

DOT 0277

Dynamic Science Report No. 301-DYS-81-002
REAR

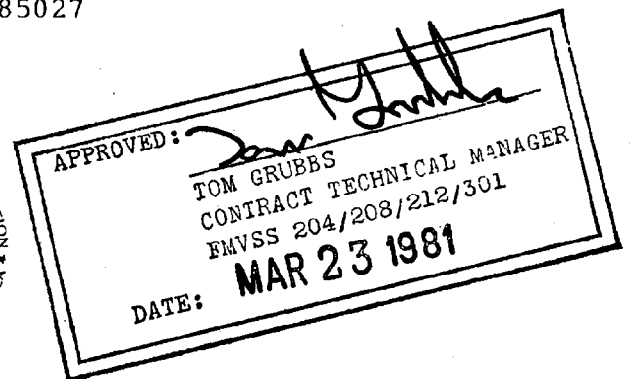
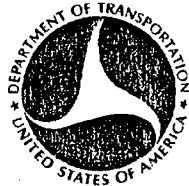
NEW VEHICLE ASSESSMENT AND
STANDARDS ENFORCEMENT INDICANT
TESTING

FMVSS 301-75
VOLKSWAGENWERK A.G., W. GERMANY
1981 VOLKSWAGEN JETTA 4-DOOR SEDAN

NHTSA NO. 810512

Prepared by:

DYNAMIC SCIENCE, INC.
A Talley Industries Company
1850 West Pinnacle Peak Road
Phoenix, Arizona 85027



February 1981

FINAL REPORT

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
-----ENFORCEMENT-----
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Prepared by Mark Pozzi

Approved by E. Cassano

Date March 4, 1981

Report Accepted by:

TOM GRUBBS

Contract Technical Manager
Office of Vehicle Safety Compliance

MAR 23 1981

Date _____

TECHNICAL REPORT STANDARD TITLE PAGE

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		6. Performing Orgn Code	
7. Mark Pozzi - Project Engineer		8. Performing Orgn Rpt No. 3103-81- 011	
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12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance Washington, D.C. 20590		13. Type of Report and Period Covered Final Test Report January 1981	
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15. Supplementary Notes			
16. Abstract FMVSS 301 Standards Enforcement Test of a 1981 VW Jetta, NHTSA 810512, VIN WVWGA9165BW113395, was conducted at the Dynamic Science, Inc. Deer Valley facility in Phoenix, Arizona, to determine compliance with the requirements of Standard 301. The moving barrier impacted the rear of the vehicle at a speed of 34.97 mph. The test date was January 16, 1981 and the ambient temperature was 63°F. The vehicle appeared to comply with the requirements of FMVSS 301 as specified for the vehicle manufacture date.			
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol When You Know Multiply by To Find Symbol

LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km

AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha

MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
short tons	short tons	0.9	metric ton	t
(2000 lb)				

VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
in ³	cubic inches	16	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	degrees Fahrenheit	5	degrees Celsius	°C
		9	(after subtracting 32)	

Approximate Conversions from Metric Measures

Symbol When You Know Multiply by To Find Symbol

LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi

AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares	2.5	acres	
(10 000 m ²)				

MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton	1.1	short tons	
(1000 kg)				

VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
ml	milliliters	0.06	cubic inches	in ³
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³

TEMPERATURE (exact)				
°C	degrees Celsius	9/5	(then degrees Fahrenheit)	°F
		add 32)		

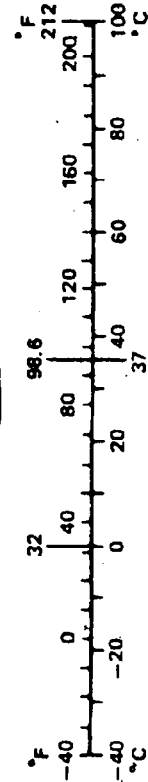


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SECTION 1
PURPOSE AND INTRODUCTION

PURPOSE

The purpose of the test was to subject a 1981 Volkswagen Jetta 4-Door Sedan to the indicant test requirements of DOT Test Plan TP-212-02, April 1, 1980, Standard Enforcement Indicant Testing for FMVSS 301-75, "Fuel System Integrity." The vehicle was tested using test parameters which are in excess of the current upper limits of the subject FMVSS in order to obtain research and vehicle rating data. This test, therefore, can only be viewed as an "indicant" test by the Office of Vehicle Safety Compliance (OVSC).

INTRODUCTION

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains Compliance Related Data for FMVSS 301-75 Indicant Testing, together with photographs related to this test. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains Calcomp plots.

SECTION 2
GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test and Vehicle Parameter Data.

GENERAL TEST AND VEHICLE PARAMETER DATA

PRE-IMPACT DATA

Make/Model: Volkswagen Jetta
 Body Style: 4-Door Sedan Model Year: 1981
 NHTSA No.: 810512 DSI No. 1143 Color: Sand Metallic

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Volkswagenwerk A.G., West Germany
 Date of Manufacture: 9/80 ; VIN: WVGGA9165BW113395
 GVWR: 2887 lb; GAWR: Front = 1609 lb; Rear = 1345 lb

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL

Vehicle Capacity: FRONT REAR RECOMMENDED LOAD RANGE:
 Tire Pressure: 28 psi 34 psi TIRE SIZE: B
175-70/SR13
 Designated Seating: 2 Front 2 Rear 4 Total
 Cargo load = 125 lb Is Spare Tire: Space Saver? No
 TOTAL = 725 lb Standard Equipment? Yes
 Engine: 4 Cylinder, transverse, 1.7 litre displacement
 Transmission: 5 speed, manual, front-wheel drive
 Date Vehicle Received by Laboratory: 12/16/80; Odometer: 36.4
 Dealer Name & Address: Biddulph VW/Fiat 4434 West Glendale Ave
Glendale, Arizona
 Remarks: Vehicle has production automatic torso belt restraint
with knee bolster.

WEIGHT (LB) OF TEST VEHICLE AS RECEIVED (WITH MAX. FLUIDS) = UDW

Right Front = 685 lb Right Rear = 410 lb
 Left Front = 687 lb Left Rear = 418 lb
 TOTAL FRONT WEIGHT = 1372 lb (62.4 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 828 lb (37.6 % of Total Vehicle Weight)
 TOTAL DELV. WEIGHT = 2200 lb
 TARGET WEIGHT = UDW + Cargo Load + 328 lbs Dummies = 2653 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 125 lb CARGO:

Right Front = 798 lb Right Rear = 545 lb
 Left Front = 776 lb Left Rear = 531 lb
 TOTAL FRONT WEIGHT = 1574 lb (59.4 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1076 lb (40.6 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 2650 lb
 Weight of ballast secured in vehicle trunk area = 100 lb

VEHICLE ATTITUDE: (inches)

Delivered Attitude: RF 31.0 LF 31.0 RR 31.0 LR 31.0
 Test Attitude: RF 29.8 LF 30.5 RR 29.9 LR 30.3

POST-TEST DATA

Type of Test: Rear (180°) Impact.
 Date of Test: 1/16/81 Time: 1056 Temperature 63 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: Primary = 34.97 mph Secondary = 34.96 mph

Distance from the vehicle's rear bumper to barrier face entering the vehicle velocity measurement device is 5.0 feet and distance exiting the vehicle velocity measurement device is 1.0 foot.

VEHICLE REBOUND AND CRUSH (in.)

Vehicle Length:	Pre-test = R	<u>169.6</u>	L	<u>169.3</u>
	Post-test = R	<u>144.7</u>	L	<u>144.5</u>
	Crash = R	<u>24.9</u>	L	<u>24.8</u>

Distance from rear $\mathcal{L}$ of test vehicle to point of impact = 64.0 ft.

VISIBLE DUMMY CONTACT POINTS

	Driver	Passenger
Head	<u>Rear seatback</u>	<u>Rear seatback</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>None</u>	<u>None</u>
Right Knee	<u>None</u>	<u>None</u>

DOOR OPENING

Front		Rear	
Left	Right	Left	Right
<u>Easy</u>	<u>Easy</u>	<u>Tools</u>	<u>Tools</u>
		<u>required</u>	<u>required</u>

SEAT MOVEMENT

Seatback Failure	<u>100%</u>	<u>100%</u>	<u>N/A</u>	<u>N/A</u>
Seat Shift (in.)	<u>2.5</u>	<u>1.5</u>	<u>N/A</u>	<u>N/A</u>

GLAZING DAMAGE

Backlight/Windshield: 100% shattered

OTHER NOTABLE IMPACT EFFECTS: Both rear tires deflated and pinned by crushed sheetmetal. Trunk lid intruded through backlight on left side.

SECTION 3

COMPLIANCE-RELATED DATA
FMVSS 301-75 INDICANT TESTING

The following data sheets and photographs document compliance data.

PRE-IMPACT DATA

Make/Model: Volkswagen Jetta
Body Style: 4-door sedan Model Year: 1981
NHTSA No. 810512 DSI No. 1143 Color: Sand Metallic

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Volkswagenwerk, A.G., West Germany
Date of Manufacture: 9/80; VIN WVGGA9165BW113395
GVWR: 2887 lb; GAWR: Front = 1609 lb; Rear 1345 lb

POST-IMPACT DATA

Type of Test: Rear (180°) Impact
Date of Test: 1/16/81 Time: 1056 Temperature 63 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = 34.97 mph Secondary = 34.96 mph
Test weight: 2650 lb Static crush: 27.2 in.
Rebound distance: 64.0 ft.

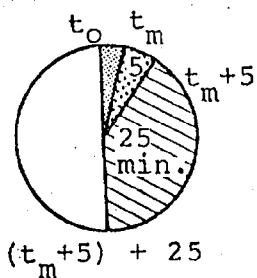
FUEL SYSTEM DATA

Test Fluid: Stoddard Solvent Specific Gravity: 0.764
Temperature: 63°F Kinematic Viscosity: 0.99 centistokes
Test Volume: 9.7 U.S. gallons

Test vehicle fuel tank filled to 93% of "usable" plus "unusable" capacity with Stoddard Solvent and with electric fuel pump operating (if it will operate without engine operation) until start of static roll.

DETAILS OF FUEL SYSTEM: Rectangular metal fuel tank is mounted above the rear axle and under the rear seat by two longitudinal metal straps. The filler tube exits the tank as a flexible connection at the right rear corner. The metal remainder of the tube proceeds to the right of the spare tire and through the right rear wheel well to a locking twist cap located above and slightly aft of the right rear wheel. The sender lines are filled by an electric fuel pump and proceed forward to engine along right side of floorpan.

FUEL SPILLAGE MEASUREMENT



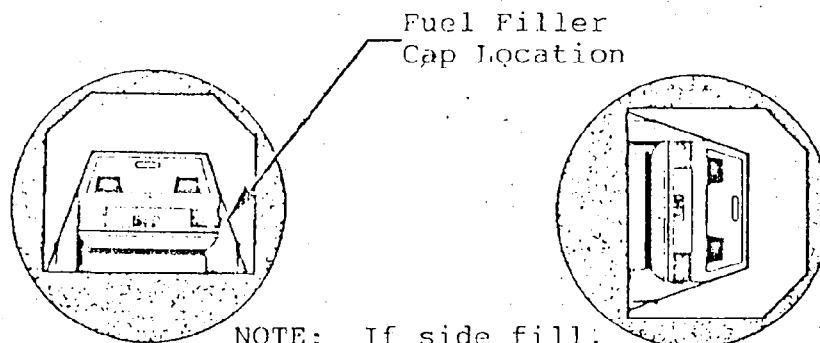
1. From impact until vehicle motion ceases
2. For 5-minute period after vehicle motion ceases
3. For next 25 minutes

	ACTUAL	MAXIMUM ALLOWABLE
1.	0	1 oz
2.	0	5 oz
3.	0	1 oz/1 min

SOLVENT SPILLAGE DETAILS: None

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA

TEST PHASE: 0° to 90° VEHICLE NHTSA NO. 810512



NOTE: If side fill,
rotate so that filler
cap is down.

DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 40 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 40 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

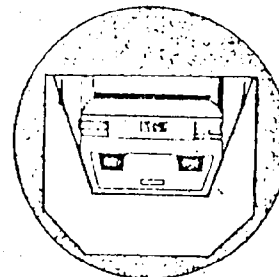
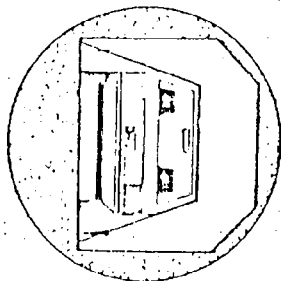
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	---

NOTE: Spillage is recorded in whole minute intervals only - as
determined above.

SOLVENT SPILLAGE LOCATION(S): None.

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA

TEST PHASE: 90° to 180° VEHICLE NHTSA NO. 810512



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 37 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 37 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

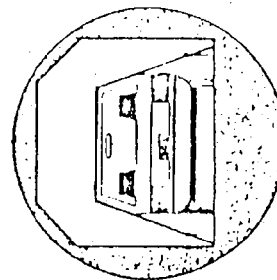
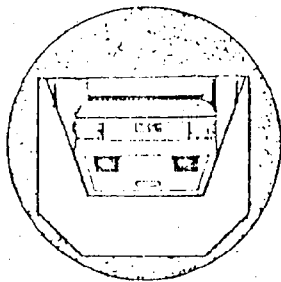
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	---

NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None.

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA

TEST PHASE: 180° to 270° VEHICLE NHTSA NO. 810512



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 37 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 37 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

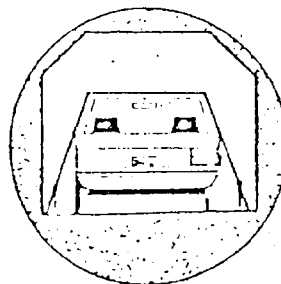
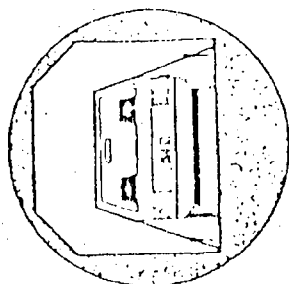
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	---

NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None.

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA

TEST PHASE: 270° to 360° VEHICLE NHTSA NO. 810512



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 38 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 38 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	---

NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None.

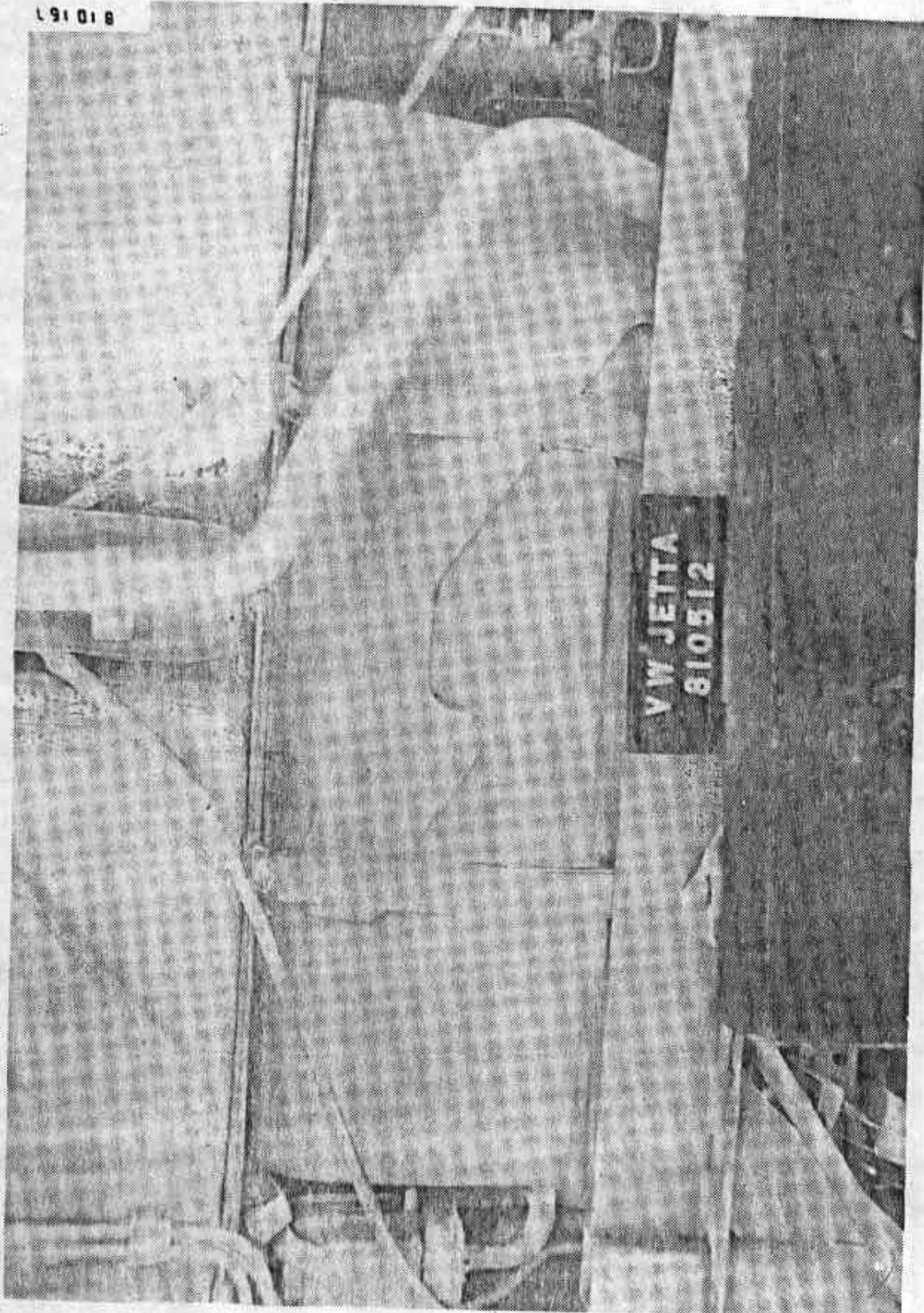


FIGURE 3-1. PRE-TEST VIEW OF FUEL TANK - 1981 VW JETTA - NHTSA 810512.

62E018

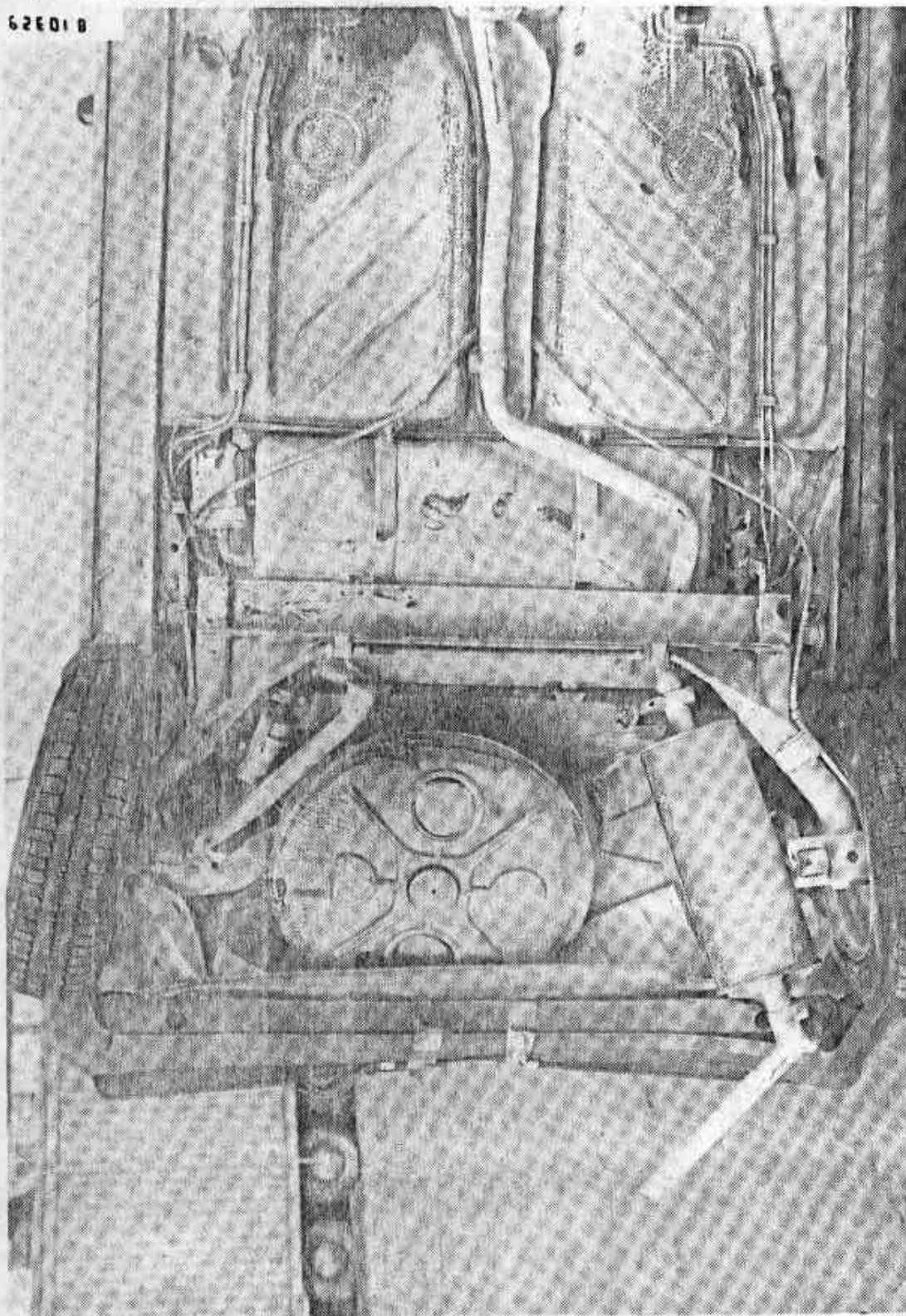


FIGURE 3-2. POST-TEST VIEW OF FUEL TANK - 1981 VW JETTA - NHTSA 810512.

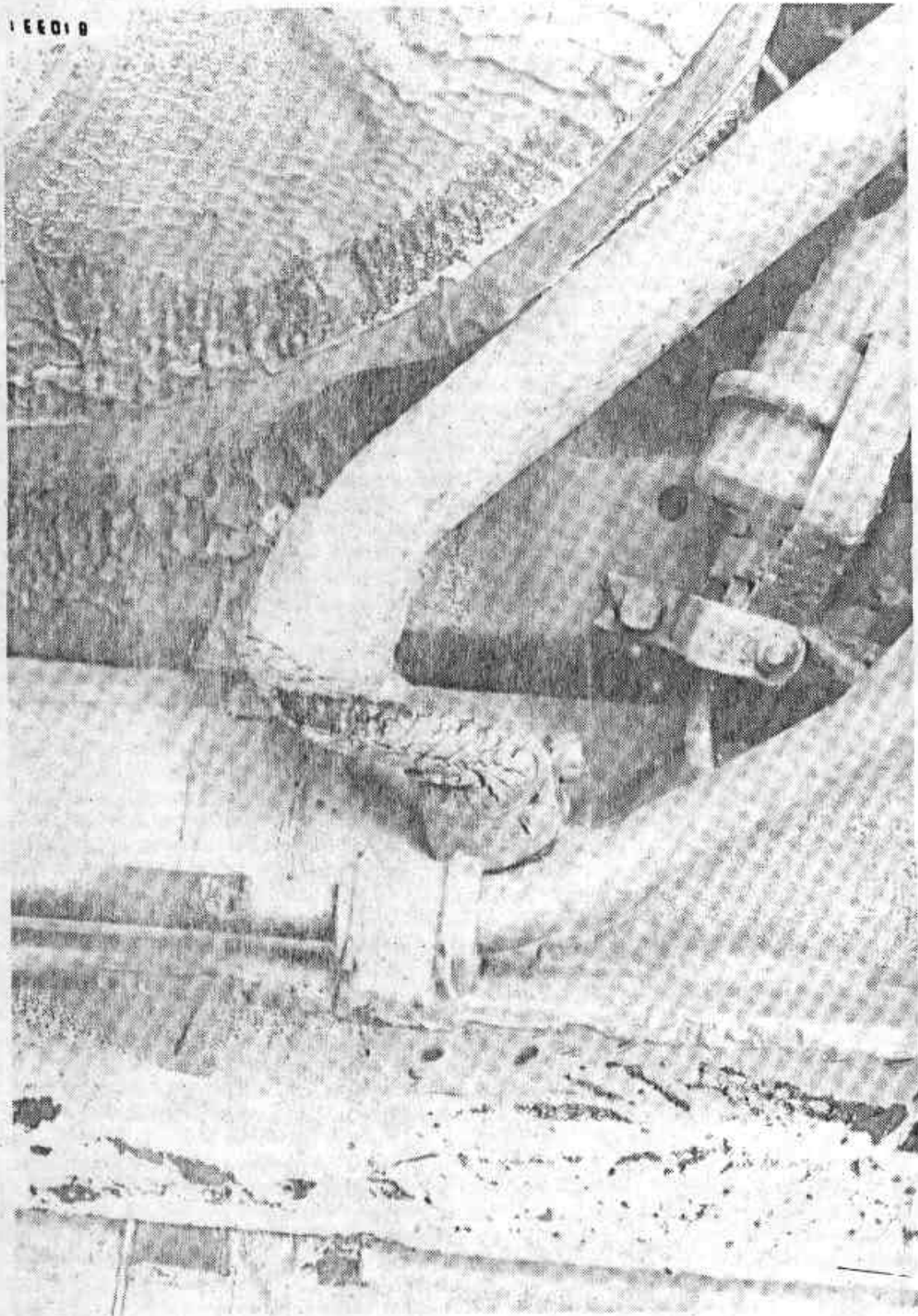


FIGURE 3-3. POST-TEST VIEW OF FILLER TUBE - 1981 VW JETTA - NHTSA 810512.

SECTION 4
DATA REQUIRED BY R&D AND OAR

The following pages are included in this section:

1. Vehicle crush data
2. Accelerometer location and data summary
3. High-speed movie camera location and specification summary

Pertinent photographs are presented in Appendix A. Calcomp plots of vehicle accelerometer data are presented in Appendix B.

VEHICLE PROFILE DATA

PRE-IMPACT DATA

Make/Model Volkswagen Jetta
 Body Style 4-door sedan Model Year 1981
 NHTSA No. 810512 DSI No. 1143 Color Sand Metallic

DATA FROM CERTIFICATION LABEL

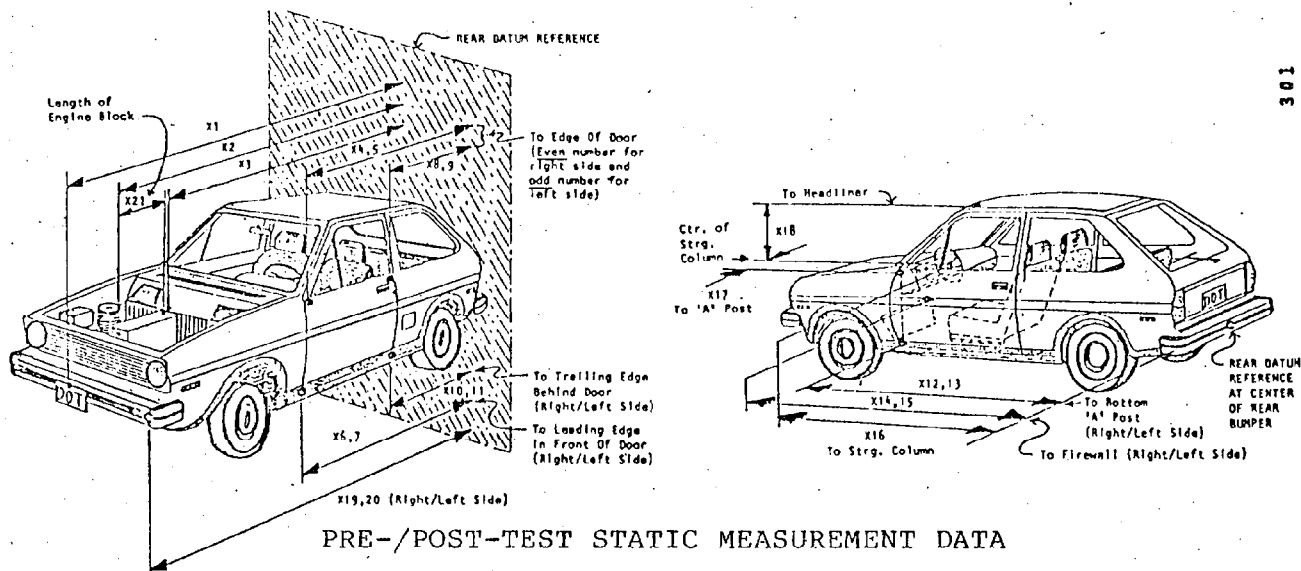
Vehicle Manufacturer Volkswagenwerk A.G., West Germany
 Date of Manufacture 9/80 VIN WVGGA9165BW113395
 GVWR 2887 lb; GAWR: Front = 1609 lb; Rear 1345 lb

POST-IMPACT DATA

Type of Test: Rear (180°) Impact
 Date of Test: 1-16-81 Time: 1056 Temperature 63 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: Primary = 34.97 mph Secondary = 34.96 mph
 Test Weight: 2650 lb; Static Crush: 27.2 in; Rebound: 64.0 ft

Measurements Referenced to Plane 15 feet rear of front Bumper $\bar{C}$.

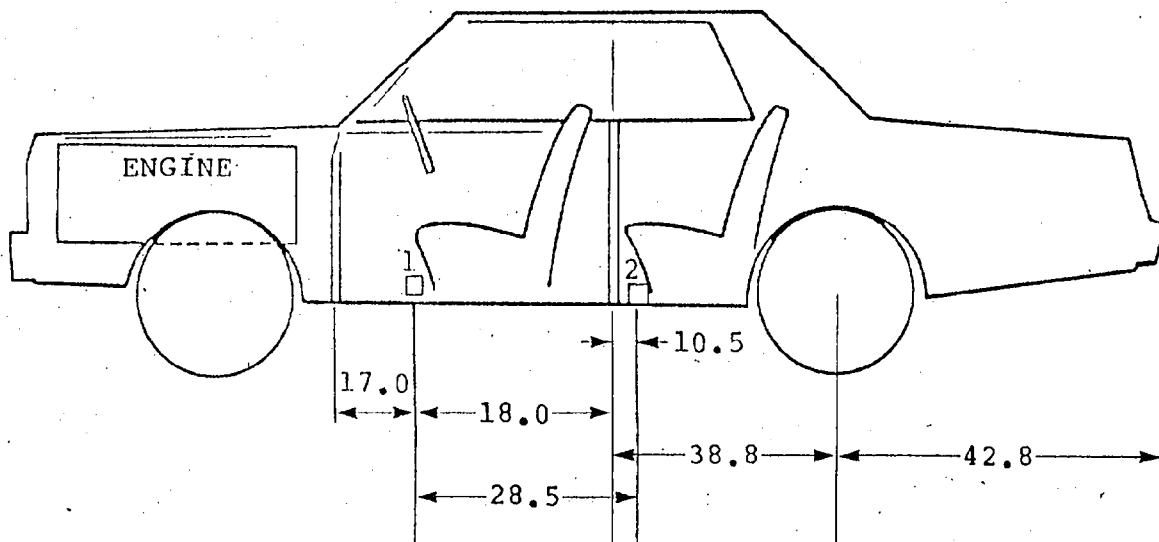
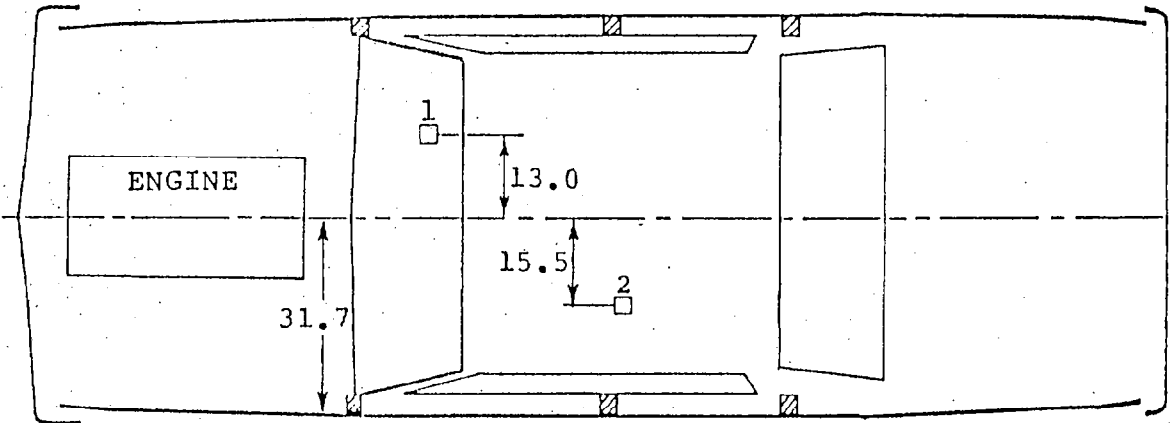
Location	Height	Vehicle Left (in.)				Vehicle Right (in.)			
		<u>28.0</u>	<u>16.8</u>	<u>5.6</u>	<u>$\bar{C}$</u>	<u>5.6</u>	<u>16.8</u>	<u>28.0</u>	
		<u>27.0</u>	<u>16.2</u>	<u>5.4</u>	<u>$\bar{C}$</u>	<u>5.4</u>	<u>16.2</u>	<u>27.0</u>	
Pre-Test Profile (in.)									
Top of Rear Bumper	20.8	10.8	9.9	9.6	9.5	9.5	9.9	10.6	
Edge of Trunk	32.5	16.4	15.8	15.5	15.4	15.4	15.8	16.5	
Post-test Profile (in.)									
Top of Rear Bumper	15.8	35.4	36.6	36.8	36.7	36.5	36.0	35.3	
Edge of Trunk	28.9	38.0	36.4	36.3	36.4	36.3	36.1	36.2	
Post-test Static Crush (in.)									
Top of Rear Bumper	5.0	24.6	26.7	27.2	27.2	27.0	26.1	24.7	
Edge of Trunk	3.6	21.6	20.6	20.8	21.0	20.9	20.3	19.7	

Vehicle: Volkswagen JettaNHTSA No.: 810512Test Date: 1/16/81D.S. No.: 1143

Reference Dimension	Pre-test Measurement	Post-test Measurement	Change
X ₁ *	170.6	143.3	27.3
X ₂			
X ₃			
X ₄			
X ₅			
X ₆			
X ₇			
X ₈ *	89.0	89.6	-0.6
X ₉ *	89.3	89.3	0.0
X ₁₀			
X ₁₁			
X ₁₂			
X ₁₃			
X ₁₄			
X ₁₅			
X ₁₆			
X ₁₇			
X ₁₈			
X ₁₉ *	169.3	144.5	24.8
X ₂₀ *	169.6	144.7	24.9
X ₂₁			

*Rear Impact Data Requirements

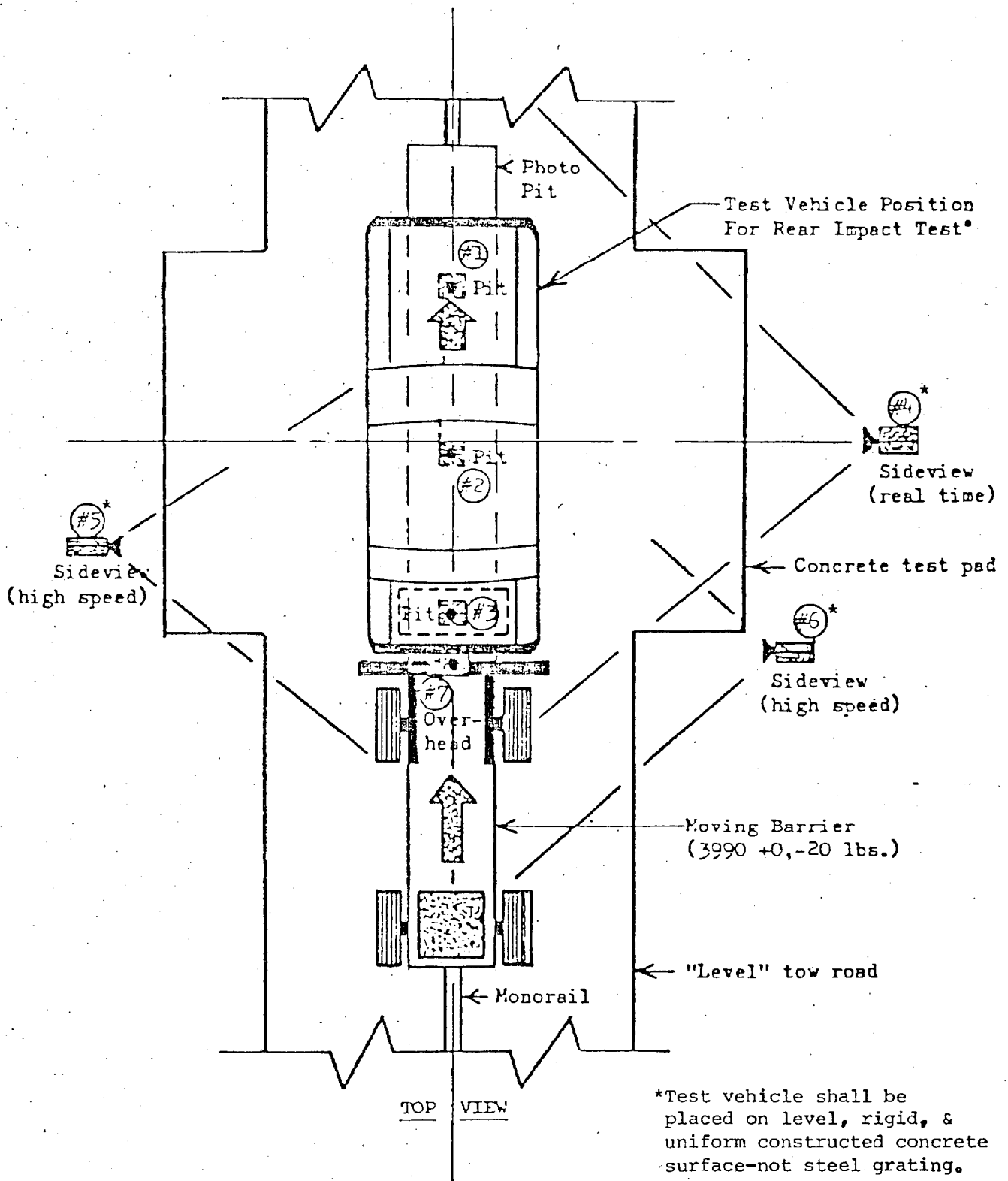
VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



VEHICLE ACCELEROMETER SUMMARY		DIRECTION			PEAK ACCELERATION (G) @ MSEC		
NO.	DESCRIPTION OF LOCATION	X	Y	Z	+	X	-
1	FRONT SEAT CROSSBEAM	✓			23.8 @12	2.4 @16	
2	REAR SEAT CROSSBEAM	✓			39.8 @30	31.8 @10	

CAMERA POSITIONS FOR REAR AND LATERAL IMPACTS

NOTE: Specific requirements shown on next page.



SUMMARY OF CAMERA LOCATIONS AND DESCRIPTIONS

Loc. No.	Location	Field of View	Lens Size	Frame Rate	Timing Speed	Ser No.	Impact Dist-X	Center-line Dist-Y	Camera Height
1	Pit	Engine underside and fuel pump	8mm	1000	101 HZ	11	12.0	0.0	-8.0
2	Pit	Overall underside	8mm	1000	100 HZ	4	8.0	0.0	-8.0
3	Pit	Fuel tank	8mm	1000	100 HZ	7	2.0	0.0	-8.0
4	Ground Based (Right) (Real Time)	Views entire right side of vehicle	AR	24	N/A	1	5.0	60.0	6.0
5	Ground Based (Left)	Views entire left side of vehicle	13mm	1000	101 HZ	6	5.0	-20.0	3.0
6	Ground Based (Right)	Views entire right side of vehicle	25mm	1000	104 HZ	10	3.0	12.0	3.0
7	Overhead (Barrier)	Barrier-vehicle contact	8mm	1000	100 HZ	8	0.0	0.0	12.0

APPENDIX A
PHOTOGRAPHS

810512

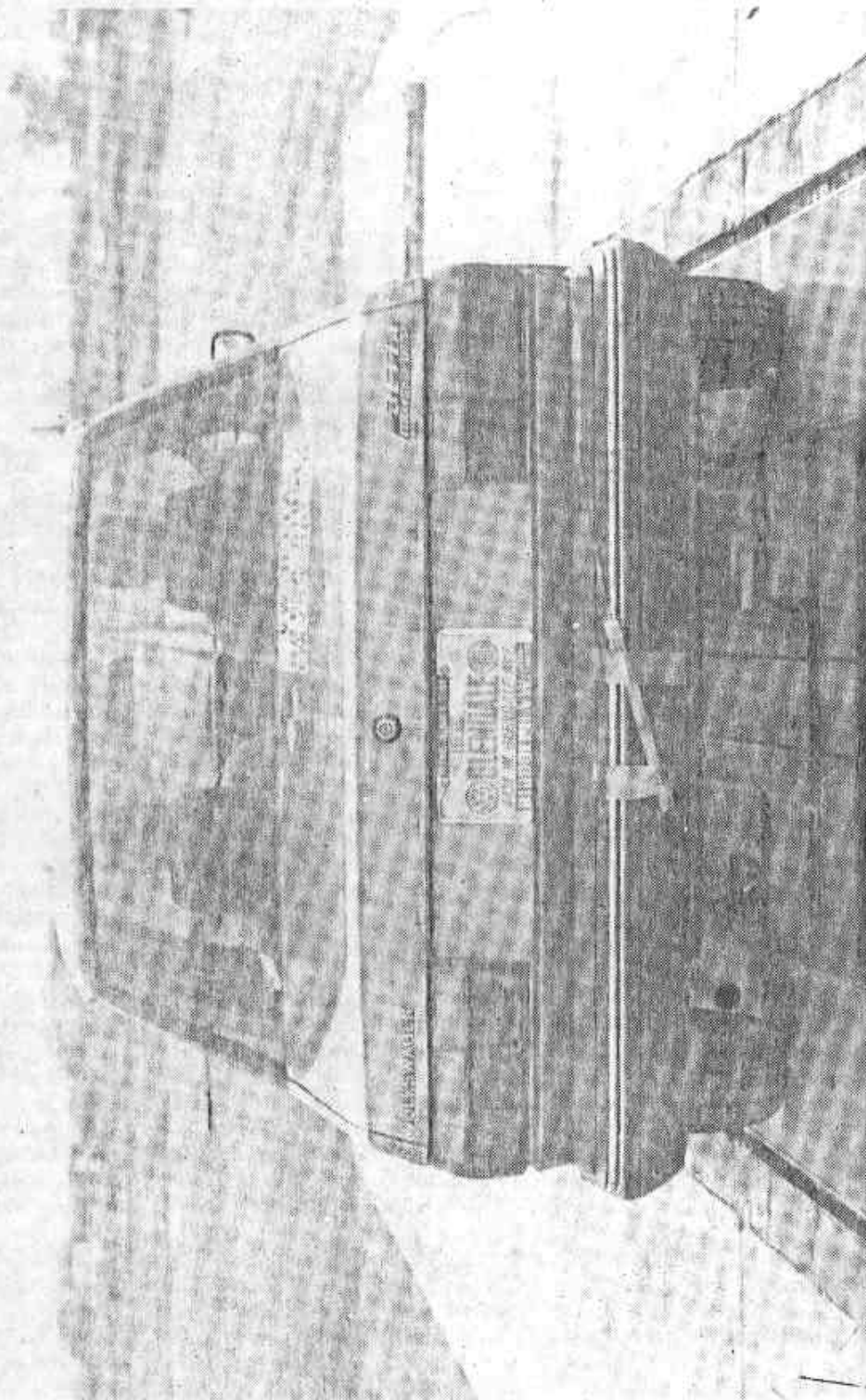


FIGURE A-1. PRE-TEST REAR VIEW - 1981 VW JETTA - NHTSA 810512.

810512

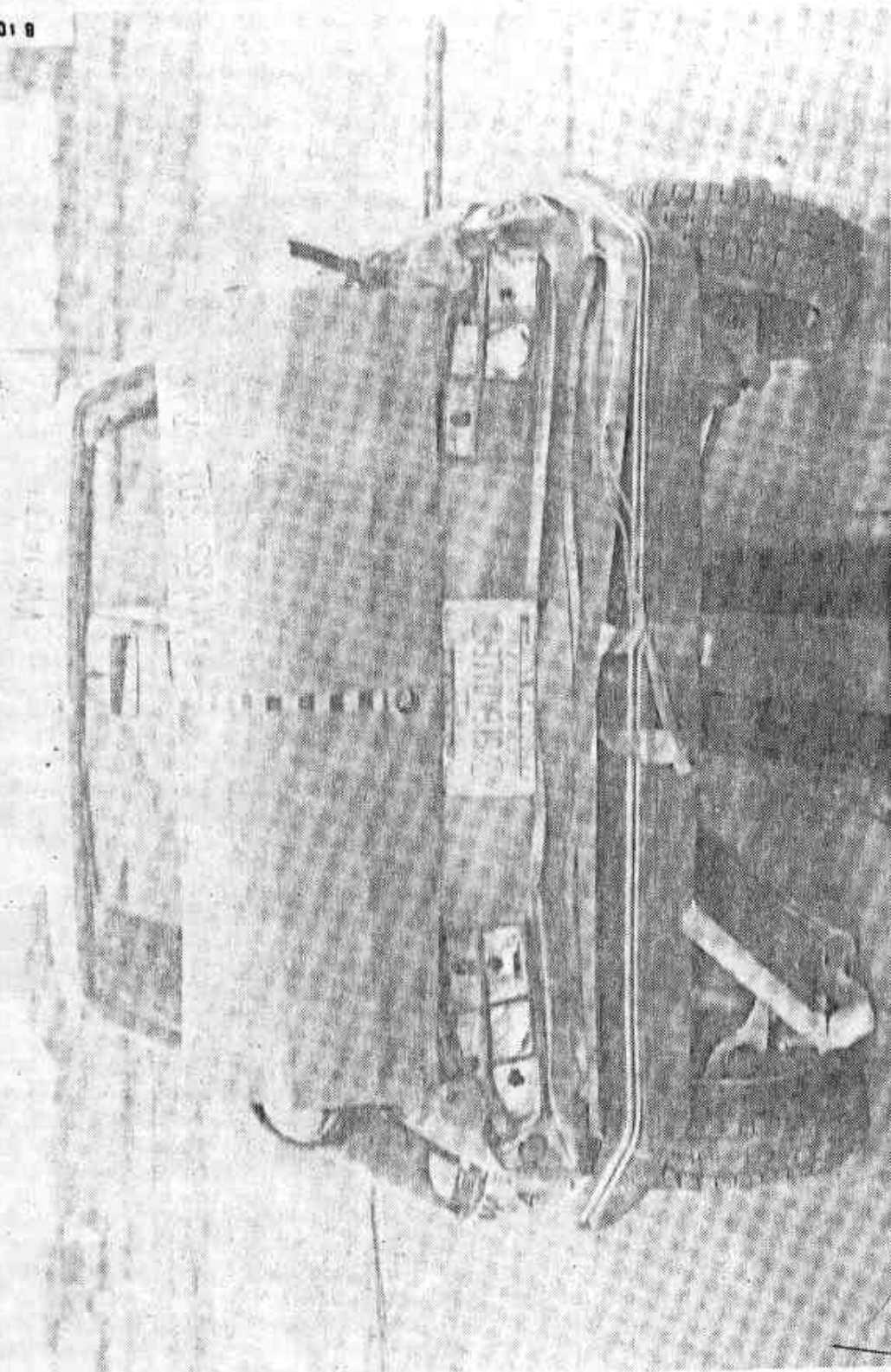


FIGURE A-2. POST-TEST REAR VIEW - 1981 VW JETTA - NHTSA 810512.

01 E 01 8

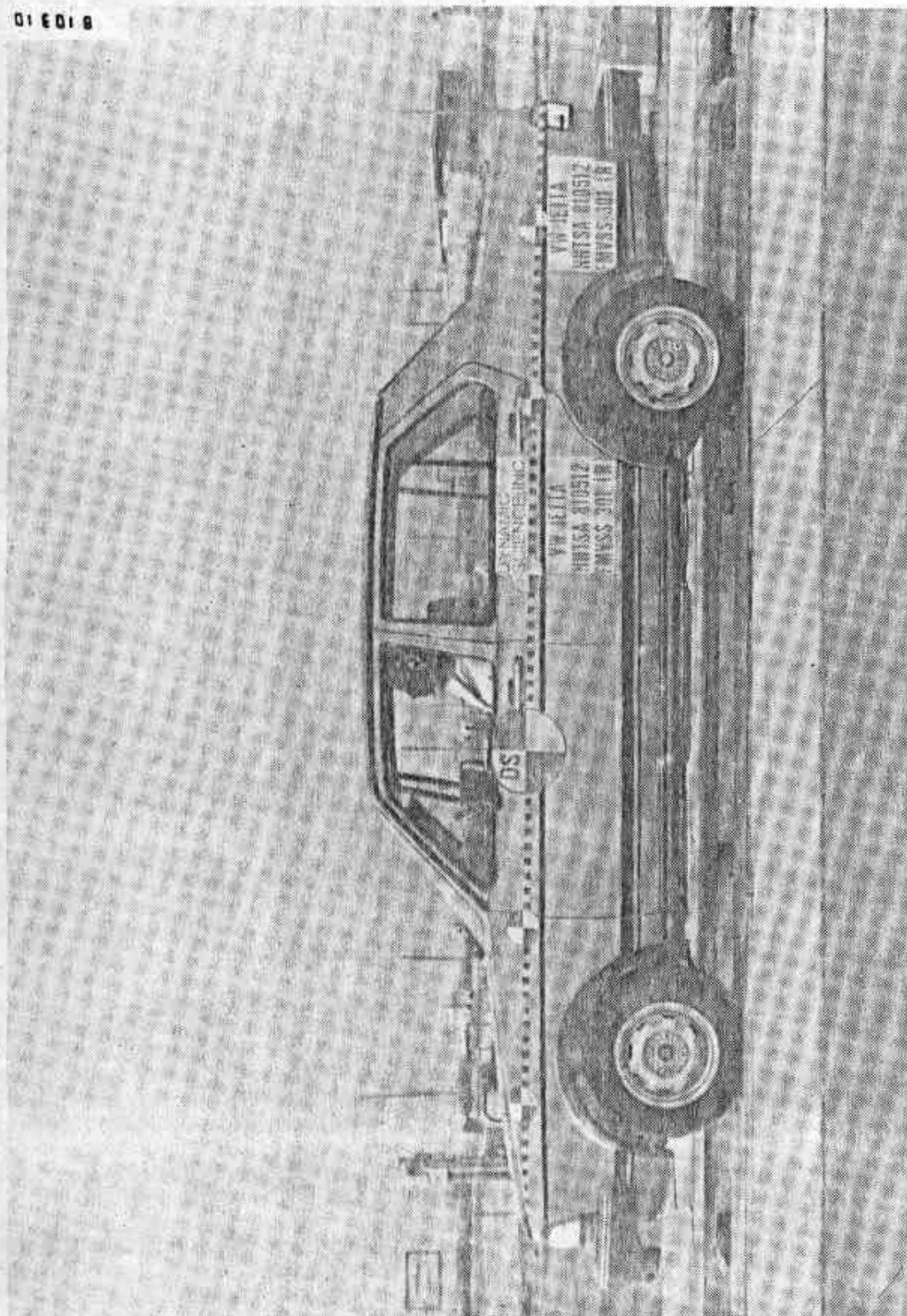


FIGURE A-3. PRE-TEST SIDE VIEW - 1981 VW JETTA - NHTSA 810512.

61 E 01 B

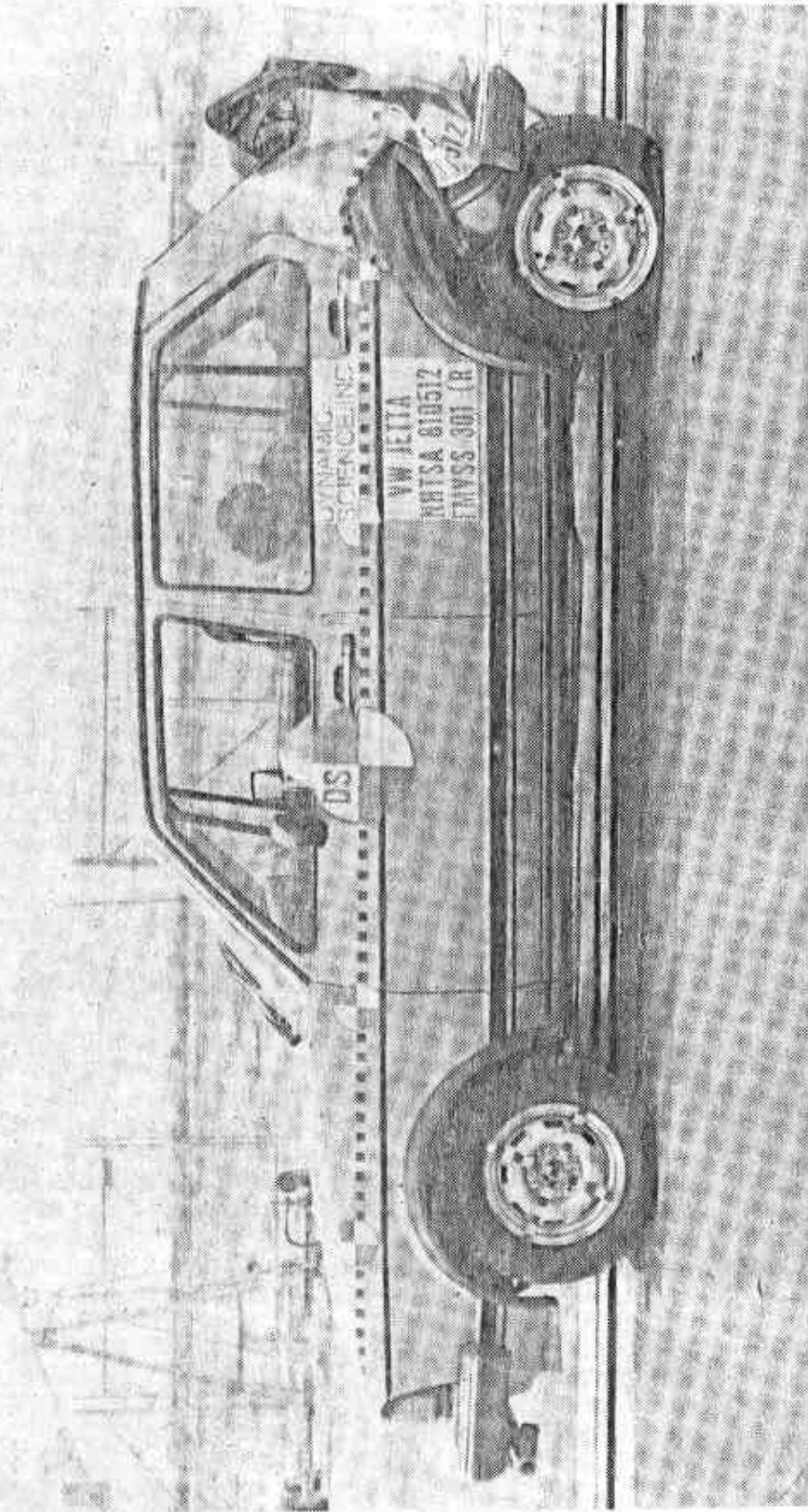


FIGURE A-4. POST-TEST SIDE VIEW - 1981 VW JETTA - NHTSA 810512.

000010

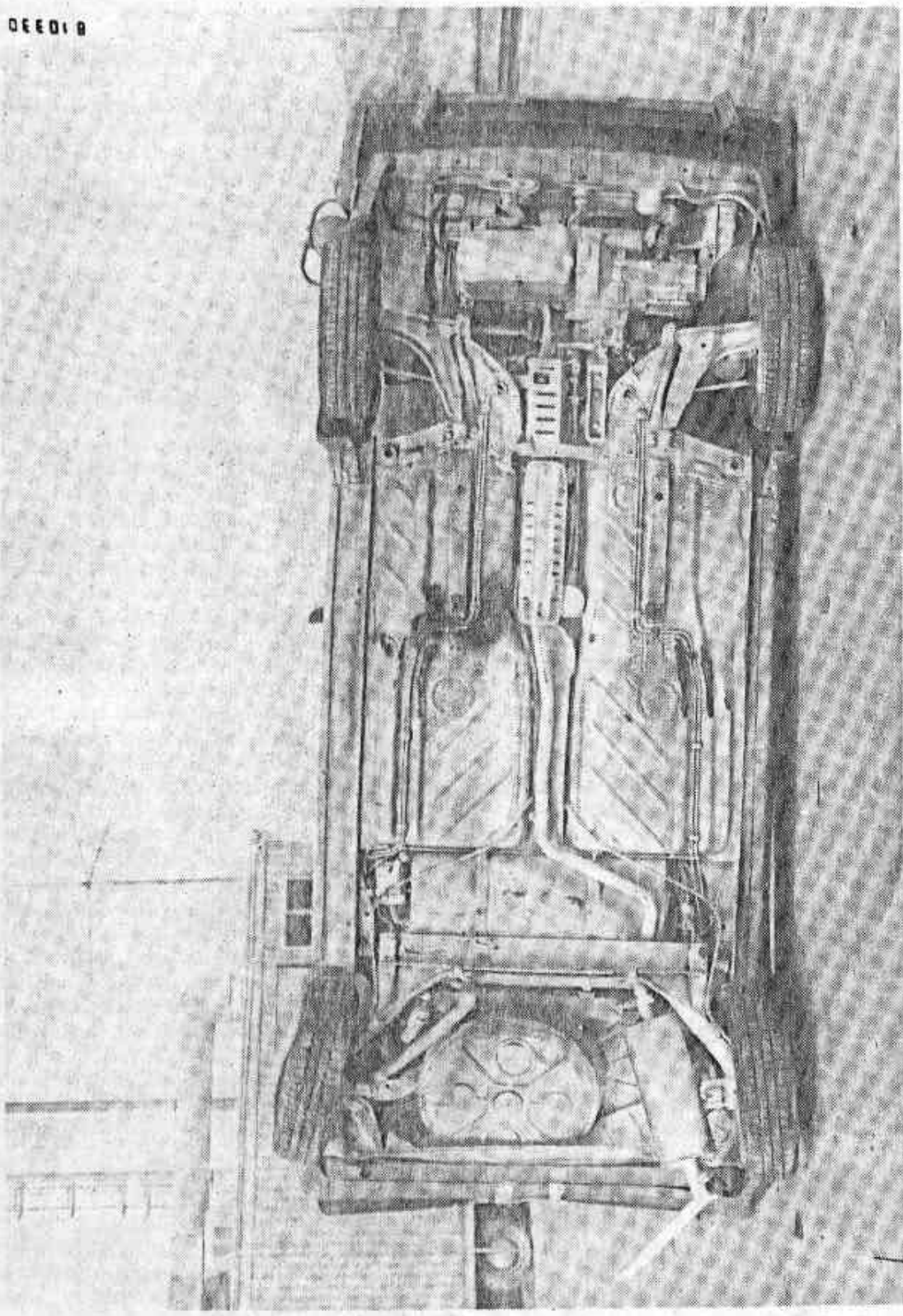


FIGURE A-5. POST-TEST OVERALL UNDERSIDE VIEW - 1981 VW JETTA - NHTSA 810512.

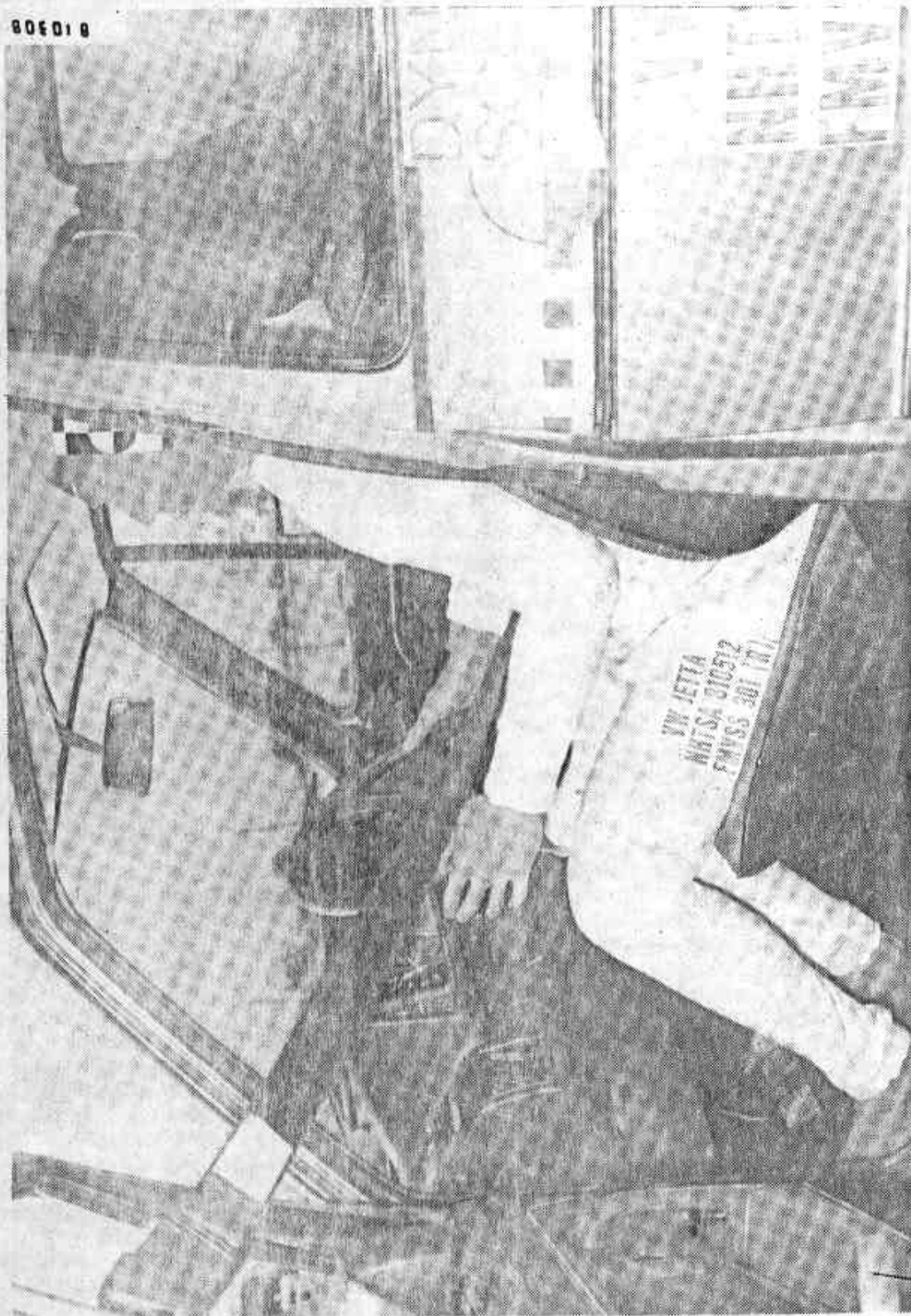
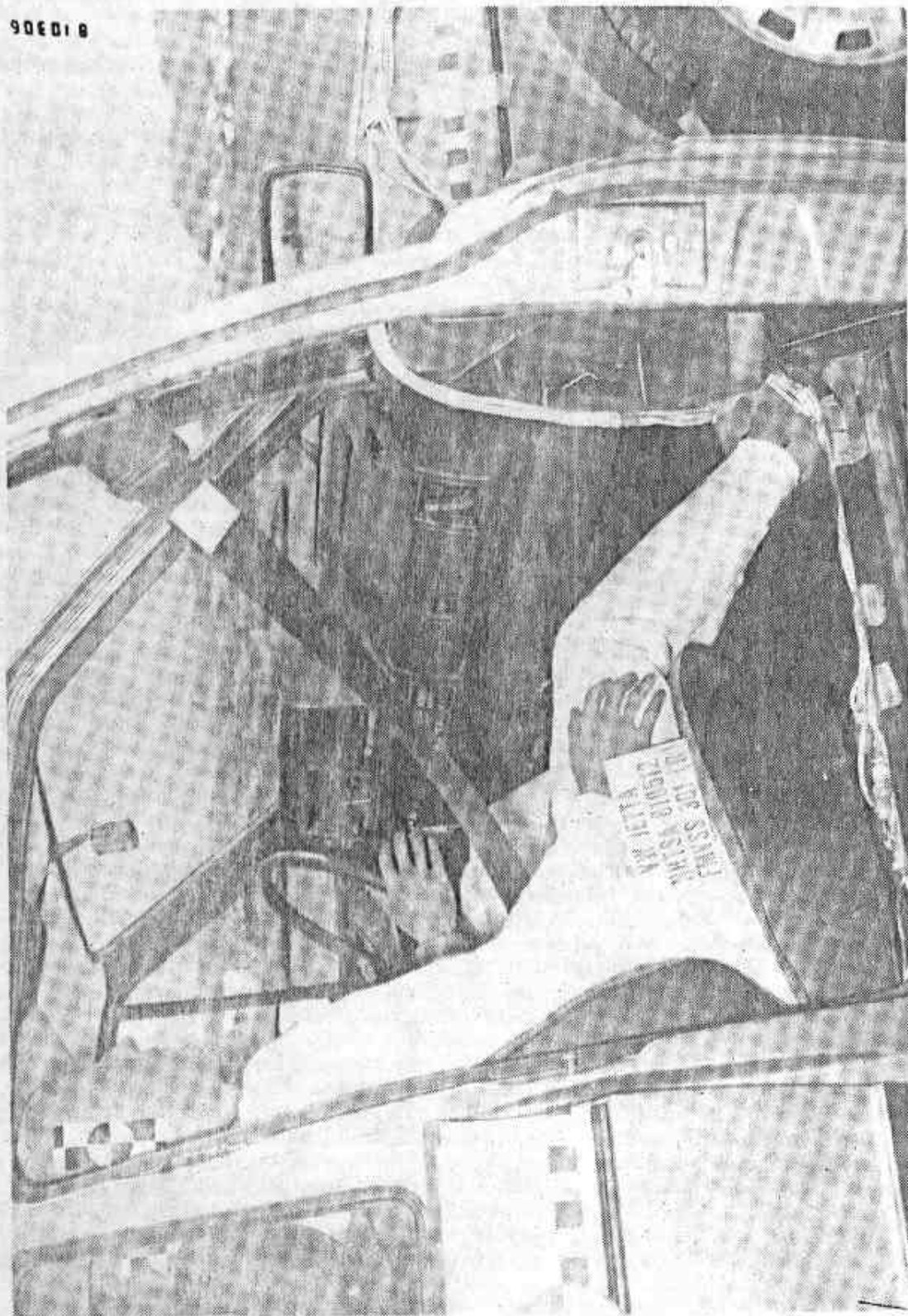


FIGURE A-6. PRE-TEST DRIVER DUMMY POSITION - 1981 VW JETTA - NHTSA 810512.



FIGURE A-7. POST-TEST DRIVER DUMMY POSITION - 1981 VW JETTA - NHTSA 810512.



90E01 8

FIGURE A-3. PRE-TEST PASSENGER DUMMY POSITION - 1981 VW JETTA - NHTSA 810512.

810512

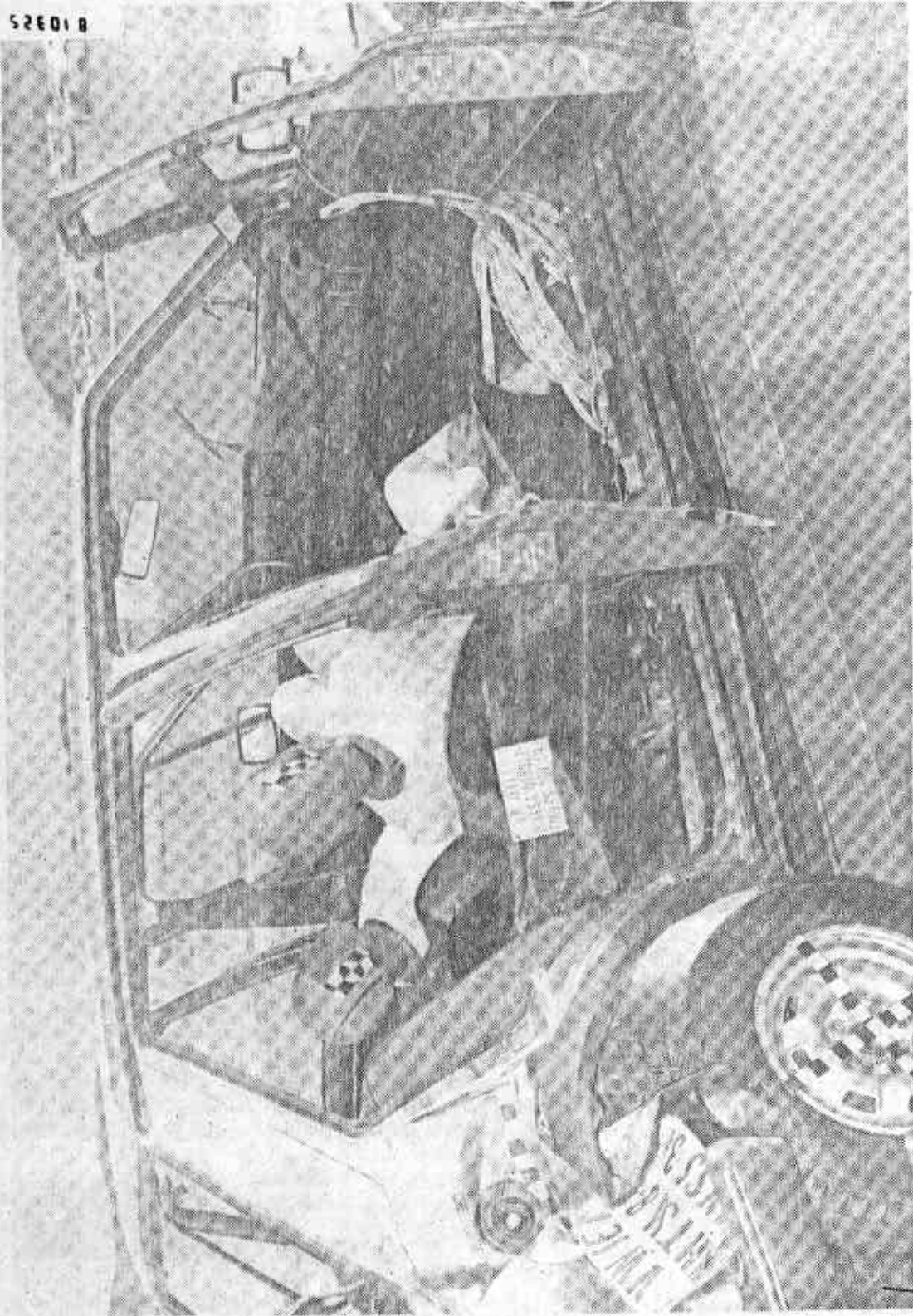


FIGURE A-9. POST-TEST PASSENGER DUMMY POSITION - 1981 VW JETTA - NHTSA 810512.

APPENDIX B
CALCOMP PLOT PRESENTATION

Calcomp plots generated from the crash test data are presented on the following pages. All data will be recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data was filtered according to SAE J211. Plot legends and test anomalies are listed below:

PLOT LEGEND

<u>Vehicle Data*</u>	<u>Location</u>
LOC 1	Front Seat Area Acceleration (G)
LOC 2	Rear Seat Area Acceleration (G)
LOC 8	Moving Barrier C.G. Acceleration (G)

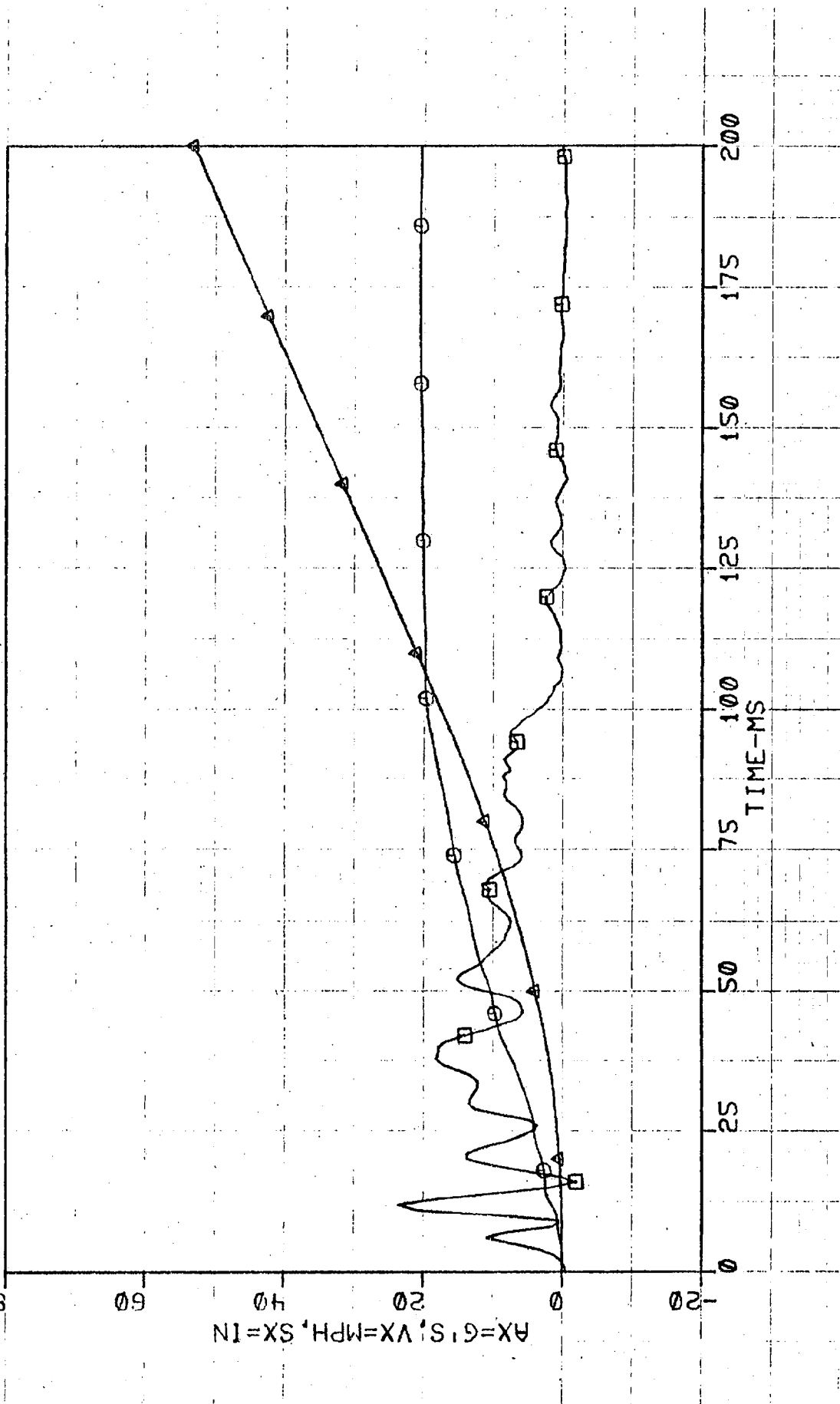
* Vehicle accelerometer location and data summarized on page 4-4.

Test Anomalies: None.

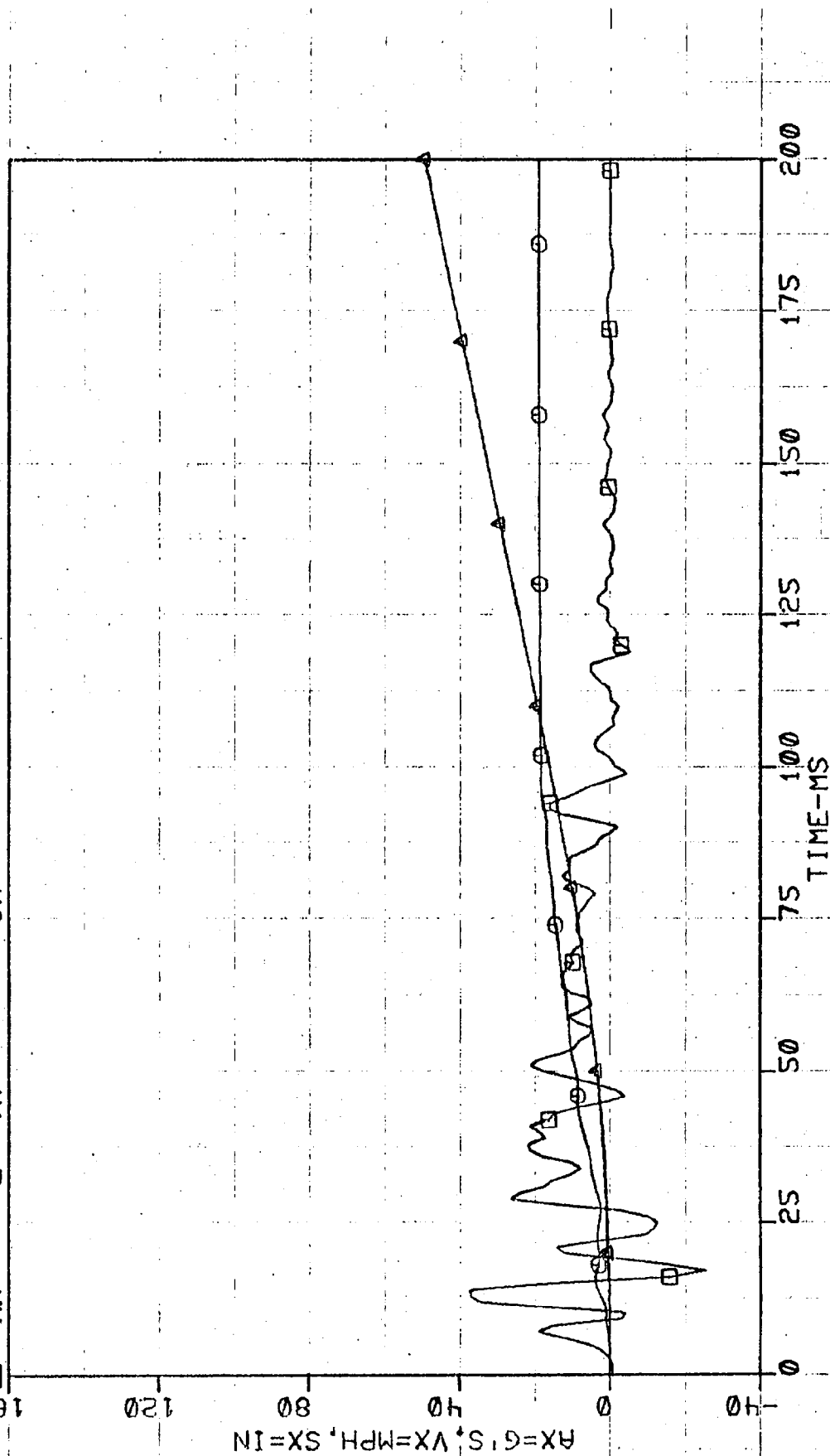
VW JETTA LOC 1R

□ = AX ○ = VX Δ = SX

AX=61'S, VX=MPH, SX=IN



VW JETTA LOC 2R
 $\square = AX$ $\circ = VX$ $\Delta = SX$



VW JETTA LOC 8
 $\square = AX$ $\circ = VX$ $\Delta = SX$

