

NEW CAR ASSESSMENT PROGRAM

VOLVO CORPORATION

1982 VOLVO DL

VRTC NO. 725

PREPARED BY:

VEHICLE RESEARCH AND TEST CENTER

St. Rt. 33 Logan County

East Liberty, Ohio 43319



FINAL REPORT

OCTOBER 1982

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF AUTOMOTIVE RATINGS

400 SEVENTH STREET, S.W.

WASHINGTON, D.C. 20590

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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons	0.9	metric ton	t
	(2000 lb)			
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
in ³	cubic inches	16	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C

Approximate Conversions From Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares	2.5	acres	acres
	(10 000 m ²)			
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton	1.1	short tons	
	(1000 kg)			
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
ml	milliliters	0.06	cubic inches	in ³
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	degrees Celsius	9/5 (then add 32)	degrees Fahrenheit	°F

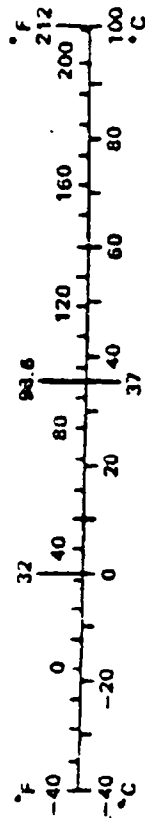


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SECTION 1
PURPOSE AND INTRODUCTION

PURPOSE

The purpose of the test was to subject a 1982 Volvo DL 4-door to the indicant test requirements of DOT Laboratory Procedure IP-212-02, September 17, 1982, except that tests for FMVSS 212, 219 and 301-75 were omitted. Calibrated Part 572 50th-percentile male dummies were utilized to acquire data relative to FMVSS 208, "Occupant Crash Protection." The vehicle was tested using test parameters which are in excess of the current upper limits of the subject FMVSS in order to obtain research and vehicle rating data.

The objectives of this New Car Assessment Program Test were to:

Measure the dynamic responses, acceleration, velocity and deformation of vehicle and dummies during impact modes that are representative of real world automobile crashes.

Evaluate the performance of late model production automobiles with respect to their crash survivability in this crash mode.

Evaluate the protection performance of the restraint device by full-scale impact tests.

Evaluate photographically the extent of dummy movement during vehicle acceleration to test speed.

INTRODUCTION

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains data required by R&D and OAR. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains Data Plots. Appendix C contains Dummy Certification.

SECTION 2

GENERAL TEST AND VEHICLE PARAMETER DATA

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

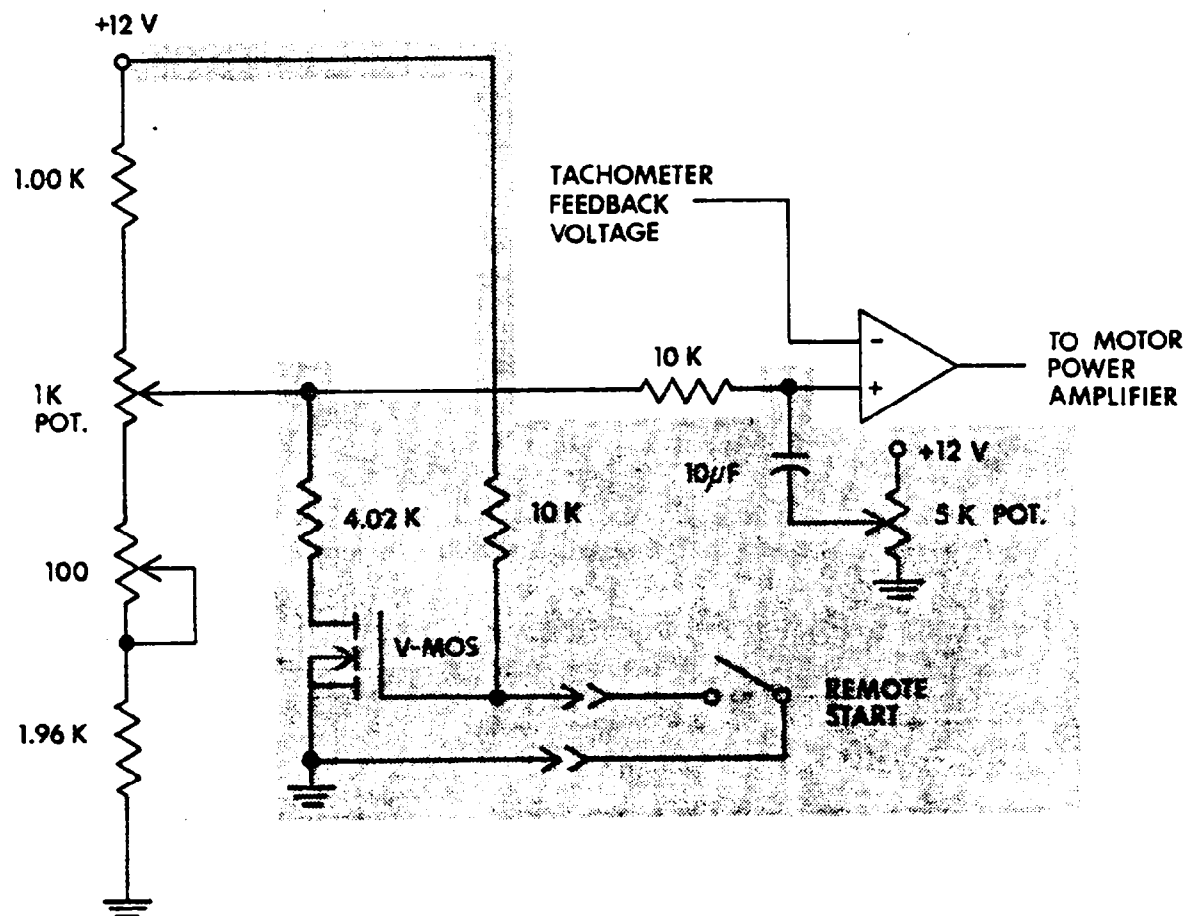
REVISED HIGH SPEED PHOTOGRAPHIC COVERAGE

The following changes were made to the high speed photographic coverage specified in IP-212-02.

- 1) The rear fuel tank pit camera was deleted.
- 2) One camera was mounted to the rear window shelf and viewed the rear of the dummies' heads. Targets were located in a vertical line on the front seat backs and the rear of the dummies' heads. The camera was manually started at 24 frames per second just prior to vehicle acceleration to test speed and then automatically switched to 500 frames per second just prior to impact.
- 3) Two high speed cameras were added offboard on the drivers side. They were positioned at the same location with one camera positioned thirty inches above the other. The purpose of these cameras was to film targets on the following vehicle components:
 - o the front, center and rear of the driver side sill,
 - o the center of the roof,
 - o the "C" pillar and
 - o the steering column.
- 4) Two additional stadia poles were located one each on the driver's and passenger's sides. The height of the driver's side stadia pole was 12.0 ± 0.1 inches and the height of the passenger's side stadia pole was 24.0 ± 0.1 inches.

CAMERA CIRCUIT MODIFICATIONS FOR TWO SPEED OPERATION

The speed controls for a Photosonic 1B high speed camera were modified to switch the speed reference voltage corresponding to 24 frames per second to the voltage corresponding to 500 frames per second. The modified circuit diagram is shown on the following page. The reference is switched on command via the remote start. The RC network is used to smooth the step change in reference voltage for motor protection.



NOTE: MODIFICATIONS ARE SHADED

CAMERA CIRCUIT MODIFICATIONS FOR TWO SPEED OPERATION

RECEIVING INSPECTION OF VEHICLES

Contractor: Contract No.: SRL 48
VIN No.: YVLAX4941C1776725 NHTSA No.: OMI-C0507
Make: Volvo Model: DL 4-door
Year: 1982 Color: Blue
Mfgr. Date: 3/82 Date Received: 9/9/82
Shipping Weight: 2918 Odometer: 00407
Dealer: Byers Volvo Triumph, Columbus, Ohio

Accessories

Power Steering	Yes	Automatic Transmission	No
Power Brakes	Yes	Automatic Speed Control	No
Power Seats	No	Tilting Steering Wheel	No
Power Windows	No	Telescoping Steering Wheel	No
Tinted Glass	Yes	Air Conditioning	No
Radio	No	Anti-Skid Brake	No
Clock	Yes	Rear Window Defroster	Yes
Other:			

Seats (front): Bucket

Brakes

Front: Disc
Rear: Disc

Tires

Size: 175 SR14	Mfgr. & Line: Michelin XZX
Ply Rating: 4	Bias Ply: No
Radial: Yes	
"Space Saver" Spare Tire: No	

Engine

Type: OHC Inline - Gasoline	Cylinders: 4
Transmission, Frwd Speeds: 4	Total Displacement: 130 cu. in.

Fuel Capacity: 15.8 Gallons (Owners Manual)

Restraint System: Inertia reel seat belt/shoulder harness combination

Remarks

1. Is the vehicle stock throughout? Yes
2. Does vehicle show evidence of prior accident history? No
3. Does vehicle show any significant corrosion? No
4. Condition of the front bumper and frame: New

SUMMARY OF CRASH TEST CONDITIONS

Test Vehicle Information

Manufacturer: Volvo Gothenburg Sweden Make & Model: Volvo DL
VIN Number: YV1AX4941C1776725 NHTSA Number: OMI-C0507
Model Year: 1982 Build Date: 3/82
Transmission: 4 speed manual w/ Overdrive Date Received: 9/9/82
Body Style: 4-door Sedan Color: Blue
Dealer: Byers Volvo Triumph.

Engine Data

Type: OHC Inline - Gasoline Cylinders: 4
Displacement: 130 cu. in.

Data from Certification Label on Left Door Rear Face or B-Post

Vehicle Mfr: Volvo Gothenburg Sweden VIN: YV1AX4941C1776725
Date of mfr: 3/82
GVWR: 4030 GAWR: Front 1885
Rear 2180

Data from "Recommended Tire Pressure" Label on Door, Post Glovebox, Etc.

Vehicle Load Up to Capacity Recommended Tire Size: 175 SR14
Front: 36 psi Load Range: N/A
Rear: 36 psi
Vehicle Capacity
Type of Seats: F-Bucket No. of Occupants (designated
Cargo Load: 920 R-Bench seating capacity): 5

Weight of Test Vehicle as Received from Dealer (with maximum fluids)

Right Front: 727 Right Rear: 696
Left Front: 798 Left Rear: 697
Total Front Weight: 1525
Total Rear Weight: 1393
Total Delivered Weight: 2918

Weight of Test Vehicle with Required Dummies and -0- Pounds of Cargo

Right Front: 784 Right Rear: 898
Left Front: 870 Left Rear: 865
Total Front Weight: 1654
Total Rear Weight: 1763
Total Test Weight: 3417
Weight of Ballast Secured in Vehicle Trunk Area: 50

Test Conditions

Date of Test: 9/17/82
Time of Test: 1537
Wind Velocity: 5-10 mph

Ambient Temperature
at Impact Area: 77°F

Test No.: 820917

Project Title: New Car Assessment Program

Date: 9/17/82
Temperature: 77°F

Time: 1537
Wind Velocity: 5-10 mph

Subject Vehicle Data

Description:

	<u>Actual</u>	<u>Intended</u>
Test Weight (lbs.)	3417	3416
Vehicle Orientation (degrees)	0	0
Vehicle Velocity (mph)	34.9*	35
Maximum Crush (inches)		
Static	27 3/8	N/A
Dynamic	N/A	N/A
Maximum Intrusion (inches)	N/A	N/A

Dummies

	<u>Driver</u>	<u>Middle Passenger</u>	<u>Rt. Front Passenger</u>	<u>Left Rear Passenger</u>	<u>Rt. Rear Passenger</u>
Type	572		572		
Serial No.	392		826		
Instrumentation					
Head Accel.	Yes		Yes		
Chest Accel.	Yes		Yes		
Femur L.C.'s	Yes		Yes		
Other					
Restraint System	Lap/shoulder belt combination.				

Remarks:

*As measured over final two feet before impact.

SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION:

Vehicle Manufacturer: Volvo Gothenburg Sweden
Make/Model: Volvo DL
Body Style: 4-Door Sedan; Model Year: 1982
VIN: YV1AX4941C776725; Build Date: 3/82
NHTSA No.: OMI-C0507; Color: Blue
Engine Data: 4 cylinders; 130 in³/₈₈ displacement
Transmission Data: 4+overdrive speed (x) Manual/ () Automatic
Date Vehicle Received by Laboratory: 9-9-82
Dealer's Name & Address: Byers Volvo Triumph -401 N. Hamilton Rd., Columbus, C 43216

DATA FROM CERTIFICATION LABEL ON LEFT DOOR REAR FACE OR 'B' POST:

Vehicle Manufactured By: Volvo Gothenburg Sweden
Date of Manufacture: 3/82; VIN: YV1AX4941C1776725
GVWR: 4030 lbs.; GAWR: Front = 1885 lbs.; Rear = 2180 lbs.

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVE BOX, ETC.:

Vehicle Load: FRONT REAR
Up to Capacity 36 psi 36 psi

RECOMMENDED TIRE SIZE:	LOAD RANGE:
<u>P175R14</u>	<u>B C D</u> DNA

Vehicle Capacity:
Type of Seats - Bench (Rear)
 Bucket (Front)
 Split Bench
CARGO LOAD = lbs.
TOTAL = 920 lbs.

Number of Occupants = 2 Front
(Designated Seating 3 Rear
Capacity) 5 Total

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with max. fluids):

Right Front = 727 lbs. Right Rear = 696 lbs.
Left Front = 798 lbs. Left Rear = 697 lbs.
TOTAL FRONT WEIGHT = 1525 lbs. (52.3 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1393 lbs. (47.7 % of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 2918 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND _____ lbs. CARGO:

Right Front = 784 lbs. Right Rear = 898 lbs.
Left Front = 870 lbs. Left Rear = 865 lbs.
TOTAL FRONT WEIGHT = 1654 lbs. (48.4 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1763 lbs. (51.6 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3417 lbs.

Weight of ballast secured in vehicle trunk area = 50 lbs.

TEST CONDITIONS:

Date of Test: 9-17-82; Time of Test: 15:37.48 am/pm
Ambient Temperature: 77 °F at impact area.

VEHICLE ATTITUDE: (all dimensions in inches)

Delivered Attitude: RF 10 9/16; LF 10 3/16; RR 10 1/8; LR 10
Pre-Test Attitude: RF 9 11/16; LF 9 1/2; RR 8 1/4; LR 8 9/16
Post-Test Attitude: RF 6 9/16; LF 7 1/4; RR 7 5/16; LR 8 3/8
VEHICLE TIRE DATA:

Recommended Cold Tire Pressure: Front = 36 psi
Rear = 36 psi

Recommended Tire Size: 175R14

Load Range: DNA

Tires on Vehicle: Michelin XYZ - 175SR14

Is Spare Tire a "Space Saver": No (yes/no)

Is Spare Tire standard equipment: Yes (yes/no)
(Temporary Spare)

TEST FLUID DATA:

Test Fluid Type: Red Stoddard Solvent #2; Spec. Grav.: 0.764

Kinematic Viscosity: 0.99 Centistokes

"USEABLE" CAPACITY*: 17.05 Gallons (Actual) (Furnished By CTM)

Test Volume: 15.86 Gallons (93%) (92-94% of USEABLE)

Fuel System Capacity (data from Owner's Manual): 15.8 gal.

Details of fuel system: _____

Electric Fuel Pump: x Yes; No; Fuel Injection: x Yes; No

Does electric fuel pump operate with ignition switch "on" and
the engine not operating: x Yes; No

VEHICLE REBOUND AND CRUSH:

Overall Length of Test Vehicle: Pre-Test = R 189 1/2 / L 189 1/4 inches

CRUSH=R 27 3/8 / L 26

Post-Test= R 162 1/2 / L 163 1/4 inches

FOR FRONTAL IMPACTS, distance from front of test vehicle to
the barrier after impact = 30 3/4 inches (left)-29 3/4 center-

31 5/16 right
*With entire fuel system filled from fuel tank through carburetor
bowl.

VEHICLE TEST WEIGHT CALCULATION

UDW - unloaded delivered weight

VCW - vehicle capacity weight

DSC - designated seating capacity

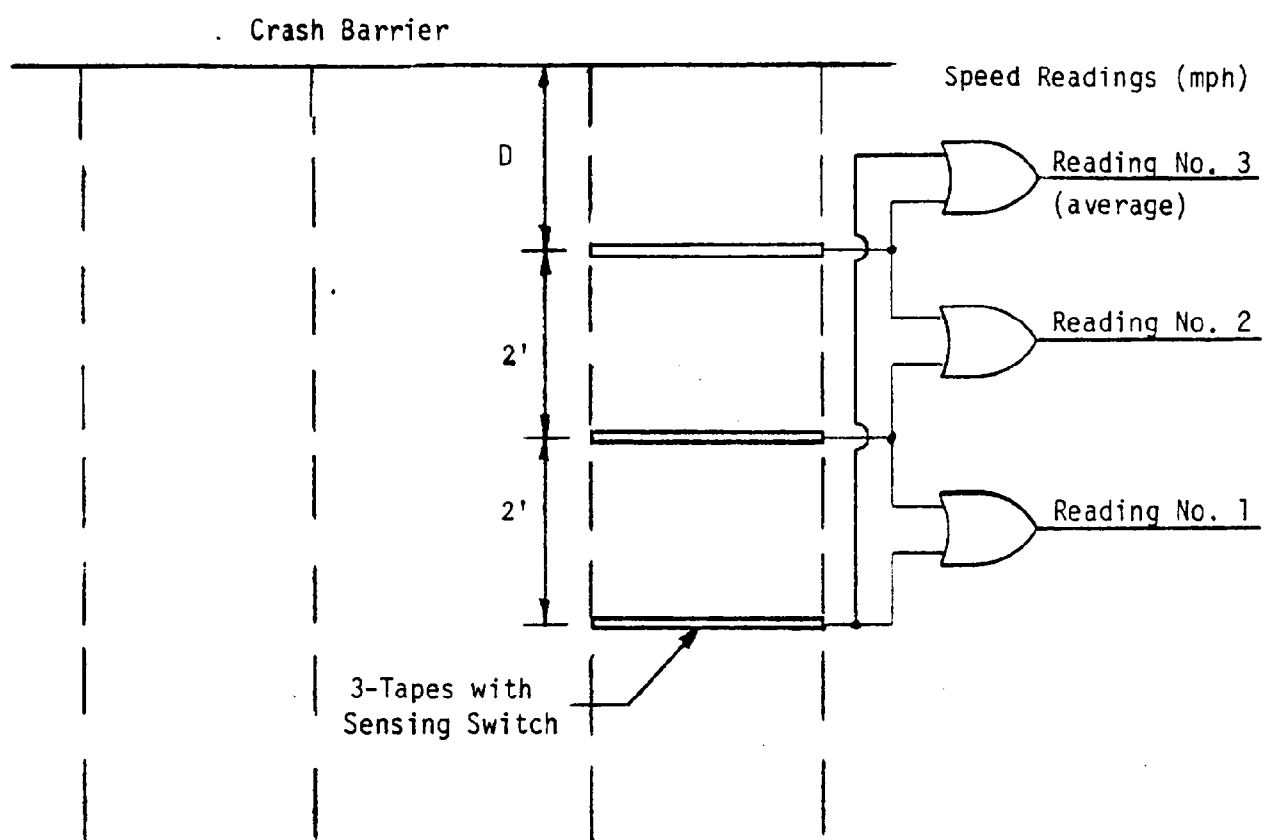
RCLW - rated cargo and luggage weight

$$VCW - 150 \times DSC = RCLW$$

$$920 - (150 \times 5) = 170$$

UDW + RCLW + Number of dummies x 164 lbs. = Test Weight

$$2918 + 170 + (2 \times 164) = 3416$$



D = Distance from bumper to center of tire - plus 2 inches;

IMPACT VELOCITY MEASURING SYSTEM

The vehicle final speeds as measured by the TRC speed trap
were as follows:

Reading No. 1	<u>35.5</u>
Reading No. 2	<u>34.9</u>
Reading No. 3 (average)	<u>35.2</u>

TEST EQUIPMENT LIST AND FUNCTION

<u>ITEM</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>PURPOSE</u>
Speed Trap	Digitec and Tapeswitch	8211	Determine impact speed in mph by using a programmable computing rate monitor, using a start and stop signal.
10,000 and 1000 hz Time Code Generator	TRC of Ohio	None	Furnish timing signal for high- speed cameras.

TEST ANOMALIES

Anomalous spikes occurred in the Passenger Left Femur data. These spikes were due to connector pin spread causing intermittent loss of data. Maximum positive and negative values of the femur data were estimated to be +98.458 lb at 159.13 msec and -576.20 lb at 73.25 msec from the filtered file.

SECTION 3
DATA REQUIRED BY R&D AND OAR

The following pages are included in this section:

1. Dummy positional data
2. Vehicle crush data
3. Accelerometer location and data summary
4. Load cell barrier face
5. High speed camera information

PART 572 DUMMY IN-VEHICLE POSITION
RECORDING SHEET

VEHICLE NHTSA NO. OMI-C0507

MFR./MAKE/MODEL: Volvo DL

SEAT TYPE: Bench
x Bucket
Split Bench

ADJUSTER TYPE: x Manual
Power

BUCKET SEAT BACK TYPE: Fixed
x Adjustable Reclining

TECHNICIANS:

1. Kokoruda
2. Echeverria
3. _____
4. _____

POSITIONING DATE: 9-17-82

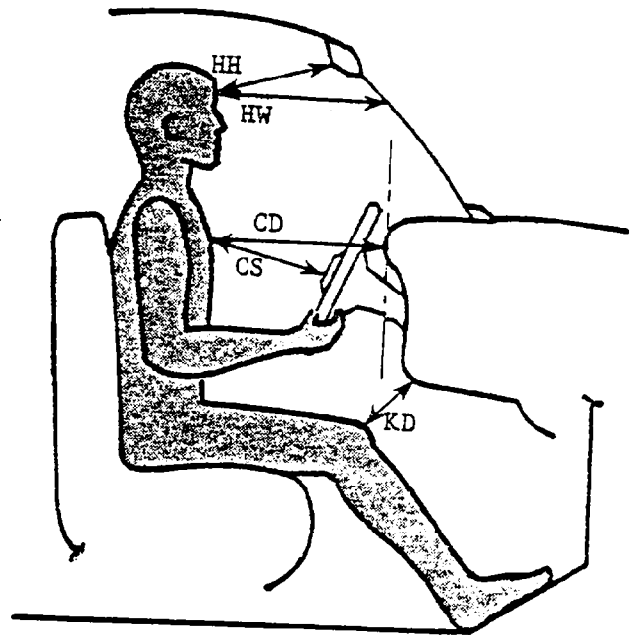
AMBIENT TEMP.: 69° F. TIME: 10:00 a.m.

DRIVER DUMMY # <u>392</u> Head <u>18 3/4</u> Target <u>2°</u> Knee <u>22 5/8</u> Joint <u>14°</u> Approx. <u>9 3/4</u> "H" Point <u>50°</u>	PASSENGER DUMMY # <u>826</u> Head <u>20</u> Target <u>7°</u> Knee <u>21 3/4</u> Joint <u>11°</u> Approx. <u>9 1/2</u> "H" Point <u>52°</u>
OVERALL 51 9/16 38 5/8 12 3/4 Door Glass Height* <u>9 1/2</u> Lateral Bar Adjustable Pointer Left Front Door Driver Dummy# 392 XXXXXXXX Passenger Dummy# 826 Right Front Door CENTER OR PASS.	

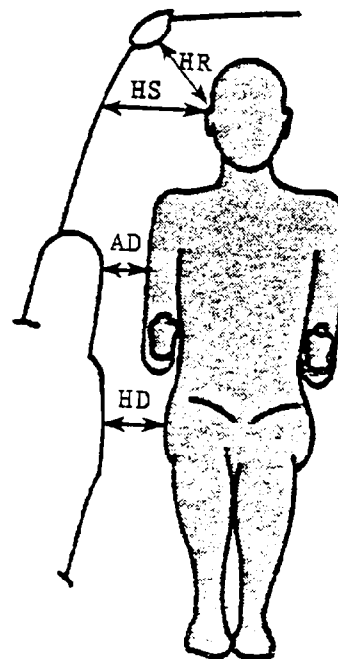
* Door glass height is equal on the right and left side of vehicle.
NOTE: All measurements in inches

DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER #392	PASSENGER #826
HH	19	16 7/8
HW	23 1/4	20 7/8
CD	20 5/8	21 5/16
CS	14	N/A
KDL	6 5/8	6 1/2
KDR	5 9/16	6 11/16



	DRIVER #392	PASSENGER #826
HR	7 1/8	7 1/8
HS	9 1/4	9 7/16
AD	4 1/4	4 5/16
HD	6 13/16	7 9/16



NOTE: All measurements in inches

VISIBLE DUMMY CONTACT POINTS

	<u>DRIVER</u>	<u>PASSENGER</u>
Head	<u>Steering Wheel</u>	<u>Dash</u>
Chest	<u> </u>	<u> </u>
Abdomen	<u> </u>	<u> </u>
Left Knee	<u>Dash</u>	<u>Dash</u>
Right Knee	<u>Dash Center Console</u>	<u>Dash</u>
<u>DOOR OPENING</u>	<u>FRONT</u>	<u>REAR</u>
	<u>LEFT</u> <u>RIGHT</u>	<u>LEFT</u> <u>RIGHT</u>
Easy	<u> </u> <u> </u>	<u> </u> <u> </u>
Difficult	<u> </u> <u> </u>	<u> </u> <u> </u>
Tools Required	<u> x </u> <u> x </u> Pry Bars	<u> x </u> <u> x </u>
<u>SEAT BACK</u>		
Failure	<u>No</u> <u> </u>	<u>No</u> <u> </u>
<u>GLAZING DAMAGE</u>		
Windshield	<u>Yes</u> <u> </u>	<u>Yes</u> <u> </u>
Backlight	<u>None</u> <u> </u>	<u> </u>
Others	<u> </u> <u> </u>	<u> </u> <u> </u>

TEST NUMBER: 820917

VEHICLE NUMBER: 725

PART 572 DUMMY DATA SUMMARY

	<u>DRIVER DUMMY</u>				<u>PASSENGER DUMMY</u>			
	<u>Positive</u>		<u>Negative</u>		<u>Positive</u>		<u>Negative</u>	
	<u>Direction *</u>		<u>Direction **</u>		<u>Direction *</u>		<u>Direction **</u>	
	<u>Peak</u>	<u>Time</u>	<u>Peak</u>	<u>Time</u>	<u>Peak</u>	<u>Time</u>	<u>Peak</u>	<u>Time</u>
	<u>(G)</u>	<u>(msec)</u>	<u>(G)</u>	<u>(msec)</u>	<u>(G)</u>	<u>(msec)</u>	<u>(G)</u>	<u>(msec)</u>
Head Acceleration								
Longitudinal	12.63	227.63	101.41	92.50	2.25	239.00	60.96	114.63
Lateral	6.85	169.50	27.79	90.25	34.40	114.63	4.88	178.88
Vertical	129.15	90.13	8.13	132.50	61.68	114.38	8.91	144.00
Resultant	157.44 @ 90.13				92.67 @ 114.50			
HIC	1181.55 from 89.125 to 100.500				518.58 from 57.250 to 134.875			
Chest Acceleration								
Longitudinal	8.60	115.50	47.49	97.25	2.78	225.75	31.50	97.50
Lateral	2.64	131.75	17.51	103.88	15.53	98.00	9.36	93.00
Vertical	4.12	44.88	12.80	82.63	19.56	61.50	10.33	137.25
Resultant (Max)	49.00 @ 97.25				35.39 @ 97.50			
Femur Loads	<u>Peak</u>	<u>Time</u>	<u>Peak</u>	<u>Time</u>	<u>Peak</u>	<u>Time</u>	<u>Peak</u>	<u>Time</u>
	<u>(lb)</u>	<u>(msec)</u>	<u>(lb)</u>	<u>(msec)</u>	<u>(lb)</u>	<u>(msec)</u>	<u>(lb)</u>	<u>(msec)</u>
Left	225.95	79.88	149.28	70.13	98.458 ^o	159.13	576.20 ^o	73.25
Right	1493.75	73.88	172.13	61.50	1391.38	75.00	193.84	54.38

Vehicle Impact Speed (mph): 34.9

*Longitudinal: Forward
 Lateral: Rightward
 Vertical: Downward
 **Longitudinal: Rearward
 Lateral: Leftward
 Vertical: Upward

^oSee test anomalies

DUMMY KINEMATIC SUMMARY

DRIVER

During impact, the knees were forced forward. The right knee struck the left side of the central console and the underside of the instrument panel. The left knee struck the underside of the instrument panel. The head and torso rotated forward until the face struck the steering hub and the upper portion of the steering wheel. The head and torso rebounded with a slight lean towards the driver's door. The dummy came to rest in approximately its original position but maintaining the slight lean towards the driver's door.

PASSENGER

During impact, the knees were forced forward and both struck the underside of the instrument panel. The head and torso rotated forward and towards the passenger door until the forehead struck the instrument panel. Upon rebound, the dummy rotated back nearly to its original orientation. The dummy came to rest in approximately its original position.

Vehicle Weight

The weight of the test vehicle is determined by placing each wheel on a KG Law Air Bearing Force Plate, certified with test weights scaled to National Bureau of Standards Class B tolerances.

Dummy Temperature Control and Positioning

The vehicle was kept inside the temperature controlled crash test building until approximately 30 minutes prior to the test. Temperature inside the vehicle and ambient temperature within the building were recorded. Vehicle and dummy temperatures while outside the crash test building were maintained portably until approximately 30 seconds prior to the test.

The following table summarizes the steps taken to position the instrumented, calibrated dummies in the test vehicle.

DUMMY PLACEMENT AND POSITIONING

Part 572

Dummy

	<u>Driver DSP</u>	<u>Passenger DSP</u>
HEAD	Surface of transverse instrument mounting platform is horizontal & midsagittal plane falls in longitudinal plane.	Surface of transverse instrument mounting platform is horizontal & midsagittal plane falls in longitudinal plane.
UPPER TORSO	Placed against seat back. Midsagittal plane is vertical & longitudinal & passes through center point of steering wheel rim.	Placed against seat back. Midsagittal plane is vertical, longitudinal, & the same distance from vehicle longitudinal centerline as driver dummy midsagittal plane.
UPPER ARMS	Initially placed against seat back & tangent to side of Upper Torso. Push arms rearward into seat back with bending at elbows.	Initially placed against seat back & tangent to side of Upper Torso. Push arms rearward into seat back with bending at elbows. Remains tangent.
LOWER ARMS	Initially placed against the outside of the thighs. Centerline as close as possible in a vertical plane.	Initially placed against the outside of the thighs. Centerline as close as possible in a vertical plane.
HAND PALMS	Palms contact outer part of steering wheel rim at horizontal centerline.	Palms contact the outsides of the thighs.
HAND THUMBS	Placed over steering wheel rim.	
HAND LITTLE FINGERS		Barely in contact with the seat cushion.
LOWER TORSO	Centered on bucket seat cushion. Midsagittal plane is vertical & longitudinal. For bench seat, midsagittal plane is vertical & longitudinal & passes through center point of plane described by steering wheel rim.	Centered on bucket seat cushion. Midsagittal plane is vertical & longitudinal. For bench seat, midsagittal plane is vertical, longitudinal, and same distance from vehicle longitudinal centerline as driver dummy midsagittal plane.
UPPER LEGS (thighs or femurs)	Placed against seat cushion. Plane defined by femur and tibia centerlines is as close as possible to vertical.	Placed against seat cushion. Plane defined by femur and tibia centerlines is as close as possible to vertical.
RIGHT KNEE	Knees initially set 14.5" apart between pivot bolt head outer surfaces.	Located so that plane defined by femur and tibia centerlines is as close as possible to vertical.
LEFT KNEE	Outer surface of pivot bolt head is 5.9" from midsagittal plane of dummy.	Located as above.
LOWER LEGS	Plane defined by femur and tibia centerlines is as close as possible to vertical longitudinal plane.	Plane defined by femur and tibia centerlines is as close as possible to vertical longitudinal plane.

DUMMY PLACEMENT AND POSITIONING (CONTD)

Part 572

<u>Dummy</u>	<u>Driver DSP</u>	<u>Passenger DSP</u>
RIGHT FOOT	Placed on undepressed accelerator pedal--rearmost point of heel on floorpan in plane of pedal.	Centerline falls in vertical longitudinal plane. Placed on toeboard--rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan.
LEFT FOOT	Placed on toeboard--rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan. Centerline falls in vertical longitudinal plane.	Centerline falls in vertical longitudinal plane. Placed on toeboard--rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan.

SHOULDER BELT TRAVEL SUMMARY

The following table is a summary of the maximum shoulder belt travel for the driver and front passenger restraint systems. The measurements were acquired by using string potentiometers and photographic analysis of the belt retractor spool out. Differences between the measurements are attributed to inherent innaccuracies in both measurement techniques.

Occupant Restraint System	Travel String Pot (in)	Travel Photographic Analysis (in)	Difference (%)
Driver	3.20 @ 131.13 msec	2.75 @ 110 msec	14.1
Passenger	2.60 @ 62.88 msec	2.22 @ 60 msec	14.6

IMPACTED VEHICLE MEASUREMENTSVEHICLE NUMBER 725 TEST NUMBER 820917

DIMENSIONS IN INCHES

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST
X 1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	191 7/8	163 9/16
X 2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	160 7/8	*N/A
X 3	REAR SURFACE OF VEHICLE TO FIREWALL	140 1/4	128 1/16
X 4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	125 1/16	124 9/16
X 5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	125	124 1/8
X 6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	127 1/2	126 1/4
X 7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	127 9/16	126 7/16
X 8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	91 11/16	91 1/16
X 9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	91 11/16	90 15/16
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	92 1/8	90 7/8
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	92 1/8	91 5/16
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF RIGHT SIDE	126 1/4	124 1/4
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF LEFT SIDE	126 1/4	125 1/2
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	141	**N/A
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	141	133 7/8
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	112 9/16	110 1/8

IMPACTED VEHICLE MEASUREMENTS

VEHICLE NUMBER 725 TEST NUMBER 820917

DIMENSIONS IN INCHES

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST
X17	STEERING COLUMN TO "A" POST	14 7/8	17 1/8
X18	REAR OF WINDSHIELD HEADER TO STEERING WHEEL CENTER	17 5/8	16 1/2
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	189 1/2	162 1/8
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	189 1/4	163 1/4
X21	LENGTH OF ENGINE BLOCK	17 3/8	17 3/8
X22	RIGHT FRONT SILL TO GROUND PLANE	10 9/16	6 9/16
X23	LEFT FRONT SILL TO GROUND PLANE	10 3/16	7 1/4
X24	RIGHT REAR SILL TO GROUND PLANE	10 1/8	7 5/16
X25	LEFT REAR SILL TO GROUND PLANE	10	8 3/8

Wheelbase - Right

104 1/8 98

Wheelbase - Left

104 1/8 98 11/16

*Radiator was wrapped around front of engine
 **Shock tower was pushed back into firewall

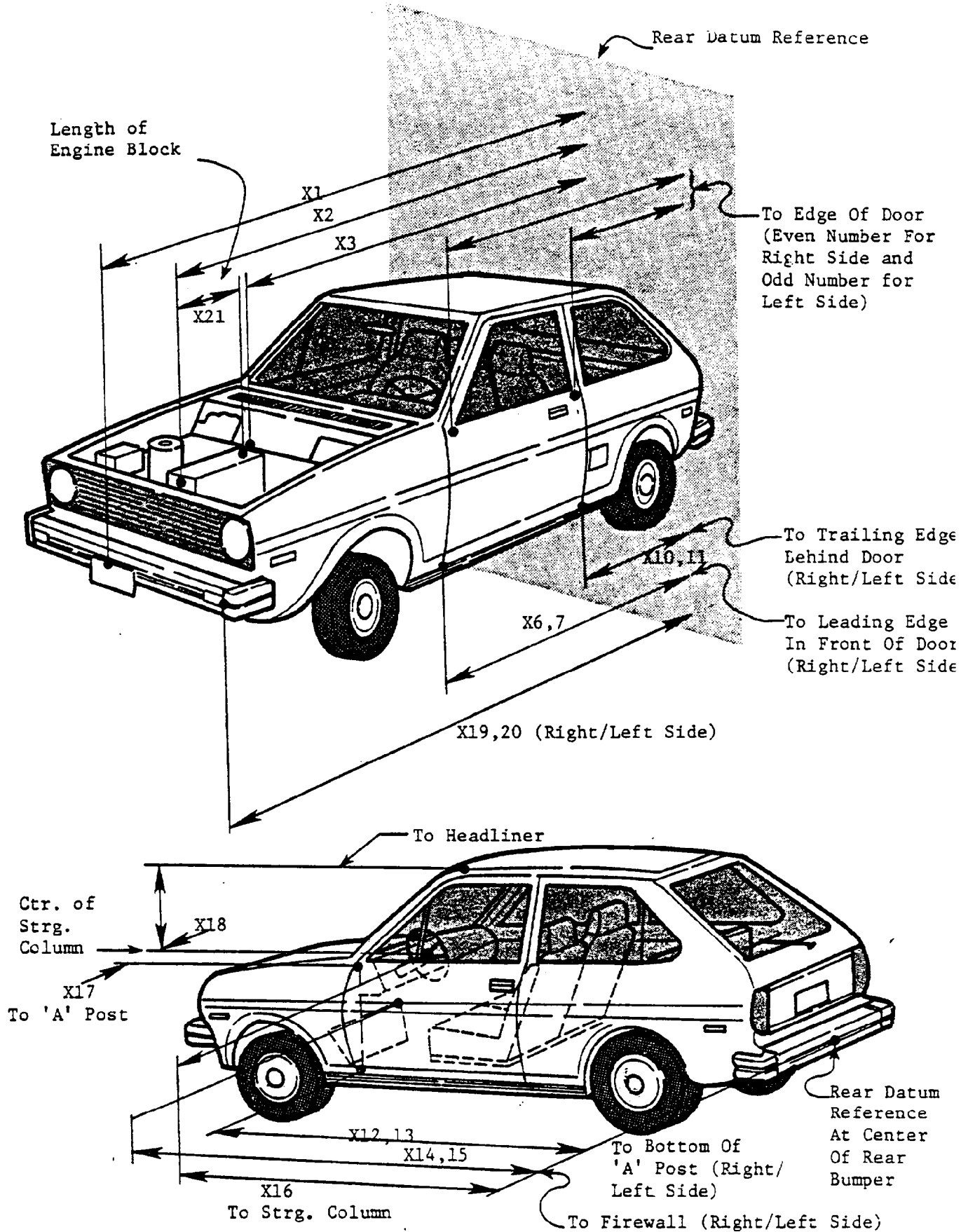
TEST TECHNICIANS Gary A. Johnson

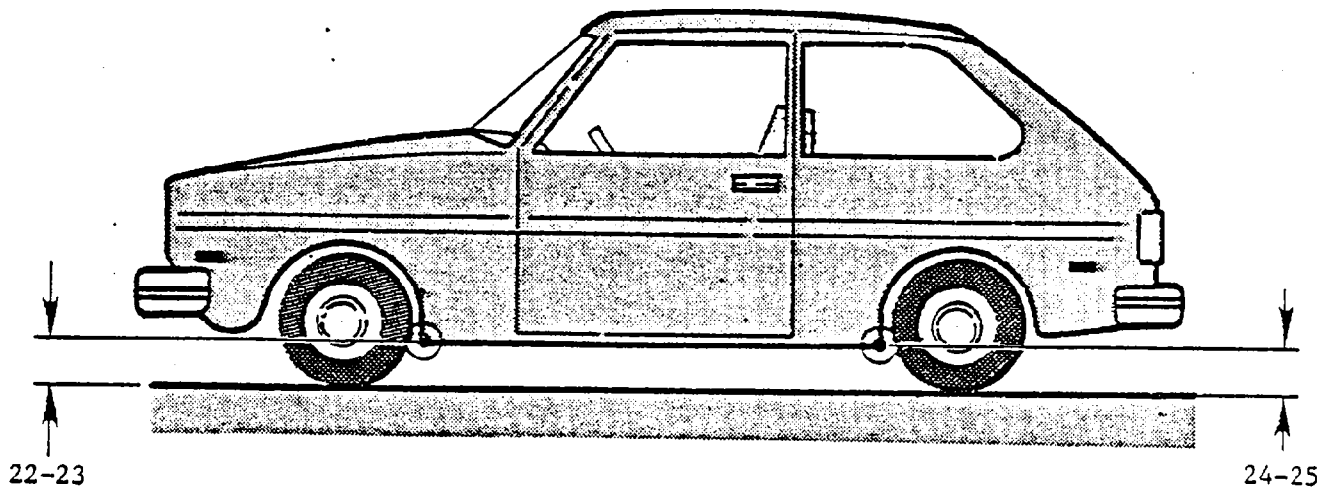
M. Schaefer

John C. Stultz

TEST ENGINEER

PRE-TEST AND POST-TEST MEASUREMENT POINTS





LONGITUDINAL LOCATIONS OF ADDITIONAL TARGETS

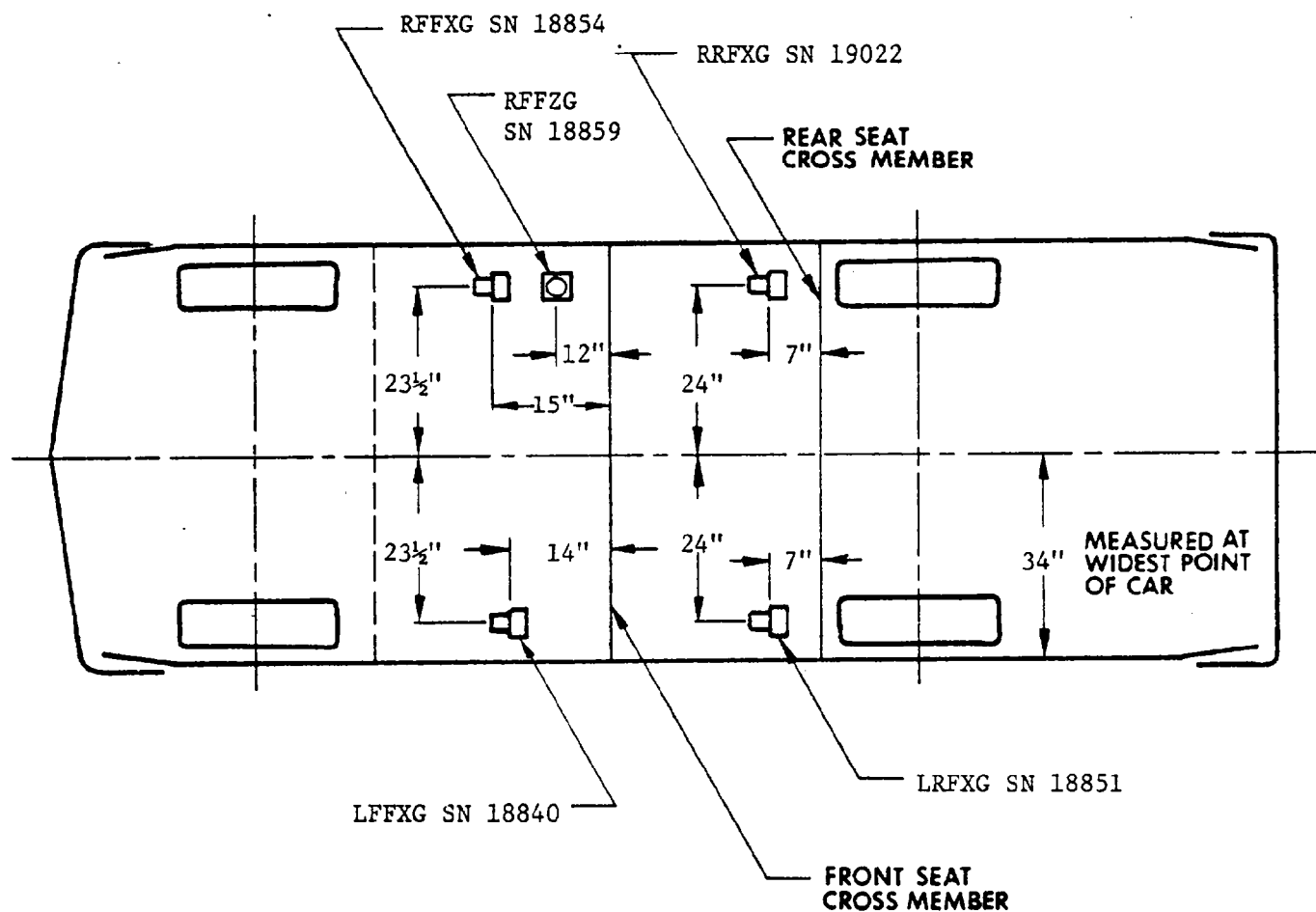
<u>Measurement</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Rearmost point of vehicle to roof target	83 15/16	84 3/8
Rearmost point of vehicle to steering column	119 1/8	116 1/4
Rearmost point of vehicle to "C" Pillar - Right	56 5/16	56 5/8
Rearmost point of vehicle to "C" Pillar - Left	56 1/2	56 15/16
Rearmost point of vehicle to front of sill - Right	135 3/8	134
Rearmost point of vehicle to front of sill - Left	135 1/2	135
Rearmost point of vehicle to middle of sill - Right	92 1/8	91 5/16
Rearmost point of vehicle to middle of sill - Left	92 1/8	92 1/4
Rearmost point of vehicle to rear of sill - Right	64 3/4	64 1/8
Rearmost point of vehicle to rear of sill - Left	64 15/10	64 15/16

Test Technicians *Mike Lamm*

JM Kolomda

Test Engineer *John C. Stultz*

VEHICLE ACCELEROMETER PLACEMENT



NOT TO SCALE

TRANSDUCER INFORMATION

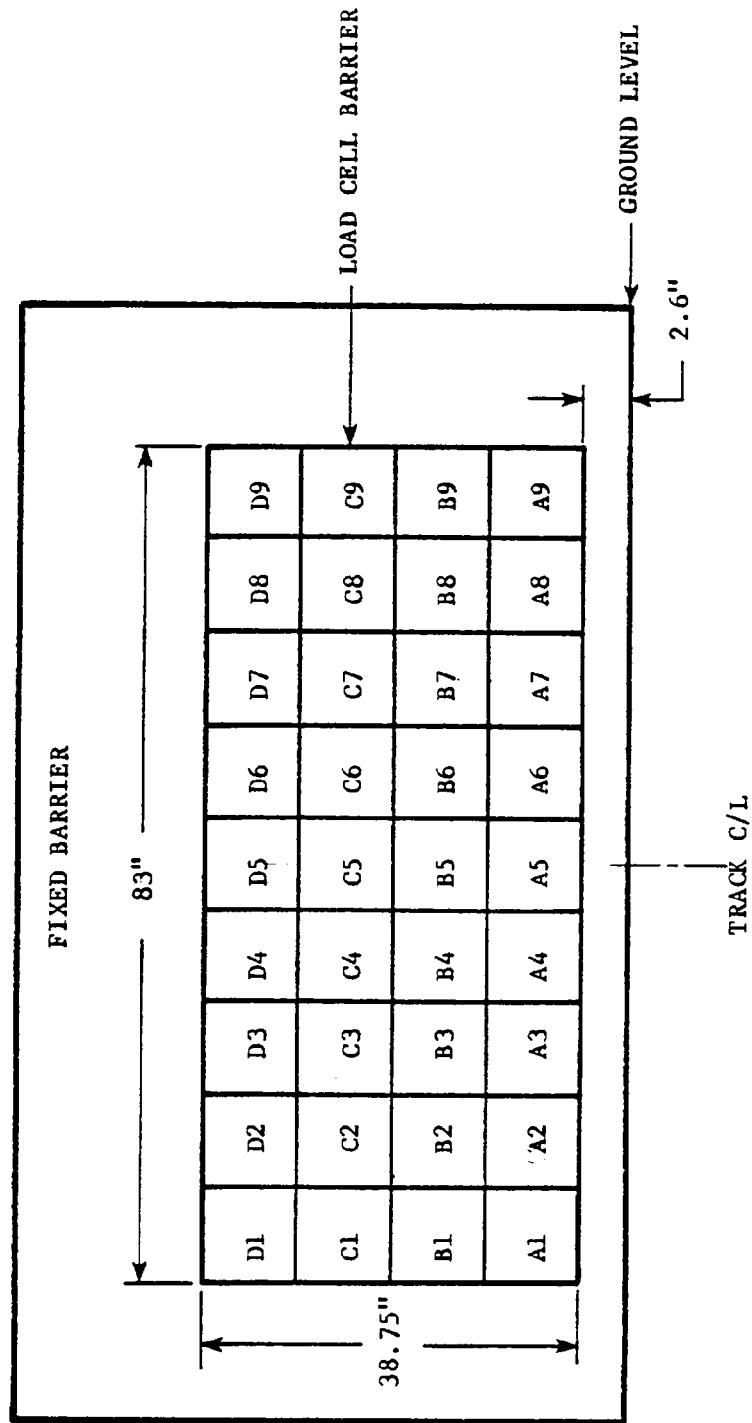
PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NUMBER	SERIAL NUMBER	MFGR.	DATE OF LAST CALIBRATION	SENSITIVITY	DESIRED FULL SCALE (ENGR. UNITS)
X Axis RR Sill	S/A Accel.	4-202-0001	19022	Bell Howell	5-21-82	.221 MV/G	100 G
Z Axis RF Floor Pan	S/A Accel.	4-202-0001	18859	Bell Howell	5-21-82	.238 MV/G	100 G
X Axis LF Sill	S/A Accel.	4-202-0001	18840	Bell Howell	5-20-82	.239 MV/G	100 G
X Axis RF Sill	S/A Accel.	4-202-0001	18854	Bell Howell	5-20-82	.237 MV/G	100 G
X Axis LR Frame	S/A Accel.	4-202-0001	18851	Bell Howell	5-20-82	.235 MV/G	100 G

Load Cell Barrier Face

The fixed, segmented barrier was instrumented with 36 load cells to provide an axial force-time history mapping during the impact. The load cell configuration employed is depicted on the following page. Data recorded by these sensors are presented in Appendix B.

36 LOAD CELLS
4 ROWS
9 COLUMNS

FRONT VIEW



BARRIER LOAD CELL CONFIGURATION

HIGH SPEED CAMERA INFORMATION

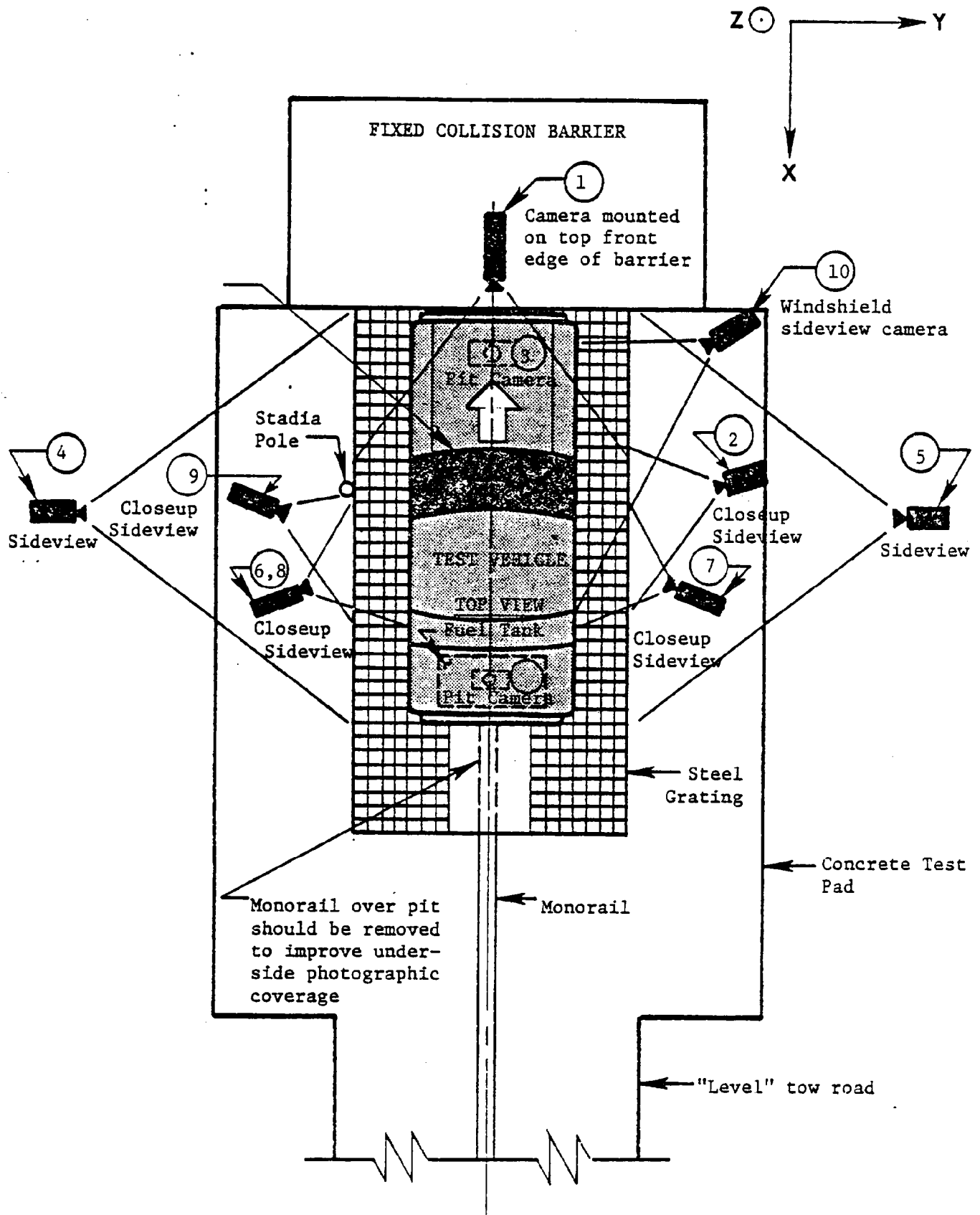
CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Overhead	Photosonic 1B	25	500	Windshield area
2	Right-front	Hycam	25	500	Passenger dummy
3	Pit	Stalex	13	500	Steering and fuel lines
4	Left	Photosonic PL-1	16	500	Overall
5	Right	Kodak K-100	16	24	Overall
6	Left	Photosonic 1B	25	500	Steering Column
7	Right-rear	Photosonic 1B	50	500	Passenger dummy
8	Left	Photosonic 1B	25	500	Steering Column
9	Left-front	Hycam	25	500	Driver Dummy
10	Right-front	Photosonic 1B	13	500	Crush
11	Onboard-Floor	Photosonic 1B	13	500	Seat belt retractor
12	Onboard-Floor	Photosonic 1B	13	500	Seat belt retractor
13	Onboard-rear	Photosonic 1B	8	24-500	Dummy movement

NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE OF FILM.
 (24 fps) REAL TIME MOVIE FILM COVERAGE OF PRE-CRASH, POST-CRASH
 AND CRASH EVENT SPLICED AT START AND END OF FILM.

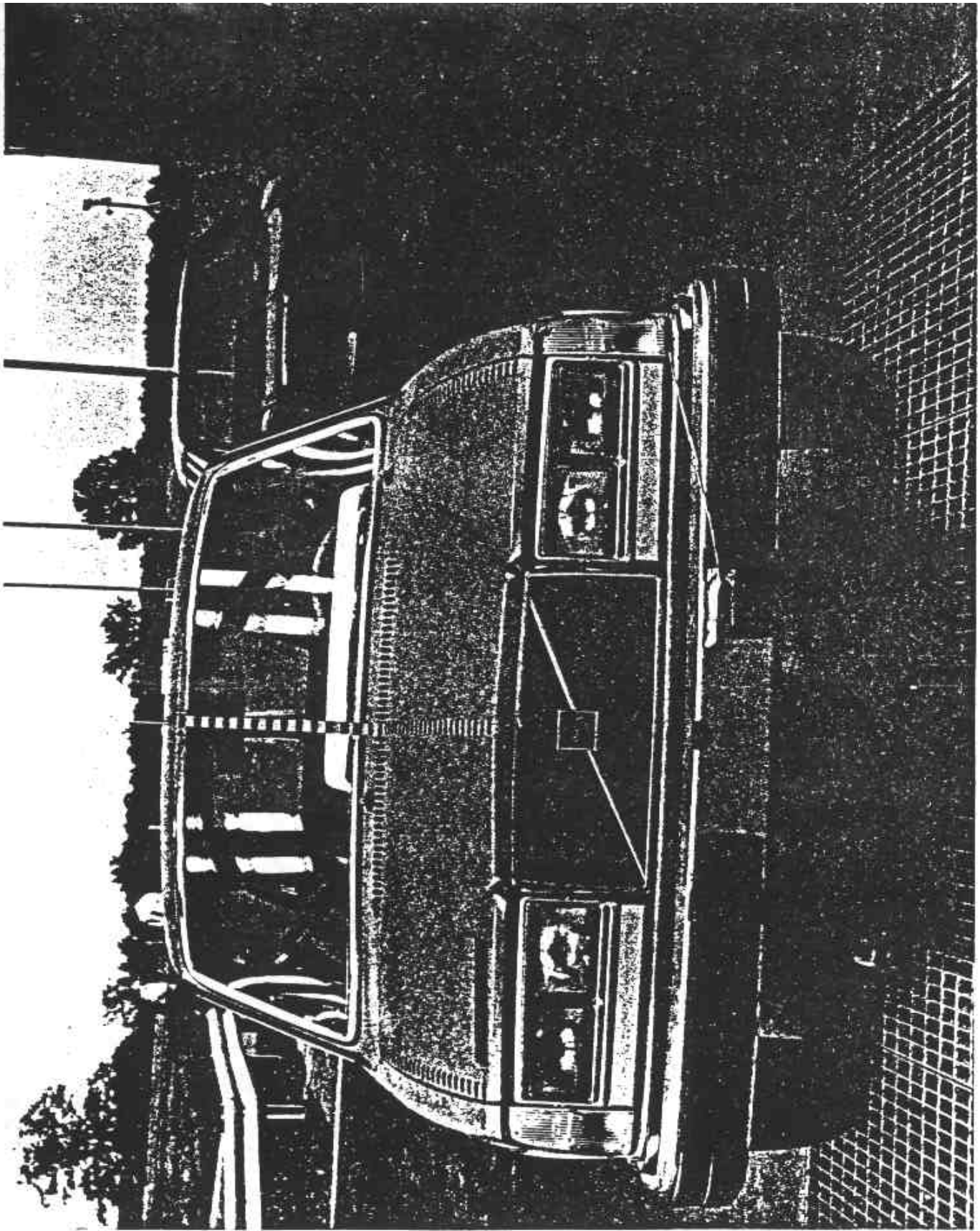
HIGH SPEED CAMERA INFORMATION

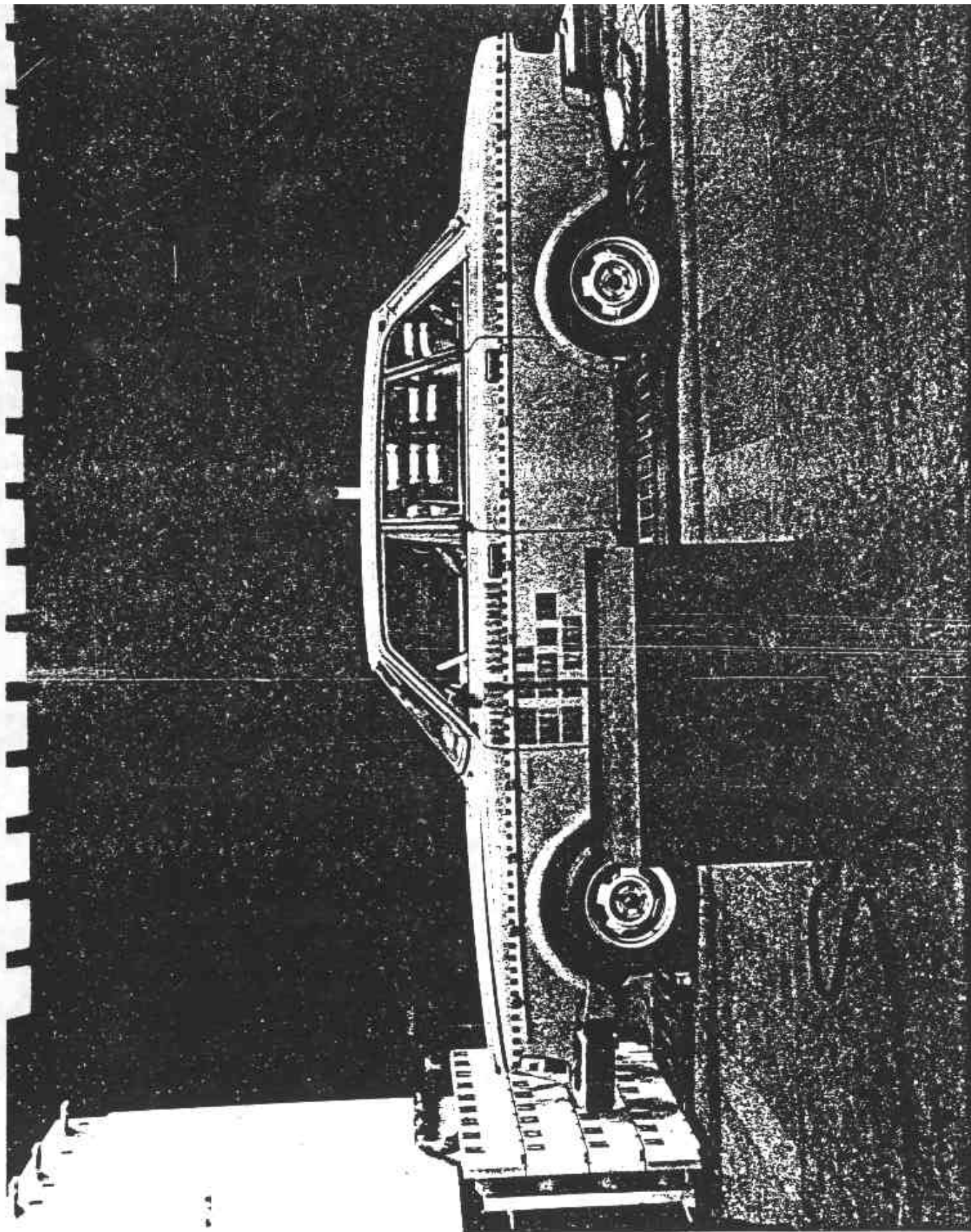
CAMERA NO.	CAM/MAG	X	Y	Z
1	1441-1150	2'	0'	18'
2	Hycam 2154	1'10"	-14'6"	59"
3	Stalex 23	3'	0'	30"
4	PL-1	5'8"	27'6"	45"
5	Kodak	15'	-44'	4'4"
6	1438-1143	16'0.5"	24'10.4"	42.3"
7	1442-1142	15'6"	-27'	50"
8	1437-1152	16'0.5"	24'10.4"	72.3"
9	Hycam 2210	-20"	14'3"	59"
10	1440-1145	-2'6"	-13'	43"
11	1443-1149	DNA	DNA	DNA
12	1444-1148	DNA	DNA	DNA
13	1436-1151	DNA	DNA	DNA
Drivers Side Stadia Pole		7' 5.1"	5' 4.4"	12.0"
Passengers Side Stadia Pole		7' 5.1"	-5' 4.4"	24.0"

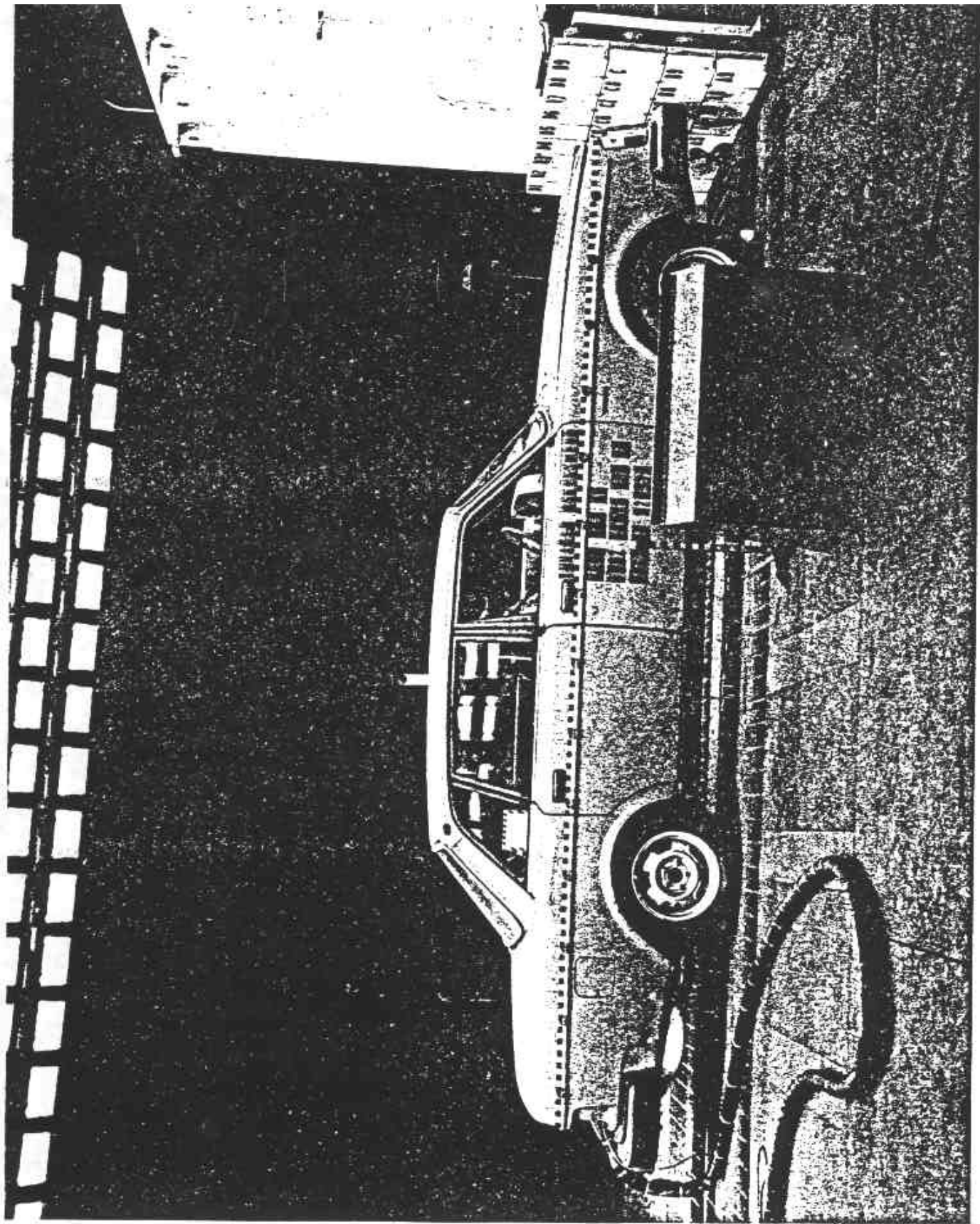
CAMERA POSITIONS FOR FRONTAL/OBLIQUE IMPACTS



APPENDIX A
PHOTOGRAPHS









APRIL 1967 - THE NEW YORK TIMES - PHOTOGRAPH BY JAMES M. HARRIS



FIGURE A-5 PRE-TEST PASSENGER SIDE DUMMY



Figure A-6. POST-TEST DRIVER SIDE DUMMY - VIEW 1

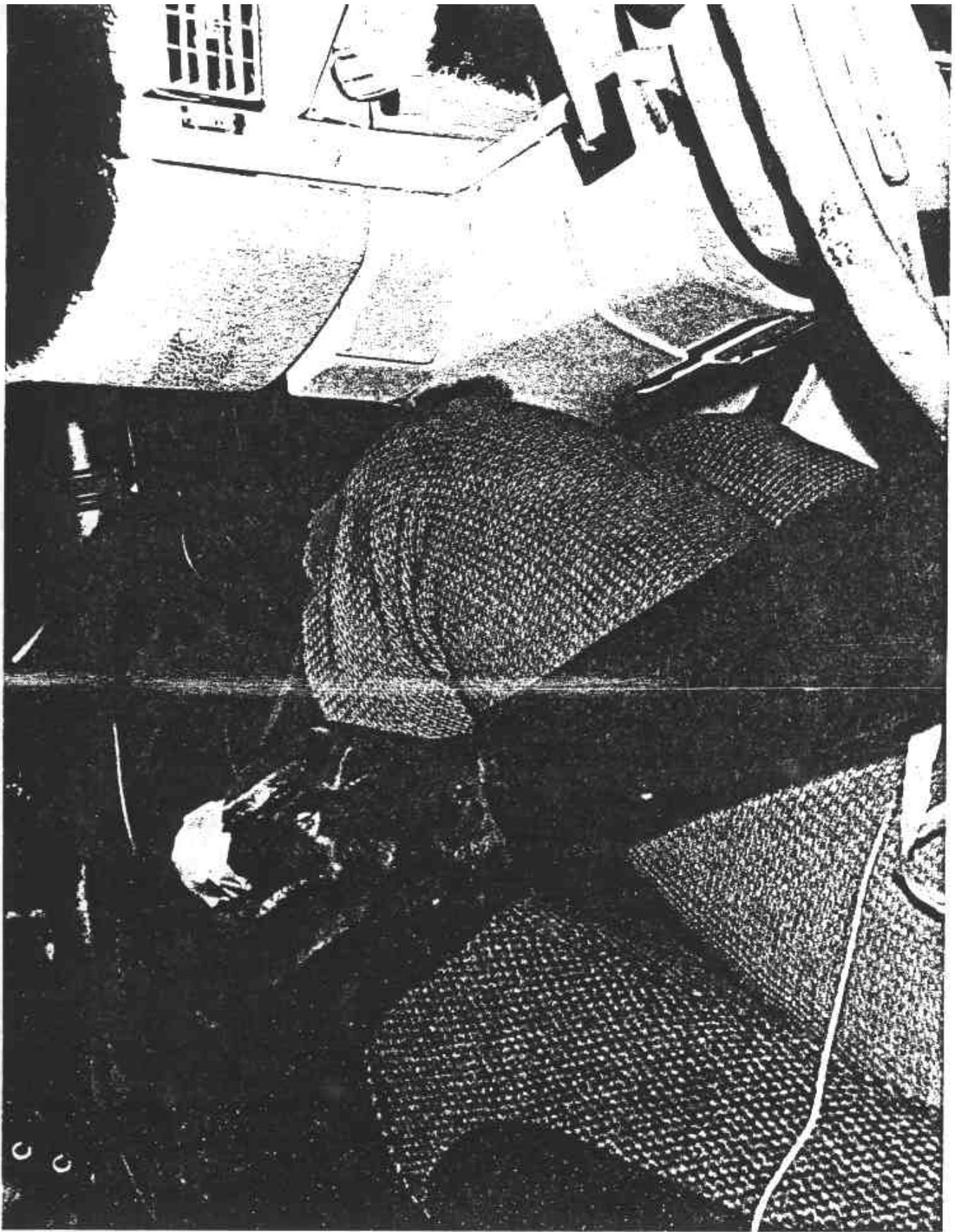




Figure A-6: High-contrast photograph of the interior of a vehicle - view 1



FIGURE A-10. POST-TEST PASSENGER SIDE DUMMY - VIEW 2

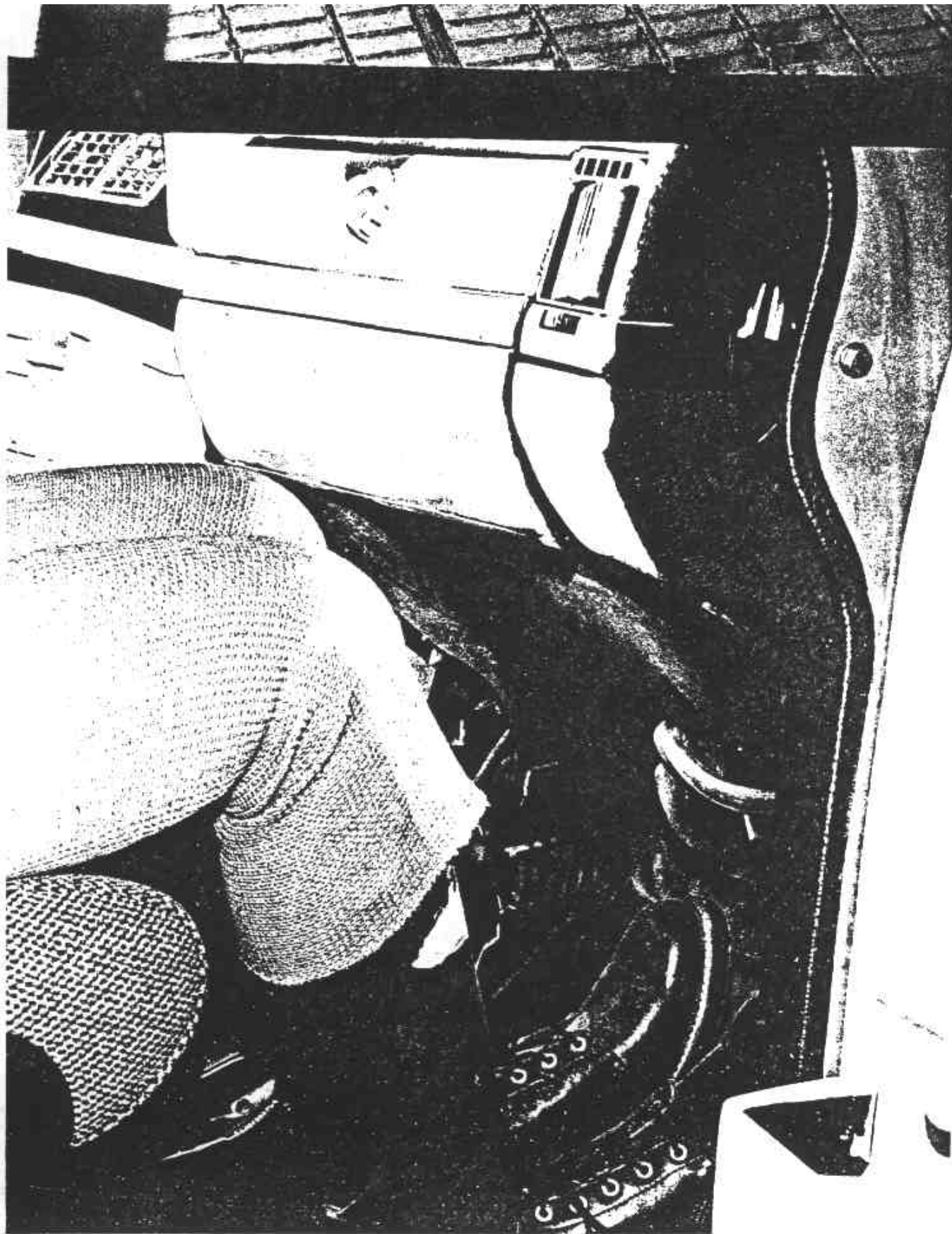


Figure A-11. POST-TEST PASSENGER SIDE DUMMY - VIEW 3

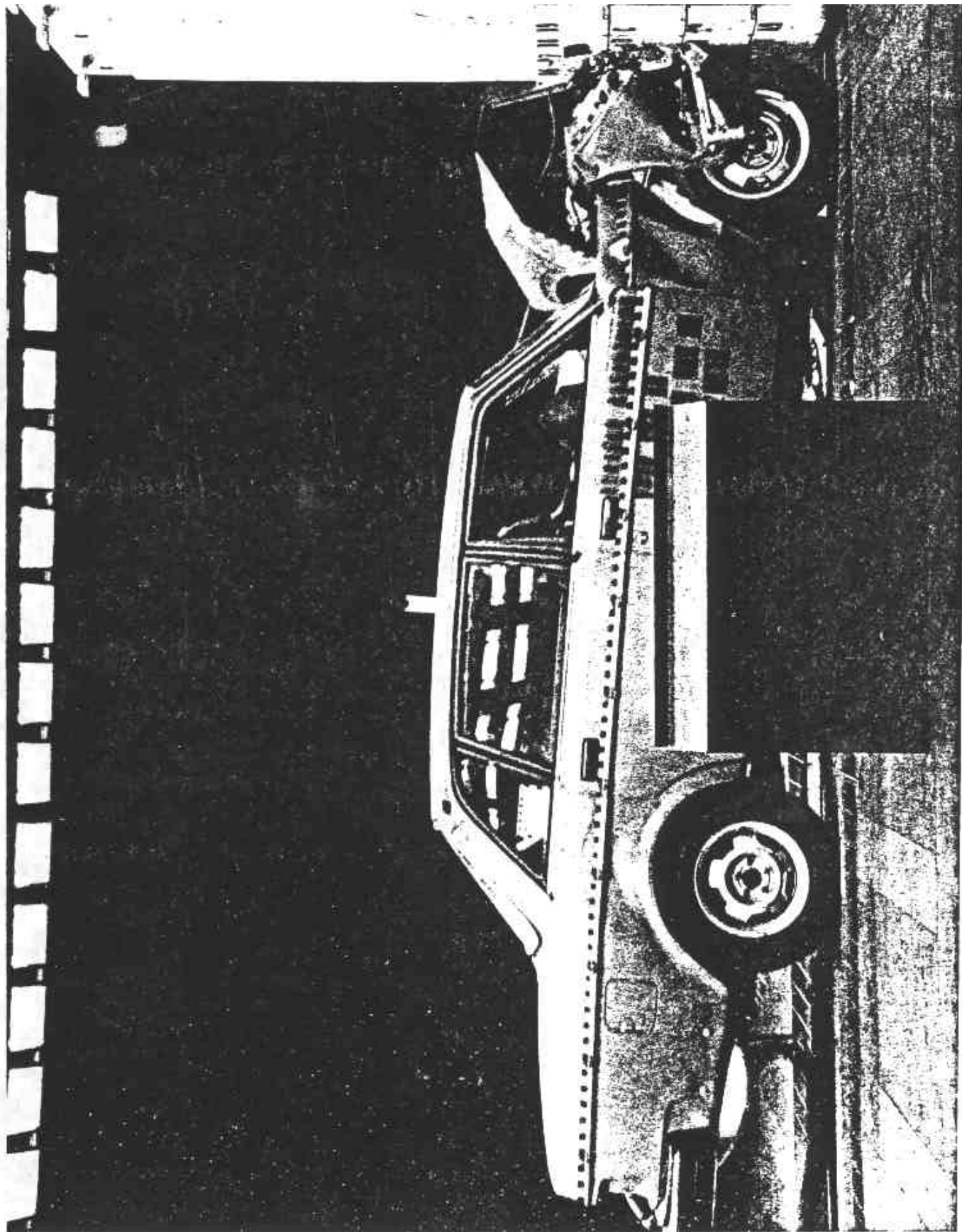


FIGURE A-13 TRUCK EVENT PHOTOGRAPH

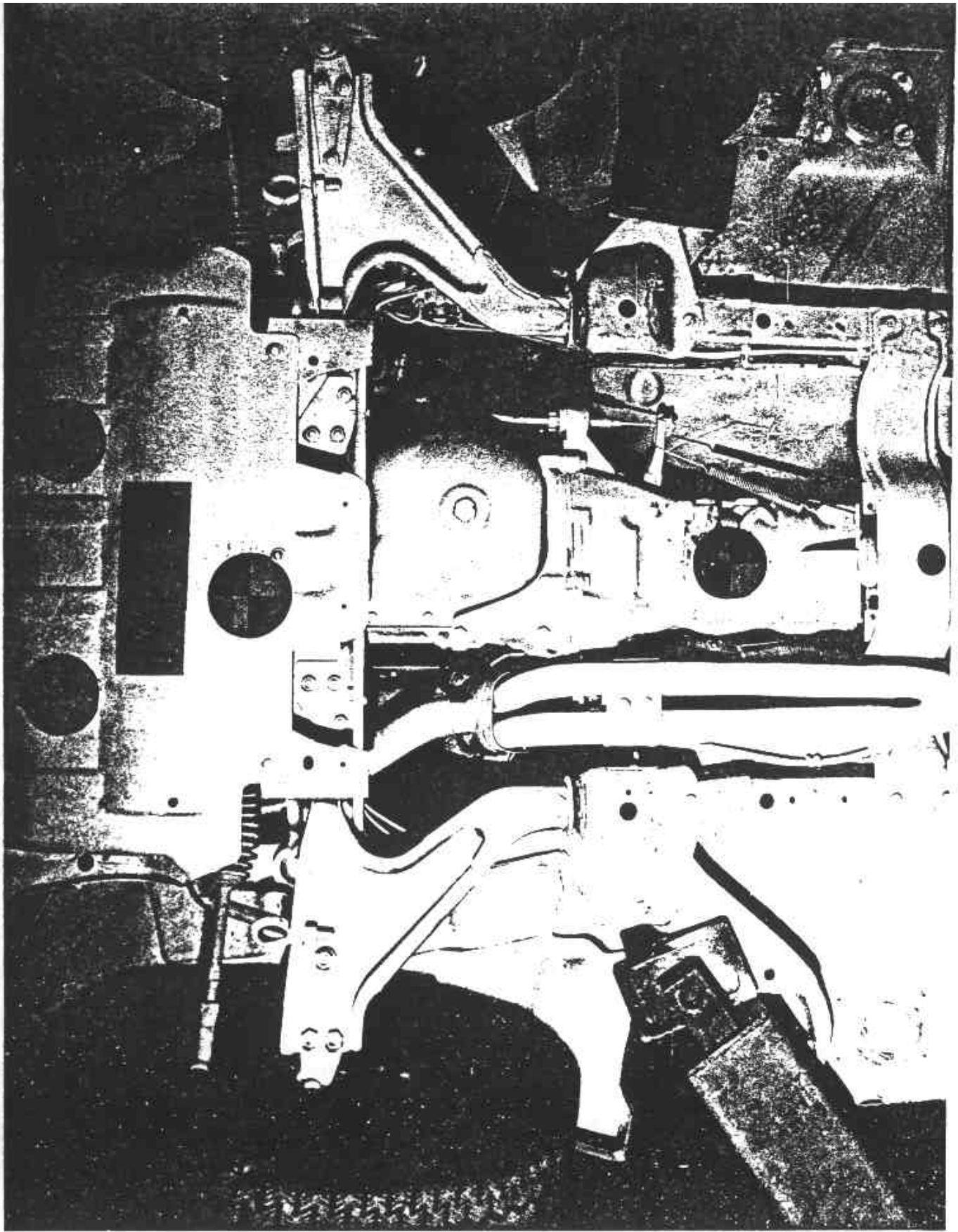


Figure A-13. PRE-TEST UNDERBODY VIEW



FIGURE 8. 1.6. SHIP'S HULL, INTERIOR VIEW

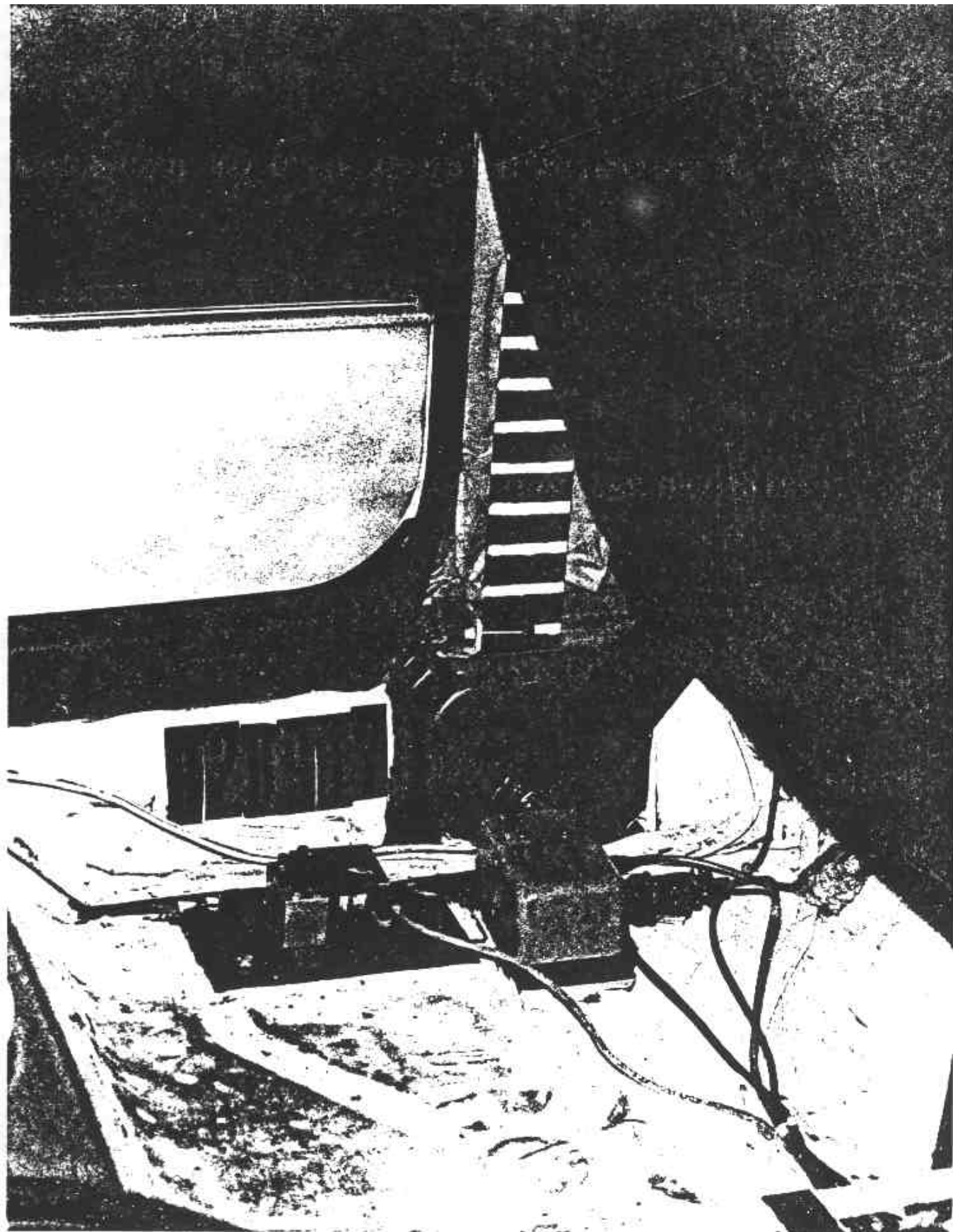
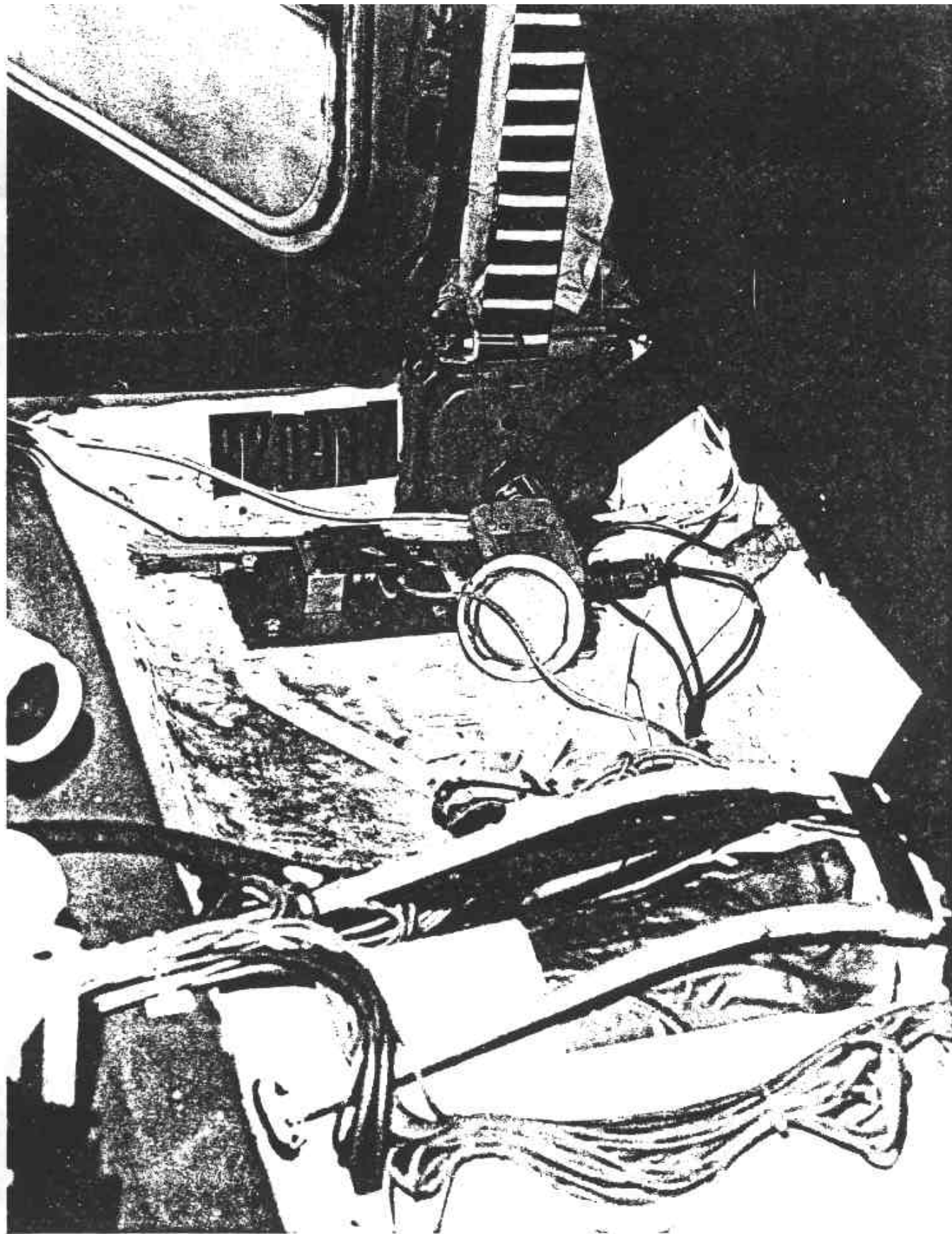
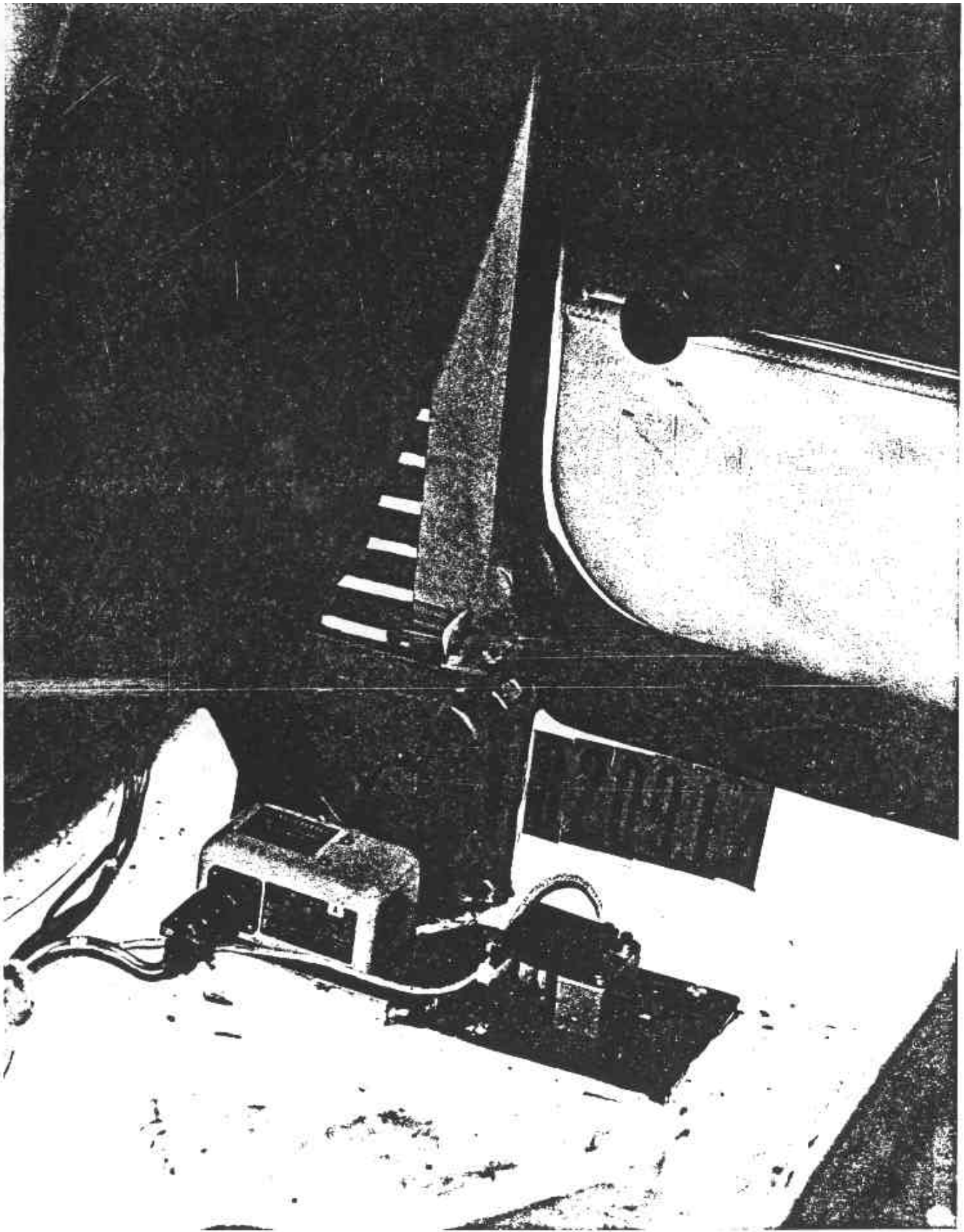
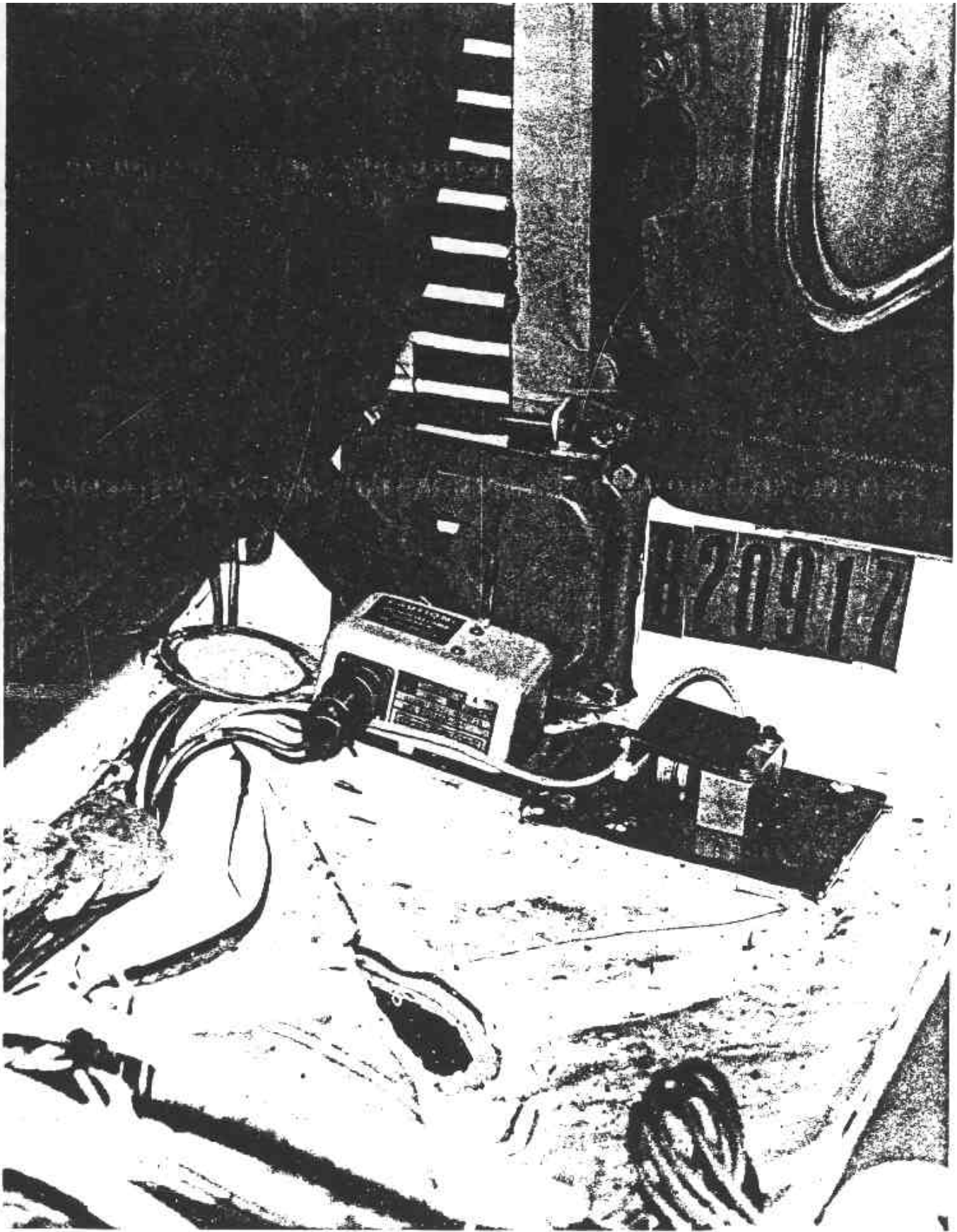


PHOTO A-16 SIDE-POST INVERT SIDE RPT DETECTOR







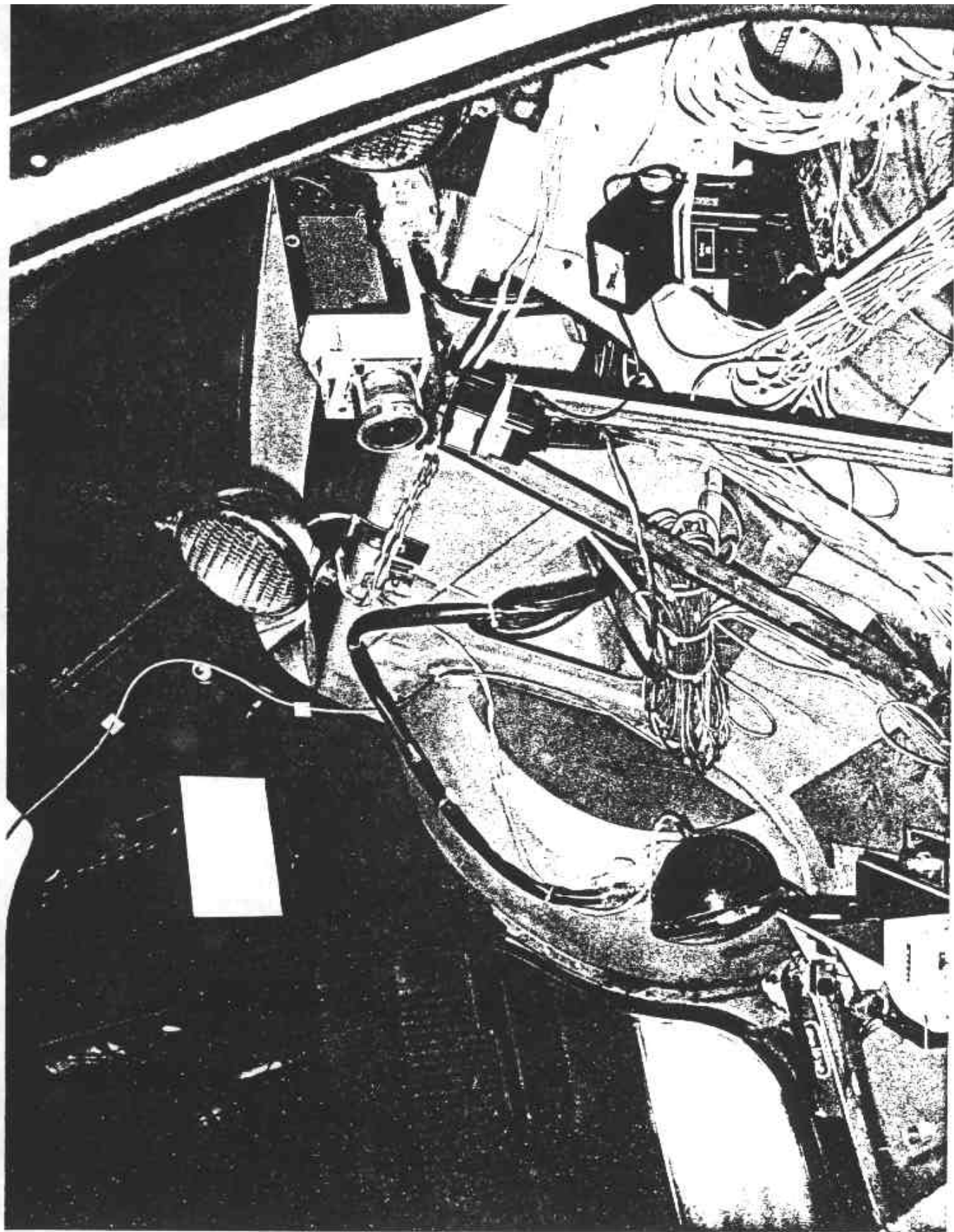


FIGURE 1. A TO. DODGE CHRYSLER ENGINE.

APPENDIX B

DATA PLOT PRESENTATION

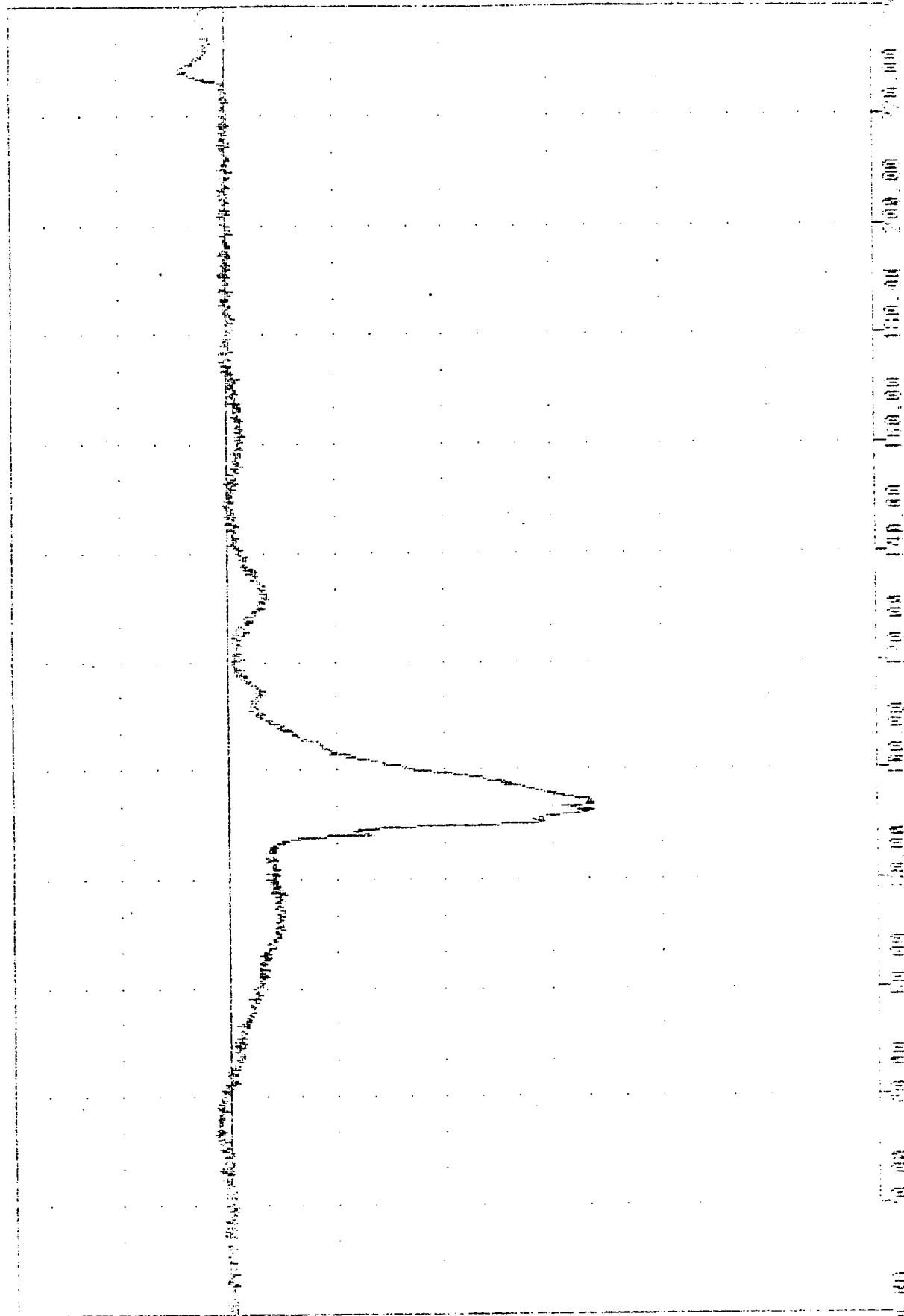
Data plots generated from the crash test data are presented on the following pages. All data are recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data were filtered according to SAE J211.

180
 VEHICLE RESURGEMENT TEST
 02260
 HFE661

PLO, DATE 8 MAY 82 14.00.13

FILTER = ALPF 1650/ 5214/ -40

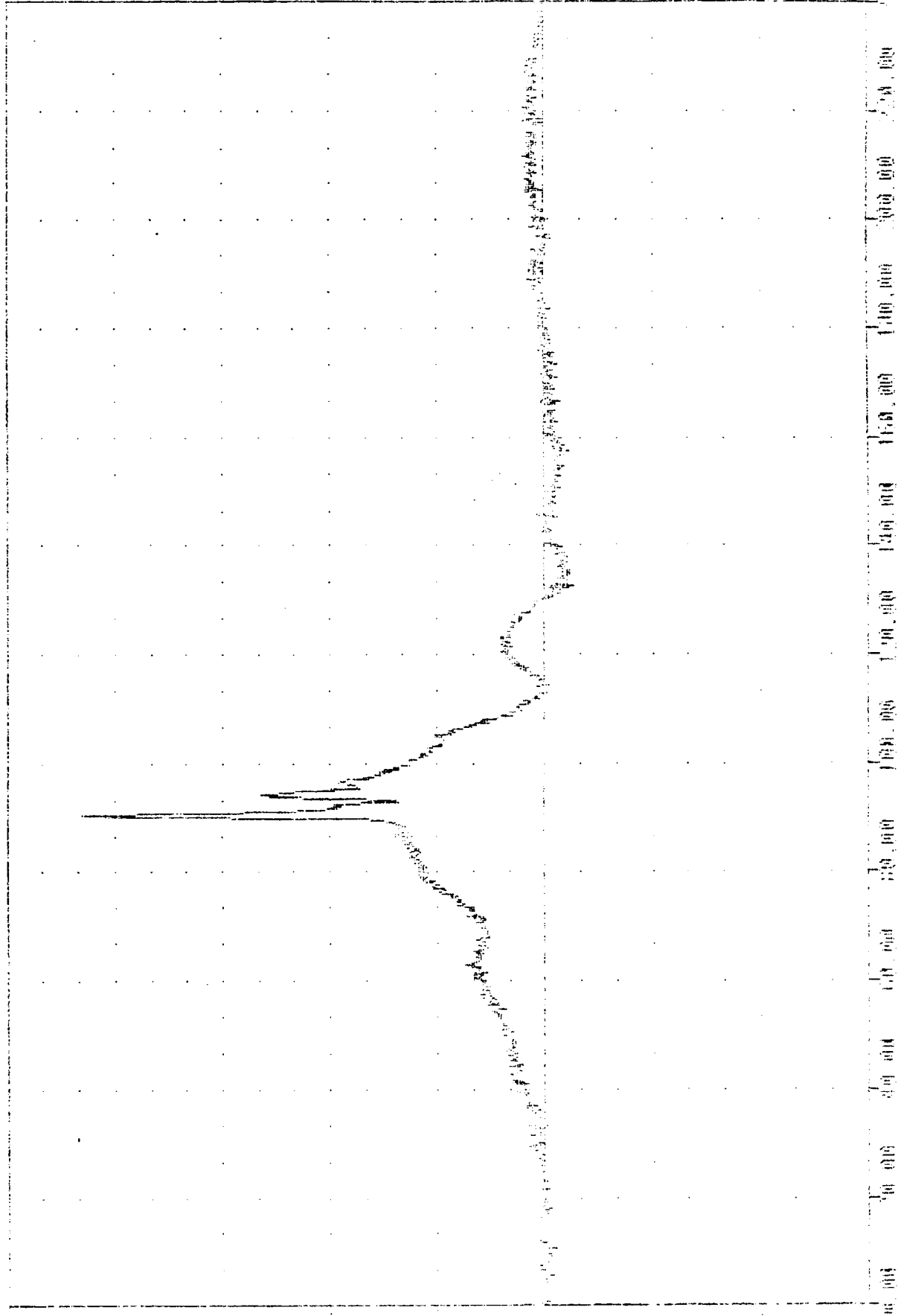
MIN. MAX VALUES = -101.410 92.50 12.63 0 227.63



VEHICLE RESURGEMENT TEST
 HFE661

FILE # 828917
VEHICLE INSPECTION TEST
82890
H0261

PLAT DATE 4-N07-82 14:00.13
FILTER = HUFF 1650/ 5.14/ -40
MIN, MAX VALUES = -0.130 142.50, 129.15 0 90.13



FILE # 828917
VEHICLE INSPECTION TEST
82890
H0261

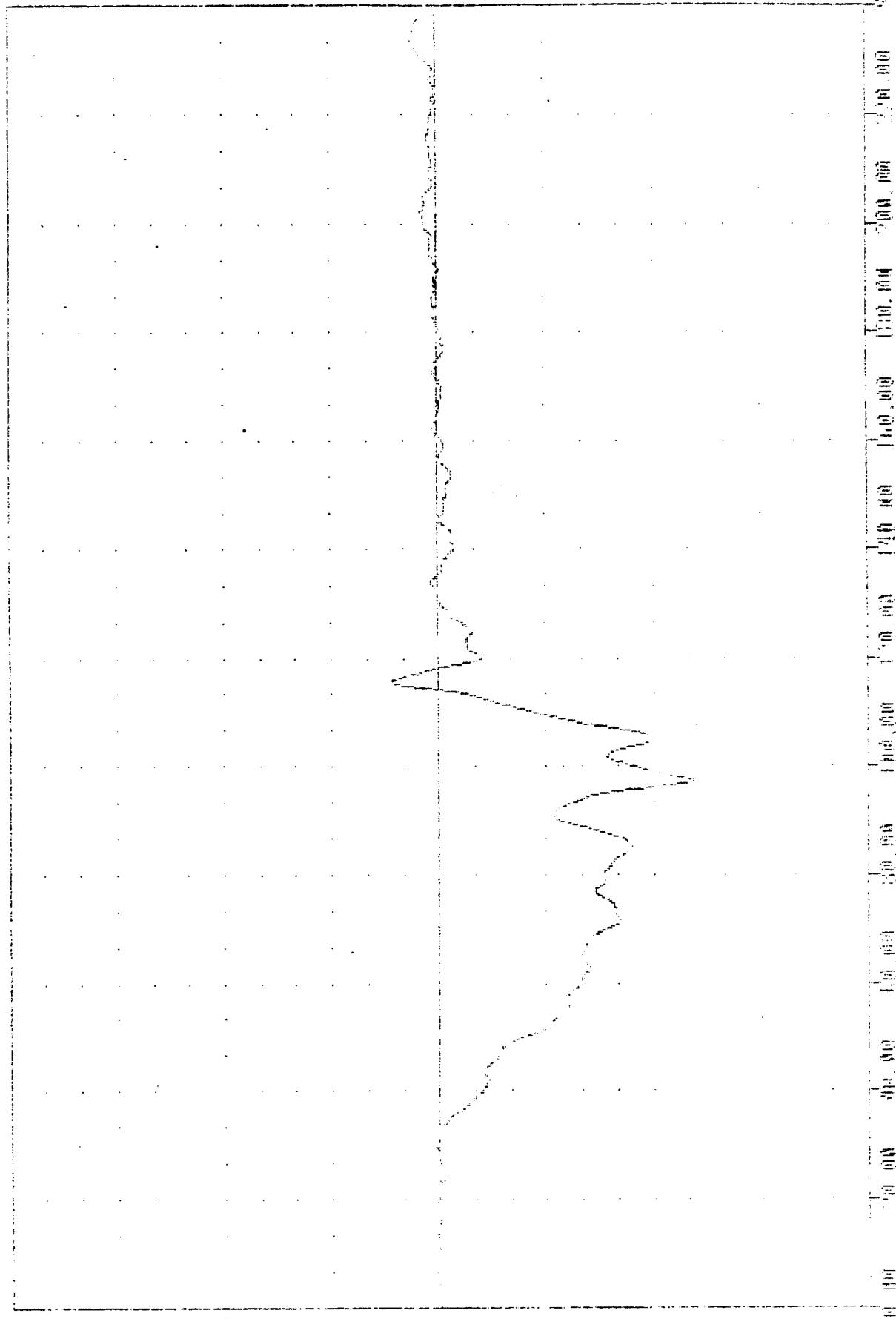
FILE NAME: 480002 04:00.13

VEHICLE ASSESSMENT TEST

FILTER = BLPF 3000/ 949/ -40

MIN. MAX VALUES = -47.438 97.25 8.60 115.50

101301



POWER SUPPLY UNIT INTERLOCK X AXIS

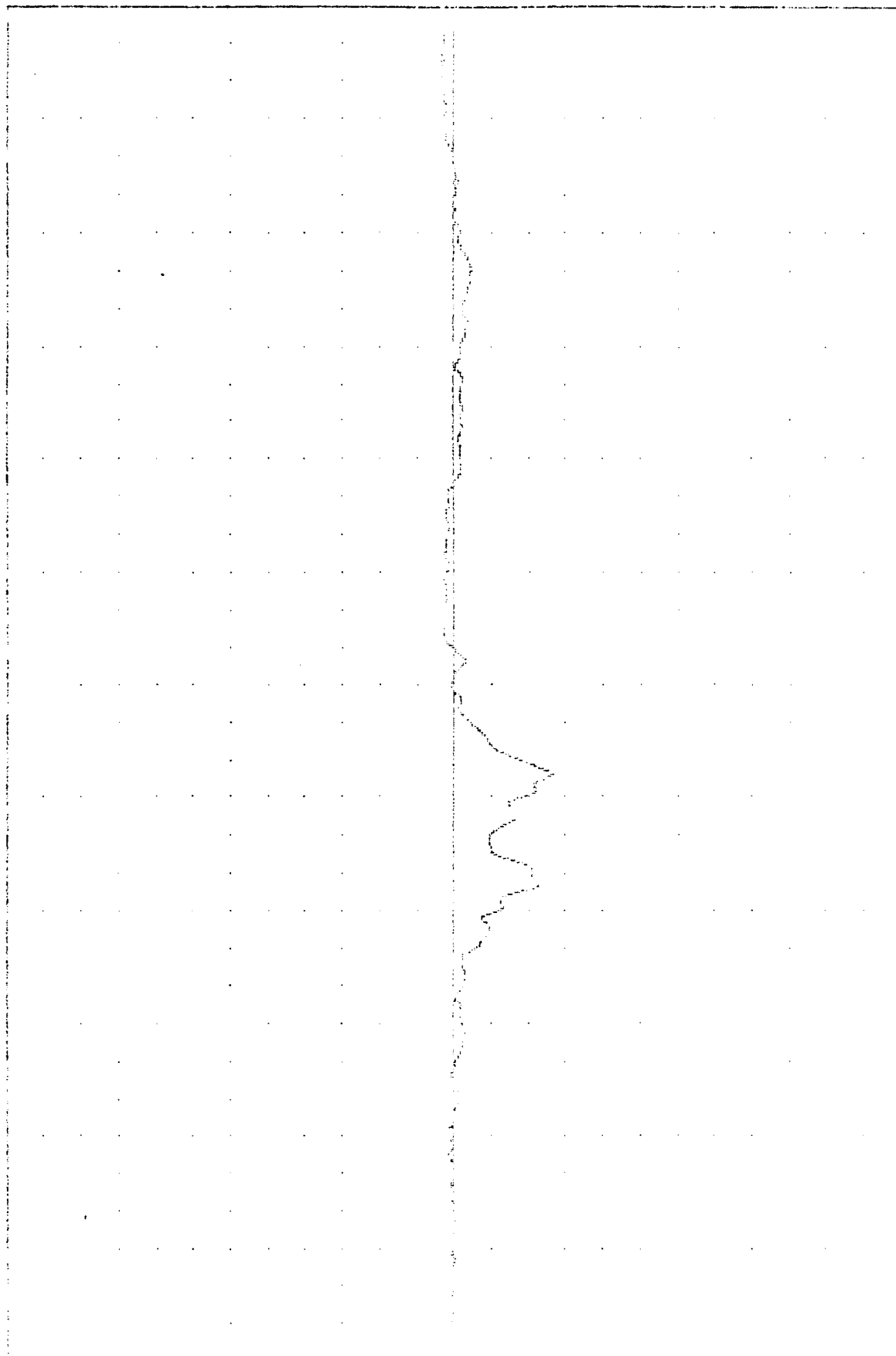
1001 mile 4 Nov 82 14.00.13

IBC 820917
VEHICLE RESPONSE TEST

FILTER - ALP 300/ 040/ -10

HQ. MAX VALUES = -17.51% 103.88, 2.64 e 131.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.90 3.00 3.10 3.20 3.30 3.40 3.50 3.60 3.70 3.80 3.90 4.00 4.10 4.20 4.30 4.40 4.50 4.60 4.70 4.80 4.90 5.00 5.10 5.20 5.30 5.40 5.50 5.60 5.70 5.80 5.90 6.00 6.10 6.20 6.30 6.40 6.50 6.60 6.70 6.80 6.90 7.00 7.10 7.20 7.30 7.40 7.50 7.60 7.70 7.80 7.90 8.00 8.10 8.20 8.30 8.40 8.50 8.60 8.70 8.80 8.90 9.00 9.10 9.20 9.30 9.40 9.50 9.60 9.70 9.80 9.90 10.00



0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.90 3.00 3.10 3.20 3.30 3.40 3.50 3.60 3.70 3.80 3.90 4.00 4.10 4.20 4.30 4.40 4.50 4.60 4.70 4.80 4.90 5.00 5.10 5.20 5.30 5.40 5.50 5.60 5.70 5.80 5.90 6.00 6.10 6.20 6.30 6.40 6.50 6.60 6.70 6.80 6.90 7.00 7.10 7.20 7.30 7.40 7.50 7.60 7.70 7.80 7.90 8.00 8.10 8.20 8.30 8.40 8.50 8.60 8.70 8.80 8.90 9.00 9.10 9.20 9.30 9.40 9.50 9.60 9.70 9.80 9.90 10.00

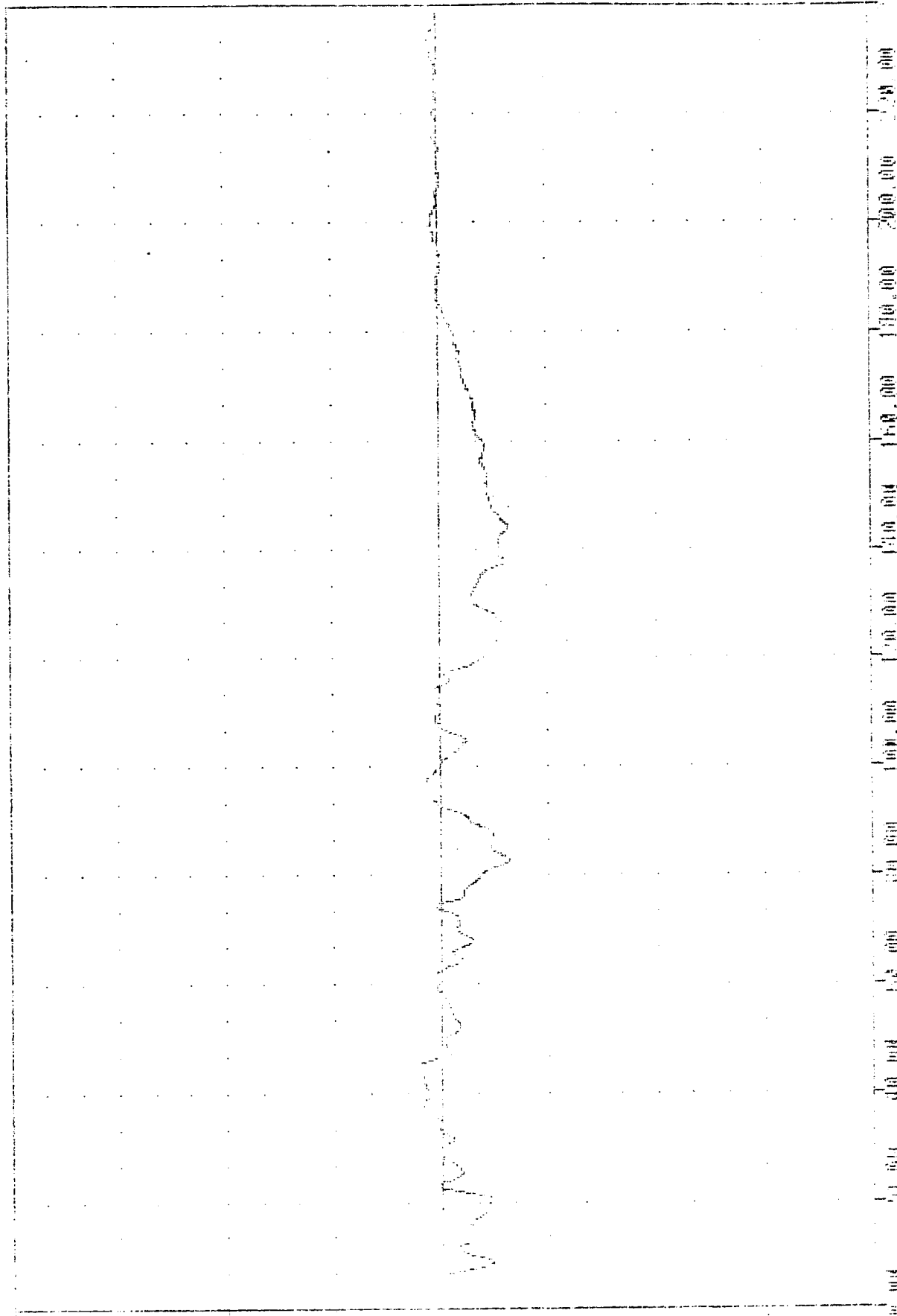
THE RESULTS
WILL BE FURNISHED TO THE
RELEVANT AGENCIES FOR THEIR
USE

INC 828917
VEHICLE REASSESSMENT TEST
02260
741251

PLOT DATE 4-NOV-82 14:08:13

FILTER = BLPF 300/ 949/ -40

MIN. MAX VALUES = -12.802 32.53 4.12 44.88



VEHICLE REASSESSMENT TEST
02260
741251

1

THE

DATE

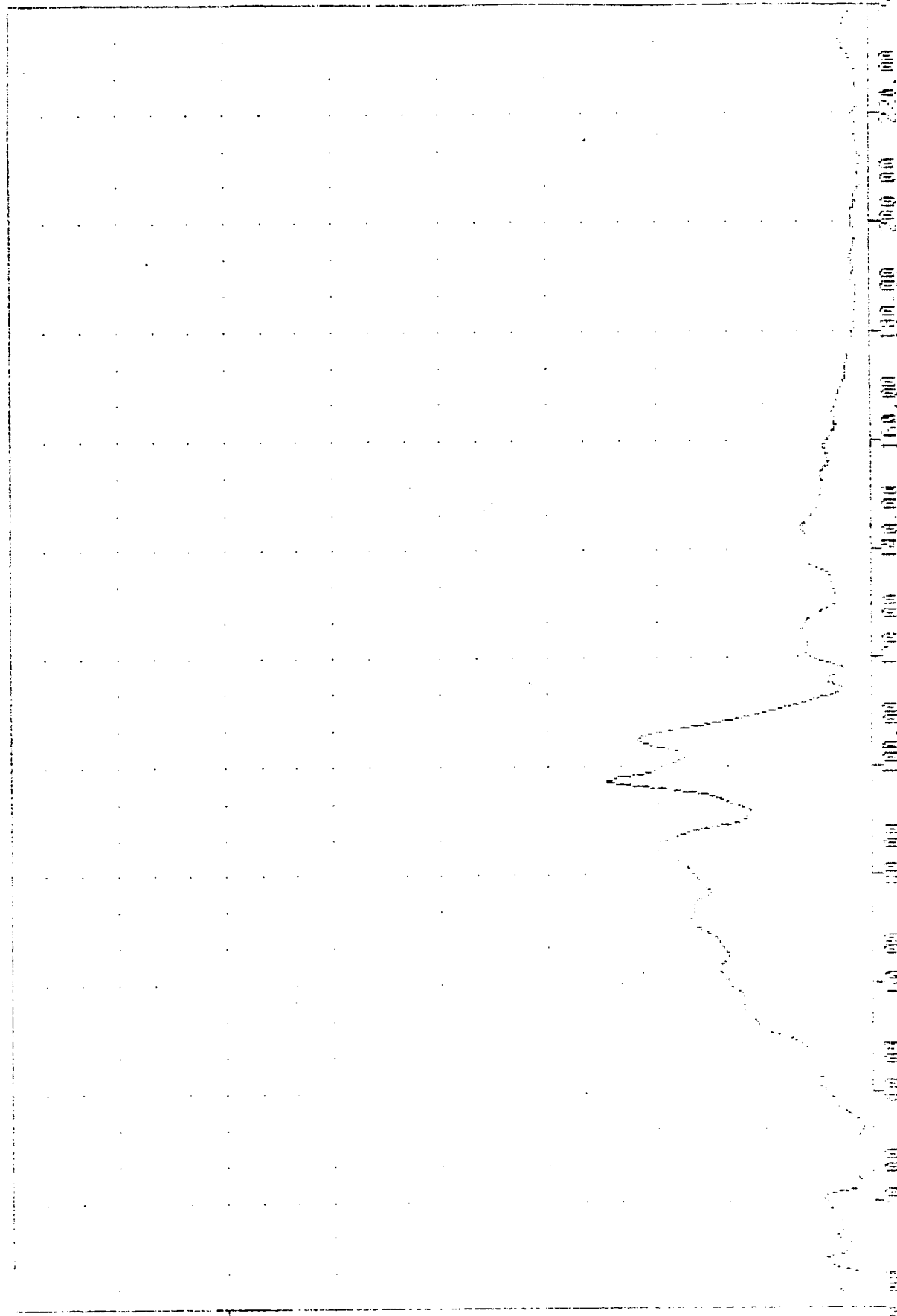
4 NOV 82

10:00:13

VEHICLE MEASUREMENT TEST

FILTER = BLPF 300.0 949.0 40

MIN. MAX VALUES = 1.00e 22.88 49.00 97.25



VEHICLE MEASUREMENT TEST

DATE

4 NOV 82

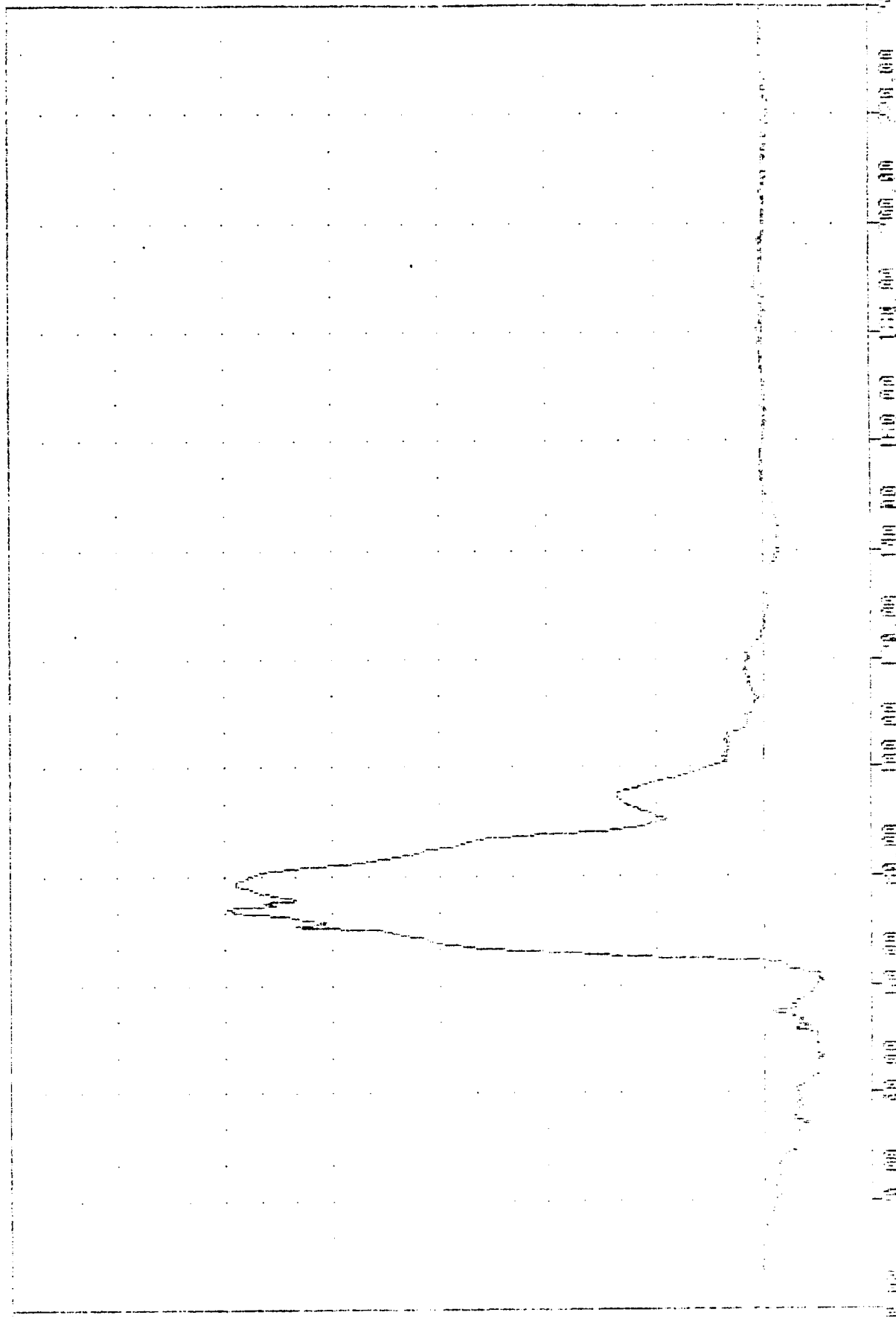
10:00:13

TAC 820817
 VEHICLE ASSESSMENT TEST
 3-260
 GPHGT

PLUT DATE 4-NOV-82 14:00:13

FILTER = BLFF 1000/ 3162/ -40

MIN, MAX VALUES = -172.13% 61.50, 1493.75 % 73.88

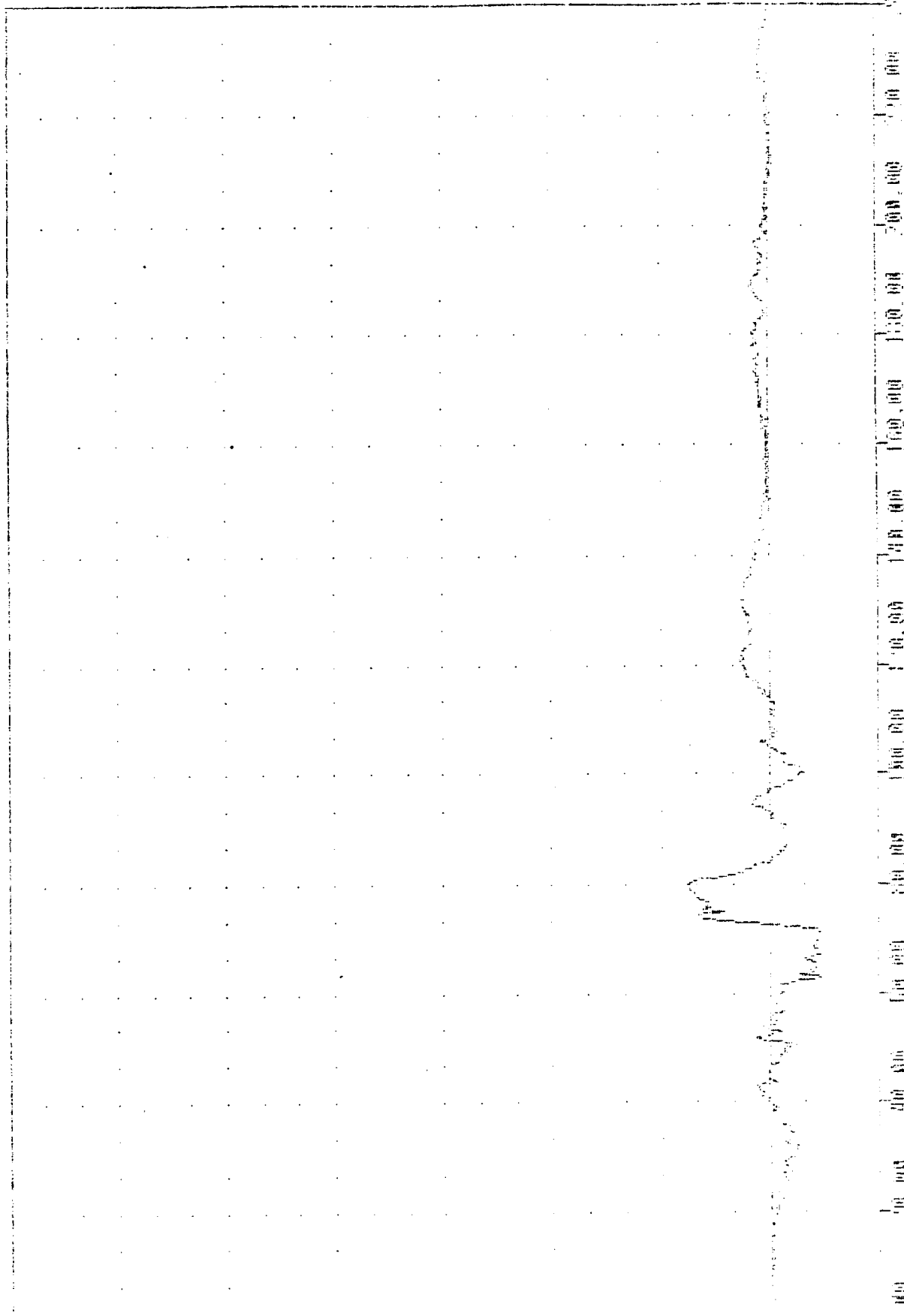


TIME
 0 100 200 300 400 500 600 700 800 900 1000
 VOLTAGE
 -100 0 100

TRC
VEHICLE REGISTRATION TEST
LFNF1

PLOT DATE 4-NDV-82 14:08:18

FILTER = ELPF 1000/ 01627 -40
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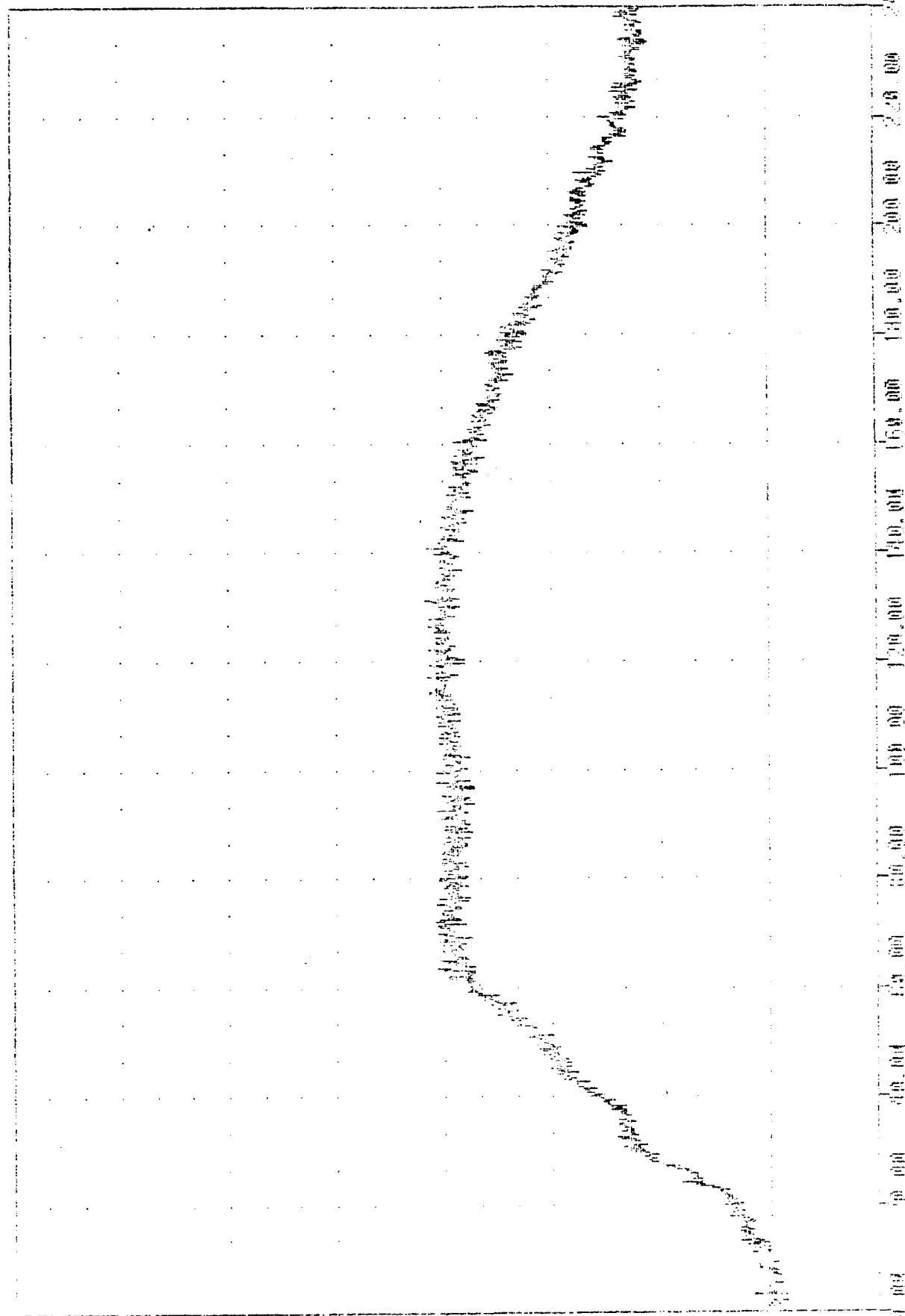
END OF PLOT
VEHICLE REGISTRATION TEST

CHC 8228917
 VEHICLE ASSESSMENT TEST
 82289
 -HEMI

PLOT DATE 4 NOV 82 14:08:13

FILTER = ALPF 1050/ 5214/ -49

HIGH MAX VALUES = -0.15e 2.13. 3.20 e 131.13

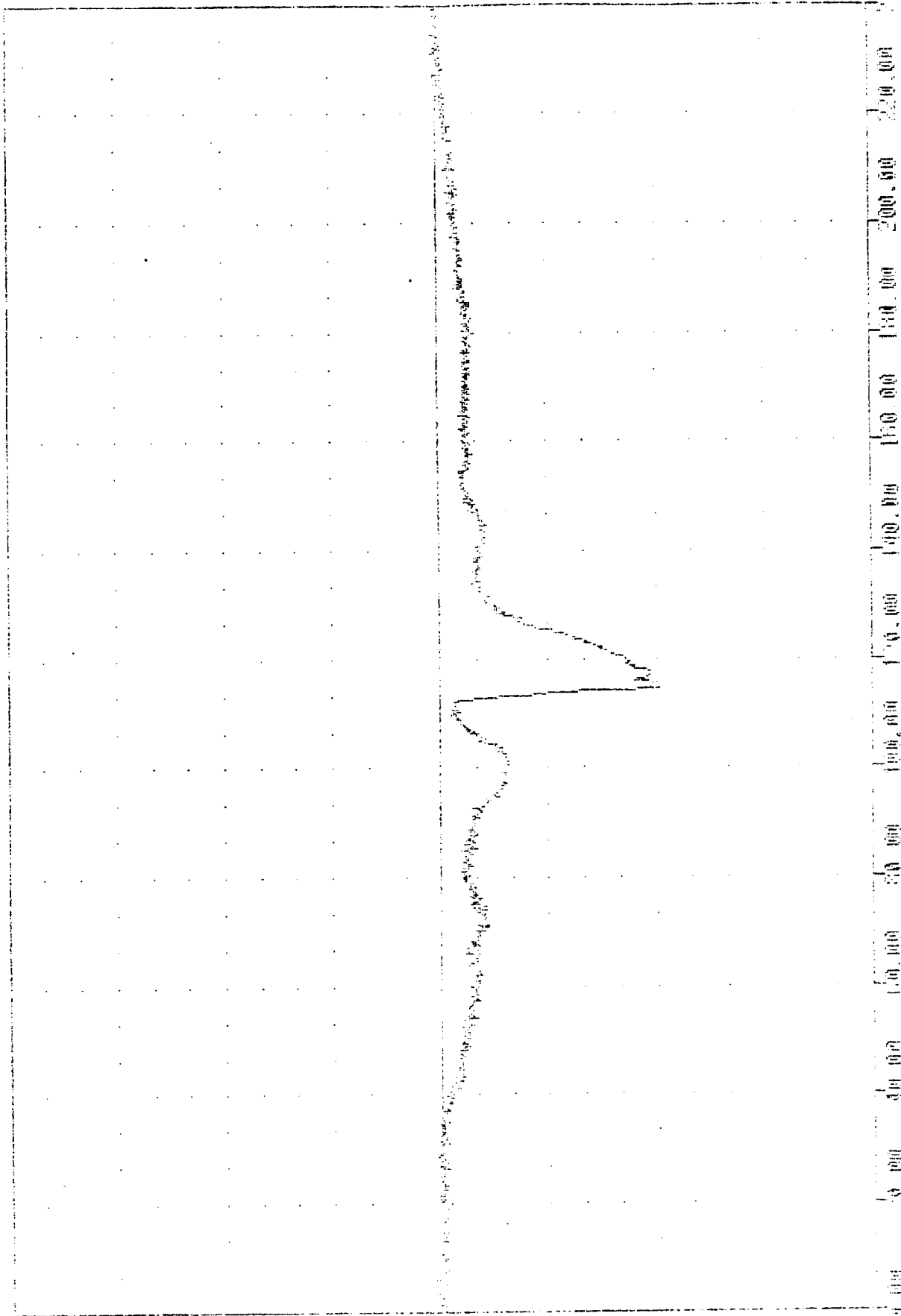


1050/ 5214/ -49
 82289
 -HEMI

THE
VEHICLE DISPLACEMENT TEST
82260
HEH002

PLOT DATE 4-MAY-82 14:08:13

FILES = RLPE 16507 52147 -10
MIN. MAX VALUES = -60.000 114.60, 2.25 2 234.00



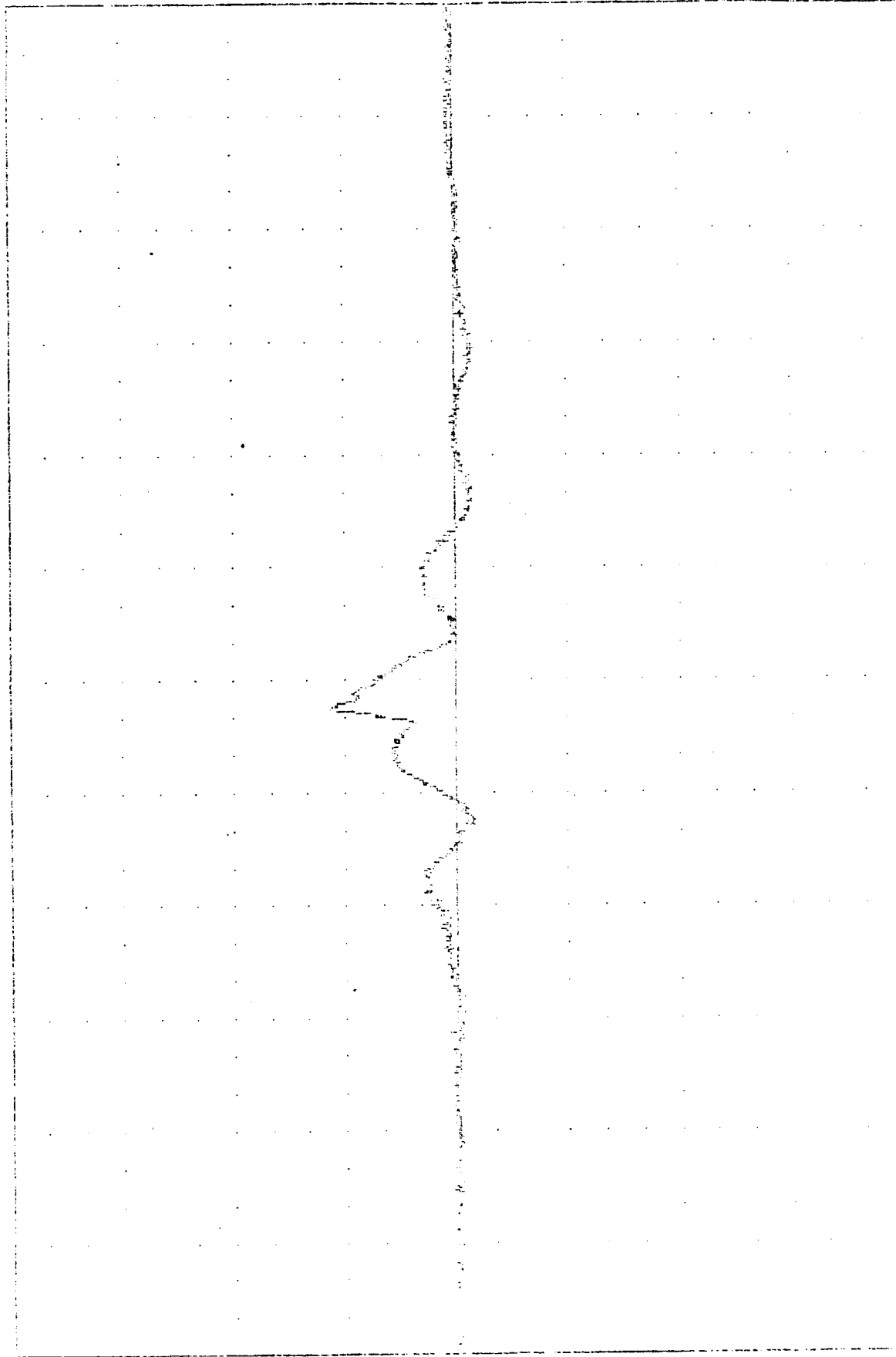
TIME
DISPLACEMENT

000 020917
VEHICLE ASSIGNMENT (E-1)
00260
HDY62

PLAT DATE 4-NOV-62 14:00:13

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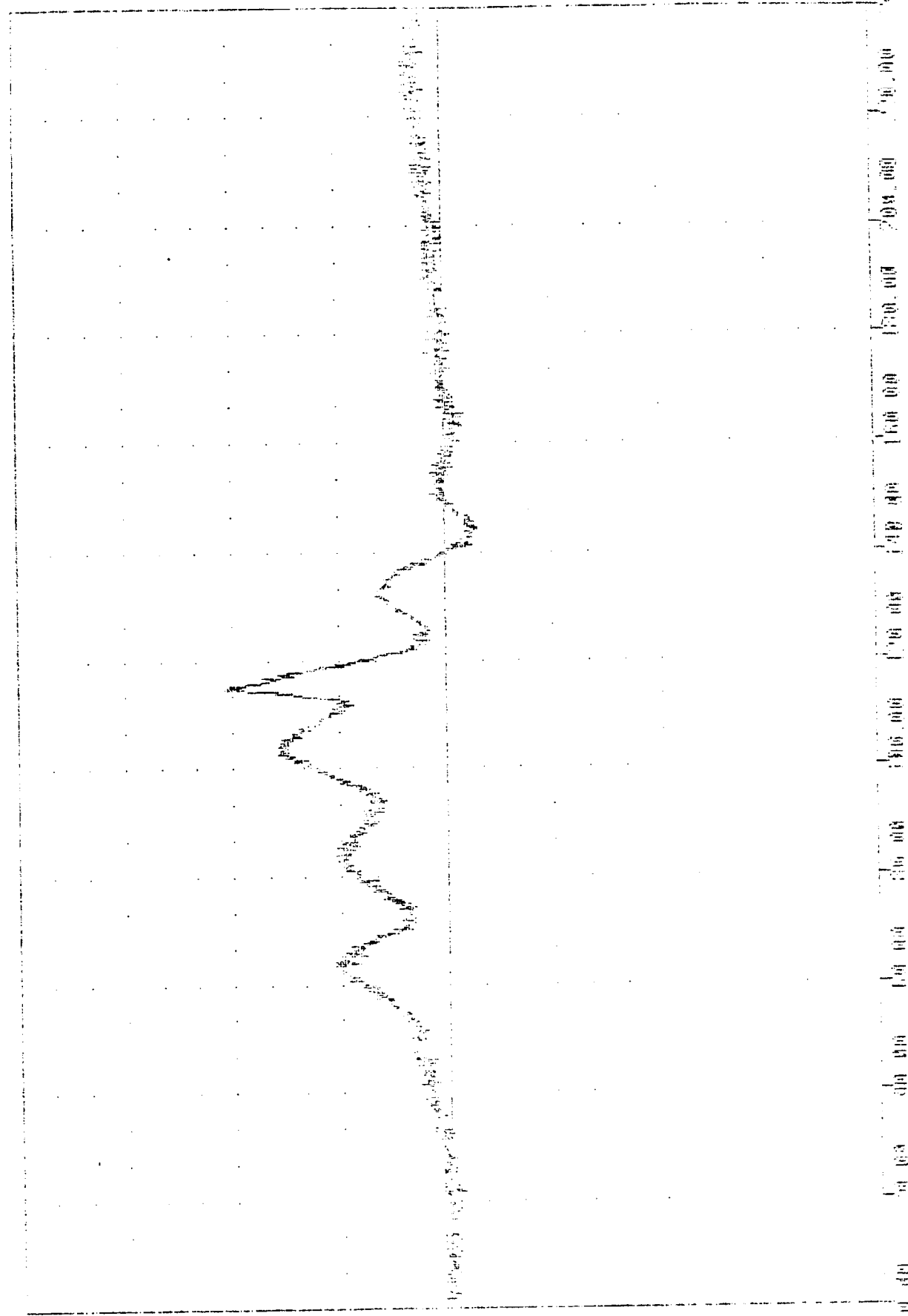
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00.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00

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VEHICLE ASSIGNMENT (E-1)
00260
HDY62

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 0.01 sec 5-NL 32 144.39
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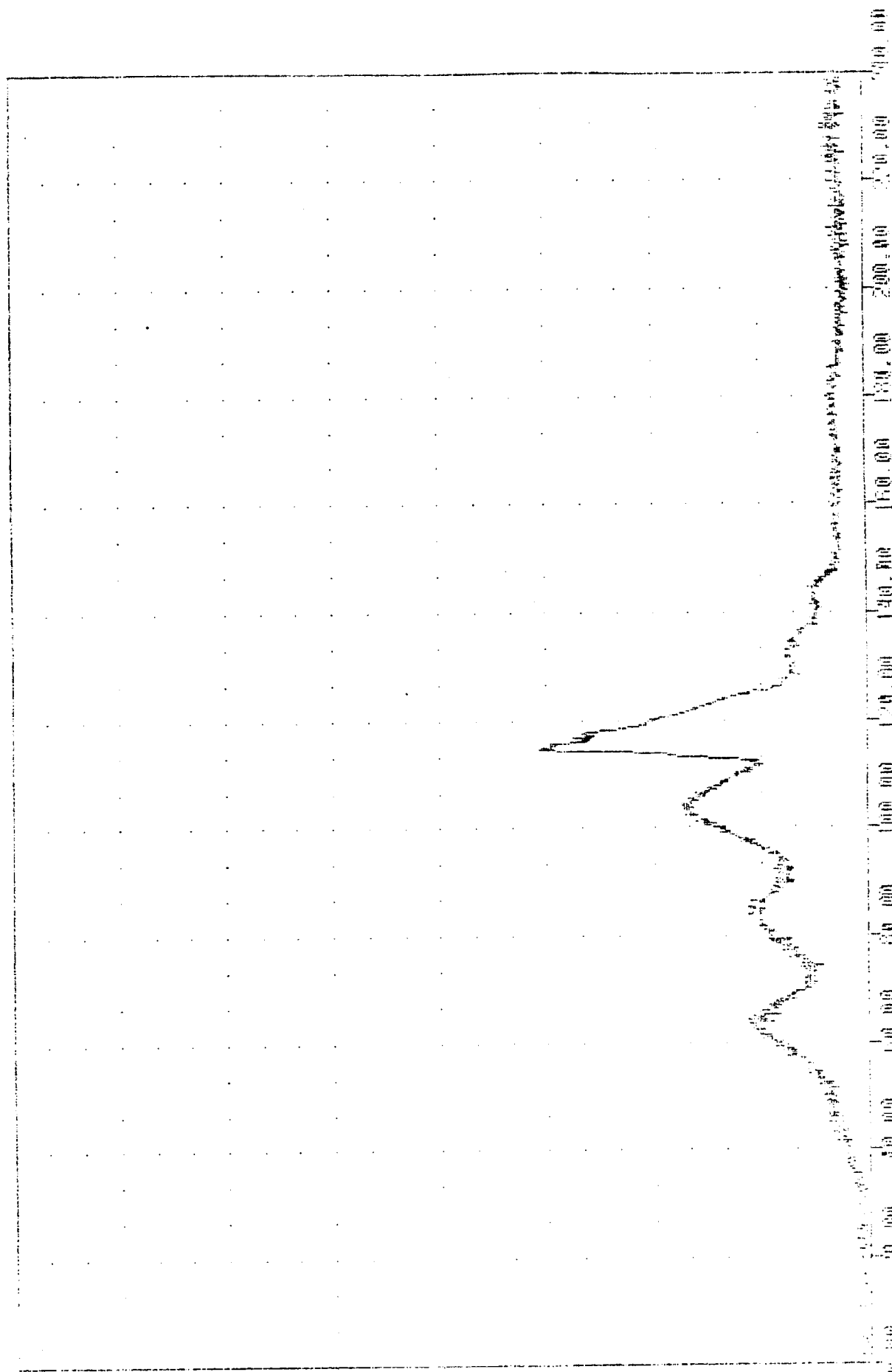
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UNCLAS, UNCLAS, UNCLAS, UNCLAS
#0060
#0062

CONFIDENTIAL

SECRET

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101X62
697
101X62-697

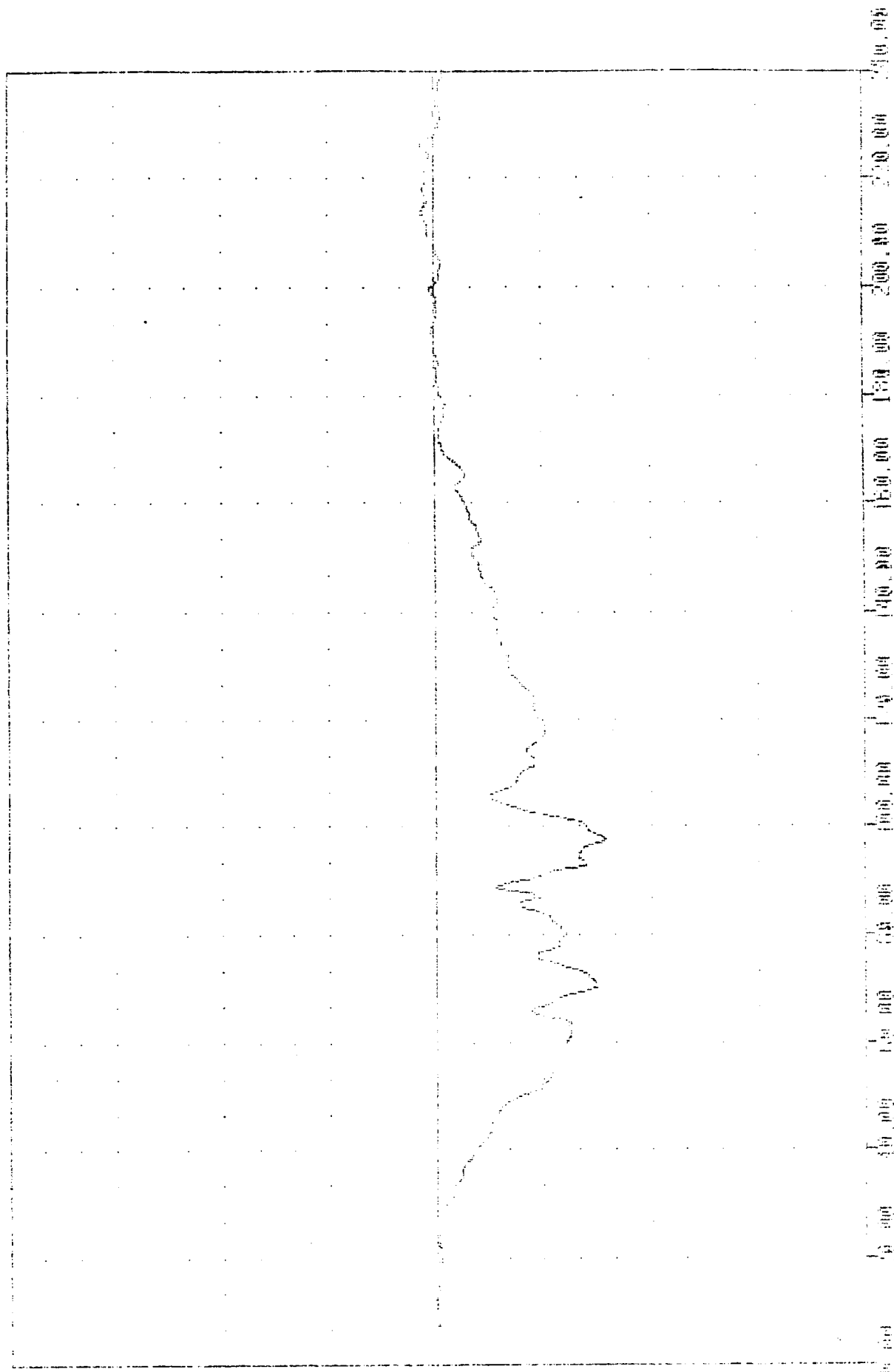
THE
JOURNAL OF THE
ROYAL ANTHROPOLOGICAL INSTITUTE

VOL. LXXV.
PART I.
1905.

LONDON:
PUBLISHED BY THE
Royal Society,
21, BEDFORD SQUARE, W.C.

PRINTED BY
HARRISON AND SONS, ST. MARTIN'S LANE, E.C.

FILED - 1997	1997	1997	1997
FILED - 1997	1997	1997	1997



1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

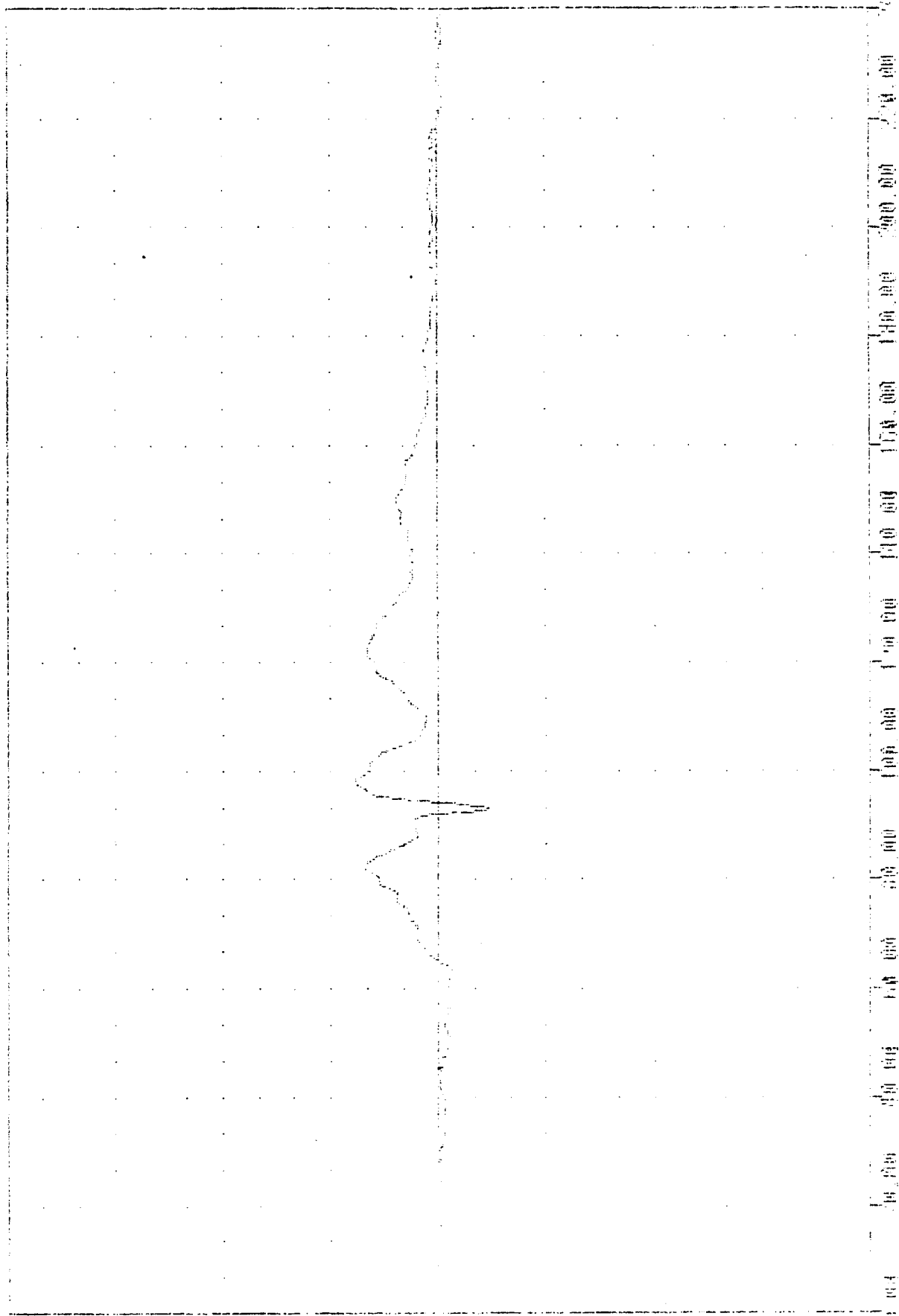
2. Once the problem is identified, the next step is to define the objectives and goals of the project. This helps to clarify what needs to be achieved and provides a clear direction for the team.

3. The third step is to develop a plan or strategy to address the problem. This involves breaking down the problem into smaller, manageable tasks and determining the resources needed to complete each task.

4. The fourth step is to implement the plan. This involves putting the strategy into action and monitoring progress regularly to ensure that the project is on track.

5. The final step is to evaluate the results of the project. This involves comparing the actual outcomes with the objectives and goals to determine the effectiveness of the project and identify areas for improvement.

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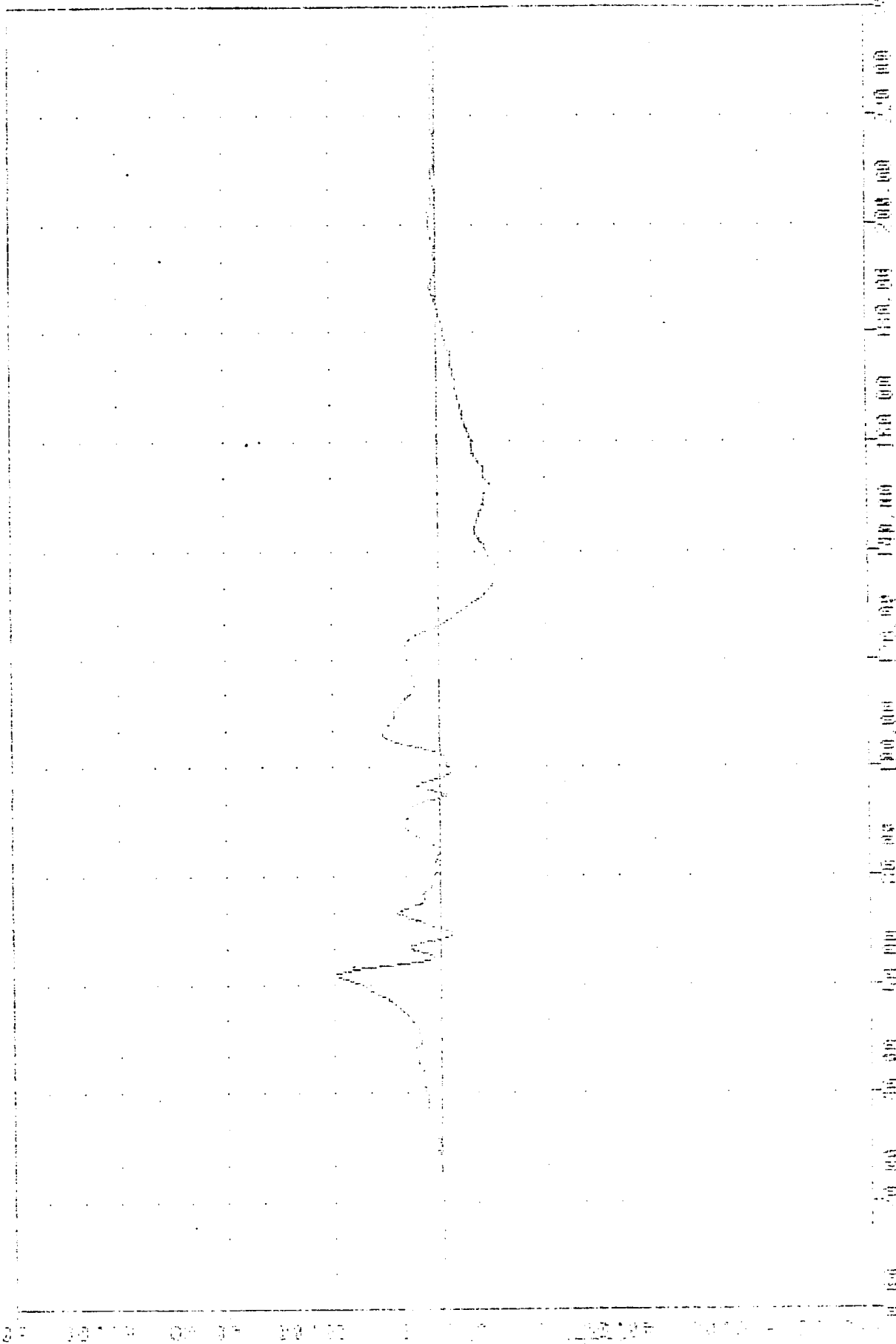


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191202

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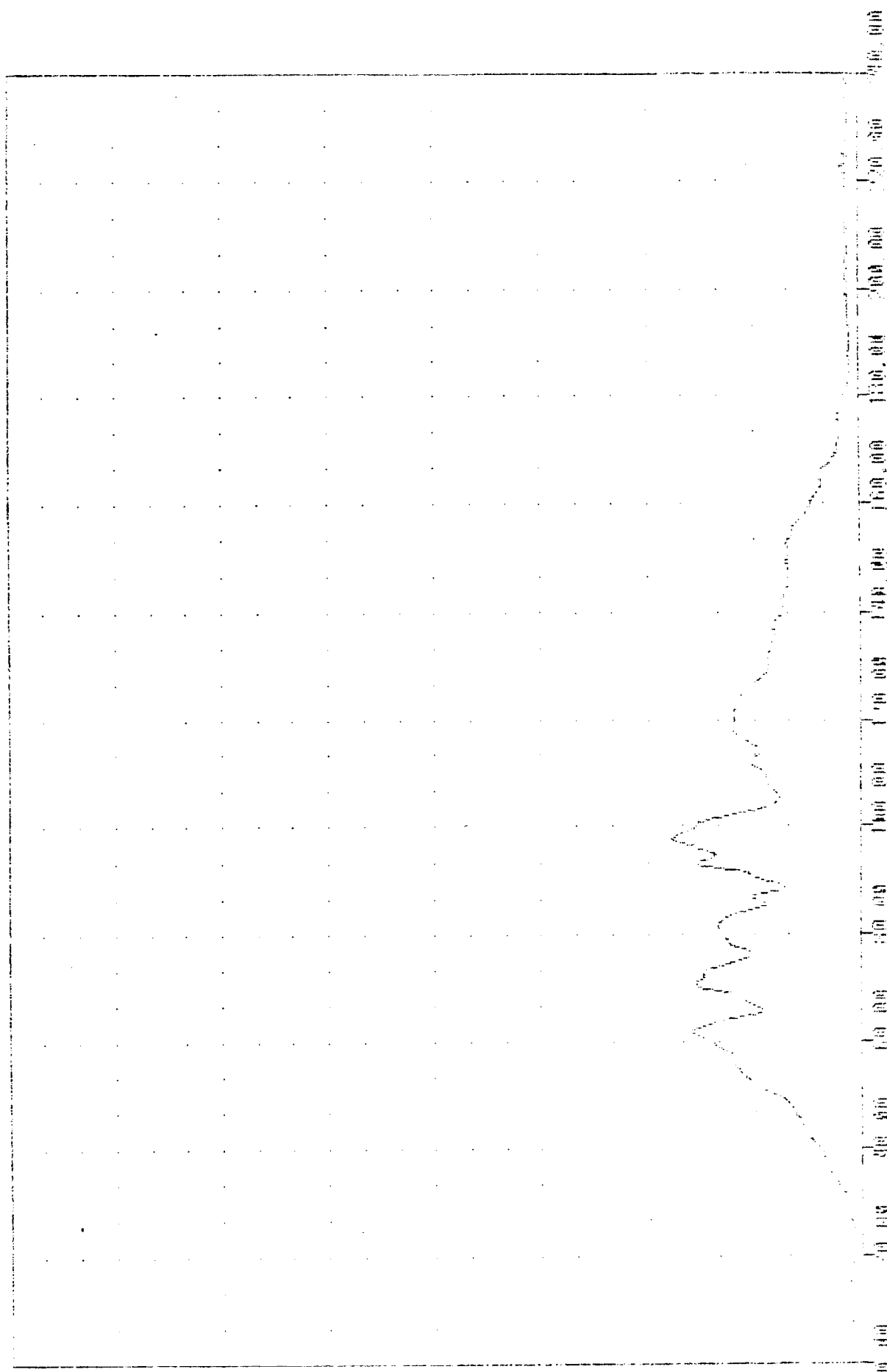
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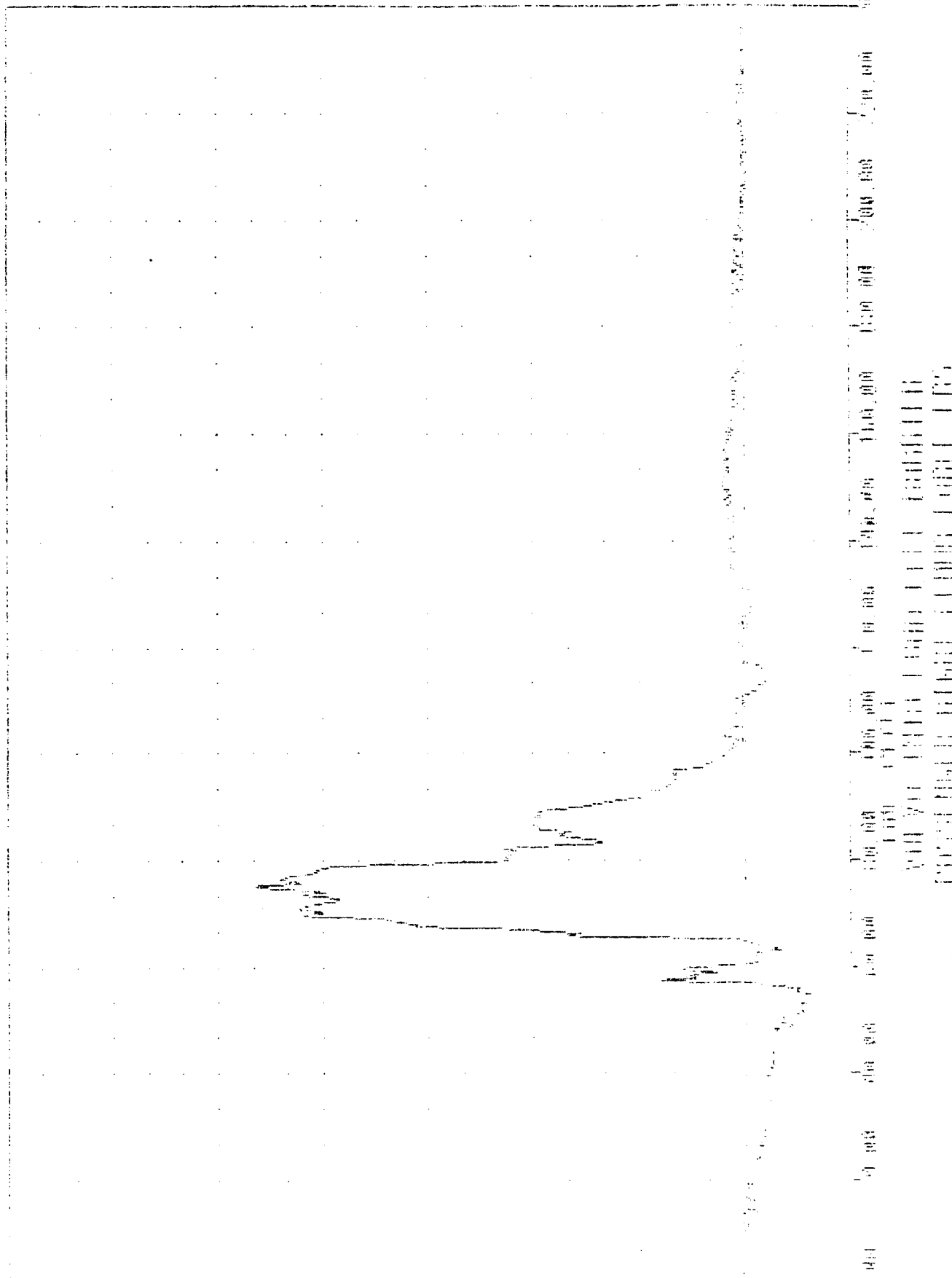
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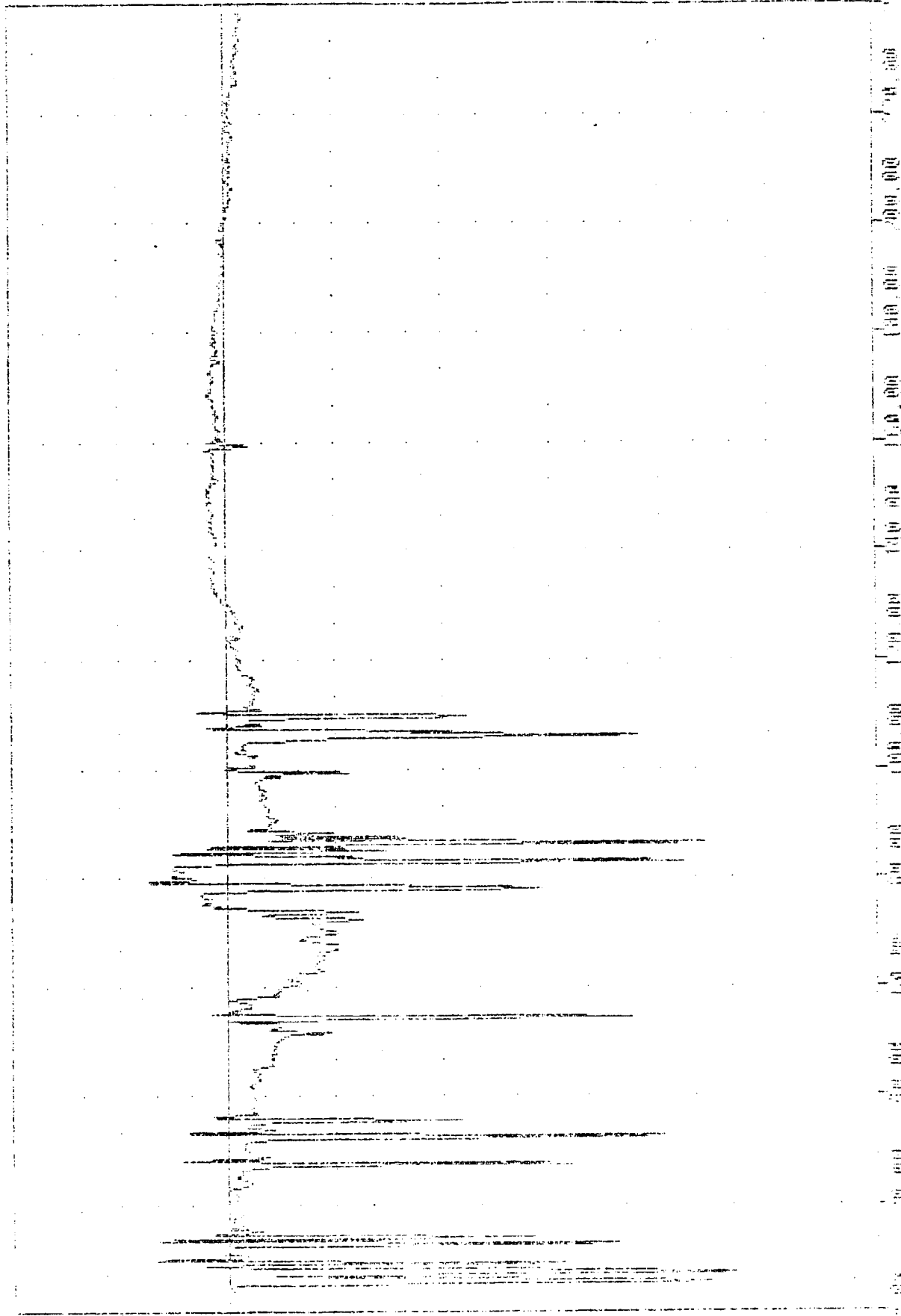
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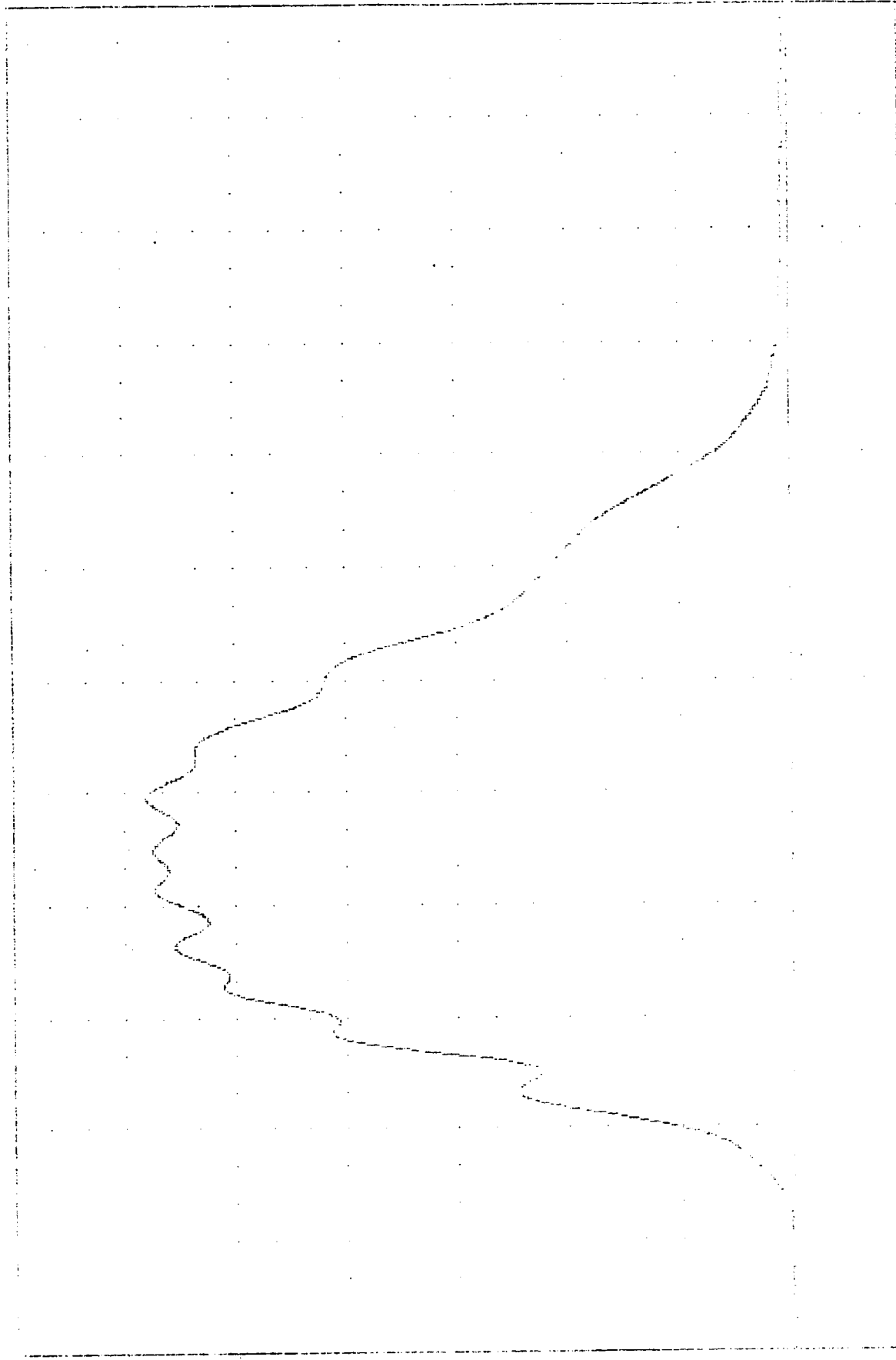
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INC 620017
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 CONF

PLANT DATE 4-10-82 14:05:13

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 100/ 315/ 40

820917 14:00:13

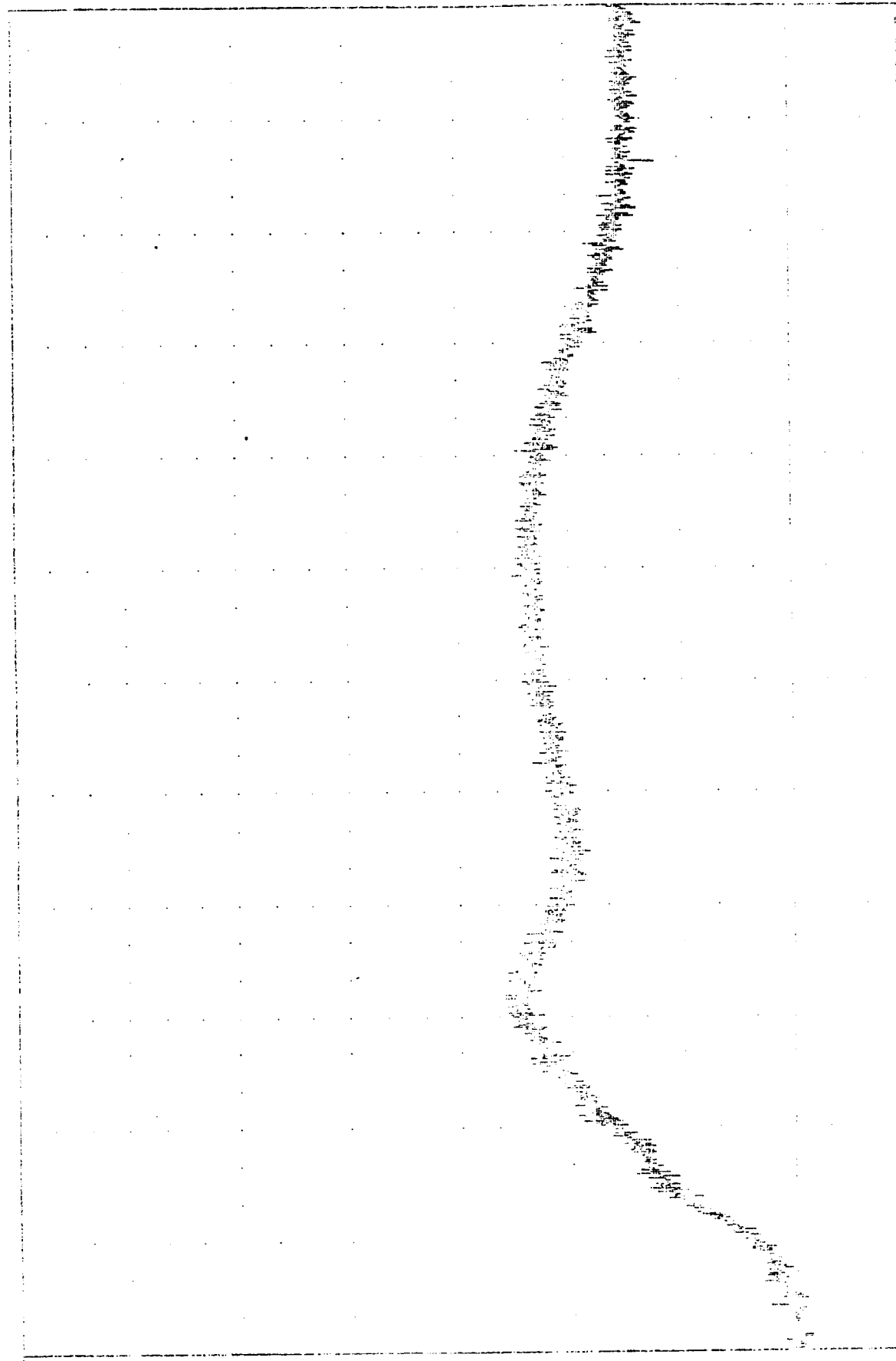
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PLOT DATE

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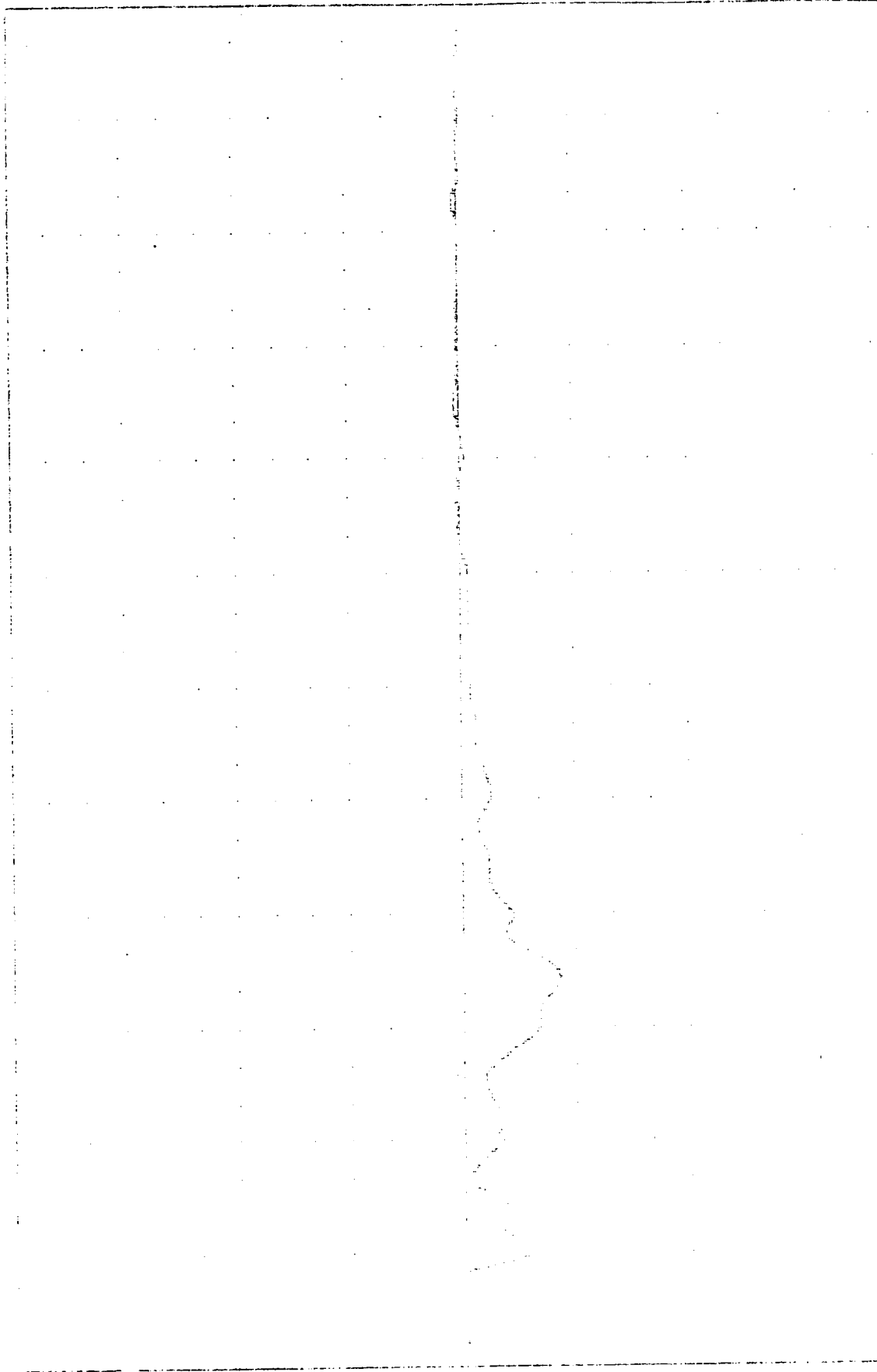
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TIME

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PLT00000 000000 14:00:00
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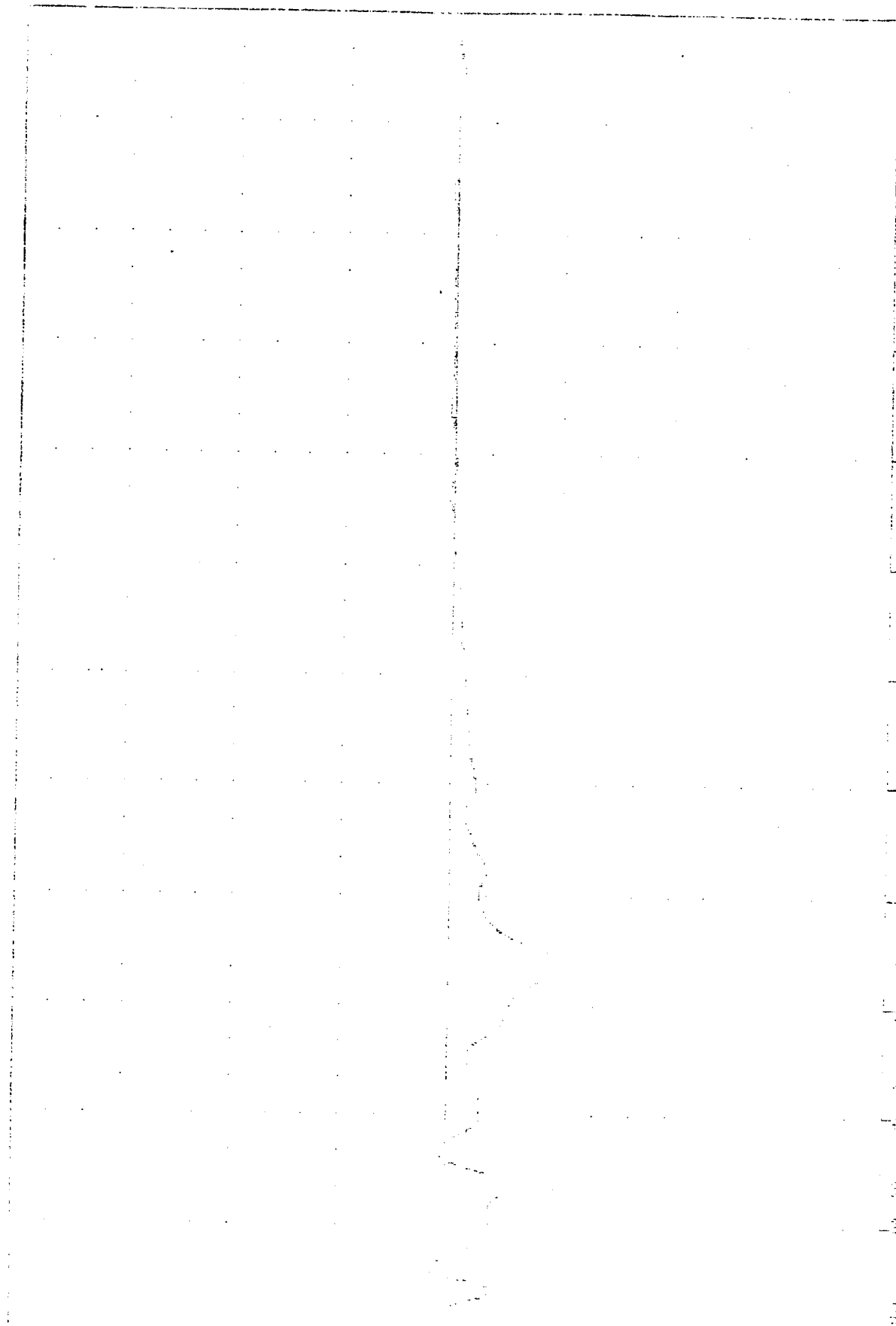
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TIME

DB

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TIME

12/20/01 14:00:00

UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

WATER RESOURCES DIVISION

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1965	1-15	1-15	10.50	
1966	1-15	1-15	10.50	
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2098	1-15	1-15	10.50	
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2100	1-15	1-15	10.50	

1. The first step is to identify the problem or question that needs to be addressed. This involves understanding the context and the specific requirements of the task.

2. Next, it is essential to gather relevant information and data. This can be done through research, consultation with experts, or by analyzing existing resources.

3. Once the information is gathered, the next step is to analyze it and identify the key factors that influence the outcome. This often involves breaking down the problem into smaller, more manageable parts.

4. After analysis, a plan or strategy should be developed. This plan should outline the steps that need to be taken to solve the problem or answer the question.

5. The final step is to implement the plan and monitor the progress. This involves carrying out the tasks outlined in the plan and making adjustments as needed based on the results.

[illegible][illegible]

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1. The first step in the process of identifying a problem is to recognize that a problem exists. This is often done by comparing current performance with a desired state or goal. If there is a discrepancy, a problem is identified.

2. Once a problem is identified, the next step is to define the problem more precisely. This involves determining the scope of the problem, the resources available, and the constraints that may be affecting the problem.

3. The third step is to analyze the problem. This involves identifying the causes of the problem and determining the relationships between different factors. This step is often the most difficult, as it requires a deep understanding of the problem and the ability to think critically.

4. The fourth step is to develop a solution. This involves brainstorming different ideas and evaluating them based on their feasibility, effectiveness, and cost. The goal is to find a solution that addresses the problem in a way that is sustainable and meets the needs of all stakeholders.

5. The final step is to implement the solution. This involves putting the solution into action and monitoring its progress. It is important to have a plan for how to implement the solution and to have a way to measure its success.

6. Once the solution is implemented, it is important to evaluate its effectiveness. This involves comparing the results of the solution to the original problem and determining whether the solution has been successful. If the solution is not successful, it may be necessary to go back to an earlier step and re-evaluate the problem.

7. The process of problem-solving is often iterative. This means that it may be necessary to go back and forth between different steps as you work on the problem. For example, you may identify a problem, define it, and then realize that you need to analyze it more thoroughly before you can develop a solution.

8. Problem-solving is a skill that can be developed through practice. The more you practice, the better you will become at identifying problems, analyzing them, and developing solutions. It is important to keep practicing and to keep learning from your experiences.

9. There are many different techniques for problem-solving. Some people prefer to work on a problem alone, while others prefer to work in a group. Some people like to use a structured approach, while others prefer to be more flexible. The key is to find a technique that works for you and to use it consistently.

10. Problem-solving is an essential part of life. We encounter problems every day, and we need to be able to solve them in order to move forward. By following these steps, you can develop your problem-solving skills and become a more effective problem-solver.

1. **NAME** _____
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 221. **REASON** _____
 222. **DESCRIPTION** _____
 223. **CONSEQUENCES** _____
 224. **REMARKS** _____

APPENDIX C
DUMMY CERTIFICATION

PART 572 DUMMY CALIBRATION TEST DATA

Dummy I.D. No.: 392

Manufacturer: Humanoid

		<u>Pre-Test</u>	<u>Post Test</u>
Date of Calibration		09-15-82	10-12-82
Calibration Sequential Number for Dummy		5	6
<u>Test Parameter</u>	<u>Specification</u>		
1. Head Drop Test			
a. Peak Resultant Accel	210 - 260G	245.85	235.8
b. Peak Lateral Accel	10G max.	6.02	7.18
c. Time Above 100G (Resultant)	0.9 - 1.5 ms	1.19	1.23
d. Temperature	66 - 78 F	75.0	69.0
e. Relative Humidity	10 - 70%	63.0	60.0
2. Neck Test			
a. Pendulum Velocity	21.5 - 25.5 fps	22.86	22.8
b. Average Decel t_2-t_3	20 - 24G	22.90	22.35
c. Pendulum Decel t_2-t_1	3 ms max.	2.59	2.97
d. Pendulum Decel t_3-t_2	25 - 30 ms	26.12	27.34
e. Pendulum Decel t_4-t_3	10 ms max.	4.79	3.89
f. Pendulum Reversal	123 ms min.	>123.0	>123.0
g. Peak Head Resultant	26G max.	25.31	24.52
h. Peak Head Rotation	63 - 73 F deg.	64.63	64.72
i. Chordal Displacement:			
<u>Head Angle</u>			
0 deg.	Time	-2.0 - 2.0 ms	0.00
	Displ	-0.5 - 0.5 in.	0.00
30 deg.	Time	25.6 - 34.4 ms	29.54
	Displ	2.1 - 3.1 in.	2.80
60 deg.	Time	40.3 - 51.7 ms	48.21
	Displ	4.3 - 5.3 in.	4.86

PART 572 DUMMY CALIBRATION TEST DATA (CONT.)

Dummy I.D. No.: 392

<u>Test Parameter</u>		<u>Specification</u>	<u>Pre-Test</u>	<u>Post Test</u>
Max. (73 deg.)	Time	53.2 - 66.8 ms	60.63	61.63
	Displ	5.0 - 6.0 in.	5.44	5.30
60 deg.	Time	67.0 - 83.0 ms	72.98	73.27
	Displ	4.3 - 5.3 in.	4.99	4.93
30 deg.	Time	85.4 - 104.6 ms	98.24	99.17
	Displ	2.1 - 3.1 in.	2.48	2.42
0 deg.	Time	101.0 - 123.0	113.95	114.44
	Displ	-0.5 - 0.5 in.	0.18	0.16
j. Temperature		66 - 78 F deg.	69.0	71.0
k. Relative Humidity		10 - 70%	62.0	58.0
3. ABDOMINAL COMPRESSION TEST				
A. FORCE AT 0.0 IN.		10 LBS.	10.0	10.0
b. Force at 1.0 in.		50 - 63 lbs.	60.0	61.0
c. Force at 1.3 in.		73 - 88 lbs.	86.0	88.0
d. Temperature		66 - 78 F deg.	72.0	68.0
e. Relative Humidity		10 - 70%	56.0	55.0
4. Lumbar Flexion Test				
a. Force at 20 deg.		22 - 34 lb.	29.0	30.0
b. Force at 30 deg.		34 - 46 lb.	39.0	37.0
c. Force at 40 deg.		46 - 58 lb.	50.0	49.0
d. Return Angle		12 deg. max.	7.66	8.2
e. Temperature		66 - 78 F deg.	73.0	70.0
f. Relative Humidity		10 - 70%	55.0	54.0
5. Thorax Impact Test				
a. High Speed				
1. Probe Velocity		21.78 - 22.22 fps	21.62	22.5
2. Peak Sternum Deflect-				
ion		1.7 in. max.	1.38	1.56
3. Peak Resistive Force		2250 lb. max.	2130.9	2154.4
4. Internal Hysteresis		50 - 70%	54.9	58.3
5. Temperature		66 - 78 F deg.	70.0	70.0
6. Relative Humidity		10 - 70%	68.0	46.0

PART 572 DUMMY CALIBRATION TEST DATA (CONT.)

Dummy I.D. No.: 392

<u>Test Parameter</u>	<u>Specification</u>	<u>Pre-Test</u>	<u>Post Test</u>
b. Low Speed			
1. Probe Velocity	13.86 - 14.14 fps	13.99	14.16
2. Peak Sternum Deflection	1.1 in. max.	0.90	0.91
3. Peak Resistive Force	1450 lb. max.	1366.01	1352.2
4. Internal Hysteresis	50 - 70%	55.4	53.0
5. Temperature	66 - 78 F deg.	69.0	70.0
6. Relative Humidity	10 - 70%	69.0	47.0
6. Knee Impact Tests			
a. Right Knee			
1. Probe Velocity	6.76 - 7.04 fps	6.95	6.94
2. Peak Force	1850 - 2500 lbs.	1935.64	2161.96
3. Time Above 1000 lbs.	1.7 ms min.	2.03	1.7
4. Temperature	66 - 78 F deg.	70.0	69.0
5. Relative Humidity	10 - 70%	66.0	42.0
b. Left Knee			
1. Probe Velocity	6.76 - 7.04 fps	7.03	6.89
2. Peak Force	1850 - 2500 lbs.	2186.17	2321.2
3. Time Above 1000 lbs.	1.7 ms min.	1.72	1.72
4. Temperature	66 - 78 F deg.	70.0	69.0
5. Relative Humidity	10 - 70%	67.0	40.0

Laboratory Technician(s): Beebe, Stewart, Roberts

Test Supervisor: LeVan

Project Engineer: Blaker

PART 572 DUMMY CALIBRATION TEST DATA

Dummy I.D. No.: 826

Manufacturer: ARL

		<u>Pre-Test</u>	<u>Post Test</u>	
Date of Calibration		09-15-82	10-12-82	
Calibration Sequential Number for Dummy		5	6	
<u>Test Parameter</u>	<u>Specification</u>			
1. Head Drop Test				
a. Peak Resultant Accel	210 - 260G	226.37	238.8	
b. Peak Lateral Accel	10G max.	3.67	-2.88	
c. Time Above 100G (Resultant)	0.9 - 1.5 ms	1.16	1.18	
d. Temperature	66 - 78 F deg.	74.0	69.0	
e. Relative Humidity	10 - 70%	55.0	60.0	
2. Neck Test				
a. Pendulum Velocity	21.5 - 25.5 fps	22.80	22.86	
b. Average Decel t_2-t_3	20 - 24G	23.22	22.81	
c. Pendulum Decel t_2-t_1	3 ms max.	2.80	2.66	
d. Pendulum Decel t_3-t_2	25 - 30 ms	27.33	26.63	
e. Pendulum Decel t_4-t_3	10 ms max.	2.96	4.79	
f. Pendulum Reversal	123 ms min.	>123.0	>123.0	
g. Peak Head Resultant	26G max.	25.62	25.10	
h. Peak Head Rotation	63 - 73 F deg.	70.43	68.65	
i. Chordal Displacement:				
<u>Head Angle</u>				
0 deg.	Time	-2.0 - 2.0 ms	0.00	0.00
	Displ	-0.5 - 0.5 in.	0.00	0.00
30 deg.	Time	25.6 - 34.4 ms	29.75	29.33
	Displ	2.1 - 3.1 in.	2.69	2.54
60 deg.	Time	40.3 - 51.7 ms	45.27	45.89
	Displ	4.3 - 5.3 in.	4.57	4.43

PART 572 DUMMY CALIBRATION TEST DATA (CONT.)

Dummy I.D. No.: 826

<u>Test Parameter</u>		<u>Specification</u>	<u>Pre-Test</u>	<u>Post Test</u>
Max. (73 deg.)	Time	53.2 - 66.8 ms	61.25	61.38
	Displ	5.0 - 6.0 in.	5.29	5.04
60 deg.	Time	67.0 - 83.0 ms	78.46	76.22
	Displ	4.3 - 5.3 in.	4.58	4.45
30 deg.	Time	85.4 - 104.6 ms	96.52	96.24
	Displ	2.1 - 3.1 in.	2.47	2.31
0 deg.	Time	101.0 - 123.0 ms	110.48	110.18
	Displ	-0.5 - 0.5 in.	0.29	0.15
j. Temperature		66 - 78 F deg.	74.0	72.0
k. Relative Humidity		10 - 70%	50.0	60.0
3. Abdominal Compression Test				
a. Force at 0.0 in.		10 lbs.	10.0	10.0
b. Force at 1.0 in.		50 - 63 lbs.	61.0	56.5
c. Force at 1.3 in.		73 - 88 lbs.	78.5	75.0
d. Temperature		66 - 78 F deg.	71.0	68.0
e. Relative Humidity		10 - 70%	64.0	55.0
4. Lumbar Flexion Test				
a. Force at 20 deg.		22 - 34 lb.	31.0	32.0
b. Force at 30 deg.		34 - 46 lb.	40.0	44.0
c. Force at 40 deg.		46 - 58 lb.	50.0	49.0
d. Return Angle		12 deg. max.	7.13	6.6
e. Temperature		66 - 78 F deg.	68.0	71.0
f. Relative Humidity		10 - 70%	60.0	53.0
5. Thorax Impact Test				
a. High Speed				
1. Probe Velocity		21.78 - 22.22 fps	21.62	21.96
2. Peak Sternum Deflection		1.7 in. max.	1.48	1.48
3. Peak Resistive Force		2250 lb. max.	2081.96	2057.0
4. Internal Hysteresis		50 - 70%	53.9	52.0
5. Temperature		66 - 78 F deg.	68.0	69.0
6. Relative Humidity		10 - 70%	69.0	59.0

PART 572 DUMMY CALIBRATION TEST DATA (CONT.)

Dummy I.D. No.: 826

<u>Test Parameter</u>	<u>Specification</u>	<u>Pre-Test</u>	<u>Post Test</u>
b. Low Speed			
1. Probe Velocity	13.86 - 14.14 fps	13.79	14.03
2. Peak Sternum Deflection	1.1 in. max.	0.89	0.93
3. Peak Resistive Force	1450 lb. max.	1315.8	1317.6
4. Internal Hysteresis	50 - 70%	53.2	58.0
5. Temperature	66 - 78 F deg.	68.0	69.0
6. Relative Humidity	10 - 70%	64.0	59.0
6. Knee Impact Tests			
a. Right Knee			
1. Probe Velocity	6.76 - 7.04 fps	6.95	6.89
2. Peak Force	1850 - 2500 lbs.	2024.3	2099.3
3. Time Above 1000 lbs.	1.7 ms min.	1.95	1.8
4. Temperature	66 - 78 F deg.	68.0	69.0
5. Relative Humidity	10 - 70%	64.0	45.0
b. Left Knee			
1. Probe Velocity	6.76 - 7.04 fps	6.95	6.89
2. Peak Force	1850 - 2500 lbs.	2331.6	2229.3
3. Time Above 1000 lbs.	1.7 ms min.	1.72	1.70
4. Temperature	66 - 78 F deg.	68.0	69.0
5. Relative Humidity	10 - 70%	65.0	44.0

Laboratory Technician(s): Beebe, Stewart, Roberts

Test Supervisor: LeVan

Project Engineer: Blaker