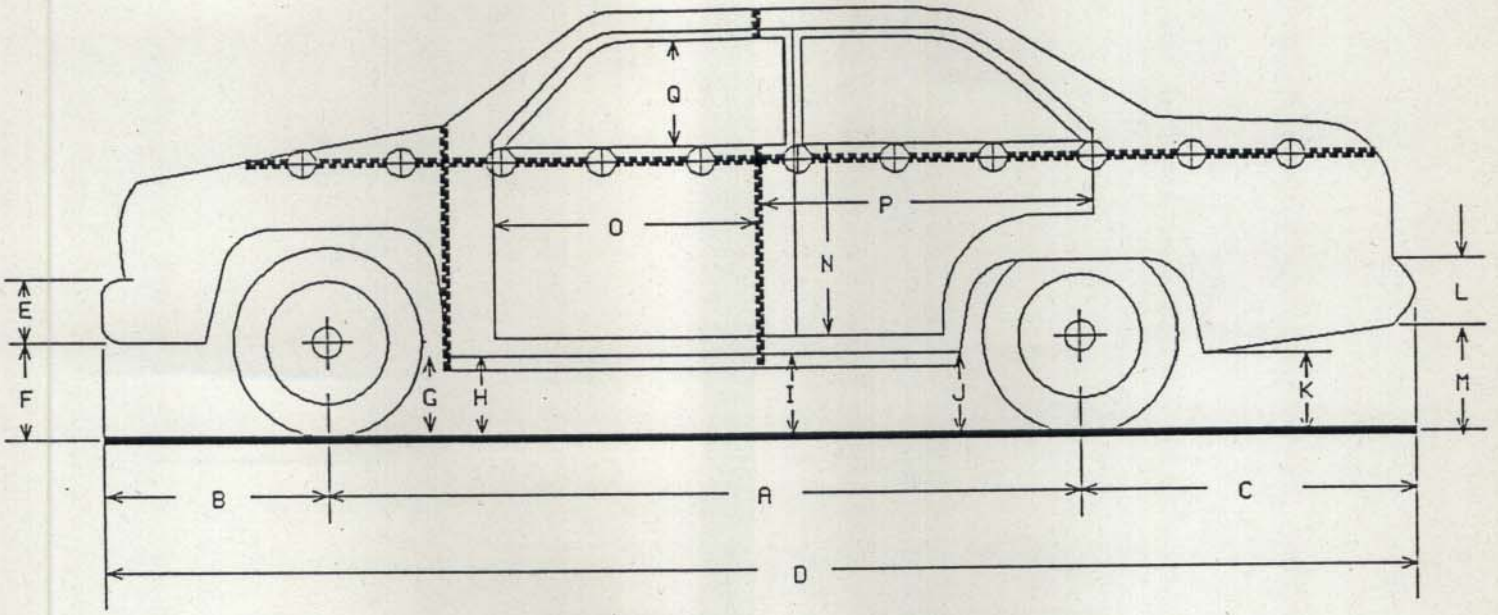
LOCATION	HEIGHT (IN)	-42	-36	-30	-24	-18	-12	-6	0	6	12	18	24	30	36
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE*)															
Axle Height	13.0	11.8	11.6	11.6	11.6	11.8	11.6	11.6	11.5	11.6	11.6	11.6	11.5	11.6	11.6
H-point	33.8	9.9	9.8	9.6	9.8	9.9	9.8	9.8	9.9	9.8	9.8	9.6	9.8	9.6	9.6
Mid Door	32.3	10.0	9.7	9.6	9.6	9.7	9.8	9.8	9.9	9.8	9.8	9.6	9.8	9.6	9.8
Window Sill	47.6	12.5	12.2	12.2	12.2	12.2	12.1	11.6	12.0	11.8	11.9	11.6	11.9	11.5	11.6
Window Top	70.0	X	X	19.4	19.0	19.0	19.2	19.9	X	X	X	X	X	X	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE*)															
Axle Height	13.0	16.2	18.6	21.0	23.8	26.1	28.8	31.4	35.0	32.0	28.5	28.5	21.9	18.5	15.2
H-point	33.8	13.7	15.2	16.7	19.4	20.6	21.6	24.1	31.9	26.5	22.2	20.0	16.5	14.5	13.6
Mid Door	32.3	13.6	15.2	16.8	19.2	21.0	22.0	24.1	32.2	26.6	22.9	20.2	16.6	14.5	13.5
Window Sill	47.6	15.4	16.2	17.2	18.4	19.8	21.2	23.9	29.8	23.6	19.5	18.5	17.6	17.0	16.4
Window Top	70.0	X	X	24.2	24.5	25.0	25.5	25.5	X	X	X	X	X	X	X
STATIC CRUSH (IN)															
Axle Height	13.0	4.4	7.0	9.4	12.2	14.3	17.2	19.8	23.5	20.4	16.9	16.9	10.4	6.9	3.6
H-point	33.8	3.8	5.4	7.1	9.6	10.7	11.8	14.3	22.0	16.7	12.4	10.4	6.7	4.9	4.0
Mid Door	32.3	3.6	5.5	7.2	9.6	11.3	12.2	14.3	22.3	16.8	13.1	10.6	6.8	4.9	3.7
Window Sill	47.6	2.9	4.0	5.0	6.2	7.6	9.1	12.3	17.8	11.8	7.6	6.9	5.7	5.5	4.8
Window Top	70.0	X	X	4.8	5.5	6.0	6.3	5.6	X	X	X	X	X	X	X

*Reference plane is parallel to and 48 inches from the vehicle's longitudinal centerline.

FIGURE 3 VEHICLE PRE-TEST & POST-TEST MEASUREMENTS

VEHICLE YEAR/MAKE/MODEL/BODY 1986/Ford/F150/pickup truck

TEST DATE: 03/22/93 VIN: 2FTCF15Y9GCB11004



LEFT SIDE VIEW

	PRE-TEST	POST-TEST	CHANGE		PRE-TEST	POST-TEST	CHANGE
A	133.5	132.0	1.5	J	17.6	16.4	1.2
B	28.0	28.5	-0.5	K	19.9	19.5	0.4
C	46.0	45.1	0.9	L	NA	NA	NA
D	207.5	205.6	1.9	M	NA	NA	NA
E	7.6	7.6	0.0	N	NA	NA	NA
F	15.6	15.8	-0.2	O	NA	NA	NA
G	12.8	13.0	-0.2	P	NA	NA	NA
H	15.4	17.4	-2.0	Q	18.8	18.8	0.0
I	16.6	19.2	-2.6				

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

TABLE 5

DUMMY DATA SUMMARY

TEST NUMBER 930322

	DRIVER DUMMY SN: 903			
	POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC
HEAD ACCELERATION (G)				
LONGITUDINAL	15.8	45.5	63.2	145.4
LATERAL	6.6	92.8	71.4	145.4
VERTICAL	11.3	81.9	77.0	145.1
RESULTANT	119.7	145.4		
HIC	368	FROM 143.6 TO 149.2		
UPPER SPINE ACCELERATION (G)				
LONGITUDINAL	22.5	159.4	14.1	45.6
LATERAL (P)	1.8	211.2	7.9	108.1
LATERAL (R)	1.3	204.4	7.1	118.1
VERTICAL	11.8	82.5	20.7	156.3
RESULTANT (P)	29.7	158.8		
RESULTANT (R)	29.6	158.8		
LOWER SPINE ACCELERATION (G)				
LONGITUDINAL	15.2	150.6	5.4	102.5
LATERAL (P)	4.7	167.5	9.2	45.6
LATERAL (R)	4.9	168.8	7.8	97.5
VERTICAL	11.6	84.4	15.4	156.3
RESULTANT (P)	20.3	150.6		
RESULTANT (R)	20.3	150.6		
LEFT UPPER THORAX RIB ACCELERATION (G)				
LATERAL (P)	5.6	45.6	10.8	178.8
LATERAL (R)	7.7	45.6	10.3	178.8
LEFT LOWER THORAX RIB ACCELERATION (G)				
LATERAL (P)	8.7	162.5	9.9	103.8
LATERAL (R)	9.3	162.5	9.2	93.1
TTI	7.8			
PELVIS ACCELERATION (G)				
LONGITUDINAL	6.1	80.0	8.9	153.8
LATERAL	4.9	167.5	14.7	45.0
VERTICAL	7.4	83.7	15.6	151.2
RESULTANT	17.9	151.2		

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

TABLE 6 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #903	PASSENGER #
HEAD	Header	NA
CHEST	None	NA
ABDOMEN	Door panel	NA
LEFT KNEE	Door panel	NA
RIGHT KNEE	Left knee	NA

DOOR OPENING:

	LEFT	RIGHT
FRONT	Tools required	Easy
REAR	NA	NA

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	None	None
REAR	NA	NA

GLAZING DAMAGE:

The rear window was completely broken out.

OTHER NOTABLE IMPACT EFFECTS:

None

FIGURE 4 DUMMY AND SEAT POSITIONING DATA

MFR./MAKE/MODEL: Ford/F150/pickup truck

SEAT TYPE: X Bench
_____Bucket
_____Split bench

ADJUSTER TYPE: X Manual
_____Power
_____Non-adjustable

SEAT BACK TYPE: X Non-adjustable
_____Adjustable reclining

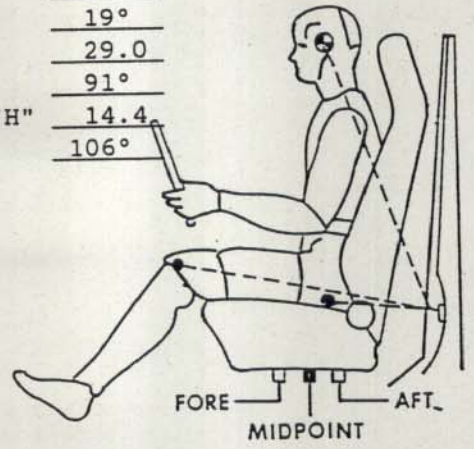
TECHNICIANS:
1. B. Miller
2. J. Taylor
3. _____
4. _____

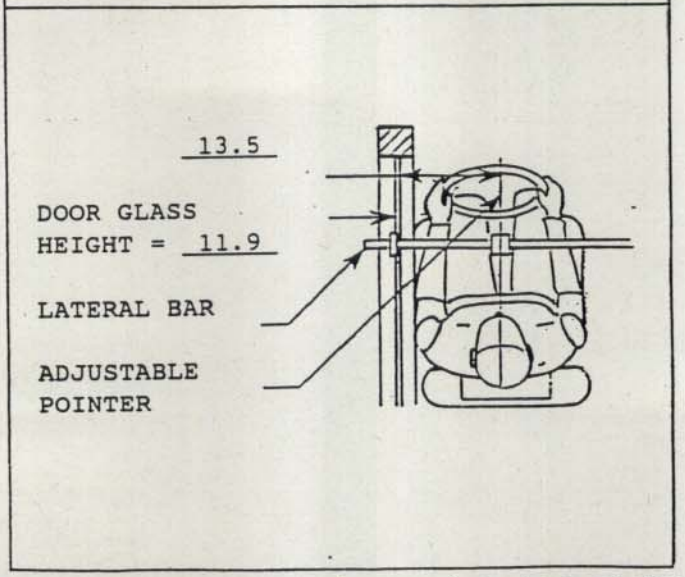
POSITIONING DATE: 03/22/93

AMBIENT TEMP.: 71° F TIME: 0925

DRIVER DUMMY* # 903 TYPE: SID

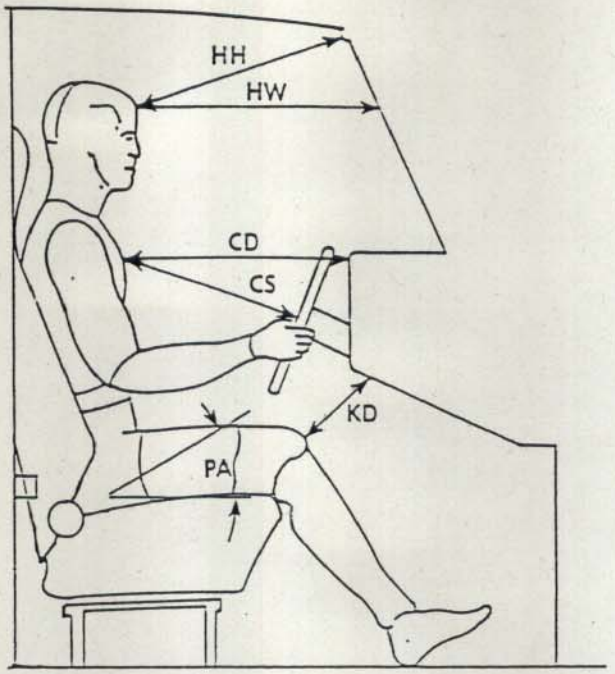
Head	24.6
Target	19°
Knee	29.0
Joint	91°
Approx. "H" Point	14.4
	106°





*Driver dummy measurements are referenced to top of front door striker.
ALL DISTANCE MEASUREMENTS ARE IN INCHES.
ALL ANGLES ARE REFERENCED TO VERTICAL.

FIGURE 5 DUMMY LONGITUDINAL CLEARANCE MEASUREMENTS



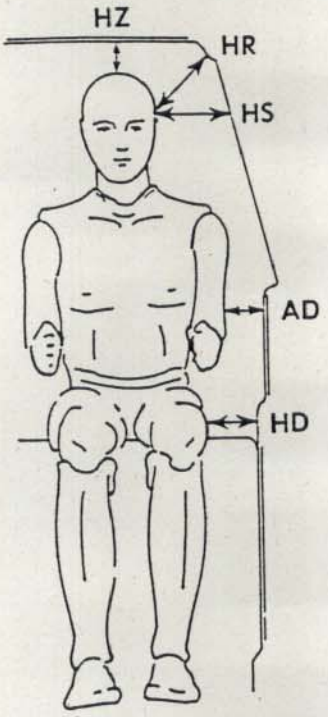
HH	20.7
HW	24.5
CD	22.8
CS	12.5
KDL	7.2
KDR	7.8
PA	15°
HB	NA
NB	NA
CB	NA
KBL	NA
KBR	NA

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

ALL ANGLES ARE REFERENCED TO HORIZONTAL.

NOTE: FOR TWO-DOOR VEHICLES, THE REAR PASSENGER'S PHX AND PHZ MEASUREMENTS ARE REFERENCED TO THE FRONT DOOR STRIKER.

FIGURE 6 DUMMY LATERAL CLEARANCE MEASUREMENTS



HR	8.1
HS	10.2
AD	3.9
HD	6.1
HZ	4.4

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 7

CAMERA POSITIONS

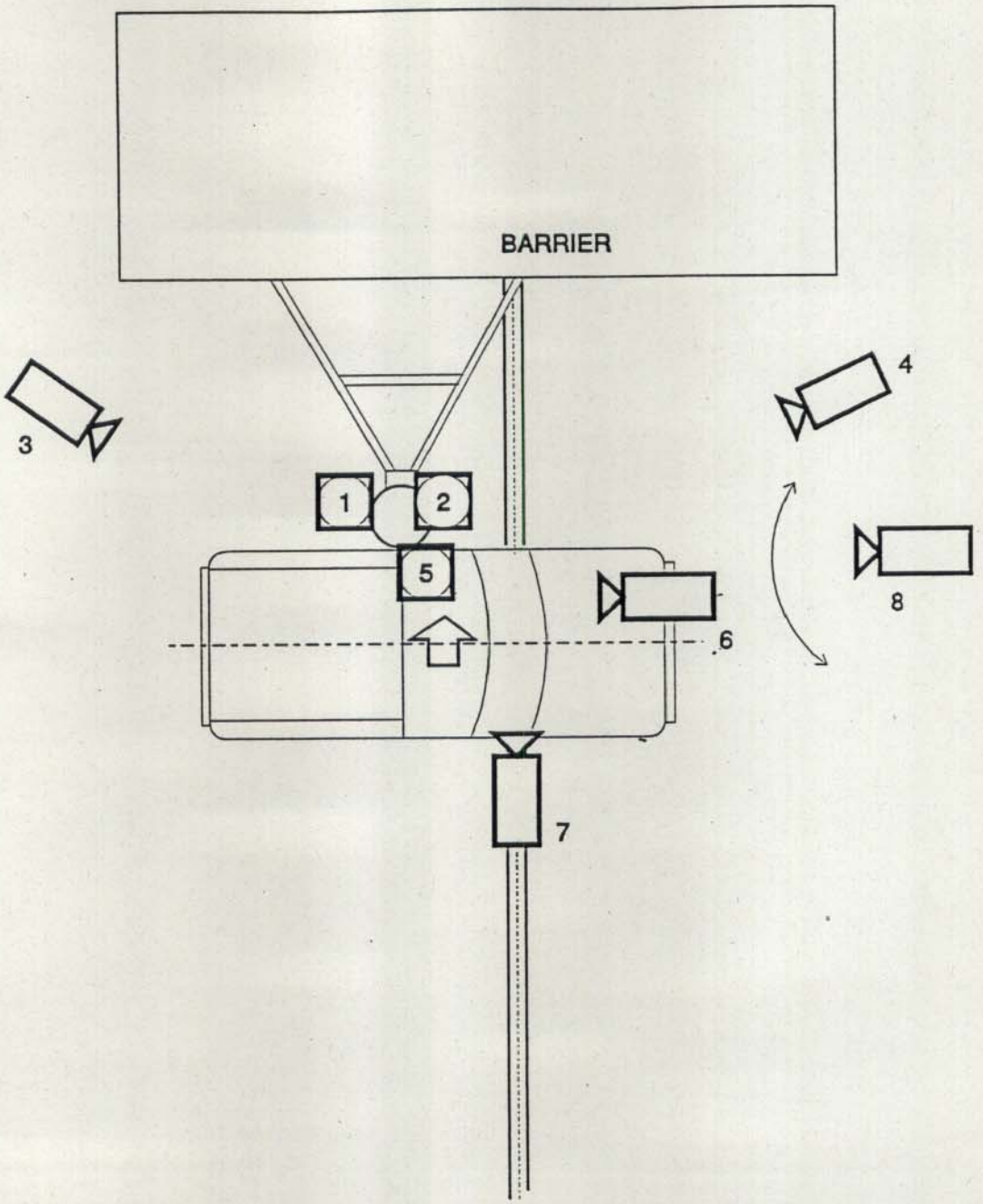


TABLE 7 CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Overhead wide	Photosonic	8.5	983	Vehicle dynamics
2	Overhead tight	Photosonic	25	998	Vehicle dynamics
3	Left angle	Stalex	13	988	Vehicle dynamics
4	Right angle	Stalex	13	998	Vehicle dynamics
5	Pit	Photosonic	17	1000	Vehicle dynamics
6	Onboard windshield	Photosonic	8	913	Dummy kinematics
7	Onboard passenger side	Photosonic	8	1005	Dummy kinematics
8	Panning	Beaulieu	12-120	24	Real-time panning

APPENDIX A

PHOTOGRAPHS

Figure A-1. PRE-TEST LEFT REAR VIEW

Figure A-2. POST-TEST LEFT REAR VIEW

Figure A-3. PRE-TEST LEFT SIDE VIEW

Figure A-4. POST-TEST LEFT SIDE VIEW

Figure A-5. PRE-TEST LEFT FRONT VIEW

Figure A-6. POST-TEST LEFT FRONT VIEW

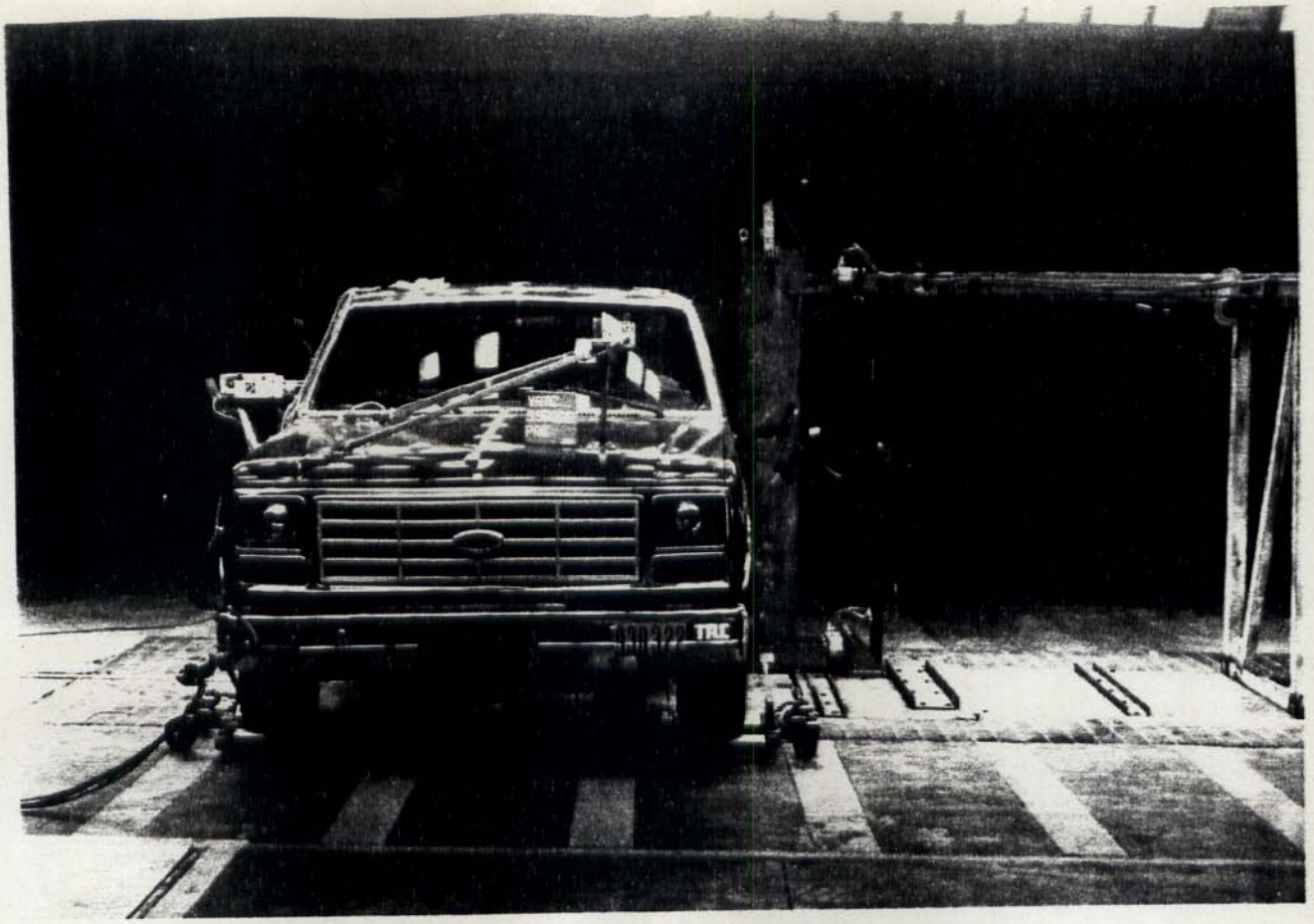


Figure A-7. PRE-TEST FRONT VIEW

Figure A-8. POST-TEST FRONT VIEW

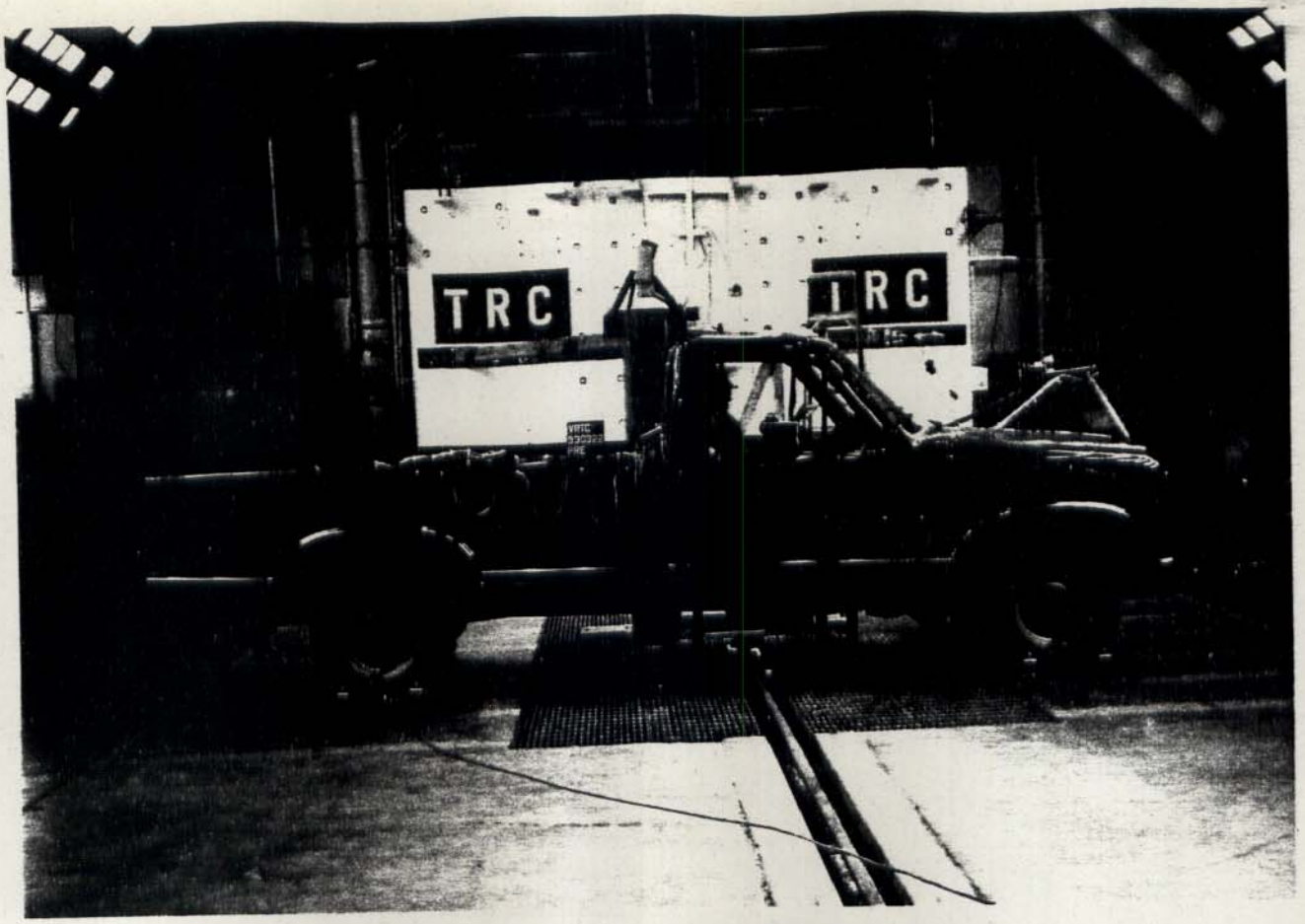


Figure A-9. PRE-TEST RIGHT SIDE VIEW

Figure A-10. POST-TEST RIGHT SIDE VIEW

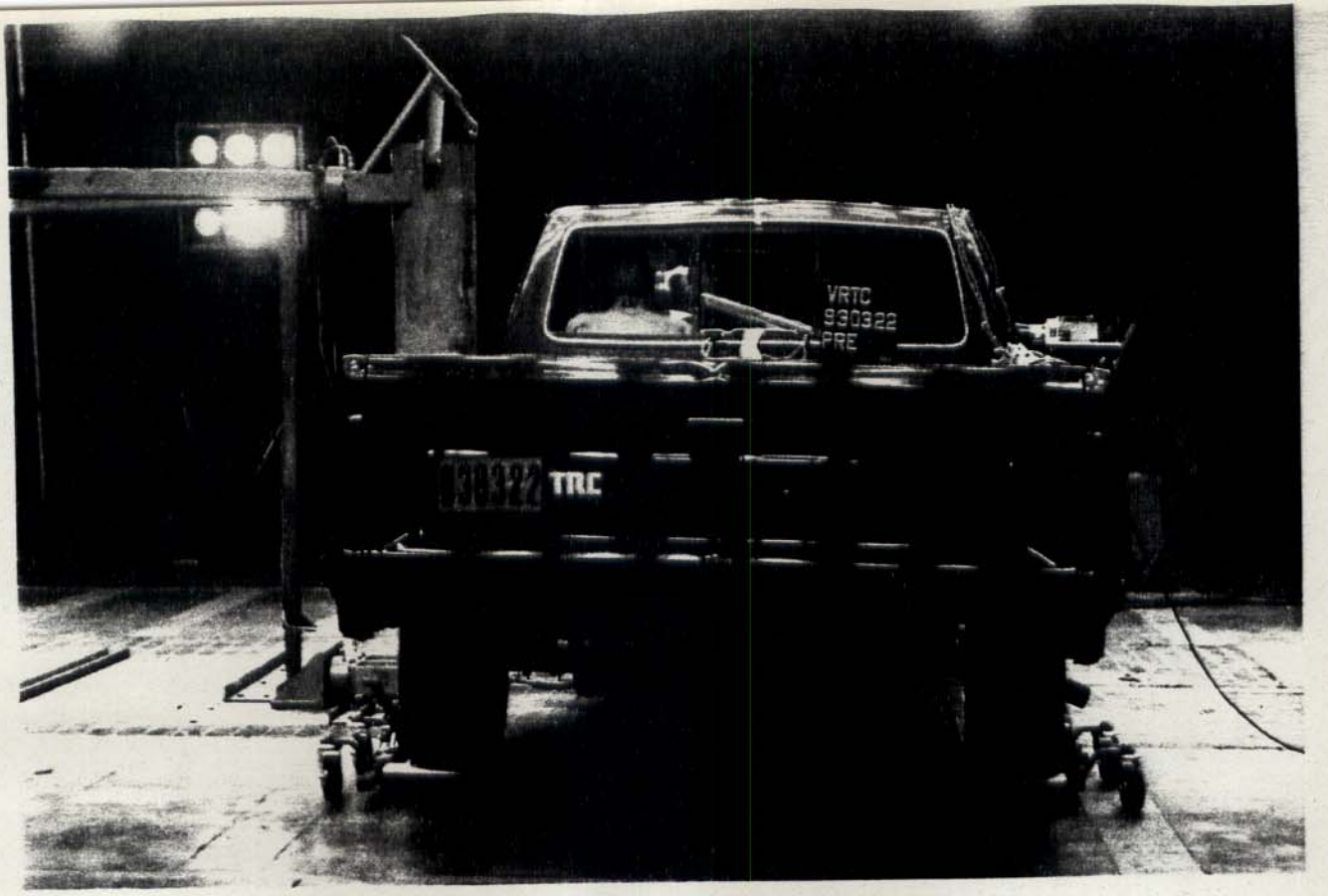


Figure A-11. PRE-TEST REAR VIEW

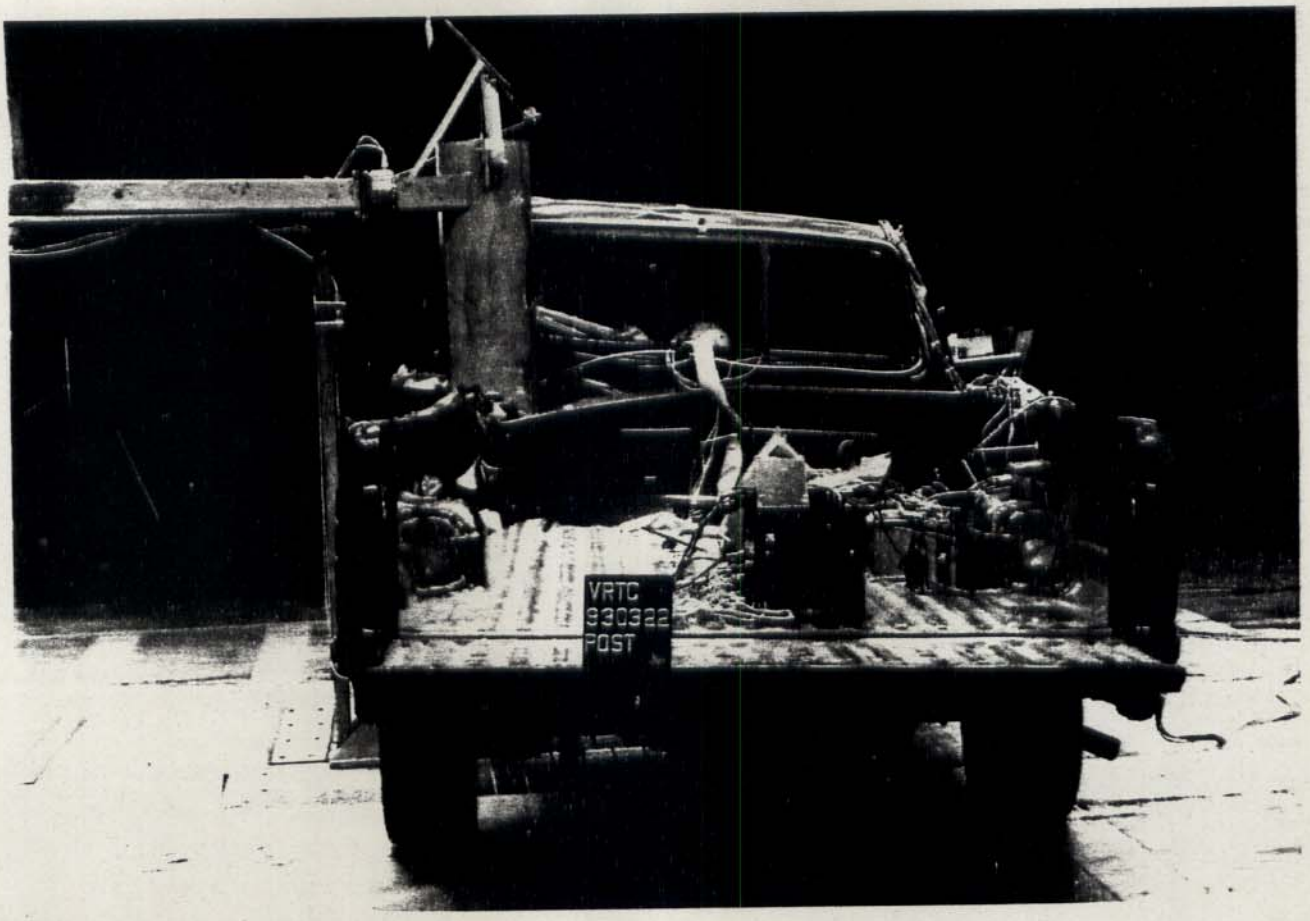


Figure A-12. POST-TEST REAR VIEW

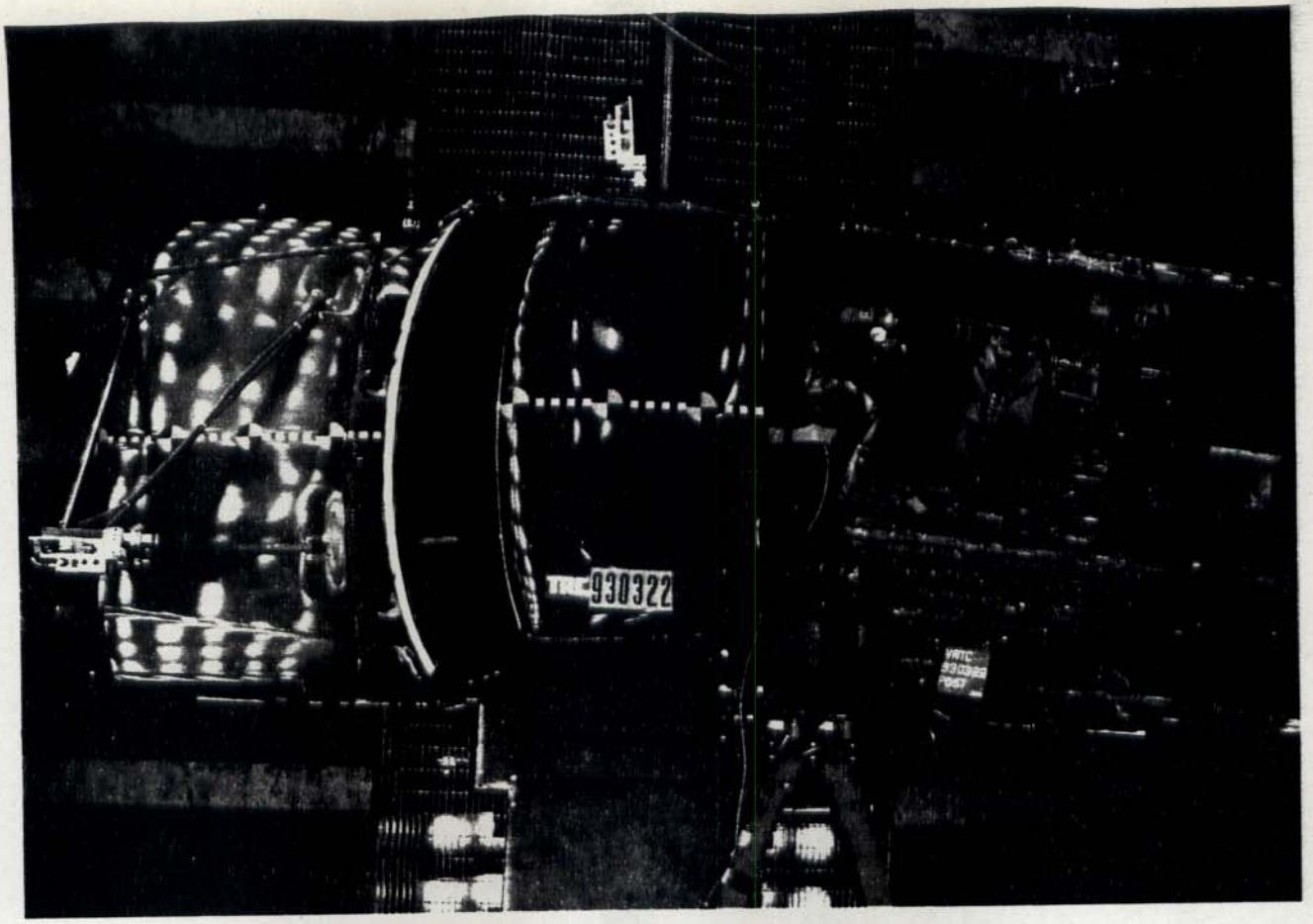


Figure A-13. POST-TEST OVERHEAD - VIEW 1

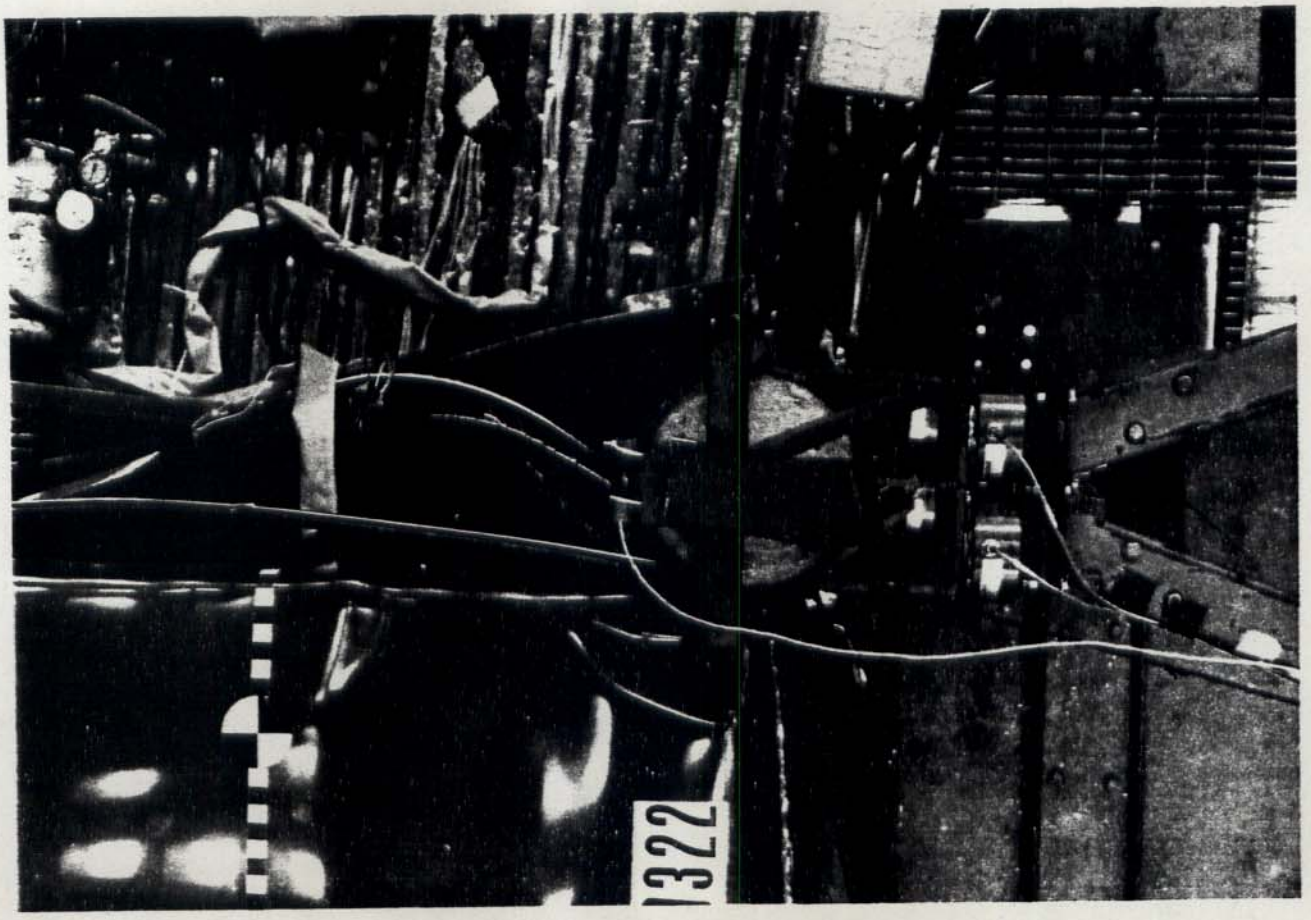


Figure A-14. POST-TEST OVERHEAD - VIEW 2

Figure A-15. POST-TEST OVERHEAD CLOSE-UP VIEW

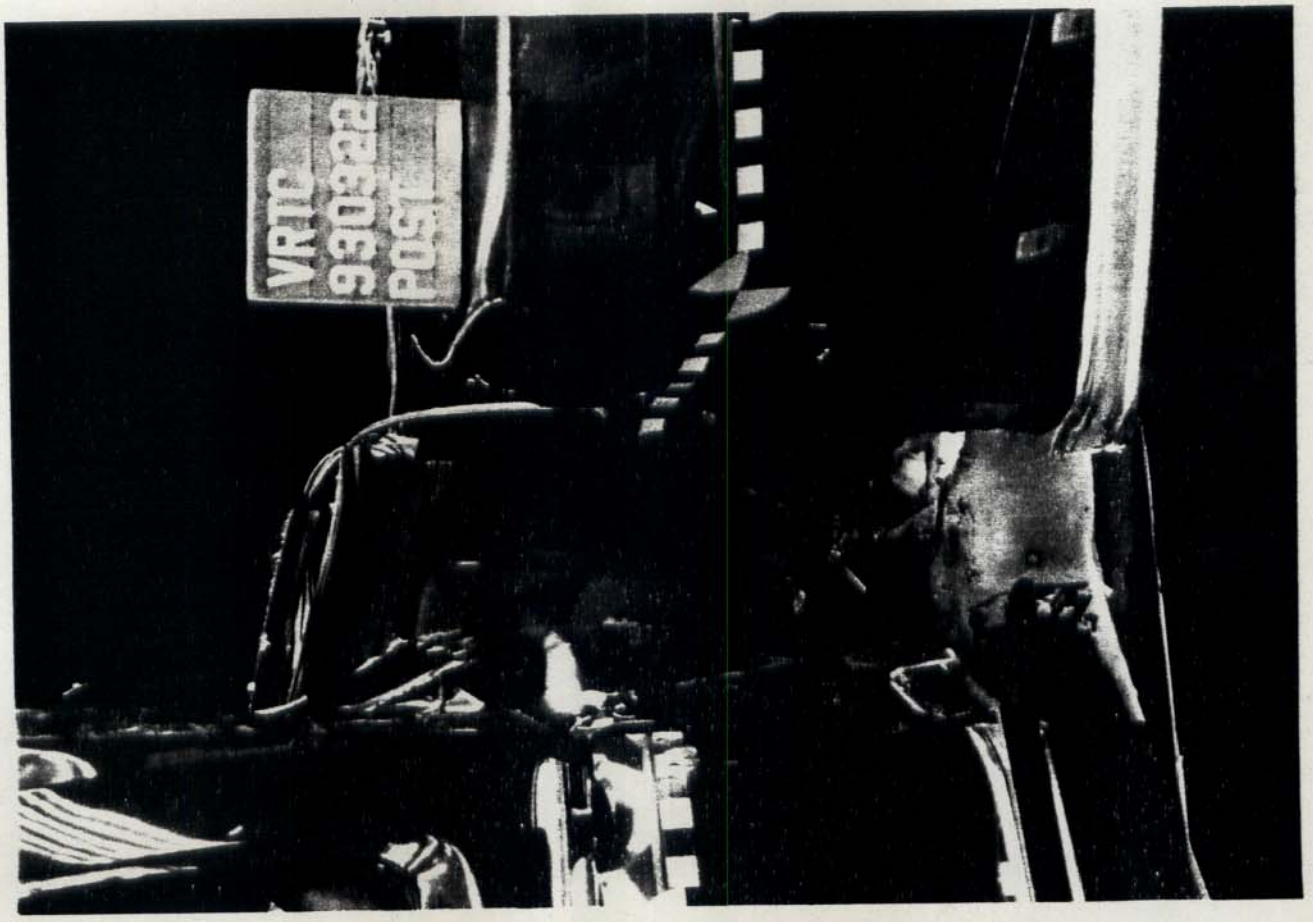


Figure A-16. POST-TEST IMPACT POINT CLOSE-UP VIEW

Figure A-17. PRE-TEST DRIVER DUMMY POSITION VIEW

Figure A-18. POST-TEST DRIVER DUMMY POSITION VIEW

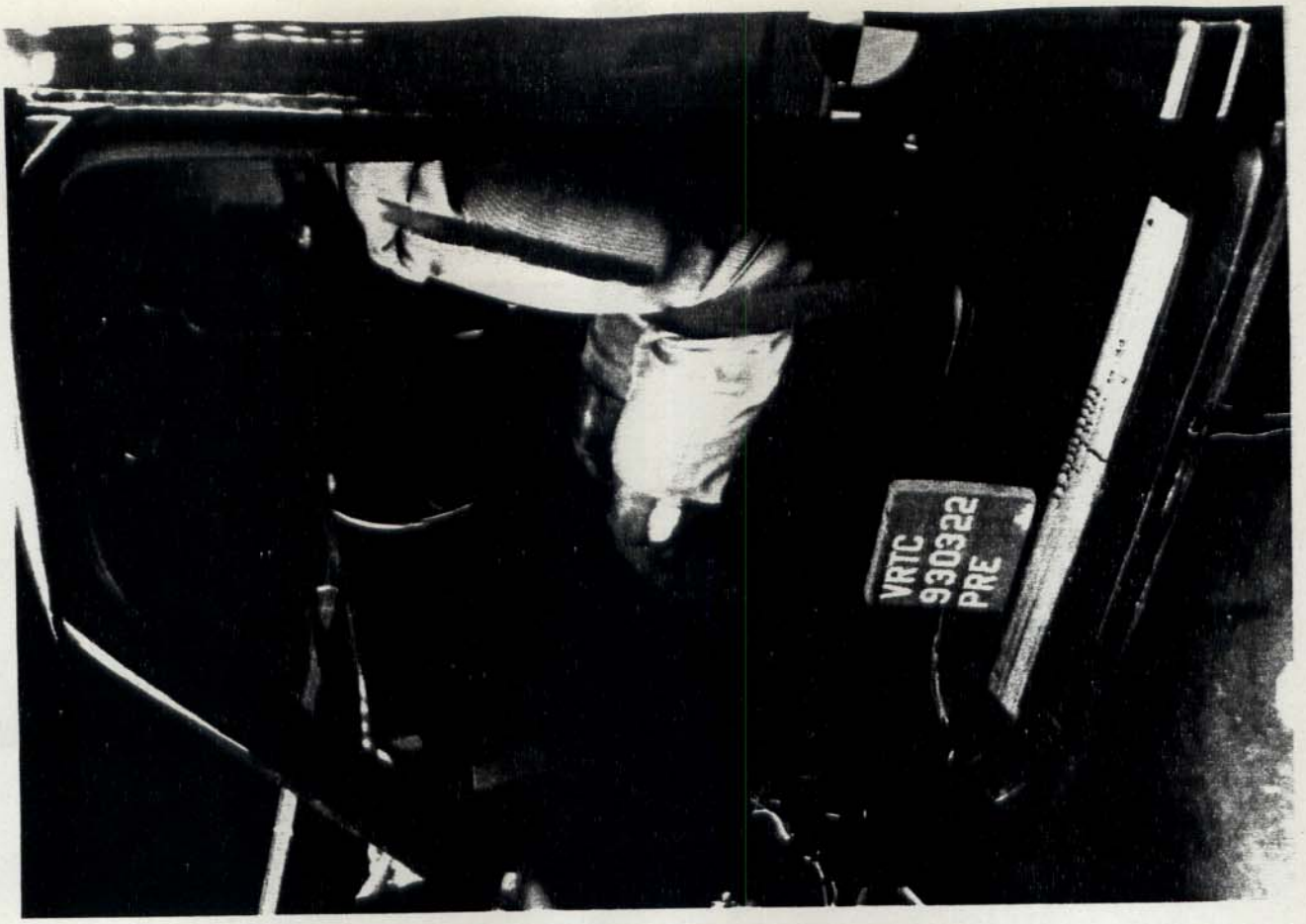


Figure A-19. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

Figure A-20. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

Figure A-21. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW

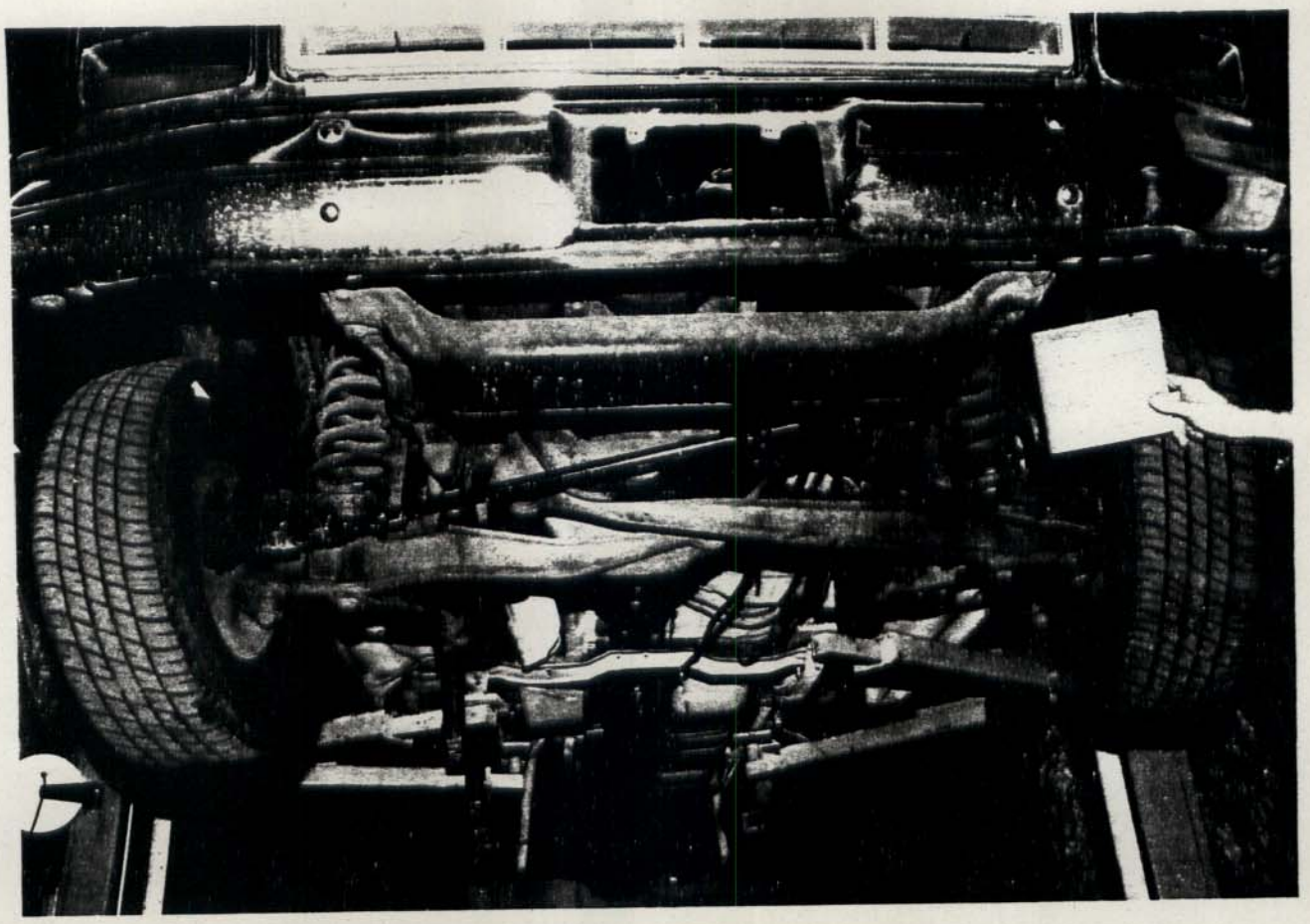


Figure A-22. PRE-TEST FRONT UNDERBODY VIEW

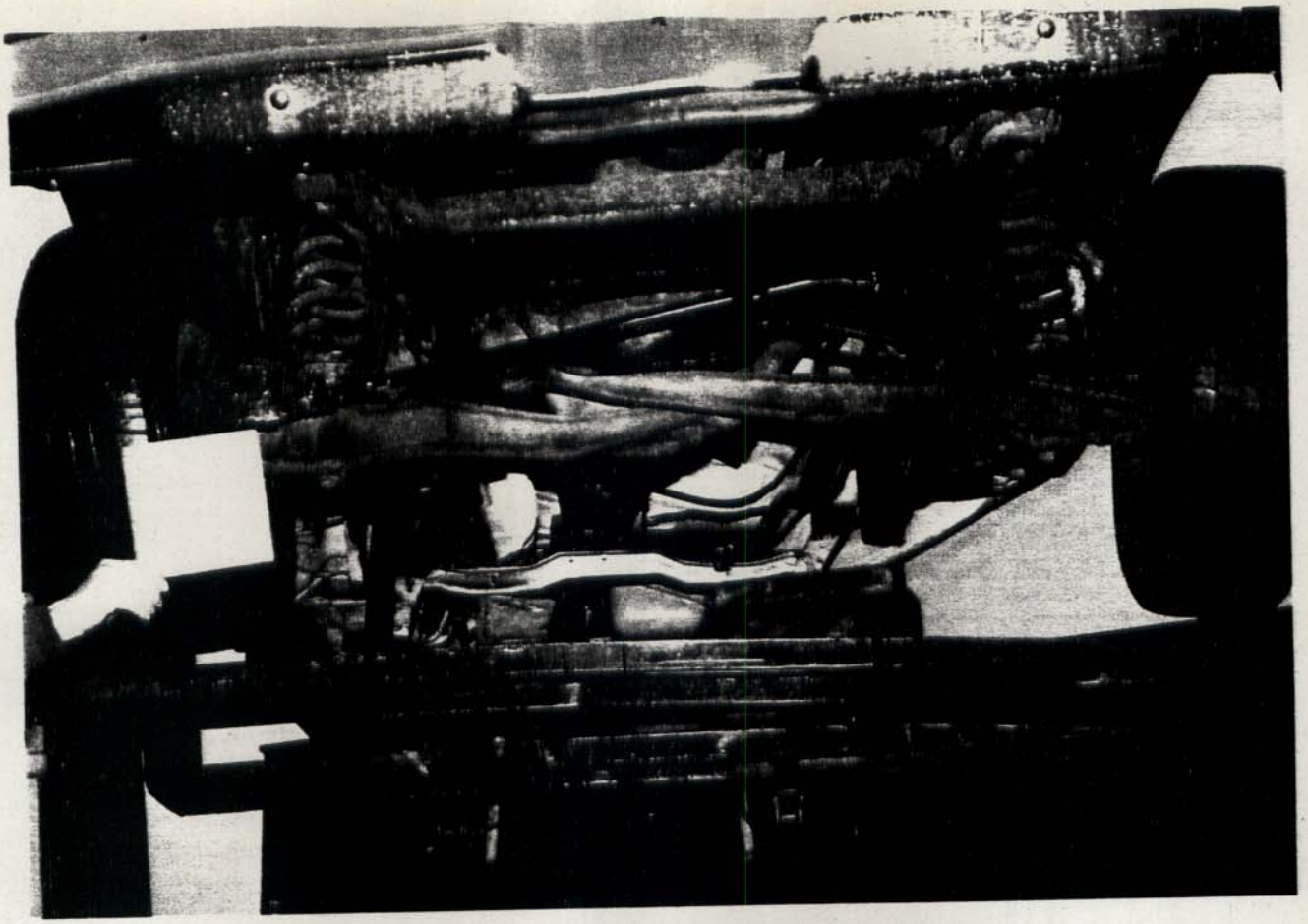


Figure A-23. POST-TEST FRONT UNDERBODY VIEW

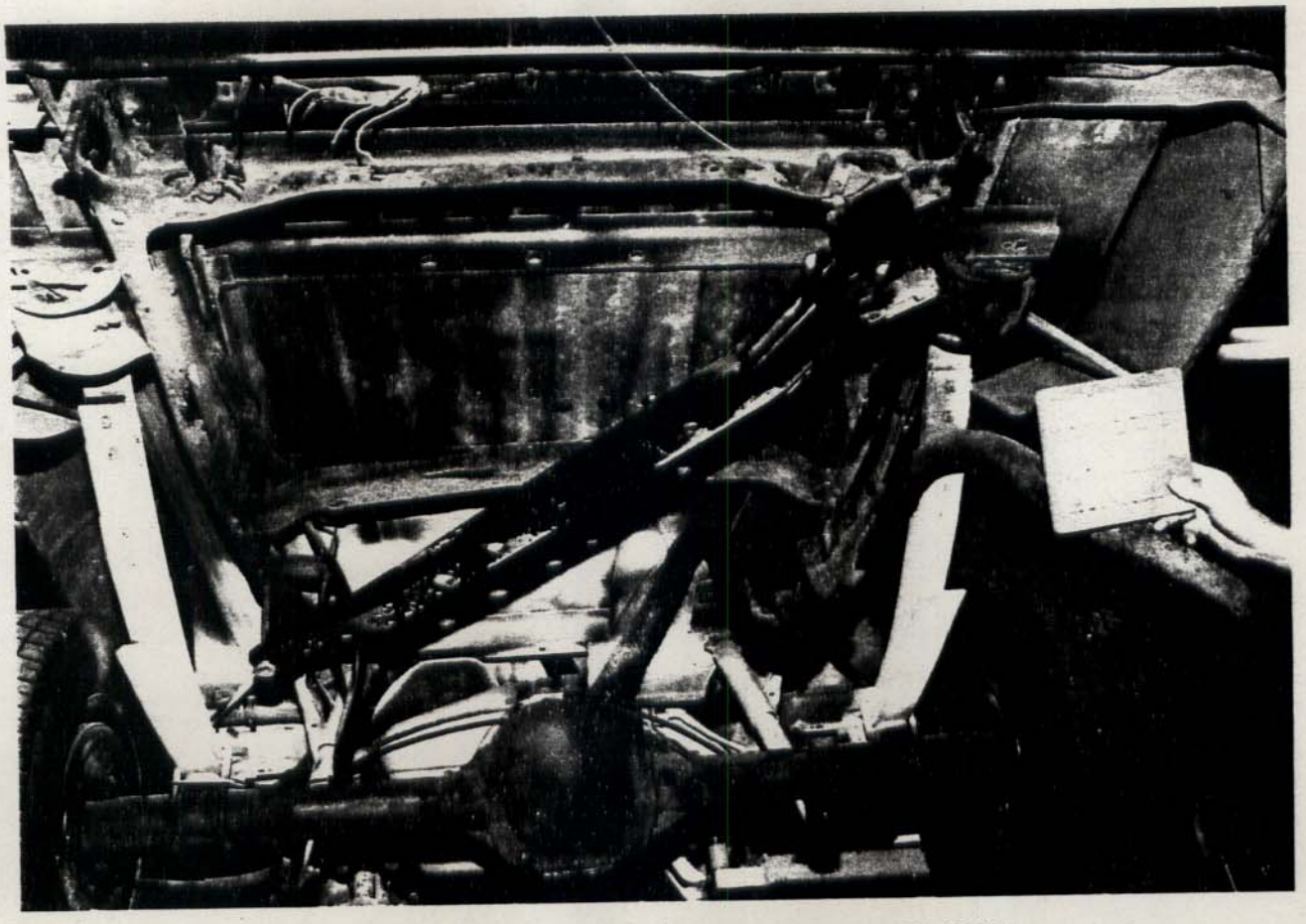


Figure A-24. PRE-TEST REAR UNDERBODY VIEW

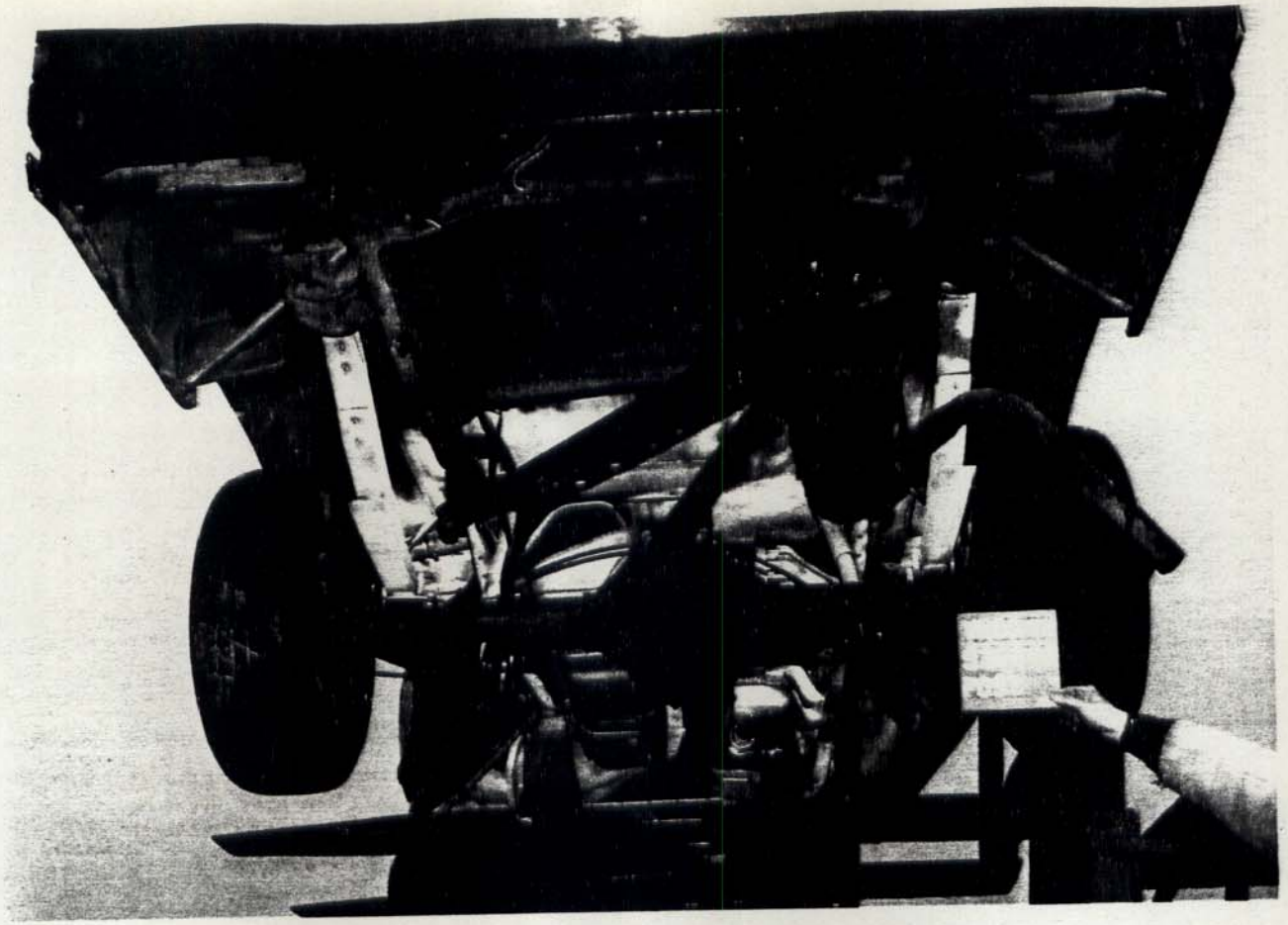


Figure A-25. POST-TEST REAR UNDERBODY VIEW

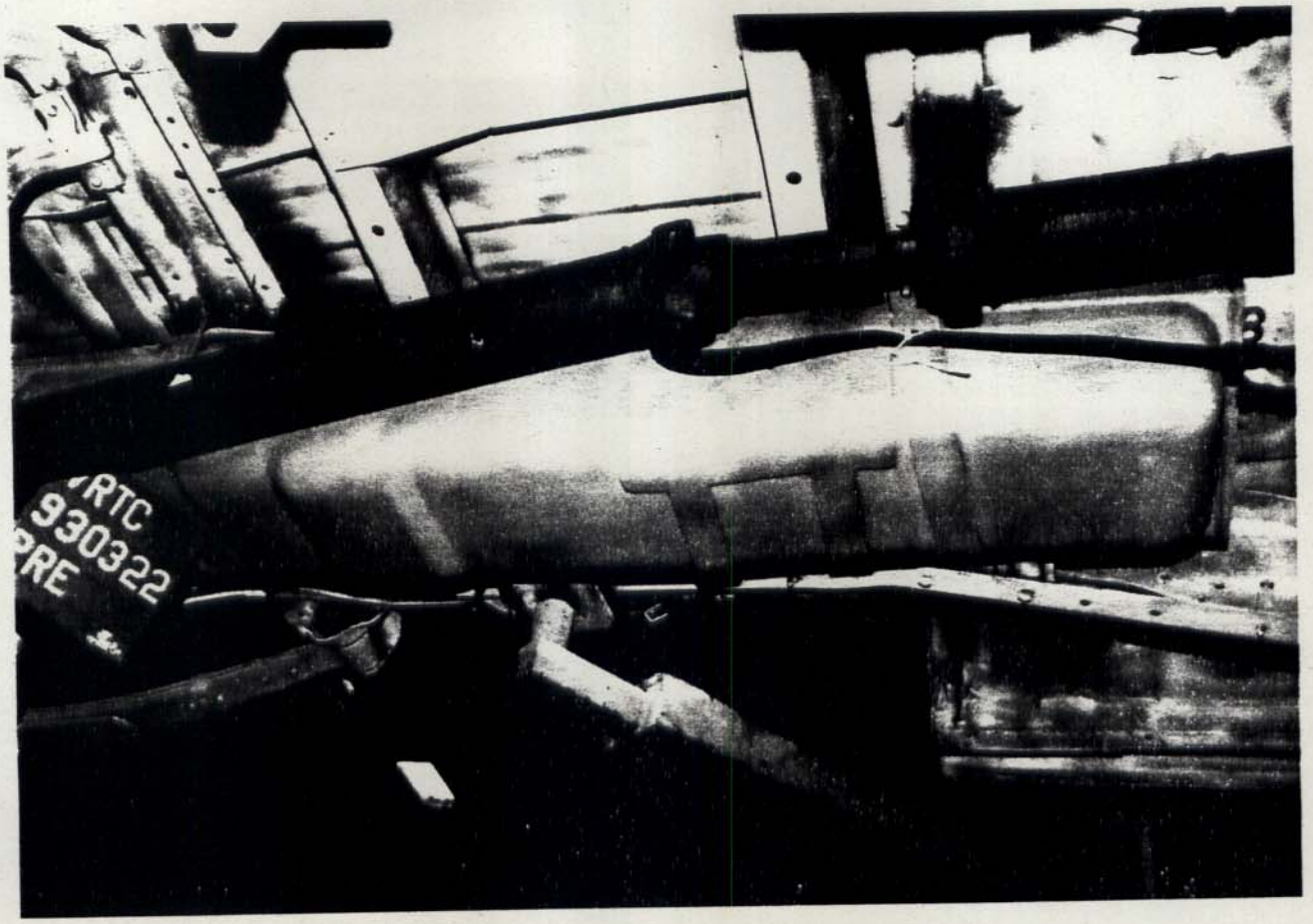


Figure A-26. PRE-TEST FUEL TANK VIEW

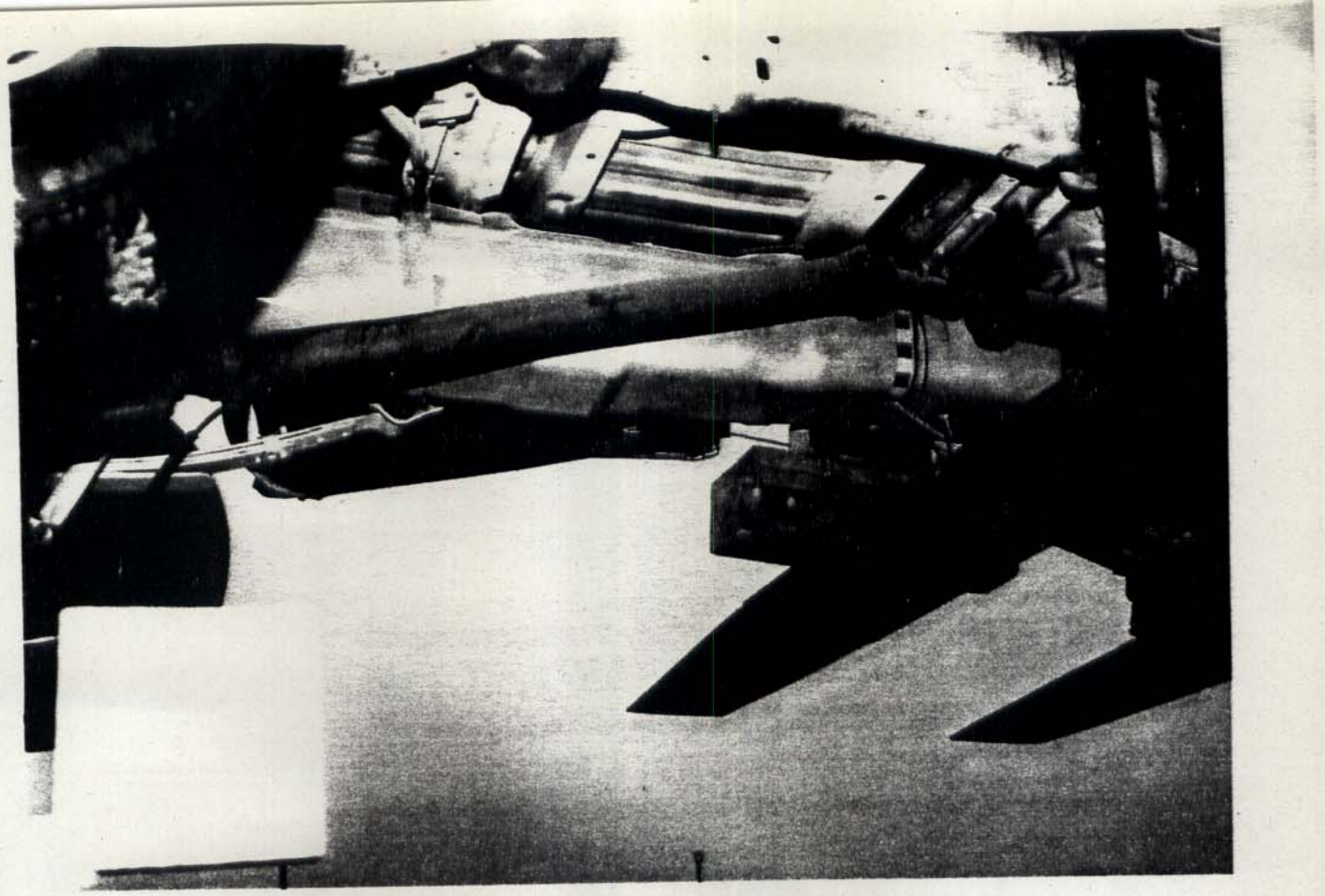


Figure A-27. POST-TEST FUEL TANK VIEW

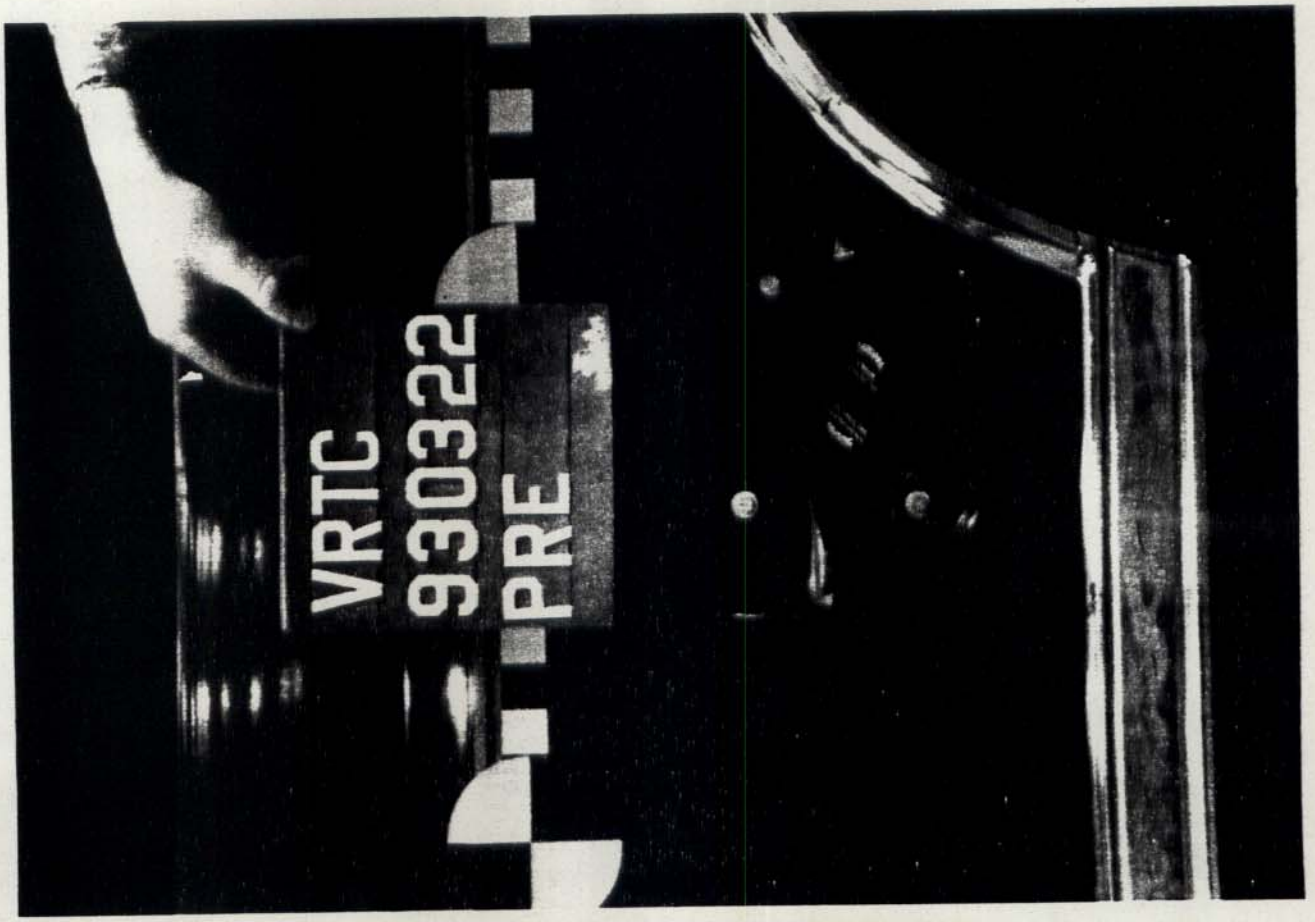


Figure A-28. PRE-TEST FUEL FILLER CAP VIEW

Figure A-29. POST-TEST FUEL FILLER CAP VIEW

Figure A-30. POST-TEST DRIVER DUMMY CONTACT - VIEW 1

Figure A-31. POST-TEST DRIVER DUMMY CONTACT - VIEW 2

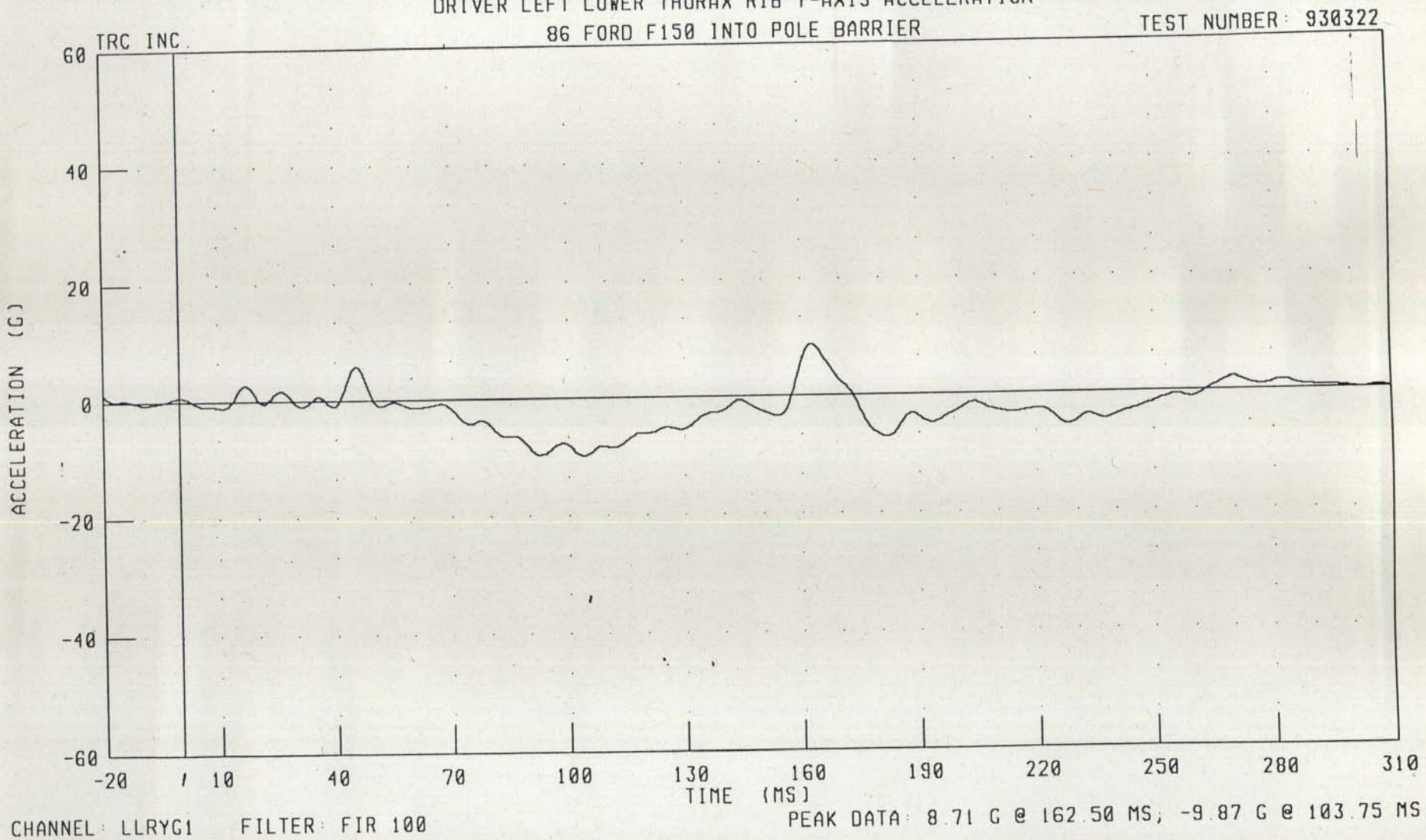
Figure A-32. POST-TEST DRIVER DUMMY CONTACT - VIEW 3

Figure A-33. IMPACT EVENT

APPENDIX C

DUMMY CALIBRATION

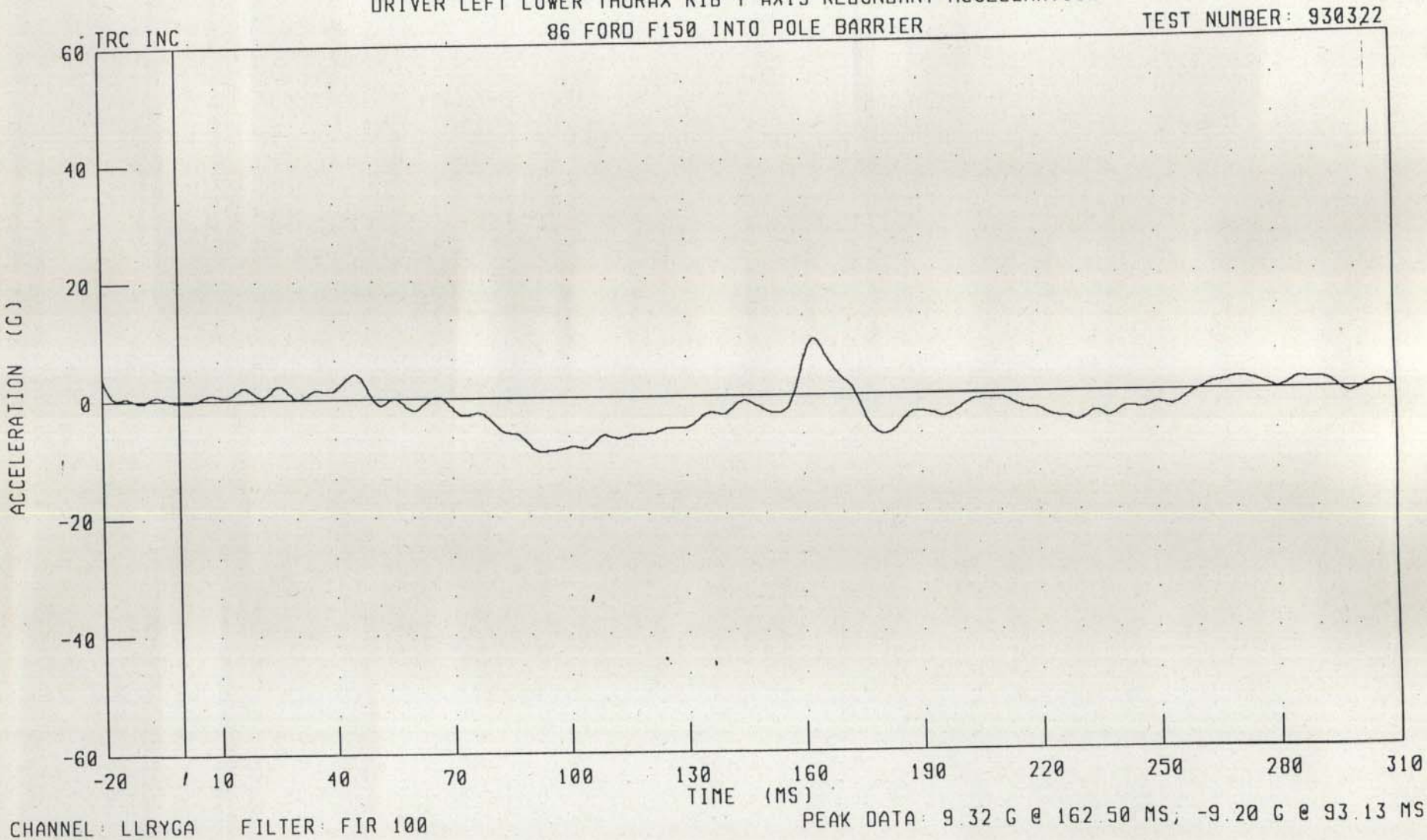
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LEFT LOWER THORAX RIB Y-AXIS ACCELERATION



CHANNEL: LLRYG1 FILTER: FIR 100

PEAK DATA: 8.71 G @ 162.50 MS; -9.87 G @ 103.75 MS

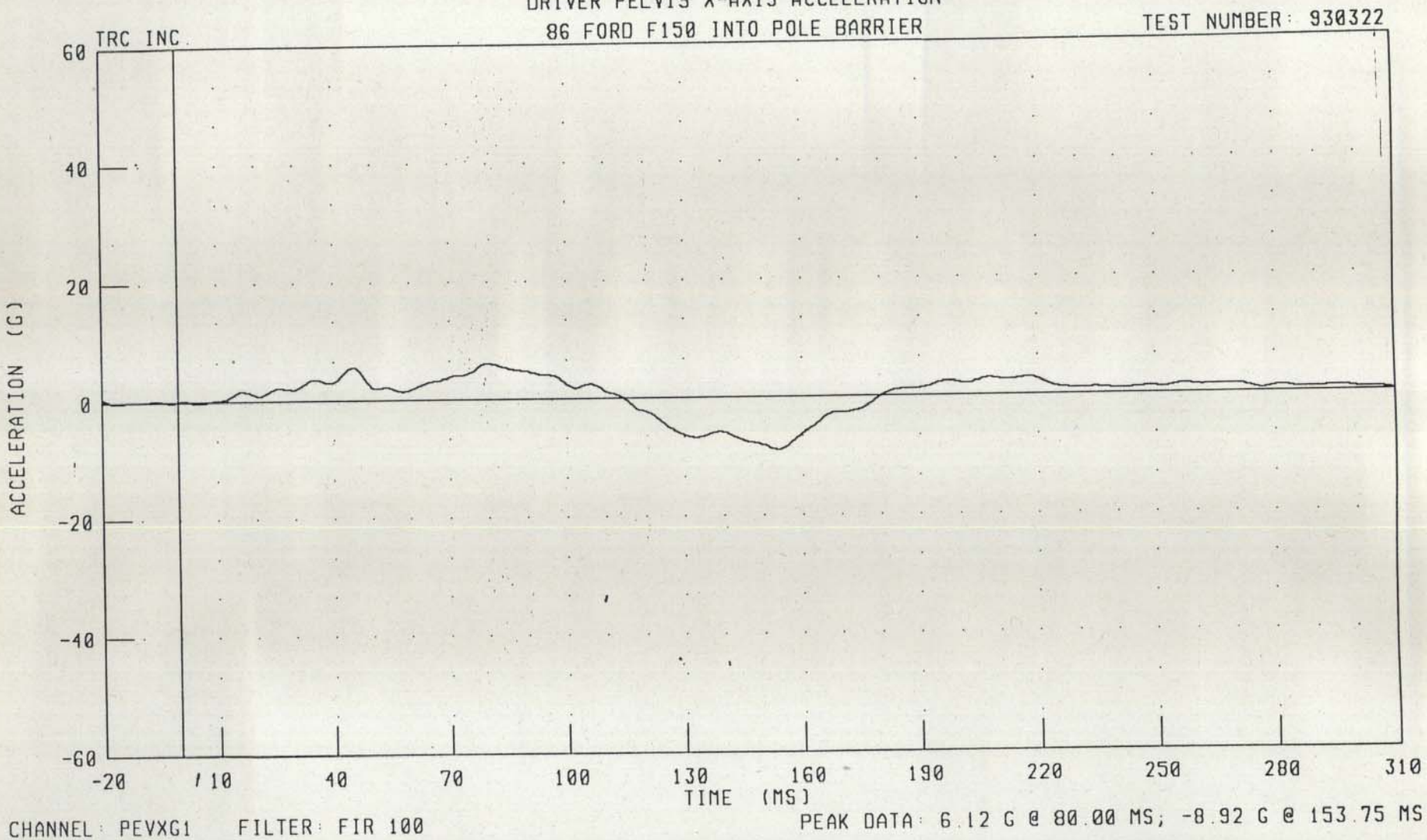
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LEFT LOWER THORAX RIB Y-AXIS REDUNDANT ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: LLRYGA FILTER: FIR 100

PEAK DATA: 9.32 G @ 162.50 MS; -9.20 G @ 93.13 MS

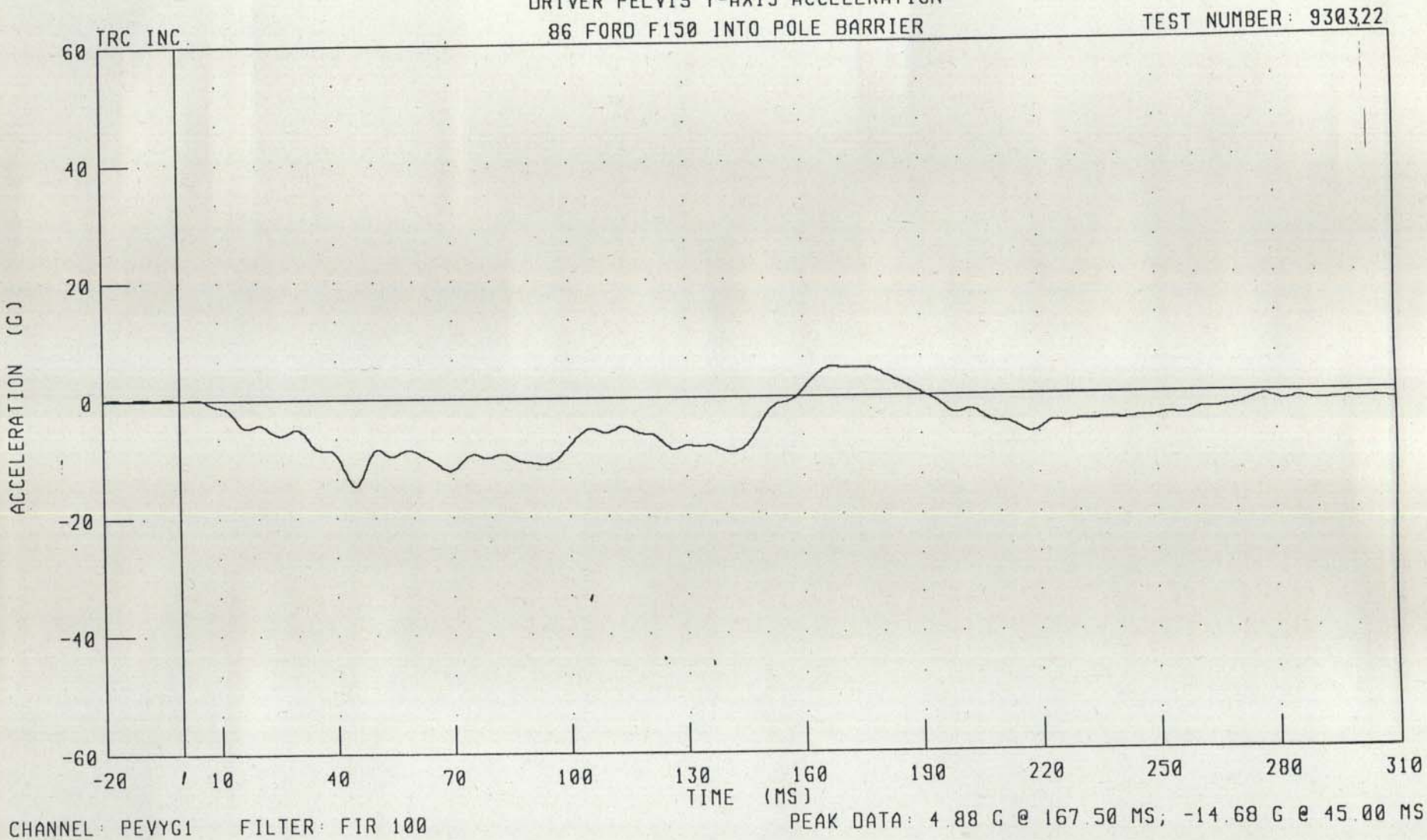
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER PELVIS X-AXIS ACCELERATION



CHANNEL: PEVXG1 FILTER: FIR 100

PEAK DATA: 6.12 G @ 80.00 MS; -8.92 G @ 153.75 MS

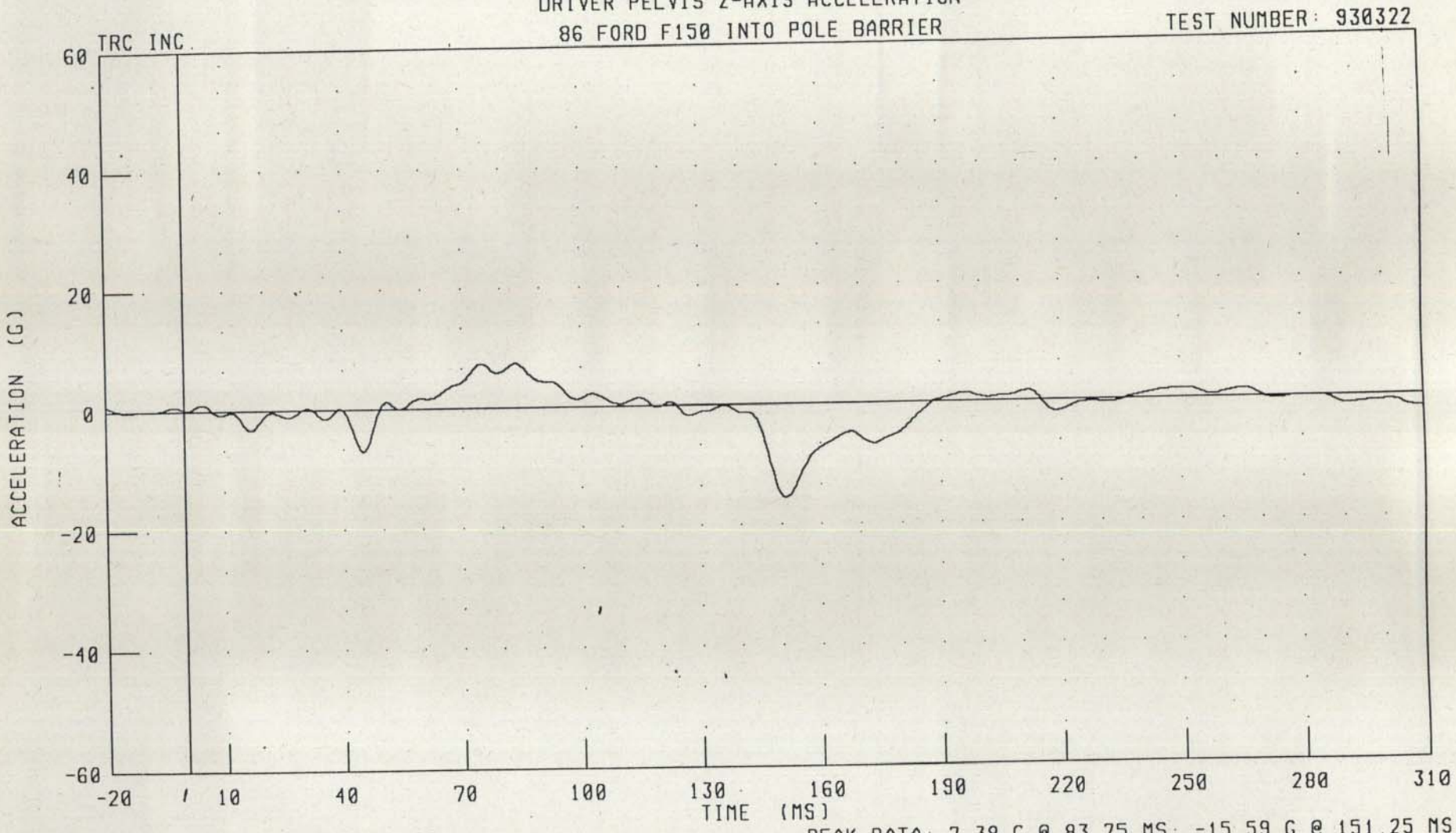
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER PELVIS Y-AXIS ACCELERATION



CHANNEL: PEVYG1 FILTER: FIR 100

PEAK DATA: 4.88 G @ 167.50 MS; -14.68 G @ 45.00 MS

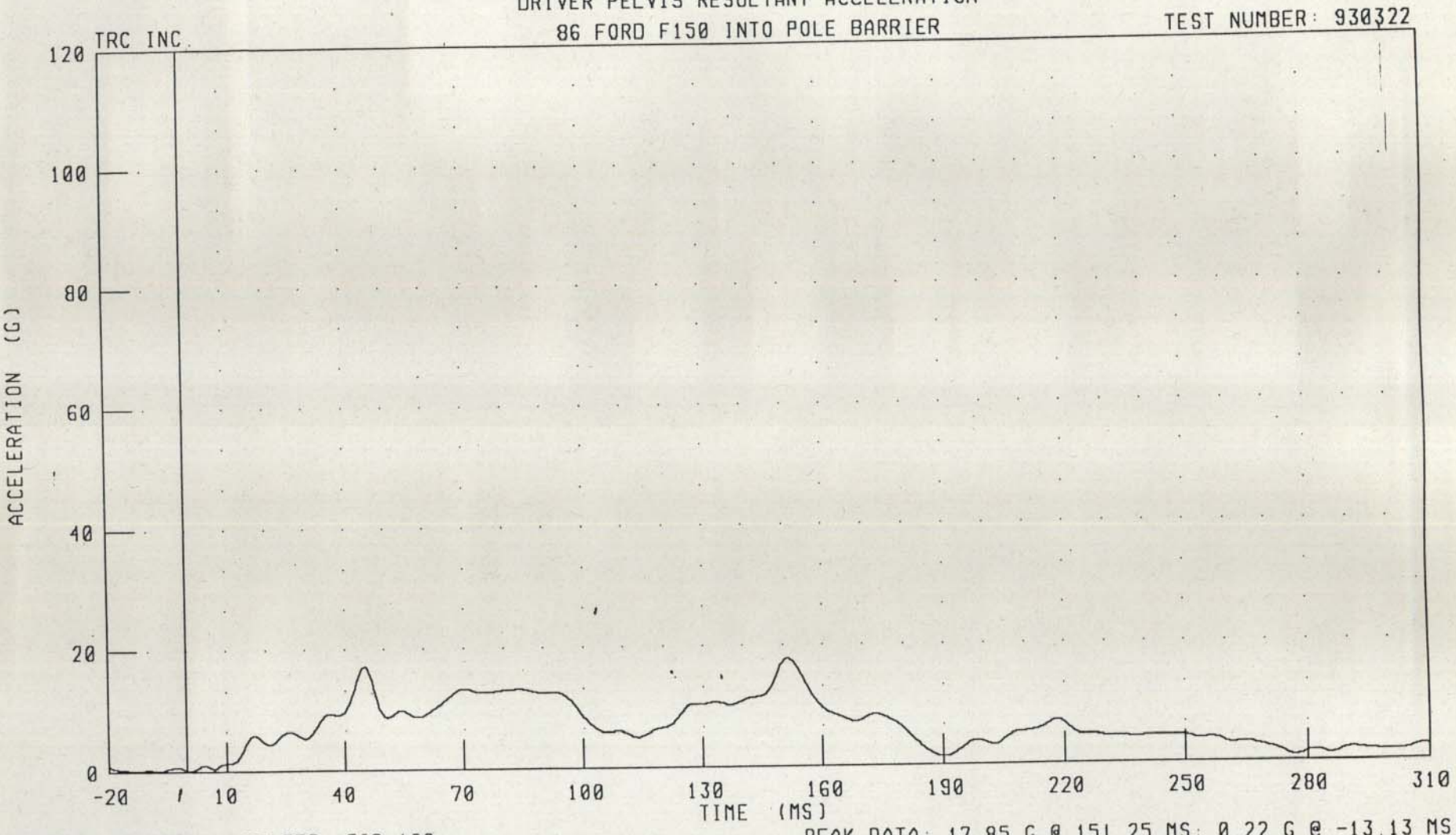
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER PELVIS Z-AXIS ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: PEVZG1 FILTER: FIR 100

PEAK DATA: 7.38 G @ 83.75 MS; -15.59 G @ 151.25 MS

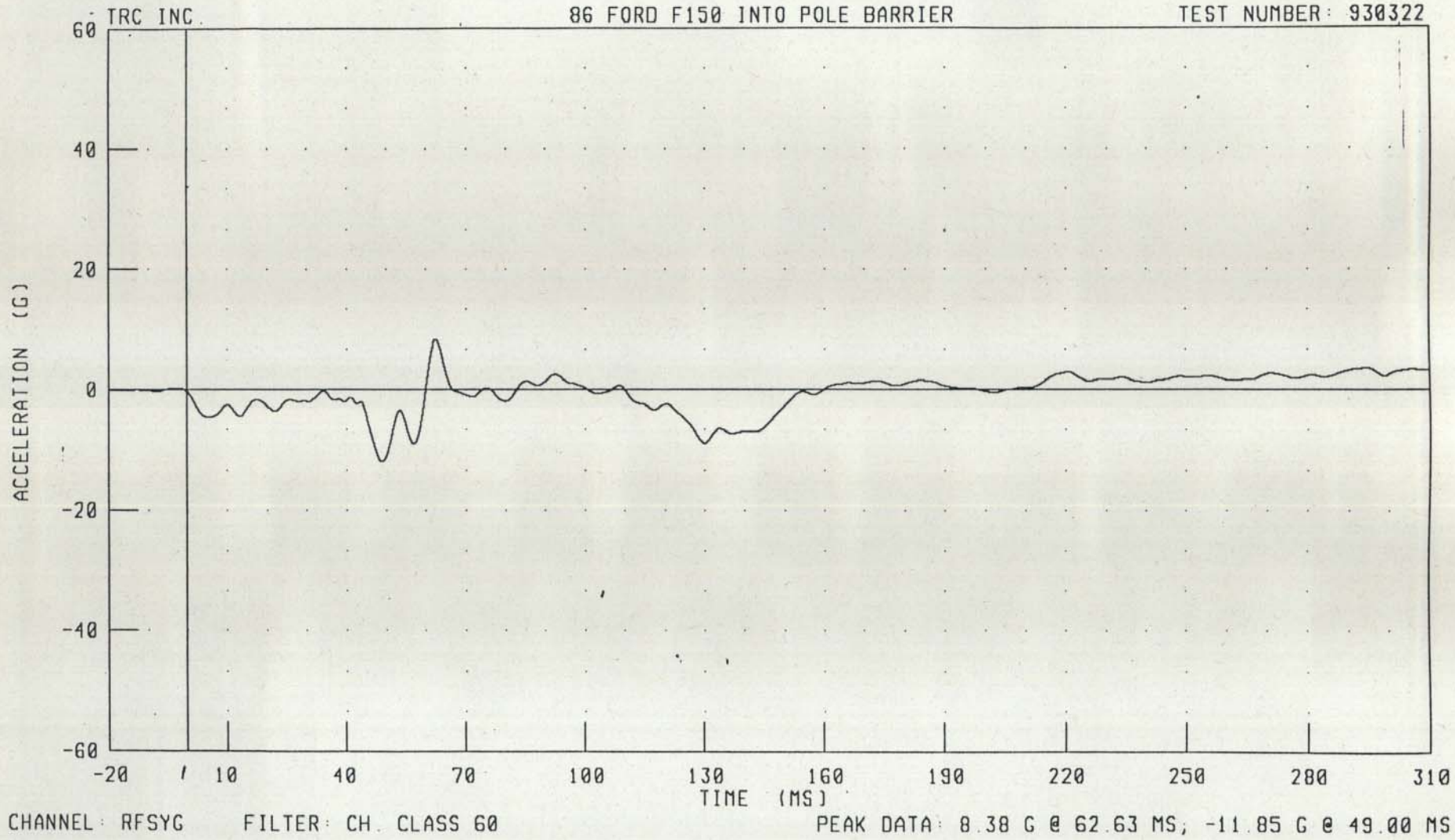
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER PELVIS RESULTANT ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: PEVRG1 FILTER: FIR 100

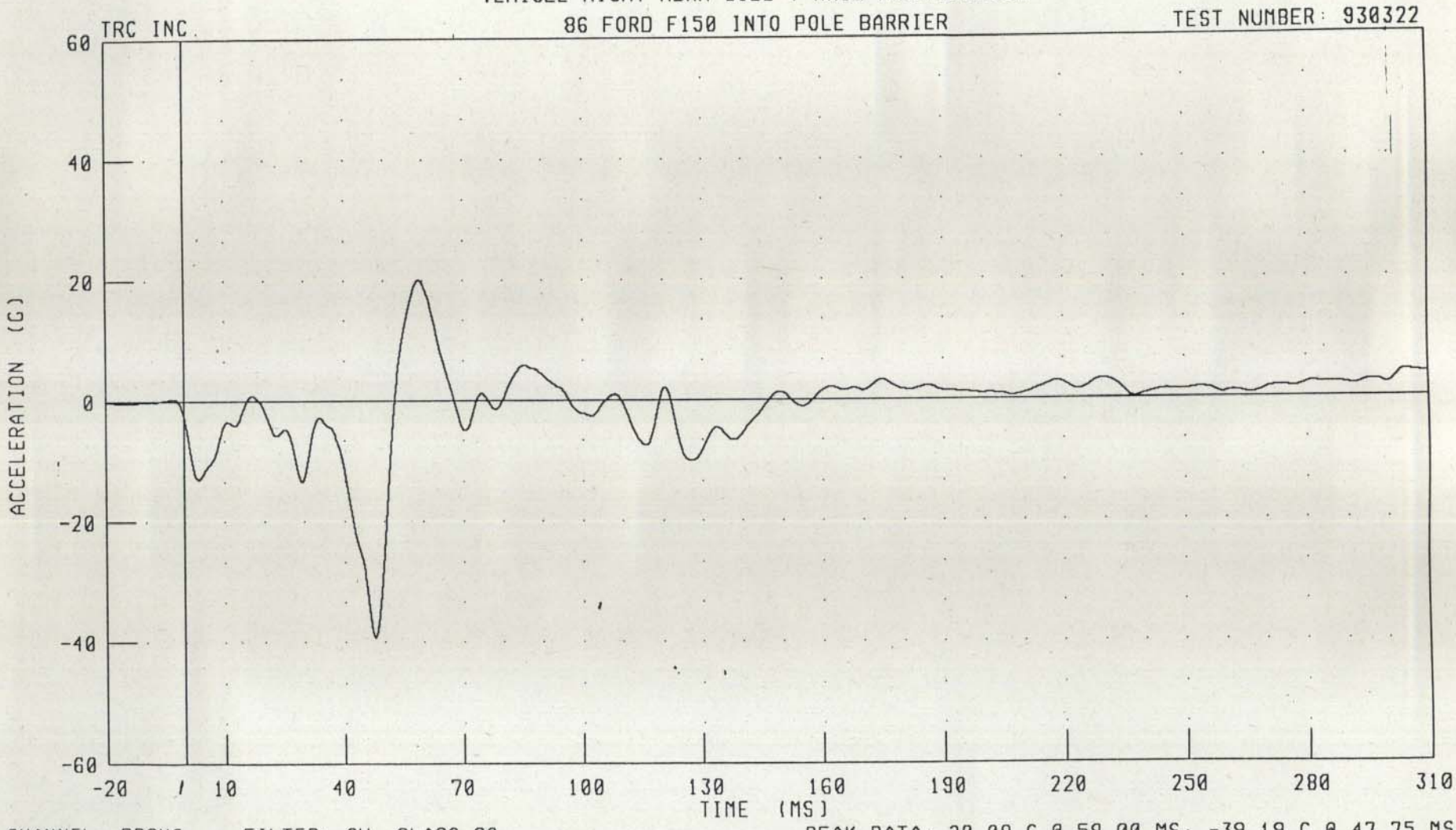
PEAK DATA: 17.85 G @ 151.25 MS; 0.22 G @ -13.13 MS

1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
VEHICLE RIGHT FRONT SILL Y-AXIS ACCELERATION



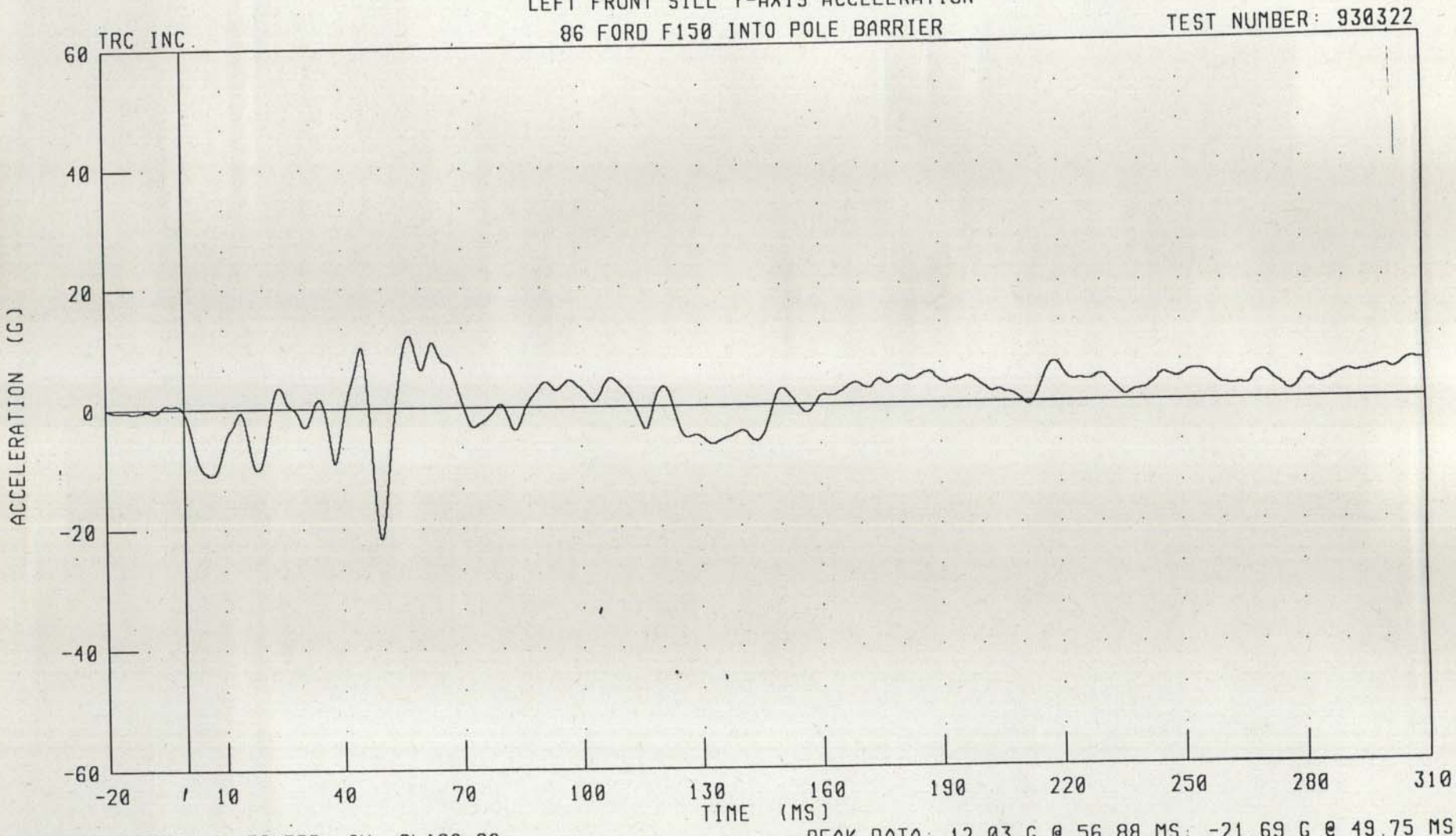
CHANNEL: RFSYG FILTER: CH. CLASS 60 PEAK DATA: 8.38 G @ 62.63 MS; -11.85 G @ 49.00 MS

1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
VEHICLE RIGHT REAR SILL Y-AXIS ACCELERATION



CHANNEL: RRSYG FILTER: CH. CLASS 60 PEAK DATA: 20.08 G @ 59.00 MS; -39.19 G @ 47.75 MS

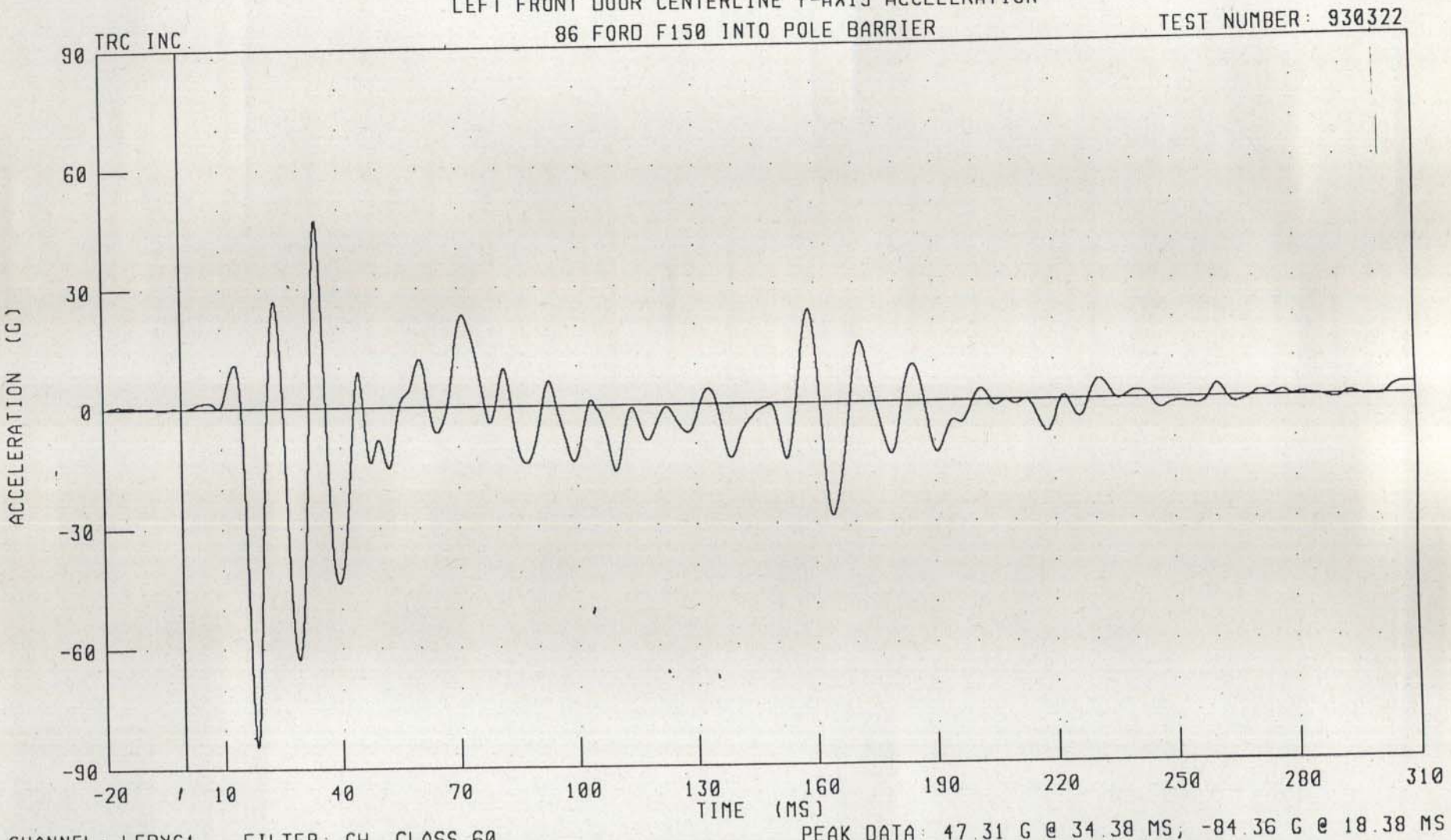
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
LEFT FRONT SILL Y-AXIS ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: LFSYG FILTER: CH. CLASS 60

PEAK DATA: 12.03 G @ 56.88 MS; -21.69 G @ 49.75 MS

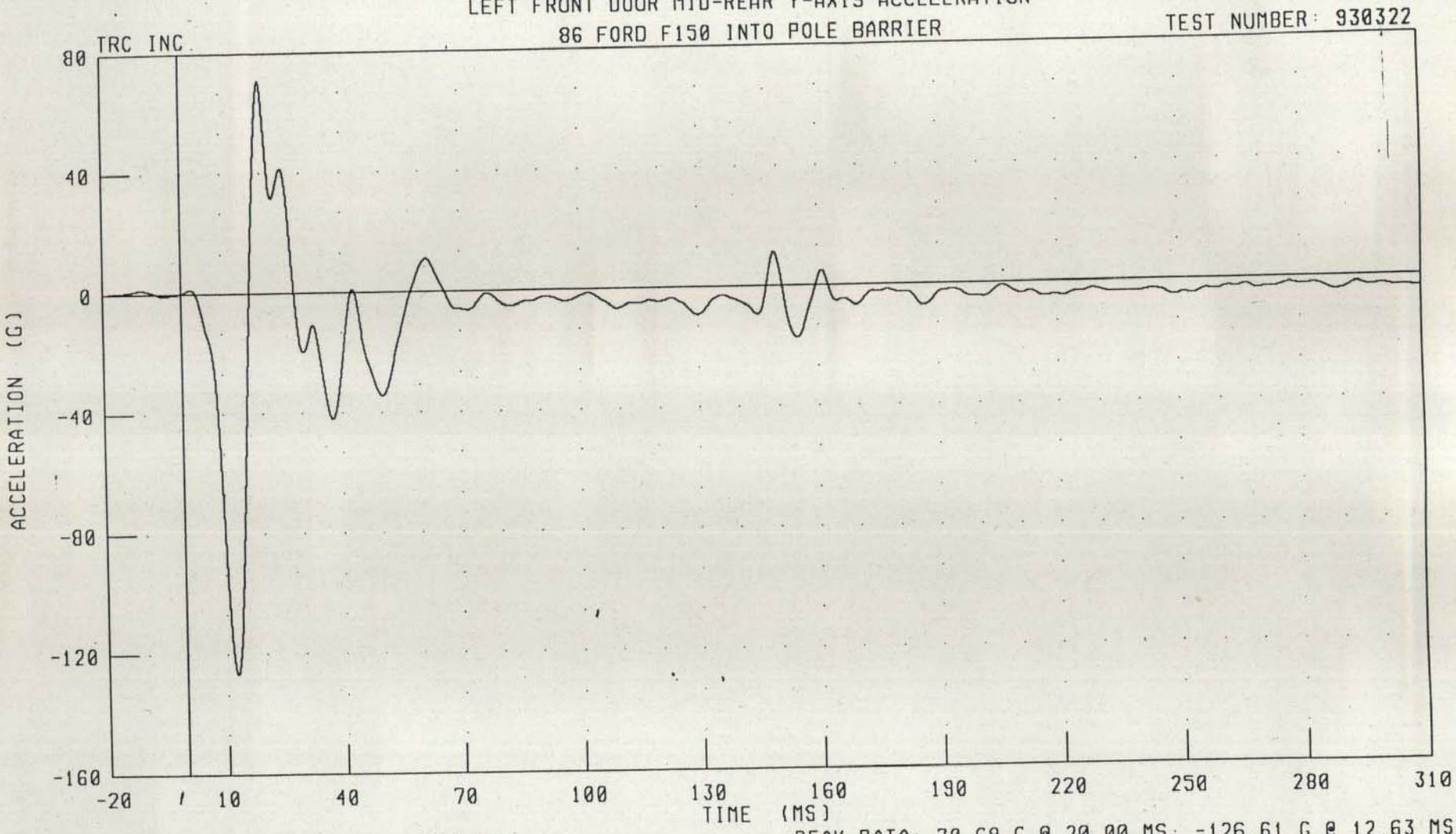
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
LEFT FRONT DOOR CENTERLINE Y-AXIS ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: LFDYG1 FILTER: CH. CLASS 60

PEAK DATA: 47.31 G @ 34.38 MS, -84.36 G @ 18.38 MS

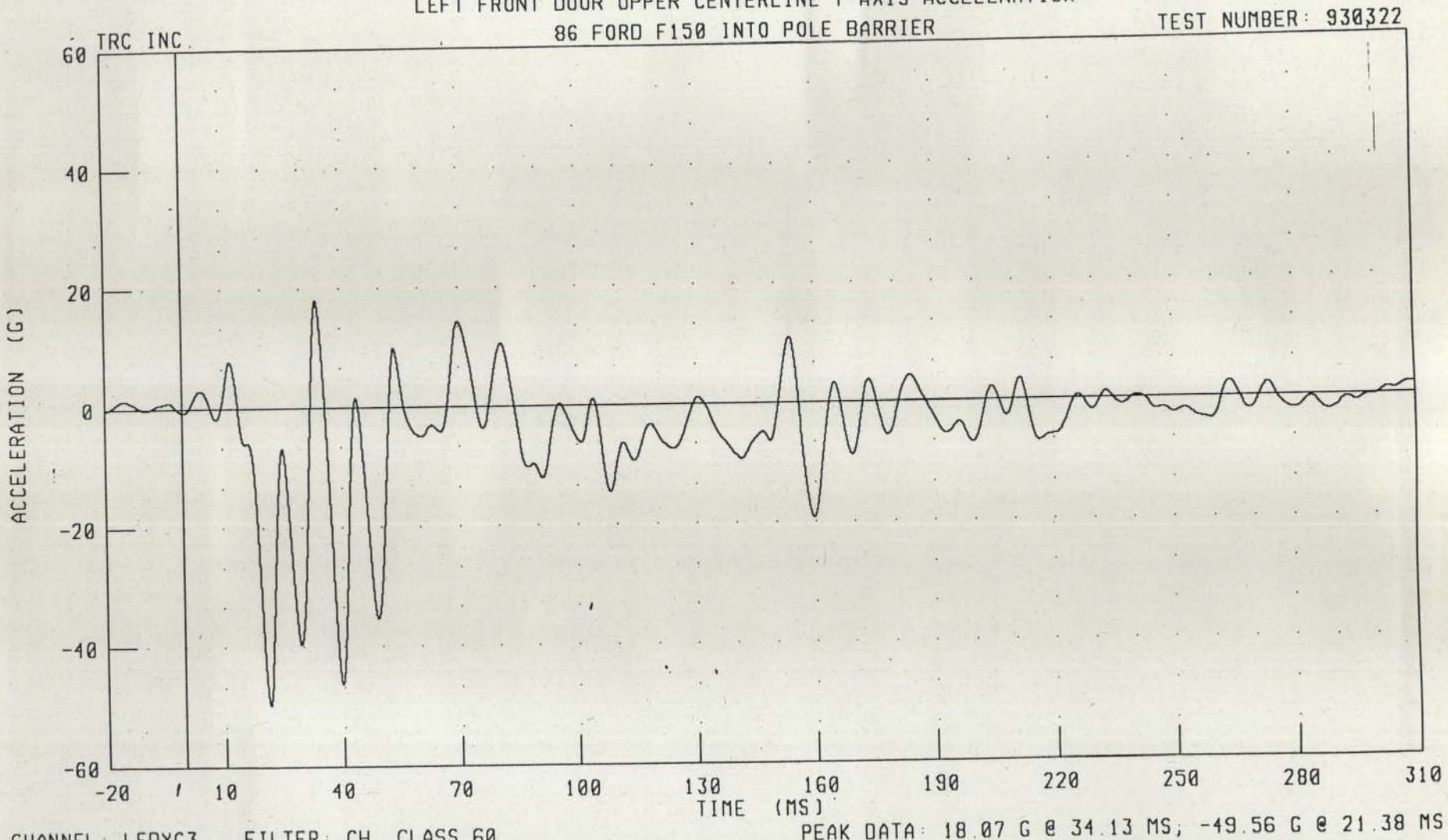
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
LEFT FRONT DOOR MID-REAR Y-AXIS ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: LFDYG2 FILTER: CH. CLASS 60

PEAK DATA: 70.69 G @ 20.00 MS; -126.61 G @ 12.63 MS

1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
LEFT FRONT DOOR UPPER CENTERLINE Y-AXIS ACCELERATION



CHANNEL: LFDYG3 FILTER: CH. CLASS 60

PEAK DATA: 18.07 G @ 34.13 MS; -49.56 G @ 21.38 MS

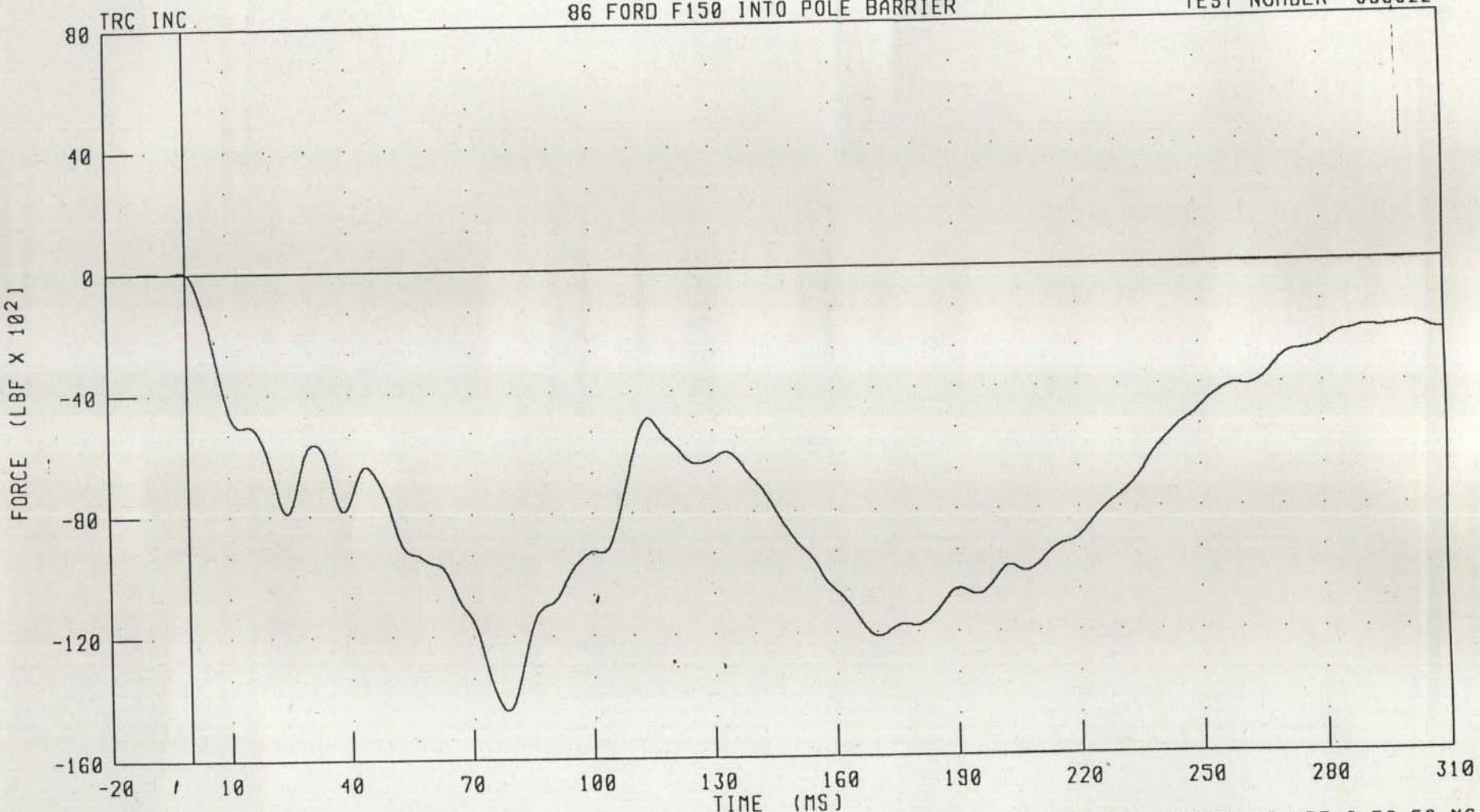
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER

POLE BARRIER TOP LEFT X-AXIS FORCE

86 FORD F150 INTO POLE BARRIER

TRC INC.

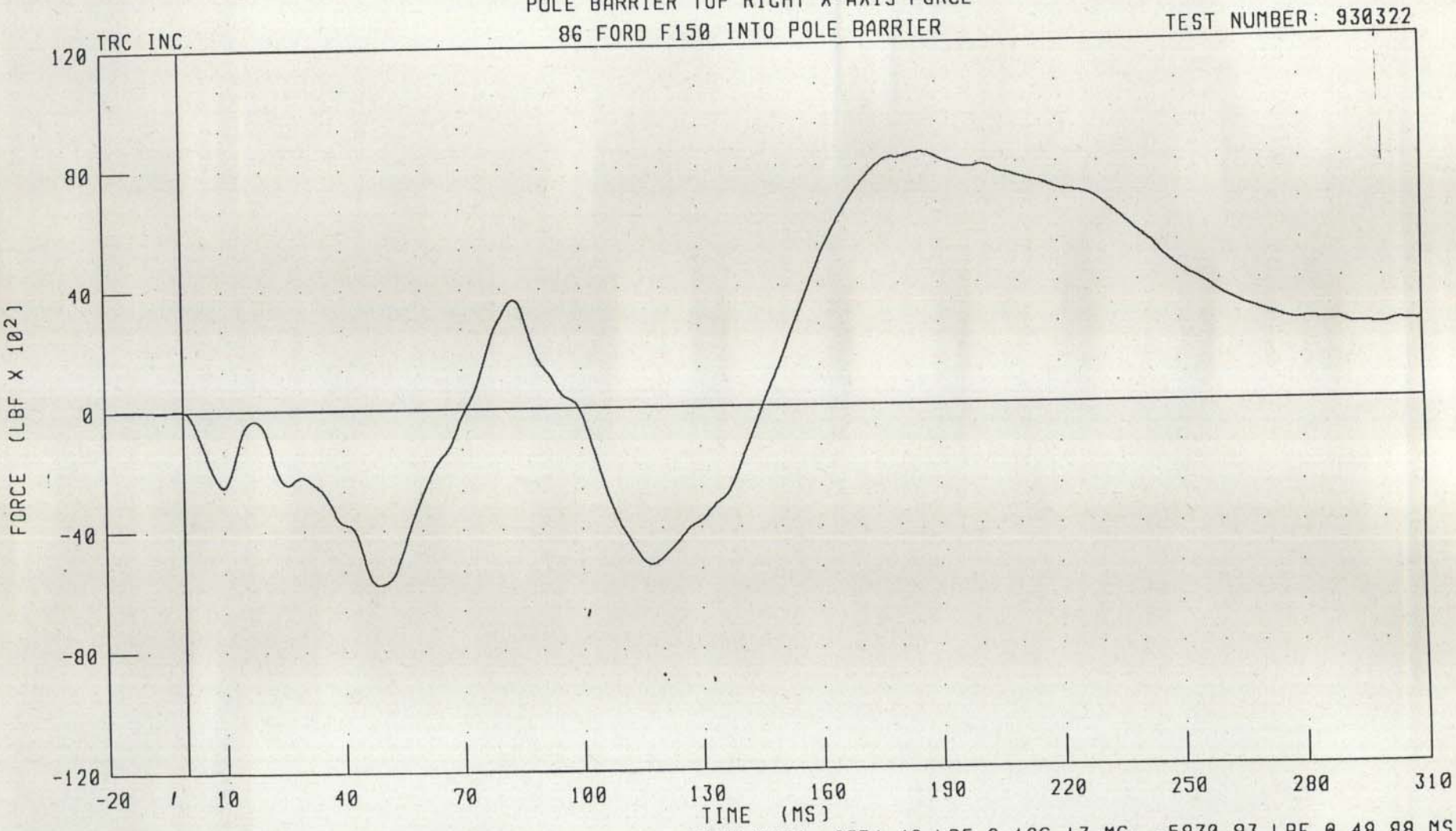
TEST NUMBER: 930322



CHANNEL POLXF1 FILTER: CH. CLASS 60

PEAK DATA: 59.90 LBF @ -1.38 MS, -14394.49 LBF @ 78.50 MS

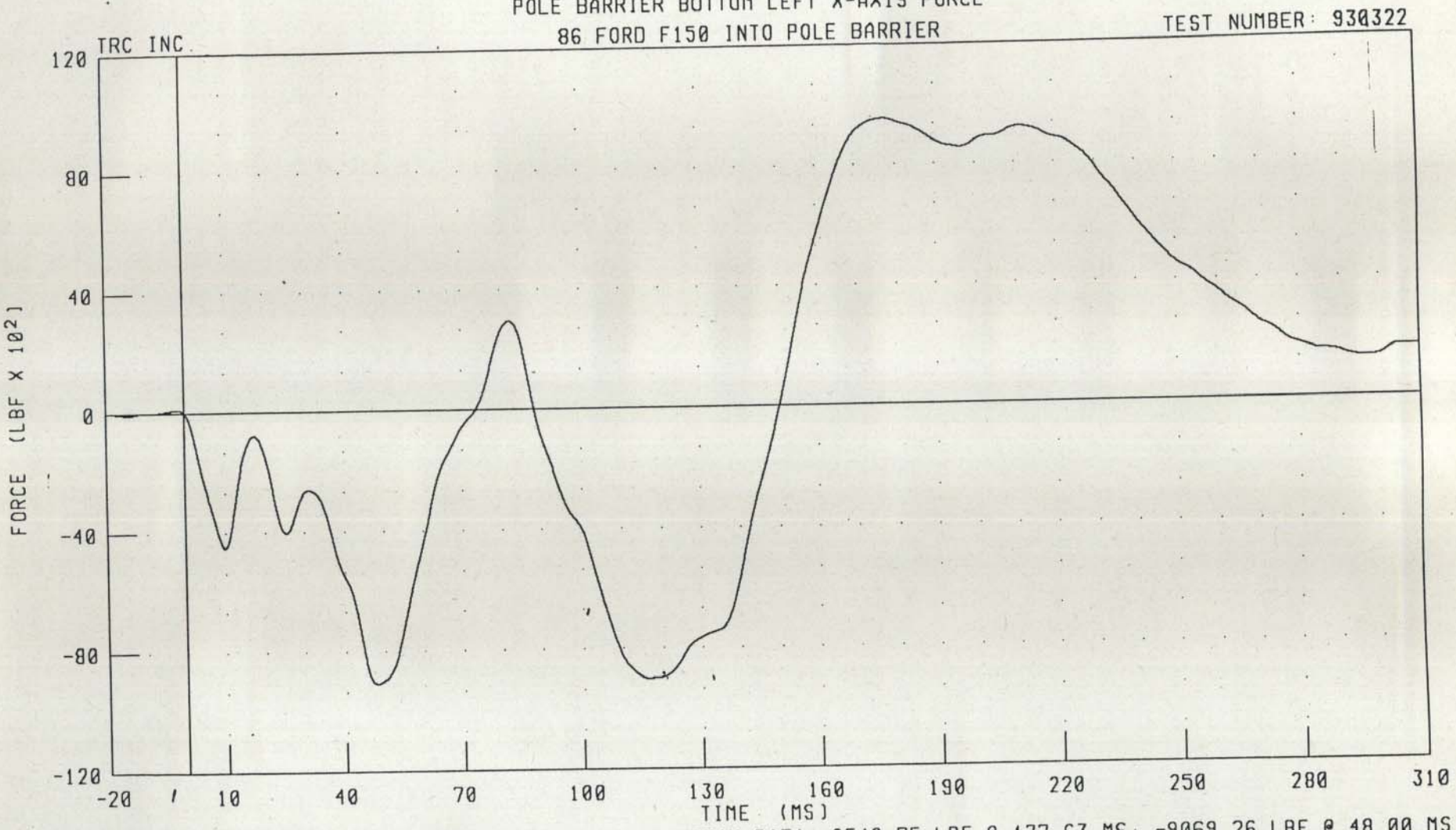
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
POLE BARRIER TOP RIGHT X-AXIS FORCE
86 FORD F150 INTO POLE BARRIER



CHANNEL: POLXF2 FILTER: CH. CLASS 60

PEAK DATA: 8354.42 LBF @ 186.13 MS, -5830.93 LBF @ 48.88 MS

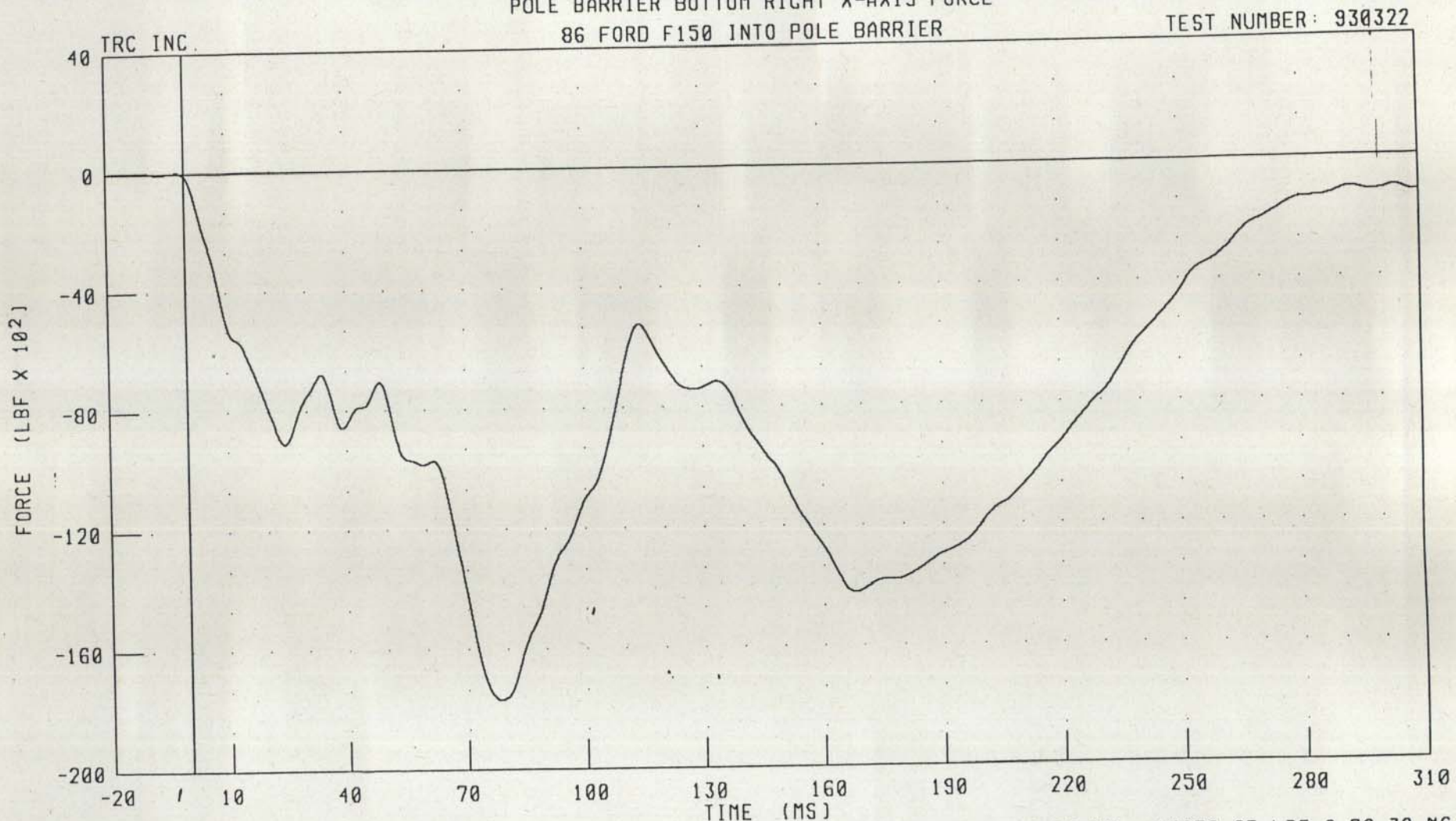
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
POLE BARRIER BOTTOM LEFT X-AXIS FORCE
86 FORD F150 INTO POLE BARRIER



CHANNEL: POLXF3 FILTER: CH. CLASS 60

PEAK DATA: 9540.75 LBF @ 177.63 MS; -9069.26 LBF @ 48.00 MS

1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
POLE BARRIER BOTTOM RIGHT X-AXIS FORCE
86 FORD F150 INTO POLE BARRIER



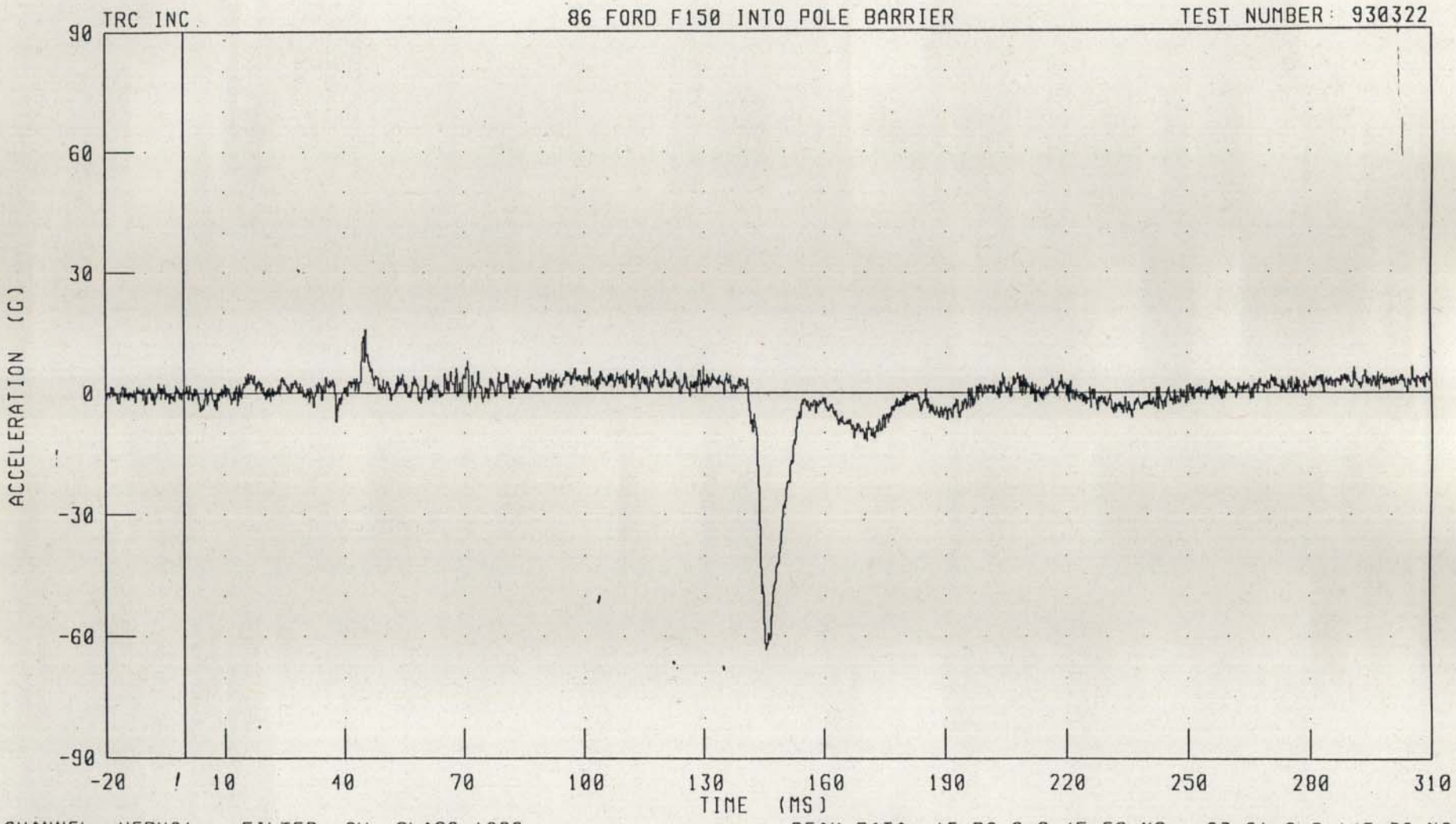
CHANNEL: POLXF4 FILTER: CH CLASS 60

PEAK DATA: 39.29 LBF @ -10.88 MS; -17679.87 LBF @ 78.38 MS

APPENDIX B

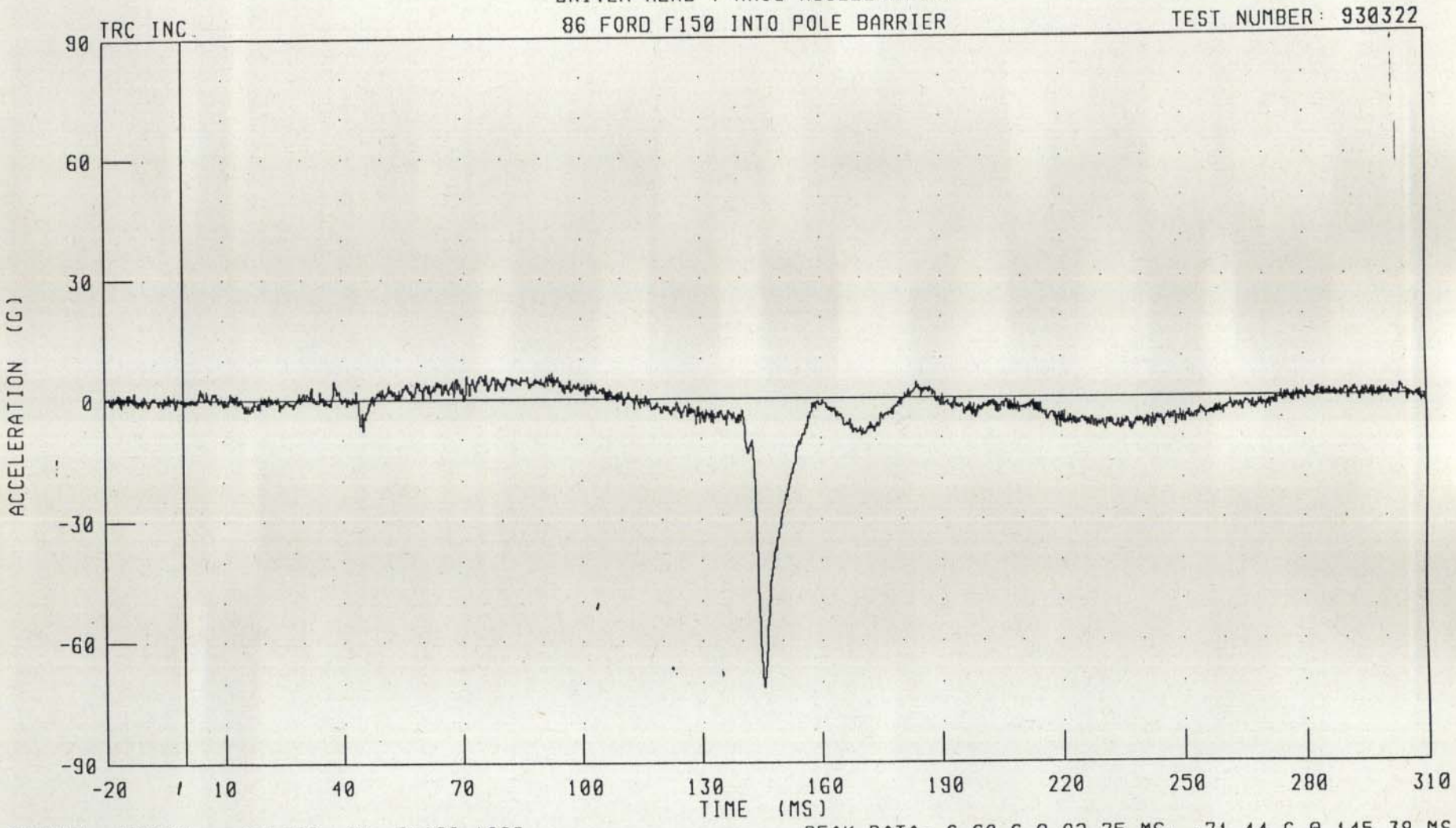
DATA PLOTS

1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER HEAD X-AXIS ACCELERATION



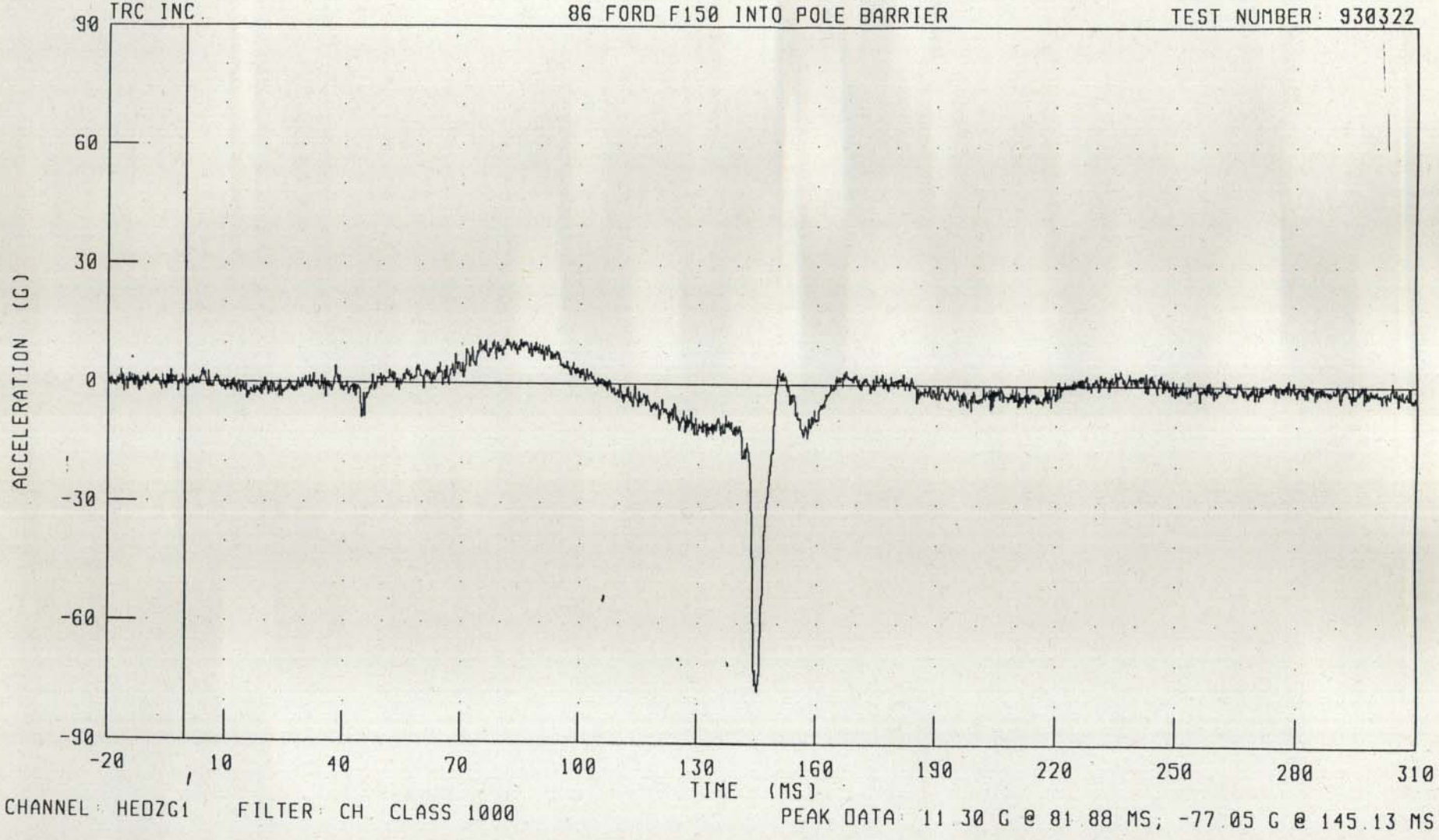
CHANNEL: HEDXG1 FILTER: CH CLASS 1000 PEAK DATA: 15.76 G @ 45.50 MS; -63.21 G @ 145.38 MS

1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER HEAD Y-AXIS ACCELERATION

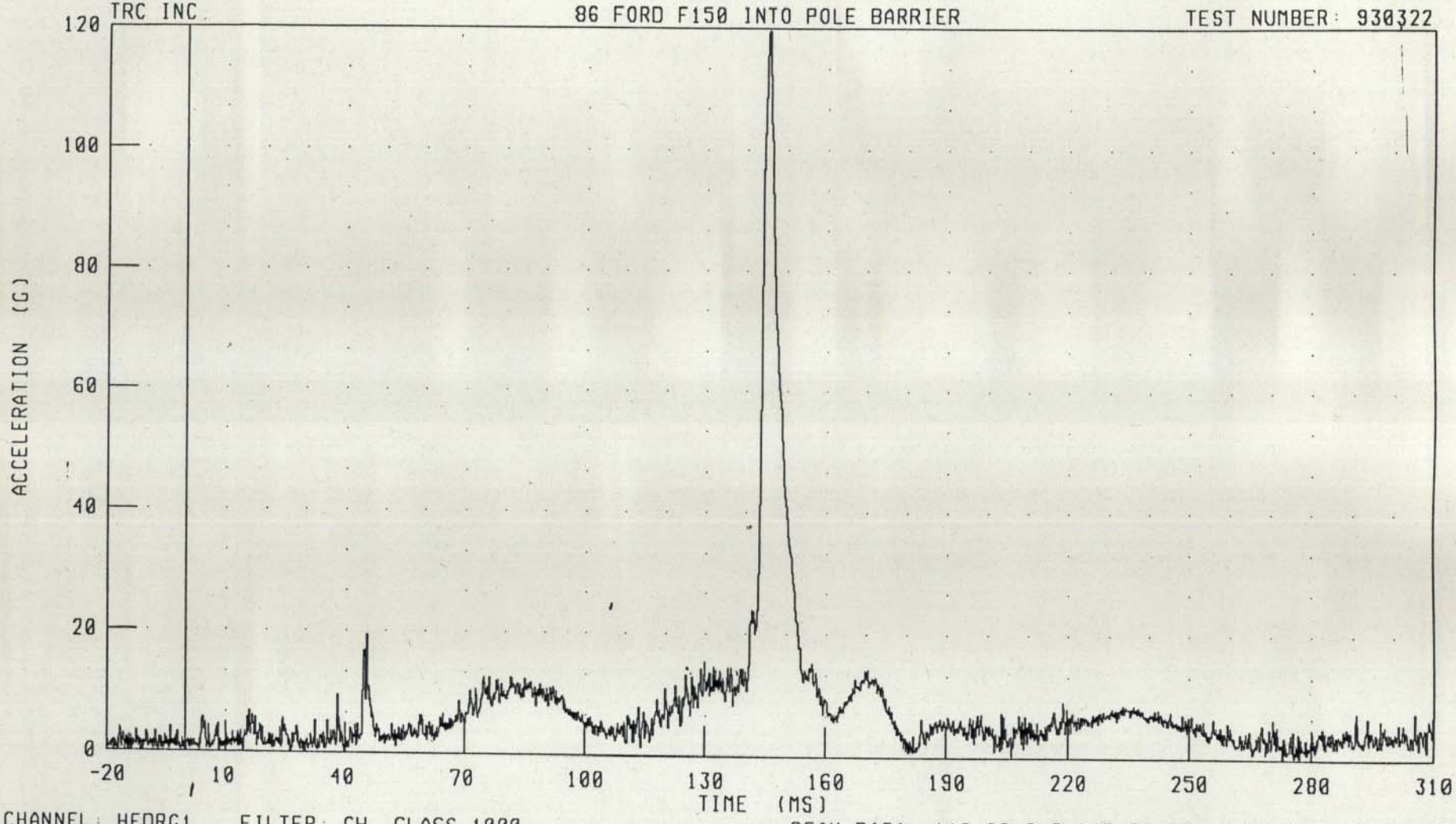


CHANNEL: HEDYG1 FILTER: CH. CLASS 1000 PEAK DATA: 6.60 G @ 92.75 MS; -71.44 G @ 145.38 MS

1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER HEAD Z-AXIS ACCELERATION



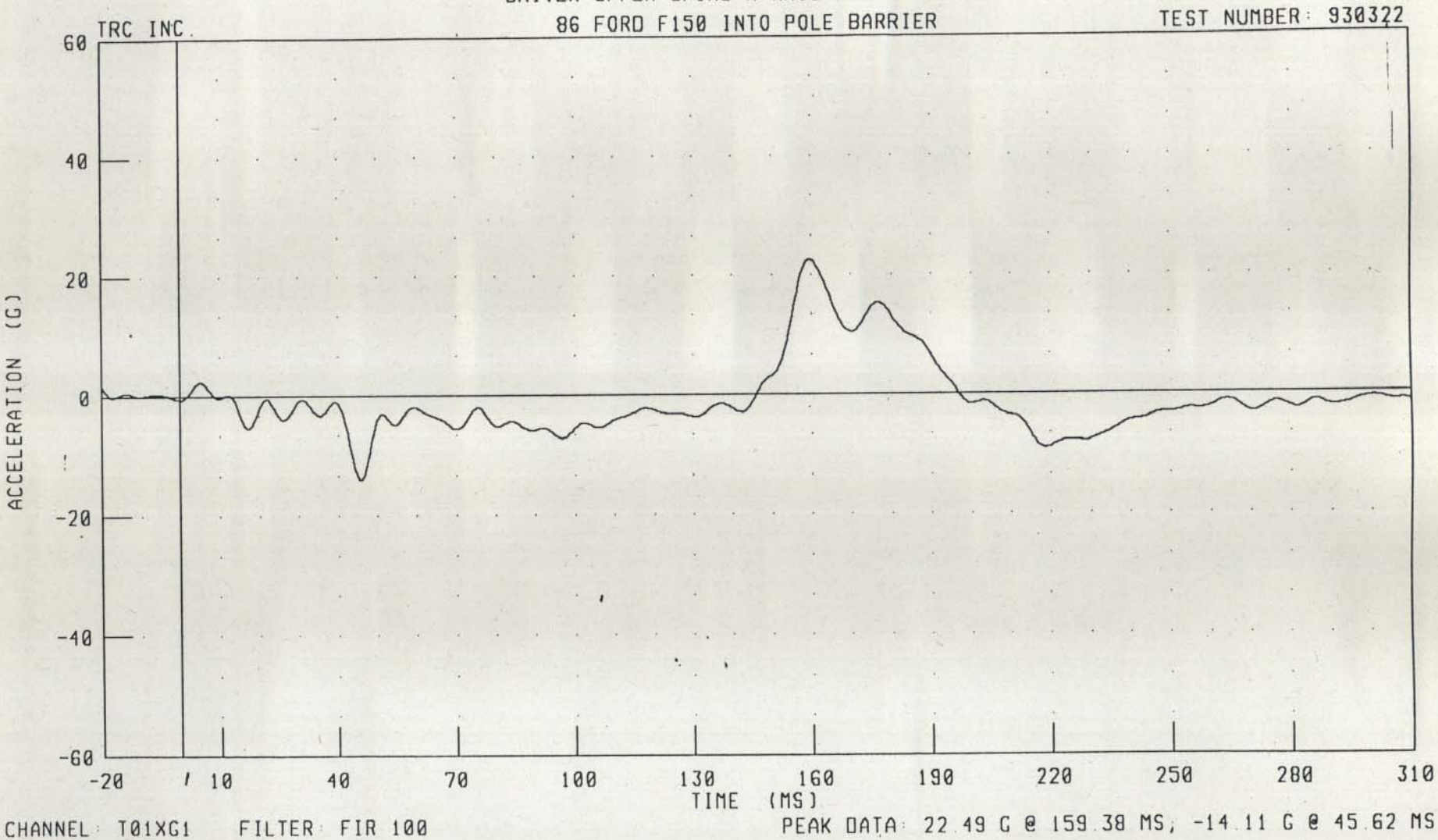
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER HEAD RESULTANT ACCELERATION



CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

PEAK DATA: 119.69 G @ 145.38 MS; 0.21 G @ -15.38 MS

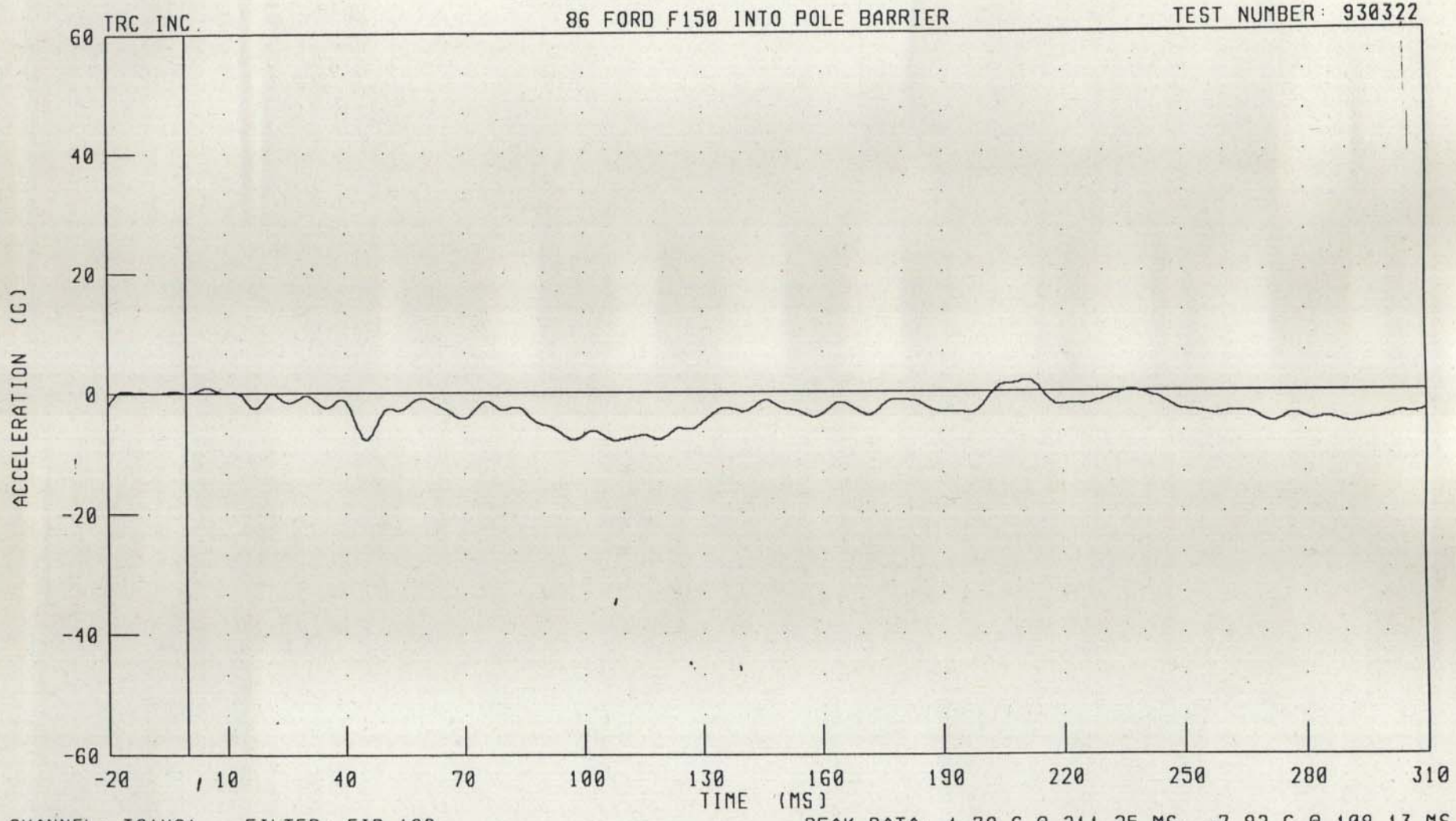
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER UPPER SPINE X-AXIS ACCELERATION



CHANNEL: T01XG1 FILTER: FIR 100

PEAK DATA: 22.49 G @ 159.38 MS, -14.11 G @ 45.62 MS

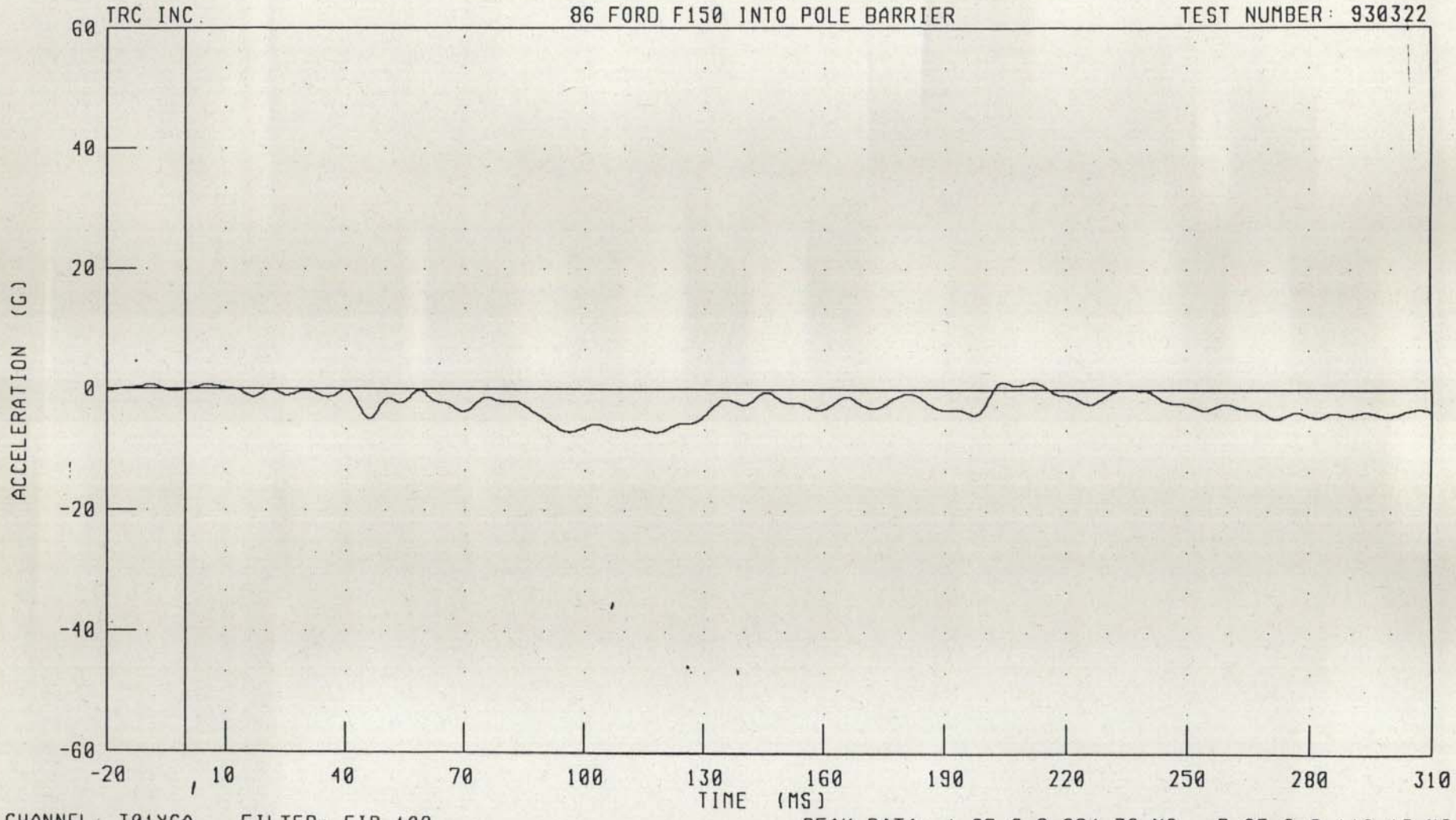
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER UPPER SPINE Y-AXIS ACCELERATION



CHANNEL: T01YG1 FILTER: FIR 100

PEAK DATA: 1.79 G @ 211.25 MS; -7.92 G @ 108.13 MS

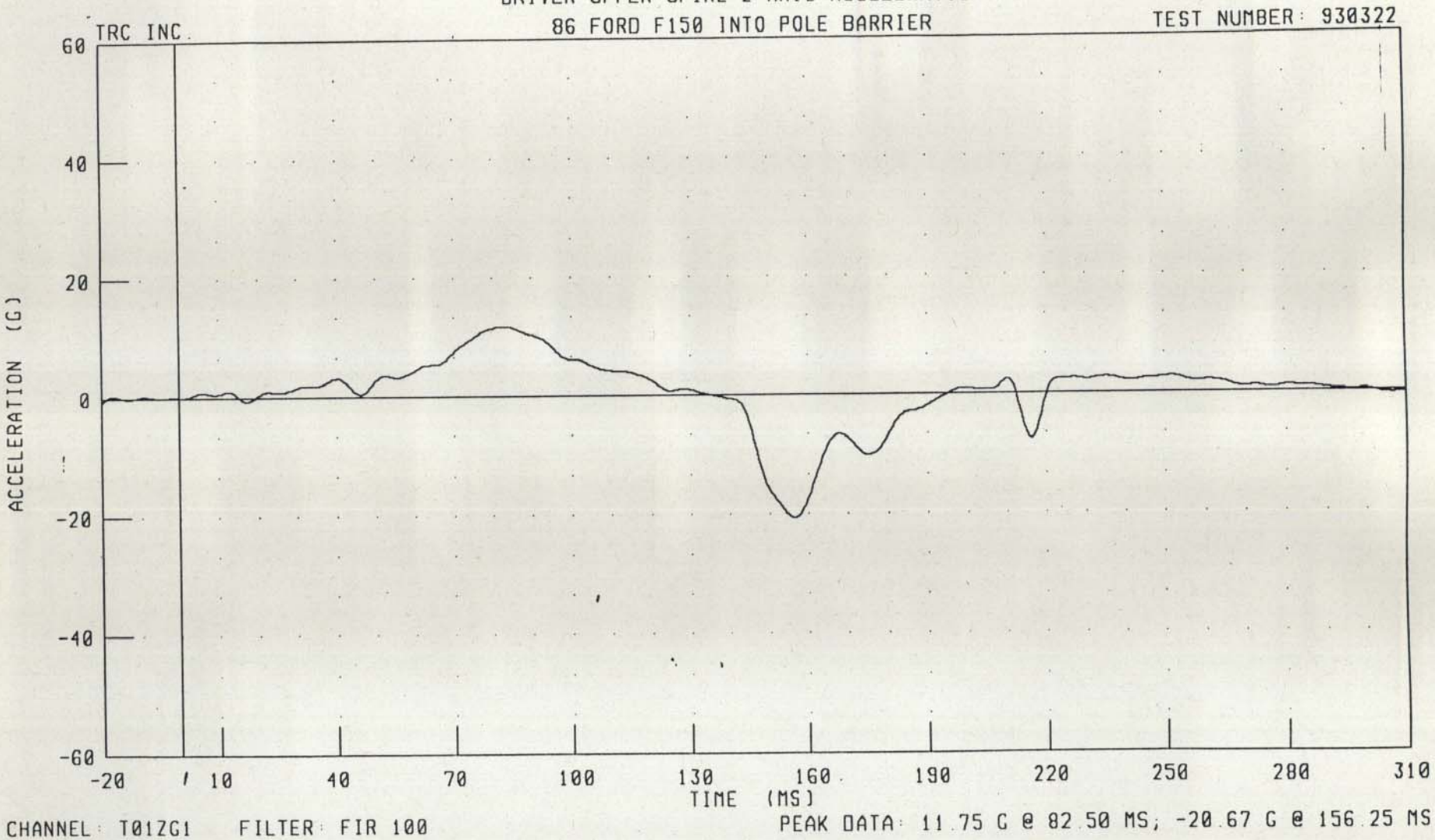
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER UPPER SPINE Y-AXIS REDUNDANT ACCELERATION



CHANNEL: T01YGA FILTER: FIR 100

PEAK DATA: 1.27 G @ 204.38 MS; -7.05 G @ 118.13 MS

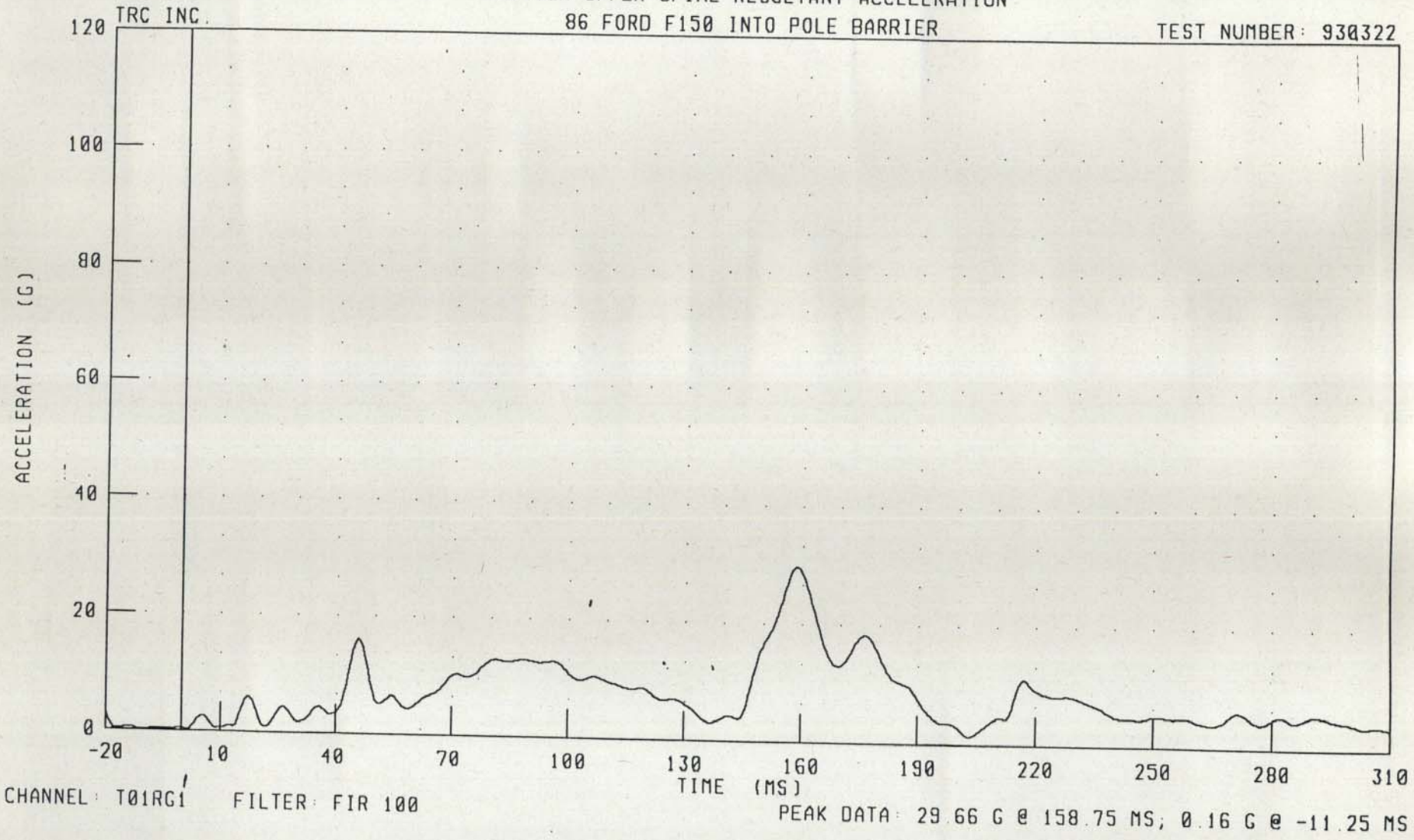
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER UPPER SPINE Z-AXIS ACCELERATION
86 FORD F150 INTO POLE BARRIER



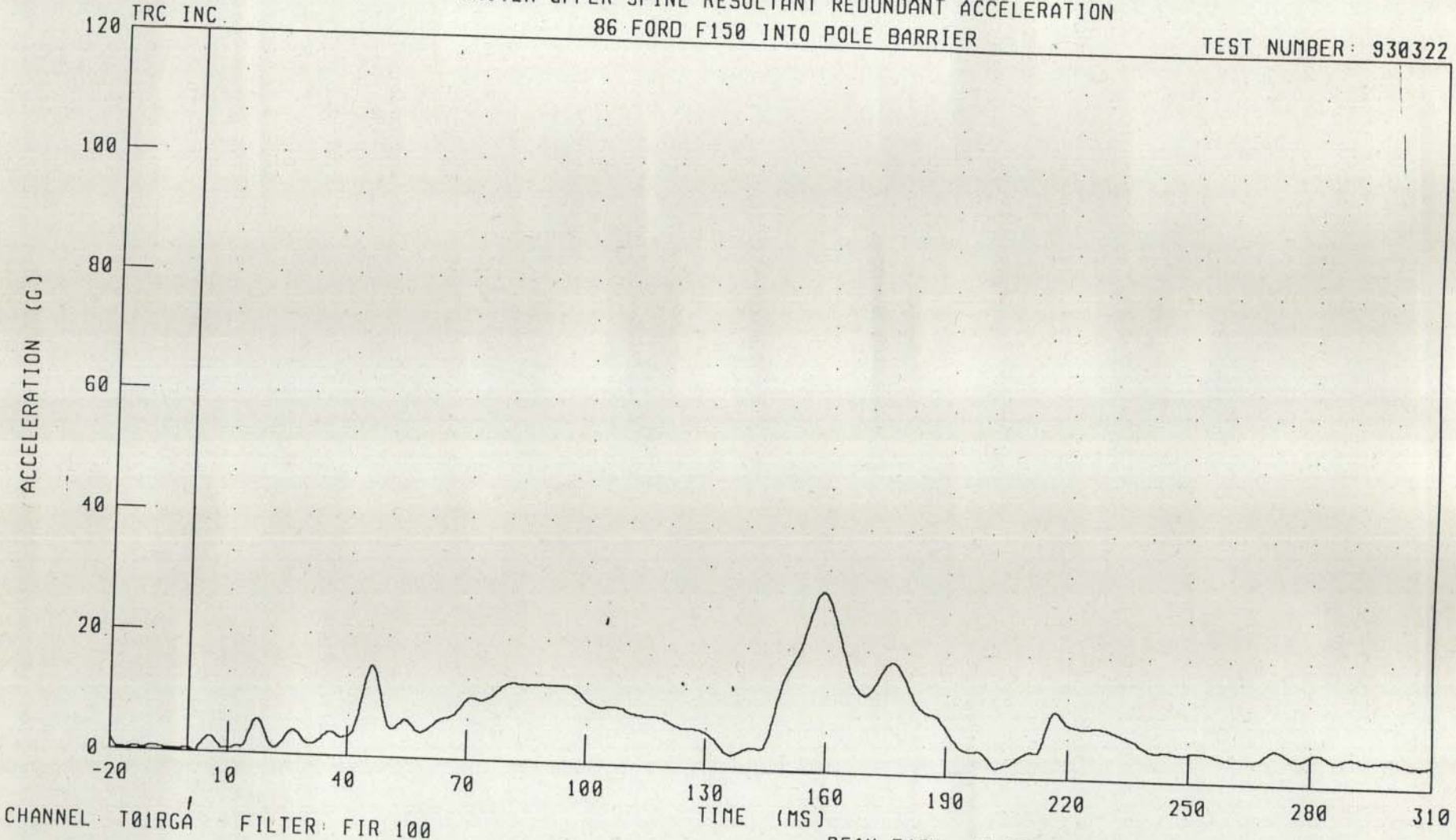
CHANNEL: T01ZG1 FILTER: FIR 100

PEAK DATA: 11.75 G @ 82.50 MS; -20.67 G @ 156.25 MS

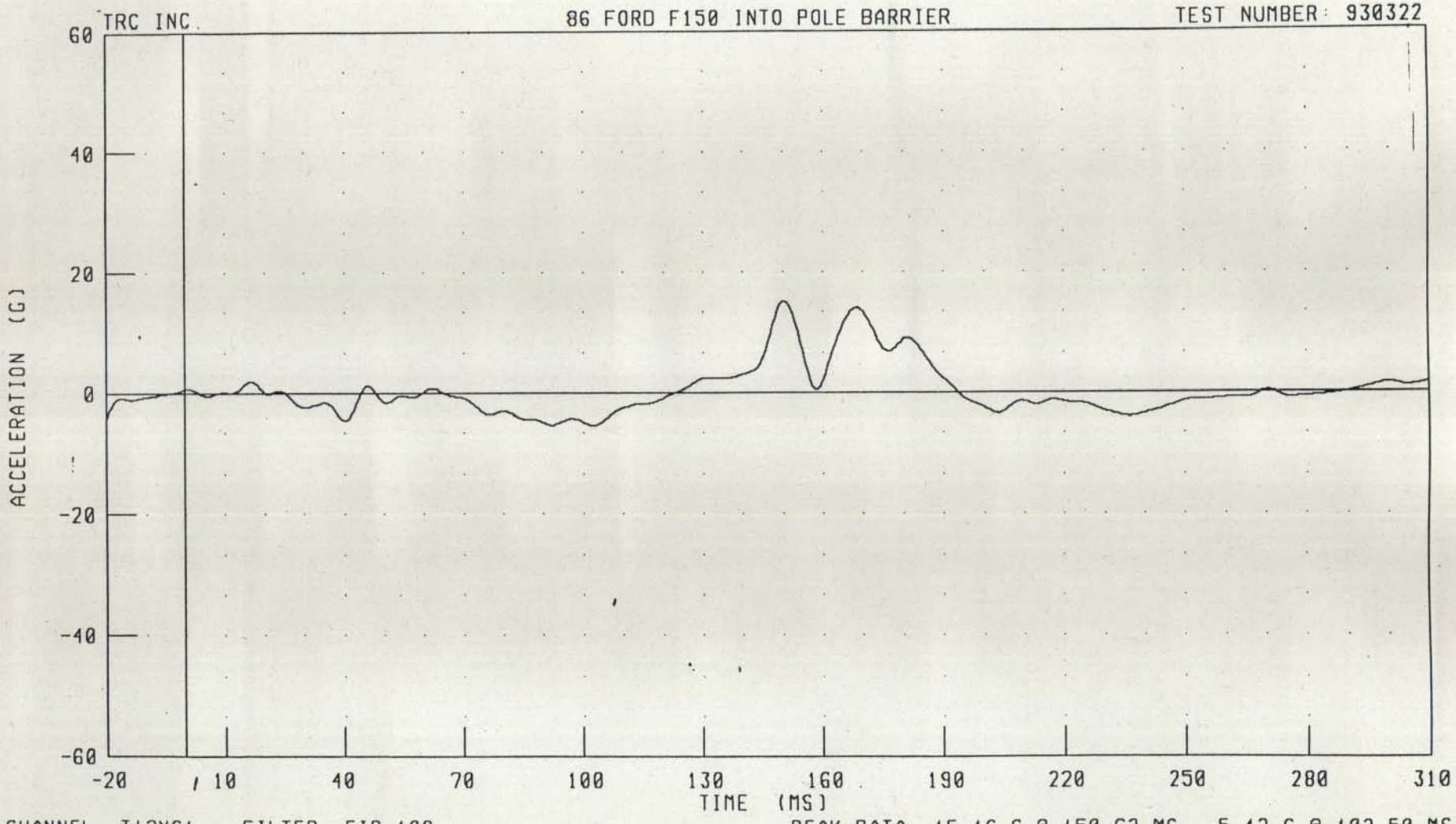
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER UPPER SPINE RESULTANT ACCELERATION



1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER UPPER SPINE RESULTANT REDUNDANT ACCELERATION
86 FORD F150 INTO POLE BARRIER



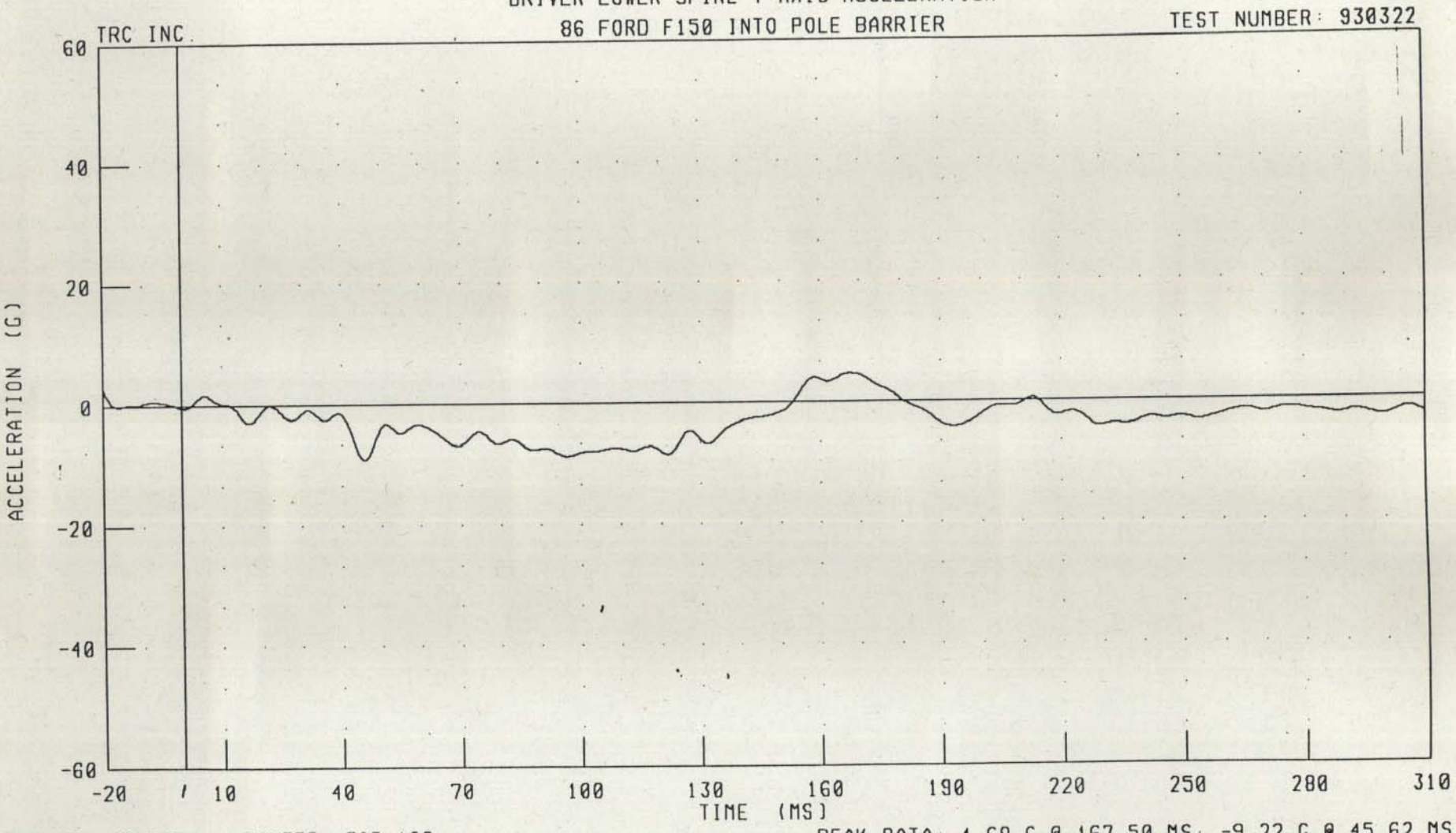
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LOWER SPINE X-AXIS ACCELERATION



CHANNEL: T12XG1 FILTER: FIR 100

PEAK DATA: 15.16 G @ 150.62 MS; -5.42 G @ 102.50 MS

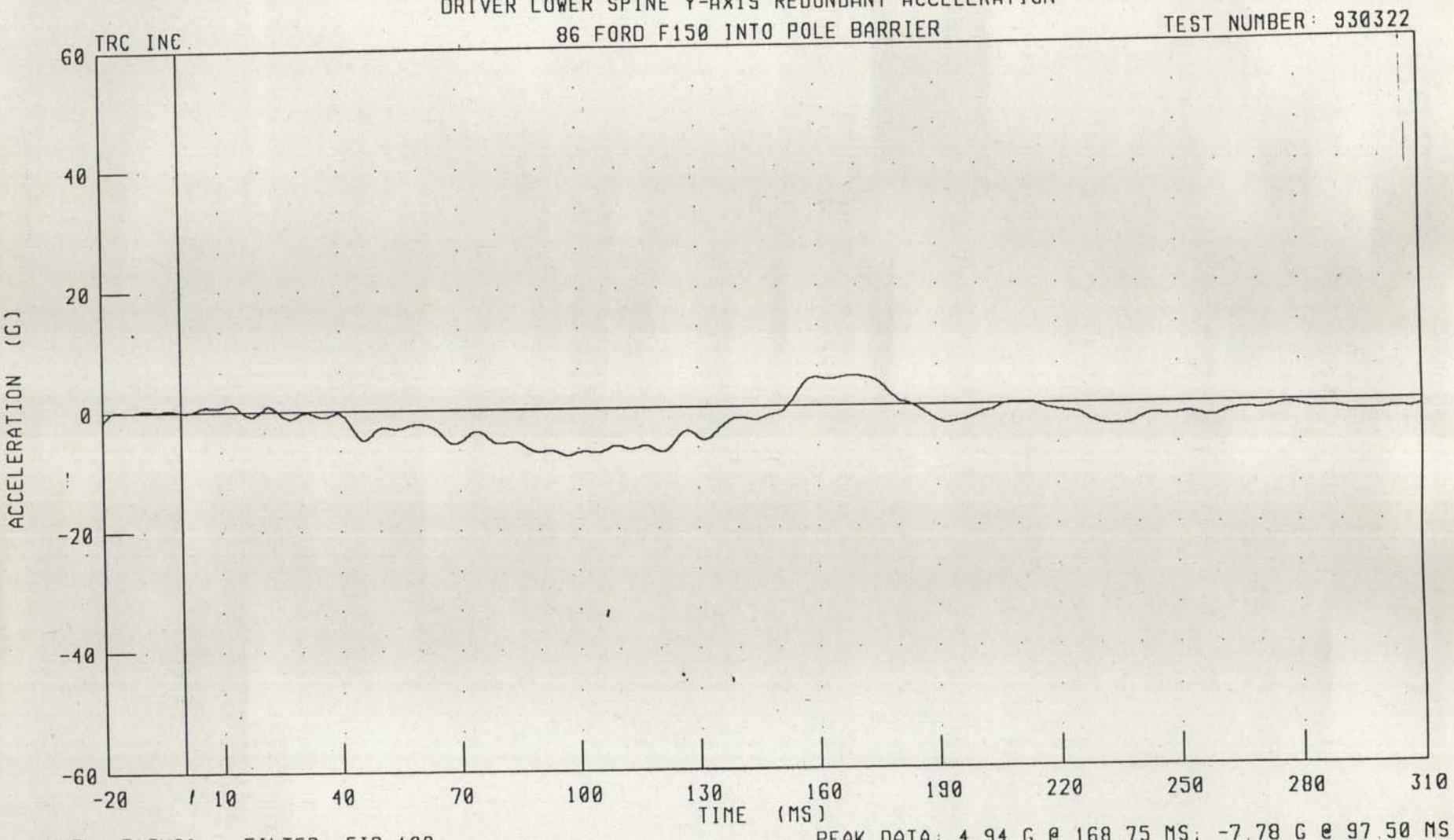
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LOWER SPINE Y-AXIS ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: T12YG1 FILTER: FIR 100

PEAK DATA: 4.68 G @ 167.50 MS; -9.22 G @ 45.62 MS

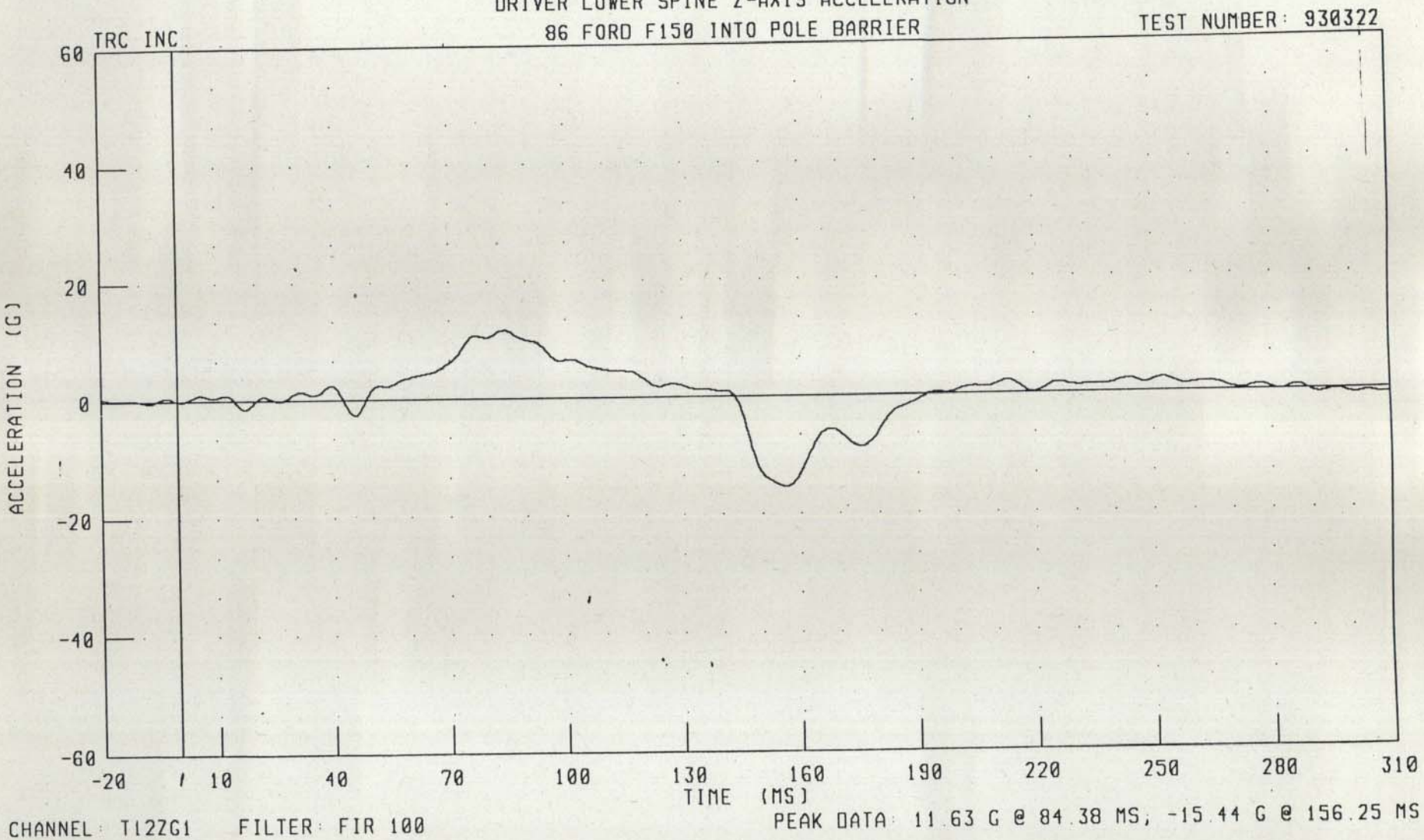
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LOWER SPINE Y-AXIS REDUNDANT ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: T12YGA FILTER: FIR 100

PEAK DATA: 4.94 G @ 168.75 MS; -7.78 G @ 97.50 MS

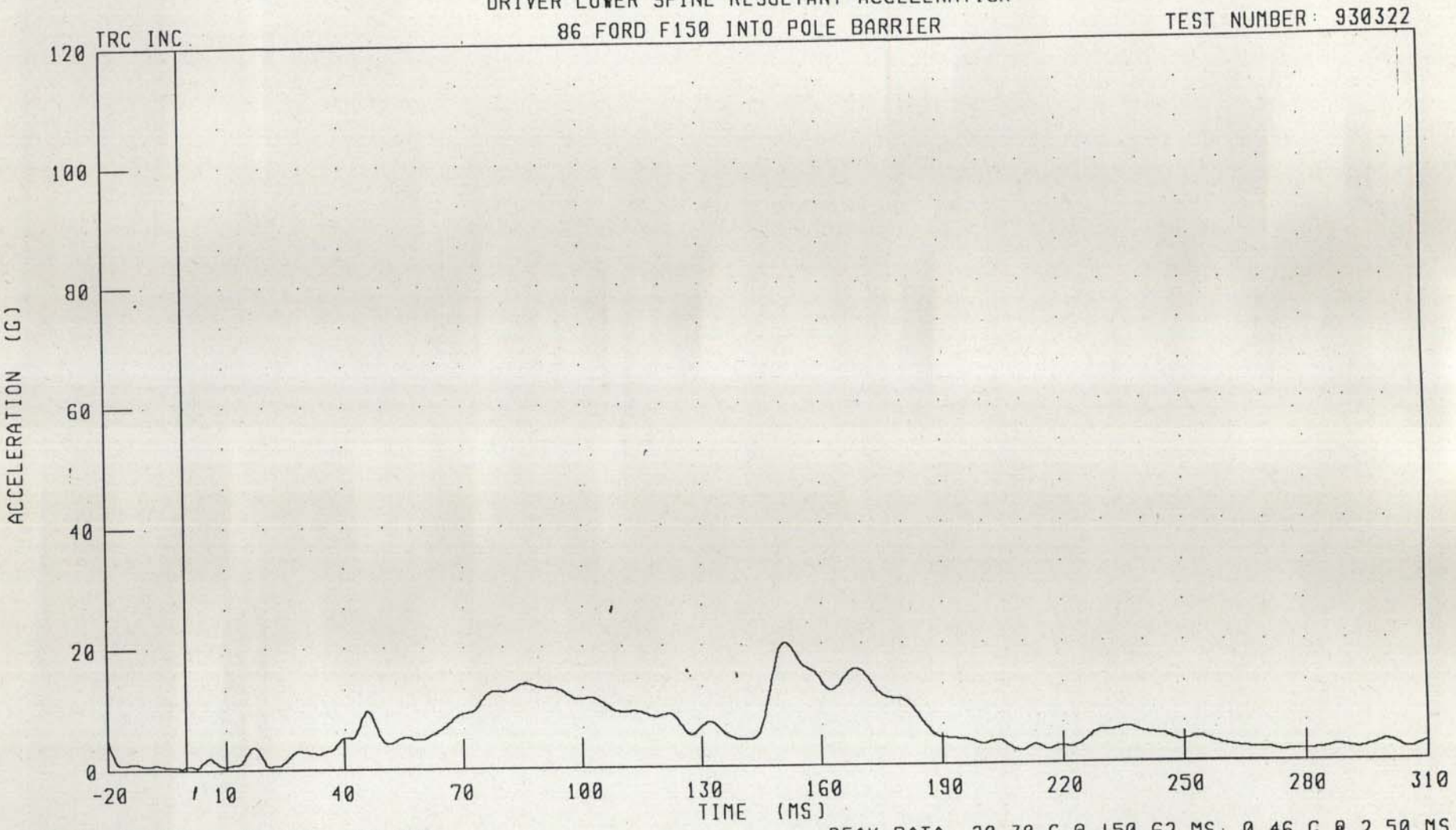
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LOWER SPINE Z-AXIS ACCELERATION



CHANNEL: T12ZG1 FILTER: FIR 100

PEAK DATA: 11.63 G @ 84.38 MS, -15.44 G @ 156.25 MS

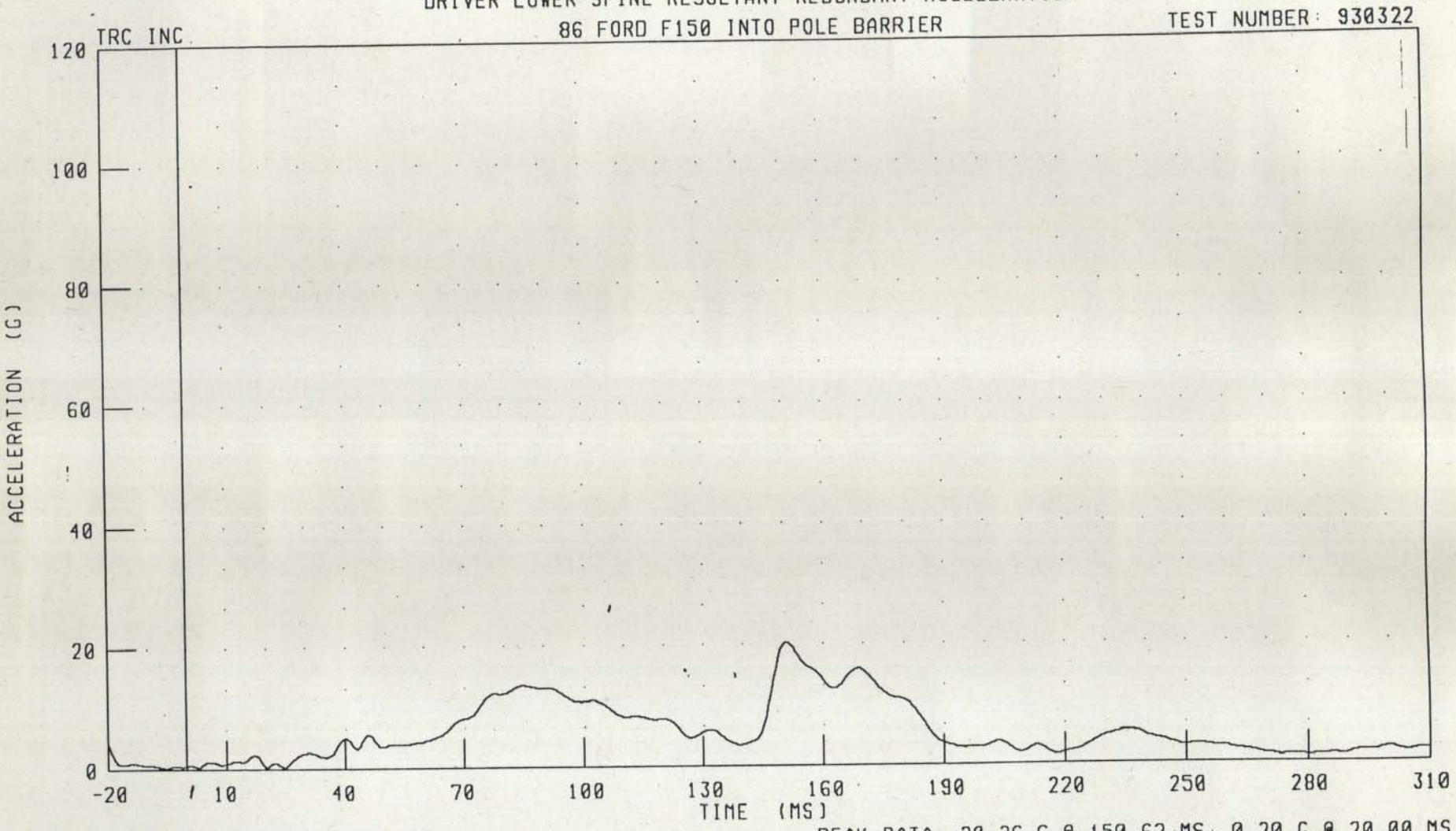
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LOWER SPINE RESULTANT ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: T12RG1 FILTER: FIR 100

PEAK DATA: 20.30 G @ 150.62 MS; 0.46 G @ 2.50 MS

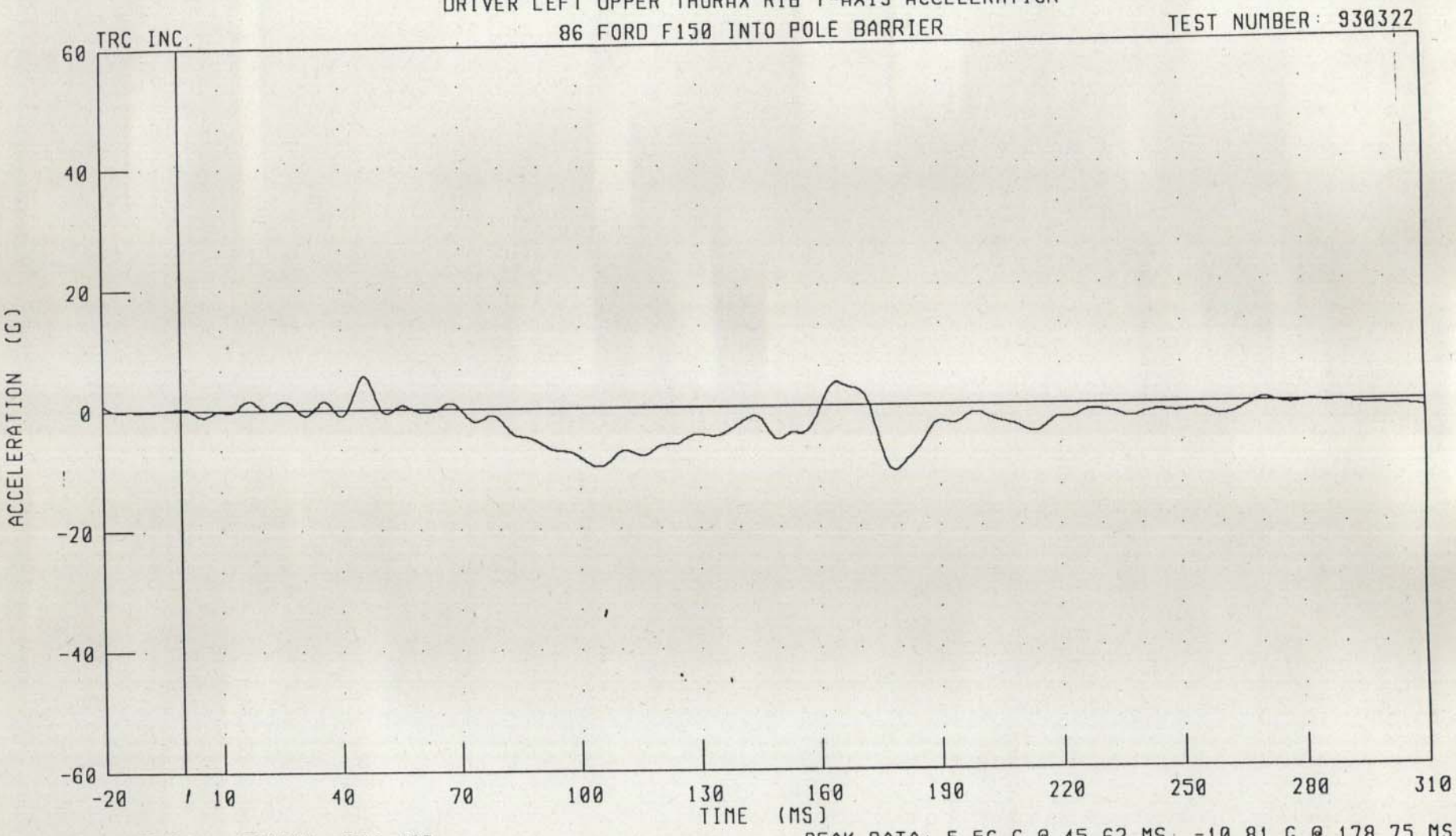
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LOWER SPINE RESULTANT REDUNDANT ACCELERATION
86 FORD F150 INTO POLE BARRIER



CHANNEL: T12RGA FILTER: FIR 100

PEAK DATA: 20.26 G @ 150.62 MS; 0.20 G @ 20.00 MS

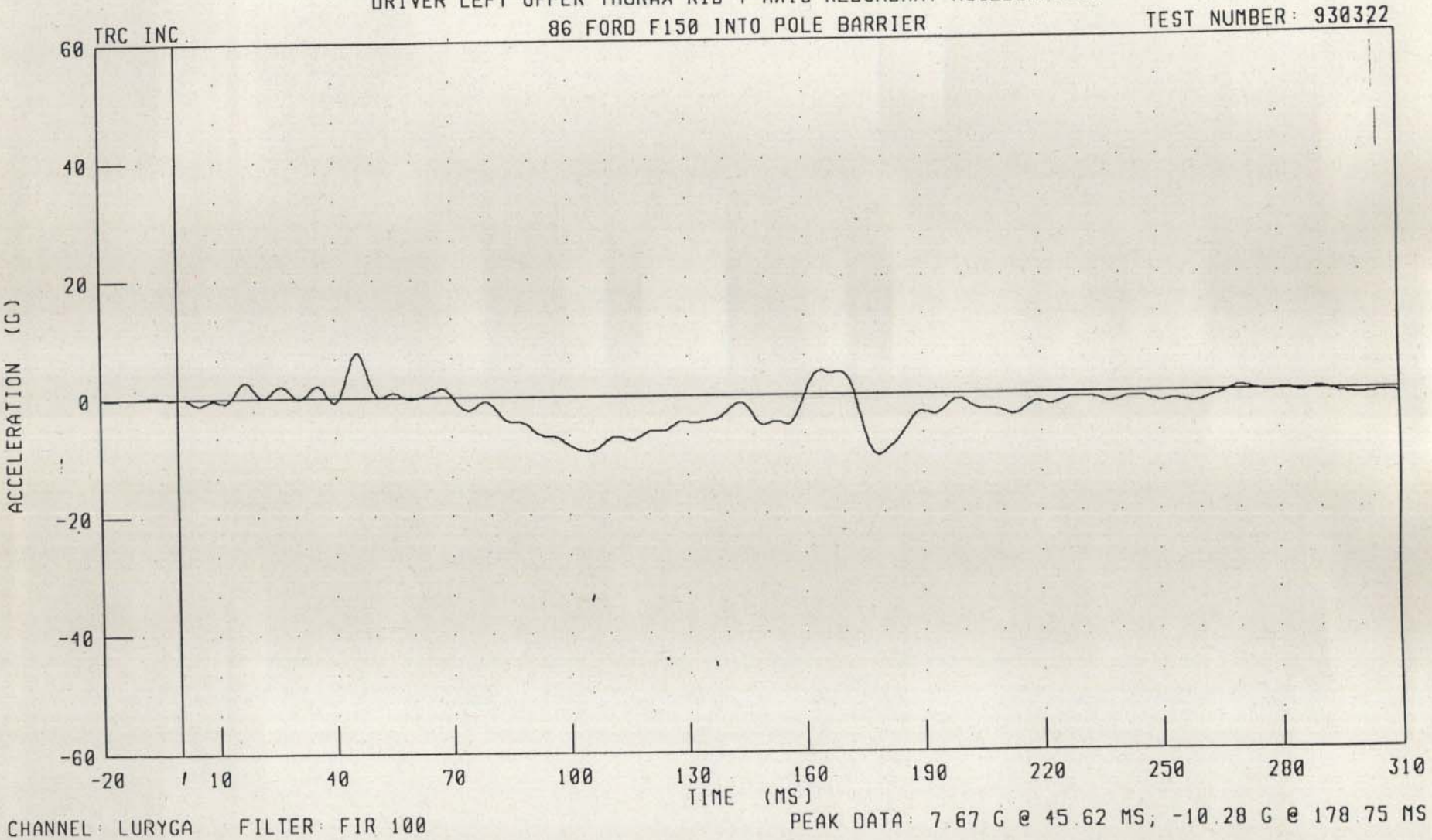
1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LEFT UPPER THORAX RIB Y-AXIS ACCELERATION



CHANNEL: LURYG1 FILTER: FIR 100

PEAK DATA: 5.56 G @ 45.62 MS; -10.81 G @ 178.75 MS

1986 FORD F150 PICKUP TRUCK INTO 12 INCH DIAMETER POLE BARRIER
DRIVER LEFT UPPER THORAX RIB Y-AXIS REDUNDANT ACCELERATION



CHANNEL: LURYGA FILTER: FIR 100

PEAK DATA: 7.67 G @ 45.62 MS; -10.28 G @ 178.75 MS

PRE-TEST CALIBRATION

DRIVER DUMMY S/N 903

TRANSPORTATION RESEARCH CENTER INC.

LATERAL THORAX IMPACT TEST

SIDE IMPACT DUMMY

17-Mar-93

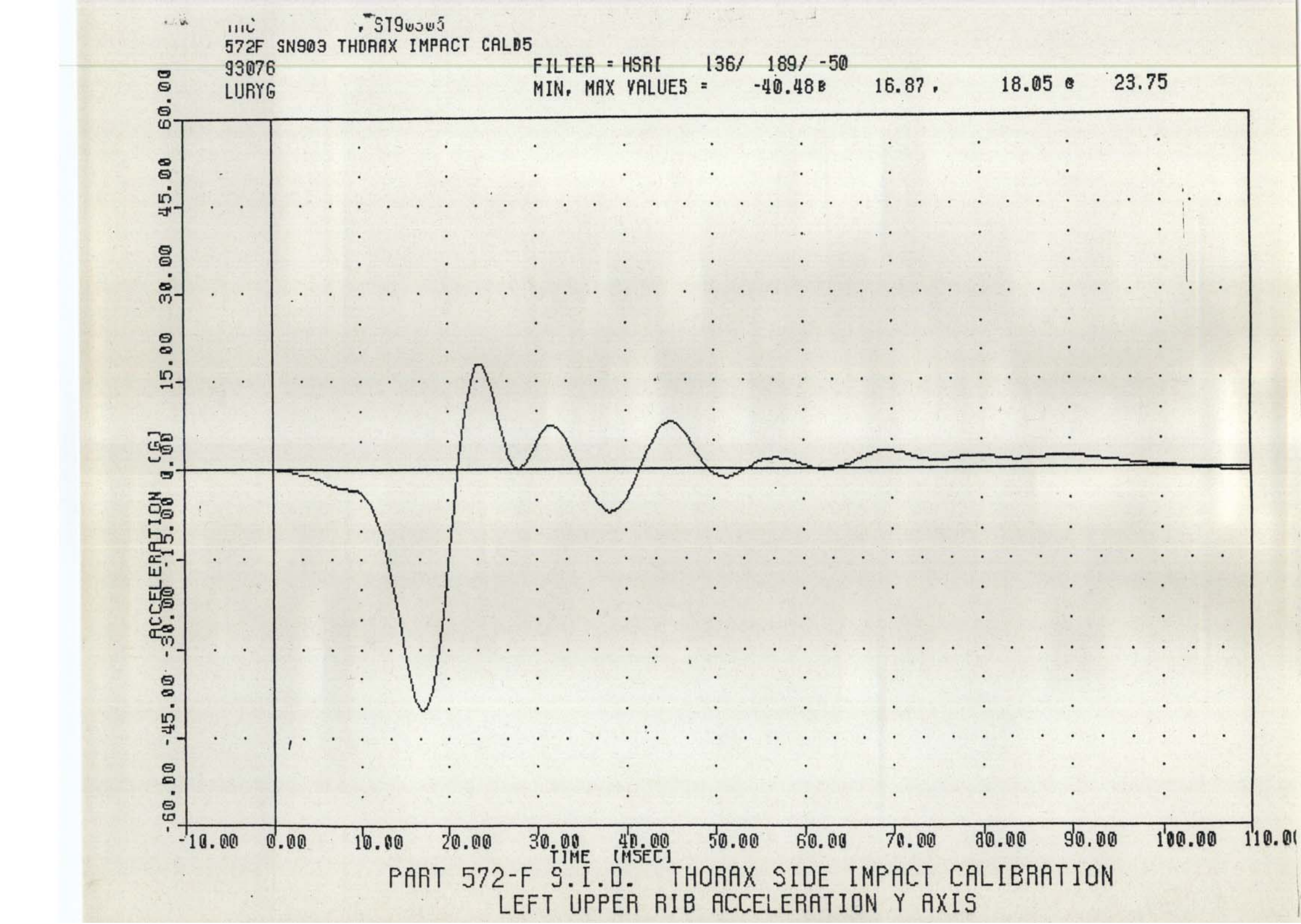
LEFT SIDE CONFIGURATION

TRC ST90305 572F SN903 THORAX IMPACT CAL05

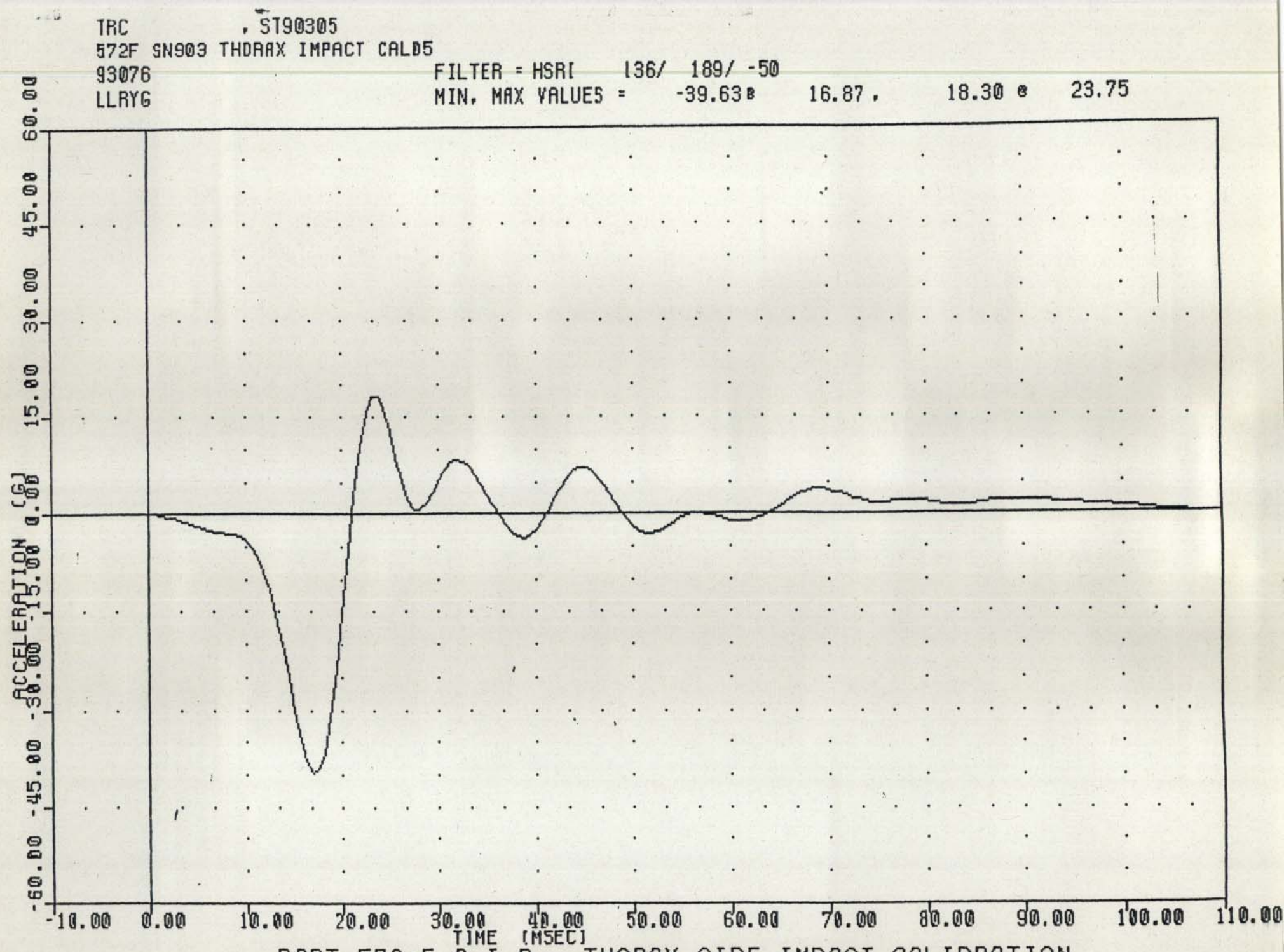
TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	66 - 78 F	71.0 DEG. F
RELATIVE HUMIDITY	10 - 70 %	45.0 %
PISTON VELOCITY	13.80 - 14.20 FT/S	13.91 FT/S
PEAK ACCELERATION: UPPER RIB BAR	37 - 46 G	-40.5 G
PEAK ACCELERATION: LOWER RIB BAR	37 - 46 G	-39.6 G
PEAK ACCELERATION: LOWER THORACIC SPINE	15 - 22 G	-16.8 G

TEST MEETS SPECIFICATIONS

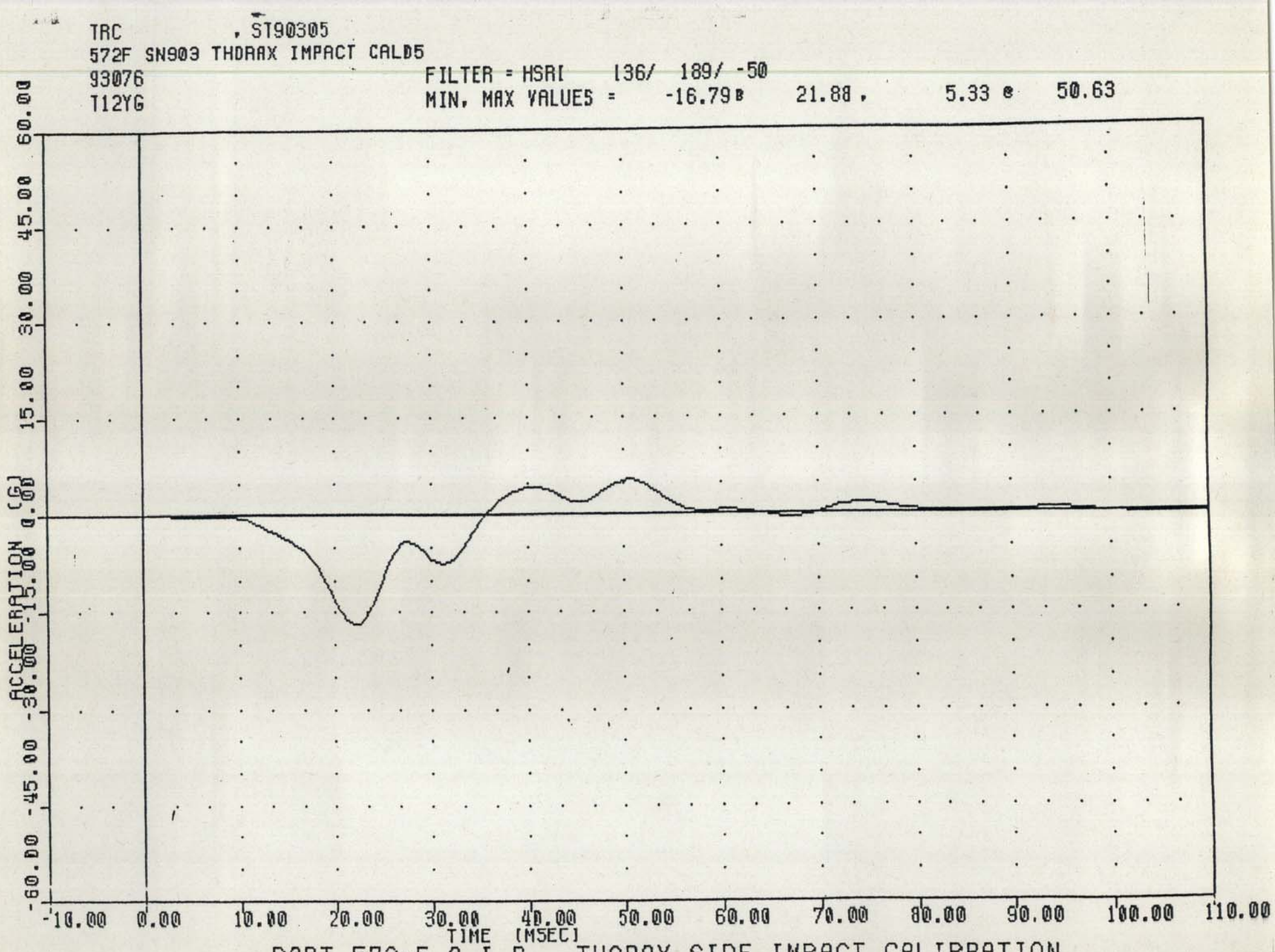
TECHNICIAN Chas. Middleton



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
LEFT LOWER RIB ACCELERATION Y AXIS



PART 572-F S.I.D. THORAX SIDE IMPACT CALIBRATION
LOWER SPINE ACCELERATION Y AXIS

TRANSPORTATION RESEARCH CENTER INC.

LATERAL PELVIS IMPACT TEST

SIDE IMPACT DUMMY

17-Mar-93

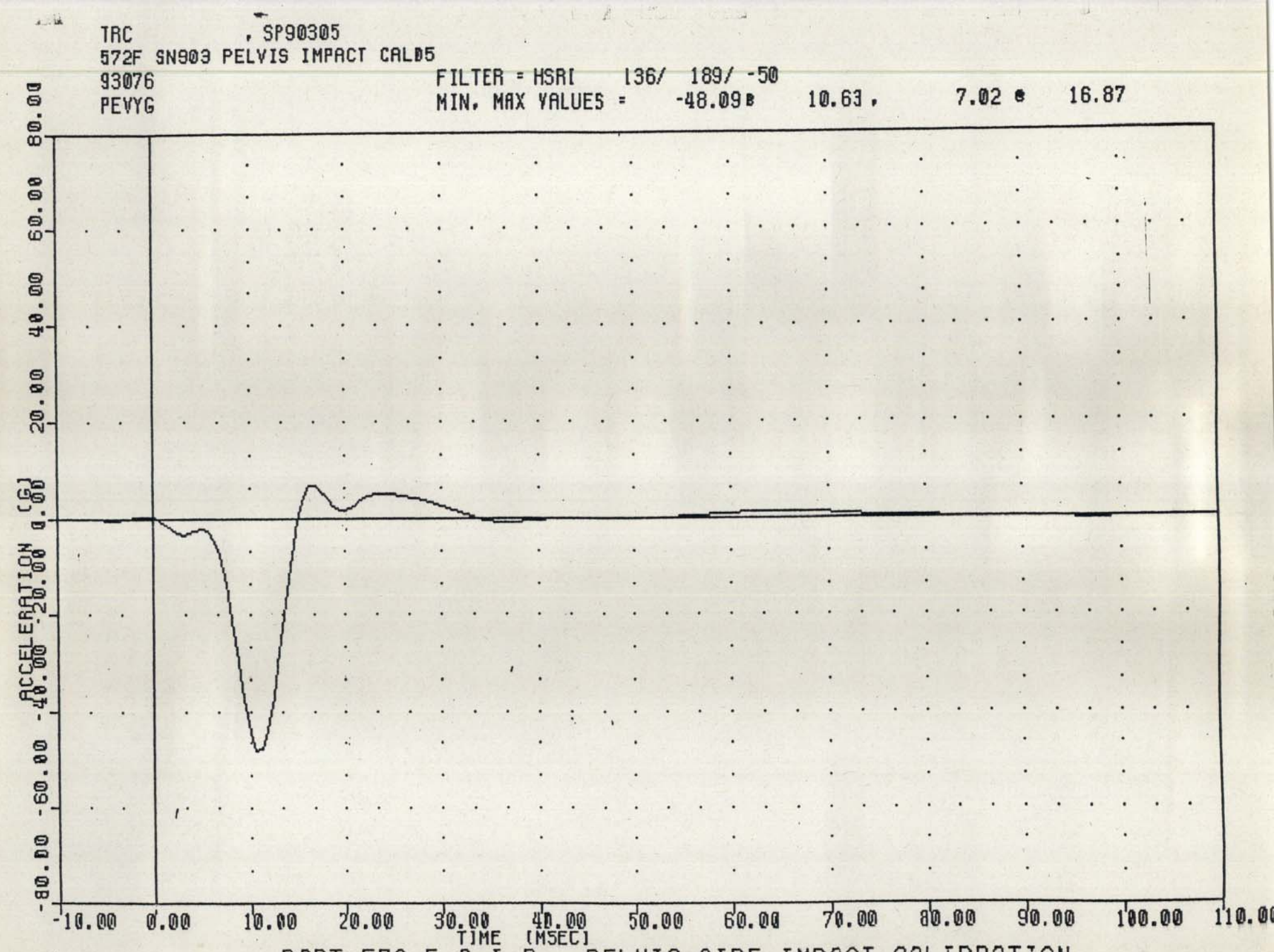
LEFT SIDE CONFIGURATION

TRC SP90305 572F SN903 PELVIS IMPACT CAL05

TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	66 - 78 F	71.0 DEG. F
RELATIVE HUMIDITY	10 - 70 %	45.0 %
PISTON VELOCITY	13.80 - 14.20 FT/S	14.03 FT/S
PEAK PELVIC ACCELERATION	40 - 60 G	-48.1 G
TIME ABOVE 20 G LEVEL	3 - 7 MSEC	5.5 MSEC
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton



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	FRONT
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	DM34J	REAR
T12YG1	LOWER SPINE	Y	ENDEVCO	7264	EJ59J	LEFT
T12YGA	LOWER SPINE REDUNDANT	Y	ENDEVCO	7264	BF65J	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

FORD F150 PICKUP TRUCK INSTRUMENTATION PLACEMENT

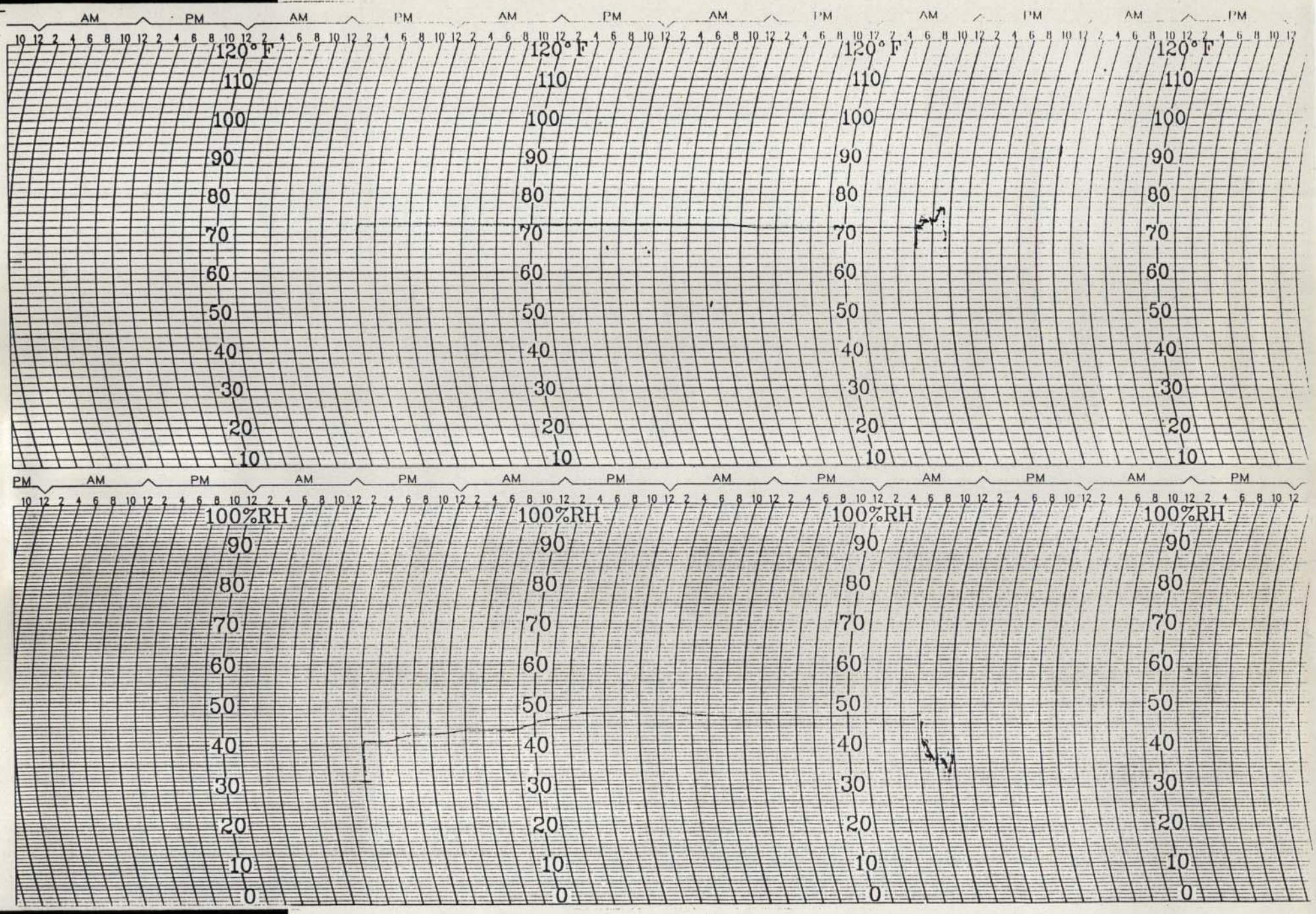
NUMBER	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
1	RIGHT FRONT SILL	Y	ENDEVCO	2264	AY72	RIGHT
2	RIGHT REAR SILL	Y	ENDEVCO	2264	AZ88	RIGHT
3	LEFT FRONT SILL	Y	ENDEVCO	2264	AK03	RIGHT
4	LEFT FRONT DOOR CENTERLINE	Y	ENDEVCO	2264	AU09	LEFT
5	LEFT FRONT DOOR MID-REAR	Y	ENDEVCO	2264	AS44	LEFT
6	LEFT FRONT DOOR UPPER CENTERLINE	Y	ENDEVCO	2264	AS76	LEFT

FREQUENCY RESPONSE CLASSES

NHTSA LABORATORY PROCEDURE TP-214D-01

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

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


AM
PM
120° F
110
100
90
80
70
60
50
40
30
20
10
100%RH
90
80
70
60
50
40
30
20
10
0