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219-AETL-80-010-971-3882-20
301-AETL-80-020-971-3882-20

FMVSS 212/219/301-75
VEHICLE SAFETY COMPLIANCE
AND
RESEARCH AND DEVELOPMENT TESTING
OF
"WINDSHIELD MOUNTING"
"WINDSHIELD ZONE INTRUSION"
"FUEL SYSTEM INTEGRITY"

FORD MOTOR COMPANY
1980 FORD BRONCO 4WD CUSTOM WAGON
NHTSA 800606

APPROVED ENGINEERING TEST LABORATORIES
1536 EAST VALENCIA DRIVE
FULLERTON, CALIFORNIA 92631



OCTOBER 1980

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
- ENFORCEMENT -
OFFICE OF VEHICLE SAFETY COMPLIANCE
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APPROVED ENGINEERING TEST LABORATORIES

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16. Abstract FMVSS 212/219/301-75 Vehicle Safety Compliance Test of a 1980 Ford Bronco 4WD Custom Wagon, NHTSA 800606, VIN-U15FLGG8321 was conducted at Approved Engineering Test Laboratories test facility in Fullerton, California, to determine compliance with the requirements of FMVSS 212/219/301-75. As a parallel non-conflicting effort, the test dummies and the vehicle were instrumented with accelerometers to measure occupant response and vehicle acceleration. The results of this effort are documented herein. The average vehicle impact speed was 29.36 mph in the frontal (0°) mode. Test date was October 17, 1980, and the ambient temperature was 69°F. The subject test vehicle appears to comply with all the requirements of FMVSS 212/219/301-75.					
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APPROVED ENGINEERING TEST LABORATORIES

SECTION 1



SECTION 1

1.0 INTRODUCTION

This report contains information regarding a joint program for the Office of Vehicle Safety Compliance (OVSC), and Research and Development (R&D) for the conduct of a vehicle Windshield Mounting, Windshield Zone Intrusion and Fuel System Integrity Test relative to Federal Motor Vehicle Safety Standard Nos. 212/219/301-75, in addition, occupant response and vehicle acceleration. This test was performed under Contract Number DOT-HS-9-02273 by Approved Engineering Test Laboratories, 1536 East Valencia Drive, Fullerton, California, in accordance with the Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures.

The specific purpose of this test was to check the performance of a 1980 Ford Bronco 4WD Custom Wagon, NHTSA 800606 to the requirements of FMVSS 212/219/301-75 and to acquire occupant response and vehicle acceleration data during the 30 mph frontal fixed barrier impact.



SECTION 1

The scope of the vehicle compliance test was expanded to accommodate the acquisition of occupant response and vehicle acceleration data. This was accomplished without creating any conflict with the Laboratory Procedures (TP219-02) issued by the Office of Vehicle Safety Compliance (OVSC). Specific procedures used to obtain the additional data are detailed in the (OVSC) Laboratory Procedures TP212-02.

Section 2 of this report contains all compliance test related data, while Section 3 contains occupant response and vehicle acceleration summary data, along with test dummy and vehicle measurements. Section 4 discusses AETL's test facilities and data acquisition and reduction system. Appendix A contains additional photographs not related to vehicle compliance. Appendix B contains the computer-generated plots, while Appendix C contains the test dummy calibration reports.



SECTION 1

1.1 ADMINISTRATIVE DATA

A. References

1. Federal Motor Vehicle Safety Standard 212 -
"Windshield Mounting," as published in the
Federal Register, Volume 41, No. 36493, dated
30 August 1976.
2. Federal Motor Vehicle Safety Standard 219 -
"Windshield Zone Intrusion," as published in
the Federal Register, Volume 40, No. 25462,
dated 16 June 1975.
3. Federal Motor Vehicle Safety Standard 301-75 -
"Fuel System Integrity," as published in the
Federal Register, Volume 38, No. 22397, dated
20 August 1973
4. National Highway Traffic Safety Administration,
Office of Vehicle Safety Compliance Laboratory
Procedures "Windshield Mounting" FMVSS 212 -
"Windshield Zone Intrusion" FMVSS 219 - "Fuel
System Integrity" FMVSS 301-75, TP219-02, dated
9 January 1979.



SECTION 1

B. Description of Test Vehicle

1. 1980 Ford Bronco 4WD Custom Wagon
2. Vehicle Identification No.: U15FLGG8321
3. NHTSA No.: 800606
4. Manufactured Date: October 1979
5. GVWR: 6,050 pounds

C. Dates

1. Vehicle Received: May 18, 1980
2. Start of Test: October 7, 1980
3. Completion of Test: October 17, 1980



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SECTION 2



SECTION 2

2.0 TEST DATA

The 1980 Ford Bronco 4WD Custom Wagon was subjected to a frontal fixed barrier impact and a static rollover maneuver as required by Federal Motor Vehicle Safety Standard Nos. 212/219/301-75.

Two (2) Part 572 test dummies were positioned in each front designated outboard seating position and were restrained by the belt system in the test vehicle. Just prior to the impact event, the driver dummy head was painted with red chalk and his knees were painted with yellow chalk. The passenger dummy head was painted with blue chalk and his knees were painted with white chalk to provide post-impact visual inspection of possible dummy head and knee contact with interior components during the impact event.

The test vehicle "rated cargo and luggage weight" (RCLW) was not used as calculated, in lieu, a 300 pound cargo ballast was utilized in determining the ultimate calculated vehicle test weight.



SECTION 2

Impact velocity for the test vehicle was regulated by the fixed tow propulsion and certified by the redundant timing traps described in Section 4.

Color motion picture coverage of the vehicle impact along with the static rollover test are considered part of the accumulated pertinent data. Where applicable still photographs are presented in this report; while the motion picture coverage is submitted separately.

TABLE I

SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION:

Manufacturer: Ford Motor Company
Make/Model: Ford Bronco 4WD Custom
Body Style: Wagon Model Year: 1980
VIN: U15FLGG8321 Build Date: October 1979
NHTSA No.: 800606 Color: Blue w/white top
Engine Data: Eight (8) Cylinders; 302.0 Cu. In. Displ.
Transmission Data: Four (4) Speed (X) Manual () Automatic
Major Options: Limited Slip Rear Axle, Cooling Package

VEHICLE ATTITUDE:

Delivered Attitude: LF 34.5 in.; RF 34.0 in.; LR 35.0 in.; RR 35.0 in.
Test Attitude: LF 34.0 in.; RF 33.1 in.; LR 34.2 in.; RR 33.7 in.

VEHICLE TIRE DATA:

Recommended Cold Tire Pressure: Front = 30 psi
(Up to Vehicle Load Capacity) Rear = 36 psi

Recommended Tire Size: L78-15 Load Range: "C"

Tires on Vehicle: L78-15 - Firestone

Spare Tire: X Yes; No; Space Saver: Yes; X No

TABLE 1a

SUMMARY OF TEST CONDITIONS (Cont'd)TEST CONDITIONS:Date of Test: October 17, 1980 Time of Test: 1600Ambient Temperature: 69 °F at Impact AreaVEHICLE CAPACITY:Type of Seats: Bench; X Bucket; Split Bench

Designated Seating Capacity:	Front	<u>2</u>
	Center	<u>0</u>
	Rear	<u>0</u>
	Total	<u>2</u>

Cargo: unknown lbs.Total unknown lbs. (Vehicle Capacity Weight)GVWR: 6,050 lbs. (Taken From Certification Label)GAWR: Front 2,475 lbs.; Rear 3,750 lbs.VEHICLE DELIVERED WEIGHT: (Fuel - 93% of NFC)

Left Front	<u>985</u> lbs.	Left Rear	<u>1,085</u> lbs.
Right Front	<u>1,158</u> lbs.	Right Rear	<u>1,009</u> lbs.
Total Front Weight	<u>2,143</u> lbs.	(<u>50.6</u> % of Total Vehicle Weight)	
Total Rear Weight	<u>2,094</u> lbs.	(<u>49.4</u> % of Total Vehicle Weight)	
Total Delivered Weight	<u>4,237</u> lbs.		

CALCULATED VEHICLE TEST WEIGHT: 4,865 lbs.(With Required Dummies and 300 lbs. Cargo)ACTUAL VEHICLE TEST WEIGHT:

Left Front	<u>1,063</u> lbs.	Left Rear	<u>1,301</u> lbs.
Right Front	<u>1,252</u> lbs.	Right Rear	<u>1,248</u> lbs.
Total Front Weight	<u>2,315</u> lbs.	(<u>47.6</u> % of Total Vehicle Weight)	
Total Rear Weight	<u>2,549</u> lbs.	(<u>52.4</u> % of Total Vehicle Weight)	
Total Test Weight	<u>4,864</u> lbs.		

TABLE 1b

SUMMARY OF TEST CONDITIONS (Cont'd)

TEST FLUID DATA:Test Fluid Type: Red Stoddard Solvent ; Specific Gravity: 0.764Kinematic Viscosity: 1.31Nominal Fuel Capacity: 25.00 gals. (NFC)Test Volume: 23.25 gals. (92-94% of NFC)Fuel System Capacity: 25.00 gals.
(Data from Owner's Manual)Electric Fuel Pump: Yes; X No; Fuel Injection: Yes; X No

Does Electric Fuel Pump Operate with Ignition Switch "On"

And the Engine Not Operating: Yes; No; X N/A

Details of Fuel System: Fuel filler located on the left rear fender aft
of wheel opening recessed behind a hinged door, fuel tank located hori-
zontally between the frame side rails under the cargo floor pan between
the differential and bumper.

VEHICLE TEST CONDITIONS:Temperature in Occupant Compartment: 72 °FTemperature of Windshield Glazing/Moulding: 76 °FVEHICLE CRUSH AND REBOUND:Overall Length of Test Vehicle: Pre-Test - Left 173.5 in.; Right 173.5 in.Post-Test - Left 154.0 in.; Right 154.7 in.Crush: Left 19.5 in.; Right 18.8 in.Rebound (From Rigid Barrier Only): 2.5 in.

TABLE II

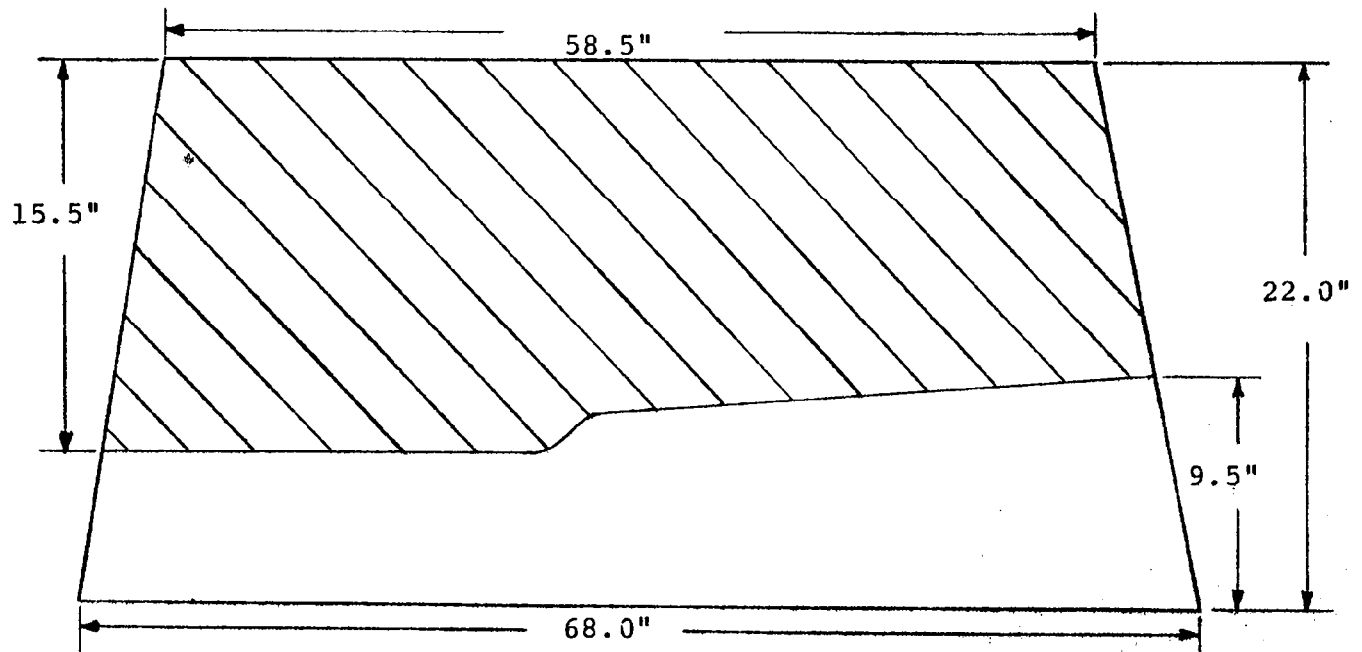
SUMMARY OF TEST CONDITIONS - FMVSS 219

Vehicle 1980 Ford Bronco 4WD

NHTSA No. 800606

Test Date October 17, 1980

PROTECTED AREA



FRONT VIEW OF WINDSHIELD

Provide all dimensions necessary to reproduce the protected zone.

Method of adhering styrofoam to the windshield _____

Panel and Foam Adhesive _____

Details of Special Windshield Retention Clips (If Applicable) _____

Not Applicable _____

TABLE 111

POST IMPACT SUMMARY

Vehicle 1980 Ford Bronco 4WDNHTSA No. 800606Test Date October 17, 1980TYPE OF TEST: ☒ 0° Frontal Impact☐ 30° Oblique Impact (Driver/Passenger) Side☐ Rear ImpactREQUIRED IMPACT VELOCITY RANGE: 28.9 to 29.9 mph

IMPACT VELOCITY: (Traps within 5 feet of impact event)

Trap 1 = 29.36 mphTrap 2 = 29.36 mphAverage 29.36 mphActual distance from vehicle front bumper to barrier
face when entering timing trap 57.0 in.Actual distance from vehicle front bumper to barrier
face when exiting timing trap 33.0 in.VEHICLE STATIC CRUSH: Driver's Side = 19.5 inchesPassenger's Side = 18.8 inchesAverage = 19.15 inchesCrush Details: Windshield cracked, frame buckled under the doors, roof
buckled over both "B" posts, cab floor pan buckled, driver dummy impacted
the steering wheel assembly.

VEHICLE REBOUND: (From rigid barrier only)

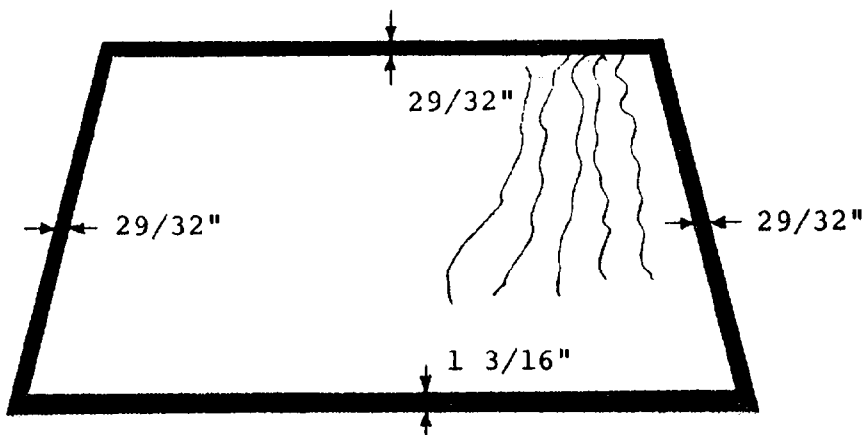
Driver's Side = 3.2 inchesPassenger's Side = 1.8 inchesAverage = 2.5 inches

TABLE IV
 POST IMPACT SUMMARY
 WINDSHIELD RETENTION - FMVSS 212

Vehicle 1980 Ford Bronco 4WD

NHTSA No. 800606

Test Date October 17, 1980



FRONT VIEW OF WINDSHIELD

	Windshield Periphery	
	Pre Test	Post Test
Left Side	85.4 in.	85.4 in.
Right Side	85.6 in.	85.6 in.
Total	171.0 in.	171.0 in.

Type of Occupant Restraints: Combination Shoulder/Lap Belt

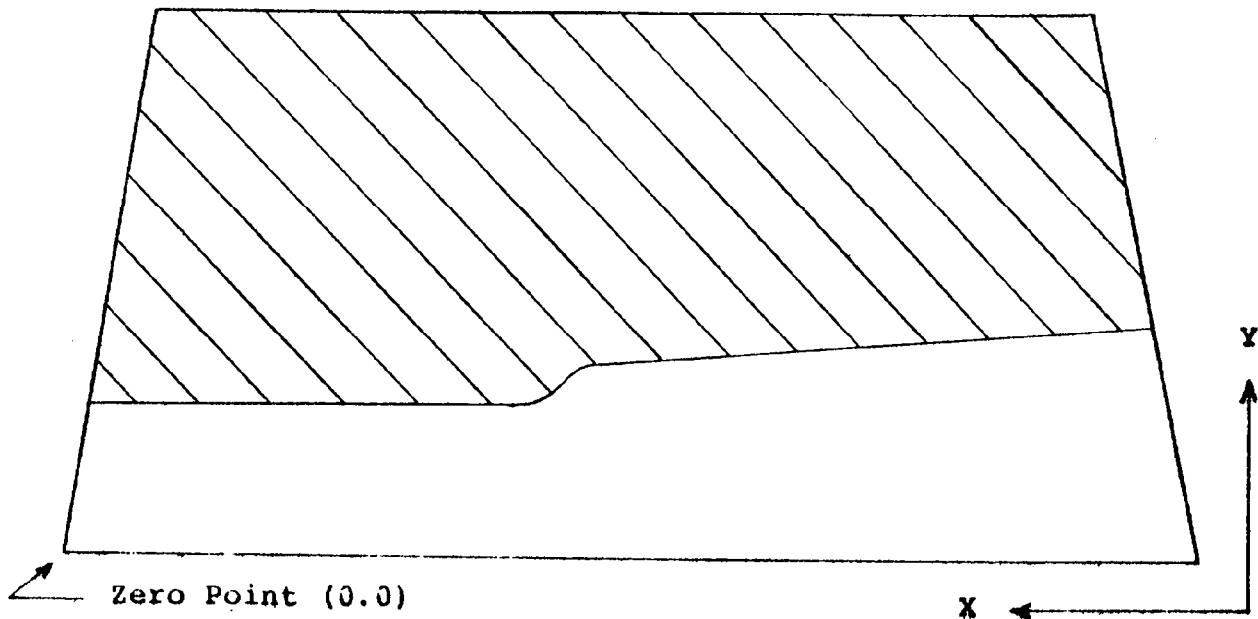
Windshield Retention:	Actual	Min. Allow
Left Side	100.0	37.5 percent
Right Side	100.0	37.5 percent
Total	100.0	75.0 percent

Details of Windshield Mounting: A chrome trim strip encompasses the windshield glass and apparent adhesive used between the windshield glass and body opening.

TABLE V

POST IMPACT SUMMARY

WINDSHIELD ZONE INTRUSION - FMVSS 219

Vehicle 1980 Ford Bronco 4WDNHTSA No. 800606Test Date October 17, 1980FRONT VIEW OF WINDSHIELD

- (A) The area that the "Protected Zone" template was penetrated more than 0.25 inches by a vehicle component other than one which is normally in contact with the windshield

Not Applicable

Coordinates

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

- (B) The area beneath the "Protected Zone" that the inner surface of the windshield was penetrated by a vehicle component.

Not Applicable

Coordinates

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

TABLE VI

POST IMPACT SUMMARY

FUEL SYSTEM INTEGRITY - FMVSS 301-75

Vehicle 1980 Ford Bronco 4WD

NHTSA No. 800606

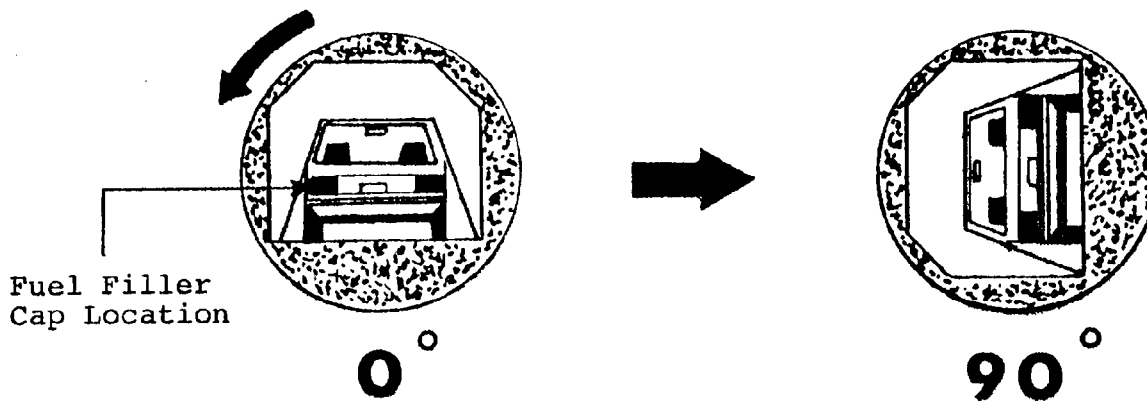
Test Date October 17, 1980

	Actual	Max. Allow.
Fuel spillage from impact until vehicle motion ceases.	- 0 -	1 ounce
Fuel spillage for 5 minute period following cessation of vehicle motion after impact.	- 0 -	5 ounces
Fuel spillage for next 25 minute period.	- 0 -	1 ounce/ 1 minute
Time duration from impact until start of rollover test periods.	25 minutes	30 minutes

Fuel Spillage Location: Not Applicable

TABLE VII
FUEL SYSTEM INTEGRITY - FMVSS 301-75
STATIC ROLLOVER

Vehicle 1980 Ford Bronco 4WD NHTSA No. 800606



	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 13 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

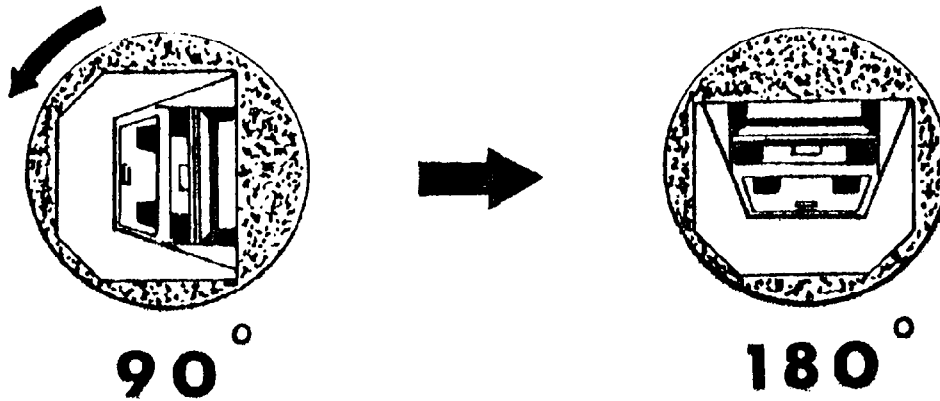
Fuel Spillage Location: Not Applicable

TABLE VIII

FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1980 Ford Bronco 4WD NHTSA No. 800606



	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 18 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

Fuel Spillage Location: Not Applicable

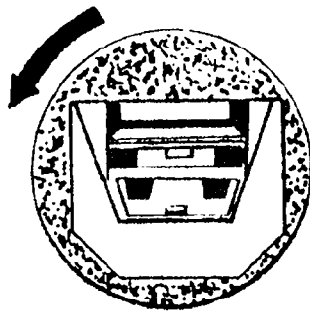
TABLE IX

FUEL SYSTEM INTEGRITY - FMVSS 301-75

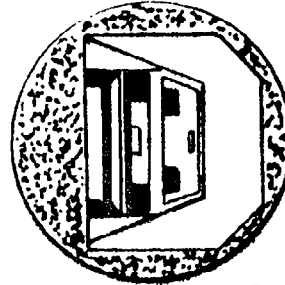
STATIC ROLLOVER

Vehicle 1980 Ford Bronco 4WD

NHTSA No. 800606



180°



270°

	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 14 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

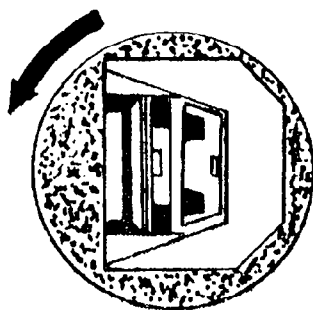
Fuel Spillage Location: Not Applicable

TABLE X

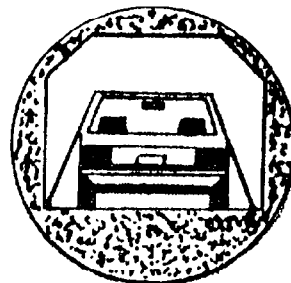
FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1980 Ford Bronco 4WD NHTSA No. 800606



270°



360°

	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 15 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

Fuel Spillage Location: Not Applicable



SECTION 2

2.1 TEST RESULTS AND PHOTOGRAPHS

The 1980 Ford Bronco 4WD Custom Wagon was subjected to a frontal fixed barrier impact followed by a static rollover test in accordance with the procedures referenced in Section 1 of this report under Administration Data. The results presented here relate specifically to vehicle performance under Federal Motor Vehicle Safety Standard 212 - "Windshield Mounting", 219 - "Windshield Zone Intrusion", and 301-75 - "Fuel System Integrity".

The test was conducted essentially in accordance with NHTSA Office of Vehicle Safety Compliance Laboratory Procedures. The critical parameters were impact velocity; windshield mounting retention criteria defined FMVSS 212, paragraph S5.2; windshield protected zone and unprotected zone intrusion criteria defined in FMVSS 219, paragraph S5; and fuel spillage criteria defined in FMVSS 301-75, paragraph S5.5 and S5.6.



SECTION 2

Post-impact inspection of the test vehicle revealed almost all crush occurred forward of the cab doors. The roof buckled over the left and right "B" post, and the cab floor pan buckled on the drivers side and center tunnel area. The left and right frame rail buckled at the cab door vicinity, and the left door was jammed. The left and right "B" post shoulder belt D-ring attachment was deformed. The driver dummy head made contact with the steering wheel assembly and the passenger dummy head made contact with his own chest.

The windshield assembly revealed no apparent retention loss during the impact event. The windshield had cracks developed by apparent cowl/body deformation. A chrome trim strip encompasses the windshield glass, retained with body clips. The windshield has apparent adhesive between the glass and body opening.

No windshield zone intrusion was recorded following the test vehicle impact. The protected windshield zone area did not appear to have been contacted by one object sufficiently to penetrate the styrofoam template outer surface. The unprotected windshield zone area was not penetrated by an object, although the windshield had cracks developed by apparent cowl/body deformation.



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SECTION 2

No fuel spillage was recorded following the test vehicle impact, nor during the time period before the start of the rollover test. No fuel spillage was recorded during the rollover test increment test periods.

The 1980 Ford Bronco 4WD Custom Wagon test vehicle appears to comply with all the requirements of FMVSS 212/219/301-75.



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Figure 2-1

1980 Ford Bronco 4WD Custom Wagon

NHTSA 800606

Pre-Test, Windshield View





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Figure 2-2

1980 Ford Bronco 4WD Custom Wagon

NHTSA 800606

Pre-Test, Windshield Template View





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Figure 2-3
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Pre-Test, Full Front View





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Figure 2-4
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Pre-Test, Left Side View





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Figure 2-5
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Pre-Test, Right Side View





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Figure 2-6
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Post-Impact, Left Side View





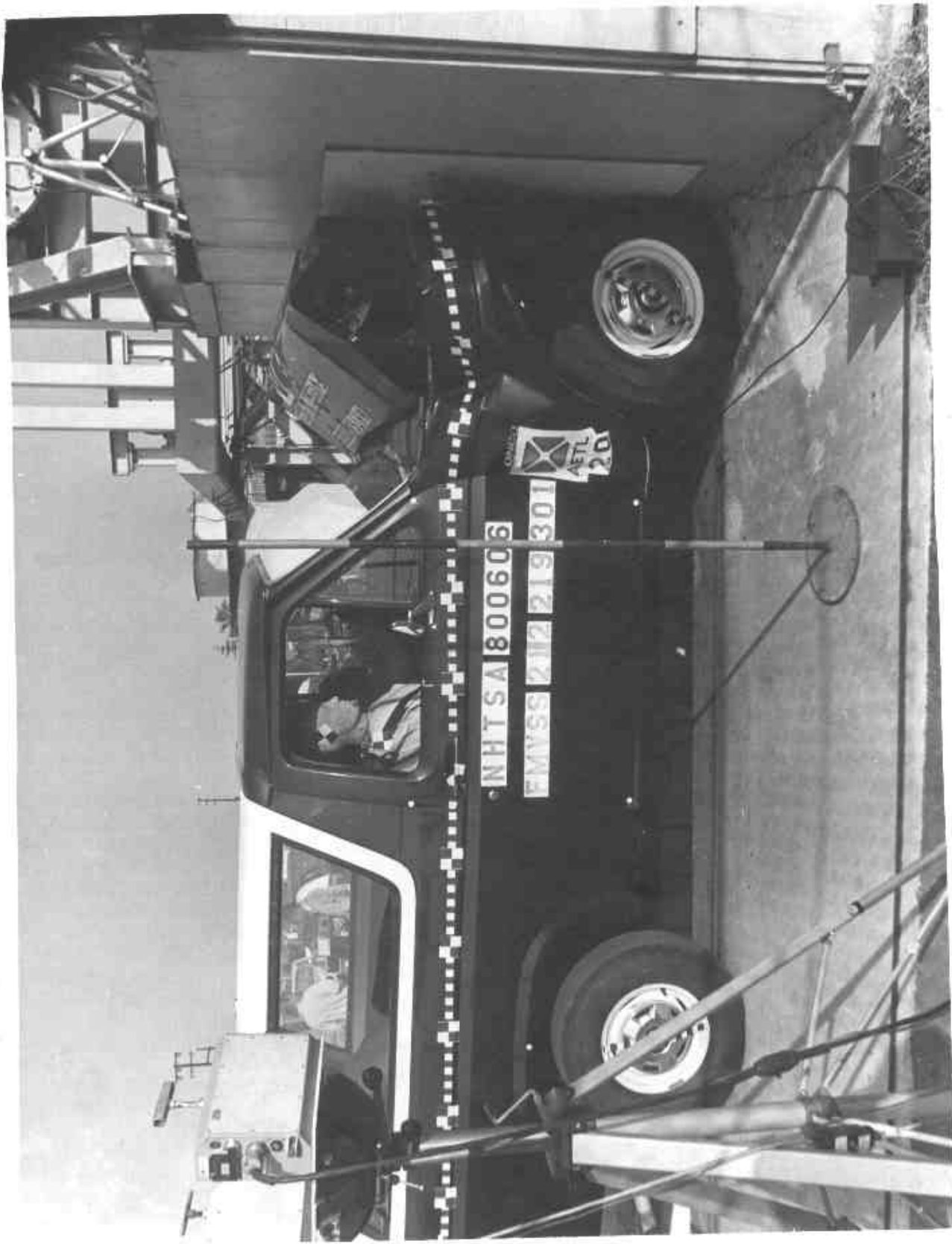
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Figure 2-7

1980 Ford Bronco 4WD Custom Wagon

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Post-Impact, Right Side View





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Figure 2-8

1980 Ford Bronco 4WD Custom Wagon

NHTSA 800606

Post-Impact, Rollover Test, 90° Increment





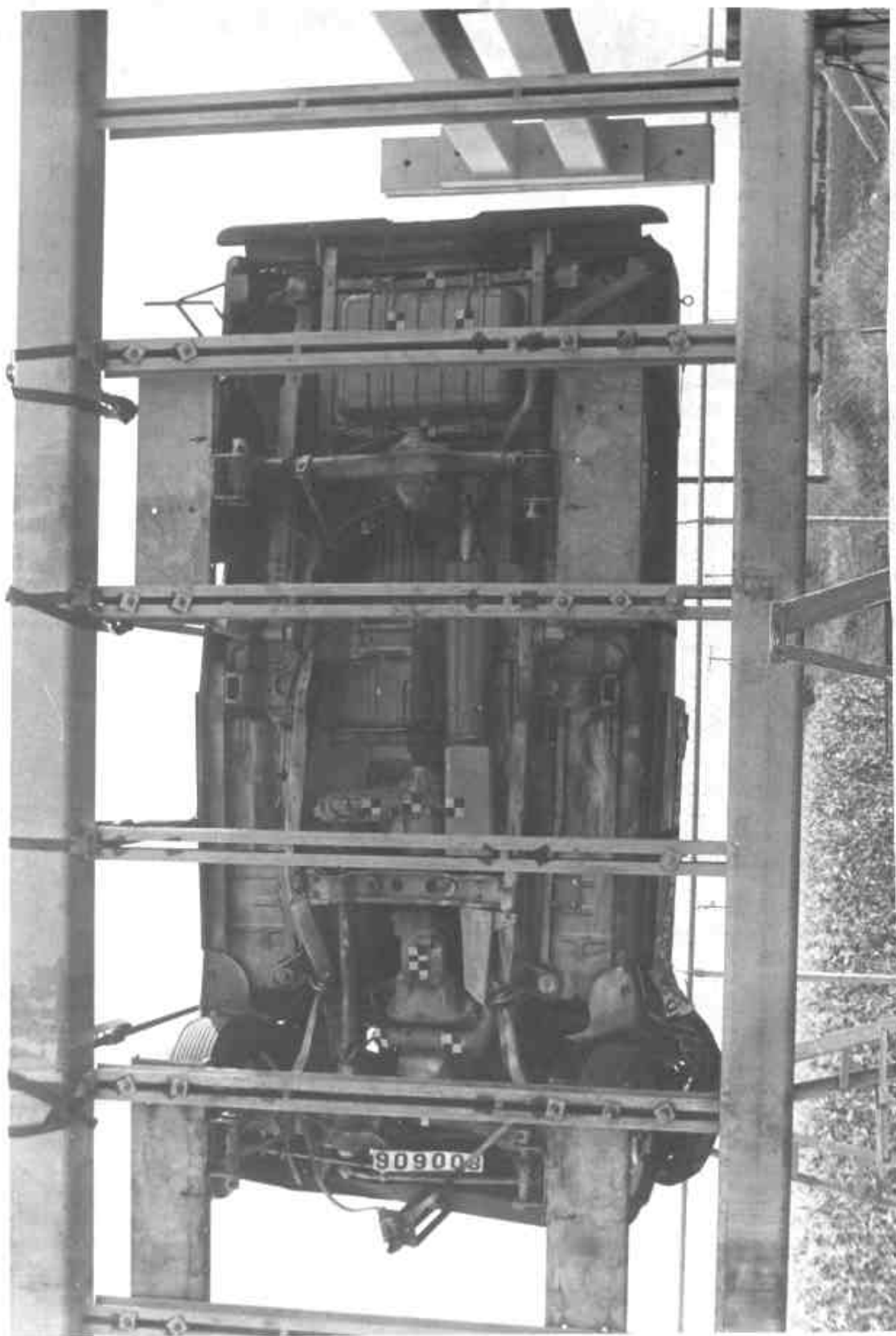
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Figure 2-9

1980 Ford Bronco 4WD Custom Wagon

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Post-Impact, Rollover Test, 270° Increment





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SECTION 3



SECTION 3

3.0 OCCUPANT RESPONSE AND VEHICLE ACCELERATION SUMMARY DATA

The following data sheets summarize:

- A. The Dummy Position Data (Part 572 Dummy In-Vehicle Position/Part 572 Dummy Pre-Test Clearance Distances Sheets)
- B. The Occupant Response Data (Part 572 Dummy Data Sheet)
- C. The Vehicle Acceleration Data (Vehicle Structural Data Sheet)
- D. The Pre and Post-Test Vehicle Dimensions Data (Vehicle Measurement Data Sheet)

More comprehensive data is presented in Appendix B in the form of computer-generated plots.



SECTION 3

The driver dummy experienced a HIC value of 913 and the passenger dummy experienced a HIC value of 957, both are within the limit specified in FMVSS 208 injury criteria. All other values for both test dummies satisfy the FMVSS 208 requirements.

In addition to the occupant and vehicle data, each shoulder belt was marked at the D-ring, after the dummy positioning, to provide a static measurement of belt position after the impact event. Post-impact measurement of the driver shoulder belt was 2.5 inch, and the passenger shoulder belt was 1.0 inch.

The vehicle left rear longitudinal accelerometer response (Tape 1, channel 10) data was not acquired due to apparent cable failure.

TABLE 3-1
PART 572 DUMMY IN-VEHICLE POSITION

VEHICLE 1980 Ford Bronco 4WD

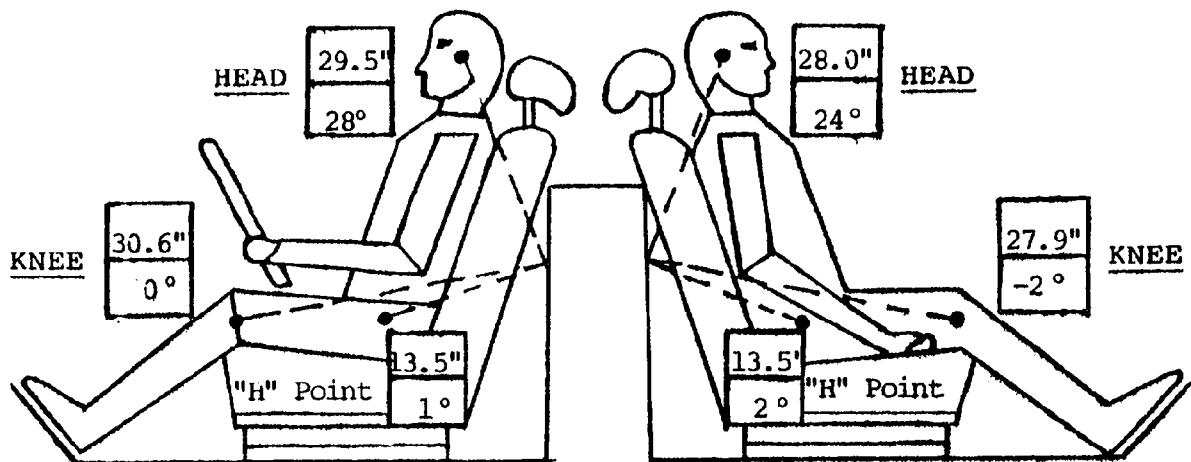
NHTSA NO. 800606

POSITIONING DATE: Oct. 17, 1980 AMBIENT TEMP: 72 °F TIME 1500

SEAT TYPE: Bench
 X Bucket
 Split Bench

ADJUSTER TYPE: X Manual
 Power

BUCKET SEAT BACK TYPE: X Fixed
 Adjustable Reclining



DRIVER
S/N 0319

PASSENGER
S/N S03

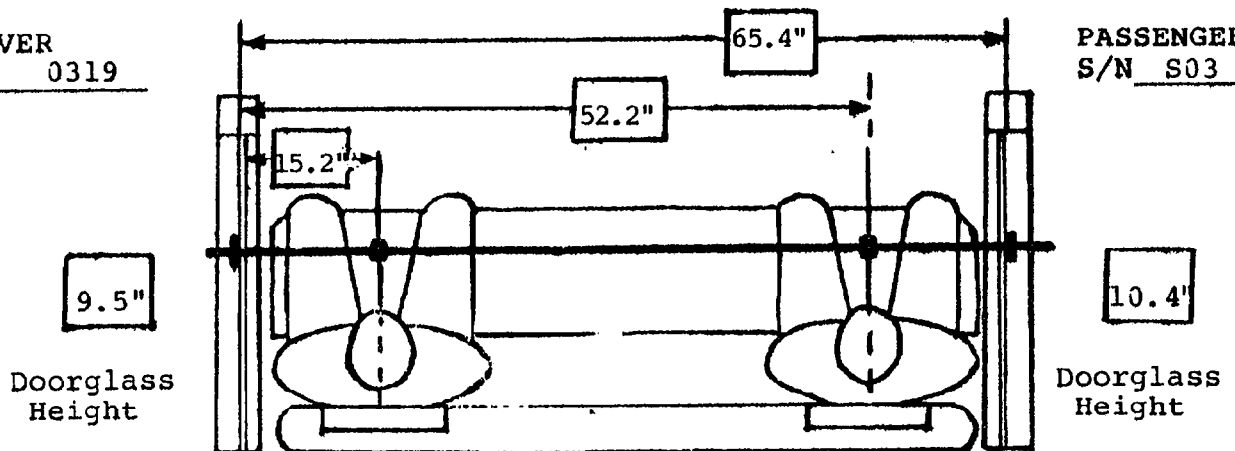


TABLE 3-2

PART 572 DUMMY PRE-TEST CLEARANCE DISTANCES

DRIVER

HH = 22.8 in.

HW = 26.5 in.

HR = 10.5 in.

HS = 11.4 in.

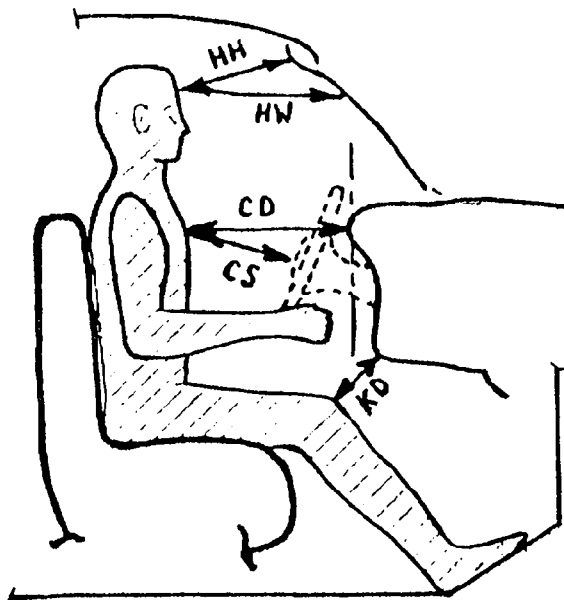
CD = 24.6 in.

CS = 13.0 in.

AD = 4.3 in.

HD = 5.5 in.

KD = 10.0 in.



PASSENGER

HH = 21.0 in.

HW = 25.0 in.

HR = 9.5 in.

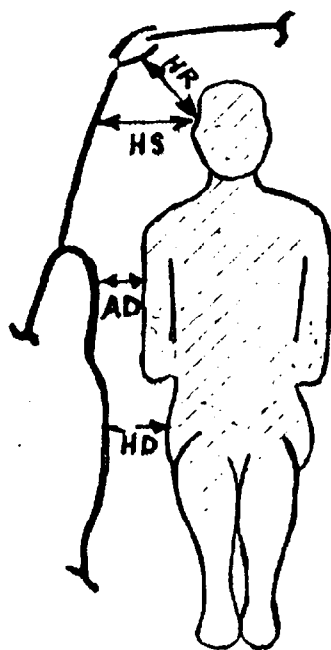
HS = 10.5 in.

CD = 25.0 in.

AD = 4.5 in.

HD = 6.0 in.

KD = 11.0 in.



MANUFACTURERS SEAT BELT INSTRUCTIONS**Seat Belts**

For personal safety and protection, all vehicle occupants front and rear should fasten the lap and lap-shoulder belts. Your vehicle features a lap-shoulder belt system for the front seat outboard positions and a seat belt warning system for the driver's seat. If

the driver does not buckle up before turning the ignition, the buzzer will sound for four to eight seconds. The seat belt warning light will remain on for the same time period with or without the belts buckled.

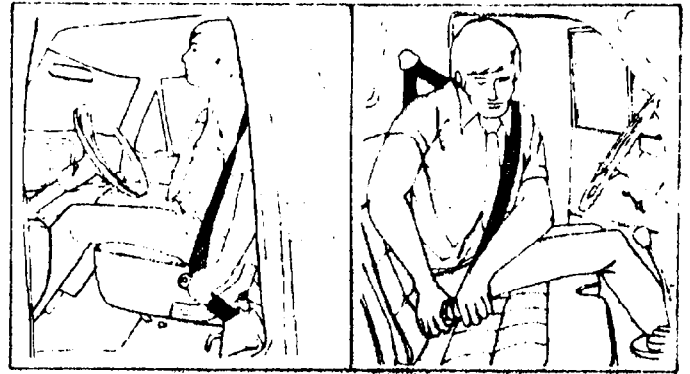
CAUTION - Never allow more slack than is required to insert a fist between the shoulder belt and the chest; never wear the shoulder belt under the arm. This practice may reduce the restraint system effectiveness. Use shoulder belt on outside shoulder only; never swing it around your neck over the inside shoulder.

CAUTION - Never use a single belt for more than one person.

Continuous Loop Lap-Shoulder Belt System

After entering your vehicle, adjust the front seat to obtain the best position for your driving comfort and visibility. Then use the following procedure for fastening belts.

- Pull the lap-shoulder belt from the retractor so the shoulder portion of the belt crosses your shoulder and chest and insert the belt slip tongue into the proper buckle until you hear a snap and feel it latch.



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- The shoulder restraint portion of the belt adjusts automatically to a snug position. The pendulum lock allows freedom of movement, locking only on hard braking or impacts of approximately 5 mph (8 km/h) or more. The reel cannot be made to lock by jerking on the webbing.
- The lap portion of the belt adjusts automatically to a snug position, but be sure the belt is fitted **AROUND THE HIPS**, not the waist. Failure to do so may result in unnecessary injury in the event of a collision.

PART 572 DUMMY DATA

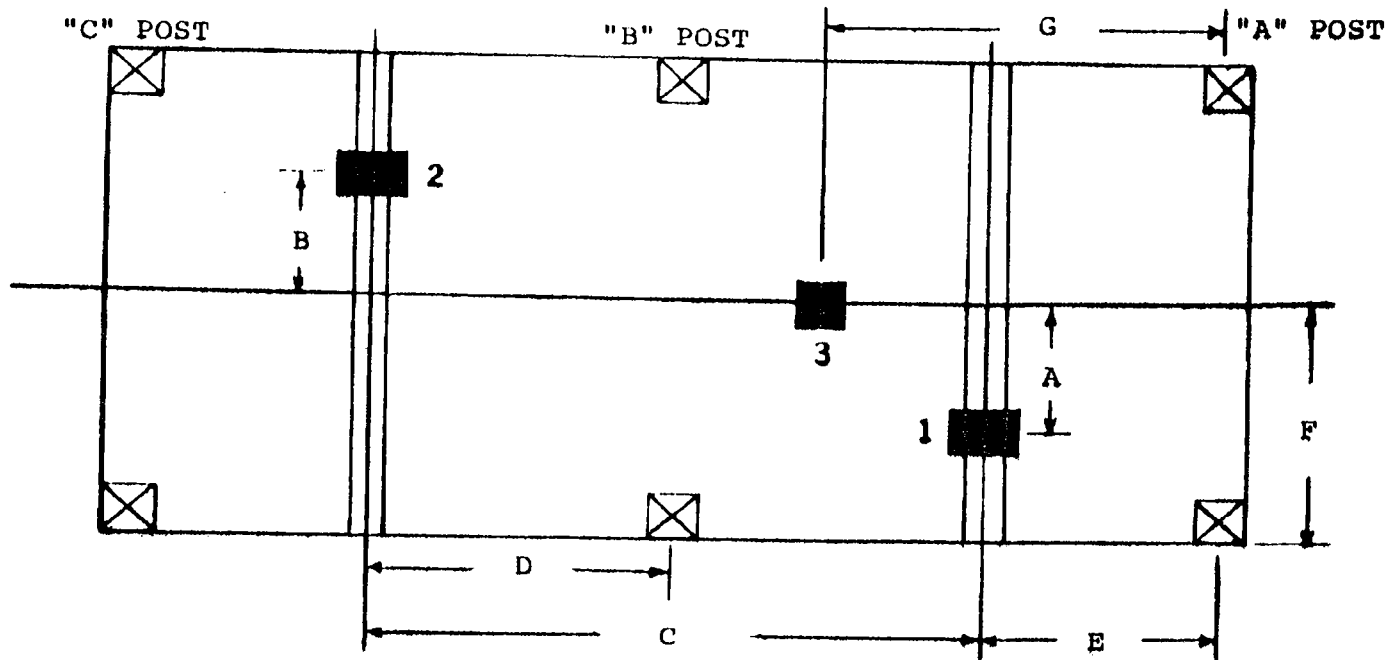
Vehicle 1980 Ford Bronco 4WD

NHTSA No. 800606

Driver S/N <u>0319</u> Passenger S/N <u>S03</u>	DRIVER				PASSENGER			
	Positive* Direction		Negative* Direction		Positive* Direction		Negative* Direction	
	Peak G	Time (msec)	Peak G	Time (msec)	Peak G	Time (msec)	Peak G	Time (msec)
HEAD ACCELERATION								
Longitudinal	3.8	27.4	155.2	79.2	2.3	28.8	30.0	131.4
Lateral	17.2	102.8	7.0	68.6	2.9	203.6	21.0	113.6
Vertical	11.0	118.4	40.4	87.8	1.8	16.0	48.8	72.2
Resultant	156.5	79.2			52.8	92.2		
HIC	913 (60 - 112 msec)				957 (59 - 147 msec)			
CHEST ACCELERATION								
Longitudinal	3.8	159.0	55.6	80.0	6.3	162.2	32.1	76.4
Lateral	10.9	75.2	8.8	81.0	17.8	83.0	7.0	155.2
Vertical	13.8	114.2	21.0	58.8	13.5	120.0	19.1	64.2
Resultant	56.4	80.0			37.7	74.2		
CSI	410 (49.9g - 3 msec clip)				272 (36.6g - 3 msec clip)			
	(lb)	Time (msec)	(lb)	Time (msec)	(lb)	Time (msec)	(lb)	Time (msec)
FEMUR LOAD								
Left	184	38.0	468	61.4	67	143.4	335	95.6
Right	109	171.8	366	65.6	198	33.2	420	67.0
BELT LOAD								
Torso	1334	72.2			1376	74.6		
Lap	2723	65.0			2215	68.8		
Average Vehicle Impact Speed <u>29.36</u> mph								
*Positive Direction - Longitudinal: Forward Lateral: Leftward Vertical: Upward Femur: Tension *Negative Direction - Longitudinal: Rearward Lateral: Rightward Vertical: Downward Femur: Compression								

TABLE 3-5
VEHICLE STRUCTURAL DATA

VEHICLE 1980 Ford Bronco 4WD NHTSA NO. 800606



DIMENSIONS			
LOCATION	MEASUREMENT (IN.)	LOCATION	MEASUREMENT (IN.)
A	23.5	E	10.0
B	23.0	F	38.5
C	36.5	G	25.0
D	4.0		

ACCELERATION PEAKS				
ACCELEROMETER LOCATION	POSITIVE* DIRECTION		NEGATIVE* DIRECTION	
	PEAK "G"	TIME (MSEC)	PEAK "G"	TIME (MSEC)
NO. 1 LONGITUDINAL	4.1	15.6	36.9	55.0
NO. 2 LONGITUDINAL	N/D	N/D	N/D	N/D
NO. 3 LONGITUDINAL	79.4	50.4	66.3	52.8
*POSITIVE - LONGITUDINAL: FORWARD DIRECTION *NEGATIVE - LONGITUDINAL: REARWARD DIRECTION				

TABLE 3-7
POST-TEST
VEHICLE MEASUREMENT DATA

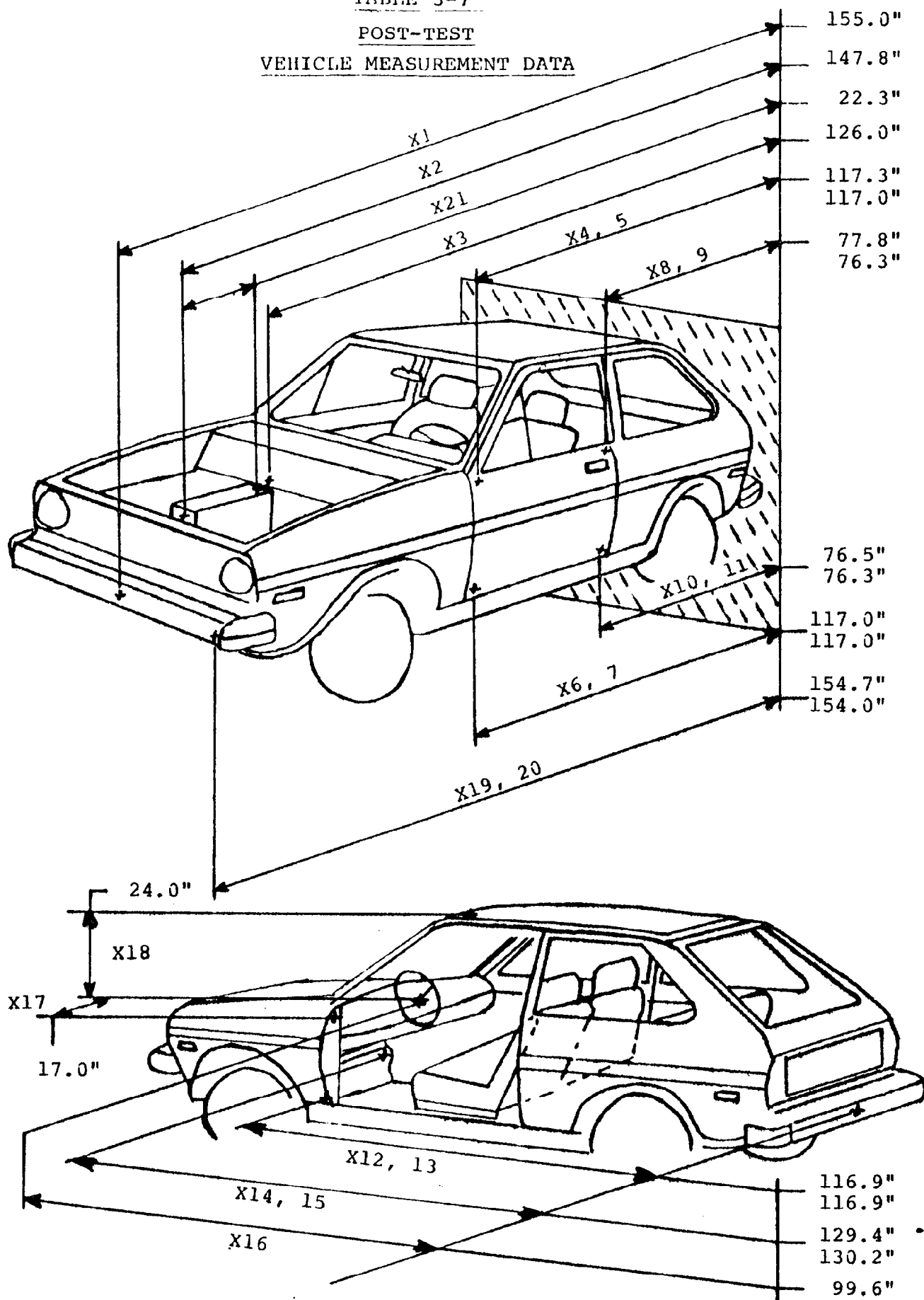


TABLE 3-8SUMMARYPRE TEST AND POST TEST VEHICLE DIMENSIONS

<u>Measurement Point</u>	<u>Pre-Test</u>	<u>Post-Test</u>	<u>Difference</u>
X1	175.0"	155.0"	20.0"
X2	150.5"	147.8"	2.7"
X3	127.5"	126.0"	1.5"
X4	117.2"	117.3"	+0.1"
X5	117.6"	117.0"	0.6"
X6	117.3"	117.0"	0.3"
X7	117.5"	117.0"	0.5"
X8	77.0"	77.8"	+0.8"
X9	76.8"	76.3"	0.5"
X10	76.2"	76.5"	+0.3"
X11	76.4"	76.3"	0.1"
X12	116.8"	116.9"	+0.1"
X13	116.9"	116.9"	0.0"
X14	130.1"	129.4"	0.7"
X15	130.8"	130.2"	0.6"
X16	101.7"	99.6"	2.1"
X17	17.2"	17.0"	0.2"
X18	22.0"	24.0"	+2.0"
X19	173.5"	154.7"	18.8"
X20	173.5"	154.0"	19.5"
X21	22.3"	22.3"	0.0"

TABLE 3-9
FMVSS 212/219/301-75
CAMERA POSITIONS

VEHICLE 1980 Ford Bronco 4WD

NHTSA NO. 800606

TEST DATE October 17, 1980

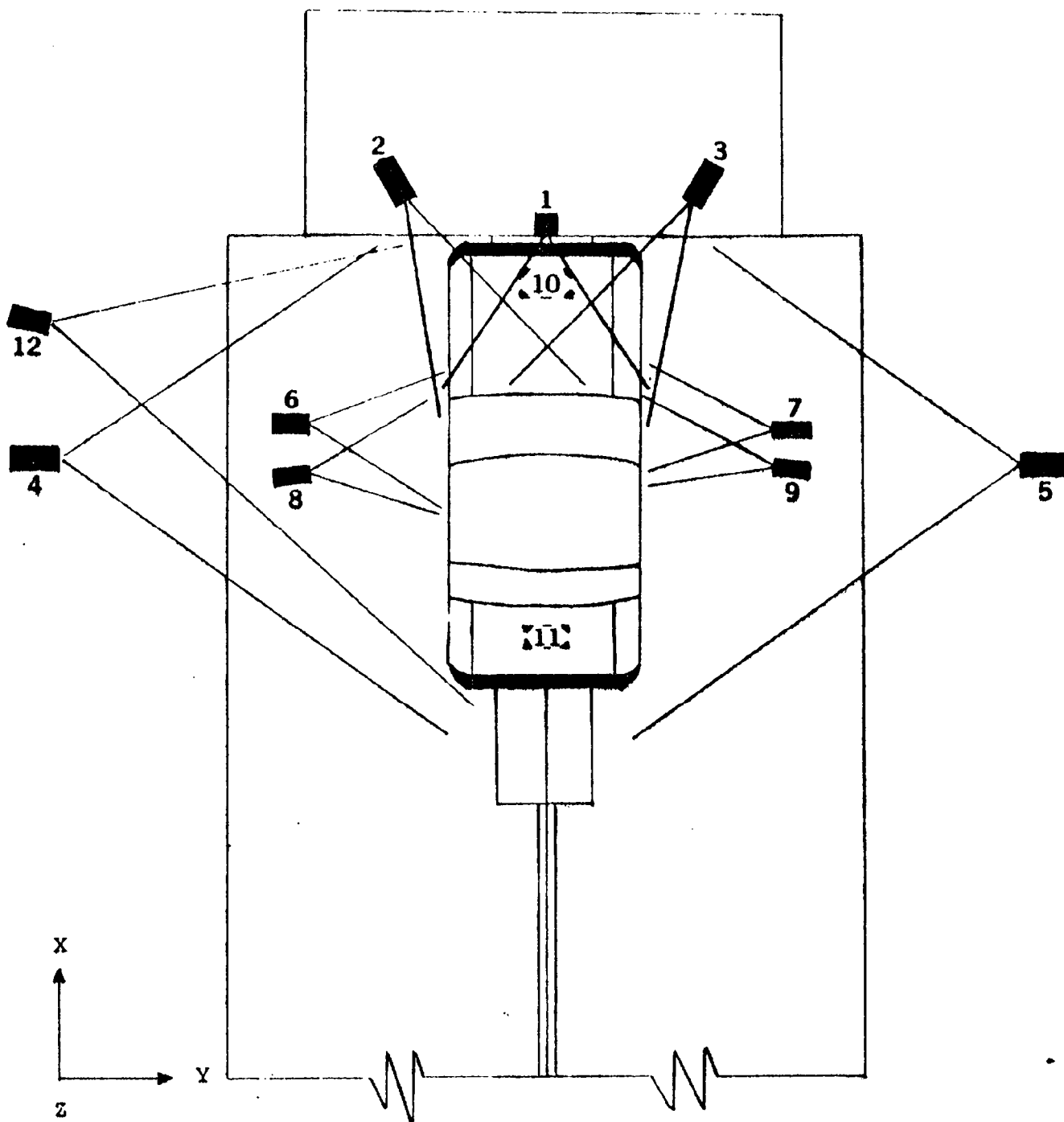


TABLE 3-10
FMVSS 212/219/301-75
CAMERA POSITIONS

VEHICLE 1980 Ford Bronco 4WD

NHTSA NO. 800606 TEST DATE October 17, 1980

1. Photo-Sonics 13mm 500FPS	X <u>11.0"</u> Y <u>- 0 -</u> Z <u>238.0"</u>	2. Photo-Sonics 13mm 500FPS	X <u>-12.0"</u> Y <u>19.0"</u> Z <u>111.5"</u>
3. Photo-Sonics 13mm 500FPS	X <u>-8.0"</u> Y <u>36.0"</u> Z <u>101.0"</u>	4. Photo-Sonics 13mm 500 FPS	X <u>41.0"</u> Y <u></u> Z <u>50.5"</u>
5. Photo-Sonics 13mm 500FPS	X <u>82.0"</u> Y <u>198.0"</u> Z <u>43.5"</u>	6. Locam 12.5mm 500FPS Dummy Head	X <u>86.0"</u> Y <u>118.5"</u> Z <u>68.0"</u> <u>95.0"</u>
7. Locam 13mm 500FPS Dummy Head	X <u>85.0"</u> Y <u>112.0"</u> Z <u>67.0"</u> <u>89.5"</u>	8. Locam 15mm 500FPS Dummy Head	X <u>92.5"</u> Y <u>117.0"</u> Z <u>67.5"</u> <u>93.5"</u>
9. Locam 12.5mm 500FPS Dummy Head	X <u>93.5"</u> Y <u>109.0"</u> Z <u>67.0"</u> <u>87.0"</u>	10. Photo-Sonics 13mm 500FPS	X <u>3.0"</u> Y <u>2.0"</u> Z <u>-44.5"</u>
11. Photo-Sonics 13mm 500FPS	X <u>219.0"</u> Y <u>3.0"</u> Z <u>-44.5"</u>	12. Canon Scoopic 12.5 - 75mm 24FPS - Documentary -	



APPROVED ENGINEERING TEST LABORATORIES

SECTION 4



SECTION 4

4.0 TEST FACILITIES AND EQUIPMENT

Approved Engineering Test Laboratories (AETL) collision barriers, vehicle static rollover machine, and data processing/computer analysis test facilities are located at the Fullerton, California Division.

This section discusses these specialized facilities, along with associated equipment and instrumentation required for the performance of this test.

4.1 FRONTAL COLLISION BARRIER FACILITY

4.1.1 The frontal (fixed) collision barrier conforms to the requirements as set by the NHTSA Office of Vehicle Safety Compliance (OVSC) and as defined in the Laboratory Procedures for FMVSS 212/219/301-75, TP219-02, dated January 9, 1979, with the following special characteristics.

4.1.2 The fixed collision barrier is a steel clad, steel reinforced concrete block with a 6'4" X 12' face. The face is 1" steel plate faced with 3/4 inch plywood. The total mass of the structure is approximately 200,000 pounds, with a substantial portion below ground to provide resistance against sliding or tipping of the barrier during impact.



SECTION 4

4.1.3 The facility consists of a 500 foot concrete paved runway, with a steel monorail embedded in the approach surface. Two camera pits are provided to allow photographing the test vehicle at impact. One pit is located immediately in front of the fixed collision barrier and is 36 inches wide (expandable to 48 inches), 7 feet deep, and 23 feet long (3 feet of the pit length extends under the barrier face). The second (mid) pit with removable monorail section is located approximately 160 feet from the fixed collision barrier and is 43 inches wide, 7 feet deep, and 23 feet long.

4.1.4 Tow propulsion is provided by a fixed prime mover and continuous cable drive system located near the mid camera pit position. The power plant for the tow cable system is a 200 h.p. synchronous electric motor, coupled to an electronically controlled Eddy Current Clutch and a 4:1 gear reduction transfer assembly.

The endless 1/2 inch diameter steel tow cable is wrapped around the drive pulley and is tensioned by a pneumatic loaded idler wheel. The tow cable passes through the fixed collision barrier and around fixed idler pulleys to complete the loop. The test vehicle or moving collision barrier is towed by a dolly assembly attached to the vehicle



SECTION 4

or moving collision barrier by a shear pin release mechanism. For a fixed collision barrier test, the test vehicle is towed within 20 feet of the fixed barrier, at which point the towing dolly assembly is disconnected from the test vehicle and the test vehicle proceeds under its own momentum for the final 20 feet to impact. For a moving collision barrier test, the moving collision barrier is towed within 5 feet of the test vehicle, at which point the towing dolly is disconnected from the moving collision barrier and the moving collision barrier proceeds under its own momentum for the final 5 feet to impact. Heavy steel stops actuate the tow cable release mechanism and prevent the towing dolly from continuing past the point of impact. The towing dolly is designed to fit inside the monorail such that it is constrained in the vertical and lateral directions, and capable of sliding freely along the monorail.

4.2 OBLIQUE ANGLE COLLISION BARRIER

- 4.2.1 The oblique angle collision barrier conforms to the requirements as set by NHTSA Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures TP219-02, with the following special characteristics.



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4.2.2 The oblique angle collision barrier is constructed of a flat 1 1/2 inch steel plate faced with 3/4 inch plywood. The barrier face is 6' X 12' and is adjustable for left or right angle impacts by means of seven tubular gussets that attach to the standard fixed frontal collision barrier to form a rigid buttress structure.

4.3 MOVING COLLISION BARRIER

4.3.1 The moving collision barrier conforms to the requirements as set by Federal Motor Vehicle Safety Standard No. 208, Paragraph S8.2 with the following special characteristics.

4.3.2 The chassis is constructed of 12 inch steel channel with tubular frame gussets. The flat impacting face plate is 1/2 inch steel plate faced with 3/4 inch plywood. The face plate is reinforced with 6 inch steel channel horizontally welded to the chassis to form a rigid symmetrical structure. A camera boom extends above the barrier face plane to provide a view of barrier to vehicle impact. The barrier assembly weighs 3,977 pounds and has a four wheel electric brake system.



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4.4 VEHICLE STATIC ROLLOVER MACHINE

4.4.1 The vehicle static rollover machine conforms to the requirements as set by the NHTSA Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures TP219-02 with the following special characteristics.

4.4.2 The vehicle static rollover machine is constructed of 10 inch square tube with adjustable wheelbase and tread width platforms to accommodate the various test vehicles. The total usable platform area is 8 feet wide and 25 feet long with special design feature to accomodate vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less with various body configuration heights to 12 feet. The test vehicle can be rotated left or right and can turn each 90° rotational increment in approximately two (2) minutes.

4.5 IMPACT VELOCITY MEASUREMENT

The test vehicle impact velocity is measured by two (2) separate certification timing trap systems located within five (5) feet of the vehicle to fixed collision barrier face and to one side on the approach apron. Each timing



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trap system contains two (2) optical beams, mounted twenty four (24) inches apart, in a mechanical housing assembly providing a start-stop signal to a digital display counter. As the test vehicle traverses the impact apron, a blade attached to the test vehicle rear fender interrupts each optical beam providing the precise measurement of time interval for the test vehicle to advance the known distance between the optical beams. Each interval of time measurement is stored in the digital display counter and photographically recorded.

The moving collision barrier impact velocity is measured by two (2) separate certification timing trap systems located within five (5) feet of the moving collision barrier to vehicle impact location and to one side on the approach apron. Each timing trap system contains two (2) optical beams, mounted twenty-four (24) inches apart, in a mechanical housing assembly providing a start-stop signal to a digital display counter. As the moving barrier traverses the impact apron, a blade attached to the moving barrier side interrupts each optical beam providing the precise measurement of time interval for the moving barrier to advance the known distance between the optical beams. Each interval of time measurement is stored in the digital display counter and photographically recorded.



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4.6 PHOTOGRAPH COVERAGE

4.6.1 Because FMVSS 212/219/301-75 may be a combined test, it is necessary that all photographic coverage of the test vehicle be done at one time with specific photographs to document the areas for Vehicle Safety Compliance consideration; windshield area and the fuel system. Each report will utilize only those photographs pertaining to the Vehicle Safety Compliance Test being reported.

4.6.2 FIXED BARRIER IMPACT TEST

Motion picture coverage of the event employs seven (7) 16mm 1B Photo-Sonics cameras and four (4) 16mm 51 Redlake Locam cameras using color film at 500 frames per second (fps). Also a 16mm Canon Scoopic 24 frames per second (fps) camera with color film is used to record vehicle pre-test condition, vehicle in-run, impact, and post-impact vehicle conditions including the rollover increments for documentary purposes. The eleven (11) high speed cameras are located at stationary positions near the point of impact. One is an overhead camera mounted on a tower above the fixed barrier face on centerline of the test vehicle at impact. Its field of view includes the barrier face and the front of the vehicle to a point about one foot aft of the windshield. A second and third camera are mounted on top of the fixed barrier with



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their field of view concentrating on the windshield area (FMVSS 212/219). The fourth and fifth cameras each have a side view of the test vehicle at impact. The sixth, seventh, eighth, and ninth cameras are located adjacent to the test vehicle front passengers compartment and positioned to photograph motion of each test dummy at impact. The tenth and eleventh cameras are located in the pit and positioned to photograph the underside of the engine compartment and fuel tank area.

4.6.3 MOVING BARRIER IMPACT TEST

Motion picture coverage of the event employs four (4) 16mm 1B Photo Sonics cameras and two (2) 16mm 51 Redlake Locam cameras using color film at 500 frames per second (fps). Also a 16mm Canon Scoopic 24 frames per second (fps) camera with color film is used to record vehicle pre-test condition, barrier in-run, impact, and post-impact vehicle conditions including the rollover increments for documentary purposes. Five (5) of the high speed cameras are located at stationary positions near the point of impact. Three (3) cameras are located in the pit and positioned to photograph the underside of the engine compartment, with overlapping field of views, aft to the fuel tank area. The fourth and fifth cameras each have a side view of the test vehicle at impact.



SECTION 4

The sixth camera is attached to the moving collision barrier to photograph the contact between the barrier and the test vehicle.

4.6.4 TIME PULSE GENERATOR

Time data from two (2) sources are contained in the high speed film coverage. The first is a time reference of 100 pulse per second (pps) light emitting diode event mark along the film edge. This pulse is generated by the time pulse generator and fed to all high speed cameras. Thus, it is possible to relate film data to a real time base. The second time record is an indication of time zero (moment of impact). This is accomplished by a trip switch and event mark system. The trip switch is positioned at the impact point so that it triggers the light emitting diode event mark along the film edge at the moment of bumper-barrier contact. Thus, the particular film frame corresponding to the point of impact is clearly indicated on all the high speed film.



SECTION 4

4.7 DATA ACQUISITION AND REDUCTION

The data acquisition and analysis system used for acquiring occupant response and vehicle acceleration are shown schematically in Figure 4-1. A complete list of instrumentation is provided in Table 4-1. An itemized procedure for acquiring data is provided on Table 4-2.

Prior to the vehicle impact test the onboard instrumentation package is installed and a calibration and null reference check is performed to checkout all data analog devices including the FM magnetic tape recorders. The moment of impact trigger switch attached to the vehicle is also checked out. Immediately following vehicle impact a post-impact calibration and null reference check is performed.

The analog data is then played back into a Hewlett Packard Digital Fourier Analyzer (DFA) system using a HP 2100S mini computer with 32K word core storage. This system uses four program controlled analog filters which provides pre-digitizing filter capability of 60 db/octave above 1250 Hz.



SECTION 4

The DFA is a hard disc based system with standard HP design software for performing data acquisition and analysis functions. The HP software is programmed using direct keyboard functions to automate the data reduction process. The data is entered into temporary storage, four channels (one set) at a time with eight total sets. Table 4-3 defines each data channel and data set. The data sets are divided into driver and passenger tape recorder groups to facilitate simultaneous data acquisition for the head, chest and vehicle accelerometers to assure appropriate calibration of injury criteria and vehicle dynamics. At the time of entry, test personnel enter the appropriate calibration for each data channel and the computer then scales the data appropriately. When all data has been acquired it is moved as a vehicle set to permanent storage on a removable magnetic disc. (Eight vehicle sets are stored on each magnetic disc. All magnetic discs and FM recorder tapes are retained on file at AETL).

The only modifications to the data at the time of permanent storage is the filtering and digitizing process of the FM tape recorder (2500 Hz) and the DFA (2000 Hz sampling for a 500 ms window). After the data is moved to permanent storage it is recalled by test personnel and plotted with the appro-

SECTION 4

priate labels and vehicle designation. As the data is recalled, the DFA is programmed to automatically apply the appropriate SAE filter where applicable.

A 1250 Hz predigitizing analog filter with a rolloff of 60 db/octave, shown in figure 4-2, was applied to all data. Also shown in figure 4-2 are SAE class 60 and class 180 filters. These filters are in accordance with SAE J211A, Instrumentation for Impact Tests. These SAE recommended filters are quadratic double pole with 65% damping and a 12 db/octave rolloff. They are applied using a fast fourier transform of the data, frequency domain multiplication, and an inverse fast fourier transform of the product. The class 60 filters is applied to vehicle acceleration and belt restraint forces. The class 180 filter is applied to chest acceleration. SAE filters were not applied to head accelerations and femur forces.

4.7.1 IMPACT DATA

All impact data is presented in computer plots of data digitized at 500 microseconds. Special SAE filters are applied to appropriate data sets. Each data plot includes labeling, defining the test vehicle, filter class, and the complete identification of the data plotted.



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4.7.1.2 DUMMY HEAD DATA

The dummy head accelerations are processed and the Head Injury Criteria (HIC) calculation is performed. The HIC calculations are maximized for start time (T1) and end time (T2), using a manual iteration routine, usually requiring about ten iterations and between 5,000 and 10,000 combinations of start and end times. Data output is in the form of computer plots with the final HIC calculations. Listing of data value and HIC calculations are available, but not provided in the final report.

4.7.1.3 DUMMY CHEST DATA

The dummy chest accelerations are processed as class 180 data, and direct Chest Severity Index (CSI) calculations are performed. Data output is in the form of computer plots with the CSI calculations.

4.7.1.4 FEMUR LOAD DATA

The dummy femur loads are processed and presented as computer plots.



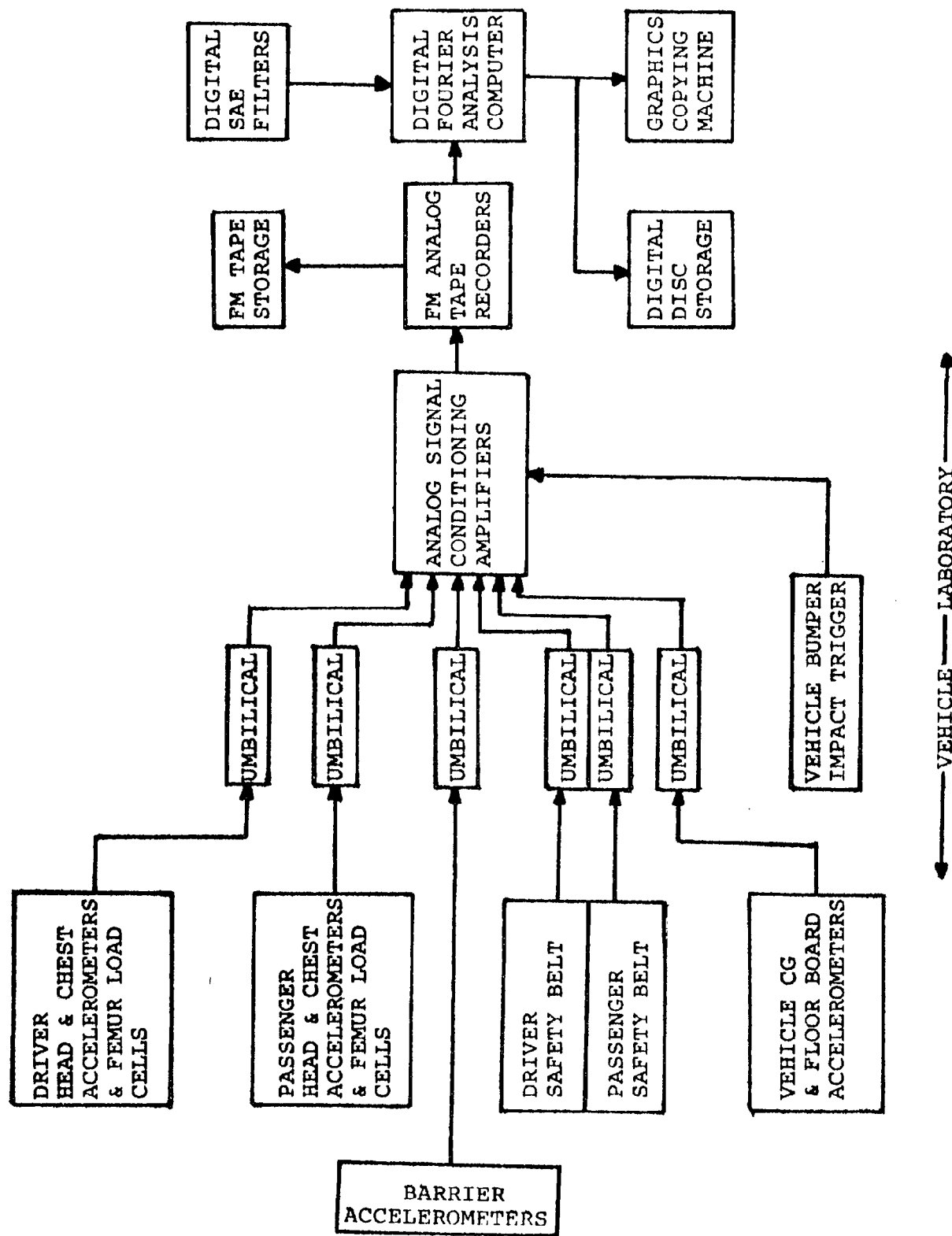
SECTION 4

4.7.1.5 RESTRAINT LOAD DATA

The dummy restraint loads are processed as class 60 data, and presented as computer plots.

4.7.1.6 VEHICLE ACCELERATION DATA

The vehicle accelerations are processed as class 60 data, and presented as computer plots.



VEHICLE AND OCCUPANT CRASH IMPACT DATA ACQUISITION SYSTEM

FIGURE 4-1

TABLE 4-1 INSTRUMENTATION FOR CRASH TEST

<u>Instrument</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>Full Scale</u>	<u>Accuracy</u>	<u>Frequency Max.</u>
Accelerometers, Head, Chest, Vehicle	Endevco	2262C-200	200g	±1%	3600 Hz
Load Cells, Femurs	GSE	2430	3000 lb	±1%	>3600 Hz
Load Cells, Safety Belts	GSE	2500	3000 lb	±1%	>3600 Hz
Contact Switch, Impact	AETL	-	2 V	-	<200 us rise time
FM Tape Recorder	Bell & Howell	4020	±2.8 V	47 db SNR	2500 Hz WB
Programmable Filter, All Data	Hewlett Packard	54440A	-	0.5%	1250 Hz, 60 db/oct
Analog-Digital Converter, All Data	Hewlett Packard	5406B	-	0.5%	200 us sampling
Analysis Computer, All Analysis	Hewlett Packard	2100S	32 K Words	16 Bit Word	-
Disc Drive	Hewlett Packard	7900A	5 Meg Words	-	-



APPROVED ENGINEERING TEST LABORATORIES

TABLE 4-2

DATA ACQUISITION AND REDUCTION PROCESS

<u>STEP</u>	<u>DESCRIPTION</u>
1	DA System Installation
2	DA System Pre-Impact Calibration
3	Impact Trigger Checkout
4	Vehicle Impact Performed
5	DA System Post-Impact Calibration
6	Data Reproduced From FM Tape Into Computer a) Data analog filtered at 1250 Hz b) Data digitized at 500 ms sample rate c) Data sychronized by impact trigger signal
7	Digitized Data Examined
8	Data Transferred Permanent Disc Storage
9	Appropriate SAE Filters Are Applied
10	Each Data Signal Plotted With Lables
11	Chest Severity Index Values Determined
12	Head Injury Criteria Values Determined

TABLE 4-3

DATA DESIGNATIONS FOR VEHICLE CRASH IMPACT DATA ACQUISITION

DATA SET	TAPE NO.	CHANNEL NO.	DESCRIPTION
1	1	1	Driver Longitudinal Head Acceleration Ax
1	1	2	Driver Lateral Head Acceleration Ay
1	1	3	Driver Vertical Head Acceleration Az
1	1	4	Driver Right Femur Force
2	1	5	Driver Longitudinal Chest Acceleration Ax
2	1	6	Driver Lateral Chest Acceleration Ay
2	1	7	Driver Vertical Chest Acceleration Az
2	1	8	Driver Left Femur Force
3	1	9	Driver Restraint Belt Force
3	1	10	Vehicle Vertical CG Acceleration Az
3	1	11	Vehicle Lateral CG Acceleration Ay
3	1	12	Vehicle Longitudinal CG Acceleration Ax
4	1	13	Left Rear Floor Pan Longitudinal Acceleration Ax
4	1	14	Left Rear Floor Pan Vertical Acceleration Az
5	2	1	Passenger Longitudinal Head Acceleration Ax
5	2	2	Passenger Lateral Head Acceleration Ay
5	2	3	Passenger Vertical Head Acceleration Az
5	2	4	Passenger Right Femur Force
6	2	5	Passenger Longitudinal Chest Acceleration Ax
6	2	6	Passenger Lateral Chest Acceleration Ay
6	2	7	Passenger Vertical Chest Acceleration Az
6	2	8	Passenger Femur Force
7	2	9	Passenger Restraint Belt Force
7	2	10	Barrier Lateral Acceleration Ay
7	2	11	Barrier Longitudinal Acceleration Ax
7	2	12	Barrier Vertical Acceleration Az
8	2	13	Right Front Floor Pan Longitudinal Acceleration Ax
8	2	14	Right Front Floor Pan Vertical Acceleration Az

COMPARISON PLOT OF SAE CLASS 60, 180, 600, 1000 FILTERS AND
THE DATA ANALYSIS 1250 HZ FREQUENTIZING ANALOG FILTER.

SAE FILTERS ROLL OFF IS 12DB/OCT, ANALOG FILTER ROLL OFF IS 60DB/OCT

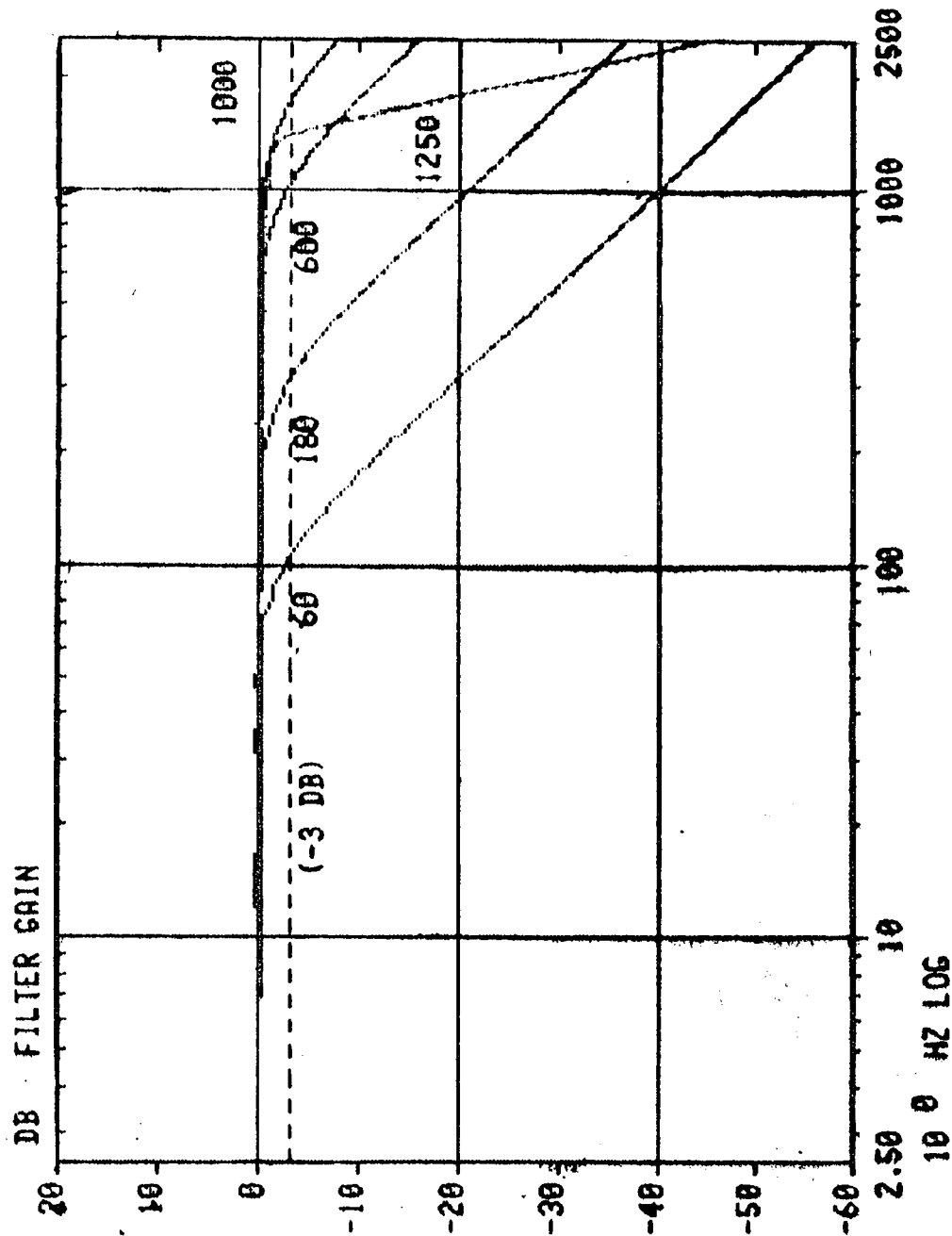


FIGURE 4 -2



APPROVED ENGINEERING TEST LABORATORIES

APPENDIX A



APPROVED ENGINEERING TEST LABORATORIES

APPENDIX A

The following photographs are pre and post test dummy positions and interior compartment locations of dummy contact during the impact event.



APPROVED ENGINEERING TEST LABORATORIES

Figure A-1
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Pre-Test, Driver Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure A-2
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Pre-Test, Passenger Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure A-3
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Post-Impact, Driver Dummy View





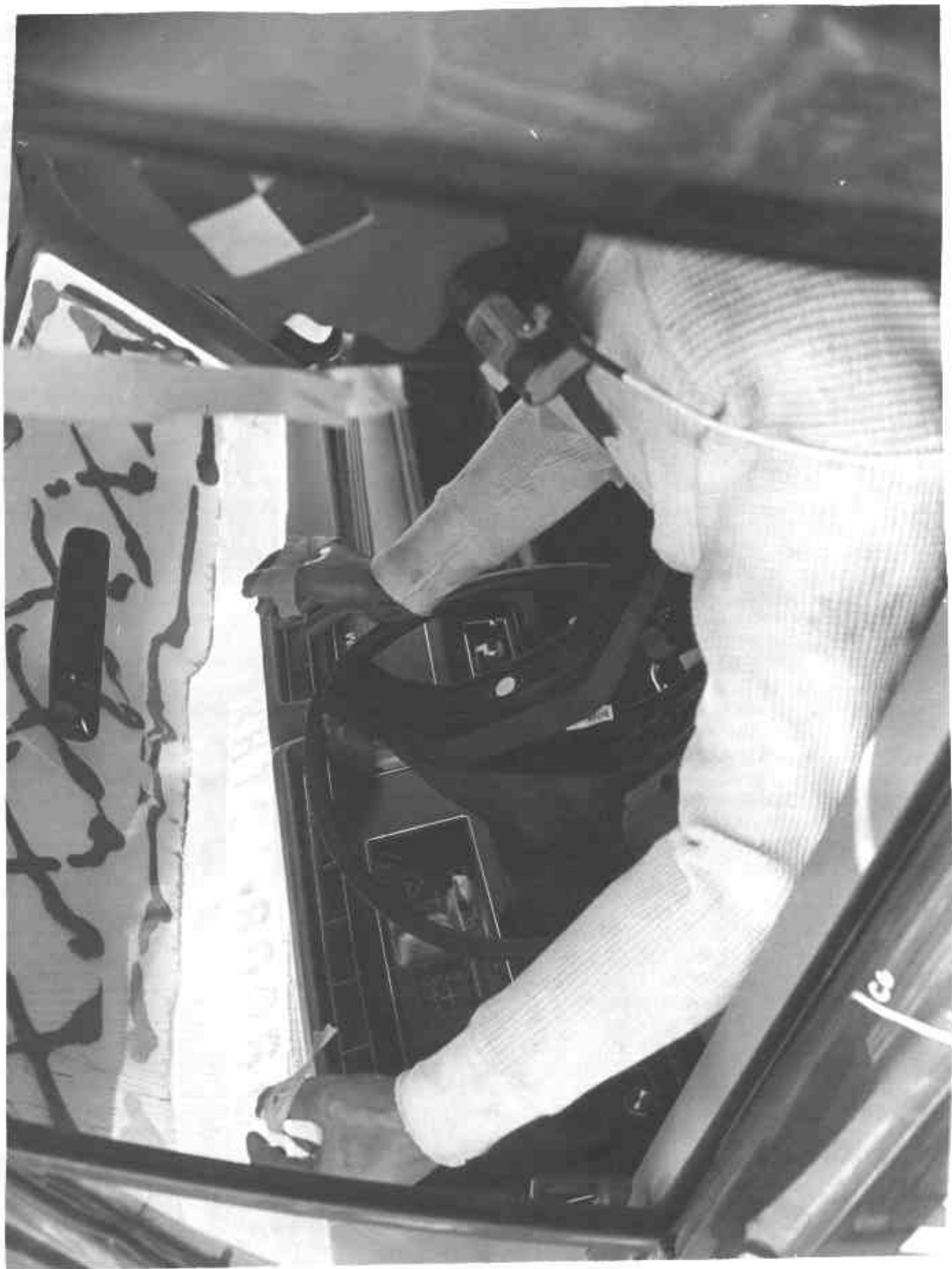
APPROVED ENGINEERING TEST LABORATORIES

Figure A-4

1980 Ford Bronco 4WD Custom Wagon

NHTSA 800606

Post-Impact, Driver Dummy Contact Area





APPROVED ENGINEERING TEST LABORATORIES

Figure A-5

1980 Ford Bronco 4WD Custom Wagon

NHTSA 800606

Post-Impact, Driver Dummy Contact Area





Figure A-6
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Post-Impact, Passenger Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure A-7
1980 Ford Bronco 4WD Custom Wagon
NHTSA 800606
Post-Impact, Passenger Dummy View





APPROVED ENGINEERING TEST LABORATORIES

APPENDIX B



APPROVED ENGINEERING TEST LABORATORIES

APPENDIX B

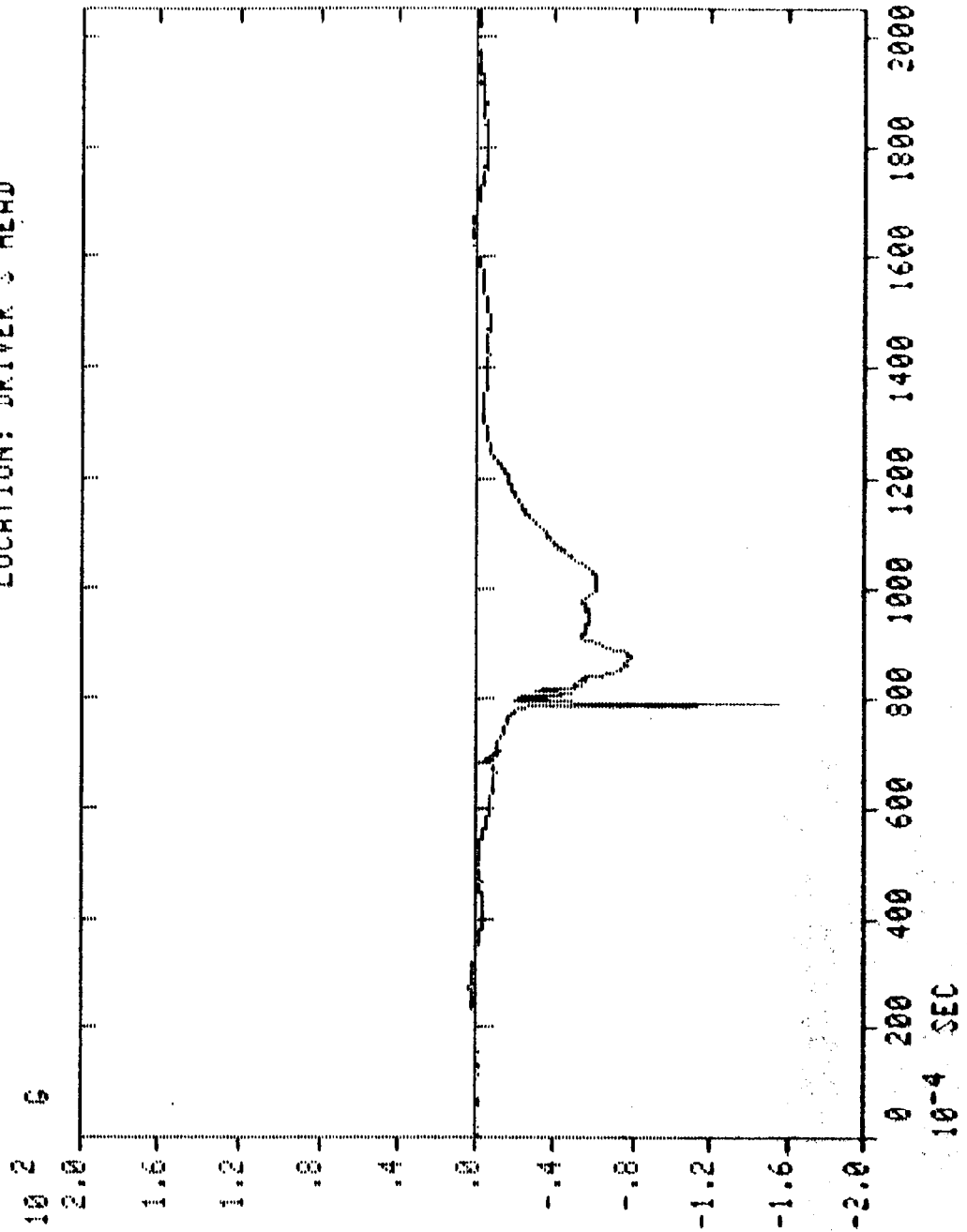
The following computer plots provide complete and comprehensive occupant response and vehicle acceleration during the frontal fixed barrier impact test of a 1980 Ford Bronco 4WD Custom Wagon, NHTSA 800606.

DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 371-3882-20
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH 1
DIRECTION: FORWARD
LOCATION: DRIVER'S HEAD

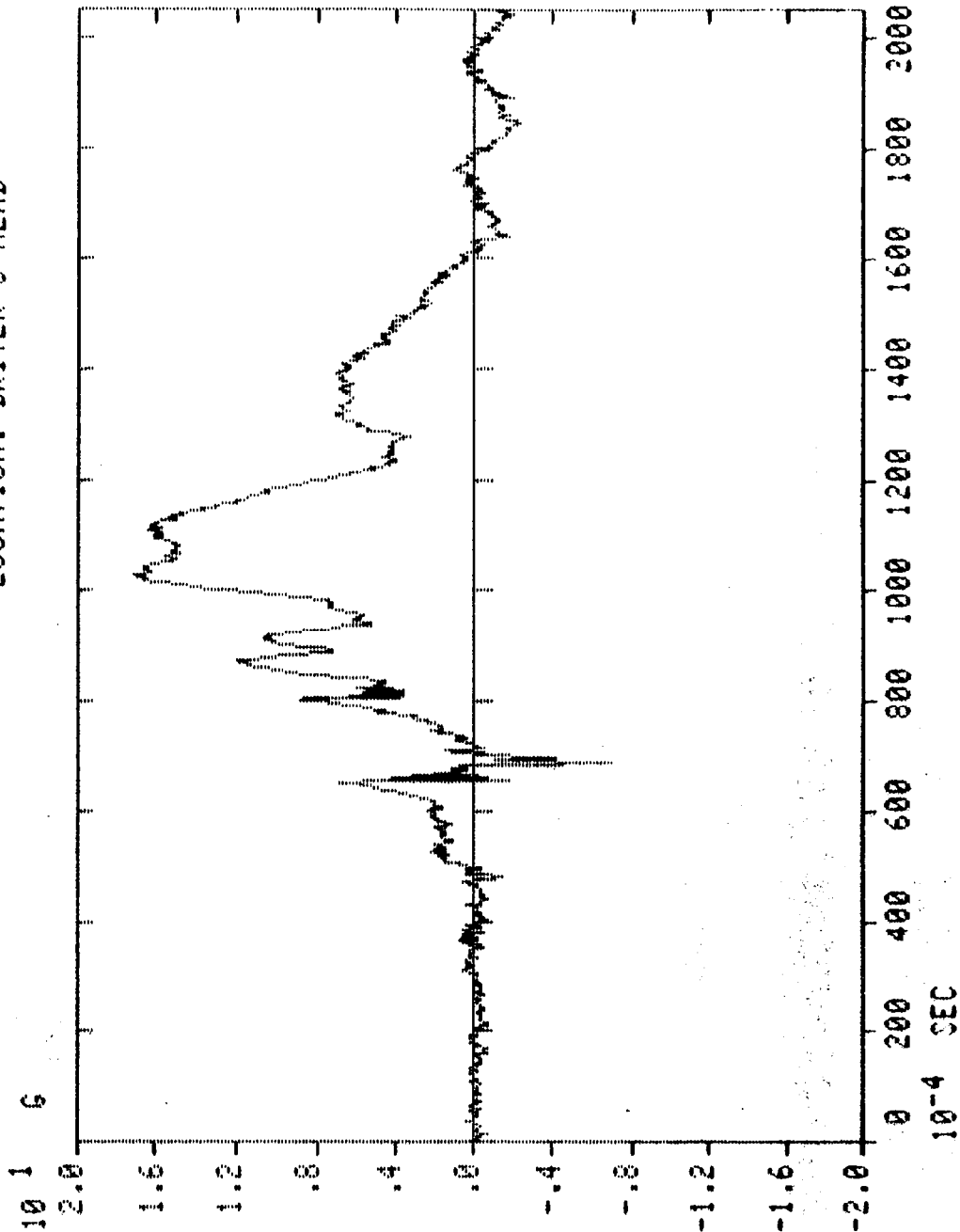


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
 FILTER: CLASS 1000
 ACCELEROMETER: TAPE 1. CH 2
 DIRECTION: LEFT
 LOCATION: DRIVER'S HEAD

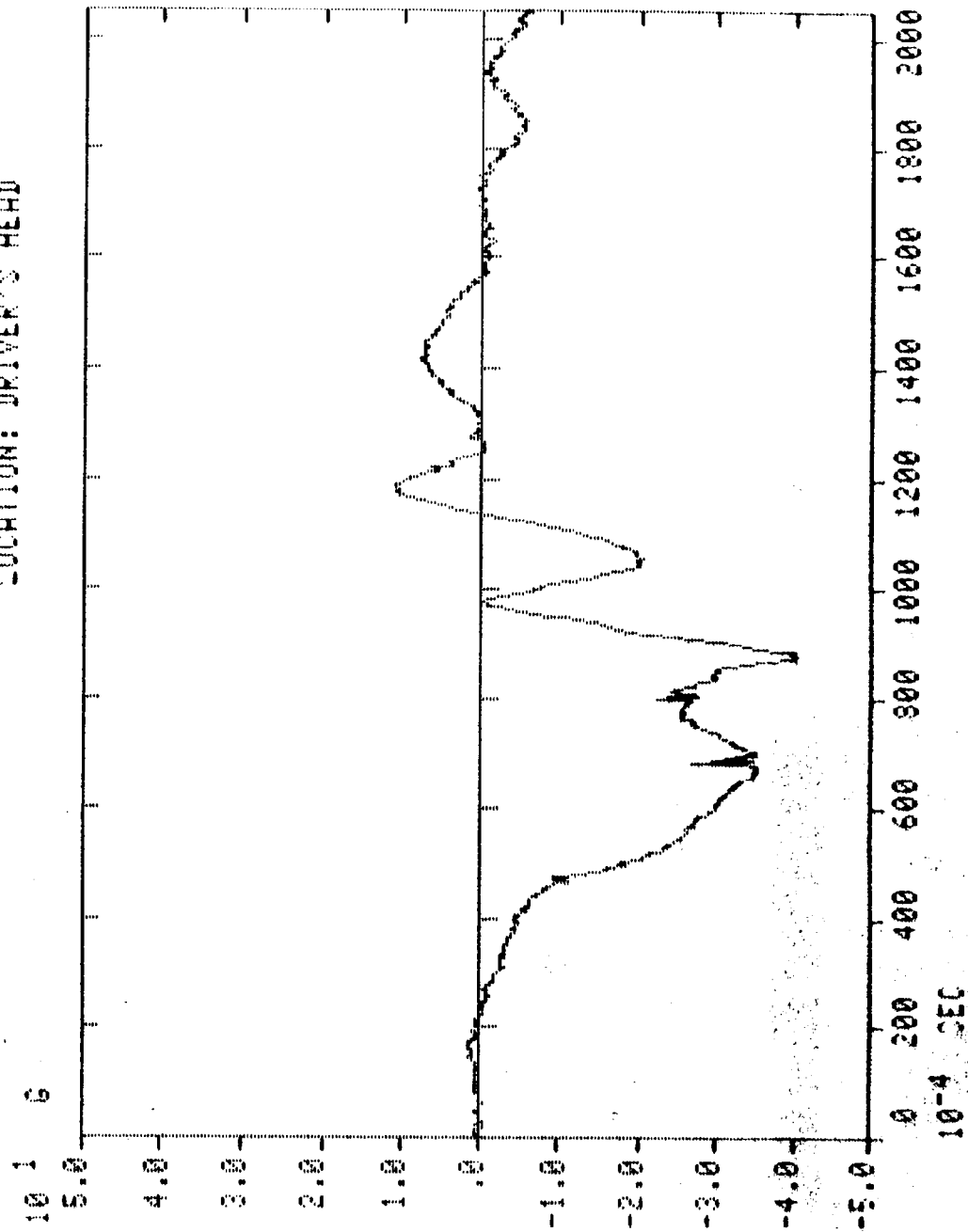


TEST TRACK REPORT

REPORTED ENGINEERING TEST DATA

VEHICLE: FORD BRONCO
VEHICLE ID: NHTCA 200606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

WJO NO.: 871-3882-20
FILTER: CLACC 1000
ACCELEROMETER: TAPE 1. CH 3
DIRECTION: UPWARD
LOCATION: DRIVER'S HEAD

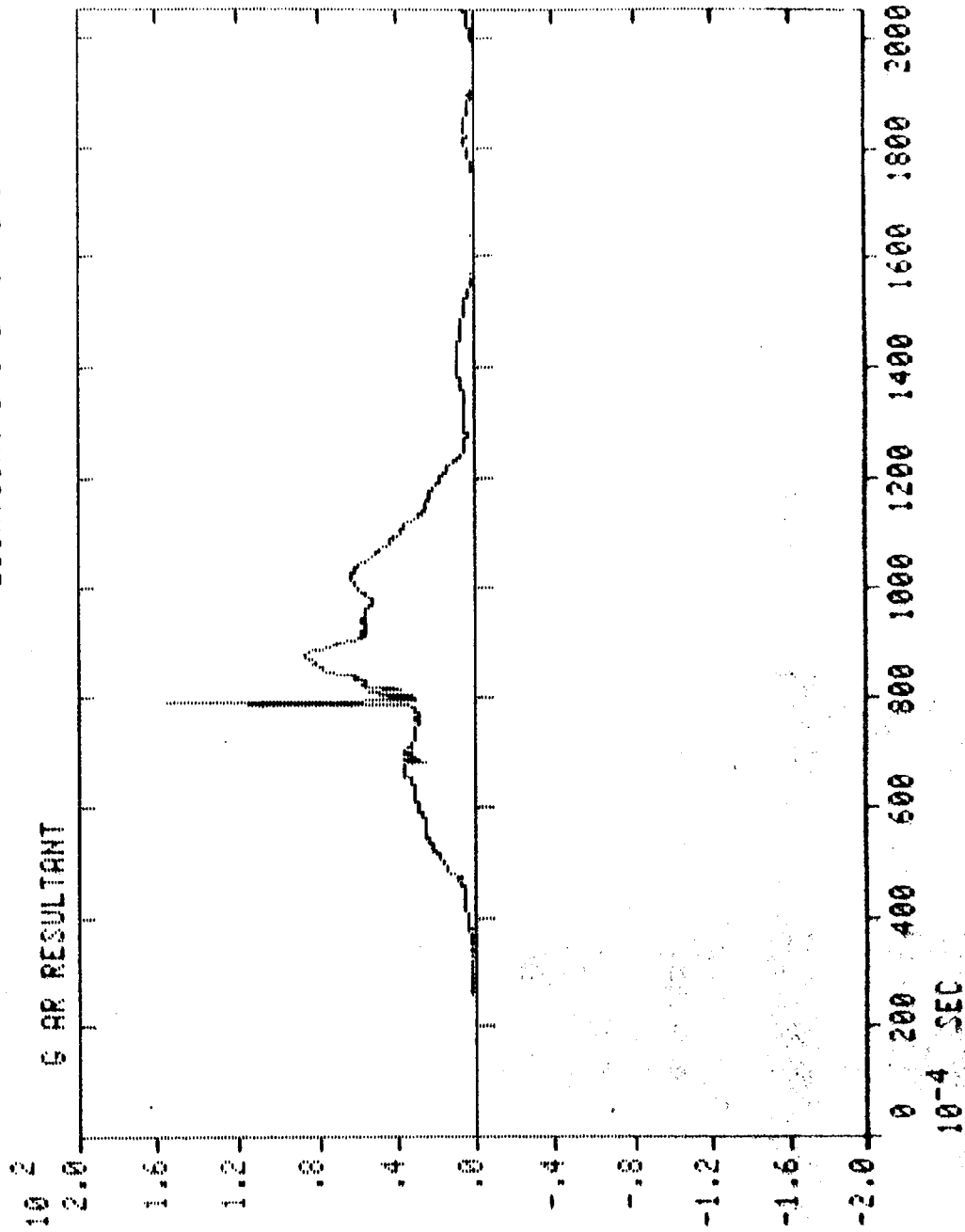


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST PROC

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO. : 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

WJO NO. : 871-3892-20
 FILTER : CLACC 1000
 ACCELEROMETER: TAPE 1.1-3
 DIRECTION : RESULTANT X/Y
 LOCATION: DRIVER'S HEAD



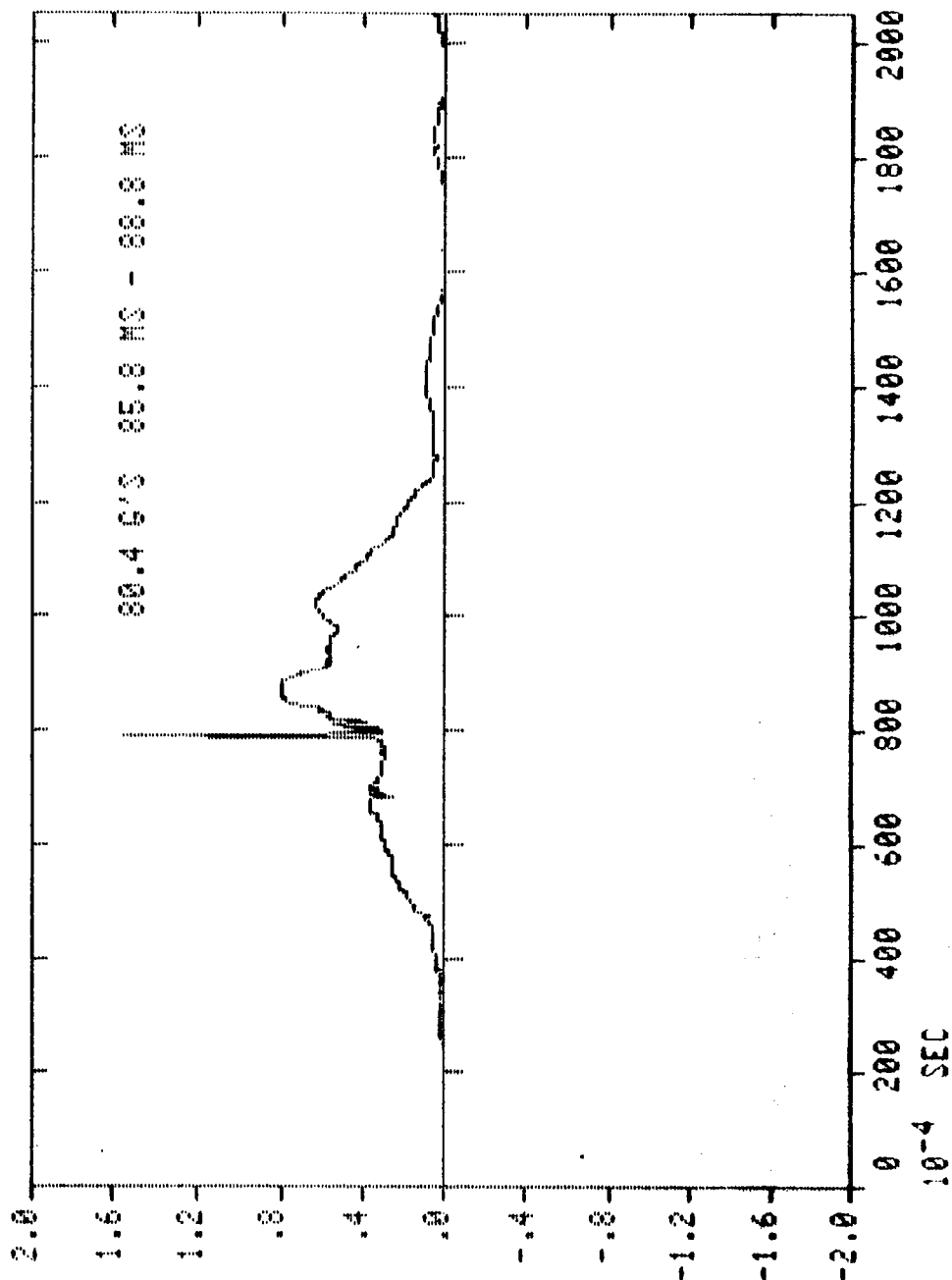
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
VEHICLE ID: NHTCA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH 1-3
DIRECTION: RESULTANT OF XYZ
LOCATION: DRIVER'S HEAD

10 2 G AR RESULTANT

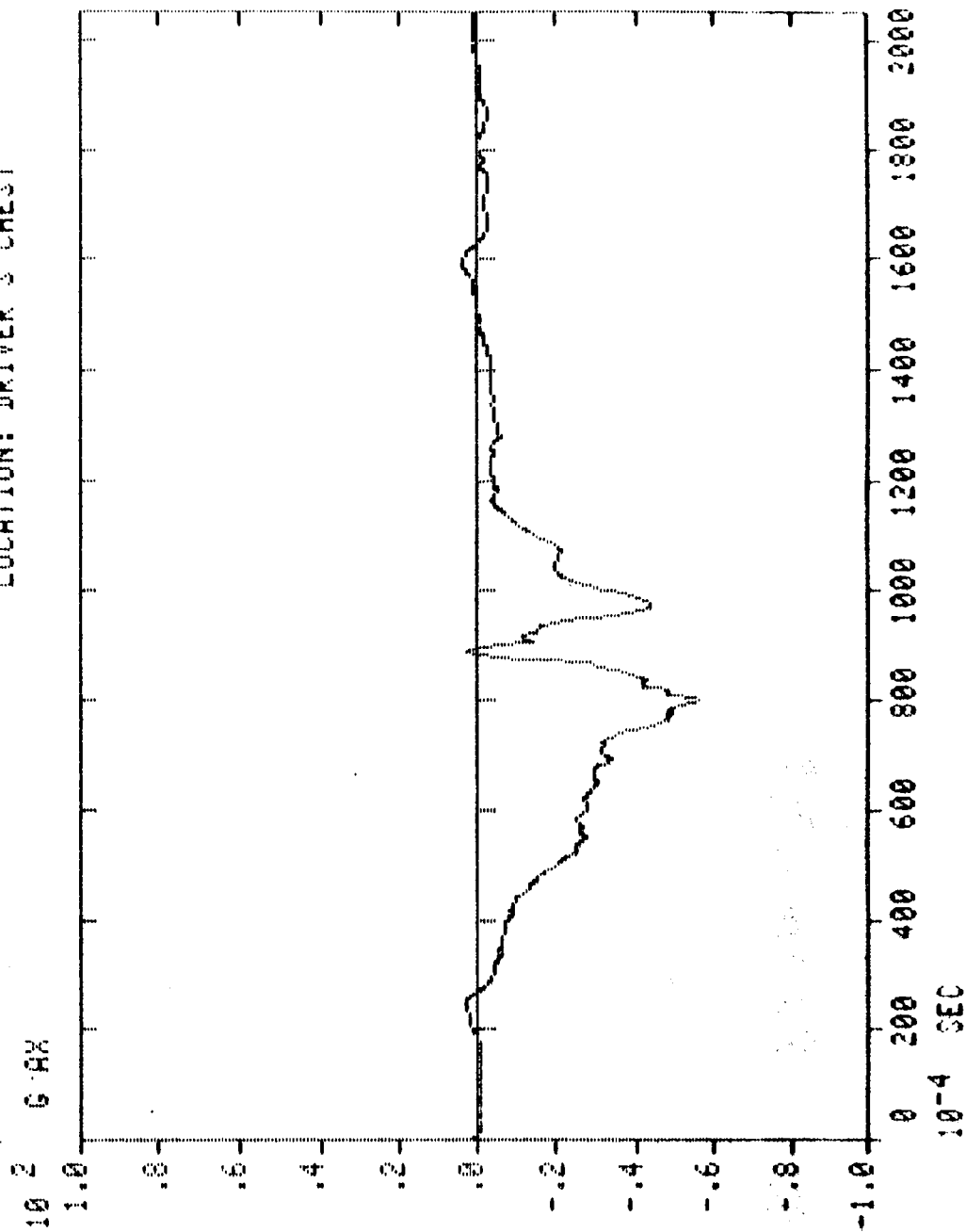


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 571-3882-20
FILTER: CLASS 100
ACCELEROMETER: TAPE 1. CH 5
DIRECTION: FORWARD
LOCATION: DRIVER'S CHEST

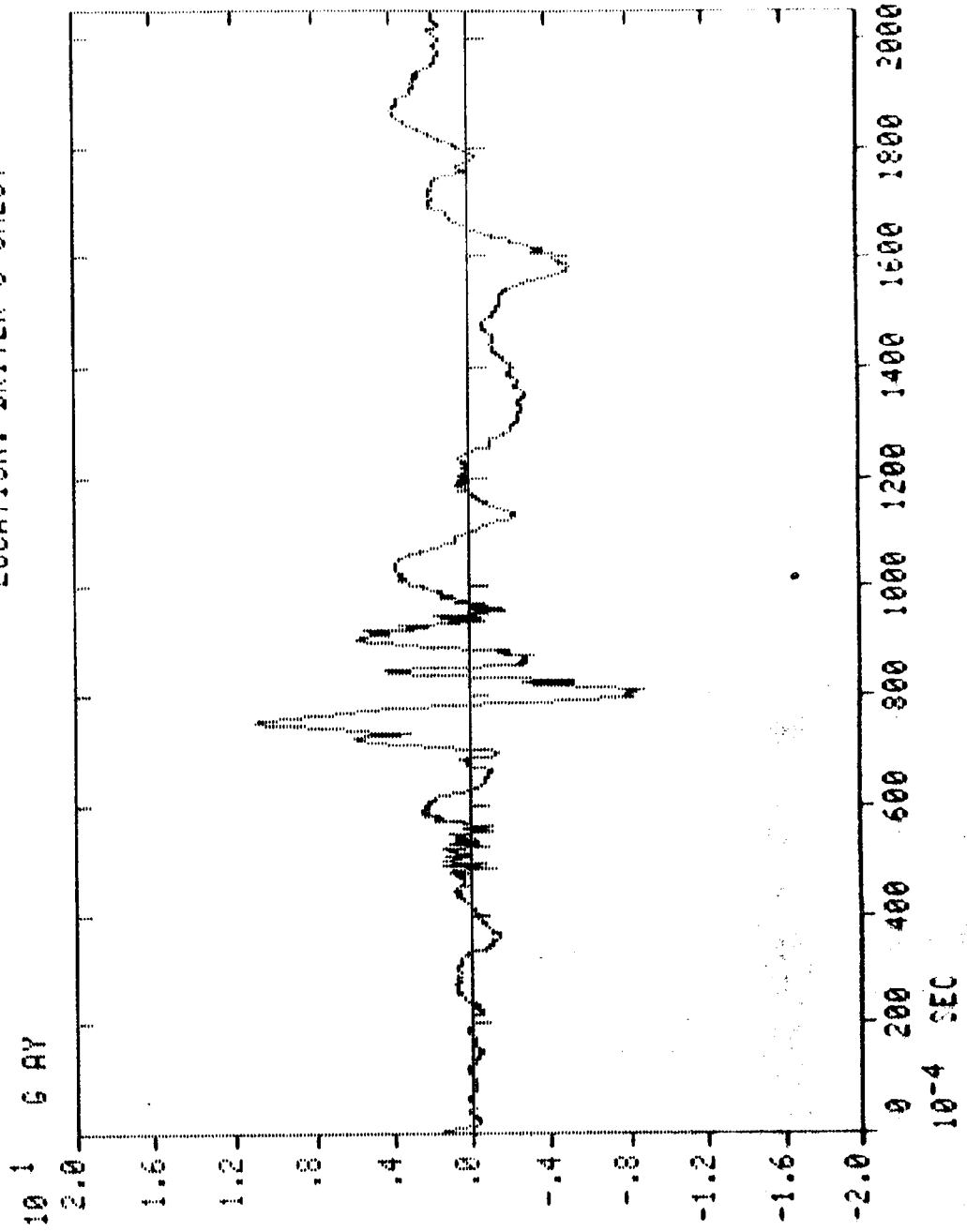


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST CASE

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 871-2882-20
FILTER: CLASS 120
ACCELEROMETER: TAPE 1. CH 1
DIRECTION: LEFT
LOCATION: DRIVER'S CHEST

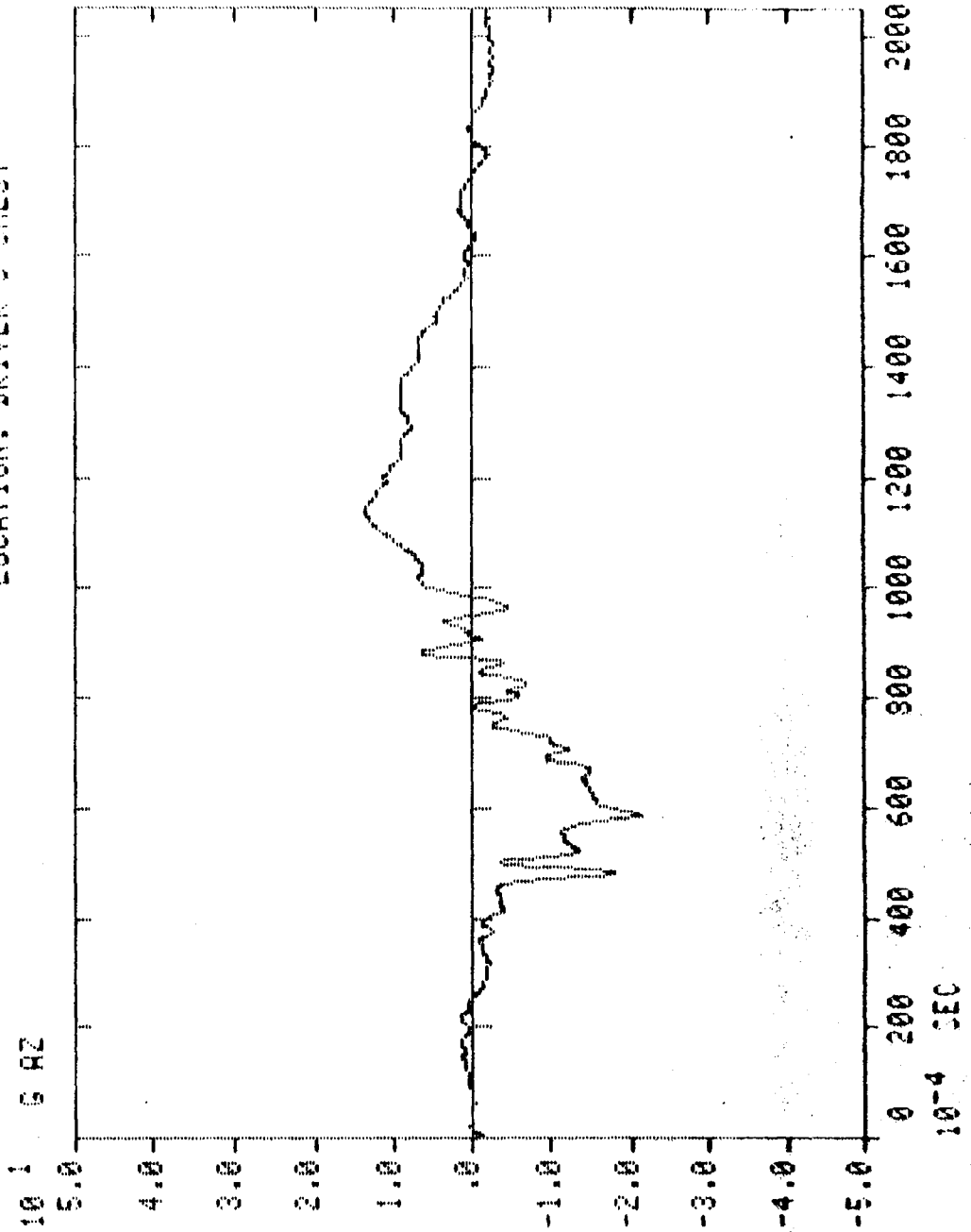


111 CRASH 250922M

APPROX SE ENGINEERING TEST 123

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 900606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MUO NO.: 871-3822-22
FILTER: CLASS 150
ACCELEROMETER: TAPE 1. 1A
DIRECTION: UPWARD
LOCATION: DRIVER'S CHEST



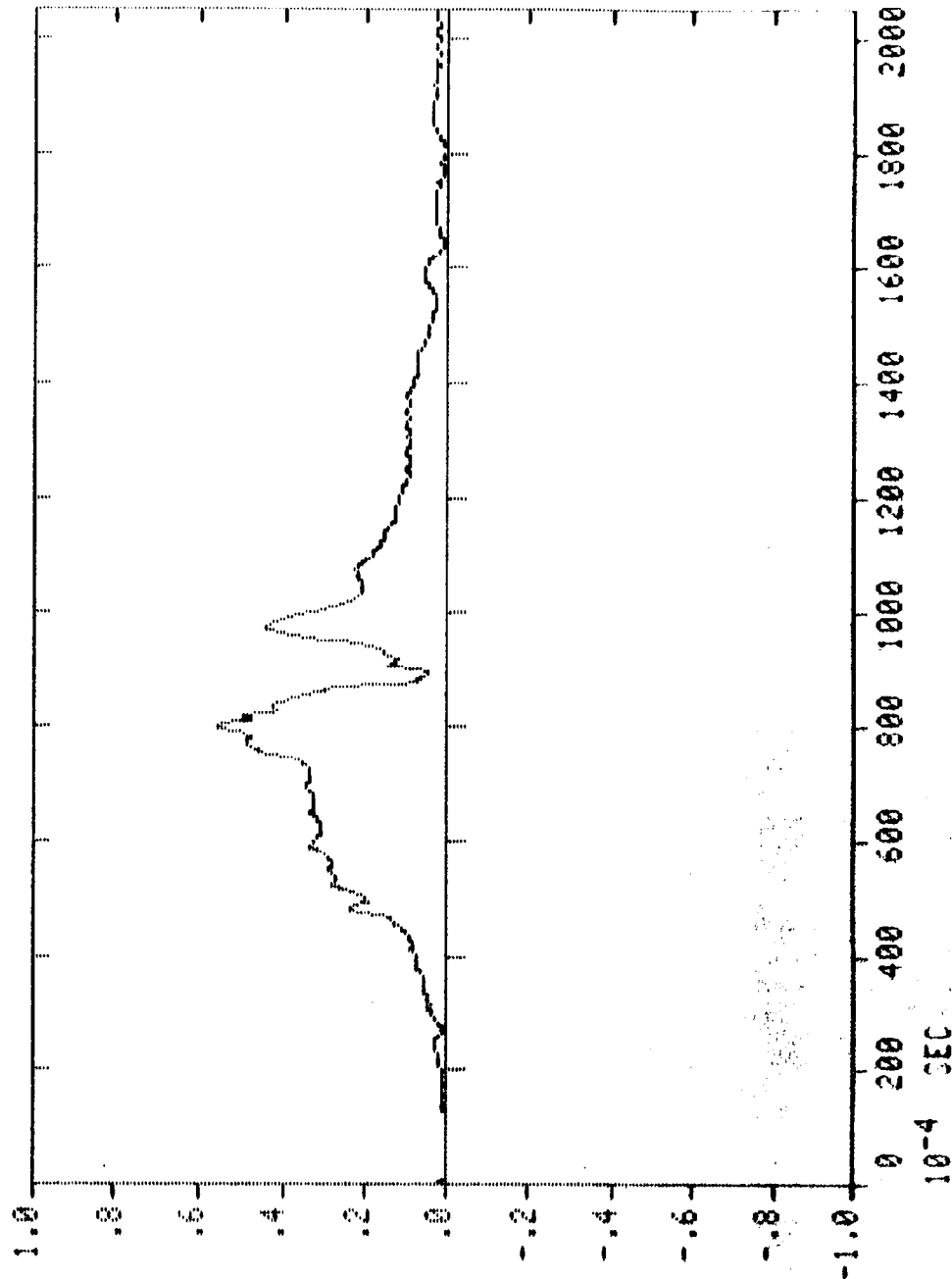
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST 1233

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

WJC NO.: 771-3282-20
 FILTER: CLASS 130
 ACCELEROMETER: TAPE 1, CH 5-7
 DIRECTION: RESULTANT OF XYZ
 LOCATION: DRIVER'S CHEST

10 2 G AR RESULTANT



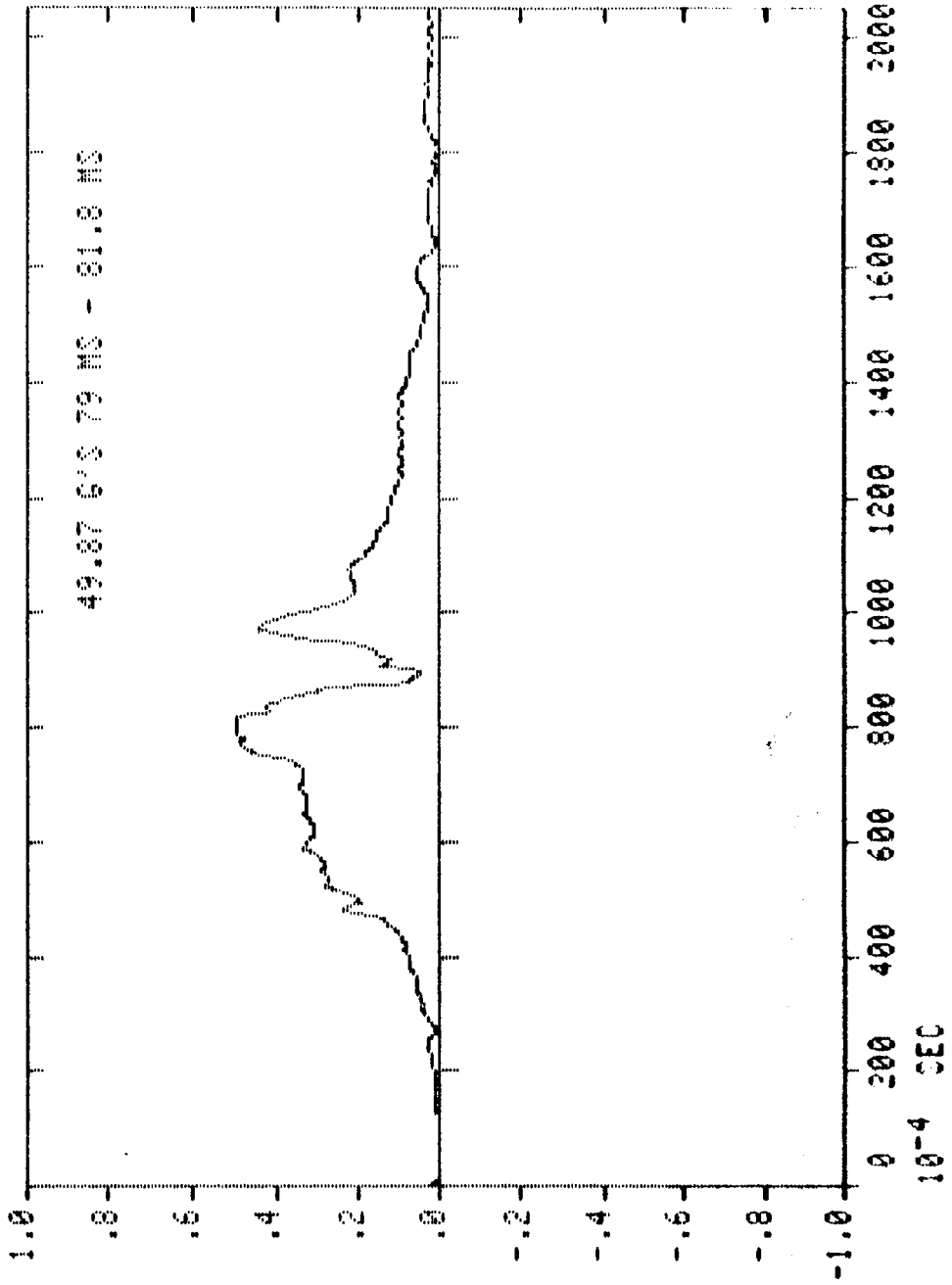
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST - 123

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 371-3882-20
 FILTER: CLACC 100
 ACCELEROMETER: TAPE 1. CH 5-7
 DIRECTION: RESULTANT OF XYZ
 LOCATION: DRIVER'S CHEST

10 2 G AR RESULTANT

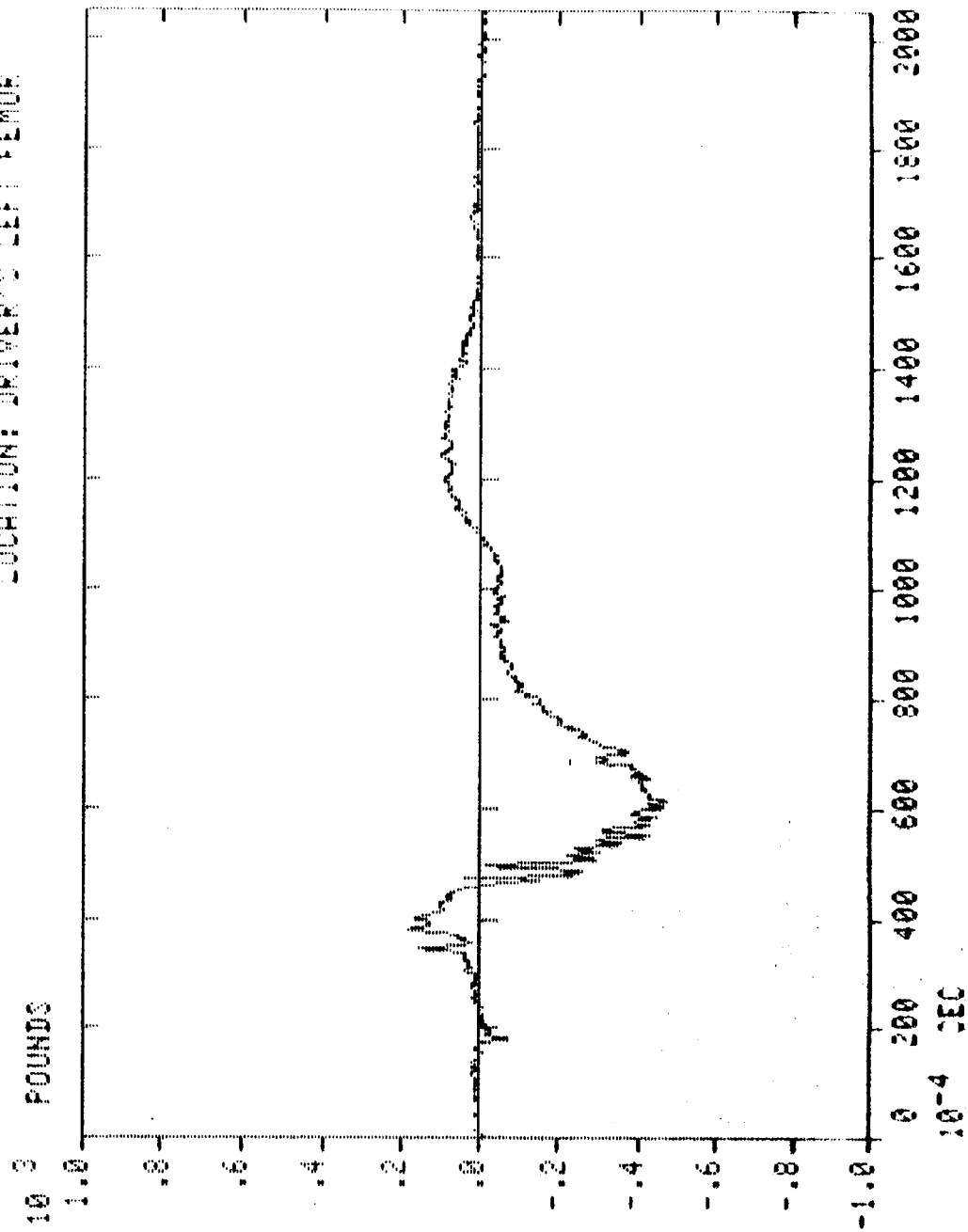


CRASH PROGRAM

APPROVED BY: [illegible]

VEHICLE: FORD BRONCO
VEHICLE ID: WHTCA 380606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

WTO NO.: 371-2382-20
FILTER: CLASS 400
LOAD CELL: TAPE 1, 2, 3
DIRECTION: TENSION
LOCATION: DRIVER'S LEFT FEMUR

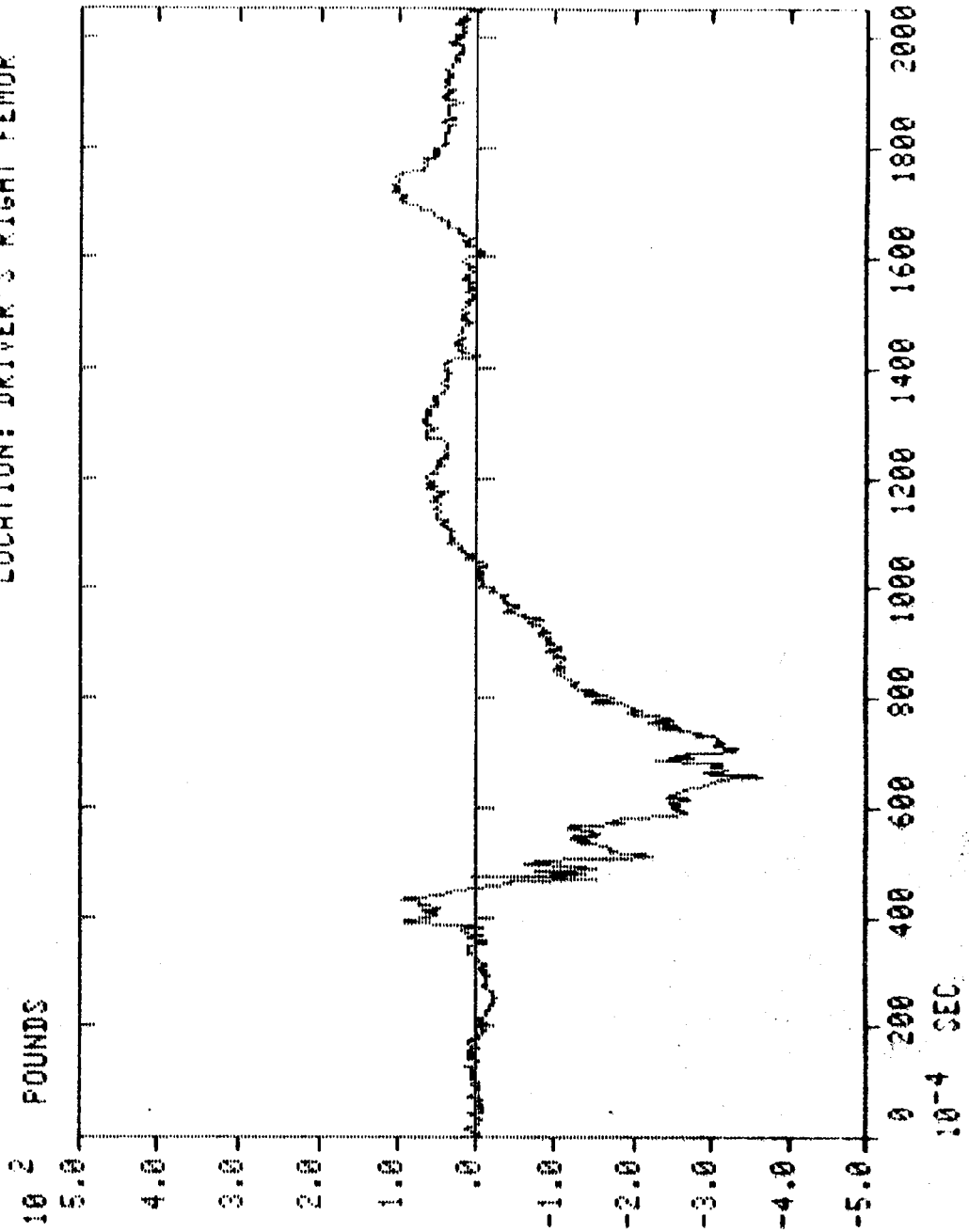


100 CRASH PROGRAM

APPROVED ENGINEERING TEST - 000

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
 FILTER: CLASS 600
 LOAD CELL: TAPE 1, CH 4
 DIRECTION: TENSION
 LOCATION: DRIVER'S RIGHT FEMUR

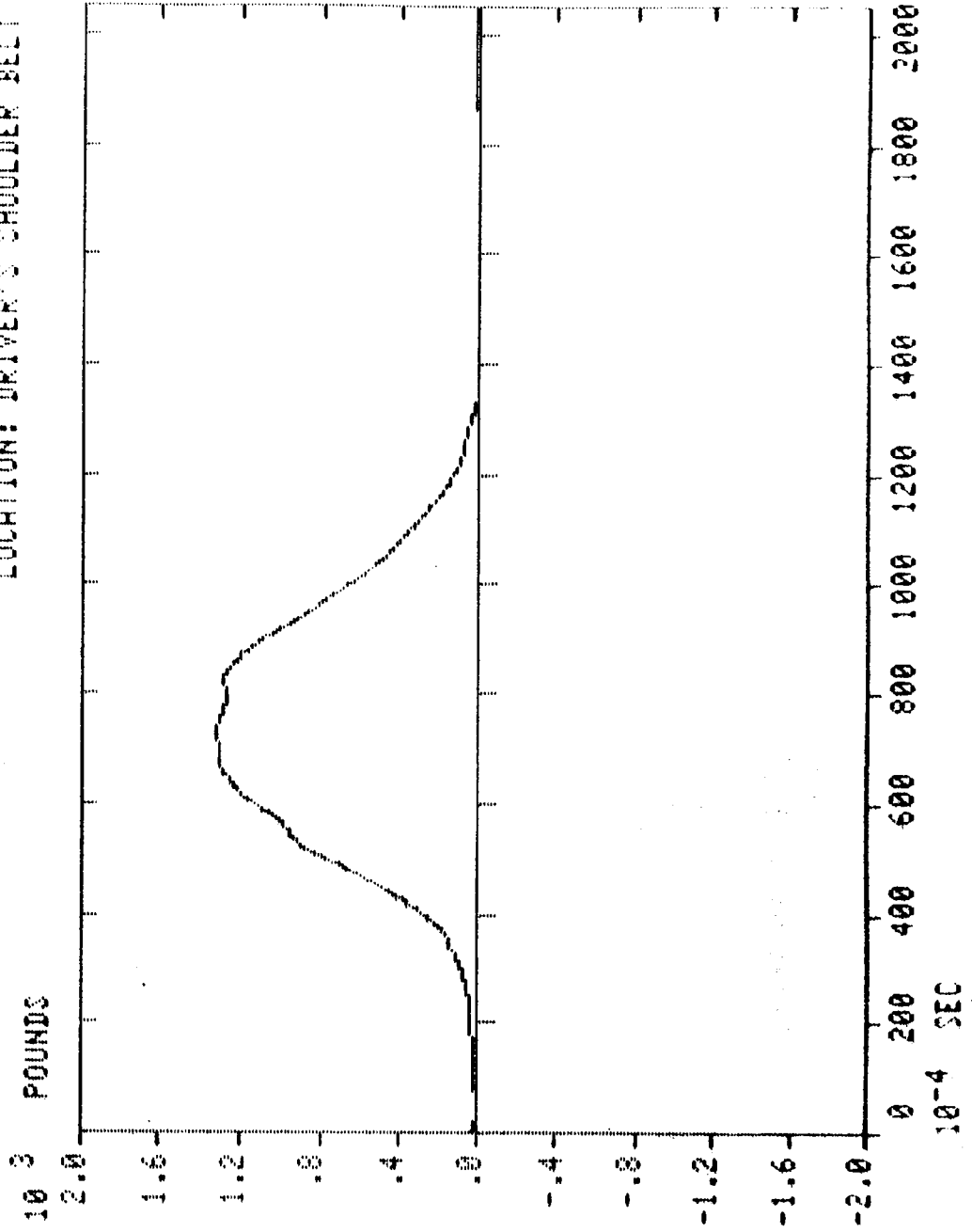


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

WJO NO.: 971-3982-20
 FILTER: CLACC 50
 LOAD CELL: TAPE 1, CH 3
 DIRECTION: TENCION
 LOCATION: DRIVER'S SHOULDER BELT

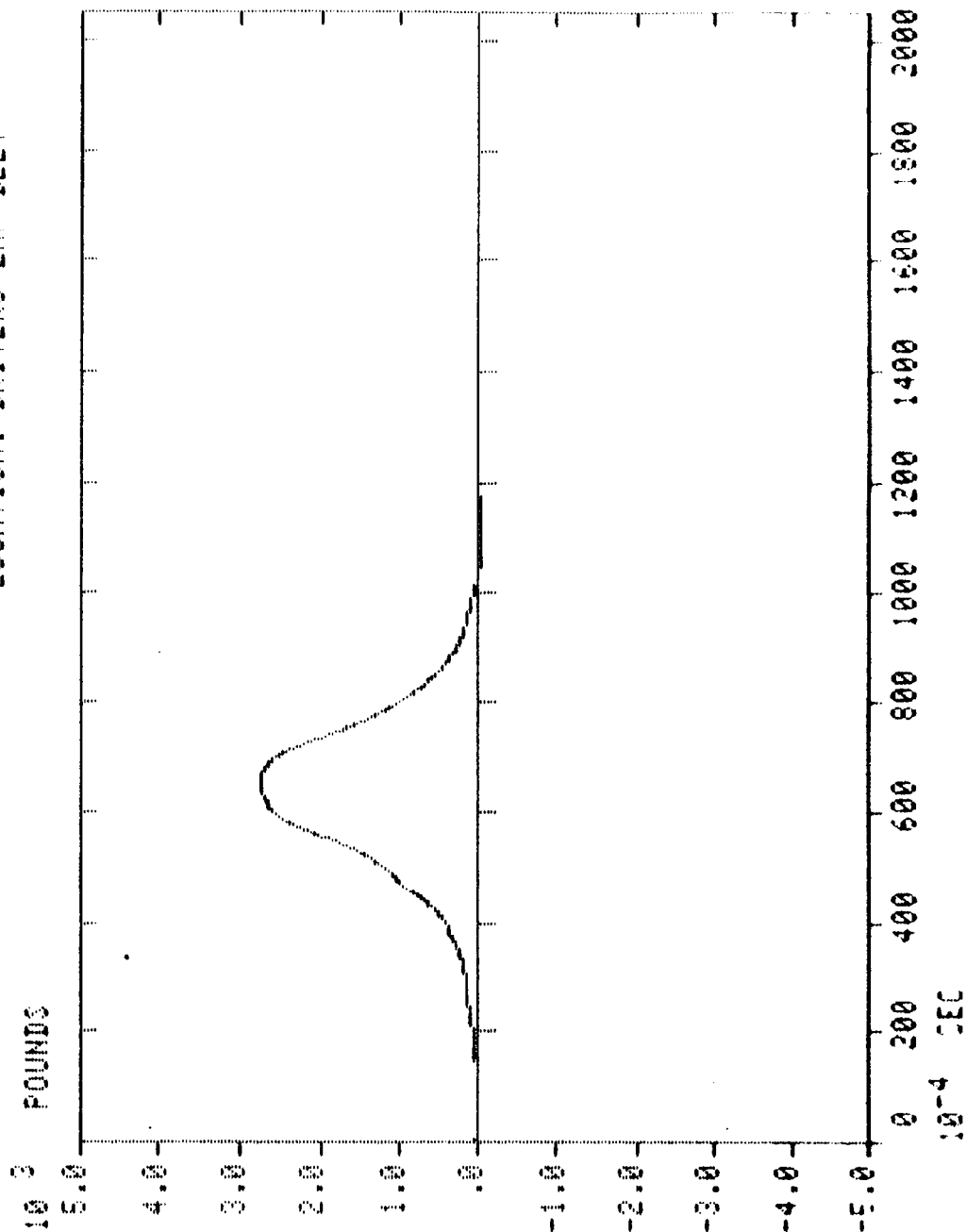


111 CRASH 880808

880808 880808 880808

VEHICLE: FORD 850400
VEHICLE ID: WHITA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MTC NO.: 11-1980-00
FILTER: CLASS 10
LOAD CELL: TAPE : CM 10
DIRECTION: TENSION
LOCATION: DRIVERS LAP BELT

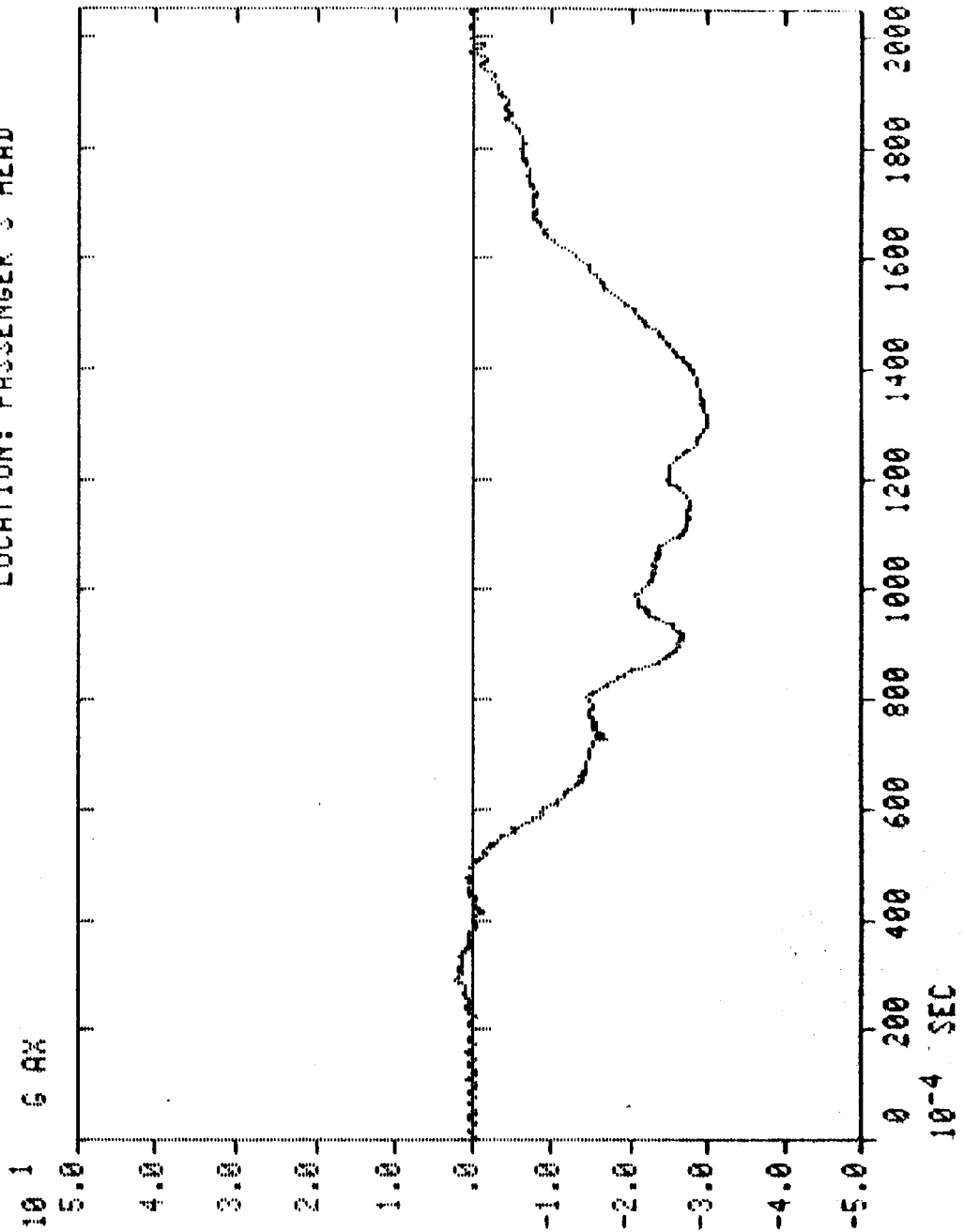


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAEC

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 1
DIRECTION: FORWARD
LOCATION: PASSENGER'S HEAD

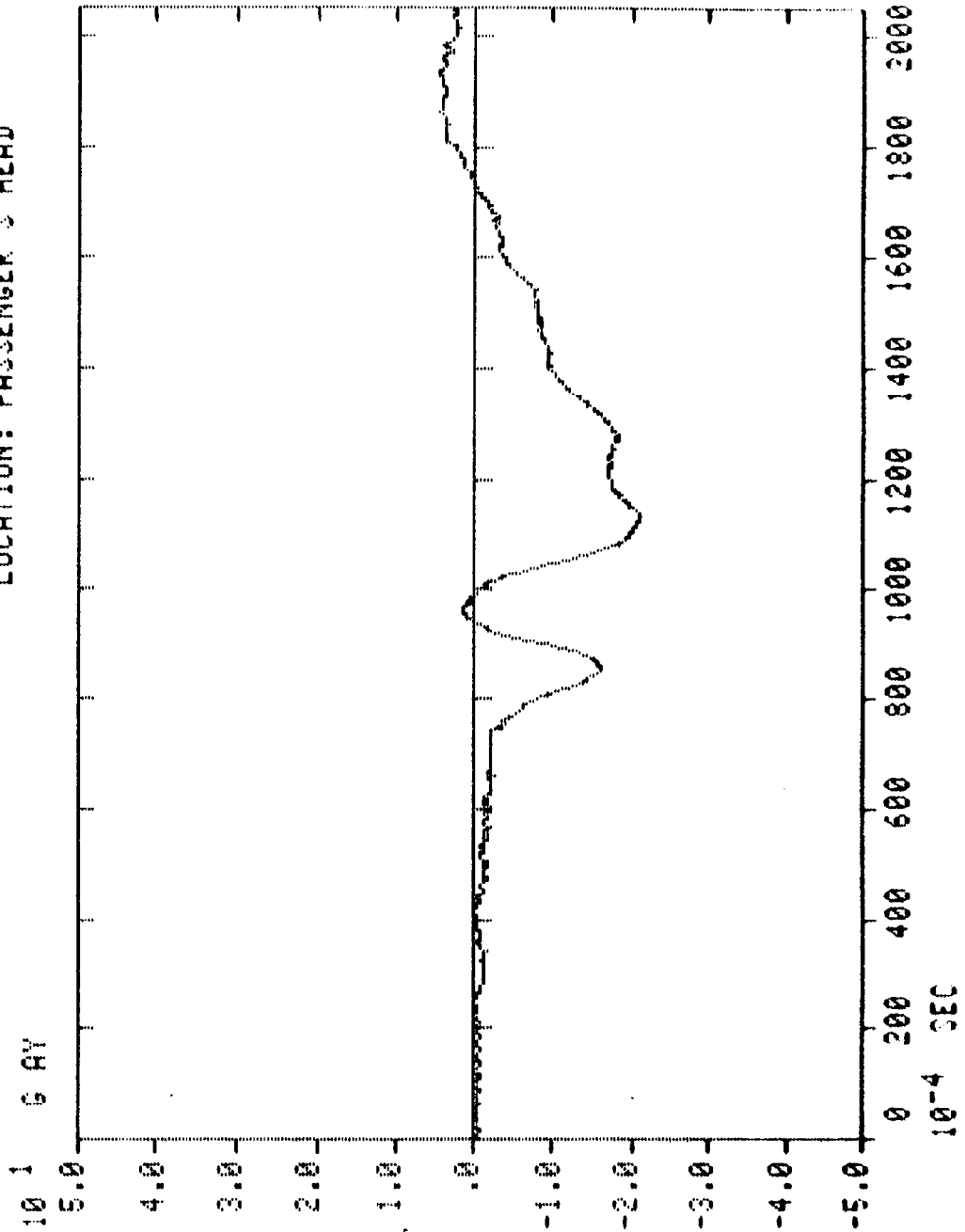


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
 FILTER: CLASS 1000
 ACCELEROMETER: TAPE 2, CH 2
 DIRECTION: LEFT
 LOCATION: PASSENGER'S HEAD

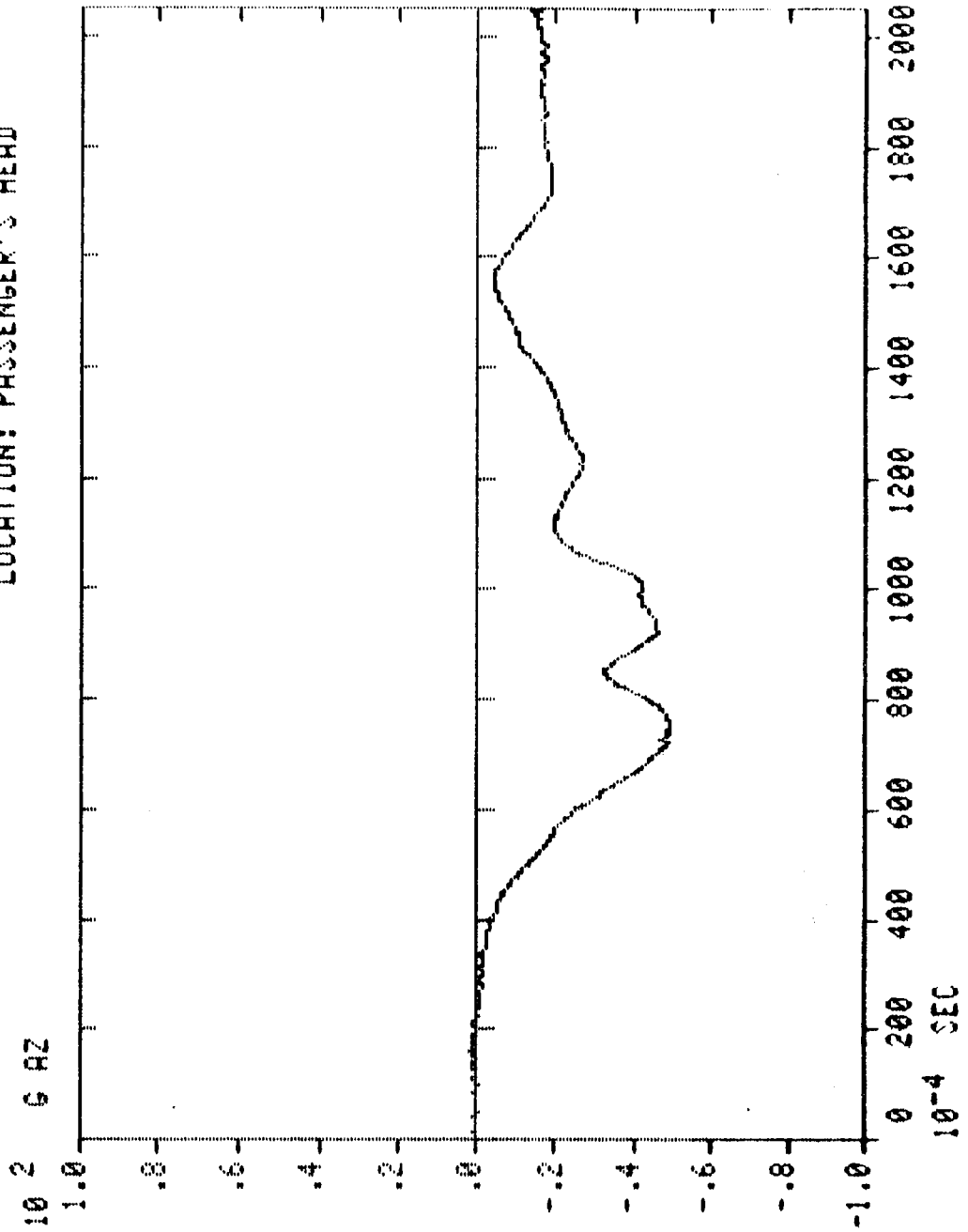


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 371-3882-20
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2. CH 3
DIRECTION: UPWARD
LOCATION: PASSENGER'S HEAD



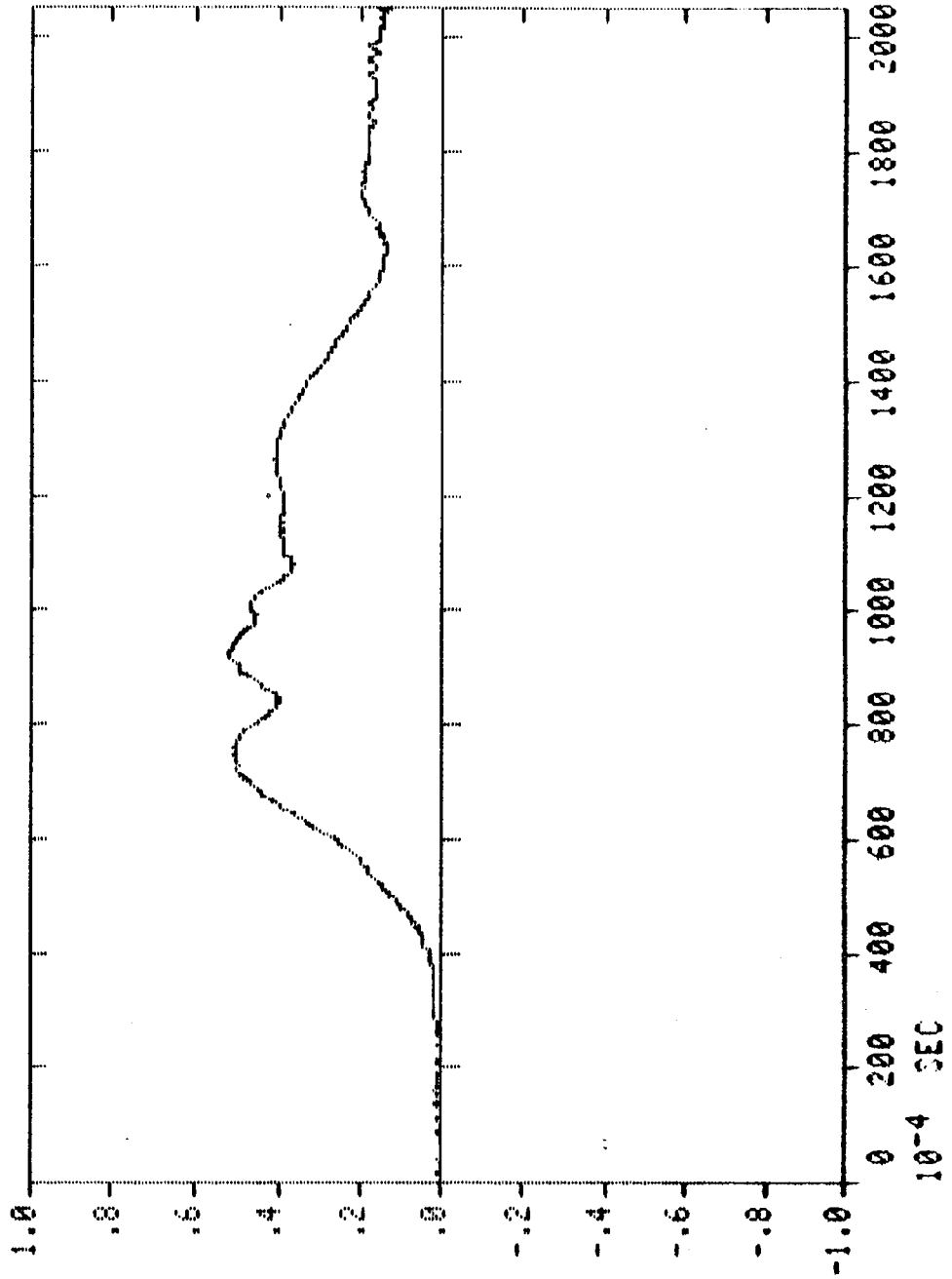
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
 FILTER: CLASS 1000
 ACCELEROMETER: TAPE 2, CH 1-3
 DIRECTION: RESULTANT OF XYZ
 LOCATION: PASSENGER'S HEAD

10 2 G AR RESULTANT



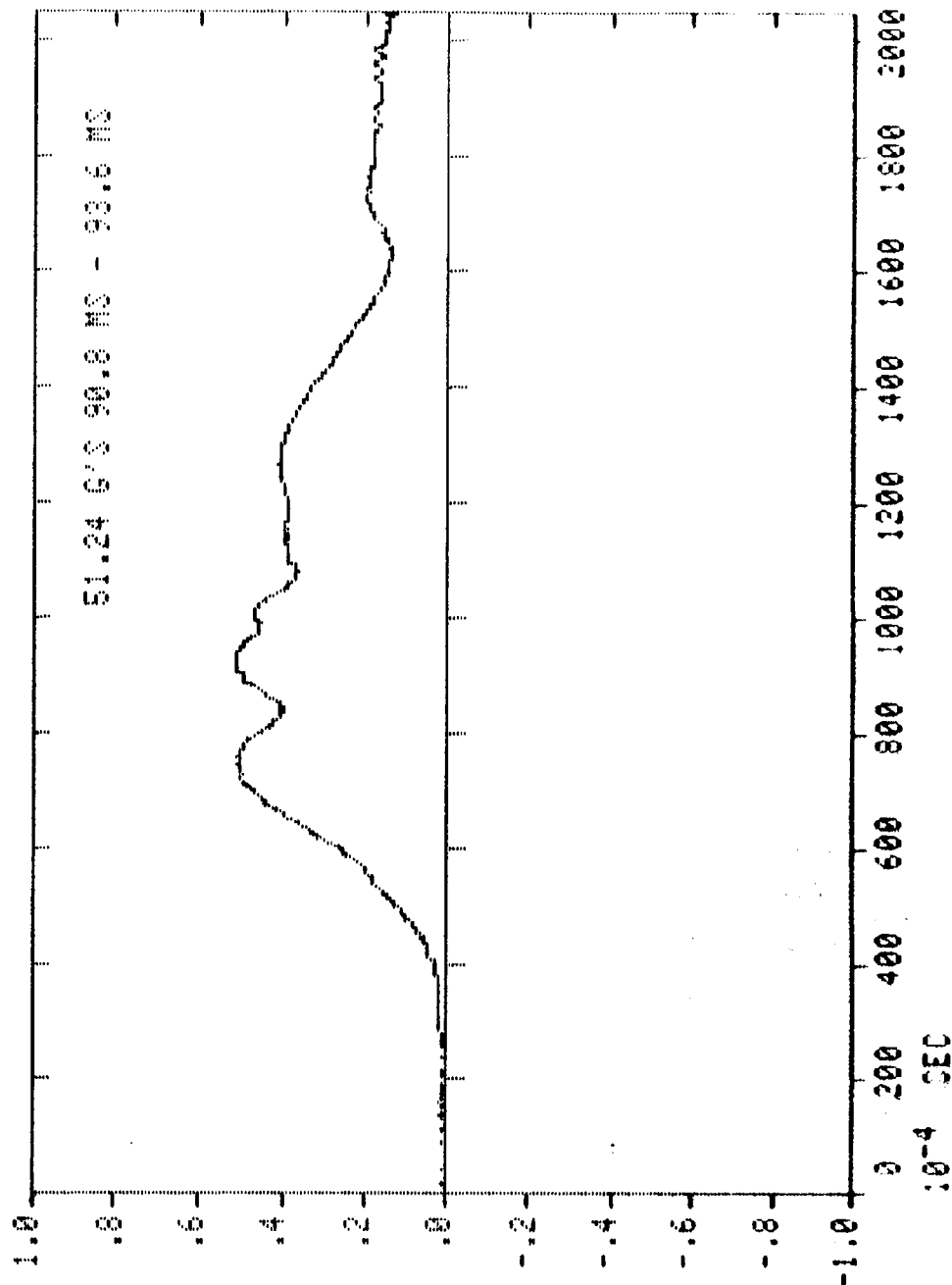
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-2882-20
 FILTER: CLASS 1000
 ACCELEROMETER: TAPE 2, CH 1-3
 DIRECTION: RESULTANT OF VTC
 LOCATION: PASSENGER'S HEAD

10 2 G AR RESULTANT

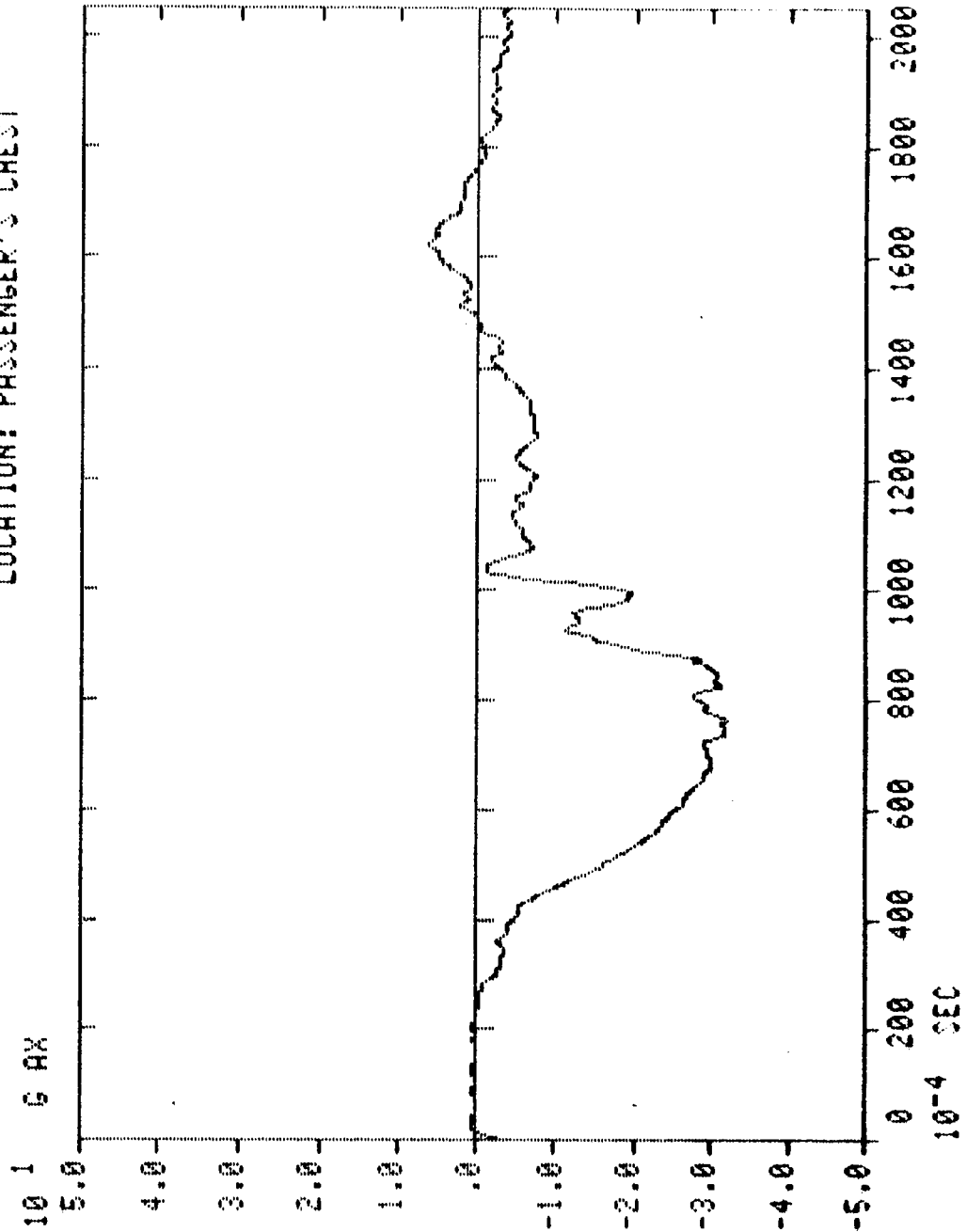


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABEL

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
 FILTER: CLASS 180
 ACCELEROMETER: TAPE 2, CH 5
 DIRECTION: FORWARD
 LOCATION: PASSENGER'S CHEST

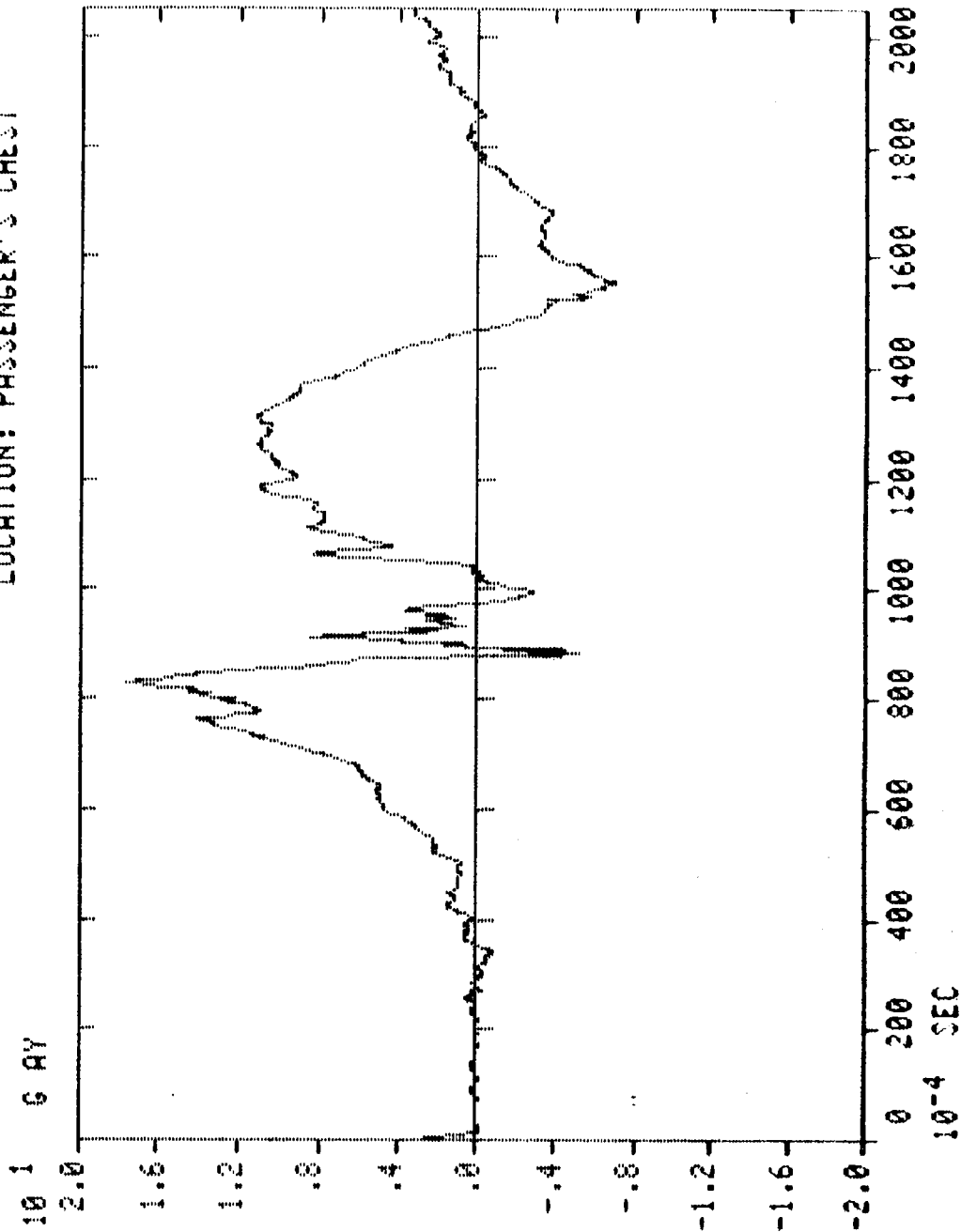


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABEL

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 371-3882-20
 FILTER: CLASS 180
 ACCELEROMETER: TAPE: 2, CH 6
 DIRECTION: LEFT
 LOCATION: PASSENGER'S CHEST

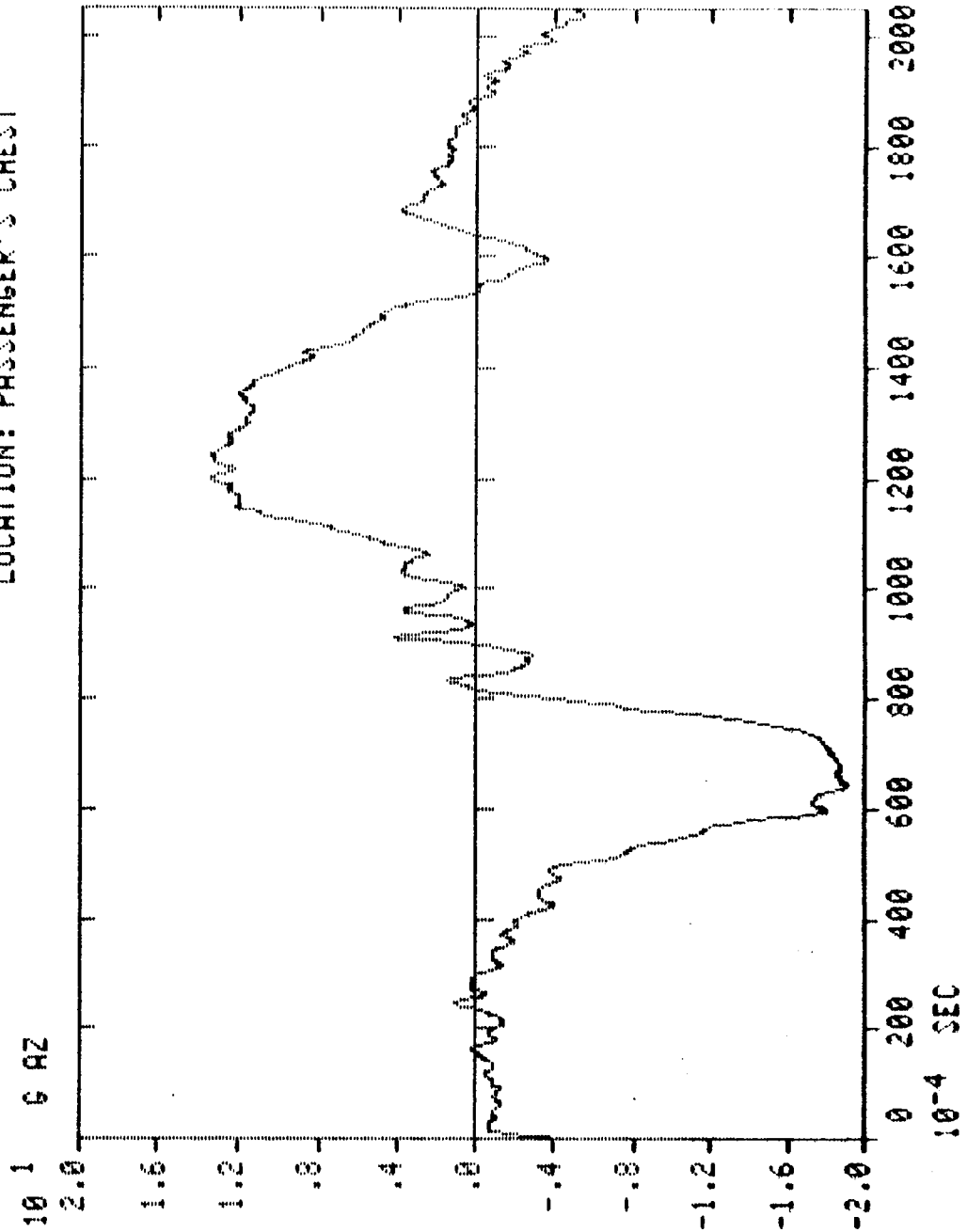


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
FILTER: CLASS 100
ACCELEROMETER: TAPE 2, CH 7
DIRECTION: UPWARD
LOCATION: PASSENGER'S CHEST

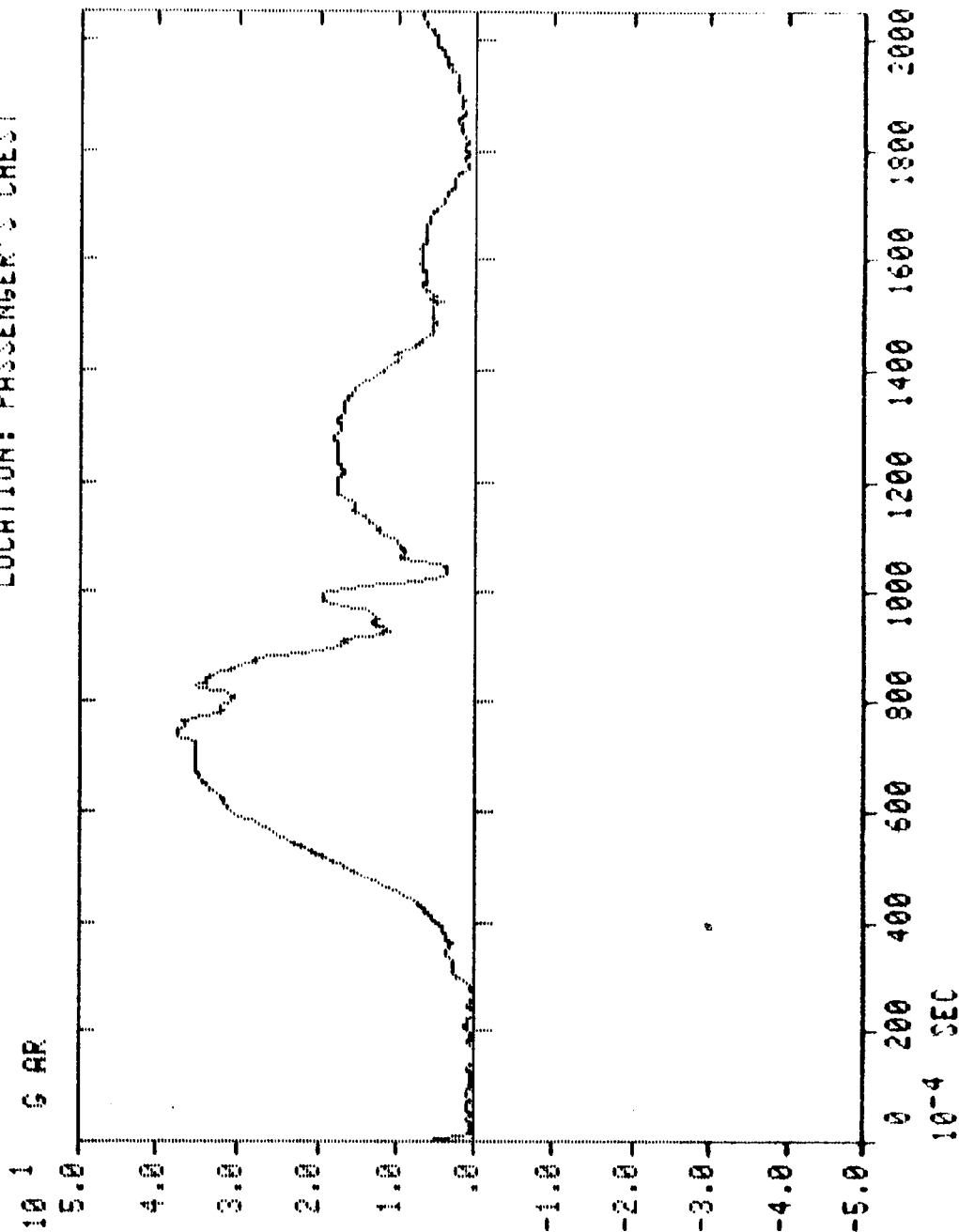


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST CASE

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 871-3882-20
 FILTER: CLASS 1000
 ACCELEROMETER: TAPE 2, CH 5-7
 DIRECTION: RESULTANT OF XYZ
 LOCATION: PASSENGER'S CHEST

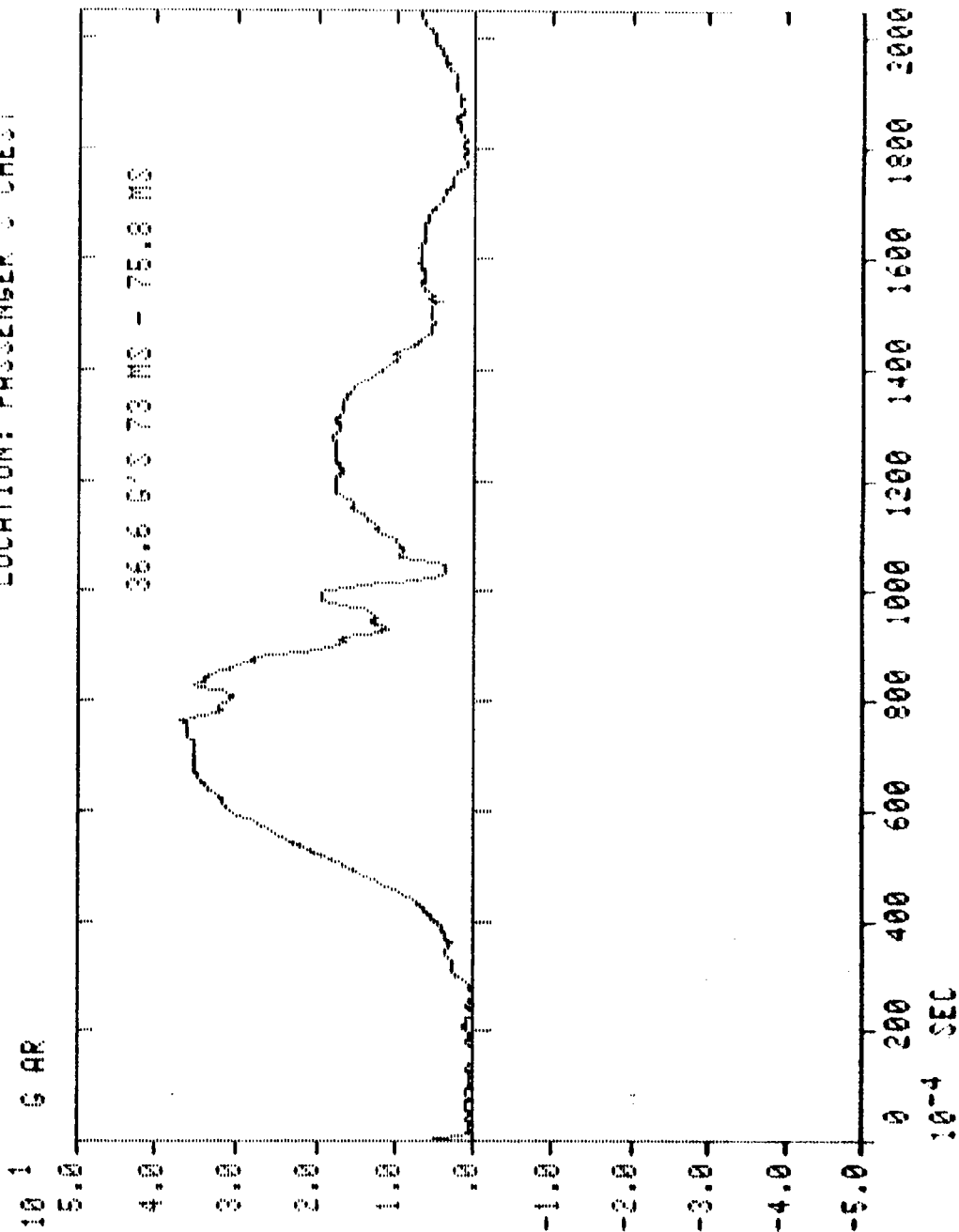


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST CASE

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 200606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3822-20
 FILTER: CLACC 1000
 ACCELEROMETER: TAPE 3. CH 5--
 DIRECTION: RESULTANT OF VVE
 LOCATION: PASSENGER'S CHEST

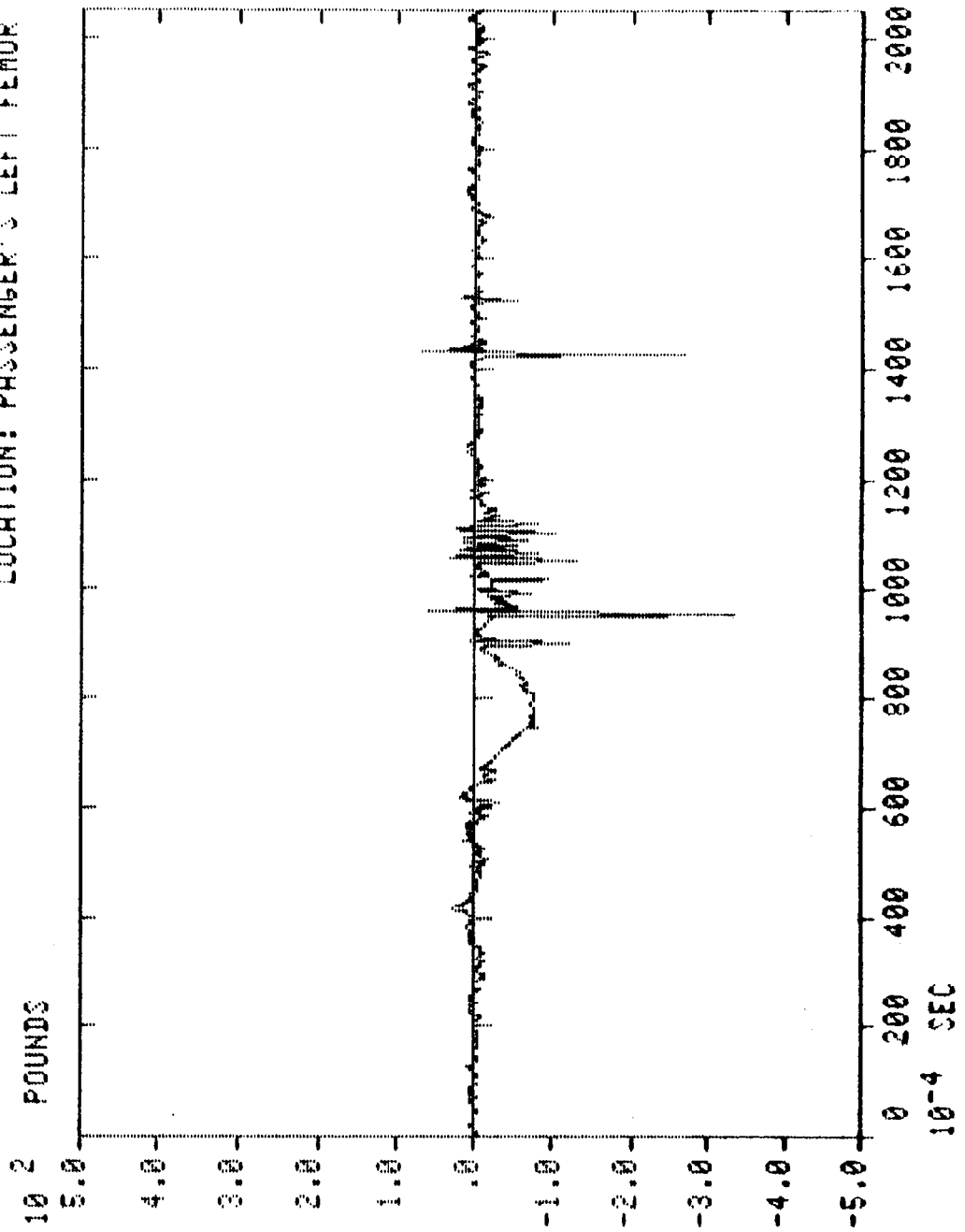


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 371-2882-20
FILTER: CLASS 600
LOAD CELL: TAPE 2, CH 8
DIRECTION: TENSION
LOCATION: PASSENGER'S LEFT FEMUR

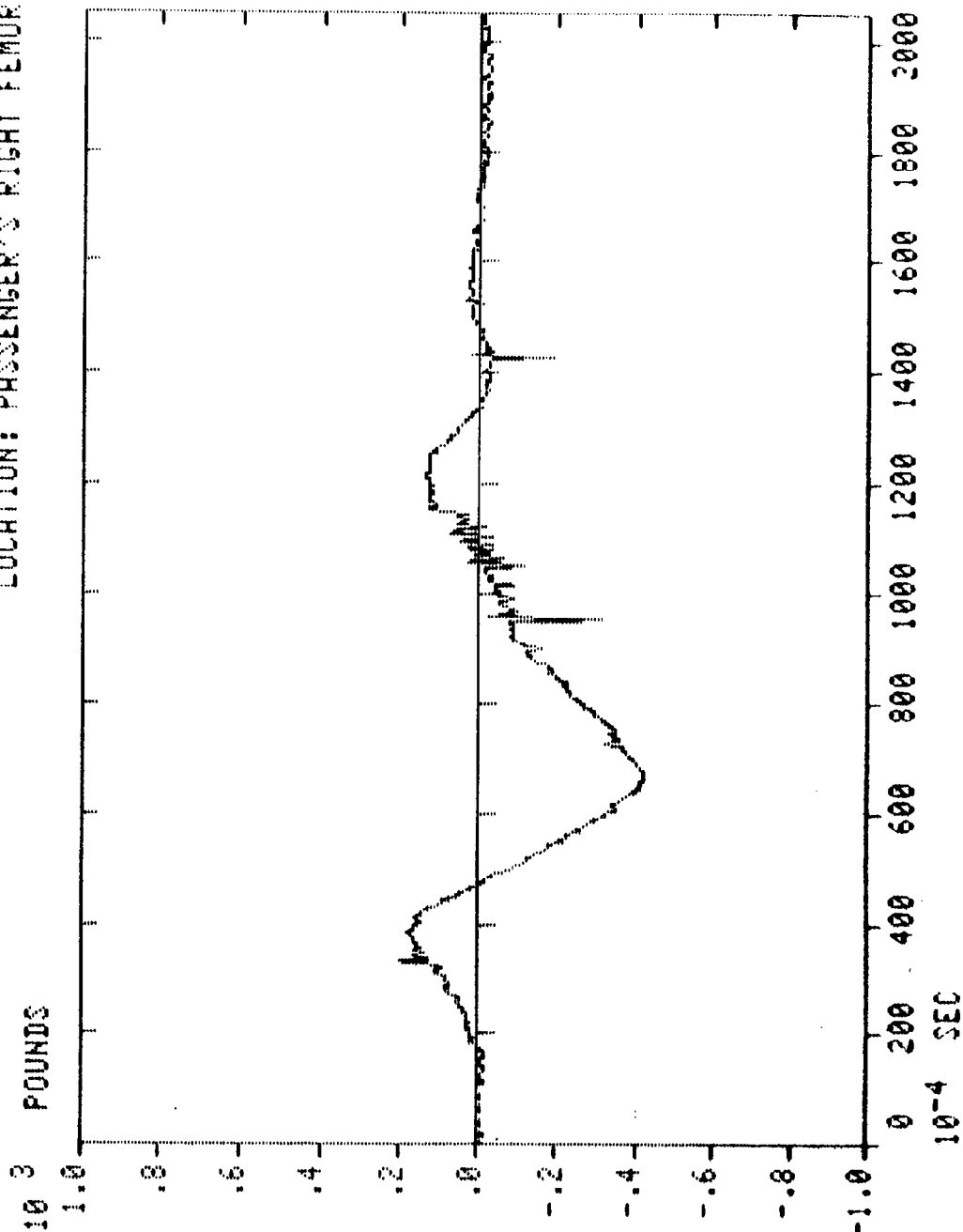


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST REC

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
FILTER: CLASS 600
LOAD CELL: TAPE 2, CH 4
DIRECTION: TENSION
LOCATION: PASSENGER'S RIGHT FEMUR

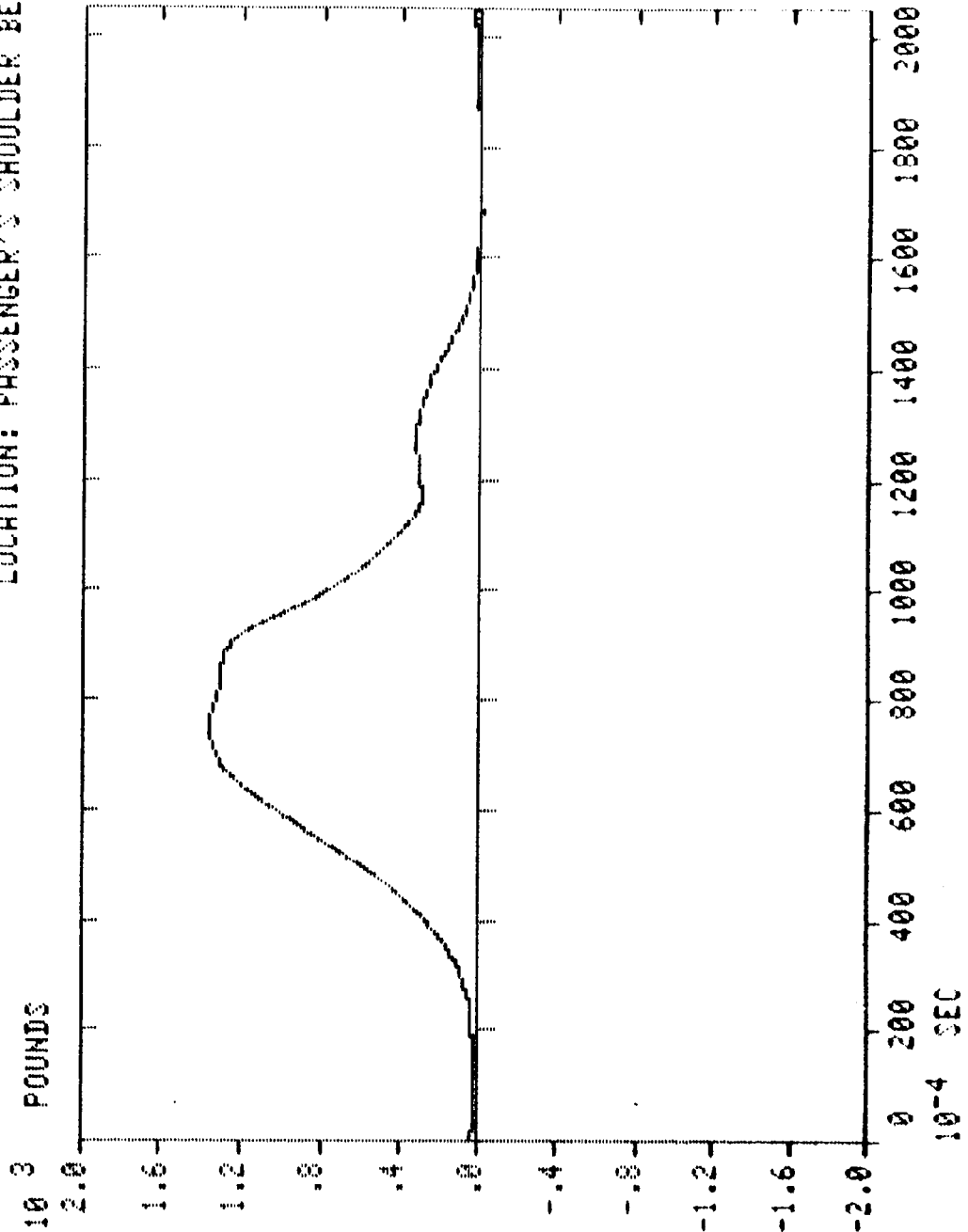


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST CASE

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 871-3882-20
 FILTER: CLASS 80
 LOAD CELL: TAPE 2, CH 9
 DIRECTION: TENSION
 LOCATION: PASSENGER'S SHOULDER BELT

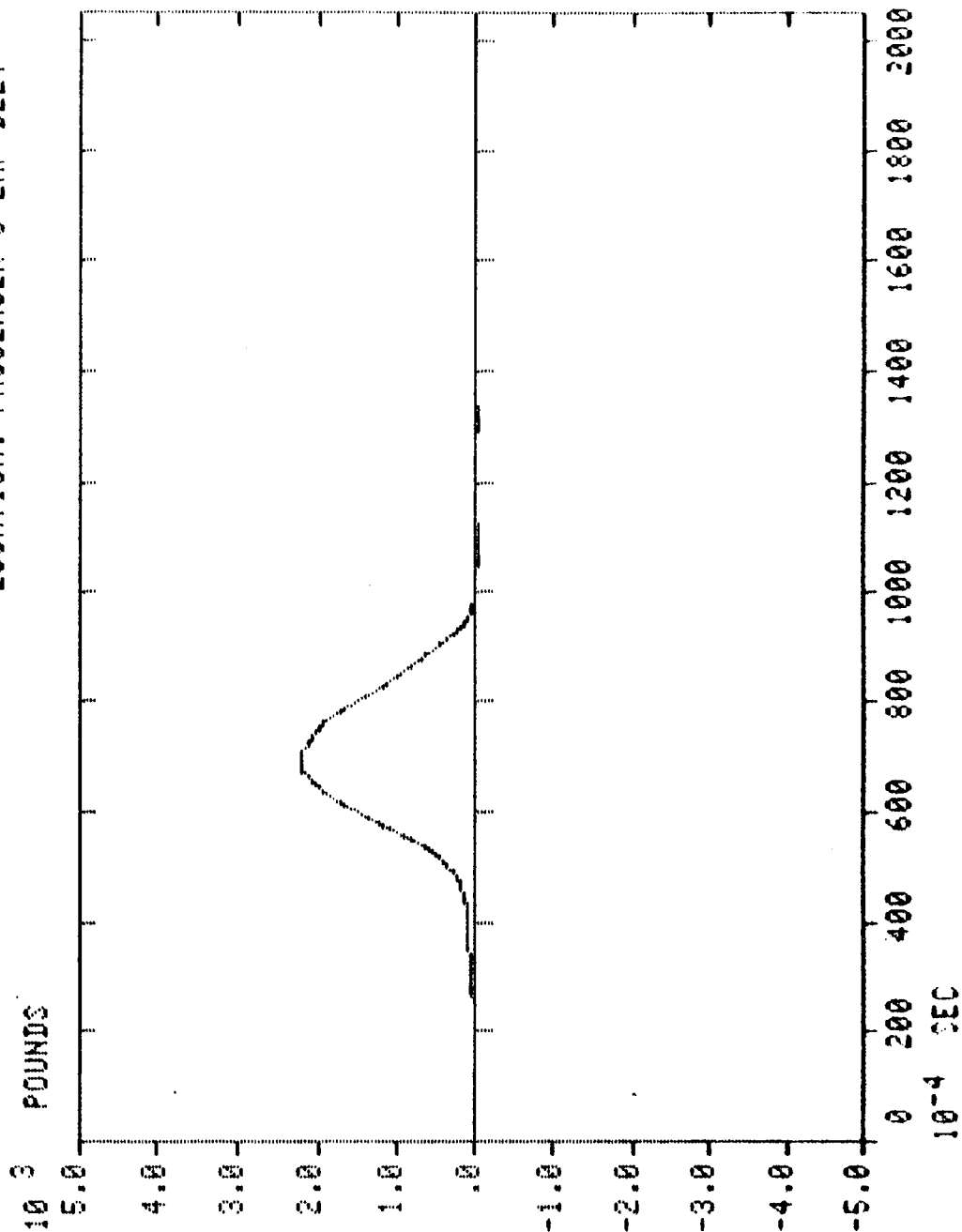


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
 FILTER: CLACC 60
 LOAD CELL: TAPE 2 CH 10
 DIRECTION: TENSION
 LOCATION: PASSENGER'S LAP BELT



*** CRASH REPORT ***

CRASHED: 0-0000000-000-000

VEHICLE: FORD BRONCO

VEHICLE NO.: 0000000-00

VEHICLE ID: WHICA 000000

FILTER: 0.000 00

TEST FILE NO.: 001 29.36 MPH

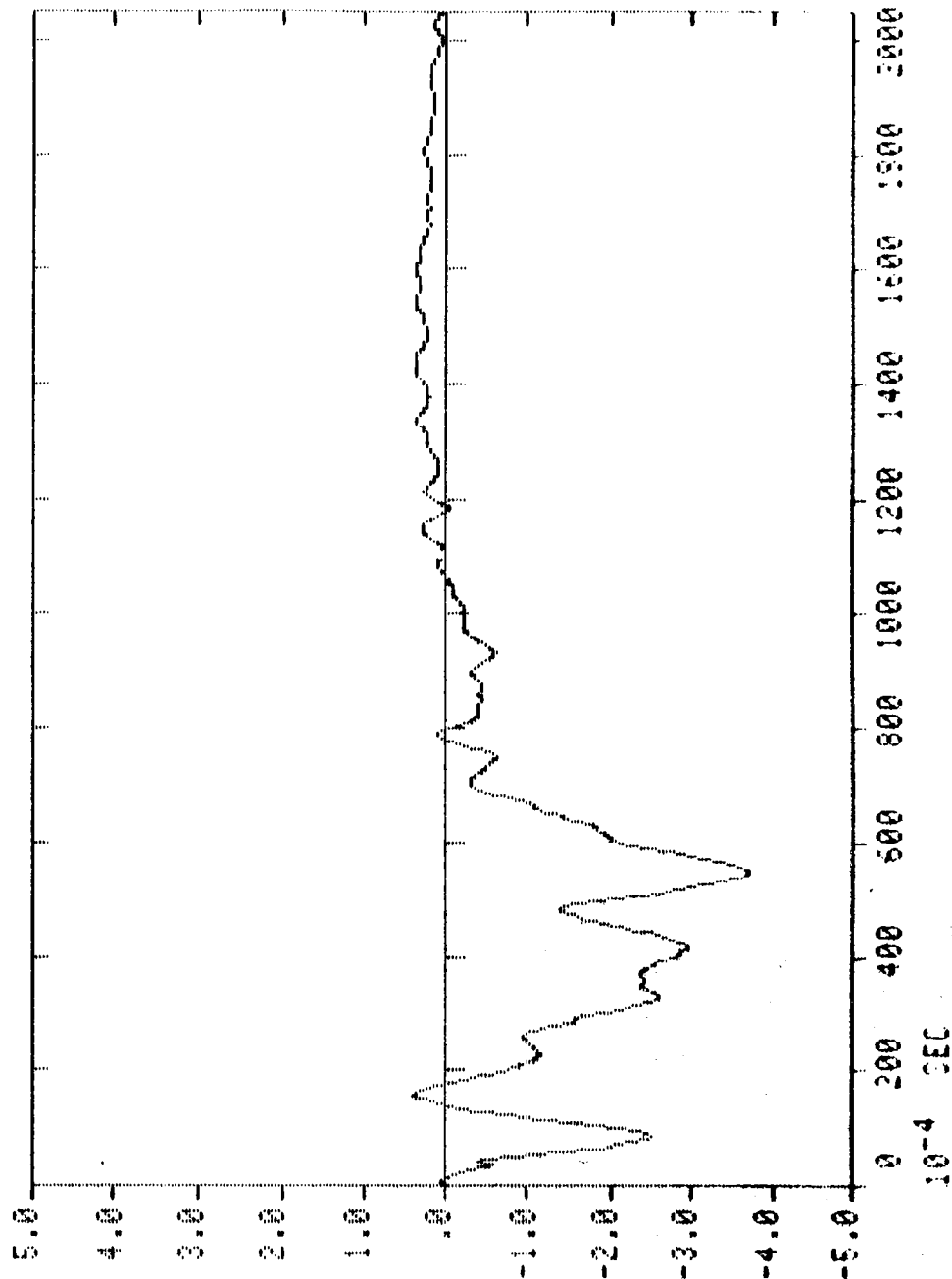
ACCELEROMETER: 0.00 0.00 0.00

DATE: OCT. 17, 1990 FRONTAL

DIRECTION: FORWARD

LOCATION: RIGHT FRONT FLOORPAN

10 1 G AX



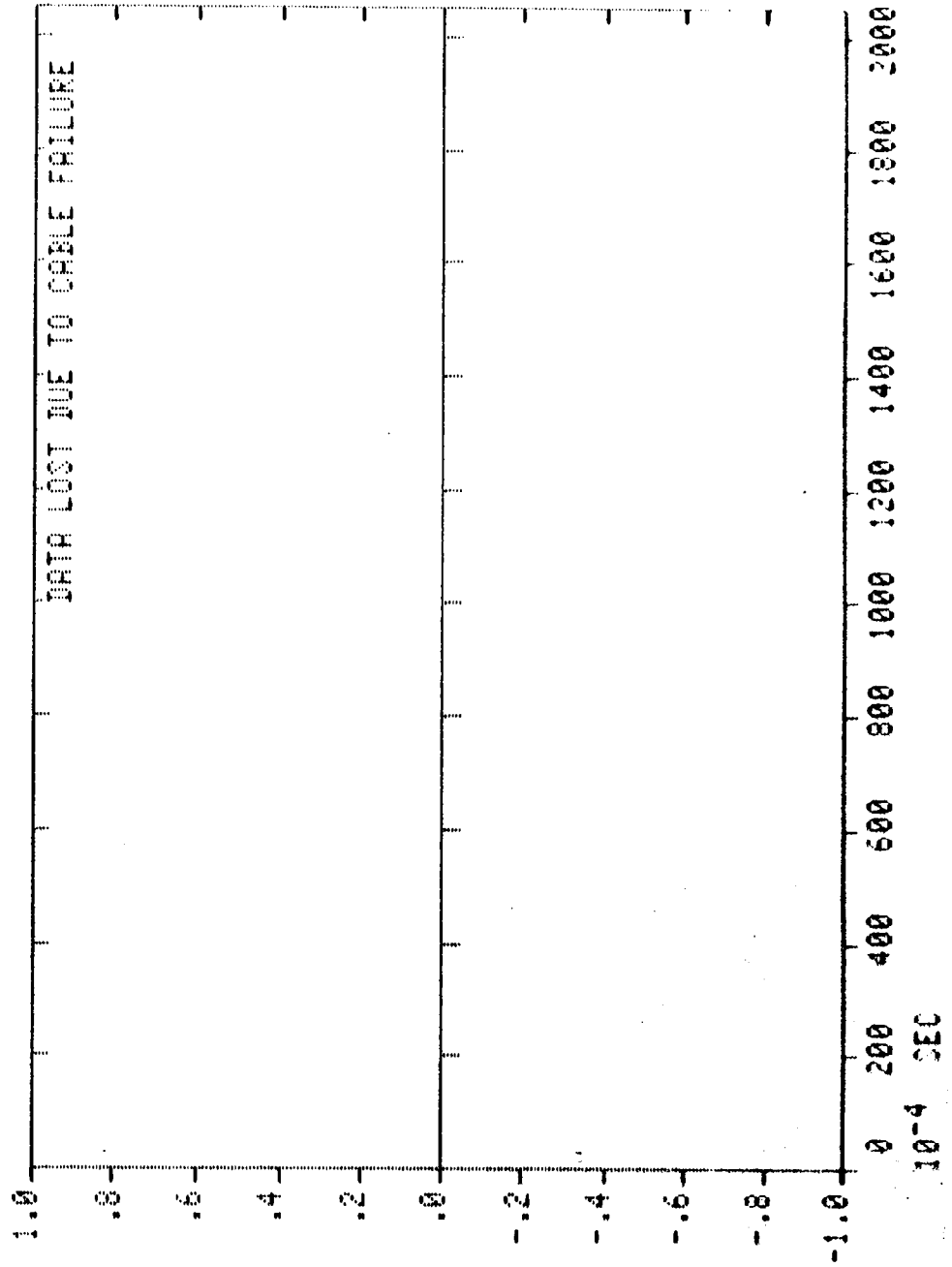
*** CRASH PROGRAM

APPROVED ENGINEERING TEST DATA

VEHICLE: FORD SPONCO
VEHICLE ID: NHTCA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

TEST NO.: 870-3882-20
FILTER: CLASS 50
ACCELEROMETER: TAFE 1.14 13
DIRECTION: FORWARD
LOCATION: LEFT REAR FLOORPAN

10-513 G AX

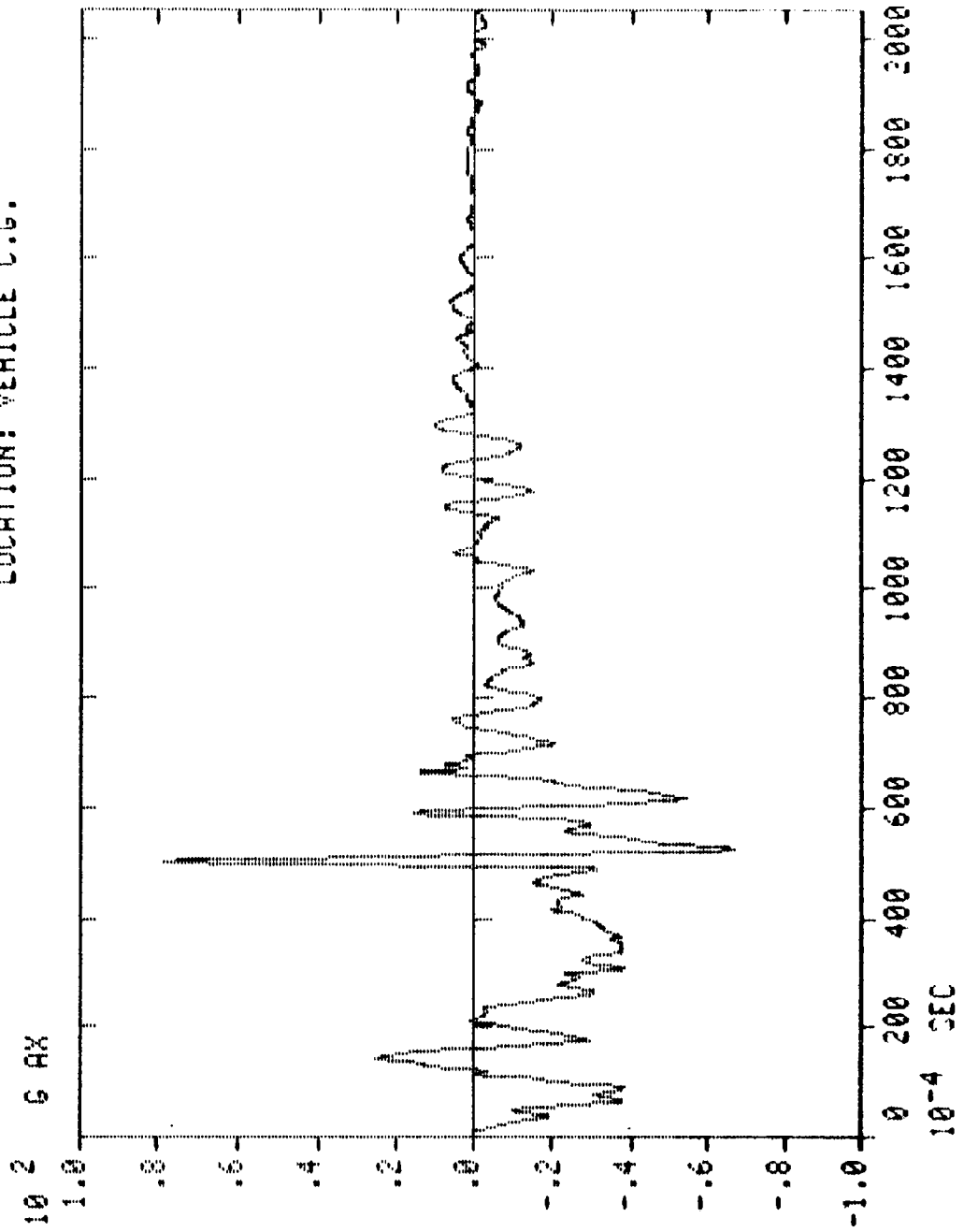


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LAEC

VEHICLE: FORD BRONCO
VEHICLE ID: NHTSA 800606
TEST FILE NO.: 101 29.36 MPH
DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 371-3882-20
FILTER: CLASS 100
ACCELEROMETER: TAPE 3. CH 5
DIRECTION: FORWARD
LOCATION: VEHICLE C.G.



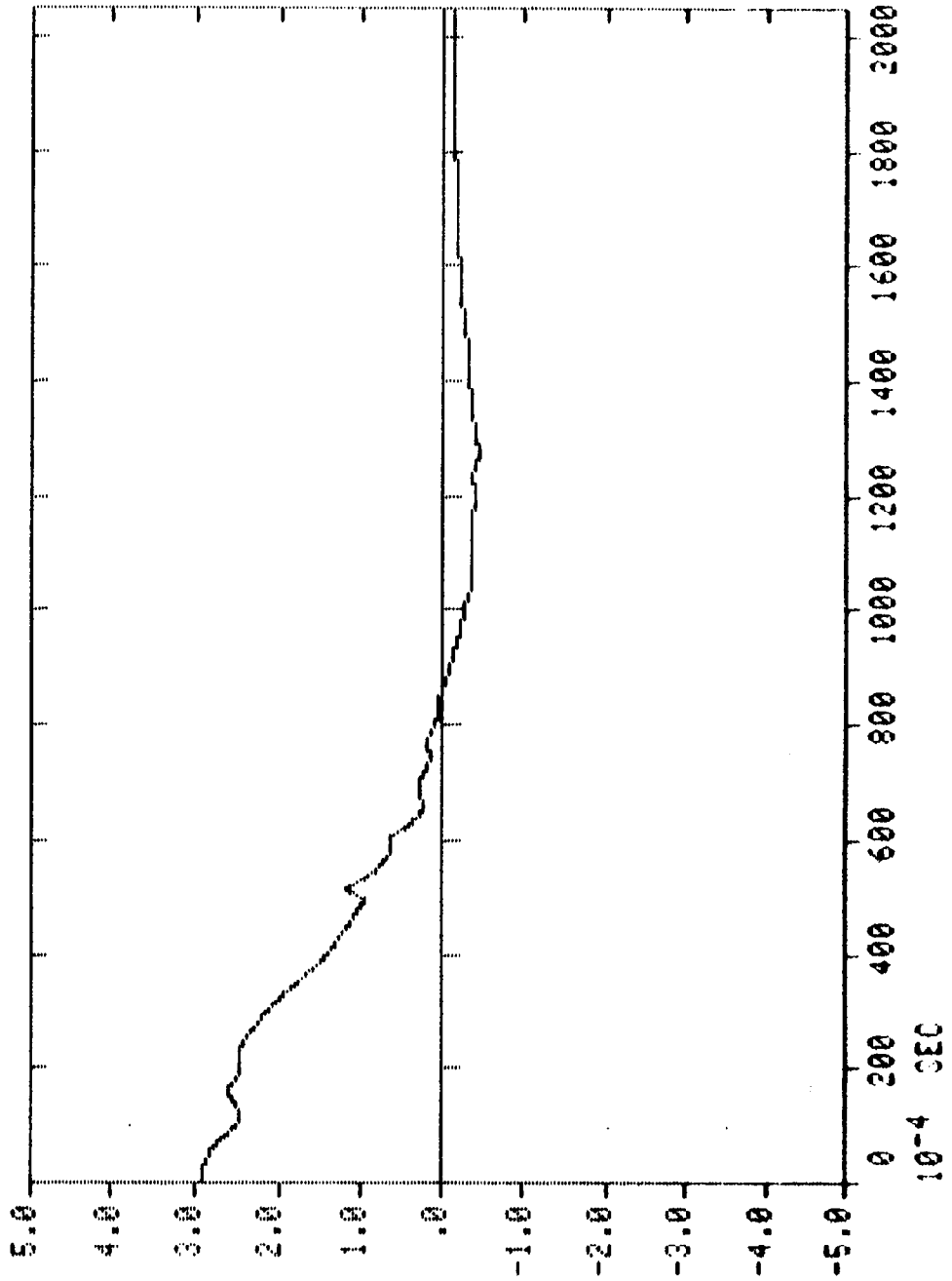
30T CRASH PROGRAM

APPROVED ENGINEERING TEST CASE

VEHICLE: FORD BRONCO
 VEHICLE ID: NHTSA 800606
 TEST FILE NO.: 101 29.36 MPH
 DATE: OCT. 17, 1980 FRONTAL

MJO NO.: 971-3882-20
 FILTER: CLASS 120
 ACCELEROMETER: TAPE 3, CH 5
 DIRECTION: FORWARD
 LOCATION: VEHICLE C.G.

10 1 G AX INTEGRATED TO SPEED - MPH



DOT CRASH PROGRAM

APPROVED ENGINEERING TEST CASE

VEHICLE: FORD BRONCO

MJO NO. : 971-3882-20

VEHICLE ID: NHTSA 800606

FILTER: CLASS 180

TEST FILE NO. : 101 29.36 MPH

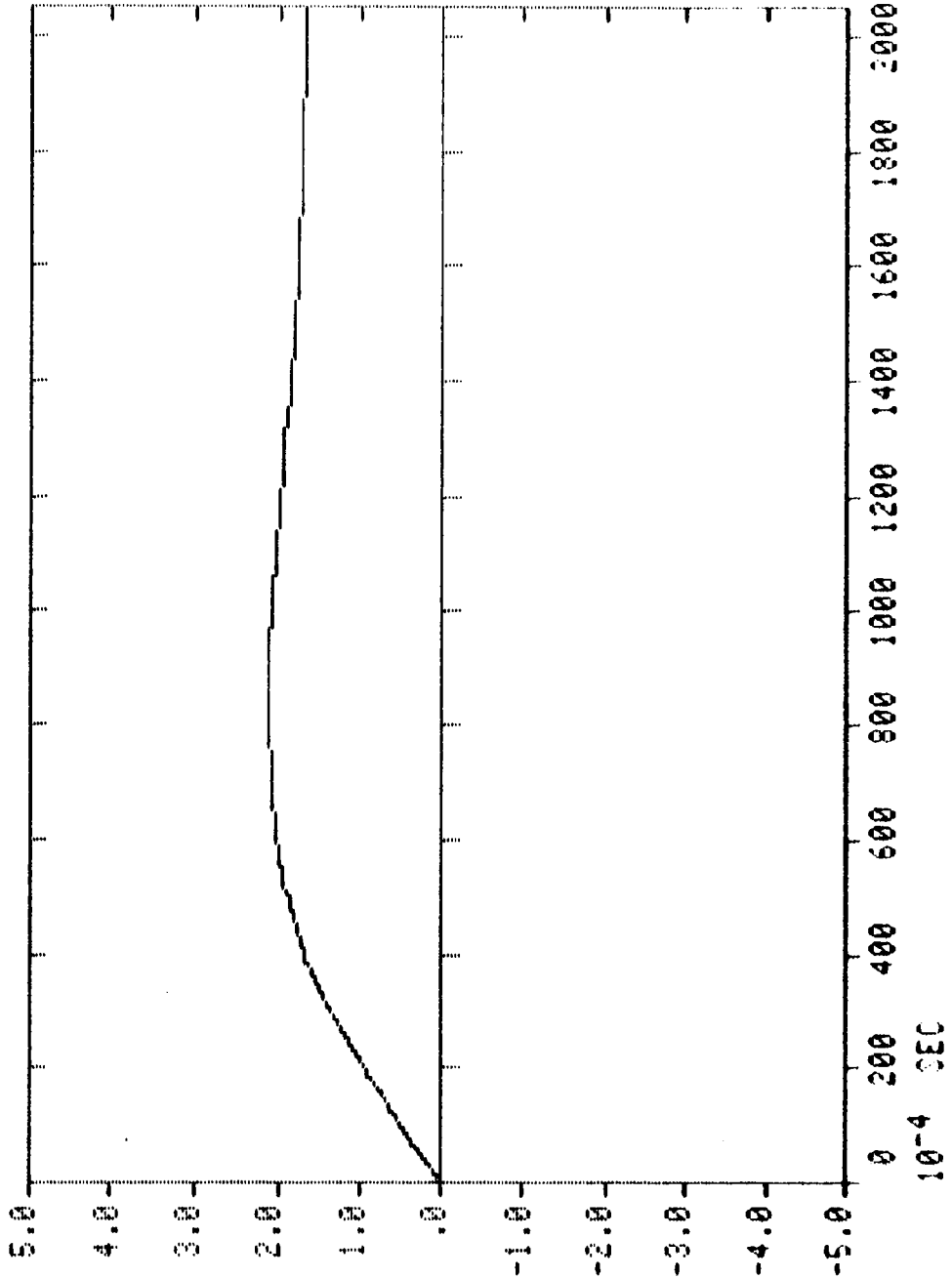
ACCELEROMETER: TAPE 3, CH 5

DATE: OCT. 17, 1980 FRONTAL

DIRECTION: FORWARD

LOCATION: VEHICLE C.G.

10 1 6 AX INTEGRATED TO CRUSH - IN





APPROVED ENGINEERING TEST LABORATORIES

APPENDIX C



APPROVED ENGINEERING TEST LABORATORIES

APPENDIX C

The following report sheets are the Part 572 test dummy calibration test data for the dummies used in the 1980 Ford Bronco 4WD Custom Wagon, NHTSA 800606 frontal fixed barrier impact test.

PART 5.1. DUMMY CALIBRATION TEST DATA

Dunham S/N 0319

Calibration Laboratory Humanoid Systems (Pre)

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration		10/10/80	
Calibration Sequential Number for Dummy		2	
Temperature in Lab. (Spec. = 66 to 78°F)		71°F	
Relative Humidity in Lab. (Spec. = 10 to 70%)		67%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel.	210 to 260G	239.8 g	
b. Peak Lateral Accel.	≤ 10G	8.5 g	
c. Time above 100G	0.9 to 1.5 ms	1.33 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed	21.5 to 25.5 fps	22.0 fps	
b. Pendulum Avg. Decel. (over t ₃ - t ₂)	20 to 24G	21.9 g	
c. Peak Resultant Head Acceleration	26G maximum	23.8 g	
d. Pendulum Decel. (t ₂ -t ₁)	≤ 3 ms	2.0 ms	
e. Pendulum Decel. (t ₃ -t ₂)	25 to 30 ms	26.9 ms	
f. Pendulum Decel. (t ₄ -t ₃)	≤ 10 ms	5.0 ms	
g. Pendulum Direction Reversal Time	≥ 123 ms	125.3 ms	
h. Max. Head Rotation	63 to 73°	66.8°	
i. Chordal Displacement:			
Head Rotation Angle			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in.	0 in.
30°	Time	25.6 to 34.4 ms	29.8 ms
	Displ.	2.1 to 3.1 in.	2.65 in.

PART 5.2 DUMMY CALIBRATION TEST DATA
(Continued)

Dummy S/N 0319

Calibration Laboratory Humanoid Systems (Pre)

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. <u>NECK BENDING TEST</u> <u>Continued:</u>				
1. Chordal Displacement: Head Rotation Angle				
60°	Time	40.3 to 51.7 ms	47.9 ms	
	Displ.	4.3 to 5.3 in.	4.63 in.	
Maximum (°)	Time	53.2 to 66.8 ms	64.8 ms	
	Displ.	5.0 to 6.0 in.	5.22 in.	
60°	Time	67.0 to 83.0 ms	76.9 ms	
	Displ.	4.3 to 5.3 in.	4.78 in.	
30°	Time	85.4 to 104.6 ms	103.0 ms	
	Displ.	2.1 to 3.1 in.	2.35 in.	
0°	Time	101.0 to 123.0 ms	119.7 ms	
	Displ.	-.5 to 0.5 in.	0.04 in.	
3. <u>ABDOMINAL COMPRESSION TEST:</u> (Preload = 10 pounds)				
a. Force @ .5"		23 to 37 lbs.	36.0 lbs.	
b. Force @ .75"		39 to 53 lbs.	43.0 lbs.	
c. Force @ 1.0"		50 to 63 lbs.	56.0 lbs.	
d. Force @ 1.3"		73 to 88 lbs.	80.0 lbs.	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20°		22 to 34 lbs.	22.3 lbs.	
b. Force @ 30°		34 to 46 lbs.	44.5 lbs.	
c. Force @ 40°		46 to 58 lbs.	51.0 lbs.	
d. Return Angle		12° maximum	8.0°	

PART 5/2 DUMMY CALIBRATION TEST DATA
(Continued)

Dummy S/N 0319

Calibration Laboratory Humanoid Systems (Pre)

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed	21.78-22.22 fps	22.0 fps	
(2) Peak Deflection	1.7" maximum	0.77 in.	
(3) Peak Resistive Force	2250 lbs. max.	2154.0 lbs.	
(4) Internal Hysteresis	50 to 70%	57.0%	
b. Low Speed			
(1) Probe Speed	13.86-14.14 fps	14.0 fps	
(2) Peak Deflection	1.1" maximum	0.99 in.	
(3) Peak Resistive Force	1450 lbs. max.	1236.4 lbs.	
(4) Internal Hysteresis	50 to 70%	56.6%	
6. KNEE IMPACT TESTS:			
a. Right Side			
(1) Probe Side	6.76 to 7.04 fps	6.90 fps	
(2) Maximum Force	1850 to 2500 lbs.	2289.0 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.86 ms	
b. Left Side			
(1) Probe Speed	6.76 to 7.04 fps	6.90 fps	
(2) Maximum Force	1850 to 2500 lbs.	2250.0 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.94 ms	

PART 4/7 DUMMY CALIBRATION TEST DATA

Dummy S/N 503

Calibration Laboratory Humanoid Systems (Pte) Ltd

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration		10/10/80	
Calibration Sequential Number for Dummy		2	
Temperature in Lab. (Spec. - 66 to 78°F)		71°F	
Relative Humidity in Lab. (Spec. - 10 to 70%)		67%	
TEST PARAMETER	SPECIFICATION		
1. <u>HEAD DROP TEST:</u>			
a. Peak Resultant Accel.	210 to 260G	245.2 g	
b. Peak Lateral Accel.	$\leq 10G$	7.23 g	
c. Time above 100G	0.9 to 1.5 ms	1.26 ms	
2. <u>NECK BENDING TEST:</u>			
a. Pendulum Speed	21.5 to 25.5 fps	22.0 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$)	20 to 24G	22.30 g	
c. Peak Resultant Head Acceleration	26G maximum	22.79 g	
d. Pendulum Decel. ($t_2 - t_1$)	≤ 3 ms	1.65 ms	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	27.31 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤ 10 ms	4.38 ms	
g. Pendulum Direction Reversal Time	≥ 123 ms	112.3 ms	
h. Max. Head Rotation	63 to 73°	65.22°	
i. Chordal Displacement:			
Head Rotation Angle			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in.	0 in.
30°	Time	25.6 to 34.4 ms	29.13 ms
	Displ.	2.1 to 3.1 in.	2.67 in.

PART 77 DUMM CALIBRATION TEST DATA
(Continued)

Dummy S/N 803

Calibration Laboratory Hammond Systems (Pre)

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. <u>NECK BENDING TEST</u> <u>Continued:</u>				
i. Chordal Displacement; Head Rotation Angle				
60°	Time	40.3 to 51.7 ms	48.58 ms	
	Displ.	4.3 to 5.3 in.	4.67 in.	
Maximum (°)	Time	53.2 to 66.8 ms	57.05 ms	
	Displ.	5.0 to 6.0 in.	5.24 in.	
60°	Time	67.0 to 83.0 ms	70.88 ms	
	Displ.	4.3 to 5.3 in.	4.84 in.	
30°	Time	85.4 to 104.6 ms	98.99 ms	
	Displ.	2.1 to 3.1 in.	2.89 in.	
0°	Time	101.0 to 123.0 ms	116.38 ms	
	Displ.	-.5 to 0.5 in.	0.02 in.	
3. <u>ABDOMINAL COMPRESSION TEST:</u> (Preload = 10 pounds)				
a. Force @ .5"		23 to 37 lbs.	26.0 lbs.	
b. Force @ .75"		39 to 53 lbs.	41.0 lbs.	
c. Force @ 1.0"		50 to 63 lbs.	58.0 lbs.	
d. Force @ 1.3"		73 to 88 lbs.	86.0 lbs.	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20°		22 to 34 lbs.	25.0 lbs.	
b. Force @ 30°		34 to 46 lbs.	33.0 lbs.	
c. Force @ 40°		46 to 58 lbs.	47.0 lbs.	
d. Return Angle		12° maximum	10.0°	

PART 5.7. DUMMY CALIBRATION TEST DATA
(Continued)

Dummy S/N 503

Calibration Laboratory Humanoid Systems (Pre)

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed	21.78-22.22 fps	22.0 fps	
(2) Peak Deflection	1.7" maximum	1.59 in.	
(3) Peak Resistive Force	2250 lbs. max.	2183.8 lbs.	
(4) Internal Hysteresis	50 to 70%	60.9%	
b. Low Speed			
(1) Probe Speed	13.86-14.14 fps	14.0 fps	
(2) Peak Deflection	1.1" maximum	0.97 in.	
(3) Peak Resistive Force	1450 lbs. max.	1340.8 lbs.	
(4) Internal Hysteresis	50 to 70%	50.0%	
6. KNEE IMPACT TESTS:			
a. Right Side			
(1) Probe Side	6.76 to 7.04 fps	6.90 fps	
(2) Maximum Force	1850 to 2500 lbs.	1947.8 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.00 ms	
b. Left Side			
(1) Probe Speed	6.76 to 7.04 fps	6.90 fps	
(2) Maximum Force	1850 to 2500 lbs.	2312.4 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.75 ms	



APPROVED ENGINEERING TEST LABORATORIES

SERVICE FOR: U. S. Department of Transportation
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
400 Seventh Street S. W.
Washington, D. C. 20590

CONTRACT NUMBER: DOT-HS-9-02273

I hereby certify that the preceding report is true and correct to the best of my knowledge.

APPROVED ENGINEERING TEST LABORATORIES

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