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V2468

Vehicle Safety Compliance Testing
for Occupant Crash Protection,
Windshield Retention, Windshield Zone Intrusion,
and Fuel System Integrity

Saturn Corporation
1997 Saturn SL
4-door sedan
NHTSA Number: CV0121
TRC Test Number: 961017

Transportation Research Center Inc.
10820 State Route 347
East Liberty, OH 43319



November 7, 1996

Final Report

Prepared For:
U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Vehicle Safety Compliance (NEF-30)
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16. Abstract A 30 mph flat frontal barrier impact test was conducted on a 1997 Saturn SL 4-door sedan, NHTSA No. CV0121, at Transportation Research Center Inc. on October 17, 1996. This test was conducted to determine compliance with Federal Motor Vehicle Safety Standards (FMVSS): 208, "Occupant Crash Protection"; 212, "Windshield Retention"; 219 (partial), "Windshield Zone Intrusion"; and 301, "Fuel System Integrity." The barrier impact velocity was 29.4 mph. The vehicle's maximum static crush was 16.3 inches. The ambient temperature was 77° F. The driver's Head Injury Criteria (HIC) was 186. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 33.0 g. The driver's chest deflection was 1.6 inches. The driver's left and right femur maximum axial forces were 1019 pounds and 1016 pounds, respectively. The passenger's HIC was 236. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 41.6 g. The passenger's chest deflection was 0.5 inch. The passenger's left and right femur maximum axial forces were 1431 pounds and 1105 pounds, respectively.			
17. Key Words Frontal Impact 30 mph Vehicle Safety Compliance Testing: FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Retention" FMVSS 219 (partial), "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"		18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division Nassif Building, Room 5108 400 Seventh Street, S.W. Washington, DC 0590	
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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	meters	m
yd	yards	0.9	kilometers	km
mi	miles	1.6		
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, SO Catalog No. C13.1-0.286.

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
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)

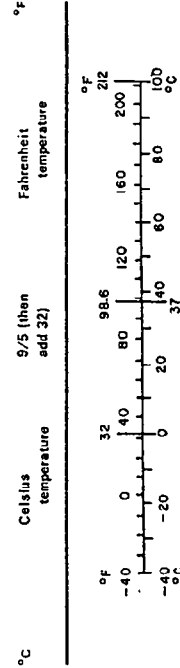


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Section 1.0

Purpose and Test Procedure

Purpose

This 30 mph flat frontal barrier impact test is part of the Federal Motor Vehicle Safety Standards (FMVSS) 208, 212, 219 (partial), and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by the Transportation Research Center Inc. (TRC) under Contract No. DTNH22-93-D-01089. The purpose of this test was to determine if the subject vehicle, a 1997 Saturn SL 4-door sedan, NHTSA No. CV0121, meets the performance requirements of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Retention"; FMVSS 219 (partial), "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," in the flat frontal barrier impact mode.

Test Procedure

This test was conducted in accordance with NHTSA's Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-208-09. Data was obtained relative to FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Retention"; FMVSS 219 (partial), "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," performance.

The test vehicle was instrumented with seven (7) accelerometers to measure longitudinal axis accelerations and one (1) accelerometer to measure vertical axis acceleration. The vehicle's specified impact velocity range was 28.9 to 29.9 mph. The vehicle impacted a flat frontal barrier.

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

Both dummies were instrumented with head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations; chest deflection potentiometers; left and right femur load cells to measure axial forces; and upper and lower tibia load cells to measure forces and moments.

The forty-six (46) data channels were digitally sampled at 12,500 samples per second and processed per Sections 11.13 through 11.15 of the Laboratory Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and fourteen (14) 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 FMVSS 208, 212, 219 (partial) and 301 data are presented in Section 3.0. The vehicle, occupant, and camera measurements are presented in Section 4.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the manufacturer's vehicle information.

Section 2.0

Frontal Barrier Impact Test Summary

Test Results Summary

This flat frontal barrier test was conducted at TRC on October 17, 1996.

The test vehicle, a 1997 Saturn SL 4-door sedan, NHTSA No. CV0121, appeared to comply with the performance requirements of FMVSS 208, 212, 219 (partial), and 301 in the flat frontal barrier impact mode. The Head Injury Criteria (HIC) calculations were less than 1000, the chest resultant accelerations did not exceed 60 g's, the chest deflections did not exceed 3.0 inches, and the compressive forces transmitted through the upper legs did not exceed 2,250 pounds as measured by Part 572 E dummies seated in the front outboard designated seating positions. The vehicle's restraint system met the applicable comfort and convenience requirements. The windshield periphery retention was 100 percent. There was no penetration into any portion of the windshield. No fluid spilled from the vehicle's fuel system following the impact or during the static rollover test.

The test vehicle was equipped with airbags at the driver's and right front passenger's seating positions. The vehicle's test weight was 2758 pounds. The vehicle's impact speed was 29.4 mph. The vehicle's maximum static crush was 16 .3 inches.

The driver's HIC was 186. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 33.0 g. The driver's chest deflection was 1.6 inches. The driver's left and right femur maximum compressive forces were 1019 pounds and 1016 pounds, respectively.

The right front passenger's HIC was 236. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 41.6 g. The passenger's chest deflection was 0.5 inch. The right front passenger's left and right femur maximum compressive forces were 1431 pounds and 1105 pounds, respectively.

There was no loss of windshield periphery retention and no penetration through the windshield. Following the impact, no fluid spilled from the vehicle's fuel system prior to the static rollover test or during any portion of the static rollover test.

Data Acquisition Explanations

The driver's head X-axis accelerometer, HEDXG1, recorded questionable data between approximately 30 to 40 milliseconds, at approximately 60 milliseconds, at approximately 125 milliseconds, and at approximately 240 milliseconds.

The above data losses affected the driver's head resultant calculation, HEDRG1. The driver's Head Injury Criteria (HIC) calculation was calculated between 60 and 125 milliseconds.

Table 1 Crash Test Summary

NHTSA number:	CV0121
Test type:	Frontal barrier impact
Test date:	10/17/96
Test time:	1512
Ambient temperature at impact area:	77° F
Vehicle year/make/ model/body style:	1997/Saturn/SL/4-door sedan
Vehicle test weight:	2758 lb
Impact angle ¹ :	0°
Impact velocity ² :	
Primary:	29.4 mph
Secondary:	29.4 mph
Maximum static crush:	16.3 in
Average rebound:	60.5 in
Number of cameras:	
Real-time:	1
High-speed:	14
Door opening data:	
Left-front:	Easy
Right-front:	Easy

¹ With respect to tow track centerline.

² Speed trap measurement ($\pm .05$ mph accuracy)

Table 1 Crash Test Summary, Cont'd.

Dummies:	<u>Driver #229</u>	<u>Passenger #230</u>
Type:	Part 572 E	Part 572 E
Location:	Left front	Right front
Restraint:	Airbag	Airbag
Number of data channels:	19	19
Front seat data:		
Seat track failure:	None	None
Seat back failure:	None	None
Visible dummy contact points:		
Head:	Airbag, sun visor, header	Airbag, sun visor, header
Chest:	Airbag	Airbag
Abdomen:	None	None
Left knee:	Instrument panel	Instrument panel
Right knee:	Instrument panel	Instrument panel

Table 2 Test Vehicle Information

Vehicle year/make/
model/body style: 1997/Saturn/SL/4-door sedan

Color: White

VIN: 1G8ZF5280VZ147132

NHTSA number: CV0121

Engine data:

Placement: Transverse/Lateral

Cylinders: 4

Displacement: 1.9 liters

Transmission data: 5 speed, X manual, __automatic, __overdrive

Final drive: X fwd, __rwd, __4wd

Date vehicle received: 10/15/96

Odometer reading: 189

Dealer's name
and address: Saturn of Dayton
995 Miamisburg-Centerville Road
Dayton, OH 45459

Accessories:

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

Certification data from vehicle's label:

Vehicle manufactured by: Saturn Corporation

Date of manufacture: 08/96

VIN: 1G8ZF5280VZ147132

GVWR: 3219 lb

GAWR: Front: 1627 lb

Rear: 1592 lb

Table 2 Test Vehicle Information, Cont'd.

Size of tires on vehicle: Firestone P175/70R14
Spare tire: Space Saver
Type of front seats: Adjustable Manual

Tire & capacity data from vehicle's label:

Recommended tire size: P175/70R14

Recommended cold tire pressure:

Front: 30 psi

Rear: 26 psi

Designated Seating Capacity:

Front 2

Rear 3

Total 5

Vehicle Capacity Weight: 864 lb

Test vehicle attitudes:

Delivered attitude: LF: 26.7 in RF: 26.7 in LR: 26.9 in RR: 27.0 in

Fully loaded attitude: LF: 25.6 in RF: 25.6 in LR: 25.2 in RR: 25.2 in

Pre-test attitude: LF: 25.8 in RF: 25.8 in LR: 25.2 in RR: 25.6 in

Table 2 Test Vehicle Information, Cont'd.

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

Right front	695	lb	Right rear	453	lb
Left front	707	lb	Left rear	468	lb
Total front weight	1402	lb	(60.4% of total vehicle weight)		
Total rear weight	921	lb	(39.6% of total vehicle weight)		
Total delivered weight	2323	lb			

Calculation of test vehicle's target test weight:

RCLW = Rated Cargo and Luggage Weight

UDW = Unloaded Delivered Weight (2323 lb)

VCW¹ = Vehicle Capacity Weight = 864 lb

DSC¹ = Designated Seating Capacity (5)

RCLW = VCW - 150 (DSC) = 864 - 150 (5) = 114 lb

Target test weight = UDW + RCLW + (Number of Hybrid III dummies x 167 lb per dummy)

Target test weight = 2323 + 114 + 334 = 2771 lb

Weight of test vehicle with required dummies and 101 lb of cargo weight:

Right front	792	lb	Right rear	593	lb
Left front	780	lb	Left rear	593	lb
Total front weight	1572	lb	(57.0% of total vehicle weight)		
Total rear weight	1186	lb	(43.0% of total vehicle weight)		
Total test weight	2758	lb	(0.5% under target test weight)		

Weight of ballast secured in vehicle: None

Components removed to meet target test weight: Right rear tail-light and rear seat.

CG rearward of front wheel centerline: 43.9 in

Vehicle Wheelbase: 102.1 in

¹ From vehicle's recommended tire pressure label.

Table 3 Post-Impact Data

Test number: 961017
NHTSA number: CV0121
Test date: 10/17/96
Test time: 1512
Test type: Frontal barrier impact
Impact angle: 0°
Ambient temperature
at impact area: 77° F
Temperature in
occupant compartment: 70° F
Impact velocity:
Primary: 29.4 mph
Secondary 29.4 mph
Specified range: 28.9 to 29.9 mph

Distance from vehicle to barrier:

Entering velocity trap: 14.0 in
Exiting velocity trap: 2.0 in

Test vehicle static crush:

Overall length of test vehicle:

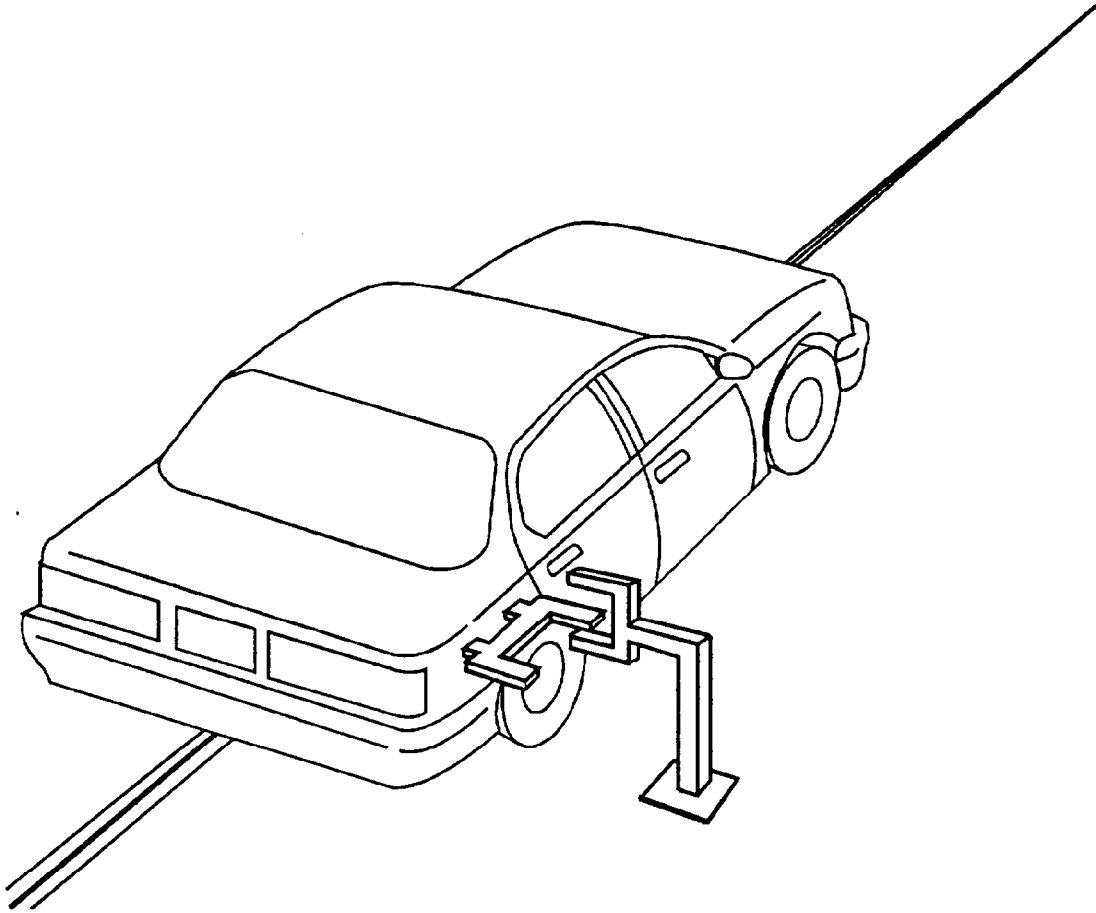
Pre-test:	L:	172.2 in	C:	176.3 in	R:	172.5 in
Post-test:	L:	159.3 in	C:	160.0 in	R:	157.2 in
Total crush:	L:	12.9 in	C:	16.3 in	R:	15.3 in
Average crush:		14.8 in				

Test vehicle rebound from flat barrier:

Distance from test vehicle to barrier:

Post-test:	L:	60.2 in	C:	59.4 in	R:	61.9 in
Average rebound:		60.5 in				

Figure 1 Impact Velocity Measurement System



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

The vanes have a one-foot spacing.

Figure 2 Accident Investigation Division Data for 30 mph Frontal Barrier Impact

NHTSA number: CV0121
Test date: 10/17/96
Vehicle year/make/
model/body style: 1997/Saturn/SL/4-door sedan
Vehicle size category: 4-door sedan
VIN: 1G8ZF5280VZ147132
Build date: 08/96
Test weight: 2758 lb
Vehicle wheelbase: 102.1 in
Maximum width: 66.9 in
Front overhang: 37.4 in

Collision Deformation

Classification (CDC) Code: 12FDEW2

Crush depth measurements:	C1:	12.9 in
	C2:	13.3 in
	C3:	15.6 in
	C4:	16.3 in
	C5:	16.3 in
	C6:	15.3 in

Midpoint of damage: D: Vehicle Longitudinal Centerline

Length of damaged
region: L: 48.0 in

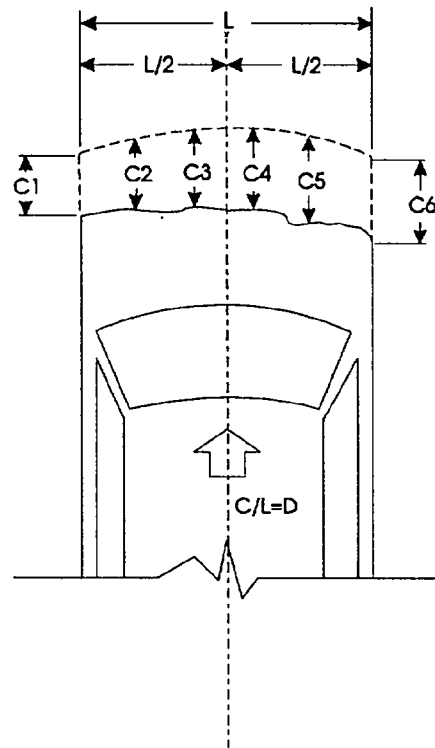


Table 4 Post-test Airbag Data

NHTSA number:	CV0121	
Test date:	10/17/96	
Technician:	Jenkins	
Vehicle year/make/ model/body style:	1997/Saturn/SL/4-door sedan	
A. Number of airbag vent holes:		
Driver:	2	
Passenger:	None	
B. Size of airbag vent holes:		
Driver:	.75 in. diameter	
Passenger:	NA	
C. Total airbag vent area:		
Driver:	.88 in ²	
Passenger:	NA	
D. Deflated airbag length and width dimensions or, if round, diameter		
Driver:	Length	NA
	Width	NA
	Diameter	19.5 in
Passenger:	Length:	27.0 in
	Width:	19.0 in
	Diameter:	NA

Table 4 Post-test Airbag Data, Cont'd.

E. Is the airbag tethered?

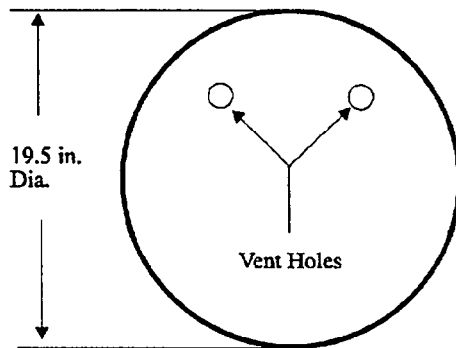
Driver: Yes

If yes, record length of tether: 8.5 inches.

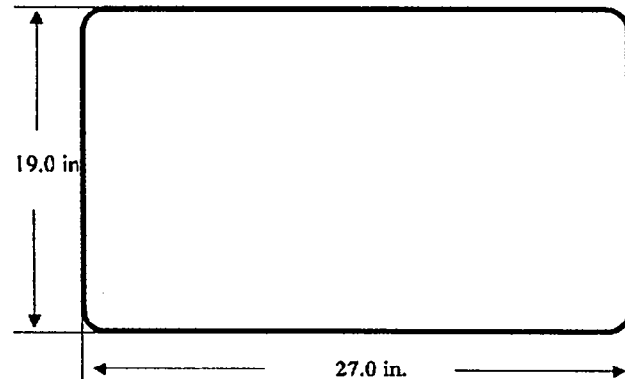
Passenger: No

If yes, record length of tether: NA

Driver's airbag:



Passenger's airbag:



F. Airbag and gas generator part numbers and manufacturer's names.

Driver: Manufacturer: NA

Airbag: NA

Inflator: AB0375IYQBYD29

Passenger: Manufacturer: NA

Airbag: NA

Inflator: AL9083ICE1233517

Figure 3 Vehicle Accelerometer Placement

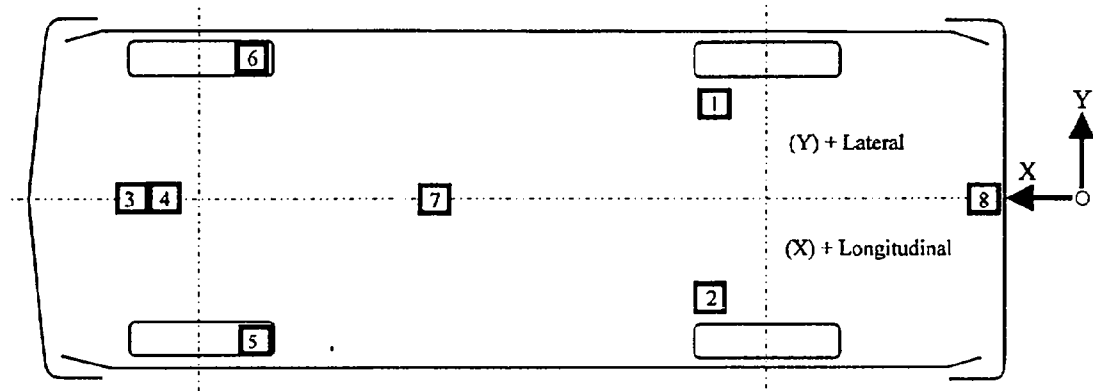
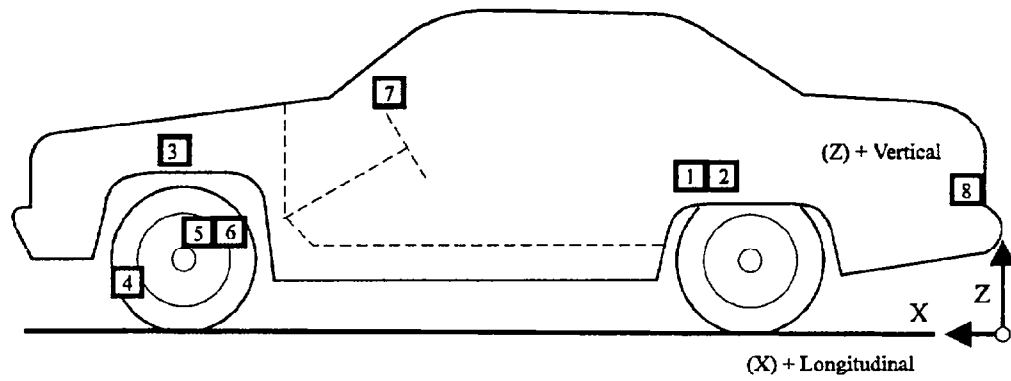


Table 5 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 961017 No. LOCATION	X	Y	Z	POSITIVE DIRECTION	NEGATIVE DIRECTION
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE 63.7 in POST 63.7 in	21.2 in 21.2 in	10.9 in 12.4 in	1.2 g @ 148.1 ms	22.2 g @ 80.1 ms
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE 63.7 in POST 63.7 in	-21.1 in -21.1 in	11.0 in 12.2 in	1.3 g @ 150.9 ms	22.4 g @ 73.1 ms
3 ENGINE TOP LONGITUDINAL	PRE 142.4 in POST 138.5 in	-2.7 in -0.4 in	32.6 in 32.2 in	4.7 g @ 60.2 ms	44.9 g @ 21.9 ms
4 ENGINE BOTTOM LONGITUDINAL	PRE 142.5 in POST 137.8 in	-6.3 in -6.5 in	10.3 in 9.4 in	7.8 g @ 61.6 ms	52.6 g @ 45.9 ms
5 RIGHT BRAKE CALIPER LONGITUDINAL	PRE 143.9 in POST 144.0 in	-25.2 in -24.8 in	12.3 in 11.9 in	33.8 g @ 105.0 ms	335.0 g @ 110.5 ms
6 LEFT BRAKE CALIPER LONGITUDINAL	PRE 143.9 in POST 140.0 in	25.2 in 24.6 in	12.3 in 12.2 in	29.8 g @ 80.2 ms	58.1 g @ 59.0 ms
7 INSTRUMENT PANEL CENTER LONGITUDINAL	PRE 116.9 in POST 117.0 in	0.0 in 0.0 in	33.1 in 34.0 in	24.6 g @ 36.1 ms	42.4 g @ 31.1 ms
8 VEHICLE REAR CENTER VERTICAL	PRE 9.8 in POST 9.8 in	0.0 in 0.0 in	17.9 in 20.9 in	8.0 g @ 8.9 ms	8.8 g @ 21.7 ms

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

Section 3.0

FMVSS 208, 212, 219 (Partial), and 301 Data

Table 6 Dummy Injury Criteria

<u>Maximum Acceleration</u>							
	<u>Head</u>				<u>Chest</u>		
	X	Y	Z	R	X	Y	Z
Driver	-37.3 g	6.0 g	-14.3 g	40.2 g	-33.4 g	4.4 g	9.3 g
Passenger	51.2 g	36.0 g	-19.7 g	55.2 g	-40.0 g	7.3 g	-16.5 g

<u>Maximum Femur Compressive Force</u>		
	<u>Left Femur</u>	<u>Right Femur</u>
Driver	1019 lbf	1016 lbf
Passenger	1431 lbf	1105 lbf

<u>Head Injury Criteria¹</u>			
	<u>HIC</u>	<u>Time t₁</u>	<u>Time t₂</u>
Driver	186	70.0 ms	106.0 ms
Passenger	236	77.4 ms	113.4 ms

<u>Chest Maximum Resultant Acceleration²</u>			
	<u>Acceleration</u>	<u>Time t₁</u>	<u>Time t₂</u>
Driver	33.0 g	81.0 ms	84.0 ms
Passenger	41.6 g	75.0 ms	78.0 ms

<u>Maximum Chest Deflection</u>	
Driver	1.6 in
Passenger	0.5 in

¹ As defined in FMVSS No. 208

² Defined as equal to or exceeding 0.003 sec. duration

Dummy Kinematic Summary

Driver Dummy

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head and chest impacted the airbag, sun visor, and head liner. The dummy's head and chest were restrained by the airbag. The dummy's head and upper torso rotated rearward as the dummy rebounded into the seat back. The dummy's head contacted the head restraint. The driver dummy came to rest seated in the driver's seat.

Right Front Passenger Dummy

Upon impact, the right front passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head and chest impacted the airbag, sun visor and head liner. The dummy's head and chest were restrained by the passenger's airbag. The dummy rebounded rearward into the seat back. The dummy came to rest seated in the right front passenger's seat.

Table 7 FMVSS 208 Seat Belt Comfort and Convenience Test Summary

Front Outboard Designated Seating Positions

NHTSA number: CV0121

Vehicle model year/make/model/body style: 1997/Saturn/SL/4-door sedan

Date of comfort/convenience check: 10/17/96

Technician performing check: Markusic

GVWR: 3219 lb

Automatic seat belts installed in any vehicle, other than a walk-in van-type vehicle which has a gross vehicle weight rating of 10,000 pounds or less, and is manufactured on or after September 1, 1986, shall meet the requirements for convenience hooks, webbing tension-relieving devices, and belt contact force.

Manual seat belts installed for compliance with this standard in front outboard designated seating positions of any vehicle, other than a walk-in van-type vehicle which has a gross vehicle rating of 10,000 pounds or less, and is manufactured after September 1, 1989, shall meet the requirements for belt contact force, plate access, retraction and seat belt guides, and hardware.

Vehicle Equipment:

The vehicle's front outboard seating positions were equipped with manual Type 2 seat belts which must comply with the dynamic test requirements of S5.1; requirements for webbing tension-relieving devices (S7.4.2), belt contact force (S7.4.3), latchplate access (S7.4.4), retraction (S7.4.5), and seat belt guides and hardware (S7.4.6) apply.

Convenience Hooks (S7.4.1):

Not applicable, the vehicle was not equipped with automatic seat belts.

Table 7 FMVSS 208 Seat Belt Comfort and Convenience Test Summary

Front Outboard Designated Seating Positions, Cont'd.

NHTSA number: CV0121

Vehicle model year/make/model/body style: 1997/Saturn/SL/4-door sedan

Date of comfort/convenience check: 10/17/96

Technician performing check: Markusic

GVWR: 3219 lb

Webbing Tension-Relieving Device (S7.4.2):

Not applicable, the vehicle is not equipped with automatic seat belts or manual type-2 belts that must comply with the dynamic test requirements.

Belt Contact Force (S7.4.3):

The belt contact force on the chest of the test dummy is 0.4 pound.

Latchplate Access (S7.4.4):

The seat belt latchplates, in their normal stowed position, are within the reach envelope.

The clearance test block moves unhindered to the latchplate or buckle.

Retraction (S7.4.5):

The seat belt automatically retracts when the seat belt latchplate is released.

The stowed seat belt webbing and hardware are not pinched when the door is closed.

Table 7 FMVSS 208 Seat Belt Comfort and Convenience Test Summary

Front Outboard Designated Seating Positions, Cont'd.

NHTSA number: CV0121

Vehicle model year/make/model/body style: 1997/Saturn/SL/4-door sedan

Date of comfort/convenience check: 10/17/96

Technician performing check: Markusic

GVWR: 3219 lb

Seat Belt Guides and Hardware (S7.4.6):

The seat cushion is not removable.

The seat back does not serve a function other than seating.

The seat is not removable.

The seat is movable but the space formerly occupied by the seat cannot be used for a secondary function.

Note: If the seat or seat cushion is removable or if the seat is movable so the space formerly occupied by the seat can be used for a secondary function, the seat belt guides and hardware requirements do not apply.

The webbing is not designed to pass through the seat cushion or between the cushion and seat back.

The restraint system does not include webbing guides.

The vehicle does not contain a center arm rest.

Table 8 FMVSS 208 Equipment Data

FMVSS 208 Seat Belt Warning System Data

With an occupant in the driver's position and the unbelt in stowed position and ignition switch placed in the "start/on" position, the duration of the reminder light is 6 s. The audible warning signal operates continuously.

With an occupant in the driver's position and the unbelt in use and the ignition switch placed in the "start/on" position the duration of audible warning signal and reminder light operation is 0 s.

NOTE: the audible warning should not operate.

The visual seat belt warning is the symbol from Table 2 of FMVSS 101.

Table 8 FMVSS 208 Equipment Data, Cont'd.

FMVSS 208 Labeling and Driver's Manual Data

The labels which describe the manufacturer's maintenance or replacement schedule for the crash-deployed occupant protection system were located on the sun visor.

The manufacturer's recommended regular airbag maintenance was that no regular maintenance is required.

Appropriate instructions concerning maintenance and/or replacement of this system were provided in the owner's manual on page 38.

A description of the functional operation of the system was provided in the owner's manual on pages 33 and 35.

A reference to the instructions and description of the system was included on the label.

An owner's manual was provided.

The owner's manual contained appropriate information concerning maintenance and/or replacement and a description of the functional operation of the systems on pages 33 - 38.

Table 8 FMVSS 208 Equipment Data, Cont'd.

FMVSS 208 Readiness Indicator Data

The vehicle contained a crash-deployed occupant protection system which was not totally mechanical. The readiness indicator was a light located on the lower left corner of the instrument cluster.

The readiness indicator was clearly visible to the driver.

A list of the elements in the occupant restraint system, being monitored by the readiness indicator was provided in the owner's manual on page 128.

FMVSS 208 Rear Outboard Seating Position Seat Belts

All rear outboard seating positions had Type 2 seat belts.

Figure 4 FMVSS 212 Test Data

Details of windshield mounting such as retention method, trim type, etc.:

Plastic trim around outer perimeter and adhesive around inner perimeter.

Clips or brackets used to retain windshield: None

FMVSS 212 requirements: The post-test periphery retention amount must be at least 75% of the pre-test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of the windshield for vehicles equipped with automatic restraint systems for front occupants.

Windshield periphery measurements:

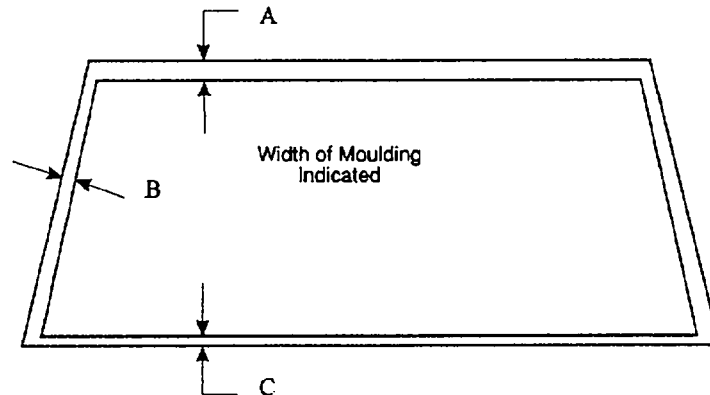
	Pre-test	Post-test	Percent Retention
Right side	84.3 in	84.3 in	100.0
Left side	84.3 in	84.3 in	100.0
Total	168.6 in	168.6 in	100.0

Pre-test windshield mounting material temperature: 70° F

A = 0.6 in

B = 2.0 in

C = 1.0 in



Front view of windshield¹

Loss of windshield retention lengths: None

¹ Indicate areas of loss of retention, if any, on windshield diagram.

Figure 5 FMVSS 219 Test Data

Protected zone lower edge requirement:

The lower edge of the protected zone is determined by placing a 6.5-inch diameter rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. Draw the locus of points on the inner surface of the windshield contactable by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 0.5 inch from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection onto the outer surface of the windshield of this line.

Windshield measurements:

A = 48.4 in

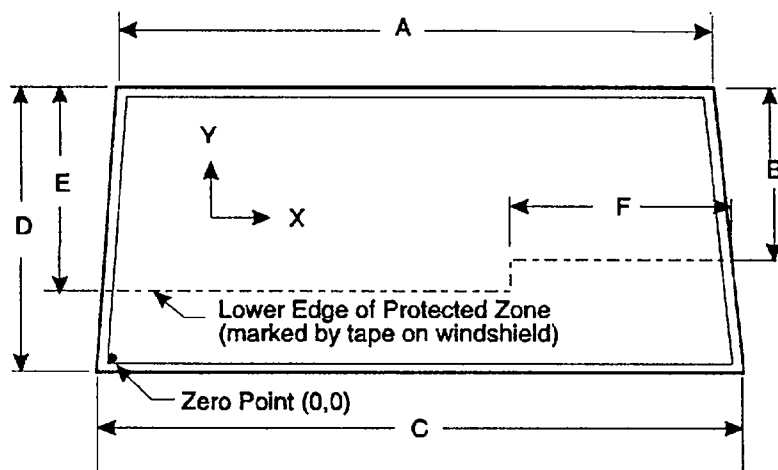
B = 24.3 in

C = 66.3 in

D = 33.7 in

E = 23.4 in

F = 22.4 in



FRONT VIEW

Method of adhering protected zone template to windshield:

NA

Areas of windshield template penetration greater than 0.25 in:

NA

Coordinates

	X	Y
1.		
2.		
3.		

Areas of windshield penetration, below the protected zone, through the inner surface of the windshield:

None

1.
2.
3.

Table 9 Fuel System Data

Vehicle year/make/ model/body style:	1997/Saturn/SL/4-door sedan
NHTSA number:	CV0121
Fuel system capacity:	12.2 gal (from owner's manual)
Usable capacity:	12.1 gal (furnished by COTR)
Test volume range:	11.2 gal to 11.5 gal (92-94% of usable)
Actual test volume:	11.3 gal (with entire fuel system filled)
Test fluid type:	Stoddard solvent
Specific gravity:	0.764
Kinematic viscosity:	0.99 centistoke
Test fluid color:	purple
Type of fuel pump:	electric

The electric fuel pump did not operate with ignition switch "on" and the engine not operating.

Details of fuel system: The fuel tank is located in the center of the vehicle in front of the rear axle. The fuel filler neck enters the rear of the tank and extends to the left side of the vehicle.

Table 10 FMVSS 301 Post-Impact Test Data

NHTSA number: CV0121
Test date: 10/17/96
Vehicle year/make/
model/body style: 1997/Saturn/SL/4-door sedan

Test requirements:

Test vehicle fuel tank filled to 92 to 94% of manufacturer's usable capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

Test vehicle impact type:

- ☒ Frontal (30 mph)
☐ Oblique (30 mph) with ___° barrier face first contacting (driver's/passenger's) side
☐ Rear moving barrier (30 mph)
☐ Lateral moving barrier (20 mph)

Fuel system fluid spillage measurements:

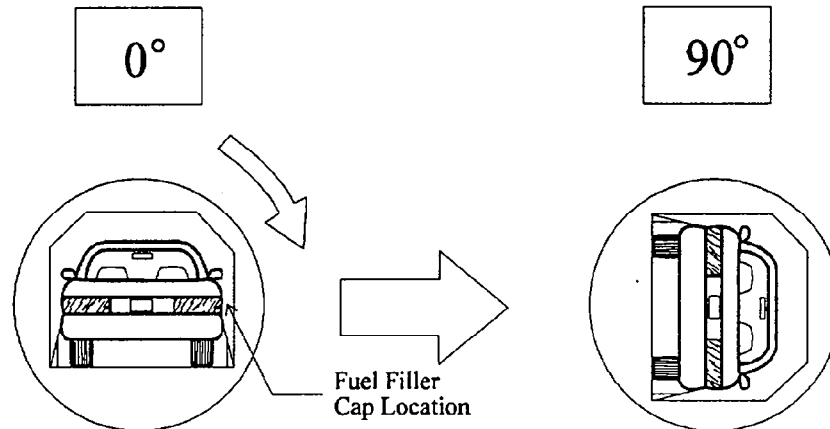
	<u>Test Results</u>	<u>Maximum Allowable</u>
1. From impact until vehicle motion ceases	0 oz	1 oz
2. 5-Minute period after vehicle motion ceases	0 oz	5 oz
3. Next 25 minutes after 5-minute period	0 oz	1 oz/1 min

Fuel system fluid spillage location(s): None

Figure 6 FMVSS 301 Static Rollover Test Data

NHTSA number: CV0121

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds

FMVSS 301 position hold time = 5 minutes, 0 seconds

Total = 7 minutes, 0 seconds

Next whole minute interval = 7 minutes

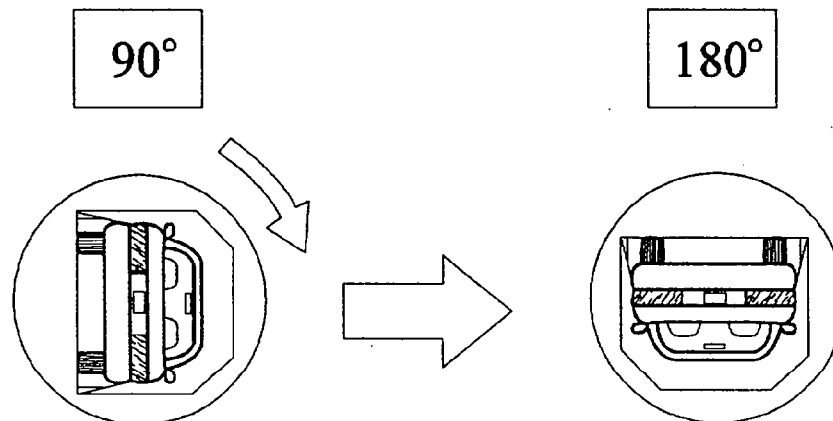
Fuel system fluid spillage measurements:

	Test Results	Maximum Allowable
<u>0° to 90° rotation (fuel filler cap down)</u>		
1. First five minutes from onset of rotation	0 oz	5 oz
2. Sixth minute from onset of rotation	0 oz	1 oz
3. Seventh minute from onset of rotation	0 oz	1 oz

Fuel system fluid spillage location(s): None

Figure 6 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds
 FMVSS 301 position hold time = 5 minutes, 0 seconds
 Total = 7 minutes, 0 seconds
 Next whole minute interval = 14 minutes

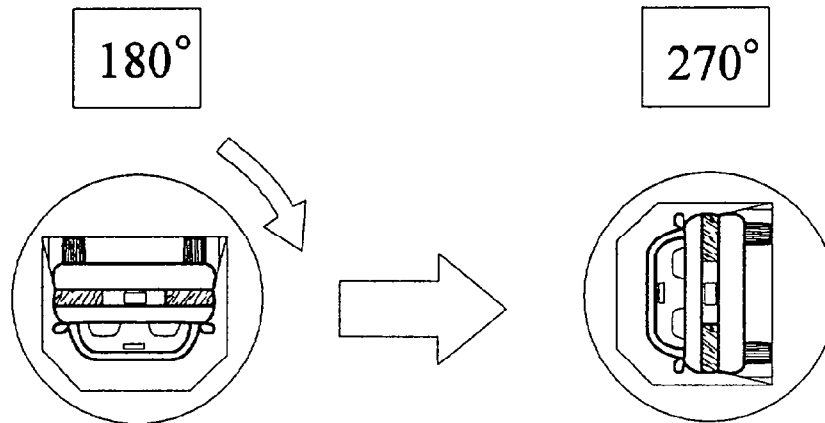
Fuel system fluid spillage measurements:

90° to 180° rotation	Test Results	Maximum Allowable
1. First five minutes from onset of rotation	0 oz	5 oz
2. Sixth minute from onset of rotation	0 oz	1 oz
3. Seventh minute from onset of rotation	0 oz	1 oz

Fuel system fluid spillage location(s): None

Figure 6 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds
 FMVSS 301 position hold time = 5 minutes, 0 seconds
 Total = 7 minutes, 0 seconds
 Next whole minute interval = 21 minutes

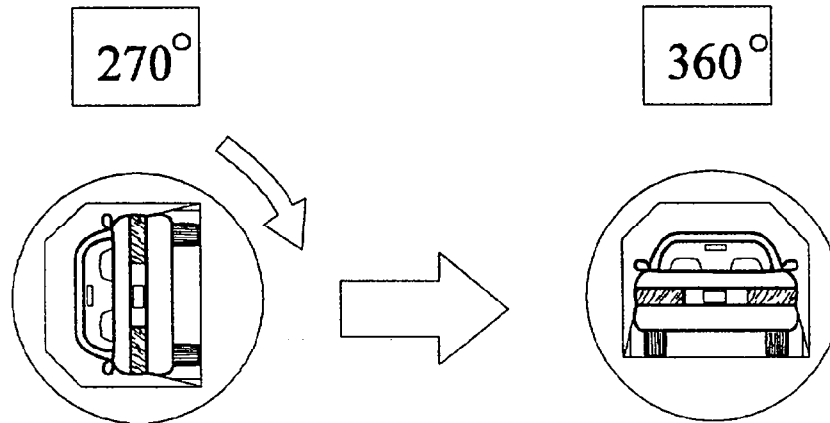
Fuel system fluid spillage measurements:

	Test Results	Maximum Allowable
<u>180 to 270° rotation</u>		
1. First five minutes from onset of rotation	0 oz	5 oz
2. Sixth minute from onset of rotation	0 oz	1 oz
3. Seventh minute from onset of rotation	0 oz	1 oz

Fuel system fluid spillage location(s): None

Figure 6 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90°	=	2	minutes,	0	seconds
FMVSS 301 position hold time	=	5	minutes,	0	seconds
Total	=	7	minutes,	0	seconds
Next whole minute interval	=	28	minutes		

Fuel system fluid spillage measurements:

270° to 360° rotation		Test Results	Maximum Allowable
1.	First five minutes from onset of rotation	0 oz	5 oz
2.	Sixth minute from onset of rotation	0 oz	1 oz
3.	Seventh minute from onset of rotation	0 oz	1 oz

Fuel system fluid spillage location(s): None

Section 4.0

Vehicle, Occupant, and Camera Measurements

Figure 7 Pre-test and Post-test Measurement Points

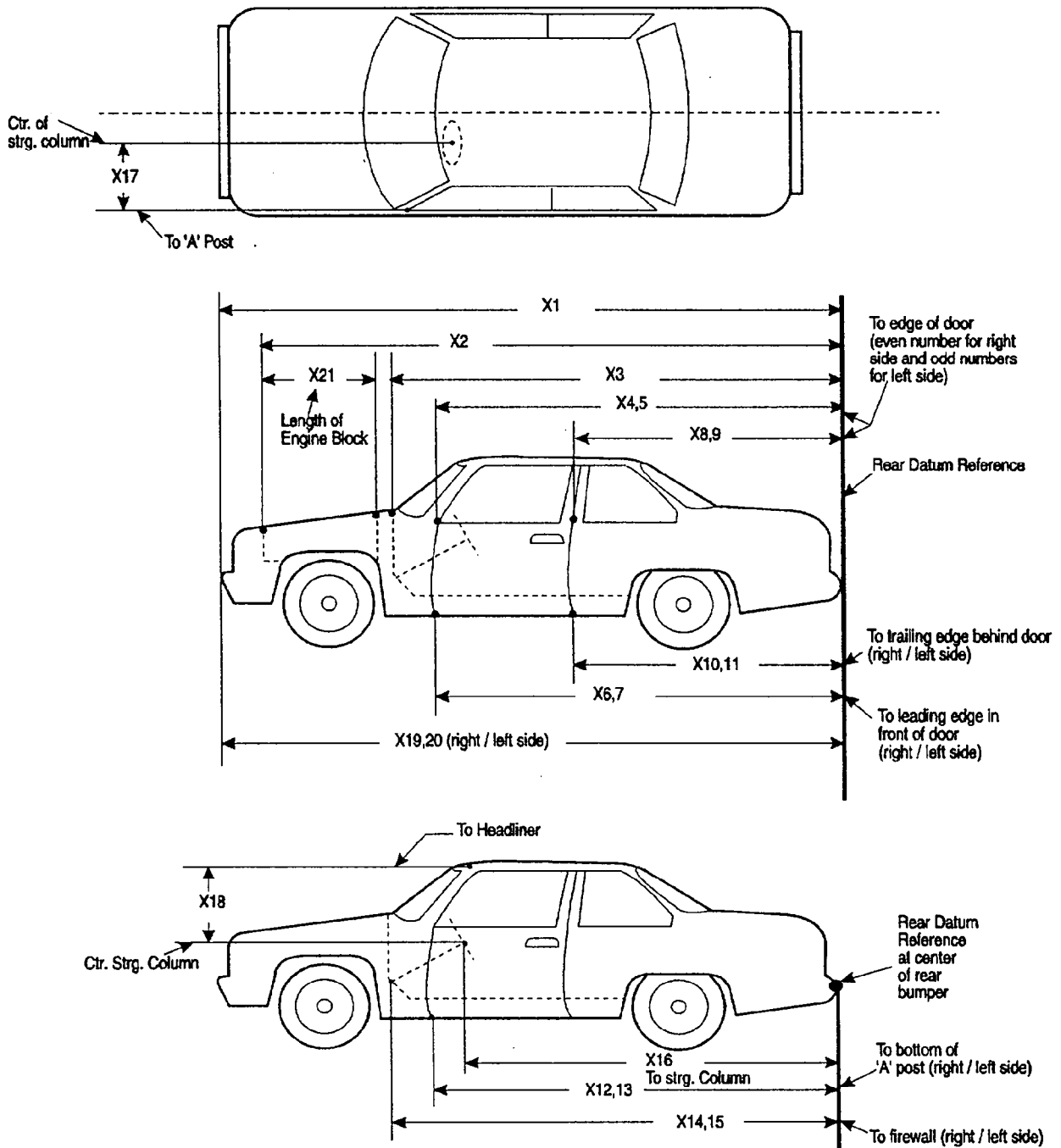


Table 11 Impacted Vehicle Measurements

Vehicle year/make/model/body style: 1997/Saturn/SL/4-door sedan

Test Number: 961017

No.	Type of measurement	Pre-test	Post-test	Difference
X1	Total length of vehicle at centerline	176.3 in	160.0 in	16.3 in
X2	Rear surface of vehicle to front of engine block	148.7 in	143.9 in	4.8 in
X3	Rear surface of vehicle to firewall	133.2 in	131.8 in	1.4 in
X4	Rear surface of vehicle to upper leading edge of right door	118.7 in	118.5 in	0.2 in
X5	Rear surface of vehicle to upper leading edge of left door	118.5 in	118.8 in	-0.3 in
X6	Rear surface of vehicle to lower leading edge of right door	117.9 in	117.2 in	0.7 in
X7	Rear surface of vehicle to lower leading edge of left door	117.9 in	117.4 in	0.5 in
X8	Rear surface of vehicle to upper trailing edge of right door	78.5 in	78.7 in	-0.2 in
X9	Rear surface of vehicle to upper trailing edge of left door	78.5 in	78.9 in	-0.4 in
X10	Rear surface of vehicle to lower trailing edge of right door	78.8 in	78.9 in	-0.1 in
X11	Rear surface of vehicle to lower trailing edge of left door	79.6 in	79.1 in	0.5 in
X12	Rear surface of vehicle to bottom of "A" post on right side	118.4 in	117.4 in	1.0 in
X13	Rear surface of vehicle to bottom of "A" post on left side	117.9 in	117.6 in	0.3 in
X14	Rear surface of vehicle to firewall - right side	131.1 in	129.0 in	2.1 in
X15	Rear surface of vehicle to firewall - left side	130.8 in	130.1 in	0.7 in
X16	Rear surface of vehicle to steering wheel center	101.5 in	103.3 in	-1.8 in
X17	Center of steering column to "A" post	12.3 in	12.2 in	0.1 in
X18	Center of steering column to headliner	17.5 in	16.9 in	0.6 in
X19	Rear surface of vehicle to right side of front bumper	172.5 in	157.2 in	15.3 in
X20	Rear surface of vehicle to left side of front bumper	172.2 in	159.3 in	12.9 in
X21	Length of engine block	16.5 in	16.5 in	0.0 in

Figure 8 Vehicle Target Locations

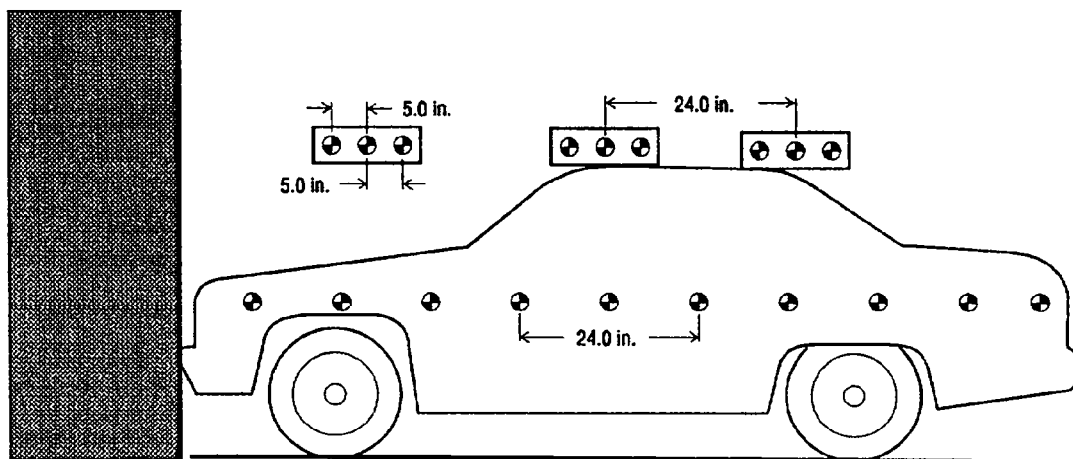


Figure 9 Dummy Measurement Locations for Front Seat Occupants

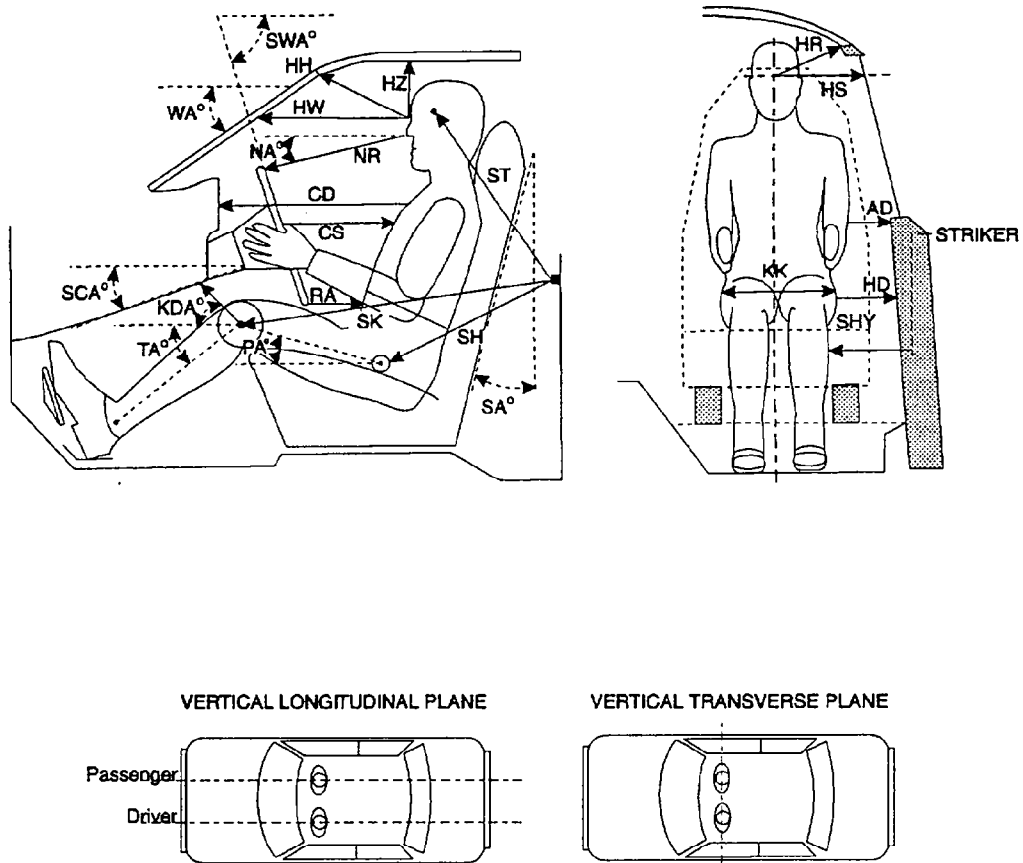


Table 12 Dummy Measurement Data for Front Seat Occupants

Designation	Type of Measurement	Driver (Serial 229)	Passenger (Serial #230)
WA	Windshield angle	26°	26°
SWA	Steering wheel angle	72°	NA
SCA	Steering column angle	18°	NA
SA	Seat back angle	26°	26°
HZ	Head to roof	7.6 in	7.2 in
HH	Head to header	13.3 in	13.5 in
HW	Head to windshield	24.6 in	21.1 in
HR	Head to side header	7.7 in	7.2 in
NR	Nose to rim	15.1 in	NA
NA	Nose to rim angle	12°	NA
CD	Chest to dash	20.2 in	19.3 in
CS	Steering wheel to chest	13.5 in	NA
RA	Rim to abdomen	8.1 in	NA
KDL	Left knee to dash	7.3 in	7.0 in
KDR	Right knee to dash	7.4 in	6.4 in
KDA	Outboard knee to dash angle	25°	27°
PA	Pelvic angle	24°	24°
TA	Tibial angle	41°	37°
KK	Knee to knee	12.2 in	10.2 in
ST ¹	Striker to head	18.6 in	19.4 in
	Striker to head angle	-89°	-82°
SK ¹	Striker to knee	21.1 in	22.5 in
	Striker to knee angle	0°	4°
SH ¹	Striker to H-point	9.6 in	10.0 in
	Striker to H-point angle	44°	46°
SHY	Striker to H-point (Y dir.)	8.5 in	9.1 in
HS	Head to side window	13.0 in	12.2 in
HD	H-point to door	5.6 in	5.7 in
AD	Arm to door	4.6 in	4.8 in

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 10 Camera Positions

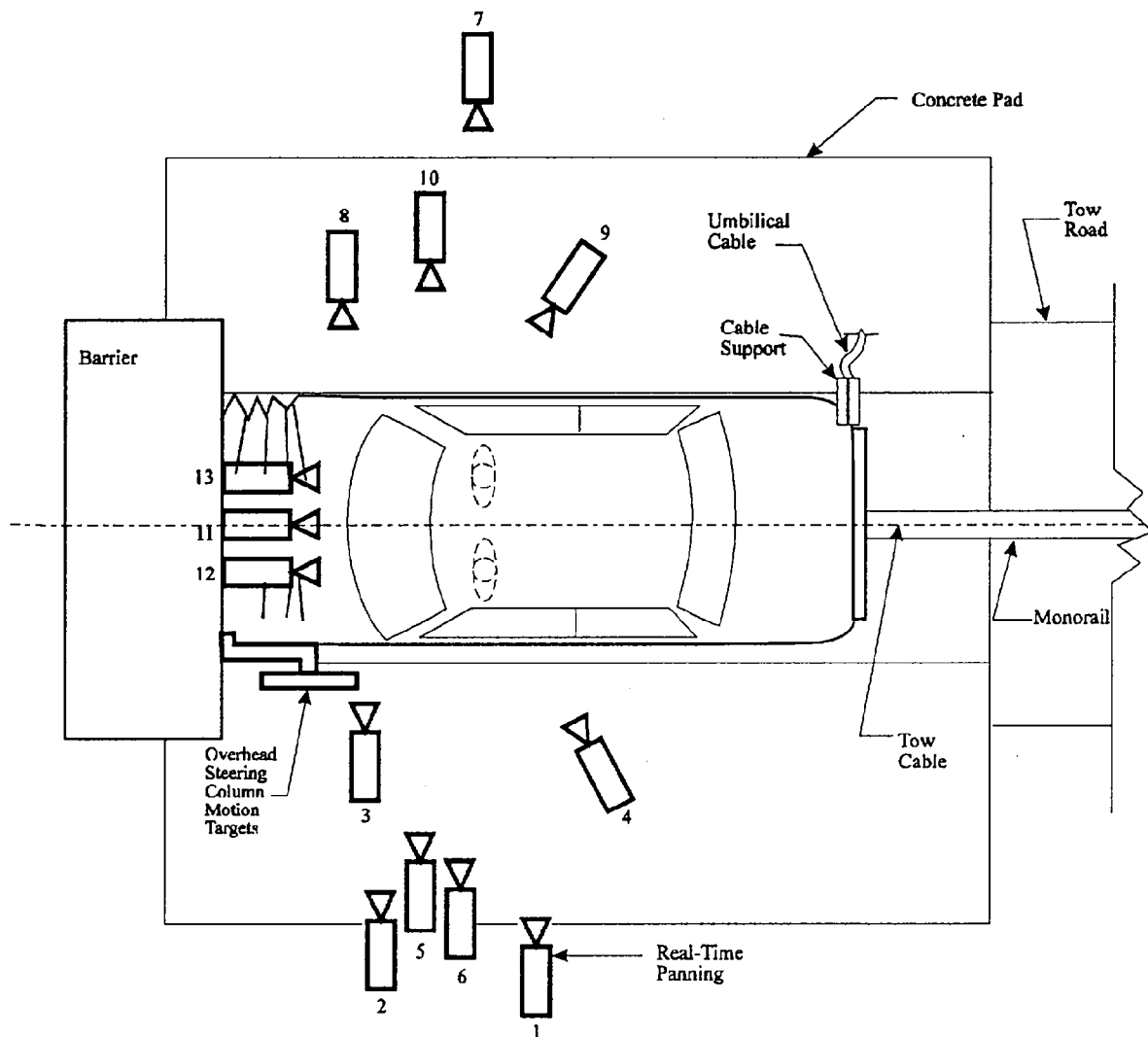


Figure 10 Camera Positions, Cont'd.

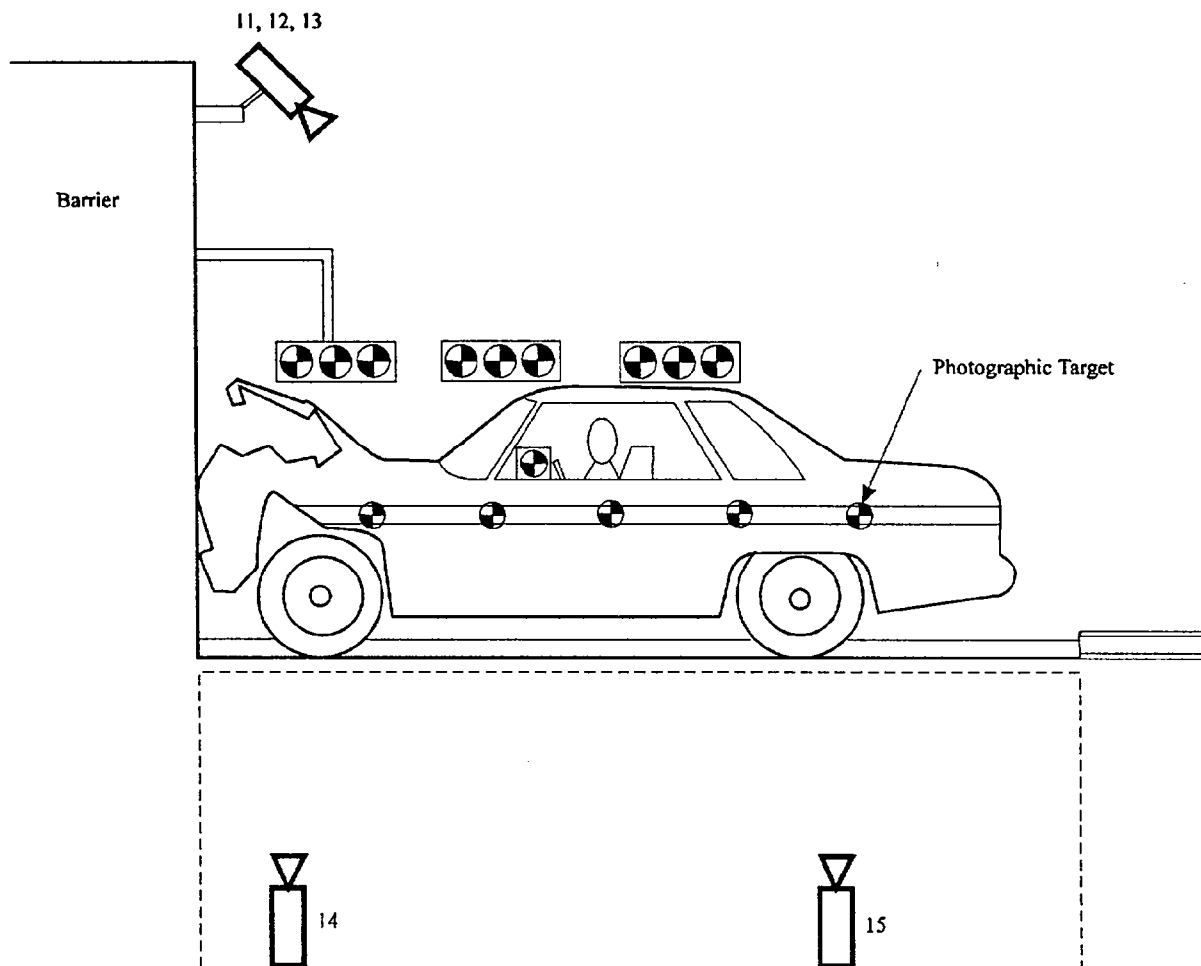


Table 13 Motion Picture Camera Locations

Vehicle year/make/model/body style: 1997/Saturn/SL/4-door sedan
Test number: 961017

Camera Number	View	Camera Positions ¹			Camera Angle ²	Film Plane to Head Target	Camera Lens	Film Speed
		X	Y	Z				
1	Real-time panning	-142.0 in	504.0 in	61.0 in	NA	NA	16 mm	24 frames/s
2	Left vehicle crush	-41.5 in	295.0 in	44.0 in	-4°	300.0 in	25 mm	1000 frames/s
3	Left windshield intrusion	-53.0 in	309.4 in	42.3 in	0°	NA	50 mm	1002 frames/s
4	Driver kinematics	-157.3 in	116.0 in	87.0 in	-27°	85.0 in	25 mm	1000 frames/s
5	Steering column motion	-46.0 in	286.0 in	103.0 in	-14°	NA	25 mm	1005 frames/s
6	Steering column motion	-46.0 in	286.0 in	75.1 in	-9°	NA	25 mm	1000 frames/s
7	Right overall	-81.3 in	-266.4 in	37.1 in	-2°	NA	13 mm	1015 frames/s
8	Right windshield intrusion	-38.1 in	-306.1 in	44.0 in	0°	NA	50 mm	1018 frames/s
9	Passenger kinematics	-152.1 in	-116.0 in	87.0 in	-26°	84.0 in	25 mm	1002 frames/s
10	Passenger kinematics	-38.8 in	-293.0 in	45.3 in	-4°	248.0 in	25 mm	1043 frames/s
11	Windshield front view	-6.0 in	0.0 in	88.0 in	-40°	NA	13 mm	998 frames/s
12	Driver - front view	-6.8 in	14.5 in	93.0 in	-50°	NA	17 mm	1000 frames/s
13	Passenger - front view	-4.5 in	-13.8 in	93.0 in	-50°	NA	17 mm	1000 frames/s
14	Pit - front position	-50.5 in	0.0 in	-92.4 in	90°	NA	13 mm	1002 frames/s
15	Pit - rear position	-99.3 in	0.0 in	-99.0 in	90°	NA	13 mm	1008 frames/s
16	Real-time documentation	NA	NA	NA	NA	NA	12-120 mm	24 frames/s

¹ +X: Film plane forward of barrier face

+Y: Film plane to left of monorail centerline

+Z: Film plane above ground level

² +Angle: Film plane angled upward from horizontal plane

Appendix A

Photographs



Figure A-1. Pre-test Front View

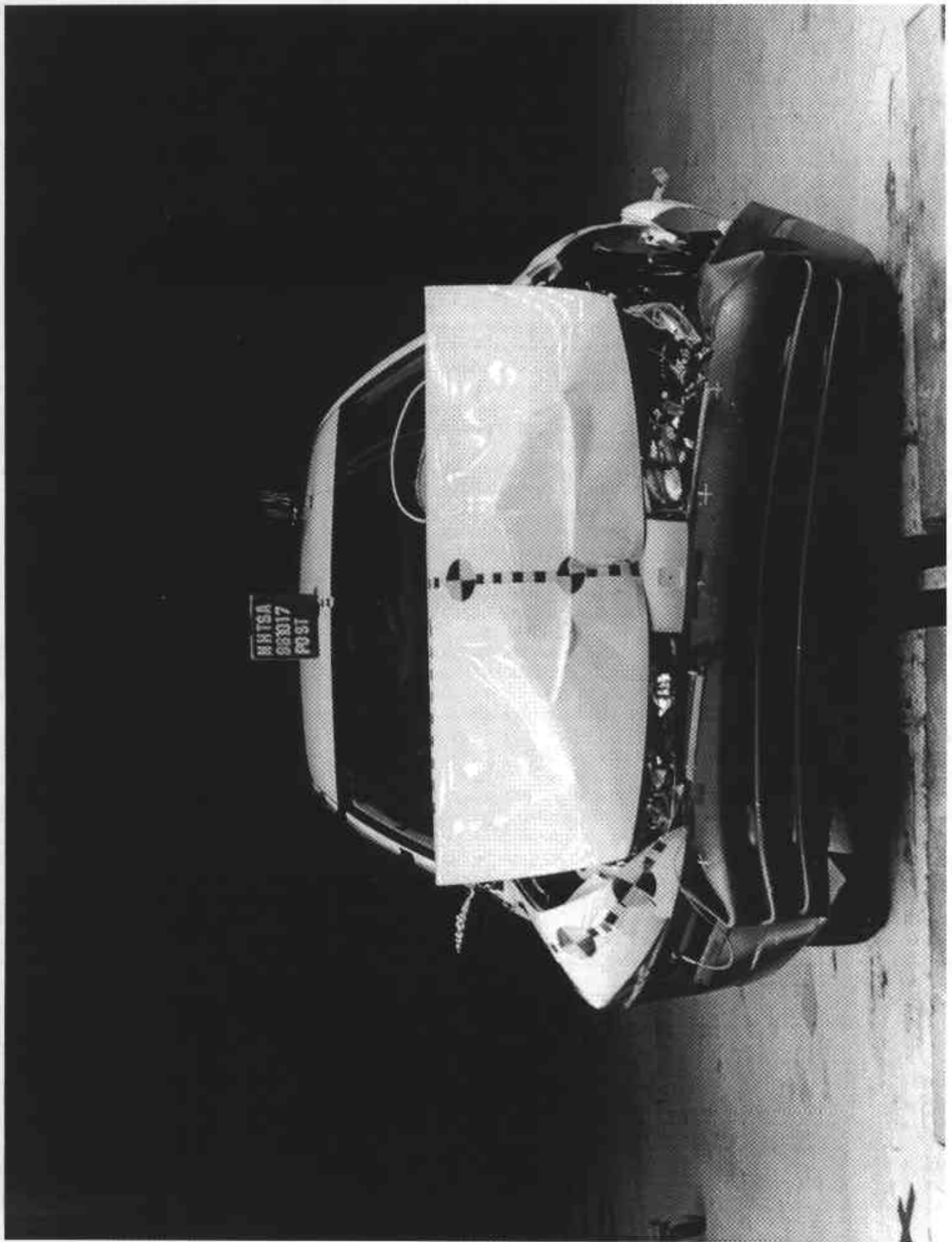


Figure A-2. Post-test Front View

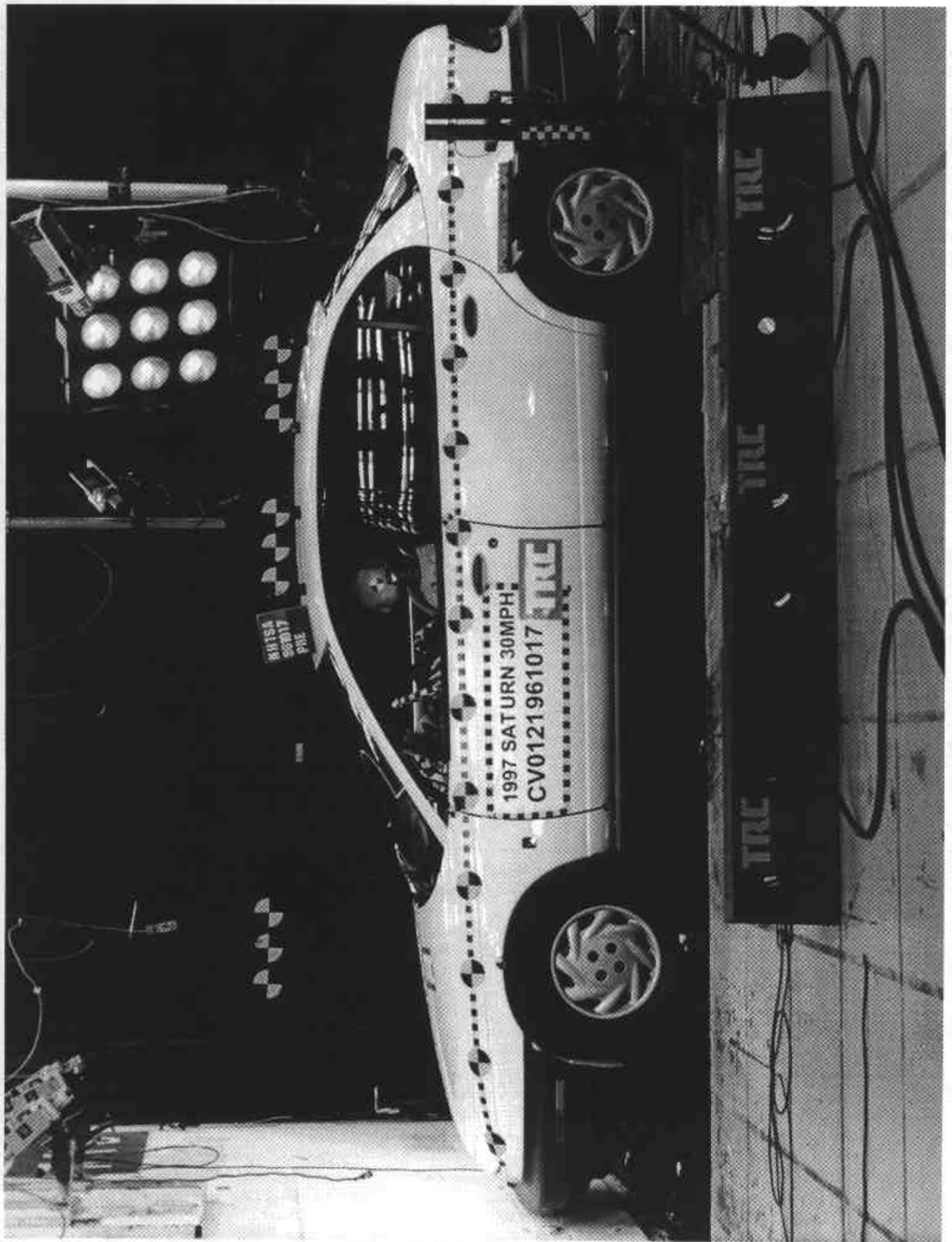


Figure A-3. Pre-test Left Side View

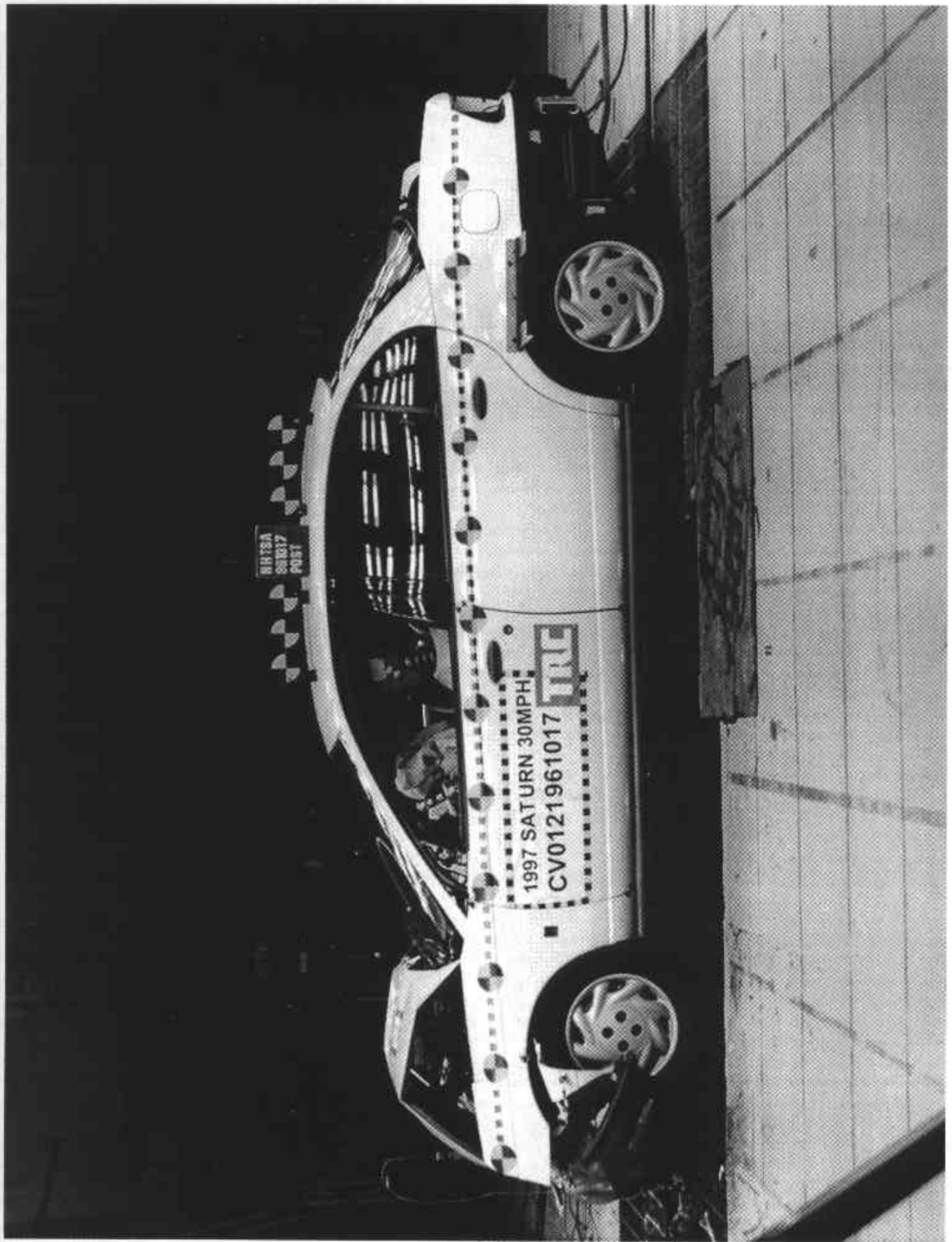


Figure A-4. Post-test Left Side View

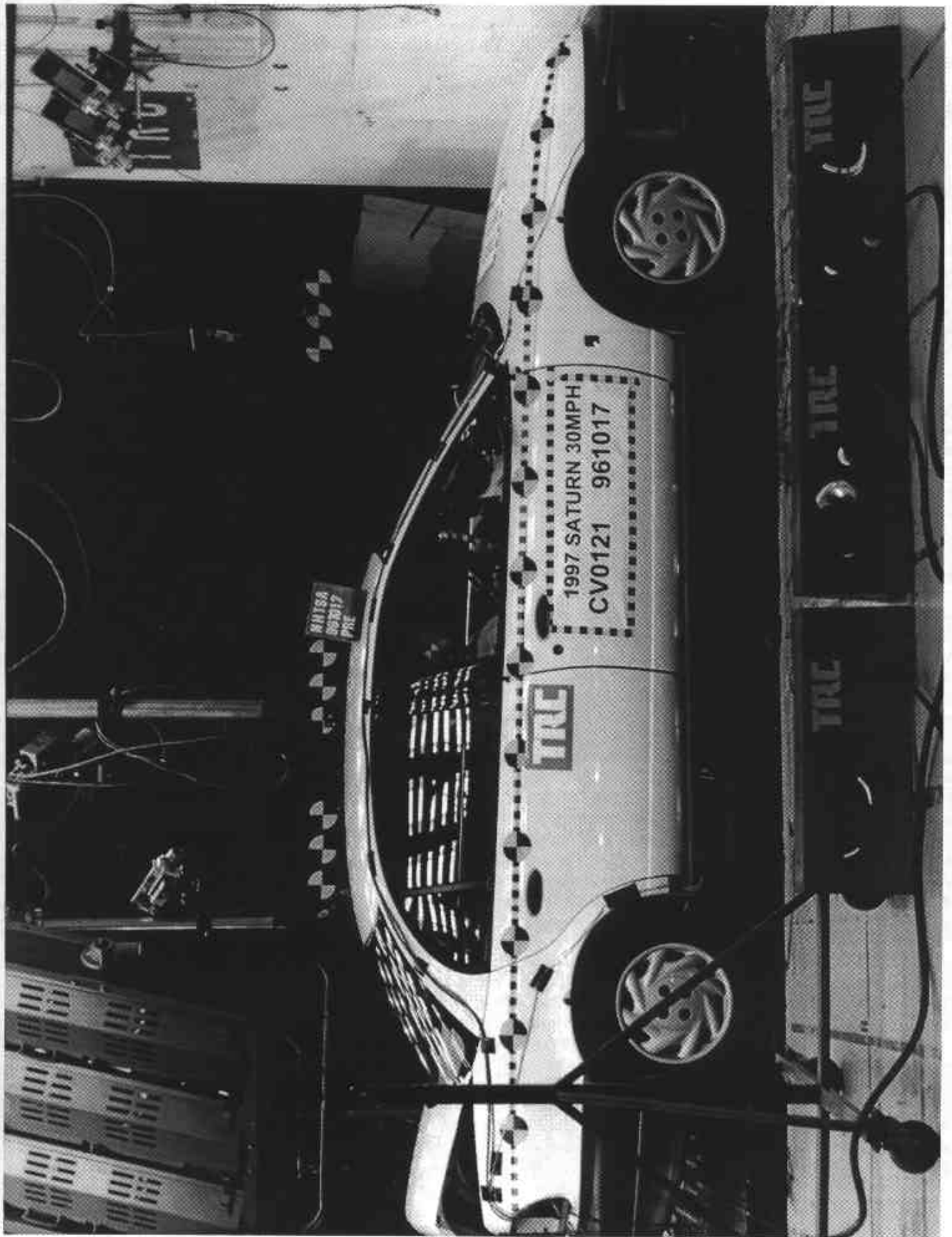


Figure A-5. Pre-test Right Side View

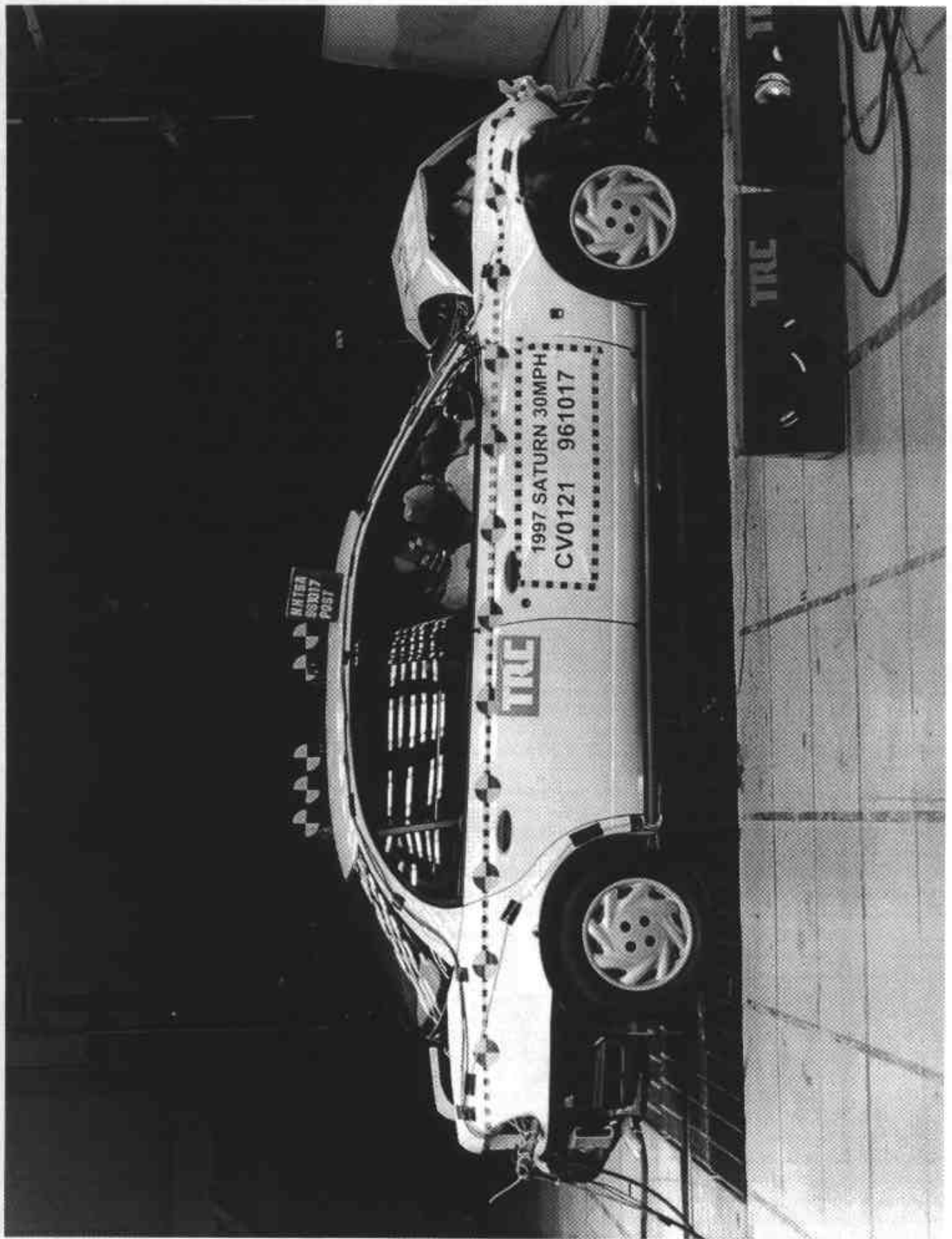


Figure A-6. Post-test Right Side View

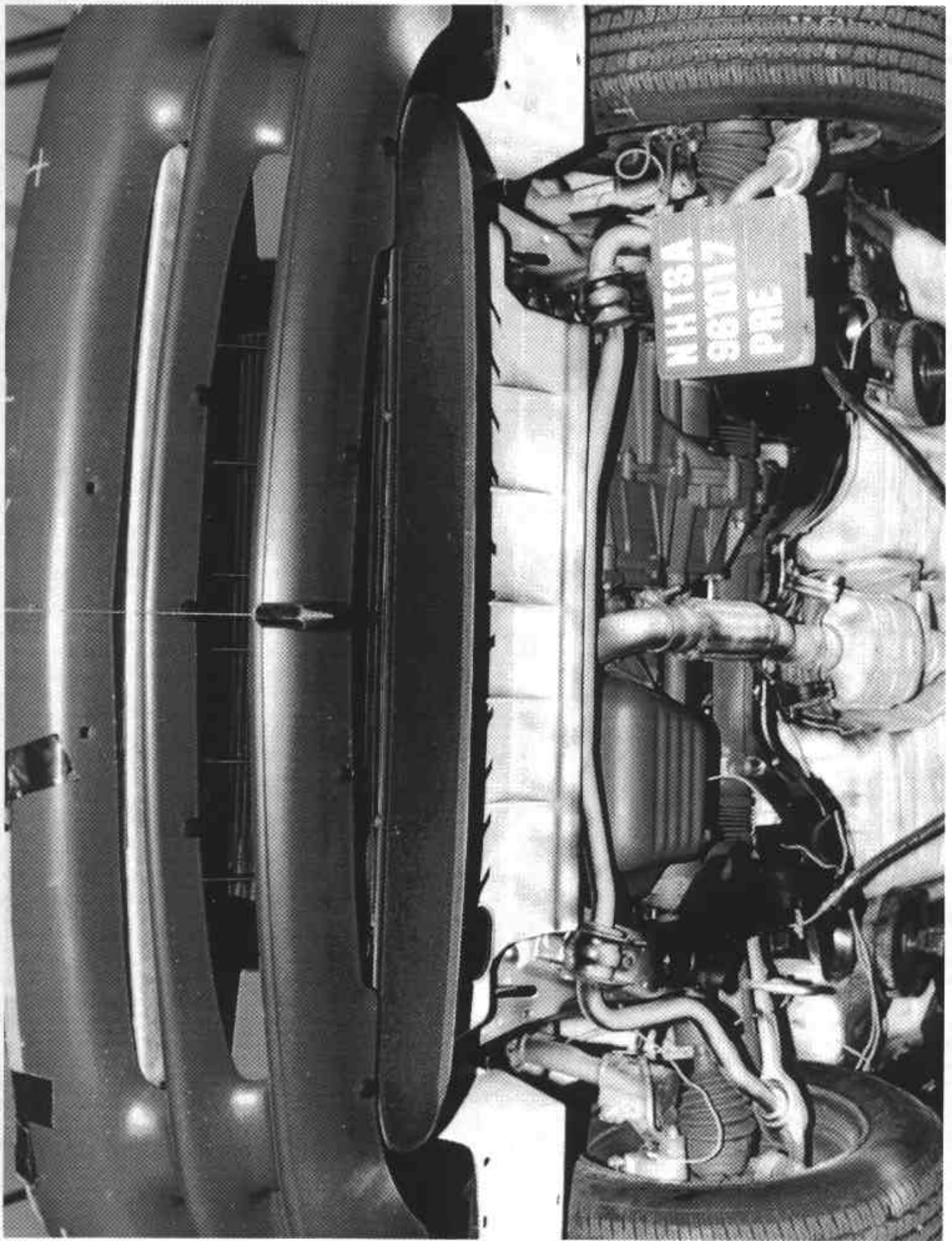


Figure A-7. Pre-test Front Underbody View

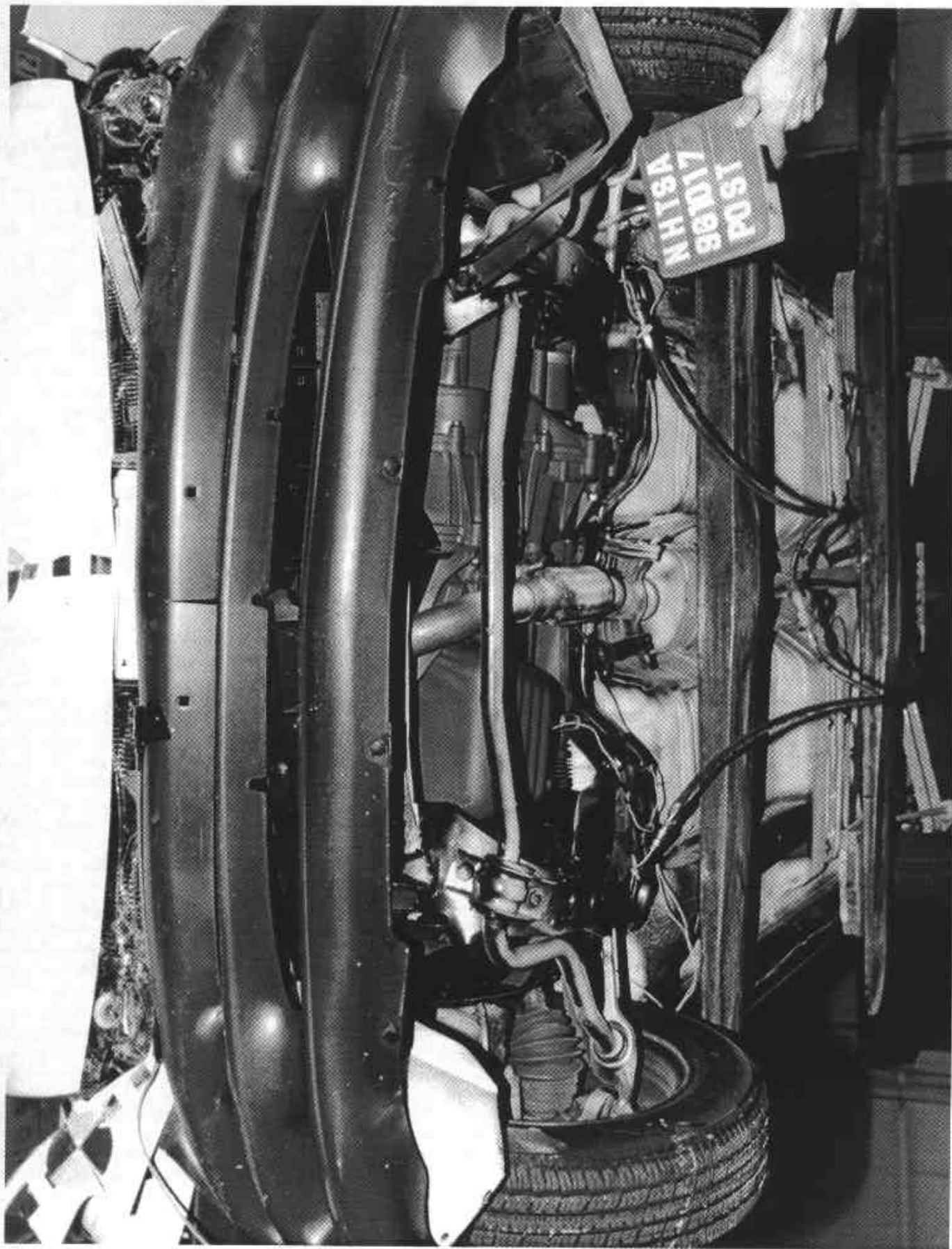


Figure A-8. Post-test Front Underbody View

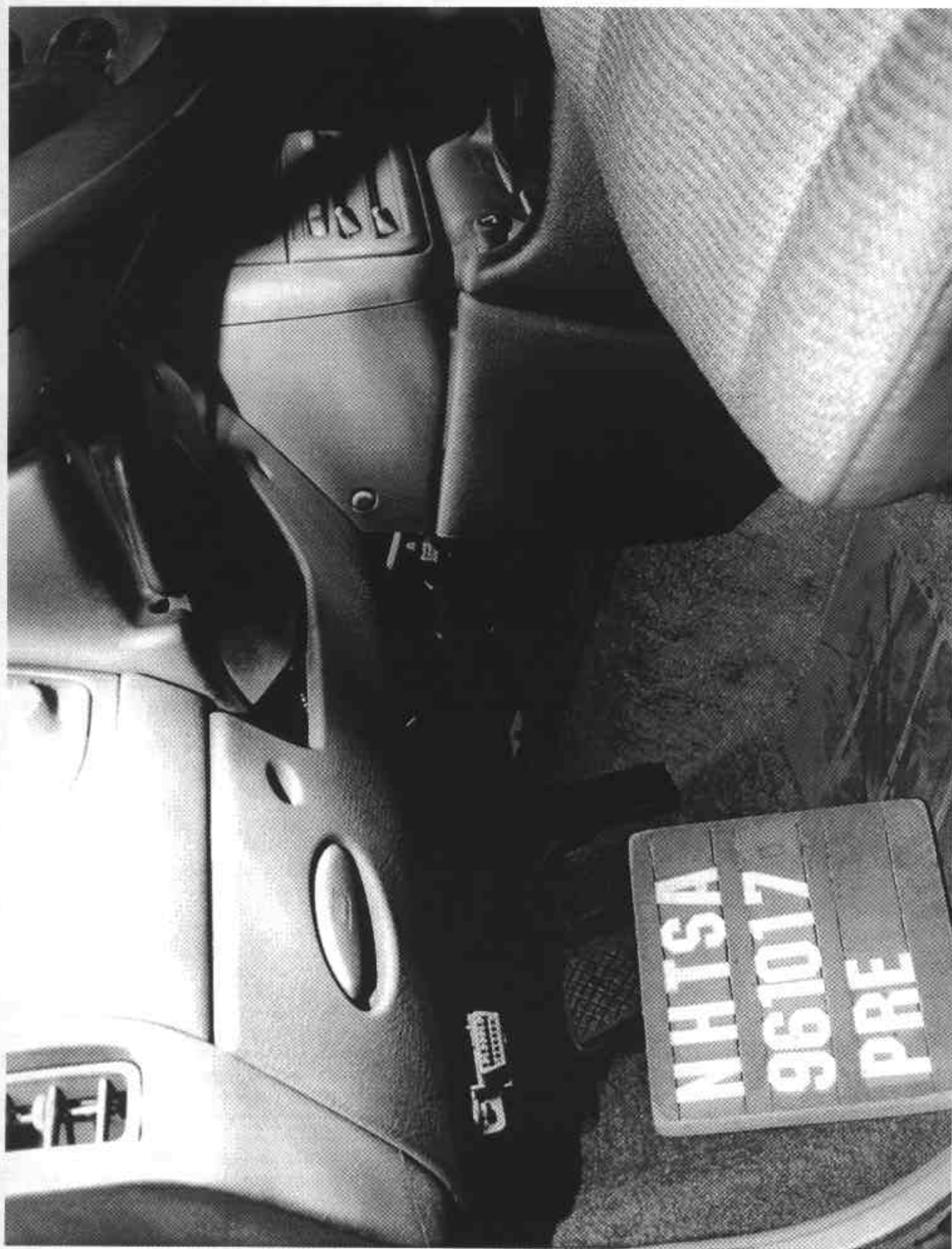


Figure A-9. Pre-test Driver's Knee Bolster View

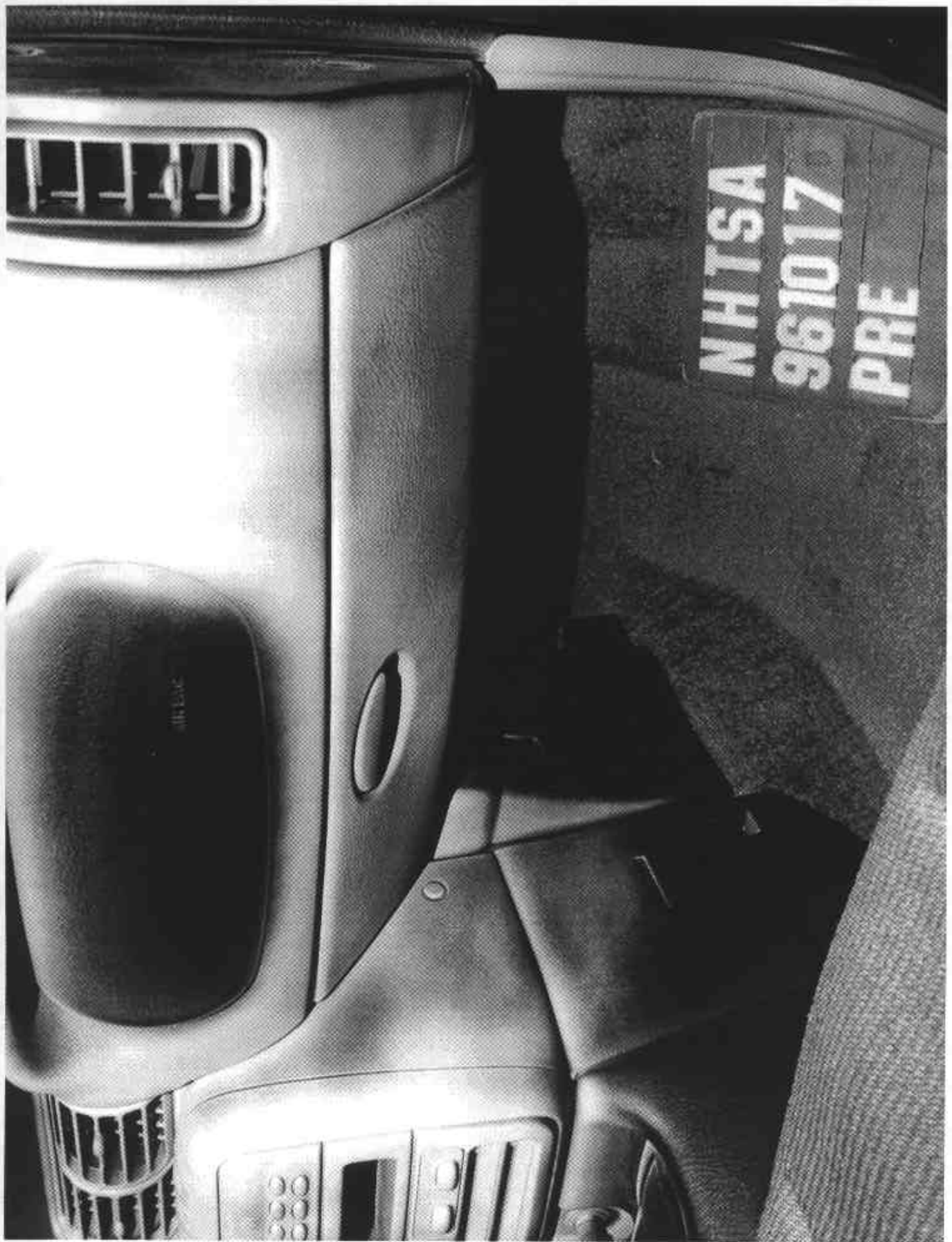


Figure A-10. Pre-test Passenger's Knee Bolster View

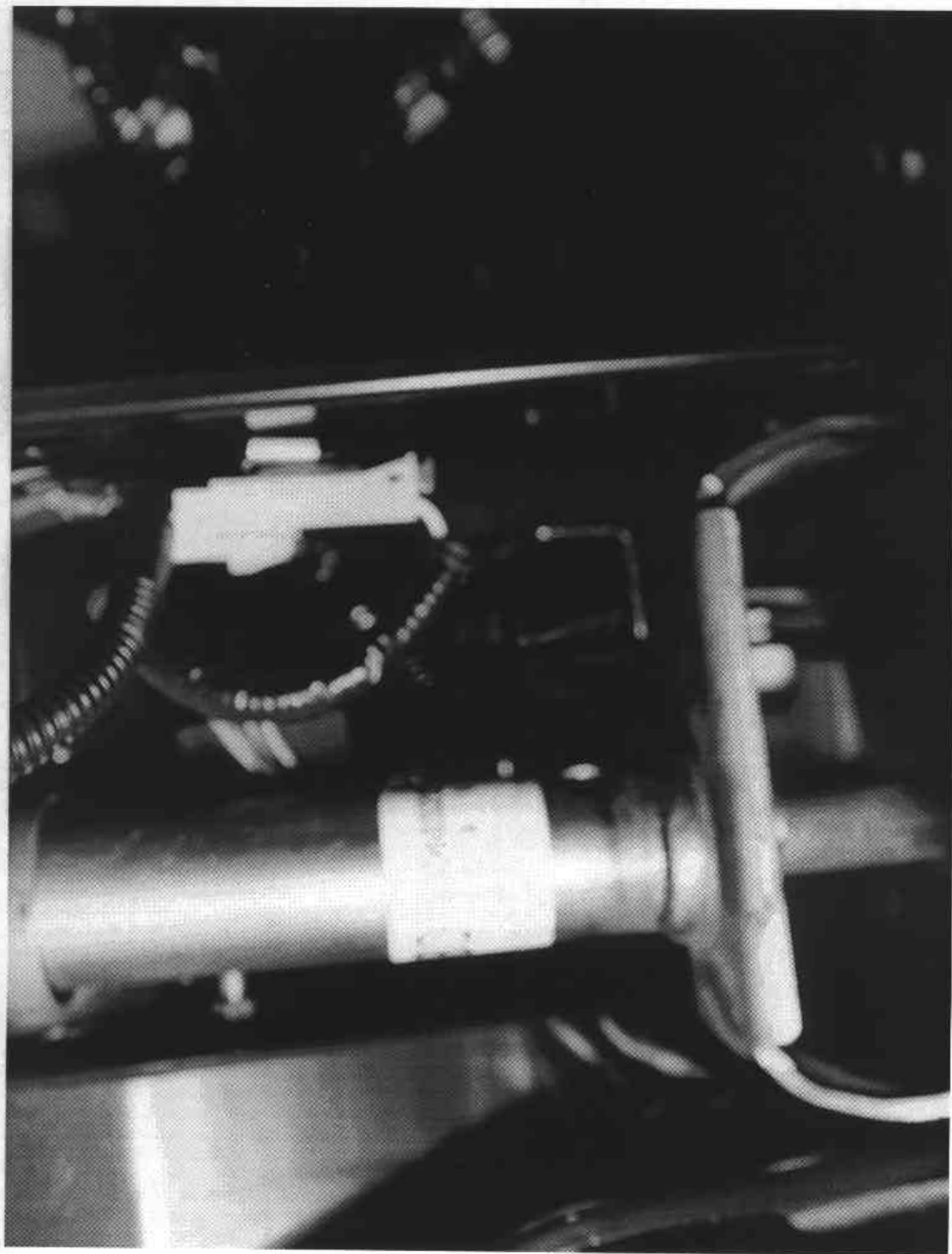


Figure A-11. Pre-test Steering Column Interior View

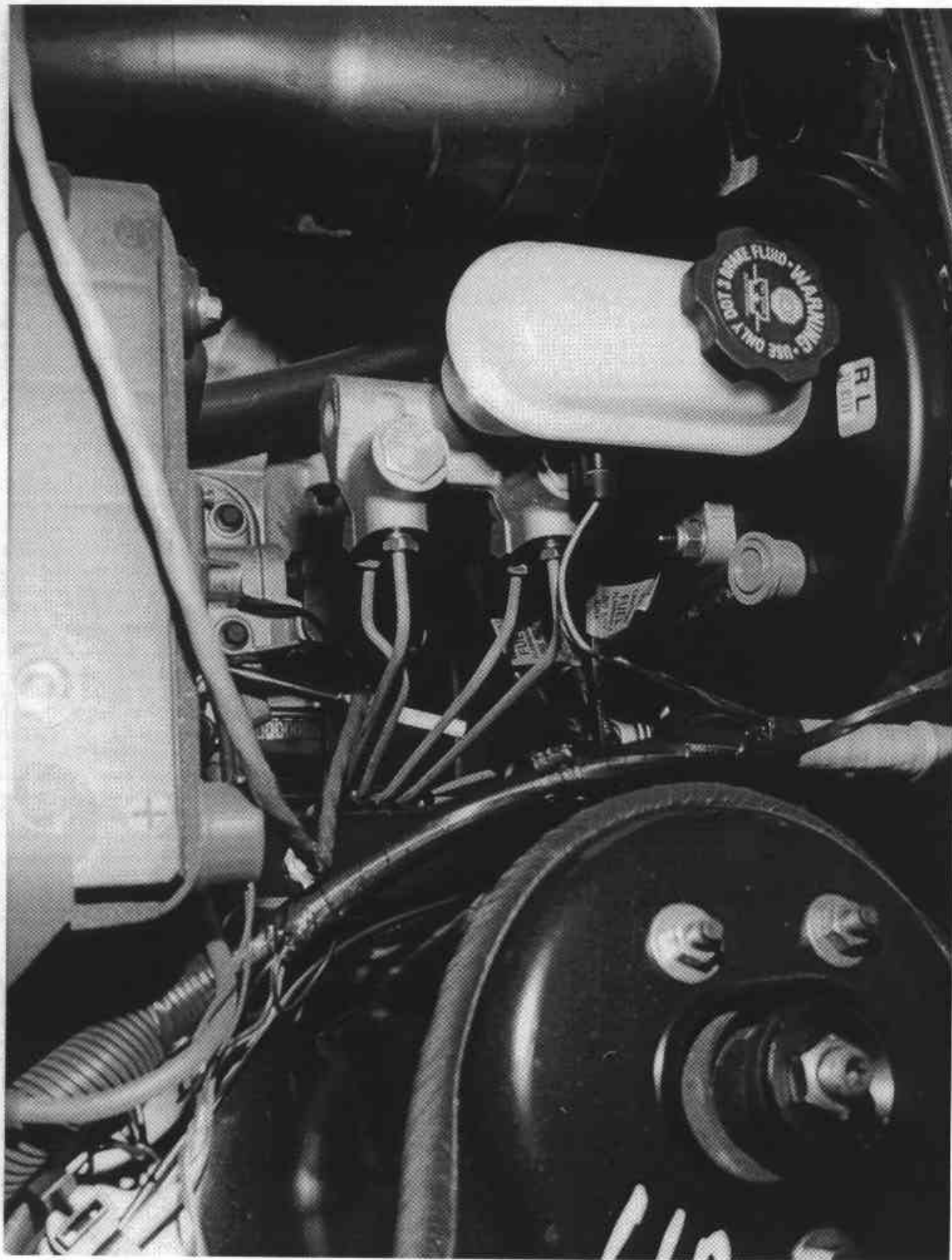


Figure A-12. Pre-test Steering Column Exterior View



Figure A-13. Pre-test Driver Dummy and Vehicle Interior View



Figure A-14. Post-test Driver Dummy and Vehicle Interior View



Figure A-15. Pre-test Passenger Dummy and Vehicle Interior View



Figure A-16. Post-test Passenger Dummy and Vehicle Interior View

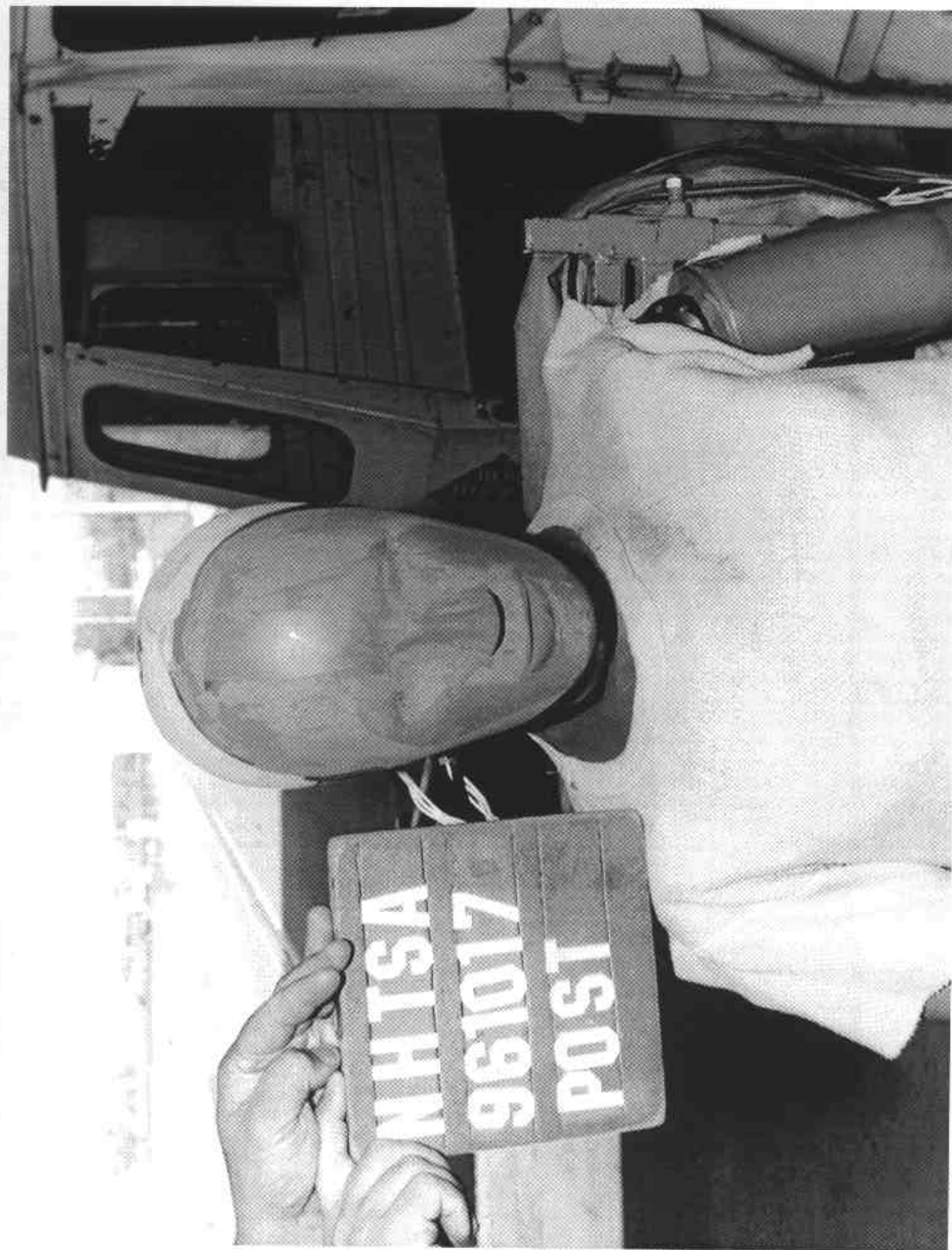


Figure A-17. Post-test Driver Dummy Head Contact - View 1



Figure A-18. Post-test Driver Dummy Head Contact - View 2

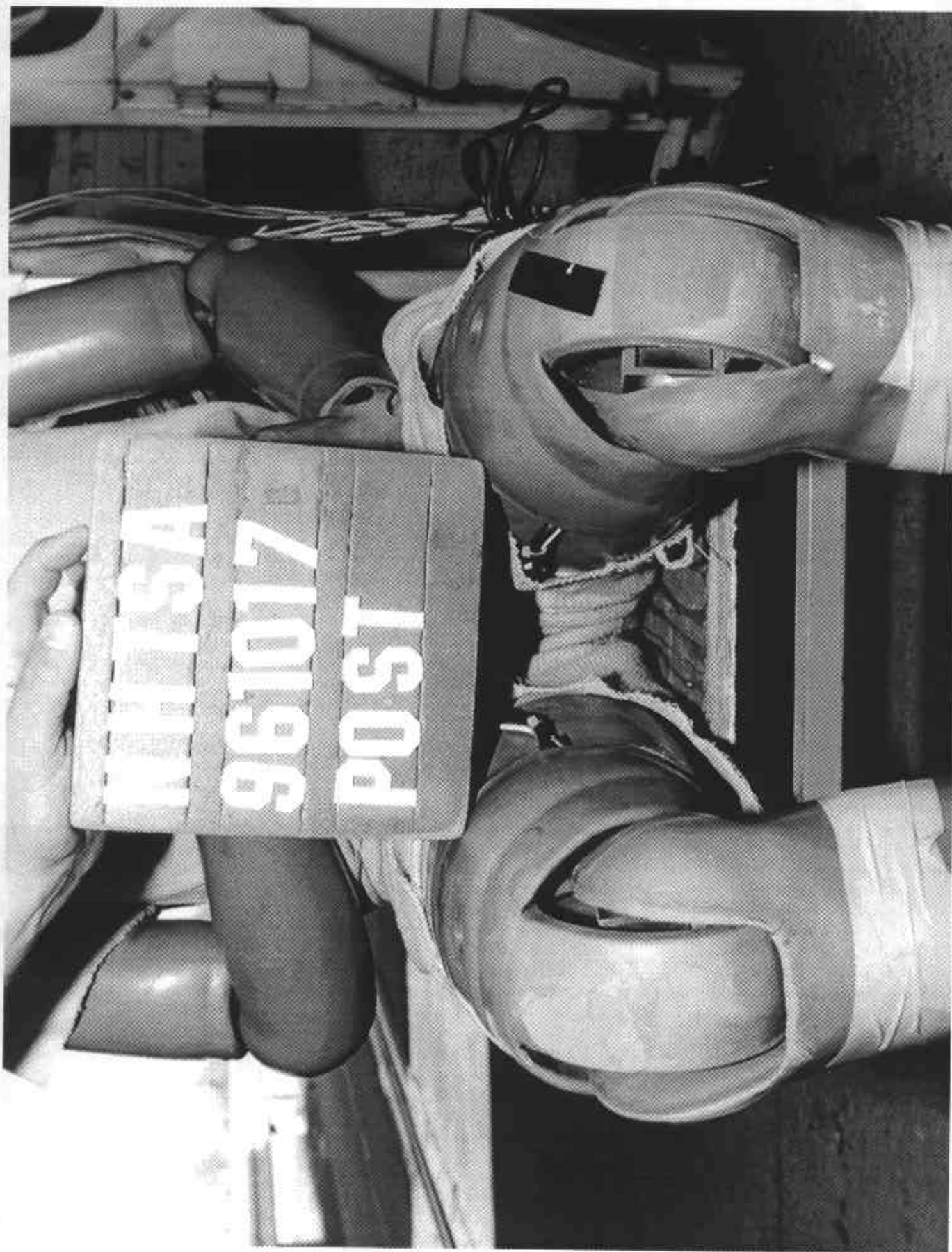


Figure A-19. Post-test Driver Dummy Knee Contact - View 1

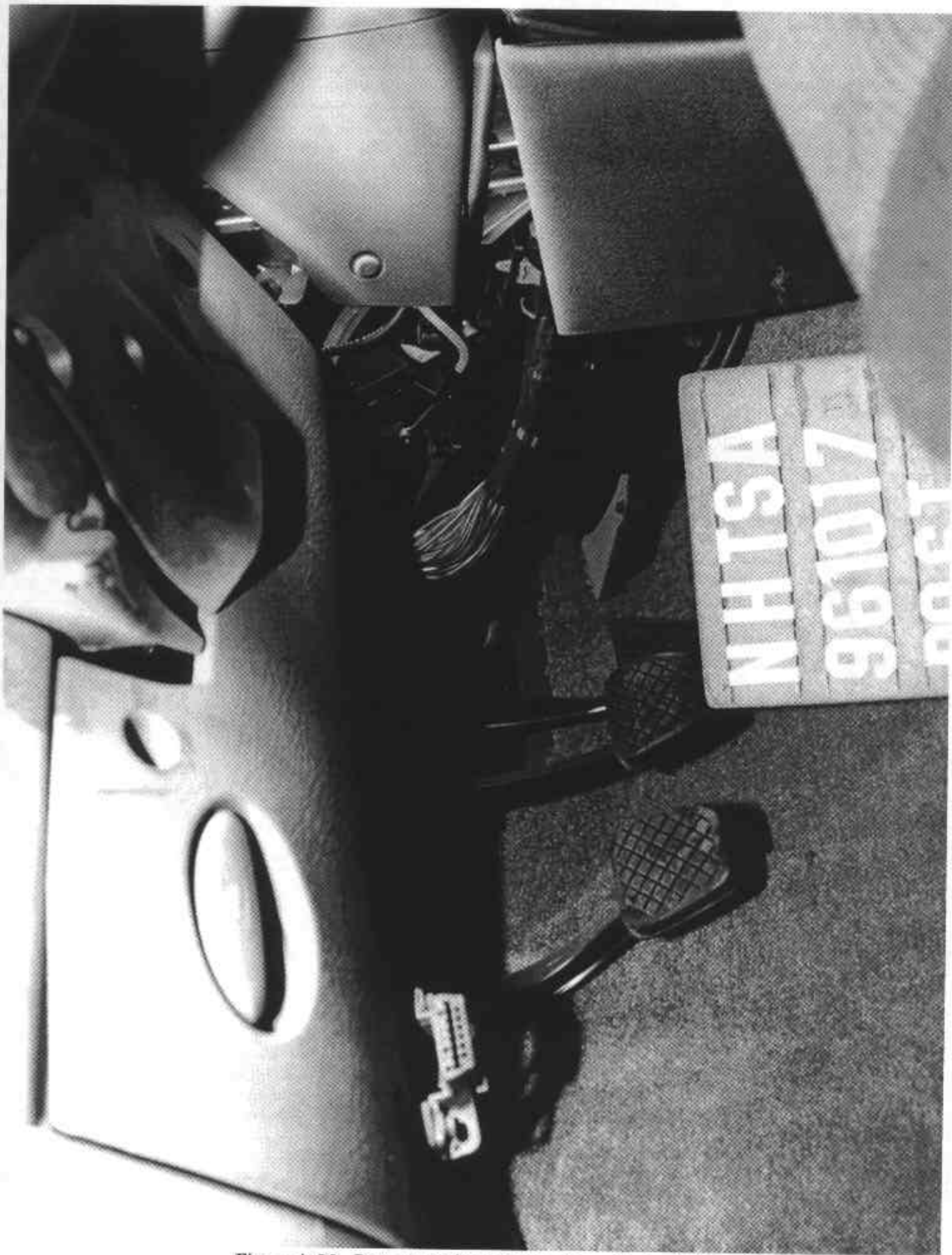


Figure A-20. Post-test Driver Dummy Knee Contact - View 2

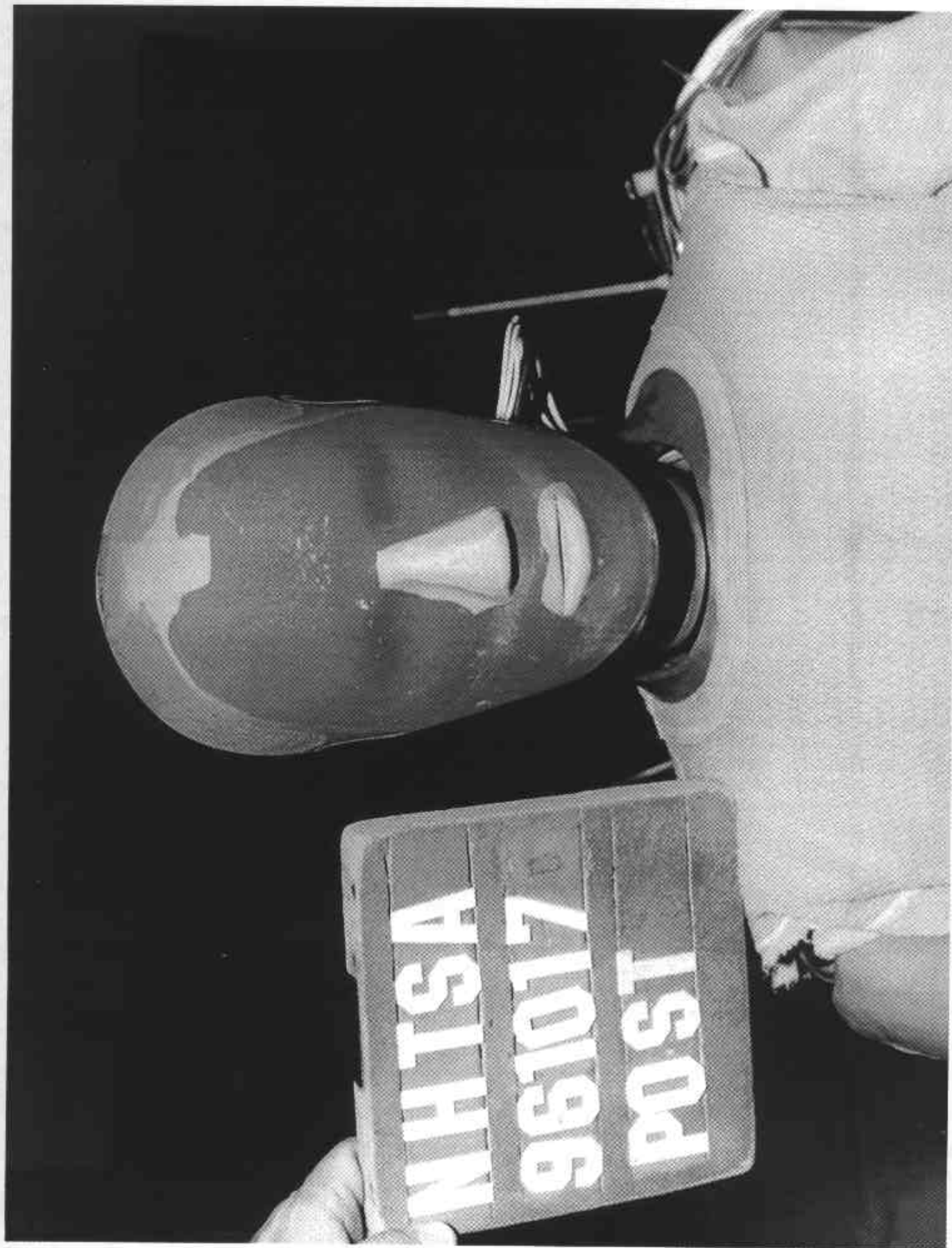


Figure A-21. Post-test Passenger Dummy Head Contact - View 1



Figure A-22. Post-test Passenger Dummy Head Contact - View 2

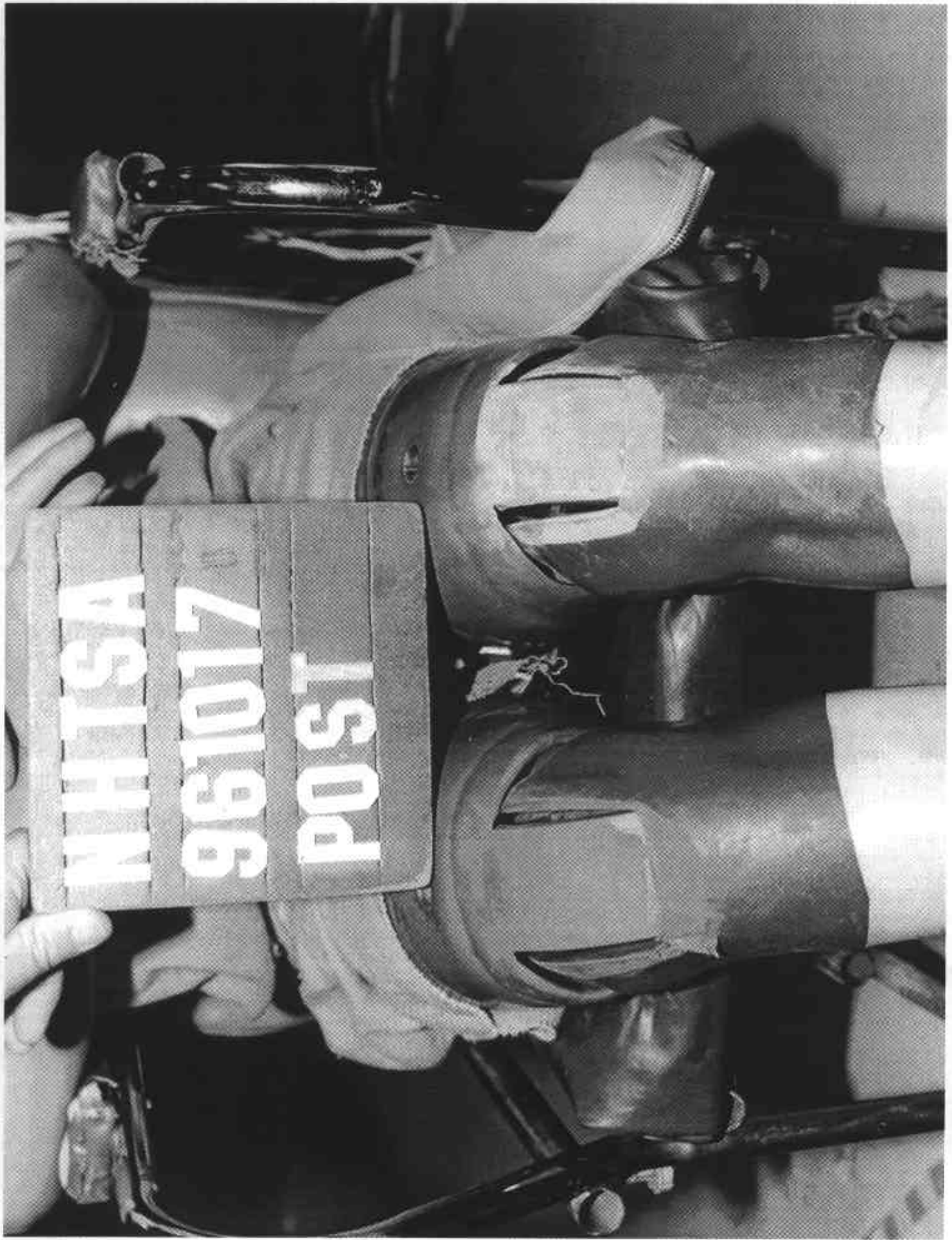


Figure A-23. Post-test Passenger Dummy Knee Contact - View 1



Figure A-24. Post-test Passenger Dummy Knee Contact - View 2

 MFD BY SATURN CORPORATION
DATE 08/96 GUMR 3219LB
GAWR FRT 1627LB
GAWR RR 1592LB
1460KG 0738KG 0722KG

THIS VEHICLE CONFORMS TO ALL APPLI-
CABLE U.S. FEDERAL MOTOR VEHICLE
SAFETY, BUMPER, AND THEFT PREVENTION
STANDARDS IN EFFECT ON THE DATE OF
MANUFACTURE SHOWN ABOVE.

1G8ZF5280VZ147132 PASS CAR

Figure A-25. Pre-test Vehicle Certification Label View

 TIRE-LOADING INFORMATION

OCCUPANTS		VEHICLE CAPACITY WT.	
FRT. CTR.	RR.	TOTAL	
2	0	3	
		5	
LBS		KG	
864		392	

MAXIMUM LOADING AT GVWR:
 SAME AS VEHICLE CAPACITY WEIGHT

ZZ35		COLD TIRE PRESSURE	
FRONT	TIRE SIZE	SPEED RATING	PSI/KPA
	P175/70R14	S	30/210
REAR	P175/70R14	S	26/180
SPARE	T115/70R14	M	60/420

IF TIRES ARE HOT, ADD 4 PSI (28 KPA)
 SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION

Figure A-26. Pre-test Recommended Tire Pressure Label View

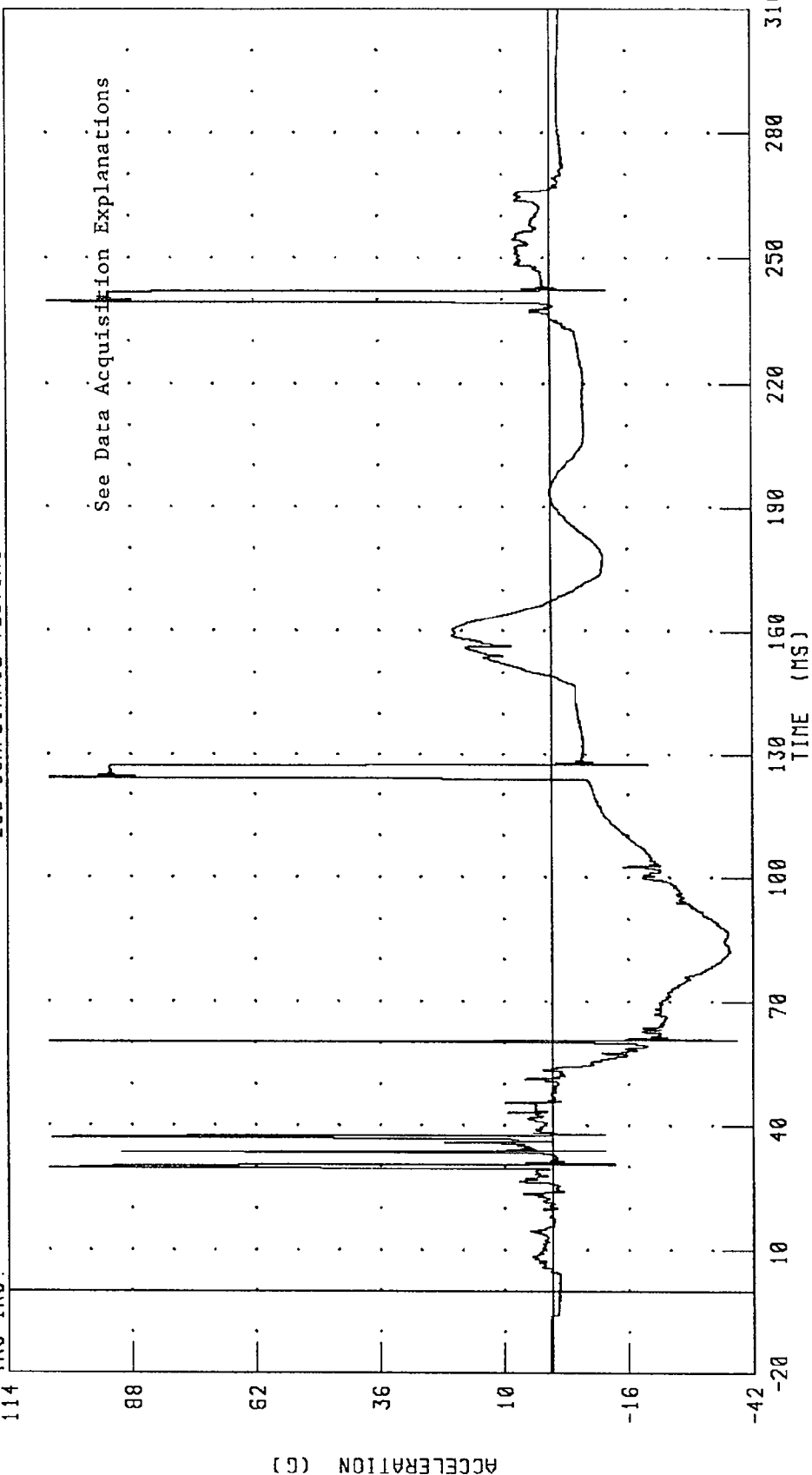
Appendix B

Data Plots

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER HEAD X-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC INC.



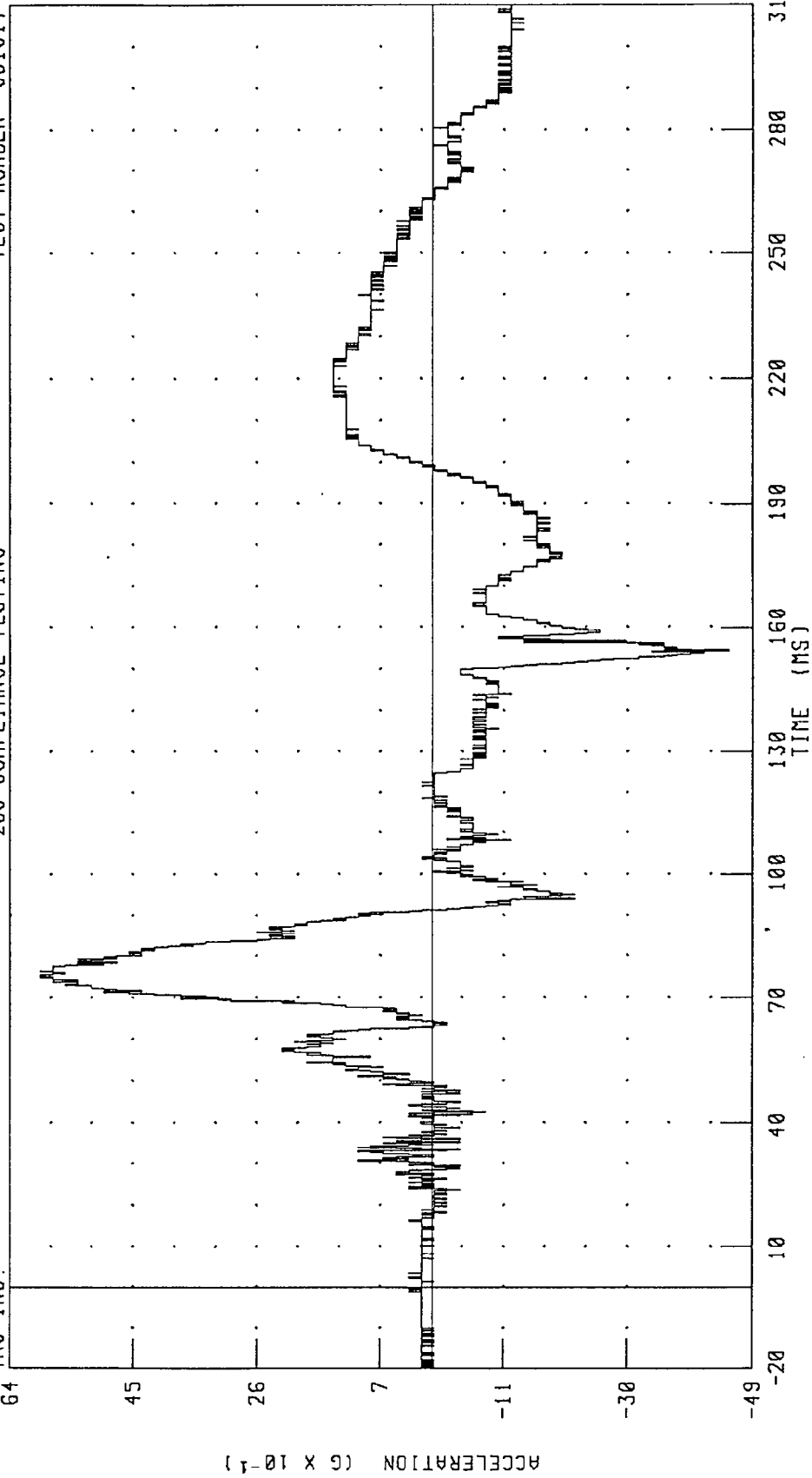
CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

PEAK DATA: 105.35 G @ 29.92 MS; -38.52 G @ 60.88 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC INC.

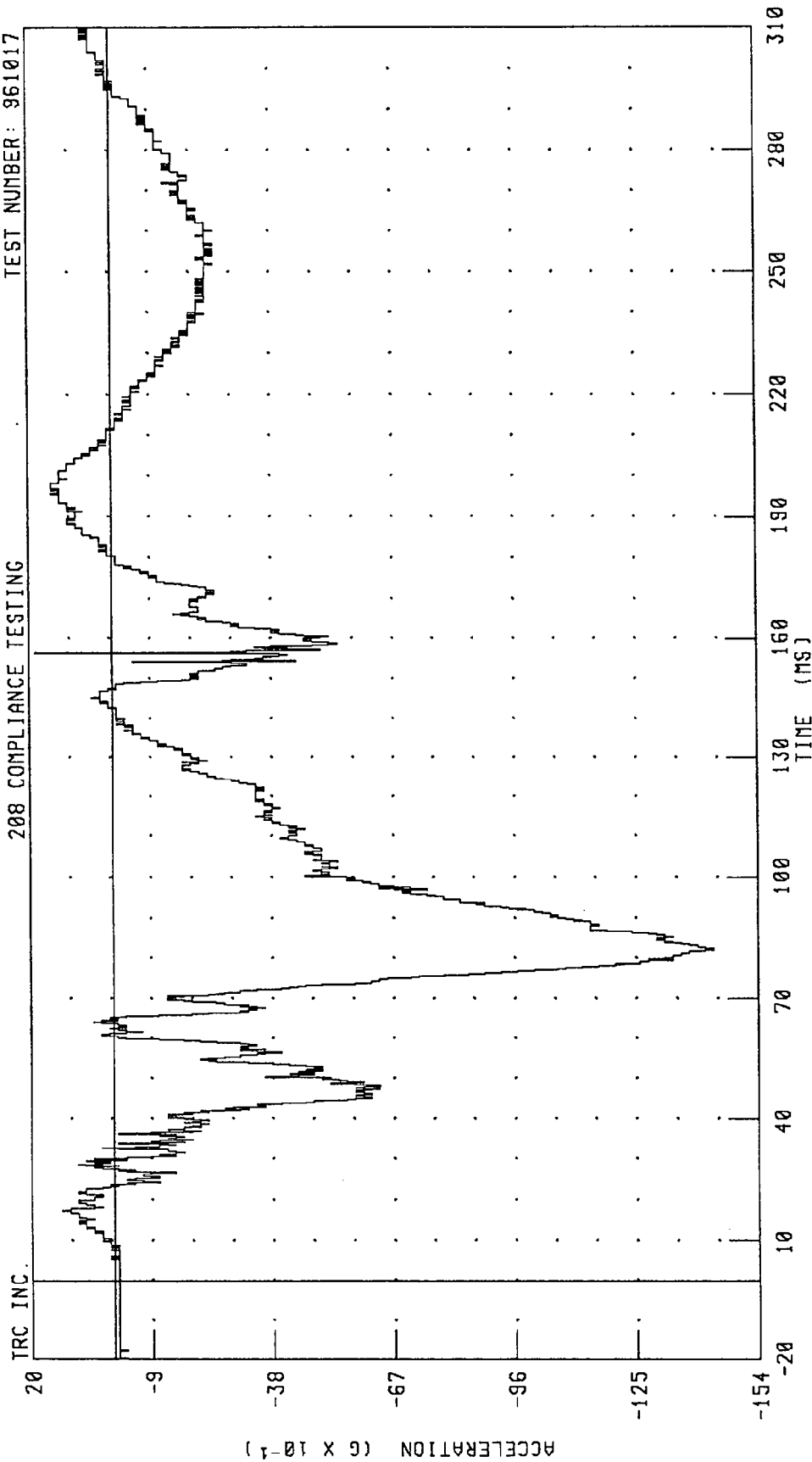


CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

PEAK DATA: 6.03 G @ 74.72 MS; -4.54 G @ 154.40 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017



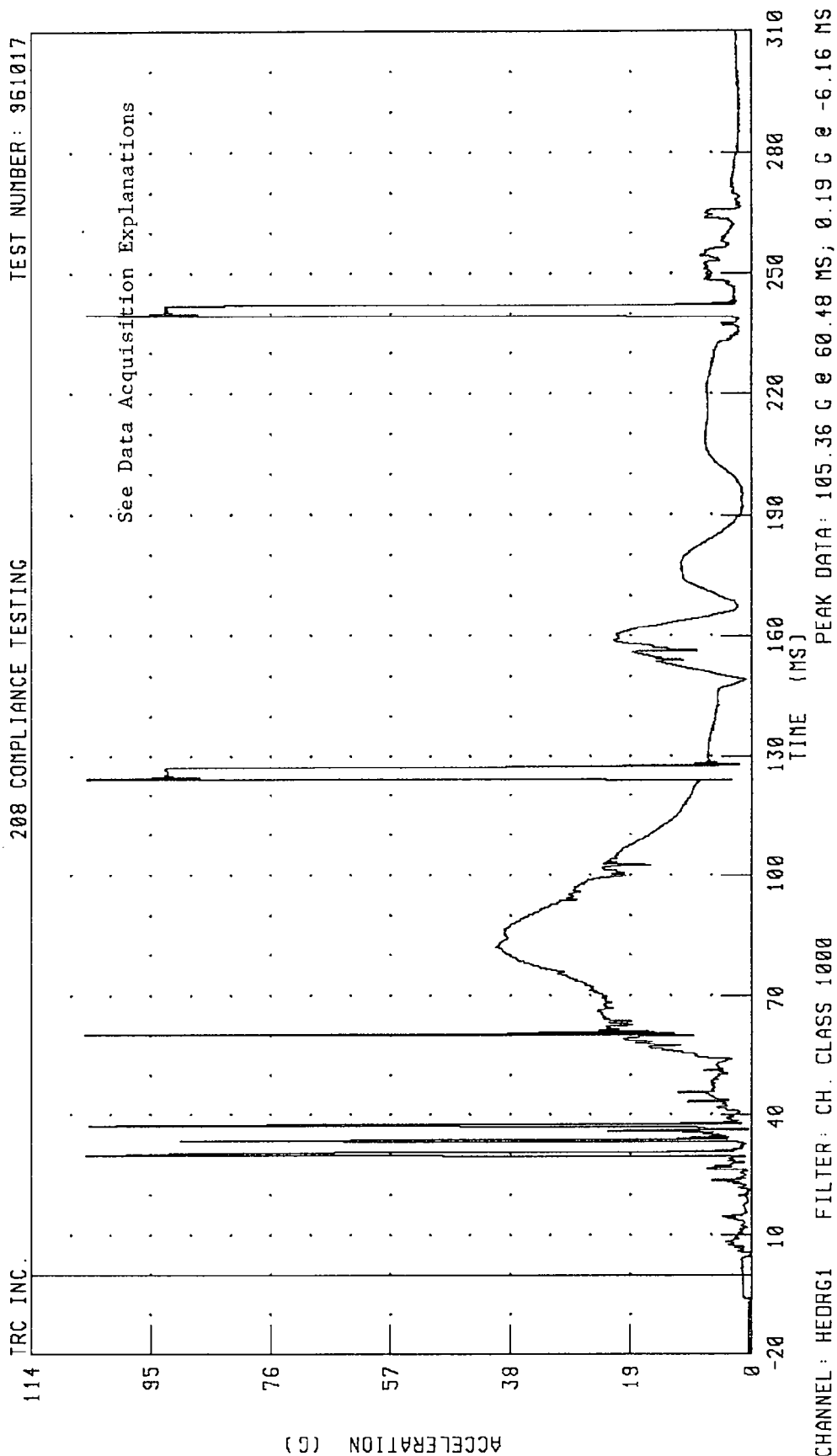
PEAK DATA: 1.85 G @ 156.48 MS; -14.35 G @ 81.84 MS

CHANNEL: HEADZG1 FILTER: CH. CLASS 1000

1997 SATURN SL INTO FLAT FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

208 COMPLIANCE TESTING

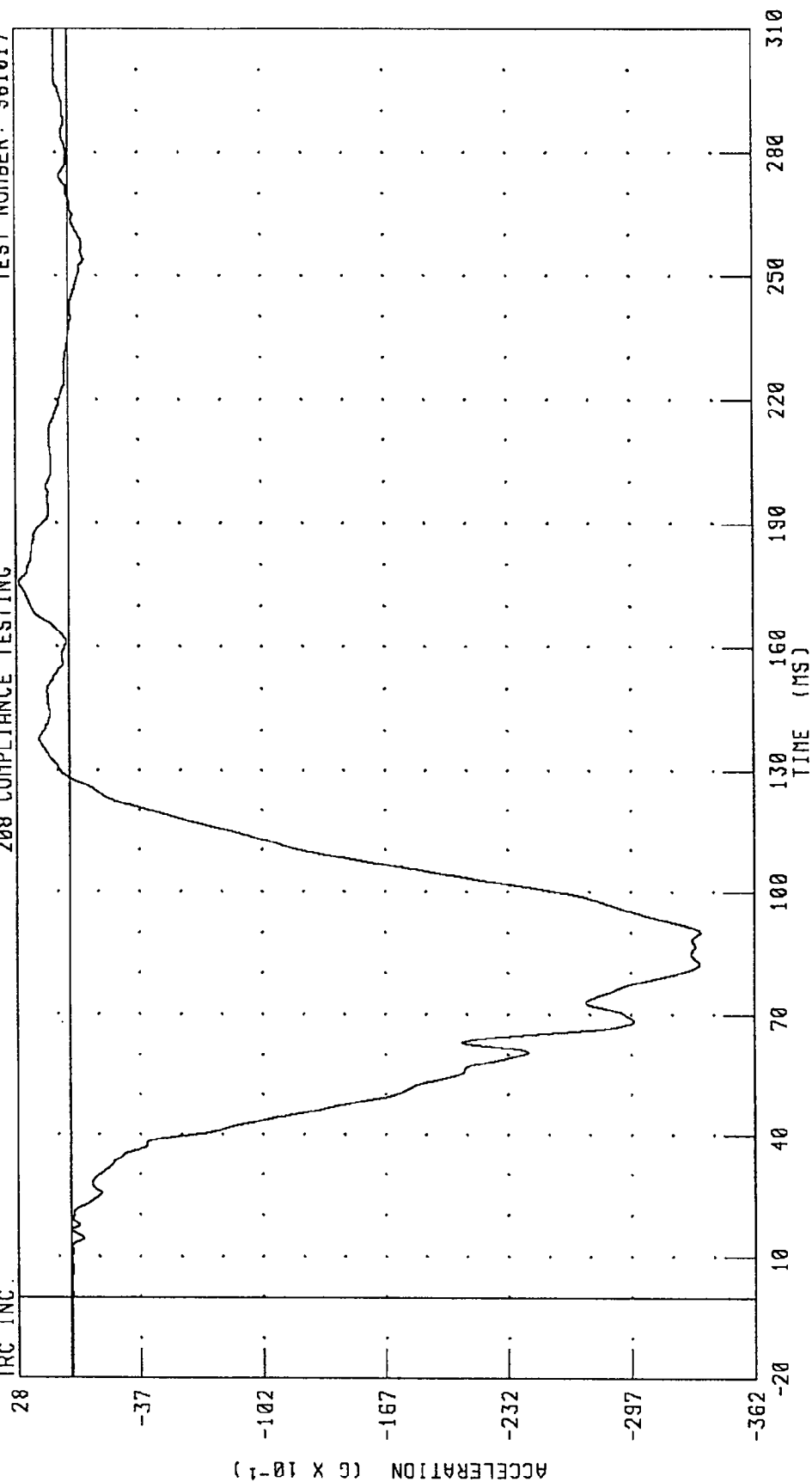
TEST NUMBER: 961017



1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER CHEST X-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC INC.

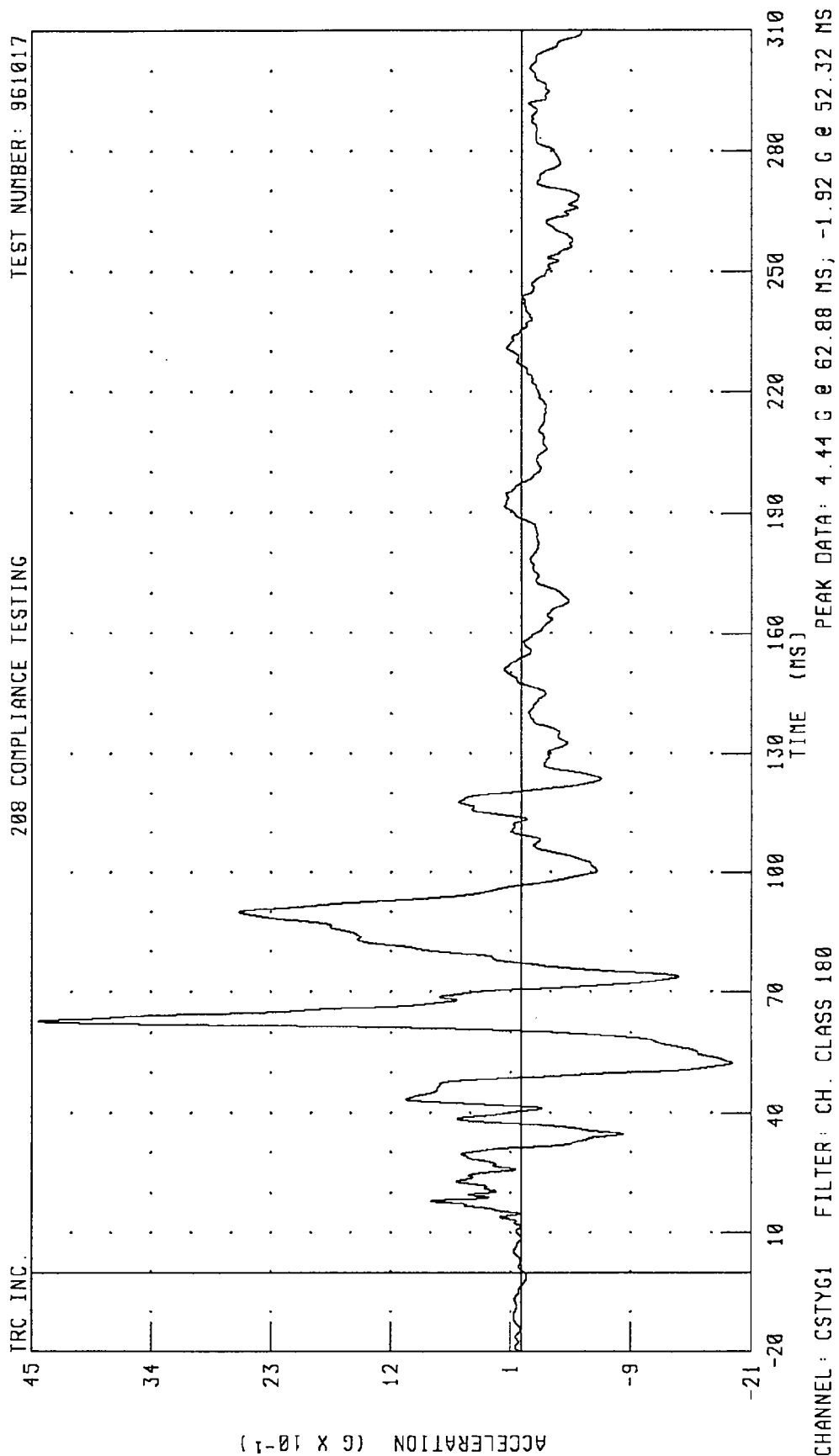


CHANNEL: CSTXG1 FILTER: CH. CLASS 180

PEAK DATA: 2.63 G @ 175.60 MS; -33.35 G @ 90.24 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

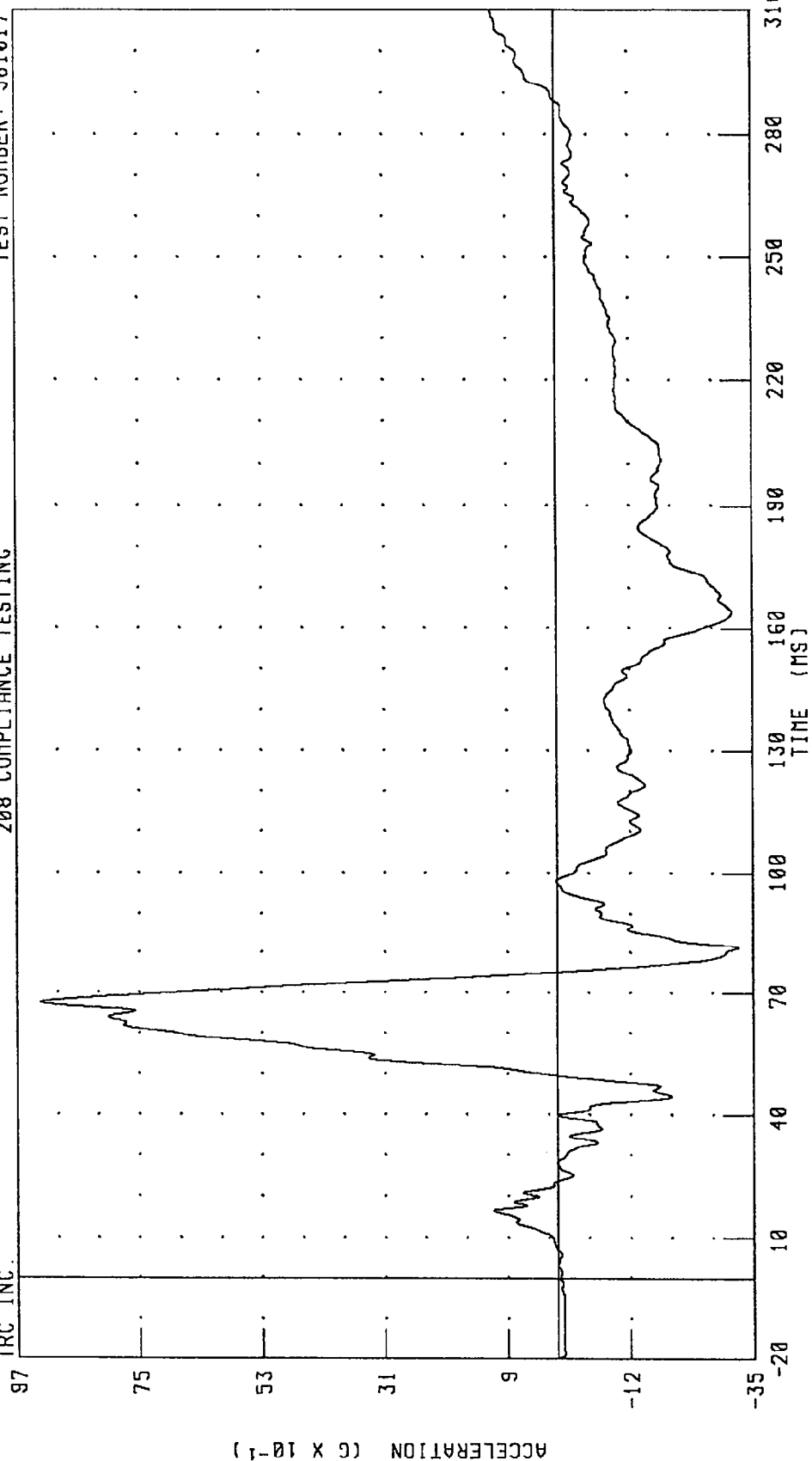


CHANNEL: CSTYG1 FILTER: CH. CLASS 180

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC INC.

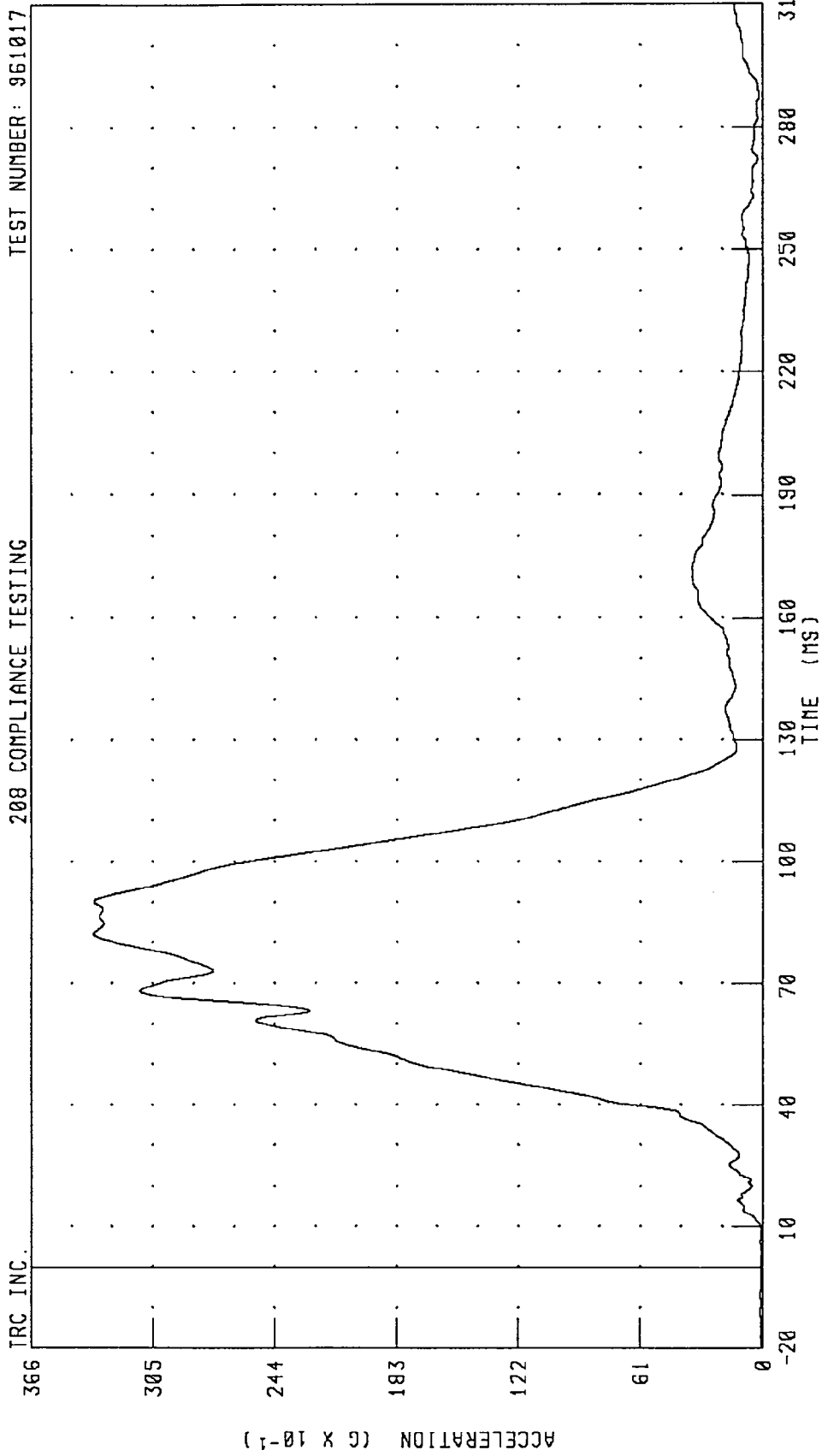


CHANNEL: CSTZG1 FILTER: CH. CLASS 180

PEAK DATA: 9.28 G @ 67.60 MS, -3.23 G @ 81.36 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER CHEST RESULTANT ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

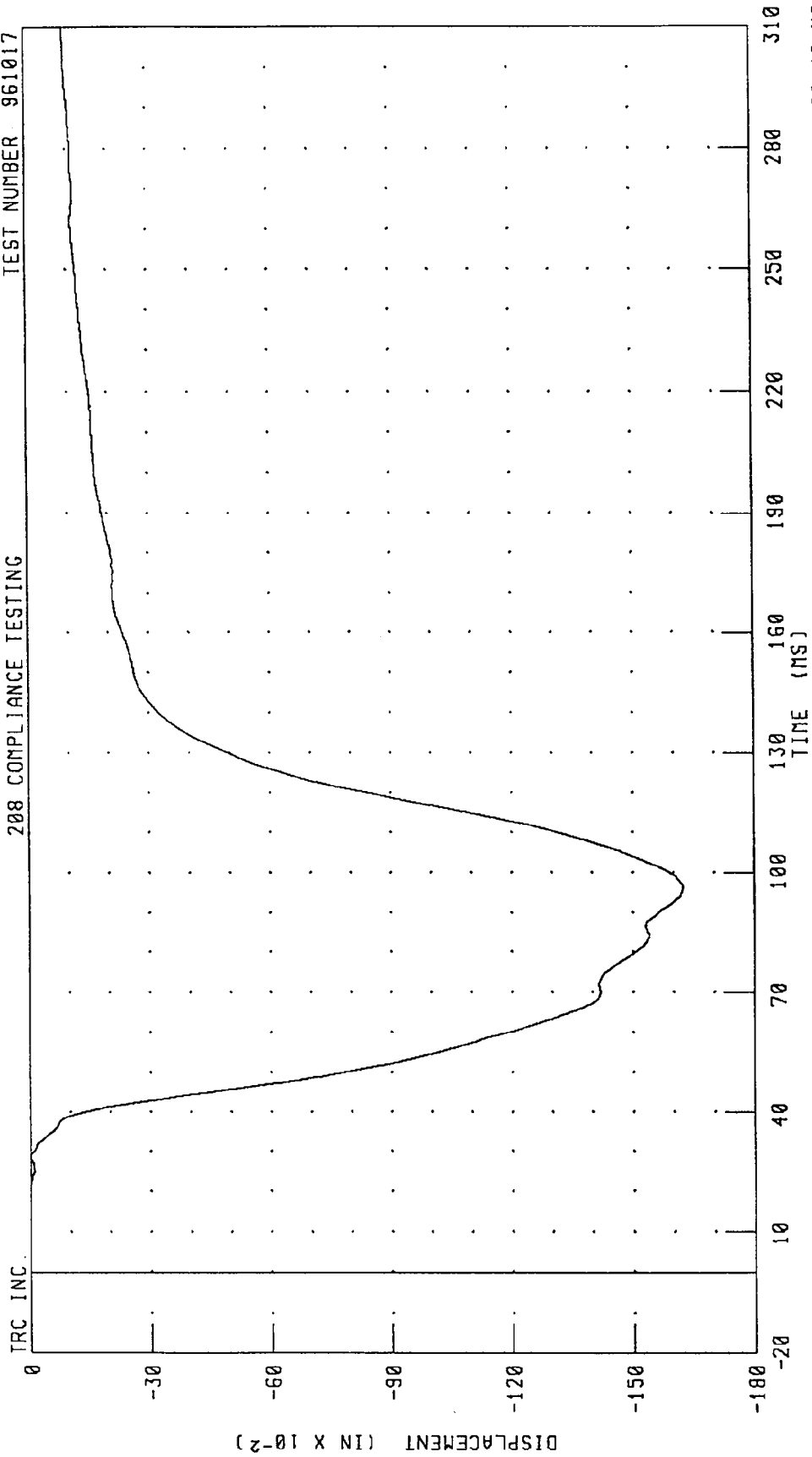


CHANNEL: CSTRG1 FILTER: CH. CLASS 180

PEAK DATA: 33.47 G @ 82.08 MS; 0.01 G @ -20.00 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
DRIVER CHEST DEFLECTION
208 COMPLIANCE TESTING

TEST NUMBER 961017



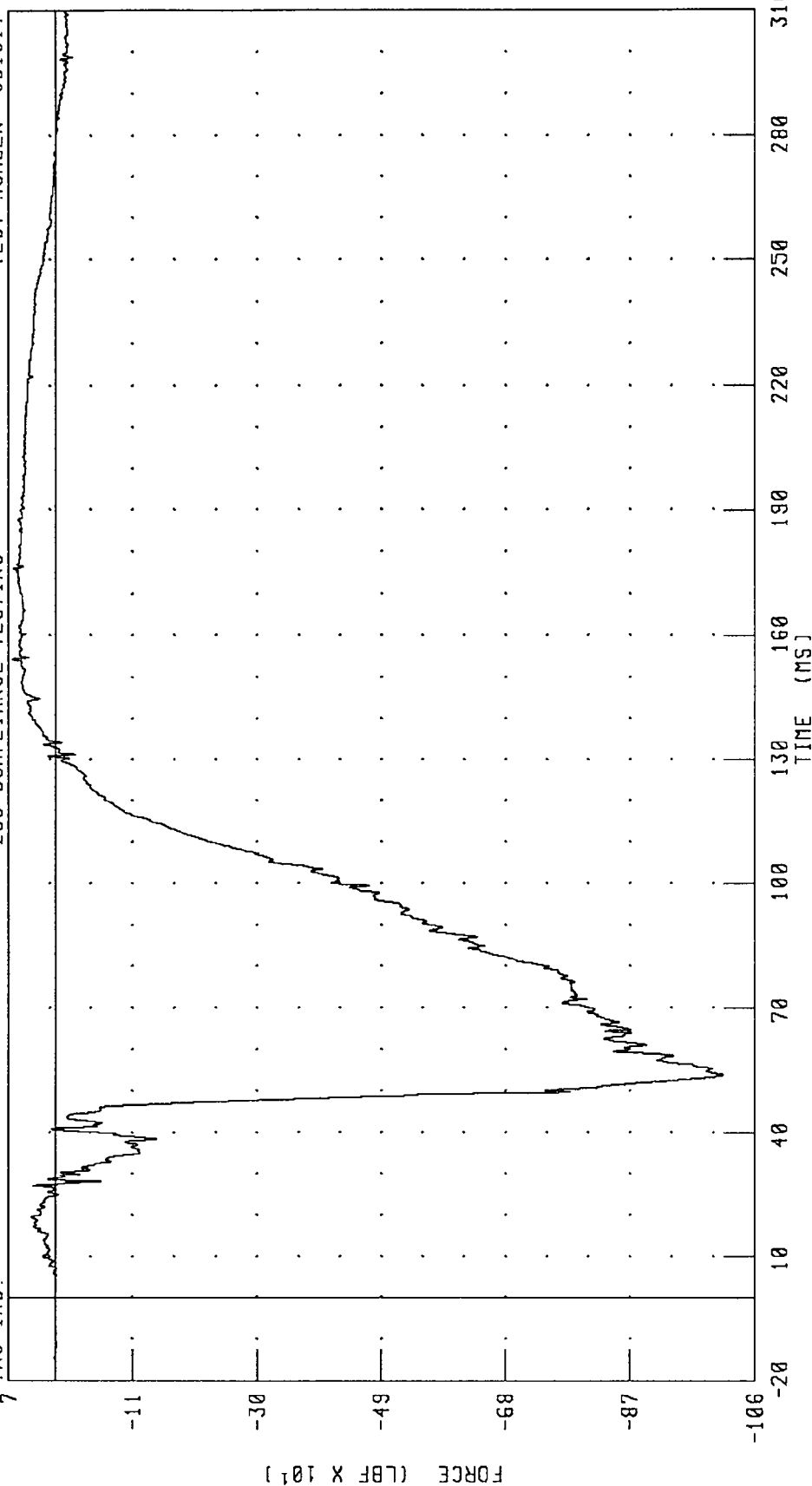
CHANNEL: CSTXD1 FILTER: CH. CLASS 180

PEAK DATA: 0.00 IN @ 18.64 MS; -1.63 IN @ 96.40 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE
208 COMPLIANCE TESTING

TEST NUMBER: 961017

7 TRC INC.

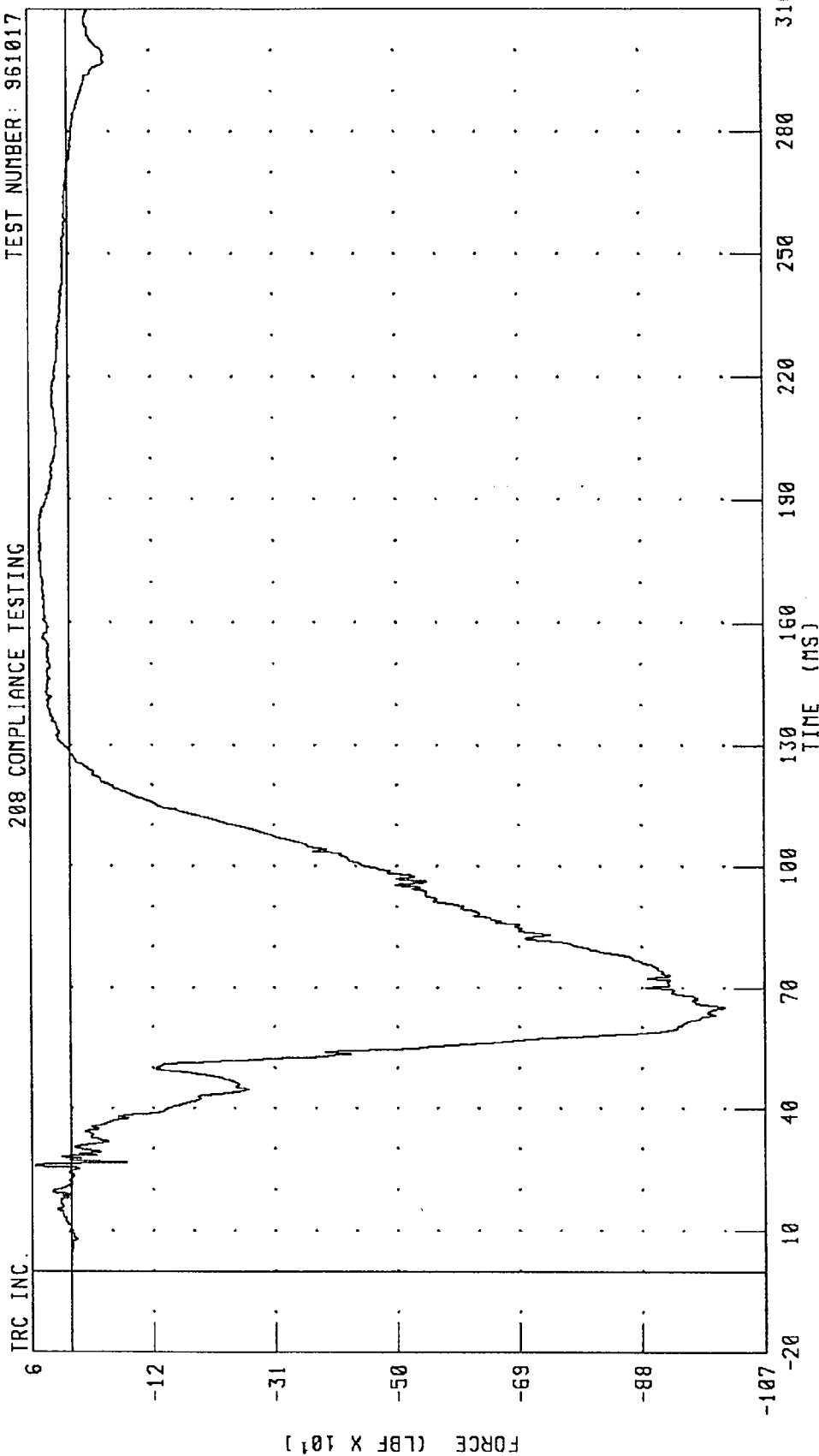


CHANNEL: LFMFI FILTER: CH. CLASS 600

PEAK DATA: 66.66 LBF @ 154.32 MS; -1018.72 LBF @ 53.76 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE
208 COMPLIANCE TESTING

TEST NUMBER: 961017

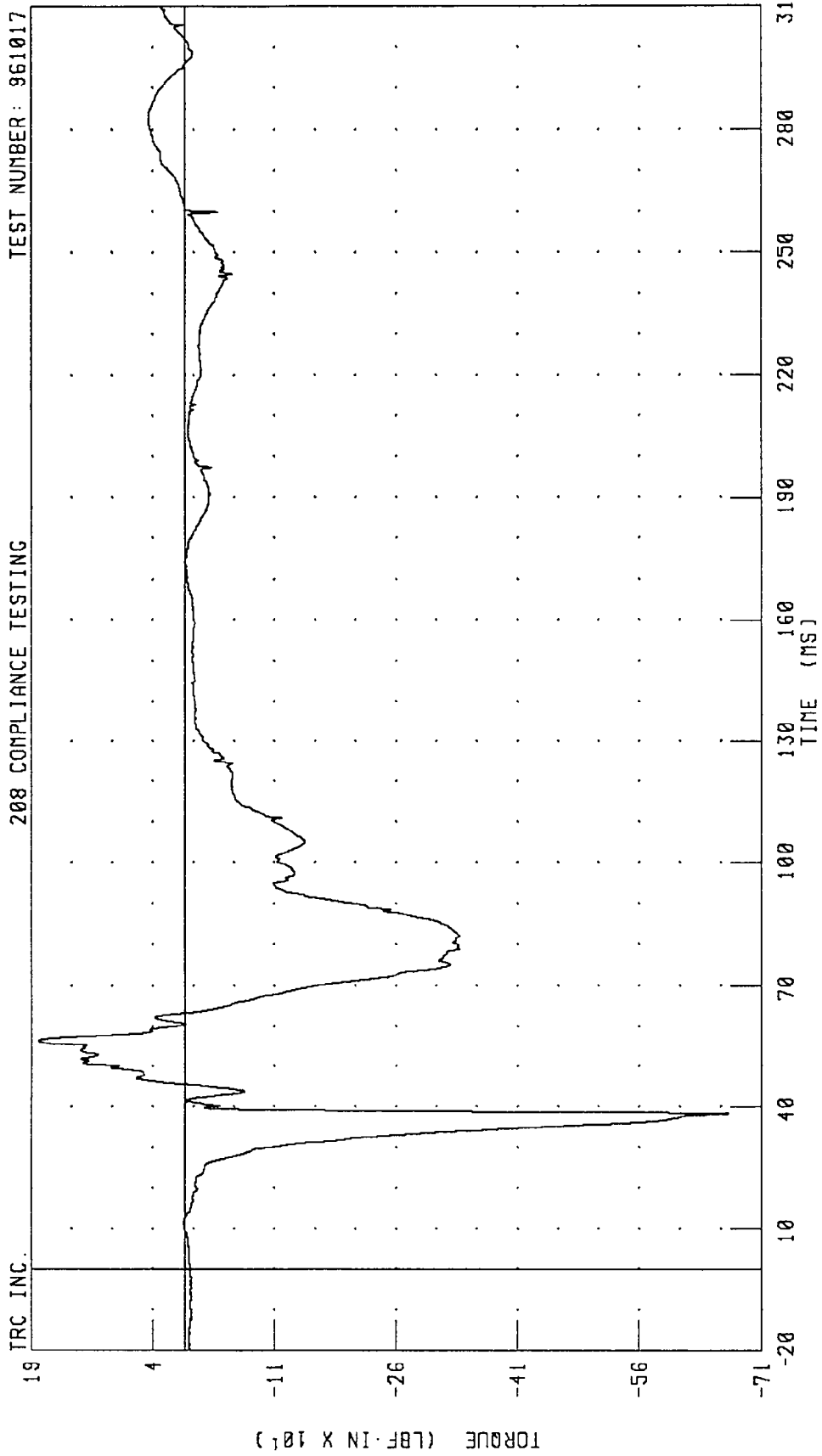


PEAK DATA: 57.03 LBF @ 25.84 MS; -1015.55 LBF @ 65.20 MS

CHANNEL: RFMF1 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER LEFT UPPER TIBIA MOMENT ABOUT X-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 961017



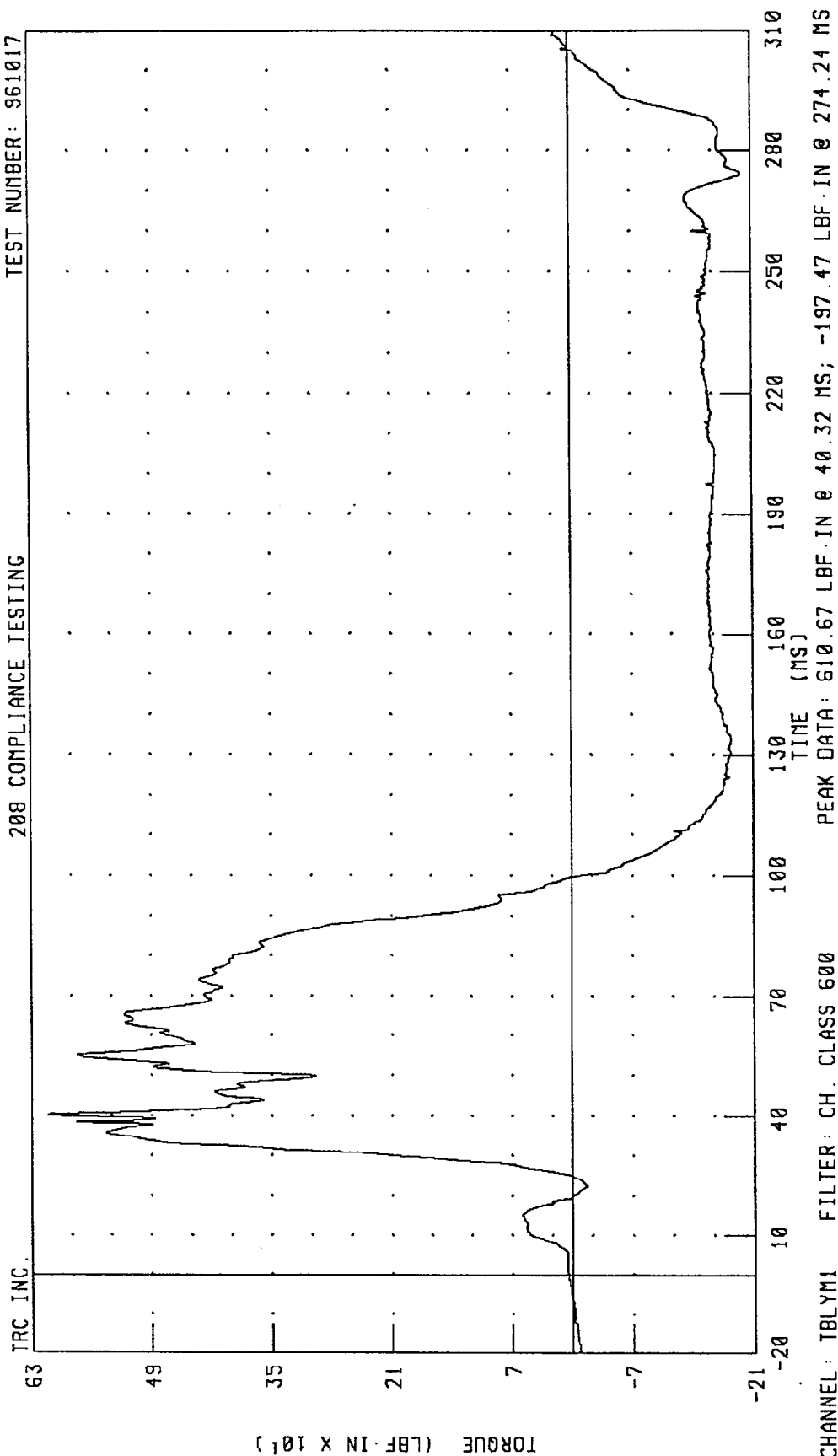
PEAK DATA: 181.26 LBF-IN @ 56.40 MS; -668.56 LBF-IN @ 38.32 MS

CHANNEL: TBLXM1 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
DRIVER LEFT UPPER TIBIA MOMENT ABOUT Y-AXIS

208 COMPLIANCE TESTING

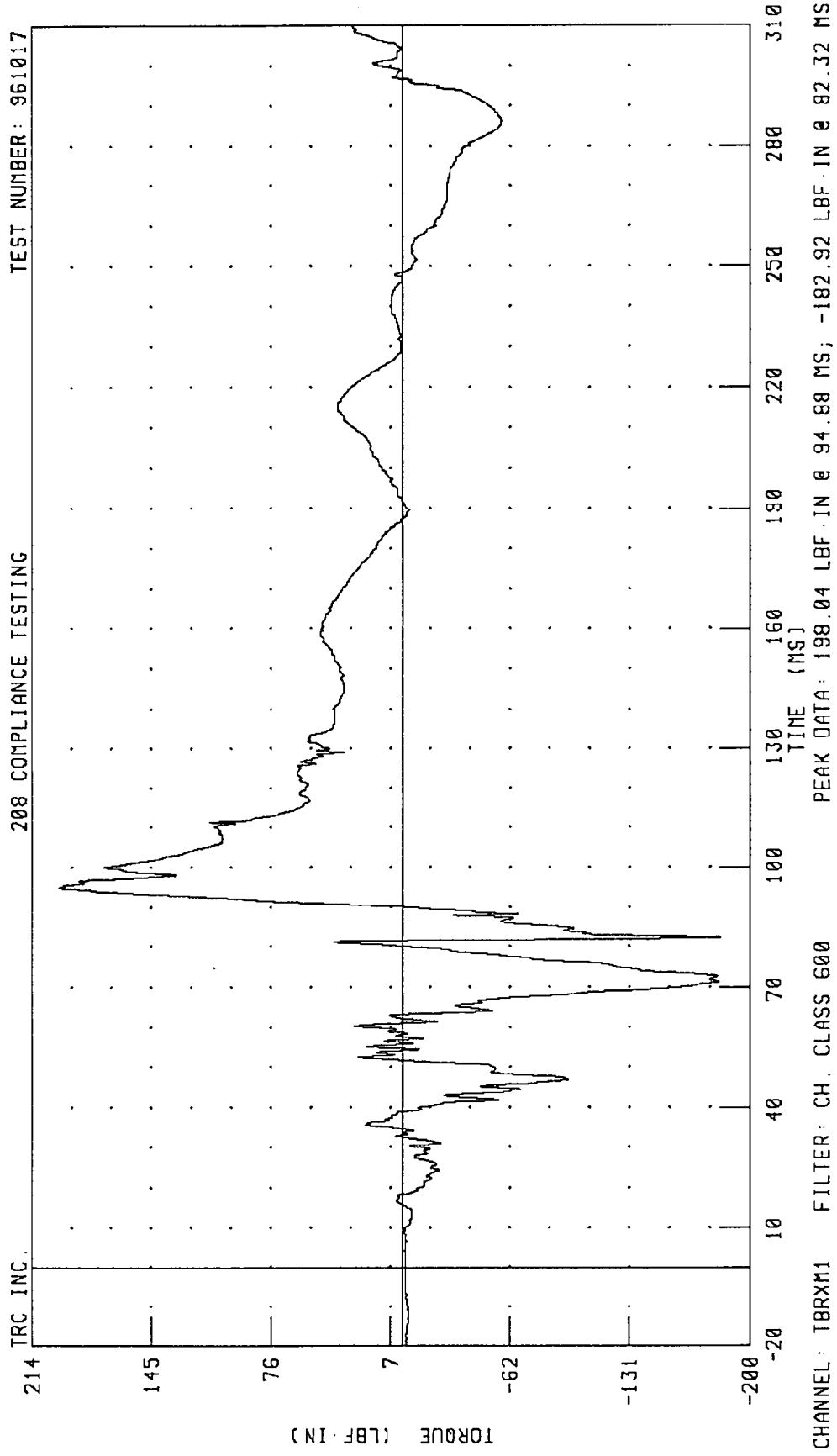
TEST NUMBER: 961017



1997 SATURN SL INTO FLAT FRONTAL BARRIER
DRIVER RIGHT UPPER TIBIA MOMENT ABOUT X-AXIS

208 COMPLIANCE TESTING

TEST NUMBER: 961017

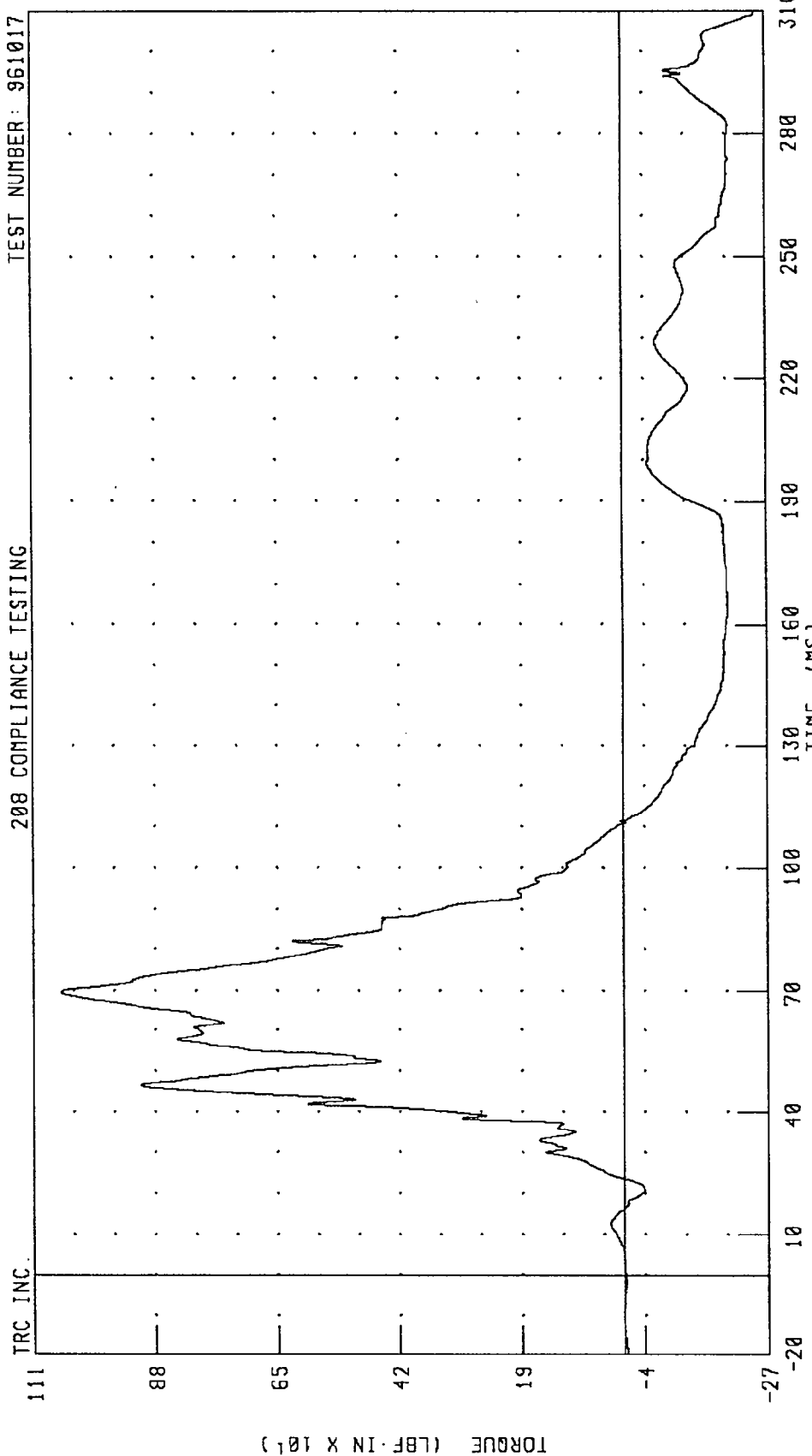


CHANNEL: TBRXM1 FILTER: CH. CLASS 600 PEAK DATA: 198.04 LBF-IN @ 94.88 MS; -182.92 LBF-IN @ 82.32 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
DRIVER RIGHT UPPER TIBIA MOMENT ABOUT Y-AXIS

TEST NUMBER: 961017

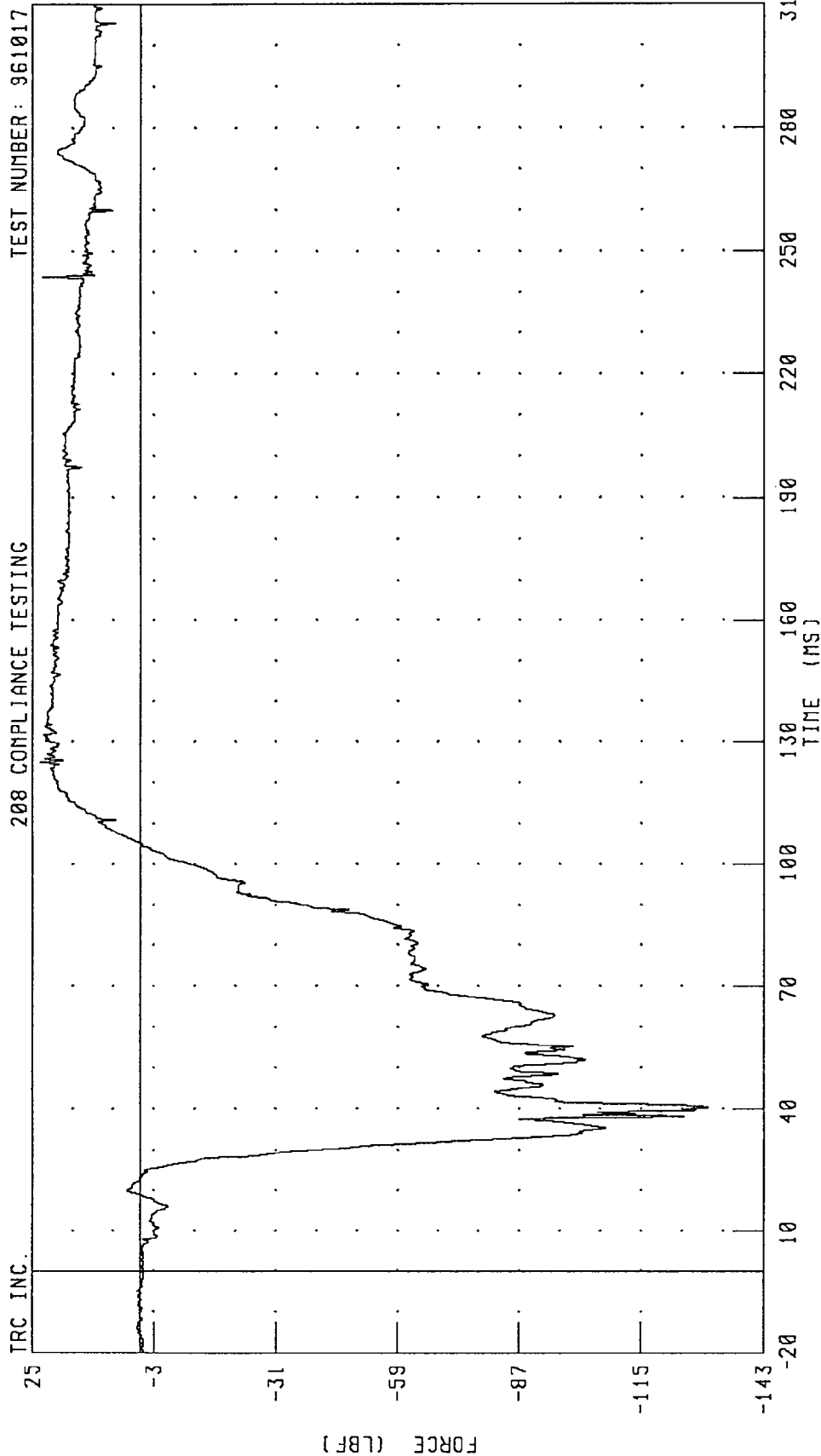
208 COMPLIANCE TESTING



PEAK DATA: 1057.85 LBF-IN @ 69.76 MS; -250.75 LBF-IN @ 309.68 MS

CHANNEL: TBRYM1 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER LEFT LOWER TIBIA X-AXIS FORCE
 208 COMPLIANCE TESTING

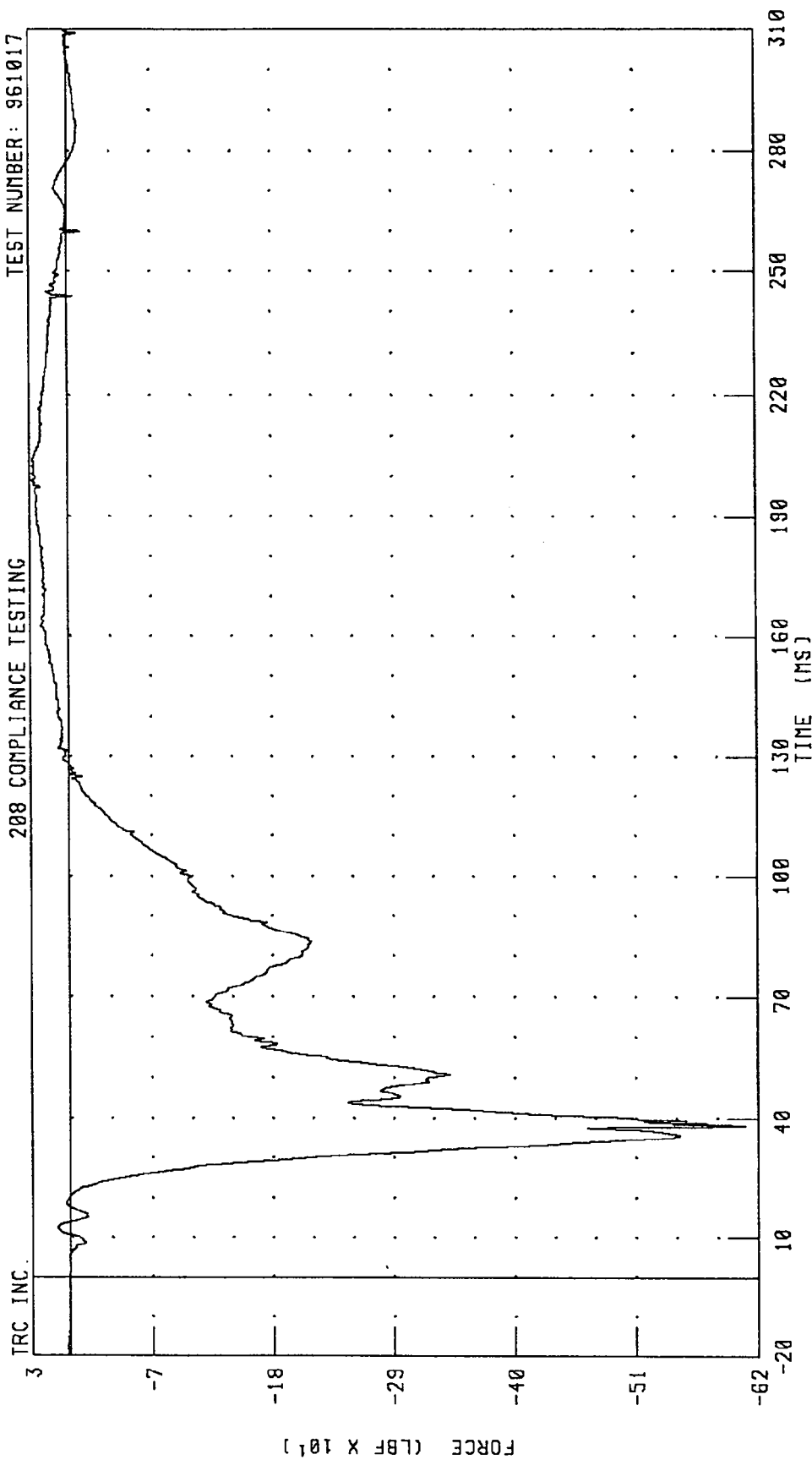


PEAK DATA: 23.10 LBF @ 124.96 MS; -130.46 LBF @ 40.40 MS

CHANNEL: ANLXF1 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER LEFT LOWER TIBIA Z-AXIS FORCE
 208 COMPLIANCE TESTING

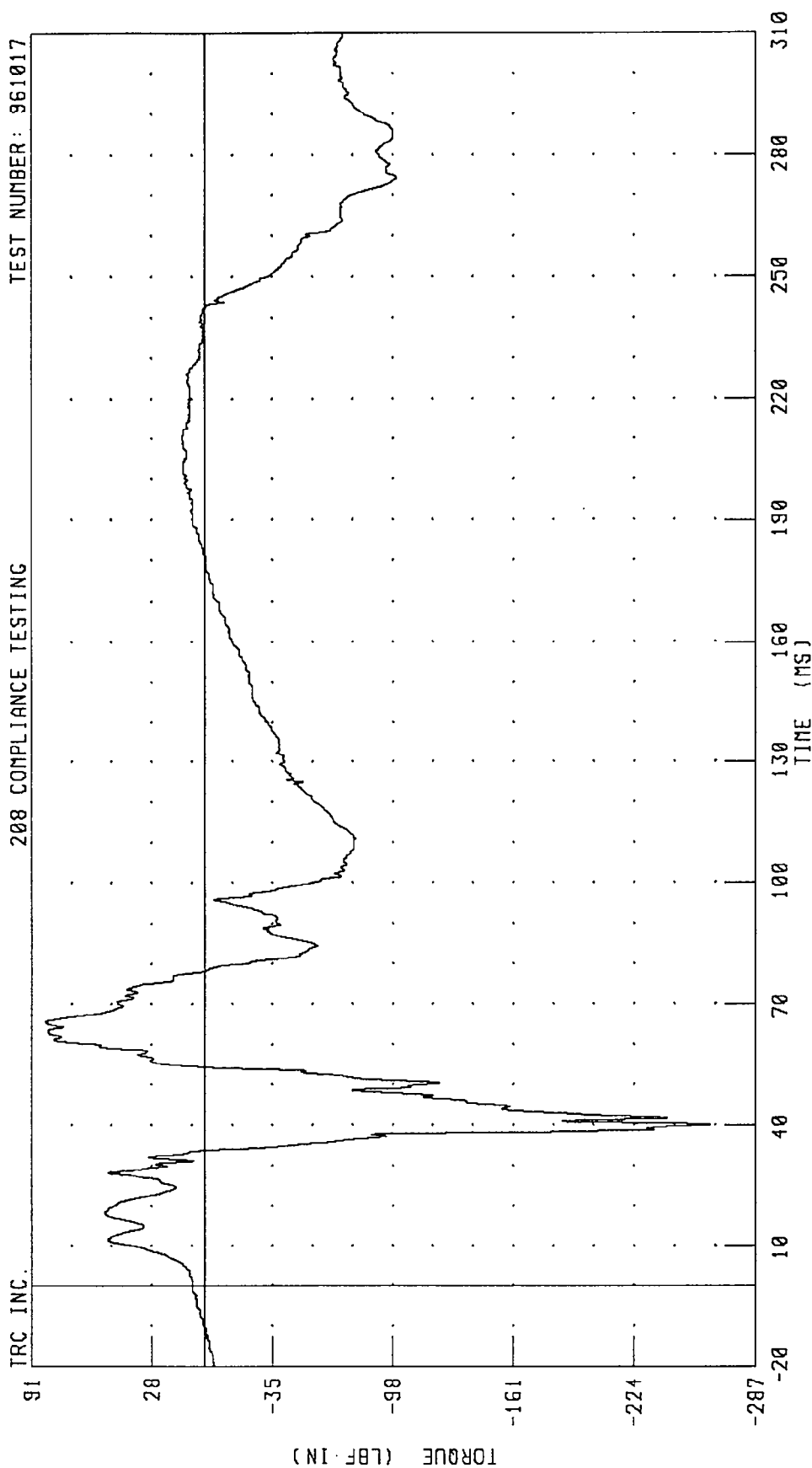
TEST NUMBER: 961017



CHANNEL: ANLZF1 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER LEFT LOWER TIBIA MOMENT ABOUT Y-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 961017



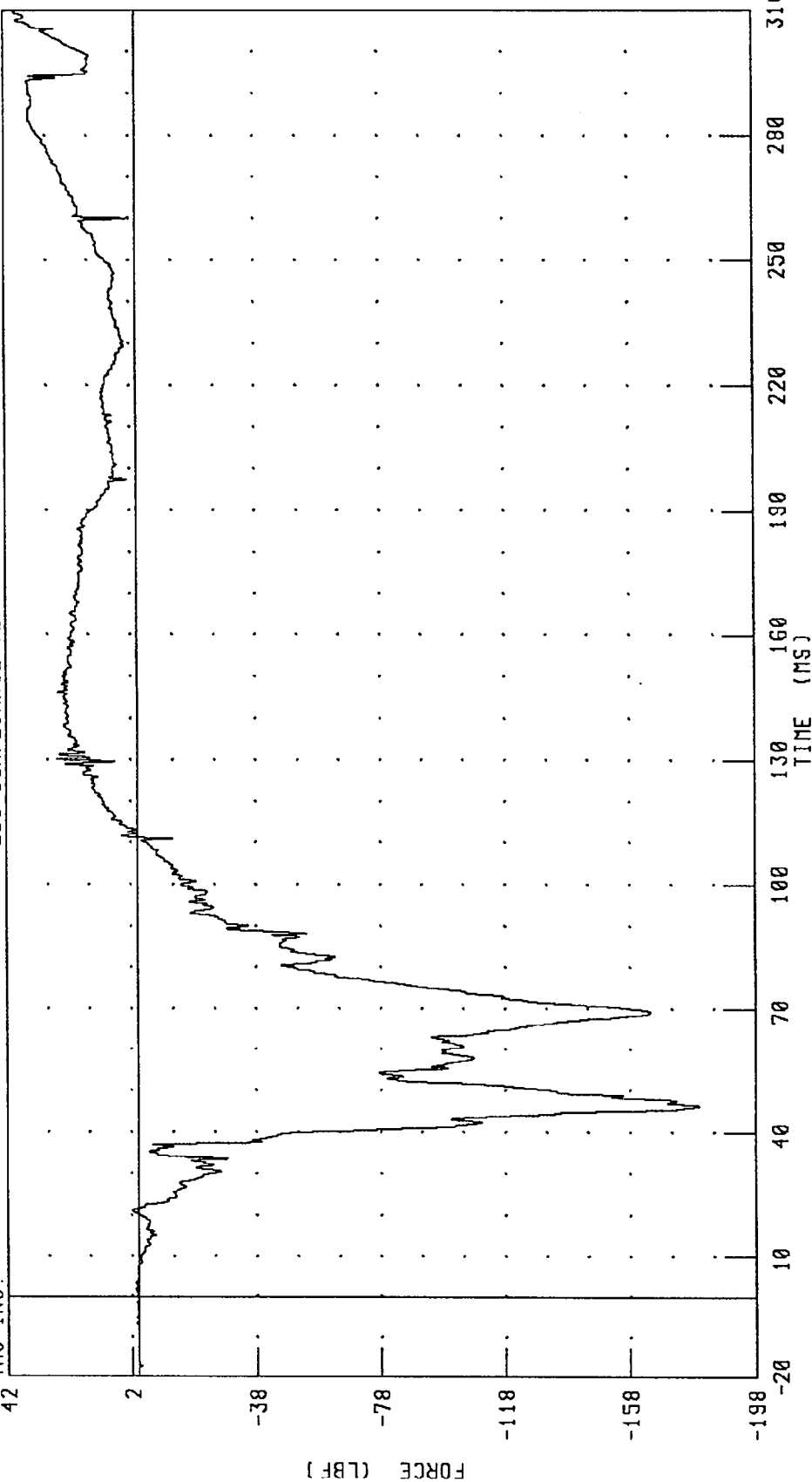
CHANNEL: ANLYM1 FILTER: CH. CLASS 600

PEAK DATA: 83.35 LBF-IN @ 65.68 MS; -263.52 LBF-IN @ 40.16 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT LOWER TIBIA X-AXIS FORCE
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC INC.

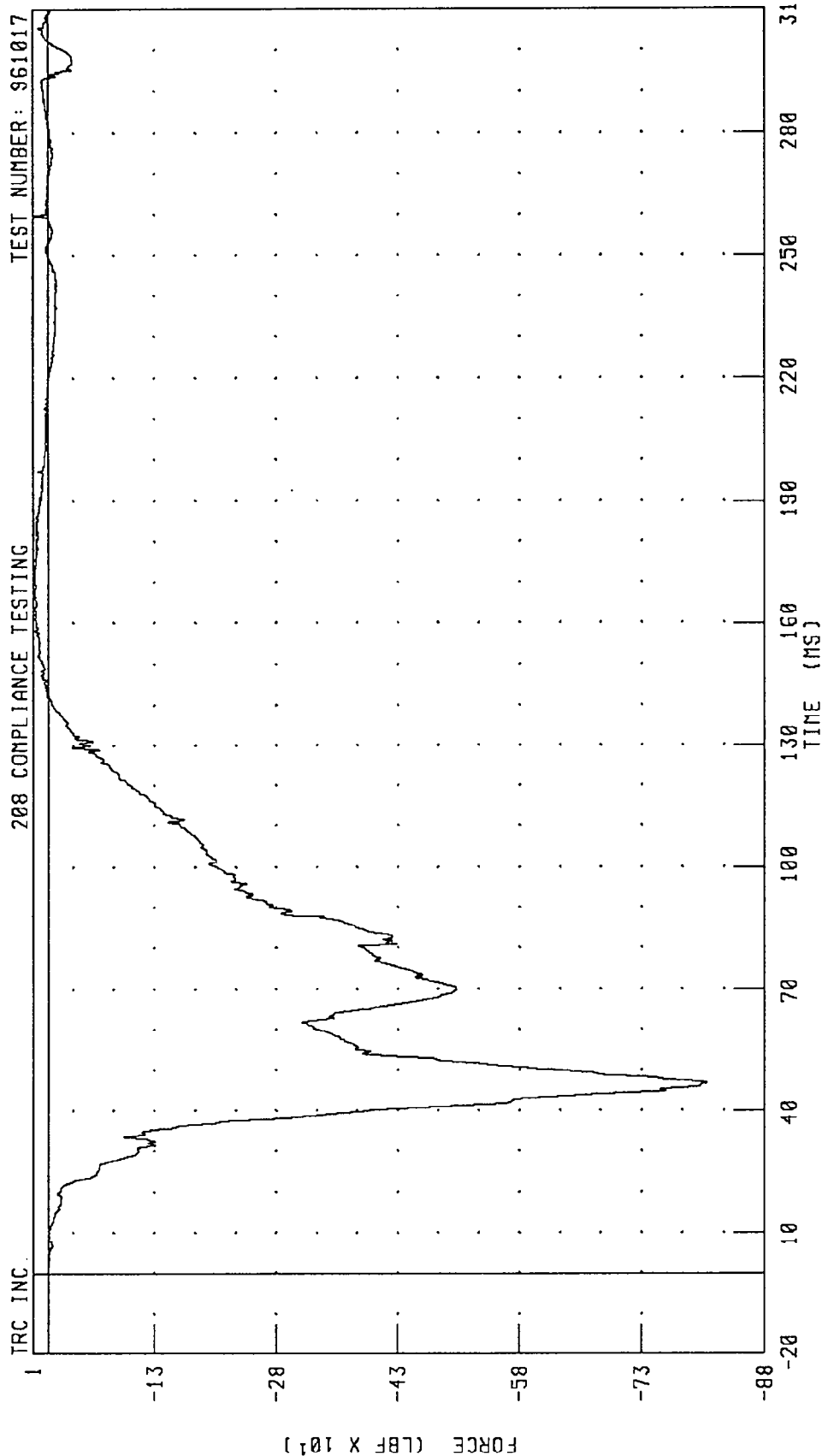


CHANNEL: ANRXF1 FILTER: CH. CLASS 600

PEAK DATA: 38.49 LBF @ 309.52 MS; -180.06 LBF @ 46.32 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT LOWER TIBIA Z-AXIS FORCE
 208 COMPLIANCE TESTING

TEST NUMBER: 961017



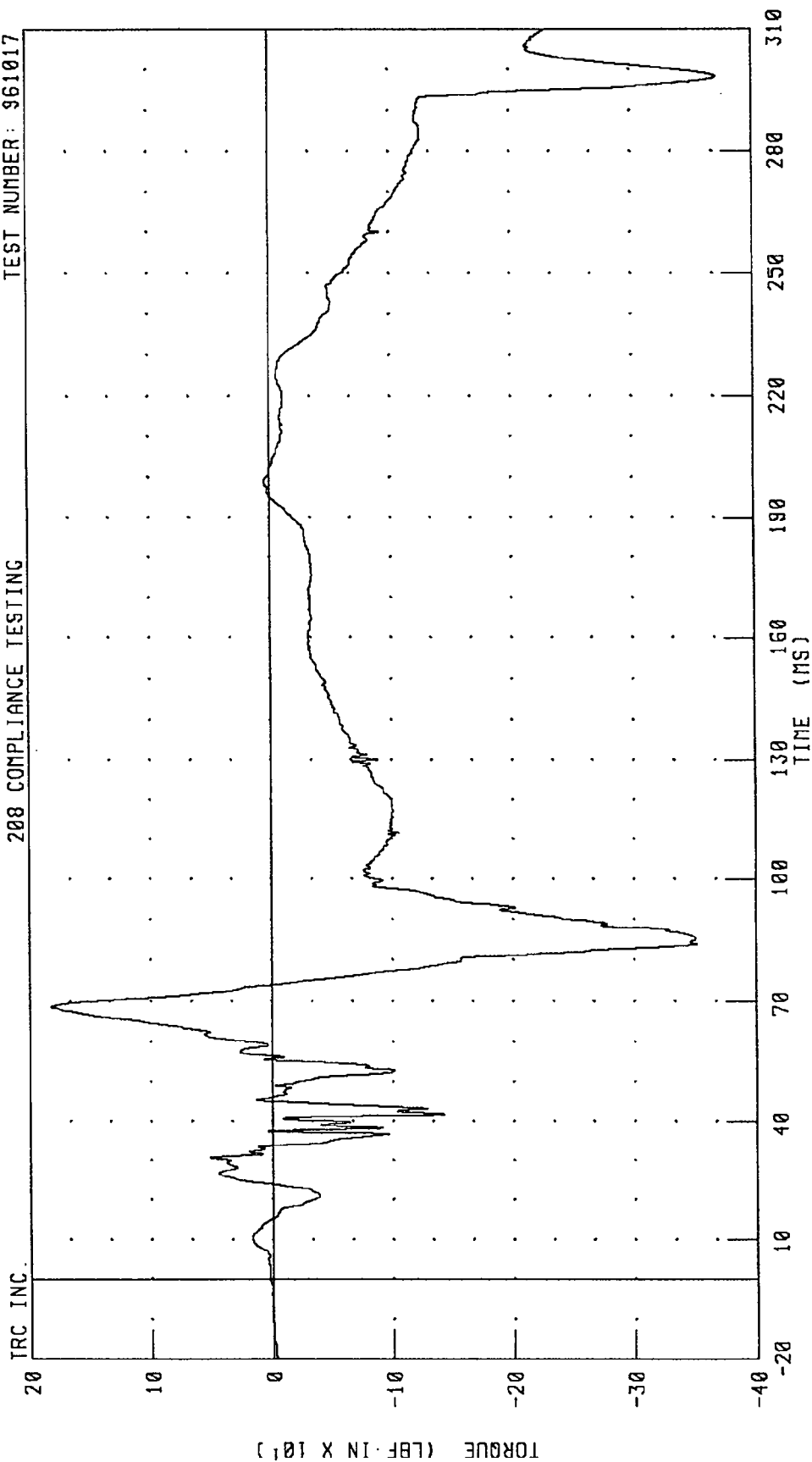
PEAK DATA: 17.80 LBF @ 259.84 MS; -810.43 LBF @ 46.72 MS

CHANNEL: ANRZF1 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
DRIVER RIGHT LOWER TIBIA MOMENT ABOUT Y-AXIS

208 COMPLIANCE TESTING

TEST NUMBER: 961017



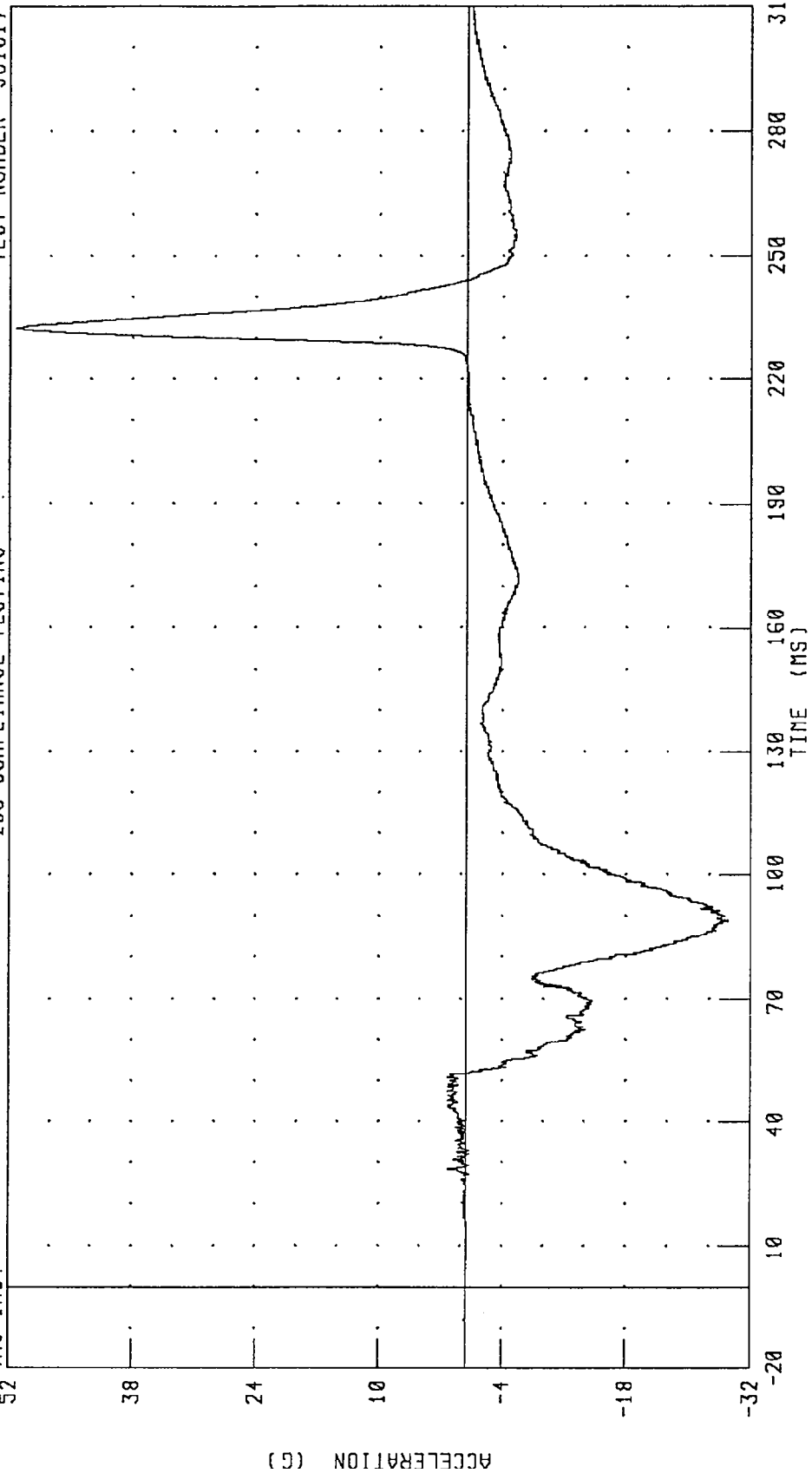
PEAK DATA: 182.56 LBF·IN @ 68.72 MS; -370.80 LBF·IN @ 298.40 MS

CHANNEL: ANRYM1 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017

IRC INC.



CHANNEL: HEDXG2 FILTER: CH. CLASS 1000

PEAK DATA: 51.17 G @ 232.32 MS; -29.48 G @ 88.88 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC, INC.

396

305

214

123

32

-58

-150

ACCELERATION (G X 10⁻¹)

TIME (MS)

310

280

250

220

190

160

130

100

70

40

10

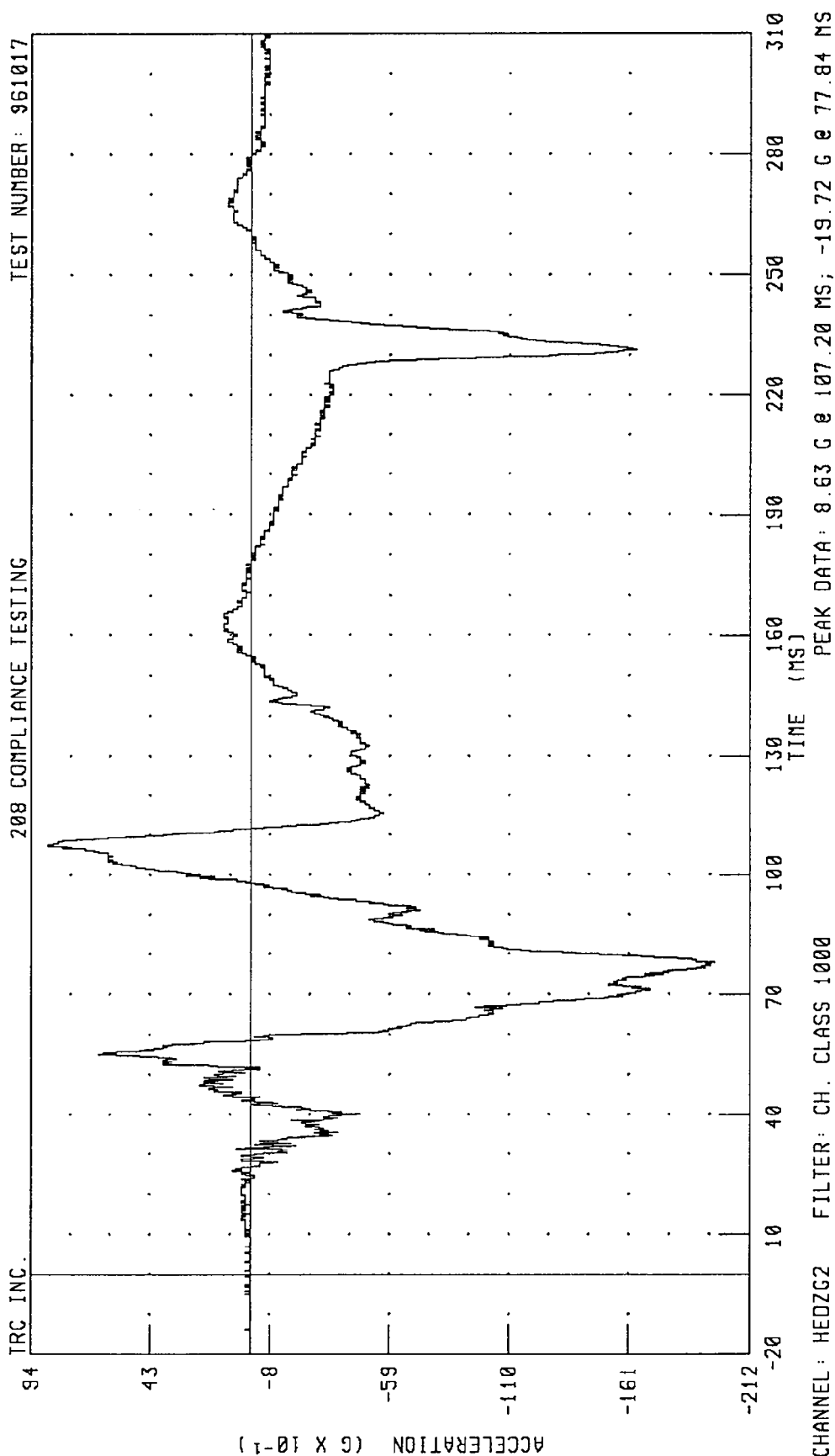
-20

PEAK DATA: 35.96 G @ 101.44 MS; -14.19 G @ 232.00 MS

CHANNEL: HEDYG2 FILTER: CH. CLASS 1000

1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017



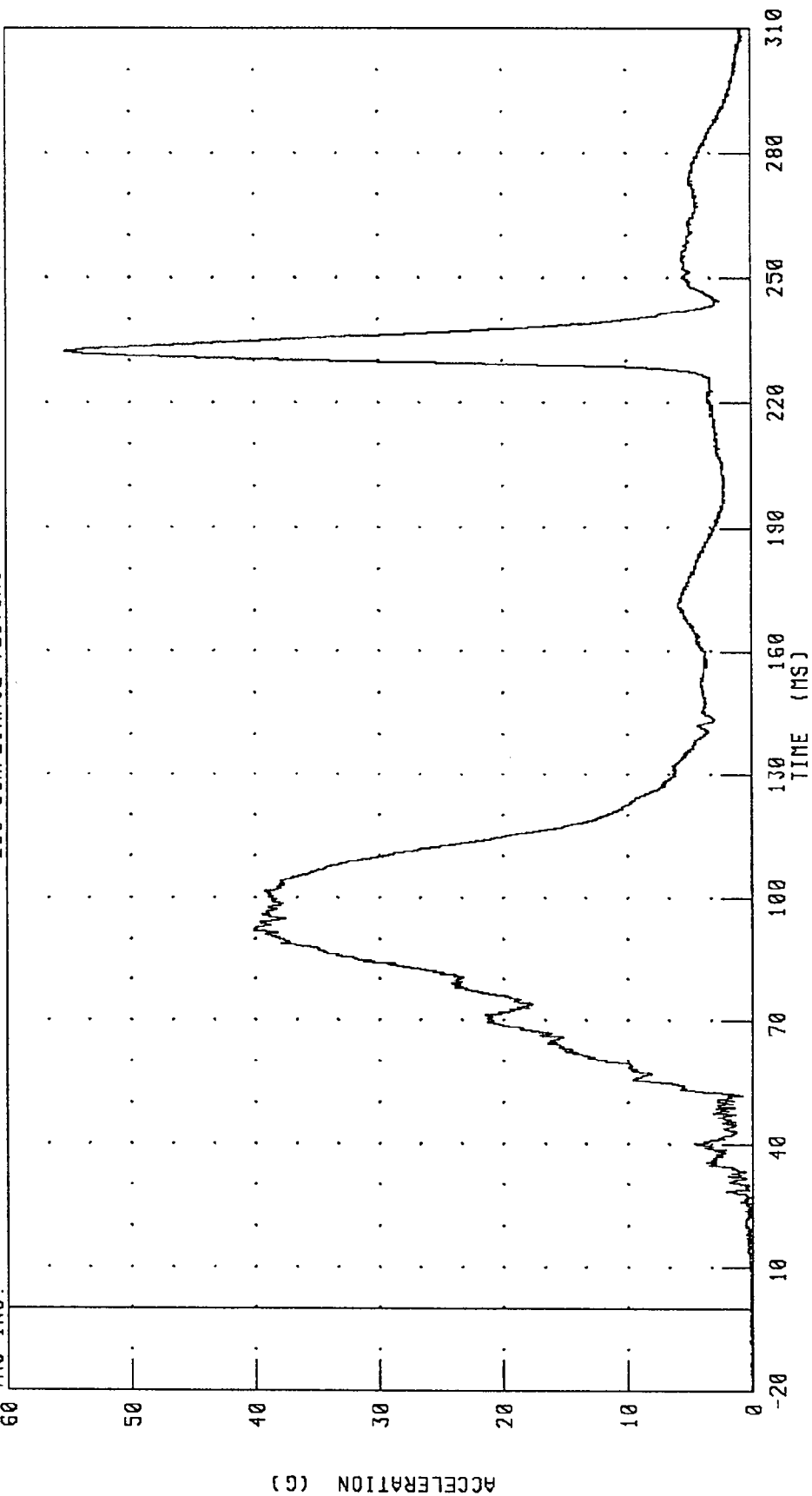
CHANNEL: HEDZG2 FILTER: CH. CLASS 1000 PEAK DATA: 8.63 G @ 107.20 MS; -19.72 G @ 77.84 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

TEST NUMBER: 961017

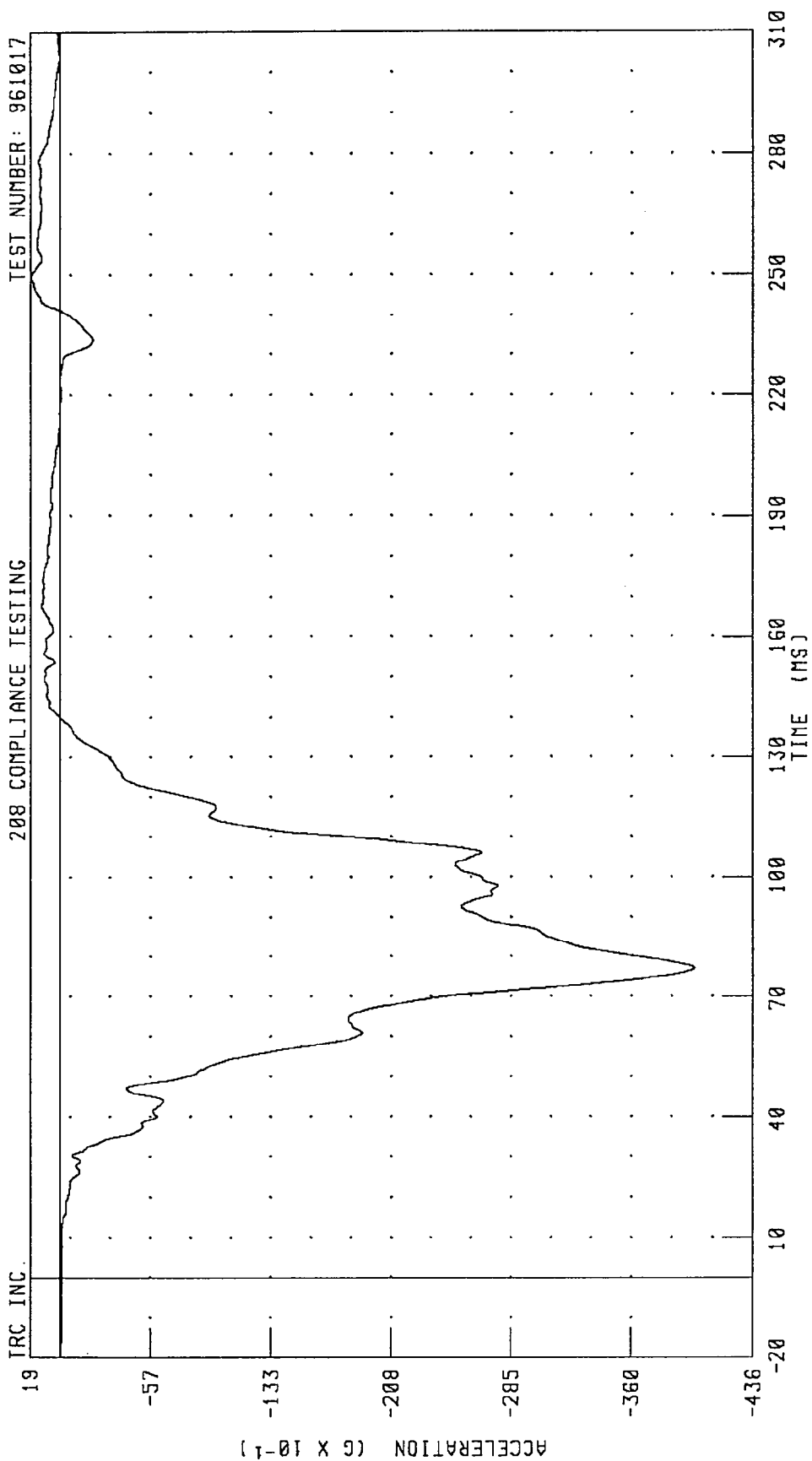
208 COMPLIANCE TESTING

TRC INC.



CHANNEL: HEDRG2 FILTER: CH. CLASS 1000

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION
 208 COMPLIANCE TESTING

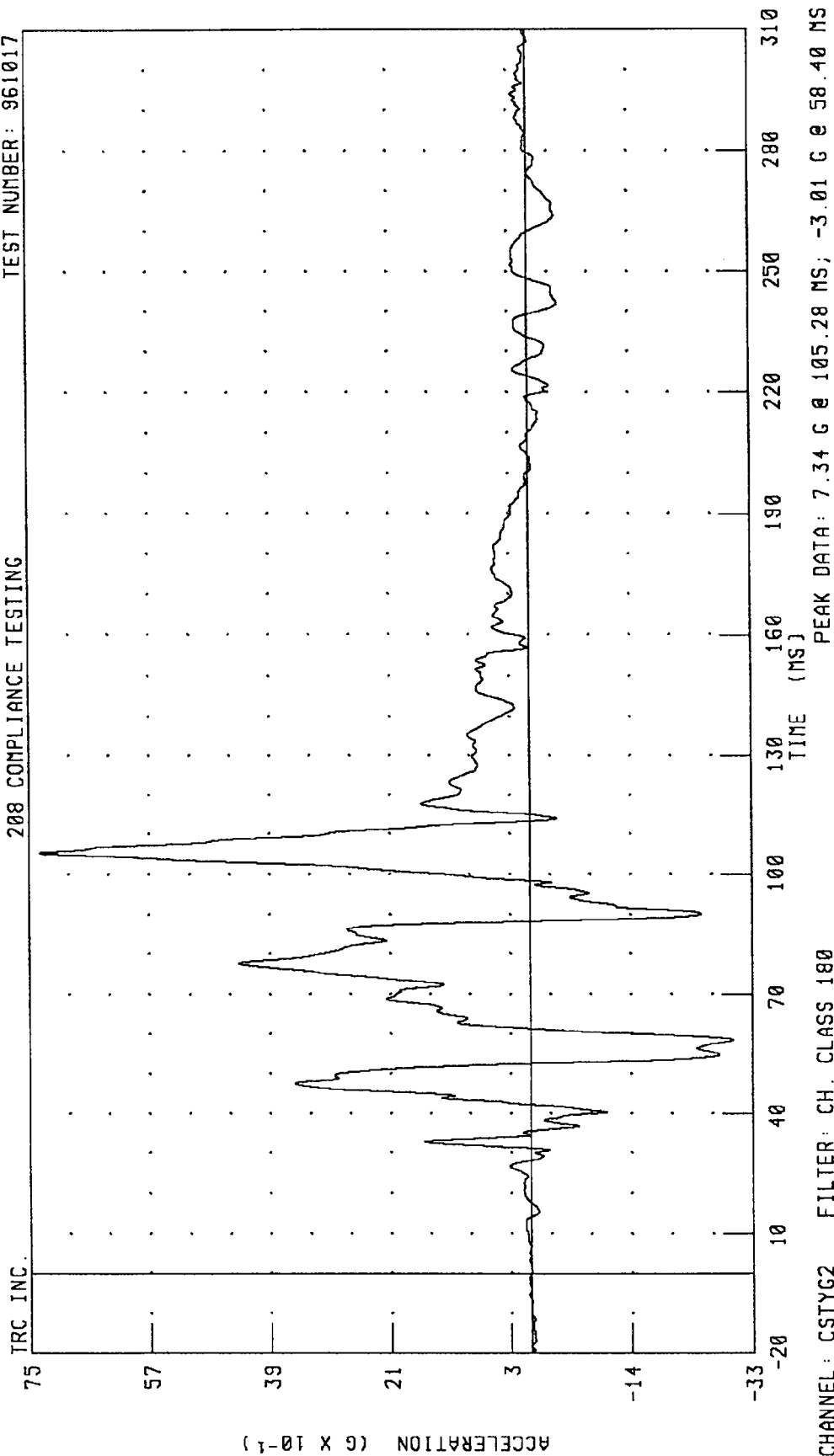


PEAK DATA: 1 82 G @ 249.28 MS; -40.04 G @ 77.04 MS

CHANNEL: CSTXG2 FILTER: CH. CLASS 180

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING

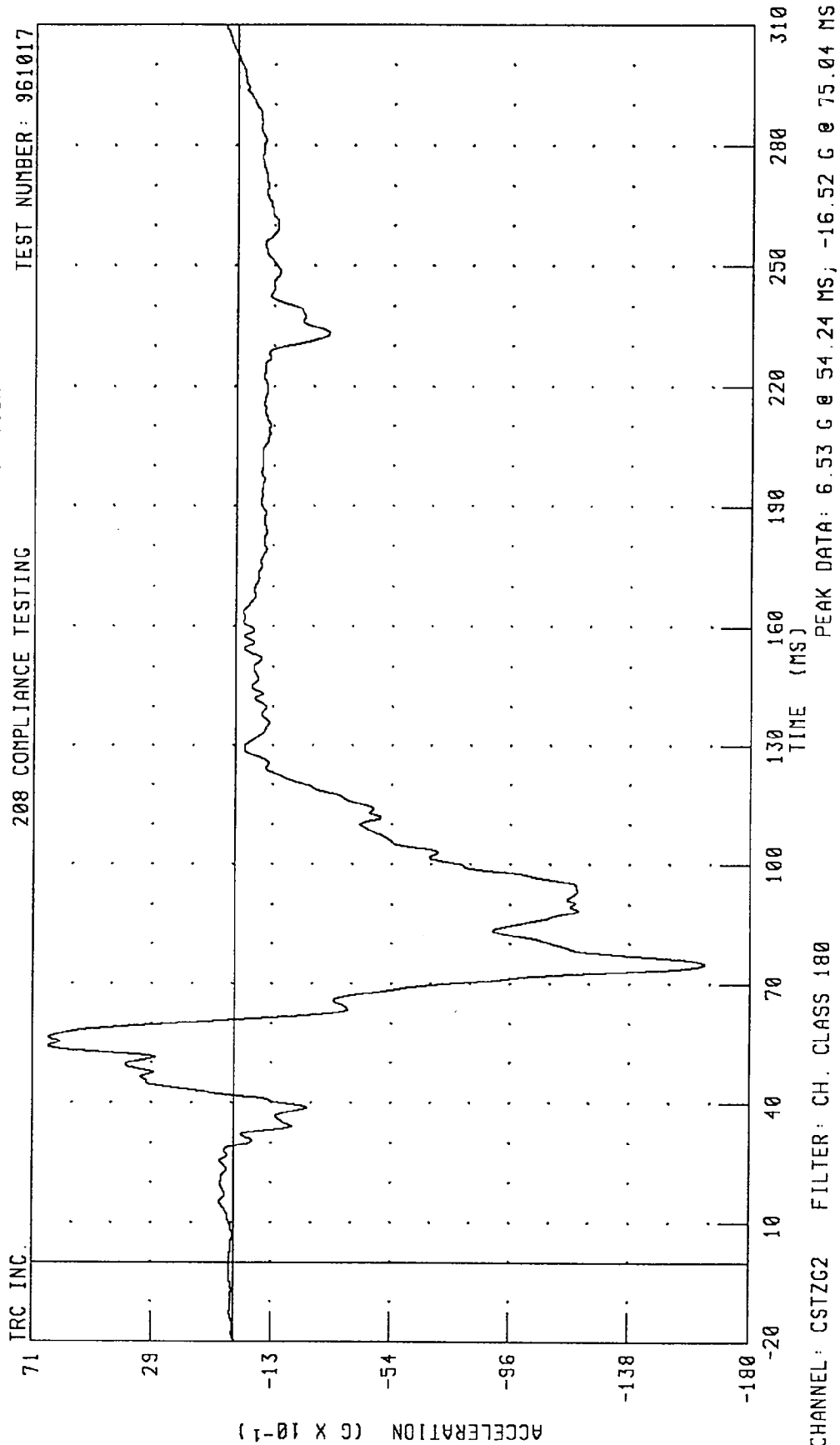
TEST NUMBER: 961017



CHANNEL: CSTYG2 FILTER: CH. CLASS 180

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

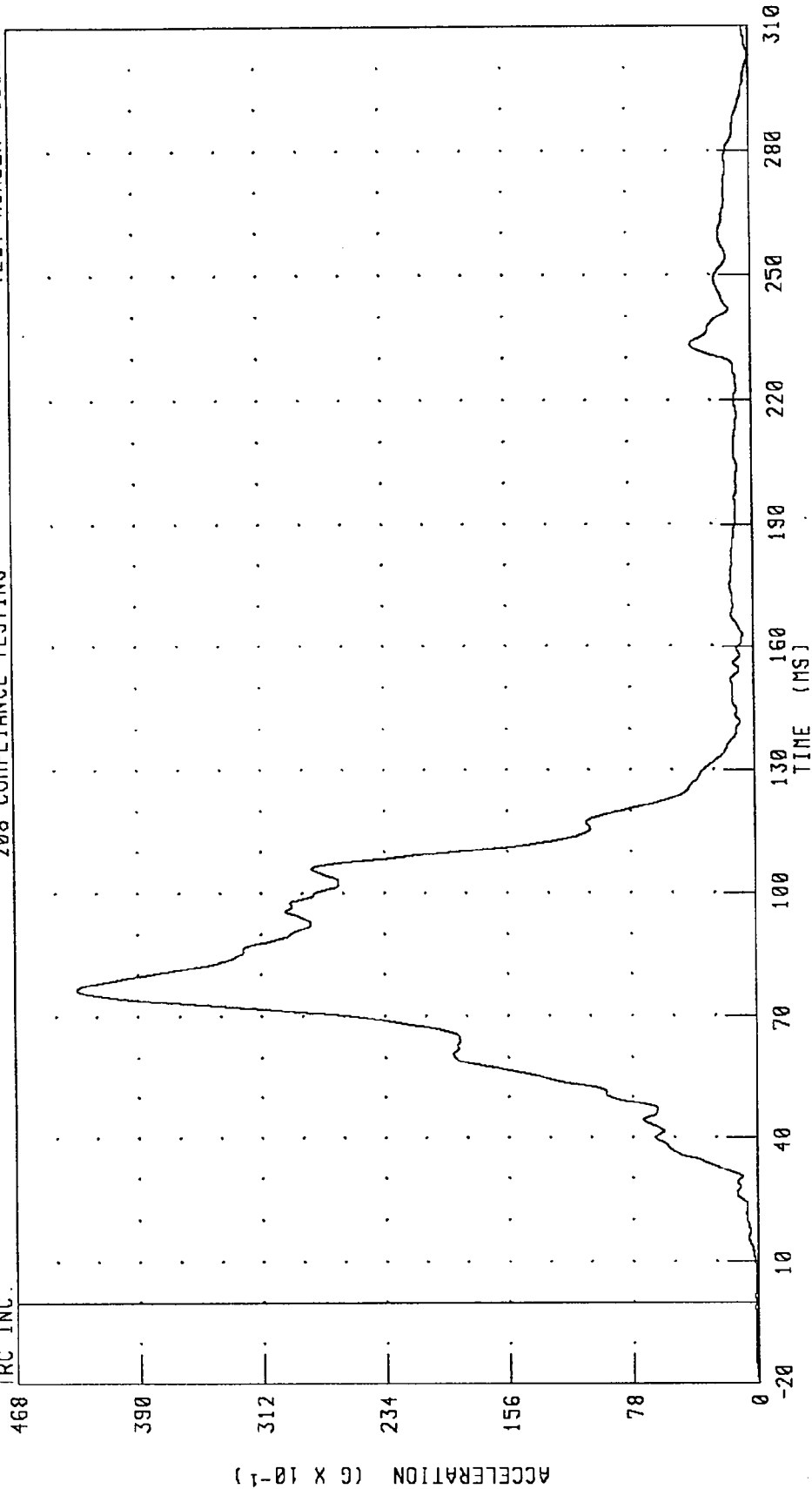


CHANNEL: CSTZG2 FILTER: CH. CLASS 180

1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017

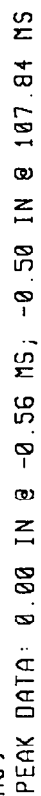
TRC INC.



CHANNEL: CSTRG2 FILTER: CH. CLASS 180

PEAK DATA: 42.89 G @ 76.40 MS; 0.01 G @ -20.00 MS

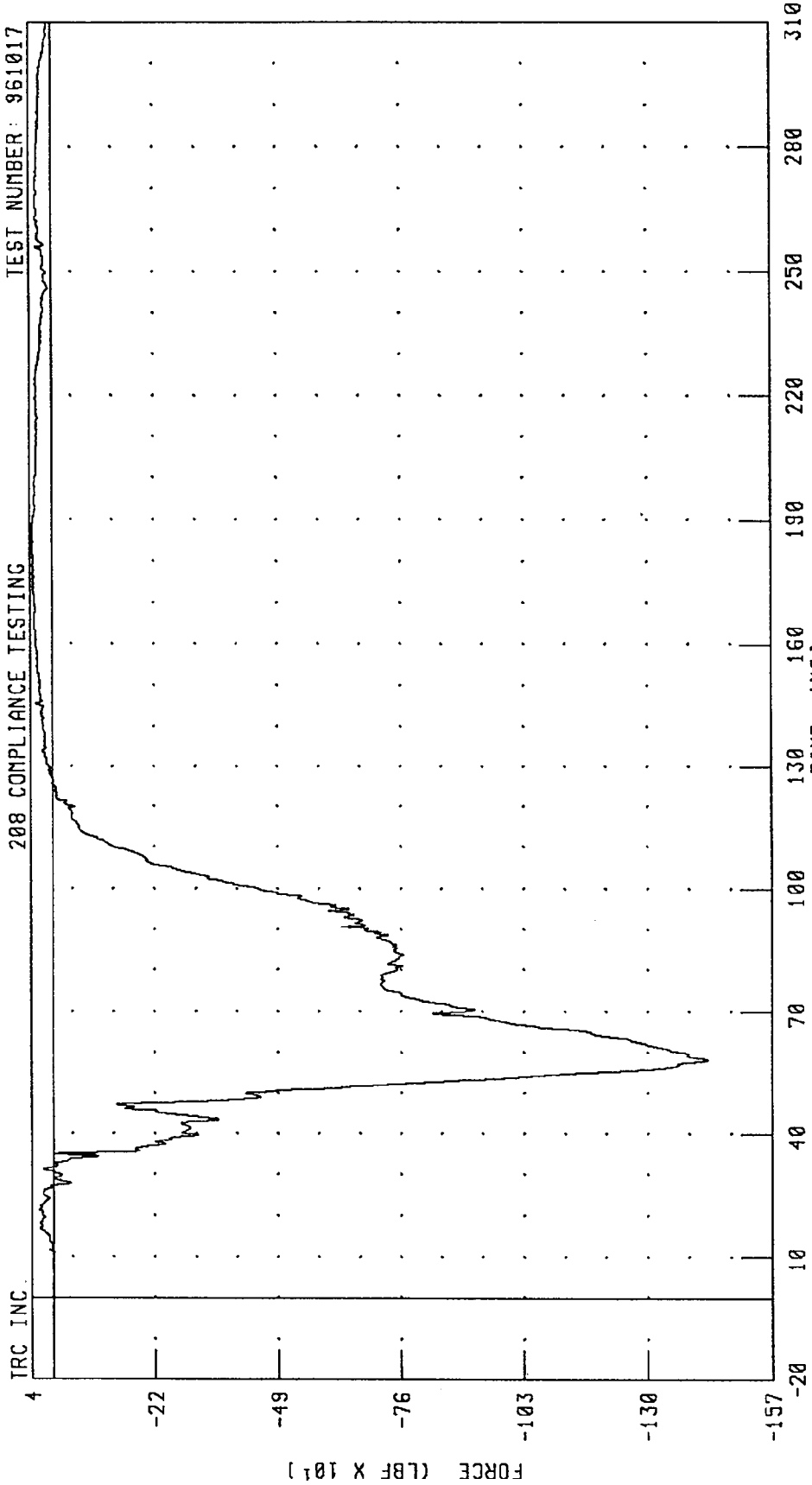
TEST NUMBER 961017



CHANNEL: CSTXD2 FILTER: CH. CLASS 180

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT FEMUR FORCE
 208 COMPLIANCE TESTING

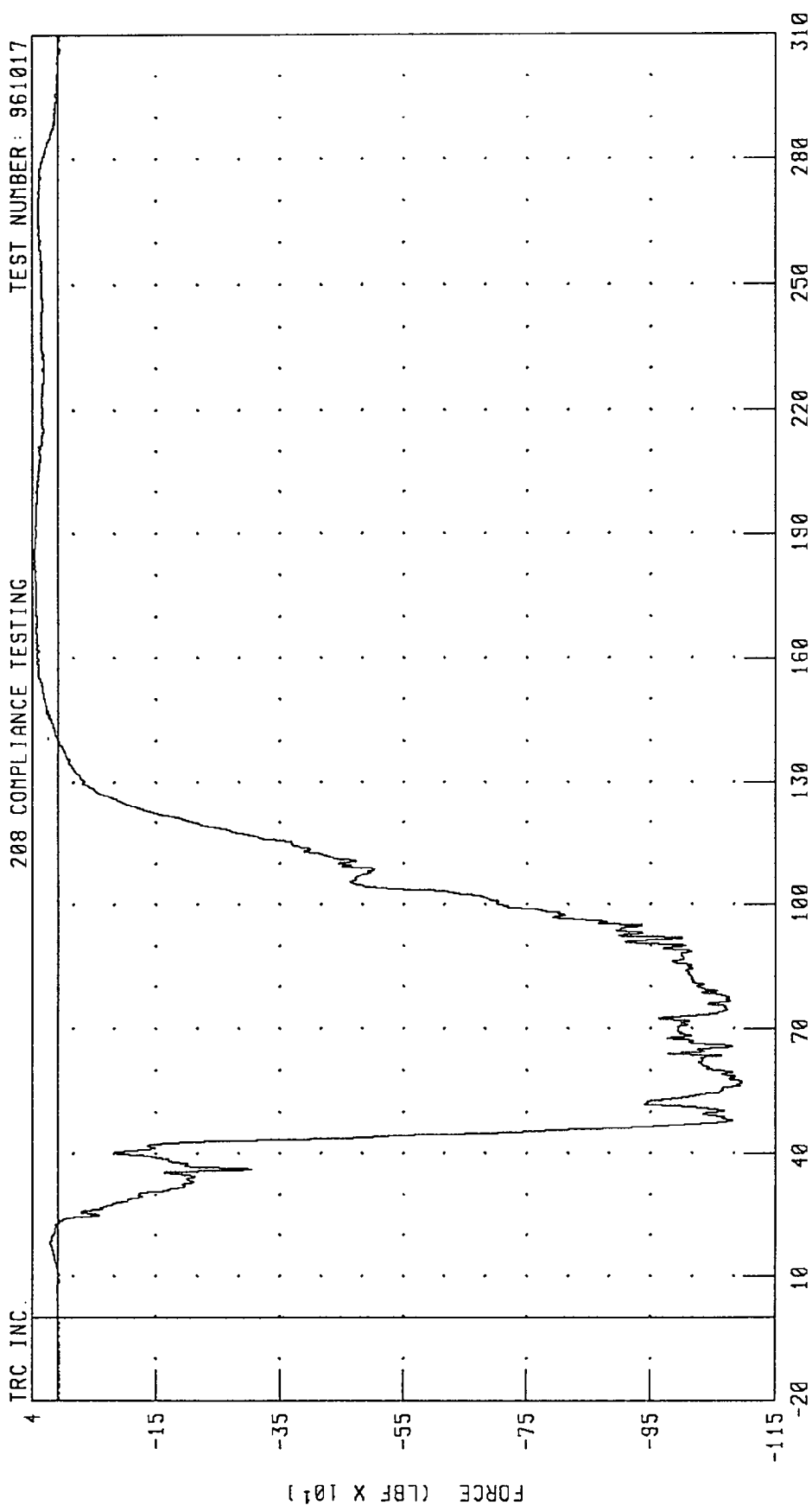
TEST NUMBER: 961017



1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

208 COMPLIANCE TESTING

TEST NUMBER: 961017

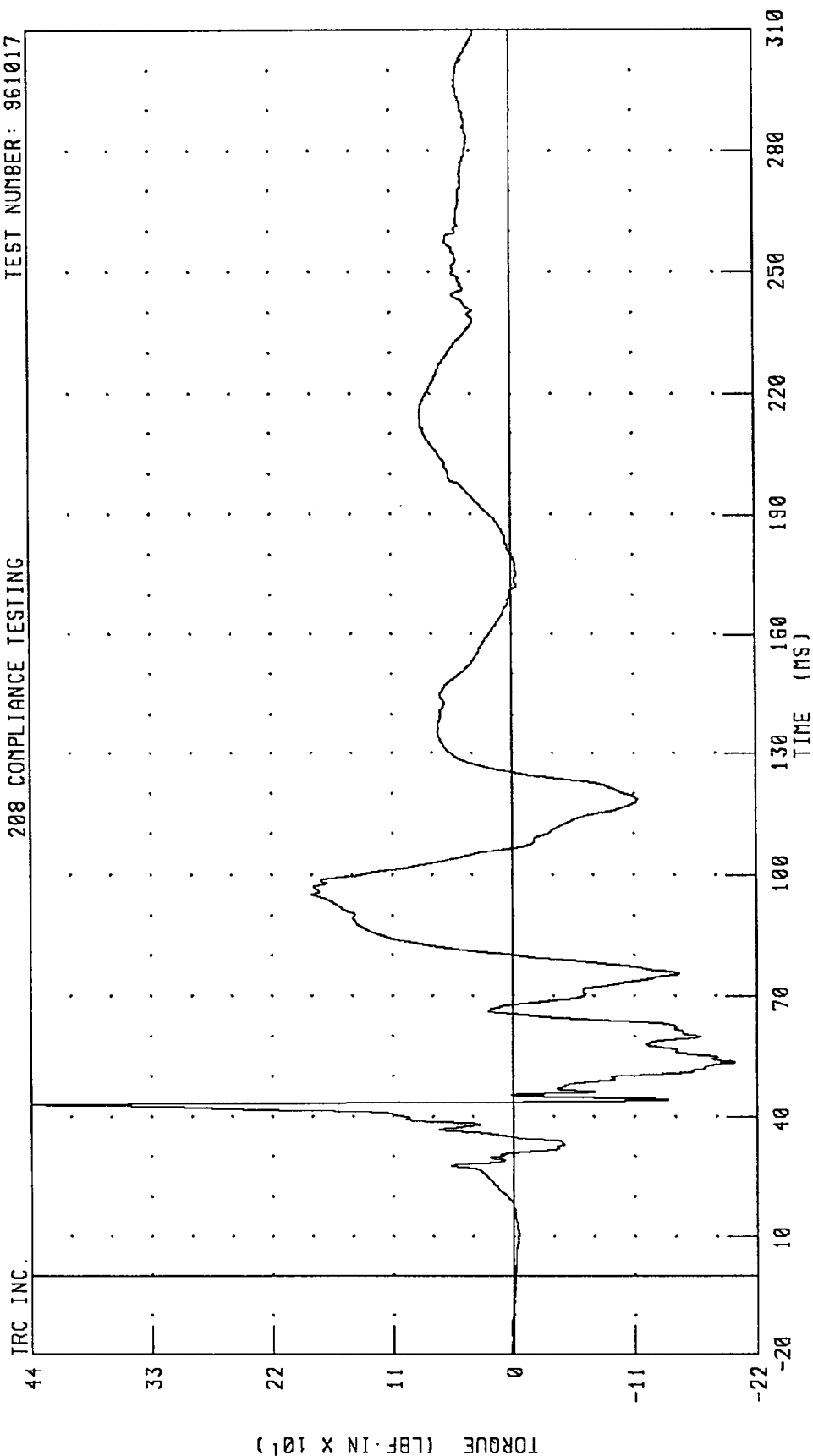


PEAK DATA: 39.46 LBF @ 181.68 MS; -1104.65 LBF @ 57.36 MS

CHANNEL: RFMF2 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT UPPER TIBIA MOMENT ABOUT X-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 961017



PEAK DATA: 437.53 LBF·IN @ 42.96 MS; -200.13 LBF·IN @ 53.44 MS

CHANNEL: TBLXM2 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT UPPER TIBIA MOMENT ABOUT Y-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC INC.

125

101

TORQUE (LBF·IN X 10¹)

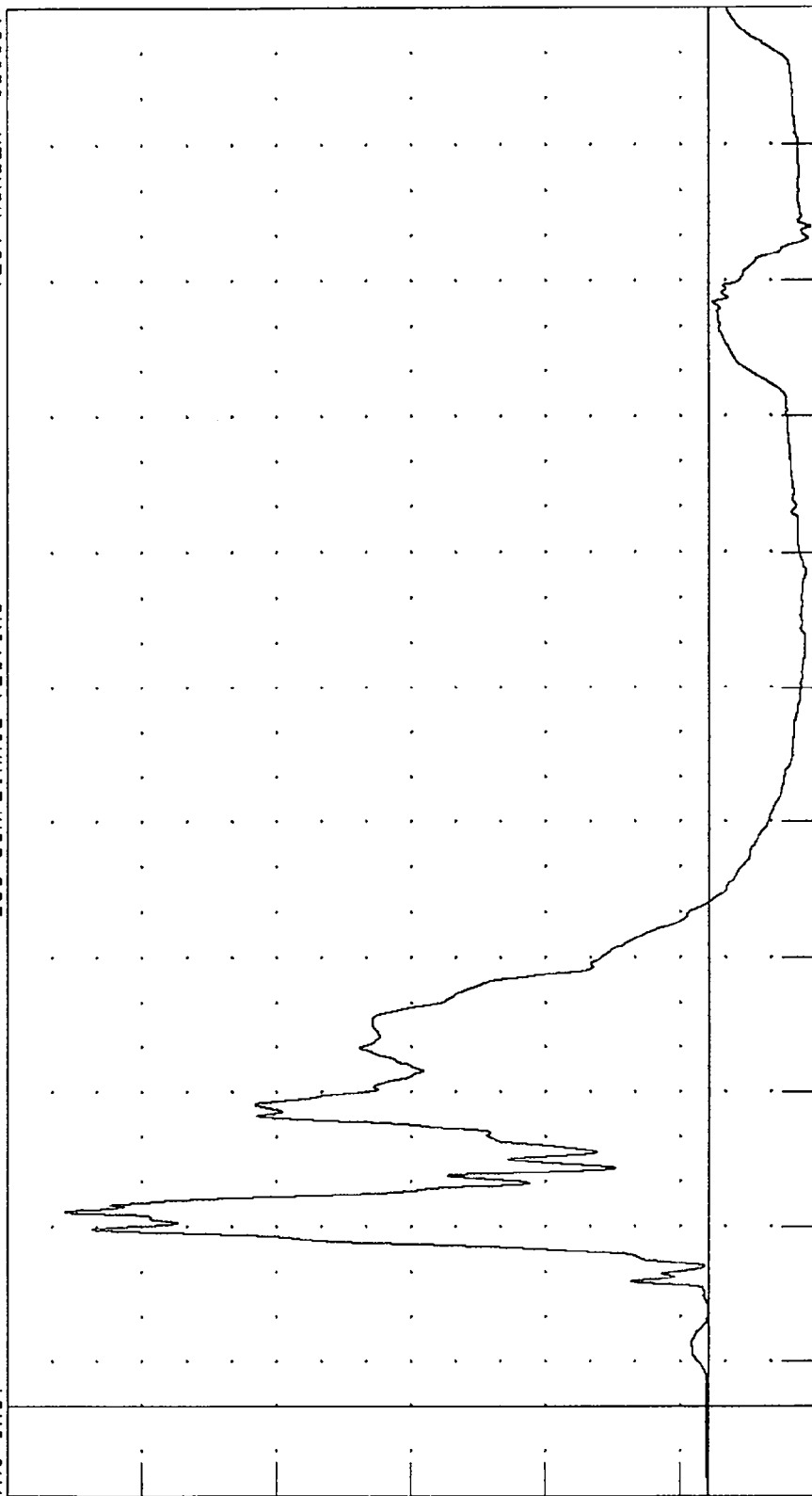
77

53

29

5

-19



TIME (MS)

310

280

250

220

190

160

130

100

70

40

10

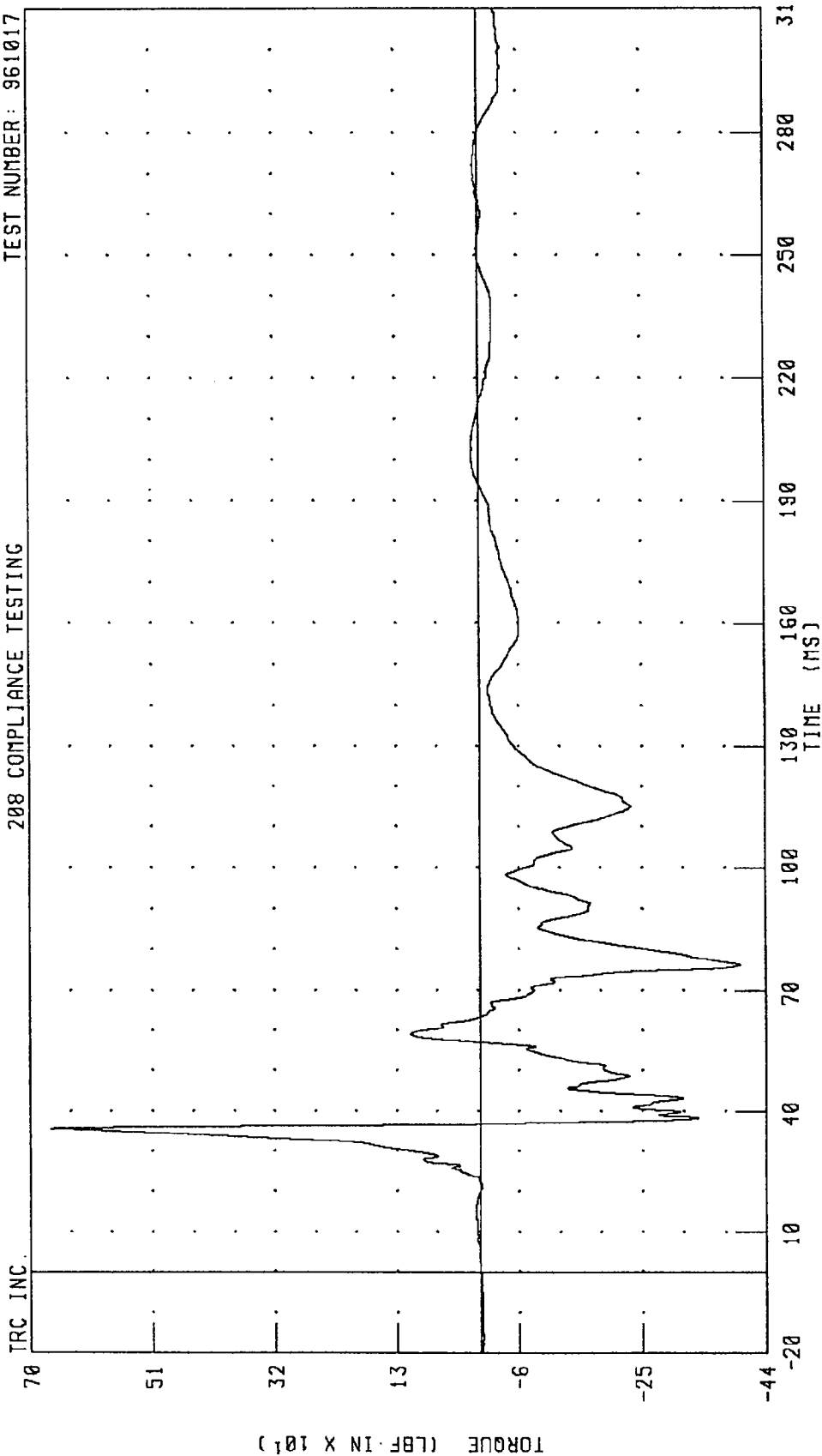
-20

CHANNEL: TBLYM2 FILTER: CH. CLASS 600

PEAK DATA: 1146.83 LBF·IN @ 43.44 MS; -179.40 LBF·IN @ 262.00 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT X-AXIS
 208 COMPLIANCE TESTING

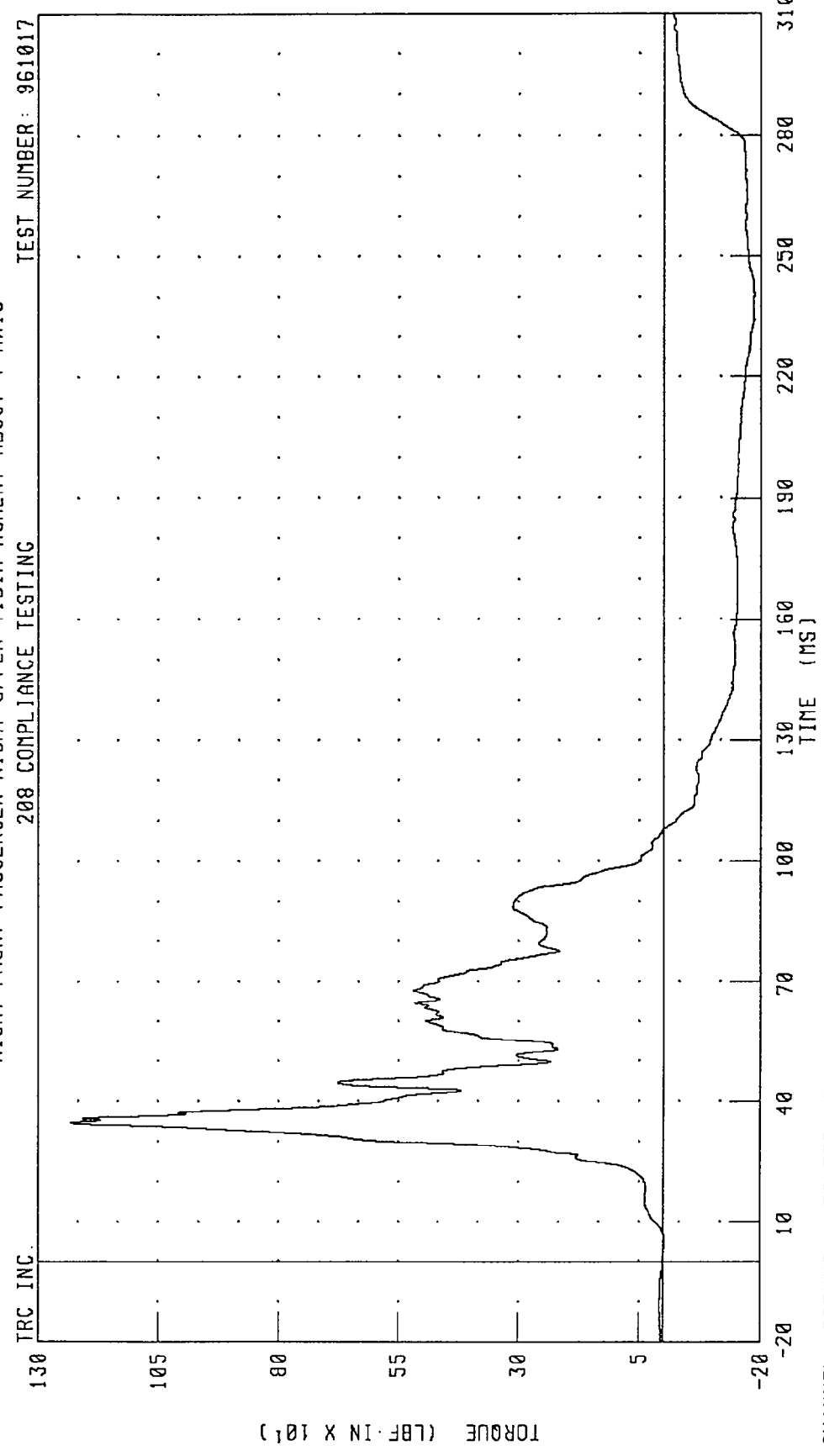
TEST NUMBER: 961017



CHANNEL: TBRXN2 FILTER: CH. CLASS 600 PEAK DATA: 667.70 LBF-IN @ 35.76 MS; -400.12 LBF-IN @ 76.40 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT Y-AXIS
208 COMPLIANCE TESTING

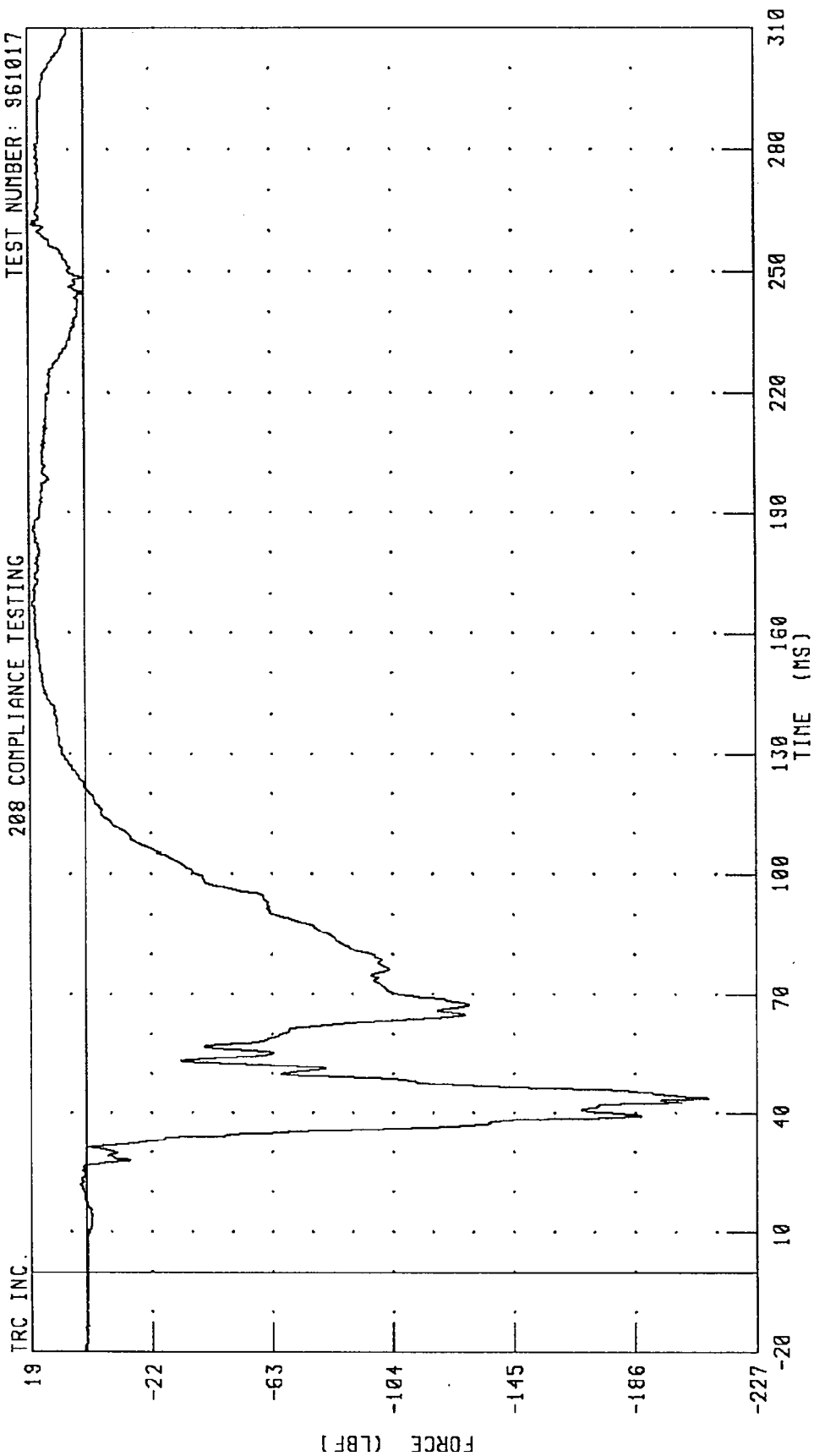
TEST NUMBER: 961017



CHANNEL: TBRYM2 FILTER: CH. CLASS 600 PEAK DATA: 1232.40 LBF-IN @ 34.72 MS; -185.78 LBF-IN @ 240.56 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT LOWER TIBIA X-AXIS FORCE
 208 COMPLIANCE TESTING

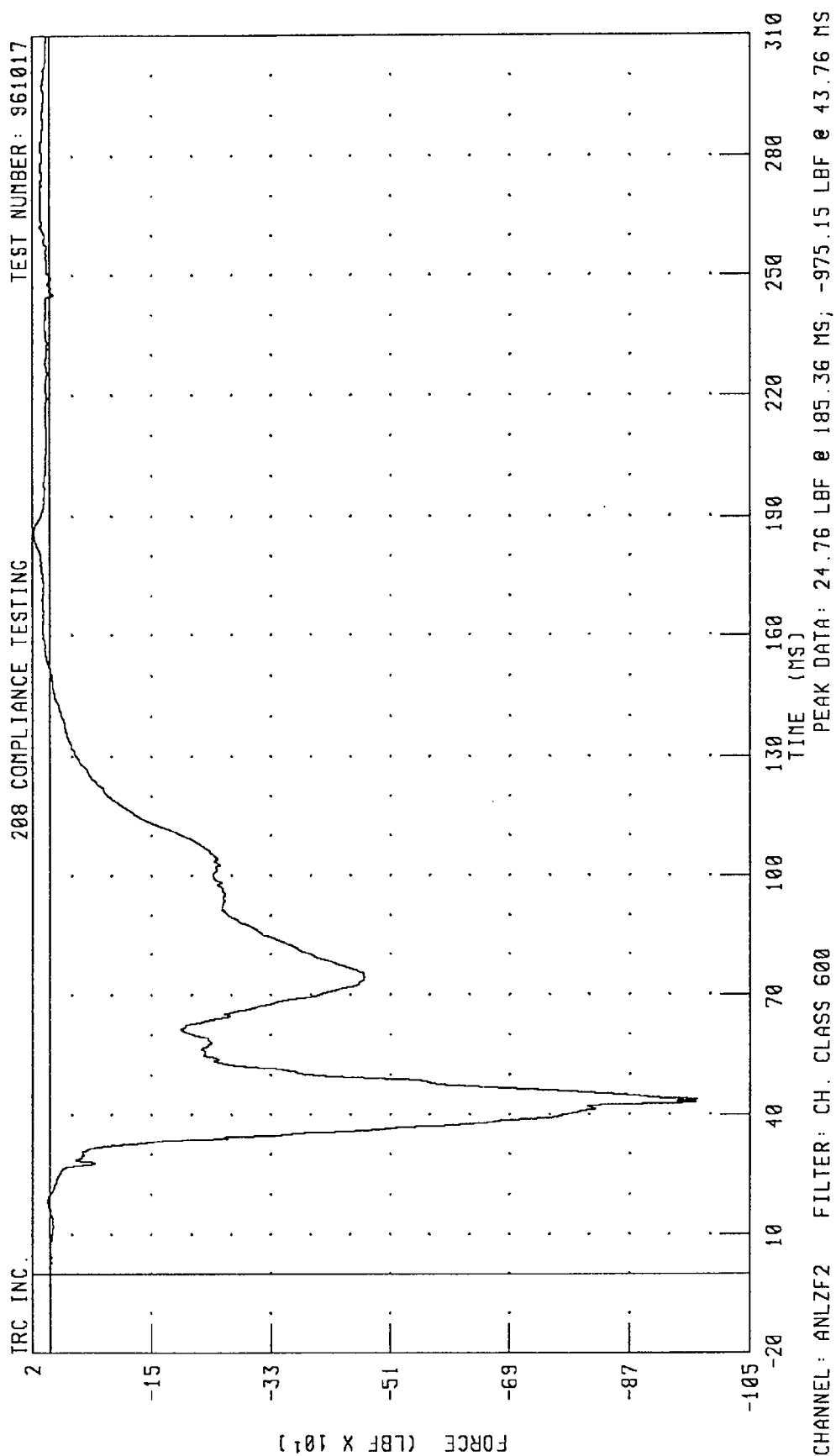
TEST NUMBER: 961017



PEAK DATA: 18.01 LBF @ 261.52 MS; -210.54 LBF @ 43.84 MS

CHANNEL: ANLXF2 FILTER: CH. CLASS 600

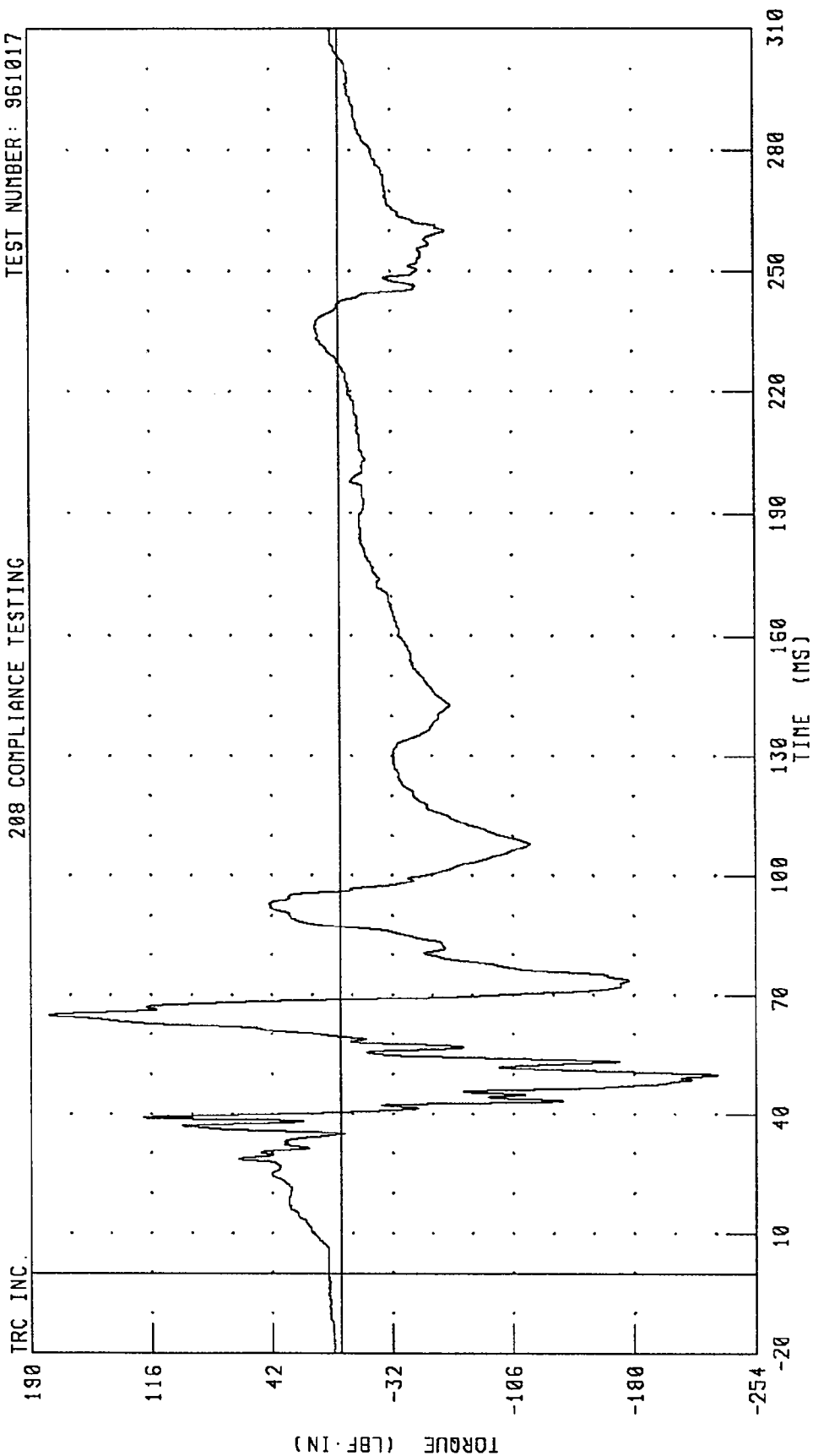
1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT LOWER TIBIA Z-AXIS FORCE
 208 COMPLIANCE TESTING



CHANNEL: ANLZF2 FILTER: CH. CLASS 600

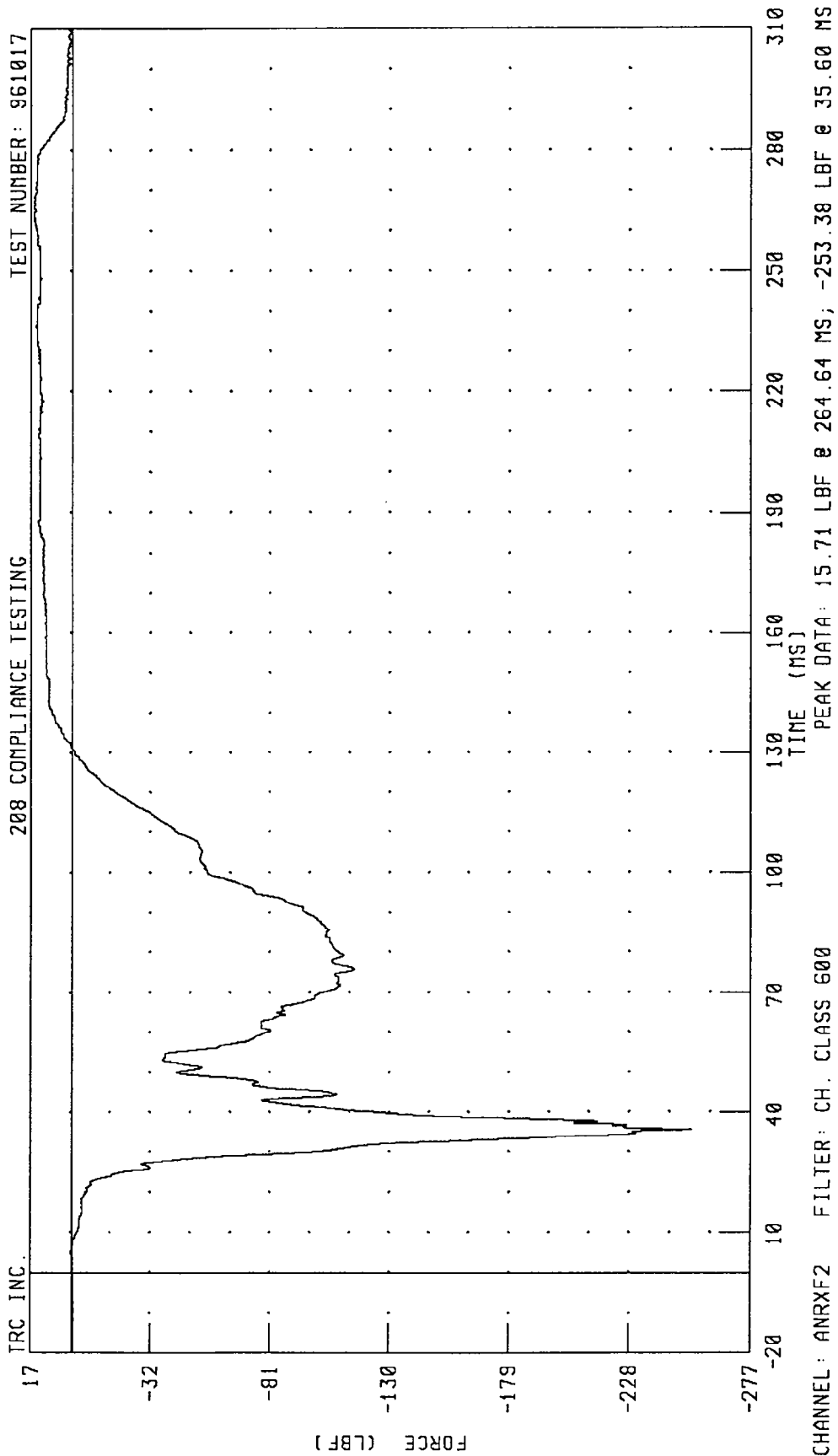
1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT LOWER TIBIA MOMENT ABOUT Y-AXIS
208 COMPLIANCE TESTING

TEST NUMBER: 961017



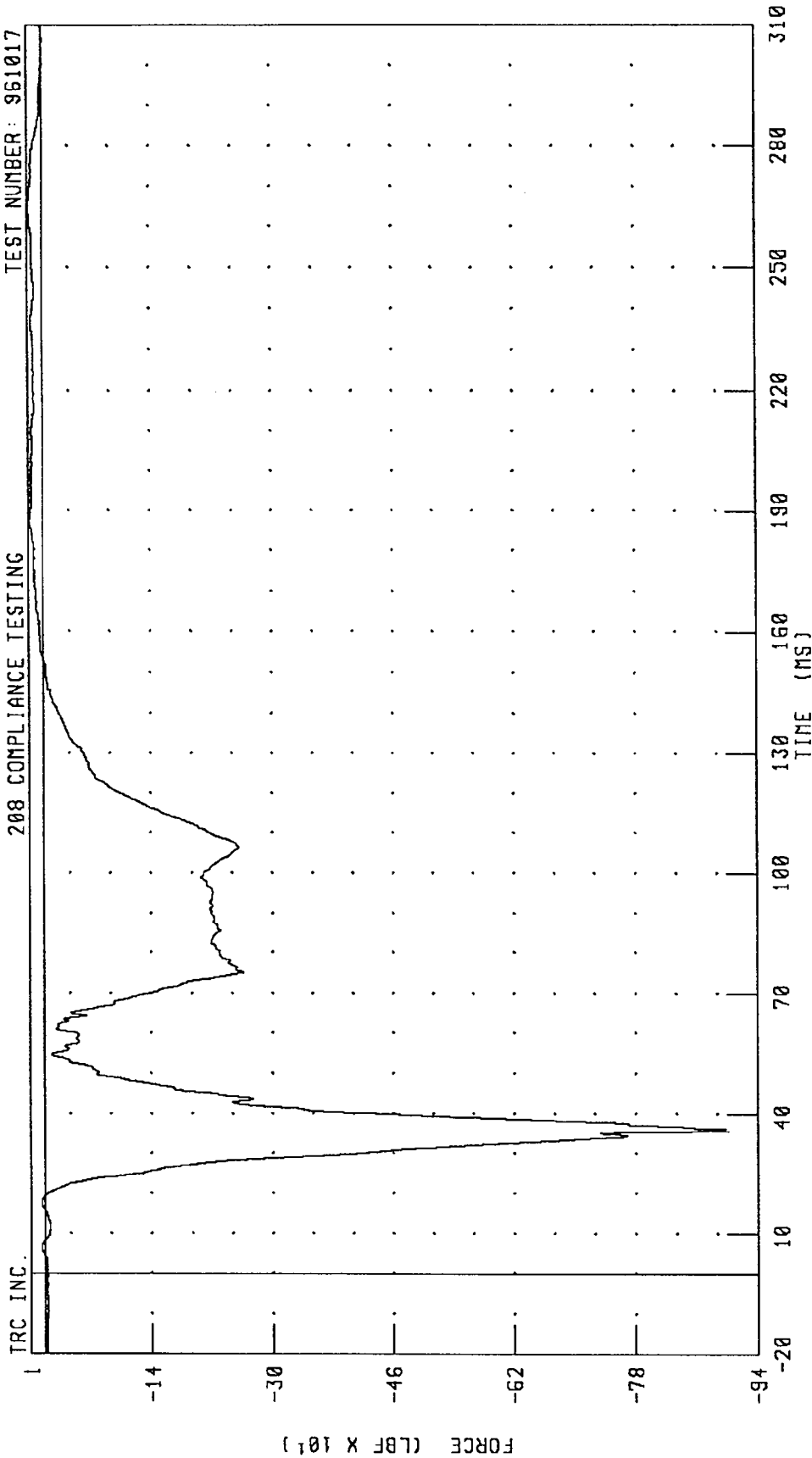
CHANNEL: ANLYM2 FILTER: CH. CLASS 600
PEAK DATA: 178.30 LBF-IN @ 65.04 MS; -230.42 LBF-IN @ 49.84 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT LOWER TIBIA X-AXIS FORCE
 208 COMPLIANCE TESTING



1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT LOWER TIBIA Z-AXIS FORCE
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

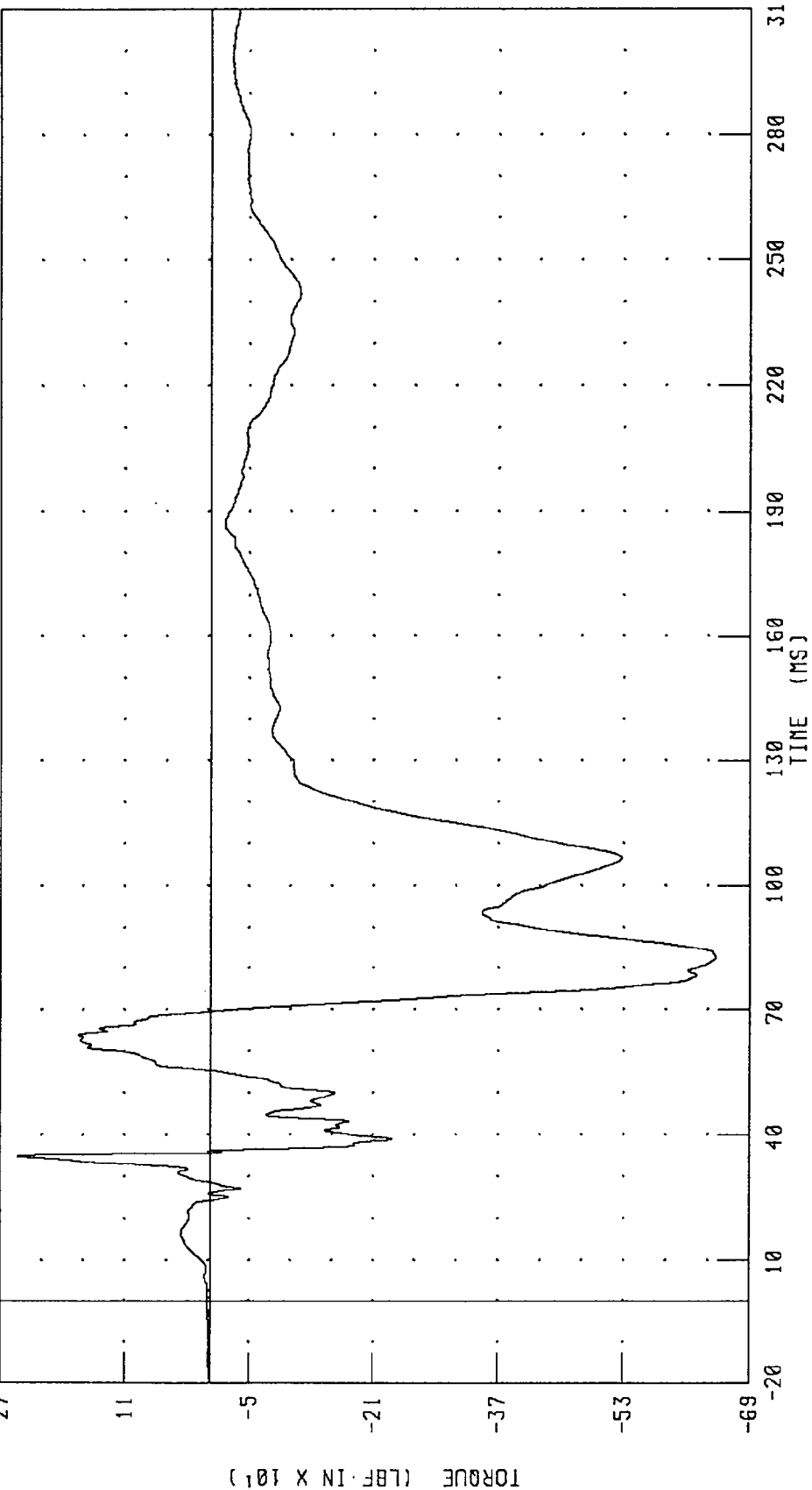


CHANNEL: ANRZF2 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT LOWER TIBIA MOMENT ABOUT Y-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC INC.

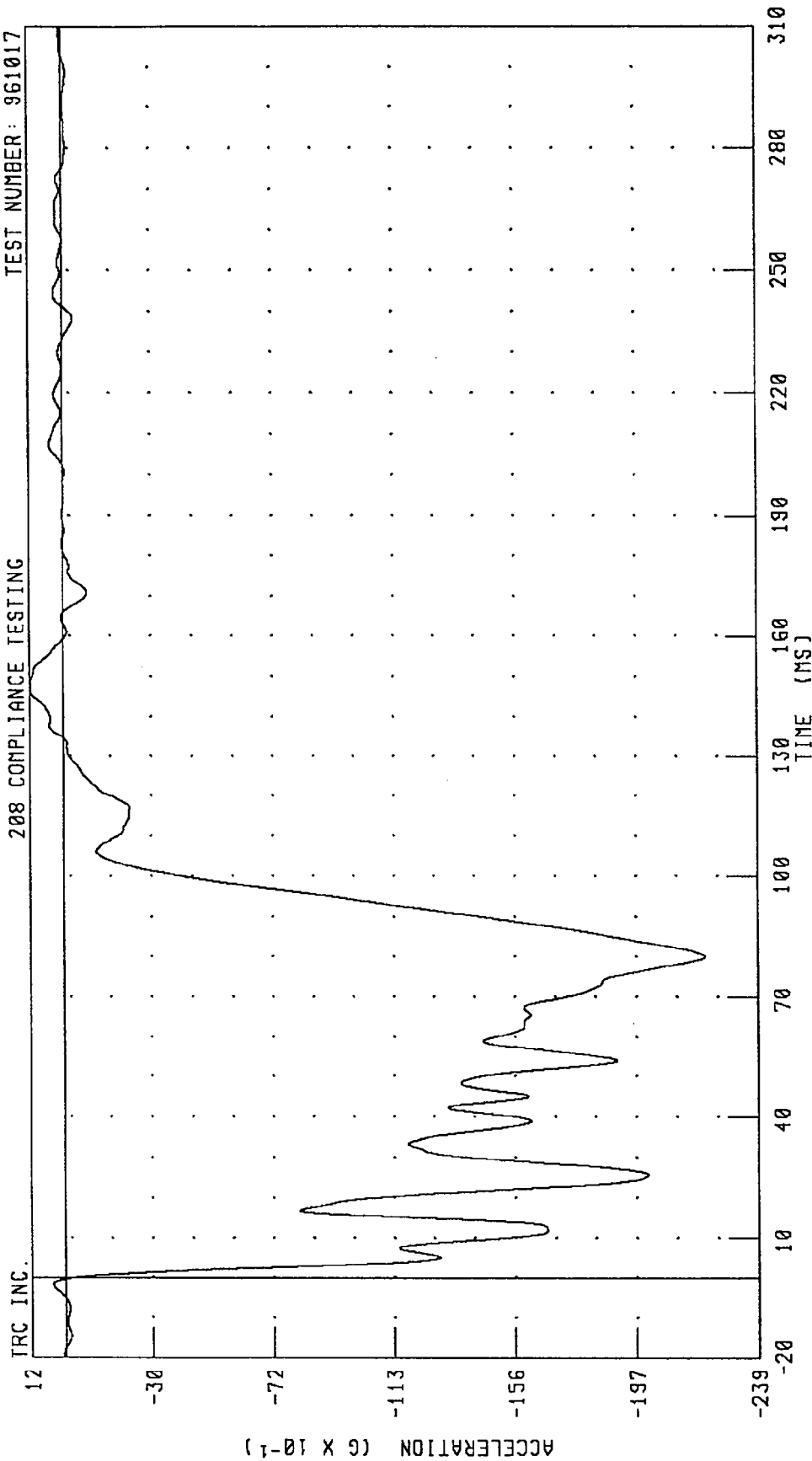


PEAK DATA: 248.22 LBF-IN @ 35.04 MS; -647.23 LBF-IN @ 82.48 MS

CHANNEL: ANRYM2 FILTER: CH. CLASS 600

1997 SATURN SL INTO FLAT FRONTAL BARRIER
LEFT REAR SEAT X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017

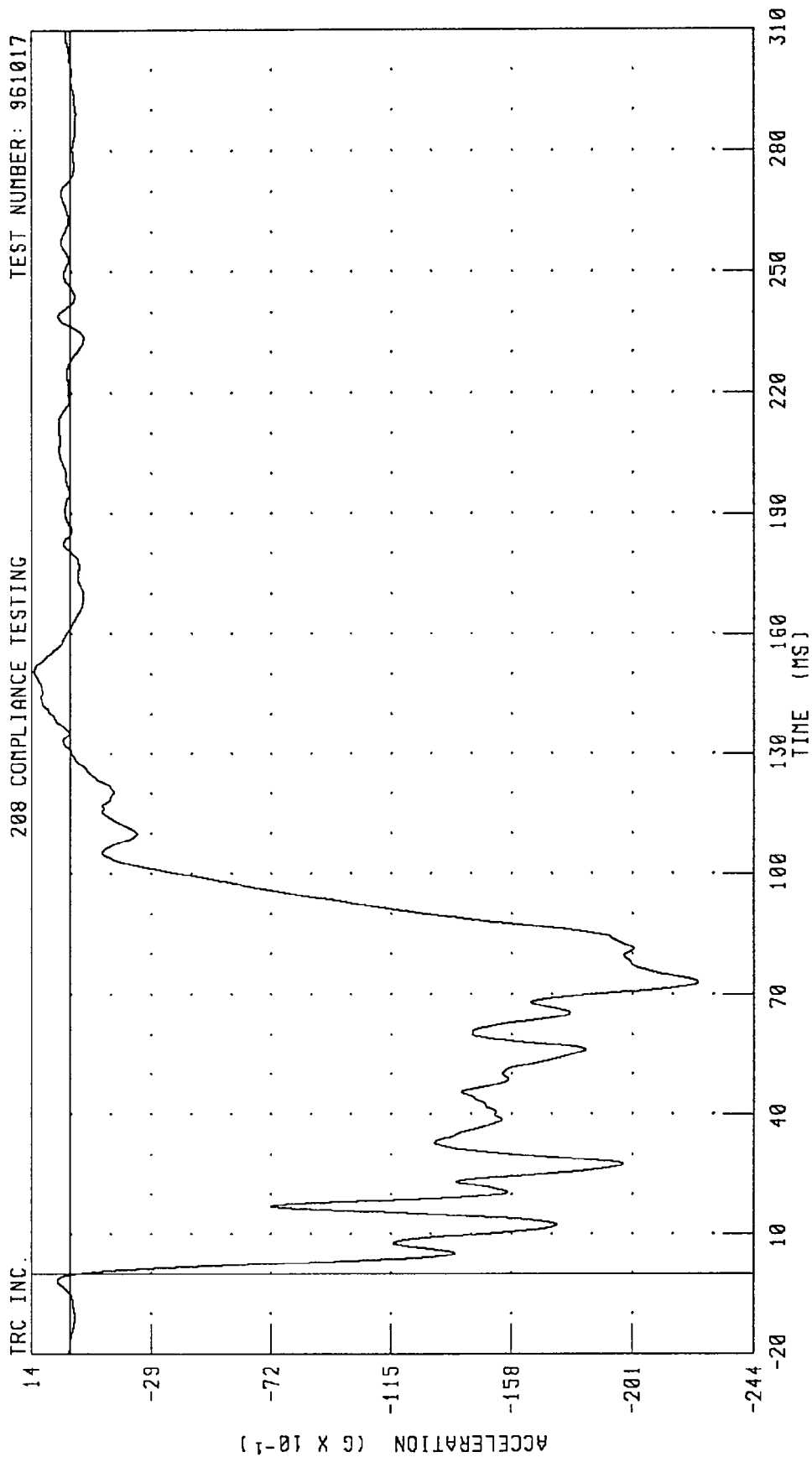


PEAK DATA: 1.17 G @ 148.08 MS; -22.17 G @ 80.08 MS

CHANNEL: TLRXG1 FILTER: CH. CLASS 60

1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT REAR SEAT X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017

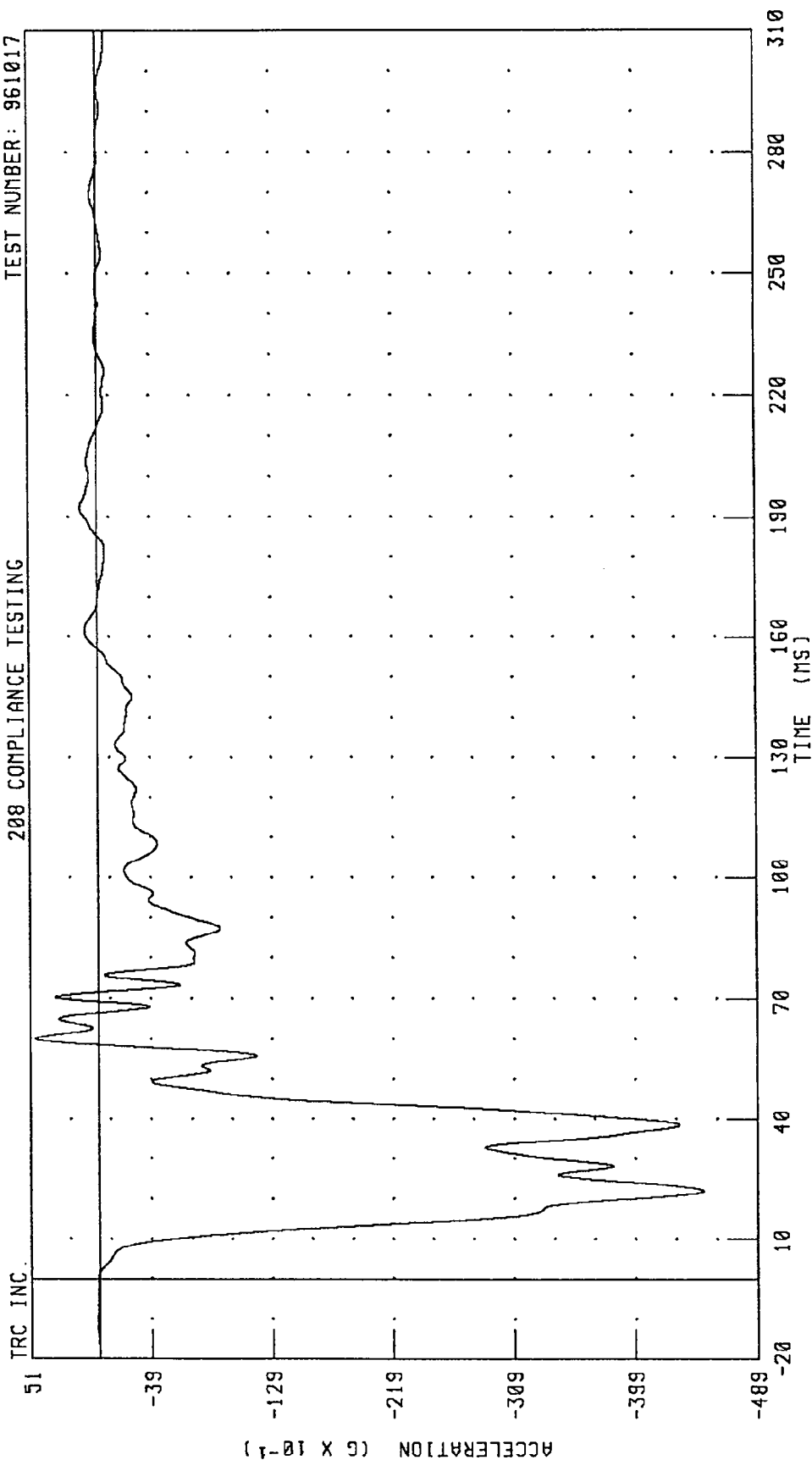


CHANNEL: TRRXG1 FILTER: CH. CLASS 60

PEAK DATA: 1.30 G @ 150.88 MS; -22.43 G @ 73.12 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
ENGINE UPPER BLOCK X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017



PEAK DATA: 4.69 G @ 60.24 MS; -44.88 G @ 21.92 MS

CHANNEL: ENGCG1 FILTER: CH. CLASS 60

1997 SATURN SL INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM BLOCK X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017

IRC INC.

8

-2

-13

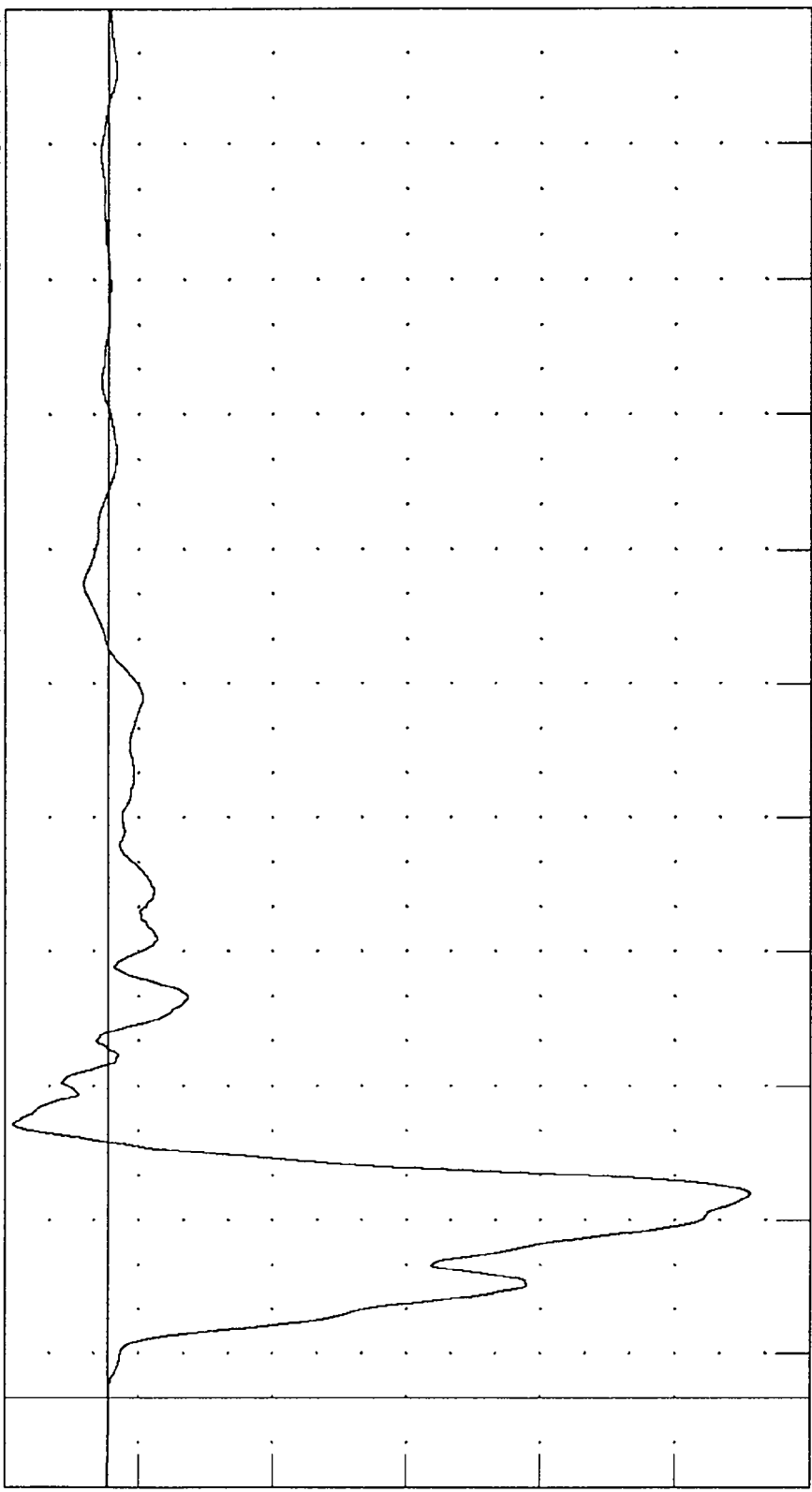
-24

-35

-46

-57

ACCELERATION (G)



PEAK DATA: 7.81 G @ 61.60 MS; -52.58 G @ 45.92 MS

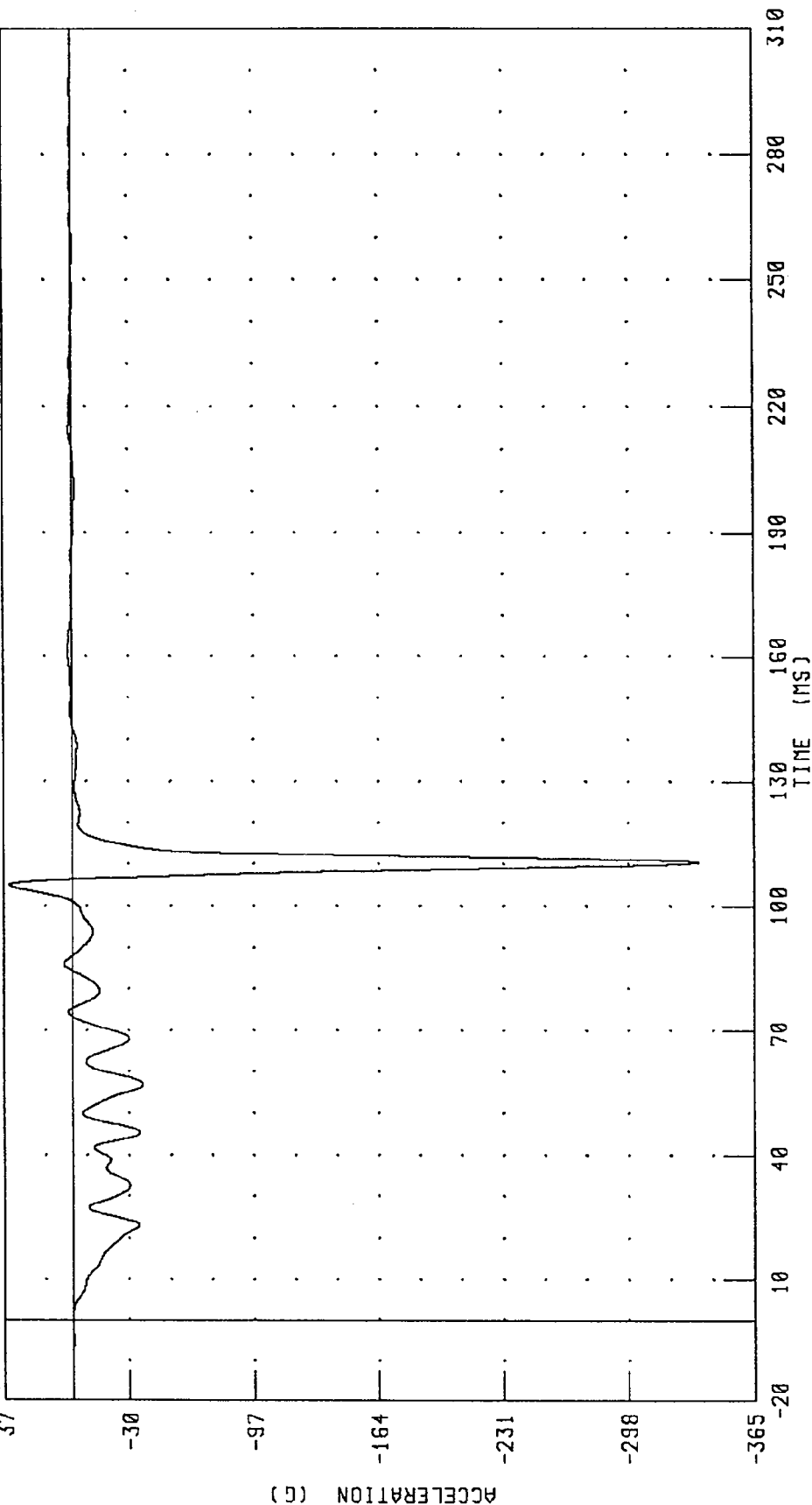
CHANNEL: ENGXC2 FILTER: CH. CLASS 60

1997 SATURN SL INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

TEST NUMBER: 961017

208 COMPLIANCE TESTING

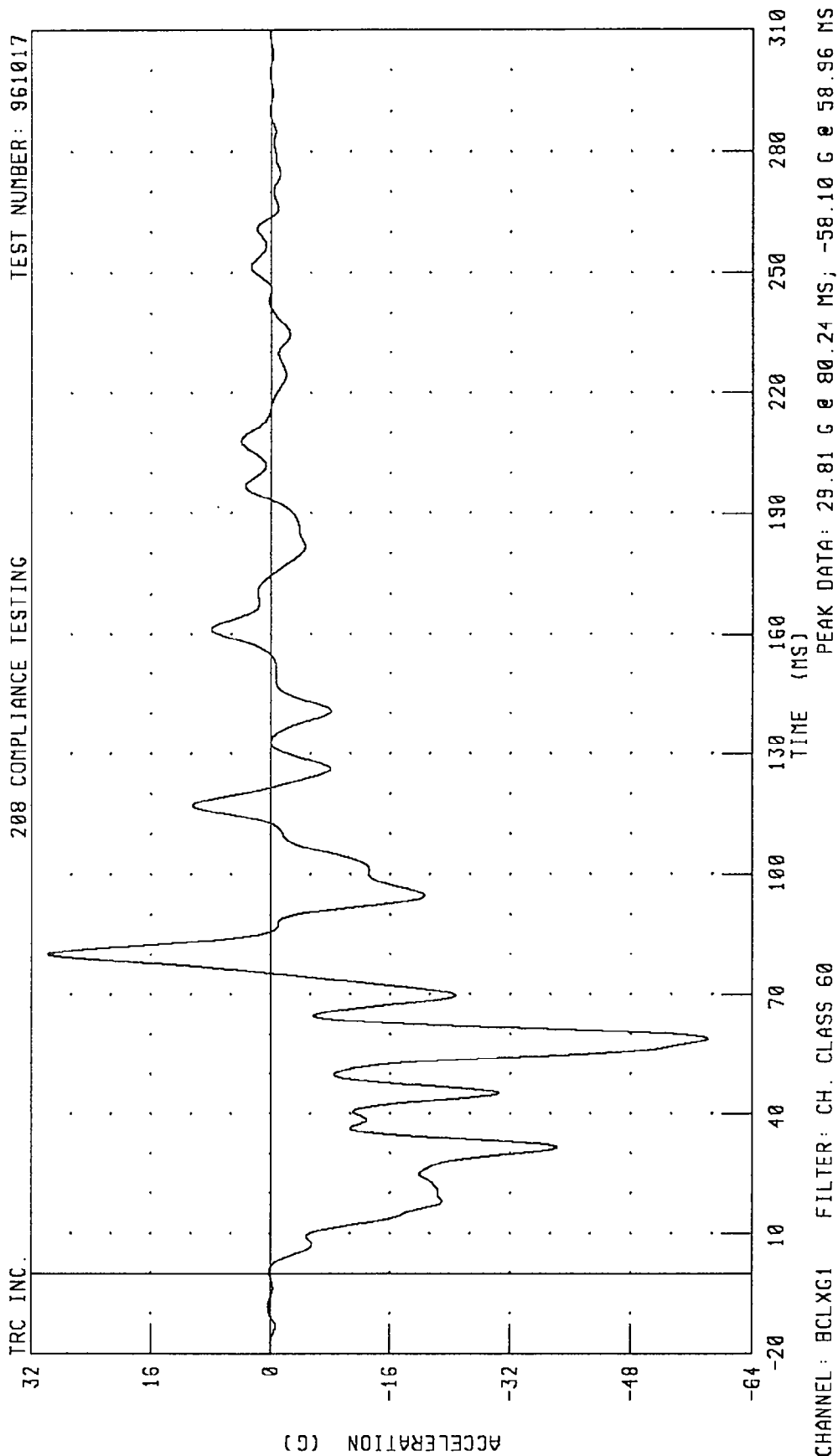
TRC INC.



CHANNEL: BCRXG1 FILTER: CH. CLASS 60

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 LEFT BRAKE CALIPER X-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

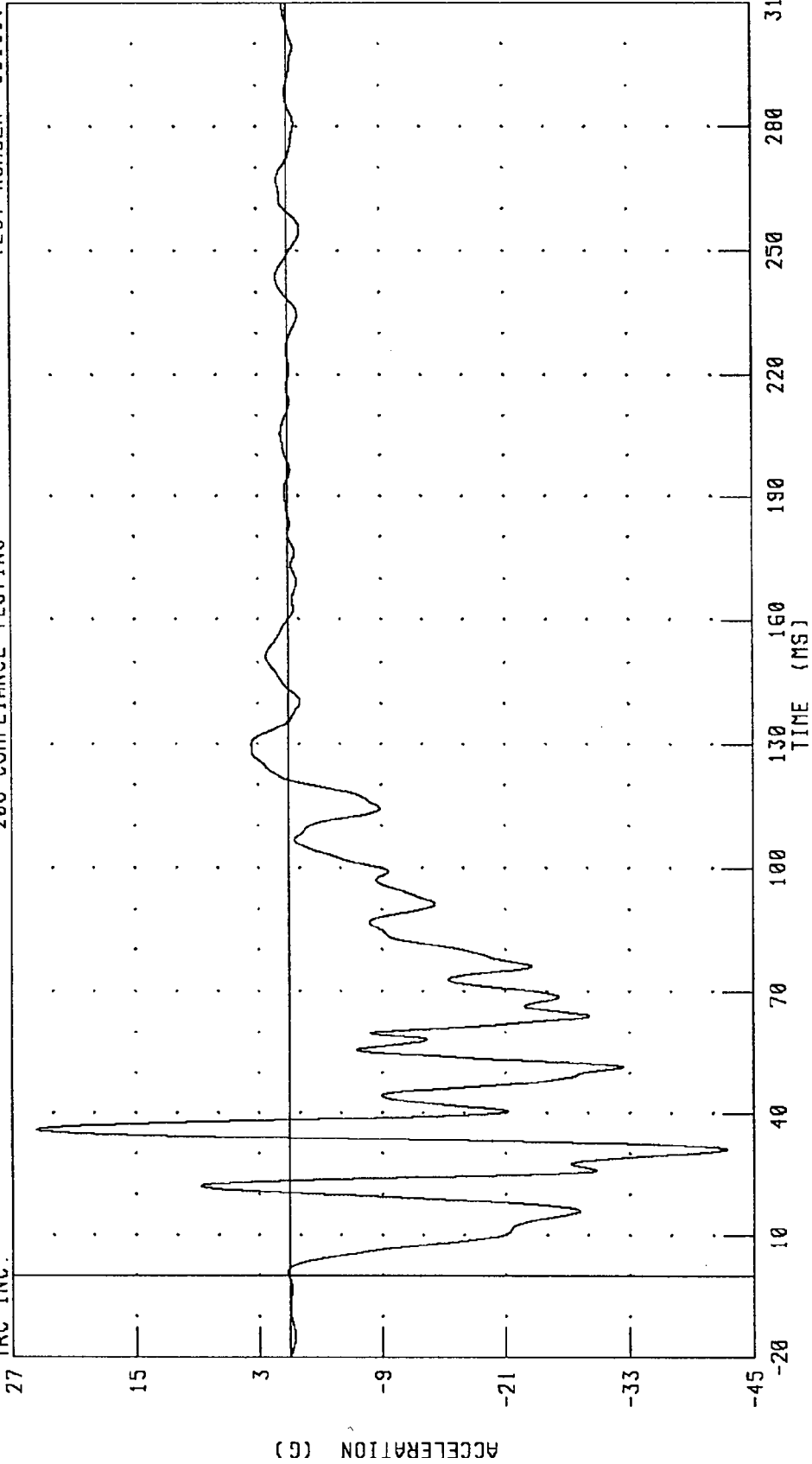


CHANNEL: BCLXG1 FILTER: CH. CLASS 60

1997 SATURN SL INTO FLAT FRONTAL BARRIER
DASH PANEL CENTER X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 961017

IRC INC.



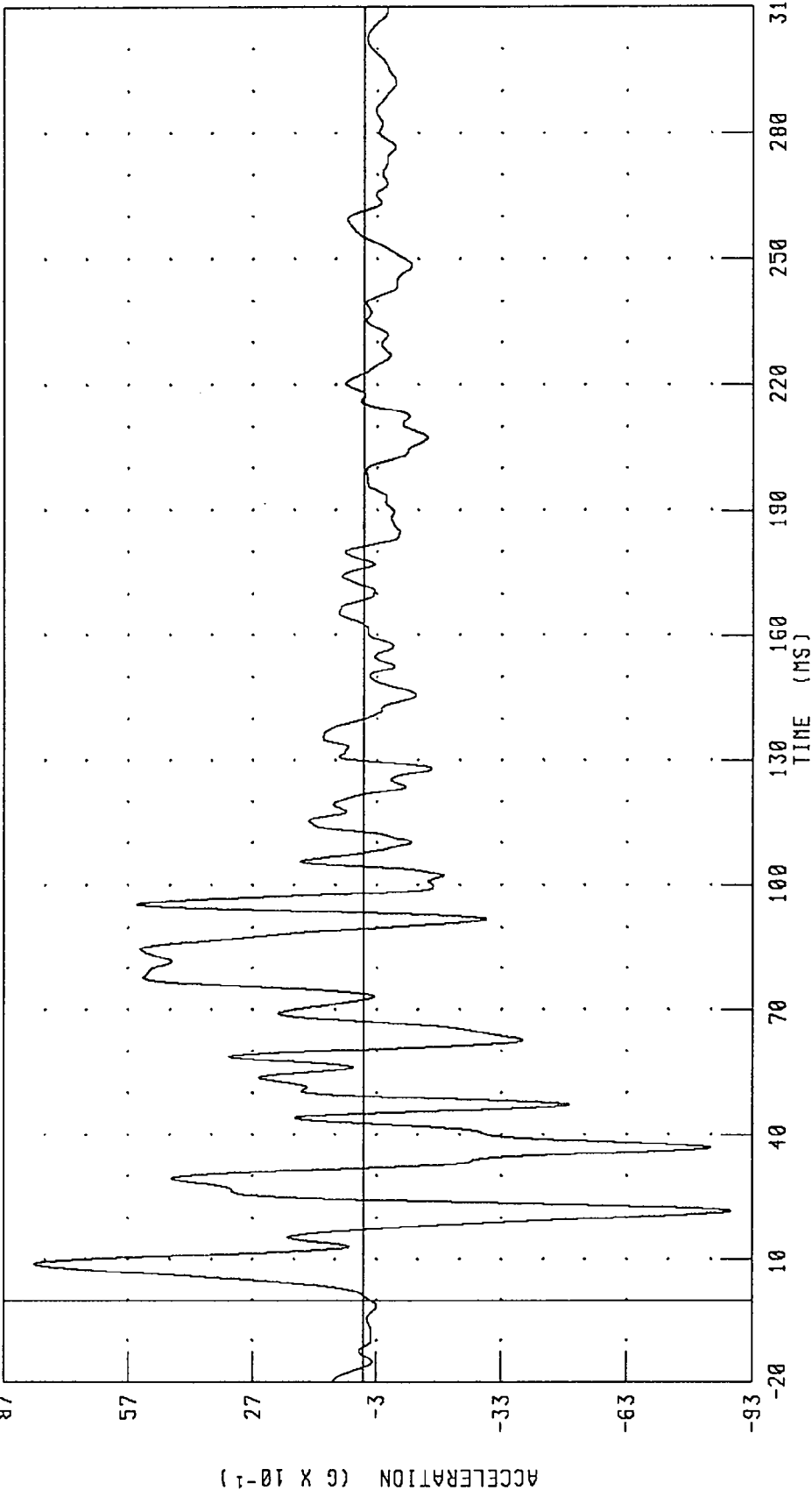
CHANNEL: DPCXG1 FILTER: CH. CLASS 60

PEAK DATA: 24.60 G @ 36.08 MS; -42.39 G @ 31.12 MS

1997 SATURN SL INTO FLAT FRONTAL BARRIER
 VEHICLE REAR CENTER Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 961017

TRC INC.



CHANNEL: TFCZG1 FILTER: CH. CLASS 60

PEAK DATA: 7.96 G @ 8.88 MS; -8.77 G @ 21.68 MS

Appendix C

Manufacturer's Vehicle Information

Enclosure 1
USG 3282

OVSC QUESTIONS & GM RESPONSES
REGARDING FMVSS 208 INFORMATION REQUEST
1997 Saturn (all models)
NSA-31CCa / IR-1767

Item 1

Please inform OVSC whether the air bag automatic restraint systems provided at the driver's and passenger's seating positions in your vehicle are certified to meet the requirements of S4.1.2.1(c)(1) or S4.1.2.1(c)(2) for FMVSS No. 208.

GM Response

All 1997 Saturn vehicles have air bags, along with manual 3-point safety belts, at the driver's and passenger's designated seating positions to meet the requirements of paragraph S4.1.2.1(c)(2) of FMVSS No. 208.

Item 2

If the automatic restraint systems provided at the driver's and passenger's seating positions in the subject vehicle were installed to meet the requirements of S4.1.2.1(c)(1), please provide a copy of the certification test reports for each of the test configurations required by that section of the standard (i.e., moving barrier lateral impact and dynamic rollover) and a copy of the certification reports for the frontal/angular barrier impact test required by S4.1.2.1.

GM Response

Since the front outboard restraint systems are installed to meet the requirements of S4.1.2.1(c)(2), no response is required.

Item 3

If a manual 3-point safety belt is provided with the driver's automatic restraint in order to meet the requirements of S4.1.2.1(c)(2), please provide a copy of the certification test reports for each of the test configurations required by that section of the standard (i.e., frontal/angular barrier impact test of the automatic restraint system with the manual safety belt unfastened and frontal/angular barrier impact test of the automatic restraint system with the manual safety belt fastened).

GM Response

Attachment A includes frontal barrier test reports pertinent to the FMVSS 208 requirements.

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Enclosure 1
USG 3282Item 4

If the manual safety belt provided at the driver's and passenger's seating positions was not installed to meet the requirements of S4.1.2.1(c)(2), please provide a copy of a crash test report or engineering analysis showing that the use of the manual safety belt with the automatic restraint system does not affect the ability of the vehicle to meet the requirements of FMVSS 208.

GM Response

Since the manual safety belt is installed to meet the requirements of S4.1.2.1(c)(2) of FMVSS 208, no response is required.

Item 5

If the vehicle uses a pressure vessel to inflate the air bag, provide a copy of the test reports or engineering analysis to demonstrate that it meets all the requirements of S9.1.

GM Response

The air bags installed in 1997 Saturn vehicles do not incorporate a pressure vessel to inflate the system. No response is required.

Item 6

If the vehicle uses an explosive device to inflate the air bag, provide a copy of the test reports or engineering analysis to demonstrate that it meets all the requirements of S9.1.

GM Response

The air bags installed in 1997 Saturn vehicles do not incorporate an explosive device to inflate the system. No response is required.

Item 7

State, for any safety belt system in this vehicle, whether or not it is equipped with a tension-relieving device. Provide a copy of the information furnished in accordance with S7.4.2, if the tension-relieving device is used.

GM Response

The safety belt systems used in 1997 Saturn vehicles are not equipped with a tension-relieving device.

-3-

Enclosure 1
USG 3282Item 8

FMVSS No. 208, S8.1.5 allows the manufacturer the option of having movable vehicle windows and vents placed in the closed position. State whether the vehicle's movable windows and vents were opened or closed for the certification tests.

GM Response

For tests C10583, C11081, C9956, and C9922, the windows were open to facilitate camera coverage. In tests C10587 and C11099, the passenger-side window was open and the driver-side window was closed. In test C11100, the driver-side window was open and the passenger-side window was closed. In test C10595, the windows were closed.

Item 9

FMVSS No. 208, S5.1 provides a manufacturer with the option of using either a Part 572(B) or 572(E) test dummy. Please inform OVSC which test dummy was used in each seat for each certification test. Submit dummy placement measurements, including diagrams or photographs which show exactly where measurements were taken. Enclosed is a diagram of some of OVSC's dummy measurements. Where possible, use the dimension shown in the diagram to provide the individual dummy placement measurements.

State whether the vehicle has a foot rest for the driver.

If the vehicle can be equipped with a split front bench seat, state whether the driver dummy was located so that the midsagittal plane was centered on the steering wheel rim or the center of the seat cushion. Also, state whether the passenger dummy was located so that the midsagittal plane was centered the same distance from the longitudinal centerline of the vehicle as the driver dummy or in the center of the seat cushion.

GM Response

The Part 572(E) dummy was used in each front seat position during certification testing. ATD placement information is included in Attachment B.

1997 Saturn domestic vehicles do not incorporate a driver foot rest.

Front bench seats are not available on 1997 Saturn vehicles.

Item 10

Provide the seat positioning, steering column positioning, and fuel tank data on the enclosed form. If more than one front seating configuration, steering column, or fuel tank are available on this vehicle, provide separate information for each.

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Enclosure 1
USG 3282GM Response

Attachment C includes the requested information.

Item 11

If the vehicle is equipped with adjustable seat belt anchorages, provide the manufacturer's nominal design position for a 50th percentile adult male occupant.

GM Response

The Saturn sedan (SL, SL1, and SL2) and wagon (SW1 and SW2) are equipped with an height-adjustable shoulder belt guide. The nominal design position for a 50th percentile male occupant is the middle position. The Saturn coupe (SC1 and SC2) incorporates a fixed anchor.

Item 12

Provide the speed at impact, vehicle test weight, and the resulting injury criteria (i.e., HIC, chest acceleration, chest compression for Part 572(E) dummy and femur loads) recorded for all certification tests conducted to meet the requirements of S4.1.2.1.

In addition, include each dummy's head and chest acceleration versus time plots and femur load versus time plots for the full frontal barrier impact tests.

GM Response

Attachment D includes a summary of the requested injury criteria information and data plots.

Item 13

When vehicle components must be removed to obtain the proper test weight, what components do you recommend for removal and in what priority order do you recommend removal?

GM Response

GM does not typically prioritize which components are to be removed from a test vehicle to accommodate test weight. However, components that have been removed during our testing include trunk interior trim, spare tire and jack, rear seats and rear carpeting. Additional components that may have been removed during specific tests include rear door trim, rear bumper facia, rear bumper and the deck lid or rear liftgate.

-5-

Enclosure 1
USG 3282Item 14

Please provide FMVSS No. 204, "Steering Control Rearward Displacement" certification data. Include a copy of the test report and any engineering analysis forming the basis of the certification. The report should document the vehicle test weight, impact velocity, and the horizontal and vertical displacements of the steering control. Pre and post test photographs are also requested.

Discuss the test procedure detailing the vehicle preparation and the measurement technique used to determine the steering control rearward displacement.

Provide a diagram of the steering control system and describe how the components of the steering control system work to provide energy management in a frontal impact.

GM Response

Attachment E provides test reports which form the basis for the FMVSS 204 certification. The FMVSS 204 certification is carryover from (and based on testing from) preceding model years. Steering column displacement plots and pre- and post-test photographs also have been included.

Attachment F provides a general description of the GM film analysis method used for determining steering column displacement.

Attachment G provides the steering column assembly diagram and description of how the assembly works to provide energy management in a frontal impact.

Item 15

Inform OVSC if these vehicles have built-in child restraints either as standard equipment or optional equipment. If they do, identify the type of restraint (i.e., 5-point harness, T-shield, or other), and provide a copy of the certification test reports and any engineering analysis forming the basis for certification to FMVSS No. 213, "Child Restraint Systems."

GM Response

Saturn does not incorporate standard or optional built-in child restraints in any of the 1997 models.

Attachment B

USG 3282

2 pages
(including this cover)

Attachment B
USG 3282

ATD CLEARANCE DIMENSIONS

for 1997 Saturn (all models)
(all measurements in mm)

DIMENSION	SEDAN & WAGON (all models)		COUPE (all models)	
	Driver	Passenger	Driver	Passenger
HH - Head to Header	340	340	370	270
NR - Nose to Rim	not determined	N/A	448	N/A
CS - Chest to Steering Wheel	290	N/A	370	N/A
CD - Chest to Dash	485	460	not determined	465
KDL - Left Knee to Dash	115	120	140	105
KDR - Right Knee to Dash	130	112	150	110
SH - Striker to H-Point	235	235	459	480
SHY - Striker to H-Point (Y)	not determined	not determined	198	198
HS - Head to Side	not determined	not determined	320	not determined
HR - Head to Side Roof	159	187	not determined	not determined
AD - Arm to Door	120	137	not determined	not determined

Attachment C

USG 3282

4 pages
(including this cover)

Attachment C
USG 3282

Test Vehicle Information

1. The following is applicable to both the driver and passenger seats.

Seat back angle = 26 degrees. Place headrest in the full "up" position. Use a level to standoff from the headrest support rods. Angle should be 9.6 degrees.

Supplemental info: Position can be set by placing the seat back in the most upright position, then moving it rearward three (3) additional notches. SC1, SL, SL1, and SW1 all utilize integral head restraints, so this method must be used to set seat back angle.

2. The following is applicable to both the driver and passenger seats.

Position seats so nine (9) notches are showing ahead and behind the locking pawl on both the inboard and outboard seat tracks. Seat cushion height adjuster (uplevel driver seats only) should be in the down position.

- 3.1. Usable Capacity = 12.1 gallons.

Operational Instructions: Remove all fuel (usable and unusable) from the tank. Fill tank with unusable (.11 gallons) and 95% of usable (11.5 gallons).

- 3.2. Amount of Stoddard added for certification tests = 11.5 gallons plus .11 gallons unusable.

- 3.3. Electric Fuel Pump Circuit

When the ignition is first turned to the ON position, without the engine running, the PCM turns the fuel pump relay *On* for two seconds. This builds up the fuel pressure quickly. If the engine is not started within two seconds, the PCM shuts the fuel pump *Off* and waits until the ignition reference pulses are present. As soon as the engine is cranked, the PCM turns the relay *On* which powers the fuel pump.

4. Operational Instructions: Locate column in mid-position (measured by marking highest and lowest point of shroud travel relative to IP and bisecting the distance).

TEST VEHICLE INFORMATION

Vehicle Model Year & Make: 1997 SATURN
 Vehicle Model & Body Style: SL*, SLI*, SL2, SW1*, SW2, SC1*, SC2

1. NOMINAL DESIGN RIDING POSITION --

For adjustable driver and passenger seat backs.
 Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent if applicable. Indicate, if applicable, how the detents are numbered (Is the first detent "0" or "1"?).

Seat back angle for driver's seat = 26°

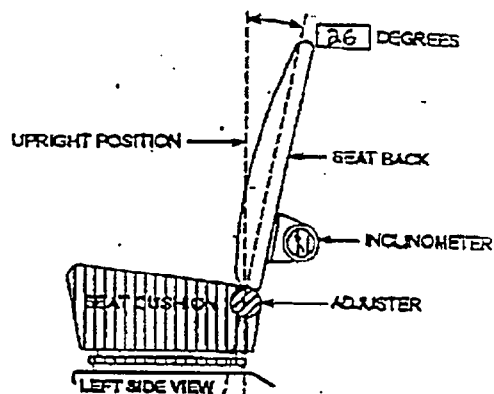
Measurement Instructions:

PLACE HEADREST IN FULL UP POSITION. USE A LEVEL TO STAND OFF FROM HEAD REST SUPPORT RODS. ANGLE SHOULD BE 9.5° *

Seat back angle for passenger's seat = 26°

Measurement Instructions:

SAME



FRONT SEAT ASSEMBLY

2. SEAT FORE & AFT POSITIONS --

Provide instructions for positioning the driver and front outboard passenger seat(s) in the center of fore and aft travel. For example, provide information to locate the detent in which the seat track is to be locked.

Positioning of the driver's seat:

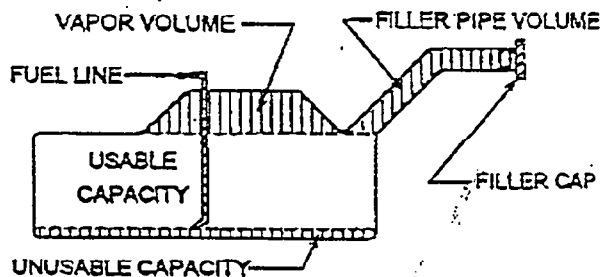
POSITION SEAT SO NINE (9) NOTCHES ARE SHOWING AHEAD AND BEHIND LOCKING PAWL ON INBOARD AND OUTBOARD TRACKS. SEAT CUSHION HEIGHT ADJUSTER (UPLEVEL DRIVER SEATS ONLY) SHOULD BE IN THE DOWN POSITION.

Positioning of the passenger's seat (if applicable):

SAME

3. FUEL TANK CAPACITY DATA --

- 3.1 A. "Usable Capacity" of standard equipment fuel tank = 12.1 gallons.
- B. "Usable Capacity" of optional equipment fuel tank = N/A gallons.
- C. "Usable Capacity" of vehicle(s) used for certification testing to requirements of FMVSS 301 = 12.1 gallons.



VEHICLE FUEL TANK ASSEMBLY

Operational Instructions:

REMOVE ALL FUEL (USABLE AND UNUSABLE) FROM THE TANK. FILL TANK WITH UNUSABLE (1.1 GALLONS) AND 95% OF USABLE (11.5 GALLONS)

* SUPPLEMENTAL INFO: POSITION CAN BE SET BY PLACING SEAT BACK IN THE MOST UPRIGHT POSITION, THEN MOVING IT REARWARD THREE (3) ADDITIONAL NOTCHES. SC1, SL, SLI, AND SW1 ALL UTILIZE INTEGRAL HEAD RESTRAINTS, SO THIS METHOD MUST BE USED TO SET SEAT BACK ANGLE.

3.2 Amount of Stoddard solvent added to vehicle(s) used for certification test(s) = 11.5 gallons
(PLUS .11 GALLONS UNUSABLE)

3.3 Is vehicle equipped with electric fuel pump?

Yes- X

No-

If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

SEE BELOW

4. STEERING COLUMN ADJUSTMENTS --

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions.

If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

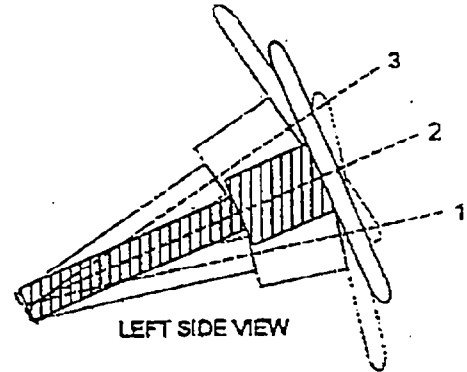
Operational Instructions:

LOCATE COLUMN IN MID-POSITION

(MEASURED BY MARKING HIGHEST AND

LOWEST POINT OF SHROUD TRAVEL RELATIVE

TO IP AND BISECTING THE DISTANCE)



STEERING COLUMN ASSEMBLY

FUEL PUMP ELECTRICAL CIRCUIT

When the ignition is first turned to the ON position, without the engine running, the PCM turns the fuel pump relay On for two seconds. This builds up the fuel pressure quickly. If the engine is not started within two seconds, the PCM shuts the fuel pump Off and waits until ignition reference pulses are present. As soon as the engine is cranked, the PCM turns the relay On which powers the fuel pump.