General Motors Corporation
Legal Staff

**Facsimile**
(810) 986-3173

**Telephone**
(810) 947-9212

JAN 23 2001

L. Robert Shelton,
Executive Director
NATIONAL HIGHWAY TRAFFIC
SAFETY ADMINISTRATION
400 Seventh Street, S.W., Room 5220
Washington, DC 20590

Dear Mr. Shelton:

Re: **Settlement Agreement**
**Section B. Fire Safety Research**

Enclosed is a final report prepared by Jack L. Jensen and Jeffrey Santrock of General Motors Corporation, entitled, "Evaluation of Motor Vehicle Fire Initiation and Propagation Part 5: Crash Tests on a Rear Wheel Drive Passenger Car."

This final report relates to Project B. 3 (Fire Initiation and Propagation Tests).

Yours truly,

D.K. Nowak-Vanderhoef

Deborah K. Nowak-Vanderhoef
Attorney

Enclosure

**Mail Code: 480-106-304**
**Research Engineering Building 30500 Mound Road Warren, Michigan 48090-9055**

<u>Evaluation of Motor Vehicle Fire Initiation and Propagation</u>
**Part 5: Crash Tests on a Rear Wheel Drive Passenger Car**

Jack L. Jensen, Jeffrey Santrock

General Motors Corporation

<u>Abstract</u>

This report describes the test conditions and presents the results of three crash tests, each of a rear-wheel-drive passenger car, to study post-collision fire potential. Specialized instrumentation was used to help identify potential ignition sources during the crash. These tests were part of a series of crash and fire propagation tests which General Motors Corporation conducted pursuant to an agreement between GM and the U.S. Department of Transportation (Project B.3).

<u>Table of Contents</u>

List of Figures



Note: additional figures in Appendices

List of Tables

## 1. Introduction

Three crash tests were conducted on a rear-wheel-drive passenger car model (1997 Chevrolet Camaro) to study post-collision fire potential. These tests were part of a series of crash and fire propagation tests which General Motors Corporation conducted pursuant to an agreement between GM and the U.S. Department of Transportation. An earlier report, "Vehicle Crash and Fire Propagation Test Program" [1] documented the overall strategies and test methodologies for this project. Part 2 of this report "Crash Tests on a Passenger Van" [2] presented the results of a series of tests similar to those presented here on a front-wheel-drive passenger van (1996 Dodge Caravan).

Two additional series of crash tests were conducted on a sport utility vehicle (1997 Ford Explorer), and a front-wheel-drive mid-sized passenger sedan (1998 Honda Accord). The results of these tests will be reported in subsequent technical reports.

The series of crash tests described in this report consisted of three crash tests each on a new 1997 Chevrolet Camaro. The three crash conditions were an 85 km/h (53 mph) offset moving deformable barrier rear impact, a 55 km/h (34 mph) offset pole frontal impact, and a 105 km/h (65 mph) oblique moving barrier impact. The three test conditions used for the rear wheel drive vehicle were the same as for the series on the sport utility and the front-wheel-drive passenger vehicle. This combination of tests, however, was slightly different than the combination used for the initial series on the passenger van, which was the first series conducted. The reasons for the differences were described in Parts 1 and 2.

The three test vehicles were newly manufactured 1997 Chevrolet Camaro 2 door coupes. All three vehicles were equipped with a 3.8-liter V-6 engine, air conditioning, 4 speed electronic automatic transmission as well as other options. As in previous tests [1], [2], the best selling engine, transmission and air conditioning options were selected. For 1997 Camaros, 66% were sold with a 3.8 liter engine, 100% with air conditioning, and 72% with 4 speed automatic transmission [3]. Sales figures were not used to select any other options. However the three test vehicles all were equipped with an electric rear window defogger, a 6-way driver power seat, and 16-inch aluminum wheels. Standard equipment for 1997 Camaros included driver and front passenger air bags, 3 point seat belt systems, and a 4-wheel anti-lock brake system.

## 2. Rear Wheel Drive Car Offset Moving Deformable Barrier Rear Impact, Test C11408

On January 8, 1997 an offset moving deformable barrier rear impact was conducted on a rear wheel drive passenger car. The test was conducted indoors at the General Motors Proving Ground, in Milford, MI.

A total of 80 data channels were recorded for this test, fewer than were recorded for the frontal impact tests. Fewer injury measurements were recorded from the Hybrid III Anthropomorphic Test Devices (ATDs) (located in the two front seating positions) because many of the injury measurements available with the Hybrid III dummy are appropriate only for frontal impacts (such as leg injury measurements.) In addition, it should be noted that the their Injury Assessment Reference Values (IARVs) for the recorded injury measurements were developed primarily for frontal impacts, and may not be appropriate for rear loading. Also, the rear impact was conducted without the engine running; thus no instrumentation was required to monitor the engine. Similarly, the hydrocarbon vapor measurements, which were recorded in the engine compartment for frontal tests were not included in this test. The purpose of the hydrocarbon vapor measurements for the frontal tests was to identify the presence of vapors resulting from gasoline or leaks of other engine compartment fluids. However, for the rear impacts, the fuel system contained Stoddard solvent, not gasoline, and no other engine compartment fluids were used.

### **2.1.** *Test Conditions*

#### **2.1.1.** Impact Conditions

This test was an offset moving deformable barrier rear impact as depicted in Figures 1, 2, and 3. The test vehicle was parked and impacted with a deformable moving barrier similar to what is specified in FMVSS214 [4]. The impact velocity, measured with radar, was 84.7 km/h (52.6 mph). The moving barrier impacted the test vehicle in the rear on the filler neck side (left side) with a 70 % overlap. The overlap was computed by measuring the widest part of the vehicle body vertically in line with the rear axle and multiplying this width by 0.70. For this particular test, the vehicle width vertically in line with the rear wheel centerline was measured to be 1868 mm, resulting in a desired overlap of 1308 mm, as shown in Figure 3. The actual impacted overlap for this test was within 15 mm of the desired.

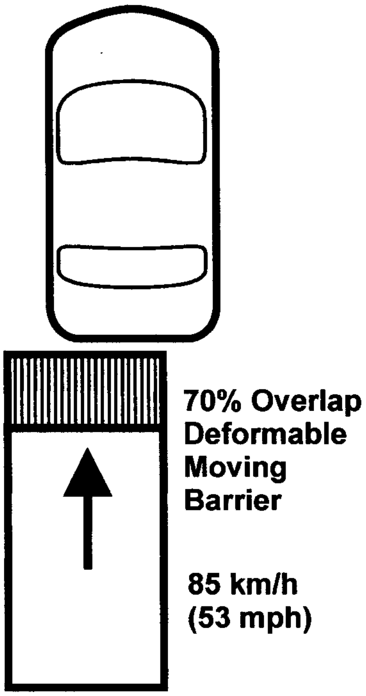



**Figure 1**

Crash Test Configuration for Test C11408

**Figure 2**

Pre-Test Photograph of Test C11408

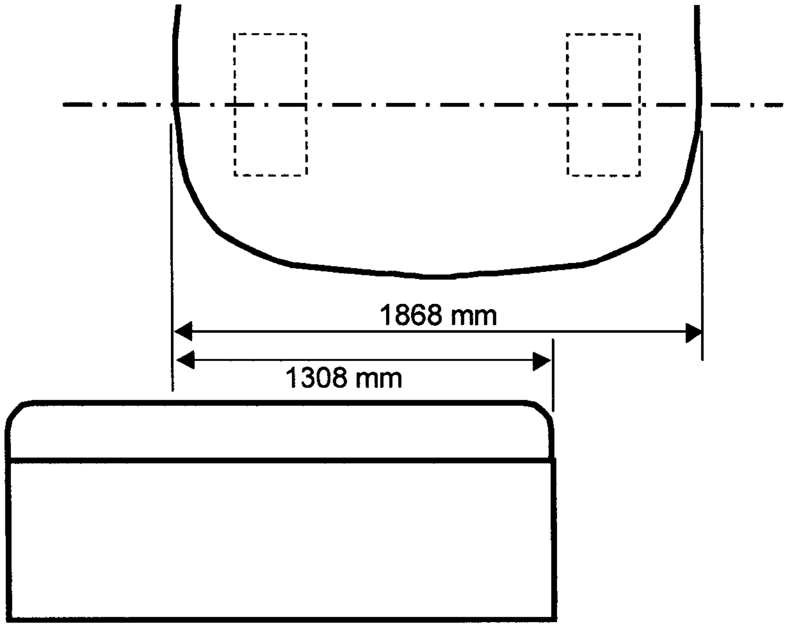



**Figure 3**
Schematic of Intended Vehicle Overlap
Test C11408

The moving barrier's total mass was 1370 kg (3020 lbs.); its frontal axle mass was 779 kg (1717 lbs.); and its rear axle mass was 591 kg (1302 lbs.) The center of gravity was measured to be 526 mm (20.7 inches) above grade, 1118 mm (44 inches) rearward of the front axle and laterally in the center of the barrier. Its wheels were aligned with the longitudinal axis of the moving barrier as shown in Figure 1 (unlike FMVSS 214 testing, in which the wheels are set at an angle.) The aluminum honeycomb barrier face was similar to that specified in FMVSS 214 and was located such that the center of the bumper form was 431 mm (17 inches) ± 12 mm (0.5 inches) above grade. The brakes on the moving barriers were activated at time zero (impact). However a mechanical delay in the pressurization of the brake lines results in an effective brake activation time of approximately 80-150 msec after impact. The barrier was also stopped following the impact using a cable attached to the barrier. This cable ("snubber" cable) was restrained with a remote brake system which was also activated at time zero, but had an effective activation time of about 100 – 150 msec.

**2.1.2.** Vehicle Description

The 1997 Chevrolet Camaro (VIN: 2G1FP22K1V2109145) had a calculated test mass of 1811 kg (3992 lbs.), which included the crash test instrumentation, Stoddard Solvent, and the ATDs. Inadvertently, the test vehicle was weighed before but not after the final installation of some crash test instrumentation. Thus the final test mass was estimated but not measured. 1811 kg represents the estimated final test mass (including all of the instrumentation). 55.7 liters (14.7 gallons) of Stoddard Solvent were added to the unusable capacity (also Stoddard) of the fuel tank. The headlights, ignition, hazard lights, and rear defroster were all on for the test. The transmission selector was placed in reverse for the test.

**2.1.3.** Modifications to Production Vehicle

Because the objective of this test was to conduct basic research on crash conditions that might result in post-collision fire and not to test a production vehicle for compliance with any performance standard, some modifications to the production vehicle were made to facilitate the test objectives. A description of some of the modifications follows.

The test vehicle's front brakes were isolated from the brake system and connected to an auxiliary brake machine which charged the lines at about 150 msec after impact. There was also a mechanical delay of 80 – 150 msec from the time the auxiliary brake machine was activated until the lines were pressurized, resulting in a effective delay of 230 – 300 msec. The test vehicle's rear brakes were not activated during or after the test.

The vehicle's hood was removed to facilitate the installation of the crash test instrumentation above the engine compartment. In addition, a pressure transducer was installed in the right fuel rail in the engine compartment to measure the fuel pressure during the crash. This transducer was attached via the production pressure check valve on the fuel rail. The fuel return pressure was also measured. That transducer was located on the left side of the engine.

Electrical measurements, such as currents and voltages, of the rear brake and turn lights were made. Every reasonable attempt was made to locate this instrumentation in locations that would not affect the outcome of the test.

For all of the tests conducted for project, the test vehicles were loaded with all required instrumentation for the test objective, independent of a target test mass. Thus, the test masses for different tests on the same vehicle model are likely different, and also different than the test mass required by FMVSS 208 [5].

**2.1.4.** Vehicle Measurements

Measurements that were recorded during this test included:

- Front left rocker panel acceleration (longitudinal, lateral, and vertical)
- Front right rocker panel acceleration (longitudinal, lateral, and vertical)
- Rear left rocker panel acceleration (longitudinal, lateral, and vertical)
- Rear right rocker panel acceleration (longitudinal, lateral, and vertical)

- Rear left frame acceleration (longitudinal, lateral, and vertical)
- Rear right frame acceleration (longitudinal, lateral, and vertical)
- Center tunnel acceleration (longitudinal, lateral, and vertical)
- Driver's and passenger's air bag current (using non-intrusive clamp on current transducers)

In addition, electrical contact measurements were used to identify the times at which structural components contacted each other. Five vehicle contacts were monitored in the rear structure of the vehicle, and are listed in order of rear to front.

- Left rear bumper beam to cargo tub
- Right rear bumper beam to cargo tub
- Center cargo tub to heat shield (which was located between the tub and the muffler)
- Rear center fuel tank to vehicle structure
- Front center fuel tank to vehicle structure

For this vehicle model, the cargo tub, which allows for cargo storage access from the hatch, is located just forward of the rear bumper. The muffler is oriented laterally (cross car) and is positioned just forward of cargo tub. The fuel tank is located forward of the tub and above the muffler. A metal heat shield is located above the muffler and also extends rearward of the muffler.

**2.1.5.** Photographic Coverage

High-speed 16 mm movie cameras were used to film the crash test. All cameras were located off-board of the vehicle. Cameras were located at various locations around the impact including above, below, and to both sides of the vehicle. In addition, video cameras were located at two off-board locations.

**2.1.6.** Moving Barrier Measurements

The following measurements were measured on the deformable moving barrier:

- Moving deformable barrier at Center of Gravity (CG) acceleration (longitudinal, lateral, and vertical)
- Moving deformable barrier at rear crossmember acceleration (longitudinal, lateral, and vertical)
- East and West "snubber" cable brake pressures

The two brake system pressure measurements are from an auxiliary disc brake system used to stop the snubber cable spool out. This cable is attached to the moving barrier and was used to stop the barrier following the impact. Thus, the brake pressure measurements are a good indication of when the cable began to stop the barrier following the impact. This "snubber" brake system was independent of the moving barrier's brakes, which were also activated (but not recorded) following the impact.

**2.1.7.** Anthropomorphic Test Device (ATD) Measurements

Two 50th Percentile Male Hybrid III ATDs, (FMVSS reference part 572, Subpart E) [6] were located in the front outboard seating positions. The seats were located in the fore-aft mid position, and the seat backs were at 26.5 degrees relative to vertical. The ATDs were restrained using the vehicle's production lap / shoulder belts with the adjustable guide loop set in the third position from the top. The ATDs were positioned per FMVSS 208 [5] guidelines and the pelvic angle was measured to be 23.7 degrees from horizontal for the left front occupant and 22.5 degrees for the right front. The head target angle was set to 0 degrees from horizontal for both occupants. The following measurements were recorded for each ATD:

- Head triaxial acceleration
- Head/ neck interface (upper neck) longitudinal shear force (Fx)
- Head/neck interface (upper neck) lateral shear force(Fy)
- Head/neck interface (upper neck) axial force (Fz)
- Head/neck interface (upper neck) moments about longitudinal, lateral and vertical axis (Mx, My, Mz)
- Chest triaxial acceleration

Appendix A includes the Injury Assessment Reference Values (IARV) [7] used for the analysis of the recorded ATD measurements. Head Injury Criteria (HIC) computations limited to 15 msec (as described in AGARD 330 [7]), as well as computations limited to 36 msec (as required by FMVSS 208 [5]) are both presented in the test results.

**2.1.8.** Hydrocarbon Vapor Measurements

There were no hydrocarbon vapor measurements made for this test.

**2.1.9.** Fluid Pressure Measurements

Both the fuel supply line pressure and return line pressure were recorded. No other fluid pressure measurements were made.

**2.1.10.** Additional Electrical Measurements

Electrical events such as shorts, arcs or overheated circuits are possible ignition sources for post-collision fires. Therefore, in addition to standard crash test electrical measurements (such as the air bag currents), electrical measurements were also made on some electrical circuits anticipated to be in the area of vehicle crush. Due to instrumentation limitations, only selected and not all electrical circuits in the area of anticipated crush were monitored.

Clamp - on current monitoring transducers were used to measure the following currents:

- Rear window defroster
- Rear left brake light
- Rear left backup light
- Rear left tail light
- Rear left turn signal

All of these five current transducers were located in the passenger compartment underneath the left rear quarter panel interior trim.

Direct voltage measurements (not requiring transducers) were also made of the following circuits:

- Ignition
- Center high-mounted stop light
- Rear window defroster
- Rear left brake light
- Rear left backup light
- Rear left tail light
- Rear left turn signal

The ignition voltage was measured in the passenger compartment under the instrument panel on the driver's side. The remaining six voltages were monitored near the current transducers underneath the left rear quarter panel interior trim.

**2.1.11.** Evaluation of the Crashworthiness of Potential Fire Detection or Suppression Technologies

Two separate experimental thermal wire fire detectors were mounted to the underside of the vehicle. One was located near the rearward edge of the fuel tank attached to the shield separating the tank and the cargo tub. The other wire was attached to the underside of the rearmost lateral swaybar. These two wires were both oriented laterally (cross-car) and were measured independently. The wire type, however, was the same for the two locations and was similar to the wires used on previous tests in this series. Each thermal wire consisted of two wires separated by an insulating material that is intended to melt when exposed to flame, thereby completing an electric circuit. For the crash tests, the closure is monitored only to evaluate the devices' crashworthiness at their given mounting location. Clearly, crashworthiness is a desired property of a fire detector if it is to be used with a suppression system to suppress post-collision fires.

A pneumatic fire detector was located on the underside of the fuel tank. It consisted of a long, thin tube attached to a pressure sensing device. The tube contained a metal-hydride compound, which generates hydrogen gas when heated. A pressure transducer at one end of the tube measures the pressure increase when the tube is exposed to flames. For this test, the tube was looped and attached on the under side of the fuel tank, while the pressure sensor was rigidly mounted on the underside of the right rear frame rail.

Both the thermal wire and pneumatic fire detectors were supplied by Santa Barbara Dual Spectrum (Goleta, CA). Devices of this type could be used with an active fire suppression system but for this test were only monitored to evaluate their crashworthiness.

**2.2.** *Summary of Test Results*

Post-test photographs of the vehicle are shown in Figures 4 and 5.


**Figure 4**

Post-Test Photograph of Test C11408, Left-Rear View

**Figure 5**

Post-Test Photograph of Test C11408, Right -Rear View

**2.2.1.** Summary of Standard Vehicle Crash Test Measurements

The complete set of recorded and computed vehicle measurements are included in Appendix B (Plots 19 through 108, 116, 129 through 133).

Accelerations of the vehicle rocker panels can be used as an indication of the passenger compartment acceleration. Many times, the higher frequency acceleration signals represent localized acceleration at the rocker panels, but the lower frequency signal and first integral of the acceleration are representative of the overall motion of the passenger compartment. The average of the two front rocker panel longitudinal acceleration measurements (Figure 6 and Appendix B, Plot 25) was integrated to compute the change in vehicle longitudinal velocity (Figure 7 and Plot 26). The peak vehicle longitudinal acceleration (after filtering at SAE class 60 [8]), was 23g and the maximum longitudinal change in vehicle velocity was 38 km/h (23.6 mph).

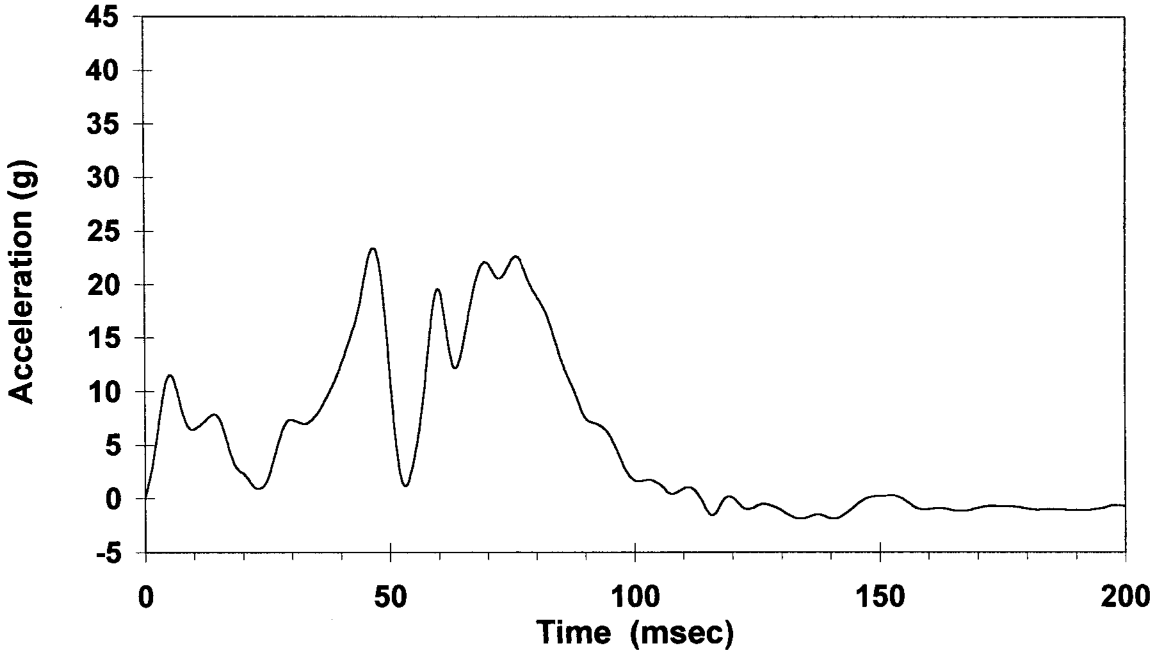



**Figure 6**

Averaged (Left & Right) Front Rocker Panel Longitudinal Acceleration,
Test C11408, filtered at SAE class 60 [8]

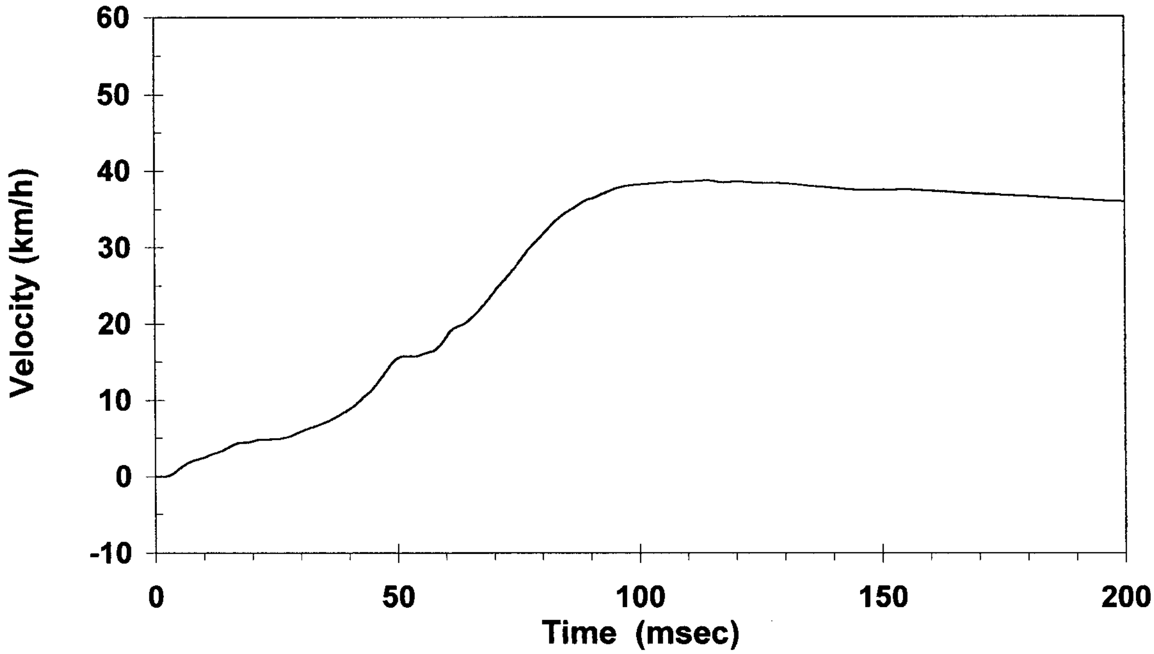



**Figure 7**

Averaged (Left & Right) Front Rocker Panel Longitudinal Velocity
Test C11408

The center tunnel longitudinal acceleration (Plot 100) and velocity (Plot 101) is also a good indication of passenger compartment motion. This measurement indicated a peak acceleration of 30 g and a velocity change of 36.5 km/h (22.6 mph). The small difference between the tunnel and rocker velocity changes as well as the larger difference between the peak accelerations can be attributed to differences in localized accelerations.

The results of the five vehicle contacts are shown in Appendix B, Plots 129 – 133. As expected, the vehicle crush progressed from rear to front. The right and left rear bumper beam first contacted the cargo tub at 5 and 8 msec respectively (Plot 130 and 131). The front center cargo tub contacted with the heat shield at 24 msec (Plot 129). The rear of the fuel tank contacted the vehicle structure at 24 msec (Plot 133) and there was no contact indicated between the front of the fuel tank and the vehicle structure (Plot 132).

The air bags did not deploy in this rear impact crash test (Plot 116).

**2.2.2.** Summary of Recorded Barrier Measurements

The acceleration measurements and related computed values from the moving barrier are included in Appendix B (Plots 134 through 154).

The longitudinal velocity of the barrier's CG is shown in plot 135 and re-created here as Figure 8. The barrier sustained a velocity change of about 55 km/h (34 mph) in 140 msec.

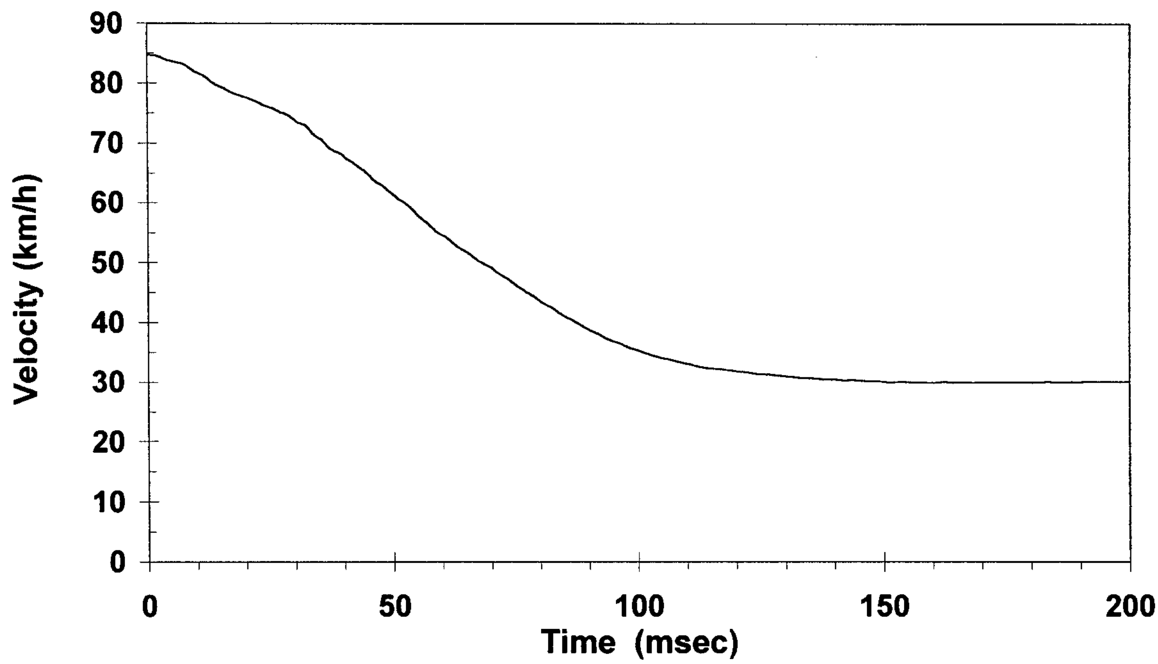



**Figure 8**

Moving Deformable Barrier Longitudinal Velocity at CG

Test C11408

**2.2.3.** Summary of Recorded ATD Measurements

The recorded and computed ATD measurements are included in Appendix B (pages i and ii, and Plots 1 through 18).

A comparison of the left front occupant's (driver's) injury measurements to their respective Injury Assessment Reference Values (IARV) (Appendix A), indicates that all monitored measurements were below their respective IARV except the upper neck tension. This measurement had a peak value of 4.97 kN, which is 151% of its IARV of 3.3 kN for 0 msec duration. This measurement is shown in Appendix B, Plots 5 and 9, (the time dependent IARV is described in Appendix A.) All other injury measurements for the left front occupant were below their respective IARVs.

A similar comparison indicates that all of the right front passenger's measurements that were monitored were below their respective IARVs.

**2.2.4.** Summary of Hydrocarbon Vapor Measurements

There were no hydrocarbon vapor measurements taken for this test.

**2.2.5.** Summary of Fluid Pressure Measurements

The dynamic pressure measurement of the fuel supply line is shown in Appendix B, Plot 123. This data trace is biased by 320 kPa, which is approximately the operating pressure of the fuel system. The data acquisition system used for this crash test, automatically forces all channels to read zero, including those channels that initially have a non-zero value when the engine is off, such as fuel pressure. (Most fuel-injected vehicles retain fuel pressure when the engine is off.) Thus, the raw recorded data indicates zero pressure, when in fact the pressure was at normal operating pressure. The recorded data is was biased during post-test data processing to indicate a starting pressure of approximately 320 kPa. This channel indicated some amount of fluctuation during the impact, but does not indicate a fuel system leak. A leak would produce a quick pressure drop to near zero. In addition, there were no fuel system leaks identified during the post-test inspection.

The pressure of the fuel return line is shown in Appendix B, Plot 124. This measurement indicated a quick rise in return line pressure to about 400 kPa at about 180 msec. This was likely due to compression of the fuel tank volume during the impact resulting in a rise in return line pressure.

**2.2.6.** Summary of Additional Electrical Measurements

The results of the additional electrical measurements made on some of the rear electrical circuits are shown in Appendix B, Plots 109 to 115 and 117 to 122.

The rear window defroster current measurement indicated a current draw of about 21 amps at impact (the defroster was on for the test.) This measurement is shown in Plot 118 and Figure 9. Note that Plot 118 only has a duration of 240 msec, while Figure 9 has a duration of 700 msec. At 40 msec, however, the current dropped to near zero, possibly due to the circuit being cut during the impact. This is also supported by the rear window defroster voltage measurement (Plot 111 and Figure 10) which increased from about 11 volts (during normal operation at impact) to 12 volts at 40 msec. If the circuit was cut at 40 msec, then the normal voltage drop due to current draw would end at 40 msec and a slight increase of voltage would be expected.

At 140 msec after impact, however, the current (Plot 118 and Figure 9) rose exceeding the full scale range of the measurement. (The full scale range was set at 20 amps, however, slight over-range measurements can be recorded, thus the initial 21 amp measurement at the time of impact was valid.) This increase of current at 140 msec was likely due to the energized side of the cut circuit shorting to ground during the crush of the vehicle. This is also supported by the voltage measurement (Plot 111 and Figure 10) which also indicated a significant drop in voltage (but not to zero) at 140 msec. At about 550 msec both the current measurement and the voltage measurement dropped to zero indicating the opening of the circuit breaker. This circuit was overload protected by a breaker rather than a fuse.

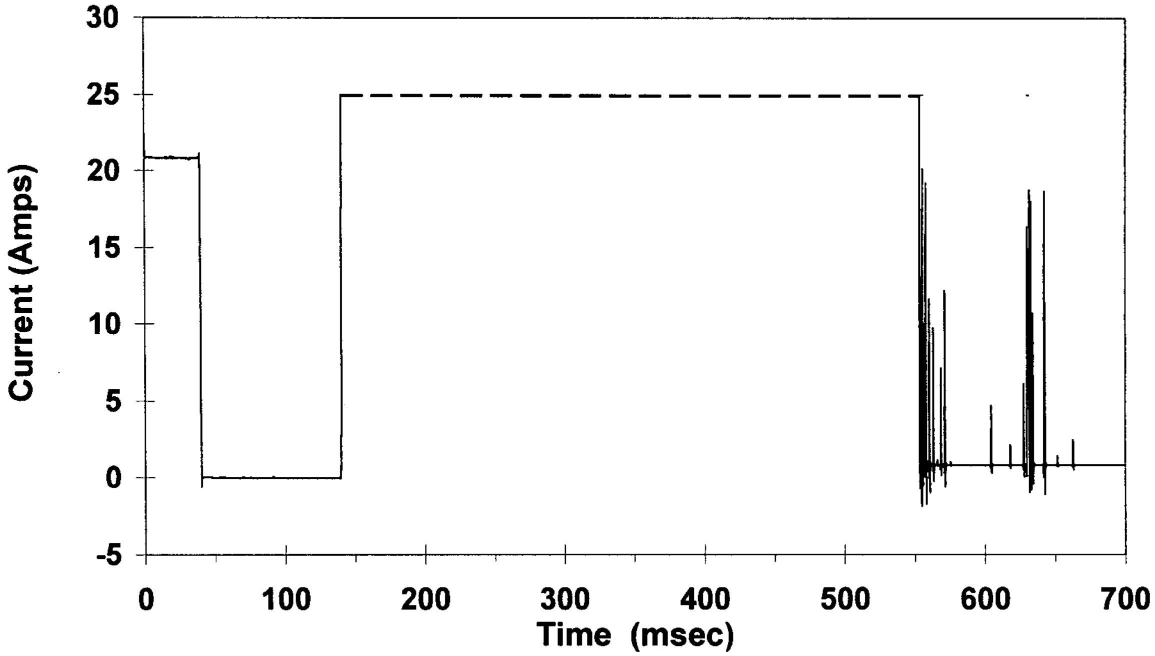



**Figure 9**

Rear Defroster Current, Test C11408

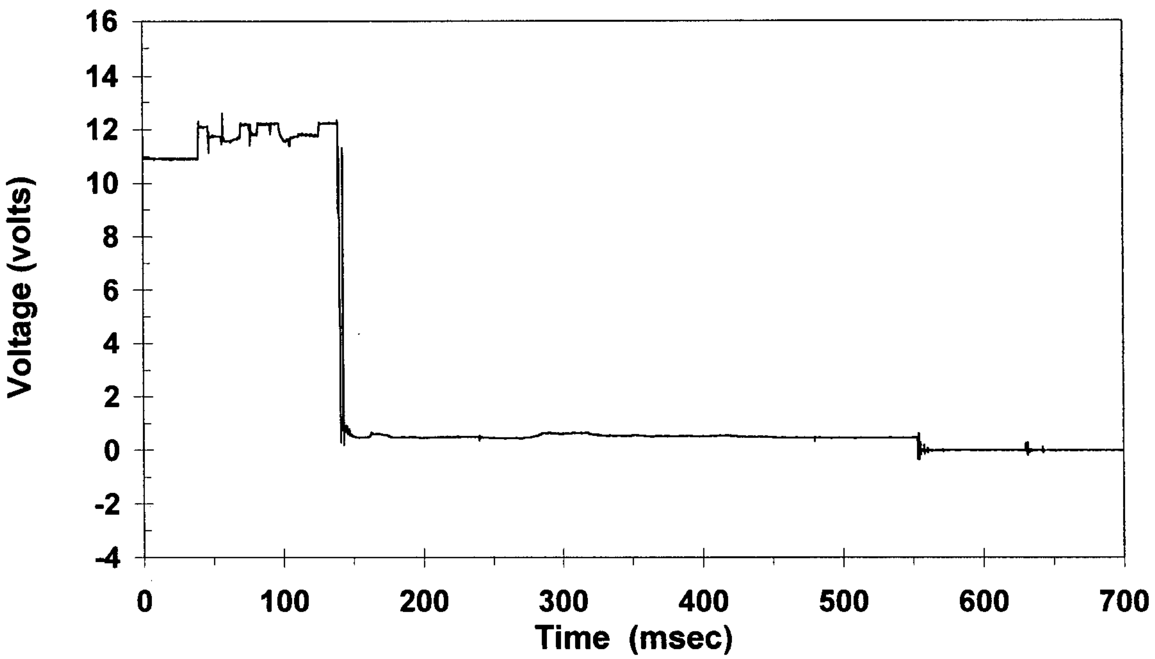



**Figure 10**

Rear Defroster Voltage, Test C11408

An inspection of the ignition voltage also supported the hypothesis of a defroster circuit short at 140 msec, with the breaker opening at 550 msec. The ignition voltage (Plot 109) dropped from 12 to 11 volts at 140 msec and returned to 12 at about 550 msec. Again, Plot 109 only shows the first 240 msec of the test, however an inspection of the recorded data past 240 msec indicated this return to 12 volts at 550 msec.

Shorting of smaller-gage overload-protected circuits was not unexpected in impacts of this type given the amount of vehicle crush experienced. Although there could be arcing during an electrical short which, in turn, could serve as an ignition source given the presence of a flammable vapor, generally overload-protected circuits are unlikely to overheat sufficiently to ignite a solid-fuel fire.

Similar to the defroster measurements, the left rear taillight also indicated a possible short, although it had a much shorter duration. The current measurement (Plot 121) indicated an overload from about 48 msec to 58 msec. The voltage measurement (Plot 114) supported a hypothesis of a possible short indicating a voltage drop from 12 to 6 volts, also at 48 msec. The voltage drop of 6 volts is likely due to the increased loading of the circuit. Both traces indicate, however, that this short was of short duration (10 msec), and did not open the fuse (which would have resulted in a permanent drop in voltage.) The post-test inspection of the fuses, also indicated that this fuse (#5) was not open. At the time of the indicated short (60 msec) the vehicle was undergoing dynamic crush in the rear structure. Thus intermittent or temporary shorts or opens would not be unexpected. As with any crash test, as the vehicle dynamically crushes, damage to the wiring circuits would have been intermittent.

No other electrical measurements indicated short circuits resulting in significant current draws, however additional observations about the electrical measurements follow:

The left rear backup light voltage (Plot 113) dropped from approximately 11.5 volts to zero at 50 msec. This was likely due to the gearshift moving from reverse to neutral during the impact. This was also supported by the current measurement of the same circuit (Plot 120) which indicated a drop of current draw from 3 amps to zero at 50 msec. The post-test inspection indicated that this fuse (#2) was not open, thus the permanent drop in voltage was likely due to the shift in gears, rather than a short opening the fuse.

The left rear turn signal voltage (Plot 115) and the current (Plot 122) dropped from normal operating levels to near zero at about 60 msec. This was due to the turn signal cycling off at the time of impact. The hazard warning lights were on for the impact, and the turn signal lamps timed off at around 60 msec. Although Plots 115 and 122 only include the first 240 msec of data, an inspection of the recorded data through 5000 msec indicated that the hazard flashers cycled at least through 5000 msec, and that a drop at 60 msec would be expected given the duty cycles observed. The post–test inspection revealed that the fuse protecting this circuit (#1) was open following the test. The current trace (Plot 122), however, did not indicate elevated current flow during the event so this wire did not short. However, the same fuse also protected several other circuits, such as the right side rear turn signal. Many of these additional circuits were not monitored during the test. One of the other non-monitored wires likely shorted causing the fuse to open. However, the fuse did not open until after 5000 msec, because voltage was observed on the left rear turn signal through at least 5000 msec.

The left rear brake light and the center high mounted stop light indicated very similar measurements. Their similarity is expected, as both indicate braking. Both current measurements (Plots 117 and 119) indicated little or no current flow for the duration of the event. The overload indicated on Plot 119 at 61 msec was of extremely short duration and was likely an artifact of the crash effects on the instrumentation (noise). The voltage channels (Plots 110 and 112) closely followed each other and rose from 0 to 4 volts from about 58 msec to 155 msec. This voltage rise is unexplained but could be due to cross feeding from other circuits all that could be damaged during impacts of this type.

**2.2.7.** Summary of Numerical Film Analysis

The numeric film analysis plots are included in Appendix C (Plots 1 through 8).

The crush of the vehicle on the left side is represented here as the longitudinal displacement of the vehicle relative to the moving barrier as numerically measured from film. This measurement is shown in Plot 1 and also Figure 11. Approximately 1250 mm of displacement occurred on the left side of the vehicle and represents the combined crush of the deformable barrier face and the vehicle.

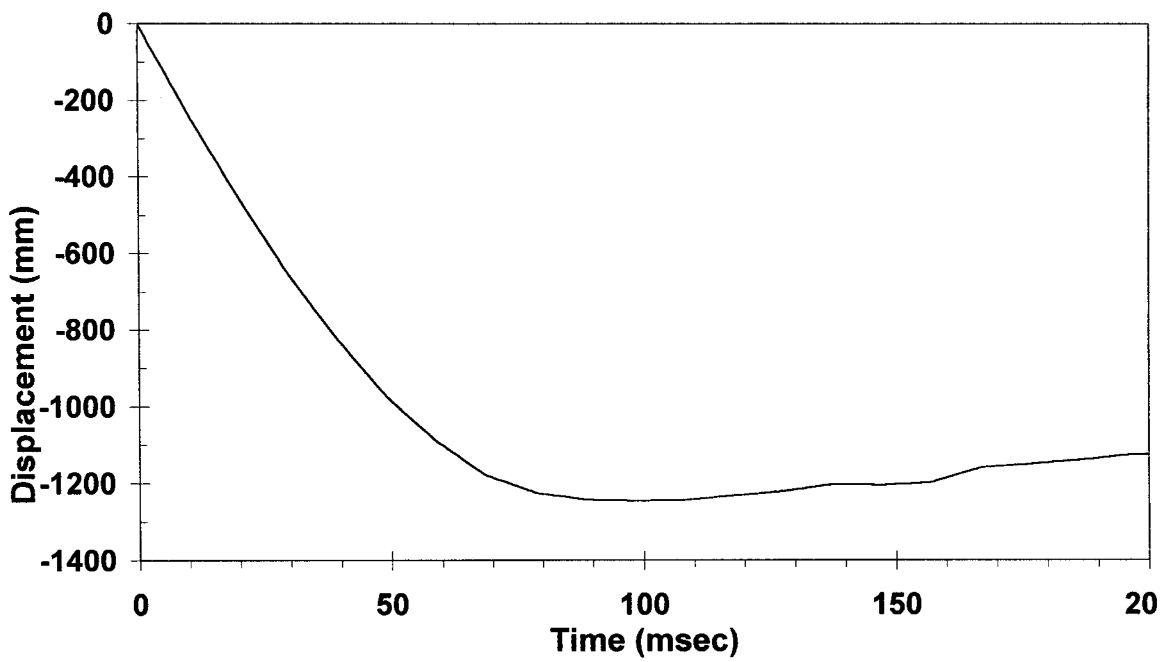



**Figure 11**

Vehicle Displacement Relative to Moving Barrier, Left Side,
Test C11408, Numerically Measured from High Speed Film

Similarly, the right side longitudinal displacement of the vehicle relative to the moving barrier (Plot 4) indicated about 1050 mm of maximum displacement at 80 msec.

**2.2.8.** Results of Post-test Static Rollover

This vehicle was rolled on January 9, 1997 using a static roll procedure similar to the roll procedure specified in FMVSS 301 [8]. The vehicle was rolled both in the negative direction (filler neck down) and also in the positive direction (filler neck up). No gasoline or Stoddard Solvent spillage was noted during the static rollover.

**2.2.9.** Results of the Evaluation of the Crashworthiness of Potential Fire Detection or Suppression Technologies

The electrical contact measurements used to monitor the pneumatic fire sensor and the two thermal wire fire detectors are shown in Plots 125 through 128. No contacts were recorded on any of the channels. This indicates that there were no activations due to fire (there was no fire) or inadvertent activations due to the vehicle crush. The detectors at the given locations were crashworthy for this crash configuration.

### 2.2.10. Summary of Post-test Vehicle Inspection

The vehicle was disassembled and inspected for air passages from the exterior into the passenger compartment, the locations of any fluid leaks that occurred during the crash test, the locations of any electrical shorts that occurred during the crash test, and any contact between combustible materials and hot surfaces. As with any severe crash test, the vehicle residual crush makes the inspection of every component difficult if not impossible. Many components became buried and impossible to inspect without further damage. Some occurrences or events may not have been identified and noted. However, a reasonable effort was made to complete as thorough an inspection as possible.

Consistent with the crash tests on other vehicles types in this project, openings from the exterior to the interior of the passenger compartment caused by the crash were identified. These openings were not evaluated for their potential contribution to fire propagation during this inspection, instead all openings identified were noted. Subsequent fire propagation tests were conducted to further evaluate possible fire propagation paths. These fire propagation tests are reported separately. The presence of interior components, such as interior trim or carpeting, in many cases, would prohibit the free flow of air through the structural openings. Those openings (excluding glass breakage) identified for this test, follow:

- opening in left rear wheel well
  (approximately 300 mm long x 110 mm wide at its widest point)
- opening in right rear wheel well near spare tire
  (approximately 280 mm long x 20 mm wide)
- opening in floorpan near frame rail
  (approximately 20 mm x 20 mm)
- dislocation of floorpan drain plug behind the driver's seat

Due to the crush of the vehicle, the inspection of the electrical circuits in the rear of the vehicle was inconclusive. The specific locations of electrical shorts or open circuits referred to in Section 2.2.6 were not identified. However, the physical inspection did indicate opened fuses at locations #8 and #1 as previously reported.

There was no evidence of combustible materials contacting normally hot surfaces identified during the post-test inspection.

## 2.3. *Conclusions*

Following are the primary conclusions that can be drawn from the results of test C11408 relative to the objectives of this project.

1. There were no fires identified during this crash test.

2. The test vehicle experienced a longitudinal velocity change of approximately 38 km/h (24 mph) in about 120 msec. The deformable rear moving barrier's longitudinal velocity change was 55 km/h (34 mph) in about 140 msec

3. No liquid gasoline or Stoddard spills off of the vehicle were noted after the crash or during the static rollover.

4. The ATD measurements indicate that a crash condition of this type may be survivable from a crash trauma standpoint. All passenger dummy injury measurements that were recorded were below their respective Injury Assessment Reference Values (IARVs). For the driver dummy, only the neck tension was above its IARV, with a peak value of 4.97 kN (151% of its zero duration IARV of 3.3 kN.)

5. The fuel supply pressure measurement also did not indicate any fuel system leaks during the impact. The fuel return line pressure measurement indicated a quick rise in return pressure from near zero to 400 kPa at about 180 msec. This was likely due to the fuel tank's volume compressing due to the vehicle crush, resulting in a tank and return line pressure rise.

6. Consistent with tests of other vehicle models in this series, electrical activity was identified on nearly every circuit monitored for the test. At least two possible shorts were identified, one on the rear defroster circuit and the other on the left rear tail light circuit. These two circuits (as well as all of the circuits in the rear of the vehicle) were overload protected. The defroster was protected by a circuit breaker that opened at 550 msec after impact. The left rear tail light short only lasted about 10 msec and did not open the fuse protecting it. Consistent with the other tests in the series, the electrical activity was difficult to analyze due to the sporadic and intermittent behavior of the electrical circuits as they are physically crushed during the impact.

7. The two different experimental fire detection technologies evaluated in this test (thermal fire wire and pneumatic sensor) both were crashworthy at their mounting locations. That is, neither indicated a false activation or were damaged during the impact.

8. The high-speed films were numerically analyzed to identify the amount of dynamic crush. The combined barrier face and vehicle crush on the left side of the vehicle was 1250 mm, which occurred during the first 80 msec. On the right side of the vehicle, the combined crush was about 1050 mm also at 80 msec.

9. Consistent with other tests in this series, crash-induced openings from outside to inside of the passenger compartment were identified. For this test the two largest openings were near the left rear

wheel well and the right rear wheel well. Smaller openings were also identified in the floorpan near the frame rail and also due to a dislodged drain plug. Subsequent fire propagation tests were conducted on some of the crash-tested vehicles that further evaluated fire propagation characteristics. These results are reported separately.

10. There was no evidence of any combustible materials contacting normally hot surfaces.

## 3. Rear Wheel Drive Passenger Car Offset Pole Frontal Impact, Test C11591

On May 14, 1997, a rear wheel drive passenger car offset pole frontal impact crash test (Test #C11591) was conducted at the General Motors Proving Ground in Milford, Michigan. A total of 146 channels of data were recorded during the test. Substantially more data channels were recorded for this frontal test than the rear impact because unlike the rear test, the engine was operating thus requiring instrumentation to monitor the engine. Also, the two Hybrid III ATDs were fully monitored which also resulted in more data channels as compared to the rear impact.

### 3.1. *Test Conditions*

#### 3.1.1. Impact Conditions

This test was an offset pole frontal impact as depicted in Figure 12 and Figure 13. The test vehicle was towed into a 355 mm (14 inch) diameter steel pole. The lateral offset between the vehicle longitudinal centerline and the pole was 305 mm (12 inches), with the impact occurring on the right side of the vehicle centerline (passenger's side). The impact velocity was measured with radar, and was 55.3 km/h (34.3 mph).

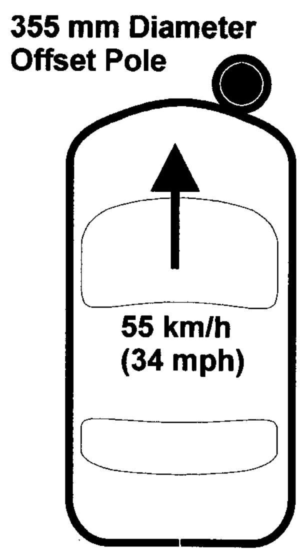



**Figure 12**

Crash Test Configuration for Test C11591


**Figure 13**
Pre-test Photograph of Test C11591

**3.1.2.** Vehicle Description

The test vehicle was a 1997 Chevrolet Camaro (VIN: 2G1FP22K5V2109780) with a test mass of 1849 kg (934 kg front, 915 kg rear) which included the two ATDs, crash test instrumentation, and Stoddard Solvent in the fuel tank. The fuel tank's unusable capacity was first filled with Stoddard Solvent, then 55.7 liters of Stoddard were added to the unusable capacity of the tank. (55.7 liters is 95% of the rated usable capacity of 58.6 liters.) The engine was operating at impact with complete engine compartment fluids, including battery electrolyte. The radio, high beam headlights and air conditioning were operating at impact. The transmission was in neutral during the vehicle tow.

**3.1.3.** Pre-test Engine Warm-up Procedure

As shown in Table 1, the engine was started approximately 60 minutes before impact.

**Table 1**

Engine Warm-Up Procedure for Test C11591

| | Time after initial engine start, (min) | Duration, (min) |
|---|---|---|
| Engine started (idle approximately 900 rpm) | 0 | 15 |
| Engine speed increased to 1200 rpm | 15 | 11 |
| Engine turned off for instrumentation set-up | 26 | 12 |
| Engine restarted, set to 1100 rpm | 38 | 22 |
| Impact | 60 | |

**3.1.4.** Modifications to Production Vehicle

The vehicle was tested with both the hood and rear hatch in place. However, the rear seat was removed to allow for the installation of the crash test instrumentation and the auxiliary fuel tank

Gasoline was supplied to the engine from an auxiliary tank mounted in the rear cargo / seat area.

The spare tire was removed for the test.

The vehicle's rear brake lines were cut and an auxiliary brake machine was installed to abort the test during the tow, if necessary. The pistons were removed from the front calipers and the brake fluid inlet port was welded shut. This allowed the front brake lines to be pre-charged and maintained at a steady state pressure, while still allowing the front wheels to rotate during tow. The front brakes were pre-charged by mechanically locking down the driver brake pedal.

As with the other frontal tests, instrumentation was included to monitor the engine compartment electrical circuits and fluid pressures. The specific locations of transducers are outlined in subsequent sections. Every reasonable attempt was made to make the added instrumentation as non-intrusive as possible to reduce the likelihood of affecting the outcome of the test. However, some of the instrumentation was required to be in areas of vehicle crush and could have, in fact, affected the test's outcome.

**3.1.5.** Vehicle Measurements

Measurements recorded during this test, included:

- Front left rocker panel acceleration (longitudinal, lateral, and vertical)
- Front right rocker panel acceleration (longitudinal, lateral, and vertical)
- Rear left rocker panel acceleration (longitudinal, lateral, and vertical)

- Rear right rocker panel acceleration (longitudinal, lateral, and vertical)
- Right floorpan acceleration (longitudinal)
- Airbag sensing and diagnostics module (SDM) acceleration (longitudinal, lateral, and vertical)
- Right toepan longitudinal displacement (relative to floorpan, using string potentiometer)
- Driver's and passenger's air bag current (using non-intrusive clamp on current transducers)
- Tach signal voltage (voltage signal from the production engine speed sending unit)
- Engine motion (rotation of crankshaft using an auxiliary magnetic pickup transducer) (labeled "hall effect sensor voltage" in Appendix D)
- Fuel pump current (at auxiliary fuel tank)
- Fuel pump voltage (at auxiliary fuel tank)

### 3.1.6. Photographic Coverage

High-speed 16 mm movie cameras were used to film the crash test. Cameras were located at various locations around the impact including above, in front of, below and to both sides of the vehicle.

### 3.1.7. Anthropomorphic Test Device (ATD) Measurements

Two 50$^{th}$ percentile male Hybrid III ATDs [6] were located in the front outboard seating positions. The seats were located in the fore-aft mid position, and the seat backs were at 26.5 degrees relative to vertical. The ATDs were restrained using the vehicle's production lap / shoulder belts with the adjustable guide loop set in the third position from the top. In addition, the ATDs were restrained by the vehicle's production frontal air bags. The ATDs were positioned per FMVSS 208 [5] guidelines and the pelvic angles were 23.7 degrees from horizontal for the left front ATD and 23.8 degrees for the right front ATD. The head target angle was at 0 degrees from horizontal for both ATDs.

Each Hybrid III ATD was instrumented to make the following measurements:

- Head triaxial acceleration
- Head/ neck interface (upper neck) longitudinal shear force (Fx)
- Head/neck interface (upper neck) lateral shear force(Fy)
- Head/neck interface (upper neck) axial force (Fz)
- Head/neck interface (upper neck) moments about longitudinal, lateral and vertical axis (Mx, My, Mz)
- Chest triaxial acceleration
- Sternal deflection
- Pelvic triaxial acceleration
- Femur axial loads, left and right femurs
- Knee clevis loads, left and right, inner and outer
- Upper tibia bending moment, (Mx, right - left), left and right legs

- Upper tibia bending moment, (My, anterior - posterior), left and right legs
- Lower tibia bending moment, (My, anterior - posterior), left and right legs
- Lower tibia shear load, (Fx, anterior - posterior), left and right legs
- Lower tibia axial load, (Fz, vertical), left and right legs
- Tibia/femur displacement, left and right legs
- Lumbar moment (My, anterior - posterior)
- Lumbar shear load (Fx, anterior - posterior)
- Lumbar axial load (Fz, vertical)

The right front (passenger) ATD only was instrumented to make the following additional measurements on the lower leg:

- Upper tibia shear load (Fx, anterior – posterior), left and right legs
- Lower tibia shear load (Fy, right - left), left and right legs
- Lower tibia bending moment (Mx, right – left), left and right legs

### **3.1.8.** Hydrocarbon Vapor Measurements

Hydrocarbon vapor was measured at the five following locations in the engine compartment:

- Above the right fuel rail (location #1)
- Above the left fuel rail (location #2)
- Above the left exhaust manifold (location #3)
- Near the descending left exhaust pipe (location #4)
- Near the catalytic converter (location #5)

The concentration of hydrocarbon vapors was measured using tin oxide sensors at each location. In addition, the temperature from each of the tin oxide sensors was also measured to more accurately interpret the output of the gas sensors. Co-located with the tin oxide sensors were sample tubes which drew gas into collection tubes during the crash test [1]. These samples were analyzed by gas chromatography to determine the composition of the vapor at each location.

### **3.1.9.** Fluid Pressure Measurements

The pressures in several of the vehicle's fluid systems were measured to help identify fluid leaks and the time during the impact when they occurred. These pressure measurements included:

- Front brake system pressure (line tapped near ABS junction box, left side of engine compartment)
- Left side power steering system pressure (measured near power steering rack)

- Right side power steering system pressure (measured near power steering rack)
- Cooling system pressure (measured at thermostat housing)
- Auxiliary fuel supply line pressure (measured near the production fuel filter where auxiliary line was tapped into production line)
- Engine oil pressure (measured at the oil pressure sending unit)
- Transmission cooler fluid pressure (tapped into transmission fluid cooler line)

A fluorescent dye was added to the cooling system to help identify coolant and to distinguish it from other fluids.

**3.1.10.** Additional Electrical Measurements

The following additional electrical measurements were made to identify possible shorts or arcing.

Clamp - on current monitoring transducers were used to measure the following currents:

- Horn (high & low tone) current (measured in engine compartment under power distribution center)
- Air conditioning compressor clutch (measured at a/c compressor)
- Radiator cooling fan (measured at rear of fan motor, left side of engine compartment)
- Alternator cable (measured at alternator)
- Battery main (measured near terminal connection on right shock tower)
- HVAC blower (measured under instrument panel inside passenger compartment)
- Headlight low beam (measured under instrument panel near steering column)

Voltage measurements were also made on the following circuits:

- Ignition (measured under instrument panel inside of passenger compartment)
- Right front headlight low beam (measured at left front headlight)
- Starter (measured at terminal on starter)
- Battery (measured at terminal on battery)
- Alternator (measured at terminal on alternator)
- High blower relay (measured in engine compartment under power distribution center)
- Relay center – A (measured at relay center, fusible link B)
- Relay center – B (measured at relay center, fusible link C)
- Radio accessory, fuse #4 (measured near main fuse box, driver's side instrument panel)
- Tail light fuse (measured near main fuse box, driver's side instrument panel)
- ABS fuse #6 (measured near main fuse box, driver's side instrument panel)
- Headlight switch

**3.1.11.** Evaluation of the Crashworthiness of Potential Fire Detection or Suppression Technologies

An experimental thermal wire fire detector was mounted to the underside of the hood, below the hood liner. This detection wire was the same type as used on previous tests conducted for this project. For this test, only one thermal wire was included. Longitudinally, it was located rearward of the hood's crush initiator (i.e., located in the rear half of the hood.) Laterally, it was located in the center of the hood and spanned approximately the center third of the hood's lateral width. The wire was looped over on itself (doubled up) and then bent in a rectangular shape and mounted to the hood liner. This thermal wire was monitored for contact closure between the wires during the test.

Figure 14 shows the under-hood location of the thermal wire device.

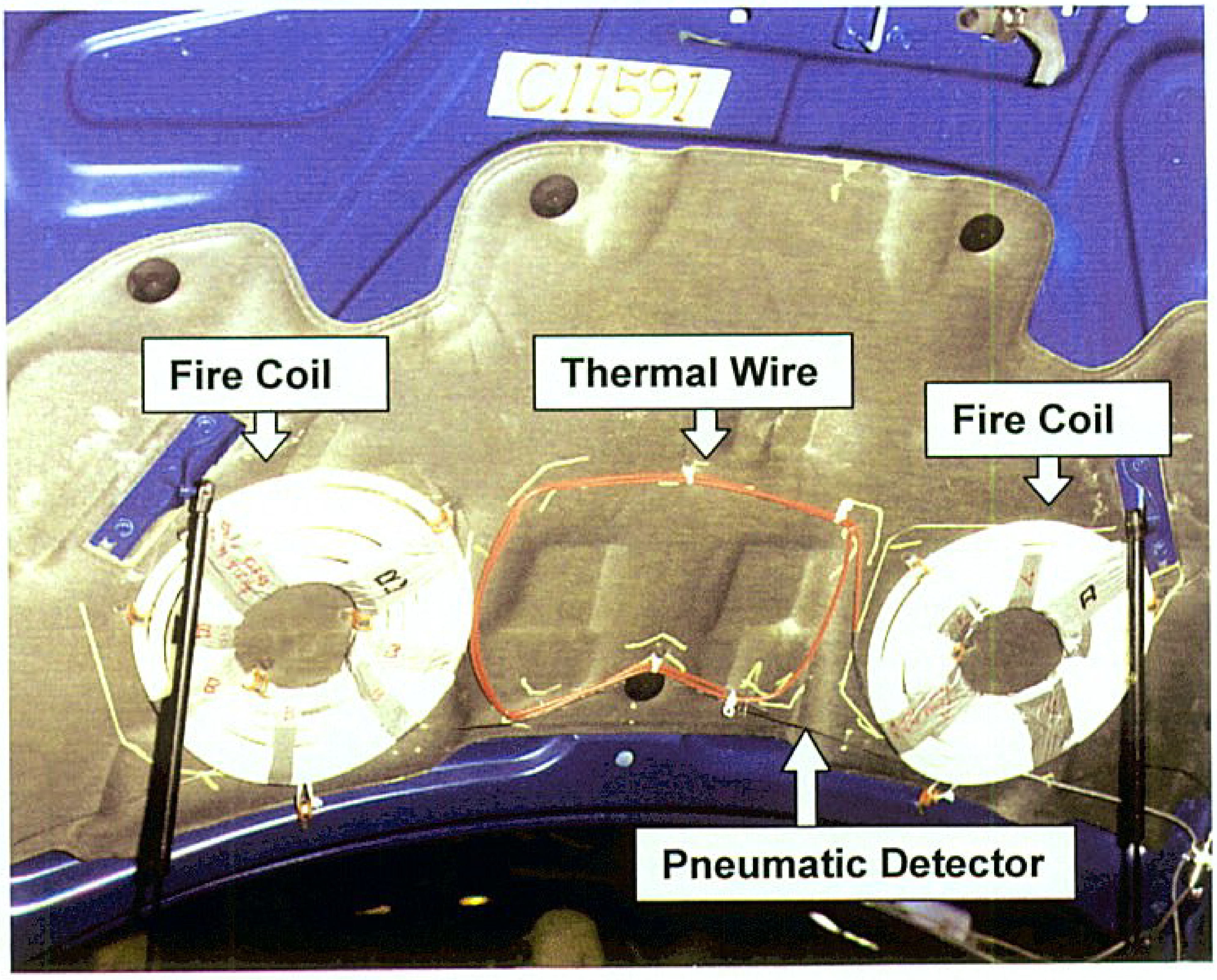



**Figure 14**

Thermal wire, pneumatic, and fire coil detectors

Test C11591

A pneumatic fire detector was also included and was also located on the underside of the hood below the hood liner. The pneumatic detector was not looped into a rectangular shape like the thermal wire, but rather spanned the entire width of the hood at the very rear of the hood liner. Two channels were monitored on the pneumatic detector, one normally open activation circuit and a normally closed fault circuit. The pneumatic detector's location is also shown in Figure 14, however, due to the small diameter of the tube it is difficult to see.

In addition to the thermal wire and pneumatic detectors, two optical fire detectors were also located in the engine compartment. These sensors (Dual Spectrum, model PM-5V) operate by sensing two separate bands of infrared energy to detect a fire. They are designed to detect fires fueled by gasoline diesel, CNG, LNG, LPG, methanol, oils, lubricants and other types of hydrocarbons. The sensors are small in size (43 mm x 89 mm x 69 mm) and have a 90 degree solid cone field of view. These two detectors were not mounted on the hood, but rather were rigidly mounted in the rear of the engine compartment under the wiper tray and faced forward. One sensor was mounted on the right side and the other was located symmetrically on the left side of the engine compartment. The two optical sensors were electrically monitored for activation during the impact.

The thermal wire, pneumatic detector and optical sensors were all supplied by Dual Spectrum (Goleta, CA). Devices of this type could be used with an active fire suppression system but for this test were only monitored to evaluate their crashworthiness.

In addition, two fire coils were also attached to the underside of the hood, as shown in Figure 14. These coils were supplied by POWSUS, Inc. These fire coils normally are Nylon-12 tubes containing liquid HFC-134a as a propellant and an active fire suppressant. These devices are activated by heat from a fire, which causes the Nylon tube to soften and rupture, allowing the propellant and fire suppression agent to escape. To be effective in extinguishing post-collision, under-hood fires that ignite seconds or minutes after the crash, these fire suppression devices must not be punctured or rupture during the crash. Thus, the purpose of including the coils on this test was to evaluate their crashworthiness at a given mounting location. A more detailed description of these coils was reported separately [9].

Each tube was a length of coiled Nylon-12 tubing (tubing o.d. = 0.5 inches, wall thickness = 0.062 inches, tubing length = approximately 11 feet, coil diameter = 12 inches). For this test, the coils were charged with liquid HFC-134a only, and did not contain the active fire suppression agent normally used in these devices (Envirogel™). The ends of the tubes were ultrasonically welded. Both coils were attached to the underside of the hood rearward of the crush initiator. One coil was to the left of the longitudinal centerline of the vehicle, and the other was to the right as shown in Figure 14.

### **3.2.** *Summary of Test Results*

Post-test photographs of the vehicle are shown in Figure 15 and Figure 16.


**Figure 15**

Post-Test Photograph of Test C11591, Front-Right View


**Figure 16**

Post-Test Photograph of Test C11591, Front View

**3.2.1.** Summary of Standard Vehicle Crash Test Measurements

The complete set of recorded and computed vehicle measurements are included in Appendix D (Plots 60 through 131, 135, 147, 148, 160, 161, and 163).

The two rear rocker panel longitudinal acceleration measurements were averaged and integrated to compute the change in vehicle velocity, and integrated again to compute vehicle displacement. The peak vehicle longitudinal acceleration (after filtering at SAE class 60 [8]), was 30 g. The maximum longitudinal change in vehicle velocity was 62 km/h (38.5 mph), with the velocity crossing zero at 118 msec past time zero (impact.) The averaged rear rocker longitudinal acceleration is shown in Figure 17 and Plot 100, while the longitudinal velocity is shown in Figure 18 and Plot 101.

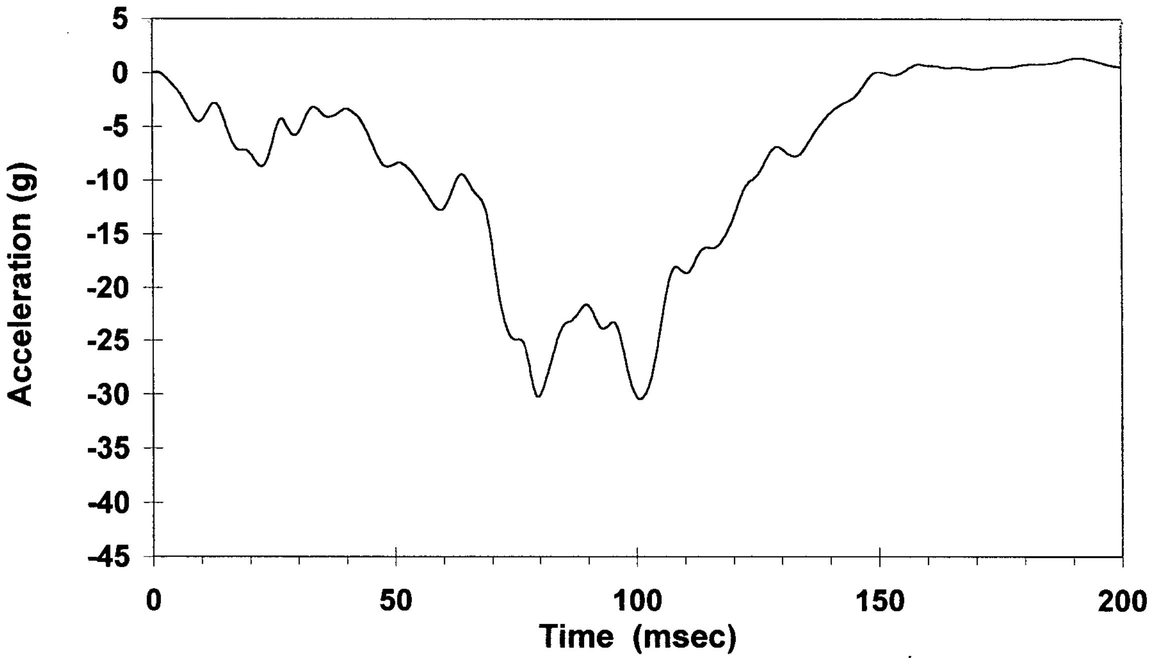



**Figure 17**

Averaged (Left & Right) Rear Rocker Panel Longitudinal Acceleration

Test C11591, filtered at SAE class 60 [8]

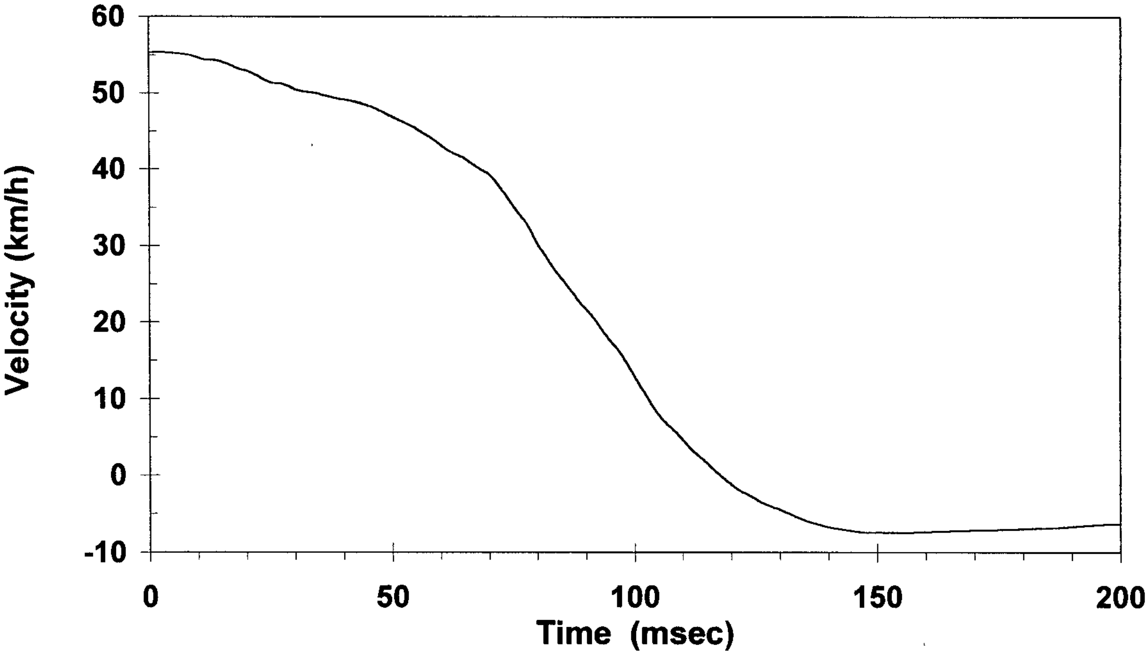



**Figure 18**

Averaged (Left & Right) Rear Rocker Panel Longitudinal Velocity

Test C11591

The displacement of the right toe pan, relative to the passenger compartment, was approximately 205 mm and is shown in Figure 19 and also Plot 131, Appendix D.

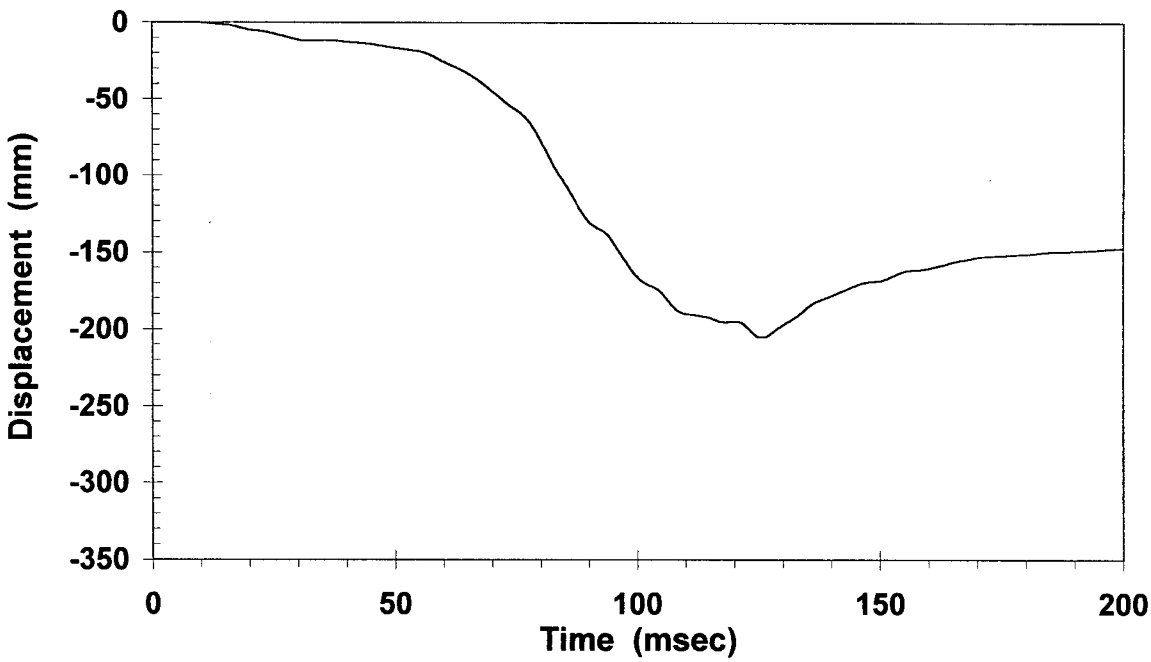



**Figure 19**

Right Toepan Displacement, Relative to Floorpan

Test C11591, filtered at SAE class 60 [8]

The magnetic pickup transducer used to monitor the rotation of the engine malfunctioned during this test and did not accurately reflect engine motion (Plot 147). This same transducer functioned properly in previous tests and had accurately represented engine motion. The tach signal voltage, which is the voltage signal from the vehicle's production engine speed sending unit is shown in Plot 148. This measurement indicated that the engine was still turning through 40 msec. However, this signal dropped to zero volts at around 40 msec because the main battery and ignition voltage also dropped at that time (see Section 3.2.5.)

The current measurements of the driver and passenger air bag circuits indicated that both air bags deployed at about 33 msec (Appendix D, Plots 160 and 161.)

Figure 20 and Plot 163 in Appendix D show the current measured at the auxiliary fuel pump. The fuel pump drew 7 amps before impact until about 40 msec, when the current dropped to zero. The fuel pump voltage measurement malfunctioned and resulted in no valid recorded data, (Plot 135). However, the battery voltage indicated a drop from 13.5 volts to near zero also at 40 msec, as shown in Figure 21 and Plot 133. The fuel pump lost power when the main vehicle electrical power was lost at 40 msec.

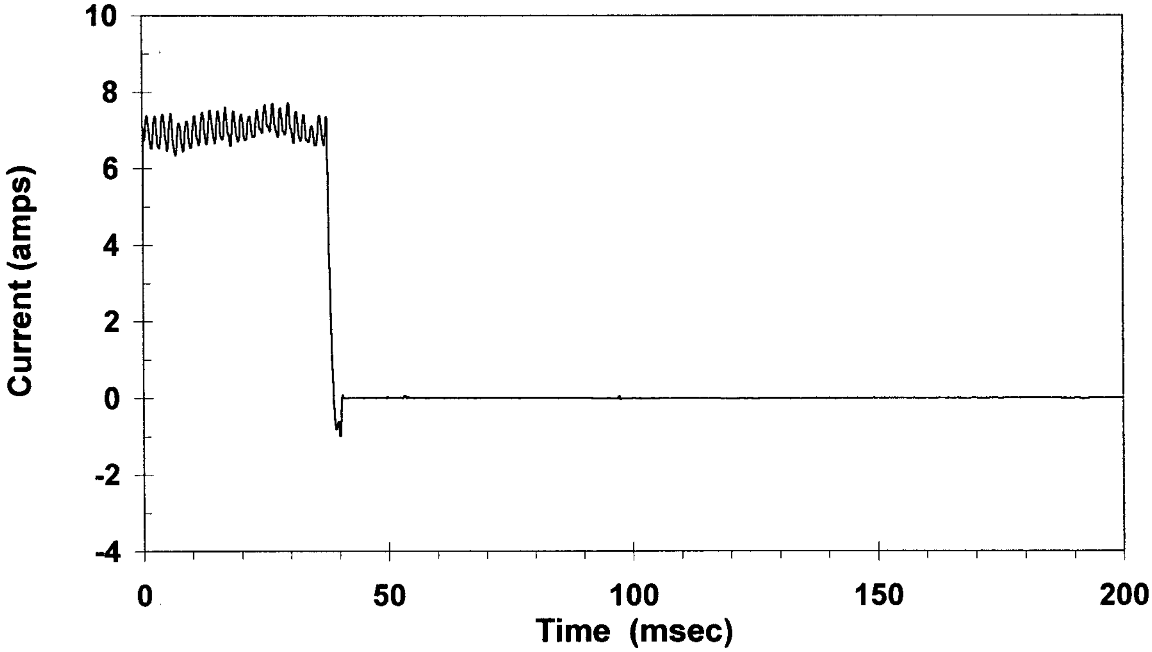



**Figure 20**

Fuel Pump Current

Test C11591

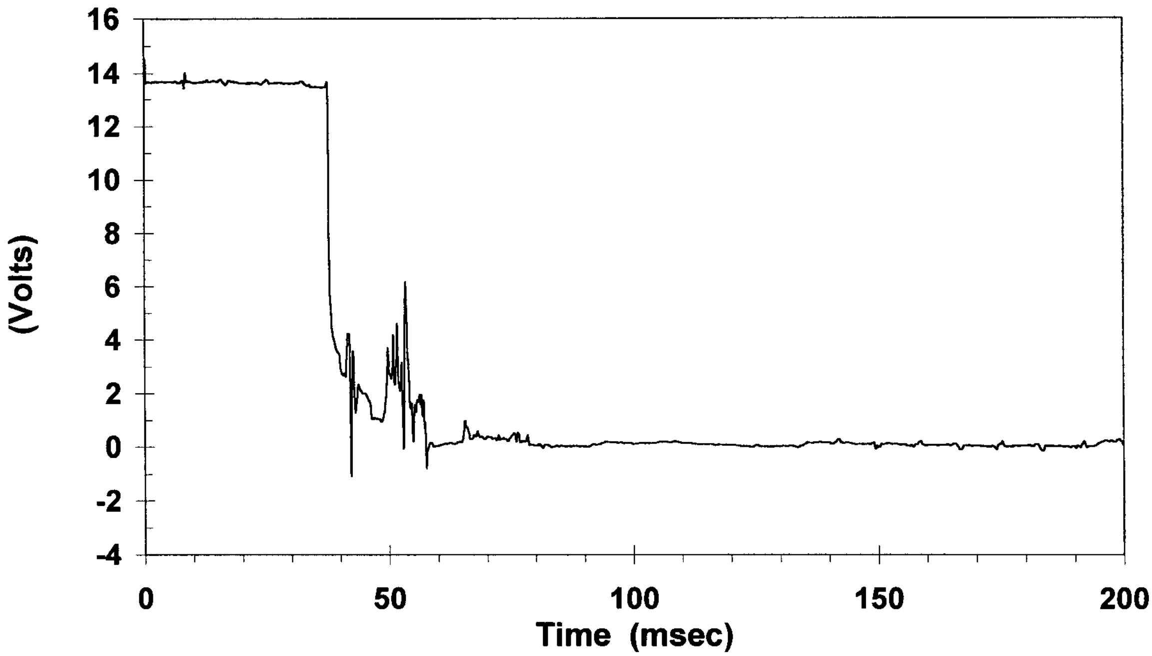



**Figure 21**

Battery Voltage

Test C11591

3.2.2. Summary of Recorded ATD Measurements

The complete set of recorded and computed ATD measurements is included in Appendix D (pages i and ii, and Plots 1 through 60).

For both of the ATDs, a comparison of the injury measurements for both of the ATDs to their respective IARVs (Appendix A), indicated that all measurements were below their respective IARVs. The goal in selecting the crash test conditions was to subject the vehicle's electrical and fluid systems to severe impacts to better understand how post-collision fires might start, but not to select conditions which were so severe that occupant fatality due to trauma injuries would be likely. The injury measurements were below their IARVs, however the penetration of the pole into the engine compartment severely challenged the electrical and fluid systems. Thus, this test severity was appropriate for this research project.

3.2.3. Summary of Hydrocarbon Vapor Measurements

A complete set of the recorded measurements is included in Appendix D, Plots 149 through 159, and also Appendix E, Figures E1 through EE5.

Of the five monitored locations, the left exhaust manifold (location #3) and near descending left exhaust pipe (location #4) indicated the highest concentrations of hydrocarbon vapors. These two measurements are recreated from Appendix E as Figure 22 and Figure 23 respectively. The measurement at location #4 was the highest and exceeded 4% for approximately 1 minute after the impact.

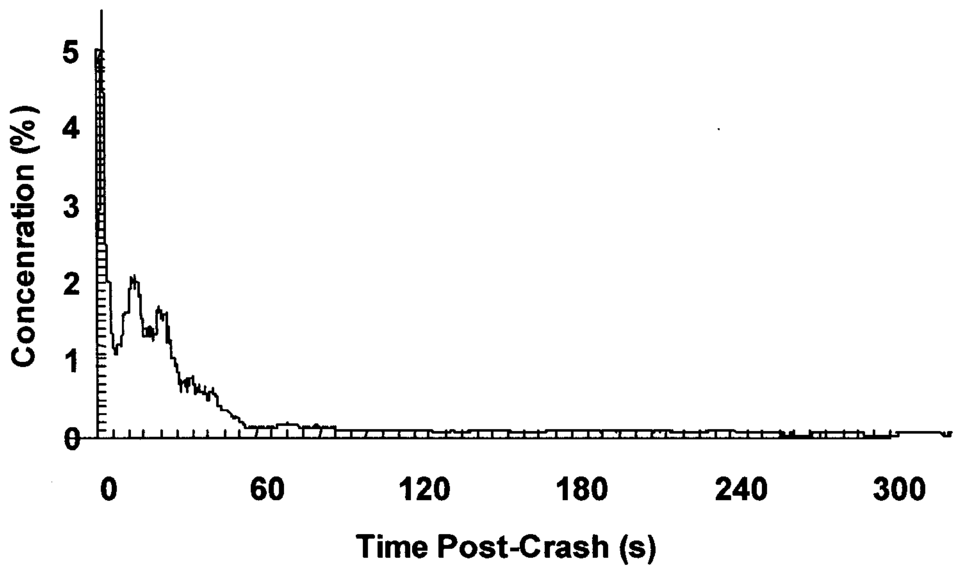



**Figure 22**

Concentration of Hydrocarbon Gas Measured near Left Exhaust Manifold (Location #3)

Test C11591

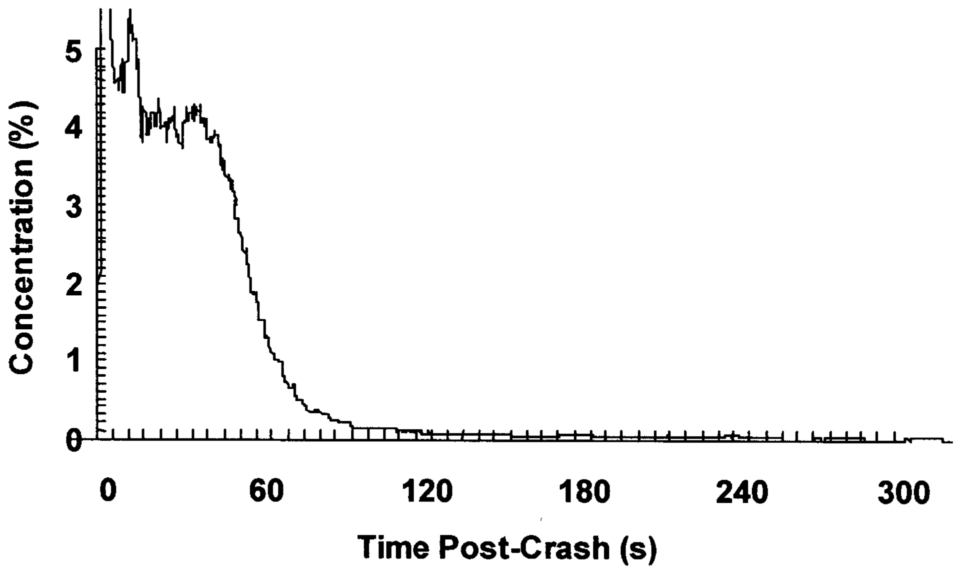



**Figure 23**

Concentration of Hydrocarbon Gas Measured near Descending Exhaust Pipe (Location #4)

Test C11591

Chromatograms from the GC/FID analysis conducted on the vapor samples collected near the descending exhaust pipe (location #4) are shown in Figure 24 and Figure 25. Figure 24 is the chromatogram from the background sample. This is the vapor sample collected prior to the impact during the final preparations of the test vehicle and while the engine was operating. The peaks in the chromatogram indicate the presence of gasoline vapor. It is possible that the source of the gasoline vapor prior to impact was the auxiliary tank being opened and filled just prior to the impact, thus releasing gasoline vapors. The GC/FID analysis is not a quantitative analysis, thus it is possible only small concentrations of gasoline vapor were present in the air prior to the test.

Figure 25 also indicates the presence of gasoline vapors. This is the sample taken after the impact. There were no liquid gasoline leaks identified immediately after the impact or during the post-test inspection. Again, the presence of low concentrations of gasoline vapors could be residual vapors in the engine compartment due to the filling of the auxiliary tank just prior to the test. Another possible source of low concentrations of gasoline vapors, was the air intake duct which was fractured during the impact.

The higher vapor concentration of vapor indicated in **Figure 23** was likely due to vapors released by the washer solvent. The post-test inspection revealed that the washer solvent reservoir was crushed and completely empty following the impact. Vapors from the washer solvent would not be identified during a GC/FID analysis, and thus would not appear in **Figure 25**.

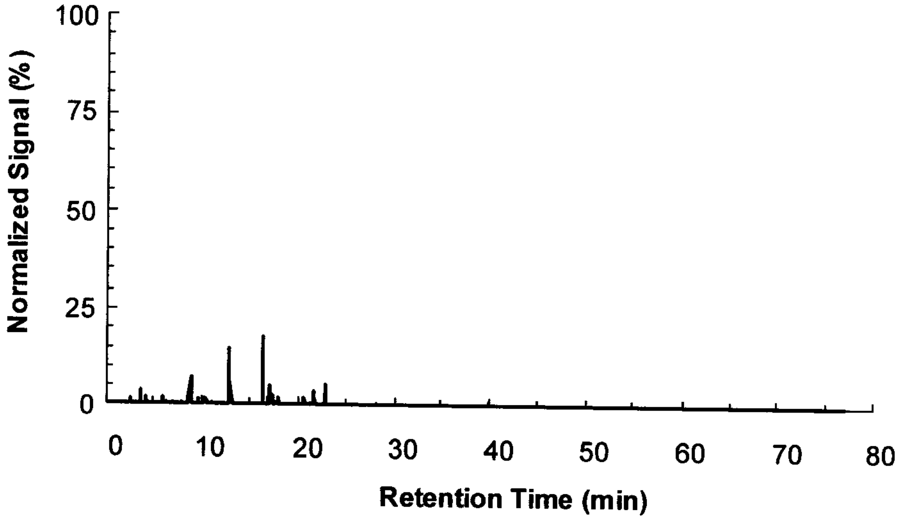



**Figure 24**

GC/FID Analysis of Hydrocarbon Vapor Background Sample Collected over Descending Exhaust Pipe (Location #4) Before the Test.

Test C11591

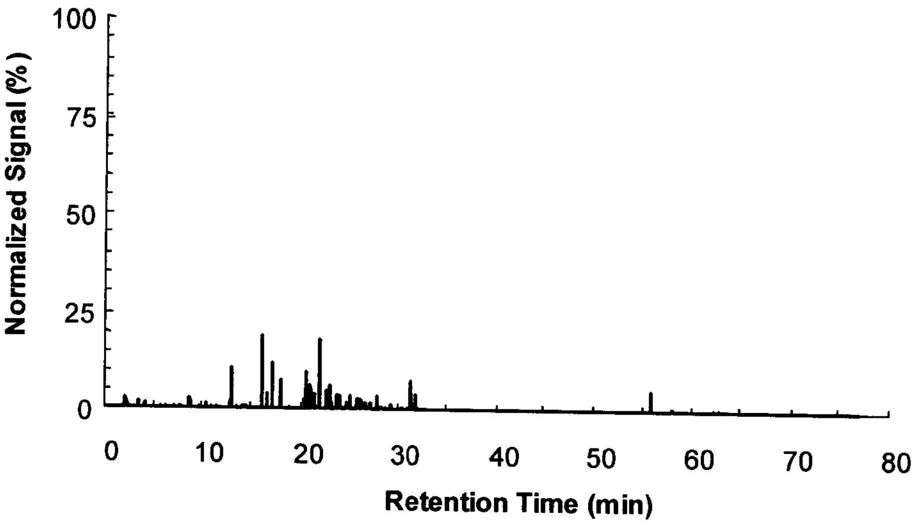



**Figure 25**

GC/FID Analysis of Hydrocarbon Vapor Sample Collected over Descending Exhaust Pipe (Location #4) Post-test.

Test C11591

**3.2.4.** Summary of Fluid Pressure Measurements

The dynamic pressure measurements of the engine compartment fluids are shown in Appendix D (Plots 170 through 178.) Similar to test C11408, the fuel supply pressure measurement was biased by 320 kPa (Plot 172). Both the unbiased (forced to zero during instrumentation setup) and biased (corrected to represent the actual pressure) measurements are included in Appendix D. Although fuel pressure measurement (Plot 172) fluctuated during the impact, these fluctuations do not indicate the presence of a fuel leak. This was supported by the post-test inspection which did not reveal the presence of a fuel leak.

Similar to the fuel pressure measurement, the cooling system pressure also required biasing because the system retains pressure when the engine is off (thus retaining pressure during the instrumentation set-up.) Thus the recorded measurement was forced to zero and a bias value of 112 kPa was added back to represent the actual pressure during the impact. The unbiased and biased values are shown in Plots 175 and 176, respectively. Although this pressure measurement exceeded the full-scale linear range, the waveform shown in Plot 176 suggests that the overload only occurred for a short duration and that the measurement is likely valid at all other times. If so, the pressure dropped from an initial value of about 120 kPa to 50 kPa. In this test, coolant was lost from both the radiator and the recovery bottle. This was consistent with previous frontal tests in this series, where the radiator was crushed and coolant lost. It is unknown why the biased coolant pressure does not drop to zero. However, one possible explanation is that the radiator hose leading from the thermostat to the radiator was crushed and pinched during the impact. This would result in a measurable pressure at the location of the transducer. Another possible explanation is that the system was not at 112 kPa during instrumentation setup. If the actual pressure was somewhat lower, then the plot which was biased by 112 kPA would reflect an unrealistically high pressure. In any event, the coolant pressure measurement may be of the least value in these tests, because coolant was lost during all of the frontal tests conducted for this project. The precise measurement of the pressure has not been required to determine the presence or absence of a coolant leak.

Neither of the power steering fluid pressure measurements (left and right side, Plots 173 and 174) suggest the presence of a leak. This was supported by the post-test inspection in which no power steering fluid leaks were identified.

The engine oil pressure (Plot 177) did drop from the normal operating pressure to zero between 40 and 80 msec. The post-test inspection revealed that oil was released from the oil filter adapter housing. The dispstick level indicator indicated that the engine was approximately ½ quart low following the test. The oil leak likely occurred during the 40 to 80 msec time frame. However, the engine stopped sometime after 40 msec, which would have resulted in a loss of oil pressure. It is likely that both the oil filter adapter fractured and the engine stopped due to the pole penetration between 40 msec and the end of the penetration (about 100 msec.)

The transmission fluid pressure measurement (Plot 178) suggested that a leak occurred during the impact. The pressure dropped to near zero by about 200 msec. The post-test inspection revealed the tail shaft housing was broken, and that the fluid retained in the transmission was about 1 ½ quarts low.

The front brake system pressure is shown in Plot 170. Although this measurement dropped to near zero at 240 msec, no leaks in the pressurized brake system were identified during the post-test inspection. However, the non-pressurized fluid reservoir was approximately ½ empty following the test. Thus it is likely that some fluid was released from the reservoir. It is unknown why the pressure measurement dropped to zero. One explanation is that a leak occurred in the pressurized system that was not identified during the post-test inspection. Another possible explanation is that the physical crushing of the brake lines resulted in the rise in pressure (from 20 to 100 msec) followed by a decline in pressure as the lines physically expanded or stretched due to the continued crush.

**3.2.5.** Summary of Additional Electrical Measurements

The results of the additional electrical measurements are shown in Appendix D (Plots 132 through 134, 136 through 144, 162, and 164 through 169).

Every recorded vehicle voltage indicated that voltage was lost at about 40 msec. This was because the battery top was disconnected from the battery during the impact. The positive terminal connection was lost when the battery top was lifted, resulting in the loss of voltage on all circuits.

All recorded vehicle current measurements indicated a drop in current to near zero at about 40 msec. Both the battery current and alternator current transducers were destroyed during the impact, and resulted in invalid data.

**3.2.6.** Summary of Numerical Film Analysis

The numerical film analysis plots are included in Appendix F (plots 1 through 8).

The numerical analysis of the overhead film indicated that the dynamic pole penetration into the engine compartment was approximately 1256 mm at 120 msec after time zero, as shown Plot 8.

**3.2.7.** Results of Post-test Static Rollover

No static rollover was conducted on this vehicle following the crash test for reasons described in the results of the first offset frontal pole impact on the passenger van. [2]

**3.2.8.** Results of the Evaluation of the Crashworthiness of Potential Fire Detection or Suppression Technologies

The results of the electrical measurements of the experimental fire detectors are shown in Appendix D (Plots 145, 146 and 179 - 181).

Monitoring of the thermal wire fire detector attached to the underside of the hood did not indicate any electrical closures throughout the event (Plot 179). This suggests that the wire at this mounting location and for this crash configuration is crashworthy. That is, it did not activate and was not damaged during the crash test.

The plot of the signal output from the pneumatic fire detector did not indicate any contact closures during the test (Plots 180 and 181). For this test configuration and mounting location, the pneumatic wire device also demonstrated crashworthiness.

Neither of the two optical detectors activated during the test (Plots 145 and 146). This also suggested that these devices for this test were crashworthy. They did not false activate and were not damaged due to the crash.

No measurements were recorded during the test to evaluate the integrity of the fire coils located on the under side of the hood. However, liquid was not visible in either tube during inspection of the vehicle immediately after the crash test. (Pressurized HFC-134a is a liquefied gas under pressure, and was visible as a liquid prior to the test.) The hood was removed from the vehicle and the coils were removed from the hood during vehicle disassembly. The post-test weights of the coils indicated that both coils lost approximately 200 g of mass between the pre-test and post-test weights. This was nominally the mass of the HFC-134a originally in the coils. Further analysis indicated the source of the leaks was the ultrasonic welds at the ends of each tube. A more detailed analysis of the condition of the fire coils after this test was reported separately [9].

**3.2.9.** Summary of Post-test Vehicle Inspection

As with the previous tests, the vehicle was disassembled and inspected to identify air passages from the engine compartment into the passenger compartment, the locations of any fluid leaks, the locations of any electrical shorts identified during the crash test, and any contact between combustible materials and hot surfaces.

Consistent with previous frontal tests on other vehicles conducted for this project, structural openings into the passenger compartment were identified. These are documented here independent of their possible contribution to fire propagation. In some cases, these openings did not result in a free flow air path due to other components (possibly combustible) blocking the air path. The results of subsequent fire propagation tests conducted on some of the crash tested vehicles are reported separately.

The following crash-induced openings into the passenger compartment were identified:

- The HVAC module which initially straddles the forward bulkhead became broken and dislodged creating an opening from the engine compartment. This opening was difficult to quantify and was partially blocked. The free flow area was approximately 125mm high by 20 mm wide.

- The right front floorpan separated from the right front hinge pillar creating an L-shaped opening. One leg of the opening was approximately 200 mm long by 10 mm wide; the shorter leg was 70 mm long by 15 mm wide.

All of the other identified openings were considerably smaller than the HVAC and floorpan openings. The smaller openings are listed below:

- Tear in the front left tunnel caused by intrusion of the engine (approx. 30 mm x 10 mm)
- Tear in the front center tunnel caused by intrusion of the engine (approx. 30 mm x 5 mm)
- Separated spot-weld in the front left toe pan (less than 10 mm diameter)
- Two separated spot welds at the lower instrument panel mounting bracket to tunnel attachment (each less than 7 mm in diameter)

The following fluid leaks were identified during the post-test inspection:

- Transmission fluid: tailshaft housing fractured, approximately 1 ½ quarts lost
- Engine coolant: radiator and recovery bottle crushed and empty
- Washer solvent: reservoir crushed and empty
- Battery electrolyte: battery housing crushed and empty
- Engine oil: oil filter adapter broken, approximately ½ quart lost
- Brake fluid: no leaks in pressurized system, however approximately ½ of the fluid in the reservoir was lost

As reported in section 3.2.5, the top of the battery became dislodged during the impact, resulting in the loss of vehicle system voltage to zero on all circuits. Further analysis of the electrical system during the post-test inspection did not reveal any open fuses or any physical evidence of electrical shorts or arcing.

The vehicle was also inspected for possible contacts between normally hot surfaces and combustible materials. Only one observation was noted. The right exhaust pipe was in contact with the ABS wiring harness on the right side of the vehicle. However, there was no indication of combustion.

### 3.3. *Conclusions*

1. There were no fires observed during or after this crash test.

2. The peak longitudinal acceleration of the passenger compartment was approximately 30 g (filtered at 60 Hz). The longitudinal velocity change of the passenger compartment was approximately 62 km/h (38.5 mph). The longitudinal velocity was zero at 118 msec (the time at which the vehicle stopped moving forward and began moving rearward.)

3. The electric fuel pump shut down at about 40 msec after impact. This was due to the drop of overall vehicle system voltage caused by the disconnection of the battery top from the battery during the impact.

4. All recorded vehicle voltages and currents dropped to zero at 40 msec when the main vehicle voltage was lost. Unlike some of the previous frontal tests, the main voltage did not later recover.

5. All recorded ATD injury measurements were below their respective injury assessment reference values (IARVs).

6. Of the five locations in which the concentrations of hydrocarbon vapors were measured, the measurement near the descending left exhaust pipe (location #4) indicated the highest concentration. The source of this vapor was likely the washer solvent.

7. No liquid gasoline or Stoddard Solvent spilled off of the vehicle. No leaks in the fuel system were identified either in the recorded data or during the post-test inspection.

8. Other engine compartment fluids which leaked included transmission fluid, engine coolant, washer solvent, battery electrolyte, engine oil, and brake fluid.

9. The numerical analysis of the overhead film indicated that the dynamic pole penetration into the engine compartment was approximately 1256 mm at 120 msec after time zero.

10. Monitoring of the experimental thermal wire fire detector attached to the underside of the hood did not show evidence of any electrical closures throughout the test, demonstrating crashworthiness for its given mounting location and this crash configuration.

11. Monitoring of the experimental pneumatic fire detector did not show evidence of any contact closures during the test. For this test configuration and mounting location, the pneumatic wire device also demonstrated crashworthiness.

12. Neither of the two experimental optical detectors included on this test activated during the event. This also suggested that these devices, given the circumstances of this test, were crashworthy.

13. Although no measurements were recorded during the test relative to the experimental fire coils, post-test measurements indicated that the coils lost fluid during the test. The source of the loss was through the ultrasonic welds at the ends of the tubes. The coils and their response during the test are reported in more detail separately.

14. Seven crash-induced openings were identified in the forward bulkhead, five were relatively small. Of the two larger openings, one was a separation of the floorpan from the right front hinge pillar (L shaped opening, one leg 200 mm long x 10 mm, the other leg 70 mm x 15 mm.) The other one was near the displaced HVAC module, creating an opening approximately 125 mm x 20 mm.

15. There was only one contact between normally hot surfaces and combustible materials. The right exhaust pipe was in contact with the ABS wiring harness on the right side of the vehicle. However, there was no indication of combustion.

## 4. Rear Wheel Drive Passenger Car Oblique Moving Barrier Frontal Impact, Test C11647

On June 18, 1997 a rear wheel drive passenger car oblique moving deformable barrier frontal impact crash test (Test #C11647) was conducted at the General Motors Proving Ground. A total of 152 channels of data were recorded during the test, including 146 channels on the test vehicle (including ATDs) and 6 channels on the oblique deformable barrier. Due to the speed of the impact, this test was conducted outdoors, thereby limiting the amount of photographic coverage available. As an example, the indoor tests included high-speed photographic coverage of the vehicle under-body taken from a pit, while the outdoor oblique moving barrier test did not.

### 4.1. *Test Conditions*

#### 4.1.1. Impact Conditions

This test was a frontal oblique moving deformable barrier frontal impact as depicted in Figure 26. The alignment of the barrier and vehicle was set so the center of the moving barrier face impacted the front left corner of the test vehicle. The test vehicle was parked at a 22 degree (+/- 2 degrees) angle relative to the approach velocity vector of the moving barrier. The angle was chosen so the velocity vector of the barrier's center of gravity (CG) at impact intersected the front left corner of the test vehicle and also the CG of the test vehicle. This impact angle was selected to minimize vehicle rotation and maximize vehicle crush. The CG of the test vehicle was approximately 1270 mm rearward of the front wheel centerline and laterally in the center of the vehicle. Similar to the previous oblique moving barrier test, the front left corner was defined as the intersection of two lines. The first line was tangent to the most forward part of the vehicle bumper and perpendicular to the vehicle longitudinal centerline. The other line was tangent to the widest part of the vehicle body (excluding mirrors) and parallel to the vehicle longitudinal centerline. This intersection represents a virtual corner of the vehicle, which was not on the vehicle body due to the contours of the body styling. This resulted in an approximate overlap of 48%. (48% of the Camaro's 1870 mm width was engaged by the moving barrier.)

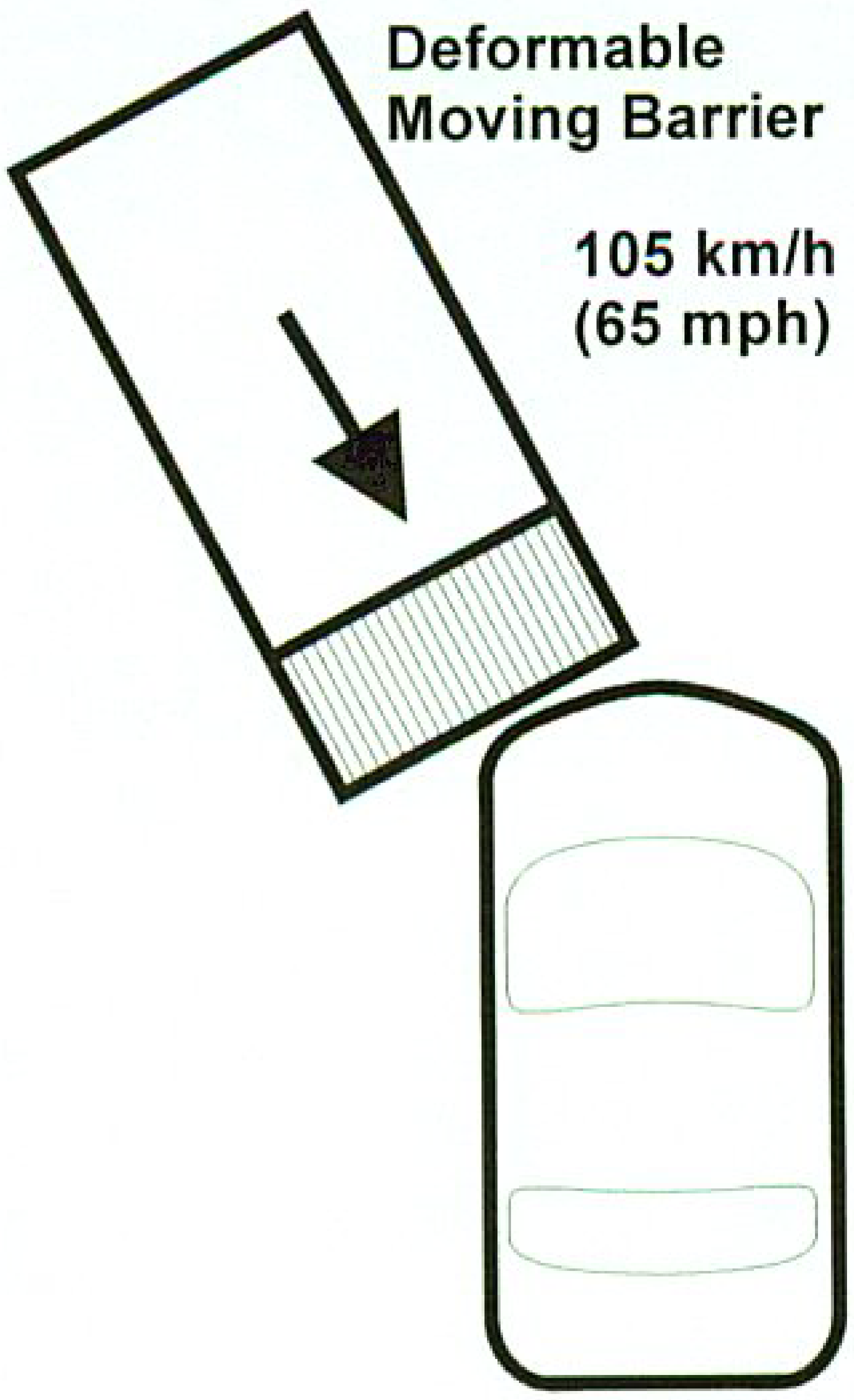



**Figure 26**

Crash Test Configuration for Test C11647

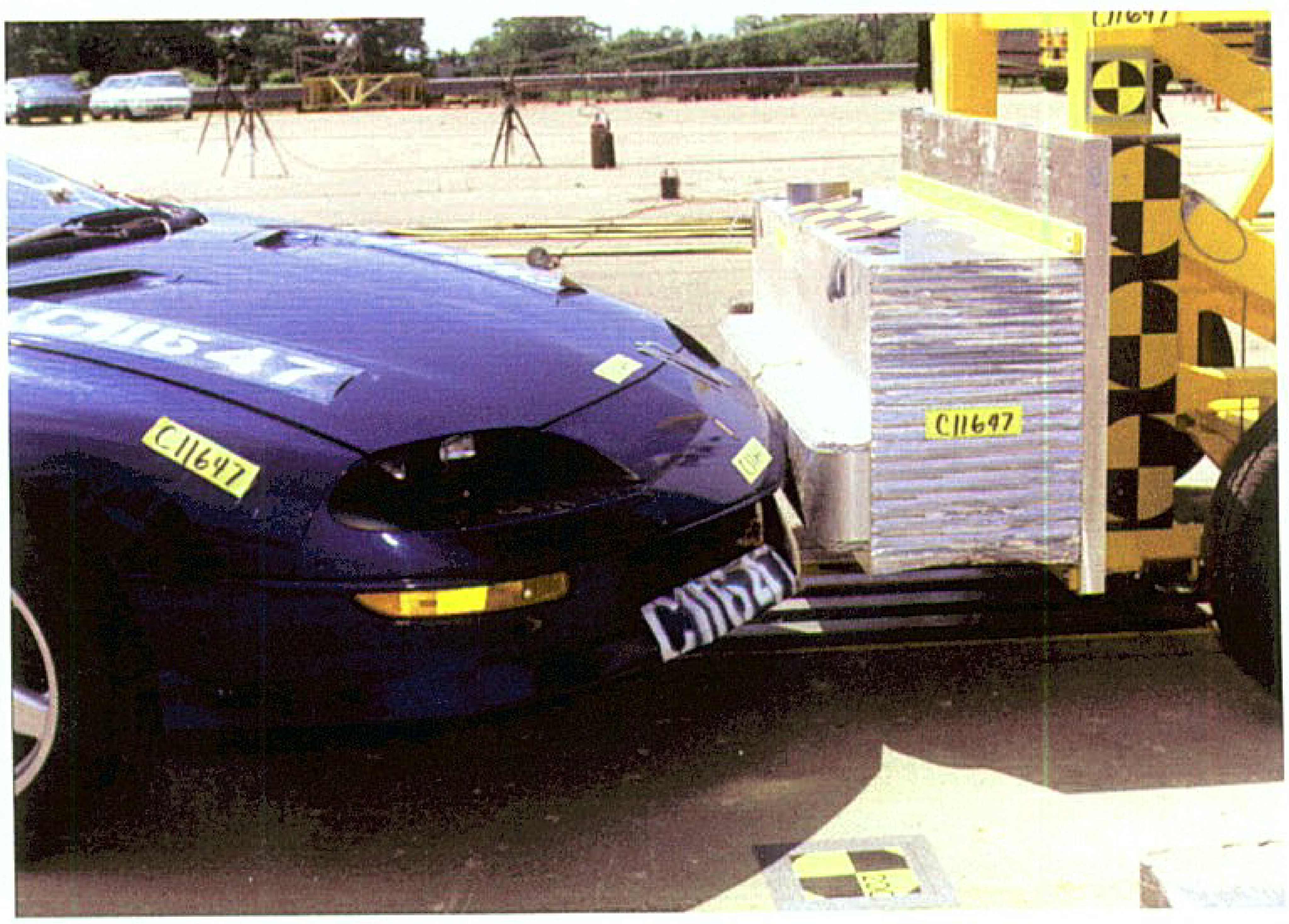



**Figure 27**

Pre-Test Photograph of Test C11647

The mass of the deformable barrier was 1638 kg (3611 lbs.). This mass was greater than what is used for FMVSS214 [4] tests (1367 kg or 3015 lb.) The height of the center of the simulated bumper form was 432 mm (17 in.) above grade (which is the same as specified in FMVSS214 [4].) The wheels of the moving barrier were oriented in the same direction of the barrier longitudinal axis. The wheelbase, trackwidth, and center of gravity of the moving barrier were all similar to what is specified for FMVSS214 [4] testing. The aluminum honeycomb barrier face was also the same as what is used for FMVSS214 [4] testing. The brakes of the moving barrier were activated at impact, resulting in an effective brake activation time of about 150 msec after impact. The test vehicle's brakes were on during the impact.

The impact velocity was measured with radar and was 104.3 km/h (64.8 mph).

#### **4.1.2.** Vehicle Description

The test vehicle was a 1997 Chevrolet Camaro (VIN: 2G1FP22K2V2108702) which had a test mass of 1850 kg (935 kg front, 915 kg rear) which included the two ATDs, crash test instrumentation, and Stoddard Solvent in the gasoline tank. First, the fuel tank's unusable capacity was filled with Stoddard Solvent, then 55.7 liters of Stoddard were added to the unusable capacity of the tank. (55.7 liters represents 95% of the usable capacity of 58.6 liters.) The engine was operating at impact with complete engine compartment fluids, including battery electrolyte. The radio, high beam headlights and air conditioning were all operating at impact.

Pre-test Engine Warm-up Procedure

The engine was started approximately 56 minutes before impact as outlined in Table 2.

**Table 2.**

Engine Warm-Up Procedure for Test C11647

| | Time after initial engine start, (min) | Duration, (min) |
|---|---|---|
| Engine started (idle approximately 900 rpm) | 0 | 25 |
| Engine speed increased to 1200 rpm | 25 | 9 |
| Engine turned off for instrumentation set-up | 34 | 10 |
| Engine restarted, set to 1100 rpm | 44 | 12 |
| Impact | 56 | |

#### 4.1.3. Modifications to Production Vehicle

As with the other tests, the production vehicle was modified to fulfill the objectives of the project. A description of the modifications for test C11647 follows.

The production fuel tank was filled to 95% of its usable capacity with Stoddard Solvent. Gasoline was supplied to the engine from an auxiliary tank mounted in the rear cargo area similar to test C11591.

The rear seat was removed to facilitate the mounting of the crash test instrumentation, and the spare tire was removed for the test.

The vehicle's rear brake lines were cut and an auxiliary brake machine was installed to charge the rear brake lines. The purpose of using the brake machine was to help control vehicle kinematics after the impact by isolating the rear brakes to ensure the rear wheels would be locked even if the brake lines were severed towards the front of the vehicle. The front brakes were pre-charged by mechanically locking down the brake pedal, so the front brake fluid pressure would be at a steady state but charged condition to enable easy identification of fluid leaks. Unlike the pole impacts, no modifications were made to the front wheel brake calipers or pads.

The instrumentation of the engine compartment was similar to Test C11591 and again every reasonable attempt was made to make the added instrumentation as non-intrusive as possible so as not to affect the outcome of the test.

#### 4.1.4. Vehicle Measurements

Measurements recorded during this test, included:

- Front left rocker panel acceleration (longitudinal, lateral, and vertical)
- Front right rocker panel acceleration (longitudinal, lateral, and vertical)
- Rear left rocker panel acceleration (longitudinal, lateral, and vertical)
- Rear right rocker panel acceleration (longitudinal, lateral, and vertical)
- Left floorpan acceleration (longitudinal)
- Airbag sensing and diagnostics module (SDM) acceleration (longitudinal, lateral, and vertical)
- Left toepan longitudinal displacement (relative to floorpan, using string potentiometer)
- Driver's and passenger's air bag current (using non-intrusive clamp on current transducers)
- Tach signal voltage (voltage signal from the production engine speed sending unit)
- Engine motion (rotation of crankshaft using an auxiliary magnetic pickup transducer) (labeled "engine speed – MP1A" in Appendix G)
- Fuel pump current (at auxiliary fuel tank)

- Fuel pump voltage (at auxiliary fuel tank)
- Vehicle yaw angular velocity (measured using rate gyroscope located on the floorpan near the CG)

**4.1.5.** Photographic Coverage

High-speed 16 mm movie cameras were used to film the crash test. Cameras were located above, in front of, and to both sides of the test vehicle.

**4.1.6.** Moving Barrier Measurements

The following accelerations were measured on the deformable moving barrier:

- Moving deformable barrier at CG acceleration (longitudinal, lateral, and vertical)
- Moving deformable barrier at rear crossmember acceleration (longitudinal, lateral, and vertical)

**4.1.7.** Anthropomorphic Test Device (ATD) Measurements

Two 50$^{th}$ percentile male Hybrid III ATDs (FMVSS reference part 572, Subpart E) [6] were located in the front outboard seating positions. The seats were located in the fore-aft mid position, and the seat backs were at 26.5 degrees relative to vertical. The ATDs were restrained using the vehicle's lap / shoulder belts with the adjustable guide loop set in the third position from the top. In addition, the ATDs were restrained by the vehicle's frontal air bags. The ATDs were positioned per FMVSS 208 [5] guidelines and the pelvic angles were measured to be 21.9 degrees from horizontal for the left front ATD and 23.5 degrees for the right front ATD. The head target angle was at 0 degrees from horizontal for both ATDs.

Each Hybrid III ATD was instrumented to make the same measurements as on test C11591, except the following enhanced lower leg measurements were recorded for the left front occupant rather than the right front occupant as with C11591:

- Upper tibia shear load (Fx, anterior – posterior), left and right legs
- Lower tibia shear load (Fy, right - left), left and right legs
- Lower tibia bending moment (Mx, right – left), left and right legs

Standard lower leg instrumentation was recorded for both ATDs.

**4.1.8.** . Hydrocarbon Vapor Measurements

Hydrocarbon vapor was measured at the five following locations in the engine compartment:

- Near the fuel line (location #1)
- Above the left exhaust manifold (location #2)
- Above the left fuel rail (location #3)
- Above the right fuel rail (location #4)
- Near the catalytic converter (location #5)

The concentration of hydrocarbon vapors was measured using tin oxide sensors at each location [1]. In addition, the temperature from each of the tin oxide sensor was also measured to more accurately interpret the output of the gas sensors. Co-located with the tin oxide sensors were sample tubes which drew gas into collection tubes for subsequent analysis by gas chromatography [1].

**4.1.9.** Fluid Pressure Measurements

Pressures in several of the vehicle's fluid systems were measured to help identify fluid leaks and the time during the impact when they occurred. Pressure measurements included:

- Front brake system pressure (line tapped near ABS junction box, left side of engine compartment)
- Left side power steering system pressure (measured near power steering rack)
- Right side power steering system pressure (measured near power steering rack)
- Cooling system pressure (measured at thermostat housing)
- Auxiliary fuel supply line pressure (measured near the production fuel filter where auxiliary line was tapped into production line)
- Engine oil pressure (measured at the oil pressure sending unit)
- Transmission cooler fluid pressure (tapped into transmission fluid cooler line)

A fluorescent dye was added to the cooling system to help identify coolant and to distinguish it from other fluids.

**4.1.10.** Additional Electrical Measurements

The following additional electrical measurements were made to identify possible shorts, arcing or overheated circuits.

Hall – effect clamp - on current monitoring transducers were used to measure the following currents:

- Alternator cable (measured at alternator)
- Battery main (measured near battery)
- Starter cable (measured near battery)

- Fusible link A: HVAC blower (measured near positive terminal on right shock tower)
- Fusible link B: Relay center (measured near positive terminal on right shock tower)
- Fusible link C: Relay center (measured near positive terminal on right shock tower)
- Fusible link E: Ignition (measured near positive terminal on right shock tower)
- Fusible link F: Radio (measured near positive terminal on right shock tower)
- Fusible link J: Taillight (measured near positive terminal on right shock tower)
- Fusible link K: ABS fuse #6 (measured near positive terminal on right shock tower)
- Fusible link Z: Headlight switch (measured near positive terminal on right shock tower)

Voltages were measured on the following circuits:

- Ignition (measured under instrument panel inside of passenger compartment)
- Left front headlight low beam (measured at right front headlight)
- Left front headlight high beam (measured at right front headlight)
- Starter (measured at terminal on starter)
- Battery (measured at terminal on battery)
- Alternator (measured at terminal on alternator)

**4.1.11.** Evaluation of the Crashworthiness of Potential Fire Detection or Suppression Technologies

Similar to test C11591, devices representing four different fire detection technologies were included on this test: optical sensors, thermal wires, pneumatic wires, and fire coils.

The experimental thermal wire fire detector was mounted to the underside of the hood, below the hood liner. This detection wire was the same type and located in the same place as test C11591.

A pneumatic fire detector was also included and was also located on the underside of the hood below the hood liner. The location of the pneumatic detector was slightly different than for test C11591. The tube was looped and bundled with the thermal wire and mounted under the rear-center portion of the hood. The tube also passed under the left rear edge of the hood to the pressure transducer, which was rigidly mounted near the left rear corner of the hood.

The thermal wire and pneumatic device were both supplied by Dual Spectrum (Santa Barbara, CA).

Figure 28 shows the location of the thermal, pneumatic, and fire coil devices. The pneumatic tube is not easily visible due to its thin diameter, but the pressure transducer can be seen at the very right edge of Figure 28 (right in photograph, left on vehicle).

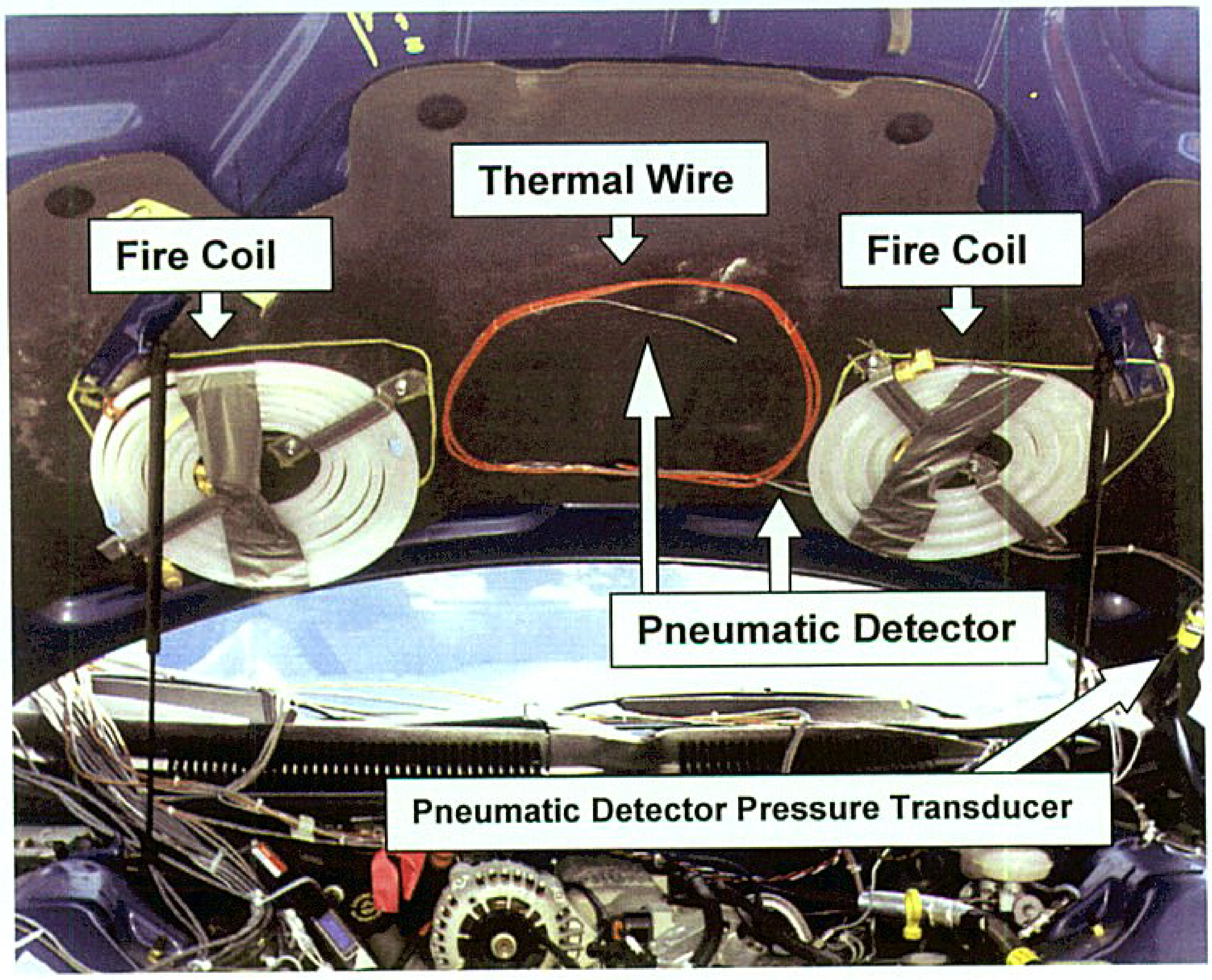



**Figure 28**

Thermal wire, pneumatic, and fire coil detectors

Test C11647

Similar to test C11591 two fire coils (supplied by POWSUS, Inc.) were also included under the hood. These were the same as for test C11591 except for the following differences. The two coils were sealed at each end with a brass fitting rather than an ultrasonic weld. Because fluid was lost through the welds on test C11591, the welds were eliminated. The use of a brass fitting is likely not feasible for a production unit, however the intent here was to determine whether the coils themselves (independent of the welds) would be crashworthy. Also, the coils were mounted differently than for test C11591. An aluminum plate was mounted between the hood liner and the hood directly above each coil. Each plate was approximately the same size as the coils and cannot be seen in Figure 28 because the liner hides them. The purpose of the plate was to improve the mounting of each coil. Two fabricated aluminum straps that spanned the entire radii of the coil and were attached to the aluminum plates with sheet metal screws and were used to secure each coil.

Two optical sensors (supplied by Dual Spectrum) were mounted in the engine compartment. These sensors and their locations were similar to test C11591.

**4.2.** *Summary of Test Results*

Post-test photographs of the vehicle are shown in Figure 29 and Figure 30.

**Figure 29**

Post-Test Photograph of Test C11647, Front Left View


**Figure 30**

Post-Test Photograph of Test C11647, Front Right View

**4.2.1.** Summary of Standard Vehicle Crash Test Measurements

The complete set of recorded and computed vehicle measurements are included in Appendix G (Plots 61 through 79, 83, 89, 90, 101, 102, 105, and 118).

Because this vehicle was impacted at a 22 degree angle, it experienced both longitudinal (relative to the vehicle) and lateral accelerations early during the crash event. The accelerations and velocity changes of the vehicle's rocker panels translated to a new coordinate system that is aligned with the initial motion of the moving barrier is one way to measure crash severity. This measurement could be compared to the vehicle's longitudinal acceleration and change in velocity in pure longitudinal crashes, such as the pole impacts, in which vehicle yaw is minimal. The axis of the vehicle and barrier are shown in Figure 31, $a_o$ is the acceleration in the vehicle's longitudinal direction, $a_a$ is the acceleration in the vehicle's lateral direction, and $a_b$ is the acceleration in the barrier's initial longitudinal direction.

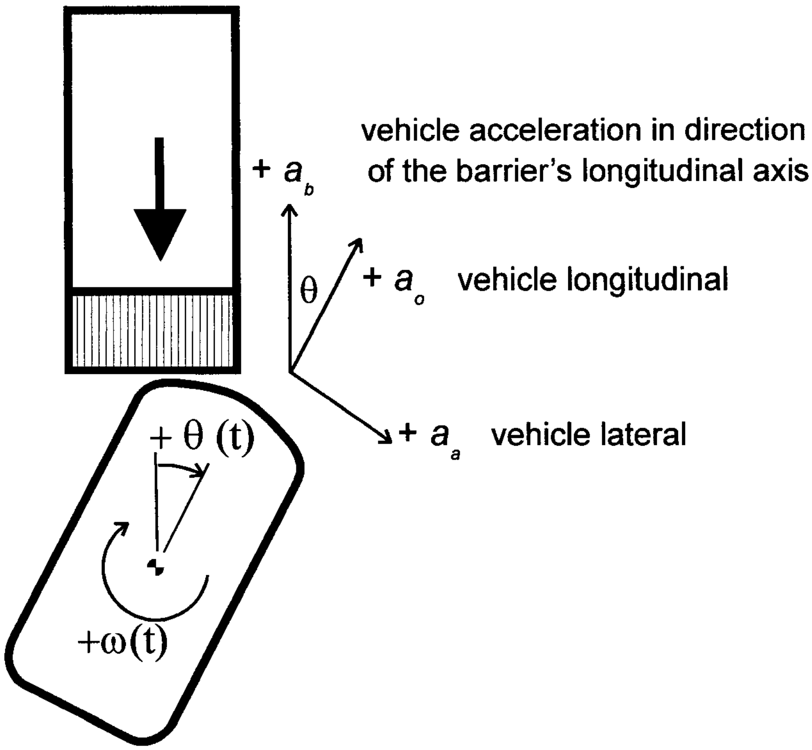



**Figure 31**

Vehicle and Barrier Axis

Test C11647

The translated measurement was calculated using the following steps.

The yaw velocity rate, $\omega(t)$ (which was measured and is shown in Plot 137, Appendix D) was integrated using a constant of 22° to yield the vehicle's angle $\theta(t)$. This angle, $\theta(t)$, is relative to the barrier's initial longitudinal axis and is shown in Figure 32.

$$\theta(t) = \int \omega(t)\, \delta t + 22^\circ$$

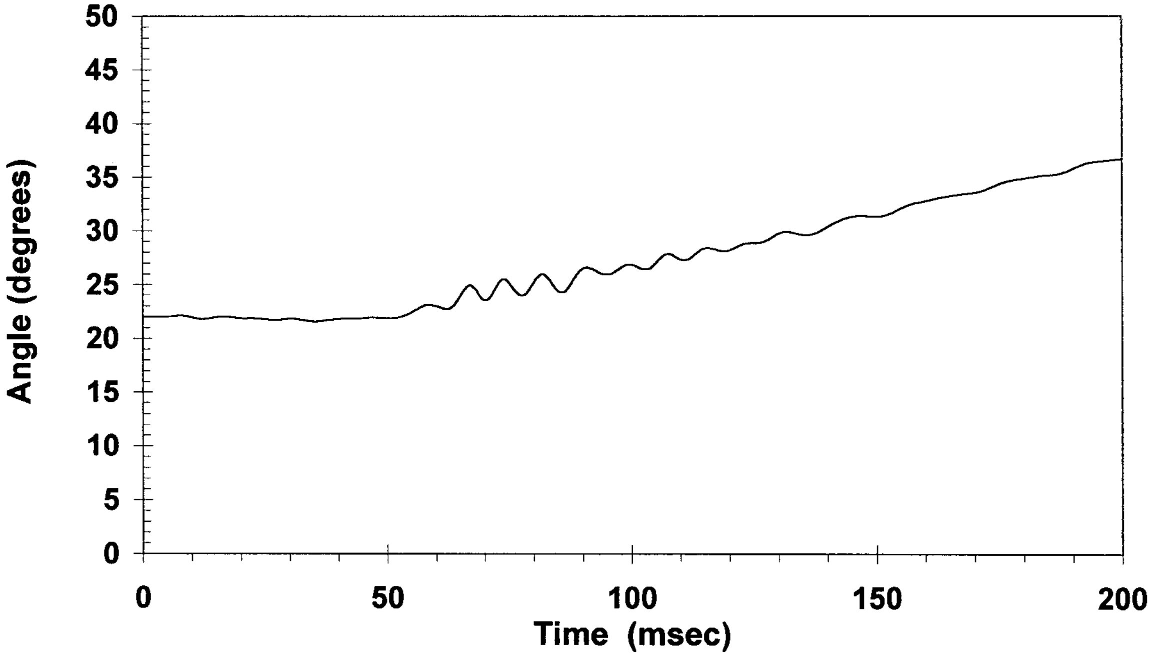



**Figure 32**

Vehicle's Yaw Angle, $\theta(T)$

Test C11647

Next, the following data channels were filtered at SAE class 60 [8] :

Right front rocker panel longitudinal acceleration, $a_{rfo}(t)$, (Plot 64, Appendix G)

Right front rocker panel lateral acceleration, $a_{rfa}(t)$, (Plot 65, Appendix G)

Left rear rocker panel longitudinal acceleration, $a_{lro}(t)$, (Plot 68, Appendix G)

Left rear rocker panel lateral acceleration, $a_{lra}(t)$, (Plot 69, Appendix G)

Next, the right front rocker resultant acceleration in the direction of the barrier's initial longitudinal axis, $a_{rfb}(t)$, was calculated using the following formula (Figure 33):

$$a_{rfb}(t) = a_{rfo}(t) \cos\theta(t) - a_{rfa}(t) \cos(90^\circ - \theta(t))$$

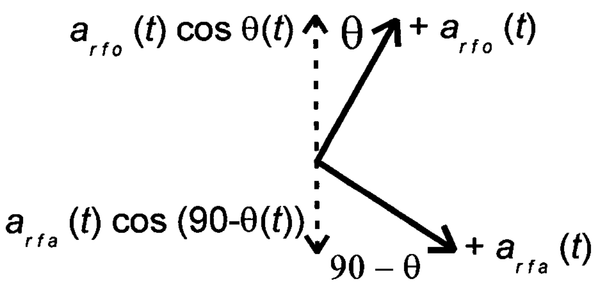



**Figure 33**

Translation of Accelerations to the Barrier's Initial Axes

In a similar fashion, the left rear rocker resultant acceleration in the direction of the barrier's initial longitudinal axis, $a_{lrb}(t)$, was calculated using the following formula:

$$a_{lrb}(t) = a_{lro}(t)\cos\theta(t) - a_{lra}(t)\cos(90^\circ - \theta(t))$$

The two locations were averaged to yield $a_{avgb}(t)$, the averaged vehicle acceleration in the direction of the barrier's initial longitudinal axis, which is shown in Figure 34.

$$a_{avgb}(t) = [a_{rfb}(t) + a_{lrb}(t)] / 2$$

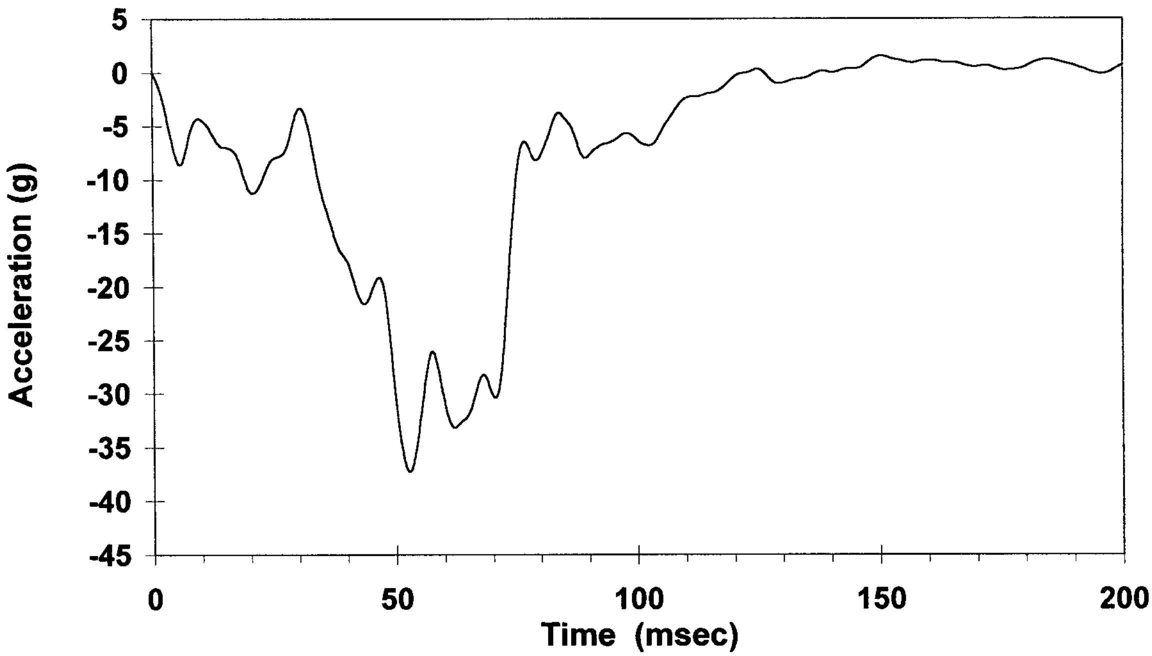



**Figure 34**

Vehicle's Averaged Acceleration In The Direction Of The Barrier's Longitudinal Axis, $A_{avgb}(T)$

Test C11647

This averaged acceleration was integrated to give $v_{avgb}(t)$, the vehicle's velocity in the direction of the barrier's initial longitudinal axis, which is shown in Figure 35. The vehicle experienced a change in velocity of 53 km/h in the direction of the barrier's initial longitudinal axis.

$v_{avgb}(t) = \int a_{avgb}(t)\, dt + 0$ (the vehicle's initial velocity was 0)

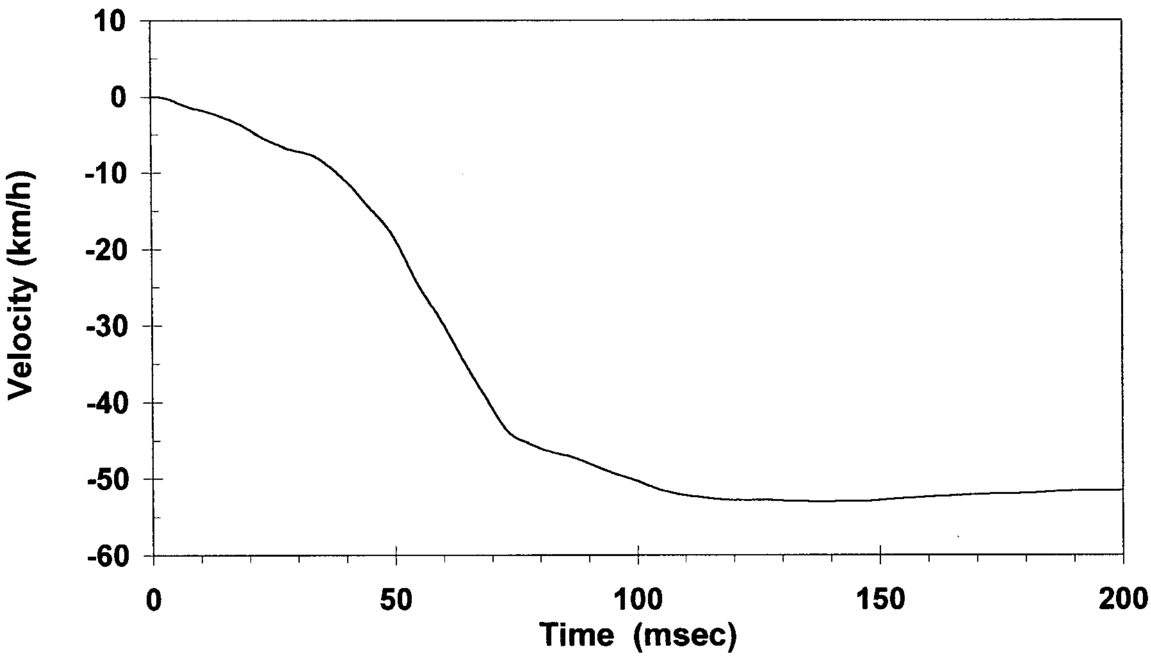



**Figure 35**

Vehicle's Averaged Velocity in the Direction of the Barrier's Longitudinal Axis, $V_{avgb}(T)$

Test C11647

The displacement of the driver's side toe pan was approximately 168 mm as shown in Figure 36 and Plot 79 Appendix G.

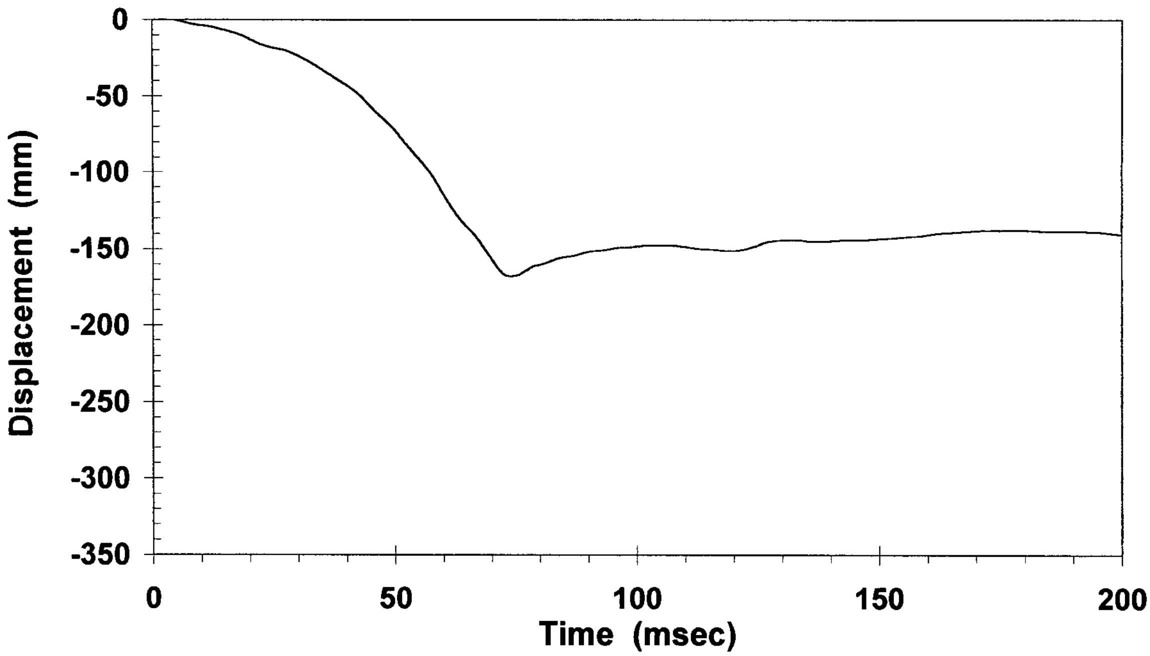



**Figure 36**

Left Toepan Displacement, Relative to Floorpan

Test C11647, filtered at SAE class 60 [8]

The current measurements of the driver and passenger air bag circuits indicated that both air bags deployed at 23 msec (Appendix G, Plots 101 and 102.)

The engine motion measurement is shown in Appendix G, Plot 89 and recreated here as Figure 37. This measurement indicated that the engine was turning at normal speed through about 40 msec after which it began to slow. The engine motion stopped by about 50 msec after impact.

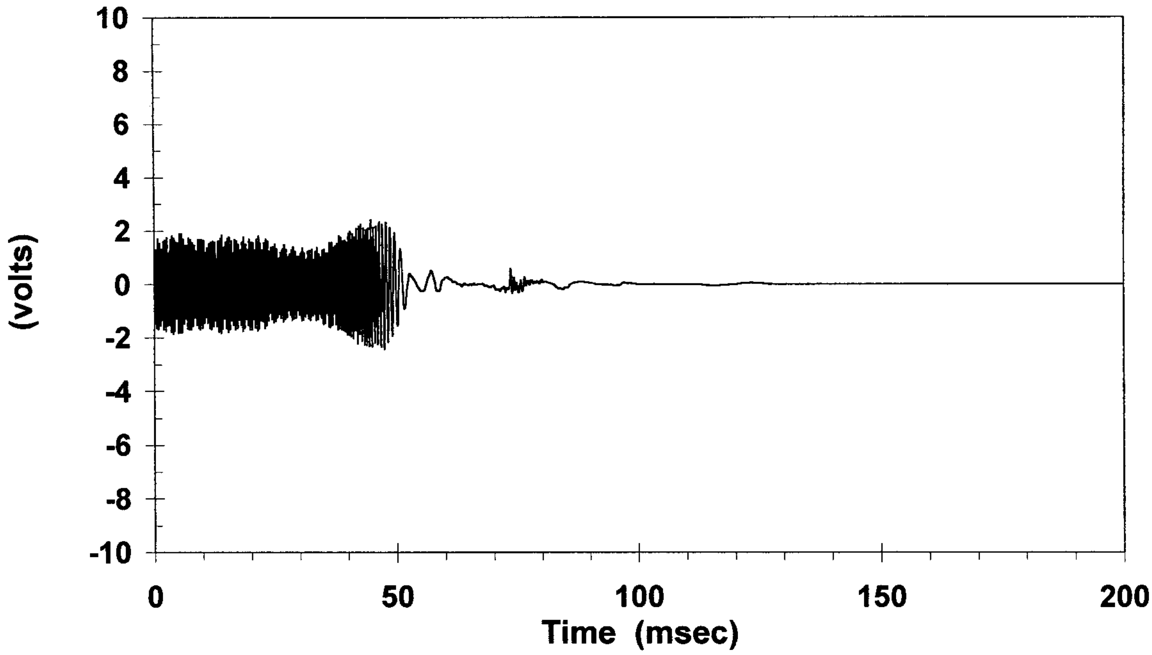



**Figure 37**

Engine Motion

Measured using Auxiliary Magnetic Pickup Transducer, Test C11647

Figure 38 and Plot 105 in Appendix G shows the fuel pump current during the impact. The fuel pump drew about 6.5 amps before impact which continued through about 25 msec after impact. By 30 msec, however, the current had dropped to zero indicating the pump was off. This is consistent with the other frontal tests of this series in that, the fuel pumps have lost electrical power early (well before 100 msec) in every test (not requiring the pumps to be "timed-out" by the powertrain-control-module). For this particular test, the vehicle's electrical system lost voltage temporarily at about 25 msec. (Shown as a drop from 13.5 volts to near zero in Plot 86, and Figure 39). The fuel pump voltage decayed from 121 volts to zero from about 30 msec to 80 msec as shown in Plot 83. This decay of the fuel pump voltage was also similar to other tests conducted for this project. Bench-tests on fuel pumps for this vehicle as well as others indicated a gradual decay (lasting 40-150 msec) when current flow was stopped to the motor. This is likely due to the windings of the motor producing a voltage drop as the motor stops.

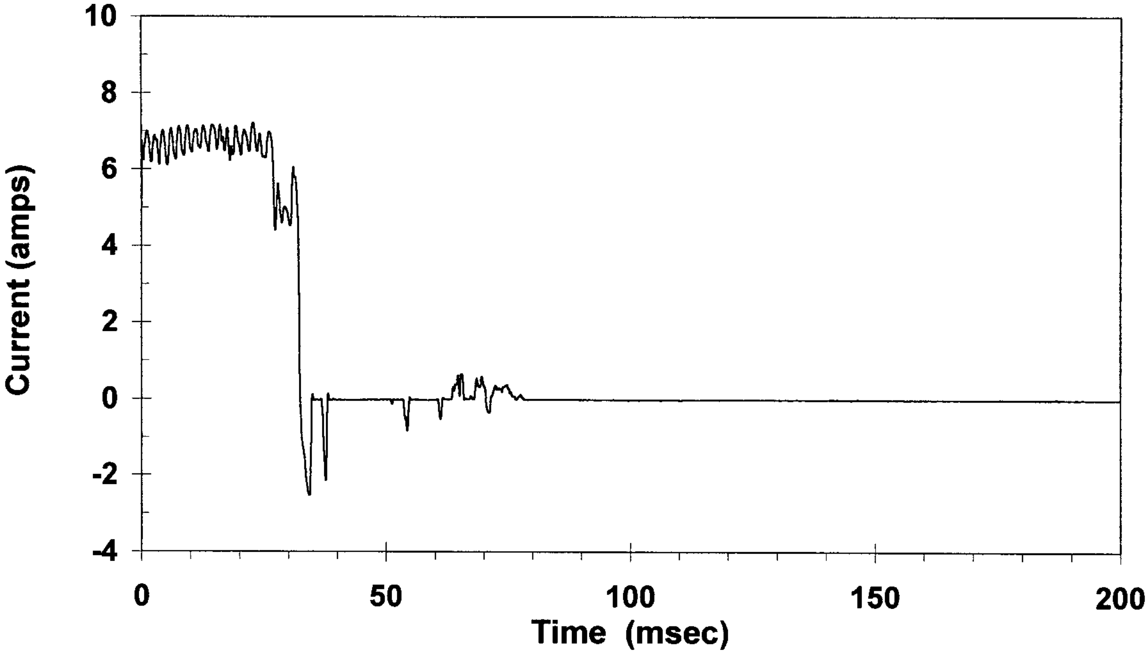



**Figure 38**

Fuel Pump Current

Test C11647

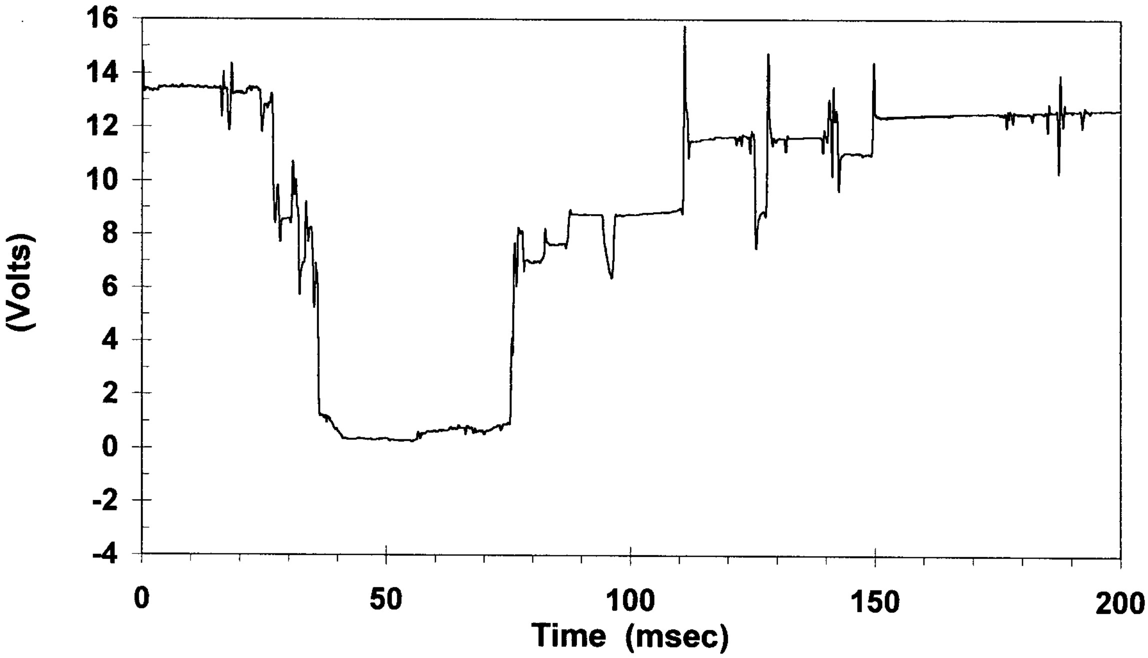



**Figure 39**

Ignition Voltage

Test C11647

### 4.2.2. Summary of Recorded Barrier Measurements

The acceleration measurements and related computed values from the moving barrier are included in Appendix G (Plots 119 through 137).

The longitudinal velocity of the barrier's CG is re-created here as Figure 40. The barrier sustained a velocity change of about 63 km/h (39 mph) in 140 msec.

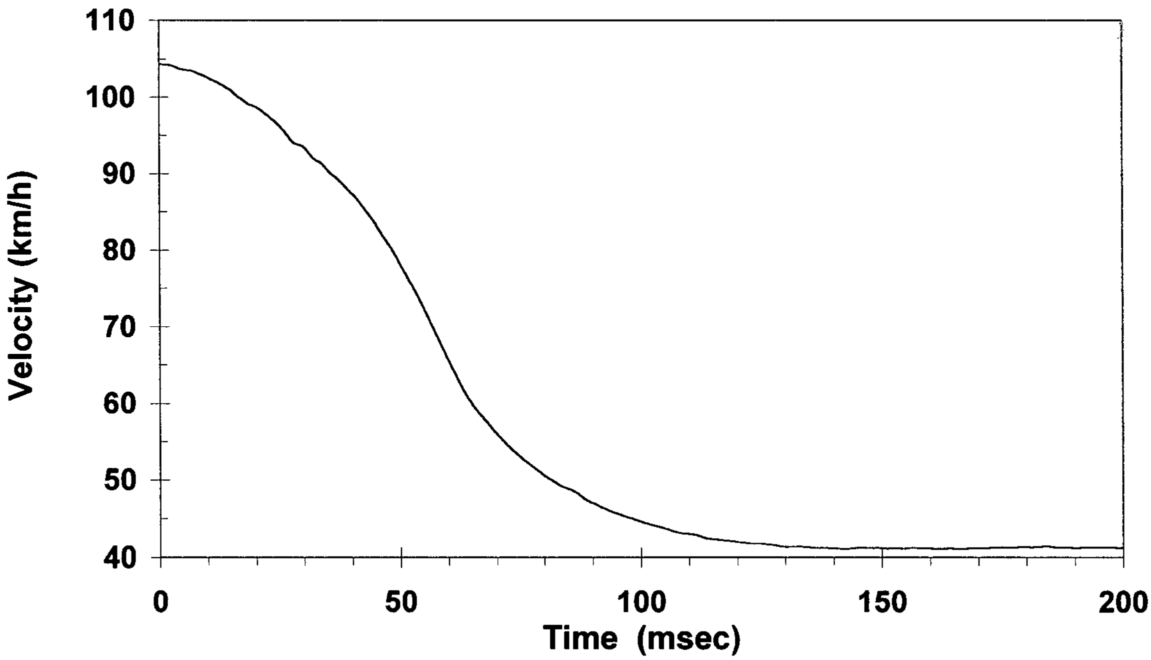



**Figure 40**

Moving Deformable Barrier Longitudinal Velocity at CG

Test C11647

### 4.2.3. Summary of Recorded ATD Measurements

The complete set of recorded and computed ATD measurements are included in Appendix G (pages i and ii, and Plots 1 through 60).

For the left front ATD, only the upper left tibia moment (Mx, My resultant) exceeded its IARV. Its peak value was 234 Nm (Plot 17) which exceeded the IARV of 225 Nm by 4%. The computed lower leg index for the left leg (Plot 23) which uses the upper tibia bending moment also exceeded its IARV. The leg index was 1.14 compared to its IARV of 1.00.

All other measurements on the left front ATD were below their respective IARVs.

For the right front occupant position, all recorded injury measurements were below their respective IARVs.

**4.2.4.** Summary of Hydrocarbon Vapor Measurements

A complete set of the recorded measurements is included in Appendix H, Figures H1 through HH5, and Appendix G, Plots 91 through 100. The signal cable from the vapor sensor located near the fuel line (location #1) was cut during the crash test and no data was recorded. Of the remaining four locations, the measurement near the left exhaust manifold (location #2) was the highest (Appendix H, Figure H2 and Figure 41.) The hydrocarbon gas concentration exceeded 5 % for the first 15 seconds after the impact and exceeded 1% for the first 45 seconds.

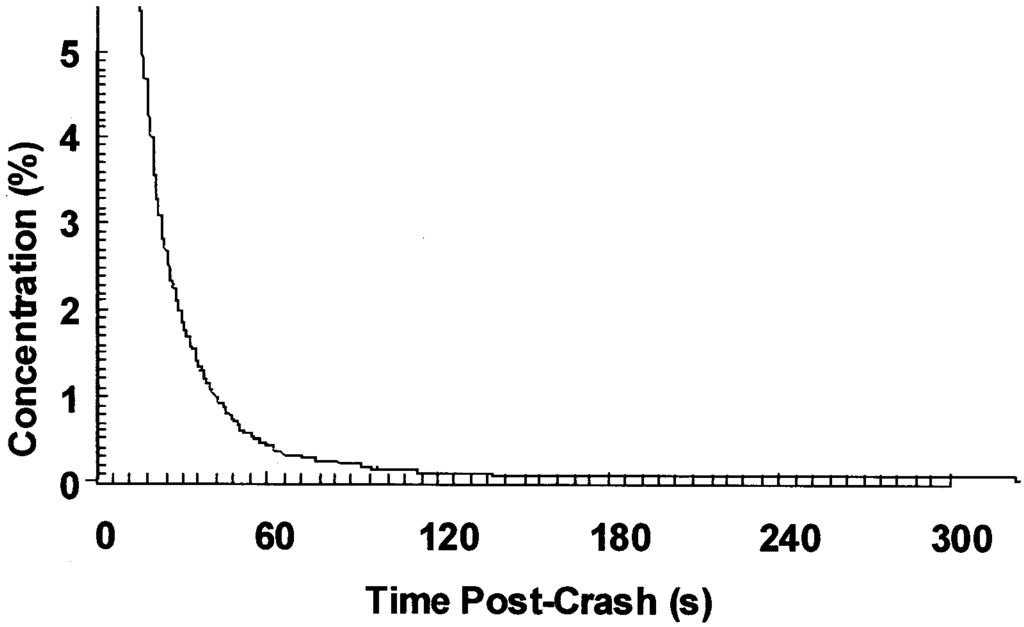



**Figure 41**

Concentration of Hydrocarbon Gas Measured near Left Exhaust Manifold (Location #2)

Test C11647

The chromatograms from the GC/FID analysis on samples collected at this location are shown in Figure 42 (background sample taken before the test) and Figure 43 (analysis of sample taken post-test.) The peaks in Figure 43 indicate the presence of vapors from engine coolant and power steering fluid. This was determined by matching the chromatogram peaks to those of head space samples taken in the laboratory.

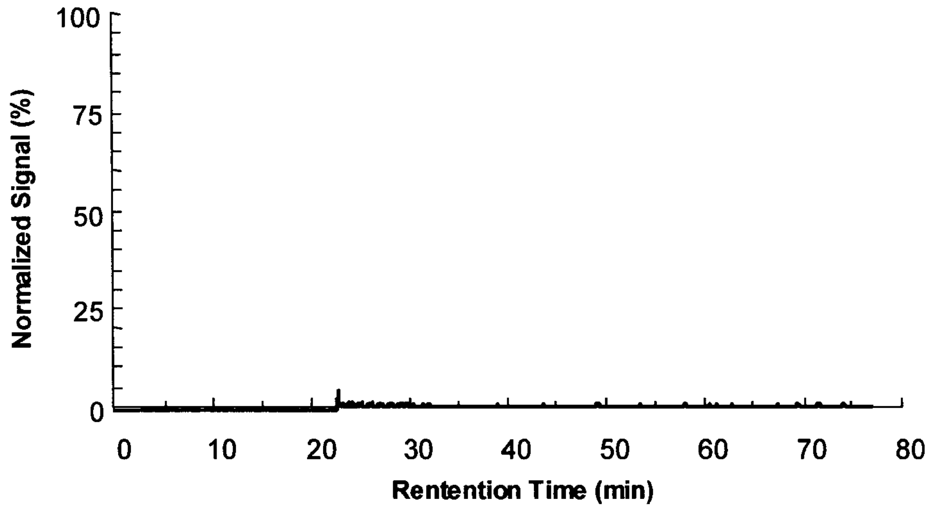



**Figure 42**

GC/FID Analysis of Hydrocarbon Vapor Background Sample Collected near Left Exhaust Manifold (Location #2) Before the Test.

Test C11647

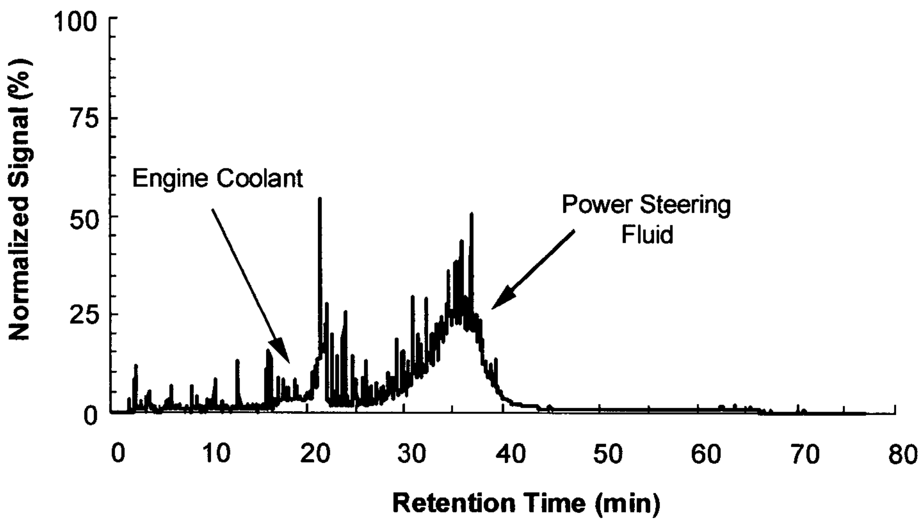



**Figure 43**

GC/FID Analysis of Hydrocarbon Vapor Sample Collected near Left Exhaust Manifold (Location #2) Post-test.

Test C11647

#### 4.2.5. Summary of Fluid Pressure Measurements

The dynamic pressure measurements of the engine compartment fluids are shown in Appendix G, Plots 138 through 146.

The transmission fluid pressure (shown in Plot 146) indicated a drop in pressure from approximately 200 kPa at 20 msec to zero at around 180 msec. This indication of a leak in transmission fluid was supported by the post-test vehicle inspection which revealed a fractured transmission tail shaft housing.

The engine oil pressure (shown in Plot 145) also indicated a drop in pressure from an initial value of 350 kPa to near zero by 70 msec. However, the post-test vehicle inspection did not reveal any leaks of the engine oil. The drop in measured pressure was likely due to the engine stopping at around 50 msec.

The fuel supply pressure (Plot 140) indicated some fluctuations in fuel pressure during the impact, but did not indicate a complete loss in pressure. Thus a gasoline leak was not evident. This was also supported by the post-test vehicle inspection which did not reveal any leaks in the fuel system. The fluctuations in fluid pressure during the impact are similar with the results of the other frontal tests. Similar to test C11591, both the unbiased measurement (which was forced to zero and is shown in Plot 139), and biased measurement (more representative of actual pressure and shown in Plot 140) are presented.

The cooling system pressure measurement (Plot 143) indicates a rapid rise in pressure at 20 msec before the measurement is overloaded. This is likely due to damage to the transducer caused by the impact. Consistent with other frontal tests, however, the radiator was crushed and coolant was lost. The loss of coolant likely occurred after 20 msec.

The left power steering pressure measurement indicated a gradual change in pressure from zero to 6000 kPa back to zero. No pressure initially was expected if the vehicle is not turning. Again, the rise in pressure could be due to the compression of the system during the crush. No leaks in the power steering system were identified during the post-test vehicle inspection.

The measurements of the brake system pressure and right power steering pressure were generally inconclusive due to instrumentation malfunction or damage during the impact. However, the post-test vehicle inspection did not reveal leaks in either of these fluid systems.

#### 4.2.6. Summary of Additional Electrical Measurements

The results of the electrical measurements made in the engine compartment are shown in Appendix G (Plots 80 through 82, 84 through 86, and 103, 104, and 106 through 114).

The starter voltage (Plot 80), battery voltage (Plot 81), alternator voltage (Plot 82), and ignition voltage (Plot 86) all indicated a similar waveform. The ignition voltage is recreated as Figure 39. The voltage trace temporarily dropped from 13.5 volts to near zero from 40 msec through 70 msec before incrementally increasing back to over 12 volts. This drop in voltage was likely caused by additional loading on the battery as a result of temporary shorts. During the post-test vehicle inspection, cuts through the insulation on the starter cable were identified in three locations: near the air conditioning accumulator mounting bracket, near the cooling fan motor, and near the frame. Indications of possible grounding were apparent at the accumulator and cooling fan locations. The starter cable current measurement was inconclusive due to overloading and possible damage to the transducer during the impact. (All references to current measurement overload imply an overload of the crash test instrumentation and do not mean an overload of the rated capacity of the circuit.) However, the first indication of current overload is just before 40 msec, which correlates to the first indication of drop in system voltage.

The left front headlight voltage measurements are shown in Plots 84 (low beam voltage) and 85 (high beam voltage.) The low beam voltage follows the general waveform as the battery voltage (Plot 81) except for a few additional voltage drops to near zero, such as the one indicated at around 140 msec. The post-test vehicle inspection revealed that both the high and low beam voltage monitoring wires pinched and were possibly shorted by the frame. These are the wires that were included for test purposes to measure the voltage and would not be present under normal circumstances. Thus, these shorts are an artifact of the test. They were likely responsible for the temporary drops to zero voltage (such as the one at 140 msec) on the low beam voltage (Plot 84). The high beam measurement dropped and stayed at zero volts after 30 msec. This measurement was also affected by the pinched monitoring wires and is an artifact of the test instrumentation as well. It is possible that these shorts of the instrumentation wires contributed to the additional loading on the battery and were at least partially responsible for the drops in system voltage. Any additional current flow caused by shorts would have been measured by the current transducer on fusible link "E" which protects the headlight circuits. This link was not open following the test indicating the current flow was not great enough to activate the link. The current measurement indicated an overload beginning at 25 msec but this could have been due to damage to the current transducer during the test. (Plot 110).

Consistent with previous tests, the current measurements were very difficult to analyze following the test and most times were inconclusive due to the limited range of the current transducers and possible damage during the test.

The battery current measurement (Plot 103) indicated normal current draw of about 65 amps at impact. This measurement exceeded its full scale range (80 amps) from about 30 msec through 140 msec (the approximate time and duration of vehicle crush.) The battery current measurement then returned to about 10 amps and remained less than 20 amps through 800 msec. (Plot 103 only displays the first 240 msec of data.)

The alternator cable current measurement (Plot 106) exceeded its full scale range (20 amps) under normal operation at time zero. However, the current drops to near zero beginning at about 50 msec. This is likely due to the rotation of both the engine and alternator stopping at about 50

The current measurements on fusible links A, C, F, J, and Z (Plots 107, 109, 111, 112, and 114) all indicated a normal current draw at time zero, followed by temporary instrumentation overloads during the impact, and all, except for fusible link J, returned to near zero after the impact. None of these fusible links were open following the test, indicating that none exceeded their rated current capacity during the impact. The fusible link J current measurement indicated about 9 amps at 240 msec, which was due to the tail lights remaining on after the impact. (Fusible link J protected the tail light circuit.)

The current measurements from fusible links B and K (Plots 108 and 113) indicated little or no current, other than instrumentation noise for the duration of the event.

#### 4.2.7. Summary of Numerical Film Analysis

No numeric film analysis was done for this test.

#### 4.2.8. Results of Post-test Static Rollover

No static rollover was conducted on this vehicle following the crash test for reasons described in the results of the first offset frontal pole impact on the passenger van. [2]

#### 4.2.9. Results of the Evaluation of the Crashworthiness of Potential Fire Detection or Suppression Technologies

The results of the electrical measurements of the experimental fire detectors are shown in Appendix G (Plots 87, 88 and 115 - 117).

Neither the monitoring of the thermal wire (Plot 115) or the pneumatic fire detector (Plot 116) indicated any electrical closures during the test. This indicates that these two devices at their respective mounting locations were crashworthy for this crash configuration. That is, they did not activate and were not damaged during the crash.

Neither of the two optical detectors indicated activation during the event (Plots 87 and 88). An activation of these sensors would have been indicated by a rise in the recorded voltage to about 12 volts for a duration of 250 msec. A small interface box was included on these crash tests to insure that a rise in voltage (indicating an activation of the sensor) would have a duration of 250 msec to insure that it could be detected. The recorded traces do, however, indicate drops in the voltage signal to zero for short durations.

The cause of these voltage drops was not positively identified, but they could be due to loose connections in the circuitry, wiring, or connectors which opening during the impact. The sensor performed as expected in bench tests following the crash test.

No measurements were recorded during the test to evaluate the integrity of the fire coils located on the under side of the hood. However, post-test observations and measurements indicated that no fluid was lost during the impact.

**4.2.10.** Summary of Post-test Vehicle Inspection

The vehicle was disassembled and inspected to identify air passages from the engine compartment into the passenger compartment, the locations of any fluid leaks, the locations of any electrical shorts identified during the crash test, and any contact between combustible materials and hot surfaces.

As with the other tests, crash-induced openings are identified independent of their potential contribution to fire propagation.

The following crash-induced openings into the passenger compartment were identified during the post-test inspection:

- The HVAC module crushed during the impact resulting in an approximate 50mm x 20mm opening.

- A separation of a floorpan weld was identified on the driver's side (near the rocker panel and just rearward of the hinge pillar) which resulted in an opening approximately 300mm long x 20mm wide.

- A separation of the steering column mounting bracket and the forward bulkhead resulted in an opening that measured approximately 50mm x 10mm.

- Three smaller separations were identified on the passenger floorpan and the passenger side of the tunnel. The three openings were approximately measured to be 30mm x 30mm, 40mm x 20mm, and 30mm x 5mm.

The following fluid leaks were identified during the post-test inspection:

- Transmission fluid: tailshaft housing fractured, fluid lost
- Engine coolant: radiator crushed, coolant lost
- Washer solvent: reservoir crushed, empty
- Power steering fluid: reservoir and pump crushed, fluid lost

There were no leaks identified in the brake system, fuel lines, engine oil system, and battery.

As previously reported in section 4.2.6 cuts in the starter cable and pinching of the headlight monitoring circuit were identified during the post test inspection. No other electrical shorts were identified. The vehicle was also inspected for possible contact between normally hot surfaces and combustible materials. Only one observation was noted. A small amount of plastic was found melted on the left exhaust manifold. The source of the plastic was from a piece of the radiator shroud. This was determined by a post-test GC/MS analysis of the melted residue and of an intact piece from the radiator shroud. There was no indication of flaming or fire propagation.

**4.3.** *Conclusions*

1. There were no fires observed during or after this crash test.

2. The electric fuel pump stopped by about 30 msec after impact due to the temporary loss of main vehicle system voltage (from about 25 msec to 110 msec.) The fuel pump did not recover with the main electrical voltage.

3. The vehicle's acceleration measurements were translated to a new coordinate system in line with the longitudinal axis of the moving barrier. The peak acceleration of the vehicle along this axis was 37 g (filtered at 60 Hz). The change of velocity of the passenger compartment along this same axis was approximately 53 km/h (33 mph).

4. The moving deformable barrier sustained a longitudinal velocity change of about 63 km/h (39 mph) in 140 msec.

5. Both air bags deployed at 23 msec past time zero.

6. Only the driver (left front) ATD's upper left tibia moment (resultant of Mx and My) was above its respective IARV. All other measurements on the left front ATD and all measurements on the right front ATD were below their respective IARV.

7. There was approximately 168 mm of toe pan intrusion on the driver's side.

8. The engine stopped by 50 msec after impact.

9. Of the five locations monitored for hydrocarbon vapor concentration, the one near the left exhaust manifold (location #2) indicated the highest concentration. The hydrocarbon gas concentration exceeded 5 % for the first 15 seconds. A subsequent GC/FID analysis of the vapors collected at this site indicated the vapors were from engine coolant and power steering fluid.

10. No liquid gasoline or Stoddard Solvent spilled off of the vehicle. No leaks in the fuel system were identified.

11. Other engine compartment fluids that leaked included transmission fluid, engine coolant, power steering fluid, and washer solvent.

12. The electrical monitoring of the experimental thermal wire fire detector attached to the underside of the hood did show evidence of any electrical closures throughout the test, demonstrating crashworthiness for its given mounting location and this crash configuration.

13. Monitoring the experimental pneumatic fire detector did not indicate any contact closures during the test. For this test configuration and mounting location, the pneumatic wire device also demonstrated crashworthiness.

14. The experimental optical fire detectors did not activate during the crash. However, their output signal did drop to zero intermittently during the impact possibly due to loose electrical connections in the signal conditioning of the sensors (not in the sensors themselves.)

15. Although no measurements were recorded during the test describing the integrity of the experimental fire coils, post-test measurements indicated that no fluid was lost during the impact, again demonstrating crashworthiness for this crash condition.

16. Six crash-induced structural openings into the passenger compartment were identified. Their locations and approximate dimensions were: A 50mm x 20 mm opening in the crushed A/C evaporator housing, a 300 mm x 20 mm opening in the driver's side floorpan near the hinge pillar, a 50 mm x 10 mm opening near the steering column pass-through, and three smaller openings on the passenger side floorpan. None of these openings were evaluated for their possible contribution to fire propagation.

17. There was only one identified contact between a normally hot surface and a combustible material identified. A piece of plastic from the radiator shroud contacted the left side exhaust manifold. The plastic melted, but was not charred or burned.

## 5. Conclusions of the Rear Wheel Drive Passenger Car Crash Test Series

From the data collected on this series of crash tests, several conclusions and observations can be made concerning post-collision fire potential. It is important to note that the intent of the crash tests was not to determine if a production vehicle met a crash test performance standard. Instead, the intent was to study how post-collision fires might start under a range of crash conditions.

Of the three tests conducted (two frontal and one rear impact), none resulted in a post-collision fire.

None of the three tests resulted in a leak in the fuel tank or in the fuel system.

For the two frontal tests in which the engine was operating, the fuel pump stopped by 40 msec in one test and 30 msec in the other. In both cases, the pump shut down due to a loss of main vehicle electrical power. In one case, the loss of main vehicle voltage was permanent due to the disconnection of the battery top from the battery and thus a disconnection of the terminals. In the other case, a drop in main vehicle voltage was temporary and lasted from 25 msec through 110 msec. The fuel pump did not begin operating again with the return of vehicle voltage. This temporary drop in system voltage was due to shorts in the electrical system resulting in additional loading on the battery. These shorts were also temporary, opening by 110 msec. The operation of the fuel pumps during the impacts was similar to what was observed in previous tests on a front wheel drive passenger van [2].

Also, consistent with the passenger van tests, numerous crash-induced electrical events were identified. For these tests on a rear-wheel drive passenger car, none of the electrical events resulted in a fire. The most significant shorts identified were starter cable shorts to ground on the oblique moving barrier impact. Cuts in the starter cable were identified at several locations, all were temporary, however, and resulted in a temporary drop in system voltage. For the rear impact test, shorts to ground were identified on two circuits, however, both were overload-protected. Also, similar to the passenger van test series, the electrical activity recorded proved to be quite difficult to analyze. This is because current measuring transducers are limited in their measurement range given the small space available for their installation. In addition electrical activity during a crash is very sporadic, with many intermittent and temporary events occurring in a very short amount of time (less than 150 msec).

Four different experimental fire-sensing or extinguishing technologies were evaluated for their crashworthiness. The thermal wire fire detectors and the pneumatic fire detectors proved crashworthy at their given mounting locations on all three crash tests. That is, they did not false activate or become damaged during the test. Optical fire sensors were included on the two frontal tests only. They did not activate in either test, however there were intermittent drops in their output voltage during the oblique moving barrier impact, possibly due to loose electrical connections. Experimental fire coils were included in the two frontal tests only. There was no loss of fluid (indicating crashworthiness) during the oblique moving barrier impact, but fluid was lost during the offset pole impact. There was not attempt to quantify the effectiveness of any of these devices at detecting or extinguishing fires during these three crash tests.

Consistent with the tests on other vehicles, crash-induced openings into the passenger compartment were identified. Their possible contribution to fire propagation was evaluated in fire propagation tests reported separately.

For the frontal pole impact, transmission fluid, engine coolant, washer solvent, battery electrolyte, engine oil, and brake fluid were released during the test. For the oblique moving barrier impact, transmission fluid, engine coolant, washer solvent, and power steering fluid was released.

Only one occurrence of contact between normally hot surfaces and combustible materials was identified during the three tests. For the oblique moving barrier test, the exhaust manifold contacted the radiator shield. There was no indication of melting, flaming, or propagation.

In general, the recorded injury measurements for the ATDs were below their respective IARVs. Only the driver's upper neck tension for the rear impact and the driver's upper left tibia moment for the oblique-moving barrier exceeded their IARV.

REFERENCES


1. Jensen J.L.; and Santrock J., "Evaluation of Motor Vehicle Fire Initiation and Propagation, Part 1: Vehicle Crash and Fire Propagation Test Program", Technical report submitted to the National Highway Traffic Safety Administration, Washington D.C., July 31, 1997.

2. Jensen J.L.; and Santrock J., "Evaluation of Motor Vehicle Fire Initiation and Propagation, Part 2: Crash Tests on a Passenger Van", Technical report submitted to the National Highway Traffic Safety Administration, Washington D.C., August 25, 1998

3. Ward's 1998 Automotive Yearbook, Sixtieth Edition, pages 291-299, Ward's Communications, Southfield, MI, 1998

4. Federal Safety Standards. Motor Vehicle Safety Standard No. 214 Side Impact Protection - Passenger Cars, Trucks, Buses & Multipurpose Passenger Vehicles with GVWR of 10,000 Pounds or Less. 60FR57838-39 (November 22, 1995).

5. Federal Safety Standards. Motor Vehicle Safety Standard No. 208 Occupant Crash Protection - Passenger Cars, Multipurpose Passenger Vehicles, Trucks, Buses. 61FR26845-46 (May 29, 1996).

6. Federal Safety Standards. Motor Vehicle Regulation No. 572, Test Dummies Specificatinos-Anthropomorphic Test Dummy for Applicable Test Procedures, Subpart E. October 23, 1986.

7. AGARD Report AR-330, "Anthropomorphic Dummies for Crash and Escape System Testing", Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France, July 1996

8. SAE J211 MAR 95, Instrumentation for Impact Test, SAE Recommended Practice, SAE Handbook, Vol. 3, 1996.

9. Santrock J; and Jensen J.L., "Evaluation of the Evaluation of the Crashworthiness of POWSUS Fire Coils for Underhood Motor Vehicle Applications.", Technical report submitted to the National Highway Traffic Safety Administration, Washington D.C., March, 1999

Appendix A

**Appendix A:** Anthropomorphic Test Device (ATD) Injury Assessment Reference Values (IARV)

# Appendix A:
## Anthropomorphic Test Device (ATD) Injury Assessment Reference Values (IARV)

The Injury Assessment Reference Values (IARV) used for the mid-sized male Hybrid III ATD are recreated here from the Advisory Group for Aerospace Research & Development, Report 330, "Anthropomorphic Dummies for Crash and Escape System Testing" [7].

| Body Region<br>Injury Assessment Criteria | Injury Assessment Reference Value for the mid sized male Hybrid III |
|---|---|
| **Head** | |
| HIC; $(t_2 - t_1) \leq 15$ msec* | 1000 |
| **Head/Neck Interface** | |
| Upper neck longitudinal shear force, +Fx and –Fx | Figure A1 |
| Upper neck axial force, compression, -Fz | Figure A2 |
| Upper neck axial force, tension, +Fz | Figure A3 |
| Upper neck longitudinal moment, flexion, +My | 190 Nm |
| Upper neck longitudinal moment, extension, -My | 57 Nm |
| **Chest** | |
| Resultant spinal acceleration | 60 g |
| Sternal deflection due to: | |
| Shoulder belt | 50 mm |
| Air bag (no belt) | 65 mm |
| Viscous Criterion (V*C) | 1 m/s |
| **Femur** | |
| Axial compression | Figure A4 |
| **Knee** | |
| Tibia-to-femur displacement | 15 mm |
| Knee clevis loads (med./lat. Compression) | 4000 N |
| **Tibia** | |
| Axial load, compression, Fz | 8000 N |
| Tibia index, TI = M/Mc + Fz/Fc | 1.0 |
| Where, | |
| M = resultant moment, (of Mx & My), for upper index | 225 Nm |
| M = anterior/posterior moment, My, for lower index | 225 Nm |
| Mc = critical bending moment | 225 Nm |
| Fc = critical compersive force | 35,900 N |

*: The Head Injury Criteria (HIC) is defined as: HIC = $(Aavg)^{2.5}$ $(t_2 - t_1)$, where Aavg is the average resultant acceleration of the center of mass of the head (expressed in G) for the time interval $t_2 - t_1$ (expressed in seconds).

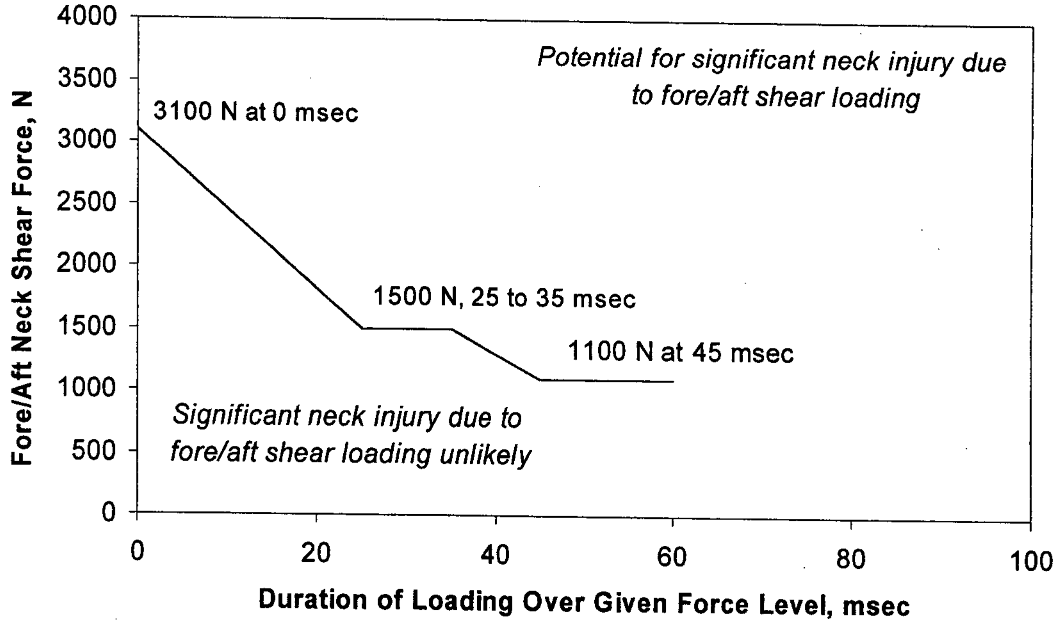



**Figure A1**

Injury Assessment Curves for Fore-and-Aft Sheer Forces Measured with Hybrid III Mid-sized Adult Male ATD [7]

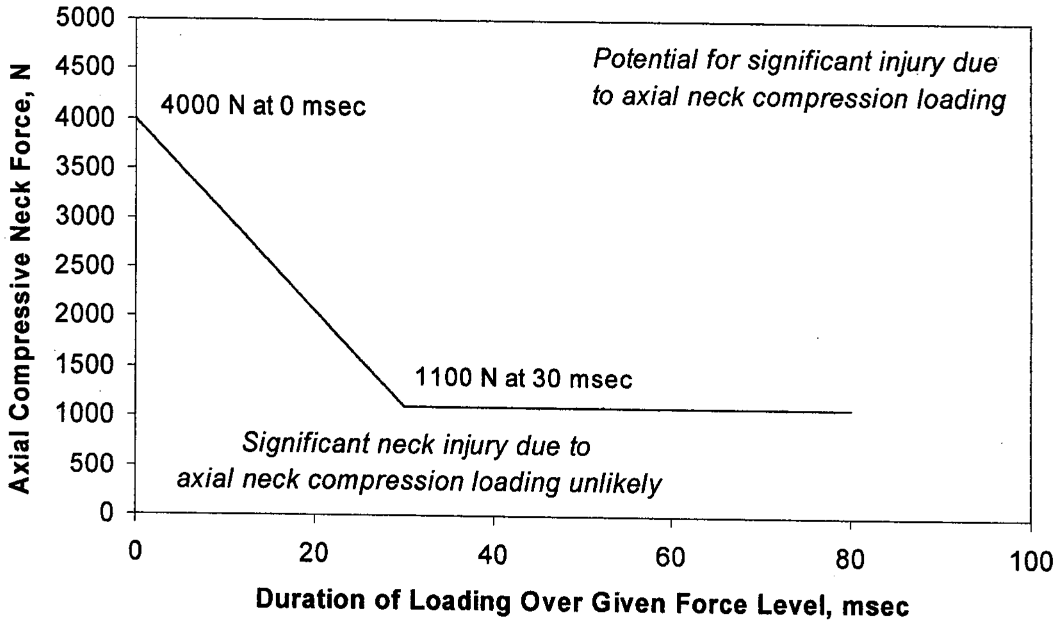



**Figure A2**

Injury Assessment Curves for Axial Neck Compression Measured with Hybrid III Mid-sized Adult Male ATD [7]

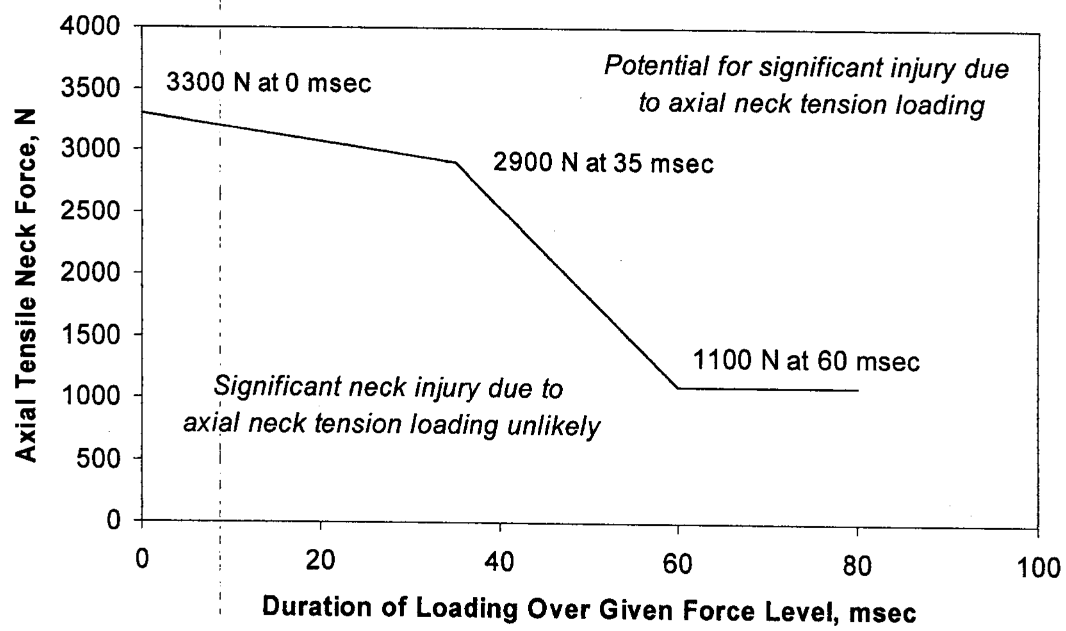
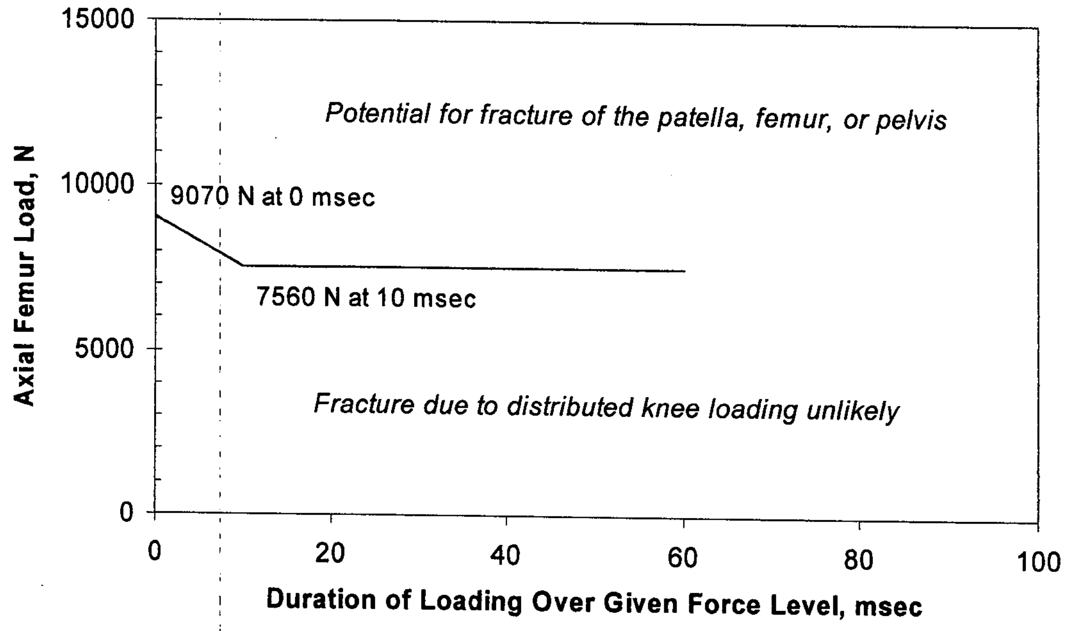



**Figure A3**
Injury Assessment Curves for Axial Neck Tension Measured with Hybrid III Mid-sized Adult Male ATD [7]




Injury Assessment Curves for Axial Compressive Femur Force Measured with Hybrid III Mid-sized Adult Male ATD [7]

# Appendix B

## **Appendix B**: C11408 data plots

# LEFT FRONT
# ANTHROPOMORPHIC TEST DEVICE SUMMARY DATA
## LTV MDB TO STATIONARY VEHICLE 84.7KM/H

.1408 REAR IMP 70% OVERLAP

R & D CTR 1VF46079 1FP87

ATD TYPE: GM50H
TEST DATE: 01/08/1997

| MEASURED QUANTITY | 100% OF IARV | 150% OF IARV | IAV VALUE | IARV |
|---|---|---|---|---|
| HIC, LIMITED TO 15 MS | | | 900 | 1000 |
| HIC, LIMITED TO 36 MS | | | 930 | 1000 |
| NECK FLEXION | | | 57NM | 190NM |
| NECK EXTENSION | | | 10NM | 57NM |
| NECK TENSION | | *** | 1.51 | 1.00 |
| NECK COMPRESSION | | | 0.02 | 1.00 |
| NECK SHEAR FORWARD | | | 0.27 | 1.00 |
| NECK SHEAR REARWARD | | | 0.08 | 1.00 |
| CHEST ACCEL | | | 45G | 60G |
| ‡ CHEST COMPRESSION W/O SH BELT | | | * | 65.0MM ‡ |
| ‡ CHEST COMPRESSION W/ SH BELT | | | * | 50.0MM ‡ |
| CHEST VISCOUS CRITERIA | | | * | 1.00M/SEC |
| FEMUR COMP, LEFT | | | * | 10000N |
| FEMUR COMP, RIGHT | | | * | 10000N |
| [illegible]MUR DURATION ASSESS, LEFT | | | * | 1.00 |
| FEMUR DURATION ASSESS, RIGHT | | | * | 1.00 |
| TIBIA/FEMUR DISP, LEFT | | | * | 15.0MM |
| TIBIA/FEMUR DISP, RIGHT | | | * | 15.0MM |
| KNEE CLEVIS, LEFT INSIDE | | | * | 4000N |
| KNEE CLEVIS, LEFT OUTSIDE | | | * | 4000N |
| KNEE CLEVIS, RIGHT INSIDE | | | * | 4000N |
| KNEE CLEVIS, RIGHT OUTSIDE | | | * | 4000N |
| TIBIA COMP, LEFT | | | * | 8000N |
| TIBIA COMP, RIGHT | | | * | 8000N |
| TIBIA MOM, UPPER, LEFT | | | * | 225NM |
| TIBIA MOM, UPPER, RIGHT | | | * | 225NM |
| TIBIA MOM, LOWER, LEFT | | | * | 225NM |
| TIBIA MOM, LOWER, RIGHT | | | * | 225NM |
| LEG INDEX, UPPER LEFT | | | * | 1.00 |
| LEG INDEX, UPPER RIGHT | | | * | 1.00 |
| LEG INDEX, LOWER LEFT | | | * | 1.00 |
| LEG INDEX, LOWER RIGHT | | | * | 1.00 |

IAV - INJURY ASSESSMENT VALUE
[illegible]ARV - INJURY ASSESSMENT REFERENCE VALUE
* NOT MEASURED, THIS TEST
‡ RESTRAINT SYSTEM DEPENDENT. CHOOSE VALUE THAT APPLIES TO THIS TEST.

*** VALUE GREATER THAN 150% OF IAV

# RIGHT FRONT
## ANTHROPOMORPHIC TEST DEVICE SUMMARY DATA
## LTV MDB TO STATIONARY VEHICLE 84.7KM/H

C11408 REAR IMP 70% OVERLAP
R & D CTR 1VF46079 1FP87

ATD TYPE: GM50H
TEST DATE: 01/08/1997

| MEASURED QUANTITY | 100% OF IARV | 150% OF IARV | IAV VALUE | IARV |
|---|---|---|---|---|
| HIC, LIMITED TO 15 MS | | | 410 | 1000 |
| HIC, LIMITED TO 36 MS | | | 480 | 1000 |
| NECK FLEXION | | | 14NM | 190NM |
| NECK EXTENSION | | | 16NM | 57NM |
| NECK TENSION | | | 0.78 | 1.00 |
| NECK COMPRESSION | | | 0.01 | 1.00 |
| NECK SHEAR FORWARD | | | 0.13 | 1.00 |
| NECK SHEAR REARWARD | | | 0.08 | 1.00 |
| CHEST ACCEL | | | 34G | 60G |
| ‡ CHEST COMPRESSION W/O SH BELT | | | * | 65.0MM ‡ |
| ‡ CHEST COMPRESSION W/ SH BELT | | | * | 50.0MM ‡ |
| CHEST VISCOUS CRITERIA | | | * | 1.00M/SEC |
| FEMUR COMP. LEFT | | | * | 10000N |
| EMUR COMP. RIGHT | | | * | 10000N |
| FEMUR DURATION ASSESS. LEFT | | | * | 1.00 |
| FEMUR DURATION ASSESS. RIGHT | | | * | 1.00 |
| TIBIA/FEMUR DISP. LEFT | | | * | 15.0MM |
| TIBIA/FEMUR DISP. RIGHT | | | * | 15.0MM |
| KNEE CLEVIS. LEFT INSIDE | | | * | 4000N |
| KNEE CLEVIS. LEFT OUTSIDE | | | * | 4000N |
| KNEE CLEVIS. RIGHT INSIDE | | | * | 4000N |
| KNEE CLEVIS. RIGHT OUTSIDE | | | * | 4000N |
| TIBIA COMP. LEFT | | | * | 8000N |
| TIBIA COMP. RIGHT | | | * | 8000N |
| TIBIA MOM. UPPER. LEFT | | | * | 225NM |
| TIBIA MOM. UPPER. RIGHT | | | * | 225NM |
| TIBIA MOM. LOWER. LEFT | | | * | 225NM |
| TIBIA MOM. LOWER. RIGHT | | | * | 225NM |
| LEG INDEX. UPPER LEFT | | | * | 1.00 |
| LEG INDEX. UPPER RIGHT | | | * | 1.00 |
| LEG INDEX. LOWER LEFT | | | * | 1.00 |
| LEG INDEX. LOWER RIGHT | | | * | 1.00 |

IAV - INJURY ASSESSMENT VALUE
IARV - INJURY ASSESSMENT REFERENCE VALUE
* NOT MEASURED, THIS TEST
‡ RESTRAINT SYSTEM LEPENDENT. CHOOSE
VALUE THAT APPLIES TO THIS TEST.

# LEFT FRONT
# ANTHROPOMORPHIC TEST DEVICE SUMMARY DATA
## LTV MDB TO STATIONARY VEHICLE 84.7KM/H

1408 REAR IMP 70% OVERLAP

R & D CTR 1VF46079 1FP87

ATD TYPE: GM50H
TEST DATE: 01/08/1997

| MEASURED QUANTITY | 100% OF IARV | 150% OF IARV | IAV VALUE | IARV |
|---|---|---|---|---|
| HIC, LIMITED TO 15 MS | | | 900 | 1000 |
| HIC, LIMITED TO 36 MS | | | 930 | 1000 |
| NECK FLEXION | | | 57NM | 190NM |
| NECK EXTENSION | | | 10NM | 57NM |
| NECK TENSION | | *** | 1.51 | 1.00 |
| NECK COMPRESSION | | | 0.02 | 1.00 |
| NECK SHEAR FORWARD | | | 0.27 | 1.00 |
| NECK SHEAR REARWARD | | | 0.08 | 1.00 |
| CHEST ACCEL | | | 45G | 60G |
| ‡ CHEST COMPRESSION W/O SH BELT | | | * | 65.0MM ‡ |
| ‡ CHEST COMPRESSION W/ SH BELT | | | * | 50.0MM ‡ |
| CHEST VISCOUS CRITERIA | | | * | 1.00M/SEC |
| FEMUR COMP, LEFT | | | * | 10000N |
| FEMUR COMP, RIGHT | | | * | 10000N |
| FEMUR DURATION ASSESS, LEFT | | | * | 1.00 |
| FEMUR DURATION ASSESS, RIGHT | | | * | 1.00 |
| TIBIA/FEMUR DISP, LEFT | | | * | 15.0MM |
| TIBIA/FEMUR DISP, RIGHT | | | * | 15.0MM |
| KNEE CLEVIS, LEFT INSIDE | | | * | 4000N |
| KNEE CLEVIS, LEFT OUTSIDE | | | * | 4000N |
| KNEE CLEVIS, RIGHT INSIDE | | | * | 4000N |
| KNEE CLEVIS, RIGHT OUTSIDE | | | * | 4000N |
| TIBIA COMP, LEFT | | | * | 8000N |
| TIBIA COMP, RIGHT | | | * | 8000N |
| TIBIA MOM, UPPER, LEFT | | | * | 225NM |
| TIBIA MOM, UPPER, RIGHT | | | * | 225NM |
| TIBIA MOM, LOWER, LEFT | | | * | 225NM |
| TIBIA MOM, LOWER, RIGHT | | | * | 225NM |
| LEG INDEX, UPPER LEFT | | | * | 1.00 |
| LEG INDEX, UPPER RIGHT | | | * | 1.00 |
| LEG INDEX, LOWER LEFT | | | * | 1.00 |
| LEG INDEX, LOWER RIGHT | | | * | 1.00 |

IAV - INJURY ASSESSMENT VALUE
IARV - INJURY ASSESSMENT REFERENCE VALUE
* NOT MEASURED, THIS TEST
‡ RESTRAINT SYSTEM DEPENDENT. CHOOSE VALUE THAT APPLIES TO THIS TEST.

*** VALUE GREATER THAN 150% OF IAV

# RIGHT FRONT
# ANTHROPOMORPHIC TEST DEVICE SUMMARY DATA
## LTV MDB TO STATIONARY VEHICLE 84.7KM/H

C11408 REAR IMP 70% OVERLAP
R & D CTR 1VF46079 1FP87

ATD TYPE: GM50H
TEST DATE: 01/08/1997

| MEASURED QUANTITY | 100% OF IARV | 150% OF IARV | IAV VALUE | IARV |
|---|---|---|---|---|
| HIC, LIMITED TO 15 MS | | | 410 | 1000 |
| HIC, LIMITED TO 36 MS | | | 480 | 1000 |
| NECK FLEXION | | | 14NM | 190NM |
| NECK EXTENSION | | | 16NM | 57NM |
| NECK TENSION | | | 0.78 | 1.00 |
| NECK COMPRESSION | | | 0.01 | 1.00 |
| NECK SHEAR FORWARD | | | 0.13 | 1.00 |
| NECK SHEAR REARWARD | | | 0.08 | 1.00 |
| CHEST ACCEL | | | 34G | 60G |
| ‡ CHEST COMPRESSION W/O SH BELT | | | * | 65.0MM ‡ |
| ‡ CHEST COMPRESSION W/ SH BELT | | | * | 50.0MM ‡ |
| CHEST VISCOUS CRITERIA | | | * | 1.00M/SEC |
| FEMUR COMP, LEFT | | | * | 10000N |
| FEMUR COMP, RIGHT | | | * | 10000N |
| FEMUR DURATION ASSESS, LEFT | | | * | 1.00 |
| FEMUR DURATION ASSESS, RIGHT | | | * | 1.00 |
| TIBIA/FEMUR DISP, LEFT | | | * | 15.0MM |
| TIBIA/FEMUR DISP, RIGHT | | | * | 15.0MM |
| KNEE CLEVIS, LEFT INSIDE | | | * | 4000N |
| KNEE CLEVIS, LEFT OUTSIDE | | | * | 4000N |
| KNEE CLEVIS, RIGHT INSIDE | | | * | 4000N |
| KNEE CLEVIS, RIGHT OUTSIDE | | | * | 4000N |
| TIBIA COMP, LEFT | | | * | 8000N |
| TIBIA COMP, RIGHT | | | * | 8000N |
| TIBIA MOM, UPPER, LEFT | | | * | 225NM |
| TIBIA MOM, UPPER, RIGHT | | | * | 225NM |
| TIBIA MOM, LOWER, LEFT | | | * | 225NM |
| TIBIA MOM, LOWER, RIGHT | | | * | 225NM |
| LEG INDEX, UPPER LEFT | | | * | 1.00 |
| LEG INDEX, UPPER RIGHT | | | * | 1.00 |
| LEG INDEX, LOWER LEFT | | | * | 1.00 |
| LEG INDEX, LOWER RIGHT | | | * | 1.00 |

IAV - INJURY ASSESSMENT VALUE
IARV - INJURY ASSESSMENT REFERENCE VALUE
* NOT MEASURED, THIS TEST
‡ RESTRAINT SYSTEM LEPENDENT. CHOOSE VALUE THAT APPLIES TO THIS TEST.

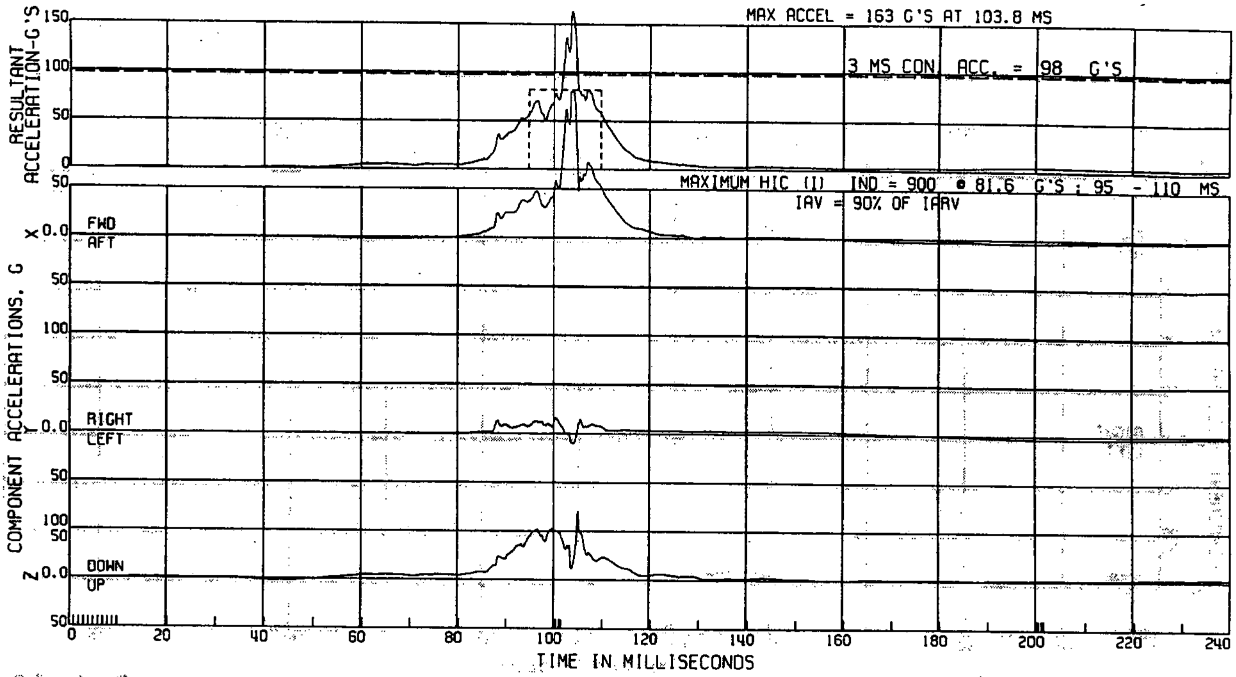
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

L. FRT HEAD ACCEL.

(HIC I LIMITED TO 15MS)

ATD TYPE: GM50H
TEST DATE:01/08/1997




Appendix B, plot # 1

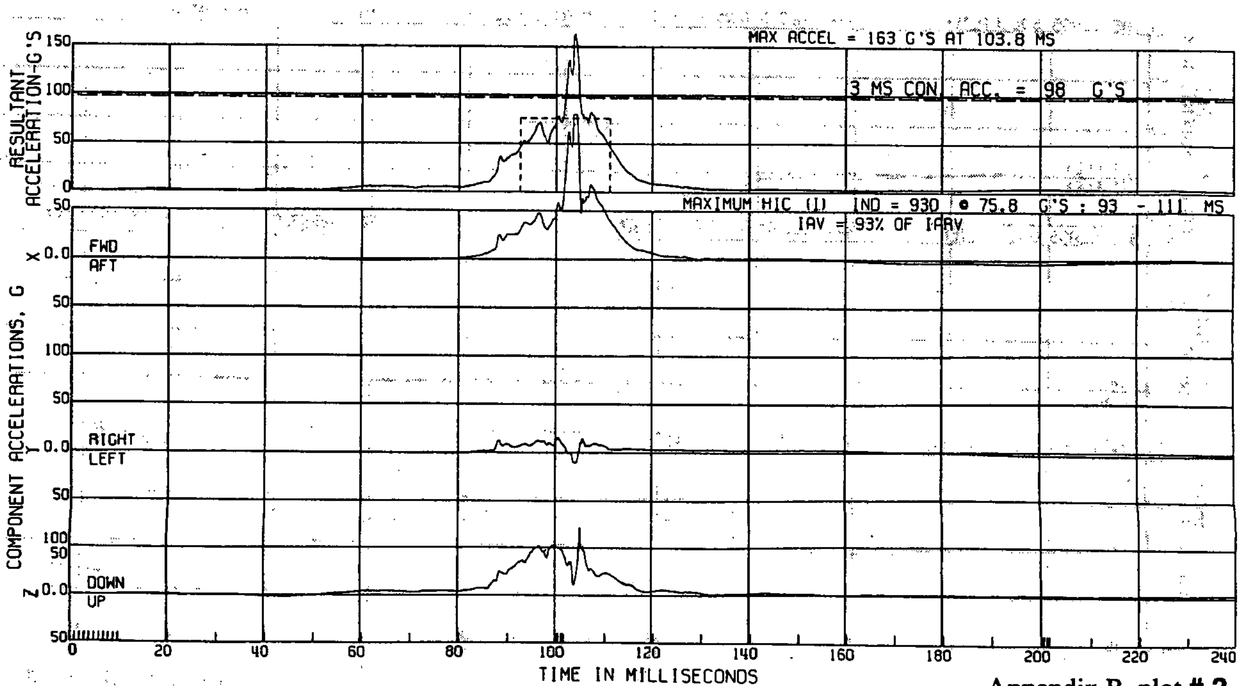
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

L. FRT HEAD ACCEL.

(HIC I LIMITED TO 36MS)

ATD TYPE: GM50H
TEST DATE:01/08/1997




Appendix B, plot # 2

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

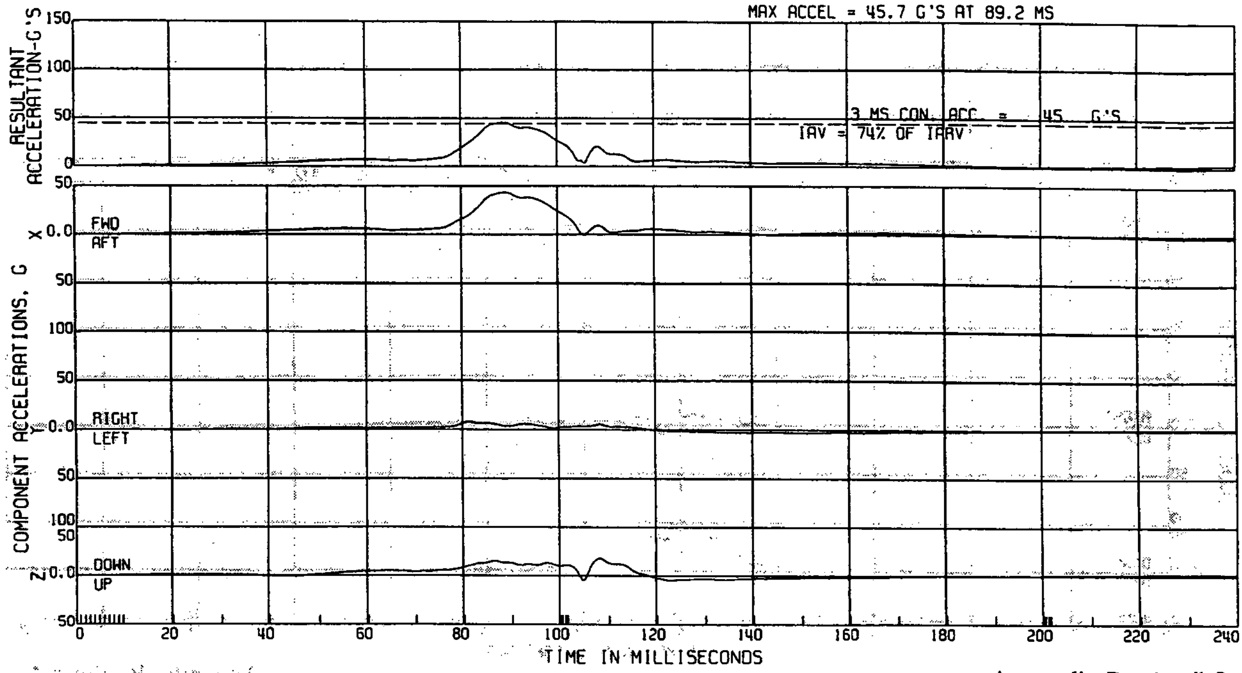
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

L. FRT CHEST ACCEL.

ATD TYPE: GM50H

TEST DATE:01/08/1997




Appendix B, plot # 3

3

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

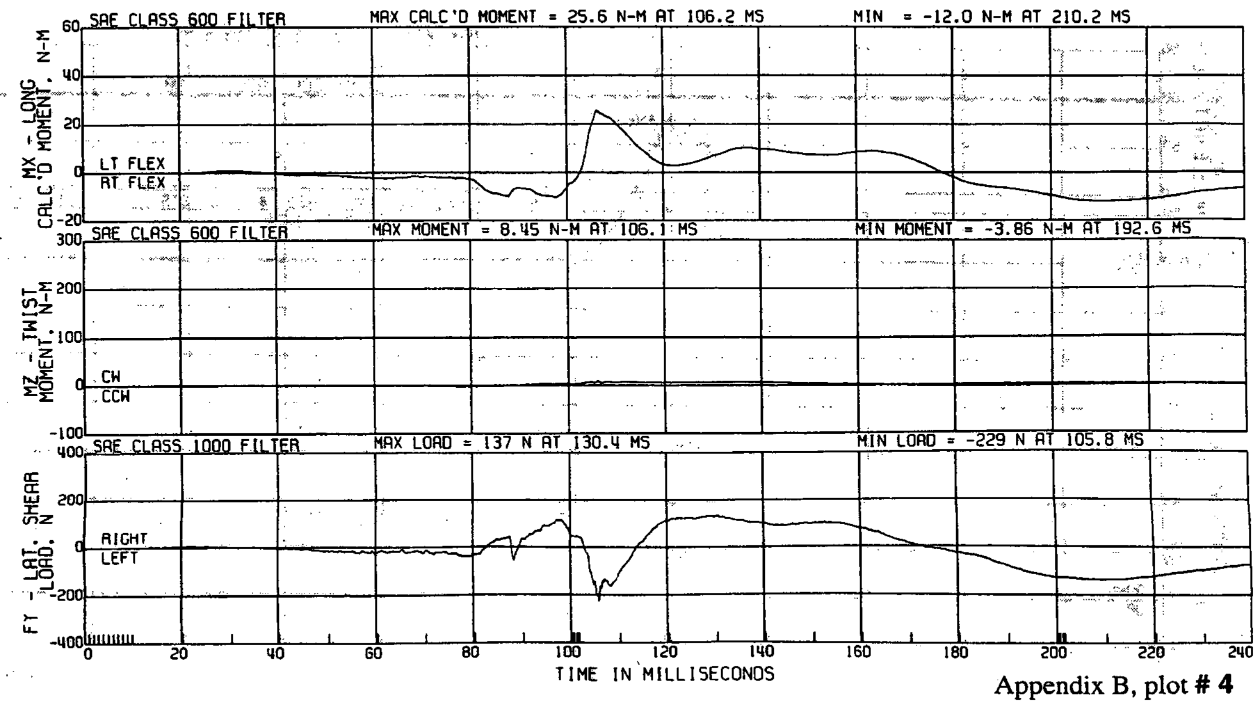
ELEC DATA

L. FRT NECK LOADING ON HEAD, UPPER LOAD

L. FRT NECK LOADING ON HEAD

ATD TYPE: GM50H

TEST DATE:01/08/1997



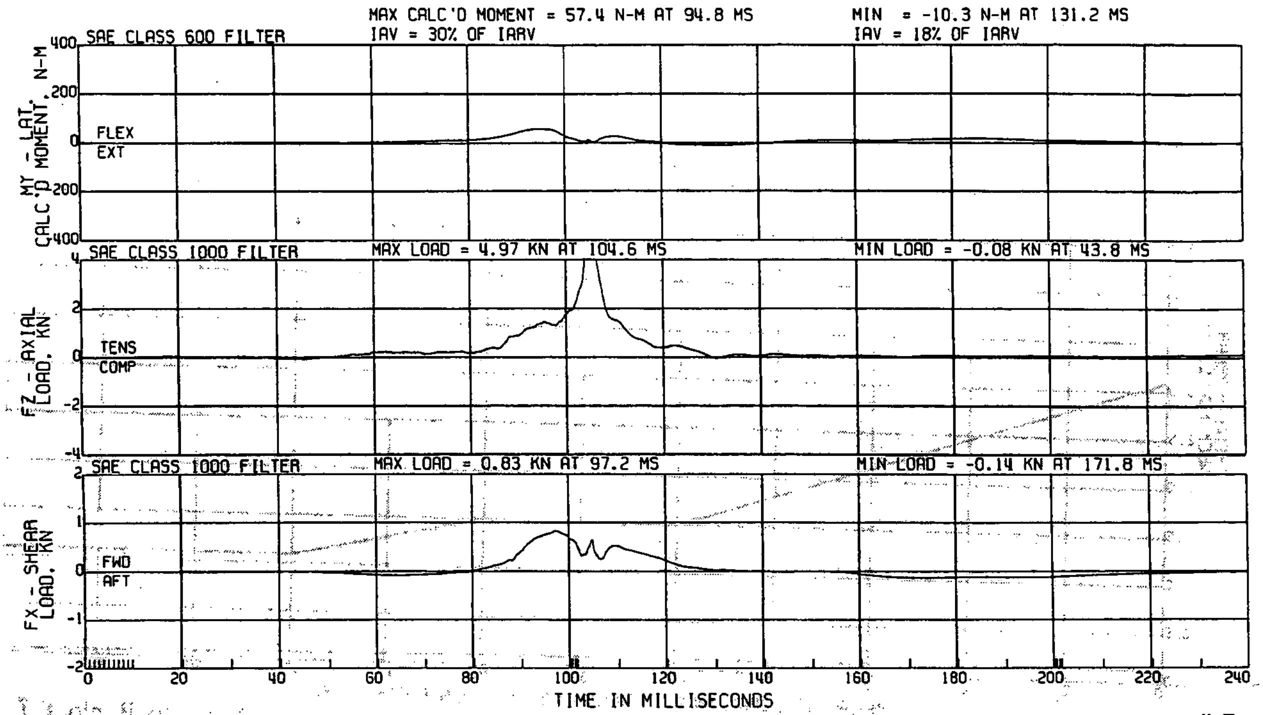

Appendix B, plot # 4

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 NECK LOADING ON HEAD ATD TYPE: GM50H

ELEC DATA TEST DATE:01/08/1997

L. FRT NECK LOADING ON HEAD



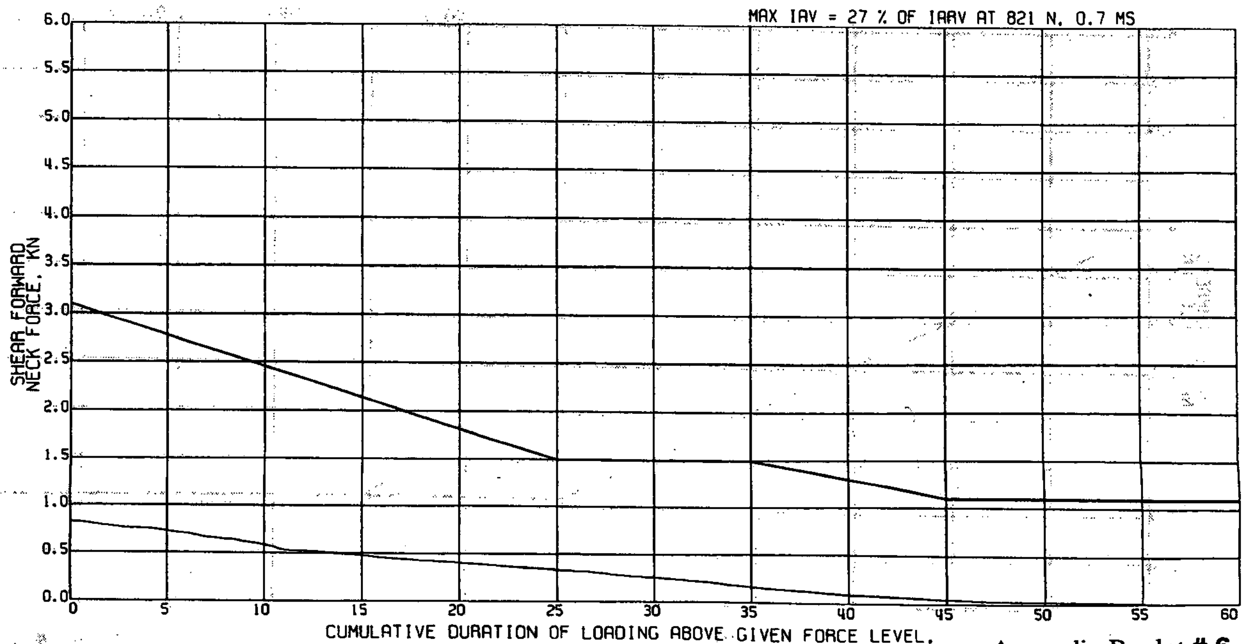

Appendix B, plot # 5

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 FORWARD NECK SHEAR ON HEAD, ATD TYPE: GM50H

ELEC DATA, SAE CLASS 1000 TEST DATE:01/08/1997

L. FRT INJURY REFERENCE




Appendix B, plot # 6

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

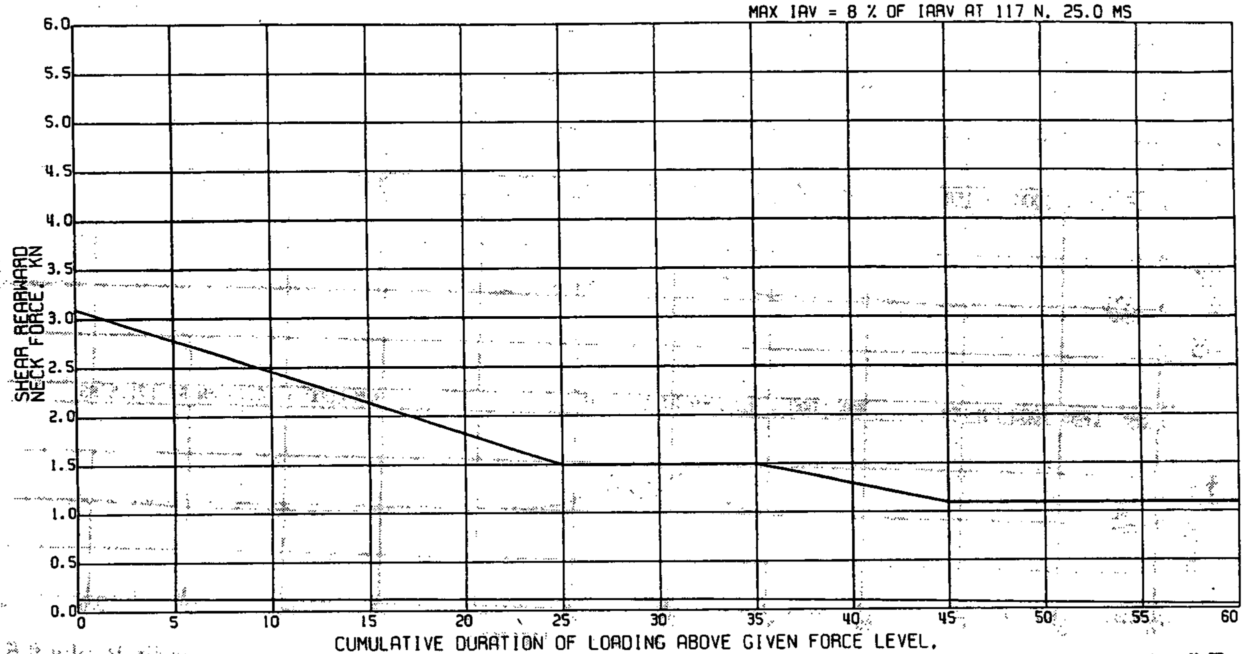
ELEC DATA, SAE CLASS 1000

REARWARD NECK SHEAR ON HEAD,

L. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:01/08/1997




Appendix B, plot # 7

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

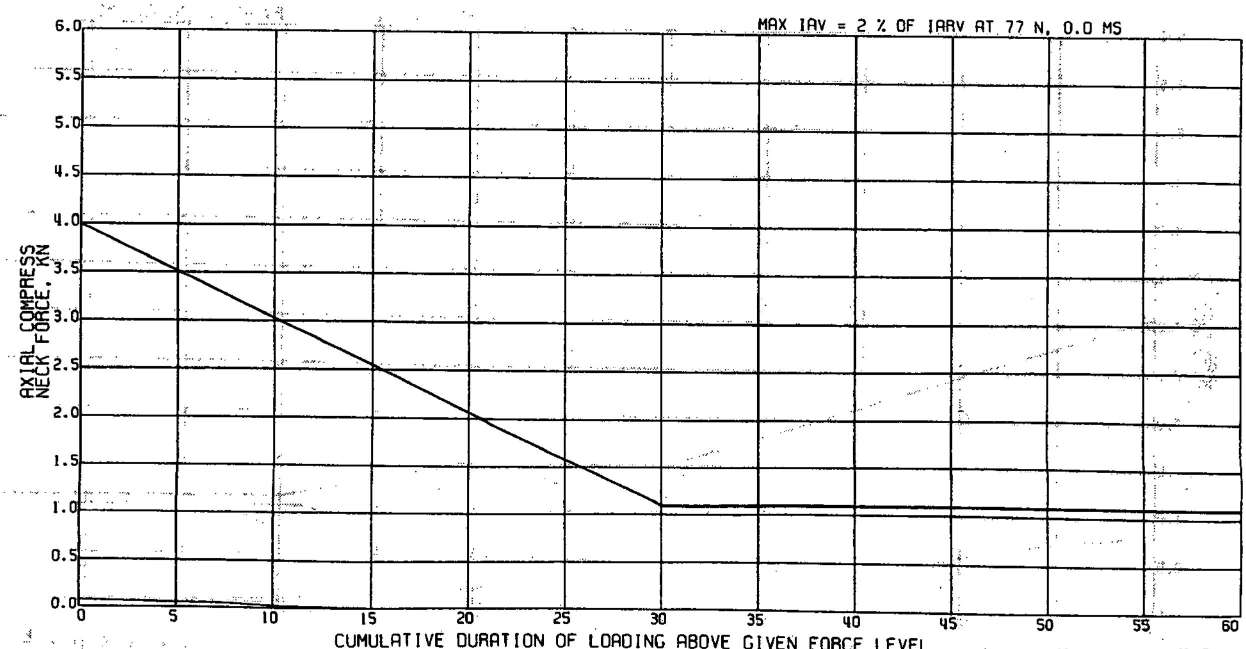
ELEC DATA, SAE CLASS 1000

AXIAL COMPRESSION ON HEAD,

L. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:01/08/1997



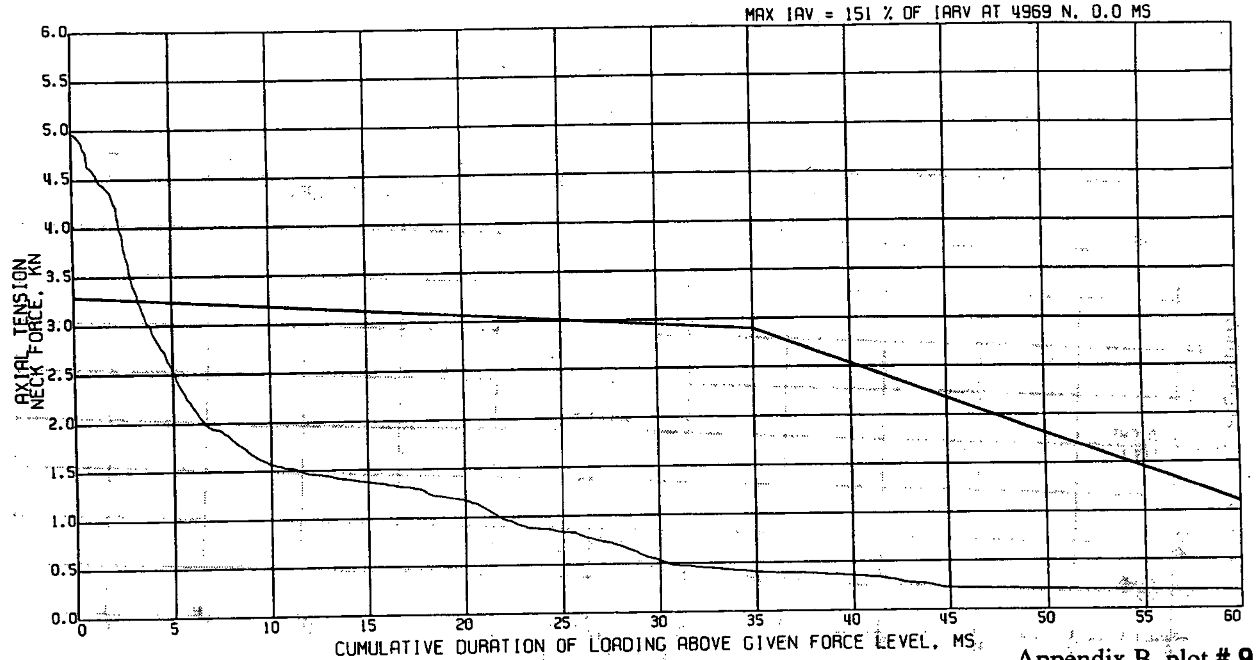

Appendix B, plot # 8

C11408 REAR IMP 70% OVERLAP    LTV MDB TO STATIONARY VEHICLE    84.7KM/H

ATD TYPE: GM50H
TEST DATE:01/08/1997

R & D CTR    1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

AXIAL TENSION ON HEAD,
L. FRT INJURY REFERENCE



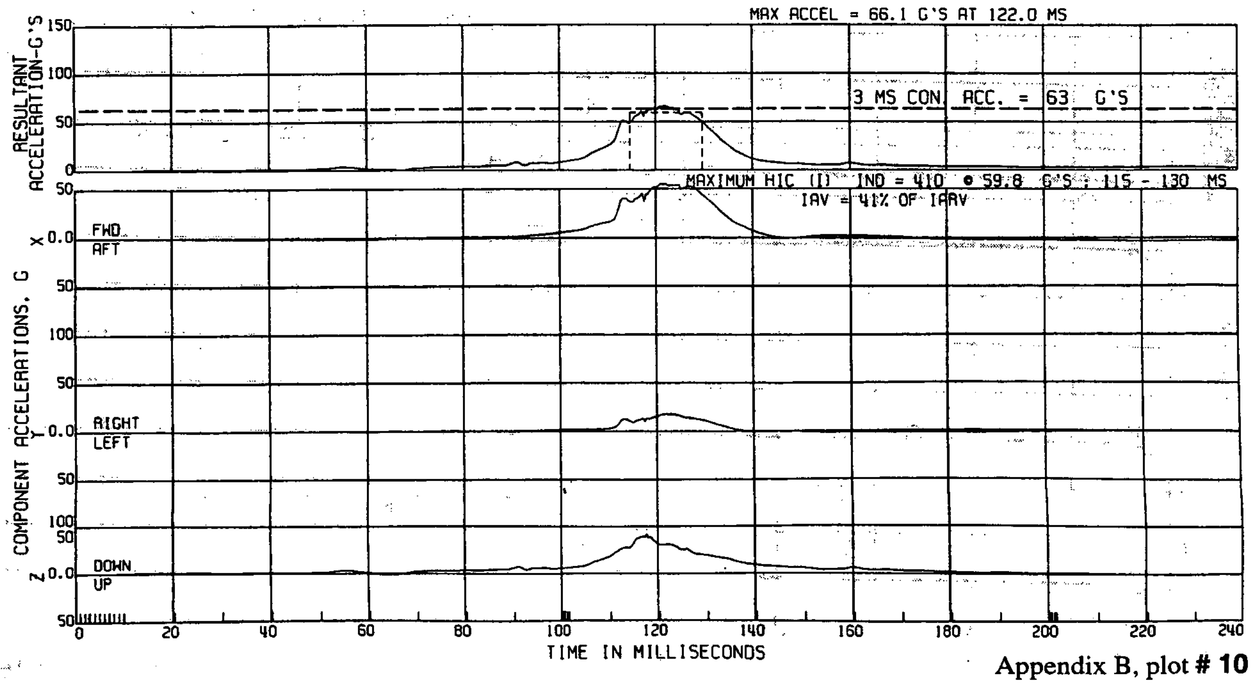

Appendix B, plot # 9

C11408 REAR IMP 70% OVERLAP    LTV MDB TO STATIONARY VEHICLE    84.7KM/H

ATD TYPE: GM50H
TEST DATE:01/08/1997

R & D CTR    1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

R. FRT HEAD ACCEL.
(HIC I LIMITED TO 15MS)




Appendix B, plot # 10

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

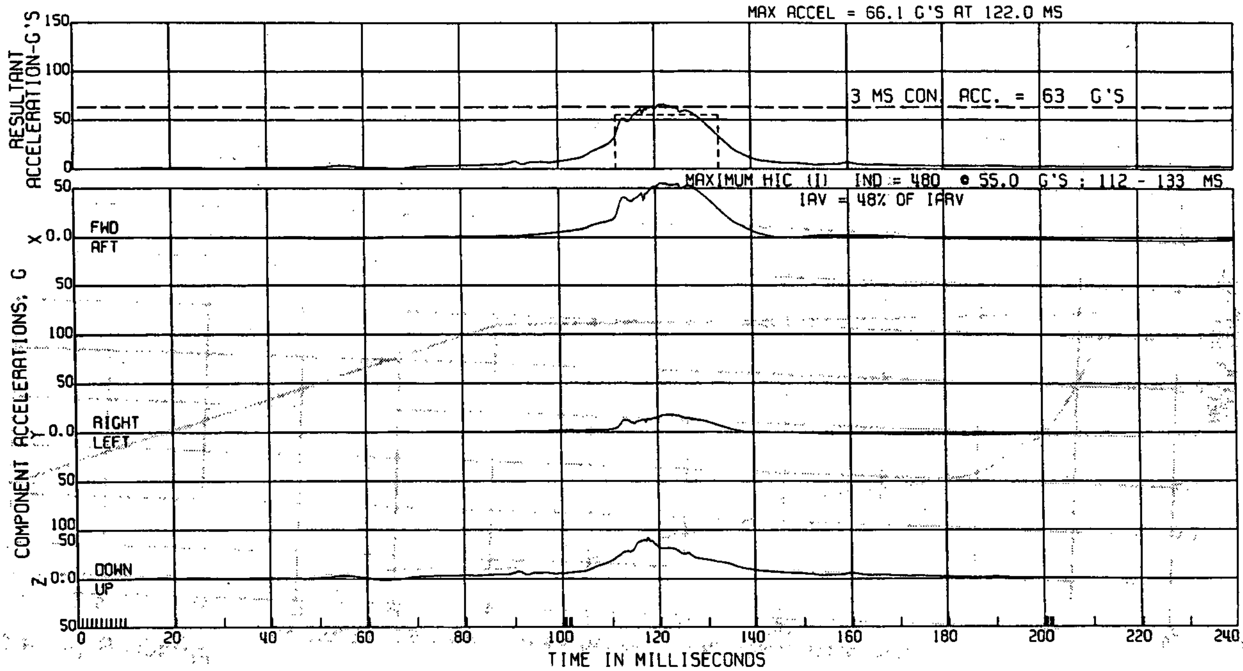
ELEC DATA, SAE CLASS 1000

R. FRT HEAD ACCEL.

(HIC I LIMITED TO 36MS)

ATD TYPE: GM50H

TEST DATE:01/08/1997




Appendix B, plot # 11

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

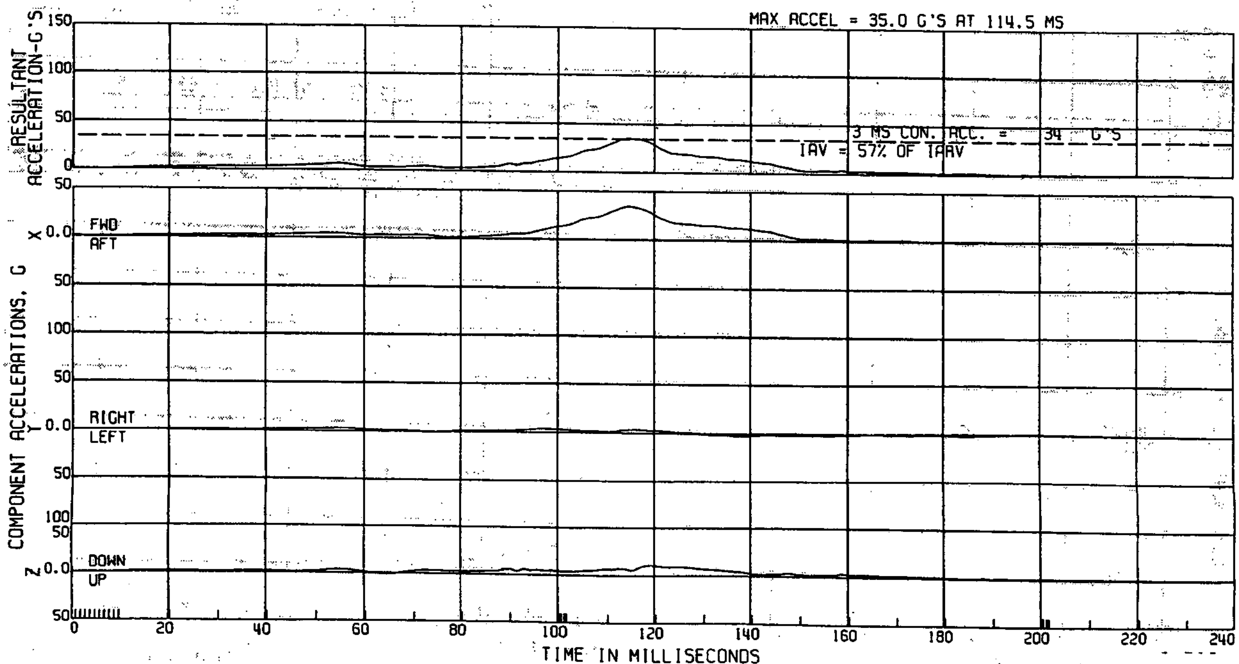
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

R. FRT CHEST ACCEL.

ATD TYPE: GM50H

TEST DATE:01/08/1997




Appendix B, plot # 12

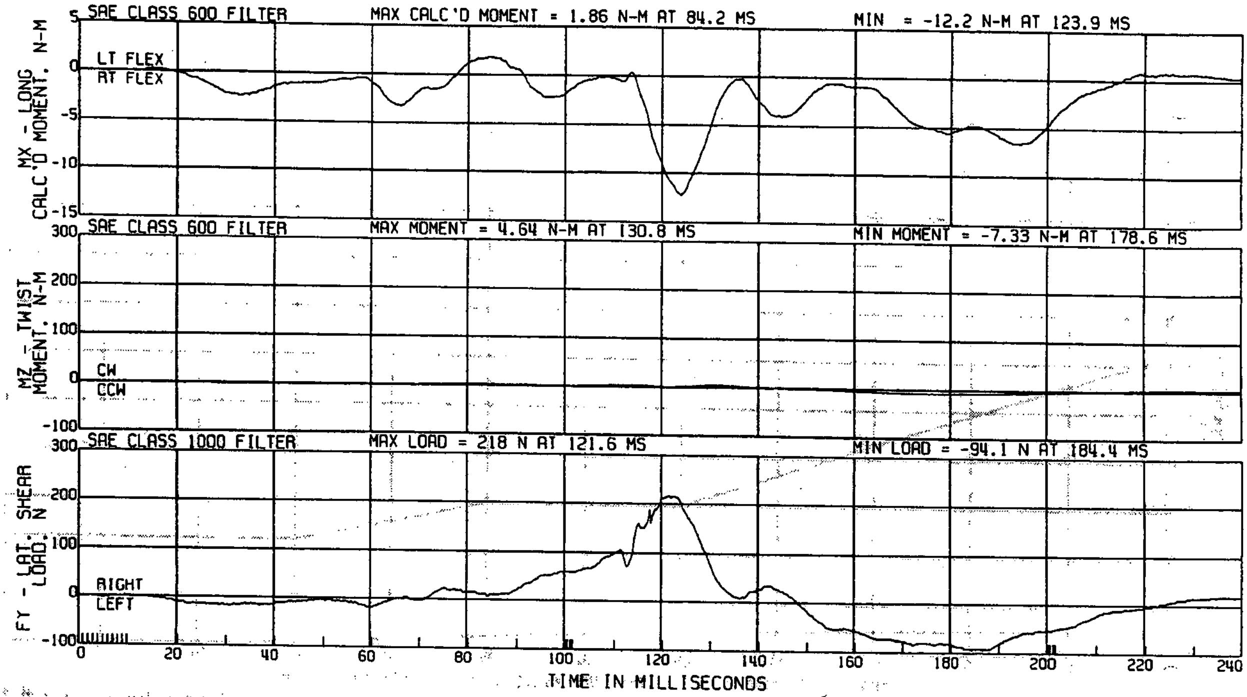
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 R. FRT NECK LOADING ON HEAD, UPPER LOAD

ELEC DATA

ATD TYPE: GM50H
TEST DATE:01/08/1997

R. FRT NECK LOADING ON HEAD




Appendix B, plot # **13**

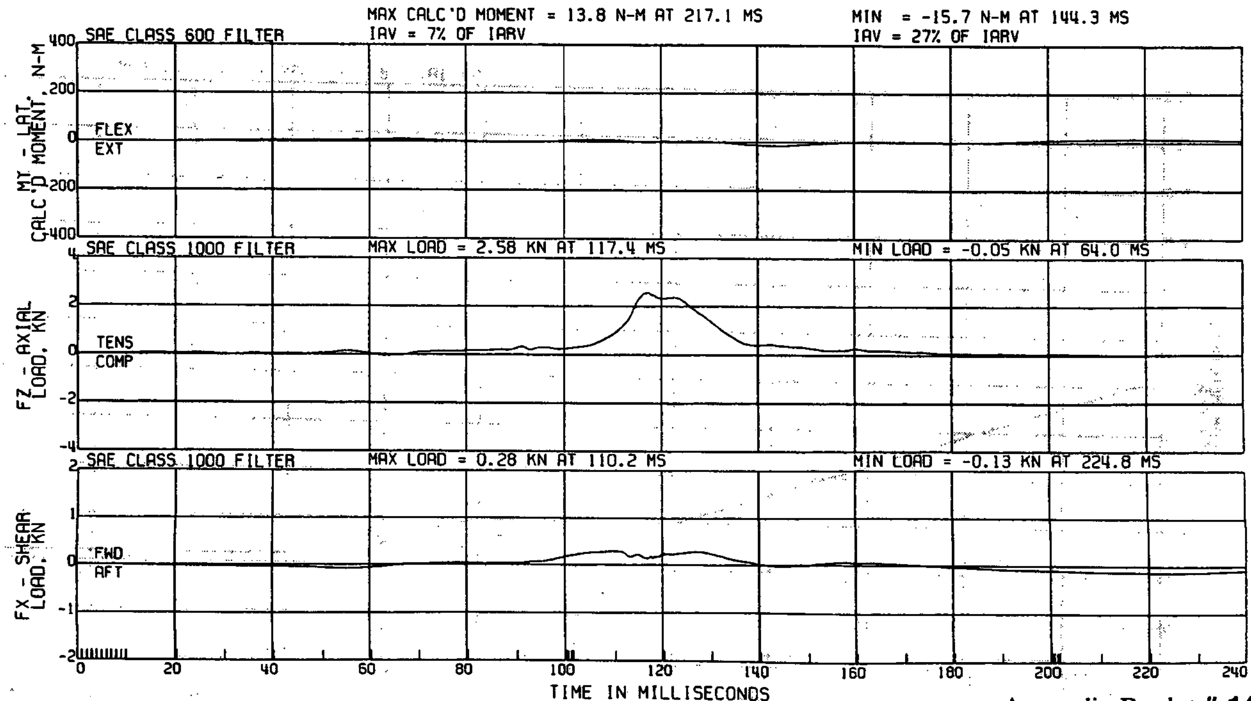
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 NECK LOADING ON HEAD

ELEC DATA

ATD TYPE: GM50H
TEST DATE:01/08/1997

R. FRT NECK LOADING ON HEAD



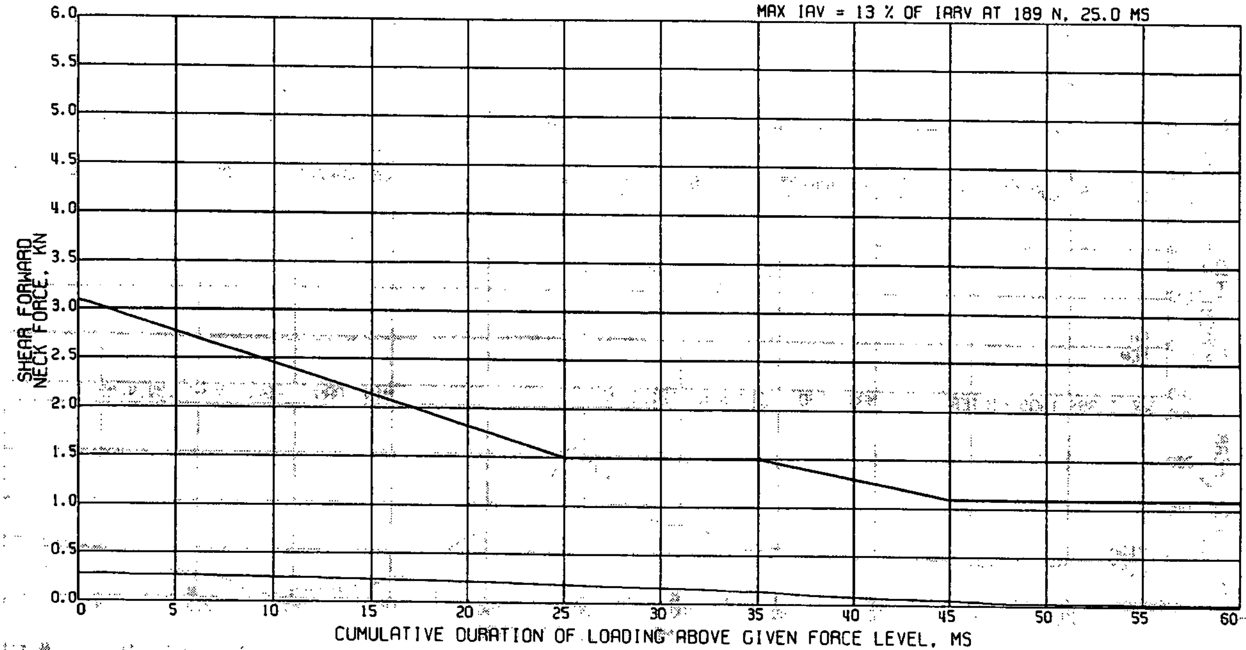

Appendix B, plot # **14**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

FORWARD NECK SHEAR ON HEAD.
R. FRT INJURY REFERENCE

ATD TYPE: GM50H
TEST DATE:01/08/1997




Appendix B, plot # **15**

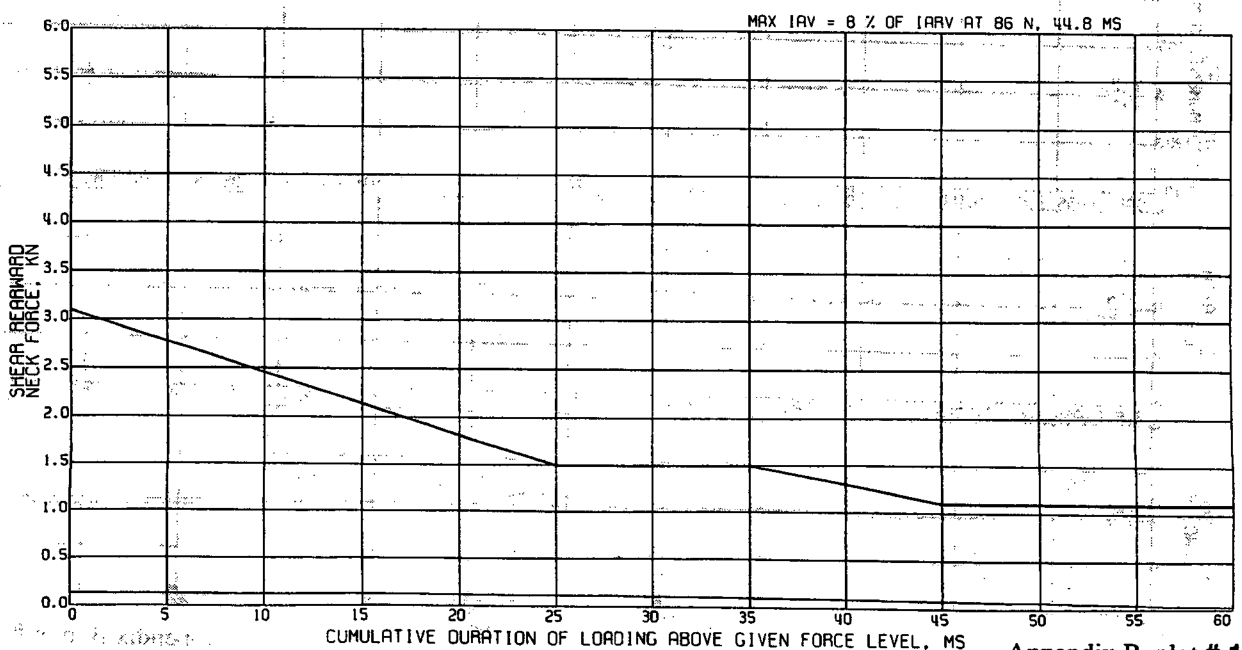


C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

REARWARD NECK SHEAR ON HEAD.
R. FRT INJURY REFERENCE

ATD TYPE: GM50H
TEST DATE:01/08/1997



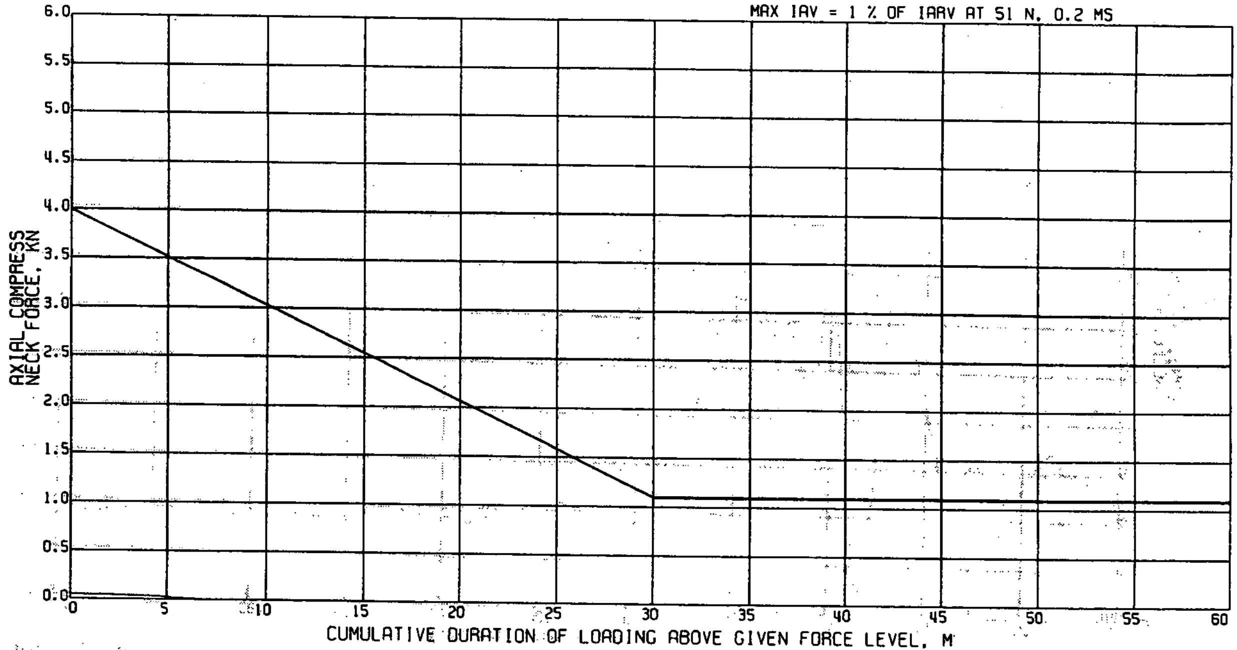

Appendix B, plot # **16**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

AXIAL COMPRESSION ON HEAD,
R. FRT INJURY REFERENCE

ATD TYPE: GM50H
TEST DATE:01/08/1997




Appendix B, plot # **17**

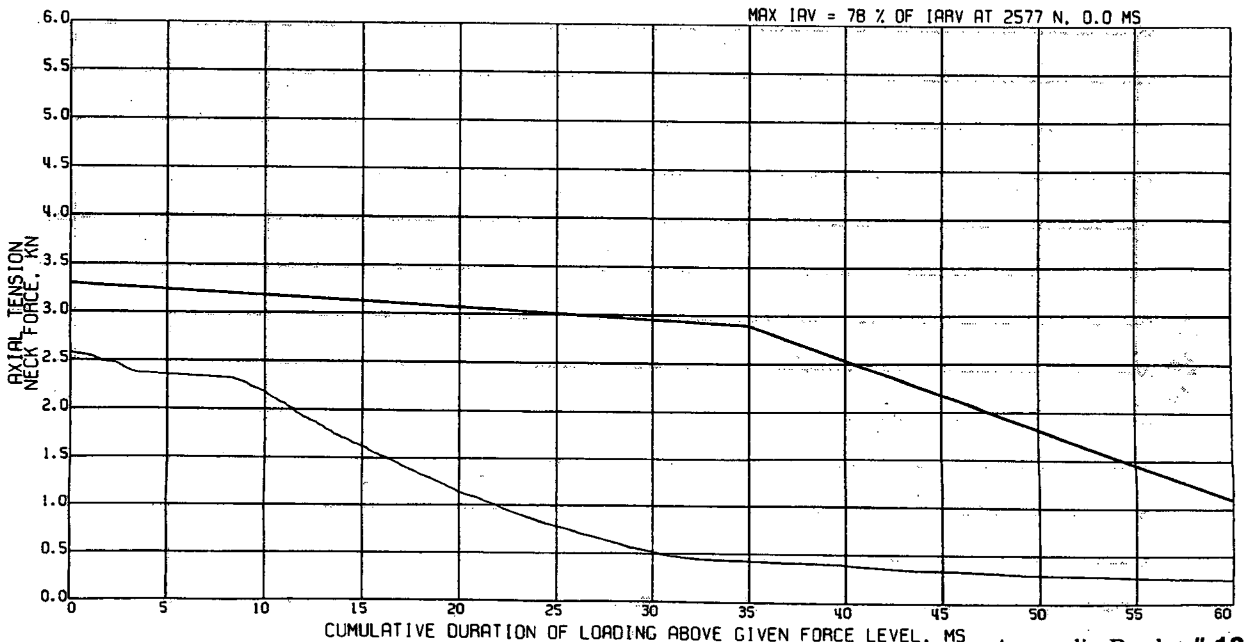
17

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

AXIAL TENSION ON HEAD,
R. FRT INJURY REFERENCE

ATD TYPE: GM50H
TEST DATE:01/08/1997




Appendix B, plot # **18**

18

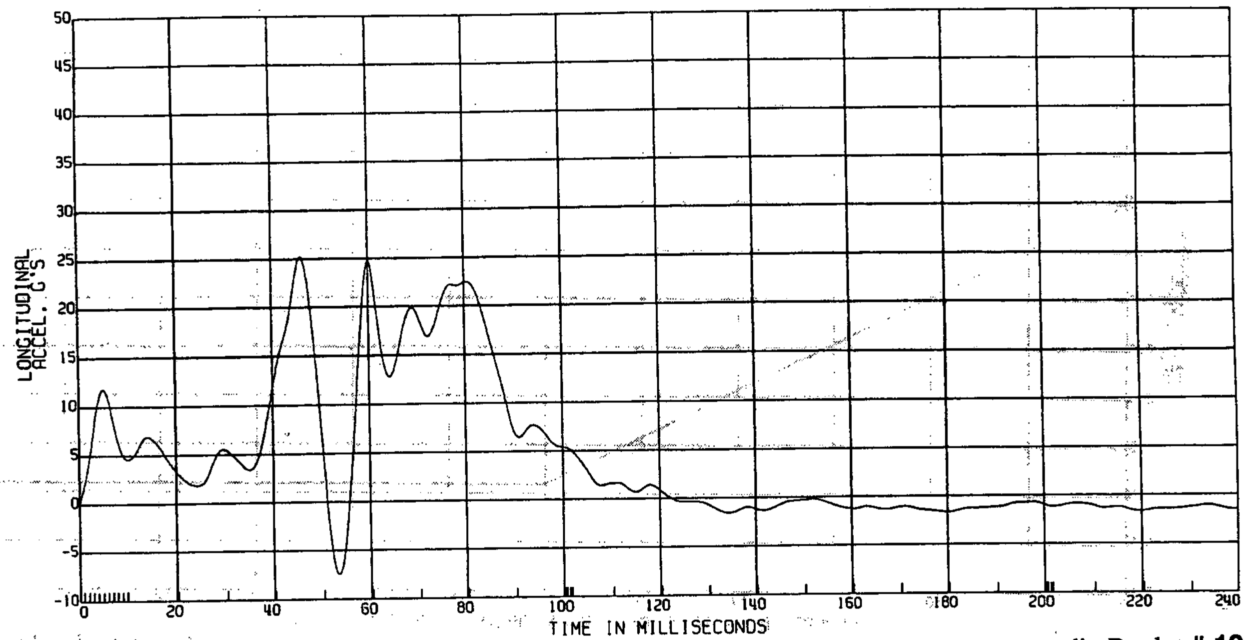
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

L. FRT ROCKER ACCEL

TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60




Appendix B, plot # 19

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

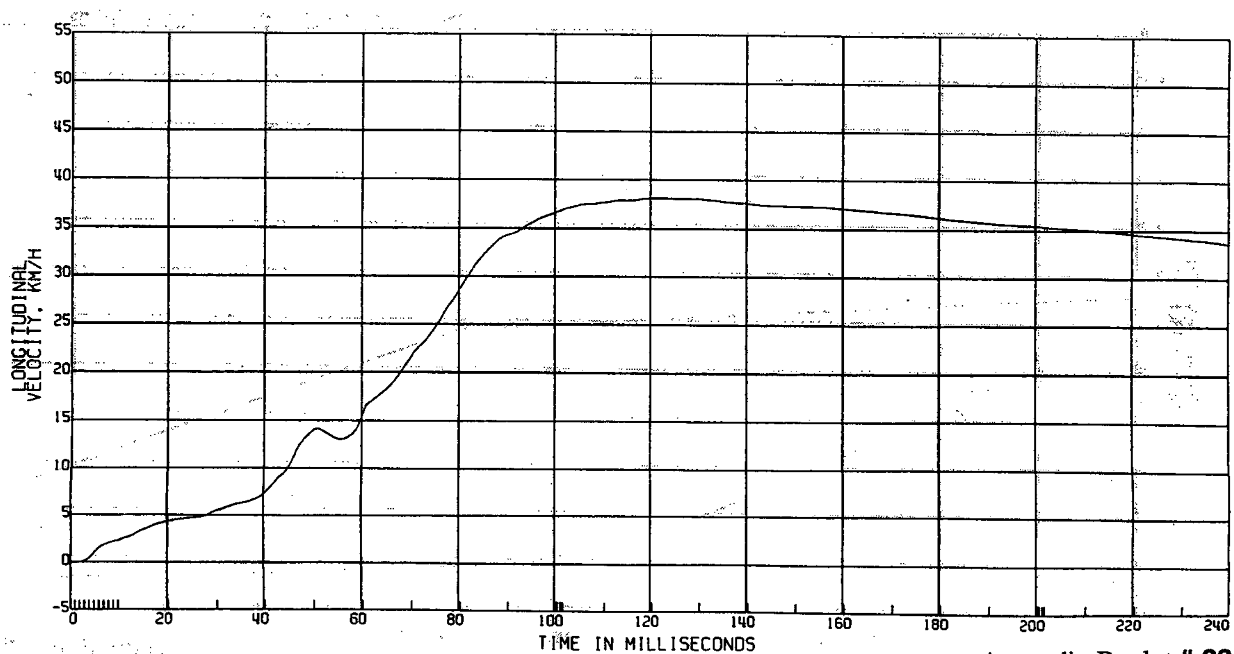
R & D CTR 1VF46079 1FP87

L. FRT ROCKER VELOCITY

TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180

(COMPUTED FROM ACCELERATION)



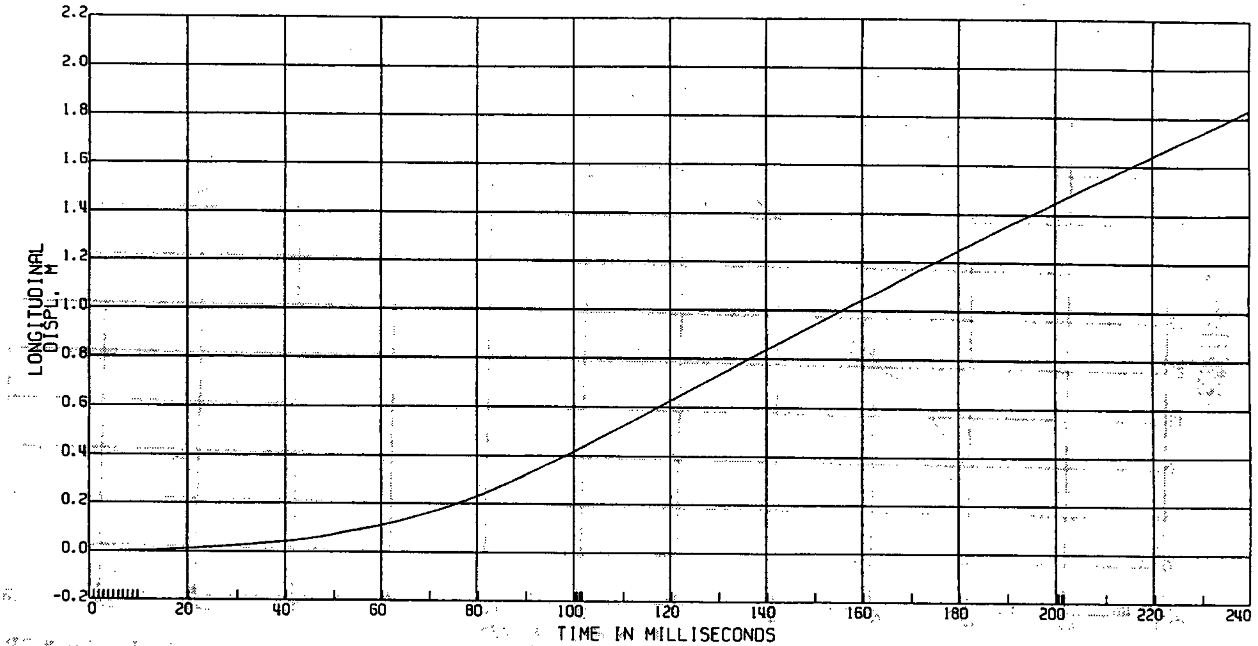

Appendix B, plot # 20

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

L. FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



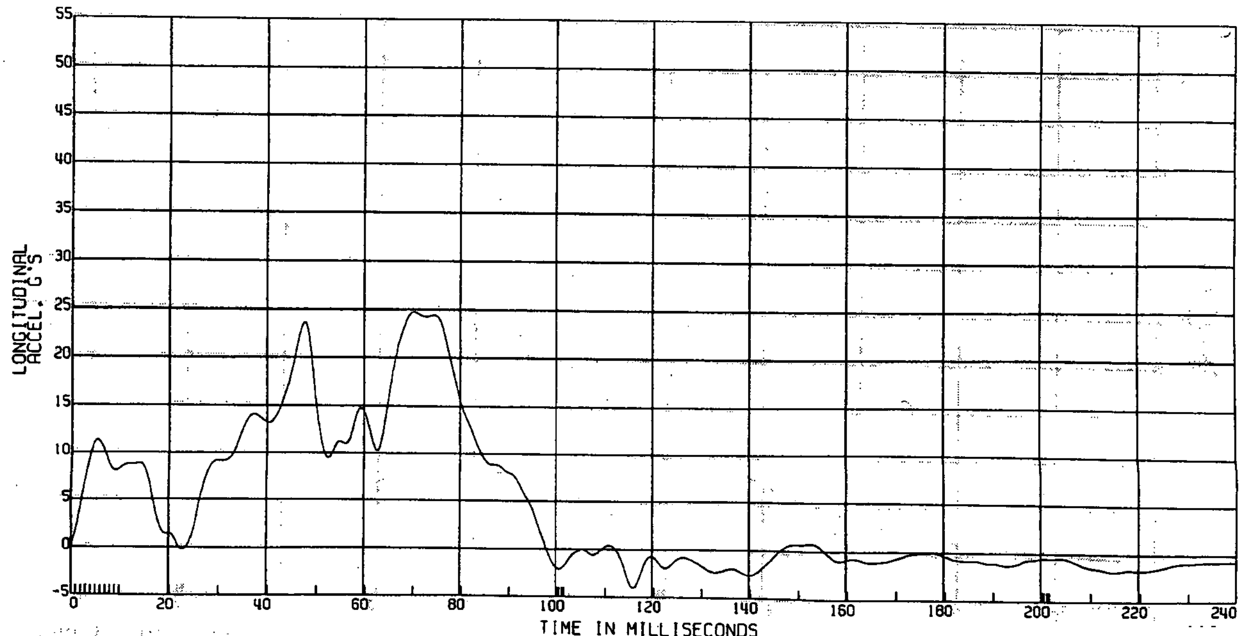

Appendix B, plot **# 21**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

R. FRT ROCKER ACCEL

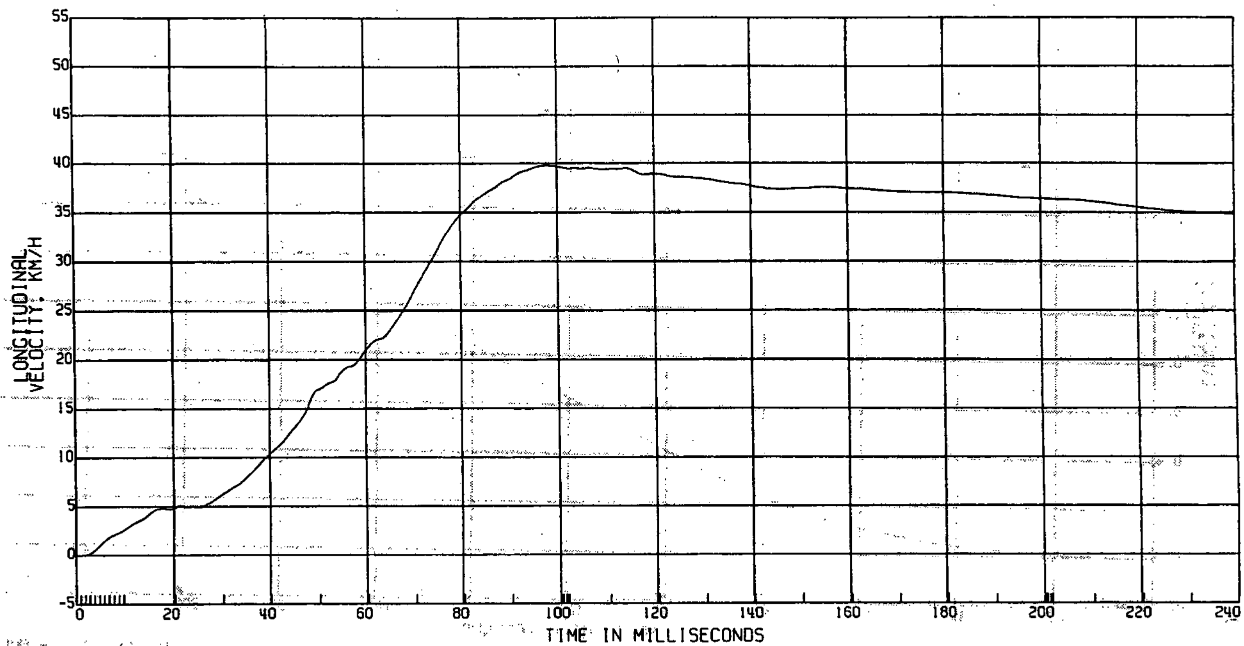
TEST DATE:01/08/1997




Appendix B, plot **# 22**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

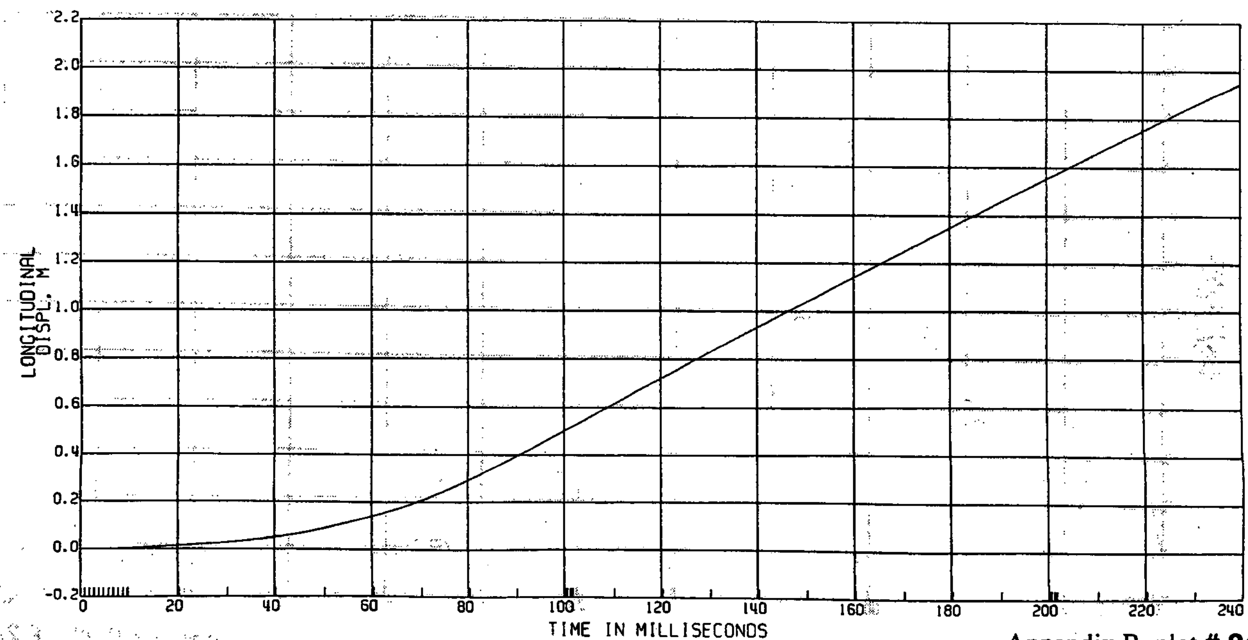
R & D CTR 1VF46079 1FP87 R. FRT ROCKER VELOCITY TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix B, plot # **23**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 R. FRT ROCKER DISPL TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix B, plot # **24**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

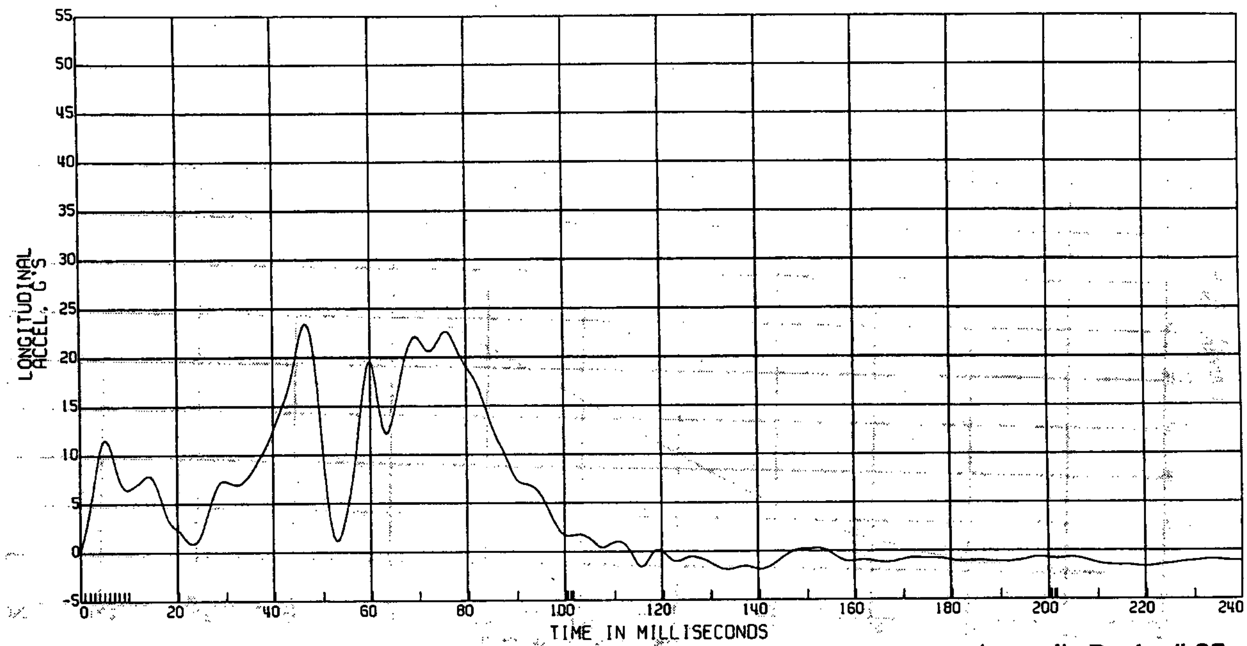
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 60

AVERAGED FRT ROCKER ACCELERATION

(AVGD L. & R. ROCKER ACCELS)

TEST DATE:01/08/1997




Appendix B, plot # 25

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

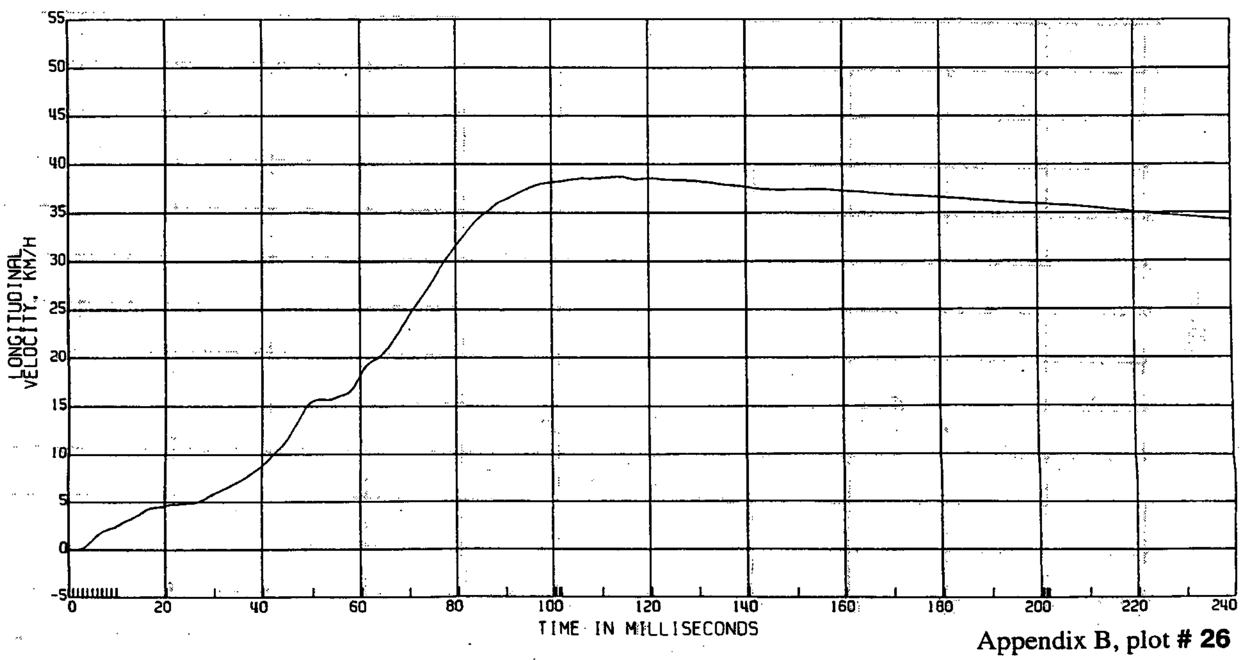
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



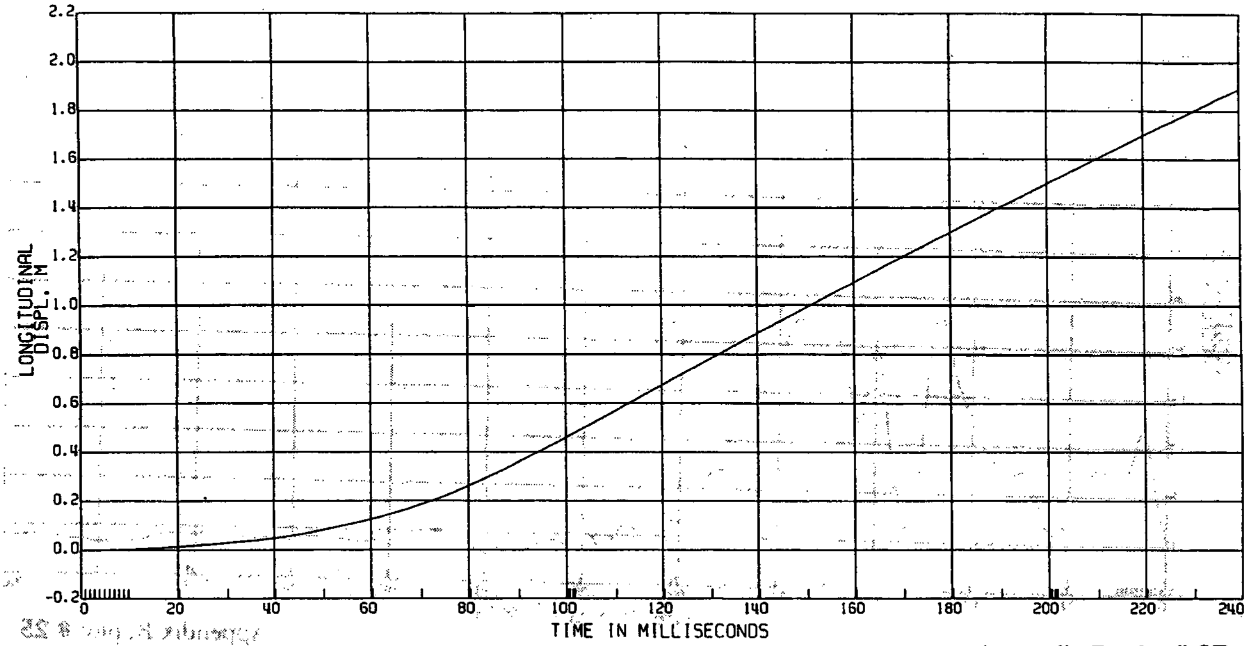

Appendix B, plot # 26

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



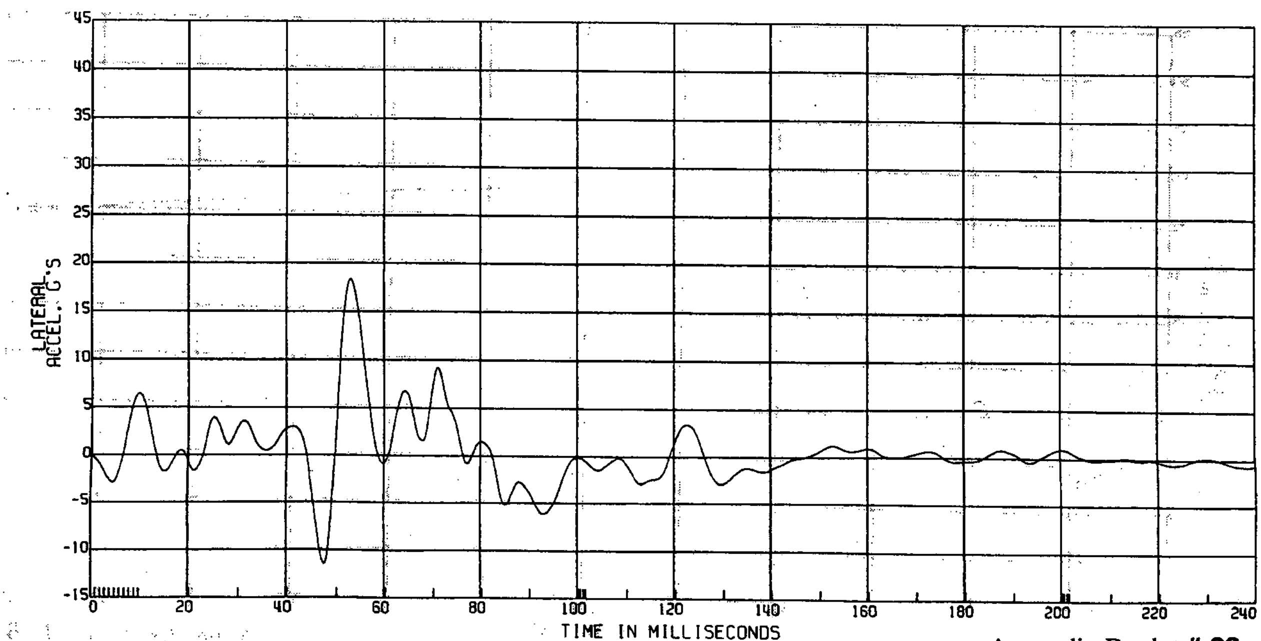

Appendix B, plot **# 27**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

L. FRT ROCKER ACCEL

TEST DATE:01/08/1997



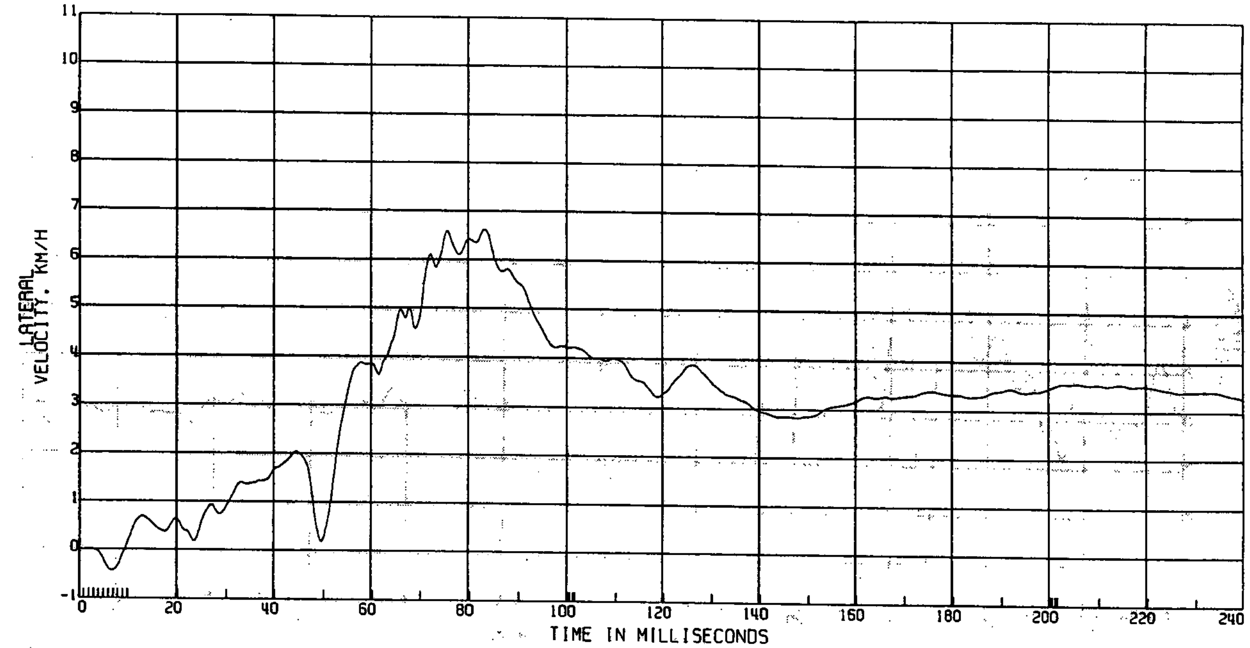

Appendix B, plot **# 28**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

L. FRT ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



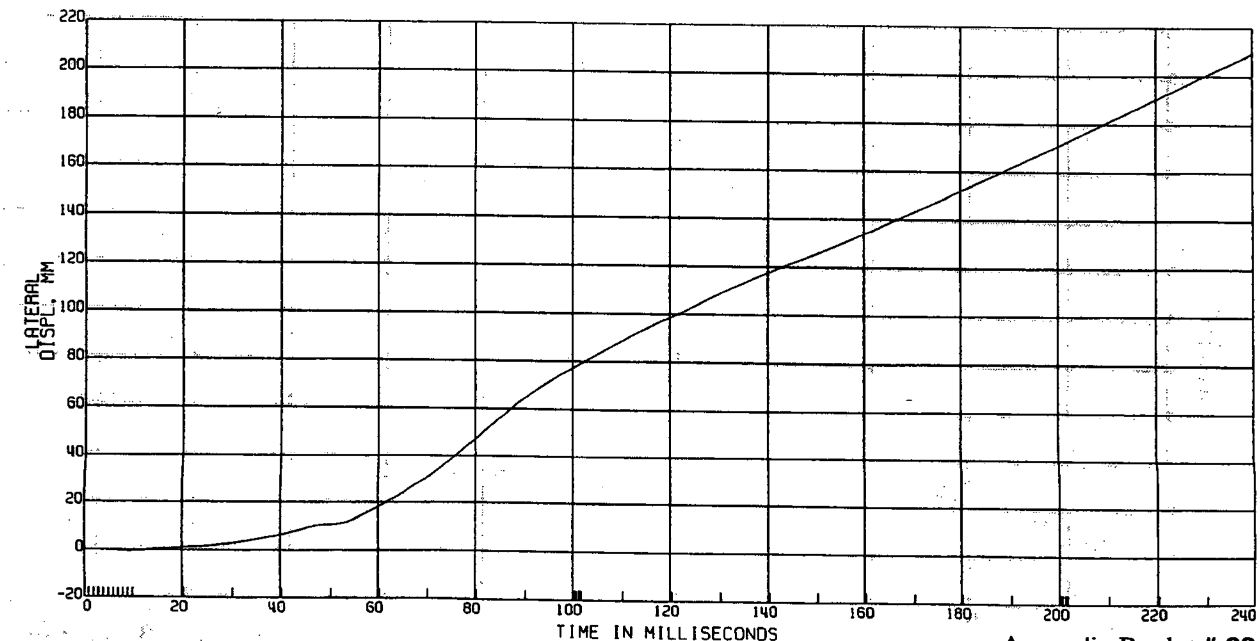

Appendix B, plot # 29

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

L. FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997

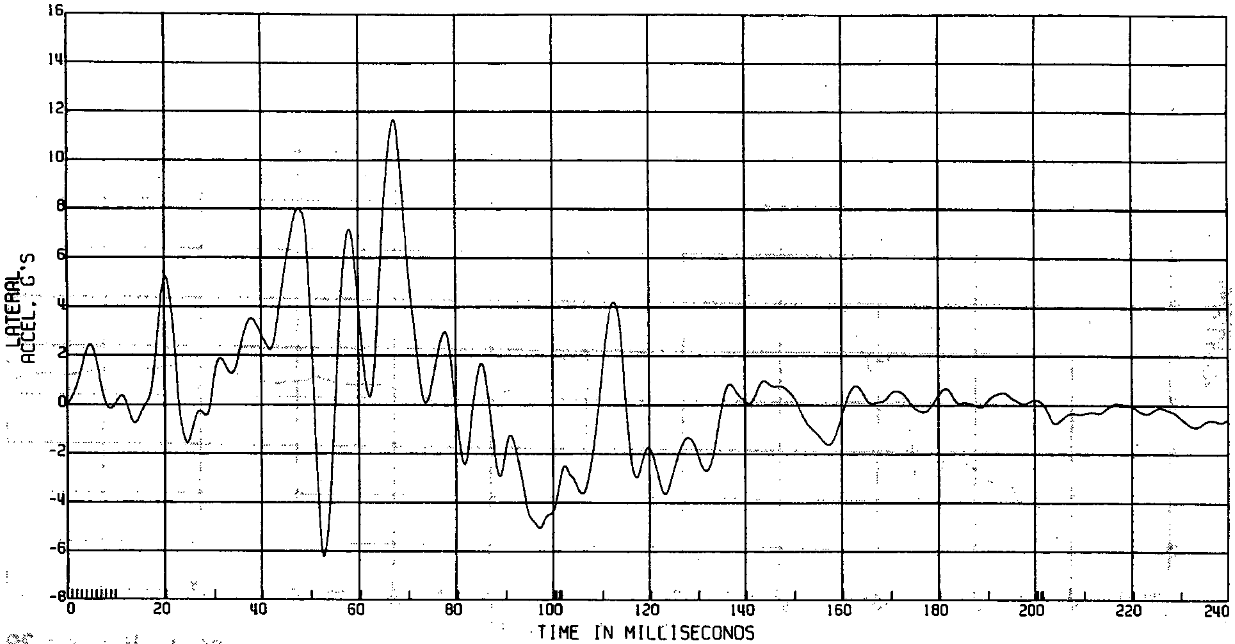



Appendix B, plot # 30

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 R. FRT ROCKER ACCEL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60

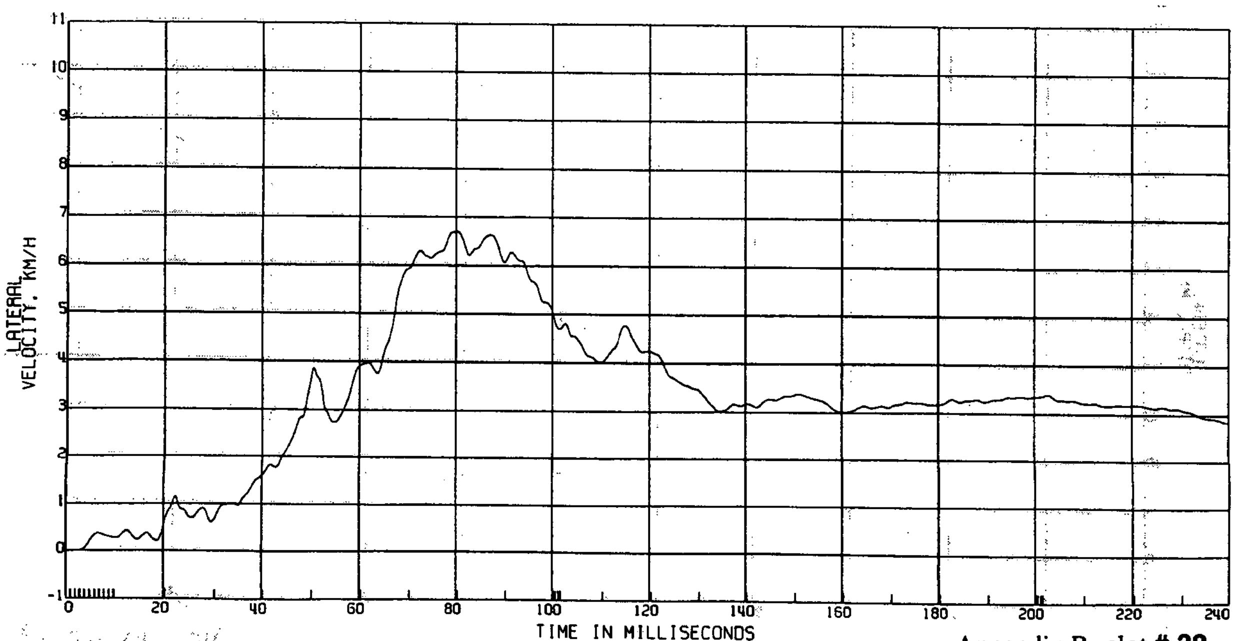



Appendix B, plot # 31

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 R. FRT ROCKER VELOCITY TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix B, plot # 32

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

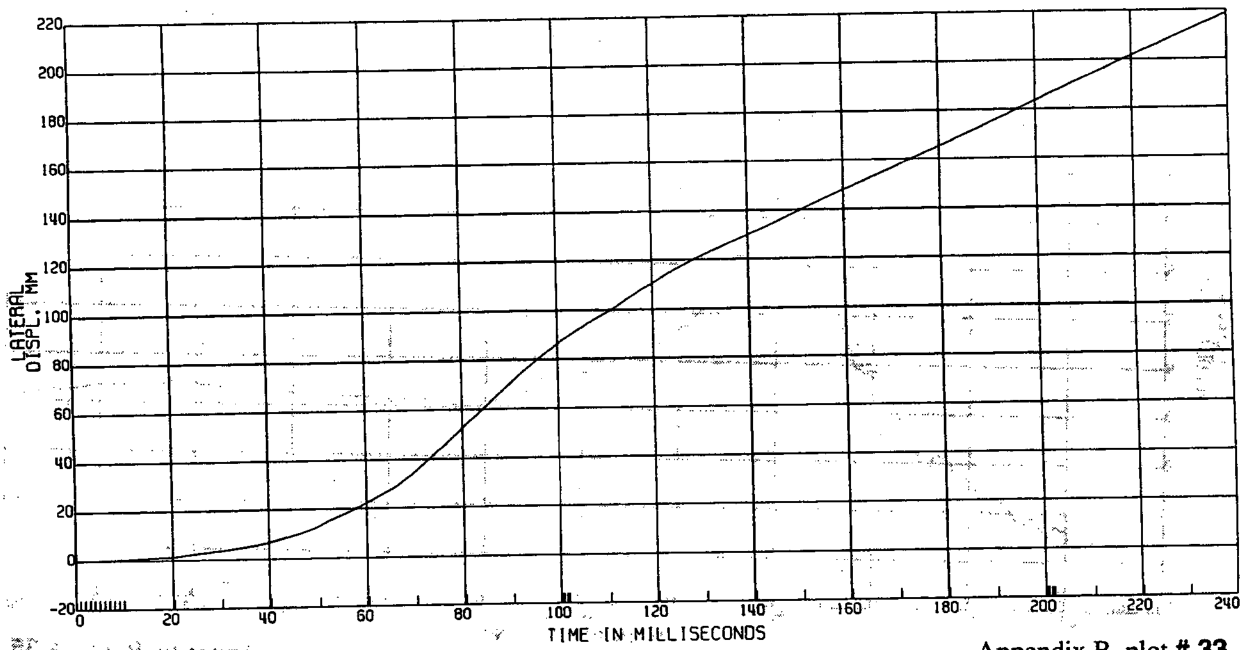
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

R. FRT ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # **33**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

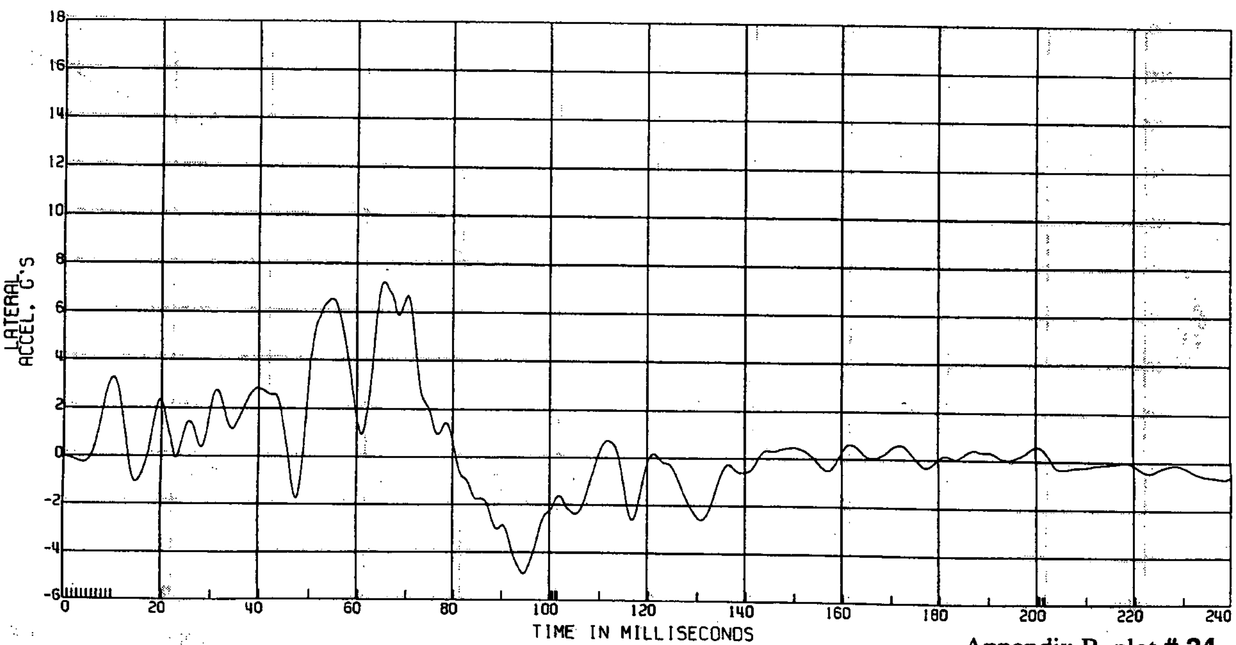
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 60

AVERAGED FRT ROCKER ACCELERATION

(AVGD L. & R. ROCKER ACCELS)

TEST DATE:01/08/1997



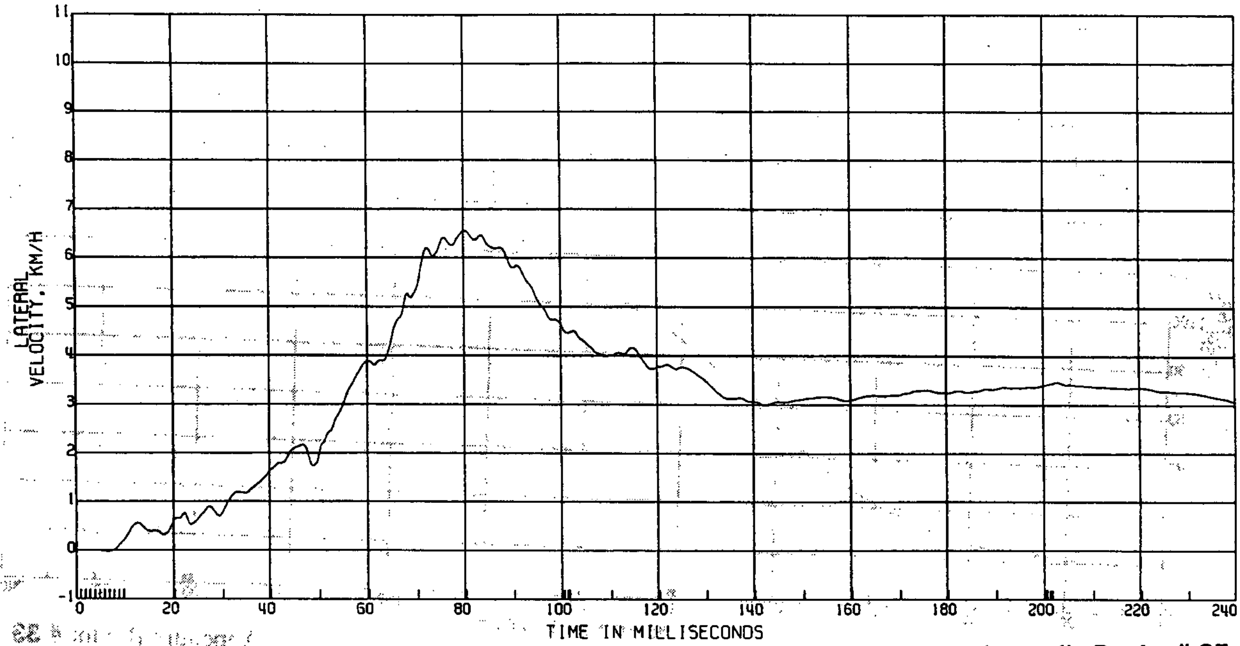

Appendix B, plot # **34**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



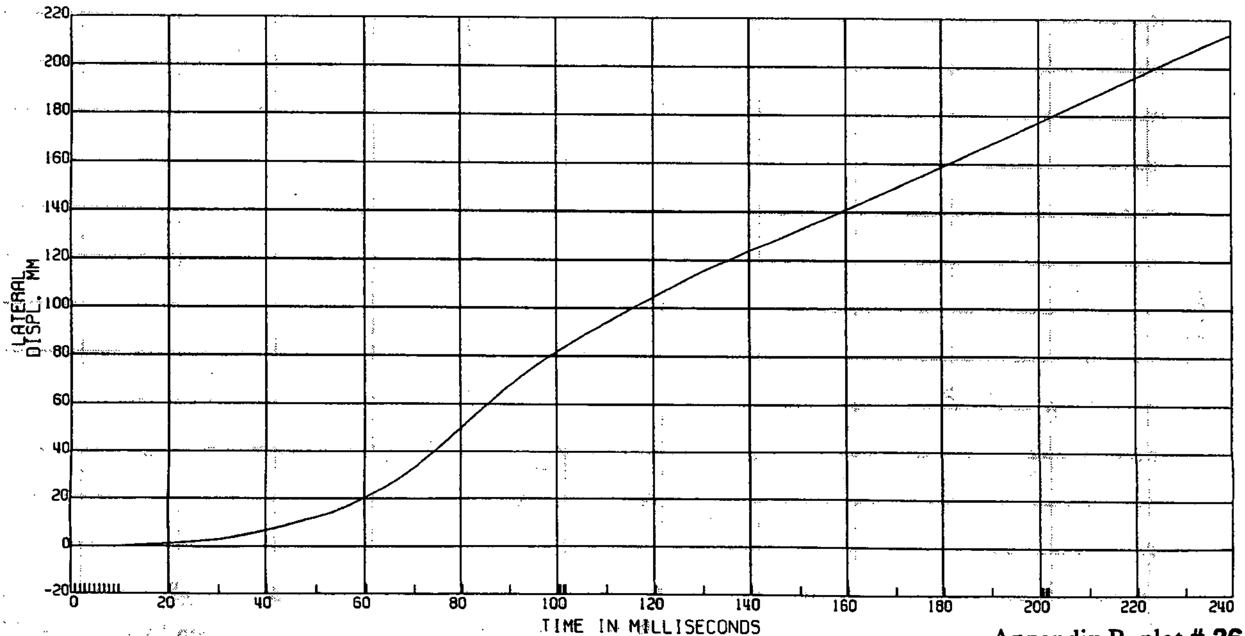

Appendix B, plot # **35**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



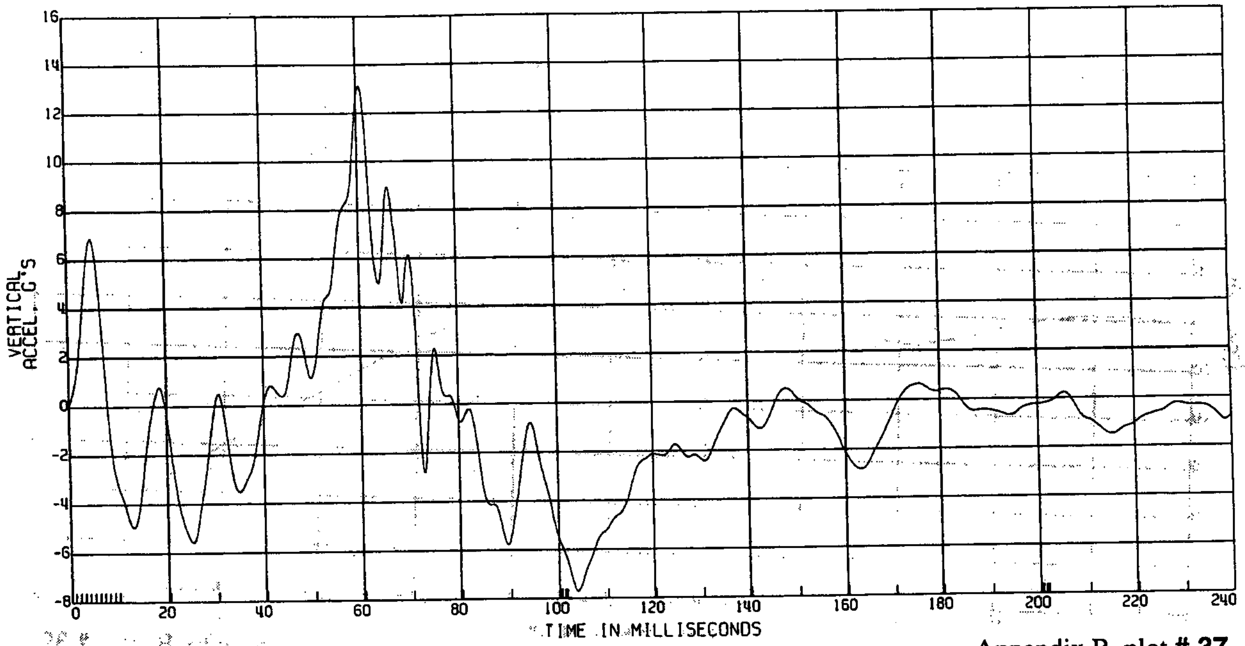

Appendix B, plot # **36**

C11408 REAR IMP 70% OVERLAP .LTV MDB TO STATIONARY VEHICLE 84.7KM/H

L. FRT ROCKER ACCEL

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

TEST DATE:01/08/1997



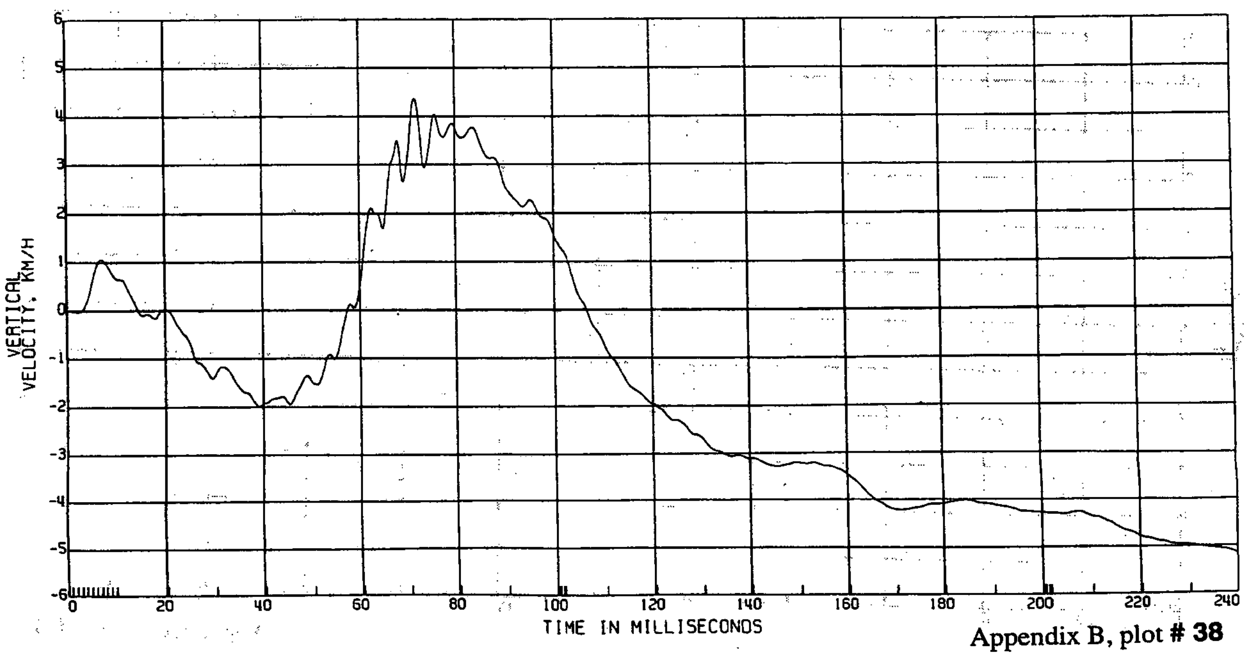

Appendix B, plot # **37**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

L. FRT ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

TEST DATE:01/08/1997




Appendix B, plot # **38**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

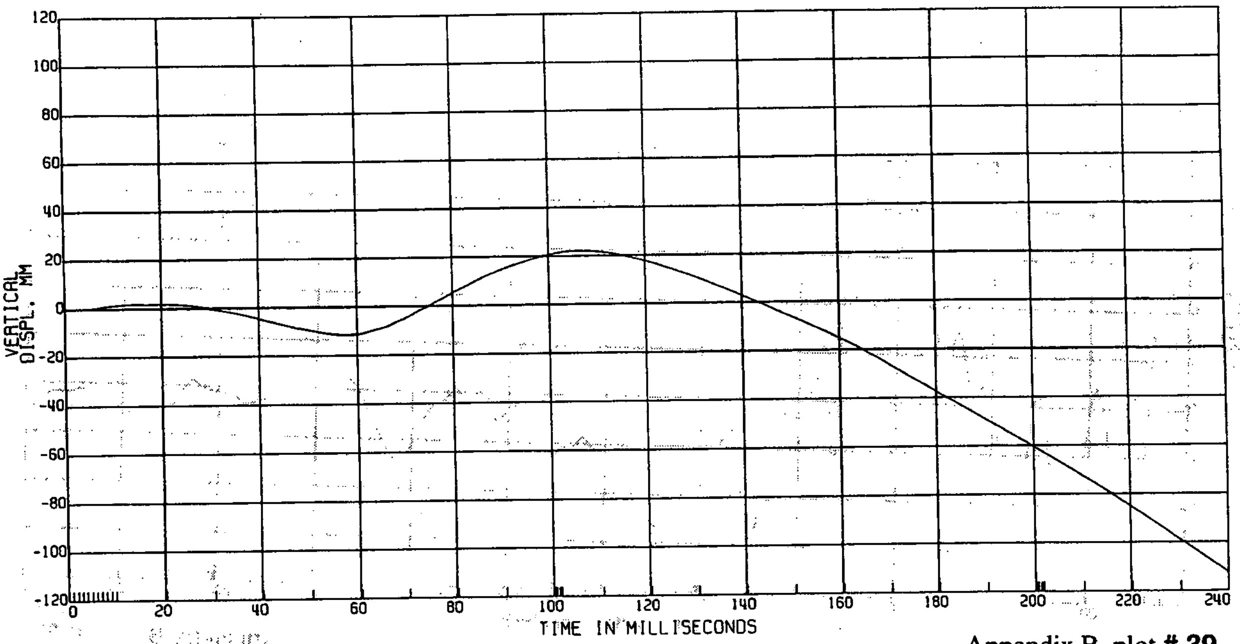
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

L. FRT ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # **39**

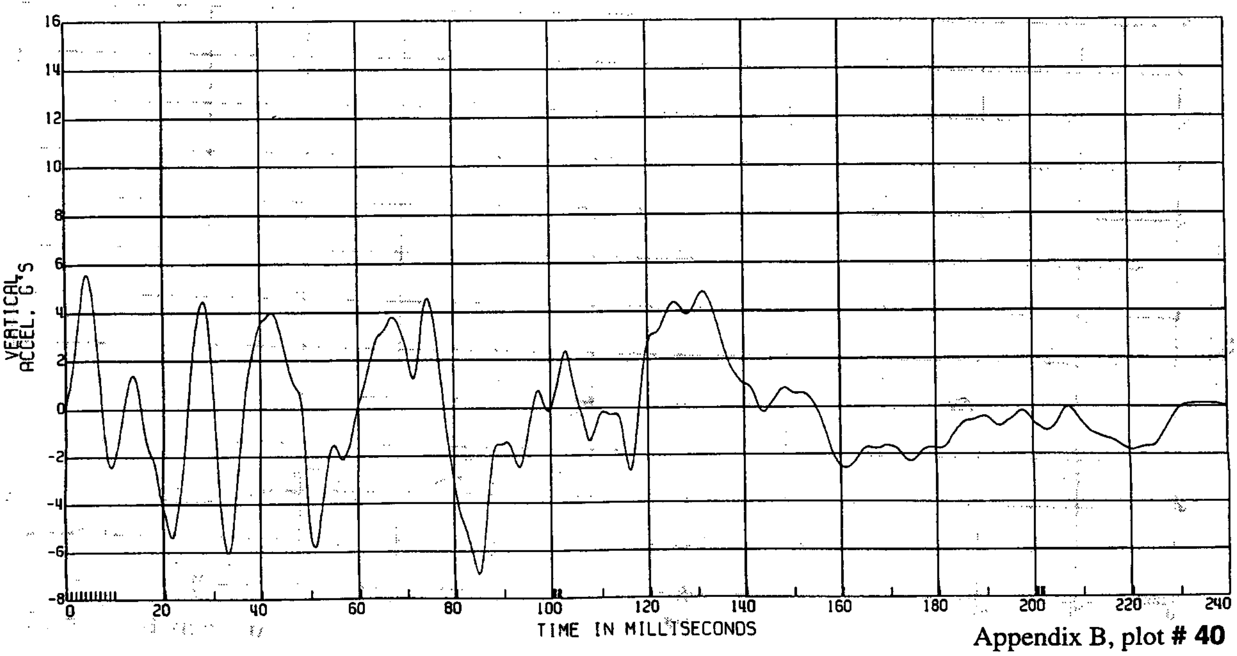
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 60

R. FRT ROCKER ACCEL

TEST DATE:01/08/1997



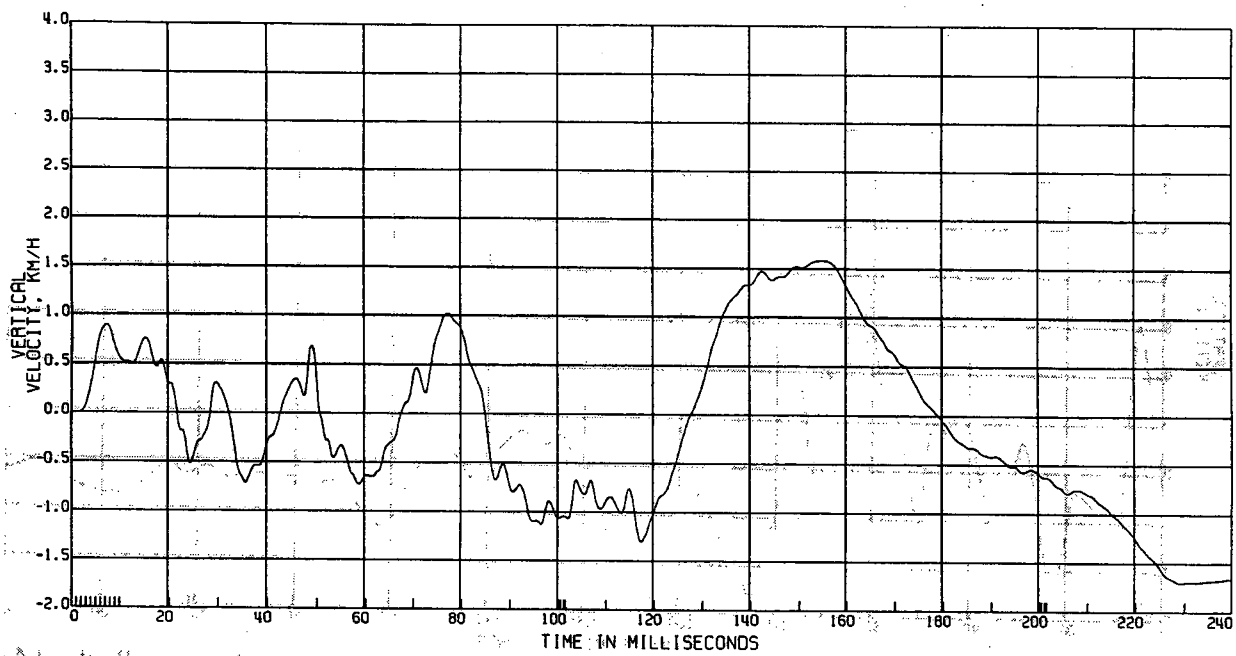

Appendix B, plot # **40**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R. FRT ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



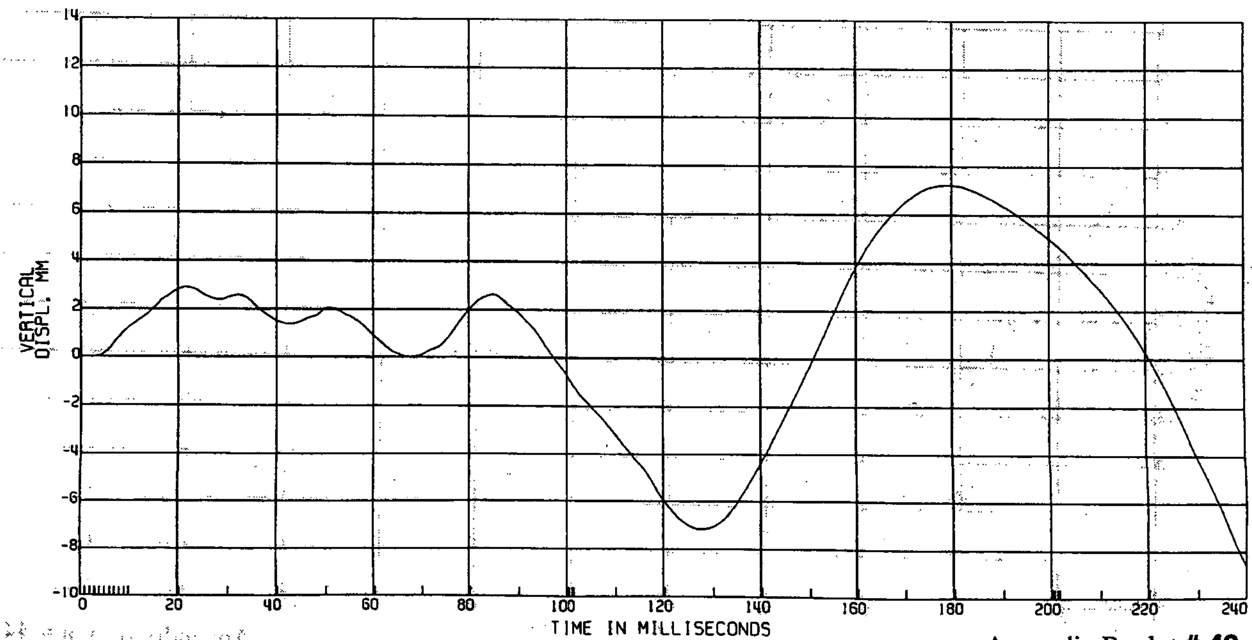

Appendix B, plot # **41**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R. FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



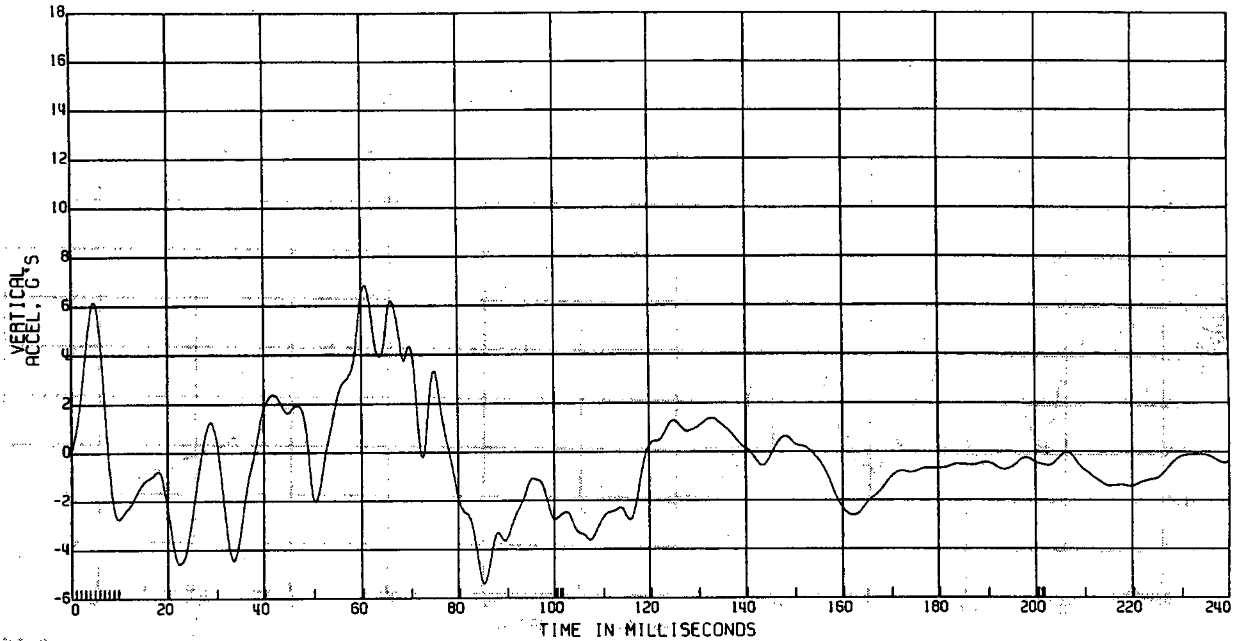

Appendix B, plot # **42**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

AVERAGED FRT ROCKER ACCELERATION
(AVGD L. & R. ROCKER ACCELS)

TEST DATE:01/08/1997



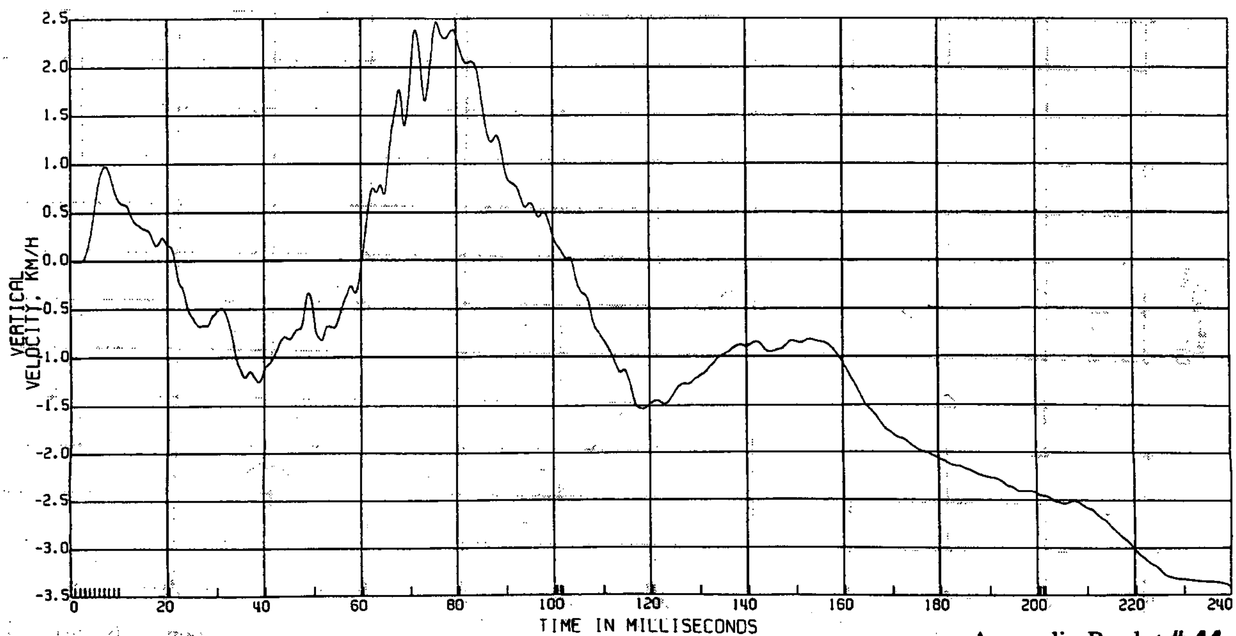

Appendix B, plot # **43**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997

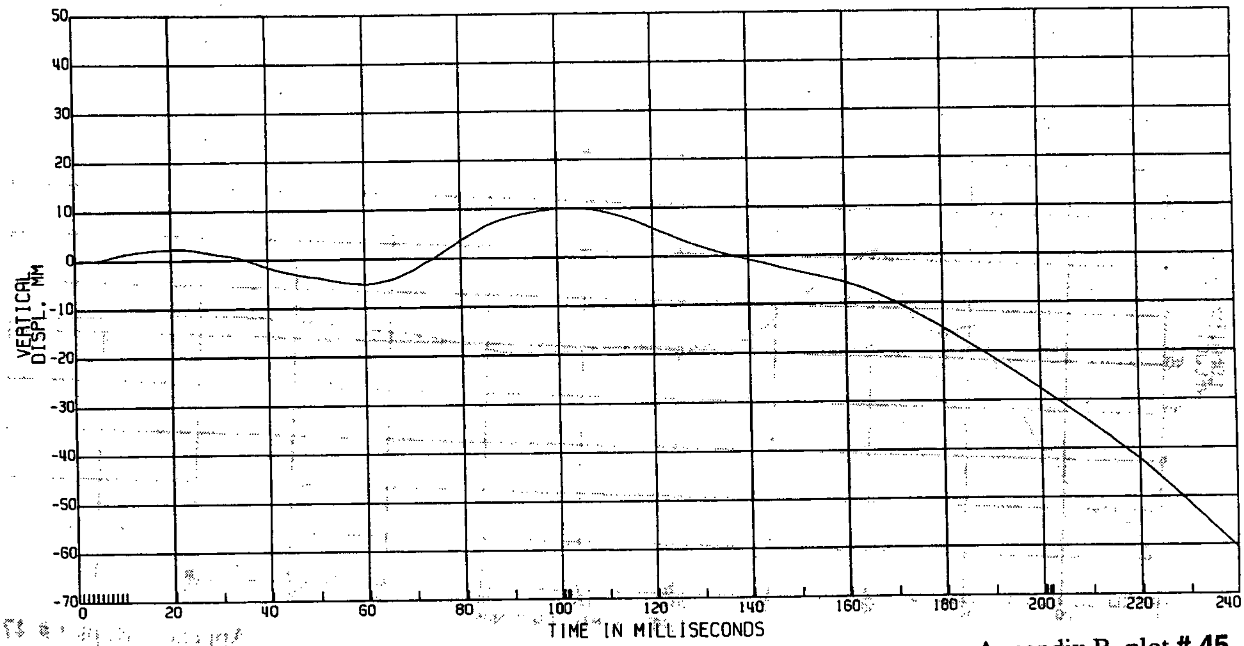



Appendix B, plot # **44**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 AVGD FRT ROCKER DISPL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

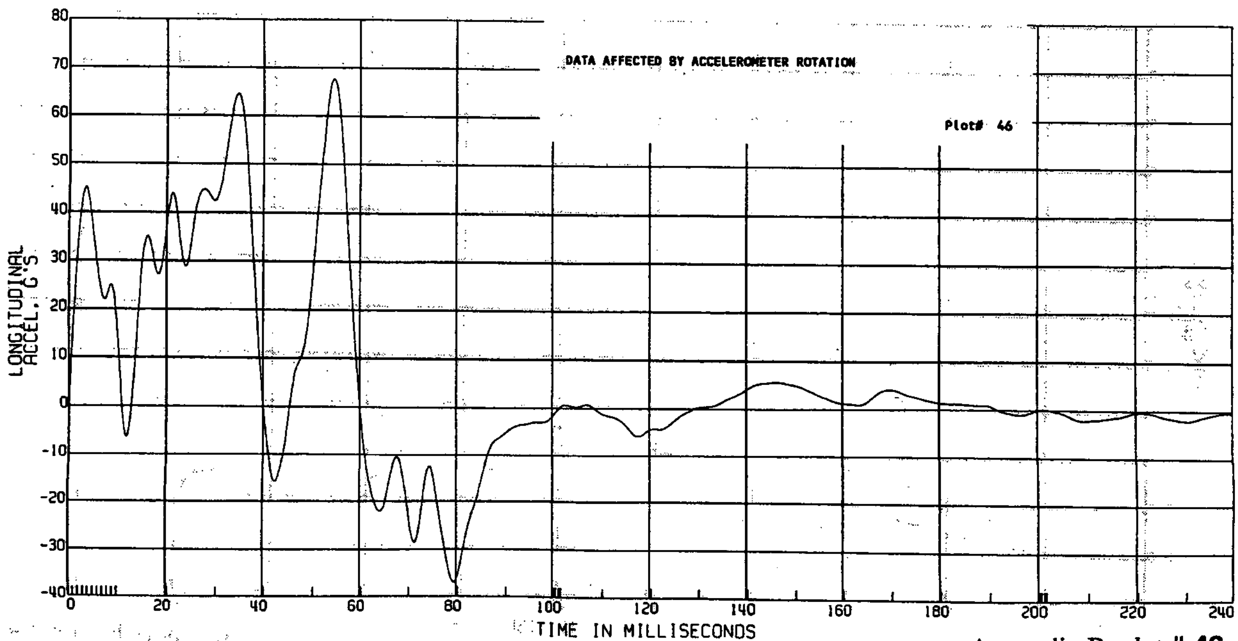



Appendix B, plot # 45

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR FRAME ACCEL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60




Appendix B, plot # 46

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

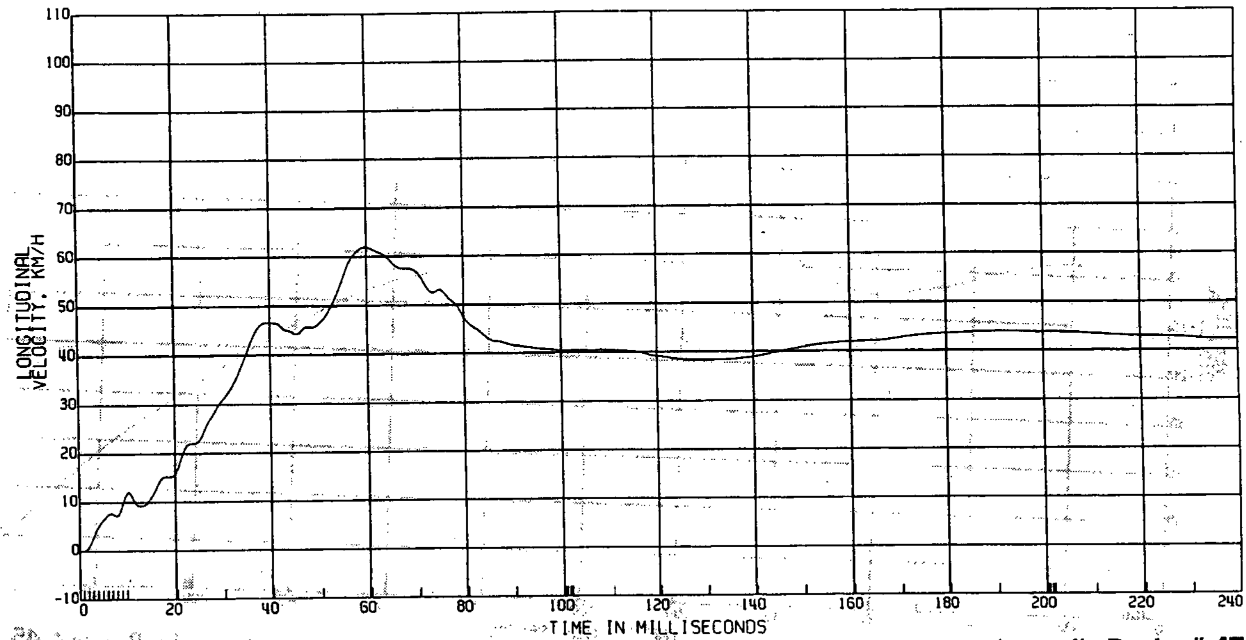
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

L.REAR FRAME VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # **47**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

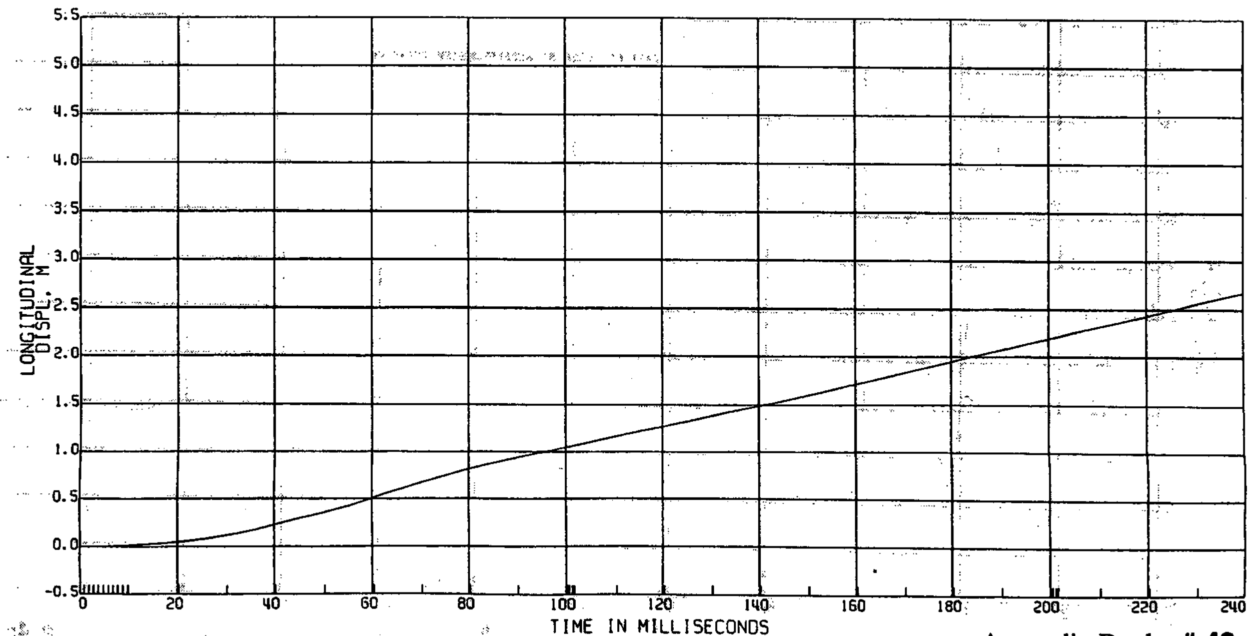
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

L.REAR FRAME DISPL

(COMPUTED FROM ACCELERATION)

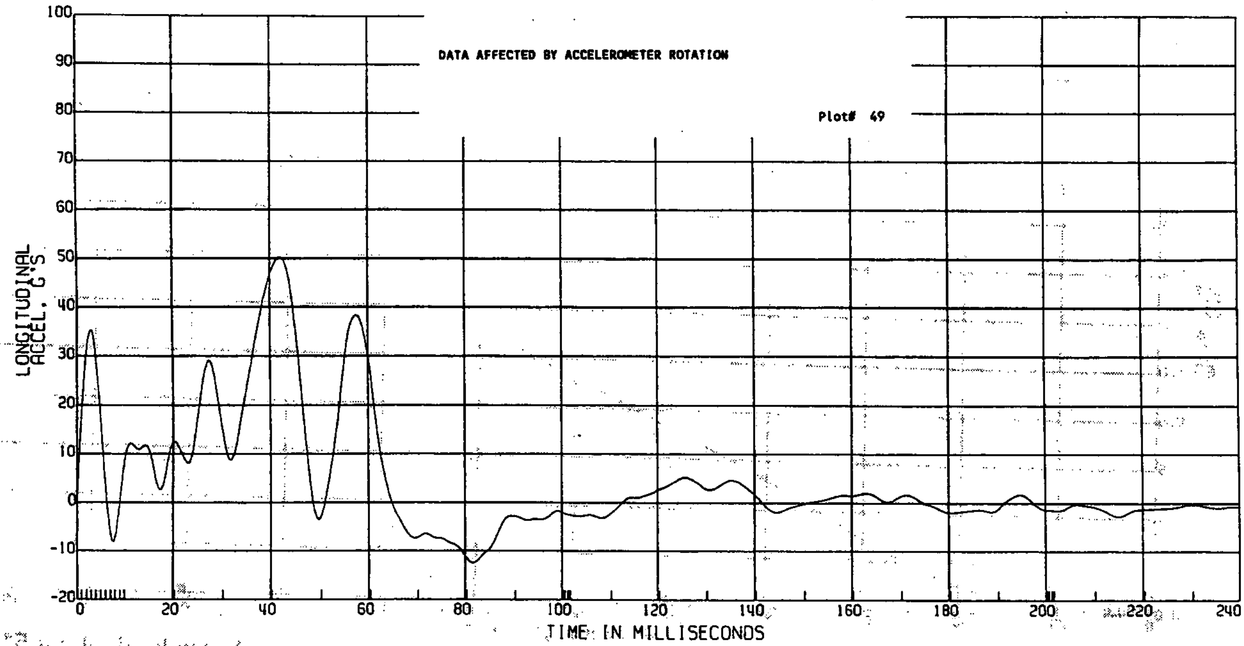
TEST DATE:01/08/1997




Appendix B, plot # **48**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

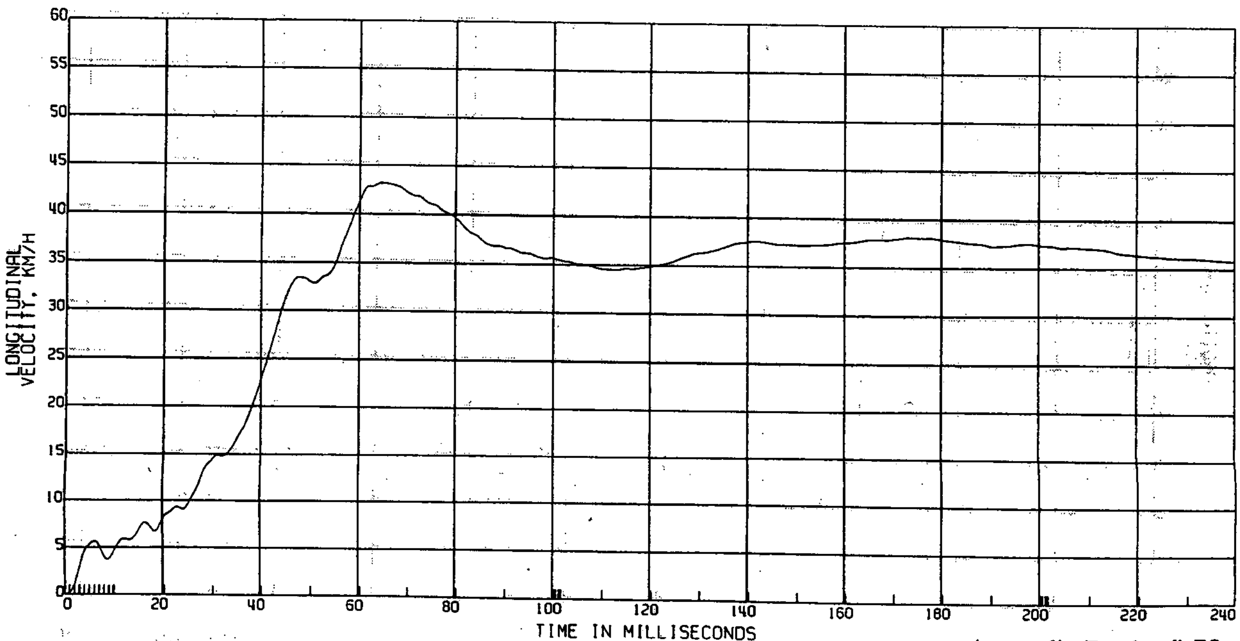
R & D CTR 1VF46079 1FP87 R.REAR FRAME ACCEL TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 60




Appendix B, plot # **49**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 R.REAR FRAME VELOCITY TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix B, plot # **50**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

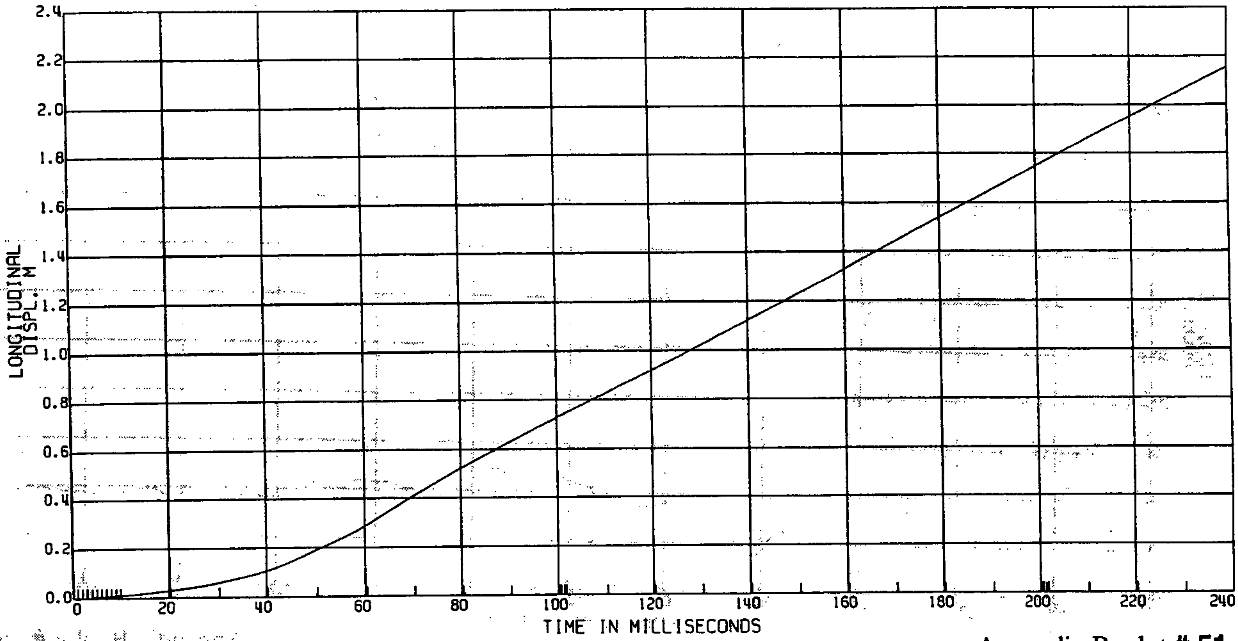
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

R.REAR FRAME DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # 51

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

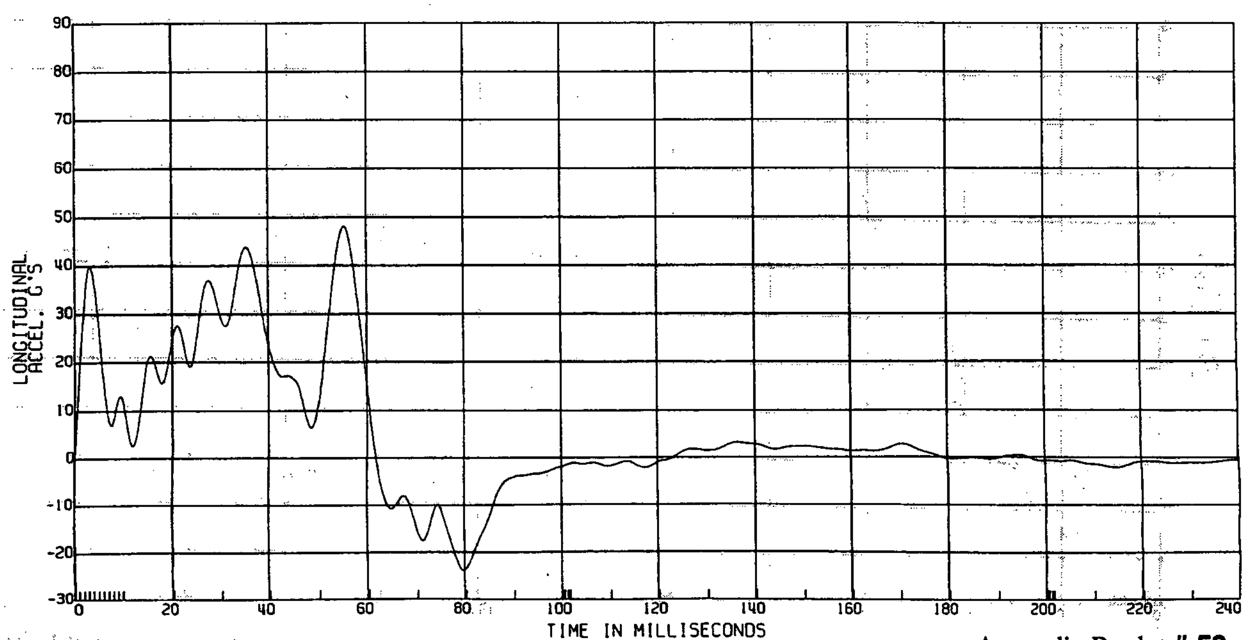
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 60

AVERAGED REAR FRAME ACCELERATION

(AVGD L. & R. FRAME ACCELS)

TEST DATE:01/08/1997




Appendix B, plot # 52

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

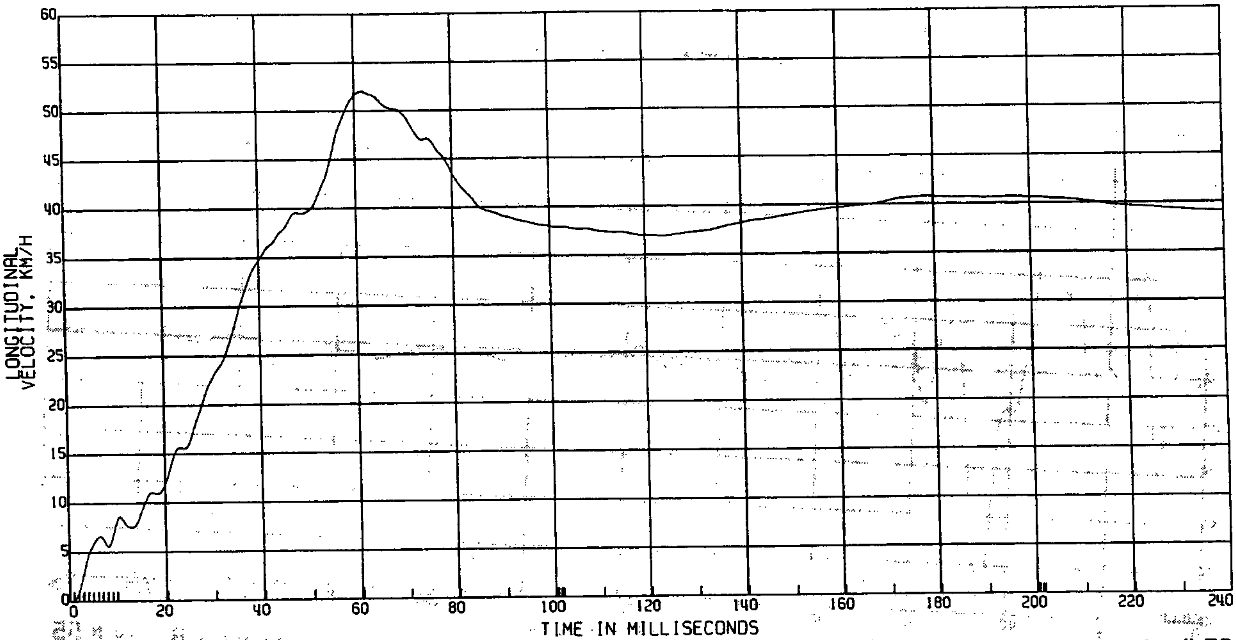
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

AVGD REAR FRAME VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # **53**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

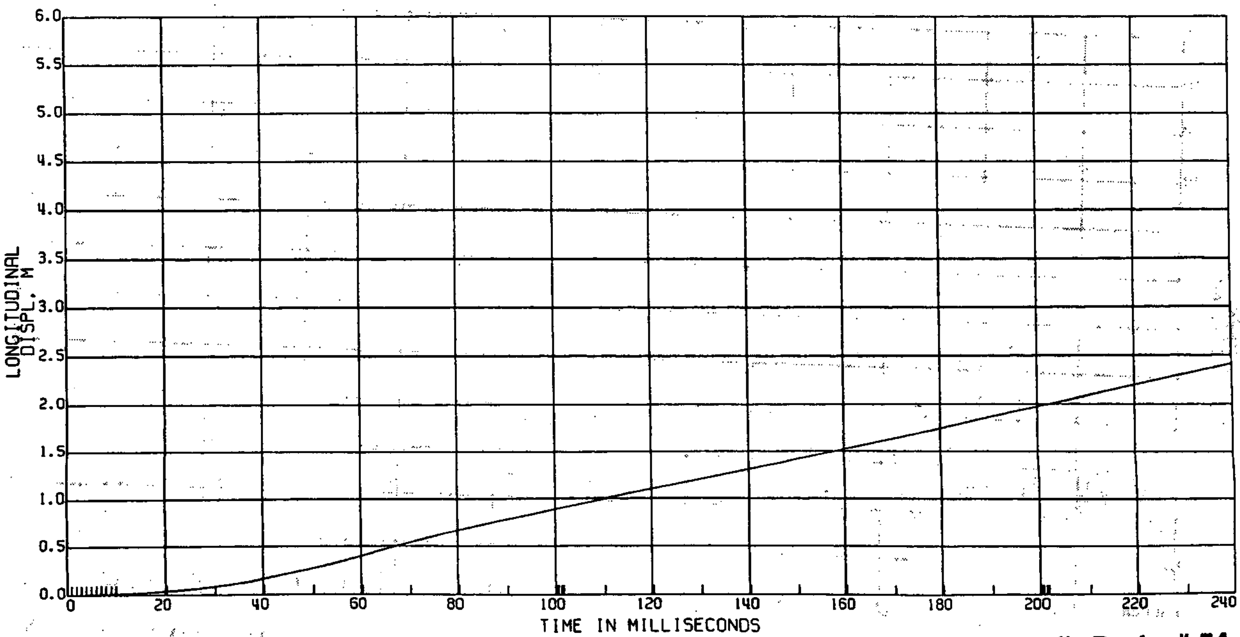
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

AVGD REAR FRAME DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # **54**

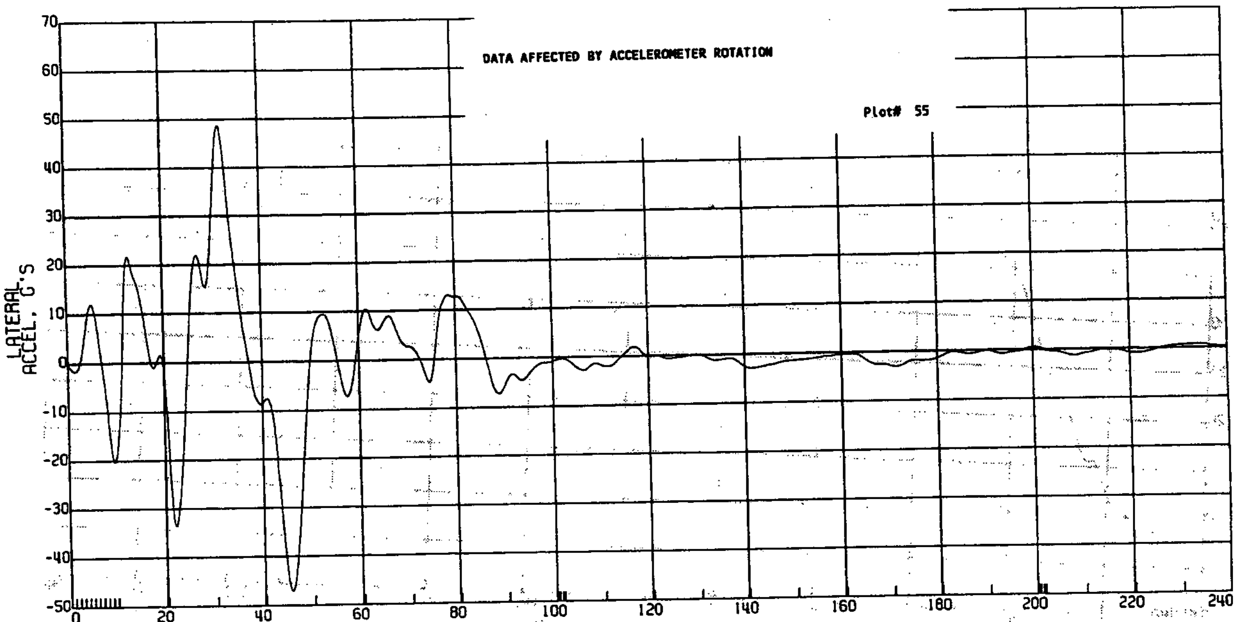
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 60

L.REAR FRAME ACCEL

TEST DATE:01/08/1997




Appendix B, plot # **55**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

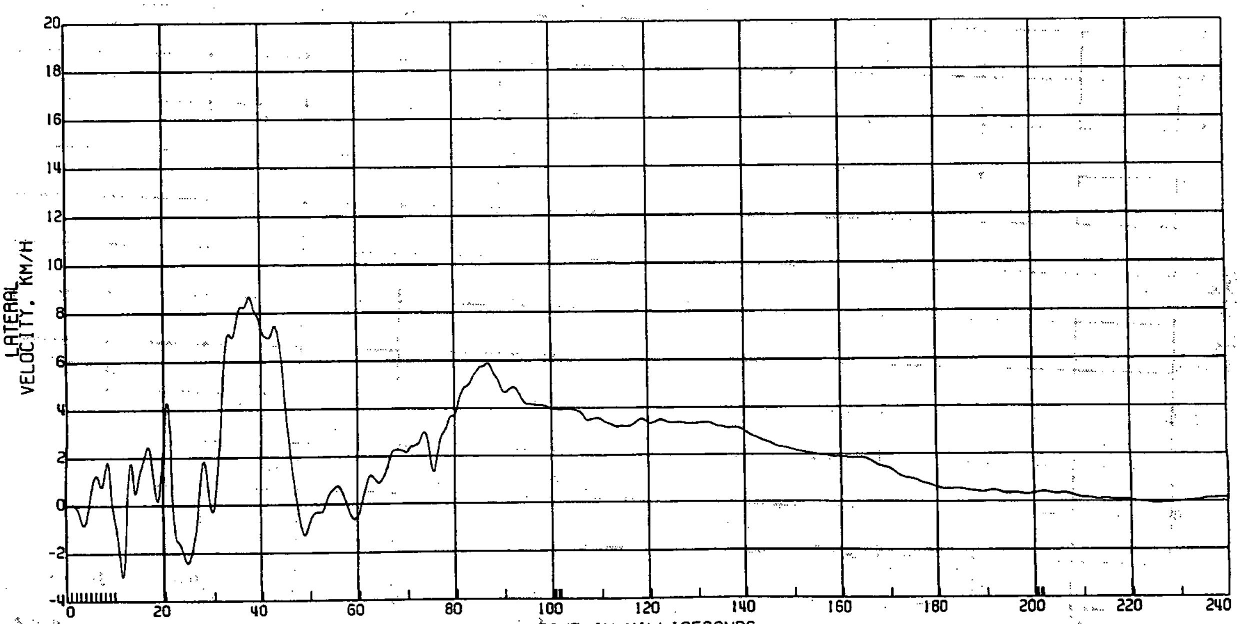
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

L.REAR FRAME VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



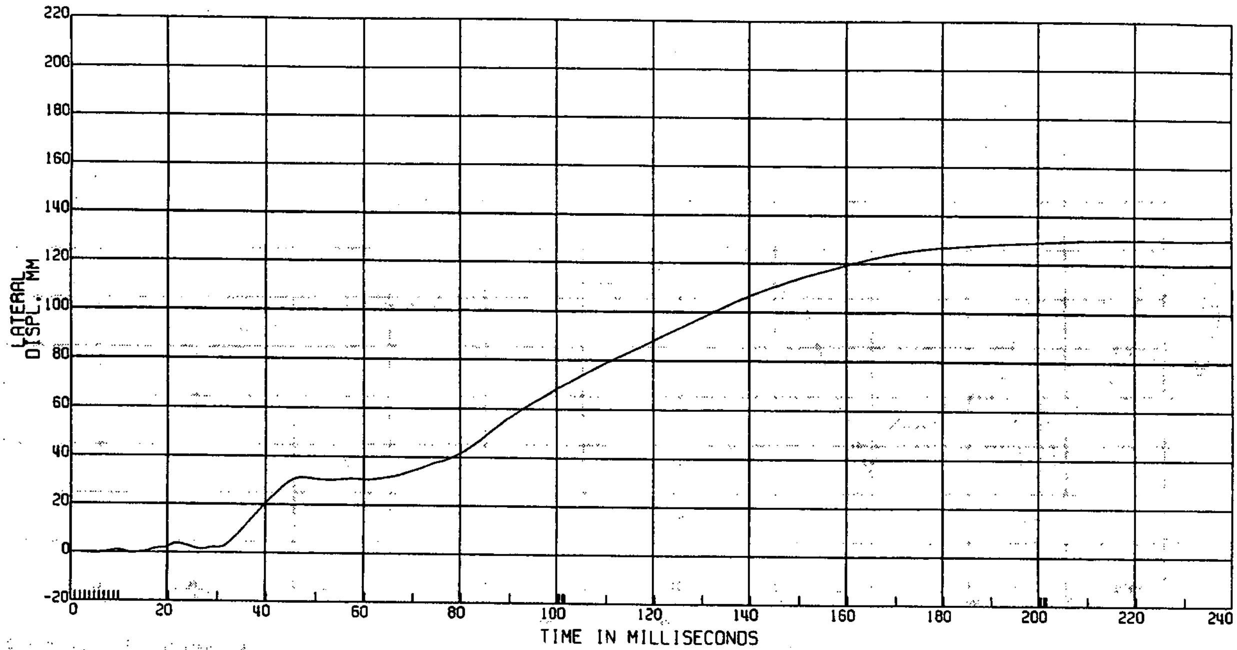

Appendix B, plot # **56**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

L.REAR FRAME DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



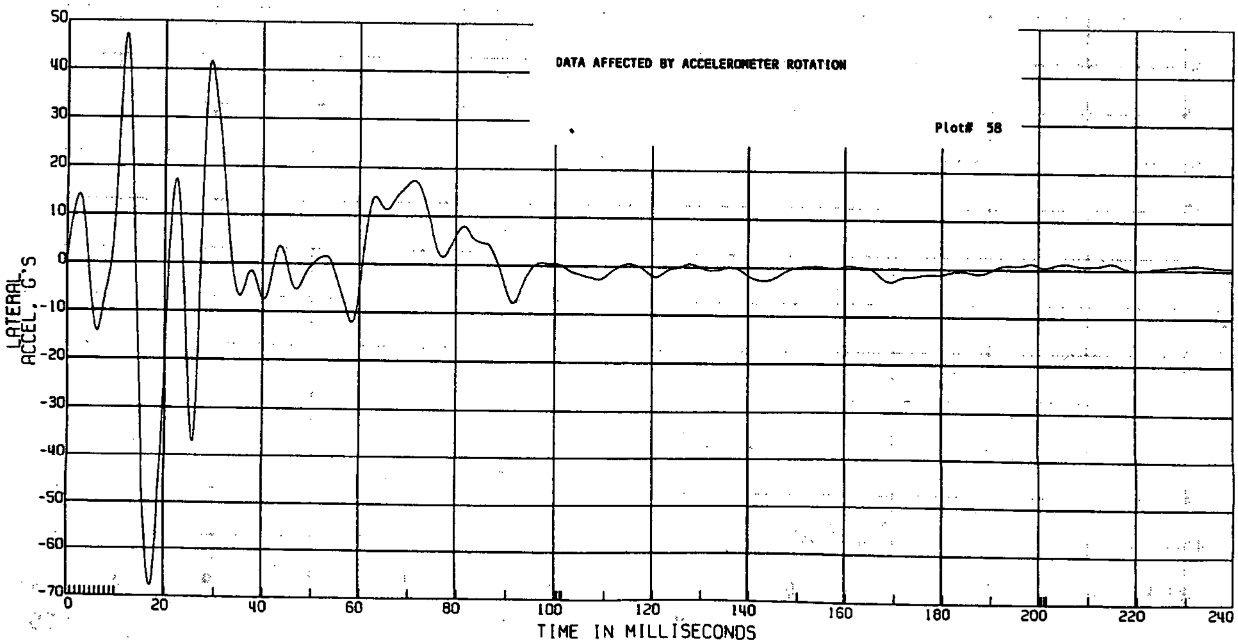

Appendix B, plot # 57

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

R.REAR FRAME ACCEL

TEST DATE:01/08/1997



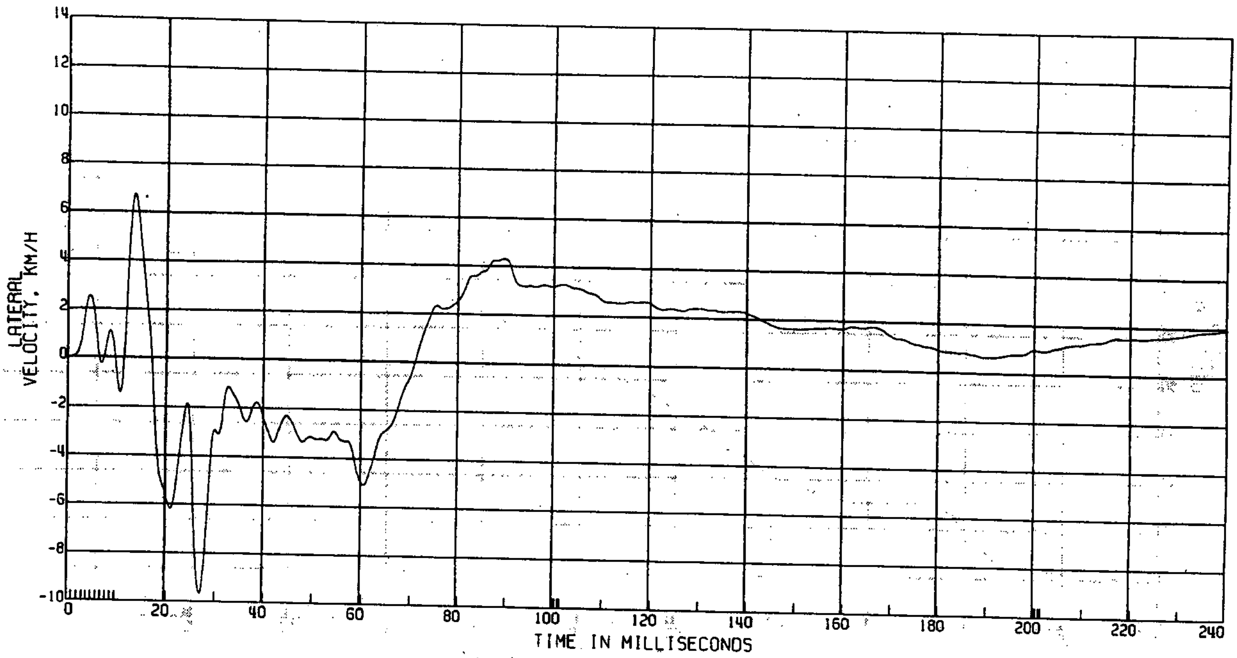

Appendix B, plot # 58

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R.REAR FRAME VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



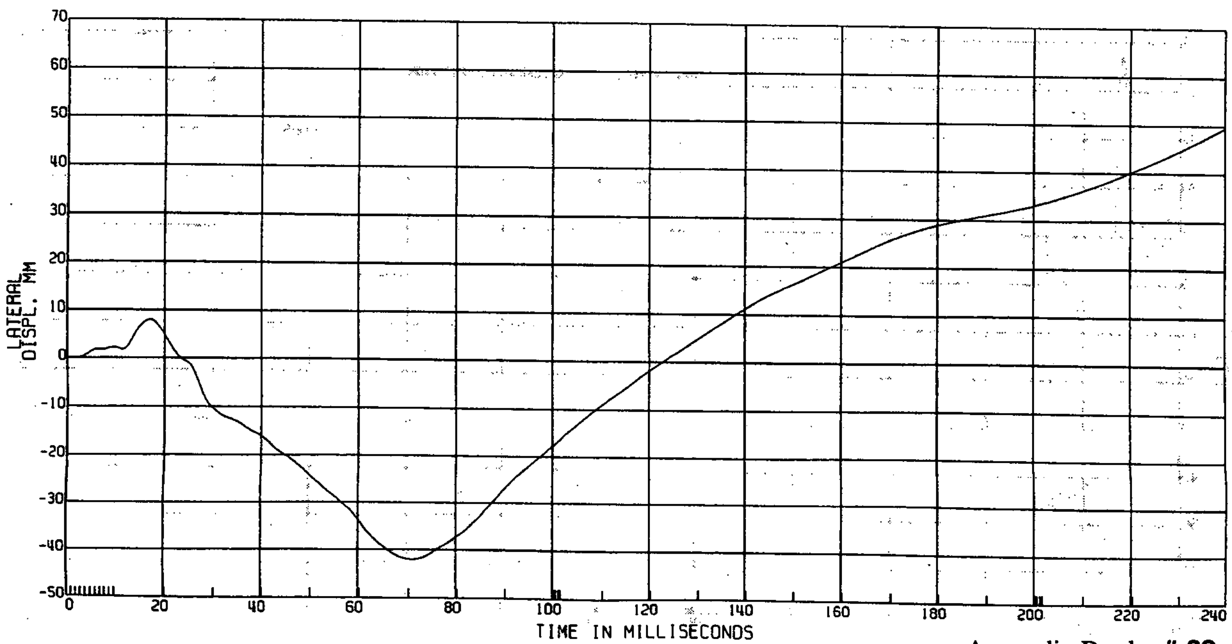

Appendix B, plot # 59

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R.REAR FRAME DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



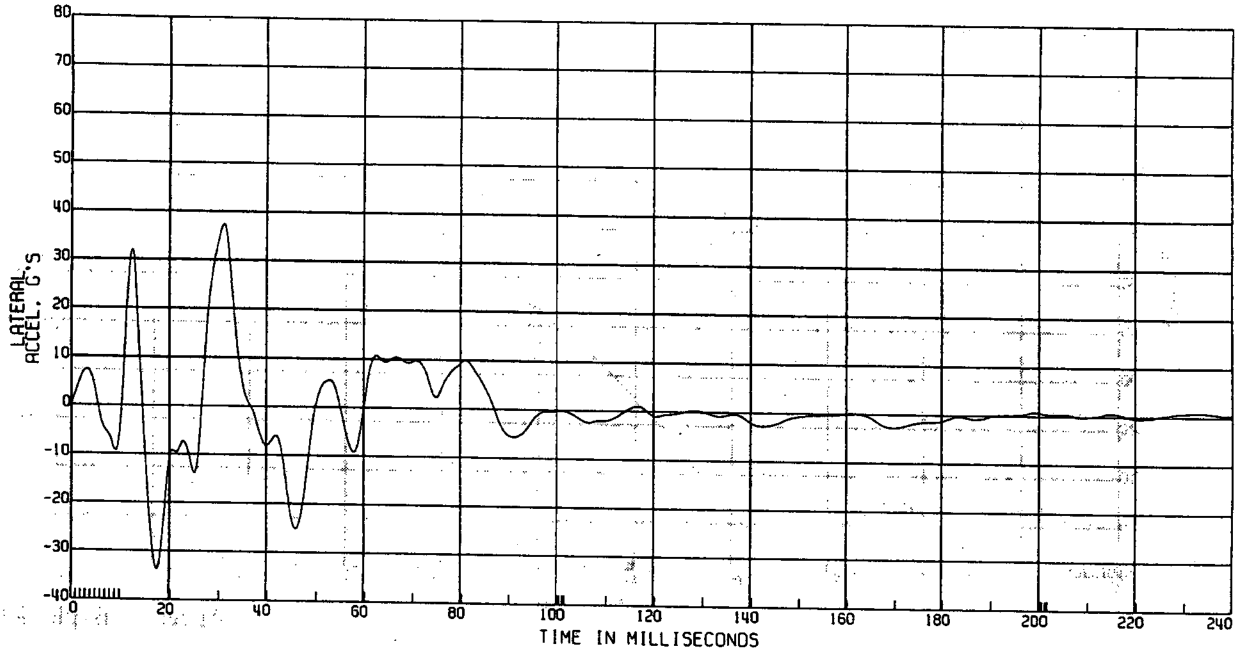

Appendix B, plot # 60

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

AVERAGED REAR FRAME ACCELERATION
(AVGD L. & R. FRAME ACCELS)

TEST DATE:01/08/1997



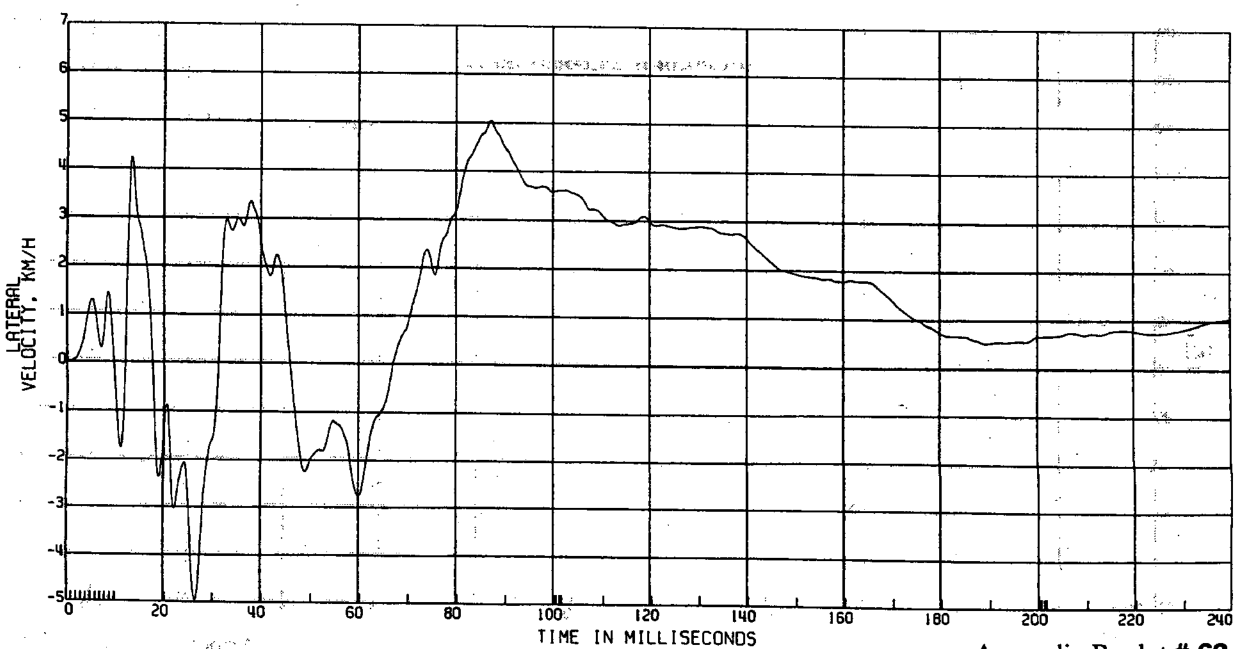

Appendix B, plot # **61**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR FRAME VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



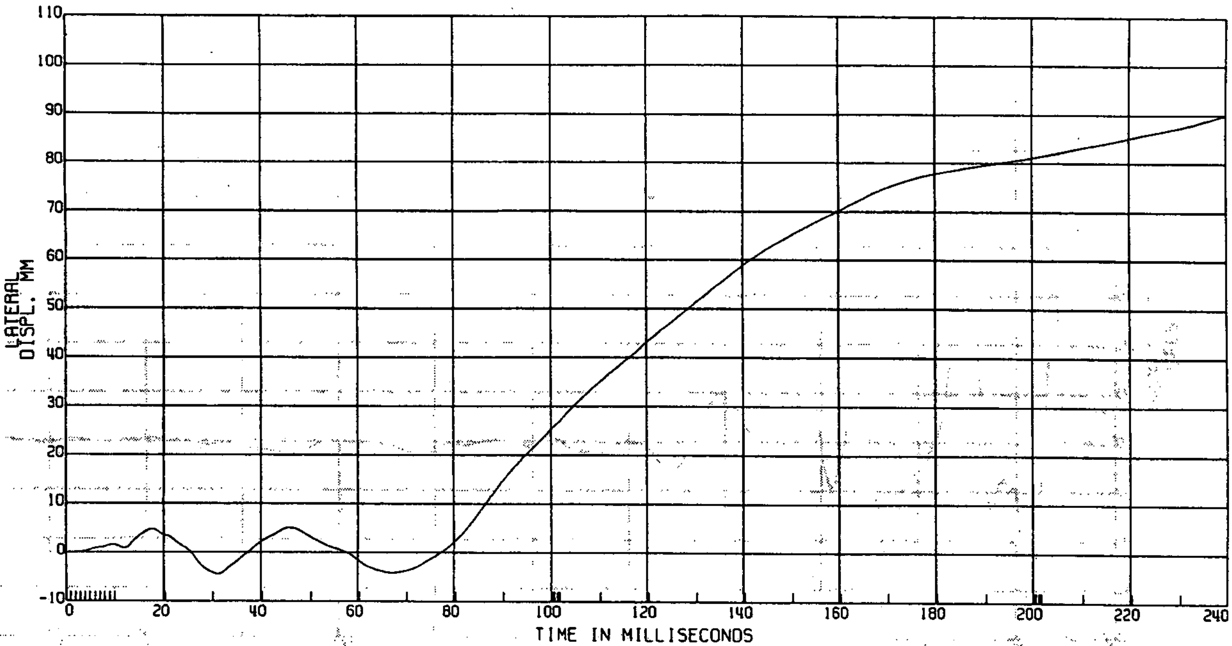

Appendix B, plot # **62**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR FRAME DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



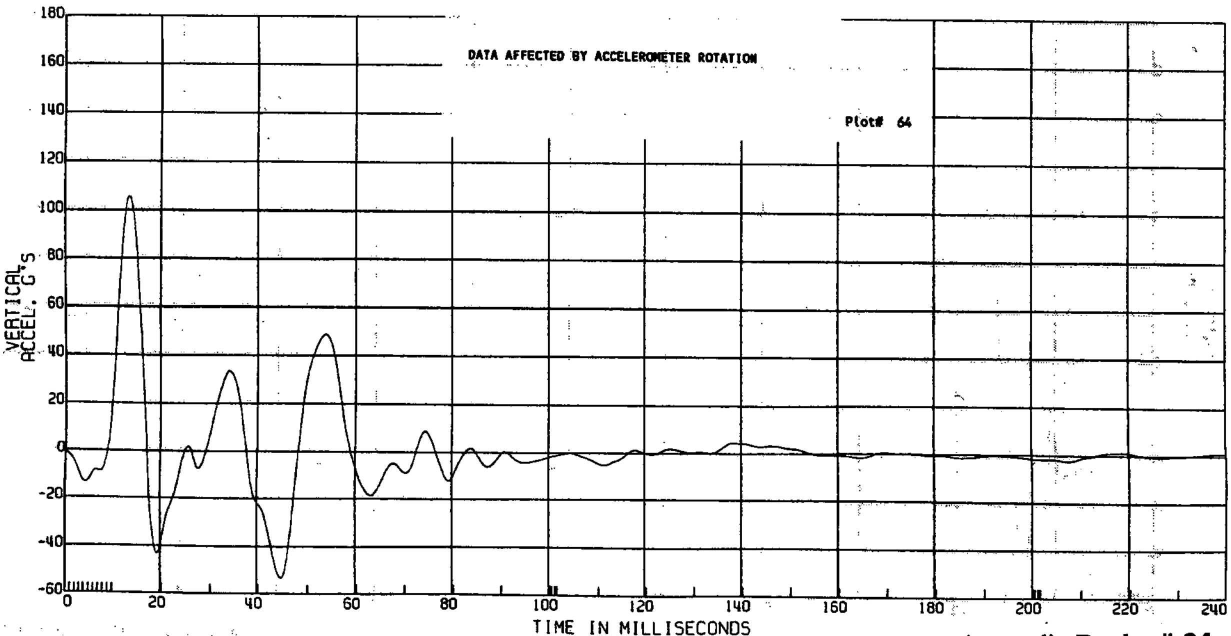

Appendix B, plot # **63**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

L.REAR FRAME ACCEL

TEST DATE:01/08/1997




Appendix B, plot # **64**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

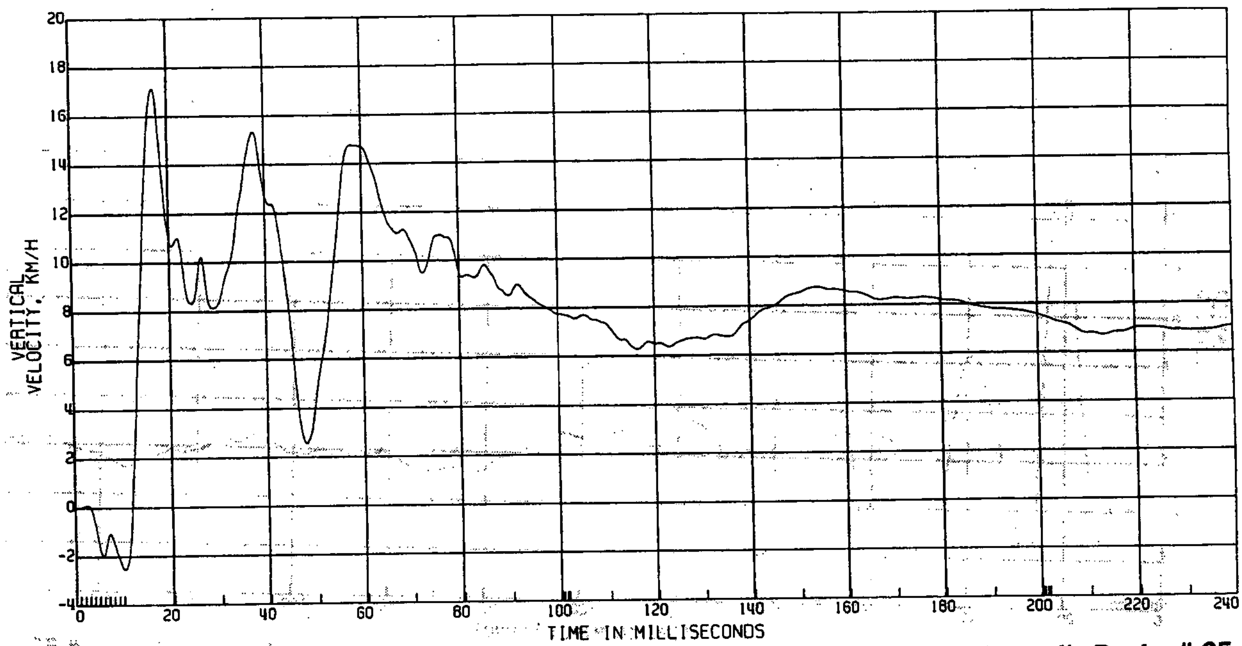
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

L.REAR FRAME VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # 65

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

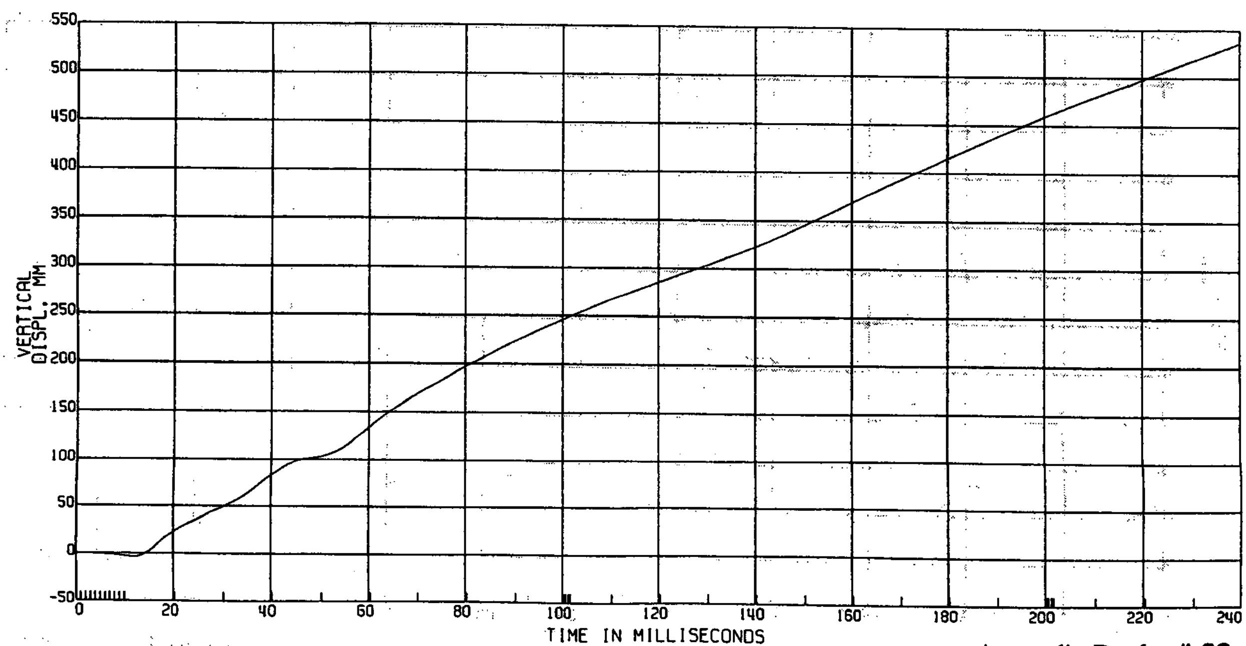
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

L.REAR FRAME DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997

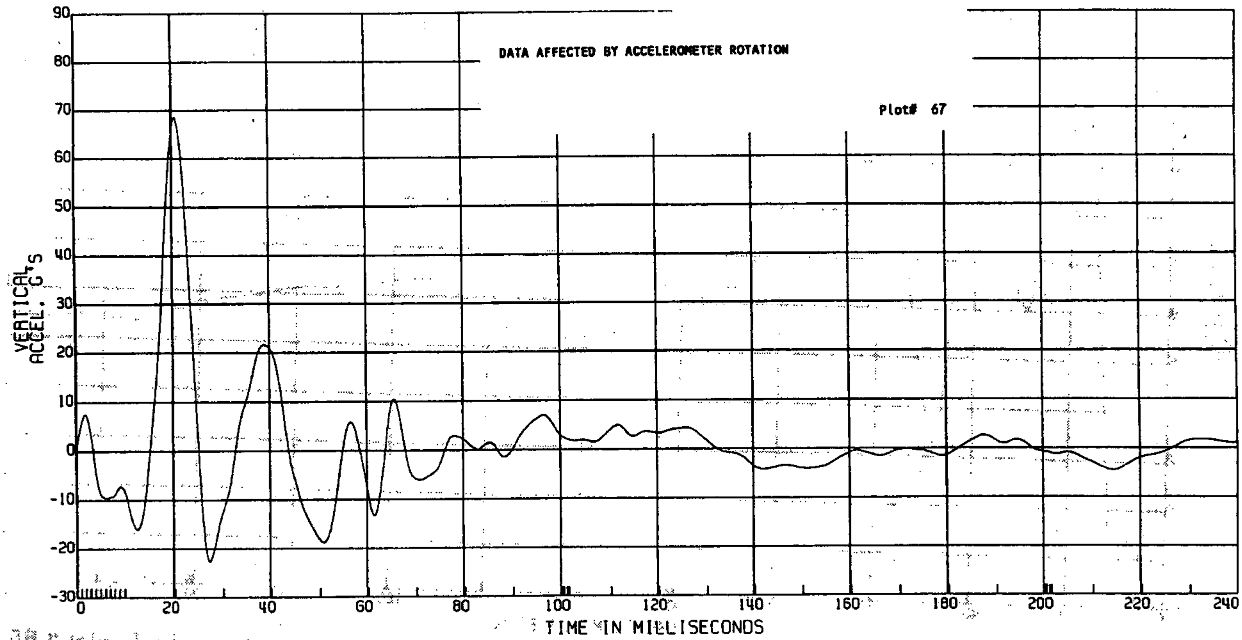



Appendix B, plot # 66

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 R.REAR FRAME ACCEL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60

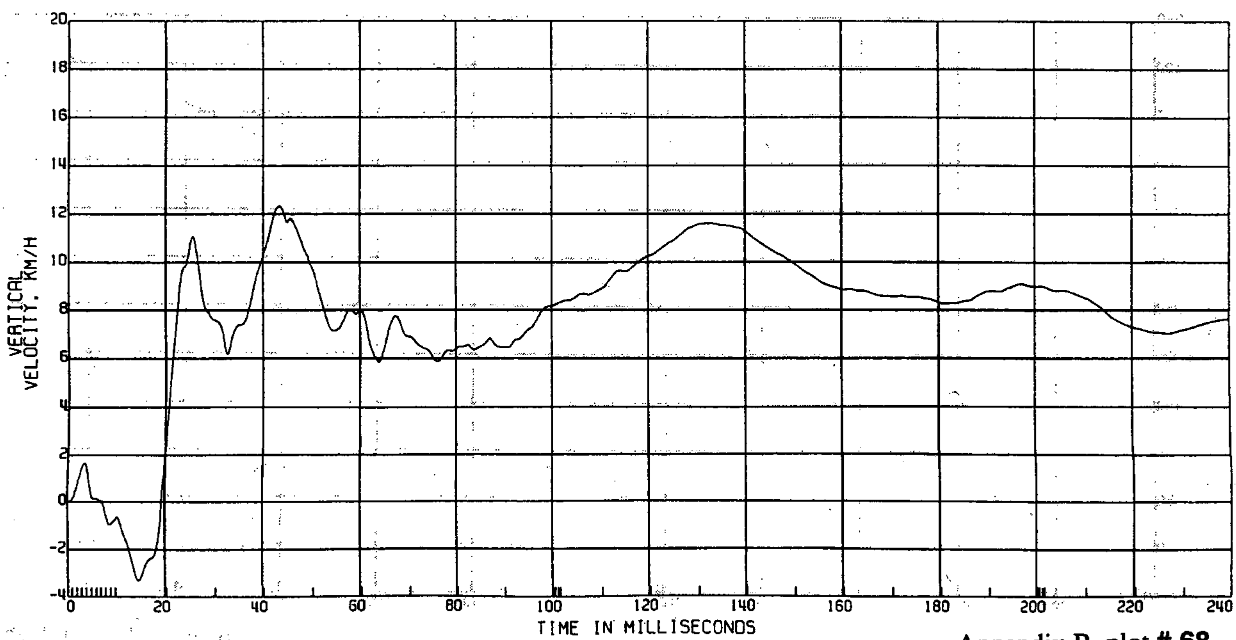



Appendix B, plot # **67**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 R.REAR FRAME VELOCITY TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



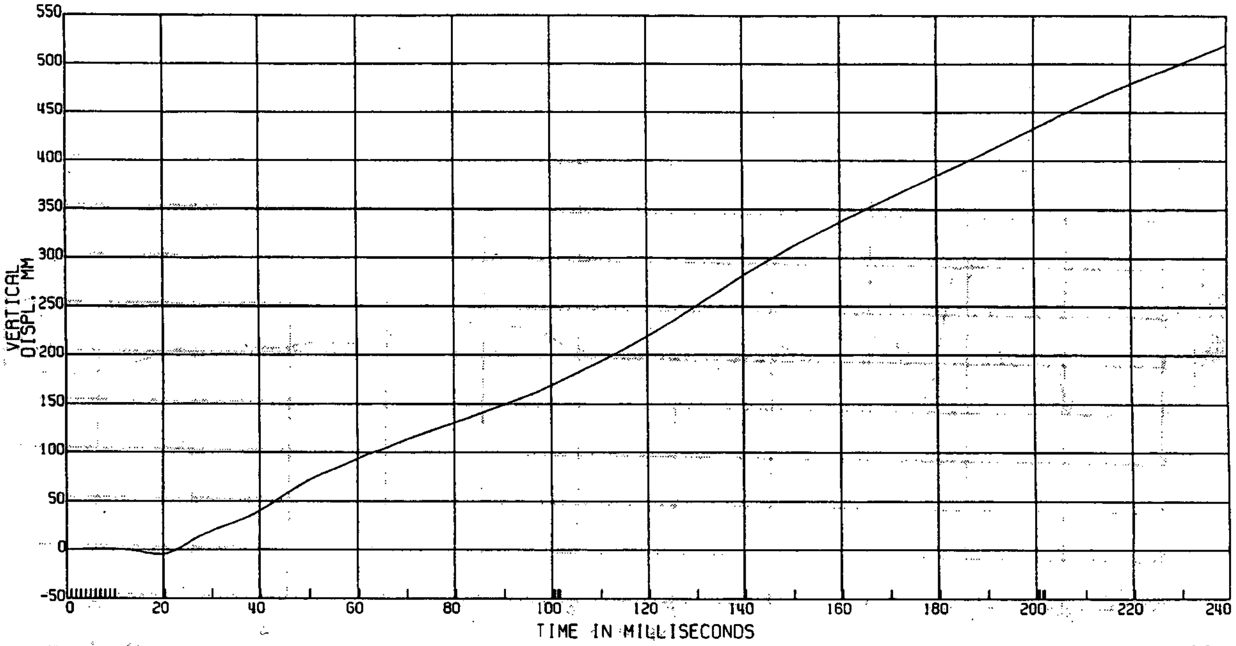

Appendix B, plot # **68**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R.REAR FRAME DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



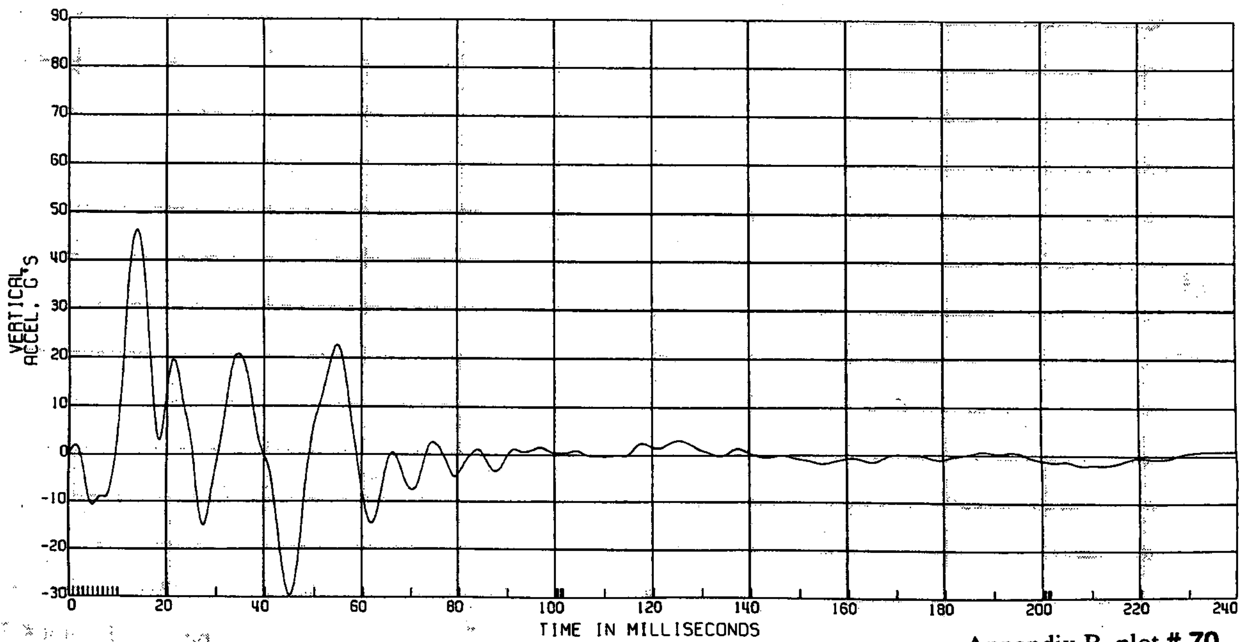

Appendix B, plot # 69

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

AVERAGED REAR FRAME ACCELERATION
(AVGD L. & R. FRAME ACCELS)

TEST DATE:01/08/1997



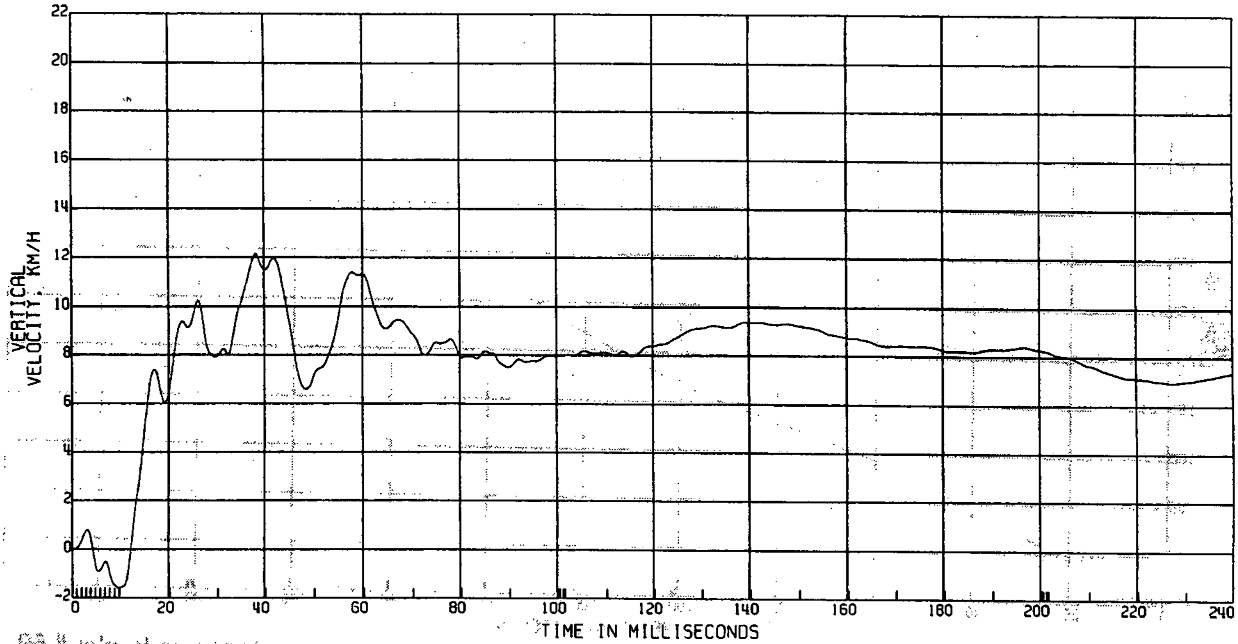

Appendix B, plot # 70

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR FRAME VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



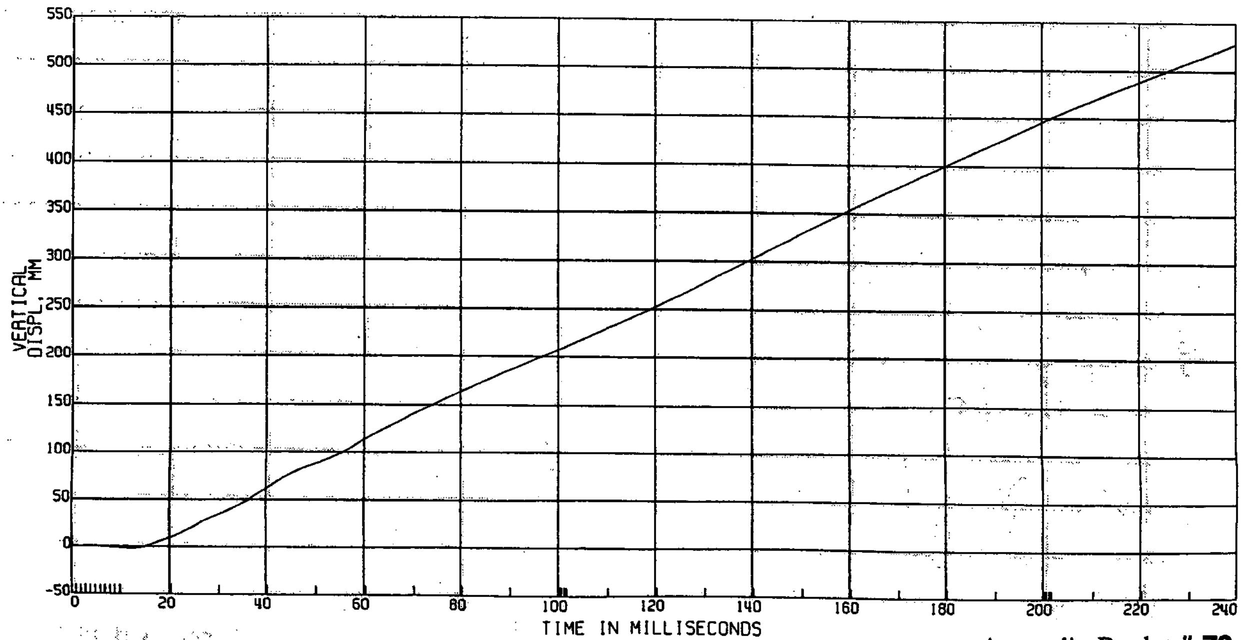

Appendix B, plot # **71**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR FRAME DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997

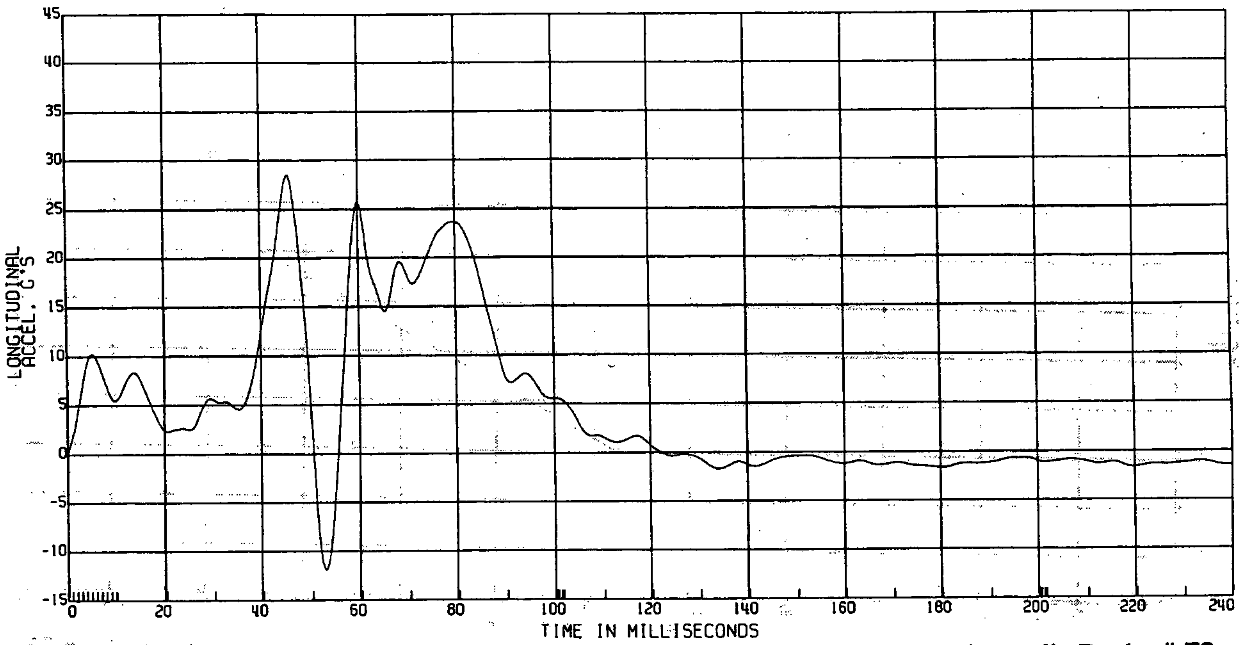



Appendix B, plot # **72**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR ROCKER ACCEL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60

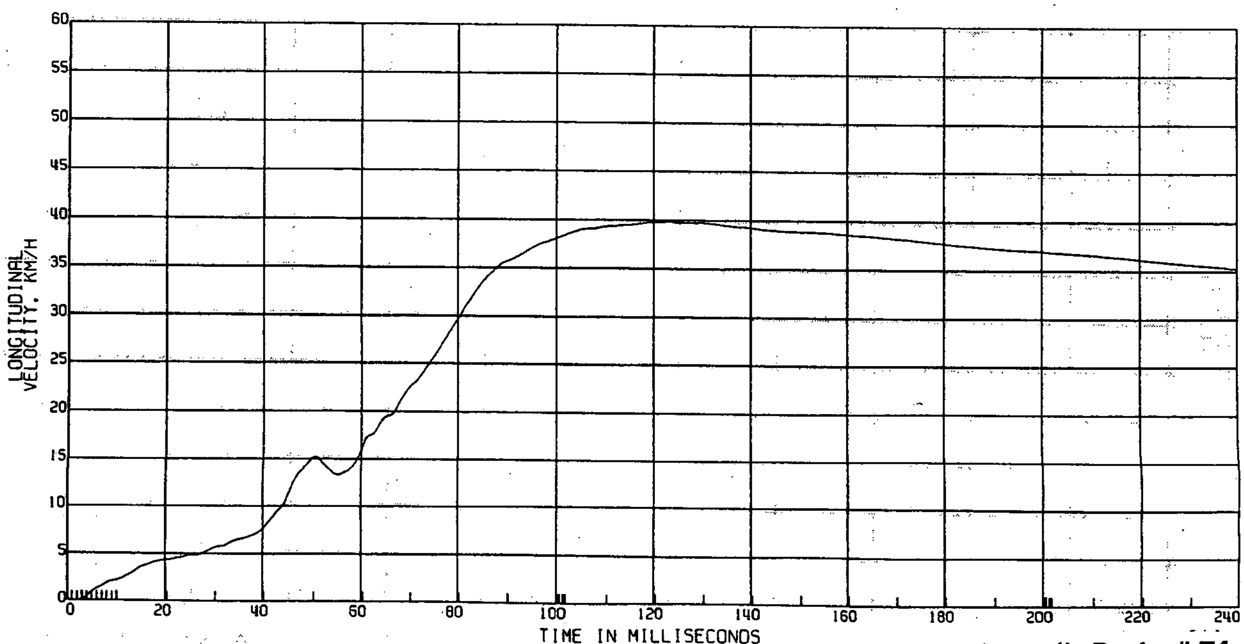



Appendix B, plot # **73**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR ROCKER VELOCITY TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



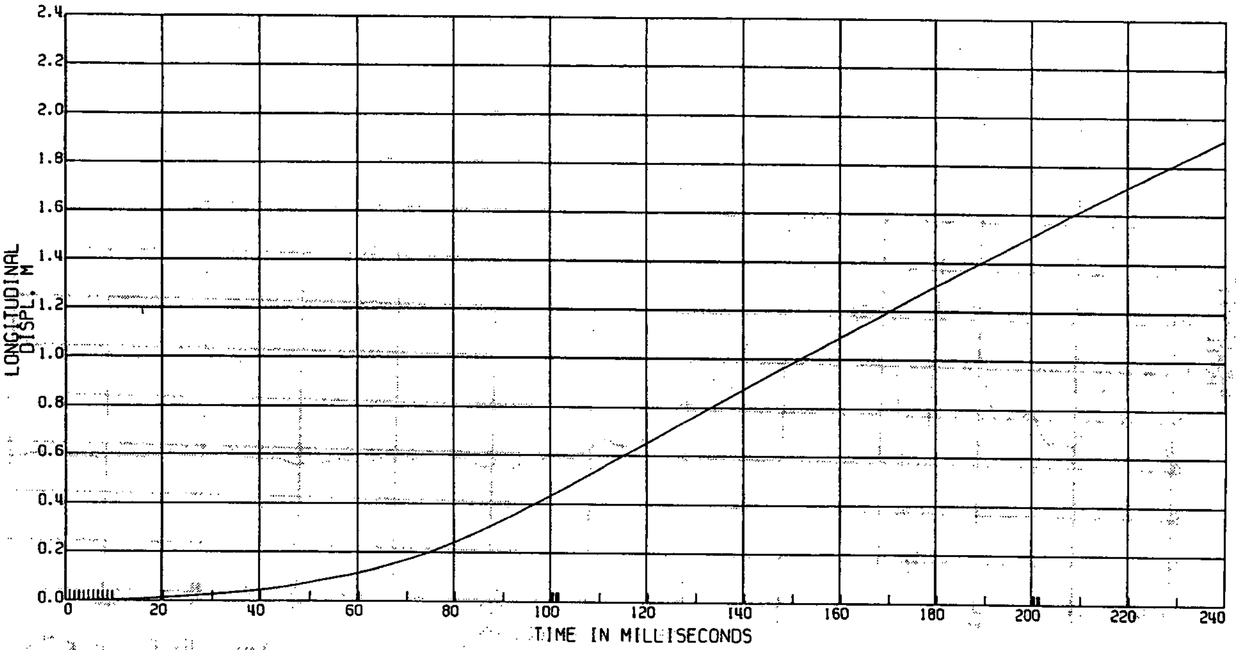

Appendix B, plot # **74**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

L.REAR ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



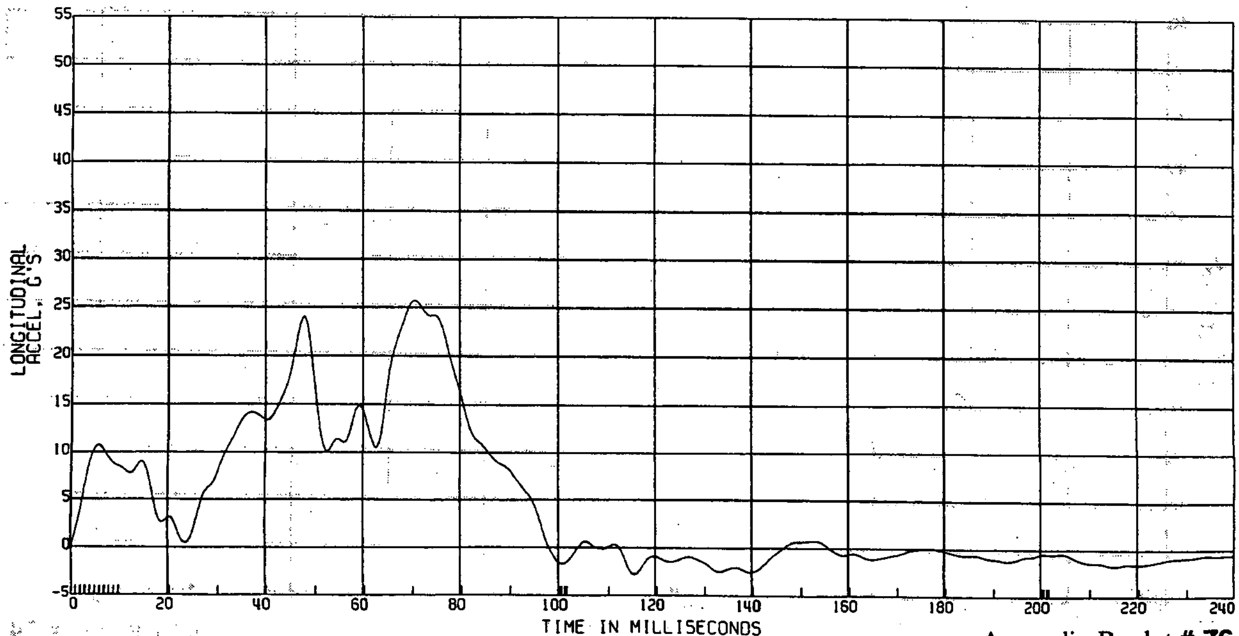

Appendix B, plot # **75**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

R.REAR ROCKER ACCEL

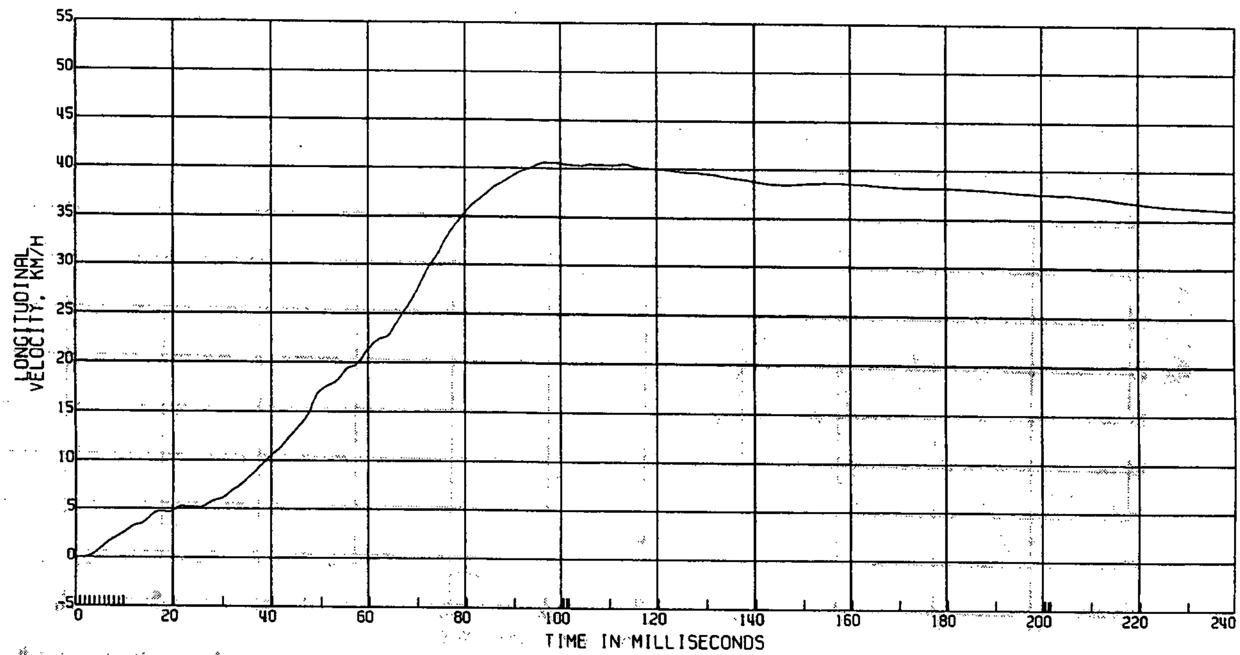
TEST DATE:01/08/1997




Appendix B, plot # **76**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

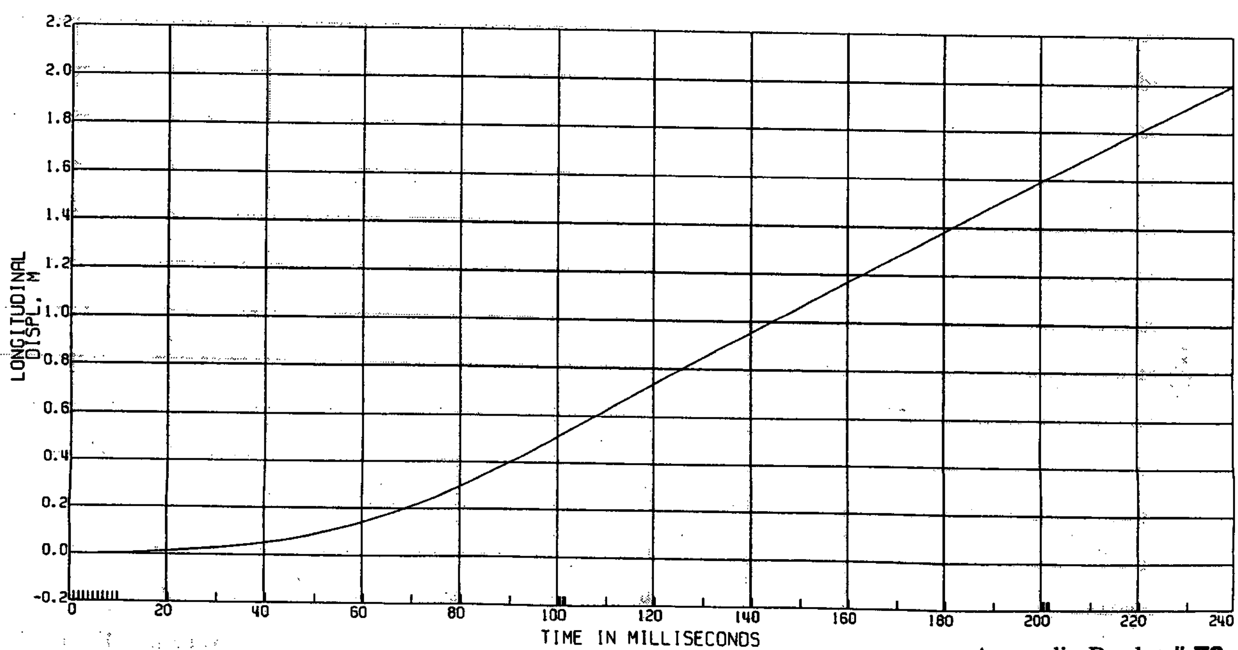
R & D CTR 1VF46079 1FP87 R.REAR ROCKER VELOCITY TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix B, plot # 77

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 R.REAR ROCKER DISPL TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



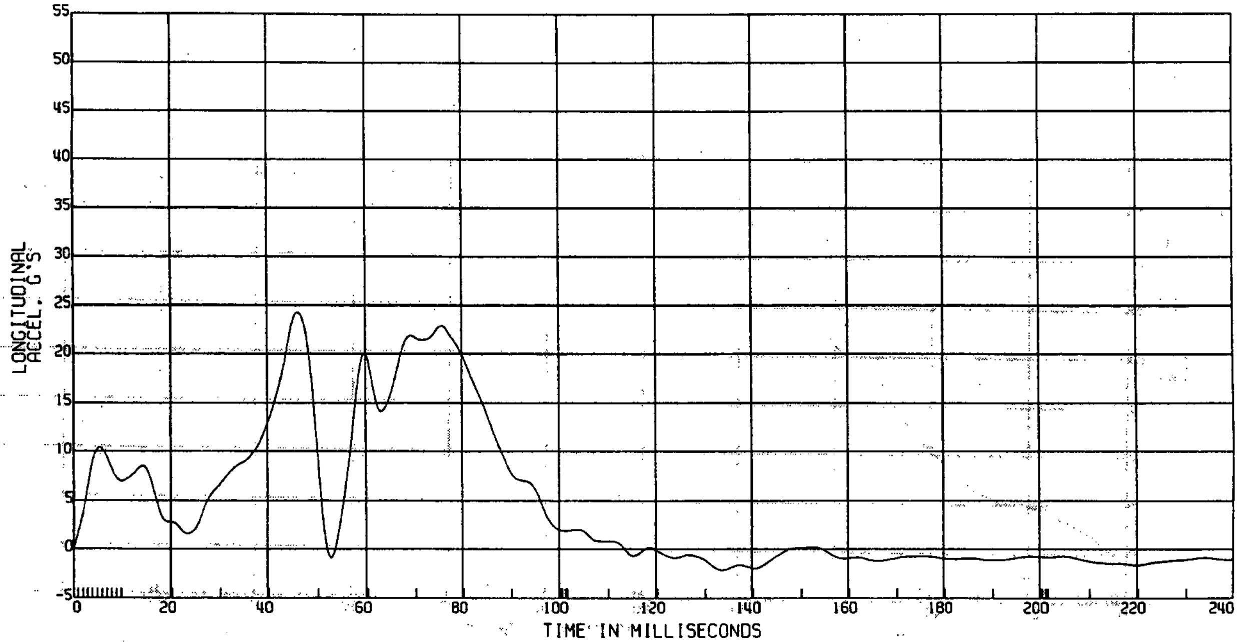

Appendix B, plot # 78

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

AVERAGED REAR ROCKER ACCELERATION
(AVGD L. & R. ROCKER ACCELS)

TEST DATE:01/08/1997



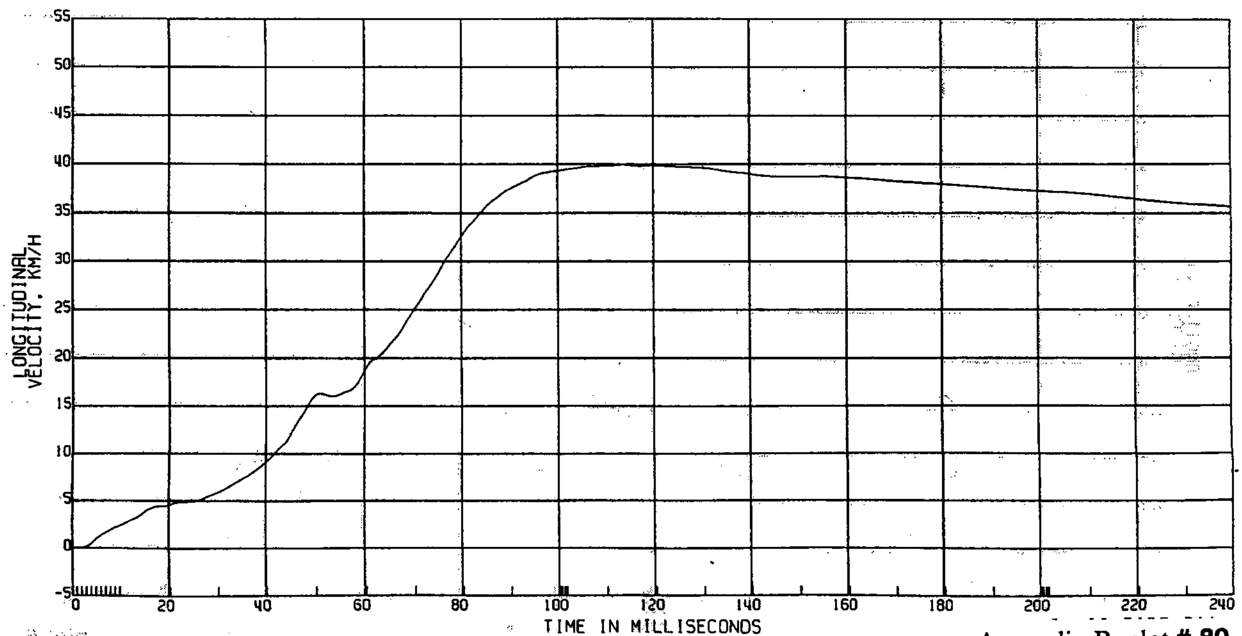

Appendix B, plot # **79**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



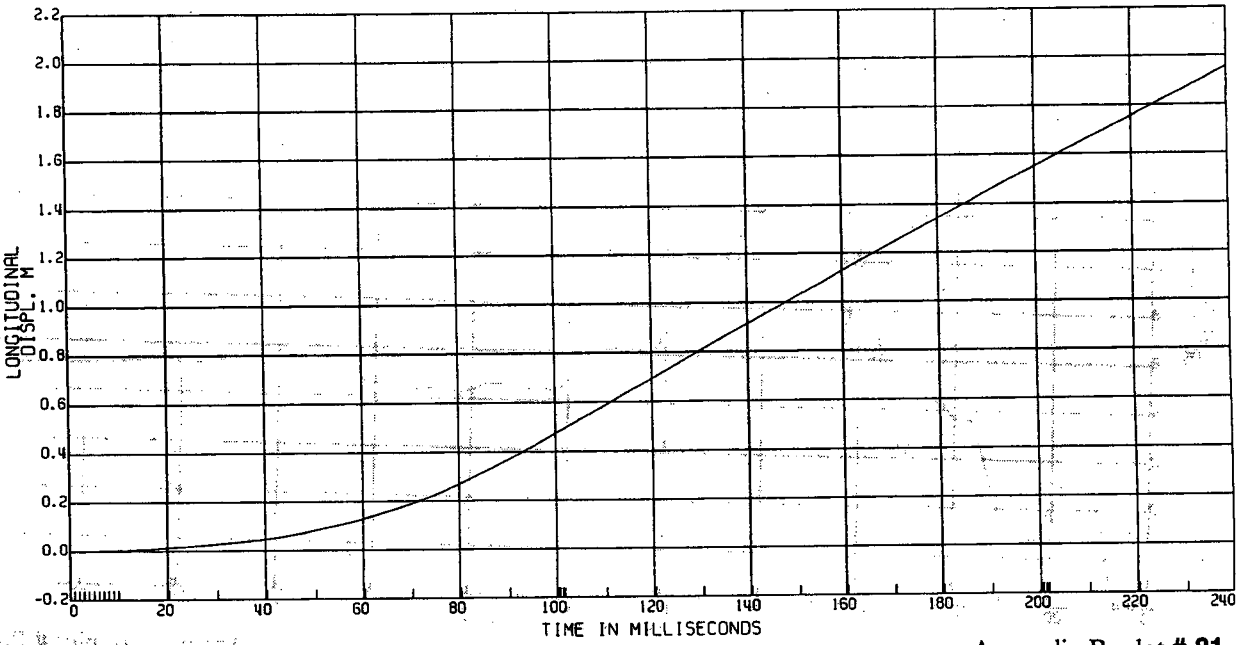

Appendix B, plot # **80**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



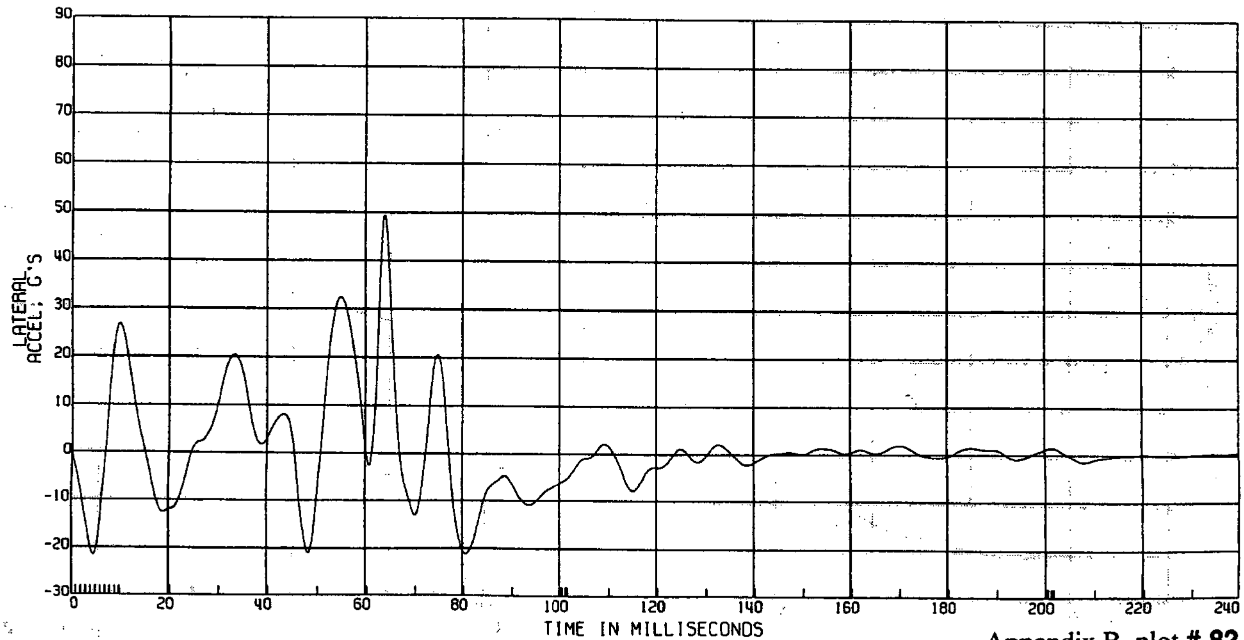

Appendix B, plot # **81**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

L.REAR ROCKER ACCEL

TEST DATE:01/08/1997




Appendix B, plot # **82**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

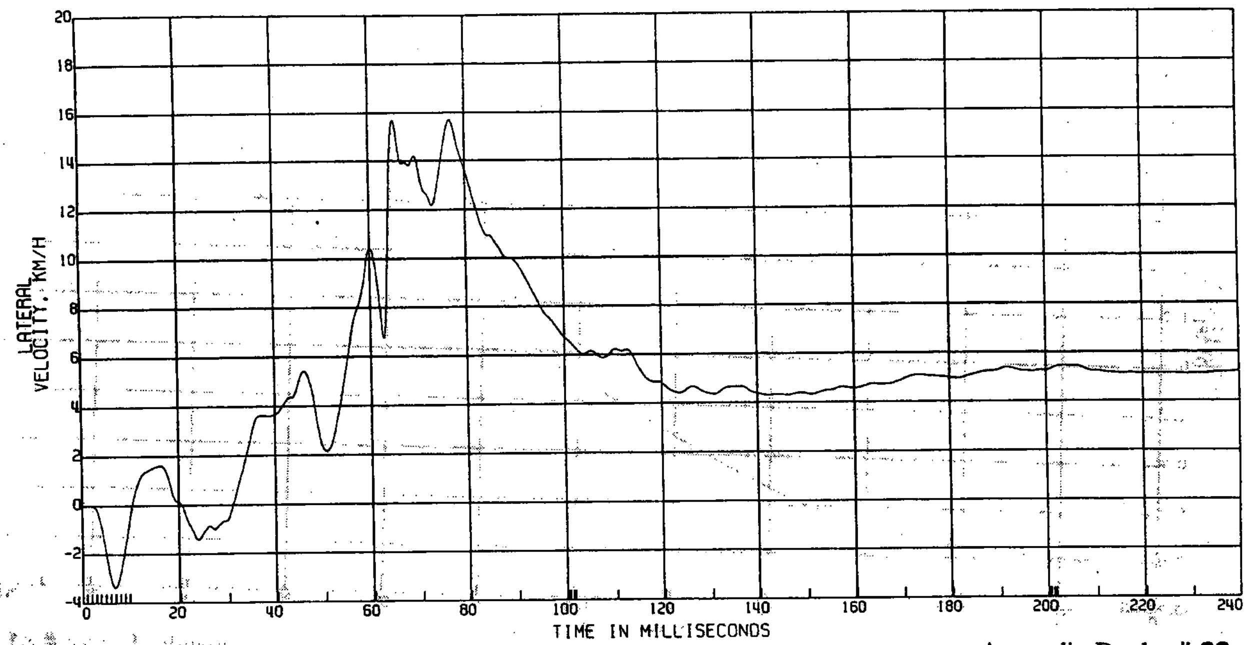
L.REAR ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

TEST DATE:01/08/1997




Appendix B, plot # **83**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

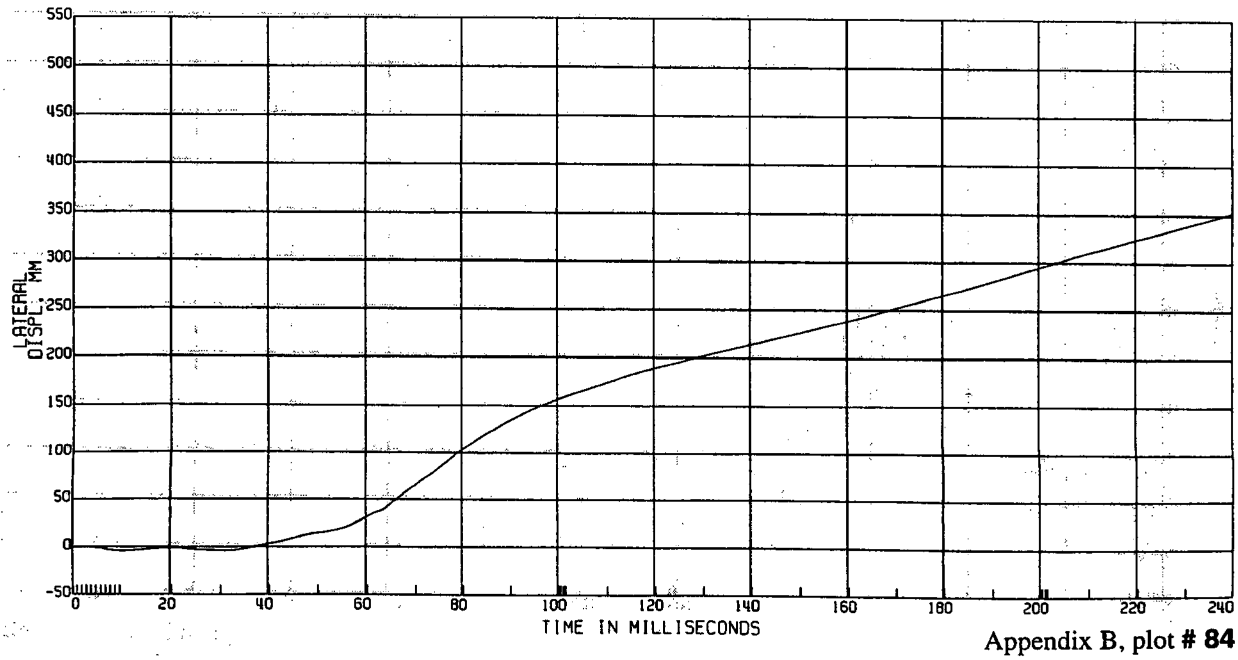
L.REAR ROCKER DISPL

(COMPUTED FROM ACCELERATION)

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

TEST DATE:01/08/1997



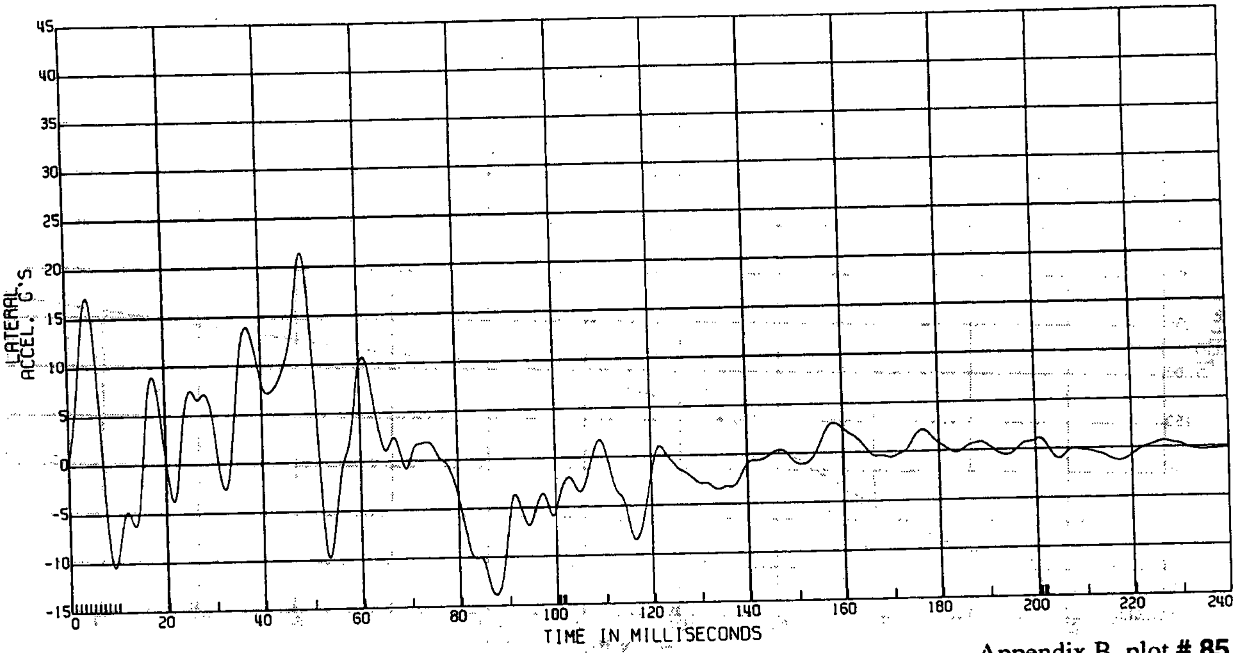

Appendix B, plot # **84**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R.REAR ROCKER ACCEL

TEST DATE:01/08/1997

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60



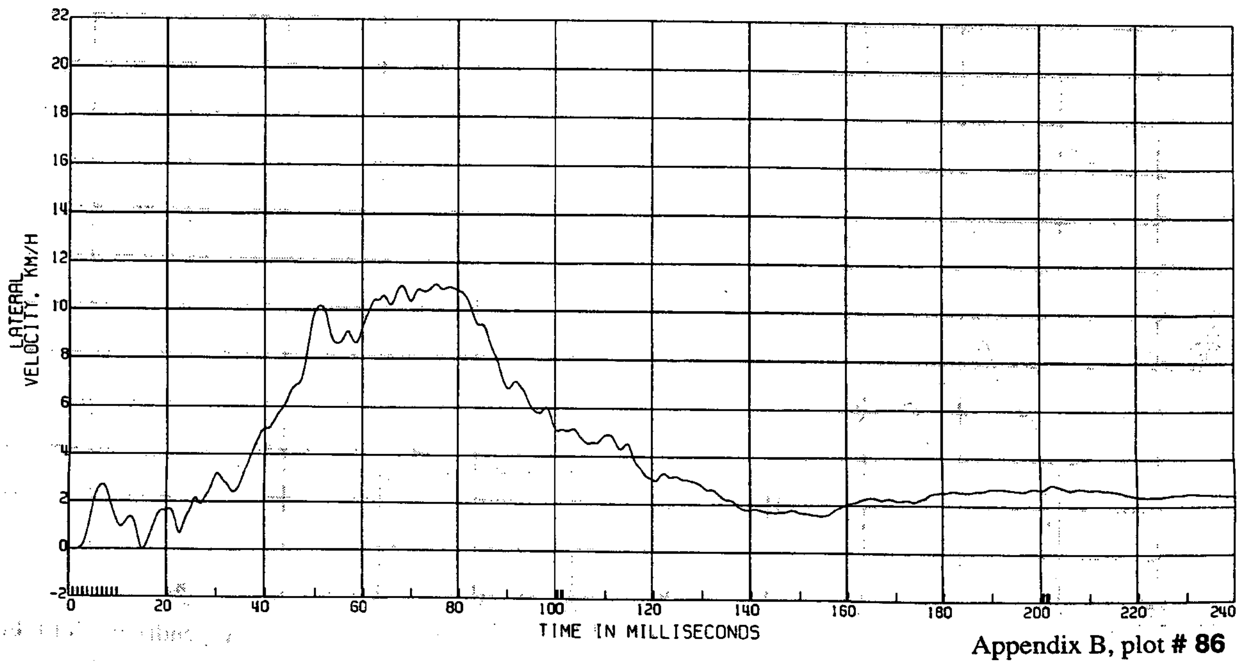

Appendix B, plot # **85**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R.REAR ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



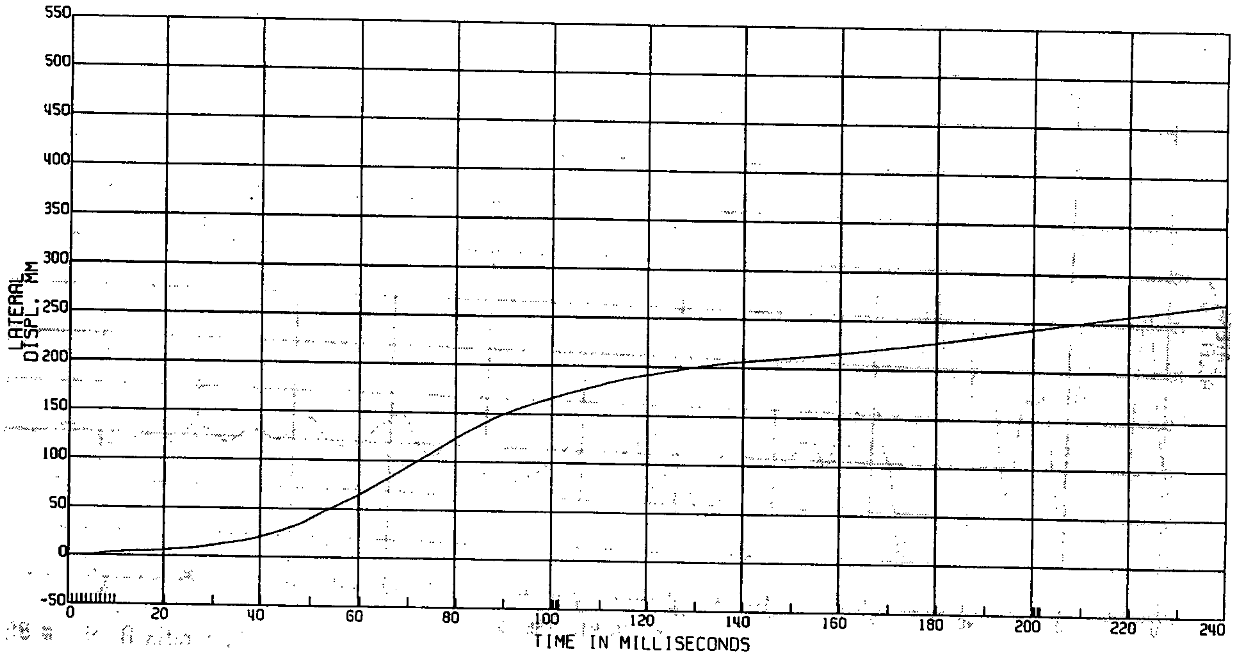

Appendix B, plot # **86**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R.REAR ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



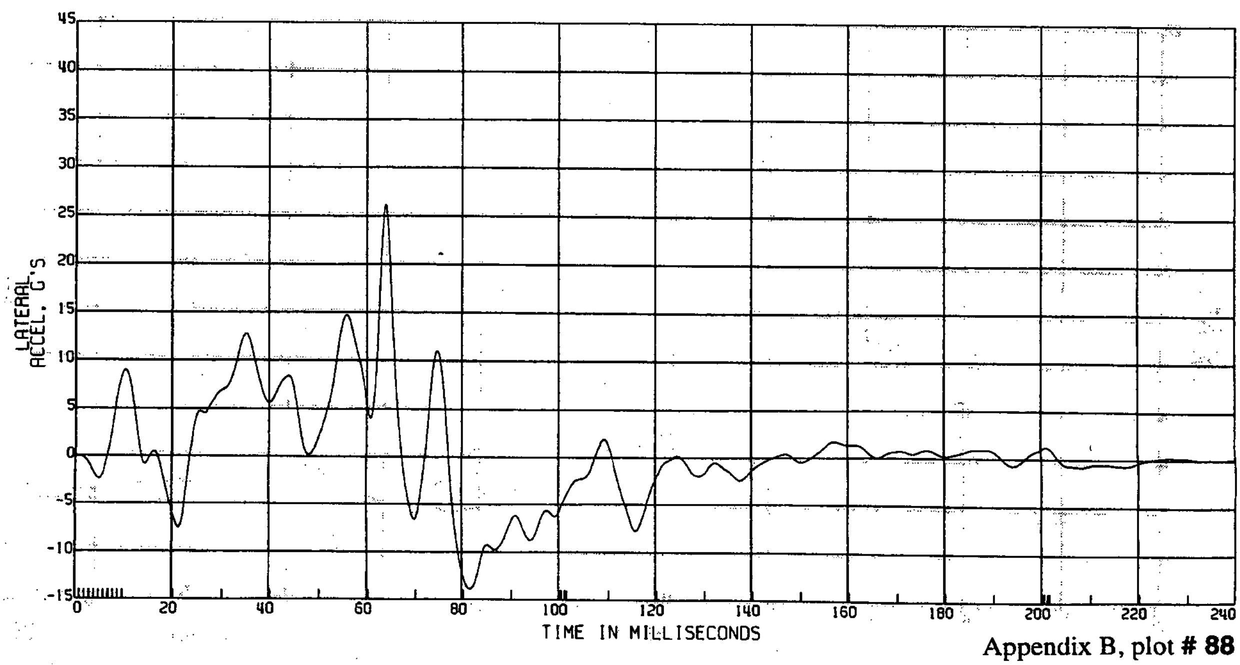

Appendix B, plot # **87**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

AVERAGED REAR ROCKER ACCELERATION
(AVGD L. & R. ROCKER ACCELS)

TEST DATE:01/08/1997

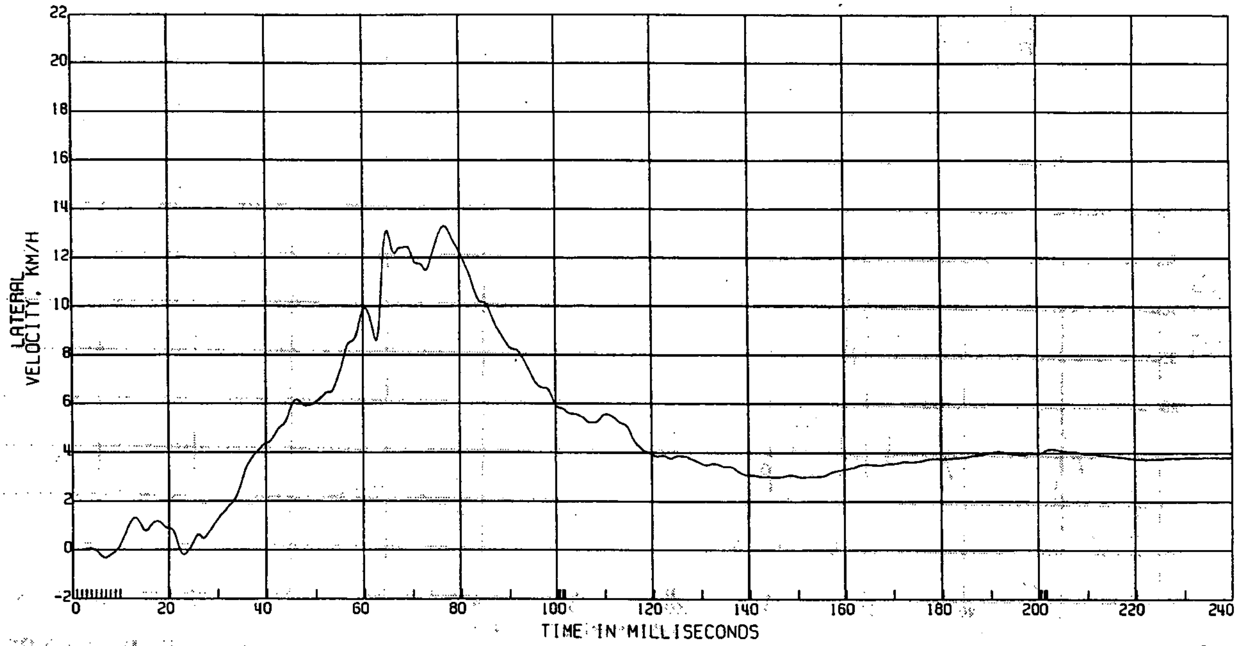



Appendix B, plot # **88**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 AVGD REAR ROCKER VELOCITY TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

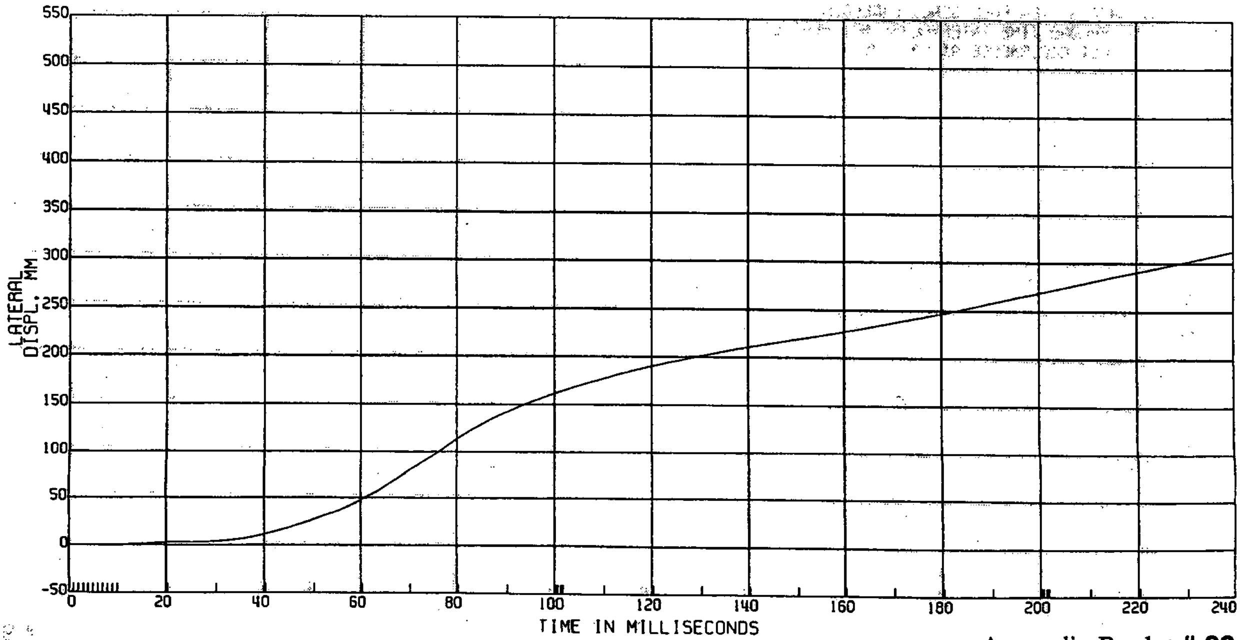



Appendix B, plot # **89**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 AVGD REAR ROCKER DISPL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

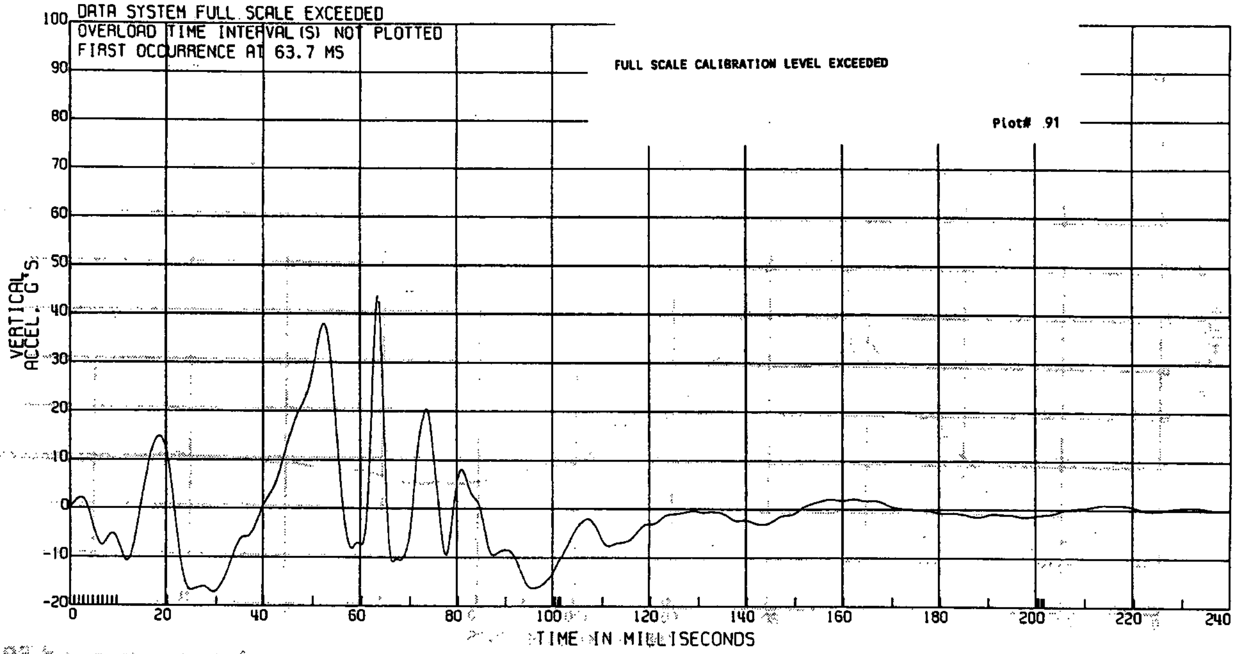



Appendix B, plot # **90**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR ROCKER ACCEL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60

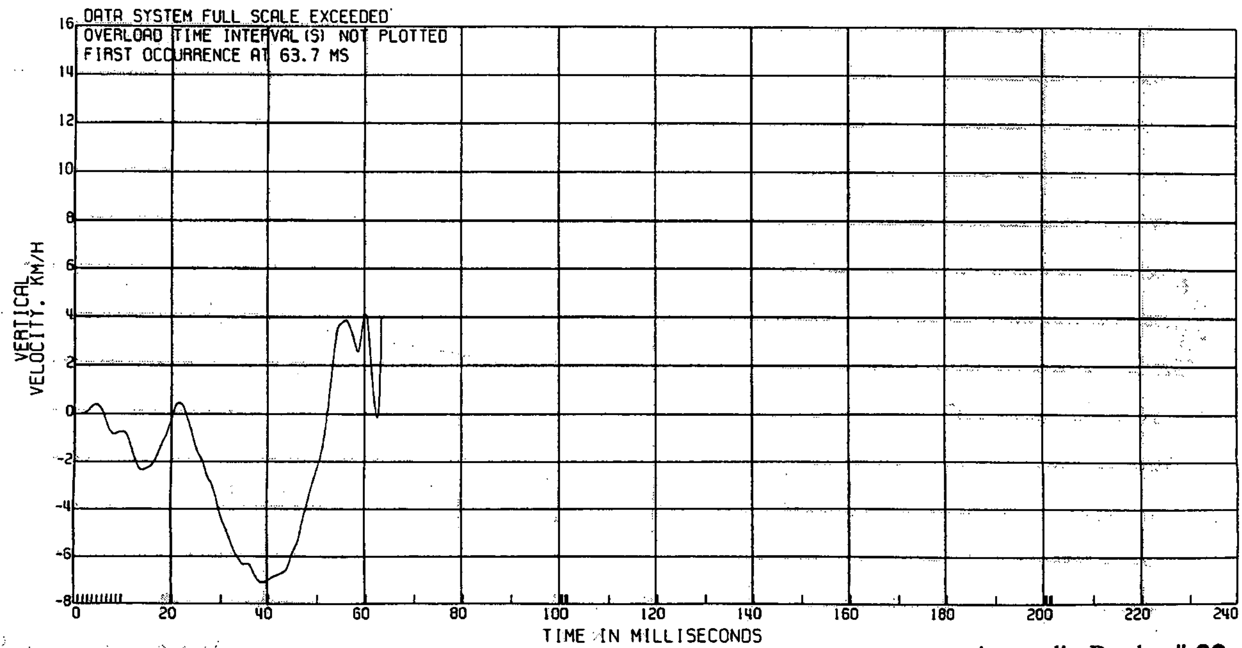



Appendix B, plot # **91**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR ROCKER VELOCITY TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



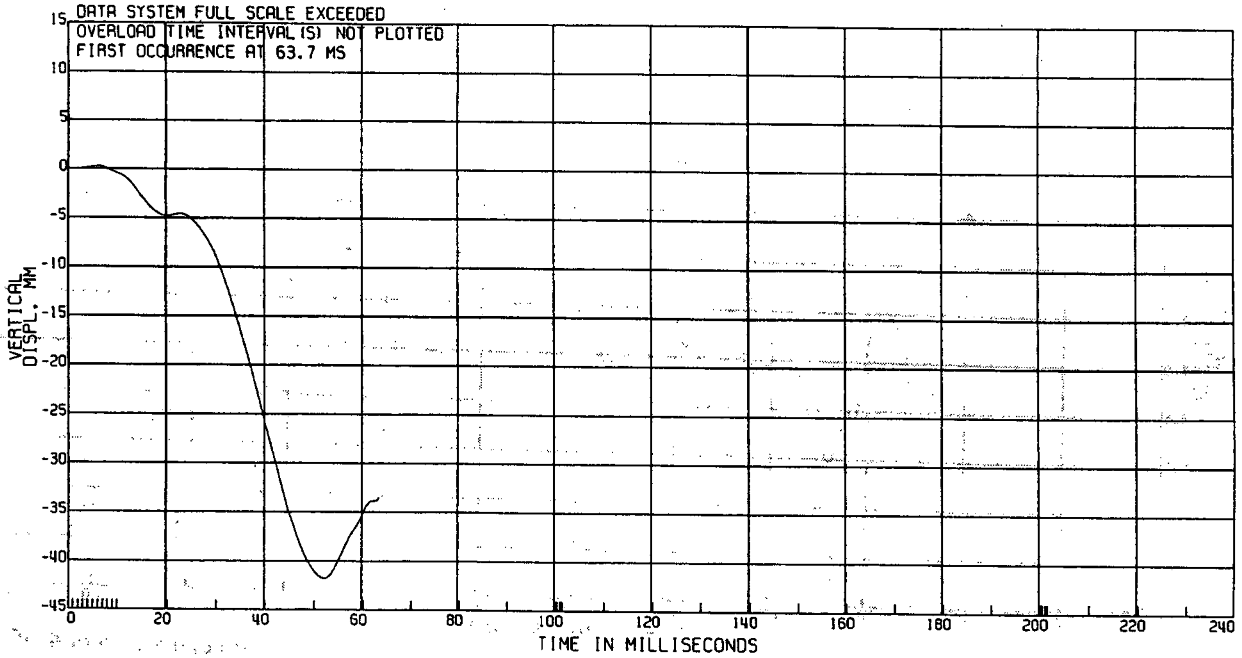

Appendix B, plot # **92**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

L.REAR ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



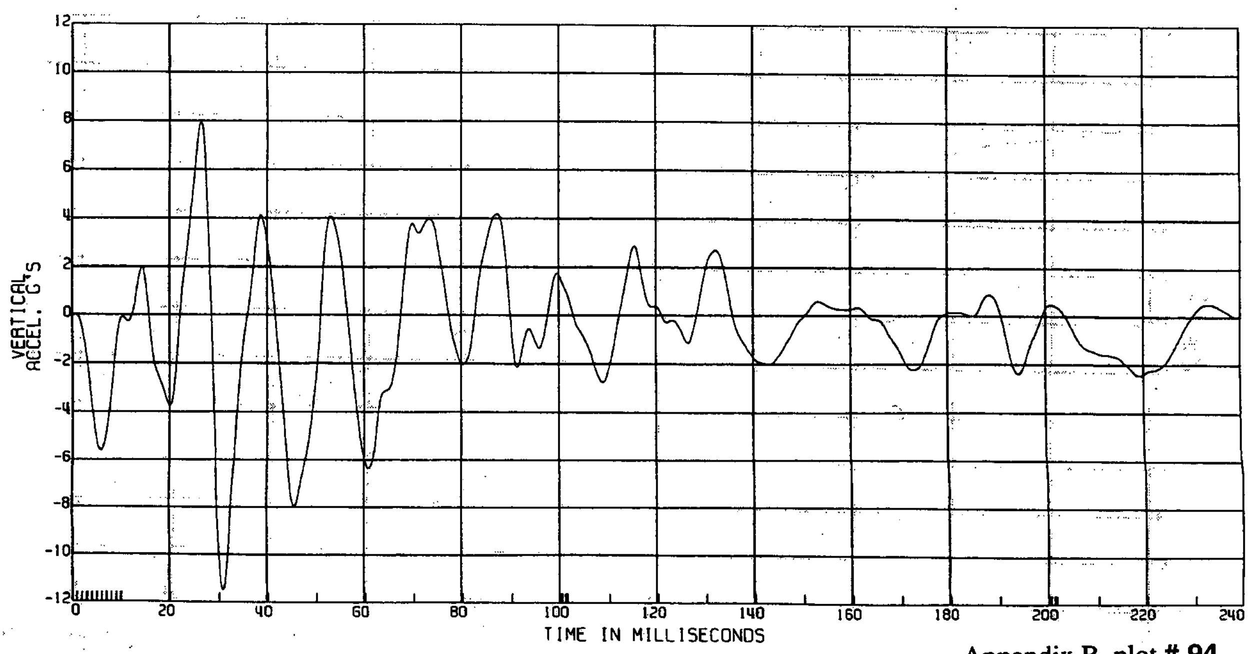

Appendix B, plot # **93**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

R.REAR ROCKER ACCEL

TEST DATE:01/08/1997



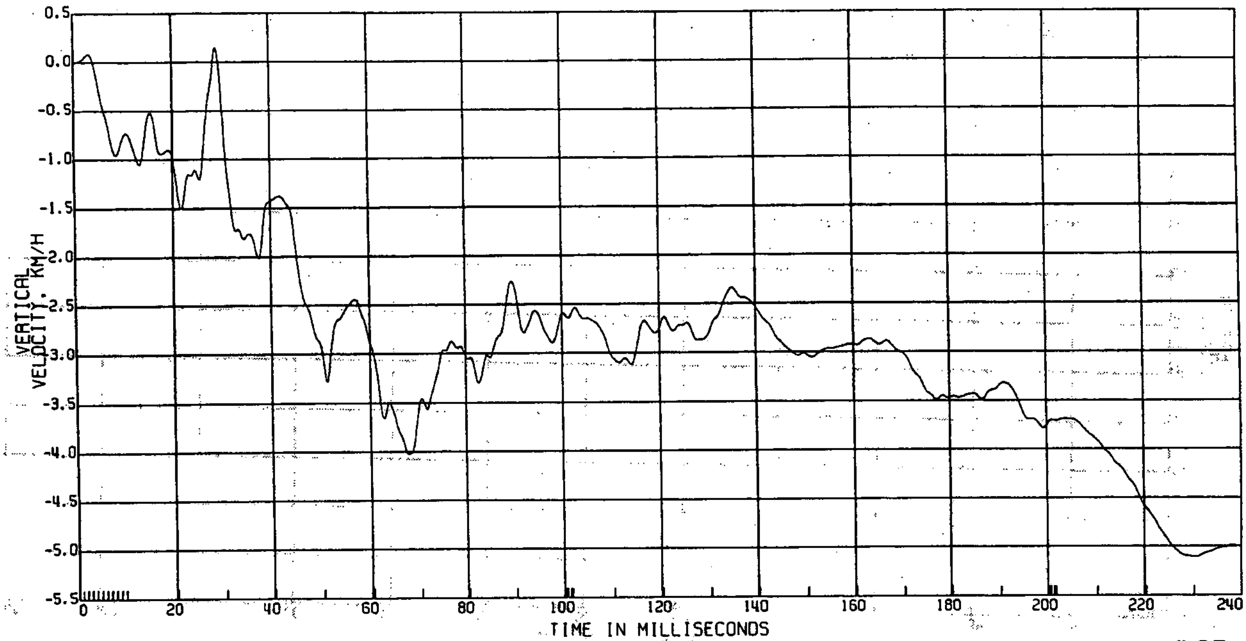

Appendix B, plot # **94**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R.REAR ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



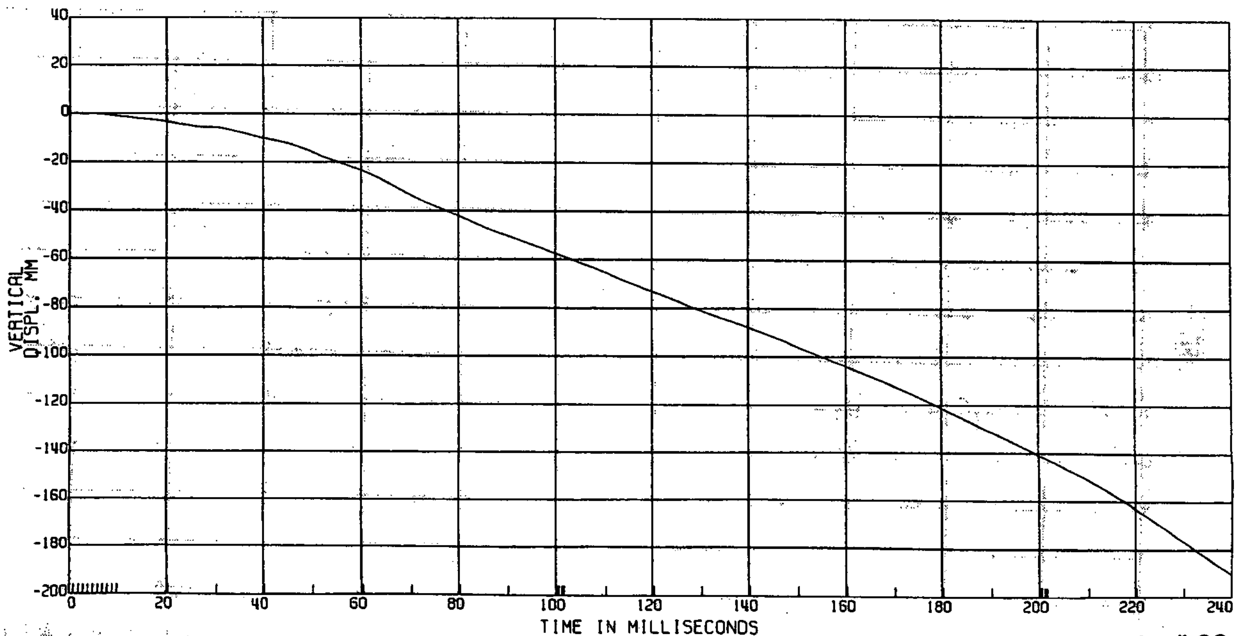

Appendix B, plot # 95

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

R.REAR ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



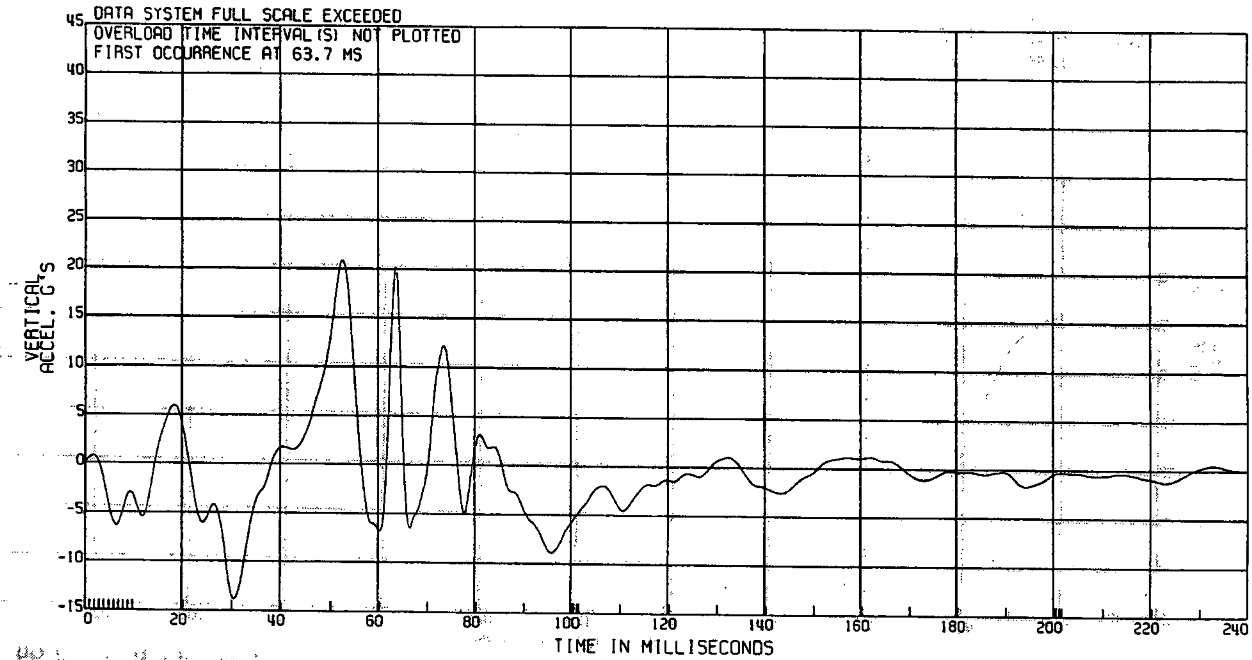

Appendix B, plot # 96

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

AVERAGED REAR ROCKER ACCELERATION
(AVGD L. & R. ROCKER ACCELS)

TEST DATE:01/08/1997



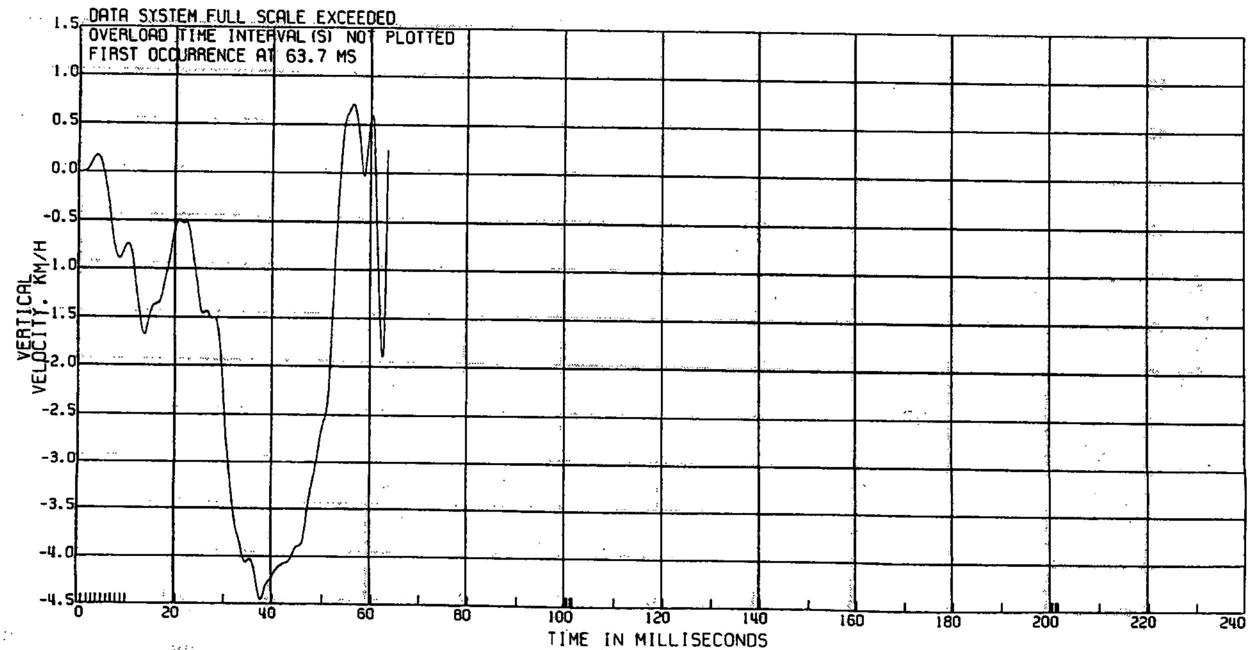

Appendix B, plot # **97**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



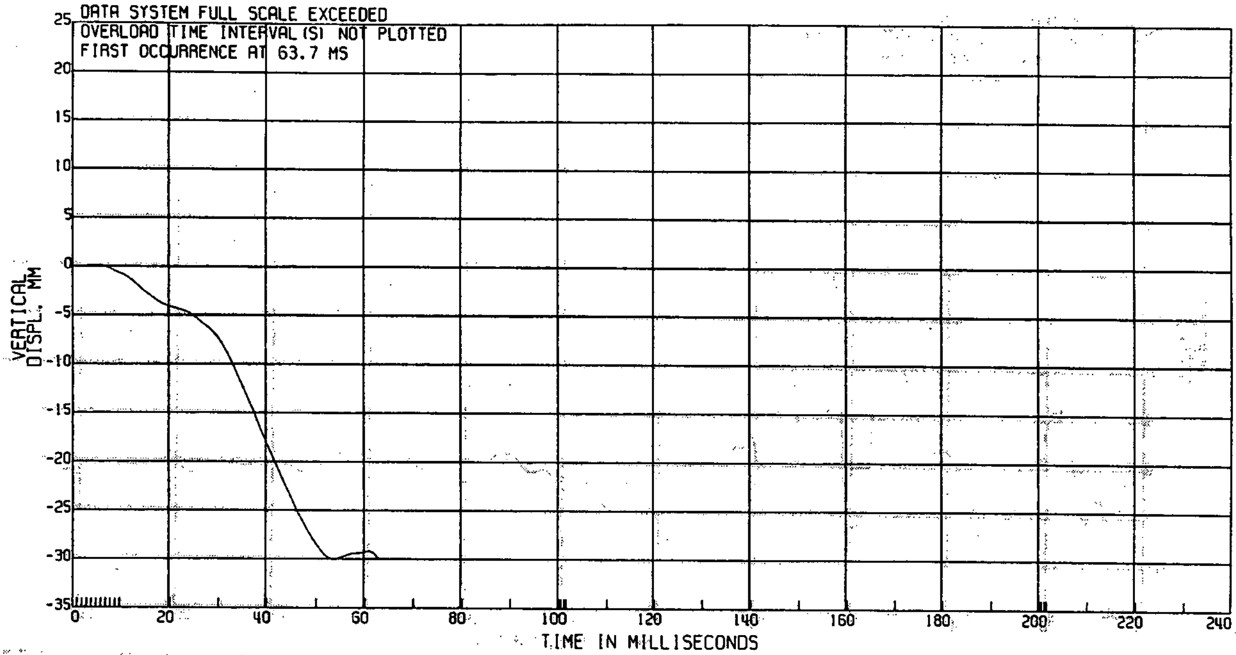

Appendix B, plot # **98**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



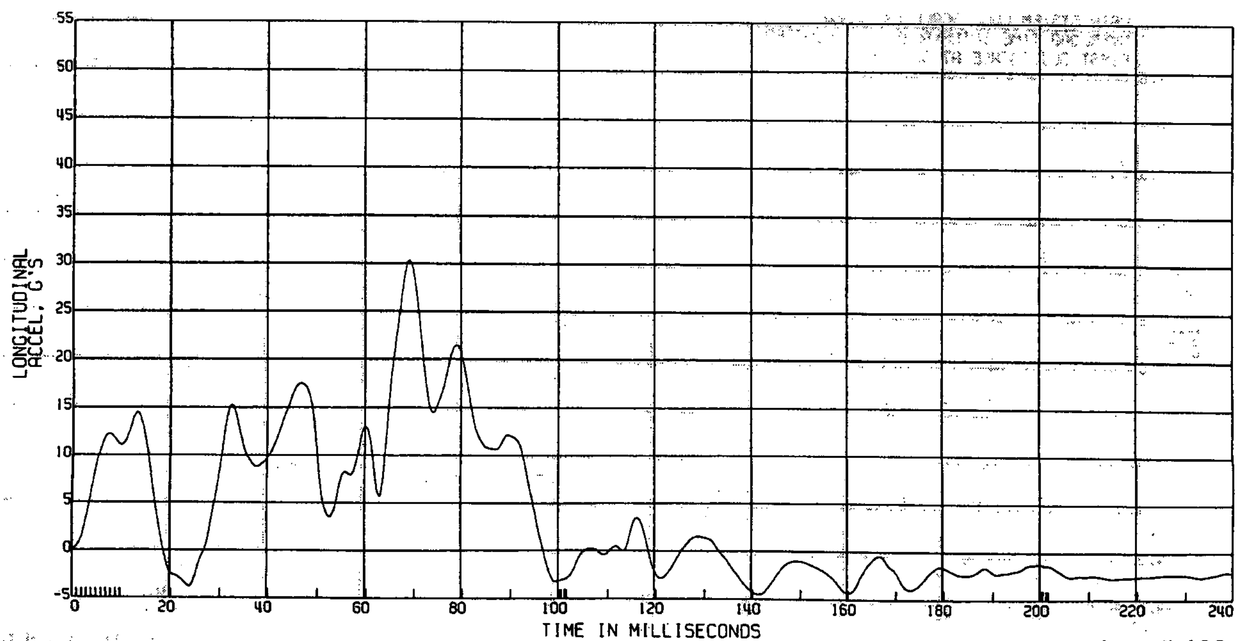

Appendix B, plot # **99**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

CTR TUNNEL ACCEL

TEST DATE:01/08/1997



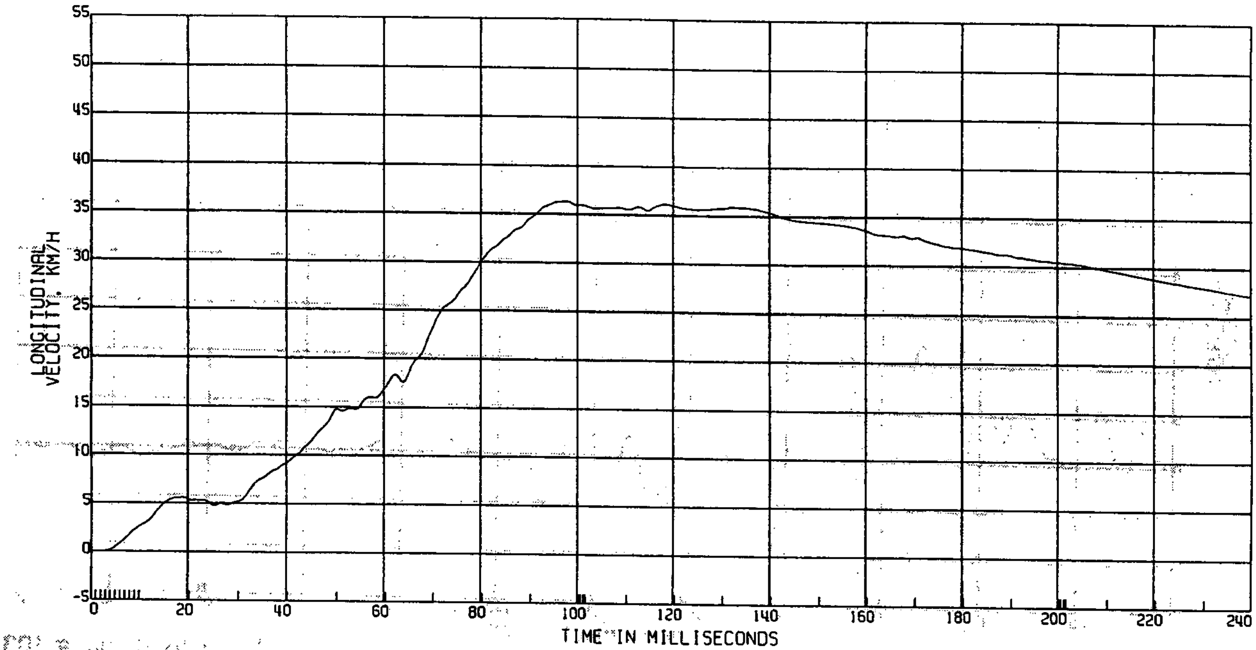

Appendix B, plot # **100**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

CTR TUNNEL VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



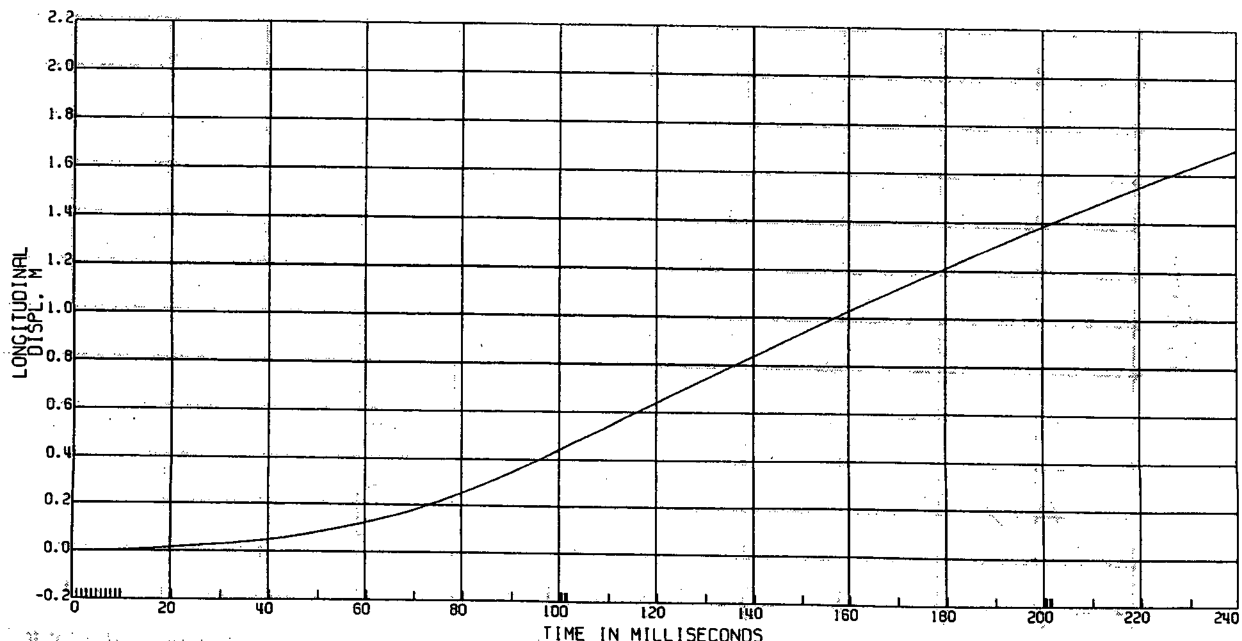

Appendix B, plot # **101**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

CTR TUNNEL DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997

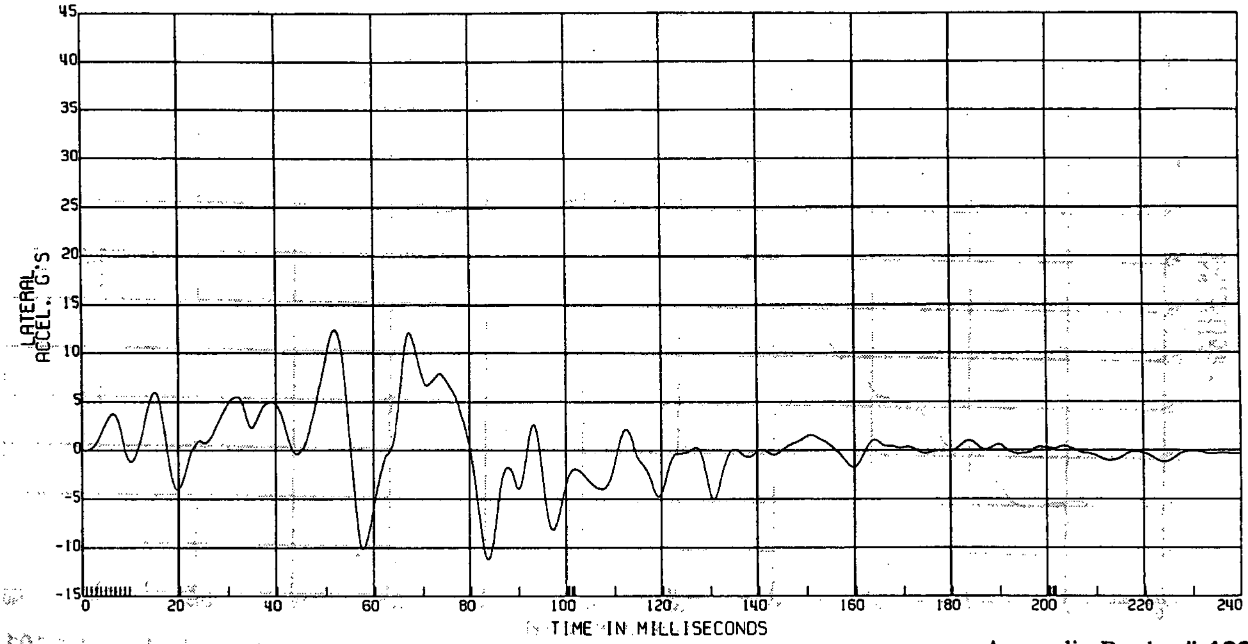



Appendix B, plot # **102**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 CTR TUNNEL ACCEL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60

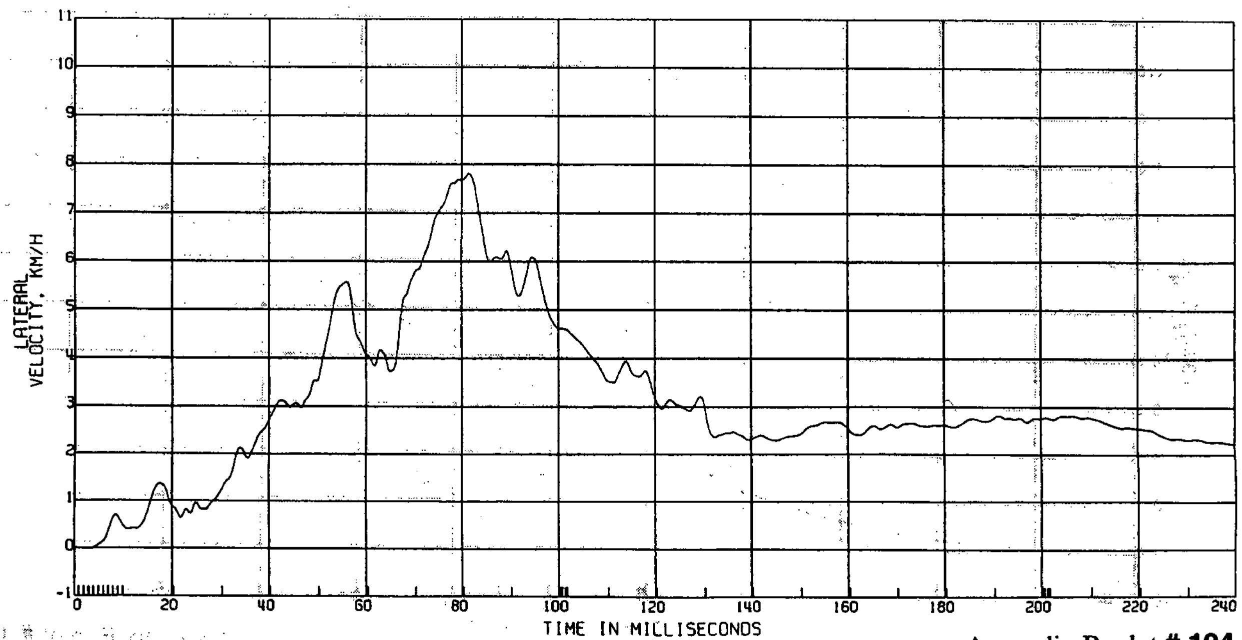



Appendix B, plot # **103**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 CTR TUNNEL VELOCITY TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



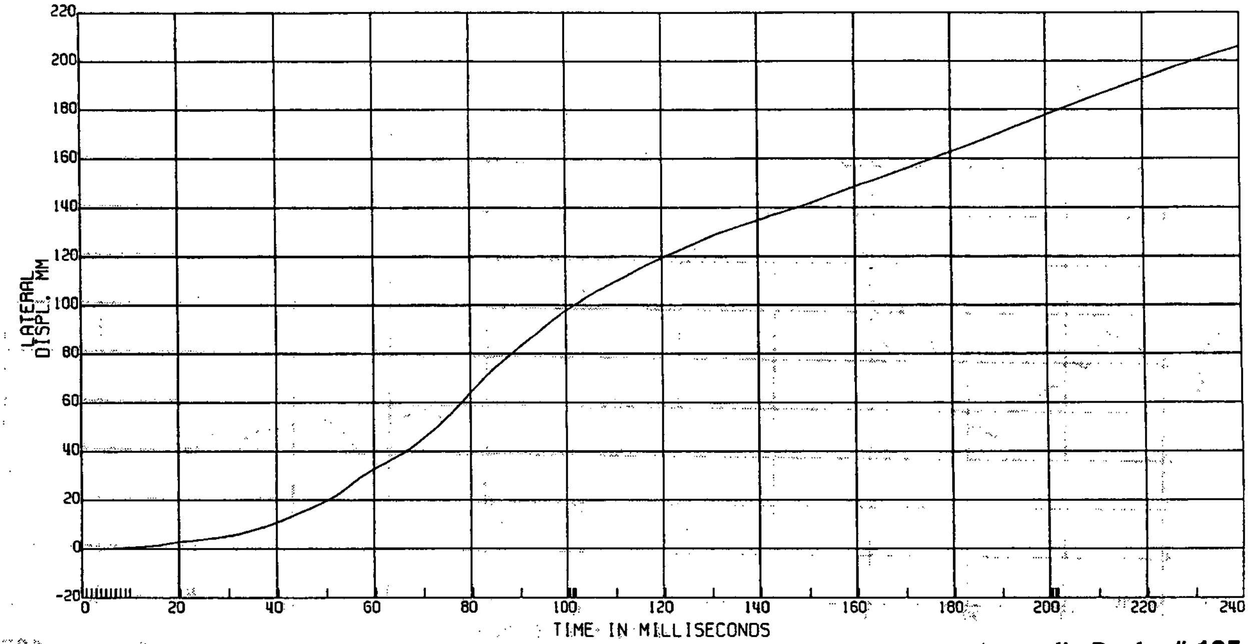

Appendix B, plot # **104**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

CTR TUNNEL DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



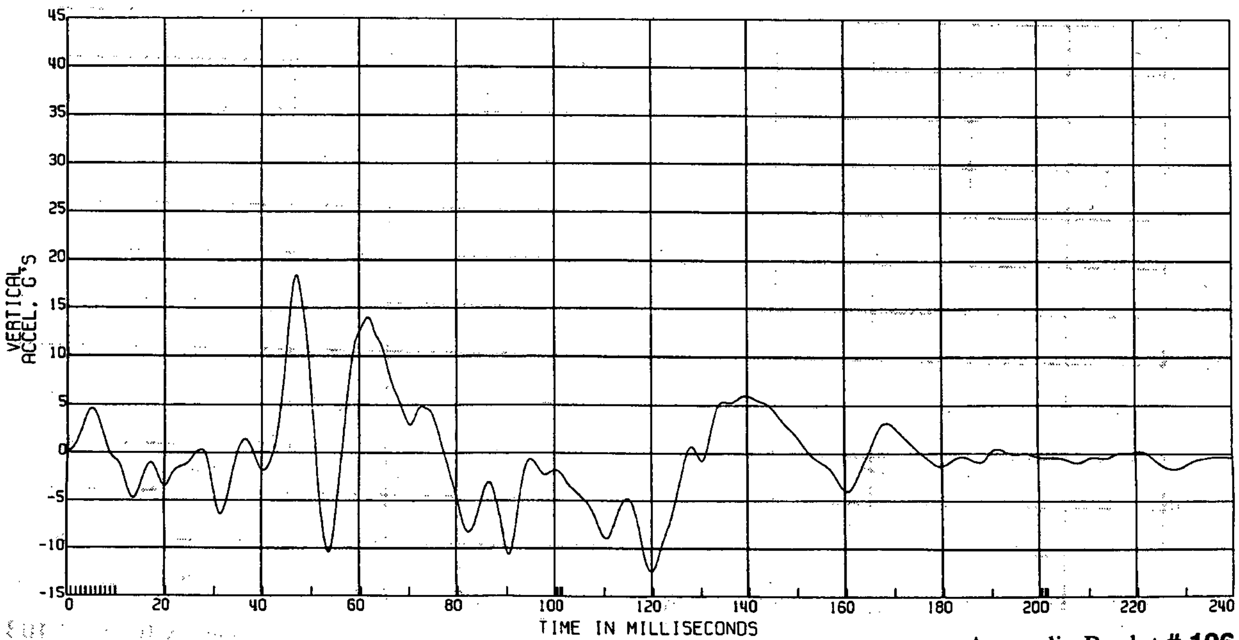

Appendix B, plot # 105

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

CTR TUNNEL ACCEL

TEST DATE:01/08/1997



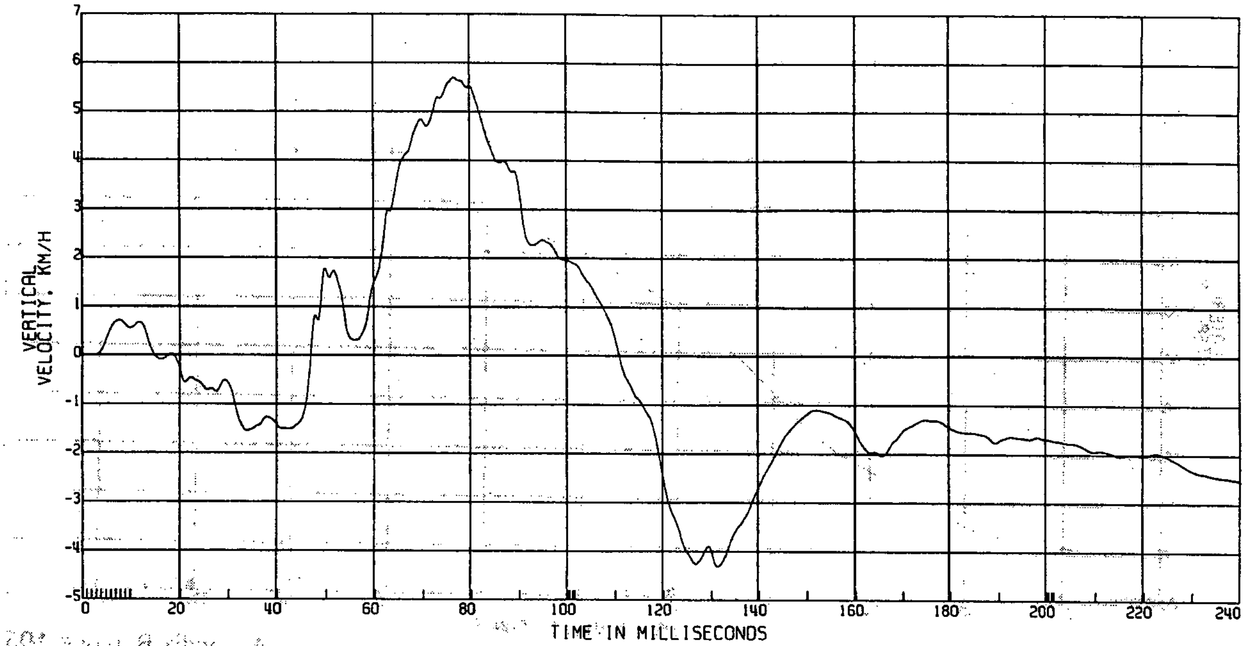

Appendix B, plot # 106

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

CTR TUNNEL VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



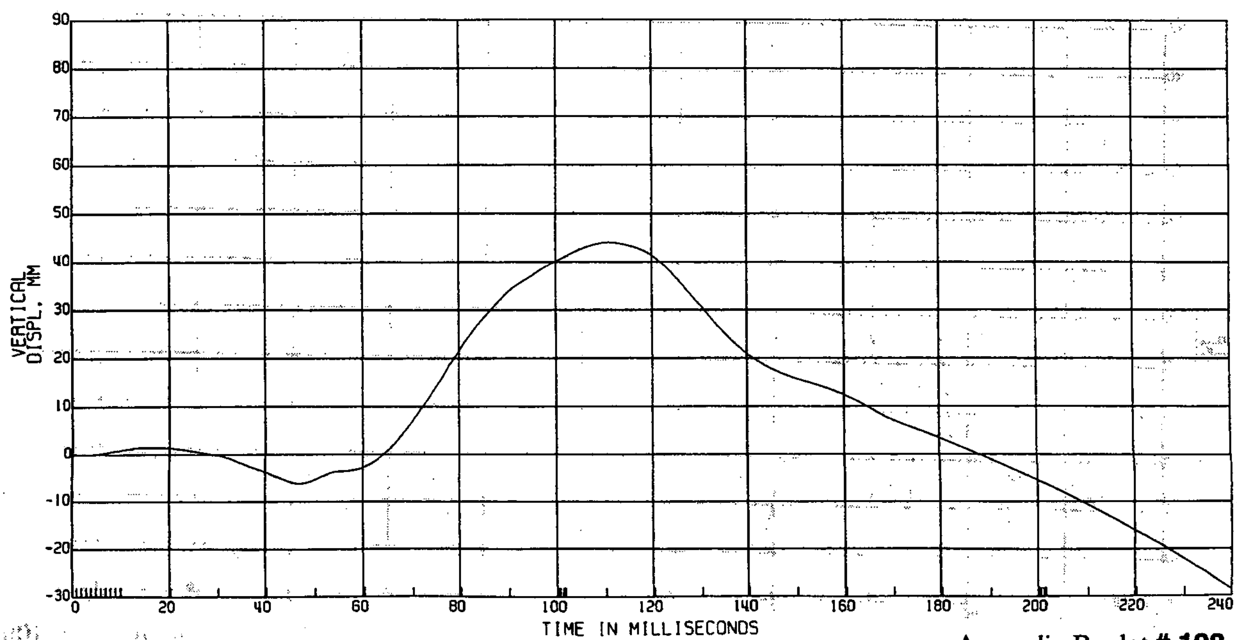

Appendix B, plot # **107**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

CTR TUNNEL DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # **108**

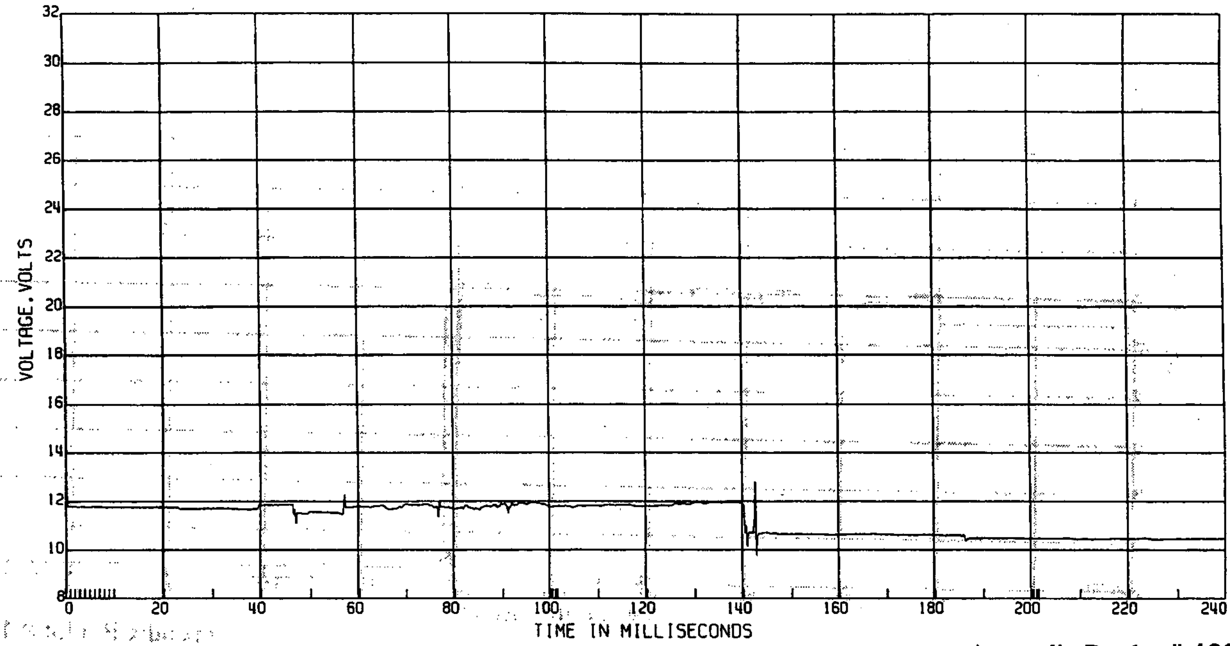
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 1000

IGNITION VOLTAGE

TEST DATE:01/08/1997




Appendix B, plot # **109**

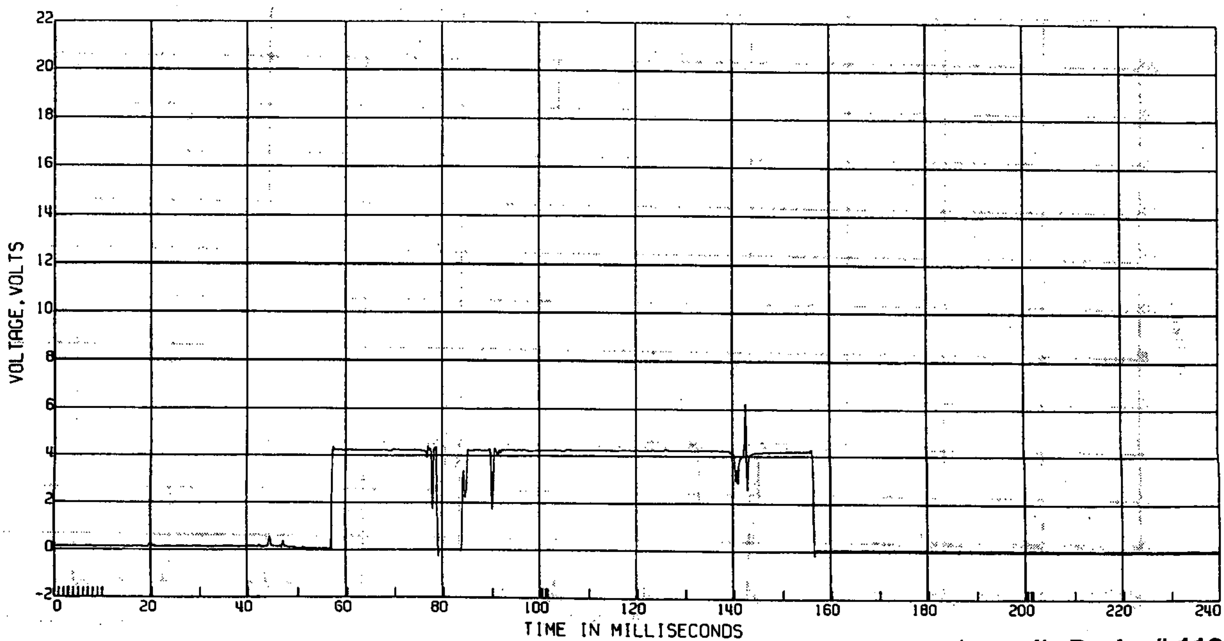
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 1000

C.H.M.S.L. VOLTAGE

TEST DATE:01/08/1997



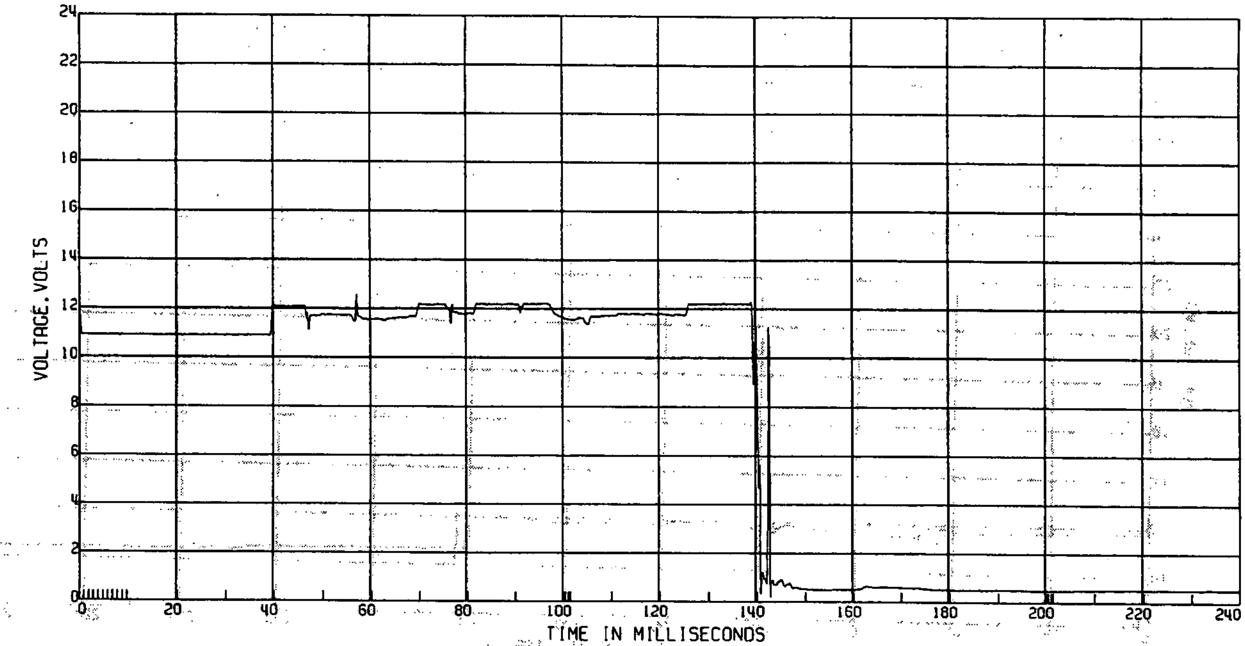

Appendix B, plot # **110**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

REAR WINDOW DEFROSTER VOLTAGE

TEST DATE:01/08/1997



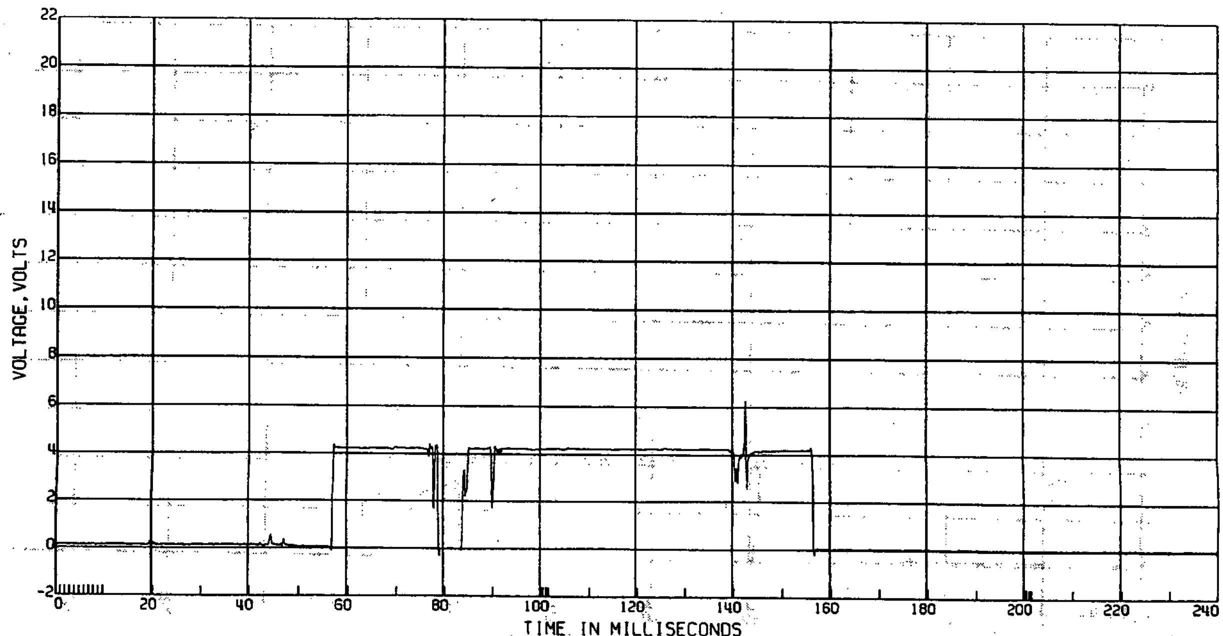

Appendix B, plot # **111**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 1000

L.REAR BRAKE LIGHT VOLTAGE

TEST DATE:01/08/1997




Appendix B, plot # **112**

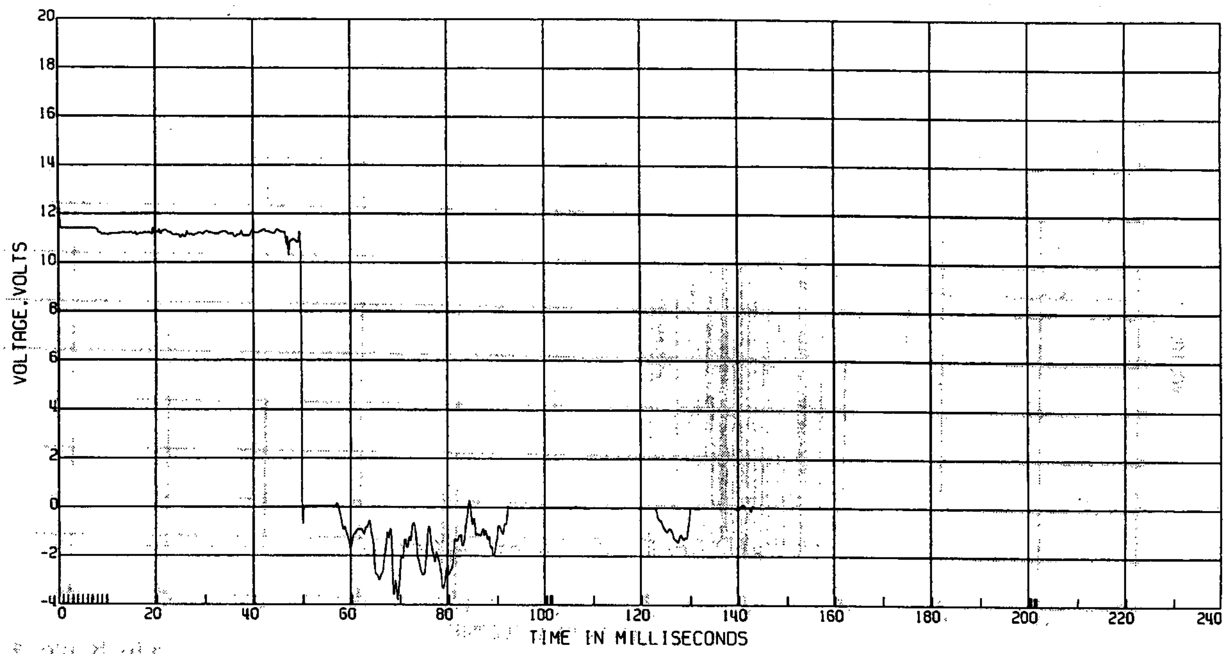
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 1000

L.REAR BACKUP LIGHT VOLTAGE

TEST DATE:01/08/1997




Appendix B, plot # **113**

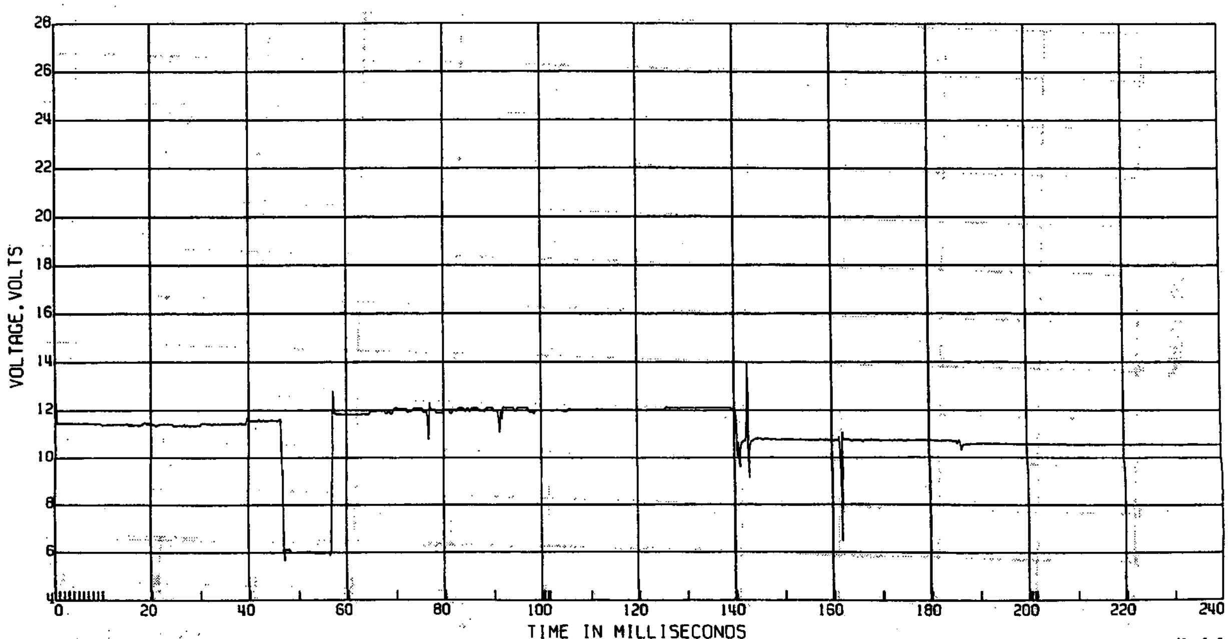
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 1000

L.REAR TAIL LIGHT VOLTAGE

TEST DATE:01/08/1997

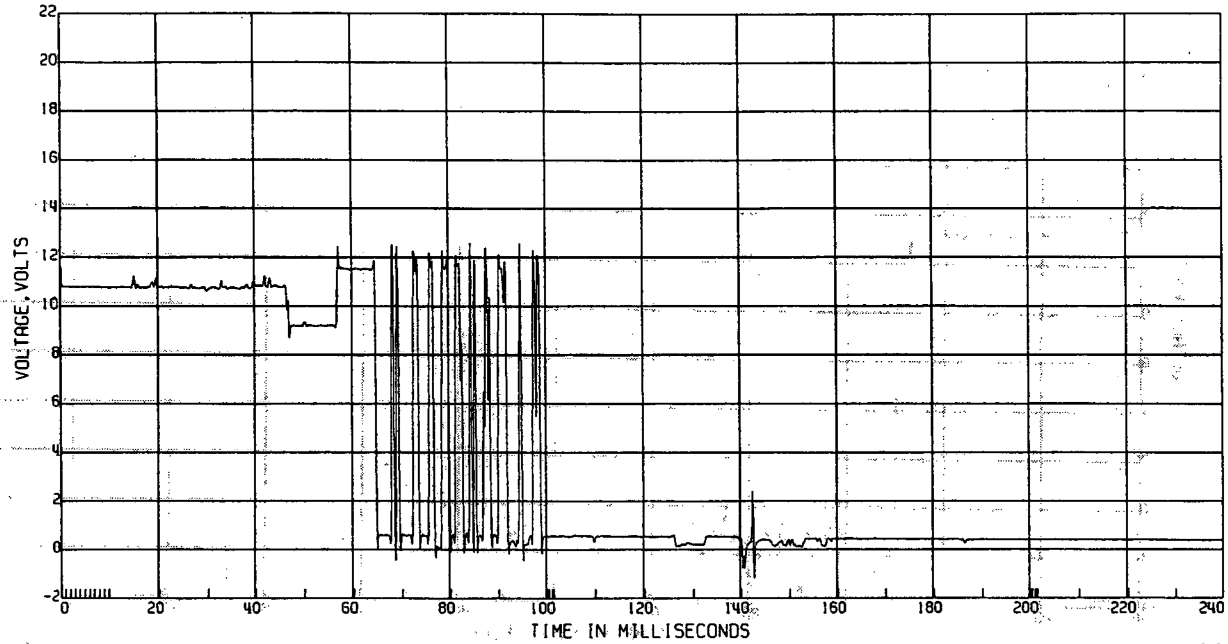



Appendix B, plot # **114**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR TURN SIGNAL LIGHT VOLTAGE TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 1000

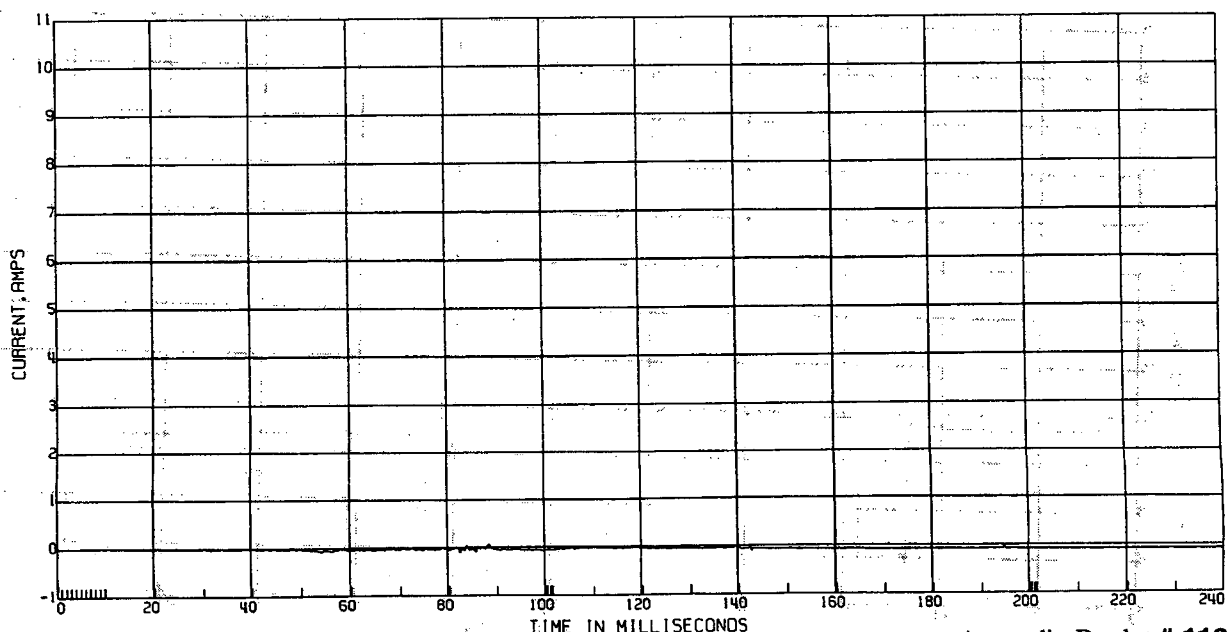



Appendix B, plot # **115**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L. WHEEL BAG CURRENT TEST DATE:01/08/1997

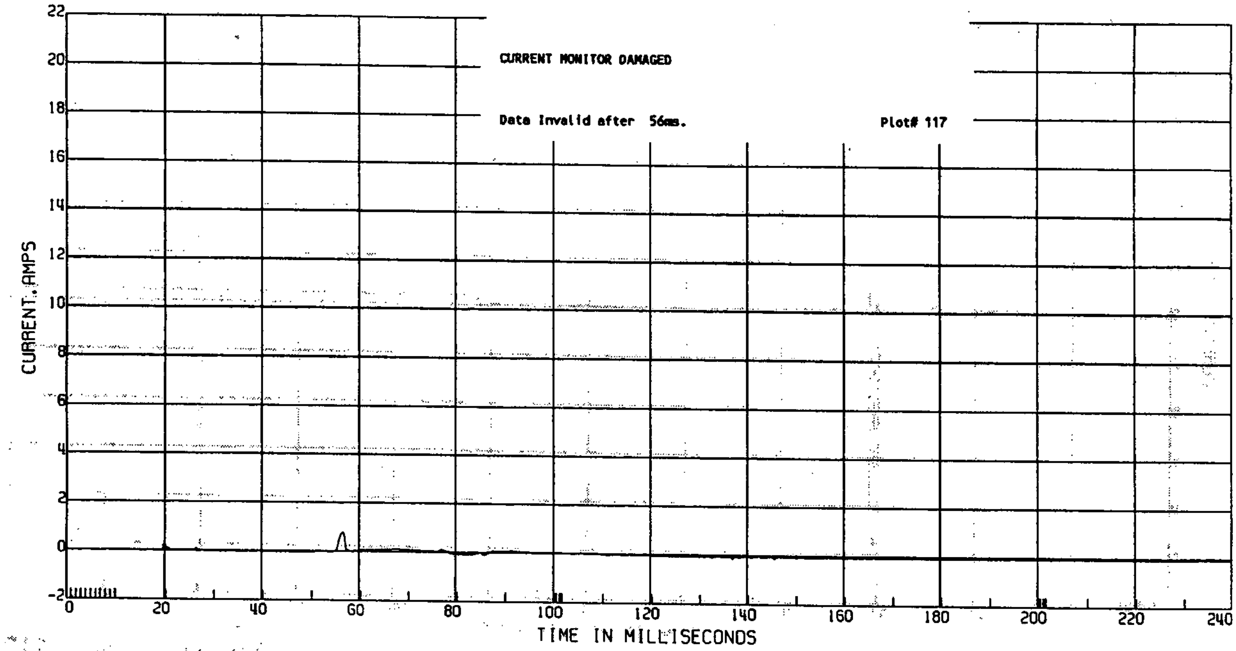
ELEC DATA, SAE CLASS 1000




Appendix B, plot # **116**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

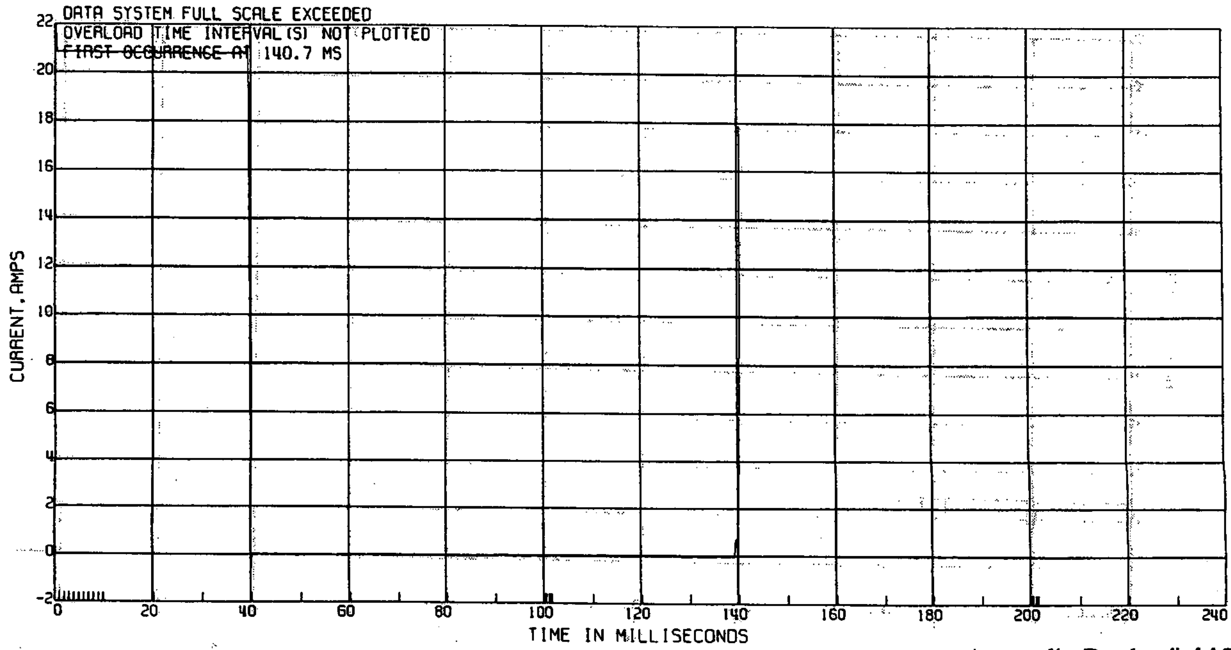
R & D CTR 1VF46079 1FP87 C.H.M.S.L. CURRENT TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000




Appendix B, plot # **117**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 REAR WINDOW DEFROSTER CURRENT TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000

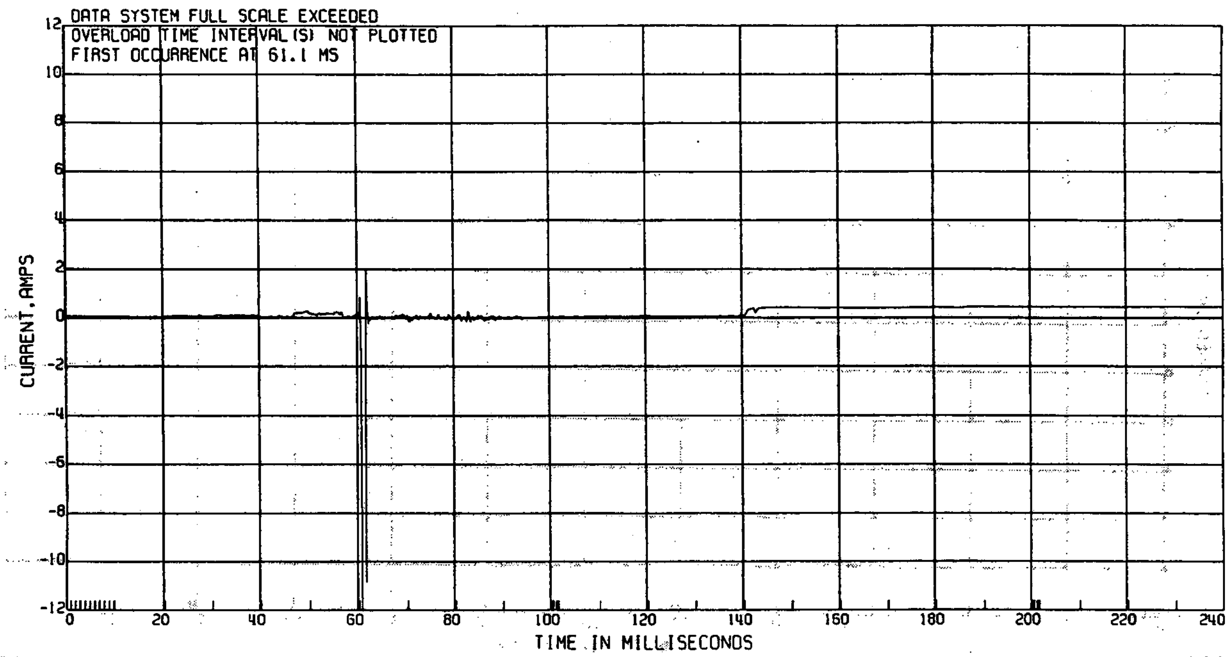



Appendix B, plot # **118**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR BRAKE LIGHT CURRENT TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 1000



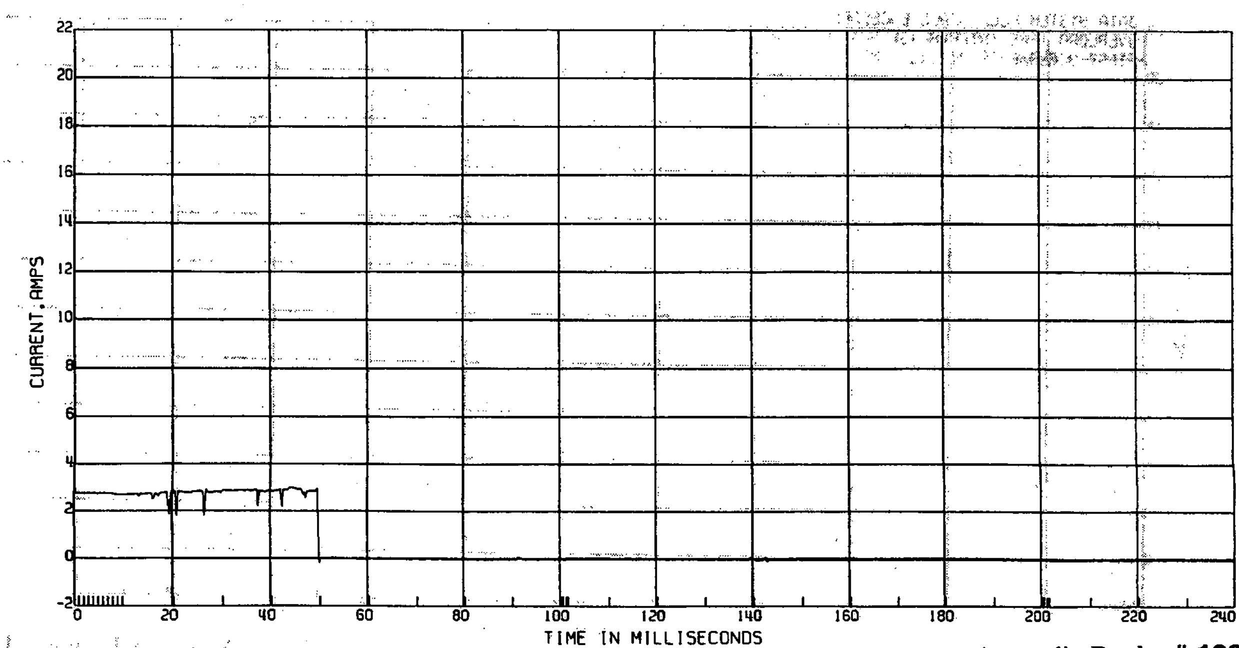

Appendix B, plot **# 119**

119

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR BACKUP LIGHT CURRENT TEST DATE:01/08/1997

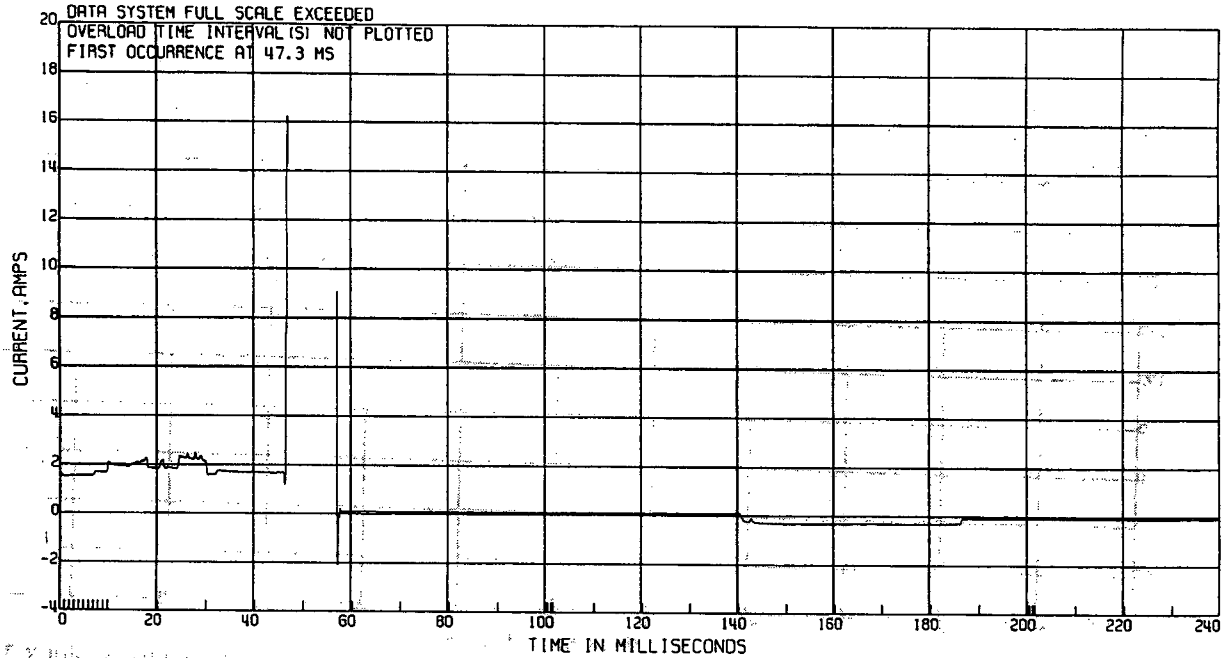
ELEC DATA, SAE CLASS 1000




Appendix B, plot **# 120**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

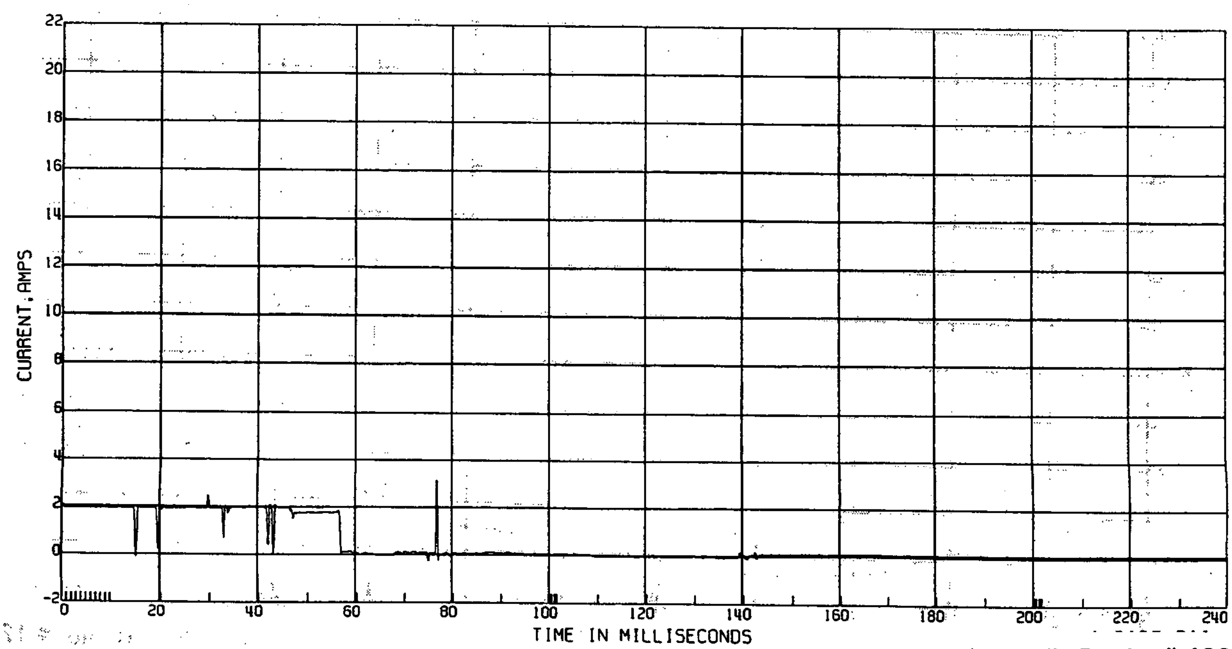
R & D CTR 1VF46079 1FP87 L.REAR TAIL LIGHT CURRENT TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000




Appendix B, plot # **121**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 L.REAR TURN SIGNAL LIGHT CURRENT TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000

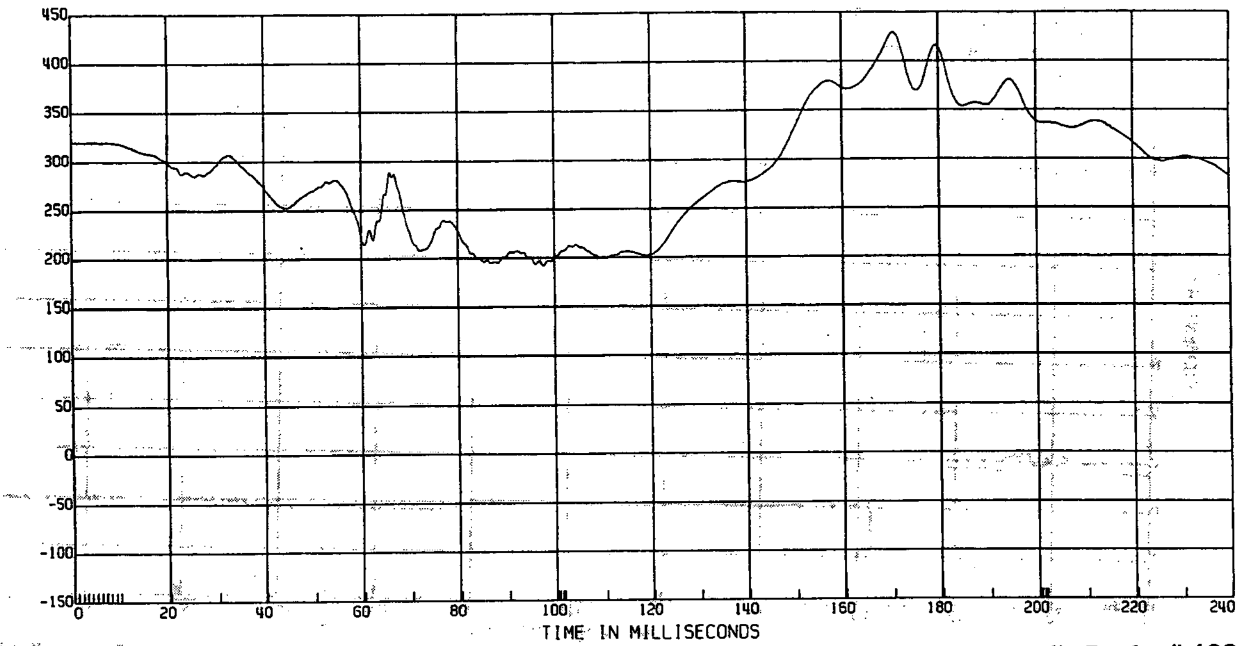



Appendix B, plot # **122**

C11408 REAR IMP 70% OVERLAP    LTV MDB TO STATIONARY VEHICLE    84.7KM/H

R & D CTR    1VF46079 1FP87    FUEL LINE PRESSURE    TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 1000    (BIASED BY 320KPA'S)



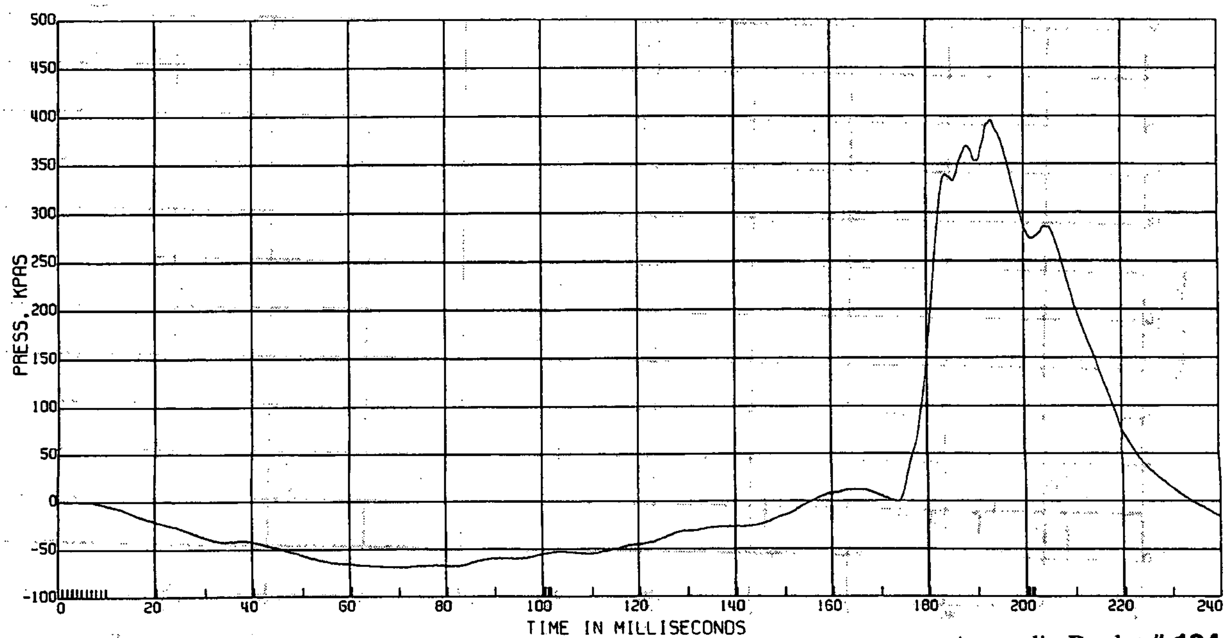

Appendix B, plot # **123**

123

C11408 REAR IMP 70% OVERLAP    LTV MDB TO STATIONARY VEHICLE    84.7KM/H

R & D CTR    1VF46079 1FP87    FUEL LINE RETURN PRESSURE    TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 1000

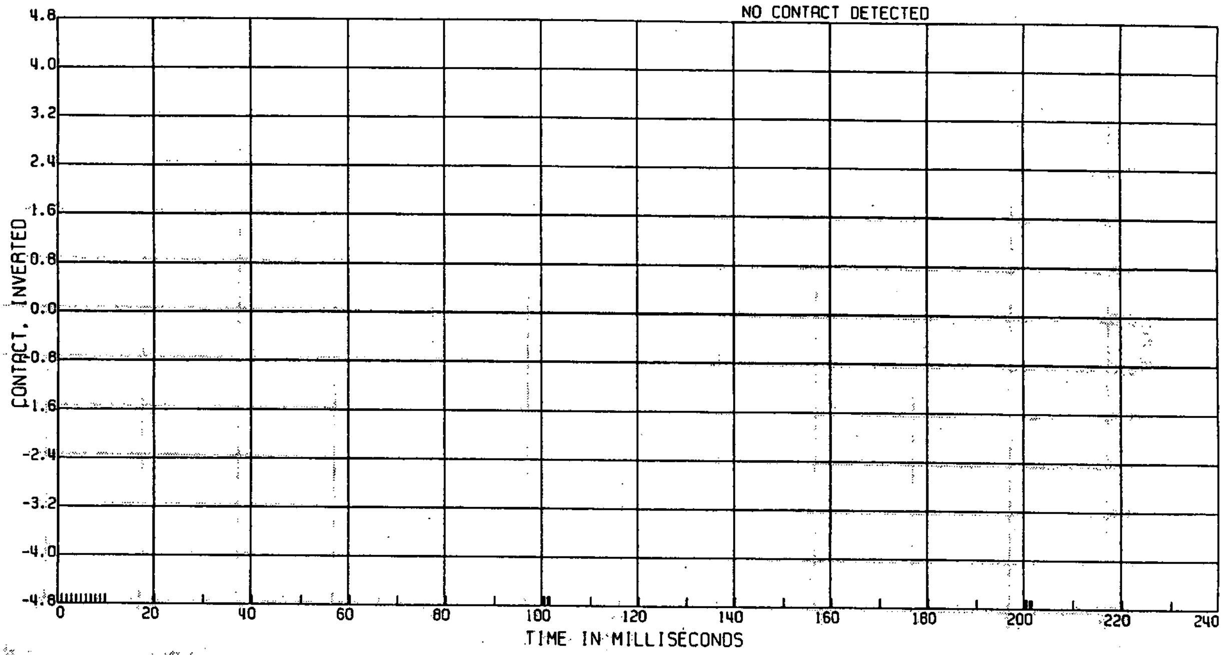



Appendix B, plot # **124**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 PNEUMATIC WIRE FAULT CONTACT TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 1000

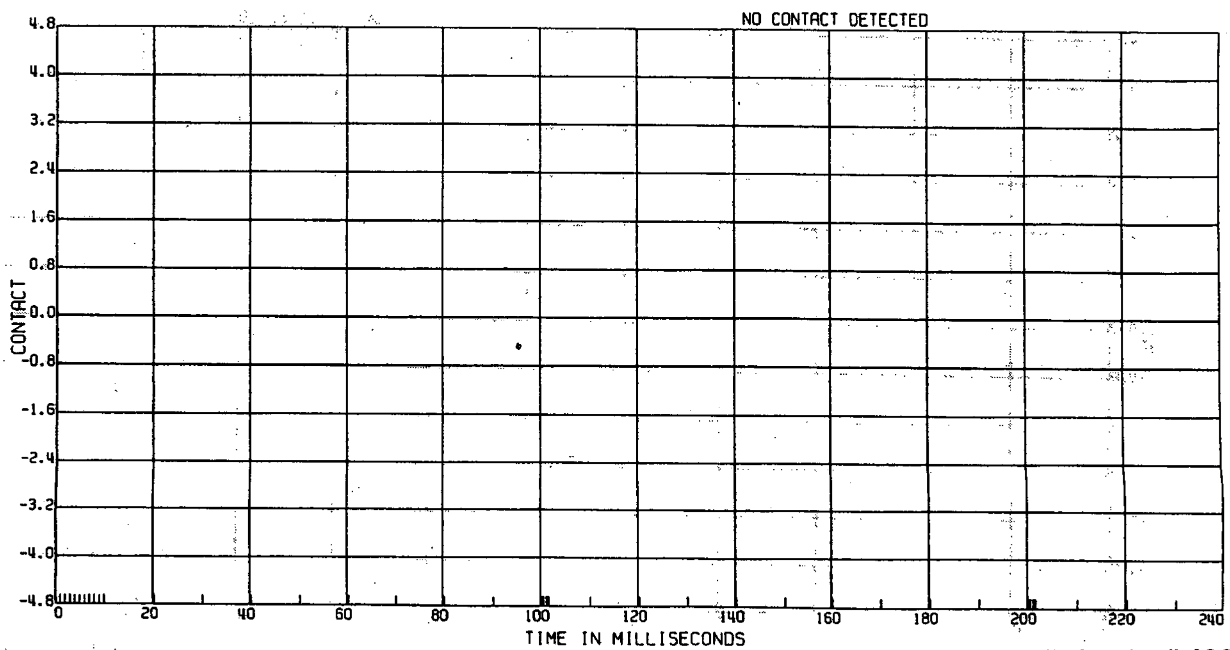



Appendix B, plot # **125**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 PNEUMATIC WIRE CONTACT TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 1000

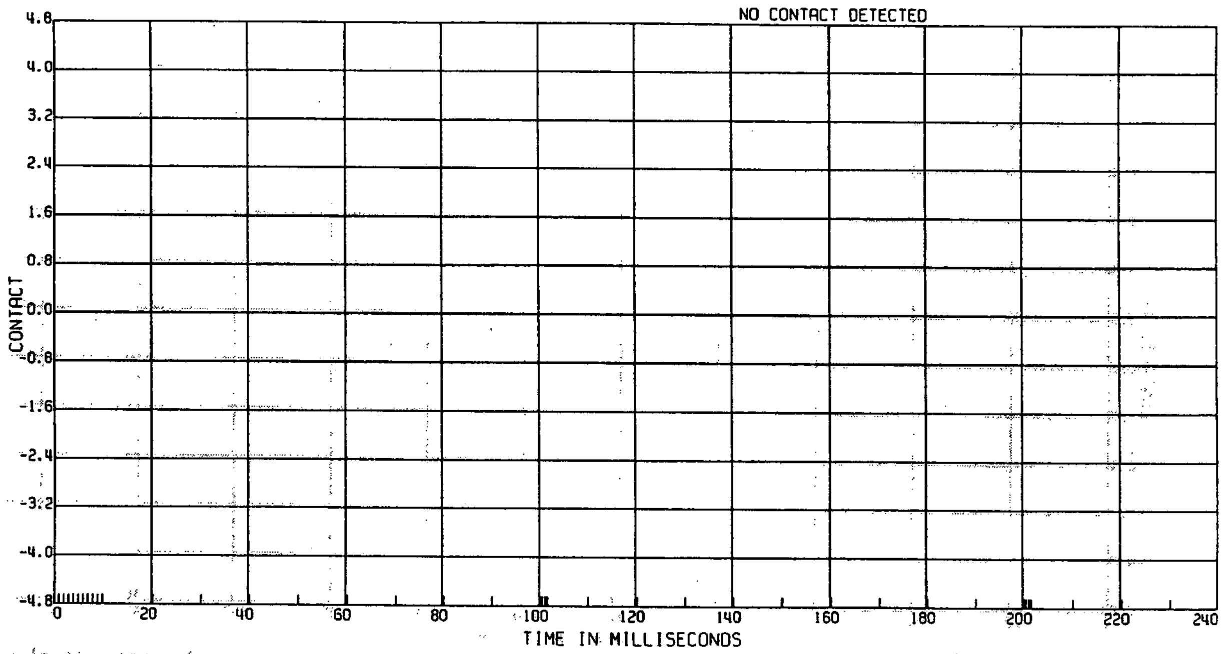



Appendix B, plot # **126**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 THERMAL WIRE-FRT CONTACT TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 1000

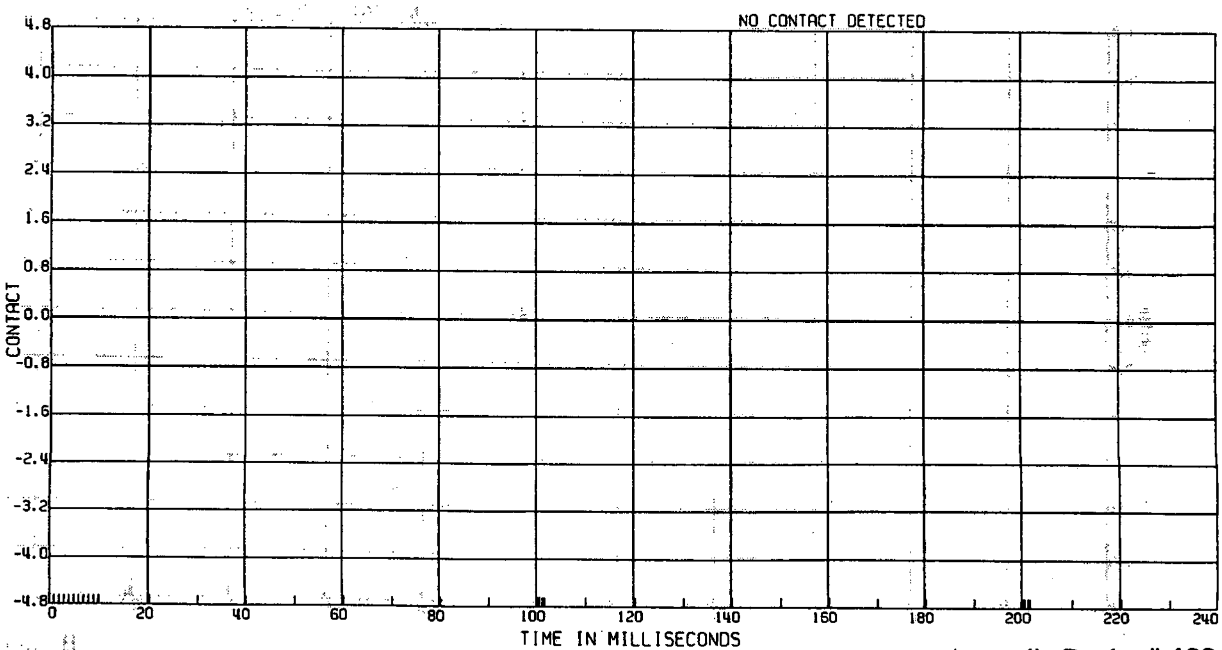



Appendix B, plot # **127**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 THERMAL WIRE-REAR CONTACT TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 1000




Appendix B, plot # **128**

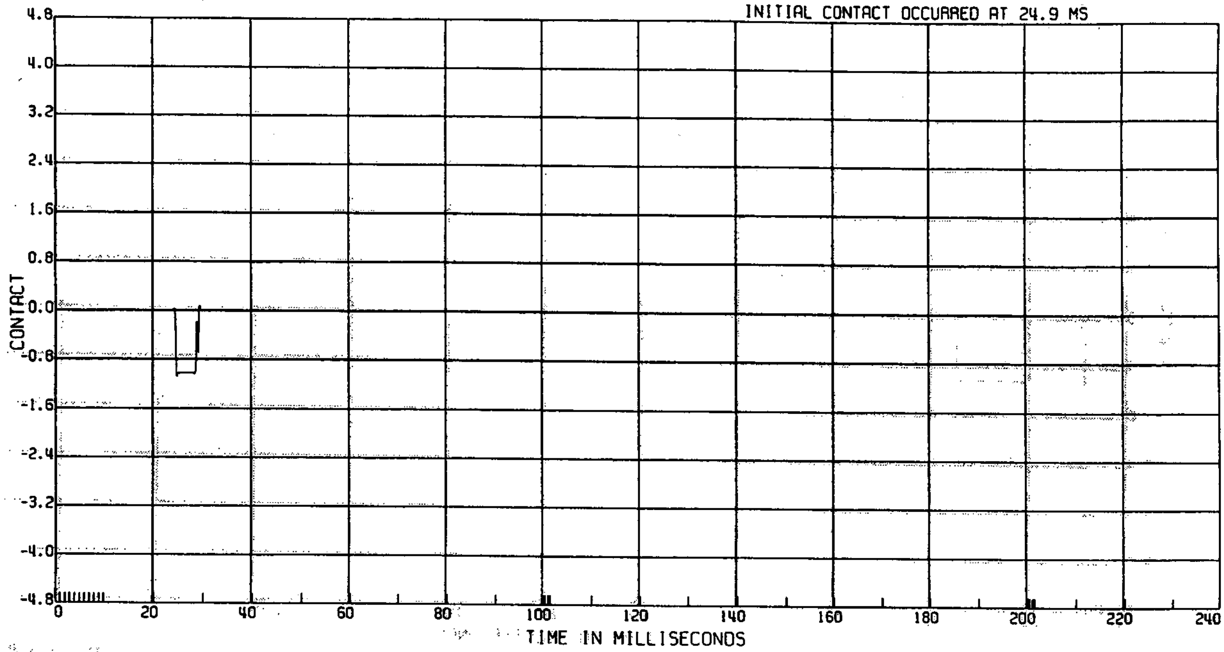
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 1000

CTR CARGO TUB CONTACT

TEST DATE:01/08/1997




Appendix B, plot # **129**

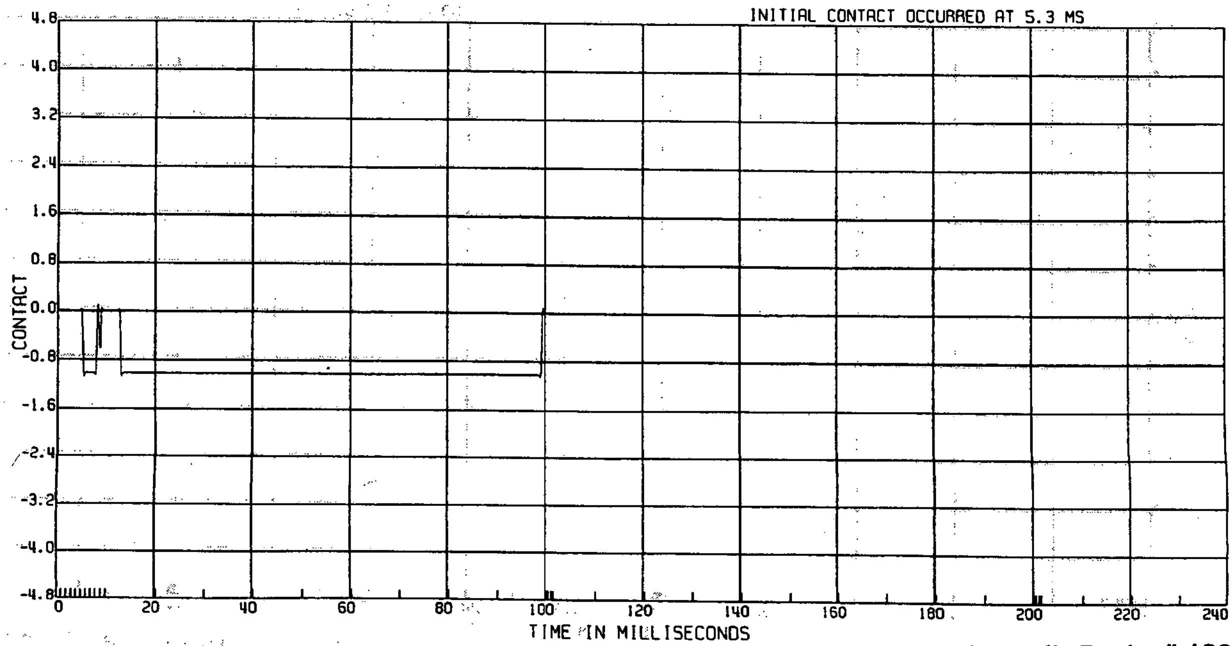
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 1000

L.REAR BUMPER BEAM TO CARGO TUB CONTACT

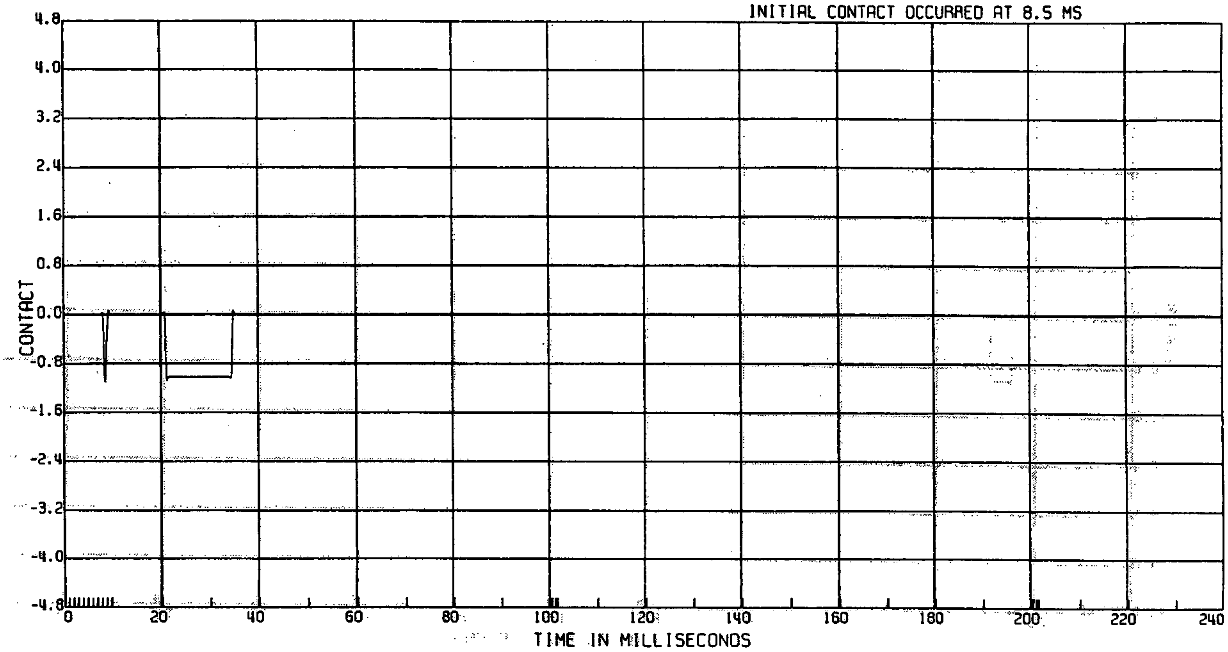
TEST DATE:01/08/1997




Appendix B, plot # **130**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

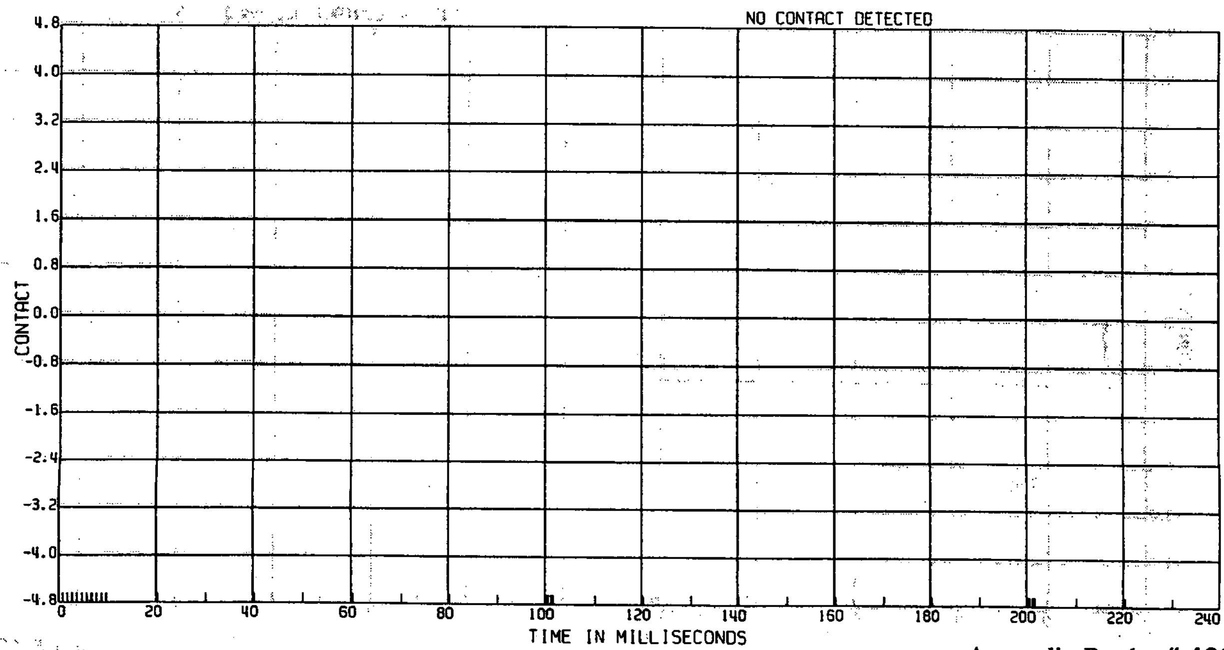
R & D CTR 1VF46079 1FP87 R.REAR BUMPER BEAM TO CARGO TUB CONTACT TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000




Appendix B, plot # 131

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

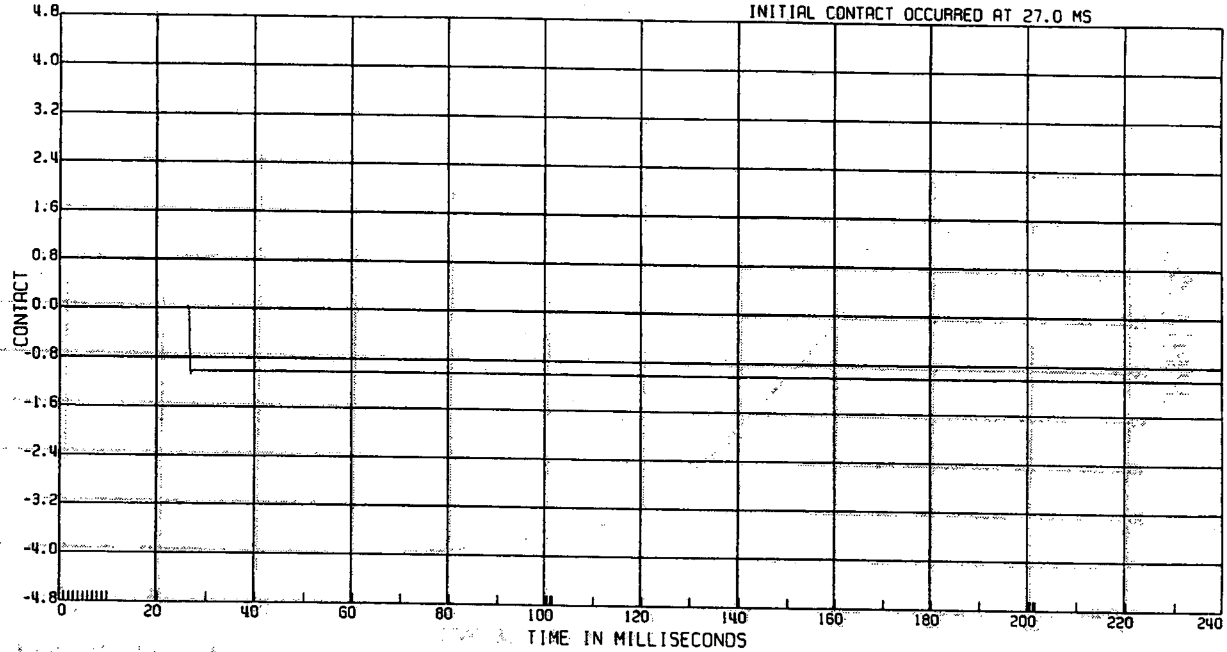
R & D CTR 1VF46079 1FP87 CTR FUEL TANK-FRT CONTACT TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000




Appendix B, plot # 132

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

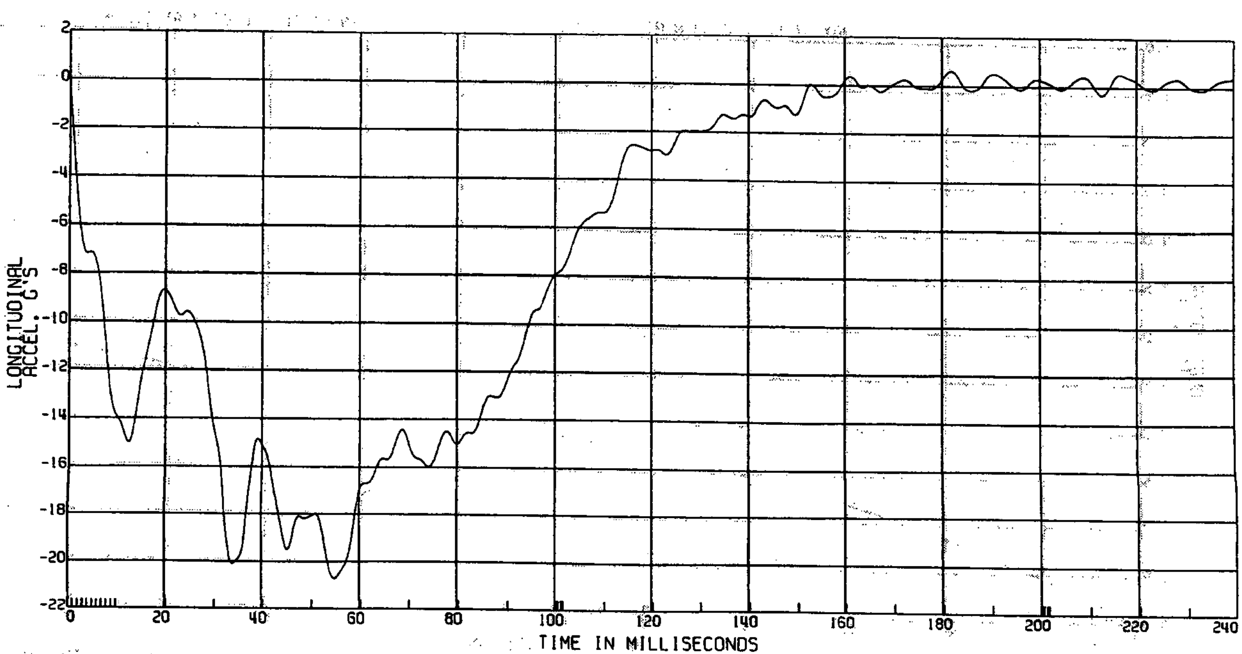
R & D CTR 1VF46079 1FP87 CTR FUEL TANK-REAR CONTACT TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000




Appendix B, plot # **133**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 LTV MDB AT C.G. ACCEL TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 60



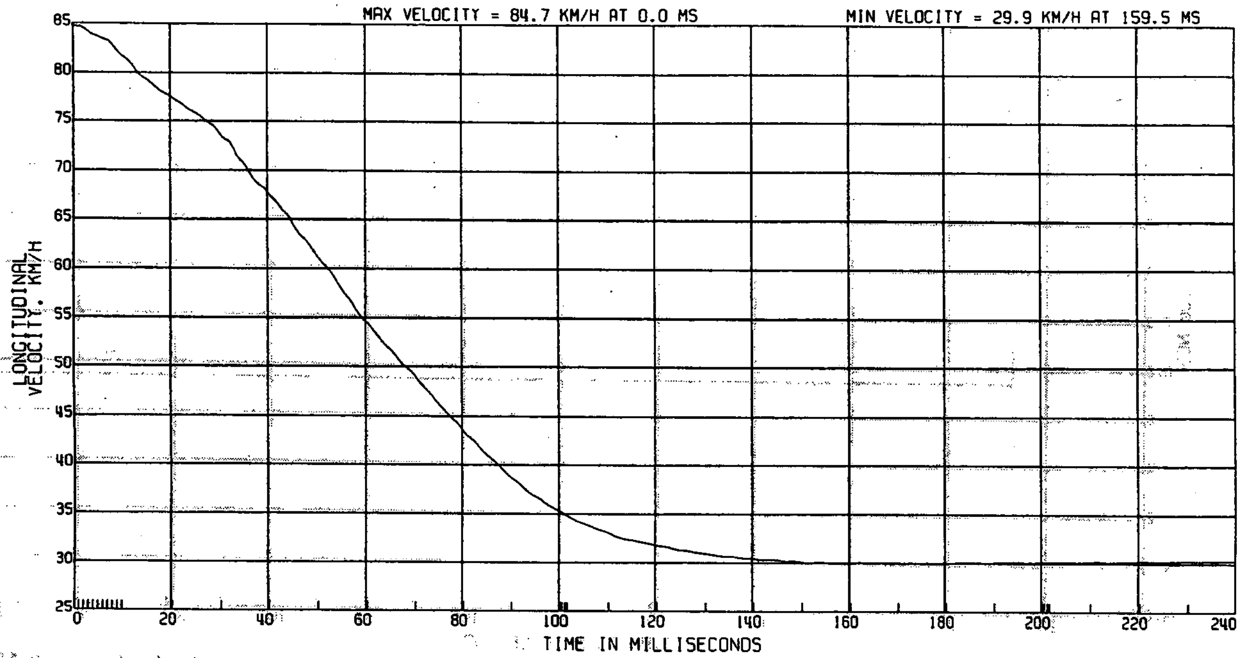

Appendix B, plot # **134**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT C.G. VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



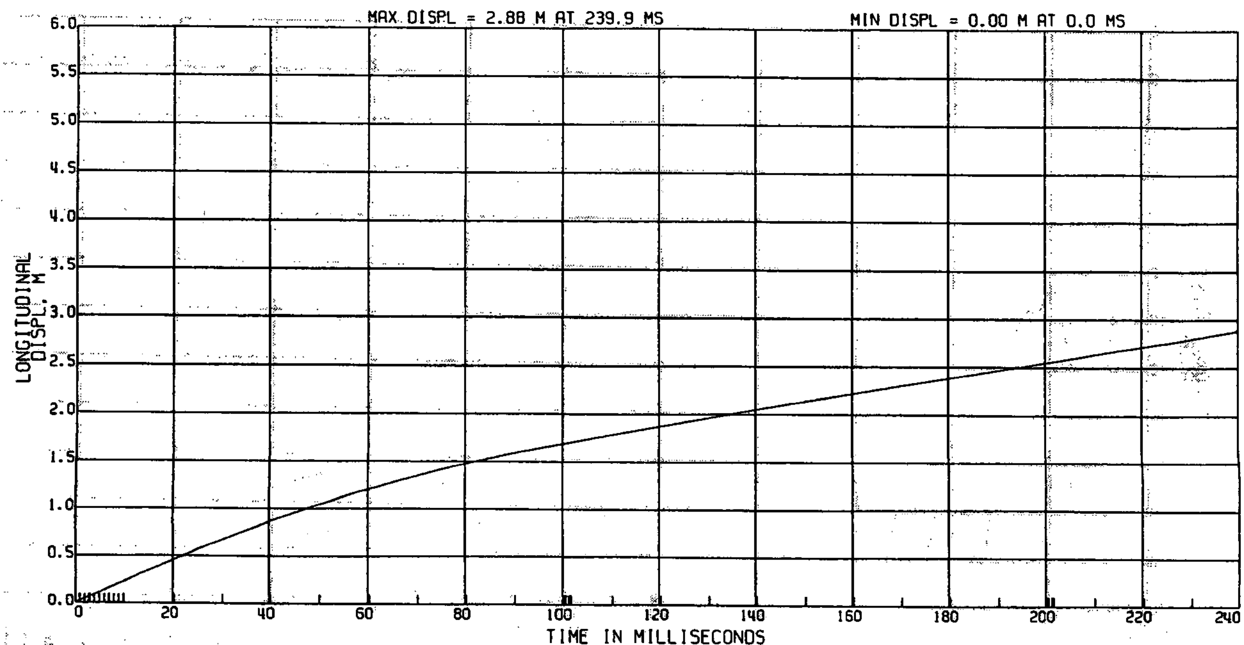

Appendix B, plot # **135**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT C.G. DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



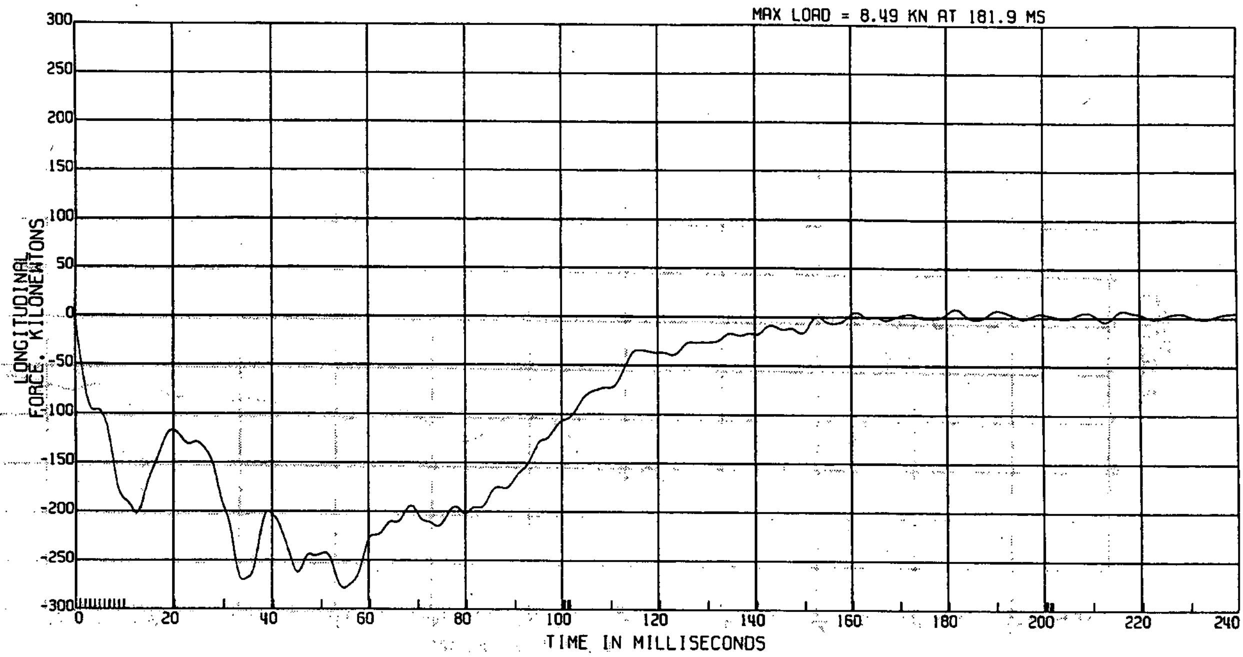

Appendix B, plot # **136**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

LTV MDB LONG. FORCE AT C.G.
(1371.0 KG) (9.807) (LONG.ACCEL)

TEST DATE:01/08/1997



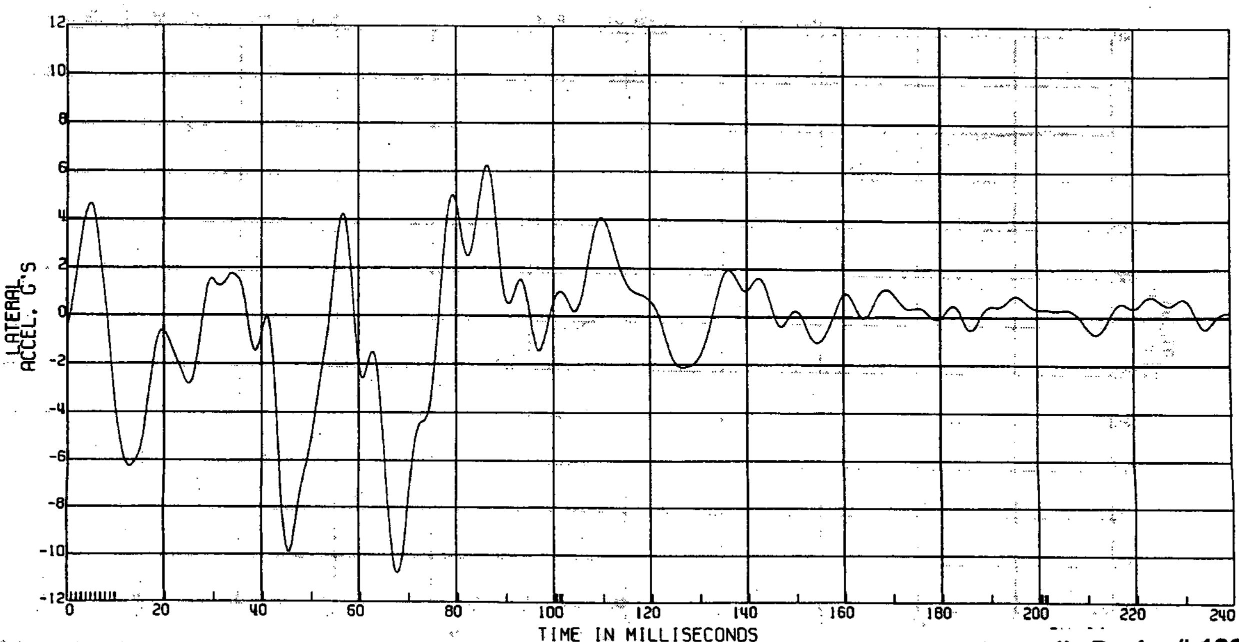

Appendix B, plot # **137**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

LTV MDB AT C.G. ACCEL

TEST DATE:01/08/1997



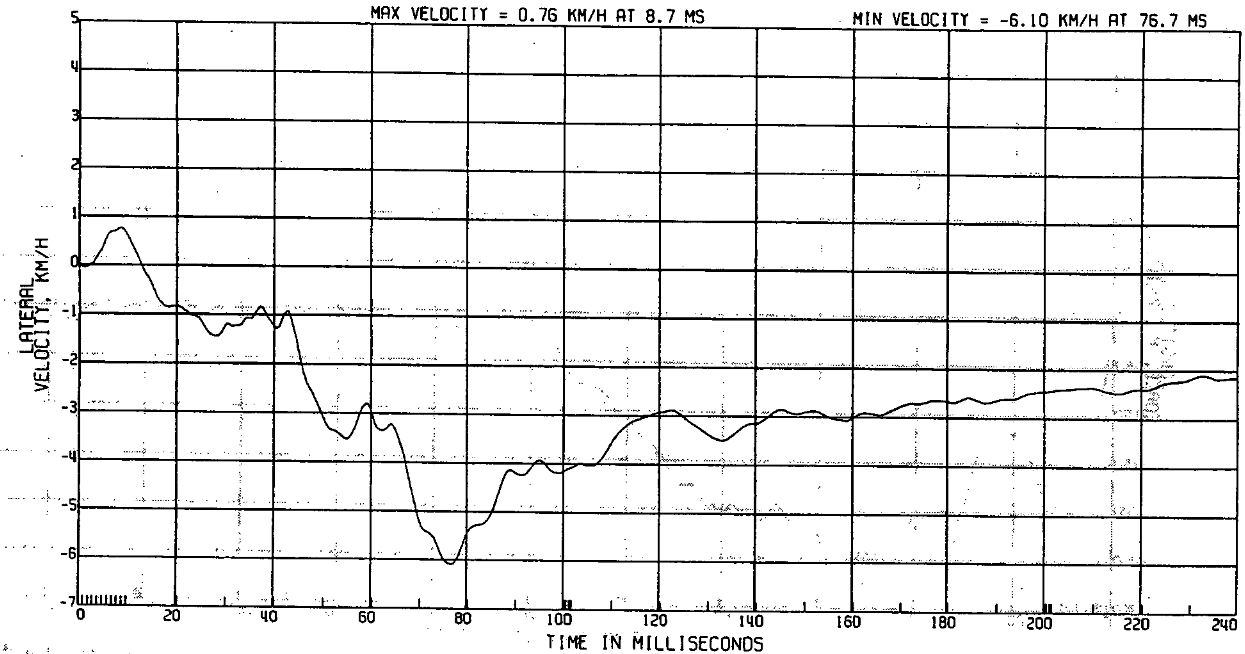

Appendix B, plot # **138**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT C.G. VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



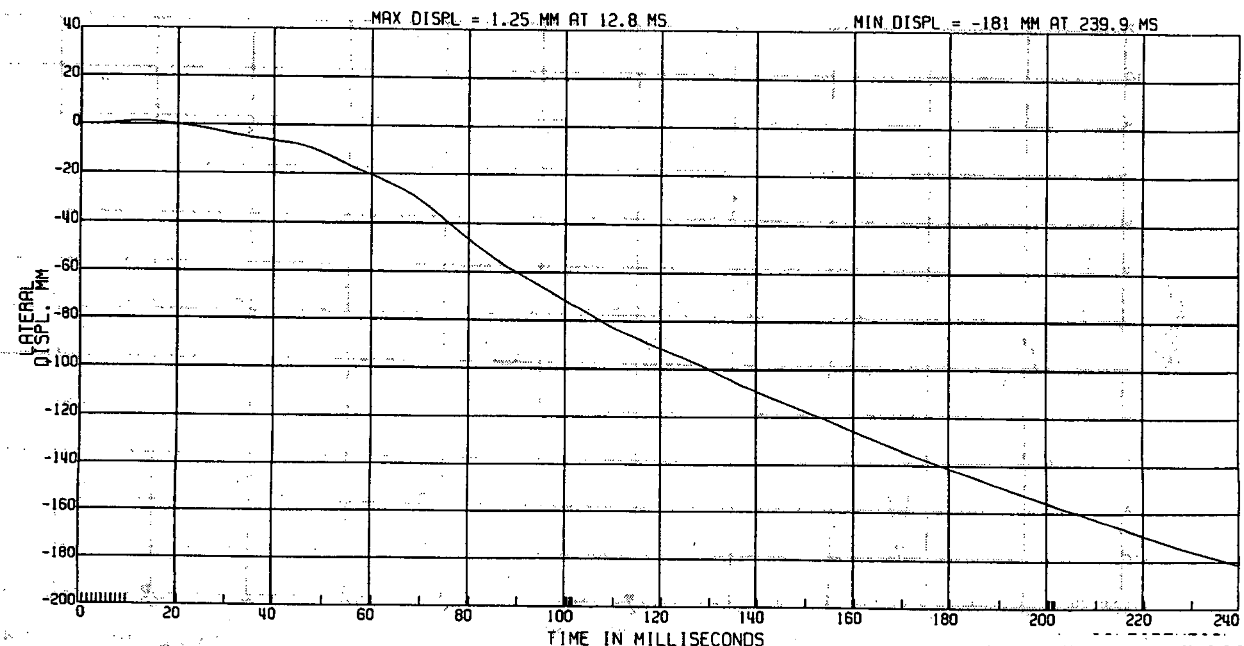

Appendix B, plot # **139**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT C.G. DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997




Appendix B, plot # **140**

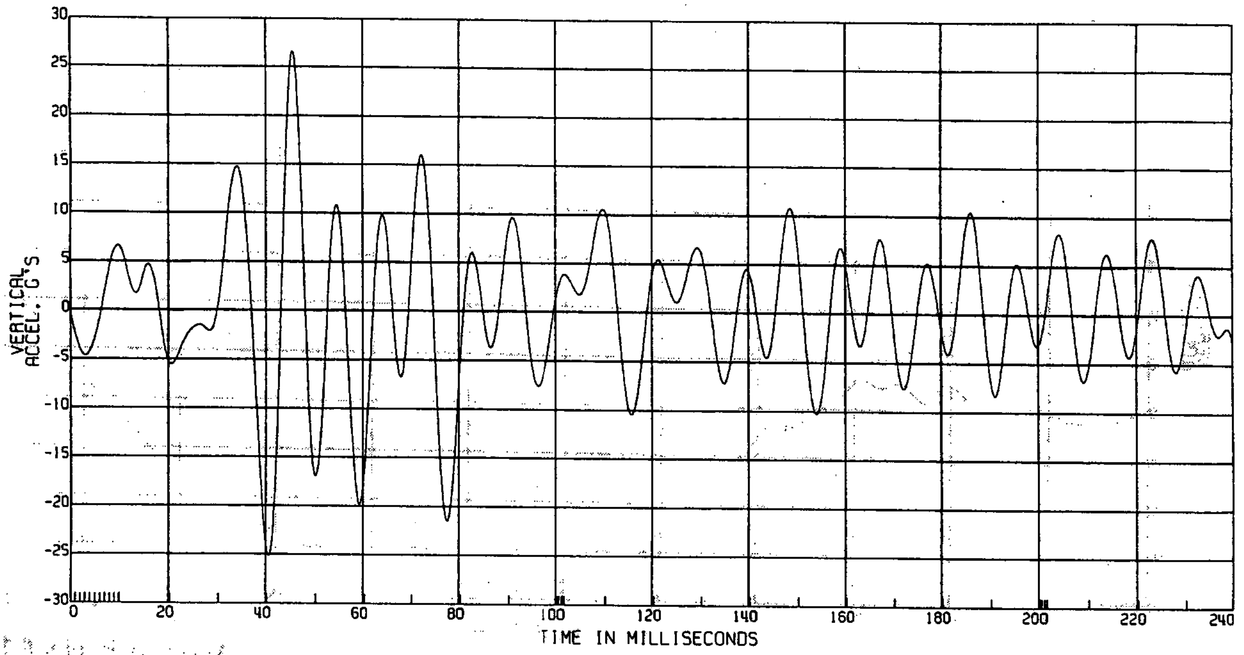
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 60

LTV MDB AT C.G. ACCEL

TEST DATE:01/08/1997




Appendix B, plot # **141**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

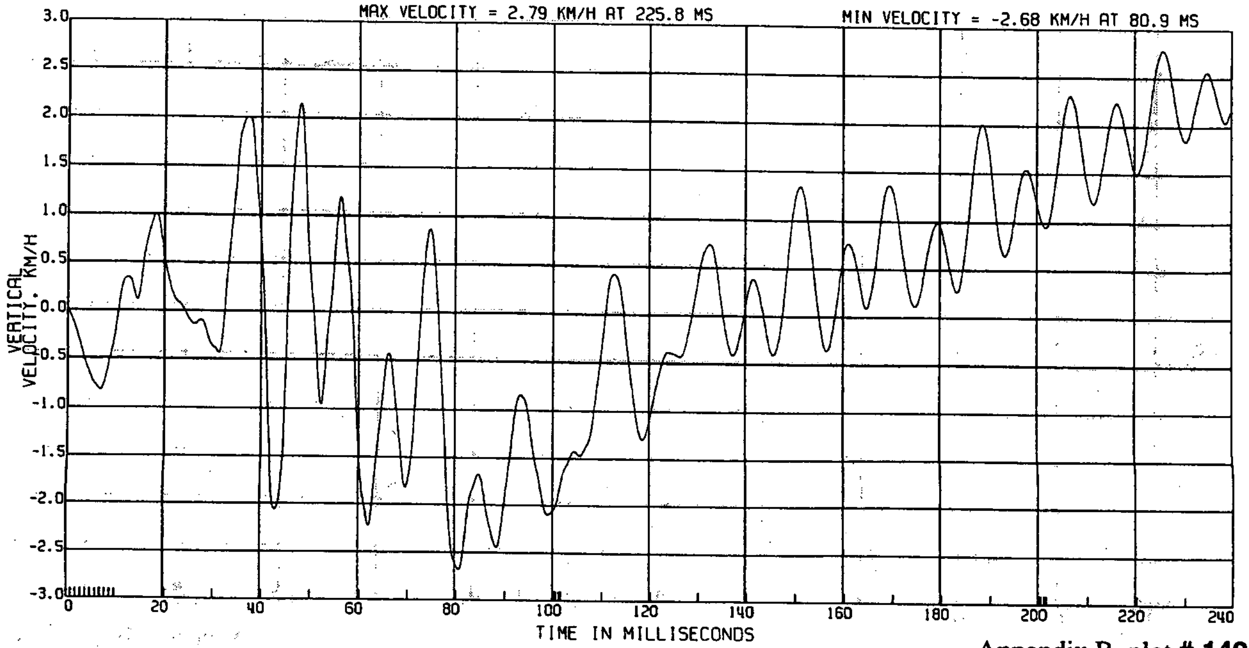
R & D CTR 1VF46079 1FP87

ELEC DATA, SAE CLASS 180

LTV MDB AT C.G. VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997

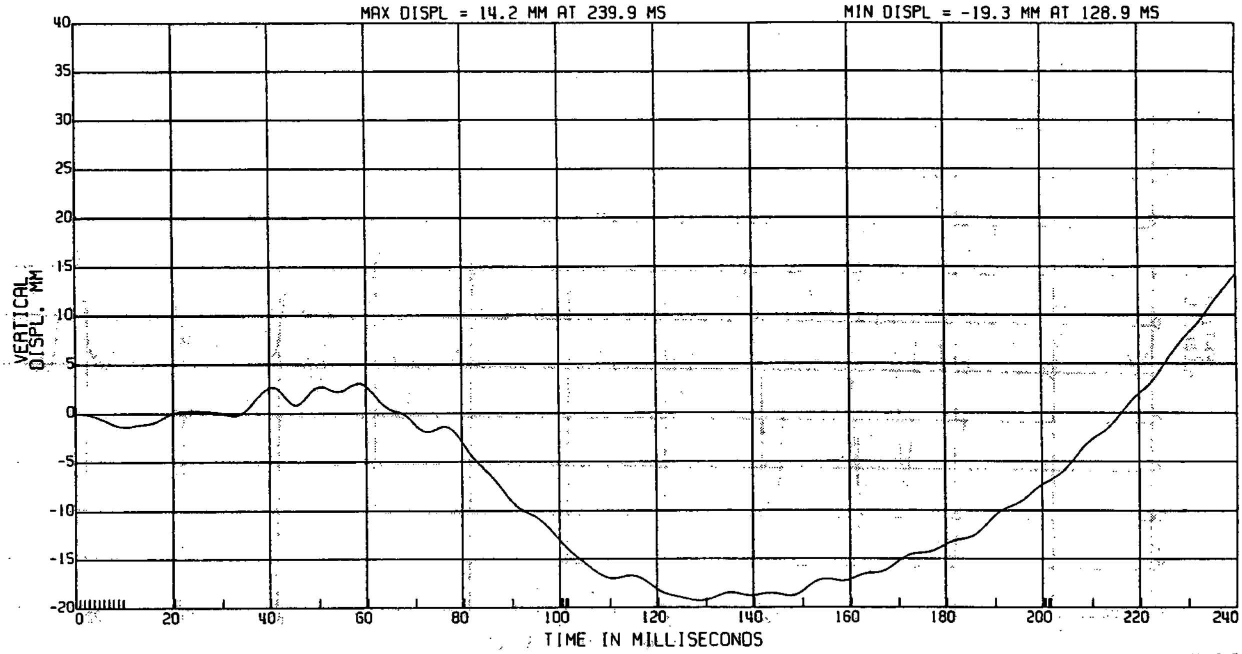



Appendix B, plot # **142**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 LTV MDB AT C.G. DISPL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

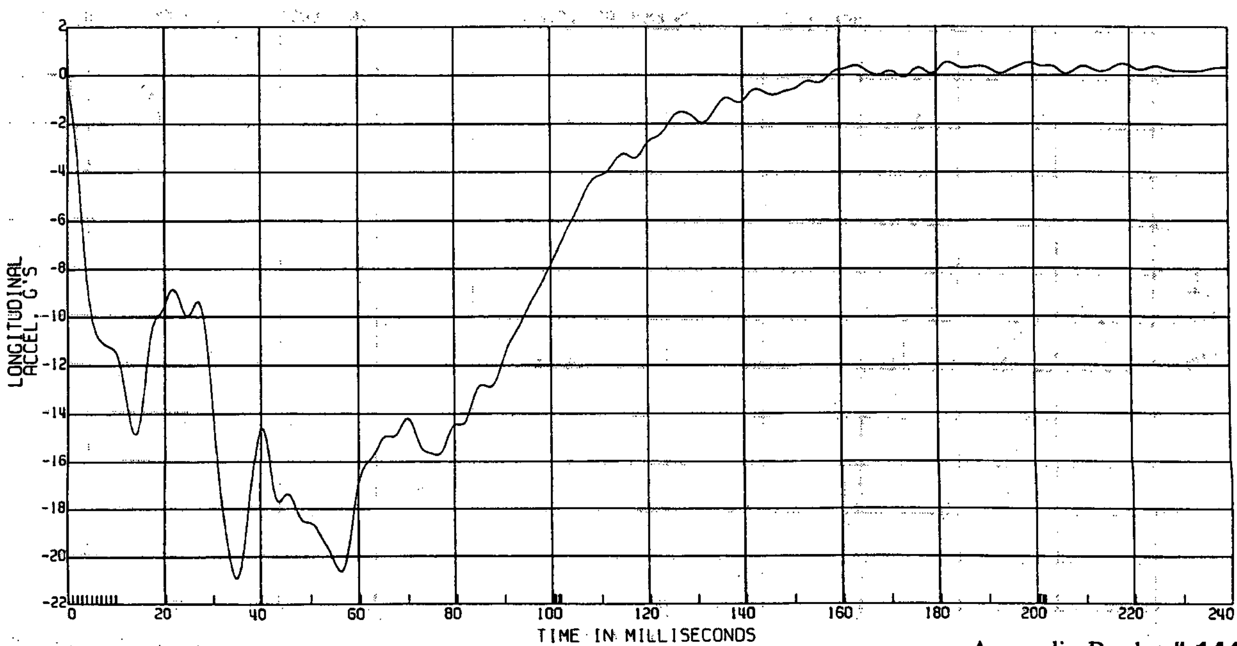



Appendix B, plot **# 143**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 LTV MDB AT REAR C/MBR ACCEL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60



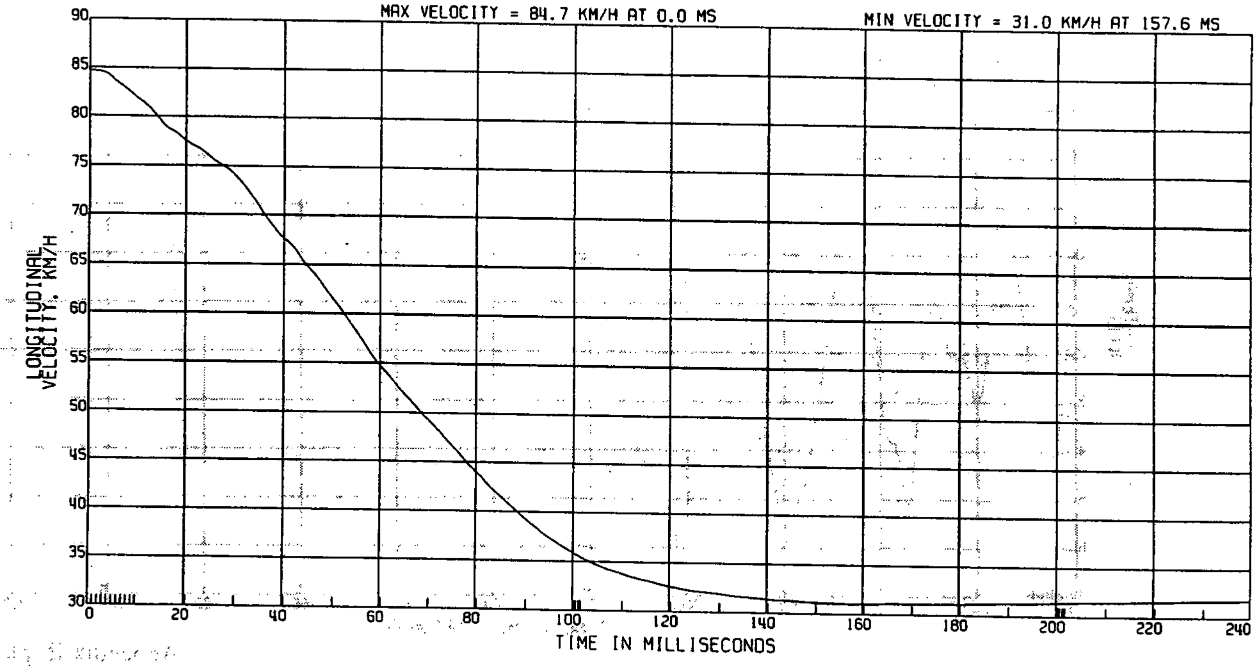

Appendix B, plot **# 144**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT REAR C/MBR VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



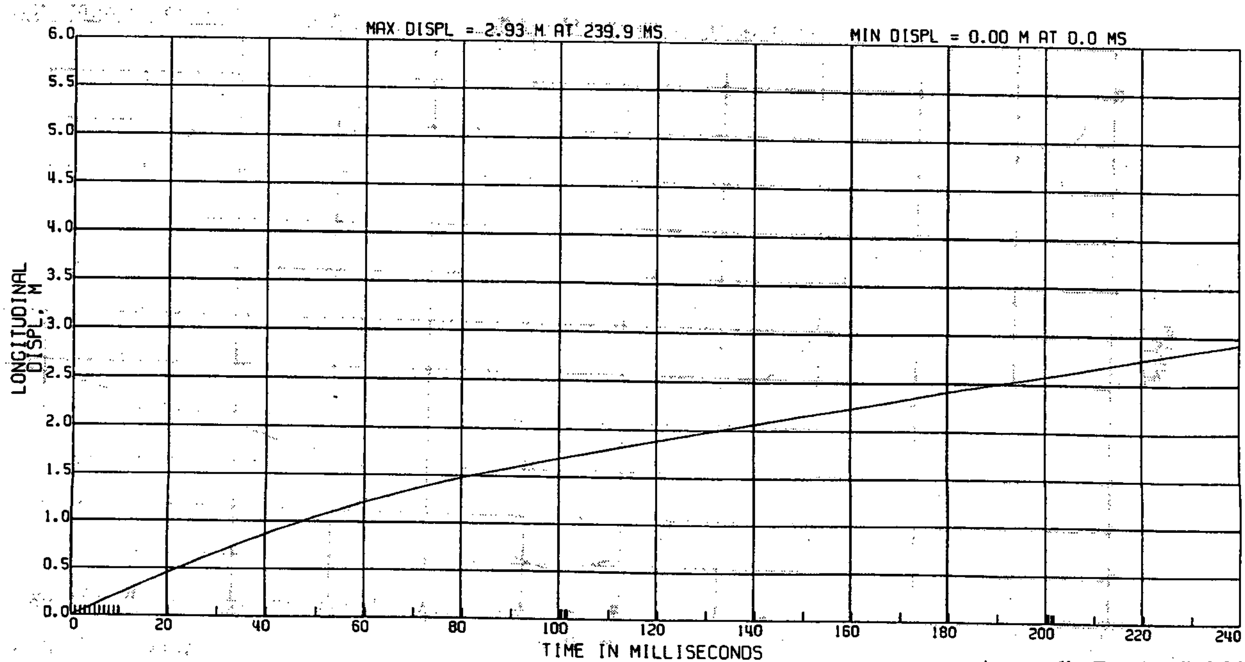

Appendix B, plot **# 145**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT REAR C/MBR DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997

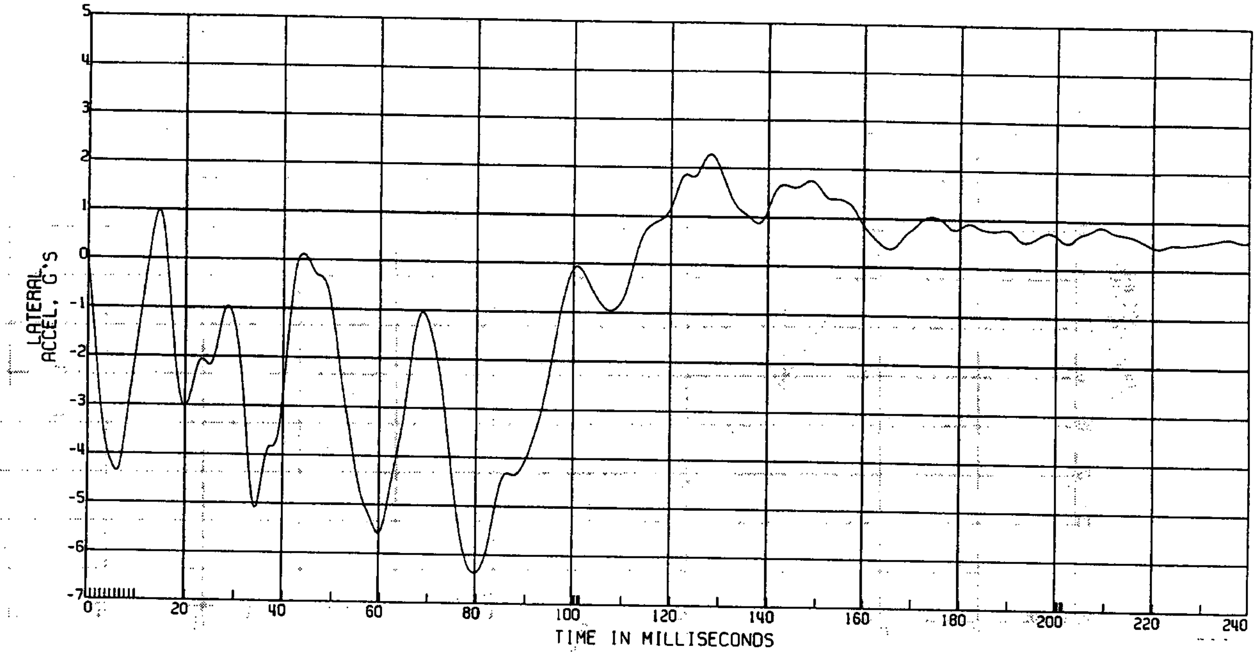



Appendix B, plot **# 146**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 LTV MDB AT REAR C/MBR ACCEL TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 60

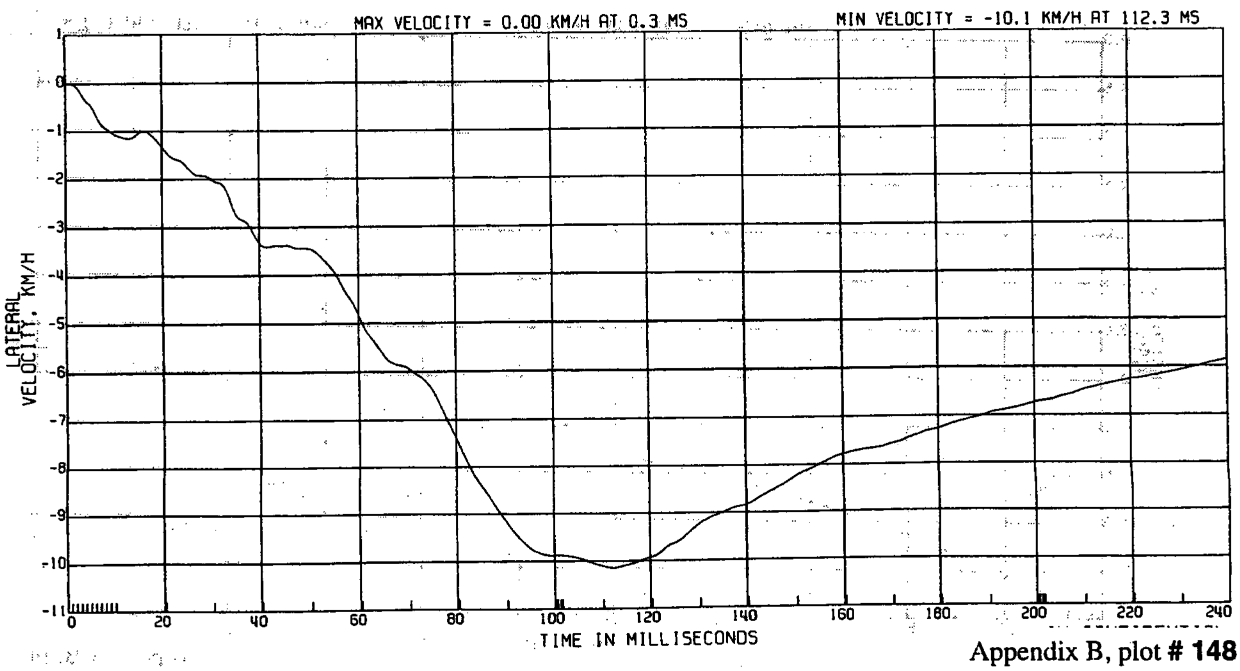



Appendix B, plot # 147

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 LTV MDB AT REAR C/MBR VELOCITY TEST DATE:01/08/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



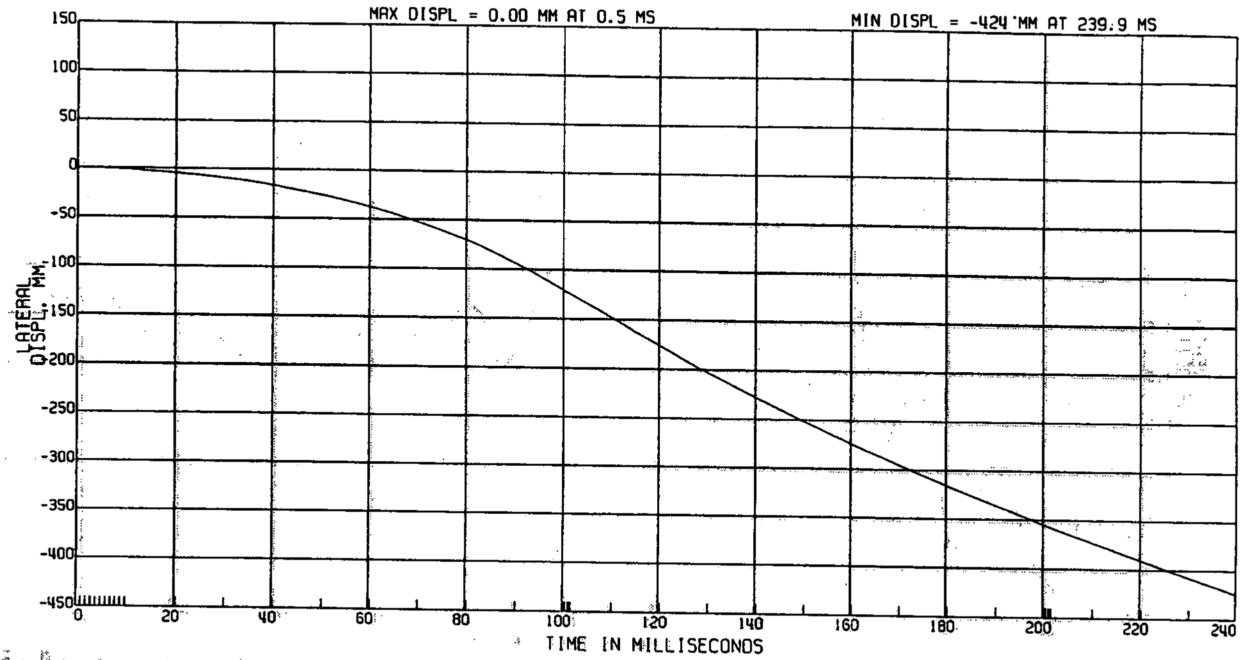

Appendix B, plot # 148

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT REAR C/MBR DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



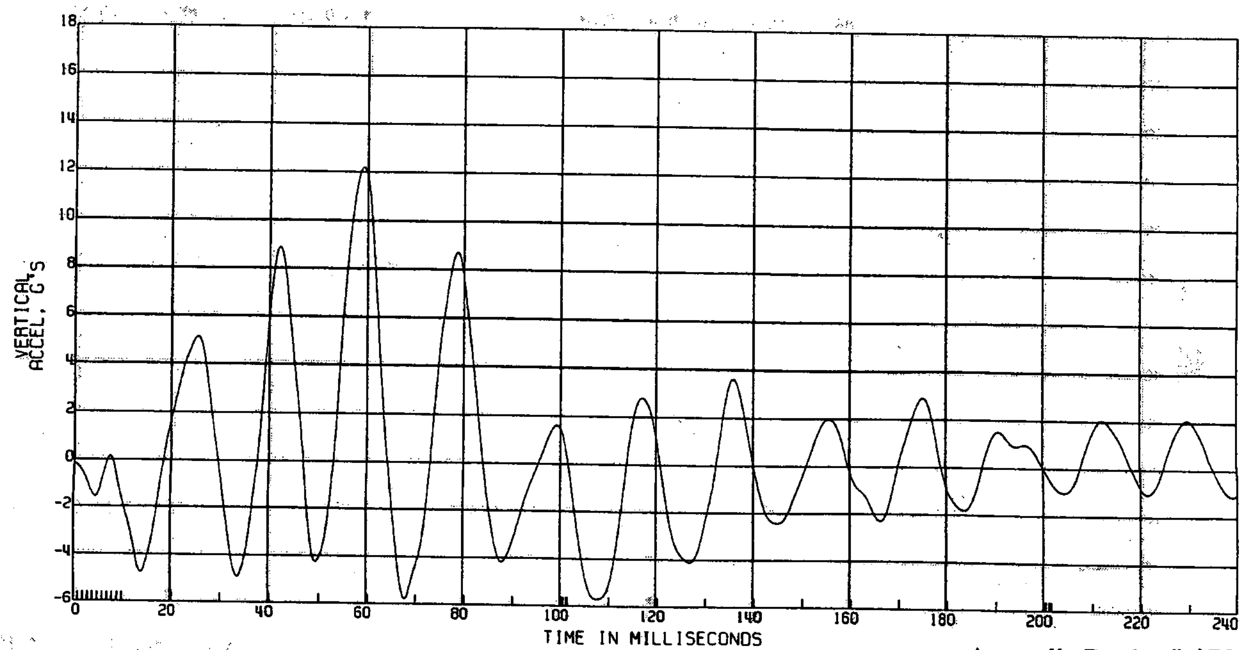

Appendix B, plot # **149**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA, SAE CLASS 60

LTV MDB AT REAR C/MBR ACCEL

TEST DATE:01/08/1997



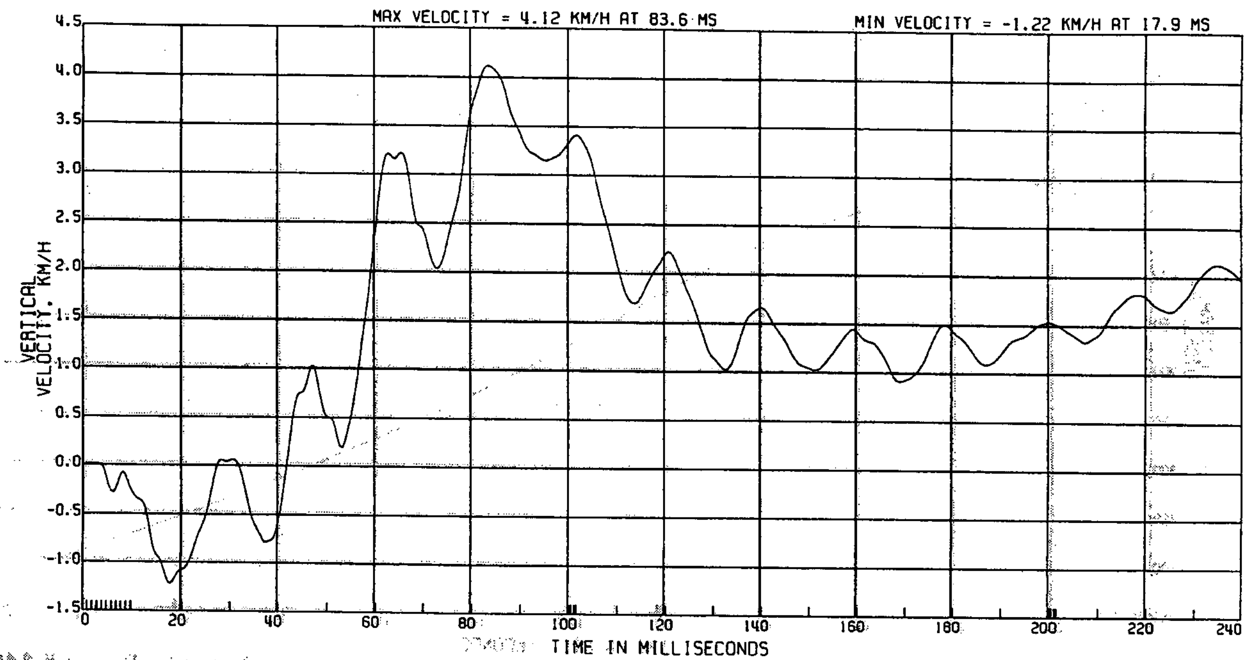

Appendix B, plot # **150**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA. SAE CLASS 180

LTV MDB AT REAR C/MBR VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:01/08/1997



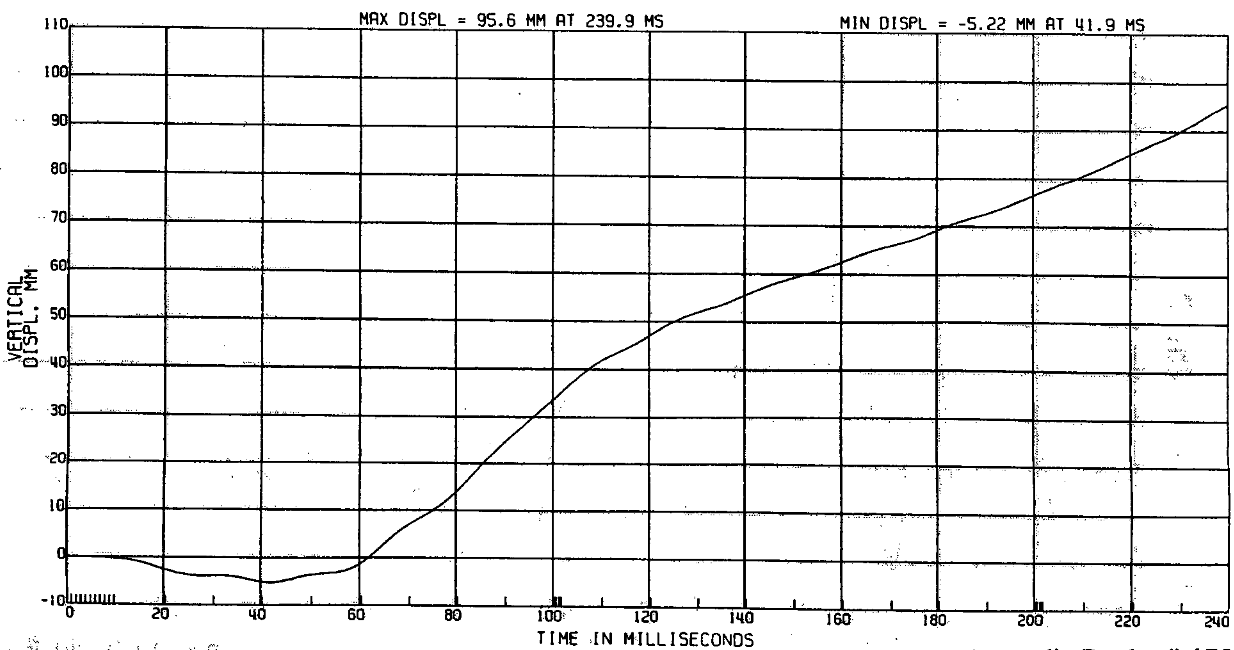

Appendix B, plot # **151**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87
ELEC DATA. SAE CLASS 180

LTV MDB AT REAR C/MBR DISPL
(COMPUTED FROM ACCELERATION)

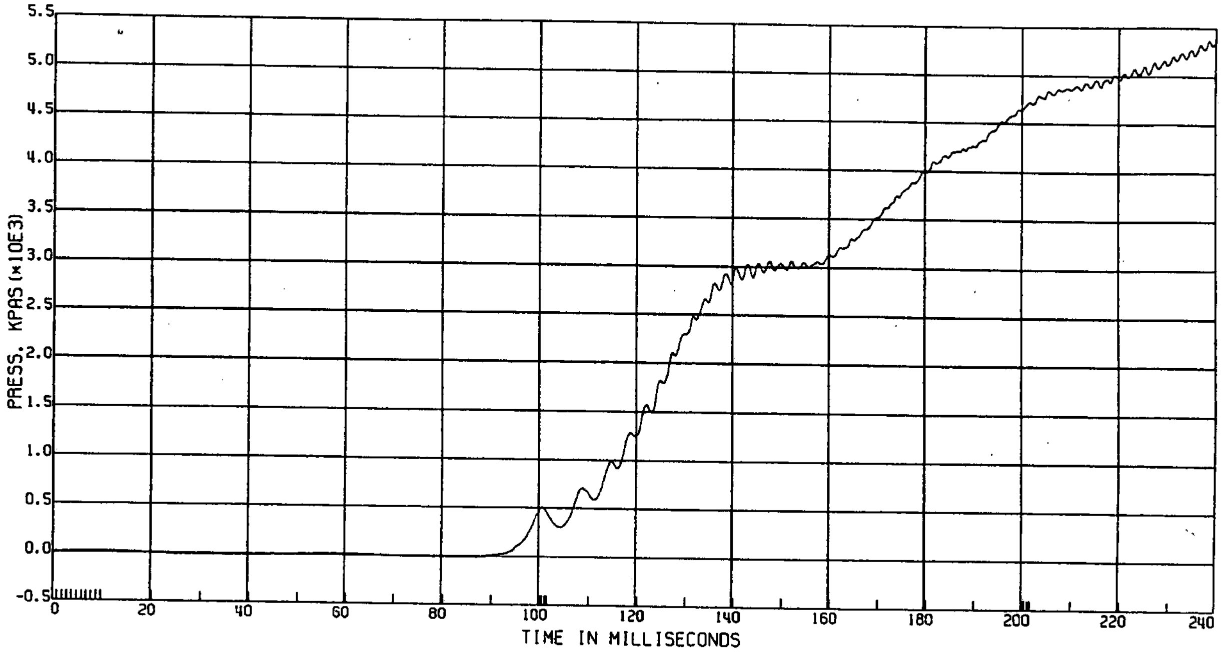
TEST DATE:01/08/1997




Appendix B, plot # **152**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

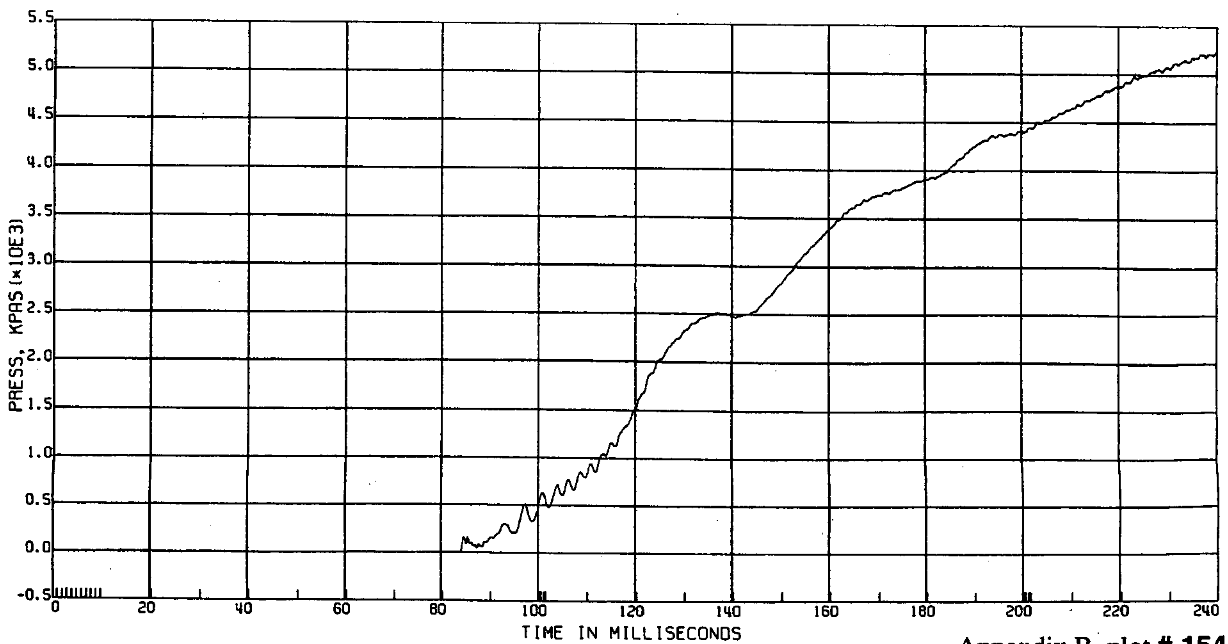
R & D CTR 1VF46079 1FP87 STL EVAL SNUBBER WEST BRAKE PRESSURE TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000




Appendix B, plot # **153**

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H

R & D CTR 1VF46079 1FP87 STL EVAL SNUBBER EAST BRAKE PRESSURE TEST DATE:01/08/1997
ELEC DATA, SAE CLASS 1000




Appendix B, plot # **154**

# Appendix C

## **Appendix C:** C11408 film plots

C11408 REAR IMP 70% OVERLAP

LTV MDB TO STATIONARY VEHICLE 84.7KM/H

FIGURE

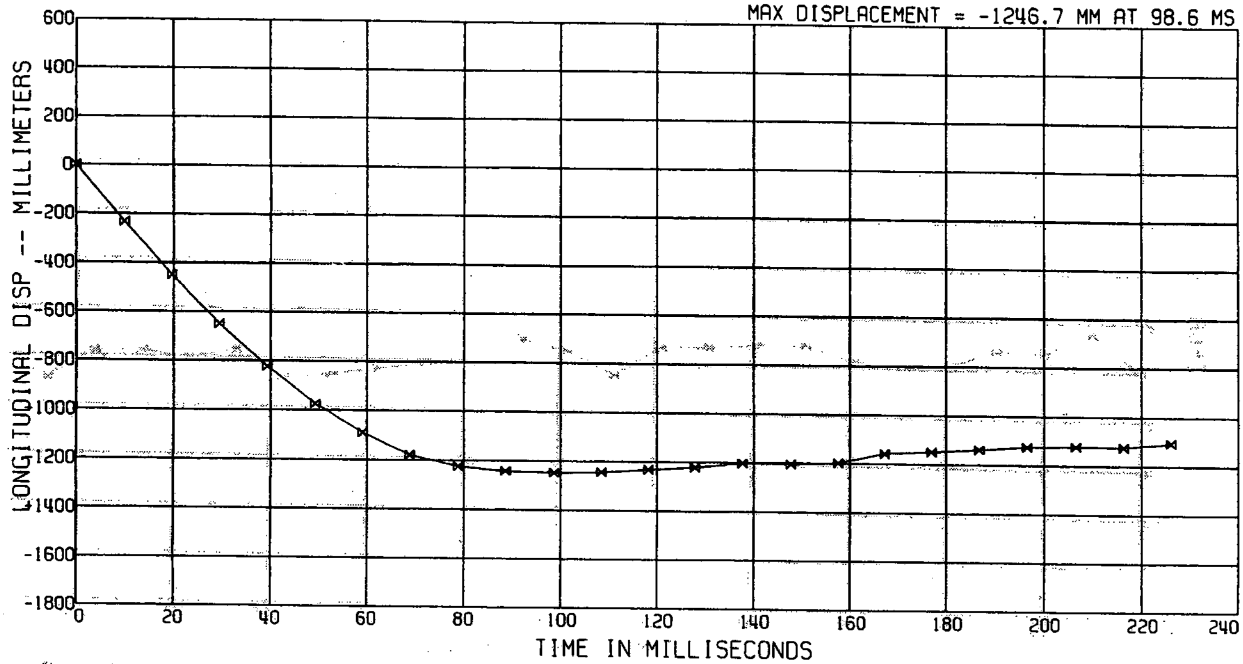
R & D CTR 1VF46079 1FP87

FILM DATA

LEFT SIDE

TEST DATE:01/08/97

STRUCK VEH DISPL RELATIVE TO MOVING BARRIER




Appendix C, plot # 1

C11408 REAR IMP 70% OVERLAP

LTV MDB TO STATIONARY VEHICLE 84.7KM/H

FIGURE

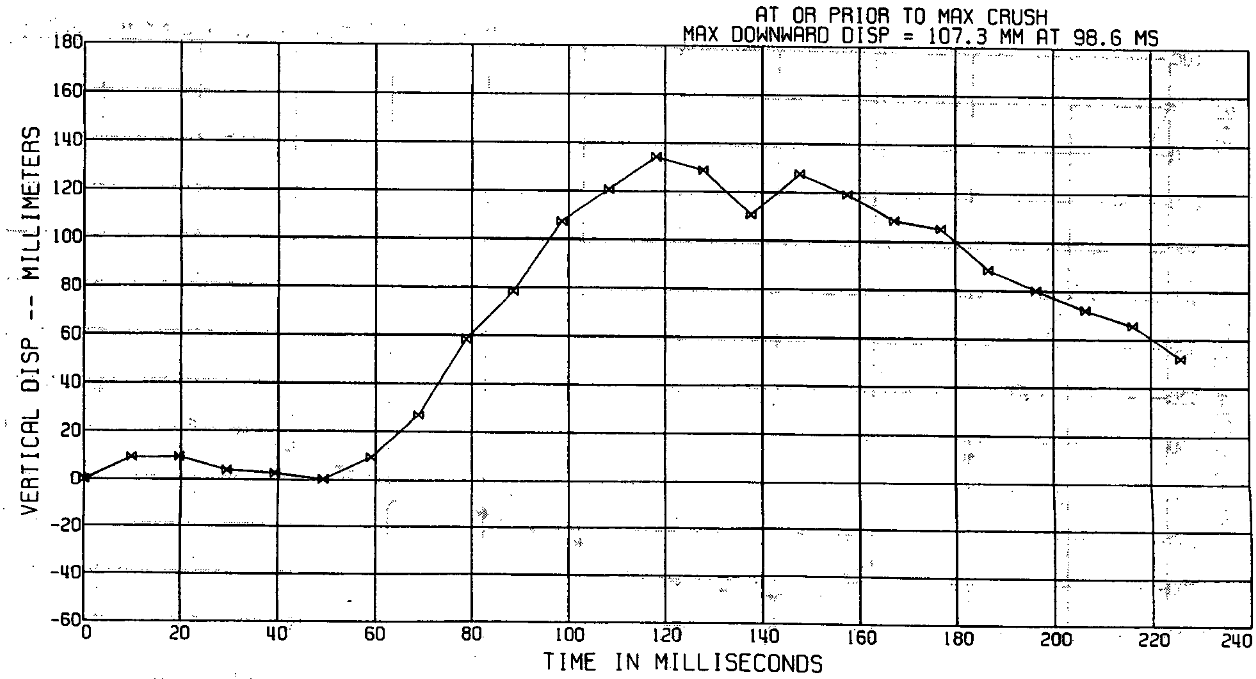
R & D CTR 1VF46079 1FP87

FILM DATA

LEFT SIDE

TEST DATE:01/08/97

STRUCK VEH DISPL RELATIVE TO MOVING BARRIER




Appendix C, plot # 2

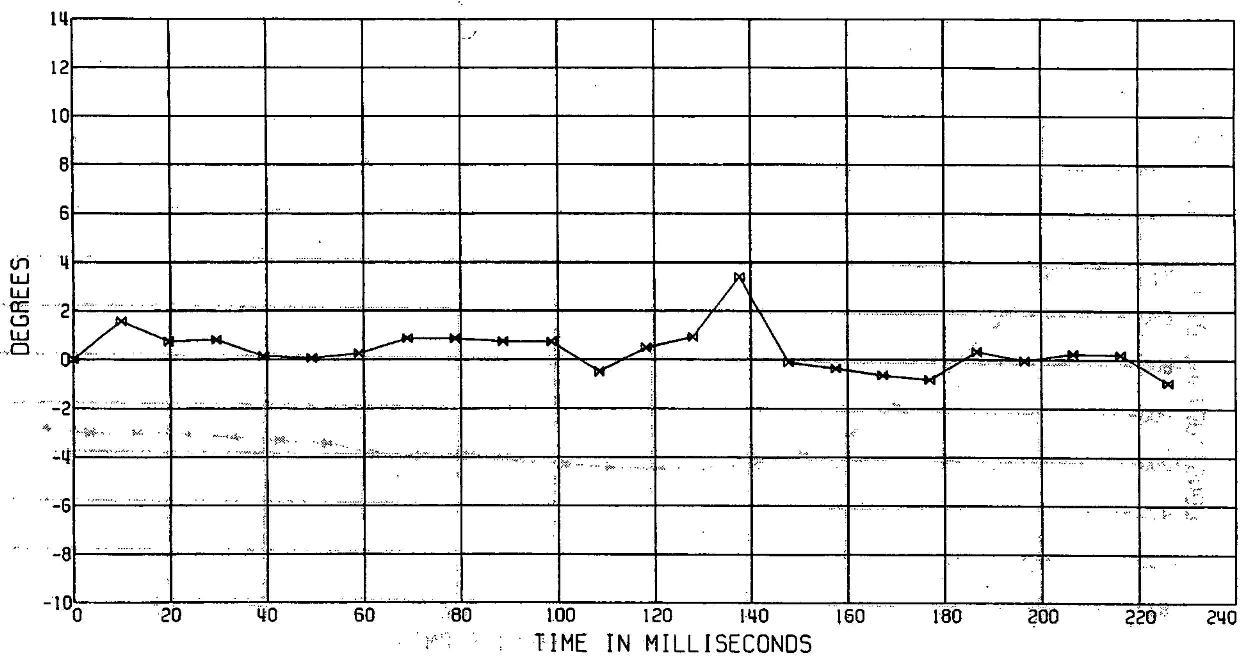
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H FIGURE

R & D CTR 1VF46079 1FP87
FILM DATA

LEFT SIDE

TEST DATE:01/08/97

STRUCK VEH PITCH RELATIVE TO GROUND REFERENCE




Appendix C, plot # 3

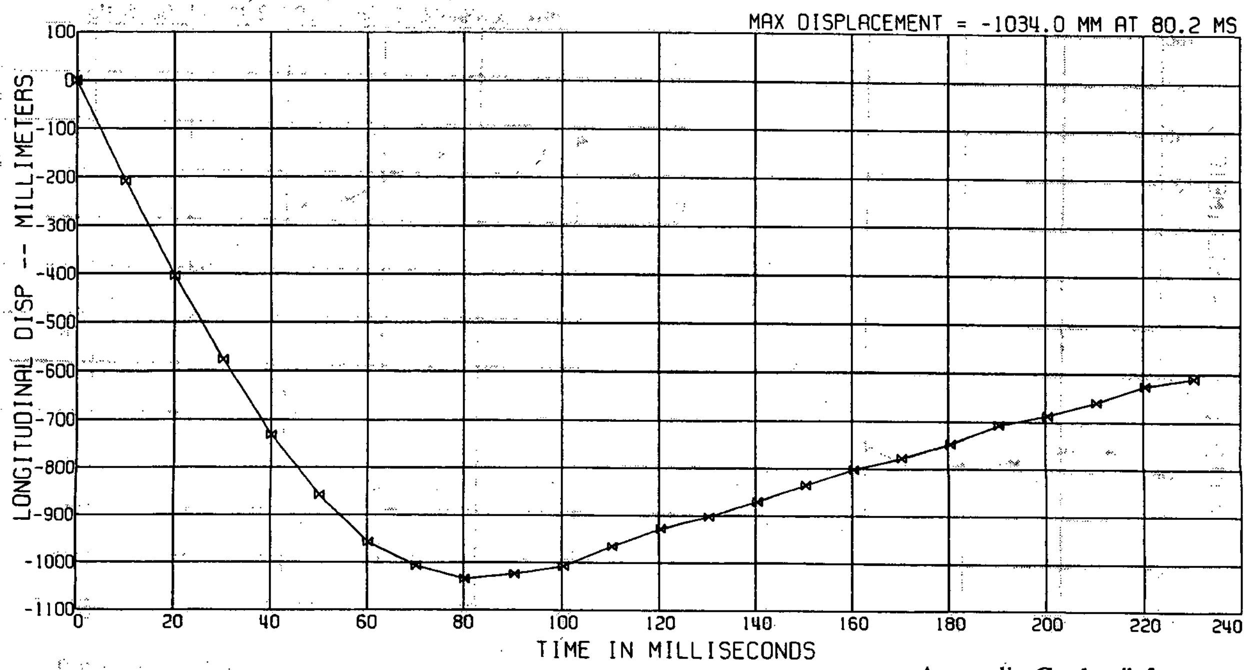
C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H FIGURE

R & D CTR 1VF46079 1FP87
FILM DATA

RIGHT SIDE

TEST DATE:01/08/97

STRUCK VEH DISPL RELATIVE TO MOVING BARRIER

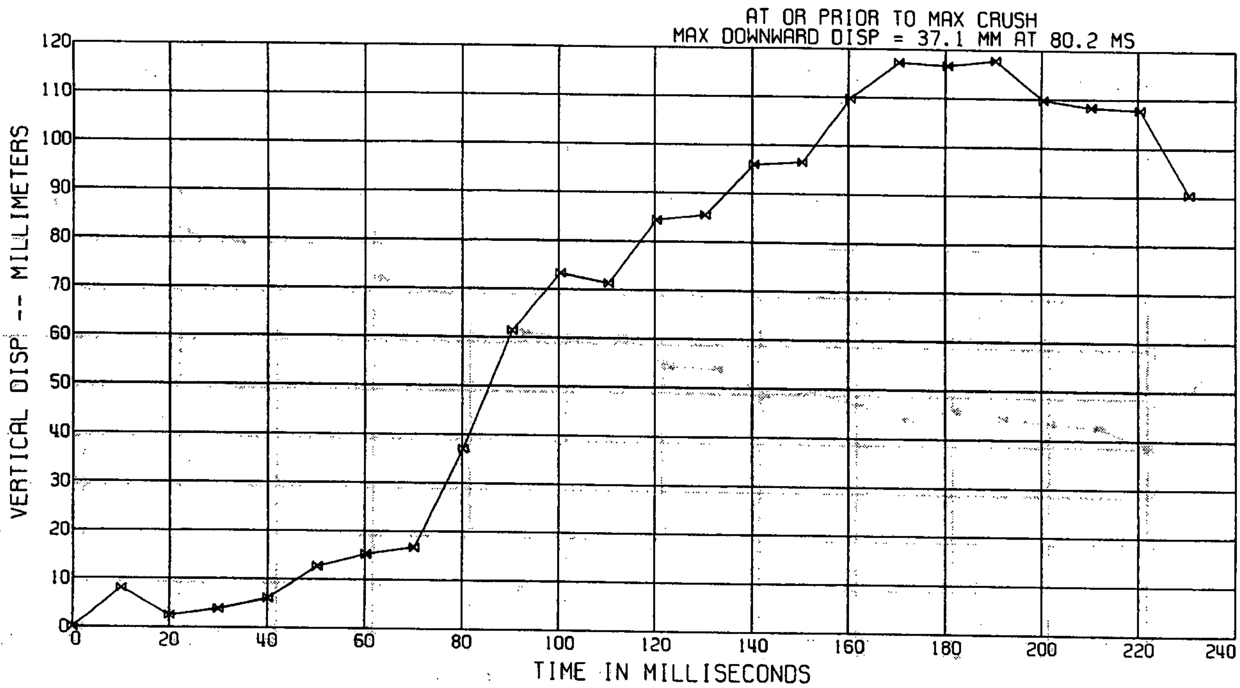



Appendix C, plot # 4

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H FIGURE

R & D CTR 1VF46079 1FP87
FILM DATA RIGHT SIDE TEST DATE:01/08/97

STRUCK VEH DISPL RELATIVE TO MOVING BARRIER

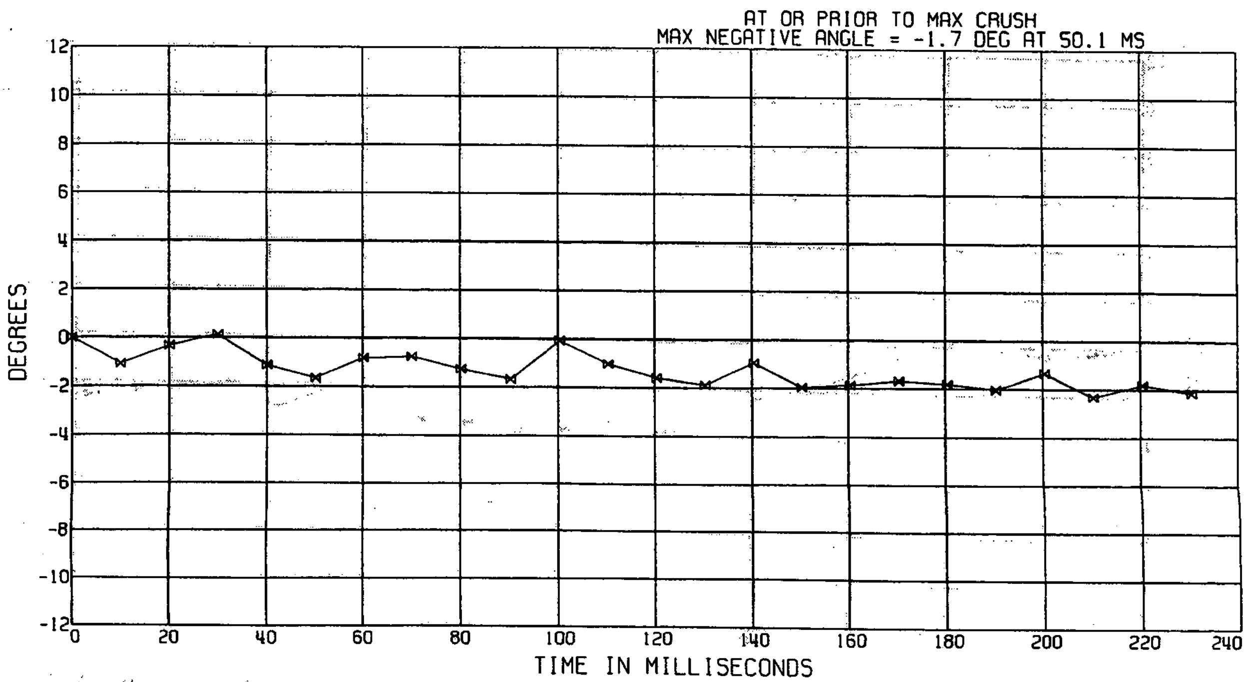



Appendix C, plot # 5

C11408 REAR IMP 70% OVERLAP LTV MDB TO STATIONARY VEHICLE 84.7KM/H FIGURE

R & D CTR 1VF46079 1FP87
FILM DATA RIGHT SIDE TEST DATE:01/08/97

STRUCK VEH PITCH RELATIVE TO GROUND REFERENCE




Appendix C, plot # 6

C11408 REAR IMP 70% OVERLAP

LTV MDB TO STATIONARY VEHICLE 84.7KM/H

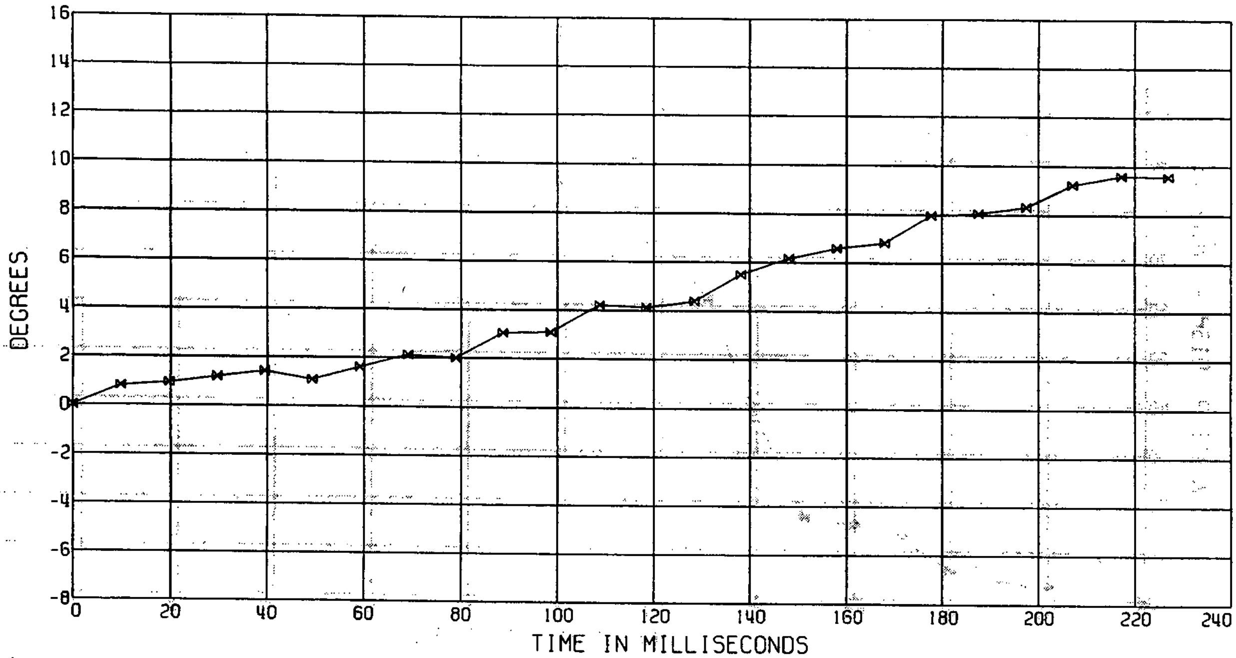
FIGURE

R & D CTR 1VF46079 1FP87
FILM DATA

OVERHEAD VIEW

TEST DATE:01/08/97

STRIKING BARRIER YAW RELATIVE TO GROUND REFERENCE




Appendix C, plot # 7

C11408 REAR IMP 70% OVERLAP

LTV MDB TO STATIONARY VEHICLE 84.7KM/H

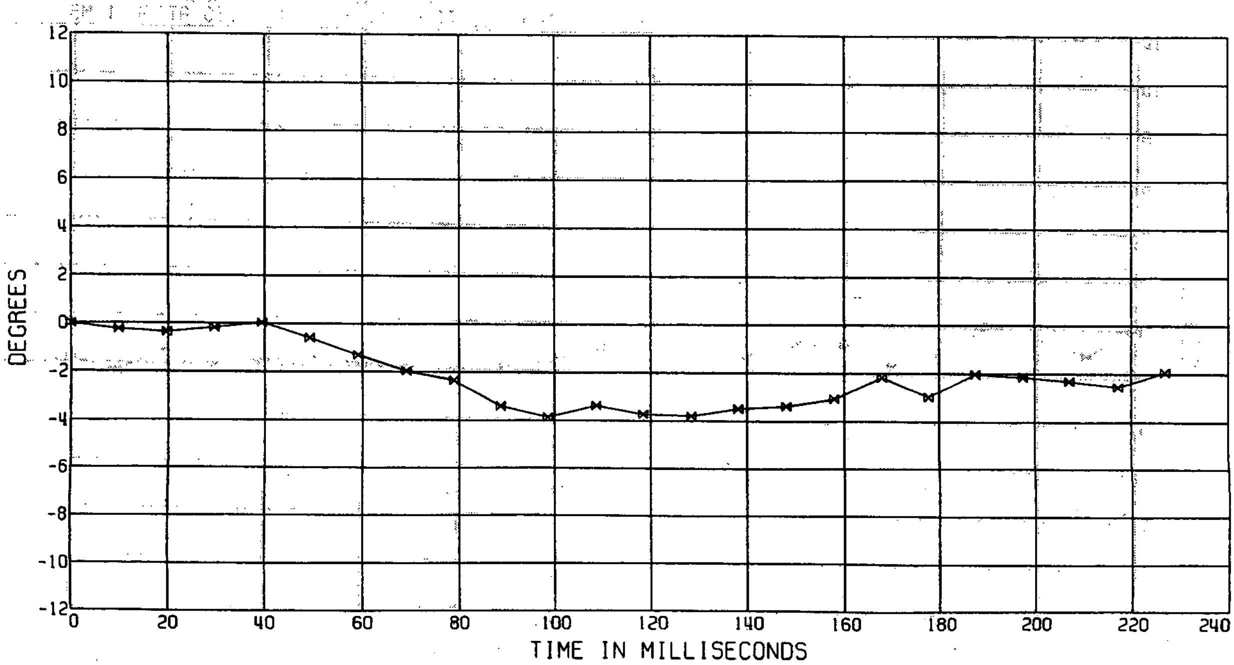
FIGURE

R & D CTR 1VF46079 1FP87
FILM DATA

OVERHEAD VIEW

TEST DATE:01/08/97

STRUCK VEHICLE YAW RELATIVE TO GROUND REFERENCE

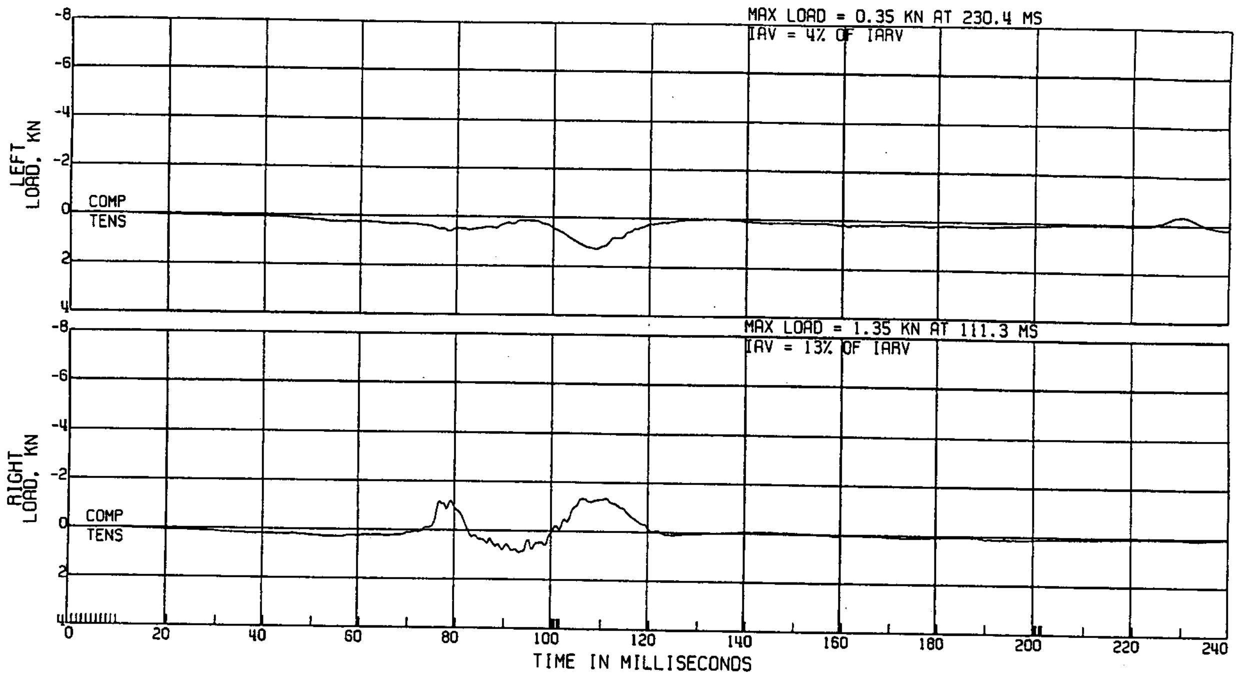



Appendix C, plot # 8

C11591 FRONT IMPACT — MOVING VEHICLE TO FIXED POLE — 55.3KM/H

R&D CTR 1VF46081 1FP87 — L. FRT FEMUR LOAD — ATD TYPE: GM50H

ELEC DATA, SAE CLASS 600 — TEST DATE:05/14/1997

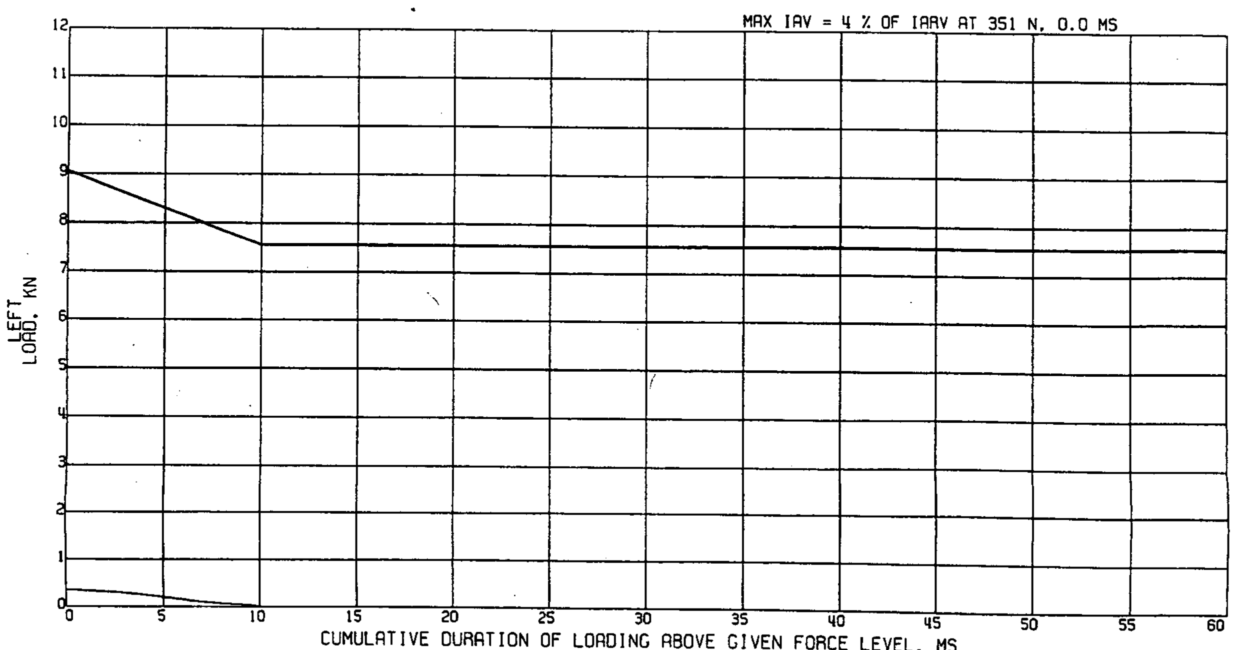



Appendix D, plot # **5**

C11591 FRONT IMPACT — MOVING VEHICLE TO FIXED POLE — 55.3KM/H

R&D CTR 1VF46081 1FP87 — L. FRT FEMUR LOAD — ATD TYPE: GM50H

ELEC DATA, SAE CLASS 600 — DURATION ASSESSMENT — TEST DATE:05/14/1997




Appendix D, plot # **6**

# **Appendix D:** C11591 data plots

# LEFT FRONT
## ANTHROPOMORPHIC TEST DEVICE SUMMARY DATA
## MOVING VEHICLE TO FIXED POLE 55.3KM/H

C11591 FRONT IMPACT

R&D CTR 1VF46081 1FP87

ATD TYPE: GM50H

TEST DATE: 05/14/1997

| MEASURED QUANTITY | IAV VALUE | IARV |
|---|---|---|
| HIC, LIMITED TO 15 MS | 380 | 1000 |
| HIC, LIMITED TO 36 MS | 520 | 1000 |
| NECK FLEXION | 29NM | 190NM |
| NECK EXTENSION | 17NM | 57NM |
| NECK TENSION | 0.58 | 1.00 |
| NECK COMPRESSION | 0.06 | 1.00 |
| NECK SHEAR FORWARD | 0.24 | 1.00 |
| NECK SHEAR REARWARD | 0.02 | 1.00 |
| CHEST ACCEL | 45G | 60G |
| ‡ CHEST COMPRESSION W/O SH BELT | 36.2MM | 65.0MM ‡ |
| ‡ CHEST COMPRESSION W/ SH BELT | 36.2MM | 50.0MM ‡ |
| CHEST VISCOUS CRITERIA | 0.22M/SEC | 1.00M/SEC |
| FEMUR COMP, LEFT | 351N | 10000N |
| FEMUR COMP, RIGHT | 1348N | 10000N |
| FEMUR DURATION ASSESS, LEFT | 0.04 | 1.00 |
| FEMUR DURATION ASSESS, RIGHT | 0.15 | 1.00 |
| TIBIA/FEMUR DISP, LEFT | 11.7MM | 15.0MM |
| TIBIA/FEMUR DISP, RIGHT | 0.1MM | 15.0MM |
| KNEE CLEVIS, LEFT INSIDE | 750N | 4000N |
| KNEE CLEVIS, LEFT OUTSIDE | 1346N | 4000N |
| KNEE CLEVIS, RIGHT INSIDE | 2556N | 4000N |
| KNEE CLEVIS, RIGHT OUTSIDE | 1355N | 4000N |
| TIBIA COMP, LEFT | 2406N | 8000N |
| TIBIA COMP, RIGHT | 4027N | 8000N |
| TIBIA MOM, UPPER, LEFT | 78NM | 225NM |
| TIBIA MOM, UPPER, RIGHT | 152NM | 225NM |
| TIBIA MOM, LOWER, LEFT | 105NM | 225NM |
| TIBIA MOM, LOWER, RIGHT | 43NM | 225NM |
| LEG INDEX, UPPER LEFT | 0.41 | 1.00 |
| LEG INDEX, UPPER RIGHT | 0.79 | 1.00 |
| LEG INDEX, LOWER LEFT | 0.51 | 1.00 |
| LEG INDEX, LOWER RIGHT | 0.24 | 1.00 |

IAV - INJURY ASSESSMENT VALUE

IARV - INJURY ASSESSMENT REFERENCE VALUE

‡ RESTRAINT SYSTEM DEPENDENT. CHOOSE VALUE THAT APPLIES TO THIS TEST.

# RIGHT FRONT
# ANTHROPOMORPHIC TEST DEVICE SUMMARY DATA
# MOVING VEHICLE TO FIXED POLE 55.3KM/H

C11591 FRONT IMPACT

R&D CTR 1VF46081 1FP87

ATD TYPE: GM50H
TEST DATE: 05/14/1997

| MEASURED QUANTITY | IAV VALUE | IARV |
|---|---|---|
| HIC, LIMITED TO 15 MS | 210 | 1000 |
| HIC, LIMITED TO 36 MS | 420 | 1000 |
| NECK FLEXION | 37NM | 190NM |
| NECK EXTENSION | 16NM | 57NM |
| NECK TENSION | 0.54 | 1.00 |
| NECK COMPRESSION | 0.05 | 1.00 |
| NECK SHEAR FORWARD | 0.03 | 1.00 |
| NECK SHEAR REARWARD | 0.31 | 1.00 |
| CHEST ACCEL | 43G | 60G |
| ‡ CHEST COMPRESSION W/O SH BELT | 32.7MM | 65.0MM ‡ |
| ‡ CHEST COMPRESSION W/ SH BELT | 32.7MM | 50.0MM ‡ |
| CHEST VISCOUS CRITERIA | 0.16M/SEC | 1.00M/SEC |
| FEMUR COMP, LEFT | 1929N | 10000N |
| FEMUR COMP, RIGHT | 4251N | 10000N |
| FEMUR DURATION ASSESS, LEFT | 0.21 | 1.00 |
| FEMUR DURATION ASSESS, RIGHT | 0.48 | 1.00 |
| TIBIA/FEMUR DISP, LEFT | 0.3MM | 15.0MM |
| TIBIA/FEMUR DISP, RIGHT | 0.6MM | 15.0MM |
| KNEE CLEVIS, LEFT INSIDE | 1698N | 4000N |
| KNEE CLEVIS, LEFT OUTSIDE | 1425N | 4000N |
| KNEE CLEVIS, RIGHT INSIDE | 2463N | 4000N |
| KNEE CLEVIS, RIGHT OUTSIDE | 2067N | 4000N |
| TIBIA COMP, LEFT | 3188N | 8000N |
| TIBIA COMP, RIGHT | 4450N | 8000N |
| TIBIA MOM, UPPER, LEFT | 93NM | 225NM |
| TIBIA MOM, UPPER, RIGHT | 67NM | 225NM |
| TIBIA MOM, LOWER, LEFT | OVERLOADED | 225NM |
| TIBIA MOM, LOWER, RIGHT | OVERLOADED | 225NM |
| LEG INDEX, UPPER LEFT | 0.44 | 1.00 |
| LEG INDEX, UPPER RIGHT | 0.41 | 1.00 |
| LEG INDEX, LOWER LEFT | OVERLOADED | 1.00 |
| LEG INDEX, LOWER RIGHT | OVERLOADED | 1.00 |

IAV - INJURY ASSESSMENT VALUE
IARV - INJURY ASSESSMENT REFERENCE VALUE

‡ RESTRAINT SYSTEM DEPENDENT. CHOOSE VALUE THAT APPLIES TO THIS TEST.

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

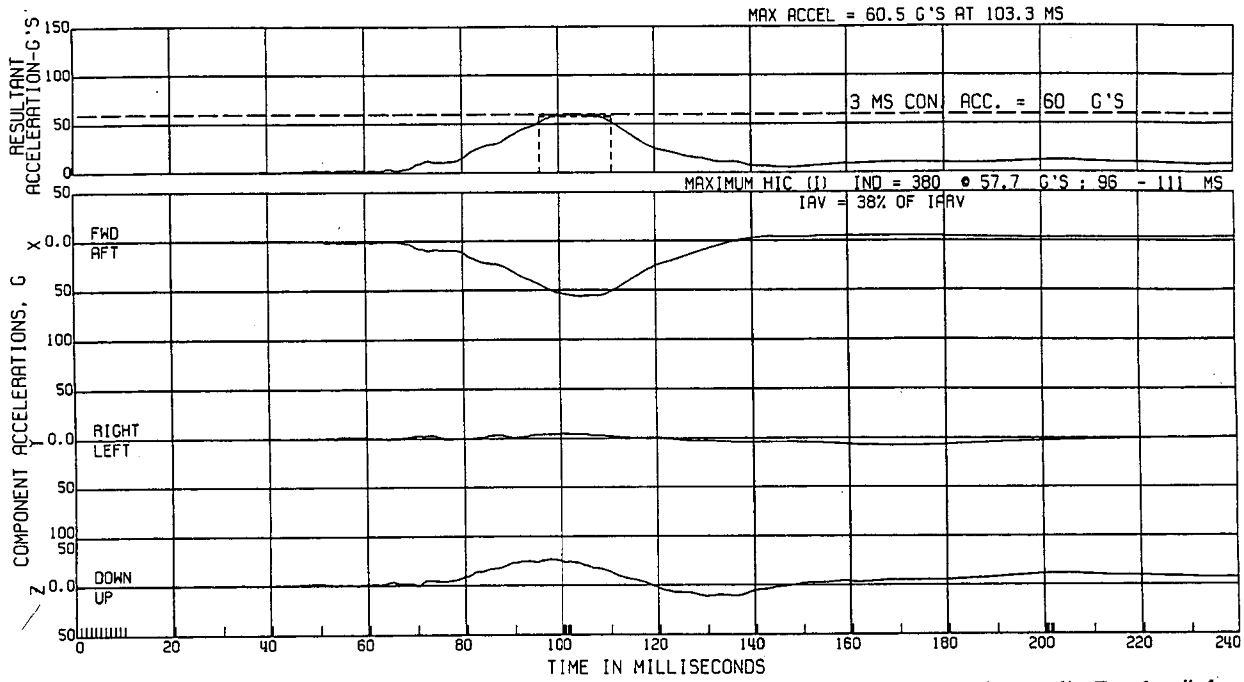
ELEC DATA, SAE CLASS 1000

L. FRT HEAD ACCEL.

(HIC I LIMITED TO 15MS)

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **1**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

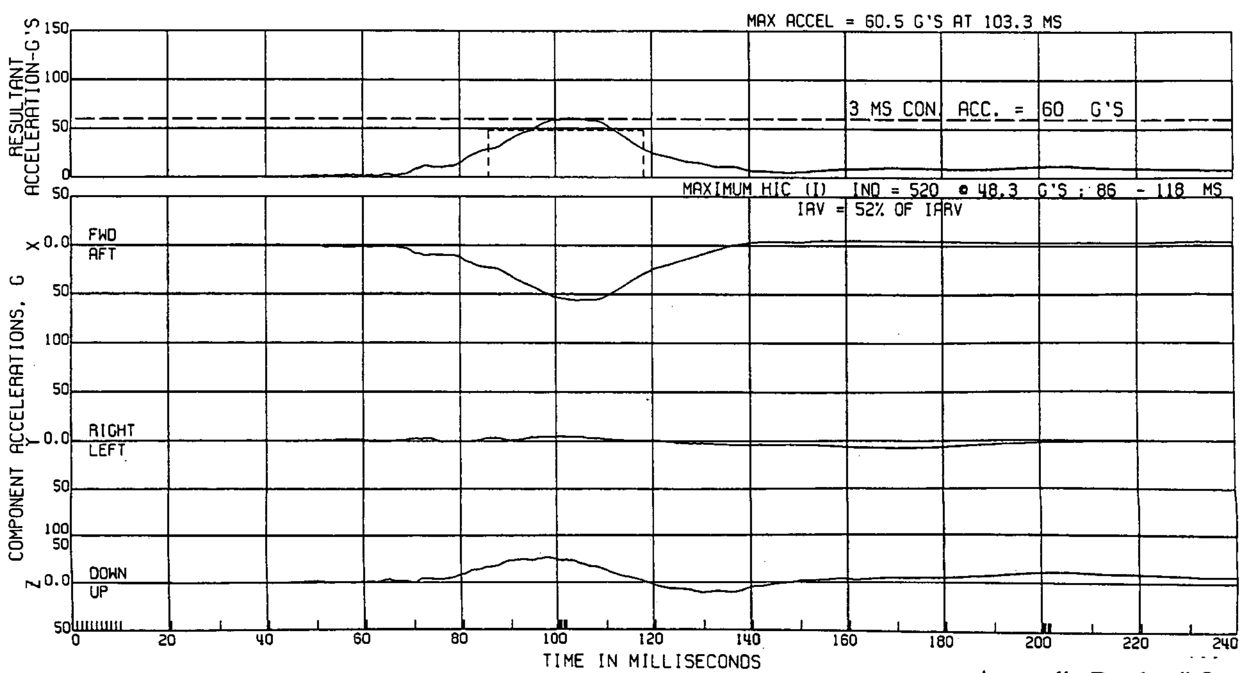
ELEC DATA, SAE CLASS 1000

L. FRT HEAD ACCEL.

(HIC I LIMITED TO 36MS)

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **2**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

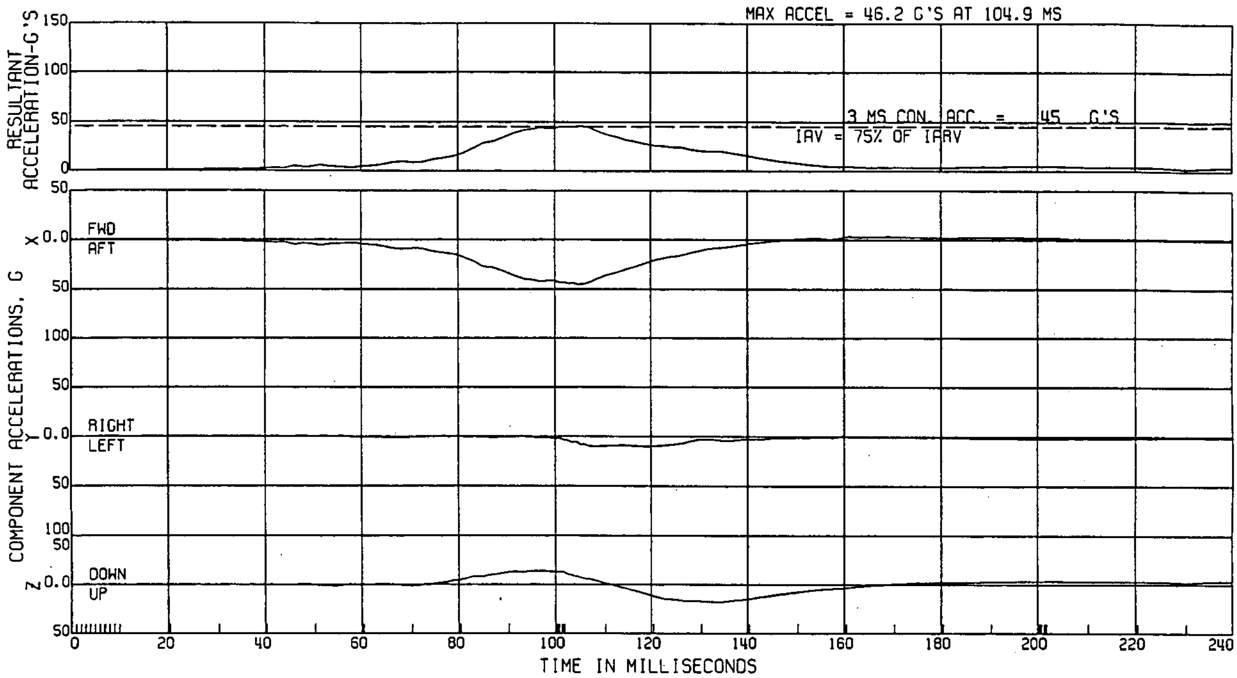
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

L. FRT CHEST ACCEL.

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **3**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

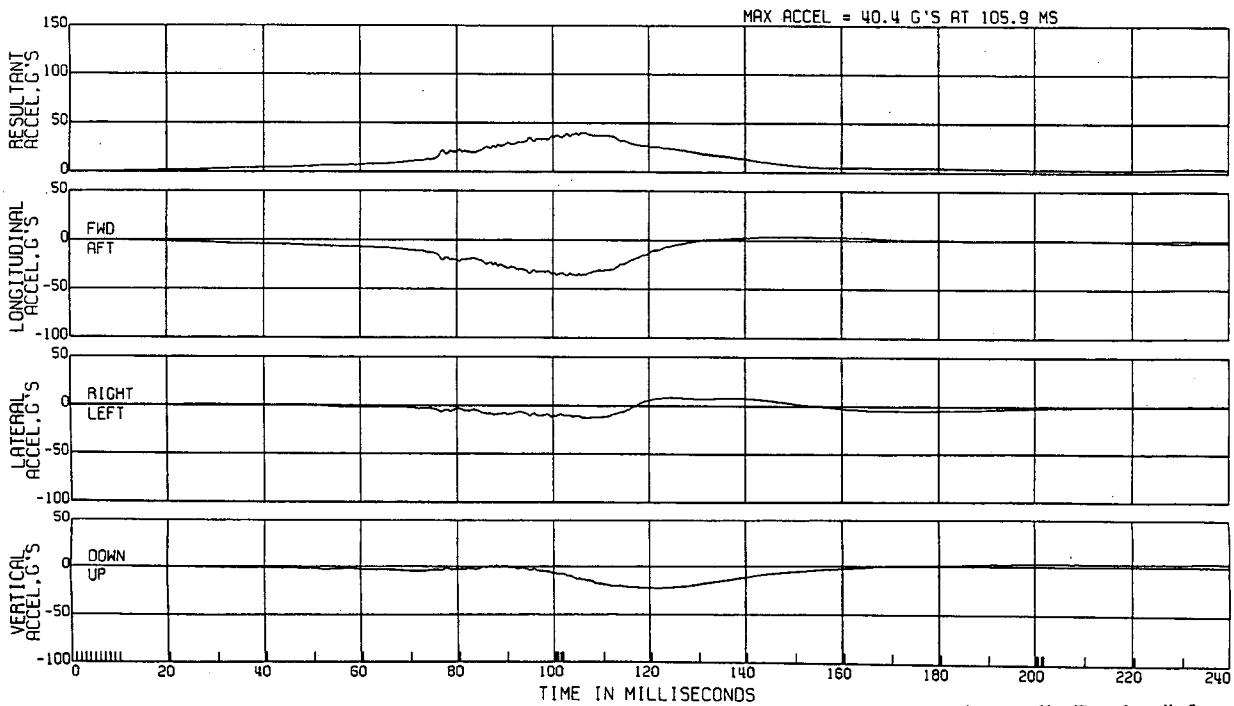
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

L. FRT PELVIC ACCEL.

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **4**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE

55.3KM/H

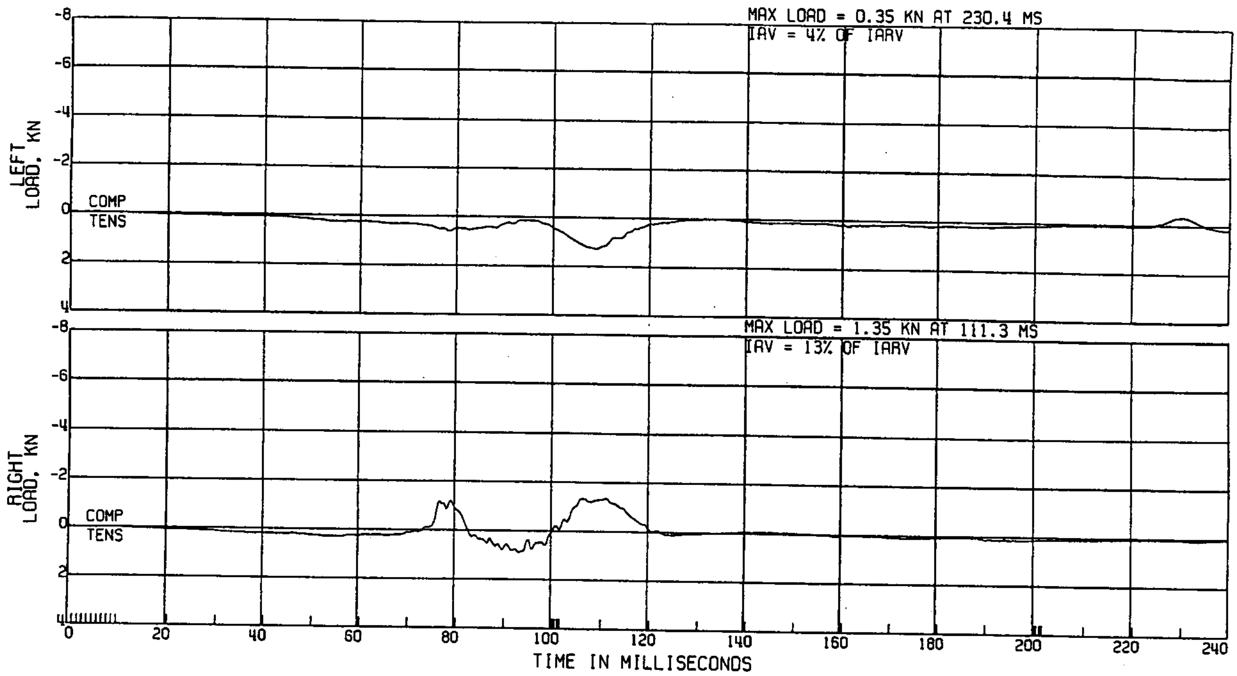
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

L. FRT FEMUR LOAD

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **5**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE

55.3KM/H

R&D CTR 1VF46081 1FP87

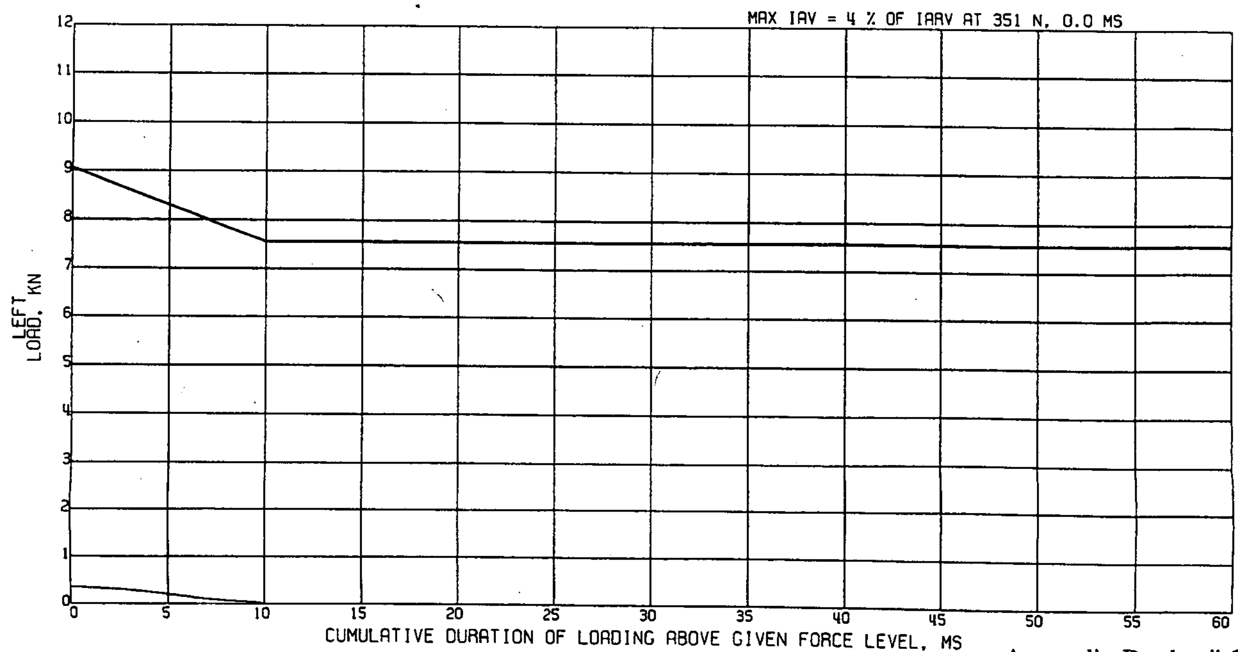
ELEC DATA, SAE CLASS 600

L. FRT FEMUR LOAD

DURATION ASSESSMENT

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **6**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

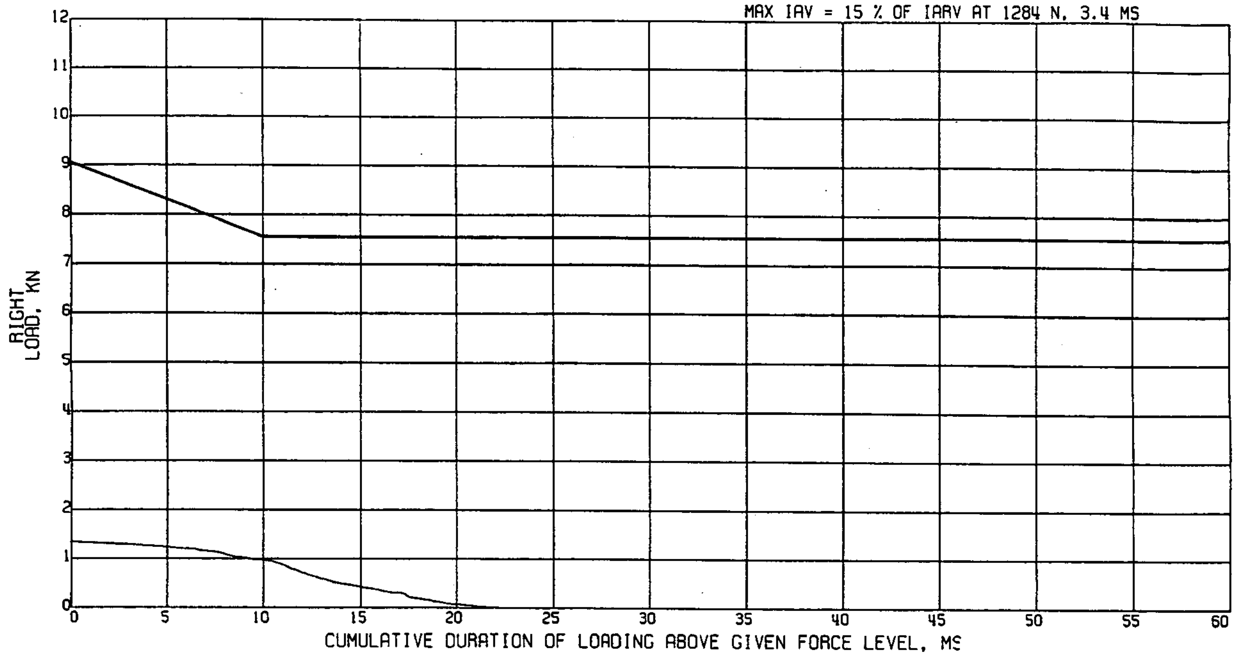
ELEC DATA, SAE CLASS 600

L. FRT FEMUR LOAD

DURATION ASSESSMENT

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # 7

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

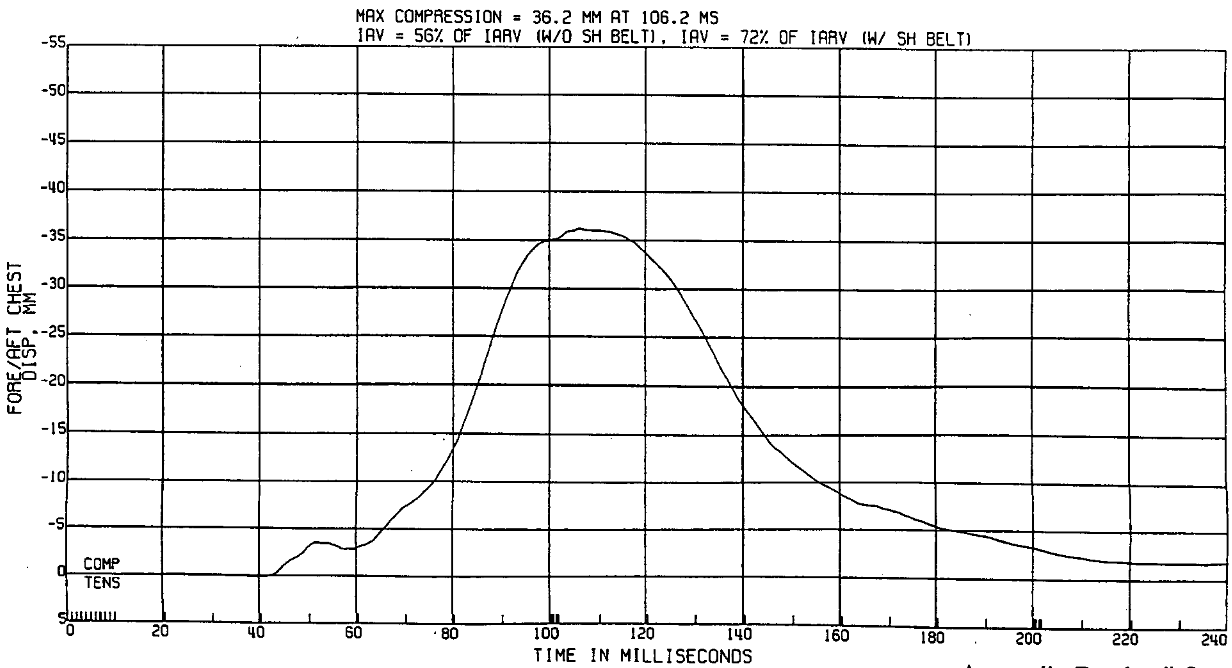
ELEC DATA, SAE CLASS 180

L. FRT CHEST DISP, TEMP AT 68.0'F

NORMALIZED TO 70.7'F & PART 572 CORRIDOR

ATD TYPE: GM50H

TEST DATE:05/14/1997

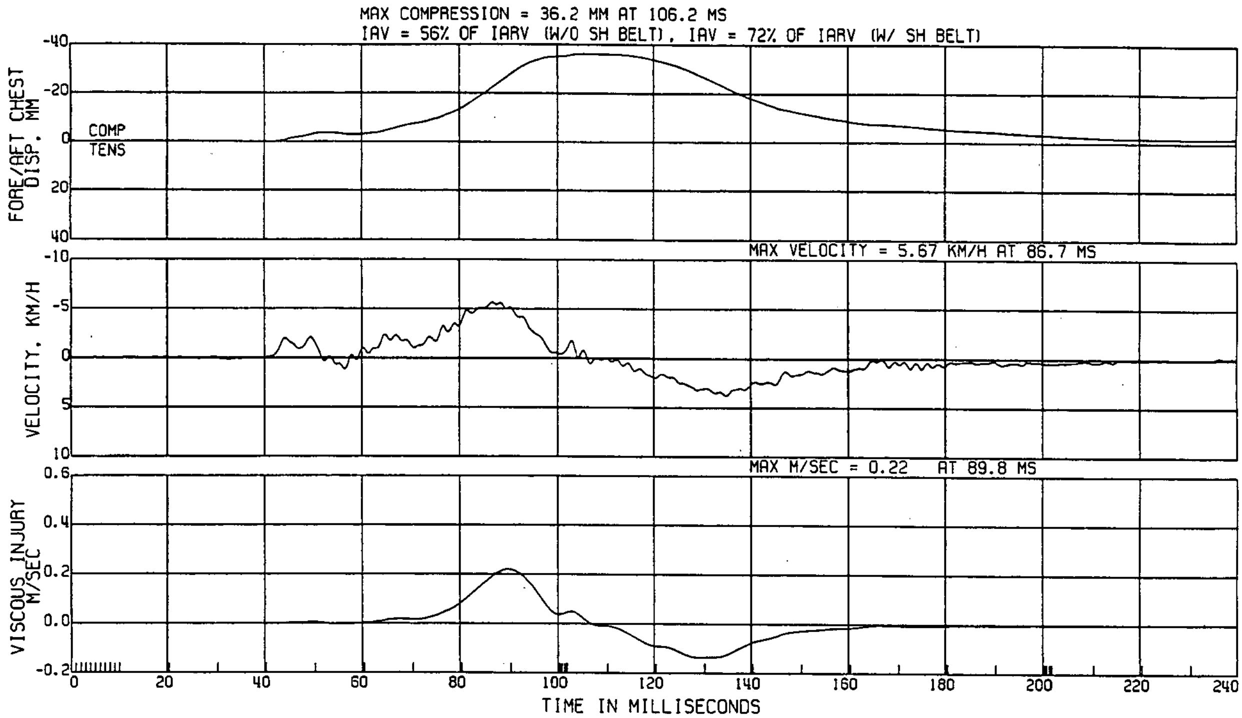



Appendix D, plot # 8

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L. FRT CHEST COMPRESSIVE DISP. ATD TYPE: GM50H TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 NORMALIZED, W/CALC VEL & VISCOUS INJURY

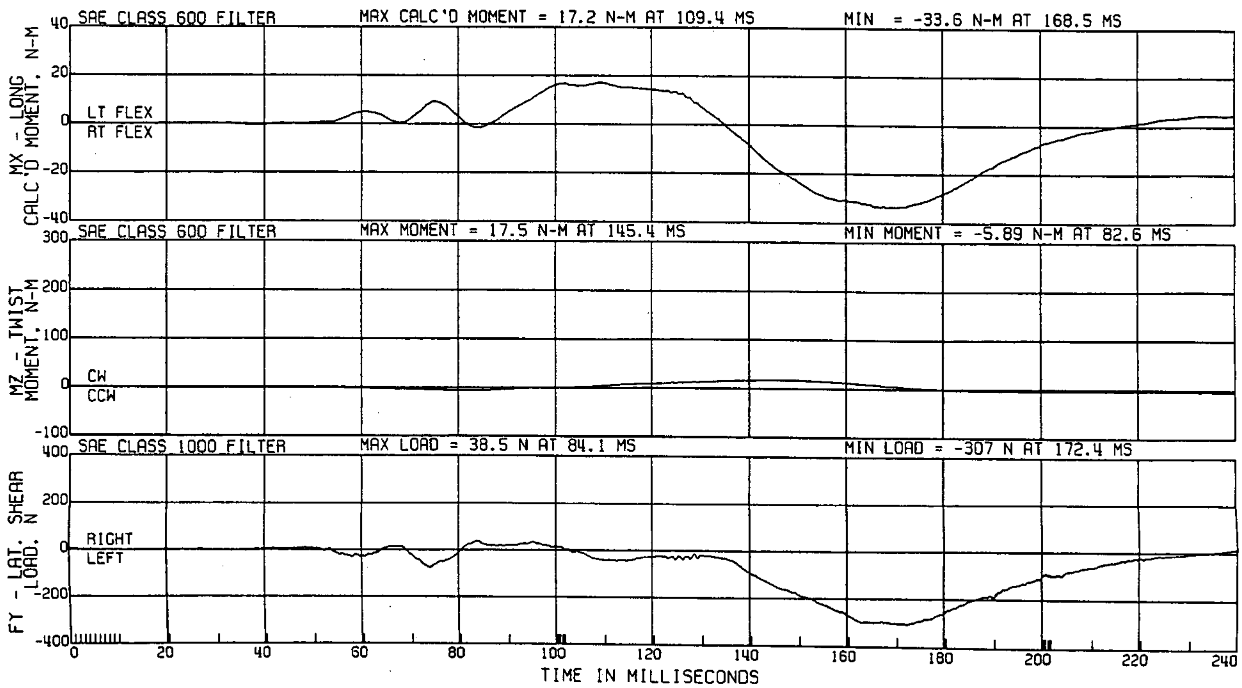



Appendix D, plot # **9**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L. FRT NECK LOADING ON HEAD, UPPER LOAD ATD TYPE: GM50H TEST DATE:05/14/1997

ELEC DATA L. FRT NECK LOADING ON HEAD

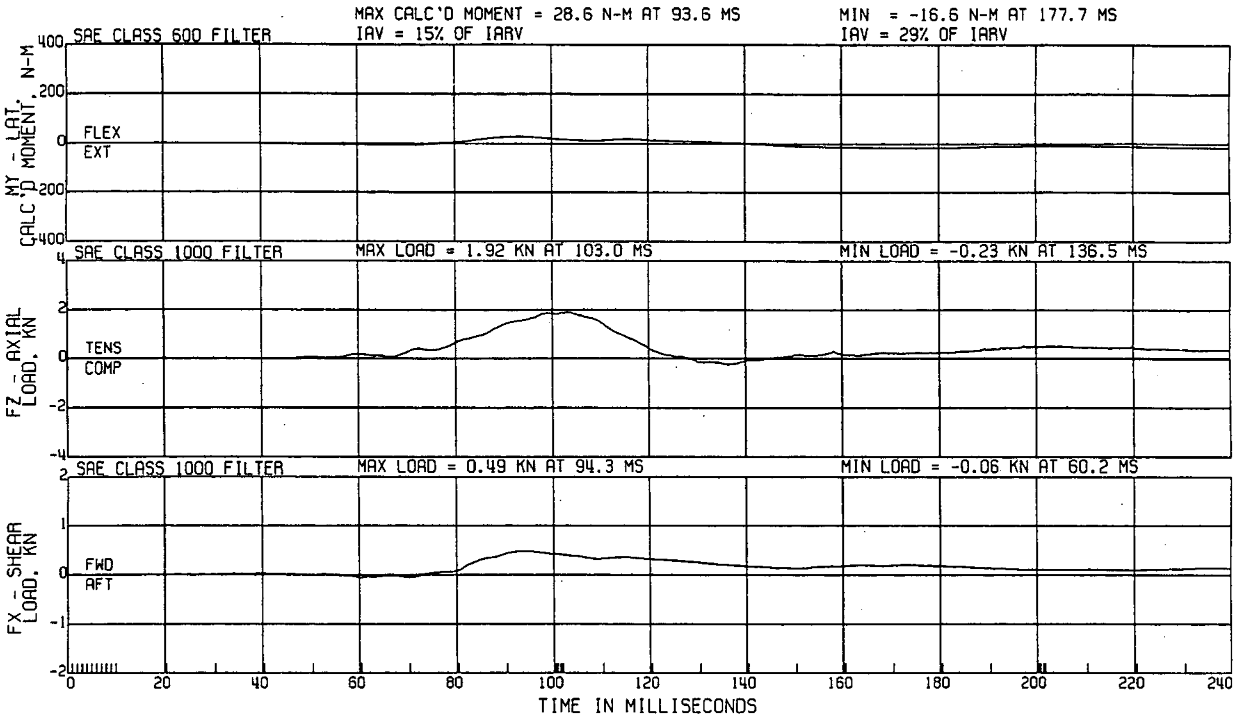



Appendix D, plot # **10**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 NECK LOADING ON HEAD ATD TYPE: GM50H TEST DATE:05/14/1997

ELEC DATA L. FRT NECK LOADING ON HEAD

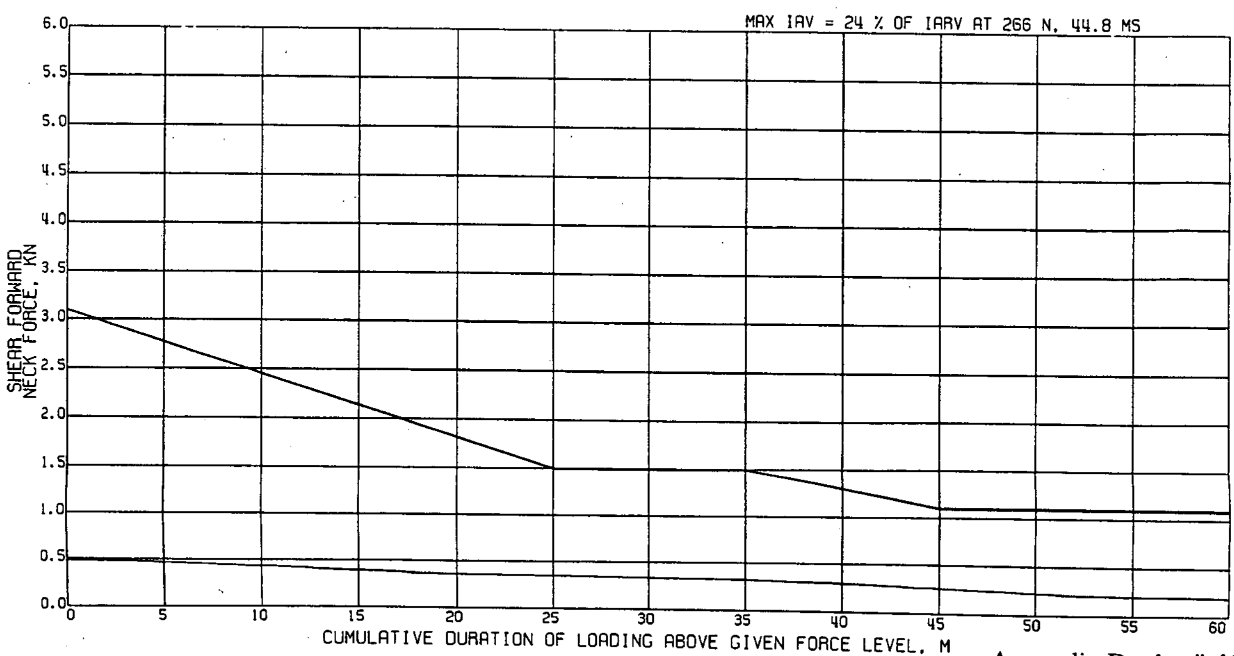



Appendix D, plot # **11**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 FORWARD NECK SHEAR ON HEAD, ATD TYPE: GM50H TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000 L. FRT INJURY REFERENCE




Appendix D, plot # **12**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

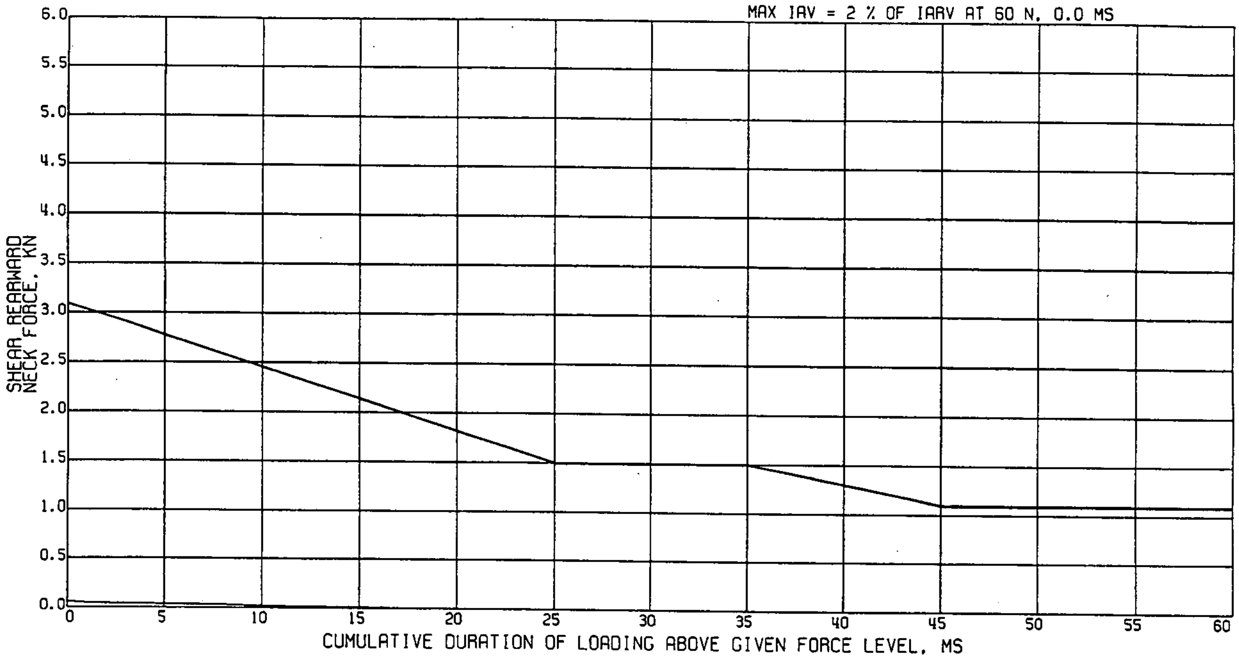
ELEC DATA, SAE CLASS 1000

REARWARD NECK SHEAR ON HEAD,

L. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:05/14/1997




13 F

Appendix D, plot # **13**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

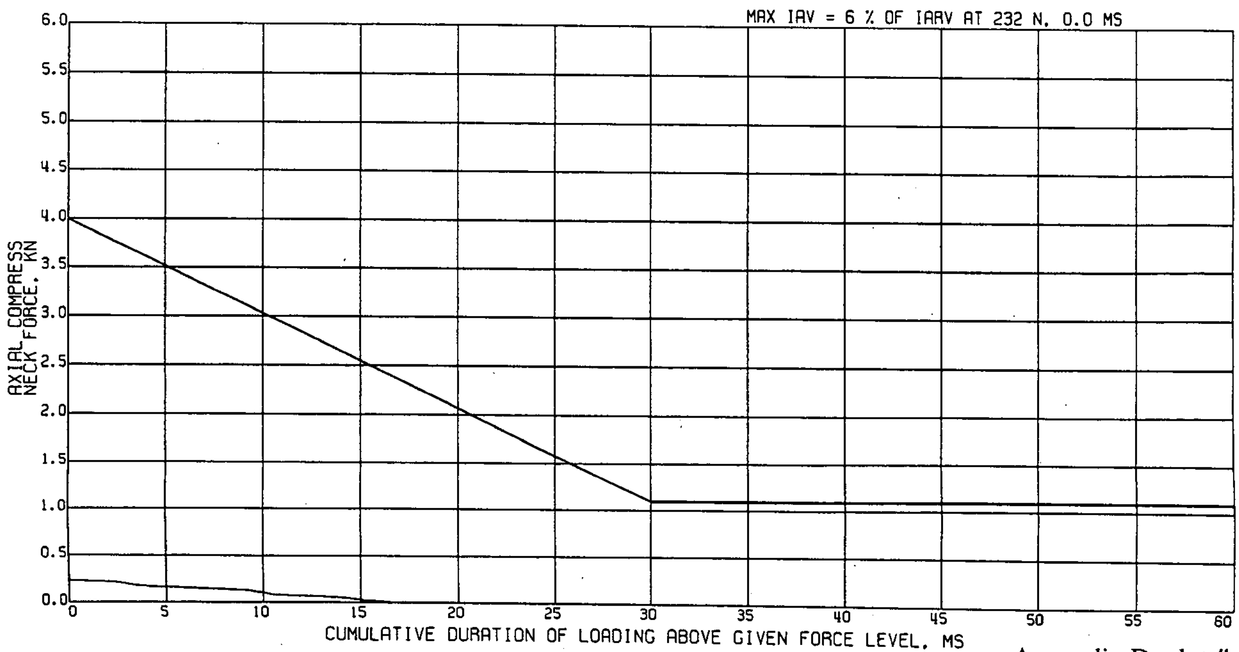
ELEC DATA, SAE CLASS 1000

AXIAL COMPRESSION ON HEAD,

L. FRT INJURY REFERENCE

ATD TYPE: GM50H

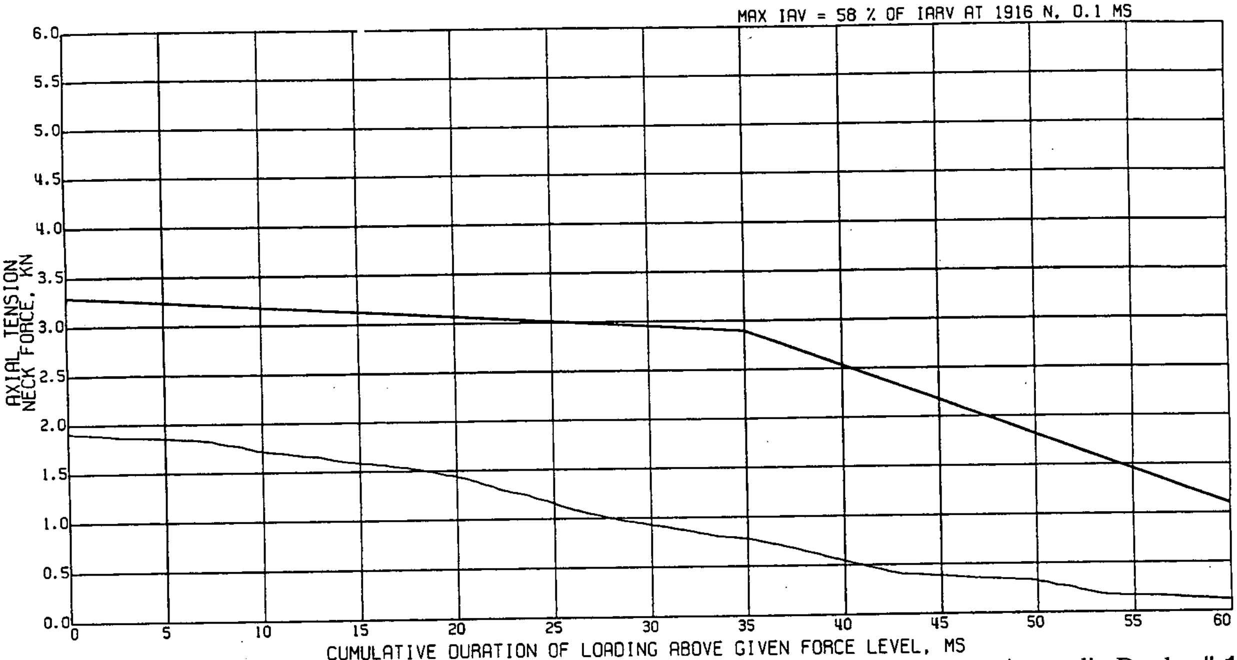
TEST DATE:05/14/1997




Appendix D, plot # **14**

14 F

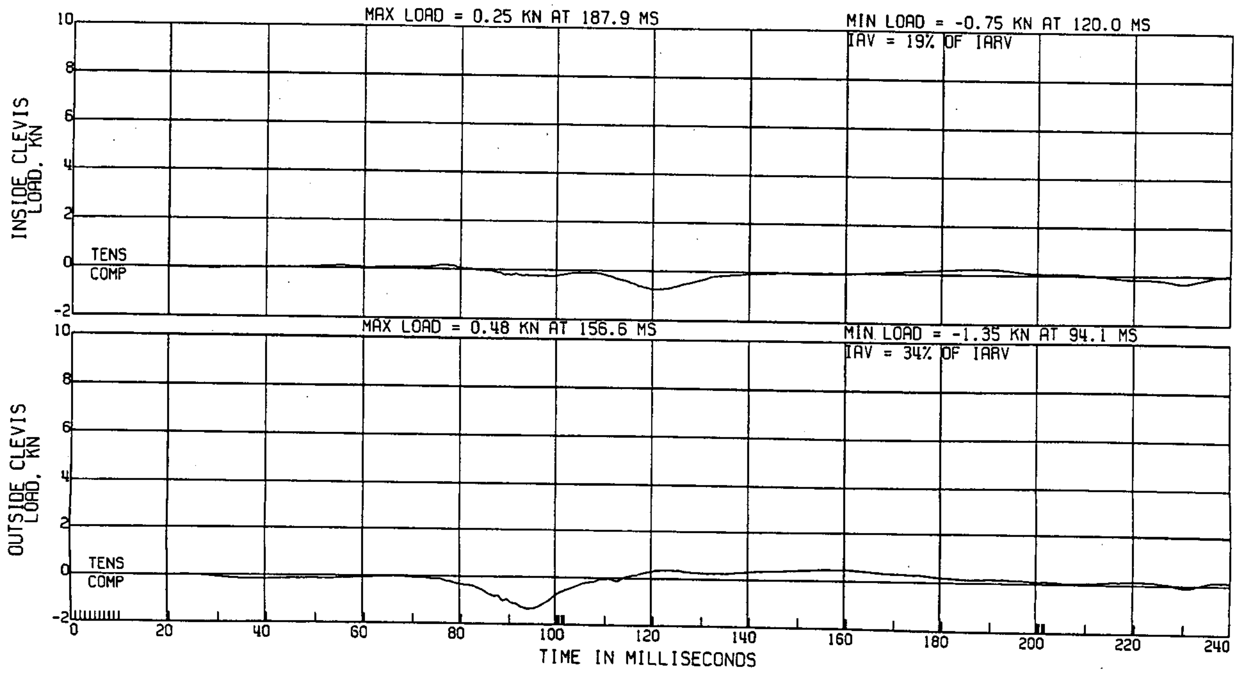
C11591 FRONT IMPACT
MOVING VEHICLE TO FIXED POLE
55.3KM/H
ATD TYPE: GM50H
R&D CTR 1VF46081 1FP87
AXIAL TENSION ON HEAD,
TEST DATE:05/14/1997
ELEC DATA, SAE CLASS 1000
L. FRT INJURY REFERENCE




Appendix D, plot # **15**

15

C11591 FRONT IMPACT
MOVING VEHICLE TO FIXED POLE
55.3KM/H
R&D CTR 1VF46081 1FP87
L. FRT LEFT KNEE CLEVIS LOAD
ATD TYPE: GM50H
TEST DATE:05/14/1997
ELEC DATA, SAE CLASS 600




Appendix D, plot # **16**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

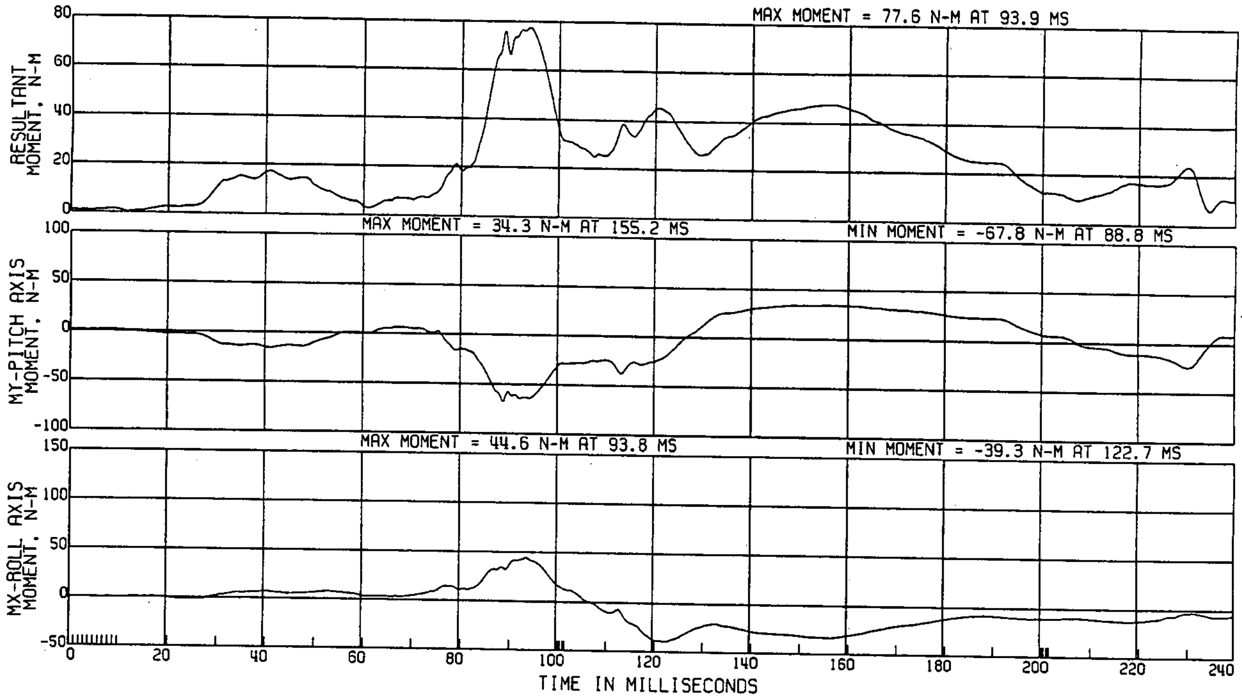
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

L. FRT LEFT TIBIA UPPER MOMENT

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **17**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

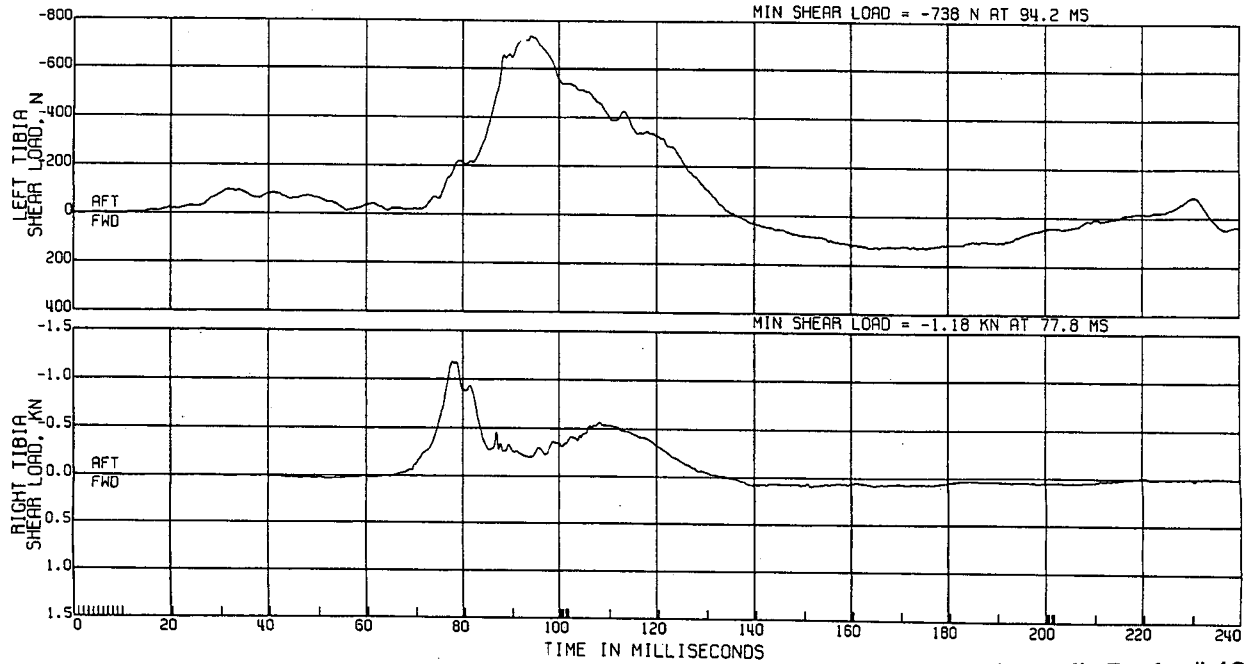
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H

TEST DATE:05/14/1997

L. FRT TIBIA LOWER SHEAR LOAD CELLS



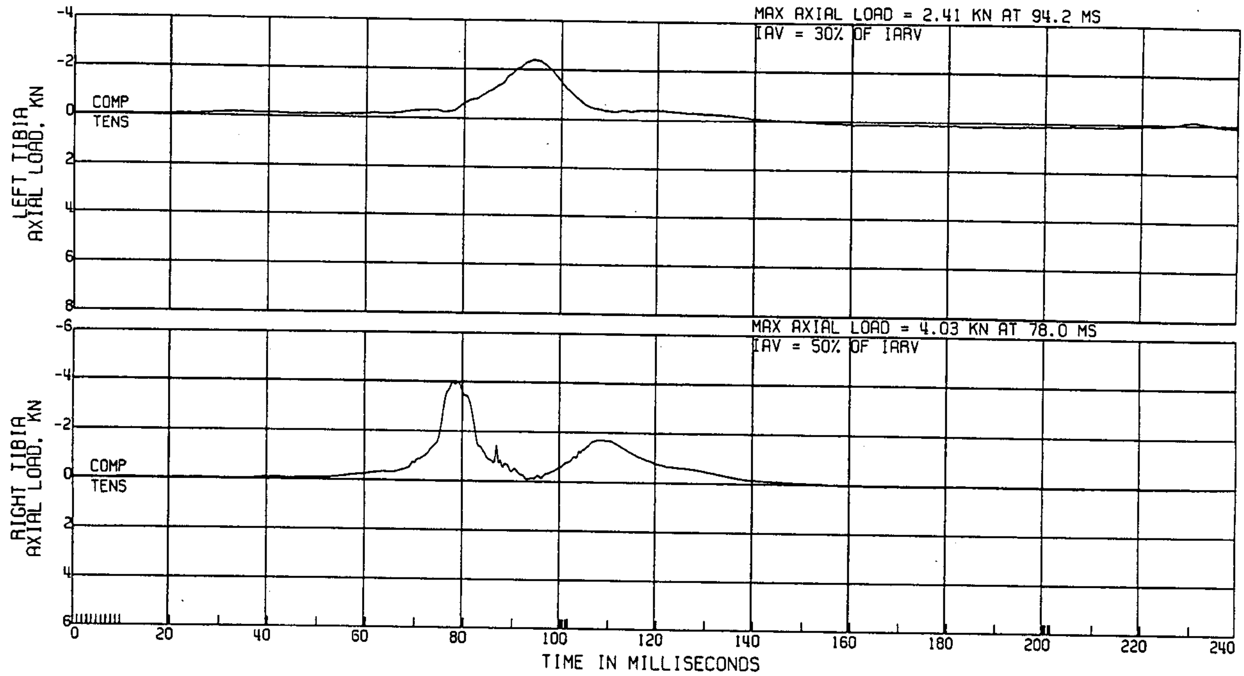

Appendix D, plot # **18**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H
TEST DATE:05/14/1997

L. FRT TIBIA LOWER AXIAL LOAD



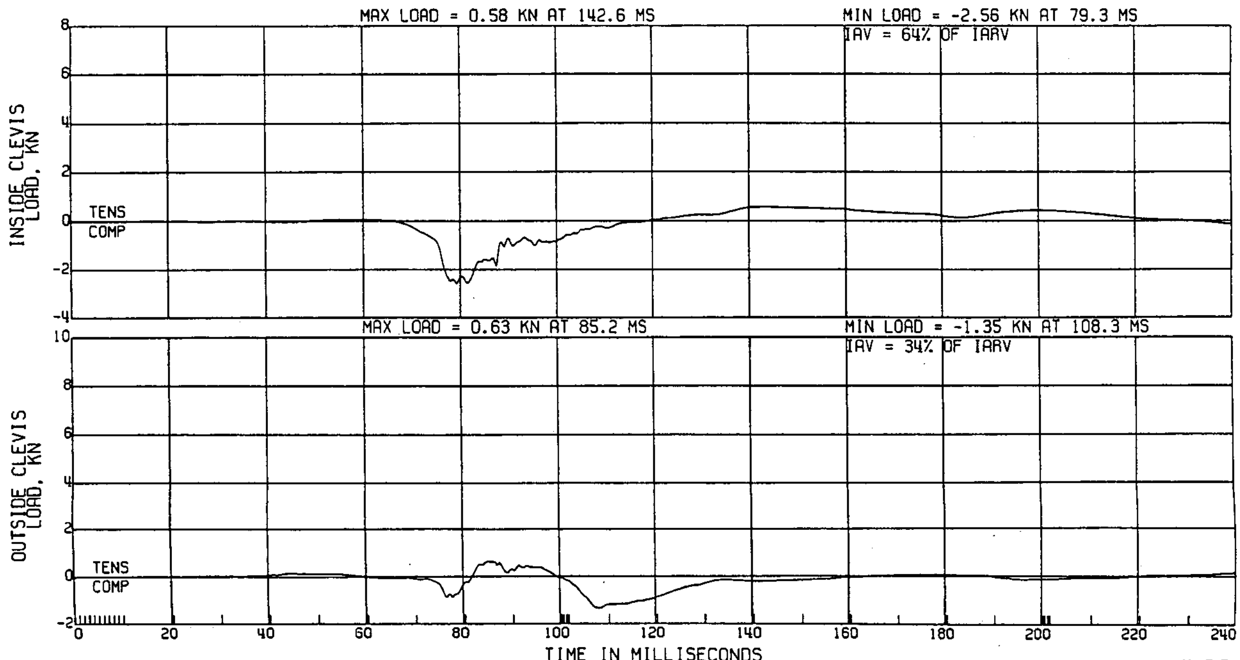

Appendix D, plot # 19

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H
TEST DATE:05/14/1997

L. FRT RIGHT KNEE CLEVIS LOAD




Appendix D, plot # 20

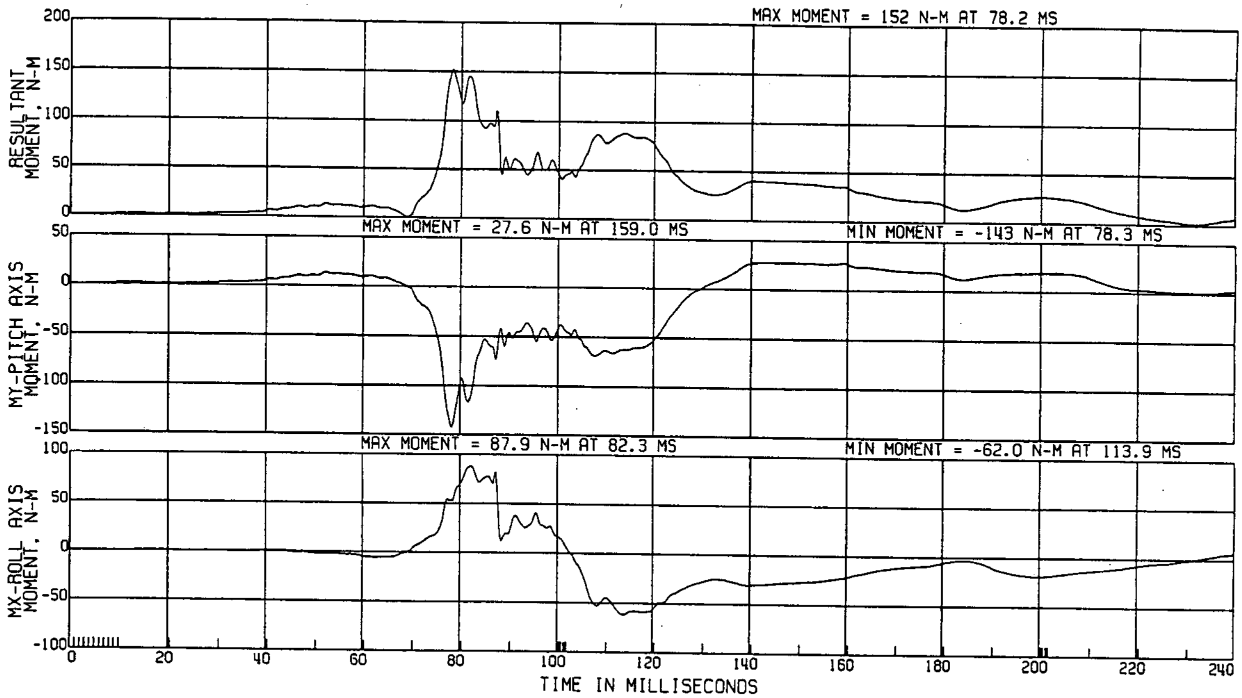
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

L. FRT RIGHT TIBIA UPPER MOMENT

ATD TYPE: GM50H
TEST DATE:05/14/1997




Appendix D, plot # **21**

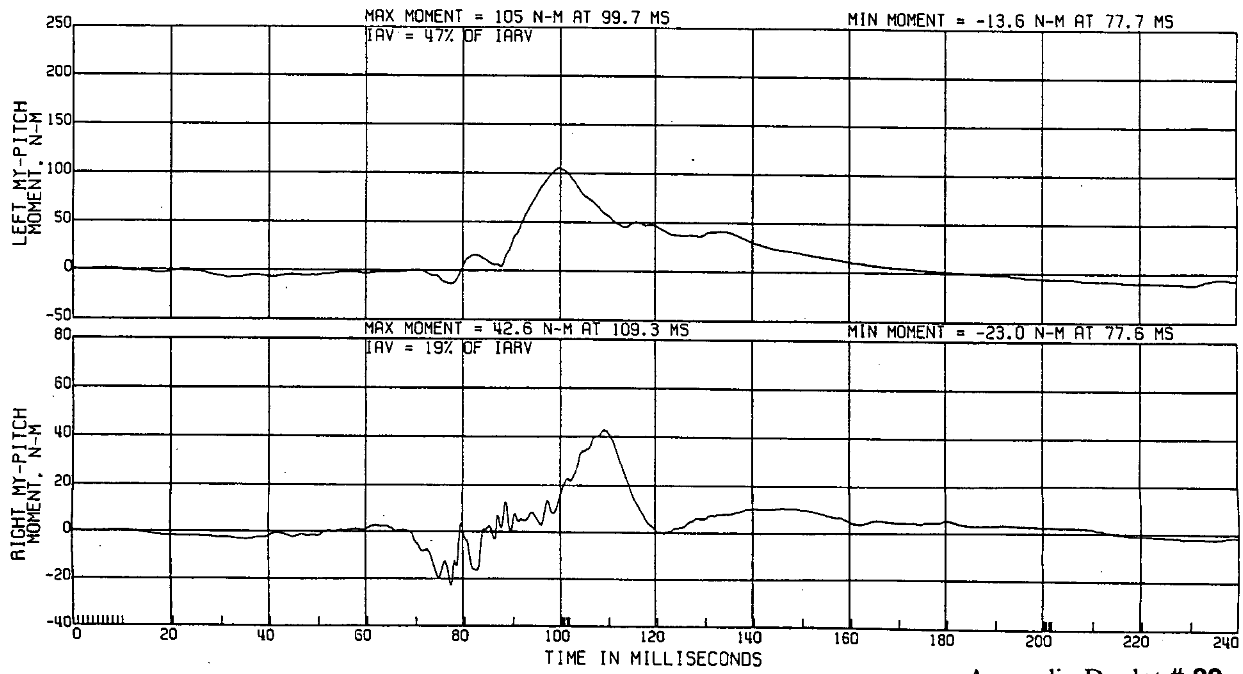
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H
TEST DATE:05/14/1997

L. FRT TIBIA LOWER BENDING MOMENTS




Appendix D, plot # **22**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

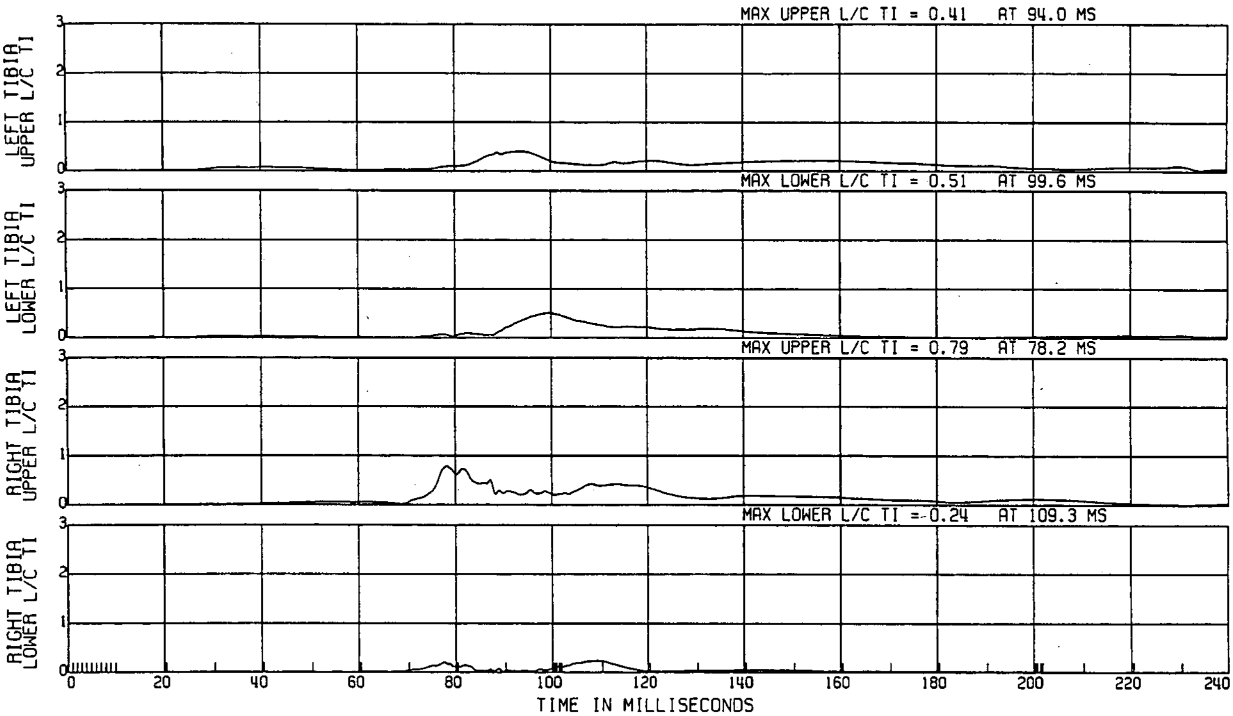
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

## L. FRT TIBIA INDICES

TI = (RES MOM/225 NM) + (AXIAL/35900 N)

ATD TYPE: GM50H
TEST DATE:05/14/1997




Appendix D, plot # **23**

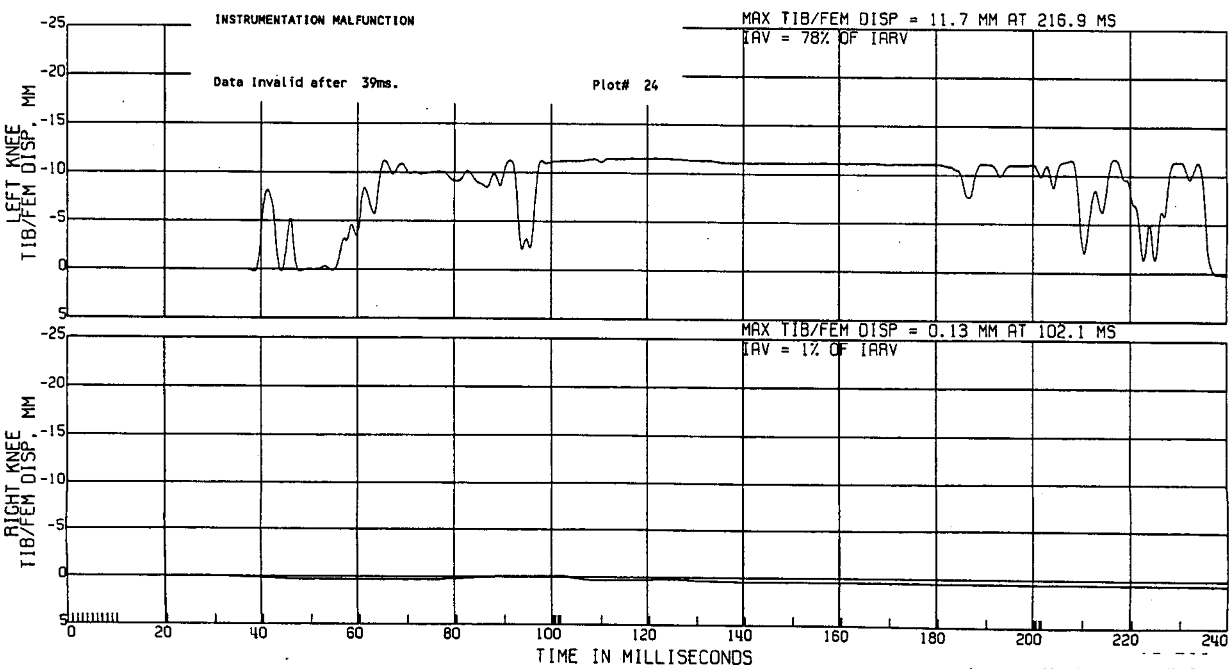
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

## L. FRT TIBIA/FEMUR DISPLACEMENT

ATD TYPE: GM50H
TEST DATE:05/14/1997



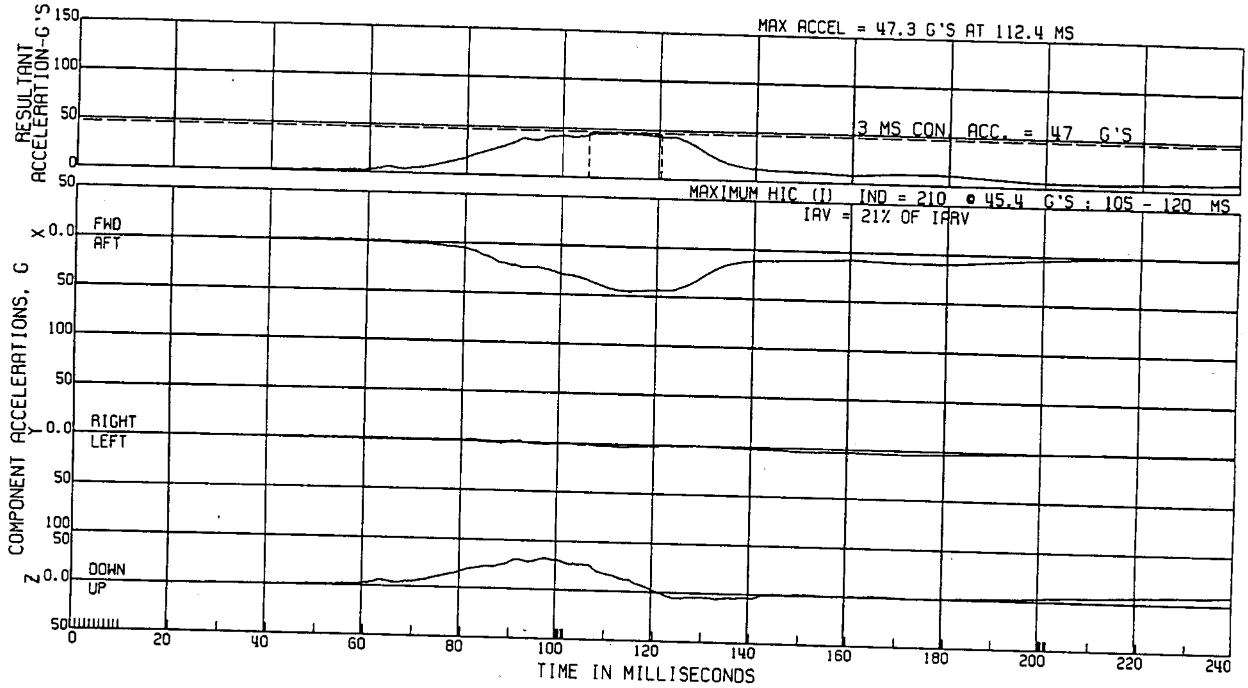

Appendix D, plot # **24**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. FRT HEAD ACCEL. ATD TYPE: GM50H

ELEC DATA, SAE CLASS 1000 TEST DATE:05/14/1997

(HIC I LIMITED TO 15MS)



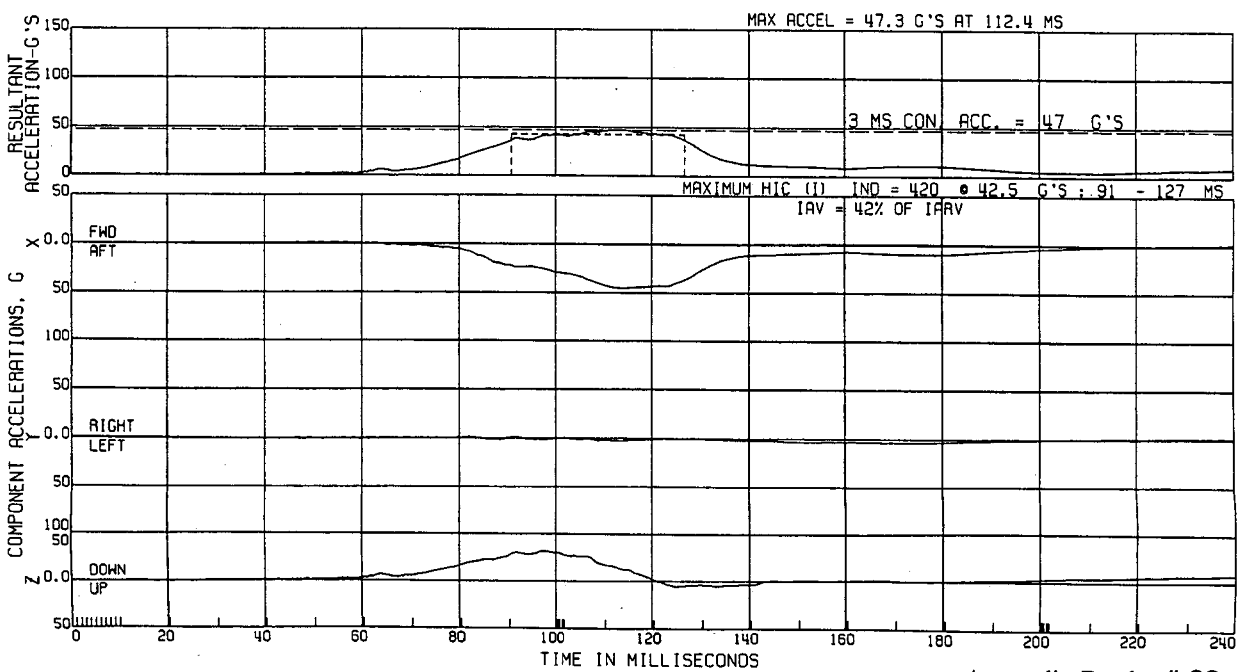

Appendix D, plot # **25**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. FRT HEAD ACCEL. ATD TYPE: GM50H

ELEC DATA, SAE CLASS 1000 TEST DATE:05/14/1997

(HIC I LIMITED TO 36MS)

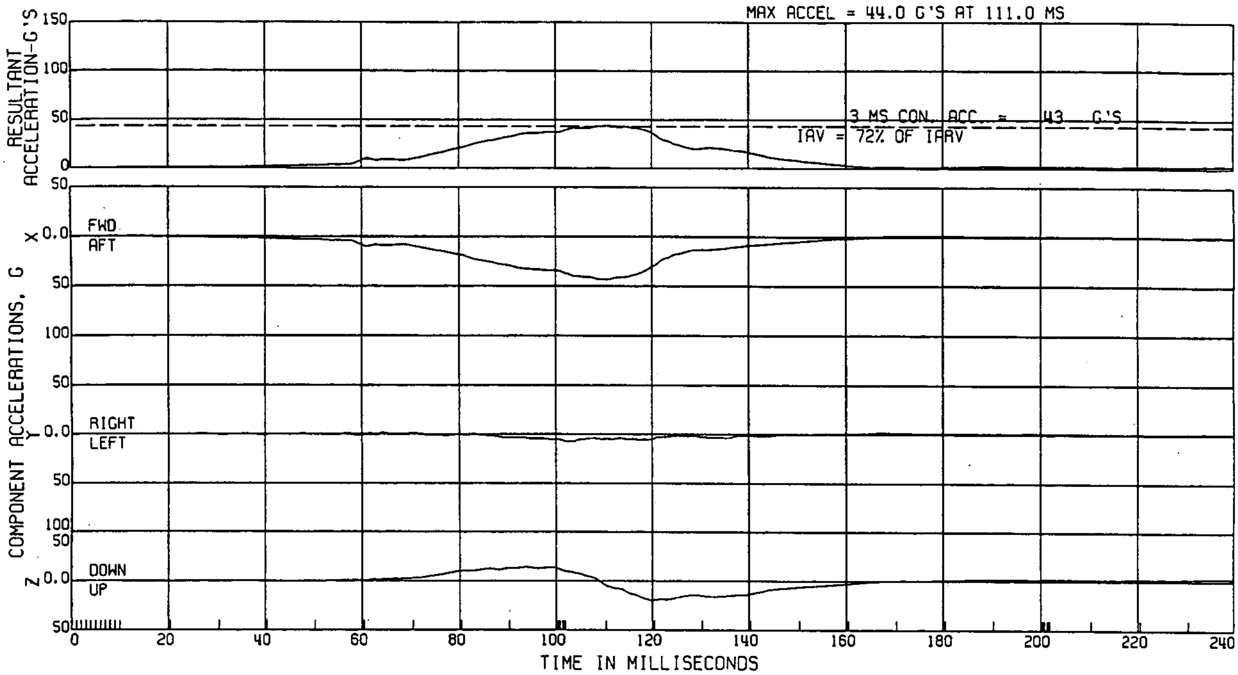



Appendix D, plot # **26**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. FRT CHEST ACCEL. ATD TYPE: GM50H TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180

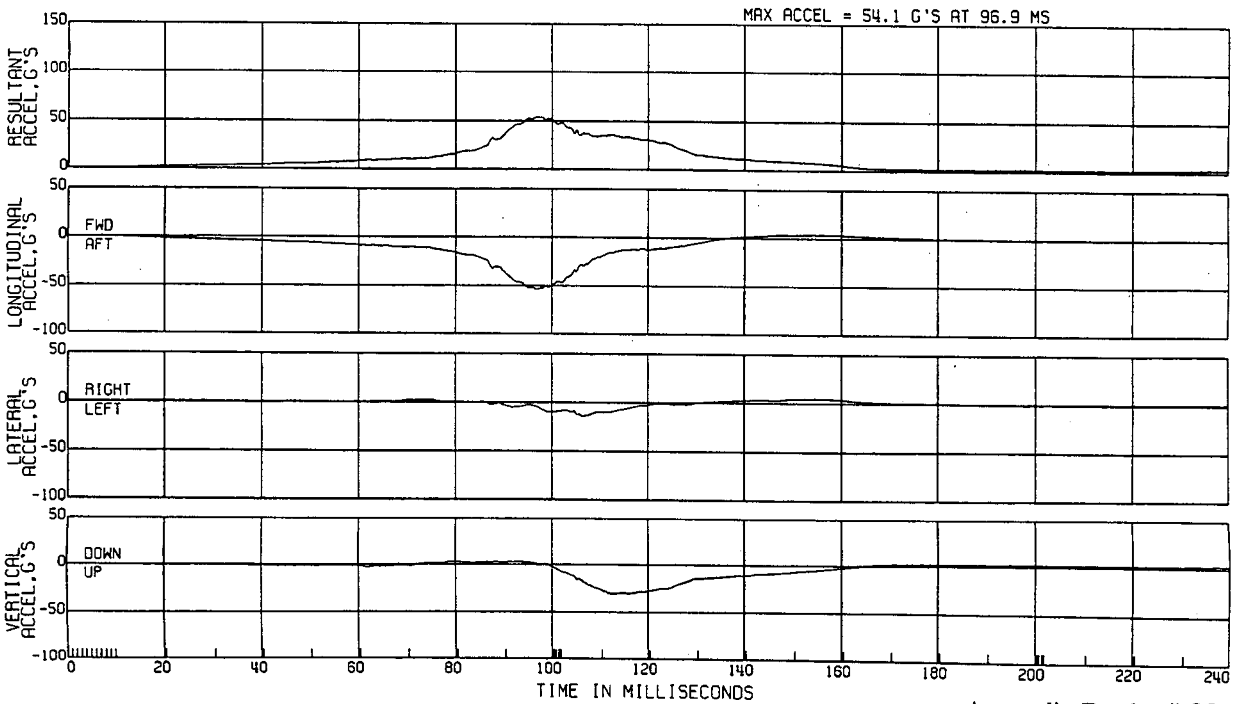



Appendix D, plot **# 27**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. FRT PELVIC ACCEL. ATD TYPE: GM50H TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000



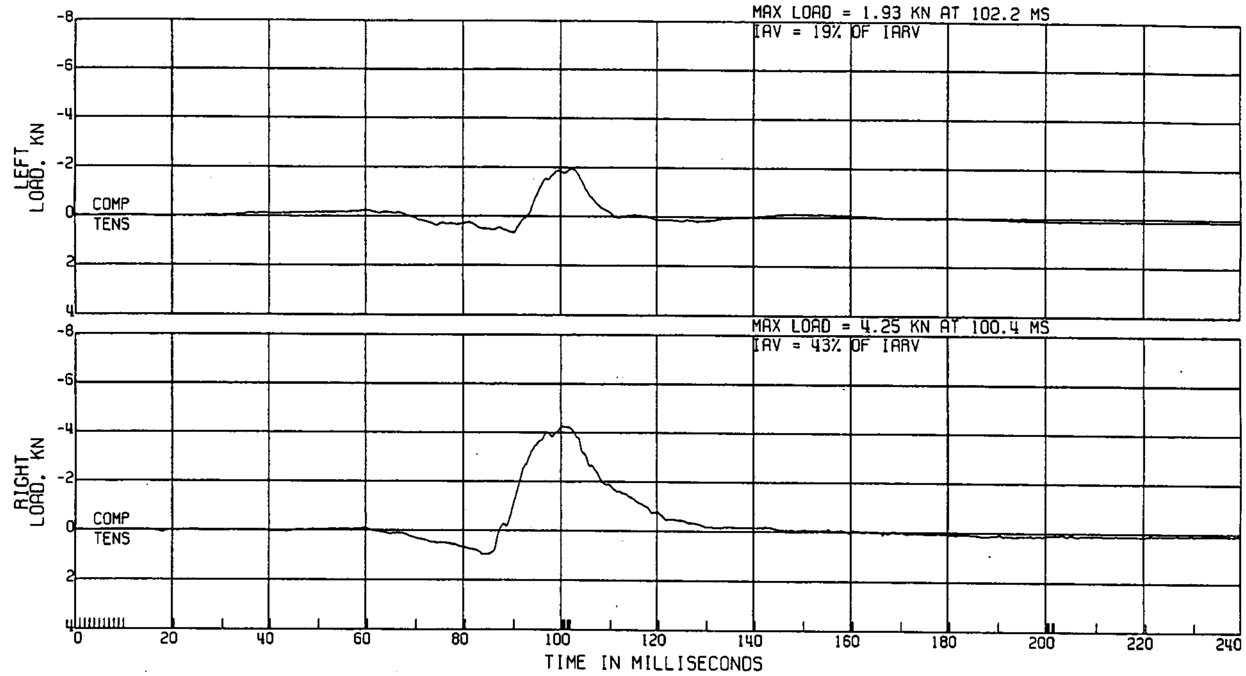

Appendix D, plot **# 28**

C11591 FRONT IMPACT | MOVING VEHICLE TO FIXED POLE | 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 600

R. FRT FEMUR LOAD

ATD TYPE: GM50H
TEST DATE:05/14/1997



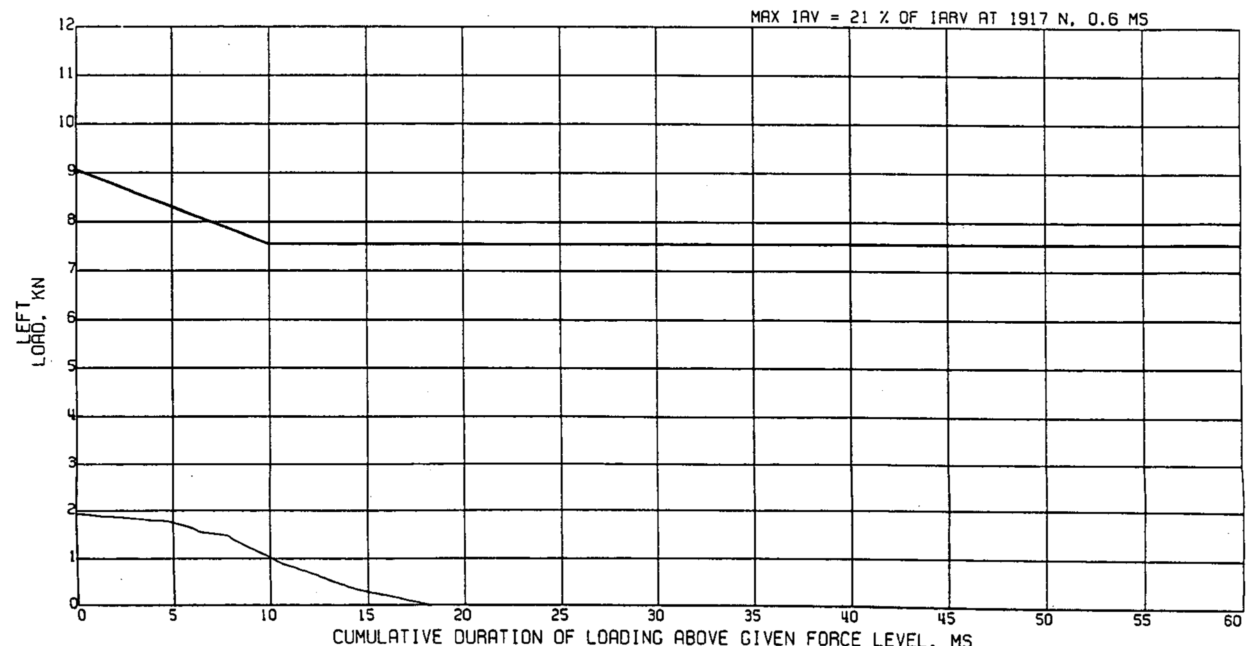

Appendix D, plot # **29**

C11591 FRONT IMPACT | MOVING VEHICLE TO FIXED POLE | 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 600

R. FRT FEMUR LOAD
DURATION ASSESSMENT

ATD TYPE: GM50H
TEST DATE:05/14/1997




Appendix D, plot # **30**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

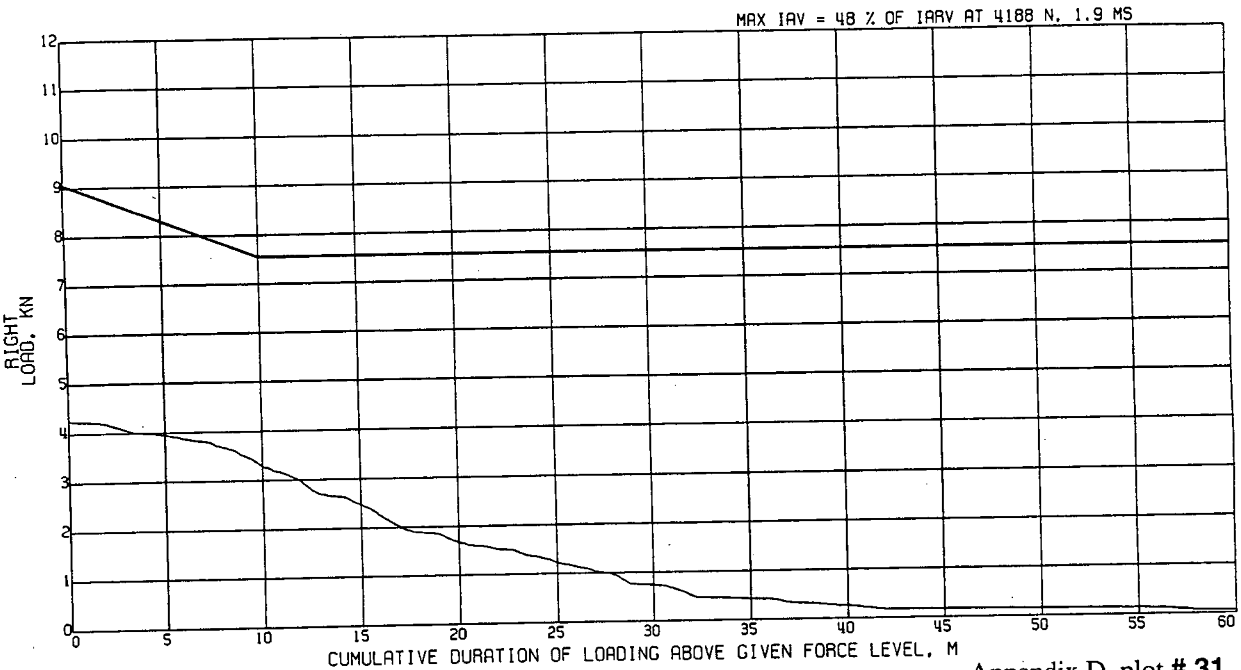
ELEC DATA, SAE CLASS 600

R. FRT FEMUR LOAD

DURATION ASSESSMENT

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **31**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

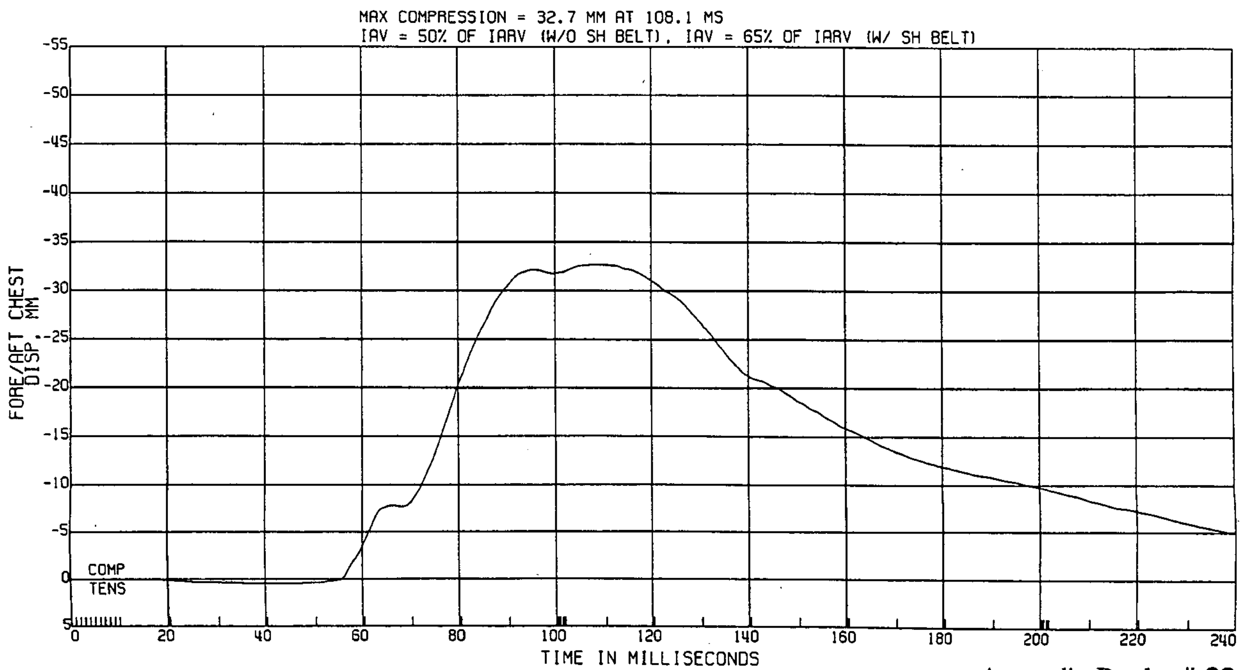
ELEC DATA, SAE CLASS 180

R. FRT CHEST DISP, TEMP AT 68.2'F

NORMALIZED TO 70.7'F & PART 572 CORRIDOR

ATD TYPE: GM50H

TEST DATE:05/14/1997

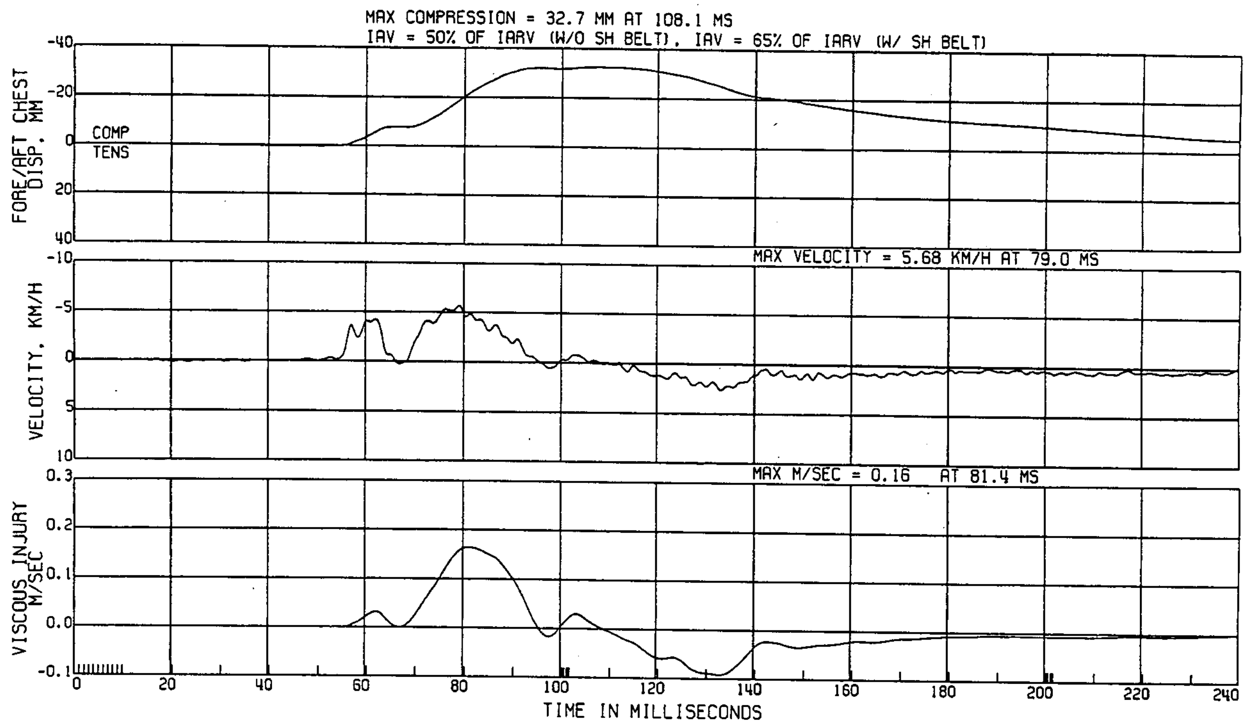



Appendix D, plot # **32**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. FRT CHEST COMPRESSIVE DISP. ATD TYPE: GM50H TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 NORMALIZED, W/CALC VEL & VISCOUS INJURY

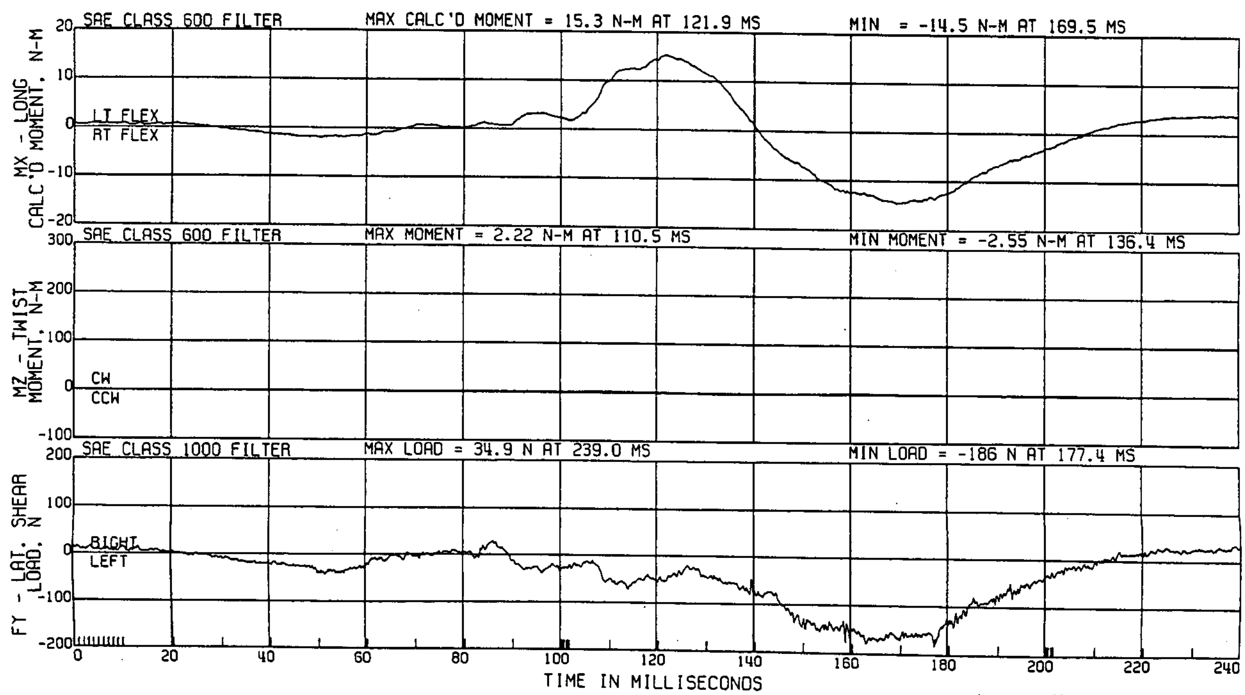



Appendix D, plot **# 33**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. FRT NECK LOADING ON HEAD, UPPER LOAD ATD TYPE: GM50H TEST DATE:05/14/1997

ELEC DATA R. FRT NECK LOADING ON HEAD




Appendix D, plot **# 34**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

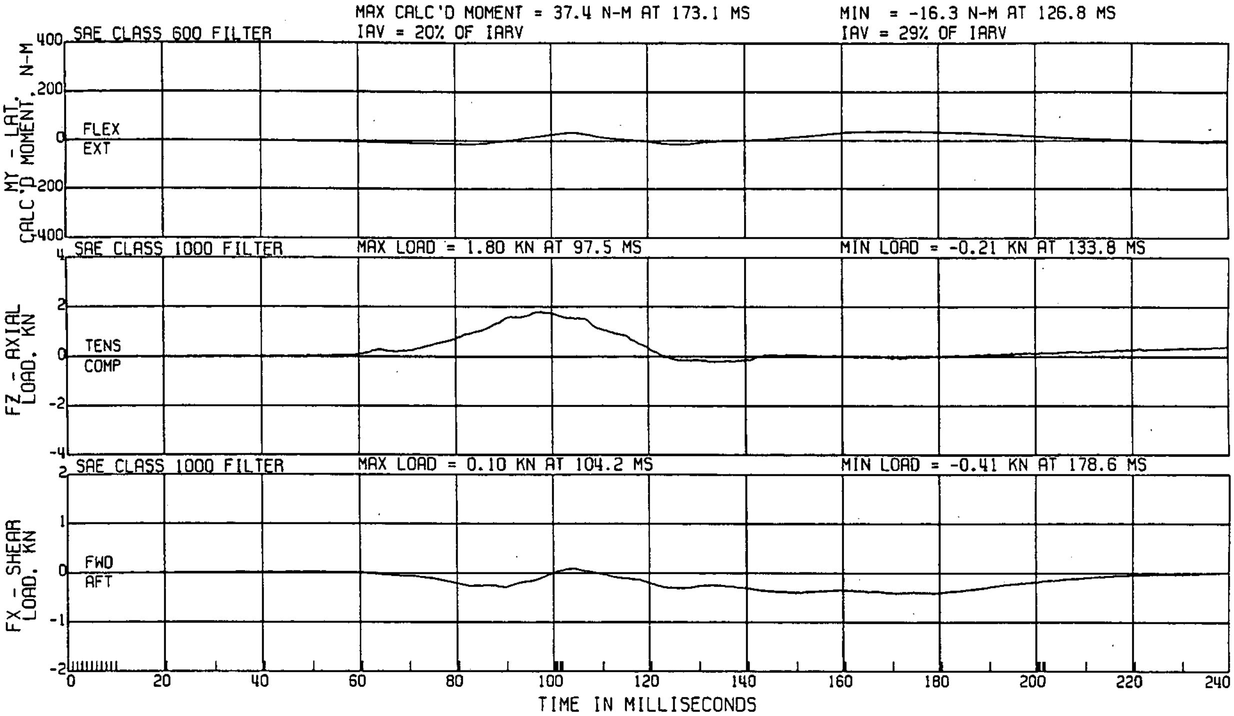
ELEC DATA

NECK LOADING ON HEAD

R. FRT NECK LOADING ON HEAD

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **35**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

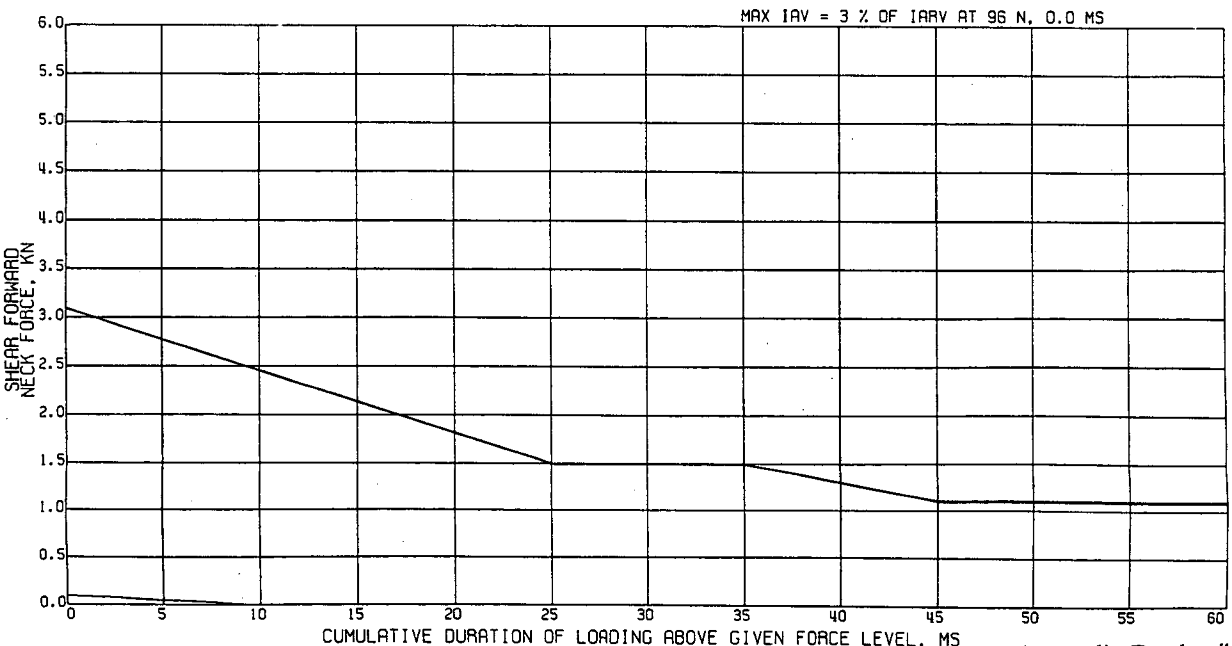
ELEC DATA, SAE CLASS 1000

FORWARD NECK SHEAR ON HEAD,

R. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **36**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

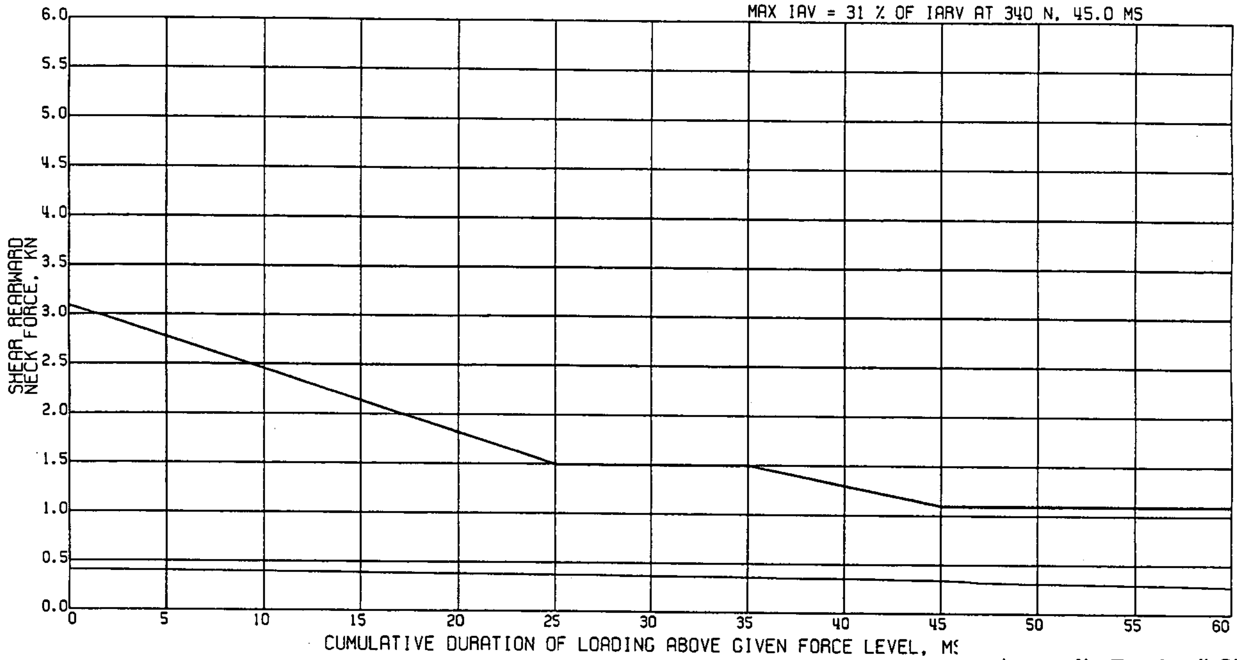
ELEC DATA, SAE CLASS 1000

REARWARD NECK SHEAR ON HEAD,

R. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot **# 37**

37

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

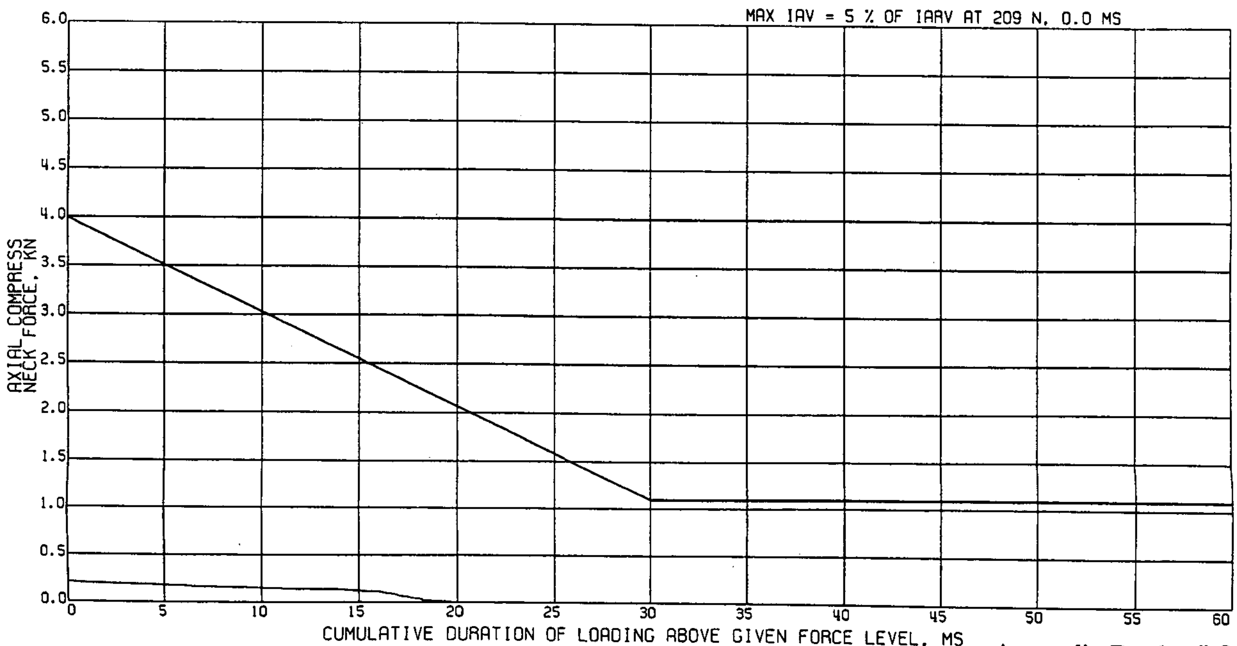
ELEC DATA, SAE CLASS 1000

AXIAL COMPRESSION ON HEAD,

R. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot **# 38**

38

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

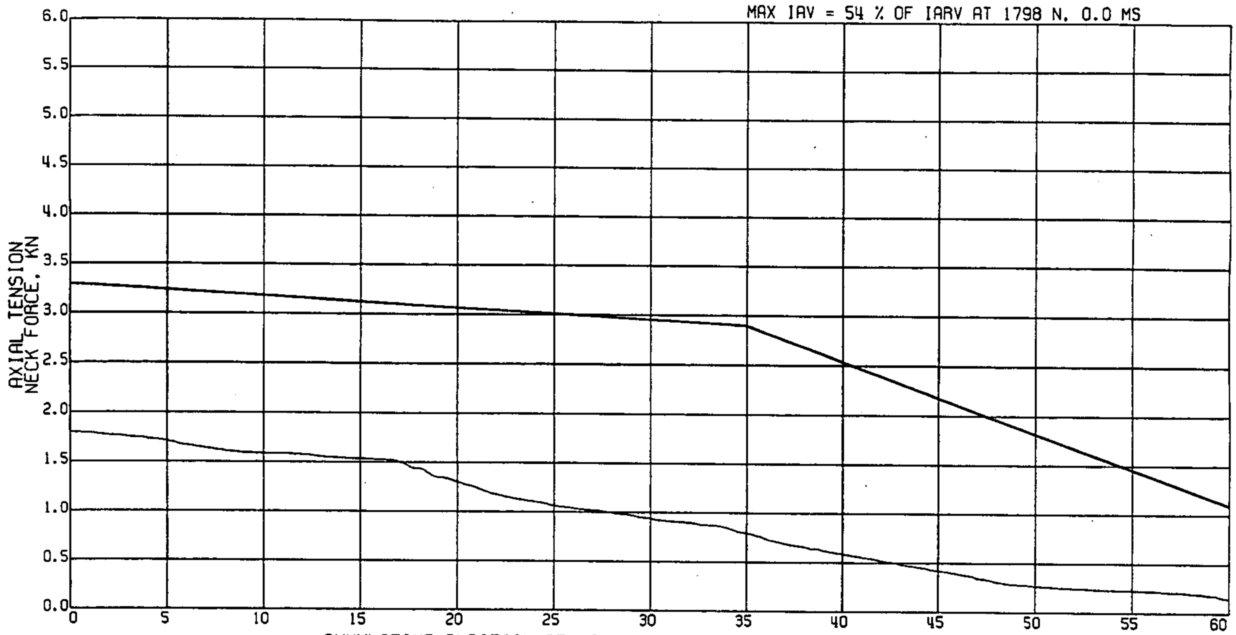
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

AXIAL TENSION ON HEAD, R. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:05/14/1997




39

Appendix D, plot # **39**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

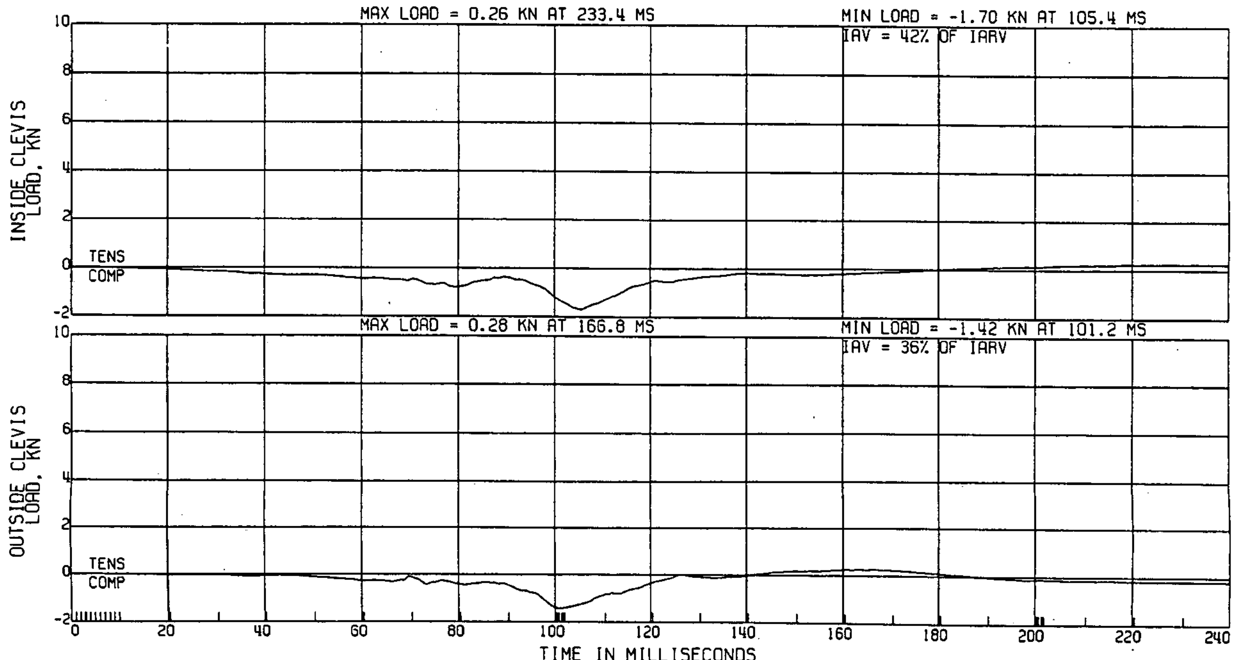
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

R. FRT LEFT KNEE CLEVIS LOAD

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **40**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

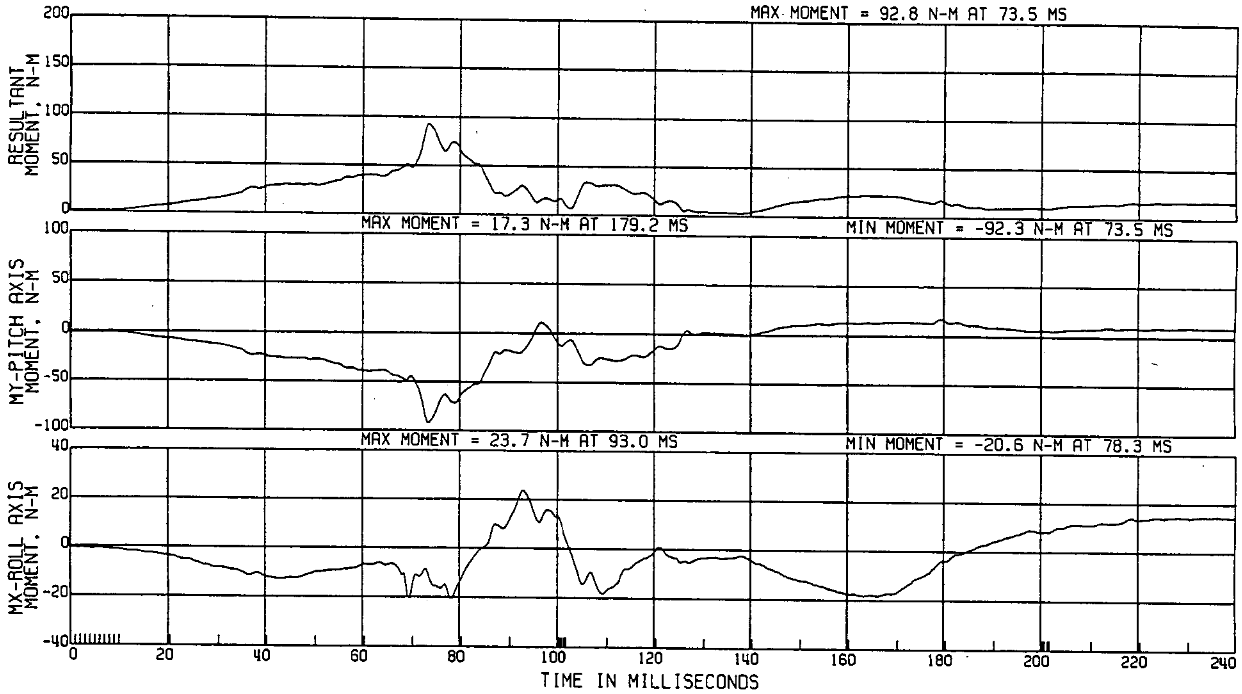
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

R. FRT LEFT TIBIA UPPER MOMENT

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **41**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

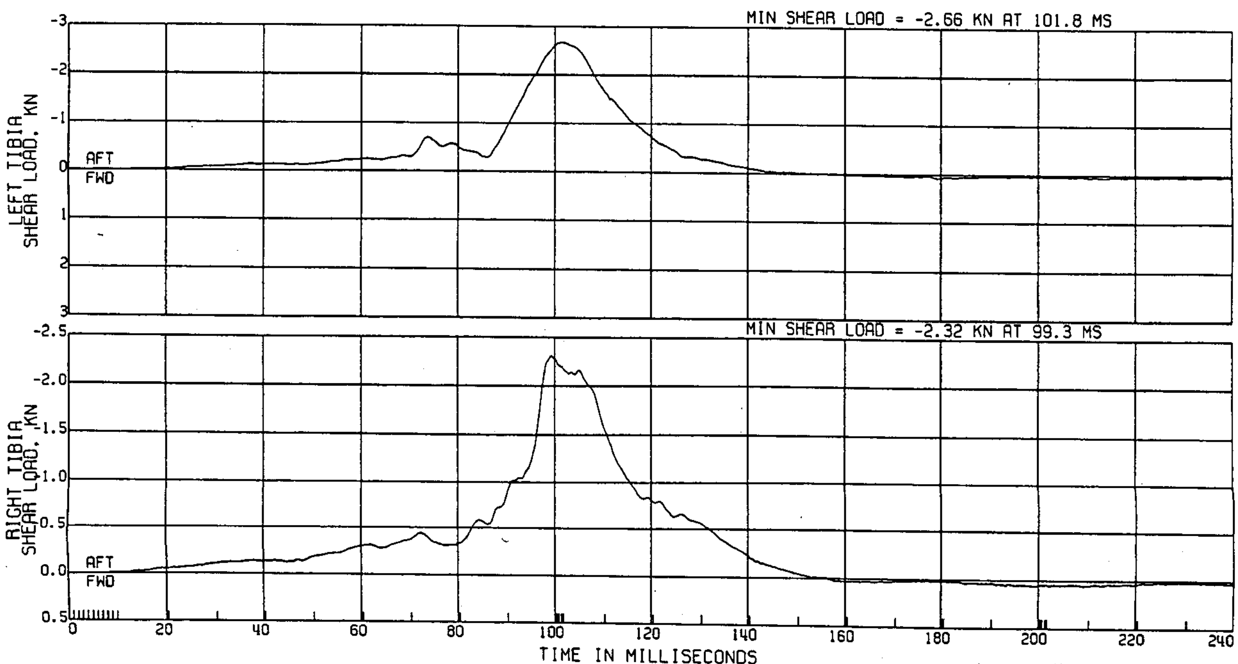
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H

TEST DATE:05/14/1997

R. FRT TIBIA LOWER SHEAR LOAD CELLS



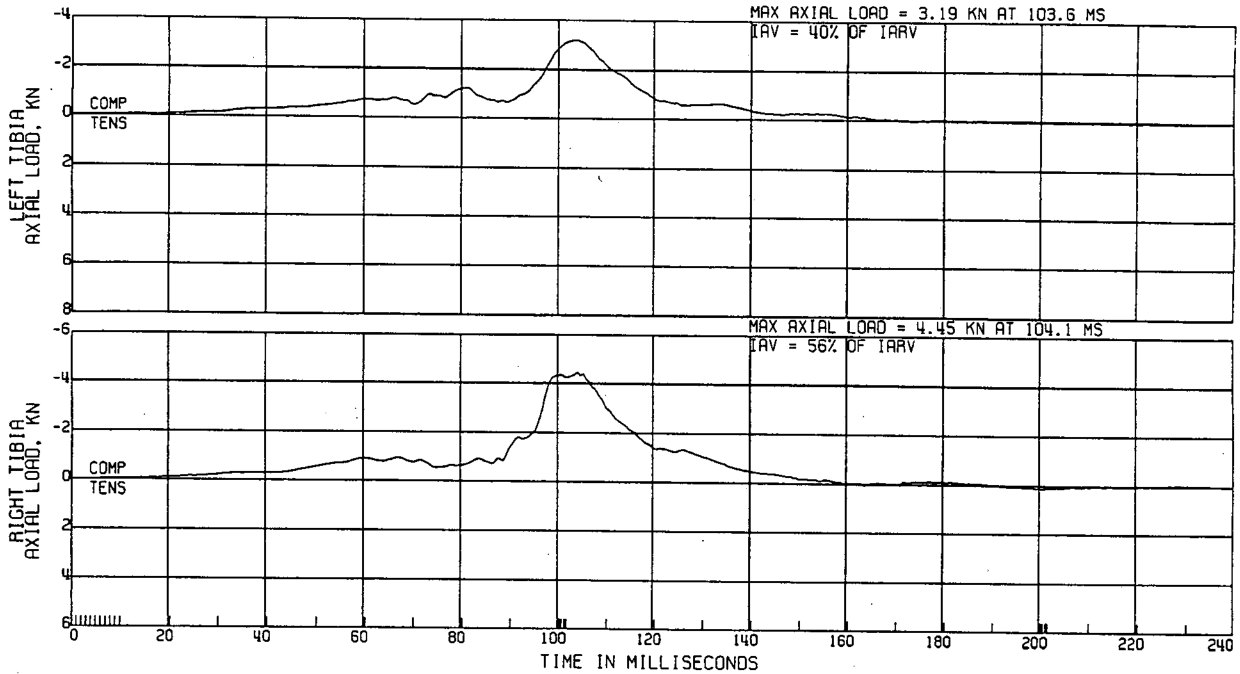

Appendix D, plot # **42**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H
TEST DATE:05/14/1997

R. FRT TIBIA LOWER AXIAL LOAD



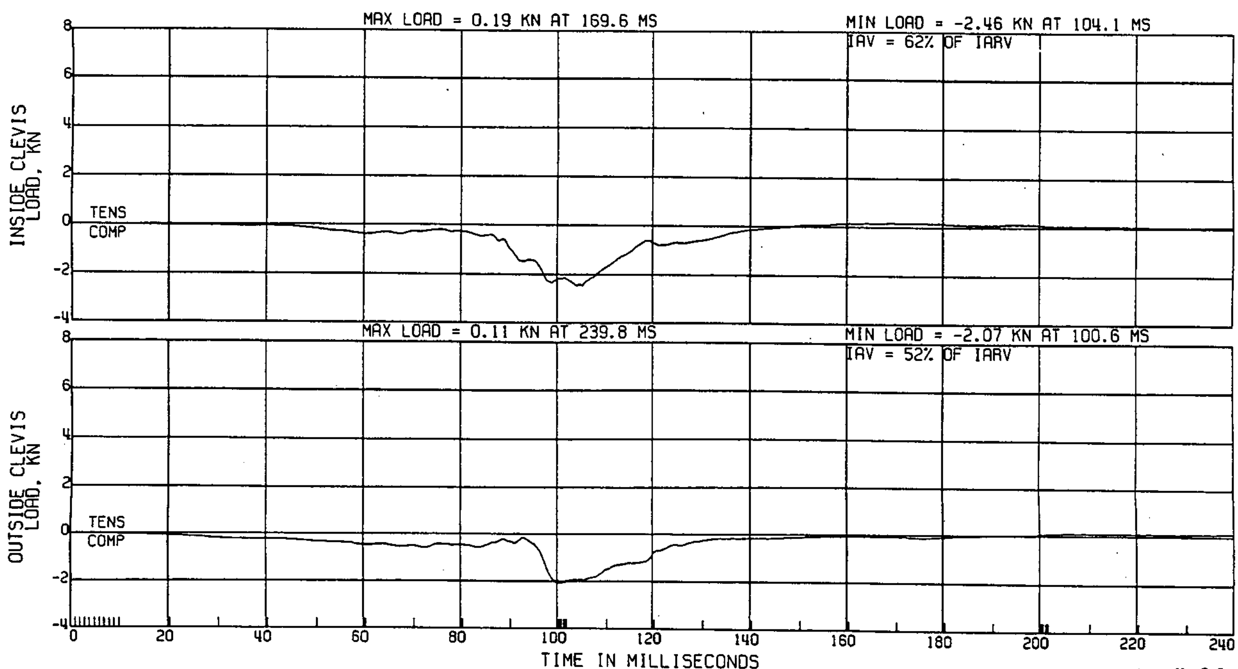

Appendix D, plot # **43**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H
TEST DATE:05/14/1997

R. FRT RIGHT KNEE CLEVIS LOAD




Appendix D, plot # **44**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

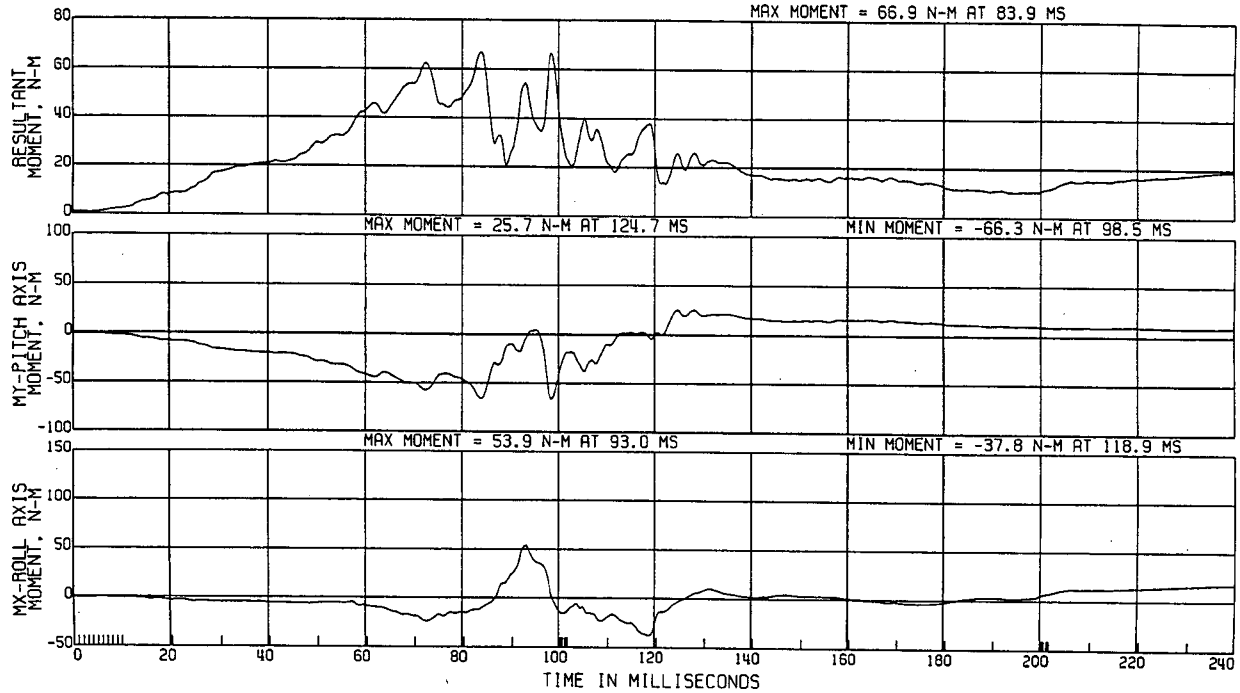
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

R. FRT RIGHT TIBIA UPPER MOMENT

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **45**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

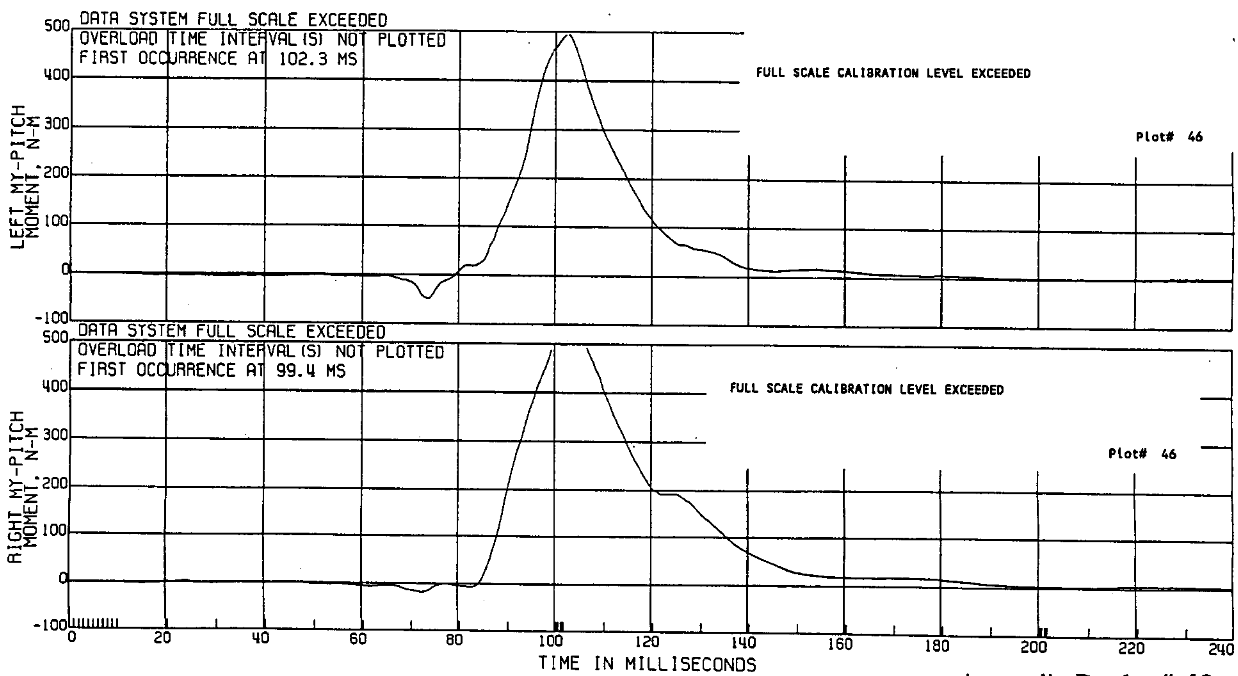
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H

TEST DATE:05/14/1997

R. FRT TIBIA LOWER BENDING MOMENTS




Appendix D, plot # **46**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

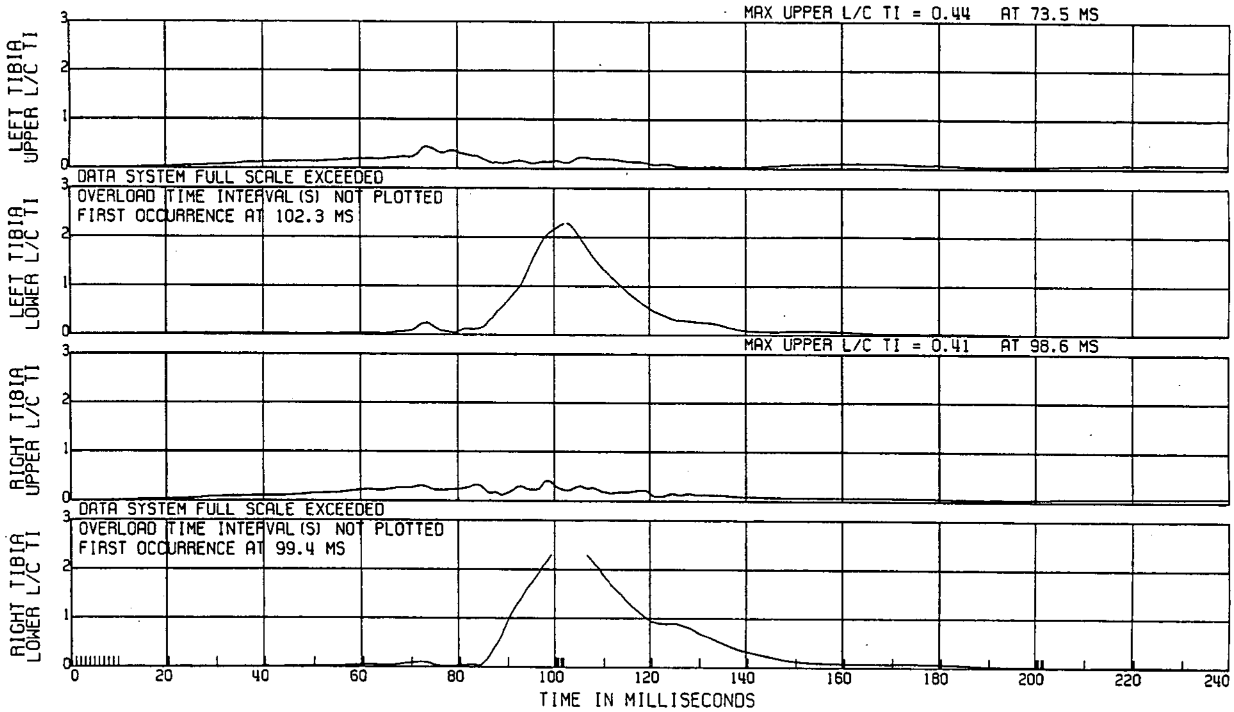
ELEC DATA, SAE CLASS 600

R. FRT TIBIA INDICES

TI = (RES MOM/225 NM) + (AXIAL/35900 N)

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **47**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

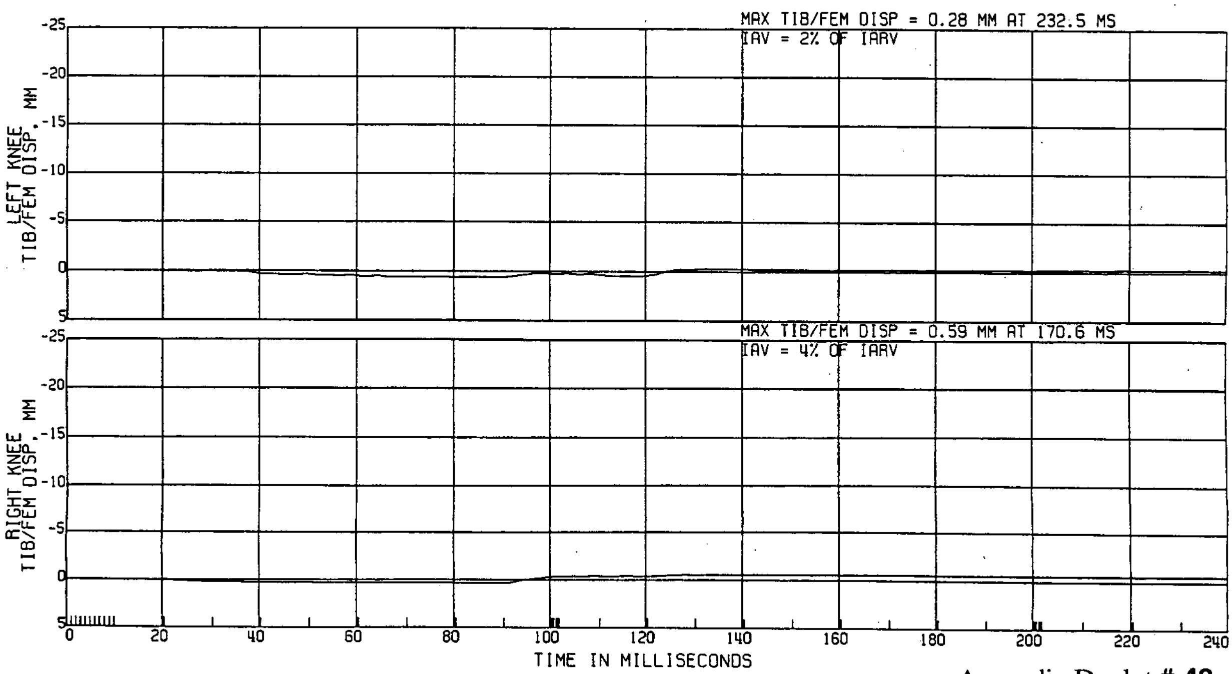
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

R. FRT TIBIA/FEMUR DISPLACEMENT

ATD TYPE: GM50H

TEST DATE:05/14/1997



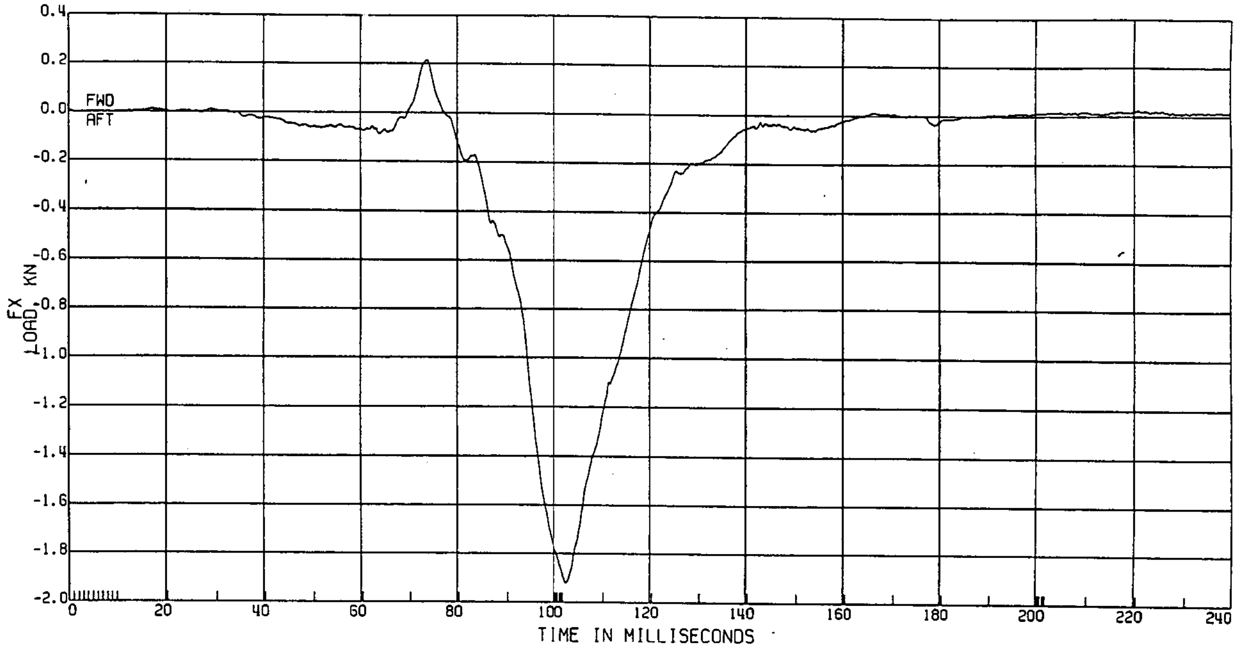

Appendix D, plot # **48**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 600

R. FRT TIBIA LEFT UPPER LOAD
(ENHANCED LOWER LEG)

ATD TYPE: GM50H
TEST DATE:05/14/1997



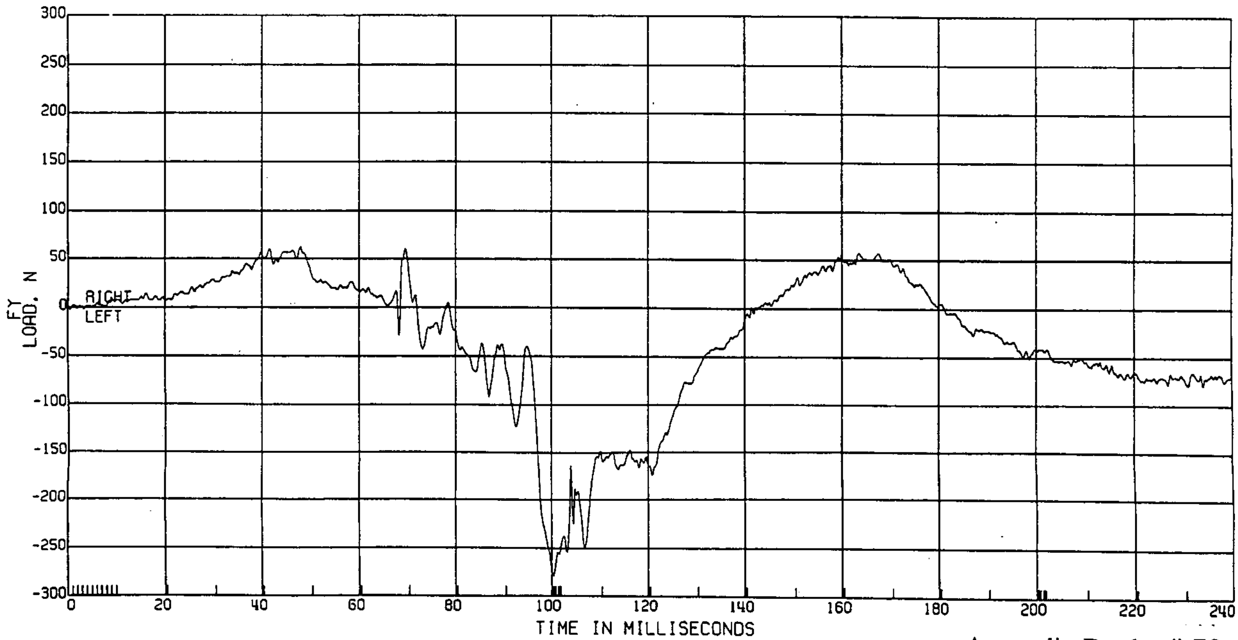

Appendix D, plot # **49**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 600

R. FRT TIBIA LEFT LOWER LOAD
(ENHANCED LOWER LEG)

ATD TYPE: GM50H
TEST DATE:05/14/1997




Appendix D, plot # **50**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

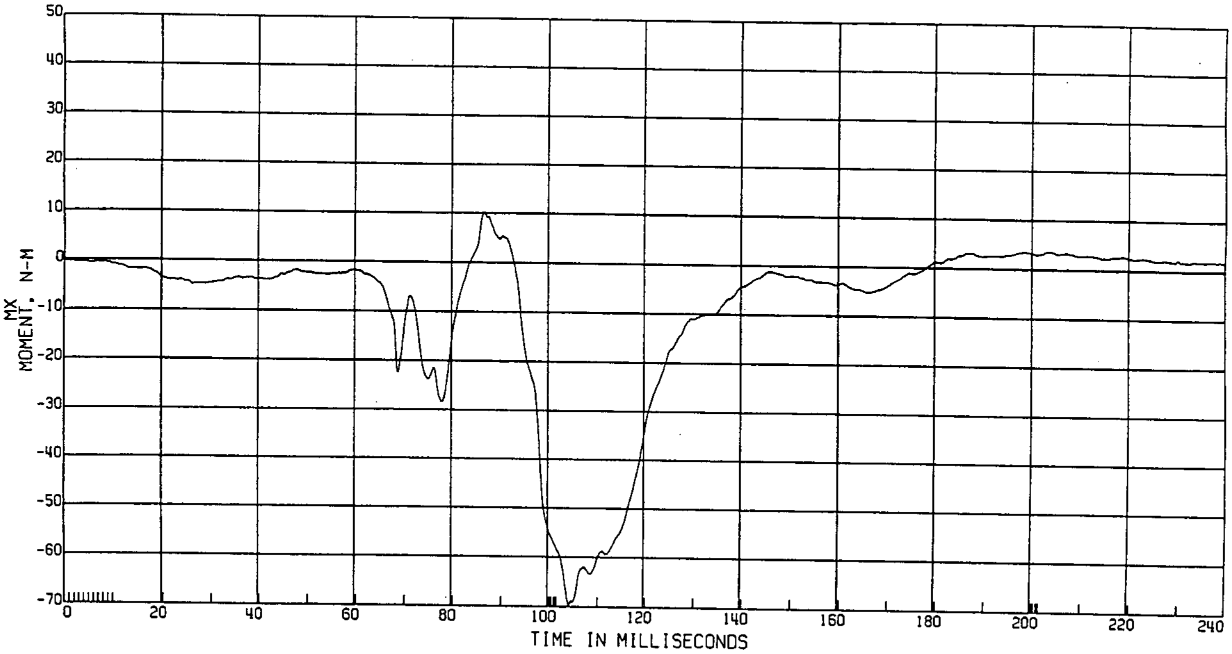
ELEC DATA, SAE CLASS 600

R. FRT TIBIA LEFT LOWER MOMENT

(ENHANCED LOWER LEG)

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **51**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

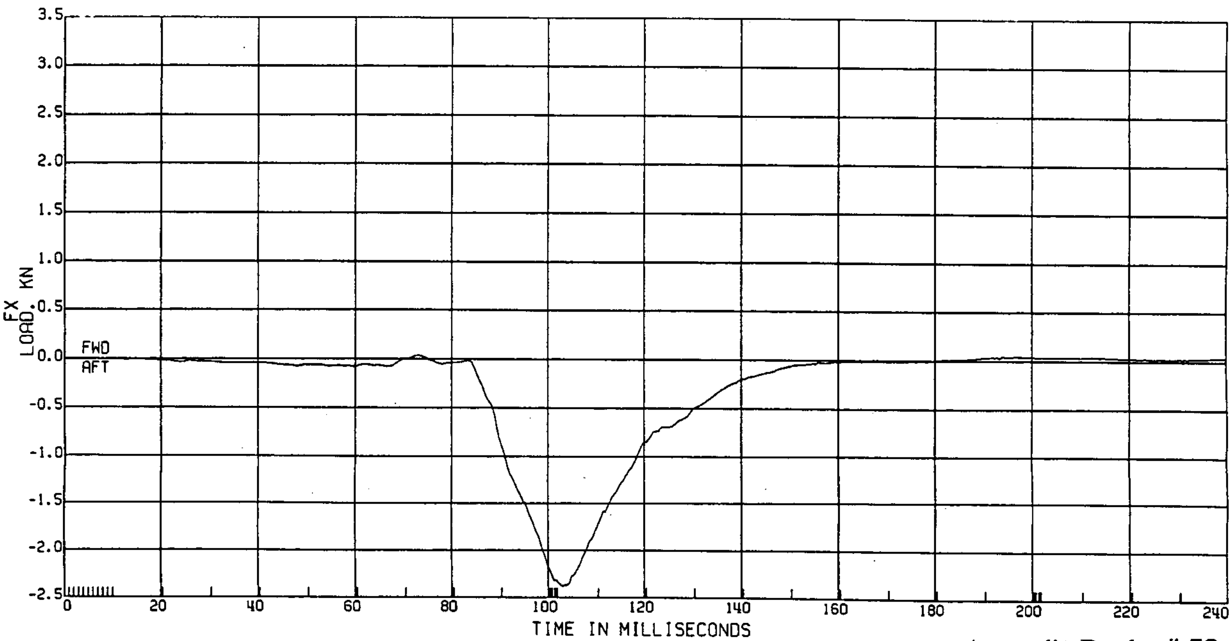
ELEC DATA, SAE CLASS 600

R. FRT TIBIA RIGHT UPPER LOAD

(ENHANCED LOWER LEG)

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **52**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

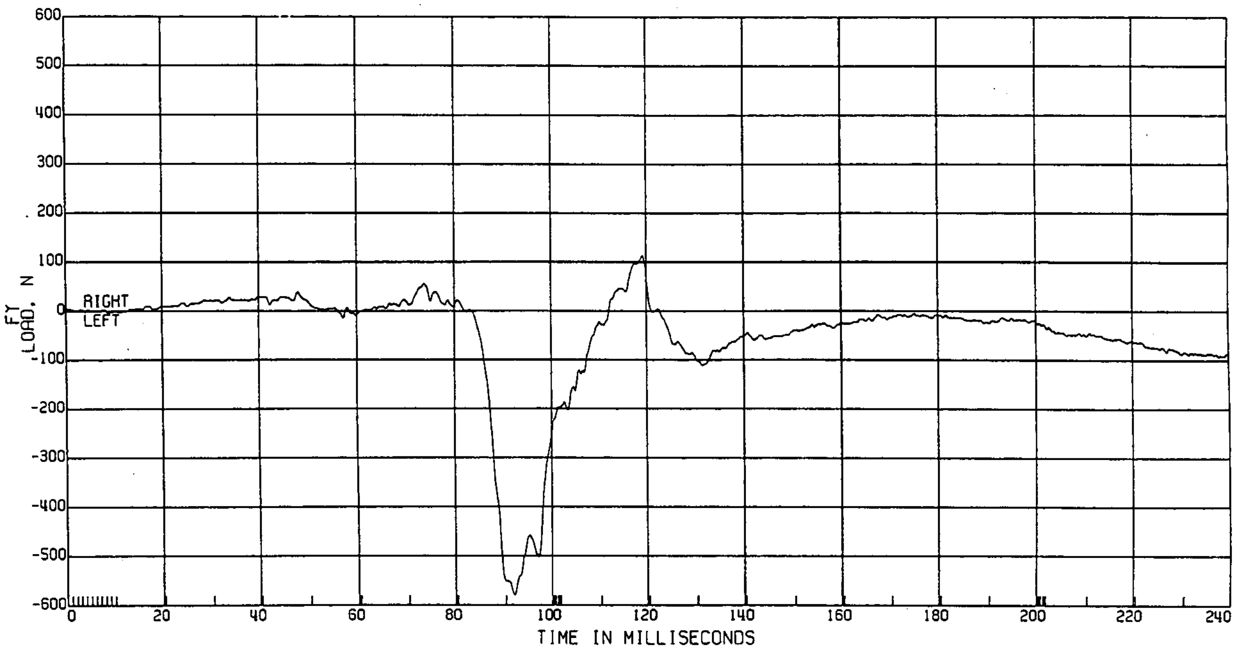
ELEC DATA, SAE CLASS 600

R. FRT TIBIA RIGHT LOWER LOAD

(ENHANCED LOWER LEG)

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **53**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

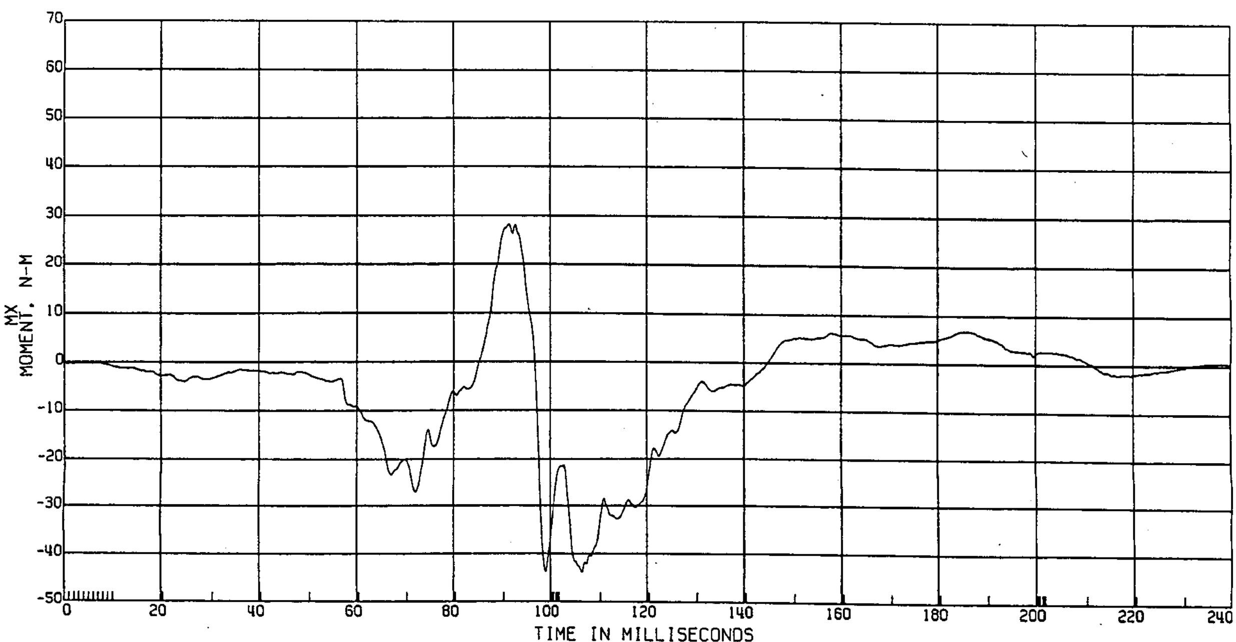
ELEC DATA, SAE CLASS 600

R. FRT TIBIA RIGHT LOWER MOMENT

(ENHANCED LOWER LEG)

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **54**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

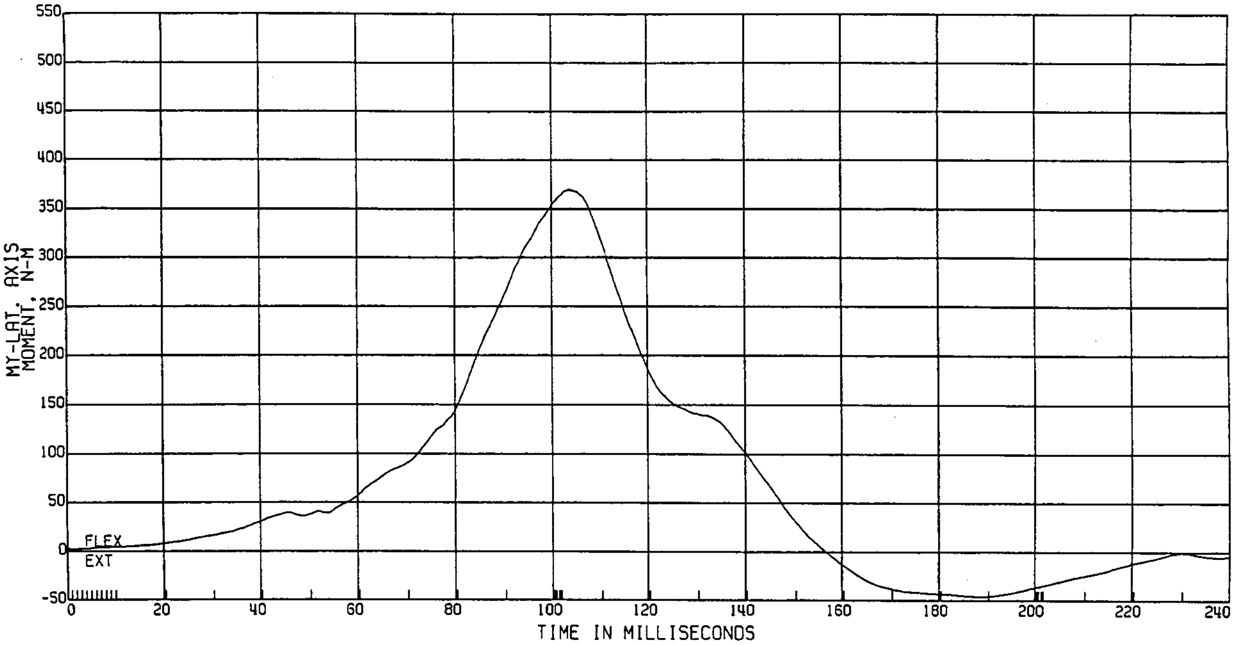
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

L. FRT LOWER LUMBAR MOMENT

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **55**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

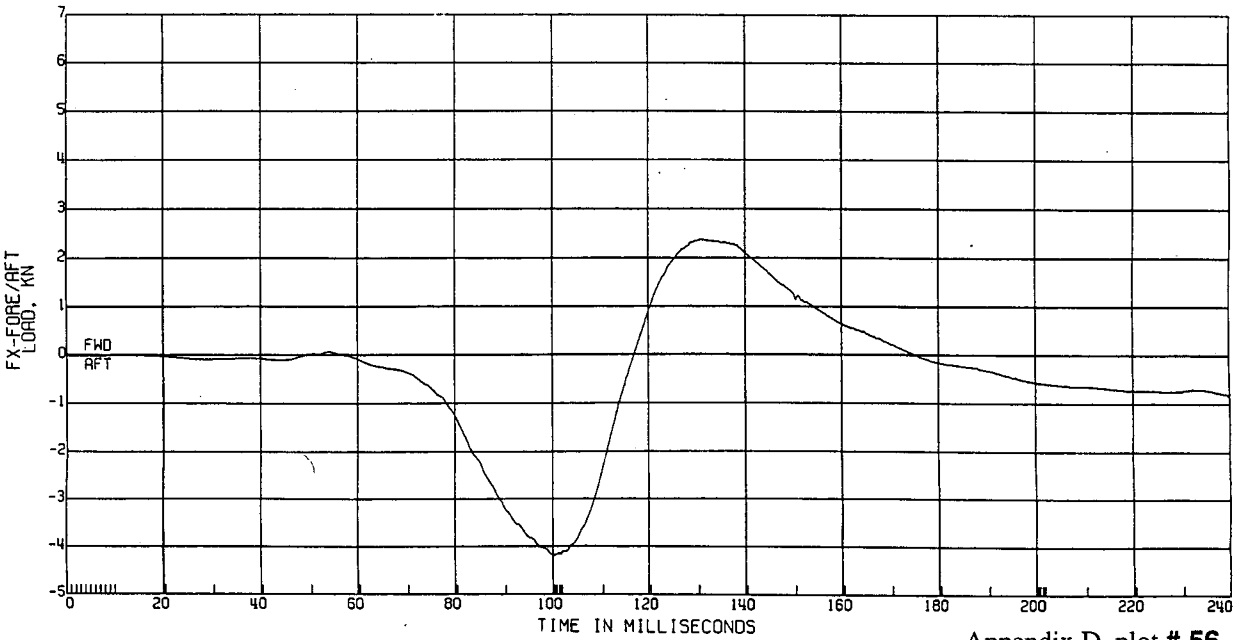
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

L. FRT LOWER LUMBAR LOAD

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **56**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

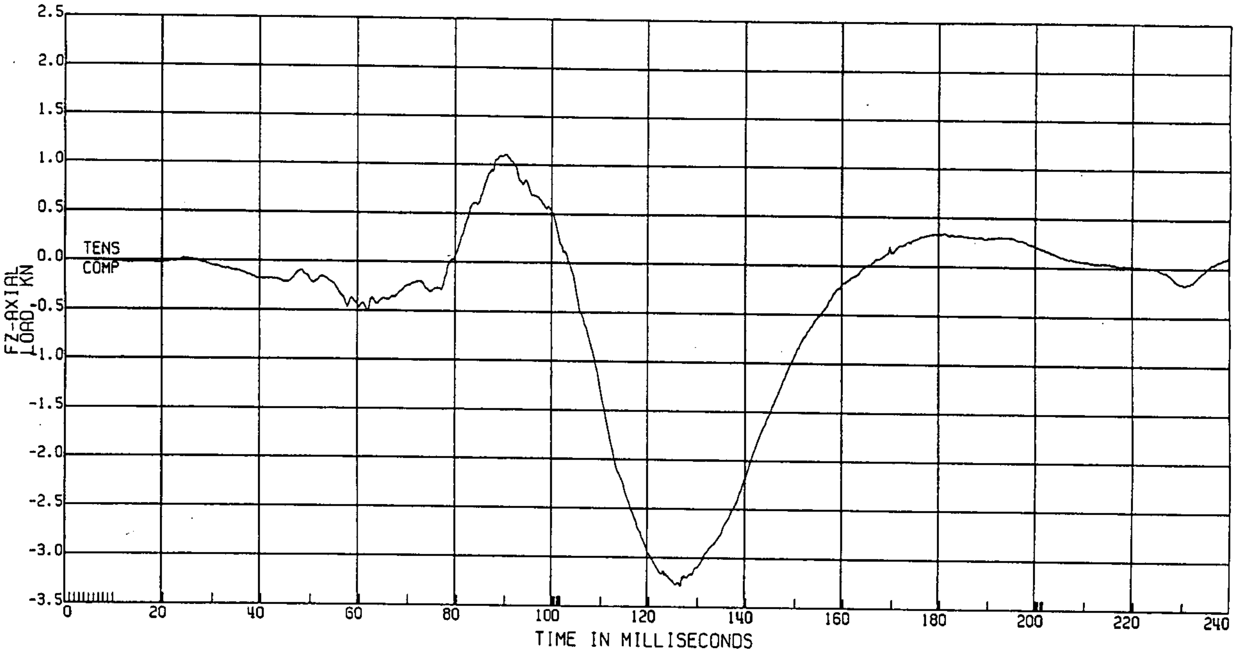
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

L. FRT LOWER LUMBAR LOAD

ATD TYPE: GM50H

TEST DATE:05/14/1997




Appendix D, plot # **57**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

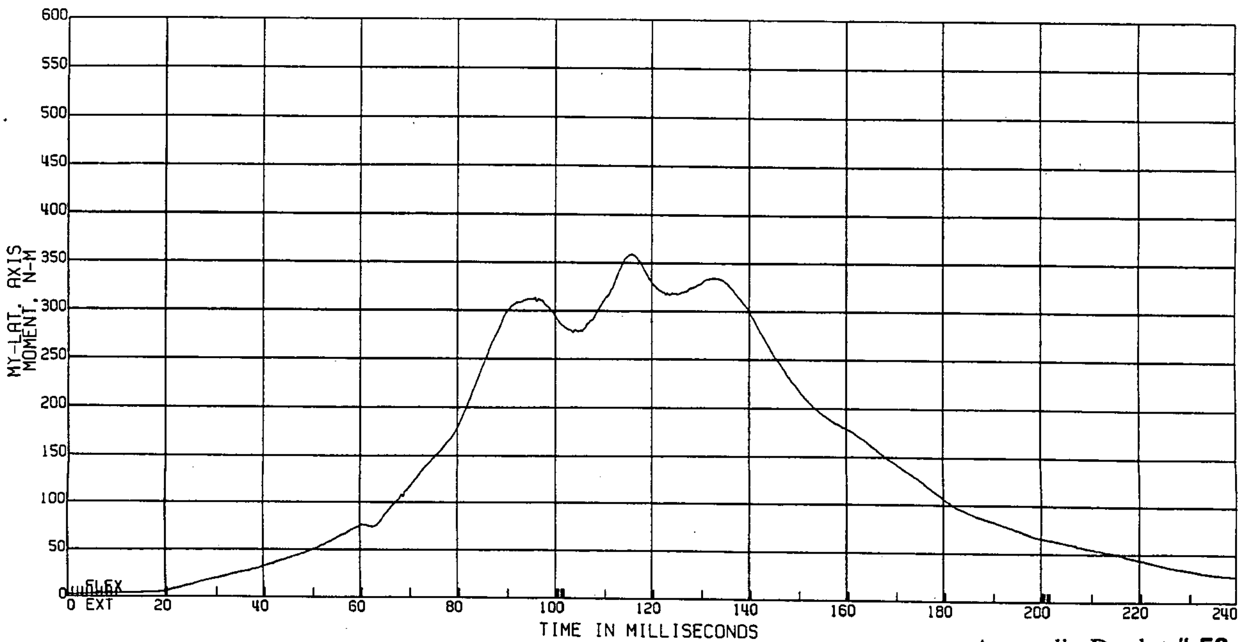
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

R. FRT LOWER LUMBAR MOMENT

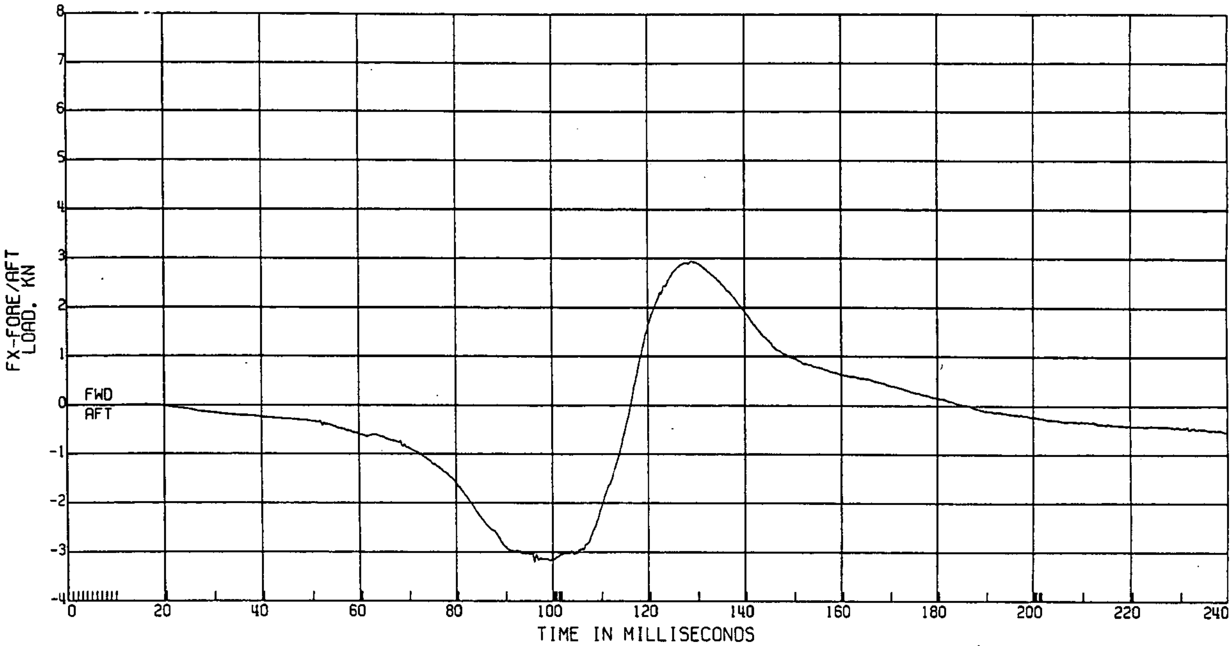
ATD TYPE: GM50H

TEST DATE:05/14/1997



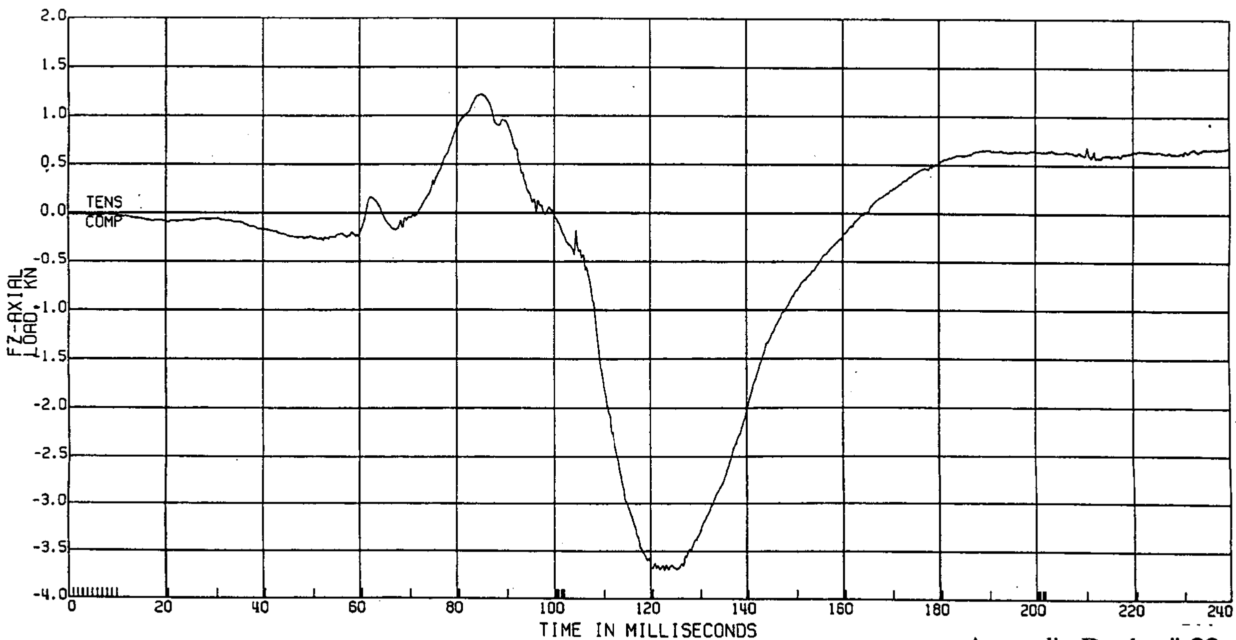

Appendix D, plot # **58**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H
R&D CTR 1VF46081 1FP87 R. FRT LOWER LUMBAR LOAD ATD TYPE: GM50H
TEST DATE:05/14/1997
ELEC DATA, SAE CLASS 1000




Appendix D, plot # **59**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H
R&D CTR 1VF46081 1FP87 R. FRT LOWER LUMBAR LOAD ATD TYPE: GM50H
TEST DATE:05/14/1997
ELEC DATA, SAE CLASS 1000

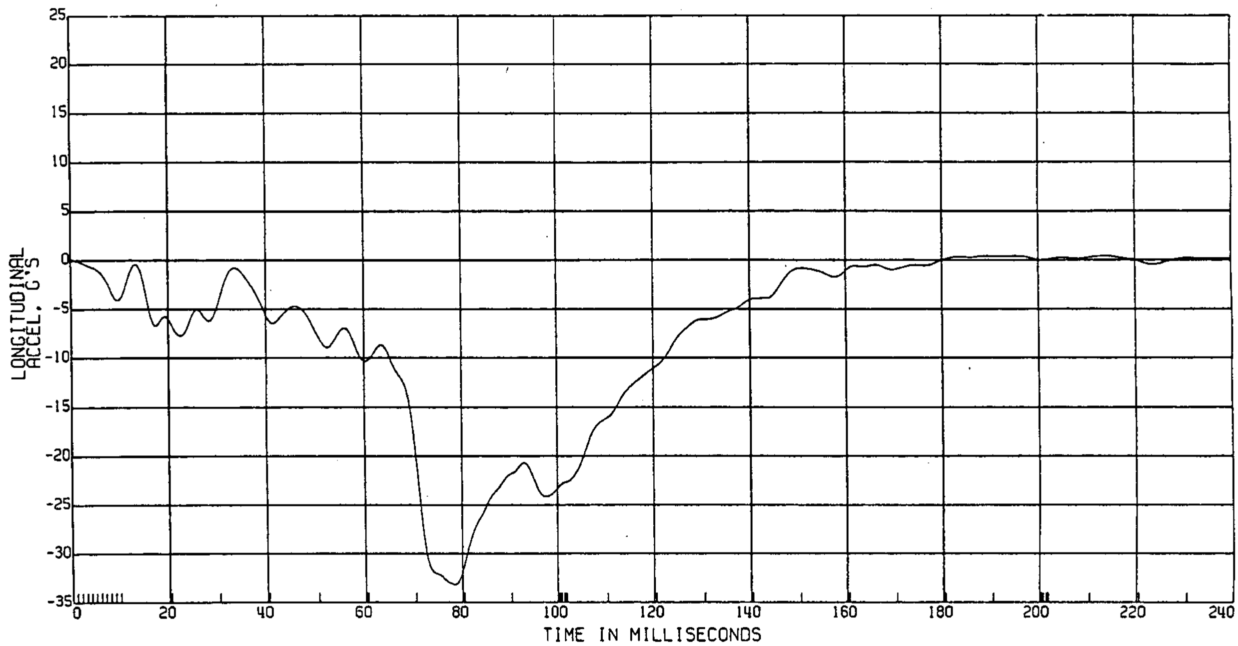



Appendix D, plot # **60**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L. FRT ROCKER ACCEL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60

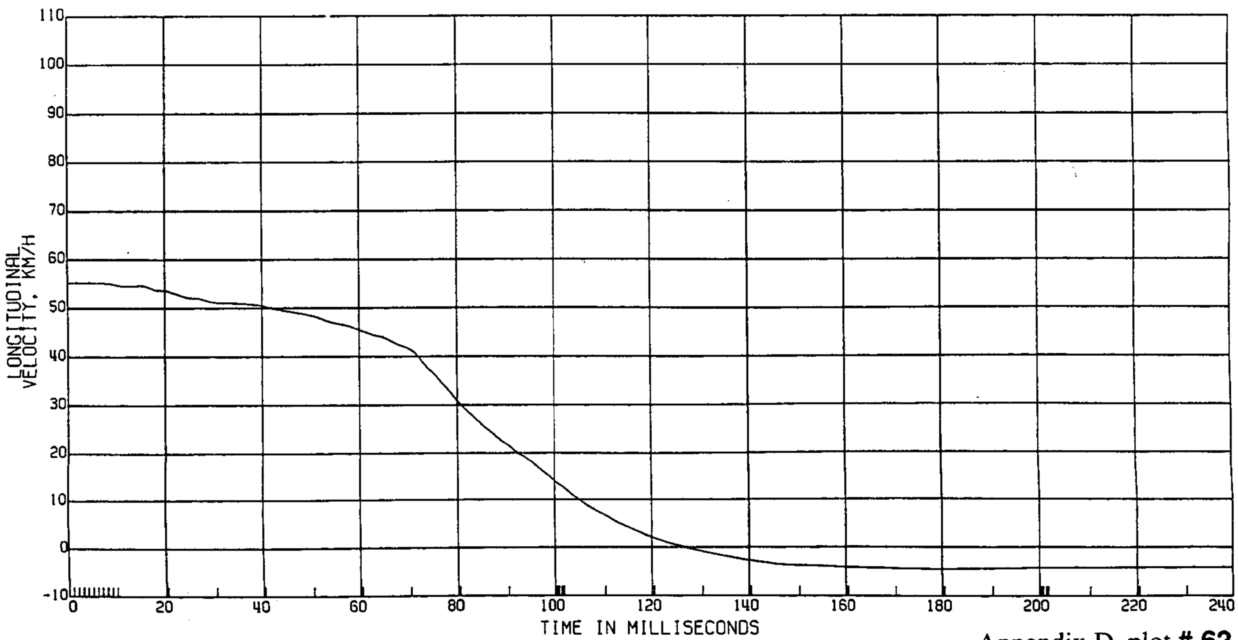



Appendix D, plot # **61**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L. FRT ROCKER VELOCITY TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



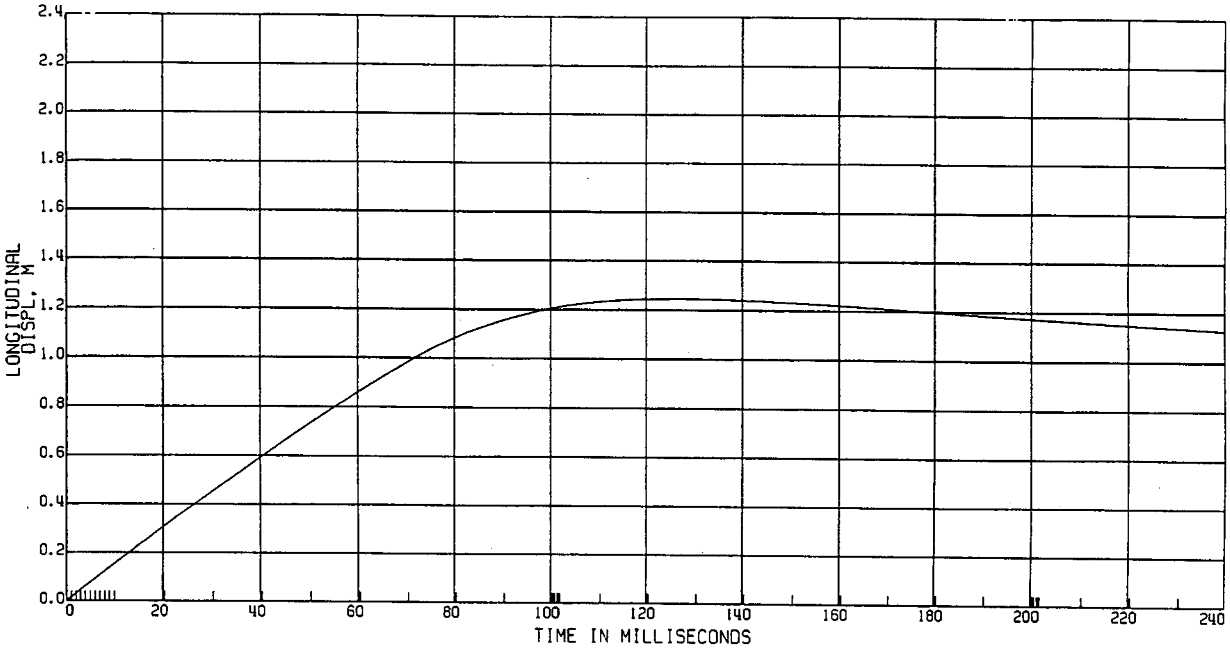

Appendix D, plot # **62**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

L. FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997



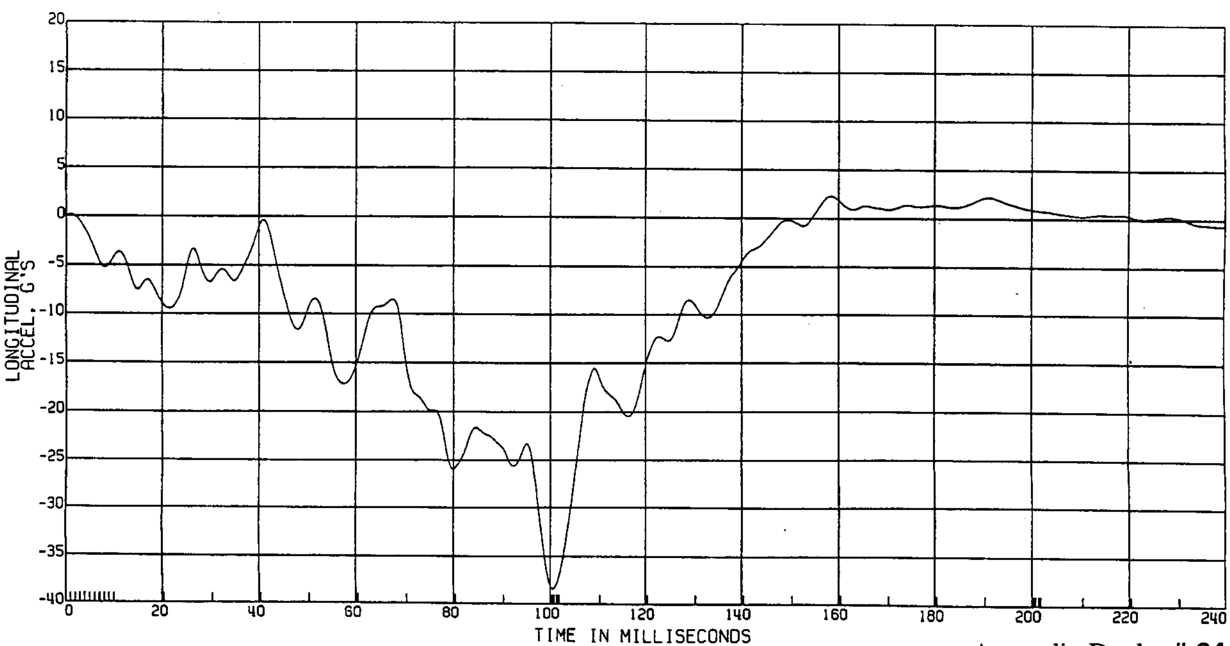

Appendix D, plot # **63**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 60

R. FRT ROCKER ACCEL

TEST DATE:05/14/1997



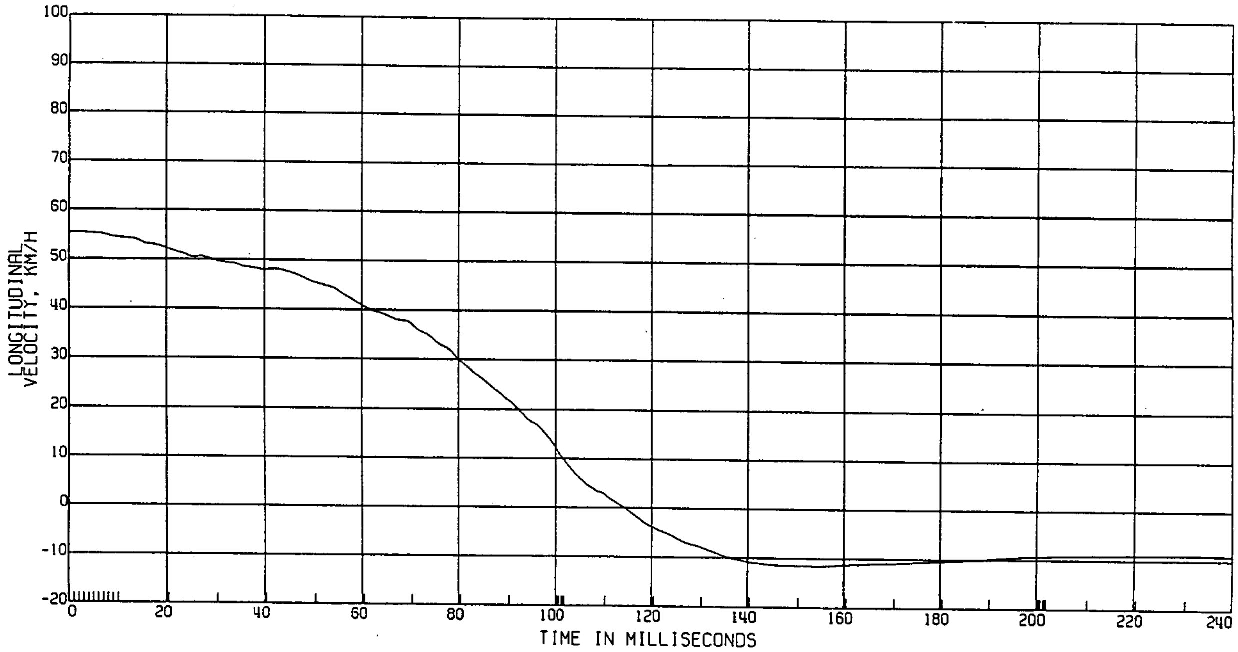

Appendix D, plot # **64**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

R. FRT ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997



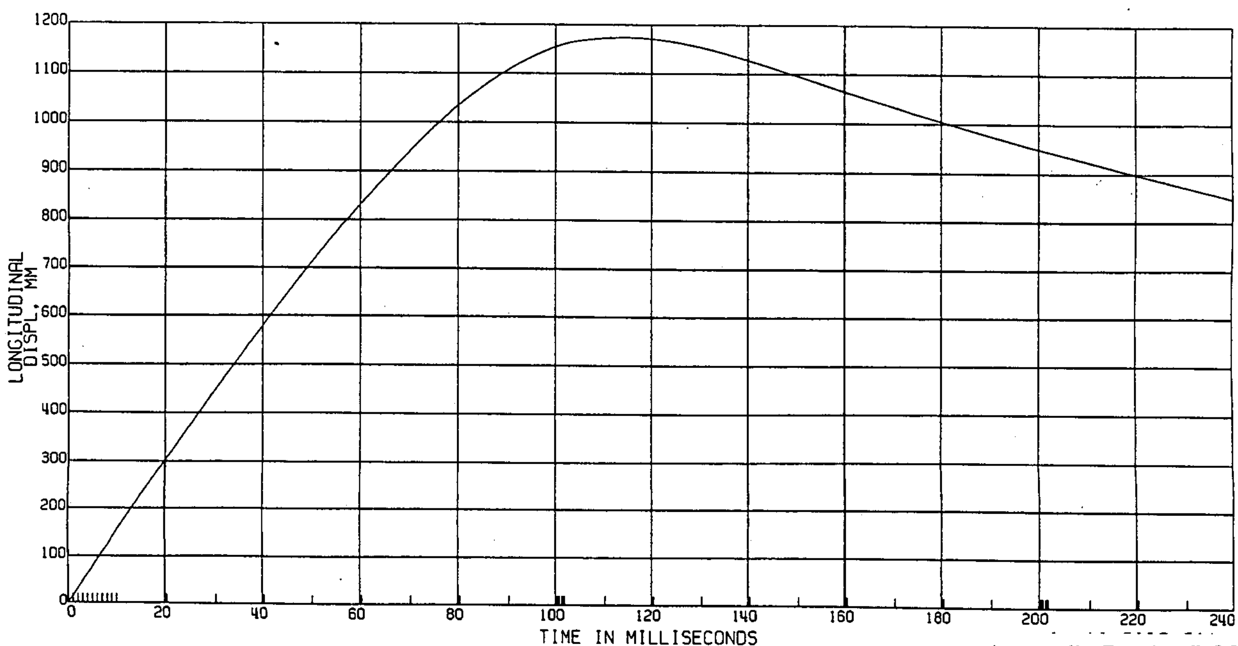

Appendix D, plot # **65**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

R. FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997

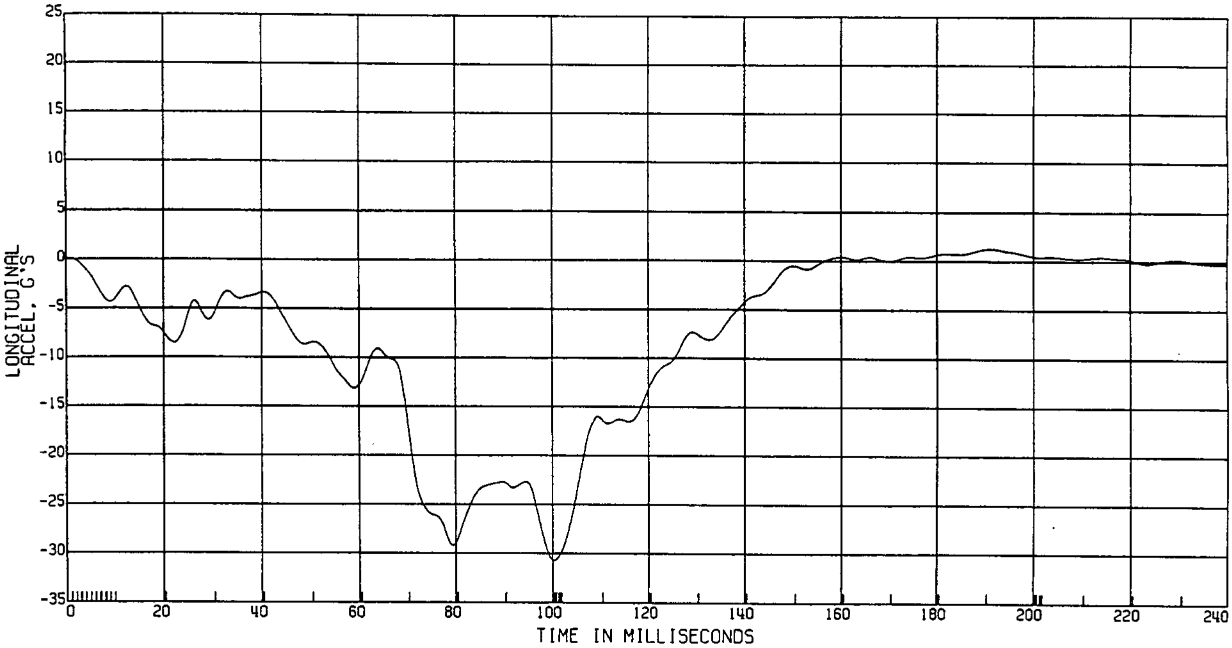



Appendix D, plot # **66**

C11591 FRONT IMPACT    MOVING VEHICLE TO FIXED POLE    55.3KM/H

R&D CTR    1VF46081 1FP87    AVERAGED FRT ROCKER ACCELERATION    TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60    (AVGD L. & R. ROCKER ACCELS)

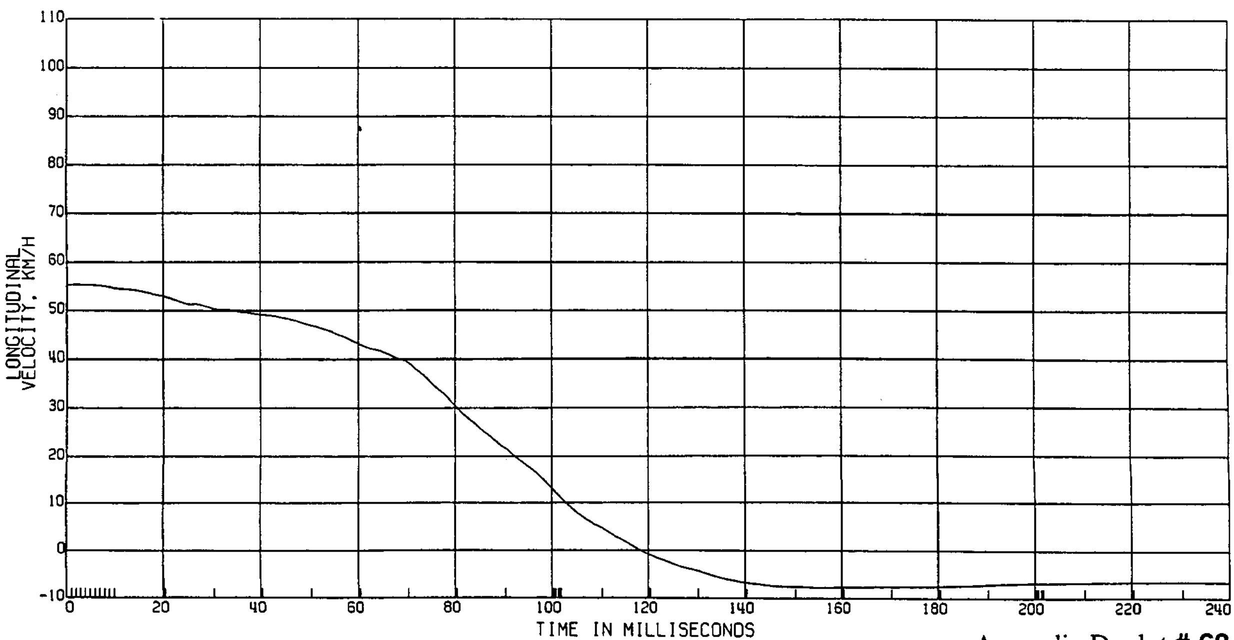



Appendix D, plot # **67**

C11591 FRONT IMPACT    MOVING VEHICLE TO FIXED POLE    55.3KM/H

R&D CTR    1VF46081 1FP87    AVGD FRT ROCKER VELOCITY    TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180    (COMPUTED FROM ACCELERATION)




Appendix D, plot # **68**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

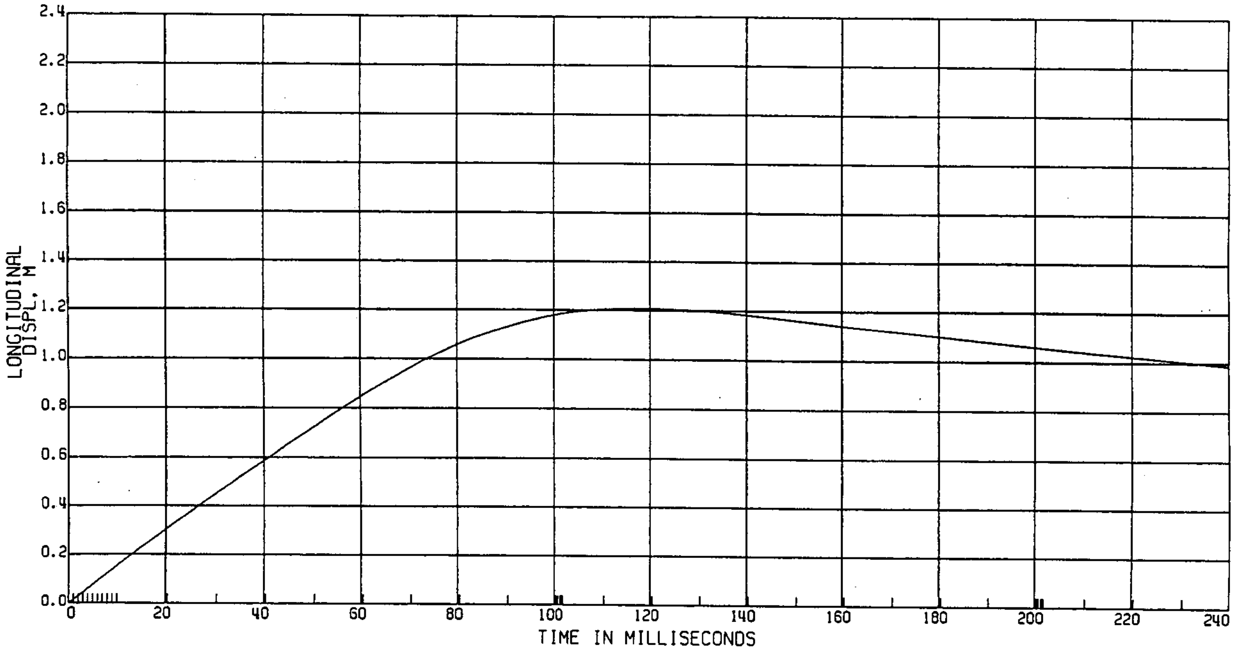
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **69**

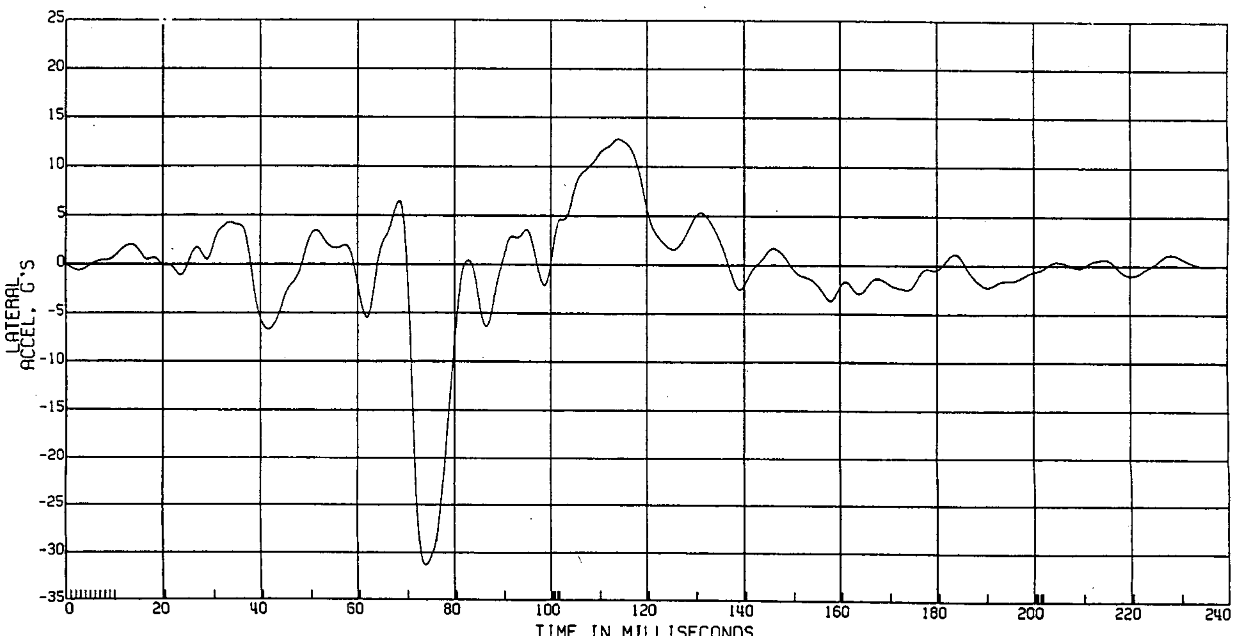
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 60

L. FRT ROCKER ACCEL

TEST DATE:05/14/1997



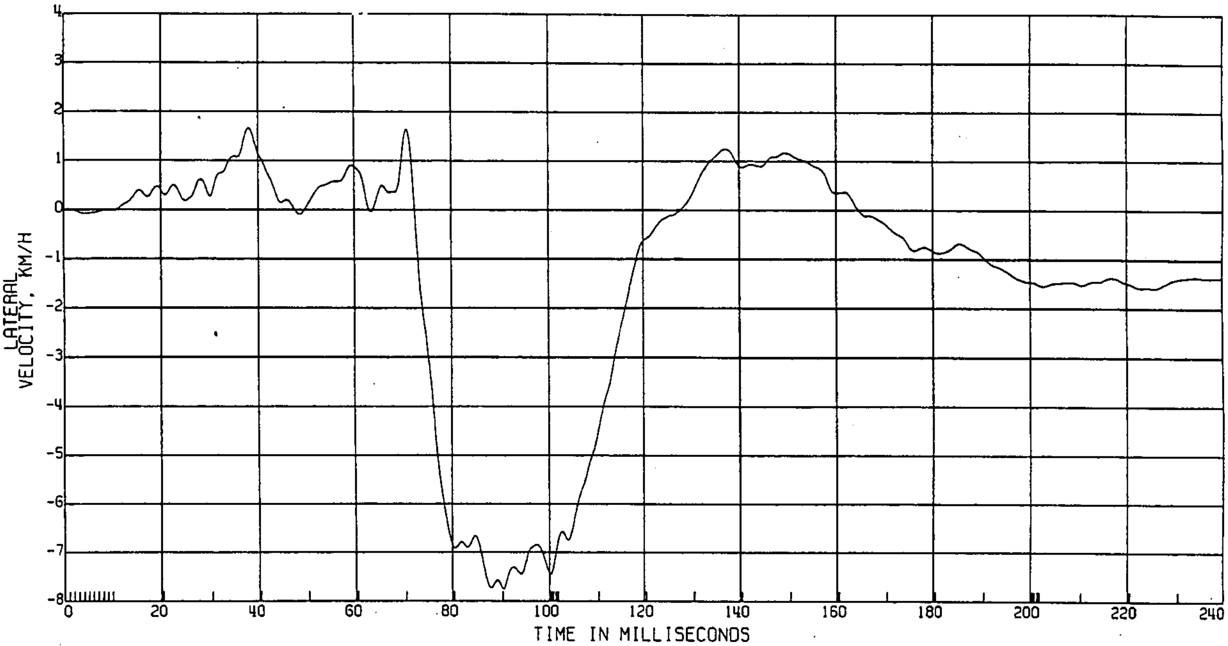

Appendix D, plot # **70**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

L. FRT ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997



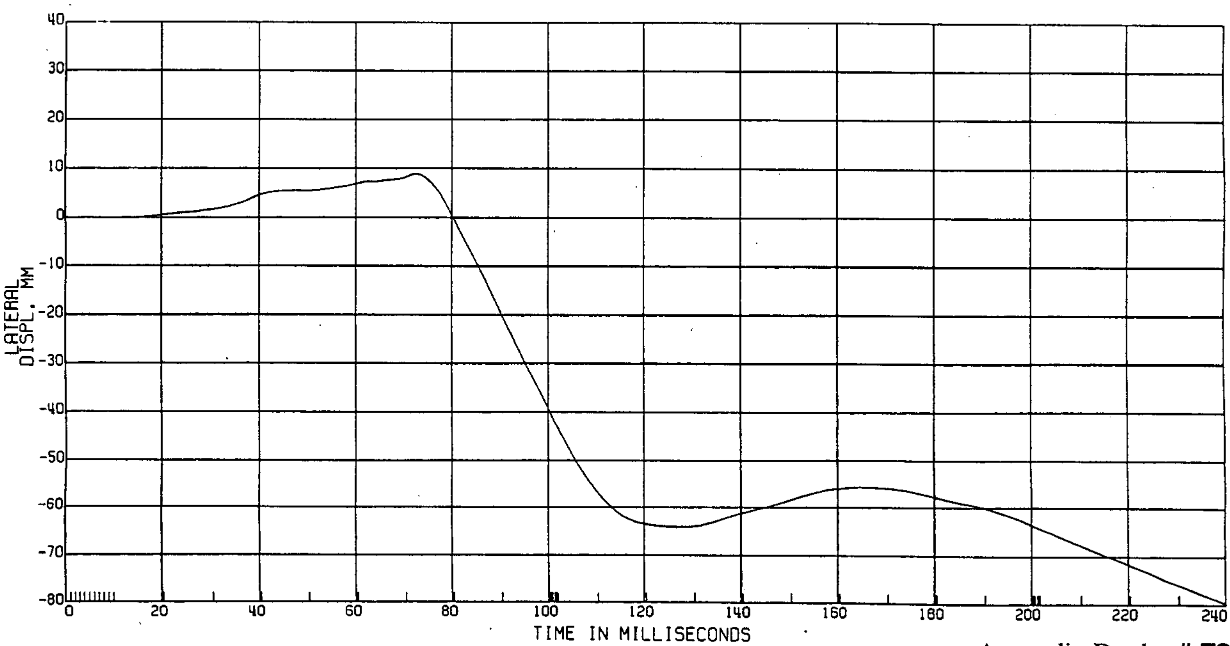

Appendix D, plot # **71**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

L. FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **72**

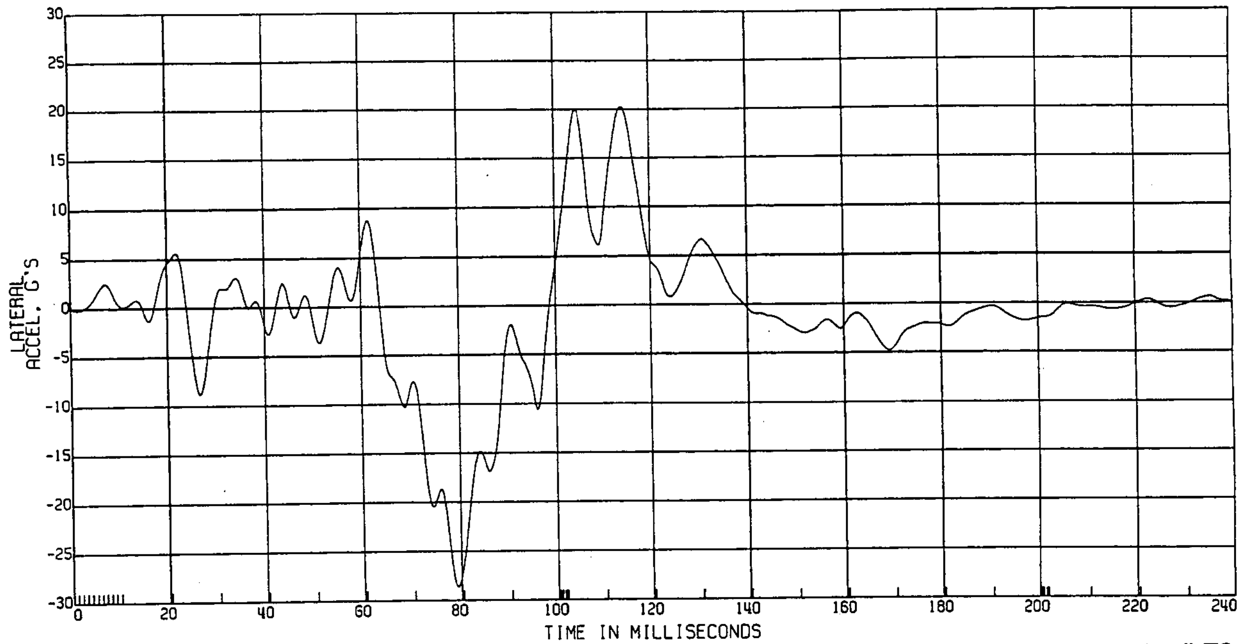
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

R. FRT ROCKER ACCEL

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60




Appendix D, plot **# 73**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

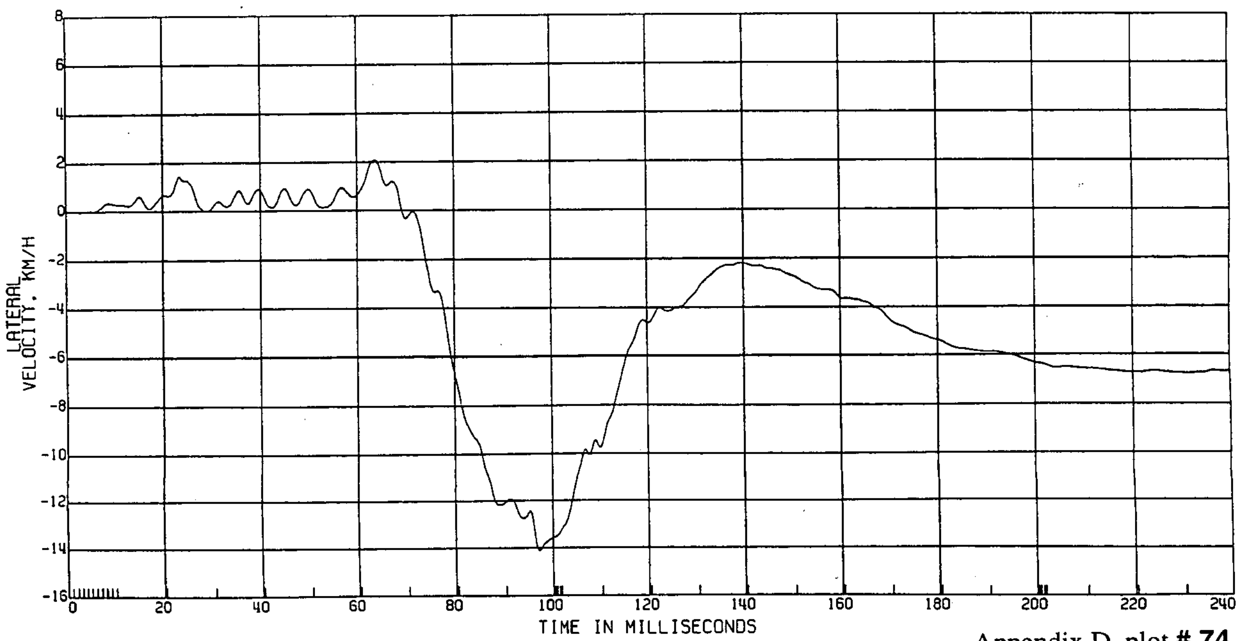
R&D CTR 1VF46081 1FP87

R. FRT ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180



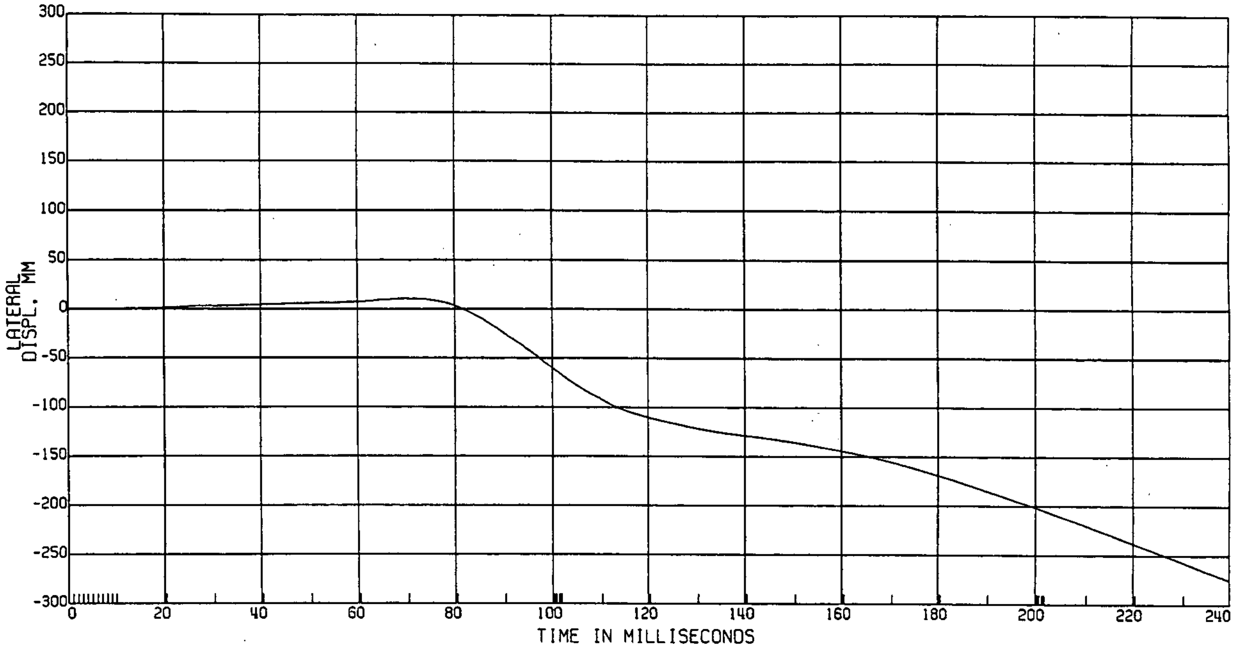

Appendix D, plot **# 74**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

R. FRT ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997



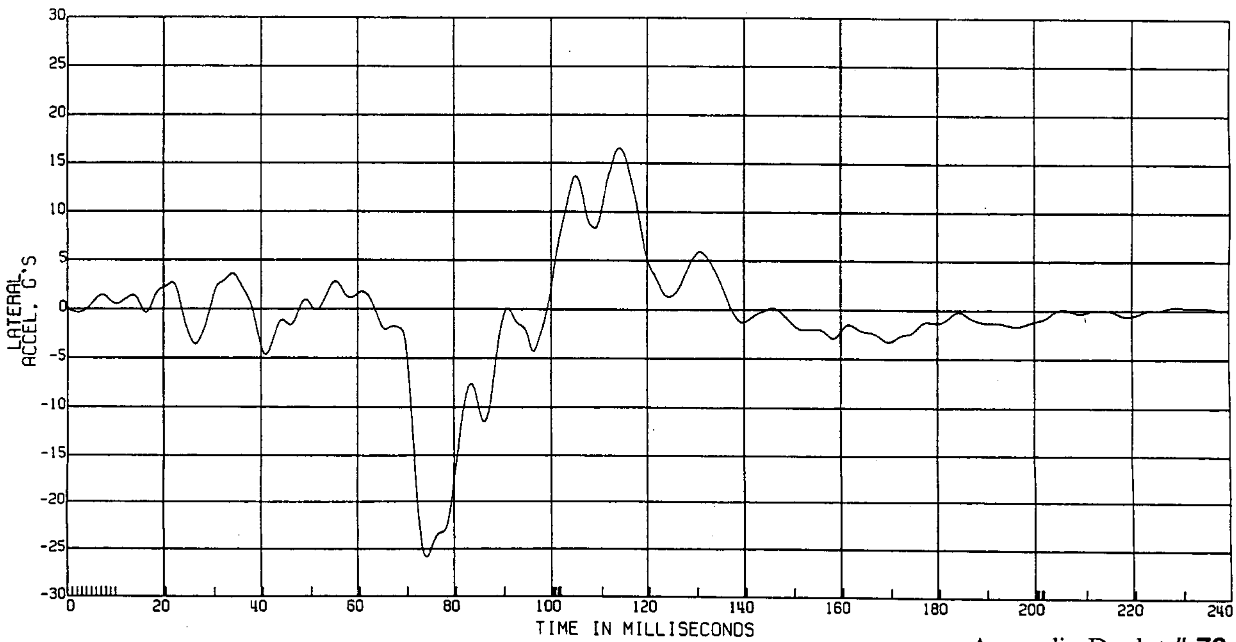

Appendix D, plot # **75**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 60

AVERAGED FRT ROCKER ACCELERATION
(AVGD L. & R. ROCKER ACCELS)

TEST DATE:05/14/1997




Appendix D, plot # **76**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

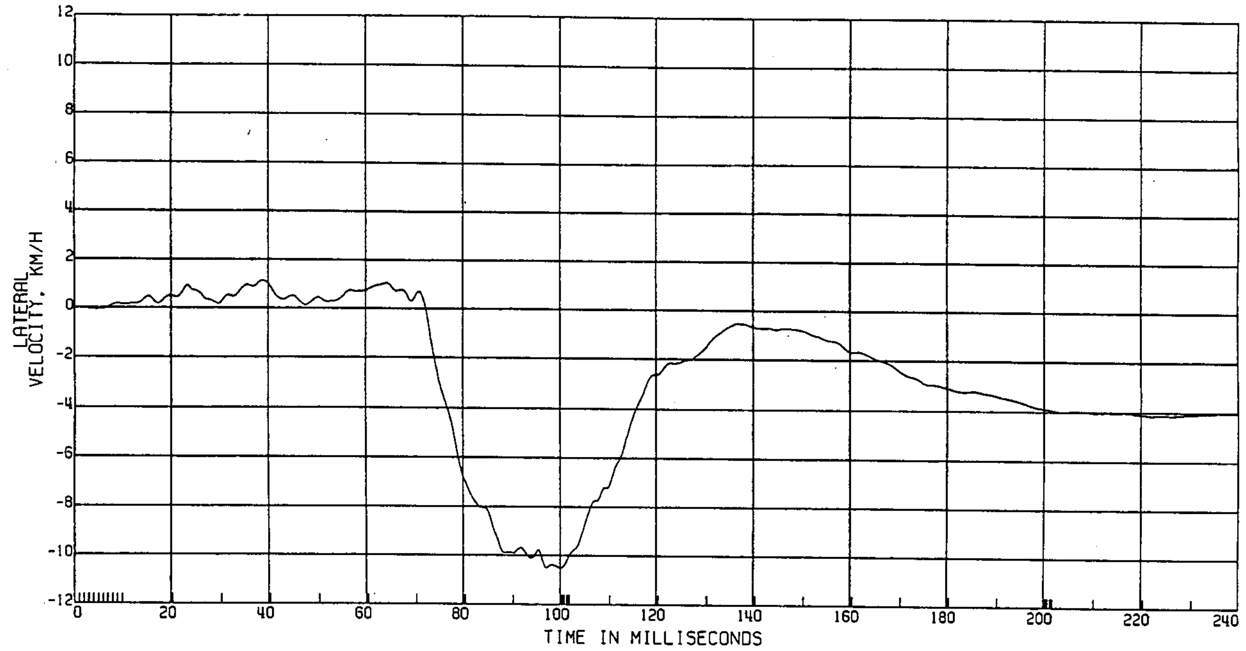
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **77**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

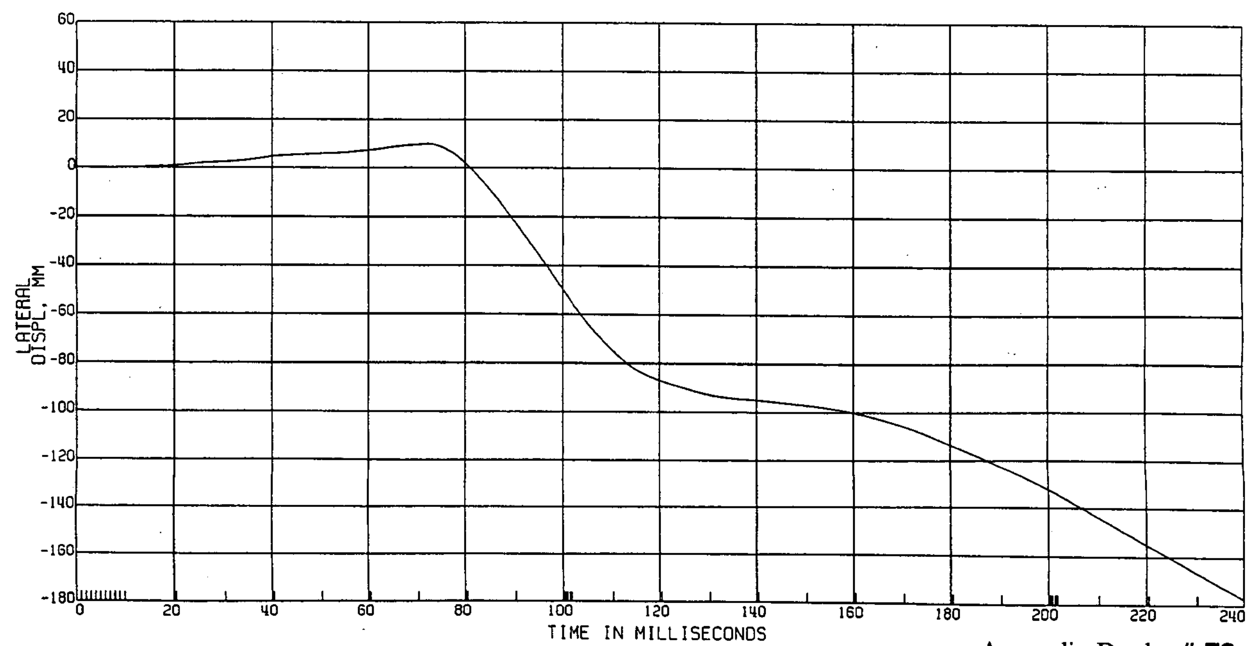
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **78**

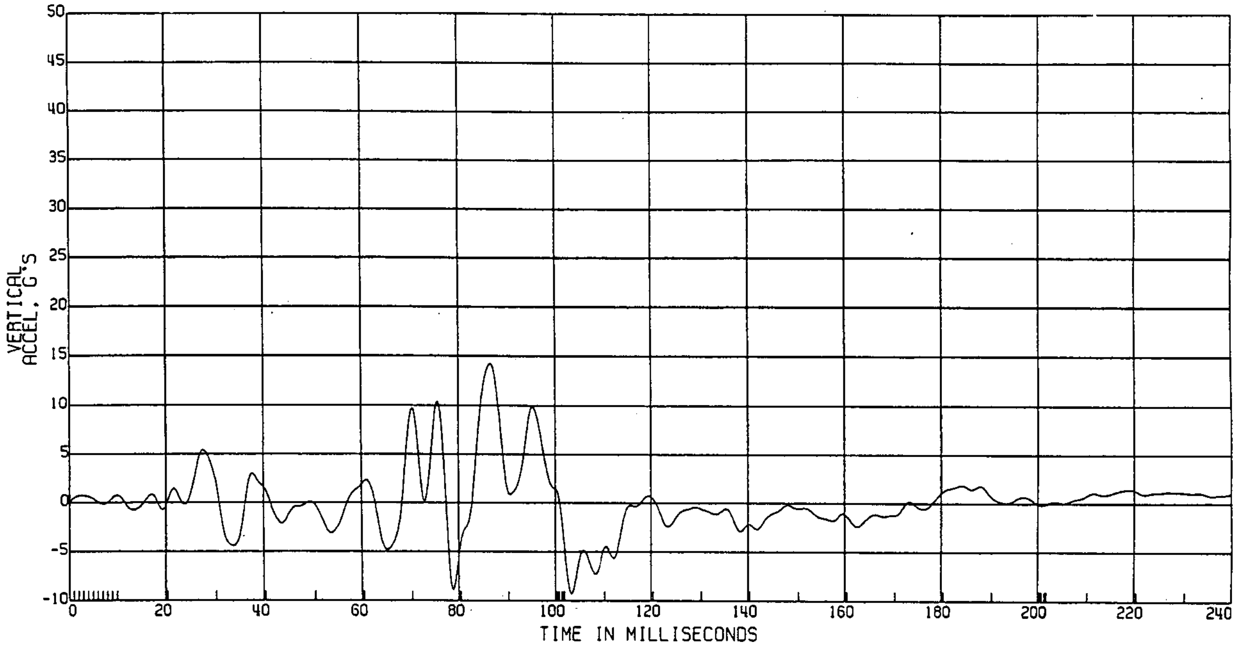
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 60

L. FRT ROCKER ACCEL

TEST DATE:05/14/1997




Appendix D, plot # **79**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

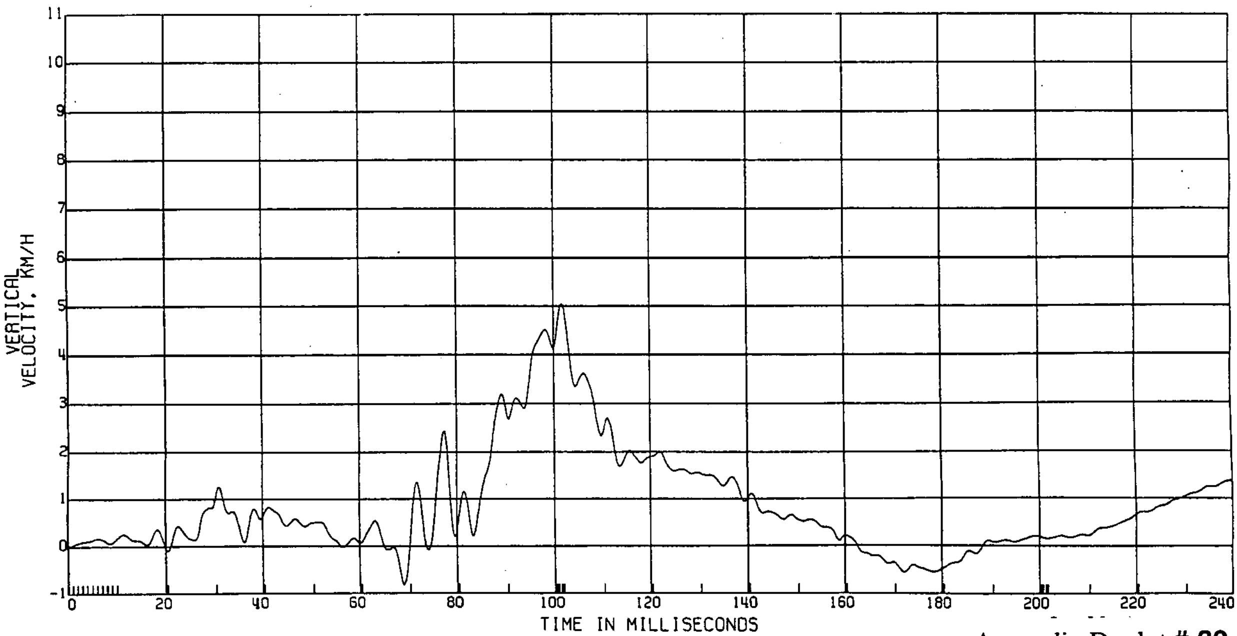
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

L. FRT ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **80**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

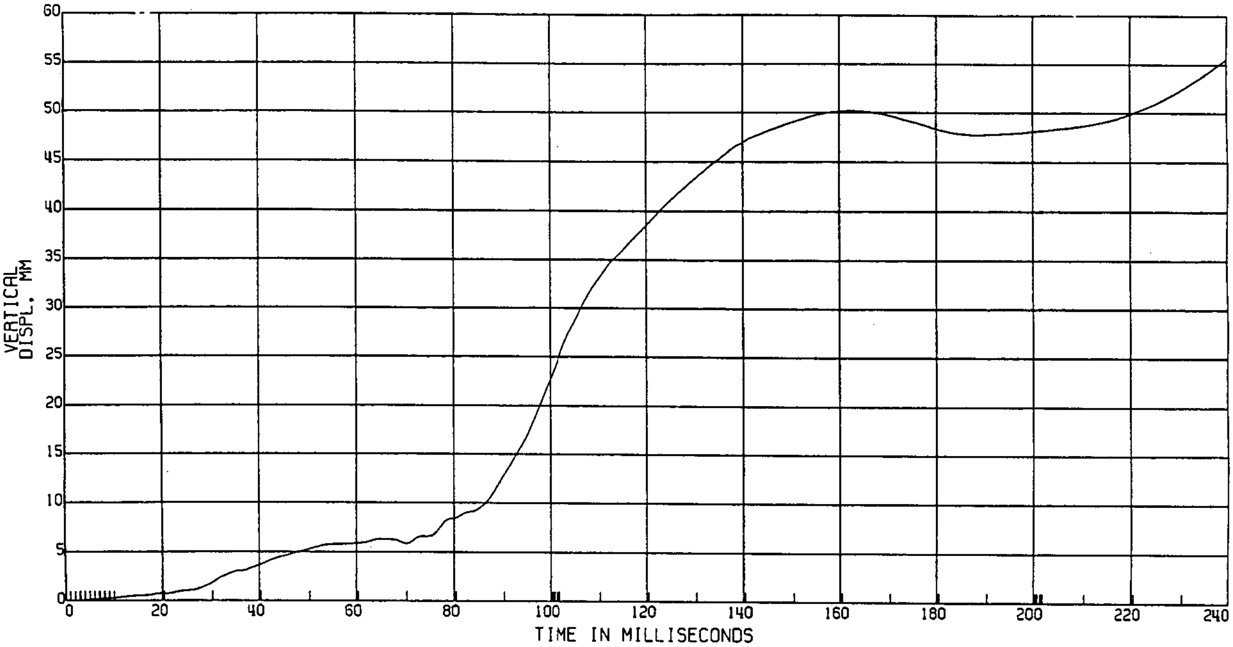
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

L. FRT ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **81**

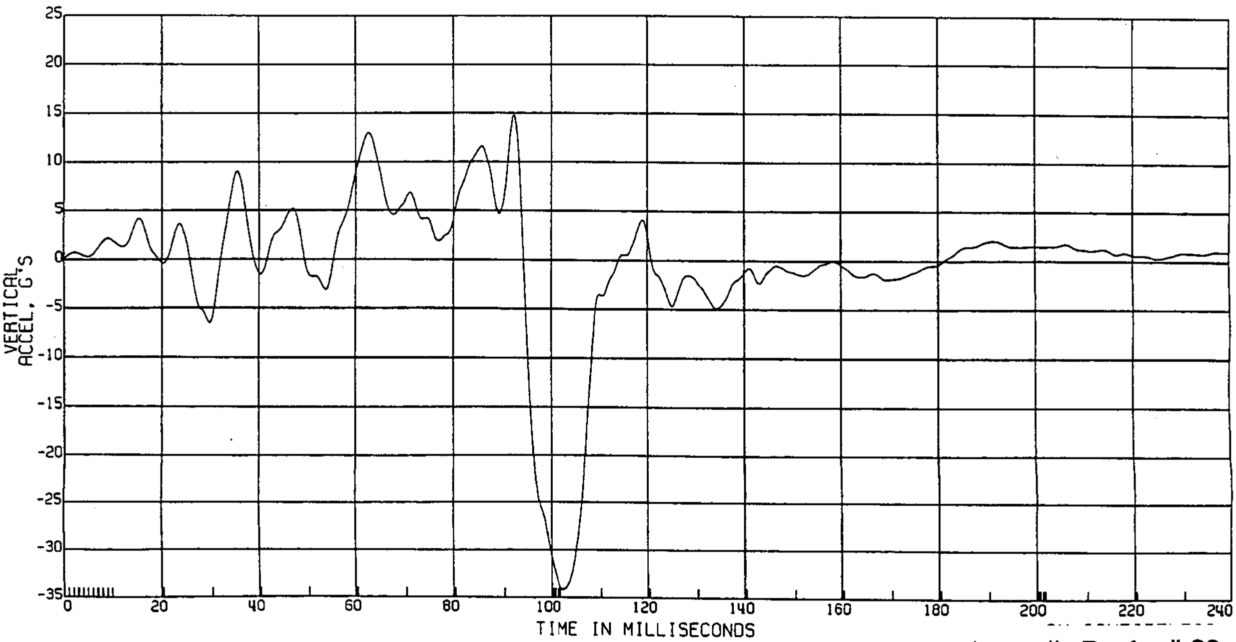
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 60

R. FRT ROCKER ACCEL

TEST DATE:05/14/1997




Appendix D, plot # **82**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

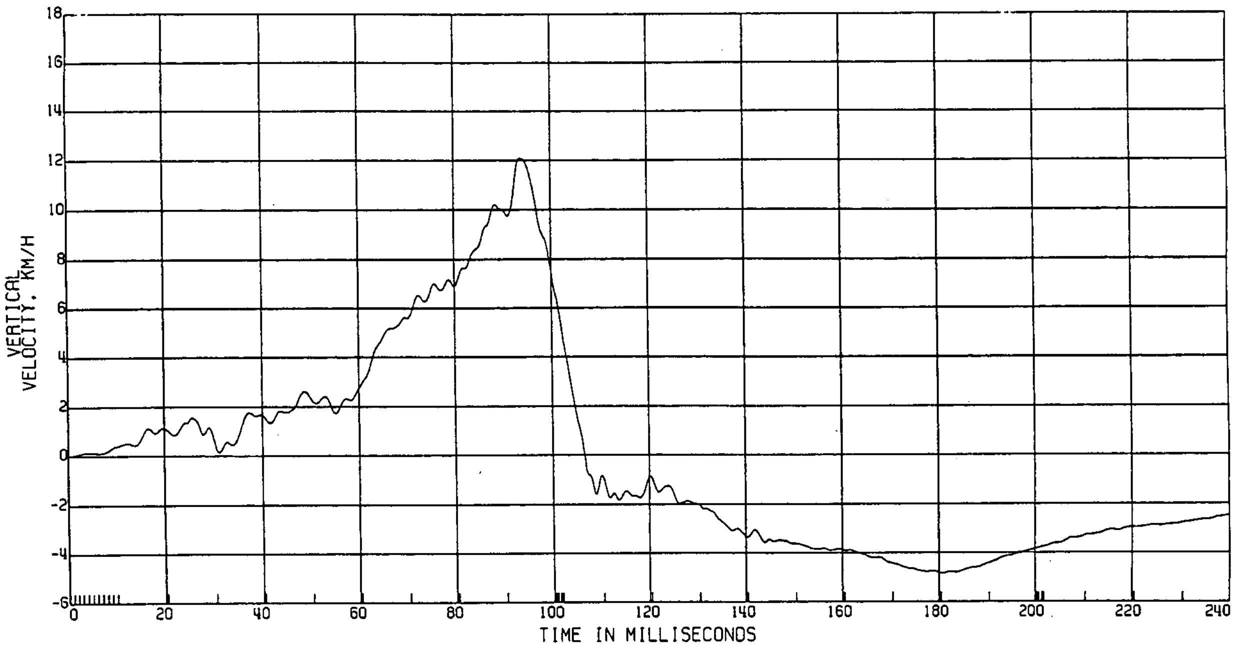
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

R. FRT ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **83**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

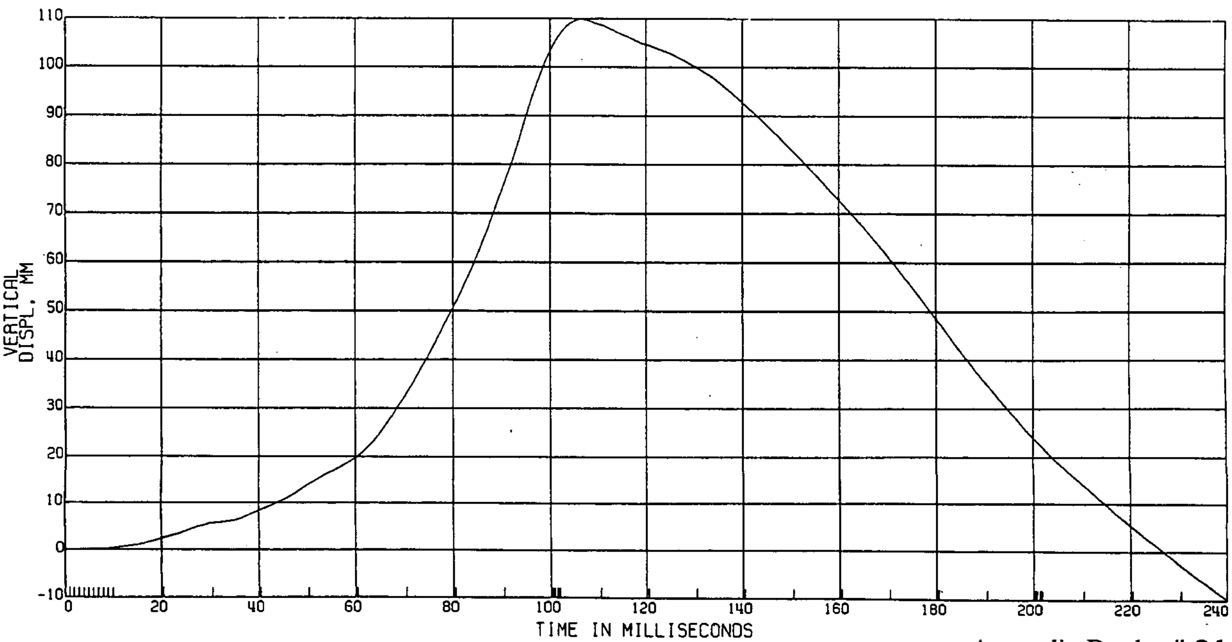
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

R. FRT ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **84**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

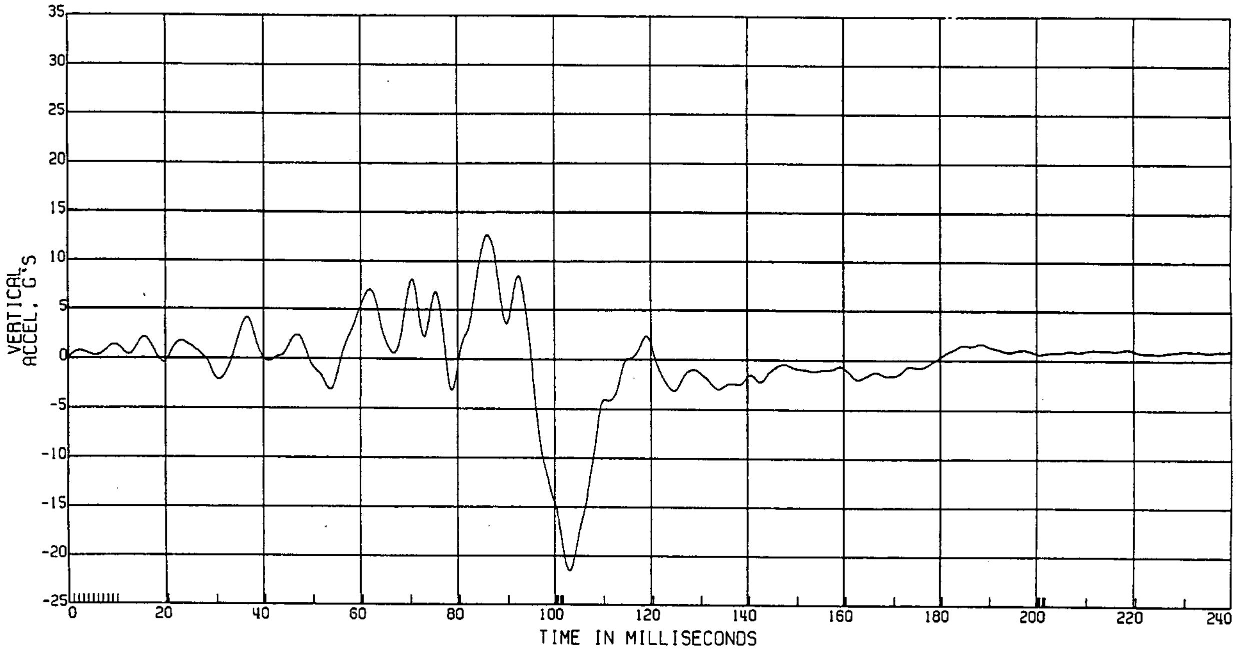
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 60

AVERAGED FRT ROCKER ACCELERATION

(AVGD L. & R. ROCKER ACCELS)

TEST DATE:05/14/1997




Appendix D, plot # **85**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

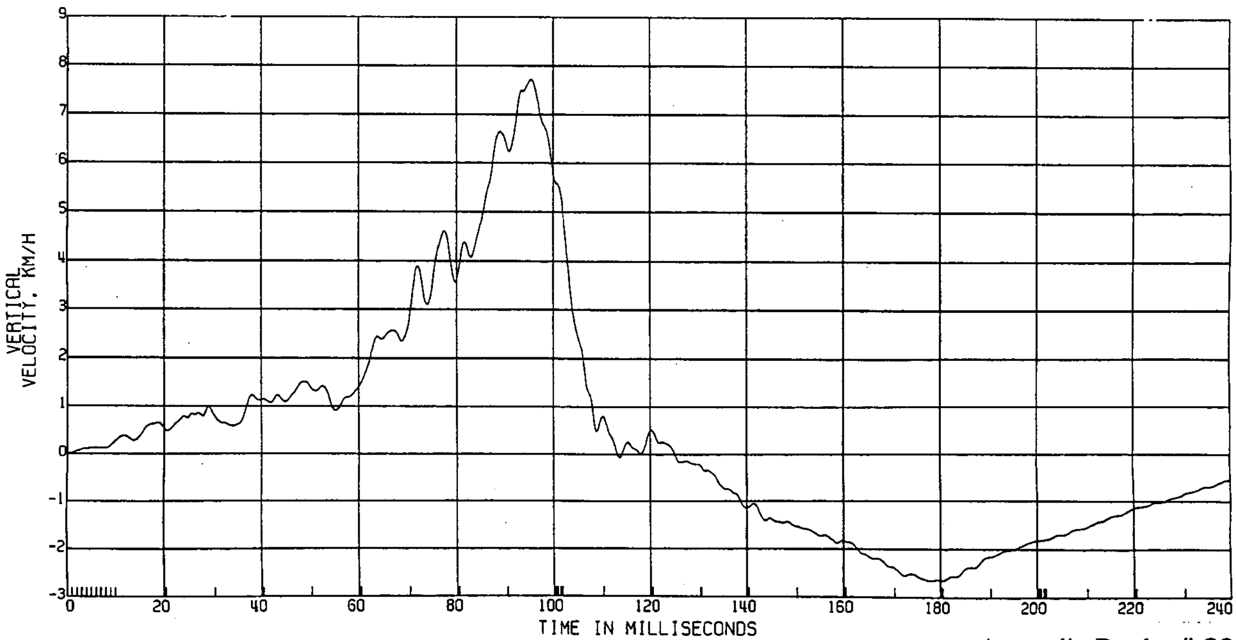
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

AVGD FRT ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997

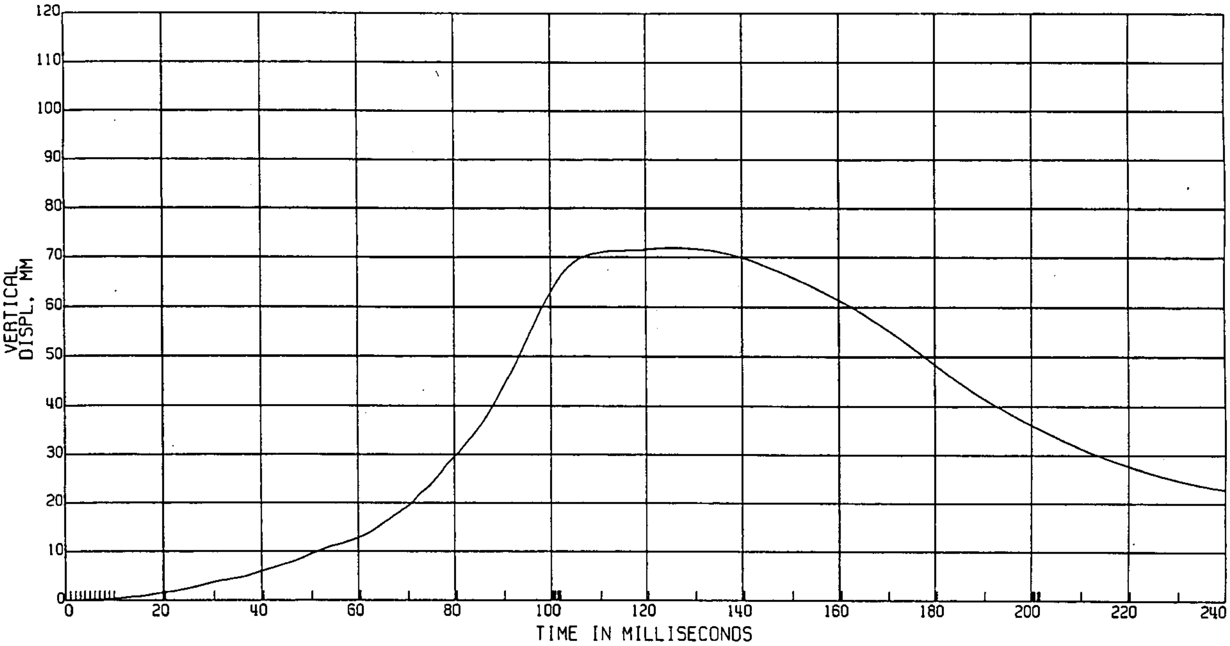



Appendix D, plot # **86**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 AVGD FRT ROCKER DISPL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

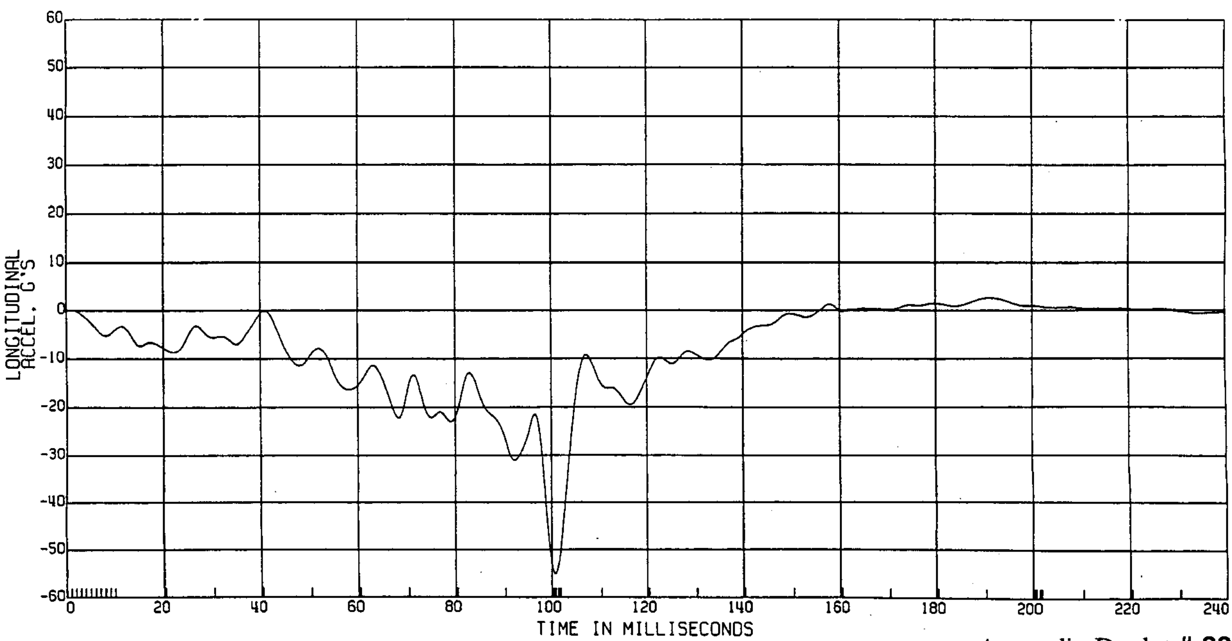



Appendix D, plot # **87**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. FLOORPAN ACCEL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60




Appendix D, plot # **88**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

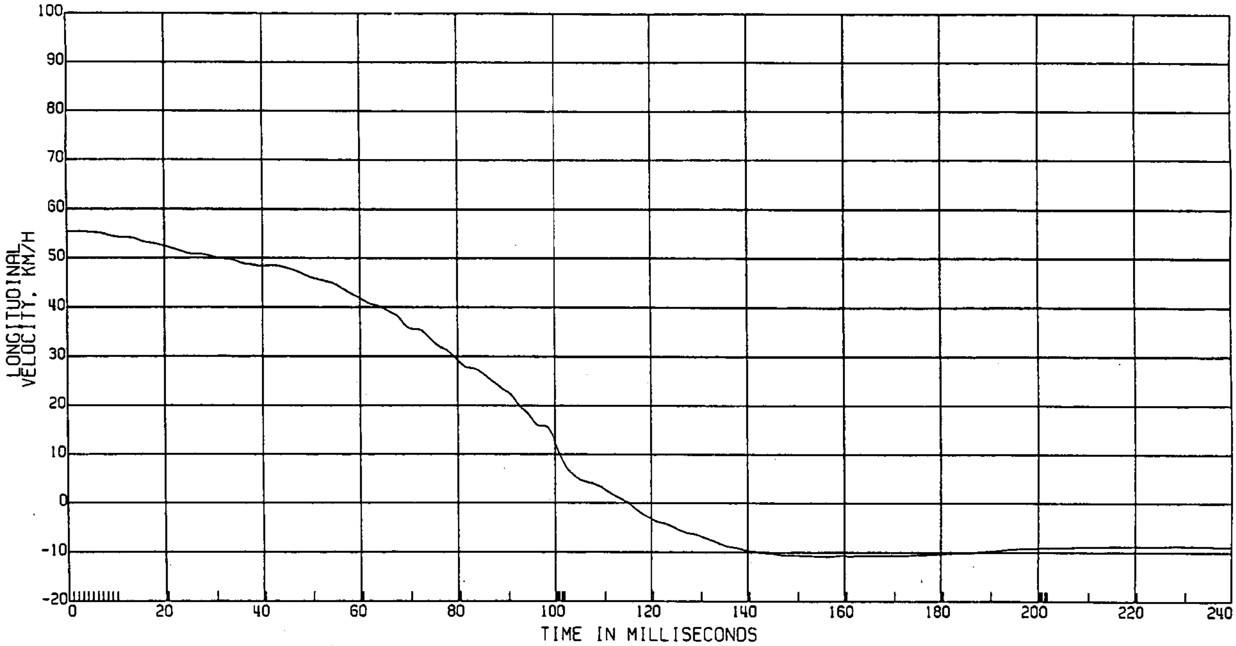
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

R. FLOORPAN VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **89**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

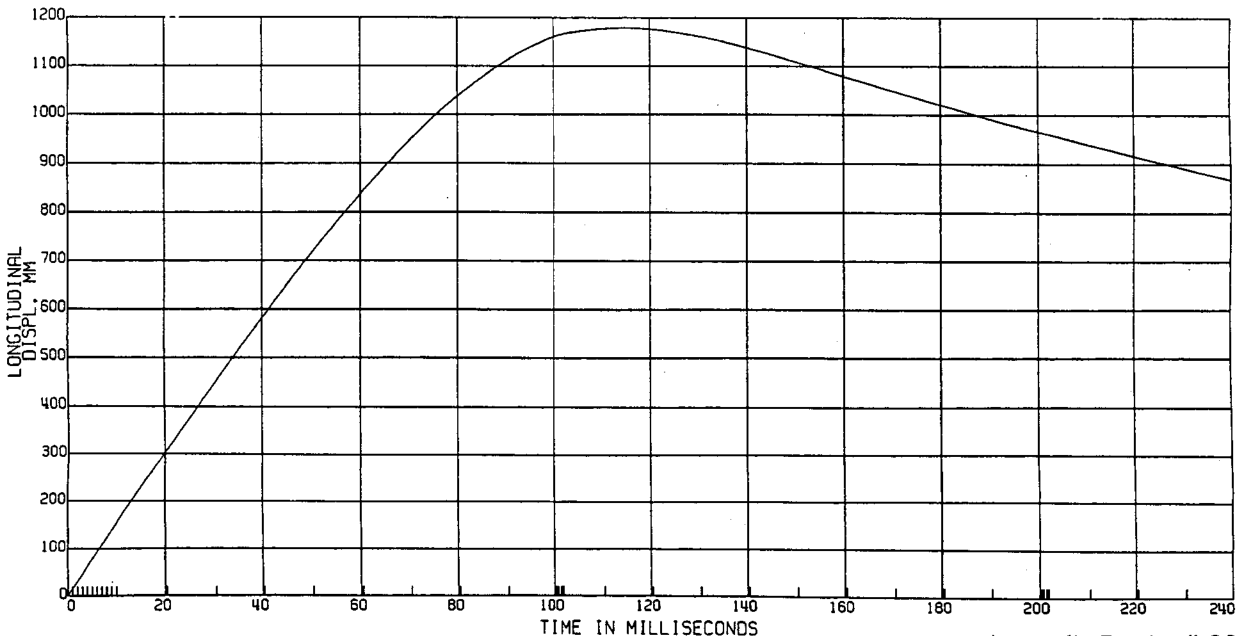
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

R. FLOORPAN DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997

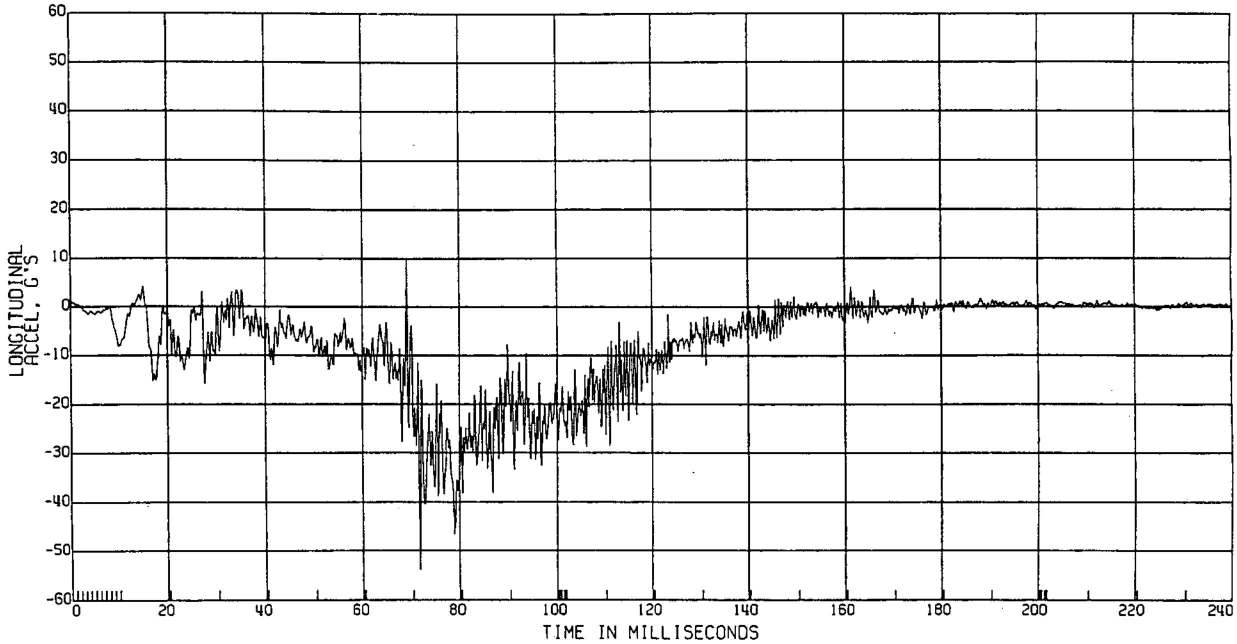



Appendix D, plot # **90**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L.REAR ROCKER ACCEL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

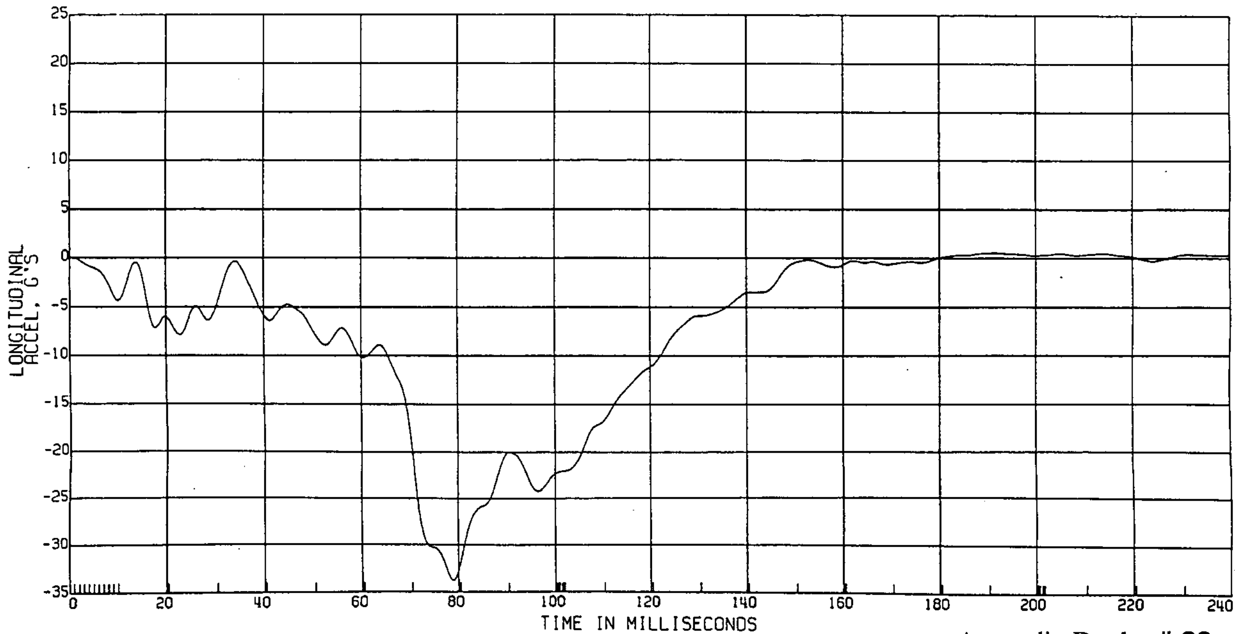



Appendix D, plot # **91**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L.REAR ROCKER ACCEL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60

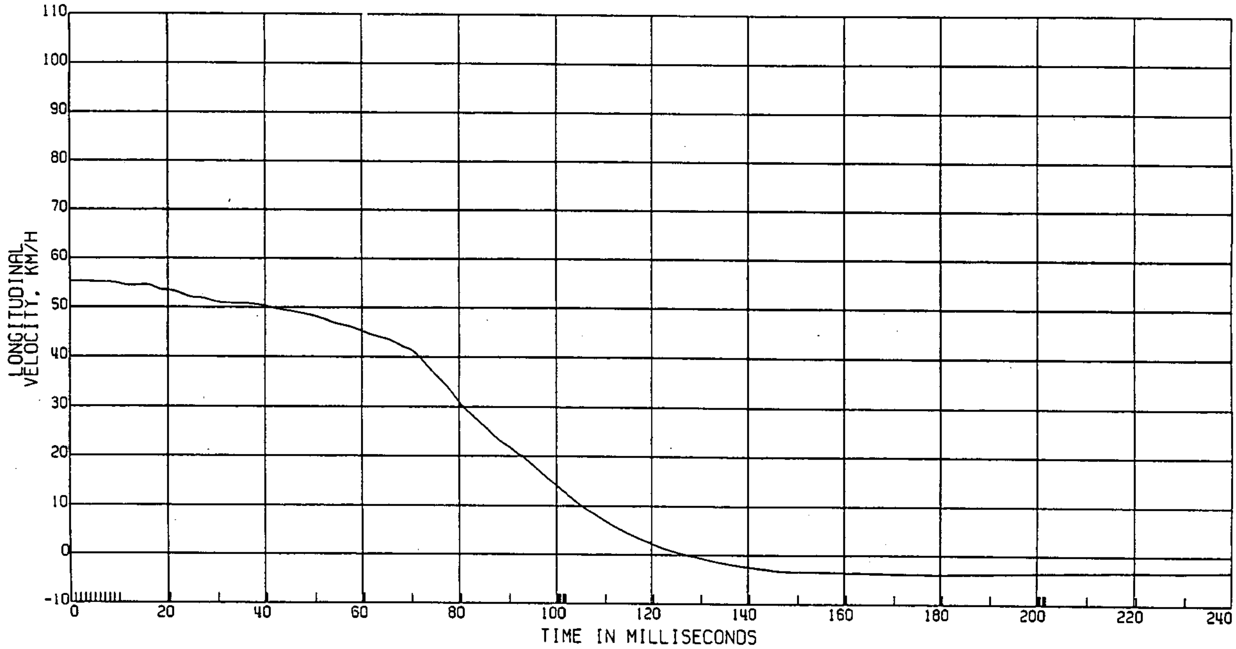



Appendix D, plot # **92**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L.REAR ROCKER VELOCITY TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

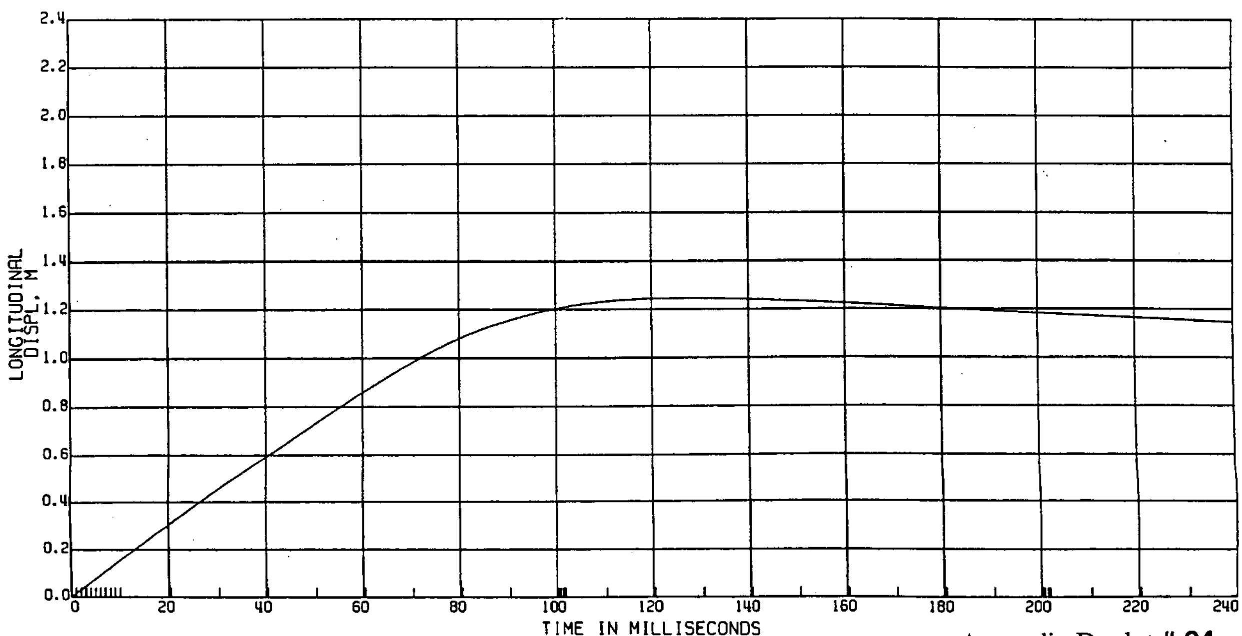



Appendix D, plot # **93**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L.REAR ROCKER DISPL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix D, plot # **94**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE

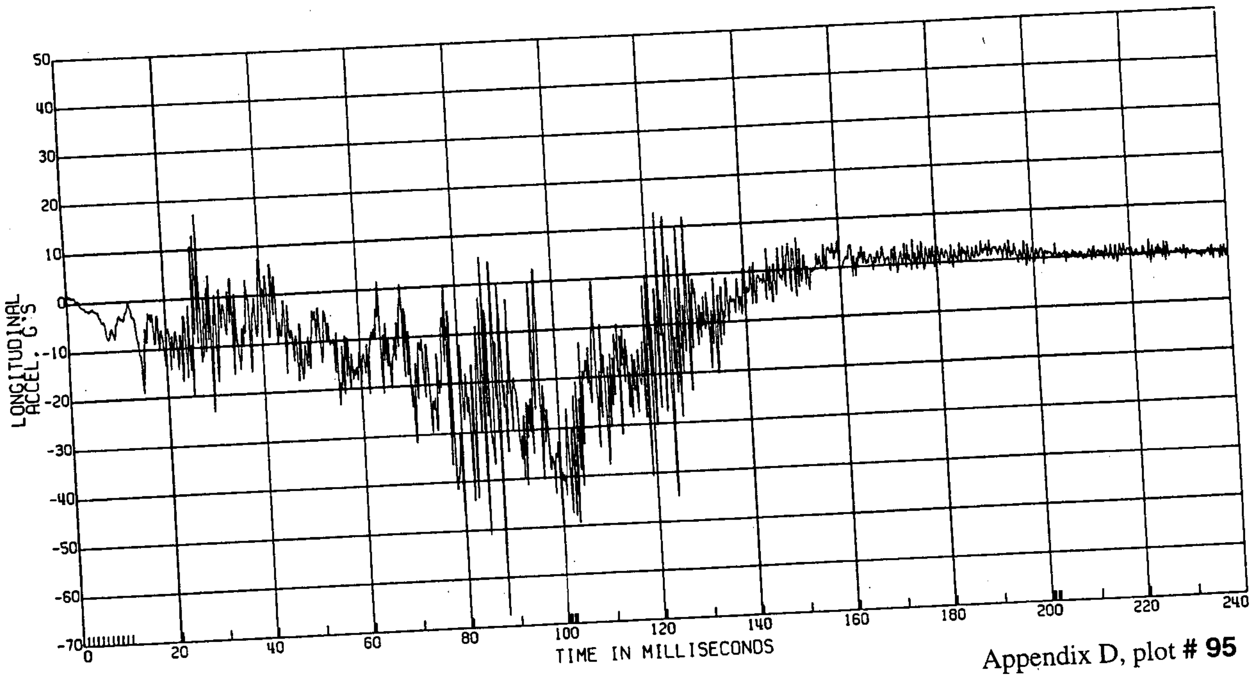
55.3KM/H

R.REAR ROCKER ACCEL

TEST DATE:05/14/1997

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000




Appendix D, plot # 95

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE

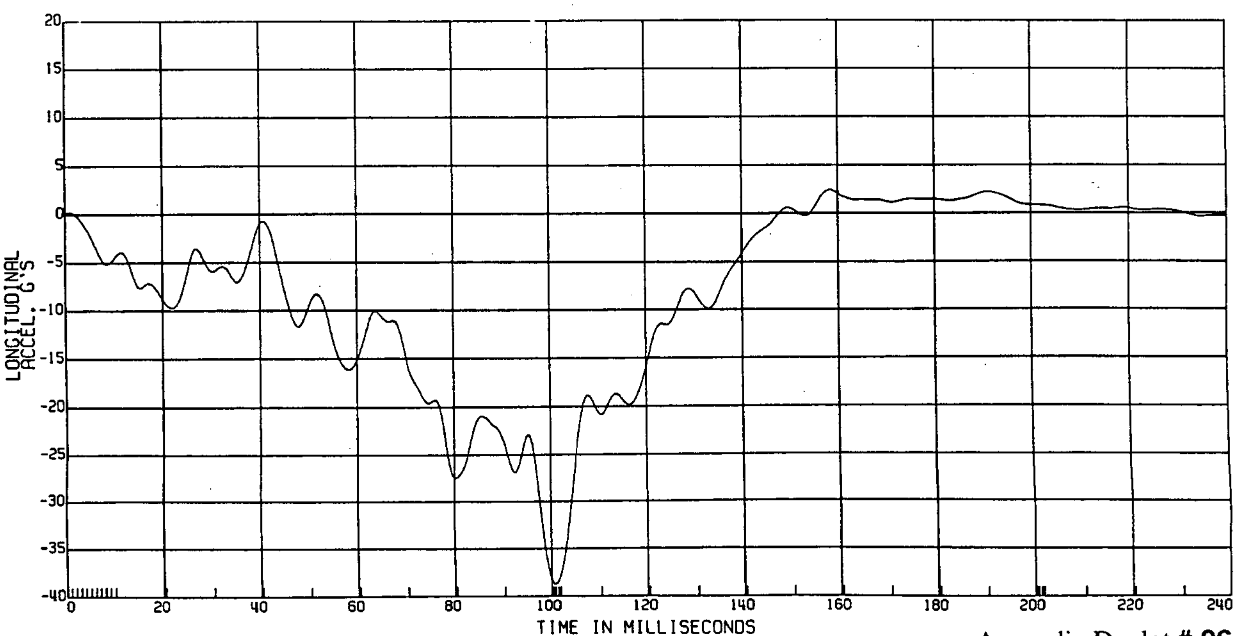
55.3KM/H

R.REAR ROCKER ACCEL

TEST DATE:05/14/1997

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 60

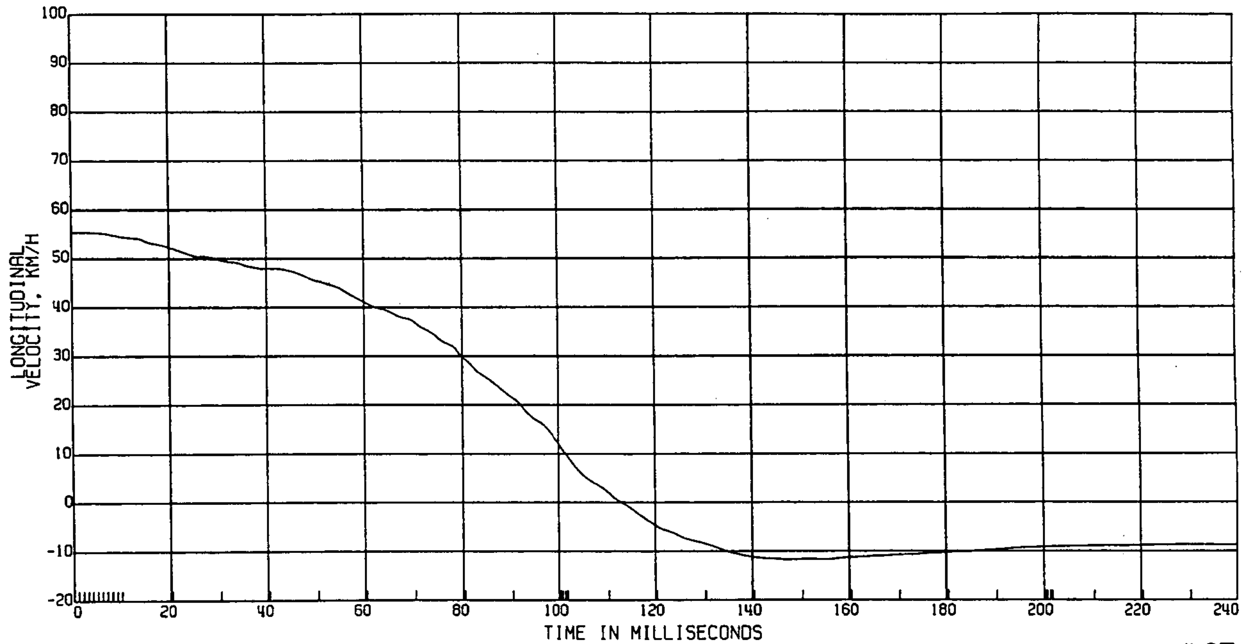



Appendix D, plot # 96

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R.REAR ROCKER VELOCITY TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

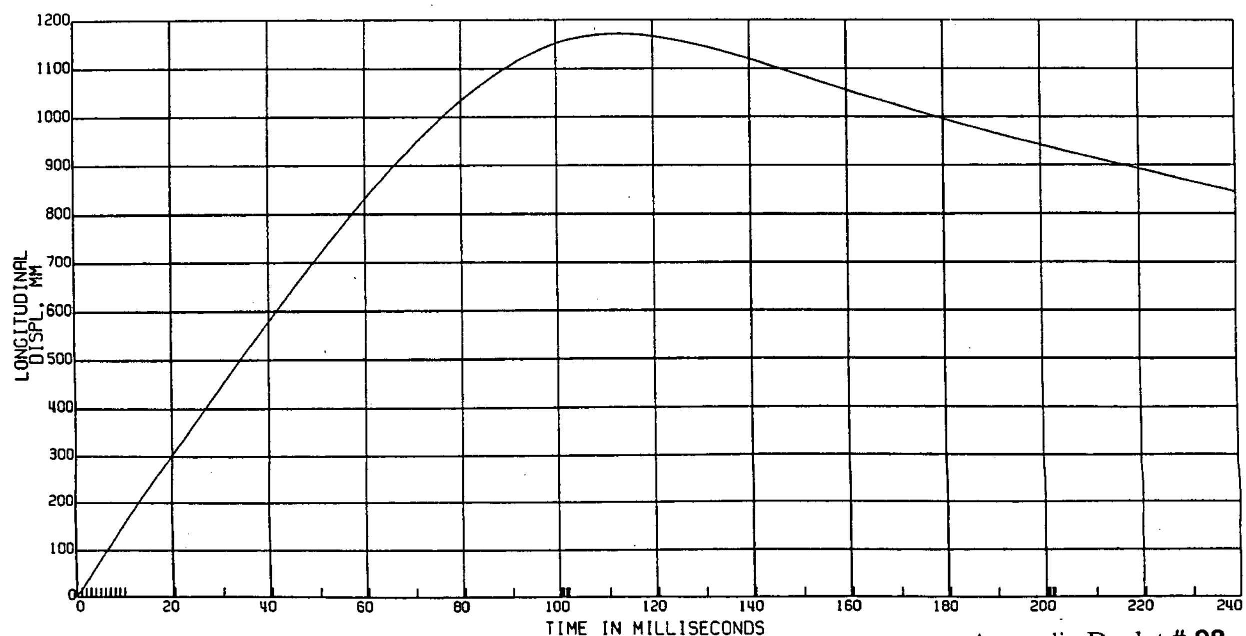



Appendix D, plot # **97**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R.REAR ROCKER DISPL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix D, plot # **98**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

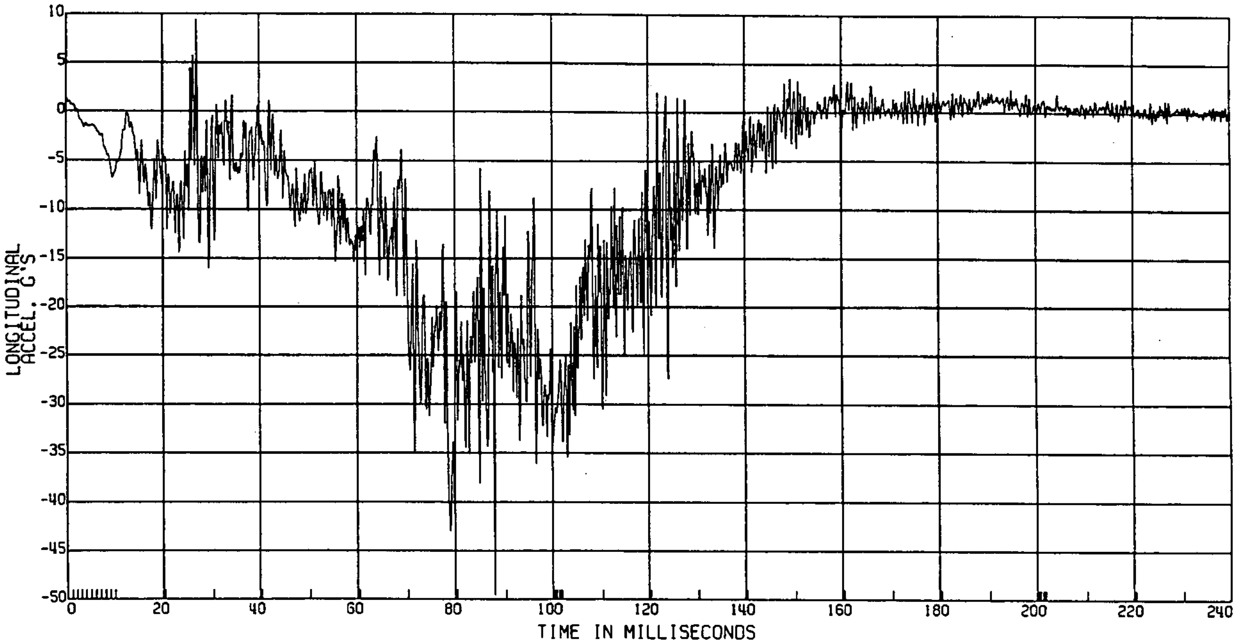
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

AVERAGED REAR ROCKER ACCELERATION

(AVGD L. & R. ROCKER ACCELS)

TEST DATE:05/14/1997




Appendix D, plot # **99**

C11591 FRONT IMPACT

MOVING VEHICLE TO FIXED POLE 55.3KM/H

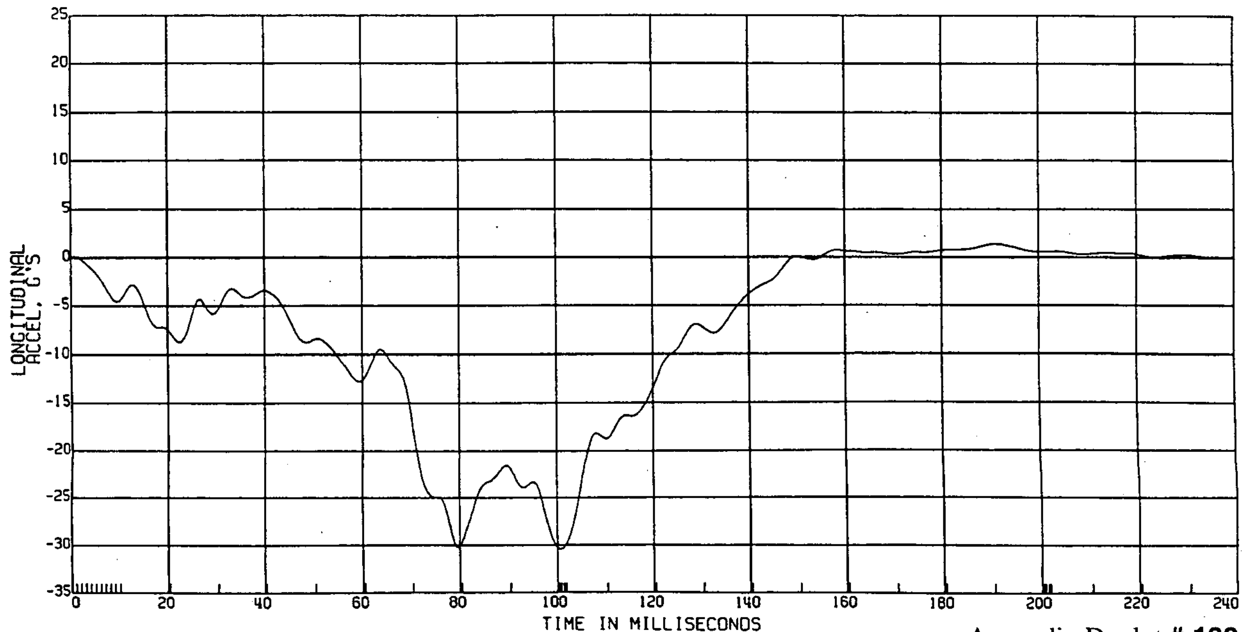
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 60

AVERAGED REAR ROCKER ACCELERATION

(AVGD L. & R. ROCKER ACCELS)

TEST DATE:05/14/1997




Appendix D, plot # **100**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

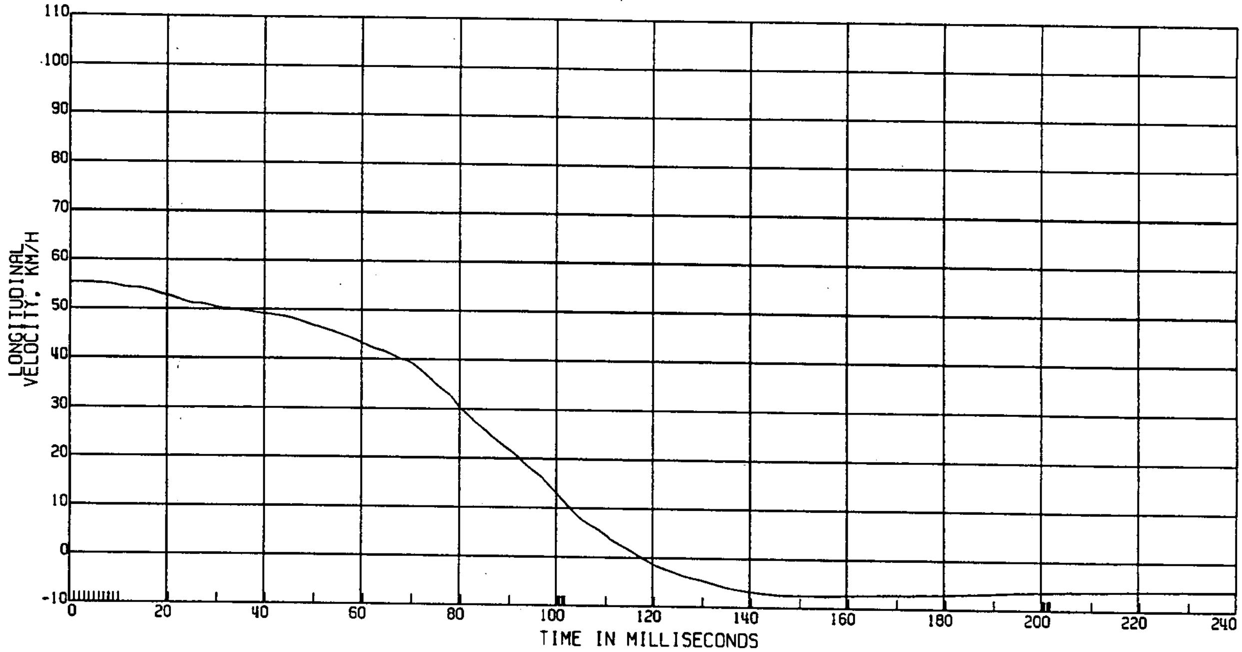
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **101**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

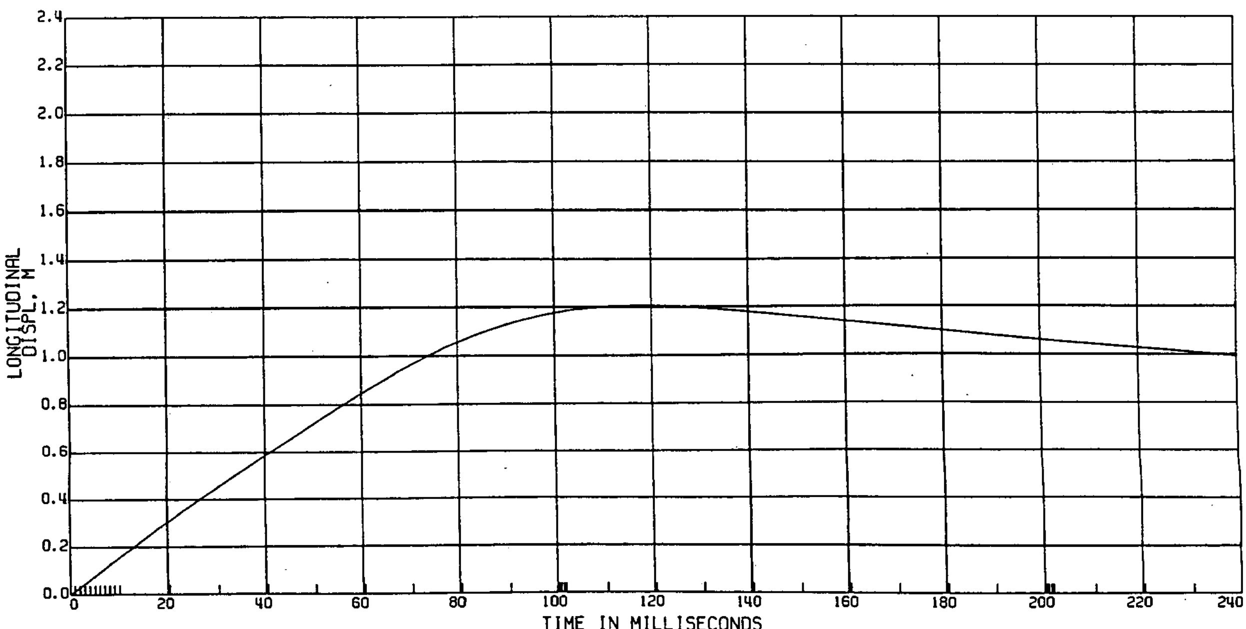
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997

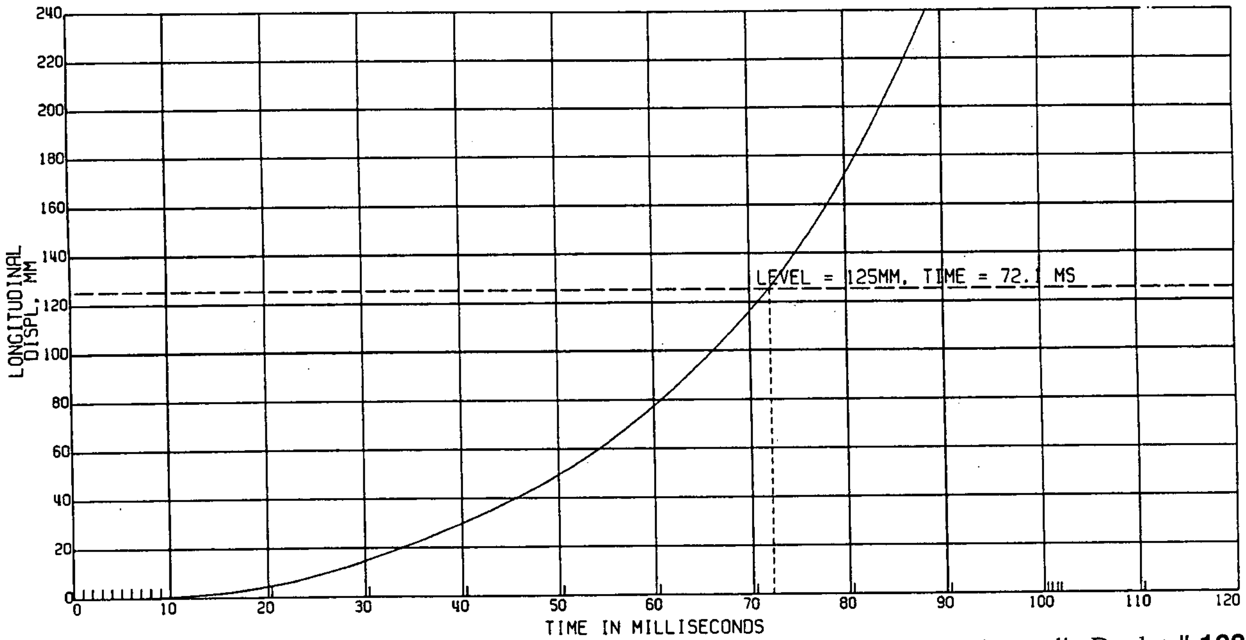



Appendix D, plot # **102**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 COMP. FREE MASS DISP. REL. TO VEHICLE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180

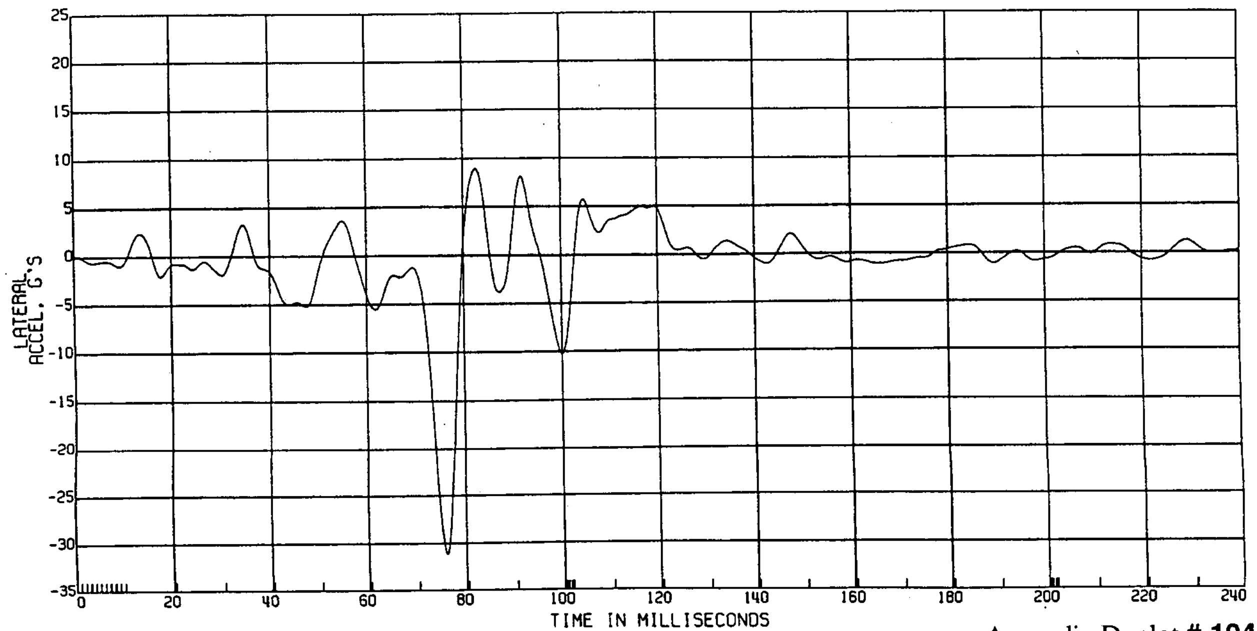



Appendix D, plot # **103**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L.REAR ROCKER ACCEL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60




Appendix D, plot # **104**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

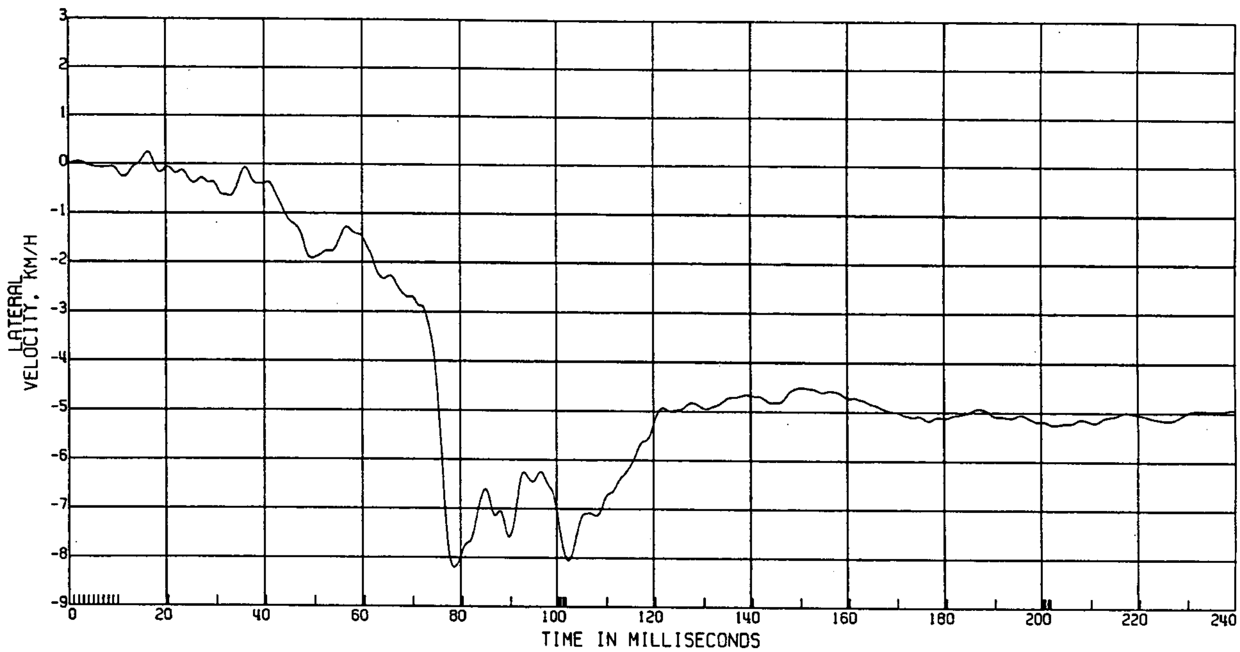
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

L.REAR ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **105**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

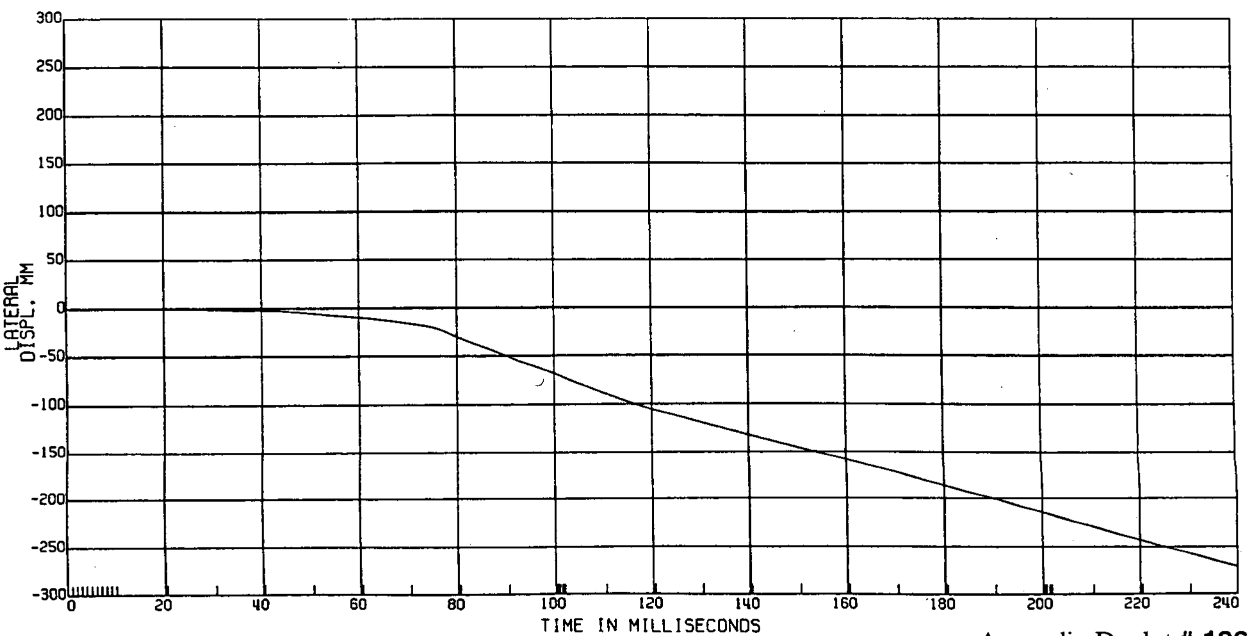
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

L.REAR ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997

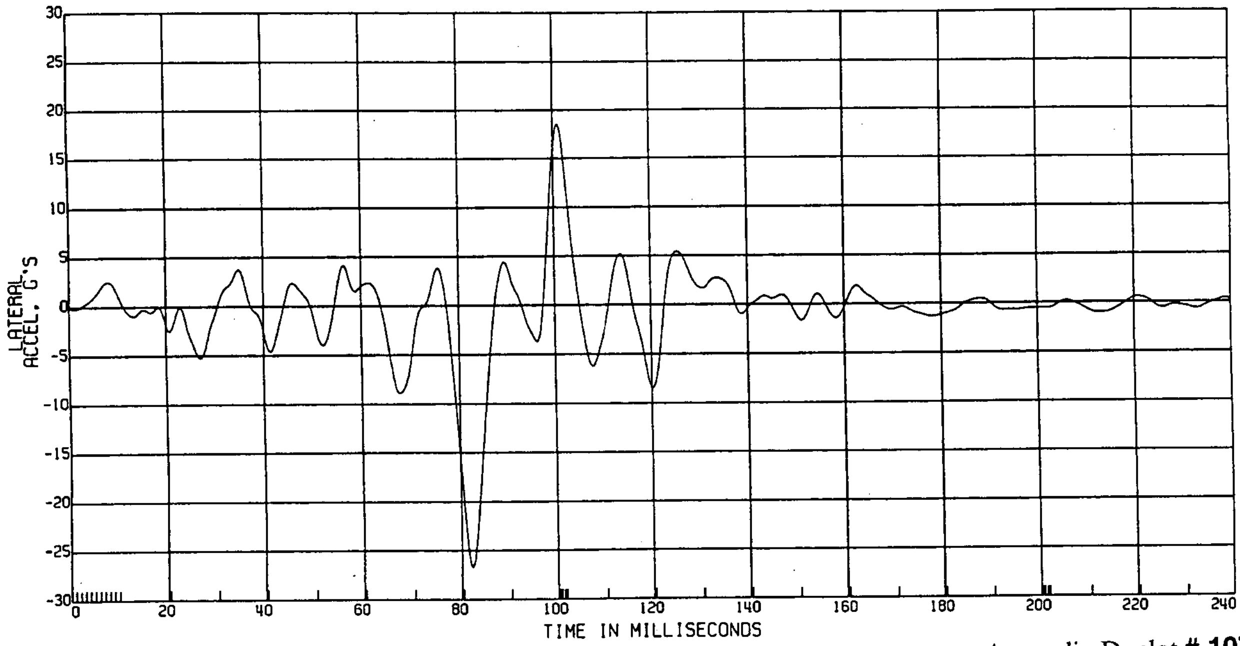



Appendix D, plot # **106**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R.REAR ROCKER ACCEL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60

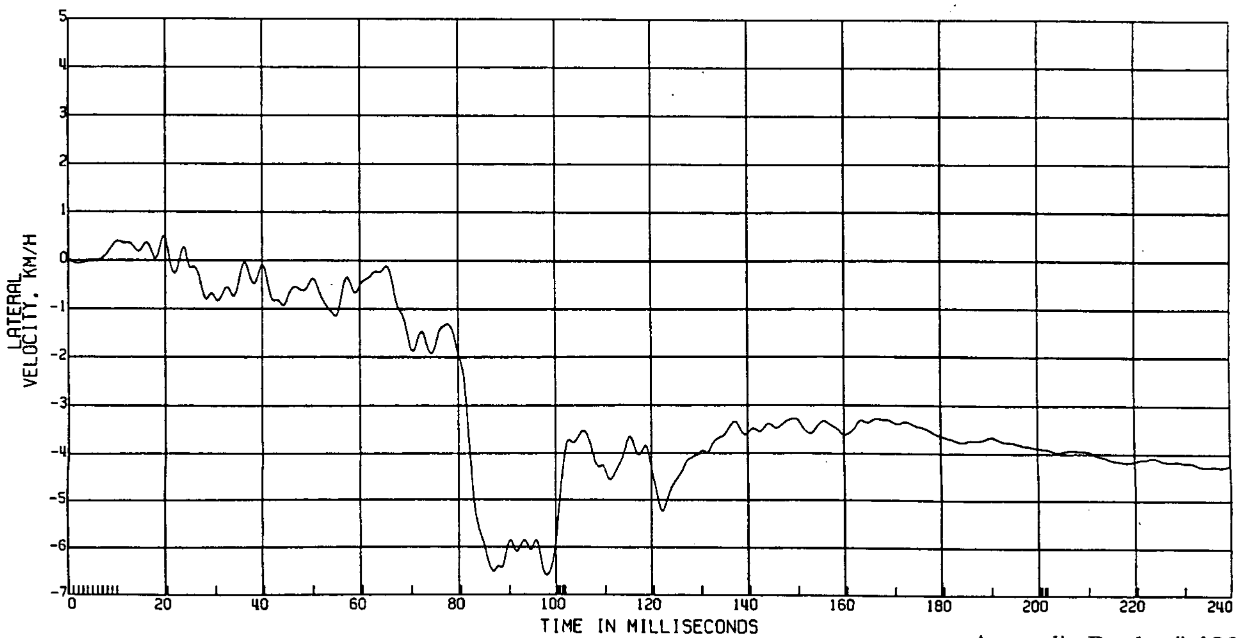



Appendix D, plot # **107**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R.REAR ROCKER VELOCITY TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

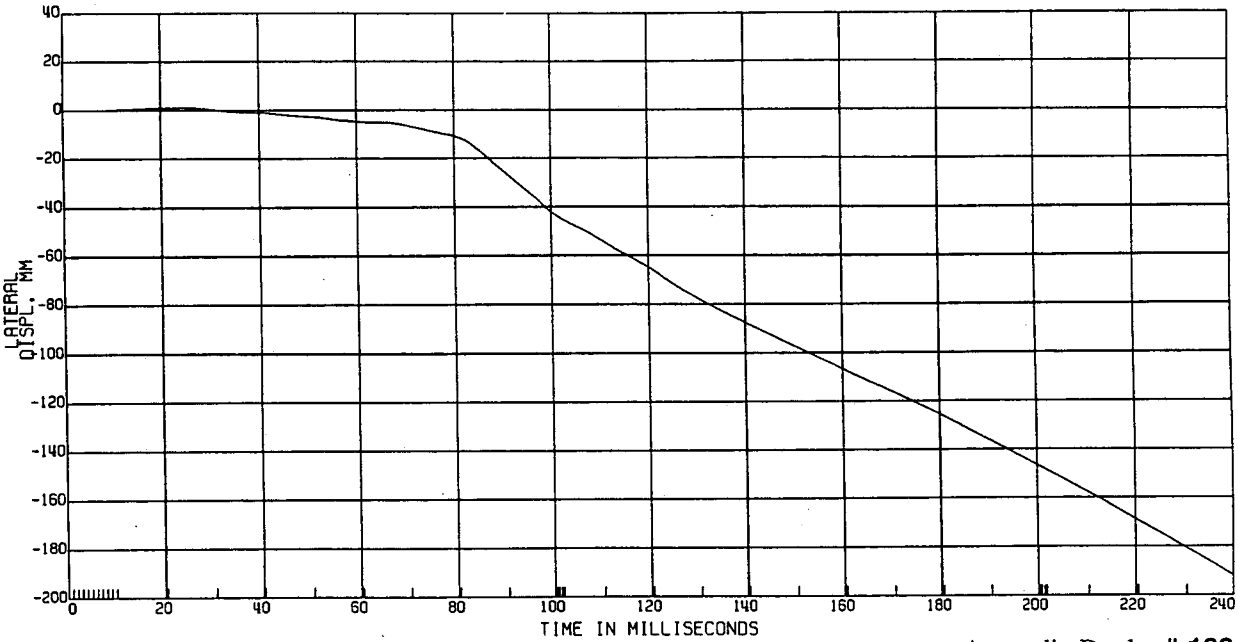



Appendix D, plot # **108**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R.REAR ROCKER DISPL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

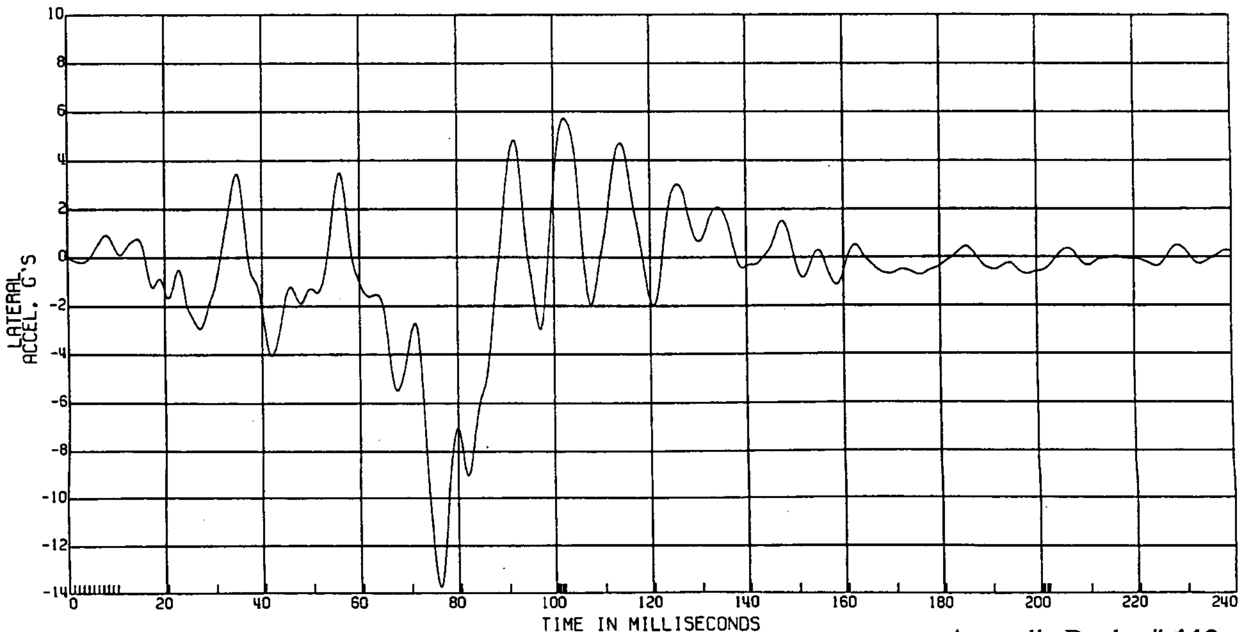



Appendix D, plot # **109**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 AVERAGED REAR ROCKER ACCELERATION TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60 (AVGD L. & R. ROCKER ACCELS)



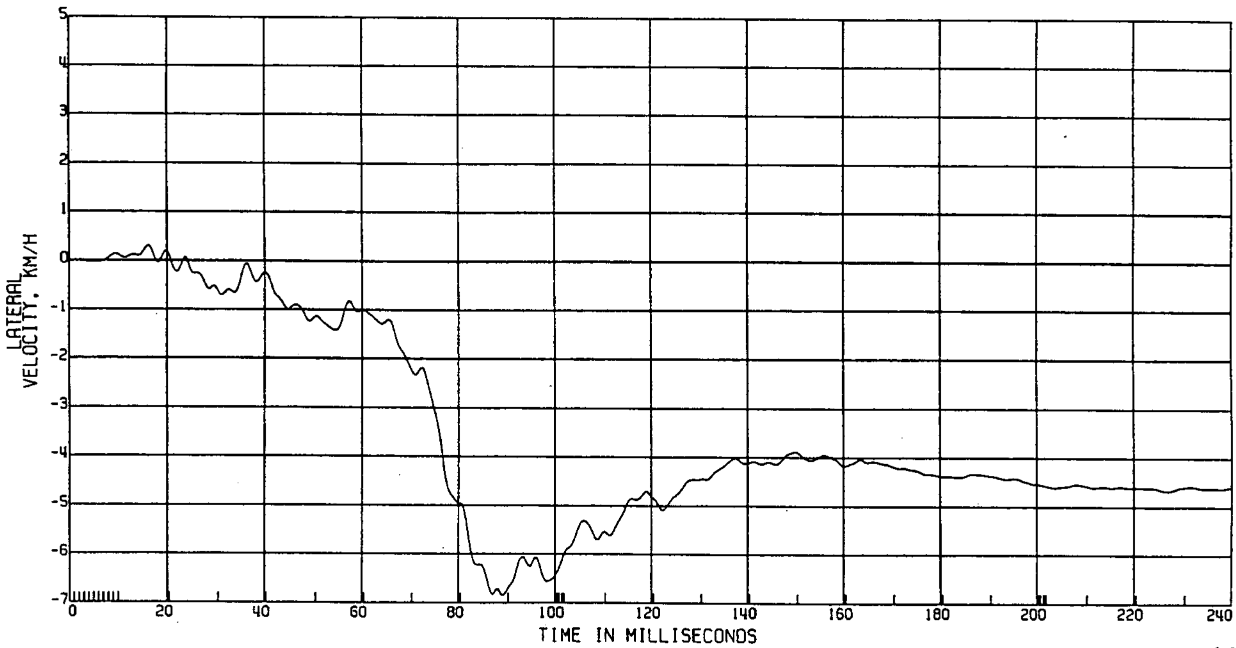

Appendix D, plot # **110**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997



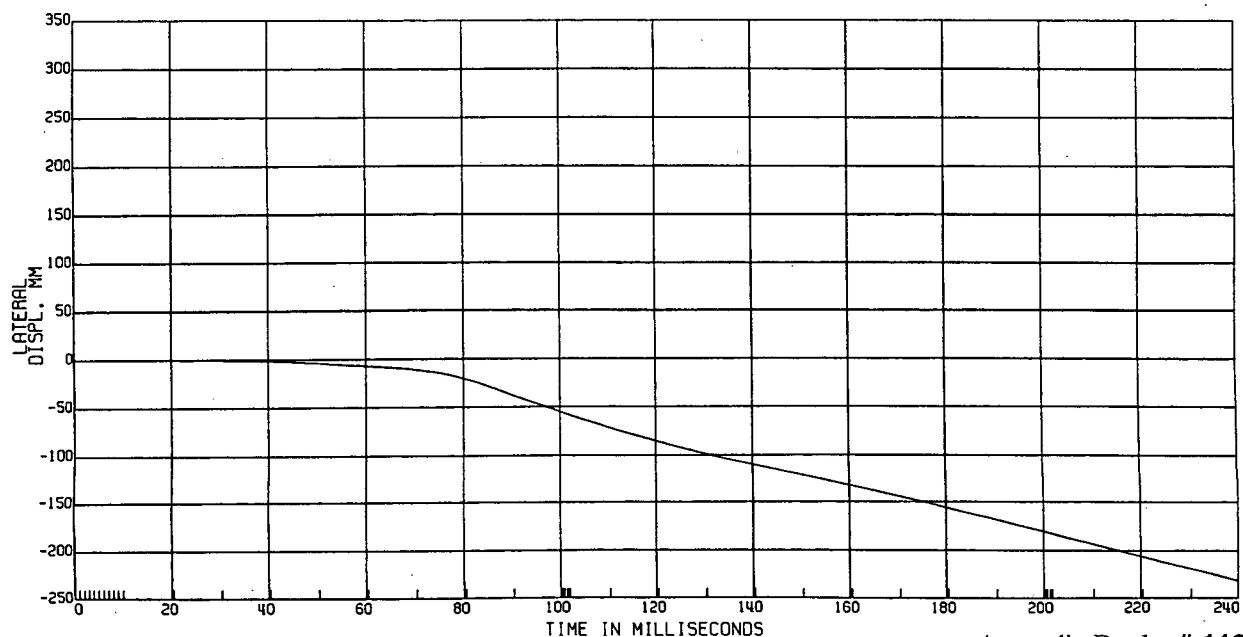

Appendix D, plot # **111**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997

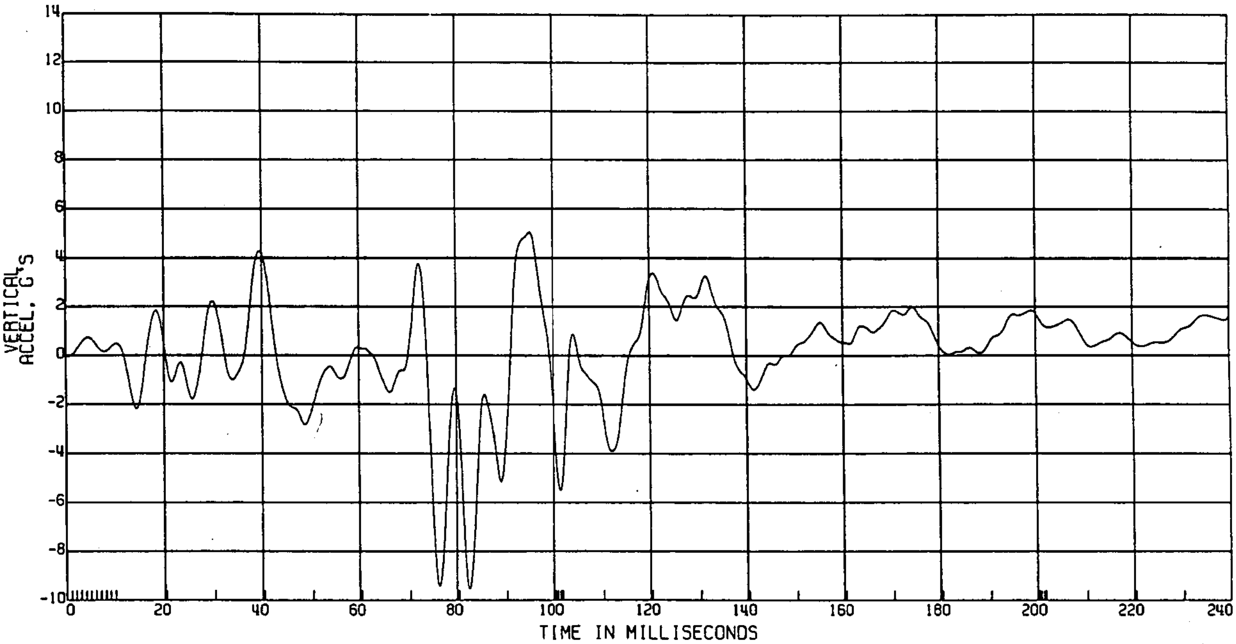



Appendix D, plot # **112**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L.REAR ROCKER ACCEL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60

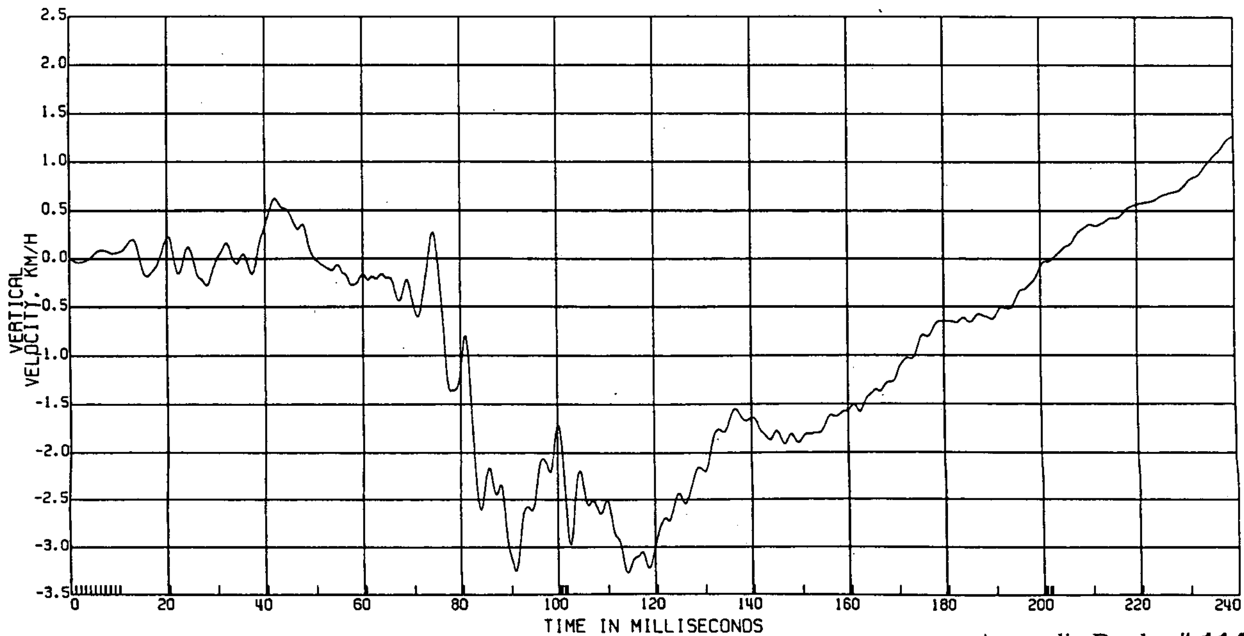



Appendix D, plot # **113**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L.REAR ROCKER VELOCITY TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

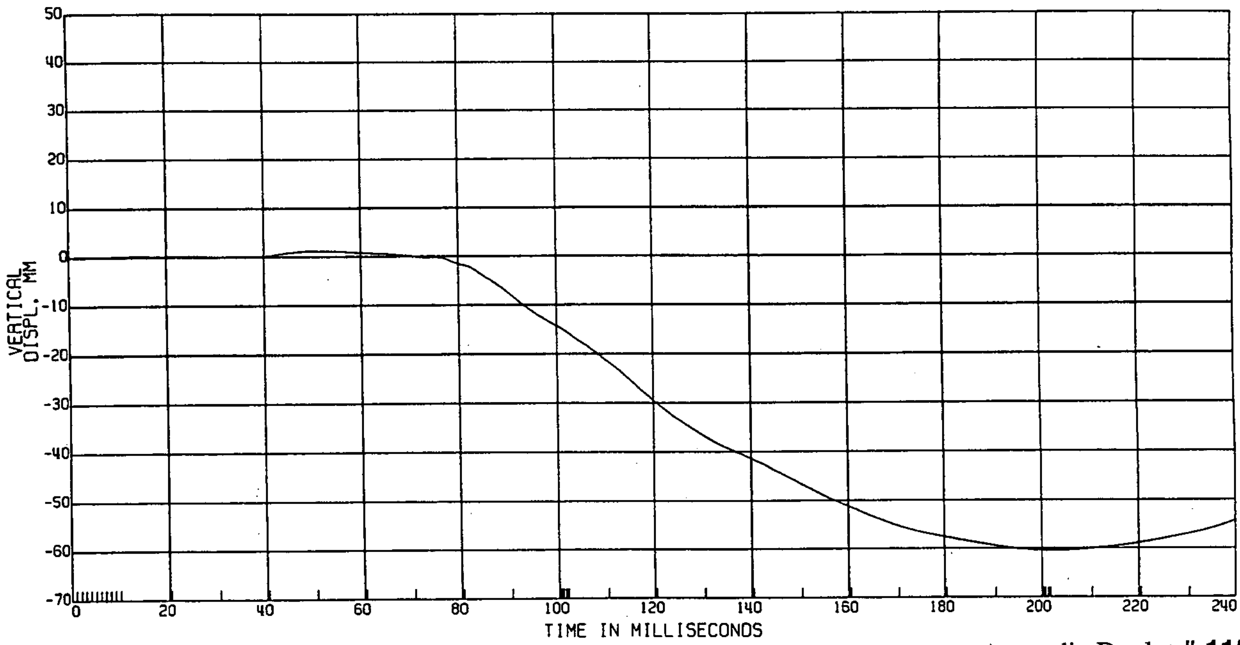



Appendix D, plot # **114**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L.REAR ROCKER DISPL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

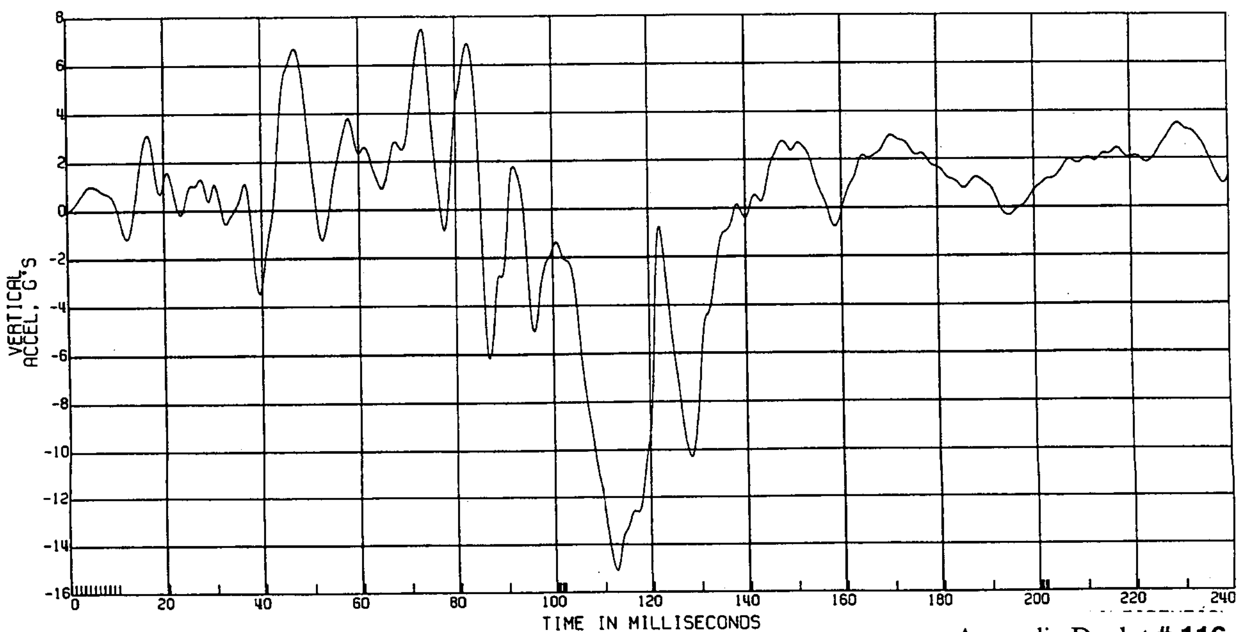



Appendix D, plot # **115**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R.REAR ROCKER ACCEL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60



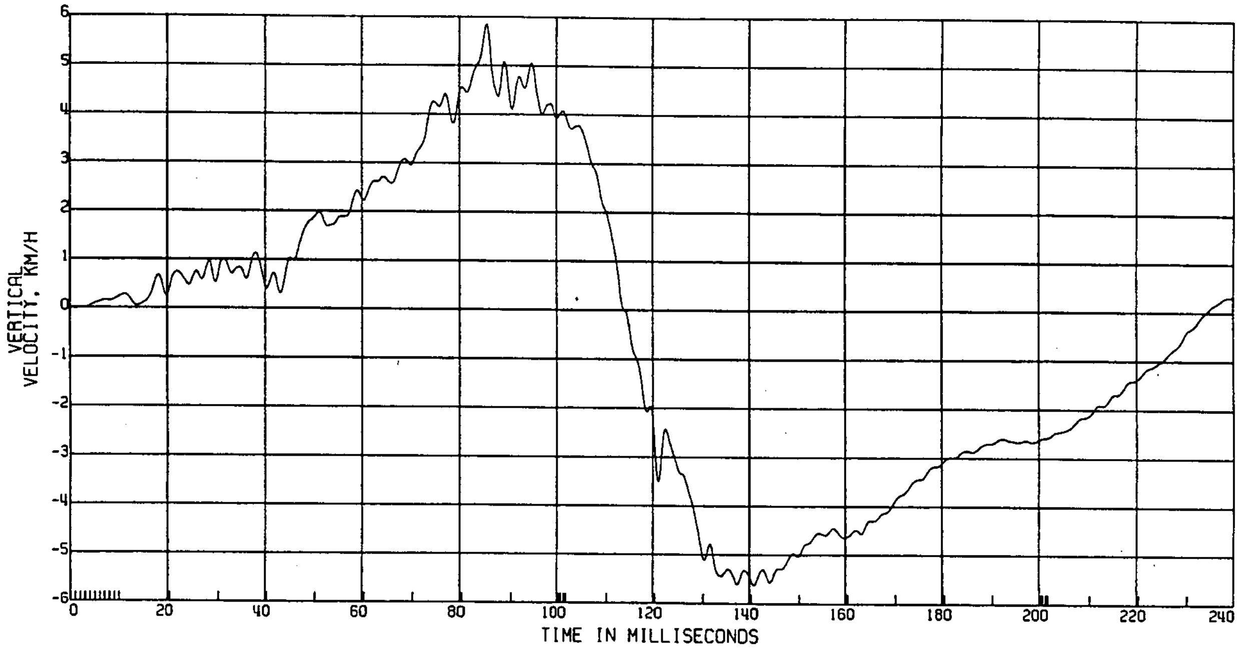

Appendix D, plot # **116**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

R.REAR ROCKER VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997



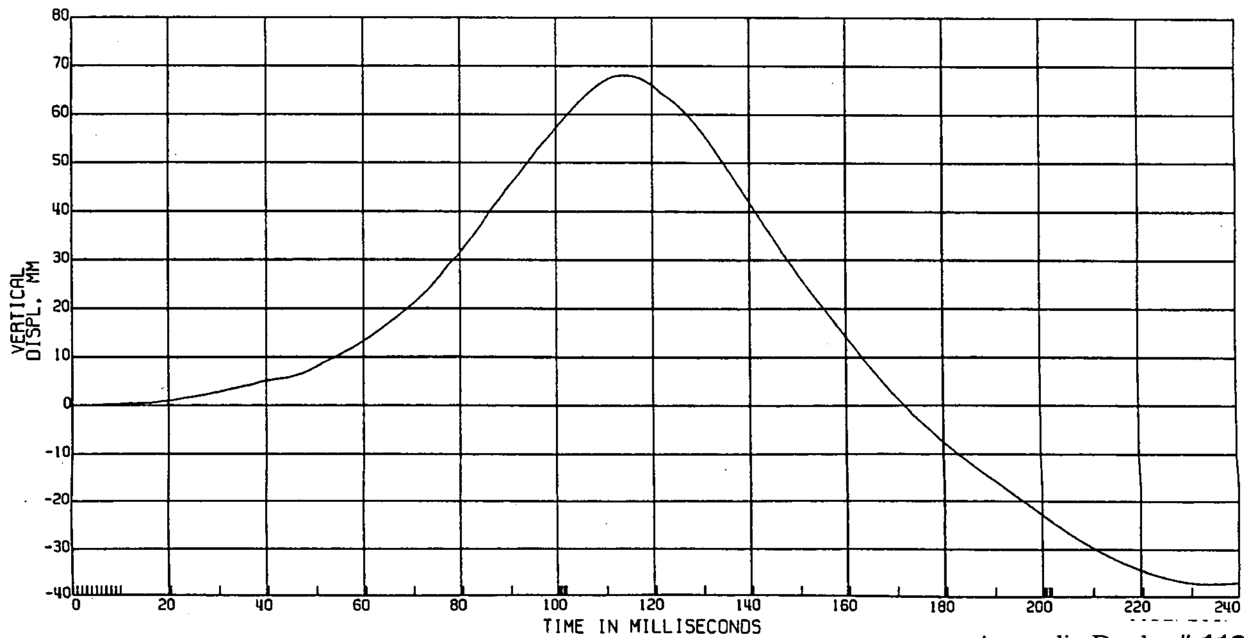

Appendix D, plot # **117**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

R.REAR ROCKER DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **118**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

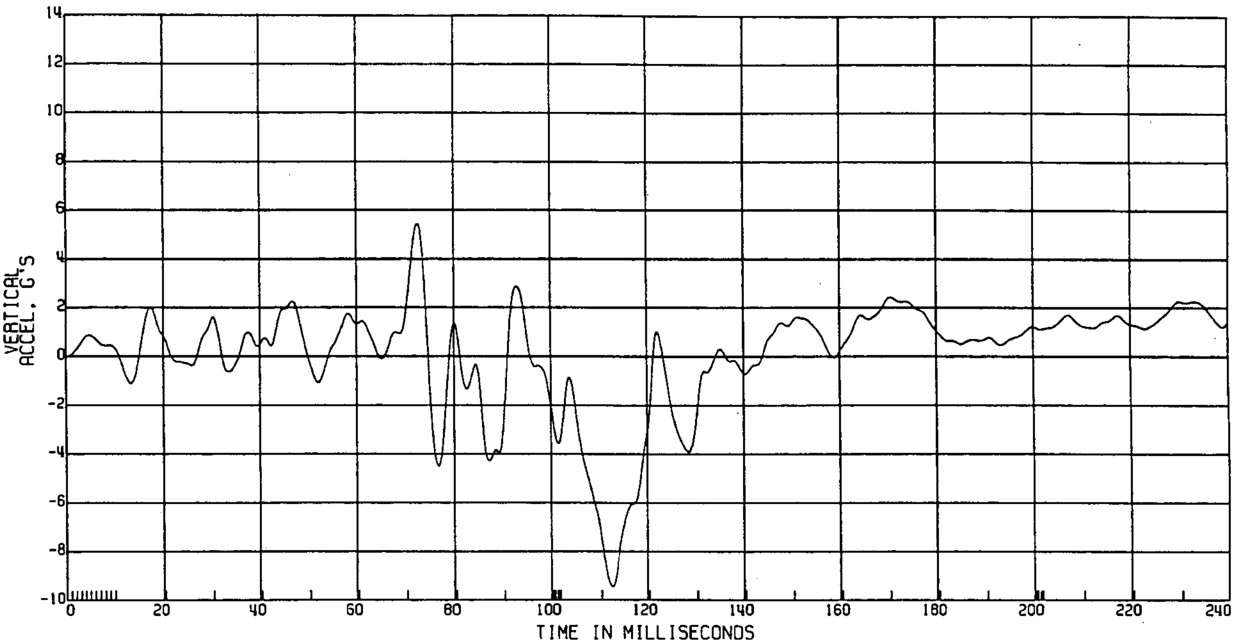
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 60

AVERAGED REAR ROCKER ACCELERATION

(AVGD L. & R. ROCKER ACCELS)

TEST DATE:05/14/1997




Appendix D, plot # **119**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

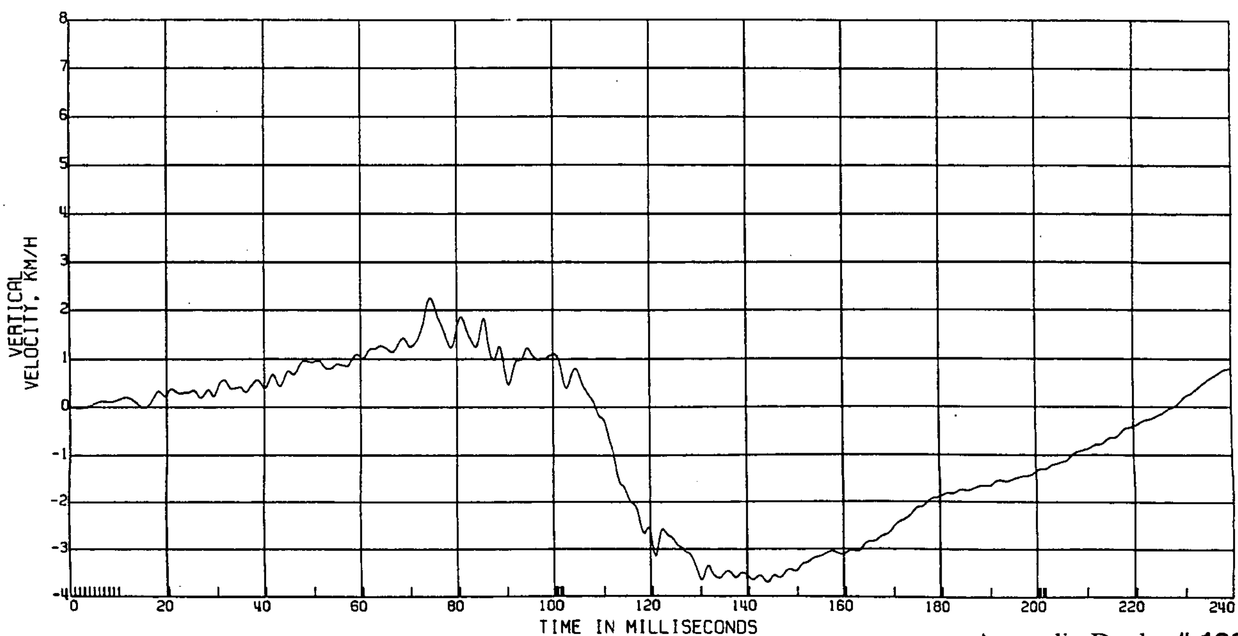
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **120**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

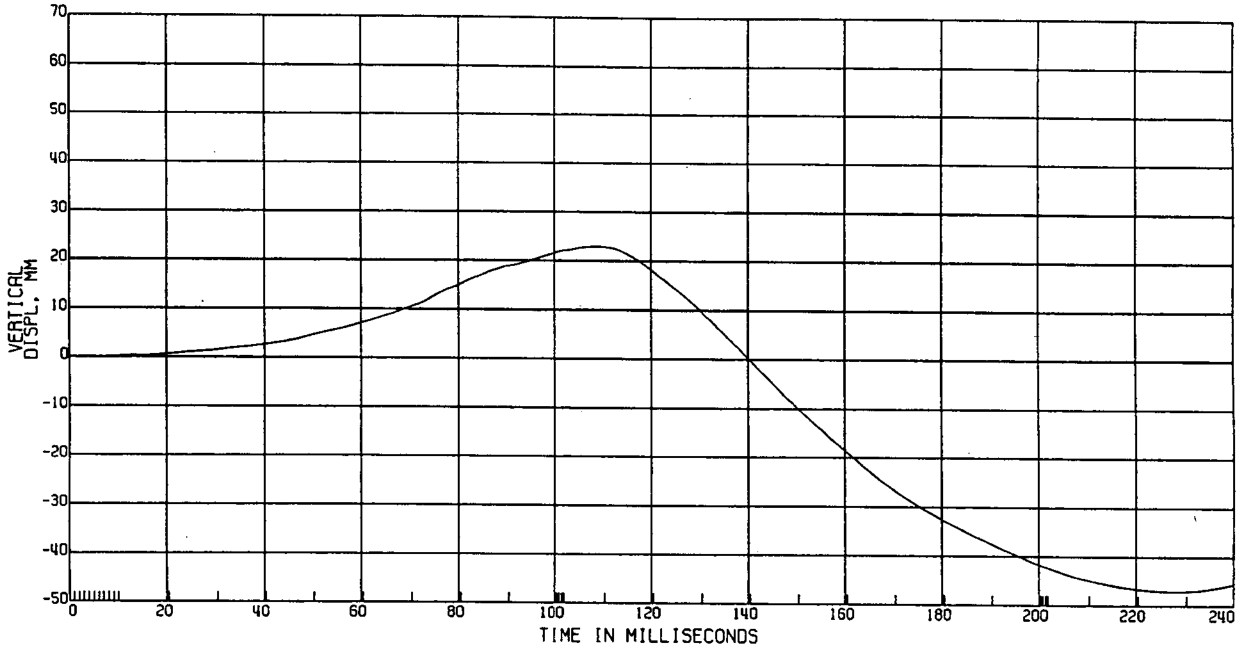
R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 180

AVGD REAR ROCKER DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997




Appendix D, plot # **121**

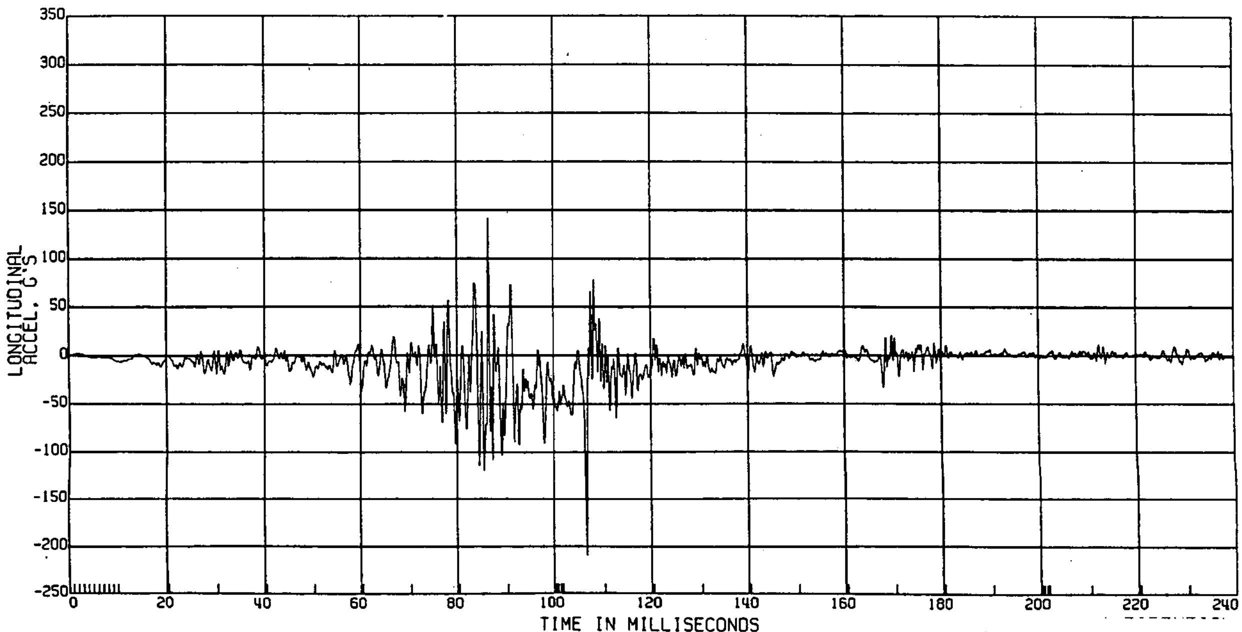
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

CTR SDM-R REAR CASE #1 ACCEL

TEST DATE:05/14/1997

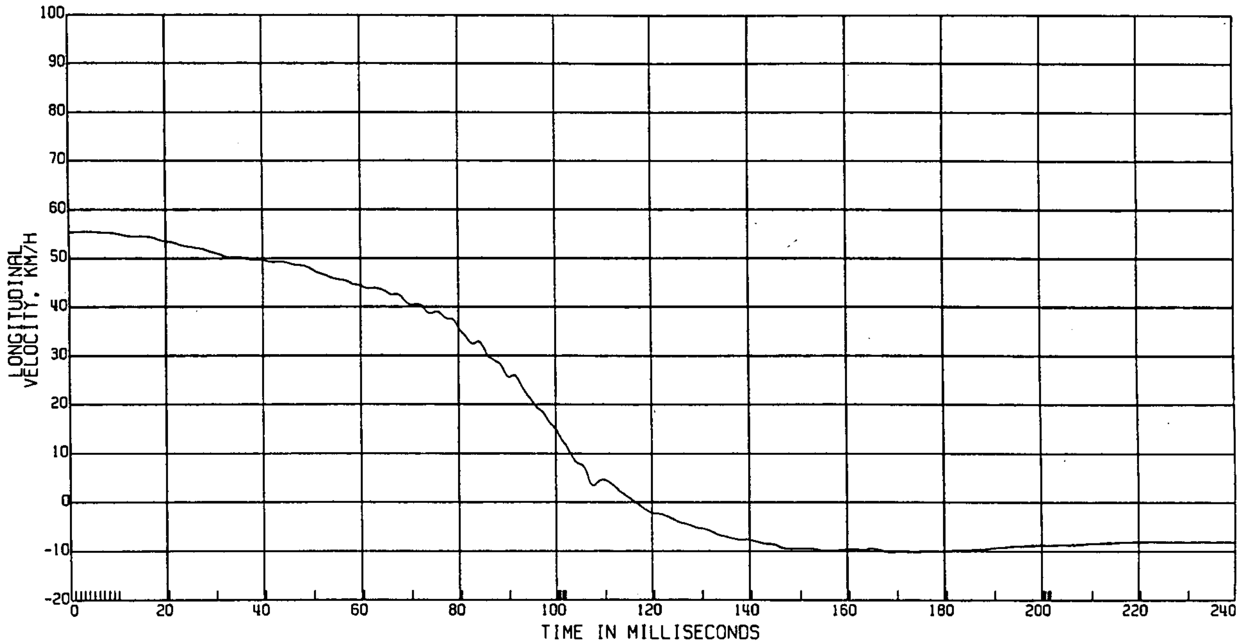



Appendix D, plot # **122**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 CTR SDM-R REAR CASE #1 VELOCITY TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

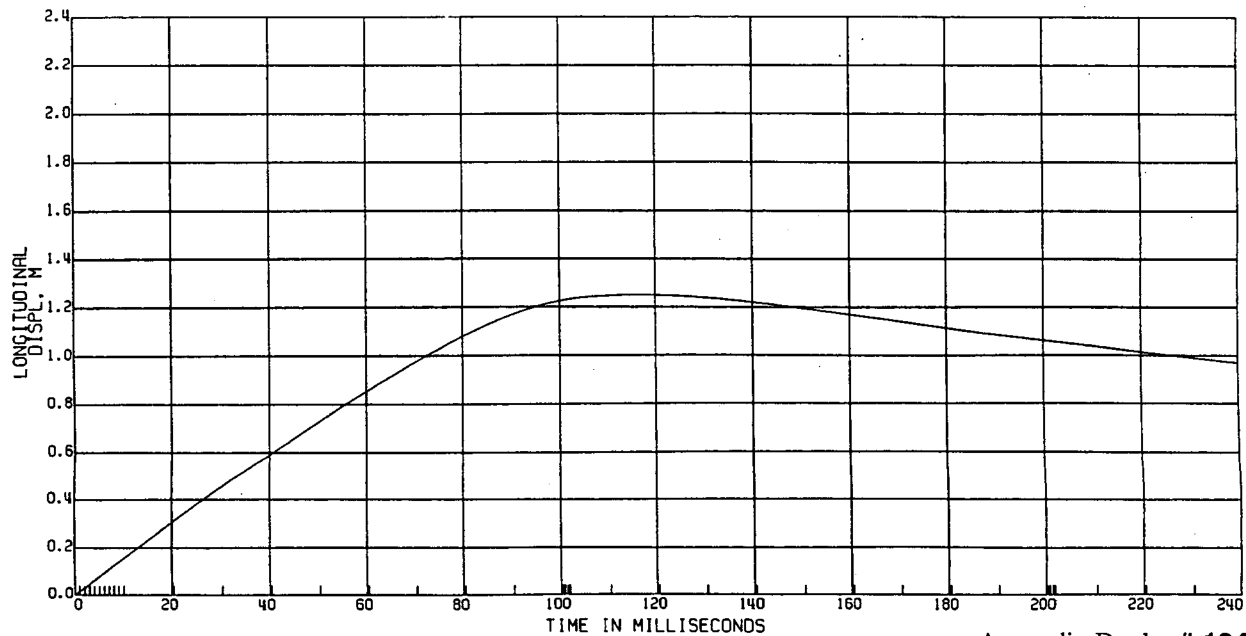



Appendix D, plot # **123**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 CTR SDM-R REAR CASE #1 DISPL TEST DATE:05/14/1997

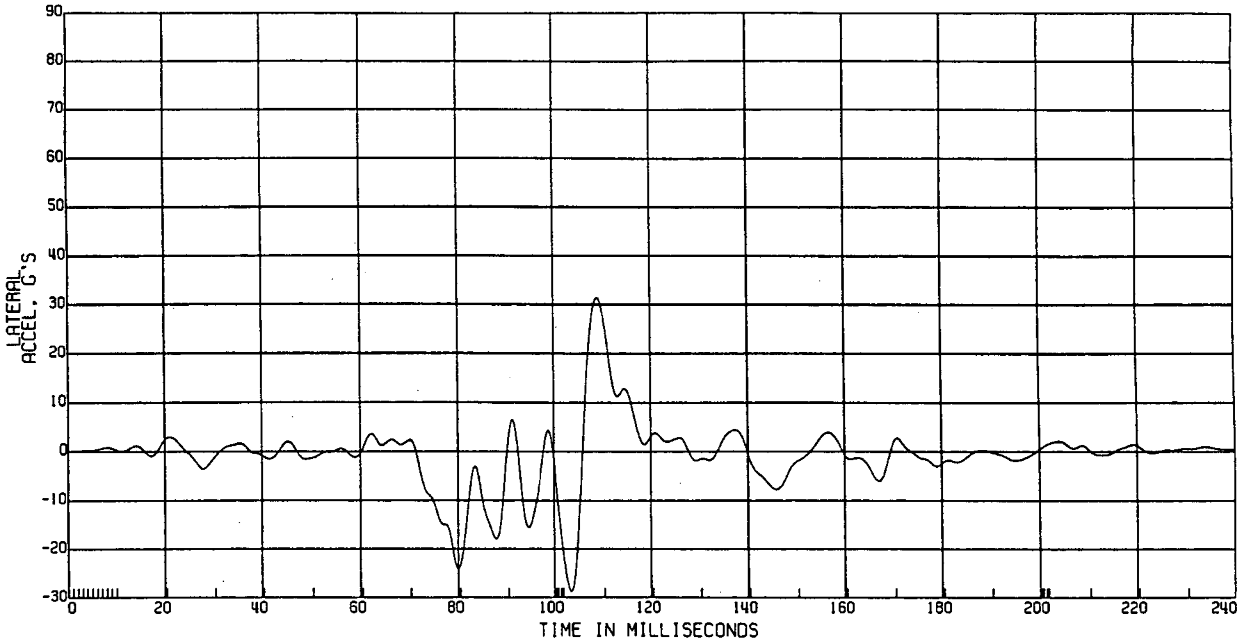
ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix D, plot # **124**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

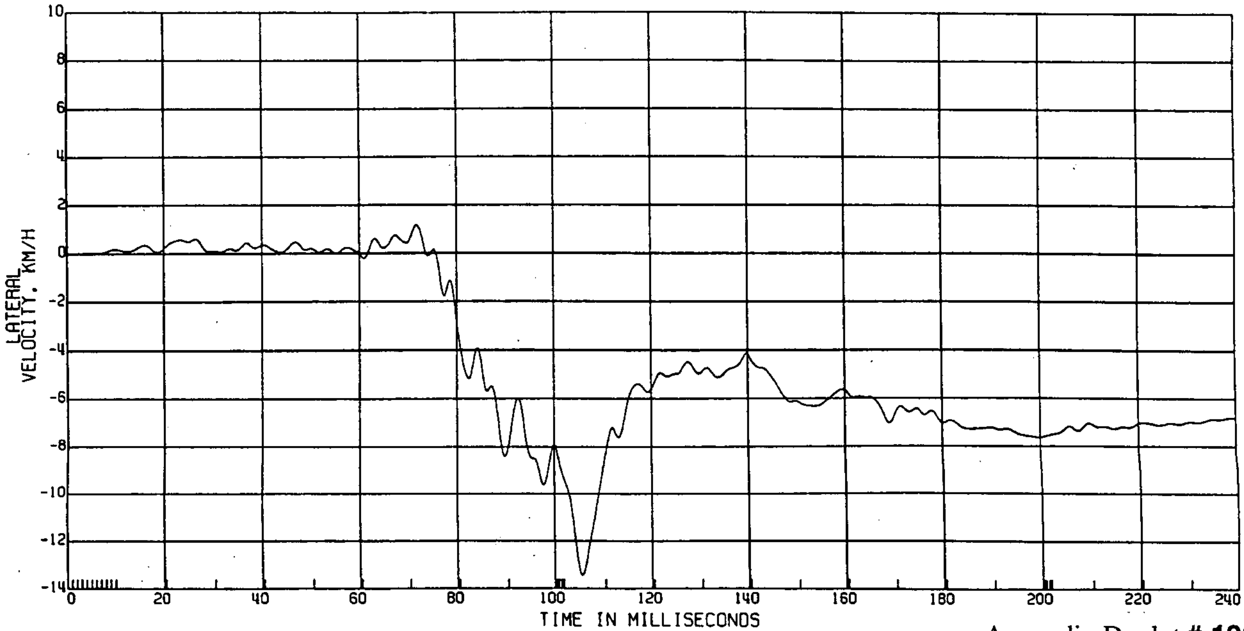
R&D CTR 1VF46081 1FP87 CTR SDM-R REAR CASE #1 ACCEL TEST DATE:05/14/1997
ELEC DATA, SAE CLASS 60




Appendix D, plot # **125**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 CTR SDM-R REAR CASE #1 VELOCITY TEST DATE:05/14/1997
ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

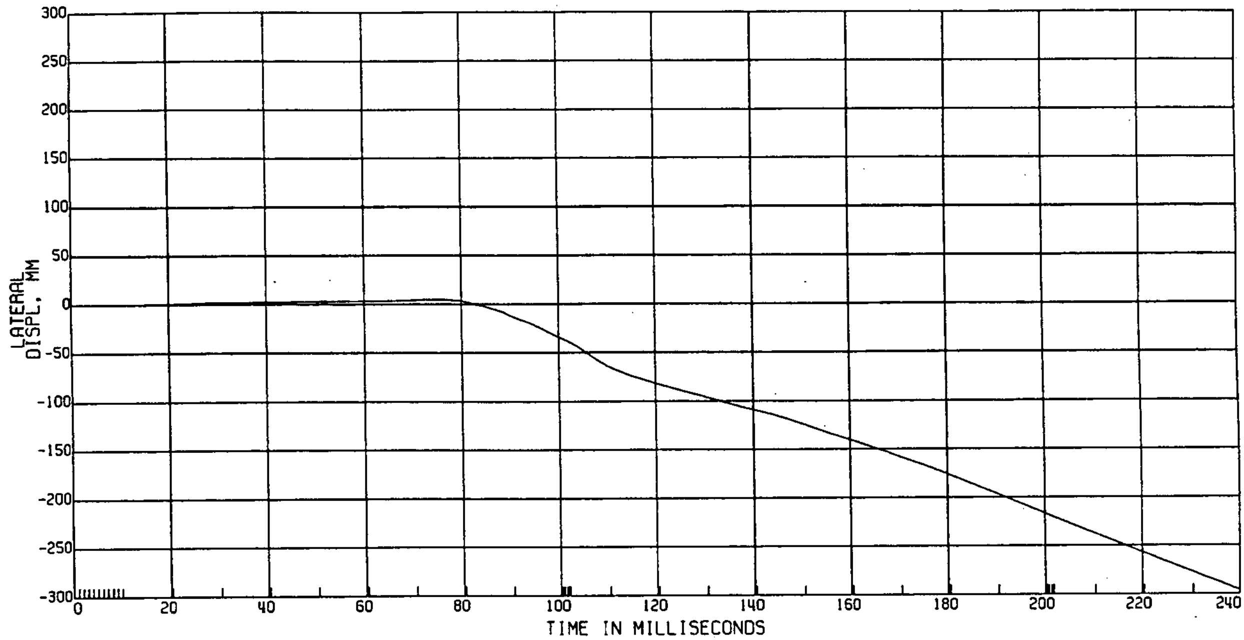



Appendix D, plot # **126**

C11591 FRONT IMPACT　　MOVING VEHICLE TO FIXED POLE　　55.3KM/H

R&D CTR　　1VF46081 1FP87　　CTR SDM-R REAR CASE #1 DISPL　　TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 180　　(COMPUTED FROM ACCELERATION)

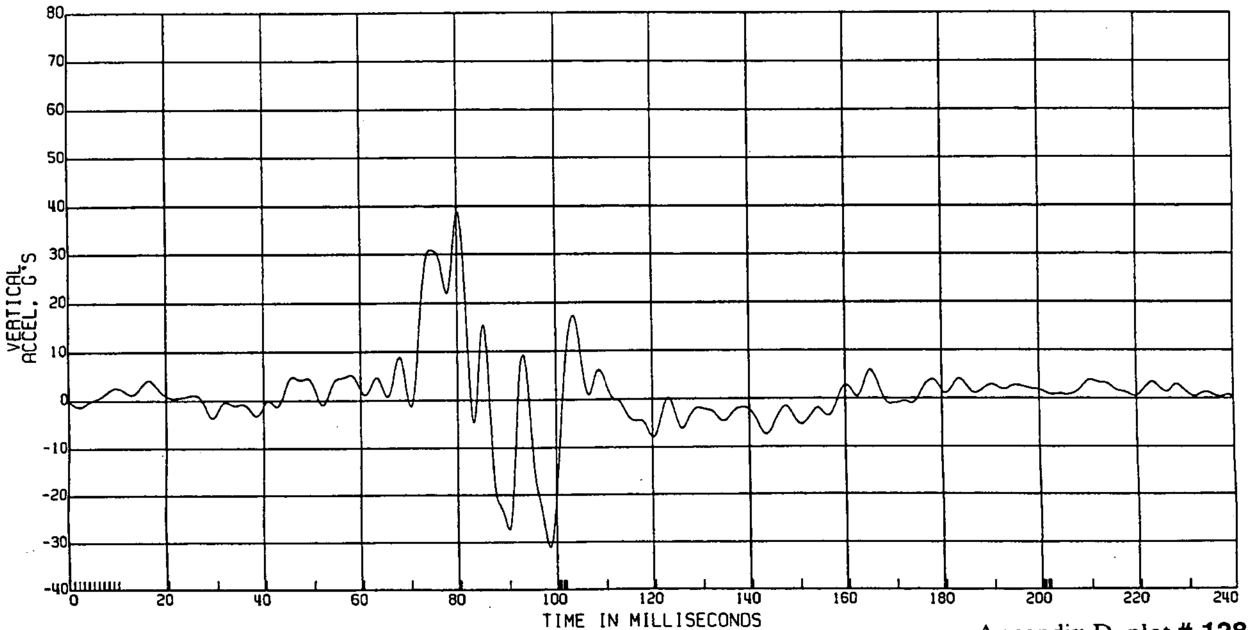



Appendix D, plot # **127**

C11591 FRONT IMPACT　　MOVING VEHICLE TO FIXED POLE　　55.3KM/H

R&D CTR　　1VF46081 1FP87　　CTR SDM-R REAR CASE #1 ACCEL　　TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60



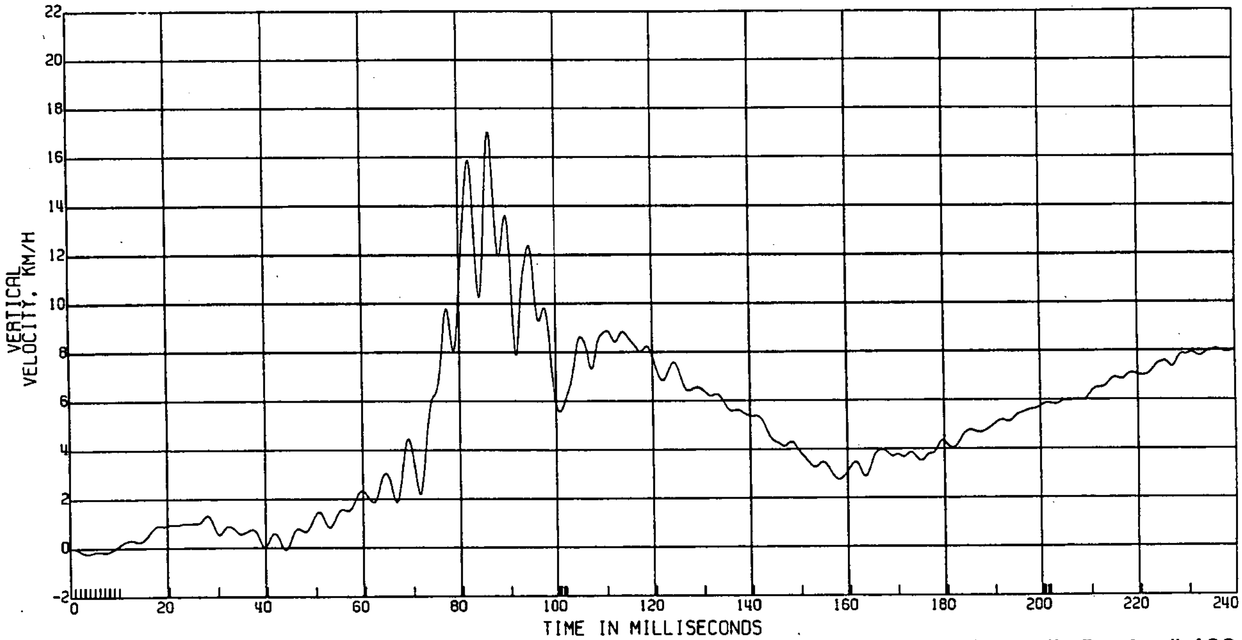

Appendix D, plot # **128**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

CTR SDM-R REAR CASE #1 VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997



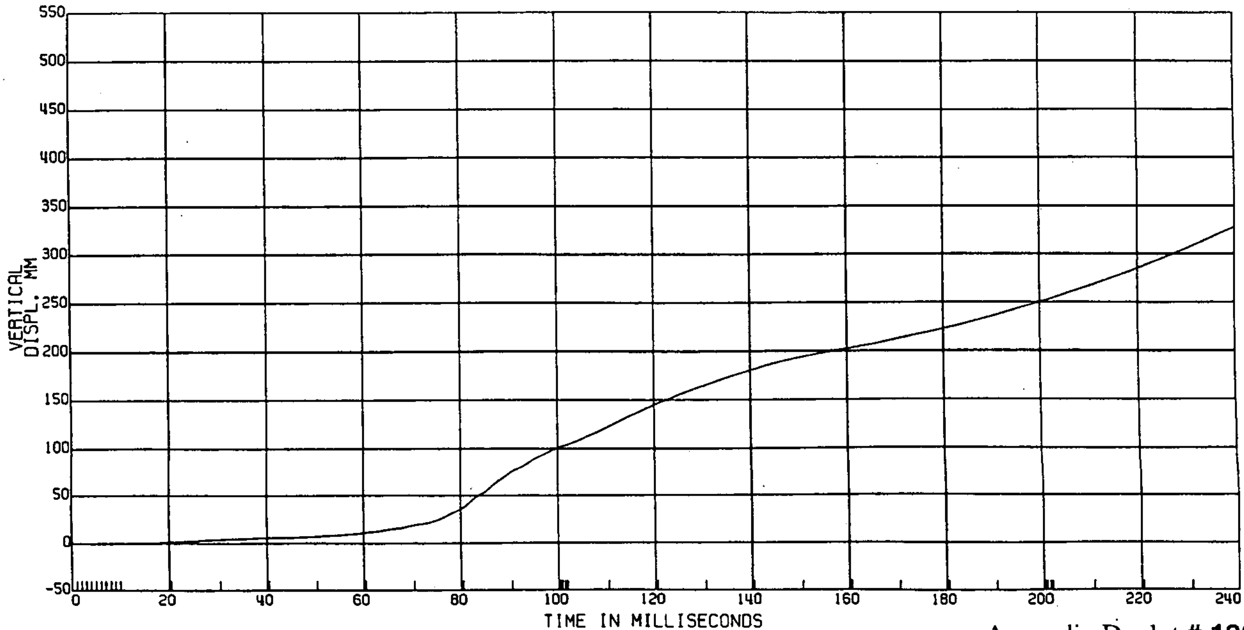

Appendix D, plot # **129**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87
ELEC DATA, SAE CLASS 180

CTR SDM-R REAR CASE #1 DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:05/14/1997

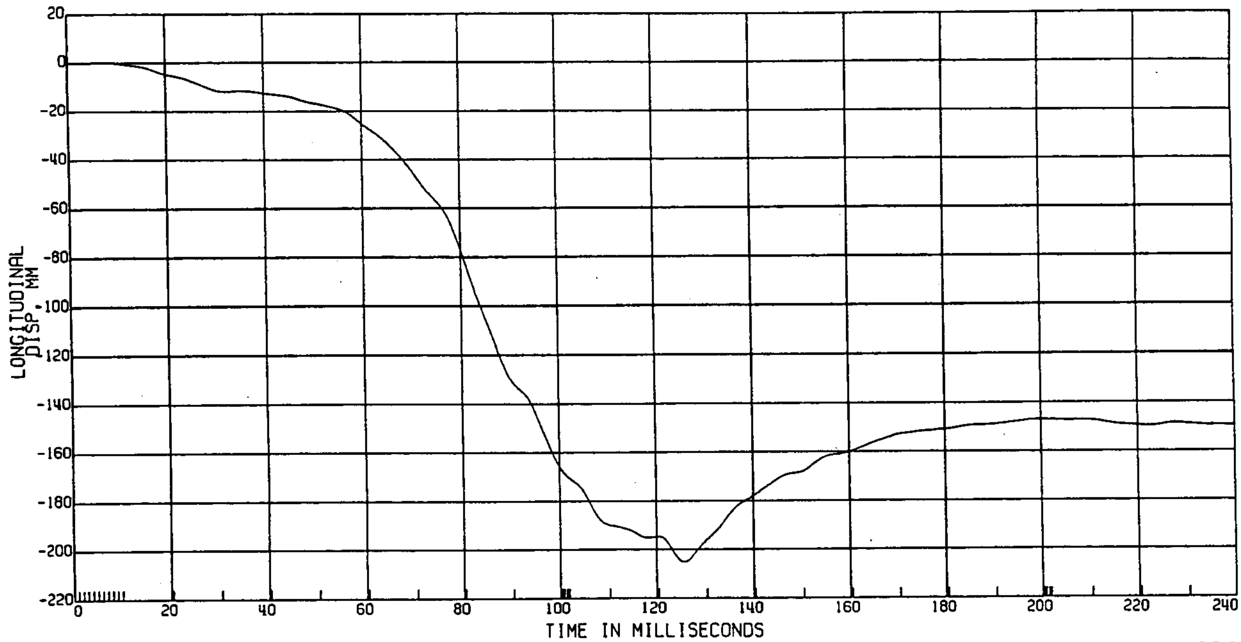



Appendix D, plot # **130**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. TOE PAN DISPL TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 60

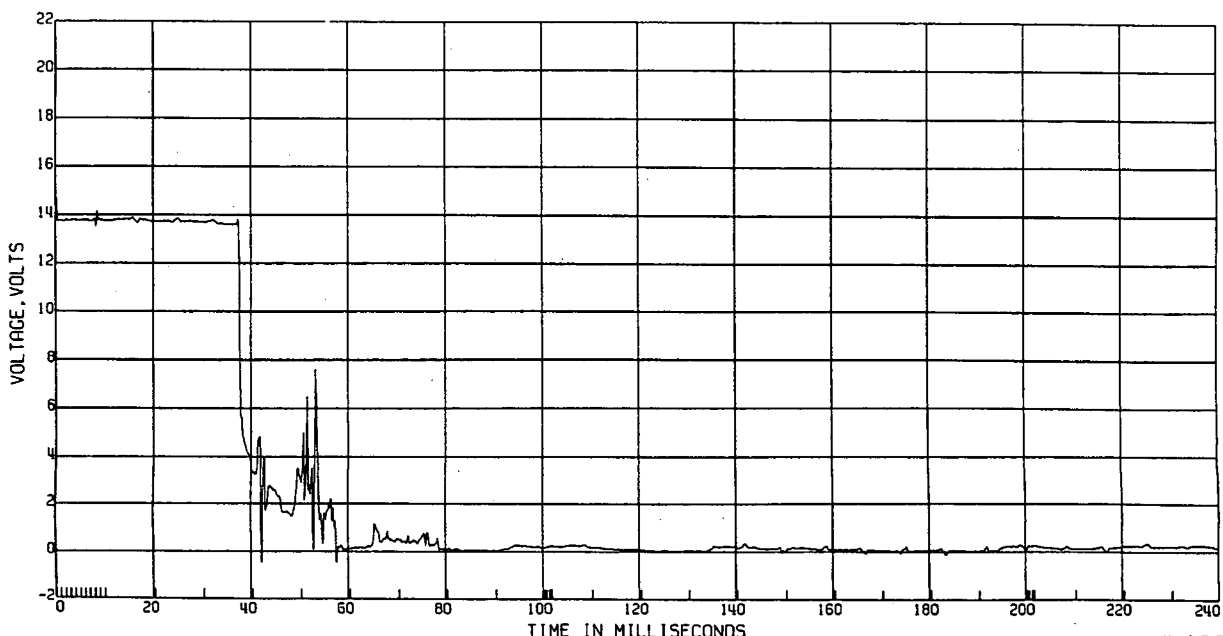



Appendix D, plot # **131**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 STARTER VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **132**

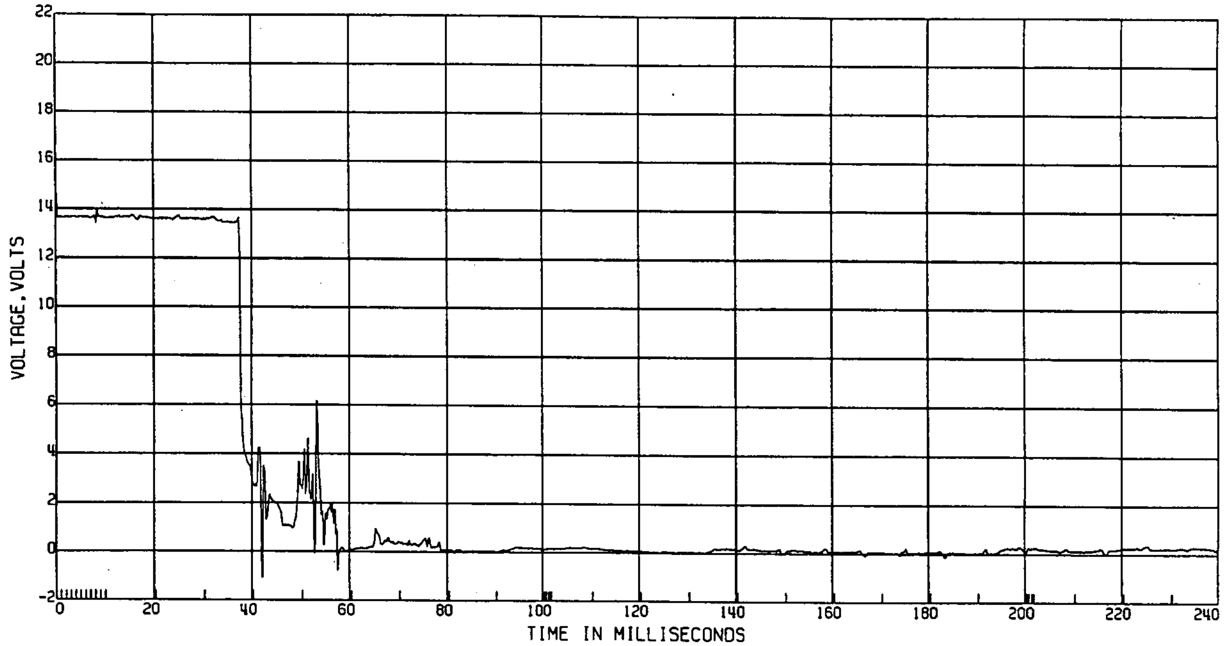
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

BATTERY VOLTAGE

TEST DATE:05/14/1997




Appendix D, plot **# 133**

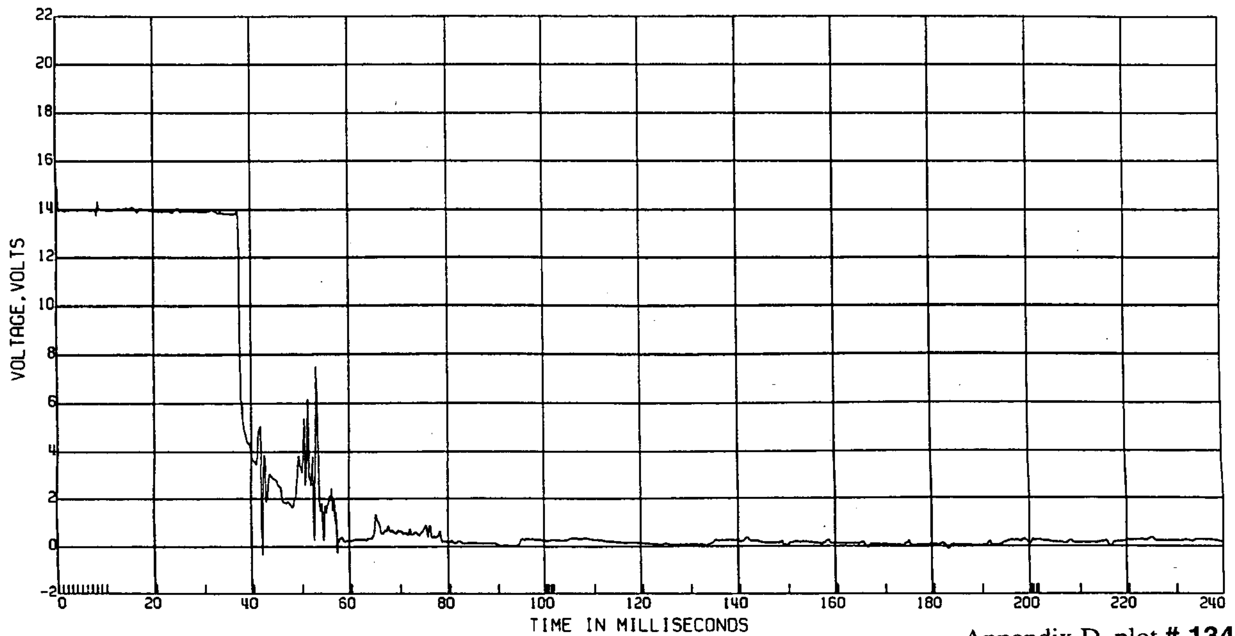
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

ALTERNATOR VOLTAGE

TEST DATE:05/14/1997



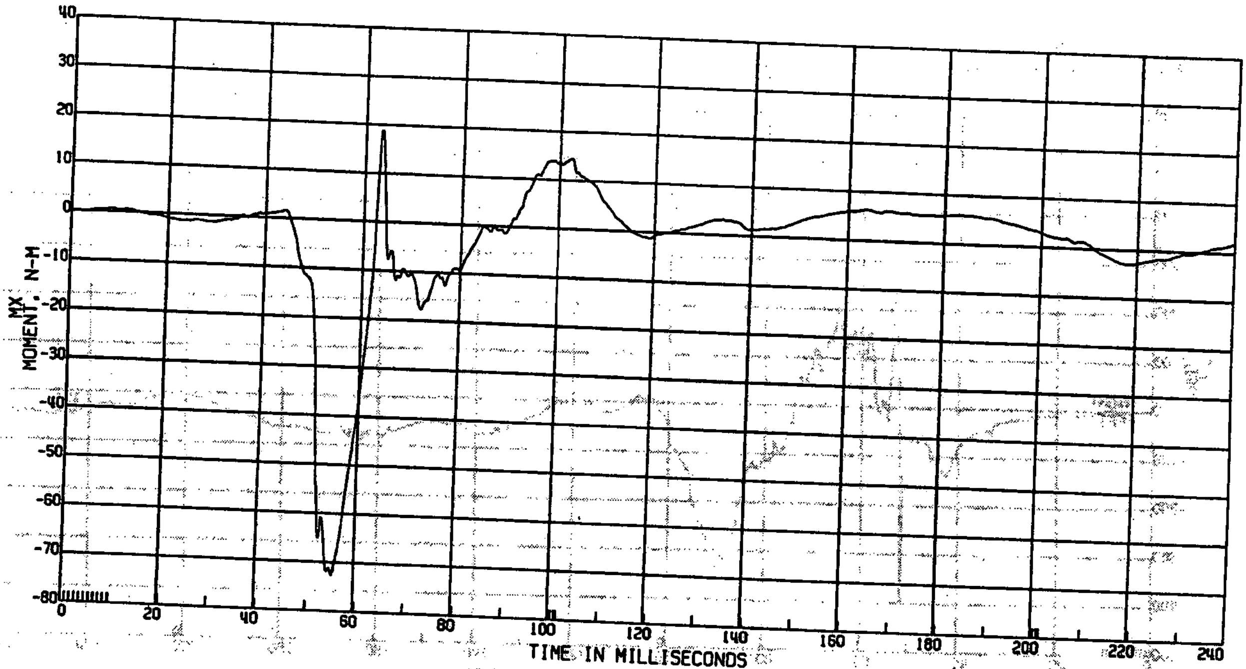

Appendix D, plot **# 134**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

L. FRT TIBIA LEFT LOWER MOMENT
(ENHANCED LOWER LEG)

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 57

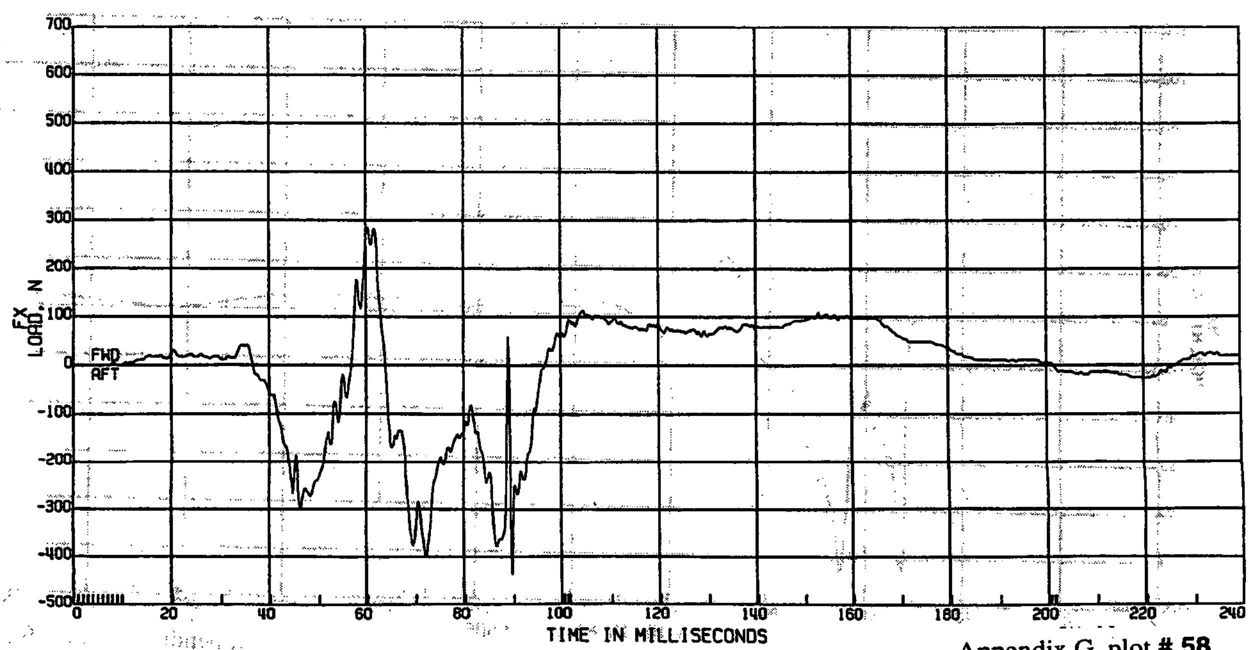
57 PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

L. FRT TIBIA RIGHT UPPER LOAD
(ENHANCED LOWER LEG)

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 58

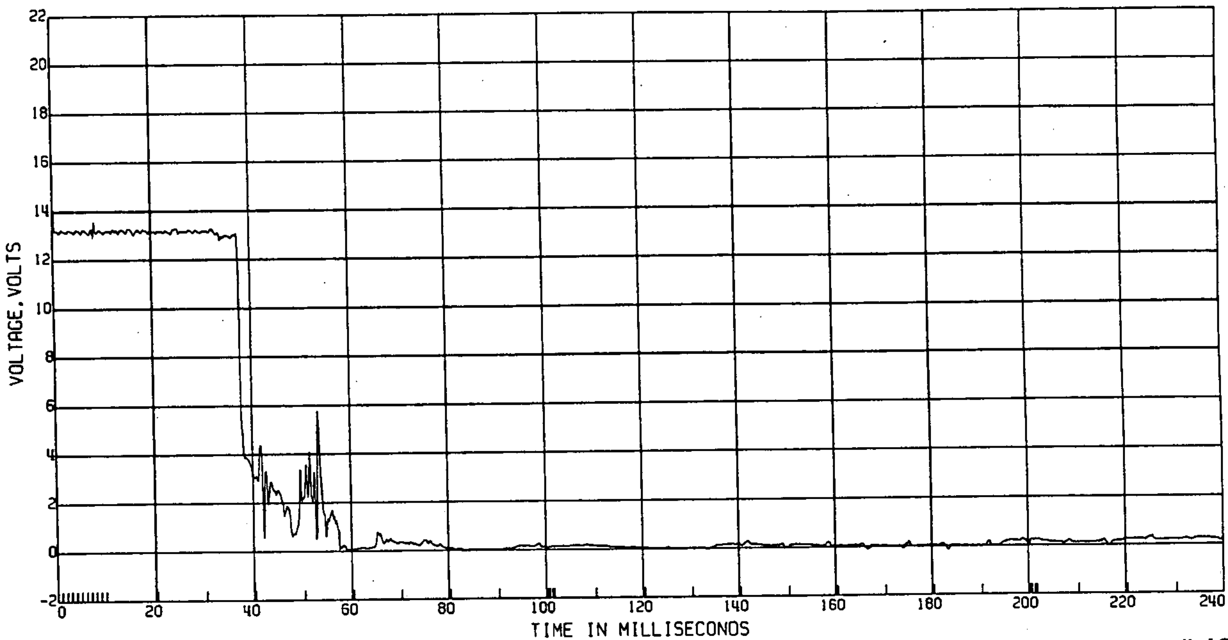
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

HIGH BLOWER RELAY VOLTAGE

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **137**

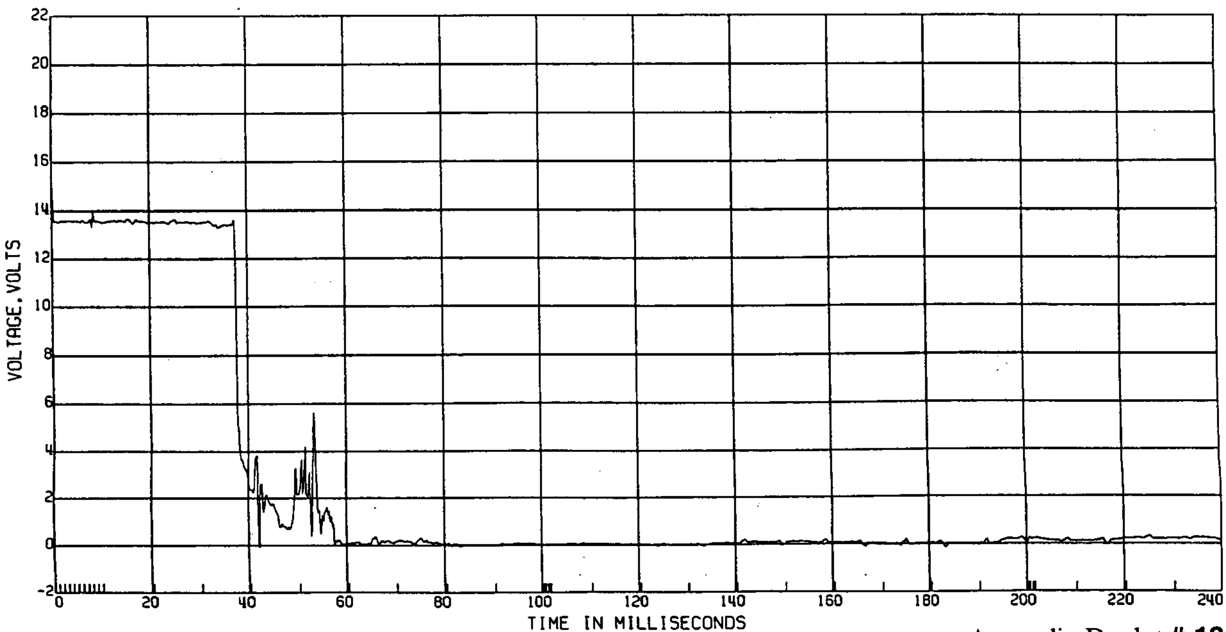
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

RELAY CTR-A VOLTAGE

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000



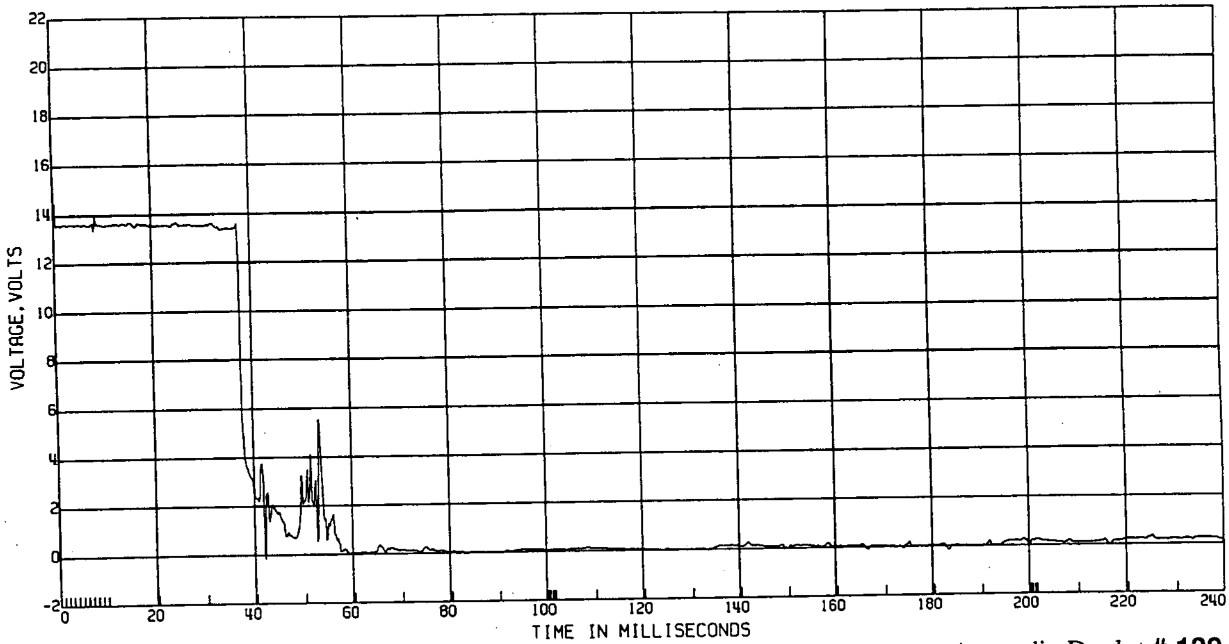

Appendix D, plot # **138**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

RELAY CTR-B VOLTAGE

R&D CTR 1VF46081 1FP87 TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000



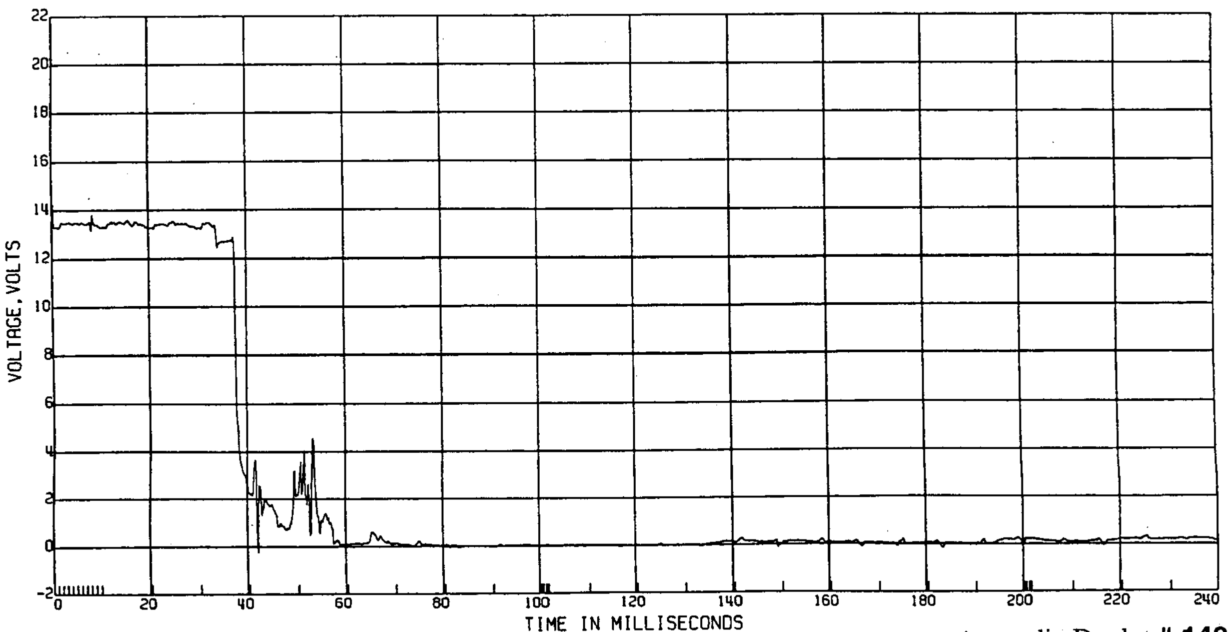

Appendix D, plot # **139**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

IGNITION VOLTAGE

R&D CTR 1VF46081 1FP87 TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

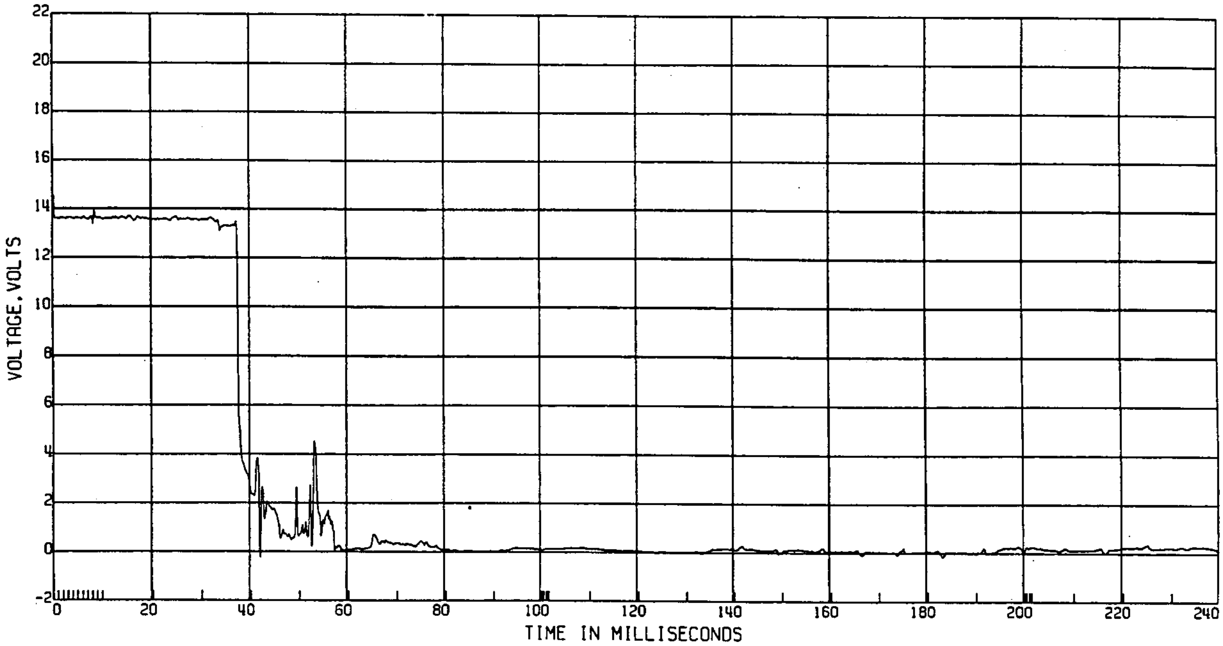



Appendix D, plot # **140**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 RADIO ACC-FUSE #4 VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

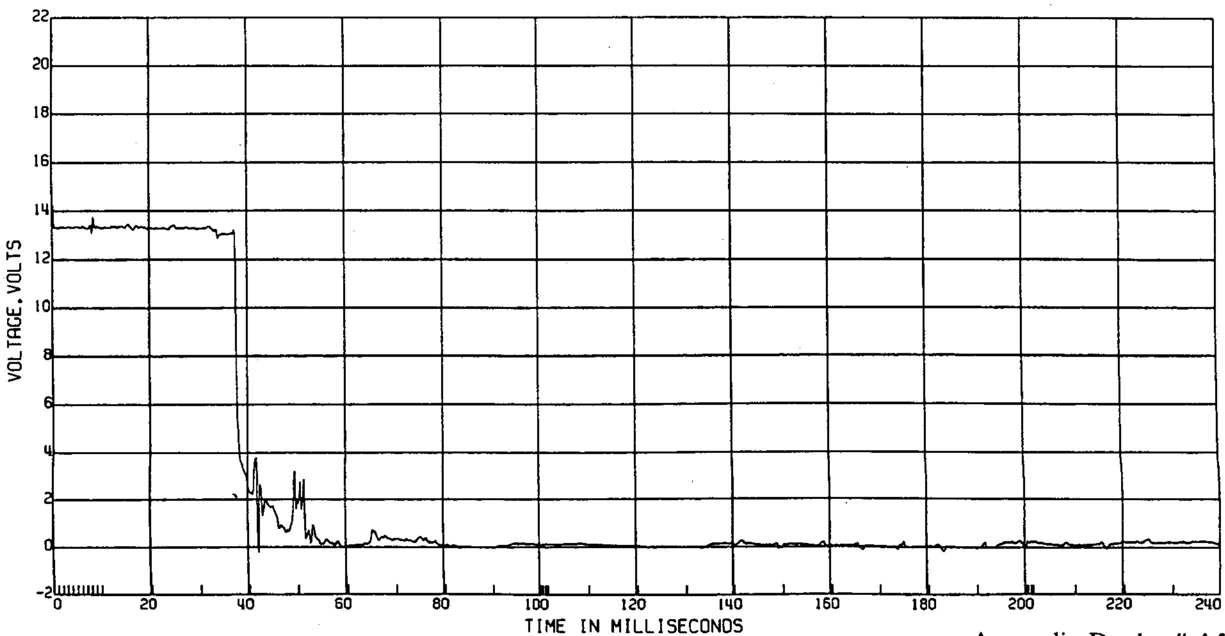



Appendix D, plot # **141**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 TAILLIGHT FUSE VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **142**

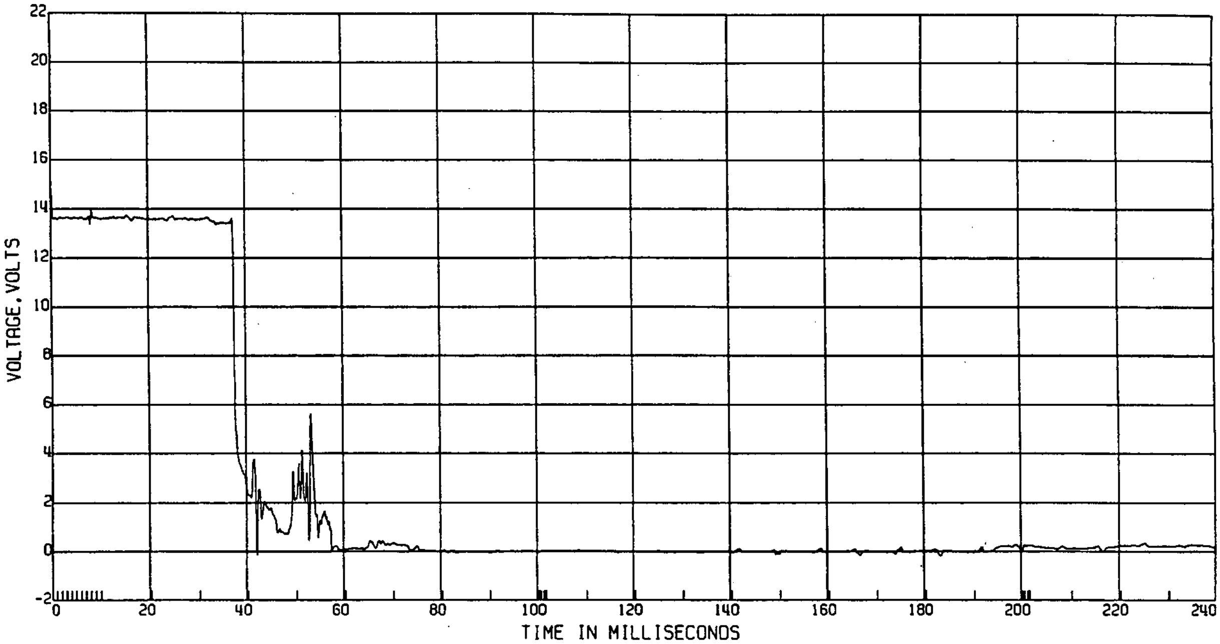
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

ABS FUSE #6 VOLTAGE

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **143**

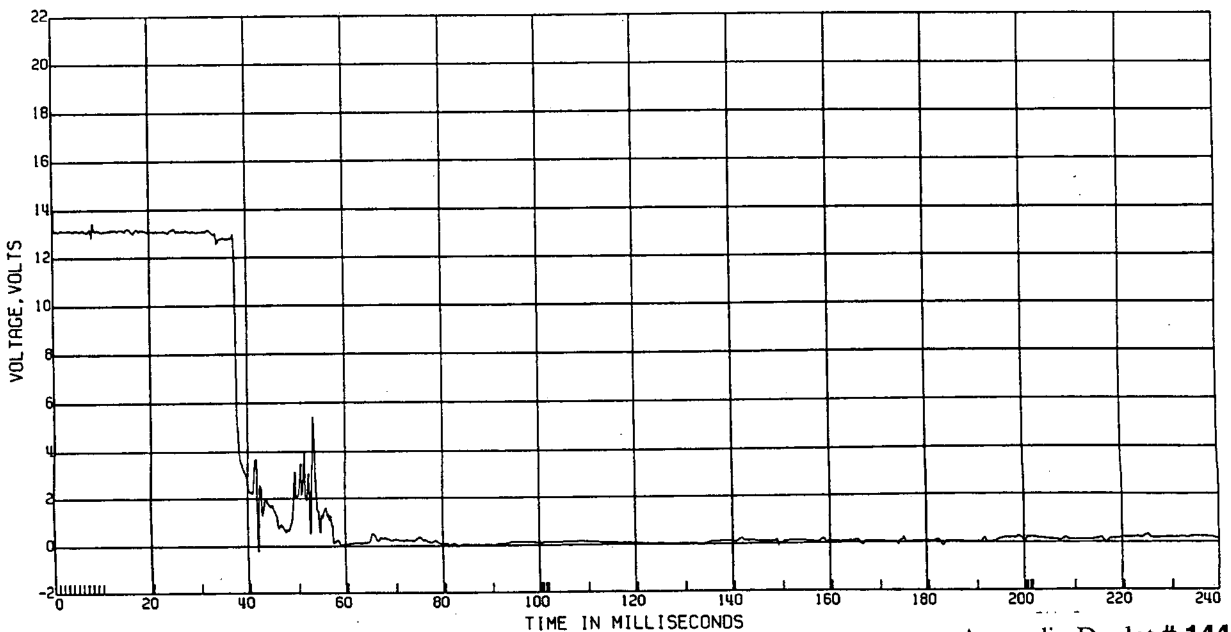
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

HEADLIGHT SWITCH VOLTAGE

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

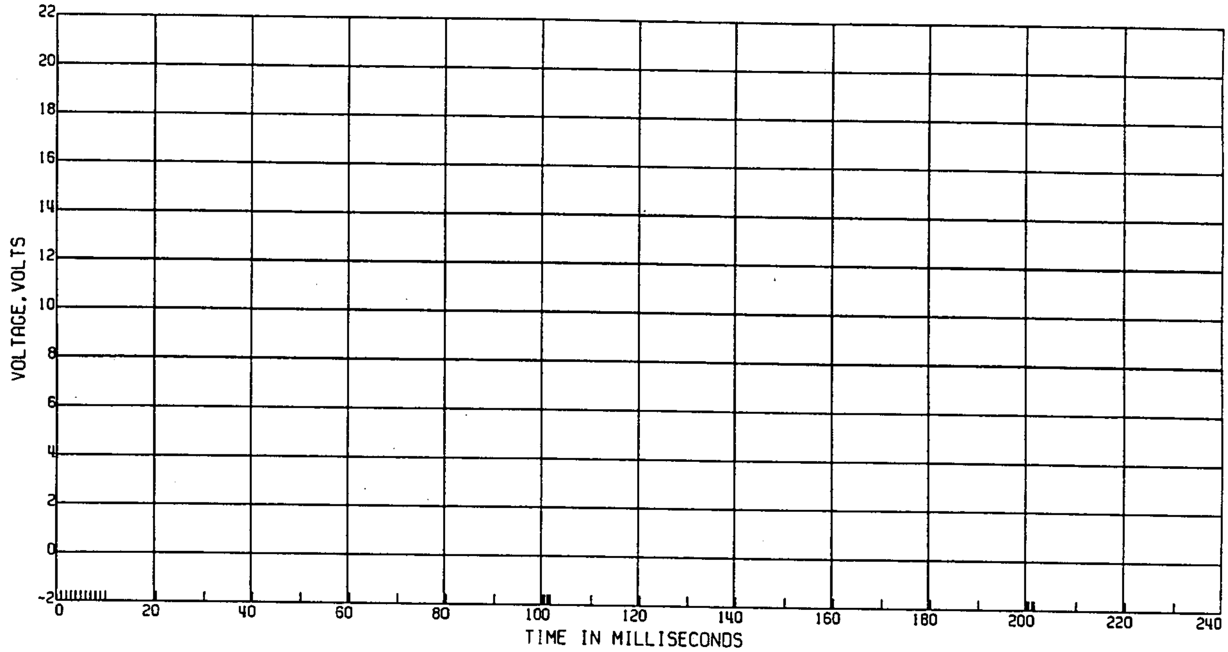



Appendix D, plot # **144**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L. OPTICAL FIRE DETECTOR VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

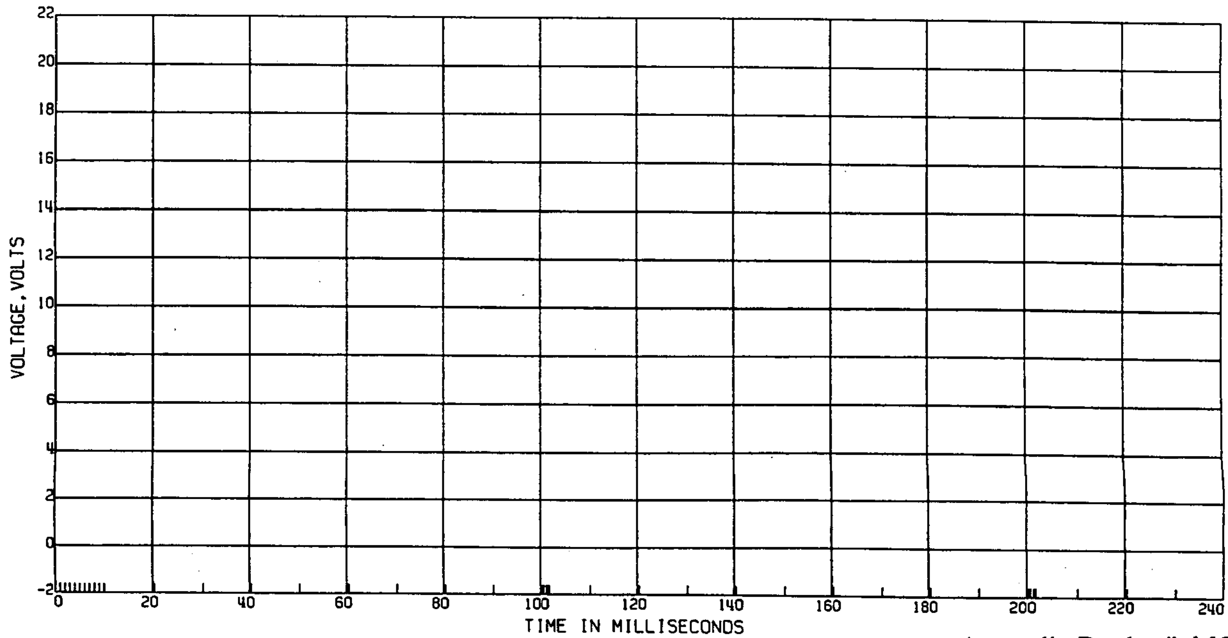



Appendix D, plot # **145**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 R. OPTICAL FIRE DETECTOR VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

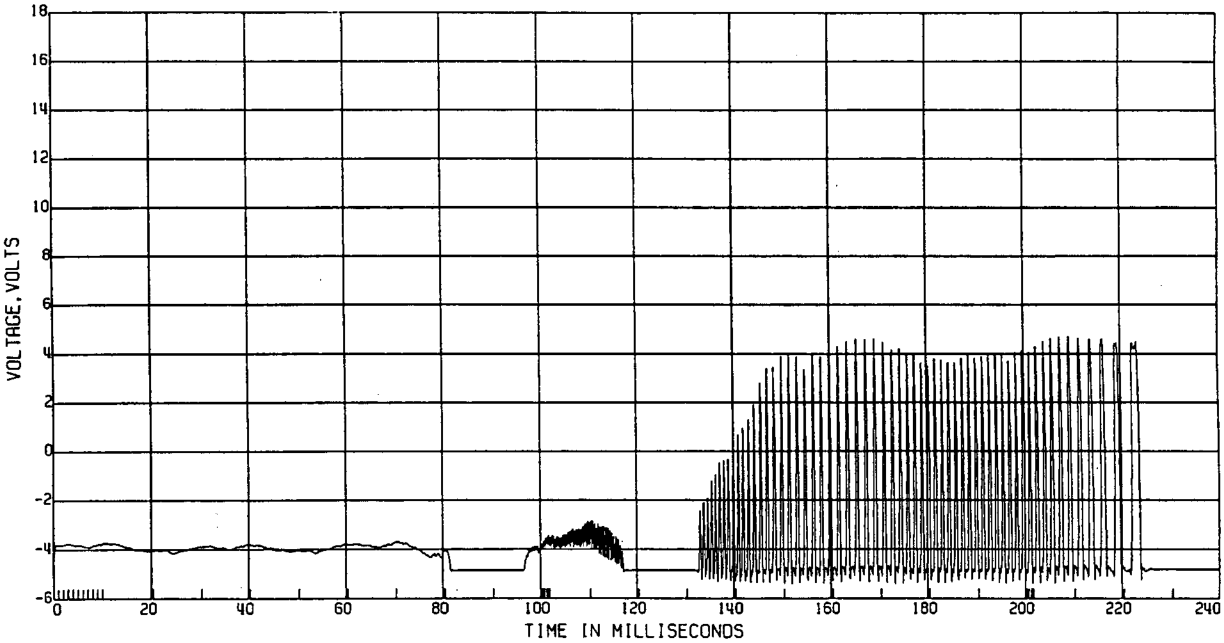



Appendix D, plot # **146**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 HALL EFFECT SENSOR VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

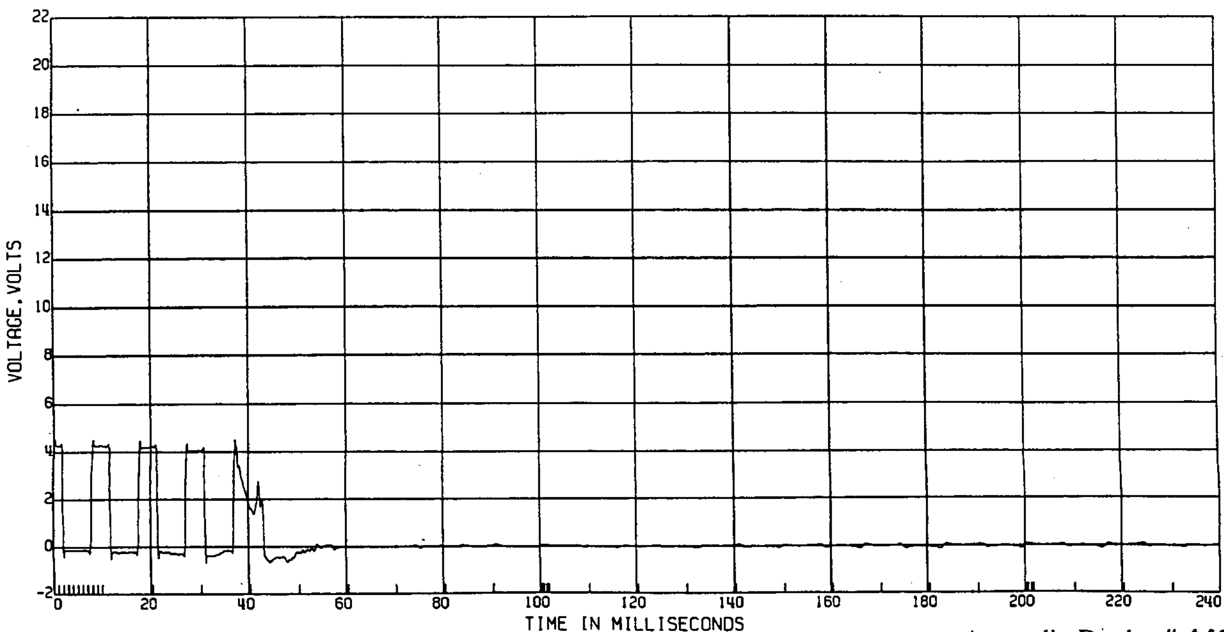



Appendix D, plot # **147**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 TACH SIGNAL VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

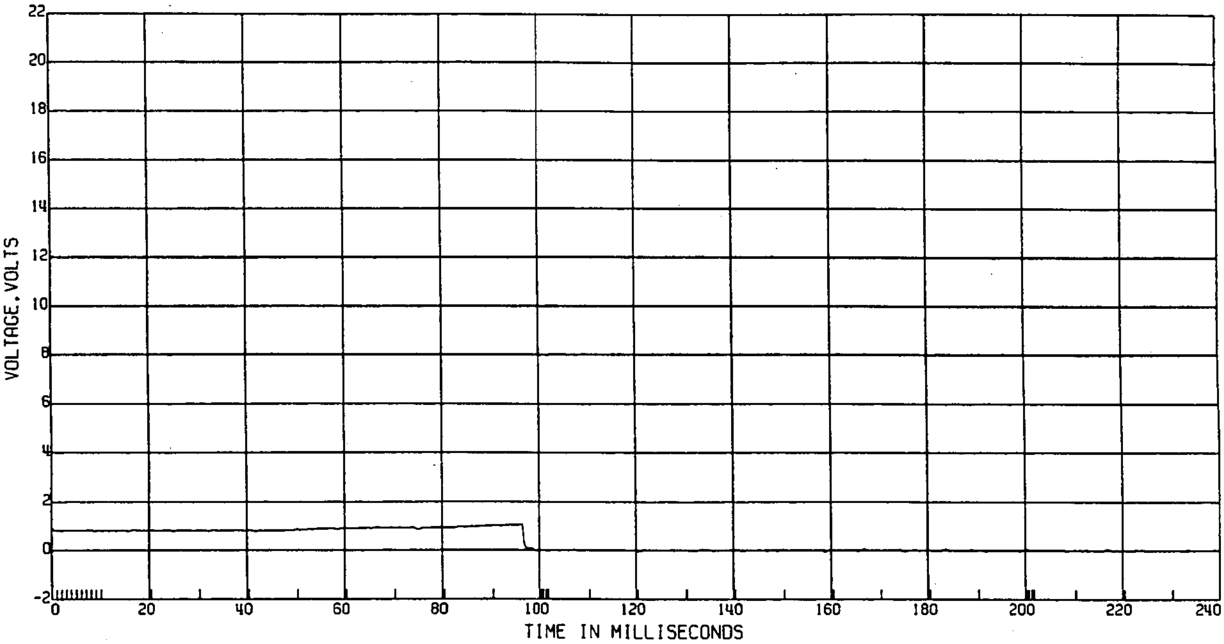



Appendix D, plot # **148**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 VAPOR SENSOR (S1) VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000



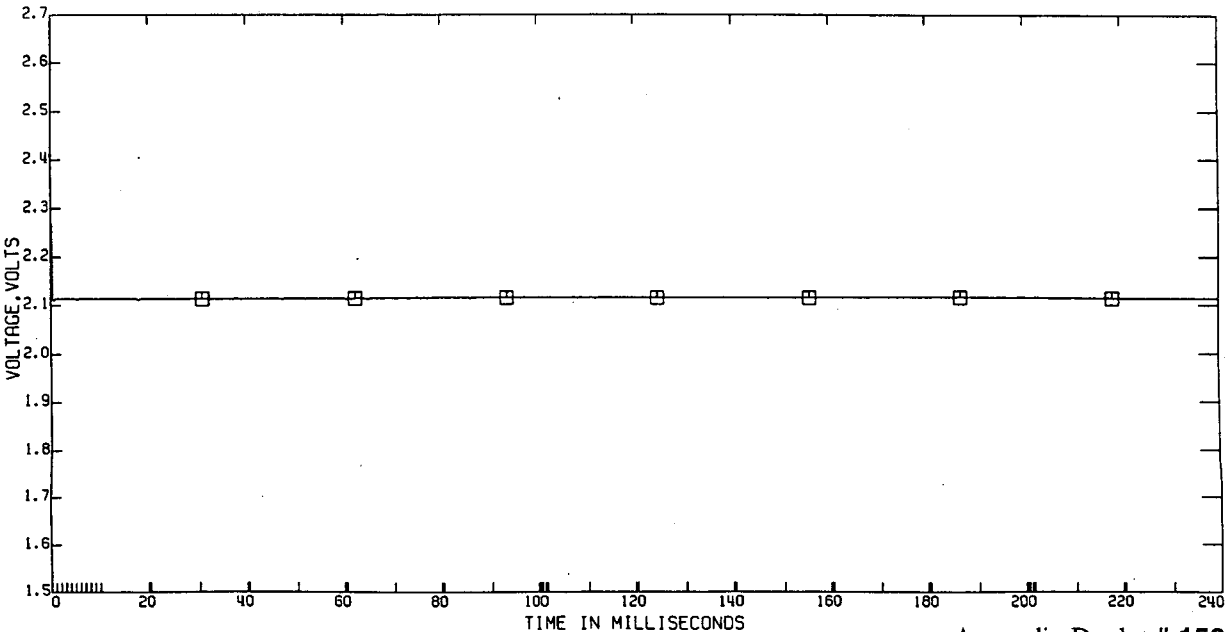

Appendix D, plot # **149**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 TEST DATE:05/14/1997

, ELEC DATA, SAE CLASS 1000

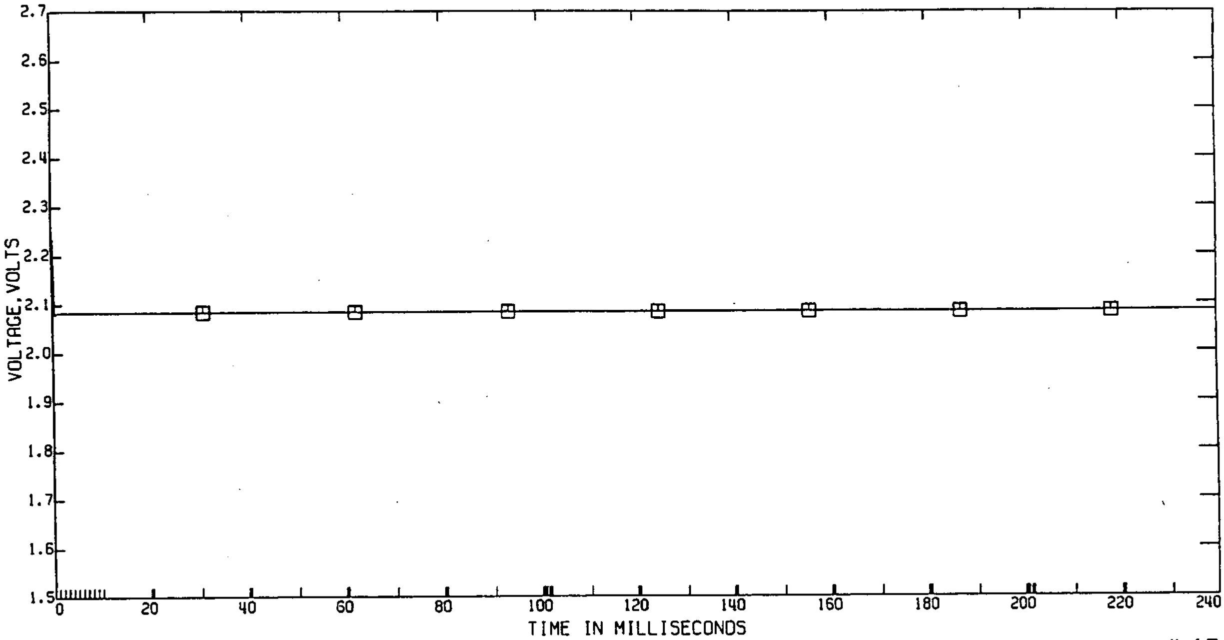
☐ TEMPERATURE SENSOR (T1) VOLTAGE




Appendix D, plot # **150**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H
R&D CTR 1VF46081 1FP87 TEST DATE:05/14/1997
, ELEC DATA, SAE CLASS 1000

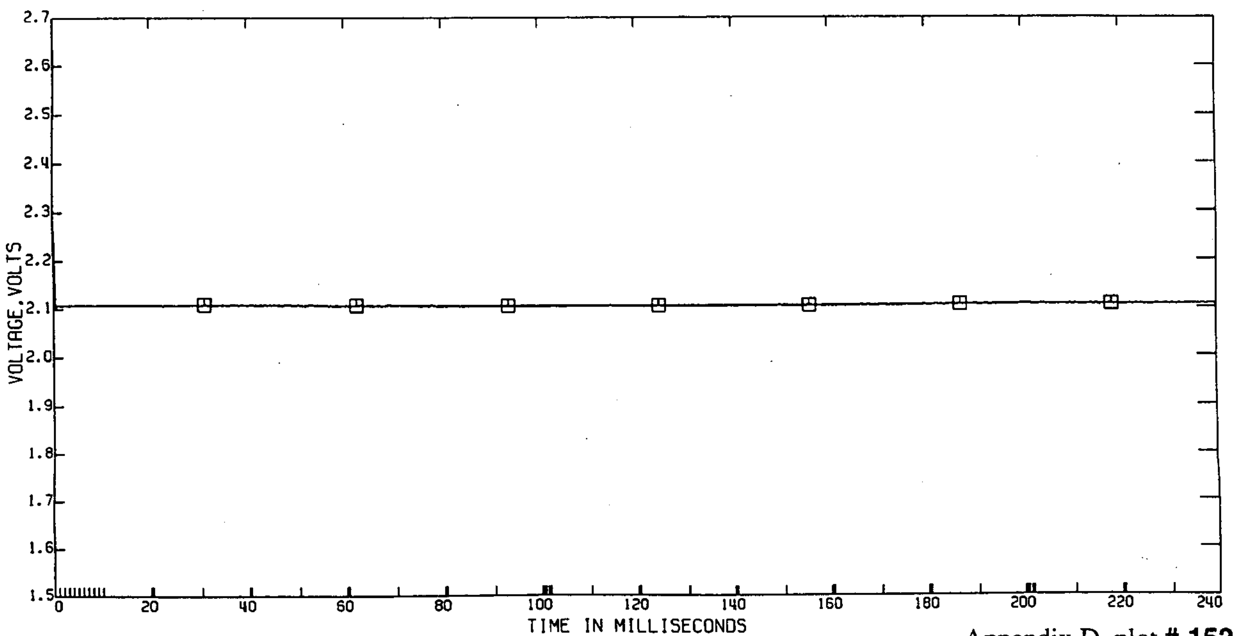
TEMPERATURE SENSOR (T2) VOLTAGE




Appendix D, plot # **151**

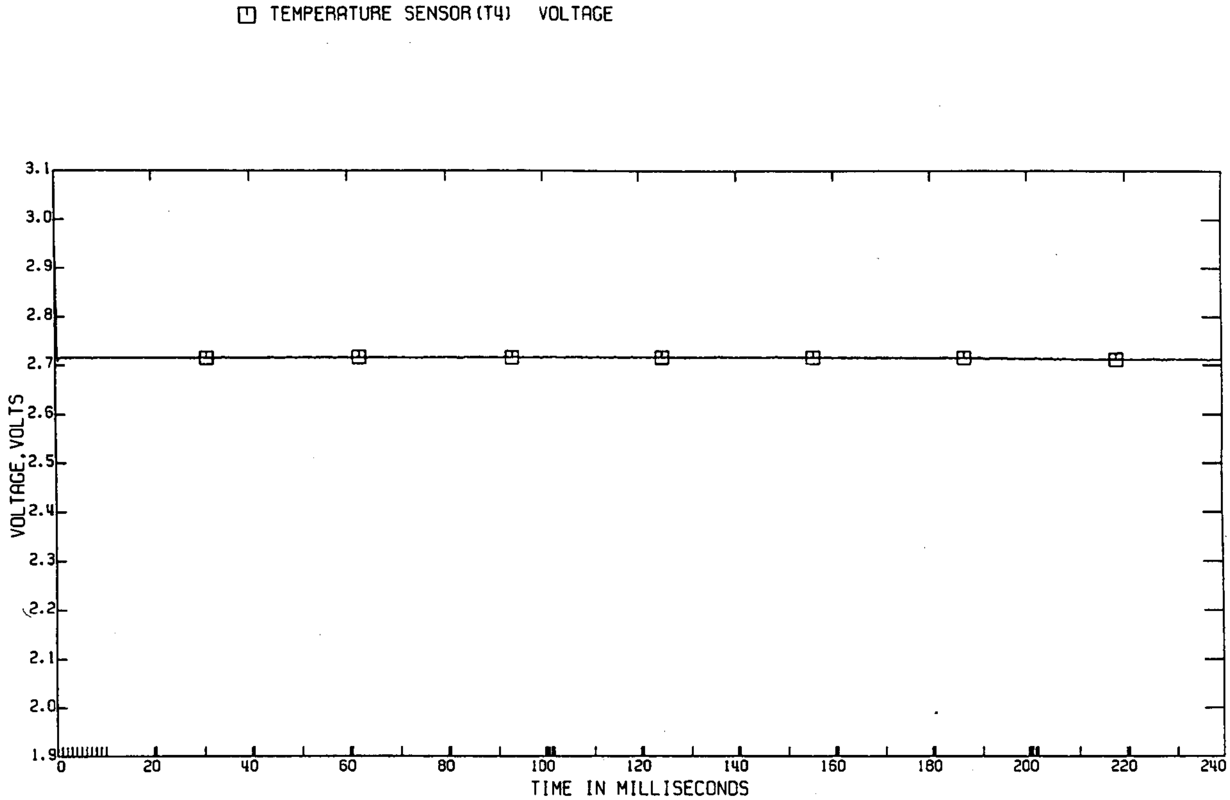
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H
R&D CTR 1VF46081 1FP87 TEST DATE:05/14/1997
, ELEC DATA, SAE CLASS 1000

TEMPERATURE SENSOR (T3) VOLTAGE



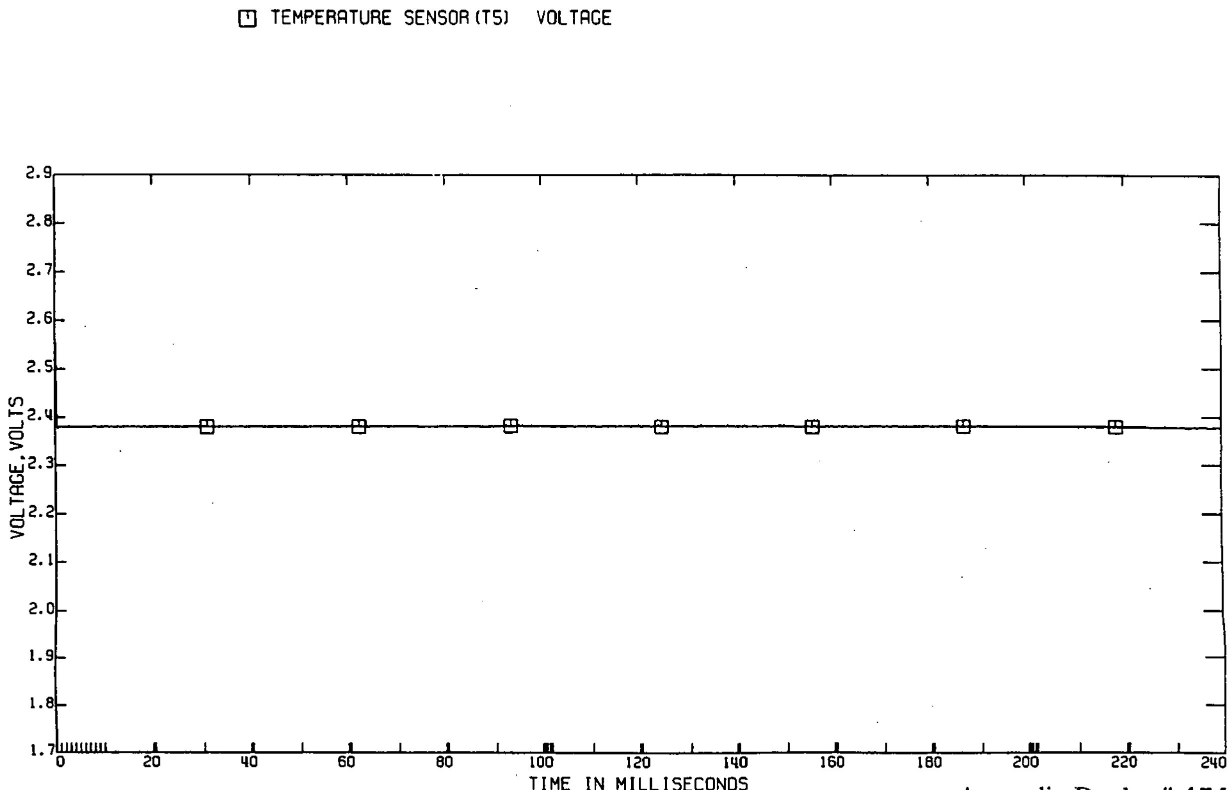

Appendix D, plot # **152**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3 KM/H
R&D CTR 1VF46081 1FP87
, ELEC DATA, SAE CLASS 1000
TEST DATE:05/14/1997



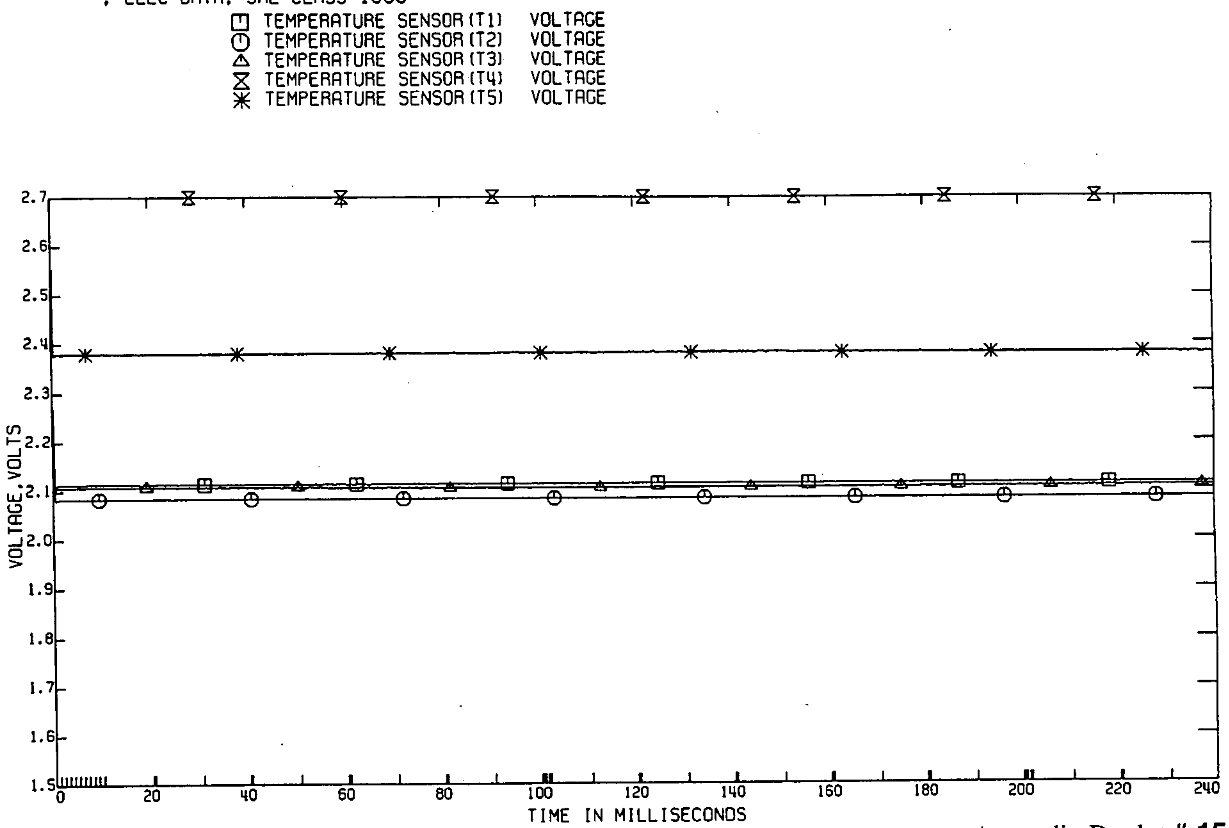

Appendix D, plot # **153**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3 KM/H
R&D CTR 1VF46081 1FP87
, ELEC DATA, SAE CLASS 1000
TEST DATE:05/14/1997




Appendix D, plot # **154**

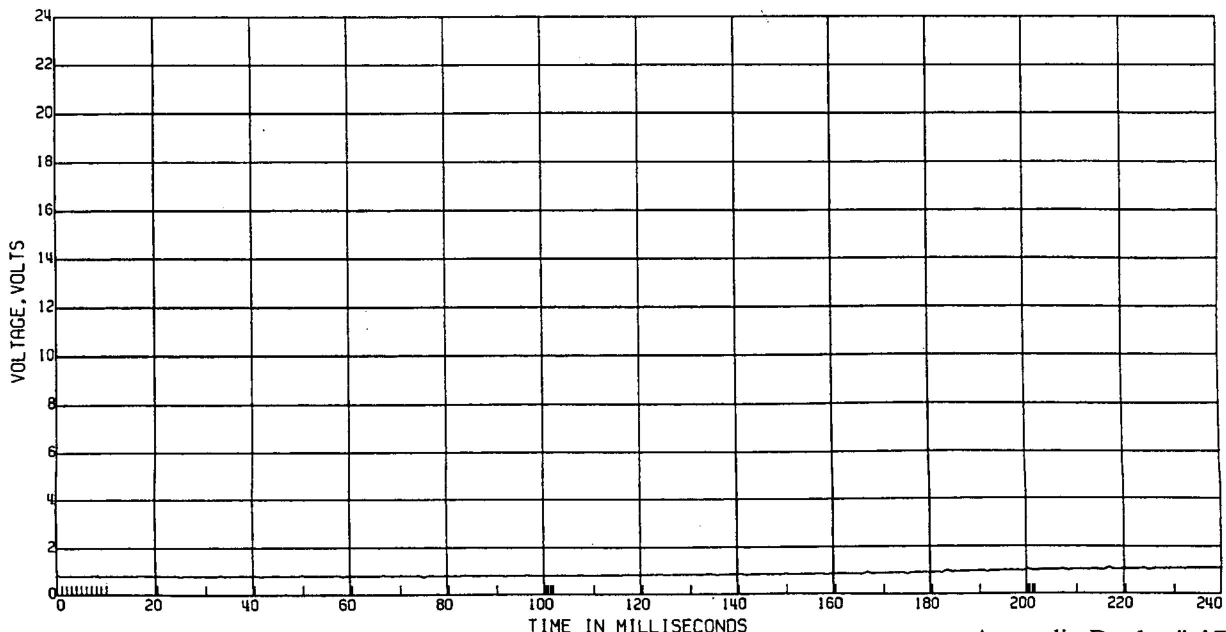
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H
R&D CTR 1VF46081 1FP87 TEST DATE:05/14/1997
, ELEC DATA, SAE CLASS 1000




Appendix D, plot # **155**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 VAPOR SENSOR (S2) VOLTAGE TEST DATE:05/14/1997
ELEC DATA, SAE CLASS 1000

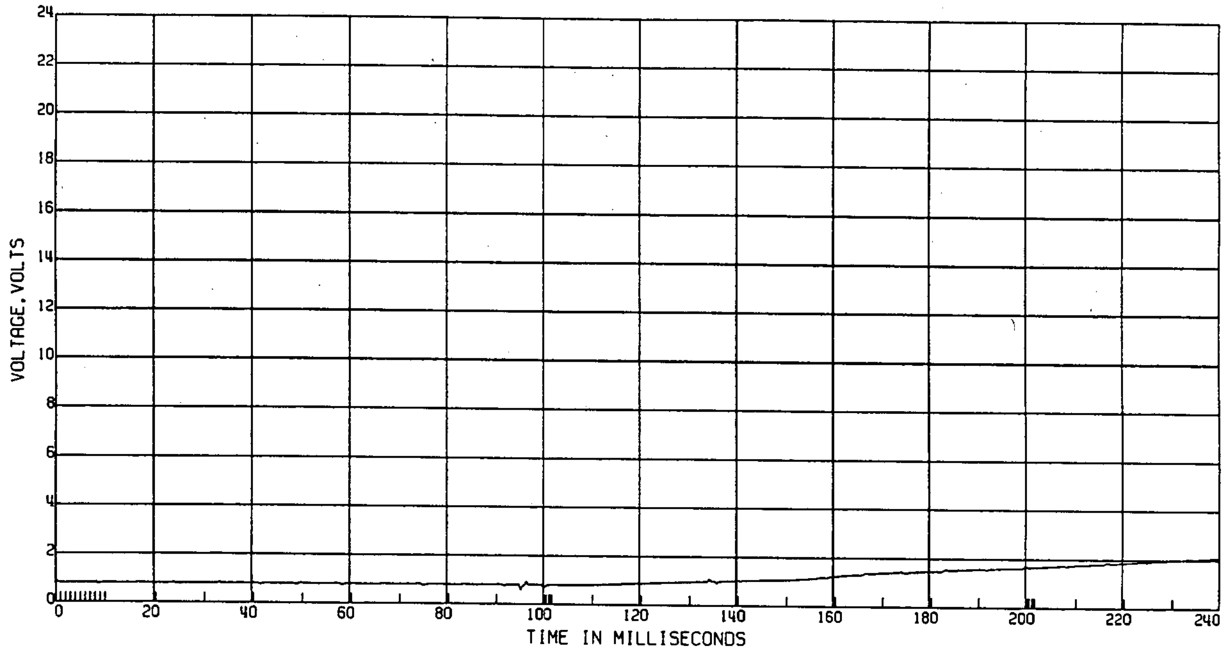



Appendix D, plot # **156**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 VAPOR SENSOR (S3) VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

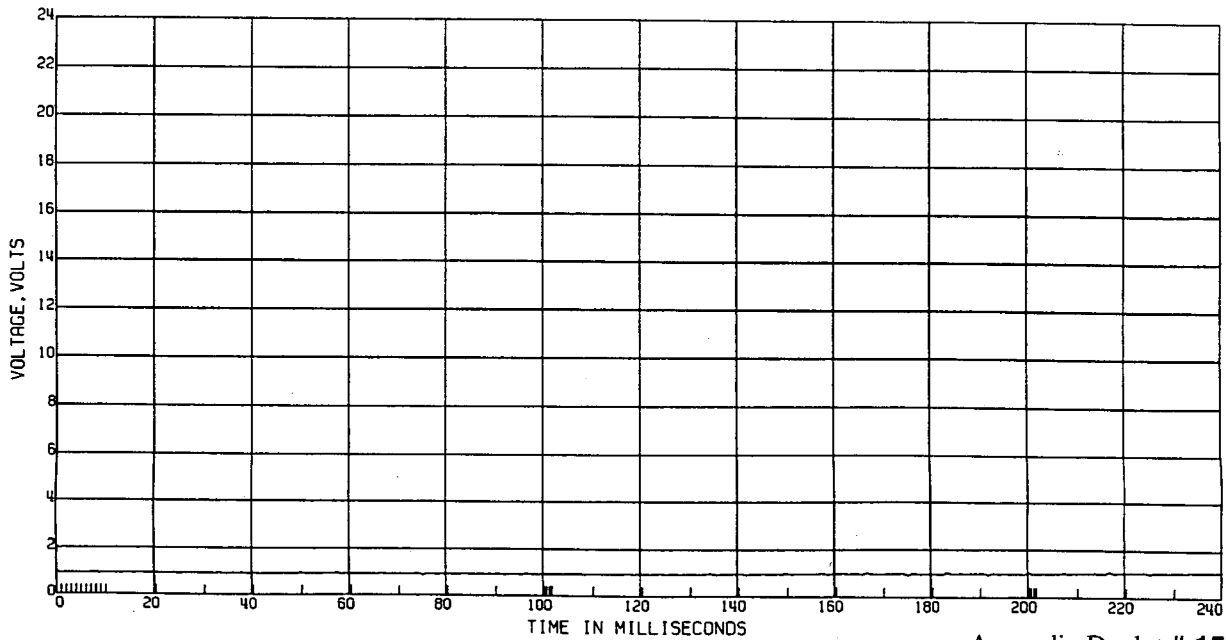



Appendix D, plot # **157**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 VAPOR SENSOR (S4) VOLTAGE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **158**

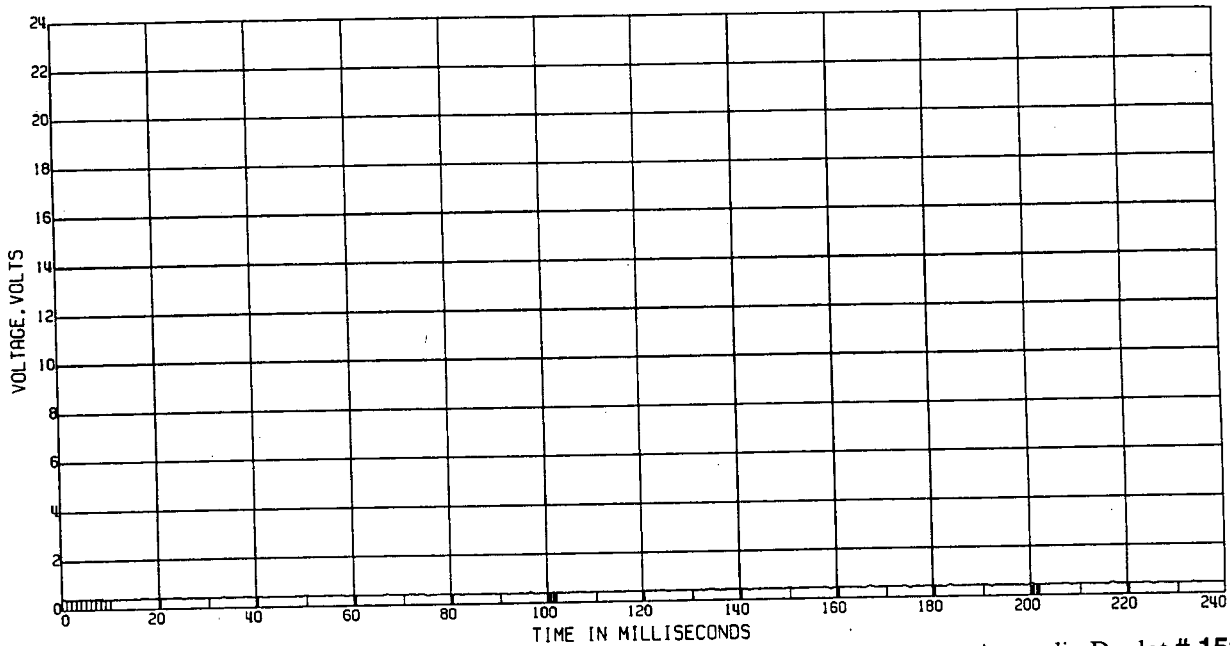
C11591 FRONT IMPACT | MOVING VEHICLE TO FIXED POLE | 55.3KM/H

R&D CTR 1VF46081 1FP87

VAPOR SENSOR (S5) VOLTAGE

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **159**

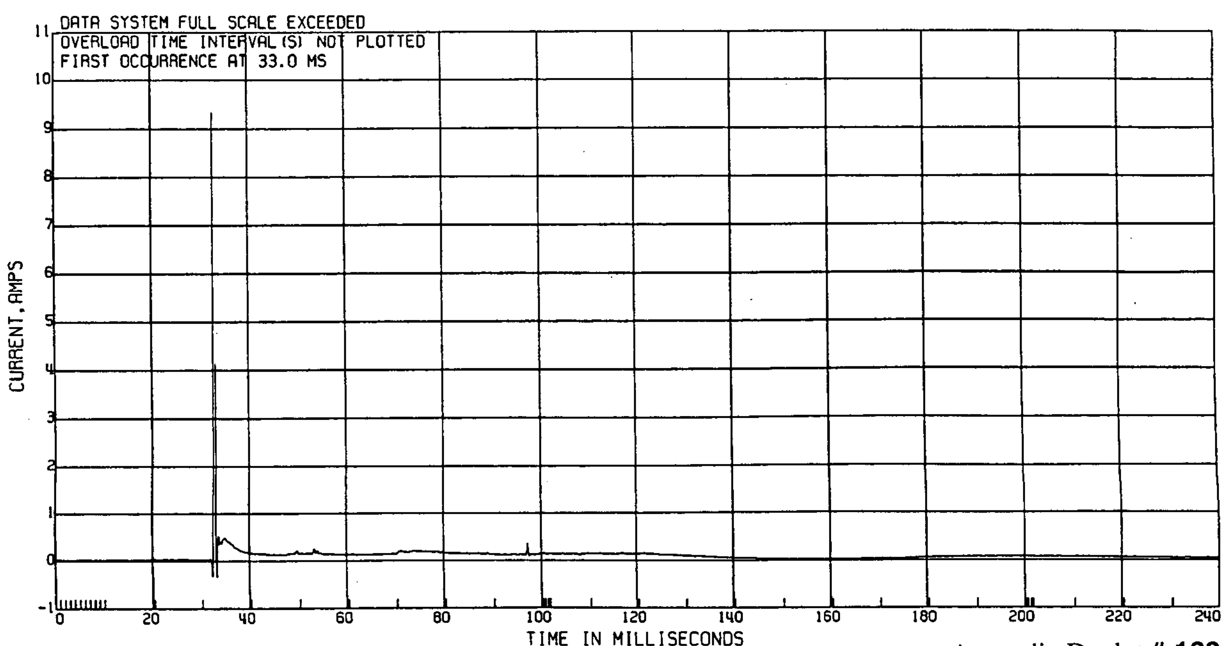
C11591 FRONT IMPACT | MOVING VEHICLE TO FIXED POLE | 55.3KM/H

R&D CTR 1VF46081 1FP87

L. WHEEL BAG CURRENT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **160**

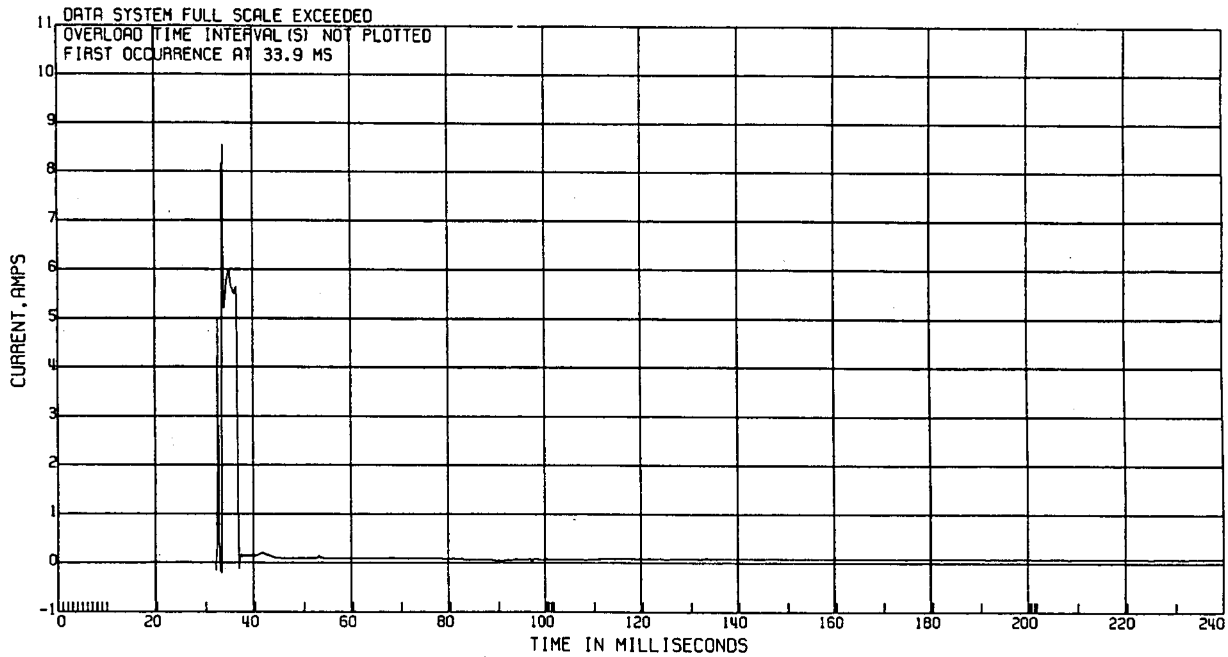
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

R. I/P BAG CURRENT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **161**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

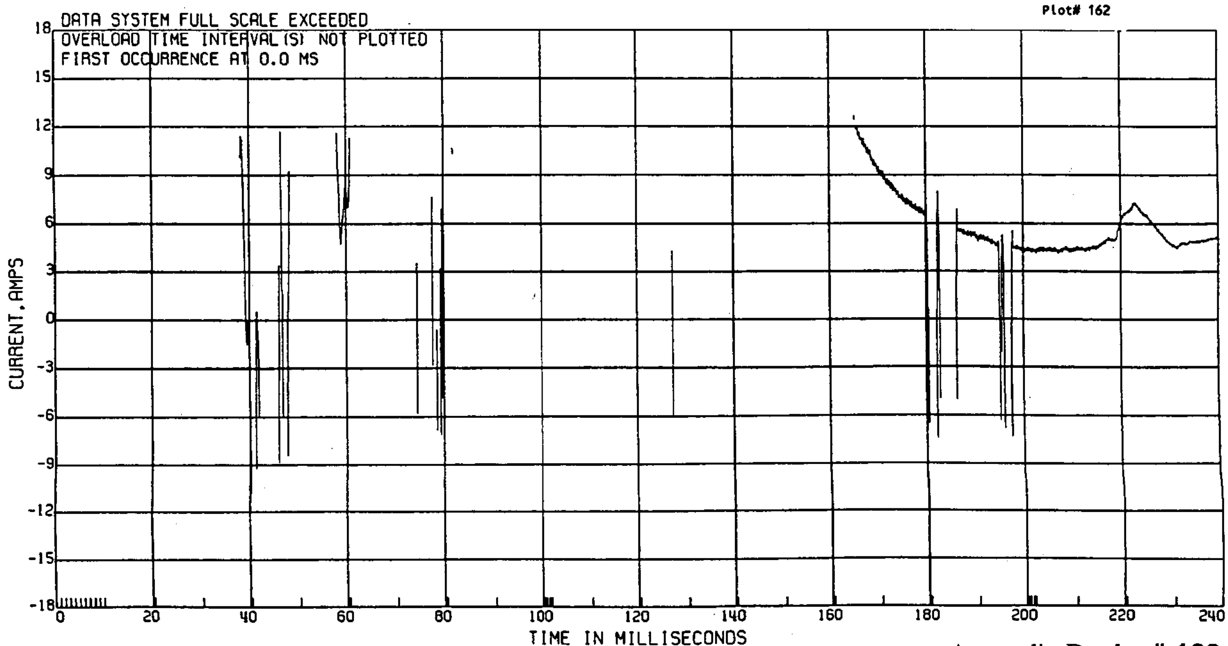
BATTERY CURRENT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

FULL SCALE CALIBRATION LEVEL EXCEEDED

Plot# 162

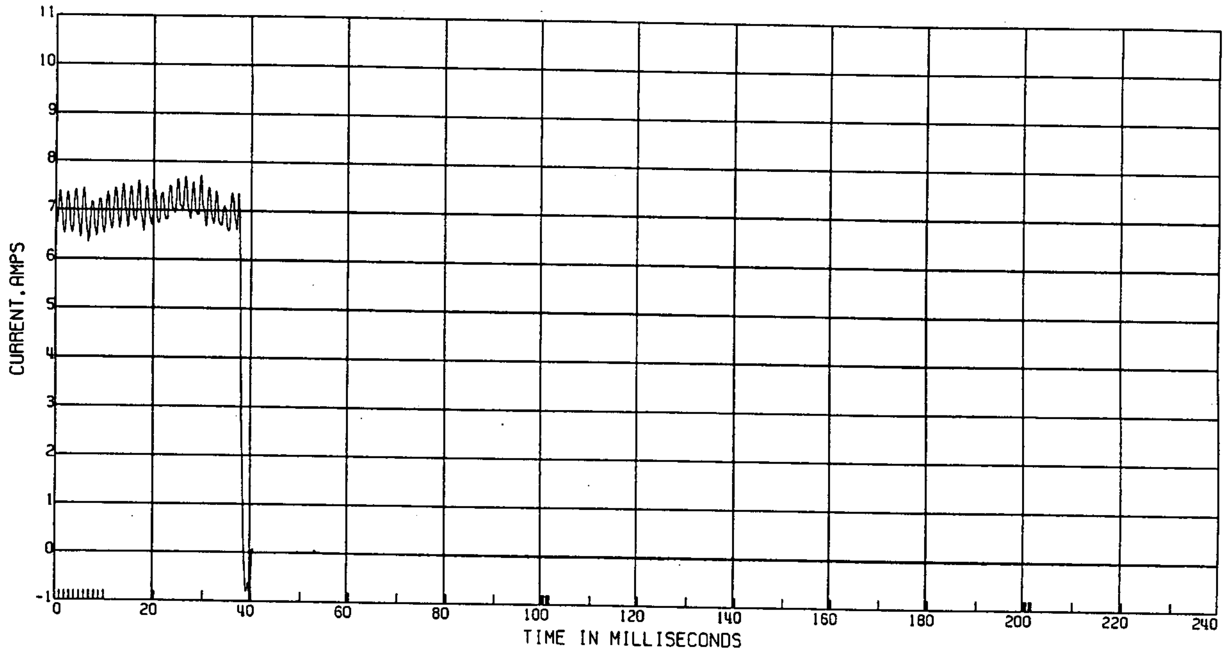



Appendix D, plot # **162**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 FUEL PUMP CURRENT TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

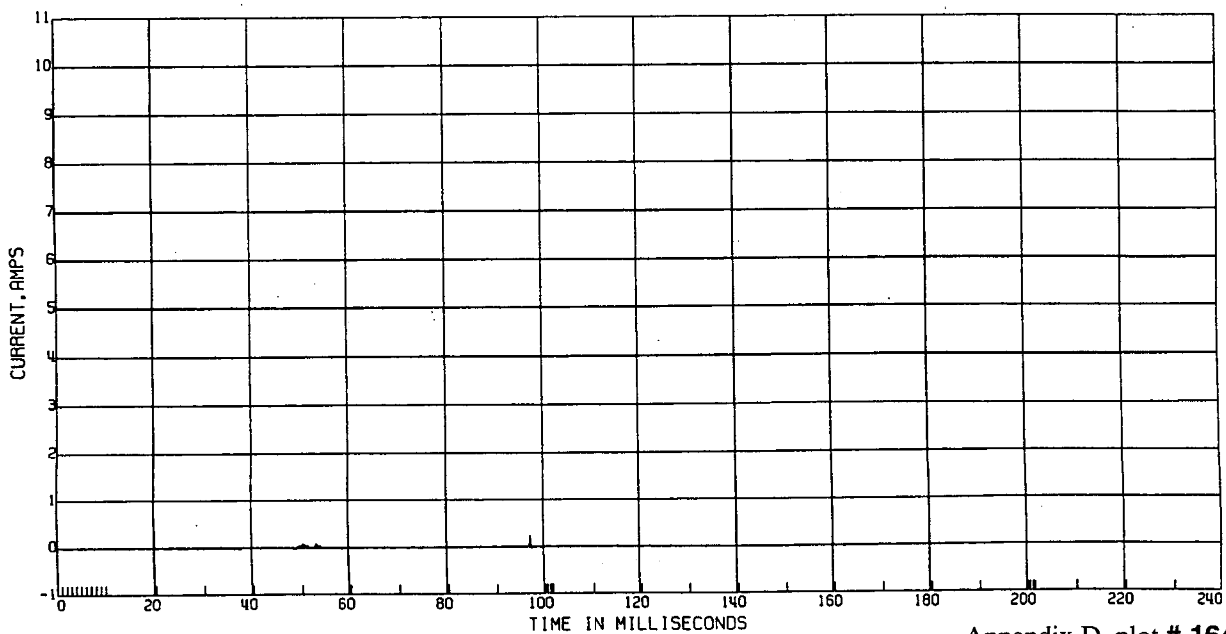



Appendix D, plot # **163**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 L. HORN HI-LO CURRENT TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **164**

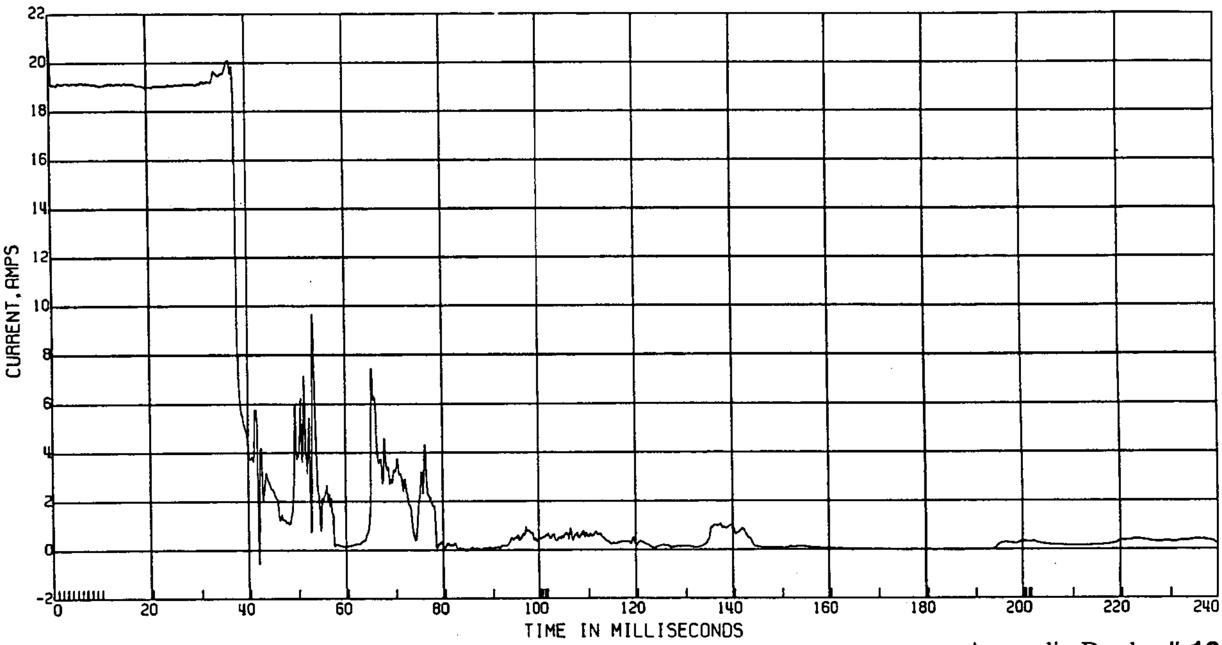
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

HEADLIGHT-LOW-HIGH CURRENT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **165**

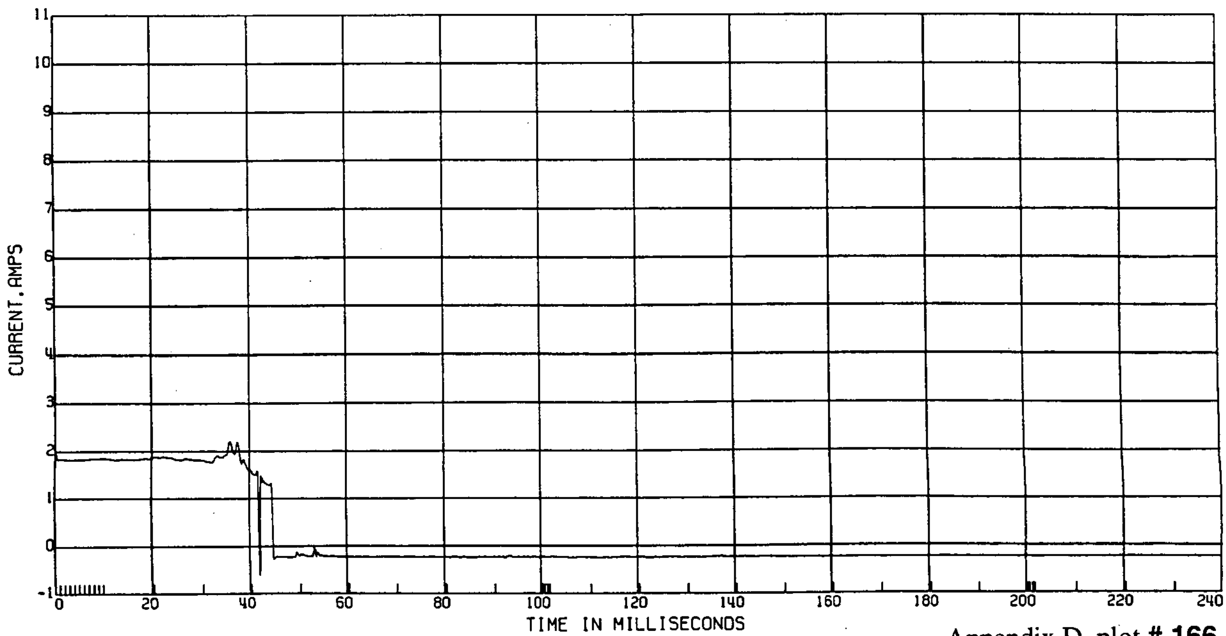
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

A/C CLUTCH CURRENT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **166**

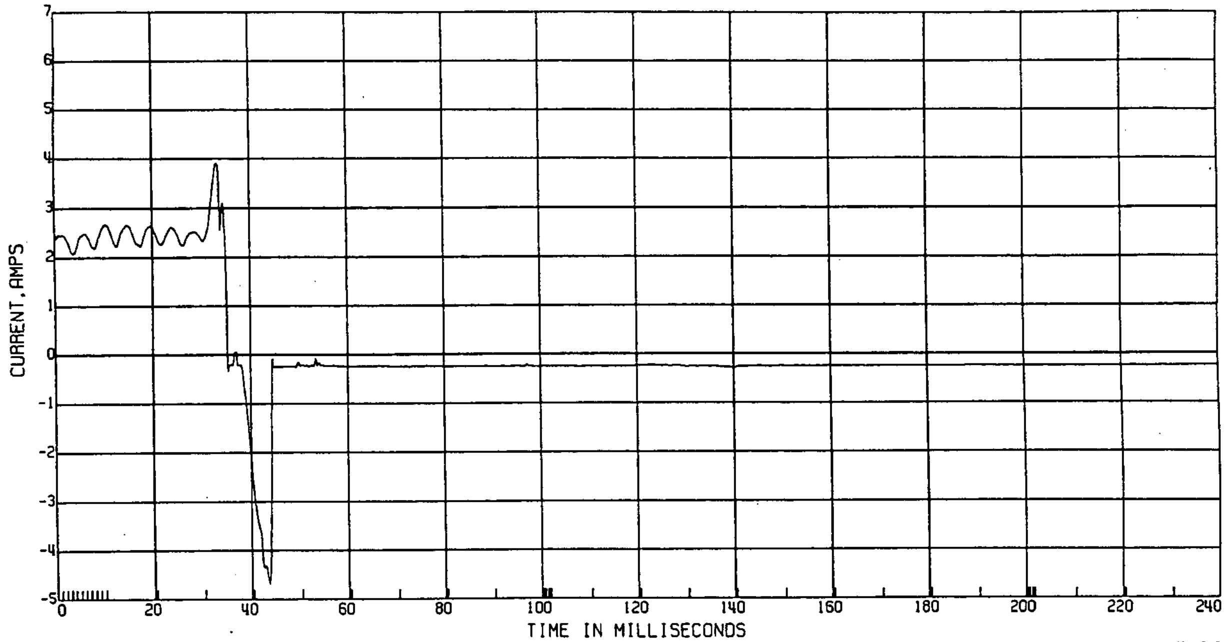
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

COOLING FAN CURRENT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **167**

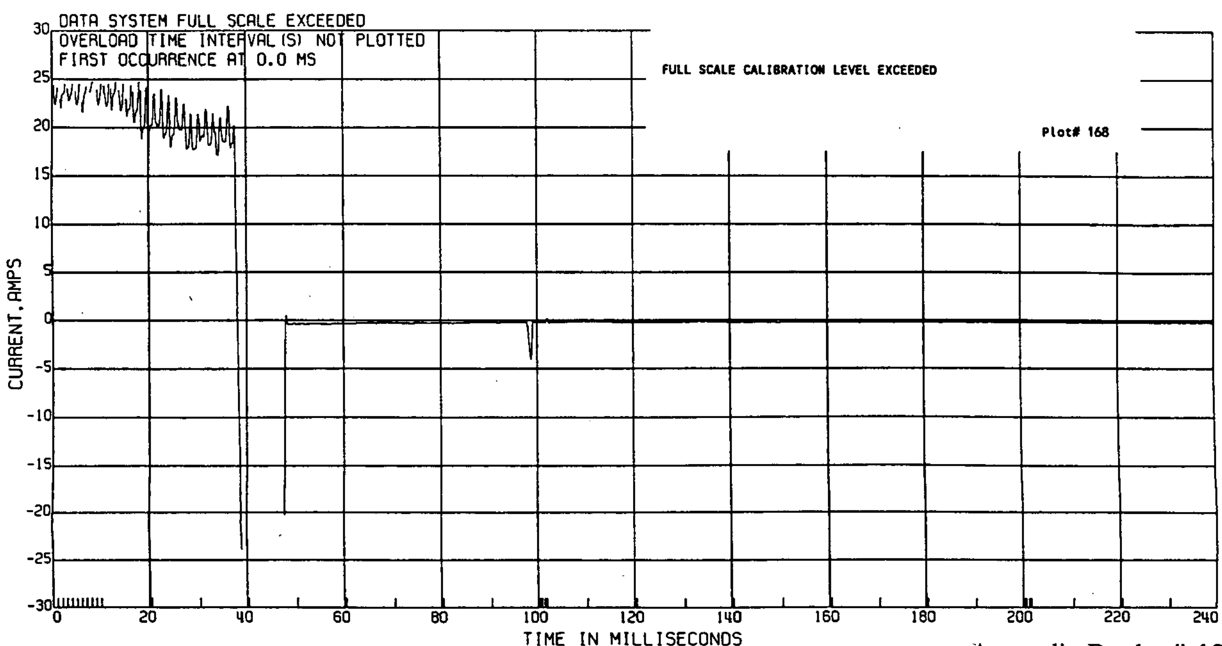
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

HVAC BLOWER CURRENT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

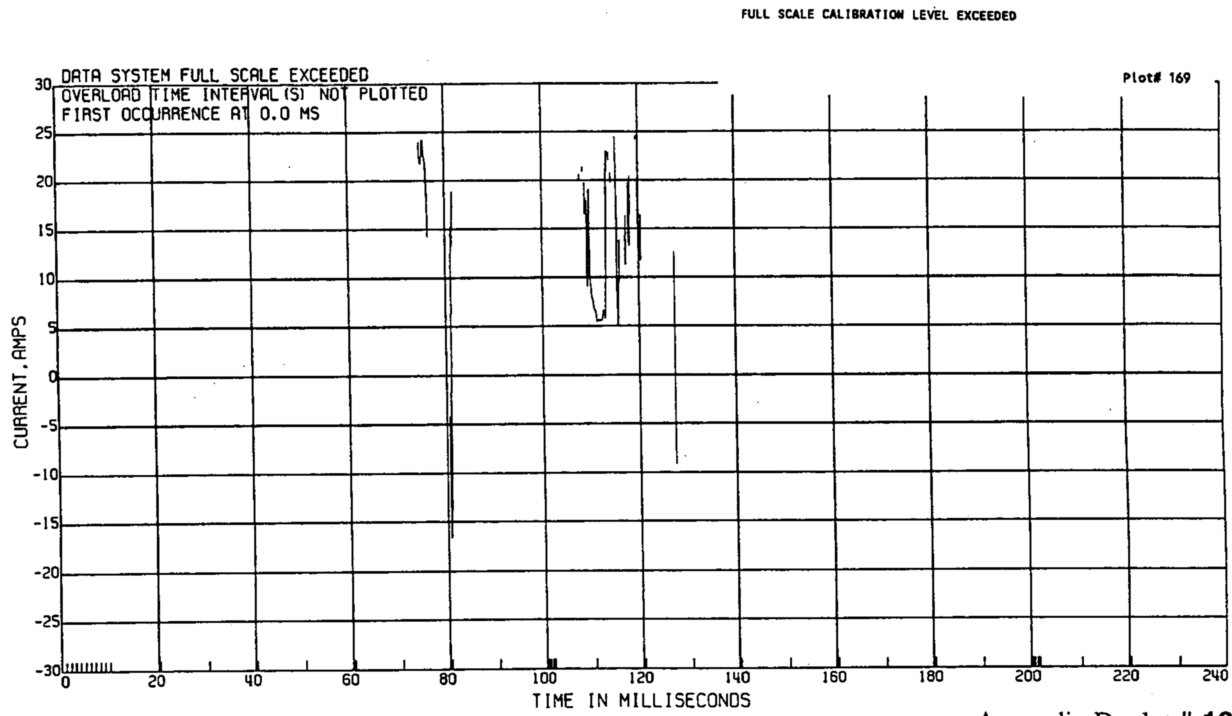



Appendix D, plot # **168**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 ALTERNATOR CABLE CURRENT TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

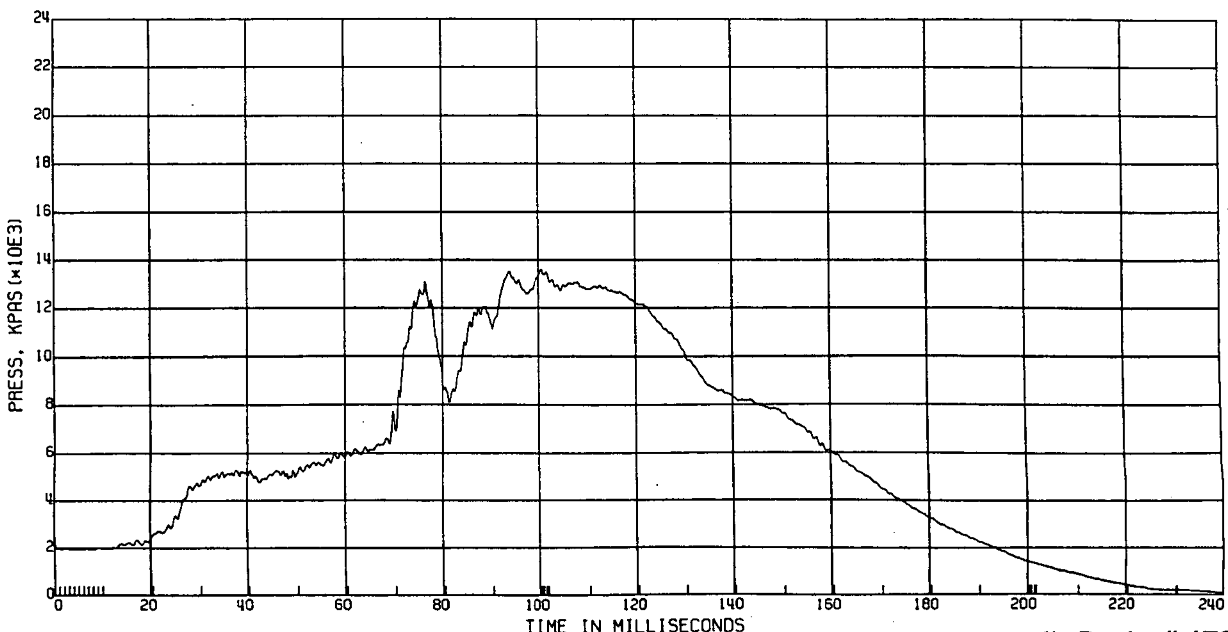



Appendix D, plot # **169**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

R & D CTR 1VF46081 1FP87 FRT BRAKE SYSTEM PRESSURE TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **170**

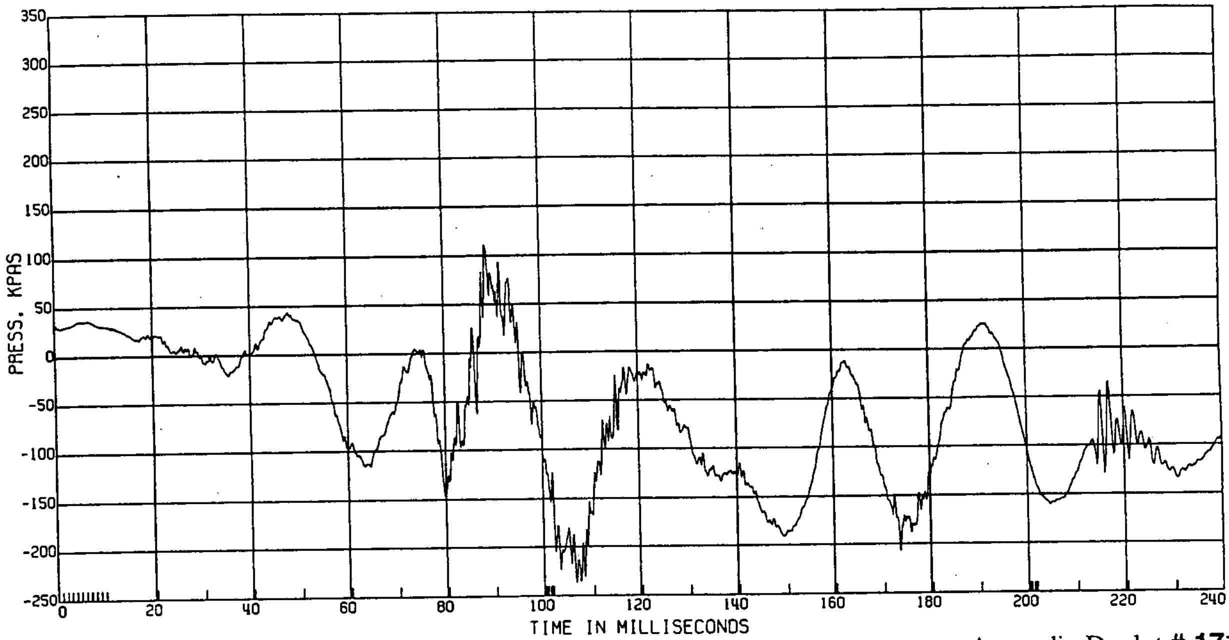
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

R & D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

FUEL SUPPLY LINE PRESSURE

TEST DATE:05/14/1997




Appendix D, plot # **171**

171

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

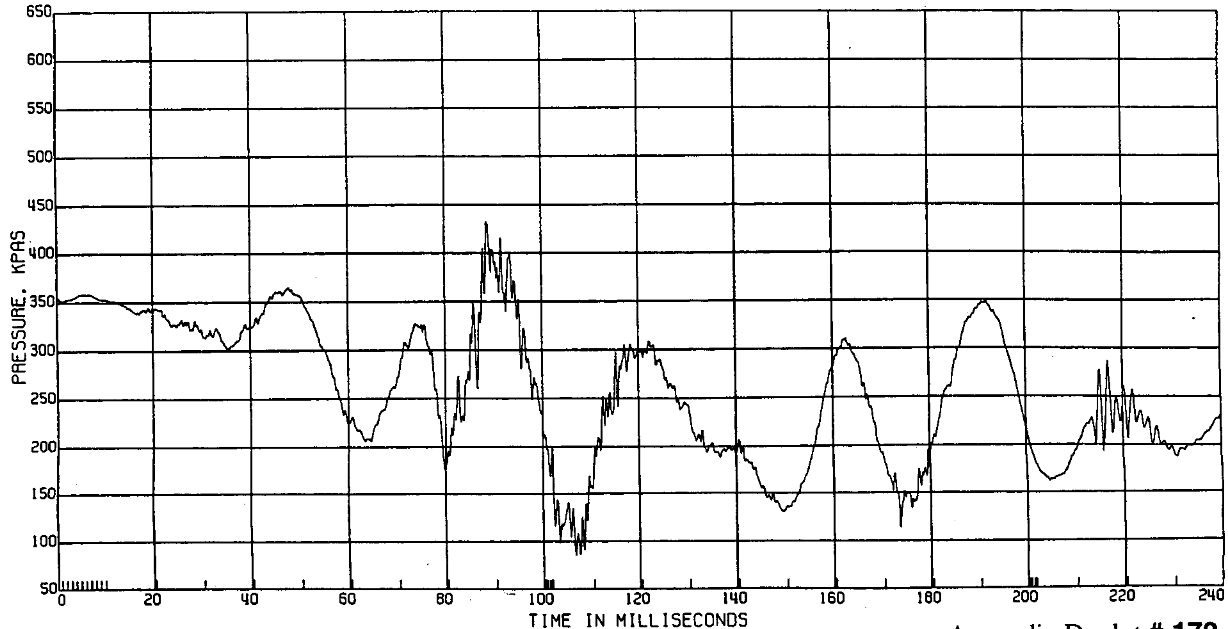
R & D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

FUEL SUPPLY LINE PRESSURE

(BIASED DATA BY 322.0KPAS)

TEST DATE:05/14/1997




Appendix D, plot # **172**

172

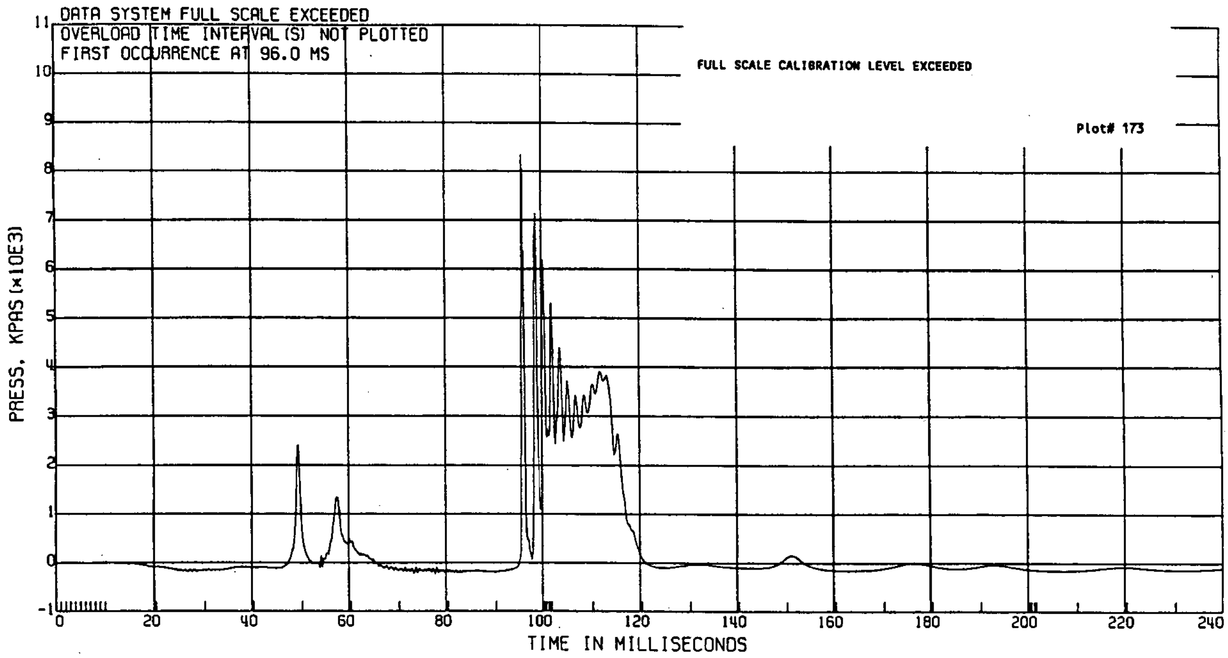
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

R & D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

L. POWER STEERING SYSTEM PRESSURE

TEST DATE:05/14/1997




Appendix D, plot # **173**

173

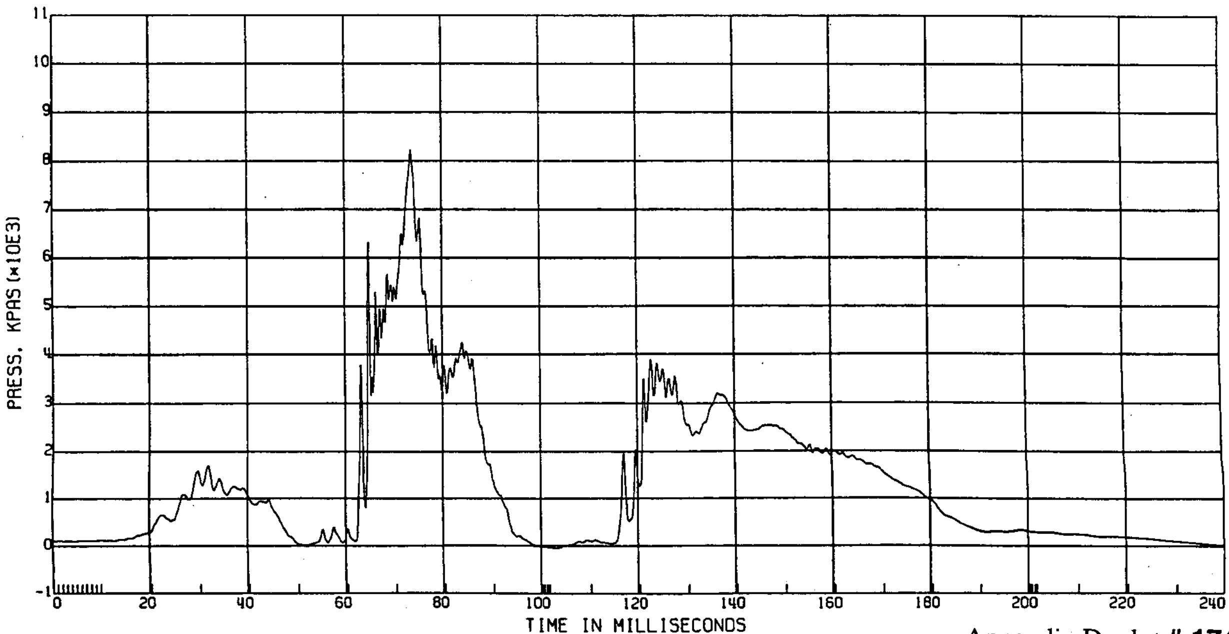
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

R & D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

R. POWER STEERING SYSTEM PRESSURE

TEST DATE:05/14/1997




Appendix D, plot # **174**

174

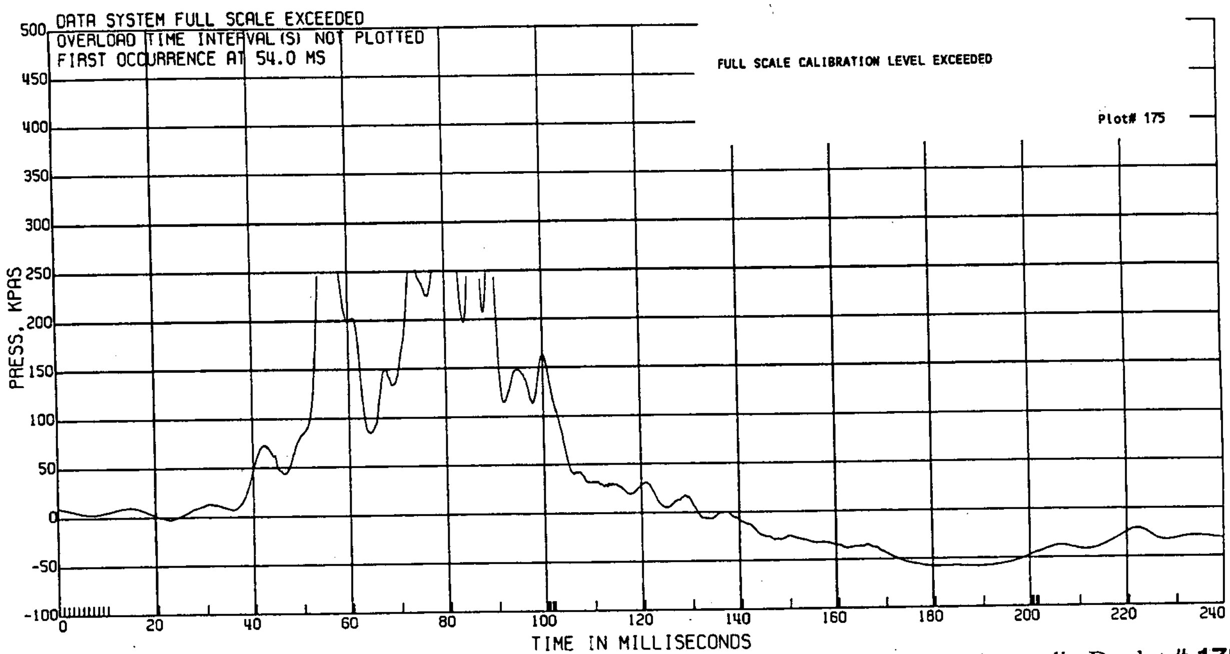
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

R & D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

COOLING SYSTEM PRESSURE

TEST DATE:05/14/1997




Appendix D, plot # 175

175

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

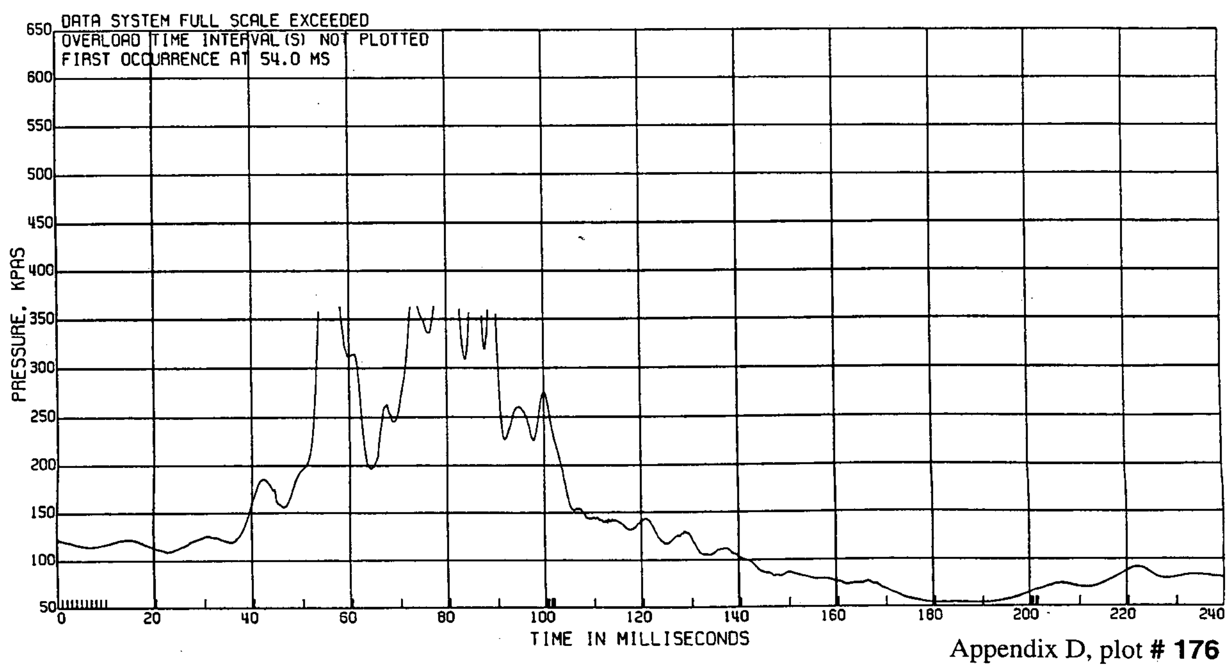
R & D CTR 1VF46081 1FP87

ELEC DATA, SAE CLASS 1000

COOLING SYSTEM PRESSURE

(BIASED DATA BY 112.0KPAS)

TEST DATE:05/14/1997




Appendix D, plot # 176

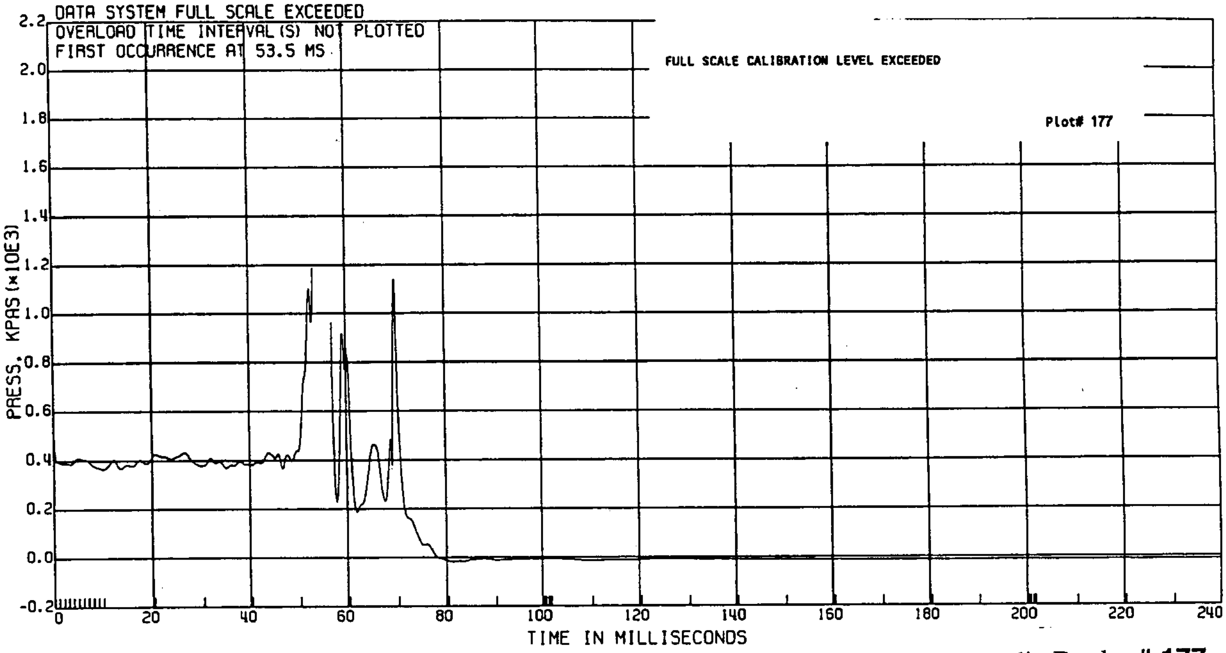
176

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

ENGINE OIL PRESSURE

R & D CTR 1VF46081 1FP87 TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **177**

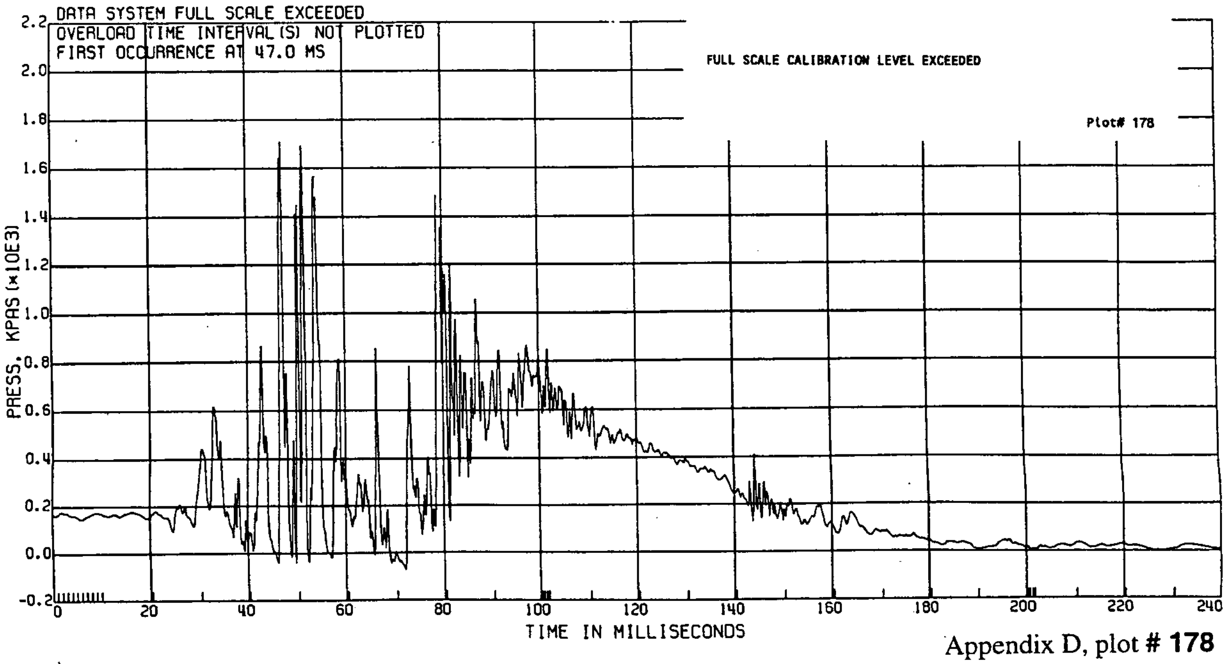
177

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.4KM/H

TRANSMISSION COOLER PRESSURE

R & D CTR 1VF46081 1FP87 TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **178**

178

C11591 FRONT IMPACT

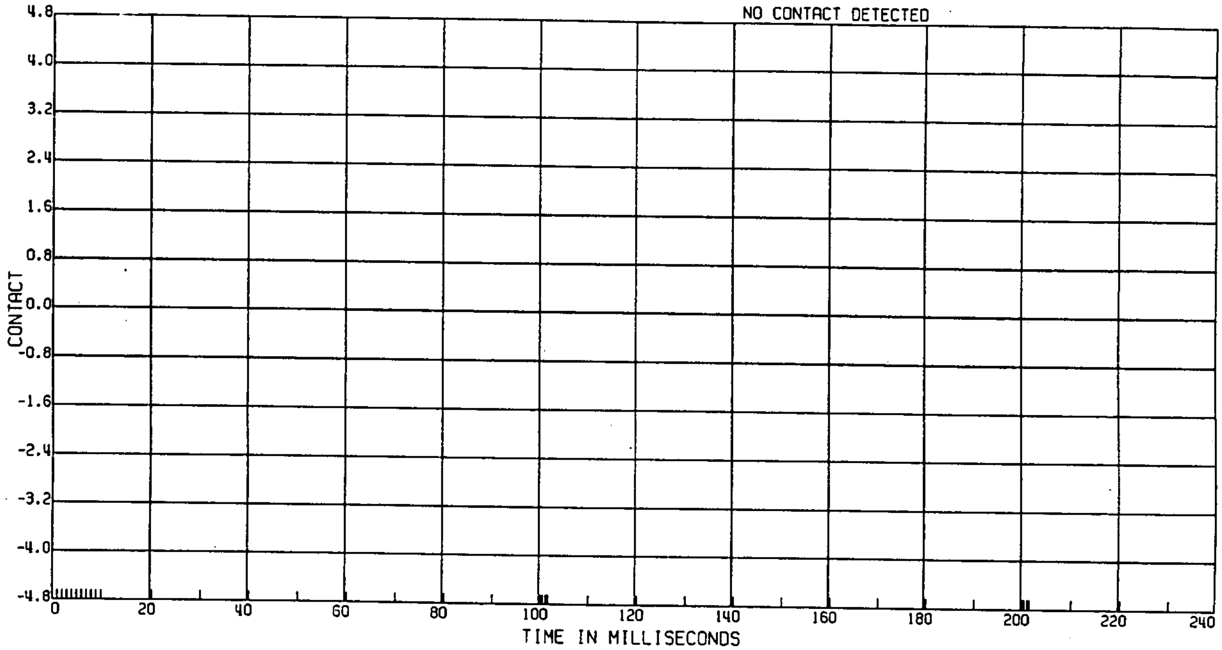
MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

THERMAL WIRE CONTACT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **179**

C11591 FRONT IMPACT

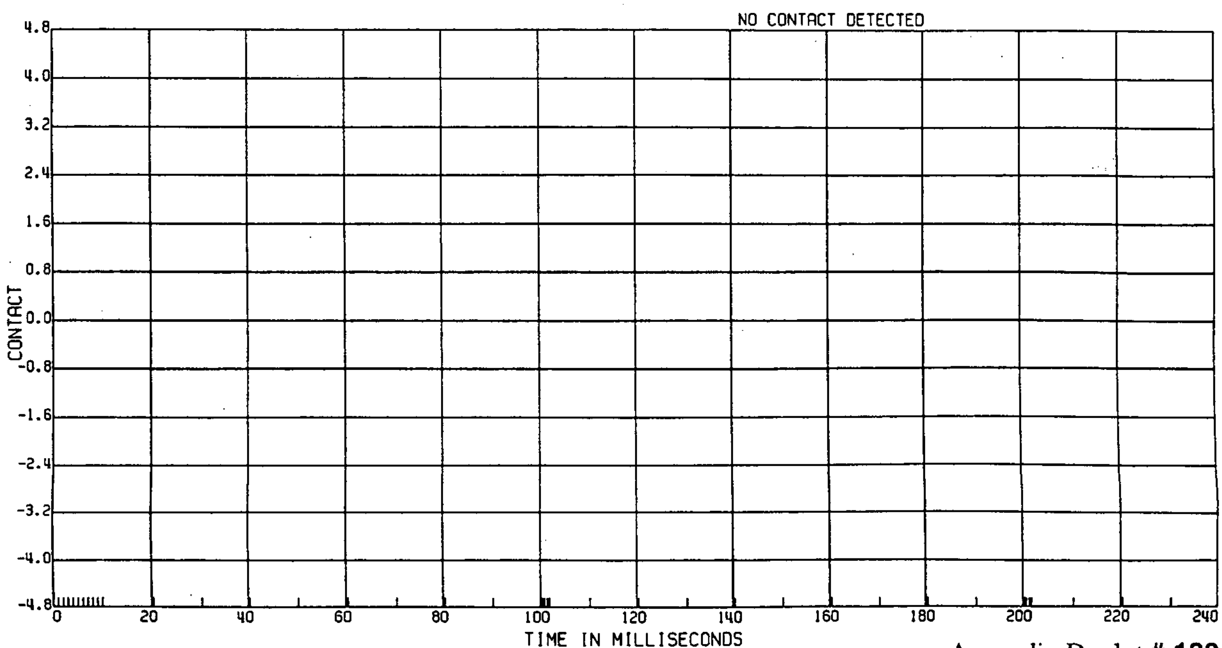
MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87

PNEUMATIC WIRE CONTACT

TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000

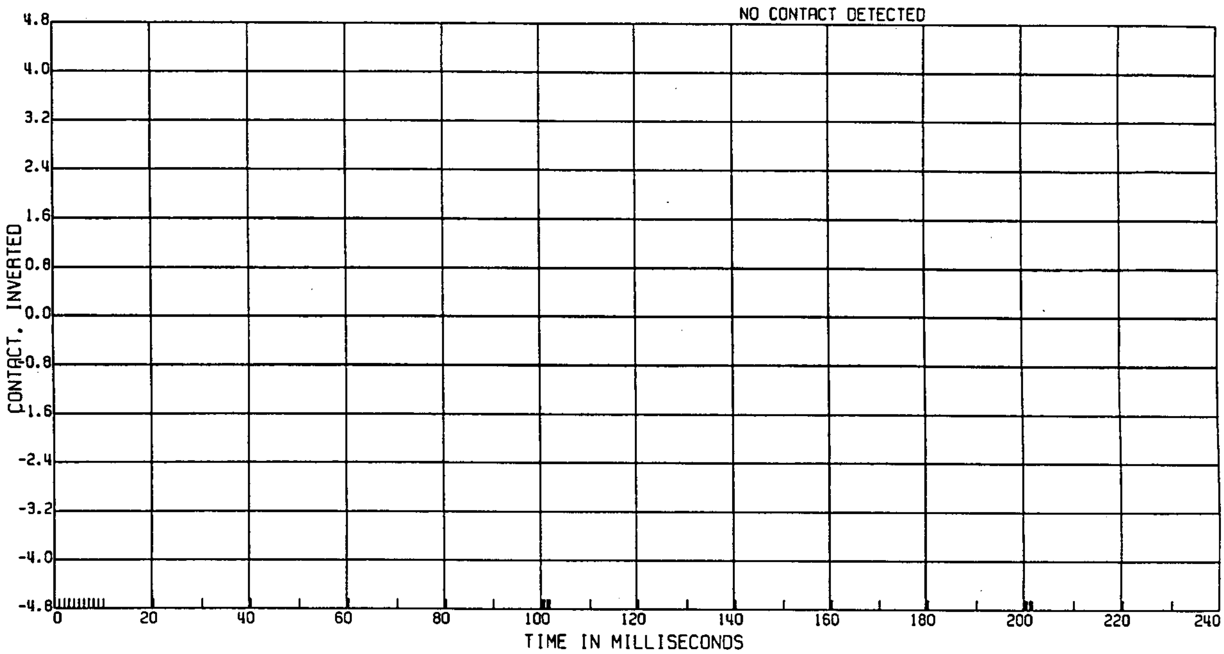



Appendix D, plot # **180**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H

R&D CTR 1VF46081 1FP87 PNEUMATIC WIRE FAULT CONTACT TEST DATE:05/14/1997

ELEC DATA, SAE CLASS 1000




Appendix D, plot # **181**

# Appendix E

**Appendix E:** C11591 hydrocarbon vapor measurement plots

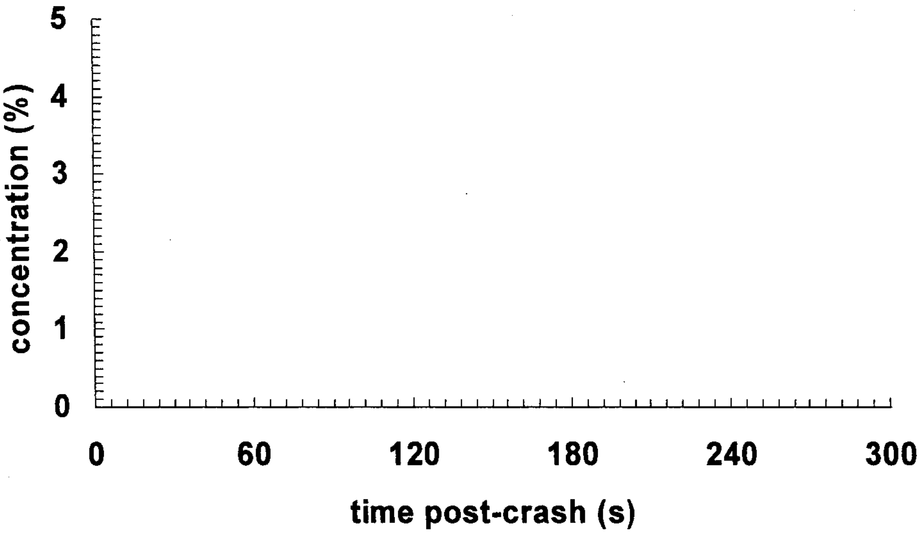



**Figure E1**

Concentration of Hydrocarbon Vapor Measured above the Right Fuel Rail (Location #1)

Test C11591

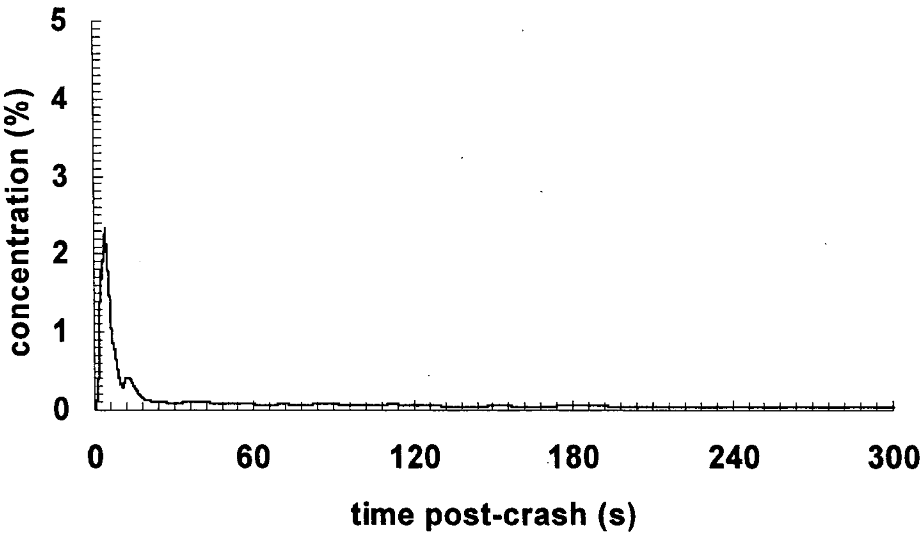



**Figure E2**

Concentration of Hydrocarbon Vapor Measured above the Left Fuel Rail (Location #2)

Test C11591

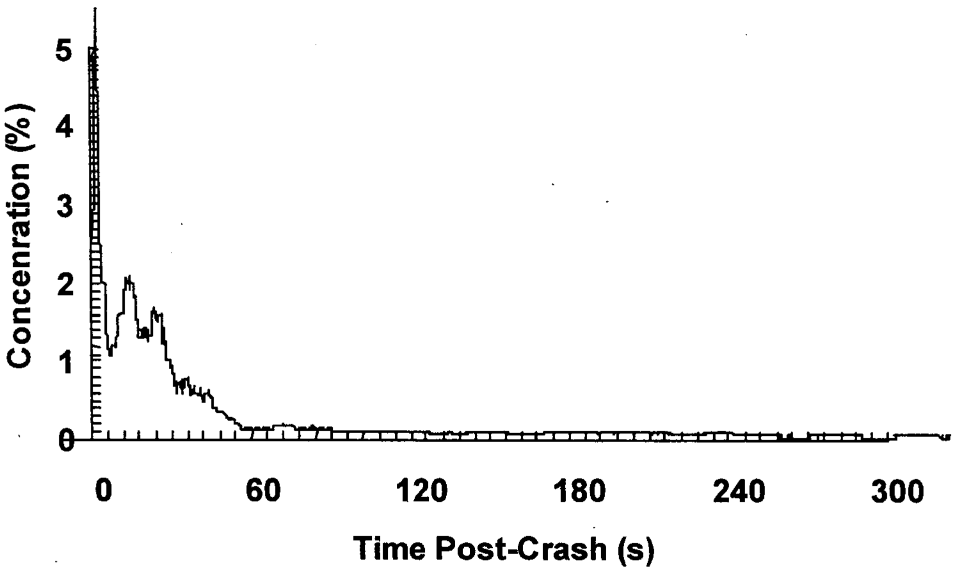



**Figure E3**

Concentration of Hydrocarbon Vapor Measured above the Left Exhaust Manifold (Location #3)

Test C11591

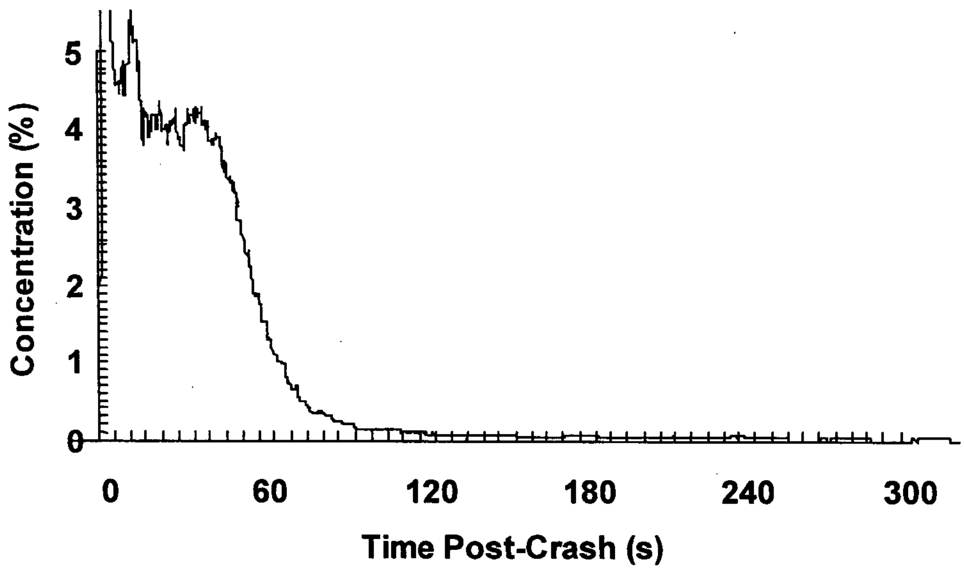



**Figure E4**

Concentration of Hydrocarbon Vapor Measured Near the Left Exhaust Pipe (Location #4)

Test C11591

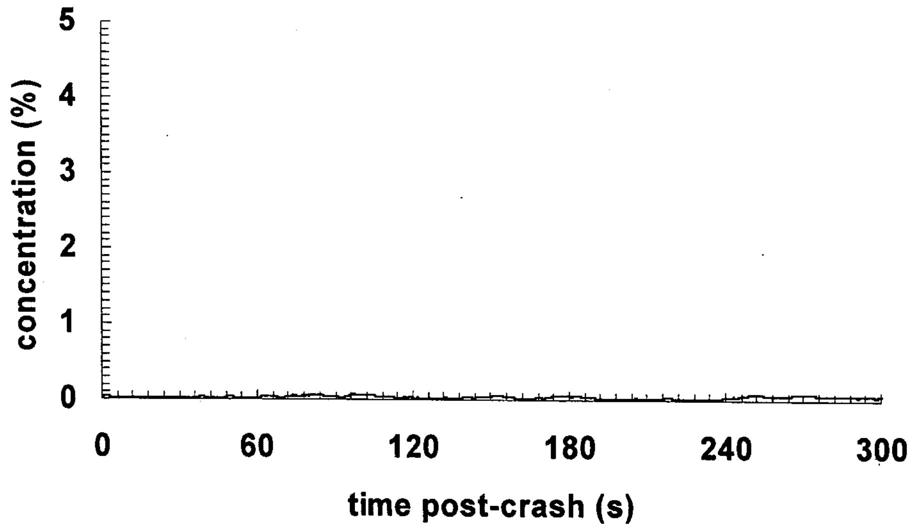



**Figure E5**
Concentration of Hydrocarbon Vapor Measured Near the Catalytic Converter (Location #5)
Test C11591

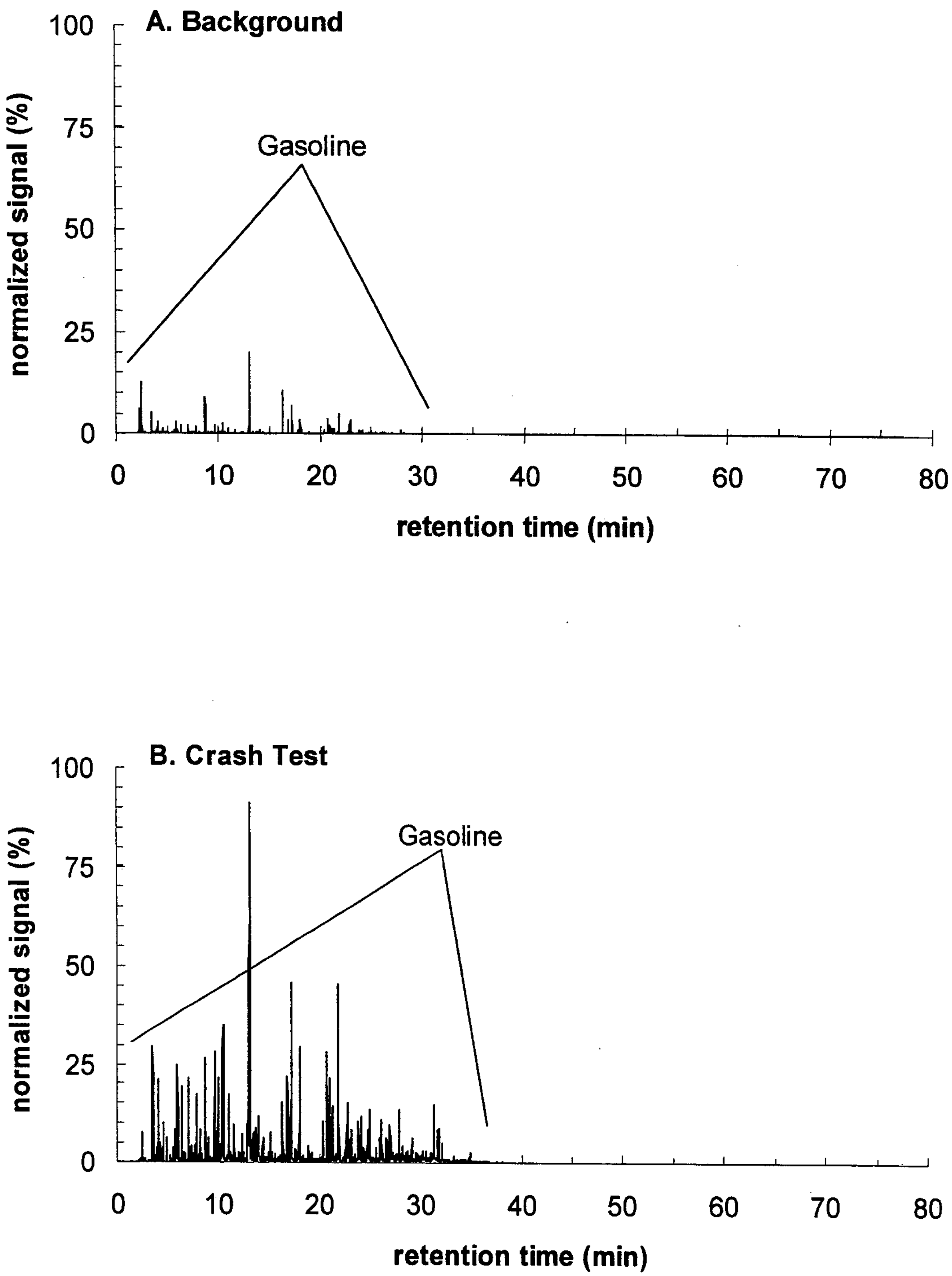



**Figure EE1**
GC/FID analysis of hydrocarbon vapor sample from over the right fuel rail (location #1) during Crash Test C11591. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample

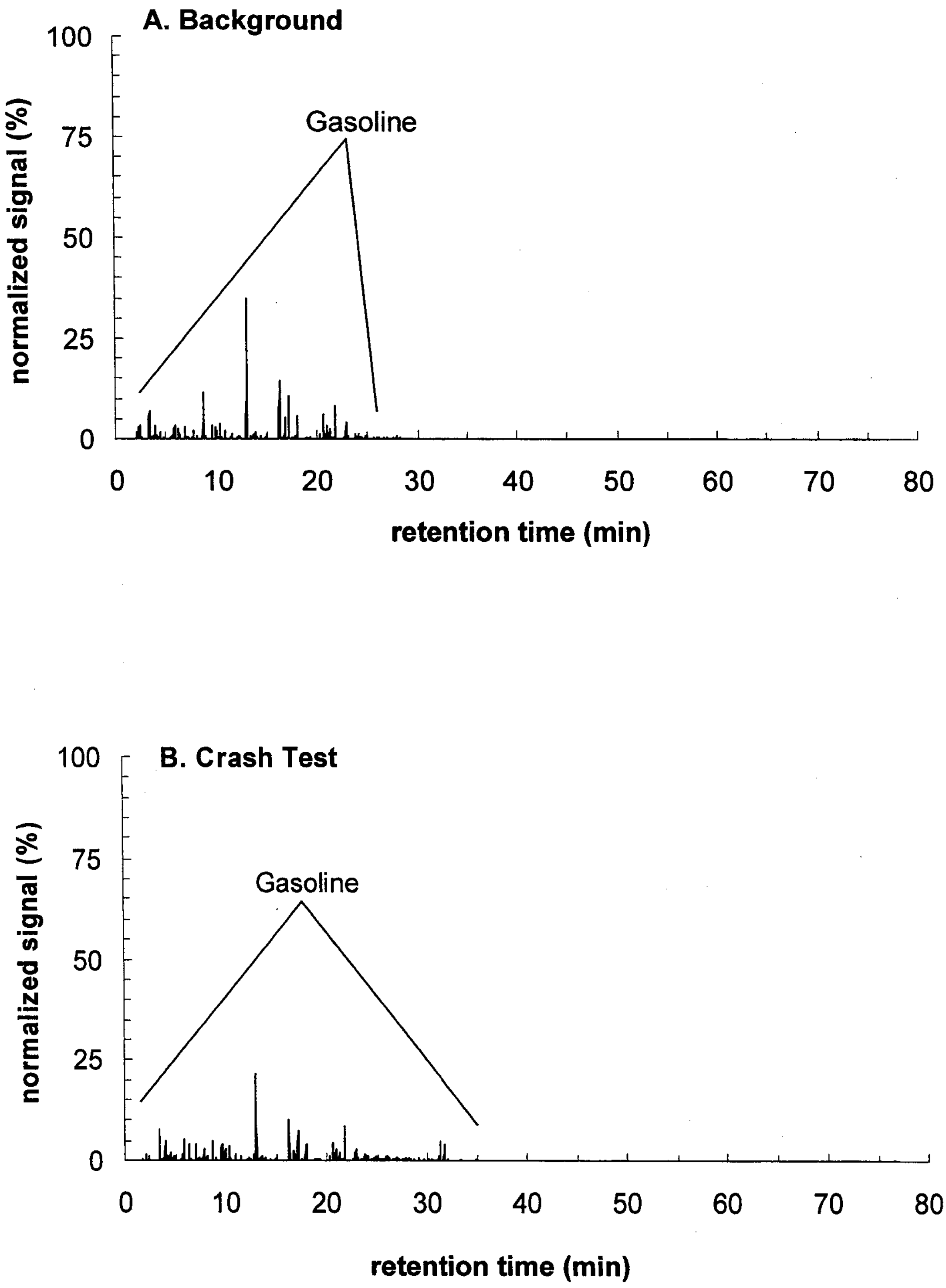
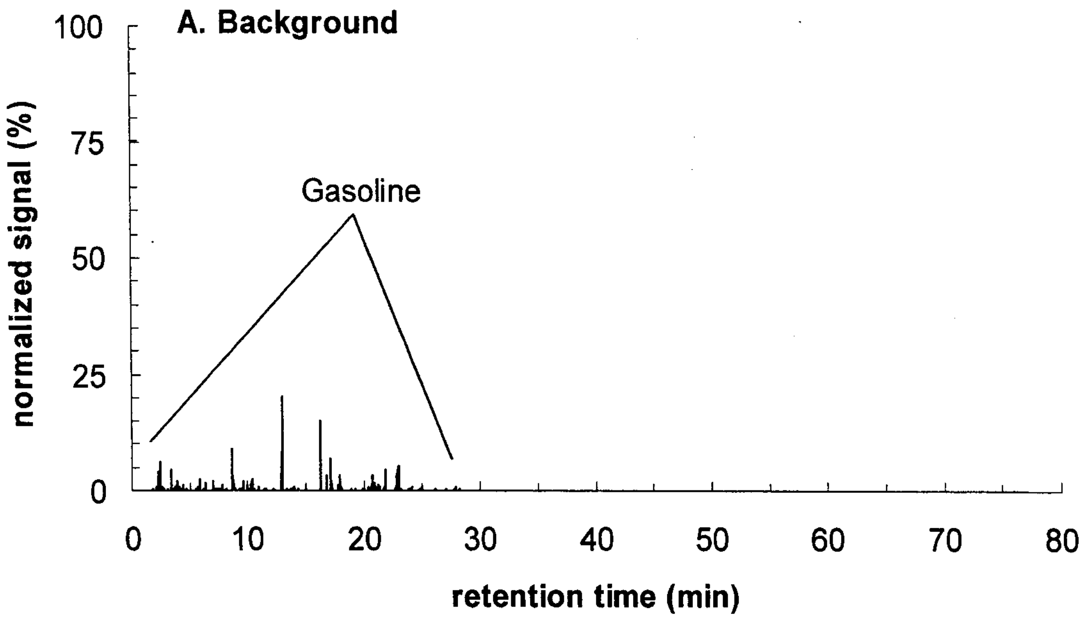



**Figure EE2.**

GC/FID analysis of hydrocarbon vapor sample from over left fuel rail (location #2) during Crash Test C11591. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.



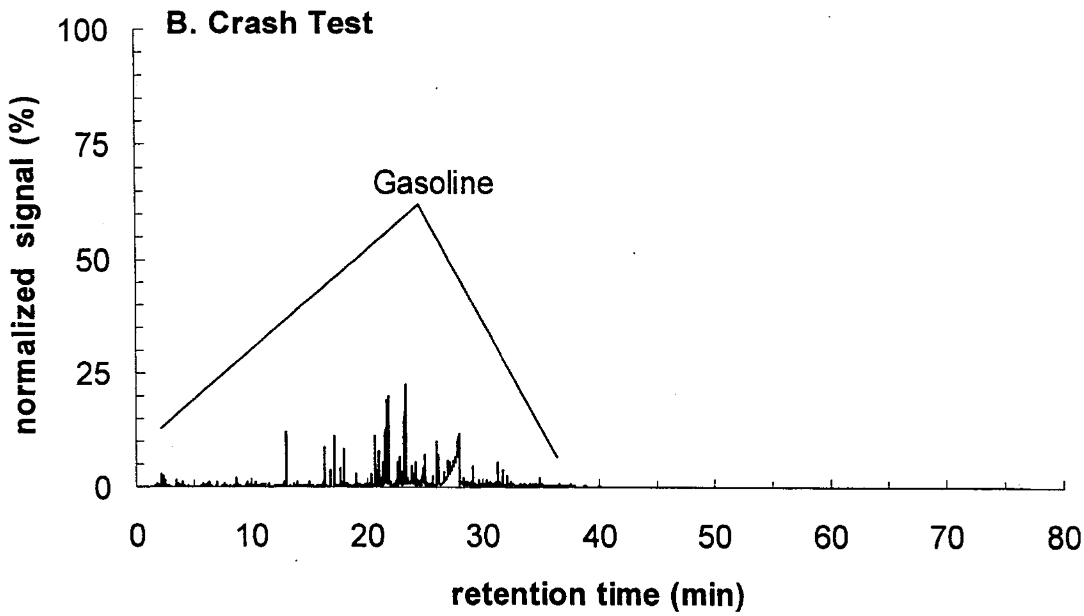




**Figure EE3.**
GC/FID analysis of hydrocarbon vapor sample from over left exhaust manifold (location #3) during Crash Test C11591. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.

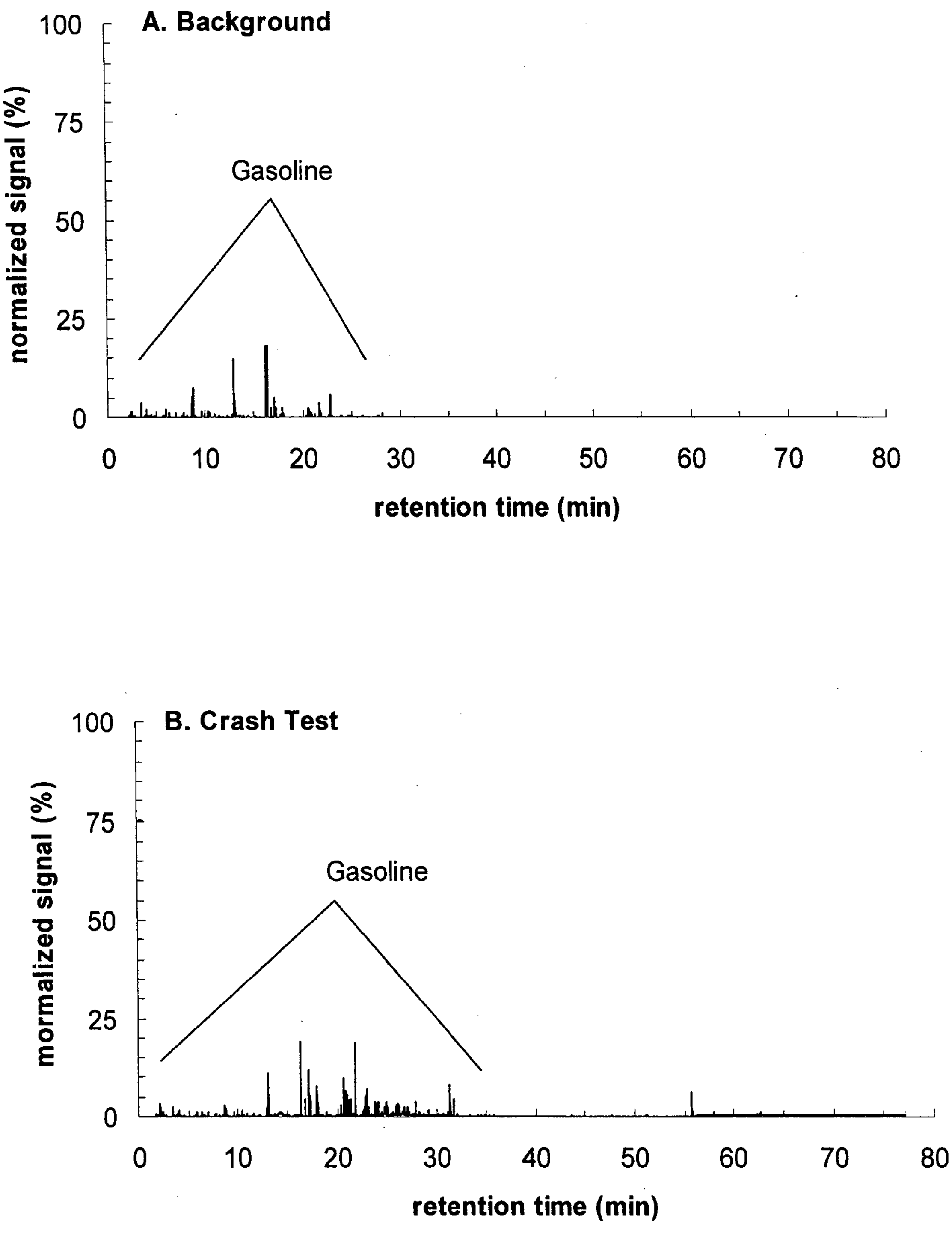



**Figure EE4.**
GC/FID analysis of hydrocarbon vapor sample from over descending left exaustpipe (location #4) during Crash Test C11591. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.

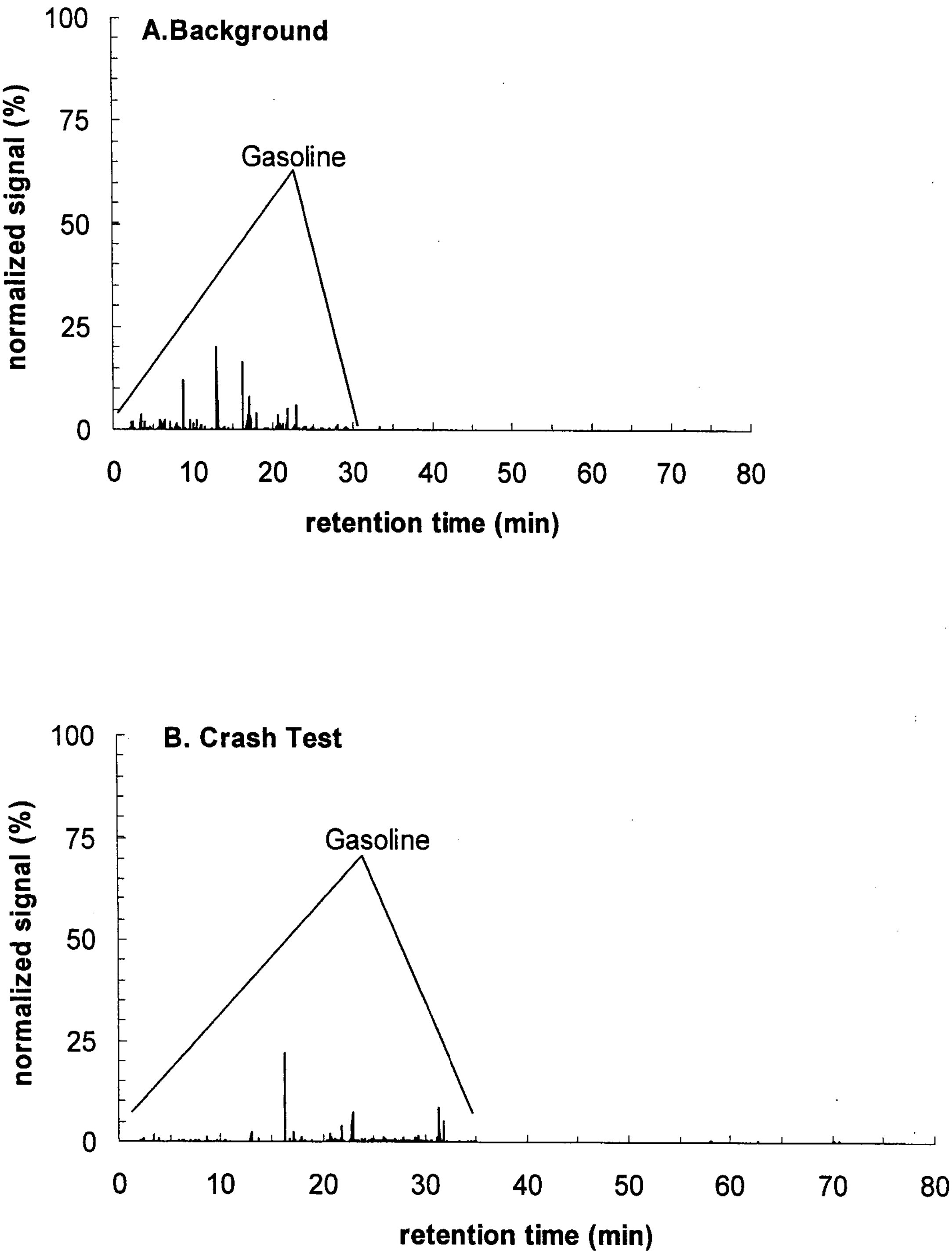



**Figure EE5**
GC/FID analysis of hydrocarbon vapor sample near catalytic converter (location #5) during Crash Test C11591. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.

Appendix F

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H FIGURE

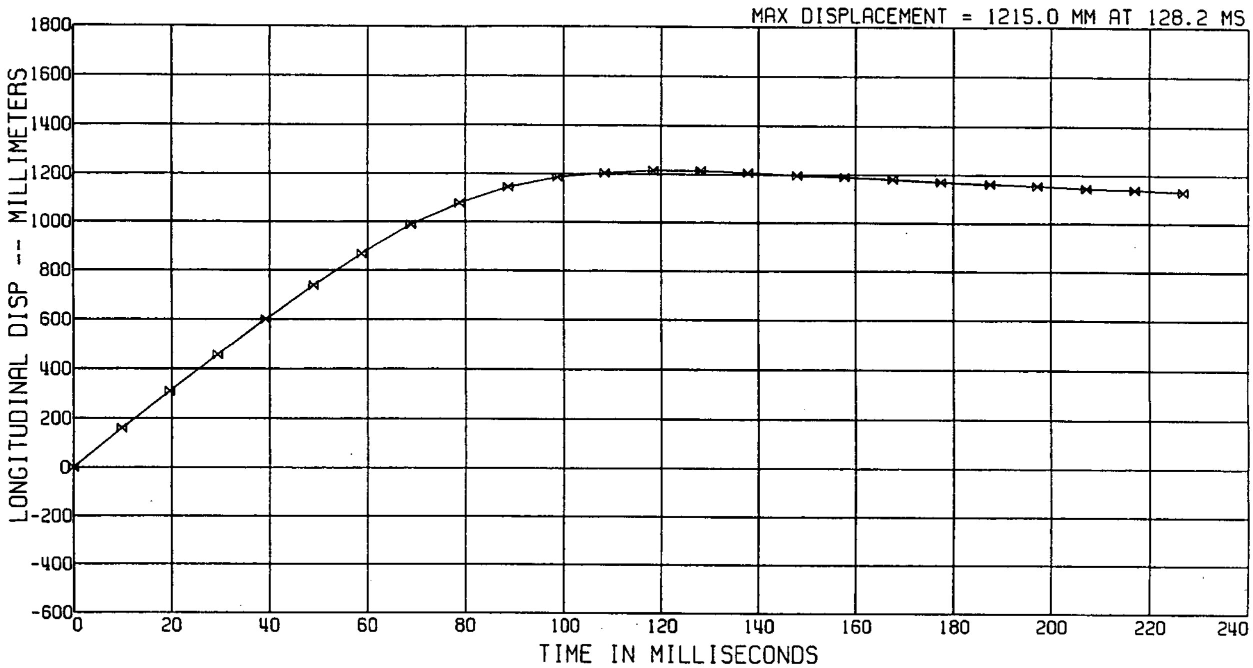
R&D CTR 1VF46081 1FP87

FILM DATA

LEFT SIDE

TEST DATE:05/14/97

VEHICLE DISPL RELATIVE TO GROUND REFERENCE




Appendix F, plot # **1**

C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H FIGURE

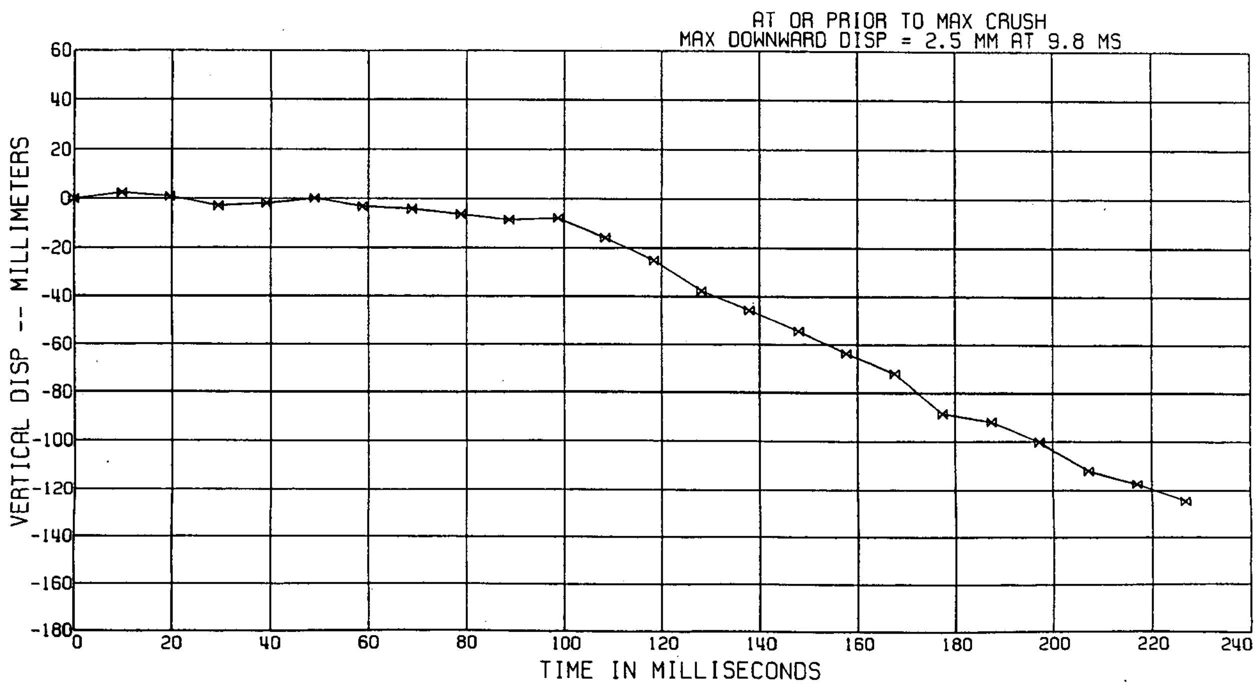
R&D CTR 1VF46081 1FP87

FILM DATA

LEFT SIDE

TEST DATE:05/14/97

VEHICLE DISPL RELATIVE TO GROUND REFERENCE




Appendix F, plot # **2**

C11591 FRONT IMPACT | MOVING VEHICLE TO FIXED POLE 55.3KM/H | FIGURE

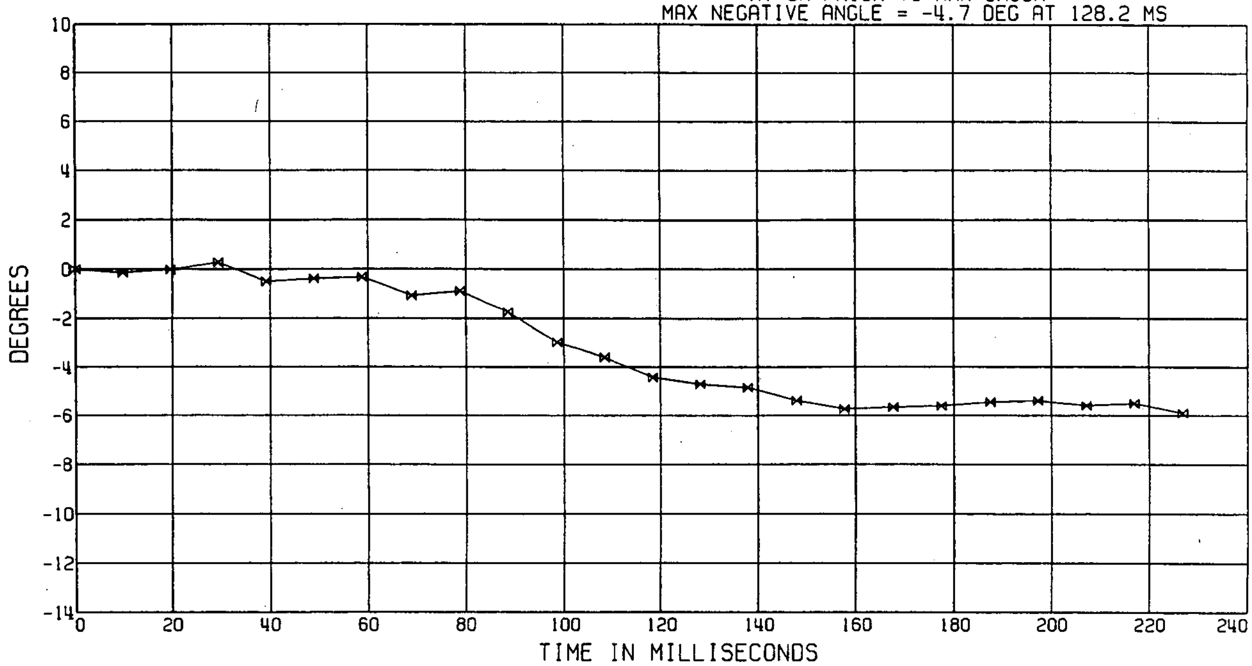
R&D CTR 1VF46081 1FP87
FILM DATA

LEFT SIDE

TEST DATE:05/14/97

VEHICLE PITCH RELATIVE TO GROUND REFERENCE

AT OR PRIOR TO MAX CRUSH
MAX NEGATIVE ANGLE = -4.7 DEG AT 128.2 MS




Appendix F, plot # **3**

C11591 FRONT IMPACT | MOVING VEHICLE TO FIXED POLE 55.3KM/H | FIGURE

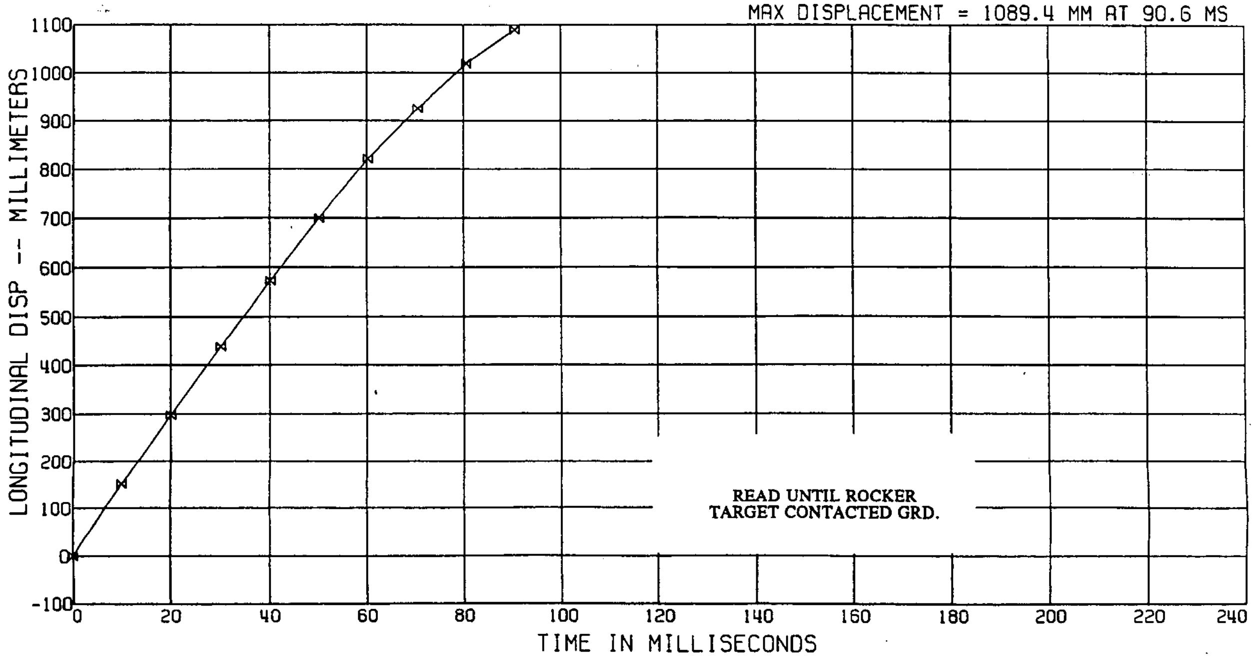
R&D CTR 1VF46081 1FP87
FILM DATA

RIGHT SIDE

TEST DATE:05/14/97

VEHICLE DISPL RELATIVE TO GROUND REFERENCE

MAX DISPLACEMENT = 1089.4 MM AT 90.6 MS




Appendix F, plot # **4**

C11591 FRONT IMPACT | MOVING VEHICLE TO FIXED POLE 55.3KM/H | FIGURE

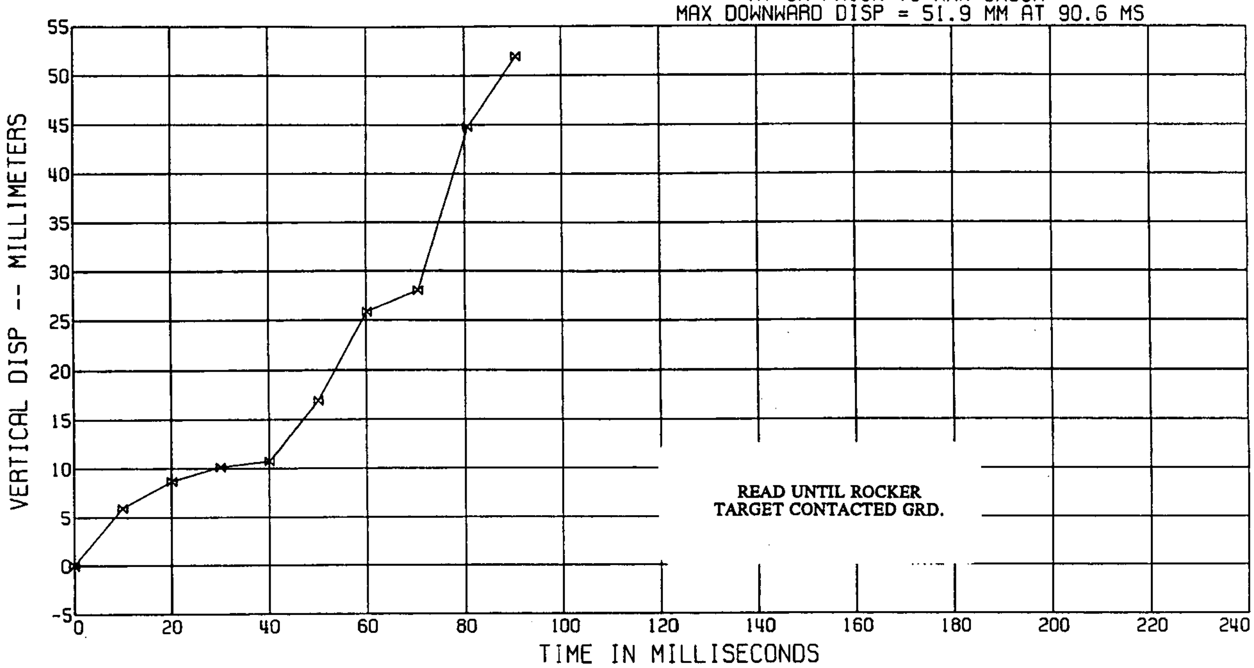
R&D CTR 1VF46081 1FP87
FILM DATA

RIGHT SIDE

TEST DATE:05/14/97

VEHICLE DISPL RELATIVE TO GROUND REFERENCE

AT OR PRIOR TO MAX CRUSH
MAX DOWNWARD DISP = 51.9 MM AT 90.6 MS




Appendix F, plot # **5**

C11591 FRONT IMPACT | MOVING VEHICLE TO FIXED POLE 55.3KM/H | FIGURE

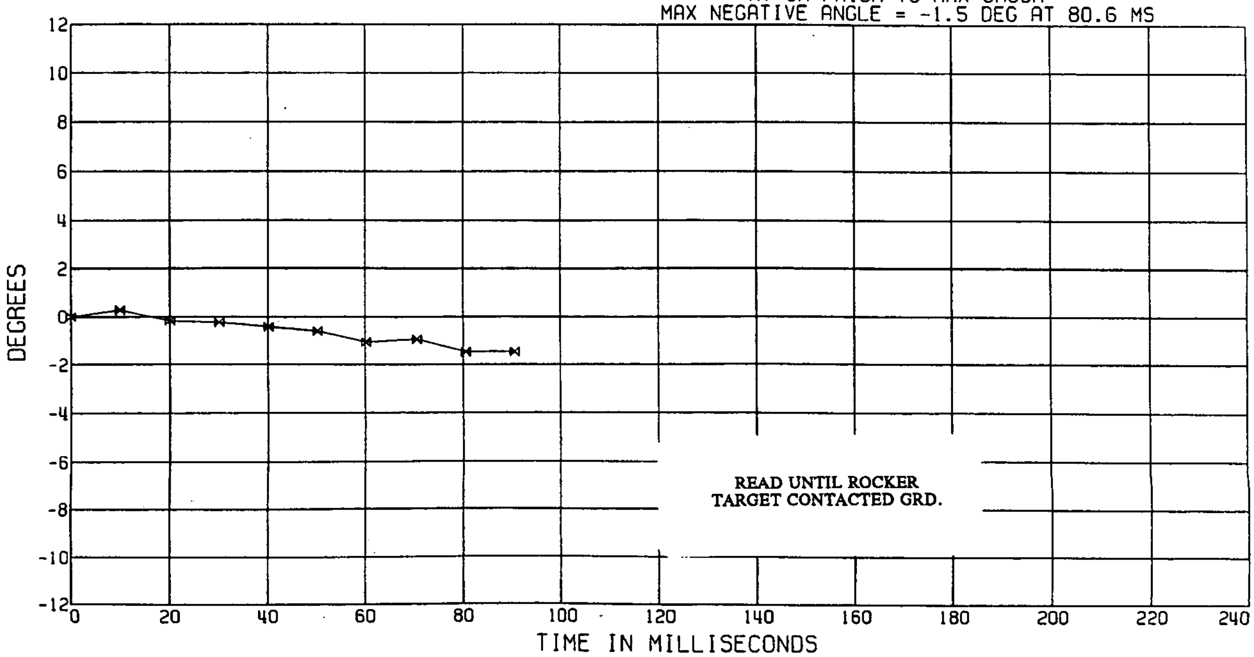
R&D CTR 1VF46081 1FP87
FILM DATA

RIGHT SIDE

TEST DATE:05/14/97

VEHICLE PITCH RELATIVE TO GROUND REFERENCE

AT OR PRIOR TO MAX CRUSH
MAX NEGATIVE ANGLE = -1.5 DEG AT 80.6 MS




Appendix F, plot # **6**

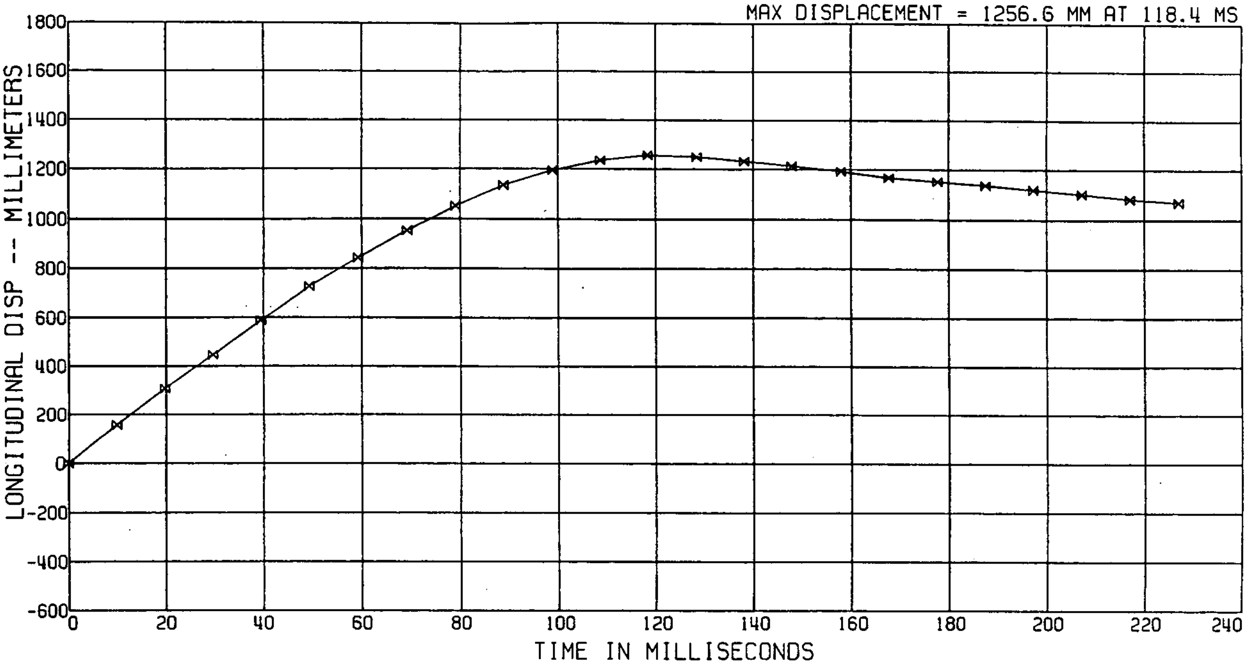
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H FIGURE

R&D CTR 1VF46081 1FP87
FILM DATA

OVERHEAD VIEW

TEST DATE:05/14/97

VEHICLE DISPL RELATIVE TO POLE REFERENCE




Appendix F, plot # **7**

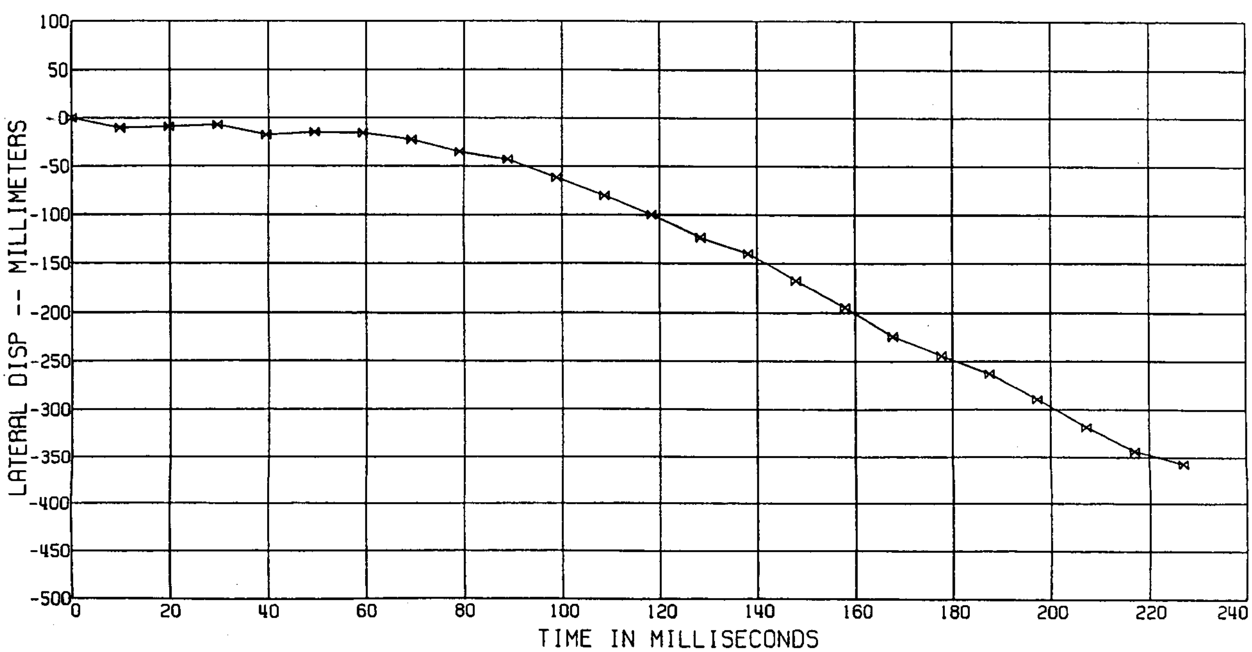
C11591 FRONT IMPACT MOVING VEHICLE TO FIXED POLE 55.3KM/H FIGURE

R&D CTR 1VF46081 1FP87
FILM DATA

OVERHEAD VIEW

TEST DATE:05/14/97

VEHICLE DISPL RELATIVE TO POLE REFERENCE




Appendix F, plot # **8**

# Appendix G

## **Appendix G:** C11647 data plots

LEFT FRONT

ANTHROPOMORPHIC TEST DEVICE SUMMARY DATA

LTV MDB TO STATIONARY VEHICLE 104.3KM/H

C11647 L. SIDE IMPACT-338 DEG

R&D CTR 1VF46080 1FP87

ATD TYPE: GM50H

TEST DATE: 06/18/1997

| MEASURED QUANTITY | 100% OF IARV | 150% OF IARV | IAV VALUE | IARV |
|---|---|---|---|---|
| HIC, LIMITED TO 15 MS | | | 440 | 1000 |
| HIC, LIMITED TO 36 MS | | | 600 | 1000 |
| NECK FLEXION | | | 52NM | 190NM |
| NECK EXTENSION | | | 28NM | 57NM |
| NECK TENSION | | | 1800N | 3300N |
| NECK COMPRESSION | | | 94N | 4000N |
| NECK SHEAR FORWARD | | | 982 N | 3100N |
| NECK SHEAR REARWARD | | | 55N | 3100N |
| NECK TENSION DUR ASSESS | | | 0.55 | 1.00 |
| NECK COMPRESSION DUR ASSESS | | | 0.02 | 1.00 |
| NECK SHEAR FWD DUR ASSESS | | | 0.46 | 1.00 |
| NECK SHEAR RWD DUR ASSESS | | | 0.02 | 1.00 |
| CHEST ACCEL | | | 48G | 60G |
| ‡ CHEST COMPRESSION W/O SH BELT | | | 42.2MM | 65.0MM ‡ |
| CHEST COMPRESSION W/ SH BELT | | | 42.2MM | 50.0MM ‡ |
| CHEST VISCOUS CRITERIA | | | 0.28M/SEC | 1.00M/SEC |
| FEMUR COMP, LEFT | | | 3320N | 10000N |
| FEMUR COMP, RIGHT | | | 5878N | 10000N |
| FEMUR DURATION ASSESS, LEFT | | | 0.37 | 1.00 |
| FEMUR DURATION ASSESS, RIGHT | | | 0.65 | 1.00 |
| TIBIA/FEMUR DISP, LEFT | | | 0.0MM | 15.0MM |
| TIBIA/FEMUR DISP, RIGHT | | | 1.2MM | 15.0MM |
| KNEE CLEVIS, LEFT INSIDE | | | 2824N | 4000N |
| KNEE CLEVIS, LEFT OUTSIDE | | | 1346N | 4000N |
| KNEE CLEVIS, RIGHT INSIDE | | | 1603N | 4000N |
| KNEE CLEVIS, RIGHT OUTSIDE | | | 1055N | 4000N |
| TIBIA COMP, LEFT | | | 3767N | 8000N |
| TIBIA COMP, RIGHT | | | 2341N | 8000N |
| TIBIA MOM, UPPER, LEFT | | | 234NM | 225NM |
| TIBIA MOM, UPPER, RIGHT | | | 118NM | 225NM |
| TIBIA MOM, LOWER, LEFT | | | 88NM | 225NM |
| TIBIA MOM, LOWER, RIGHT | | | 65NM | 225NM |
| LEG INDEX, UPPER LEFT | | | 1.14 | 1.00 |
| LEG INDEX, UPPER RIGHT | | | 0.55 | 1.00 |
| LEG INDEX, LOWER LEFT | | | 0.47 | 1.00 |
| LEG INDEX, LOWER RIGHT | | | 0.33 | 1.00 |

IAV - INJURY ASSESSMENT VALUE

IARV - INJURY ASSESSMENT REFERENCE VALUE

PROCESSED 06/20/1997 13:48 V2.07

‡ RESTRAINT SYSTEM DEPENDENT. CHOOSE VALUE THAT APPLIES TO THIS TEST.

# RIGHT FRONT
# ANTHROPOMORPHIC TEST DEVICE SUMMARY DATA
# LTV MDB TO STATIONARY VEHICLE 104.3KM/H

C11647 L. SIDE IMPACT-338 DEG

R&D CTR 1VF46080 1FP87

ATD TYPE: GM50H

TEST DATE: 06/18/1997

| MEASURED QUANTITY | 100% OF IARV | 150% OF IARV | IAV VALUE | IARV |
|---|---|---|---|---|
| HIC, LIMITED TO 15 MS | | | 320 | 1000 |
| HIC, LIMITED TO 36 MS | | | 630 | 1000 |
| NECK FLEXION | | | 18NM | 190NM |
| NECK EXTENSION | | | 40NM | 57NM |
| NECK TENSION | | | 2167N | 3300N |
| NECK COMPRESSION | | | 43N | 4000N |
| NECK SHEAR FORWARD | | | 341N | 3100N |
| NECK SHEAR REARWARD | | | 162N | 3100N |
| NECK TENSION DUR ASSESS | | | 0.66 | 1.00 |
| NECK COMPRESSION DUR ASSESS | | | 0.01 | 1.00 |
| NECK SHEAR FWD DUR ASSESS | | | 0.19 | 1.00 |
| NECK SHEAR RWD DUR ASSESS | | | 0.05 | 1.00 |
| CHEST ACCEL | | | 53G | 60G |
| ‡ CHEST COMPRESSION W/O SH BELT | | | 29.4MM | 65.0MM ‡ |
| CHEST COMPRESSION W/ SH BELT | | | 29.4MM | 50.0MM ‡ |
| CHEST VISCOUS CRITERIA | | | 0.14M/SEC | 1.00M/SEC |
| FEMUR COMP, LEFT | | | 2418N | 10000N |
| FEMUR COMP, RIGHT | | | 2547N | 10000N |
| FEMUR DURATION ASSESS, LEFT | | | 0.27 | 1.00 |
| FEMUR DURATION ASSESS, RIGHT | | | 0.28 | 1.00 |
| TIBIA/FEMUR DISP, LEFT | | | 0.7MM | 15.0MM |
| TIBIA/FEMUR DISP, RIGHT | | | 0.5MM | 15.0MM |
| KNEE CLEVIS, LEFT INSIDE | | | 1904N | 4000N |
| KNEE CLEVIS, LEFT OUTSIDE | | | 371N | 4000N |
| KNEE CLEVIS, RIGHT INSIDE | | | 751N | 4000N |
| KNEE CLEVIS, RIGHT OUTSIDE | | | 1814N | 4000N |
| TIBIA COMP, LEFT | | | 2149N | 8000N |
| TIBIA COMP, RIGHT | | | 2769N | 8000N |
| TIBIA MOM, UPPER, LEFT | | | 154NM | 225NM |
| TIBIA MOM, UPPER, RIGHT | | | 106NM | 225NM |
| TIBIA MOM, LOWER, LEFT | | | 44NM | 225NM |
| TIBIA MOM, LOWER, RIGHT | | | 30NM | 225NM |
| LEG INDEX, UPPER LEFT | | | 0.73 | 1.00 |
| LEG INDEX, UPPER RIGHT | | | 0.55 | 1.00 |
| LEG INDEX, LOWER LEFT | | | 0.25 | 1.00 |
| LEG INDEX, LOWER RIGHT | | | 0.21 | 1.00 |

IAV - INJURY ASSESSMENT VALUE

IARV - INJURY ASSESSMENT REFERENCE VALUE

PROCESSED 06/20/1997 13:48 V2.07



‡ RESTRAINT SYSTEM DEPENDENT. CHOOSE VALUE THAT APPLIES TO THIS TEST.

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

ATD TYPE: GM50H

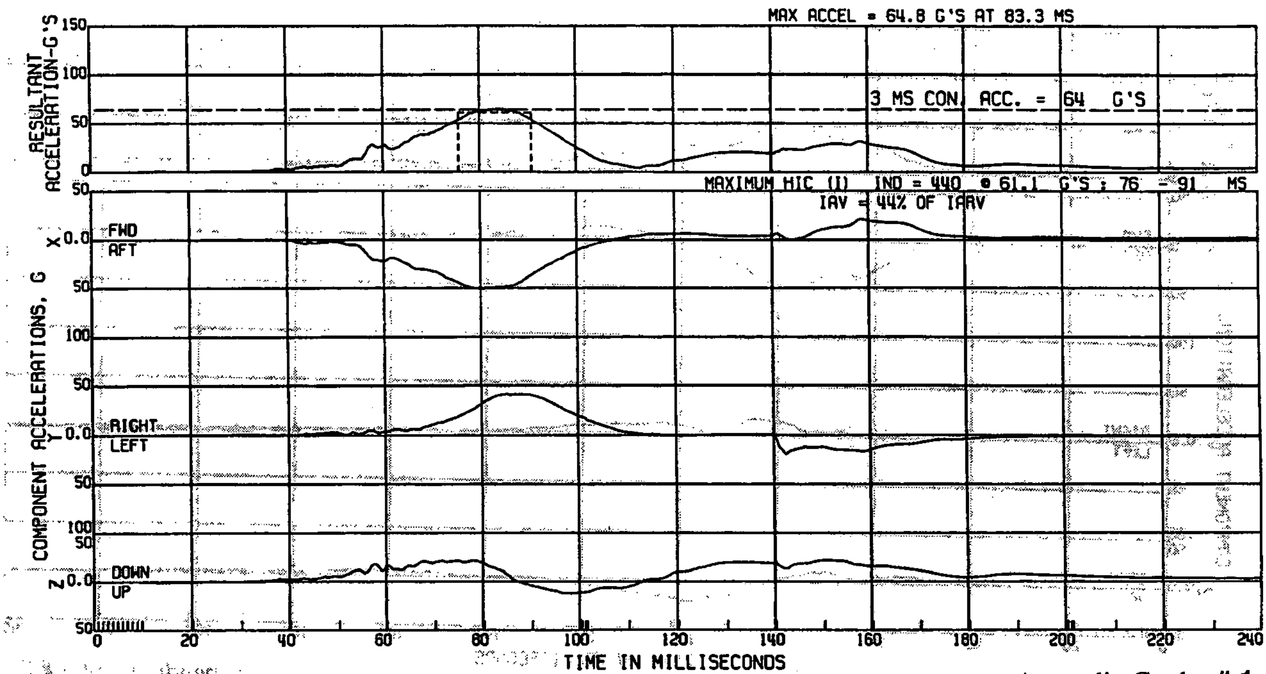
R&D CTR 1VF46080 1FP87

L. FRT HEAD ACCEL.

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

(HIC I LIMITED TO 15MS)




Appendix G, plot # 1

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

ATD TYPE: GM50H

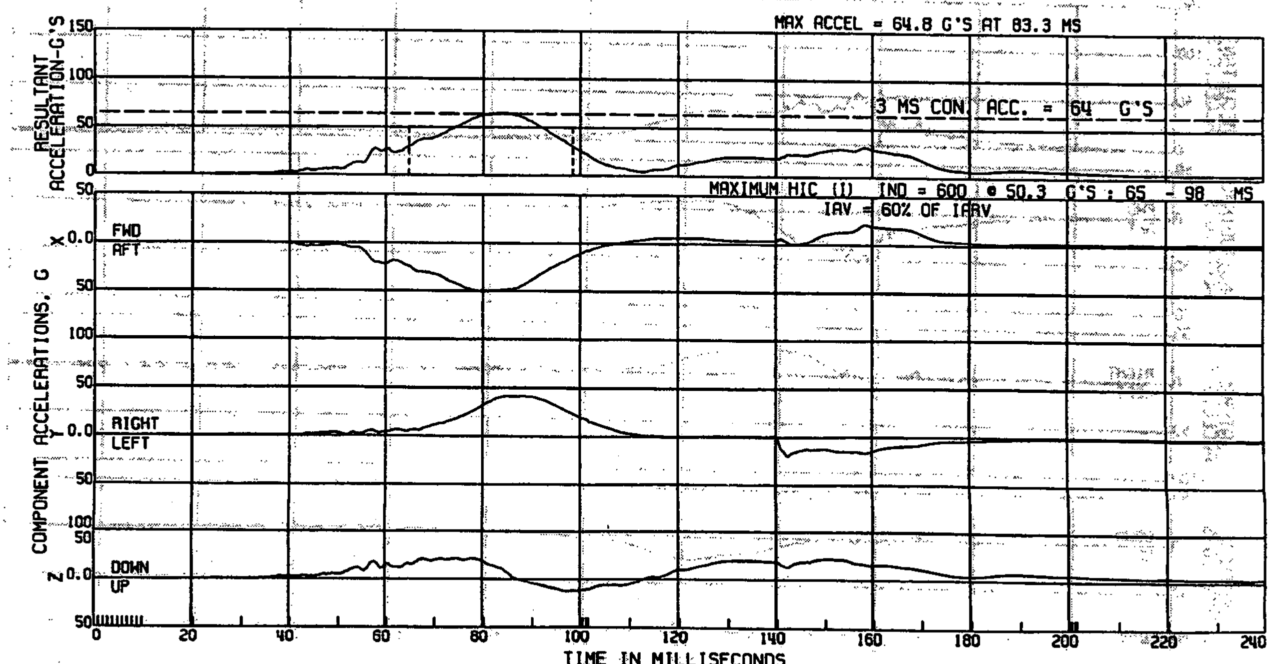
R&D CTR 1VF46080 1FP87

L. FRT HEAD ACCEL.

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

(HIC I LIMITED TO 36MS)




Appendix G, plot # 2

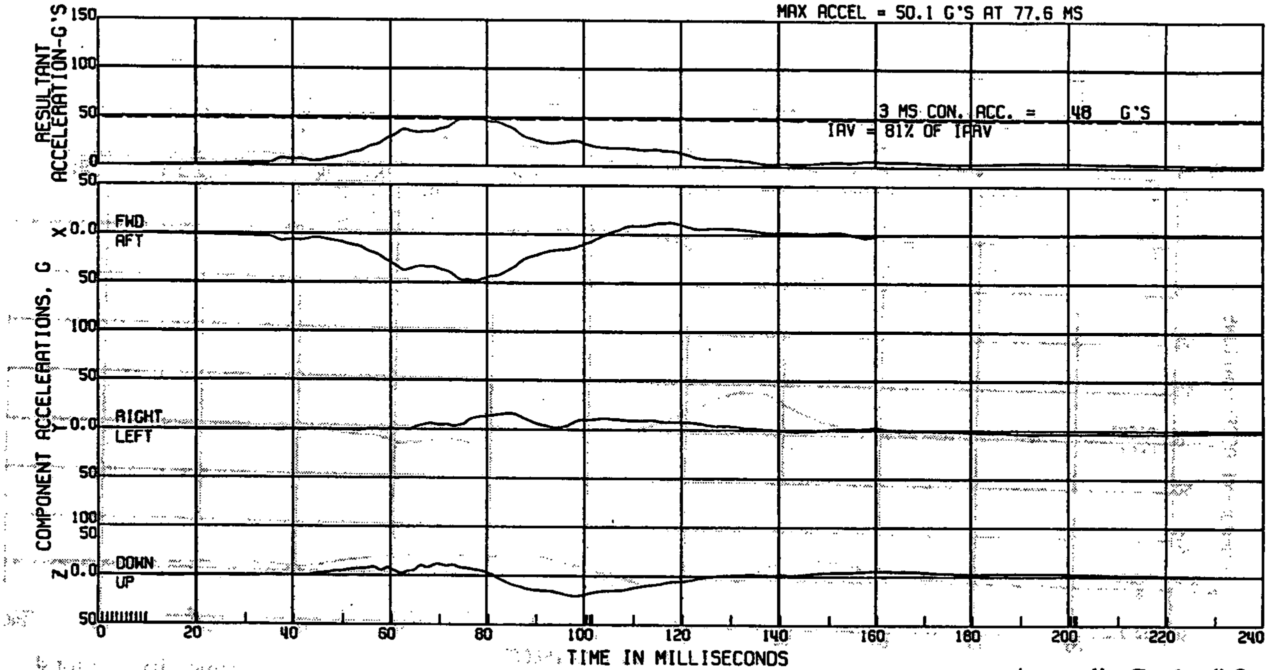
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 180

L. FRT CHEST ACCEL.

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # **3**

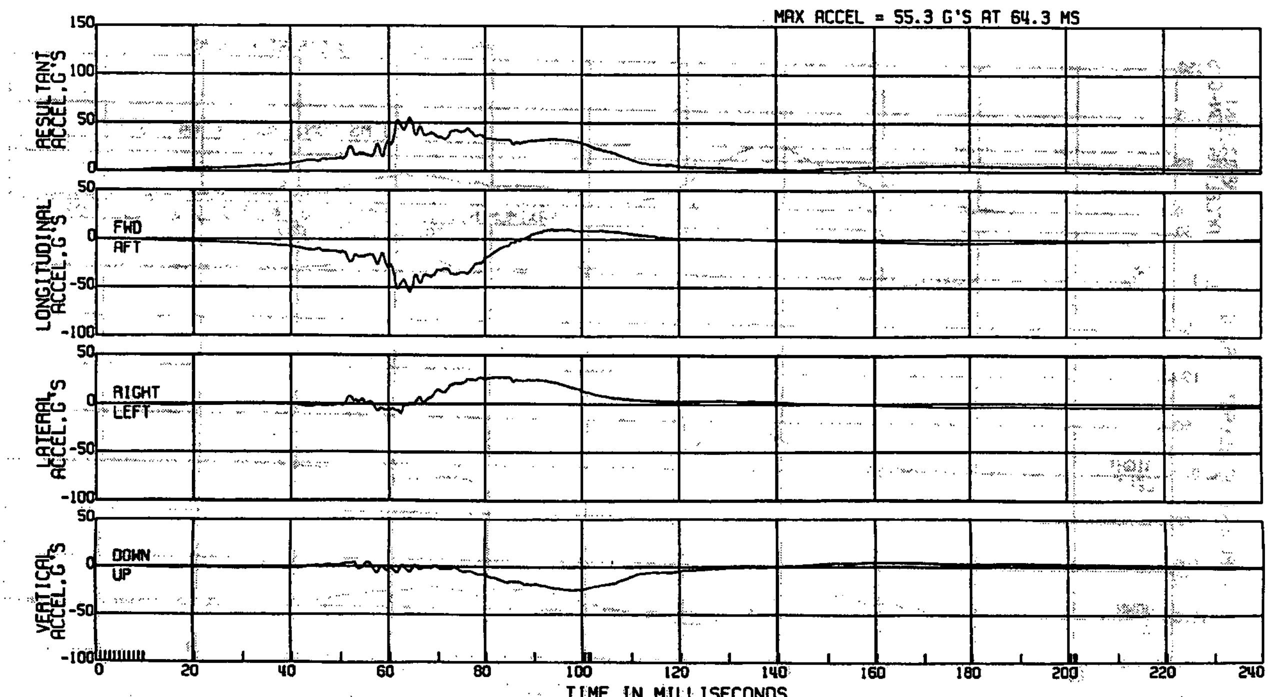
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

L. FRT PELVIC ACCEL.

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # **4**

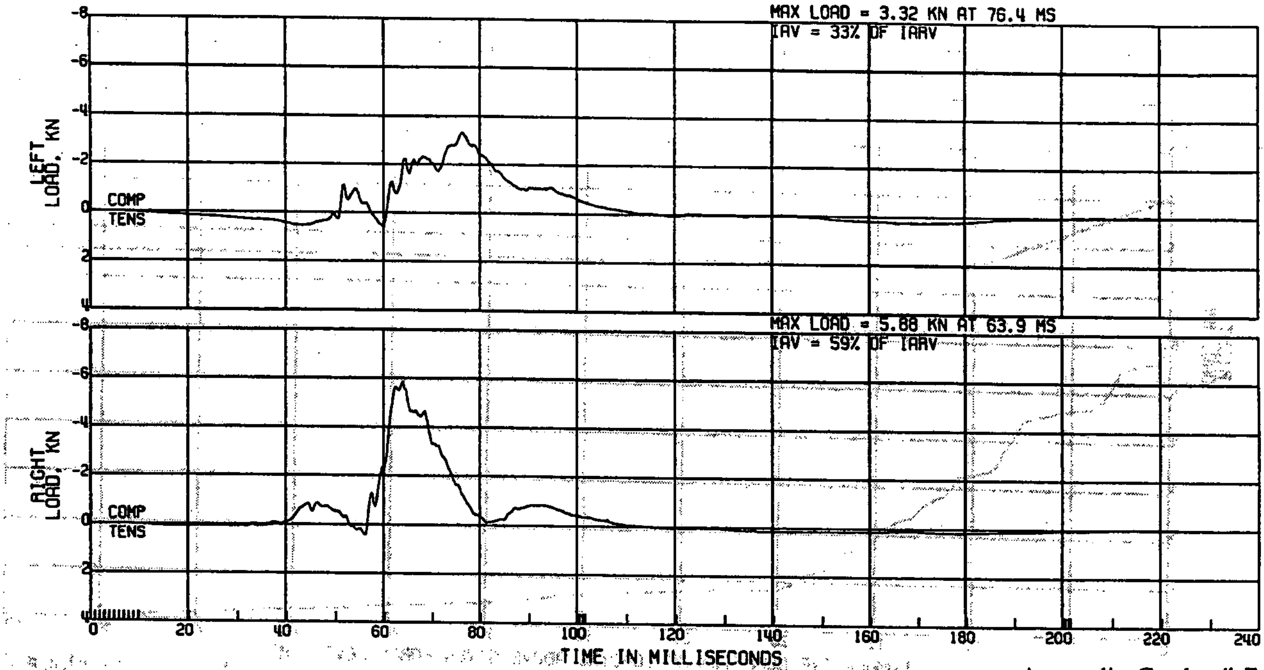
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 600

L. FRT FEMUR LOAD

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 5

5 PROCESSED 6/20/1997 13:46 V2.07

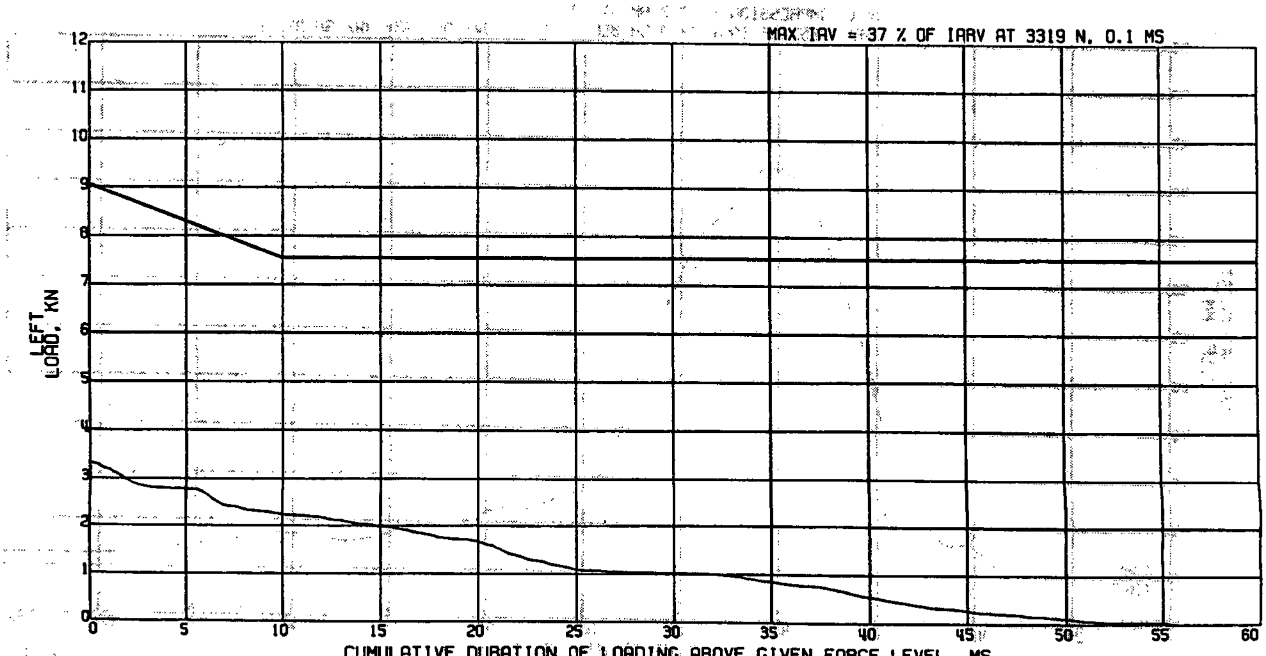
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 600

L. FRT FEMUR LOAD
DURATION ASSESSMENT

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 6

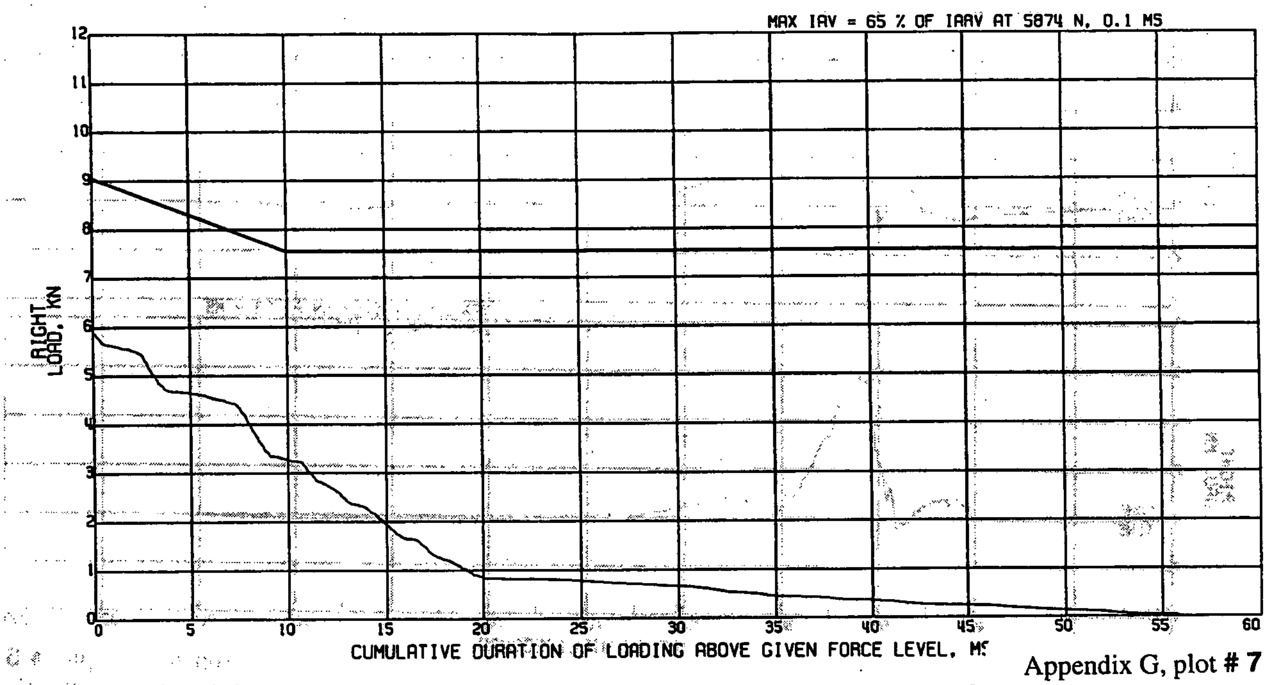
6 1

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

L. FRT FEMUR LOAD
DURATION ASSESSMENT

ATD TYPE: GM50H
TEST DATE:06/18/1997



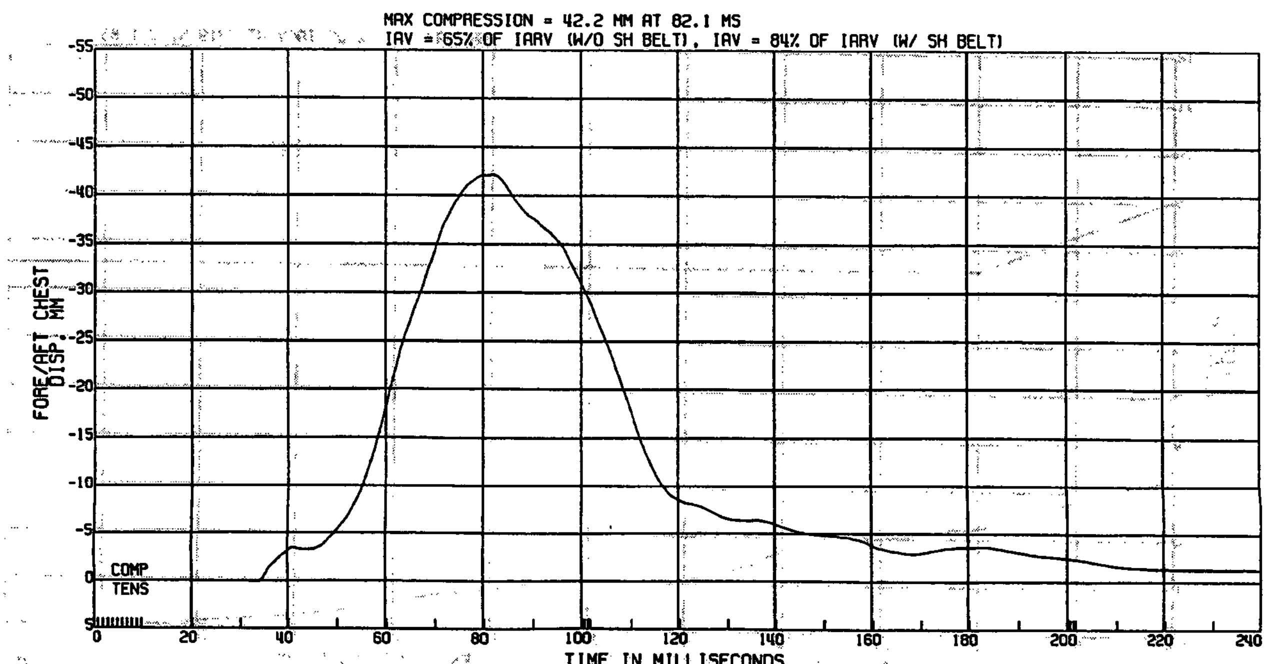

Appendix G, plot # **7**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 180

L. FRT CHEST DISP, TEMP AT 69.8'F
NORMALIZED TO 70.7'F & PART 572 CORRIDOR

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # **8**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

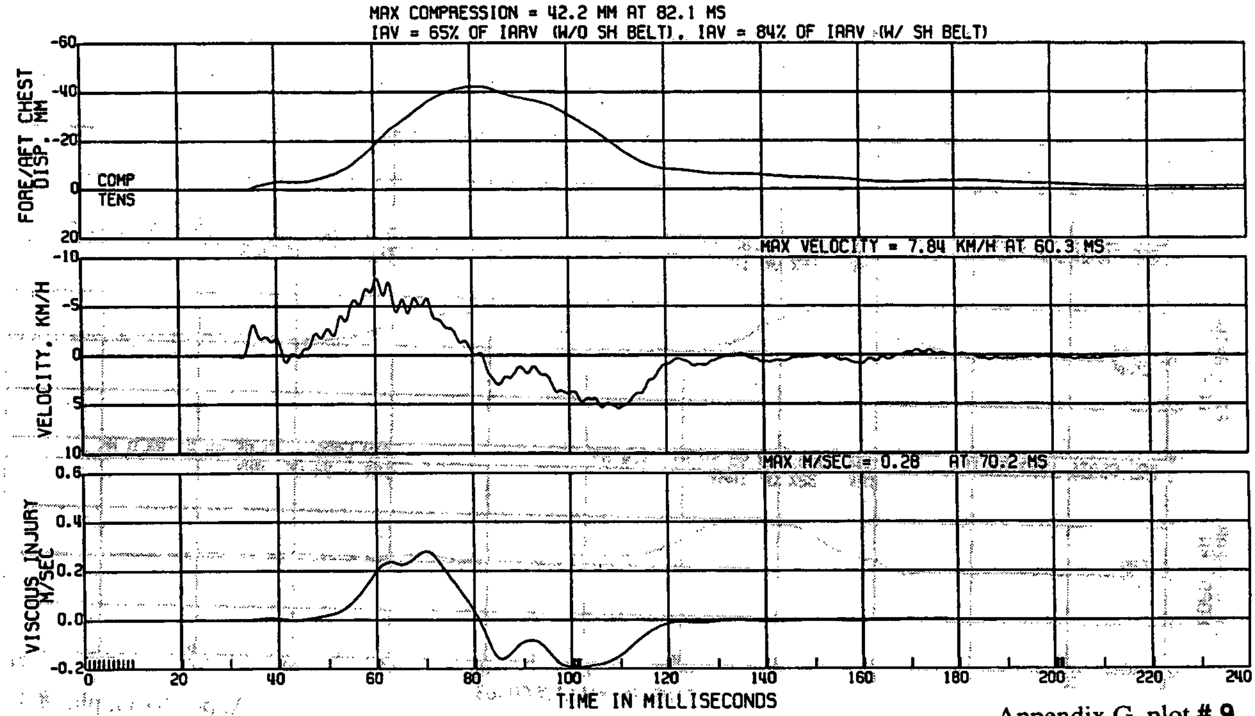
ELEC DATA, SAE CLASS 180

L. FRT CHEST COMPRESSIVE DISP.

NORMALIZED, W/CALC VEL & VISCOUS INJURY

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # 9

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

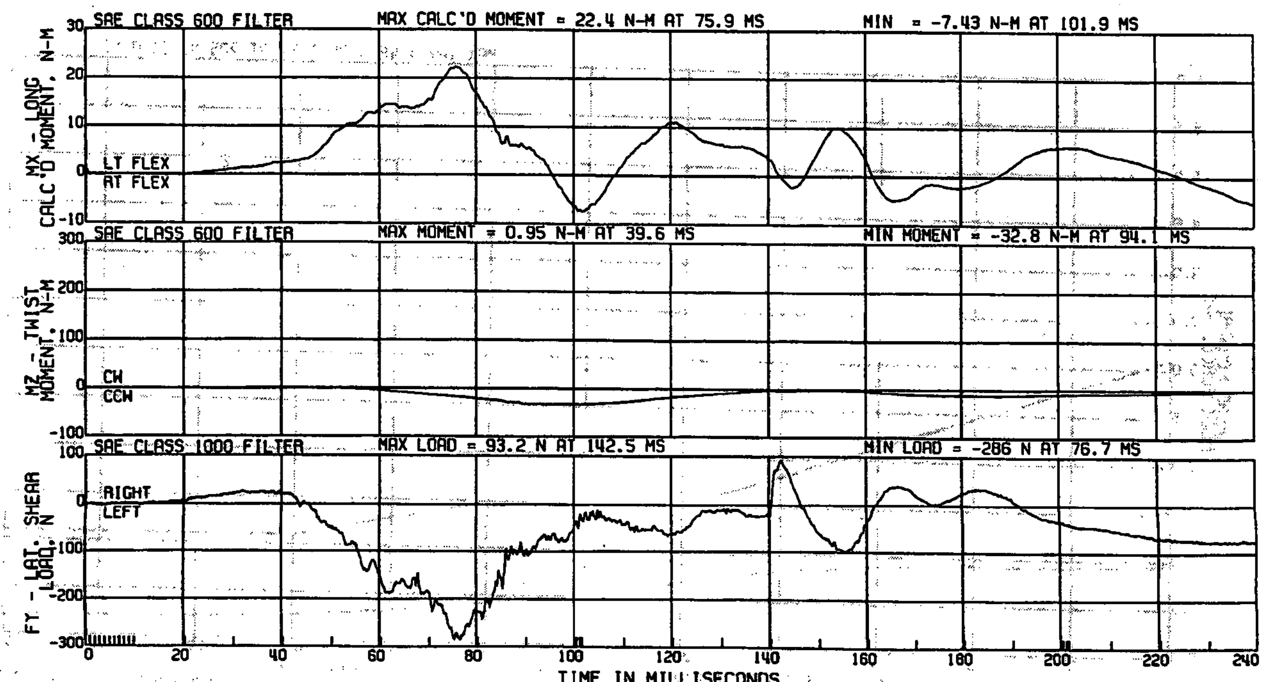
ELEC DATA

L. FRT NECK LOADING ON HEAD, UPPER LOAD

L. FRT NECK LOADING ON HEAD

ATD TYPE: GM50H

TEST DATE:06/18/1997

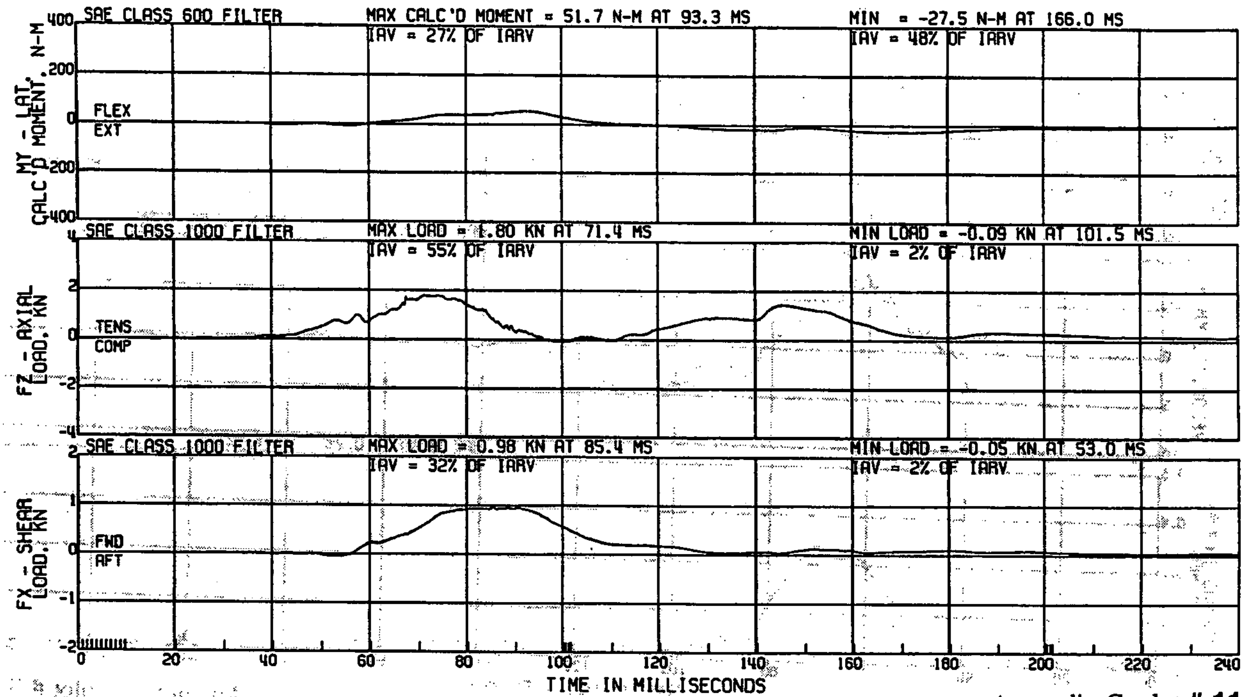



Appendix G, plot # 10

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 NECK LOADING ON HEAD ATD TYPE: GM50H
ELEC DATA TEST DATE:06/18/1997

L. FRT NECK LOADING ON HEAD

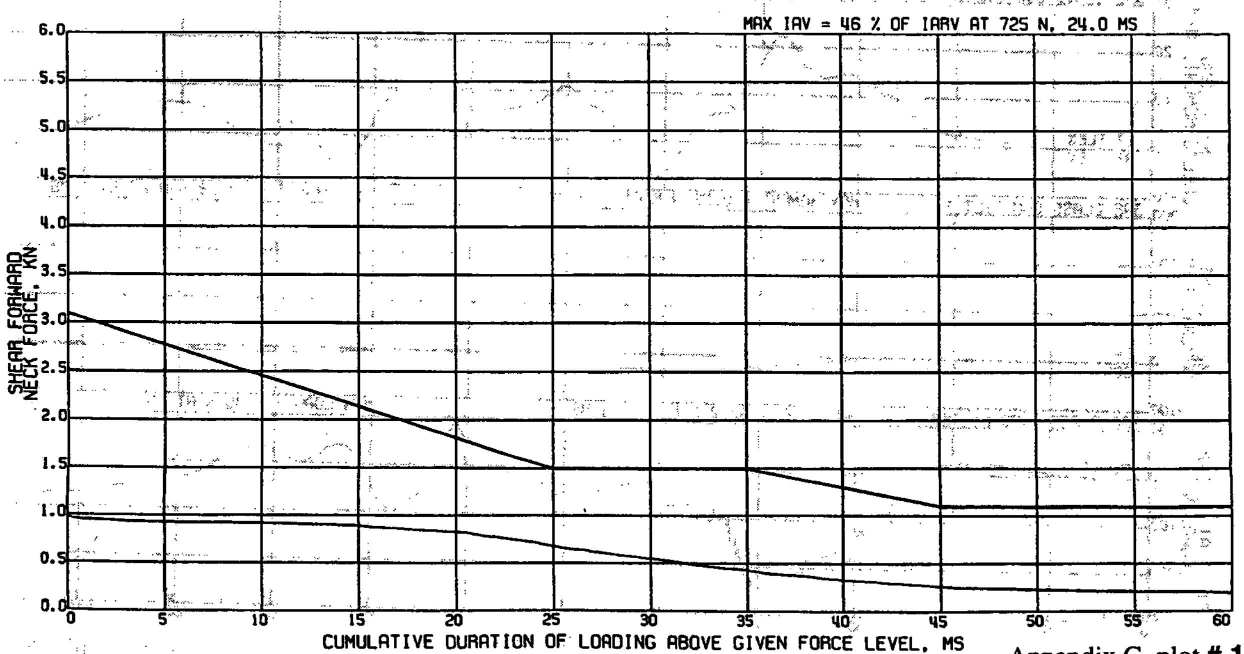



Appendix G, plot **# 11**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FORWARD NECK SHEAR ON HEAD, ATD TYPE: GM50H
ELEC DATA, SAE CLASS 1000 TEST DATE:06/18/1997

L. FRT INJURY REFERENCE



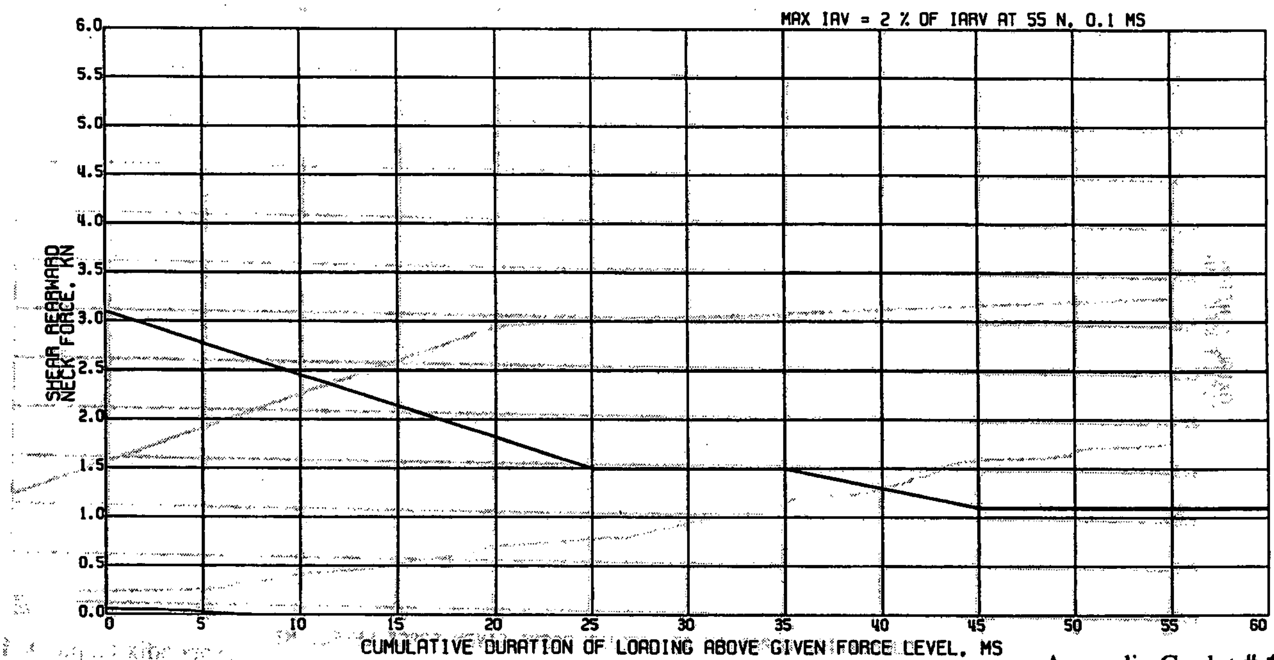

Appendix G, plot **# 12**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 1000

REARWARD NECK SHEAR ON HEAD,
L. FRT INJURY REFERENCE

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 13

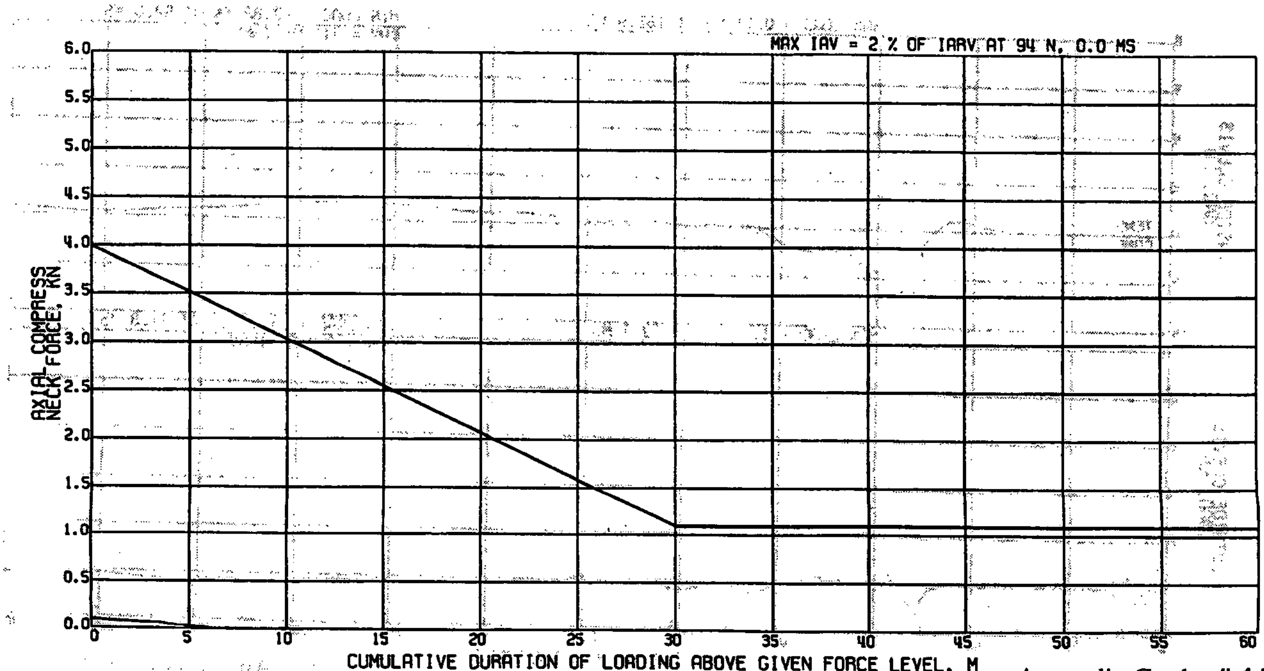
13

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 1000

AXIAL COMPRESSION ON HEAD,
L. FRT INJURY REFERENCE

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 14

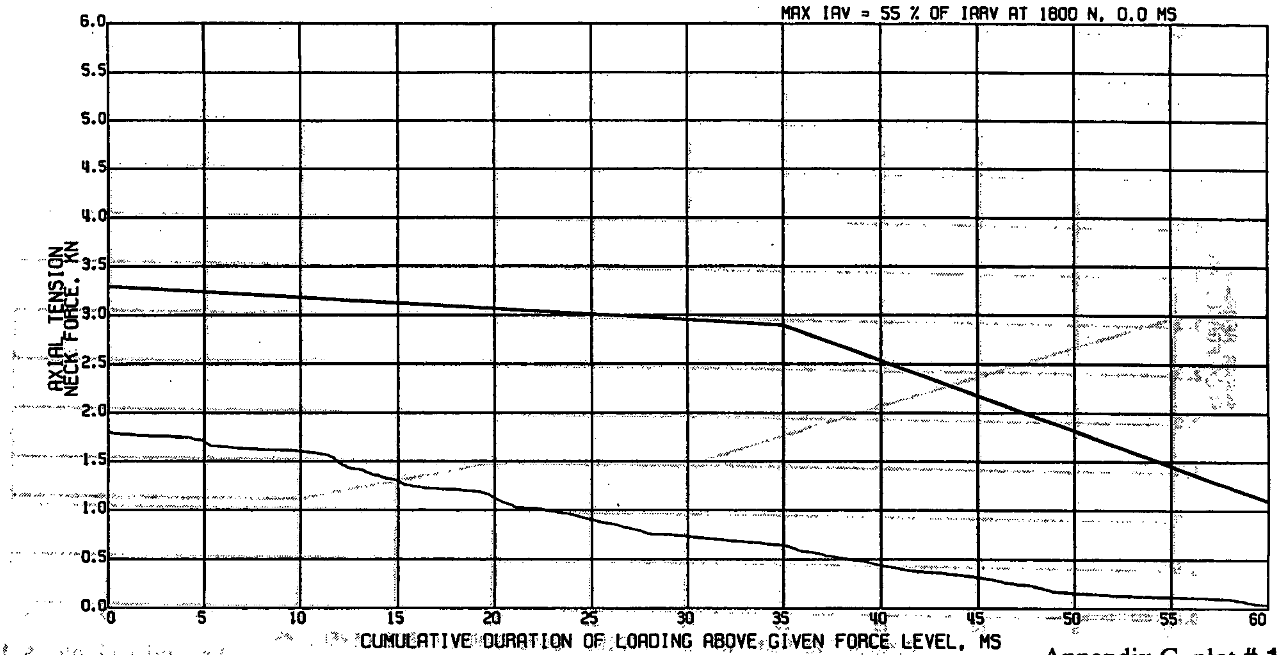
14

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 1000

AXIAL TENSION ON HEAD,
L. FRT INJURY REFERENCE

ATD TYPE: GM50H
TEST DATE:06/18/1997



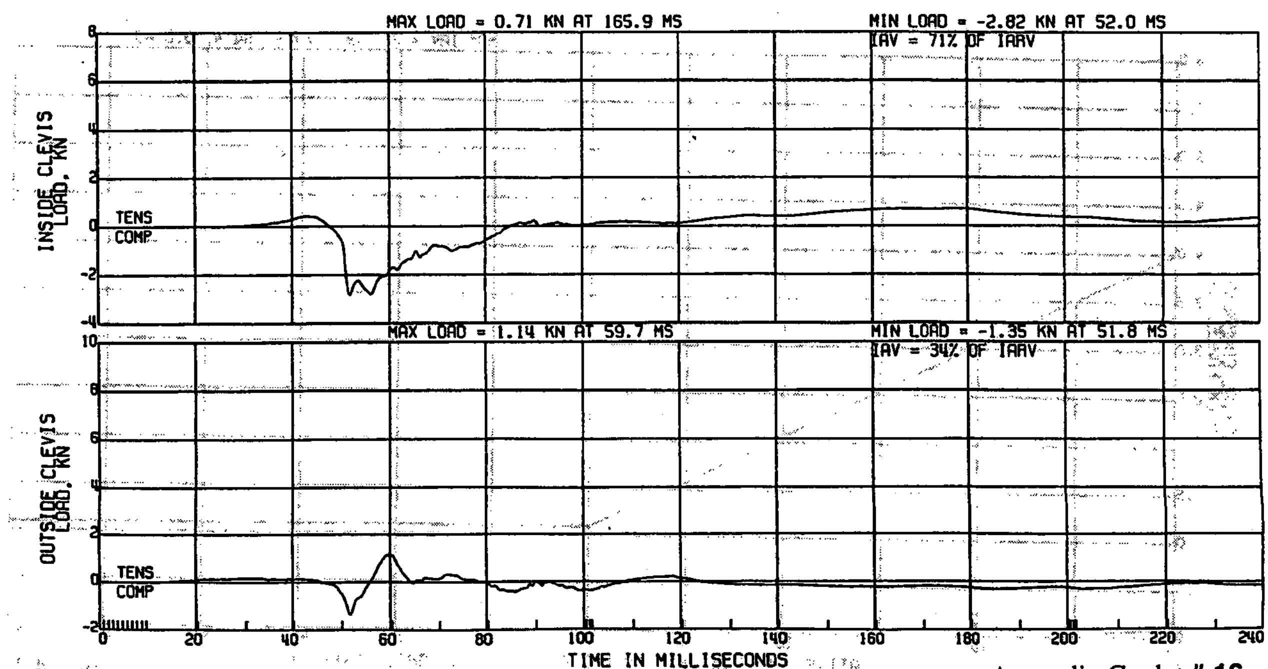

Appendix G, plot # 15

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

L. FRT LEFT KNEE CLEVIS LOAD

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 16

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

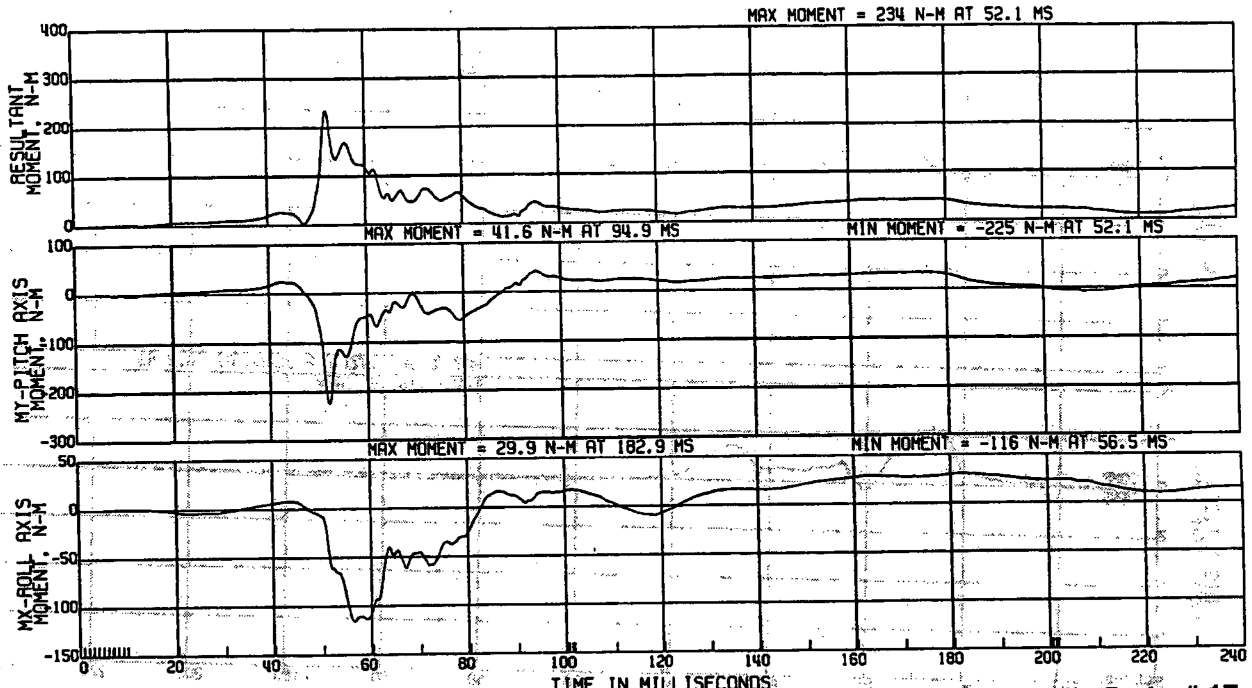
ATD TYPE: GM50H

R&D CTR 1VF46080 1FP87

L. FRT LEFT TIBIA UPPER MOMENT

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 600




Appendix G, plot # **17**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

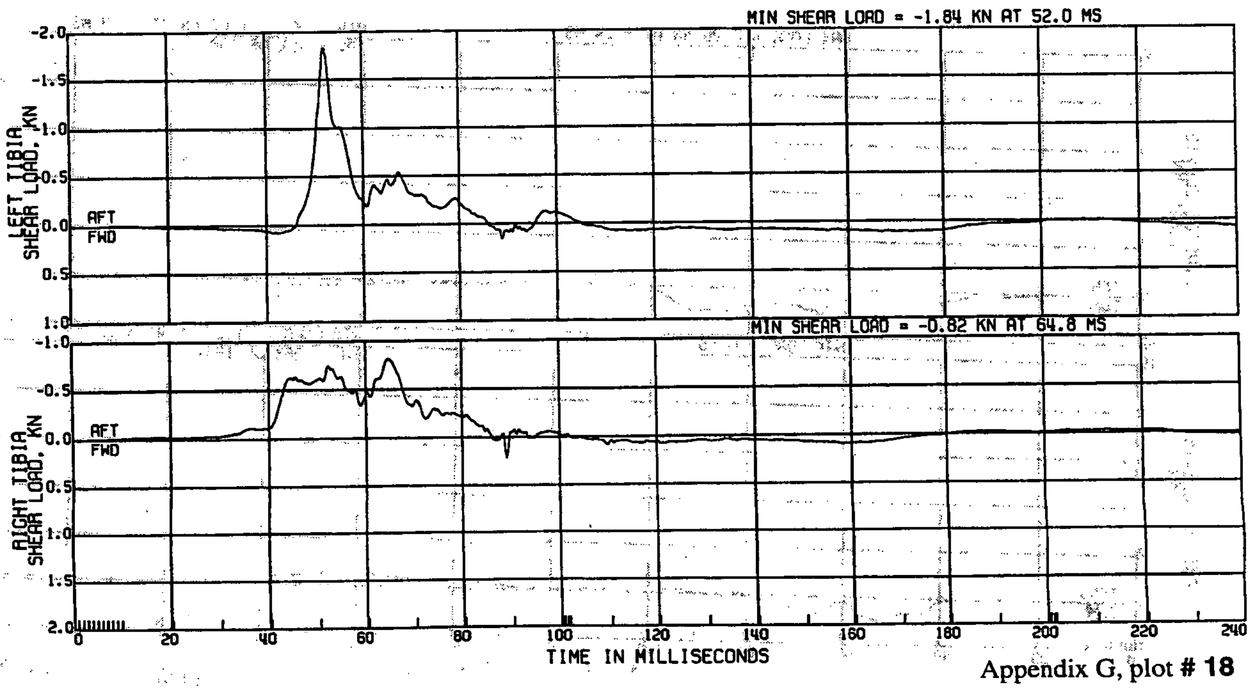
ATD TYPE: GM50H

R&D CTR 1VF46080 1FP87

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 600

L. FRT TIBIA LOWER SHEAR LOAD CELLS



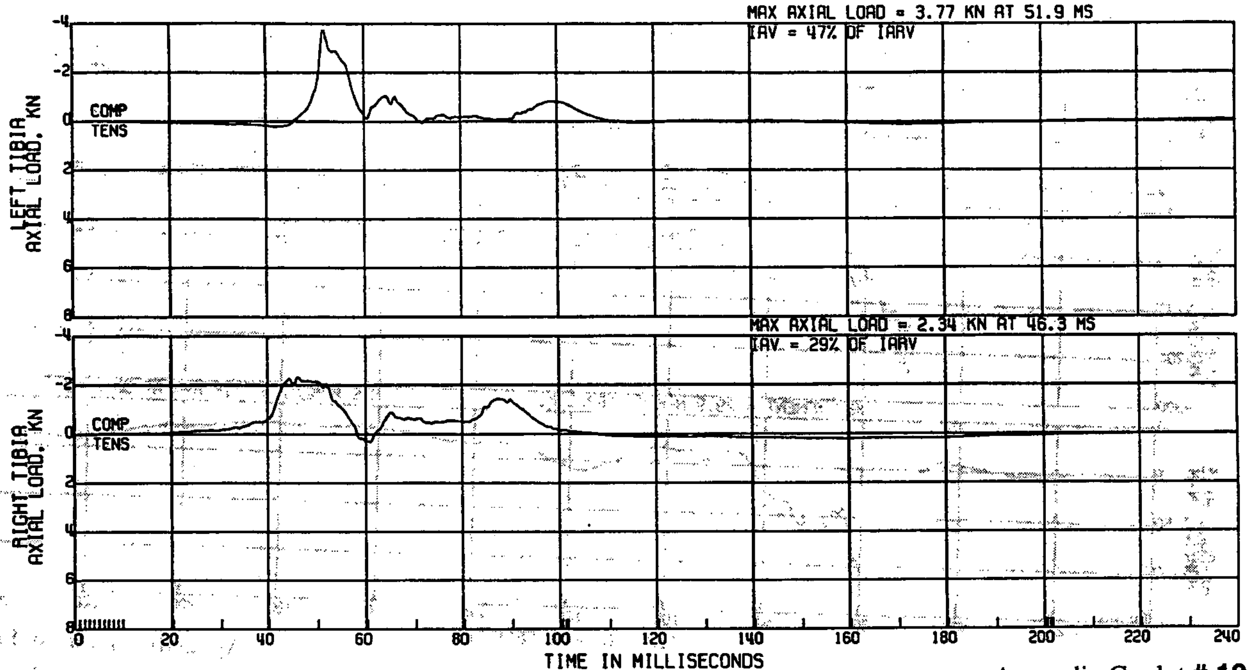

Appendix G, plot # **18**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H
TEST DATE:06/18/1997

L. FRT TIBIA LOWER AXIAL LOAD



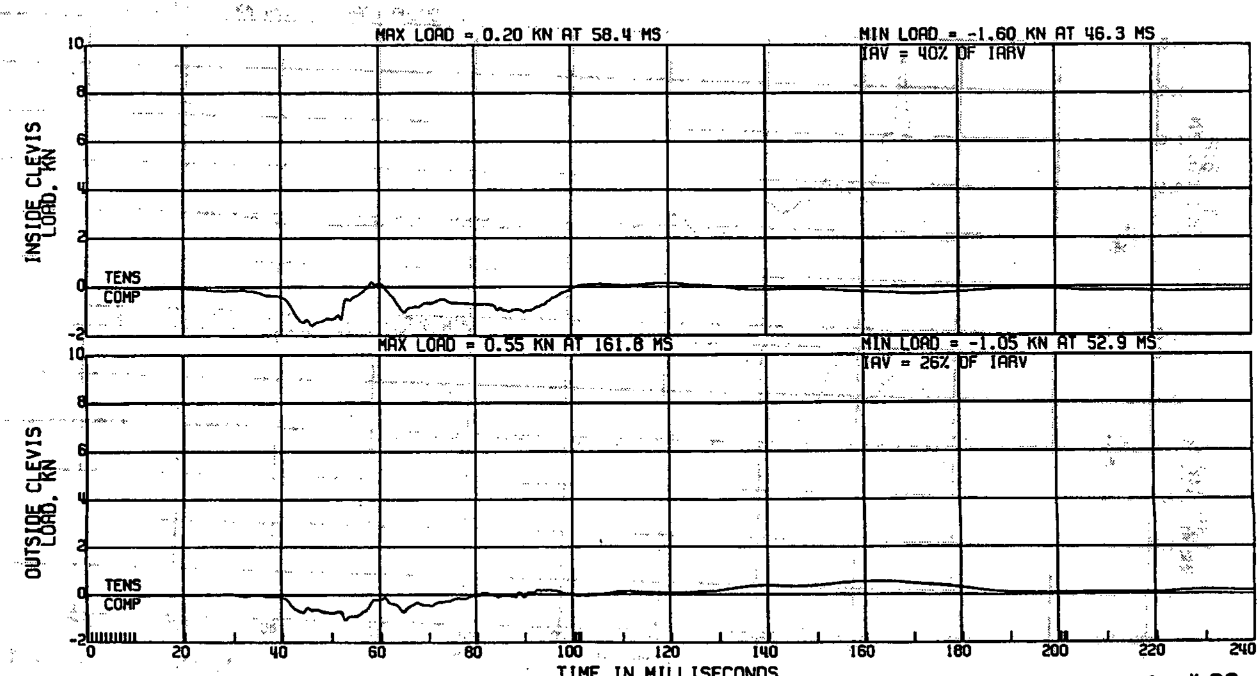

Appendix G, plot **# 19**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

ATD TYPE: GM50H
TEST DATE:06/18/1997

L. FRT RIGHT KNEE CLEVIS LOAD




Appendix G, plot **# 20**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

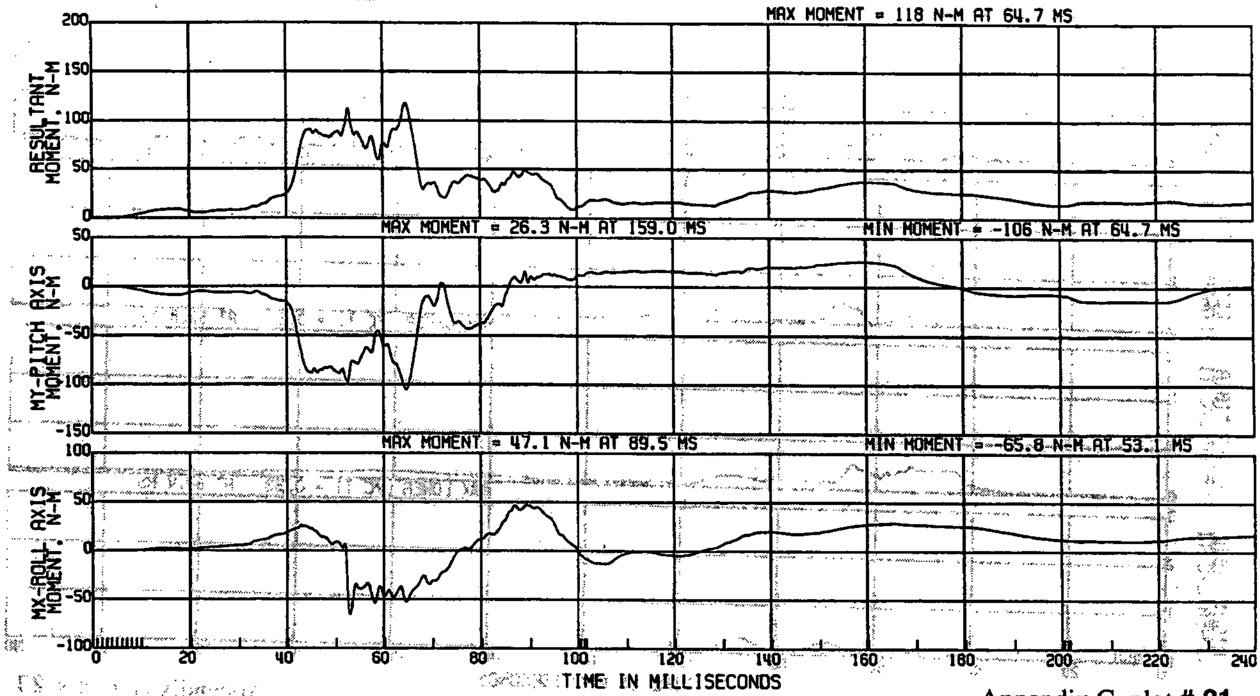
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 600

L. FRT RIGHT TIBIA UPPER MOMENT

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # **21**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

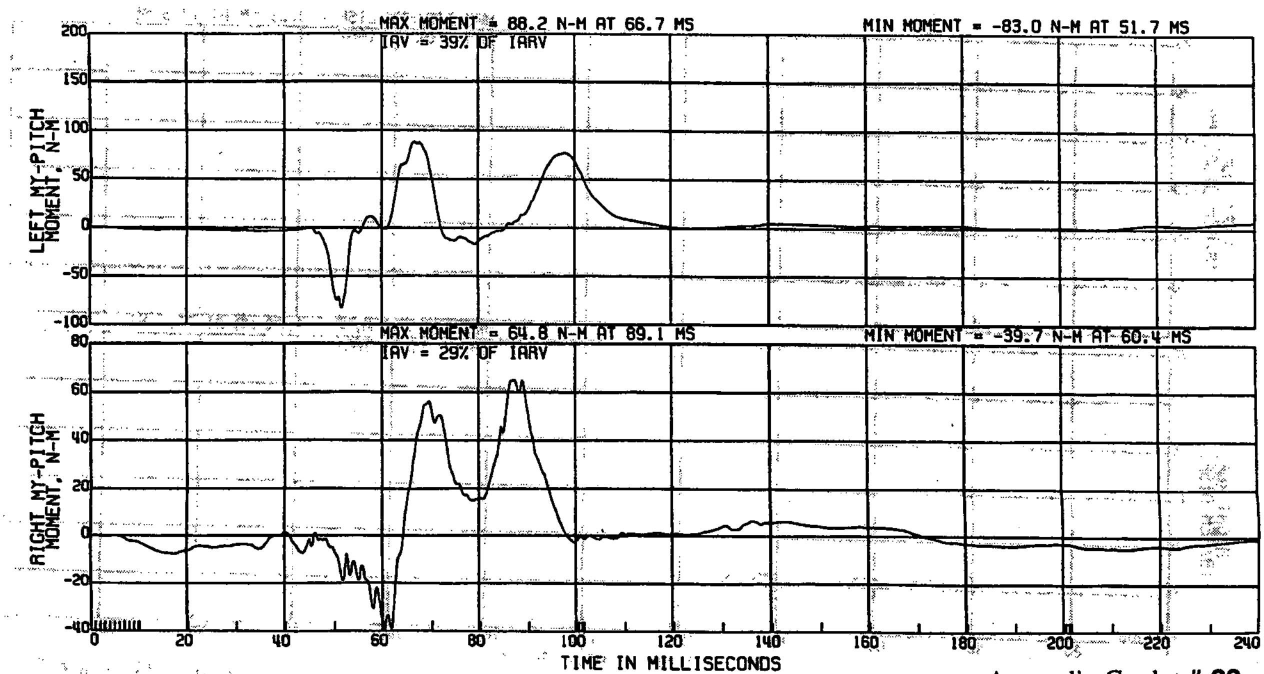
ATD TYPE: GM50H

R&D CTR 1VF46080 1FP87

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 600

L. FRT TIBIA LOWER BENDING MOMENTS




Appendix G, plot # **22**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

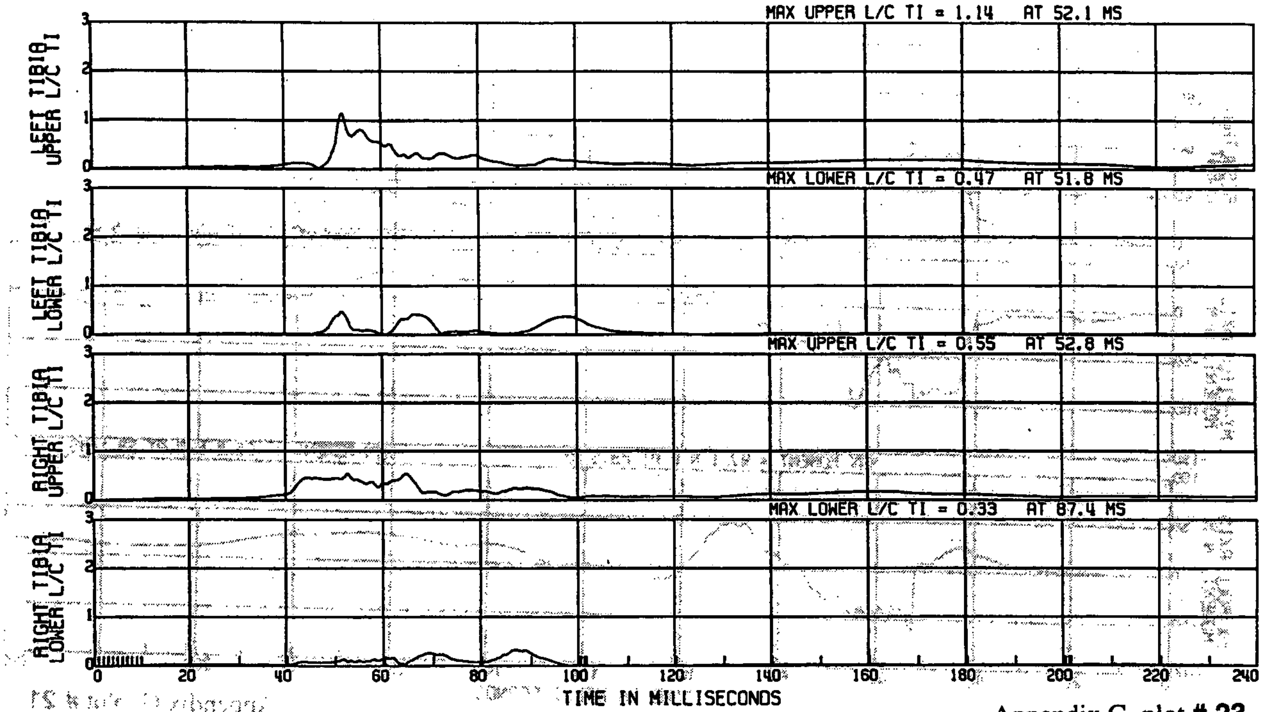
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 600

L. FRT TIBIA INDICES

ATD TYPE: GM50H
TEST DATE:06/18/1997

TI = (RES MOM/225 NM) + (AXIAL/35900 N)




Appendix G, plot # **23**

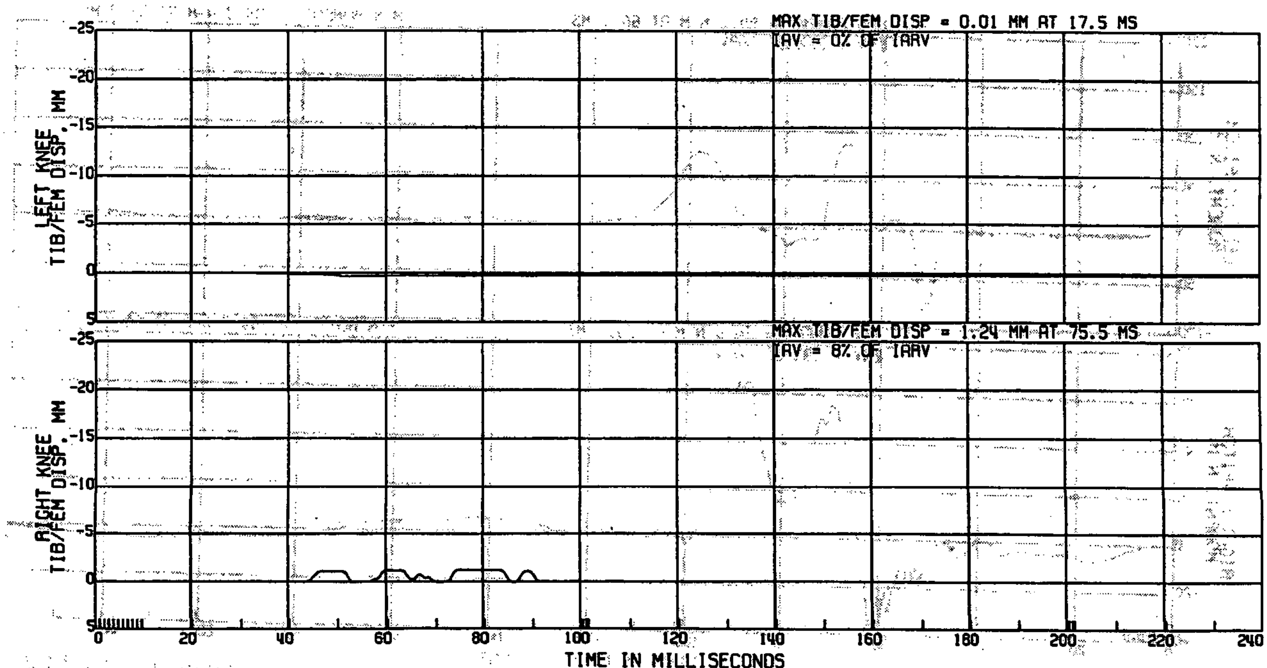
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 180

L. FRT TIBIA/FEMUR DISPLACEMENT

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # **24**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

ATD TYPE: GM50H

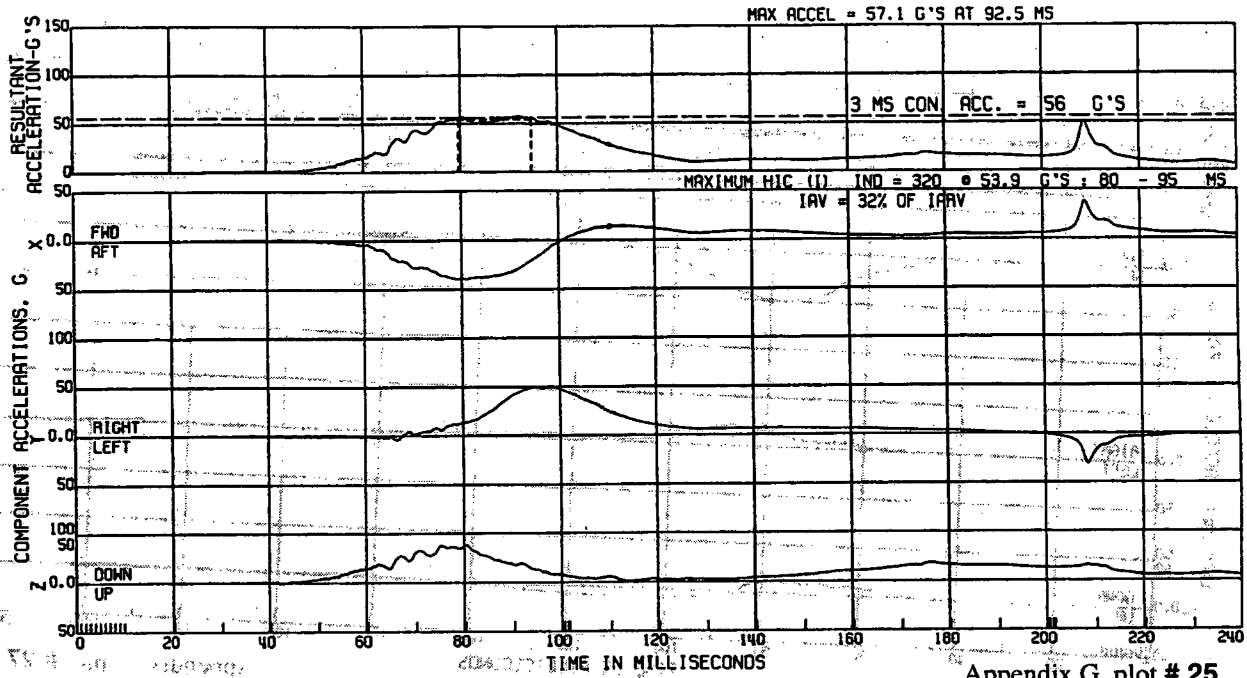
R&D CTR 1VF46080 1FP87

R. FRT HEAD ACCEL.

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

(HIC I LIMITED TO 15MS)




Appendix G, plot # 25

25 PROCESSED 6/20/1997 13:46 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

ATD TYPE: GM50H

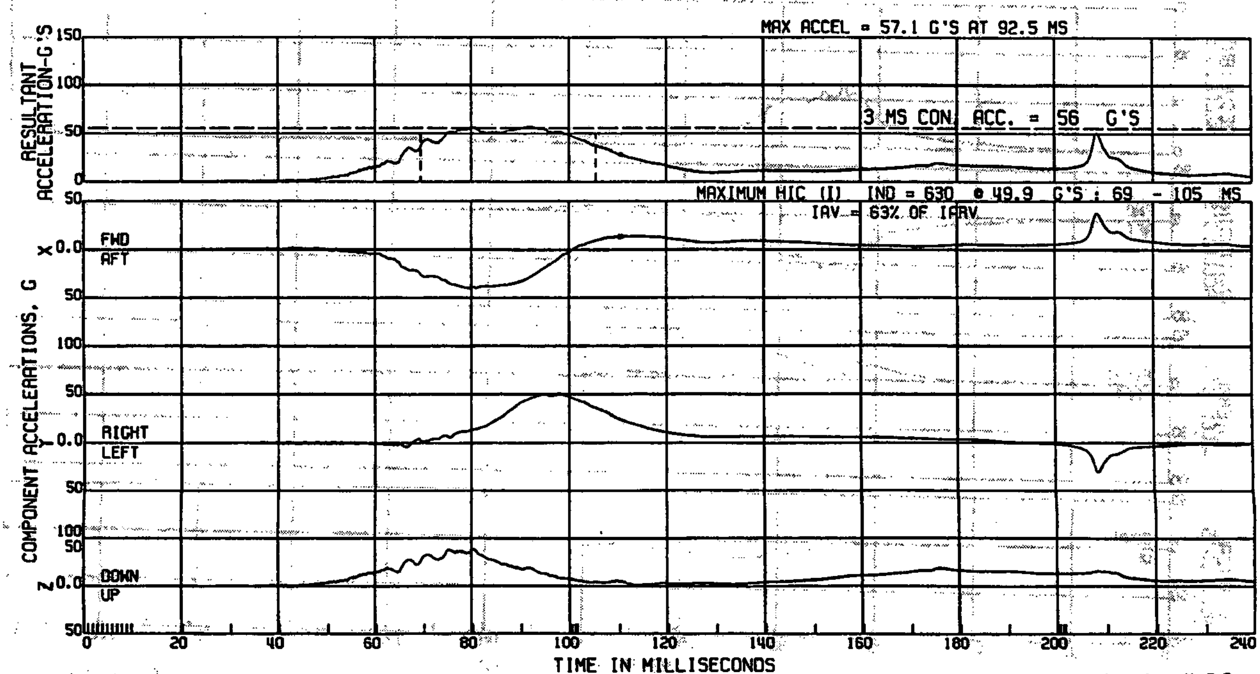
R&D CTR 1VF46080 1FP87

R. FRT HEAD ACCEL.

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

(HIC I LIMITED TO 36MS)




Appendix G, plot # 26

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

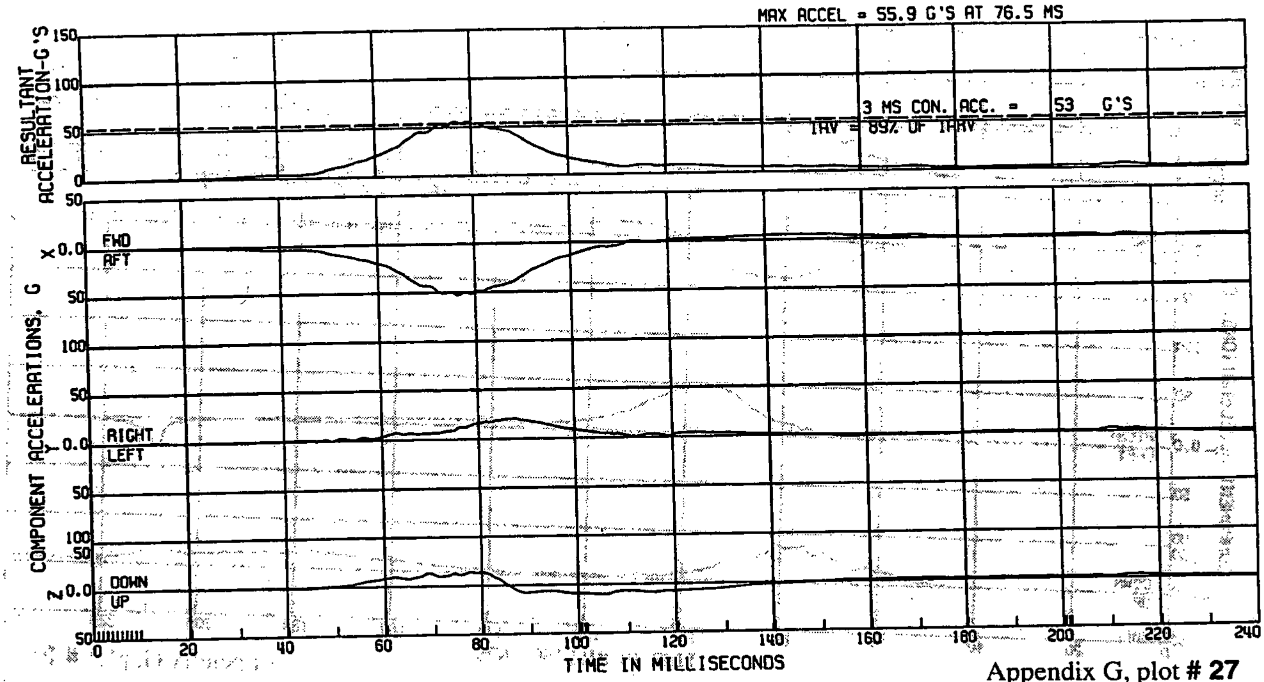
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 180

R. FRT CHEST ACCEL.

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # **27**

27 PROCESSED 6/20/1997 13:46 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

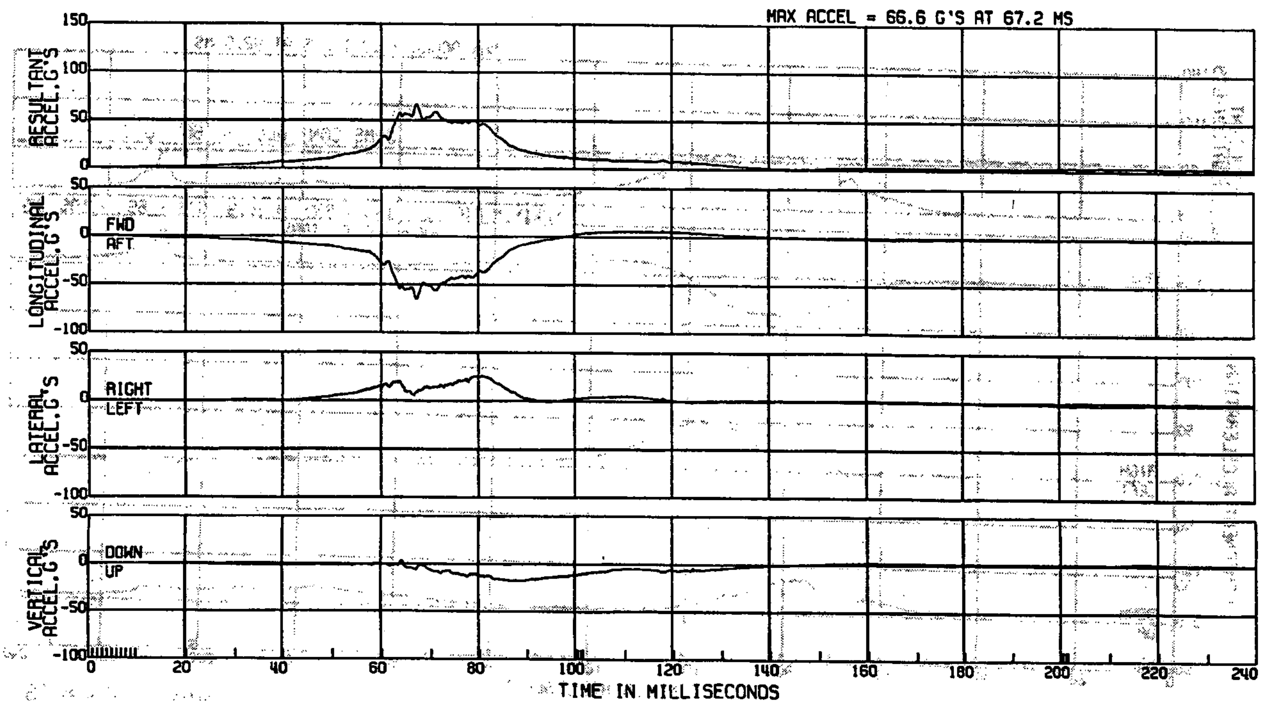
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

R. FRT PELVIC ACCEL.

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # **28**

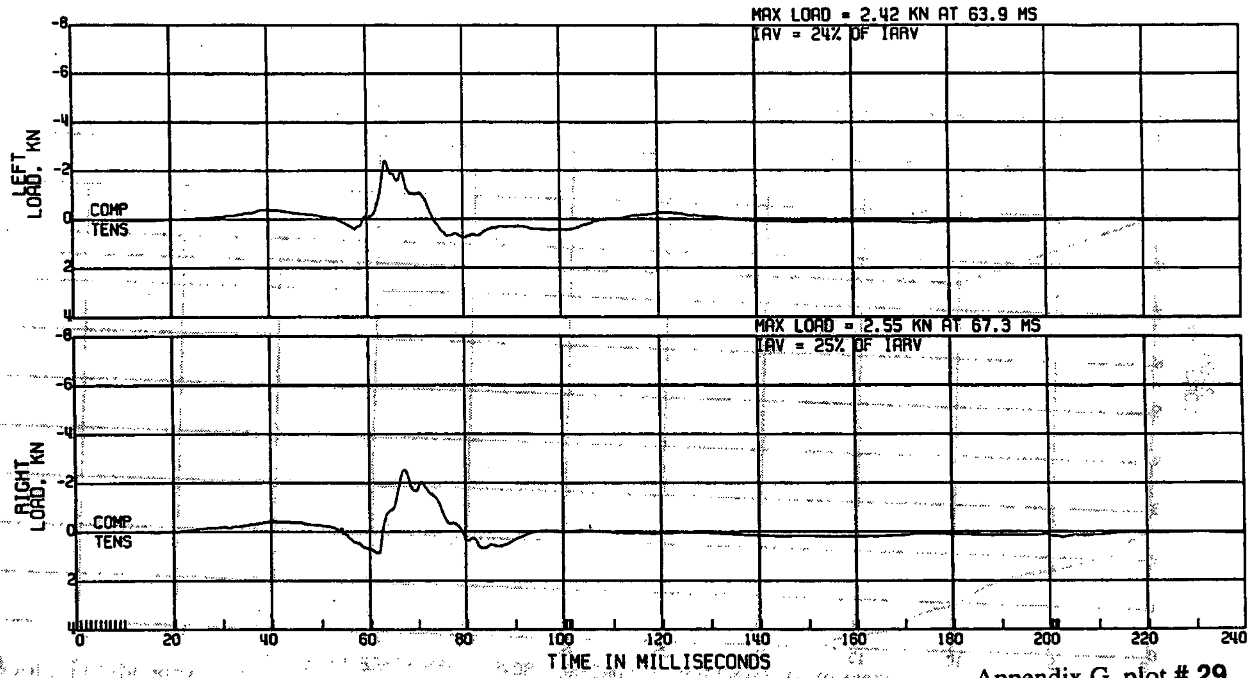
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 600

R. FRT FEMUR LOAD

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # **29**

29 PROCESSED 8/20/1997 13:46 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

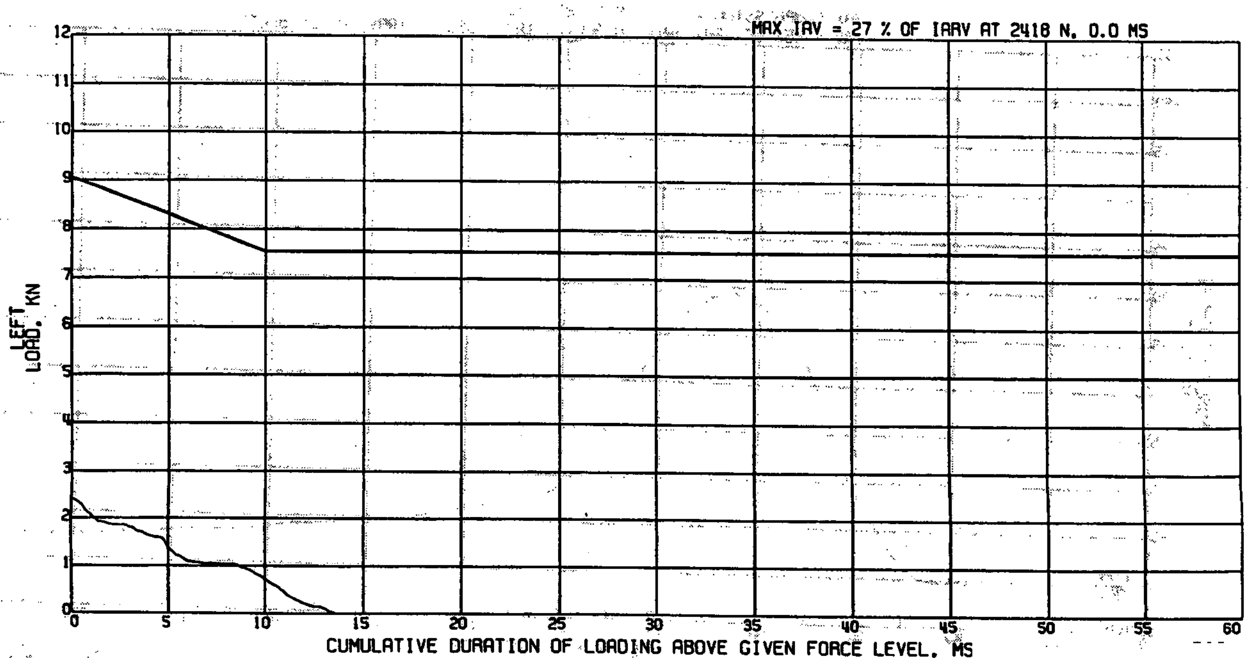
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 600

R. FRT FEMUR LOAD

DURATION ASSESSMENT

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # **30**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

ATD TYPE: GM50H

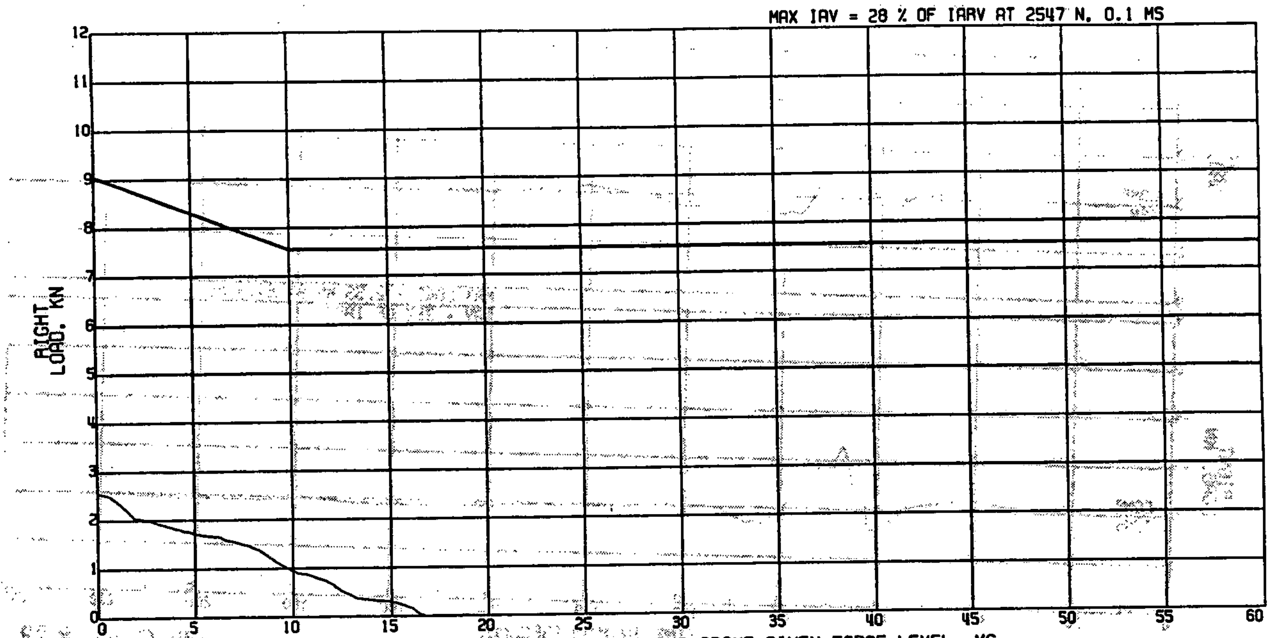
R. FRT FEMUR LOAD

TEST DATE:06/18/1997

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 600

DURATION ASSESSMENT




Appendix G, plot # 31

31 PROCESSED 6/20/1997 13:46 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

ATD TYPE: GM50H

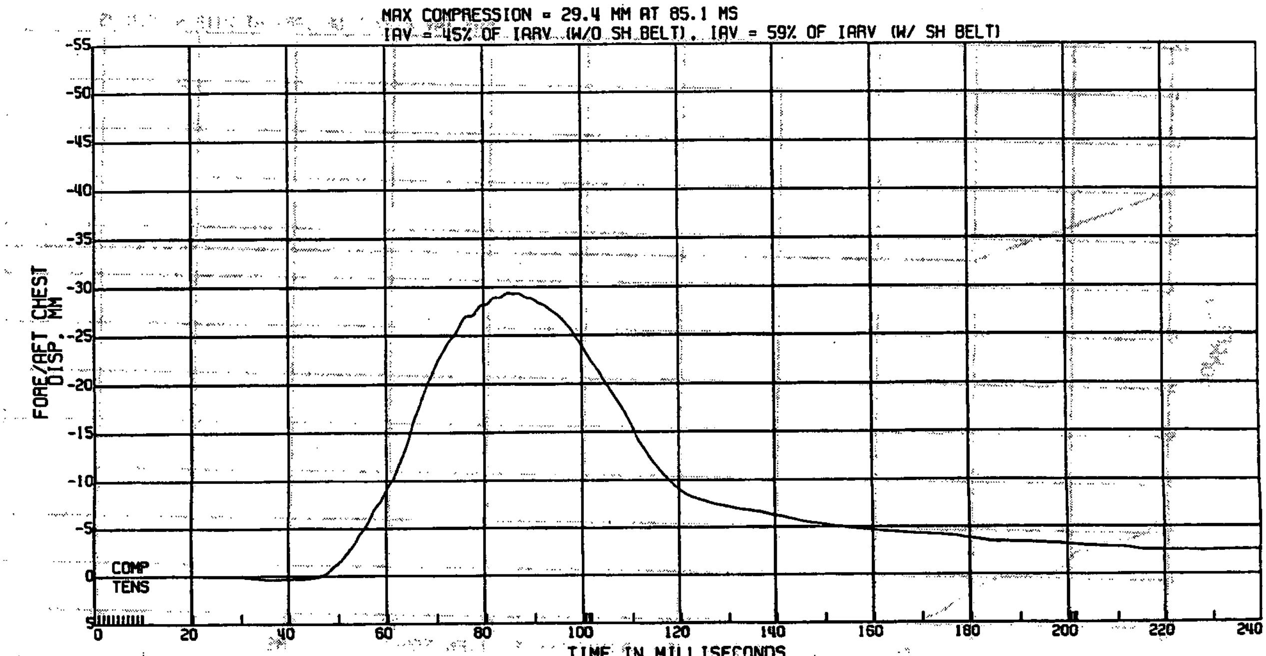
R. FRT CHEST DISP, TEMP AT 68.7'F

TEST DATE:06/18/1997

R&D CTR 1VF46080 1FP87

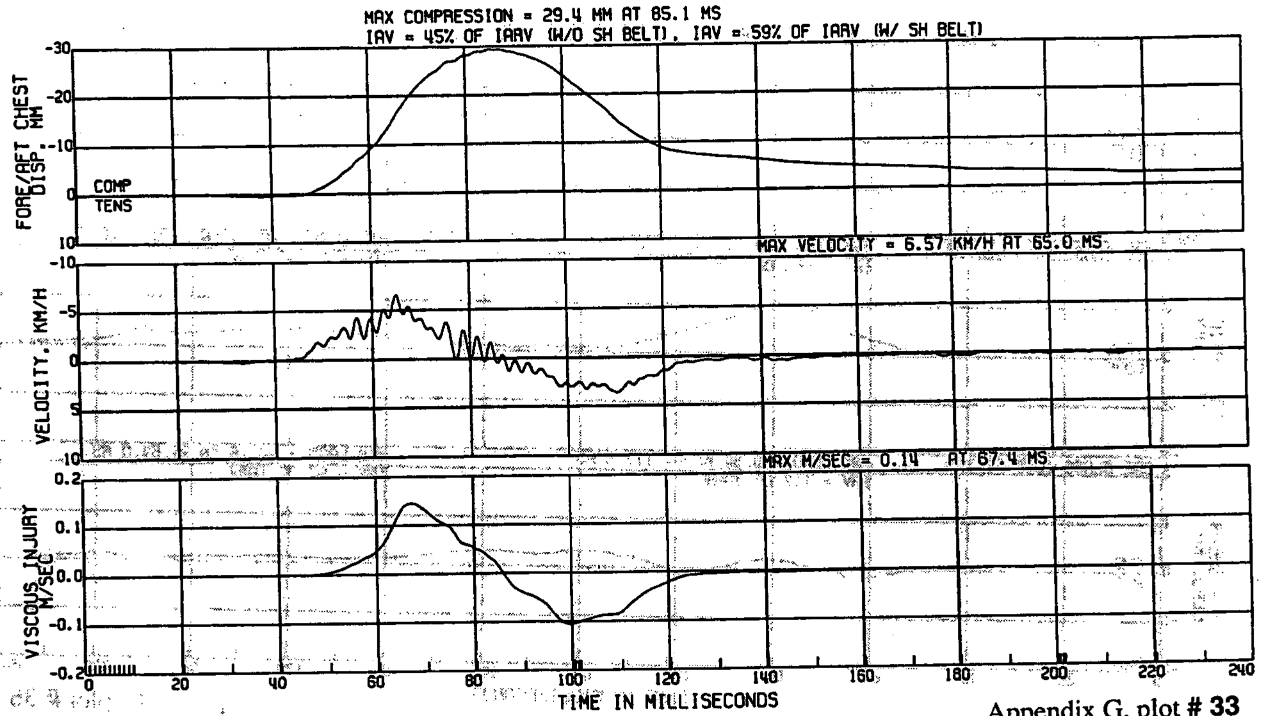
ELEC DATA, SAE CLASS 180

NORMALIZED TO 70.7'F & PART 572 CORRIDOR




Appendix G, plot # 32

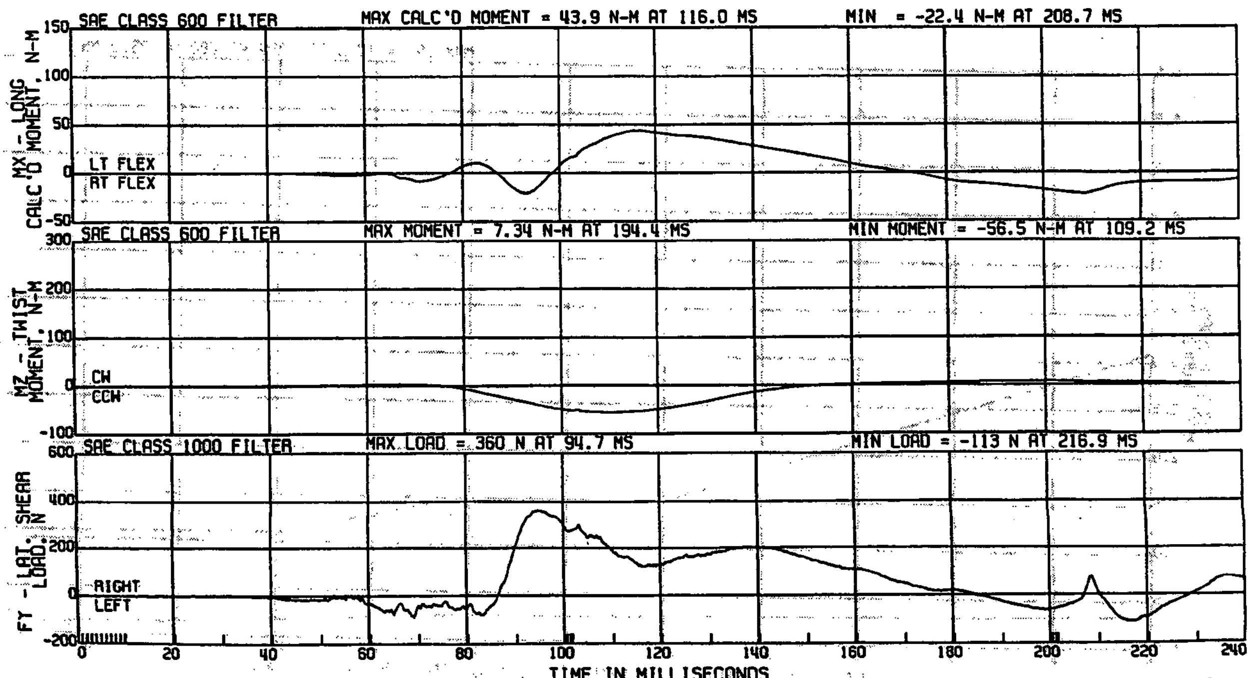
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H
ATD TYPE: GM50H
R&D CTR 1VF46080 1FP87 R. FRT CHEST COMPRESSIVE DISP. TEST DATE:06/18/1997
ELEC DATA, SAE CLASS 180 NORMALIZED, W/CALC VEL & VISCOUS INJURY




Appendix G, plot # 33

33 PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H
ATD TYPE: GM50H
R&D CTR 1VF46080 1FP87 R. FRT NECK LOADING ON HEAD, UPPER LOAD TEST DATE:06/18/1997
ELEC DATA R. FRT NECK LOADING ON HEAD

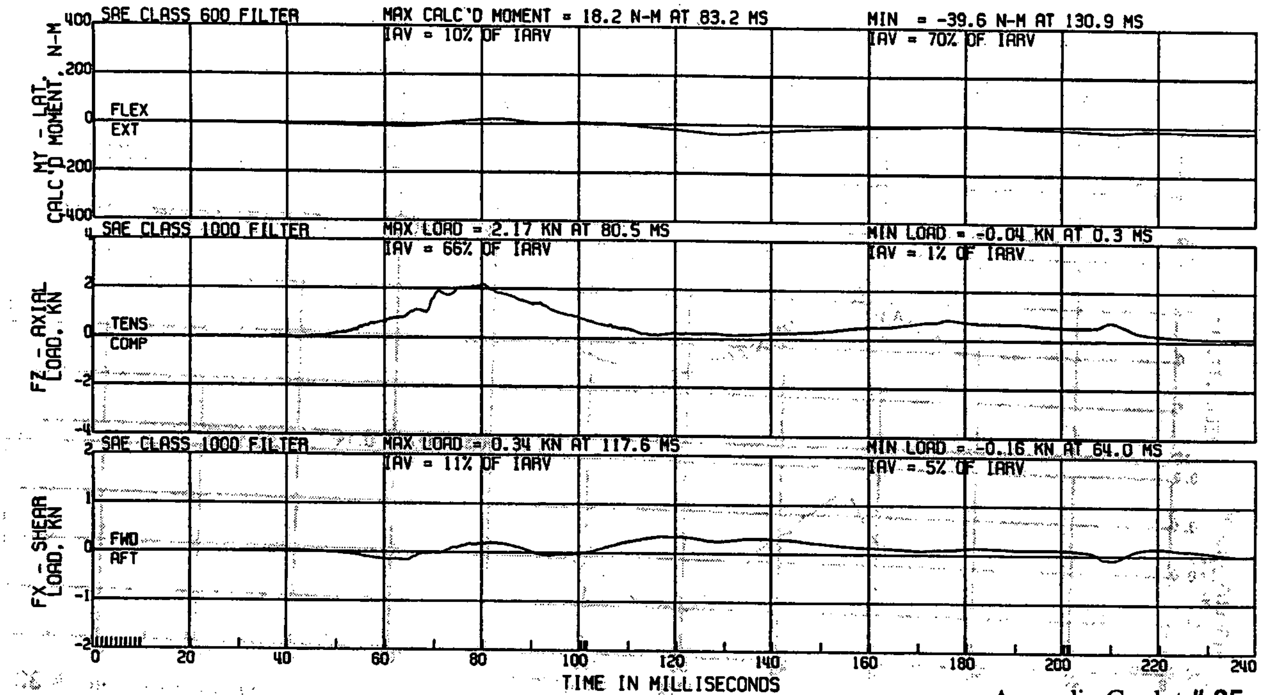



Appendix G, plot # 34

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 NECK LOADING ON HEAD ATD TYPE: GM50H

ELEC DATA R. FRT NECK LOADING ON HEAD TEST DATE:06/18/1997



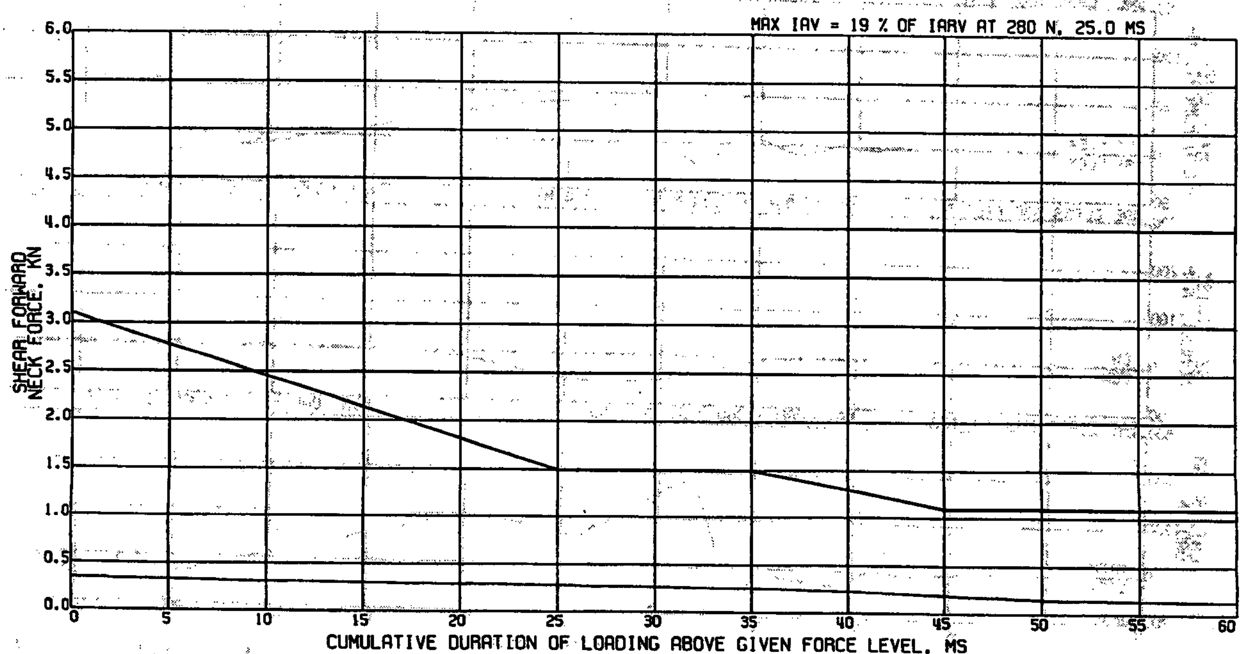

Appendix G, plot # 35

PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FORWARD NECK SHEAR ON HEAD ATD TYPE: GM50H

ELEC DATA, SAE CLASS 1000 R. FRT INJURY REFERENCE TEST DATE:06/18/1997




Appendix G, plot # 36

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

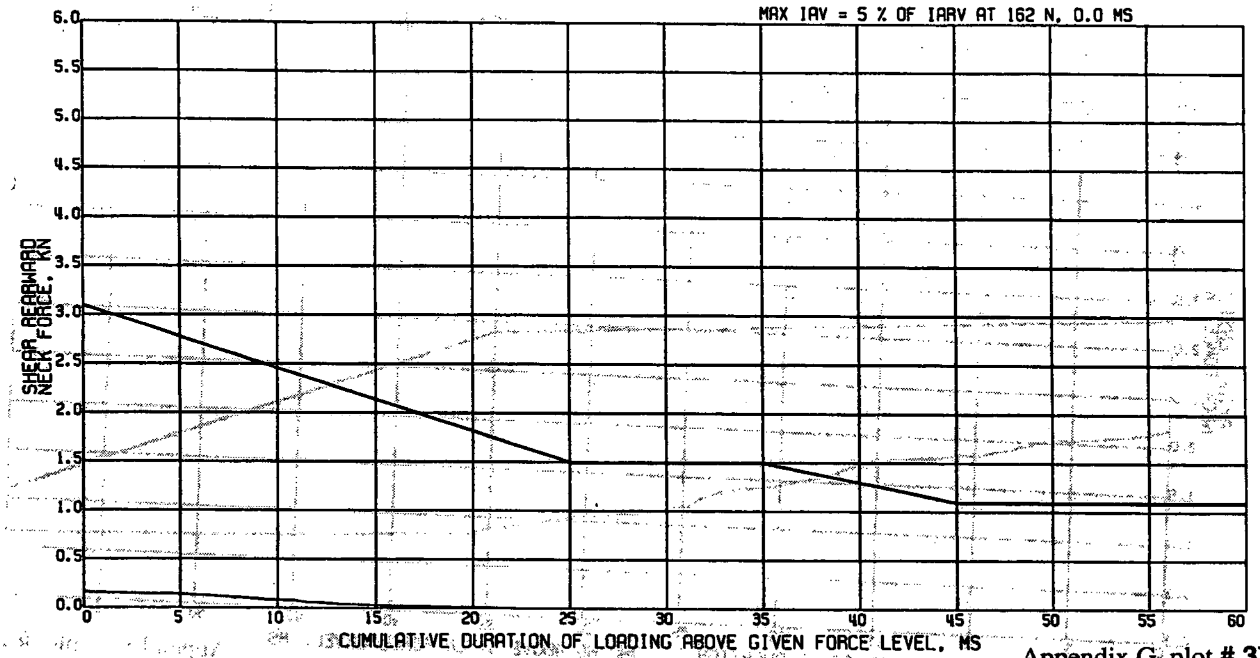
ELEC DATA, SAE CLASS 1000

REARWARD NECK SHEAR ON HEAD,

R. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # 37

37 PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

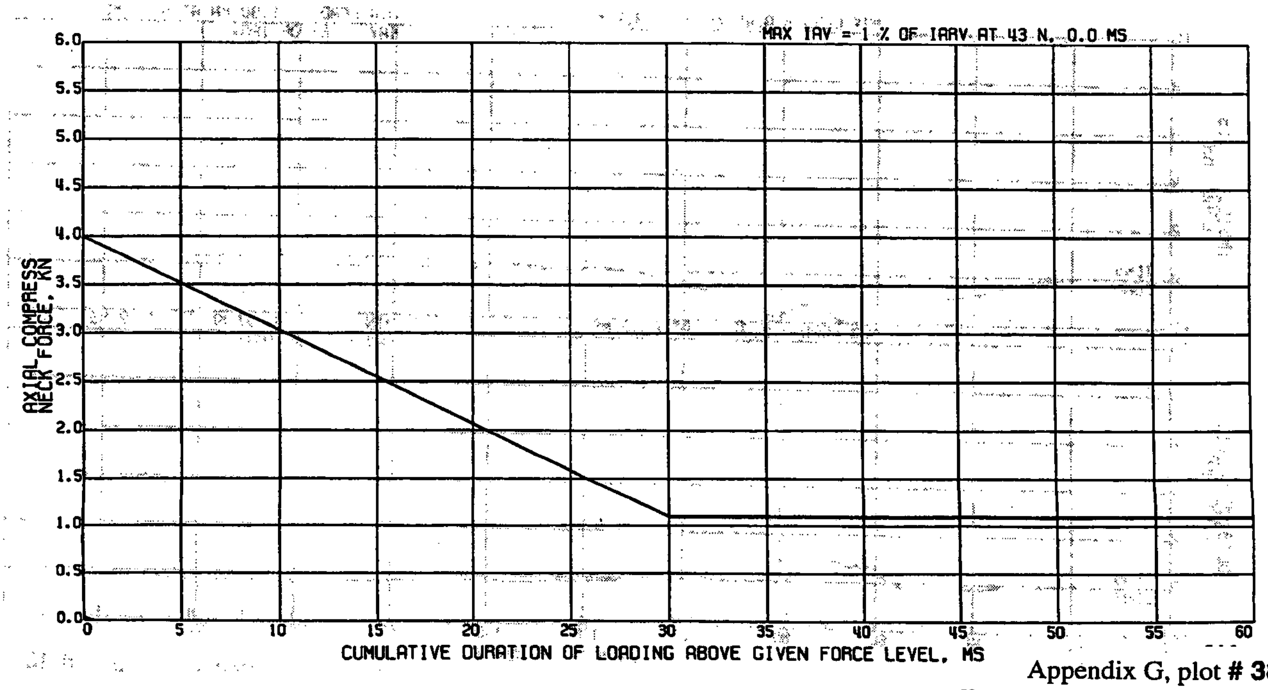
ELEC DATA, SAE CLASS 1000

AXIAL COMPRESSION ON HEAD,

R. FRT INJURY REFERENCE

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # 38

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

ATD TYPE: GM50H

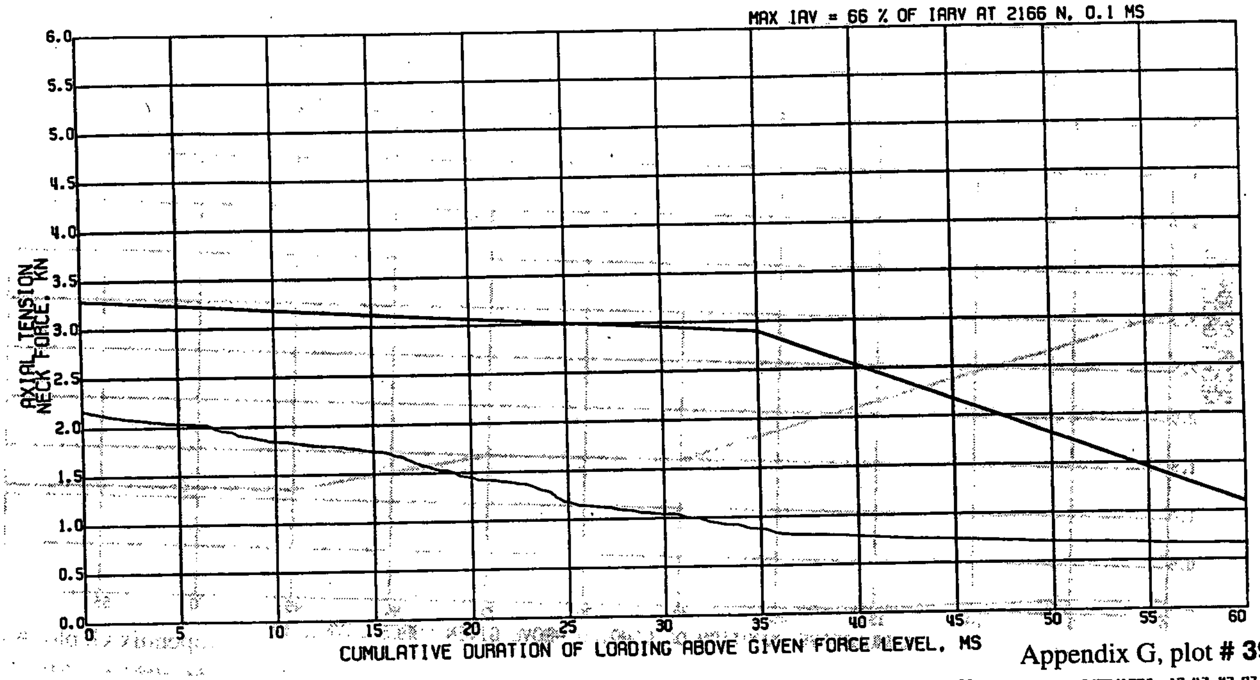
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

AXIAL TENSION ON HEAD,

R. FRT INJURY REFERENCE

TEST DATE:06/18/1997




Appendix G, plot # 39

39 PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

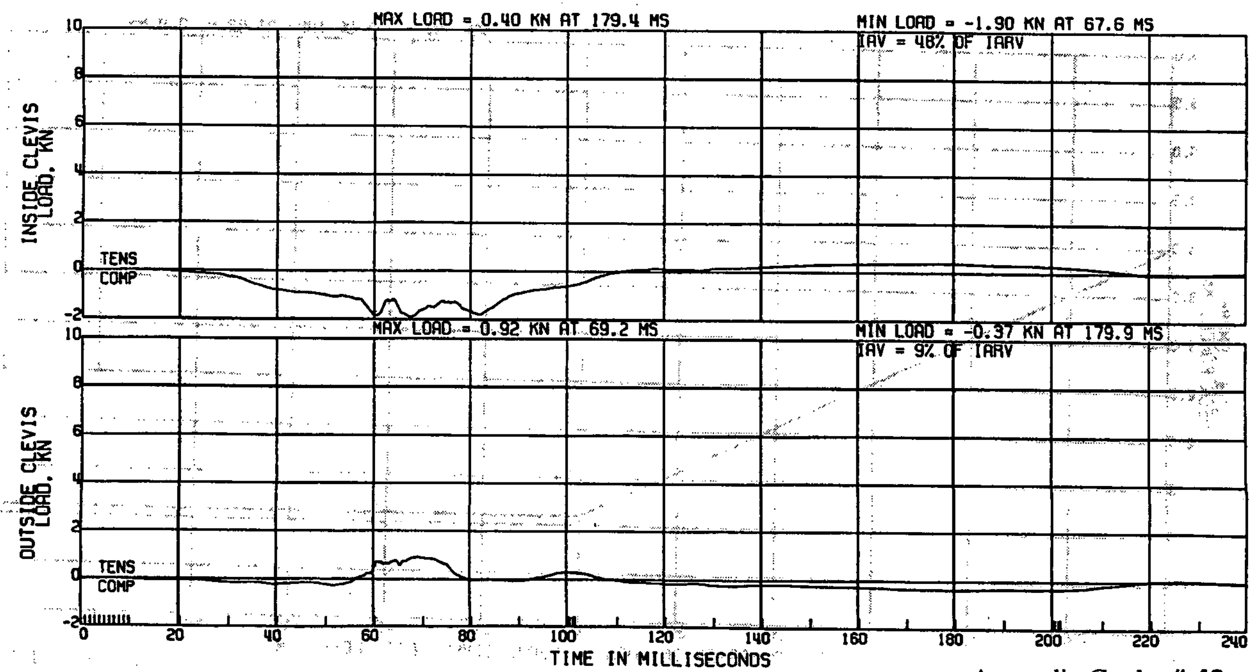
ATD TYPE: GM50H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 600

R. FRT LEFT KNEE CLEVIS LOAD

TEST DATE:06/18/1997




Appendix G, plot # 40

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

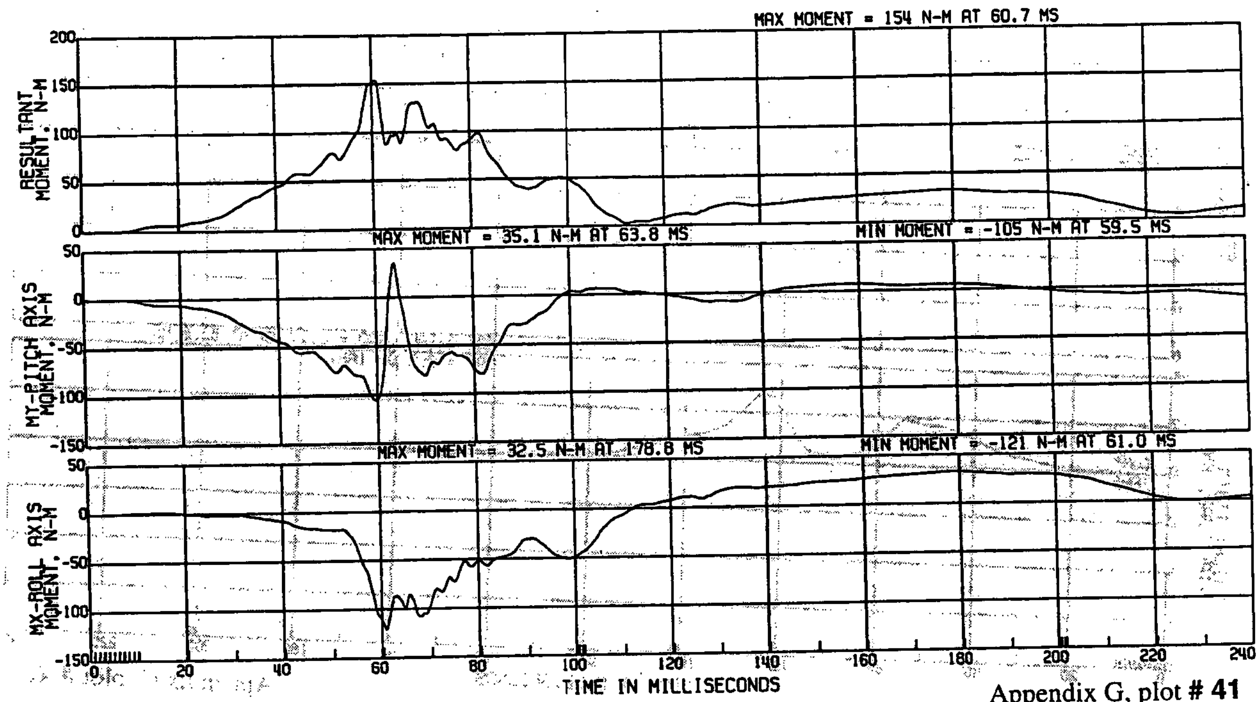
ATD TYPE: GM50H

R&D CTR 1VF46080 1FP87

R. FRT LEFT TIBIA UPPER MOMENT

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 600




Appendix G, plot # **41**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

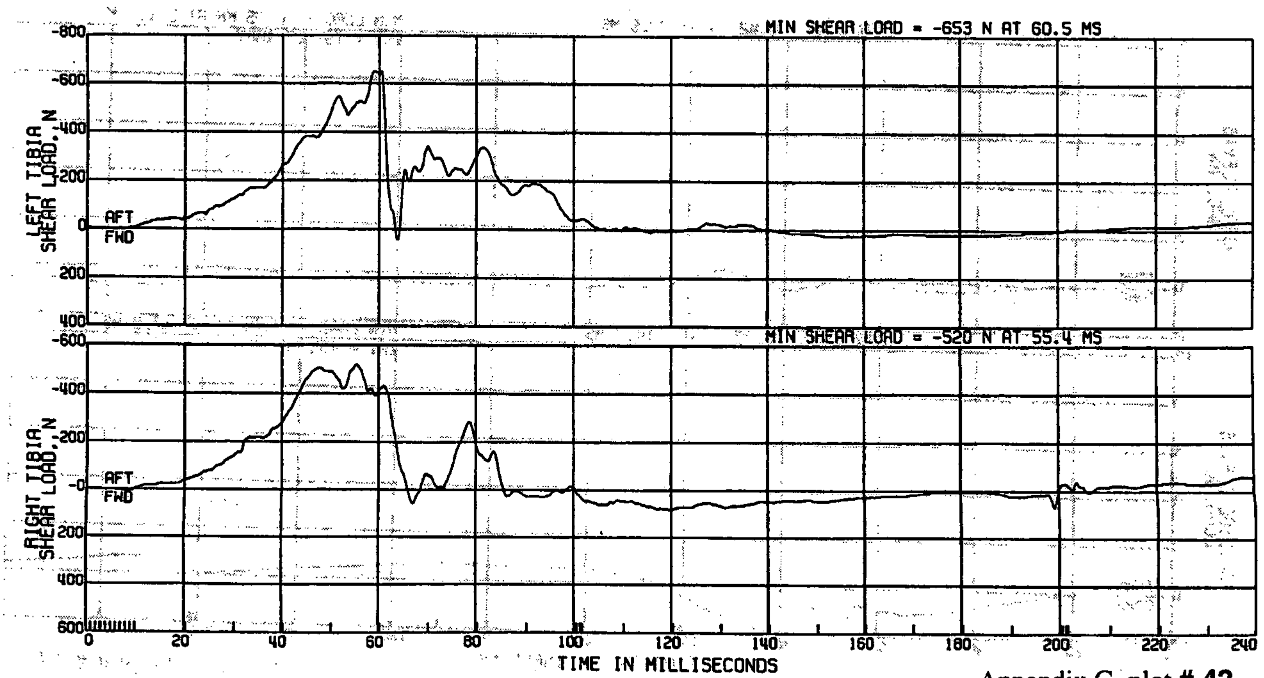
ATD TYPE: GM50H

R&D CTR 1VF46080 1FP87

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 600

R. FRT TIBIA LOWER SHEAR LOAD CELLS




Appendix G, plot # **42**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

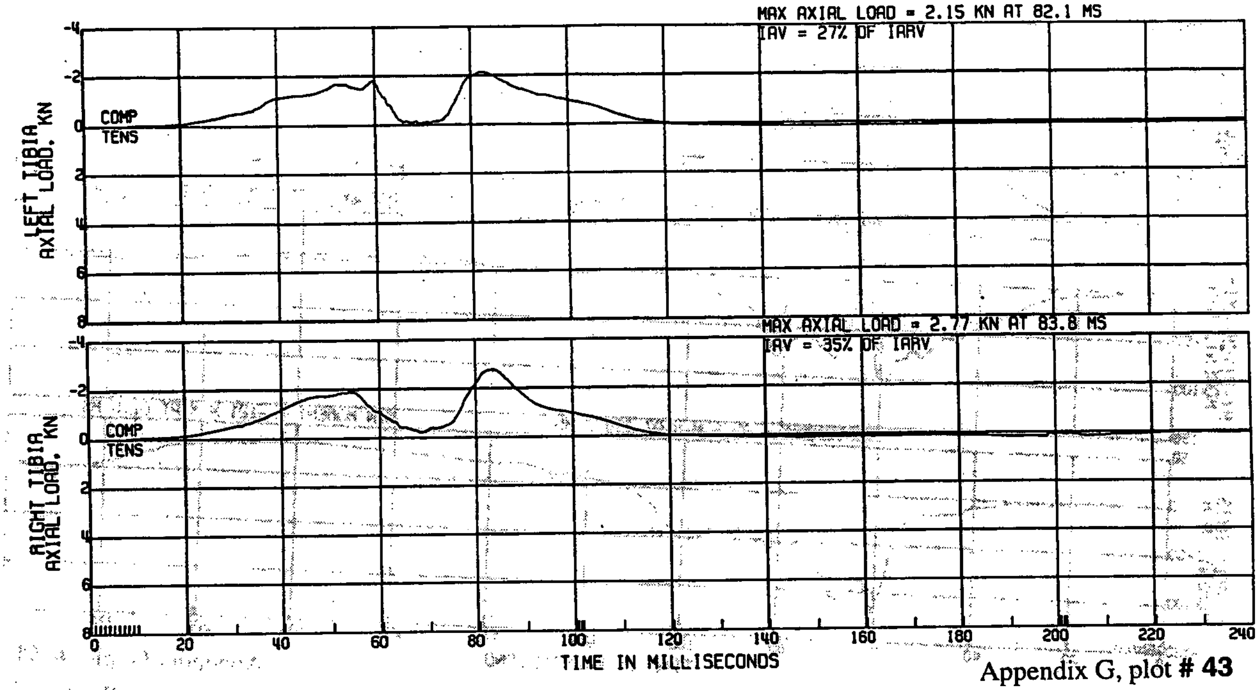
ATD TYPE: GM50H

R&D CTR 1VF46080 1FP87

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 600

R. FRT TIBIA LOWER AXIAL LOAD




Appendix G, plot # 43

43 PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

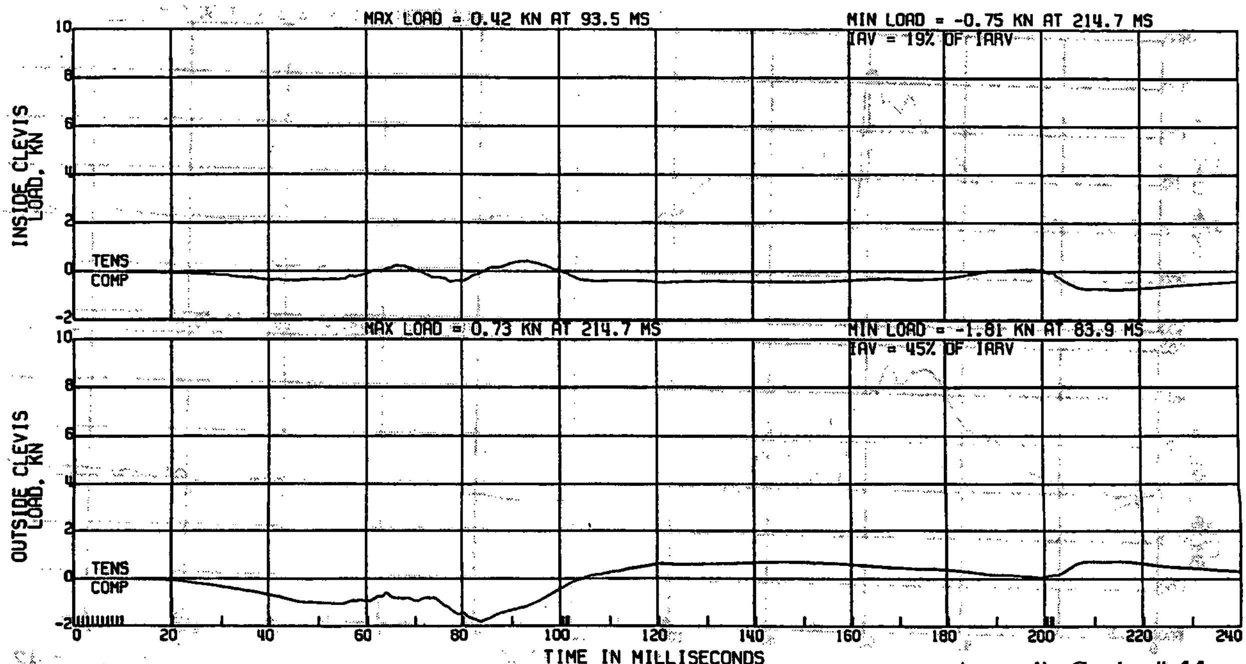
ATD TYPE: GM50H

R&D CTR 1VF46080 1FP87

R. FRT RIGHT KNEE CLEVIS LOAD

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 600

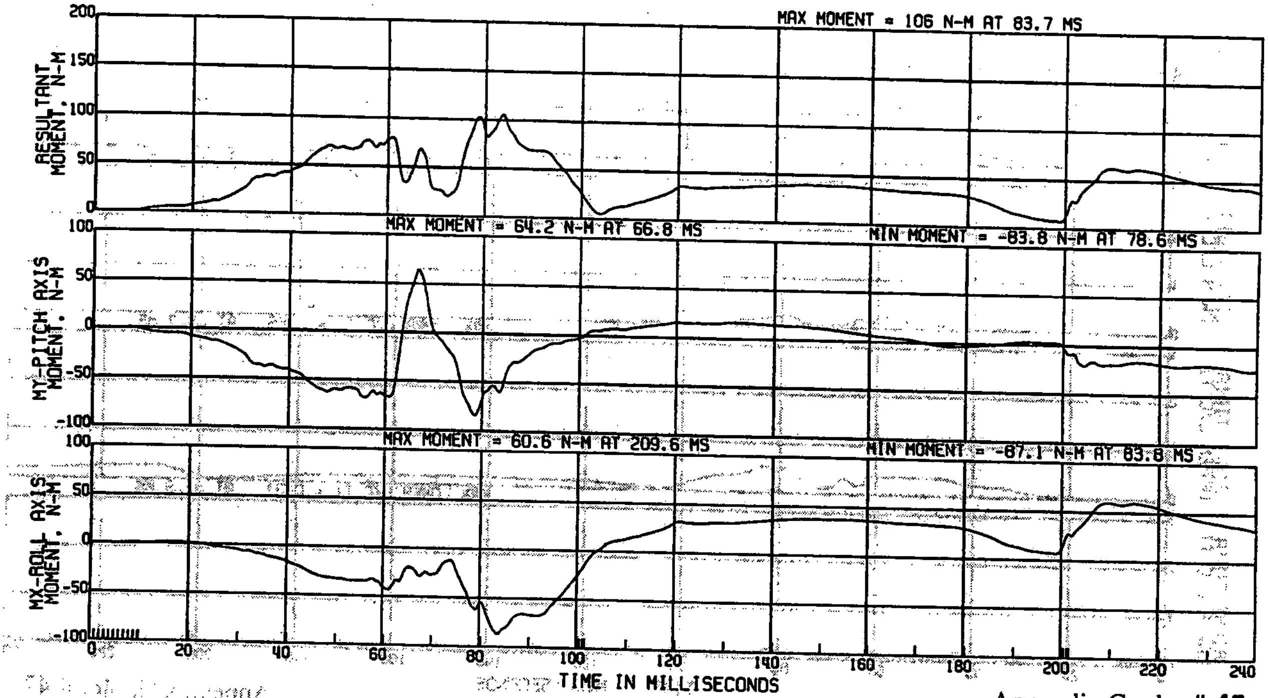



Appendix G, plot # 44

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 R. FRT RIGHT TIBIA UPPER MOMENT ATD TYPE: GM50H

ELEC DATA, SAE CLASS 600 TEST DATE:06/18/1997




Appendix G, plot # **45**

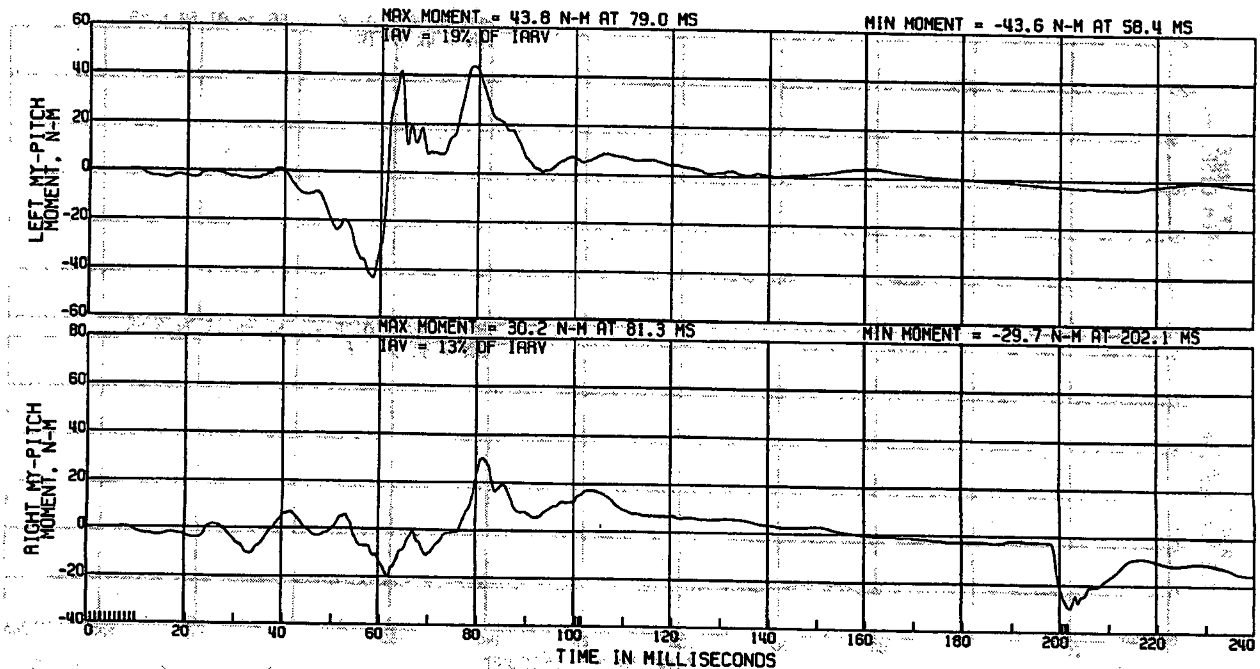
45 PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 ATD TYPE: GM50H

ELEC DATA, SAE CLASS 600 TEST DATE:06/18/1997

R. FRT TIBIA LOWER BENDING MOMENTS




Appendix G, plot # **46**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

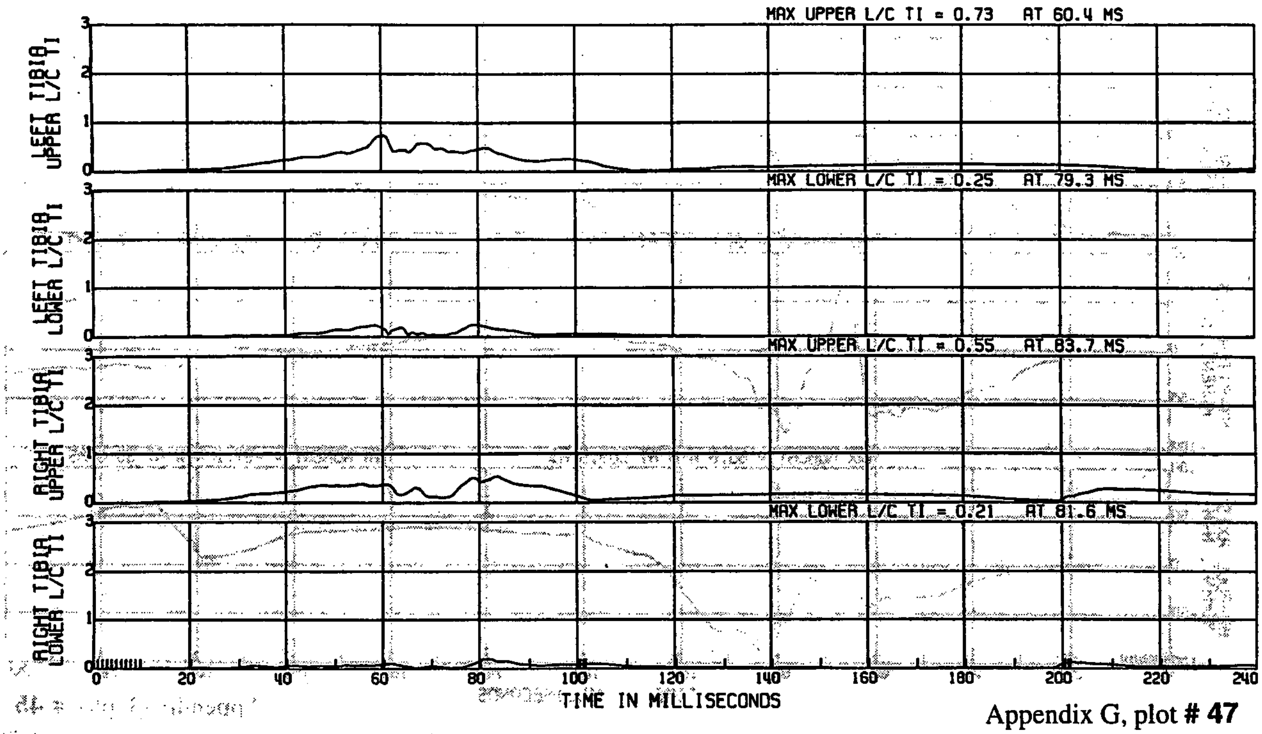
ELEC DATA, SAE CLASS 600

R. FRT TIBIA INDICES

TI = (RES MOM/225 NM) + (AXIAL/35900 N)

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # 47

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

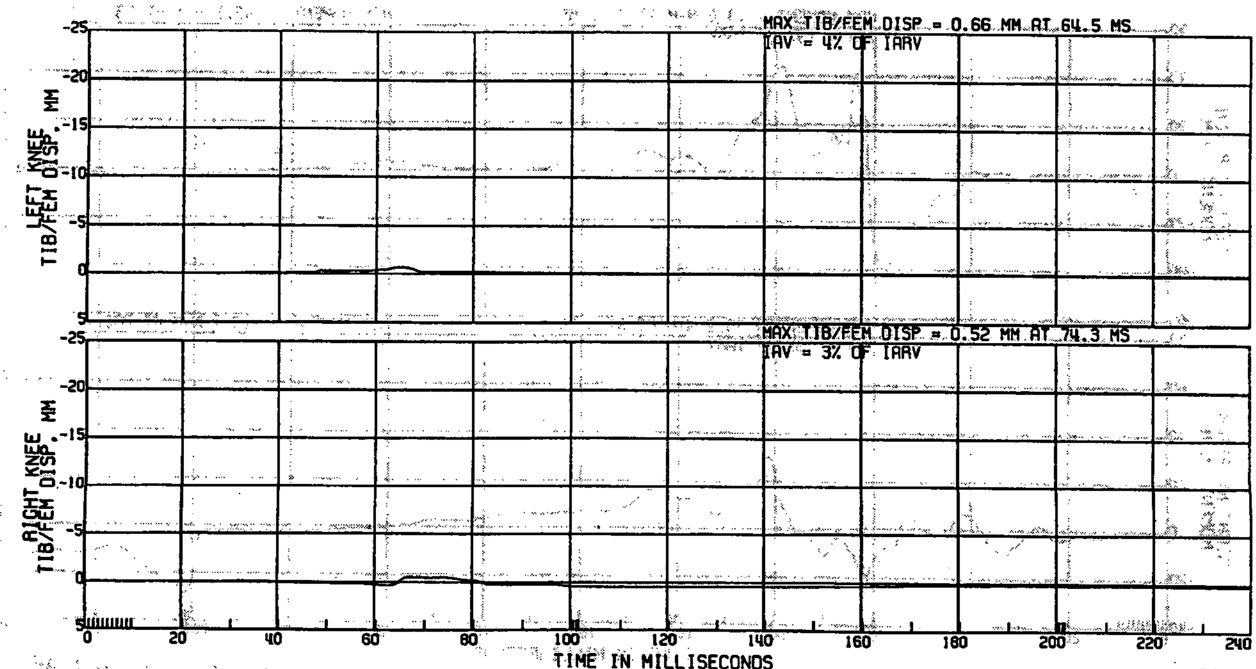
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 180

R. FRT TIBIA/FEMUR DISPLACEMENT

ATD TYPE: GM50H

TEST DATE:06/18/1997

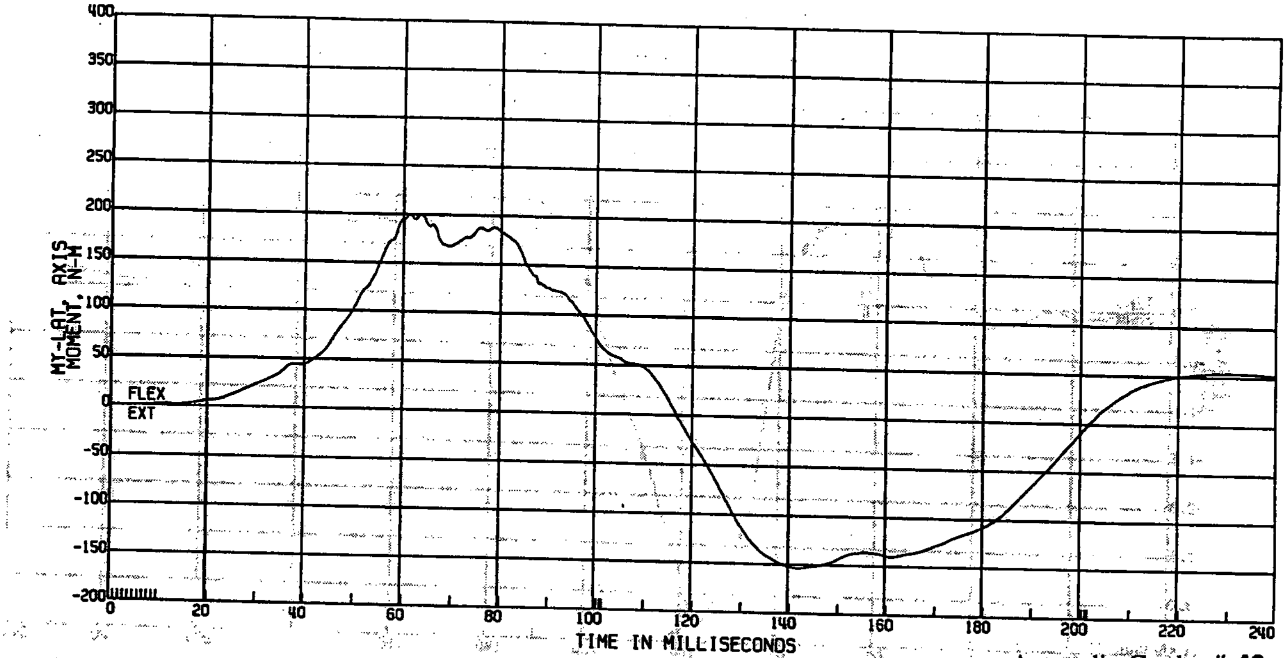



Appendix G, plot # 48

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L. FRT LOWER LUMBAR MOMENT ATD TYPE: GM50H

ELEC DATA, SAE CLASS 1000 TEST DATE:06/18/1997

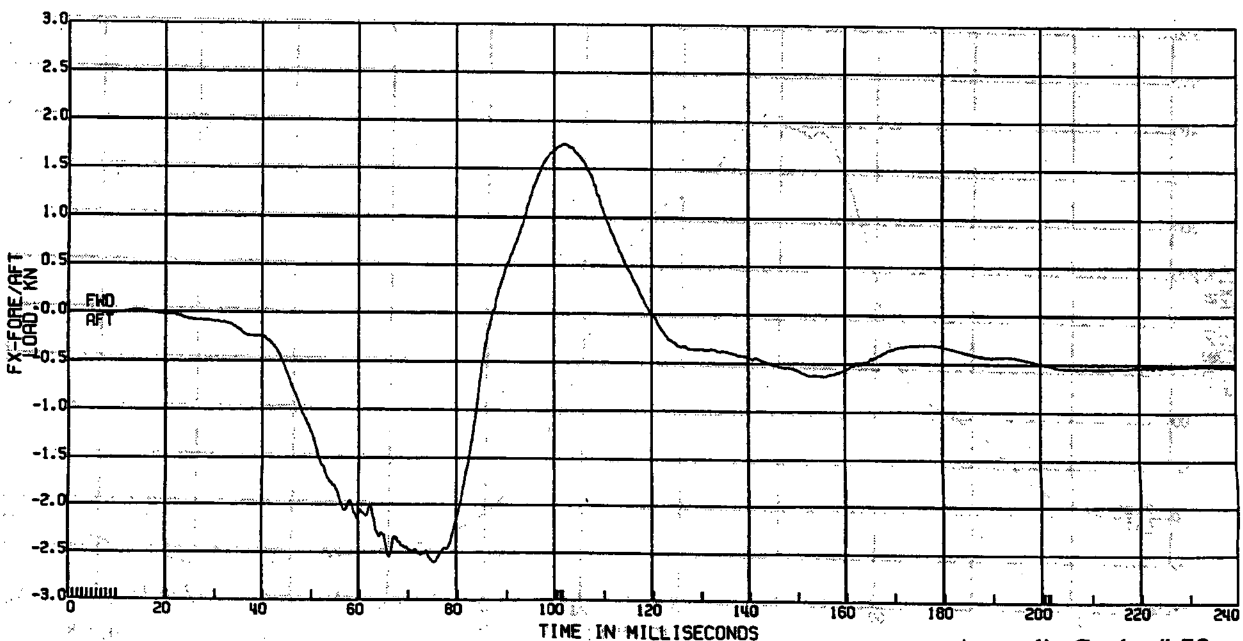



Appendix G, plot # **49**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L. FRT LOWER LUMBAR LOAD ATD TYPE: GM50H

ELEC DATA, SAE CLASS 1000 TEST DATE:06/18/1997




Appendix G, plot # **50**

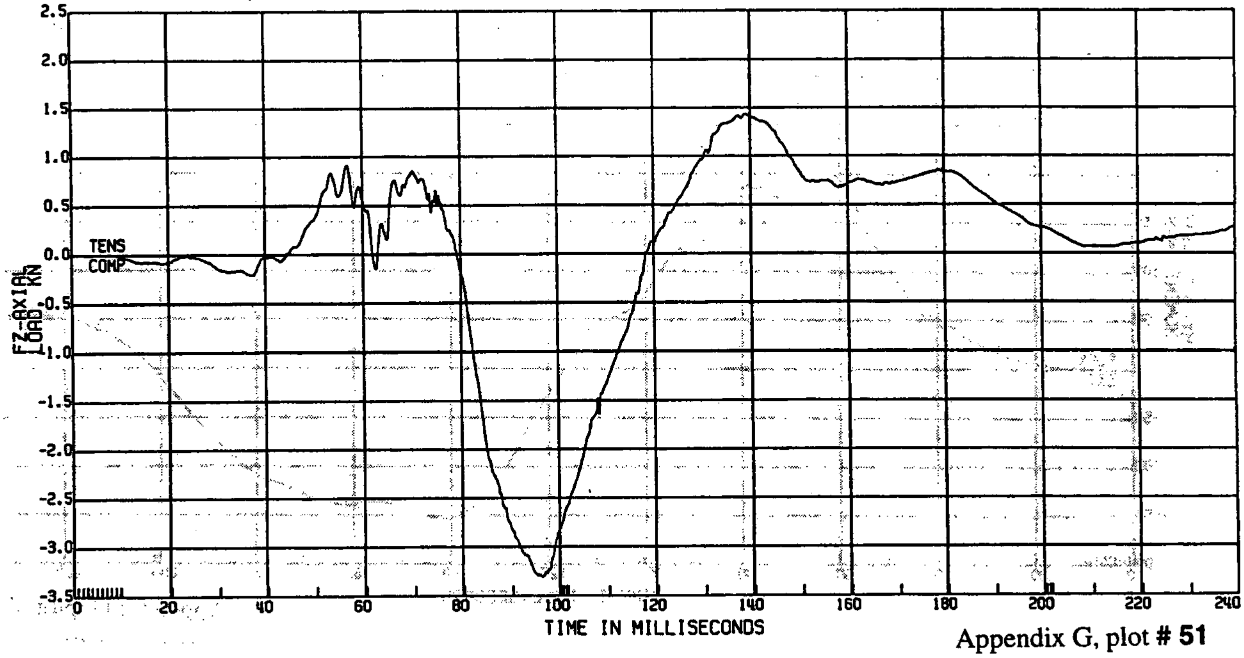
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

L. FRT LOWER LUMBAR LOAD

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 51

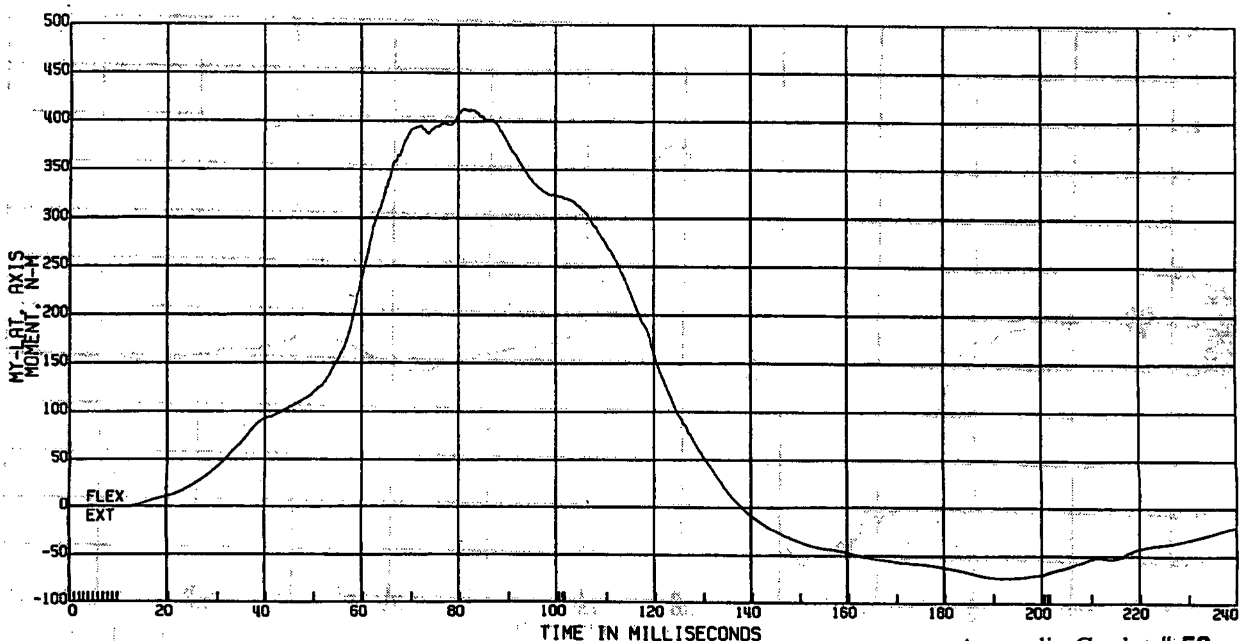
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

R. FRT LOWER LUMBAR MOMENT

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 52

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

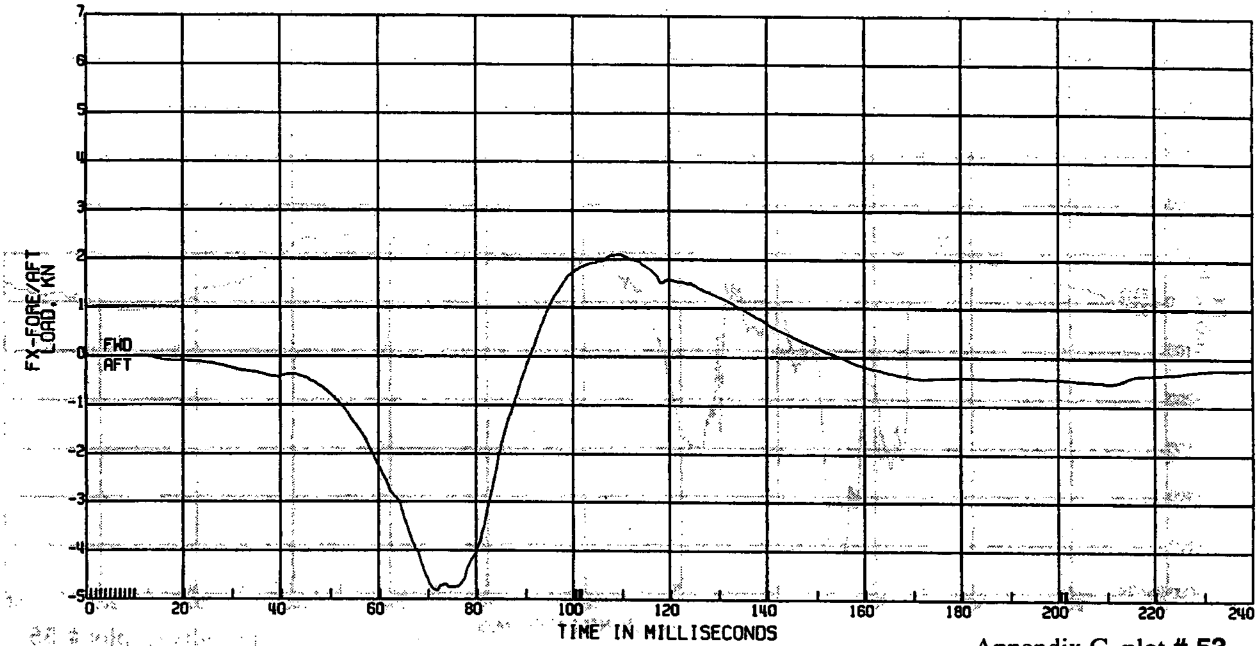
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

R. FRT LOWER LUMBAR LOAD

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # 53

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

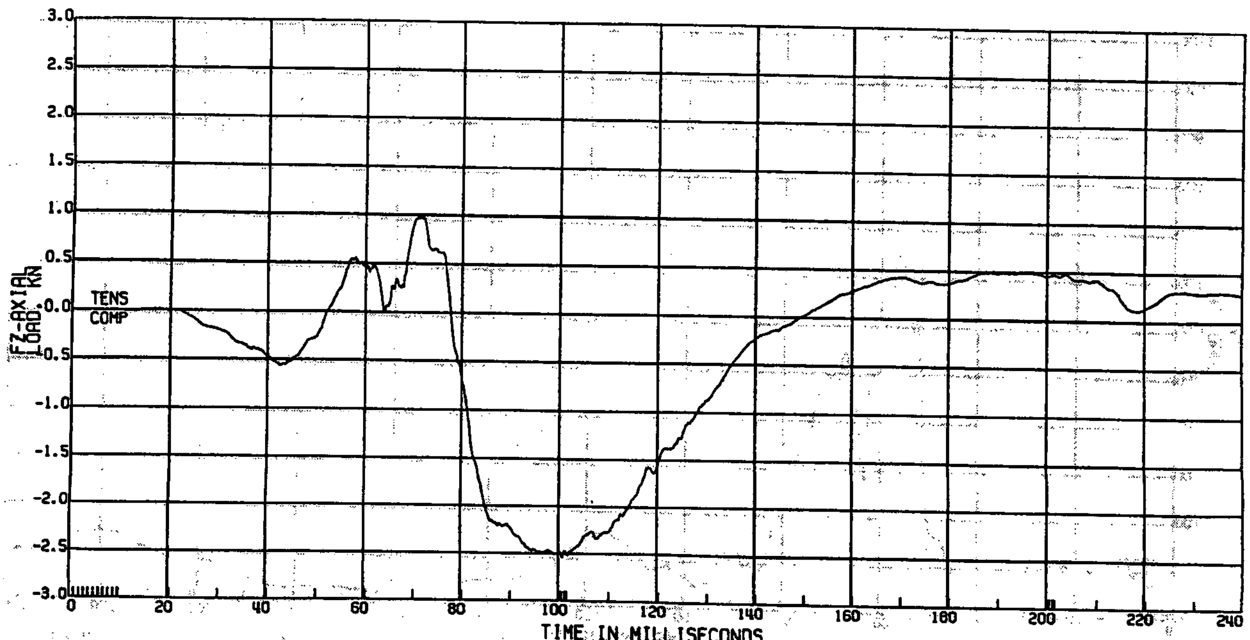
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

R. FRT LOWER LUMBAR LOAD

ATD TYPE: GM50H

TEST DATE:06/18/1997



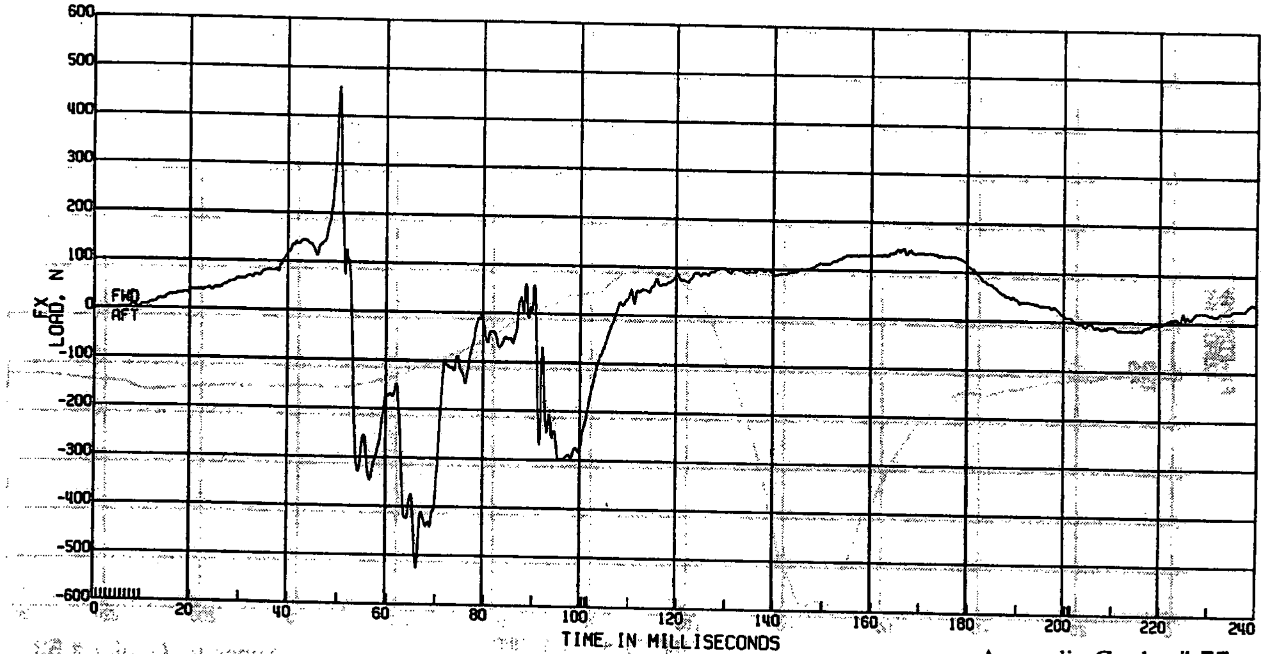

Appendix G, plot # 54

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

L. FRT TIBIA LEFT UPPER LOAD
(ENHANCED LOWER LEG)

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 55

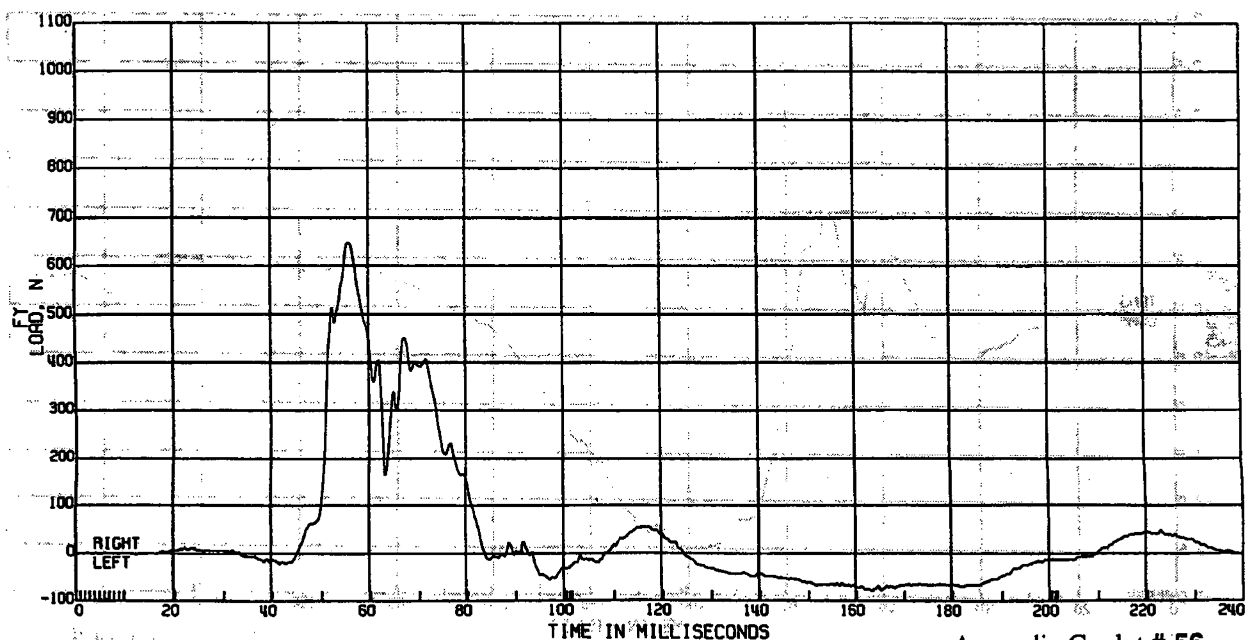
55 PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

L. FRT TIBIA LEFT LOWER LOAD
(ENHANCED LOWER LEG)

ATD TYPE: GM50H
TEST DATE:06/18/1997



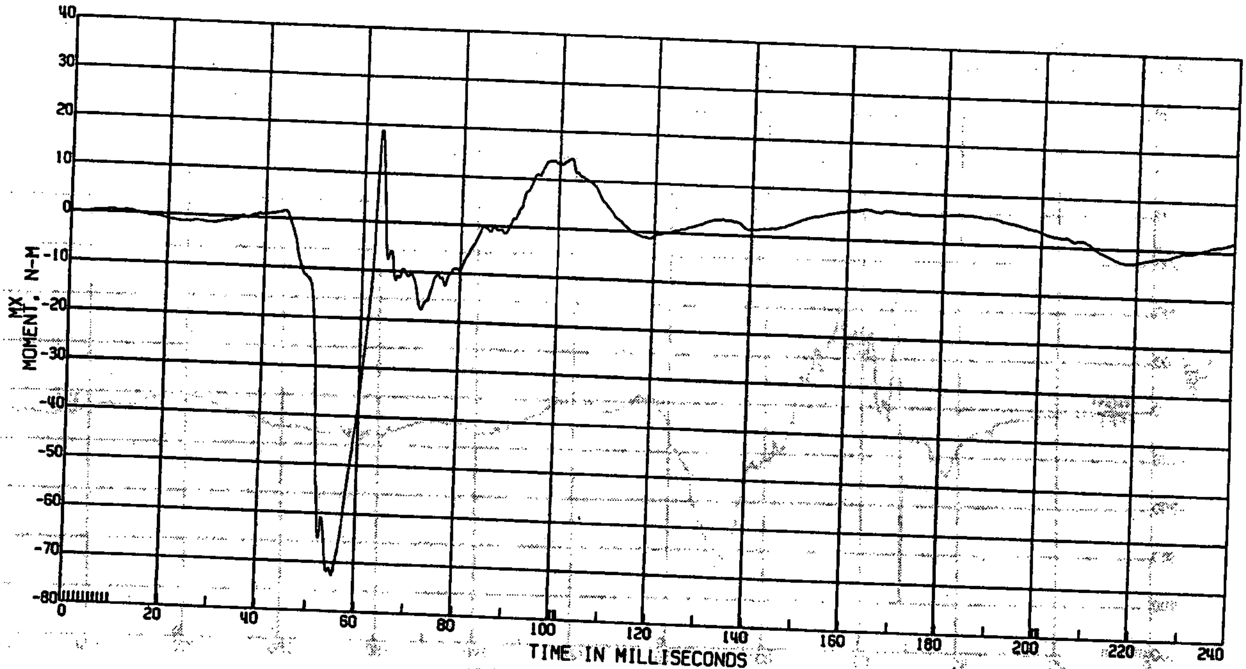

Appendix G, plot # 56

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

L. FRT TIBIA LEFT LOWER MOMENT
(ENHANCED LOWER LEG)

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 57

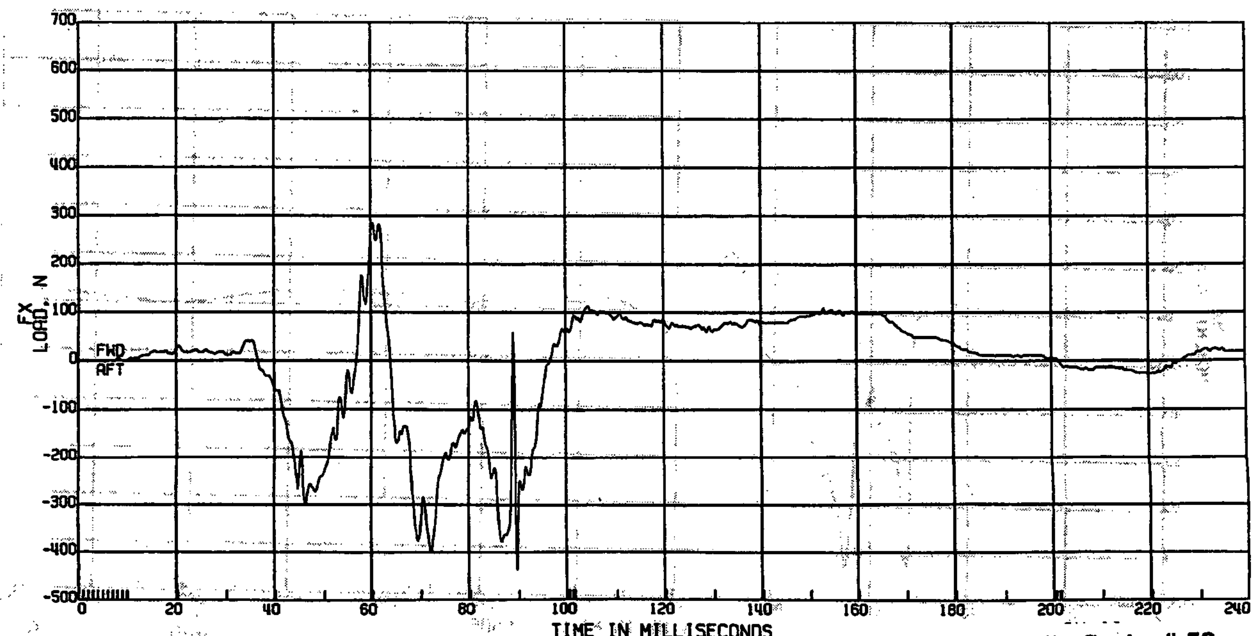
57 PROCESSED 6/20/1997 13:47 V2.07

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 600

L. FRT TIBIA RIGHT UPPER LOAD
(ENHANCED LOWER LEG)

ATD TYPE: GM50H
TEST DATE:06/18/1997




Appendix G, plot # 58

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

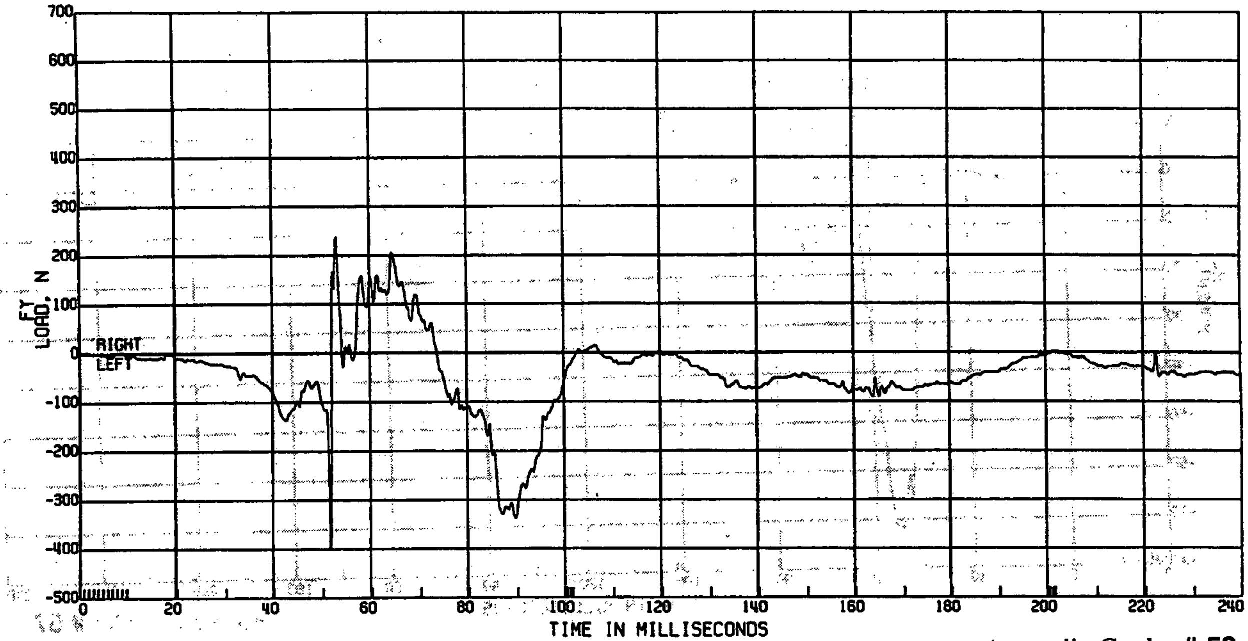
ELEC DATA, SAE CLASS 600

L. FRT TIBIA RIGHT LOWER LOAD

(ENHANCED LOWER LEG)

ATD TYPE: GM50H

TEST DATE:06/18/1997




Appendix G, plot # 59

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

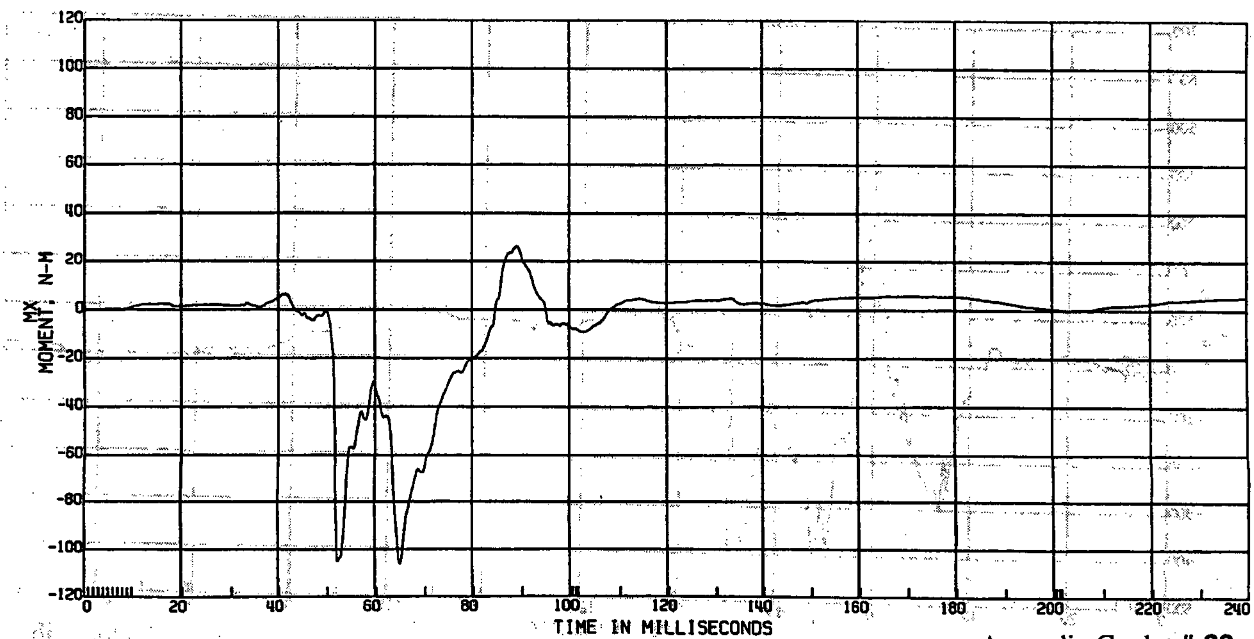
ELEC DATA, SAE CLASS 600

L. FRT TIBIA RIGHT LOWER MOMENT

(ENHANCED LOWER LEG)

ATD TYPE: GM50H

TEST DATE:06/18/1997

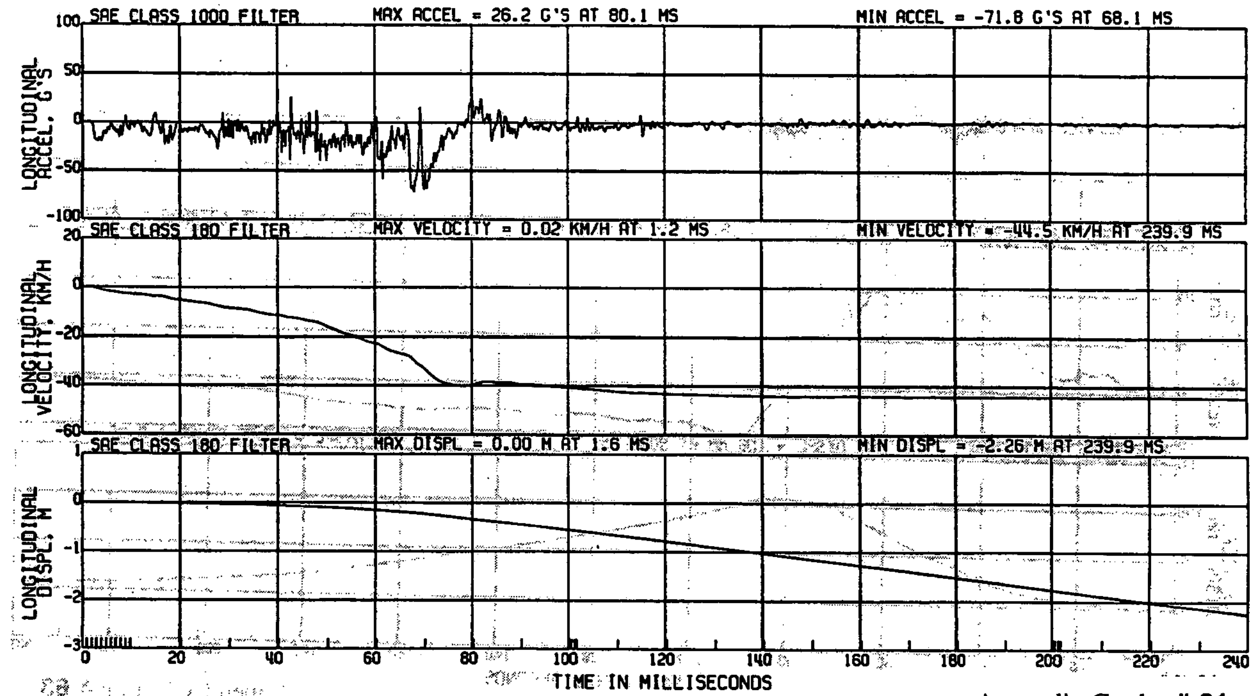



Appendix G, plot # 60

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L. FRT ROCKER TEST DATE:06/18/1997

ELEC DATA

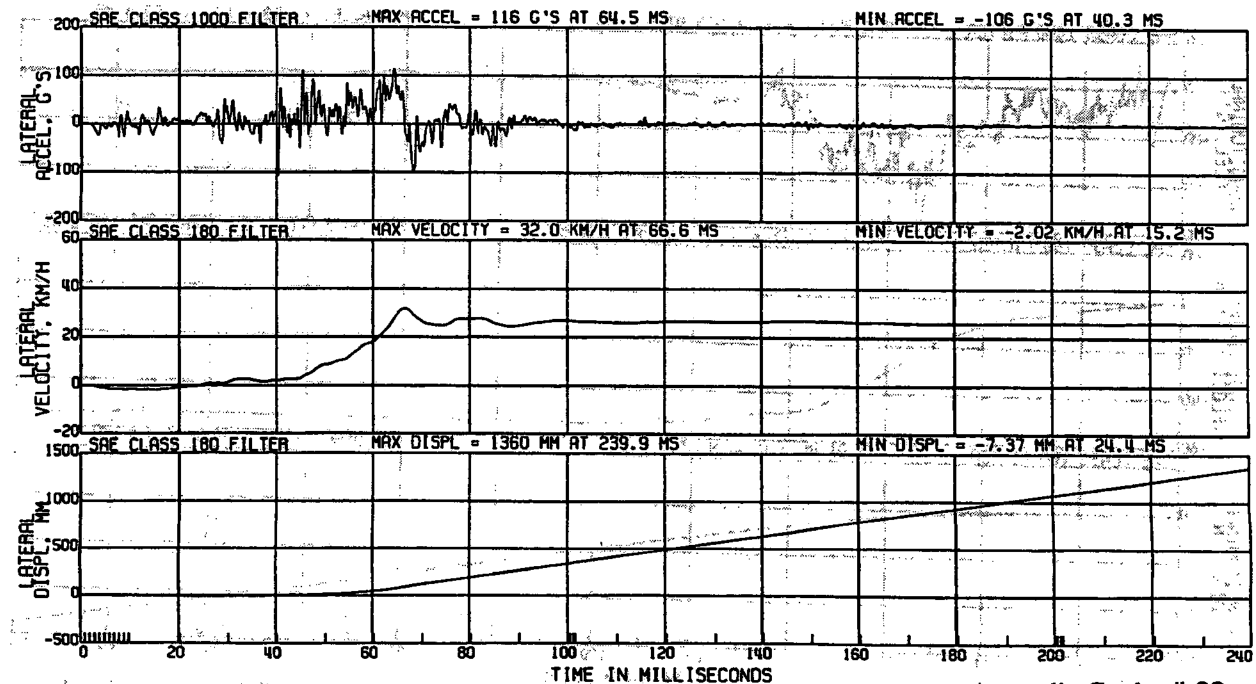



Appendix G, plot # **61**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L. FRT ROCKER TEST DATE:06/18/1997

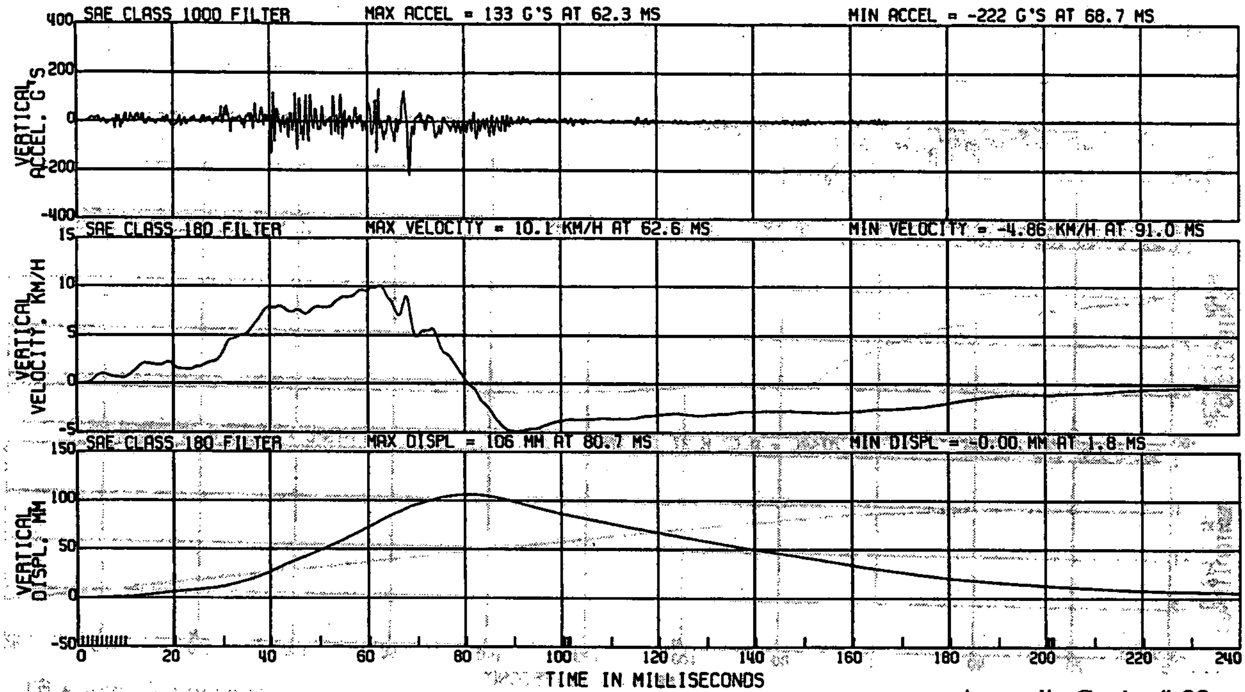
ELEC DATA




Appendix G, plot # **62**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

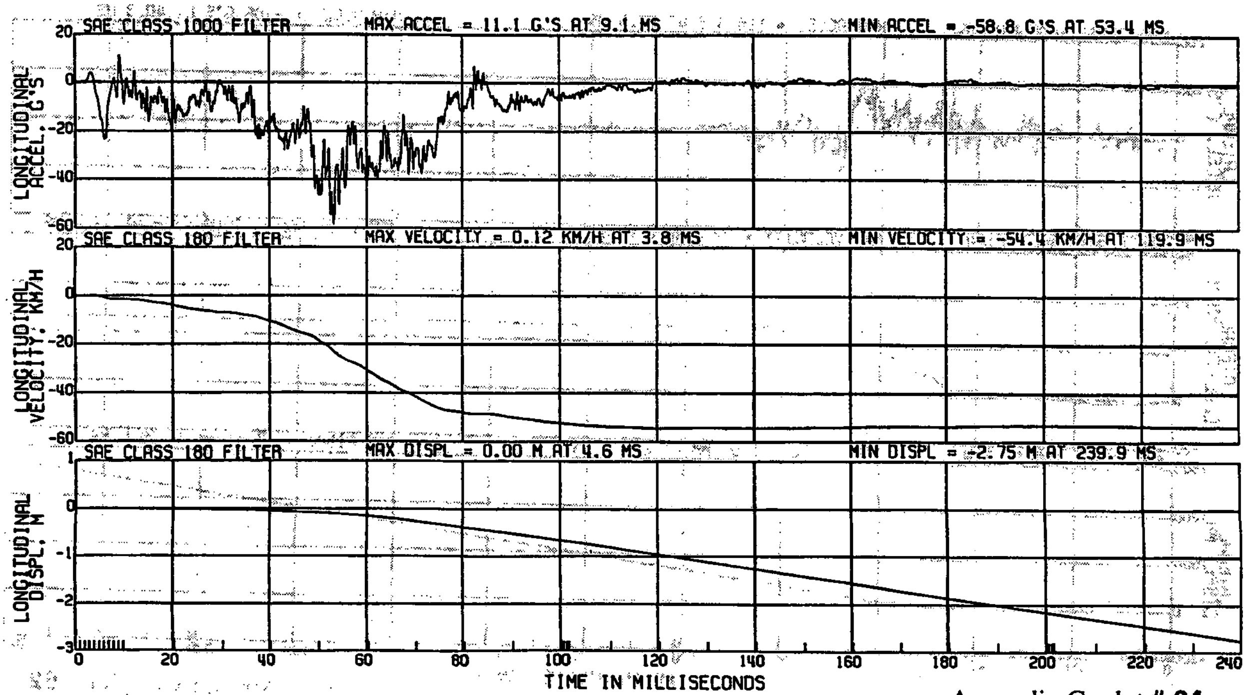
R&D CTR 1VF46080 1FP87 L. FRT ROCKER TEST DATE:06/18/1997
ELEC DATA




Appendix G, plot # **63**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

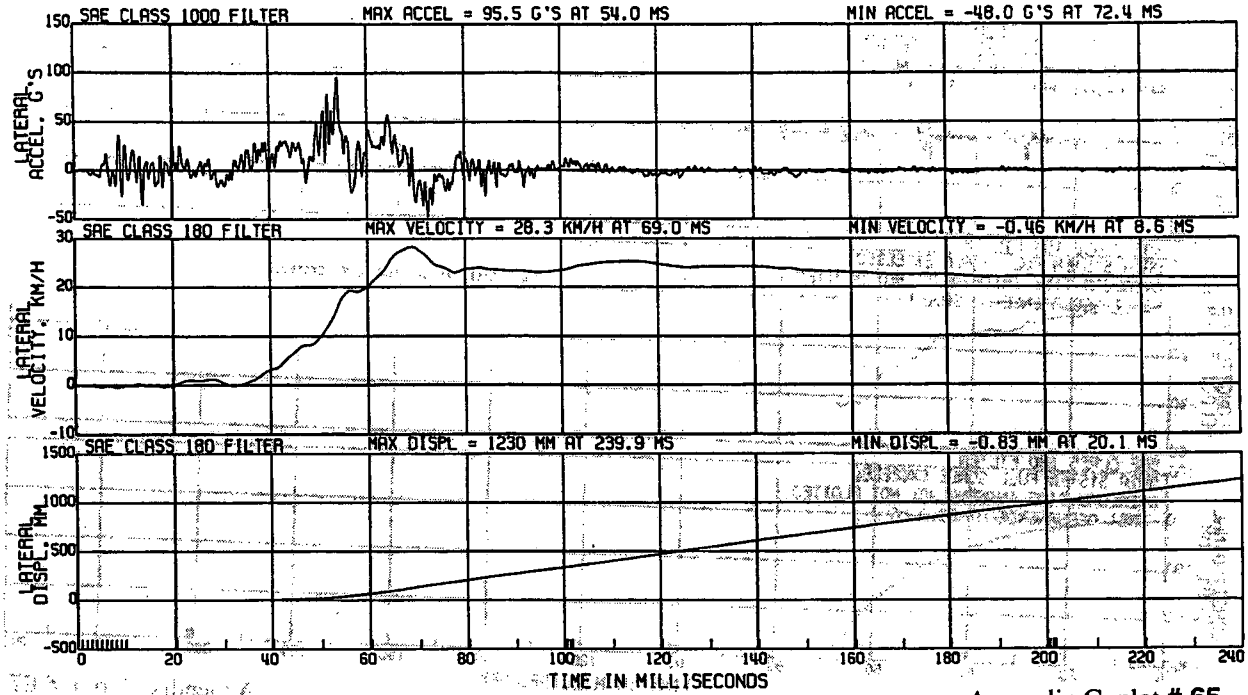
R&D CTR 1VF46080 1FP87 R. FRT ROCKER TEST DATE:06/18/1997
ELEC DATA




Appendix G, plot # **64**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

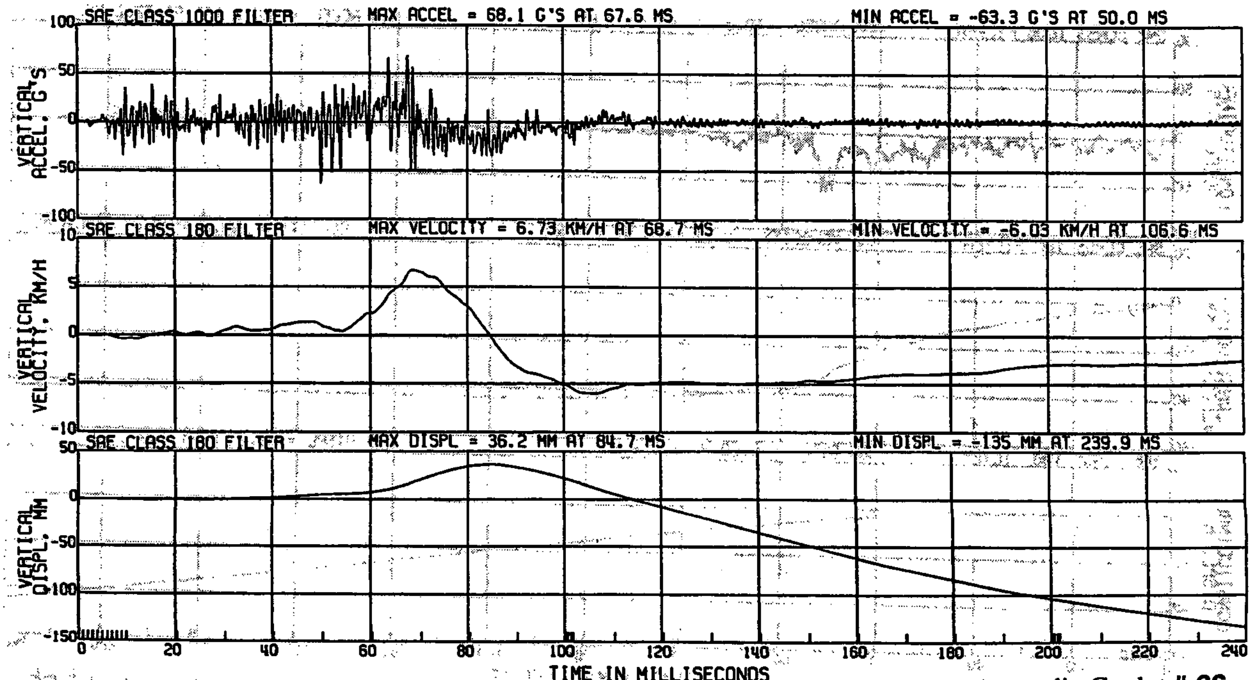
R&D CTR 1VF46080 1FP87 R. FRT ROCKER TEST DATE:06/18/1997
ELEC DATA




Appendix G, plot # **65**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 R. FRT ROCKER TEST DATE:06/18/1997
ELEC DATA

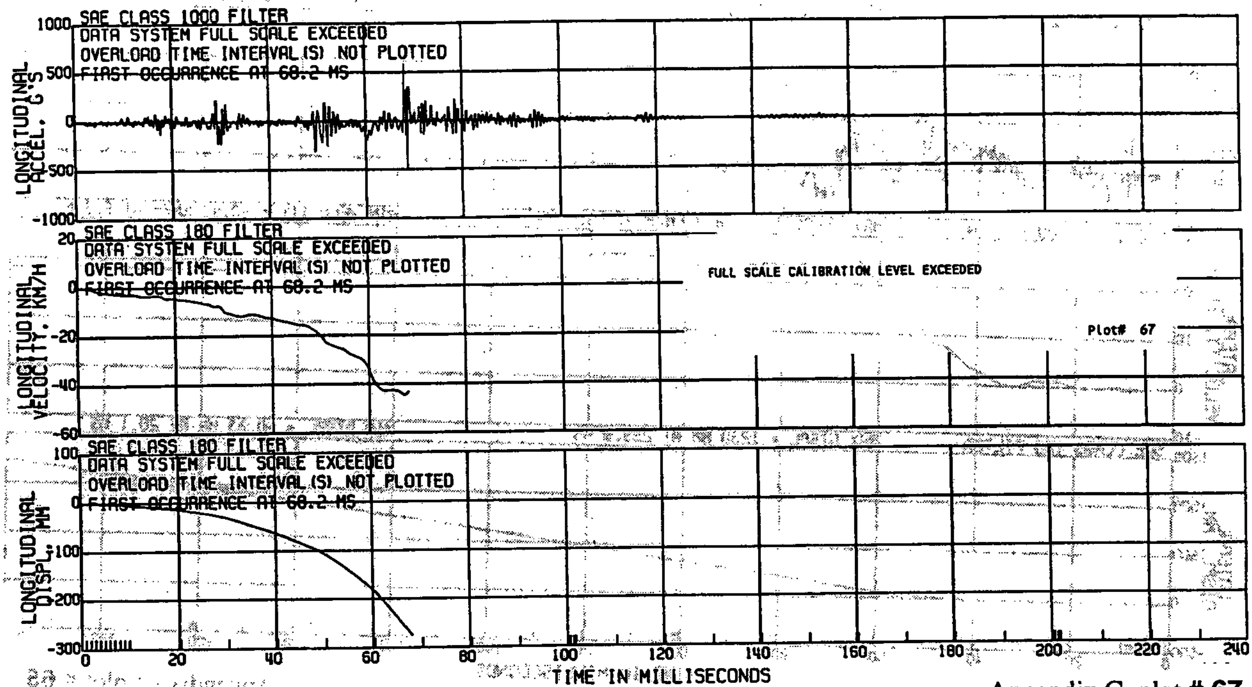



Appendix G, plot # **66**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L. FLOORPAN TEST DATE:06/18/1997

ELEC DATA

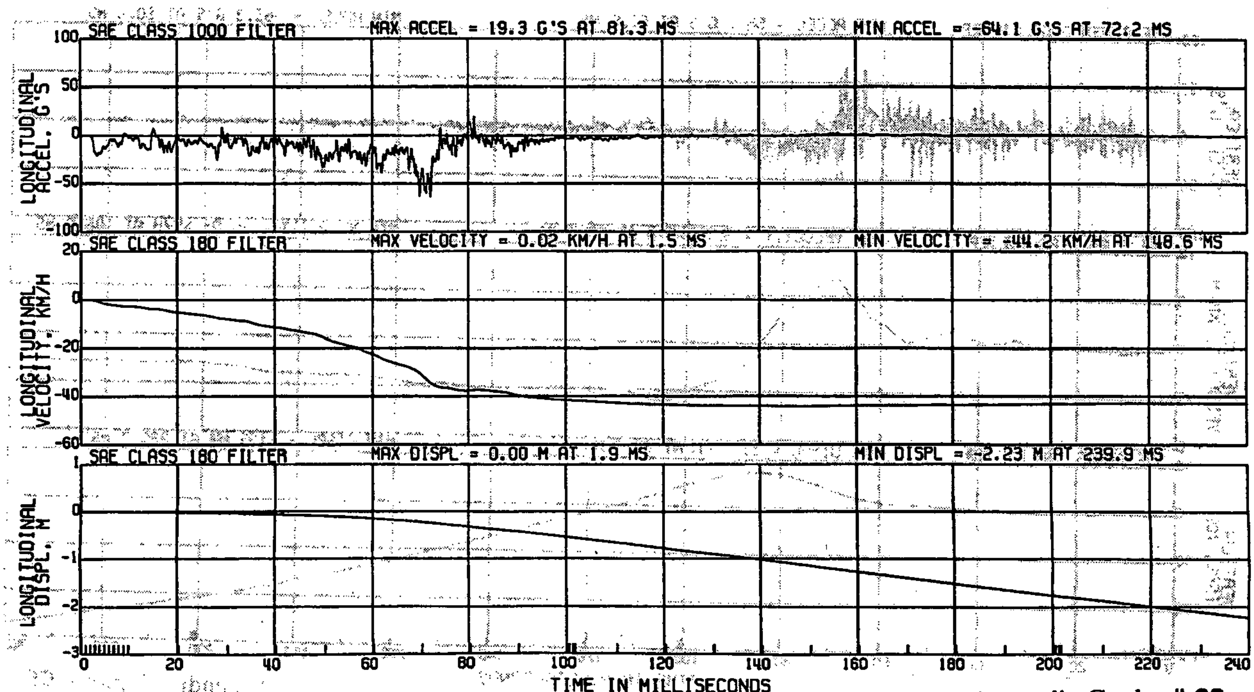



Appendix G, plot # **67**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L.REAR ROCKER TEST DATE:06/18/1997

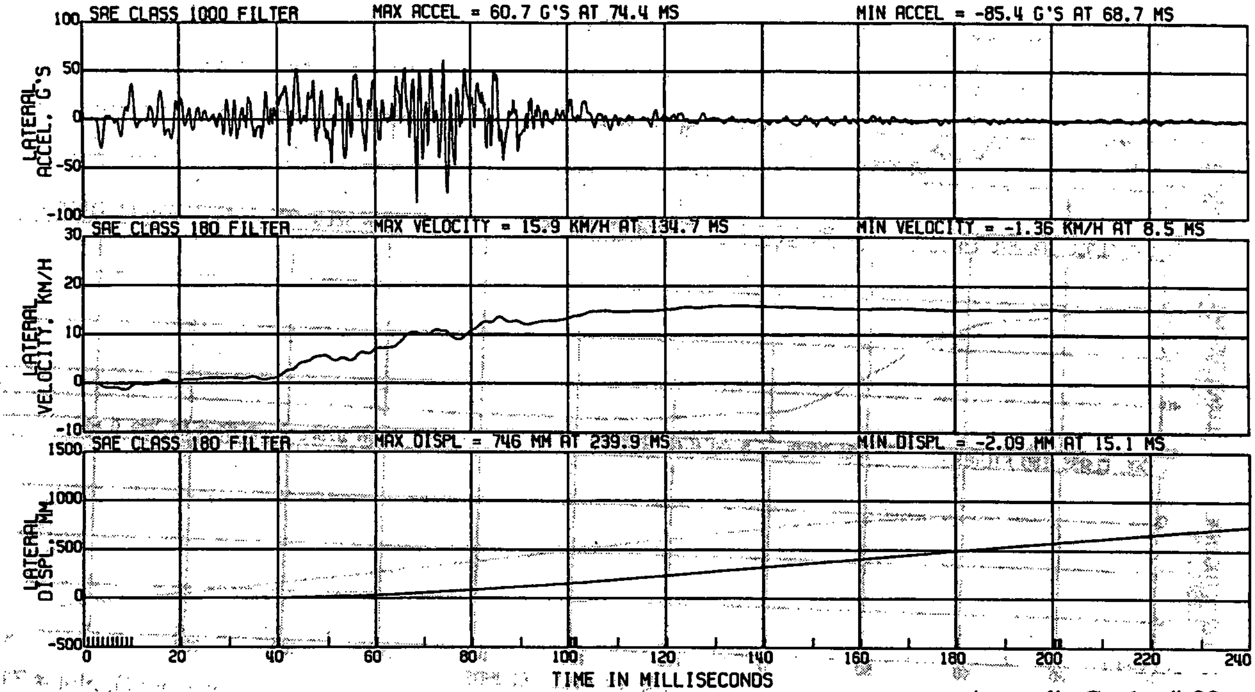
ELEC DATA




Appendix G, plot # **68**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

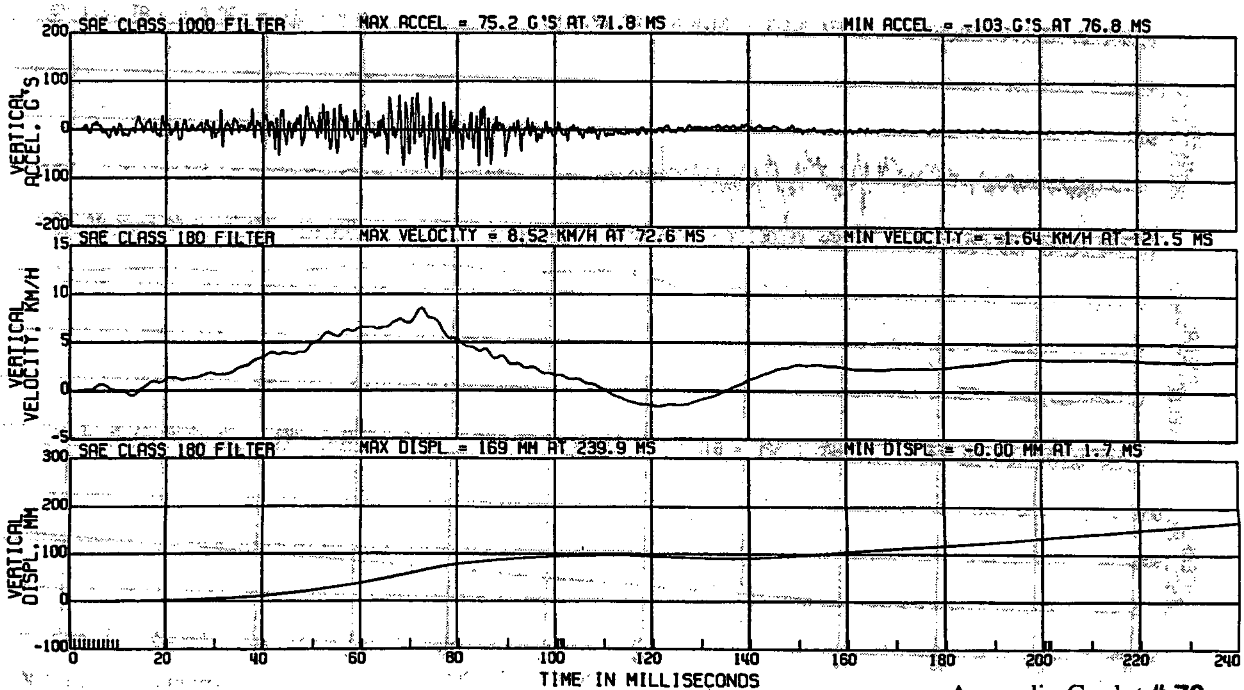
R&D CTR 1VF46080 1FP87 L.REAR ROCKER TEST DATE:06/18/1997
ELEC DATA




Appendix G, plot # **69**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L.REAR ROCKER TEST DATE:06/18/1997
ELEC DATA



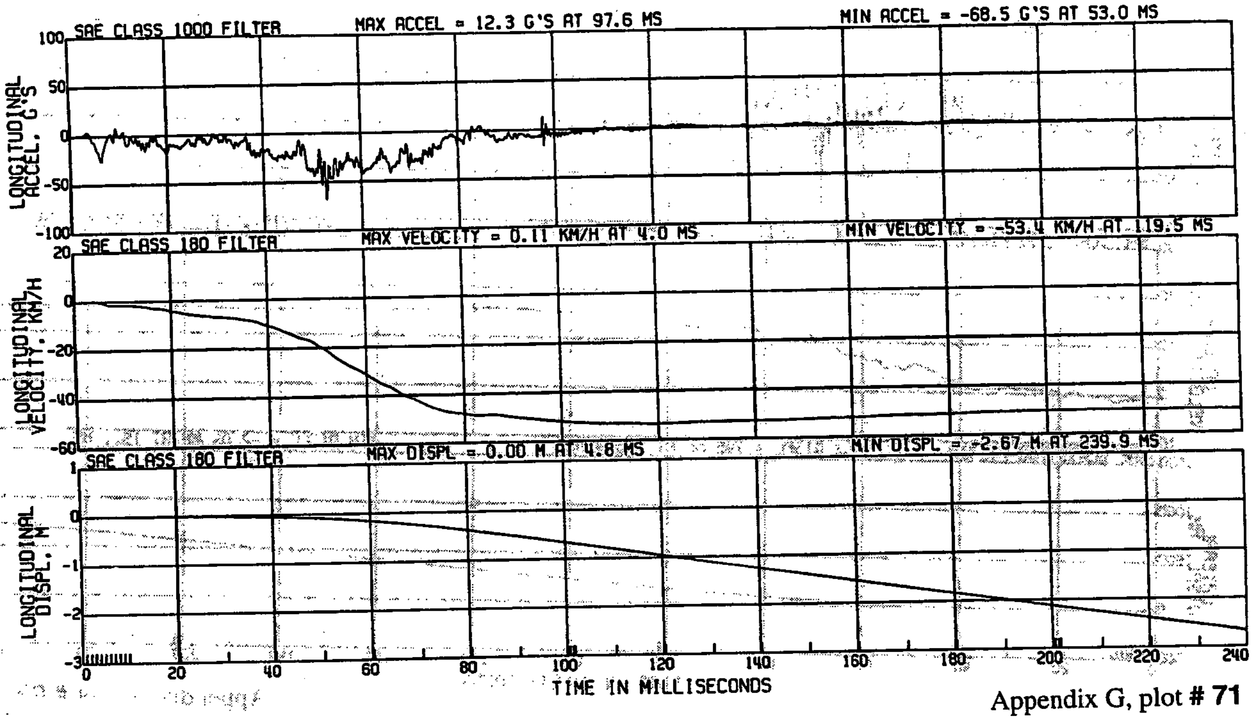

Appendix G, plot # **70**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R.REAR ROCKER

R&D CTR 1VF46080 1FP87 TEST DATE:06/18/1997

ELEC DATA



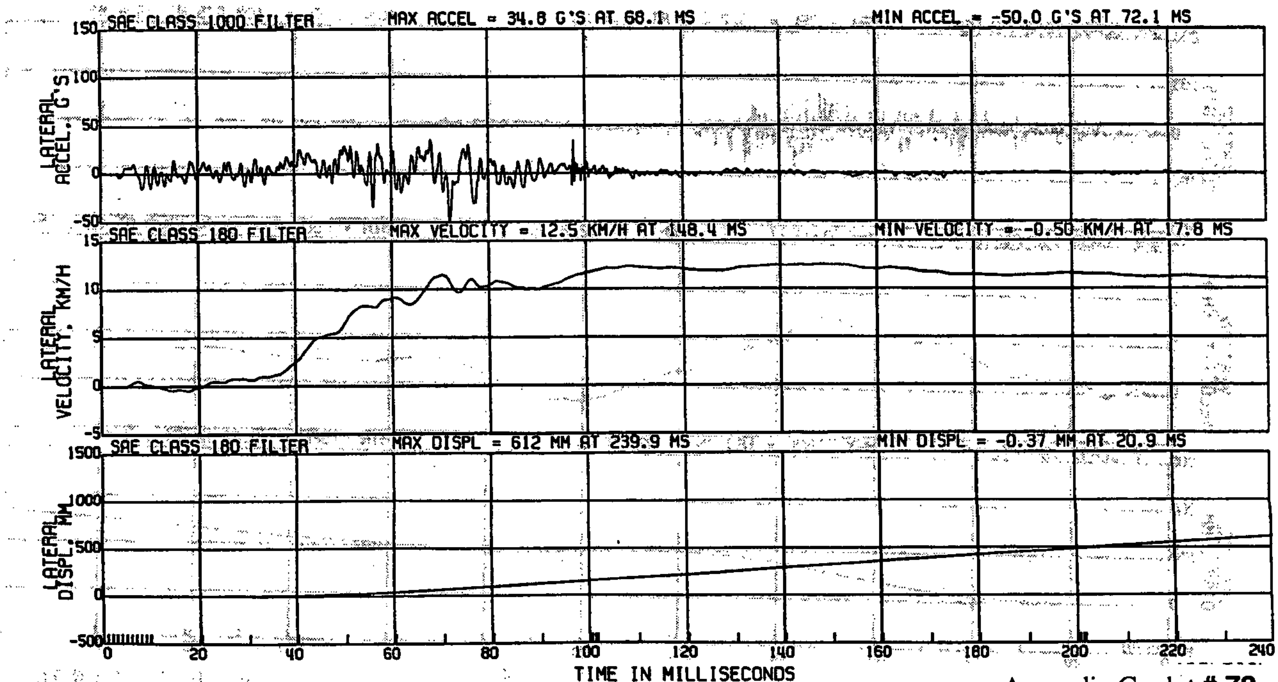

Appendix G, plot # 71

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R.REAR ROCKER

R&D CTR 1VF46080 1FP87 TEST DATE:06/18/1997

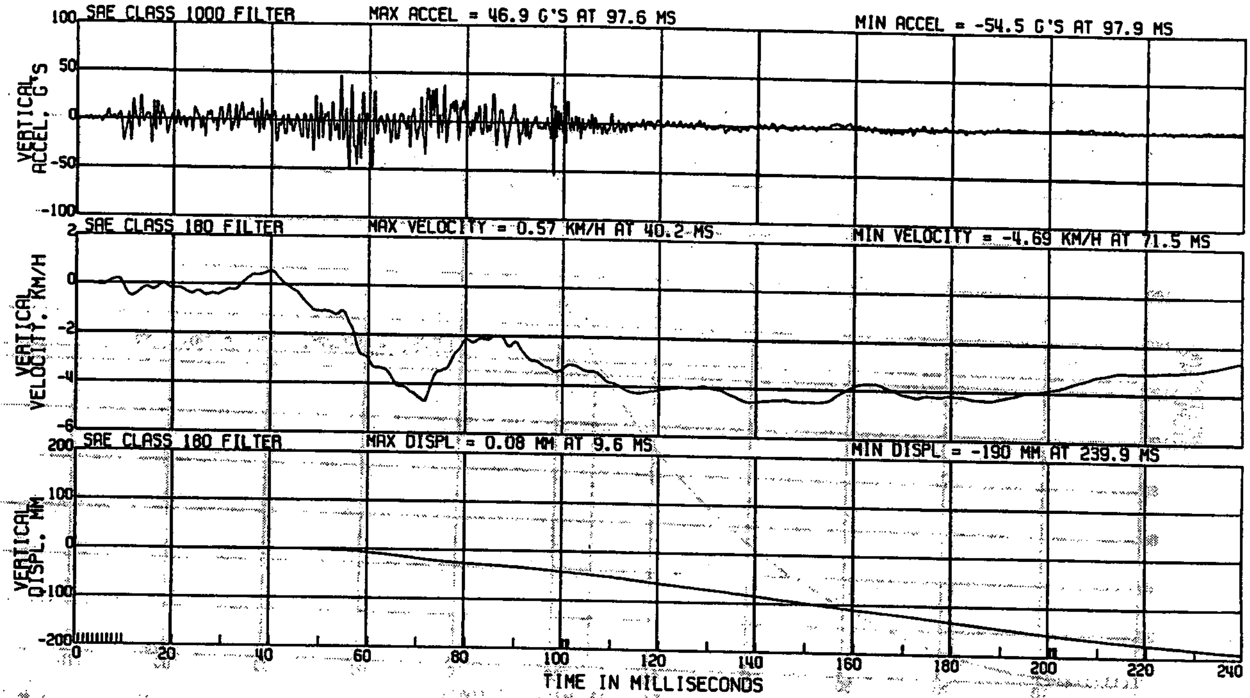
ELEC DATA




Appendix G, plot # 72

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

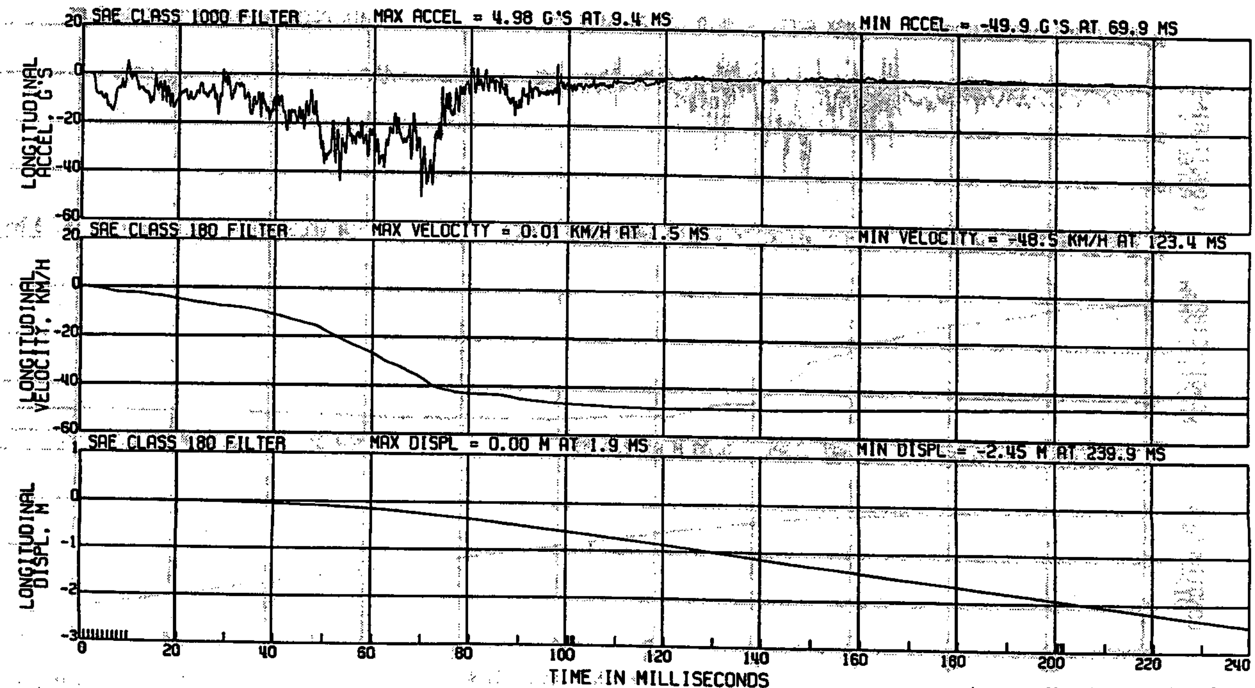
R&D CTR 1VF46080 1FP87 R.REAR ROCKER TEST DATE:06/18/1997
ELEC DATA




Appendix G, plot # **73**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 AVERAGED REAR ROCKER TEST DATE:06/18/1997
ELEC DATA

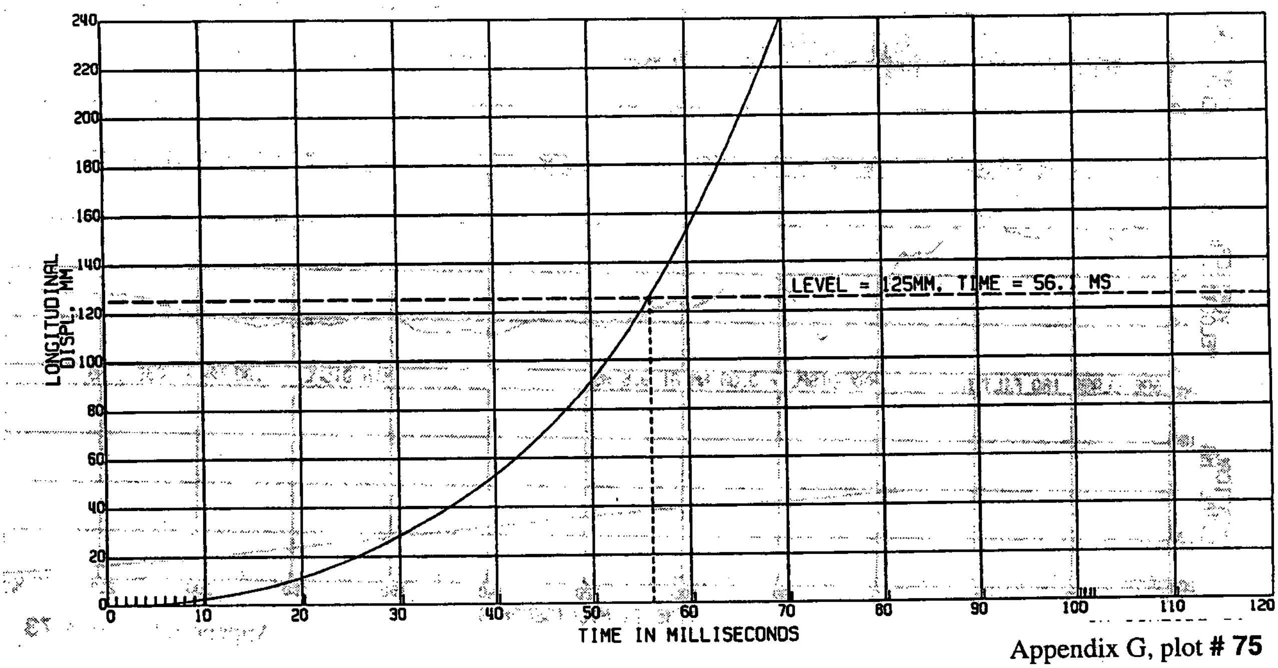



Appendix G, plot # **74**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 COMP. FREE MASS DISP. REL. TO VEHICLE TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 180

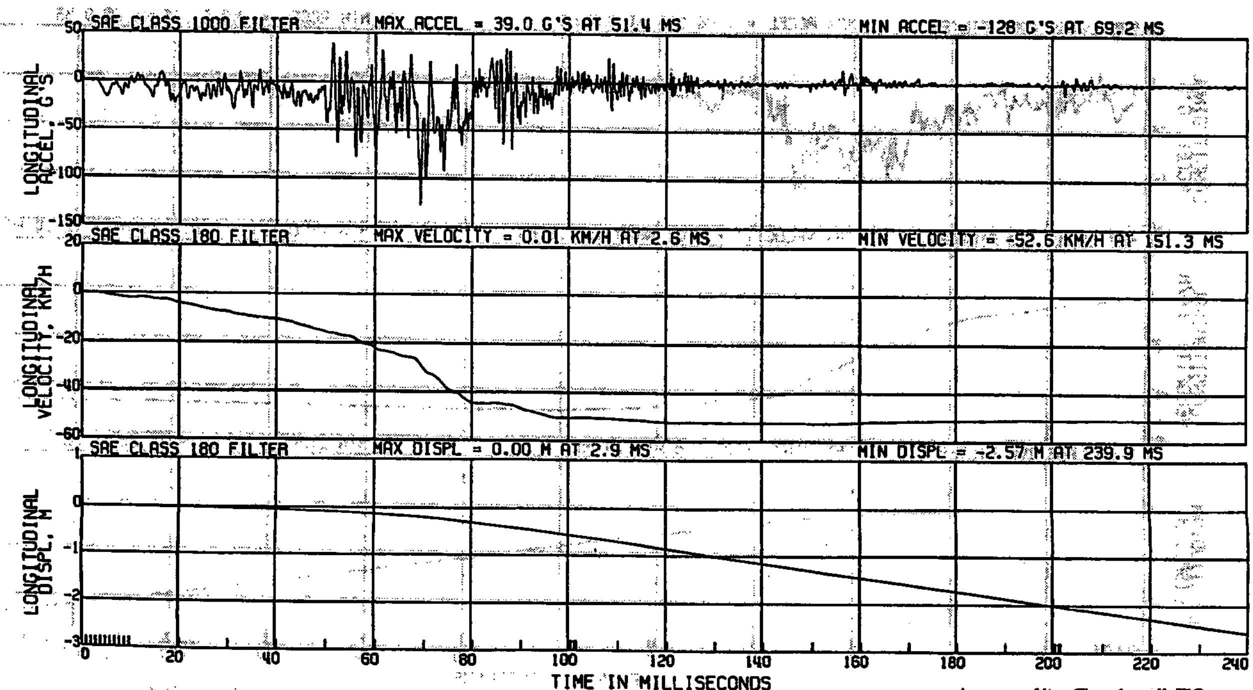



Appendix G, plot # **75**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 CTR SDM-R REAR CASE #1 TEST DATE:06/18/1997

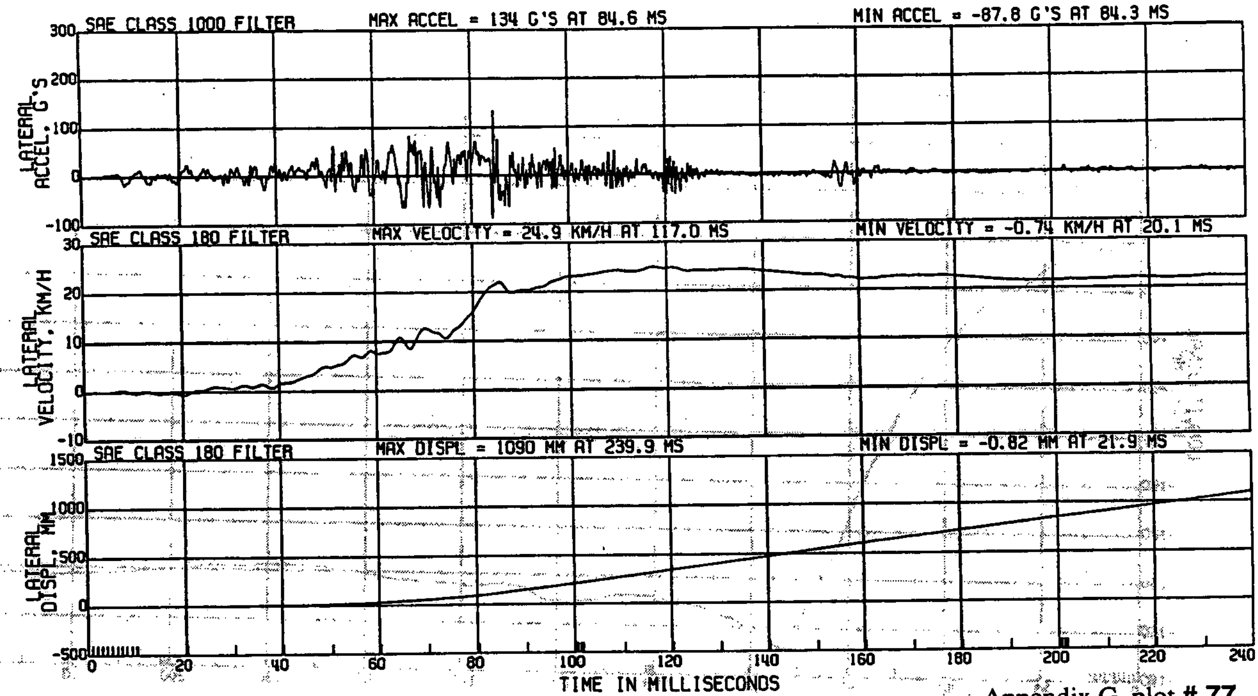
ELEC DATA




Appendix G, plot # **76**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

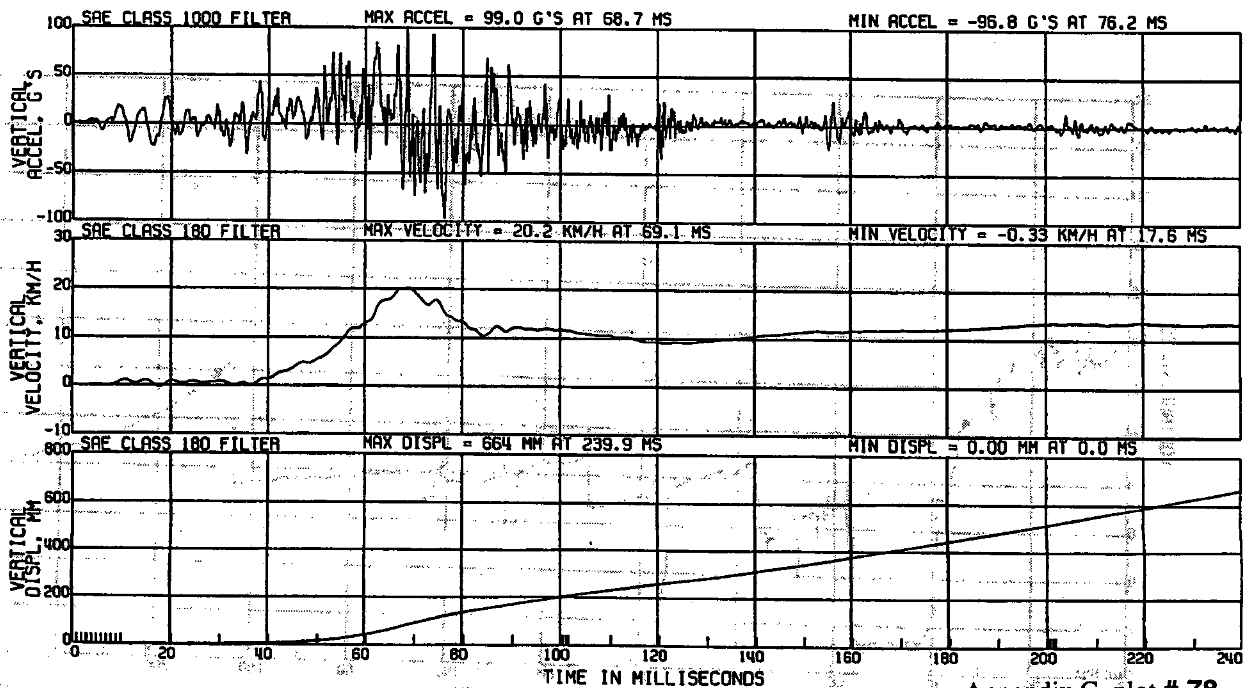
R&D CTR 1VF46080 1FP87 CTR SDM-R REAR CASE #1 TEST DATE:06/18/1997
ELEC DATA




Appendix G, plot # **77**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 CTR SDM-R REAR CASE #1 TEST DATE:06/18/1997
ELEC DATA

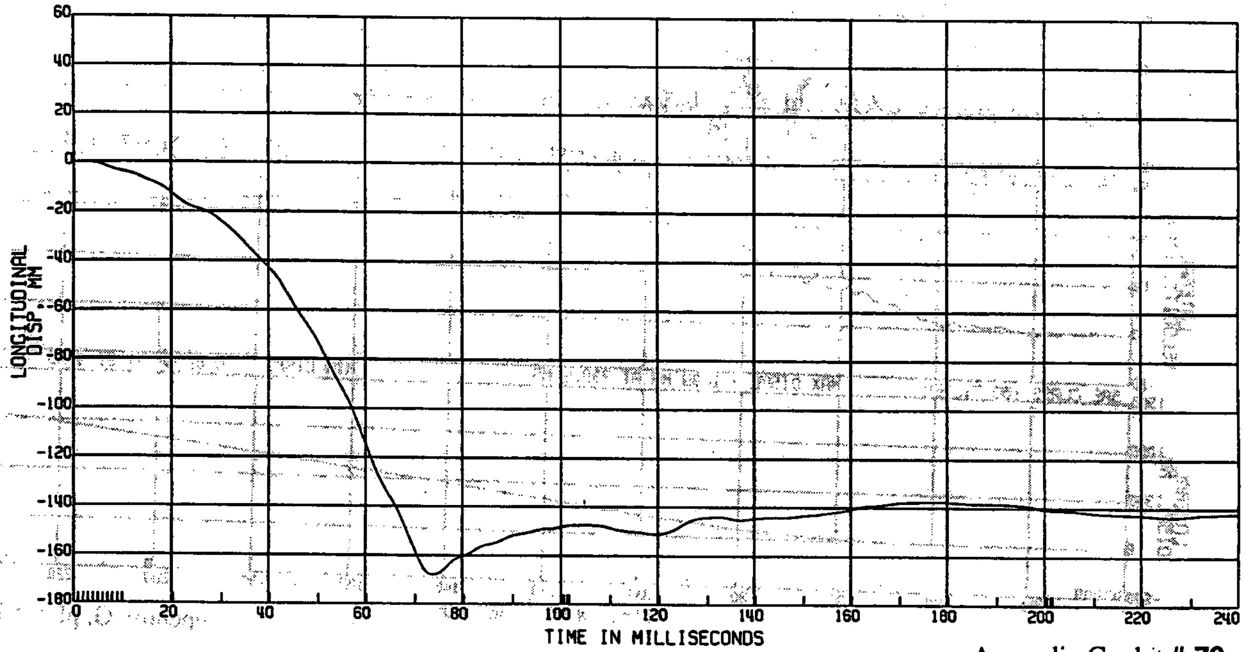



Appendix G, plot # **78**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L. TOE PAN DISPL TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 60

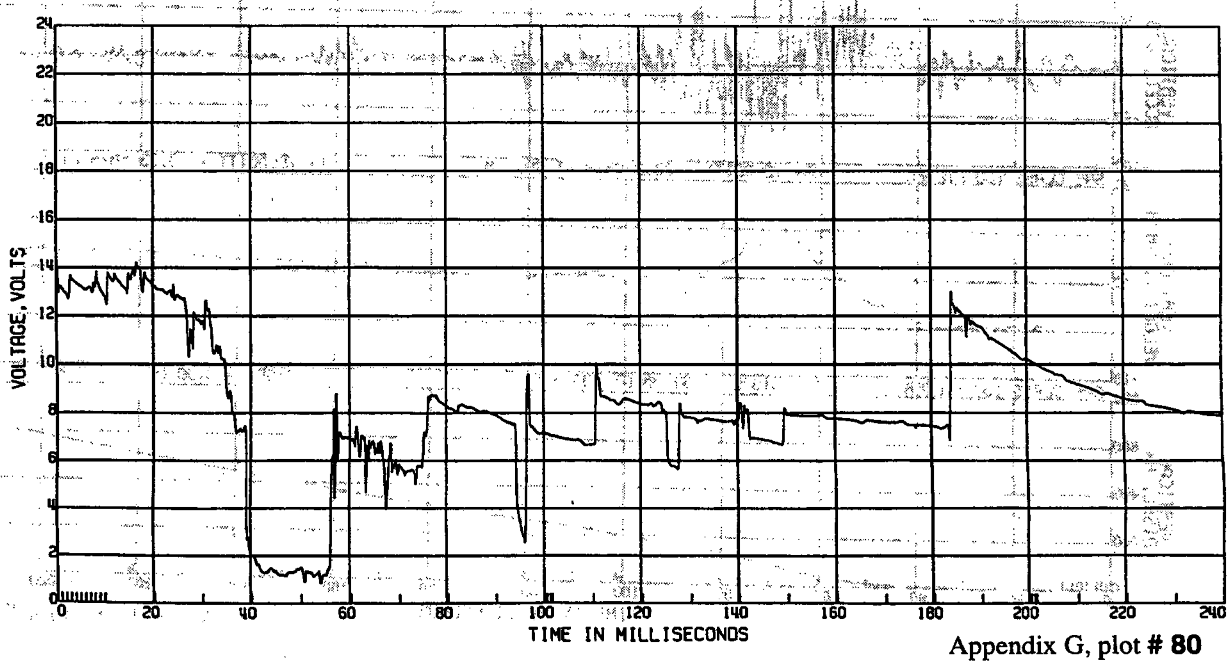



Appendix G, plot # **79**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 STARTER VOLTAGE TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # **80**

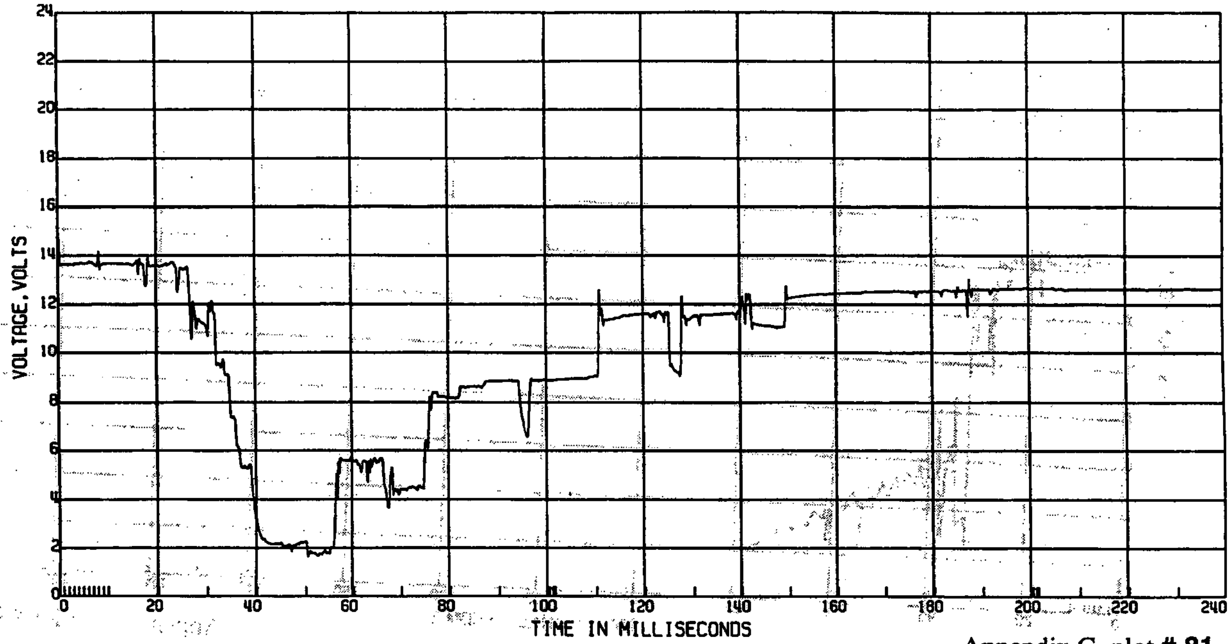
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

BATTERY VOLTAGE

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # 81

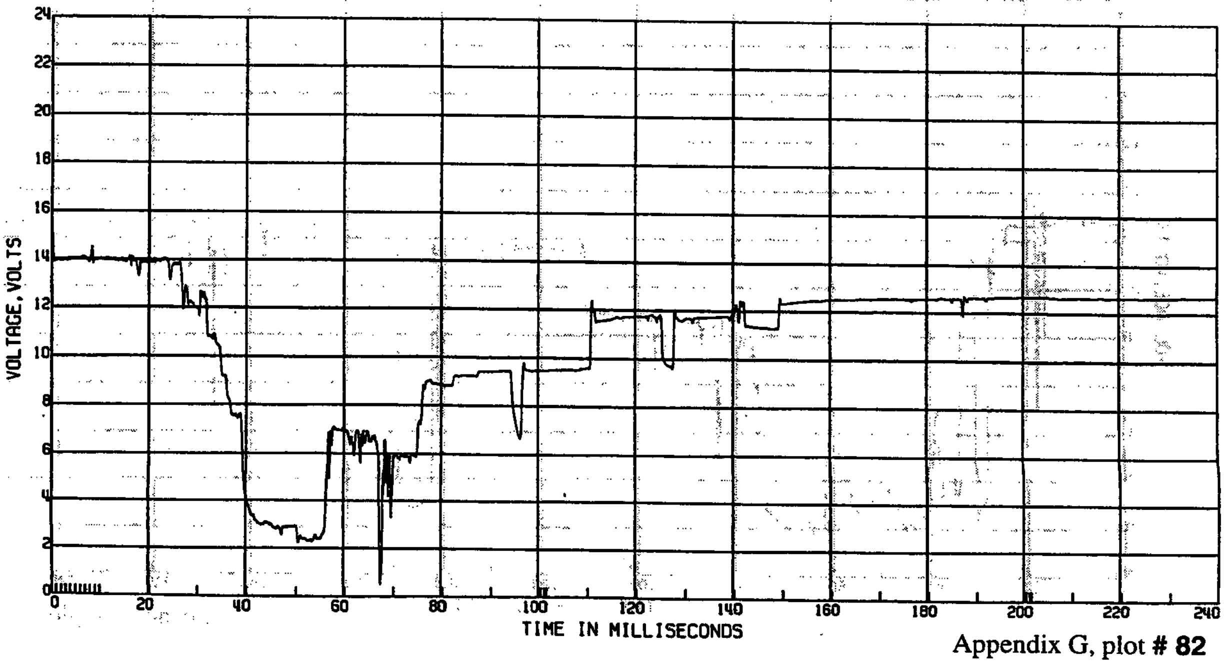
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ALTERNATOR VOLTAGE

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # 82

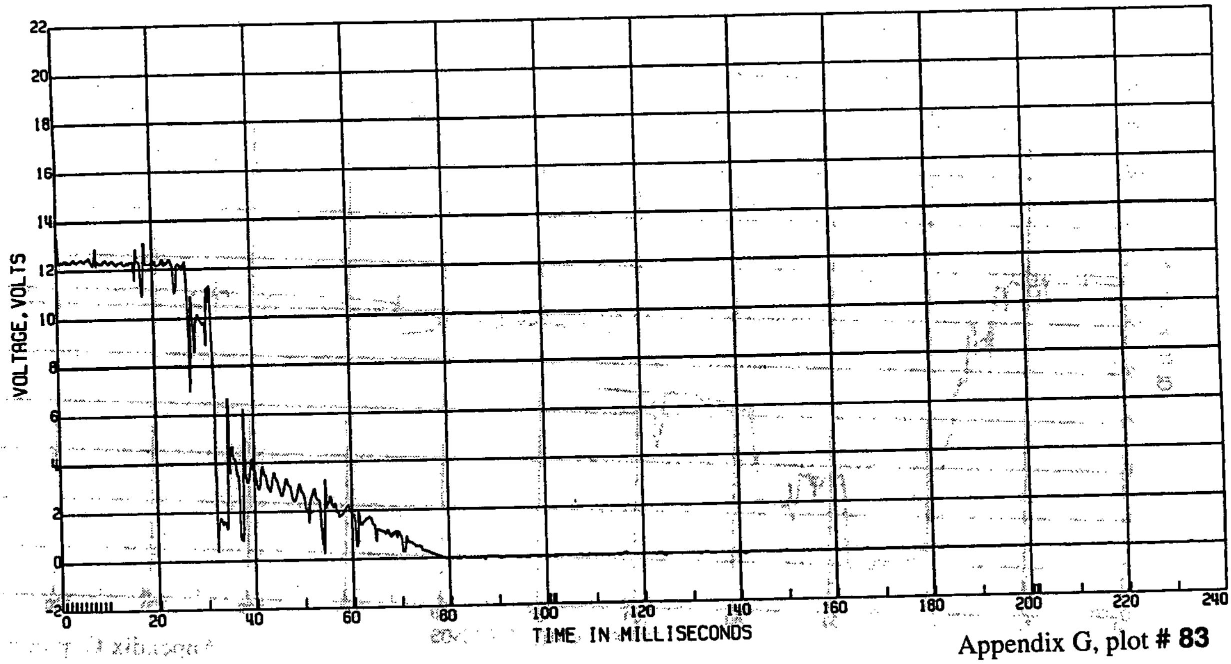
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

FUEL PUMP VOLTAGE

TEST DATE:06/18/1997




Appendix G, plot # **83**

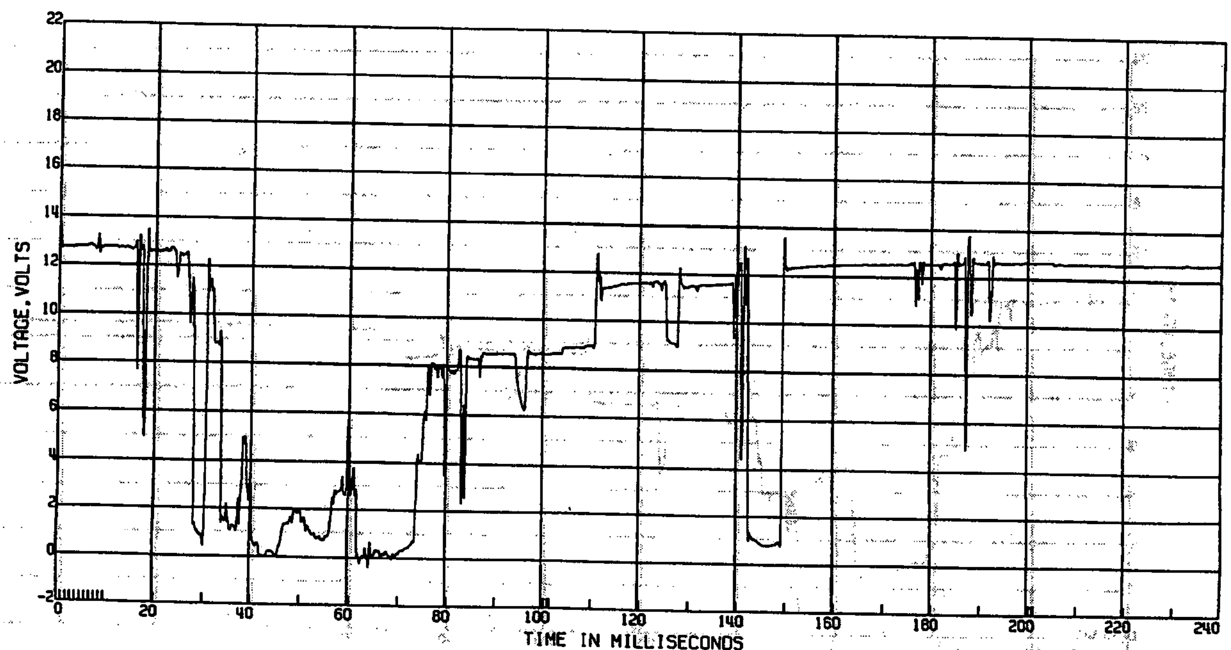
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

L. FRT HEADLIGHT-LO BEAM VOLTAGE

TEST DATE:06/18/1997




Appendix G, plot # **84**

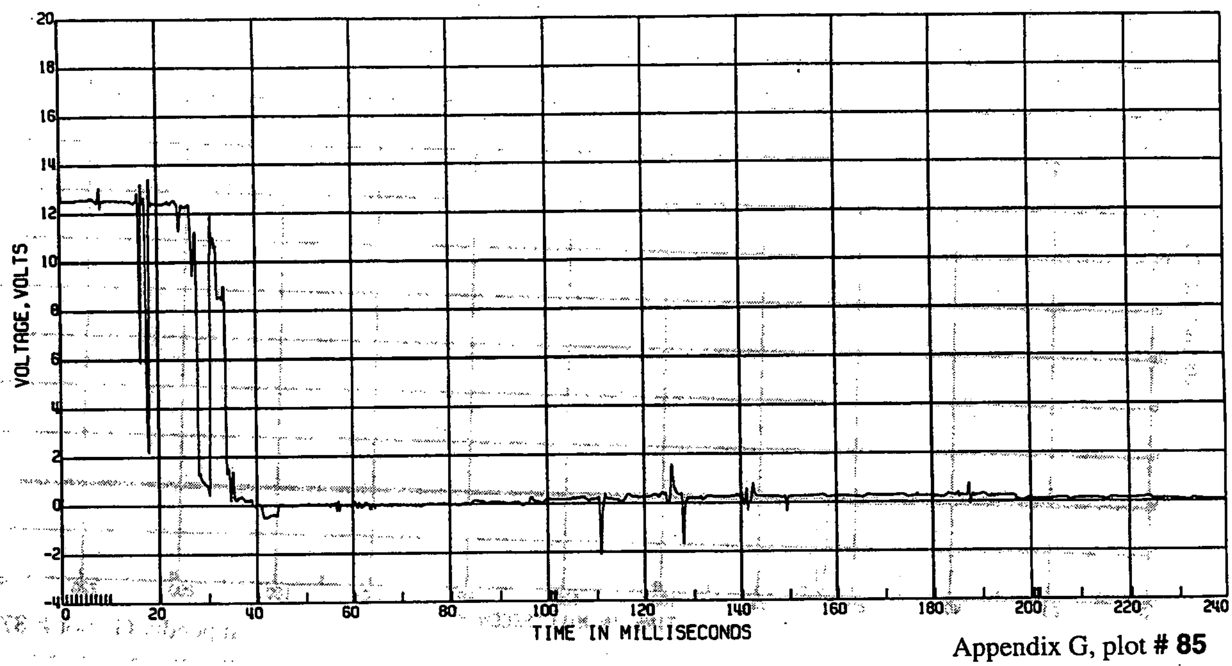
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

L. FRT HEADLIGHT-HI BEAM VOLTAGE

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # 85

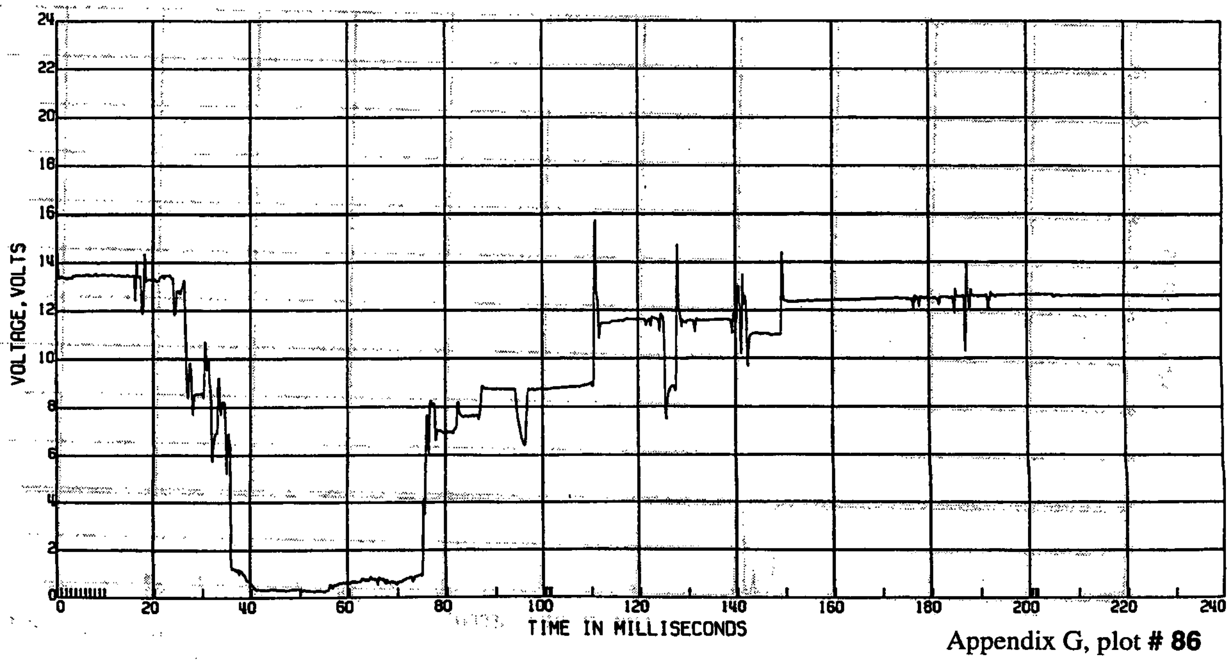
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

IGNITION VOLTAGE

TEST DATE:06/18/1997

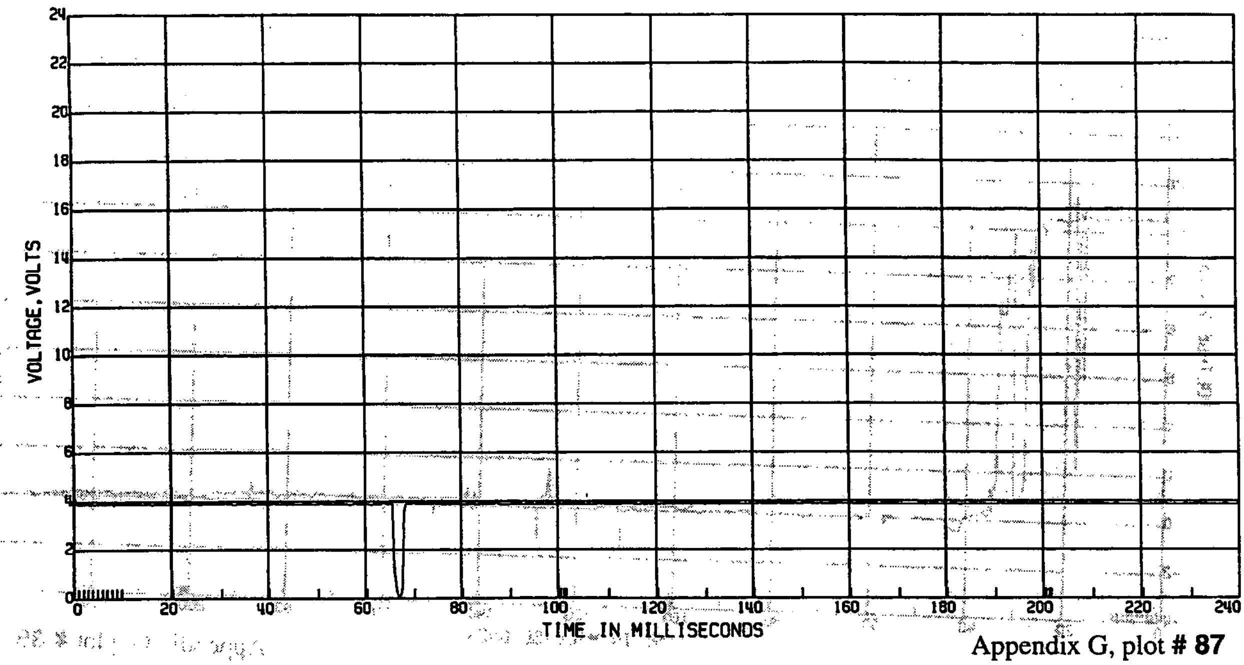
ELEC DATA, SAE CLASS 1000




Appendix G, plot # 86

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

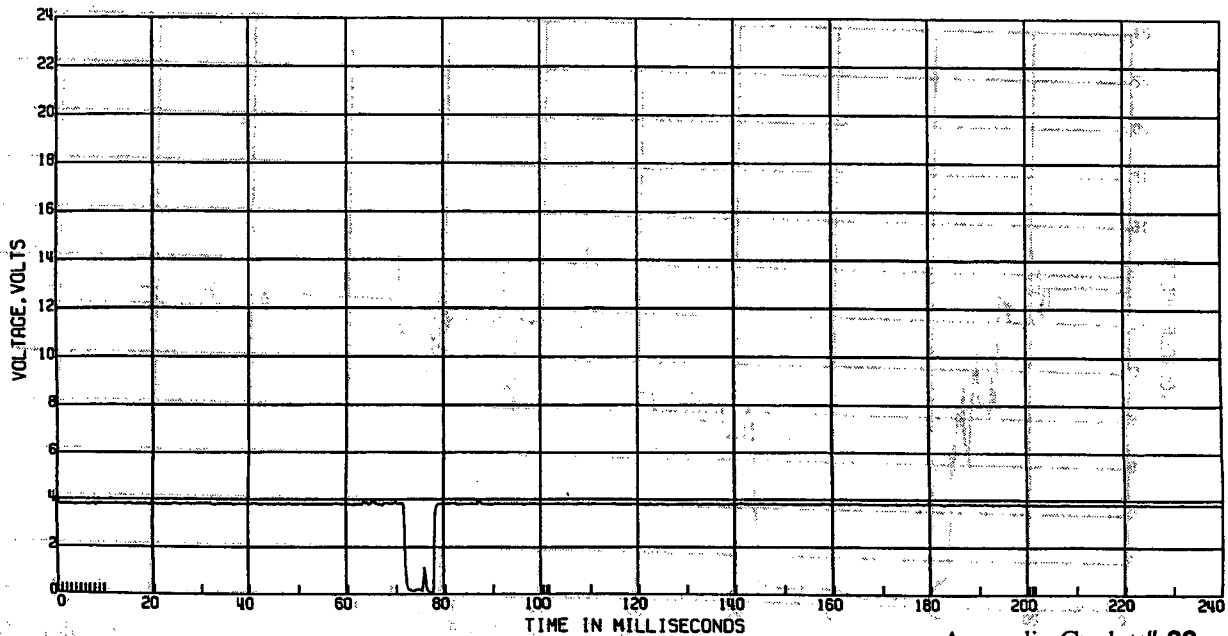
R&D CTR 1VF46080 1FP87 L. OPTICAL FIRE DETECTOR VOLTAGE TEST DATE:06/18/1997
ELEC DATA, SAE CLASS 1000




Appendix G, plot # 87

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 R. OPTICAL FIRE DETECTOR VOLTAGE TEST DATE:06/18/1997
ELEC DATA, SAE CLASS 1000

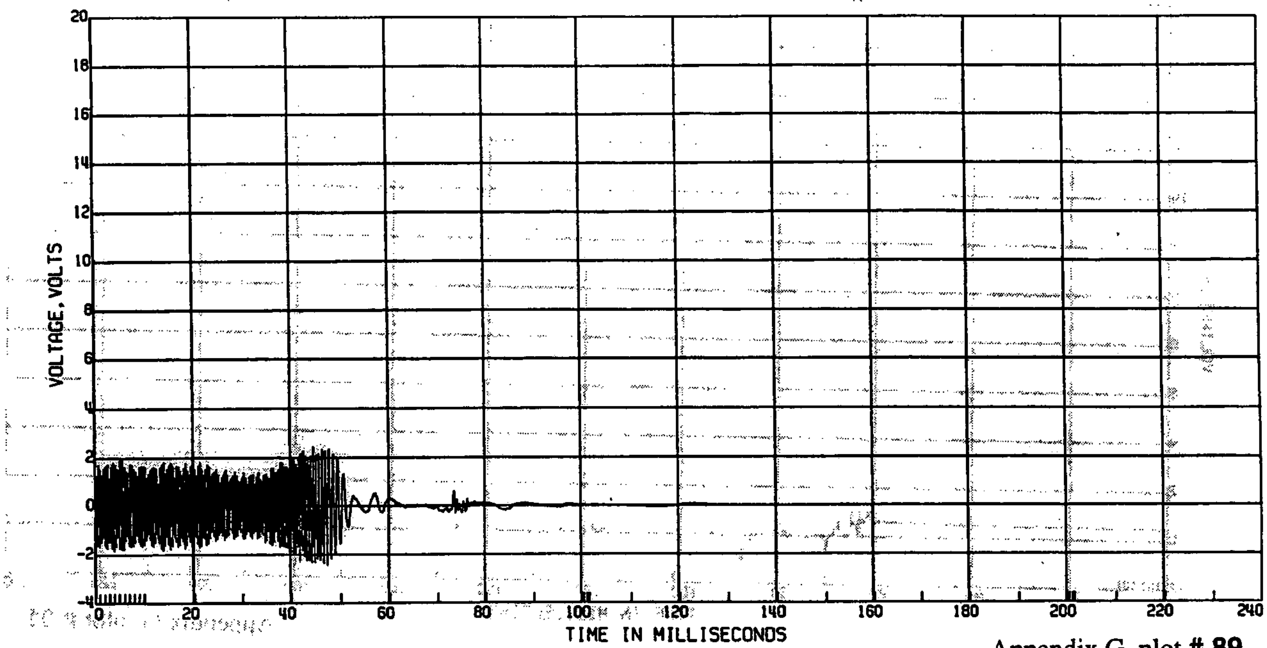



Appendix G, plot # 88

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 ENGINE SPEED-(MP1A) VOLTAGE TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

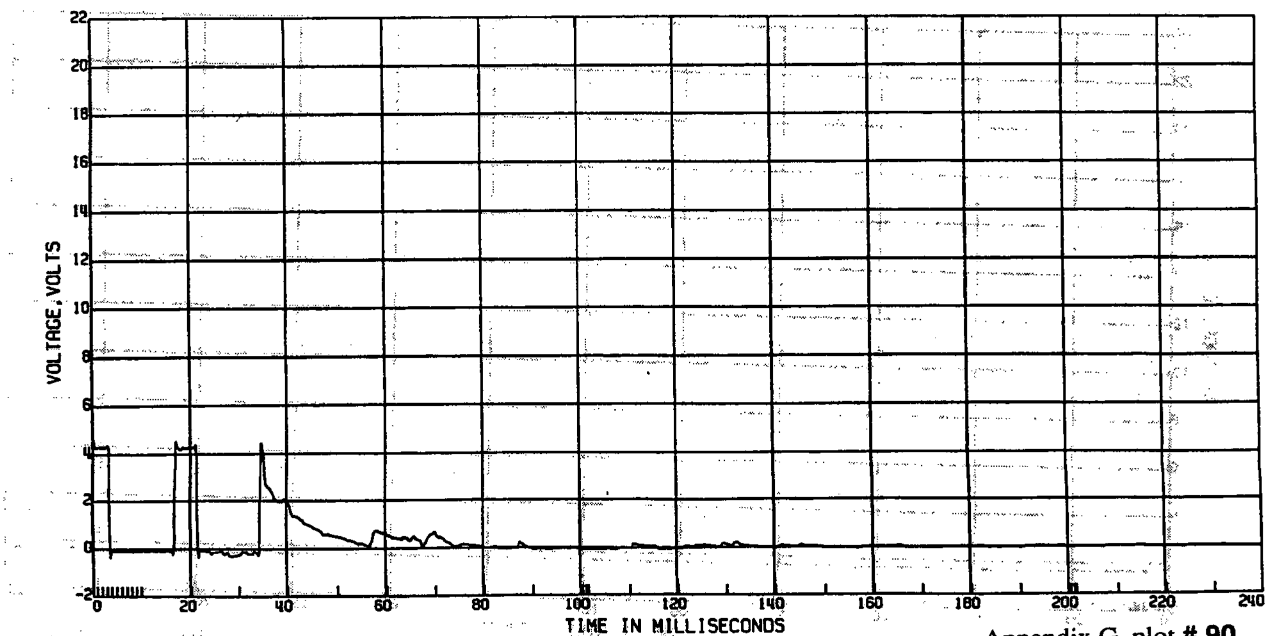



Appendix G, plot # **89**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 TACH SIGNAL VOLTAGE TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # **90**

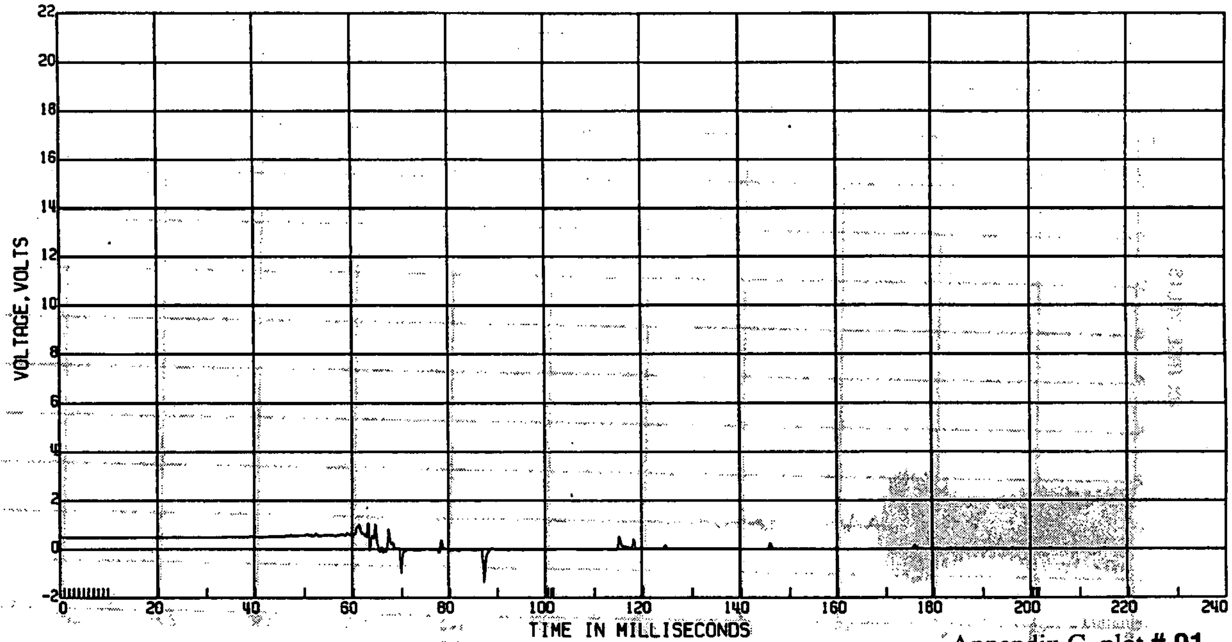
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

FUEL LINE VAPOR (S1) VOLTAGE

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # 91

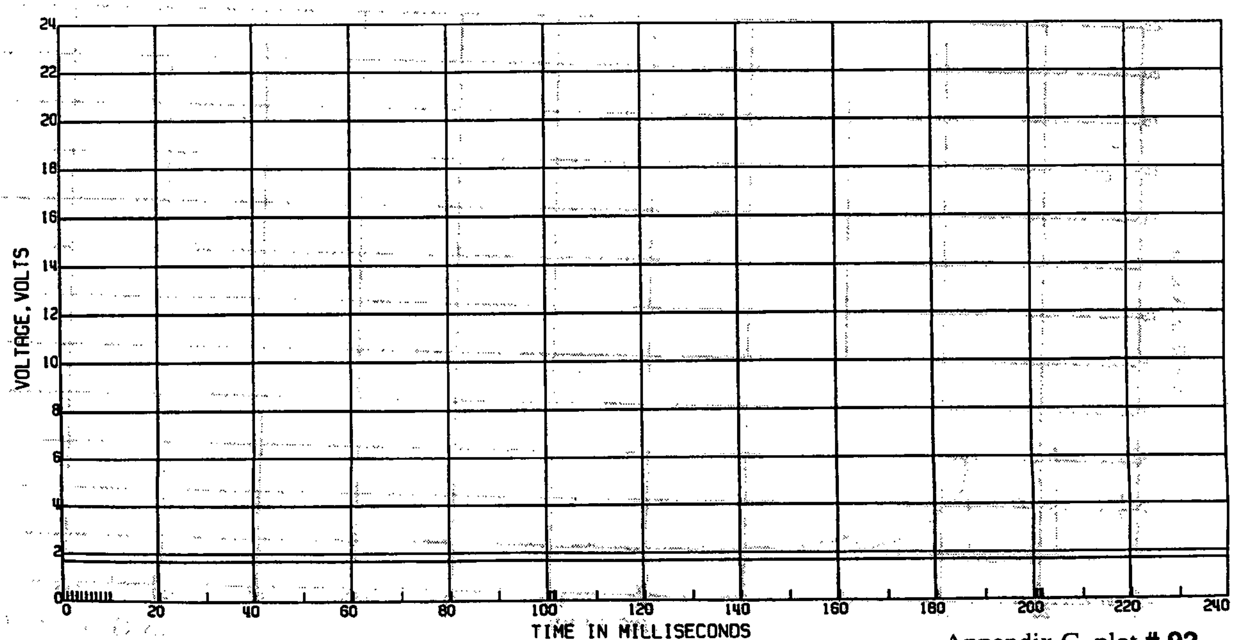
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

FUEL LINE TEMPERATURE (T1) VOLTAGE

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # 92

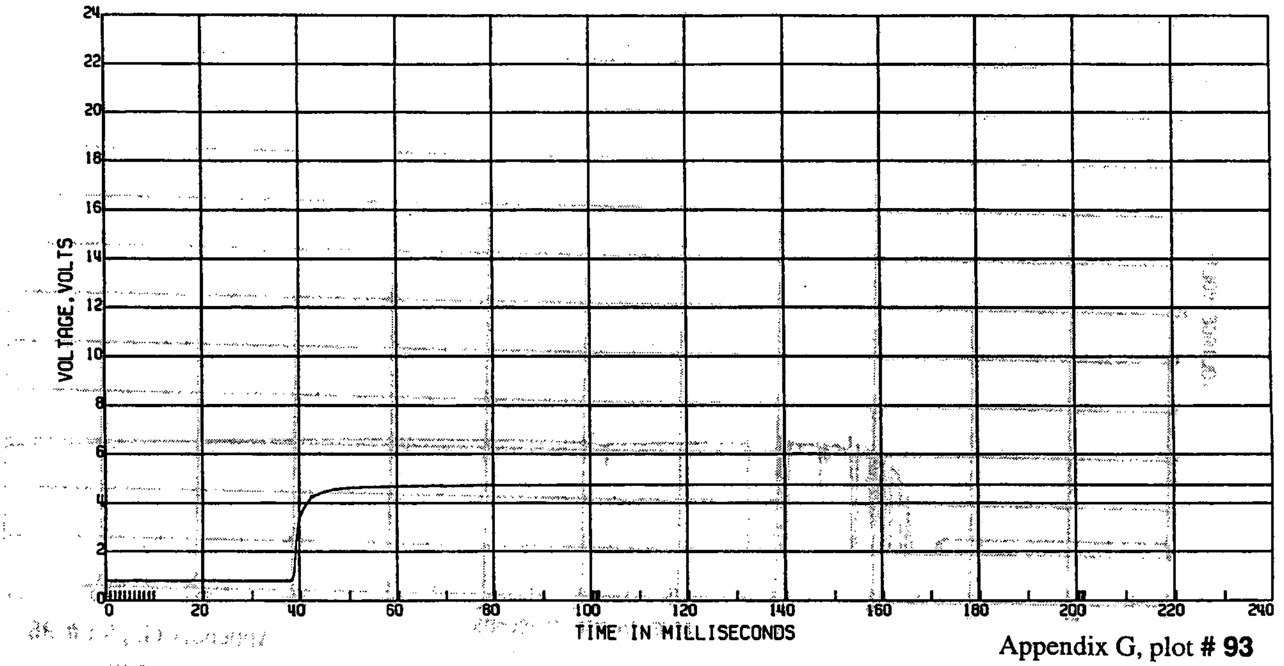
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

L. EX. MANIFOLD VAPOR (S2) VOLTAGE

TEST DATE:06/18/1997




Appendix G, plot # 93

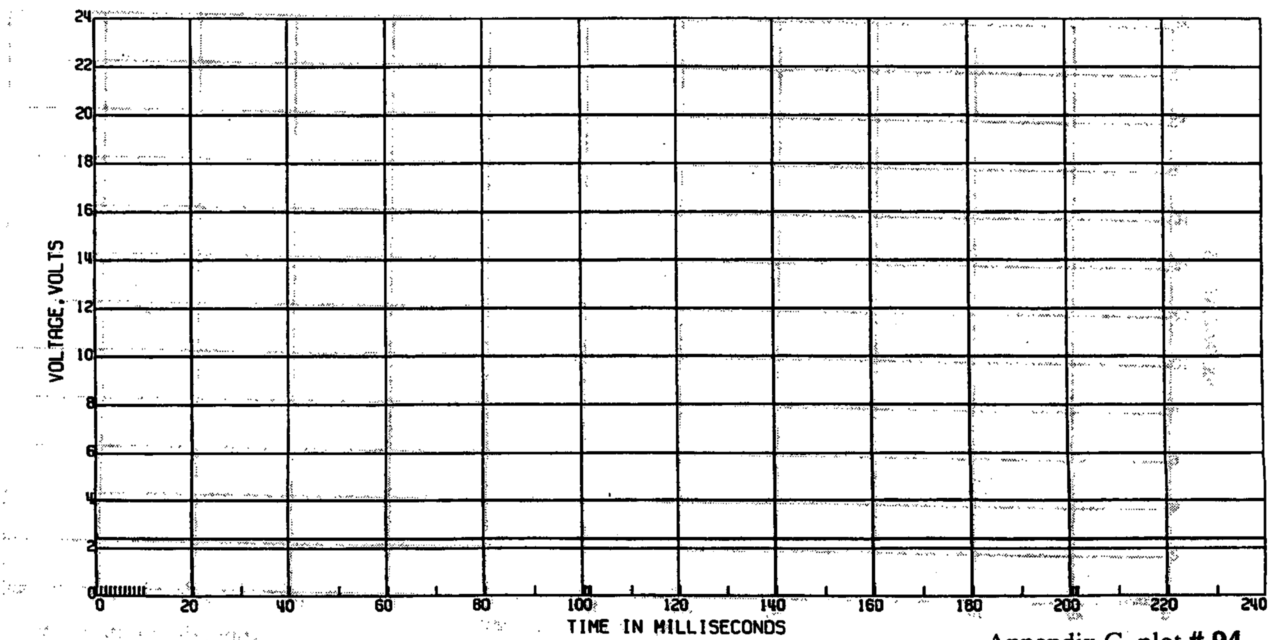
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

L. EX. MANIFOLD TEMP (T2) VOLTAGE

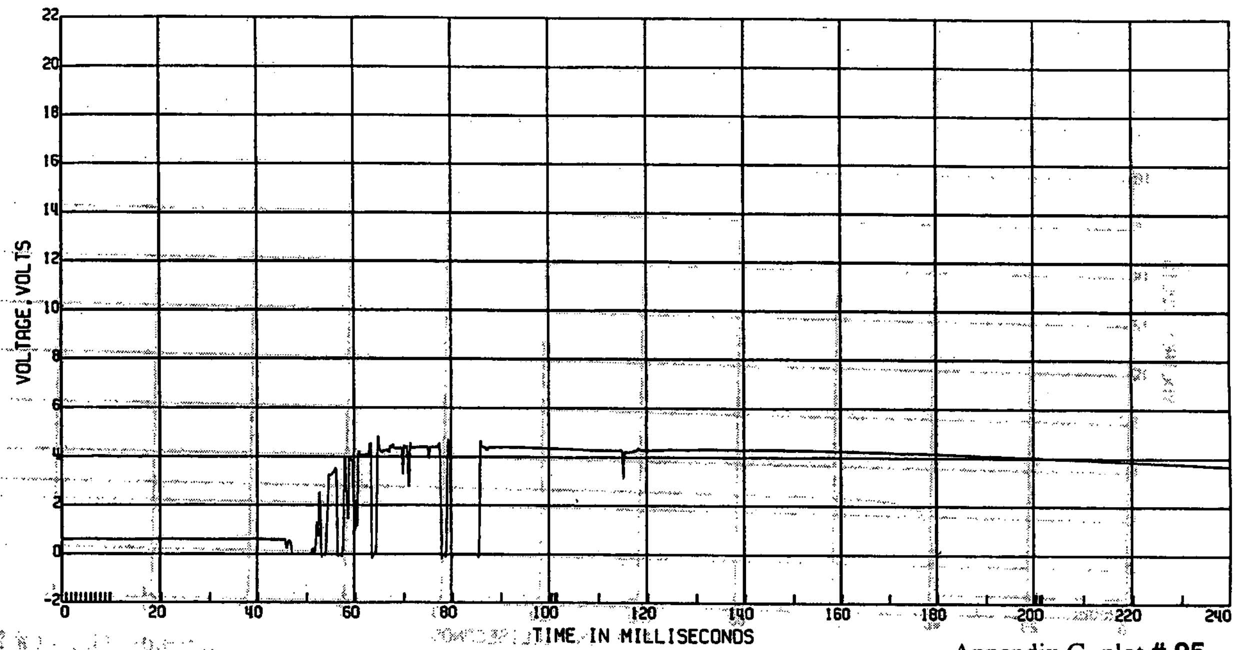
TEST DATE:06/18/1997




Appendix G, plot # 94

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

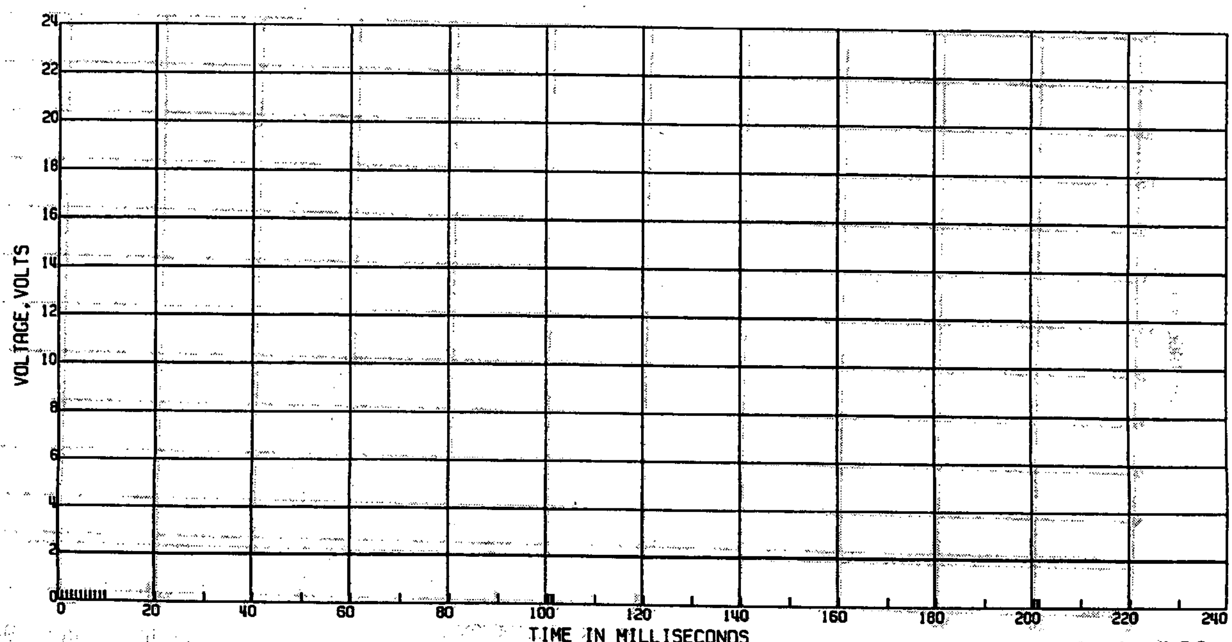
R&D CTR 1VF46080 1FP87 L. FUEL RAIL VAPOR (S3) VOLTAGE TEST DATE:06/18/1997
ELEC DATA, SAE CLASS 1000




Appendix G, plot # 95

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L. FUEL RAIL TEMPERATURE (T3) VOLTAGE TEST DATE:06/18/1997
ELEC DATA, SAE CLASS 1000

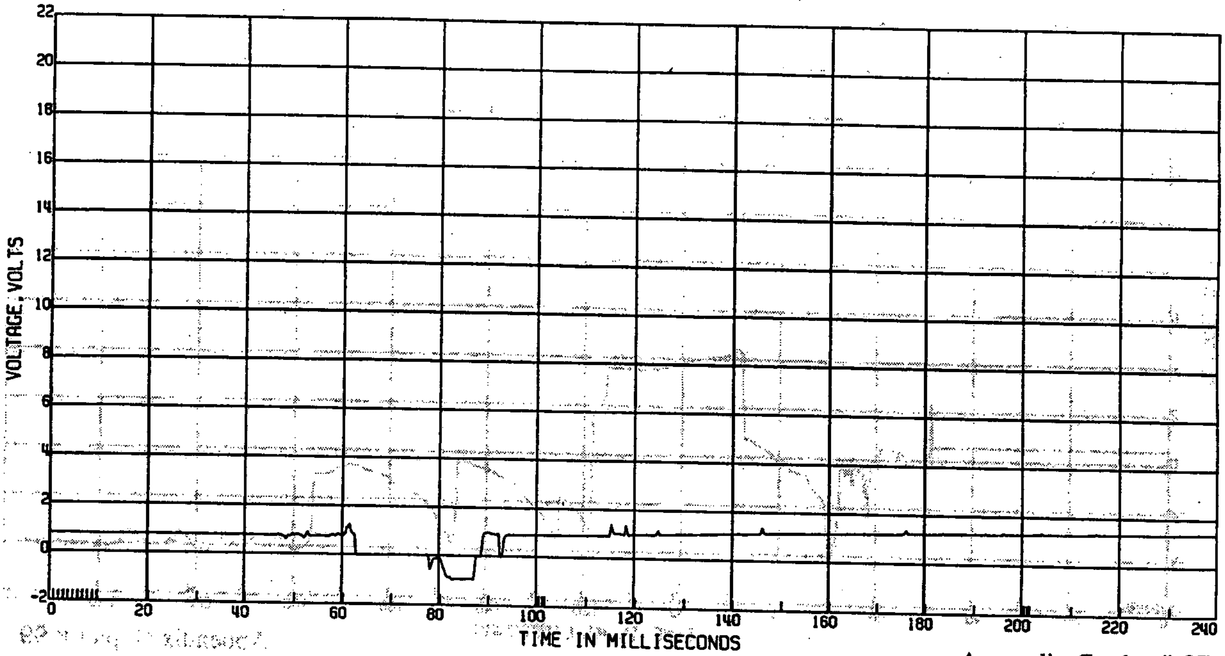



Appendix G, plot # 96

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 R. FUEL RAIL VAPOR (S4) VOLTAGE TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

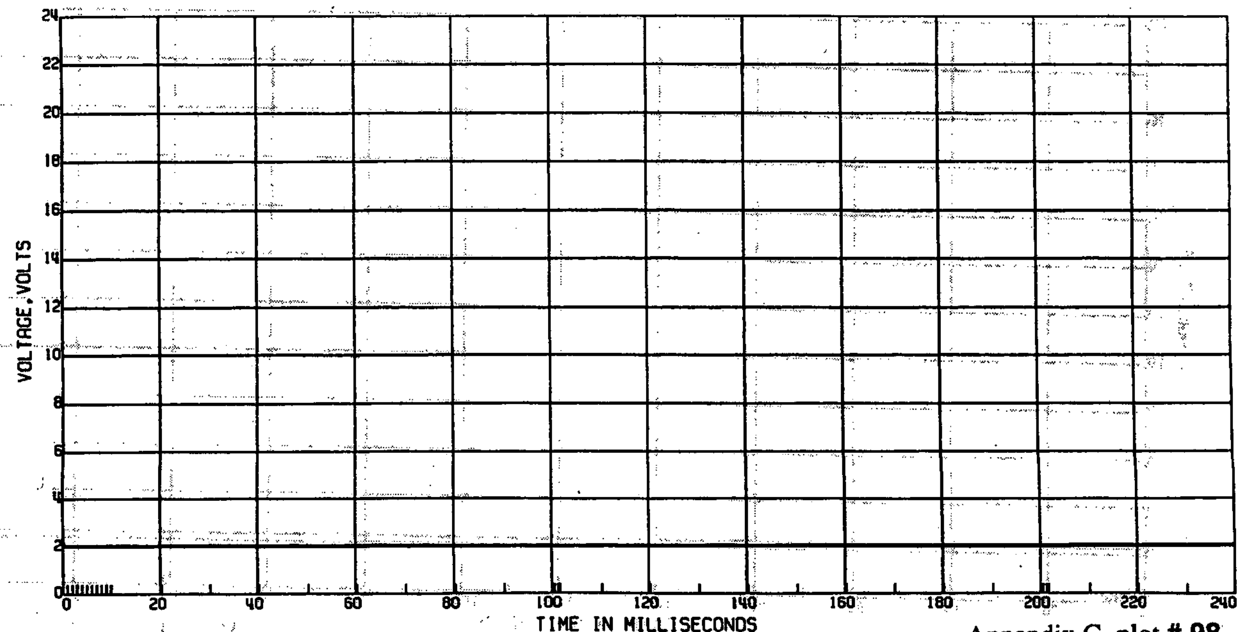



Appendix G, plot # **97**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 R. FUEL RAIL TEMPERATURE (T4) VOLTAGE TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # **98**

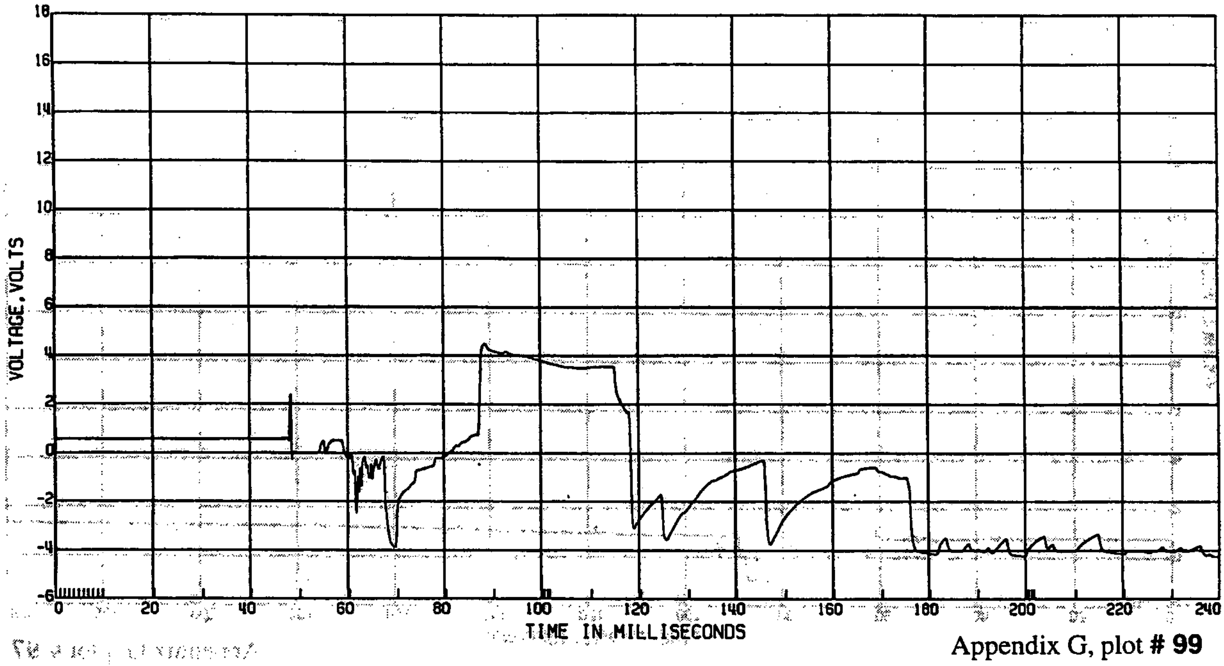
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

CONVERTER VAPOR(S5) VOLTAGE

TEST DATE:06/18/1997




Appendix G, plot # 99

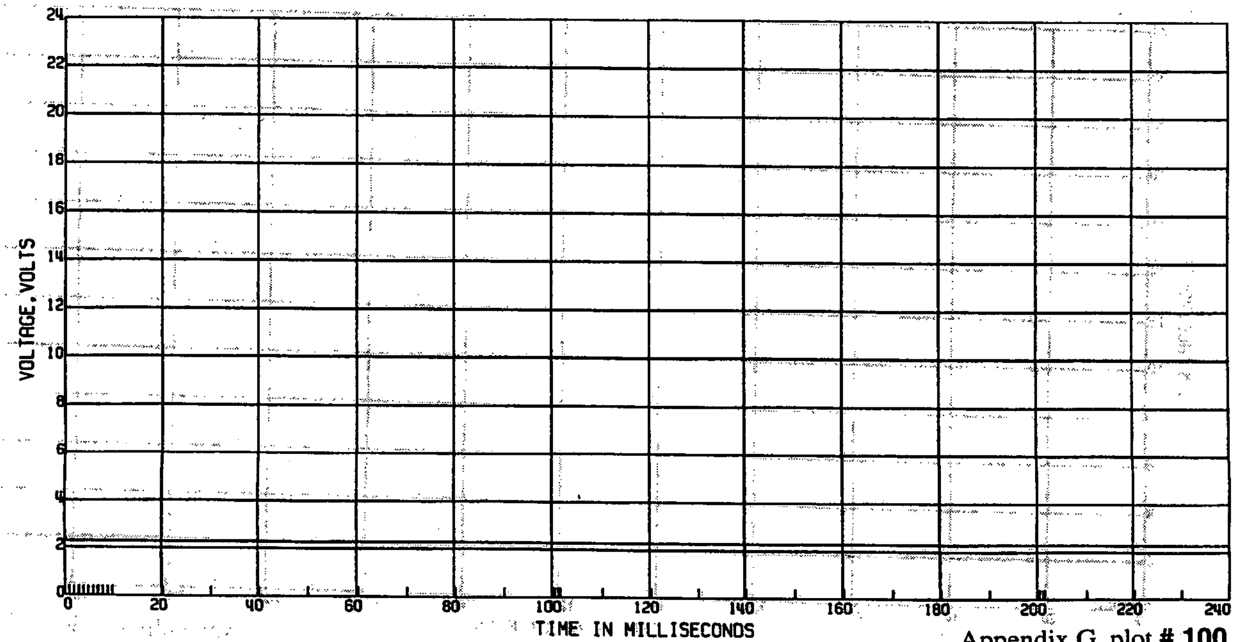
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

CONVERTER TEMPERATURE(T5) VOLTAGE

TEST DATE:06/18/1997

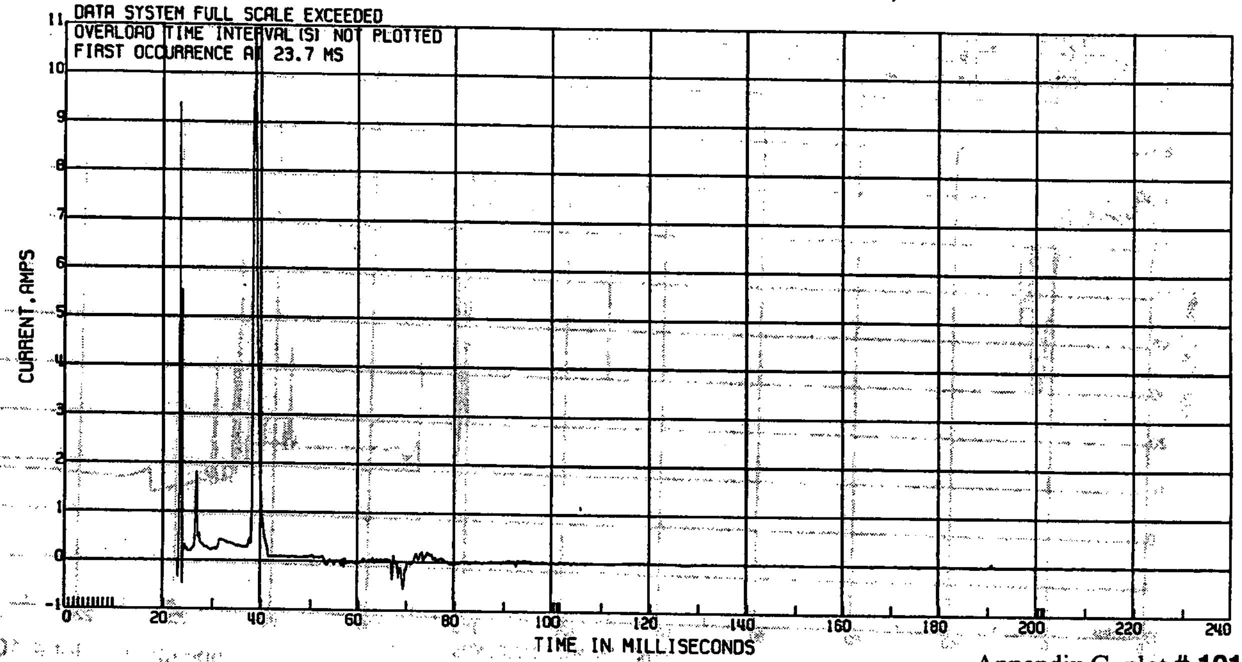



Appendix G, plot # 100

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 L. WHEEL BAG CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

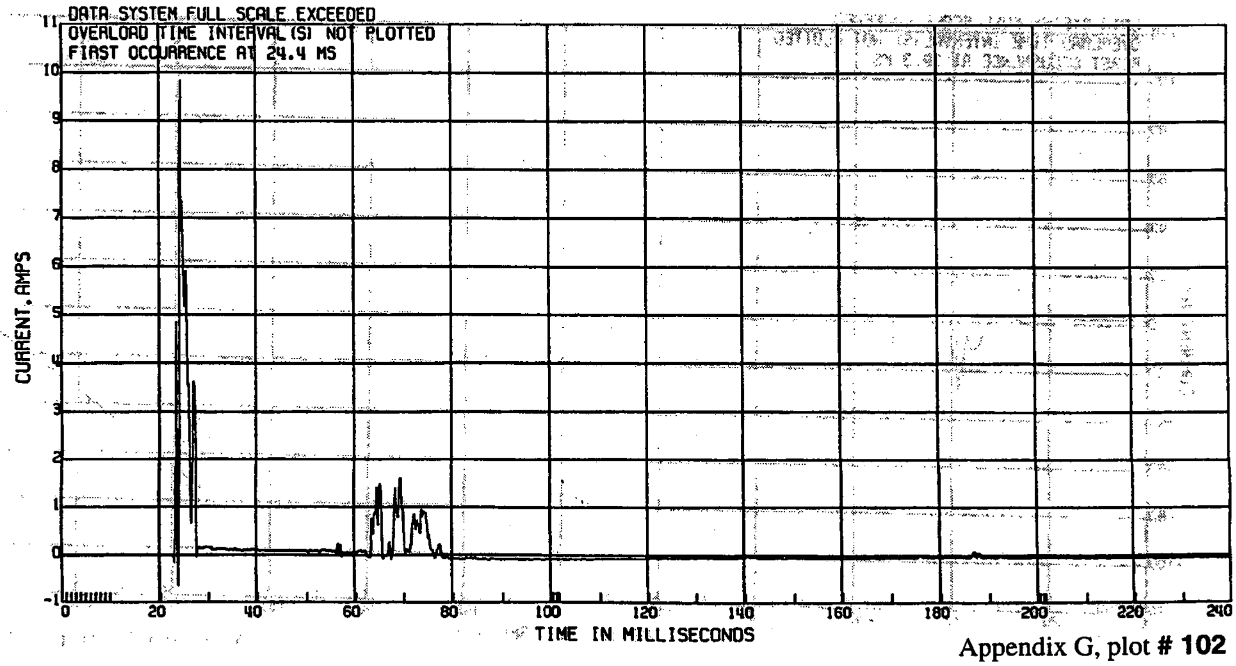



Appendix G, plot # **101**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 R. I/P BAG CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # **102**

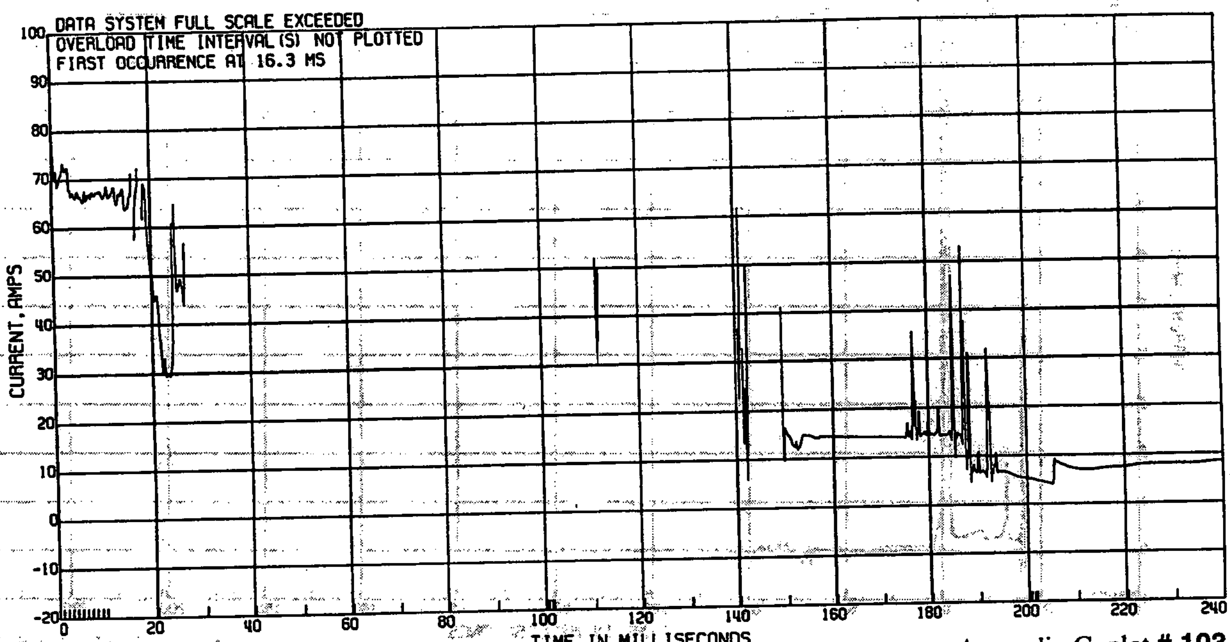
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

BATTERY CURRENT

TEST DATE:06/18/1997




Appendix G, plot # **103**

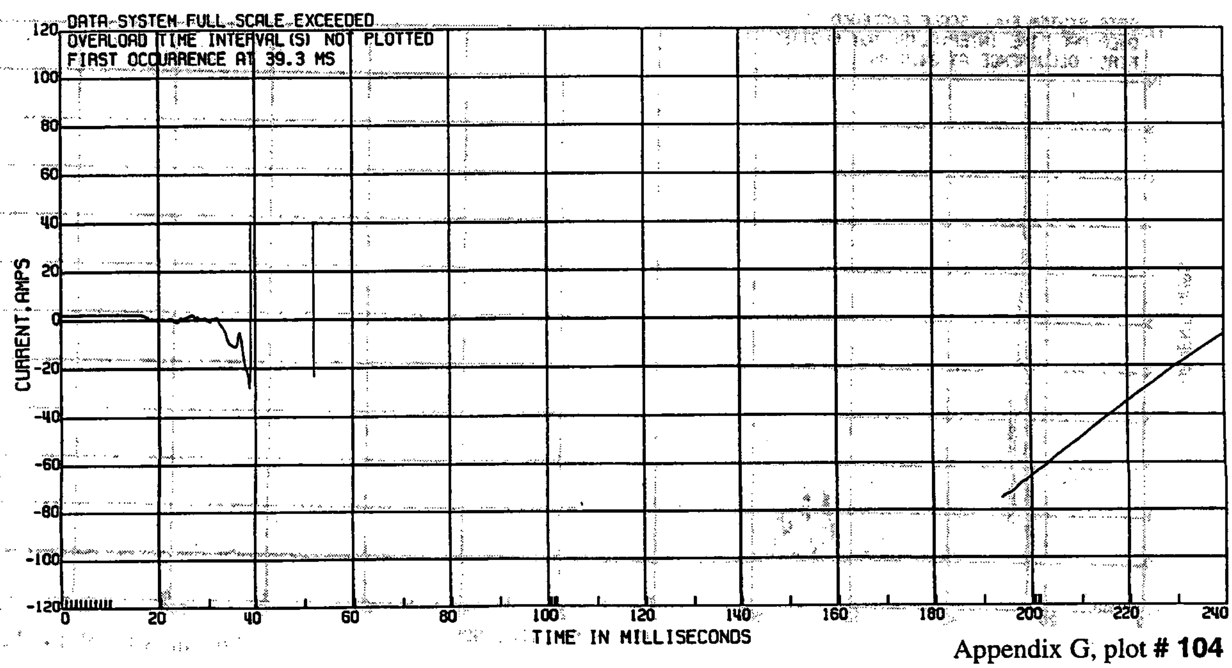
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

STARTER CABLE AT BATTERY CURRENT

TEST DATE:06/18/1997




Appendix G, plot # **104**

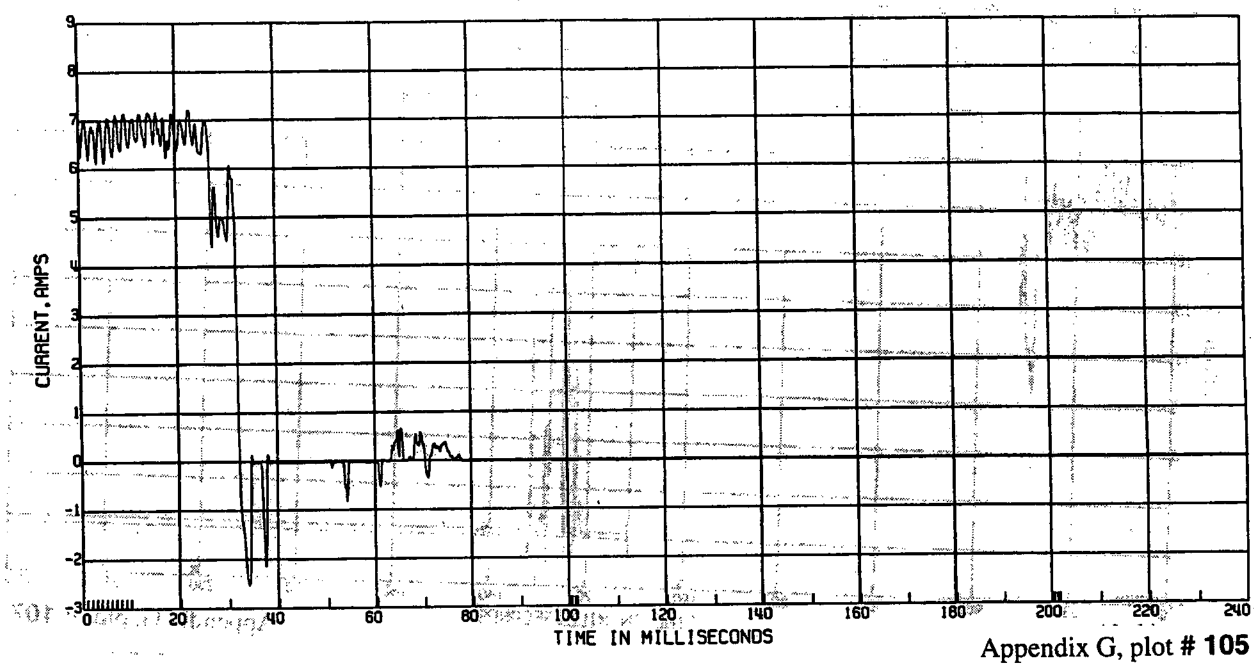
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

FUEL PUMP CURRENT

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # **105**

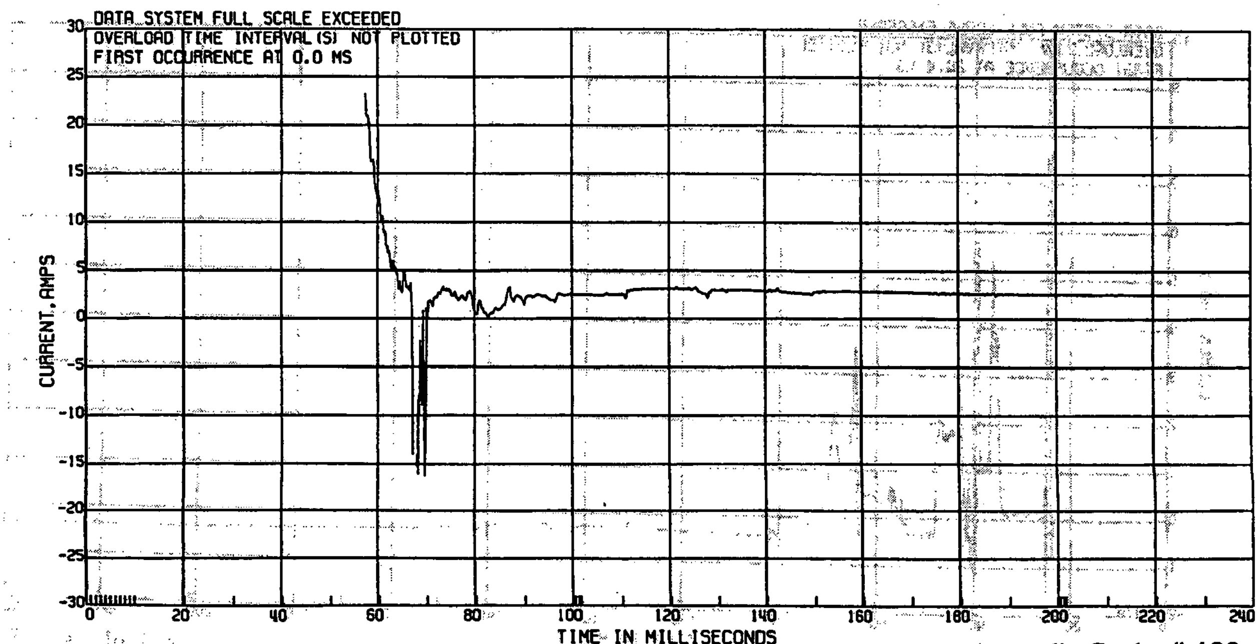
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ALTERNATOR CABLE CURRENT

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

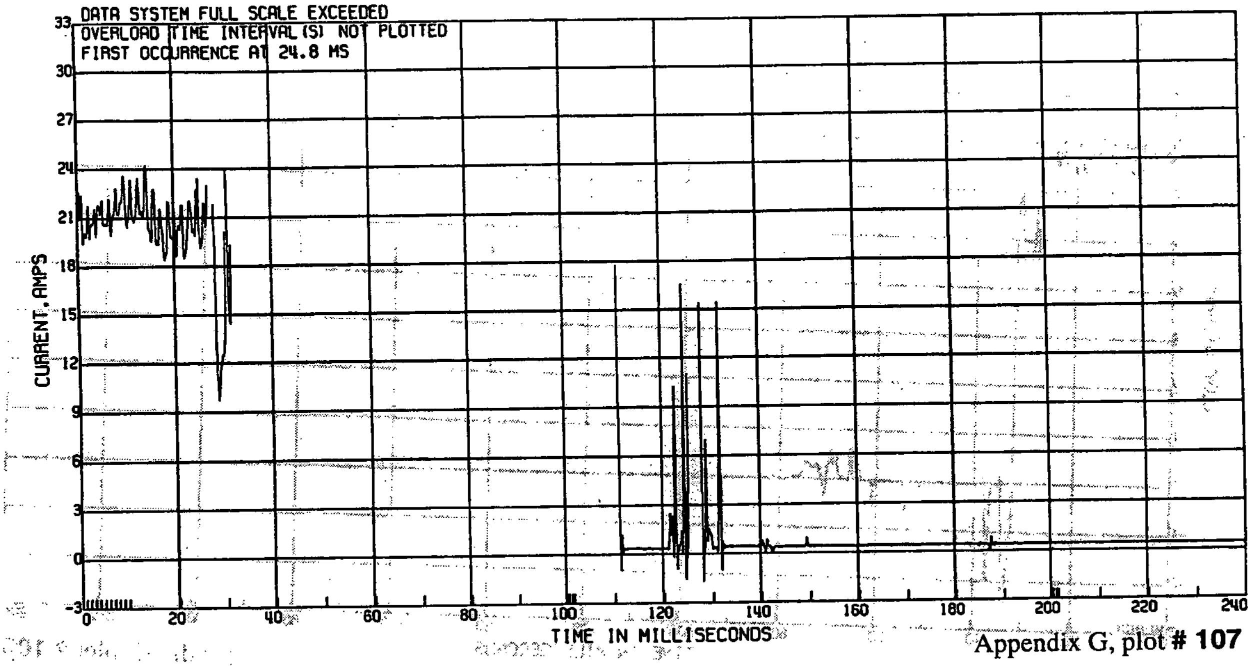



Appendix G, plot # **106**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FUSIBLE LINK A-HVAC BLOWER CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

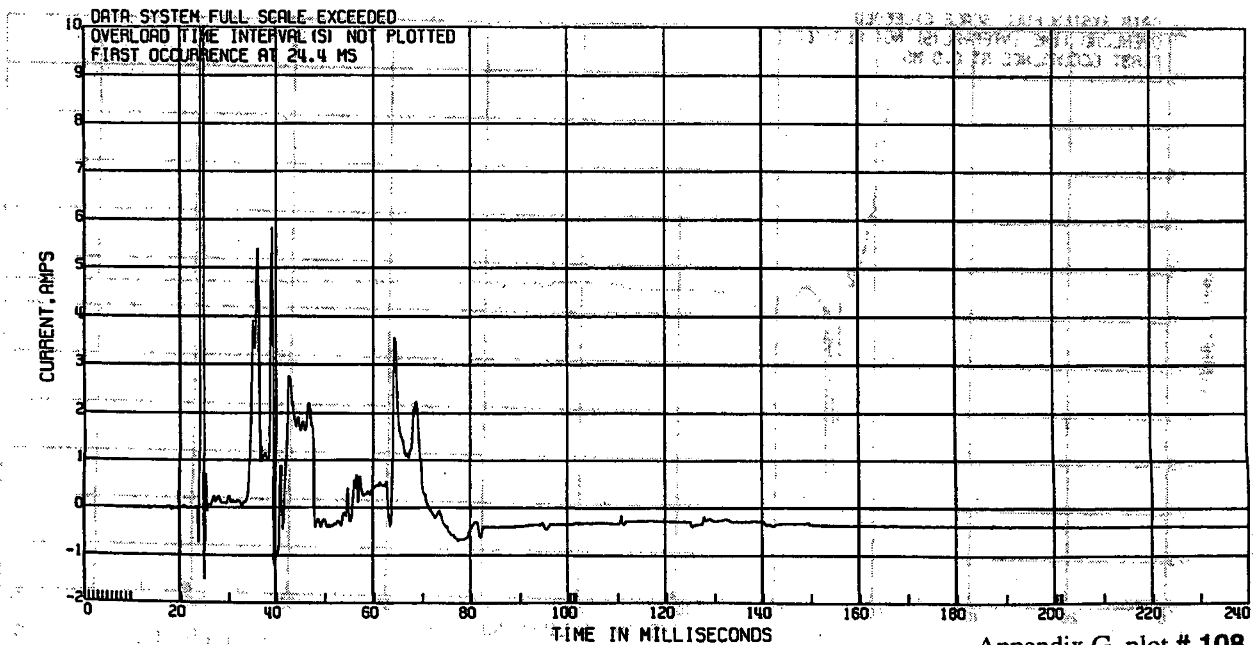



Appendix G, plot # 107

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FUSIBLE LINK B-RELAY CTR CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

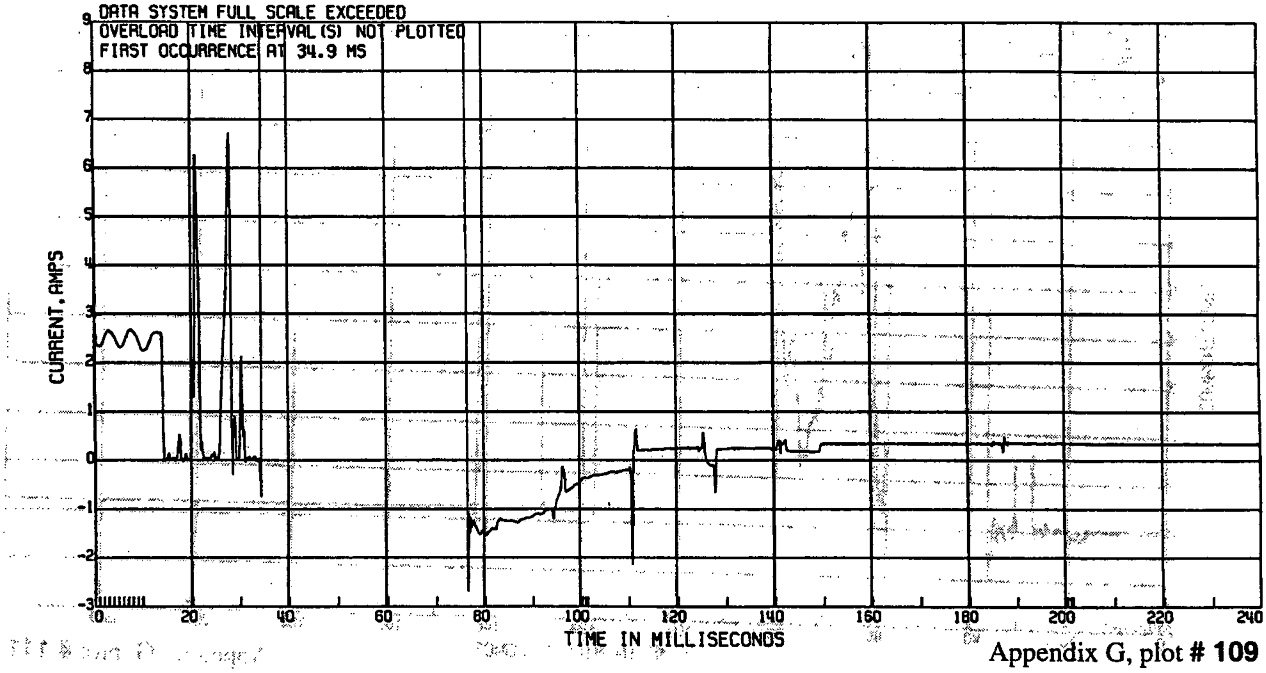



Appendix G, plot # 108

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FUSIBLE LINK C-RELAY CTR CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

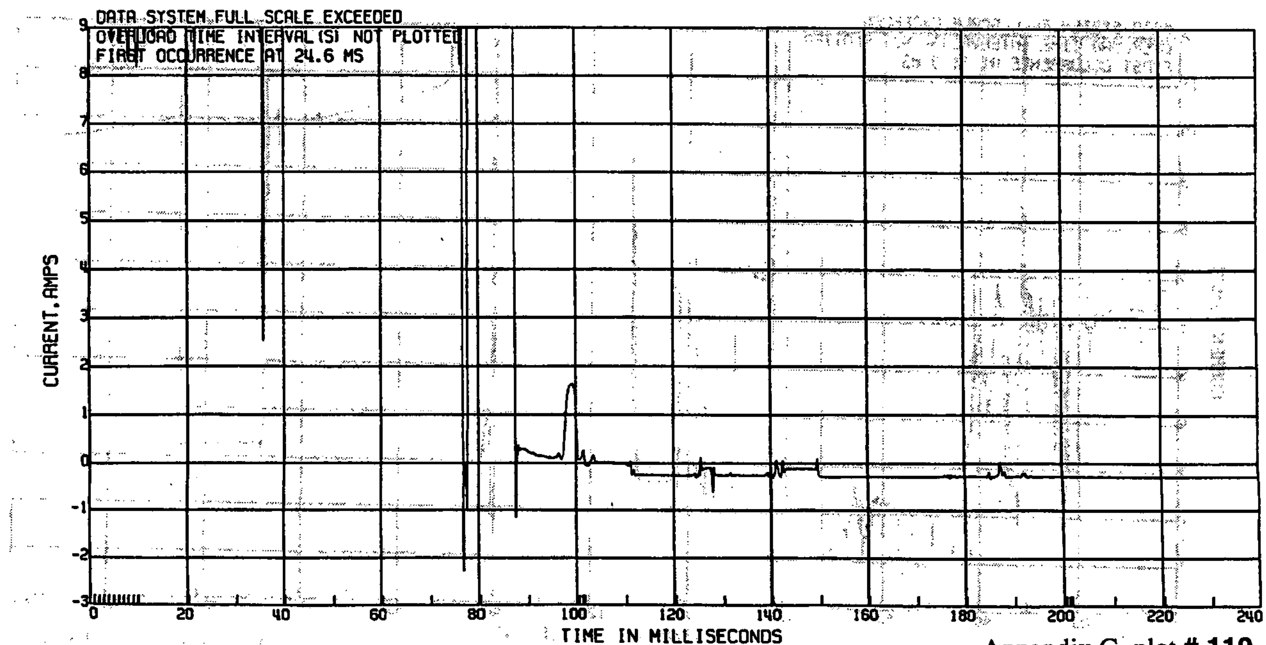



Appendix G, plot # **109**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FUSIBLE LINK E-IGNITION CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

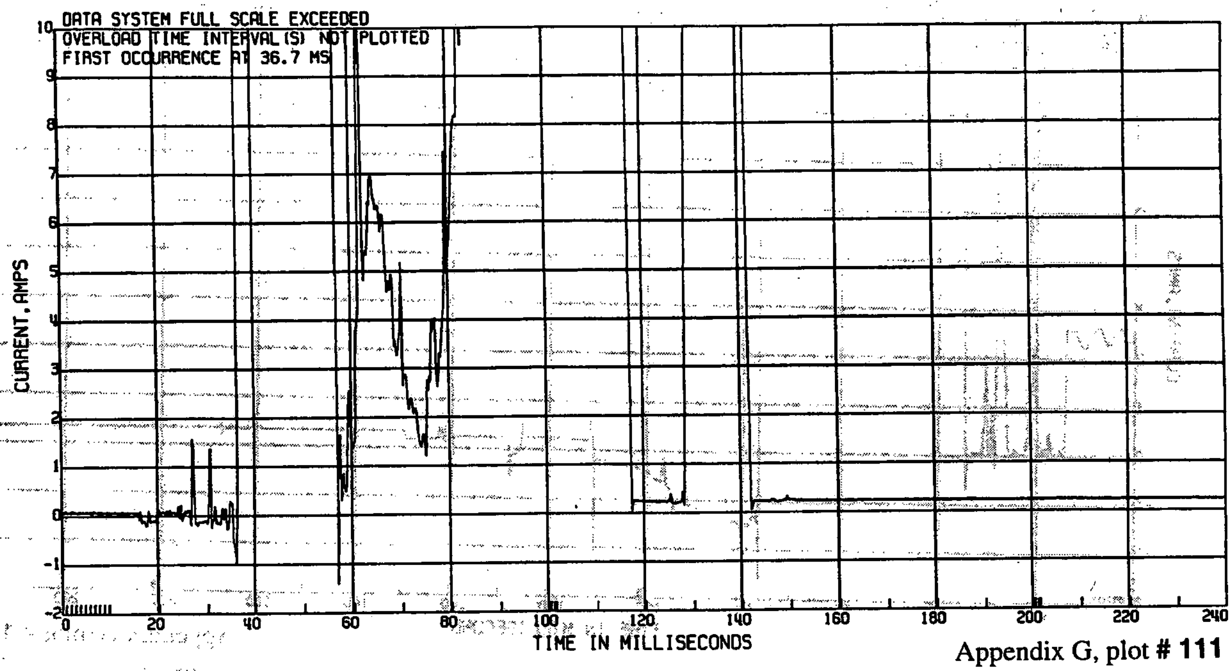



Appendix G, plot # **110**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FUSIBLE LINK F-RADIO CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

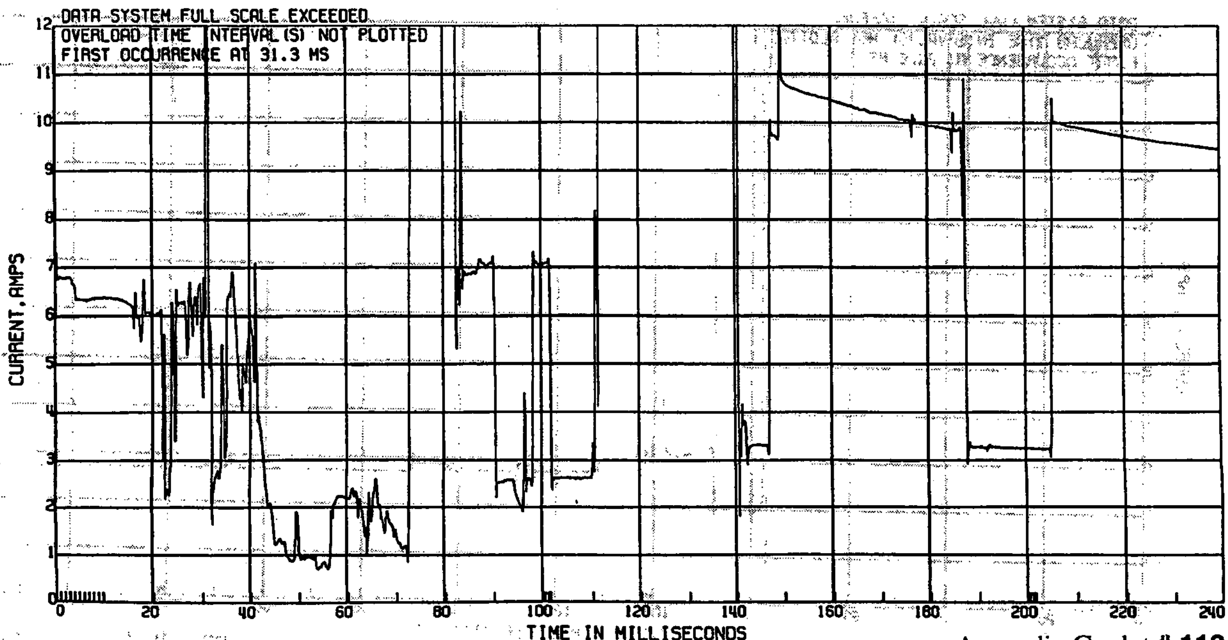



Appendix G, plot # 111

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FUSIBLE LINK J-TAILLIGHT CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

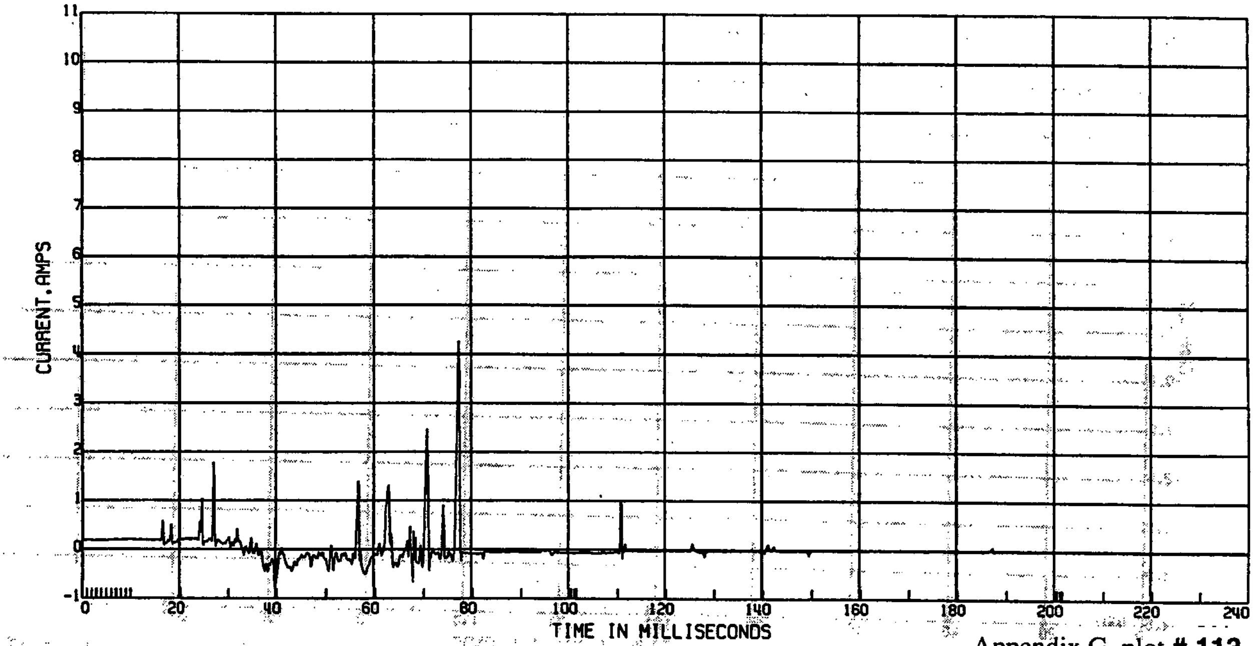



Appendix G, plot # 112

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FUSIBLE LINK K-ABS FUSE #6 CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

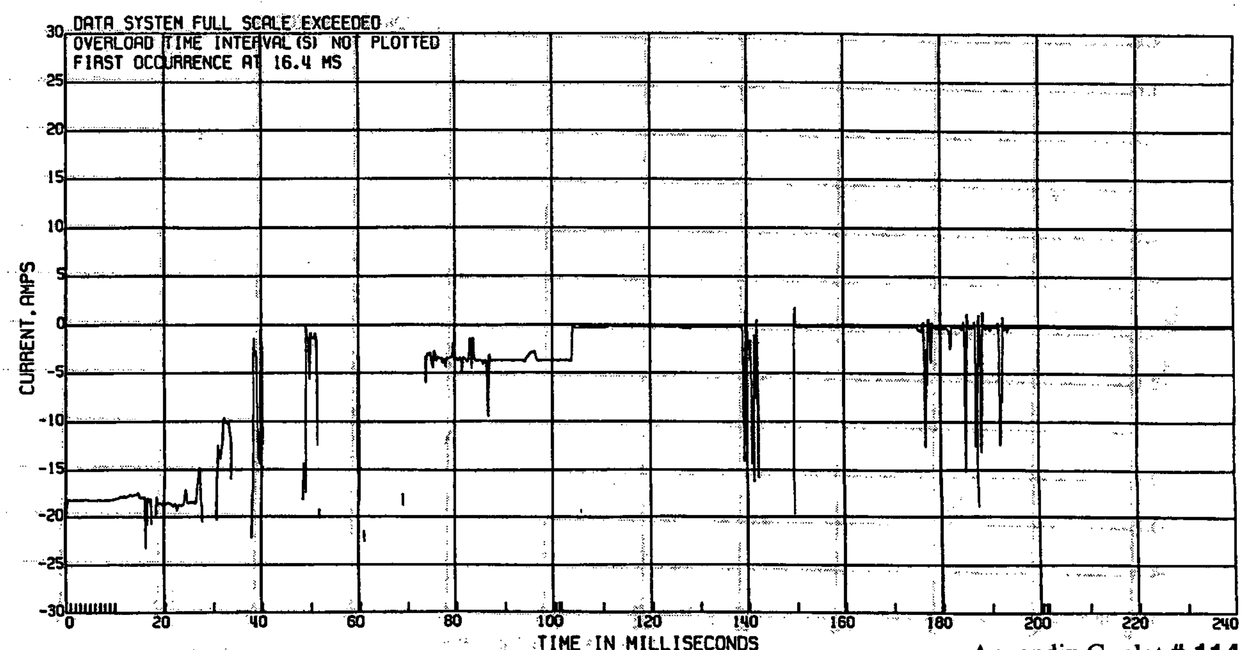



Appendix G, plot # **113**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 FUSIBLE LINK Z-HEADLIGHT SWITCH CURRENT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

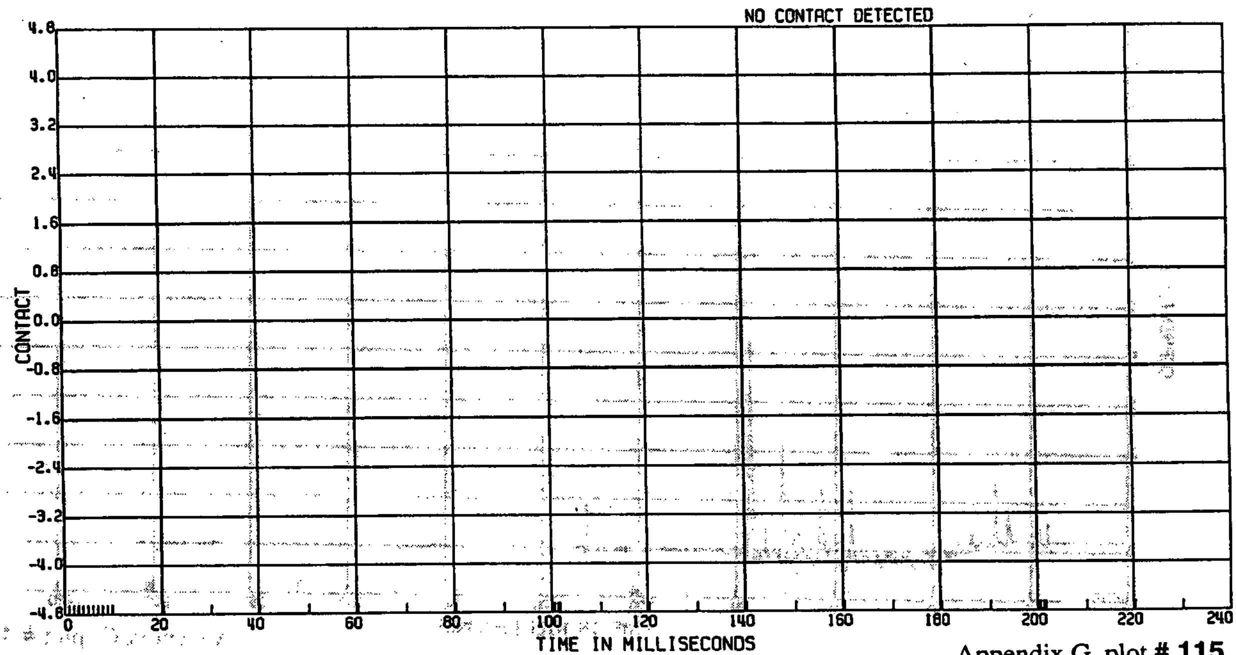



Appendix G, plot # **114**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 THERMAL WIRE CONTACT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000

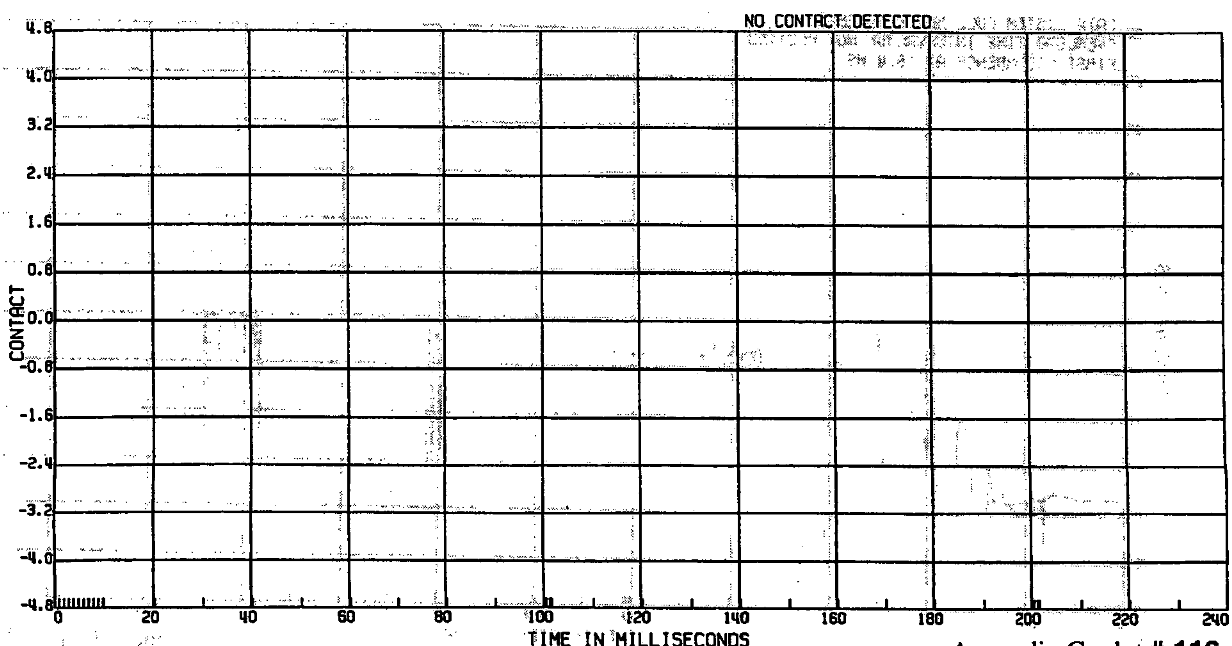



Appendix G, plot # **115**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 PNEUMATIC WIRE CONTACT TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # **116**

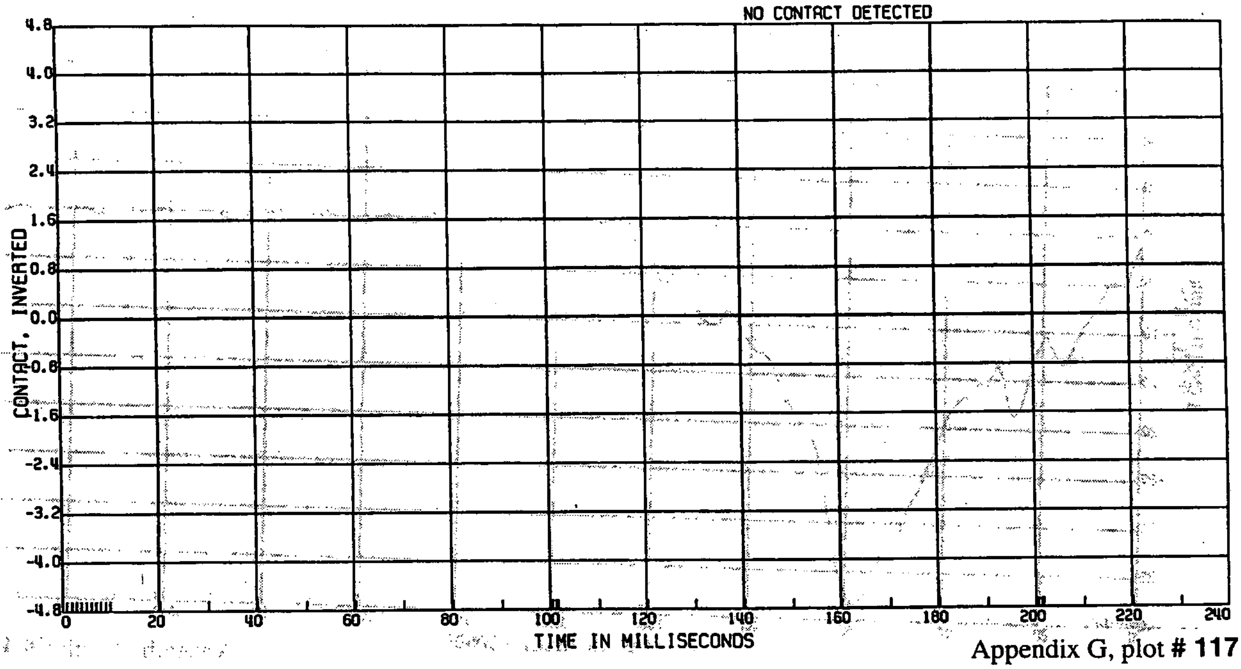
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

PNEUMATIC WIRE FAULT CONTACT

TEST DATE:06/18/1997




Appendix G, plot # **117**

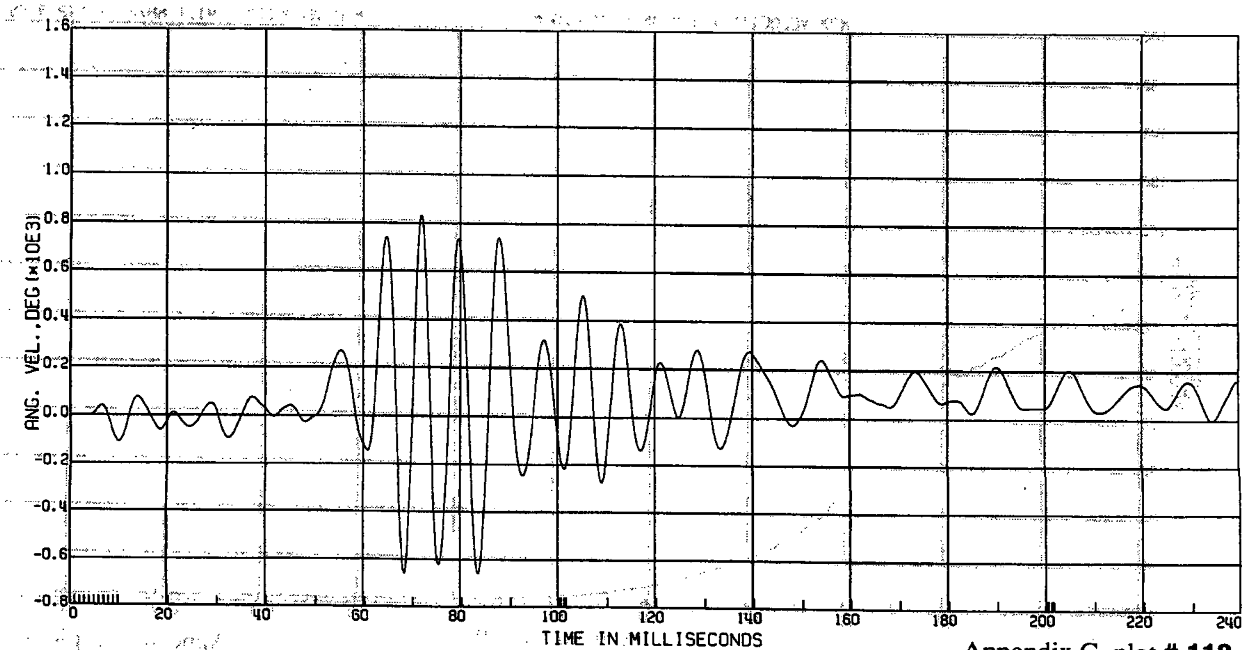
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 180

CTR RATE GYROSCOPE ANG. VEL.

TEST DATE:06/18/1997



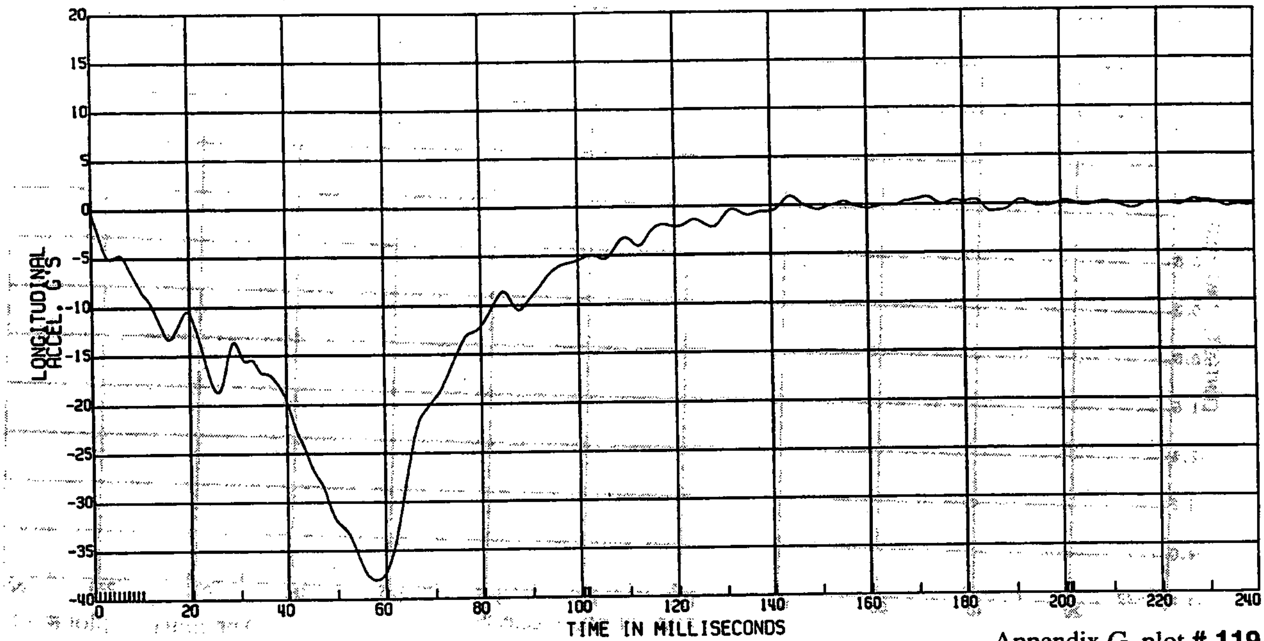

Appendix G, plot # **118**

118

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 LTV MDB AT C.G. ACCEL TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 60

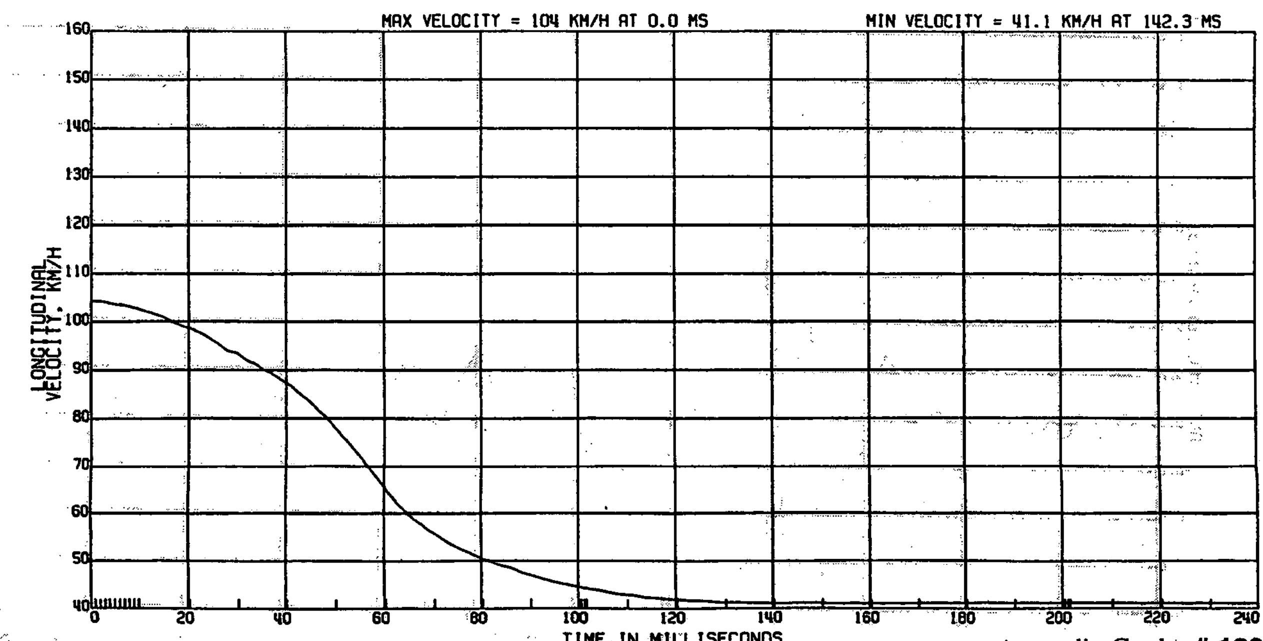



Appendix G, plot # **119**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 LTV MDB AT C.G. VELOCITY TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)




Appendix G, plot # **120**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

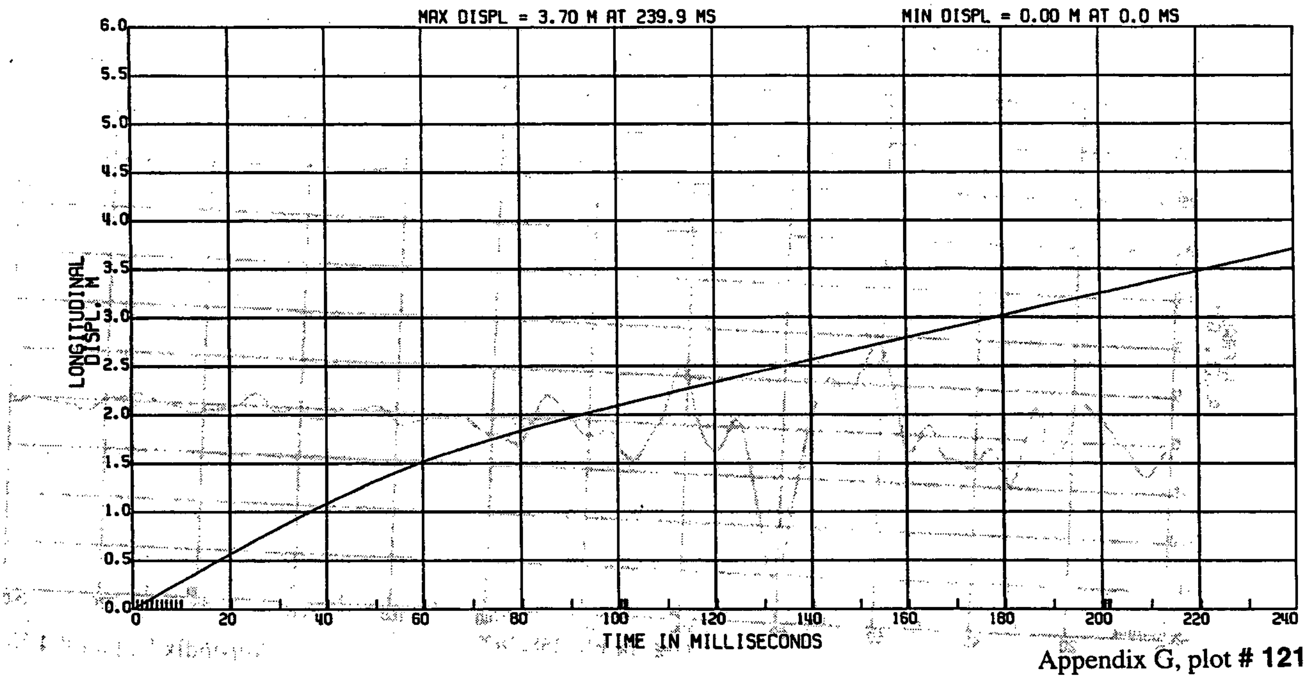
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 180

LTV MDB AT C.G. DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:06/18/1997




Appendix G, plot # **121**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

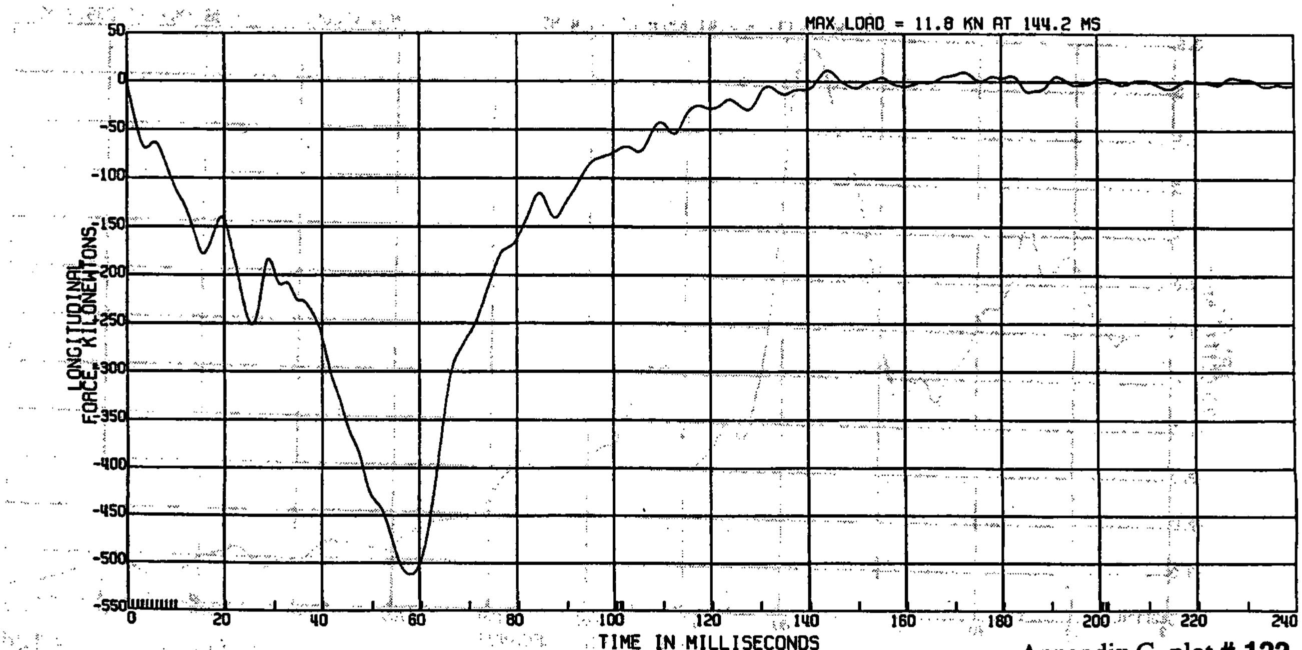
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 60

LTV MDB LONG. FORCE AT C.G.

(1371.0 KG) (9.807) (LONG.ACCEL)

TEST DATE:06/18/1997




Appendix G, plot # **122**

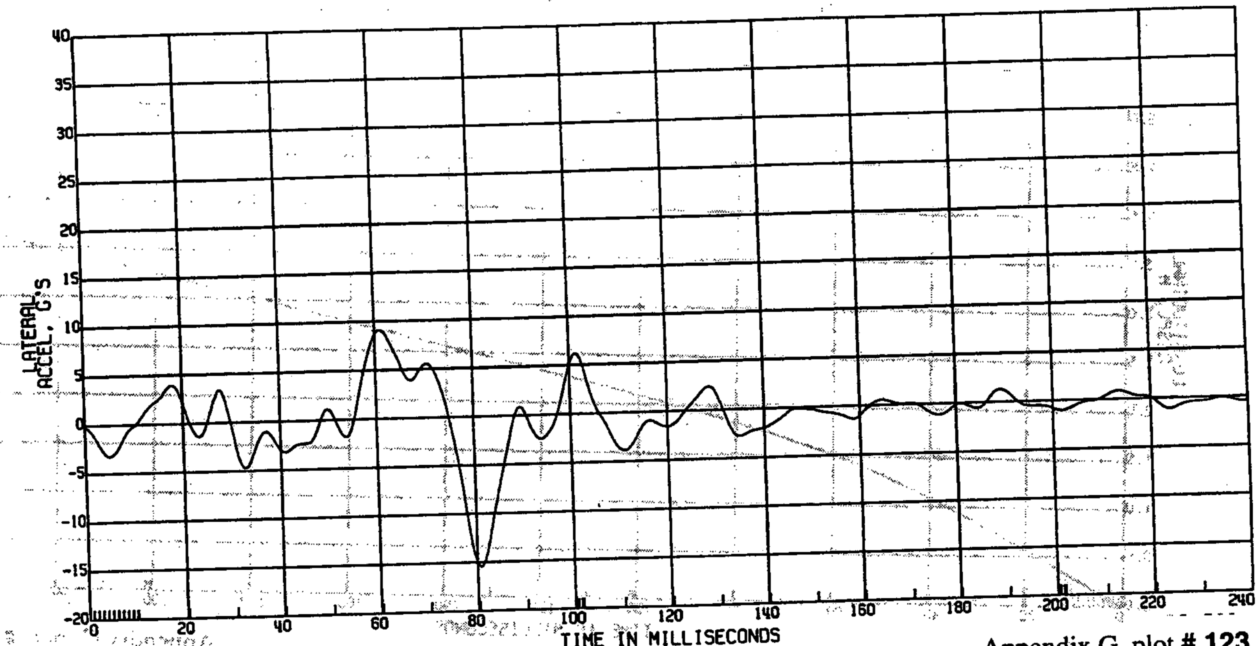
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

LTV MDB AT C.G. ACCEL

TEST DATE:06/18/1997

R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 60




Appendix G, plot # **123**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

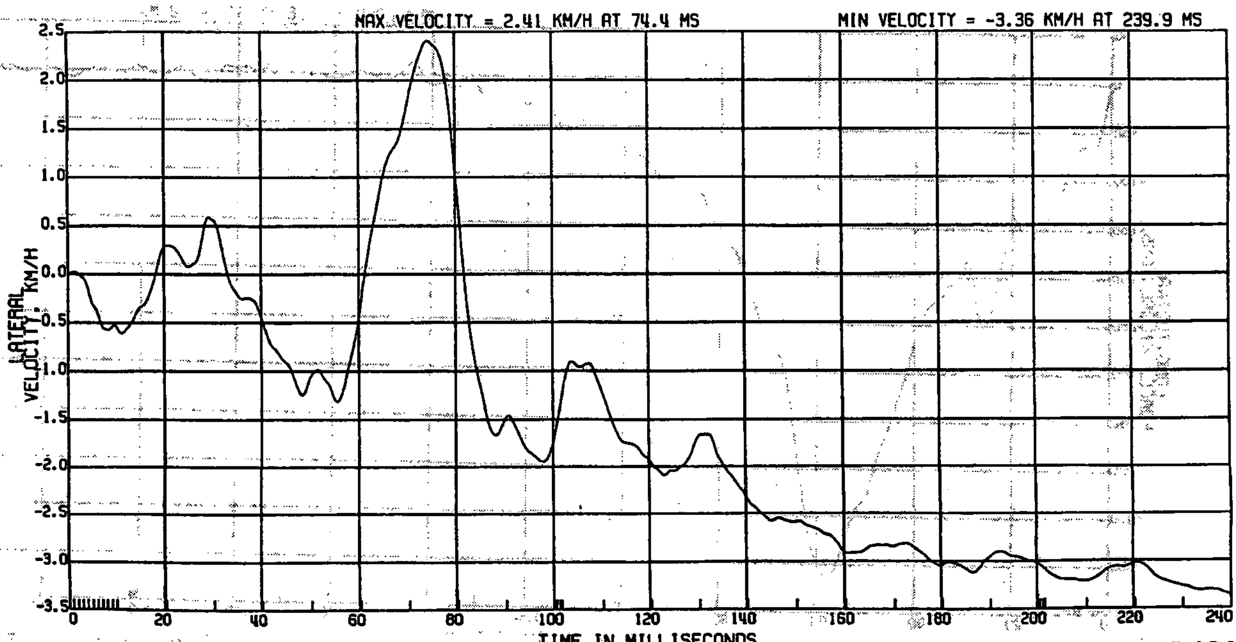
R&D CTR 1VF46080 1FP87

LTV MDB AT C.G. VELOCITY

TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 180

(COMPUTED FROM ACCELERATION)

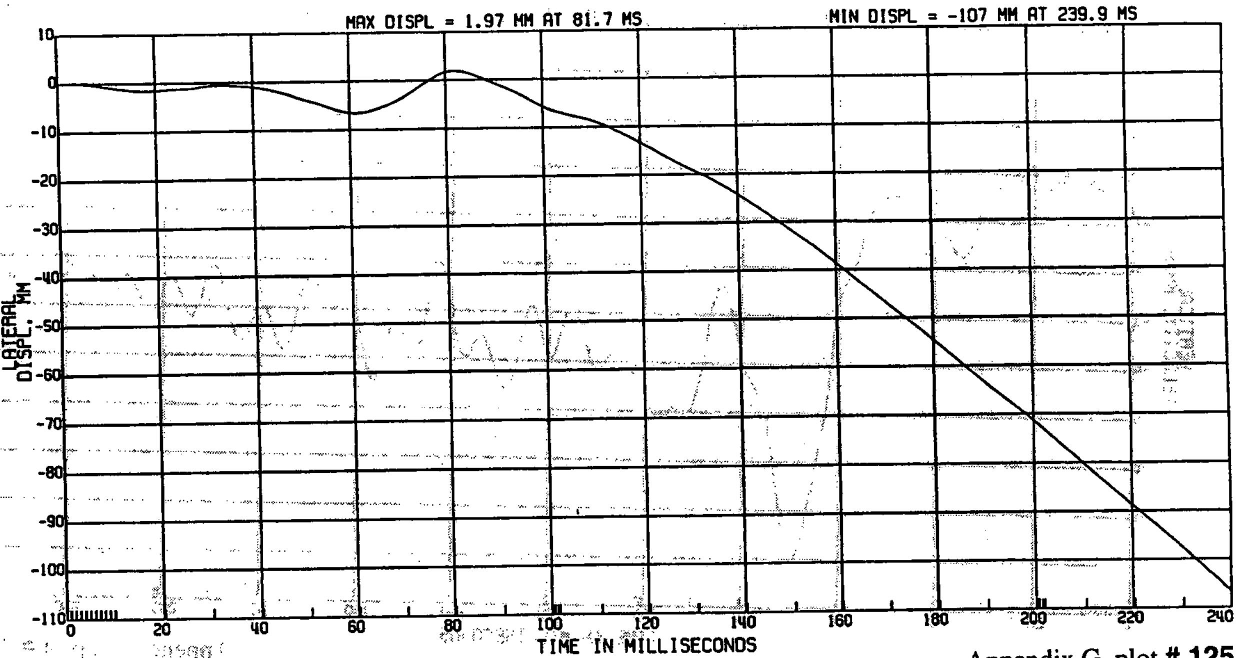



Appendix G, plot # **124**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 LTV MDB AT C.G. DISPL TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)

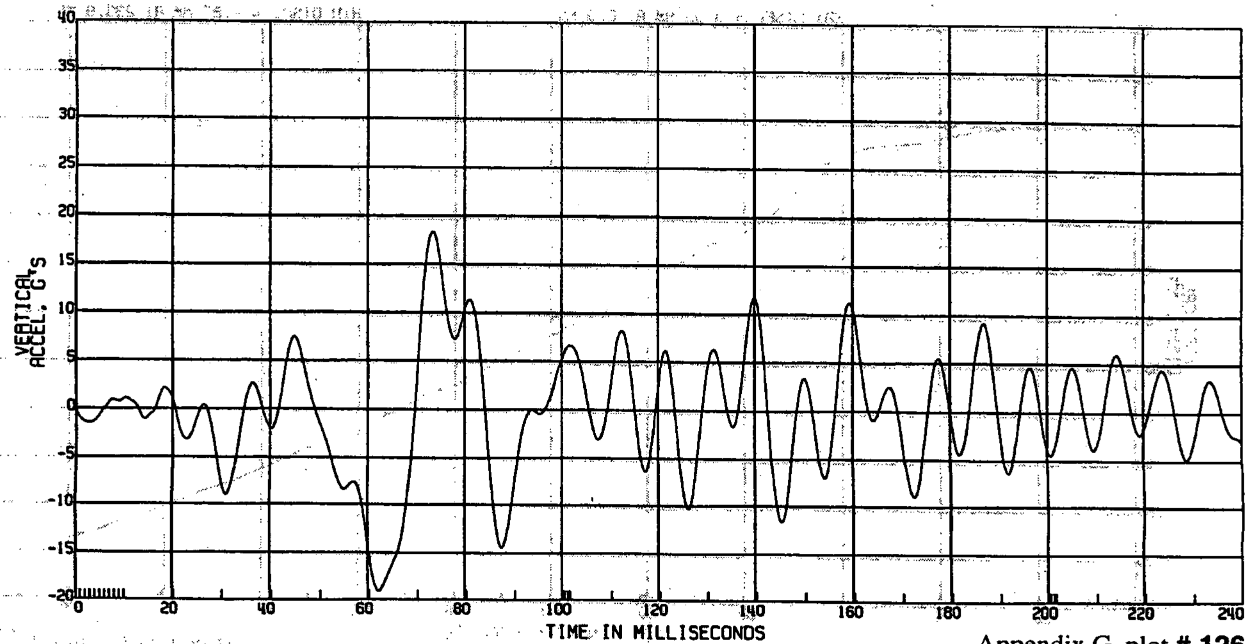



Appendix G, plot # **125**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 LTV MDB AT C.G. ACCEL TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 60



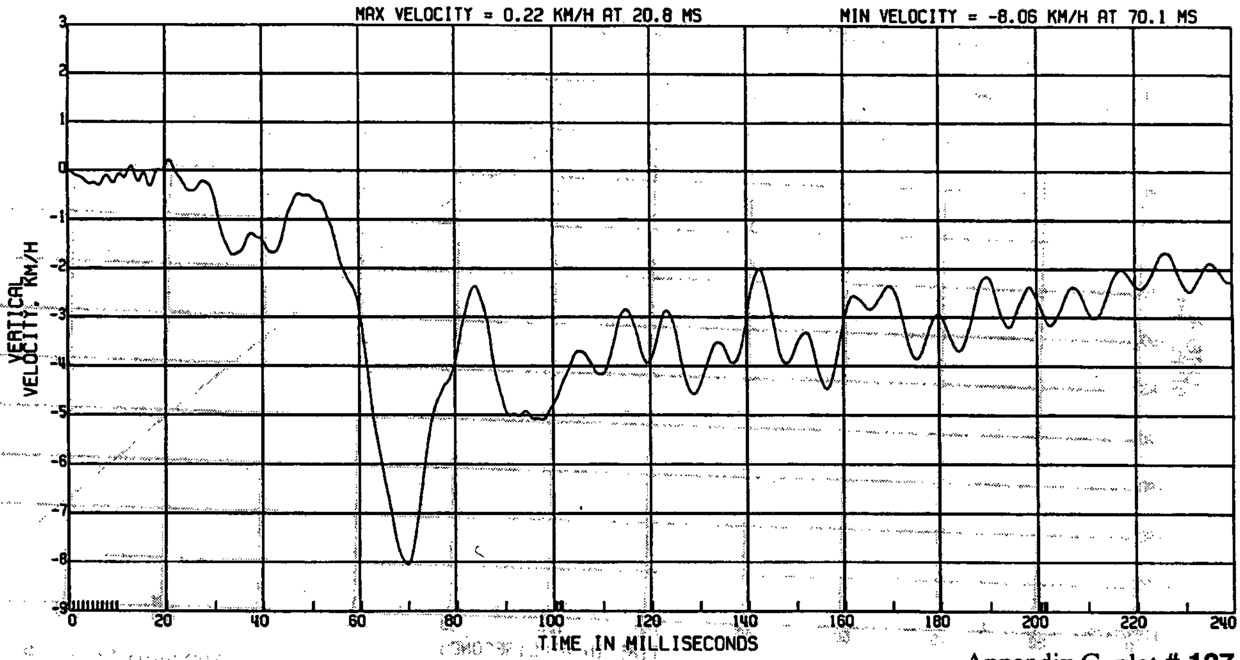

Appendix G, plot # **126**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT C.G. VELOCITY
(COMPUTED FROM ACCELERATION)

TEST DATE:06/18/1997



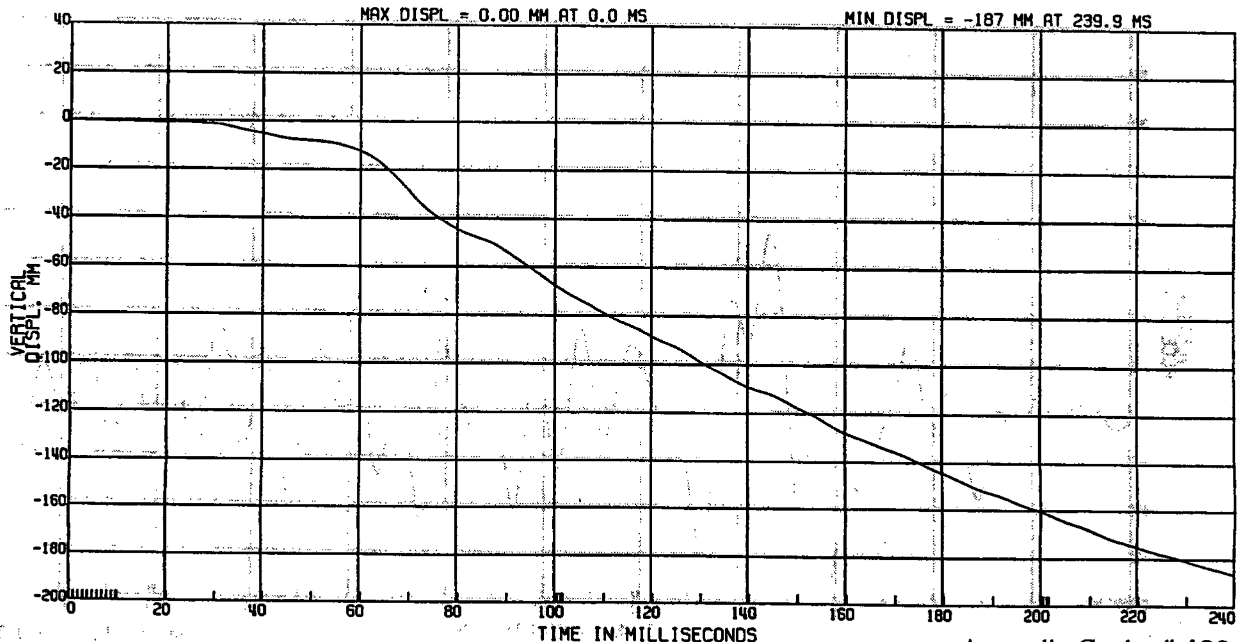

Appendix G, plot # **127**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT C.G. DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:06/18/1997

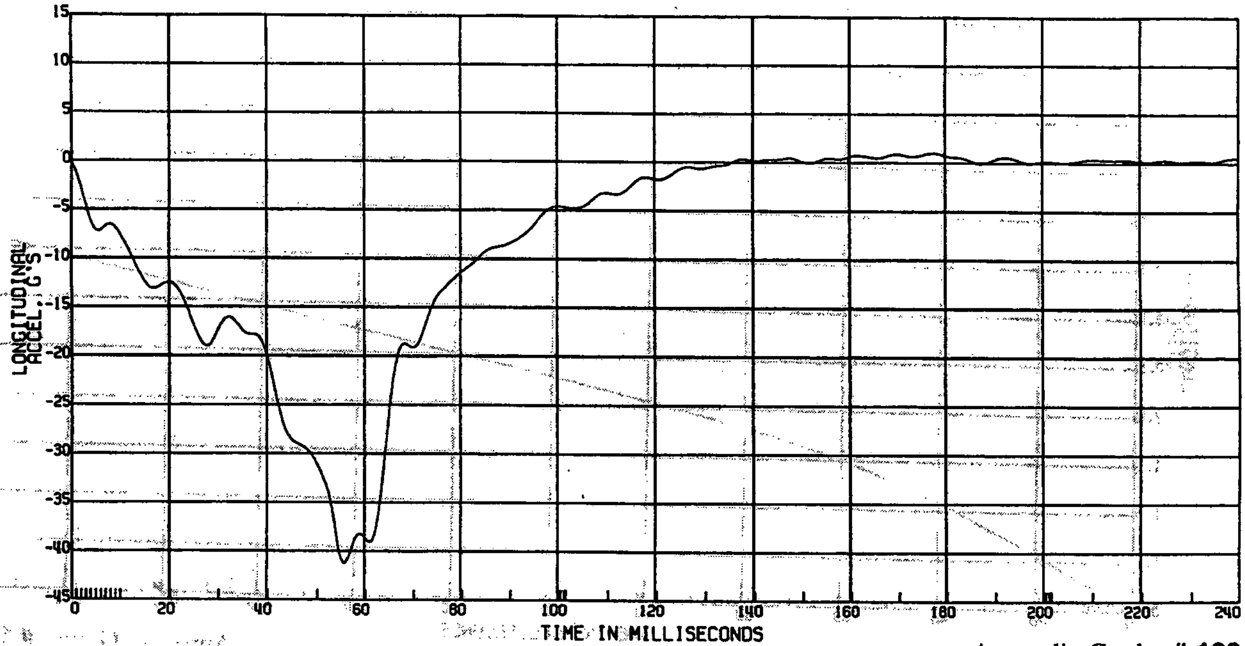



Appendix G, plot # **128**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 LTV MDB AT REAR C/MBR ACCEL TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 60

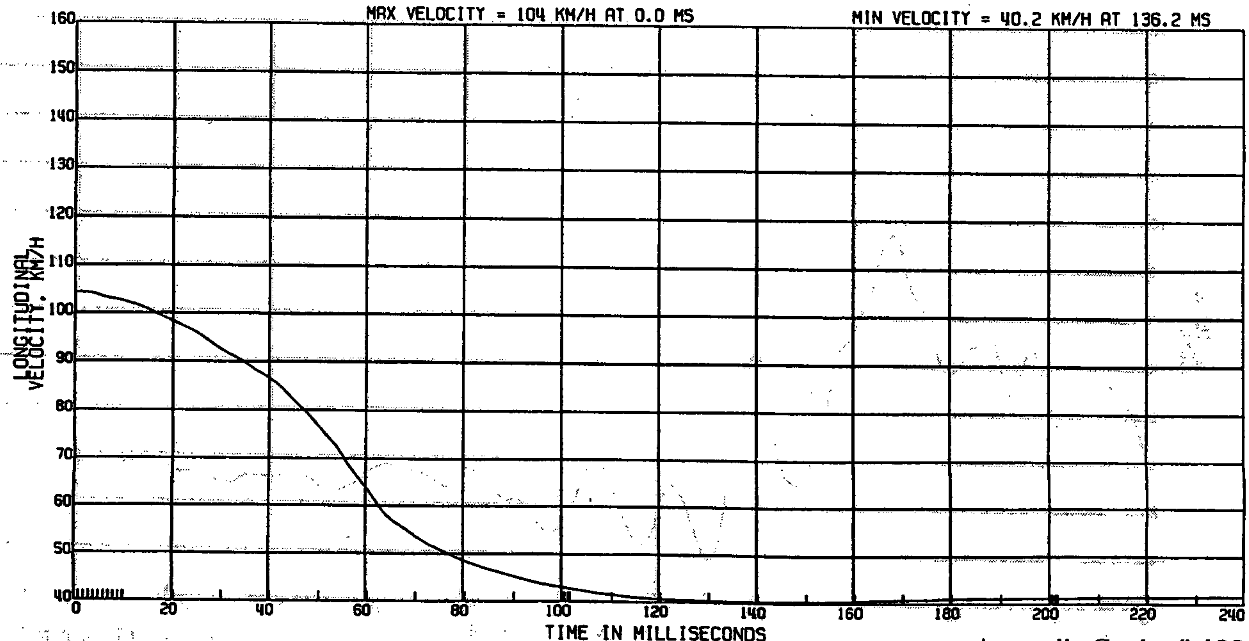



Appendix G, plot # 129

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 LTV MDB AT REAR C/MBR VELOCITY TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



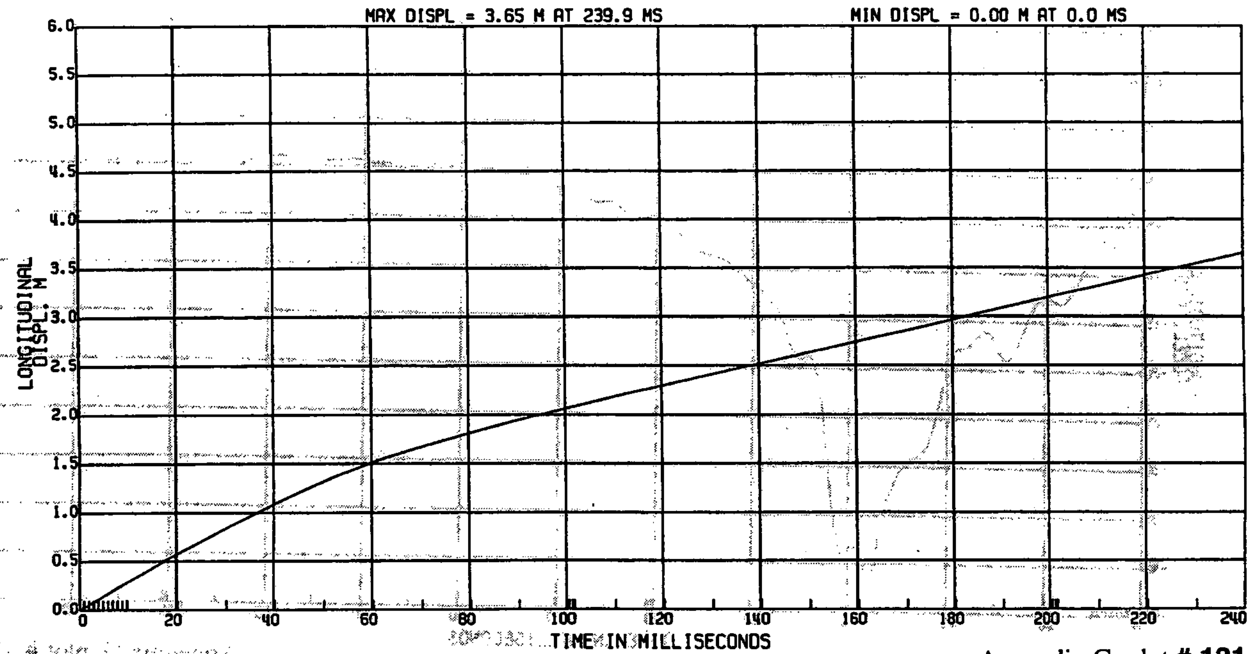

Appendix G, plot # 130

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT REAR C/MBR DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:06/18/1997



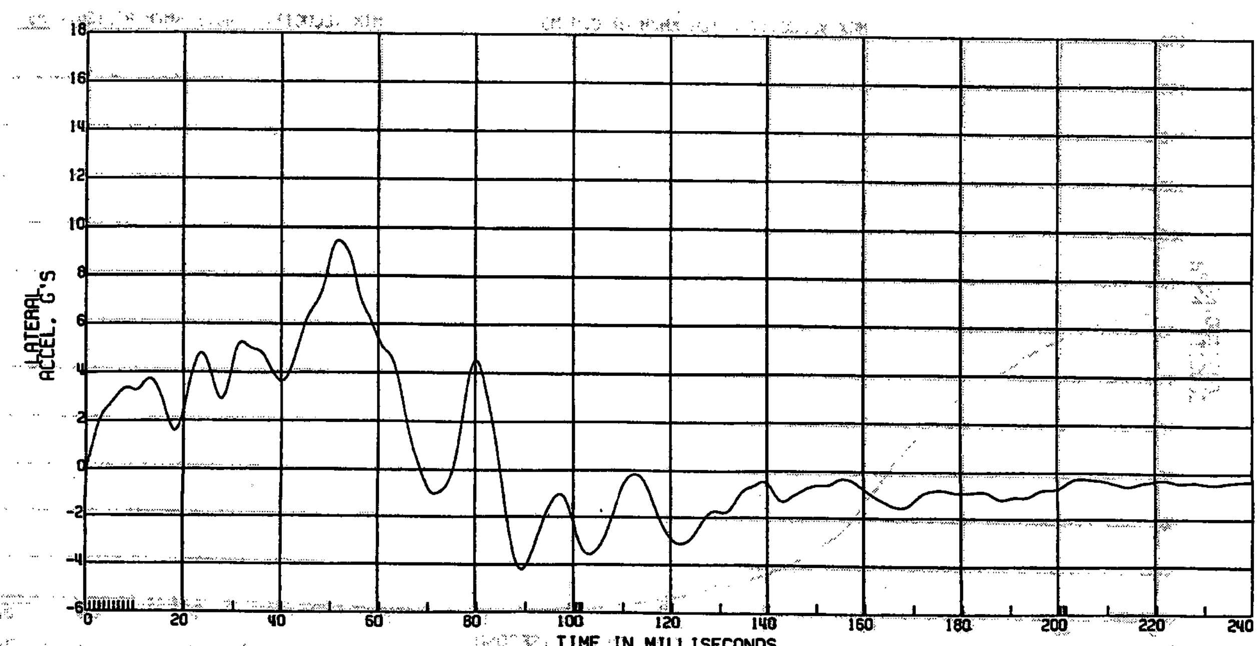

Appendix G, plot # 131

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 60

LTV MDB AT REAR C/MBR ACCEL

TEST DATE:06/18/1997




Appendix G, plot # 132

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

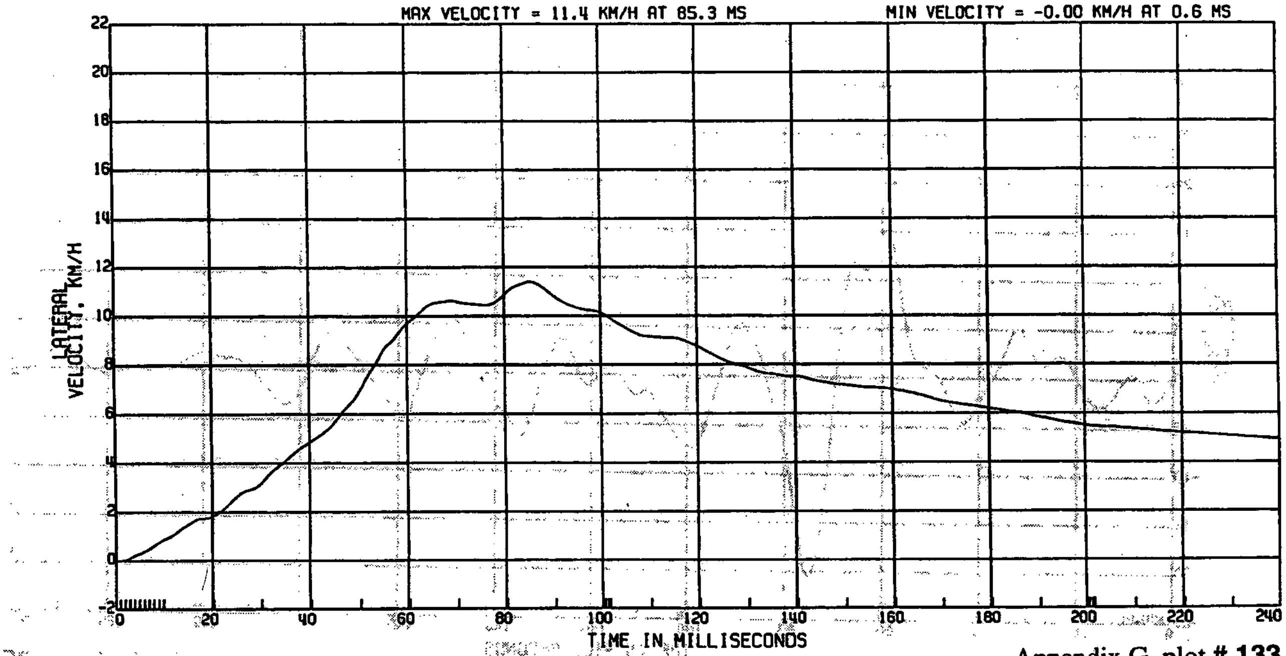
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 180

LTV MDB AT REAR C/MBR VELOCITY

(COMPUTED FROM ACCELERATION)

TEST DATE:06/18/1997




Appendix G, plot # **133**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

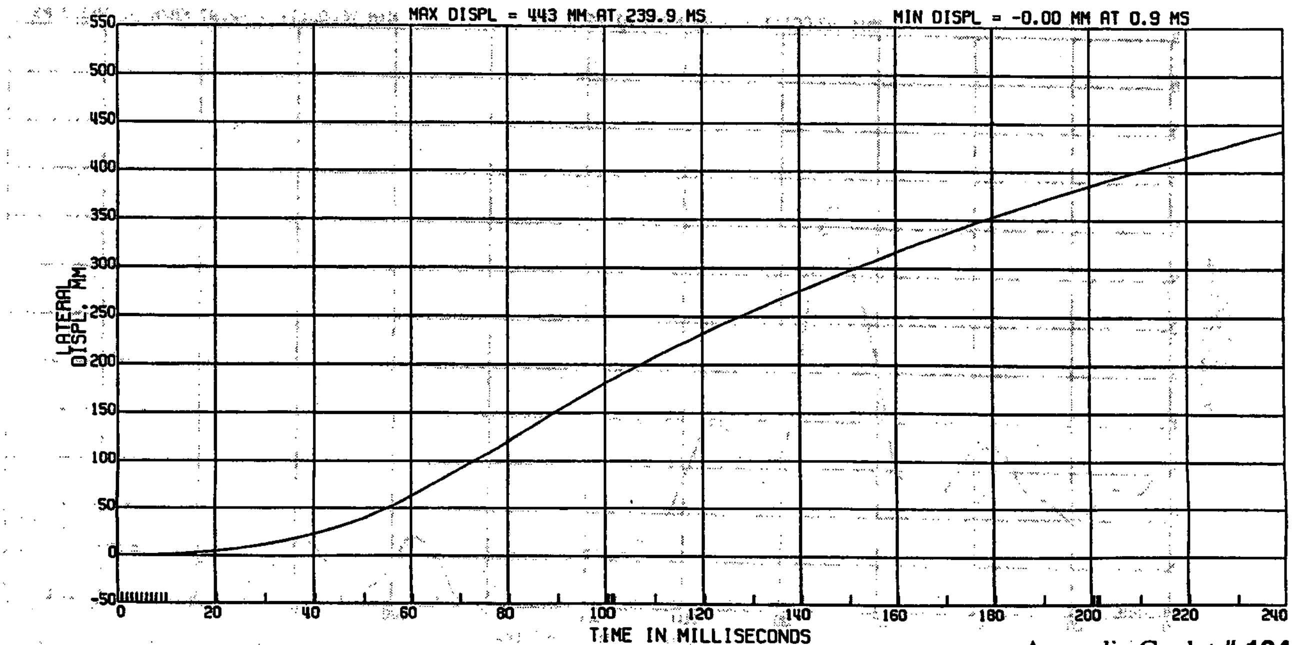
R&D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 180

LTV MDB AT REAR C/MBR DISPL

(COMPUTED FROM ACCELERATION)

TEST DATE:06/18/1997

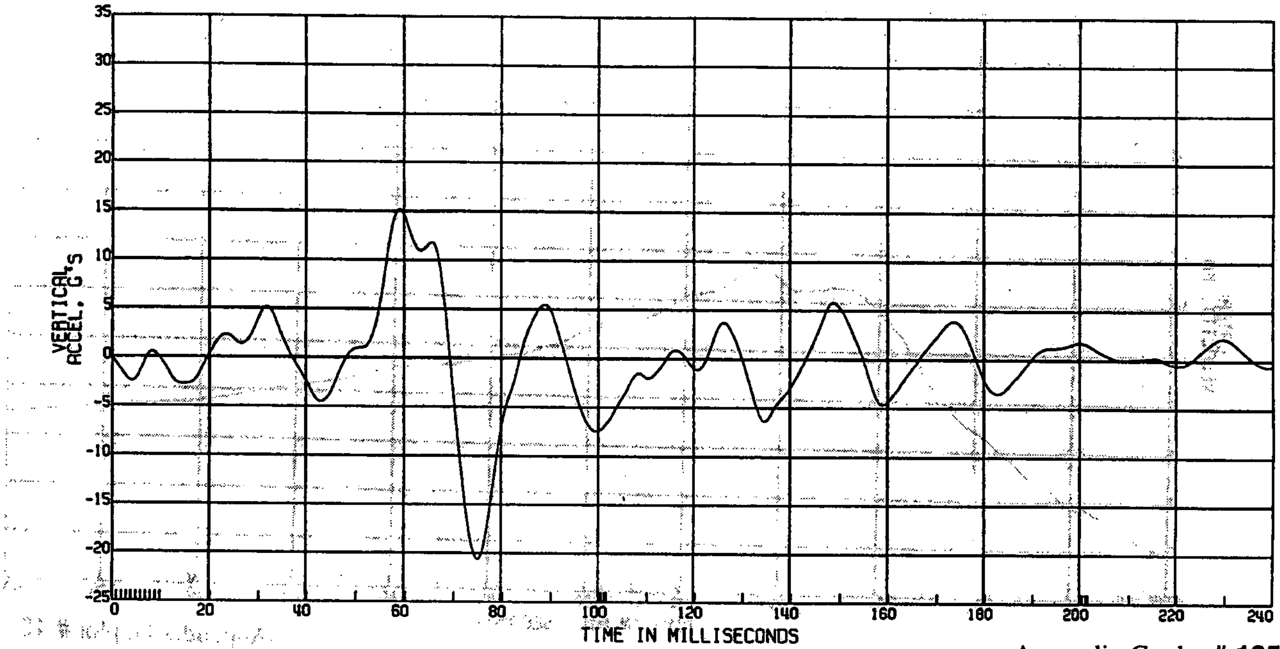



Appendix G, plot # **134**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 LTV MDB AT REAR C/MBR ACCEL TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 60

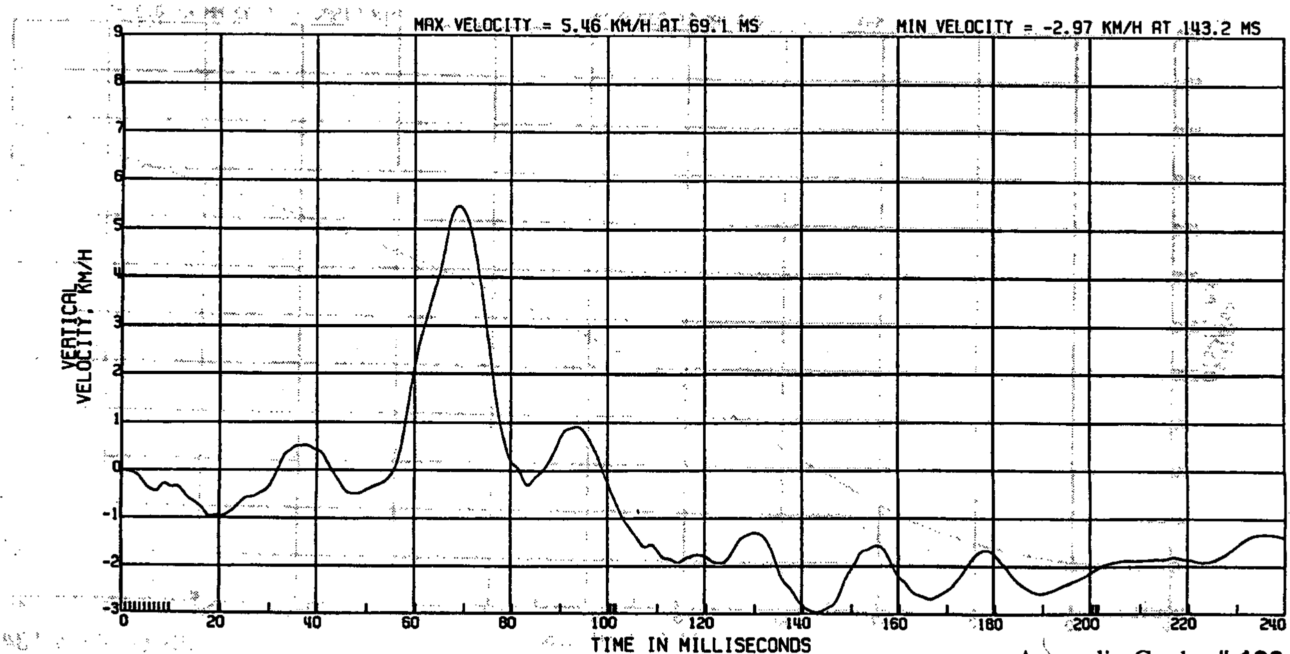



Appendix G, plot # **135**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87 LTV MDB AT REAR C/MBR VELOCITY TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 180 (COMPUTED FROM ACCELERATION)



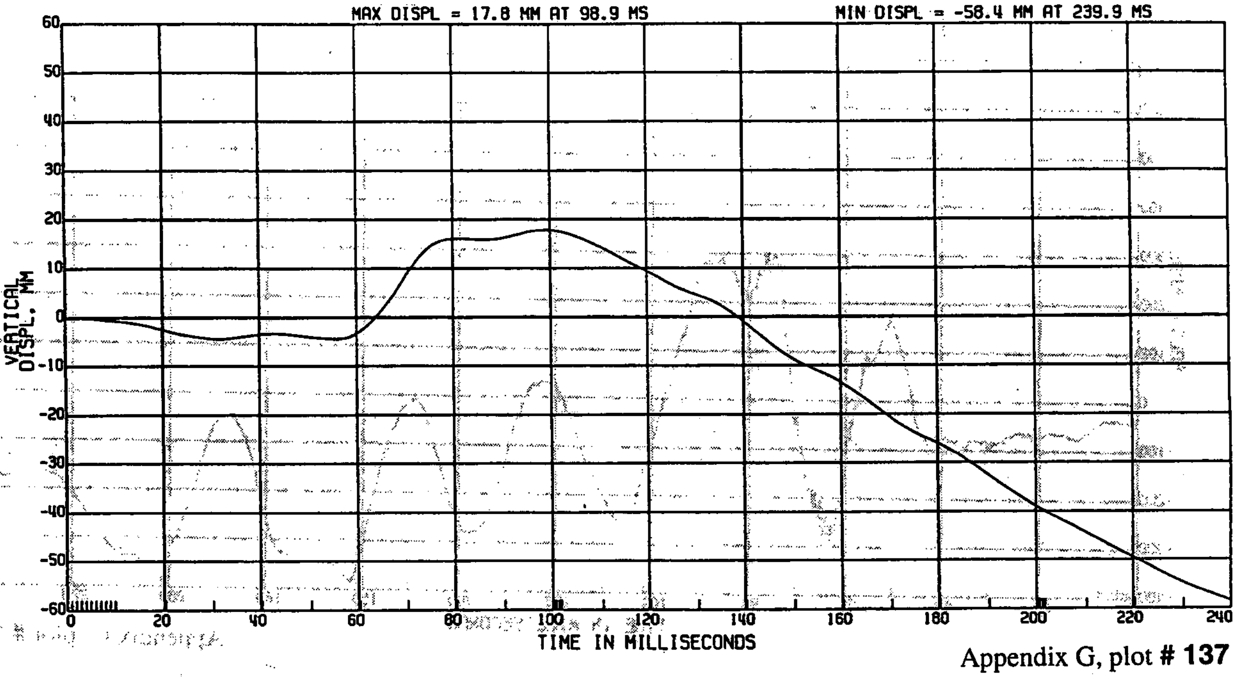

Appendix G, plot # **136**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R&D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 180

LTV MDB AT REAR C/MBR DISPL
(COMPUTED FROM ACCELERATION)

TEST DATE:06/18/1997



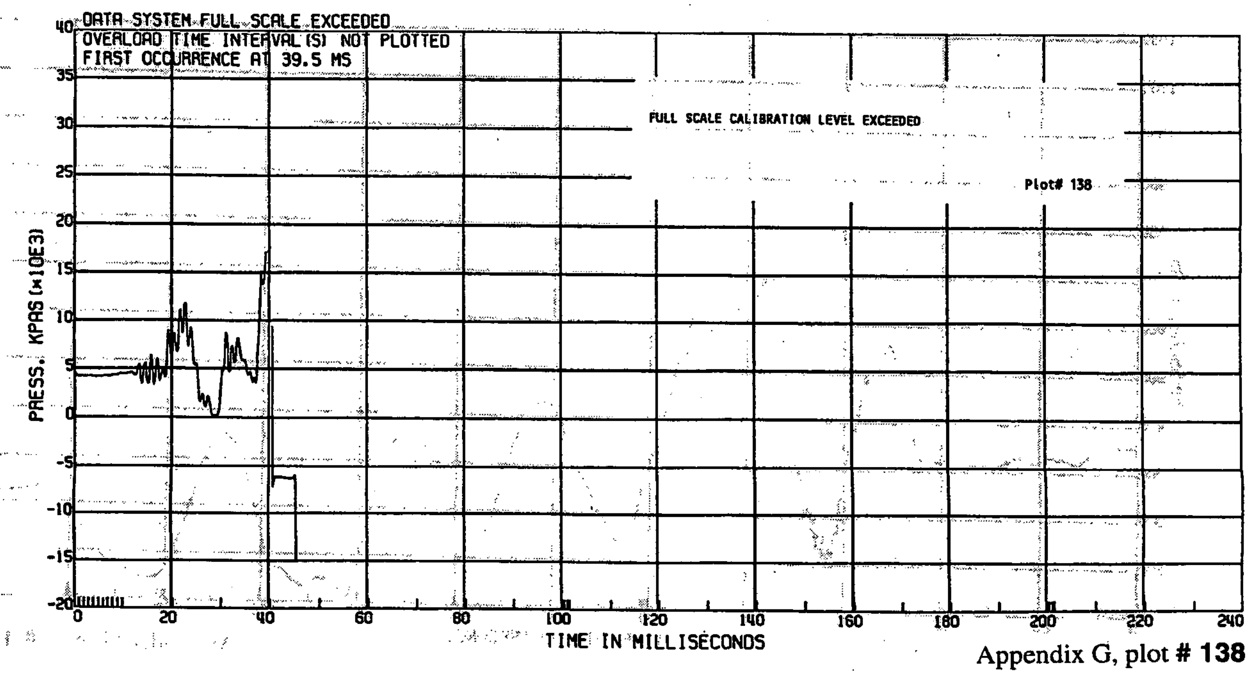

Appendix G, plot # **137**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 1000

FRT BRAKE SYSTEM PRESSURE

TEST DATE:06/18/1997



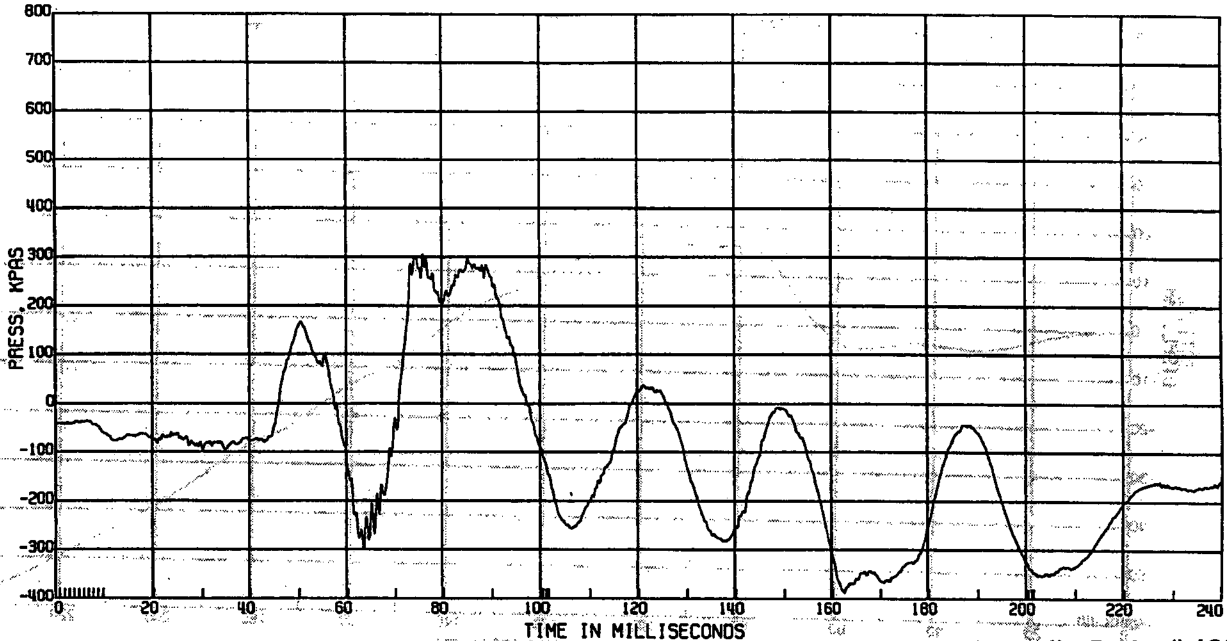

Appendix G, plot # **138**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 1000

FUEL SUPPLY LINE PRESSURE

TEST DATE:06/18/1997




Appendix G, plot # **139**

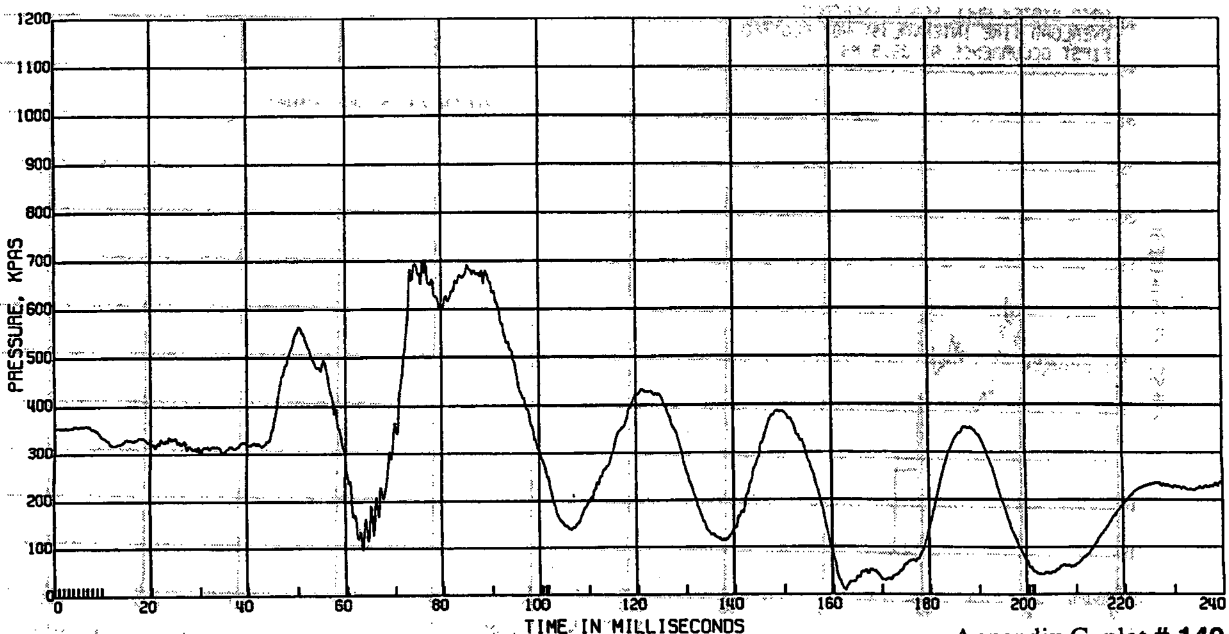
139

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 1000

FUEL SUPPLY LINE PRESSURE
(BIASED DATA BY 396.0KPAS)

TEST DATE:06/18/1997



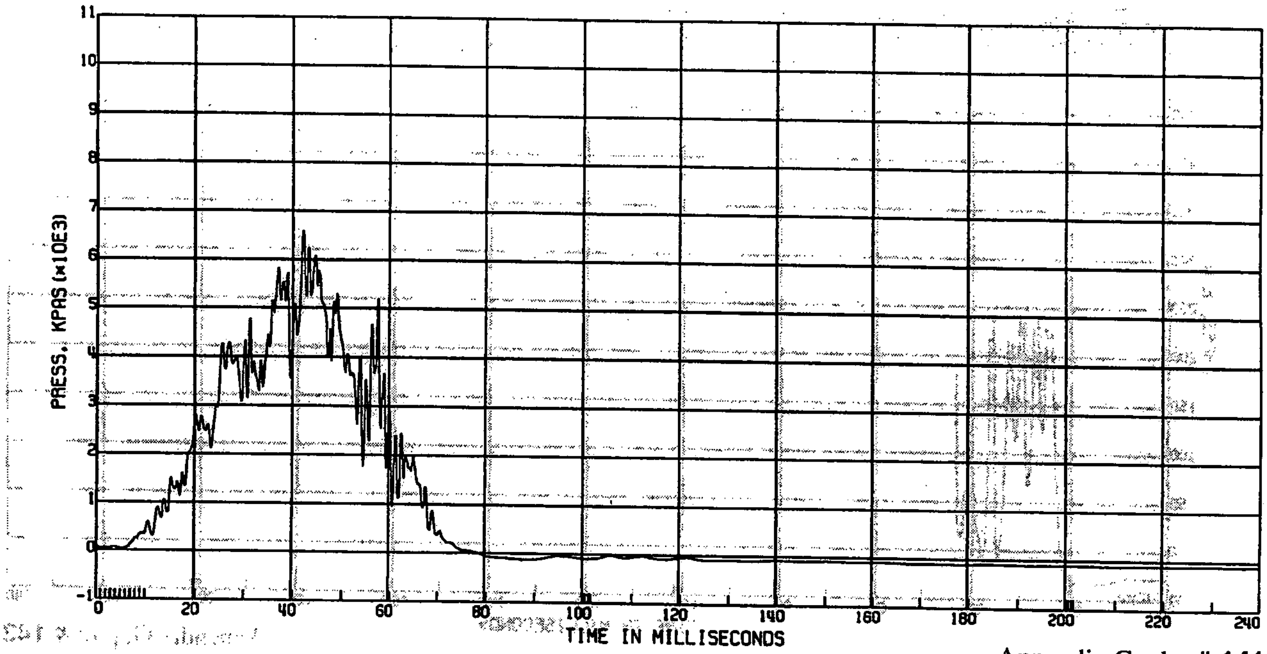

Appendix G, plot # **140**

140

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87 L. POWER STEERING SYSTEM PRESSURE TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000



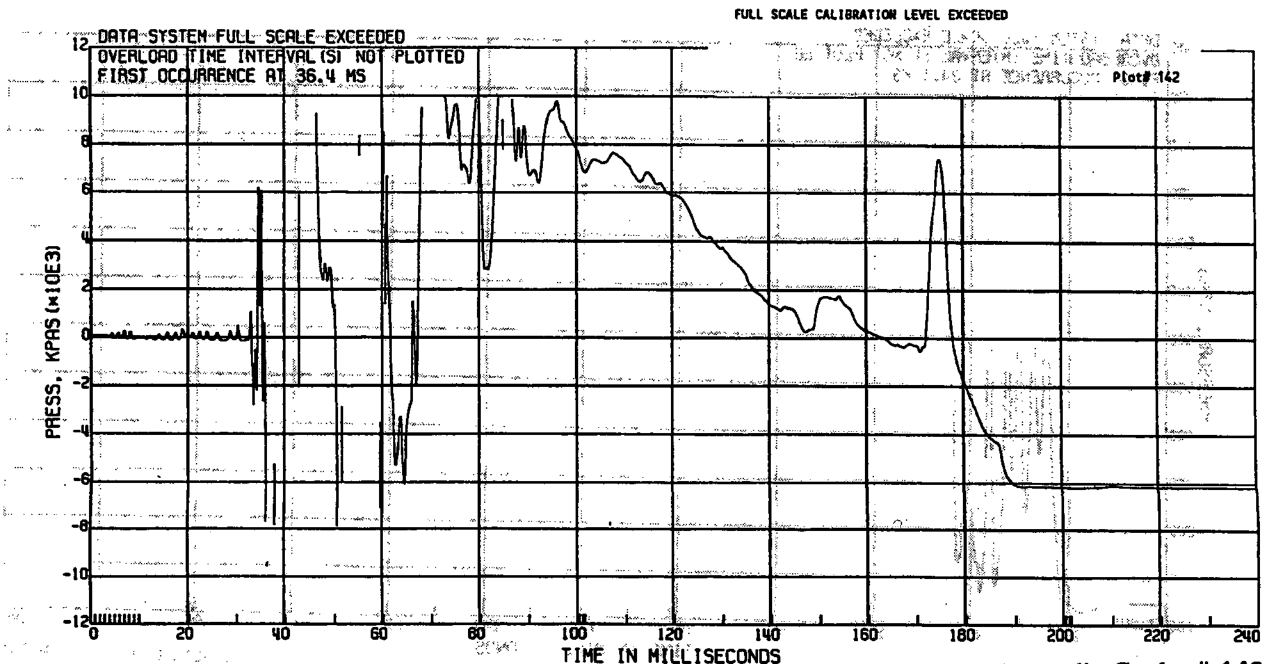

Appendix G, plot # **141**

141

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87 R. POWER STEERING SYSTEM PRESSURE TEST DATE:06/18/1997

ELEC DATA, SAE CLASS 1000




Appendix G, plot # **142**

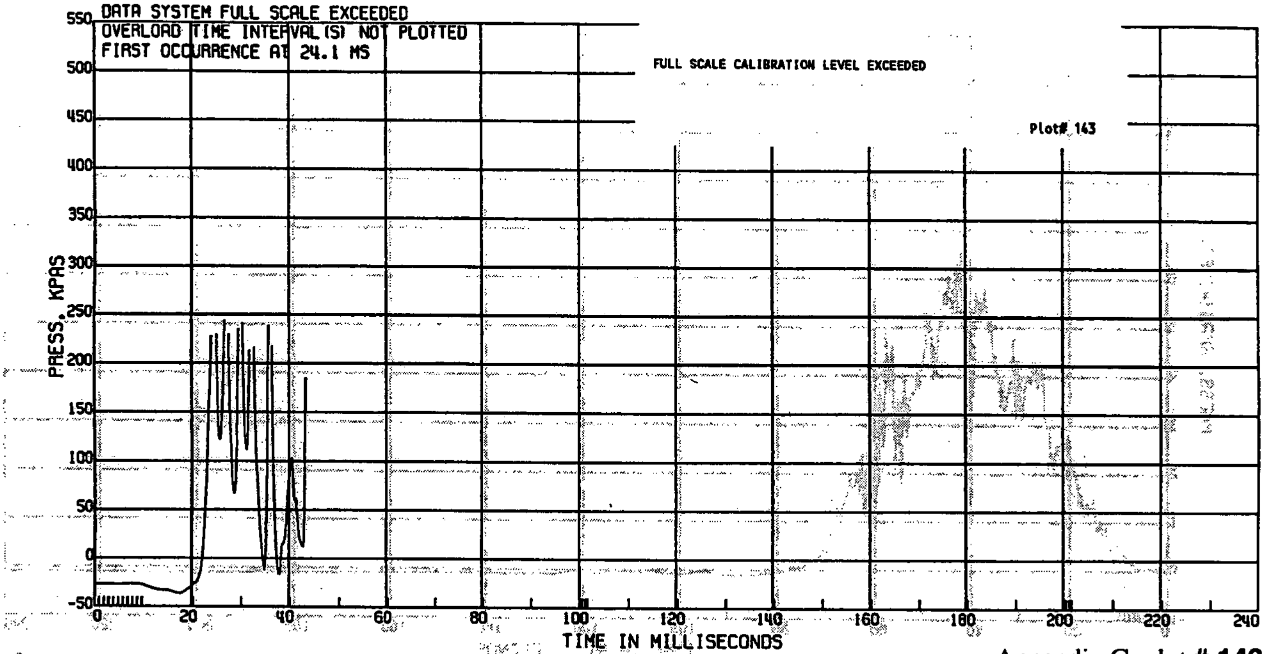
C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

COOLING SYSTEM PRESSURE

TEST DATE:06/18/1997




Appendix G, plot # **143**

143

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

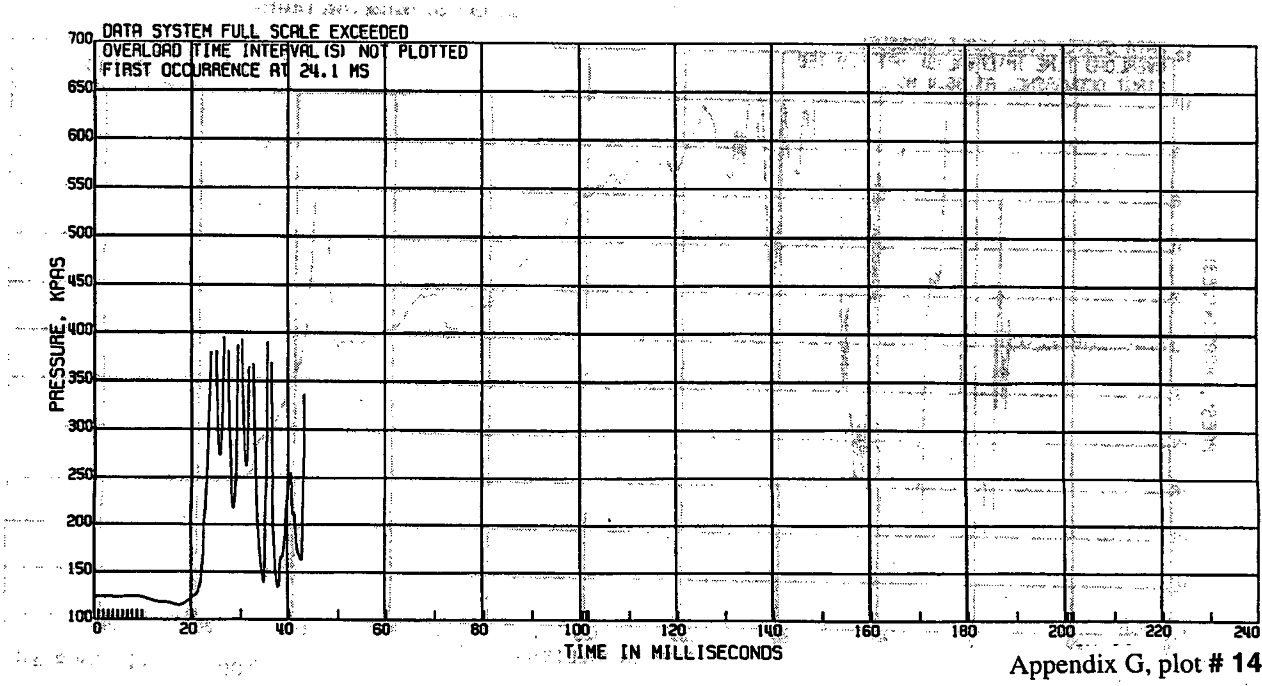
R & D CTR 1VF46080 1FP87

ELEC DATA, SAE CLASS 1000

COOLING SYSTEM PRESSURE

(BIASED DATA BY 151.0KPAS)

TEST DATE:06/18/1997



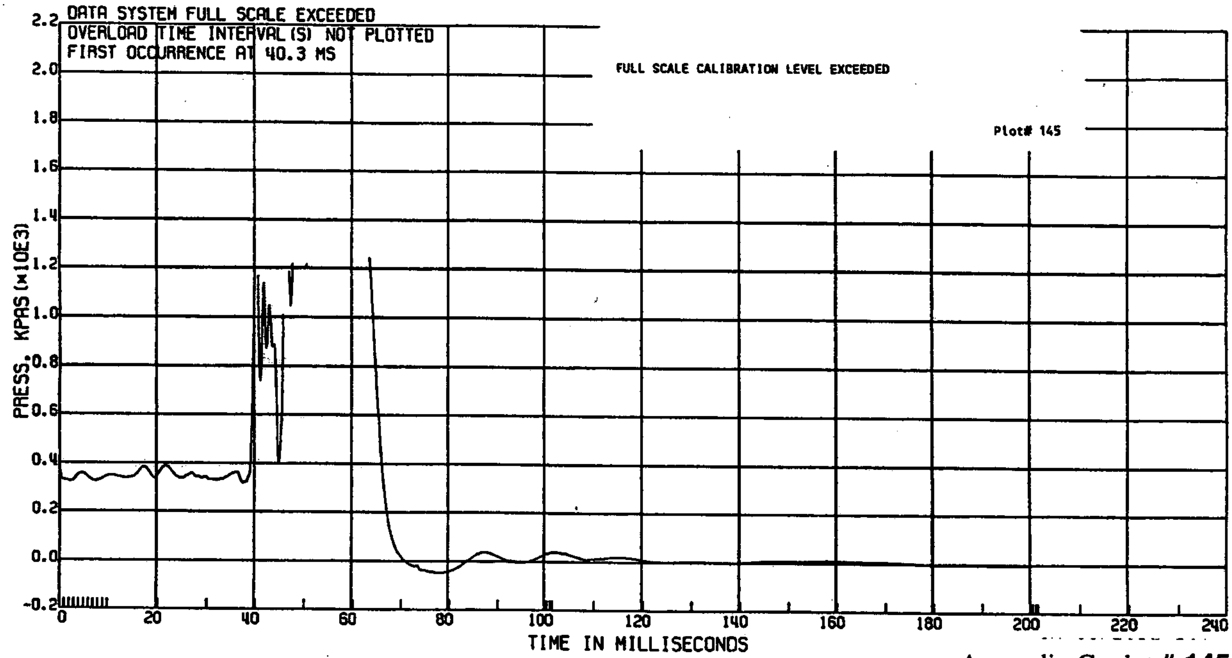

Appendix G, plot # **144**

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 1000

ENGINE OIL PRESSURE

TEST DATE:06/18/1997




Appendix G, plot # **145**

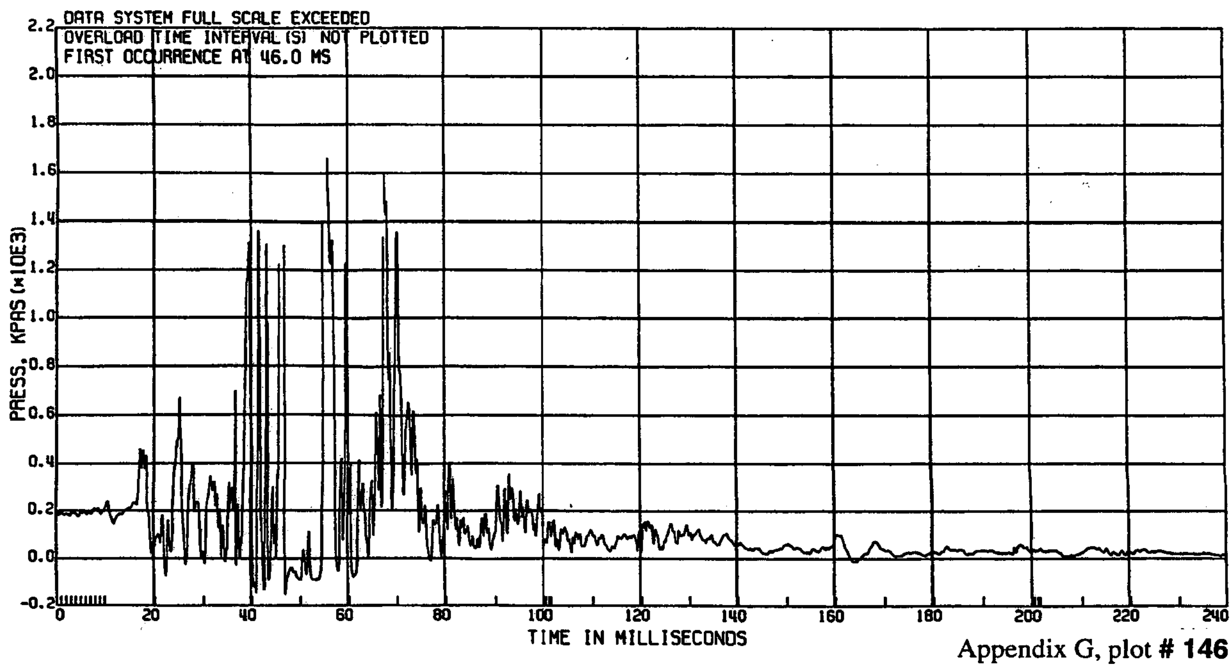
145

C11647 L. SIDE IMPACT-338 DEG LTV MDB TO STATIONARY VEHICLE 104.3KM/H

R & D CTR 1VF46080 1FP87
ELEC DATA, SAE CLASS 1000

TRANSMISSION COOLER PRESSURE

TEST DATE:06/18/1997




Appendix G, plot # **146**

146

# Appendix H

**Appendix H**: C11647 hydrocarbon vapor measurement plots

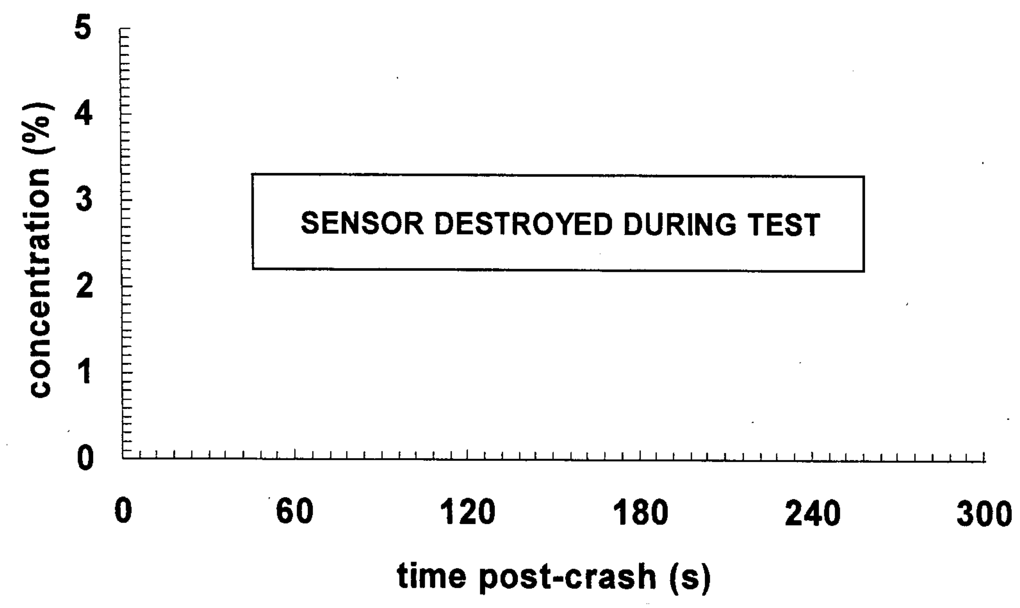



**Figure H1**

Concentration of Hydrocarbon Vapor Measured Near the Fuel Line (Location #1)

Test C11647

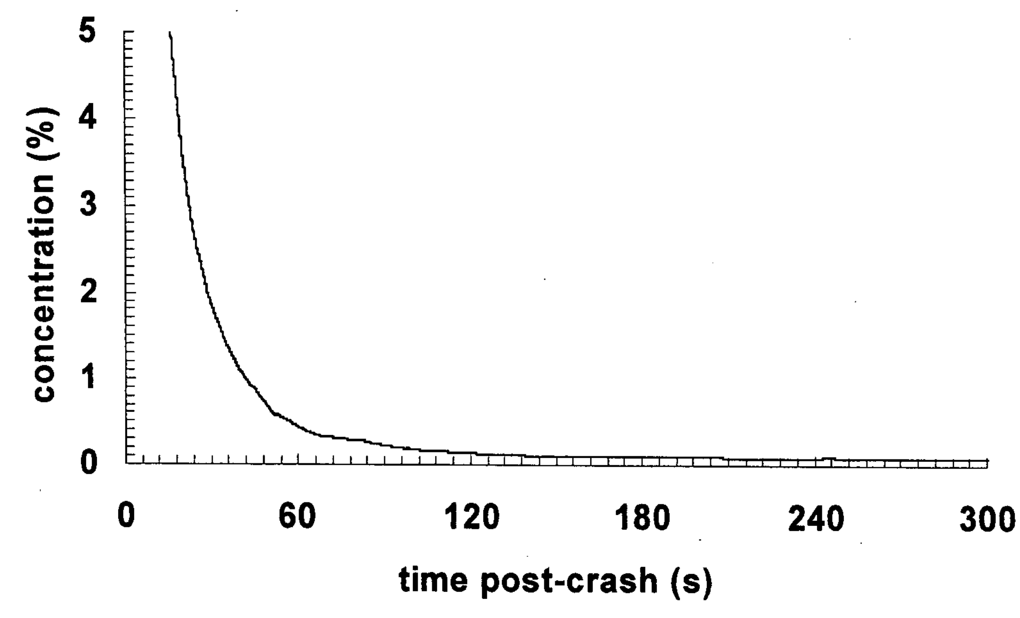



**Figure H2**

Concentration of Hydrocarbon Vapor Measured above the Left Exhaust Manifold (Location #2)

Test C11647

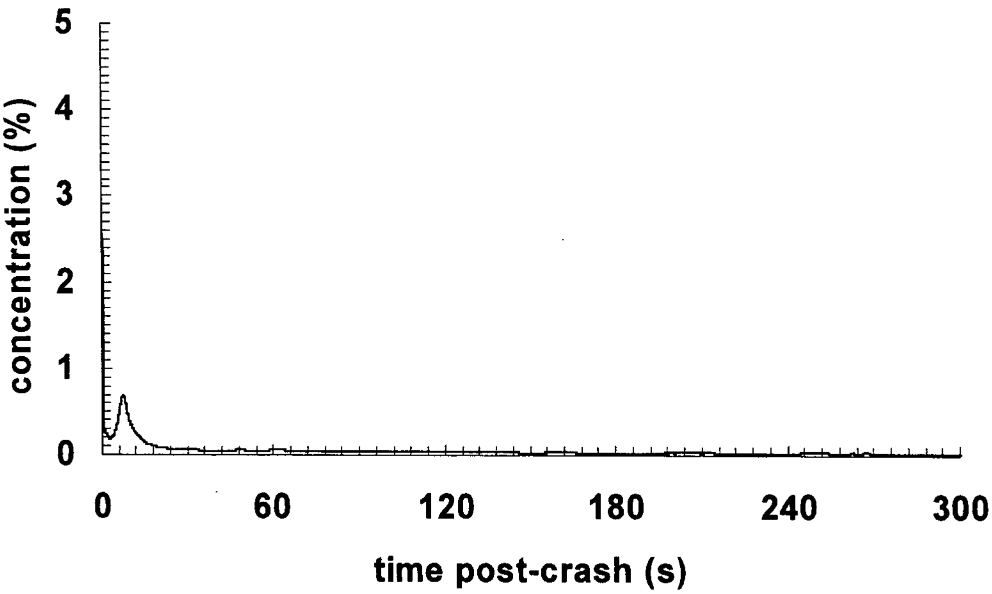



**Figure H3**

Concentration of Hydrocarbon Vapor Measured above the Left Fuel Rail (Location #3)

Test C11647

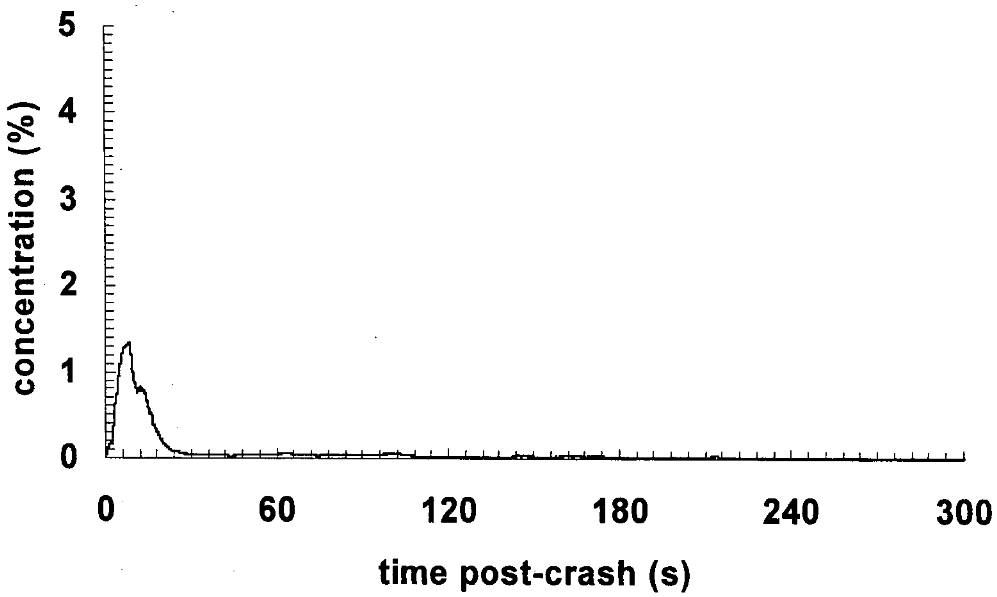



**Figure H4**

Concentration of Hydrocarbon Vapor Measured above the Right Fuel Rail (Location #4)

Test C11647

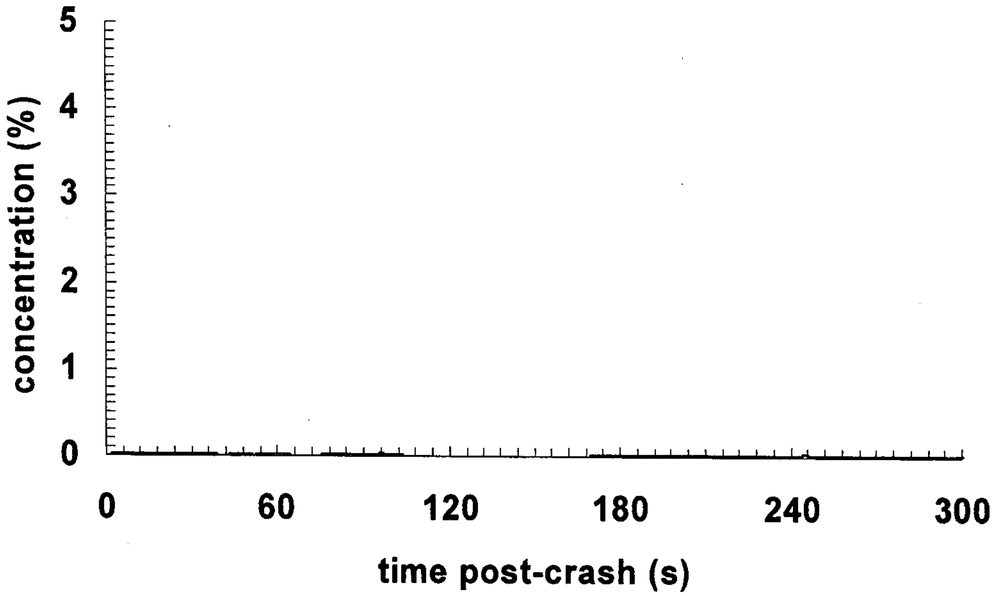



**Figure H5**

Concentration Of Hydrocarbon Vapor Measured Near The Catalytic Converter (Location #5)

Test C11647

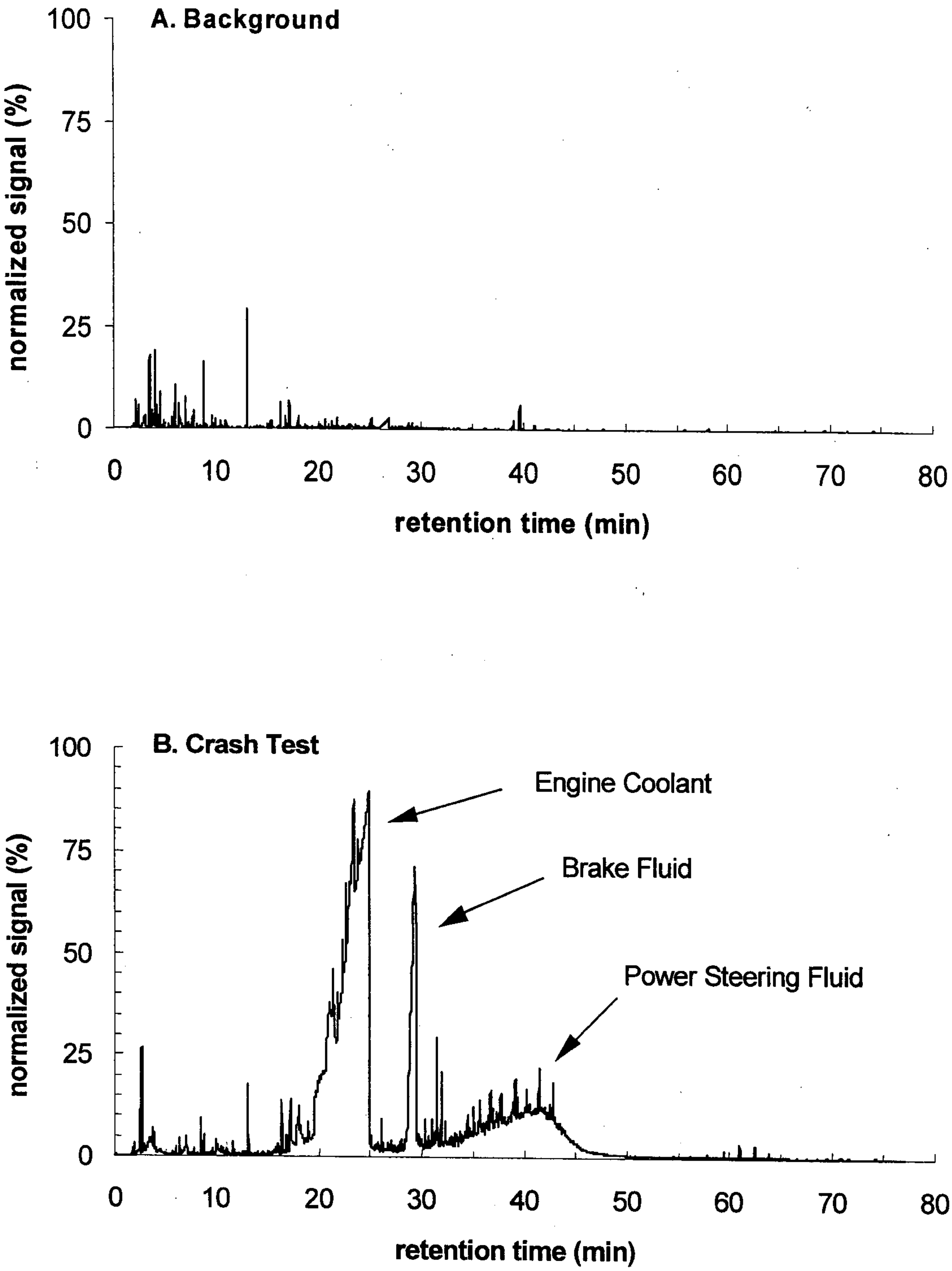



**Figure HH1**
GC/FID analysis of hydrocarbon vapor sample from the fuel line feed through in the left wheelwell (location #1) during Crash Test C11647. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.

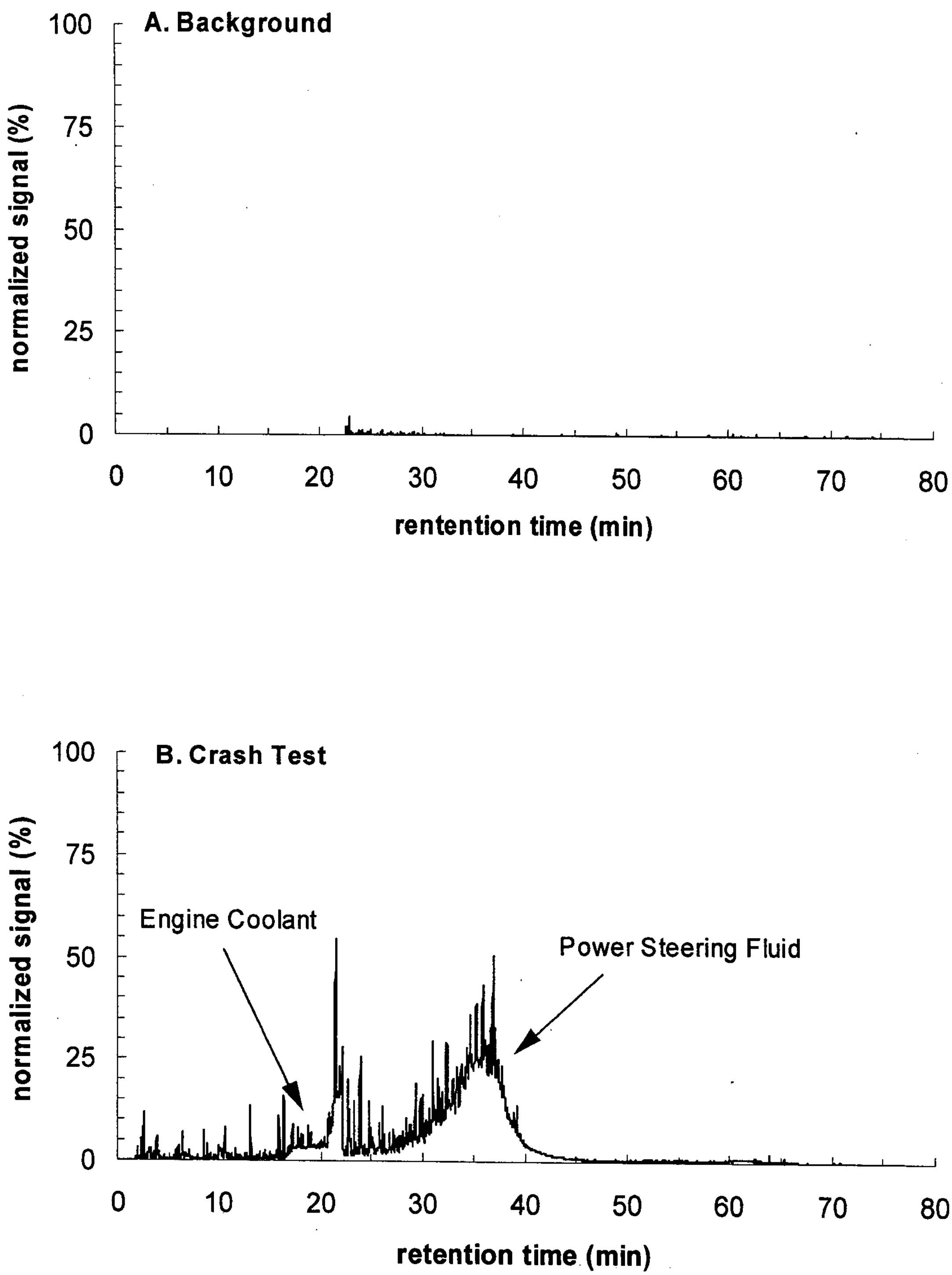
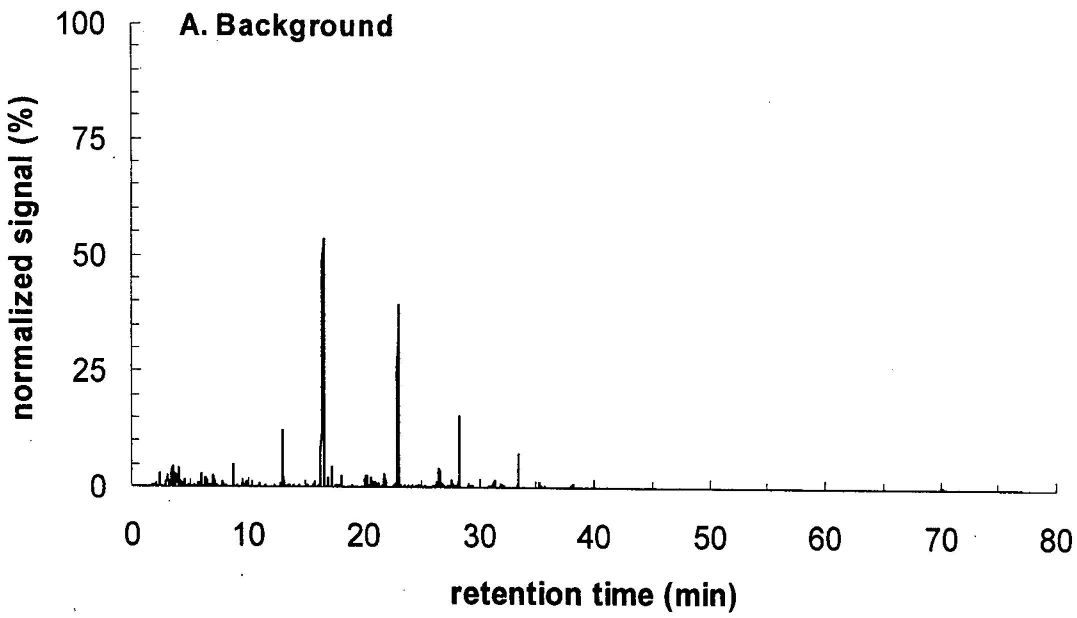



**Figure HH2**
GC/FID analysis of hydrocarbon vapor sample above left exhaust manifold (location # 2) during Crash Test C11647. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.



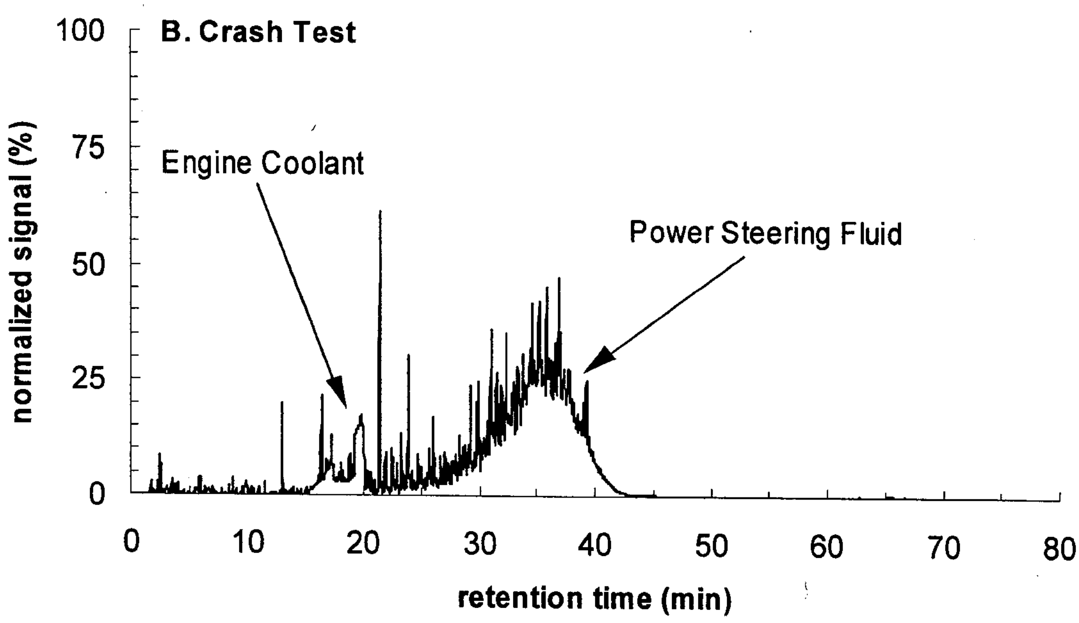




**Figure HH3.**
GC/FID analysis of hydrocarbon vapor sample above the left fuel rail (location # 3) during Crash Test C11647. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.

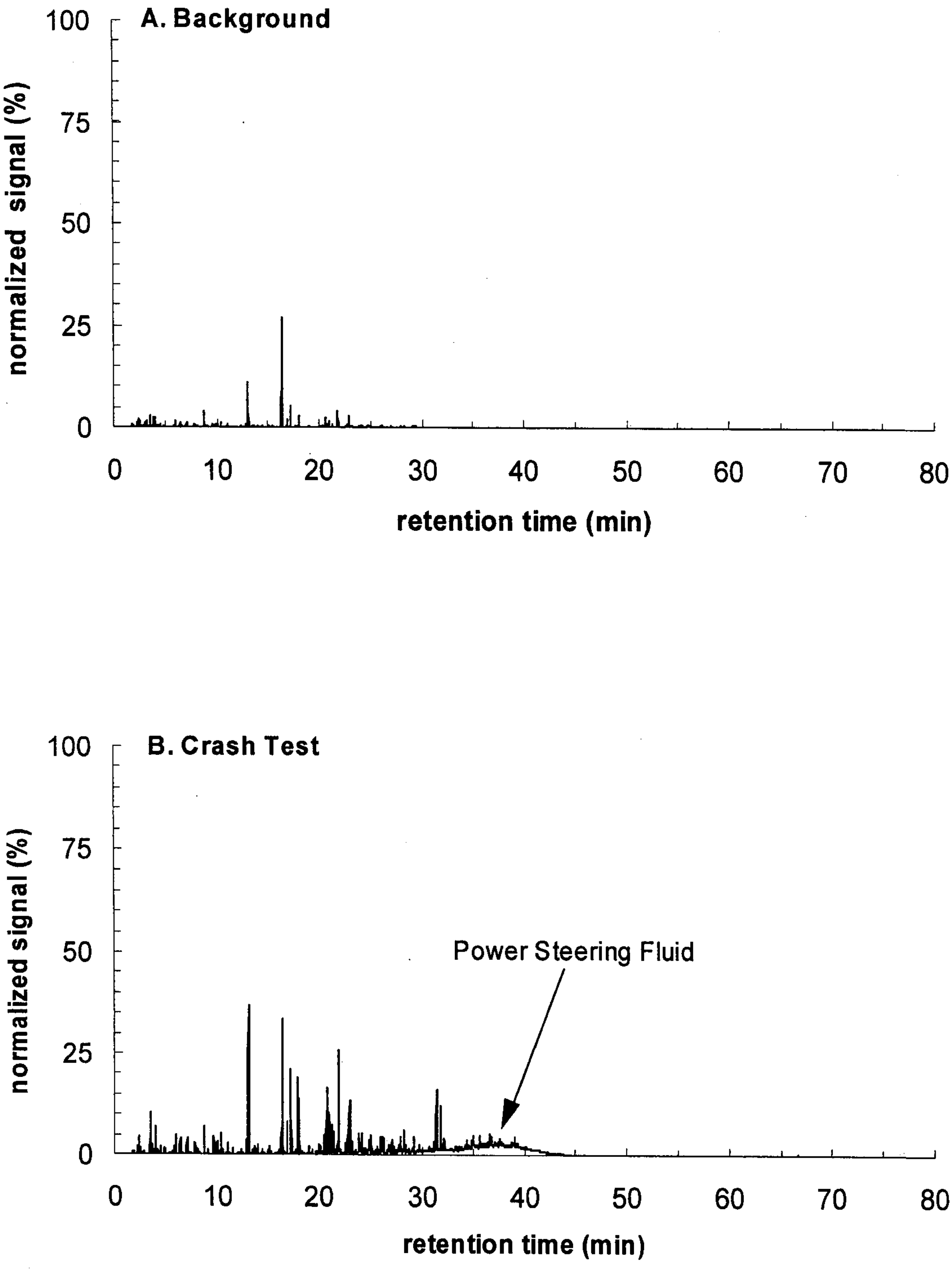



**Figure HH4**
GC/FID analysis of hydrocarbon vapor sample above right fuel rail (location # 4) during Crash Test C11647. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.

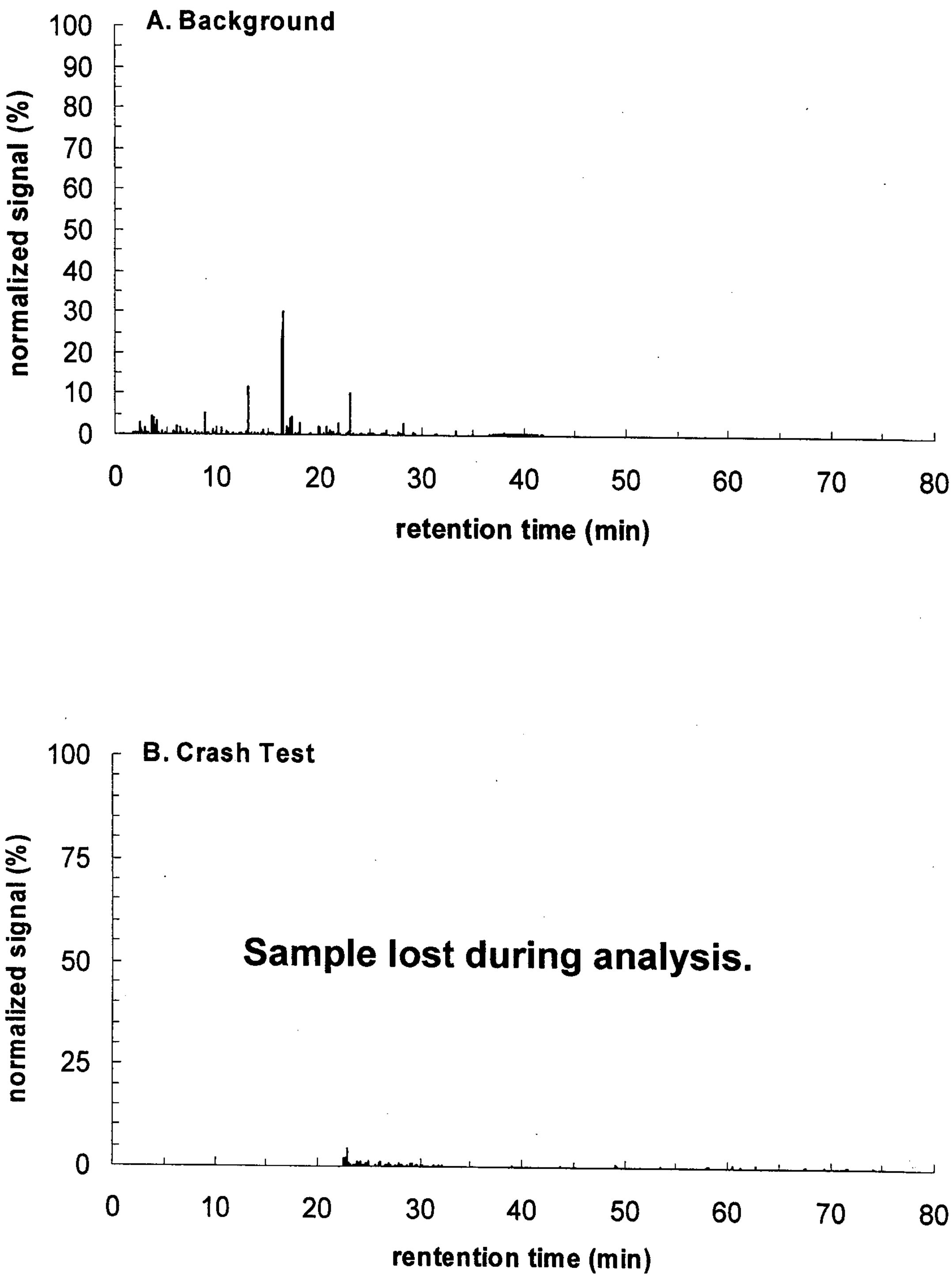



**Figure HH5**
GC/FID analysis of hydrocarbon vapor sample near catalytic converter (location #5) during Crash Test C11647. Panel A shows the chromatogram of background sample and panel B shows the chromatogram of the post-crash sample.

# Appendix I

**Appendix I:** Instrumentation Summaries

Standard ISF Printout

Test Number : C11408
Test Type : REAR IMPACT
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

ATD Usage:

| Position | ID Number |
|---|---|
| | |
| | |
| | |

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G15 | VOLTAGE.1 | 5 | N | V | TIME ZERO | | | VOLTAGE, VOLTS | 0011 |
| 2 | G16 | VOLTAGE.1 | 5 | N | V | PHOTO TIMING | | | VOLTAGE, VOLTS | 0021 |
| 3 | C01 | CN25.1 | 200 | N | G | L. FRT | HEAD | LONGITUDINAL | ACCEL, G'S | 0031 |
| 4 | C02 | CP81.1 | 200 | N | G | L. FRT | HEAD | LATERAL | ACCEL, G'S | 0041 |
| 5 | C03 | FN17.1 | 200 | N | G | L. FRT | HEAD | VERTICAL | ACCEL, G'S | 0051 |
| 6 | C04 | CR82.1 | 200 | R | G | L. FRT | CHEST | LONGITUDINAL | ACCEL, G'S | 0062 |
| 7 | C05 | CV14.1 | 200 | N | G | L. FRT | CHEST | LATERAL | ACCEL, G'S | 0071 |
| 8 | C06 | DB53.1 | 200 | R | G | L. FRT | CHEST | VERTICAL | ACCEL, G'S | 0082 |
| 9 | C10 | P50N.1 | 6000 | N | N | L. FRT | NECK | UAP SHEAR | LOAD, N'S | 0091 |
| 10 | C11 | P50N.2 | 6000 | N | N | L. FRT | NECK | URL SHEAR | LOAD, N'S | 0101 |
| 11 | C12 | P50N.3 | 6000 | N | N | L. FRT | NECK | UPPER AXIAL | LOAD, N'S | 0111 |
| 12 | C13 | P50N.4 | 400 | N | N-M | L. FRT | NECK | URL MOMENT | MOMENT, NM'S | 0121 |
| 13 | C14 | P50N.5 | 400 | N | N-M | L. FRT | NECK | UAP MOMENT | MOMENT, NM'S | 0131 |
| 14 | C15 | P50N.6 | 400 | N | N-M | L. FRT | NECK | ROT MOMENT | MOMENT, NM'S | 0141 |
| 15 | D01 | DA88.1 | 200 | N | G | R. FRT | HEAD | LONGITUDINAL | ACCEL, G'S | 0151 |
| 16 | D02 | DA96.1 | 200 | N | G | R. FRT | HEAD | LATERAL | ACCEL, G'S | 0161 |
| 17 | D03 | DB57.1 | 200 | N | G | R. FRT | HEAD | VERTICAL | ACCEL, G'S | 0171 |
| 18 | D04 | AA77.1 | 200 | R | G | R. FRT | CHEST | LONGITUDINAL | ACCEL, G'S | 0182 |
| 19 | D05 | AA78.1 | 200 | N | G | R. FRT | CHEST | LATERAL | ACCEL, G'S | 0191 |
| 20 | D06 | AA79.1 | 200 | R | G | R. FRT | CHEST | VERTICAL | ACCEL, G'S | 0202 |
| 21 | D10 | P18N.1 | 6000 | N | N | R. FRT | NECK | UAP SHEAR | LOAD, N'S | 0211 |
| 22 | D11 | P18N.2 | 6000 | N | N | R. FRT | NECK | URL SHEAR | LOAD, N'S | 0221 |
| 23 | D12 | P18N.3 | 6000 | N | N | R. FRT | NECK | UPPER AXIAL | LOAD, N'S | 0231 |
| 24 | D13 | P18N.4 | 400 | N | N-M | R. FRT | NECK | URL MOMENT | MOMENT, NM'S | 0241 |
| 25 | D14 | P18N.5 | 400 | N | N-M | R. FRT | NECK | UAP MOMENT | MOMENT, NM'S | 0251 |
| 26 | D15 | P18N.6 | 400 | N | N-M | R. FRT | NECK | ROT MOMENT | MOMENT, NM'S | 0261 |
| 27 | A01 | ANAF9.1 | 450 | N | G | L. FRT | ROCKER | LONGITUDINAL | ACCEL, G'S | 0271 |
| 28 | A02 | ANAH0.1 | 450 | N | G | L. FRT | ROCKER | LATERAL | ACCEL, G'S | 0281 |
| 29 | A03 | ANAM4.1 | 450 | N | G | L. FRT | ROCKER | VERTICAL | ACCEL, G'S | 0291 |
| 30 | A04 | J12385.1 | 450 | N | G | R. FRT | ROCKER | LONGITUDINAL | ACCEL, G'S | 0301 |
| 31 | A05 | J12393.1 | 450 | R | G | R. FRT | ROCKER | LATERAL | ACCEL, G'S | 0312 |
| 32 | A06 | J12389.1 | 450 | R | G | R. FRT | ROCKER | VERTICAL | ACCEL, G'S | 0322 |

Date: 01-12-2001 Time: 13:42:01

Standard ISF Printout

Test Number : C11408
Test Type : REAR IMPACT
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 33 | A07 | AHTH4.1 | 750 | N | G | L. REAR | FRAME | LONGITUDINAL | ACCEL,G'S | 0331 |
| 34 | A08 | AHY08.1 | 750 | N | G | L. REAR | FRAME | LATERAL | ACCEL,G'S | 0341 |
| 35 | A09 | AHYY7.1 | 750 | N | G | L. REAR | FRAME | VERTICAL | ACCEL,G'S | 0351 |
| 36 | A10 | J12244.1 | 750 | R | G | R. REAR | FRAME | LONGITUDINAL | ACCEL,G'S | 0362 |
| 37 | A11 | J12246.1 | 750 | N | G | R. REAR | FRAME | LATERAL | ACCEL,G'S | 0371 |
| 38 | A12 | J12234.1 | 750 | R | G | R. REAR | FRAME | VERTICAL | ACCEL,G'S | 0382 |
| 39 | A13 | J12243.1 | 450 | N | G | L. REAR | ROCKER | LONGITUDINAL | ACCEL,G'S | 0391 |
| 40 | A14 | J12160.1 | 450 | N | G | L. REAR | ROCKER | LATERAL | ACCEL,G'S | 0401 |
| 41 | A15 | J12196.1 | 450 | N | G | L. REAR | ROCKER | VERTICAL | ACCEL,G'S | 0411 |
| 42 | A16 | J12274.1 | 450 | N | G | R. REAR | ROCKER | LONGITUDINAL | ACCEL,G'S | 0421 |
| 43 | A17 | J12271.1 | 450 | R | G | R. REAR | ROCKER | LATERAL | ACCEL,G'S | 0432 |
| 44 | A18 | J12288.1 | 450 | R | G | R. REAR | ROCKER | VERTICAL | ACCEL,G'S | 0442 |
| 45 | A19 | J12312.1 | 450 | R | G | CTR | CENTER TUNNEL | LONGITUDINAL | ACCEL,G'S | 0452 |
| 46 | A20 | J12307.1 | 450 | N | G | CTR | CENTER TUNNEL | LATERAL | ACCEL,G'S | 0461 |
| 47 | A21 | J12306.1 | 450 | N | G | CTR | CENTER TUNNEL | VERTICAL | ACCEL,G'S | 0471 |
| 48 | B01 | VOLTCOND.1 | 20 | N | V | | IGNITION | | VOLTAGE,VOLTS | 0481 |
| 49 | B02 | VOLTCOND.1 | 20 | N | V | | CHMSL | | VOLTAGE,VOLTS | 0491 |
| 50 | B03 | VOLTCOND.1 | 20 | N | V | REAR | WINDOW DEFROSTER | | VOLTAGE,VOLTS | 0501 |
| 51 | B04 | VOLTCOND.1 | 20 | N | V | L. REAR | BRAKE LIGHT | | VOLTAGE,VOLTS | 0511 |
| 52 | B05 | VOLTCOND.1 | 20 | N | V | L. REAR | BACKUP LIGHT | | VOLTAGE,VOLTS | 0521 |
| 53 | B06 | VOLTCOND.1 | 20 | N | V | L. REAR | TAIL LIGHT | | VOLTAGE,VOLTS | 0531 |
| 54 | B07 | VOLTCOND.1 | 20 | N | V | L. REAR | TURN SIGNAL | | VOLTAGE,VOLTS | 0541 |
| 55 | B08 | CP132.1 | 10 | N | A | L. | WHEEL BAG | | CURRENT,AMPS | 0551 |
| 56 | B09 | CP224.1 | 20 | N | A | | CHMSL | | CURRENT,AMPS | 0561 |
| 57 | B10 | CP114.1 | 20 | N | A | REAR | WINDOW DEFROSTER | | CURRENT,AMPS | 0571 |
| 58 | B11 | CP190.1 | 20 | N | A | L. REAR | BRAKE LIGHT | | CURRENT,AMPS | 0581 |
| 59 | B12 | CP142.1 | 20 | N | A | L. REAR | BACKUP LIGHT | | CURRENT,AMPS | 0591 |
| 60 | B13 | CP210.1 | 20 | N | A | L. REAR | TAIL LIGHT | | CURRENT,AMPS | 0601 |
| 61 | B14 | CP151.1 | 20 | N | A | L. REAR | TURN SIGNAL | | CURRENT,AMPS | 0611 |
| 62 | B15 | AM6F0.1 | 1400 | N | KPA | | FUEL LINE | | PRESSURE,KPA'S | 0621 |
| 63 | B16 | AM1C4.1 | 1400 | N | KPA | | FUEL LINE RETURN | | PRESSURE,KPA'S | 0631 |
| 64 | B17 | CONTACT.1 | 8 | N | V | | PNEUMATIC WIRE FAULT | | CONTACT,N/C | 0641 |

Date: 01-12-2001 Time: 13:42:05

Standard ISF Printout

Test Number : C11408
Test Type : REAR IMPACT
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 65 | B18 | CONTACT.1 | 8 | N | V | | PNEUMATIC WIRE | | CONTACT,N/O | 0651 |
| 66 | B19 | CONTACT.1 | 8 | N | V | | THERMAL WIRE-FRONT | | CONTACT,N/O | 0661 |
| 67 | B20 | CONTACT.1 | 8 | N | V | | THERMAL WIRE-REAR | | CONTACT,N/O | 0671 |
| 68 | B21 | CONTACT.1 | 8 | N | V | CTR | CARGO TUB | | CONTACT,N/O | 0681 |
| 69 | B22 | CONTACT.1 | 8 | N | V | L. REAR | BUMPER BEAM TO CARGO TUB | | CONTACT,N/O | 0691 |
| 70 | B23 | CONTACT.1 | 8 | N | V | R. REAR | BUMPER BEAM TO CARGO TUB | | CONTACT,N/O | 0701 |
| 71 | B24 | CONTACT.1 | 8 | N | V | CTR | FUEL TANK-FRONT | | CONTACT,N/O | 0711 |
| 72 | B25 | CONTACT.1 | 8 | N | V | CTR | FUEL TANK-REAR | | CONTACT,N/O | 0721 |
| 73 | E01 | A98C.1 | 250 | N | G | | LTV MDB AT C.G. | LONGITUDINAL | ACCEL,G'S | 0731 |
| 74 | E02 | AN3P2.1 | 250 | R | G | | LTV MDB AT C.G. | LATERAL | ACCEL,G'S | 0742 |
| 75 | E03 | A58A.1 | 250 | N | G | | LTV MDB AT C.G. | VERTICAL | ACCEL,G'S | 0751 |
| 76 | E04 | J12804.1 | 250 | N | G | | LTV MDB AT REAR C/MBR | LONGITUDINAL | ACCEL,G'S | 0761 |
| 77 | E05 | J12812.1 | 250 | R | G | | LTV MDB AT REAR C/MBR | LATERAL | ACCEL,G'S | 0772 |
| 78 | E06 | J12759.1 | 250 | N | G | | LTV MDB AT REAR C/MBR | VERTICAL | ACCEL,G'S | 0781 |
| 79 | F01 | 11676.1 | 10000 | N | KPA | STL EVAL | SNUBBER WEST BRAKE PRESSURE | | PRESSURE,KPA'S | 0791 |
| 80 | F02 | 1128.1 | 10000 | N | KPA | STL EVAL | SNUBBER EAST BRAKE PRESSURE | | PRESSURE,KPA'S | 0801 |

Standard ISF Printout

Test Number : C11591
Test Type : FRT HI POLE OFFSET,RT
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

ATD Usage:

| Position | ID Number |
|---|---|
| | |
| | |
| | |

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G15 | VOLTAGE.1 | 5 | N | V | TIME ZERO | | | VOLTAGE,VOLTS | 0011 |
| 2 | G16 | VOLTAGE.1 | 5 | N | V | PHOTO TIMING | | | VOLTAGE,VOLTS | 0021 |
| 3 | D01 | CS67.1 | 200 | N | G | L. FRT | HEAD | LONGITUDINAL | ACCEL,G'S | 0031 |
| 4 | D02 | CV20.1 | 200 | N | G | L. FRT | HEAD | LATERAL | ACCEL,G'S | 0041 |
| 5 | D03 | CV31.1 | 200 | N | G | L. FRT | HEAD | VERTICAL | ACCEL,G'S | 0051 |
| 6 | D04 | CM30.1 | 200 | R | G | L. FRT | CHEST | LONGITUDINAL | ACCEL,G'S | 0062 |
| 7 | D05 | CM34.1 | 200 | N | G | L. FRT | CHEST | LATERAL | ACCEL,G'S | 0071 |
| 8 | D06 | CM71.1 | 200 | R | G | L. FRT | CHEST | VERTICAL | ACCEL,G'S | 0082 |
| 9 | D07 | CK69.1 | 200 | N | G | L. FRT | PELVIC | LONGITUDINAL | ACCEL,G'S | 0091 |
| 10 | D08 | CS45.1 | 200 | N | G | L. FRT | PELVIC | LATERAL | ACCEL,G'S | 0101 |
| 11 | D09 | CM89.1 | 200 | N | G | L. FRT | PELVIC | VERTICAL | ACCEL,G'S | 0111 |
| 12 | D20 | P48L.1 | 14000 | N | N | L. FRT | FEMUR | LEFT | LOAD,N'S | 0121 |
| 13 | D21 | P48R.1 | 14000 | N | N | L. FRT | FEMUR | RIGHT | LOAD,N'S | 0131 |
| 14 | D22 | P48D.1 | 80 | N | MM | L. FRT | CHEST | LONGITUDINAL | DISPL,MM'S | 0141 |
| 15 | D10 | P48N.1 | 6000 | N | N | L. FRT | NECK | UAP SHEAR | LOAD,N'S | 0151 |
| 16 | D11 | P48N.2 | 6000 | N | N | L. FRT | NECK | URL SHEAR | LOAD,N'S | 0161 |
| 17 | D12 | P48N.3 | 6000 | N | N | L. FRT | NECK | UPPER AXIAL | LOAD,N'S | 0171 |
| 18 | D13 | P48N.4 | 400 | N | N-M | L. FRT | NECK | URL MOMENT | MOMENT,NM'S | 0181 |
| 19 | D14 | P48N.5 | 400 | N | N-M | L. FRT | NECK | UAP MOMENT | MOMENT,NM'S | 0191 |
| 20 | D15 | P48N.6 | 400 | N | N-M | L. FRT | NECK | ROT MOMENT | MOMENT,NM'S | 0201 |
| 21 | D23 | P48TUL.1 | 400 | N | N-M | L. FRT | LEFT TIBIA | URL MOMENT | MOMENT,NM'S | 0211 |
| 22 | D24 | P48TUL.2 | 400 | N | N-M | L. FRT | LEFT TIBIA | UAP MOMENT | MOMENT,NM'S | 0221 |
| 23 | D25 | P48TLL.1 | 400 | N | N-M | L. FRT | LEFT TIBIA | LAP MOMENT | MOMENT,NM'S | 0231 |
| 24 | D26 | P48TLL.2 | 10000 | N | N | L. FRT | LEFT TIBIA | LAP SHEAR | LOAD,N'S | 0241 |
| 25 | D27 | P48TLL.3 | 8000 | N | N | L. FRT | LEFT TIBIA | LOWER AXIAL | LOAD,N'S | 0251 |
| 26 | D16 | P48KNL.1 | 7000 | N | N | L. FRT | LEFT KNEE | L. CLEVIS | LOAD,N'S | 0261 |
| 27 | D17 | P48KNL.2 | 7000 | N | N | L. FRT | LEFT KNEE | R. CLEVIS | LOAD,N'S | 0271 |
| 28 | C13 | P48TUR.1 | 400 | N | N-M | L. FRT | RIGHT TIBIA | URL MOMENT | MOMENT,NM'S | 0281 |
| 29 | C14 | P48TUR.2 | 400 | N | N-M | L. FRT | RIGHT TIBIA | UAP MOMENT | MOMENT,NM'S | 0291 |
| 30 | C15 | P48TLR.1 | 400 | N | N-M | L. FRT | RIGHT TIBIA | LAP MOMENT | MOMENT,NM'S | 0301 |
| 31 | C12 | P48TLR.2 | 10000 | N | N | L. FRT | RIGHT TIBIA | LAP SHEAR | LOAD,N'S | 0311 |
| 32 | C16 | P48TLR.3 | 8000 | N | N | L. FRT | RIGHT TIBIA | LOWER AXIAL | LOAD,N'S | 0321 |

Date: 01-12-2001 Time: 13:43:02

Standard ISF Printout

Test Number : C11591
Test Type : FRT HI POLE OFFSET,RT
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 33 | D18 | P48KNR.1 | 7000 | N | N | L. FRT | RIGHT KNEE | L. CLEVIS | LOAD,N'S | 0331 |
| 34 | D19 | P48KNR.2 | 7000 | N | N | L. FRT | RIGHT KNEE | R. CLEVIS | LOAD,N'S | 0341 |
| 35 | A01 | P48TFL.1 | 24 | N | MM | L. FRT | TIBIA/FEMUR LEFT | | DISPL,MM'S | 0351 |
| 36 | A02 | P48TFR.1 | 24 | N | MM | L. FRT | TIBIA/FEMUR RIGHT | | DISP,MM'S | 0361 |
| 37 | E01 | CR84.1 | 200 | N | G | R. FRT | HEAD | LONGITUDINAL | ACCEL,G'S | 0371 |
| 38 | E02 | CS08.1 | 200 | N | G | R. FRT | HEAD | LATERAL | ACCEL,G'S | 0381 |
| 39 | E03 | CX20.1 | 200 | N | G | R. FRT | HEAD | VERTICAL | ACCEL,G'S | 0391 |
| 40 | E04 | CU48.1 | 200 | N | G | R. FRT | CHEST | LONGITUDINAL | ACCEL,G'S | 0401 |
| 41 | E05 | CV53.1 | 200 | N | G | R. FRT | CHEST | LATERAL | ACCEL,G'S | 0411 |
| 42 | E06 | CS23.1 | 200 | R | G | R. FRT | CHEST | VERTICAL | ACCEL,G'S | 0422 |
| 43 | E07 | CG37.1 | 200 | N | G | R. FRT | PELVIC | LONGITUDINAL | ACCEL,G'S | 0431 |
| 44 | E08 | CN57.1 | 200 | N | G | R. FRT | PELVIC | LATERAL | ACCEL,G'S | 0441 |
| 45 | E09 | CQ88.1 | 200 | N | G | R. FRT | PELVIC | VERTICAL | ACCEL,G'S | 0451 |
| 46 | E20 | P56L.1 | 14000 | N | N | R. FRT | FEMUR | LEFT | LOAD,N'S | 0461 |
| 47 | E21 | P56R.1 | 14000 | N | N | R. FRT | FEMUR | RIGHT | LOAD,N'S | 0471 |
| 48 | E22 | P56D.1 | 80 | N | MM | R. FRT | CHEST | LONGITUDINAL | DISPL,MM'S | 0481 |
| 49 | E10 | P56N.1 | 6000 | N | N | R. FRT | NECK | UAP SHEAR | LOAD,N'S | 0491 |
| 50 | E11 | P56N.2 | 6000 | N | N | R. FRT | NECK | URL SHEAR | LOAD,N'S | 0501 |
| 51 | E12 | P56N.3 | 6000 | N | N | R. FRT | NECK | UPPER AXIAL | LOAD,N'S | 0511 |
| 52 | E13 | P56N.4 | 400 | N | N-M | R. FRT | NECK | URL MOMENT | MOMENT,NM'S | 0521 |
| 53 | E14 | P56N.5 | 400 | N | N-M | R. FRT | NECK | UAP MOMENT | MOMENT,NM'S | 0531 |
| 54 | E15 | P56N.6 | 400 | N | N-M | R. FRT | NECK | ROT MOMENT | MOMENT,NM'S | 0541 |
| 55 | E23 | P56TUL.1 | 395 | N | N-M | R. FRT | LEFT TIBIA | URL MOMENT | MOMENT,NM'S | 0551 |
| 56 | E24 | P56TUL.2 | 395 | N | N-M | R. FRT | LEFT TIBIA | UAP MOMENT | MOMENT,NM'S | 0561 |
| 57 | E25 | P56TLL.1 | 395 | N | N-M | R. FRT | LEFT TIBIA | LAP MOMENT | MOMENT,NM'S | 0571 |
| 58 | E26 | P56TLL.2 | 10000 | N | N | R. FRT | LEFT TIBIA | LAP SHEAR | LOAD,N'S | 0581 |
| 59 | E27 | P56TUL.3 | 8000 | N | N | R. FRT | LEFT TIBIA | LOWER AXIAL | LOAD,N'S | 0591 |
| 60 | E16 | P56KNL.1 | 7000 | N | N | R. FRT | LEFT KNEE | L. CLEVIS | LOAD,N'S | 0601 |
| 61 | E17 | P56KNL.2 | 7000 | N | N | R. FRT | LEFT KNEE | R. CLEVIS | LOAD,N'S | 0611 |
| 62 | E28 | P56TUR.1 | 395 | N | N-M | R. FRT | RIGHT TIBIA | URL MOMENT | MOMENT,NM'S | 0621 |
| 63 | E29 | P56TUR.2 | 395 | N | N-M | R. FRT | RIGHT TIBIA | UAP MOMENT | MOMENT,NM'S | 0631 |
| 64 | E30 | P56TLR.1 | 395 | N | N-M | R. FRT | RIGHT TIBIA | LAP MOMENT | MOMENT,NM'S | 0641 |

Date: 01-12-2001 Time: 13:43:06

Standard ISF Printout

Test Number : C11591
Test Type : FRT HI POLE OFFSET,RT
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 65 | E31 | P56TLR.2 | 10000 | N | N | R. FRT | RIGHT TIBIA | LAP SHEAR | LOAD,N'S | 0651 |
| 66 | E32 | P56TUR.3 | 8000 | N | N | R. FRT | RIGHT TIBIA | LOWER AXIAL | LOAD,N'S | 0661 |
| 67 | E18 | P56KNR.1 | 7000 | N | N | R. FRT | RIGHT KNEE | L. CLEVIS | LOAD,N'S | 0671 |
| 68 | E19 | P56KNR.2 | 7000 | N | N | R. FRT | RIGHT KNEE | R. CLEVIS | LOAD,N'S | 0681 |
| 69 | C01 | P56STL.1 | 24 | N | MM | R. FRT | TIBIA/FEMUR LEFT | | DISP,MM'S | 0691 |
| 70 | C02 | P56STR.1 | 24 | N | MM | R. FRT | TIBIA/FEMUR RIGHT | | DISP,MM'S | 0701 |
| 71 | C03 | P56TUL.4 | 10000 | N | N | R. FRT | LEFT TIBIA | FX-FORE/AFT | LOAD,N'S | 0711 |
| 72 | C04 | P56TLL.3 | 10000 | N | N | R. FRT | LEFT TIBIA | FY-LAT SHEAR | LOAD,N'S | 0721 |
| 73 | C05 | P56TLL.4 | 400 | N | N-M | R. FRT | LEFT TIBIA | MX-LONGITUDINAL | MOMENT,NM'S | 0731 |
| 74 | C06 | P56TUR.4 | 10000 | N | N | R. FRT | RIGHT TIBIA | FX-FORE/AFT | LOAD,N'S | 0741 |
| 75 | C07 | P56TLR.3 | 10000 | N | N | R. FRT | RIGHT TIBIA | FY-LAT SHEAR | LOAD,N'S | 0751 |
| 76 | C08 | P56TLR.4 | 400 | N | N-M | R. FRT | RIGHT TIBIA | MX-LONGITUDINAL | MOMENT,NM'S | 0761 |
| 77 | A03 | LS116.1 | 700 | N | N-M | L. FRT | LOWER LUMBAR | MY-LAT. AXIS | MOMENT,NM'S | 0771 |
| 78 | A04 | LS116.2 | 10000 | N | N | L. FRT | LOWER LUMBAR | FX-FORE/AFT | LOAD,N'S | 0781 |
| 79 | A05 | LS116.3 | 6000 | N | N | L. FRT | LOWER LUMBAR | FZ-AXIAL | LOAD,N'S | 0791 |
| 80 | C09 | LS145.1 | 700 | N | N-M | R. FRT | LOWER LUMBAR | MY-LAT. AXIS | MOMENT,NM'S | 0801 |
| 81 | C10 | LS145.2 | 10000 | N | N | R. FRT | LOWER LUMBAR | FX-FORE/AFT | LOAD,N'S | 0811 |
| 82 | C11 | LS145.3 | 6000 | N | N | R. FRT | LOWER LUMBAR | FZ-AXIAL | LOAD,N'S | 0821 |
| 83 | A06 | J17560.1 | 450 | N | G | L. FRT | ROCKER | LONGITUDINAL | ACCEL,G'S | 0831 |
| 84 | A07 | J17561.1 | 450 | N | G | L. FRT | ROCKER | LATERAL | ACCEL,G'S | 0841 |
| 85 | A08 | J17563.1 | 450 | R | G | L. FRT | ROCKER | VERTICAL | ACCEL,G'S | 0852 |
| 86 | A09 | J11703.1 | 450 | N | G | R. FRT | ROCKER | LONGITUDINAL | ACCEL,G'S | 0861 |
| 87 | A10 | J11702.1 | 450 | N | G | R. FRT | ROCKER | LATERAL | ACCEL,G'S | 0871 |
| 88 | A11 | J11701.1 | 450 | R | G | R. FRT | ROCKER | VERTICAL | ACCEL,G'S | 0882 |
| 89 | A12 | J11816.1 | 500 | N | G | R. | FLOORPAN | LONGITUDINAL | ACCEL,G'S | 0891 |
| 90 | A13 | AN8K6.1 | 450 | N | G | L. REAR | ROCKER | LONGITUDINAL | ACCEL,G'S | 0901 |
| 91 | A14 | AN8F7.1 | 450 | N | G | L. REAR | ROCKER | LATERAL | ACCEL,G'S | 0911 |
| 92 | A15 | ANAY1.1 | 450 | R | G | L. REAR | ROCKER | VERTICAL | ACCEL,G'S | 0922 |
| 93 | A16 | J12281.1 | 450 | R | G | R. REAR | ROCKER | LONGITUDINAL | ACCEL,G'S | 0932 |
| 94 | A17 | ANB50.1 | 450 | R | G | R. REAR | ROCKER | LATERAL | ACCEL,G'S | 0942 |
| 95 | A18 | J12478.1 | 450 | R | G | R. REAR | ROCKER | VERTICAL | ACCEL,G'S | 0952 |
| 96 | A19 | J12308.1 | 400 | N | G | CTR | SDM-R REAR CASE #1 | LONGITUDINAL | ACCEL,G'S | 0961 |

Date: 01-12-2001 Time: 13:43:10

Standard ISF Printout

Test Number : C11591
Test Type : FRT HI POLE OFFSET,RT
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 97 | A20 | J12280.1 | 400 | R | G | CTR | SDM-R REAR CASE #1 | LATERAL | ACCEL,G'S | 0972 |
| 98 | A21 | J12291.1 | 400 | N | G | CTR | SDM-R REAR CASE #1 | VERTICAL | ACCEL,G'S | 0981 |
| 99 | A22 | SR84.1 | 400 | N | MM | R. | TOE PAN | LONGITUDINAL | DISPL,MM'S | 0991 |
| 100 | A23 | VOLTCOND.1 | 20 | N | V | | STARTER | | VOLTAGE,VOLTS | 1001 |
| 101 | A24 | VOLTCOND.1 | 20 | N | V | | BATTERY | | VOLTAGE,VOLTS | 1011 |
| 102 | A25 | VOLTCOND.1 | 20 | N | V | | ALTERNATOR | | VOLTAGE,VOLTS | 1021 |
| 103 | C31 | VOLTCOND.1 | 20 | N | V | | FUEL PUMP | | VOLTAGE,VOLTS | 1031 |
| 104 | A27 | VOLTCOND.1 | 20 | N | V | R. FRT | HEADLIGHT - LOW BEAM | | VOLTAGE,VOLTS | 1041 |
| 105 | A28 | VOLTCOND.1 | 20 | N | V | | HIGH BLOWER RELAY | | VOLTAGE,VOLTS | 1051 |
| 106 | A29 | VOLTCOND.1 | 20 | N | V | | RELAY CTR-A | | VOLTAGE,VOLTS | 1061 |
| 107 | A30 | VOLTCOND.1 | 20 | N | V | | RELAY CTR-B | | VOLTAGE,VOLTS | 1071 |
| 108 | A31 | VOLTCOND.1 | 20 | N | V | | IGNITION | | VOLTAGE,VOLTS | 1081 |
| 109 | B01 | VOLTCOND.1 | 20 | N | V | | RADIO ACC-FUSE #4 | | VOLTAGE,VOLTS | 1091 |
| 110 | B02 | VOLTCOND.1 | 20 | N | V | | TAILLIGHT FUSE | | VOLTAGE,VOLTS | 1101 |
| 111 | B03 | VOLTCOND.1 | 20 | N | V | | ABS FUSE #6 | | VOLTAGE,VOLTS | 1111 |
| 112 | B04 | VOLTCOND.1 | 20 | N | V | | HEADLIGHT SWITCH | | VOLTAGE,VOLTS | 1121 |
| 113 | B05 | VOLTAGE.1 | 5 | N | V | L. | OPTICAL FIRE DETECTOR | | VOLTAGE,VOLTS | 1131 |
| 114 | B06 | VOLTAGE.1 | 5 | N | V | R. | OPTICAL FIRE DETECTOR | | VOLTAGE,VOLTS | 1141 |
| 115 | B07 | VOLTAGE.1 | 8 | N | V | | HALL EFFECT SENSOR | | VOLTAGE,VOLTS | 1151 |
| 116 | B08 | VOLTAGE.1 | 5 | N | V | | TACH SIGNAL | | VOLTAGE,VOLTS | 1161 |
| 117 | B09 | VOLTAGE.1 | 5 | N | V | | VAPOR SENSOR (S1) | | VOLTAGE,VOLTS | 1171 |
| 118 | B10 | VOLTAGE.1 | 5 | N | V | | TEMPATURE SENSOR (T1) | | VOLTAGE,VOLTS | 1181 |
| 119 | B11 | VOLTAGE.1 | 5 | N | V | | VAPOR SENSOR (S2) | | VOLTAGE,VOLTS | 1191 |
| 120 | B12 | VOLTAGE.1 | 5 | N | V | | TEMPATURE SENSOR (T2) | | VOLTAGE,VOLTS | 1201 |
| 121 | B13 | VOLTAGE.1 | 5 | N | V | | VAPOR SENSOR (S3) | | VOLTAGE,VOLTS | 1211 |
| 122 | B14 | VOLTAGE.1 | 5 | N | V | | TEMPERTURE SENSOR (T3) | | VOLTAGE,VOLTS | 1221 |
| 123 | B15 | VOLTAGE.1 | 5 | N | V | | VAPOR SENSOR (S4) | | VOLTAGE,VOLTS | 1231 |
| 124 | B16 | VOLTAGE.1 | 5 | N | V | | TEMPATURE SENSOR (T4) | | VOLTAGE,VOLTS | 1241 |
| 125 | B17 | VOLTAGE.1 | 5 | N | V | | VAPOR SENSOR (S5) | | VOLTAGE,VOLTS | 1251 |
| 126 | B18 | VOLTAGE.1 | 5 | N | V | | TEMPATURE SENSOR (T5) | | VOLTAGE,VOLTS | 1261 |
| 127 | B19 | CP210.1 | 10 | N | A | | WHEEL BAG | | CURRENT,AMPS | 1271 |
| 128 | B20 | CP114.1 | 10 | N | A | | I/P BAG | | CURRENT,AMPS | 1281 |

Date: 01-12-2001 Time: 13:43:13

Standard ISF Printout

Test Number : C11591
Test Type : FRT HI POLE OFFSET,RT
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 129 | B21 | CP212.1 | 10 | N | A | | BATTERY | | CURRENT,AMPS | 1291 |
| 130 | C28 | CP161.1 | 20 | N | A | | FUEL PUMP | | CURRENT,AMPS | 1301 |
| 131 | B23 | CP142.1 | 20 | N | A | L. | HORN HI & LO | | CURRENT,AMPS | 1311 |
| 132 | B24 | CP137.1 | 20 | N | A | | HEADLIGHT - LO | | CURRENT,AMPS | 1321 |
| 133 | B25 | CP125.1 | 20 | N | A | | A/C CLUTCH | | CURRENT,AMPS | 1331 |
| 134 | B26 | CP106.1 | 20 | N | A | | COOLING FAN | | CURRENT,AMPS | 1341 |
| 135 | B27 | CP118.1 | 20 | N | A | | HVAC BLOWER | | CURRENT,AMPS | 1351 |
| 136 | C29 | CP226.1 | 20 | N | A | | ALTERNATOR CABLE | | CURRENT,AMPS | 1361 |
| 137 | B29 | APKE2.1 | 14000 | N | KPA | FRT | BRAKE SYSTEM | | PRESSURE,KPA'S | 1371 |
| 138 | B30 | AM1C4.1 | 500 | N | KPA | | FUEL SUPPLY LINE | | PRESSURE,KPA'S | 1381 |
| 139 | B31 | APKC9.1 | 8000 | N | KPA | L. | POWER STEERING | | PRESSURE,KPA'S | 1391 |
| 140 | B32 | 10110.1 | 8000 | N | KPA | R. | POWER STEERING | | PRESSURE,KPA'S | 1401 |
| 141 | C18 | G1002.1 | 200 | N | KPA | | COOLANT SYSTEM | | PRESSURE,KPA'S | 1411 |
| 142 | C19 | AMJM5.1 | 1000 | N | KPA | | ENGINE OIL | | PRESSURE,KPA'S | 1421 |
| 143 | C20 | AM1C6.1 | 1400 | N | KPA | | TRANSMISSION COOLER | | PRESSURE,KPA'S | 1431 |
| 144 | C21 | CONTACT.1 | 8 | N | V | | THERMAL WIRE | | CONTACT,N/O | 1441 |
| 145 | C22 | CONTACT.1 | 8 | N | V | | PNEUMATIC WIRE | | CONTACT,N/O | 1451 |
| 146 | C30 | CONTACT.1 | 8 | N | V | | PNEUMATIC WIRE FAULT | | CONTACT,N/C | 1461 |

Date: 01-12-2001 Time: 13:43:15

Standard ISF Printout

Test Number : C11647
Test Type : LTV MDB TO STAT. VEH-2
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

ATD Usage:

| Position | ID Number |
|---|---|
| | |
| | |
| | |

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G15 | VOLTAGE.1 | 5 | N | V | TIME ZERO | | | VOLTAGE,VOLTS | 0011 |
| 2 | G16 | VOLTAGE.1 | 5 | N | V | PHOTO TIMING | | | VOLTAGE,VOLTS | 0021 |
| 3 | D01 | CN25.1 | 200 | N | G | L. FRT | HEAD | LONGITUDINAL | ACCEL,G'S | 0031 |
| 4 | D02 | CP81.1 | 200 | N | G | L. FRT | HEAD | LATERAL | ACCEL,G'S | 0041 |
| 5 | D03 | FN17.1 | 200 | N | G | L. FRT | HEAD | VERTICAL | ACCEL,G'S | 0051 |
| 6 | D04 | CR82.1 | 200 | R | G | L. FRT | CHEST | LONGITUDINAL | ACCEL,G'S | 0062 |
| 7 | D05 | CV14.1 | 200 | N | G | L. FRT | CHEST | LATERAL | ACCEL,G'S | 0071 |
| 8 | D06 | DB53.1 | 200 | R | G | L. FRT | CHEST | VERTICAL | ACCEL,G'S | 0082 |
| 9 | D07 | CN26.1 | 400 | N | G | L. FRT | PELVIC | LONGITUDINAL | ACCEL,G'S | 0091 |
| 10 | D08 | CN35.1 | 400 | N | G | L. FRT | PELVIC | LATERAL | ACCEL,G'S | 0101 |
| 11 | D09 | CR30.1 | 400 | N | G | L. FRT | PELVIC | VERTICAL | ACCEL,G'S | 0111 |
| 12 | D20 | P50L.1 | 14000 | N | N | L. FRT | FEMUR | LEFT | LOAD,N'S | 0121 |
| 13 | D21 | P50R.1 | 14000 | N | N | L. FRT | FEMUR | RIGHT | LOAD,N'S | 0131 |
| 14 | D22 | P50D.1 | 80 | N | MM | L. FRT | CHEST | LONGITUDINAL | DISPL,MM'S | 0141 |
| 15 | D10 | P50N.1 | 6000 | N | N | L. FRT | NECK | UAP SHEAR | LOAD,N'S | 0151 |
| 16 | D11 | P50N.2 | 6000 | N | N | L. FRT | NECK | URL SHEAR | LOAD,N'S | 0161 |
| 17 | D12 | P50N.3 | 6000 | N | N | L. FRT | NECK | UPPER AXIAL | LOAD,N'S | 0171 |
| 18 | D13 | P50N.4 | 400 | N | N-M | L. FRT | NECK | URL MOMENT | MOMENT,NM'S | 0181 |
| 19 | D14 | P50N.5 | 400 | N | N-M | L. FRT | NECK | UAP MOMENT | MOMENT,NM'S | 0191 |
| 20 | D15 | P50N.6 | 400 | N | N-M | L. FRT | NECK | ROT MOMENT | MOMENT,NM'S | 0201 |
| 21 | D23 | P50TUL.1 | 400 | N | N-M | L. FRT | LEFT TIBIA | URL MOMENT | MOMENT,NM'S | 0211 |
| 22 | D24 | P50TUL.2 | 400 | N | N-M | L. FRT | LEFT TIBIA | UAP MOMENT | MOMENT,NM'S | 0221 |
| 23 | D25 | P50TLL.1 | 400 | N | N-M | L. FRT | LEFT TIBIA | LAP MOMENT | MOMENT,NM'S | 0231 |
| 24 | D26 | P50TLL.2 | 10000 | N | N | L. FRT | LEFT TIBIA | LAP SHEAR | LOAD,N'S | 0241 |
| 25 | D27 | P50TUL.3 | 8000 | N | N | L. FRT | LEFT TIBIA | LOWER AXIAL | LOAD,N'S | 0251 |
| 26 | D16 | P50KNL.1 | 7000 | N | N | L. FRT | LEFT KNEE | L. CLEVIS | LOAD,N'S | 0261 |
| 27 | D17 | P50KNL.2 | 7000 | N | N | L. FRT | LEFT KNEE | R. CLEVIS | LOAD,N'S | 0271 |
| 28 | D28 | P50TUR.1 | 400 | N | N-M | L. FRT | RIGHT TIBIA | URL MOMENT | MOMENT,NM'S | 0281 |
| 29 | D29 | P50TUR.2 | 400 | N | N-M | L. FRT | RIGHT TIBIA | UAP MOMENT | MOMENT,NM'S | 0291 |
| 30 | D30 | P50TLR.1 | 400 | N | N-M | L. FRT | RIGHT TIBIA | LAP MOMENT | MOMENT,NM'S | 0301 |
| 31 | D31 | P50TLR.2 | 10000 | N | N | L. FRT | RIGHT TIBIA | LAP SHEAR | LOAD,N'S | 0311 |
| 32 | D32 | P50TUR.3 | 8000 | N | N | L. FRT | RIGHT TIBIA | LOWER AXIAL | LOAD,N'S | 0321 |

Date: 01-12-2001 Time: 13:42:29

Standard ISF Printout

Test Number : C11647
Test Type : LTV MDB TO STAT. VEH-2
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 33 | D18 | P50KNR.1 | 7000 | N | N | L. FRT | RIGHT KNEE | L. CLEVIS | LOAD,N'S | 0331 |
| 34 | D19 | P50KNR.2 | 7000 | N | N | L. FRT | RIGHT KNEE | R. CLEVIS | LOAD,N'S | 0341 |
| 35 | A01 | P50TFL.1 | 24 | N | MM | L. FRT | TIBIA/FEMUR LEFT | | DISPL,MM'S | 0351 |
| 36 | A02 | P50TFR.1 | 24 | N | MM | L. FRT | TIBIA/FEMUR RIGHT | | DISP,MM'S | 0361 |
| 37 | E01 | CD55.1 | 200 | N | G | R. FRT | HEAD | LONGITUDINAL | ACCEL,G'S | 0371 |
| 38 | E02 | CT32.1 | 200 | N | G | R. FRT | HEAD | LATERAL | ACCEL,G'S | 0381 |
| 39 | E03 | CD12.1 | 200 | N | G | R. FRT | HEAD | VERTICAL | ACCEL,G'S | 0391 |
| 40 | E04 | CD56.1 | 200 | N | G | R. FRT | CHEST | LONGITUDINAL | ACCEL,G'S | 0401 |
| 41 | E05 | CC07.1 | 200 | N | G | R. FRT | CHEST | LATERAL | ACCEL,G'S | 0411 |
| 42 | E06 | CC05.1 | 200 | R | G | R. FRT | CHEST | VERTICAL | ACCEL,G'S | 0422 |
| 43 | E07 | FT40.1 | 400 | N | G | R. FRT | PELVIC | LONGITUDINAL | ACCEL,G'S | 0431 |
| 44 | E08 | FL31.1 | 400 | N | G | R. FRT | PELVIC | LATERAL | ACCEL,G'S | 0441 |
| 45 | E09 | DD75.1 | 400 | N | G | R. FRT | PELVIC | VERTICAL | ACCEL,G'S | 0451 |
| 46 | E20 | P41L.1 | 14000 | N | N | R. FRT | FEMUR | LEFT | LOAD,N'S | 0461 |
| 47 | E21 | P41R.1 | 14000 | N | N | R. FRT | FEMUR | RIGHT | LOAD,N'S | 0471 |
| 48 | E22 | P41D.1 | 80 | N | MM | R. FRT | CHEST | LONGITUDINAL | DISPL,MM'S | 0481 |
| 49 | E10 | P41N.1 | 6000 | N | N | R. FRT | NECK | UAP SHEAR | LOAD,N'S | 0491 |
| 50 | E11 | P41N.2 | 6000 | N | N | R. FRT | NECK | URL SHEAR | LOAD,N'S | 0501 |
| 51 | E12 | P41N.3 | 6000 | N | N | R. FRT | NECK | UPPER AXIAL | LOAD,N'S | 0511 |
| 52 | E13 | P41N.4 | 400 | N | N-M | R. FRT | NECK | URL MOMENT | MOMENT,NM'S | 0521 |
| 53 | E14 | P41N.5 | 400 | N | N-M | R. FRT | NECK | UAP MOMENT | MOMENT,NM'S | 0531 |
| 54 | E15 | P41N.6 | 400 | N | N-M | R. FRT | NECK | ROT MOMENT | MOMENT,NM'S | 0541 |
| 55 | E23 | P41TUL.1 | 395 | N | N-M | R. FRT | LEFT TIBIA | URL MOMENT | MOMENT,NM'S | 0551 |
| 56 | E24 | P41TUL.2 | 395 | N | N-M | R. FRT | LEFT TIBIA | UAP MOMENT | MOMENT,NM'S | 0561 |
| 57 | E25 | P41TLL.1 | 395 | N | N-M | R. FRT | LEFT TIBIA | LAP MOMENT | MOMENT,NM'S | 0571 |
| 58 | E26 | P41TLL.2 | 10000 | N | N | R. FRT | LEFT TIBIA | LAP SHEAR | LOAD,N'S | 0581 |
| 59 | E27 | P41TLL.3 | 8000 | N | N | R. FRT | LEFT TIBIA | LOWER AXIAL | LOAD,N'S | 0591 |
| 60 | E16 | P41KNL.1 | 7000 | N | N | R. FRT | LEFT KNEE | L. CLEVIS | LOAD,N'S | 0601 |
| 61 | E17 | P41KNL.2 | 7000 | N | N | R. FRT | LEFT KNEE | R. CLEVIS | LOAD,N'S | 0611 |
| 62 | E28 | P41TUR.1 | 395 | N | N-M | R. FRT | RIGHT TIBIA | URL MOMENT | MOMENT,NM'S | 0621 |
| 63 | E29 | P41TUR.2 | 395 | N | N-M | R. FRT | RIGHT TIBIA | UAP MOMENT | MOMENT,NM'S | 0631 |
| 64 | E30 | P41TLR.1 | 395 | N | N-M | R. FRT | RIGHT TIBIA | LAP MOMENT | MOMENT,NM'S | 0641 |

Date: 01-12-2001 Time: 13:42:33

Standard ISF Printout

Test Number : C11647
Test Type : LTV MDB TO STAT. VEH-2
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 65 | E31 | P41TLR.2 | 10000 | N | N | R. FRT | RIGHT TIBIA | LAP SHEAR | LOAD,N'S | 0651 |
| 66 | E32 | P41TLR.3 | 8000 | N | N | R. FRT | RIGHT TIBIA | LOWER AXIAL | LOAD,N'S | 0661 |
| 67 | E18 | P41KNR.1 | 7000 | N | N | R. FRT | RIGHT KNEE | L. CLEVIS | LOAD,N'S | 0671 |
| 68 | E19 | P41KNR.2 | 7000 | N | N | R. FRT | RIGHT KNEE | R. CLEVIS | LOAD,N'S | 0681 |
| 69 | F01 | P41TFL.1 | 24 | N | MM | R. FRT | TIBIA/FEMUR LEFT | | DISP,MM'S | 0691 |
| 70 | F02 | P41TFR.1 | 24 | N | MM | R. FRT | TIBIA/FEMUR RIGHT | | DISP,MM'S | 0701 |
| 71 | A03 | LS118.1 | 700 | N | N-M | L. FRT | LOWER LUMBAR | MY-LAT. AXIS | MOMENT,NM'S | 0711 |
| 72 | A04 | LS118.2 | 10000 | N | N | L. FRT | LOWER LUMBAR | FX-FORE/AFT | LOAD,N'S | 0721 |
| 73 | A05 | LS118.3 | 6000 | N | N | L. FRT | LOWER LUMBAR | FZ-AXIAL | LOAD,N'S | 0731 |
| 74 | F03 | LS136.1 | 700 | N | N-M | R. FRT | LOWER LUMBAR | MY-LAT. AXIS | MOMENT,NM'S | 0741 |
| 75 | F04 | LS136.2 | 10000 | N | N | R. FRT | LOWER LUMBAR | FX-FORE/AFT | LOAD,N'S | 0751 |
| 76 | F05 | LS136.3 | 6000 | N | N | R. FRT | LOWER LUMBAR | FZ-AXIAL | LOAD,N'S | 0761 |
| 77 | A06 | P50TUL.4 | 10000 | N | N | L. FRT | LEFT TIBIA | TUL FX | LOAD,N'S | 0771 |
| 78 | A07 | P50TLL.3 | 10000 | N | N | L. FRT | LEFT TIBIA | TLL FY | LOAD,N'S | 0781 |
| 79 | A08 | P50TLL.4 | 395 | N | N-M | L. FRT | LEFT TIBIA | TLL MX | MOMENT,NM'S | 0791 |
| 80 | A09 | P50TUR.4 | 10000 | N | N | L. FRT | RIGHT TIBIA | TUR FX | LOAD,N'S | 0801 |
| 81 | A10 | P50TLR.3 | 10000 | N | N | L. FRT | RIGHT TIBIA | TLR FY | LOAD,N'S | 0811 |
| 82 | A11 | P50TLR.4 | 395 | N | N-M | L. FRT | RIGHT TIBIA | TLR MX | MOMENT,NM'S | 0821 |
| 83 | A12 | J14855.1 | 750 | N | G | L. FRT | ROCKER | LONGITUDINAL | ACCEL,G'S | 0831 |
| 84 | A13 | J14989.1 | 750 | N | G | L. FRT | ROCKER | LATERAL | ACCEL,G'S | 0841 |
| 85 | A14 | J14535.1 | 750 | N | G | L. FRT | ROCKER | VERTICAL | ACCEL,G'S | 0851 |
| 86 | A15 | ANB38.1 | 750 | R | G | R. FRT | ROCKER | LONGITUDINAL | ACCEL,G'S | 0862 |
| 87 | A16 | AN8A1.1 | 750 | R | G | R. FRT | ROCKER | LATERAL | ACCEL,G'S | 0872 |
| 88 | A17 | ANA29.1 | 750 | N | G | R. FRT | ROCKER | VERTICAL | ACCEL,G'S | 0881 |
| 89 | A18 | AJ9P0.1 | 500 | N | G | L. | FLOORPAN | LONGITUDINAL | ACCEL,G'S | 0891 |
| 90 | A19 | J15176.1 | 750 | N | G | L. REAR | ROCKER | LONGITUDINAL | ACCEL,G'S | 0901 |
| 91 | A20 | J15191.1 | 750 | N | G | L. REAR | ROCKER | LATERAL | ACCEL,G'S | 0911 |
| 92 | A21 | J15178.1 | 750 | N | G | L. REAR | ROCKER | VERTICAL | ACCEL,G'S | 0921 |
| 93 | A22 | AP1E6.1 | 750 | N | G | R. REAR | ROCKER | LONGITUDINAL | ACCEL,G'S | 0931 |
| 94 | A23 | AP126.1 | 750 | R | G | R. REAR | ROCKER | LATERAL | ACCEL,G'S | 0942 |
| 95 | A24 | AP2C8.1 | 750 | N | G | R. REAR | ROCKER | VERTICAL | ACCEL,G'S | 0951 |
| 96 | A25 | J12284.1 | 400 | N | G | CTR | SDM-R REAR CASE #1 | LONGITUDINAL | ACCEL,G'S | 0961 |

Date: 01-12-2001 Time: 13:42:36

Standard ISF Printout

Test Number : C11647
Test Type : LTV MDB TO STAT. VEH-2
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 97 | A26 | J12135.1 | 400 | N | G | CTR | SDM-R REAR CASE #1 | LATERAL | ACCEL,G'S | 0971 |
| 98 | A27 | ANBM0.1 | 400 | N | G | CTR | SDM-R REAR CASE #1 | VERTICAL | ACCEL,G'S | 0981 |
| 99 | A28 | SR84.1 | 400 | N | MM | L. | TOE PAN | LONGITUDINAL | DISPL,MM'S | 0991 |
| 100 | A29 | VOLTCOND.1 | 20 | N | V |  | STARTER |  | VOLTAGE,VOLTS | 1001 |
| 101 | A30 | VOLTCOND.1 | 20 | N | V |  | BATTERY |  | VOLTAGE,VOLTS | 1011 |
| 102 | A31 | VOLTCOND.1 | 20 | N | V |  | ALTERNATOR |  | VOLTAGE,VOLTS | 1021 |
| 103 | A32 | VOLTCOND.1 | 20 | N | V |  | FUEL PUMP |  | VOLTAGE,VOLTS | 1031 |
| 104 | B01 | VOLTCOND.1 | 20 | N | V | L. FRT | HEADLIGHT - LOW BEAM |  | VOLTAGE,VOLTS | 1041 |
| 105 | B02 | VOLTCOND.1 | 20 | N | V | L. FRT | HEADLIGHT-HIGH BEAM |  | VOLTAGE,VOLTS | 1051 |
| 106 | B03 | VOLTCOND.1 | 20 | N | V |  | IGNITION |  | VOLTAGE,VOLTS | 1061 |
| 107 | B04 | VOLTAGE.1 | 8 | N | V | L. | OPTICAL FIRE DETECTOR |  | VOLTAGE,VOLTS | 1071 |
| 108 | B05 | VOLTAGE.1 | 8 | N | V | R. | OPTICAL FIRE DETECTOR |  | VOLTAGE,VOLTS | 1081 |
| 109 | B06 | VOLTAGE.1 | 8 | N | V |  | ENG SPEED-(MP1A) |  | VOLTAGE,VOLTS | 1091 |
| 110 | B07 | VOLTAGE.1 | 5 | N | V |  | TACH SIGNAL |  | VOLTAGE,VOLTS | 1101 |
| 111 | B08 | VOLTAGE.1 | 5 | N | V |  | FUEL LINE VAPOR (S1) |  | VOLTAGE,VOLTS | 1111 |
| 112 | B09 | VOLTAGE.1 | 5 | N | V |  | FUEL LINE TEMPATURE (T1) |  | VOLTAGE,VOLTS | 1121 |
| 113 | B10 | VOLTAGE.1 | 5 | N | V |  | L. EX. MANIFOLD VAPOR (S2) |  | VOLTAGE,VOLTS | 1131 |
| 114 | B11 | VOLTAGE.1 | 5 | N | V |  | L. EX. MANIFOLD TEMP (T2) |  | VOLTAGE,VOLTS | 1141 |
| 115 | B12 | VOLTAGE.1 | 5 | N | V |  | L. FUEL RAIL VAPOR (S3) |  | VOLTAGE,VOLTS | 1151 |
| 116 | B13 | VOLTAGE.1 | 5 | N | V |  | L. FUEL RAIL TEMPERTURE (T3) |  | VOLTAGE,VOLTS | 1161 |
| 117 | B14 | VOLTAGE.1 | 5 | N | V |  | R. FUEL RAIL VAPOR (S4) |  | VOLTAGE,VOLTS | 1171 |
| 118 | B15 | VOLTAGE.1 | 5 | N | V |  | R. FUEL RAIL TEMPATURE (T4) |  | VOLTAGE,VOLTS | 1181 |
| 119 | B16 | VOLTAGE.1 | 5 | N | V |  | CONVERTER VAPOR (S5) |  | VOLTAGE,VOLTS | 1191 |
| 120 | B17 | VOLTAGE.1 | 5 | N | V |  | CONVERTER TEMPATURE (T5) |  | VOLTAGE,VOLTS | 1201 |
| 121 | B18 | CP132.1 | 10 | N | A |  | WHEEL BAG |  | CURRENT,AMPS | 1211 |
| 122 | B19 | CP171.1 | 10 | N | A |  | I/P BAG |  | CURRENT,AMPS | 1221 |
| 123 | B20 | CG101.1 | 60 | N | A |  | BATTERY |  | CURRENT,AMPS | 1231 |
| 124 | B21 | CG103.1 | 60 | N | A |  | STARTER CABLE AT BATTERY |  | CURRENT,AMPS | 1241 |
| 125 | F32 | CP207.1 | 20 | N | A |  | FUEL PUMP |  | CURRENT,AMPS | 1251 |
| 126 | B23 | NODATA.1 | 1 | N | V |  | A/C CLUTCH DROPPED |  | CURRENT,AMPS | 1261 |
| 127 | B24 | CG104.1 | 20 | N | A |  | ALTERNATOR CABLE |  | CURRENT,AMPS | 1271 |
| 128 | B25 | CP190.1 | 20 | N | A |  | FUSIBLE LINK A HVAC BLOWER |  | CURRENT,AMPS | 1281 |

Date: 01-12-2001 Time: 13:42:40

Standard ISF Printout

Test Number : C11647
Test Type : LTV MDB TO STAT. VEH-2
Division :
Divisional Engineer :
Test Engineer :
Instrument Technician:
Test Technician :

| Ref | DAS | Tran ID# | Req FS | P | Units | Position | Location | Component | Units | PrCd |
|---|---|---|---|---|---|---|---|---|---|---|
| 129 | B26 | CP185.1 | 20 | N | A | | FUSIBLE LINK B-RELAY CENTER | | CURRENT,AMPS | 1291 |
| 130 | B27 | CP224.1 | 20 | N | A | | FUSIBLE LINK C-RELAY CENTER | | CURRENT,AMPS | 1301 |
| 131 | B28 | CP176.1 | 20 | N | A | | FUSIBLE LINK E-IGNITION | | CURRENT,AMPS | 1311 |
| 132 | B29 | CP151.1 | 20 | N | A | | FUSIBLE LINK F-RADIO | | CURRENT,AMPS | 1321 |
| 133 | B30 | CP212.1 | 20 | N | A | | FUSIBLE LINK J-TAILLIGHT | | CURRENT,AMPS | 1331 |
| 134 | B31 | CP136.1 | 20 | N | A | | FUSIBLE LINK K-ABS FUSE #6 | | CURRENT,AMPS | 1341 |
| 135 | B32 | CP141.1 | 20 | N | A | | FUS. LINK Z-HEADLIGHT SWITCH | | CURRENT,AMPS | 1351 |
| 136 | F06 | APKE2.1 | 14000 | N | KPA | FRONT | BRAKE SYSTEM | | PRESSURE,KPA'S | 1361 |
| 137 | F07 | AM1C4.1 | 500 | N | KPA | | FUEL SUPPLY LINE | | PRESSURE,KPA'S | 1371 |
| 138 | F08 | APKC9.1 | 8000 | N | KPA | L. | POWER STEERING | | PRESSURE,KPA'S | 1381 |
| 139 | F09 | 10110.1 | 8000 | N | KPA | R. | POWER STEERING | | PRESSURE,KPA'S | 1391 |
| 140 | F10 | G1002.1 | 200 | N | KPA | | COOLANT SYSTEM | | PRESSURE,KPA'S | 1401 |
| 141 | F11 | 10009.1 | 1000 | N | KPA | | ENGINE OIL | | PRESSURE,KPA'S | 1411 |
| 142 | F12 | AM1C6.1 | 1400 | N | KPA | | TRANSMISSION COOLER | | PRESSURE,KPA'S | 1421 |
| 143 | F13 | CONTACT.1 | 8 | N | V | | THERMAL WIRE | | CONTACT,N/O | 1431 |
| 144 | F14 | CONTACT.1 | 8 | N | V | | PNEUMATIC WIRE | | CONTACT,N/O | 1441 |
| 145 | F15 | CONTACT.1 | 8 | N | V | | PNEUMATIC WIRE FAULT | | CONTACT,N/C | 1451 |
| 146 | F16 | RG101.1 | 1000 | N | DEG/SEC | CTR | RATE GYROSCOPE | | DEG/SEC | 1461 |
| 147 | C01 | A98C.1 | 250 | N | G | | LTV MDB AT C.G. | LONGITUDINAL | ACCEL,G'S | 1471 |
| 148 | C02 | AN3P2.1 | 250 | R | G | | LTV MDB AT C.G. | LATERAL | ACCEL,G'S | 1482 |
| 149 | C03 | A58A.1 | 250 | N | G | | LTV MDB AT C.G. | VERTICAL | ACCEL,G'S | 1491 |
| 150 | C04 | J12804.1 | 250 | N | G | | LTV MDB AT REAR C/MBR | LONGITUDINAL | ACCEL,G'S | 1501 |
| 151 | C05 | J12812.1 | 250 | R | G | | LTV MDB AT REAR C/MBR | LATERAL | ACCEL,G'S | 1512 |
| 152 | C06 | J12759.1 | 250 | N | G | | LTV MDB AT REAR C/MBR | VERTICAL | ACCEL,G'S | 1521 |

Date: 01-12-2001 Time: 13:42:43