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Final Report

Heavy Truck with Cab and Baseline Bumper into 1987 Ford Taurus 4–Door Sedan

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16. Abstract

This report documents a crash test that was conducted for research and development in support of reducing heavy truck aggressiveness. This test was conducted with a 1987 Ford Taurus 4-door sedan, VIN 1FABP52U6HA162809, at Transportation Research Center Inc. on June 16, 1995. The left front 50% of the test vehicle was impacted by a heavy truck with cab and baseline bumper. The vehicle contained seventeen (17) accelerometers, two (2) seat belt load cells, and one (1) instrumented Hybrid III driver dummy.

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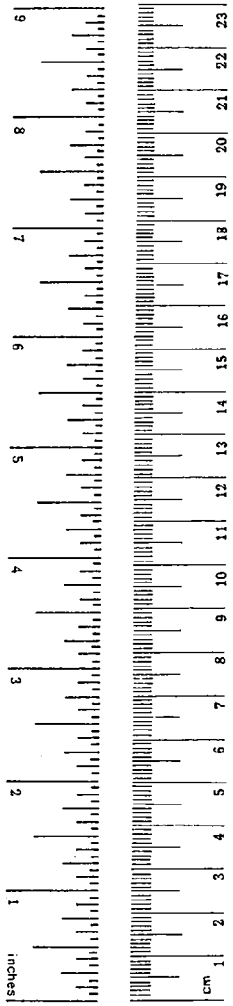
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

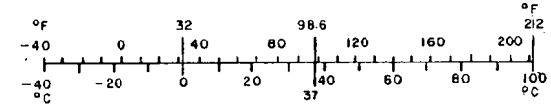
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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Section 1.0

Purpose and Test Summary

Purpose and Test Summary

This test was conducted as research in support of reducing heavy truck aggressiveness. This test was conducted on June 16, 1995.

The test vehicle, a 1987 Ford Taurus 4-door sedan, was equipped with a 3.0-liter, 6-cylinder, transverse gasoline engine and a 3-speed automatic transmission. The test weight of the vehicle was 1582 kg. The vehicle was instrumented with seven (7) longitudinal axis accelerometers, five (5) lateral axis accelerometers, five (5) vertical axis accelerometer and two (2) seat belt force load cells. One (1) Part 572E dummy was seated in the left front outboard seating position according to the dummy placement procedure specified in Appendix B and Optional Appendix C of Laboratory Test Procedure TP-208-09. The dummy was instrumented in the head, chest, and pelvis with longitudinal, lateral, and vertical accelerometers. The dummy was also instrumented with two (2) femur load cells, and a chest deflection potentiometer.

The vehicle was impacted by a Peterbilt Model 352ST heavy truck with cab and baseline bumper at 92.1 kph. The intended impact engagement was the left front 50% of the car with the left front of the truck bumper. The Taurus sustained 489 mm of static crush.

The dummy's head injury criterion, HIC, was 4609 (See Data Acquisition Explanations). The dummy's chest deceleration with 3 milliseconds minimum duration was 46.9 g. The dummy's maximum chest deflection was 28.7 mm. The dummy's maximum left femur force was 6650 N. The dummy's maximum right femur force was 7854 N.

The vehicle and dummy data were digitally sampled at 12,500 samples per second. The data was digitally filtered as per SAE J211 OCT88.

The test was filmed by one (1) real-time panning motion picture camera and seven (7) high-speed motion picture cameras operating at approximately 1000 frames per second.

Section 2.0 contains the vehicle, dummy, and test data. Appendix A contains the pre- and post-test still photographs. Appendix B contains the final test data plots. Appendix C contains miscellaneous test information.

Data Acquisition Explanations

The driver dummy's X-axis head acceleration data channel, HEDXG1, exceeded its data channel full scale output at approximately 99 milliseconds. This anomaly affected the computations of the driver dummy's resultant head acceleration and Head Injury Criteria.

The vehicle's left front sill Z-axis acceleration data channel, LFSZG2, exceeded its data channel full scale output at approximately 68 milliseconds. This anomaly affected the computation of the vehicle's left front sill resultant acceleration.

The vehicle's steering wheel hub X-axis acceleration data channel, SHIXG2, exceeded its data channel full scale output at approximately 57 and 111 milliseconds.

Section 2.0

Vehicle, Dummy, and Test Data

Table 1 Crash Test Summary

Test type:	Heavy Truck with Cab and Baseline Bumper into Vehicle
Test date:	06/16/95
Test time:	1540
Ambient temperature:	28° C
Vehicle:	1987 Ford Taurus 4-door sedan
Vehicle test weight:	1582 kg
Offset:	Left front 50% of vehicle
Impact angle:[1]	0°
Impact velocity:[2]	Primary = 92.1 kph Secondary = 92.1 kph
Heavy Truck:	Peterbilt Model 352ST with Cab
Truck Bumper:	Baseline
Truck Test Weight:	9725 kg
Vehicle Maximum static crush:	489 mm
Truck Maximum static crush:	316 mm
Dummies:	Driver #043
Type:	Part 572 E
Location:	Left front
Restraint:	3-point unibelt
Number of data channels:	37
Number of cameras:	
High-speed	7
Real-time	1

[1] With respect to two track centerline.
[2] Speed trap measurement (± .08 kph accuracy)

Table 2 Test Vehicle Information

Vehicle manufacturer:	Ford Motor Company
Make/model:	Ford/Taurus
VIN:	1FABP52U6HA162809
Model year:	1987
Body style:	4-door sedan
Color:	Blue
Engine data:	
Type:	Transverse
Cylinders:	6
Displacement:	3.0-liter
Transmission data:	_3_ Speed, _ Manual, _X_ Automatic, _X_ FWD, _ RWD, _ 4WD
Date vehicle received:	06/09/95
Odometer reading:	6,806
Dealer's name and address:	NA

Accessories:

Power steering	Yes	Automatic transmission	Yes
Power brakes	Yes	Automatic speed control	Yes
Power seats	No	Tilting steering wheel	Yes
Power windows	No	Telescoping steering wheel	No
Tinted glass	Yes	Air conditioning	Yes
Radio	Yes	Anti-skid brake	No
Clock	Yes	Rear window defroster	No
Other	None		

Certification data from vehicle's label:

Vehicle manufactured by:		Ford Motor Company
Date of manufacture:		01/87
VIN:		1FABP52U6HA162809
GVWR:		4595 lbs.
GAWR:	Front:	2507 lbs.
	Rear:	2133 lbs.

Table 2 Test Vehicle Information, Cont'd.

Tires on vehicle (mfr., line, size):	Goodyear, Invicta, P205/70R14
Tire pressure with maximum capacity vehicle load:	Front: 241 kPa Rear: 241 kPa
Spare tire (mfr., line, size):	Michelin, Tex, T135/80R14
Type of seats:	Front: Split bench Rear: Bench
Type of front seat backs:	Manually adjustable
Maximum width:	1818 mm
Wheelbase:	2689 mm

Location of "Recommended Tire Pressure" label:

The label was located on the passenger's rear door jam.

Data from vehicle's "Recommended Tire Pressure" label:

Recommended tire size:	P195/70R14 P205/70R14 P205/65R15
Recommended cold tire pressure:	Front: 35 psi Rear: 35 psi
Seating capacity:	Front: 3 Rear: 3 Total: 6
Vehicle capacity load:	1100 lbs.

Test vehicle attitude:

Delivered attitude:	LF	702 mm;	RF	700 mm;	LR	648 mm;	RR	649 mm
Pre-test attitude:	LF	698 mm;	RF	694 mm;	LR	611 mm;	RR	609 mm
Post-test attitude[1]:	LF	NA;	RF	608 mm;	LR	543 mm;	RR	550 mm

[1] Left front fender was destroyed during the impact event.

Table 2 Test Vehicle Information, Cont'd.

Weight of test vehicle as received (with maximum fluids):

Right front	465	kg	Right rear	240	kg
Left front	450	kg	Left rear	264	kg
Total front weight	915	kg	(64.4% of total vehicle weight)		
Total rear weight	504	kg	(35.6% of total vehicle weight)		
Total test weight	1419	kg			
Target test weight[1]	1581	kg			

Weight of test vehicle with required dummies and 87 kg of cargo weight:

Right front	476	kg	Right rear	308	kg
Left front	468	kg	Left rear	330	kg
Total front weight	944	kg	(59.7% of total vehicle weight)		
Total rear weight	638	kg	(40.3% of total vehicle weight)		
Total test weight	1582	kg	(1 kg over target test weight)		

Weight of ballast secured in vehicle cargo area:	28 kg
Components removed to meet target test weight:	None
CG rearward of front wheel centerline:	1085 mm

[1] Provided by Vehicle Research and Test Center.

Table 3 Heavy Truck Information

Vehicle manufacturer:	Peterbilt Motors Co.
Model:	352ST
Serial No.:	34256
Chassis/body type:	Cab-over with sleeper
Wheelbase:	3945 mm
Chassis weight:	6169 kg
Gross weight:	22,226 kg
Test weight:	
Front:	3502 kg
Rear:	6223 kg
Total:	9725 kg

Table 4 Post-Impact Data

Test number:	950616
Date of test:	06/16/95
Time of test:	1540
Type of test: Vehicle	Heavy Truck with Cab and Baseline bumper into
Impact angle:[1]	0°
Offset:	Left Front 50% of Vehicle
Ambient temperature at impact area:	28° C
Temperature in occupant compartment:	22° C
Impact velocity:	
Primary	92.1 kph
Secondary	92.1 kph
Distance from heavy truck to vehicle:	
Entering trap	381 mm
Exiting trap	51 mm

Test vehicle static crush:
Overall length of test vehicle:

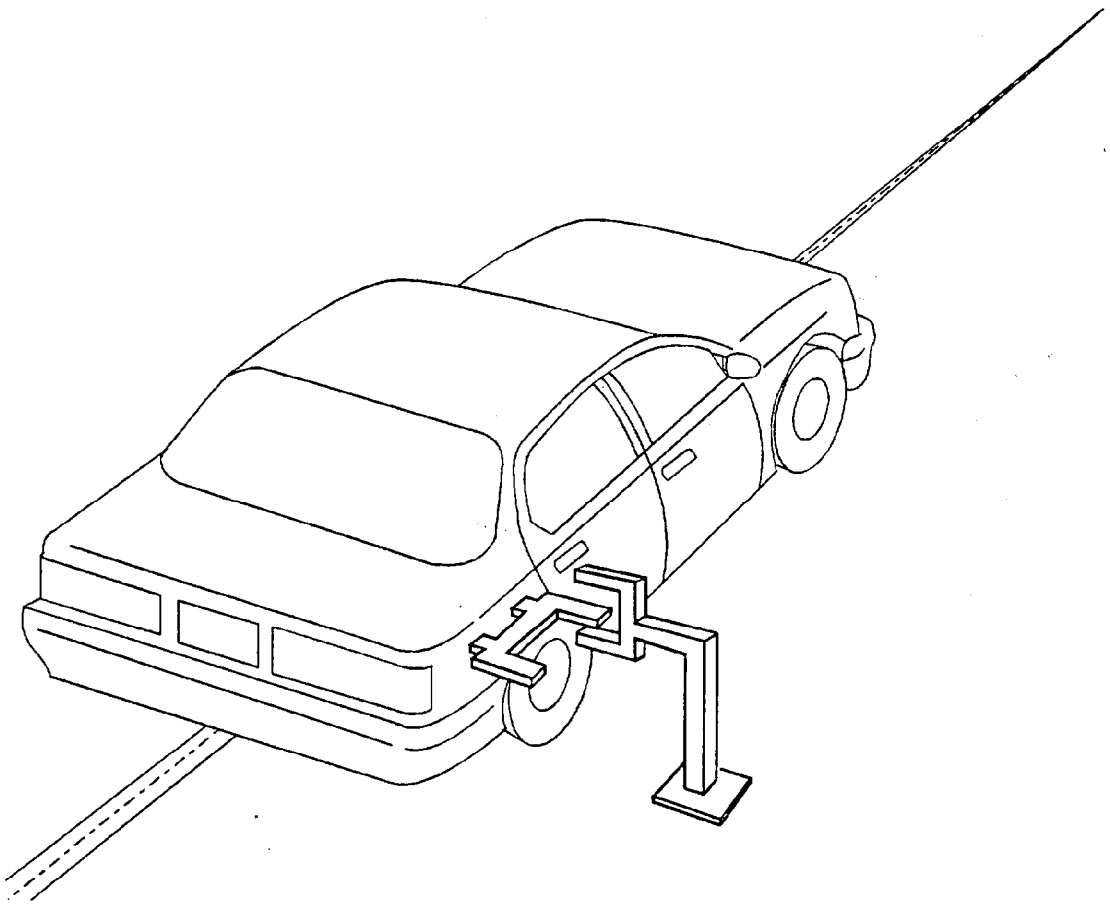
Pre-test:	L	4644 mm;	C	4775 mm;	R	4655 mm
Post-test:	L	4155 mm;	C	4457 mm;	R	4660 mm
Total crush:	L	489 mm;	C	318 mm;	R	-5 mm
Average crush:	267 mm					

Heavy truck static crush:
Overall length of test vehicle:

Pre-test:	L	6145 mm;	C	6225 mm;	R	6148 mm
Post-test:	L	5829 mm;	C	6215 mm;	R	6268 mm
Total crush:	L	316 mm;	C	10 mm;	R	-120 mm
Average crush:	69 mm					

[1] As measured clockwise from the subject vehicle's front longitudinal centerline.

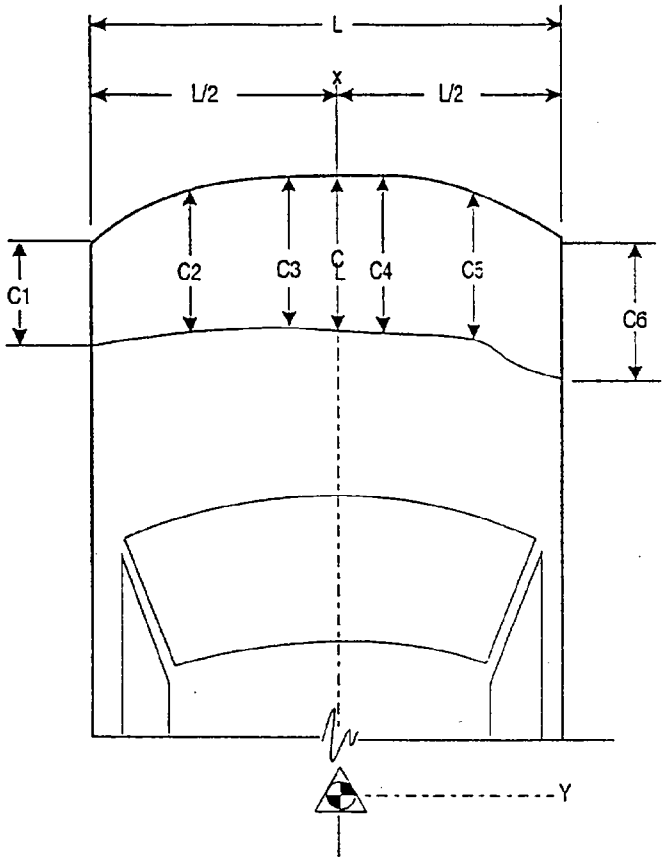
Figure 1 Impact Velocity Measurement System



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

The vanes have 305-millimeter spacing.

Figure 2. Vehicle Crush



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

Vehicle: 1987 Ford Taurus

	Pre-test	Post-test[1]	Crush
L	1524 mm		
C1	4644 mm	4155 mm	489 mm
C2	4735 mm	4296 mm	439 mm
C3	4769 mm	4380 mm	389 mm
C4	4771 mm	4536 mm	235 mm
C5	4737 mm	4630 mm	107 mm
C6	4655 mm	4660 mm	-5 mm
CL	4775 mm	4457 mm	318 mm

[1] Post-test measurements taken to plane of front bumper mounting flanges because the front bumper was destroyed during the impact event.

Figure 3 Pre-Test and Post-Test Measurement Points

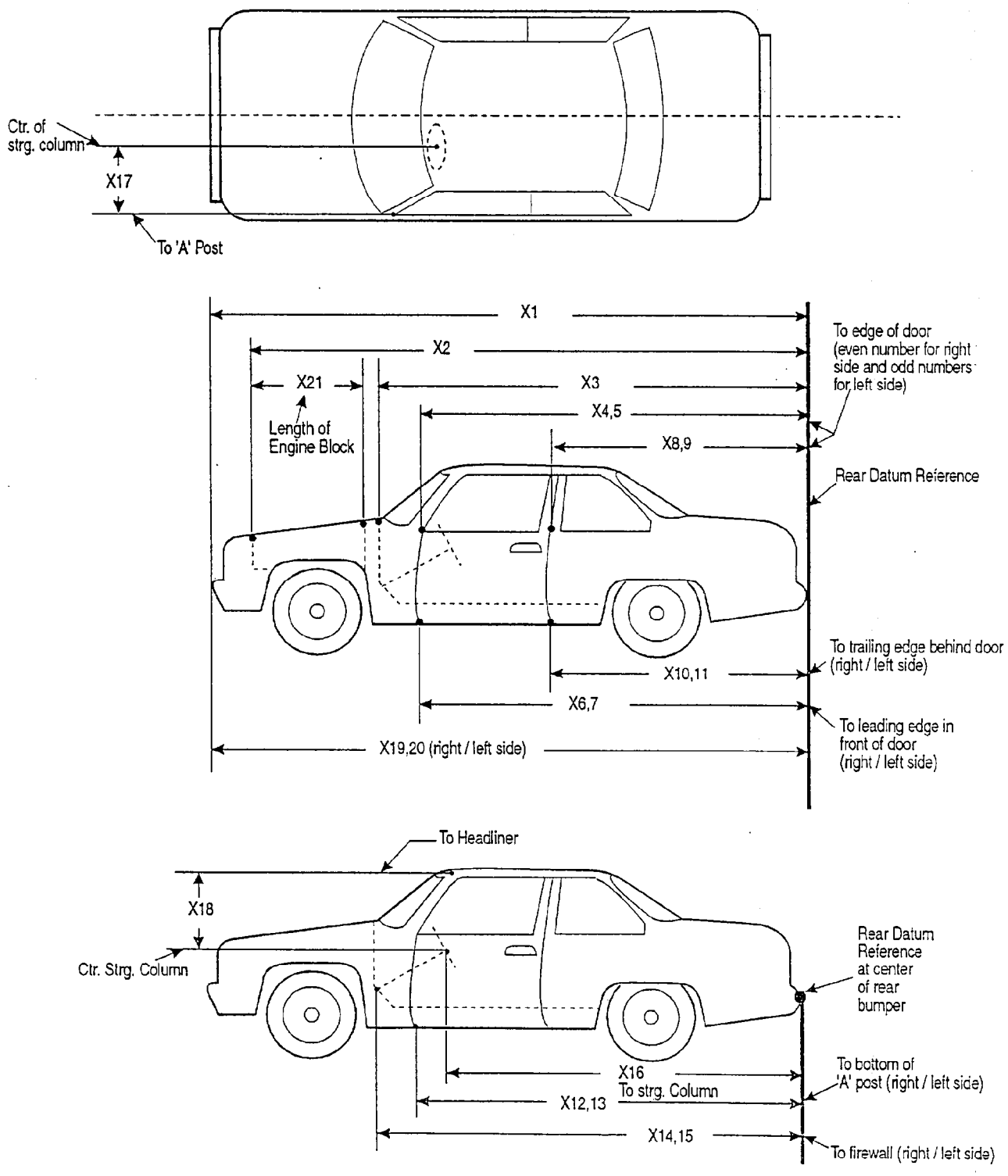
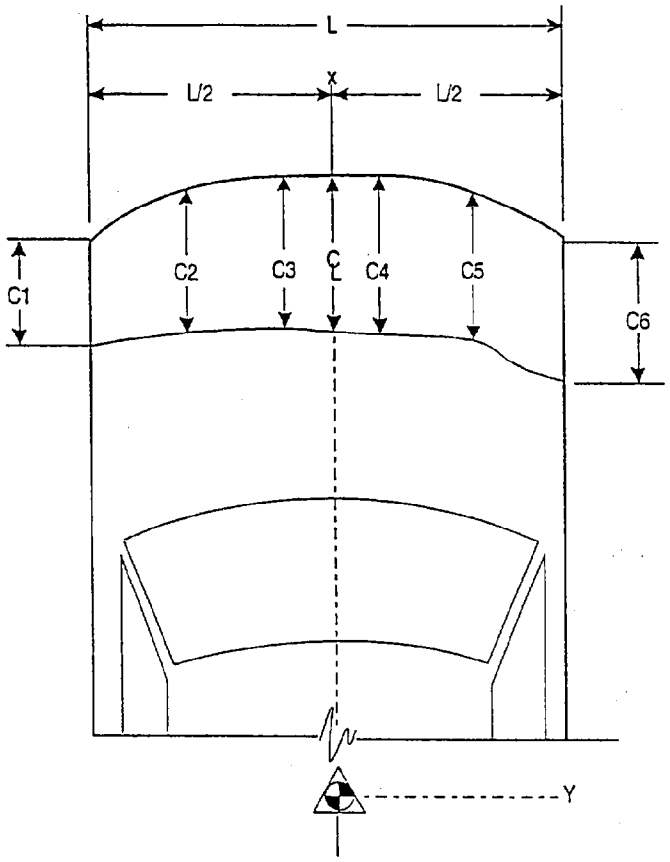


Table 5 Impacted Vehicle Measurements

Vehicle Make/Model: Ford/Taurus Test Number: 950616

No.	Type of measurement	Pre-test	Post-test	Diff.
X1	Total length of vehicle at centerline	4775 mm	4457 mm	318 mm
X2	Rear surface of vehicle to front of engine block	4233 mm	3922 mm	311 mm
X3	Rear surface of vehicle to firewall	3604 mm	3375 mm	229 mm
X4	Rear surface of vehicle to upper leading edge of right door	3308 mm	3322 mm	-14 mm
X5	Rear surface of vehicle to upper leading edge of left door	3305 mm	2920 mm	385 mm
X6	Rear surface of vehicle to lower leading edge of right door	3254 mm	3325 mm	-71 mm
X7	Rear surface of vehicle to lower leading edge of left door	3254 mm	3175 mm	79 mm
X8	Rear surface of vehicle to upper trailing edge of right door	2226 mm	2235 mm	-9 mm
X9	Rear surface of vehicle to upper trailing edge of left door	2219 mm	2205 mm	14 mm
X10	Rear surface of vehicle to lower trailing edge of right door	2205 mm	2202 mm	3 mm
X11	Rear surface of vehicle to lower trailing edge of left door	2208 mm	2135 mm	73 mm
X12	Rear surface of vehicle to bottom of "A" post on right side	3208 mm	3216 mm	-8 mm
X13	Rear surface of vehicle to bottom of "A" post on left side	3213 mm	2920 mm	293 mm
X14	Rear surface of vehicle to firewall - right side	3581 mm	2985 mm	596 mm
X15	Rear surface of vehicle to firewall - left side	3549 mm	3485 mm	64 mm
X16	Rear surface of vehicle to steering wheel center	2818 mm	2585 mm	233 mm
X17	Center of steering column to "A" post	262 mm	430 mm	-168 mm
X18	Center of steering column to headliner	424 mm	586 mm	-162 mm
X19	Rear surface of vehicle to right side of front bumper	4655 mm	4660 mm	-5 mm
X20	Rear surface of vehicle to left side of front bumper	4644 mm	4155 mm	489 mm
X21	Length of engine block	400 mm	400 mm	0 mm

Figure 4 Heavy Truck Crush

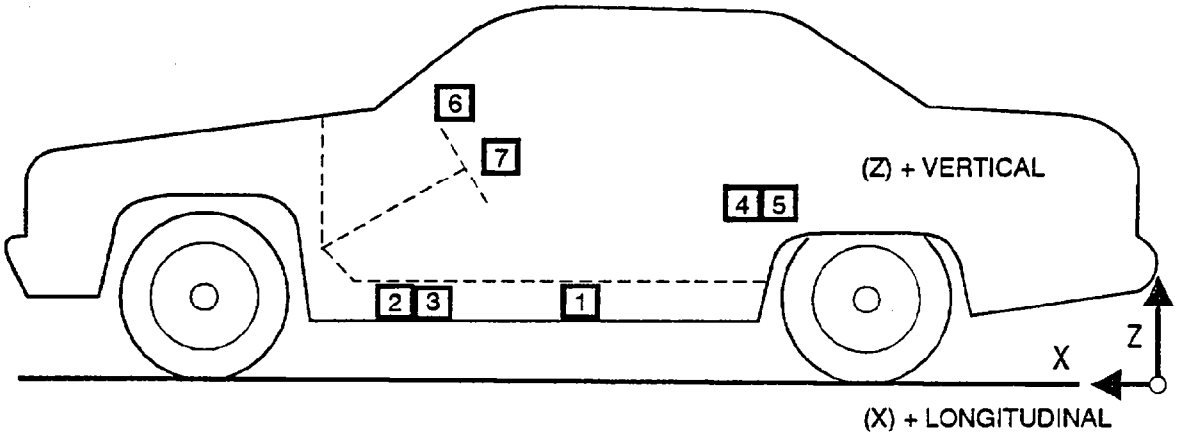


NOTES: L is pre-test length of contact surface.
C1 through C6 are spaced equally apart.
CL is truck centerline.

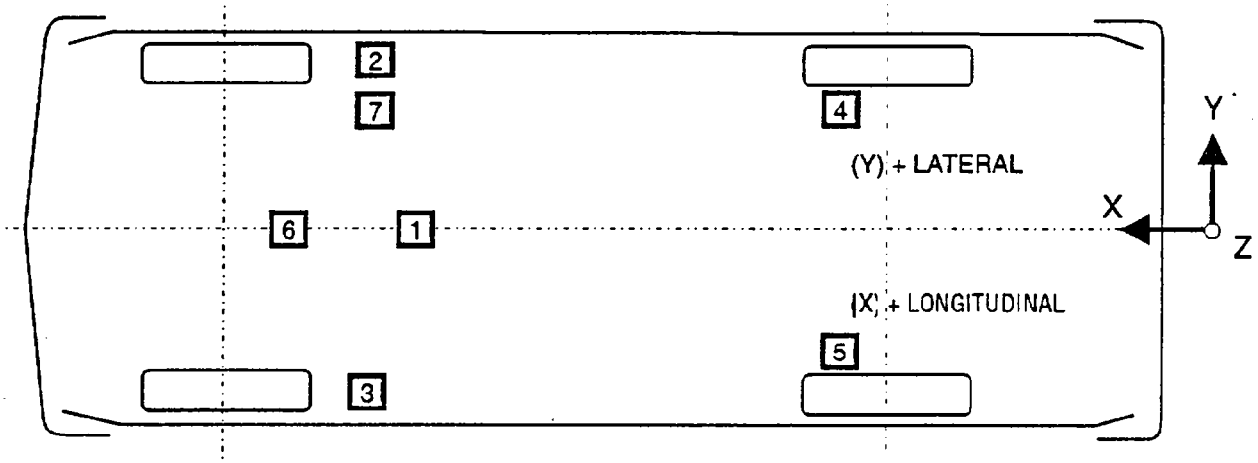
Vehicle: Heavy truck

	Pre-test	Post-test[1]	Crush
L	2235 mm		
C1	6145 mm	5829 mm	316 mm
C2	6198 mm	6085 mm	113 mm
C3	6225 mm	6218 mm	7 mm
C4	6225 mm	6208 mm	17 mm
C5	6202 mm	6228 mm	-26 mm
C6	6148 mm	6268 mm	-120 mm
CL	6225 mm	6215 mm	10 mm

Figure 5 Vehicle Accelerometer Placement



SIDE VIEW



BOTTOM VIEW

Table 6 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 950616 No. LOCATION	X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
1 CENTER OF GRAVITY	2515 mm	0 mm	355 mm				
LONGITUDINAL				1.4 g	@ 246.4 ms	33.3 g	@ 57.0 ms
LATERAL				6.4 g	@ 69.7 ms	10.6 g	@ 56.2 ms
VERTICAL				28.5 g	@ 57.3 ms	28.9 g	@ 52.2 ms
RESULTANT				44.9 g	@ 57.1 ms		
2 LEFT FRONT SILL	2932 mm	692 mm	279 mm				
LONGITUDINAL				1.8 g	@ 284.4 ms	28.6 g	@ 52.2 ms
LATERAL				26.7 g	@ 70.7 ms	20.7 g	@ 55.8 ms
VERTICAL[1]				107.1 g	@ 68.9 ms	25.8 g	@ 53.1 ms
RESULTANT[1]				109.6 g	@ 68.9 ms		
3 RIGHT FRONT SILL	2912 mm	-675 mm	276 mm				
LONGITUDINAL				1.1 g	@ 278.8 ms	22.1 g	@ 57.2 ms
LATERAL				13.2 g	@ 57.3 ms	18.7 g	@ 47.3 ms
VERTICAL				14.3 g	@ 73.6 ms	18.1 g	@ 48.8 ms
RESULTANT				29.4 g	@ 47.9 ms		
4 LEFT REAR SEAT CROSSMEMBER	1724 mm	682 mm	359 mm				
LONGITUDINAL				2.1 g	@ 284.9 ms	24.5 g	@ 52.4 ms
LATERAL				8.4 g	@ 69.9 ms	13.3 g	@ 64.1 ms
VERTICAL				19.0 g	@ 84.2 ms	21.5 g	@ 103.7 ms
RESULTANT				27.9 g	@ 103.3 ms		

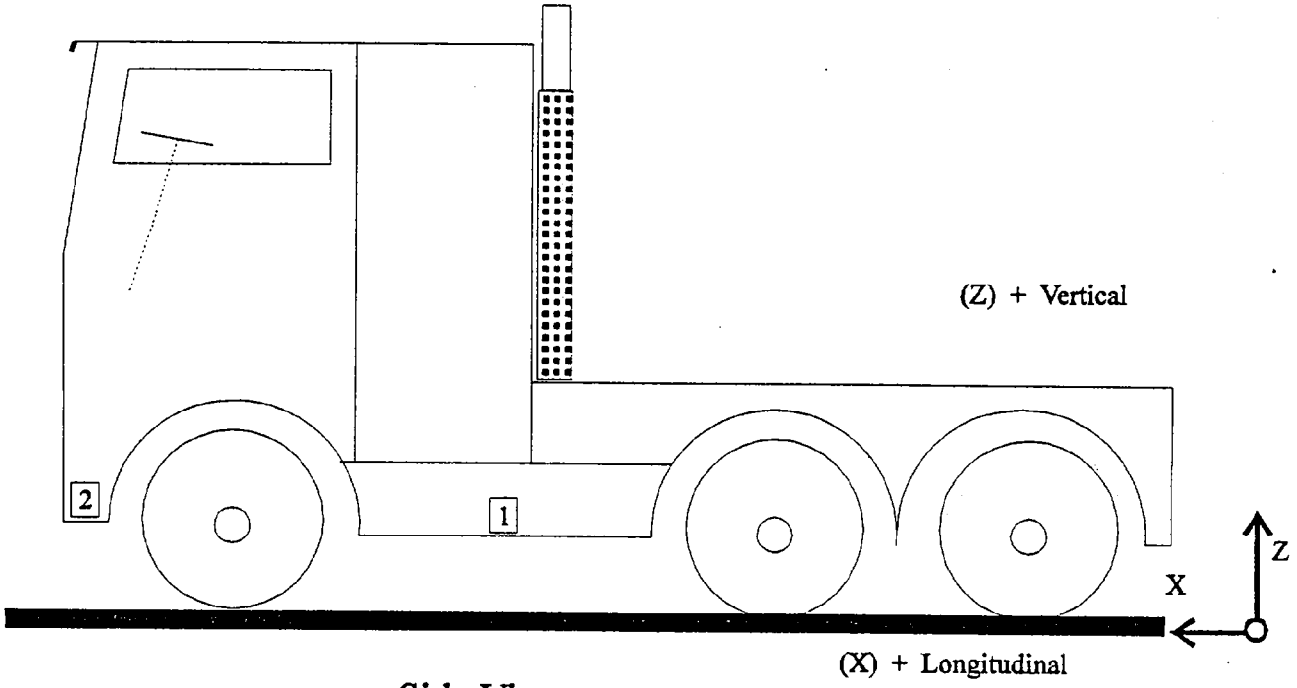
Table 6 Vehicle Accelerometer Locations and Data Summary, Cont'd.

TEST NUMBER: 950616 No. LOCATION	X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
5 RIGHT REAR SEAT CROSSMEMBER	2024 mm	-688 mm	318 mm				
LONGITUDINAL				1.9 g	@ 279.1 ms	17.8 g	@ 43.1 ms
LATERAL				1.6 g	@ 125.1 ms	9.2 g	@ 77.4 ms
VERTICAL				6.3 g	@ 92.2 ms	13.3 g	@ 71.8 ms
RESULTANT				20.6 g	@ 72.0 ms		
6 INSTRUMENT PANEL CENTER	3281 mm	-14 mm	952 mm				
LONGITUDINAL				22.6 g	@ 132.5 ms	69.6 g	@ 55.6 ms
7 STEERING WHEEL HUB	3018 mm	288 mm	737 mm				
LONGITUDINAL[1]				19.2 g	@ 69.2 ms	120.6 g	@ 57.9 ms

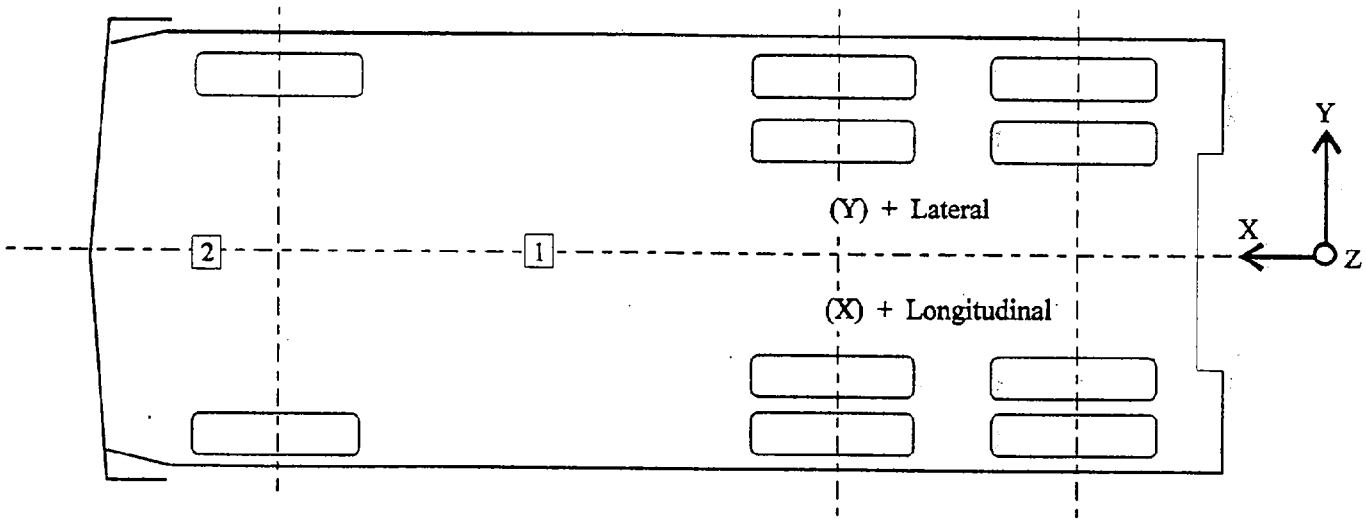
REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

[1] See DATA ACQUISITION EXPLANATIONS

Figure 6 Heavy Truck Accelerometer Placement



Side View



Bottom View

Table 7 Heavy Truck Accelerometer Locations and Data Summary

TEST NUMBER: 950616 No. LOCATION	X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
1 CENTER OF GRAVITY	2995 mm	0 mm	678 mm				
LONGITUDINAL				3.6 g	@ 102.0 ms	7.8 g	@ 51.8 ms
LATERAL				4.8 g	@ 190.6 ms	6.5 g	@ 109.4 ms
VERTICAL				8.0 g	@ 63.1 ms	6.8 g	@ 121.4 ms
RESULTANT				9.5 g	@ 63.0 ms		
2 FRONT FRAME CROSSMEMBER	5782 mm	0 mm	383 mm				
LONGITUDINAL				8.3 g	@ 131.7 ms	25.0 g	@ 111.8 ms
LATERAL				66.6 g	@ 112.7 ms	10.9 g	@ 135.7 ms
VERTICAL				30.6 g	@ 111.2 ms	19.3 g	@ 15.1 ms
RESULTANT				72.6 g	@ 112.5 ms		

REFERENCE: X: + FORWARD FROM TRAILING EDGE OF TRUCK
Y: + LEFT FROM TRUCK CENTERLINE
Z: + UP FROM GROUND LEVEL

Table 8 Dummy Data Summary

TEST NUMBER: 950616 DRIVER DUMMY SERIAL NUMBER: 043

	POSITIVE DIRECTION		NEGATIVE DIRECTION	
HEAD ACCELERATION				
LONGITUDINAL[1]	12.2 g	@ 138.6 ms	402.1 g	@ 99.4 ms
LATERAL	25.4 g	@ 166.7 ms	317.4 g	@ 102.6 ms
VERTICAL	64.7 g	@ 100.0 ms	70.8 g	@ 103.2 ms
RESULTANT[1]	479.4 g	@ 99.5 ms		
HIC[1]	4609 from 98.6 to 103.4			
CHEST ACCELERATION				
LONGITUDINAL	2.5 g	@ 115.0 ms	45.0 g	@ 94.5 ms
LATERAL	6.8 g	@ 65.8 ms	22.0 g	@ 111.8 ms
VERTICAL	19.6 g	@ 118.9 ms	24.3 g	@ 77.8 ms
RESULTANT	47.9 g	@ 94.5 ms		
3 MSEC	46.9			
CHEST DEFLECTION				
LONGITUDINAL	28.7 mm	@ 93.0 ms	0.3 mm	@ 232.0 ms
PELVIS ACCELERATION				
LONGITUDINAL	8.1 g	@ 82.9 ms	76.7 g	@ 65.4 ms
LATERAL	31.4 g	@ 61.3 ms	25.1 g	@ 111.1 ms
VERTICAL	16.3 g	@ 120.9 ms	12.7 g	@ 61.9 ms
RESULTANT	77.3 g	@ 65.4 ms		
FEMUR LOAD				
LEFT	464.5 N	@ 52.7 ms	6650.2 N	@ 73.9 ms
RIGHT	3986.7 N	@ 82.6 ms	7853.7 N	@ 67.2 ms

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

[1] See DATA ACQUISITION EXPLANATIONS

Table 9 Post-Impact Dummy/Vehicle Data

Visible Dummy Contact Points:

	Driver #043	Passenger #NA
Head	Visor	
Chest	None	
Abdomen	None	
Left knee	Instrument panel	
Right knee	Instrument panel	

Door Opening:

	Left	Right
Front	Tools required	Easy
Rear	Tools required	Easy

Seat Movement:

	Seat Back Failure	Seat Shift
Front	None	None
Rear	NA	NA

Glazing Damage: The entire windshield cracked and retention was lost for the left half. The driver side door glass was broken out.

Other Notable Impact Effects: The left front fender was destroyed.

Dummy Kinematic Summary

Upon impact the driver dummy translated forward and to the left across the seat. Both knees impacted the lower instrument panel. The dummy was restrained by the three-point unibelt. The dummy rebounded rearward and to the right. The dummy then came to rest facing forward and slightly leaning toward the right in the driver's seating position.

Figure 7 Dummy Measurement Locations for Front Seat Occupants

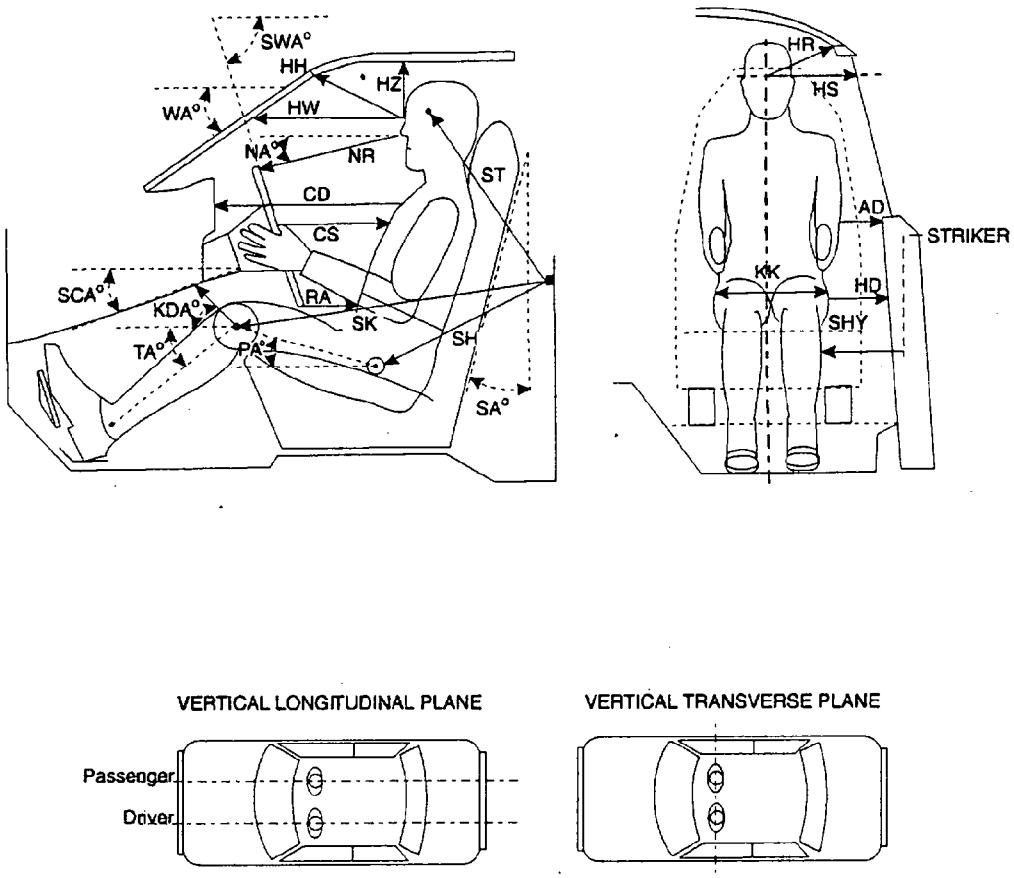


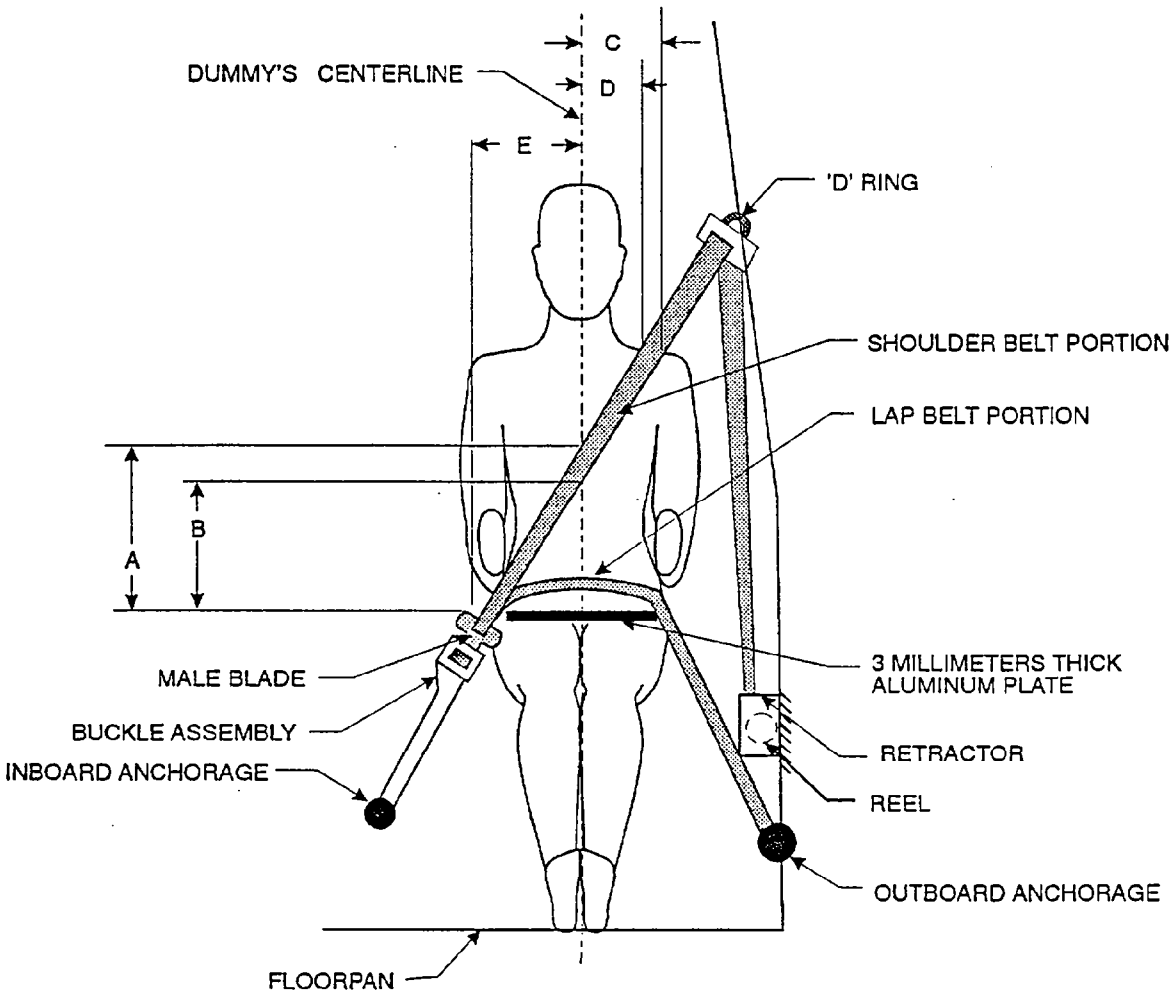
Table 10 Dummy Measurement Data For Front Seat Occupants

Designation	Type of Measurement	Driver (Serial #043)	Passenger (Serial #NA)
WA	Windshield angle	29°	
SWA	Steering wheel angle	68°	
SCA	Steering column angle	22°	
SA	Seat back angle	23°	
HZ	Head to roof	190 mm	
HH	Head to header	352 mm	
HW	Head to windshield	556 mm	
HR	Head to side header	NA mm	
NR	Nose to rim	651 mm	
NA	Nose to rim angle	12°	
CD	Chest to dash	560 mm	
CS	Steering wheel to chest	331 mm	
RA	Rim to abdomen	209 mm	
KDL	Left knee to dash	194 mm	
KDR	Right knee to dash	193 mm	
KDA	Outboard knee to dash angle	28°	
PA	Pelvic angle	24°	
TA	Tibial angle	37°	
KK	Knee to knee	269 mm	
ST[1]	Striker to head	451 mm	
	Striker to head angle	-80°	
SK[1]	Striker to knee	582 mm	
	Striker to knee angle	9°	
SH[1]	Striker to H-point	263 mm	
	Striker to H-point angle	46°	
SHY	Striker to H-point (Y dir.)	247 mm	
HS	Head to side window	341 mm	
HD	H-point to door	168 mm	
AD	Arm to door	111 mm	

The seat back angle (SA°) is measured relative to vertical, all other angles are measured relative to horizontal.

[1] A negative angle indicates the measurement point was located above the striker.

Figure 8 Seat Belt Positioning Data

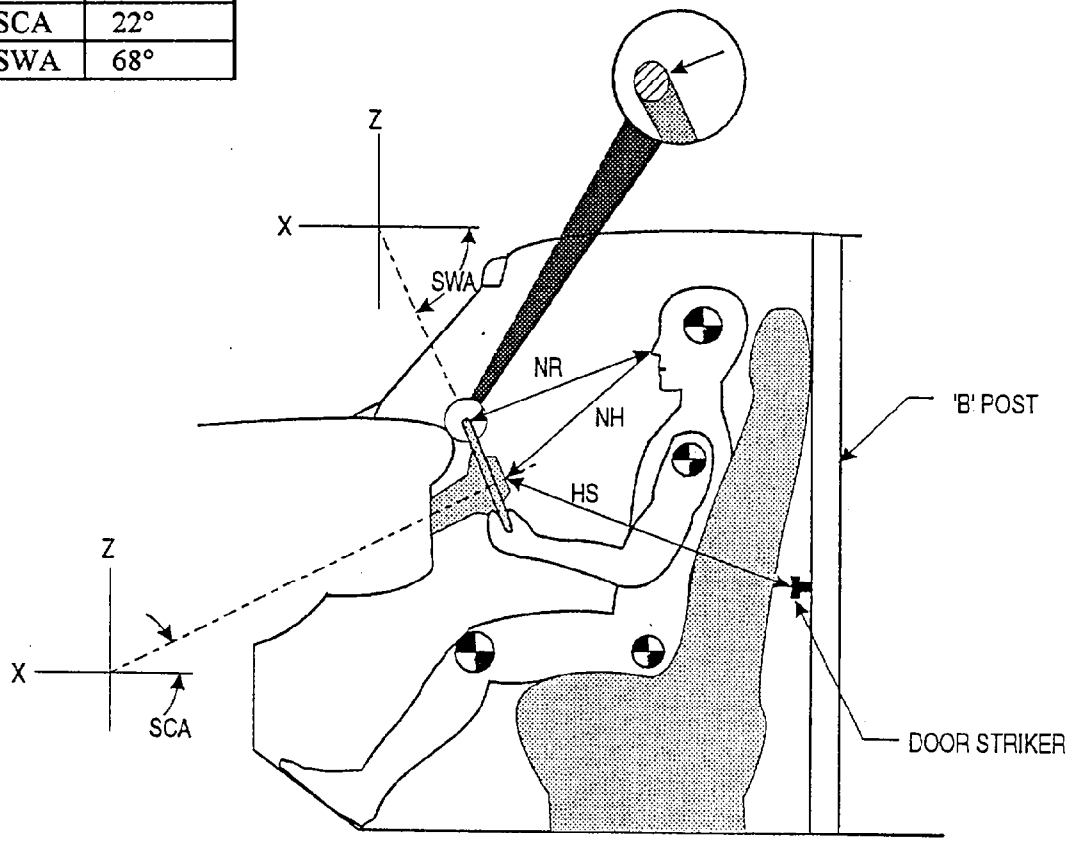


		Driver	Passenger
A	Top surface of aluminum plate to belt upper edge	361	NA
B	Top surface of aluminum plate to belt lower edge	281	NA
C	Dummy centerline to outer edge of belt at chest flesh top	55	NA
D	Dummy centerline to inner edge of belt at chest flesh top	112	NA
E	Dummy centerline to intersection of upper torso belt and lap belt	225	NA

All distance measurements are in millimeters.

Figure 9 Driver Dummy To Steering Column/Wheel Assembly Data

NR	407 mm
NH	428 mm
HS	534 mm
SCA	22°
SWA	68°



Position of steering column tilting and telescoping adjustments, if any:
The steering column was fastened in the middle of the adjustment range.

NR = Distance from tip of dummy's nose to top rear surface of steering wheel rim.
NH = Distance from tip of dummy's nose to center of steering column hub.
HS = Distance from center of steering column hub to the forward surface of the door lock striker pin.
SCA = Angle of steering column relative to horizontal.
SWA = Angle of steering wheel relative to horizontal.

Figure 10 Camera Positions

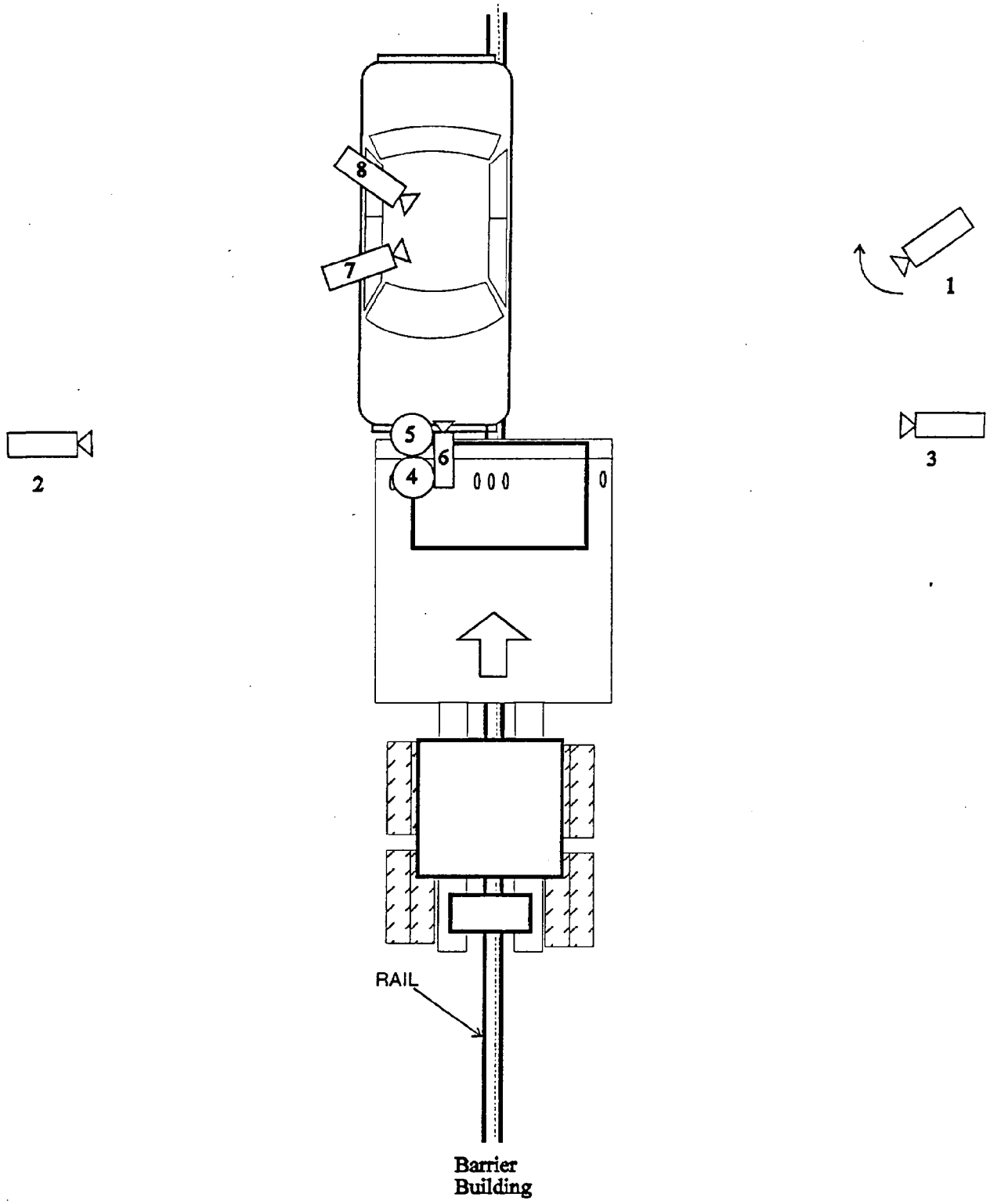


Table 11 Motion Picture Camera Information

Camera Number	Location	Type	Lens (mm)	Speed (Fps)	Purpose of Camera Data
1	Left panning	Bolex	16	24	Real-time documentation
2	Left wide	Photosonic	13	998	Vehicle dynamics
3	Right wide	Photosonic	13	1002	Vehicle dynamics
4	Overhead wide	Photosonic	8.5	1025	Vehicle dynamics
5	Overhead tight	Photosonic	35	998	Vehicle dynamics
6	Onboard truck	Photosonic	8	1000	Dummy kinematics
7	Onboard car front	Photosonic	8	725	Dummy kinematics
8	Onboard car rear	Photosonic	8	800	Dummy kinematics

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

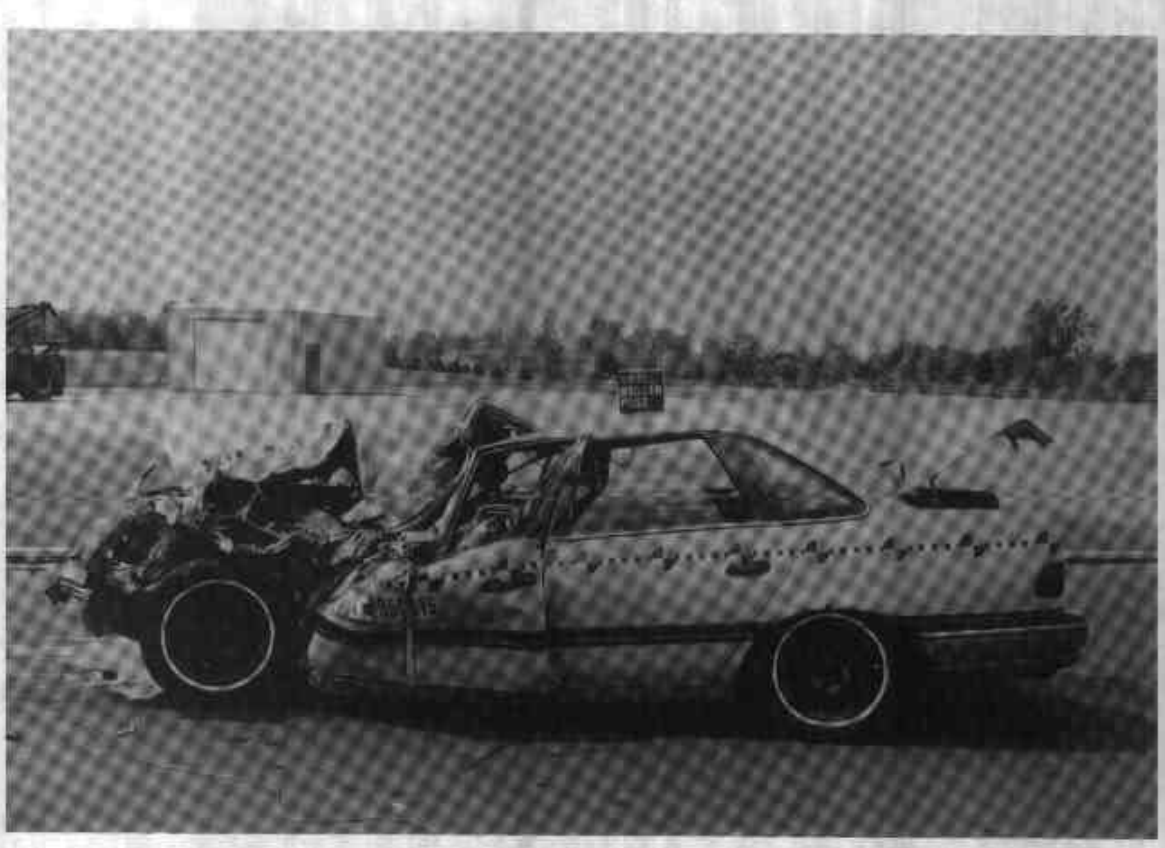


Figure A-4 Post-Test Left Side View

Figure A-5 Pre-Test Rear View

Figure A-6 Post-Test Rear View

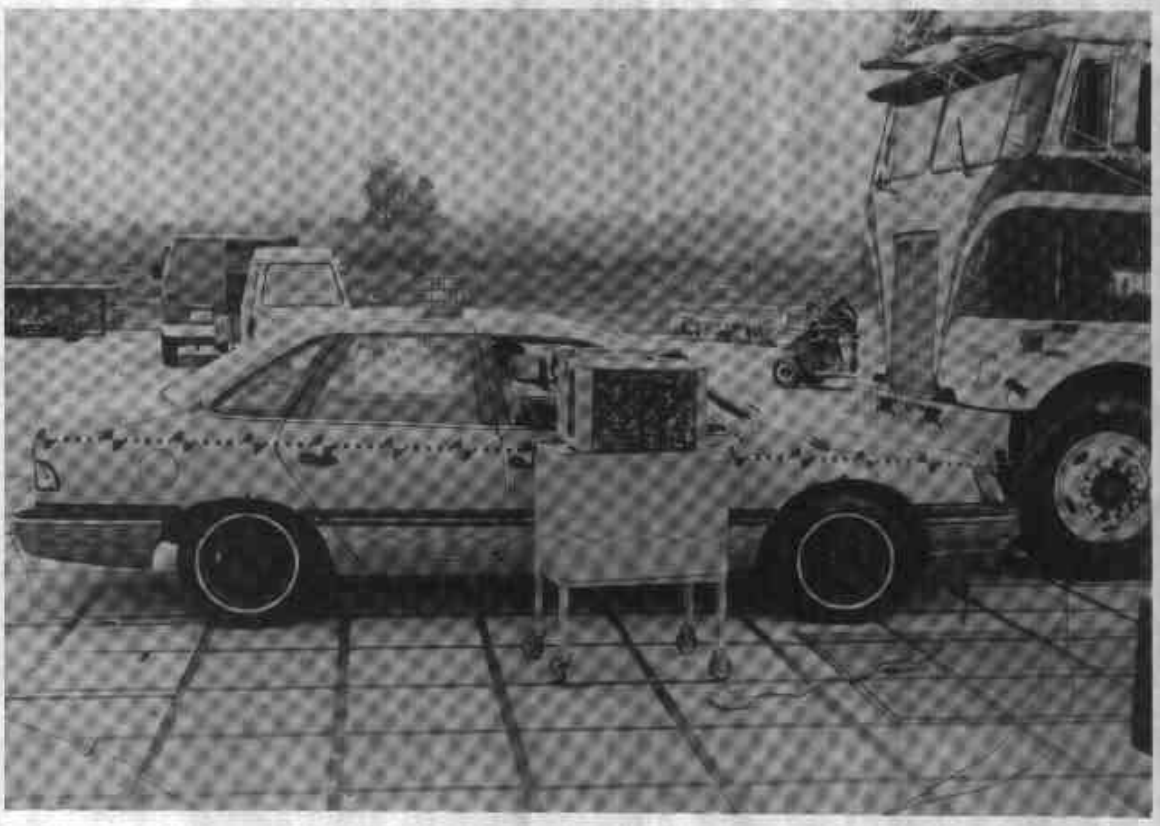


Figure A-7 Pre-Test Right Side View

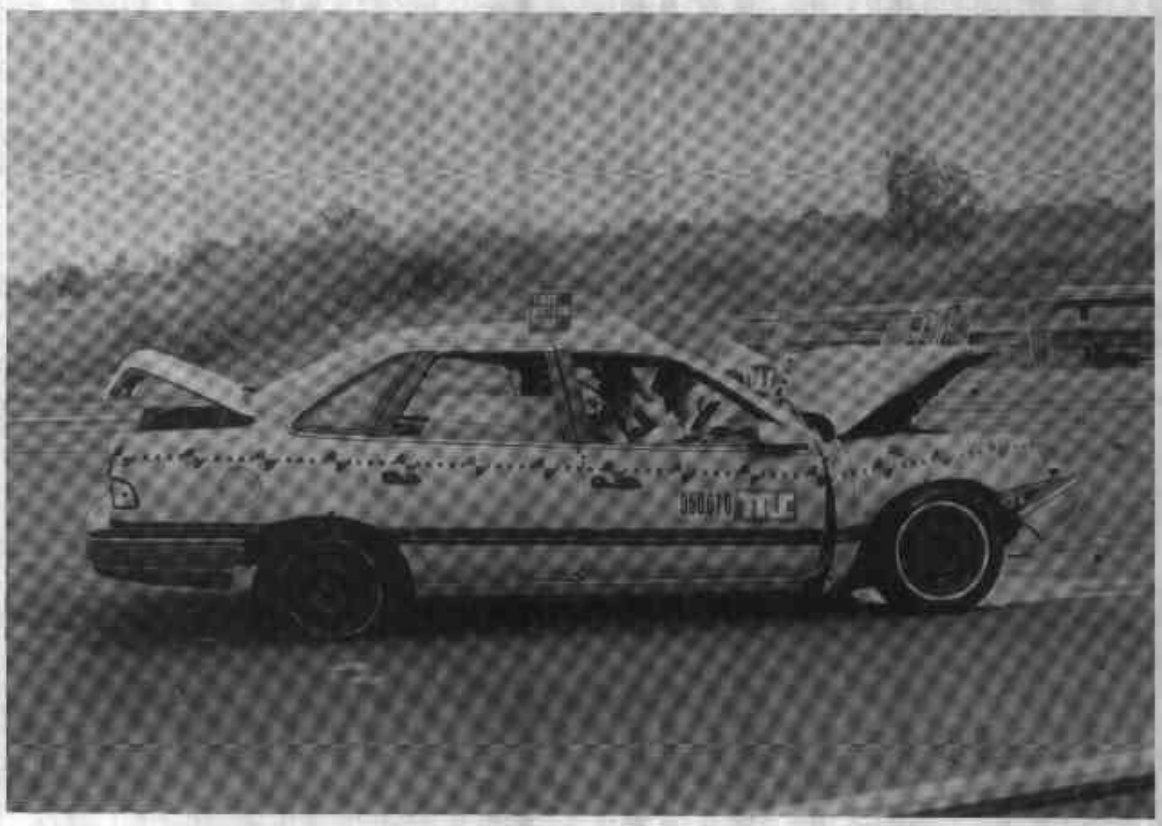


Figure A-8 Post-Test Right Side View

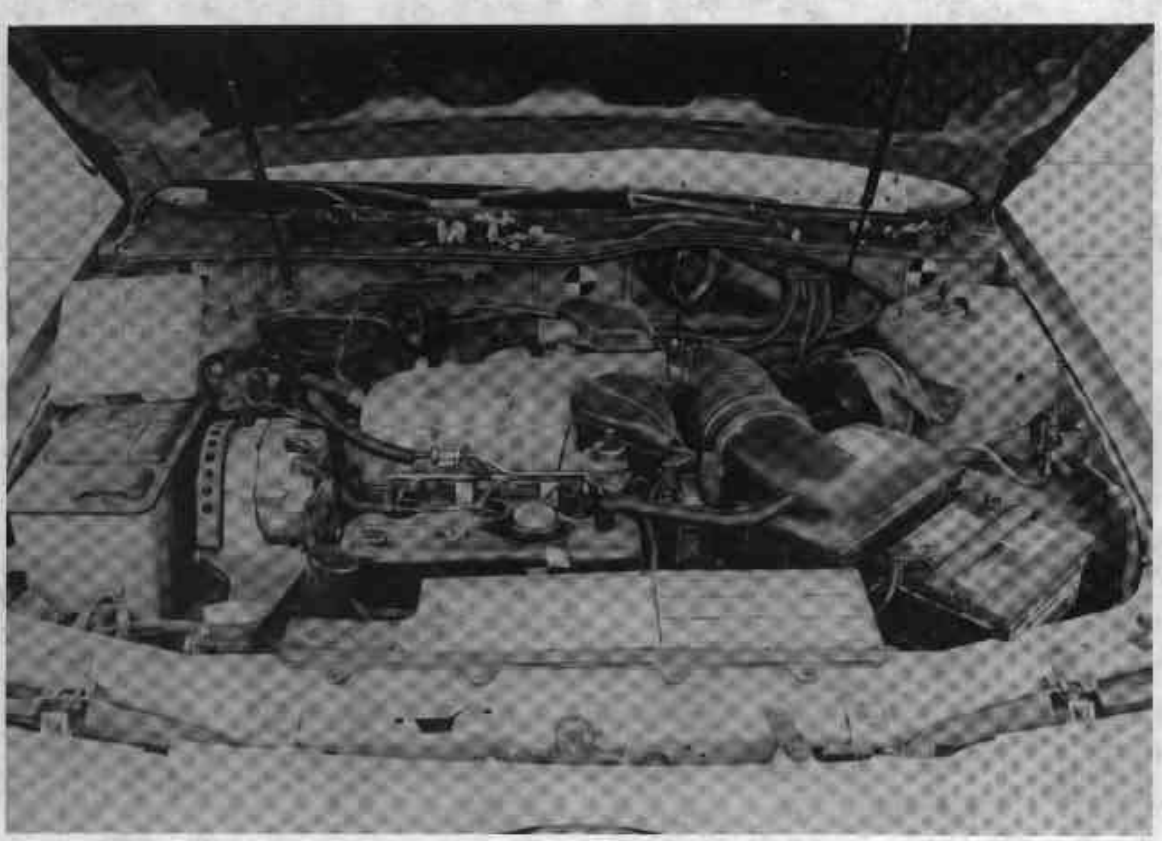


Figure A-9 Pre-Test Engine Compartment View

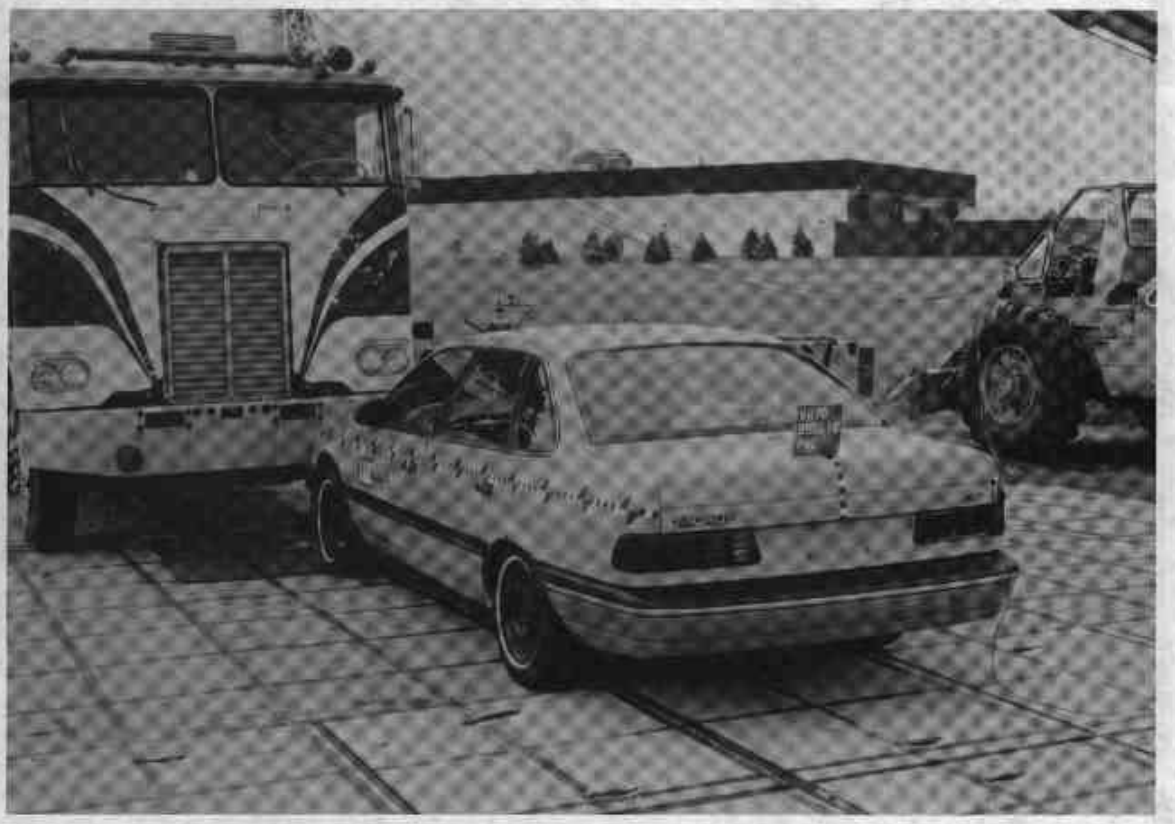


Figure A-10 Pre-Test Vehicle Truck Alignment - View 1

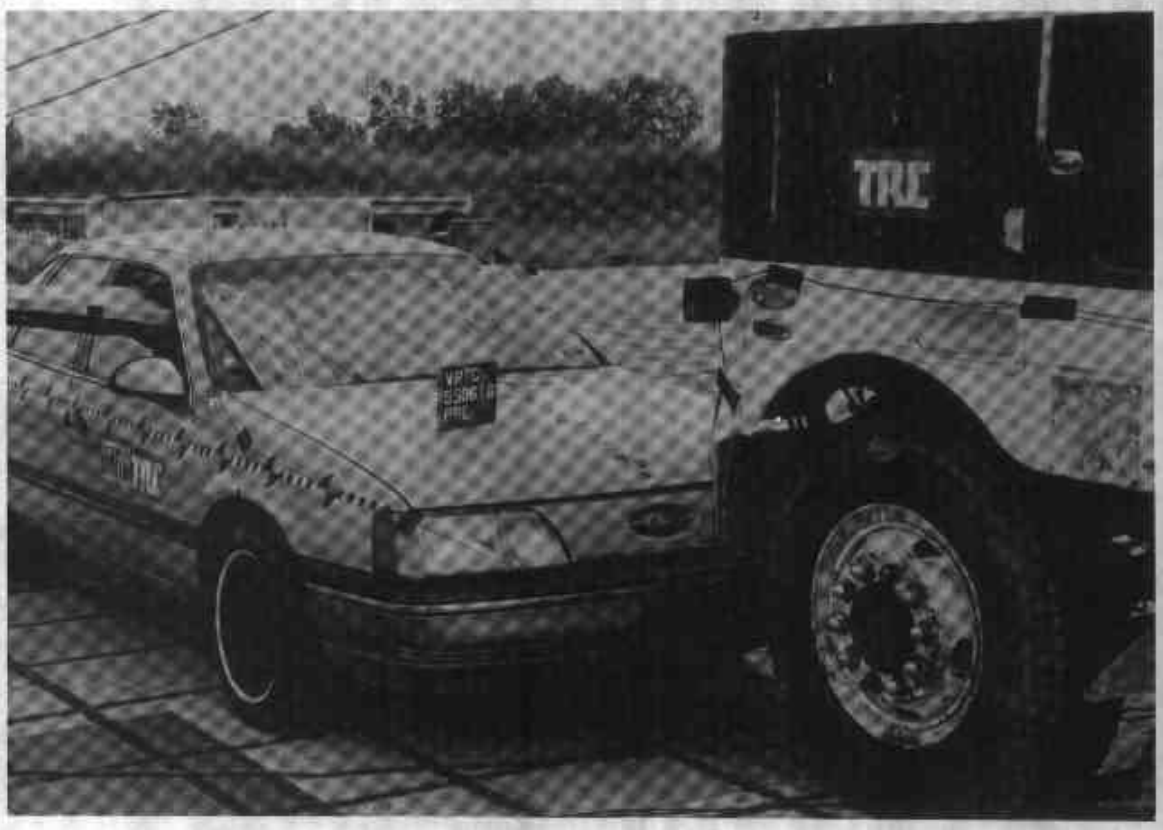


Figure A-11 Pre-Test Vehicle Truck Alignment - View 2

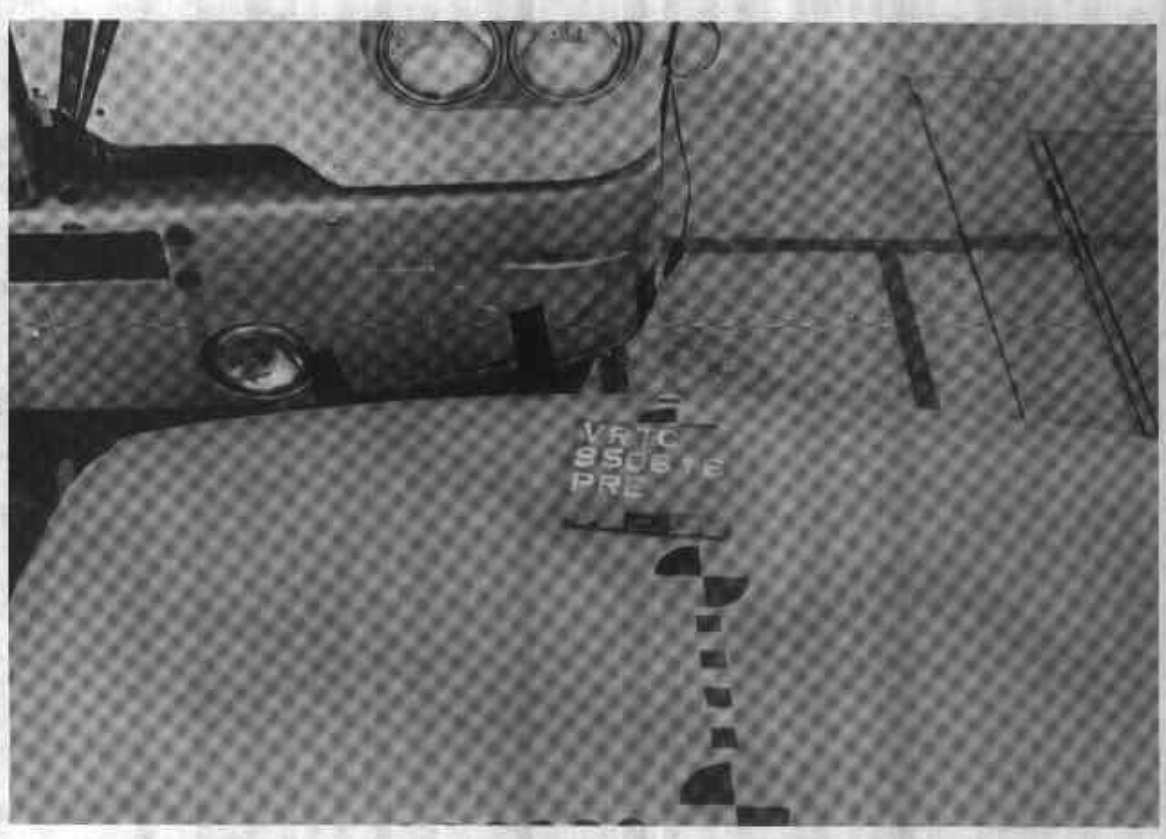


Figure A-12 Pre-Test Vehicle Truck Alignment - View 3

Figure A-13 Pre-Test Vehicle Truck Alignment - View 4

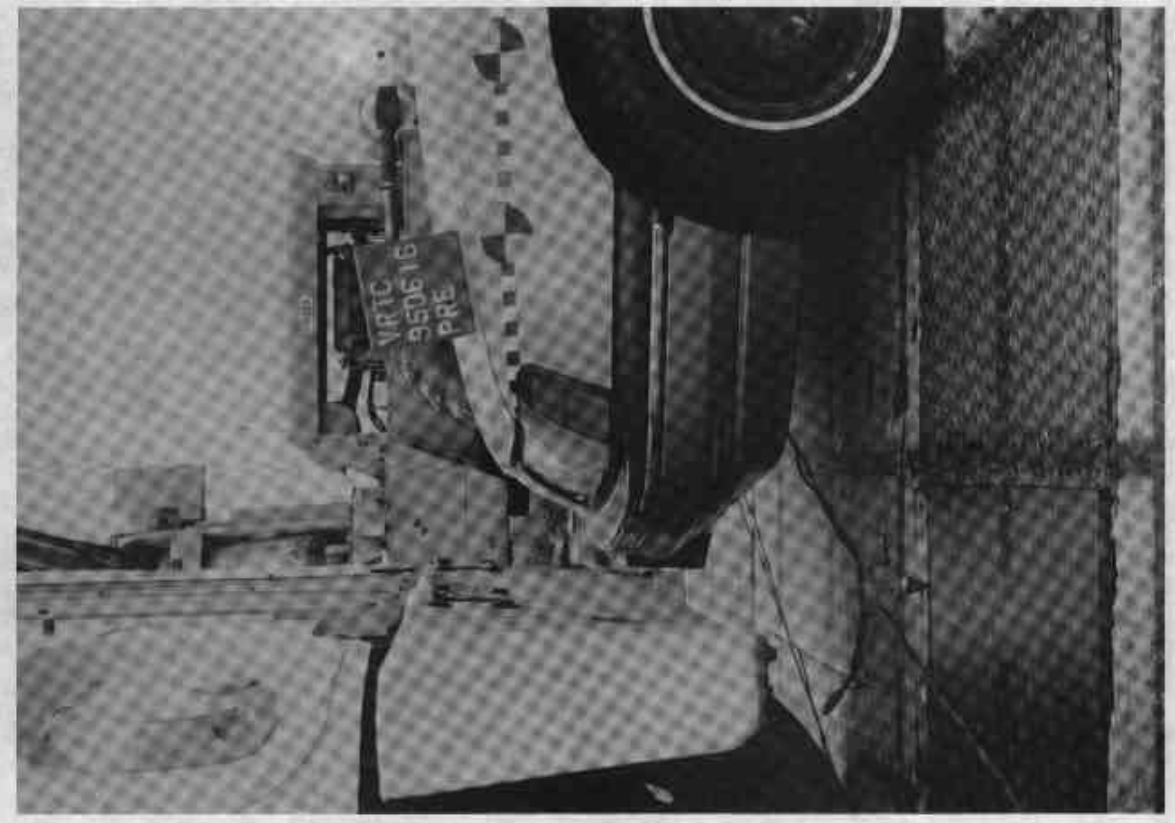


Figure A-14 Pre-Test Vehicle Truck Alignment - View 5

Figure A-15 Pre-Test Driver Dummy Frontal View

Figure A-16 Post-Test Driver Dummy Frontal View

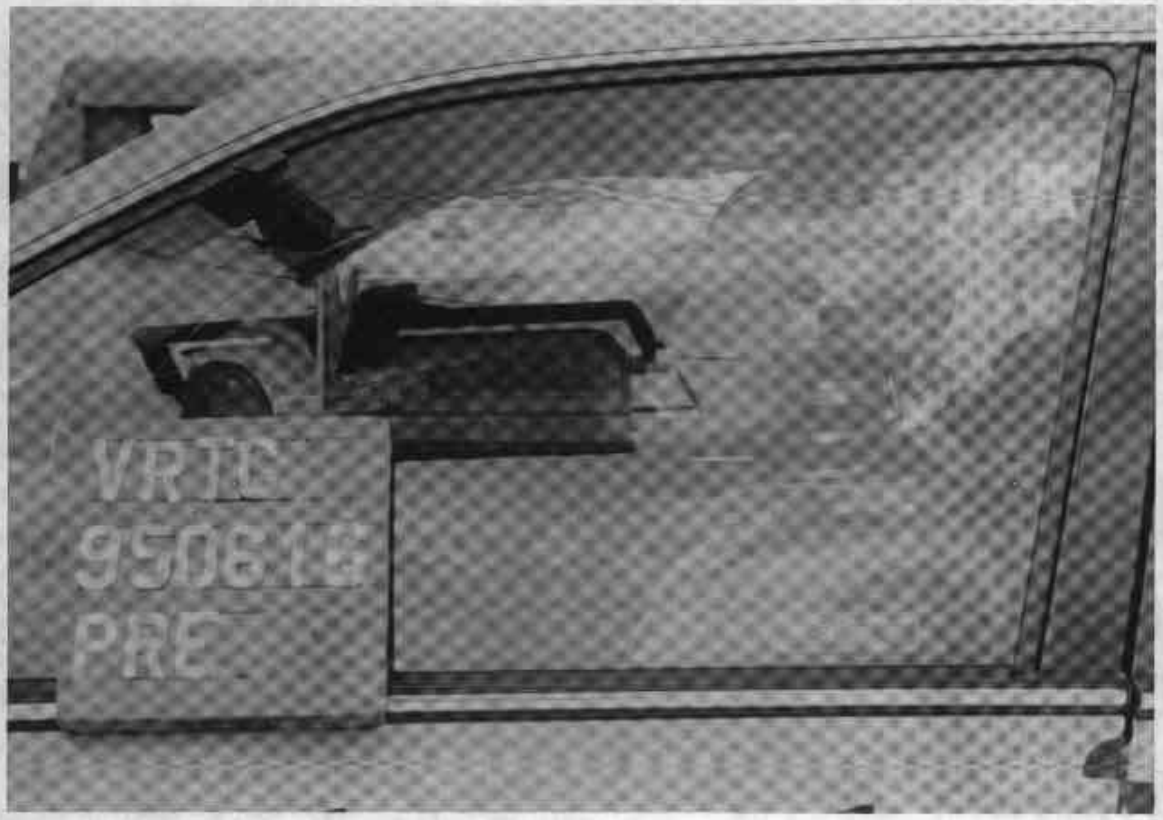


Figure A-17 Pre-Test Driver Dummy Left Side View

Figure A-18 Post-Test Driver Dummy Left Side View

Figure A-19 Pre-Test Driver Dummy and Vehicle Interior - View 1

Figure A-20 Pre-Test Driver Dummy and Vehicle Interior - View 2

Figure A-21 Post-Test Driver Dummy Over Shoulder View

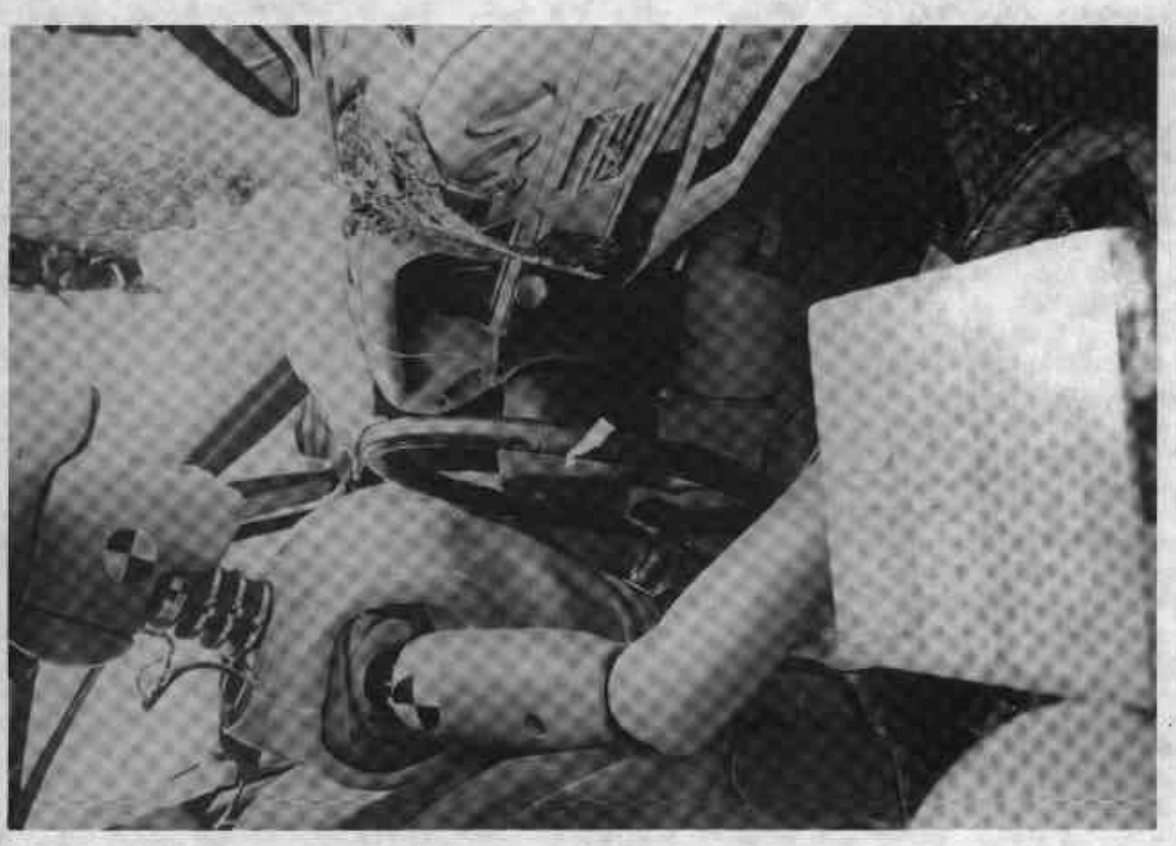


Figure A-22 Post-Test Driver Dummy Right Side View

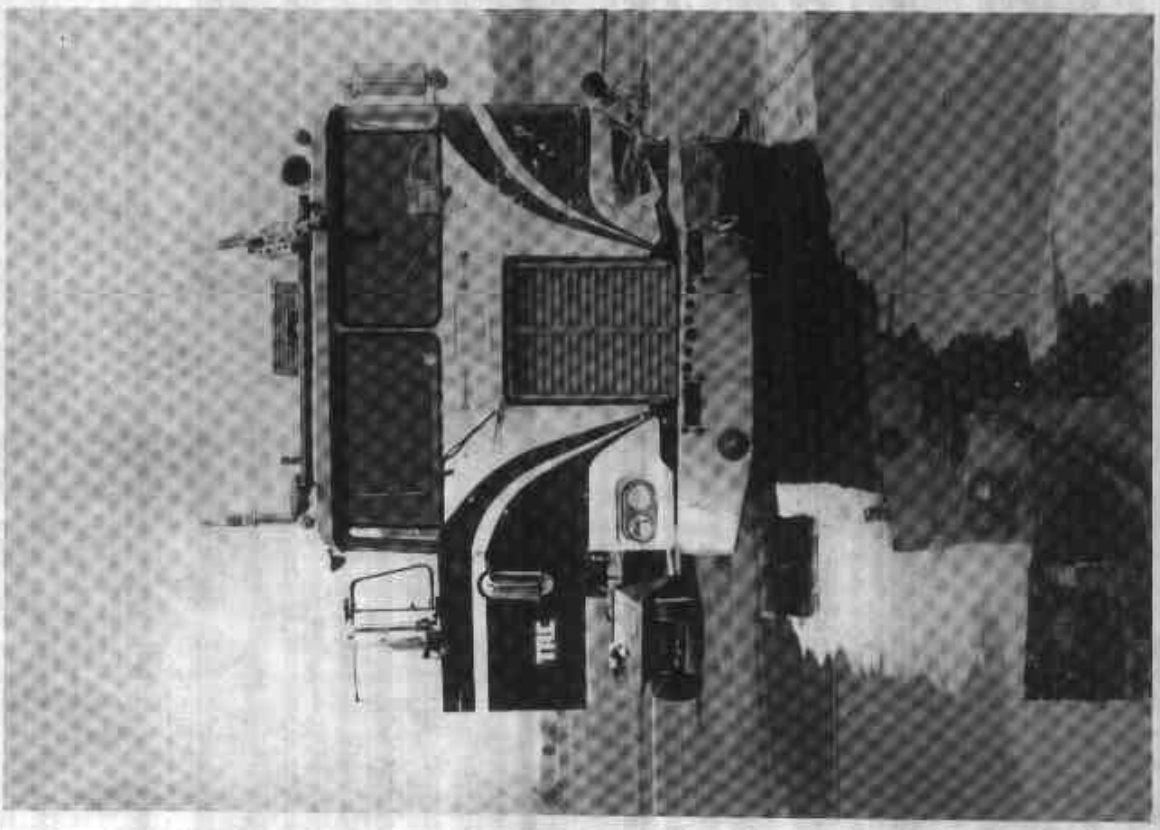


Figure A-23 Post-Test Heavy Truck Frontal View

Intentionally Left Blank

Figure A-24 Post-Test Heavy Truck Left Side - View 1

Figure A-25 Post-Test Heavy Truck Left Side - View 2

Figure A-26 Post-Test Heavy Truck Left Side - View 3

Intentionally Left Blank

Figure A-27 Post-Test Heavy Truck Right Side - View 1

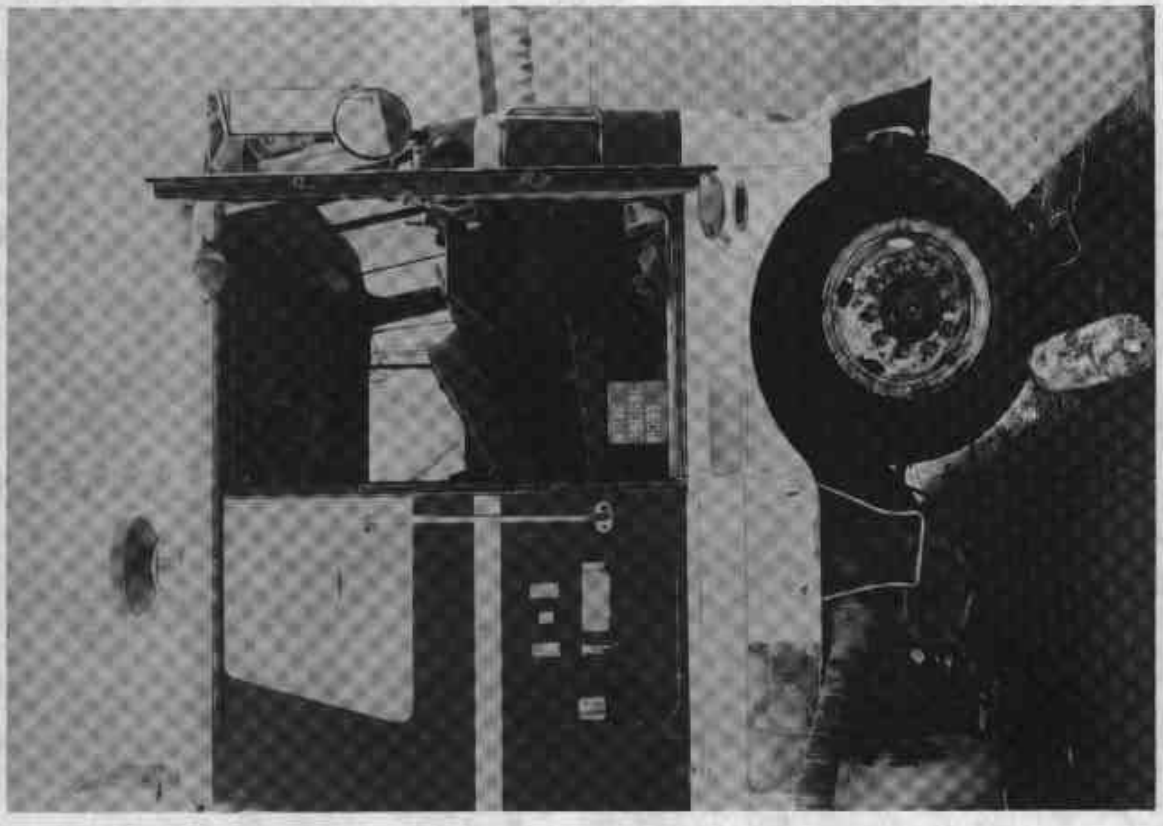


Figure A-28 Post-Test Heavy Truck Right Side - View 2

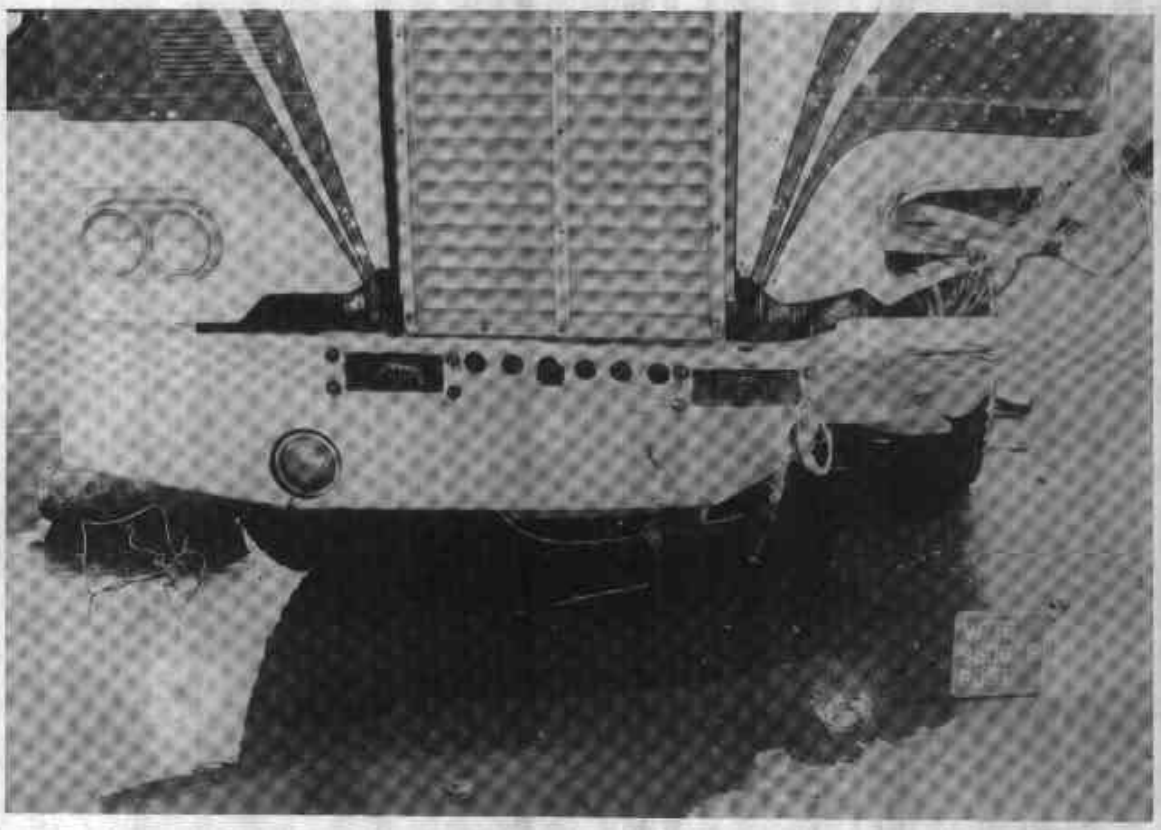


Figure A-29 Post-Test Heavy Truck Bumper - View 1

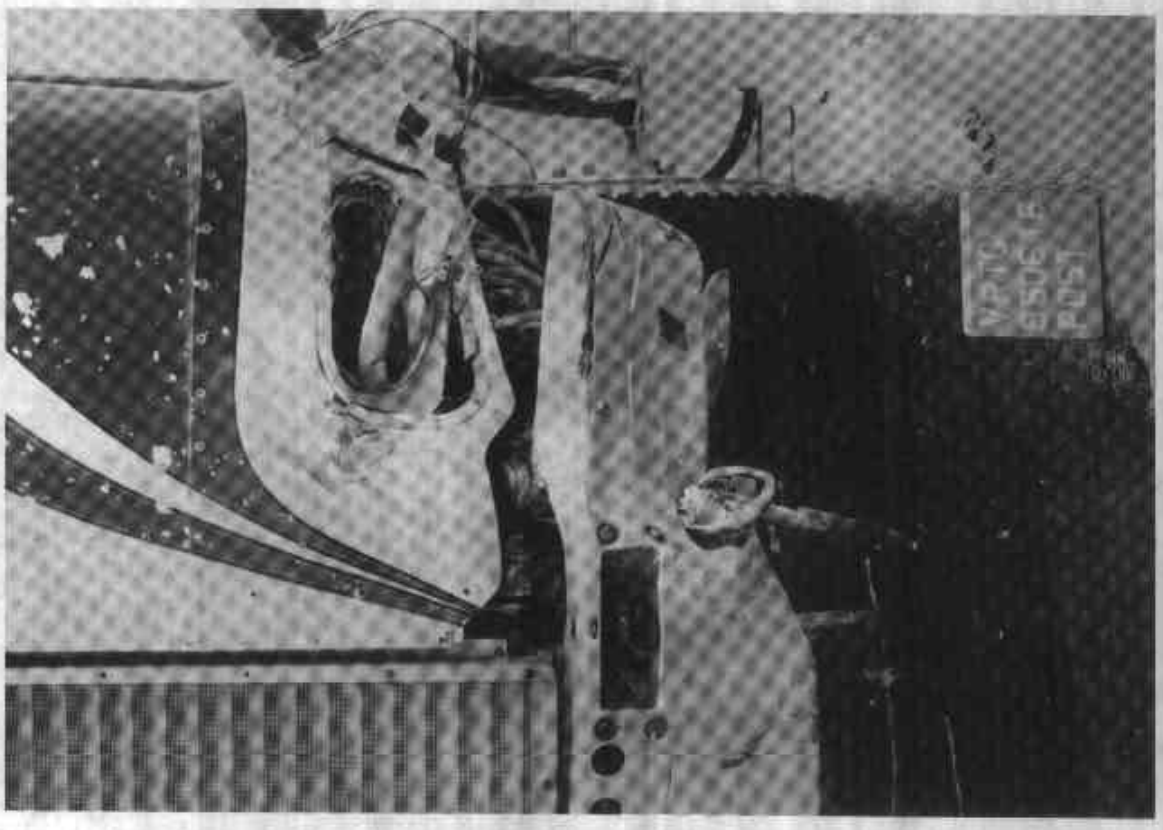


Figure A-30 Post-Test Heavy Truck Bumper - View 2

Figure A-31 Post-Test Heavy Truck Bumper - View 3

Figure A-32 Pre-Test Vehicle Ballast Location View

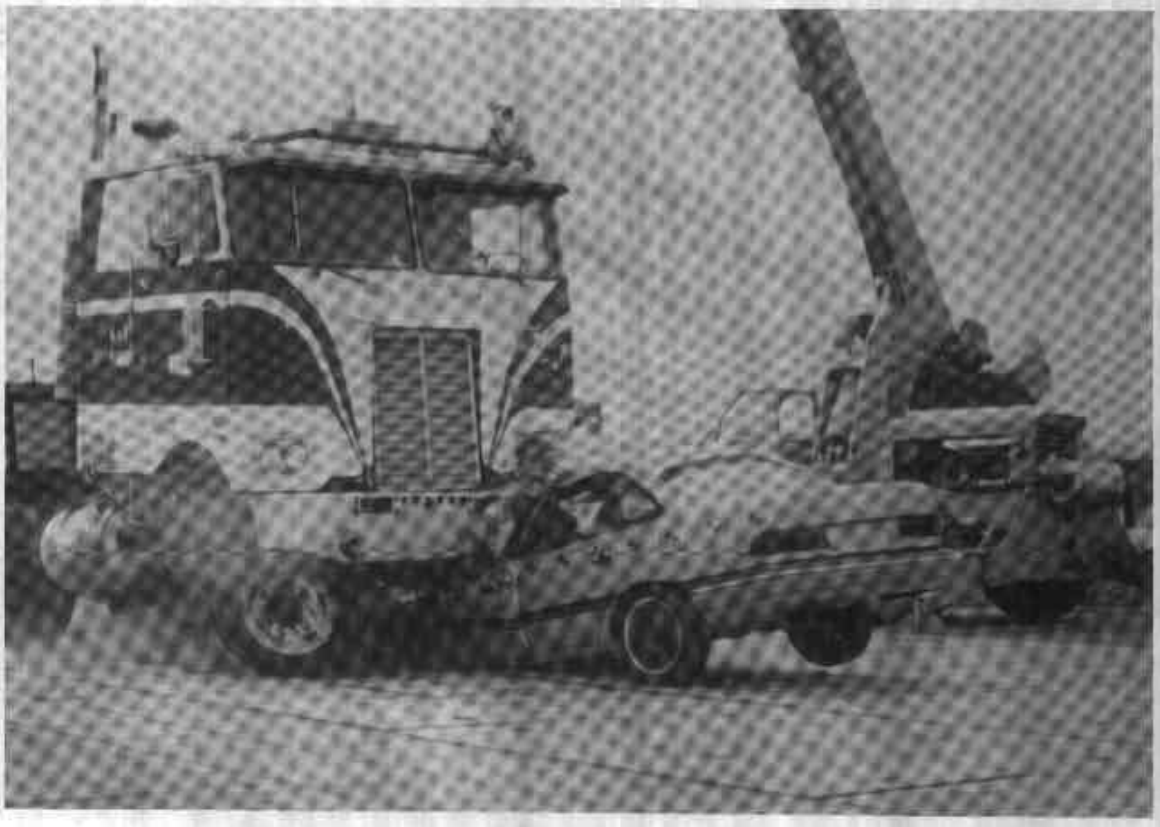
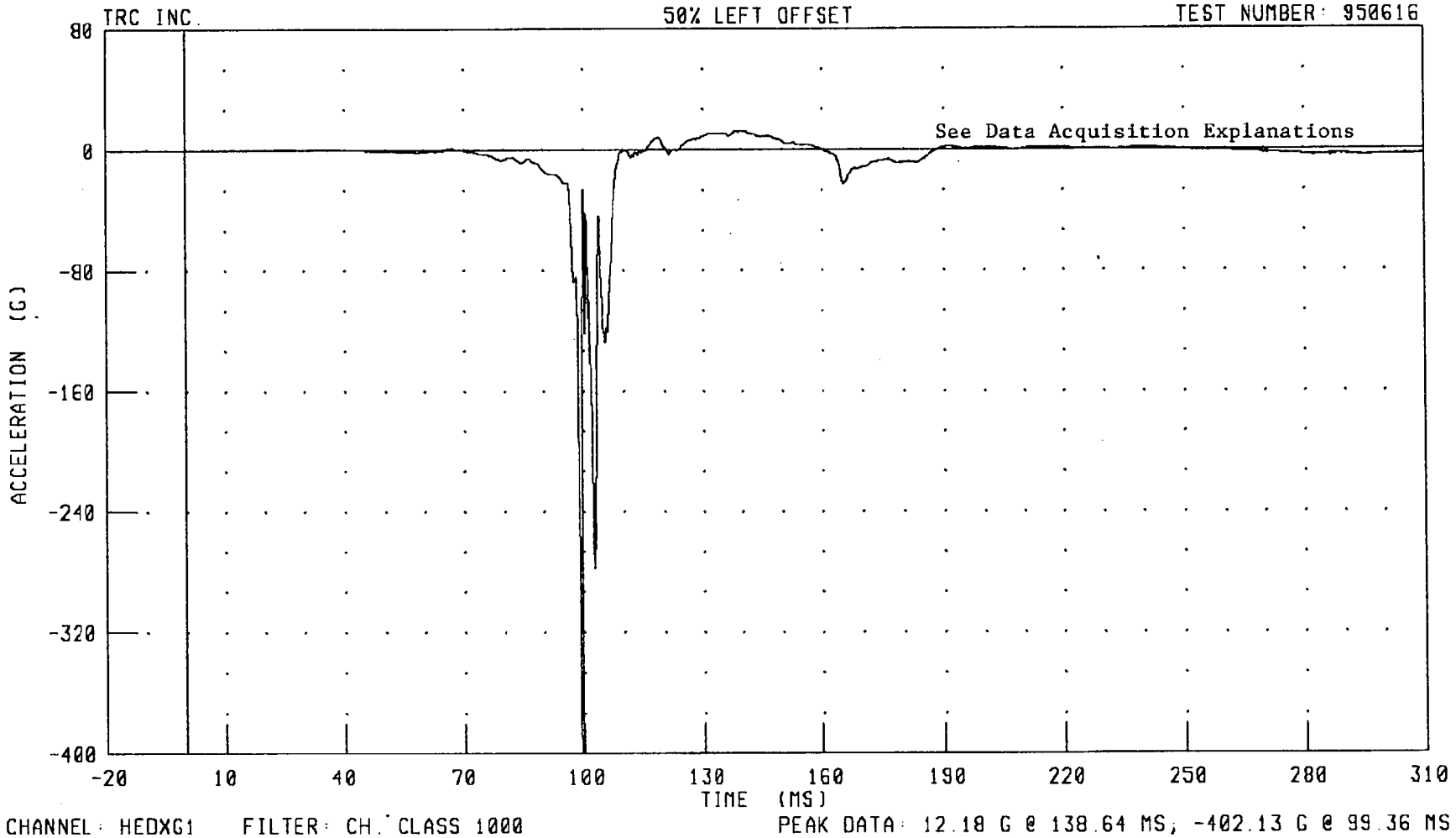


Figure A-33 Impact Event Still

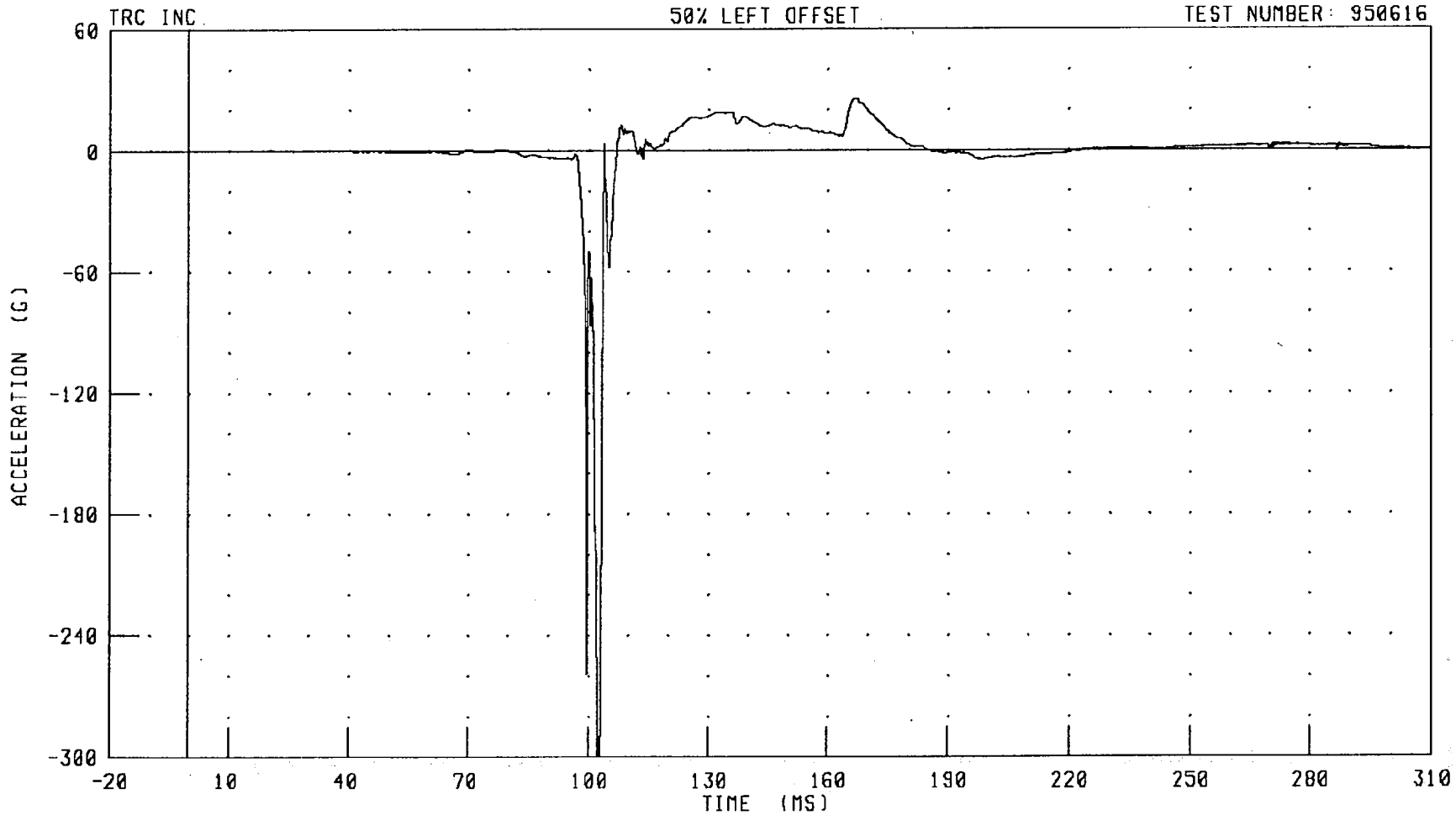
Appendix B

Data Plots

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER HEAD X-AXIS ACCELERATION

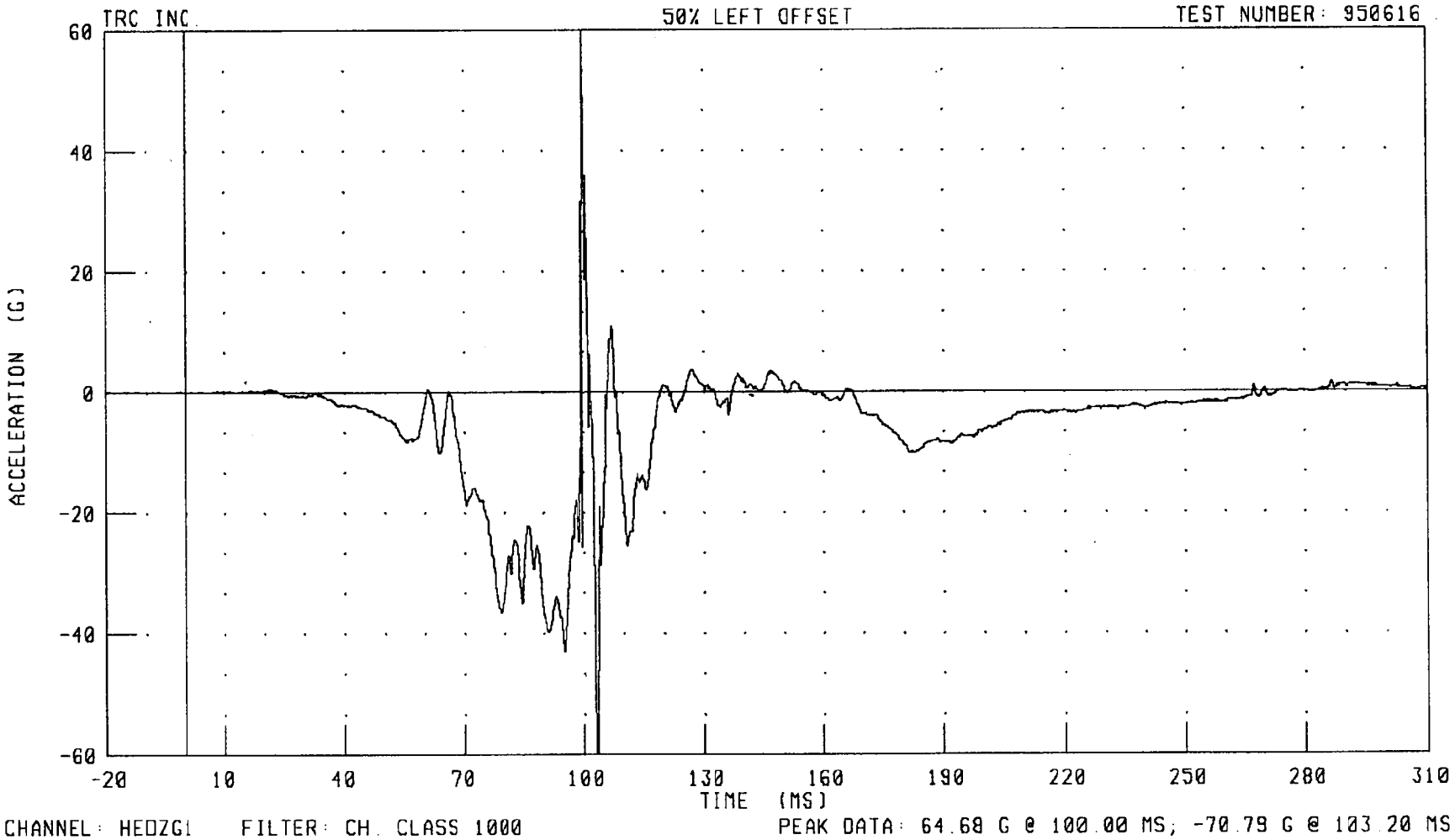


HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER HEAD Y-AXIS ACCELERATION



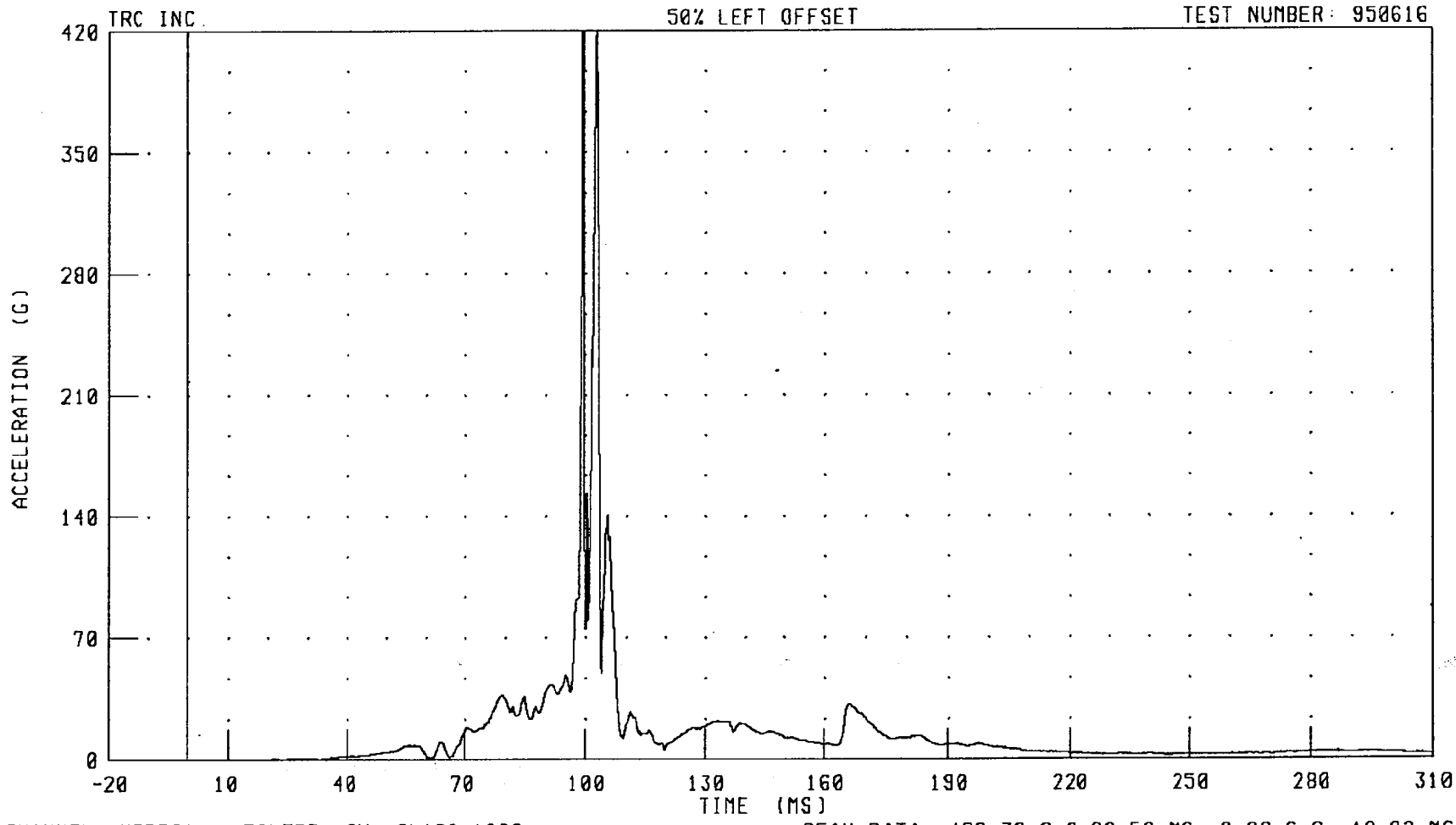
CHANNEL: HEDYG1 FILTER: CH. CLASS 1000 PEAK DATA: 25.39 G @ 166.72 MS; -317.40 G @ 102.64 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER HEAD Z-AXIS ACCELERATION

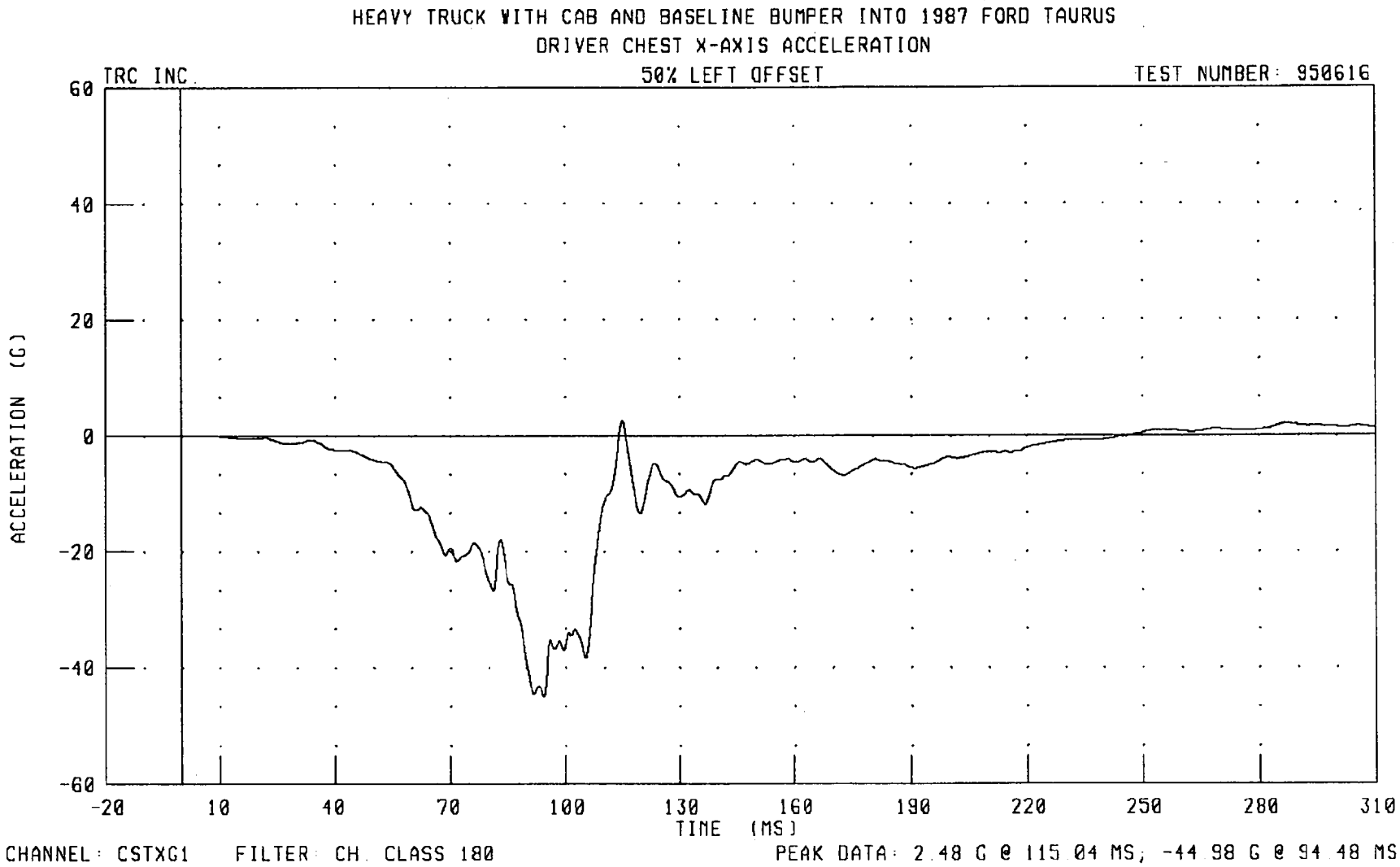


CHANNEL: HEDZG1 FILTER: CH. CLASS 1000 PEAK DATA: 64.68 G @ 100.00 MS; -70.79 G @ 103.20 MS

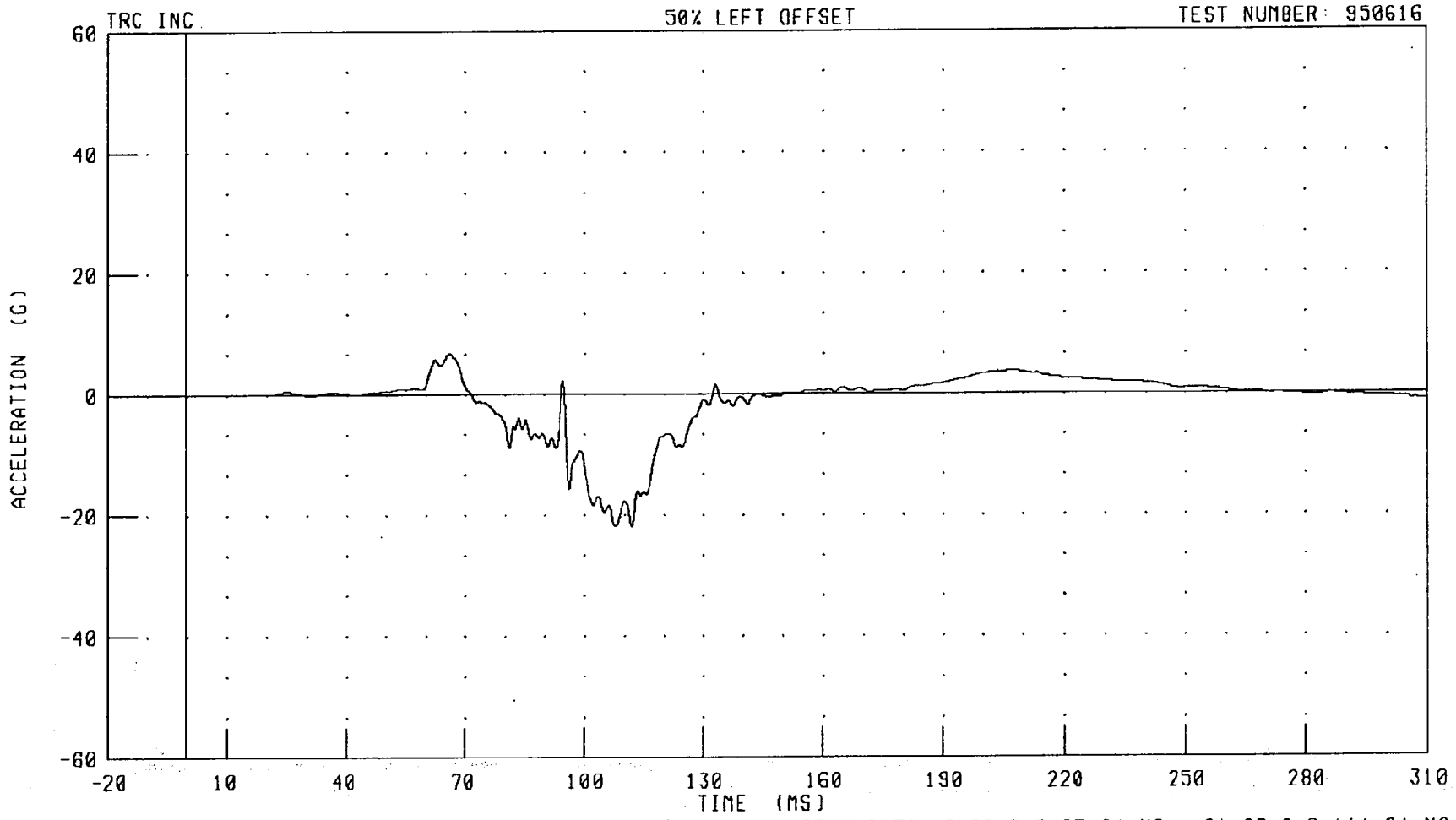
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER HEAD RESULTANT ACCELERATION



CHANNEL: HEDRG1 FILTER: CH. CLASS 1000 PEAK DATA: 479.36 G @ 99.52 MS; 0.02 G @ -19.92 MS

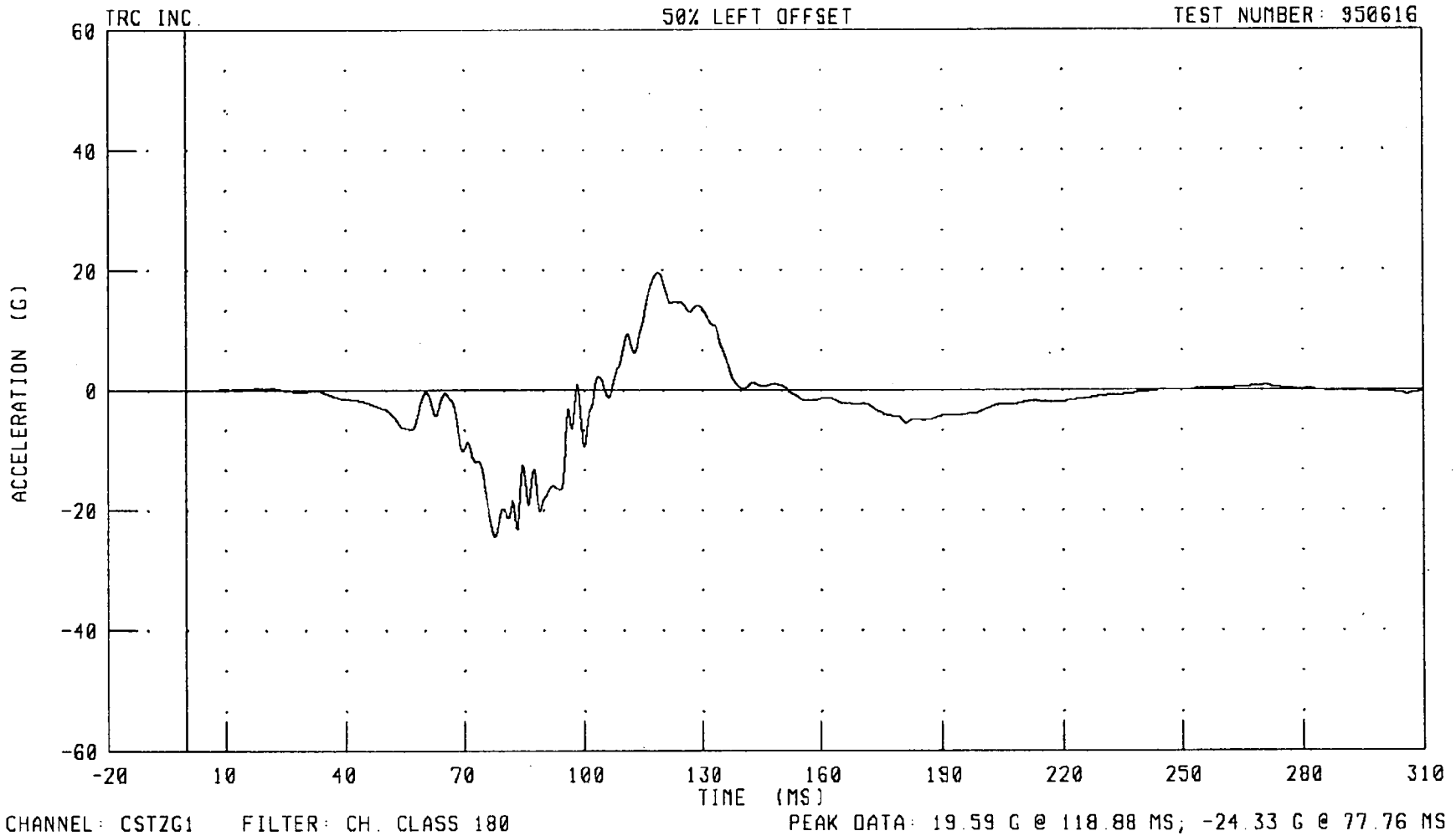

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER CHEST X-AXIS ACCELERATION
TRC INC
50% LEFT OFFSET
TEST NUMBER: 950616
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: CSTXG1
FILTER: CH. CLASS 180
PEAK DATA: 2.48 G @ 115.04 MS; -44.98 G @ 94.48 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER CHEST Y-AXIS ACCELERATION

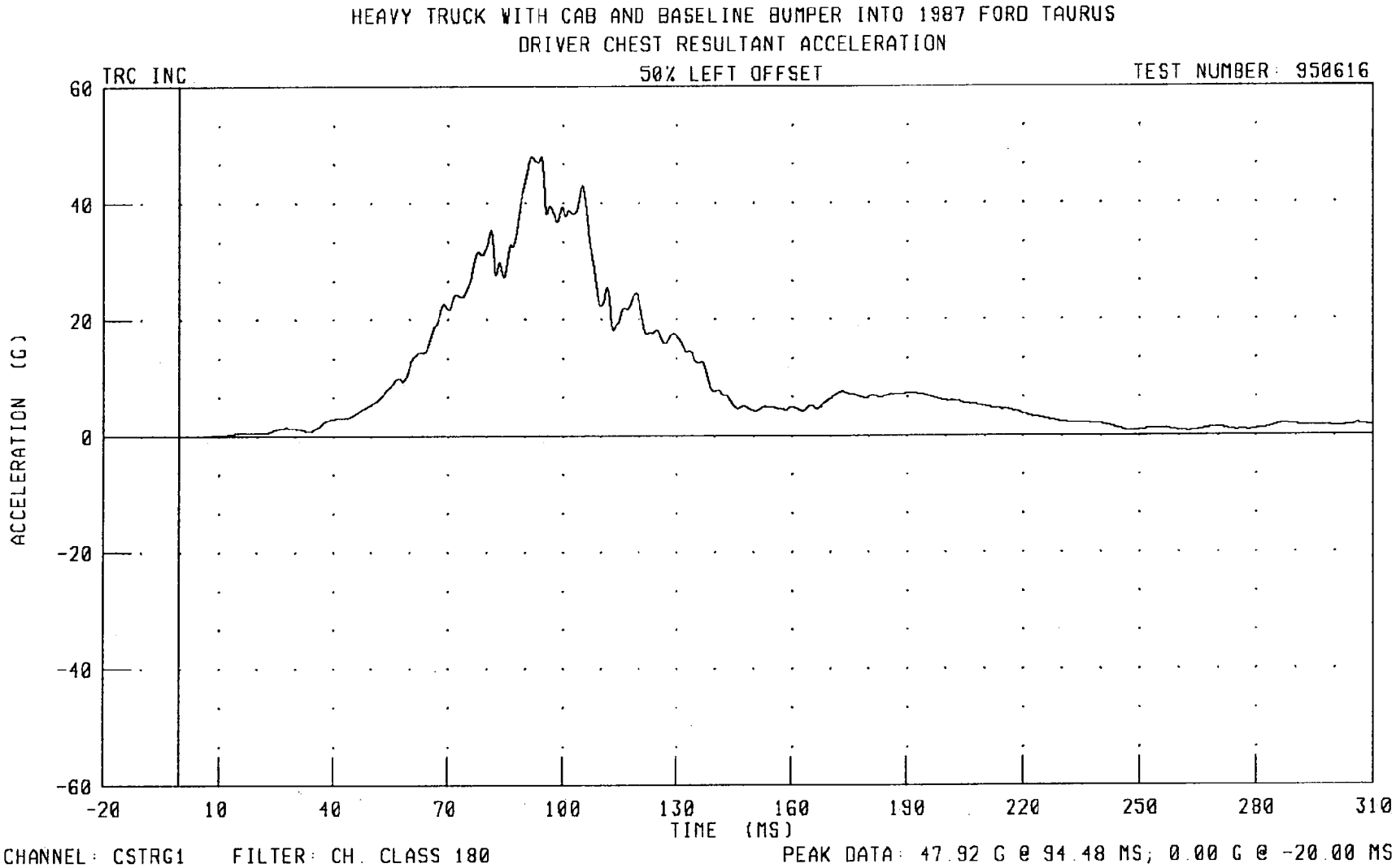


CHANNEL: CSTYG1 FILTER: CH CLASS 180 PEAK DATA: 6.80 G @ 65.84 MS; -21.98 G @ 111.84 MS

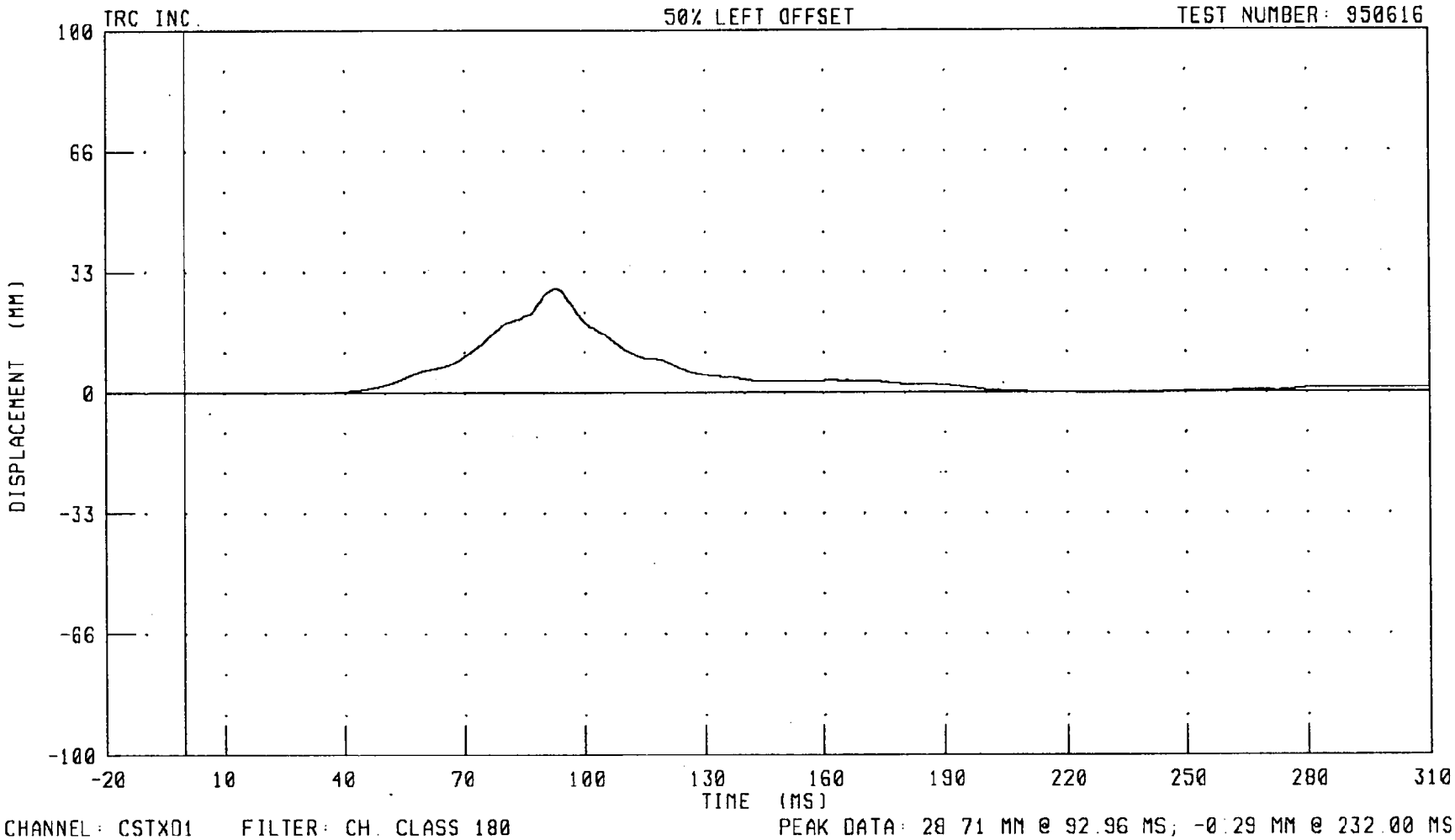
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER CHEST Z-AXIS ACCELERATION



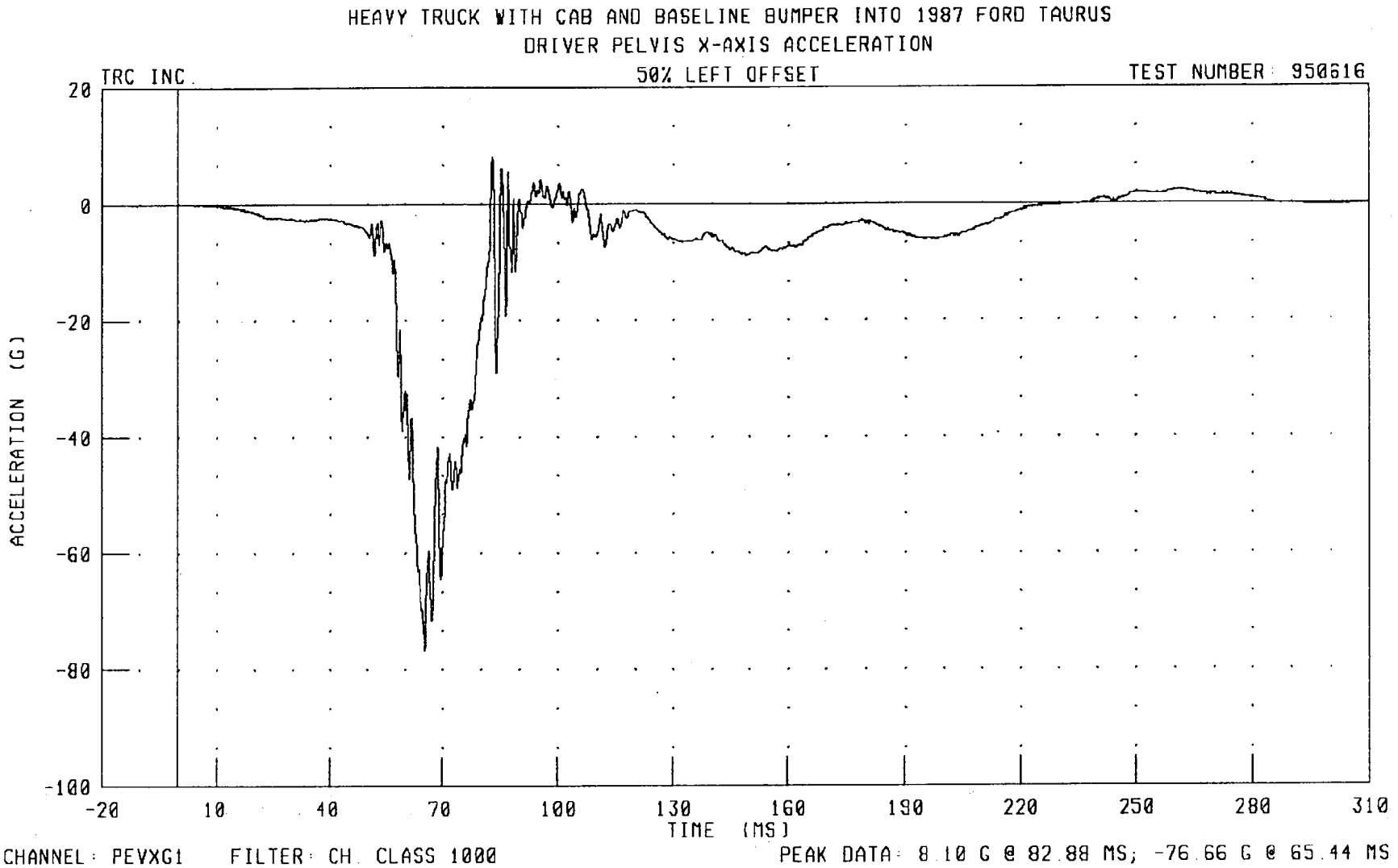
CHANNEL: CSTZG1 FILTER: CH. CLASS 180 PEAK DATA: 19.59 G @ 118.88 MS; -24.33 G @ 77.76 MS


HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER CHEST RESULTANT ACCELERATION
TRC INC
50% LEFT OFFSET
TEST NUMBER: 950616
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: CSTRG1
FILTER: CH. CLASS 180
PEAK DATA: 47.92 G @ 94.48 MS; 0.00 G @ -20.00 MS

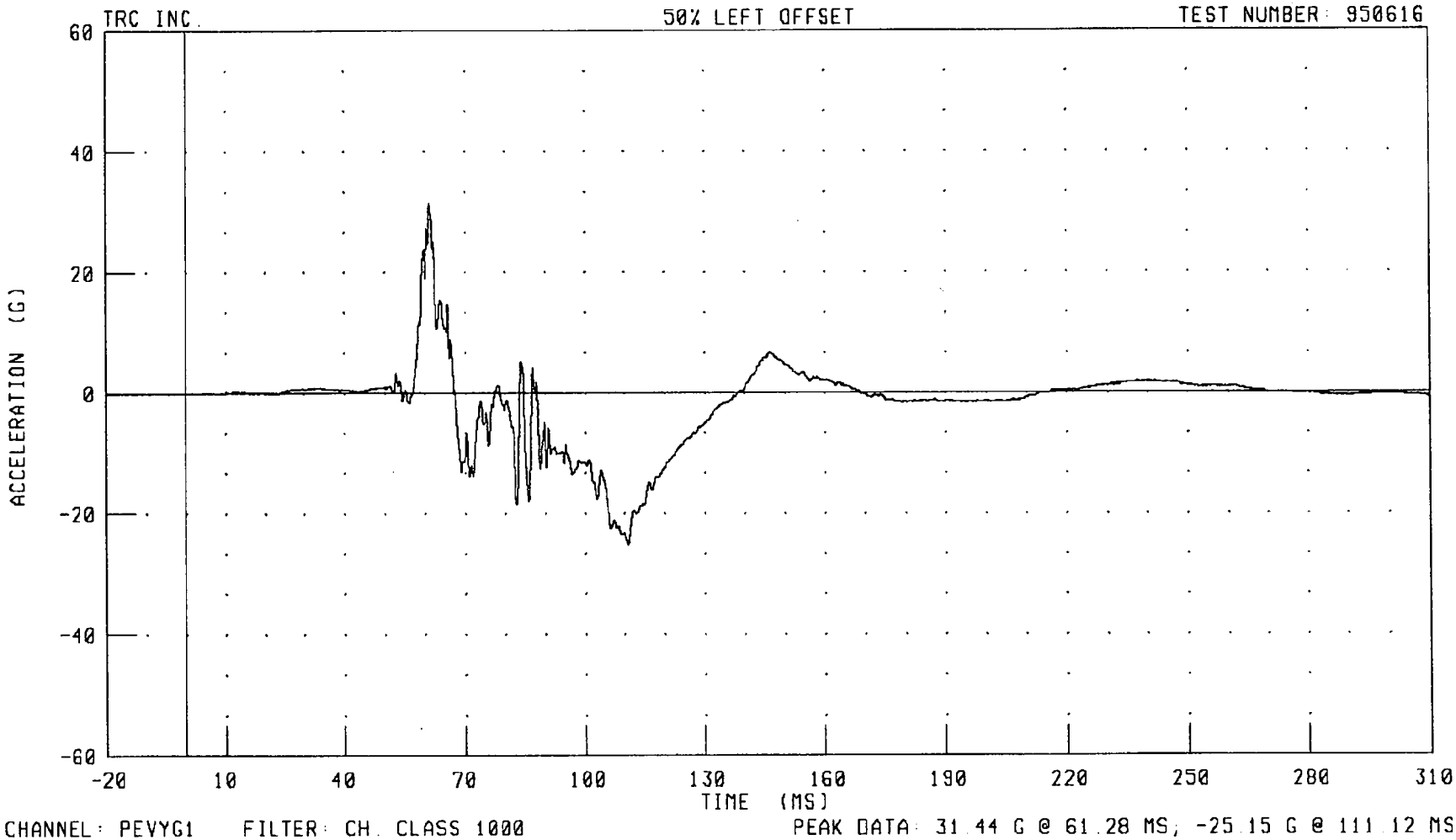
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER CHEST DEFLECTION
50% LEFT OFFSET



CHANNEL: CSTXD1 FILTER: CH. CLASS 180 PEAK DATA: 28.71 MM @ 92.96 MS; -0.29 MM @ 232.00 MS

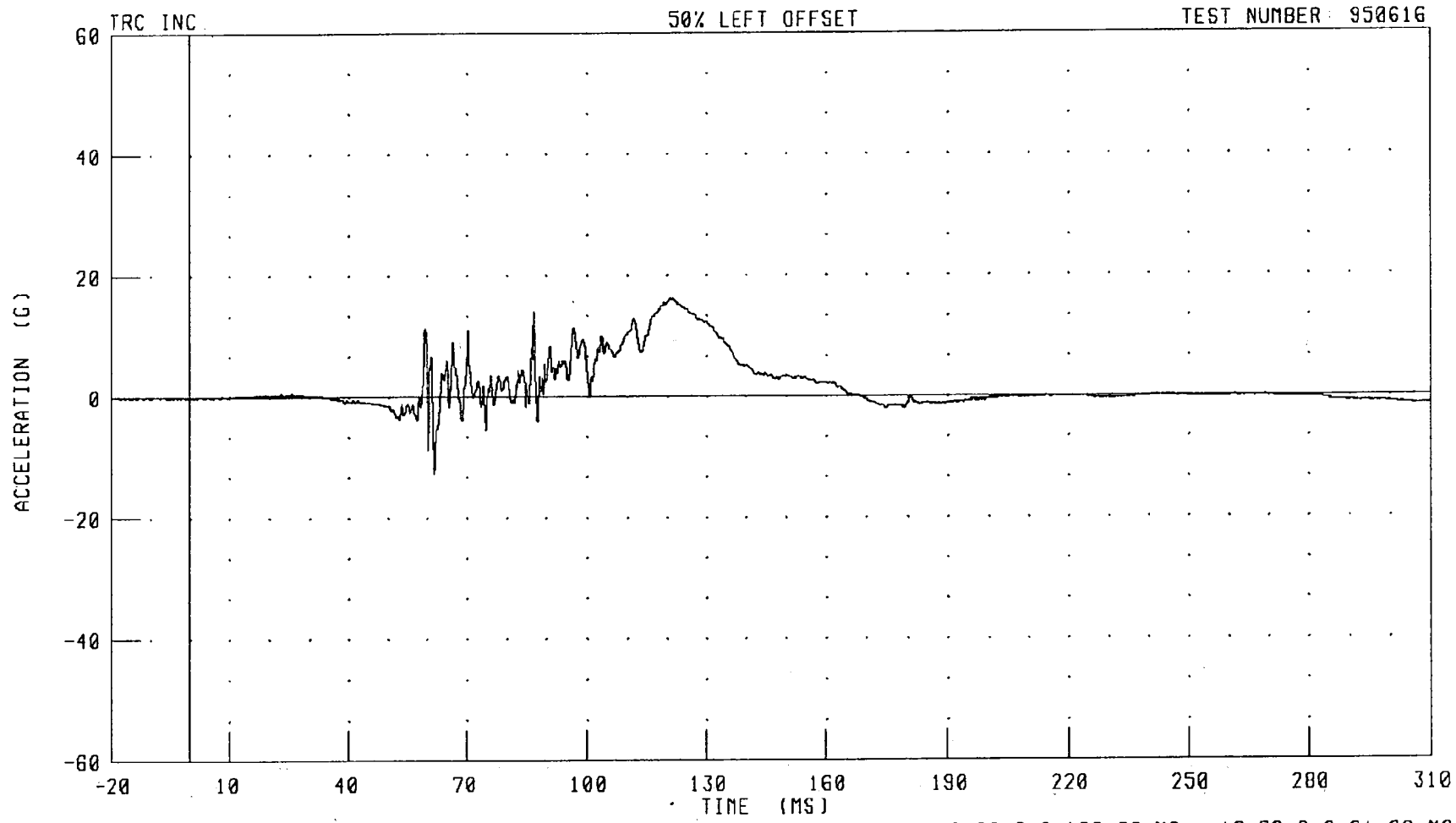

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER PELVIS X-AXIS ACCELERATION
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
20
0
-20
-40
-60
-80
-100
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVXG1
FILTER: CH. CLASS 1000
PEAK DATA: 8.10 G @ 82.88 MS; -76.66 G @ 65.44 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER PELVIS Y-AXIS ACCELERATION



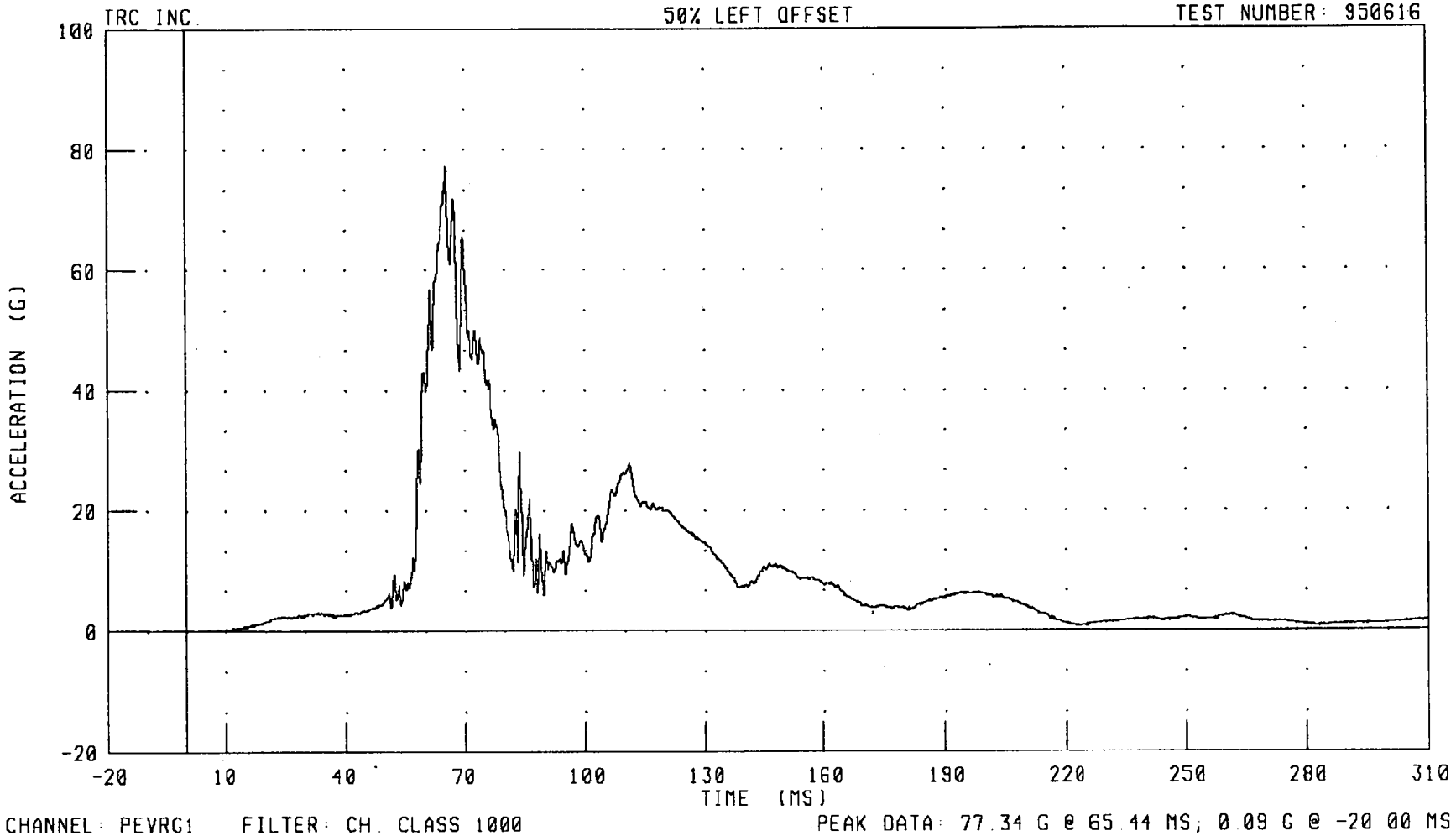
CHANNEL: PEVYG1 FILTER: CH. CLASS 1000 PEAK DATA: 31.44 G @ 61.28 MS; -25.15 G @ 111.12 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER PELVIS Z-AXIS ACCELERATION



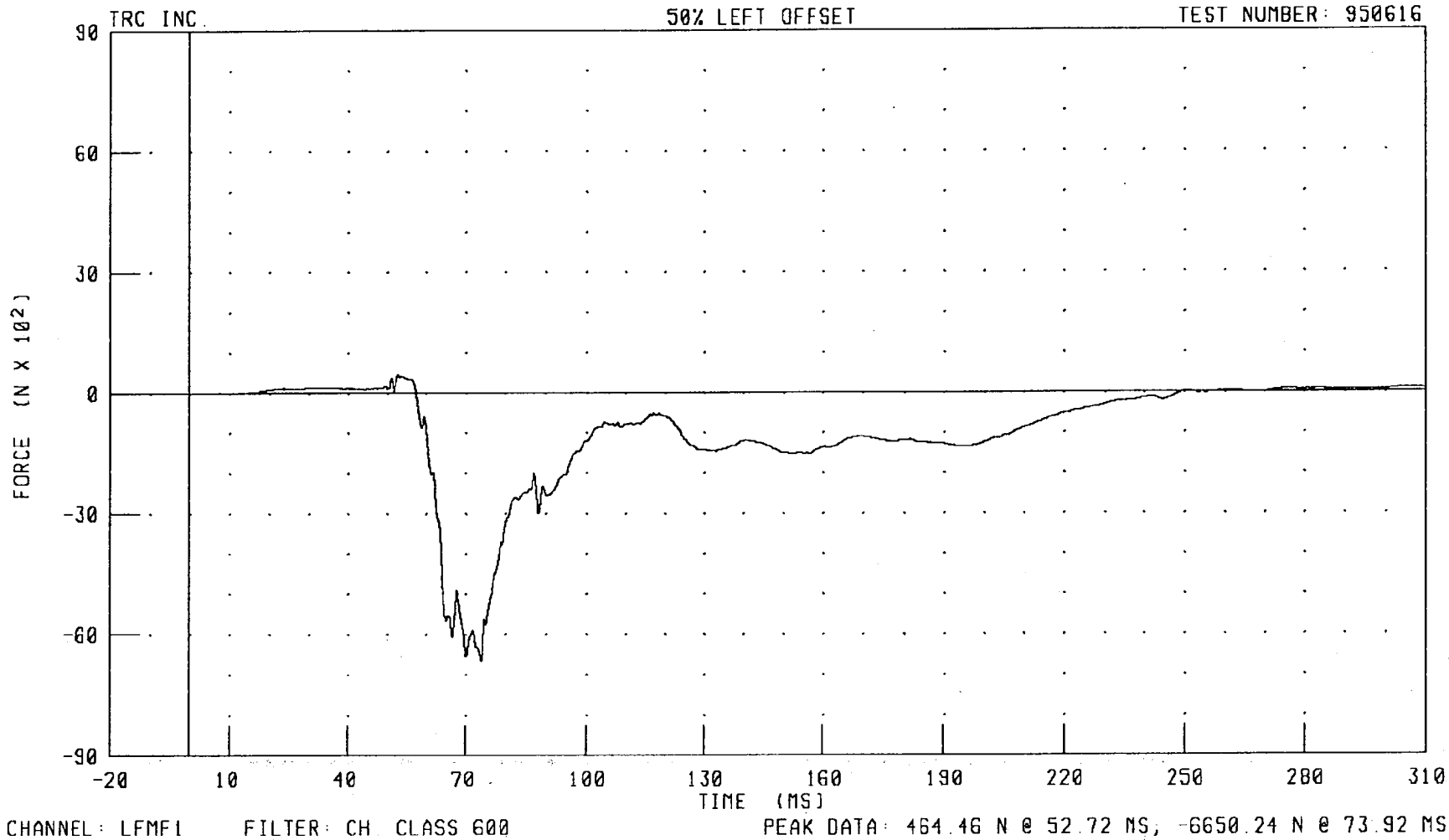
CHANNEL: PEVZG1 FILTER: CH. CLASS 1000 PEAK DATA: 16.29 G @ 120.88 MS; -12.72 G @ 61.92 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER PELVIS RESULTANT ACCELERATION



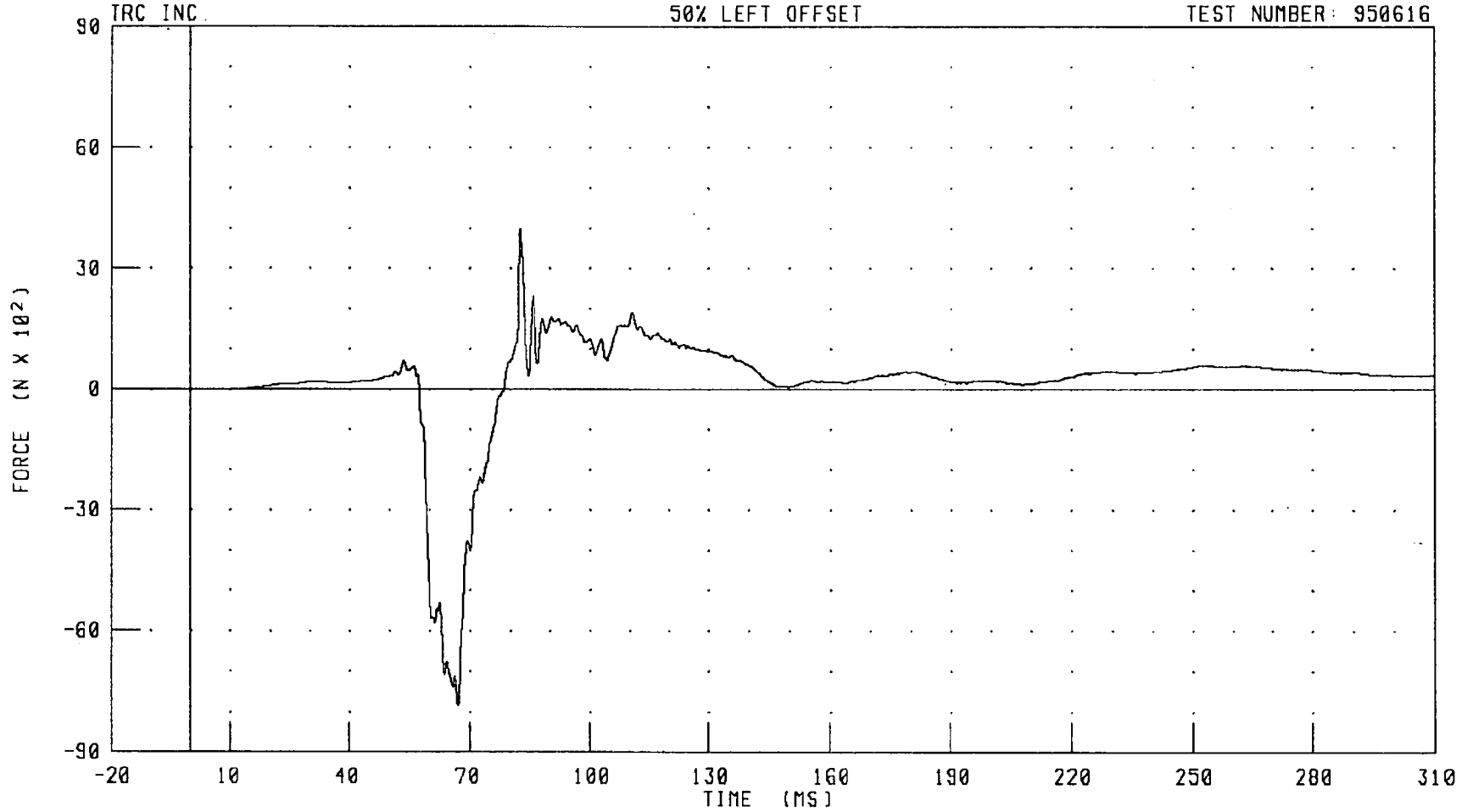
CHANNEL: PEVRG1 FILTER: CH. CLASS 1000 PEAK DATA: 77.34 G @ 65.44 MS, 0.09 G @ -20.00 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER LEFT FEMUR FORCE



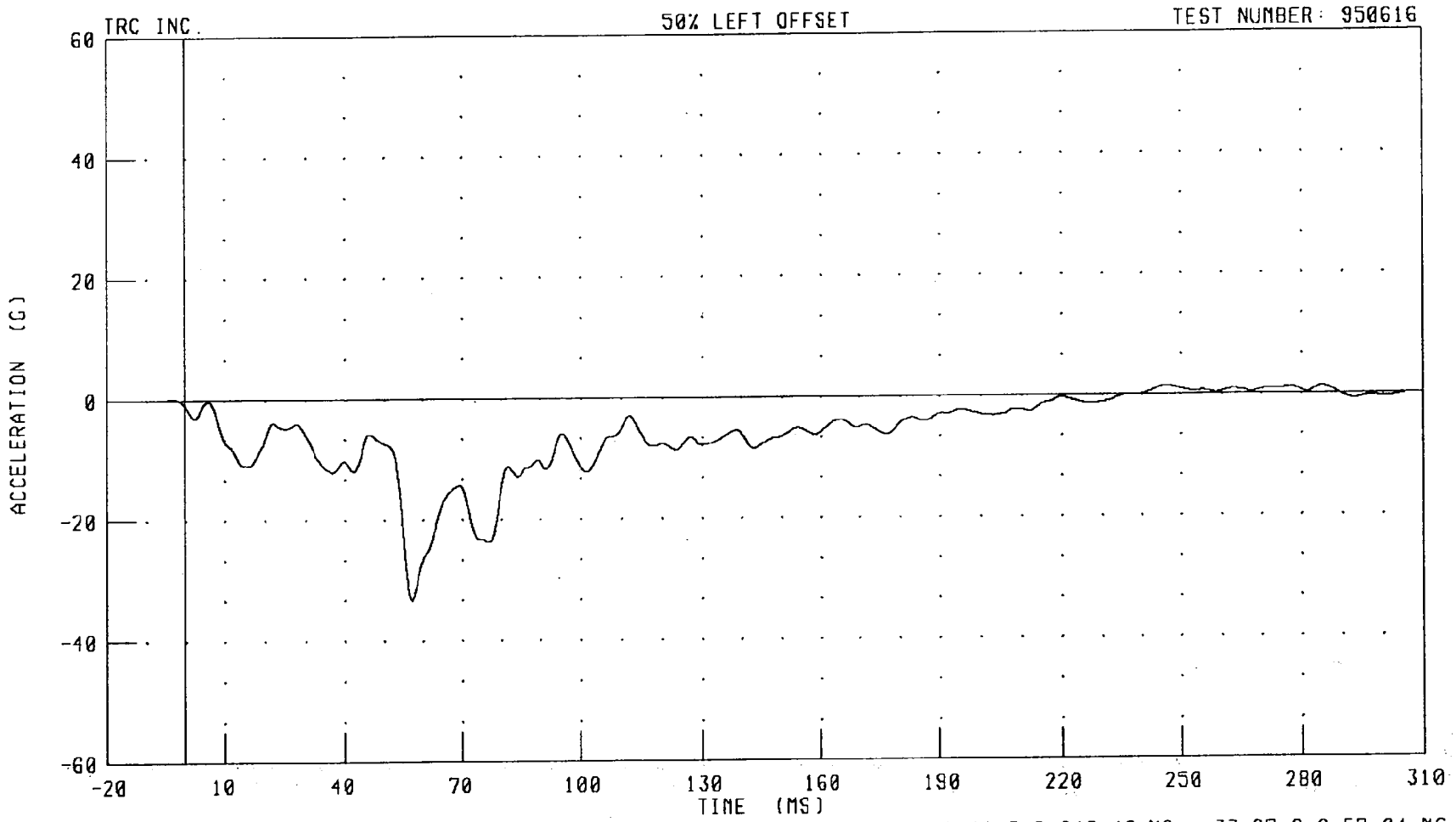
CHANNEL: LFMF1 FILTER: CH CLASS 600 PEAK DATA: 464.46 N @ 52.72 MS, -6650.24 N @ 73.92 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER RIGHT FEMUR FORCE



CHANNEL: RFMF1 FILTER: CH CLASS 600 PEAK DATA: 3986.69 N @ 82.56 MS; -7853.67 N @ 67.20 MS

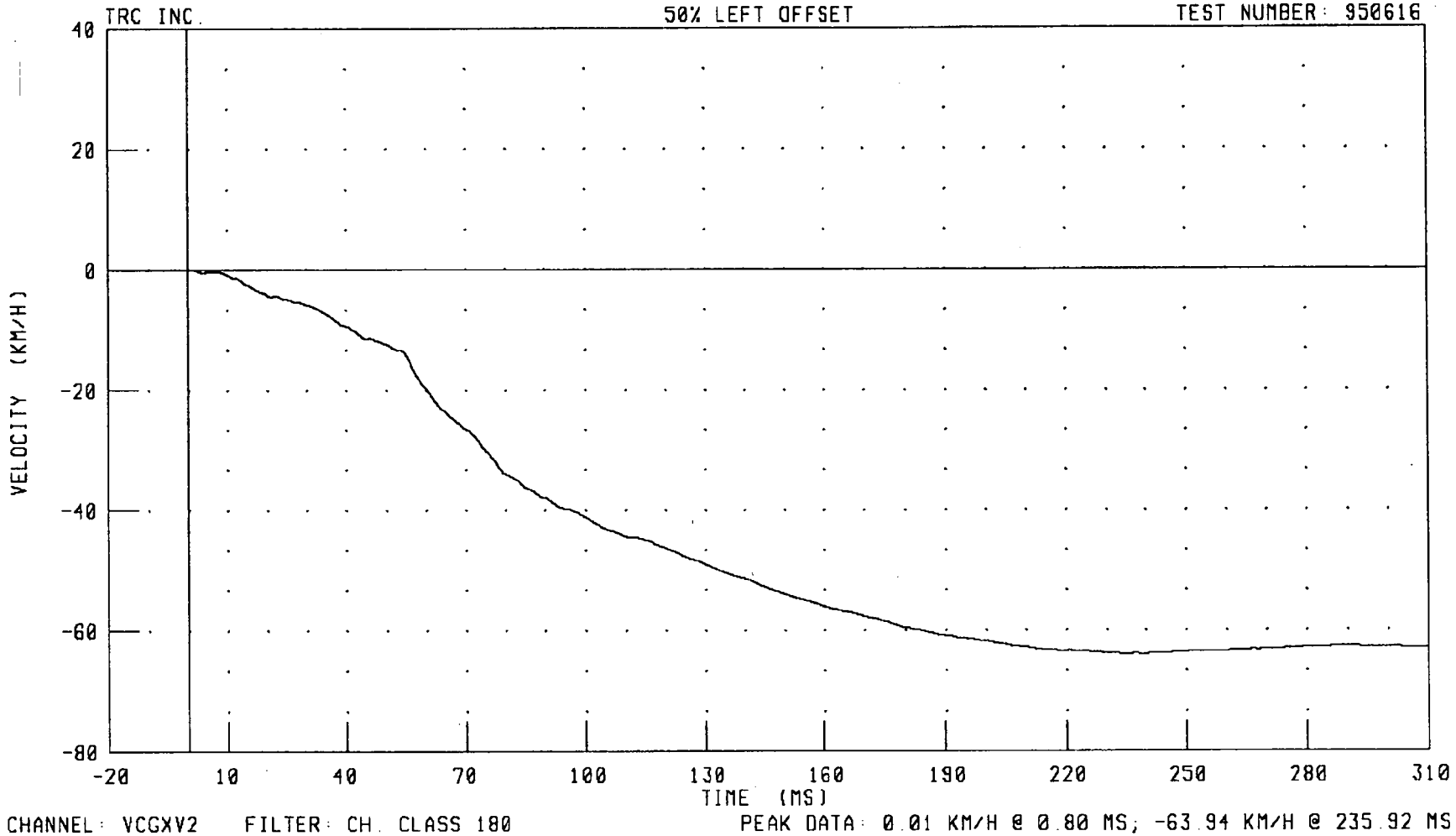
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
CAR CENTER OF GRAVITY X-AXIS ACCELERATION
50% LEFT OFFSET



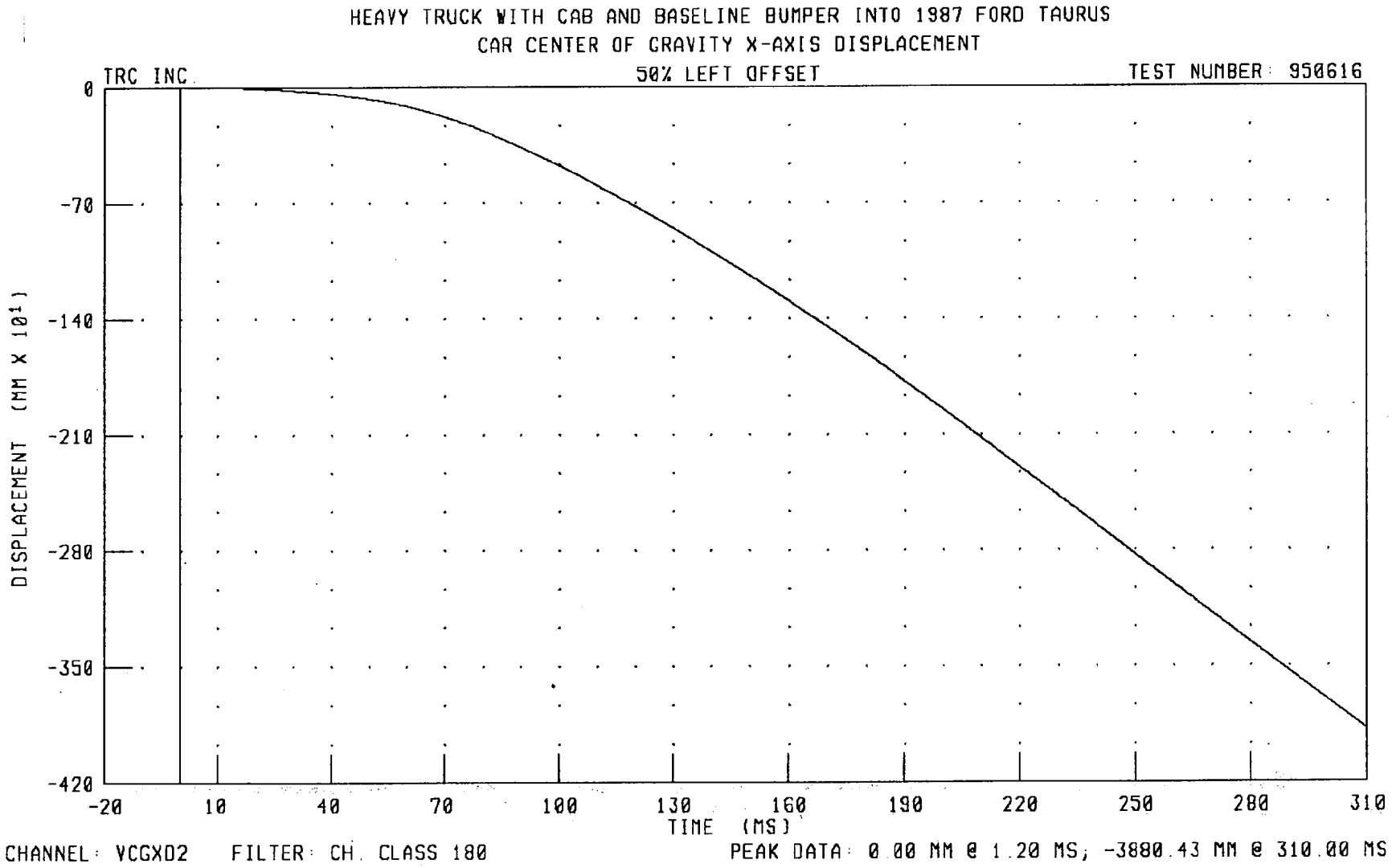
CHANNEL: VCGXG2 FILTER: CH. CLASS 60

PEAK DATA: 1.44 G @ 246.40 MS, -33.27 G @ 57.04 MS

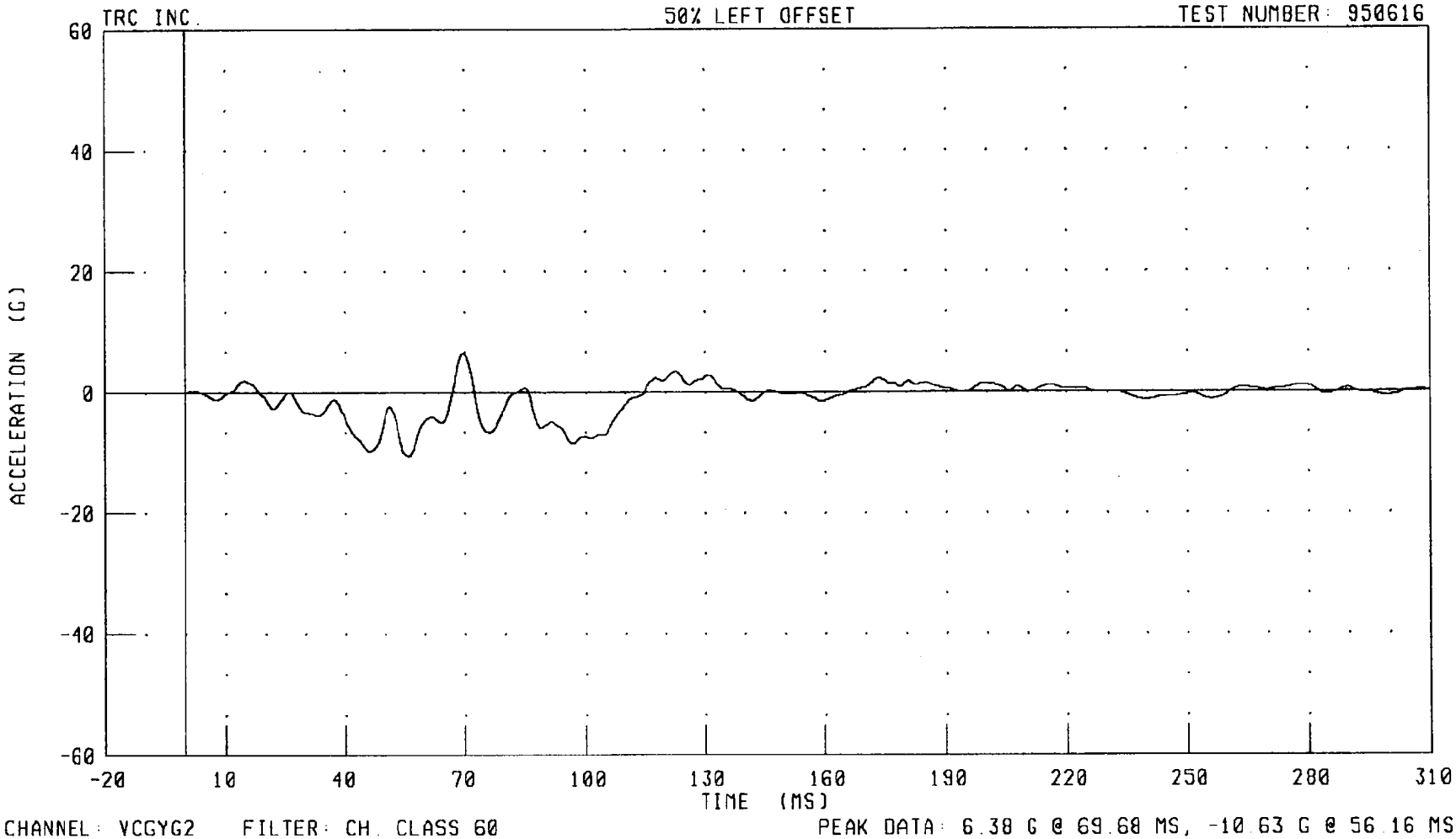
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
CAR CENTER OF GRAVITY X-AXIS VELOCITY



CHANNEL: VCGXV2 FILTER: CH. CLASS 180 PEAK DATA: 0.01 KM/H @ 0.80 MS; -63.94 KM/H @ 235.92 MS

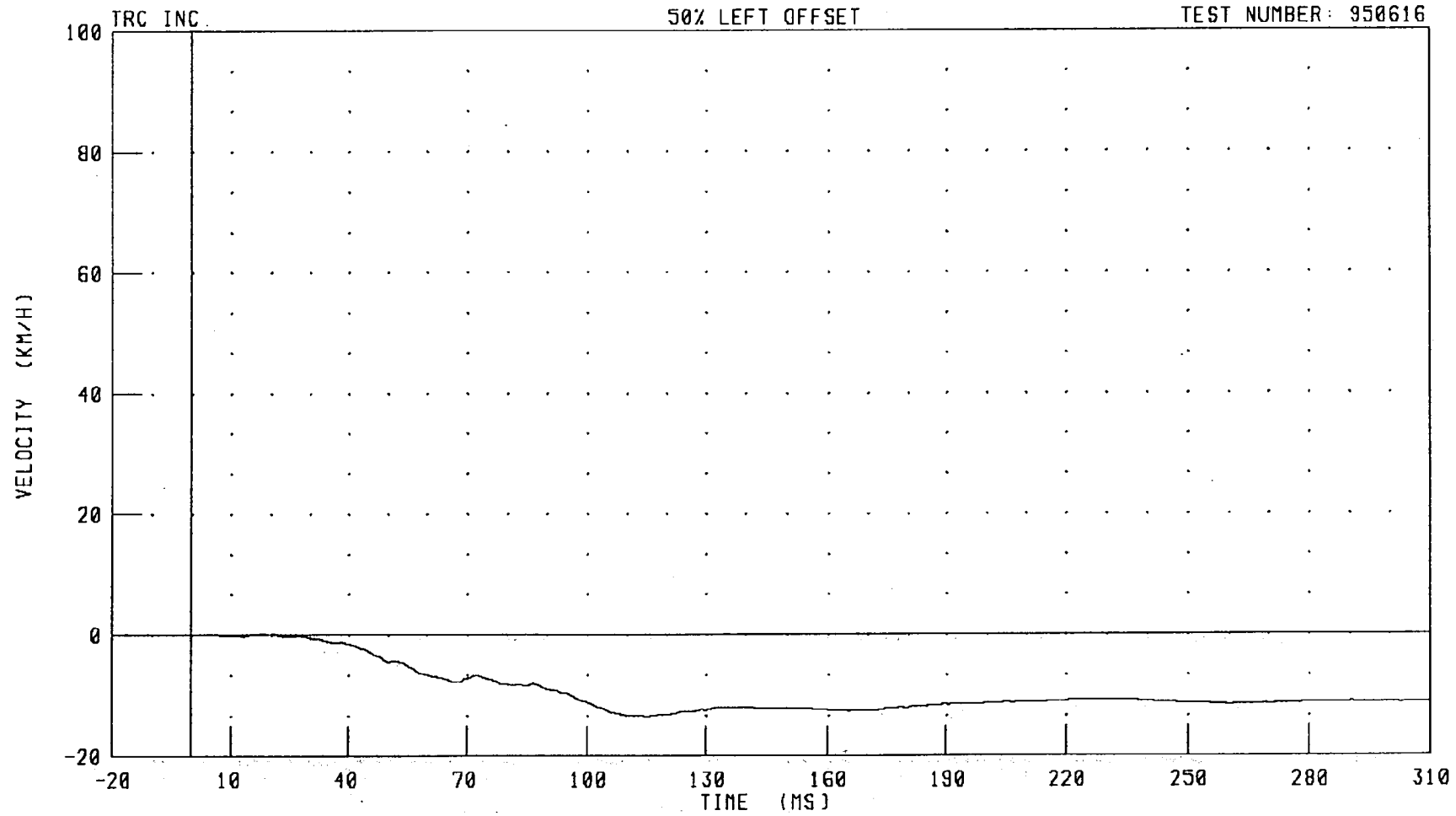

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
CAR CENTER OF GRAVITY X-AXIS DISPLACEMENT
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
DISPLACEMENT (MM X 10¹)
0
-70
-140
-210
-280
-350
-420
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGXD2
FILTER: CH. CLASS 180
PEAK DATA: 0.00 MM @ 1.20 MS; -3880.43 MM @ 310.00 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
CAR CENTER OF GRAVITY Y-AXIS ACCELERATION

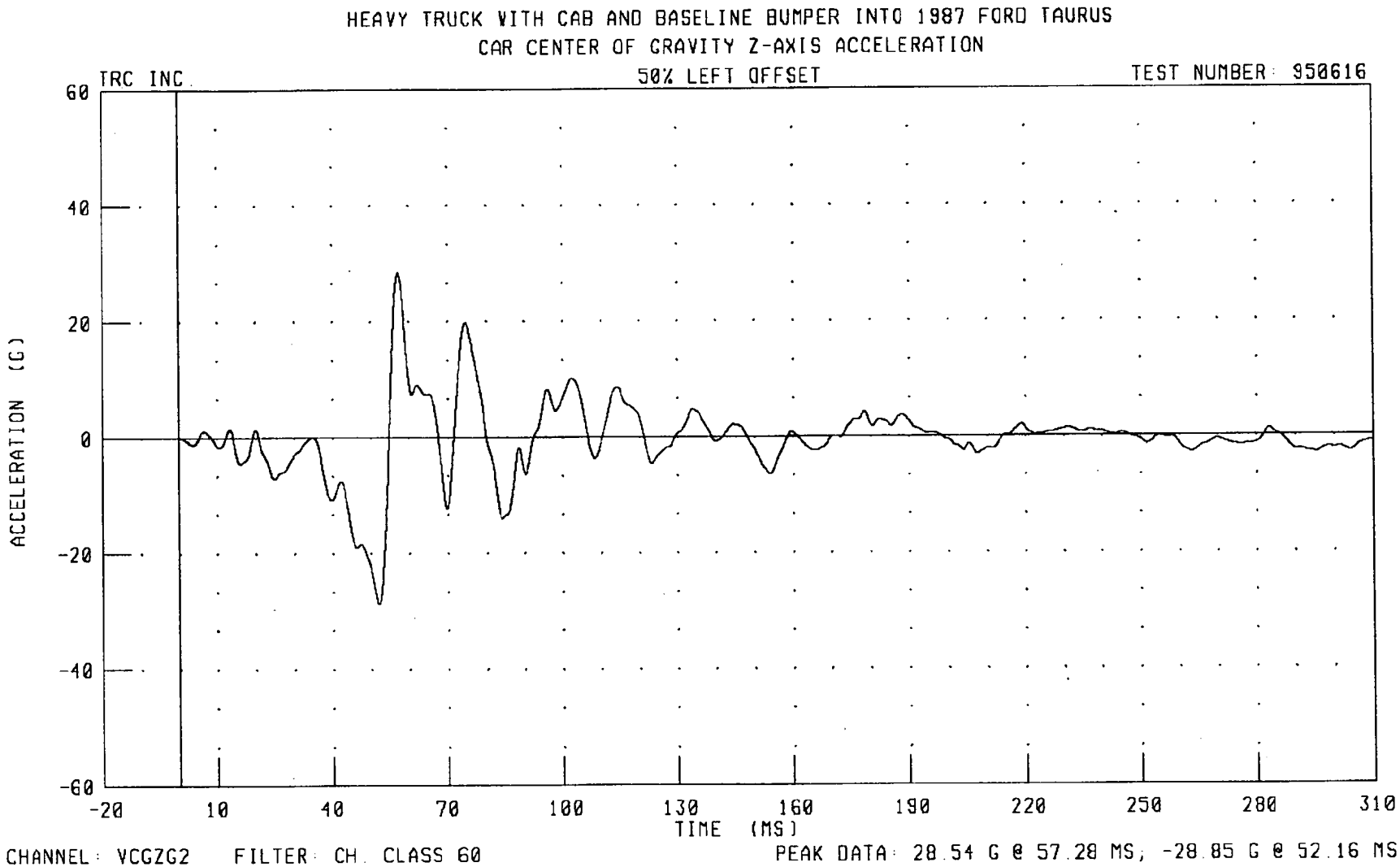


CHANNEL: VCGYG2 FILTER: CH. CLASS 60 PEAK DATA: 6.38 G @ 69.68 MS, -10.63 G @ 56.16 MS

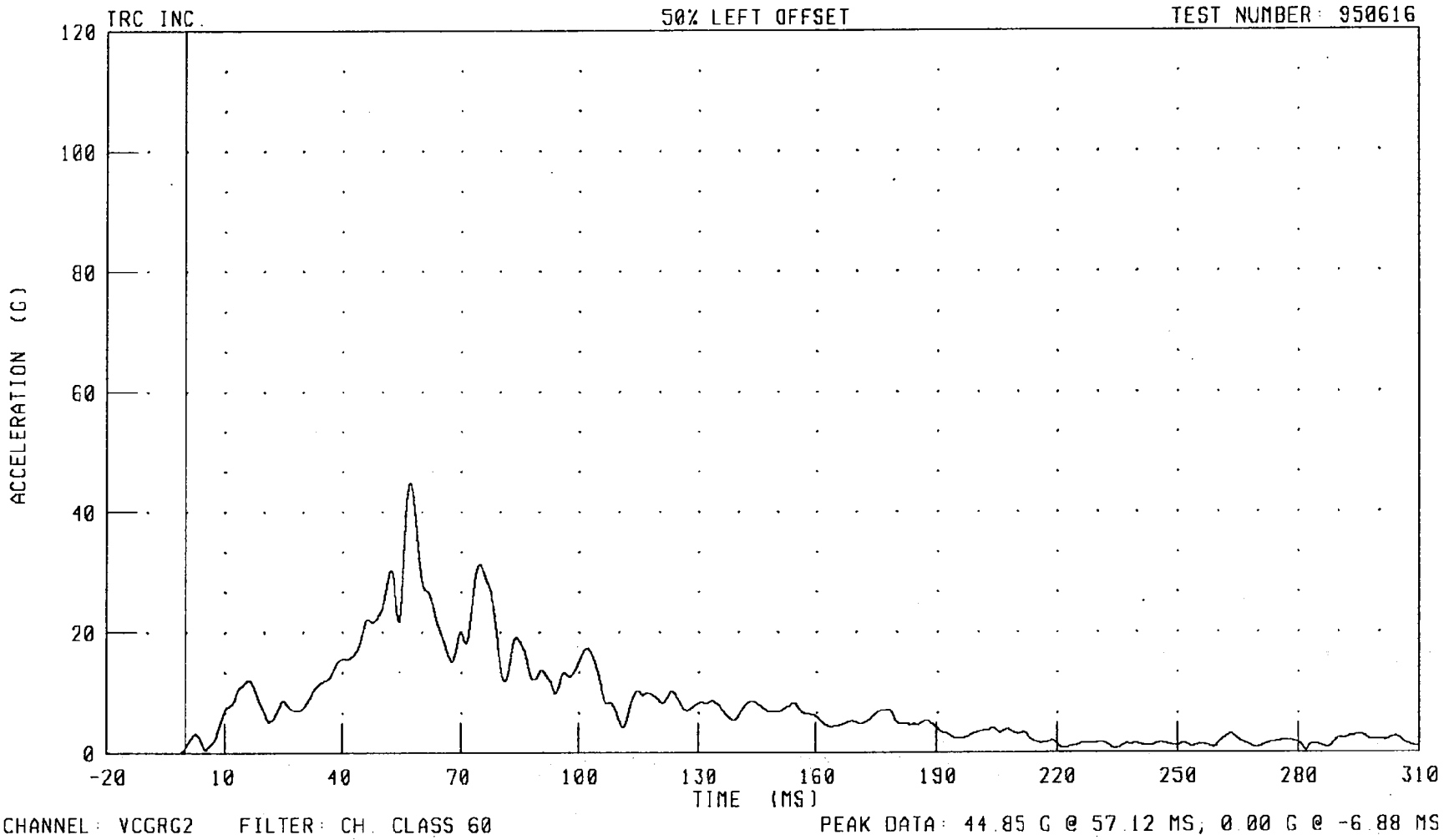
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
CAR CENTER OF GRAVITY Y-AXIS VELOCITY



CHANNEL: VCGYV2 FILTER: CH. CLASS 180 PEAK DATA: 0.21 KM/H @ 17.76 MS; -13.55 KM/H @ 115.20 MS

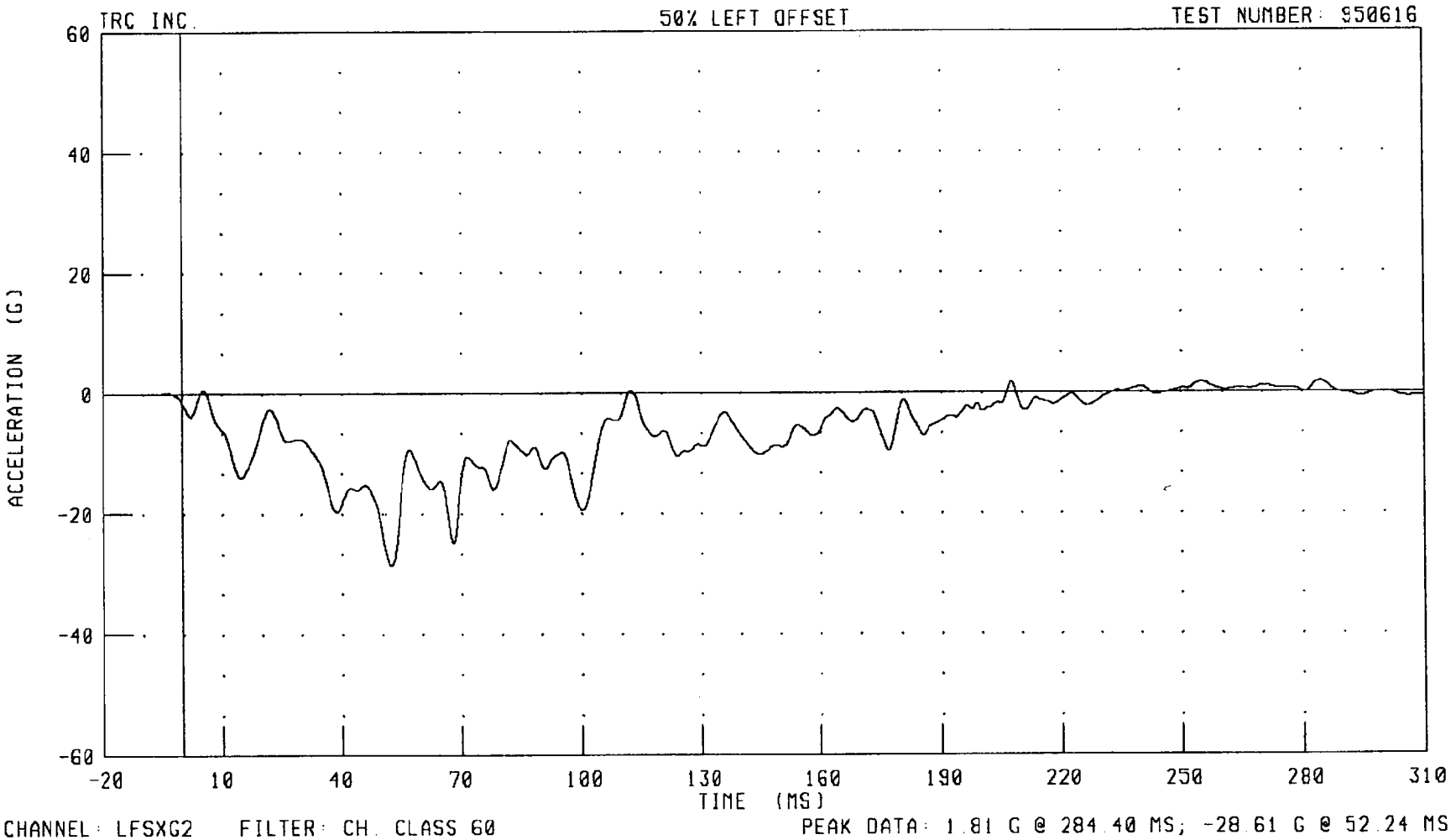

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
CAR CENTER OF GRAVITY Z-AXIS ACCELERATION
50% LEFT OFFSET
TRC INC.
TEST NUMBER: 950616
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGZG2
FILTER: CH. CLASS 60
PEAK DATA: 28.54 G @ 57.28 MS; -28.85 G @ 52.16 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
CAR CENTER OF GRAVITY RESULTANT ACCELERATION



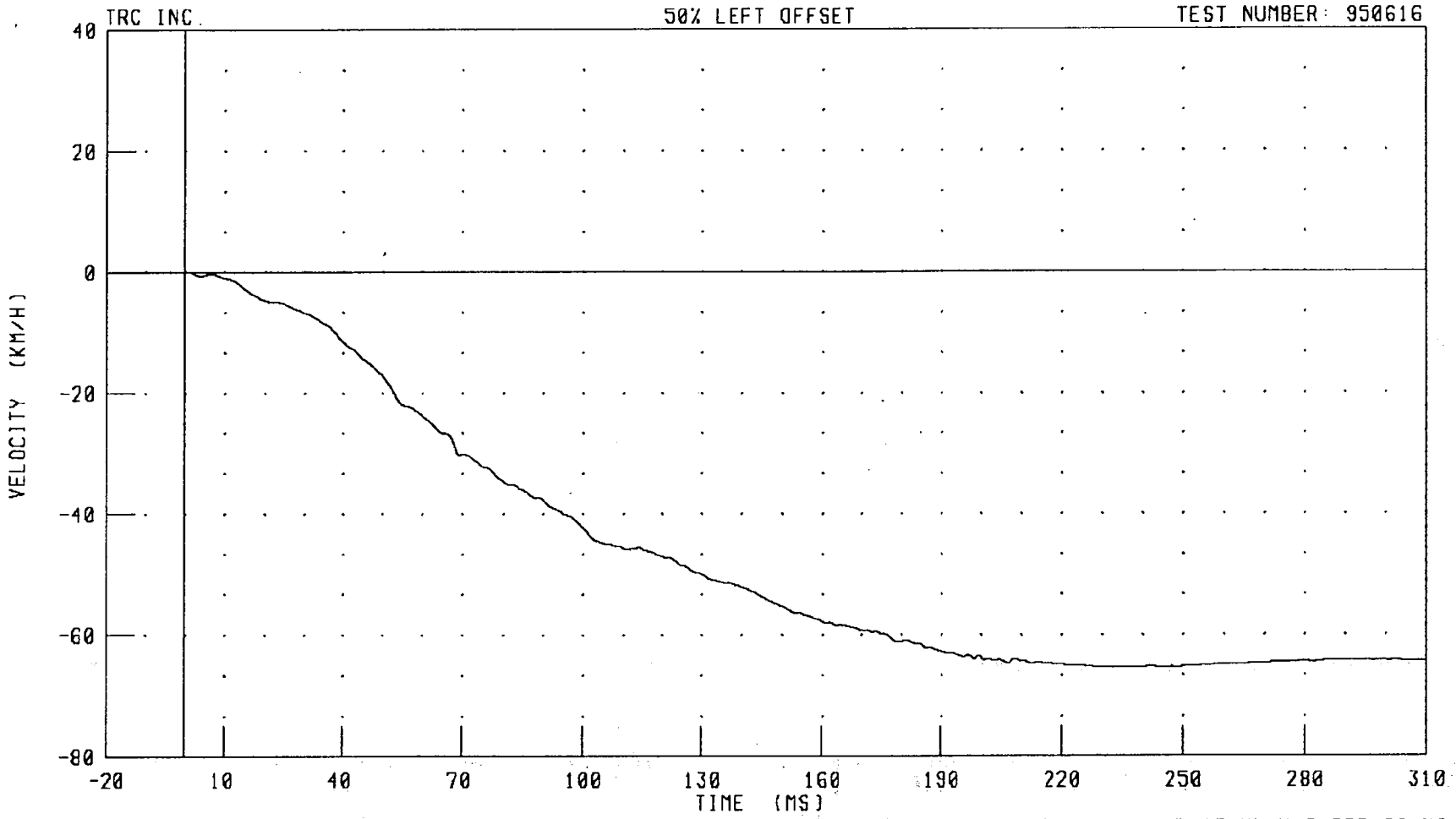
CHANNEL: VCGRG2 FILTER: CH. CLASS 60 PEAK DATA: 44.85 G @ 57.12 MS; 0.00 G @ -6.88 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT FRONT SILL X-AXIS ACCELERATION

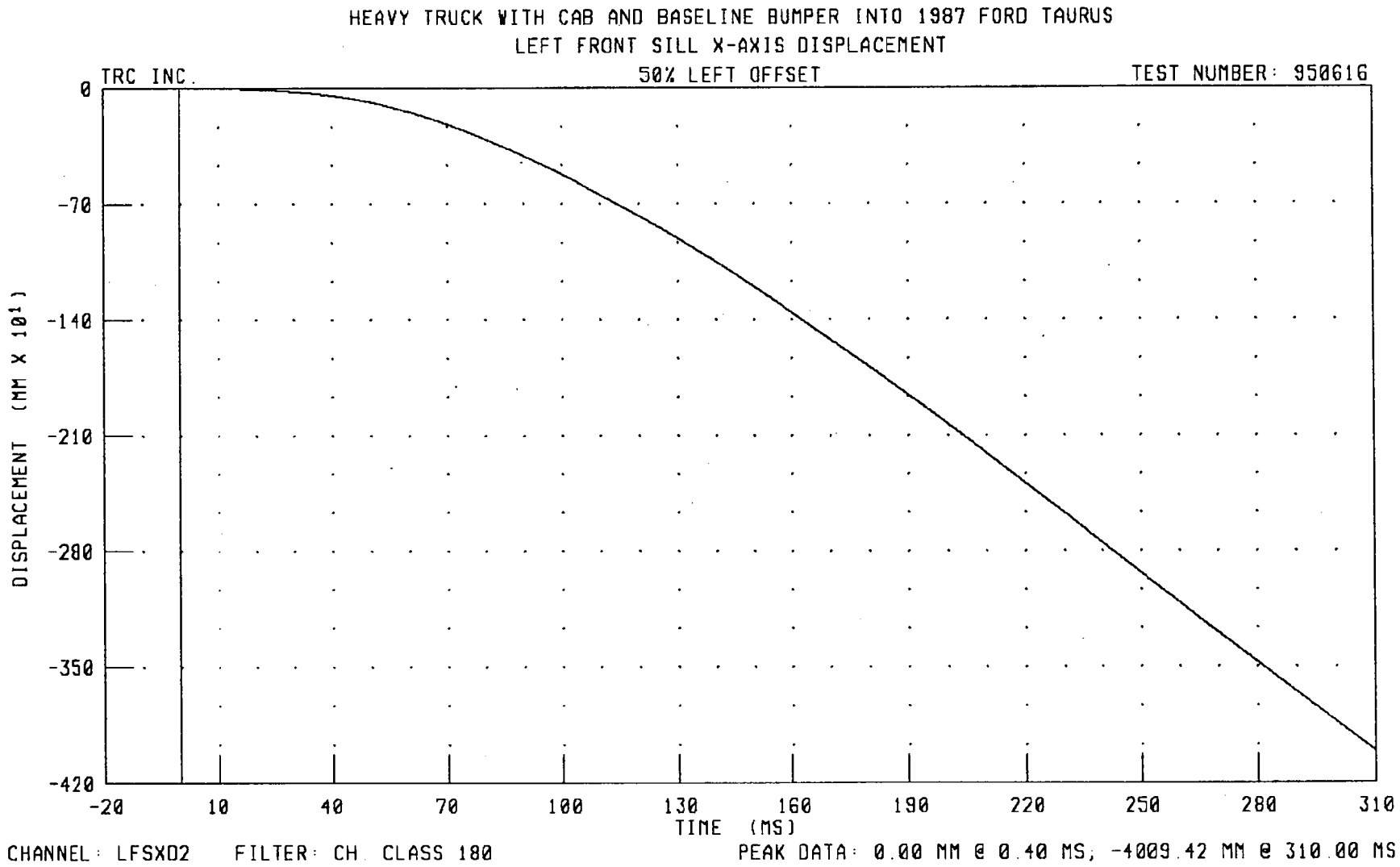


CHANNEL: LFSXG2 FILTER: CH. CLASS 60 PEAK DATA: 1.81 G @ 284.40 MS; -28.61 G @ 52.24 MS

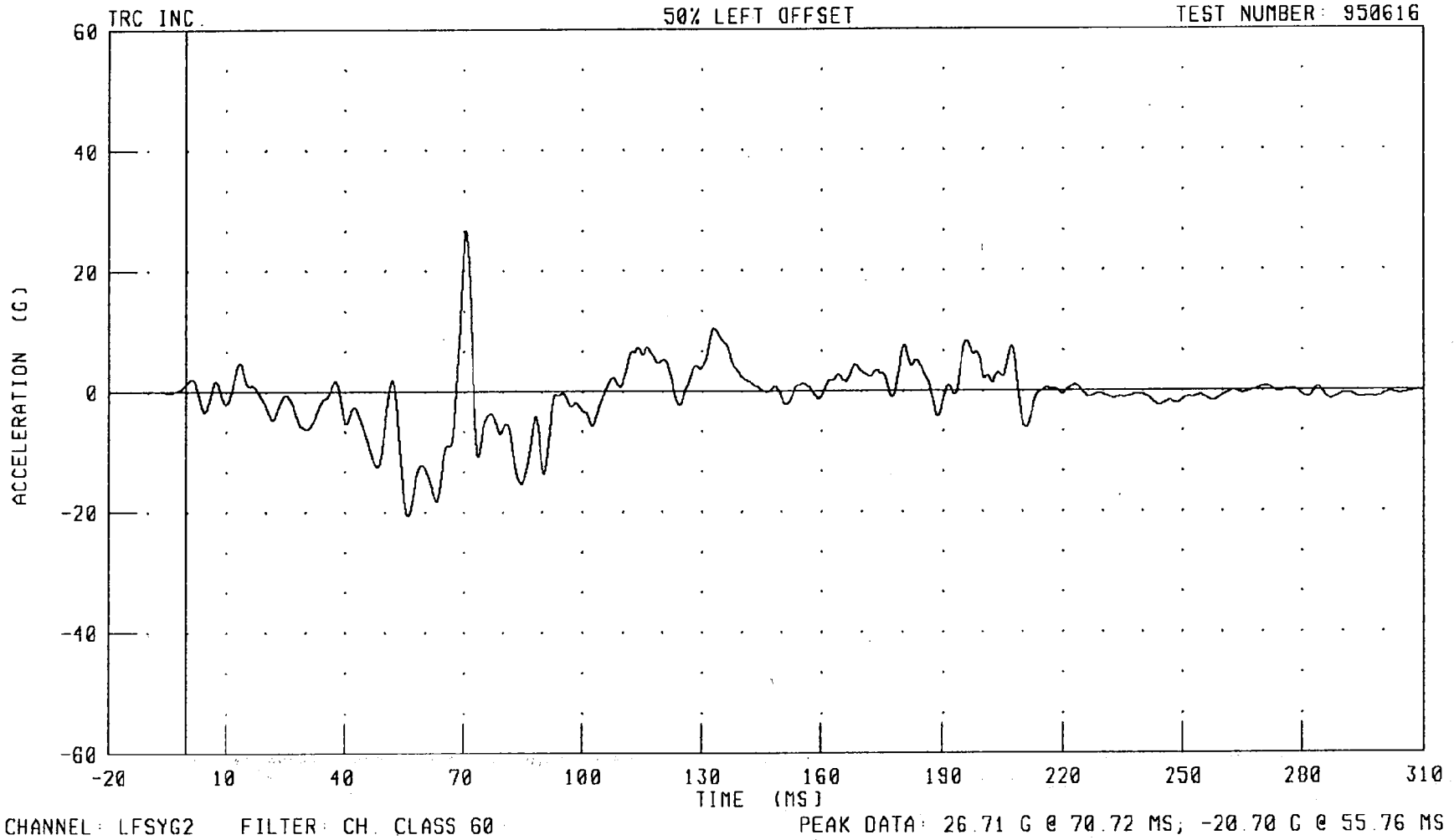
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT FRONT SILL X-AXIS VELOCITY



CHANNEL: LFSXV2 FILTER: CH. CLASS 180 PEAK DATA: 0.00 KM/H @ 0.24 MS; -65.45 KM/H @ 233.20 MS

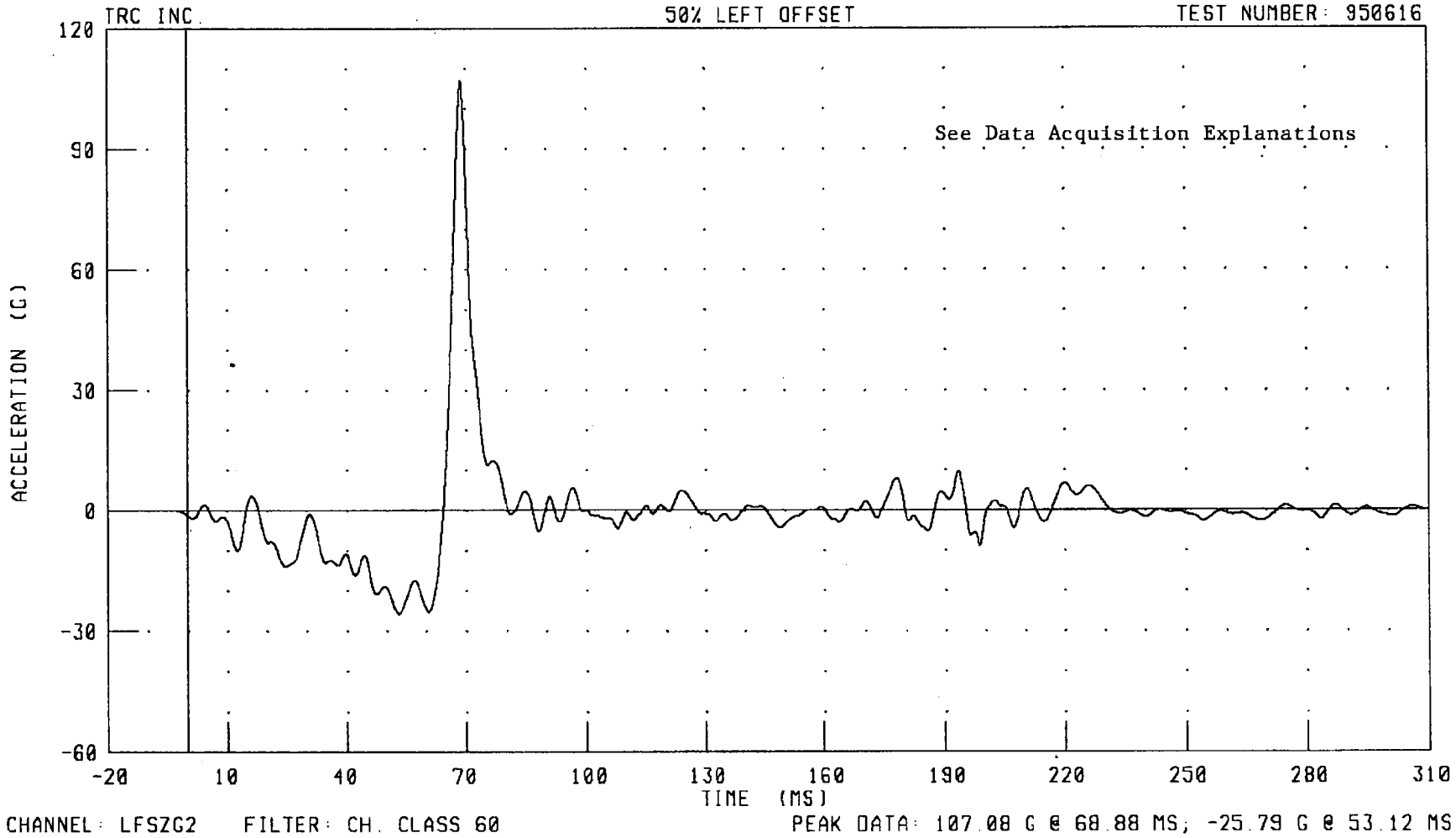

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT FRONT SILL X-AXIS DISPLACEMENT
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
0
-70
-140
-210
-280
-350
-420
DISPLACEMENT (MM X 10¹)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: LFSXD2
FILTER: CH CLASS 180
PEAK DATA: 0.00 MM @ 0.40 MS, -4009.42 MM @ 310.00 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT FRONT SILL Y-AXIS ACCELERATION



CHANNEL: LFSYG2 FILTER: CH. CLASS 60 PEAK DATA: 26.71 G @ 70.72 MS; -20.70 G @ 55.76 MS

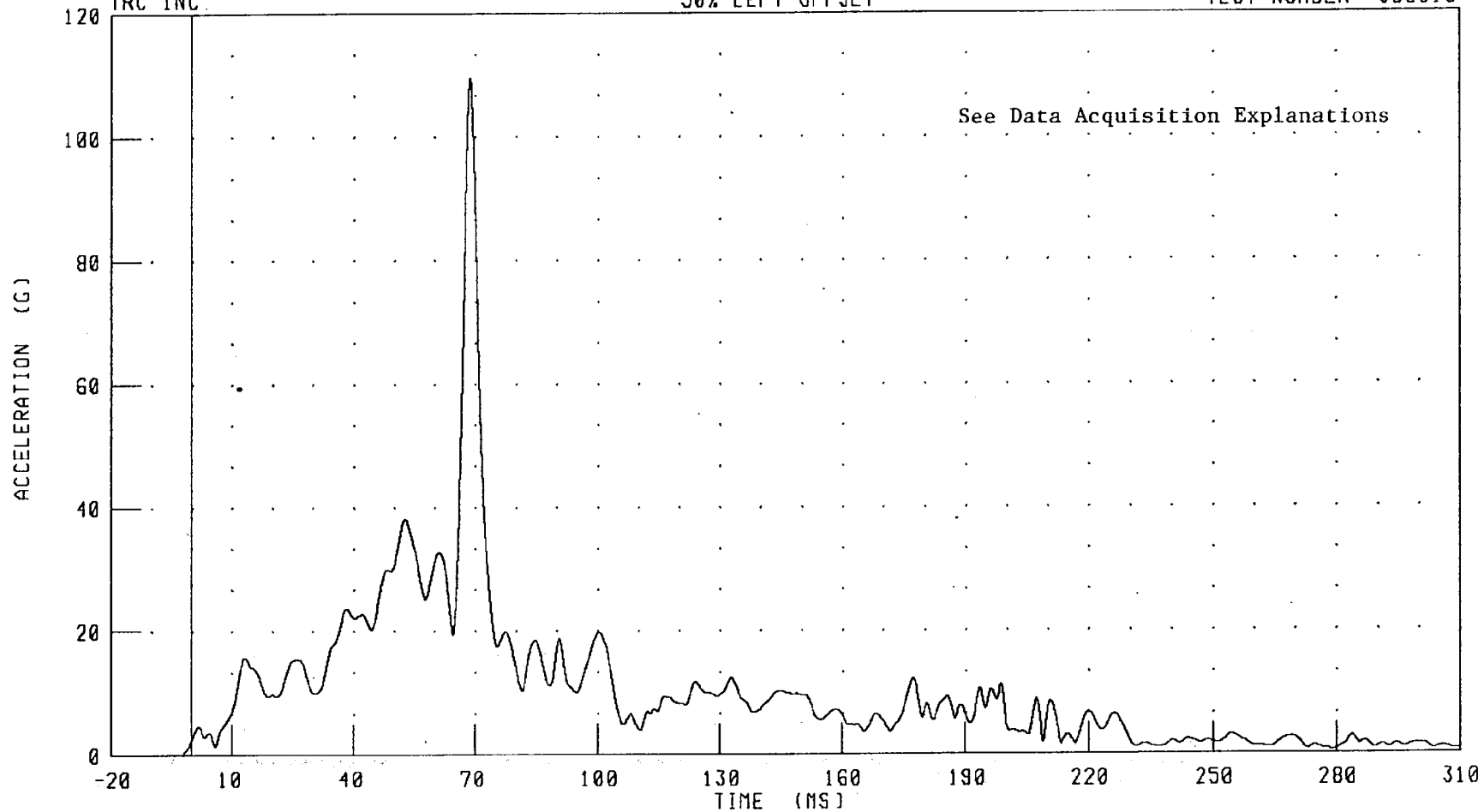
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT FRONT SILL Z-AXIS ACCELERATION



CHANNEL: LFSZG2 FILTER: CH. CLASS 60 PEAK DATA: 107.08 G @ 68.88 MS; -25.79 G @ 53.12 MS

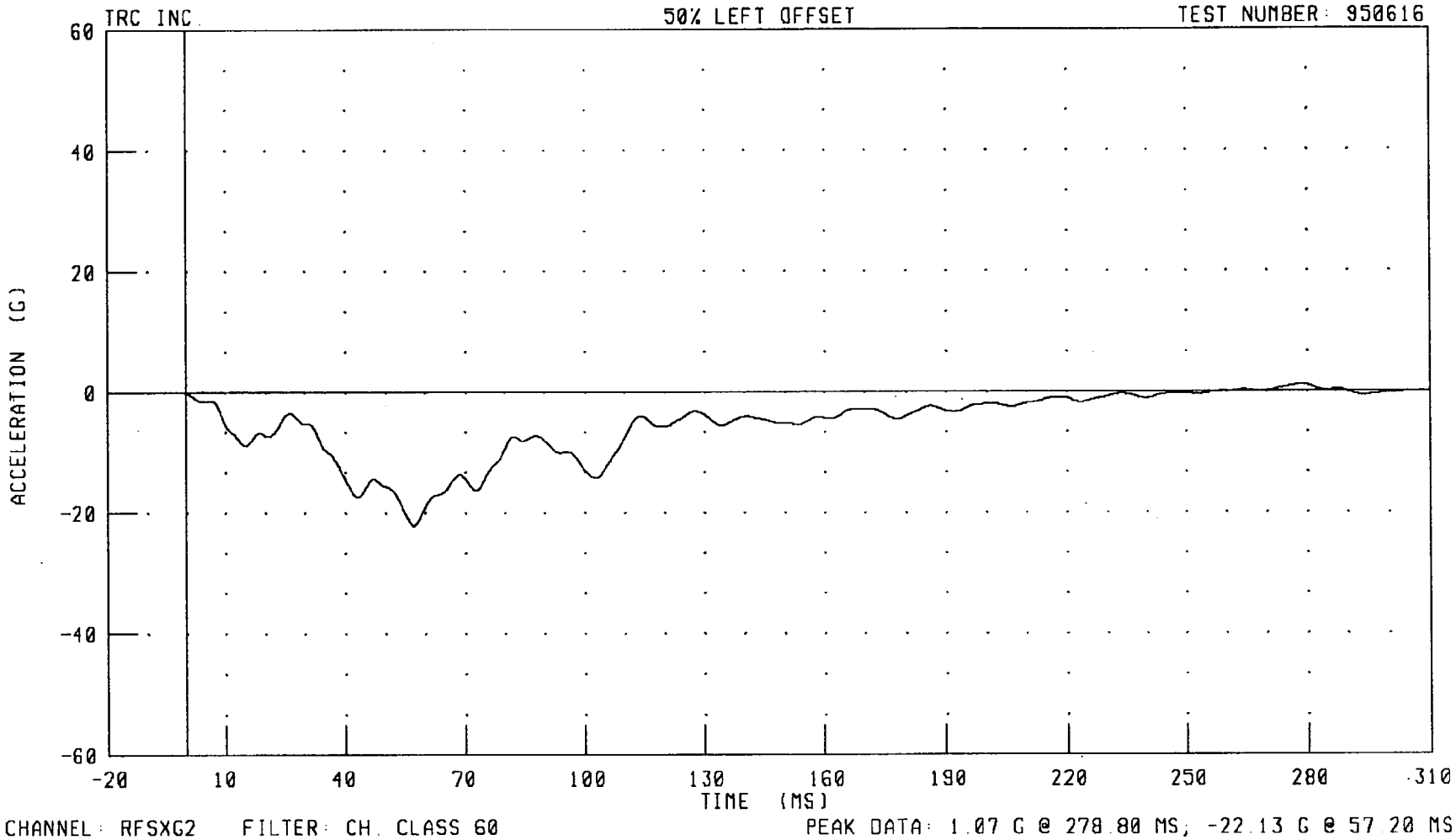
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT FRONT SILL RESULTANT ACCELERATION

TRC INC. 50% LEFT OFFSET TEST NUMBER: 950616

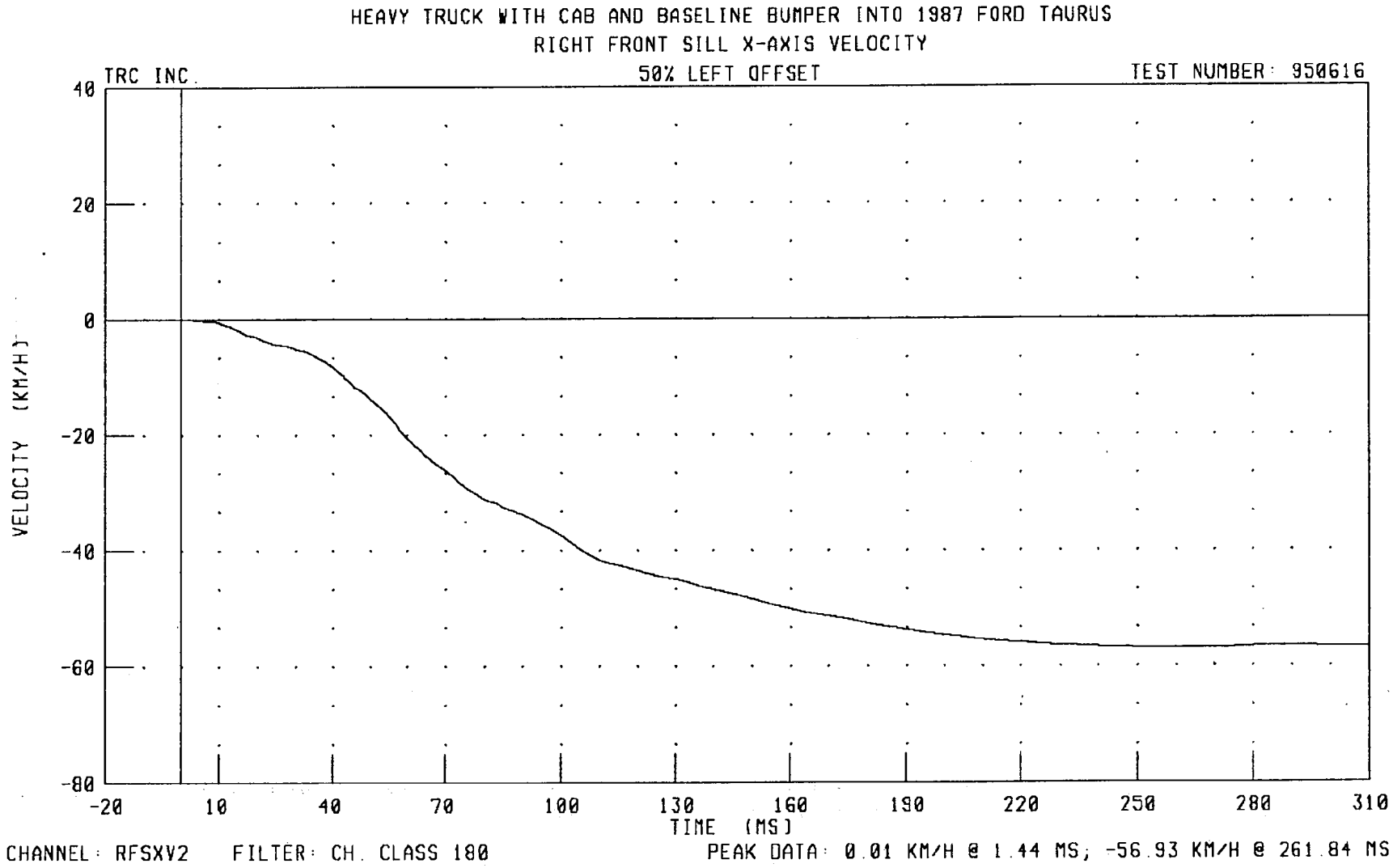


CHANNEL: LFSRG2 FILTER: CH. CLASS 60 PEAK DATA: 109.58 G @ 68.88 MS; 0.01 G @ -14.32 MS

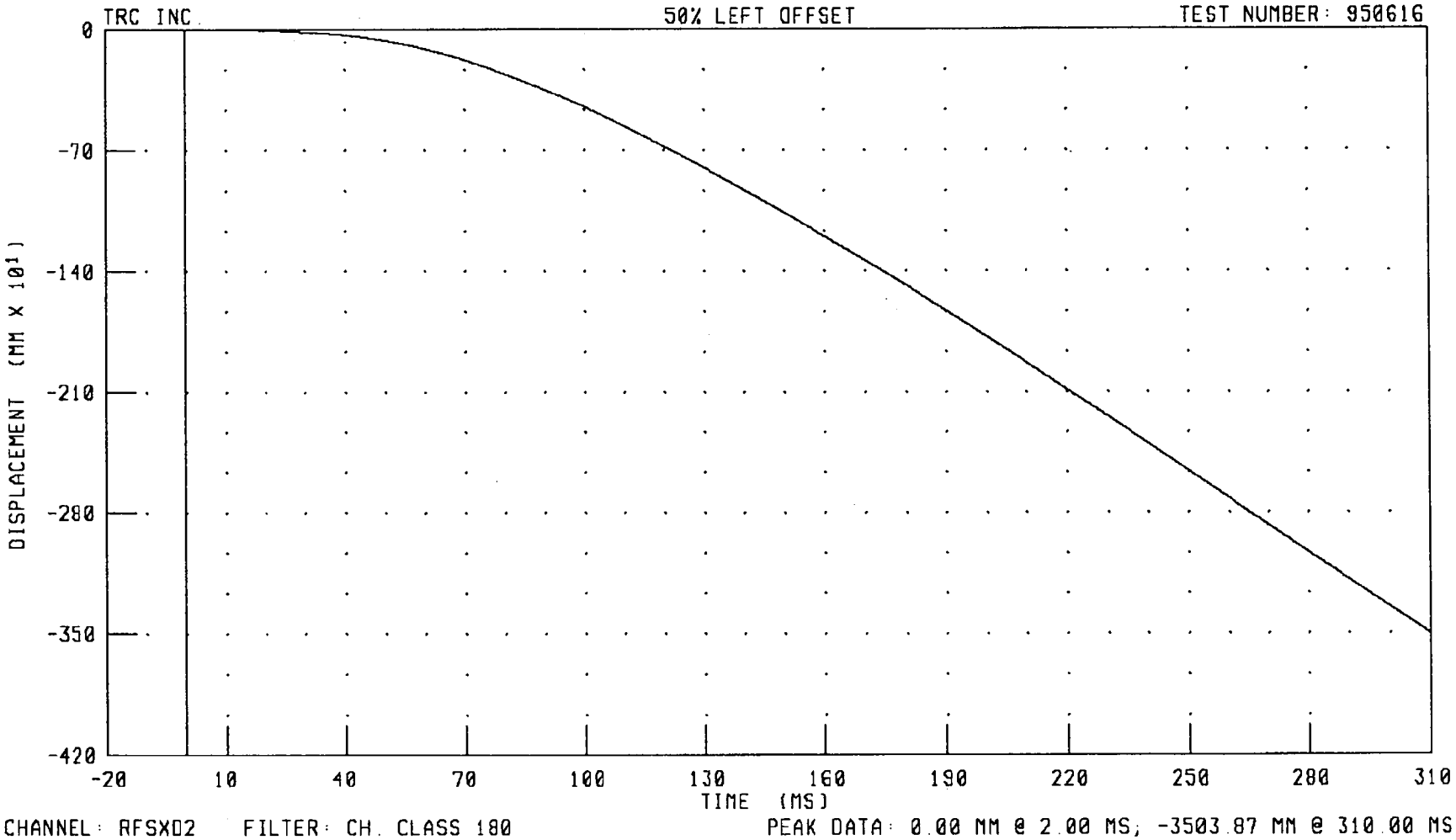
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT FRONT SILL X-AXIS ACCELERATION



CHANNEL: RFSXG2 FILTER: CH. CLASS 60 PEAK DATA: 1.07 G @ 278.80 MS; -22.13 G @ 57.20 MS

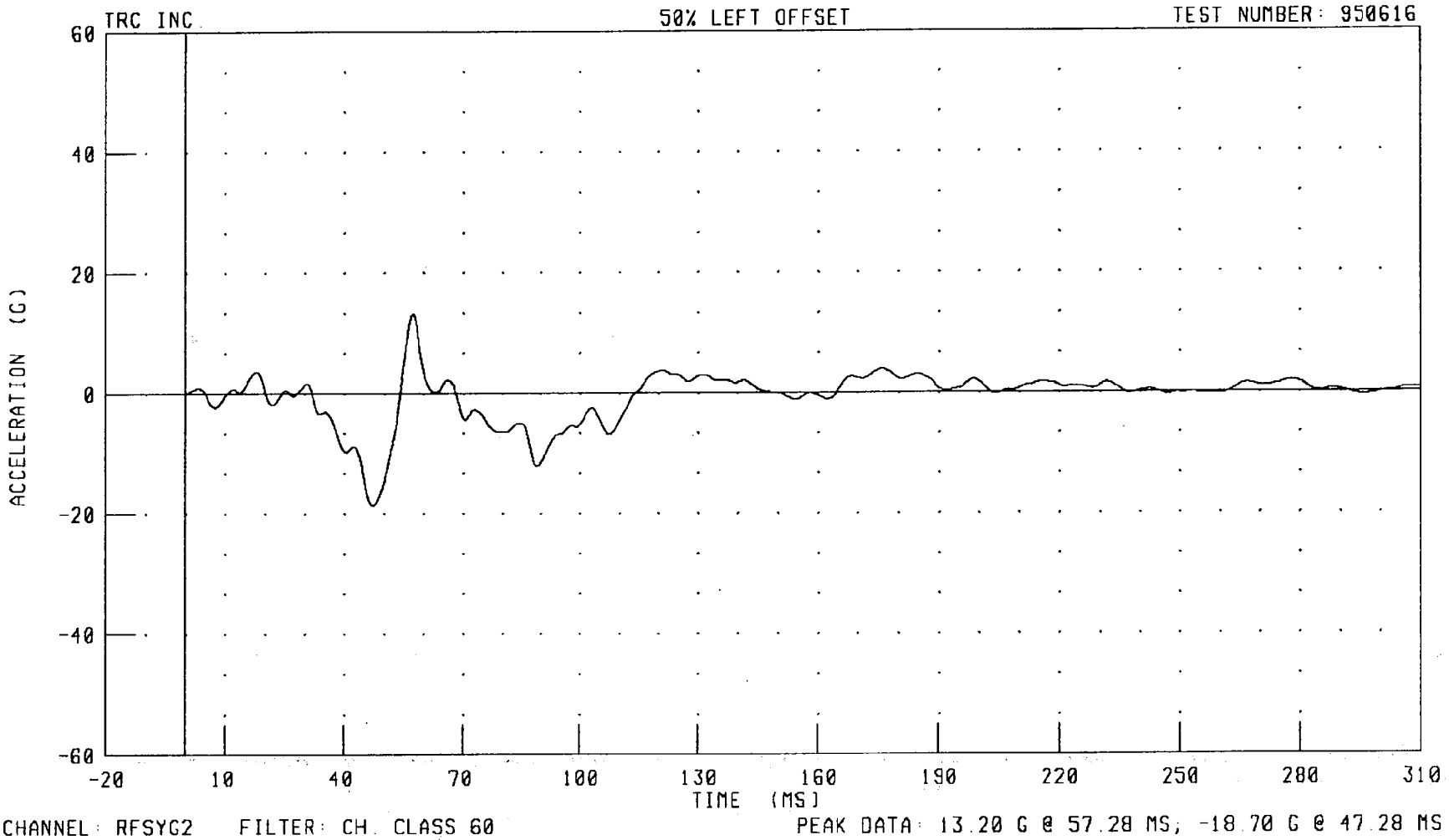

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT FRONT SILL X-AXIS VELOCITY
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
VELOCITY (KM/H)
40
20
0
-20
-40
-60
-80
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: RFSXV2
FILTER: CH. CLASS 180
PEAK DATA: 0.01 KM/H @ 1.44 MS; -56.93 KM/H @ 261.84 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT FRONT SILL X-AXIS DISPLACEMENT



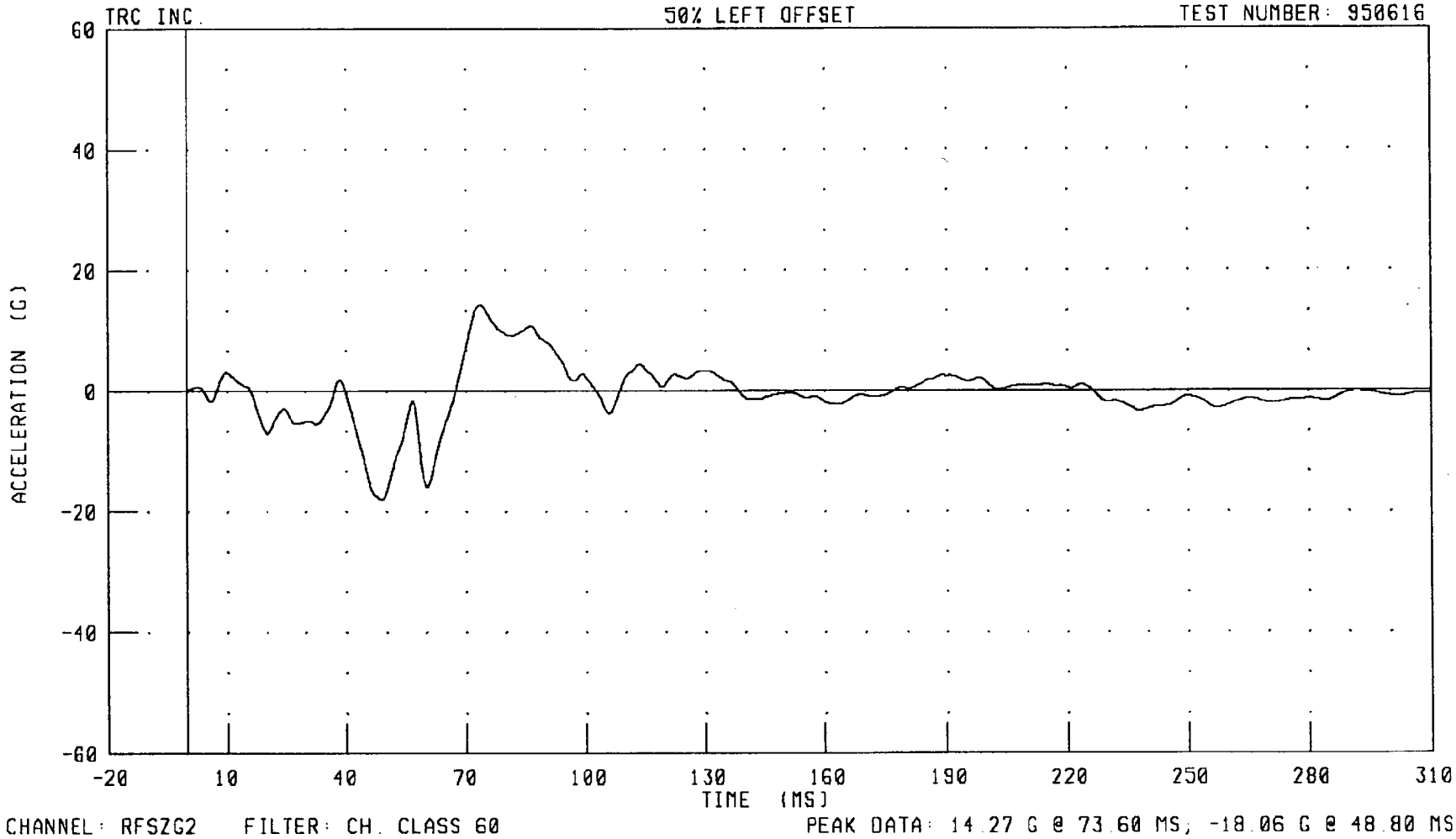
CHANNEL: RFSXD2 FILTER: CH. CLASS 180 PEAK DATA: 0.00 MM @ 2.00 MS; -3503.87 MM @ 310.00 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT FRONT SILL Y-AXIS ACCELERATION



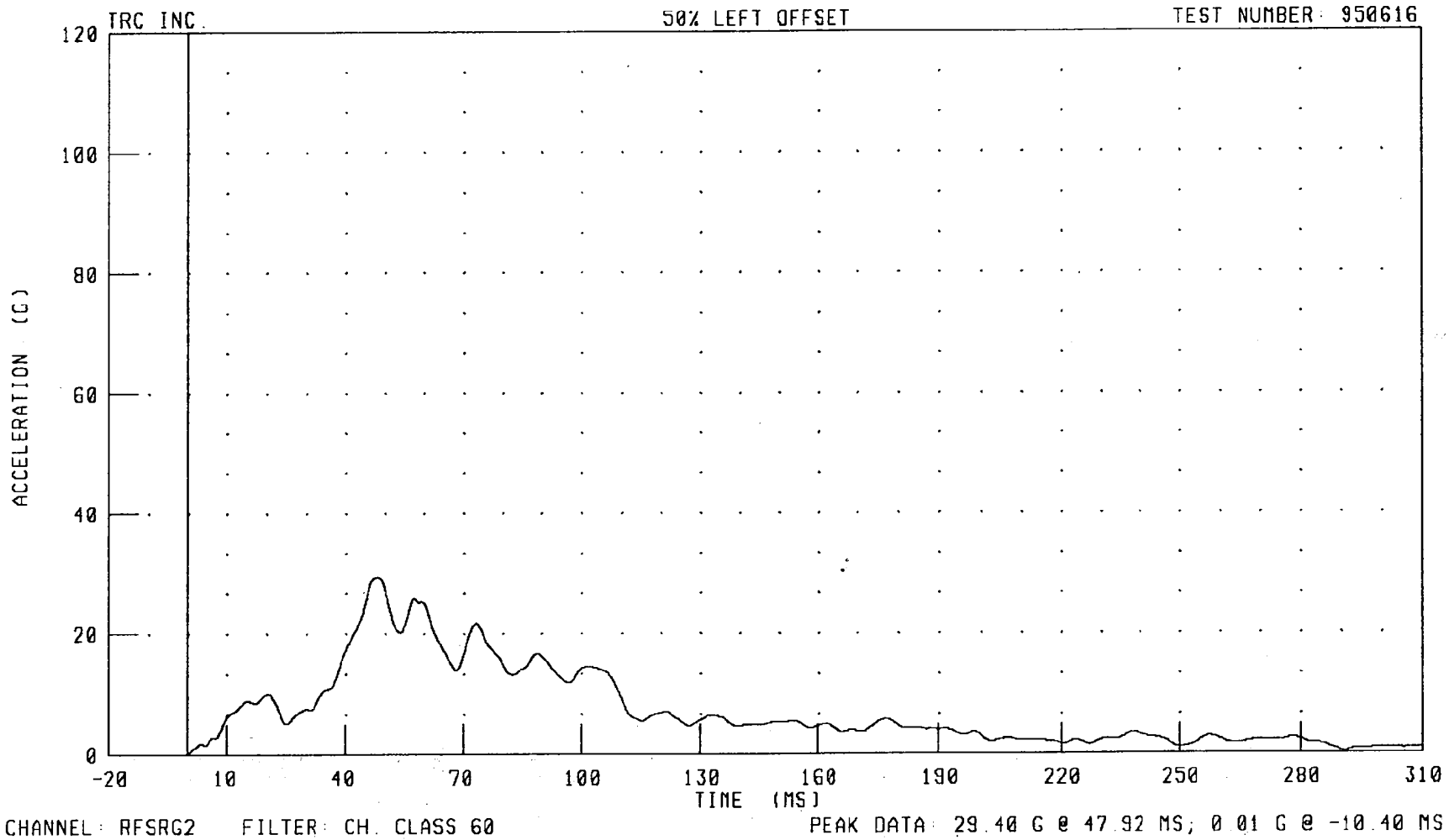
CHANNEL: RFSYG2 FILTER: CH. CLASS 60 PEAK DATA: 13.20 G @ 57.28 MS; -18.70 G @ 47.28 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT FRONT SILL Z-AXIS ACCELERATION



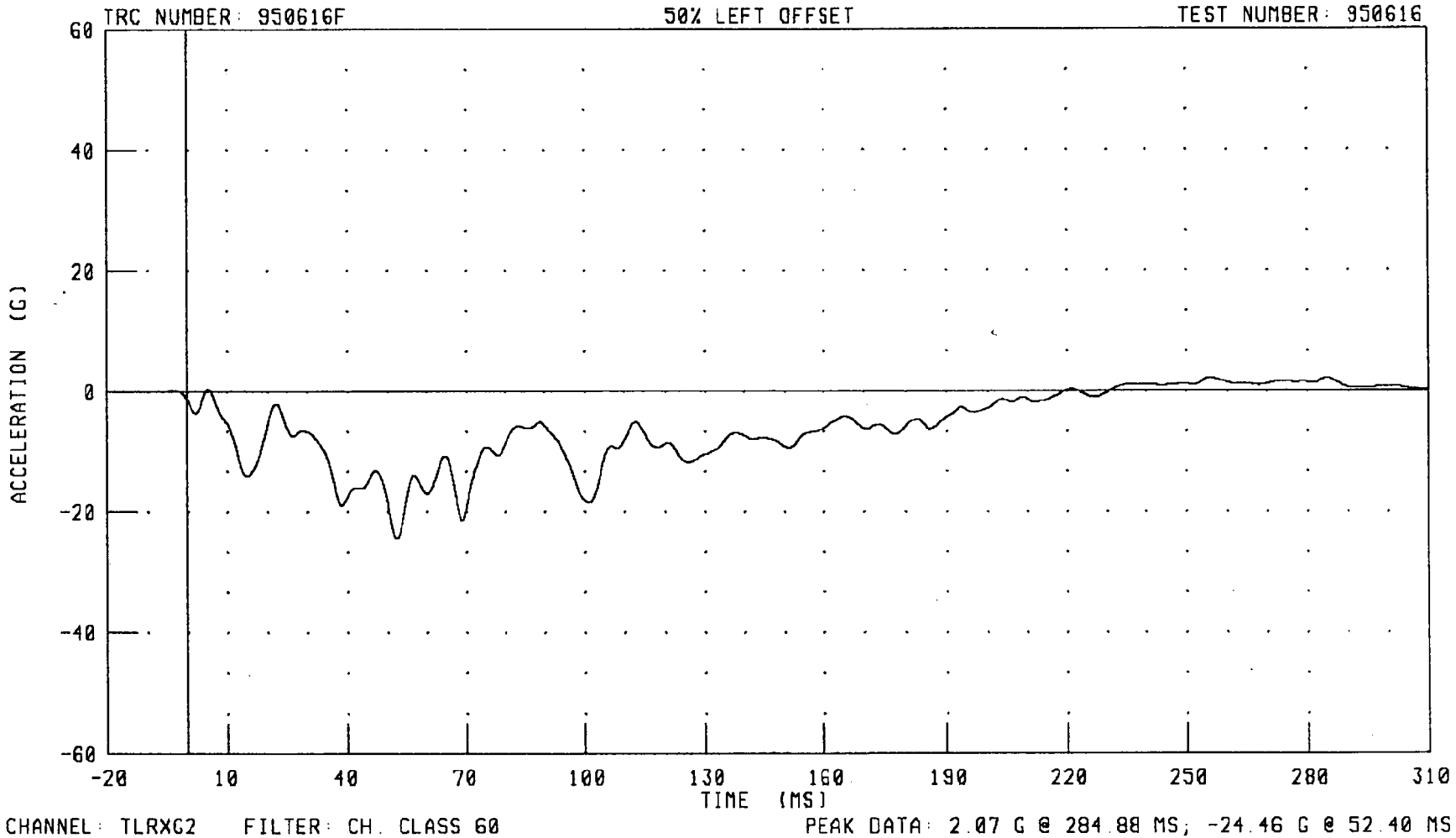
CHANNEL: RFSZG2 FILTER: CH. CLASS 60 PEAK DATA: 14.27 G @ 73.60 MS, -18.06 G @ 48.80 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT FRONT SILL RESULTANT ACCELERATION

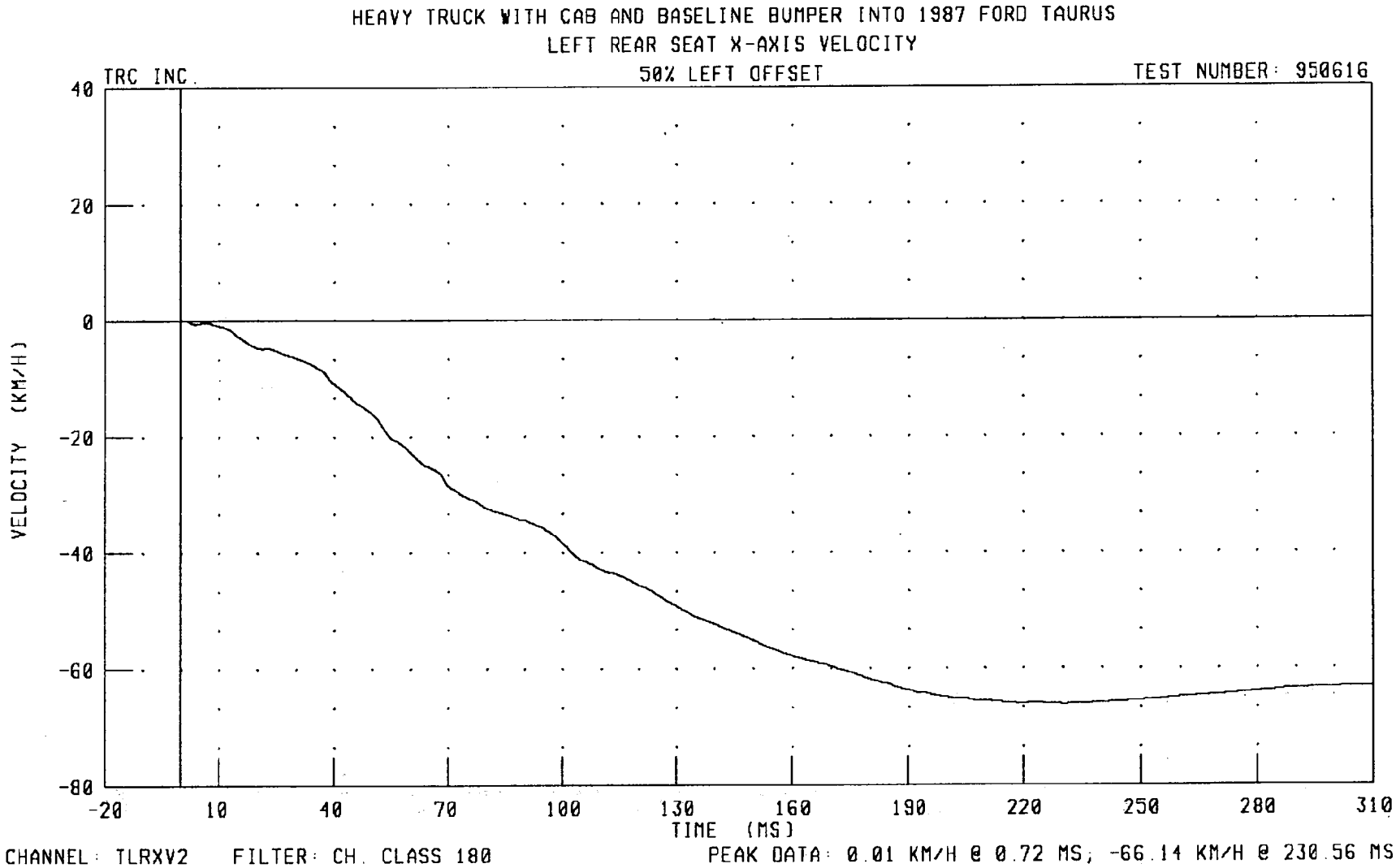


CHANNEL: RFSRG2 FILTER: CH. CLASS 60 PEAK DATA: 29.40 G @ 47.92 MS; 0.01 G @ -10.40 MS

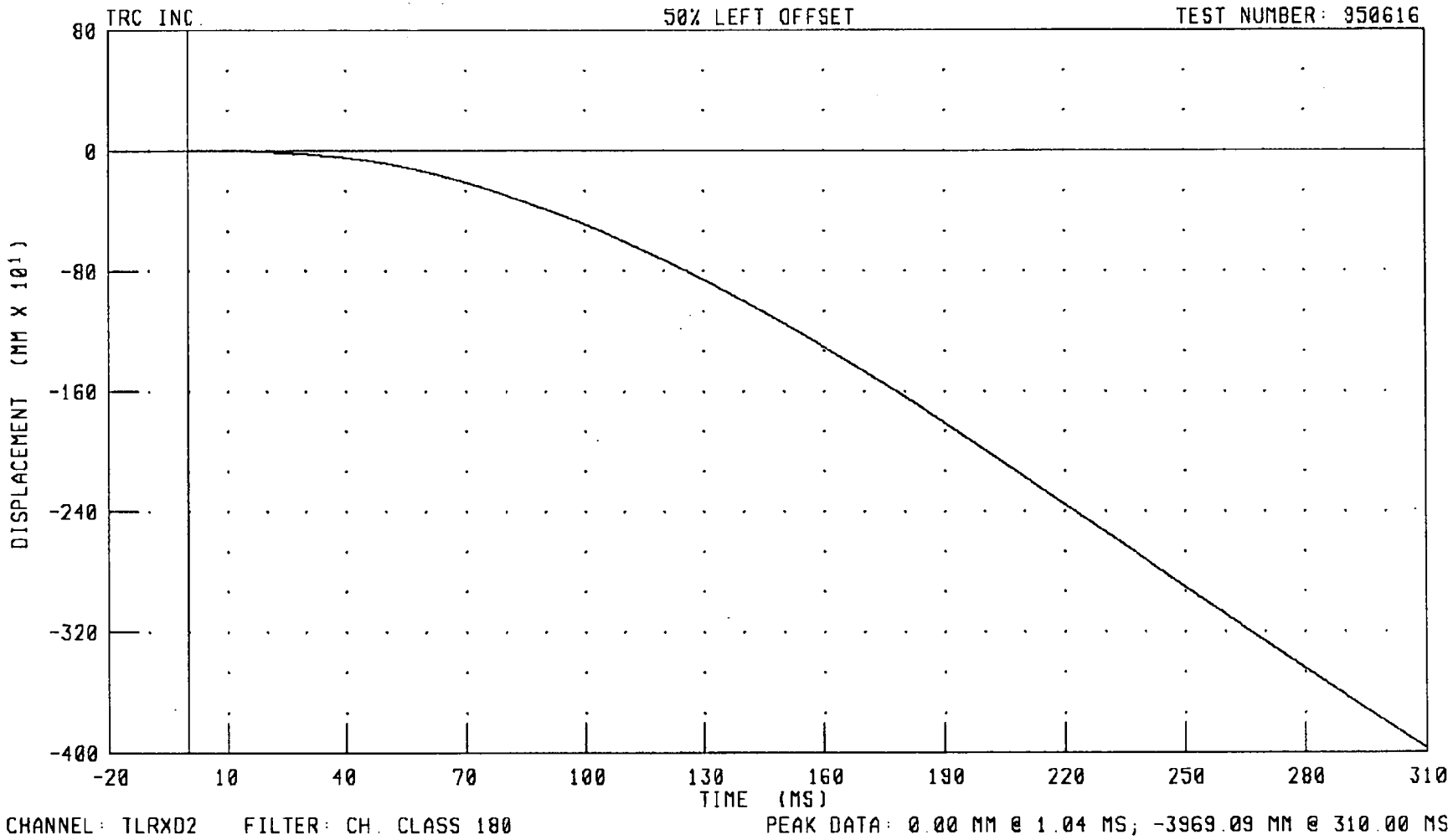
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT REAR SEAT X-AXIS ACCELERATION



CHANNEL: TLRXG2 FILTER: CH. CLASS 60 PEAK DATA: 2.07 G @ 284.88 MS; -24.46 G @ 52.40 MS

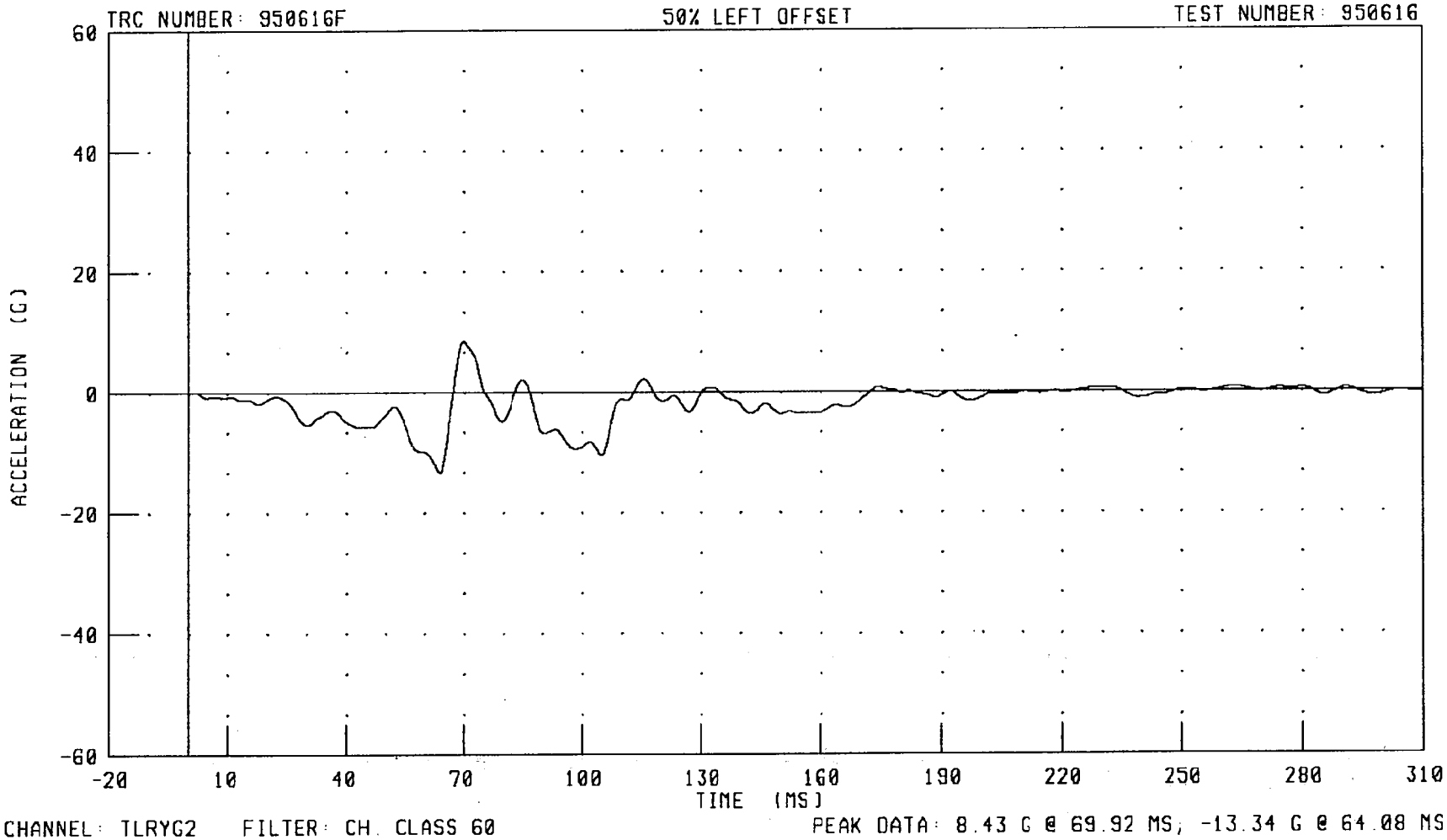

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT REAR SEAT X-AXIS VELOCITY
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
VELOCITY (KM/H)
40
20
0
-20
-40
-60
-80
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TLRXV2
FILTER: CH. CLASS 180
PEAK DATA: 0.01 KM/H @ 0.72 MS; -66.14 KM/H @ 230.56 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT REAR SEAT X-AXIS DISPLACEMENT



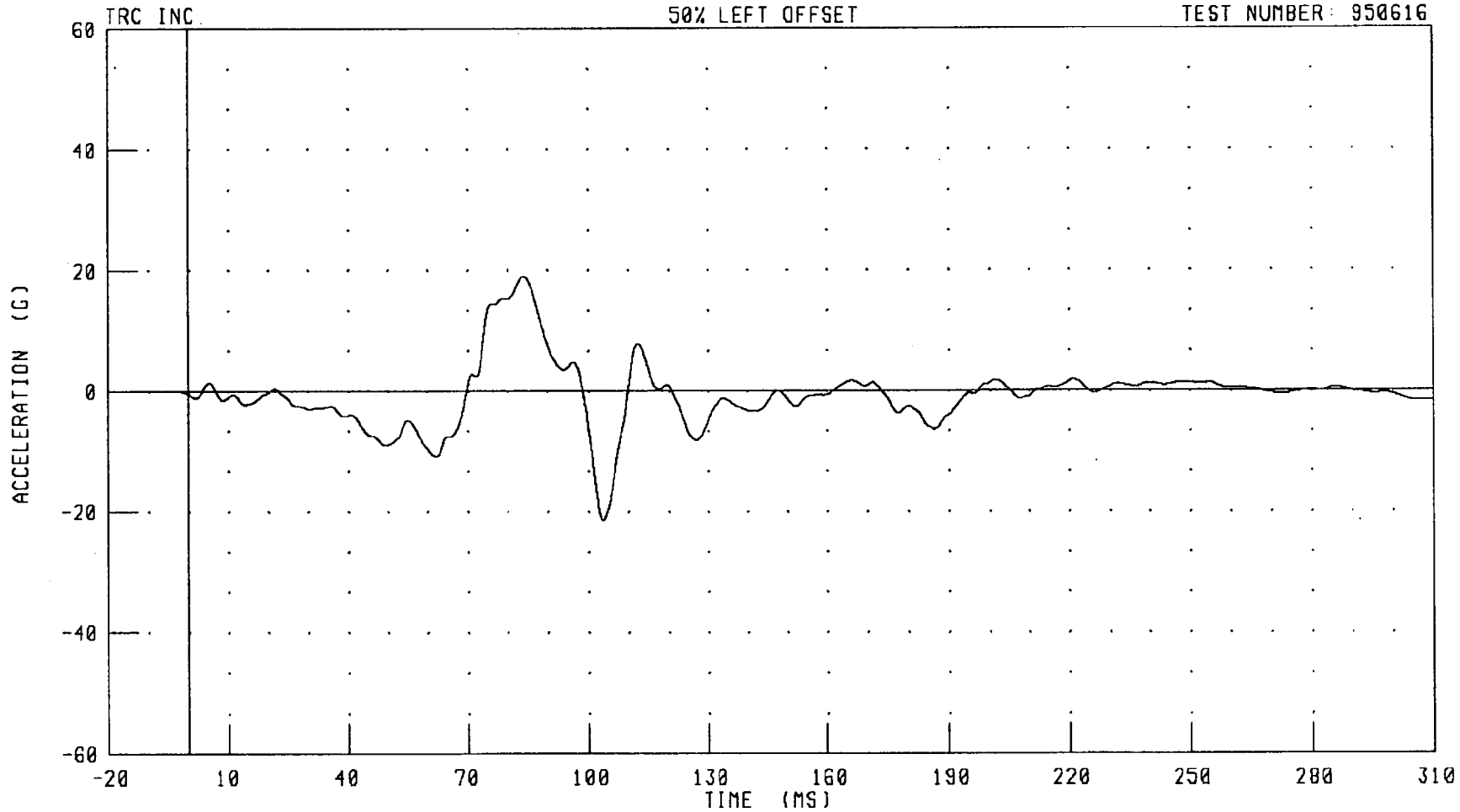
CHANNEL: TLRXD2 FILTER: CH. CLASS 180 PEAK DATA: 0.00 MM @ 1.04 MS; -3969.09 MM @ 310.00 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT REAR SEAT Y-AXIS ACCELERATION



CHANNEL: TLRYG2 FILTER: CH. CLASS 60 PEAK DATA: 8.43 G @ 69.92 MS, -13.34 G @ 64.08 MS

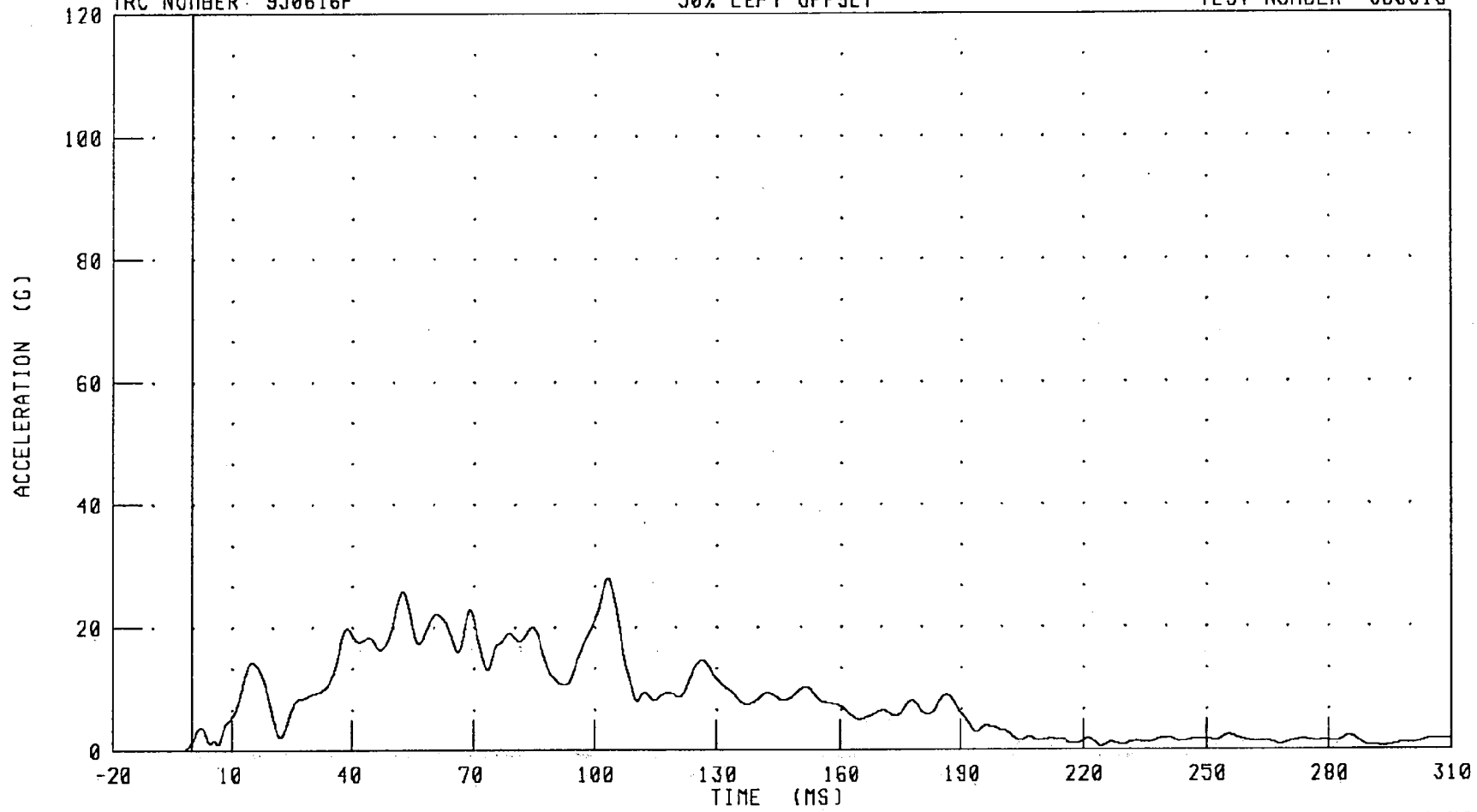
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT REAR SEAT Z-AXIS ACCELERATION



CHANNEL: TLRZG2 FILTER: CH CLASS 60 PEAK DATA: 19.04 G @ 84.24 MS; -21.54 G @ 103.68 MS

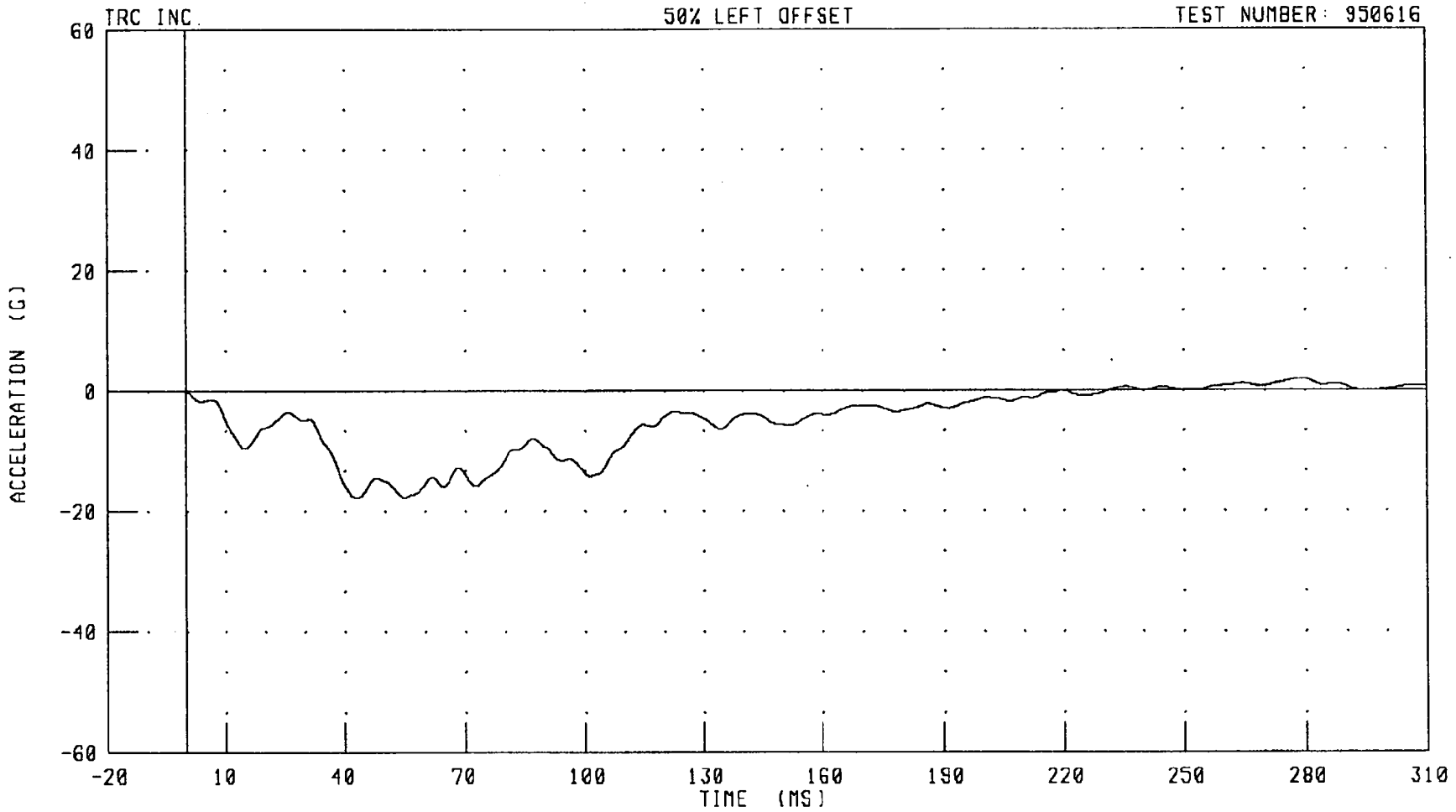
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
LEFT REAR SEAT RESULTANT ACCELERATION

TRC NUMBER: 950616F 50% LEFT OFFSET TEST NUMBER: 950616

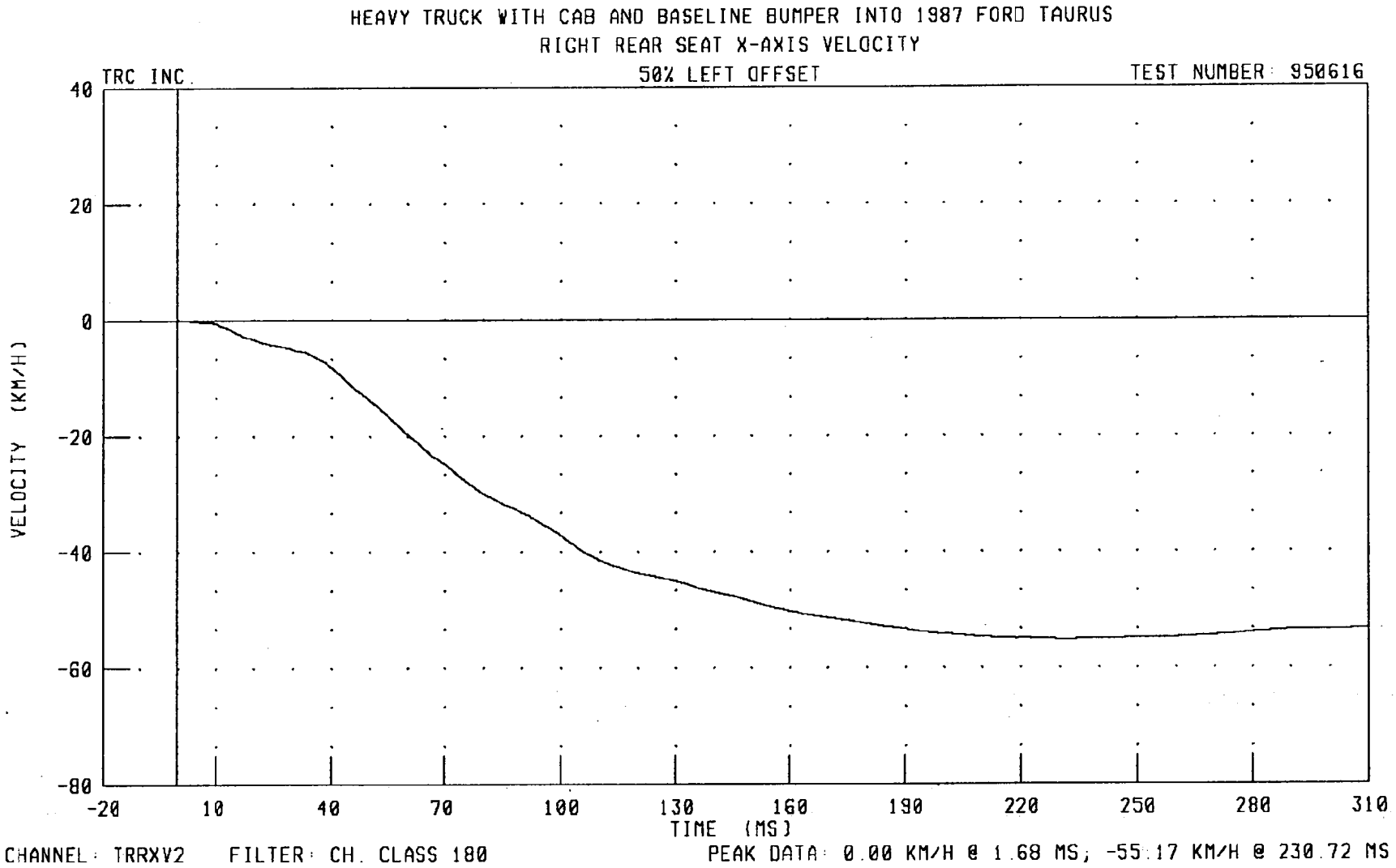


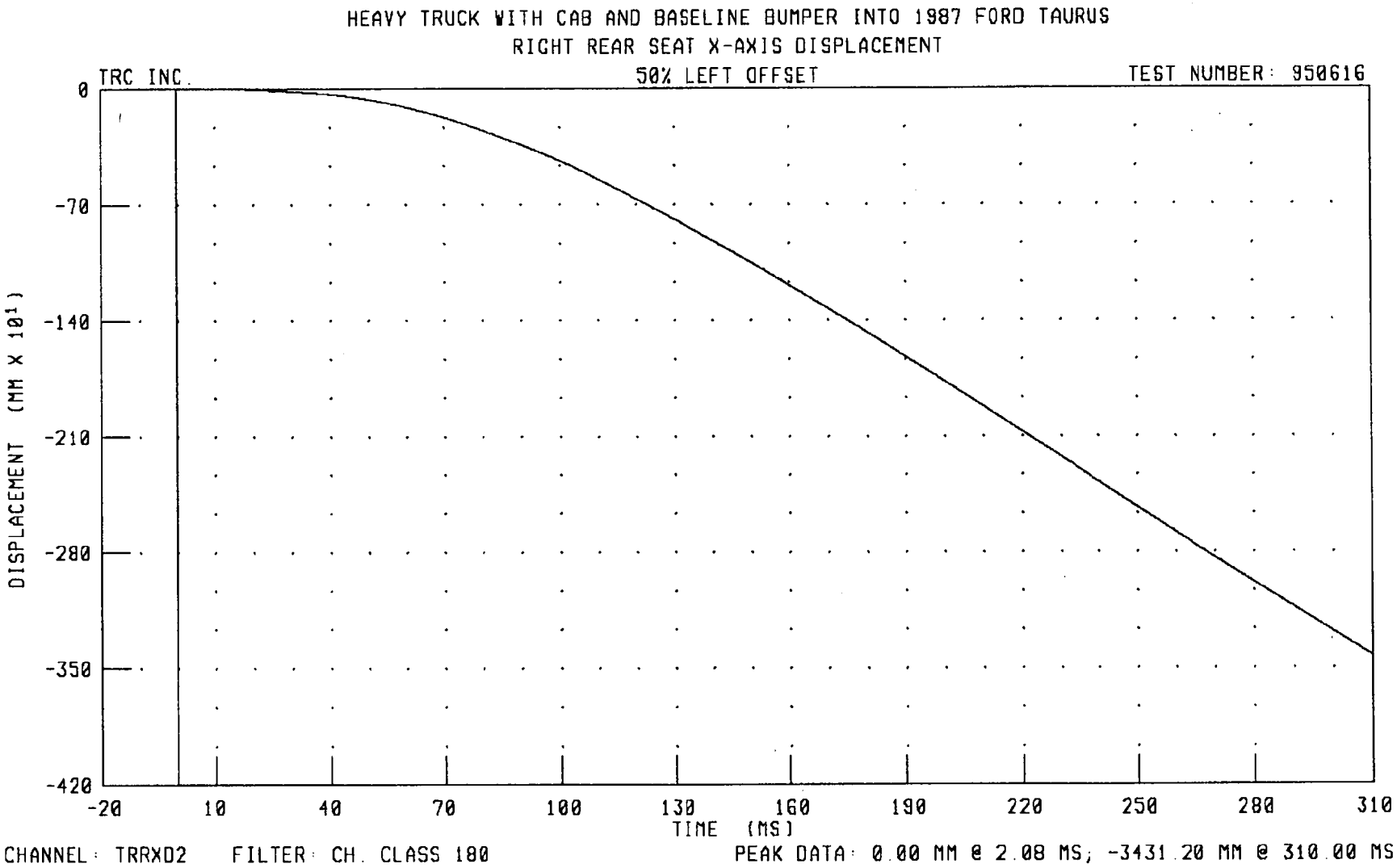
CHANNEL: TLRRG2 FILTER: CH. CLASS 60 PEAK DATA: 27.88 G @ 103.28 MS, 0.01 G @ -11.44 MS

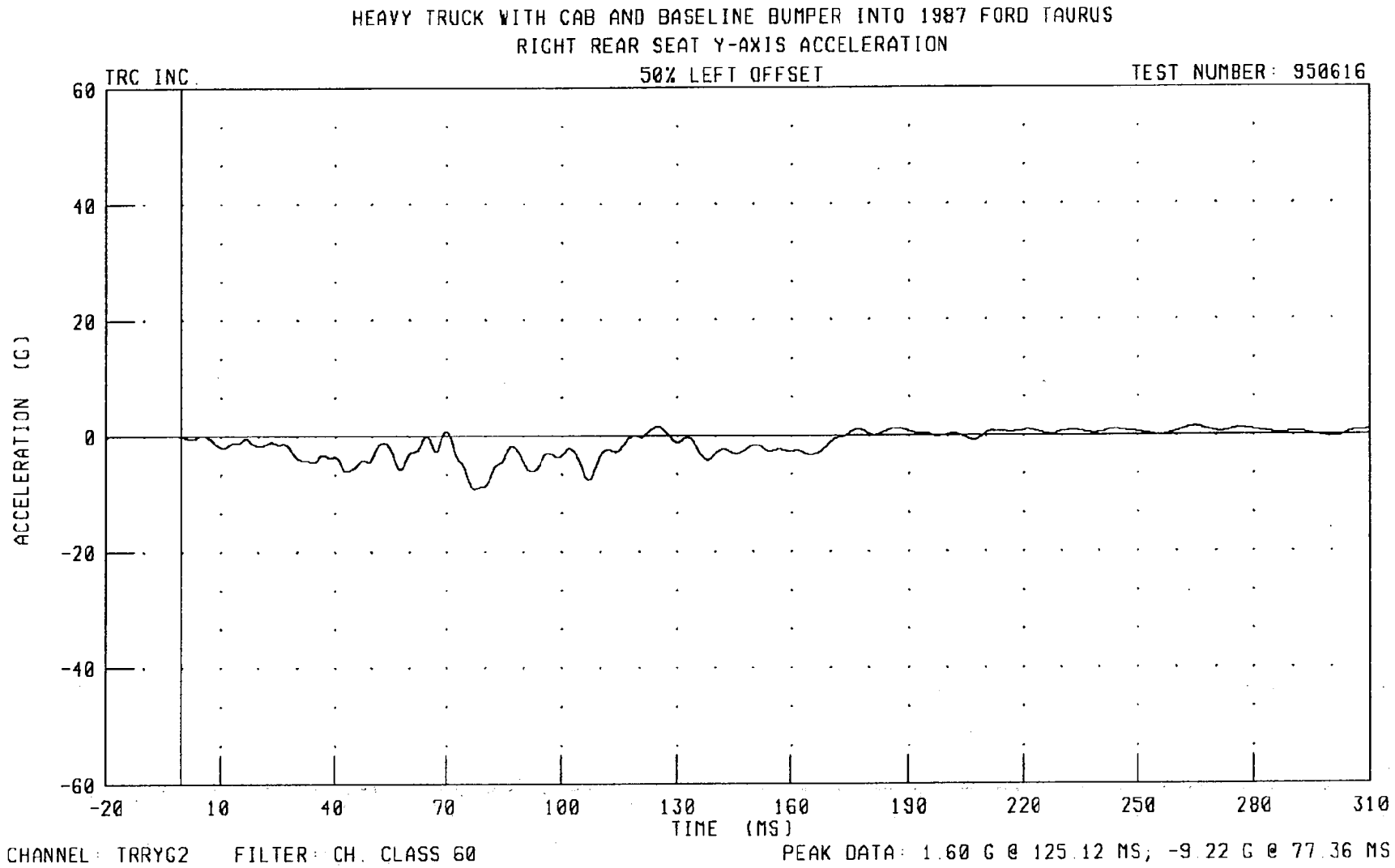
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT REAR SEAT X-AXIS ACCELERATION



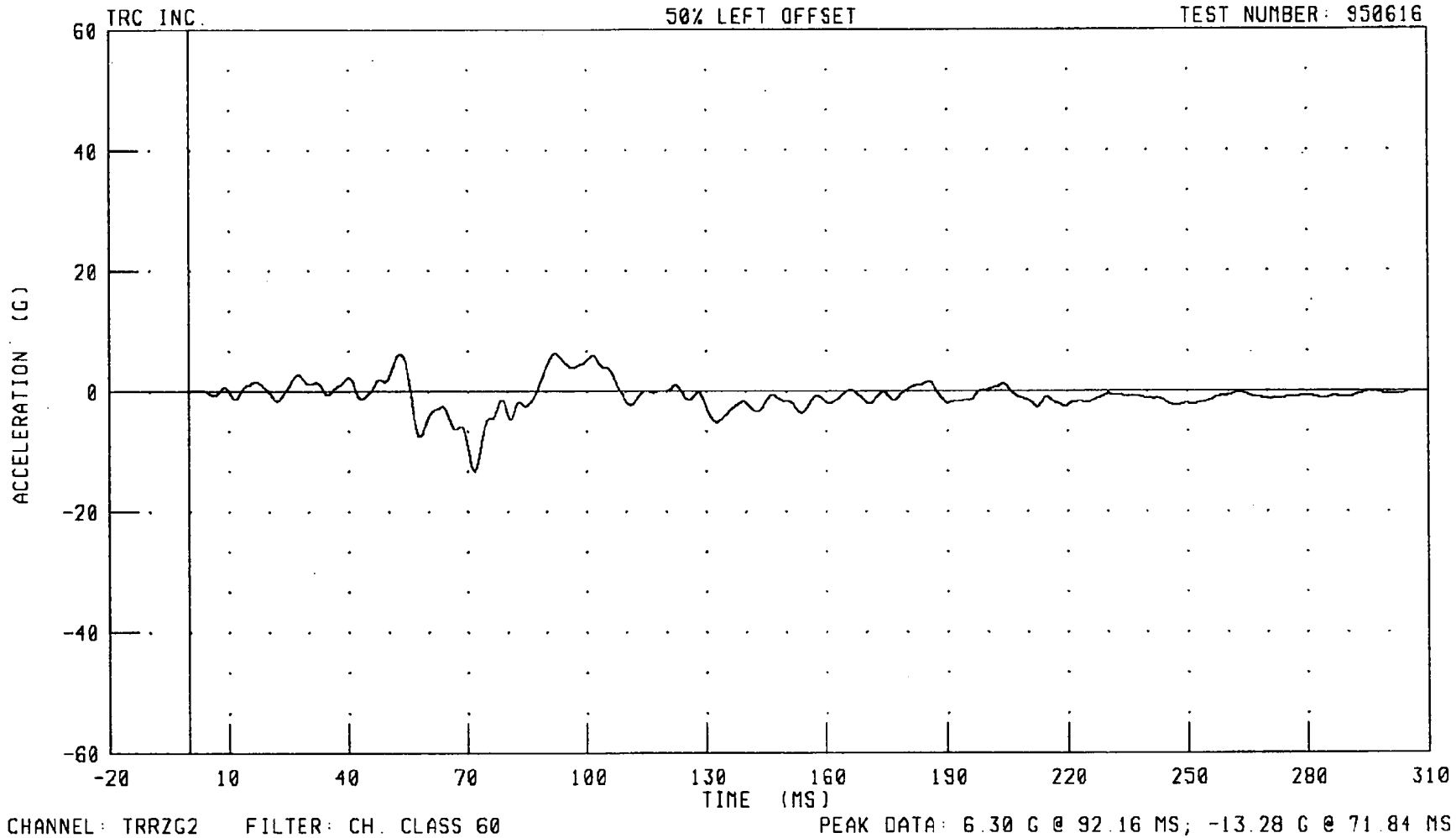
CHANNEL: TRRXG2 FILTER: CH. CLASS 60 PEAK DATA: 1.94 G @ 279.12 MS, -17.83 G @ 43.12 MS


HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT REAR SEAT X-AXIS VELOCITY
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
VELOCITY (KM/H)
40
20
0
-20
-40
-60
-80
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TRRXV2
FILTER: CH. CLASS 180
PEAK DATA: 0.00 KM/H @ 1.68 MS; -55.17 KM/H @ 230.72 MS


HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT REAR SEAT X-AXIS DISPLACEMENT
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
0
-70
-140
-210
-280
-350
-420
DISPLACEMENT (MM X 10¹)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TRRXD2
FILTER: CH. CLASS 180
PEAK DATA: 0.00 MM @ 2.08 MS; -3431.20 MM @ 310.00 MS

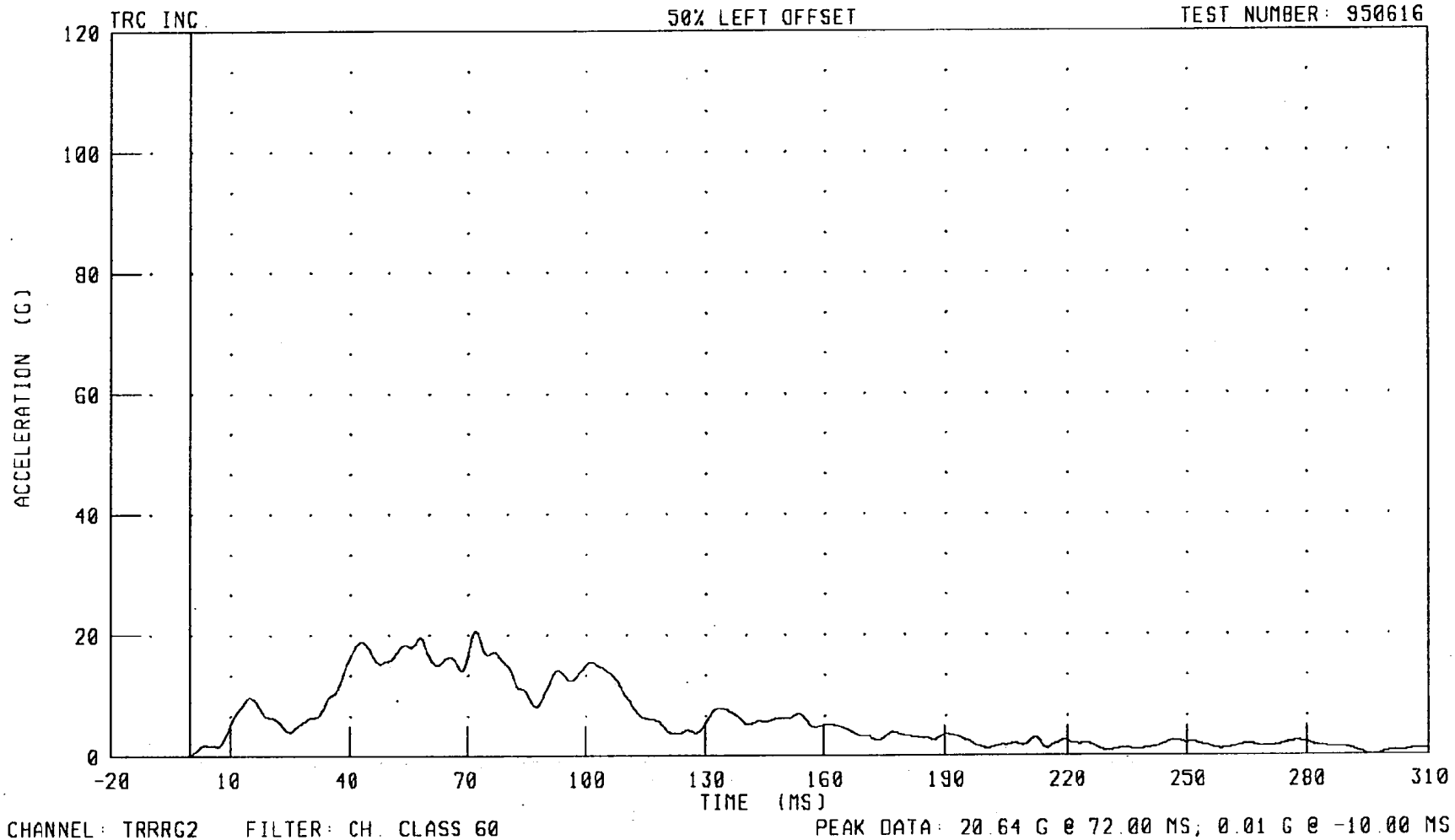

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT REAR SEAT Y-AXIS ACCELERATION
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TRRYG2
FILTER: CH. CLASS 60
PEAK DATA: 1.60 G @ 125.12 MS; -9.22 G @ 77.36 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT REAR SEAT Z-AXIS ACCELERATION



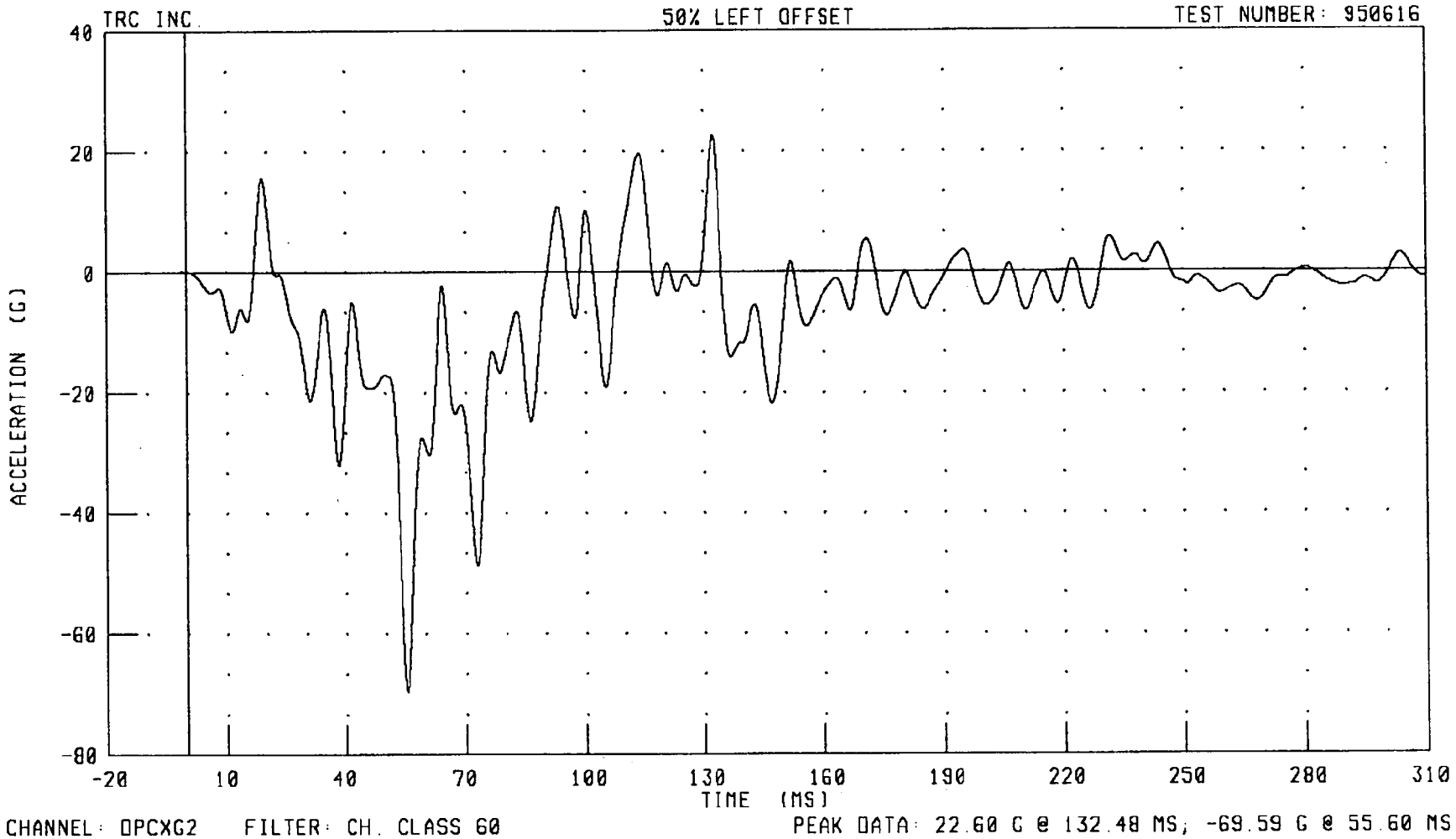
CHANNEL: TRRZG2 FILTER: CH. CLASS 60 PEAK DATA: 6.30 G @ 92.16 MS; -13.28 G @ 71.84 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
RIGHT REAR SEAT RESULTANT ACCELERATION



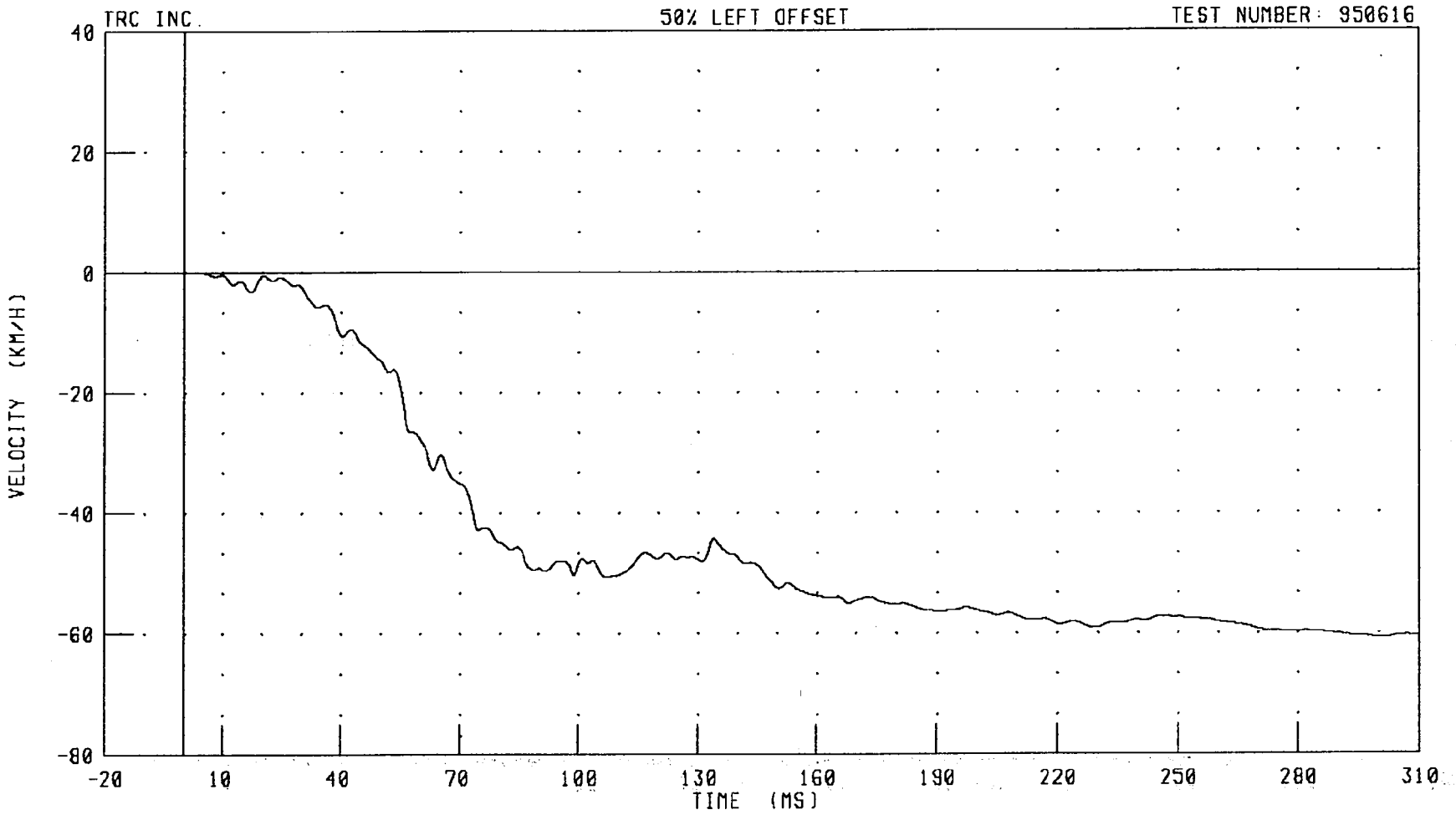
CHANNEL: TRRRG2 FILTER: CH. CLASS 60 PEAK DATA: 20.64 G @ 72.00 MS; 0.01 G @ -10.00 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION

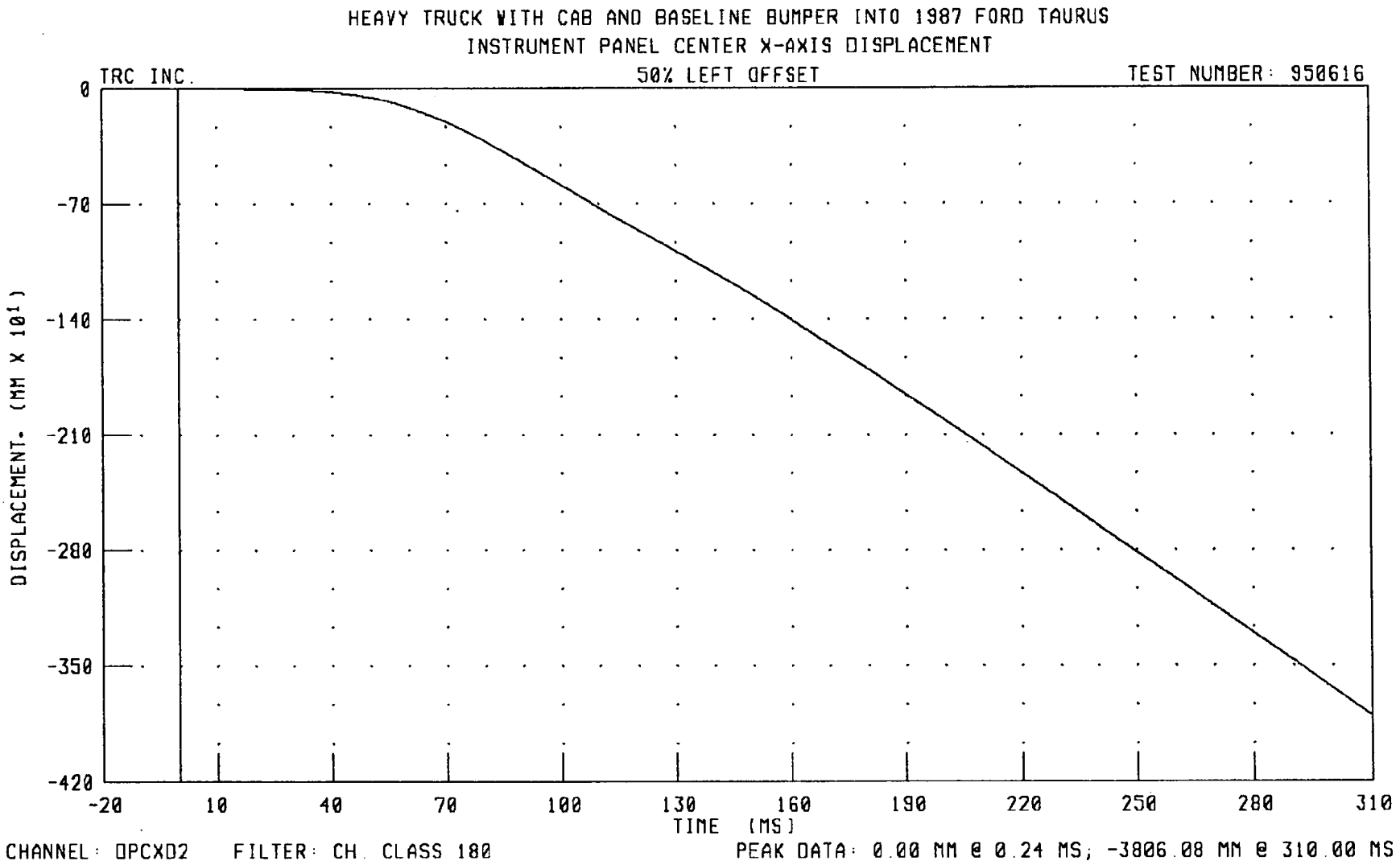


CHANNEL: DPCXG2 FILTER: CH. CLASS 60 PEAK DATA: 22.60 G @ 132.48 MS; -69.59 G @ 55.60 MS

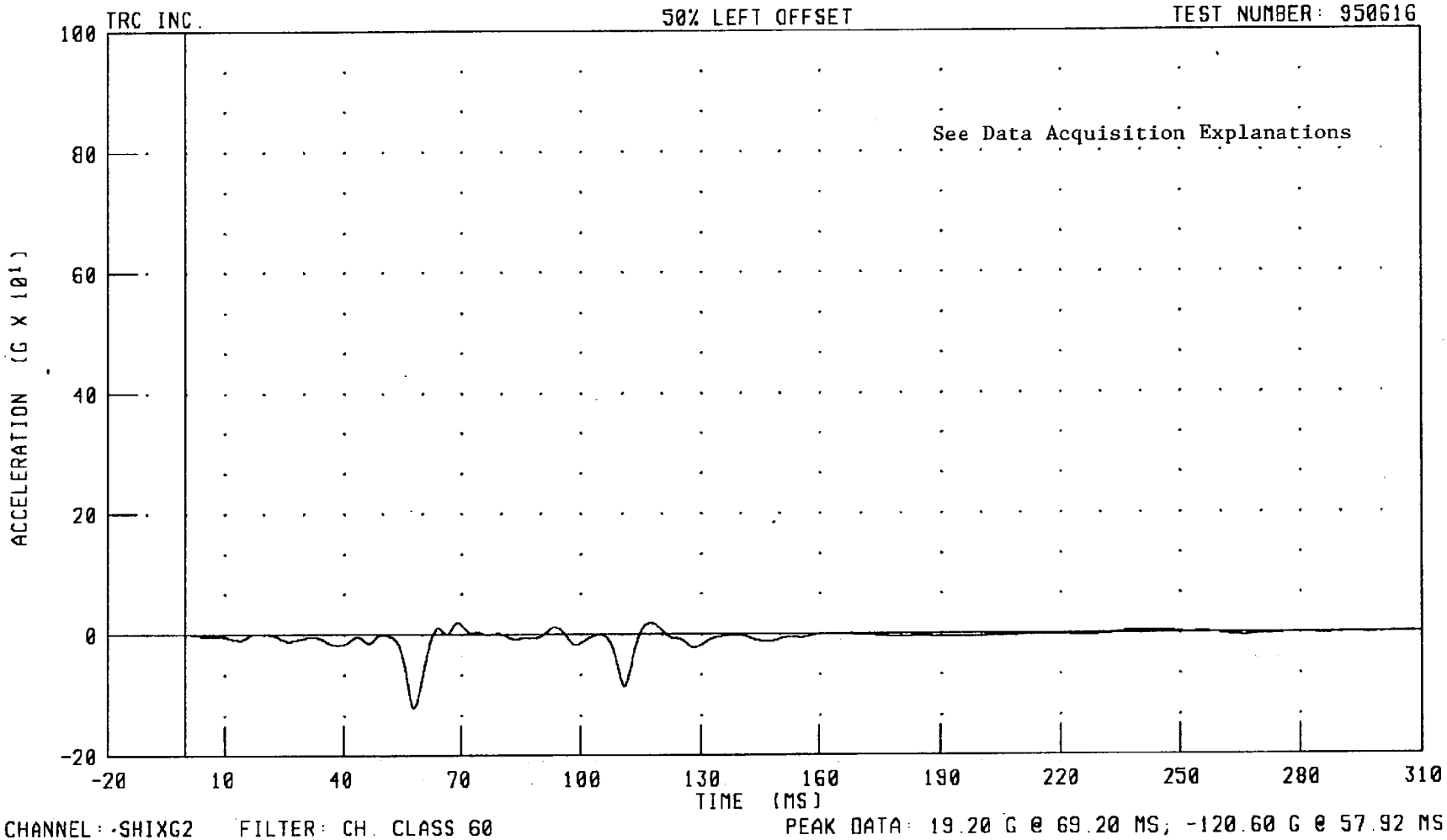
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
INSTRUMENT PANEL CENTER X-AXIS VELOCITY



CHANNEL: DPCXV2 FILTER: CH. CLASS 180 PEAK DATA: 0.00 KM/H @ 0.16 MS; -60.80 KM/H @ 301.68 MS

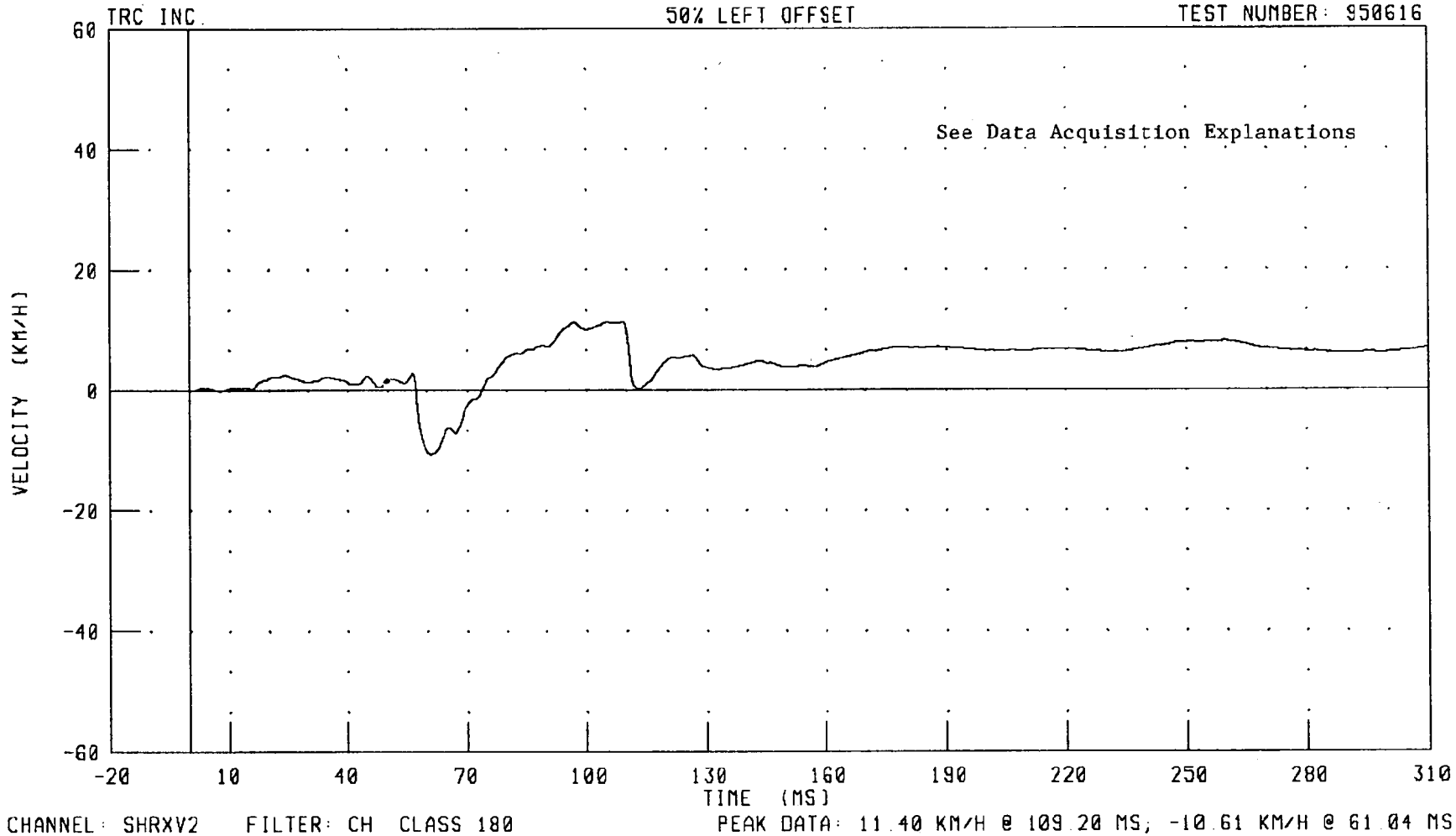

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
INSTRUMENT PANEL CENTER X-AXIS DISPLACEMENT
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
DISPLACEMENT- (MM X 10¹)
0
-70
-140
-210
-280
-350
-420
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: DPCXD2
FILTER: CH. CLASS 180
PEAK DATA: 0.00 MM @ 0.24 MS; -3806.08 MM @ 310.00 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
STEERING WHEEL HUB X-AXIS ACCELERATION
50% LEFT OFFSET

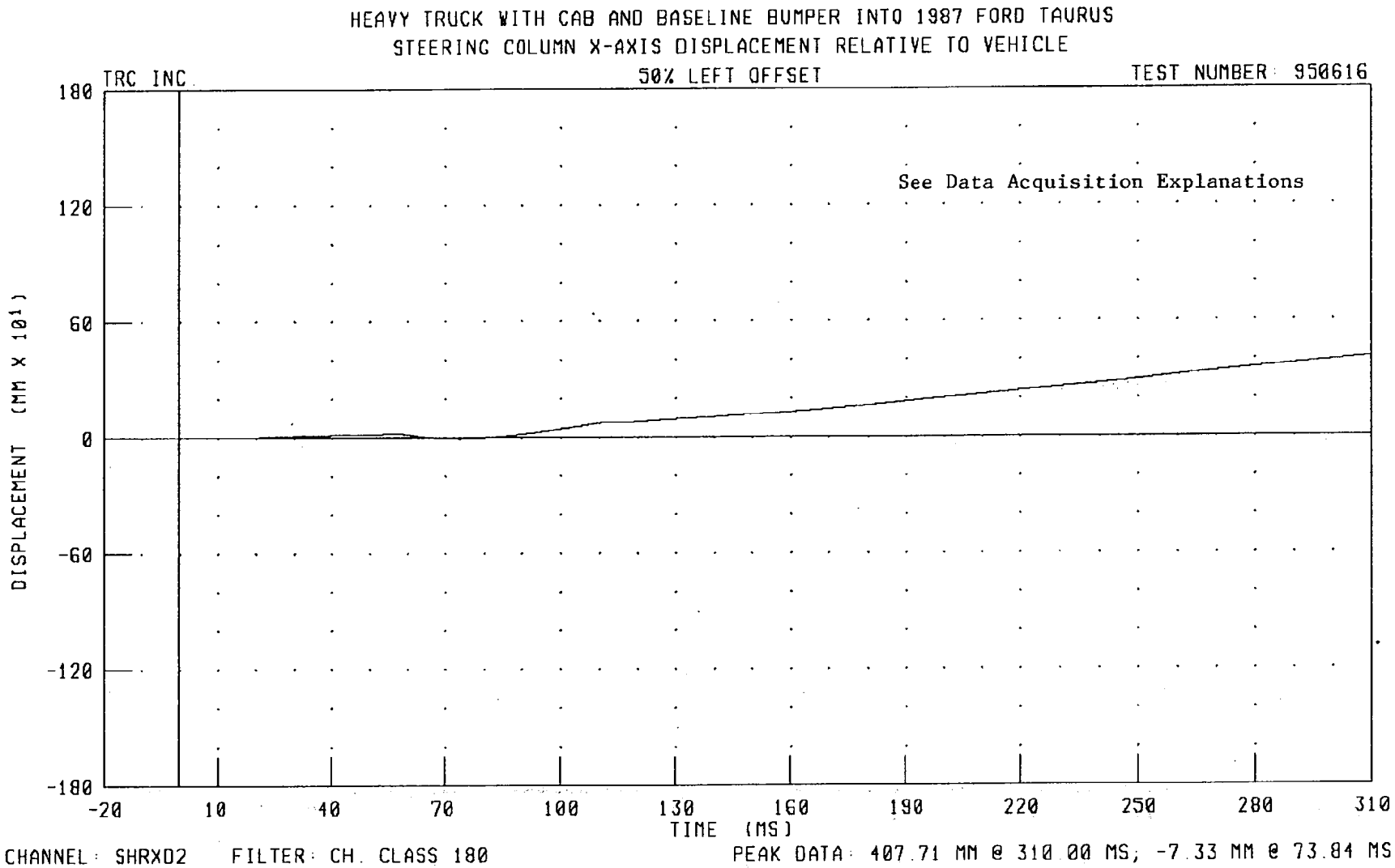


CHANNEL: ·SHIXG2 FILTER: CH. CLASS 60 PEAK DATA: 19.20 G @ 69.20 MS; -120.60 G @ 57.92 MS

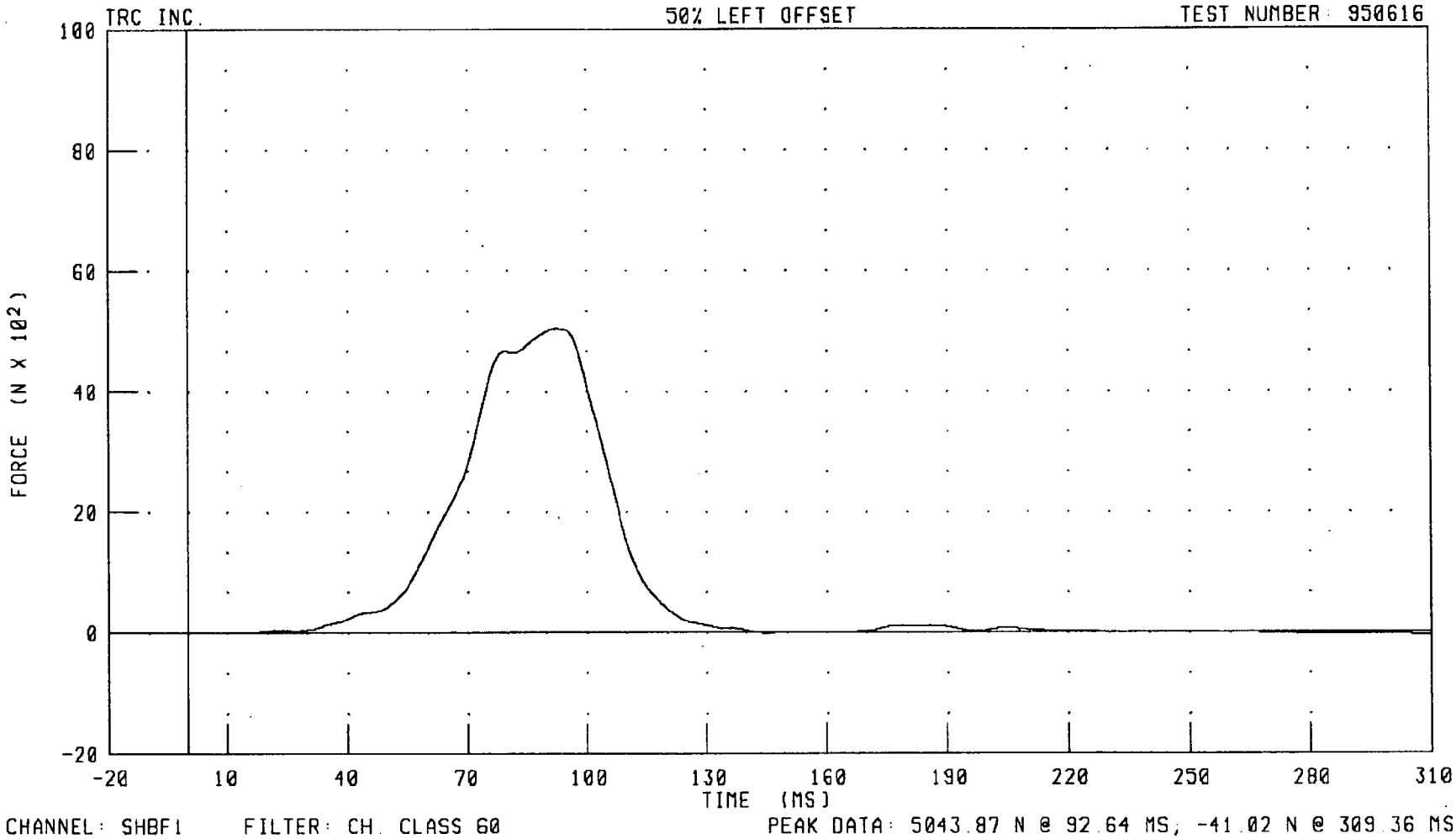
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
STEERING COLUMN X-AXIS VELOCITY RELATIVE TO VEHICLE



CHANNEL: SHRXV2 FILTER: CH CLASS 180 PEAK DATA: 11.40 KM/H @ 109.20 MS; -10.61 KM/H @ 61.04 MS

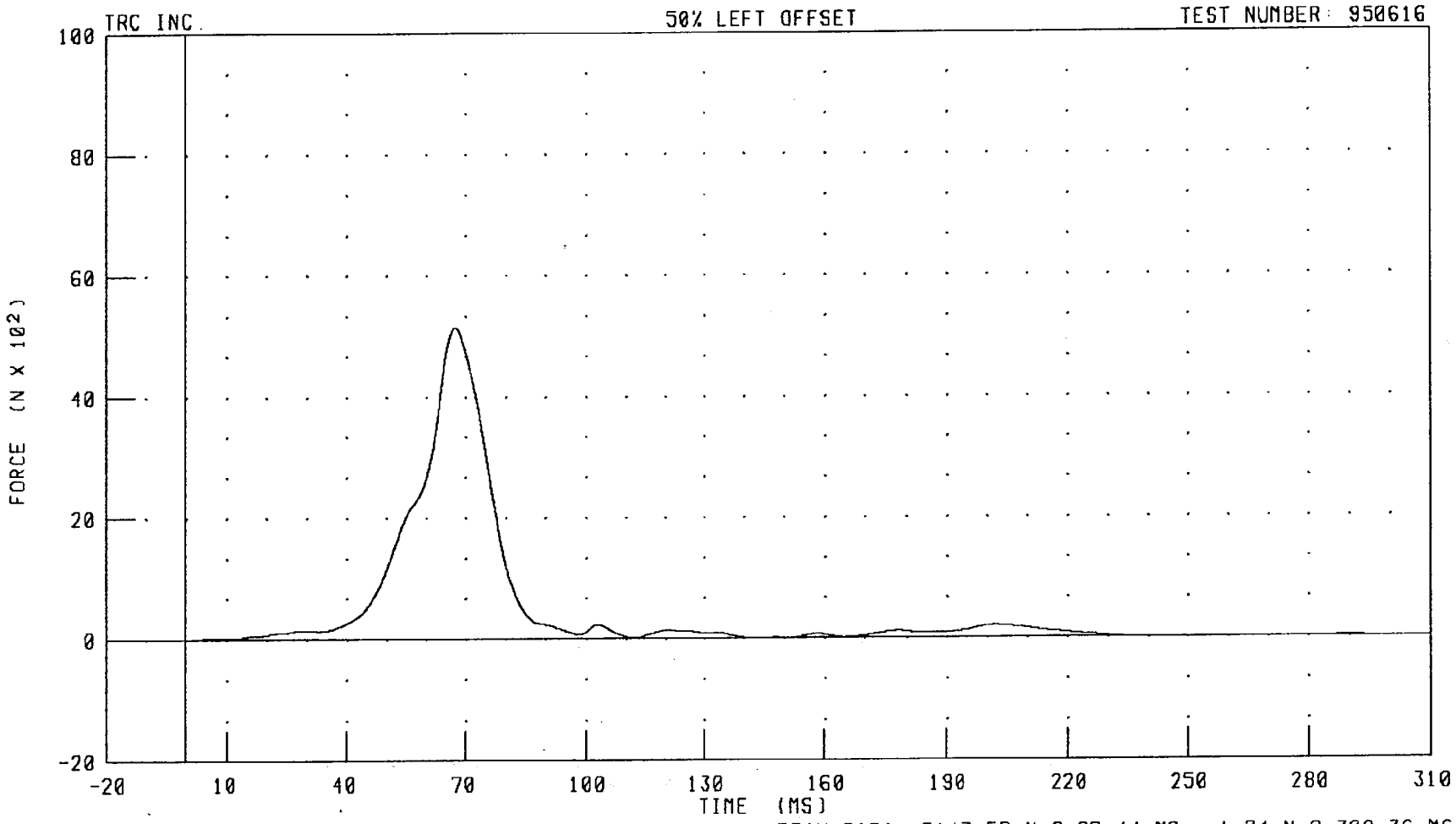

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
STEERING COLUMN X-AXIS DISPLACEMENT RELATIVE TO VEHICLE
TRC INC
50% LEFT OFFSET
TEST NUMBER: 950616
See Data Acquisition Explanations
DISPLACEMENT (MM X 10¹)
180
120
60
0
-60
-120
-180
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: SHRXD2
FILTER: CH. CLASS 180
PEAK DATA: 407.71 MM @ 310.00 MS; -7.33 MM @ 73.84 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER SHOULDER BELT FORCE



CHANNEL: SHBF1 FILTER: CH. CLASS 60 PEAK DATA: 5043.87 N @ 92.64 MS, -41.02 N @ 309.36 MS

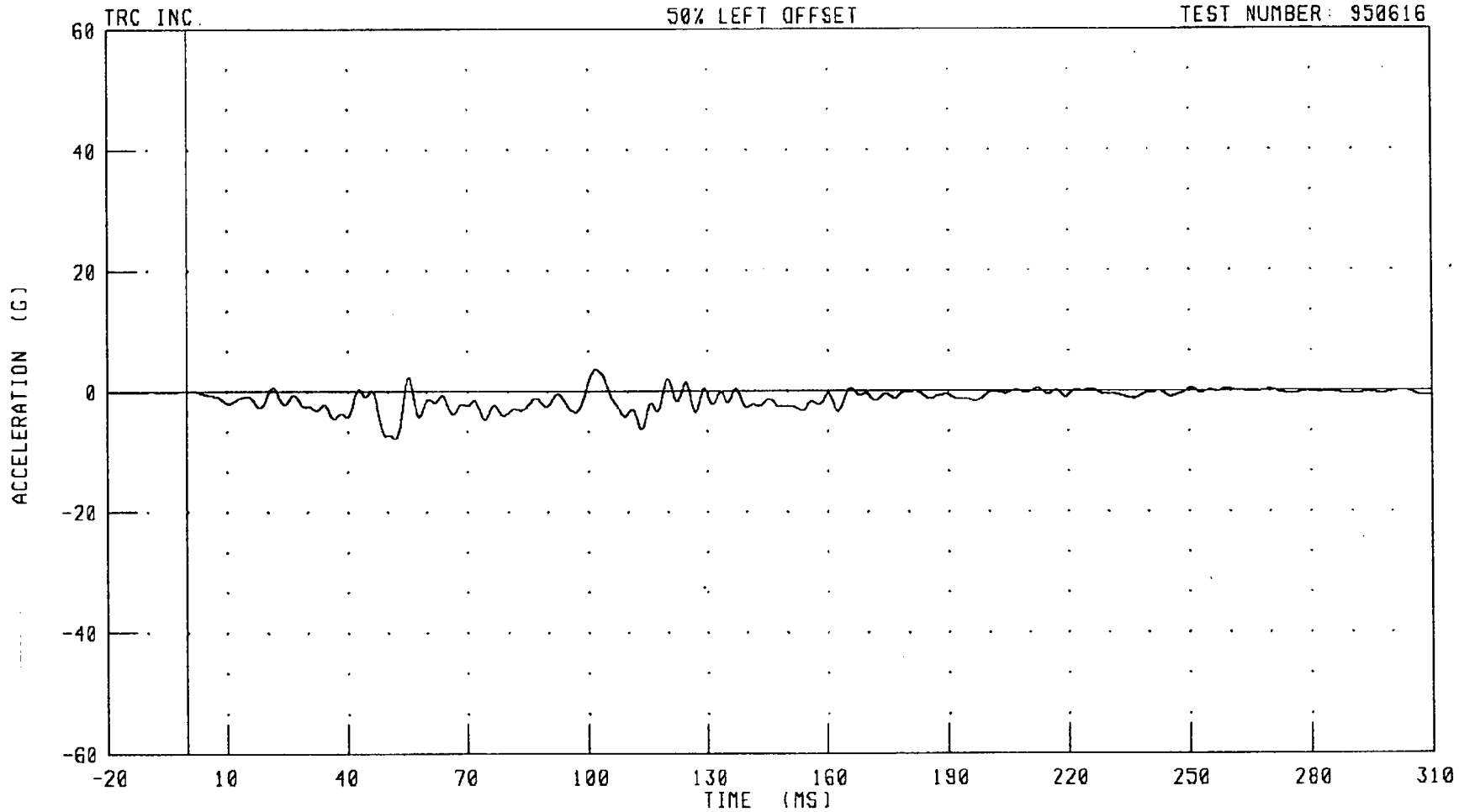
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
DRIVER LAP BELT OUTBOARD FORCE



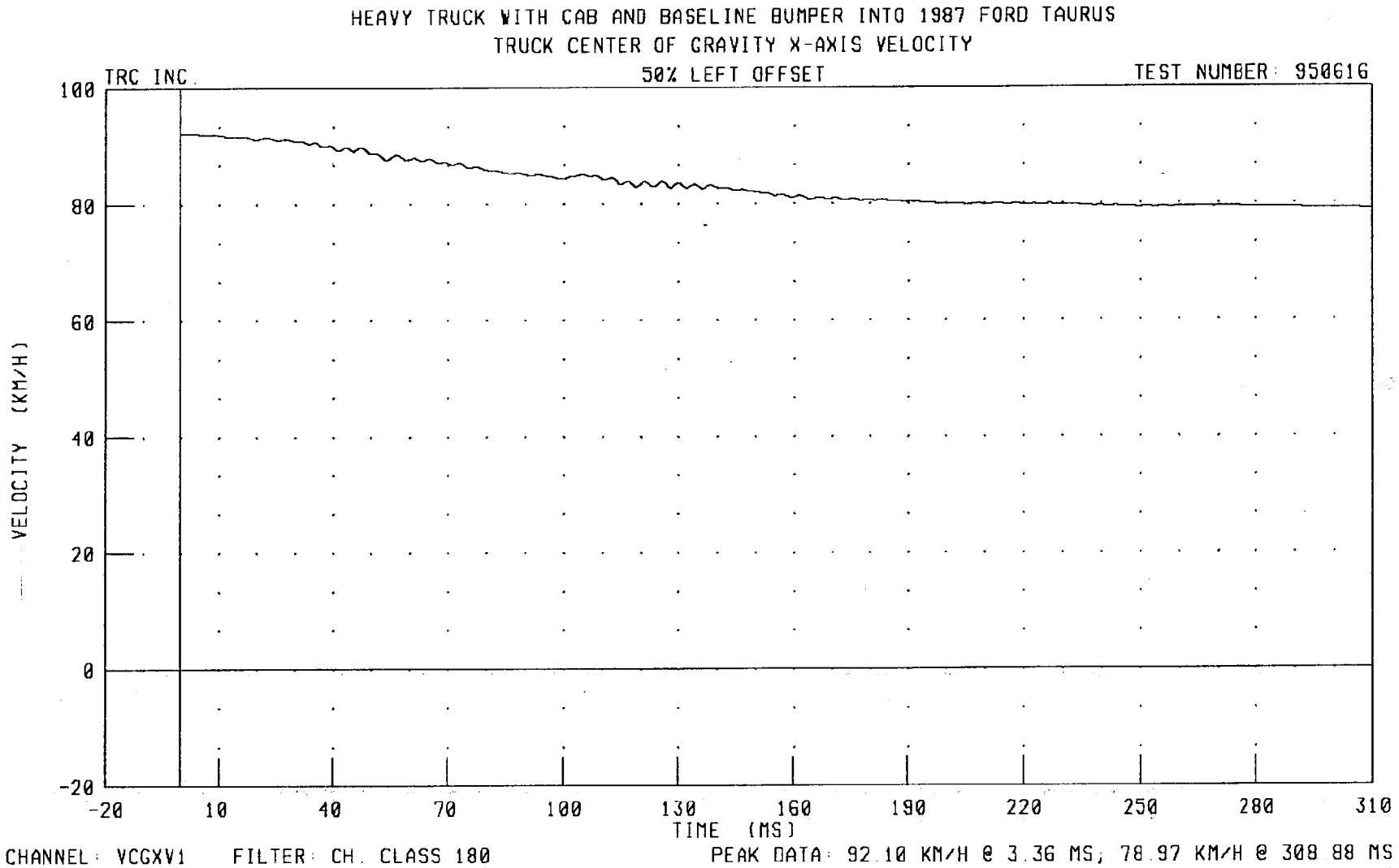
CHANNEL: LBOFI FILTER: CH. CLASS 60

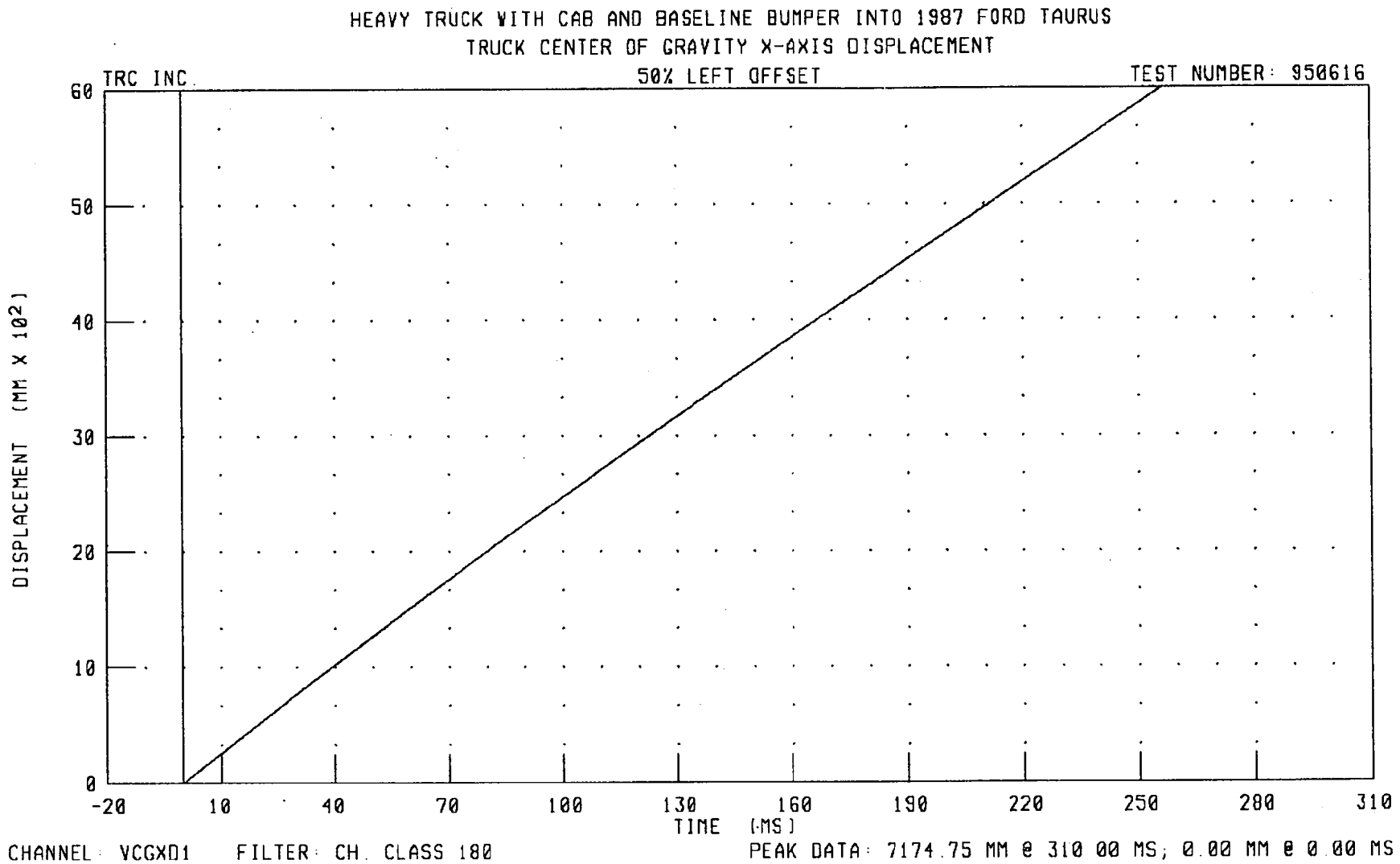
PEAK DATA: 5143.57 N @ 67.44 MS, -1.74 N @ 309.36 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY X-AXIS ACCELERATION

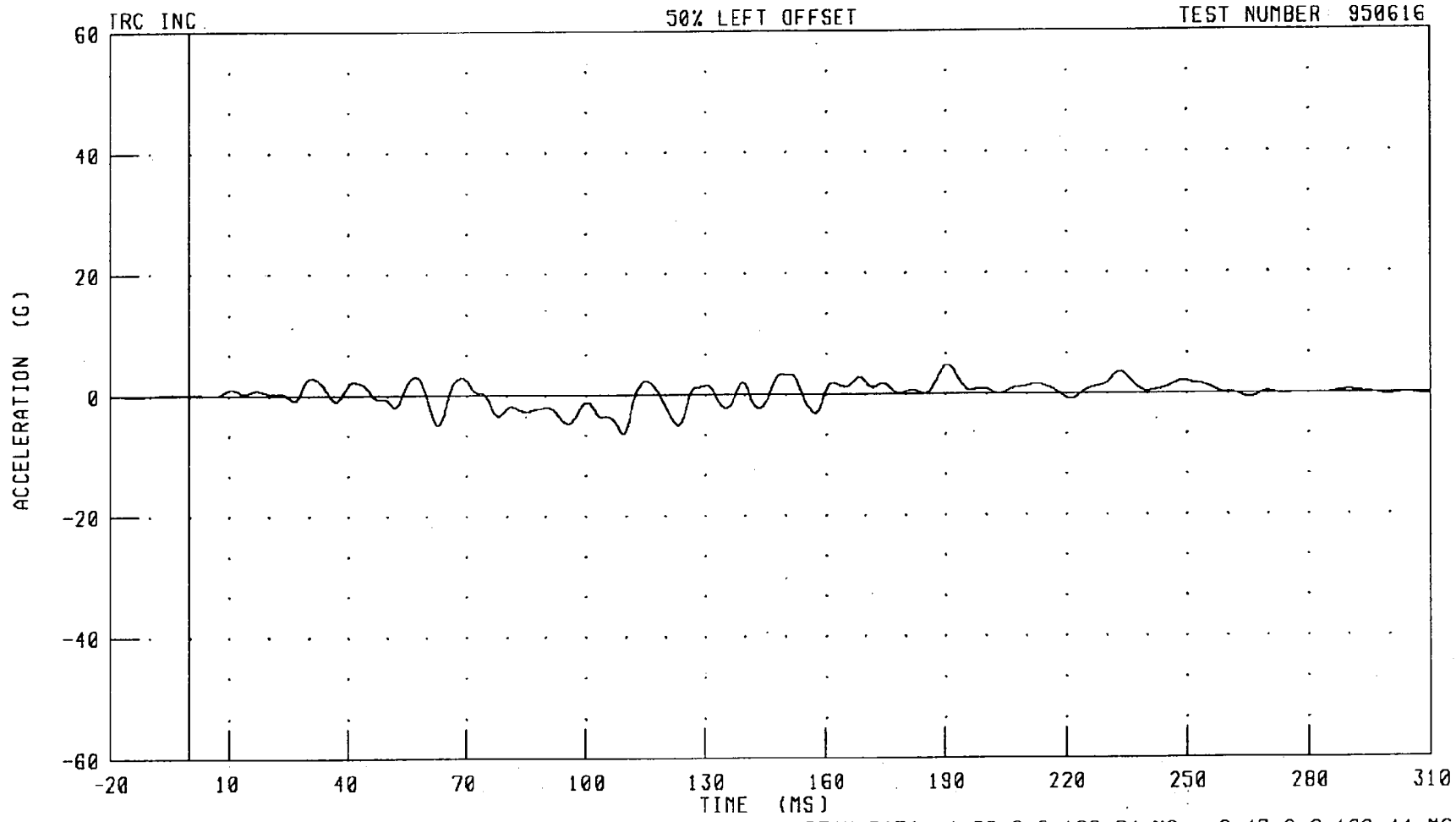


CHANNEL: VCGXG1 FILTER: CH. CLASS 60 PEAK DATA: 3.56 G @ 102.00 MS; -7.79 G @ 51.84 MS

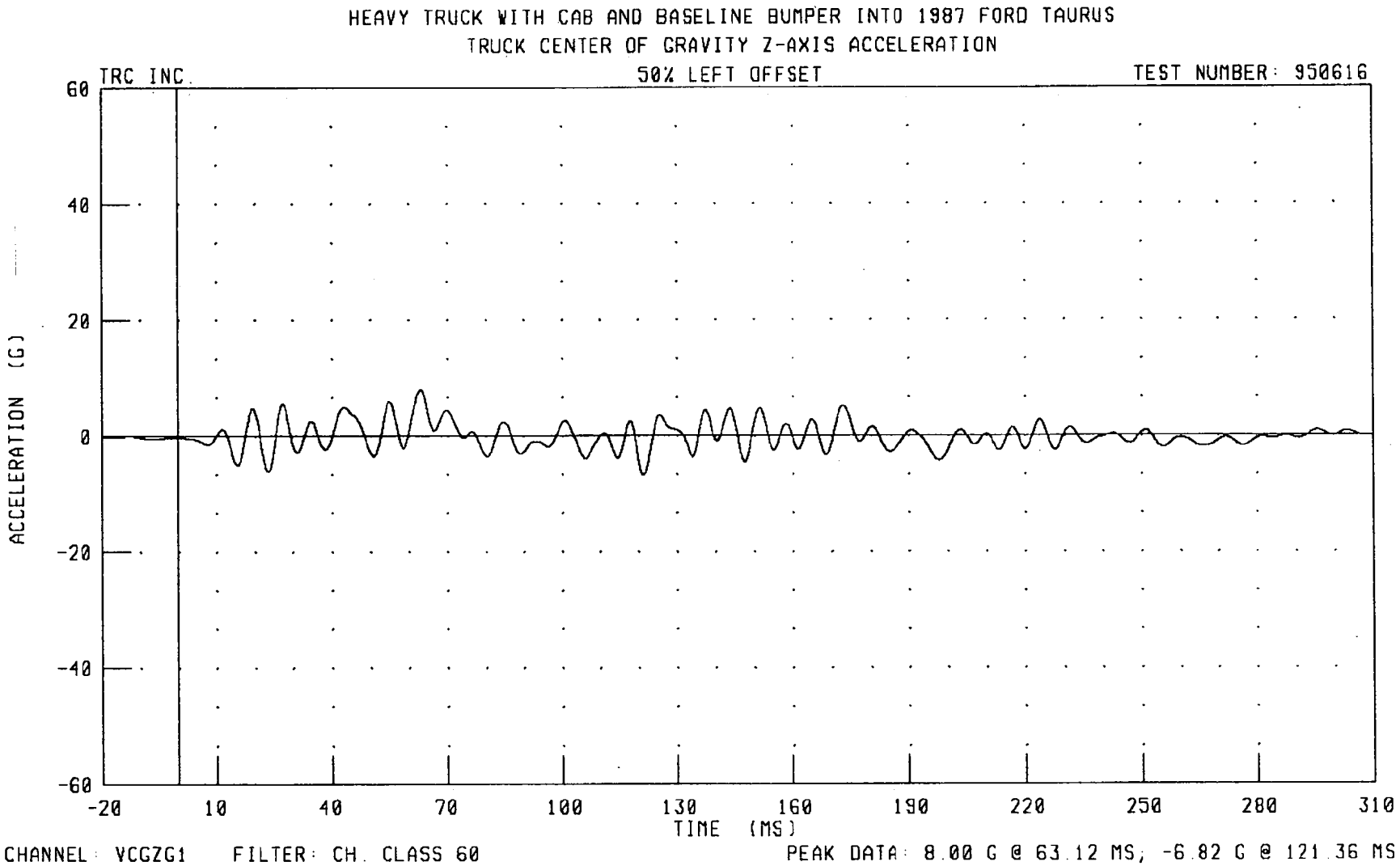

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY X-AXIS VELOCITY
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
VELOCITY (KM/H)
100
80
60
40
20
0
-20
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGXV1
FILTER: CH. CLASS 180
PEAK DATA: 92.10 KM/H @ 3.36 MS; 78.97 KM/H @ 308.88 MS


HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY X-AXIS DISPLACEMENT
50% LEFT OFFSET
TRC INC.
TEST NUMBER: 950616
DISPLACEMENT (MM X 10²)
60
50
40
30
20
10
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGXD1
FILTER: CH. CLASS 180
PEAK DATA: 7174.75 MM @ 310.00 MS; 0.00 MM @ 0.00 MS

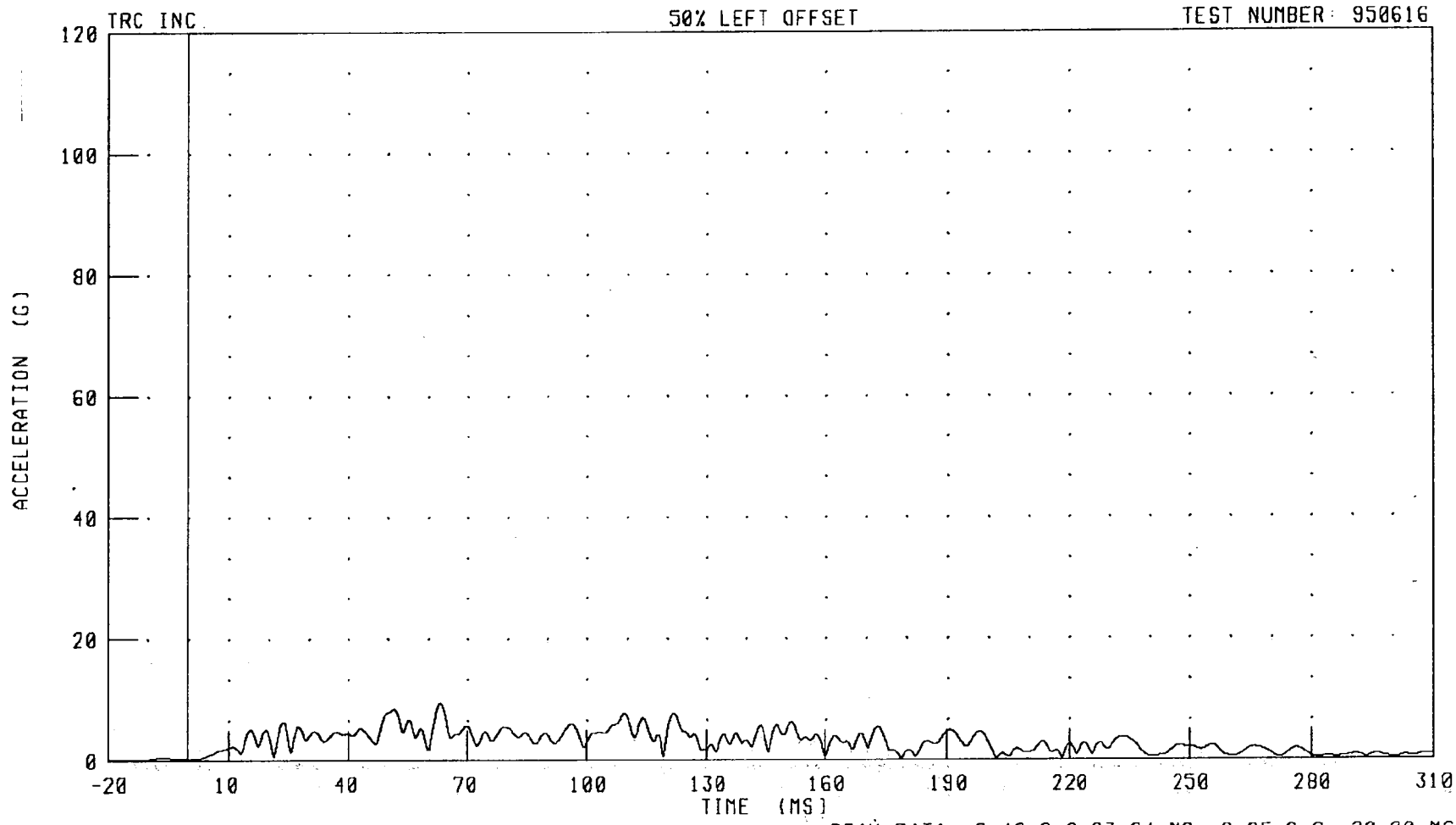
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY Y-AXIS ACCELERATION



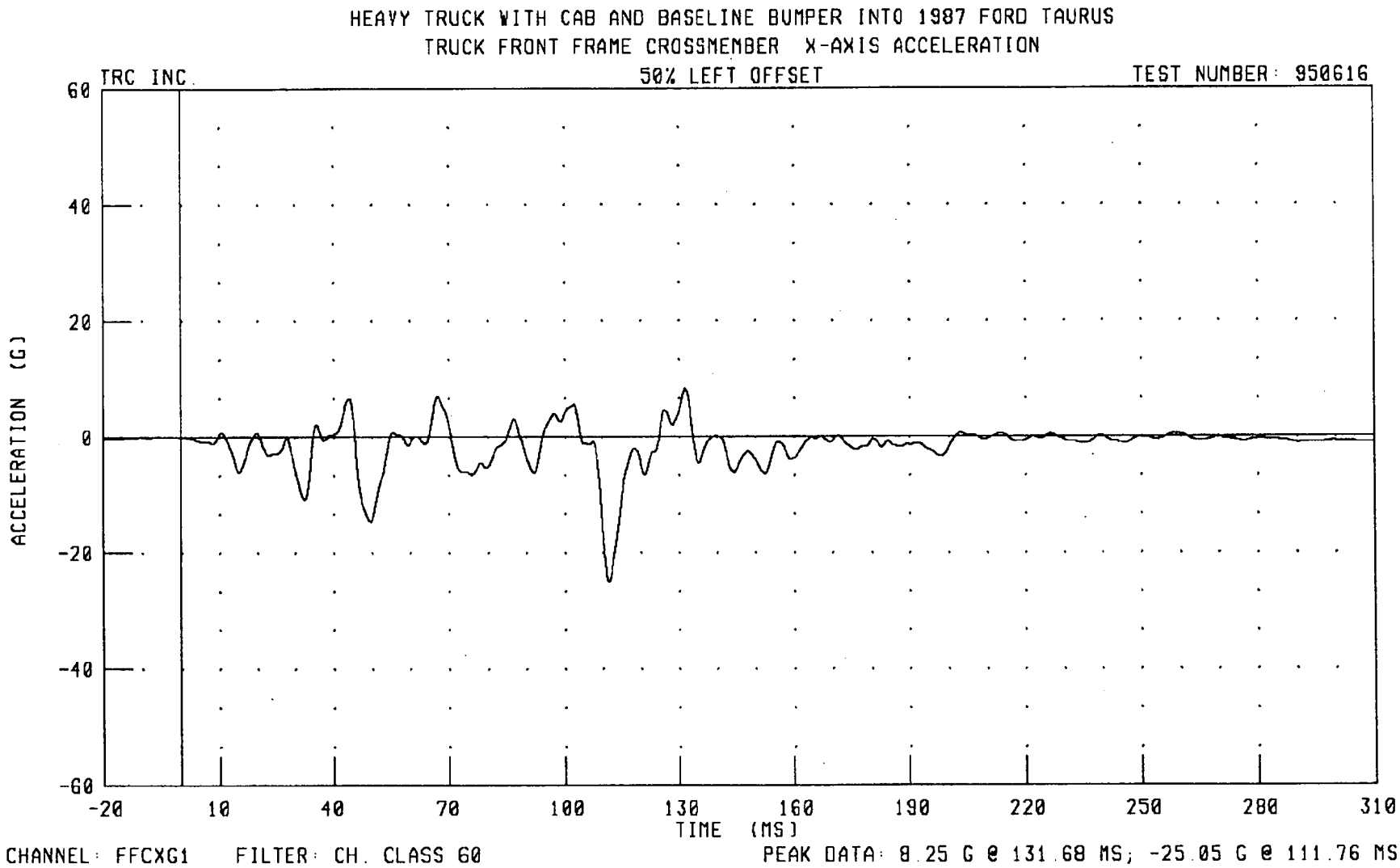
CHANNEL: VCGYG1 FILTER: CH. CLASS 60 PEAK DATA: 4.82 G @ 190.64 MS; -6.47 G @ 109.44 MS

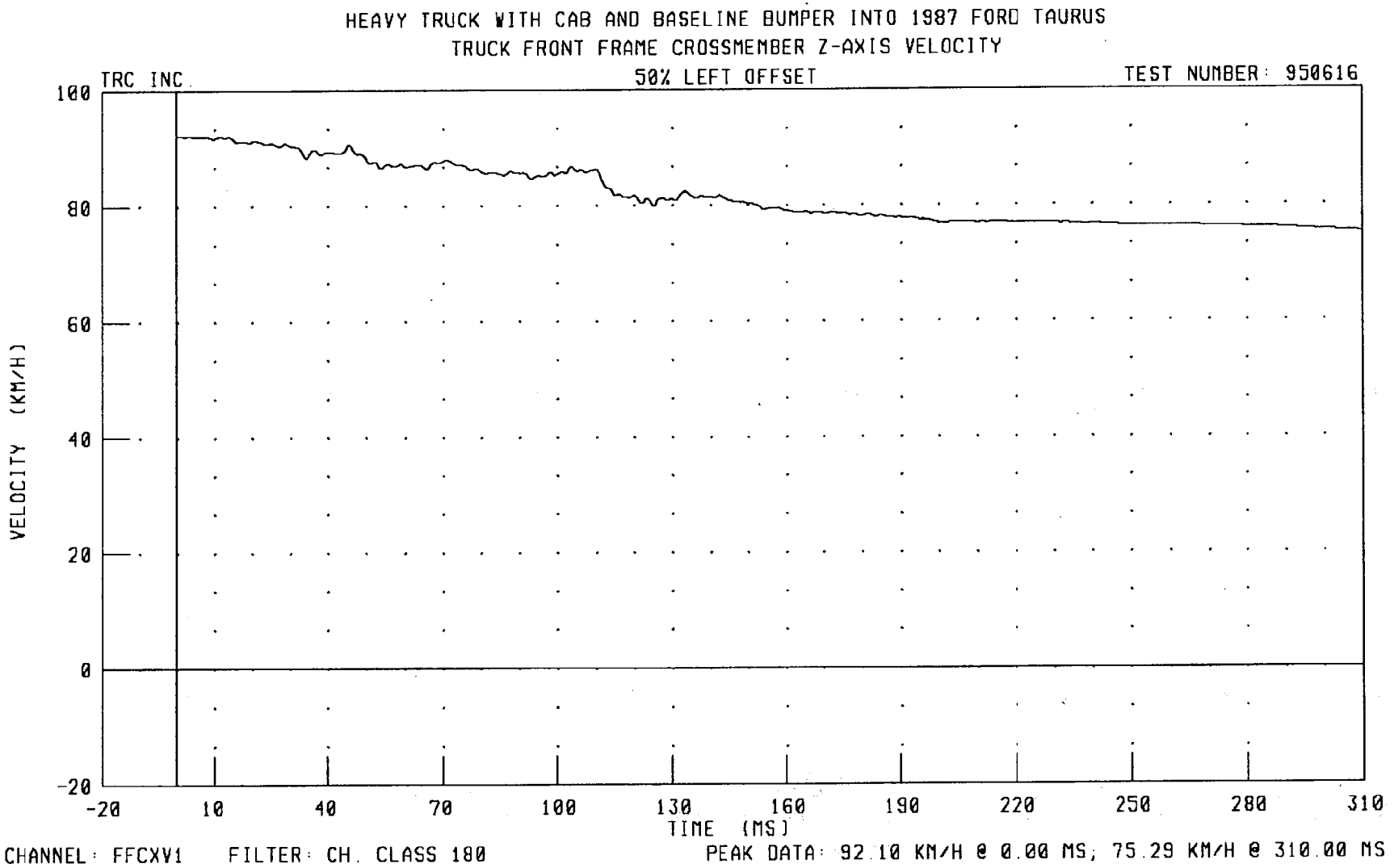

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY Z-AXIS ACCELERATION
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGZG1
FILTER: CH. CLASS 60
PEAK DATA: 8.00 G @ 63.12 MS; -6.82 G @ 121.36 MS

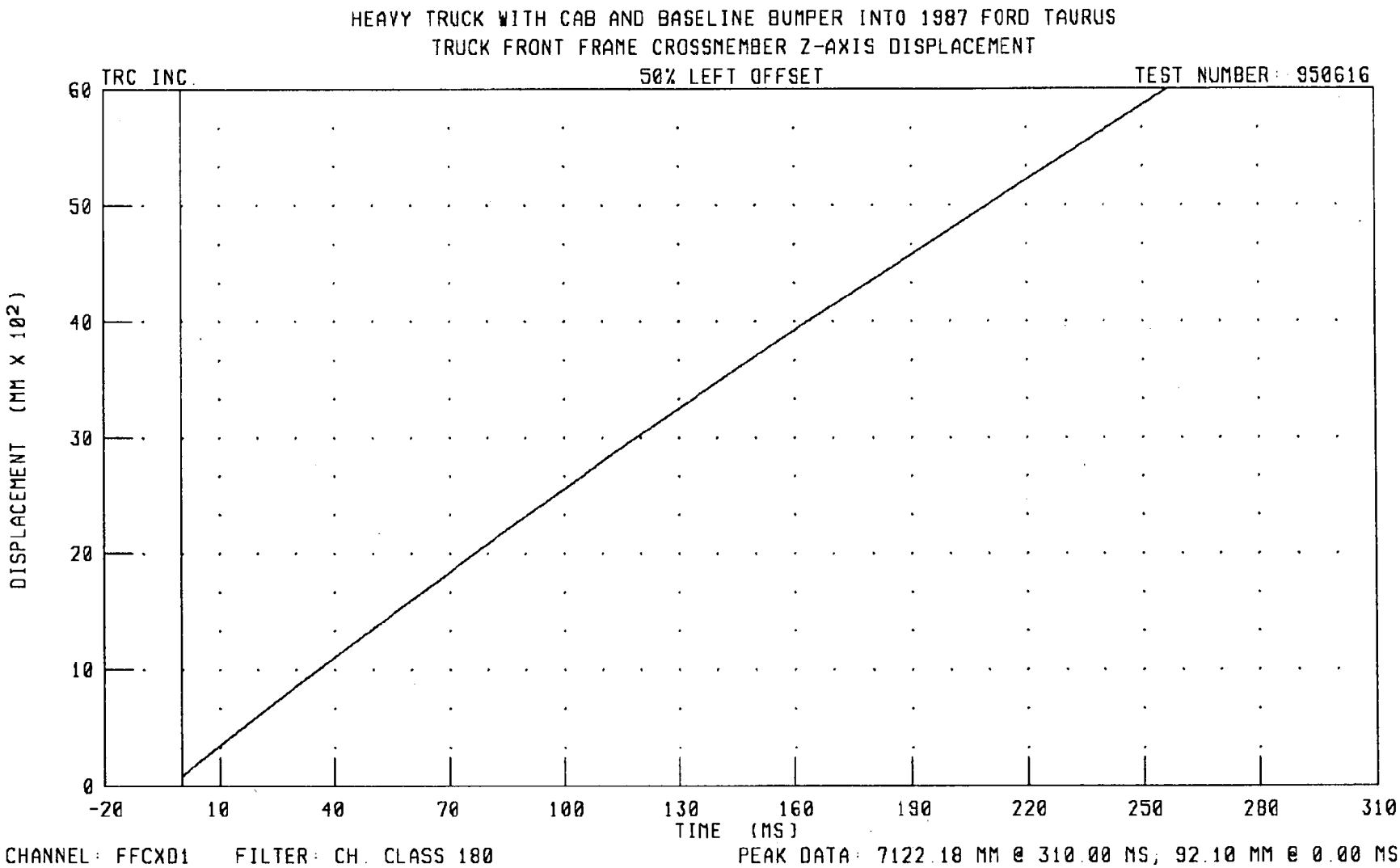
HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY RESULTANT ACCELERATION

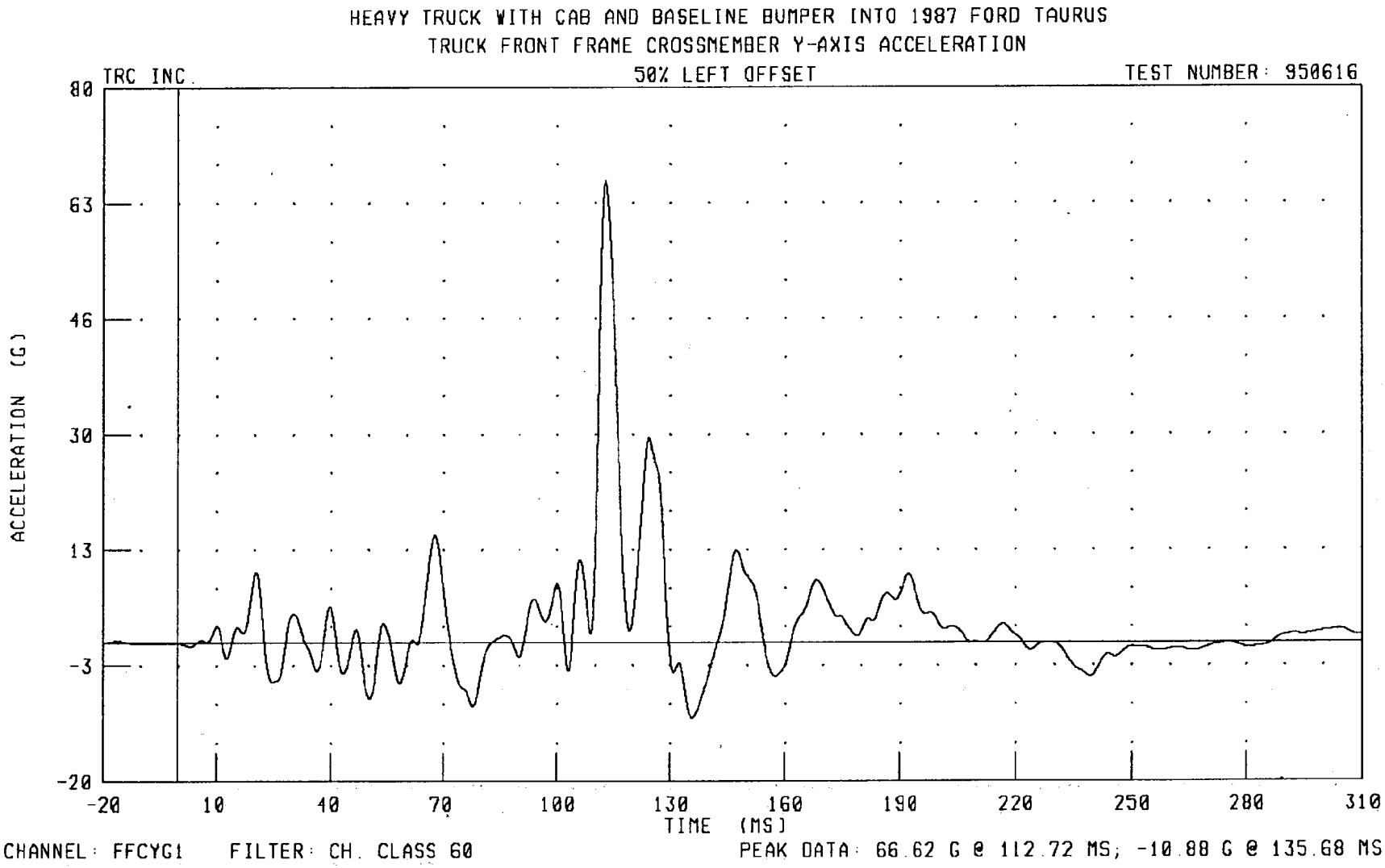


CHANNEL: VCGRG1 FILTER: CH. CLASS 60 PEAK DATA: 9.48 G @ 63.04 MS, 0.05 G @ -20.00 MS

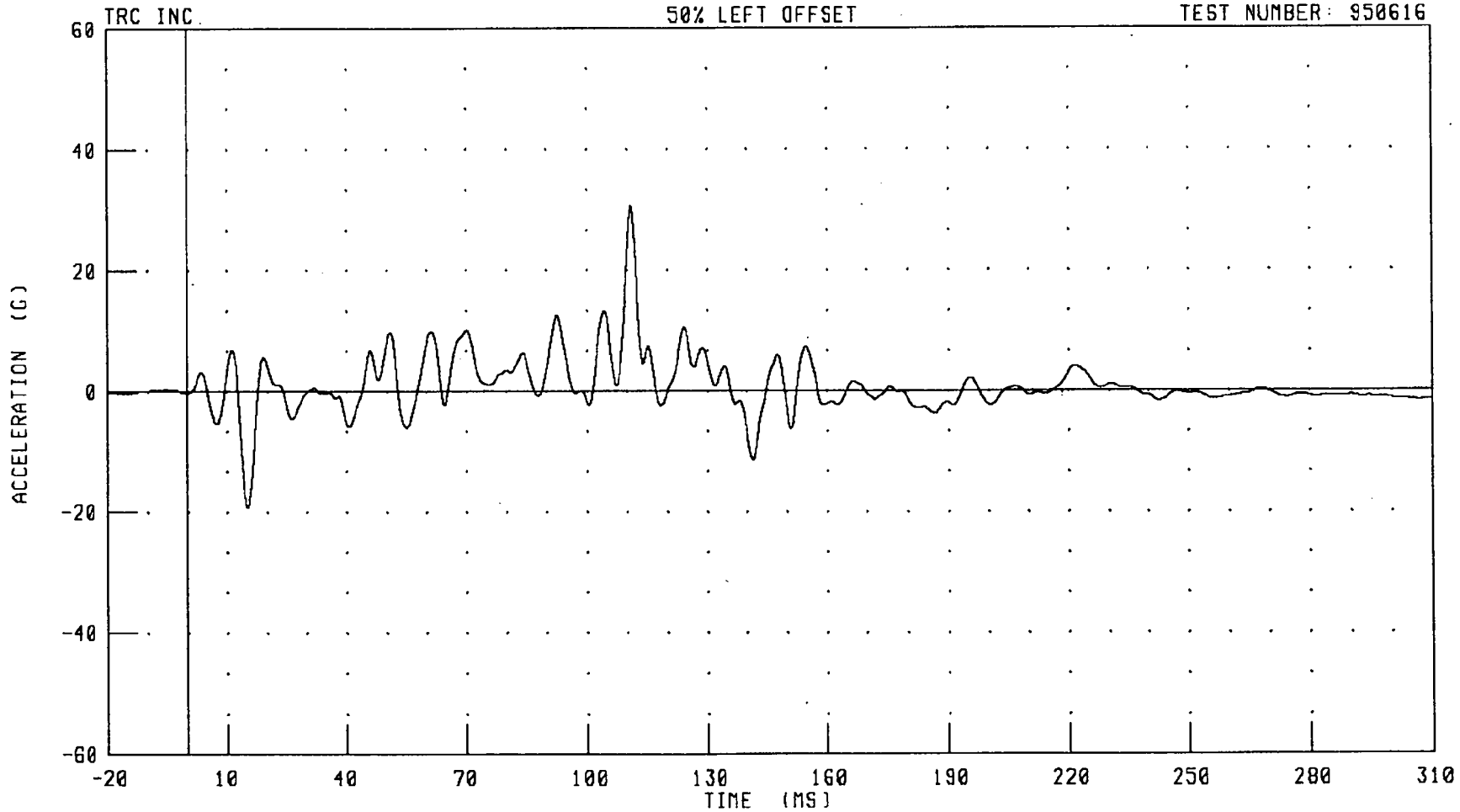

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER X-AXIS ACCELERATION
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: FFCXG1
FILTER: CH. CLASS 60
PEAK DATA: 8.25 G @ 131.68 MS; -25.05 G @ 111.76 MS


HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER Z-AXIS VELOCITY
TRC INC
50% LEFT OFFSET
TEST NUMBER: 950616
VELOCITY (KM/H)
100
80
60
40
20
0
-20
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: FFCXV1
FILTER: CH. CLASS 180
PEAK DATA: 92.10 KM/H @ 0.00 MS; 75.29 KM/H @ 310.00 MS


HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER Z-AXIS DISPLACEMENT
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
DISPLACEMENT (MM X 10²)
60
50
40
30
20
10
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: FFCXD1
FILTER: CH. CLASS 180
PEAK DATA: 7122.18 MM @ 310.00 MS, 92.10 MM @ 0.00 MS

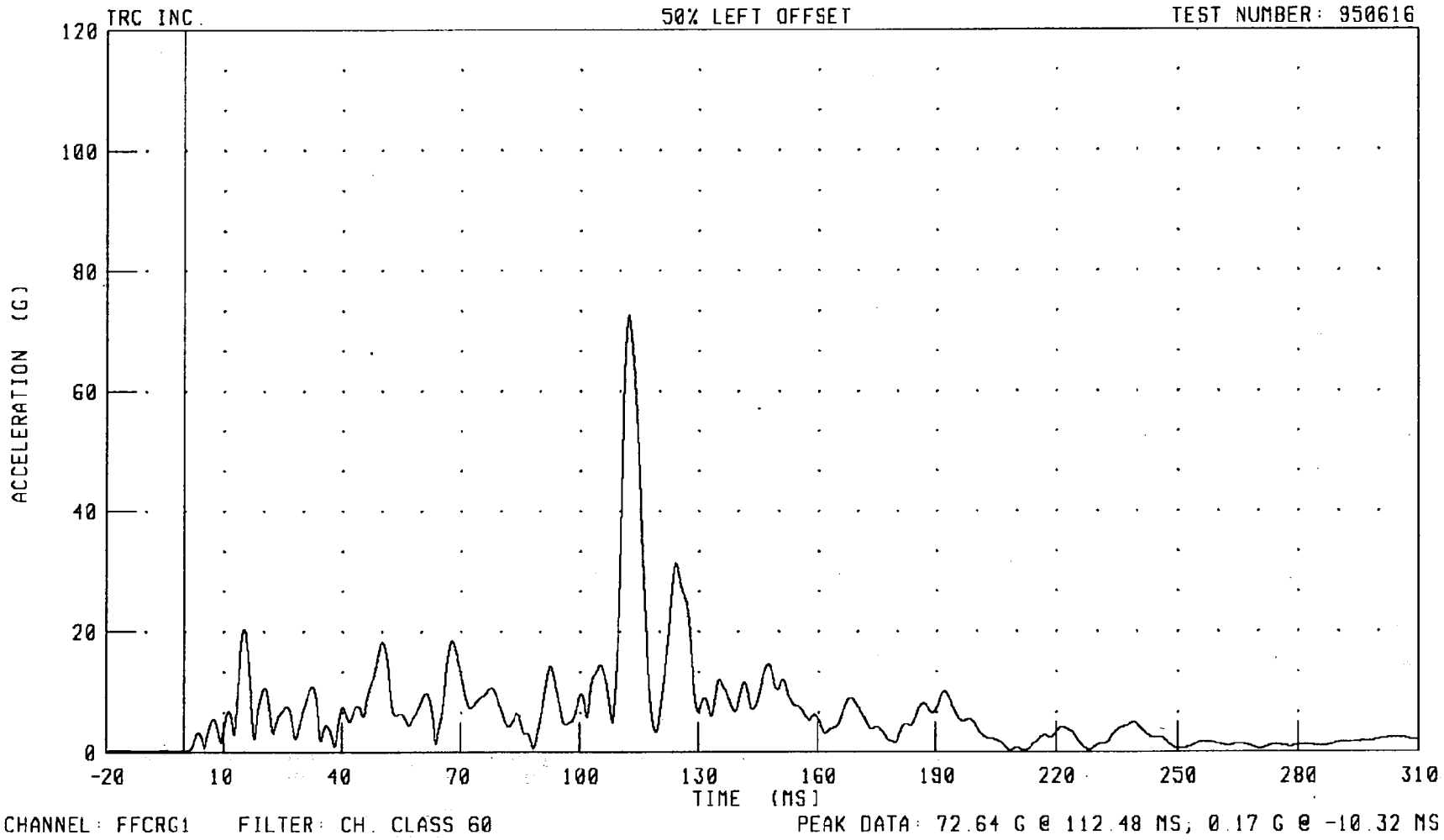

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER Y-AXIS ACCELERATION
TRC INC.
50% LEFT OFFSET
TEST NUMBER: 950616
ACCELERATION (G)
80
63
46
30
13
-3
-20
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: FFCYG1
FILTER: CH. CLASS 60
PEAK DATA: 66.62 G @ 112.72 MS; -10.88 G @ 135.68 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER Z-AXIS ACCELERATION



CHANNEL: FFCZG1 FILTER: CH. CLASS 60 PEAK DATA: 30.58 G @ 111.20 MS, -19.31 G @ 15.12 MS

HEAVY TRUCK WITH CAB AND BASELINE BUMPER INTO 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER RESULTANT ACCELERATION



CHANNEL: FFCRG1 FILTER: CH. CLASS 60 PEAK DATA: 72.64 G @ 112.48 MS; 0.17 G @ -10.32 MS

Appendix C

Miscellaneous Test Information

Dummy Instrumentation Placement

Dummy Mfr. & S/N: Humanoid/043

Seating Position: Driver

Location	Axis	Mfr.	Model	S/N	Orientation (+ Sensing)
Head Acceleration	X	Endevco	7264	DC54J	Rear
Head Acceleration	Y	Endevco	7264	EY99J	Left
Head Acceleration	Z	Endevco	7264	EH75J	Up
Chest Acceleration	X	Endevco	7264	DC72J	Front
Chest Acceleration	Y	Endevco	7264	BC26J	Left
Chest Acceleration	Z	Endevco	7264	DG50J	Up
Chest Deflection	X	Servo	14CB1-2897	CP043	Outward
Pelvis Acceleration	X	Endevco	7264	BF42J	Rear
Pelvis Acceleration	Y	Endevco	7264	FJ66J	Left
Pelvis Acceleration	Z	Endevco	7264	DG56J	Up
Left Femur Force		GSE	2435	739	Tension
Right Femur Force		GSE	2430	741	Tension

Vehicle Instrumentation Information

Test No. 950616

No.	Location	Axis	Mfr.	Model	S/N	Orientation (+ Sensing)
1	Vehicle Center of Gravity					
	Longitudinal	X	Endevco	7264	AW52	Front
	Lateral	Y	Endevco	7264	AP87J	Right
	Vertical	Z	Endevco	7264	DM66J	Up
2	Left Front Sill					
	Longitudinal	X	Endevco	7264	BF24J	Front
	Lateral	Y	Endevco	7264	BT29J	Right
	Vertical	Z	Endevco	7264	BE24J	Up
3	Right Front Sill					
	Longitudinal	X	Endevco	7264	FB67J	Front
	Lateral	Y	Endevco	7264	BE02J	Left
	Vertical	Z	Endevco	7264	DF92J	Down
4	Left Rear Seat					
	Longitudinal	X	Endevco	7264	BH95J	Front
	Lateral	Y	Endevco	7264	AP87	Right
	Vertical	Z	Endevco	7264	BD41J	Up
5	Right Rear Seat					
	Longitudinal	X	Endevco	7264	AL40	Front
	Lateral	Y	Endevco	7264	BF04	Right
	Vertical	Z	Endevco	7264	EH78J	Up
6	Instrument Panel Center					
	Longitudinal	X	Endevco	7264	BD75J	Front
7	Steering Wheel Hub					
	Longitudinal	X	Endevco	7264	BC41J	Rear
	Lap Belt Outboard Force		Lebow	3419	234	Tension
	Shoulder Belt Outboard Force		Lebow	3419	236	Tension

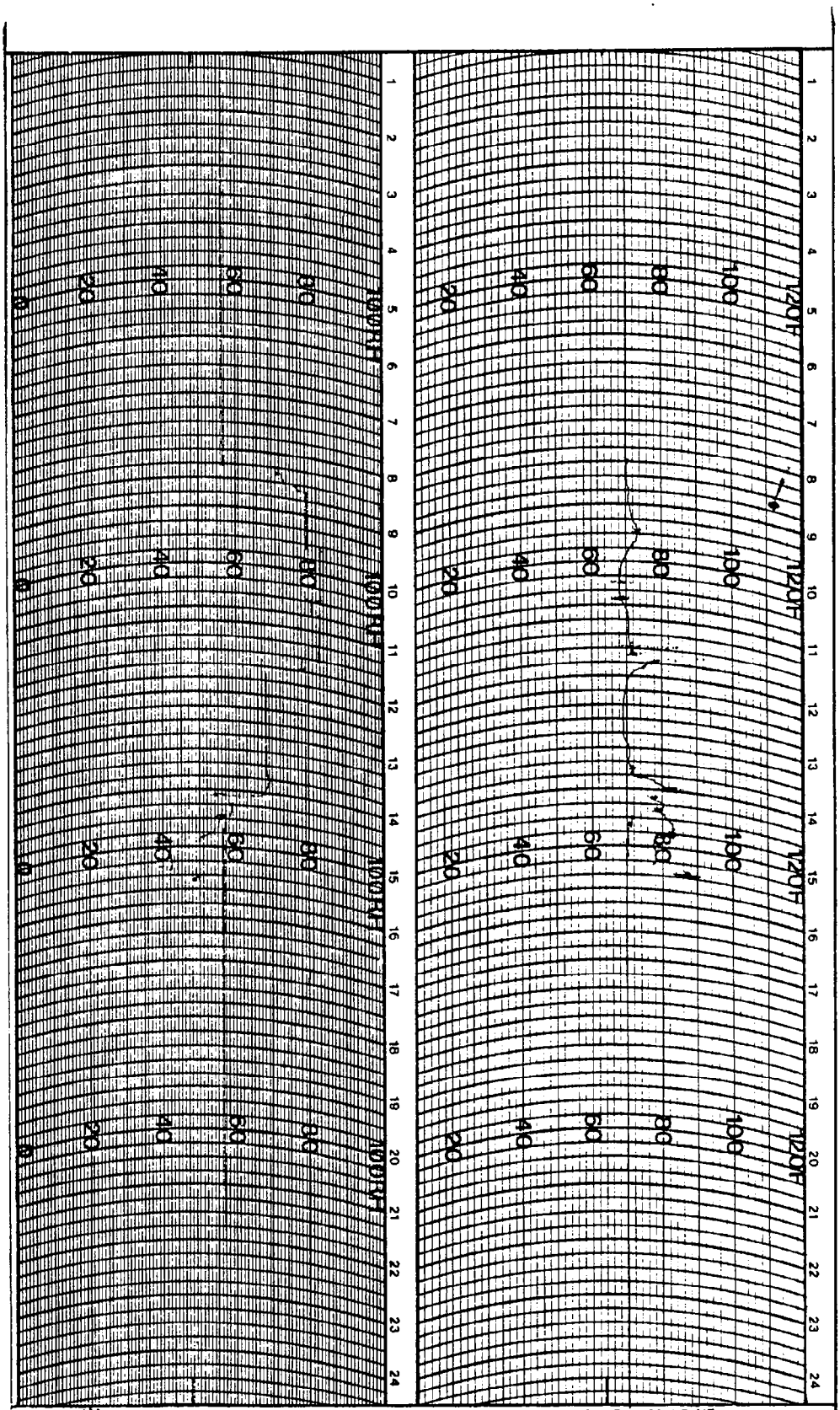
Heavy Truck Instrumentation Information

Test No. 950616

No.	Location	Axis	Mfr.	Model	S/N	Orientation (+ Sensing)
1	Center of Gravity					
	Longitudinal	X	Endevco	7264	BH91J	Front
	Lateral	Y	Endevco	7264	BC75J	Left
	Vertical	Z	Endevco	7264	BF99J	Up
2	Front Frame Crossmember					
	Longitudinal	X	Endevco	7264	BG38J	Rear
	Lateral	Y	Endevco	7264	BH32J	Left
	Vertical	Z	Endevco	7264	AU31	Up

Sign Convention
NHTSA Data Tape Reference Guide

Accelerometers:	+X: Forward	
	+Y: Leftward	
	+Z: Upward	
Potentiometers:	+Chest Longitudinal Deflection:	outward
	+Chest Lateral Deflection:	leftward
	+Seat Belt Displacement:	outward
	+Seat Belt Extension:	elongation
	+Knee Slider Displacement:	distance between femur and tibia increased (in relation to a seated dummy)
Load Cells:	+Femur Force:	tension
	+Seat Belt Force:	tension
	+Barrier Force:	tension
Neck Load Cells:	+X Force:	head pushed forward
	+Y Force:	head pushed leftward
	+Z Force:	head pulled upward (tension on neck)
	+X Moment:	right ear rotating toward right shoulder
	+Y Moment:	chin rotating toward chest
	+Z Moment:	chin rotating toward left shoulder
Tibia Load Cells:	+X Force:	tension
	+Y Force:	tension
	+Z Force:	tension
	+X Moment:	bottom of tibia moving leftward
	+Y Moment:	bottom of tibia moving rearward



Occupant Compartment Thermograph