



DOT 6290

APPROVED ENGINEERING TEST LABORATORIES / 1536 EAST VALENCIA / FULLERTON, CALIFORNIA 92631 / TEL. (714) 879-6110  
A NATIONAL TECHNICAL SERVICES COMPANY

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219-AETL-80-014-971-3882-27  
301-AETL-80-027-971-3882-27

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

TOYO KOGYO COMPANY  
1980 FORD COURIER - PICKUP  
NHTSA 800609

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



DECEMBER 1980

FINAL REPORT

PREPARED 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



APPROVED ENGINEERING TEST LABORATORIES

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Approved by J. J. Valenzuela

Date 7 January 1981

Report Accepted by:

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Contract Technical Manager  
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Date 1/26/81

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                           |                                |           |                                                                                                    |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------|-----------|----------------------------------------------------------------------------------------------------|--|
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| 4. Title and Subtitle<br><br>Final Report of FMVSS 212/219/301-75<br>Vehicle Safety Compliance and Research<br>and Development Testing on a 1980 Ford<br>Courier - Pickup - NHTSA 800609                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                           |                                |           | 5. Report Date<br><br>January 20, 1981                                                             |  |
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| 16. Abstract<br><br>FMVSS 212/219/301-75 Vehicle Safety Compliance Test of a 1980 Ford<br>Courier - Pickup, NHTSA 800609, VIN-SGTBWU54991 was conducted at Approved<br>Engineering Test Laboratories test facility in Fullerton, California, to<br>determine compliance with the requirements of FMVSS 212/219/301-75.<br><br>As a parallel non-conflicting effort, the test dummies and the vehicle<br>were instrumented with accelerometers to measure occupant response and<br>vehicle acceleration. The results of this effort are documented herein.<br><br>The average vehicle impact speed was 29.73 mph in the frontal (0°) mode.<br>Test date was December 2, 1980, and the ambient temperature was 64°F.<br><br>The subject test vehicle appears to comply with all the requirements of<br>FMVSS 212/219/301-75. |                                                           |                                |           |                                                                                                    |  |
| 17. Key Words<br>FMVSS 212 - Windshield Mounting<br>FMVSS 219 - Windshield Zone Intrusion<br>FMVSS 301-75 - Fuel System Integrity<br>Research and Development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                           |                                |           | 18. Distribution Statement                                                                         |  |
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APPROVED ENGINEERING TEST LABORATORIES

SECTION 1



## APPROVED ENGINEERING TEST LABORATORIES

### 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 Courier - Pickup, NHTSA 800609 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.



## APPROVED ENGINEERING TEST LABORATORIES

### 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.



APPROVED ENGINEERING TEST LABORATORIES

SECTION 1

B. Description of Test Vehicle

1. 1980 Ford Courier - Pickup
2. Vehicle Identification No.: SGTBWU54991
3. NHTSA No.: 800609
4. Manufactured Date: October 1979
5. GVWR: 4,100 pounds

C. Dates

1. Vehicle Received: January 29, 1980
2. Start of Test: November 18, 1980
3. Completion of Test: December 2, 1980



APPROVED ENGINEERING TEST LABORATORIES

SECTION 2



SECTION 2

2.0 TEST DATA

The 1980 Ford Courier - Pickup 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.



APPROVED ENGINEERING TEST LABORATORIES

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: Toyo Kogyo Company  
Make/Model: Ford Courier  
Body Style: Pickup Model Year: 1980  
VIN: SGTBWU54991 Build Date: October 1979  
NHTSA No.: 800609 Color: White  
Engine Data: Four (4) Cylinders; 140.0 Cu. In. Displ.  
Transmission Data: Four (4) Speed (X) Manual ( ) Automatic  
Major Options: None

VEHICLE ATTITUDE:

Delivered Attitude: LF 28.0 in.; RF 28.0 in.; LR 28.6 in.; RR 29.2 in.  
Test Attitude: LF 27.0 in.; RF 27.5 in.; LR 27.5 in.; RR 27.8 in.

VEHICLE TIRE DATA:

Recommended Cold Tire Pressure: Front = 26 psi  
(Up to Vehicle Load Capacity) Rear = 45 psi

Recommended Tire Size: 6.00-14 Load Range: "C"  
Tires on Vehicle: 6.00-14LT - w/s/w - Bridgestone  
Spare Tire: X Yes;    No; Space Saver:    Yes; X No

TABLE Ia

SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS:

Date of Test: December 2, 1980 Time of Test: 1442

Ambient Temperature: 64 °F at Impact Area

VEHICLE CAPACITY:

Type of Seats: X Bench;        Bucket;        Split Bench

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

Cargo: 1,100 lbs.

Total 1,400 lbs. (Vehicle Capacity Weight)

GVWR: 4,100 lbs. (Taken From Certification Label)

GAWR: Front 1,850 lbs.; Rear 2,530 lbs.

VEHICLE DELIVERED WEIGHT: (Fuel - 93% of NFC)

|                        |                   |                                          |                 |
|------------------------|-------------------|------------------------------------------|-----------------|
| Left Front             | <u>712</u> lbs.   | Left Rear                                | <u>576</u> lbs. |
| Right Front            | <u>731</u> lbs.   | Right Rear                               | <u>509</u> lbs. |
| Total Front Weight     | <u>1,443</u> lbs. | ( <u>57.1</u> % of Total Vehicle Weight) |                 |
| Total Rear Weight      | <u>1,085</u> lbs. | ( <u>42.9</u> % of Total Vehicle Weight) |                 |
| Total Delivered Weight | <u>2,528</u> lbs. |                                          |                 |

CALCULATED VEHICLE TEST WEIGHT: 3,156 lbs.  
(With Required Dummies and 300 lbs. Cargo)

ACTUAL VEHICLE TEST WEIGHT:

|                    |                   |                                          |                 |
|--------------------|-------------------|------------------------------------------|-----------------|
| Left Front         | <u>862</u> lbs.   | Left Rear                                | <u>723</u> lbs. |
| Right Front        | <u>765</u> lbs.   | Right Rear                               | <u>790</u> lbs. |
| Total Front Weight | <u>1,627</u> lbs. | ( <u>51.8</u> % of Total Vehicle Weight) |                 |
| Total Rear Weight  | <u>1,513</u> lbs. | ( <u>48.2</u> % of Total Vehicle Weight) |                 |
| Total Test Weight  | <u>3,140</u> lbs. |                                          |                 |

TABLE 1b

SUMMARY OF TEST CONDITIONS (Cont'd)

TEST FLUID DATA:

Test Fluid Type: Red Stoddard Solvent ; Specific Gravity: 0.764

Kinematic Viscosity: 1.31

Nominal Fuel Capacity: 14.80 gals. (NFC)

Test Volume: 13.76 gals. (92-94% of NFC)

Fuel System Capacity: 15.00 gals.  
(Data from Owner's Manual)

Electric Fuel Pump: ☒ Yes; ☐ No; Fuel Injection: ☐ Yes; ☒ No

Does Electric Fuel Pump Operate with Ignition Switch "On"

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

Details of Fuel System: Fuel filler located on left rear cargo box wall  
forward of wheel opening recessed behind a hinged door, fuel tank located  
inside left frame rail between cab and rear axle under cargo floor pan.

VEHICLE TEST CONDITIONS:

Temperature in Occupant Compartment: 70 °F

Temperature of Windshield Glazing/Moulding: 72 °F

VEHICLE CRUSH AND REBOUND:

Overall Length of Test Vehicle: Pre-Test - Left 176.8 in.; Right 177.0 in.

Post-Test - Left 158.3 in.; Right 158.4 in.

Crush: Left 18.5 in.; Right 18.6 in.

Rebound (From Rigid Barrier Only): 8.25 in.

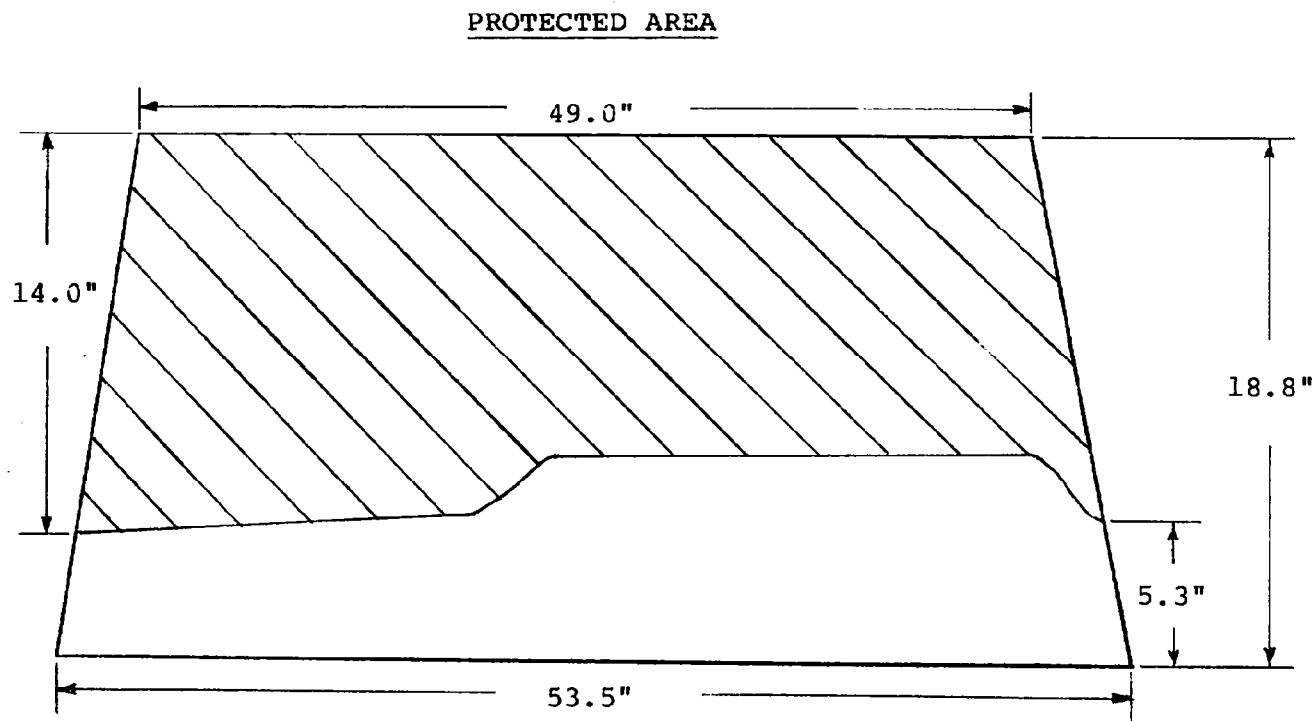
TABLE II

SUMMARY OF TEST CONDITIONS - FMVSS 219

Vehicle 1980 Ford Courier

NHTSA No. 800609

Test Date December 2, 1980



FRONT VIEW OF WINDSHIELD

Provide all dimensions necessary to reproduce the protected zone.

Method of adhering styrofoam to the windshield \_\_\_\_\_

General Electric Silicone

Details of Special Windshield Retention Clips (If Applicable) \_\_\_\_\_

Not Applicable

TABLE III  
POST IMPACT SUMMARY

Vehicle 1980 Ford Courier

NHTSA No. 800609 Test Date December 2, 1980

TYPE OF TEST: ☒ 0° Frontal Impact  
☐ 30° Oblique Impact (Driver/Passenger) Side  
☐ Rear Impact

REQUIRED IMPACT VELOCITY RANGE: 28.9 to 29.9 mph

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

Trap 1 = 29.73 mph

Trap 2 = 29.73 mph

Average 29.73 mph

Actual distance from vehicle front bumper to barrier  
face when entering timing trap 55.2 in.

Actual distance from vehicle front bumper to barrier  
face when exiting timing trap 31.2 in.

VEHICLE STATIC CRUSH: Driver's Side = 18.5 inches

Passenger's Side = 18.6 inches

Average = 18.55 inches

Crush Details: Windshield unbroken, both frame rails buckled at "A" post,  
cargo box impacted cab, driver dummy impacted steering wheel and dash assembly,  
passenger dummy knees impacted dash assembly.

VEHICLE REBOUND: (From rigid barrier only)

Driver's Side = 8.5 inches

Passenger's Side = 8.0 inches

Average = 8.25 inches

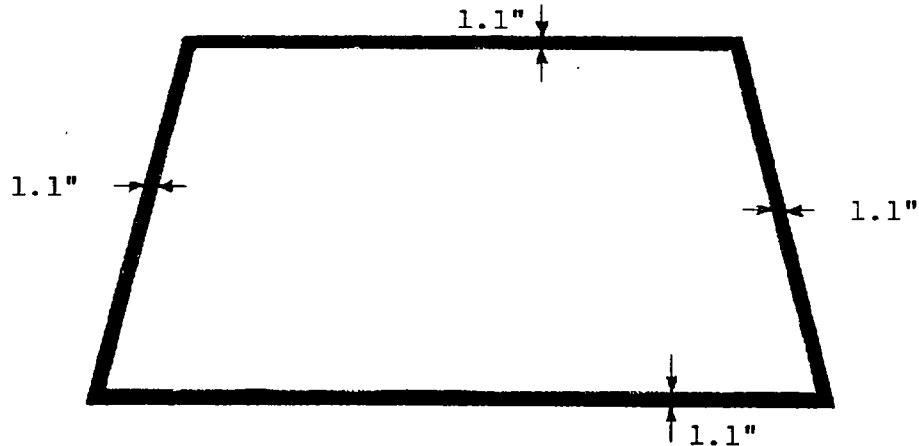
TABLE IV  
POST IMPACT SUMMARY

WINDSHIELD RETENTION - FMVSS 212

Vehicle 1980 Ford Courier

NHTSA No. 800609

Test Date December 2, 1980



FRONT VIEW OF WINDSHIELD

|            | Windshield Periphery |           |
|------------|----------------------|-----------|
|            | Pre Test             | Post Test |
| Left Side  | 70.6 in.             | 70.6 in.  |
| Right Side | 70.6 in.             | 70.6 in.  |
| Total      | 141.2 in.            | 141.2 in. |

Type of Occupant Restraints: Combination Lap/Shoulder 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: Rubber retainer encompasses the windshield glass with apparent adhesive between glass and retainer and between retainer and body opening.

TABLE V

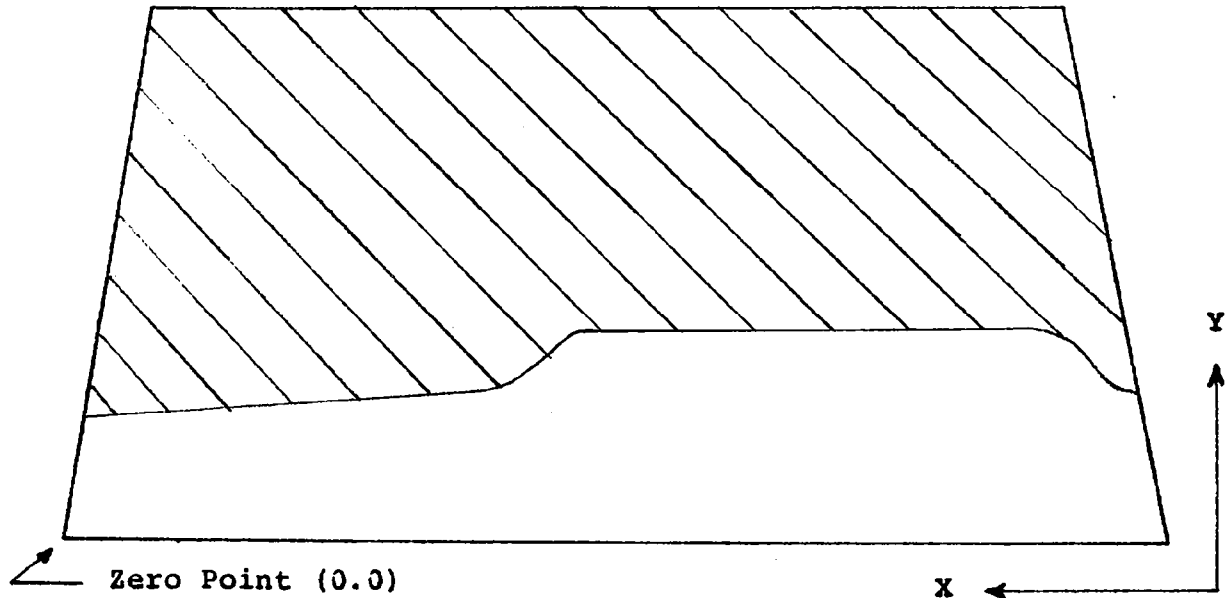
POST IMPACT SUMMARY

WINDSHIELD ZONE INTRUSION - FMVSS 219

Vehicle 1980 Ford Courier

NHTSA No. 800609

Test Date December 2, 1980



FRONT 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 Courier

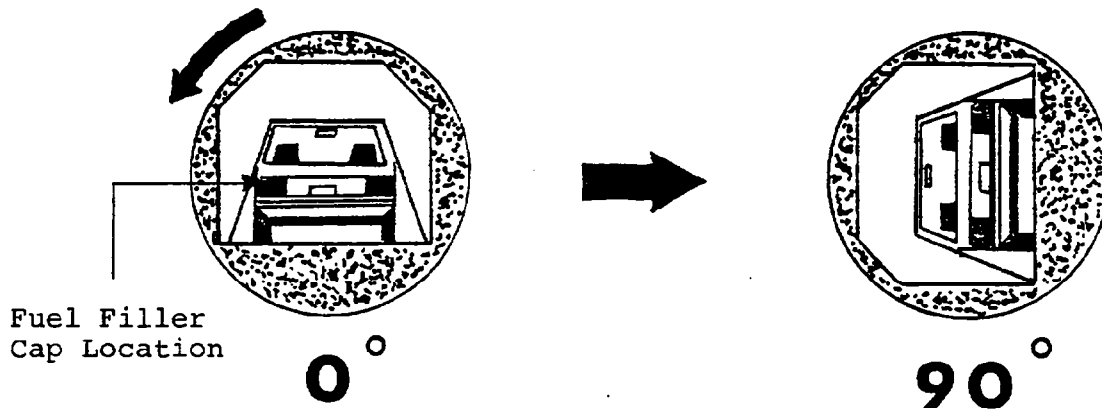
NHTSA No. 800609 Test Date December 2, 1980

|                                                                                       | 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/<br>1 minute |
| Time duration from impact until start of rollover test periods.                       | 30<br>minutes | 30<br>minutes        |

Fuel Spillage Location: Not Applicable

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

Vehicle 1980 Ford Courier NHTSA No. 800609

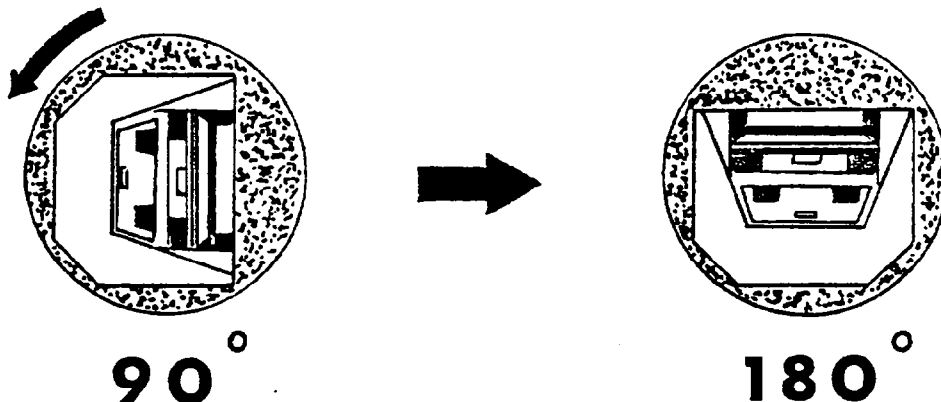


|                                                               | Actual            | Max. Allowed      |
|---------------------------------------------------------------|-------------------|-------------------|
| Rollover fixture 90° rotation time                            | 2 min.<br>15 sec. | 1 to 3<br>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 Courier NHTSA No. 800609



|                                                               | Actual            | Max. Allowed      |
|---------------------------------------------------------------|-------------------|-------------------|
| Rollover fixture 90° rotation time                            | 2 min.<br>20 sec. | 1 to 3<br>Minutes |
| Fuel spillage during 5 minute period from onset of rotation   | immeasurable      | 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: Carburetor/Air Cleaner Assembly Area

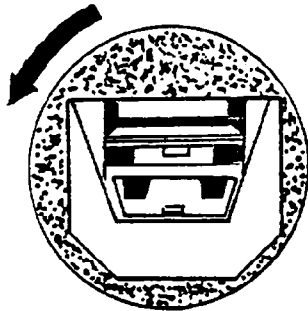
TABLE IX

FUEL SYSTEM INTEGRITY - FMVSS 301-75

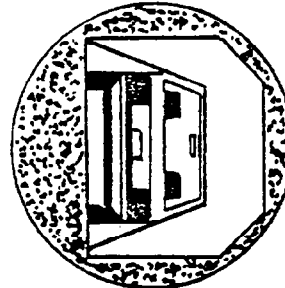
STATIC ROLLOVER

Vehicle 1980 Ford Courier

NHTSA No. 800609



**180°**



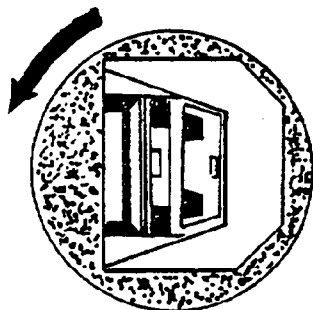
**270°**

|                                                               | Actual            | Max. Allowed      |
|---------------------------------------------------------------|-------------------|-------------------|
| Rollover fixture 90° rotation time                            | 2 min.<br>14 sec. | 1 to 3<br>Minutes |
| Fuel spillage during 5 minute period from onset of rotation   | immeasurable      | 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           |

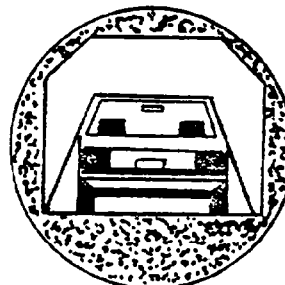
Fuel Spillage Location: Carburetor/Air Cleaner Assembly Area

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

Vehicle 1980 Ford Courier NHTSA No. 800609



**270°**



**360°**

|                                                               | Actual            | Max. Allowed      |
|---------------------------------------------------------------|-------------------|-------------------|
| Rollover fixture 90° rotation time                            | 2 min.<br>11 sec. | 1 to 3<br>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 PHOTOGRAPH

The 1980 Ford Courier - Pickup 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 Administrative 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 left and right frame rail buckled under the "A" post. The cargo box impacted the cab wall and the cab floor pan buckled. The driver dummy head made contact with the steering wheel assembly and both knees made contact with the dash assembly. The passenger dummy head made contact with his own legs and both knees made contact with the dash assembly.

The windshield assembly revealed no apparent retention loss during the impact event. The windshield glass was unbroken. A rubber retainer encompasses the windshield glass and apparent adhesive was used between the rubber retainer and windshield glass and between retainer and the 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 an object sufficiently to penetrate the styrofoam template outer surface. The unprotected windshield zone area was not penetrated by an object. The windshield glass remained unbroken.



APPROVED ENGINEERING TEST LABORATORIES

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 time periods.

The 1980 Ford Courier - Pickup test vehicle appears to comply with all the requirements of FMVSS 212/219/301-75.



APPROVED ENGINEERING TEST LABORATORIES

Figure 2-1  
1980 Ford Courier - Pickup  
NHTSA 800609  
Pre-Test, Windshield View





APPROVED ENGINEERING TEST LABORATORIES

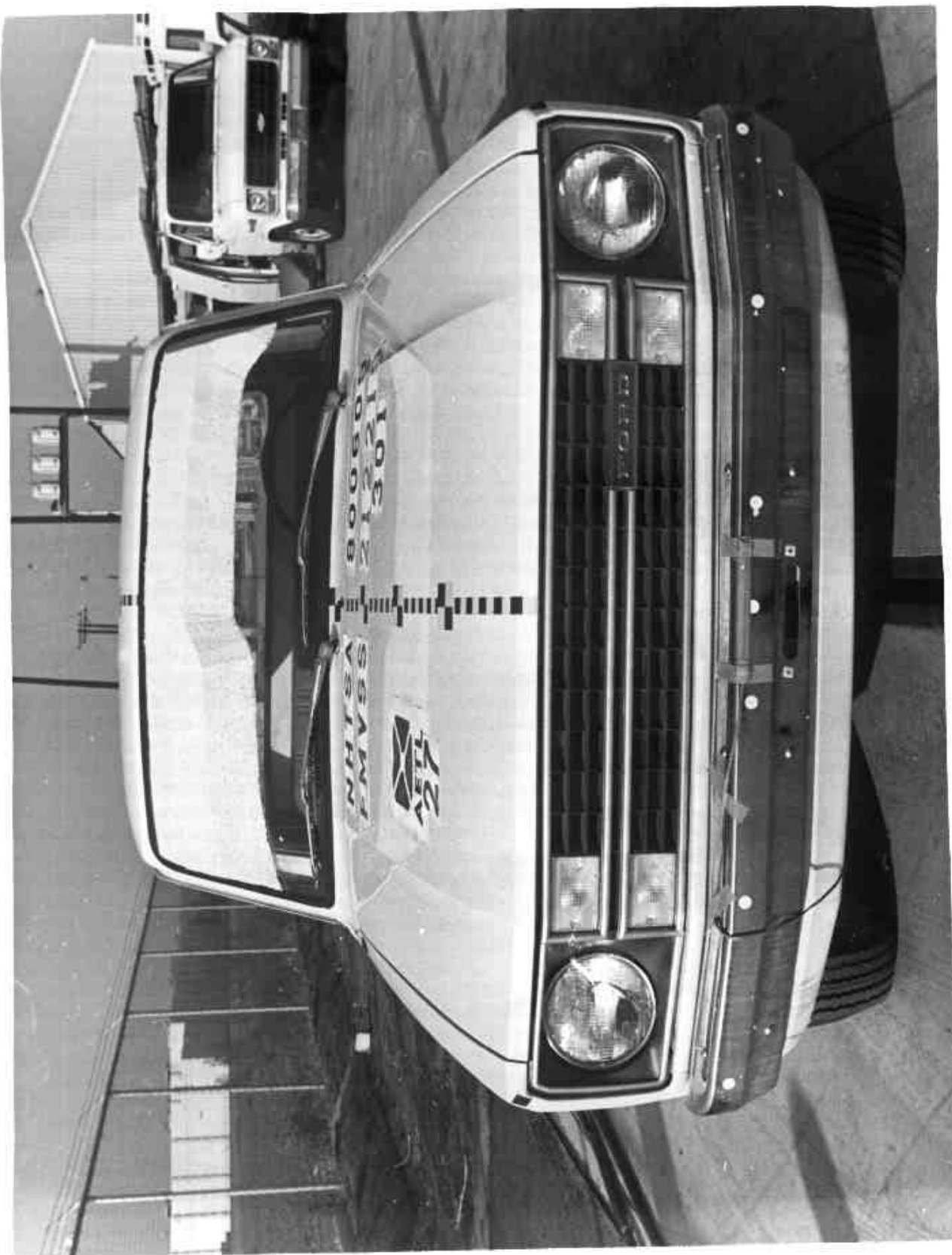
Figure 2-2  
1980 Ford Courier - Pickup  
NHTSA 800609  
Pre-Test, Windshield Template View





APPROVED ENGINEERING TEST LABORATORIES

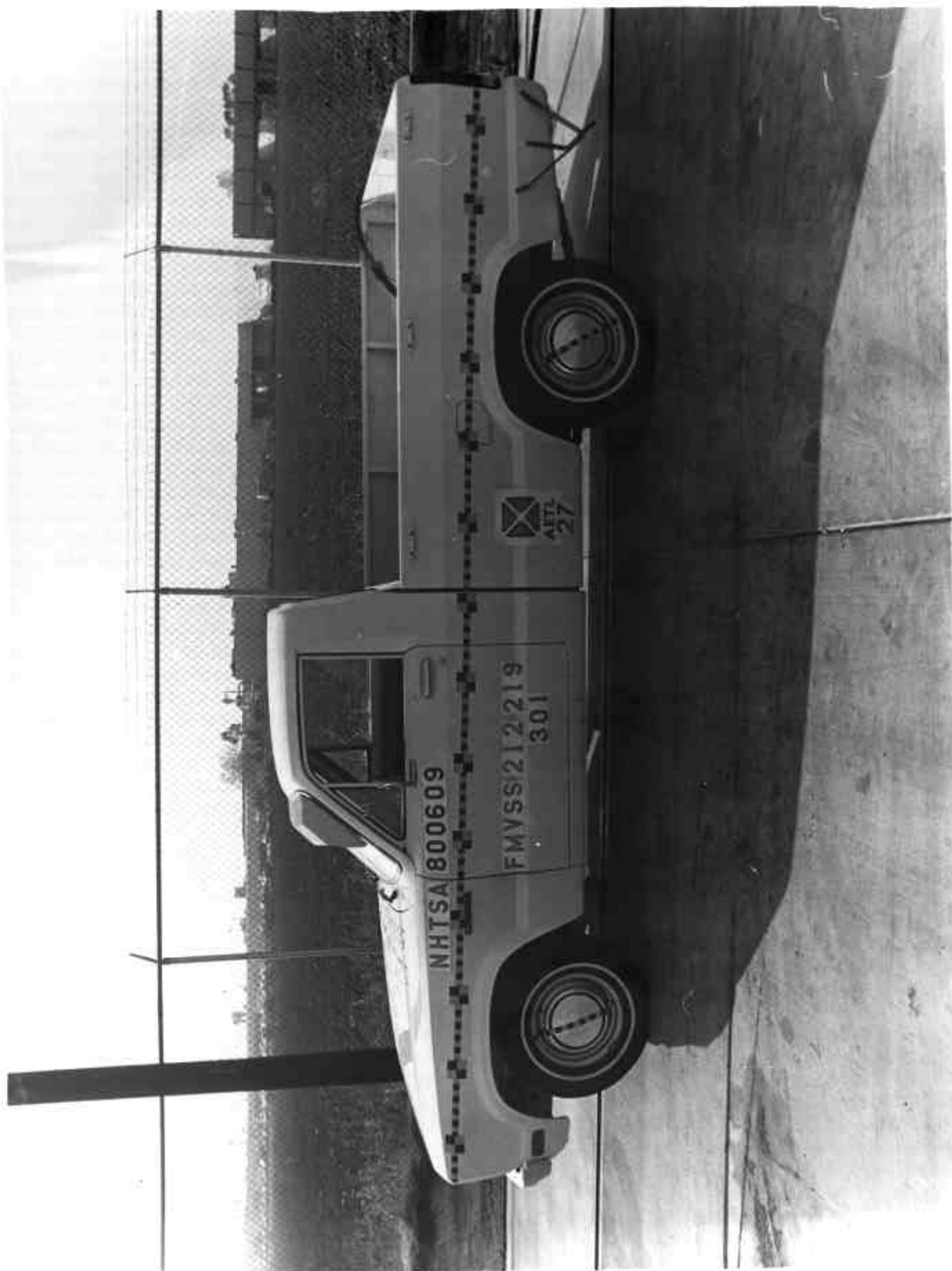
Figure 2-3  
1980 Ford Courier - Pickup  
NHTSA 800609  
Pre-Test, Full Front View





APPROVED ENGINEERING TEST LABORATORIES

Figure 2-4  
1980 Ford Courier - Pickup  
NHTSA 800609  
Pre-Test, Left Side View





APPROVED ENGINEERING TEST LABORATORIES

Figure 2-5  
1980 Ford Courier - Pickup  
NHTSA 800609  
Pre-Test, Right Side View





APPROVED ENGINEERING TEST LABORATORIES

Figure 2-6  
1980 Ford Courier - Pickup  
NHTSA 800609  
Post-Impact, Windshield View





APPROVED ENGINEERING TEST LABORATORIES

Figure 2-7  
1980 Ford Courier - Pickup  
NHTSA 800609  
Post-Impact, Left Side View





APPROVED ENGINEERING TEST LABORATORIES

Figure 2-8  
1980 Ford Courier - Pickup  
NHTSA 800609  
Post-Impact, Right Side View





APPROVED ENGINEERING TEST LABORATORIES

Figure 2-9

1980 Ford Courier - Pickup

NHTSA 800609

Post-Impact, Rollover Test, 90° Increment





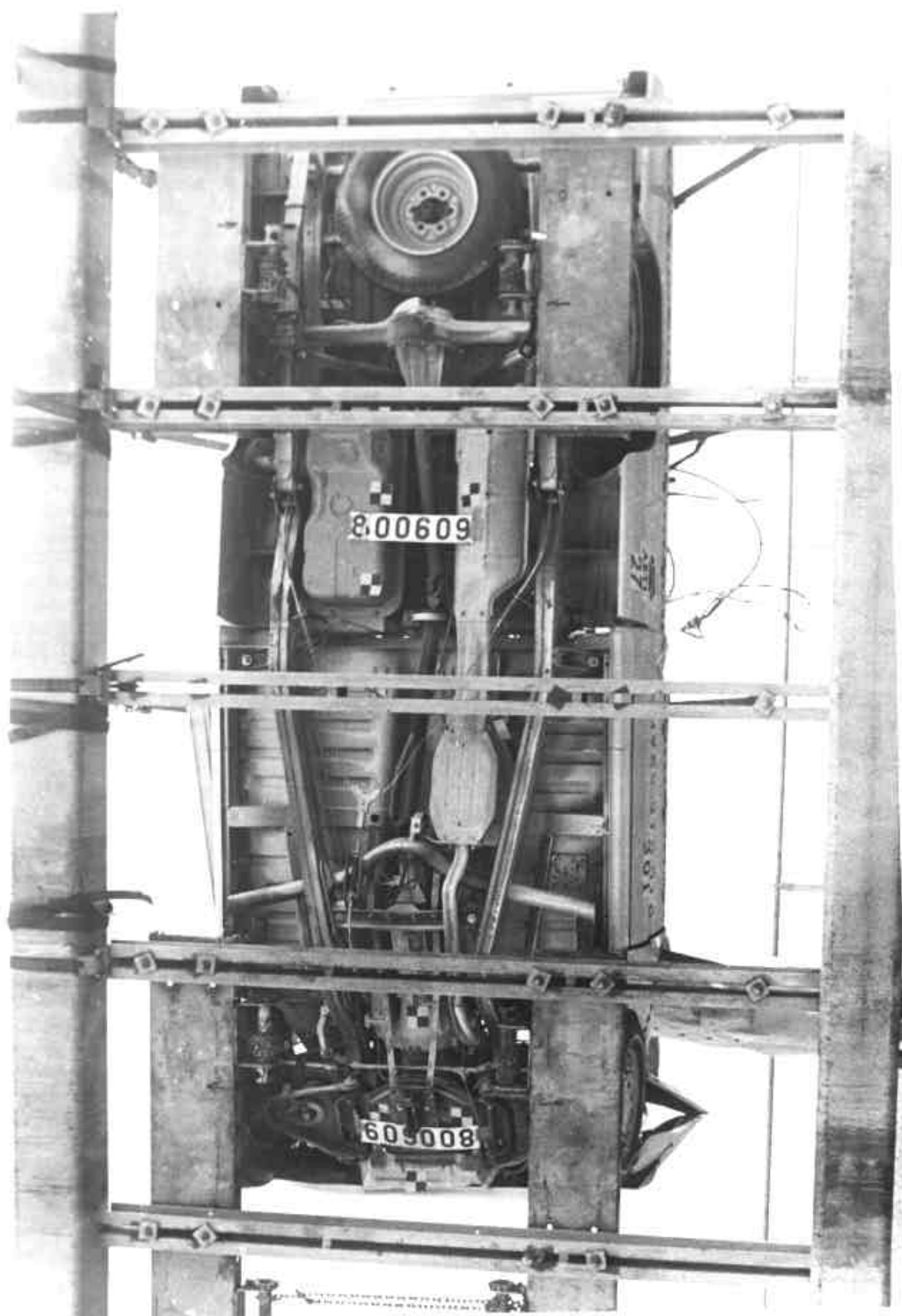
APPROVED ENGINEERING TEST LABORATORIES

Figure 2-10

1980 Ford Courier - Pickup

NHTSA 800609

Post-Impact, Rollover Test, 270° Increment





APPROVED ENGINEERING TEST LABORATORIES

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

All driver dummy response (Tape 1, channel 1 thru 10) data channels had signal drop out between 53 and 80 milliseconds. The following driver dummy summaries maybe considered inconclusive.

The passenger dummy experienced a HIC value of 721 and a chest resultant three millisecond clip of 33.9 g's, both are within the limit specified in FMVSS 208 injury criteria. All other values for the passenger dummy satisfy the FMVSS 208 requirements.

In addition to the occupant and vehicle data, each shoulder belt was marked at the D-ring after dummy positioning to provide a static measurement of belt position after the impact event. Post-impact measurement of the driver shoulder belt was 3.5 inch and the passenger shoulder belt was 3.5 inch.

TABLE 3-1  
PART 572 DUMMY IN-VEHICLE POSITION

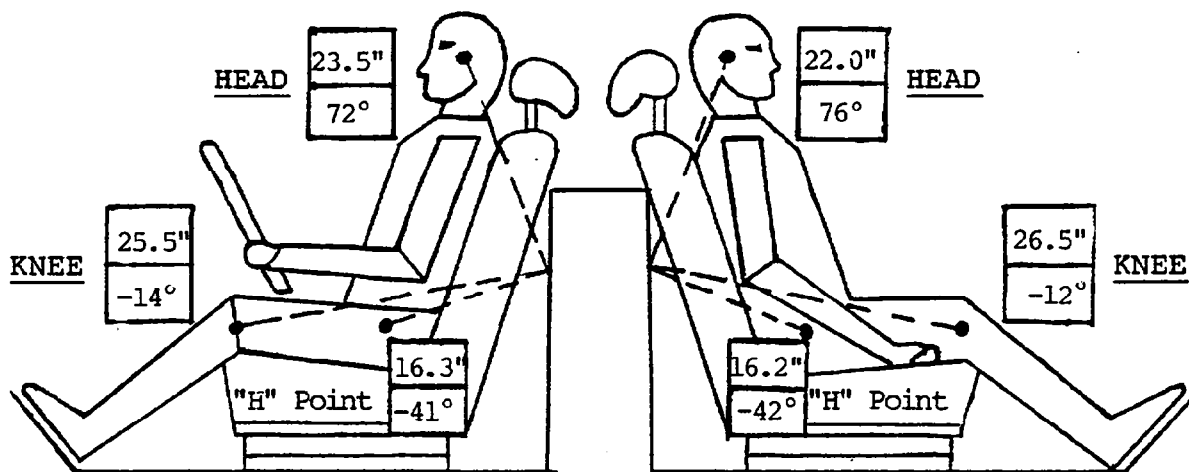
VEHICLE 1980 Ford Courier NHTSA NO. 800609

POSITIONING DATE: Dec. 2, 1980 AMBIENT TEMP: 72 °F TIME 1320

SEAT TYPE: X Bench  
       Bucket  
       Split Bench

ADJUSTER TYPE: X Manual  
       Power

BUCKET SEAT BACK TYPE: X Fixed  
       Adjustable Reclining



DRIVER  
S/N S06

PASSENGER  
S/N S03

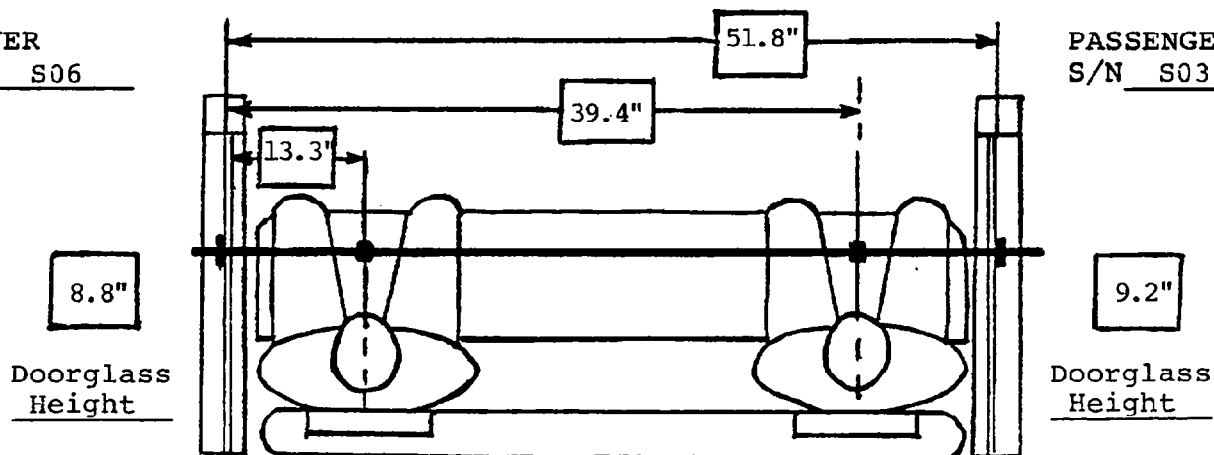


TABLE 3-2

PART 572 DUMMY PRE-TEST CLEARANCE DISTANCES

DRIVER

HH = 18.2 in.

HW = 22.2 in.

HR = 9.1 in.

HS = 10.3 in.

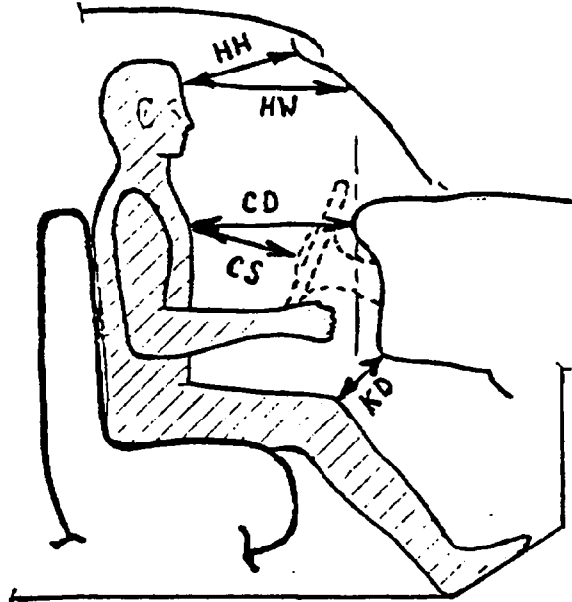
CD = 22.5 in.

CS = 13.6 in.

AD = 3.5 in.

HD = 7.0 in.

KD = 8.0 in.



PASSENGER

HH = 18.0 in.

HW = 21.1 in.

HR = 8.5 in.

HS = 9.0 in.

CD = 22.6 in.

AD = 2.7 in.

HD = 6.1 in.

KD = 8.6 in.

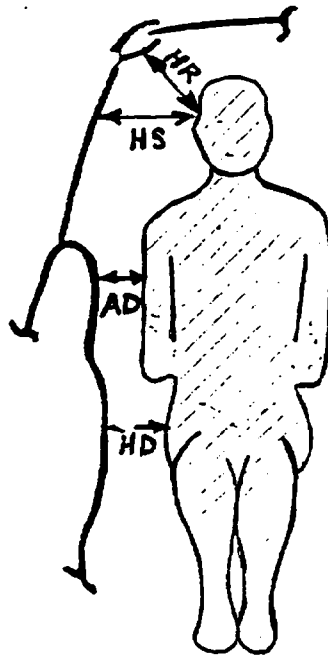


**TABLE 3-3**  
**MANUFACTURERS SEAT BELT INSTRUCTIONS**

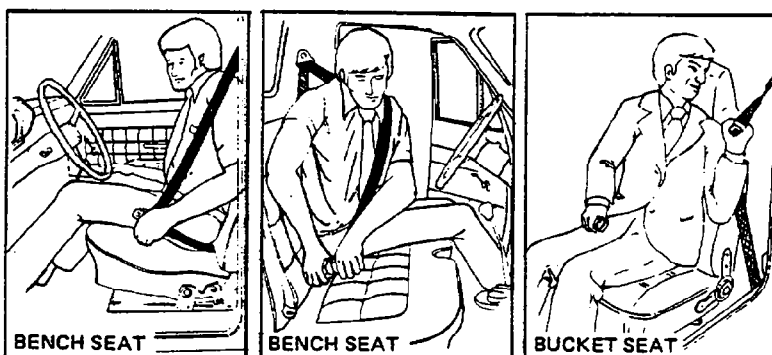
**Occupant Restraint System**

For personal safety and protection, all vehicle occupants should fasten the lap-shoulder belts. Your truck features a seat belt warning system for the driver's seat and a three-point belt system for the front seat outboard position. If the driver does not buckle up before turning on the ignition, the buzzer will sound for about eight seconds. The seat belt warning light (see page 11) will remain on for four to eight seconds with or without the belts being buckled.

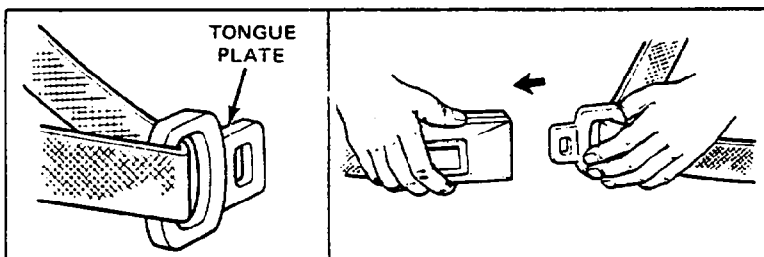
**To Fasten the Front Lap-Shoulder Belts**

After entering your truck, 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 in one continuous motion so the shoulder portion of the belt crosses your shoulder and chest and insert the belt tongue into the proper buckle until you hear a snap and feel it latch.



- If the belt is not long enough to permit buckling, hold the tongue plate at a right angle to the belt webbing and pull the belt until the desired length is obtained.



- The lap portion of the belt adjusts automatically to a snug position. Adjust the lap portion of the belt **AROUND THE HIPS** (not the waist).
- The shoulder restraint portion of the belt adjusts automatically to a snug position. The inertia reel allows freedom of movement, locking tight 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.

---

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

---

**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.

---

TABLE 3-4  
PART 572 DUMMY DATA

Vehicle 1980 Ford Courier

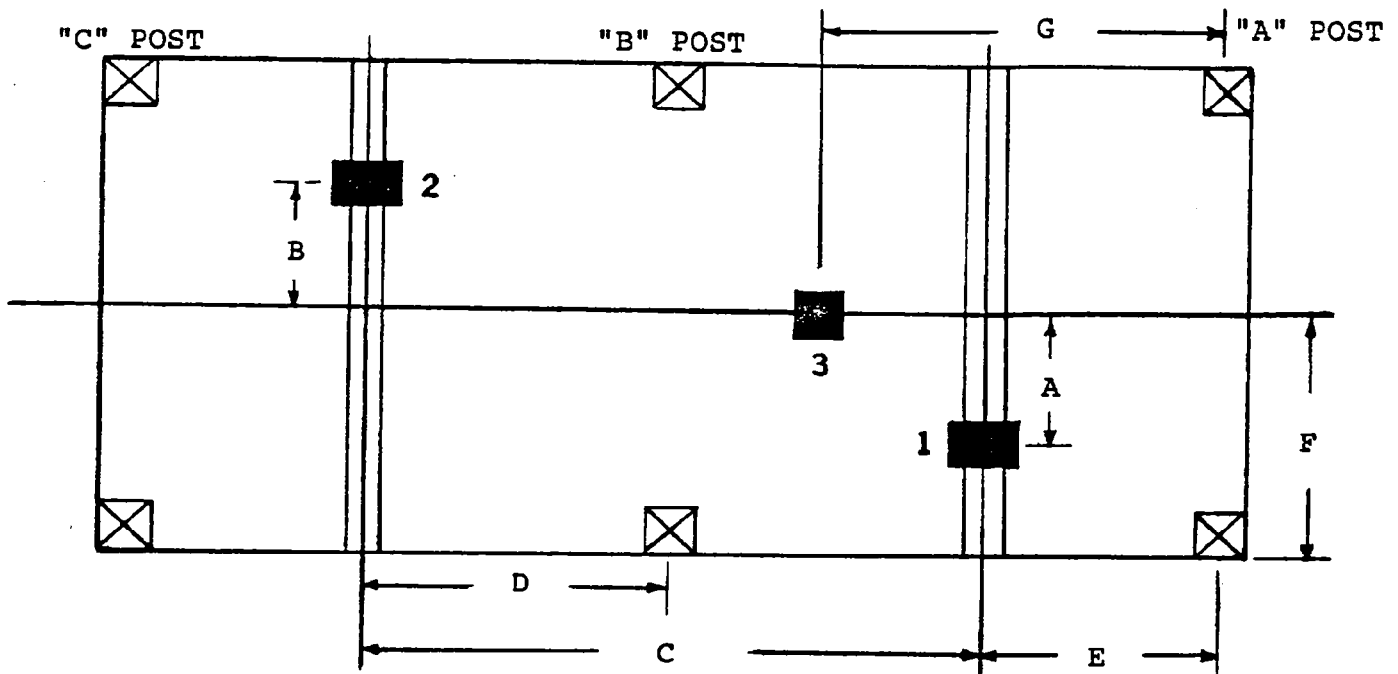
NHTSA No. 800609

| Driver S/N <u>S06</u><br>Passenger S/N <u>S03</u>                                                                                                                                                                                               | DRIVER                 |                |                        |                | PASSENGER                 |                |                        |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------|------------------------|----------------|---------------------------|----------------|------------------------|----------------|
|                                                                                                                                                                                                                                                 | Positive*<br>Direction |                | Negative*<br>Direction |                | Positive*<br>Direction    |                | Negative*<br>Direction |                |
|                                                                                                                                                                                                                                                 | Peak<br>G              | Time<br>(msec) | Peak<br>G              | Time<br>(msec) | Peak<br>G                 | Time<br>(msec) | Peak<br>G              | Time<br>(msec) |
| <b>HEAD ACCELERATION</b>                                                                                                                                                                                                                        |                        |                |                        |                |                           |                |                        |                |
| Longitudinal                                                                                                                                                                                                                                    | 34.7                   | 151.4          | 31.1                   | 85.4           | 0.6                       | 26.4           | 83.0                   | 111.4          |
| Lateral                                                                                                                                                                                                                                         | 12.3                   | 104.4          | 17.8                   | 150.2          | 38.9                      | 111.8          | 5.7                    | 70.8           |
| Vertical                                                                                                                                                                                                                                        | 26.8                   | 101.4          | 80.8                   | 80.2           | 7.0                       | 115.0          | 100.5                  | 111.4          |
| Resultant                                                                                                                                                                                                                                       | 82.7                   | 80.4           |                        |                | 134.9                     | 111.4          |                        |                |
| HIC                                                                                                                                                                                                                                             | No Data                |                |                        |                | 721 (56 - 125 msec)       |                |                        |                |
| <b>CHEST ACCELERATION</b>                                                                                                                                                                                                                       |                        |                |                        |                |                           |                |                        |                |
| Longitudinal                                                                                                                                                                                                                                    | 12.6                   | 143.2          | 51.9                   | 82.2           | 4.1                       | 171.8          | 36.3                   | 114.0          |
| Lateral                                                                                                                                                                                                                                         | 2.3                    | 45.4           | 14.6                   | 85.6           | 7.4                       | 79.0           | 14.5                   | 112.6          |
| Vertical                                                                                                                                                                                                                                        | 17.9                   | 101.0          | 16.9                   | 50.2           | 20.0                      | 118.2          | 16.4                   | 62.4           |
| Resultant                                                                                                                                                                                                                                       | 52.5                   | 82.2           |                        |                | 39.0                      | 113.0          |                        |                |
| CSI                                                                                                                                                                                                                                             | No Data                |                |                        |                | 286 (33.9g - 3 msec clip) |                |                        |                |
|                                                                                                                                                                                                                                                 | (1b)                   | Time<br>(msec) | (1b)                   | Time<br>(msec) | (1b)                      | Time<br>(msec) | (1b)                   | Time<br>(msec) |
| <b>FEMUR LOAD</b>                                                                                                                                                                                                                               |                        |                |                        |                |                           |                |                        |                |
| Left                                                                                                                                                                                                                                            | 261                    | 50.0           | 195                    | 30.2           | 295                       | 54.4           | 709                    | 30.0           |
| Right                                                                                                                                                                                                                                           | 277                    | 50.6           | 344                    | 115.4          | 305                       | 54.2           | 283                    | 58.2           |
| <b>BELT LOAD</b>                                                                                                                                                                                                                                |                        |                |                        |                |                           |                |                        |                |
| Torso                                                                                                                                                                                                                                           | 992                    | 54.0           |                        |                | 1271                      | 71.0           |                        |                |
| Lap                                                                                                                                                                                                                                             | 1579                   | 53.8           |                        |                | 1487                      | 61.0           |                        |                |
| Average Vehicle Impact Speed <u>29.73</u> mph                                                                                                                                                                                                   |                        |                |                        |                |                           |                |                        |                |
| <p>*Positive Direction - Longitudinal: Forward<br/> Lateral: Leftward<br/> Vertical: Upward<br/> Femur: Tension</p> <p>*Negative Direction - Longitudinal: Rearward<br/> Lateral: Rightward<br/> Vertical: Downward<br/> Femur: Compression</p> |                        |                |                        |                |                           |                |                        |                |

TABLE 3-5  
VEHICLE STRUCTURAL DATA

VEHICLE 1980 Ford Courier

NHTSA NO. 800609



| DIMENSIONS |                   |          |                   |
|------------|-------------------|----------|-------------------|
| LOCATION   | MEASUREMENT (IN.) | LOCATION | MEASUREMENT (IN.) |
| A          | 20.8              | E        | 8.9               |
| B          | 18.7              | F        | 31.5              |
| C          | 39.5              | G        | 25.7              |
| D          | 14.1              |          |                   |

| ACCELERATION PEAKS                                                                            |                        |                |                        |                |
|-----------------------------------------------------------------------------------------------|------------------------|----------------|------------------------|----------------|
| ACCELEROMETER<br>LOCATION                                                                     | POSITIVE*<br>DIRECTION |                | NEGATIVE*<br>DIRECTION |                |
|                                                                                               | PEAK<br>"G"            | TIME<br>(MSEC) | PEAK<br>"G"            | TIME<br>(MSEC) |
| NO. 1 LONGITUDINAL                                                                            | 4.1                    | 166.6          | 45.2                   | 36.2           |
| NO. 2 LONGITUDINAL                                                                            | 37.6                   | 63.8           | 78.9                   | 59.0           |
| NO. 3 LONGITUDINAL                                                                            | 97.8                   | 74.4           | 212.6                  | 56.4           |
| *POSITIVE - LONGITUDINAL: FORWARD DIRECTION      *NEGATIVE - LONGITUDINAL: REARWARD DIRECTION |                        |                |                        |                |

TABLE 3-6  
PRE-TEST  
VEHICLE MEASUREMENT DATA

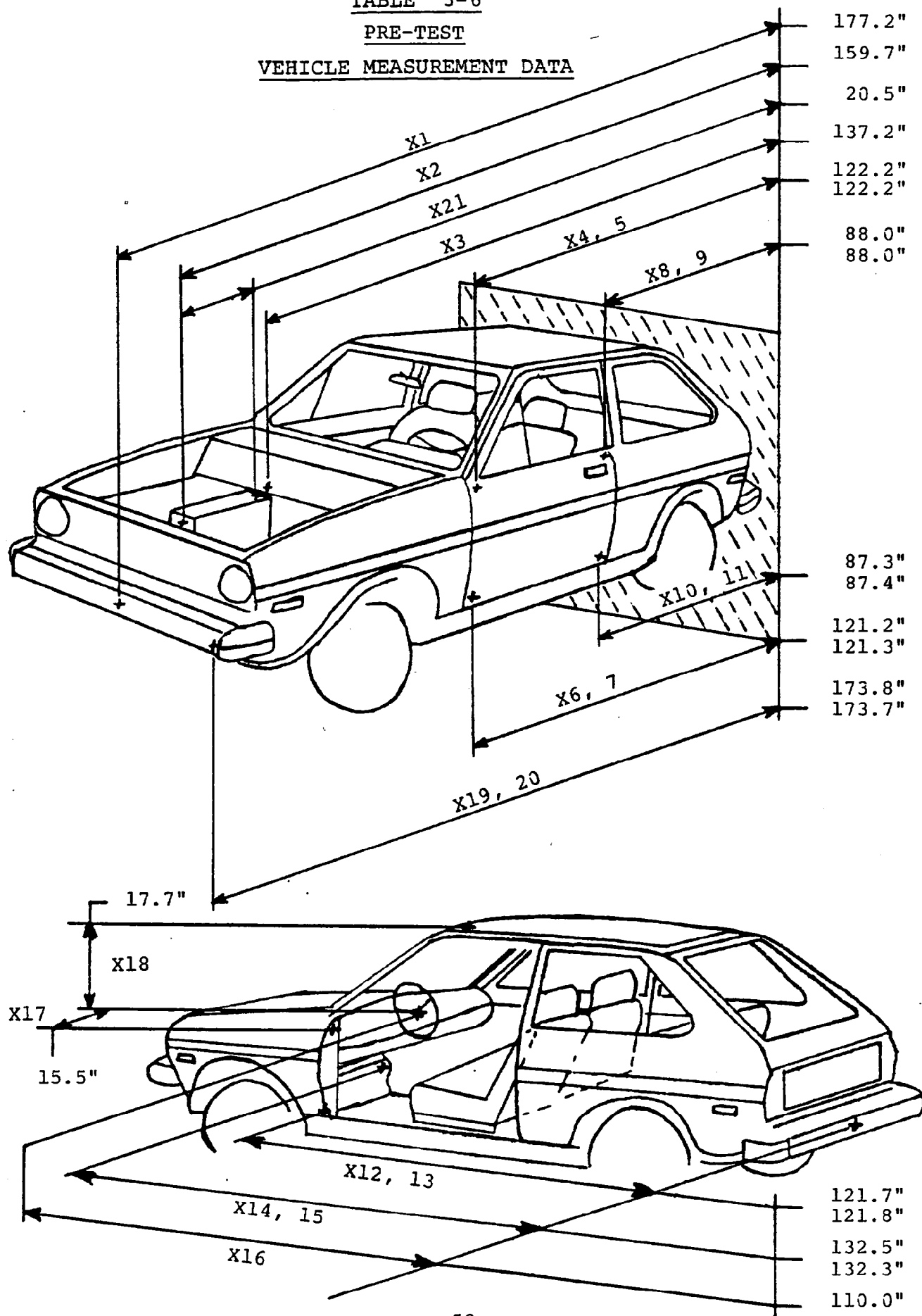
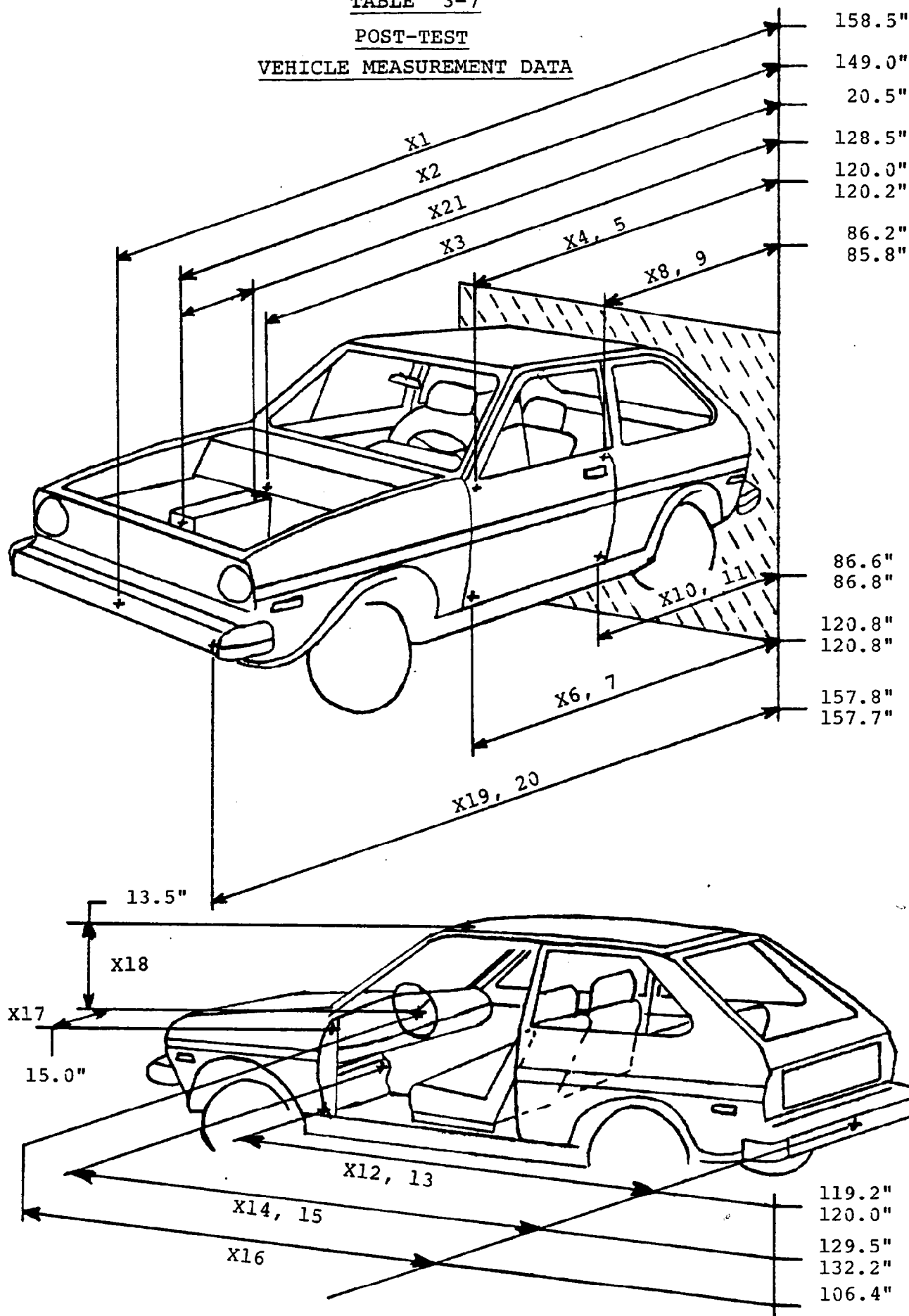


TABLE 3-7  
POST-TEST  
VEHICLE MEASUREMENT DATA





APPROVED ENGINEERING TEST LABORATORIES

TABLE 3-8

SUMMARY

PRE TEST AND POST TEST VEHICLE DIMENSIONS

| <u>Measurement Point</u> | <u>Pre-Test</u> | <u>Post-Test</u> | <u>Difference</u> |
|--------------------------|-----------------|------------------|-------------------|
| X1                       | 177.2"          | 158.5 "          | 18.7 "            |
| X2                       | 159.7"          | 149.0 "          | 10.7 "            |
| X3                       | 137.2"          | 128.5 "          | 8.7 "             |
| X4                       | 122.2"          | 120.0 "          | 2.2 "             |
| X5                       | 122.2"          | 120.2 "          | 2.0 "             |
| X6                       | 121.2"          | 120.8 "          | 0.4 "             |
| X7                       | 121.3"          | 120.8 "          | 0.5 "             |
| X8                       | 88.0"           | 86.2 "           | 1.8 "             |
| X9                       | 88.0"           | 85.8 "           | 2.2 "             |
| X10                      | 87.3"           | 86.6 "           | 0.7 "             |
| X11                      | 87.4"           | 86.8 "           | 0.6 "             |
| X12                      | 121.7"          | 119.2 "          | 2.5 "             |
| X13                      | 121.8"          | 120.0 "          | 1.8 "             |
| X14                      | 132.5"          | 129.5 "          | 3.0 "             |
| X15                      | 132.3"          | 132.2 "          | 0.1 "             |
| X16                      | 110.0"          | 106.4 "          | 3.6 "             |
| X17                      | 15.5"           | 15.0 "           | 0.5 "             |
| X18                      | 17.7"           | 13.5 "           | 4.2 "             |
| X19                      | 173.8"          | 157.8 "          | 16.0 "            |
| X20                      | 173.7"          | 157.7 "          | 16.0 "            |
| X21                      | 20.5"           | 20.5 "           | 0.0 "             |

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

VEHICLE 1980 Ford Courier

NHTSA NO. 800609

TEST DATE December 2, 1980

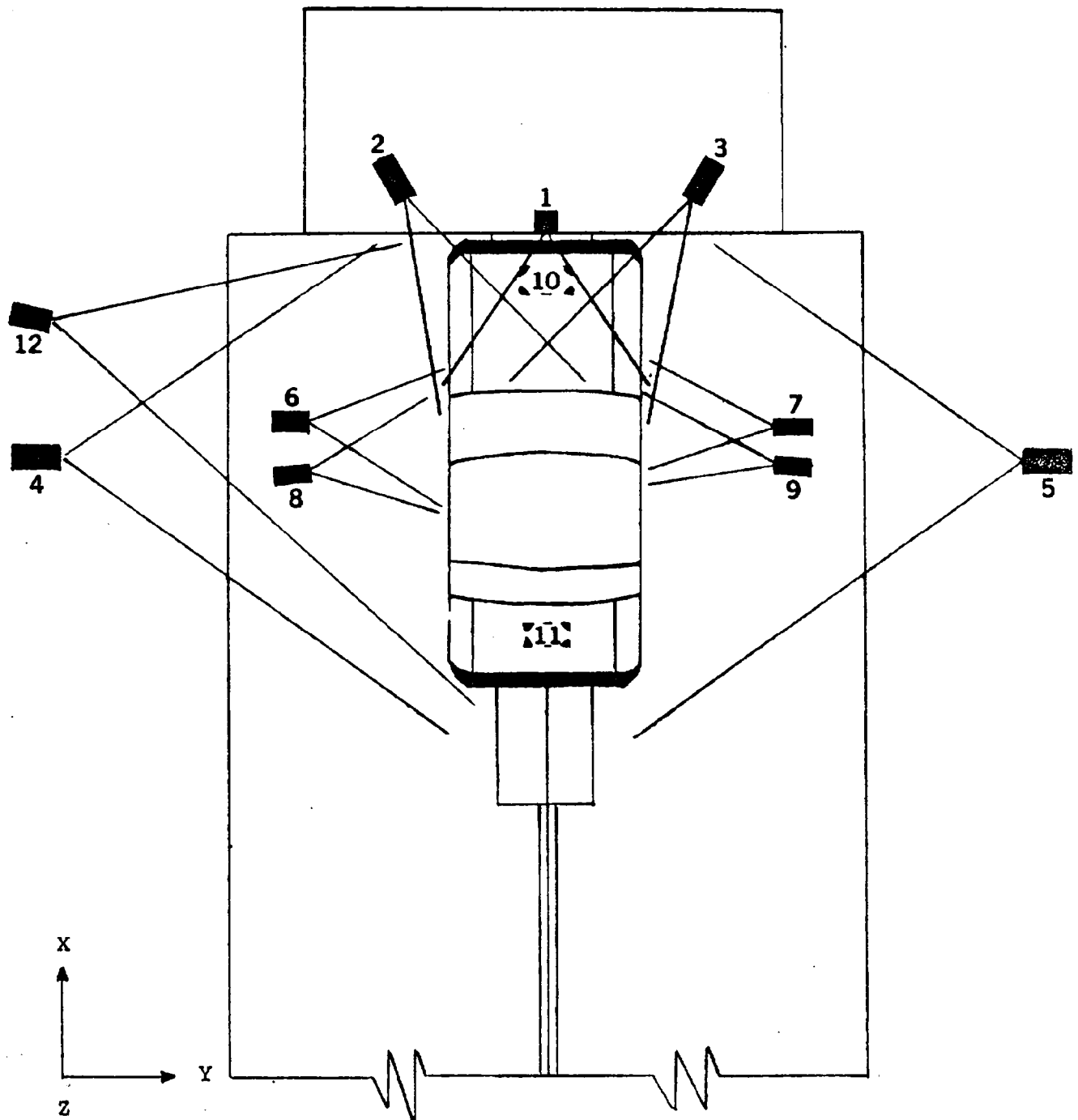


TABLE 3-10  
FMVSS 212/219/301-75  
CAMERA POSITIONS

VEHICLE 1980 Ford Courier

NHTSA NO. 800609 TEST DATE December 2, 1980

|                  |   |               |                   |   |               |
|------------------|---|---------------|-------------------|---|---------------|
| 1. Photo-Sonics  | X | <u>11.0"</u>  | 2. Photo-Sonics   | X | <u>-7.5"</u>  |
| 13mm 500FPS      | Y | <u>- 0 -</u>  | 13mm 500FPS       | Y | <u>18.5"</u>  |
|                  | Z | <u>238.0"</u> |                   | Z | <u>105.0"</u> |
| 3. Photo-Sonics  | X | <u>-5.0"</u>  | 4. Photo-Sonics   | X | <u>53.0"</u>  |
| 13mm 500FPS      | Y | <u>29.0"</u>  | 13mm 500FPS       | Y | <u>317.0"</u> |
|                  | Z | <u>100.0"</u> |                   | Z | <u>50.0"</u>  |
| 5. Photo-Sonics  | X | <u>41.0"</u>  | 6. Locam          | X | <u>85.0"</u>  |
| 13mm 500FPS      | Y | <u>181.0"</u> | 12.5mm 500FPS     | Y | <u>96.5"</u>  |
|                  | Z | <u>47.0"</u>  |                   | Z | <u>59.0"</u>  |
|                  |   |               | Dummy Head        |   | <u>81.0"</u>  |
| 7. Locam         | X | <u>92.0"</u>  | 8. Locam          | X | <u>94.0"</u>  |
| 13mm 500FPS      | Y | <u>105.0"</u> | 15mm              | Y | <u>94.5"</u>  |
|                  | Z | <u>57.5"</u>  | 500FPS            | Z | <u>59.0"</u>  |
| Dummy Head       |   | <u>90.5"</u>  | Dummy Head        |   | <u>79.0"</u>  |
| 9. Locam         | X | <u>100.0"</u> | 10. Photo-Sonics  | X | <u>9.0"</u>   |
| 12.5mm 500FPS    | Y | <u>104.0"</u> | 13mm 500FPS       | Y | <u>1.0"</u>   |
|                  | Z | <u>57.5"</u>  |                   | Z | <u>-31.0"</u> |
| Dummy Head       |   | <u>88.5"</u>  |                   |   |               |
| 11. Photo-Sonics | X | <u>169.0"</u> | 12. Canon Scoopic |   |               |
| 13mm 500FPS      | Y | <u>0.5"</u>   | 12.5 - 75mm 24FPS |   |               |
|                  | Z | <u>-36.0"</u> | - 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.



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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.



SECTION 4

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



SECTION 4

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 predigitizing filter capability of 48 db/octave above 1250 Hz for class 60, class 180 and class 600 data. A predigitizing filter of 24 db/octave above 1650 Hz is used for class 1000 data.



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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. 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. (Nine 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 (5000 Hz sampling for a 200 ms window). After the data is moved to permanent storage it is recalled by test personnel and plotted with the appro-



#### SECTION 4

priate label and vehicle designation. As the data is recalled, the DFA is programmed to automatically filter the data with the appropriate SAE filter.

Figure 4-2 illustrates the SAE class 60, 180, 600 and 1000 filters applied to the data. These filters are in accordance with SAE J211a, Instrumentation for Impact Tests. These recommended filters are quadratic double pole with 65% damping and a 12 db/octave rolloff. They are applied to the data using a Fast Fourier Transform (FFT) of the data, frequency domain multiplication, and an inverse Fast Fourier Transform (FFT) of the product.

It should be noted that in Figure 4-2 the predigitizing analog filter attenuates data above the 1250 Hz or 1650 Hz cutoff frequency. This has no effect on the class 60 or class 180 data. The class 600 data is within SAE J211a recommendation to 1900 Hz and -20 db. Above 1900 Hz the class 600 data is attenuated at 48 db/octave instead of 24 db/octave. This has very negligible effect on the class 600 data. The modification of class 1000 data, by predigitizing filter, is attenuation of ~~24~~ db/octave above



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1650 Hz. Therefore, the class 1000 data falls within the filter envelope as defined by SAE J211b until 2500 Hz and -15 db.

Class 60 filters are applied to the vehicle acceleration and belt restraint forces, while the class 180 filter is applied to the chest acceleration forces. The class 600 filter is applied to the femur forces and class 1000 filter is applied to the head acceleration forces.

4.7.1 IMPACT DATA

All impact data is presented in computer plots of data digitized at 200 microseconds. Special SAE filters are applied to the 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 as class 1000 data, 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 and the highest acceleration value of at least three millisecond duration (3 ms clip) are performed. Data output is in the form of computer plots with the 3 ms clip calculations.

4.7.1.4 FEMUR LOAD DATA

The dummy femur loads are processed as class 600 data, and presented as computer plots.



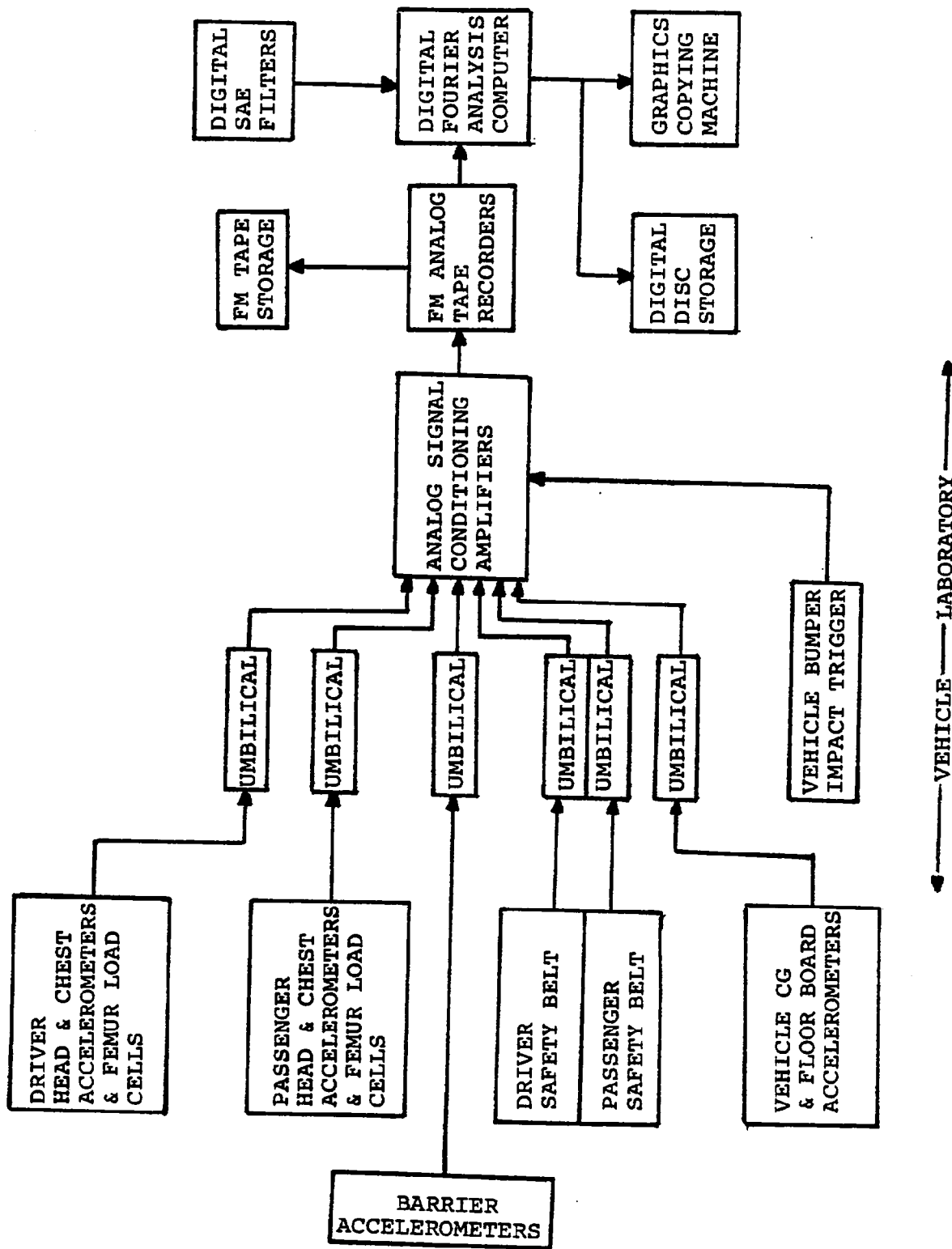
SECTION 4

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. Additionally, the longitudinal vehicle acceleration is integrated to provide approximate vehicle velocity change and vehicle crush during the impact event.



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,<br>Head, Chest,<br>Vehicle | Endevco             | 2262C-200        | 200g              | ±1%             | 3600 Hz               |
| Load Cells,<br>Femurs                      | GSE                 | 2430             | 3000 lb           | ±1%             | >3600 Hz              |
| Load Cells,<br>Safety Belts                | GSE                 | 2500             | 3000 lb           | ±1%             | >3600 Hz              |
| Contact Switch,<br>Impact                  | AETL                | -                | 2 V               | -               | <200 us<br>rise time  |
| FM Tape Recorder                           | Bell & Howell       | 4020             | ±2.8 V            | 47 db SNR       | 2500 Hz WB            |
| Programmable<br>Filter, All Data           | Hewlett<br>Packard  | 54440A           | -                 | 0.5%            | 1250 Hz,<br>48 db/oct |
| Analog-Digital<br>Converter,<br>All Data   | Hewlett<br>Packard  | 5466B            | -                 | 0.5%            | 200 us<br>sampling    |
| Analysis Computer,<br>All Analysis         | Hewlett<br>Packard  | 2100S            | 32 K Words        | 16 Bit Word     | -                     |
| Disc Drive                                 | Hewlett<br>Packard  | 7900A            | 5 Meg Words       | -               | -                     |
| Low Pass Filter                            | Rockland            | 452              | -                 | ±1%             | 1650 Hz,<br>24 db/oct |

TABLE 4-2DATA 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<br>a) Data analog filtered at 1250 Hz or 1650 Hz<br>b) Data digitized at 200 ms sample rate<br>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                                                                                                                                                 |
| 13          | Vehicle Dynamics Evaluated (MPH & Crush)                                                                                                                                               |

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 Shoulder Belt Force                         |
| 3        | 1        | 10          | Driver Lap Belt Force                              |
| 3        | 1        | 11          | Left Rear Floor Pan Longitudinal Acceleration Ax   |
| 3        | 1        | 12          | Vehicle Longitudinal CG Acceleration Ax            |
| 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 Left Femur Force                         |
| 7        | 2        | 9           | Passenger Shoulder Belt Force                      |
| 7        | 2        | 10          | Passenger Lap Belt Force                           |
| 7        | 2        | 11          | Right Front Floor Pan Longitudinal Acceleration Ax |

DOT CRASH PROGRAM                      APPROVED ENGINEERING TEST LABS

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

SAE FILTER ROLL OFF IS 12 DB/OCTAVE, ANALOG FILTER ROLL OFF IS 48 DB/O

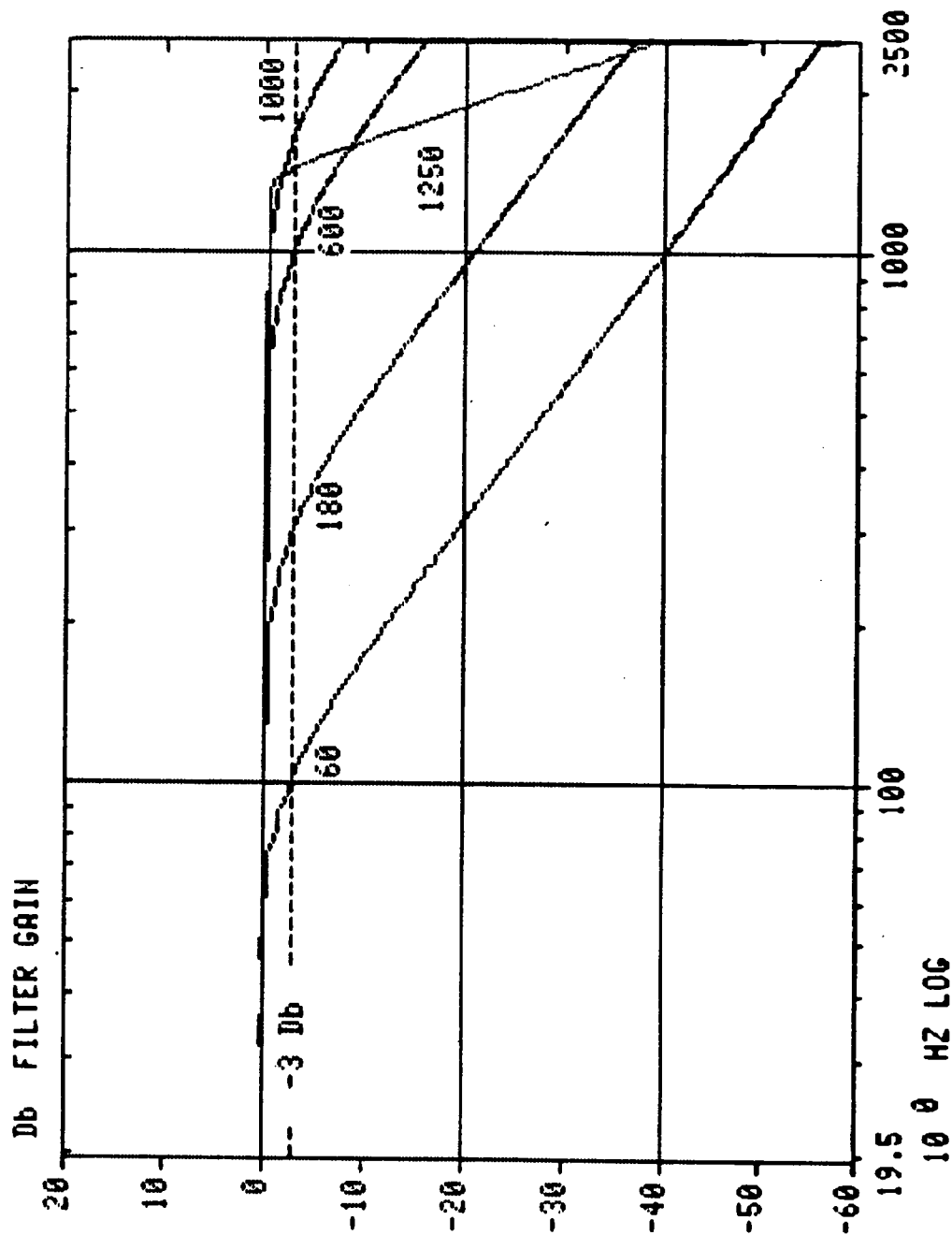


FIGURE 4-2



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 Courier - Pickup  
NHTSA 800609  
Pre-Test, Driver Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure A-2  
1980 Ford Courier - Pickup  
NHTSA 800609  
Pre-Test, Passenger Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure A-3  
1980 Ford Courier - Pickup  
NHTSA 800609  
Post-Impact, Driver Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure A-4  
1980 Ford Courier - Pickup  
NHTSA 800609  
Post-Impact, Driver Dummy Contact Area





APPROVED ENGINEERING TEST LABORATORIES

**Figure A-5**

**1980 Ford Courier - Pickup**

**NHTSA 800609**

**Post-Impact, Driver Dummy Contact Area**





APPROVED ENGINEERING TEST LABORATORIES

Figure A-6  
1980 Ford Courier - Pickup  
NHTSA 800609  
Post-Impact, Passenger Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure A-7

1980 Ford Courier - Pickup

NHTSA 800609

Post-Impact, Passenger Dummy Contact Area





APPROVED ENGINEERING TEST LABORATORIES

Figure A-8

1980 Ford Courier - Pickup

NHTSA 800609

Post-Impact, Passenger Dummy View





APPROVED ENGINEERING TEST LABORATORIES

APPENDIX B



APPROVED ENGINEERING TEST LABORATORIES

APPENDIX B

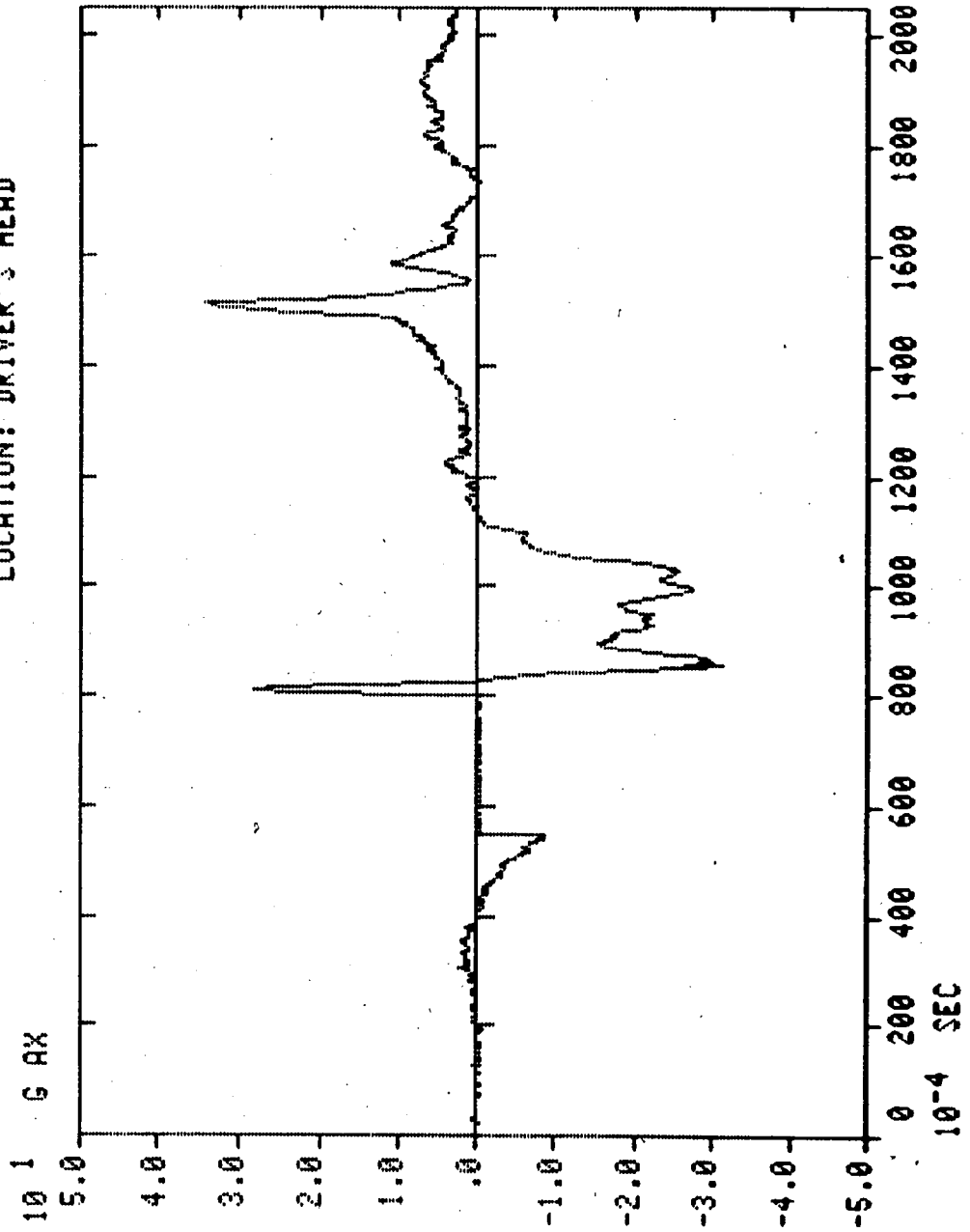
The following computer plots provide complete and comprehensive occupant response and vehicle acceleration during the frontal fixed barrier impact test of a 1980 Ford Courier - Pickup, NHTSA 800609.

30T CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 1, CH 1  
DIRECTION: FORWARD  
LOCATION: DRIVER'S HEAD

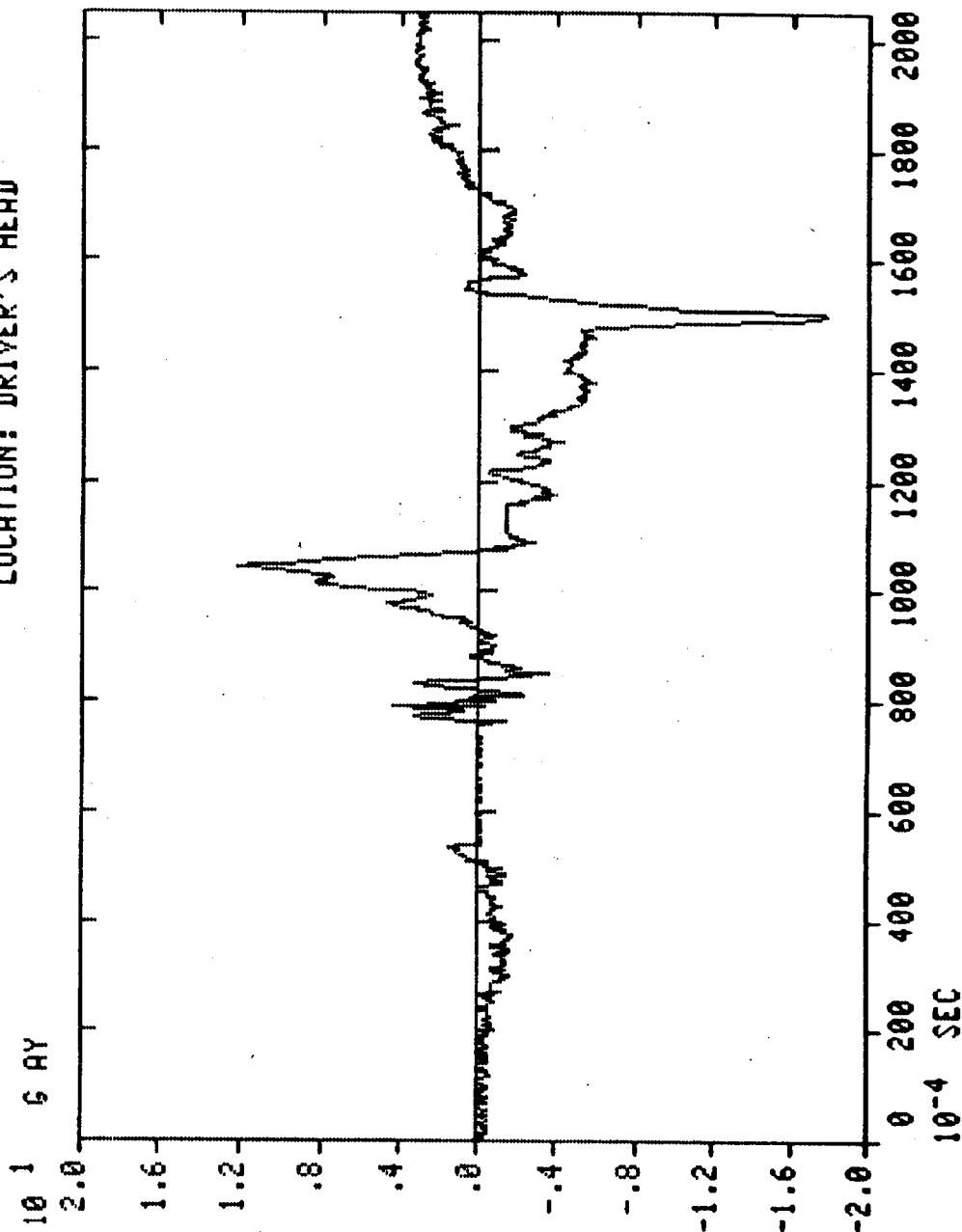


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPR 1, CH 2  
DIRECTION: LEFT  
LOCATION: DRIVER'S HEAD

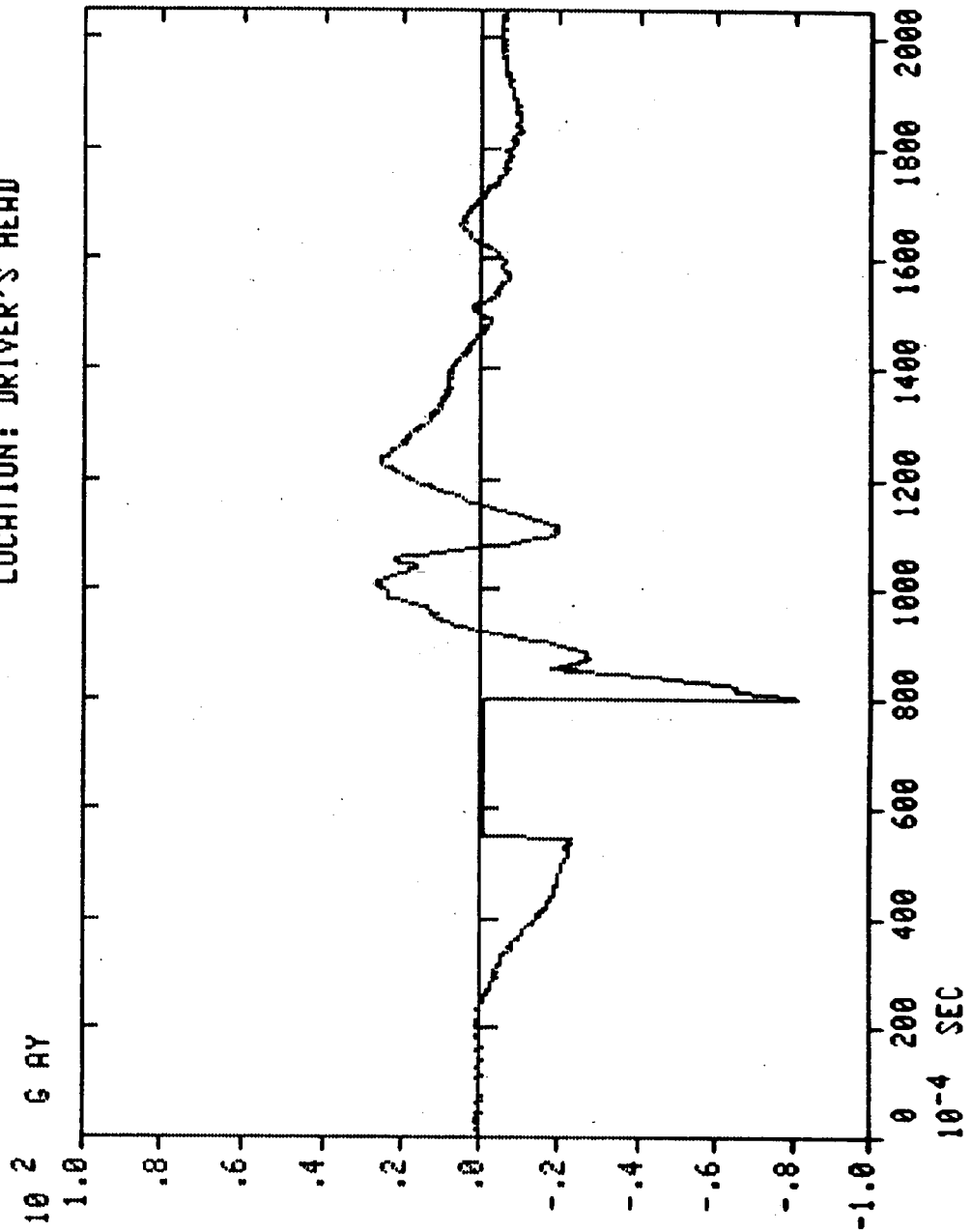


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 1, CH3  
DIRECTION: UPWARD  
LOCATION: DRIVER'S HEAD

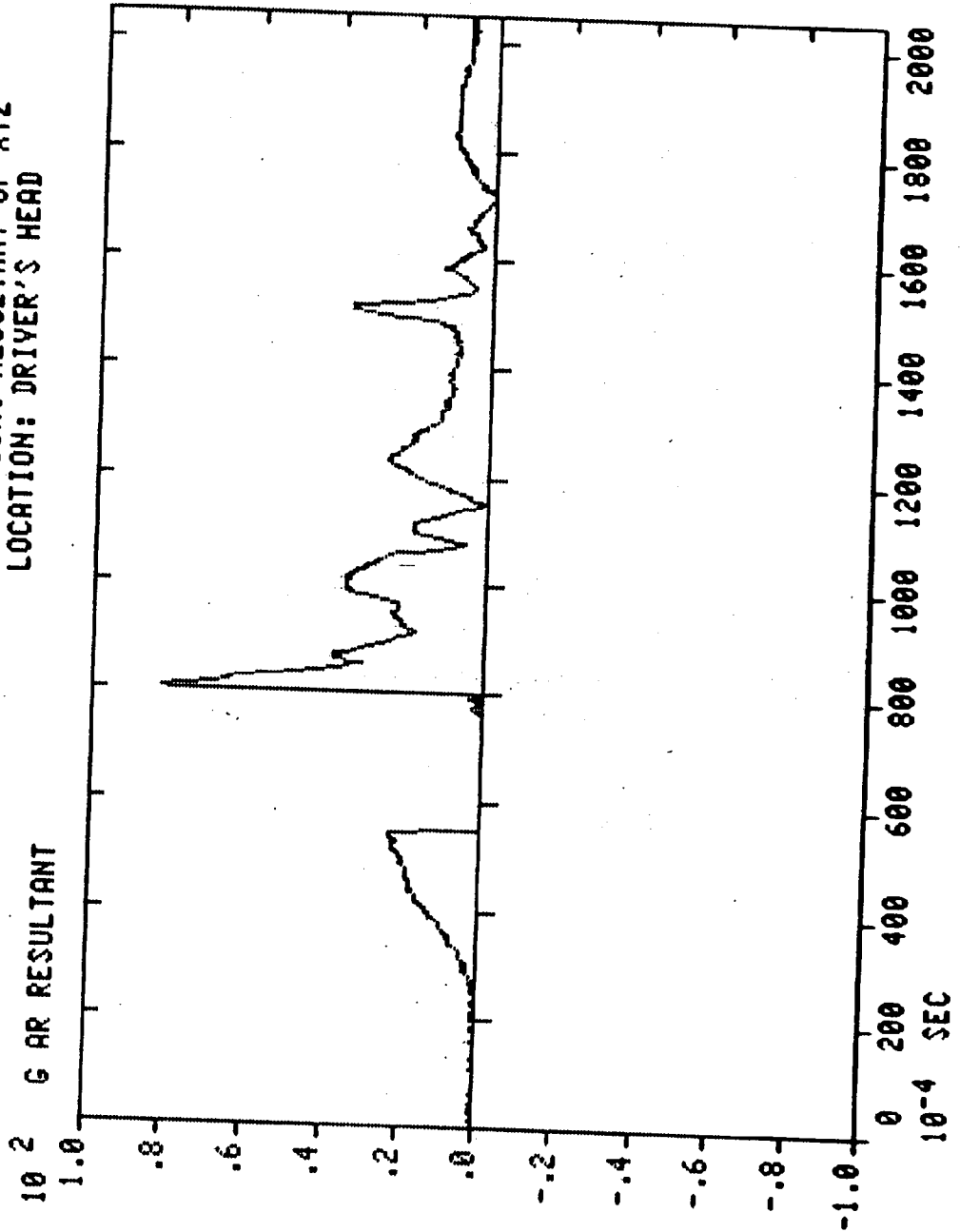


DOT CRASH PROGRAM

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO. : 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 1, CH 1-3  
DIRECTION: RESULTANT OF XYZ  
LOCATION: DRIVER'S HEAD

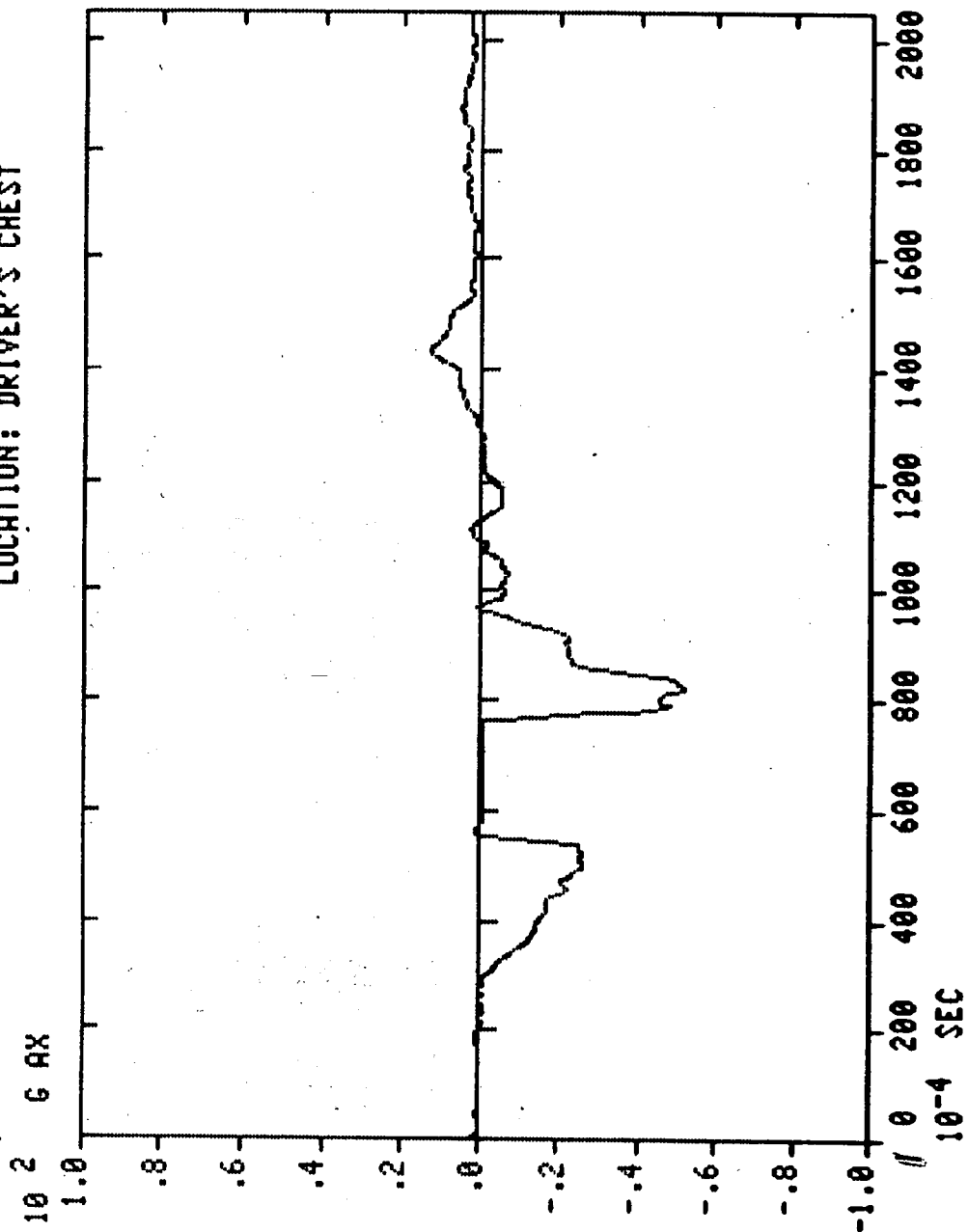


DOT CRASH PROGRAM

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO.: 971-3882-27  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 1, CH 5  
DIRECTION: FORWARD  
LOCATION: DRIVER'S CHEST

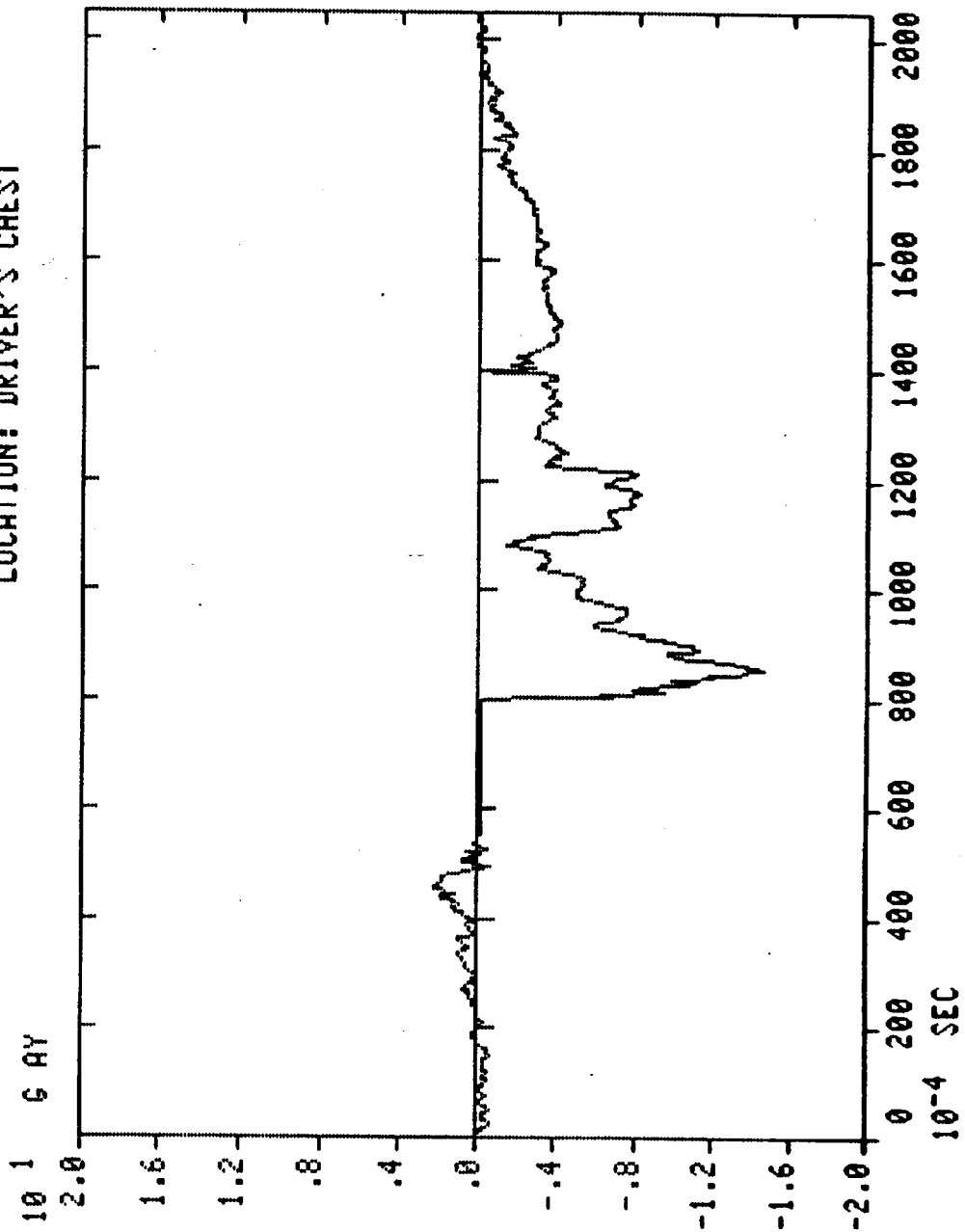


DOT CRASH PROGRAM

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO.: 971-3882-27  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 1, CH 6  
DIRECTION: LEFT  
LOCATION: DRIVER'S CHEST

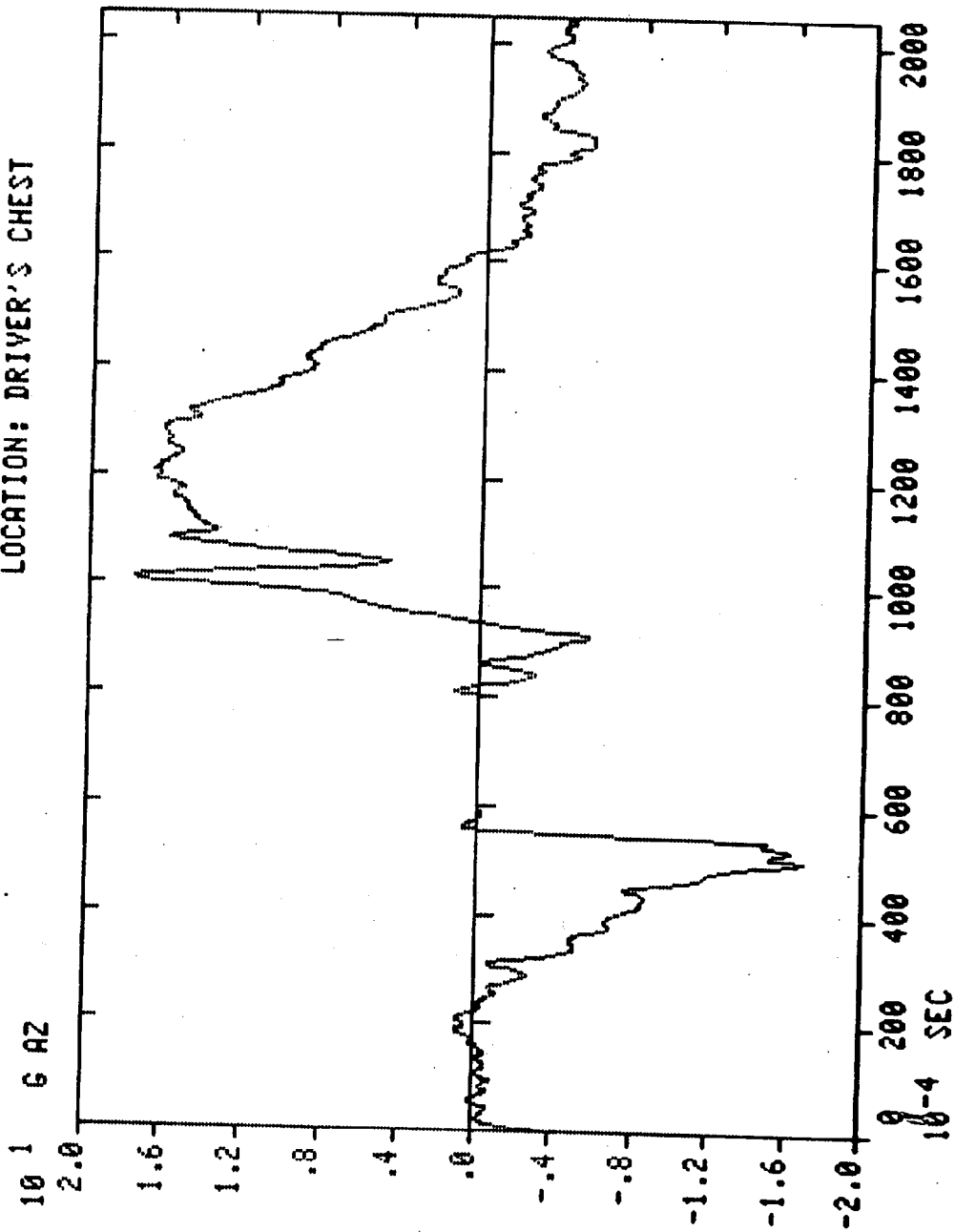


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 1, CH 7  
DIRECTION: UPWARD  
LOCATION: DRIVER'S CHEST

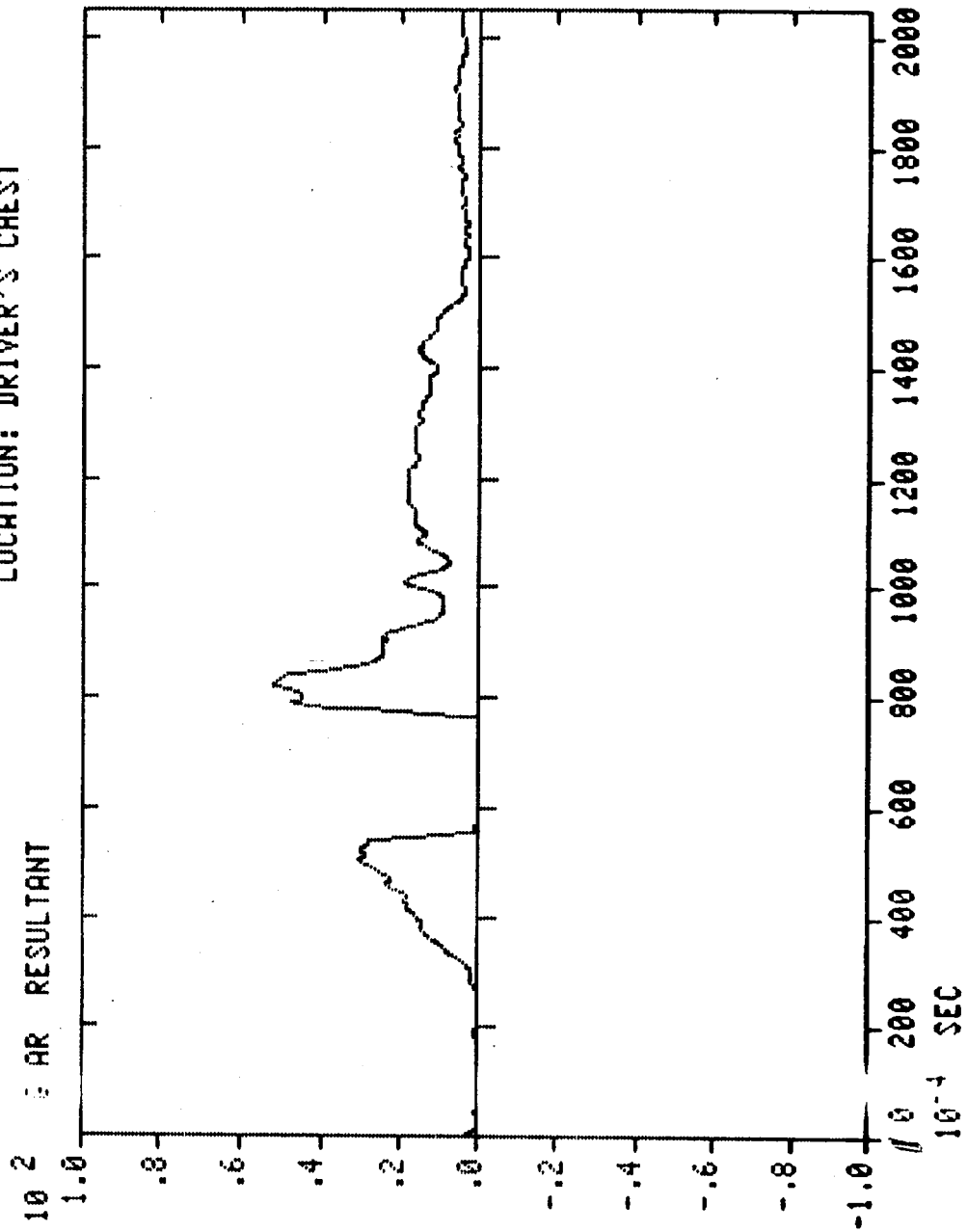


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 1, CH 5-7  
DIRECTION: RESULTANT OF XYZ  
LOCATION: DRIVER'S CHEST

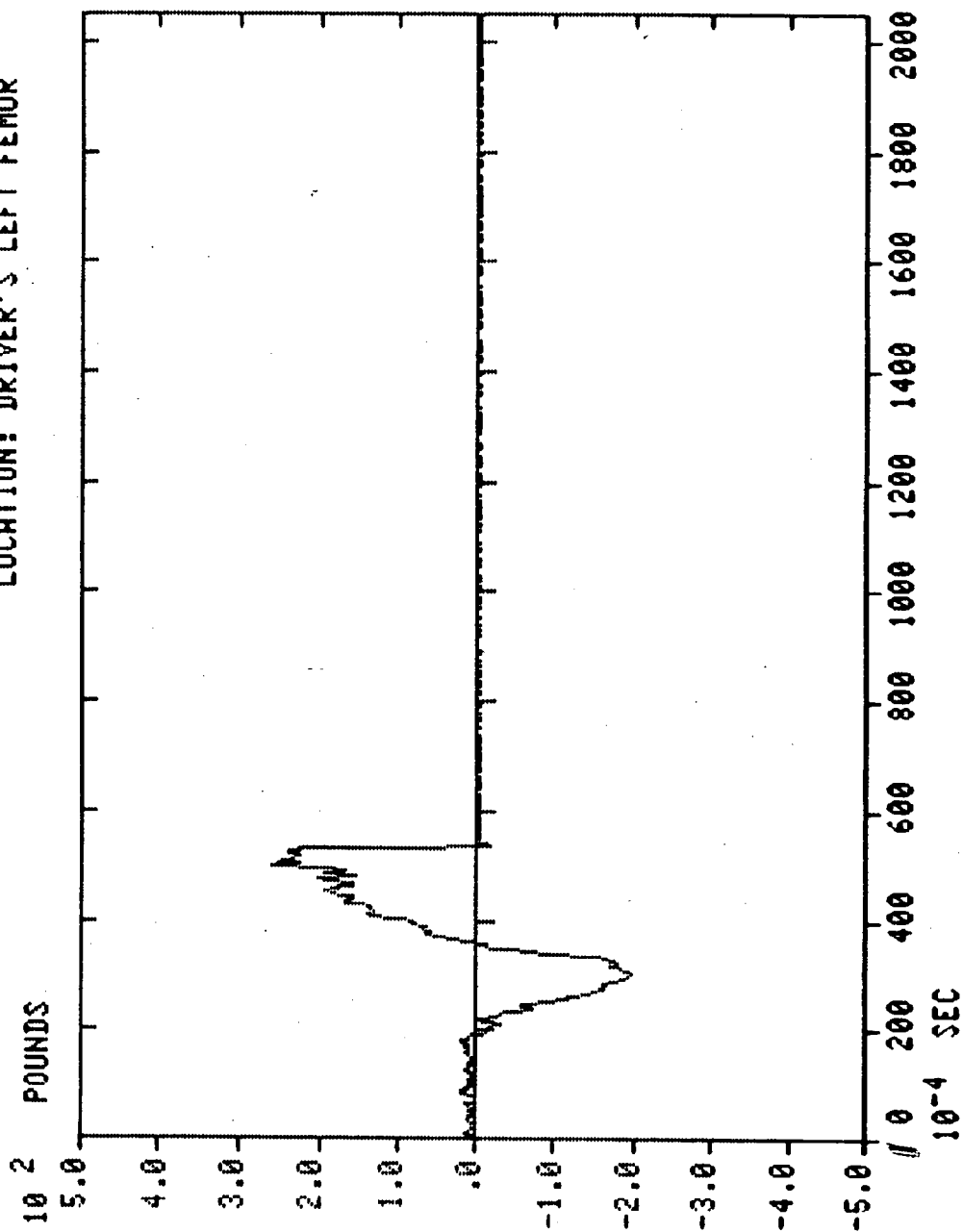


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 600  
LOAD CELL: TAPE 1, CH 8  
DIRECTION: TENSION  
LOCATION: DRIVER'S LEFT FEMUR

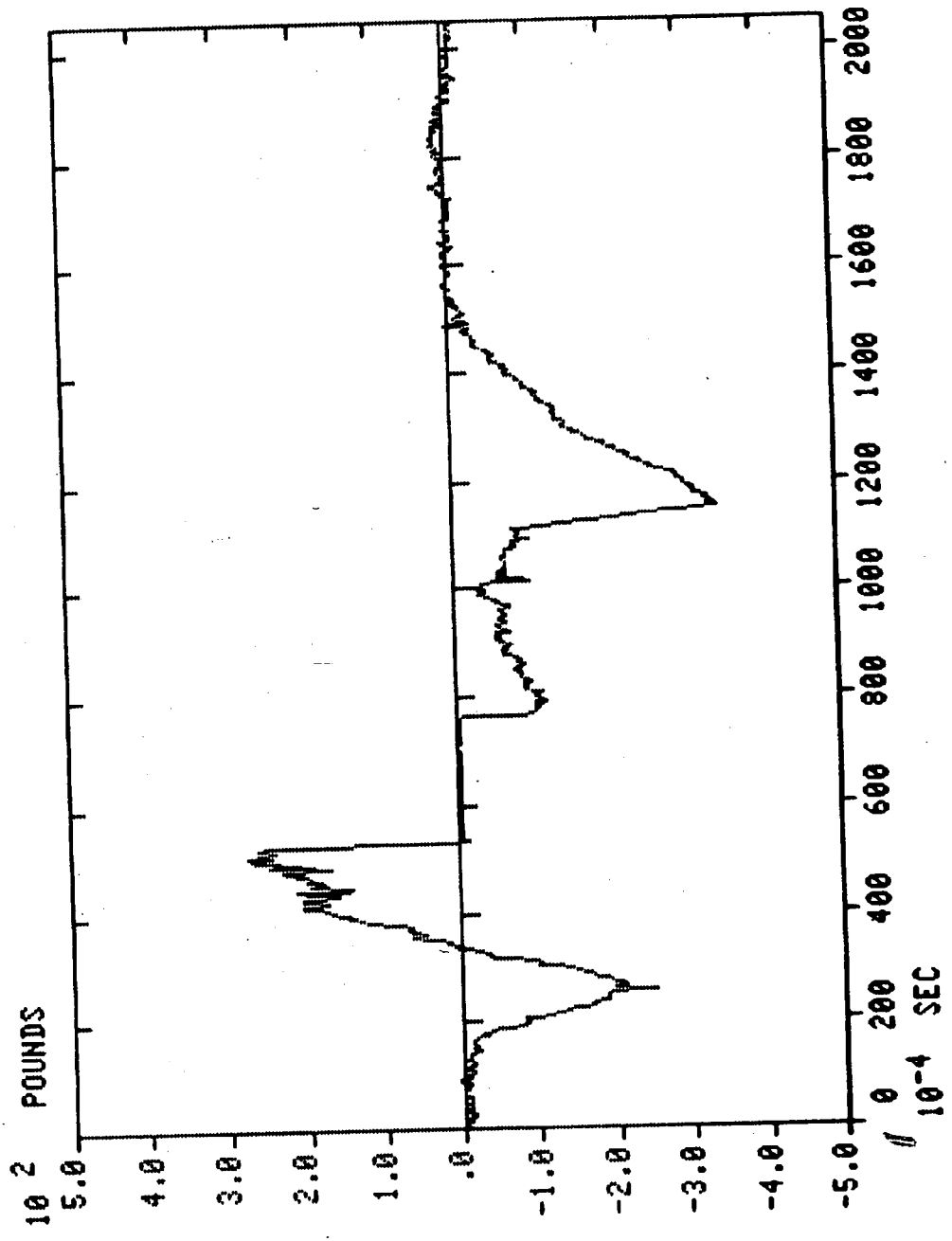


APPROVED ENGINEERING TEST LABS

DOT CRASH PROGRAM

MJO NO. : 971-3882-27  
FILTER: CLASS 600  
LOAD CELL: TAPE 1, CH 4  
DIRECTION: TENSION  
LOCATION: DRIVER'S RIGHT FEMUR

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 880609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

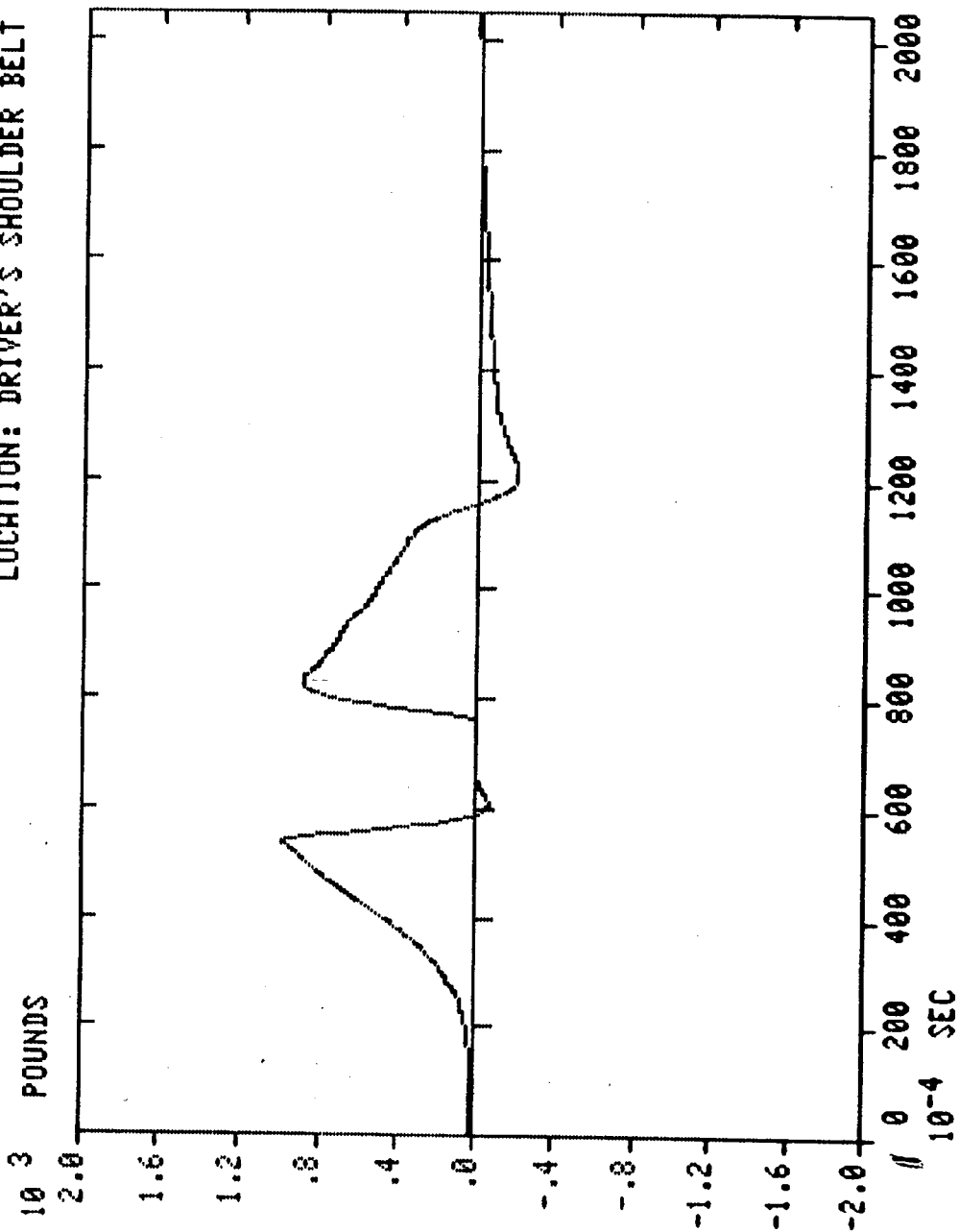


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 60  
LOAD CELL: TAPE 1, CH 9  
DIRECTION: TENSION  
LOCATION: DRIVER'S SHOULDER BELT

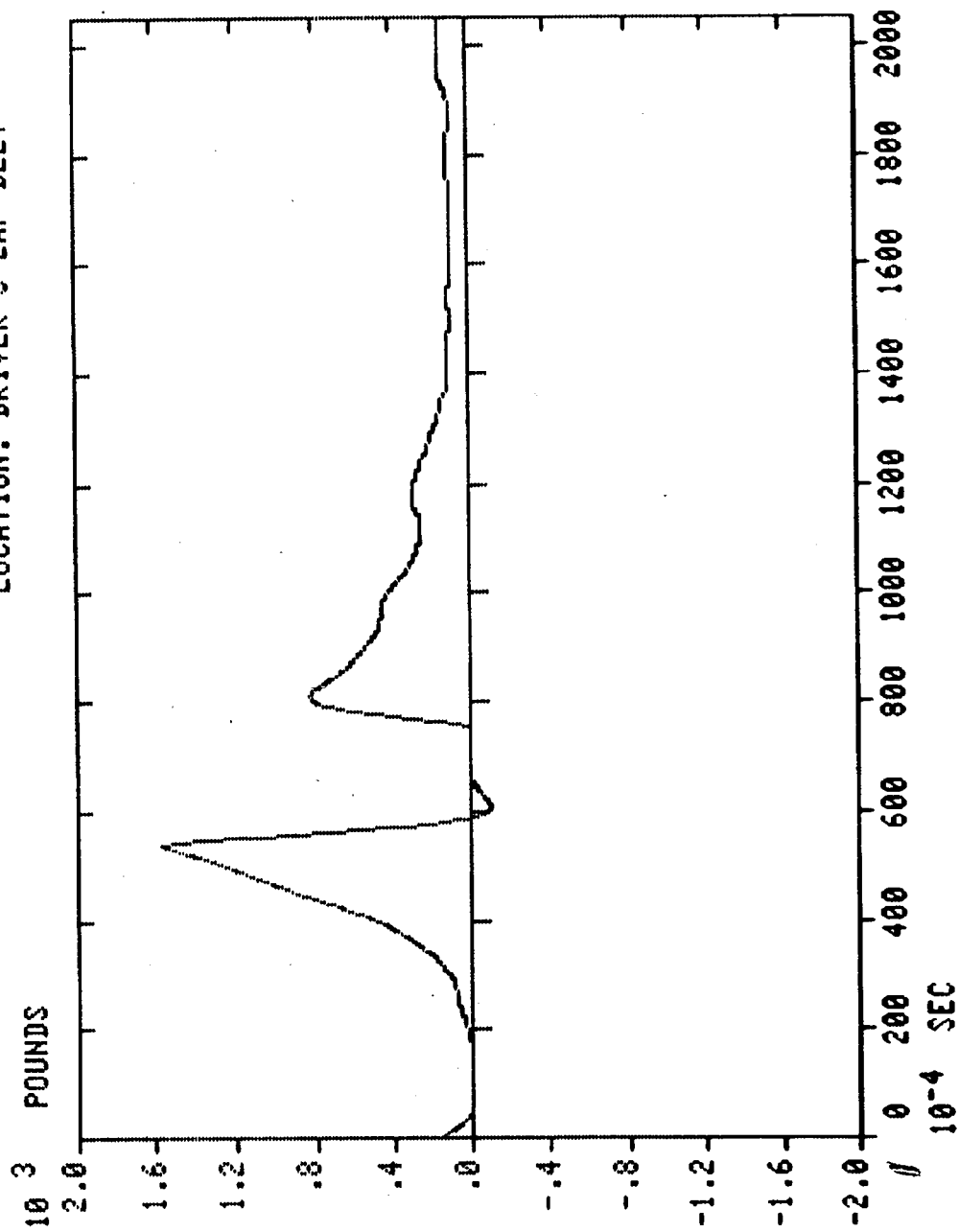


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 60  
LOAD CELL: TAPE 1, CH 10  
DIRECTION: TENSION  
LOCATION: DRIVER'S LAP BELT

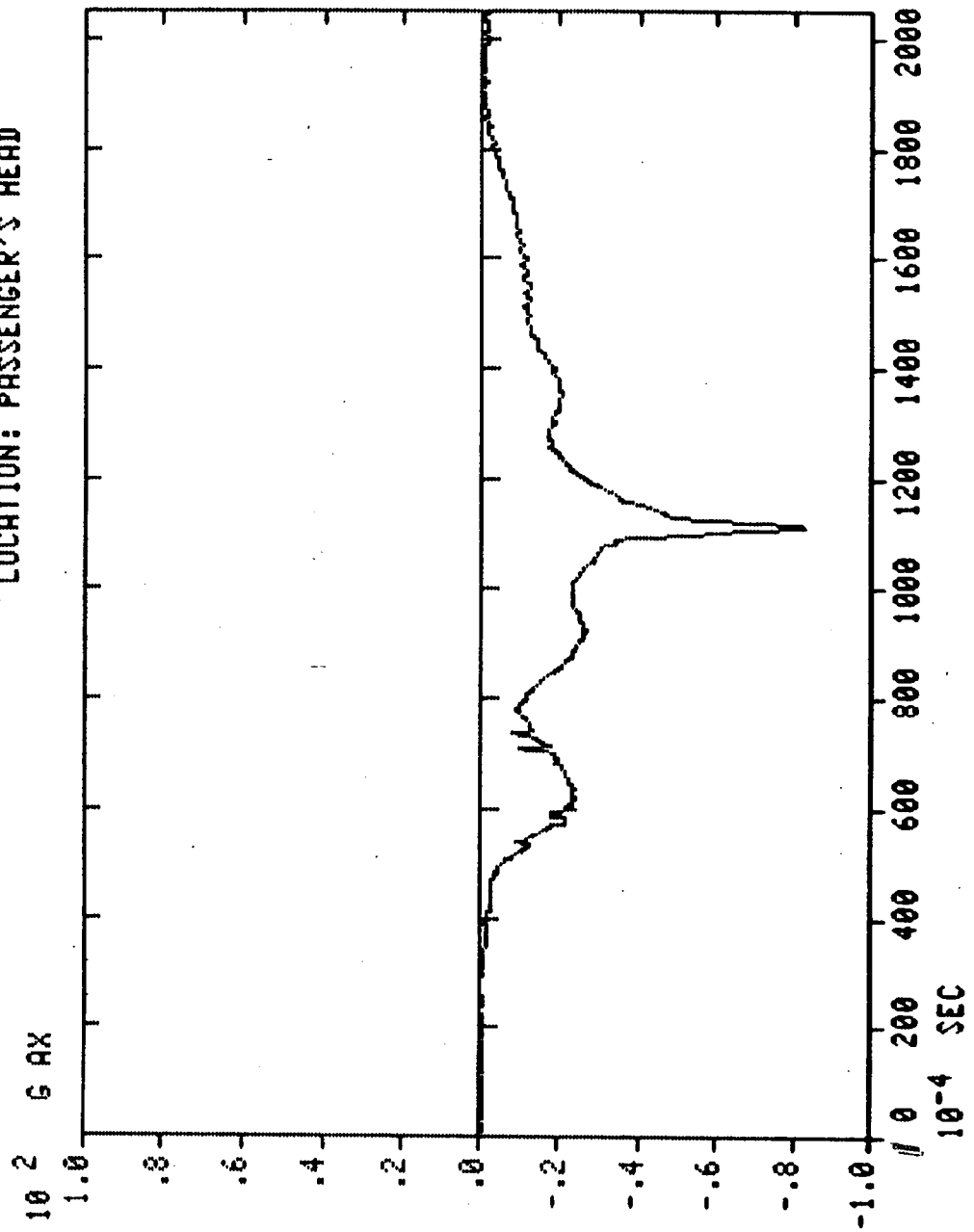


DOT CRASH PROGRAM

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO.: 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 1  
DIRECTION: FORWARD  
LOCATION: PASSENGER'S HEAD

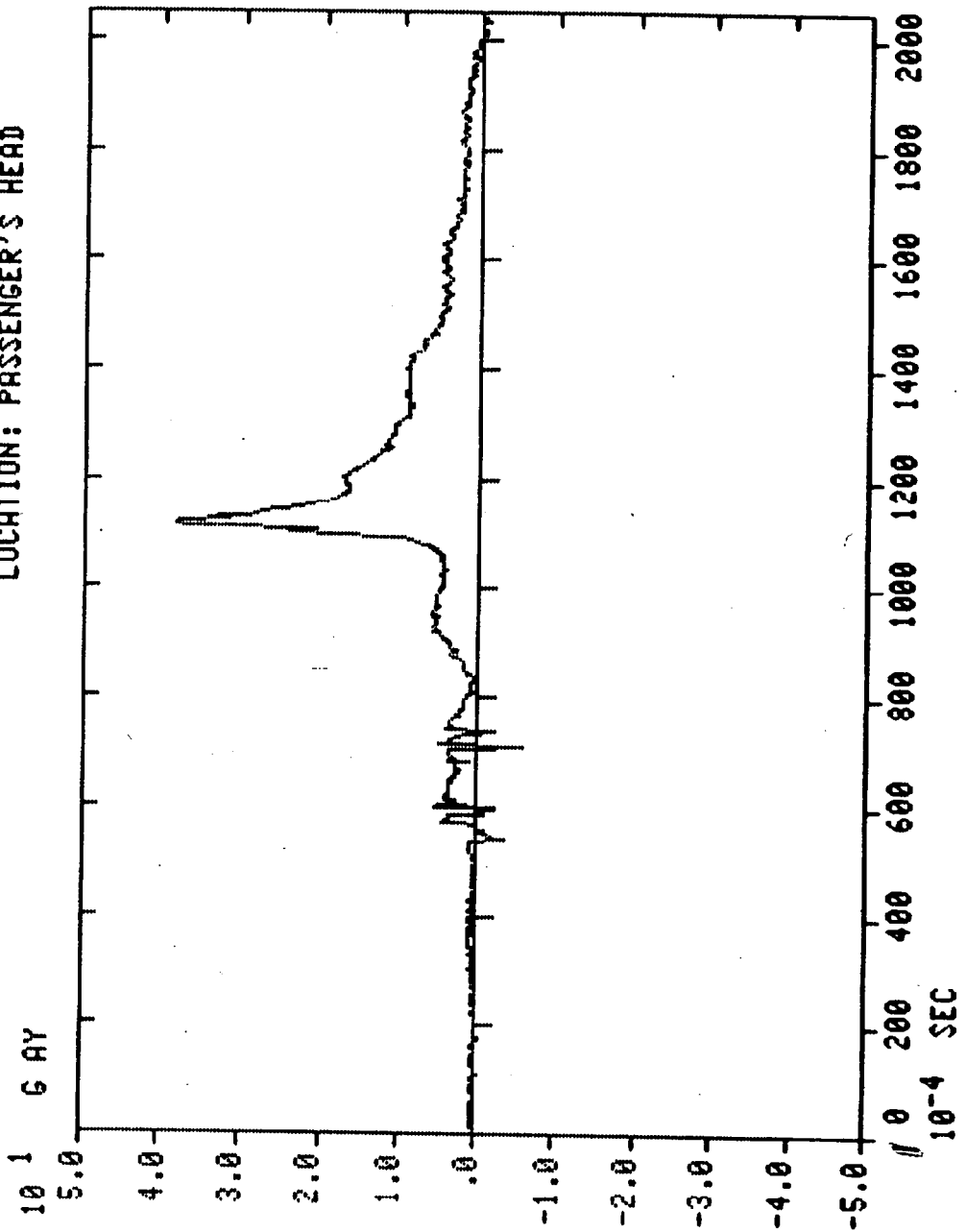


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 2  
DIRECTION: LEFT  
LOCATION: PASSENGER'S HEAD

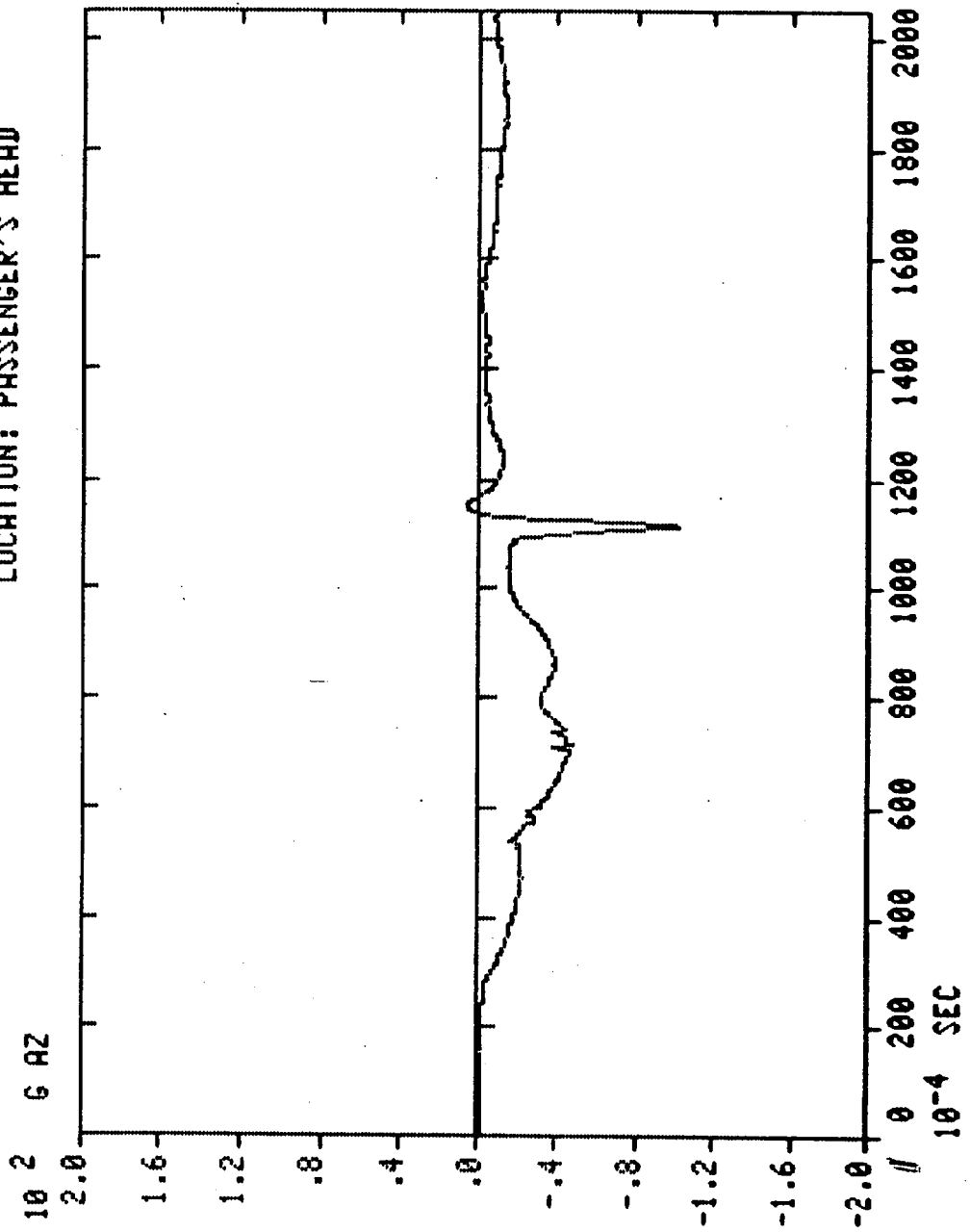


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 3  
DIRECTION: UPWARD  
LOCATION: PASSENGER'S HEAD

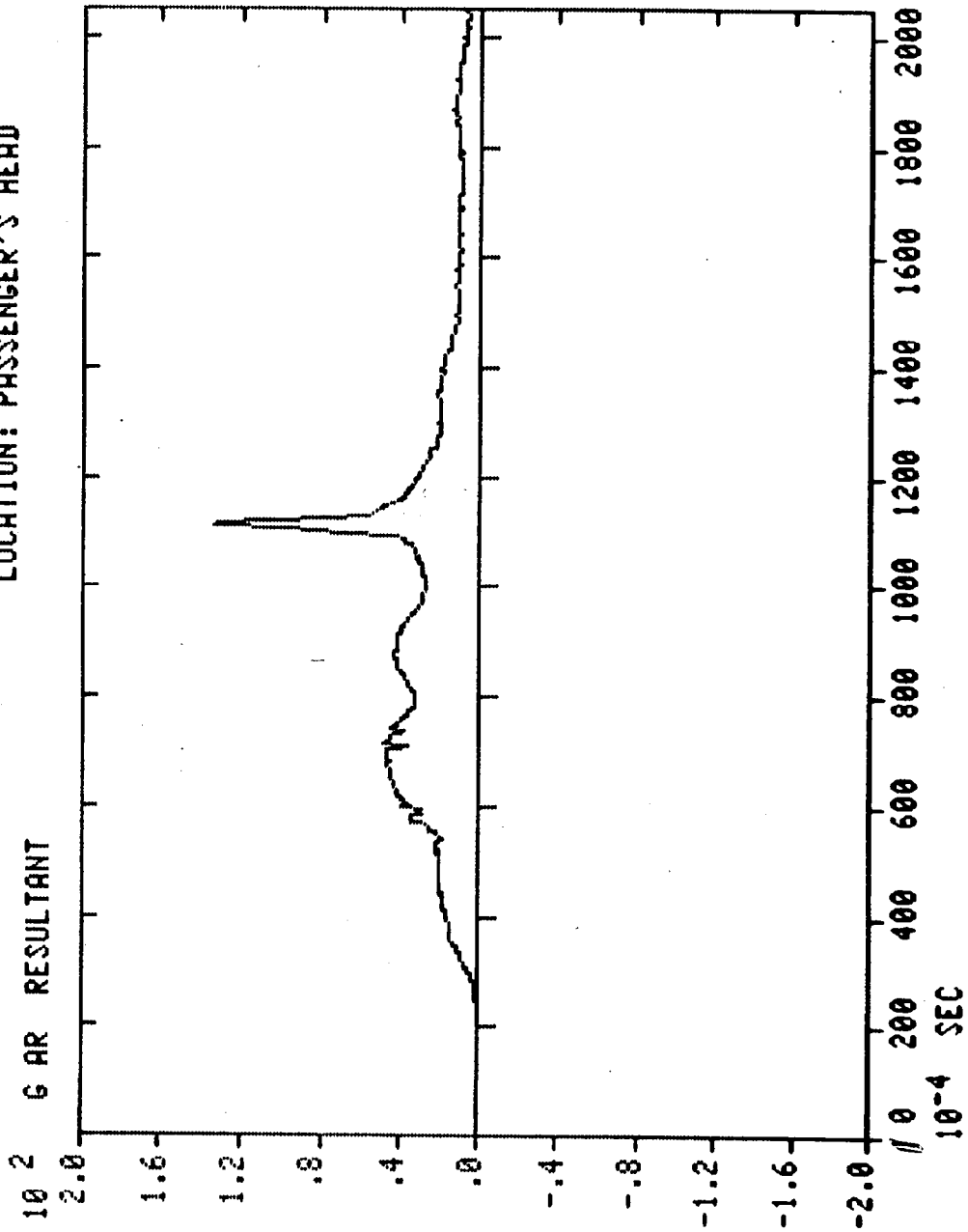


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 1-3  
DIRECTION: RESULTANT OF XYZ  
LOCATION: PASSENGER'S HEAD



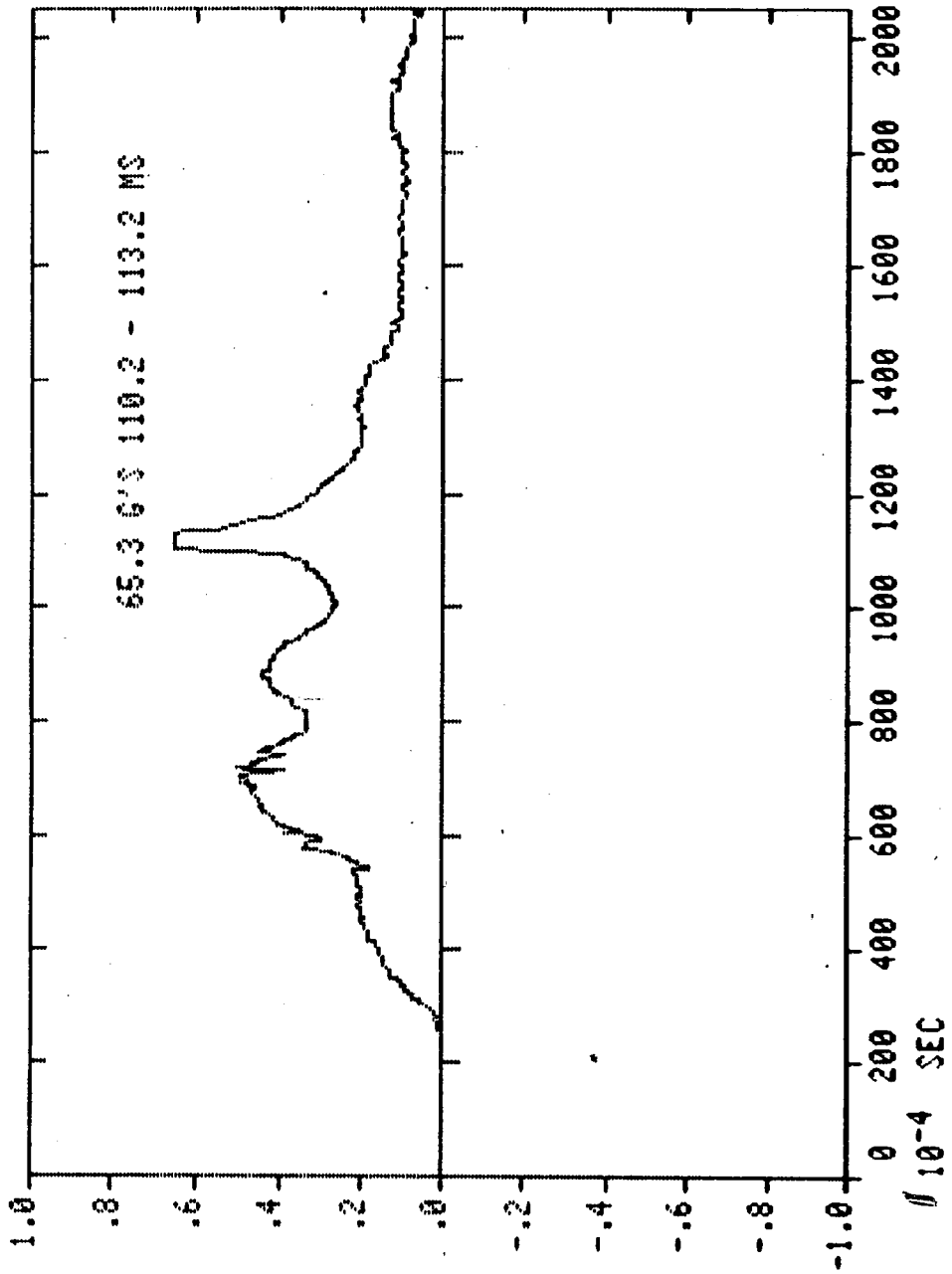
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 1-3  
DIRECTION: RESULTANT OF XYZ  
LOCATION: PASSENGER'S HEAD

10 2 G AR RESULTANT

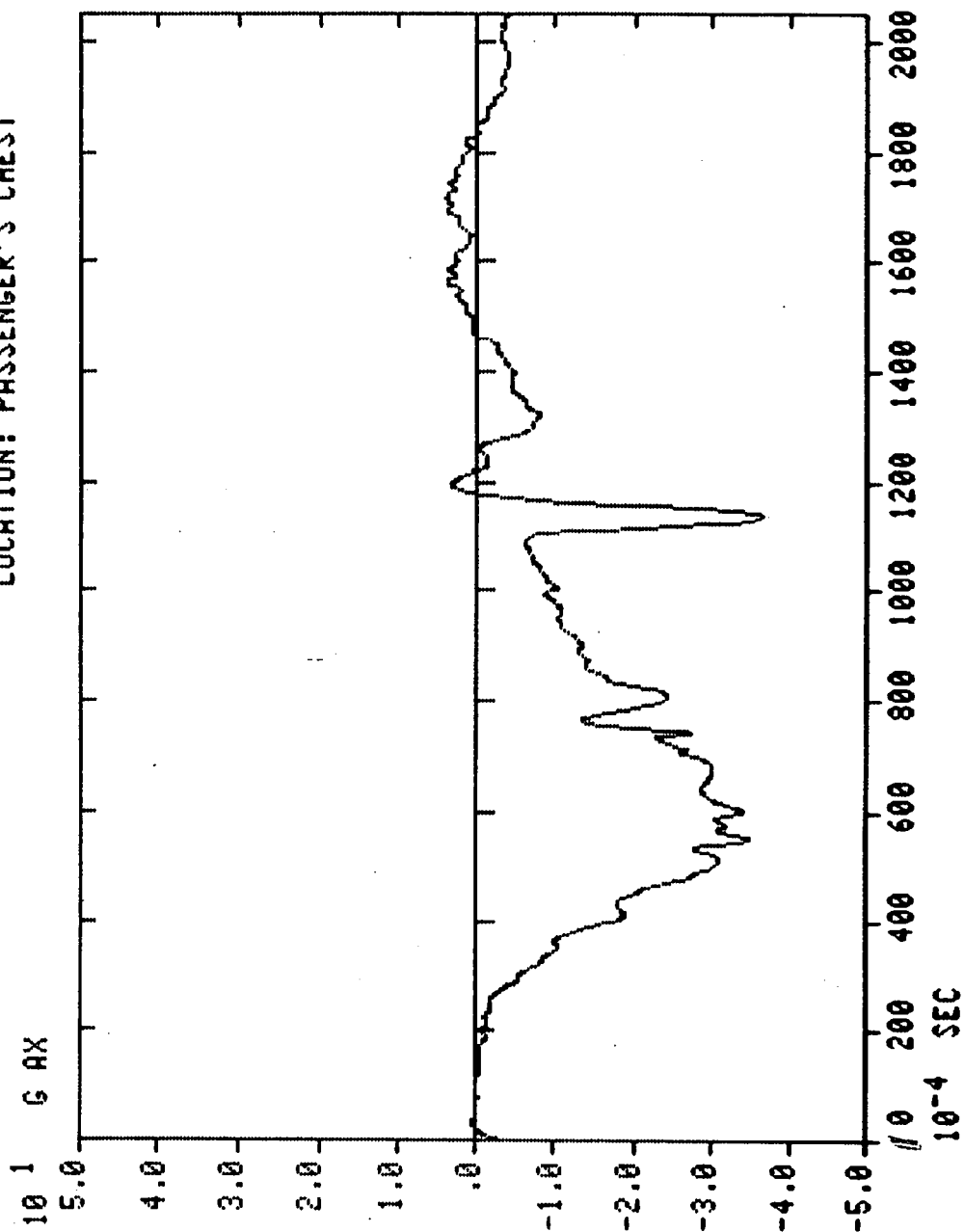


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 2, CH 5  
DIRECTION: FORWARD  
LOCATION: PASSENGER'S CHEST

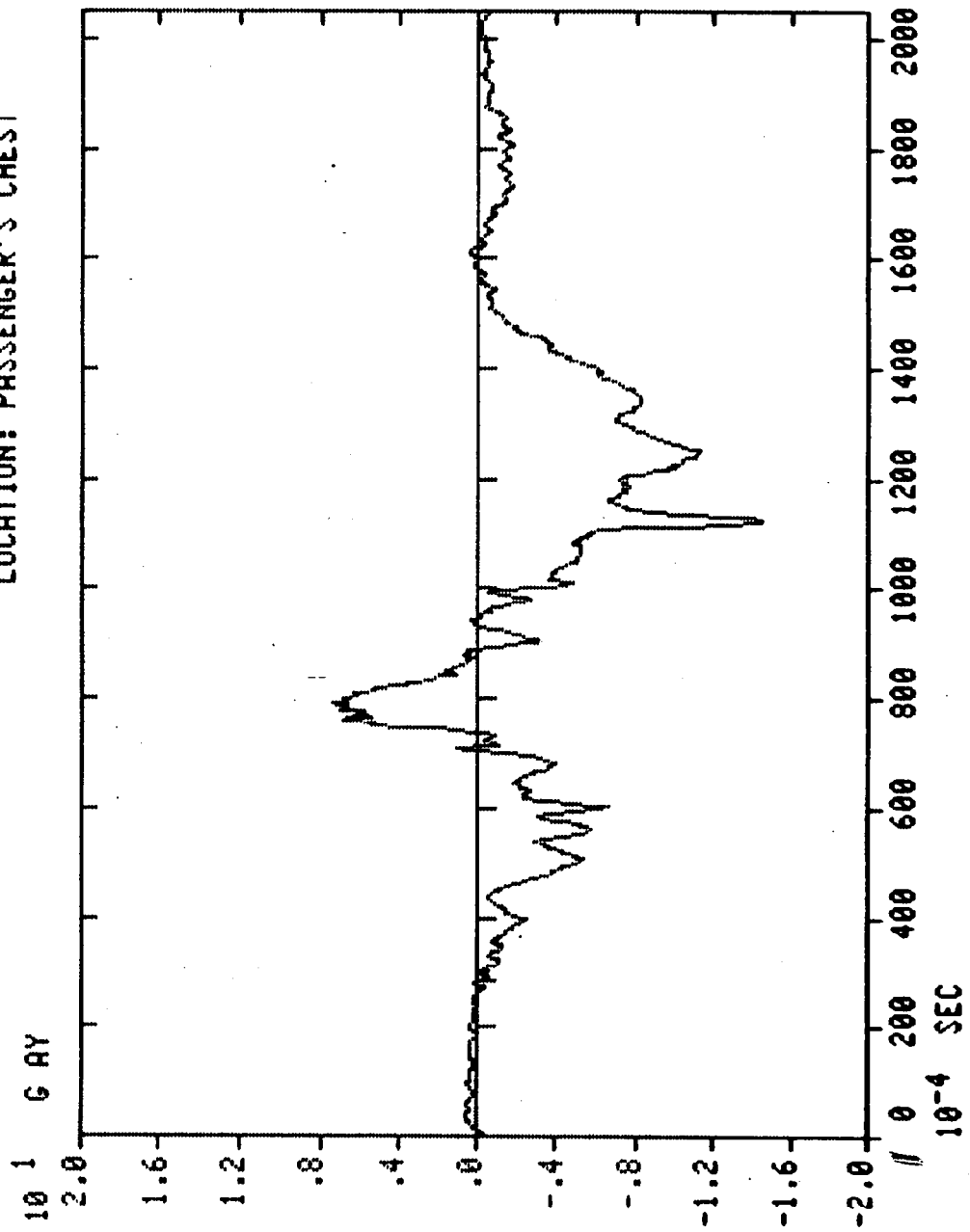


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 180  
ACCELEROMETER: TAPE: 2, CH 6  
DIRECTION: LEFT  
LOCATION: PASSENGER'S CHEST

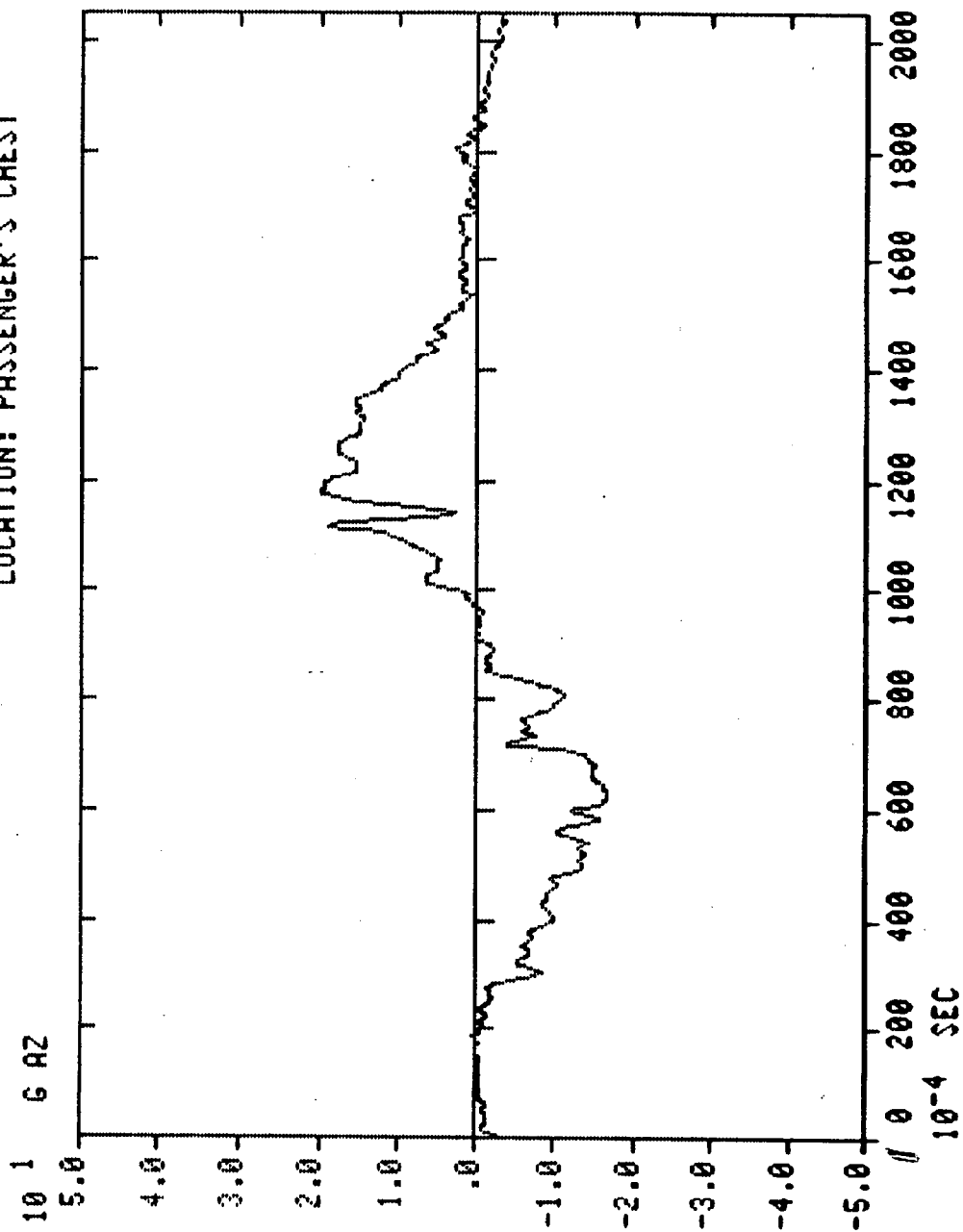


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 2, CH 7  
DIRECTION: UPWARD  
LOCATION: PASSENGER'S CHEST

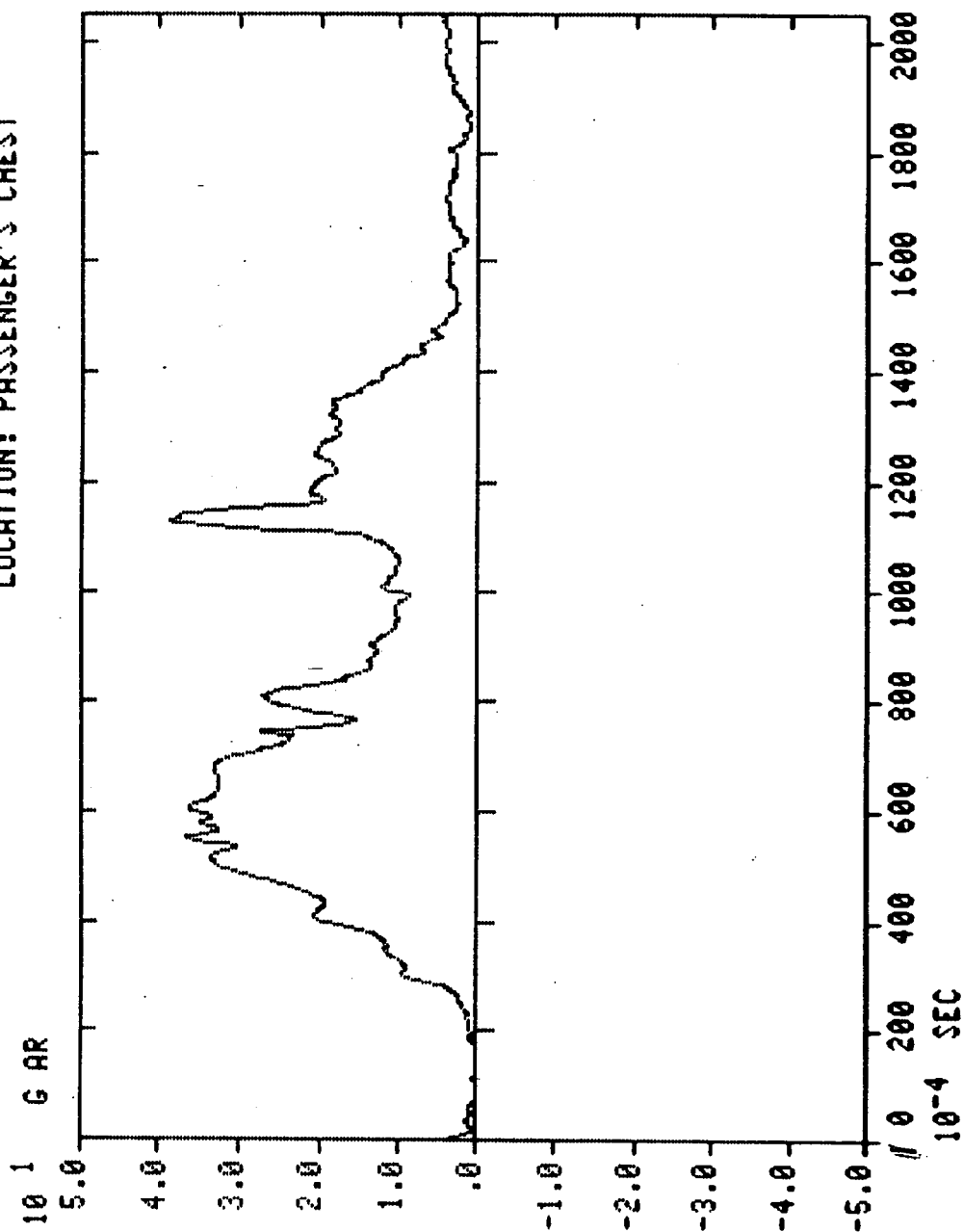


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 5-7  
DIRECTION: RESULTANT OF XYZ  
LOCATION: PASSENGER'S CHEST

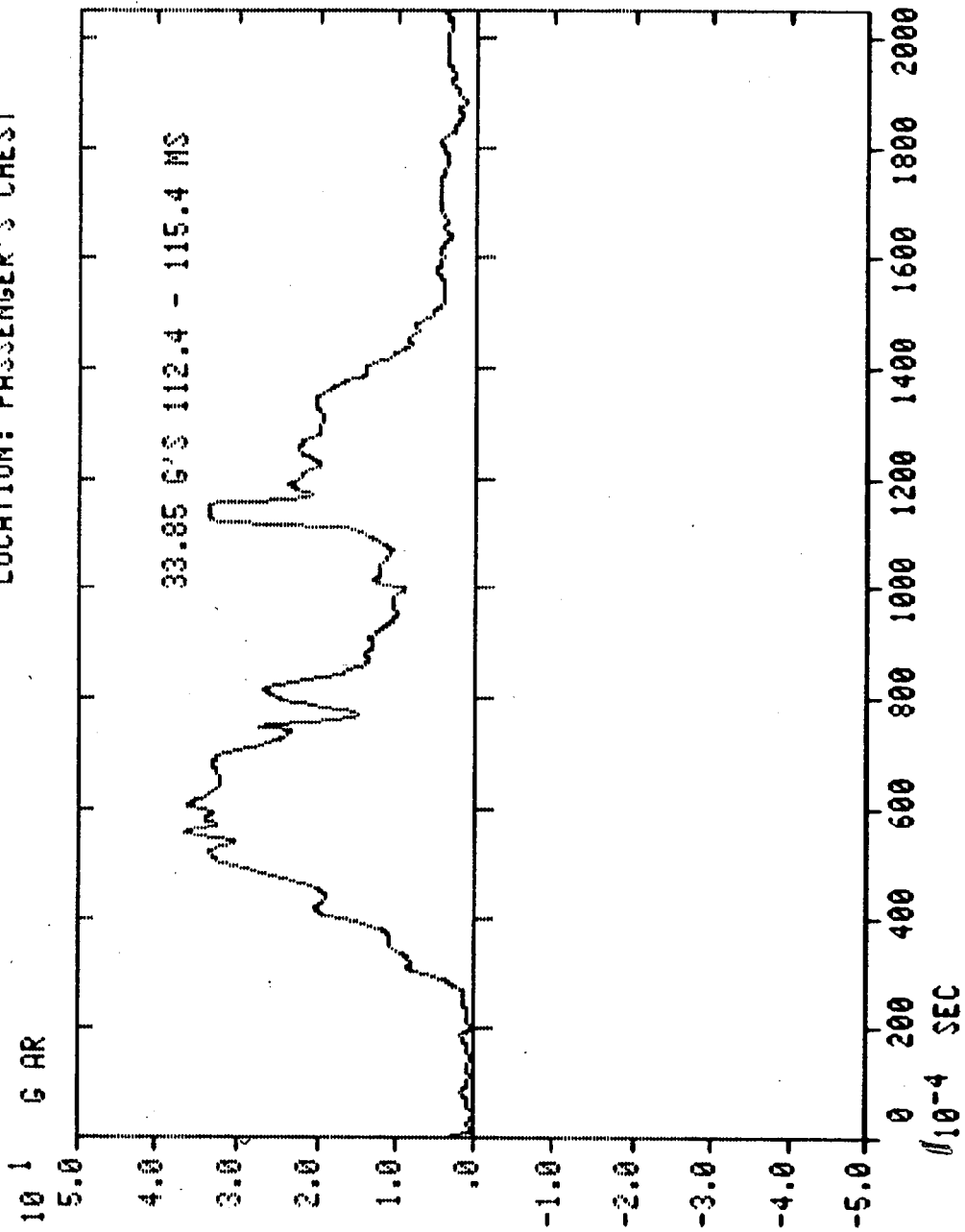


DOT CRASH PROGRAM

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

APPROVED ENGINEERING TEST LABS

MJO NO.: 971-3882-27  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 5-7  
DIRECTION: RESULTANT OF XYZ  
LOCATION: PASSENGER'S CHEST

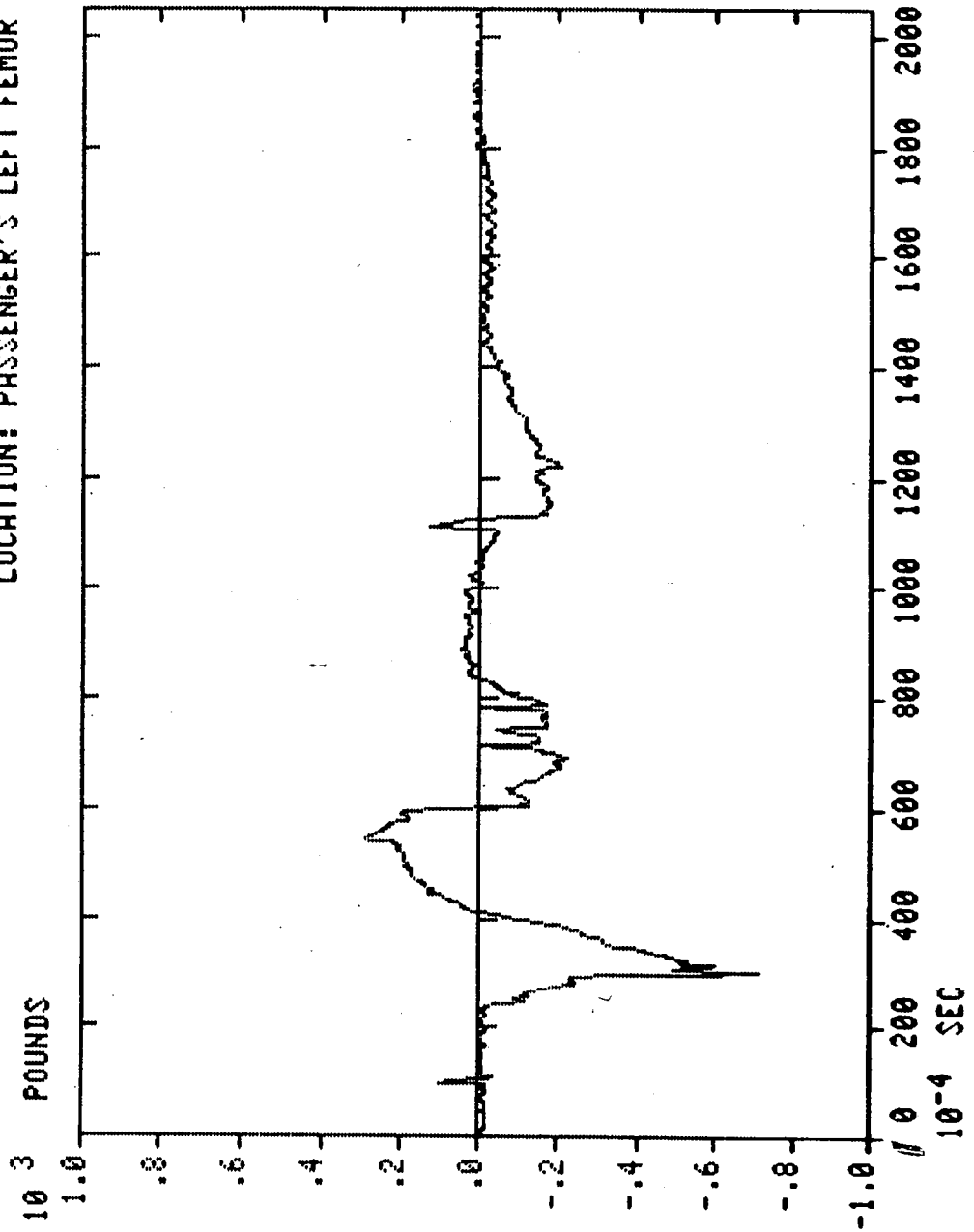


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 600  
LOAD CELL: TAPE 2, CH 8  
DIRECTION: TENSION  
LOCATION: PASSENGER'S LEFT FEMUR

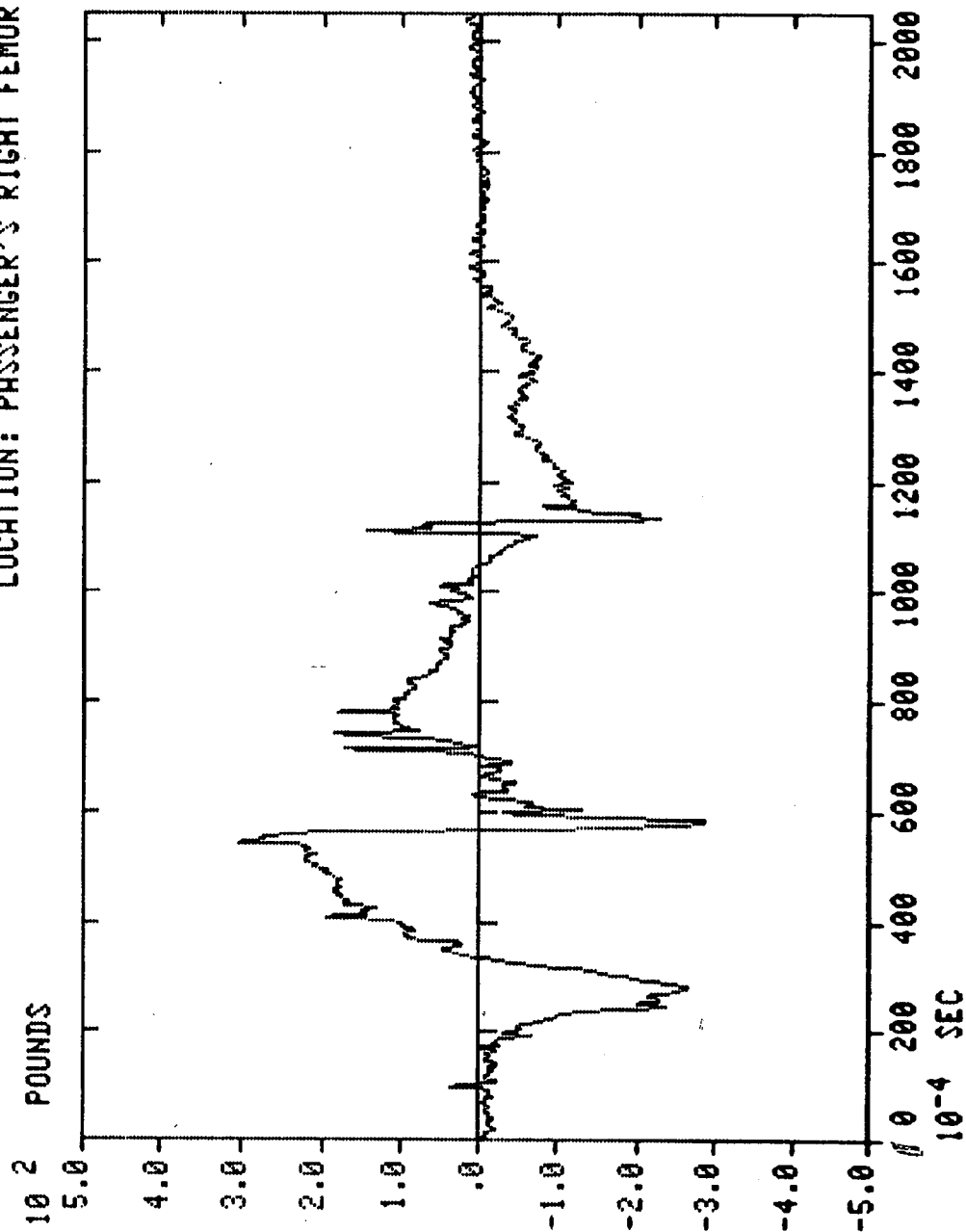


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO. : 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO. : 971-3882-27  
FILTER: CLASS 600  
LOAD CELL: TAPE 2, CH 4  
DIRECTION: TENSION  
LOCATION: PASSENGER'S RIGHT FEMUR

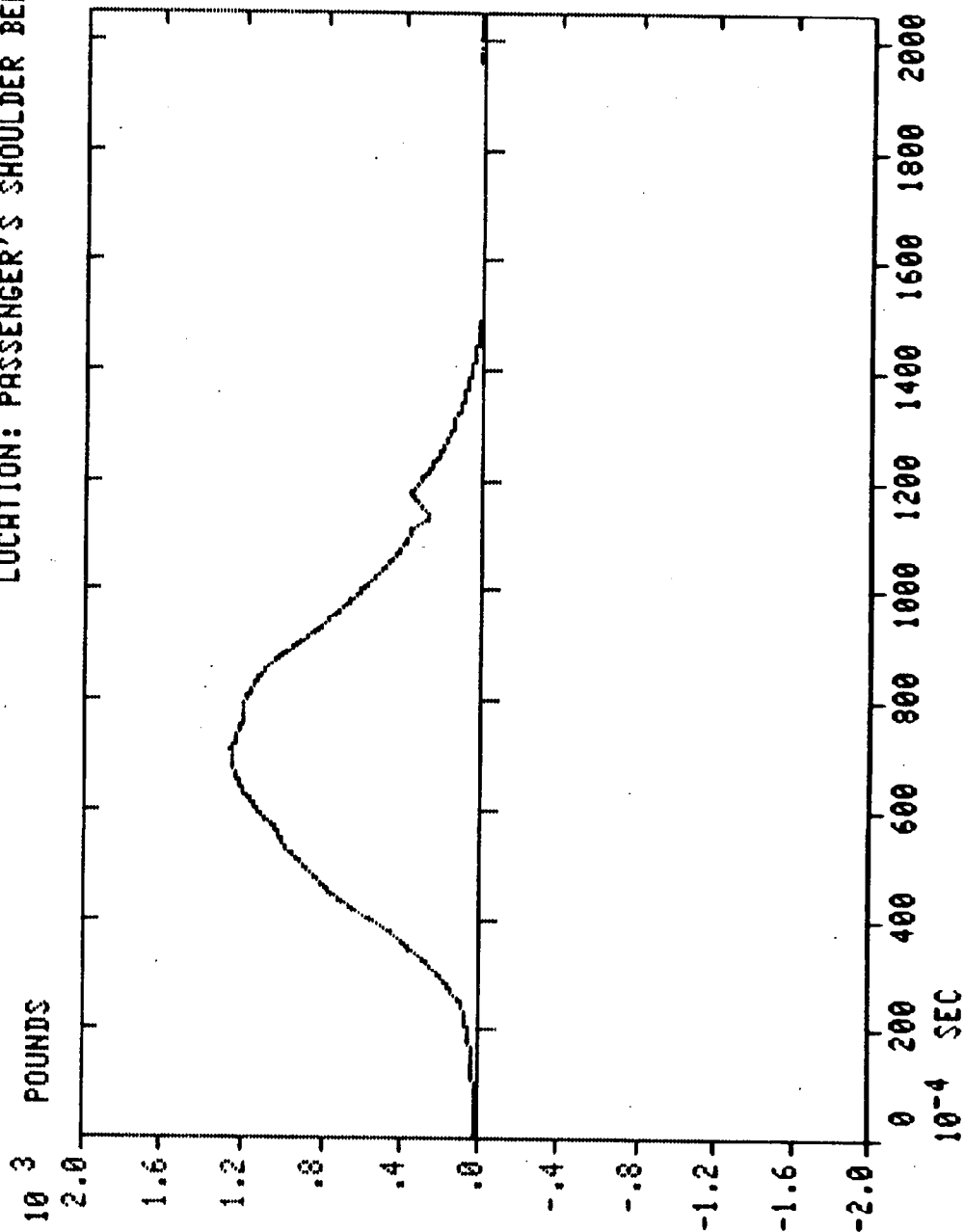


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 60  
LOAD CELL: TAPE 2, CH 9  
DIRECTION: TENSION  
LOCATION: PASSENGER'S SHOULDER BELT

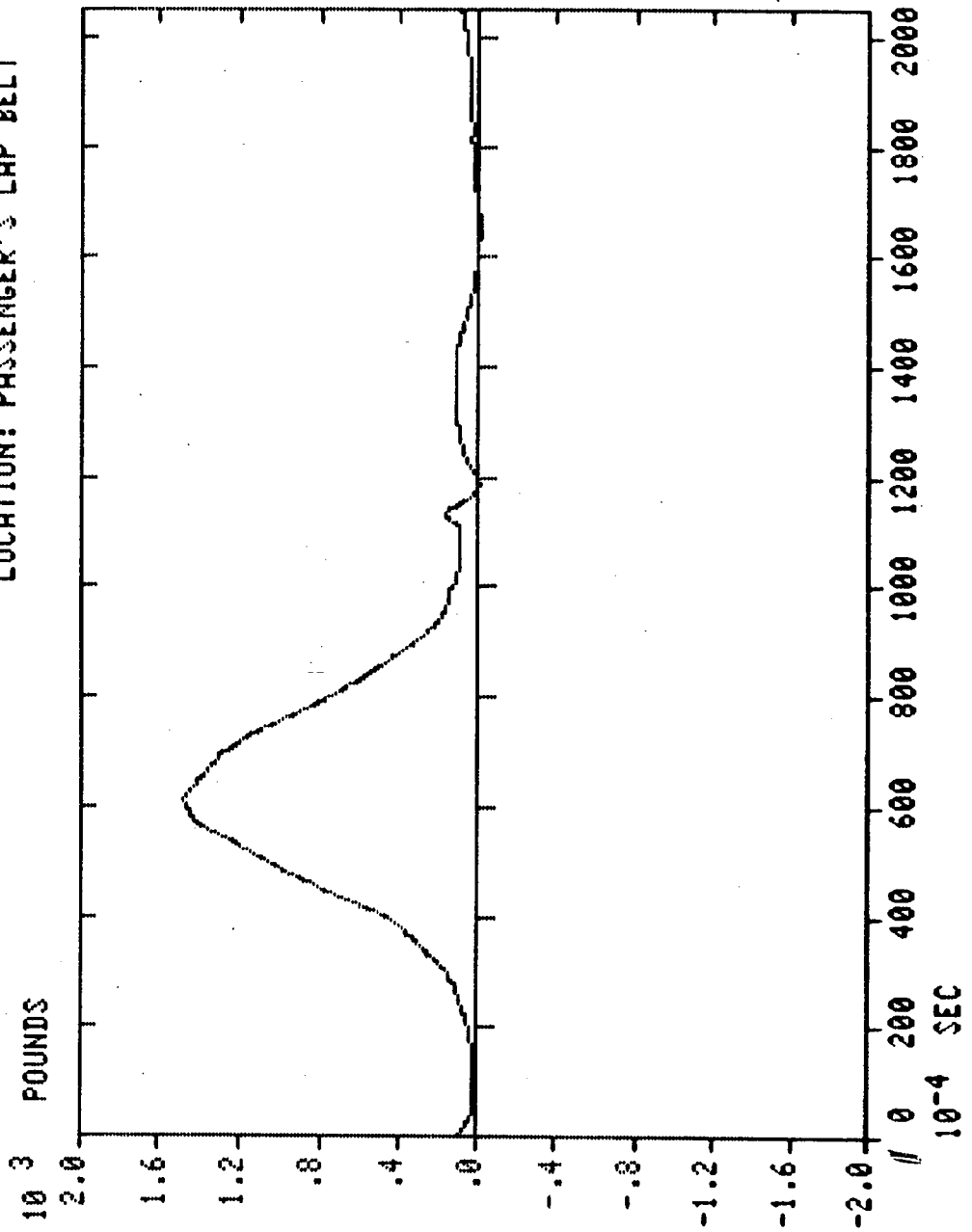


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 60  
LOAD CELL: TAPE 2, CH 10  
DIRECTION: TENSION  
LOCATION: PASSENGER'S LAP BELT

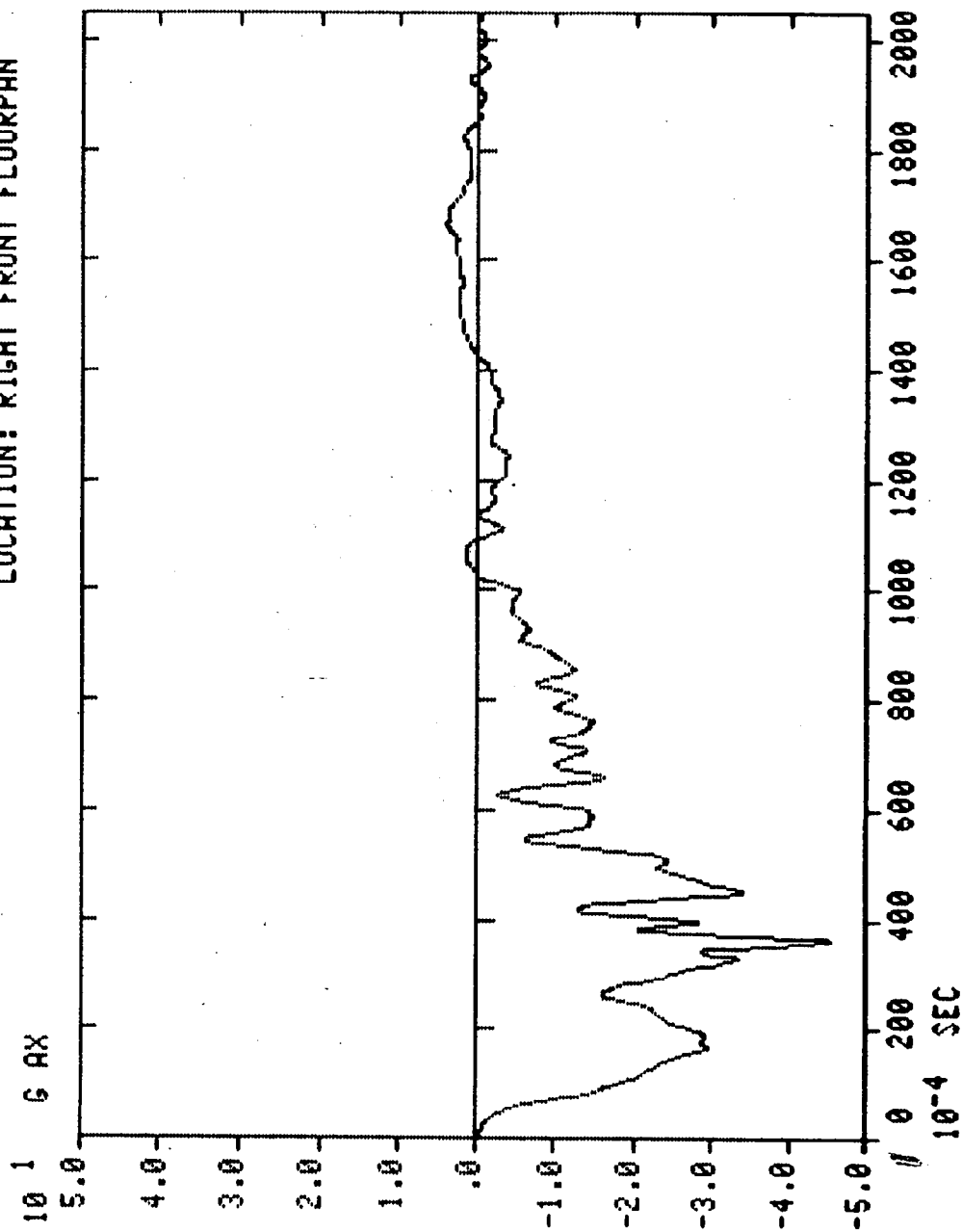


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 60  
ACCELEROMETER: TAPE 1, CH 12  
DIRECTION: FORWARD  
LOCATION: RIGHT FRONT FLOORPAN

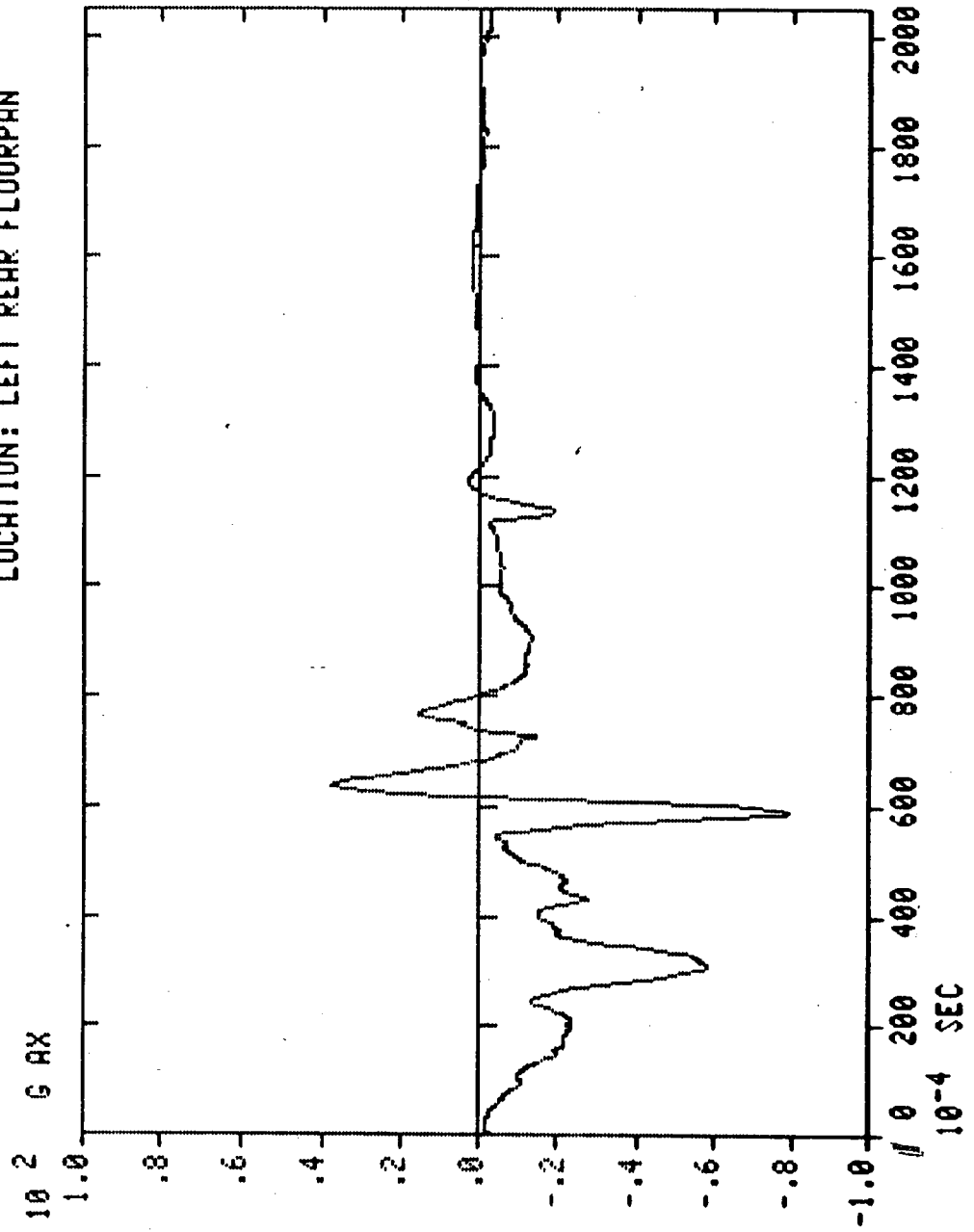


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD COURIER  
VEHICLE ID: NHTSA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

MJO NO.: 971-3882-27  
FILTER: CLASS 60  
ACCELEROMETER: TAPE 1, CH 10  
DIRECTION: FORWARD  
LOCATION: LEFT REAR FLOORPAN

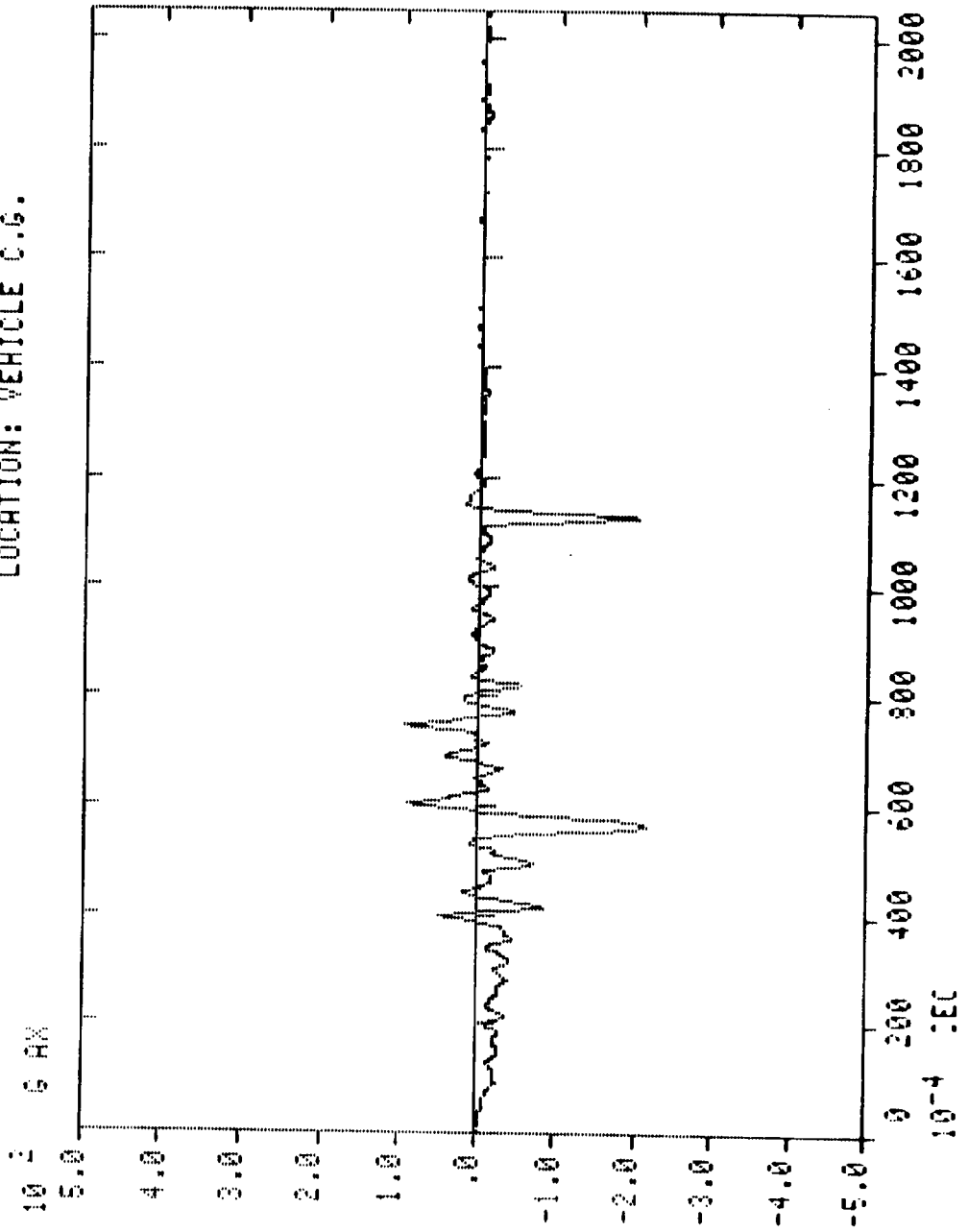


10-4 800000

APPROVED ENGINEERING TEST LAB

DRIVER: FRED COLLIER  
VEHICLE ID: WATCA 800000  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL

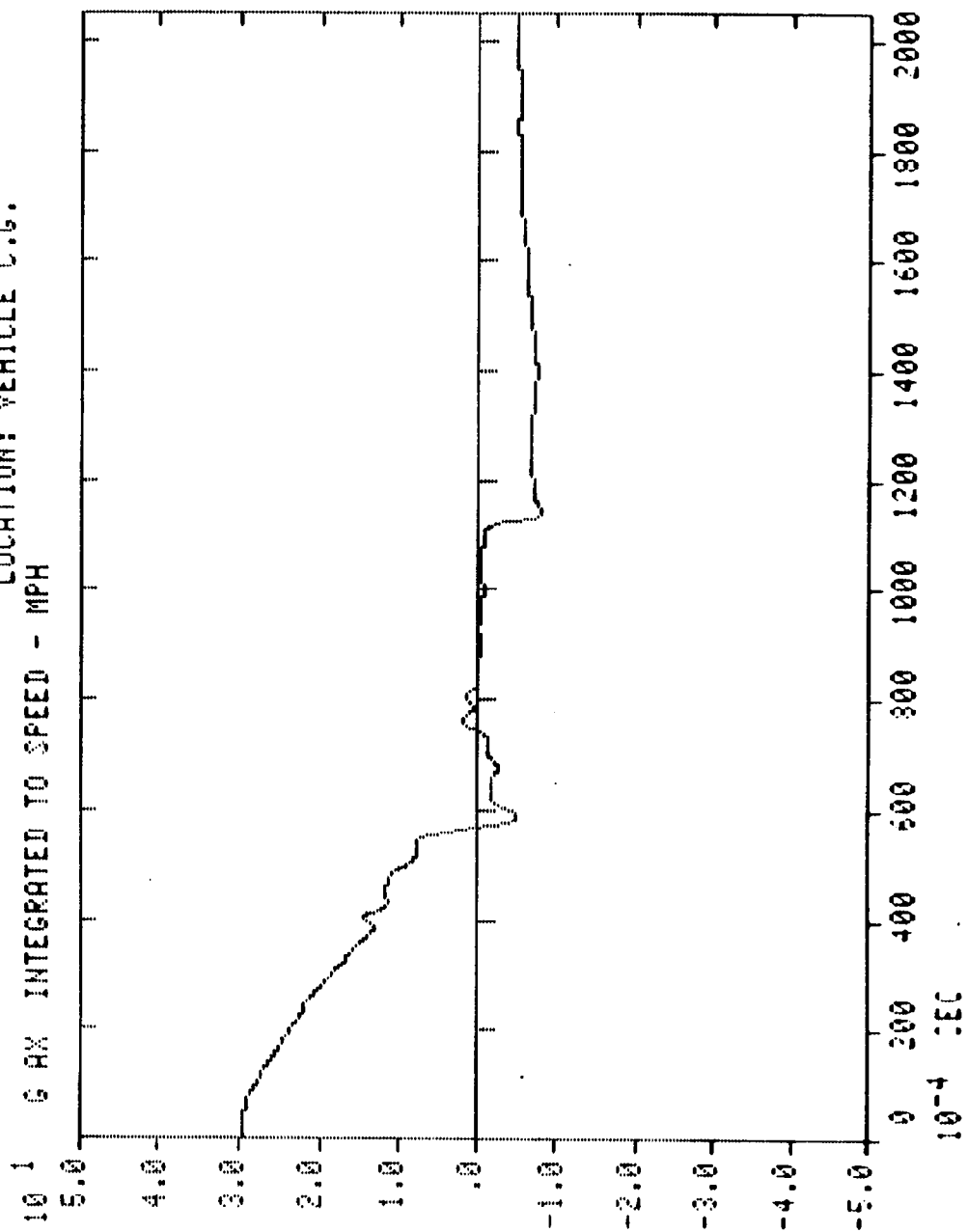
MJO NO.: 771-3882-27  
FILTER: CLASS 130  
ACCELEROMETER: TAPE 3, CH 5  
DIRECTION: FORWARD  
LOCATION: VEHICLE C.G.



TEST DATA PROGRAM

APPROVED ENGINEERING TEST LAB

VEHICLE: FORD COURIER  
VEHICLE ID: NHTCA 800609  
TEST FILE NO.: 125 29.73 MPH  
DATE: DEC. 2, 1980 FRONTAL  
MUO NO.: 371-3882-27  
FILTER: CLASS 130  
ACCELEROMETER: TAPE 3, CH 5  
DIRECTION: FORWARD  
LOCATION: VEHICLE C.G.



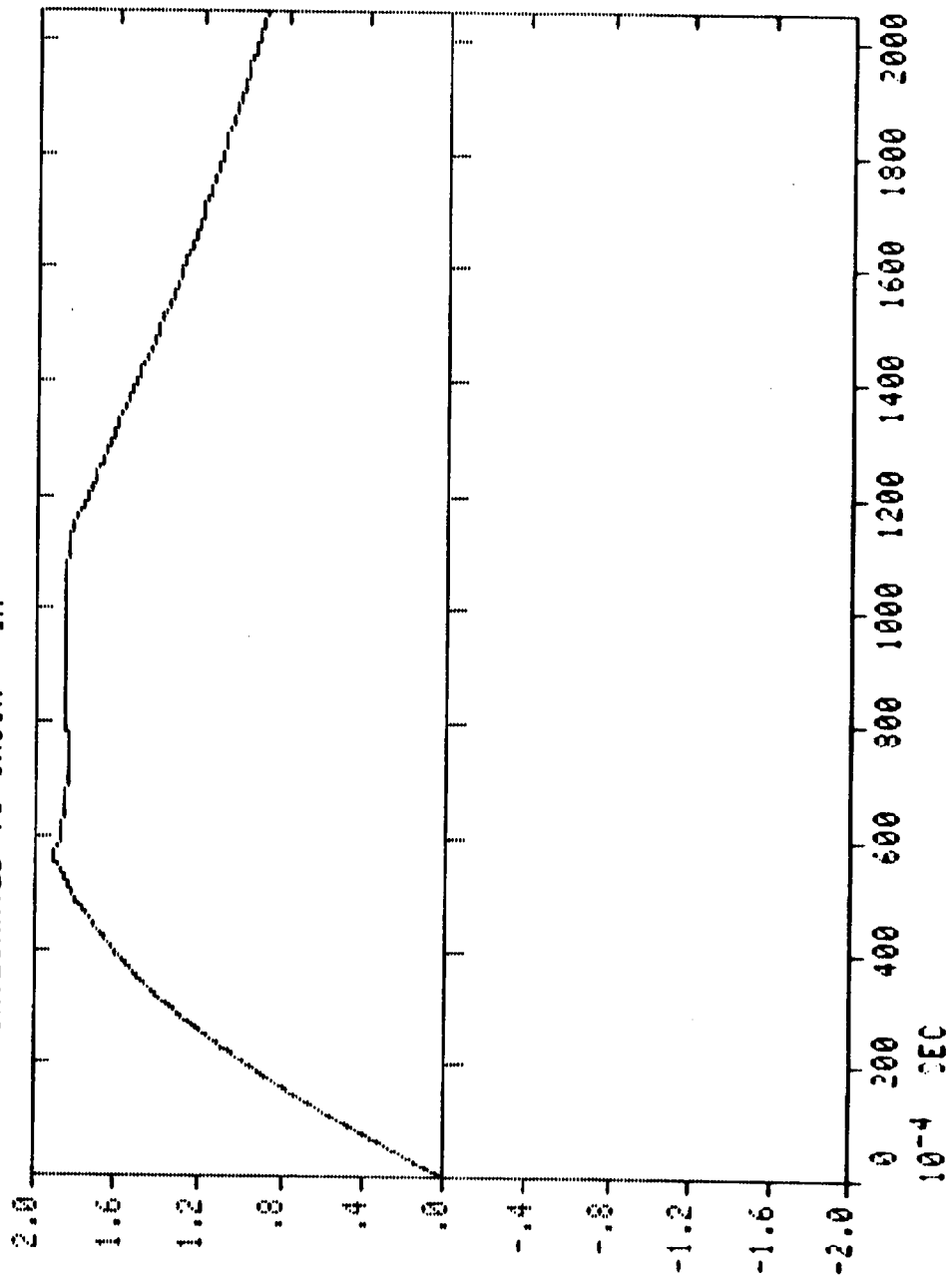
# DOT CRASH PROGRAM

ASSIGNED ENGINEERING TEST 123

VEHICLE: FORD COURIER  
 VEHICLE ID: NHTSA 800609  
 TEST FILE NO.: 125 29.73 MPH  
 DATE: DEC. 2, 1980 FRONTAL

MOO NO.: 371-3882-27  
 FILTER: CLASS 130  
 ACCELEROMETER: TAPE 3, CH 5  
 DIRECTION: FORWARD  
 LOCATION: VEHICLE C.G.

10 1 G 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 Courier - Pickup, NHTSA 800609 frontal fixed barrier impact test.

PART 572 DUMMY CALIBRATION TEST DATA

Dummy S/N S06

● Calibration Laboratory Humanoid Systems

|                                                                 |                  | Pre-Test Calibration | Post-Test Calibration |
|-----------------------------------------------------------------|------------------|----------------------|-----------------------|
| Date of Dummy Calibration                                       |                  | 11/26/80             |                       |
| Calibration Sequential Number for Dummy                         |                  | 3                    |                       |
| 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      | 223.19 g             |                       |
| b. Peak Lateral Accel.                                          | ≤ 10G            | 6.22 g               |                       |
| c. Time above 100G                                              | 0.9 to 1.5 ms    | 1.31 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 <sub>3</sub> - t <sub>2</sub> ) | 20 to 24G        | 22.64 g              |                       |
| c. Peak Resultant Head Acceleration                             | 26G maximum      | 24.59 g              |                       |
| d. Pendulum Decel. (t <sub>2</sub> -t <sub>1</sub> )            | ≤ 3 ms           | 1.74 ms              |                       |
| e. Pendulum Decel. (t <sub>3</sub> -t <sub>2</sub> )            | 25 to 30 ms      | 29.15 ms             |                       |
| f. Pendulum Decel. (t <sub>4</sub> -t <sub>3</sub> )            | ≤ 10 ms          | 2.93 ms              |                       |
| g. Pendulum Direction Reversal Time                             | ≥ 123 ms         | 123.0 ms             |                       |
| h. Max. Head Rotation                                           | 63 to 73°        | 63.84°               |                       |
| 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      | 29.70 ms              |
|                                                                 | Displ.           | 2.1 to 3.1 in.       | 2.99 in.              |

PART 572 DUMMY CALIBRATION TEST DATA  
(Continued)

Dummy S/N S06

● Calibration Laboratory Humanoid Systems

| TEST PARAMETER                                                 |        | SPECIFICATION     | Pre-Test Calibration | Post-Test Calibration |
|----------------------------------------------------------------|--------|-------------------|----------------------|-----------------------|
| 2. <u>NECK BENDING TEST</u><br><u>Continued:</u>               |        |                   |                      |                       |
| i. Chordal Displacement:<br>Head Rotation Angle                |        |                   |                      |                       |
| 60°                                                            | Time   | 40.3 to 51.7 ms   | 51.64 ms             |                       |
|                                                                | Displ. | 4.3 to 5.3 in.    | 5.30 in.             |                       |
| Maximum<br>( °)                                                | Time   | 53.2 to 66.8 ms   | 60.50 ms             |                       |
|                                                                | Displ. | 5.0 to 6.0 in.    | 5.80 in.             |                       |
| 60°                                                            | Time   | 67.0 to 83.0 ms   | 69.20 ms             |                       |
|                                                                | Displ. | 4.3 to 5.3 in.    | 5.22 in.             |                       |
| 30°                                                            | Time   | 85.4 to 104.6 ms  | 97.40 ms             |                       |
|                                                                | Displ. | 2.1 to 3.1 in.    | 2.93 in.             |                       |
| 0°                                                             | Time   | 101.0 to 123.0 ms | 116.70 ms            |                       |
|                                                                | Displ. | -.5 to 0.5 in.    | 0.00 in.             |                       |
| 3. <u>ABDOMINAL COMPRESSION TEST:</u><br>(Preload = 10 pounds) |        |                   |                      |                       |
| a. Force @ .5"                                                 |        | 23 to 37 lbs.     | 27.0 lbs.            |                       |
| b. Force @ .75"                                                |        | 37 to 50 lbs.     | 43.0 lbs.            |                       |
| c. Force @ 1.0"                                                |        | 50 to 63 lbs.     | 60.0 lbs.            |                       |
| d. Force @ 1.3"                                                |        | 73 to 88 lbs.     | 86.5 lbs.            |                       |
| 4. <u>LUMBAR FLEXION TEST:</u>                                 |        |                   |                      |                       |
| a. Force @ 20°                                                 |        | 22 to 34 lbs.     | 27.0 lbs.            |                       |
| b. Force @ 30°                                                 |        | 34 to 46 lbs.     | 39.0 lbs.            |                       |
| c. Force @ 40°                                                 |        | 46 to 58 lbs.     | 52.0 lbs.            |                       |
| d. Return Angle                                                |        | 12° maximum       | 10.0°                |                       |

PART 572 DUMMY CALIBRATION TEST DATA  
(Continued)

Dummy S/N S06

Calibration Laboratory Humanoid Systems

| TEST PARAMETER                       | SPECIFICATION     | Pre-Test Calibration | Post-Test Calibration |
|--------------------------------------|-------------------|----------------------|-----------------------|
| <b>5. <u>CHEST IMPACT TESTS:</u></b> |                   |                      |                       |
| a. High Speed                        |                   |                      |                       |
| (1) Probe Speed                      | 21.78-22.22 fps   | 22.0 fps             |                       |
| (2) Peak Deflection                  | 1.7" maximum      | 1.49 in.             |                       |
| (3) Peak Resistive Force             | 2250 lbs. max.    | 2217.5 lbs.          |                       |
| (4) Internal Hysteresis              | 50 to 70%         | 63.29%               |                       |
| b. Low Speed                         |                   |                      |                       |
| (1) Probe Speed                      | 13.86-14.14 fps   | 14.0 fps             |                       |
| (2) Peak Deflection                  | 1.1" maximum      | 0.87 in.             |                       |
| (3) Peak Resistive Force             | 1450 lbs. max.    | 1277.0 lbs.          |                       |
| (4) Internal Hysteresis              | 50 to 70%         | 60.66%               |                       |
| <b>6. <u>KNEE IMPACT TESTS:</u></b>  |                   |                      |                       |
| a. Right Side                        |                   |                      |                       |
| (1) Probe Side                       | 6.76 to 7.04 fps  | 6.90 fps             |                       |
| (2) Maximum Force                    | 1850 to 2500 lbs. | 2243.1 lbs.          |                       |
| (3) Time Above 1000#                 | 1.7 ms minimum    | 1.76 ms              |                       |
| b. Left Side                         |                   |                      |                       |
| (1) Probe Speed                      | 6.76 to 7.04 fps  | 6.90 fps             |                       |
| (2) Maximum Force                    | 1850 to 2500 lbs. | 2423.2 lbs.          |                       |
| (3) Time Above 1000#                 | 1.7 ms minimum    | 2.02 ms              |                       |

# PART 572 DUMMY CALIBRATION TEST DATA

Dummy S/N S03

Calibration Laboratory Humanoid Systems

|                                                                 |                  | Pre-Test Calibration | Post-Test Calibration |
|-----------------------------------------------------------------|------------------|----------------------|-----------------------|
| Date of Dummy Calibration                                       |                  | 11/26/80             |                       |
| Calibration Sequential Number for Dummy                         |                  | 3                    |                       |
| 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      | 240.81 g             |                       |
| b. Peak Lateral Accel.                                          | ≤ 10G            | 8.50 g               |                       |
| c. Time above 100G                                              | 0.9 to 1.5 ms    | 1.24 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 <sub>3</sub> - t <sub>2</sub> ) | 20 to 24G        | 22.92 g              |                       |
| c. Peak Resultant Head Acceleration                             | 26G maximum      | 22.51 g              |                       |
| d. Pendulum Decel. (t <sub>2</sub> -t <sub>1</sub> )            | ≤ 3 ms           | 1.56 ms              |                       |
| e. Pendulum Decel. (t <sub>3</sub> -t <sub>2</sub> )            | 25 to 30 ms      | 29.42 ms             |                       |
| f. Pendulum Decel. (t <sub>4</sub> -t <sub>3</sub> )            | ≤ 10 ms          | 2.15 ms              |                       |
| g. Pendulum Direction Reversal Time                             | ≥ 123 ms         | 123.40 ms            |                       |
| h. Max. Head Rotation                                           | 63 to 73°        | 63.66°               |                       |
| 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      | 29.80 ms              |
|                                                                 | Displ.           | 2.1 to 3.1 in.       | 2.95 in.              |

PART 572 DUMMY CALIBRATION TEST DATA  
(Continued)

Dummy S/N S03

● Calibration Laboratory Humanoid Systems

| TEST PARAMETER                                                 |        | SPECIFICATION     | Pre-Test Calibration | Post-Test Calibration |
|----------------------------------------------------------------|--------|-------------------|----------------------|-----------------------|
| 2. <u>NECK BENDING TEST</u><br><u>Continued:</u>               |        |                   |                      |                       |
| i. Chordal Displacement:<br>Head Rotation Angle                |        |                   |                      |                       |
| 60°                                                            | Time   | 40.3 to 51.7 ms   | 51.62 ms             |                       |
|                                                                | Displ. | 4.3 to 5.3 in.    | 5.12 in.             |                       |
| Maximum<br>(°)                                                 | Time   | 53.2 to 66.8 ms   | 58.02 ms             |                       |
|                                                                | Displ. | 5.0 to 6.0 in.    | 5.51 in.             |                       |
| 60°                                                            | Time   | 67.0 to 83.0 ms   | 72.94 ms             |                       |
|                                                                | Displ. | 4.3 to 5.3 in.    | 5.11 in.             |                       |
| 30°                                                            | Time   | 85.4 to 104.6 ms  | 98.37 ms             |                       |
|                                                                | Displ. | 2.1 to 3.1 in.    | 2.72 in.             |                       |
| 0°                                                             | Time   | 101.0 to 123.0 ms | 116.77 ms            |                       |
|                                                                | Displ. | -.5 to 0.5 in.    | 0.17 in.             |                       |
| 3. <u>ABDOMINAL COMPRESSION TEST:</u><br>(Preload = 10 pounds) |        |                   |                      |                       |
| a. Force @ .5"                                                 |        | 23 to 37 lbs.     | 25.5 lbs.            |                       |
| b. Force @ .75"                                                |        | 37 to 50 lbs.     | 38.0 lbs.            |                       |
| c. Force @ 1.0"                                                |        | 50 to 63 lbs.     | 52.5 lbs.            |                       |
| d. Force @ 1.3"                                                |        | 73 to 88 lbs.     | 74.5 lbs.            |                       |
| 4. <u>LUMBAR FLEXION TEST:</u>                                 |        |                   |                      |                       |
| a. Force @ 20°                                                 |        | 22 to 34 lbs.     | 25.0 lbs.            |                       |
| b. Force @ 30°                                                 |        | 34 to 46 lbs.     | 35.0 lbs.            |                       |
| c. Force @ 40°                                                 |        | 46 to 58 lbs.     | 47.0 lbs.            |                       |
| d. Return Angle                                                |        | 12° maximum       | 9.0°                 |                       |

PART 572 DUMMY CALIBRATION TEST DATA  
(Continued)

Dummy S/N S03

Calibration Laboratory Humanoid Systems

| TEST PARAMETER                       | SPECIFICATION     | Pre-Test Calibration | Post-Test Calibration |
|--------------------------------------|-------------------|----------------------|-----------------------|
| <b>5. <u>CHEST IMPACT TESTS:</u></b> |                   |                      |                       |
| a. High Speed                        |                   |                      |                       |
| (1) Probe Speed                      | 21.78-22.22 fps   | 22.0 fps             |                       |
| (2) Peak Deflection                  | 1.7" maximum      | 1.42 in.             |                       |
| (3) Peak Resistive Force             | 2250 lbs. max.    | 2183.0 lbs.          |                       |
| (4) Internal Hysteresis              | 50 to 70%         | 59.84%               |                       |
| b. Low Speed                         |                   |                      |                       |
| (1) Probe Speed                      | 13.86-14.14 fps   | 14.0 fps             |                       |
| (2) Peak Deflection                  | 1.1" maximum      | 0.88 in.             |                       |
| (3) Peak Resistive Force             | 1450 lbs. max.    | 1331.5 lbs.          |                       |
| (4) Internal Hysteresis              | 50 to 70%         | 52.78%               |                       |
| <b>6. <u>KNEE IMPACT TESTS:</u></b>  |                   |                      |                       |
| a. Right Side                        |                   |                      |                       |
| (1) Probe Side                       | 6.76 to 7.04 fps  | 6.90 fps             |                       |
| (2) Maximum Force                    | 1850 to 2500 lbs. | 2383.6 lbs.          |                       |
| (3) Time Above 1000#                 | 1.7 ms minimum    | 1.93 ms              |                       |
| b. Left Side                         |                   |                      |                       |
| (1) Probe Speed                      | 6.76 to 7.04 fps  | 6.90 fps             |                       |
| (2) Maximum Force                    | 1850 to 2500 lbs. | 2334.1 lbs.          |                       |
| (3) Time Above 1000#                 | 1.7 ms minimum    | 1.91 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

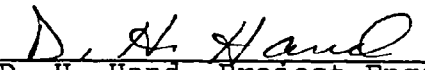
CONTRACT NUMBER:

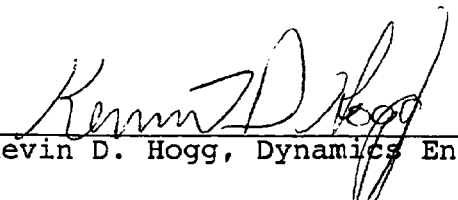
DOT-HS-9-02273

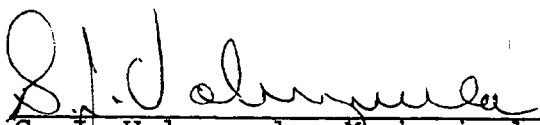
I hereby certify that the preceding report is true and correct to  
the best of my knowledge.

APPROVED ENGINEERING TEST LABORATORIES

  
R. D. Short, P.E., Division Manager

  
D. H. Hand, Project Engineer

  
Kevin D. Hogg, Dynamics Engineer

  
G. J. Valenzuela, Mechanical  
Department Supervisor

  
R. J. McKelligott, P.E.,  
Quality Assurance Manager



rmh