



DOT 301

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

OCCUPANT RESPONSE  
AND  
VEHICLE ACCELERATION  
IN A  
30 MPH FRONTAL IMPACT TEST

FORD MOTOR COMPANY  
1978 FORD ECONOLINE E100 - VAN  
NHTSA 780623

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



NOVEMBER 1978

CONTRACT NUMBER DOT-HS-6-01477

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
OFFICE OF RESEARCH AND DEVELOPMENT  
2100 SECOND STREET S. W.  
WASHINGTON, D. C. 20590



APPROVED ENGINEERING TEST LABORATORIES

This final test report was prepared for the U. S. Department of Transportation, National Highway Traffic Safety Administration under Contract Number DOT-HS-6-01477. This document is disseminated under the sponsorship of the U. S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or the use thereof.

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Occupant Response and Vehicle Acceleration in a 30 mph Frontal Impact Test - 1978 Ford Econoline E100 - Van - NHTSA 780623		5. Report Date January 17, 1979	
		6. Performing Organization Code	
7. Author(s) <u>D. A. Hand</u> Project Engineer		8. Performing Organization Report No. 671-1489-50	
9. Performing Organization Name and Address Approved Engineering Test Laboratories 1536 East Valencia Drive Fullerton, California 92631 Phone No.: 714-879-6110		10. Work Unit. No.	
		11. Contract or Grant No. DOT-HS-6-01477	
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Admin. Office of Research and Development 2100 Second Street S. W. Washington, D. C. 20590		13. Type of Report and Period Covered Final Report October 17 - November 9, 1978	
		14. Sponsoring Agency Code	
15. Supplementary Notes Approved: <u>S. J. Valenzuela</u> Mechanical Dept Supervisor Approved Engineering Test Labs.			
16. Abstract A 1978 Ford Econoline E100 - Van, NHTSA 780623, VIN-E04HHBA7418 was impact tested for compliance with FMVSS 219 (Windshield Zone Intrusion), FMVSS 301-75 (Fuel System Integrity) and documented in Reports No. 219-AETL-78-012 and No. 301-AETL-78-050. As a parallel non-conflicting effort the anthropomorphic dummies and the vehicle were instrumented with accelerometers to measure occupant response and vehicle acceleration. The results of this effort are documented herein. The average vehicle impact speed was 29.270 mph in the frontal (0°) mode.			
17. Key Words Frontal Impact Test Occupant Response Vehicle Acceleration		18. Distribution Statement	
19. Security Class. (of this report) Unclassified	20. Security Class. (of this page) Unclassified	21. No. of Pages 69	22. Price



APPROVED ENGINEERING TEST LABORATORIES

TABLE OF CONTENTS

<u>Section</u>	<u>Paragraph</u>	<u>Description</u>	<u>Page</u>
1	1.0	Introduction	8
2	2.0	Test Summary	10
	2.1	Summary of Test Results	14
3	3.0	Test Results and Photographs	20
4	4.0	Test Procedures	30
	4.1	Fixed Barrier Impact Test	30
	4.2	Test Dummy Positioning	30
	4.3	Data Acquisition and Reduction	31
	4.4	Impact Data	33
Appendix A		Computer Plots	42



APPROVED ENGINEERING TEST LABORATORIES

TABLES

<u>Table</u>	<u>Description</u>	<u>Page</u>
4-1	Instrumentation	37
4-2	Data Acquisition and Reduction Process	38
4-3	Data Designations for Vehicle Crash Impact Data Acquisition	39



APPROVED ENGINEERING TEST LABORATORIES

ILLUSTRATIONS

<u>Figure</u>	<u>Description</u>	<u>Page</u>
3-1	Pre-Test, Driver Dummy View	21
3-2	Pre-Test, Passenger Dummy View	23
3-3	Post-Impact, Driver Dummy View	25
3-4	Post-Impact, Passenger Dummy View	27
4-1	Vehicle and Occupant Crash Impact Data Acquisition System	36
4-2	Comparison Plot of SAE Class 60, 180,600 and 1000 Filters	40



APPROVED ENGINEERING TEST LABORATORIES

SECTION 1



SECTION 1

1.0 INTRODUCTION

The test was performed by Approved Engineering Test Laboratories under Contract Number DOT-HS-6-01477 in accordance with the Office of Vehicle Safety Compliance Laboratory Procedures.

The purpose of the effort documented herein was to acquire occupant response and vehicle acceleration data in a 1978 Ford Econoline E100 - Van - NHTSA 780623 during a 30-mph frontal fixed barrier impact test. This effort was conducted in conjunction with Federal Motor Vehicle Safety Standards (FMVSS) 219 - "Windshield Zone Intrusion" and 301-75 - "Fuel System Integrity" compliance test. These compliance tests were previously documented in NHTSA/OVSC Report No. 219-AETL-78-012 and 301-AETL-78-050. Only the occupant response and vehicle acceleration aspects of the test are covered in this report.

The scope of the vehicle 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 (TP219-01) issued by the Office of Vehicle Safety Compliance (OVSC). Specific procedures used to obtain the additional data are detailed in Section 4.



APPROVED ENGINEERING TEST LABORATORIES

SECTION 2



APPROVED ENGINEERING TEST LABORATORIES

SECTION 2

2.0 TEST SUMMARY

The 1978 Ford Econoline E100 - Van was subjected to a frontal fixed barrier impact as required by Federal Motor Vehicle Safety Standards 219 and 301-75.

Color motion picture coverage of the vehicle impact 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 IDENTIFICATION:

Manufacturer: Ford Motor Company  
Make/Model: Ford Econoline E100  
Body Style: Van Model Year: 1978  
VIN: E04HHBA7418 Build Date: October 1977  
NHTSA No.: 780623 Color: Tan  
Engine Data: Eight (8) Cylinders; 351 Cu. In. Displ.  
Transmission Data: Three (3) Speed ( ) Manual (XX) Automatic  
Major Options: Power Steering, Power Brakes

VEHICLE ATTITUDE:

Delivered Attitude: LF 34.0 in.; RF 34.0 in.; LR 34.0 in.; RR 34.0 in.  
Test Attitude: LF 33.3 in.; RF 33.1 in.; LR 32.7 in.; RR 32.8 in.

VEHICLE TIRE DATA:

Recommended Cold Tire Pressure: Front = 32 psi  
(Up to Vehicle Load Capacity) Rear = 30 psi  
Recommended Tire Size: G78-15 Load Range: B  
Tires on Vehicle: G78-15 - General  
Spare Tire: XX Yes;      No; Space Saver:      Yes; XX No



SUMMARY OF TEST CONDITIONS (Cont'd)

PRE-TEST DUMMY POSITIONS:

<u>MEASUREMENT</u>	<u>DRIVER</u>	<u>PASSENGER</u>
Dummy Centerline to Vehicle Center line	<u>20.5</u> in.	<u>20.5</u> in.
Nose to Upper Rim of Steering Wheel	<u>21.0</u> in.	
Nose to Windshield (Horizontal Distance)		<u>30.1</u> in.
Left Knee to Closest Point on Lower Panel	<u>8.8</u> in.	<u>6.3</u> in.
Right Knee to Closest Point on Lower Panel	<u>9.0</u> in.	<u>7.0</u> in.
Ankle Distance	<u>8.3</u> in.	<u>4.0</u> in.
Knee Distance	<u>9.0</u> in.	<u>6.8</u> in.



SECTION 2

2.1 SUMMARY OF TEST RESULTS

The following data sheets summarize:

1. The occupant response data (Part 572 Dummy Data Sheet)
2. The vehicle acceleration data (Vehicle Structural Data Sheet)
3. The Pre and Post-Test vehicle dimensions data (Vehicle Structural Data Sheets)

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

PART 572 DUMMY DATA

Vehicle 1978 Ford Econoline E100 NHTSA No. 780623

	DRIVER				PASSENGER			
	Positive* Direction		Negative* Direction		Positive* Direction		Negative* Direction	
	Peak G	Time (msec)	Peak G	Time (msec)	Peak G	Time (msec)	Peak G	Time (msec)
Head Acceleration								
Longitudinal	0	0	136.3	84.4	11.9	188.4	66.8	105.3
Lateral	30.1	81.3	19.0	89.4	12.8	115.6	10.2	103.1
Vertical	19.9	103.4	50.4	86.6	1.8	116.9	94.3	102.5
Resultant	138.9	84.7			109.7	104.7		
HIC	1182 (76-108 msec)				2193 (70-198 msec)			
Chest Acceleration								
Longitudinal	1.8	106.6	54.0	74.4	8.0	157.2	51.3	74.7
Lateral	8.2	72.8	7.1	60.0	19.6	83.4	4.5	198.4
Vertical	15.9	56.9	24.8	47.2	11.4	60.3	8.3	113.8
Resultant	44.3	75.9	2.4	120.3	44.7	75.3	3.3	129.1
Severity Index	301				419			
Femur Loads	(lb)	Time (msec)	(lb)	Time (msec)	(lb)	Time (msec)	(lb)	Time (msec)
Left	127	51.6	544	59.7	11	65.9	13	47.5
Right	417	68.1	4,583	56.3	408	77.2	379	54.1
Belt Load								
Torso	1,598	74.7			1,118	81.3		

Average Vehicle Impact Speed 29.270 mph

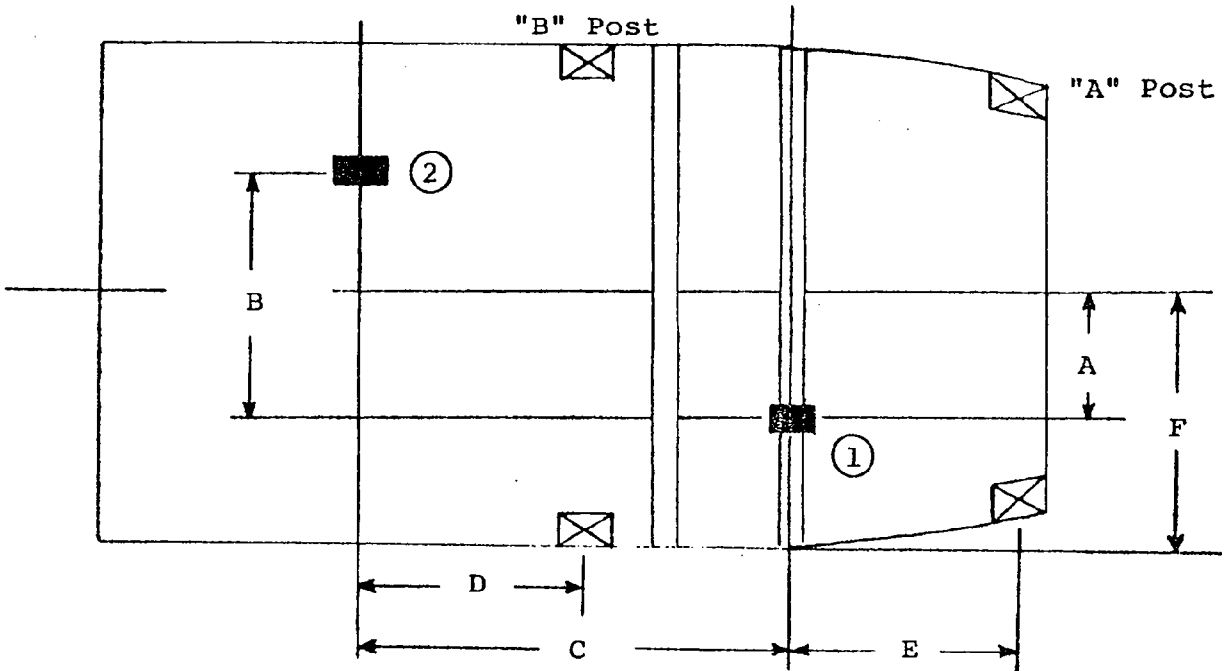
\*Positive Direction - Longitudinal: Forward  
                           Lateral: Rightward  
                           Vertical: Upward  
                           Femur: Tension

\*Negative Direction - Longitudinal: Rearward  
                           Lateral: Leftward  
                           Vertical: Downward  
                           Femur: Compression

VEHICLE STRUCTURAL DATA

Vehicle 1978 Ford Econoline E100 NHTSA No. 780623

Average Vehicle Impact Speed 29,270 mph; Test Weight 4,830 lbs



**DIMENSIONS**

LOCATION	MEASUREMENT (in.)	LOCATION	MEASUREMENT (in.)
A	18.3	D	11.0
B	19.0	E	15.5
C	34.5	F	

Steering Column Movement 0.5" Rearward, 1.5" Leftward, 5.0" Upward  
 Vehicle Rebound Distance 8.8 in.  
 Overall Vehicle Crush 14.3 in

**Acceleration Peaks**

LOCATION	Positive* Direction		Negative* Direction		No Data Acquired
	Peak G	Time (msec)	Peak G	Time (msec)	
No. 1 Longitudinal	3.1	79.4	37.2	26.3	
No. 2 Longitudinal	N/D	N/D	N/D	N/D	
No. 2 Lateral	N/A	N/A	N/A	N/A	
No. 2 Vertical	23.7	80.6	21.2	54.1	

Positive Direction - Longitudnal: Forward  
 Lateral: Rightward  
 Vertical: Upward

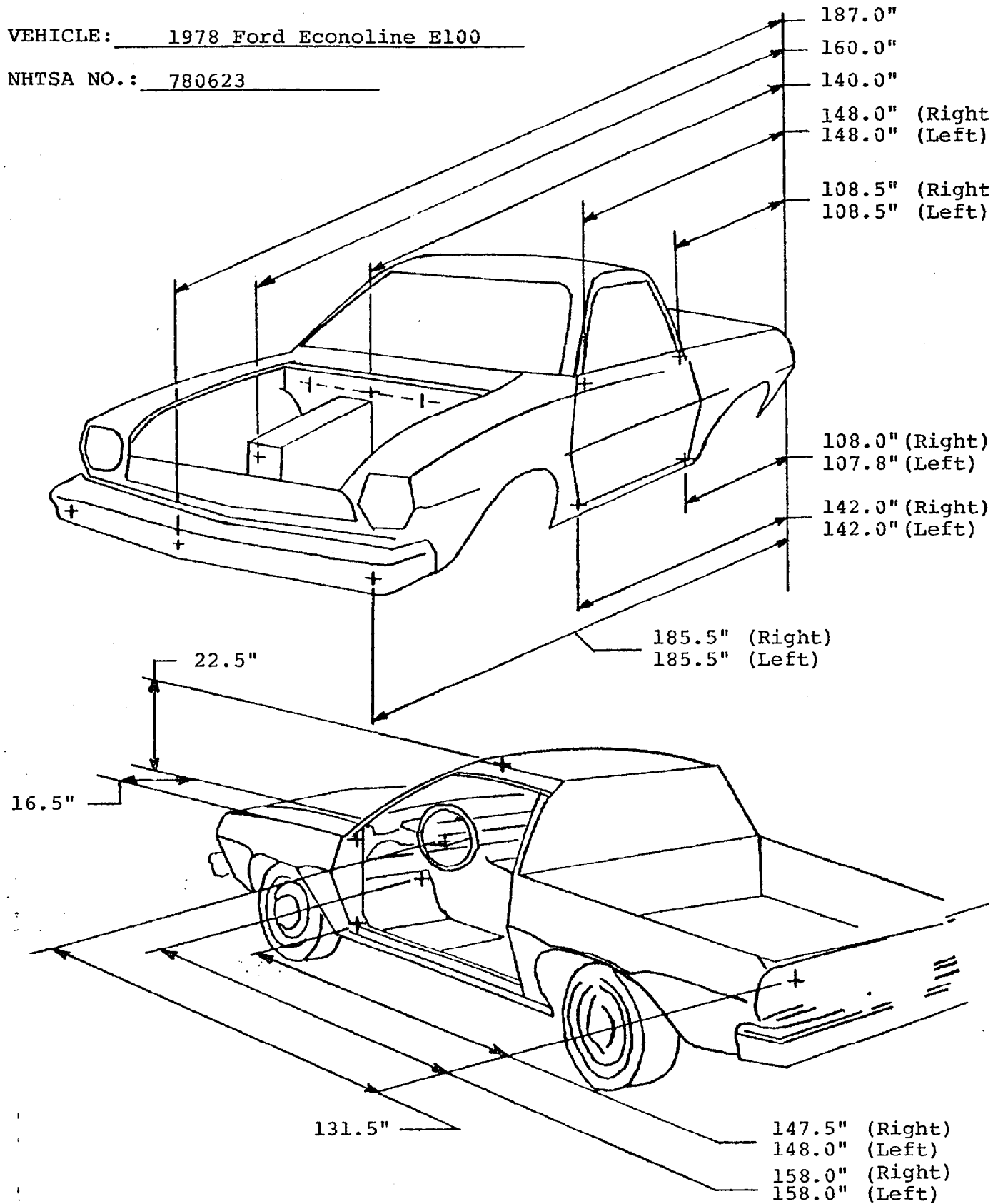
Negative Direction - Longitudnal: Rearward  
 Lateral: Leftward  
 Vertical: Downward

PRE-TEST

VEHICLE STRUCTURAL DATA

VEHICLE: 1978 Ford Econoline E100

NHTSA NO.: 780623

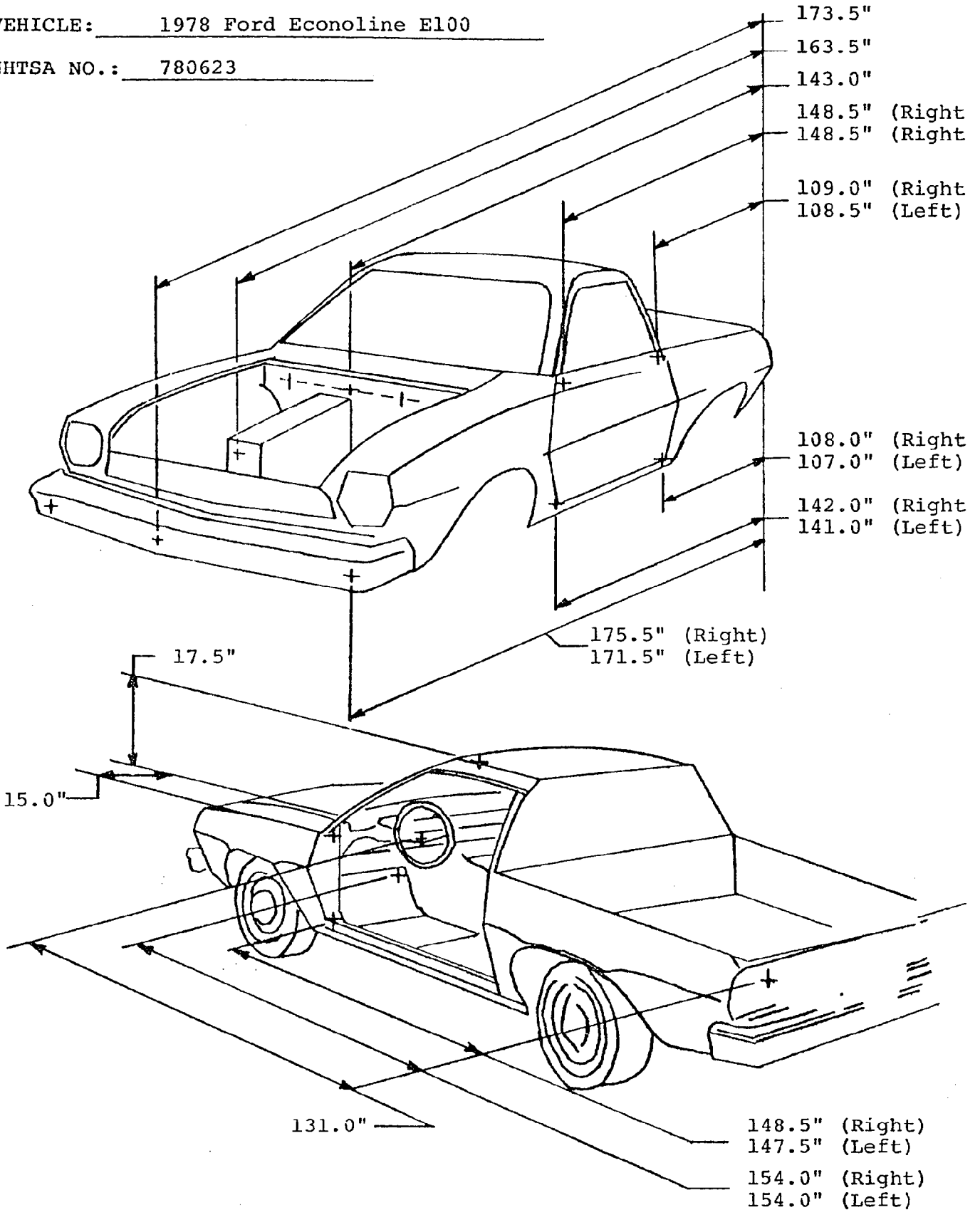


POST-TEST

VEHICLE STRUCTURAL DATA

VEHICLE: 1978 Ford Econoline E100

NHTSA NO.: 780623





APPROVED ENGINEERING TEST LABORATORIES

SECTION 3



SECTION 3

3.0 TEST RESULTS AND PHOTOGRAPHS

The test vehicle performance was determined by a frontal fixed barrier impact at an average speed of 29.270 mph. The vehicle rebound distance from the barrier face was 8.8 inches and the average vehicle static crush was 14.3 inches.

Post-impact inspection of the vehicle revealed almost all crush occurred forward of the front doors. The hood buckled up in the middle and both front fenders pushed back into the doors. The left front tire was flat and the left frame rail buckled in the vicinity of the "B" post. The roof buckled over both "B" posts. The steering wheel column assembly penetrated the drivers compartment and the steering wheel rim was severely bent by driver dummy contact. The passenger dummy made contact with the dash assembly. The dash assembly was deformed and the windshield was cracked along the lower left corner area.

Figures 3-1 through 3-4 are pre-test and post-test views of the occupant compartment, restraint systems, and dummies.



APPROVED ENGINEERING TEST LABORATORIES

Figure 3-1  
1978 Ford Econoline E100 - Van  
NHTSA 780623  
Pre-Test, Driver Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure 3-2  
1978 Ford Econoline E100 - Van  
NHTSA 780623  
Pre-Test, Passenger Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure 3-3  
1978 Ford Econoline E100 - Van  
NHTSA 780623  
Post-Impact, Driver Dummy View





APPROVED ENGINEERING TEST LABORATORIES

Figure 3-4  
1978 Ford Econoline E100 - Van  
NHTSA 780623  
Post-Impact, Passenger Dummy View





APPROVED ENGINEERING TEST LABORATORIES

SECTION 4



SECTION 4

4.0 TEST PROCEDURES

4.1 FIXED BARRIER IMPACT TEST

The procedures for conducting the fixed barrier impact test are presented in detail in the FMVSS 219 "Windshield Zone Intrusion" and FMVSS 310-75 "Fuel System Integrity" reports previously submitted to DOT-NHTSA Office of Vehicle Safety Compliance.

4.2 TEST DUMMY POSITIONING

The driver and right front passenger dummies were placed in the center of the seat cushion and pushed into the seat back. The shoulders were pushed back against the seat back and the head centered on the head restraint. The thighs were pushed down on the seat cushion and the heels placed on the floor. The thumbs and index fingers of the driver dummy were positioned around the steering wheel rim at the 3 and 9 o'clock positions. The upper position of the passenger dummy arms were pushed against the seat back and the hands placed to the side of the thighs.



SECTION 4

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

The analog data was then played back into a Hewlett Packard Digital Fourier Analyzer (DFA) system using a HP 2100S mini computer with 35K word core storage. This system used four program controlled analog filters which provided predigitizing filter capability of 60 db/octave above 1250 Hz.

The DFA is a hard disc based system with standard HP design software for performing data acquisition and analysis functions. The HP software was programmed using direct keyboard program functions to automate the data reduction process. The data was entered into temporary storage, four channels (one set) at a time with six total sets. Table 4-3 defines each data channel and data set. The data sets were divided into driver and passenger tape recorder groups to facilitate simultaneous data acquisition for the head, chest



SECTION 4

4.3 DATA ACQUISITION AND REDUCTION (COND'T)

and vehicle accelerometers to assure appropriate calibration of injury criteria and vehicle dynamics. At the time of entry, test personnel entered the appropriate calibration for each data channel and the computer then scaled the data appropriately. When all data had been acquired it was 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 modification to the data at the time of permanent storage was the filtering and digitizing process of the FM recorder tape (2500 Hz) and the DFA (1250 Hz, 200 ms). Immediately after the data was moved to permanent storage it was recalled by the test personnel and plotted with the appropriate label and vehicle designation. As the data was recalled the DFA was 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. The class 60 filter was applied to the vehicle acceleration and belt restraint forces. The class 180 filter was applied to the chest acceleration forces. The class 600 filter was applied to the femur forces and the class 1000 filter was applied to the head acceleration forces.



SECTION 4

4.3 DATA ACQUISITION AND REDUCTION (CONT'D)

The SAE recommended filters are quadratic double pole filters with 65% damping and 12 db/octave rolloff. They are applied to the data using a Fast Fourier Transform (FFT) of the data, frequency domain multiplication, and inverse FFT operation on the product.

It should be noted in Figure 4-2 that the predigitizing analog filter attenuates all signals above the 1250 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 was attenuated at 60 db/octave instead of 24 db/octave. This had very negligible effect on the class 600 data. The modification of class 1000 data by the predigitizing filter is attenuation of 60 db/octave above 1250 Hz instead of 24 db/octave above 1650 Hz. Examination of typical class 1000 data shows the high frequency components between 1250 Hz and 1650 Hz are uniformly less than 3 percent of the largest components at lower frequencies. The effect of the predigitizing filter has a very slight smoothing of the plotted data.

4.4 IMPACT DATA

All impact data is presented in computer plots of data digitized at 200 microseconds. Special SAE filters were applied to each data set. Each data plot includes labeling, defining the test vehicle, filter class, and the complete identification of the data plotted.



SECTION 4

4.4.1 DUMMY HEAD DATA

The dummy head accelerations were processed as class 1000 data, and the Head Injury Criteria (HIC) calculation was performed. The HIC calculations were 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.

4.4.2 DUMMY CHEST DATA

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

4.4.3 FEMUR LOAD DATA

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

4.4.4 RESTRAINT LOAD DATA

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



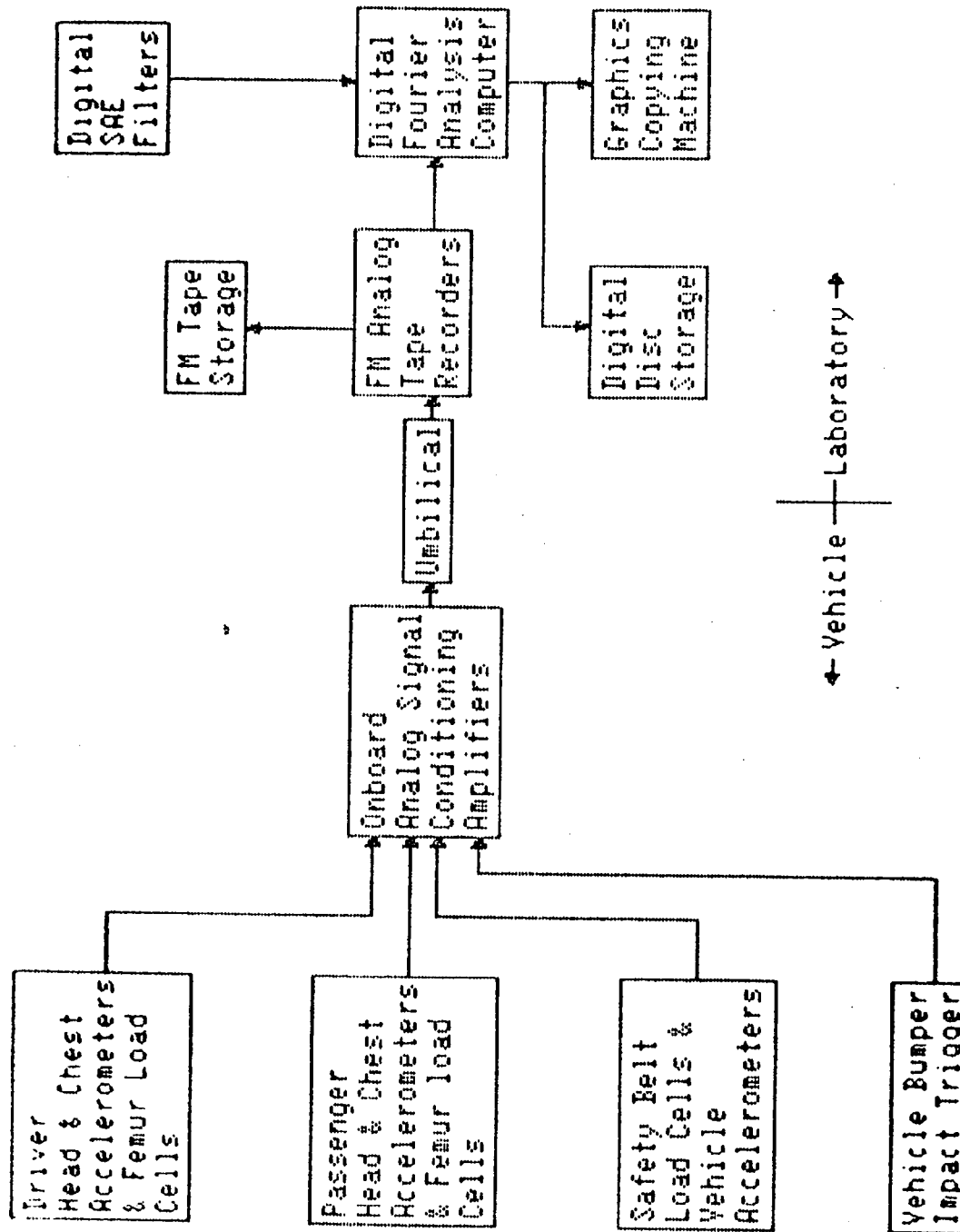
APPROVED ENGINEERING TEST LABORATORIES

SECTION 4

4.4.5 VEHICLE ACCELERATION DATA

The vehicle accelerations were processed as class 60 data, and presented as computer plots. Additionally, the longitudinal vehicle acceleration was integrated to provide approximate vehicle velocity change and vehicle crush during the impact event.

APPROVED ENGINEERING TEST LABS



VEHICLE AND OCCUPANT CRASH IMPACT DATA ACQUISITION SYSTEM

FIGURE 4-1

TABLE 4.1 INSTRUMENTATION FOR CRASH TEST

<u>Instrument</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>Full Scale</u>	<u>Accuracy</u>	<u>Frequency Max.</u>
Accelerometers, Head, Chest, Vehicle	Endevco	2262C-200	200g	±1%	3600 Hz
Load Cells, Femurs	GSE	2430	3000 lb	±1%	>3600 Hz
Load Cells, Safety Belts	GSE	2500	3000 lb	±1%	>3600 Hz
Contact Switch, Impact	AETL	-	2 V	-	<200 us rise time
FM Tape Recorder	Bell & Howell	4020	±2.8 V	47 db SNR	2500 Hz WB
Programmable Filter, All Data	Hewlett Packard	54440A	-	0.5%	1250 Hz, 60 db/oct
Analog-Digital Converter, All Data	Hewlett Packard	5466B	-	0.5%	200 us sampling
Analysis Computer, All Analysis	Hewlett Packard	2100S	32 K Words	16 Bit Word	-
Disc Drive	Hewlett Packard	7900A	5 Meg Words	-	-



APPROVED ENGINEERING TEST LABORATORIES

TABLE 4-2

DATA ACQUISITION AND REDUCTION PROCESS

<u>STEP</u>	<u>DESCRIPTION</u>
1	DA System Installation
2	DA System Pre-Impact Calibration
3	Impact Trigger Checkout
4	Vehicle Impact Performed
5	DA System Post-Impact Calibration
6	Data Reproduced From FM Tape Into Computer a) Data analog filtered at 1250 Hz b) Data digitized at 200 ms sample rate c) Data sychronized by impact trigger signal
7	Digitized Data Examined
8	Data Transferred Permanent Disc Storage
9	Appropriate SAE Filters Are Applied
10	Each Data Signal Plotted With Lables
11	Chest Severity Index Values Determined
12	Head Injury Criteria Values Determined
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 $A_x$
1	1	2	Driver Lateral Head Acceleration $A_y$
1	1	3	Driver Vertical Head Acceleration $A_z$
1	1	4	Driver Right Femur Force
2	1	5	Driver Longitudinal Chest Acceleration $A_x$
2	1	6	Driver Lateral Chest Acceleration $A_y$
2	1	7	Driver Vertical Chest Acceleration $A_z$
2	1	8	Driver Left Femur Force
3	1	9	Driver Restraint Belt Force
3	1	10	Longitudinal Vehicle Acceleration (Front) $A_x$
3	1	11	Longitudinal Vehicle Acceleration (Rear) $A_x$
3	1	12	Vertical Vehicle Acceleration (Rear) $A_z$
4	2	1	Passenger Longitudinal Head Acceleration $A_x$
4	2	2	Passenger Lateral Head Acceleration $A_y$
4	2	3	Passenger Vertical Head Acceleration $A_z$
4	2	4	Passenger Right Femur Force
5	2	5	Passenger Longitudinal Chest Acceleration $A_x$
5	2	6	Passenger Lateral Chest Acceleration $A_y$
5	2	7	Passenger Vertical Chest Acceleration $A_z$
5	2	8	Passenger Left Femur Force
6	2	9	Passenger Restraint Belt Force
6	2	10-12	Same as Tape 1, Ch's 10-12

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

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

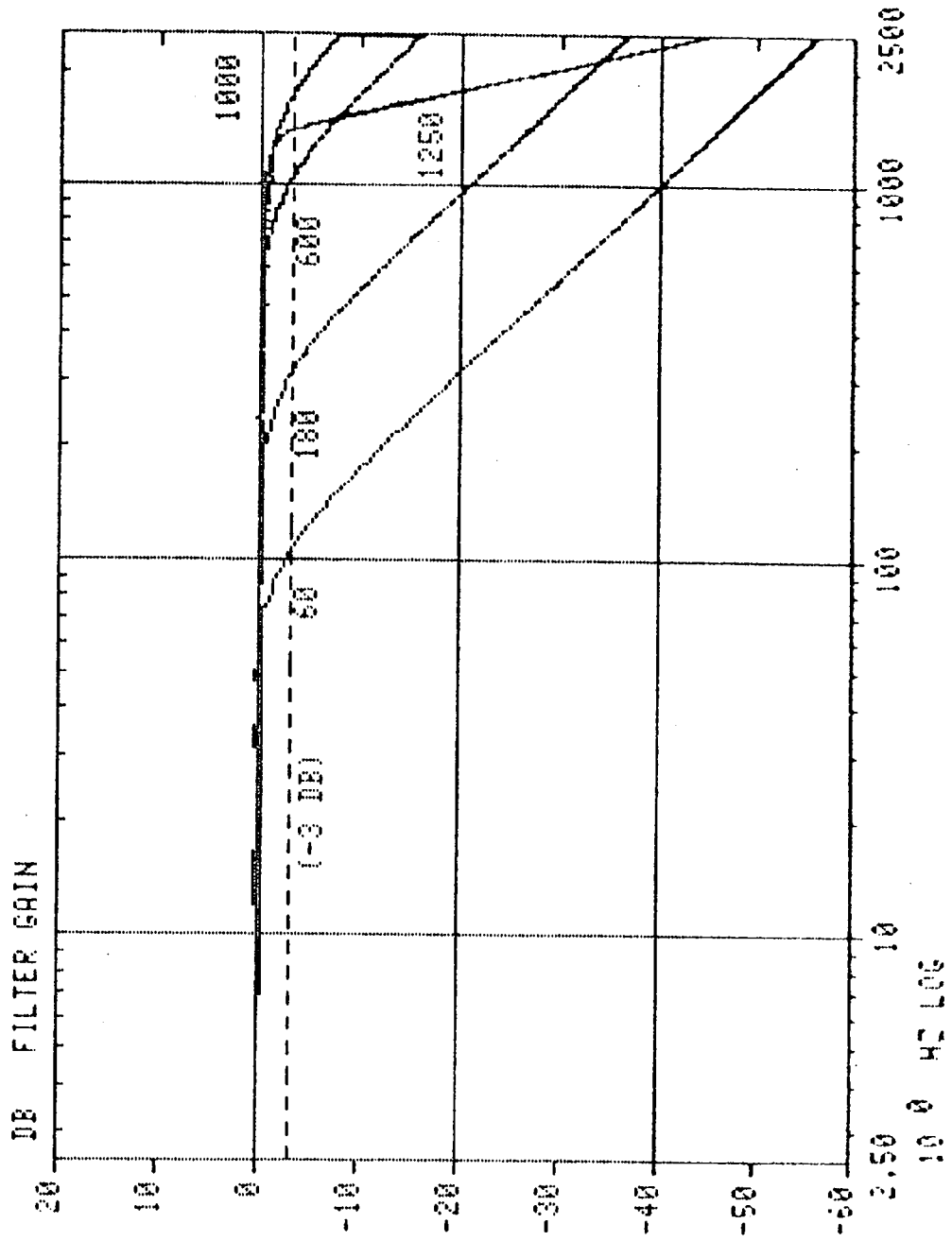


FIGURE 4-2



APPROVED ENGINEERING TEST LABORATORIES

APPENDIX A



APPROVED ENGINEERING TEST LABORATORIES

APPENDIX A

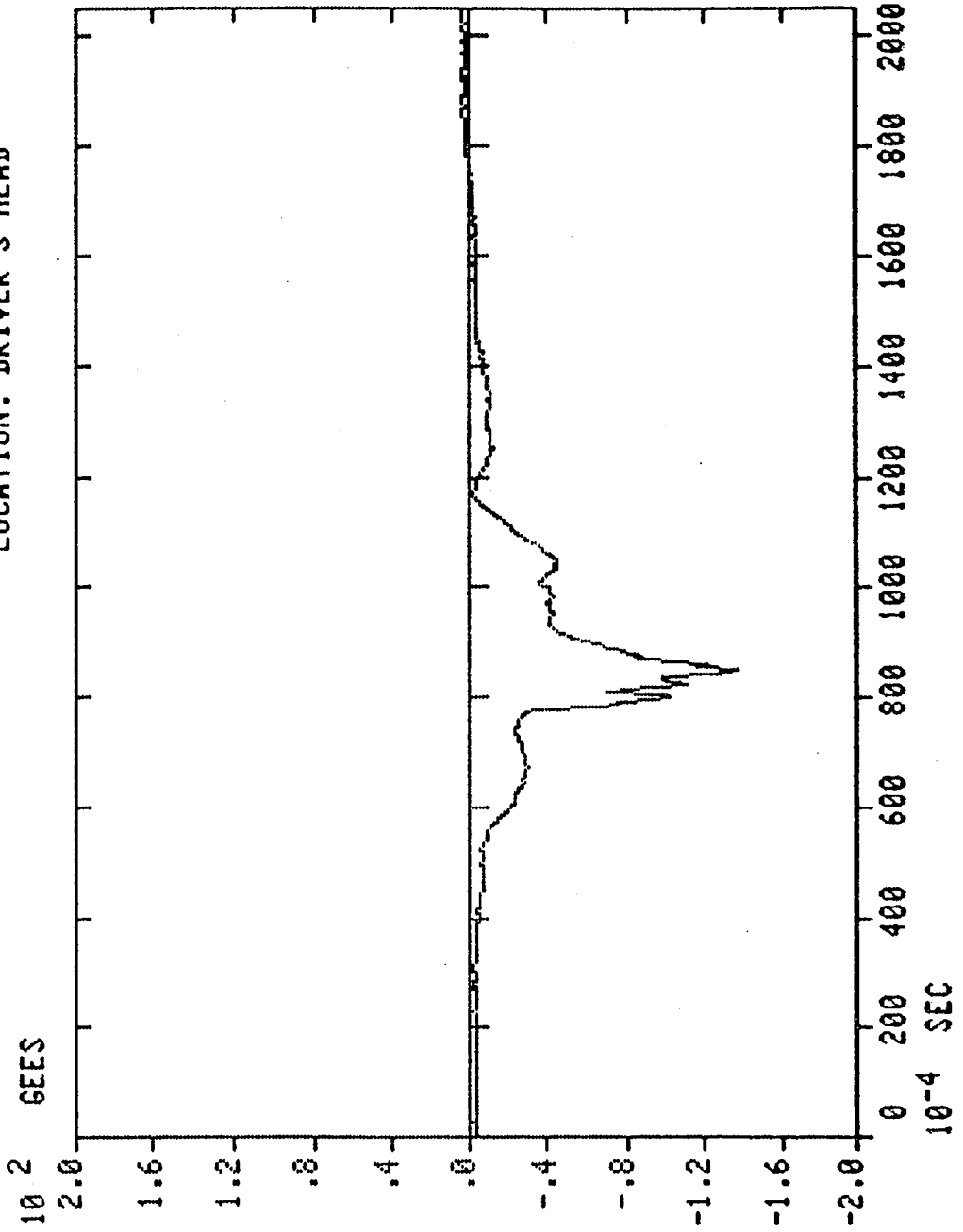
The following computer plots provide complete and comprehensive occupant response and vehicle acceleration during the impact event.

DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 1, CH 1  
DIRECTION: FORWARD  
LOCATION: DRIVER'S HEAD

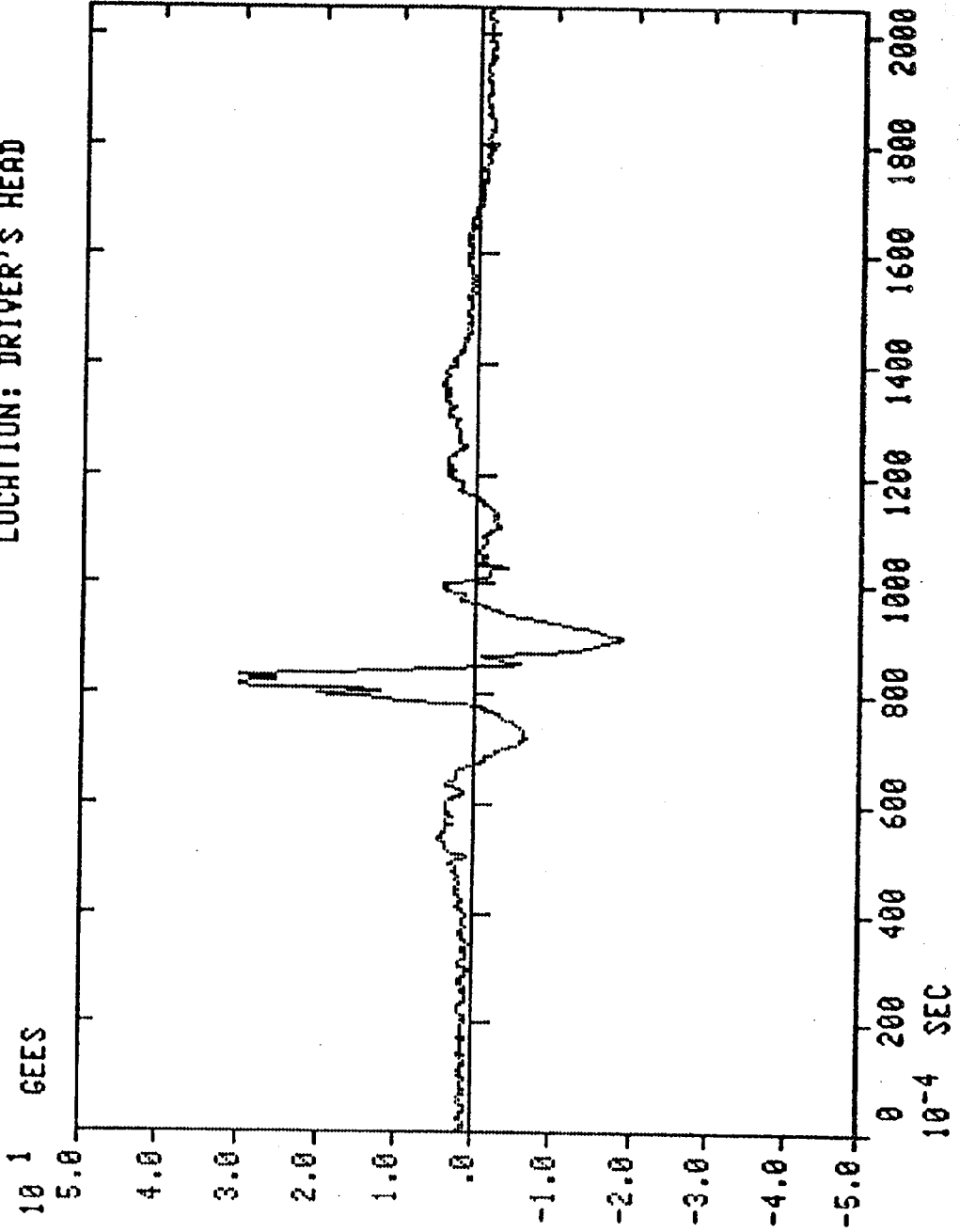


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 1, CH 2  
DIRECTION: RIGHT  
LOCATION: DRIVER'S HEAD

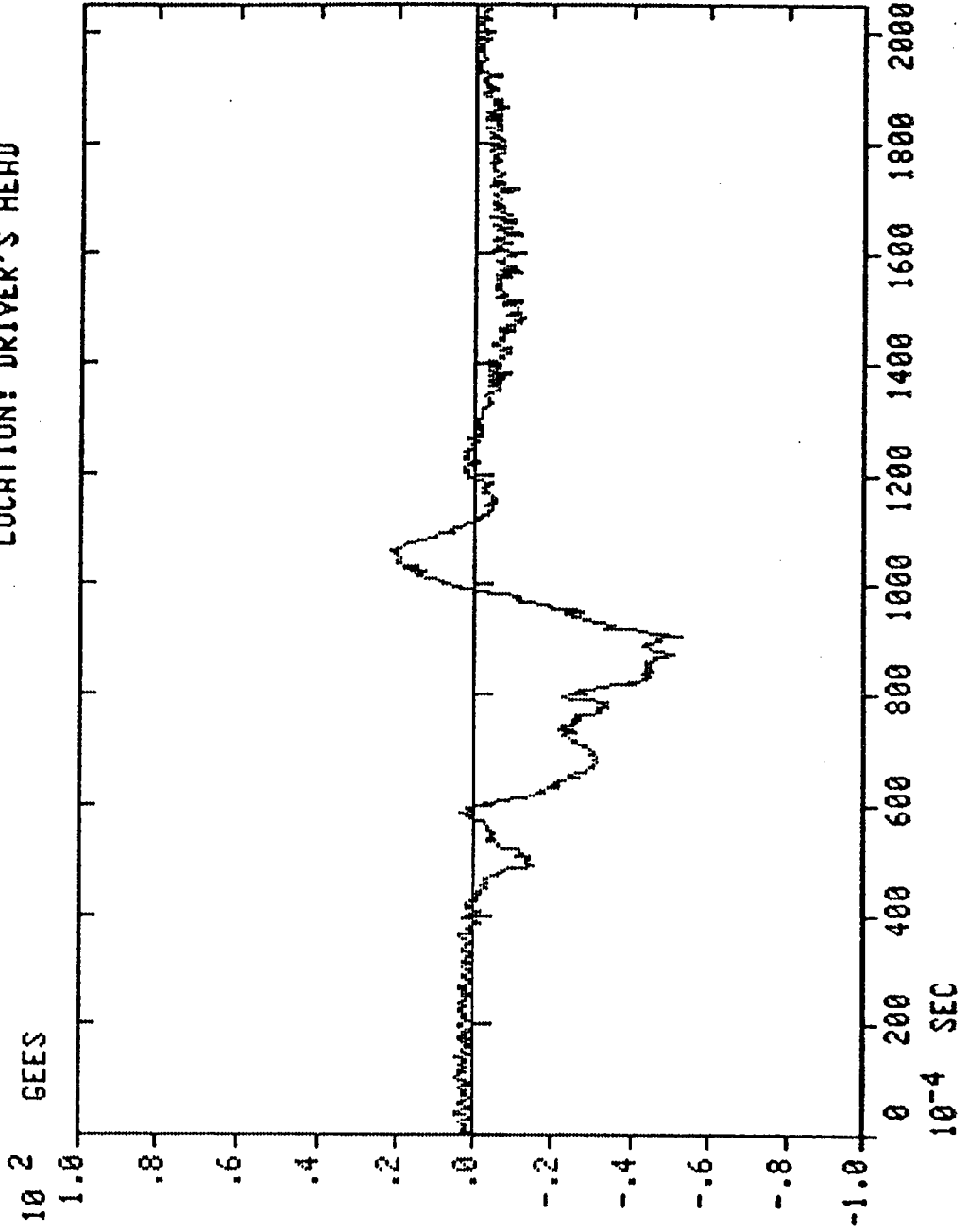


DOT CRASH PROGRAM

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489  
FILTER: CLASS 1000  
ACCELEROMETR: TAPE 1, CH 3  
DIRECTION: UPWARD  
LOCATION: DRIVER'S HEAD



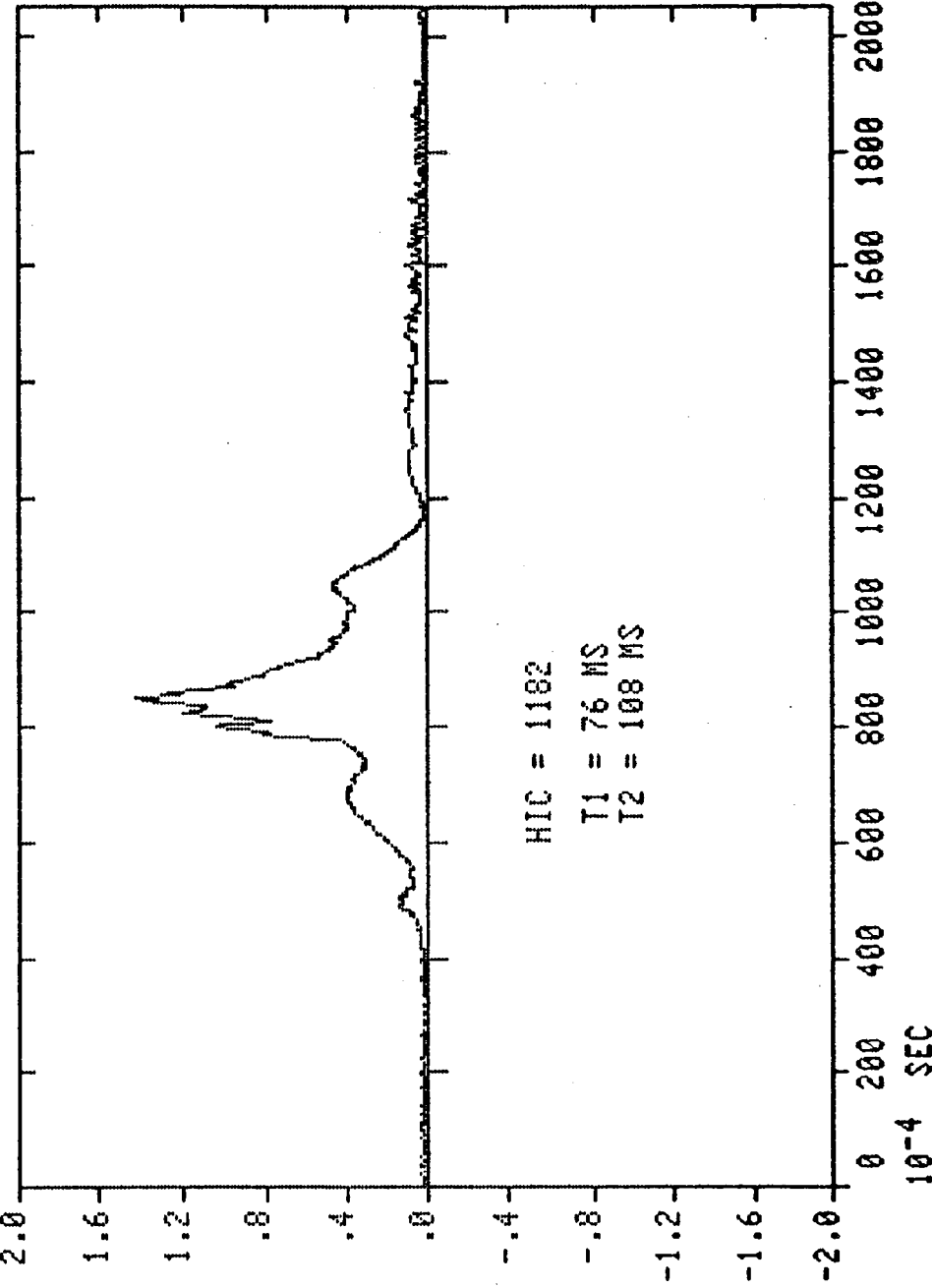
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO.: 117  
DATE: NOVEMBER 9, 1978

MJO NO.: 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 1, CH 1-3  
DIRECTION: RESULTANT OF XYZ  
LOCATION: DRIVER'S HEAD

10 2 GEES RESULTANT

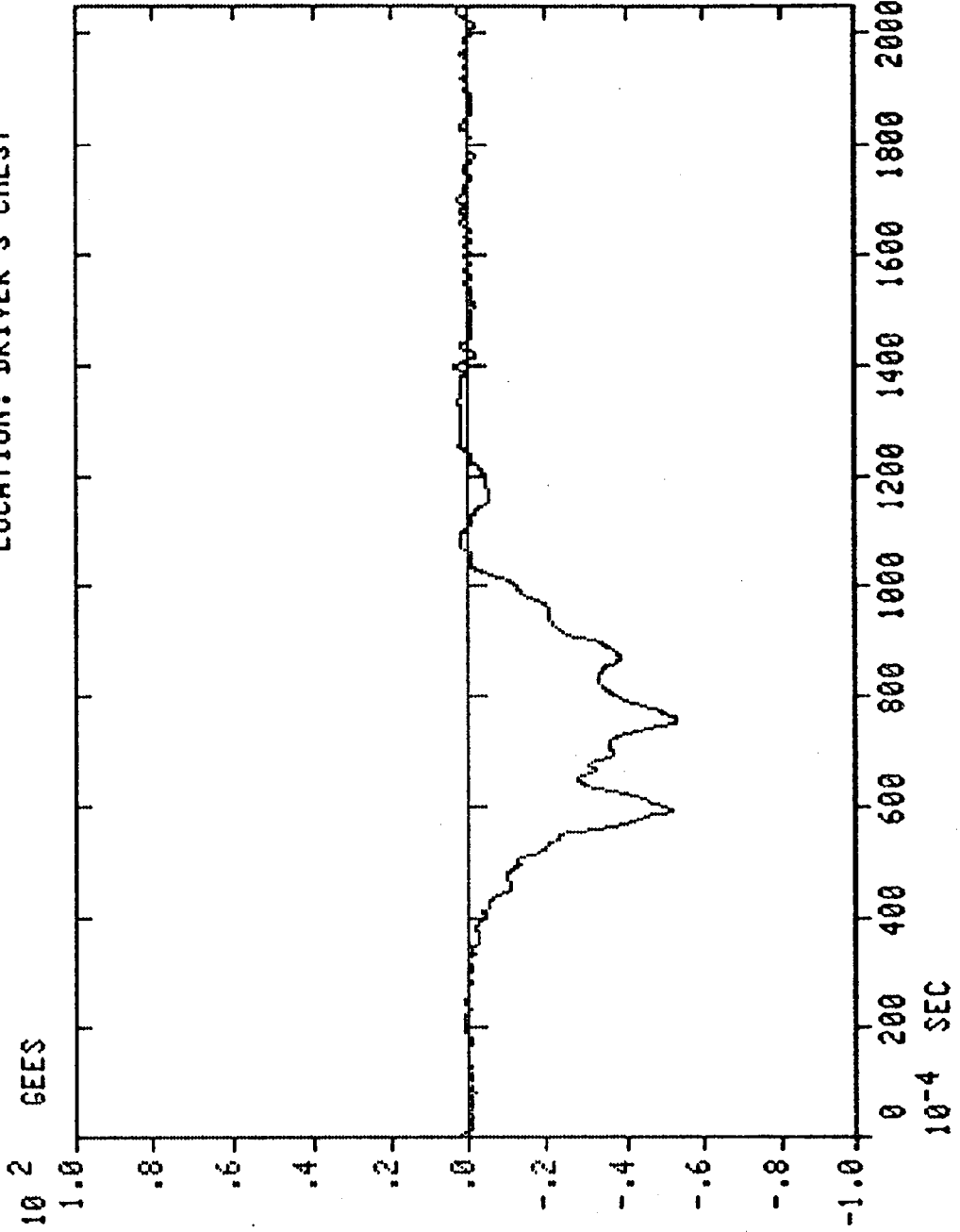


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 1, CH 5  
DIRECTION: FORWARD  
LOCATION: DRIVER'S CHEST

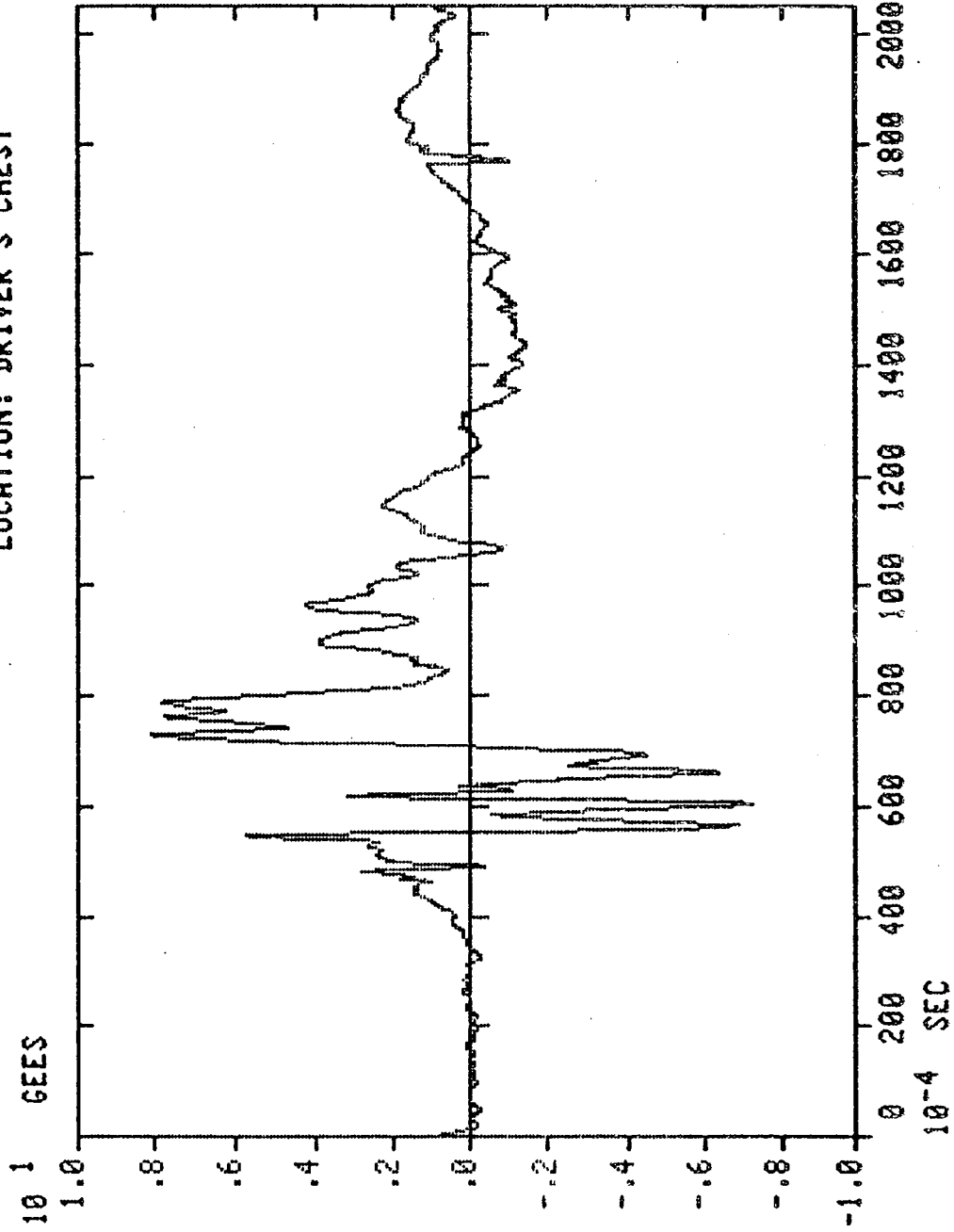


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 1, CH 6  
DIRECTION: RIGHT  
LOCATION: DRIVER'S CHEST

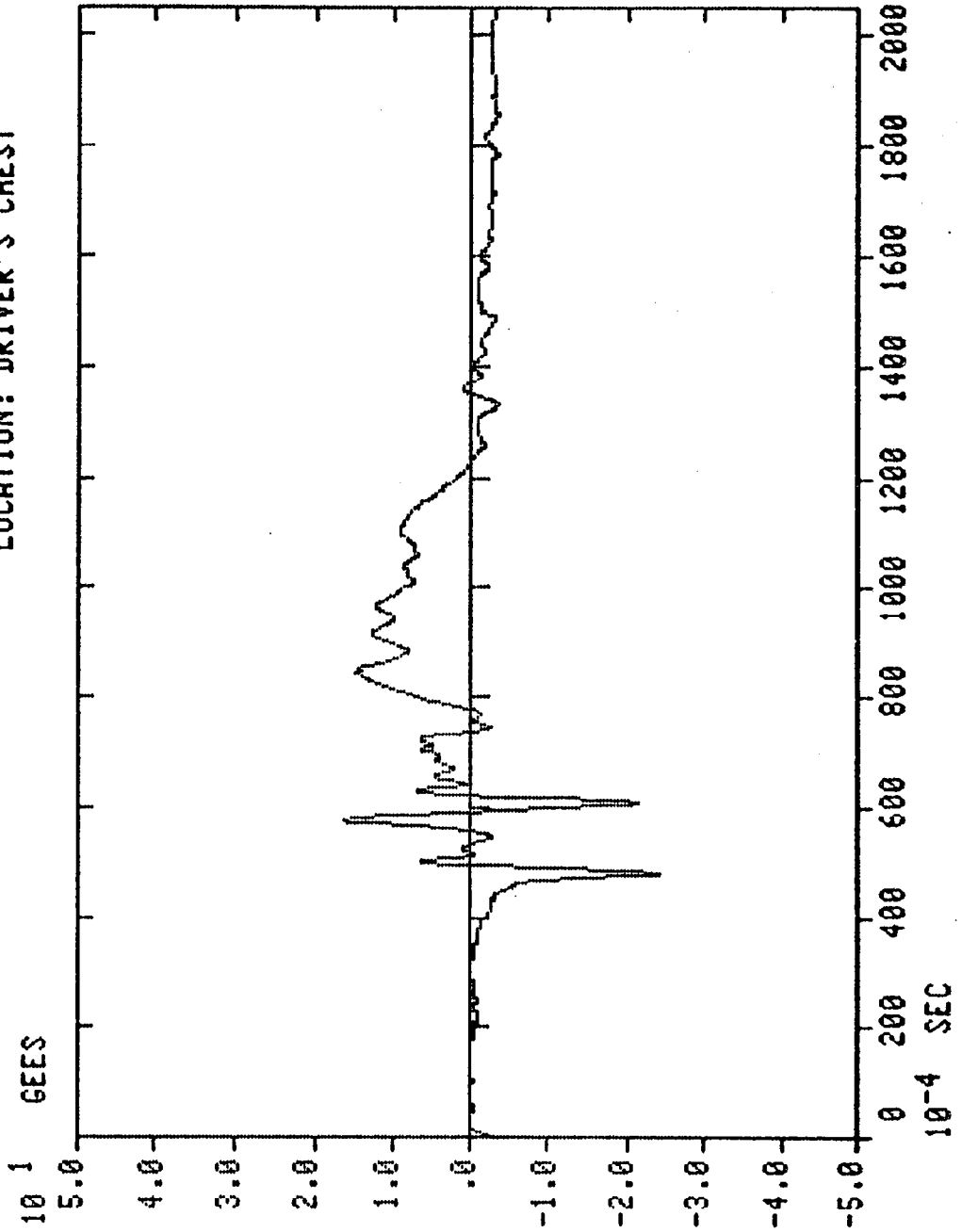


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 1, CH 7  
DIRECTION: UPWARD  
LOCATION: DRIVER'S CHEST

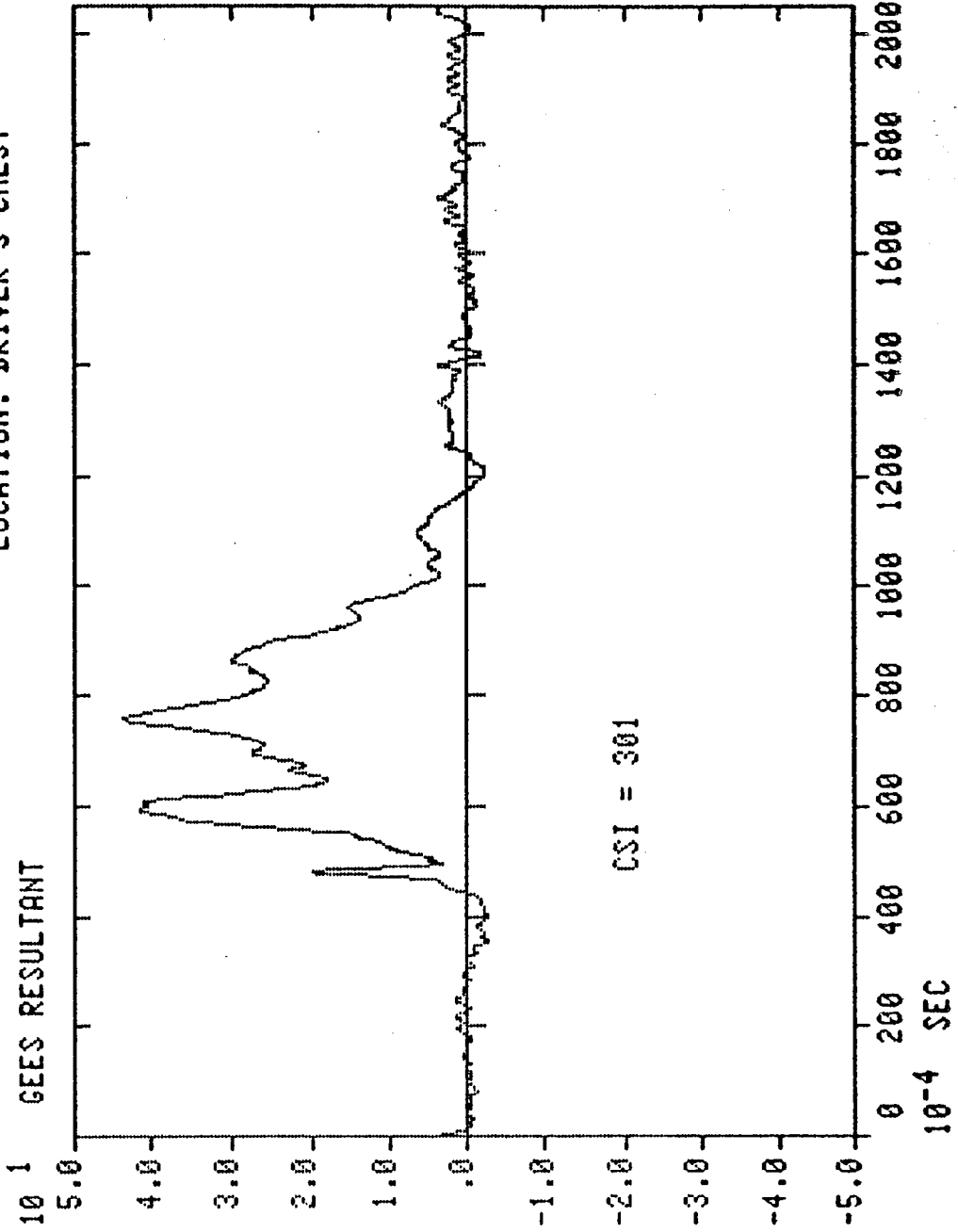


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 1, CH 5-7  
DIRECTION: RESULTANT OF XYZ  
LOCATION: DRIVER'S CHEST

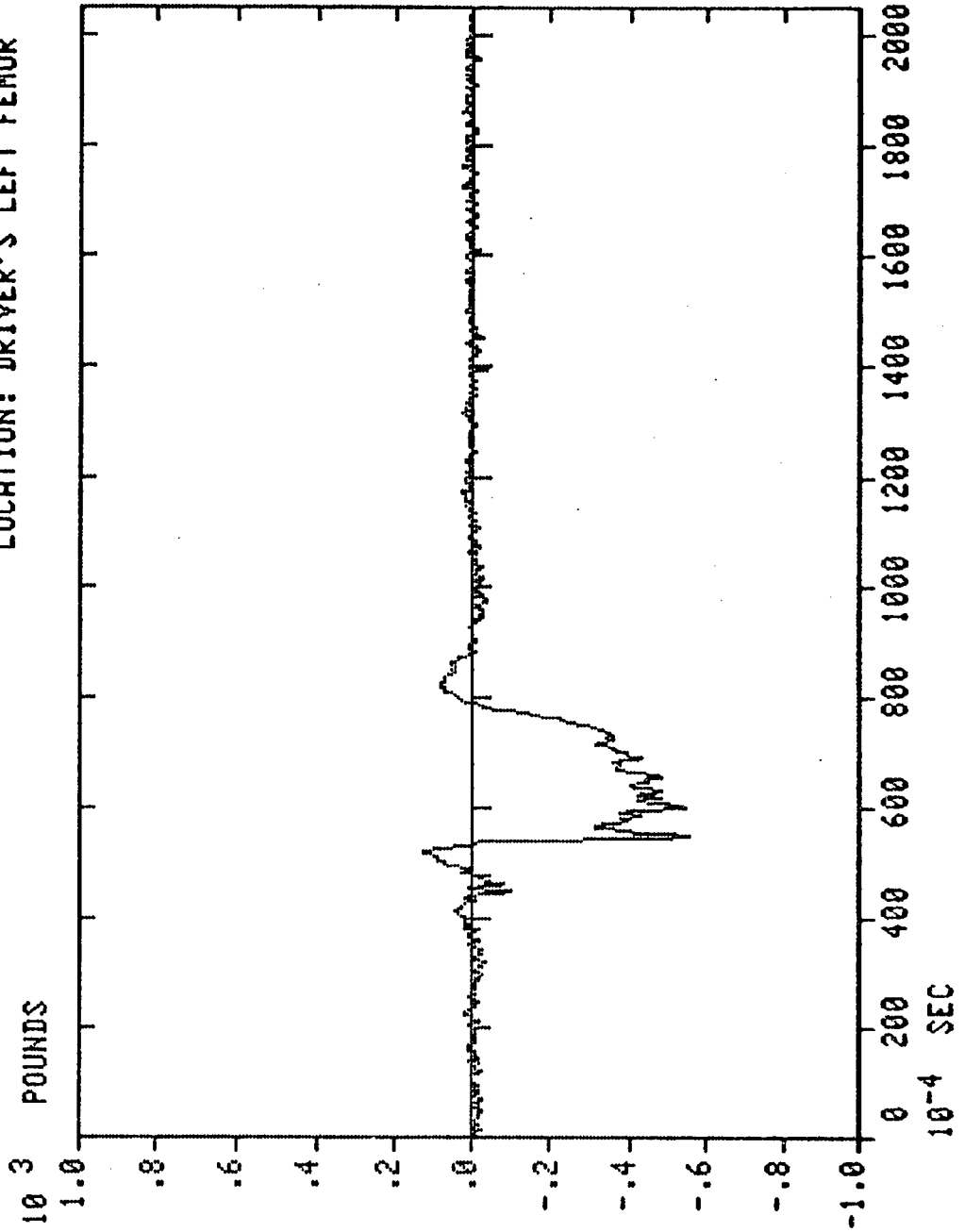


DOT CRASH PROGRAM

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489  
FILTER: CLASS 600  
LOAD CELL: TAPE 1, CH 8  
DIRECTION: TENSION  
LOCATION: DRIVER'S LEFT FEMUR

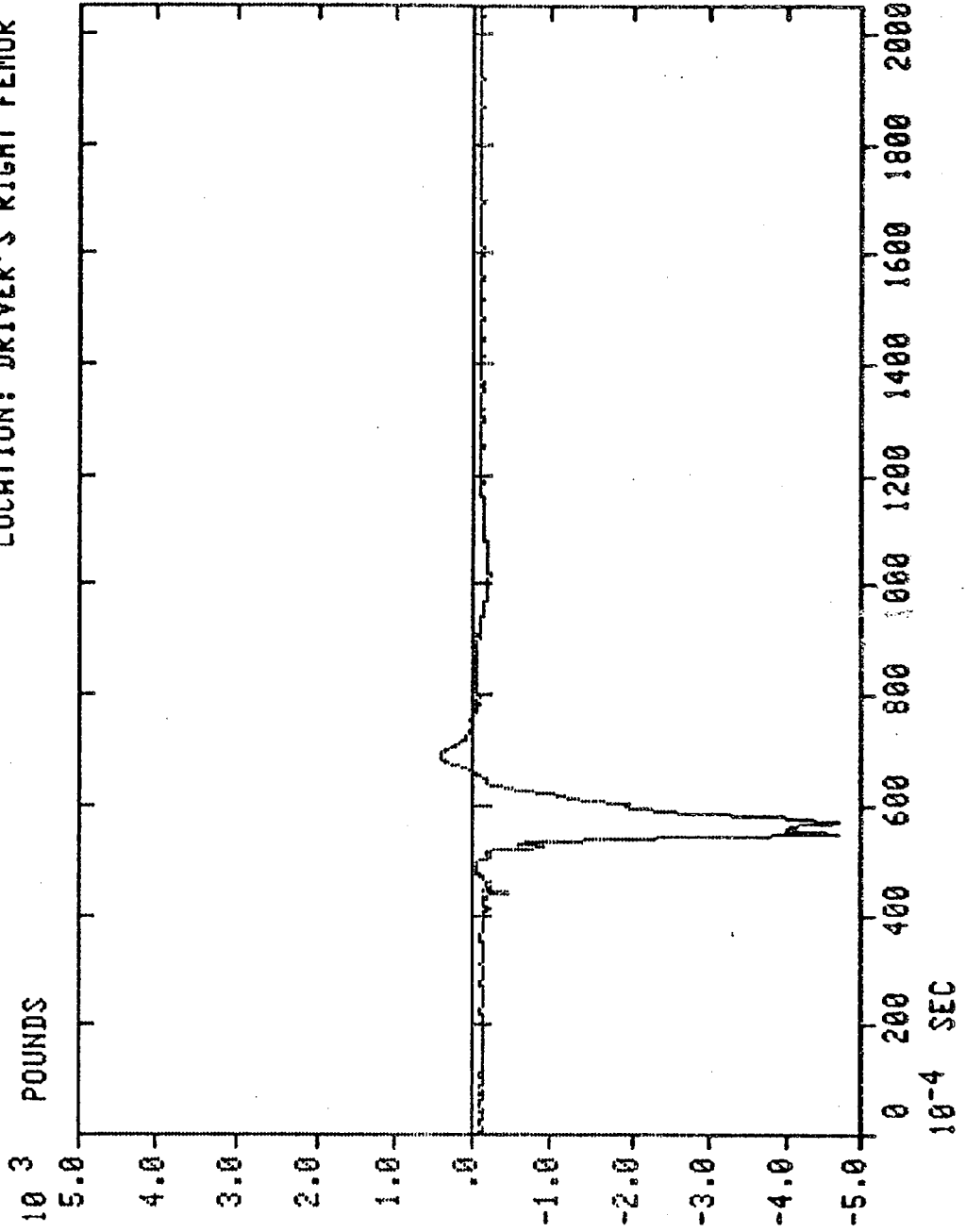


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 600  
LOAD CELL: TAPE 1, CH 4  
DIRECTION: TENSION  
LOCATION: DRIVER'S RIGHT FEMUR

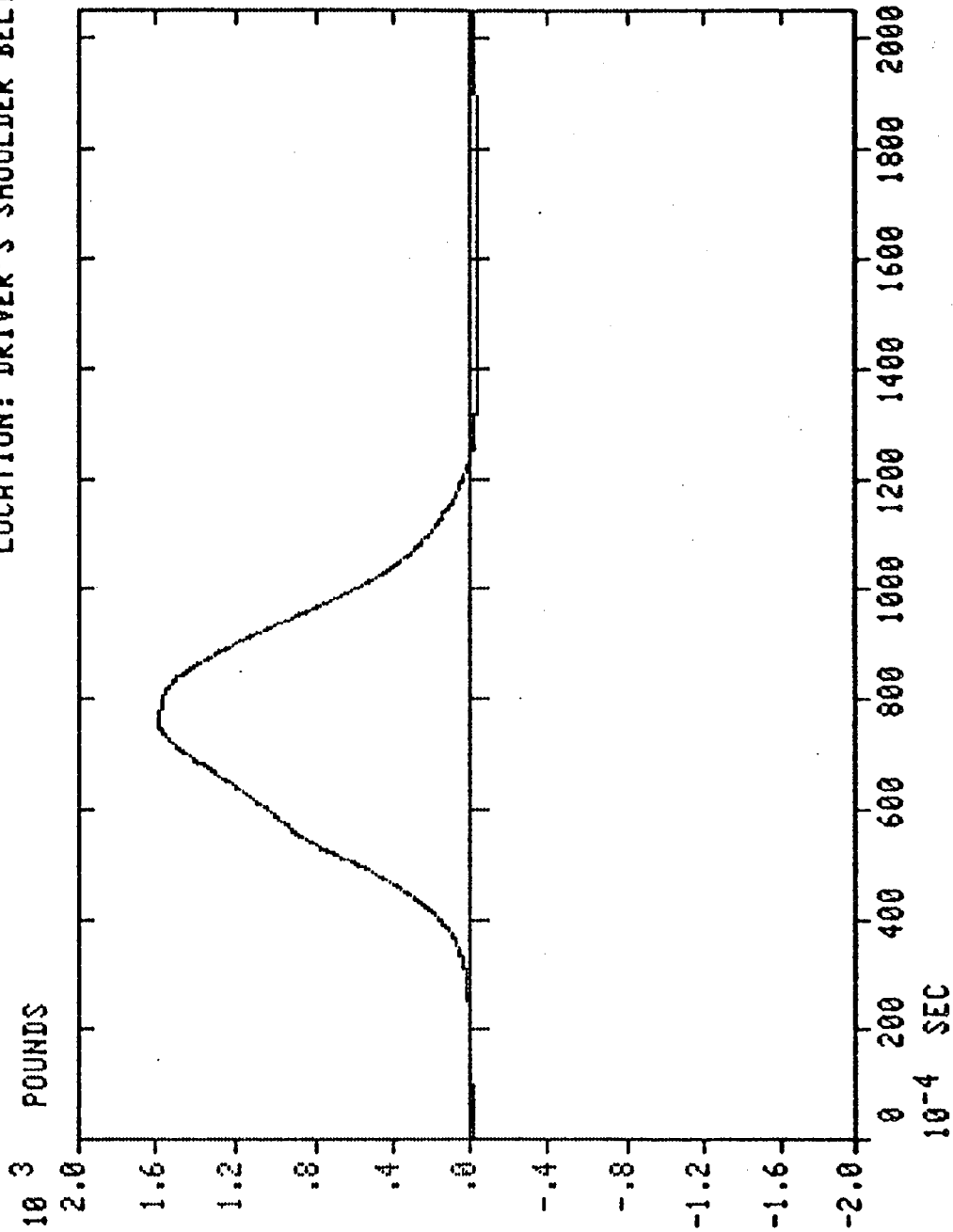


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 60  
LOAD CELL: TAPE 1, CH 9  
DIRECTION: TENSION  
LOCATION: DRIVER'S SHOULDER BELT

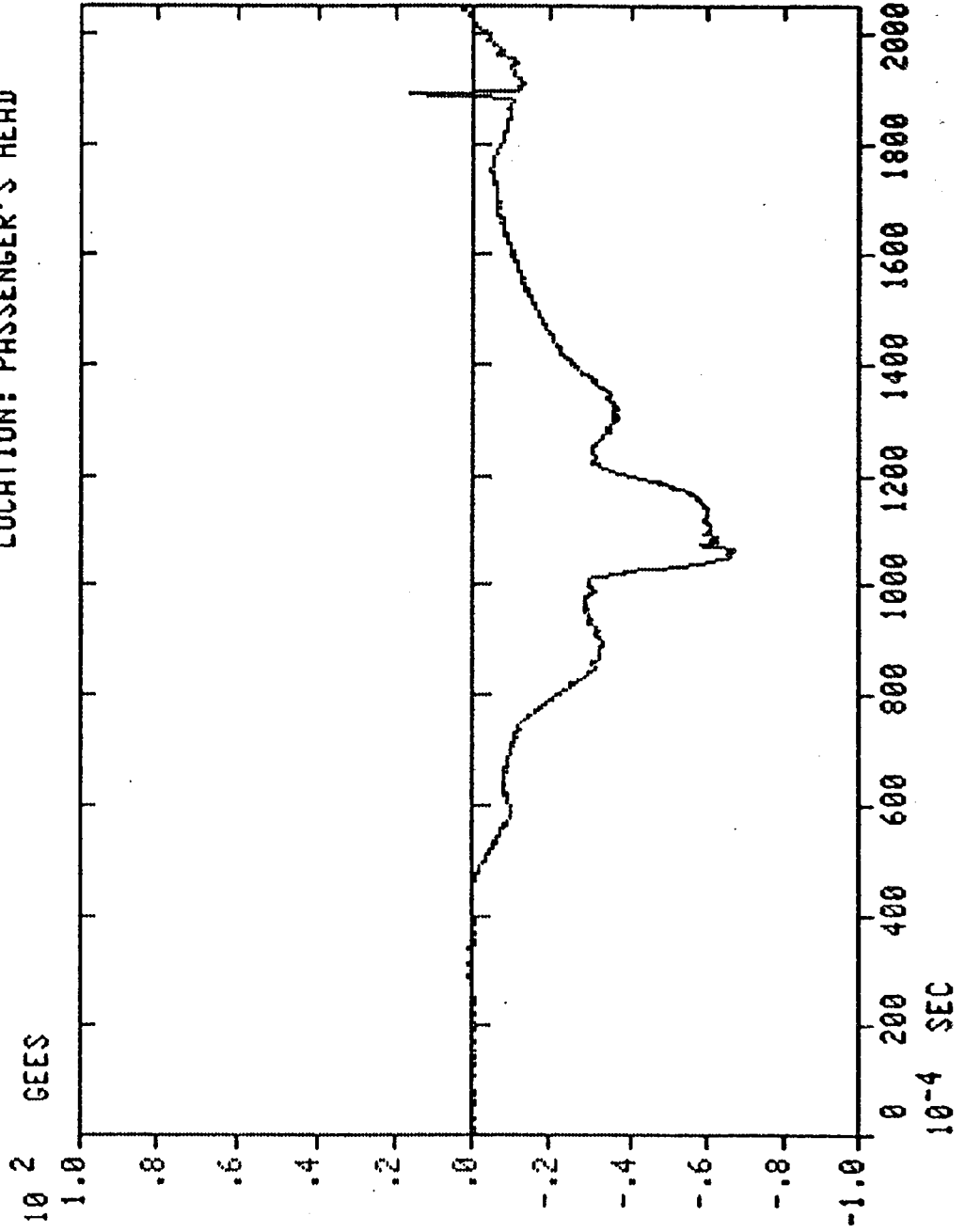


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 1  
DIRECTION: FORWARD  
LOCATION: PASSENGER'S HEAD

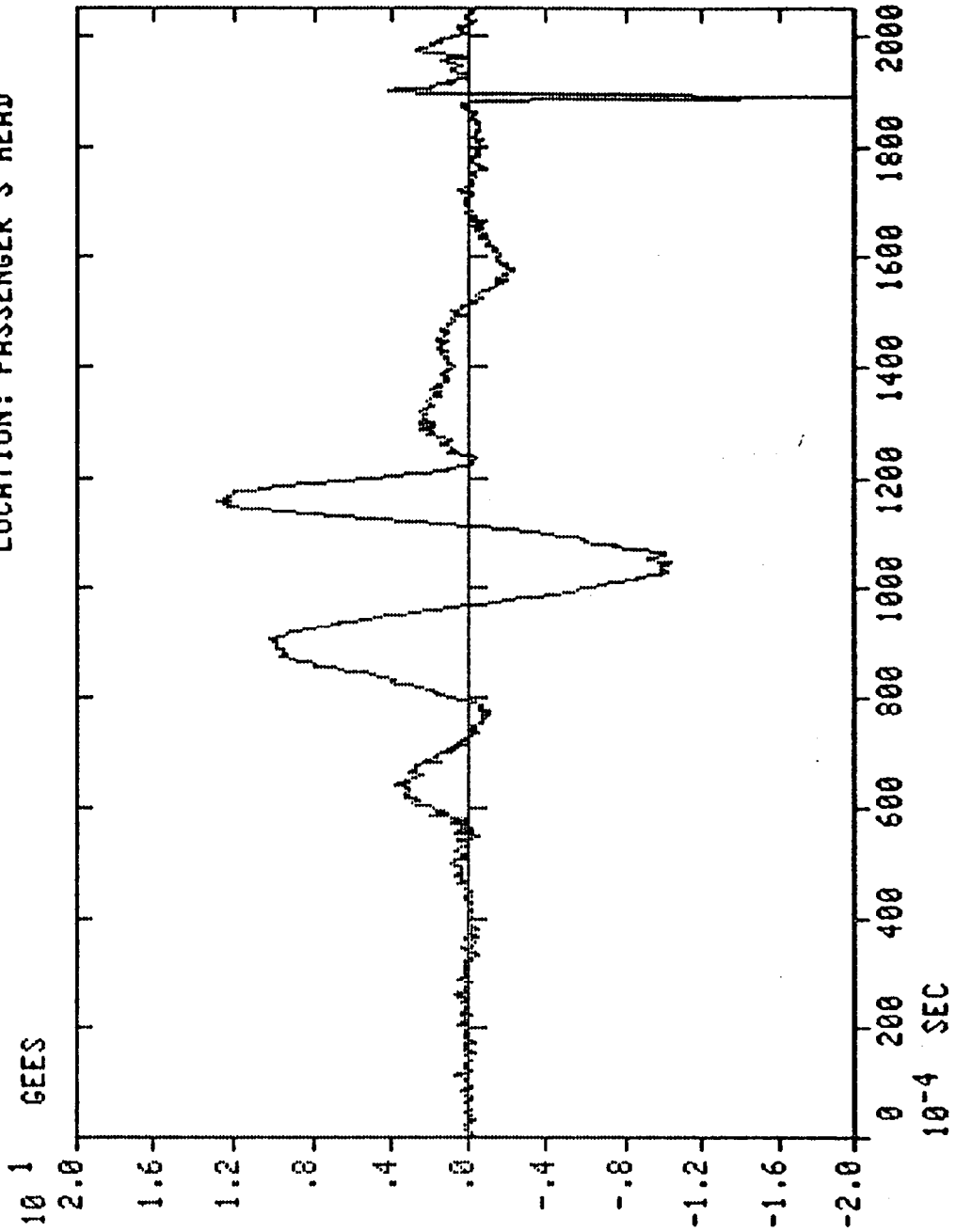


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO.: 117  
DATE: NOVEMBER 9, 1978

MJO NO.: 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 2  
DIRECTION: RIGHT  
LOCATION: PASSENGER'S HEAD

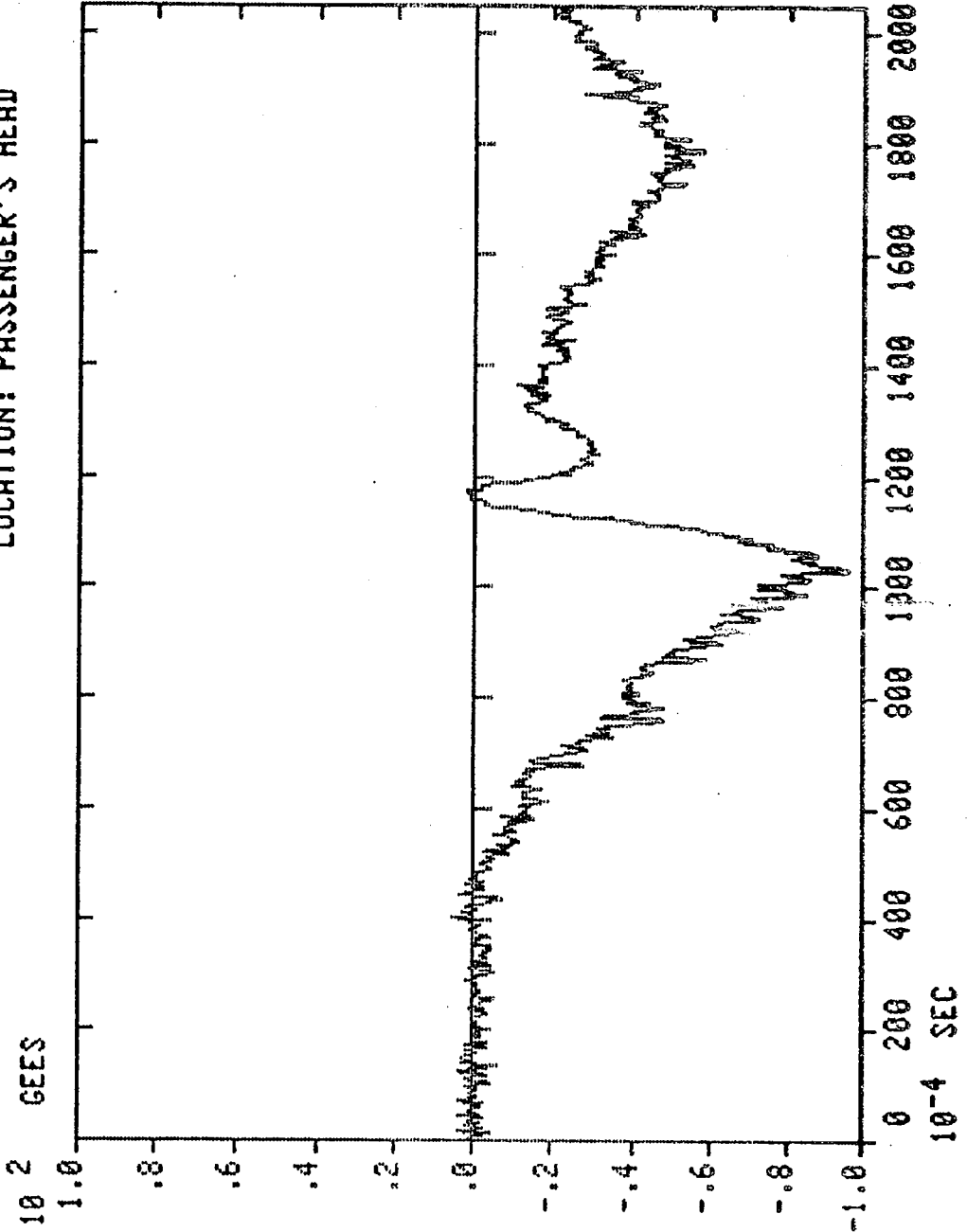


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 3  
DIRECTION: UPWARD  
LOCATION: PASSENGER'S HEAD



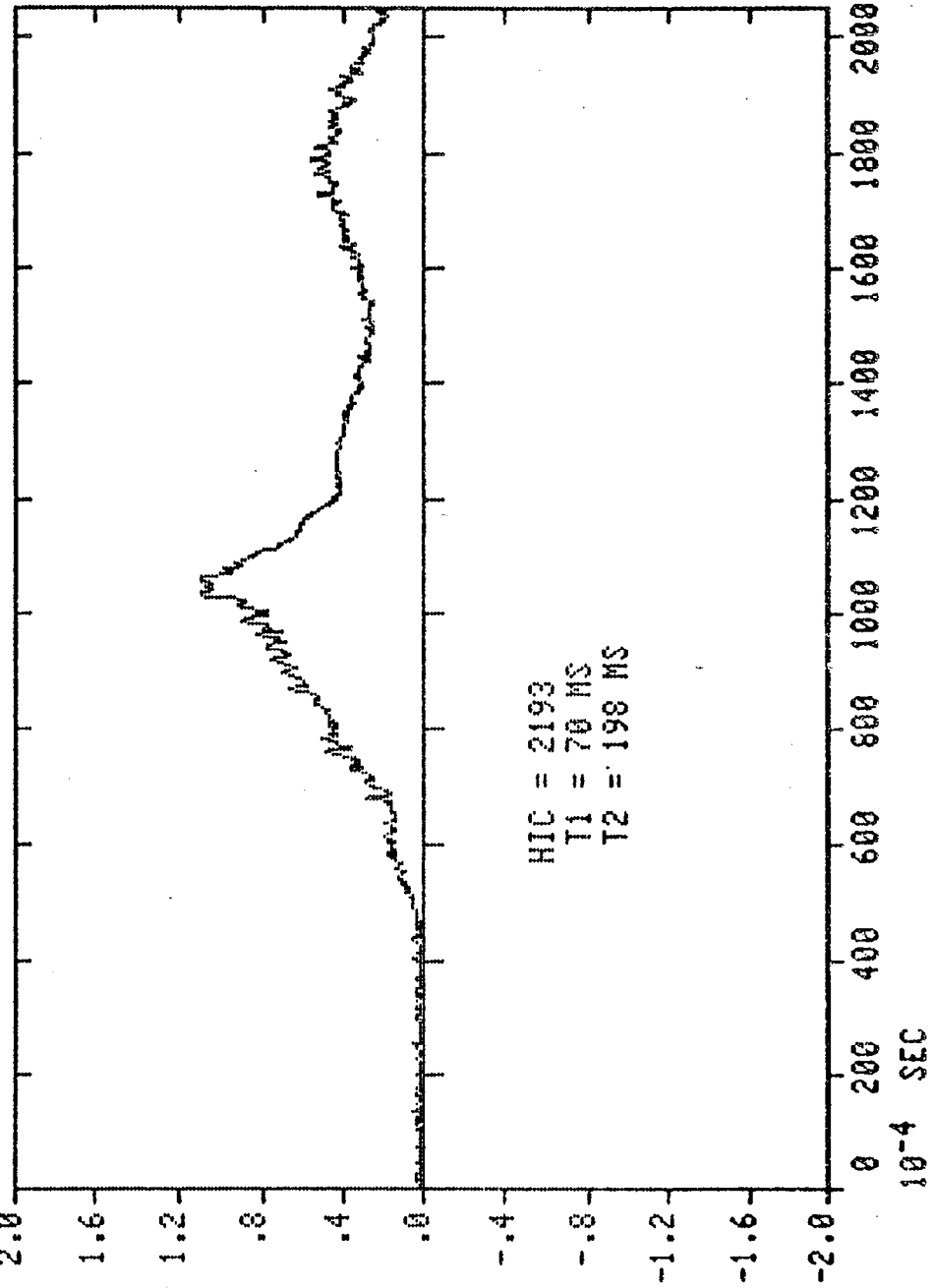
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 1-3  
DIRECTION: RESULTANT OF XYZ  
LOCATION: PASSENGER'S HEAD

10 2 GEES RESULTANT



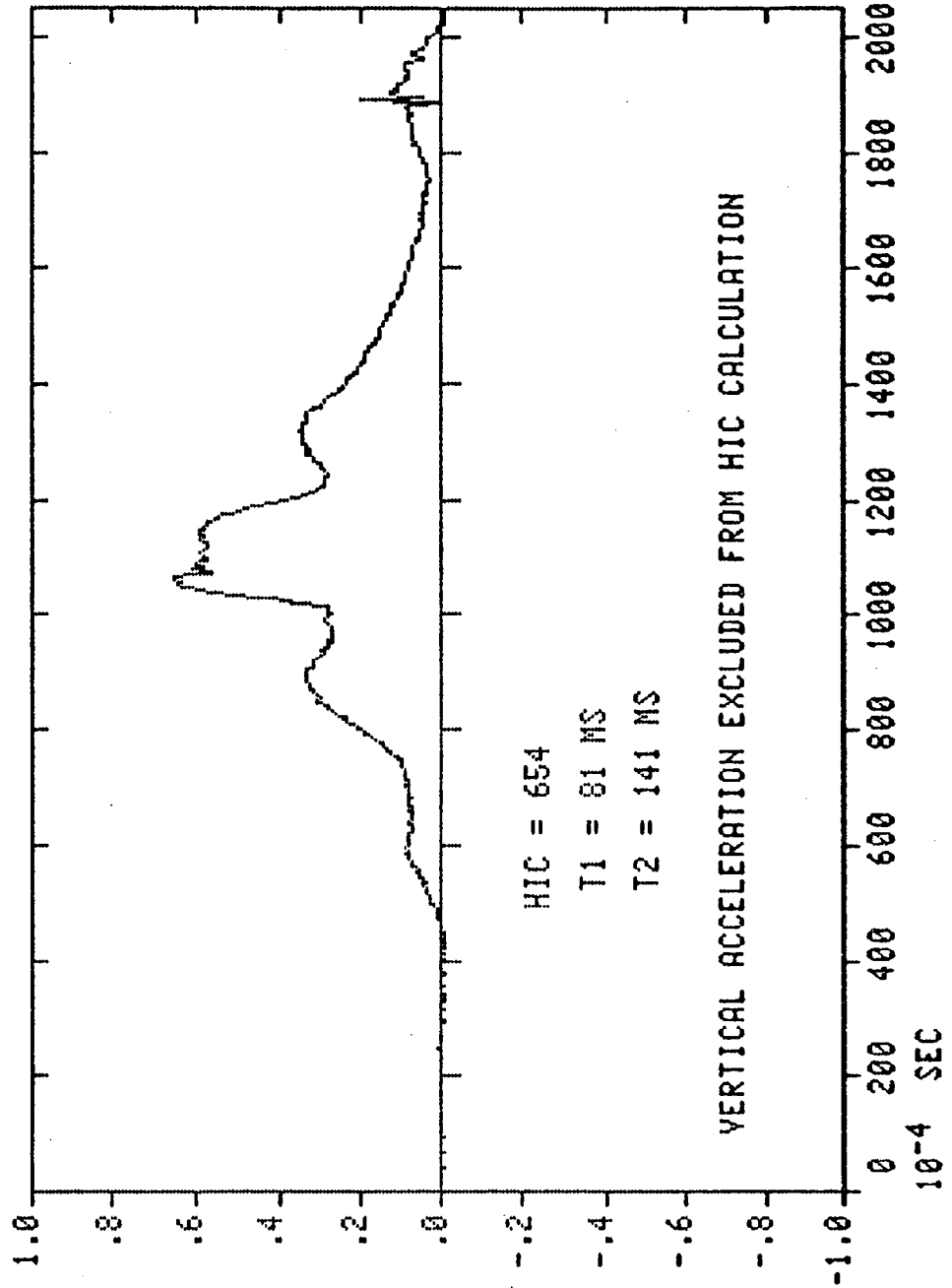
DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 1-3  
DIRECTION: RESULTANT OF XY  
LOCATION: PASSENGER'S HEAD

10 2 GEES RESULTANT

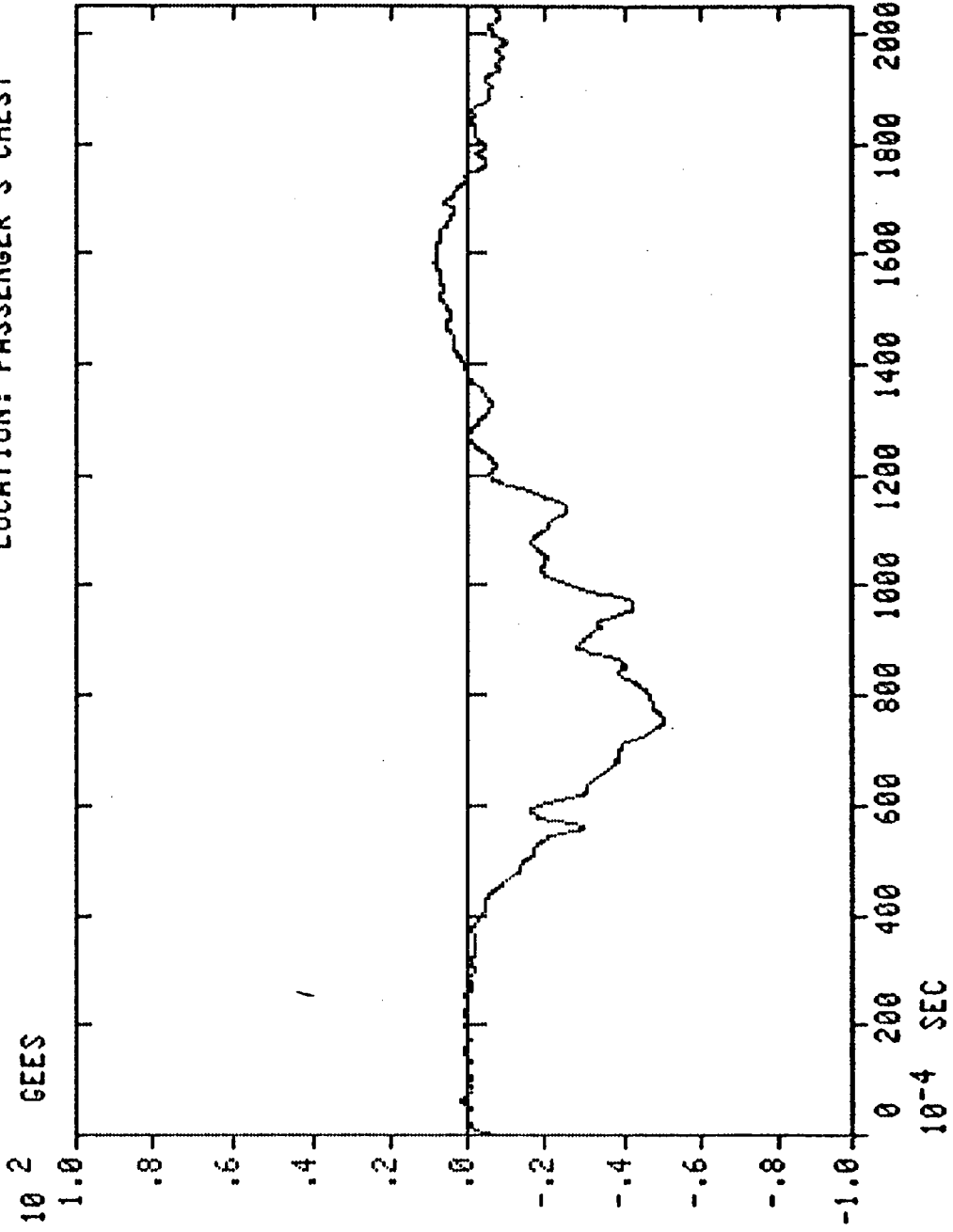


DOT CRASH PROGRAM

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 2, CH 5  
DIRECTION: FORWARD  
LOCATION: PASSENGER'S CHEST

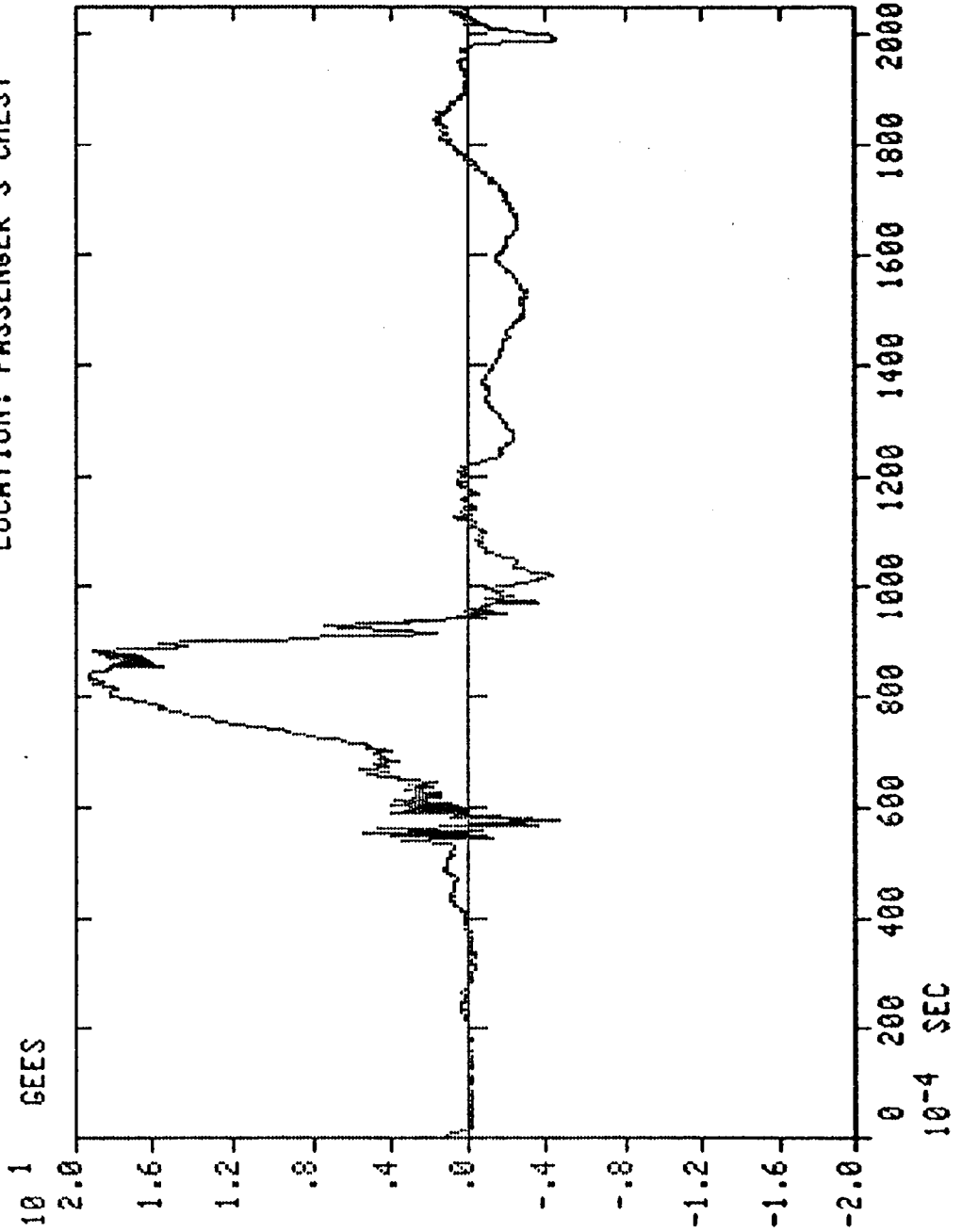


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 180  
ACCELEROMETER: TAPE: 2, CH 6  
DIRECTION: RIGHT  
LOCATION: PASSENGER'S CHEST

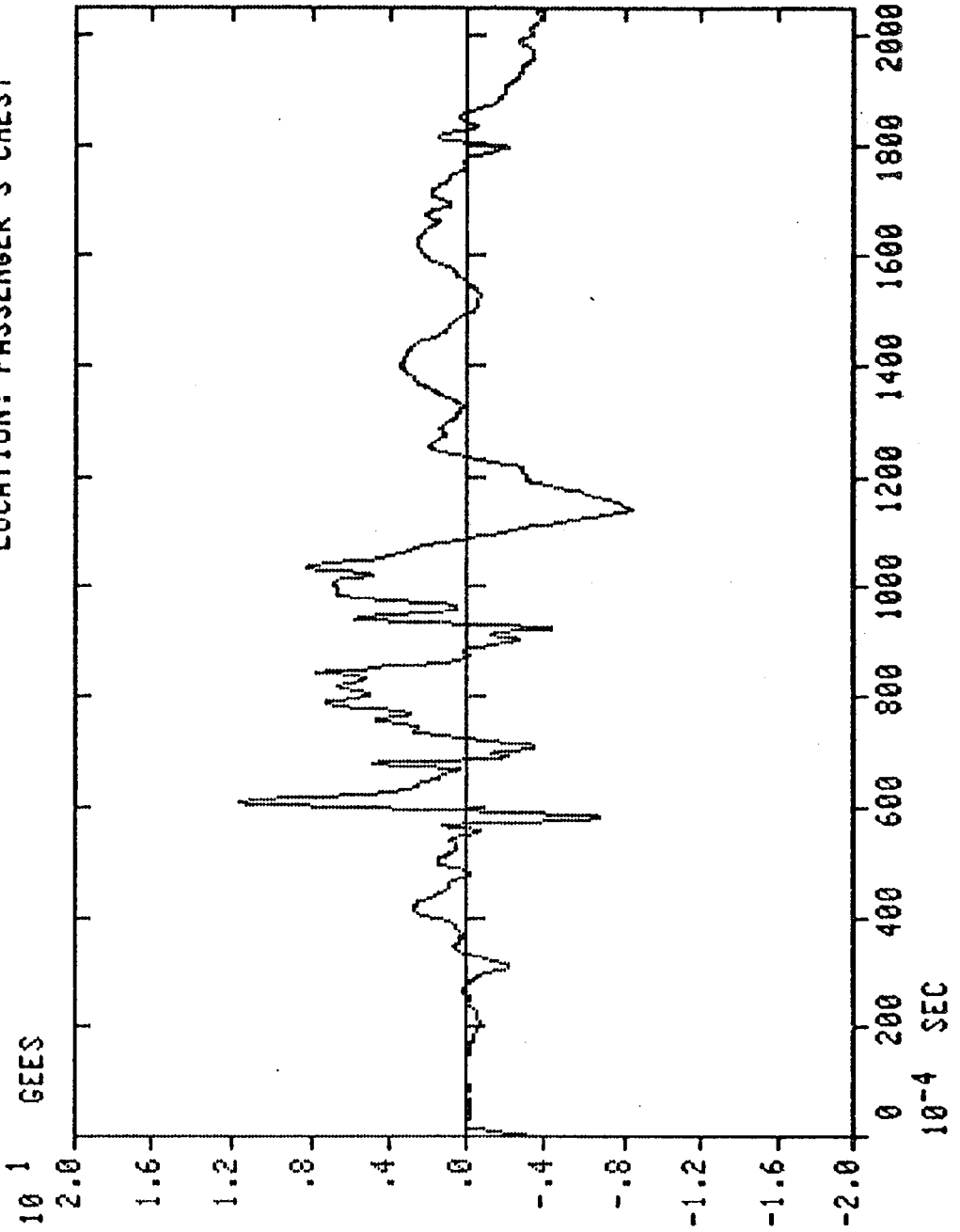


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO.: 117  
DATE: NOVEMBER 9, 1978

MJO NO.: 671-1489  
FILTER: CLASS 180  
ACCELEROMETER: TAPE 2, CH 7  
DIRECTION: UPWARD  
LOCATION: PASSENGER'S CHEST

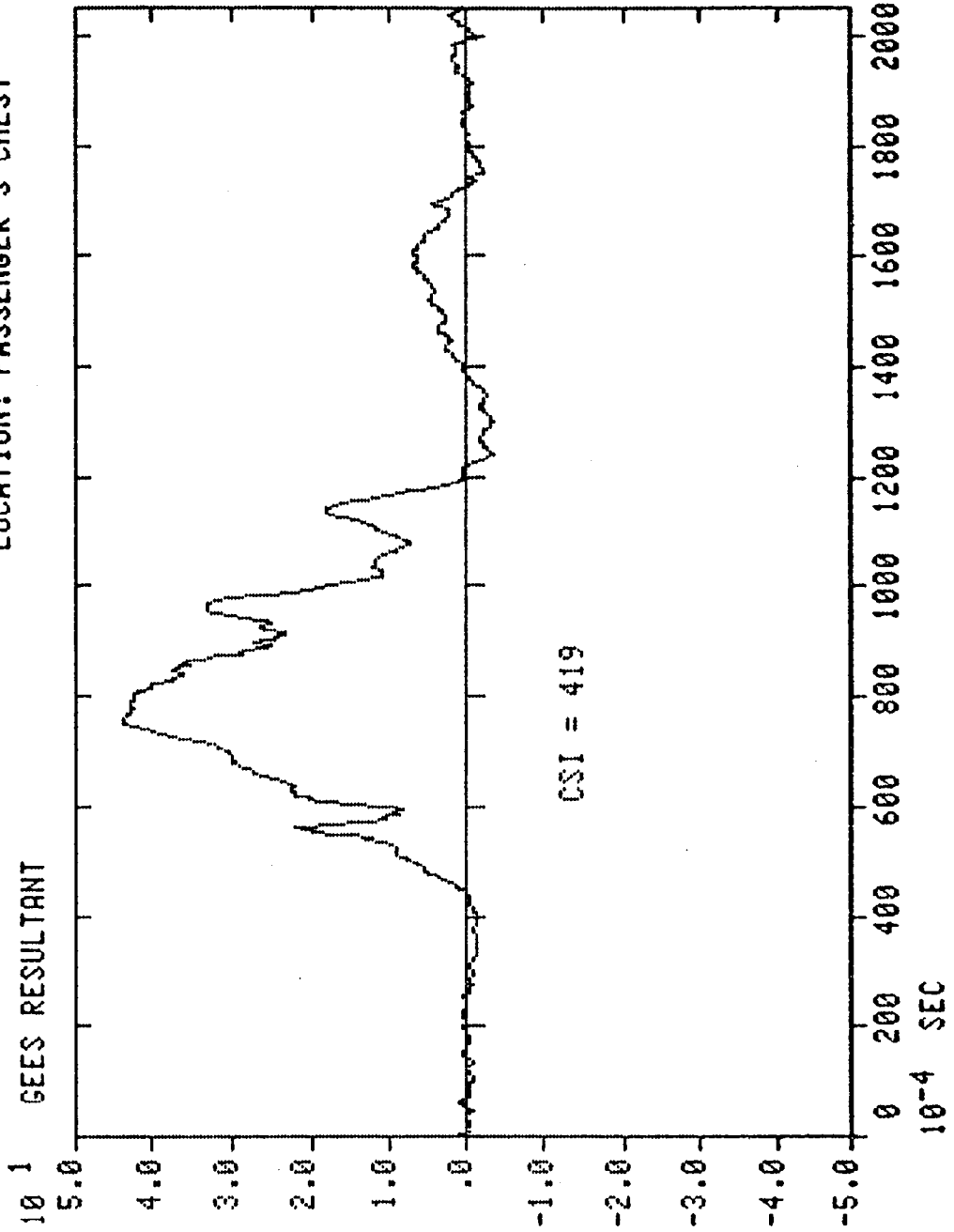


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 1000  
ACCELEROMETER: TAPE 2, CH 5-7  
DIRECTION: RESULTANT OF XYZ  
LOCATION: PASSENGER'S CHEST

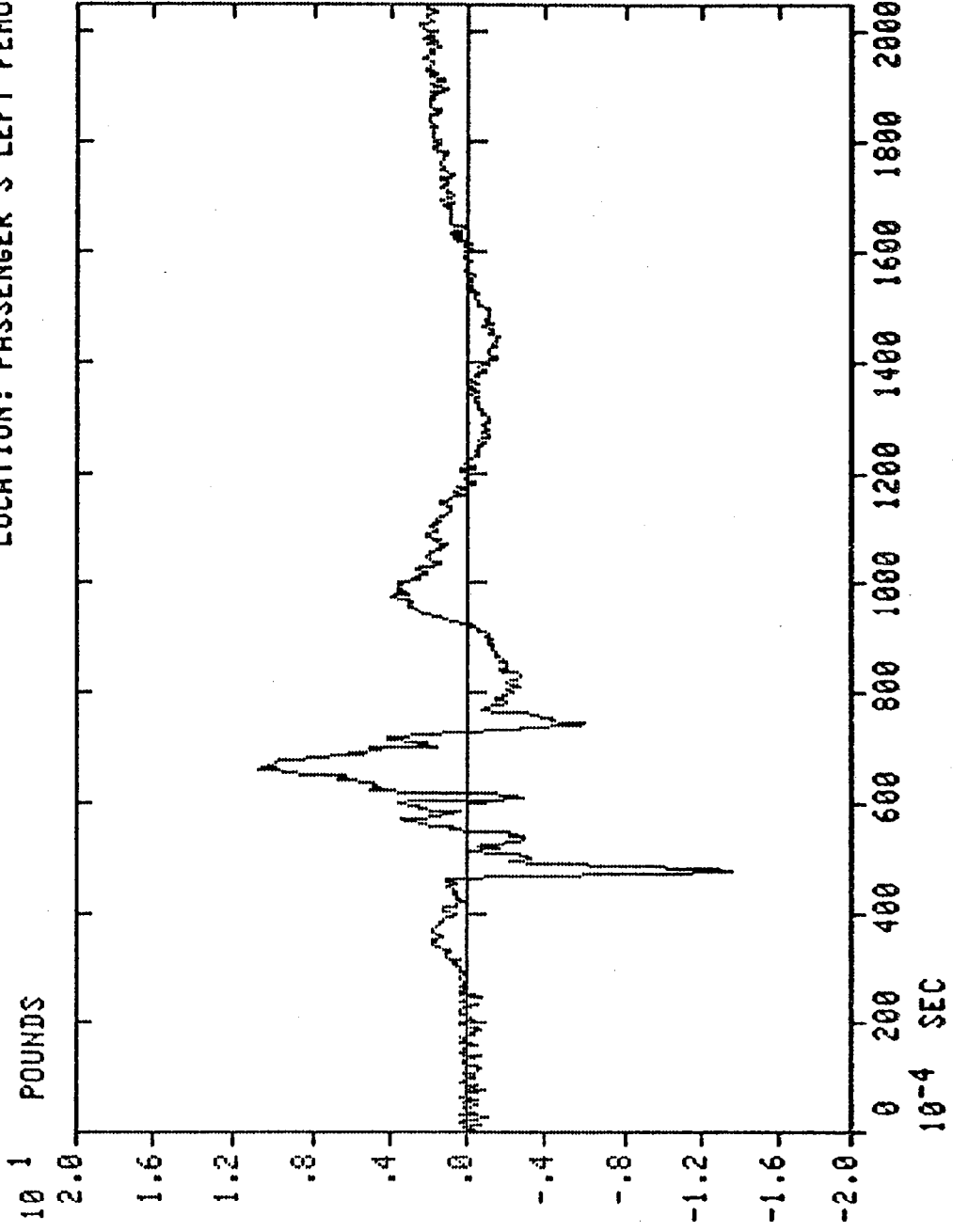


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 600  
LOAD CELL: TAPE 2, CH 8  
DIRECTION: TENSION  
LOCATION: PASSENGER'S LEFT FEMUR

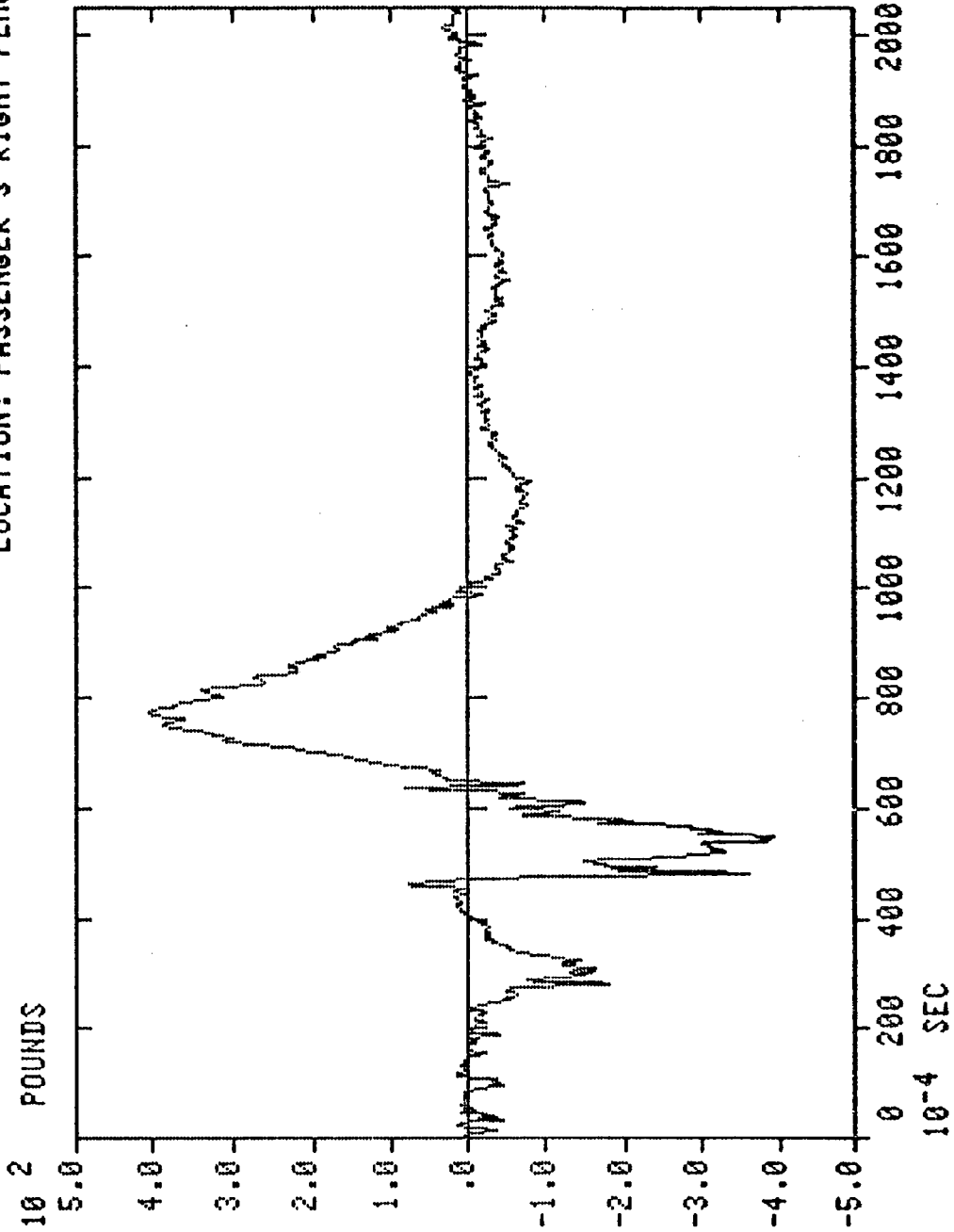


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 600  
LOAD CELL: TAPE 2, CH 4  
DIRECTION: TENSION  
LOCATION: PASSENGER'S RIGHT FEMUR

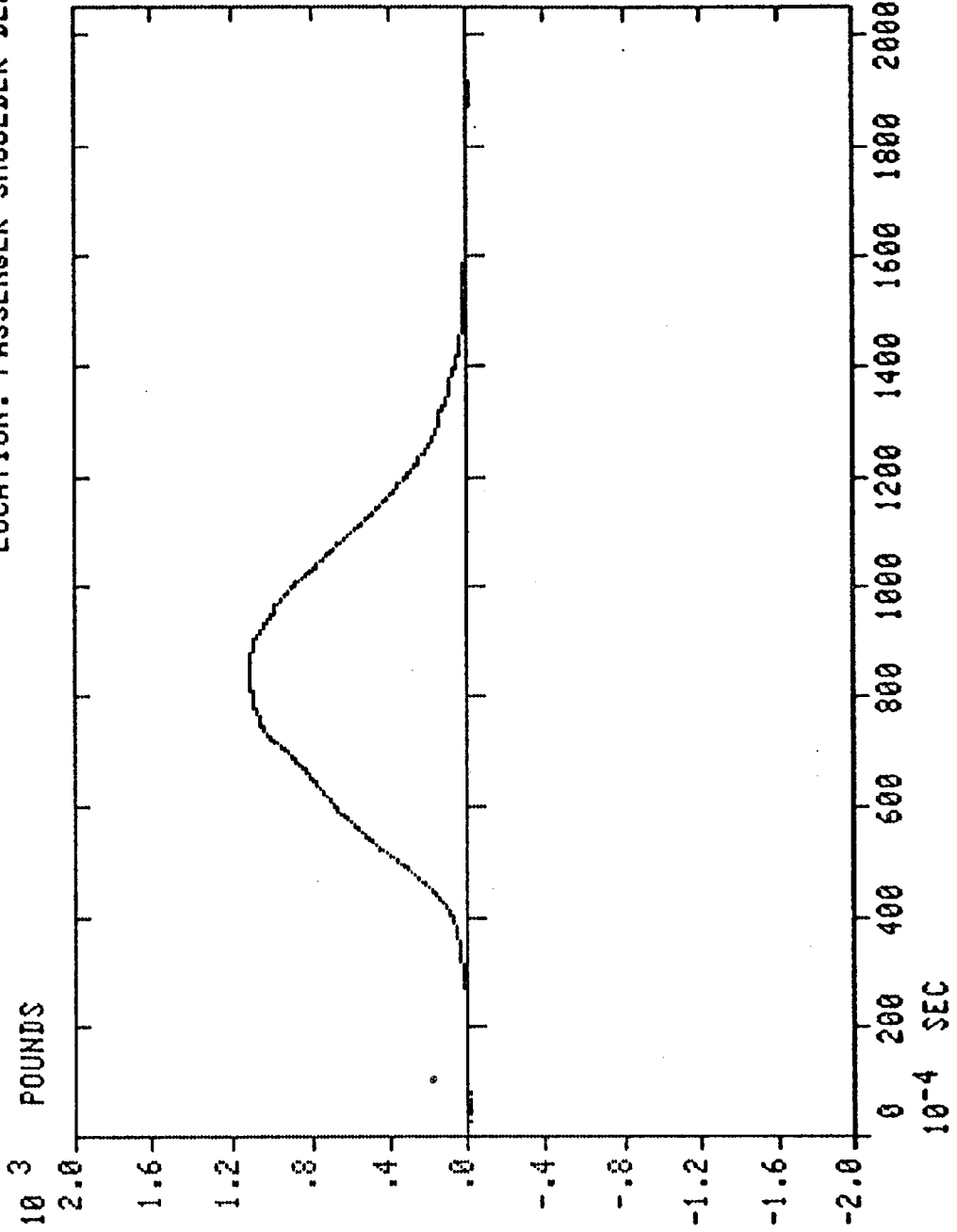


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 60  
LOAD CELL: TAPE 2, CH 9  
DIRECTION: TENSION  
LOCATION: PASSENGER SHOULDER BELT

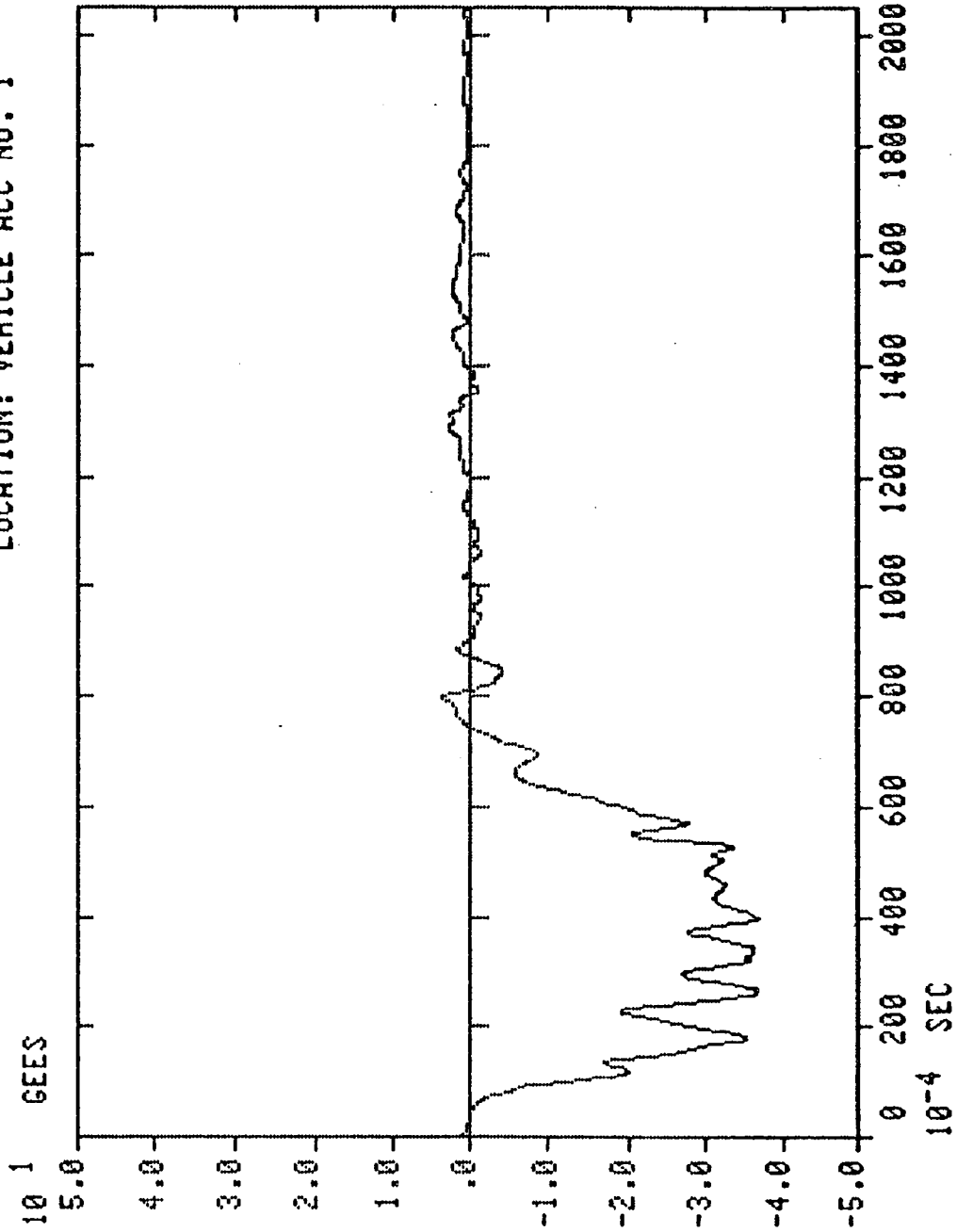


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

MJO NO. : 671-1489  
FILTER: CLASS 60  
ACCELEROMETER: TAPE 1, CH 10  
DIRECTION: FORWARD  
LOCATION: VEHICLE ACC NO. 1

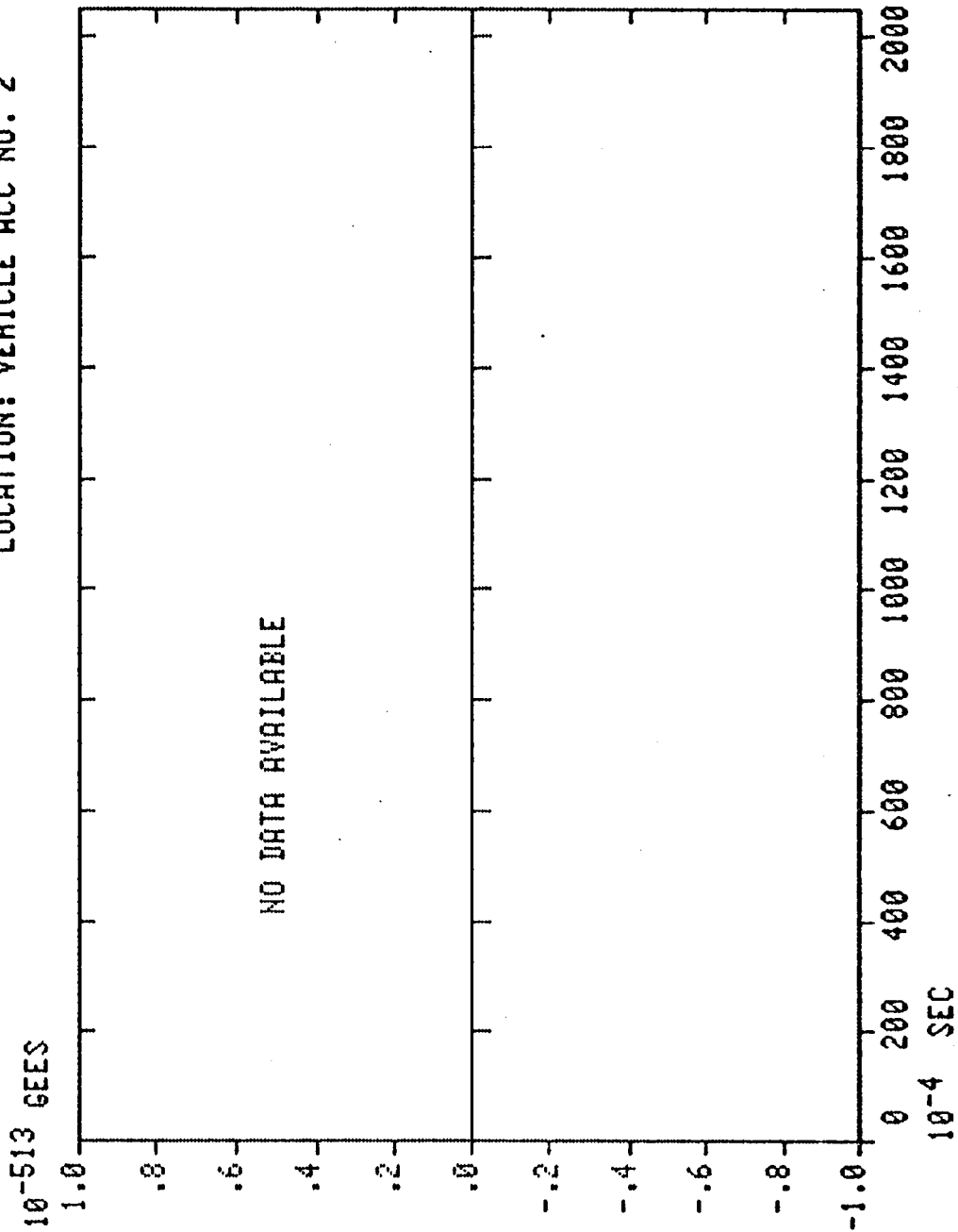


DOT CRASH PROGRAM

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO. : 117  
DATE: NOVEMBER 9, 1978

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489  
FILTER: CLASS 60  
ACCELEROMETER: TAPE 1, CH 11  
DIRECTION: FORWARD  
LOCATION: VEHICLE ACC NO. 2

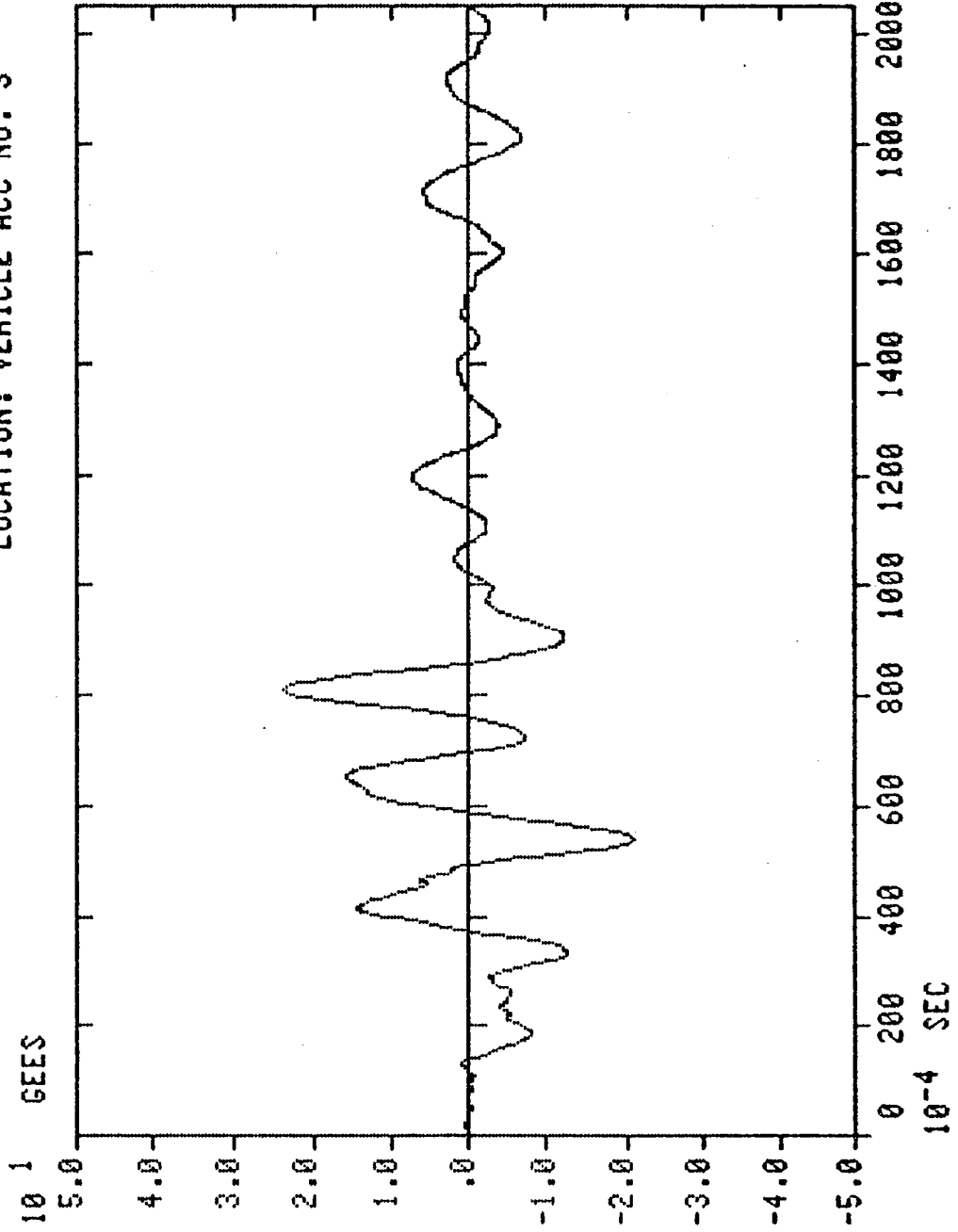


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: FORD ECONOLINE VAN  
VEHICLE ID: NHTSA 780623  
TEST FILE NO.: 117  
DATE: NOVEMBER 9, 1978

MJO NO.: 671-1489  
FILTER: CLASS 60  
ACCELEROMETER: TAPE 1, CH 12  
DIRECTION: UPWARD  
LOCATION: VEHICLE ACC NO. 3





APPROVED ENGINEERING TEST LABORATORIES

SERVICE FOR:

U. S. Department of Transportation  
National Highway Traffic Safety Administration  
Office of Research and Development  
2100 Second Street S. W.  
Washington, D. C. 20590

PURCHASE ORDER NUMBER: DOT-HS-6-01477

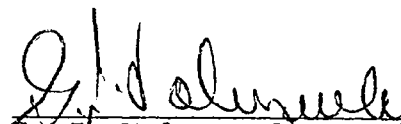
I hereby certify that the preceding report is true and correct to the best of my knowledge.

APPROVED ENGINEERING TEST LABORATORIES

  
\_\_\_\_\_  
R. D. Short, Division Manager

  
\_\_\_\_\_  
D. H. Hand, Project Engineer

  
\_\_\_\_\_  
R. E. Allen, Dynamics  
R & D Department Manager

  
\_\_\_\_\_  
G. J. Valenzuela, Mechanical  
Department Supervisor

  
\_\_\_\_\_  
R. J. McKelligott  
Quality Assurance Manager

rmh