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Final Report

Final Report of a 1992 Dodge Ram B250 Van Rear Impact CNG Fuel Tank Integrity

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16. Abstract

This 30 mph rear impact test was conducted at Transportation Research Center Inc. on September 25, 1993. The subject vehicle, a Dodge Ram 250 Model B van, VIN 2B4HB25TXNK135503 was impacted in the rear by the FMVSS 301 moving barrier at 29.3 mph. The purpose of this test was to investigate and demonstrate the practicality of the proposed FMVSS 303 test procedure for evaluating the fuel system integrity of a CNG fueled vehicle.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

SECTION 1.0

PURPOSE AND TEST PROCEDURE

PURPOSE

This 30 mph moving barrier rear impact test was conducted for Vehicle Research and Test Center by Transportation Research Center Inc. (TRC). The purpose of this test was to investigate and demonstrate the practicality of the proposed FMVSS 303 test procedure for evaluating the fuel system integrity of a CNG fueled vehicle. The subject vehicle for this test was a Dodge Ram 250 Model B van.

TEST PROCEDURE

This test was conducted in accordance with the applicable portions of NHTSA's Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-301-00, with the addition of vehicle accelerometers. Data was obtained relative to fuel system integrity.

The test vehicle was instrumented with six (6) accelerometers to measure longitudinal, lateral, and vertical axis accelerations, three (3) thermocouples to measure tank, tube, and ambient temperatures, and a pressure transducer to measure fuel system pressure. The moving barrier was instrumented with three (3) accelerometers to measure longitudinal, lateral, and vertical axis accelerations. The moving barrier impacted the test vehicle's rear in the specified impact velocity range of 28.9 to 29.9

The test vehicle contained two (2) uninstrumented Part 572 B 50th percentile adult anthropomorphic test devices (dummies) positioned in the front outboard designated seating positions. The fuel system was filled with nitrogen gas at 3000 psi at 70° F.

The eight (8) acceleration data channels were multiplexed and recorded on a 14-track tape drive. The acceleration data was digitally sampled at 8000 samples per second and processed according to SAE J211 OCT88. The pressure and temperature data was recorded by a Fluke 2625A Data Logger. The data logger sampled the data at 2.7 sec/sample.

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

The rear impact data are presented in Section 2.0. The camera information is presented in Section 3.0. Appendix A contains the still photographic prints. Appendix B contains the vehicle and moving barrier data plots.

SECTION 2.0

REAR IMPACT TEST SUMMARY

TEST RESULTS SUMMARY

This rear impact moving barrier test was conducted at TRC on September 25, 1993.

The test vehicle, a 1992 Dodge Ram B250 van, appeared to comply with the proposed performance requirements of FMVSS 303 in the rear moving barrier impact mode. No gas appeared to leak from the vehicle's fuel system following the impact.

The test vehicle was equipped with a 5.2-liter inline engine, automatic transmission, power steering, and power brakes. The vehicle's test weight was 5711 pounds. The vehicle's maximum static crush was 7.2 inches. The moving barrier's test weight was 3989 pounds. The moving barrier's impact speed was 29.3 mph.

DATA ACQUISITION EXPLANATIONS

The vehicle center of gravity X-axis acceleration, VCGXG1, recorded anomalous data after 54 milliseconds.

The vehicle center of gravity Y-axis acceleration, VCGYG1, recorded a questionable data spike at 7 milliseconds.

The vehicle center of gravity Z-axis acceleration, VCGZG1, recorded a questionable data spike at 7 milliseconds.

The vehicle center of gravity resultant acceleration, VCGRG1, calculation was affected by the above anomalies.

The fuel tank pressure recorded an anomalous step down in the data at 34 minutes after impact.

All of the temperature channels recorded anomalous spikes at 5 minutes and at 8 minutes after impact.

TABLE 1 CRASH TEST SUMMARY

TEST TYPE: Rear Moving Barrier Impact

TEST DATE: 09/25/93 TEST TIME: 1230 AMBIENT TEMP. (°F): 60

VEHICLE: 1992 Dodge Ram B250 van

VEHICLE TEST WEIGHT (LBS.): 5711

MOVING BARRIER TEST WEIGHT (LBS.): 3989

IMPACT ANGLE[1] (DEG): 180

IMPACT VELOCITY[2] (MPH): PRIMARY = 29.3 SECONDARY = 28.7

MAXIMUM STATIC CRUSH (IN): 7.3

DUMMIES:	Driver	Passenger
TYPE:	Part 572 B	Part 572 B
LOCATION:	Left front	Right front
RESTRAINT:	Three-point unibelt	Three-point unibelt
NUMBER OF DATA CHANNELS:	16	
NUMBER OF CAMERAS:	HIGH-SPEED 7	REAL-TIME 1

[1]With respect to tow track centerline.
[2]Speed trap measurement (± .05 mph accuracy)

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Chrysler Corporation

MAKE/MODEL: Dodge/Ram B250 VIN: 2B4HB25TXNK135503

BODY STYLE: VAN MODEL YEAR: 1992

COLOR: Blue

ENGINE DATA: TYPE: Inline CYLINDERS: 8 DISPLACEMENT: 5.2 liters

TRANSMISSION DATA: _3_SPEED, ___MANUAL, _X_AUTOMATIC, ___FWD, _X_RWD,___4WD

DATE VEHICLE RECEIVED: NA ODOMETER READING: 1870

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

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

REMARKS:

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

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Chrysler Corporation

DATE OF MANUFACTURE: 03/92

VIN: 2B4HB25TXNK135503

GVWR: 6400 LBS.

GAWR: FRONT: 3300 LBS.
REAR: 3700 LBS.

[1]The vehicle was modified to operate on compressed natural gas.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

TIRES ON VEHICLE (MFR., LINE, SIZE): Michelin, XW4, P235/75R15 XW4

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

SPARE TIRE (MFR., LINE, SIZE): NA

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manually adjustable

WHEELBASE: 127.5 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the driver's B-pillar.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P235/7515XL

RECOMMENDED COLD TIRE PRESSURE: FRONT: 35 PSI; REAR: 41 PSI

DESIGNATED SEATING CAPACITY: ---FRONT ---REAR ---TOTAL

VEHICLE CAPACITY WEIGHT: --- LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE:	LF	31.0;	RF	31.6;	LR	30.8;	RR	31.1
FULLY LOADED ATTITUDE:	LF	30.4;	RF	31.3;	LR	30.0;	RR	30.5
PRE-TEST ATTITUDE:	LF	30.4;	RF	30.8;	LR	30.8;	RR	30.8
POST-TEST ATTITUDE:	LF	30.2;	RF	31.0;	LR	31.1;	RR	31.3

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

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

RIGHT FRONT	1339 LBS.	RIGHT REAR	1141 LBS.
LEFT FRONT	1409 LBS.	LEFT REAR	1202 LBS.
TOTAL FRONT WEIGHT	2748 LBS.	(54.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	2343 LBS.	(46.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT	5091 LBS.		

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW[1] = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (5091 LBS.)

VCW[1] = VEHICLE CAPACITY WEIGHT (LBS.)

DSC[1] = DESIGNATED SEATING CAPACITY ( )

RCLW[1]= VCW - 150 (DSC) = 300

TARGET TEST WEIGHT = UDW + RCLW[1]+ (NO. OF HYBRID II DUMMIES X 164 LBS./DUMMY)

TARGET TEST WEIGHT = 5719 LBS.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 292 LBS. OF CARGO WEIGHT:

RIGHT FRONT	1580 LBS.	RIGHT REAR	1249 LBS.
LEFT FRONT	1305 LBS.	LEFT REAR	1577 LBS.
TOTAL FRONT WEIGHT	2885 LBS.	(50.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	2826 LBS.	(49.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	5711 LBS.	(0.1% UNDER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE: 150 LBS.

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 63.1 INCHES REARWARD OF FRONT WHEEL CENTERLINE

[1]Cargo weight for multipurpose passenger vehicles, trucks, and buses is the vehicle's rated cargo and luggage weight from the vehicle's label or 300 pounds, whichever is less.

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 930925

TEST DATE: 09/25/93 TEST TIME: 1230

TEST TYPE: Rear Moving Barrier Impact IMPACT ANGLE: 180°

AMBIENT TEMPERATURE AT IMPACT AREA: 60° F

TEMPERATURE IN OCCUPANT COMPARTMENT: 60° F

IMPACT VELOCITY: PRIMARY = 29.3 MPH SECONDARY = 28.7 MPH

(SPECIFIED RANGE = 28.9 TO 29.9 MPH)

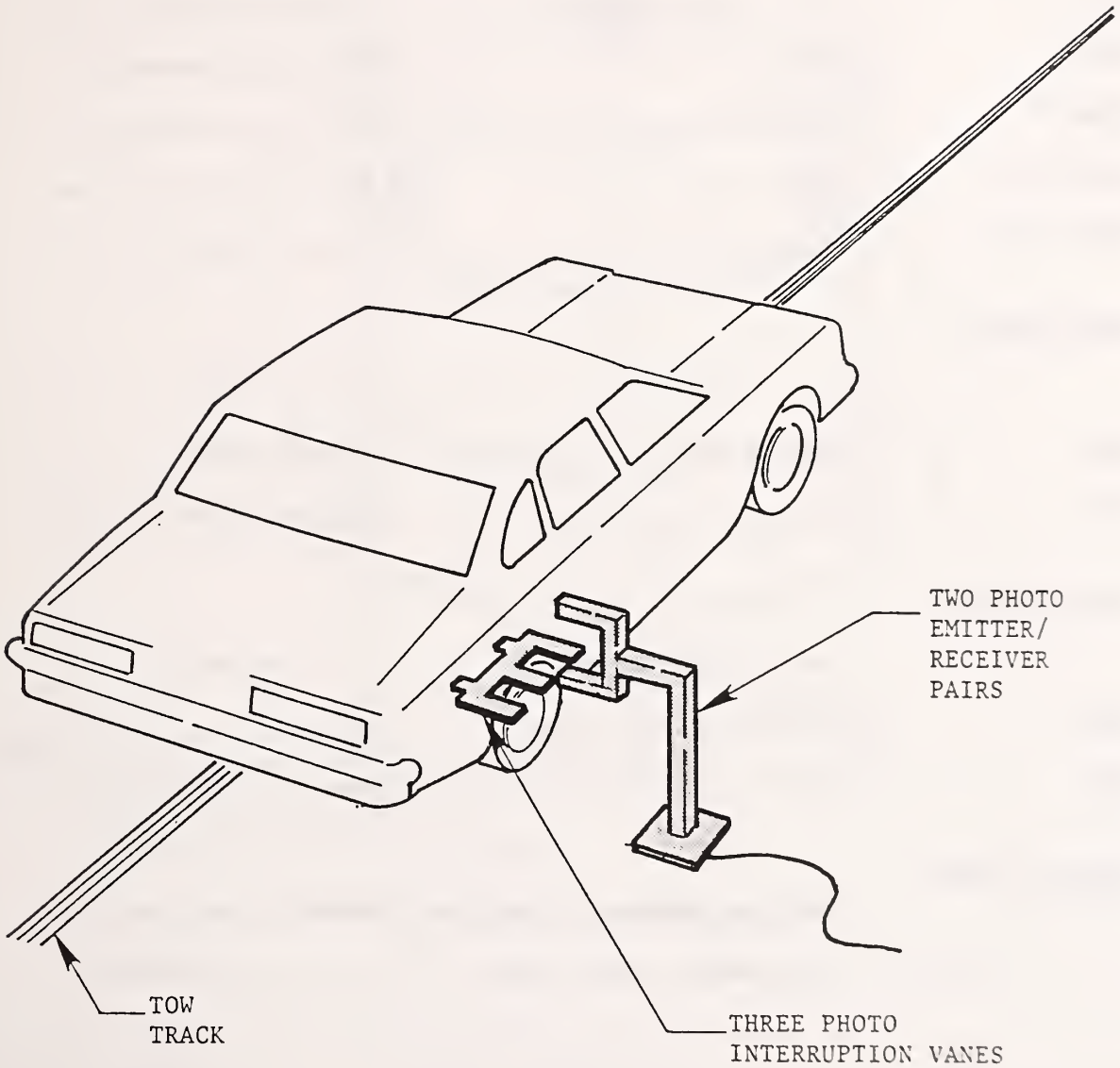
DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 14.0 IN.

EXITING VELOCITY TRAP = 2.0 IN.

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

OVERALL LENGTH OF TEST VEHICLE:	PRE-TEST:	L	199.5;	C	199.0;	R 199.2
	POST-TEST:	L	193.8;	C	193.2;	R 193.8
	TOTAL CRUSH:	L	5.7;	C	5.8;	R 5.4
	AVERAGE CRUSH:	5.6				

FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



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

The vanes have one-foot spacing.

TABLE 4 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER	PASSENGER
HEAD	NA	NA
CHEST	NA	NA
ABDOMEN	NA	NA
LEFT KNEE	NA	NA
RIGHT KNEE	NA	NA

DOOR OPENING:

	LEFT	RIGHT
FRONT	Opened easily	Opened easily
REAR	NA	Opened easily

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	Both back seats failed	No
REAR	No	No

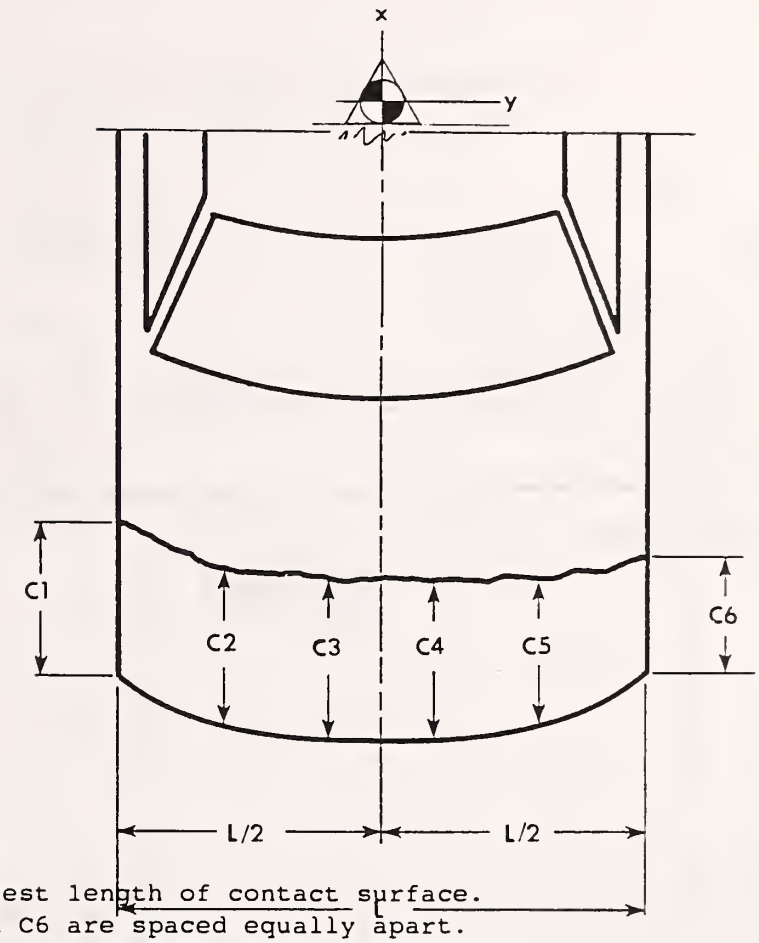
GLAZING DAMAGE:

The rear window and two side windows broke during the crash.

OTHER NOTABLE IMPACT EFFECTS:

None

FIGURE 2 VEHICLE CRUSH

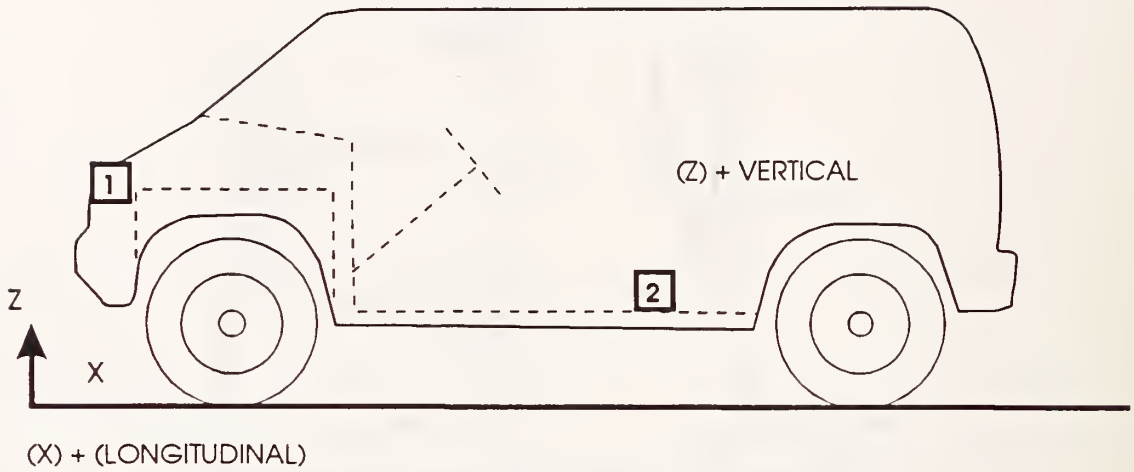


NOTES: L is pre-test length of contact surface.
C1 through C6 are spaced equally apart.
CL is vehicle centerline.
All measurements are in inches.

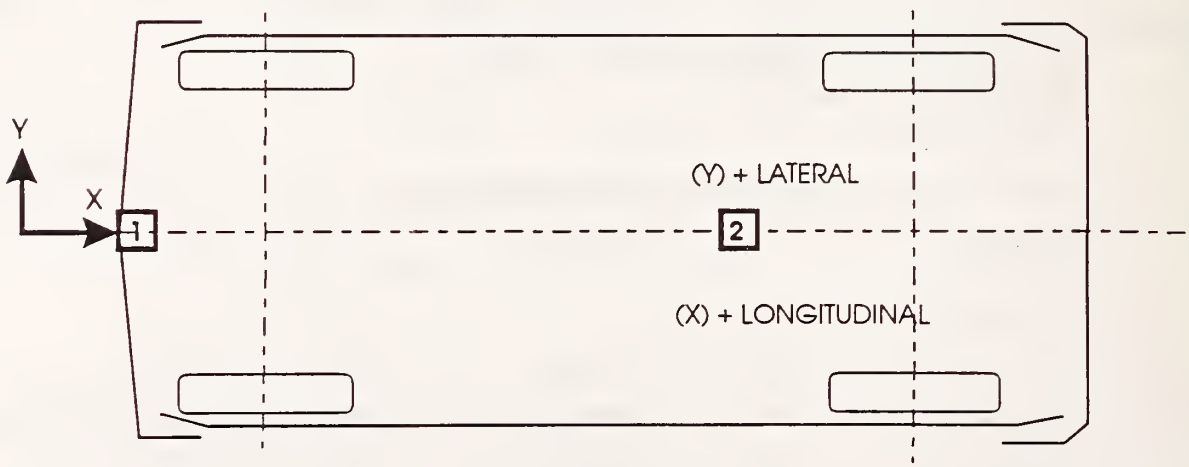
Vehicle Dodge Ram B250 van

	PRE-TEST	POST-TEST	CRUSH
L	75.0		
C1	199.5	193.8	5.7
C2	201.1	193.8	7.3
C3	199.0	193.2	5.8
C4	199.2	193.2	6.0
C5	201.0	193.8	7.2
C6	199.2	193.8	5.4
CL	199.0	193.2	5.8

FIGURE 3 VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

GR\093382\0100

TABLE 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930925

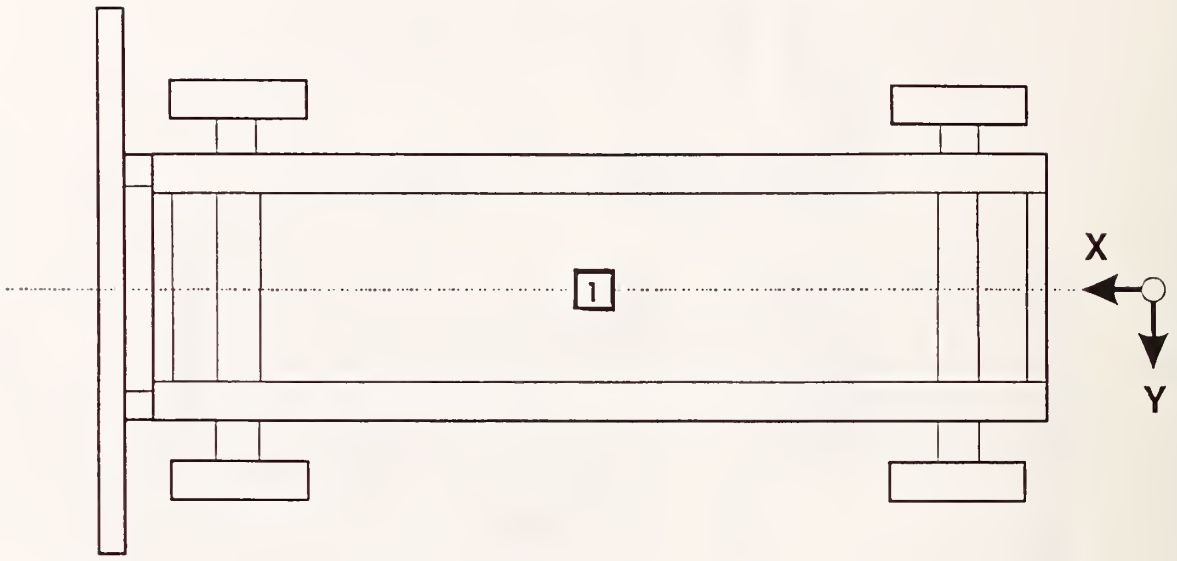
No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	FRONT FRAME CROSSMEMBER	190.6	0.0	39.0				
	LONGITUDINAL				41.2	34.8	23.4	57.0
	LATERAL				4.9	32.8	5.3	75.0
	VERTICAL				22.9	26.6	17.5	34.1
	RESULTANT				44.5	34.5		
2	VEHICLE CENTER OF GRAVITY	136.0	0.0	23.9				
	LONGITUDINAL[1]				---	---	---	---
	LATERAL[1]				4.8	1.0	112.6	6.9
	VERTICAL[1]				214.7	7.5	9.7	92.3
	RESULTANT[1]				---	---		

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

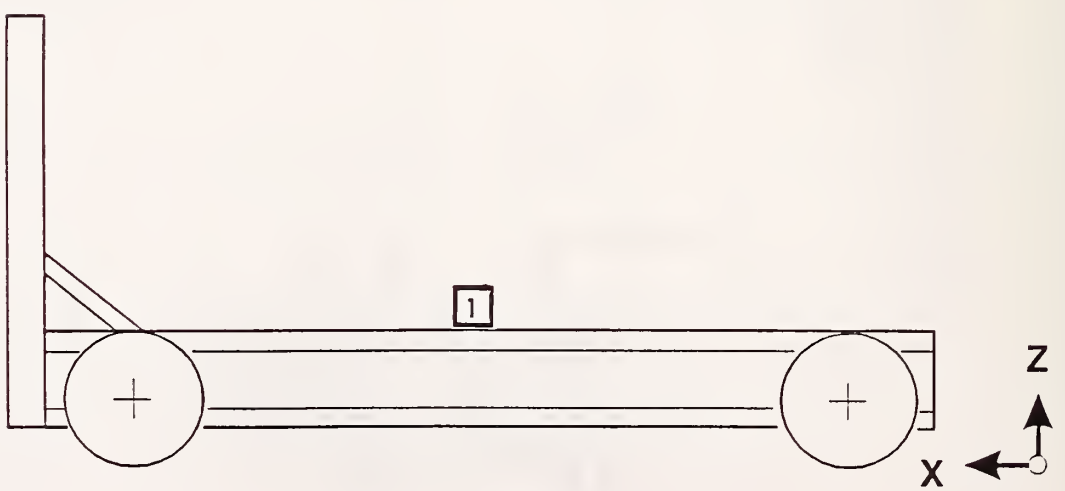
REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

[1] See DATA ACQUISITION EXPLANATIONS

FIGURE 4 MOVING BARRIER ACCELEROMETER PLACEMENT



TOP VIEW



SIDE VIEW

GR\093382\ACC0101

TABLE 6

MOVING BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930925

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	CENTER OF GRAVITY	74.8	0.0	12.6				
	LONGITUDINAL				1.4	66.4	32.2	20.6
	LATERAL				3.0	11.3	5.8	32.9
	VERTICAL				16.4	21.1	20.1	15.4
	RESULTANT				36.1	20.9		

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

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

TABLE 7 FUEL SYSTEM DATA

MAKE/MODEL: Dodge/Ram B250

FUEL SYSTEM CAPACITY: 150.7 LITERS (FROM OWNER'S MANUAL)

RATED SERVICE PRESSURE: 3000 PSI AT 70° F

ACTUAL TEST PRESSURE: 2980 PSI AT 64° F

TEST GAS TYPE: NITROGEN

DETAILS OF FUEL SYSTEM: Two fuel tanks were located behind the rear axle and one fuel tank was located outside of the left frame rail. The fuel filler neck was located on the left side of the vehicle. The fuel lines followed the right frame rail to the engine compartment.

ELECTRIC FUEL PUMP: NA

FUEL INJECTION: Yes

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING? NA

SECTION 3.0

CAMERA INFORMATION

FIGURE 5

CAMERA POSITIONS

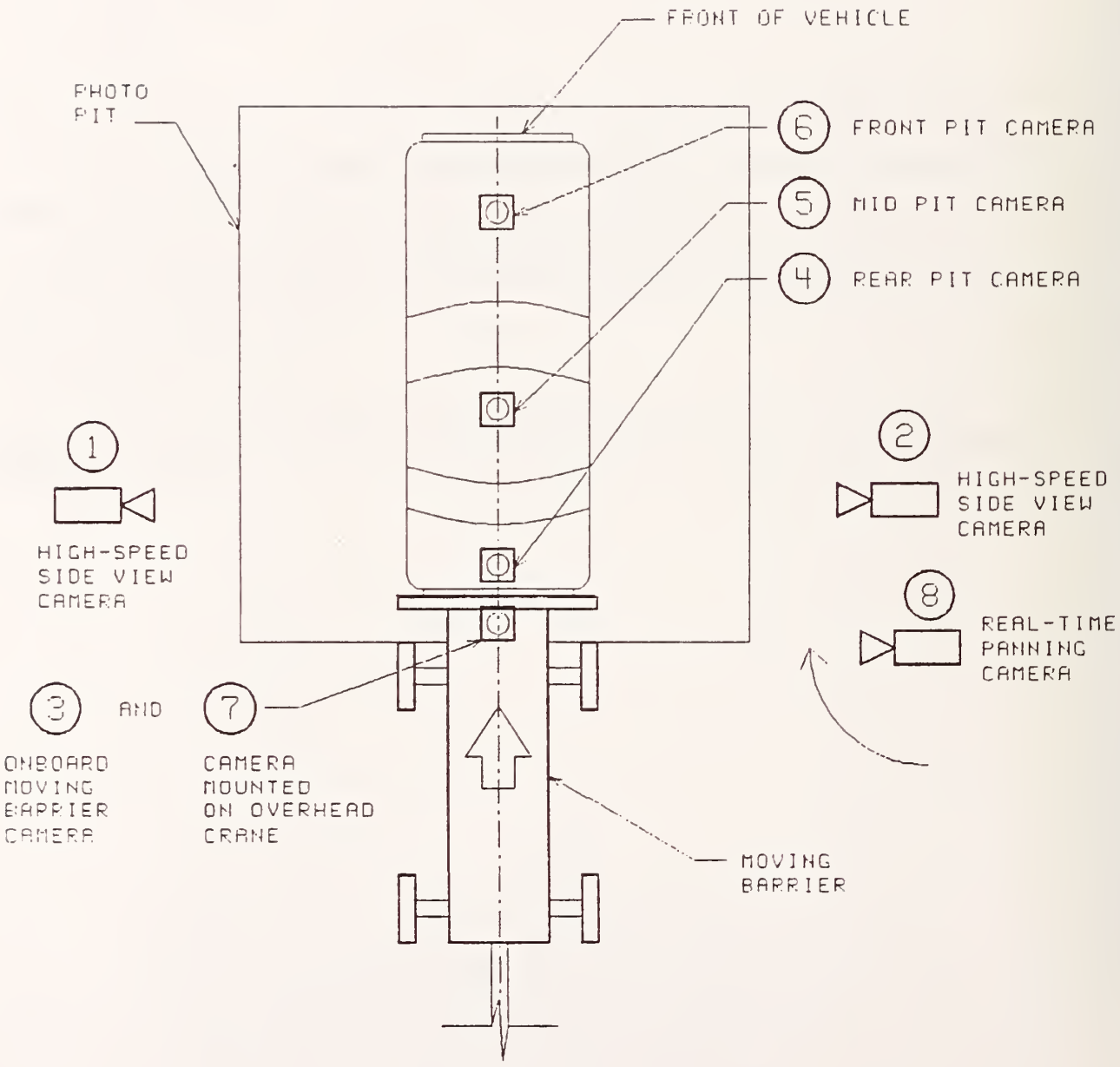


TABLE 8 MOTION PICTURE CAMERA INFORMATION

CAMERA NUMBER	LOCATION	TYPE	LENS (MM)	SPEED (FPS)	PURPOSE OF CAMERA DATA
1	Left wide	Photosonic	13	500	Vehicle crush
2	Right wide	Photosonic	13	513	Vehicle crush
3	Onboard Mvg. Bar.	Photosonic	13	500	Vehicle crush
4	Pit - rear	Photosonic	8.5	948	Vehicle crush
5	Pit - mid	Photosonic	17	800	Vehicle crush
6	Pit - front	Photosonic	25	800	Vehicle crush
7	Overhead wide	Photosonic	17	800	Vehicle crush
8	Right panning	Beaulieu	12-120	24	Real-time panning

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

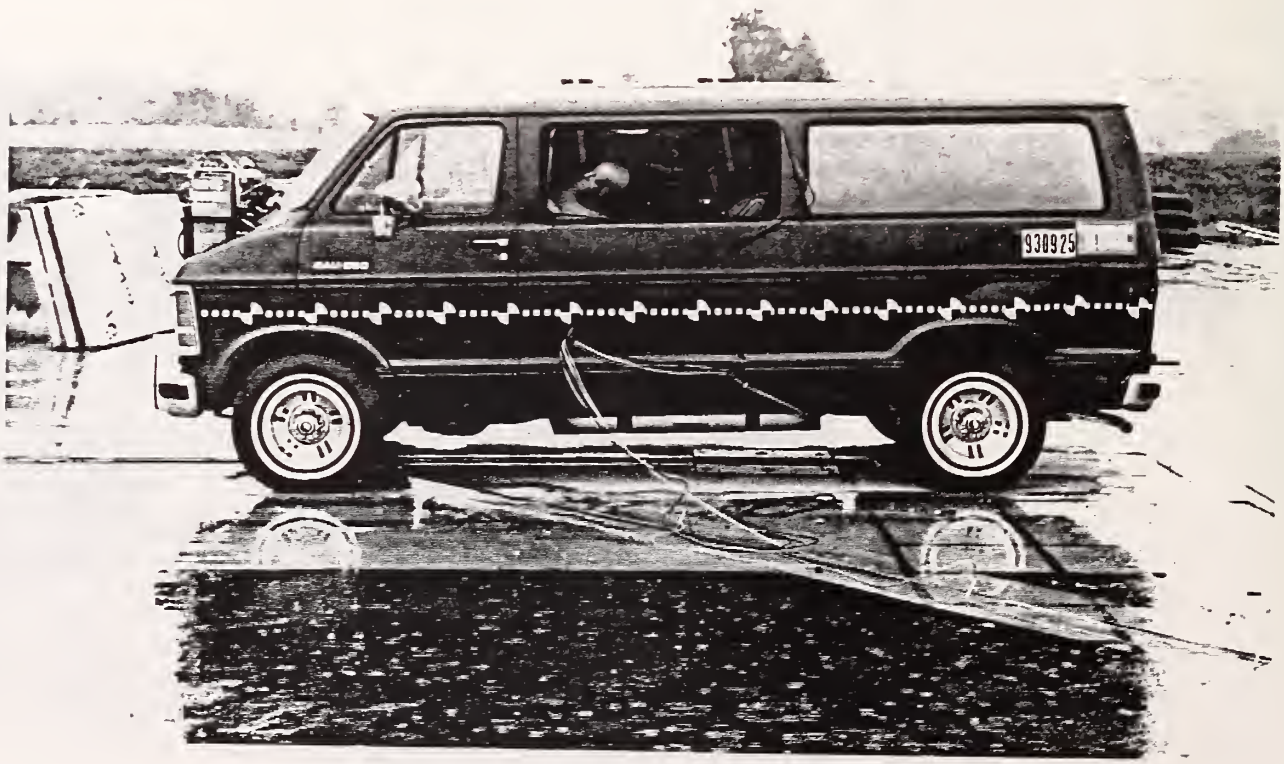


Figure A-4. POST-TEST LEFT SIDE VIEW

Figure A-5. PRE-TEST REAR VIEW

Figure A-6. POST-TEST REAR VIEW

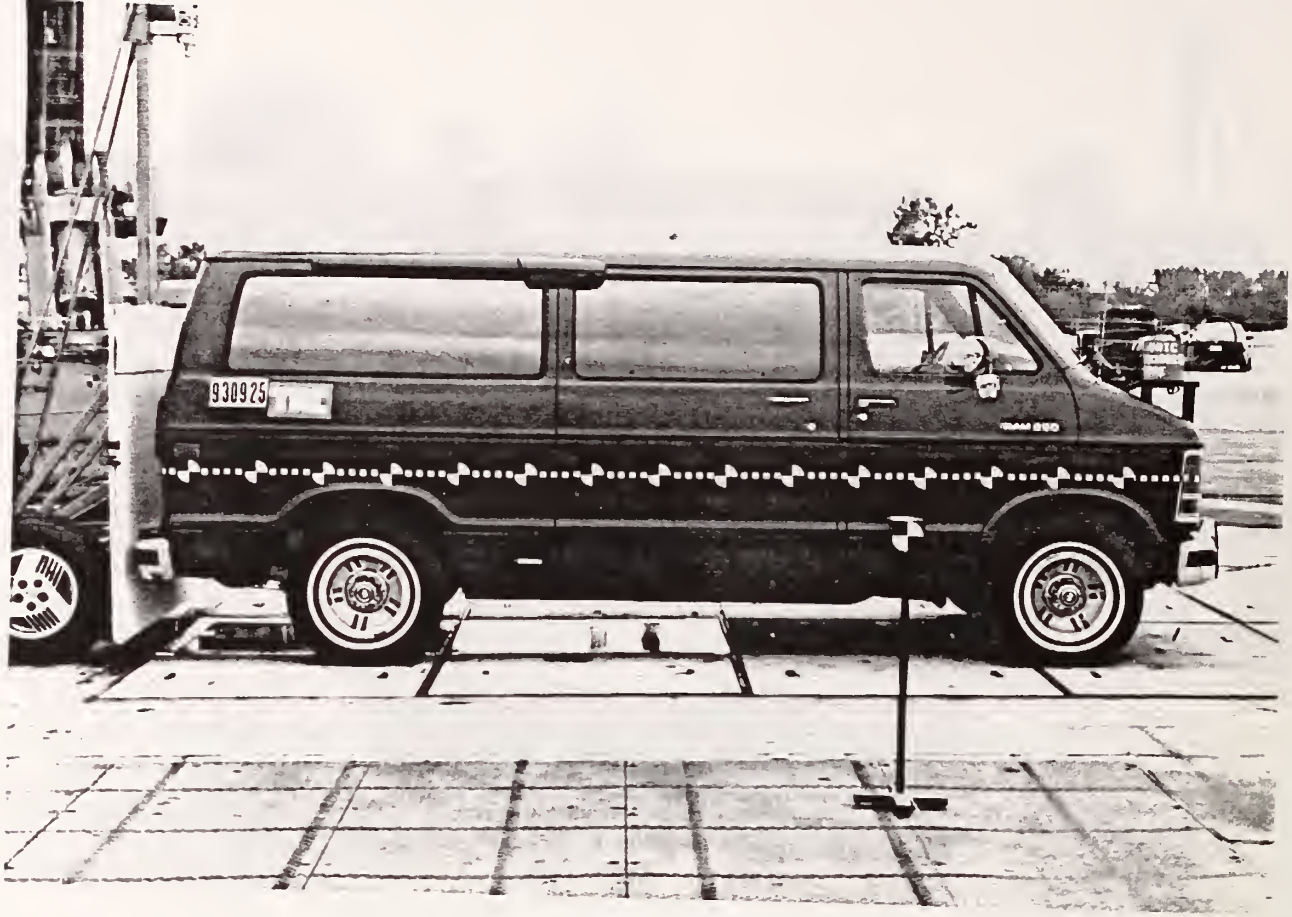


Figure A-7. PRE-TEST RIGHT SIDE VIEW

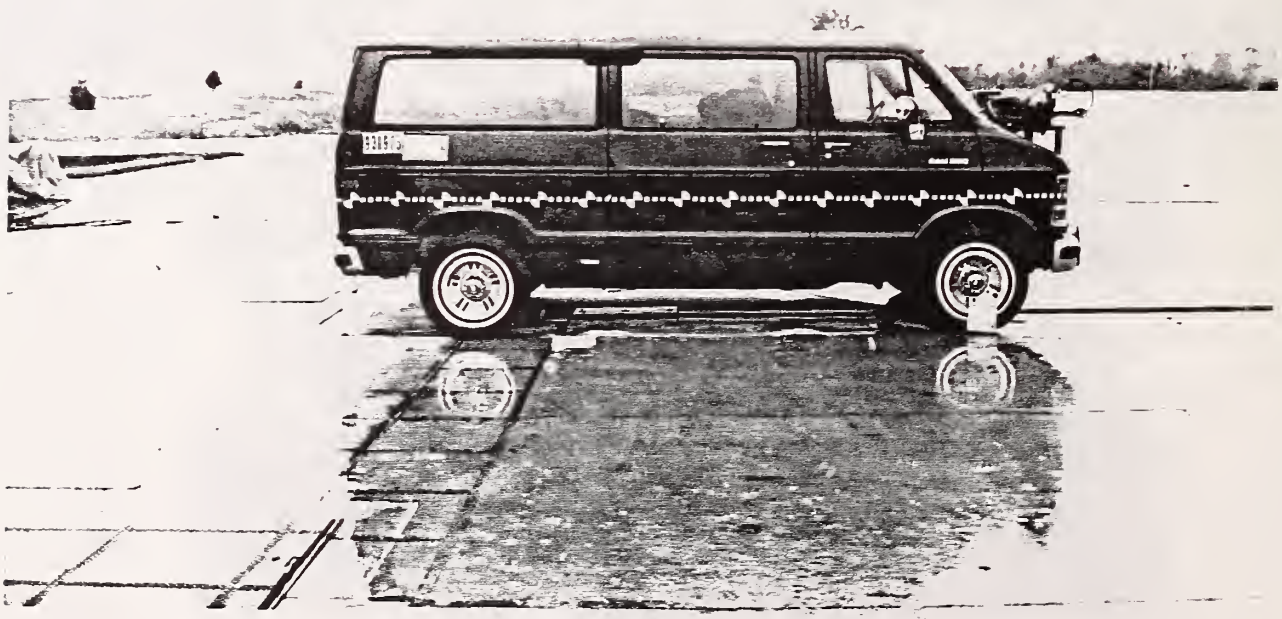


Figure A-8. POST-TEST RIGHT SIDE VIEW

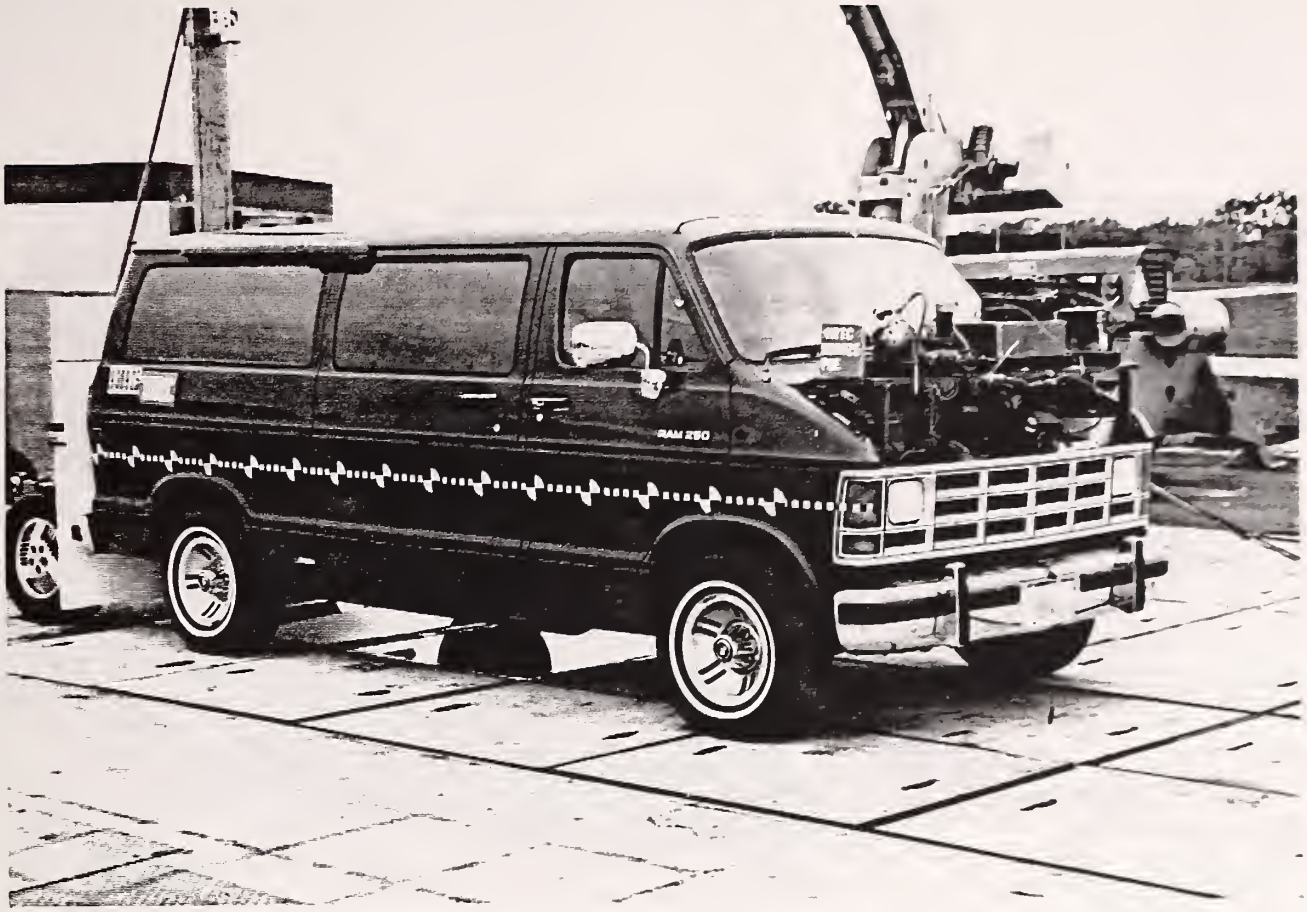


Figure A-9. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

Figure A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

Figure A-11. PRE-TEST RIGHT REAR THREE-QUARTER VIEW

Figure A-12. POST-TEST RIGHT REAR THREE-QUARTER VIEW

Figure A-13. PRE-TEST LEFT FRONT THREE-QUARTER VIEW

Figure A-14. POST-TEST LEFT FRONT THREE-QUARTER VIEW

Figure A-15. PRE-TEST LEFT REAR THREE-QUARTER VIEW

Figure A-16. POST-TEST LEFT REAR THREE-QUARTER VIEW

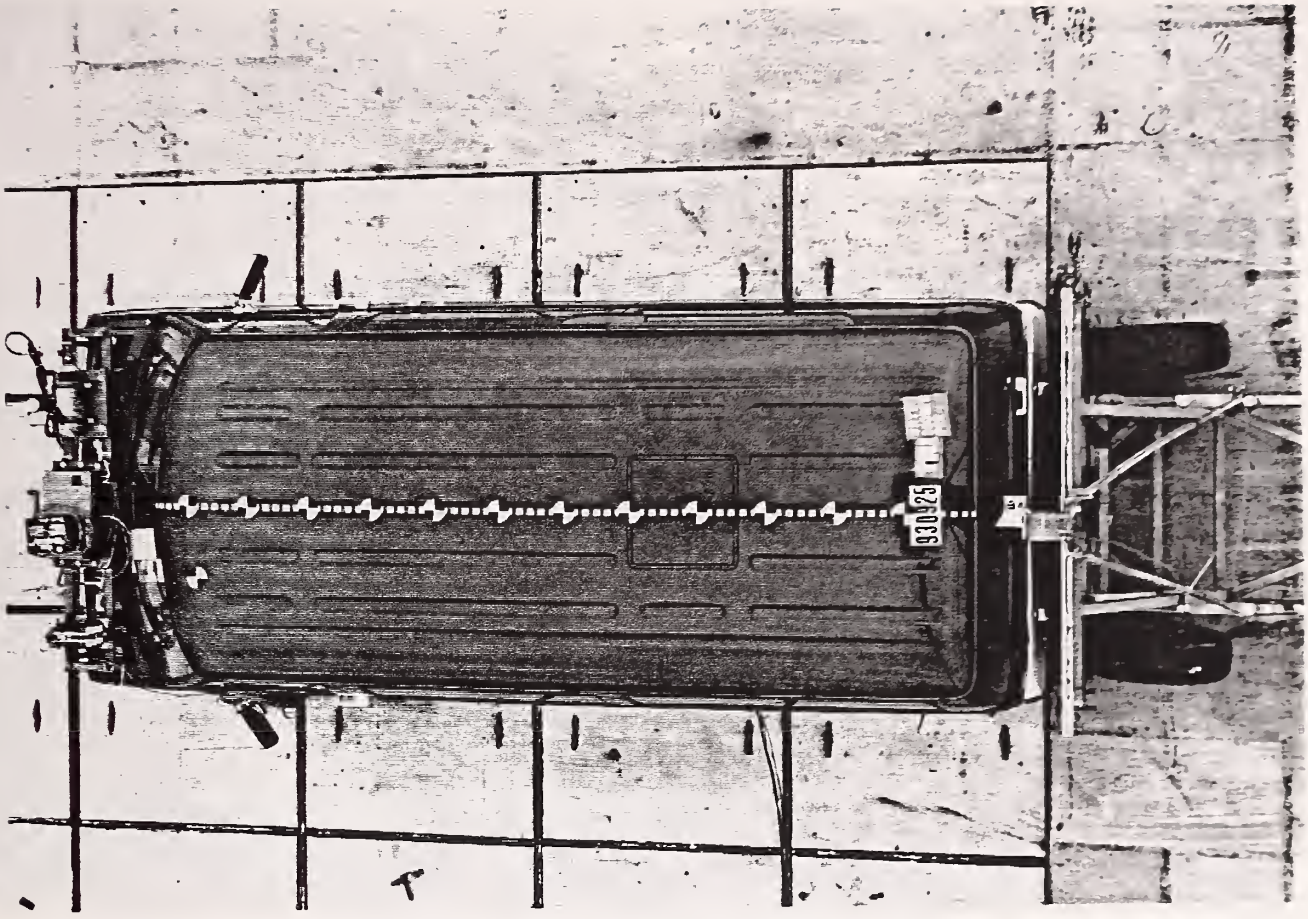


Figure A-17. PRE-TEST OVERHEAD VIEW

Figure A-18. PRE-TEST FUEL TANK - VIEW 1

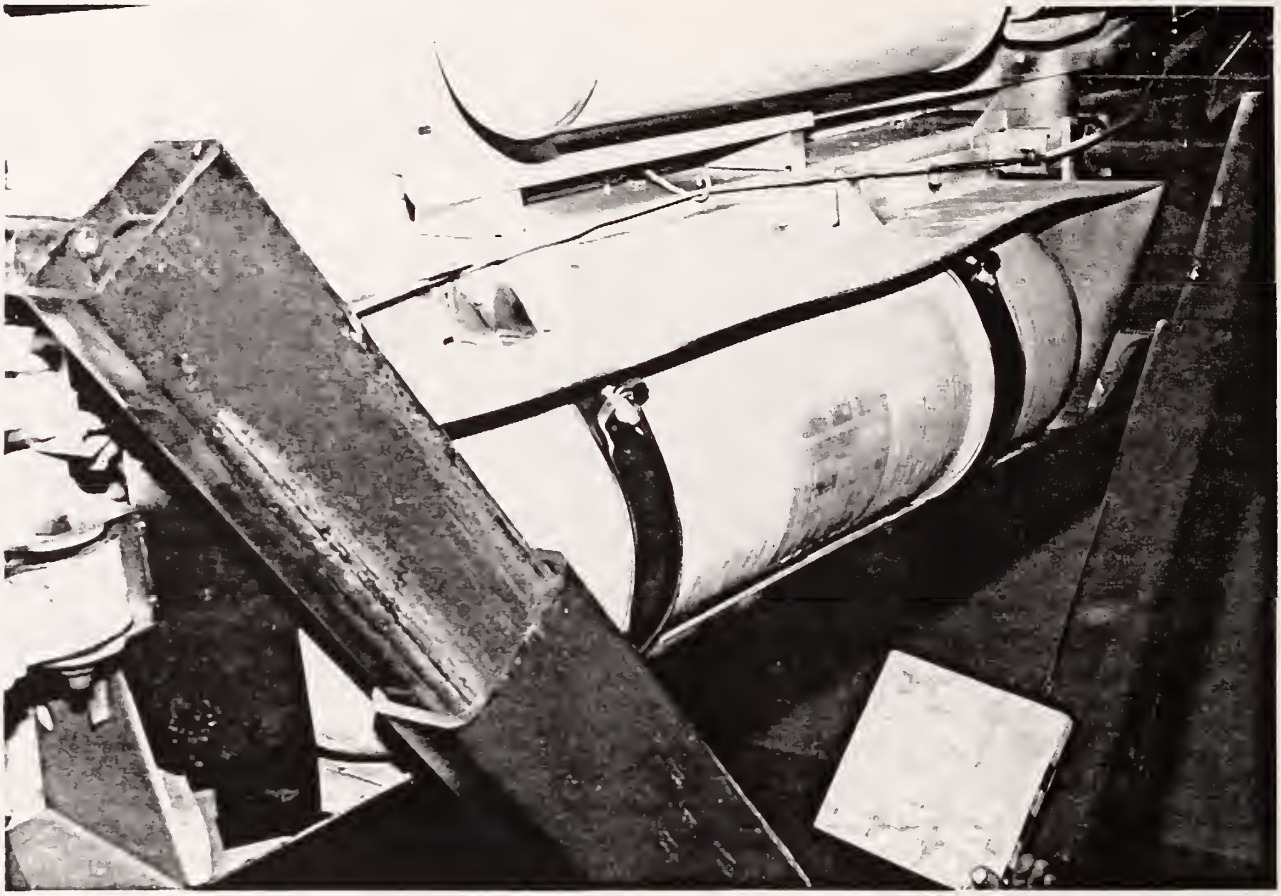


Figure A-19. PRE-TEST FUEL TANK - VIEW 2

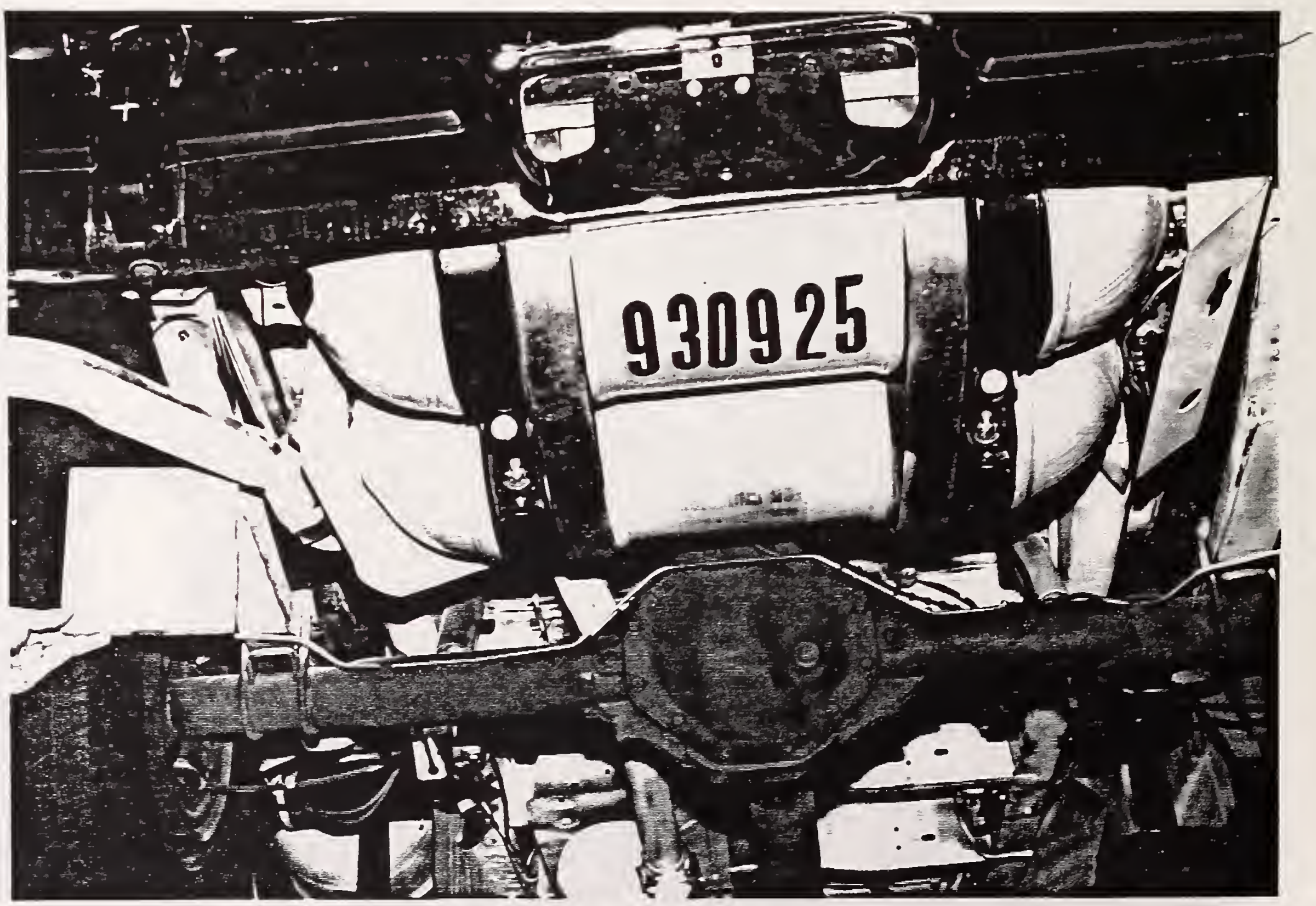


Figure A-20. POST-TEST FUEL TANK VIEW

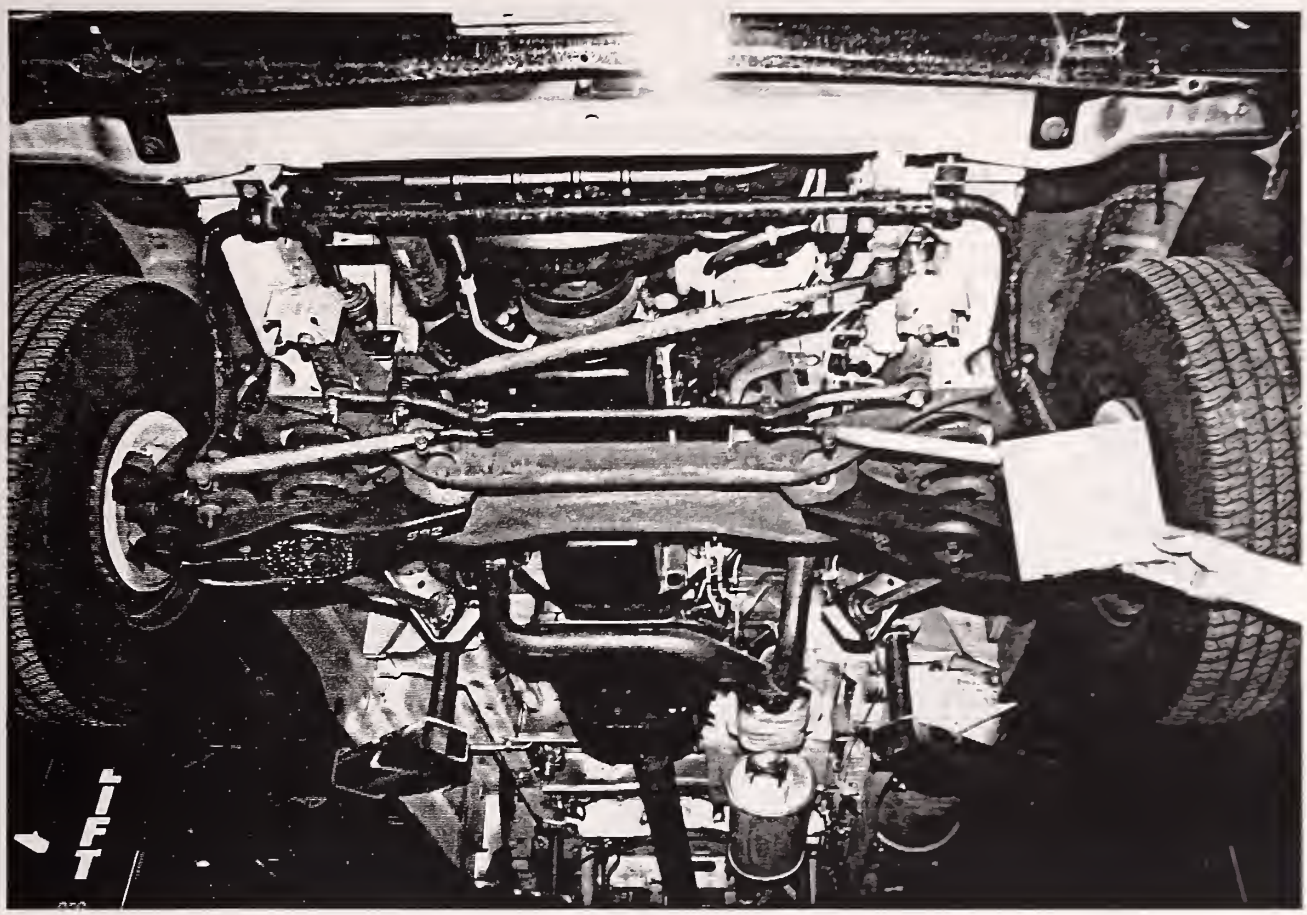


Figure A-21. PRE-TEST FRONT UNDERBODY VIEW

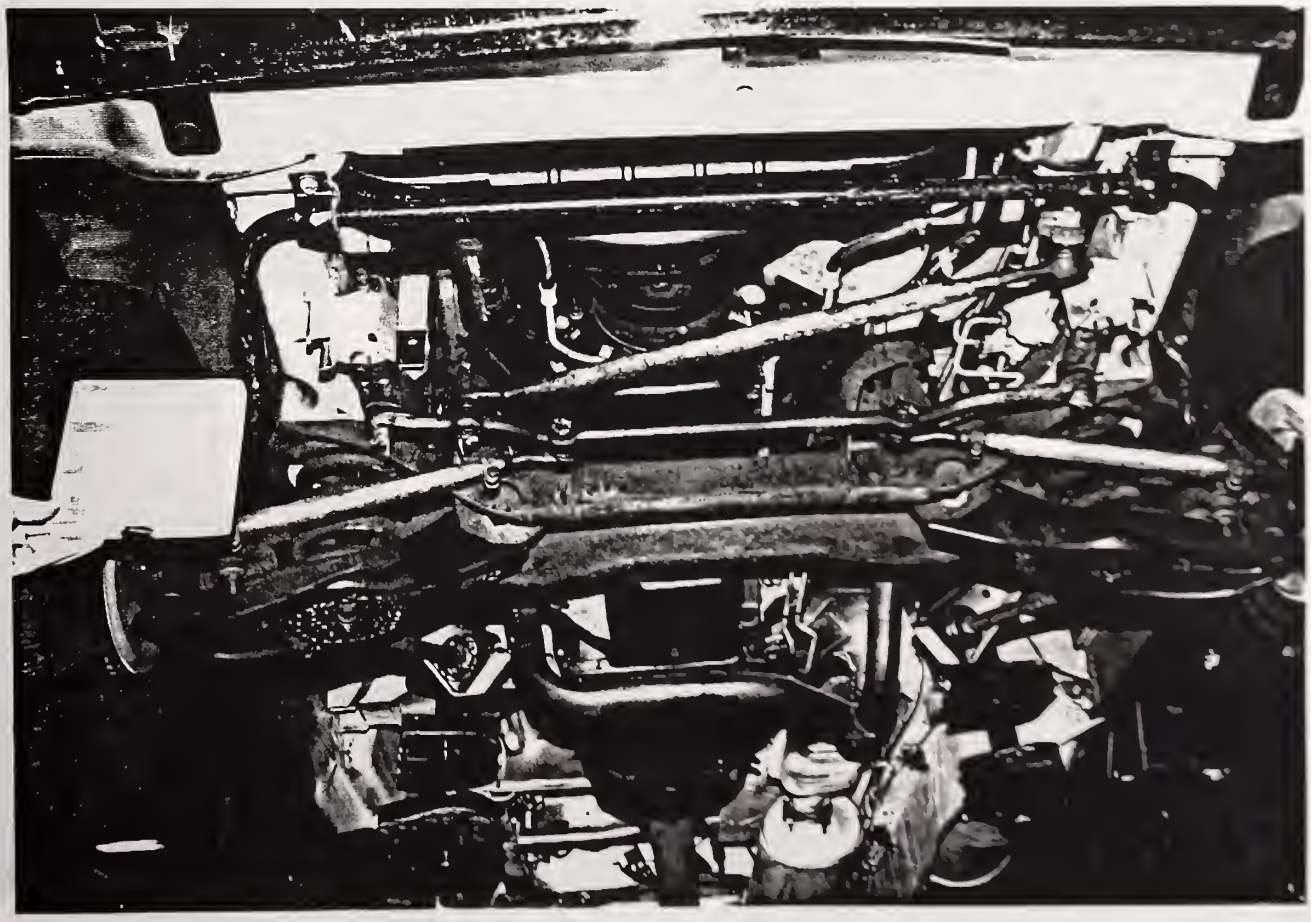


Figure A-22. POST-TEST FRONT UNDERBODY VIEW

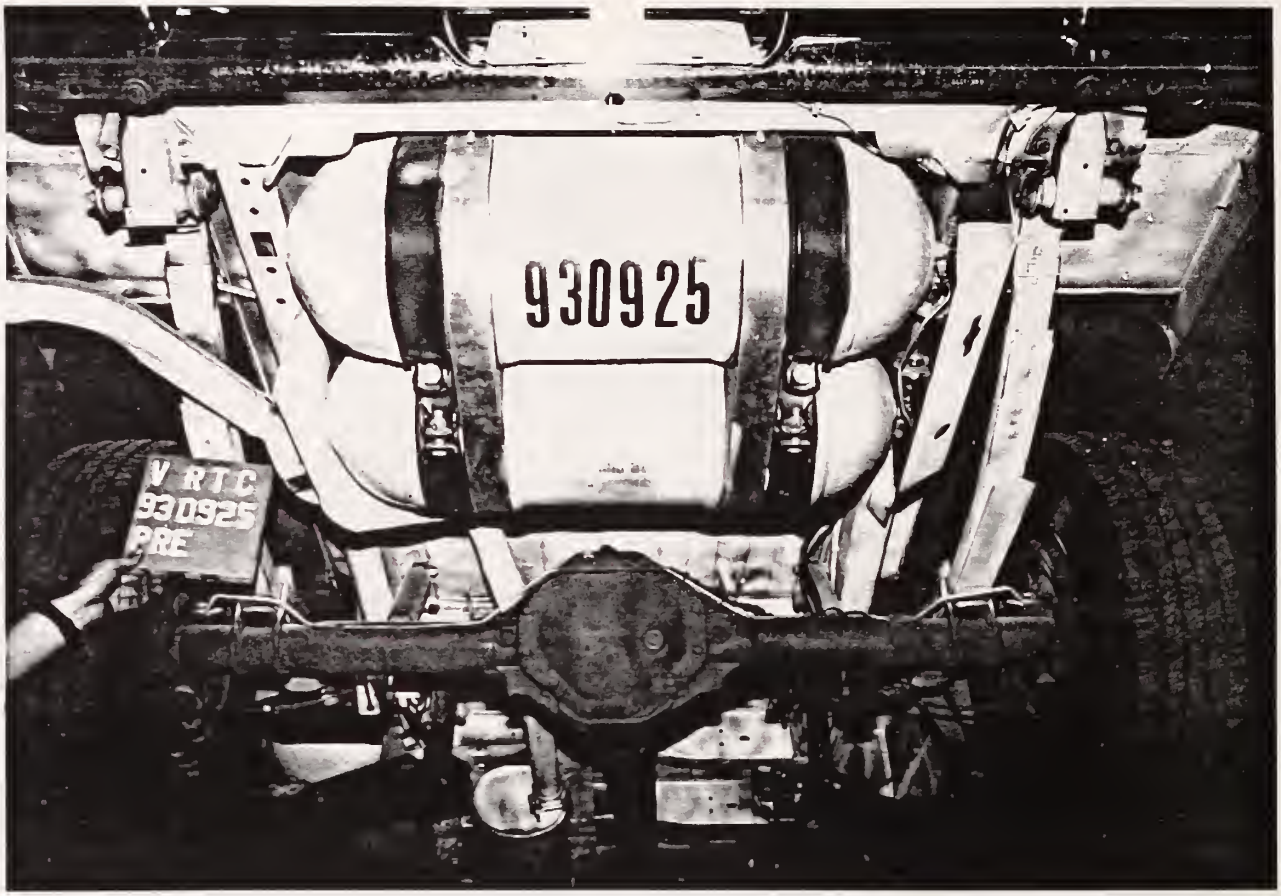


Figure A-23. PRE-TEST REAR UNDERBODY VIEW

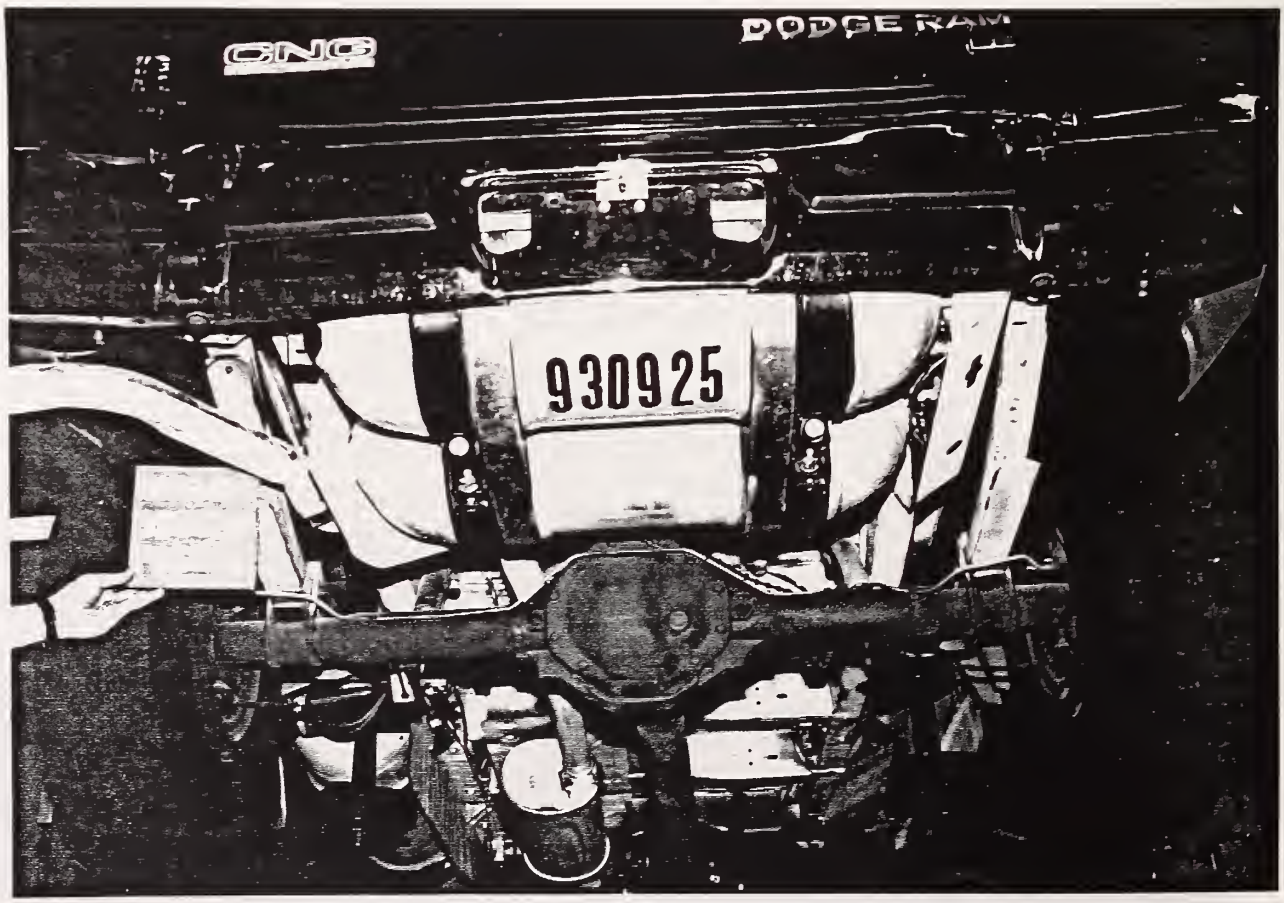
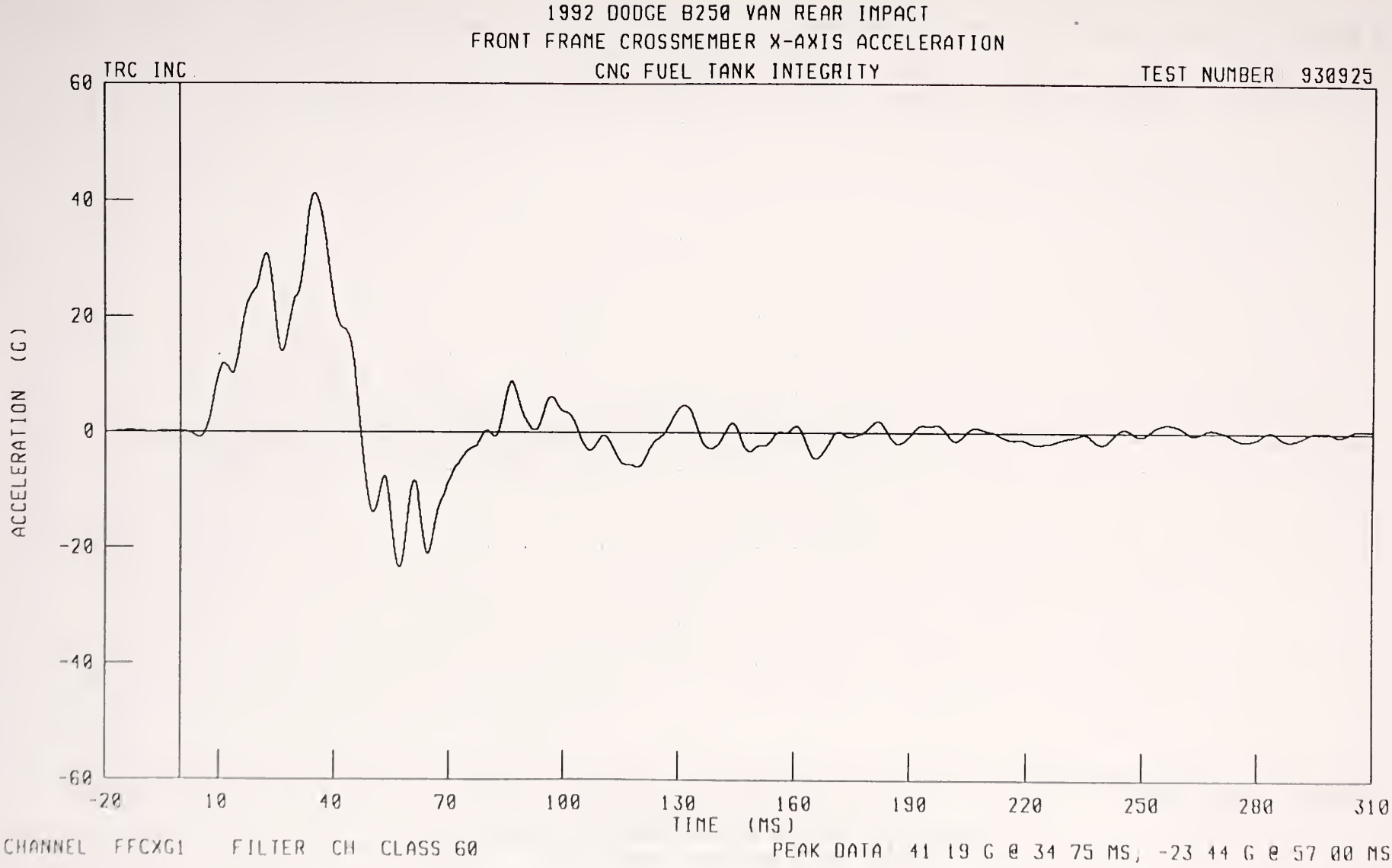
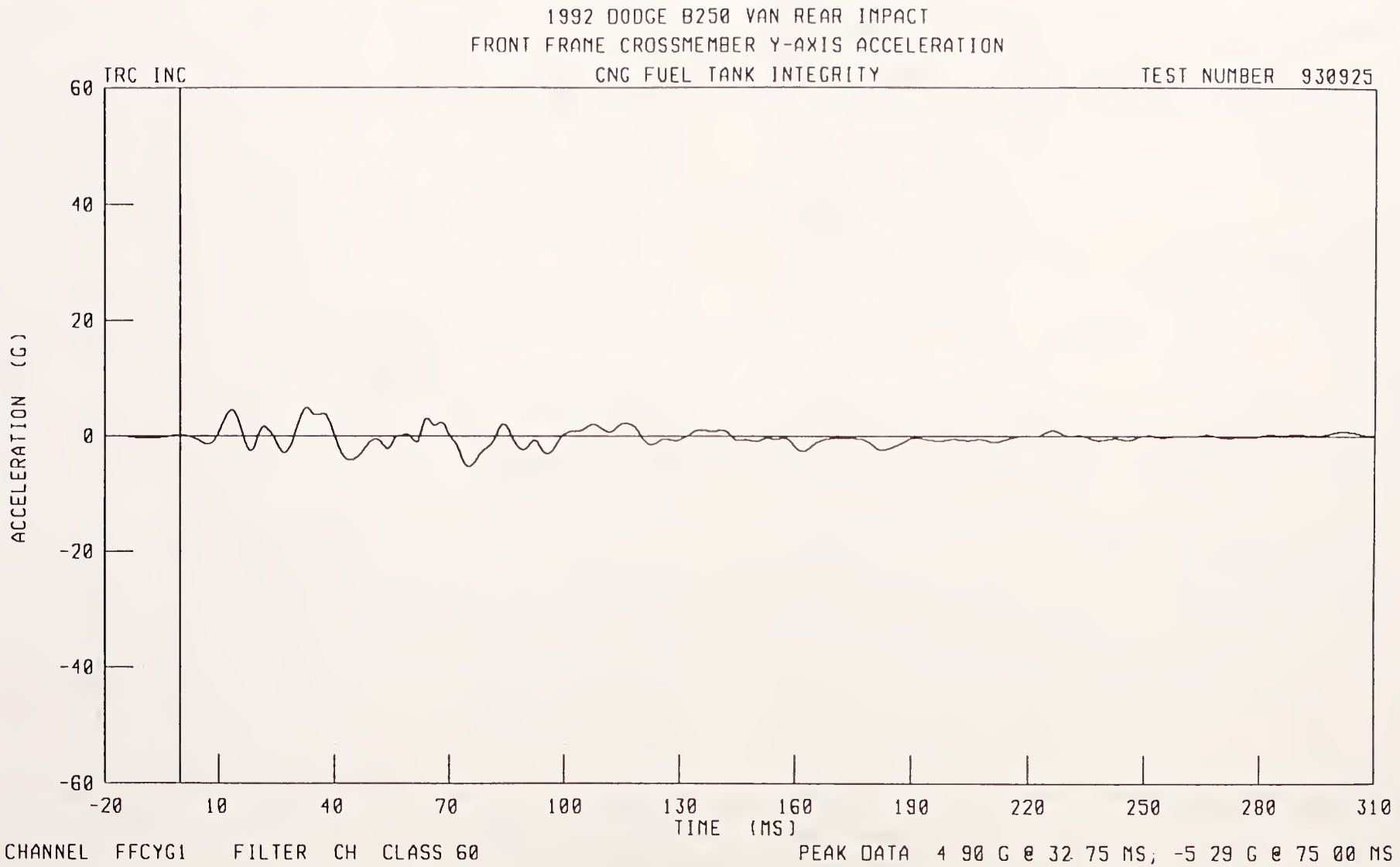


Figure A-24. POST-TEST REAR UNDERBODY VIEW

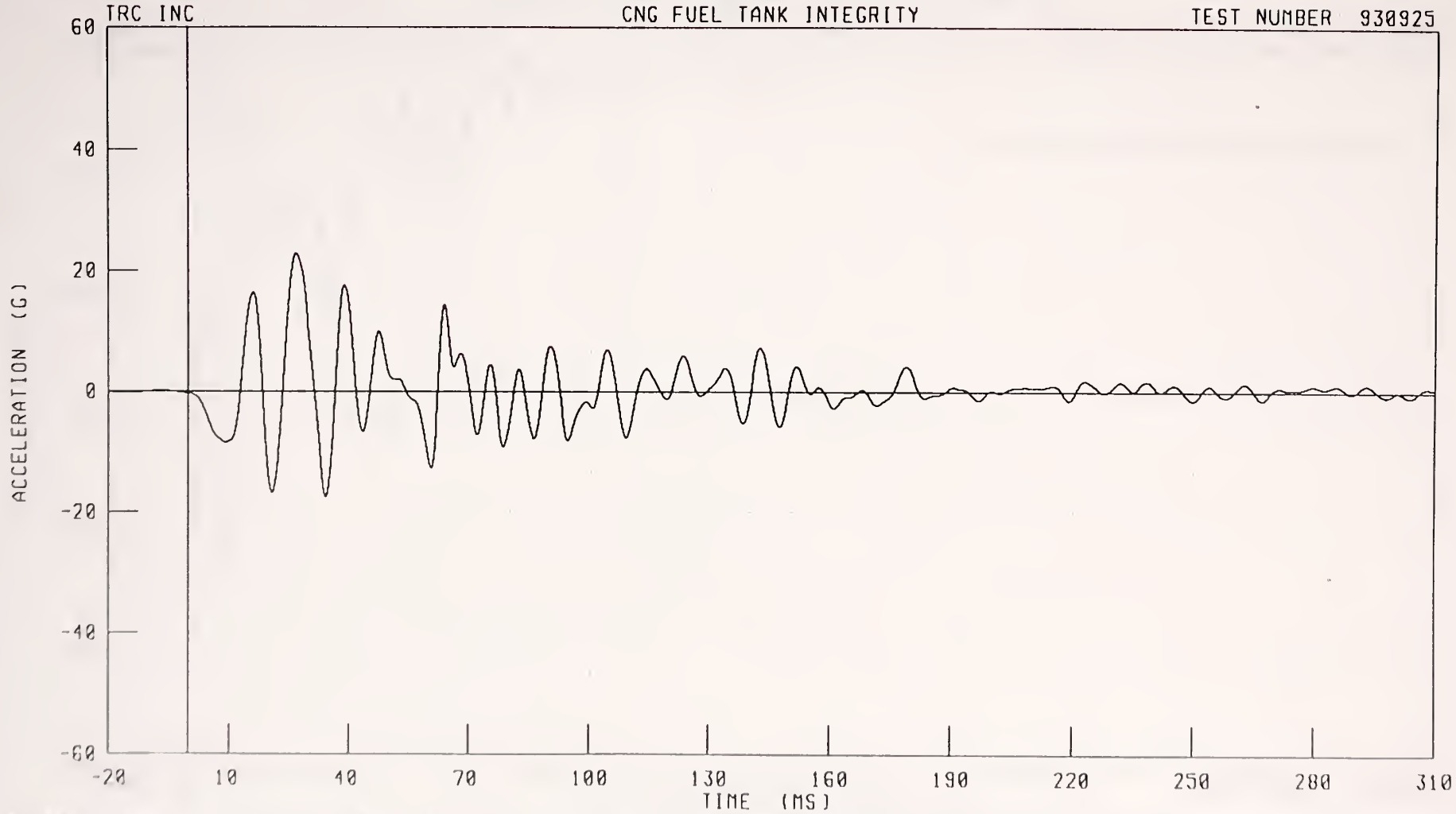
APPENDIX B

DATA PLOTS


1992 DODGE B250 VAN REAR IMPACT
FRONT FRAME CROSSMEMBER X-AXIS ACCELERATION
CNG FUEL TANK INTEGRITY
TRC INC
TEST NUMBER 930925
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL FFCXG1 FILTER CH CLASS 60
PEAK DATA 41 19 G @ 34 75 MS, -23 44 G @ 57 00 MS


1992 DODGE B250 VAN REAR IMPACT
FRONT FRAME CROSSMEMBER Y-AXIS ACCELERATION
TRC INC
CNG FUEL TANK INTEGRITY
TEST NUMBER 930925
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL FFCYG1 FILTER CH CLASS 60
PEAK DATA 4 90 G @ 32 75 MS; -5 29 G @ 75 00 MS

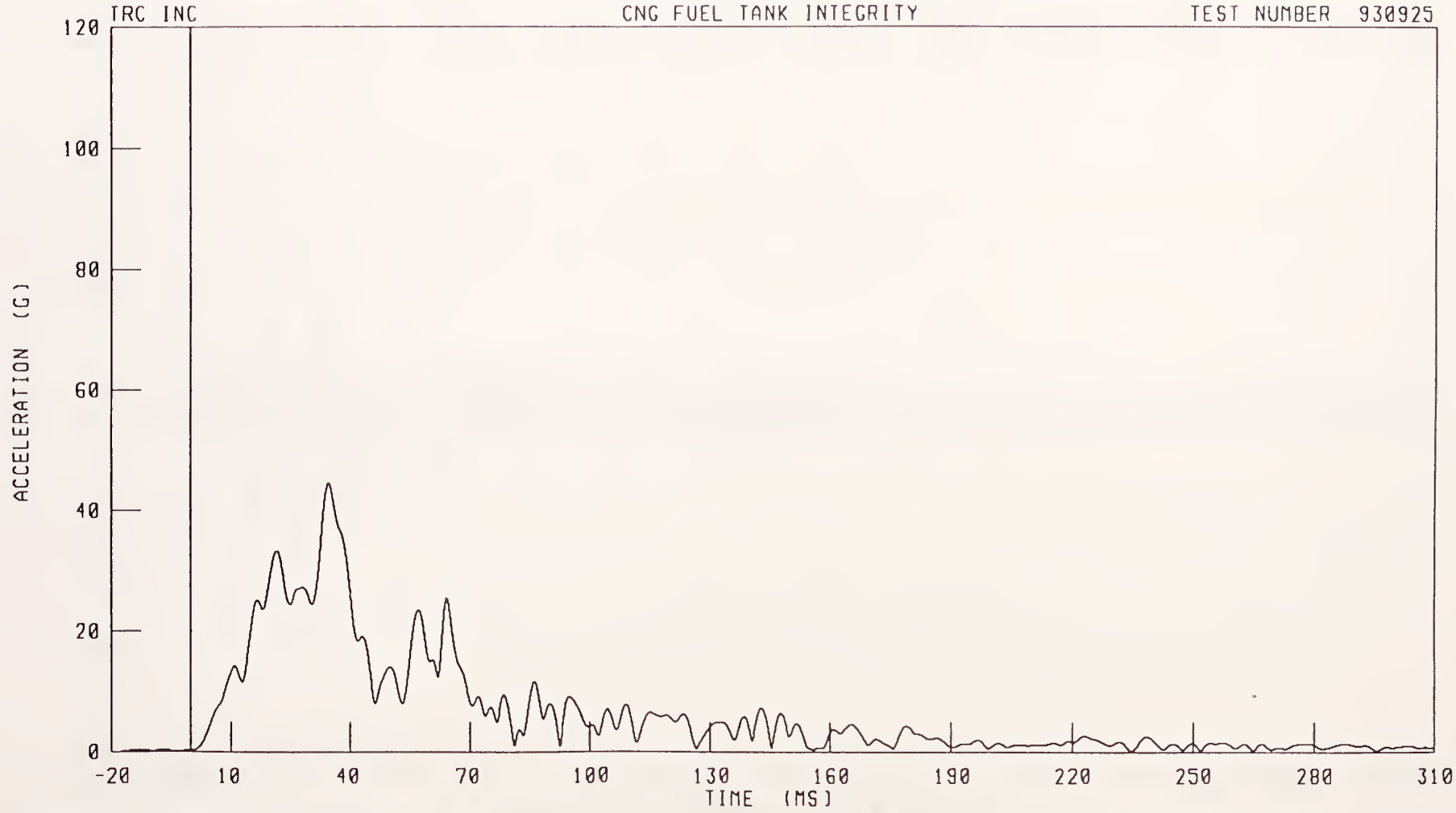
1992 DODGE B250 VAN REAR IMPACT
FRONT FRAME CROSSMEMBER Z-AXIS ACCELERATION
CNG FUEL TANK INTEGRITY



CHANNEL FFCZG1 FILTER CH CLASS 60

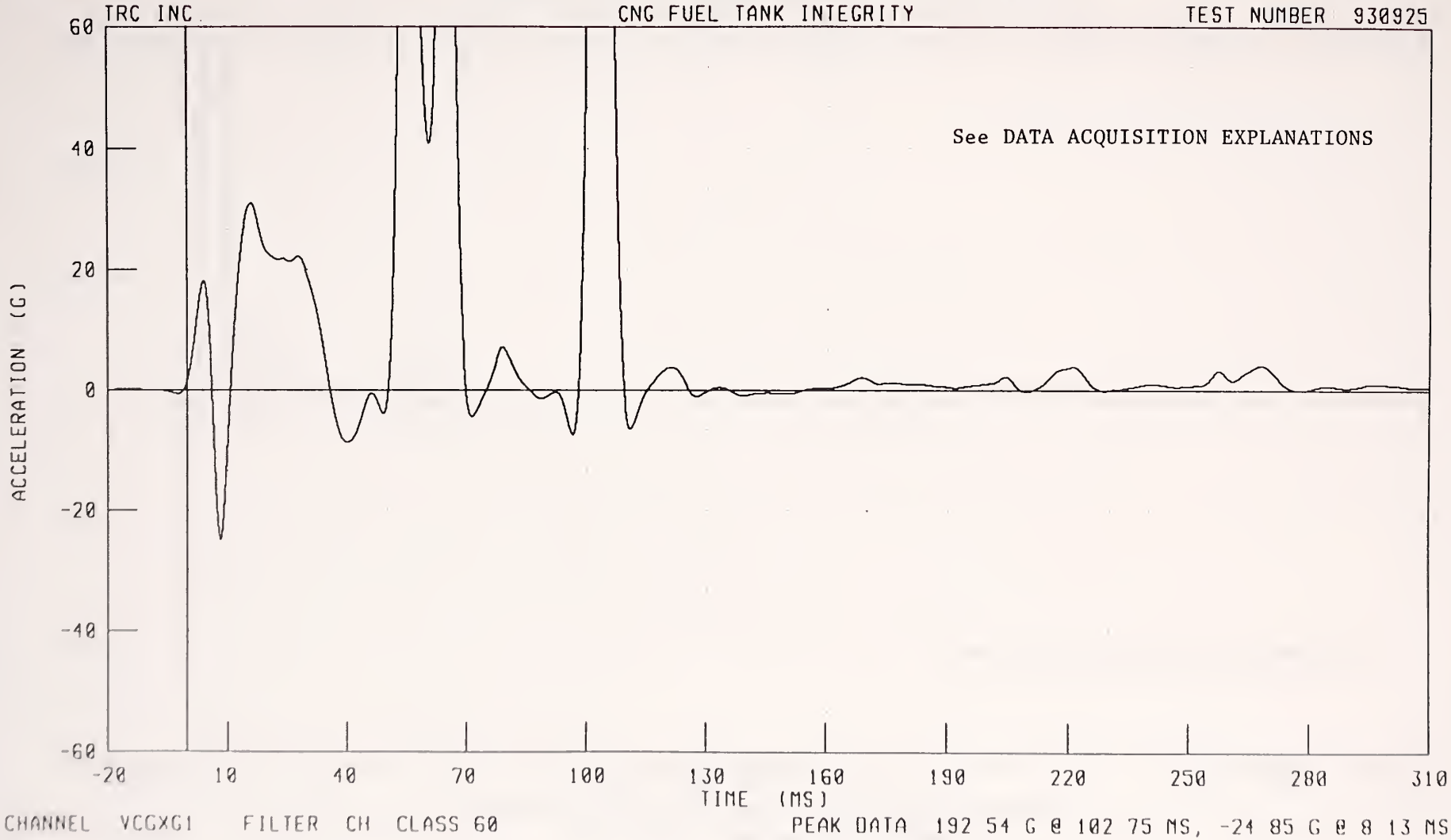
PEAK DATA 22 89 G @ 26 63 MS, -17 49 G @ 34 13 MS

1992 DODGE B250 VAN REAR IMPACT
FRONT FRAME CROSSMEMBER RESULTANT ACCELERATION



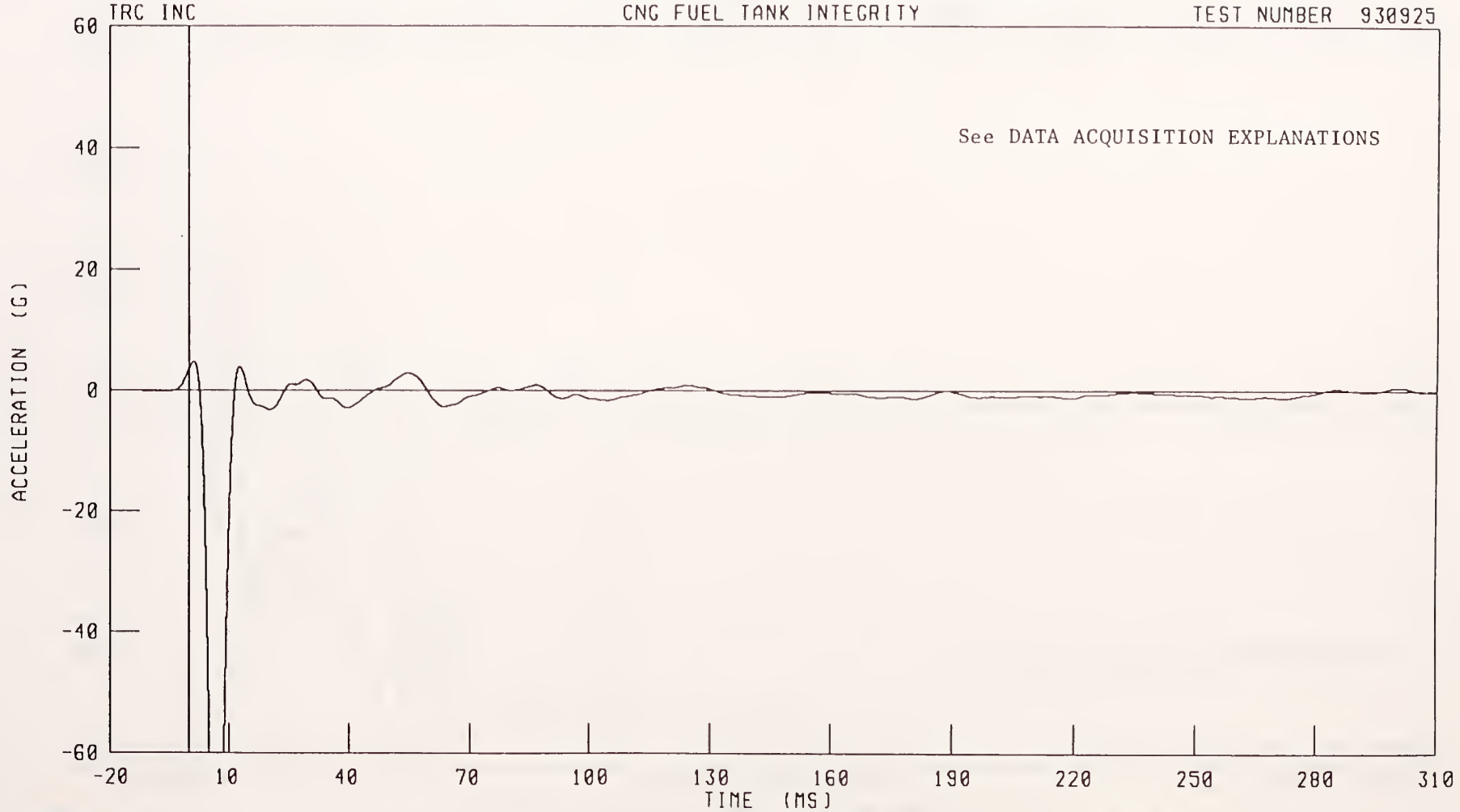
CHANNEL FFCRG1 FILTER CH CLASS 60 PEAK DATA 44 52 G @ 34 50 MS; 0 07 G @ -19 25 MS

1992 DODGE B250 VAN REAR IMPACT
VEHICLE CENTER OF GRAVITY X-AXIS ACCELERATION



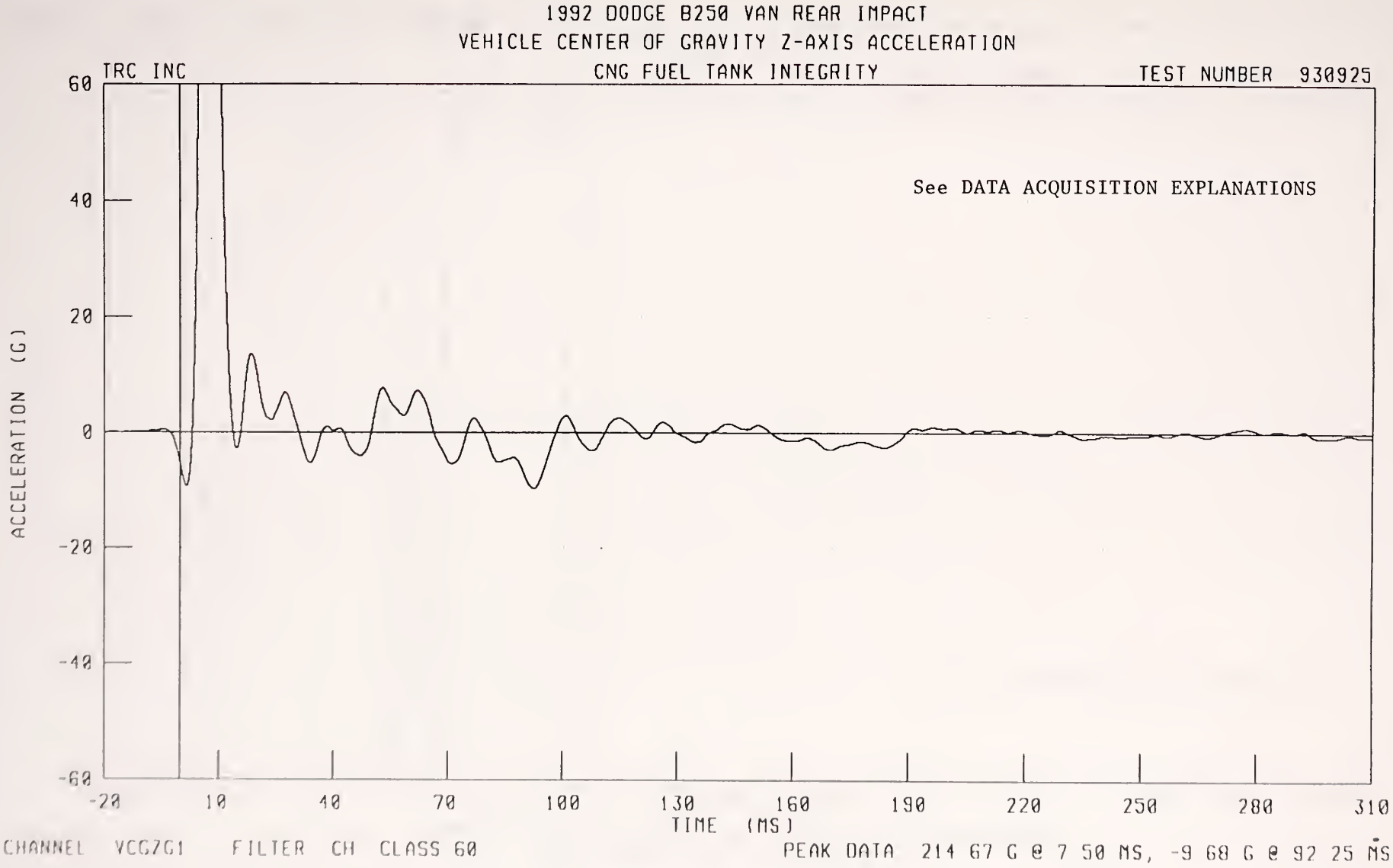
CHANNEL VCGXG1 FILTER CH CLASS 60
PEAK DATA 192 54 G @ 102 75 MS, -24 85 G @ 8 13 MS

1992 DODGE B250 VAN REAR IMPACT
VEHICLE CENTER OF GRAVITY Y-AXIS ACCELERATION
CNG FUEL TANK INTEGRITY

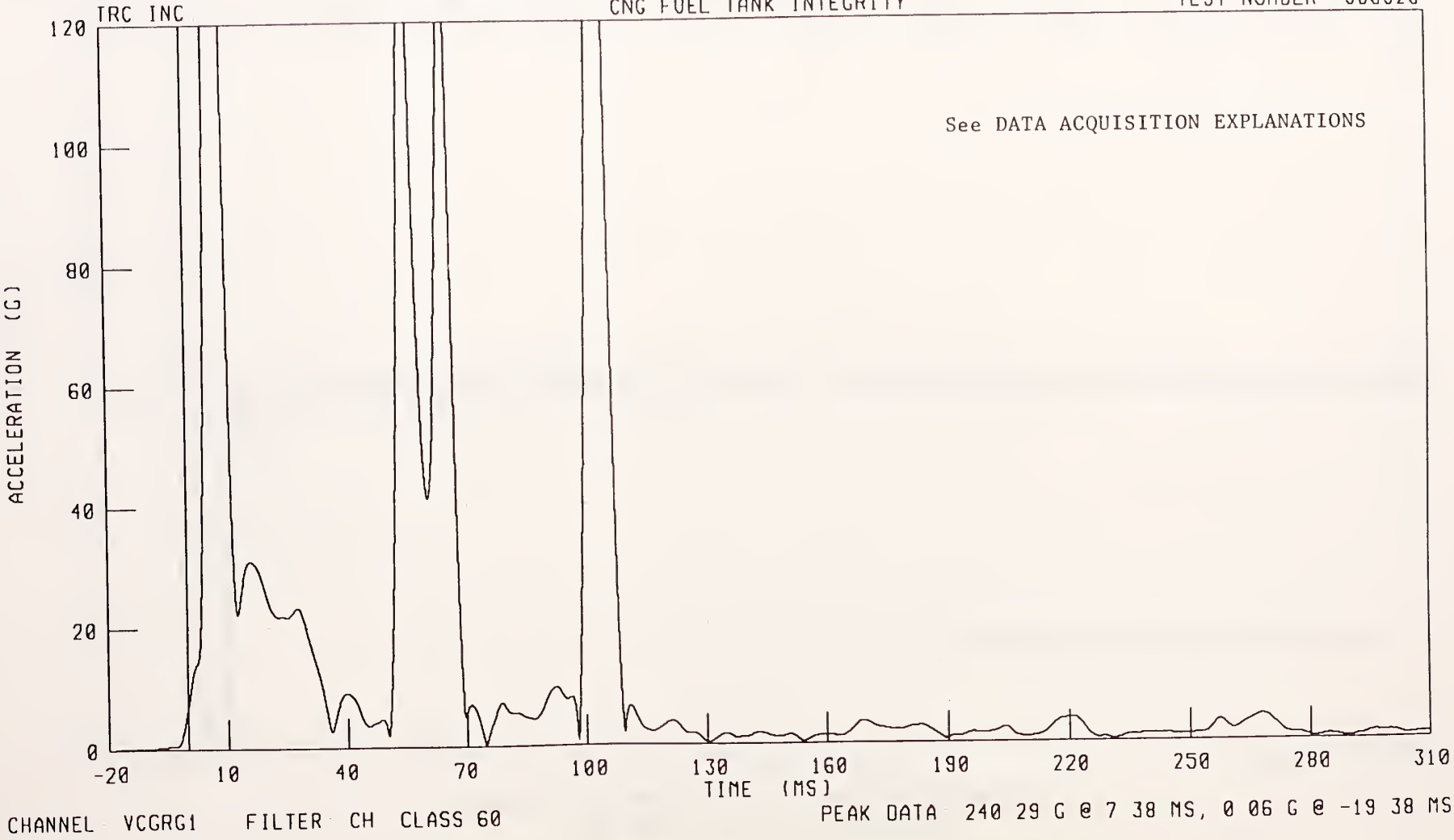


CHANNEL VCGYG1 FILTER CH CLASS 60

PEAK DATA 4 79 G @ 1 00 MS, -112 61 G @ 6 88 MS


1992 DODGE B250 VAN REAR IMPACT
VEHICLE CENTER OF GRAVITY Z-AXIS ACCELERATION
CNG FUEL TANK INTEGRITY
TRC INC
TEST NUMBER 930925
See DATA ACQUISITION EXPLANATIONS
ACCELERATION (G)
60
40
20
0
-20
-40
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL VCG7G1 FILTER CH CLASS 60
PEAK DATA 214 67 G @ 7 50 MS, -9 68 G @ 92 25 MS

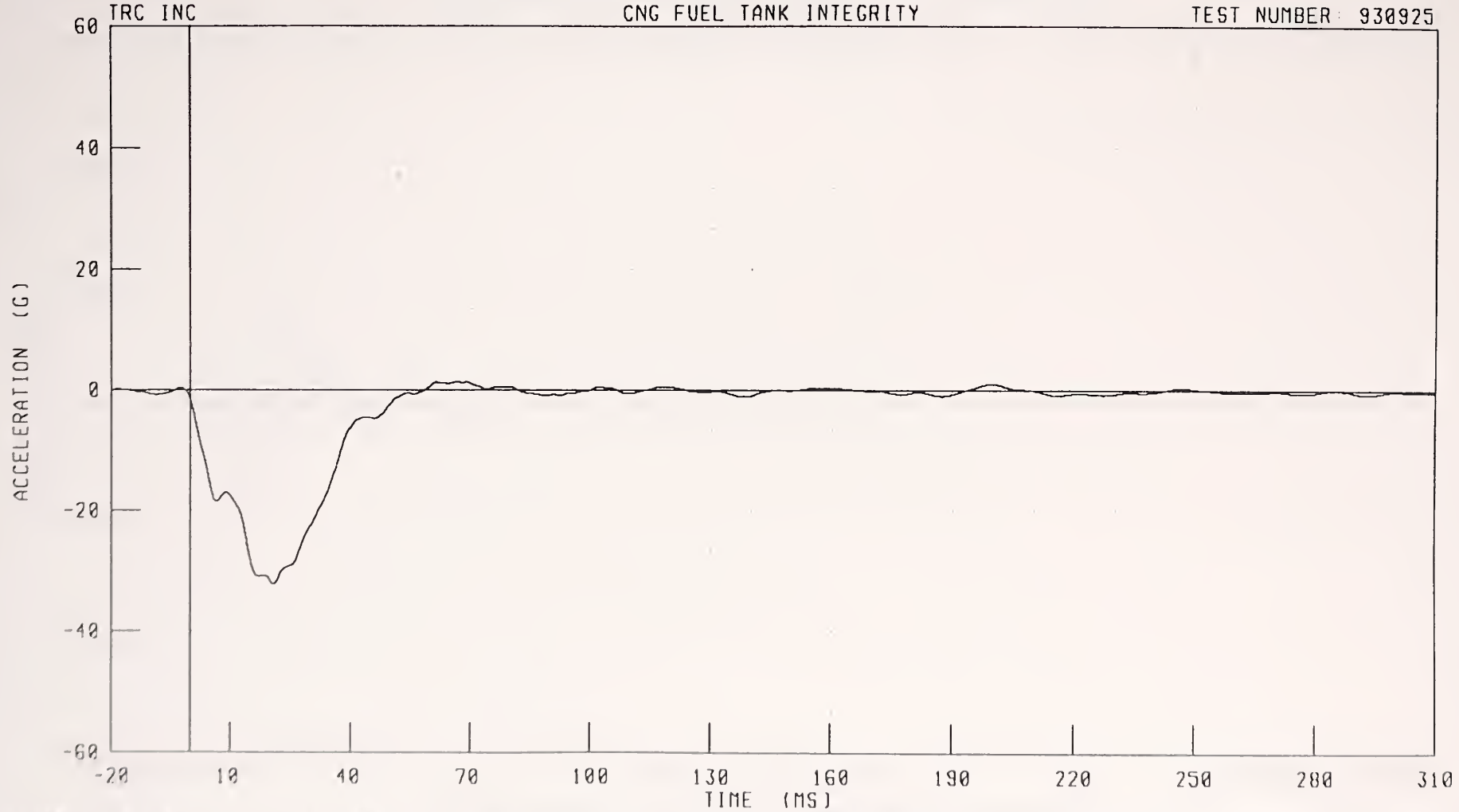
1992 DODGE B250 VAN REAR IMPACT
VEHICLE CENTER OF GRAVITY RESULTANT ACCELERATION
CNG FUEL TANK INTEGRITY



CHANNEL VCGRG1 FILTER CH CLASS 60

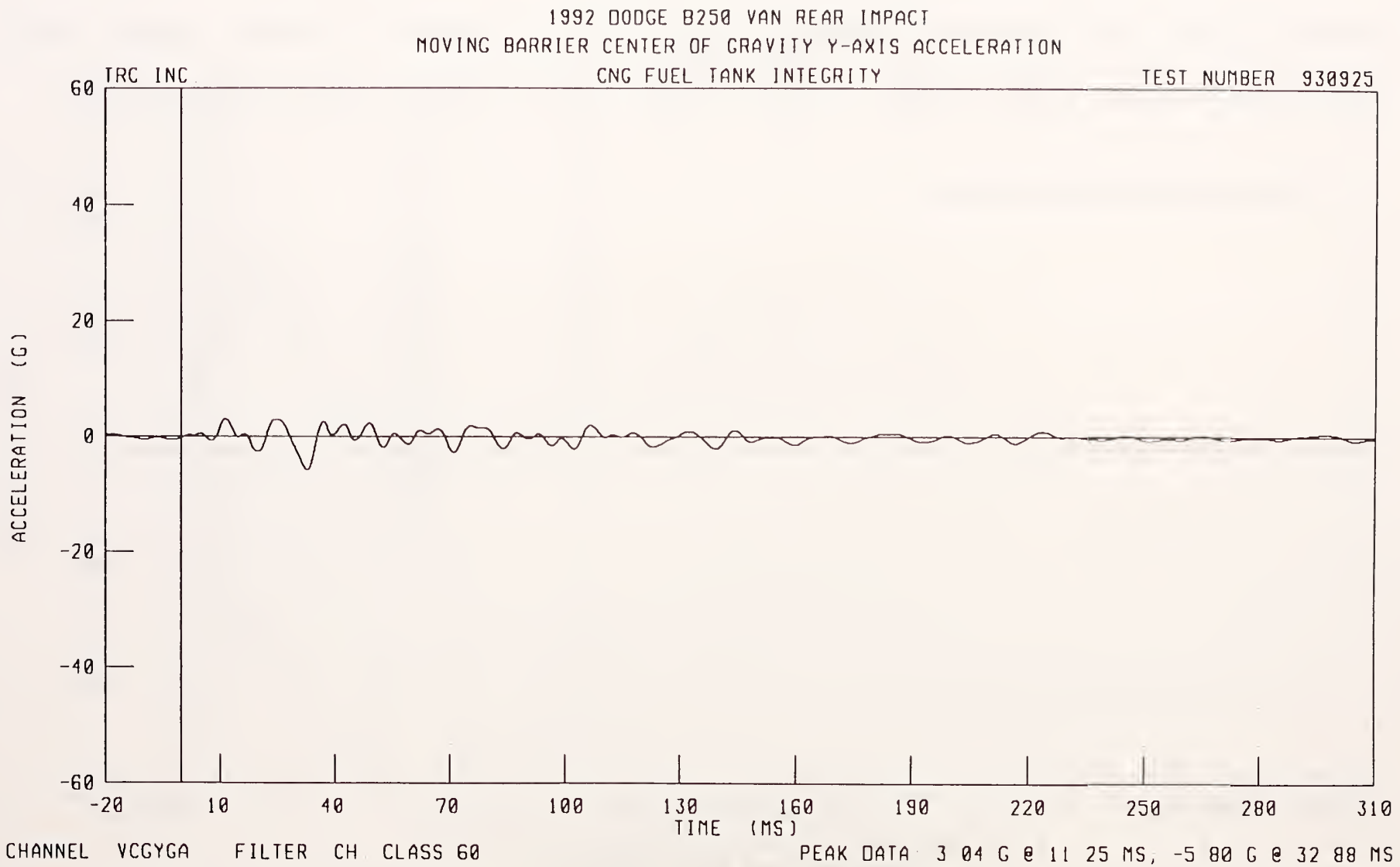
PEAK DATA 240 29 G @ 7 38 MS, 0 06 G @ -19 38 MS

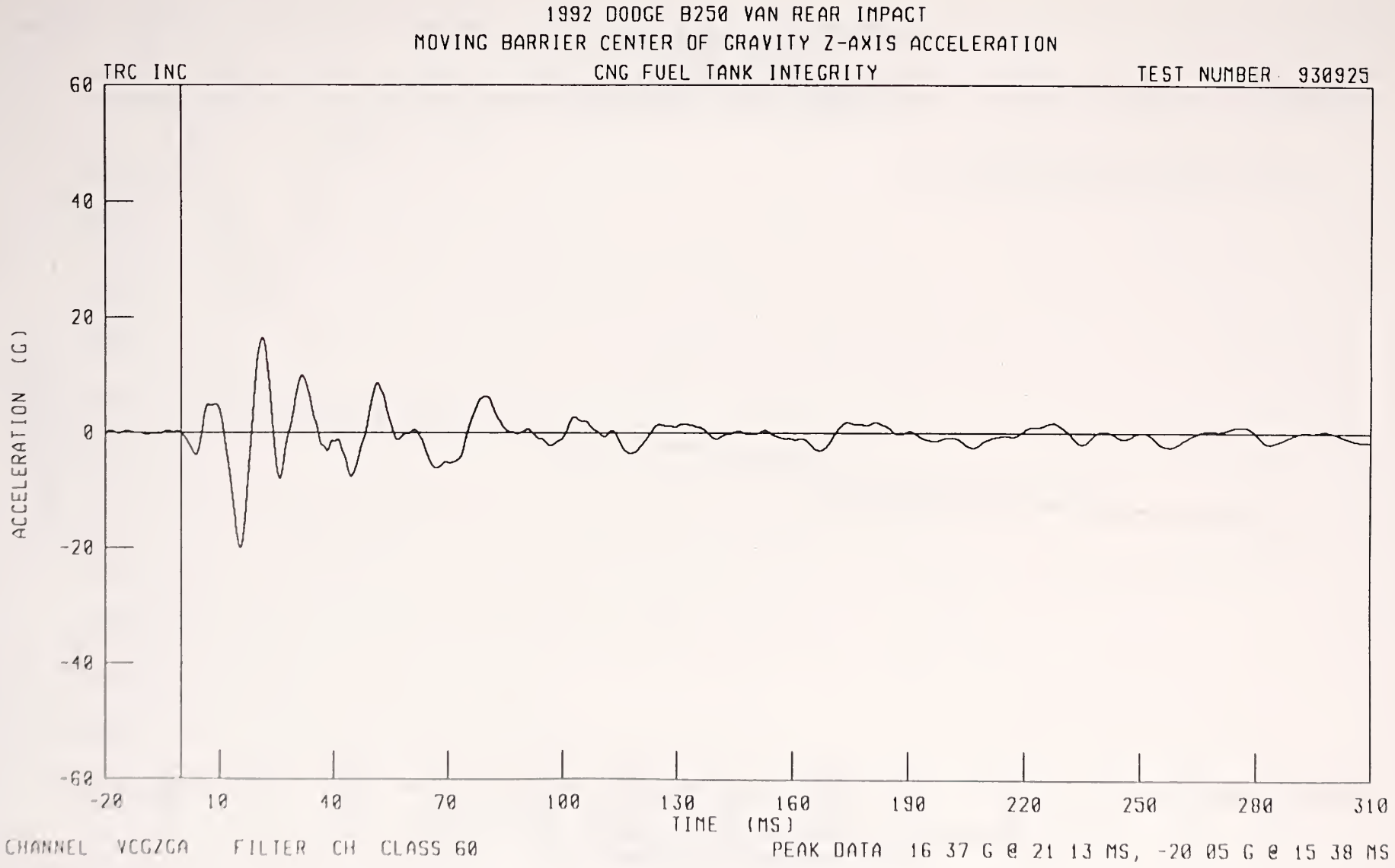
1992 DODGE B250 VAN REAR IMPACT
MOVING BARRIER CENTER OF GRAVITY X-AXIS ACCELERATION

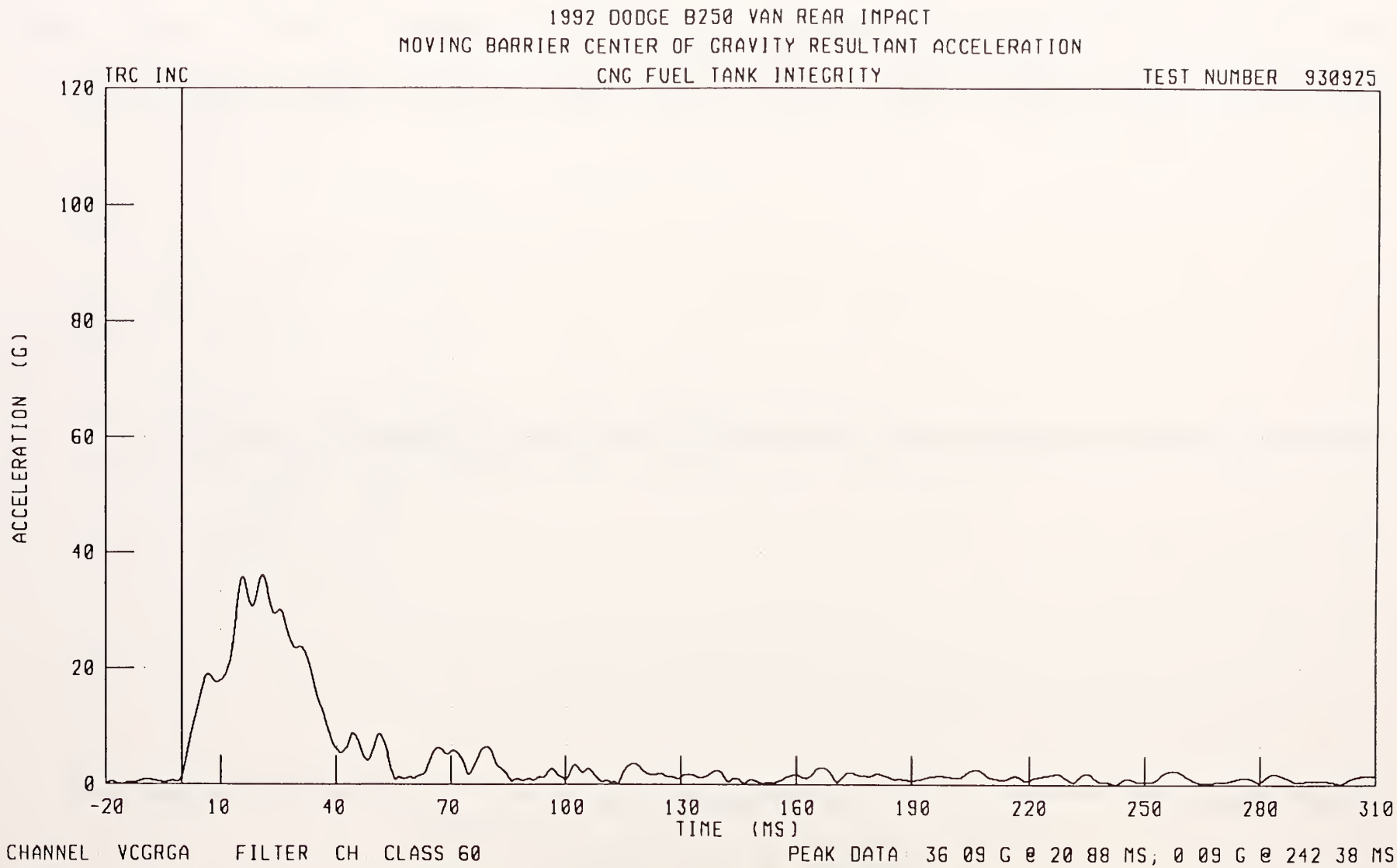


CHANNEL VCGXGA FILTER CH CLASS 60

PEAK DATA 1 38 G @ 66 38 MS, -32 21 G @ 20 63 MS

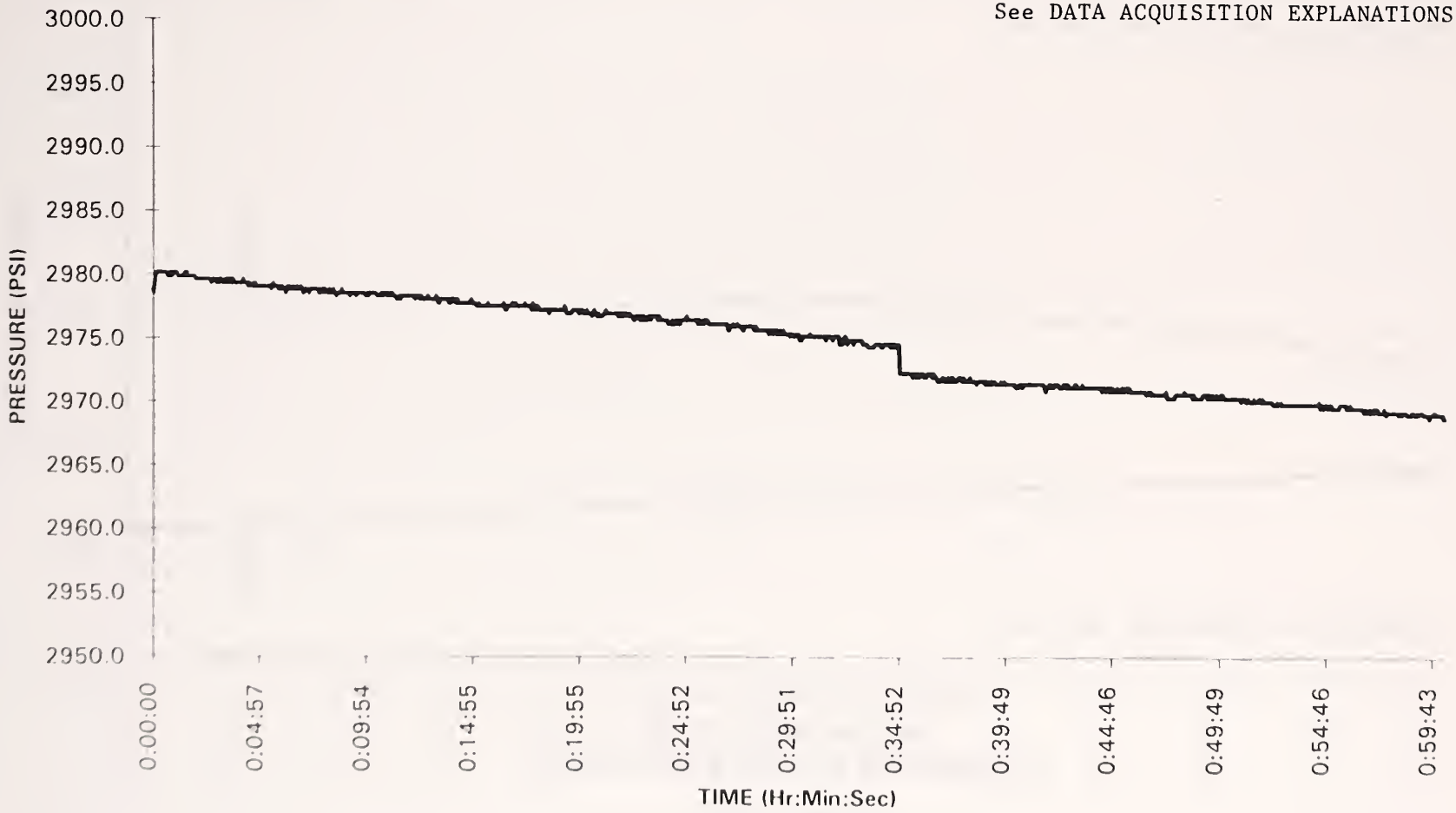

1992 DODGE B250 VAN REAR IMPACT
MOVING BARRIER CENTER OF GRAVITY Y-AXIS ACCELERATION
TRC INC
CNG FUEL TANK INTEGRITY
TEST NUMBER 930925
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL VCGYGA FILTER CH CLASS 60
PEAK DATA 3 04 G @ 11 25 MS, -5 80 G @ 32 88 MS


1992 DODGE B250 VAN REAR IMPACT
MOVING BARRIER CENTER OF GRAVITY Z-AXIS ACCELERATION
TRC INC
CNG FUEL TANK INTEGRITY
TEST NUMBER 930925
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL VCG2GA FILTER CH CLASS 60
PEAK DATA 16 37 G @ 21 13 MS, -20 05 G @ 15 38 MS


1992 DODGE B250 VAN REAR IMPACT
MOVING BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION
TRC INC
CNG FUEL TANK INTEGRITY
TEST NUMBER 930925
ACCELERATION (G)
120
100
80
60
40
20
0
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL VCGRGA FILTER CH CLASS 60
PEAK DATA 36 09 G @ 20 88 MS; 0 09 G @ 242 38 MS

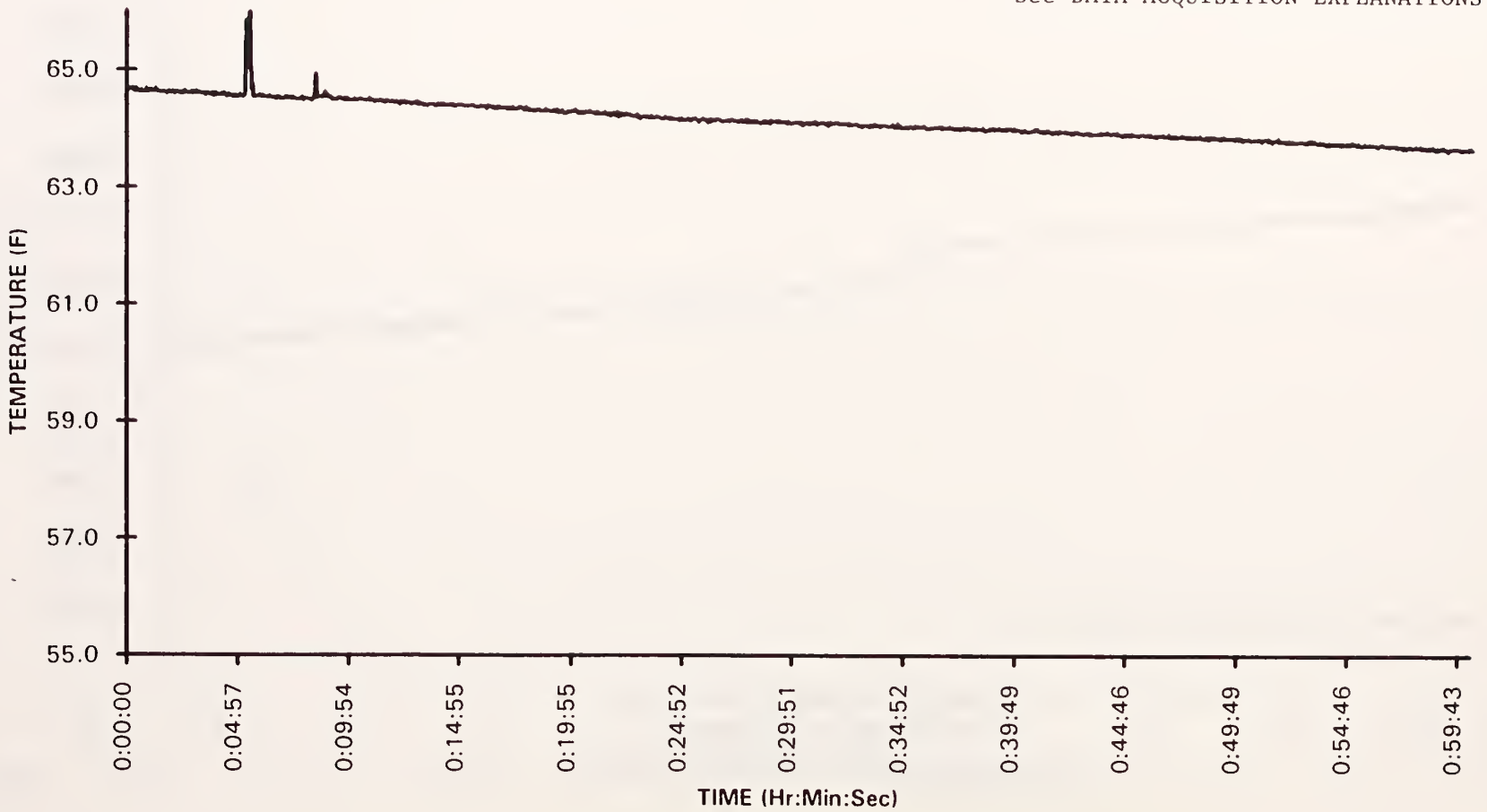
1992 DODGE B250 VAN REAR IMPACT
FUEL TANK PRESSURE
CNG FUEL TANK INTEGRITY

See DATA ACQUISITION EXPLANATIONS



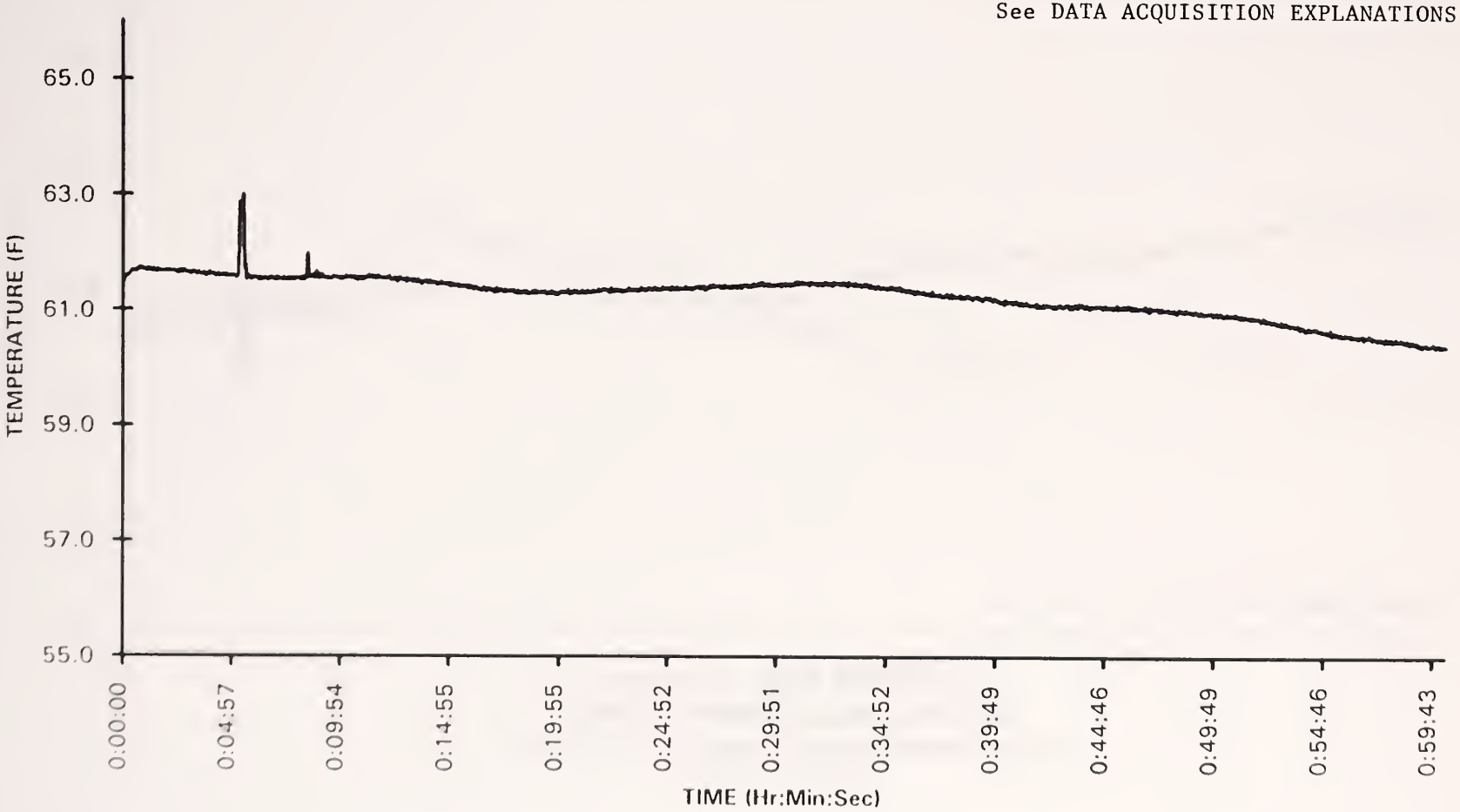
1992 DODGE B250 VAN REAR IMPACT
FUEL TEMPERATURE
CNG FUEL TANK INTEGRITY

See DATA ACQUISITION EXPLANATIONS



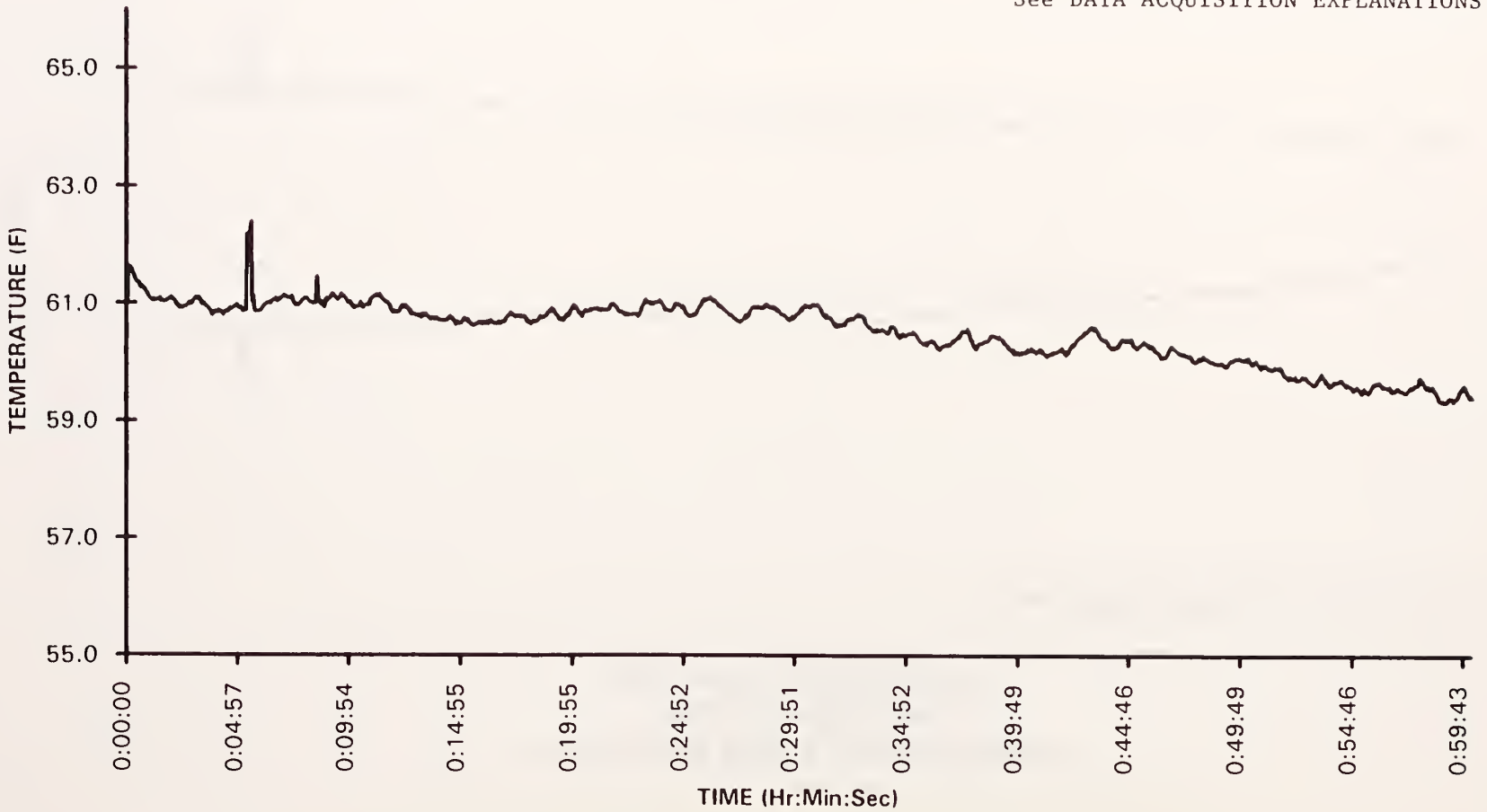
1992 DODGE B250 VAN REAR IMPACT
TUBE TEMPERATURE
CNG FUEL TANK INTEGRITY

See DATA ACQUISITION EXPLANATIONS



1992 DODGE B250 VAN REAR IMPACT
VEHICLE AMBIENT TEMPERATURE
CNG FUEL TANK INTEGRITY

See DATA ACQUISITION EXPLANATIONS



1992 DODGE B250 VAN REAR IMPACT
OUTSIDE AMBIENT TEMPERATURE
CNG FUEL TANK INTEGRITY

See DATA ACQUISITION EXPLANATIONS