DOT Ø21Ø

Dynamic Science Report No. 301-DYS-79-041

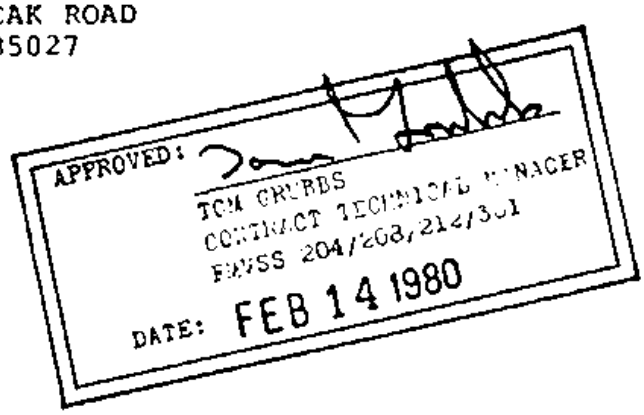
NEW VEHICLE ASSESSMENT AND STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS 301-75

FORD MOTOR COMPANY
1979 FORD MUSTANG 2-DOOR SEDAN
NHTSA NO. 790222

Prepared by:

DYNAMIC SCIENCE, INC.
A TALLEY INDUSTRIES COMPANY
1850 WEST PINNACLE PEAK ROAD
PHOENIX, ARIZONA 85027



FINAL REPORT

January 1980

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
-----ENFORCEMENT-----
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, S.W.
WASHINGTON, D.C. 20590

dsi DynamicScience Inc.
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1850 WEST PINNACLE PEAK ROAD PHOENIX, ARIZONA 85027

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FINAL REPORT ACCEPTED BY:

TOM GRUBBS

NHTSA Contract Technical Manager
FMVSS 301-75

FEB 14 1980

Date of Report Acceptance

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Approved: E. Tarver, Director of Test Operations

16. Abstract

FMVSS 301 Standards Enforcement Test of a 1979 Ford Mustang 2-Door Sedan, NHTSA No. 790222, VIN 9R02Z178521, was conducted at the Dynamic Science, Inc. Phoenix facility.

The moving barrier impacted the rear of the vehicle at a speed of 35.33 mph.

The test date was December 19, 1979, and the ambient temperature was 73° F.

The vehicle appeared to comply with the requirements of FMVSS 301 as specified for the vehicle manufacture date.

17. Key Words	18. Distribution Statement
FMVSS 301 Standards Enforcement Testing, Fuel Tanks, Fuel Tank Filler Pipes, Fuel Tank Connections, Fuel System Integrity, Rear End Impact	Copies of this report are available from Technical Reference Division, National Highway Traffic Safety Administration, Rm. 5108, Nassif Bldg., 400 7th Street, S.W., Washington, D.C. 20590

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Unclassified	Unclassified	77	

Form DOT F 1700.7 (8-69)

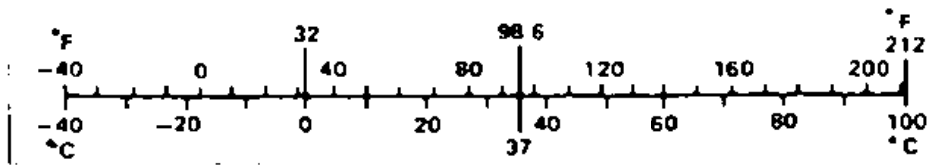
METRIC CONVERSION FACTORS

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	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
	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 (10 000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton (1000 kg)	1.1	short tons	
	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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LIST OF ILLUSTRATIONS (CONTD)

SECTION 1
PURPOSE AND INTRODUCTION

PURPOSE:

The purpose of the test was to subject a 1979 Ford Mustang 2-Door Sedan to the indicant test requirements of DOT Test Plan TP-212-01, March 20, 1979, Standard Enforcement Indicant Testing for FMVSS 301-75, "Fuel System Integrity." The vehicle was tested using test parameters which are in excess of the current upper limits of FMVSS 301-75, in order to obtain research and vehicle rating data. This test, therefore, can only be viewed as an "indicant" test by the Office of Vehicle Safety Compliance (OVSC).

INTRODUCTION:

The test procedure describing the facilities used and the test checklists completed for each vehicle indicant tested for FMVSS 301-75 are contained in Appendix A. Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains Compliance Related Data for FMVSS 301-75 Indicant Testing, together with photographs related to these tests. Appendix B contains Calcomp plots.

SECTION 2
GENERAL TEST AND VEHICLE PARAMETER DATA

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

SECTION 2
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Vehicle Manufacturer: Ford Motor Company
Make/Model: Ford Mustang
Body Style: 2-Door Sedan Model Year: 1979
VIN: 9R02Z178521 Build Date: 7-79
NHTSA No.: 790222 Color: Yellow
Engine Data: V6 cylinders; 2.8 Litre displacement
Transmission Data: 3 speed ( ) Manual (X) Automatic
Date Vehicle Received by Laboratory: December 5, 1979
Dealer Name & Address: Pioneer Ford, 2600 W. Grand Ave.
Phoenix, Az. 85009

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

Vehicle Manufactured By: Ford Motor Company
Date of Manufacture: July 1979 ; VIN: 9R02Z178521
GVWR: 3754 lb; GAWR: Front = 1963 lb; Rear = 1811 lb

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

Vehicle Load:	FRONT	REAR	RECOMMENDED TIRE SIZE:	LOAD RANGE:
Up to Capacity	30 psi	30 psi		
Vehicle Capacity:			B78-13/C78-13	B

Type of Seats - ___ Bench, X Bucket, ___ Split Bench
Number of Occupants (Designated Seating Capacity) = 2 Front, 2 Rear, 4 Total

CARGO LOAD = 100 lb
TOTAL = 700 lb

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

Right Front = 832 lb Right Rear = 545 lb
Left Front = 812 lb Left Rear = 566 lb
TOTAL FRONT WEIGHT = 1644 lb (59.7% of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1111 lb (40.3% of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 2755 lb

TARGET WEIGHT = CARGO LOAD + UDW + 164 (NO. OF DUMMIES) = 3183 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 100 lb CARGO:

Right Front = 947 lb Right Rear = 670 lb
Left Front = 890 lb Left Rear = 676 lb
TOTAL FRONT WEIGHT = 1837 lb (57.7% of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1346 lb (42.3% of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3183 lb

Weight of ballast secured in vehicle trunk area = N/A lb

TEST CONDITIONS:

Date of Test: December 19, 1979 Time of Test: 1500

Ambient Temperature: 73 °F at impact area.

Temperature in Occupant Compartment: 73 °F Windshield Molding Temperature: 73 °F

VEHICLE ATTITUDE: (all dimensions in inches)

Delivered Attitude:	RF 30.0	LF 30.0	RR 30.0	LR 30.0
Test Attitude:	RF 29.3	LF 29.4	RR 28.8	LR 28.5

VEHICLE TIRE DATA:

Recommended Cold Tire Pressure: Front = 30 psi
Rear = 30 psi

Recommended Tire Size: B78-13 C78-13

Load Range: B

Tires on Vehicle: C78-13 Firestone

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

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

TEST FLUID DATA:

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

Kinematic Viscosity: 0.99 centistokes

Spill Point Volume: 12.9 Gallons (SPV)

Test Volume: 11.7 Gallons (90 to 91% of SPV)

Fuel System Capacity (data from Owner's Manual): 12.5 gallons

Details of Fuel System: Fuel tank mounted by two tank straps aft of the rear axle. A plastic shield is secured between rear axle and fuel tank. The filler tube inserts into a grommet on the top right side of the tank and terminates on the right side of right rear wheel. Filler tube is sealed by a twist-type cap and is concealed by a hinged access door.

Electric Fuel Pump: No (yes/no); Fuel Injection: No (yes/no)

Does electric fuel pump operate with ignition switch "on" and the engine not operating: N/A (yes/no)

VEHICLE REBOUND AND CRUSH:

Overall Length of Test Vehicle	Pre-test =	R 173.6	L 173.4	inches
	Post-test =	R 158.9	L 159.8	inches

CRUSH = R 14.7 L 13.6

FOR FRONTAL IMPACTS, distance from front of test vehicle to the barrier after impact = N/A inches

VISIBLE DUMMY CONTACT POINTS

	Driver	Passenger
Head	Seat back	Seat back
Chest	None	None
Abdomen	None	None
Left Knee	None	None
Right Knee	None	None

	Front		Rear	
DOOR OPENING	Left	Right	Left	Right
Easy			N/A	N/A
Difficult			N/A	N/A
Tools Required	X	X	N/A	N/A
SEAT BACK				
Failure	X	X	Rear seat back came loose.	
GLAZING DAMAGE				
Windshield	None			
Backlight	Shattered			
Others	No	No	X	X

OTHER NOTABLE IMPACT EFFECTS: Vehicle moved 63 feet downrange; skidded for 54 feet before swerving to left. Bogey skidded 31 feet. Both B-pillar and C-pillar bent. Both rear tires pinned by crushed sheet metal. No fuel leakage for 30 minutes post-test. Driveshaft was broken at both ends upon impact and was located in monorail trench approximately 30 feet downrange from impact point.

Figure 2-1. Pre-test Rear View - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

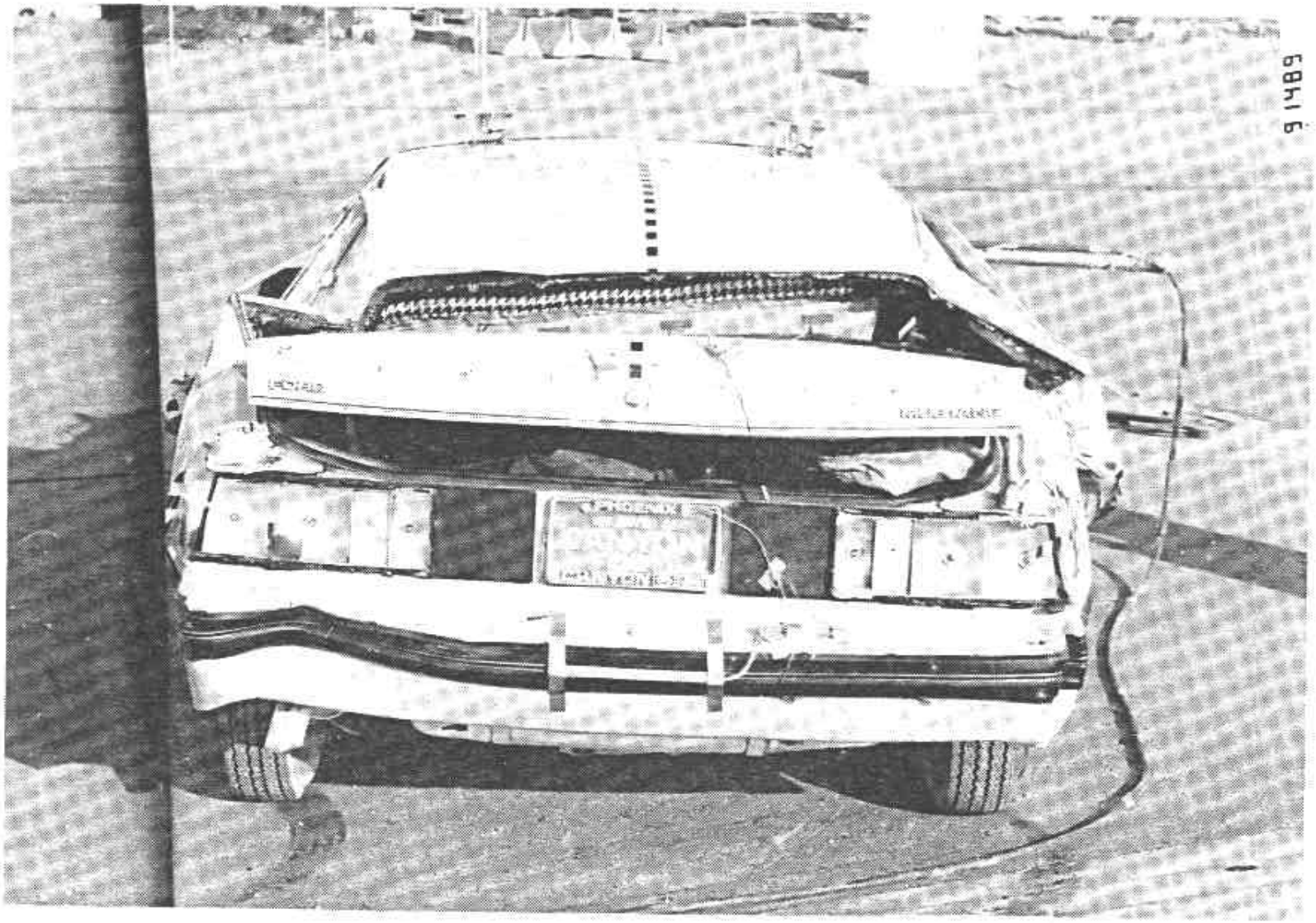


Figure 2-2. Post-test Rear View - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

Figure 2-3. Pre-test Side View - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

Figure 2-4. Post-test Side View - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

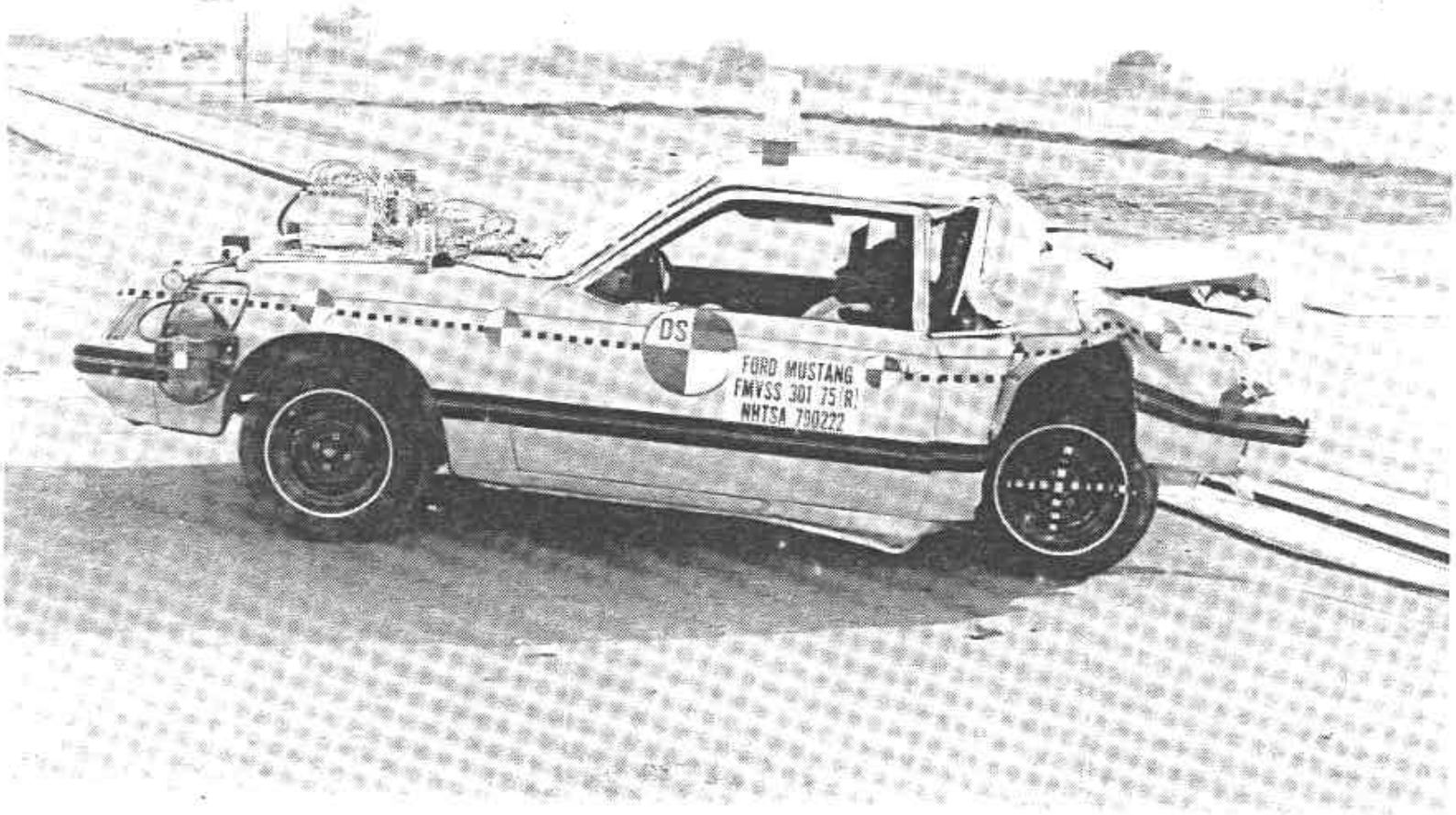


Figure 2-5. Post-test Side View - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

Figure 2-6. Post-test Left Rear Quarter View - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

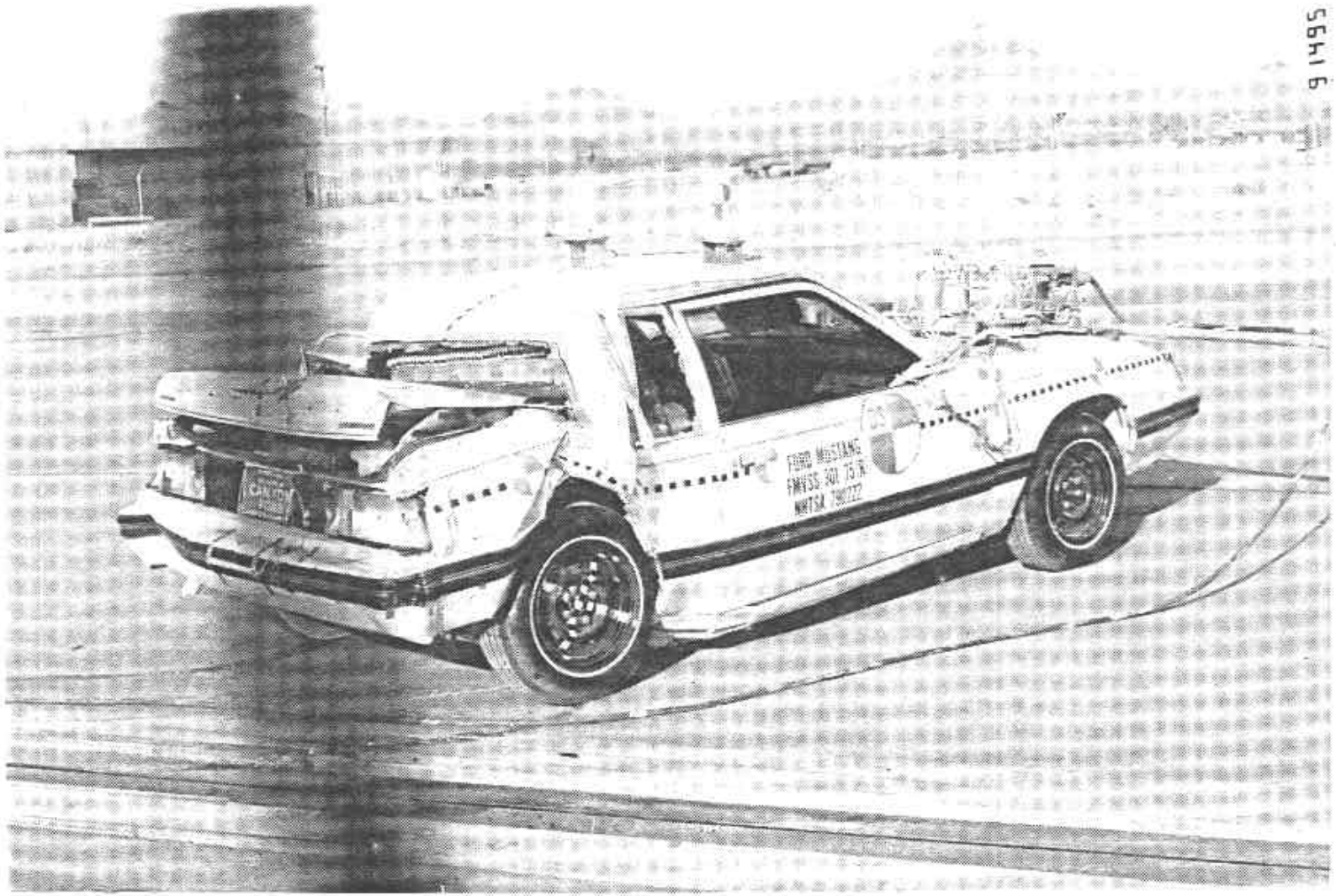


Figure 2-7. Post-test Right Rear Quarter View - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

SECTION 3

COMPLIANCE-RELATED DATA
FMVSS 301-75 INDICANT TESTING

The following data sheets and photographs document compliance data related to FMVSS 301-75.

SECTION 3
FMVSS 301-75 INDICANT DATA

GENERAL TEST CONDITIONS:

Vehicle Impact Speed:

Primary 35.33 mph Secondary 35.34 mph

Speed Range Specified by CTM: 34.5 to 35.5 mph

Ambient Temperature at Time of Test: 73 °F

Date of Test: December 19, 1979 Time: 1500

FUEL SYSTEM DATA:

Test Fluid: Stoddard Solvent No. 2 Specific Gravity: 0.764

Kinematic Viscosity: 0.99 centistokes

Spill Point Volume: 12.9 U.S. gal/lb Liquid Temp: 80 °F

Test Volume: 11.7 U.S. gal/lb Liquid Temp: 80 °F

Details of Fuel Tank, Filler Pipes, and Connections: Fuel tank is mounted by two tank straps aft of the rear axle. A plastic shield is secured between rear axle and fuel tank. The filler tube inserts into a grommet on the top right side of tank and terminates on right side of body aft of right rear wheel. Filler tube is sealed by twist-type cap and is concealed by a hinged access door.

PERFORMANCE SUMMARY FOR FMVSS NO. 301-75:

	Actual Data	Standard Requirement	Pass/Fail
1. Transimpact Fluid Loss (oz)	0	1 oz maximum	Pass
2. Post-impact Fluid Loss (oz) (30-minute period post-impact)	0	1 oz/ minute maximum	Pass

Details of Leakage: None

3. Static Rollover: See following four pages

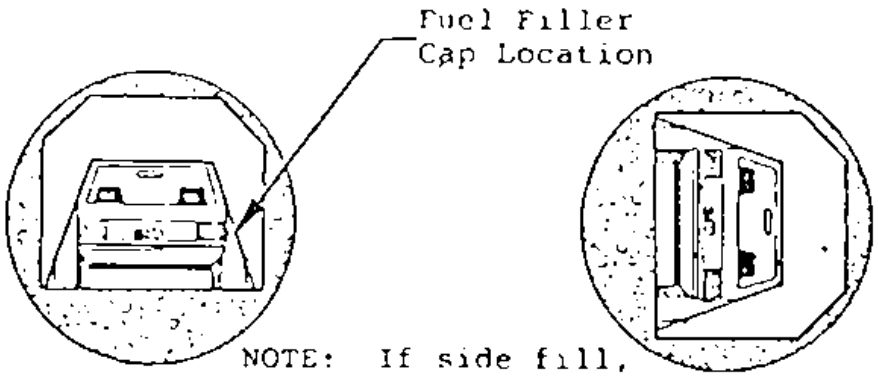
LABORATORY INFORMATION:

Project Engineer: M. Pozzi Date: 12-19-79

Project Manager: E. Enserink Date: 12-19-79

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA SHEET

TEST PHASE: 0 to 90° VEHICLE NHTSA NO. 790222



NOTE: If side fill, rotate so that filler cap is down.

DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 39 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 39 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

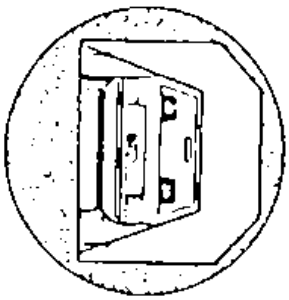
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	Trace	Trace	Trace	---

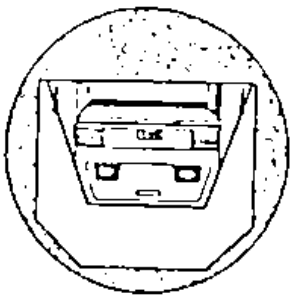
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): Right rear flange of tank

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA SHEET

TEST PHASE: 90° to 180° VEHICLE NHTSA NO. 790222





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 37 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = ____ min, ____ sec =

Total ..... = 6 min, 39 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

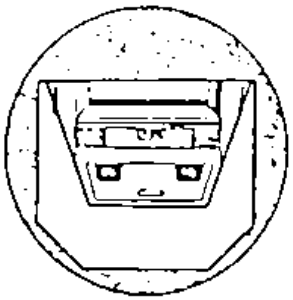
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	Trace	Trace	Trace	---

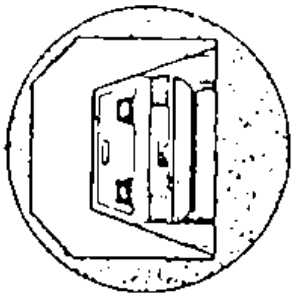
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): Right rear Tank flange, Carburetor.

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA SHEET

TEST PHASE: 180° to 270° VEHICLE NHTSA NO. 790222





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 36 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 36 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

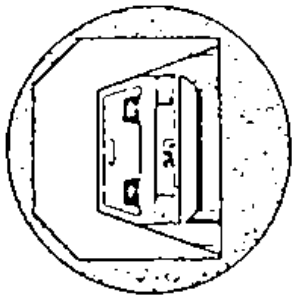
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	Trace	Trace	Trace	---

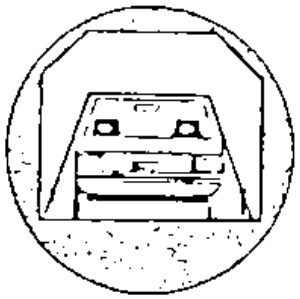
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): Carburetor

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA SHEET

TEST PHASE: 270° to 360° VEHICLE NHTSA NO. 790222





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 39 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 39 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	--

NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None

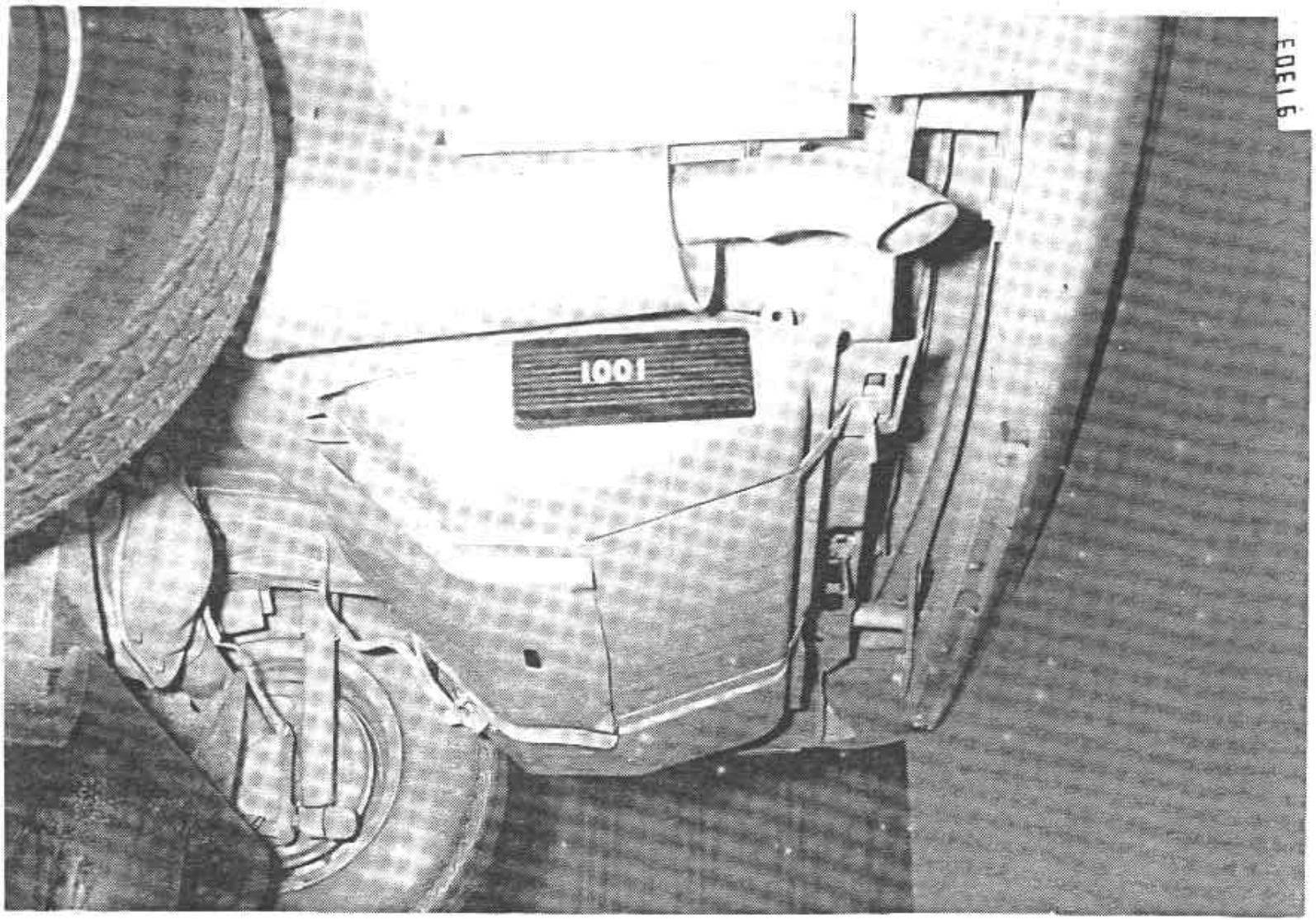


Figure 3-1. Pre-test View of Fuel Tank - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

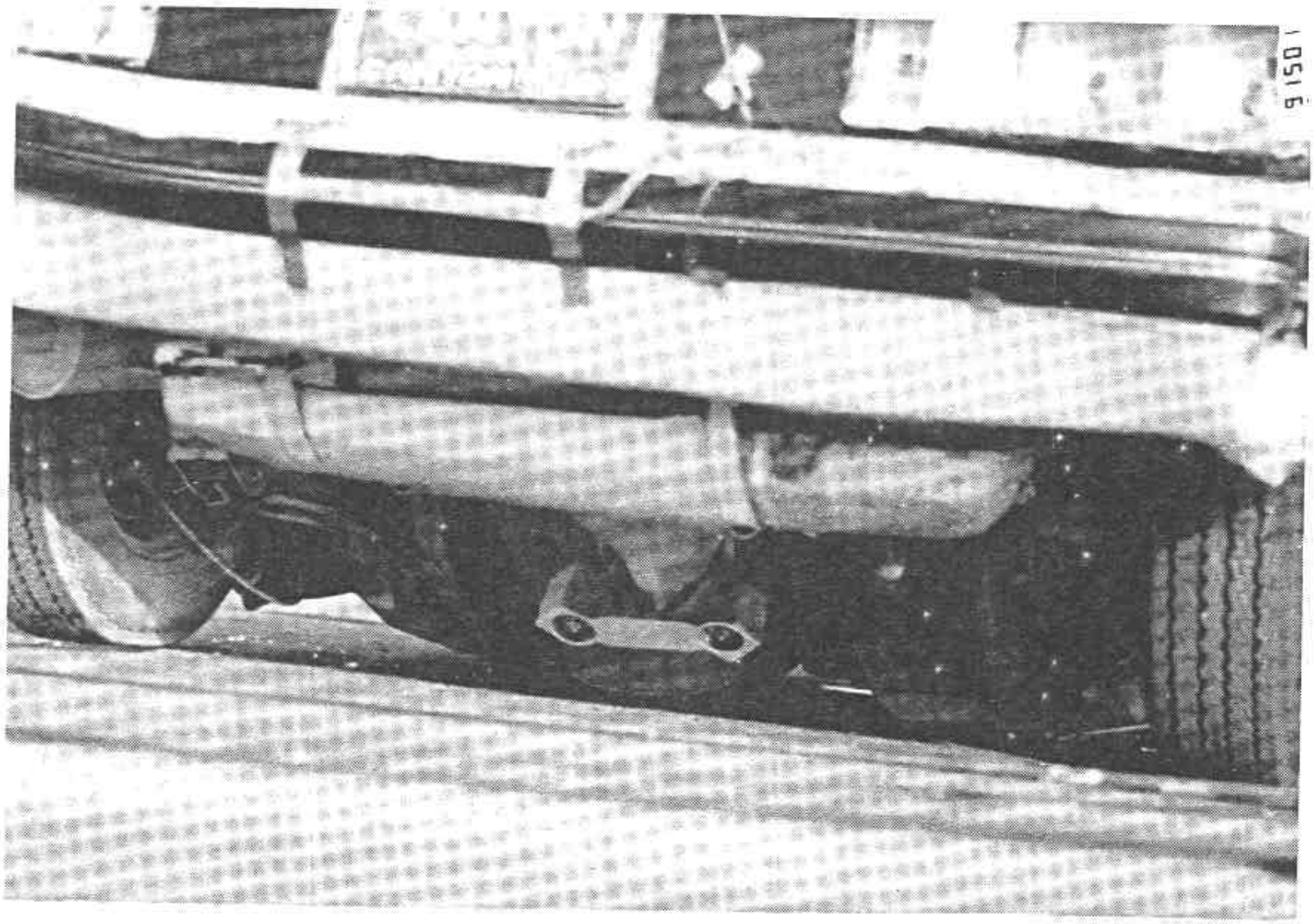


Figure 3-2. Post-test View of Fuel Tank - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

SECTION 4
DATA REQUIRED BY R&D AND OAR

The following pages are included in this section:

1. Dummy positional data
2. Dummy injury summaries
3. Vehicle crush data
4. Accelerometer location and data summary
5. Photographs pertinent to R&D and OAR

Calcomp plots of dummy and vehicle accelerometer data are presented in Appendix B.

SECTION 4
DUMMY POSITIONING

Pre-test Dummy Positions

Measurement	Driver (in.)	Passenger (in.)
Dummy Centerline to Vehicle Centerline	15.0	14.7
Nose to Upper Rim Steering Wheel	17.0	N/A
Nose to Windshield (Horizontal Distance)	17.4	17.8
Left Knee to Closest Point on Lower Panel	4.7	4.6
Right Knee to Closest Point on Lower Panel	5.5	4.5
Ankle Distance	10.0	9.0
Knee Distance	9.0	8.5
Nose to Seatback	11.2	10.5

Additional dummy positioning information is presented in the PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET which follows.

PART 572 DUMMY IN-VEHICLE POSITION
RECORDING SHEET

NHTSA No.: 790222 Manufacturer: Ford Motor Company

Make/Model: Ford Mustang Model Year: 1979

SEAT TYPE:
___ Bench X Bucket
___ Split Bench

ADJUSTER TYPE:
X Manual
___ Power

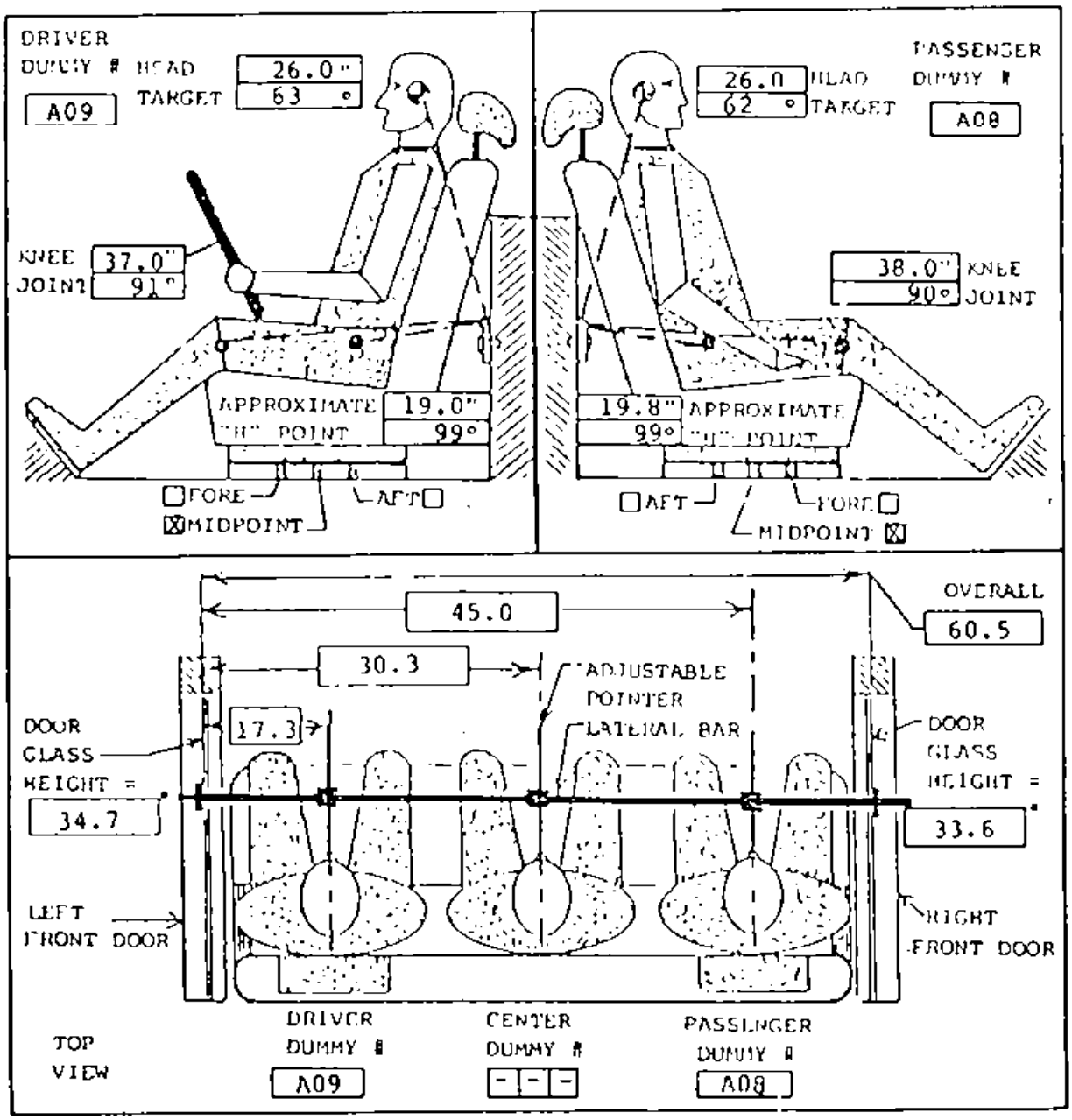
BUCKET SEAT BACK TYPE:
___ Adjustable Reclining
X Fixed

AMBIENT TEMPERATURE: 73 °F; TIME: 1500

POSITIONING DATE: December 19, 1979

TECHNICIANS: 1. Mark Pozzi
2. Dale Miller

All front seat dummies shall be positioned according to the procedure "OSE RECOMMENDED PROCEDURE FOR POSITIONING PART 572 DUMMIES IN TEST VEHICLE."



*Door glass height is equal on the right and left side of vehicle

SECTION 4

PART 572 DUMMY DATA SUMMARY

	Driver Dummy				Passenger Dummy			
	Positive Direction*		Negative Direction**		Positive Direction*		Negative Direction**	
	Peak (G)	Time (msec)	Peak (G)	Time (msec)	Peak (G)	Time (msec)	Peak (G)	Time (msec)
Head Acceleration								
Longitudinal	45.4	122.0	10.1	189.0	28.3	117.0	3.1	181.0
Lateral	3.2	198.0	14.0	126.0	12.2	126.0	3.3	69.0
Vertical	22.5	112.0	6.1	189.0	14.1	121.0	2.7	181.0
Resultant	48.7	122.0	0.6	16.0	31.3	121.0	0.2	13.0
HIC	251.6 @ 100 to 135 msec				05.8 @ 84 to 140 msec			
Chest Acceleration								
Longitudinal	33.9	106.0	5.0	53.0	30.8	110.0	0.4	46.0
Lateral	2.8	126.0	5.8	107.0	5.6	113.0	4.4	67.0
Vertical	8.0	103.0	0.3	155.0	8.0	93.0	0.4	2.0
Resultant (Max)	35.0	106.0			31.3	110.0		
Resultant (clip)	33.6	108.0			28.8	108.0		
TIME > 60 G	0 msec				0 msec			
SEVERITY INDEX	303.8 @ 200 msec				91.1 @ 200 msec			
	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)
Femur Loads								
Left	N/A							
Right	N/A							
Belt Loads								
Lap	N/A							
Torso	N/A							

Vehicle Impact Speed (mph): 35.33

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

SECTION 4
DUMMY KINEMATIC SUMMARY

DRIVER - Violent transition backward, absorbing impact of front seat backs striking rear seat back. Came to rest reclining, leaning medially with knees bent upward and head in contact with other dummy.

PASSENGER - Same as driver.

OTHER COMMENTS:

SECTION 4

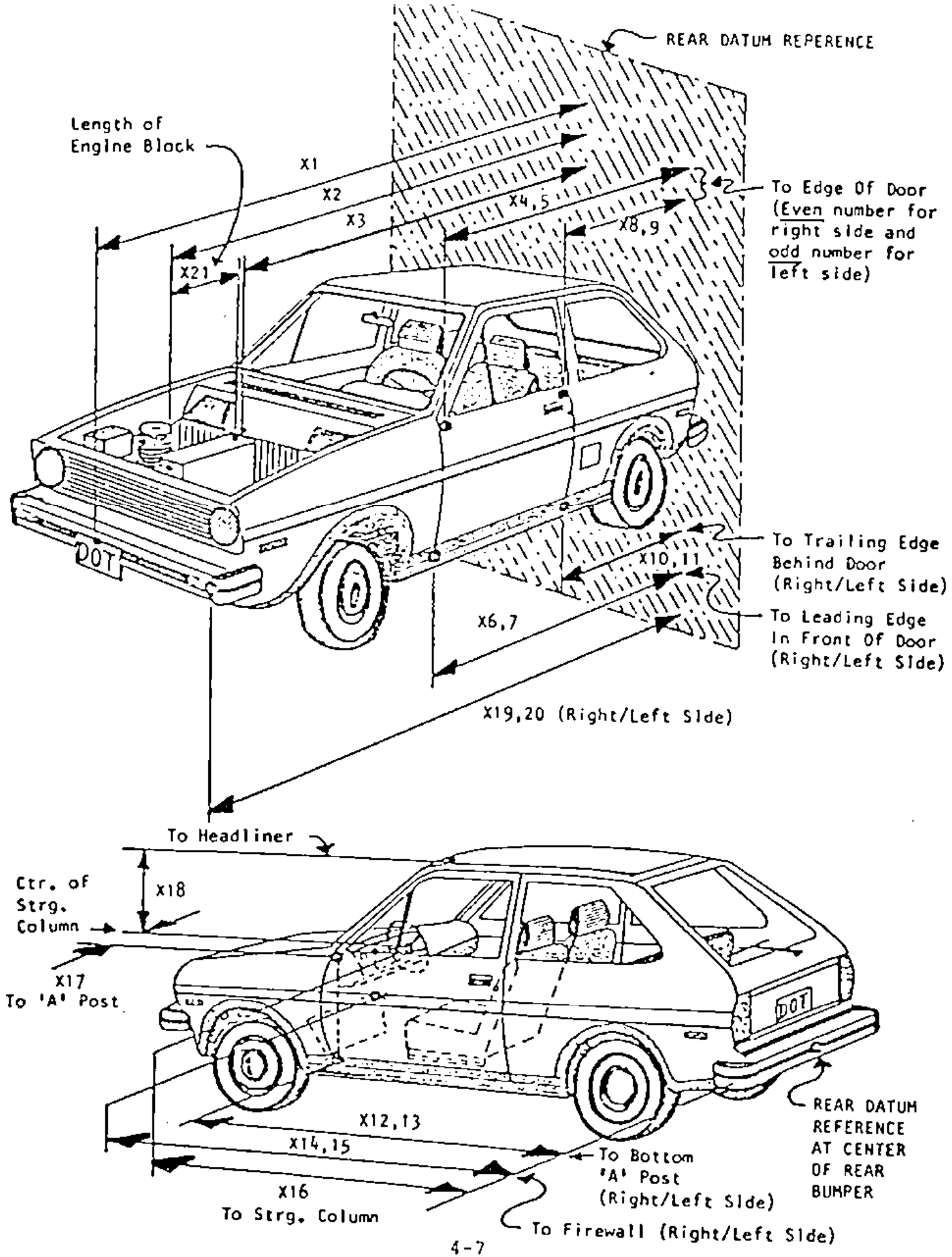
PRE-/POST-TEST STATIC MEASUREMENT DATA
(See Following Page for Dimension Definition)

Vehicle: 1979 Ford Mustang NHTSA No.: 790222

Test Date: December 19, 1979 D.S. No.: 1001

Reference Dimension	Pre-test Measurement	Post-test Measurement	Change
X_1*	179.3	163.8	15.5
X_2			
X_3			
X_4			
X_5			
X_6			
X_7			
X_8*	63.8	48.6	15.2
X_9*	64.4	50.3	14.1
X_{10}			
X_{11}			
X_{12}			
X_{13}			
X_{14}			
X_{15}			
X_{16}			
Y_{17}			
Z_{18}			
X_{19}*	173.6	158.9	14.7
X_{20}*	173.4	159.8	13.6
X_{21}			

*Rear impact data requirements.


REAR DATUM REPERENCE
Length of Engine Block
X1
X2
X3
X4,5
X8,9
X21
To Edge Of Door (Even number for right side and odd number for left side)
To Trailing Edge Behind Door (Right/Left Side)
X10,11
To Leading Edge In Front Of Door (Right/Left Side)
X6,7
X19,20 (Right/Left Side)
To Headliner
X18
Ctr. of Strg. Column
X17
To 'A' Post
X12,13
X14,15
X16
To Strg. Column
To Bottom 'A' Post (Right/Left Side)
To Firewall (Right/Left Side)
REAR DATUM REFERENCE AT CENTER OF REAR BUMPER

SECTION 4
VEHICLE PROFILE DATA SHEET

Vehicle: 1979 Ford Mustang D.S. No.: 1001 Test Date: December 19, 1979

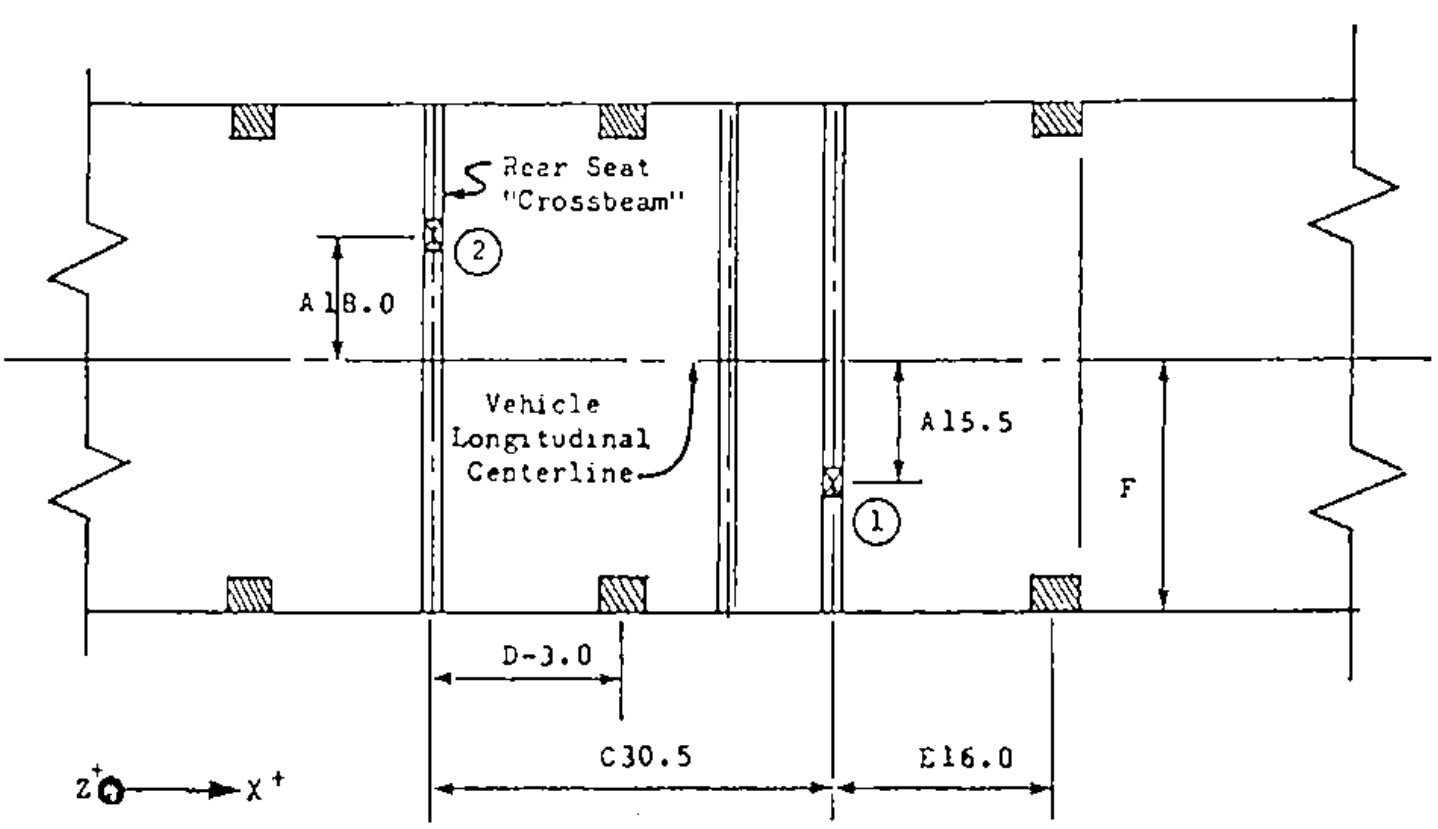
Measurement Date: Pre-test: 12-12-79 Post-test 12-20-79

Exterior Measurements Referenced to Plane: 16'

Rearward of: Front Bumper

Location	Height	Vehicle Left (in.) 30	24	18	12	6	0	Vehicle Right (in.) 6	12	18	24	30
Pre-test Profile (in.)												
Top of Front Bumper	22.1	19.9	19.0	18.6	18.1	17.9	17.9	17.9	18.1	18.5	18.9	19.7
Front of Hood	33.8	--	24.1	23.8	23.5	23.1	22.9	23.0	23.1	23.4	23.9	--
Post-test Profile (in.)												
Top of Front Bumper	18.8	32.6	34.0	33.1	33.1	32.8	32.6	32.5	32.5	32.6	32.9	34.0
Front of Hood	36.4	--	37.0	36.7	36.5	36.2	26.2	36.2	36.1	36.2	36.2	--
Post-test Static Crush (in.)												
Top of Front Bumper	3.3	12.7	15.0	14.5	15.0	14.9	14.7	14.6	14.4	14.1	14.0	14.3
Front of Hood	2.6	--	12.9	12.9	13.0	13.1	13.3	13.2	13.0	12.8	12.3	--

TEST VEHICLE ACCELEROMETER LOCATION DEFINITION AND DATA SUMMARY



Measured to widest part of vehicle body

No.	Location Description	Component Direction X	Y	Z	Data Summary Peak G @ msec X "+"	X "-"	Y "+"	Y "-"	Z "+"	Z "-"
1	Front seat "crossbeam"	✓	✓	✓	21.3 @ 95.0	2.4 @ 98.0	18.2 @ 15.0	30.9 @ 22.0	19.4 @ 14.0	18.5 @ 43.0
2	Rear seat "crossbeam"	✓		✓	39.9 @ 44.0	20.1 @ 14.0	@	@	38.6 @ 20.0	40.3 @ 70.0

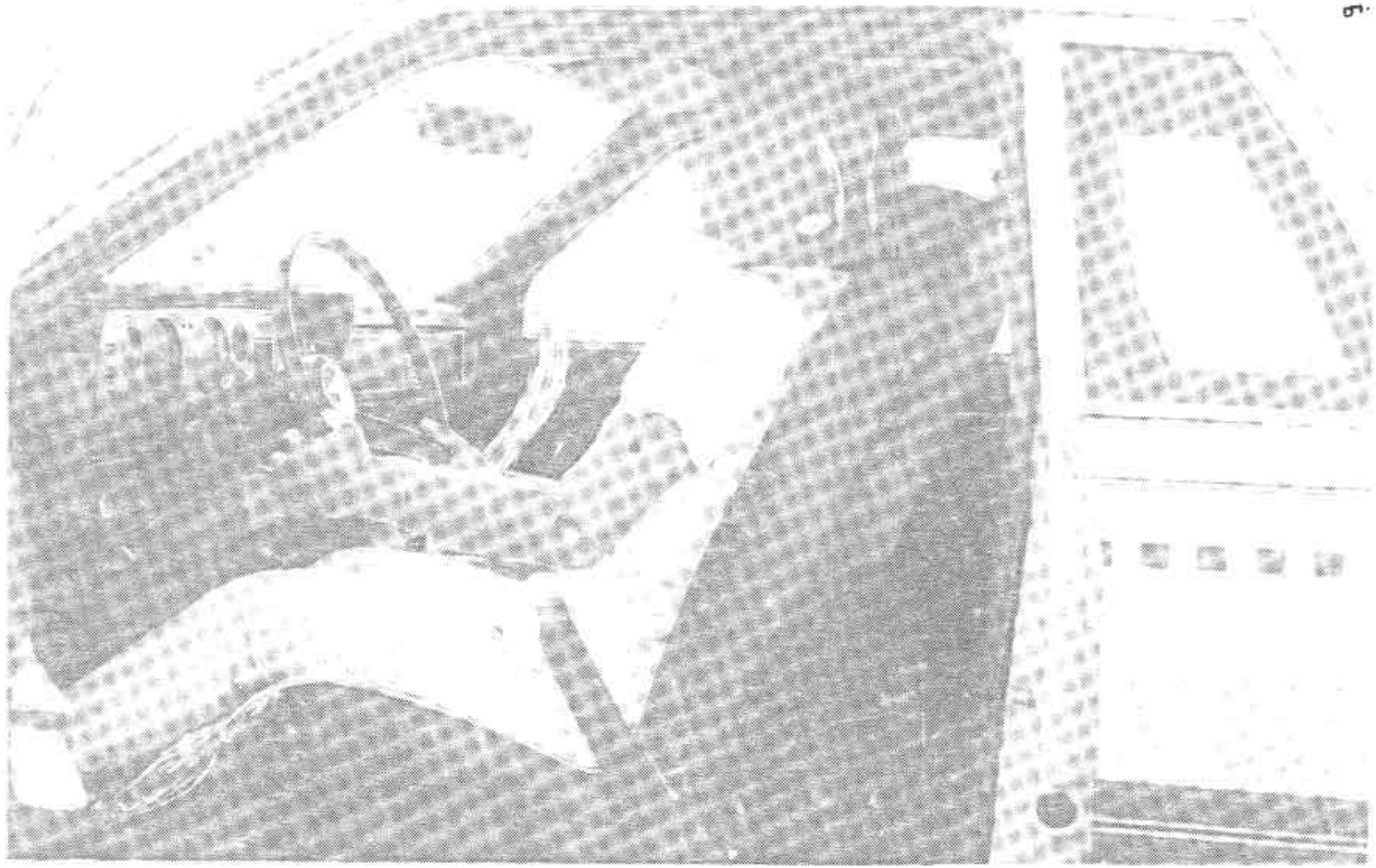


Figure 4-1. Pre-test Driver Dummy Position - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

Figure 4-2. Post-test Driver Dummy Position - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

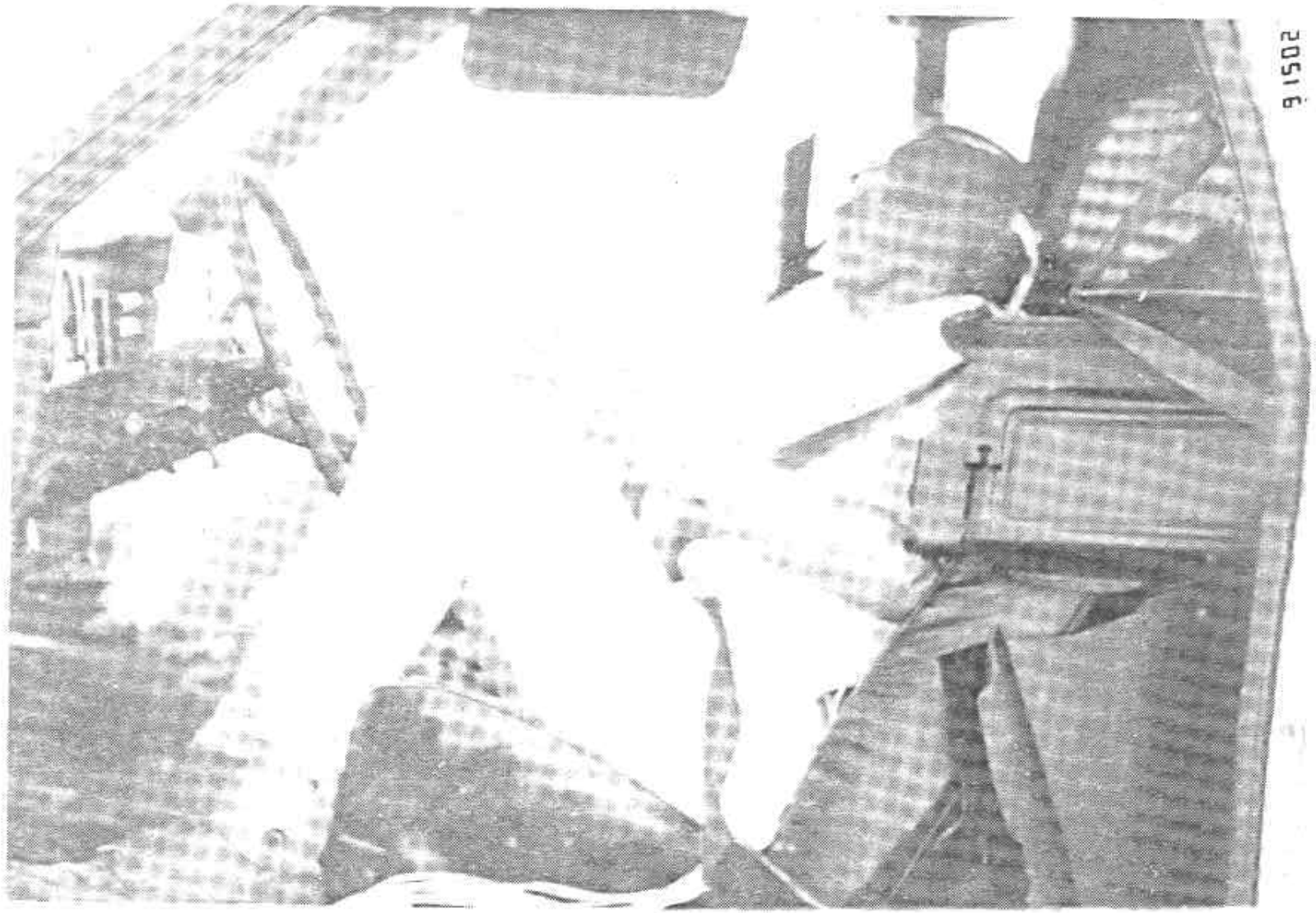


Figure 4-3. Post-test Driver Dummy Position - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

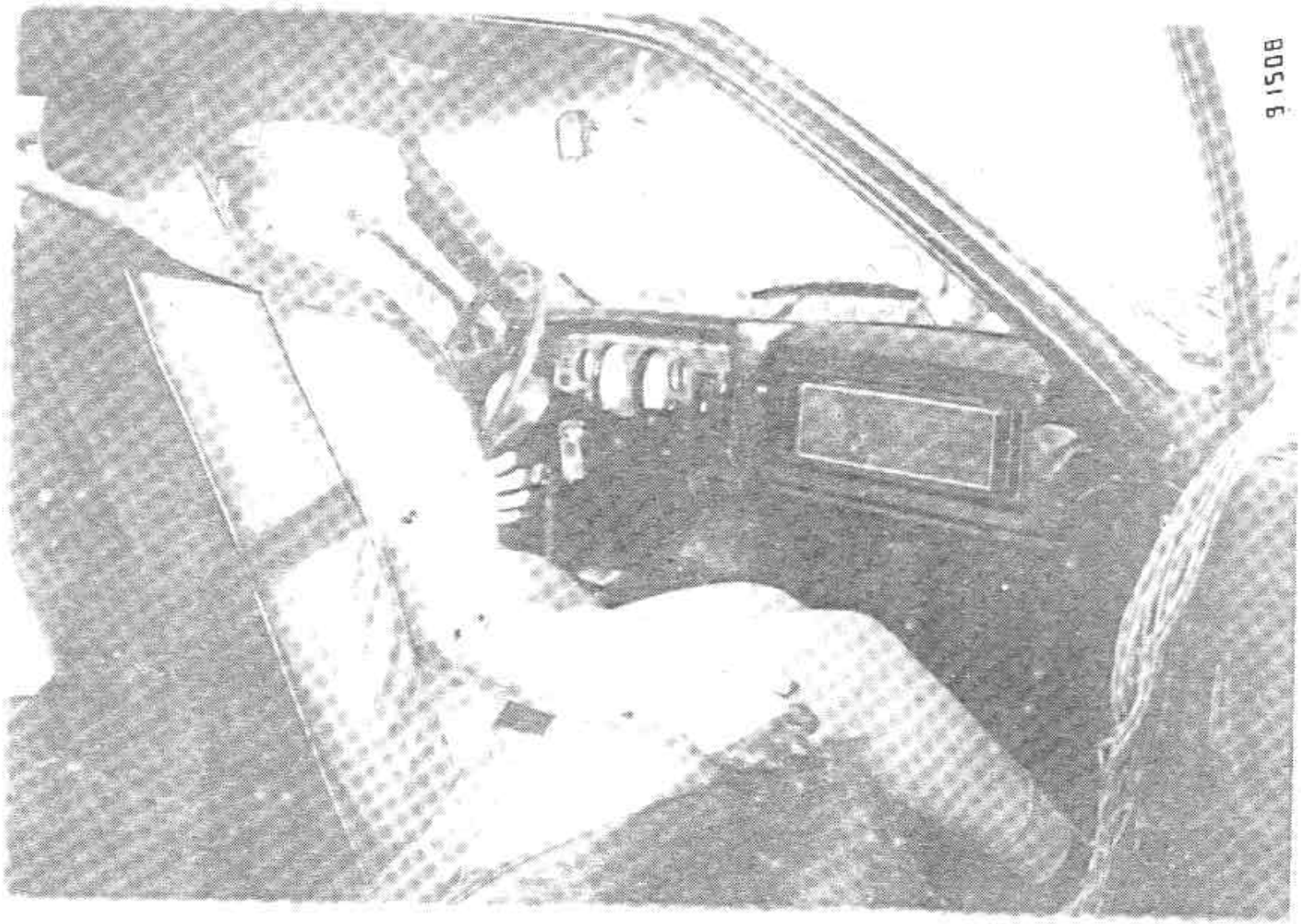


Figure 4-4. Pre-test Passenger Dummy Position - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

Figure 4-5. Post-test Passenger Dummy Position - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

Figure 4-6. Post-test Passenger Dummy Position - 1979 Ford Mustang 2-Door Sedan - NHTSA 790222.

APPENDIX A

TEST FACILITIES AND PROCEDURE

APPENDIX A

TEST FACILITY AND EQUIPMENT FOR REAR MOVING BARRIER IMPACT TESTS

General Test Facility Description

Rear Moving Barrier impact tests are conducted at the Dynamic Science, Inc. Phoenix Facility in Phoenix, Arizona. Figure A-1 is an overall aerial view of that facility.

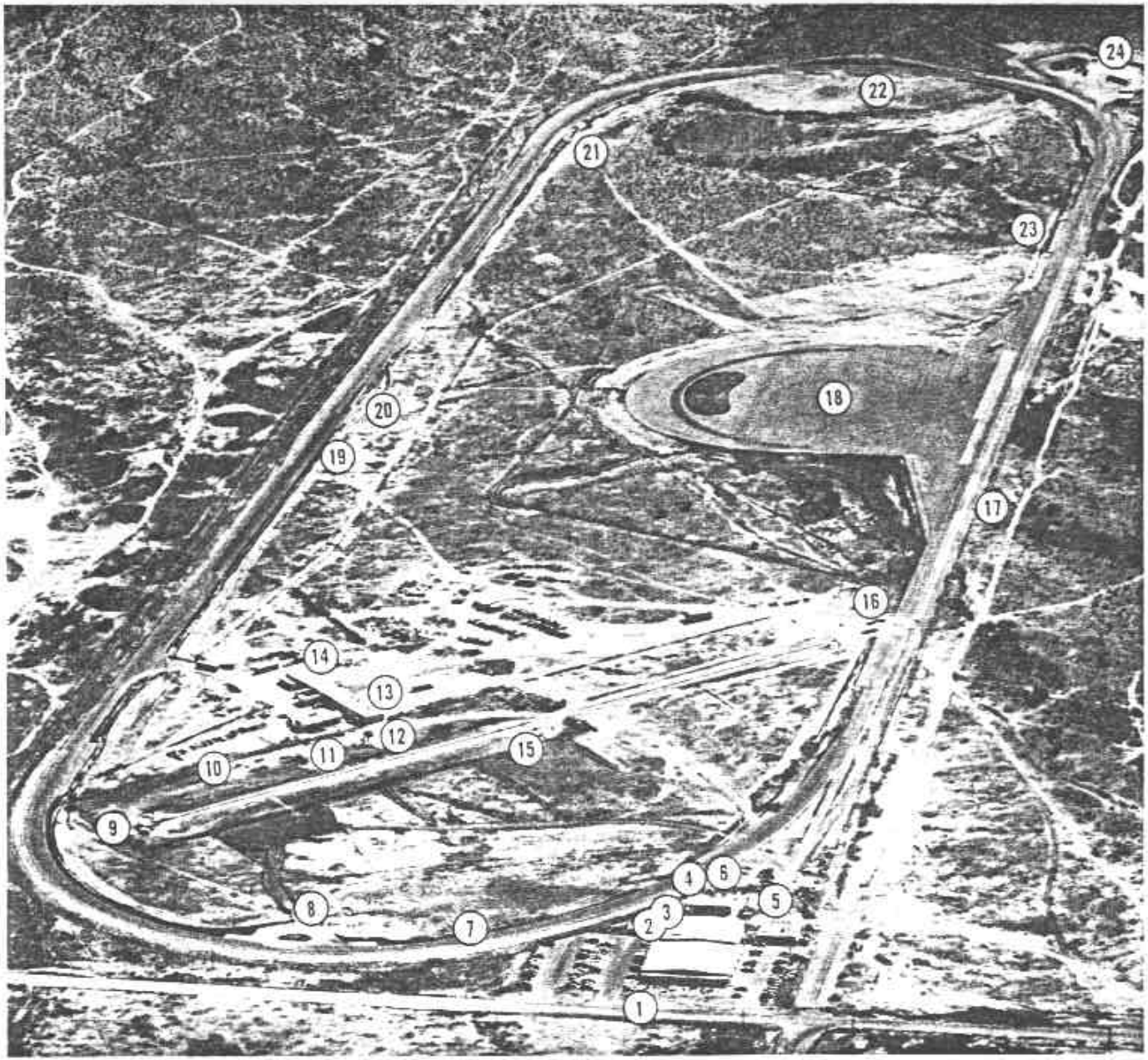
More specifically, the Monorail Impact Facility shown schematically in Figure A-2 is used. As indicated in Figure A-2, the Monorail Impact Facility accommodates a variety of test modes and configurations.

Test Track and Guidance System

The test track consists of 1,200 feet of asphalt pavement (SN = 75 ±5), 14 feet in width. The length allows sufficient acceleration distance to accommodate impact speeds in excess of 60 mph with sufficient distance remaining to abort the test if necessary. Guidance for the test vehicle is provided by a sliding shoe attached to the vehicle. The sliding shoe rides on the monorail embedded in the test track. Prior to impact, the shoe is mechanically released from the test vehicle.

Tow System and Velocity Control

The tow system consists of a drum-driven endless cable powered by a pair of 390-cubic-inch engines driven in tandem driving a modified three-speed C-6 automatic truck transmission. The tow system can propel a 6,000-pound vehicle into the fixed barrier at 75 mph. Velocity control is achieved through a manually controlled throttle system. A visual readout of speed versus distance is provided and compared with the "ideal curve." Velocity control under ±0.5 mph is realizable down to 20 mph and ±2.0 percent down to zero mph.



1. ENGINEERING/ADMINISTRATION CENTER
2. MECHANICAL/INSTRUMENTATION SHOPS
3. DUMMY CALIBRATION LABORATORY
4. GARAGE/MAINTENANCE SHOP
5. ENVIRONMENTAL CHAMBER
6. STATIC CRUSH FACILITY
7. TWO-MILE OVAL
8. TURNAROUND (TYPICAL OF TWO)
9. BARRIER IMPACT FACILITY
10. DROP TOWER/SLED TEST FACILITY
11. CENTRAL DATA ACQUISITION AND CONTROL STATION
12. PENDULUM FACILITY
13. NONMETALLICS LABORATORY
14. TEST SERVICE FACILITY
15. VEHICLE-TO-VEHICLE TEST FACILITY
16. ROLLOVER TEST FACILITY
17. RIDE QUALITY COURSE
18. SKID PAD
19. HIGH AND LOW SKID NUMBER BRAKING LANES
20. SALT WATER TROUGH
21. BELGIAN BLOCK
22. PARKING BRAKE TEST RAMP
23. PULL-OFF AREA (TYPICAL OF THIRTEEN)
24. BALLISTIC TEST RANGE

Figure A-1. The Dynamic Science, Inc. Phoenix Facility.

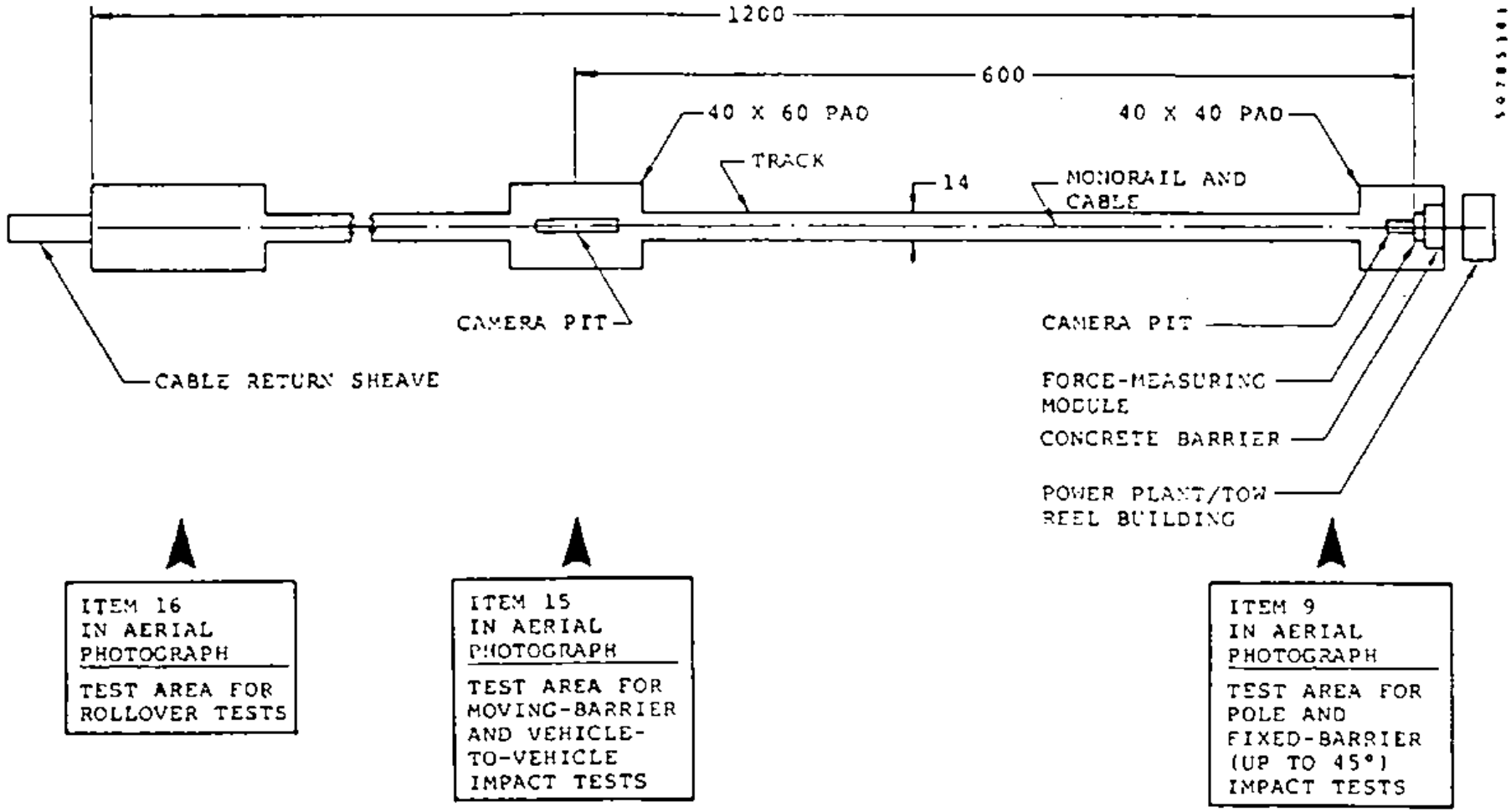


Figure A-2. Monorail Impact Facility.

Automatic abort capability is provided through the vehicle service brakes which are actuated by releasing high-pressure air into the hydraulic system. Abort criteria consist of vehicle speed, data acquisition and instrumentation system readiness, and stability of the vehicle on the test track. The first two criteria are automatically monitored by the test control system, while the third criterion is visually monitored by the test conductor. Manual abort provisions are available to the test conductor. Upon verifying vehicle speed, the test control system automatically deactivates the abort system to preclude inadvertent test abort immediately prior to impact.

Control System

The master control system used for impact tests controls and monitors all primary system functions that must operate throughout a predetermined interval during a test. This includes the starting and stopping of the tape recorder, high-speed cameras, and oscillograph, and control of the power winch which propels the test vehicle. The operation of the various devices is confirmed, including vehicle velocity and tape recorder speed synchronization, before it passes through a "commit" window. When the vehicle is committed, the abort system is disarmed, preventing an accidental abort after the point of no return is reached.

Any system malfunction, including improper vehicle velocity up to the commit window, generates an abort. The control system uses the pulse output from the IRIG time base generator as a clock with a manual push button defining time zero. The logic circuits compare pulse counts from time zero to preset values dialed in at the control panel. As each control circuit gets an equal comparison, that circuit is turned on. If the self-test circuit does not verify, the abort system is automatically activated. After successful vehicle test, the last control circuit shuts the entire system down. The manual backup control system provides the test conductor the option for manually aborting the test if the need arises.

Moving Barrier

The moving barrier used by Dynamic Science conforms to all the requirements of paragraph S8.2 of FMVSS 208, "Occupant Crash Protection." It is rigid and has a solid suspension so it undergoes no significant amount of dynamic or static deformation and absorbs no significant portion of the energy dissipated in the impact.

The impact surface is a vertical, rigid, flat rectangle, 78 inches wide and 60 inches high, perpendicular to the barrier's direction of travel. The lower edge of the barrier face is horizontal and 5 inches above the ground surface.

The nominal weight of the moving barrier is 4,000 pounds. The actual measured weight of the barrier is 3,996 pounds distributed as follows:

LF	1536 lb	RF	1415 lb
LR	427 lb	RR	618 lb

The tires are size J60-15, inflated to 24 psi in the front and 10 psi in the rear.

A guide at the back of the moving barrier which rides along the monorail ensures that the barrier travels in a straight line with no significant lateral, vertical, or rotational movement.

Fuel Simulation

As prescribed in the FMVSS 301 Laboratory Procedure, the vehicle fuel system is filled to 90 to 95 percent of capacity with Stoddard Solvent.

The fuel is pumped out of the fuel tank, and the residual fuel in the fuel lines and the carburetor is burned by operating the vehicle engine. The fuel system is filled with Stoddard Solvent No. 2. Stoddard Solvent is then pumped into the fuel lines, up to the carburetor. The weight of the Stoddard Solvent added and removed is determined with two Western Beam Scales (Model No. WP 2000).

The solvent used, Stoddard Solvent No. 2, has a specific gravity of 0.764 at 75°F and a viscosity of 0.99 centistokes.

High-Speed Motion Photography

Six high-speed (1,000 frames per second) motion cameras with 100 Hz timing marks are used for photographic test documentation. The general location of the cameras is diagrammed in Figure A-3. Precise positioning is accomplished through bore sighting with the vehicle at the impact point prior to the test.

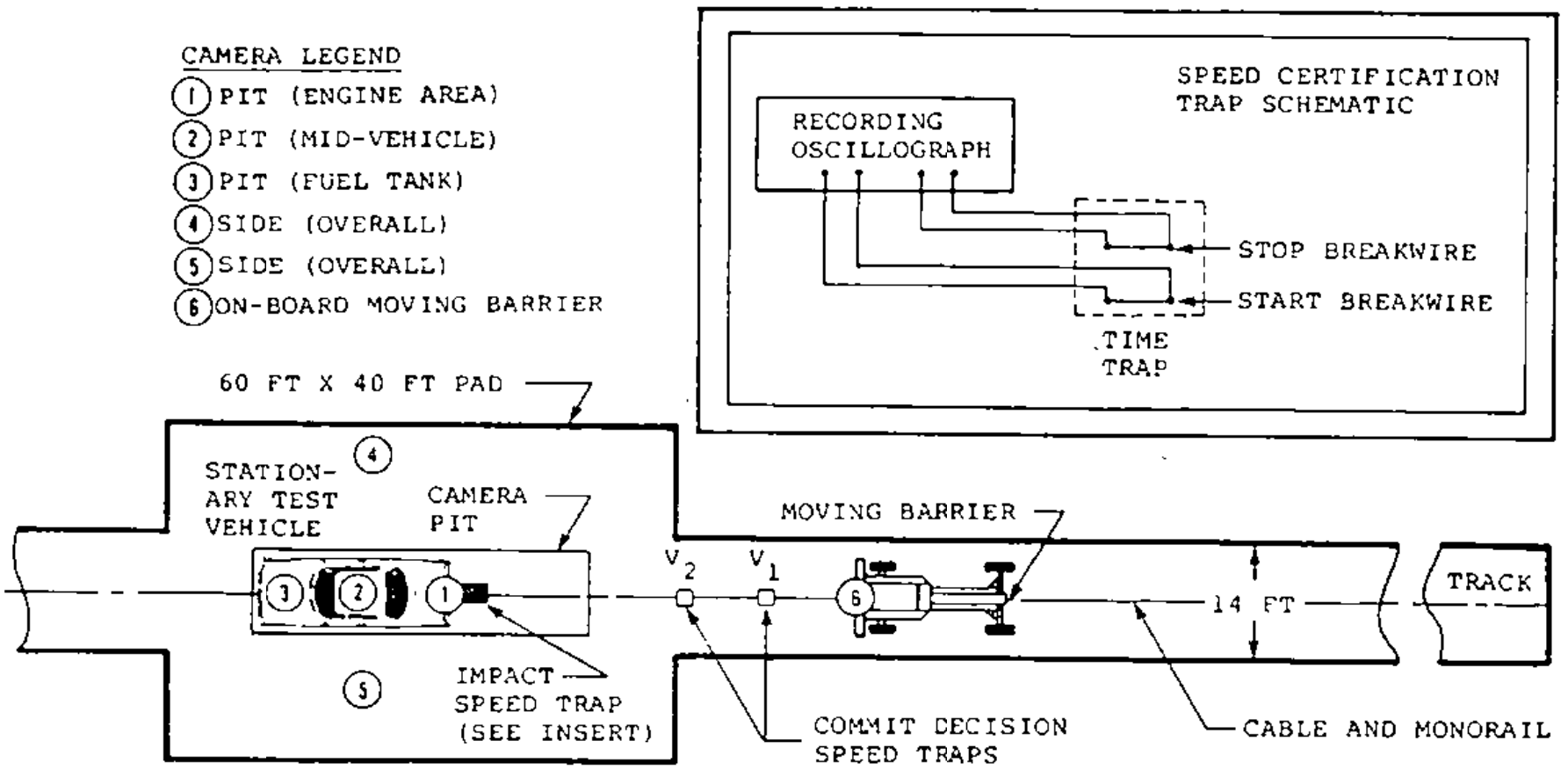


Figure A-3. Rear Moving Barrier Impact Test Site Layout.

Ballast Weight

The ballast used in this program is weighed on a Howe platform scale prior to installation in the test vehicle.

The platform scale is calibrated by placing precision weights thereon and recording the scale reading. The accuracy of the ballast weights is:

- ±1/2 pound for 0 to 300-pound weights
- ±1 pound for 300 to 1000-pound weights.

Vehicle Weight

The weights of the test vehicle are determined by placing each wheel on a Western Model WP 2000 beam scale, certified with test weights scaled to National Bureau of Standards Class B tolerances.

Dummy Positioning

The following table summarizes the steps taken to position the instrumented, calibrated dummies in the test vehicle. The dummies were kept in a temperature-controlled enclosure at the head of the track until t-30 seconds. The temperatures both in the enclosure, and the outside ambient temperature were recorded immediately prior to rollout.

DUMMY PLACEMENT AND POSITIONING

Part 572 Dummy	Driver DSP	Passenger DSP
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.

DUMMY PLACEMENT AND POSITIONING (CONTD)

Part 572 Dummy	Driver DSP	Passenger DSP
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. Midsaggital 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 (tibias)	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.
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.

Test Equipment List and Function

Item	Manufacturer	Model	Purpose
Timing Trap	Dynamic Science	None	Determine impact speed by furnishing a start and stop signal to recording oscillograph.
Oscillograph	Bell and Howell	5-134	Records timing start and stop signals from timing traps, cable drum drive rpm, and impact switch.
Speed Control	Dynamic Science	None	Precision control of cable drive drum rpm.
Beam Scales	Western	WP 2000	Used to determine vehicle test weights.
High-speed Motion Picture Cameras	Photosonics Milliken Red Lake Labs	16-1B 5A 164-5AC	Used for front, side, overhead, and underside film coverage.
Motion Picture Camera	Canon Scoopic		Panning and documentation.
Still Camera	Mamiya	RB 67	Documentary photo coverage.
100 and 1000 Hz Time Code Generators	Dynamic Science	None	Furnish timing signal for high-speed cameras and a 1 second timing for velocity determination.
Stop Watch	Brietling	None	Time for collection of fuel leak samples.
Containers	-	-	Collection for fuel leak samples.
Graduated Cylinder	Pyrex	3022	Fuel volume measurement.
Graduated Cylinder	Kimax	-	Fuel volume measurement.
Calibrated Steel Rule	Starret	48 in.	Precision measurement of velocity trap spacing.
Anthropomorphic Dummies	Alderson Research Labs	Hybrid II	To ballast the vehicle and to gather occupant response data.

APPENDIX B

CALCOMP PLOT PRESENTATION

Calcomp plots generated from the crash test data are presented on the following pages. All data will be recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data was filtered according to SAE J211. Plot legends and test anomalies are listed below:

PLOT LEGEND

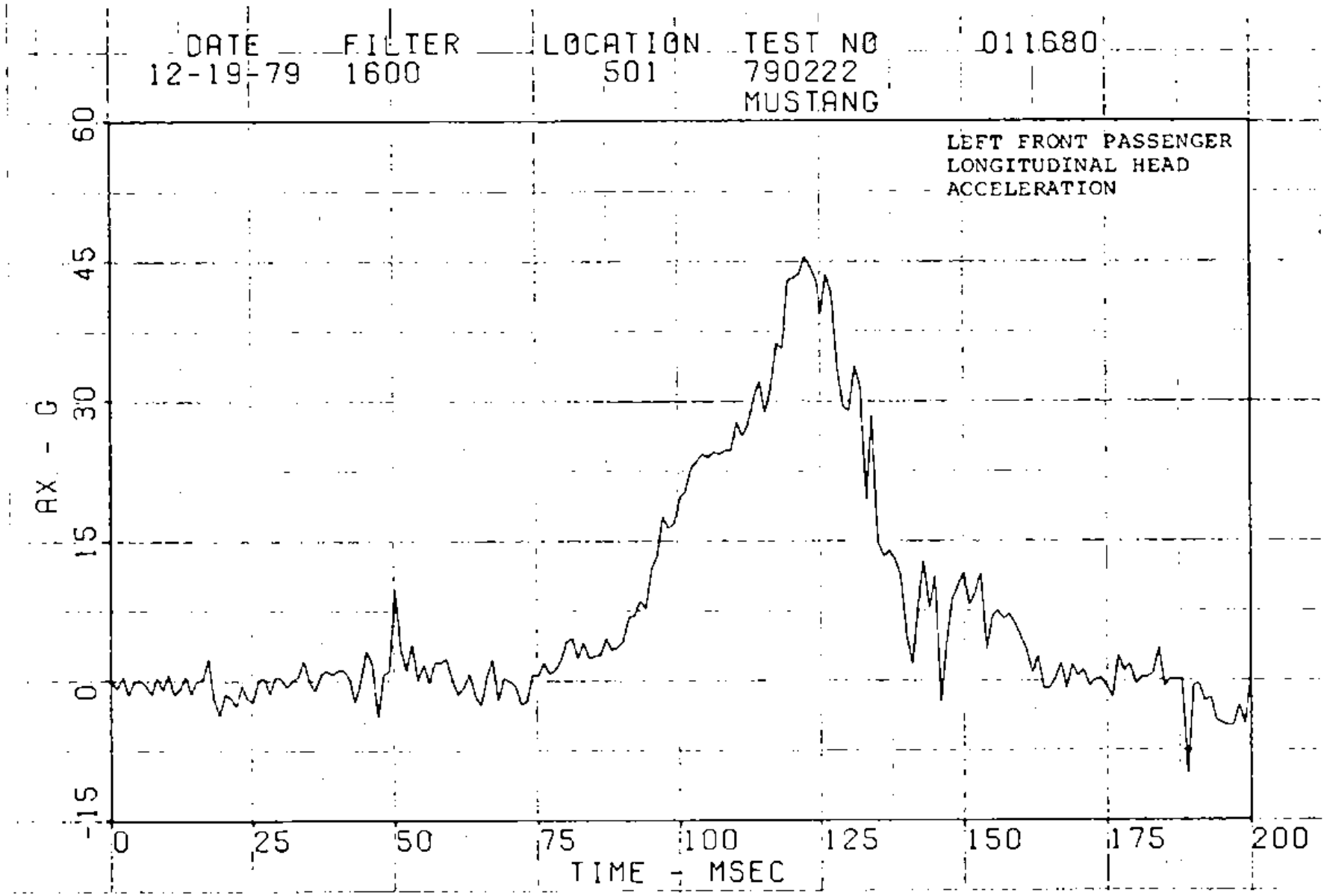
Dummy Data*

Driver	RF Outboard Passenger	Data Description
501	503	Head Acceleration
1101	1103	Chest Acceleration

Vehicle Data**

	Location
101	Front Seat Area
102	Rear Seat Area

*Dummy Injury Summary presented on page 4-4.
**Vehicle accelerometer location and data summarized on page 4-9.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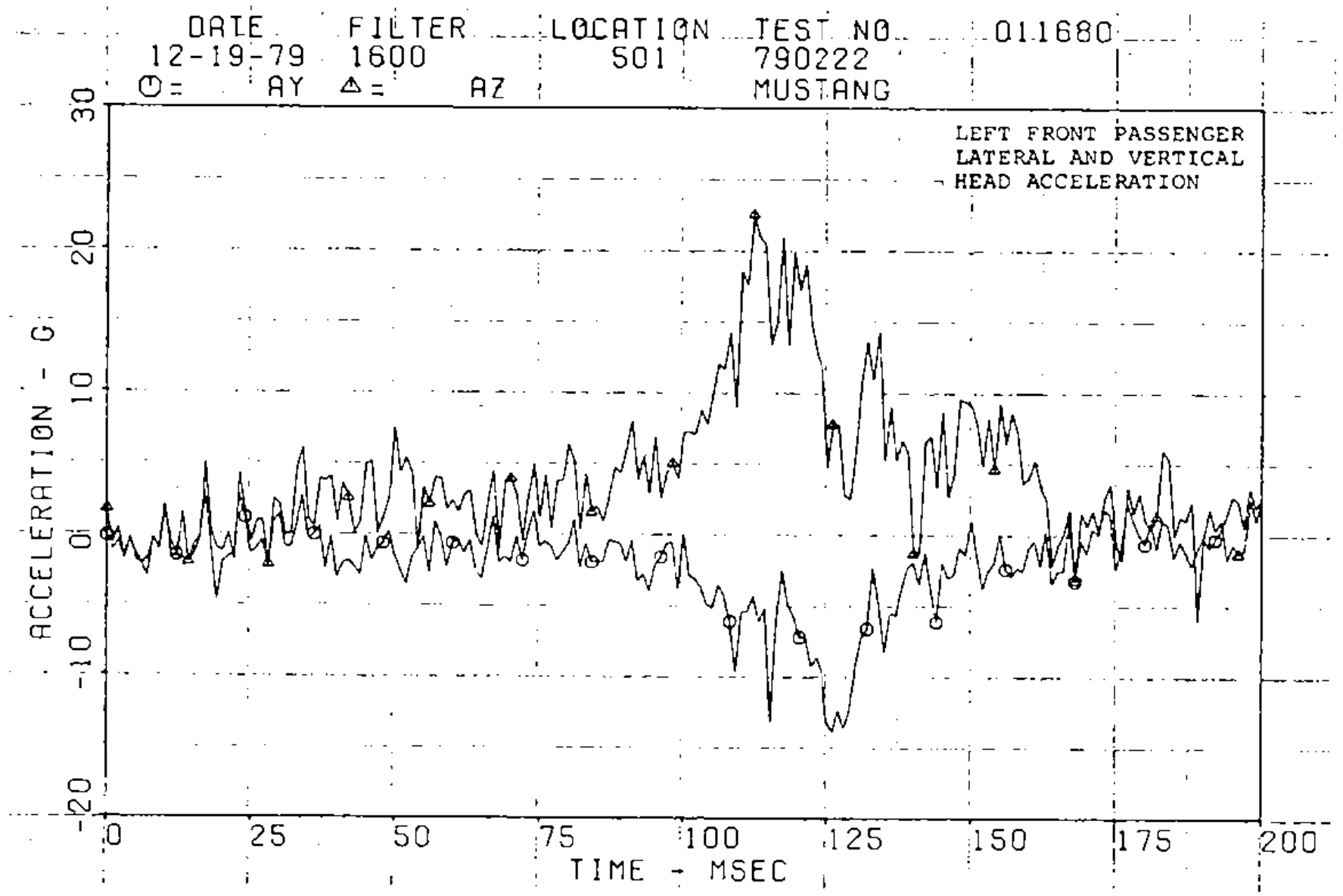
12-19-79
FILTER
1600
LOCATION
501
TEST NO
790222
MUSTANG
011680
LEFT FRONT PASSENGER
LONGITUDINAL HEAD
ACCELERATION
AX - G
60
45
30
15
0
-15
0
25
50
75
100
125
150
175
200
TIME - MSEC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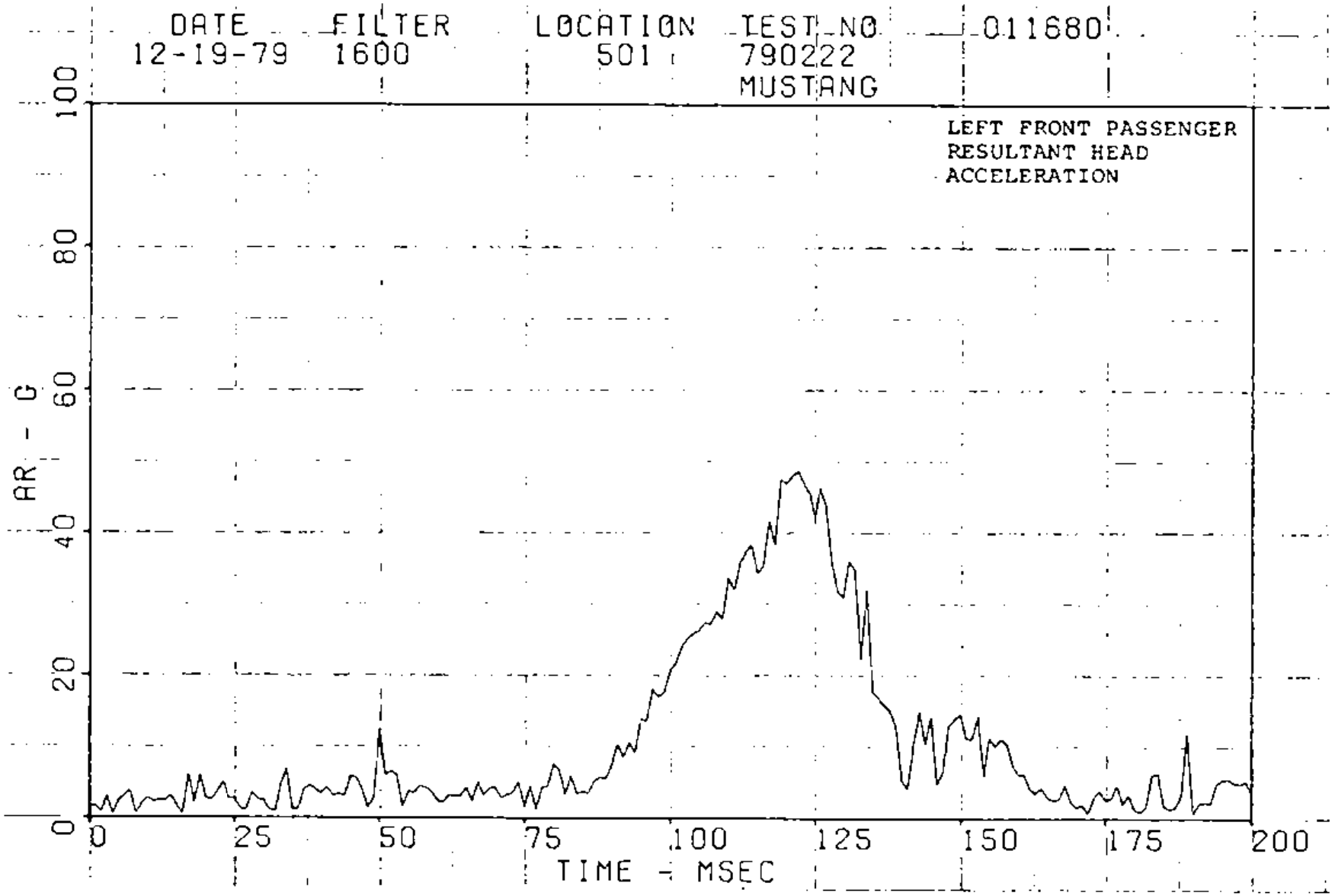
12-19-79
FILTER
1600
LOCATION
501
TEST NO
790222
011680
MUSTANG
○ = AY △ = AZ
LEFT FRONT PASSENGER
LATERAL AND VERTICAL
HEAD ACCELERATION
ACCELERATION - G
30
20
10
0
-10
-20
0
25
50
75
100
125
150
175
200
TIME - MSEC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FILTER
1600
LOCATION
501
TEST NO
790222
MUSTANG
011680
LEFT FRONT PASSENGER
RESULTANT HEAD
ACCELERATION
AR - G
0
20
40
60
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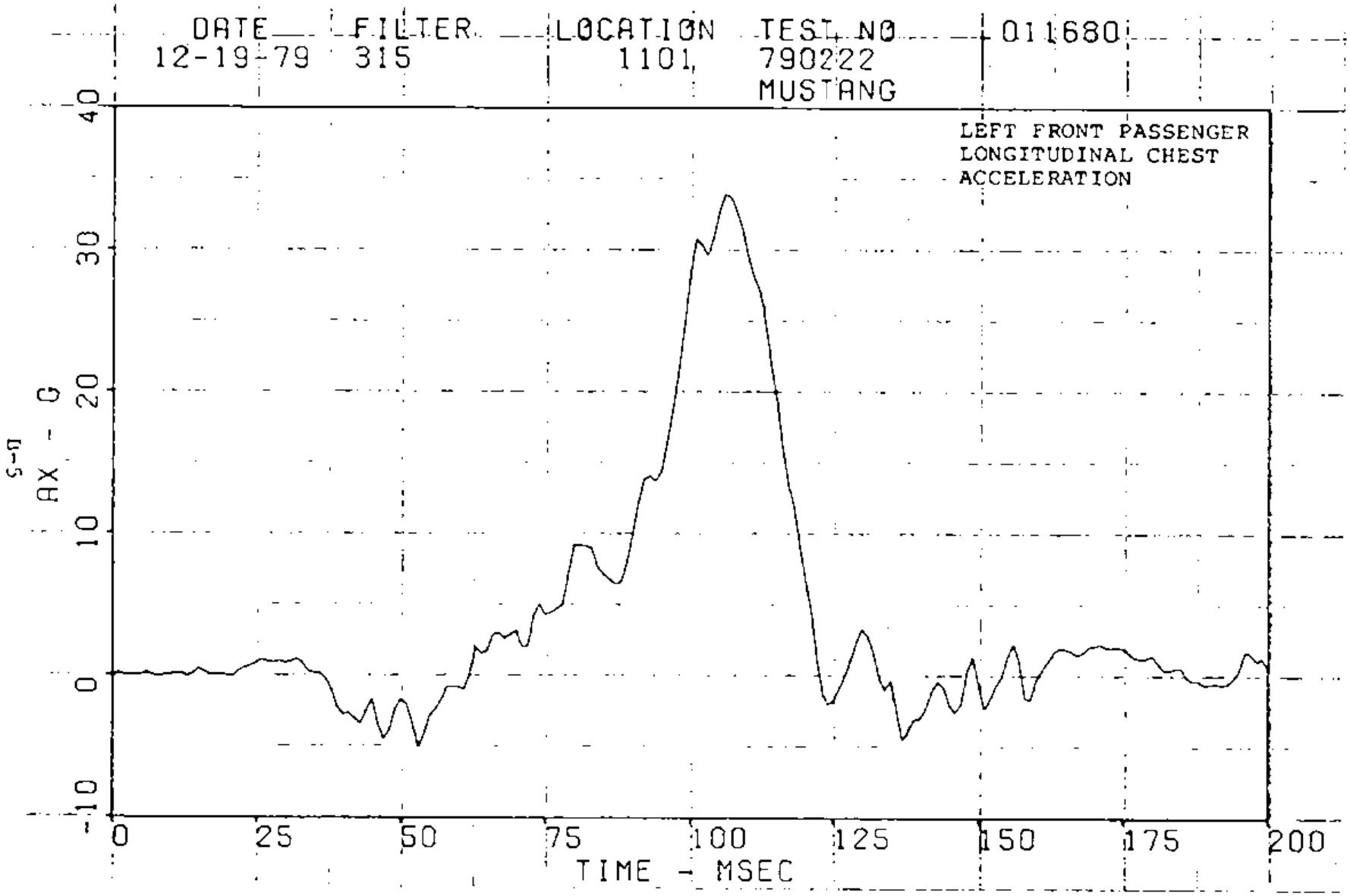
100
0
25
50
75
100
125
150
175
200
TIME - MSEC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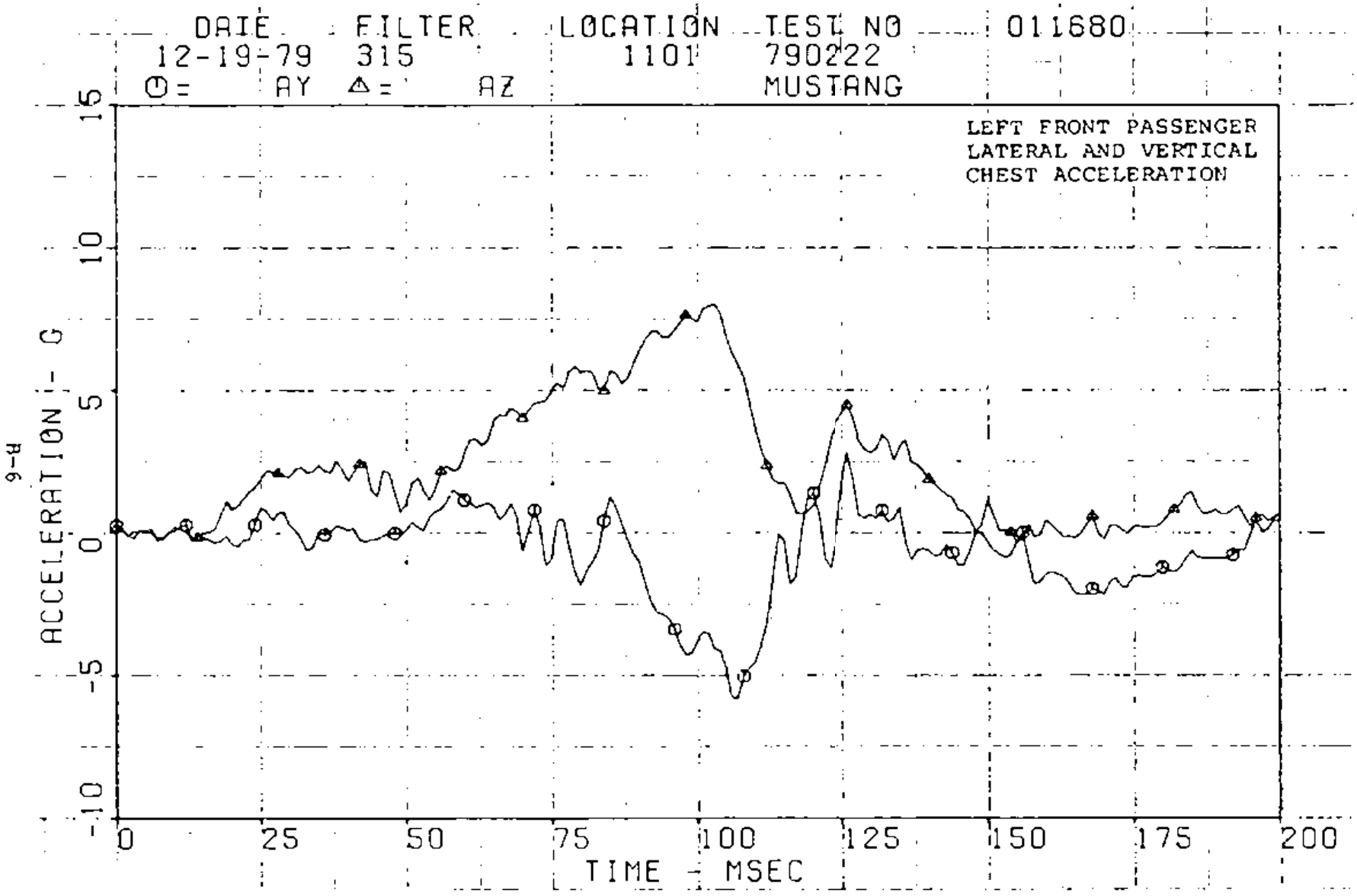
12-19-79
FILTER
315
LOCATION
1101
TEST NO
790222
MUSTANG
011680
LEFT FRONT PASSENGER
LONGITUDINAL CHEST
ACCELERATION
AX - G
40
30
20
10
0
-10
0
25
50
75
100
125
150
175
200
TIME - MSEC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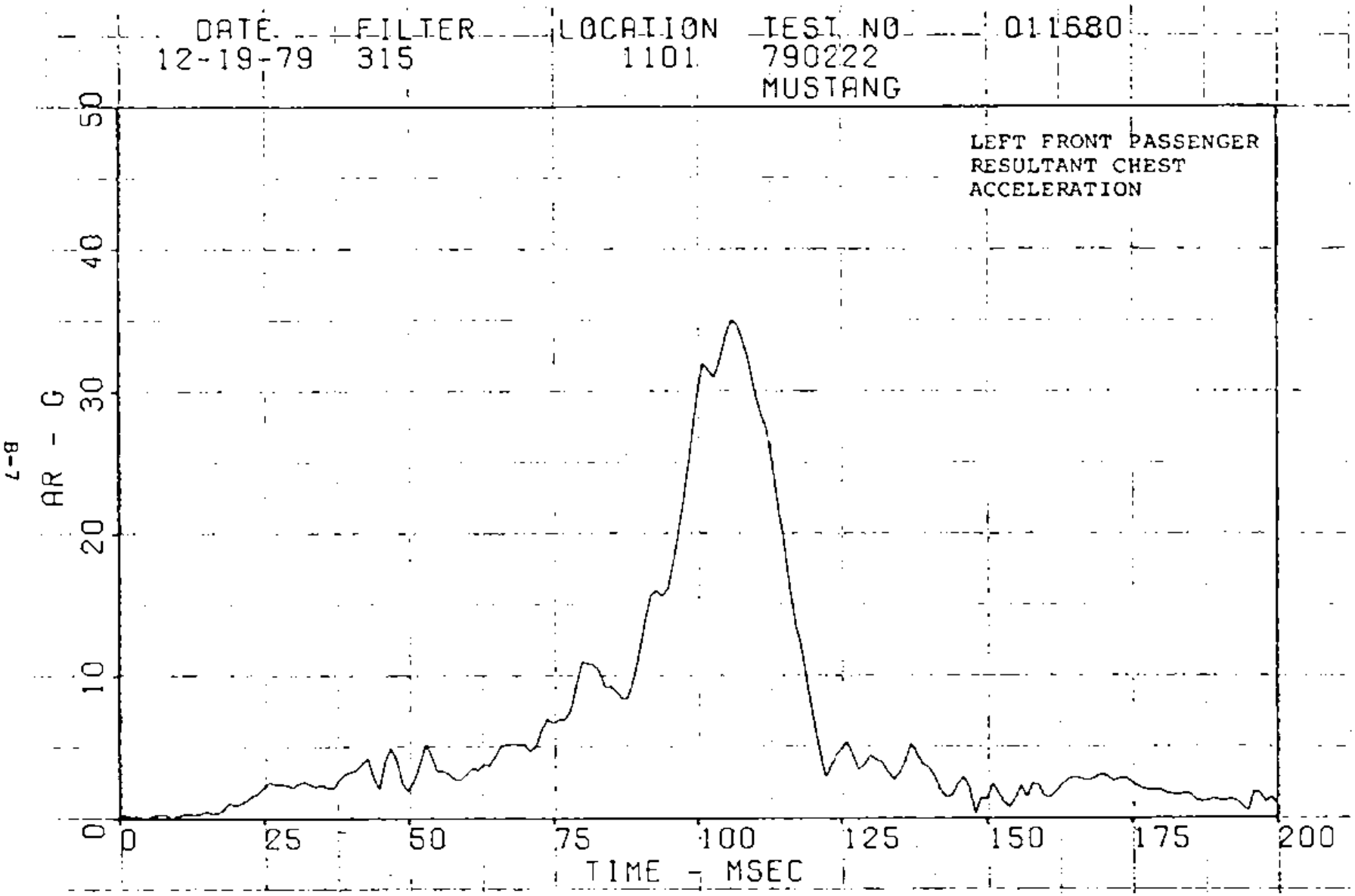
12-19-79
FILTER
315
LOCATION
1101
TEST NO
790222
011680
MUSTANG
O = AY Δ = AZ
LEFT FRONT PASSENGER
LATERAL AND VERTICAL
CHEST ACCELERATION
ACCELERATION - G
15
10
5
0
-5
-10
0
25
50
75
100
125
150
175
200
TIME - MSEC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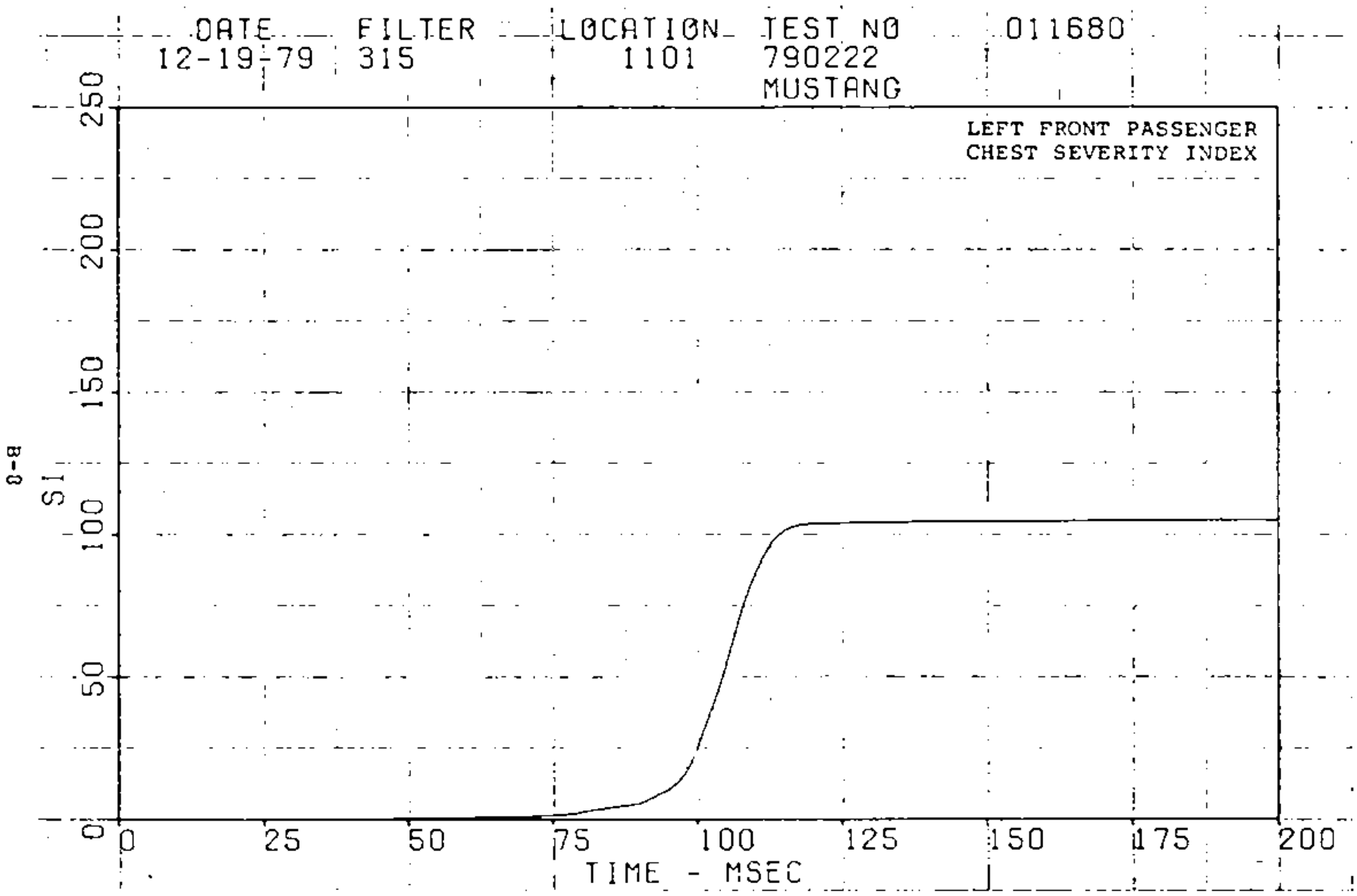
FILTER
315
LOCATION
1101
TEST NO
790222
MUSTANG
011680
LEFT FRONT PASSENGER
RESULTANT CHEST
ACCELERATION
AR - G
0
10
20
30
40
50
0
25
50
75
100
125
150
175
200
TIME - MSEC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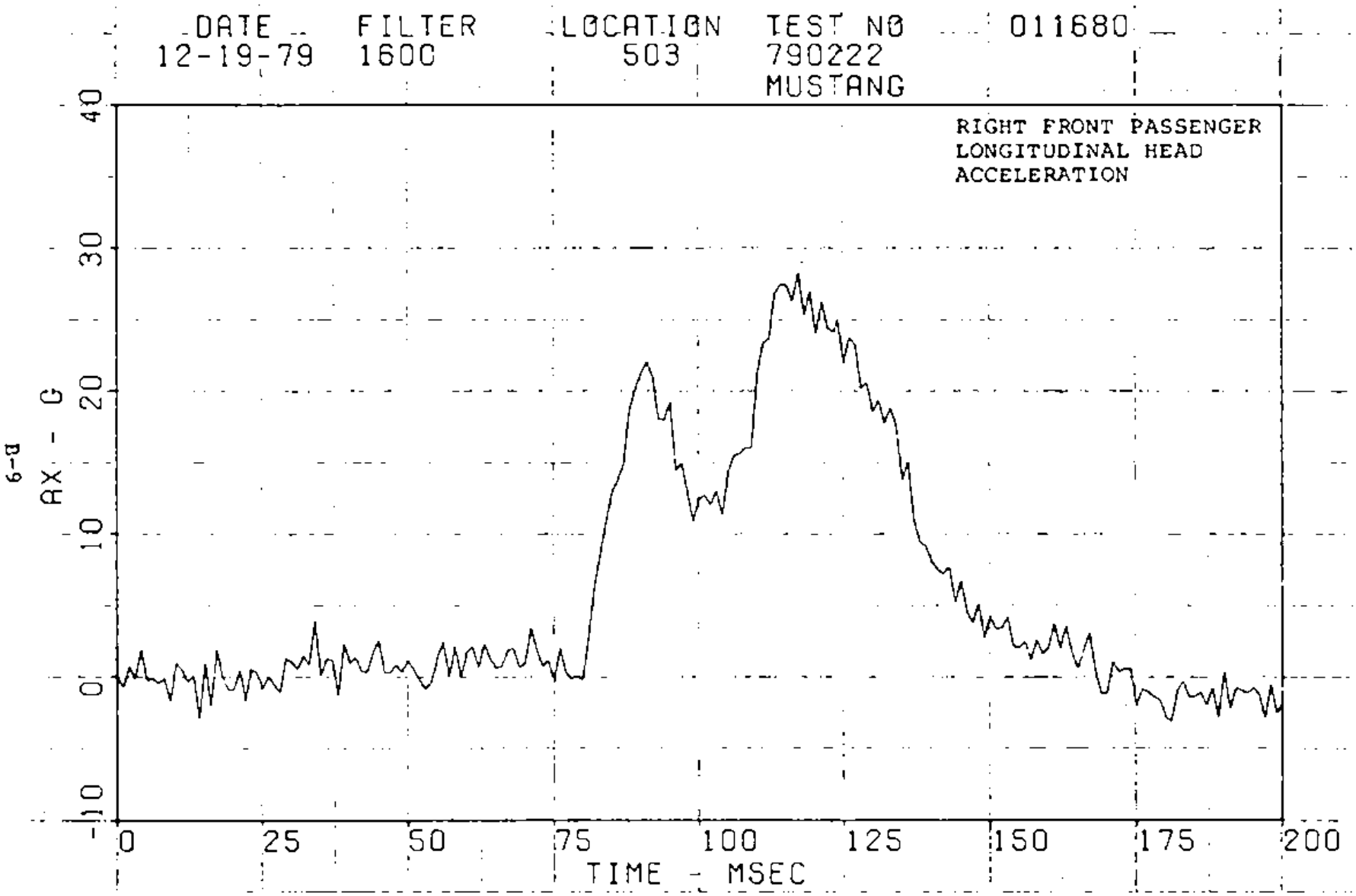
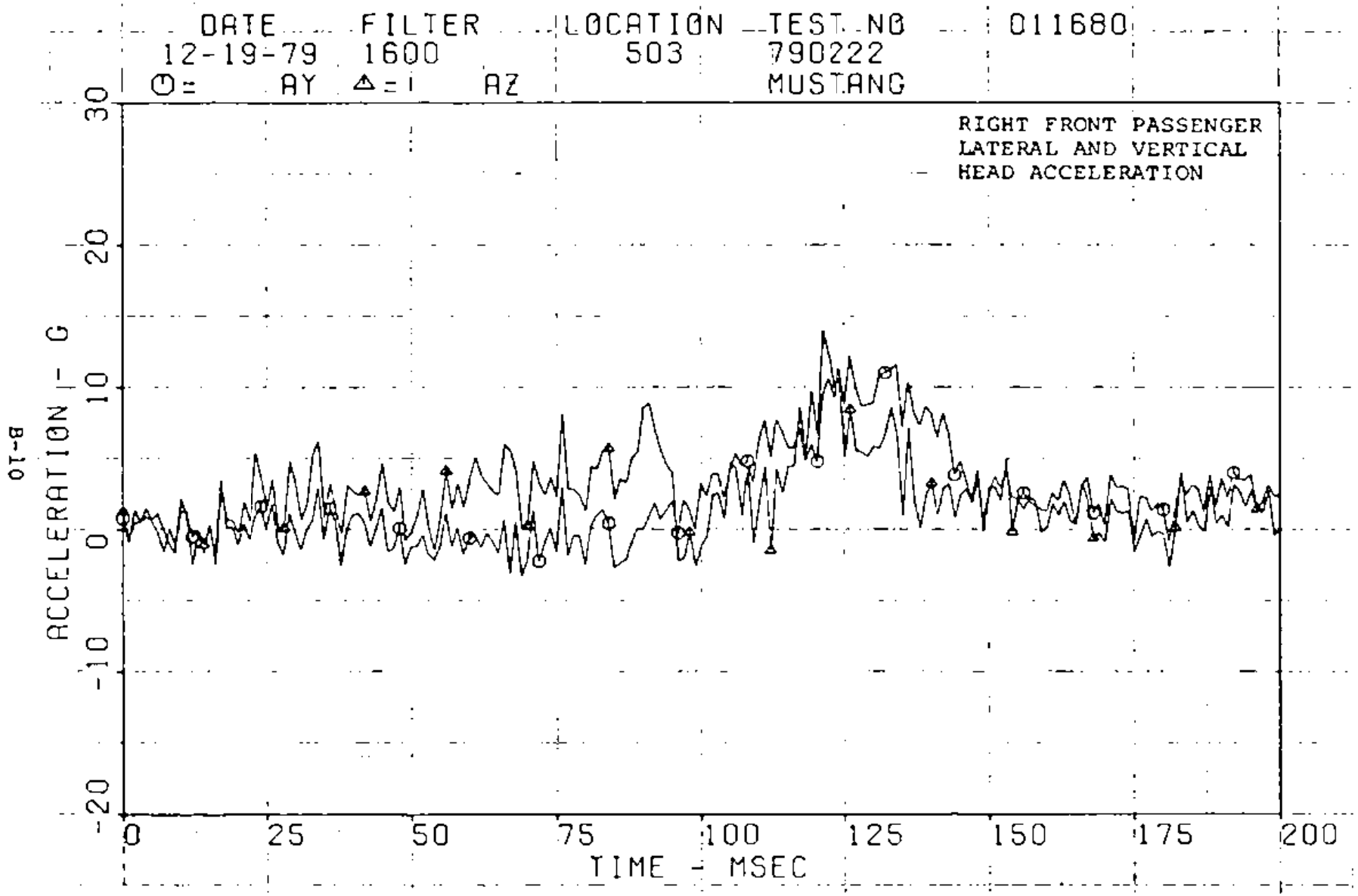
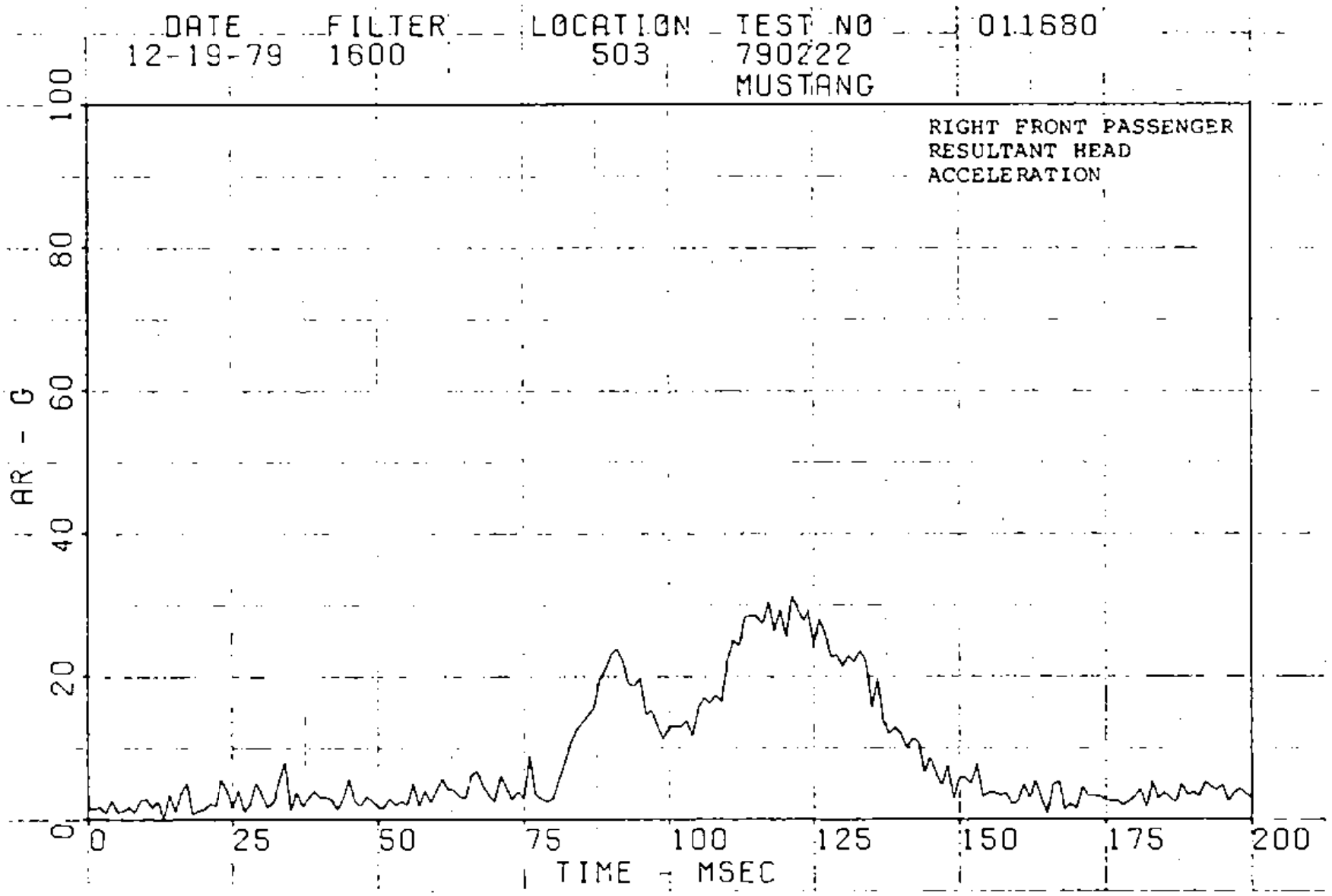
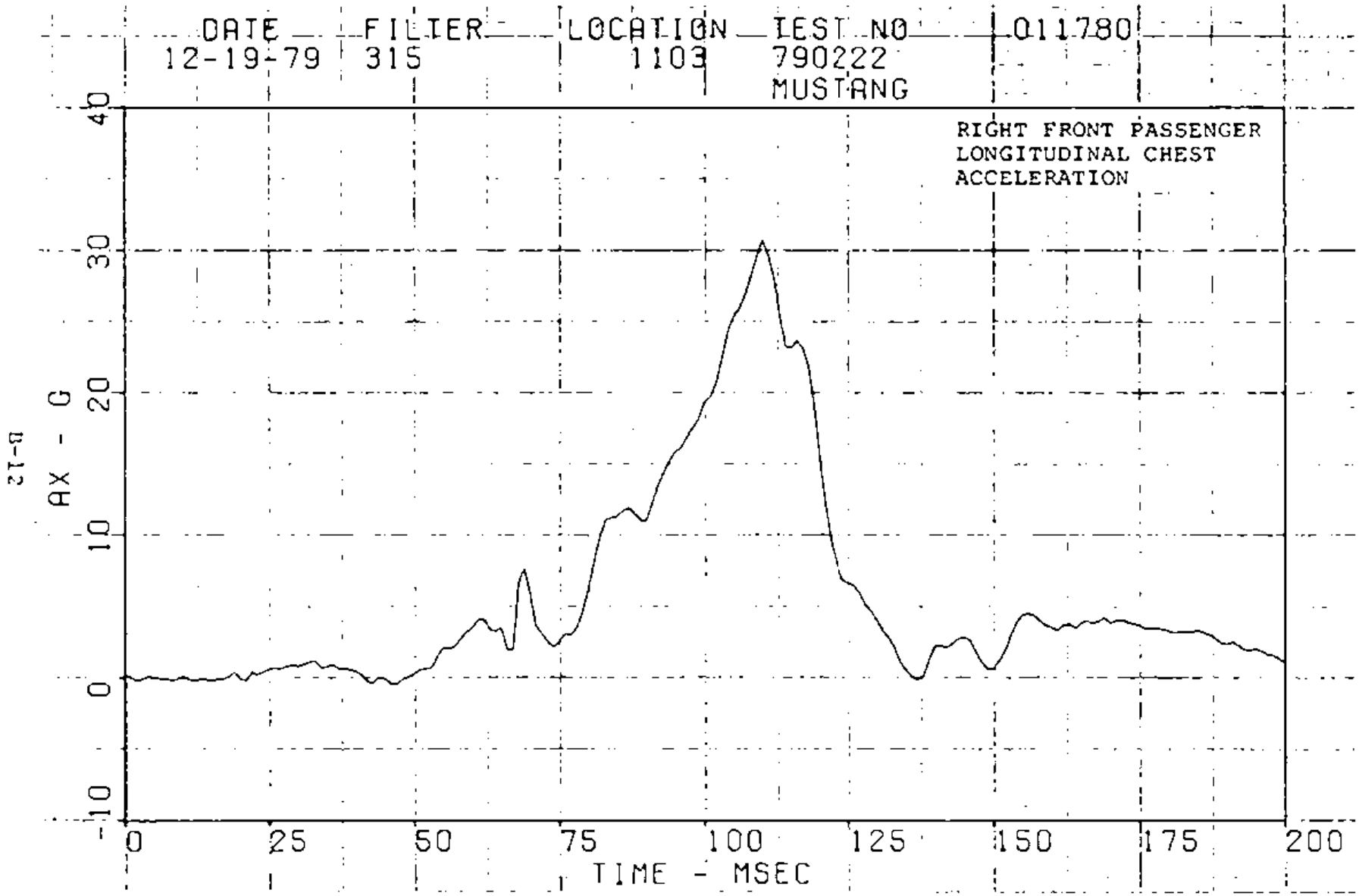
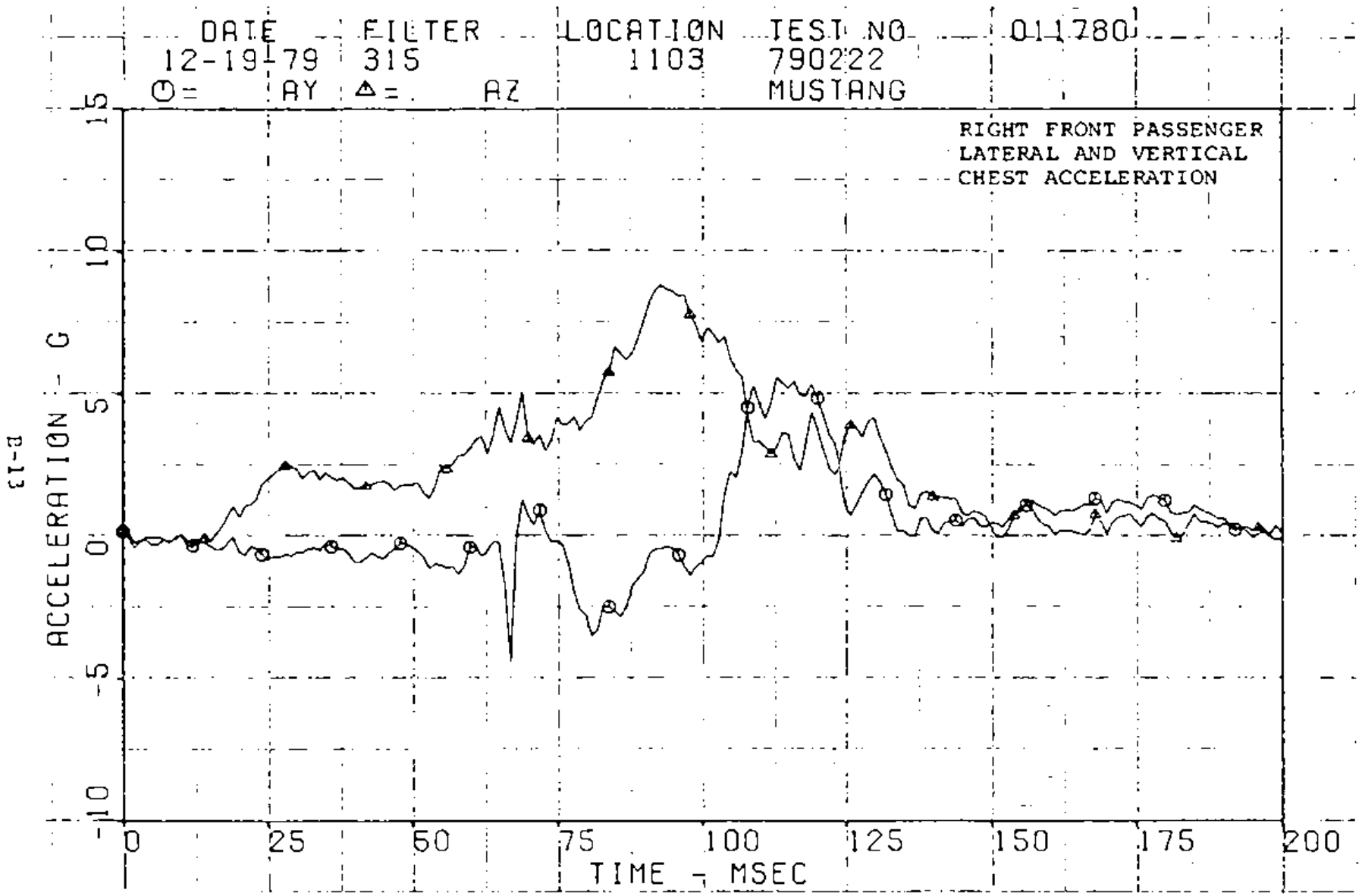
12-19-79
FILTER
315
LOCATION
1101
TEST NO
790222
MUSTANG
011680
LEFT FRONT PASSENGER
CHEST SEVERITY INDEX
SI
0-g
250
200
150
100
50
0
0
25
50
75
100
125
150
175
200
TIME - MSEC

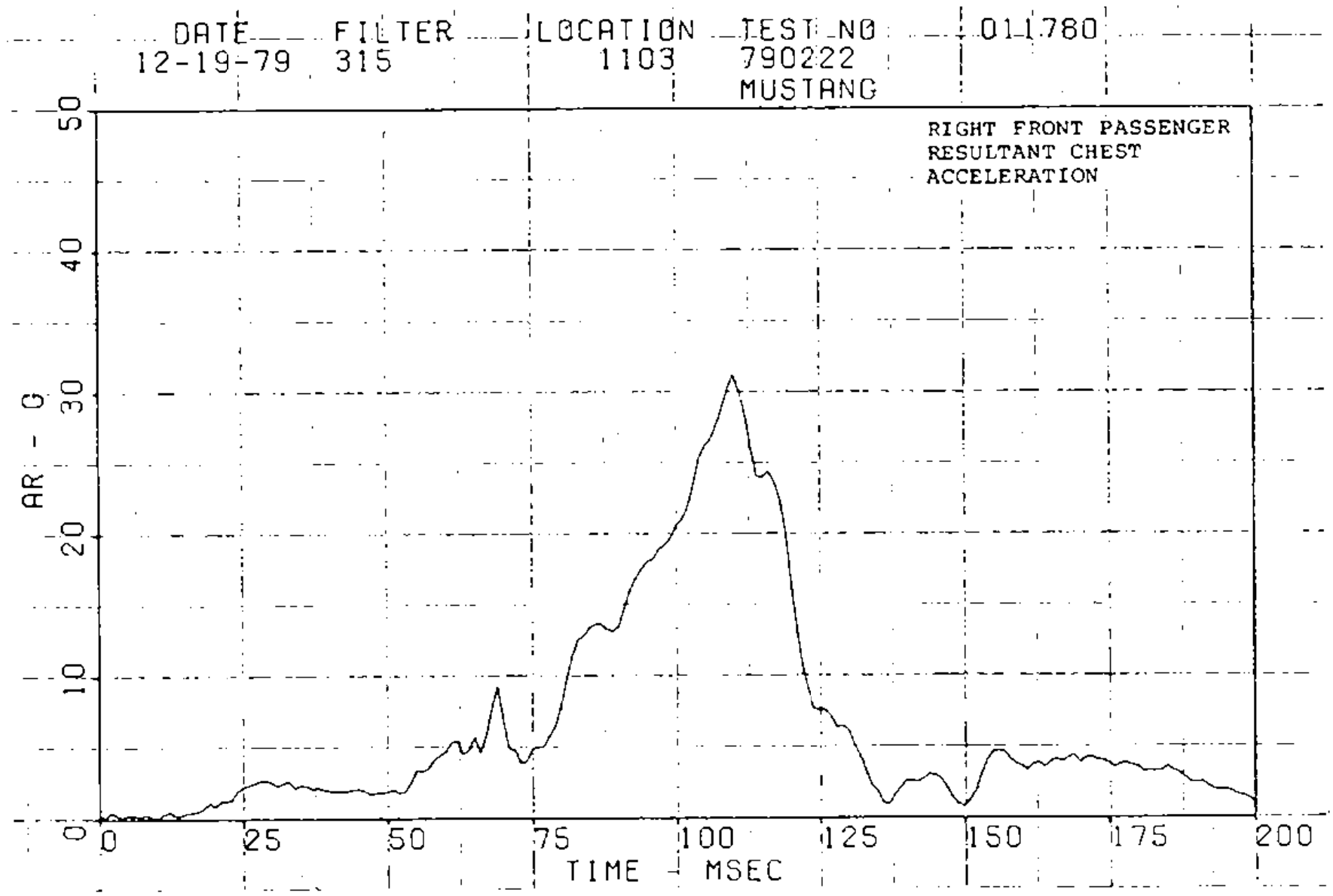

DATE
12-19-79
FILTER
1600
LOCATION
503
TEST NO
790222
MUSTANG
011680
RIGHT FRONT PASSENGER
LONGITUDINAL HEAD
ACCELERATION
6-a
AX - G
40
30
20
10
0
-10
0
25
50
75
100
125
150
175
200
TIME - MSEC

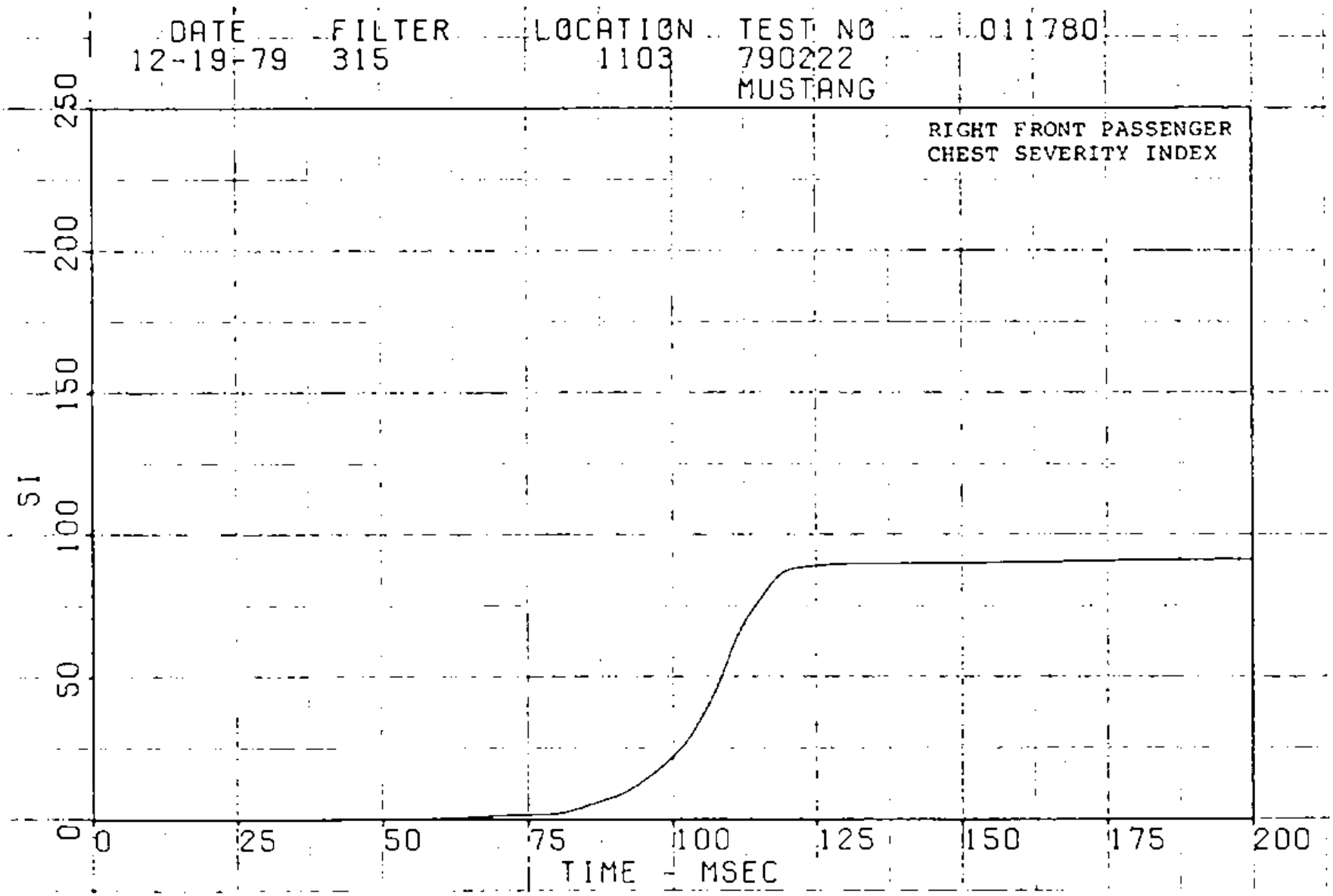

DATE
12-19-79
FILTER
1600
LOCATION
503
TEST NO
790222
011680
MUSTANG
AY
AZ
RIGHT FRONT PASSENGER
LATERAL AND VERTICAL
HEAD ACCELERATION
ACCELERATION - G
30
20
10
0
-10
-20
0
25
50
75
100
125
150
175
200
TIME - MSEC

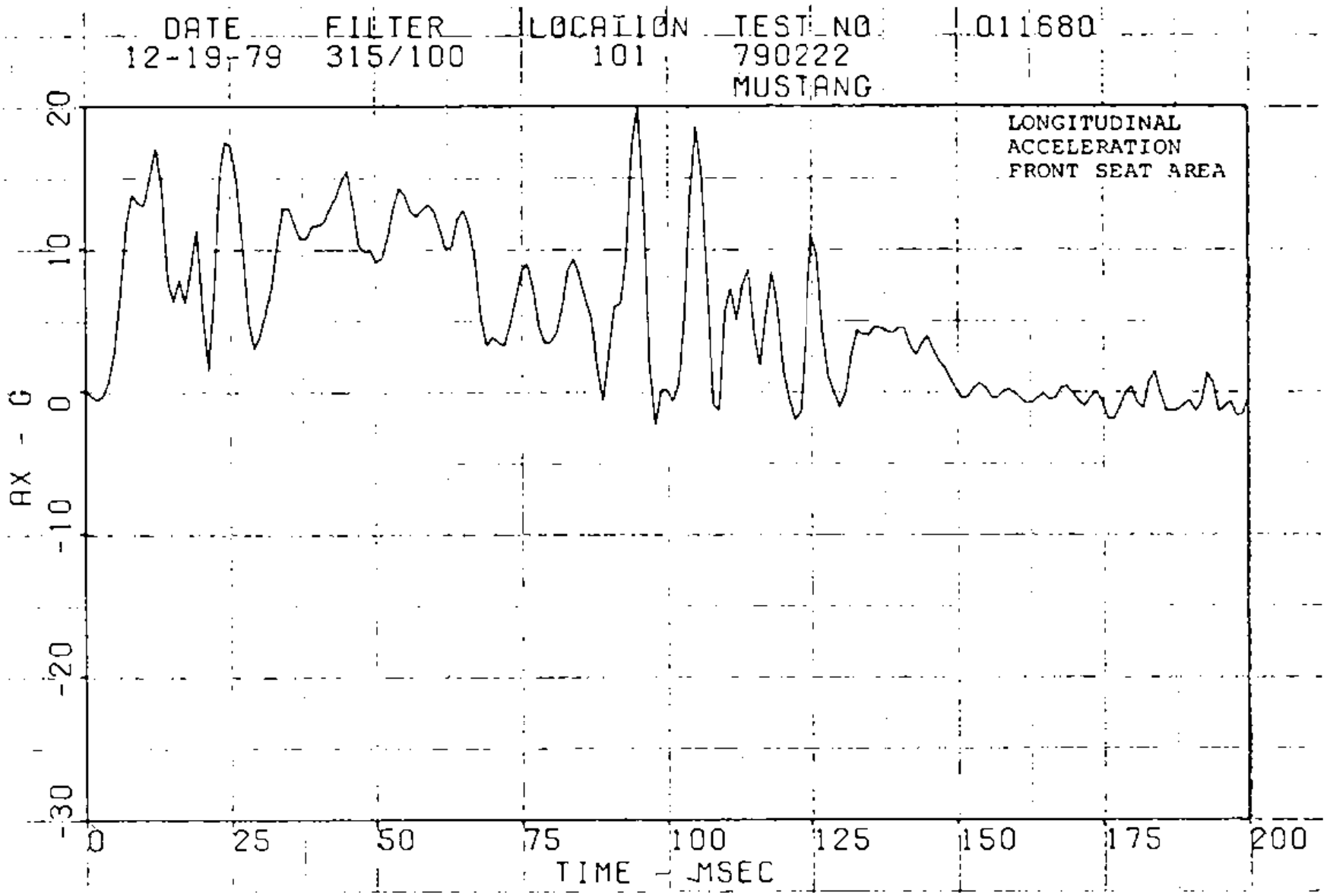

DATE
12-19-79
FILTER
1600
LOCATION
503
TEST NO
790222
MUSTANG
011680
RIGHT FRONT PASSENGER
RESULTANT HEAD
ACCELERATION
AR - G
0
20
40
60
80
100
0
25
50
75
100
125
150
175
200
TIME - MSEC

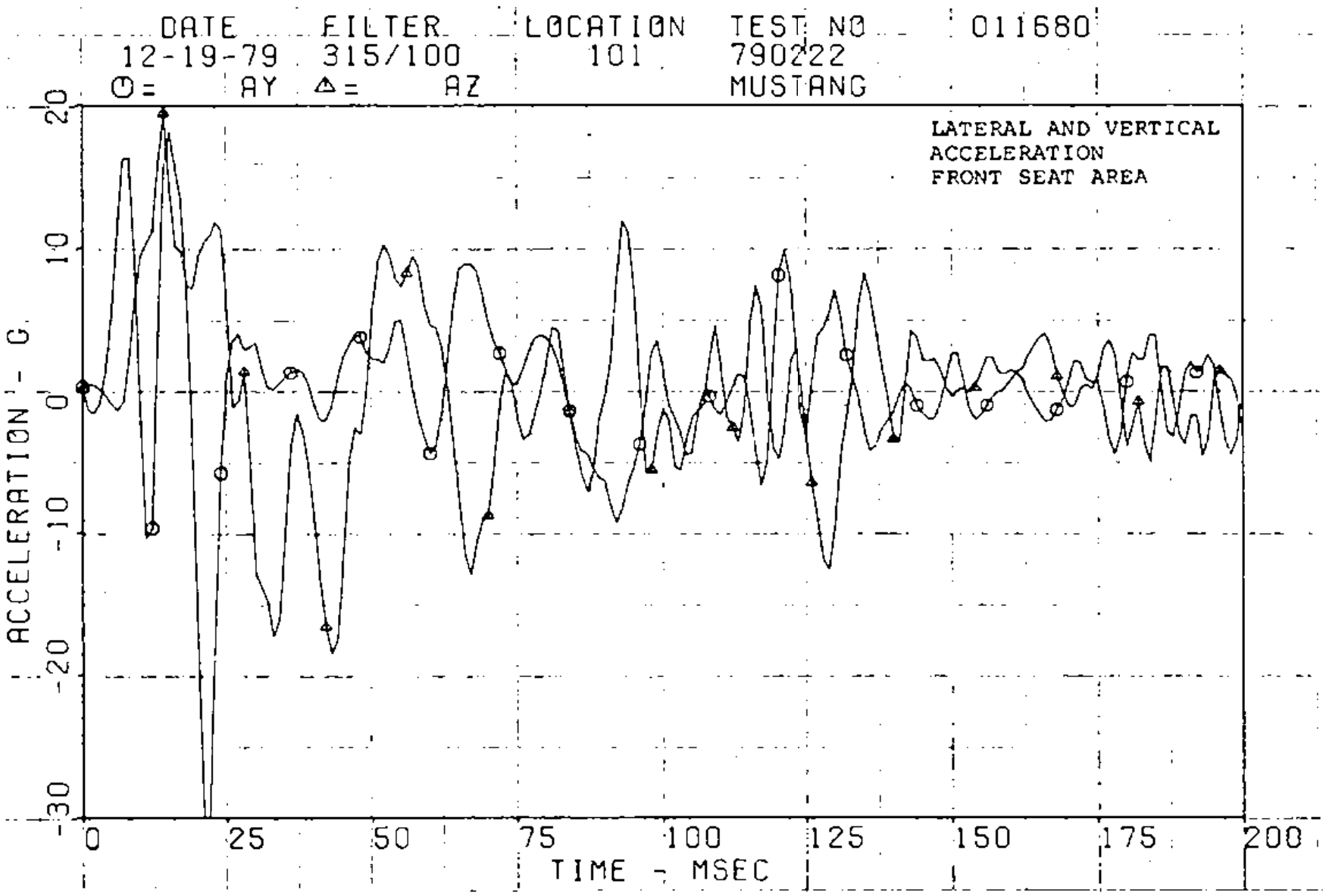

DATE
12-19-79
FILTER
315
LOCATION
1103
TEST NO
790222
MUSTANG
011780
RIGHT FRONT PASSENGER
LONGITUDINAL CHEST
ACCELERATION
AX - G
40
30
20
10
0
-10
0
25
50
75
100
125
150
175
200
TIME - MSEC

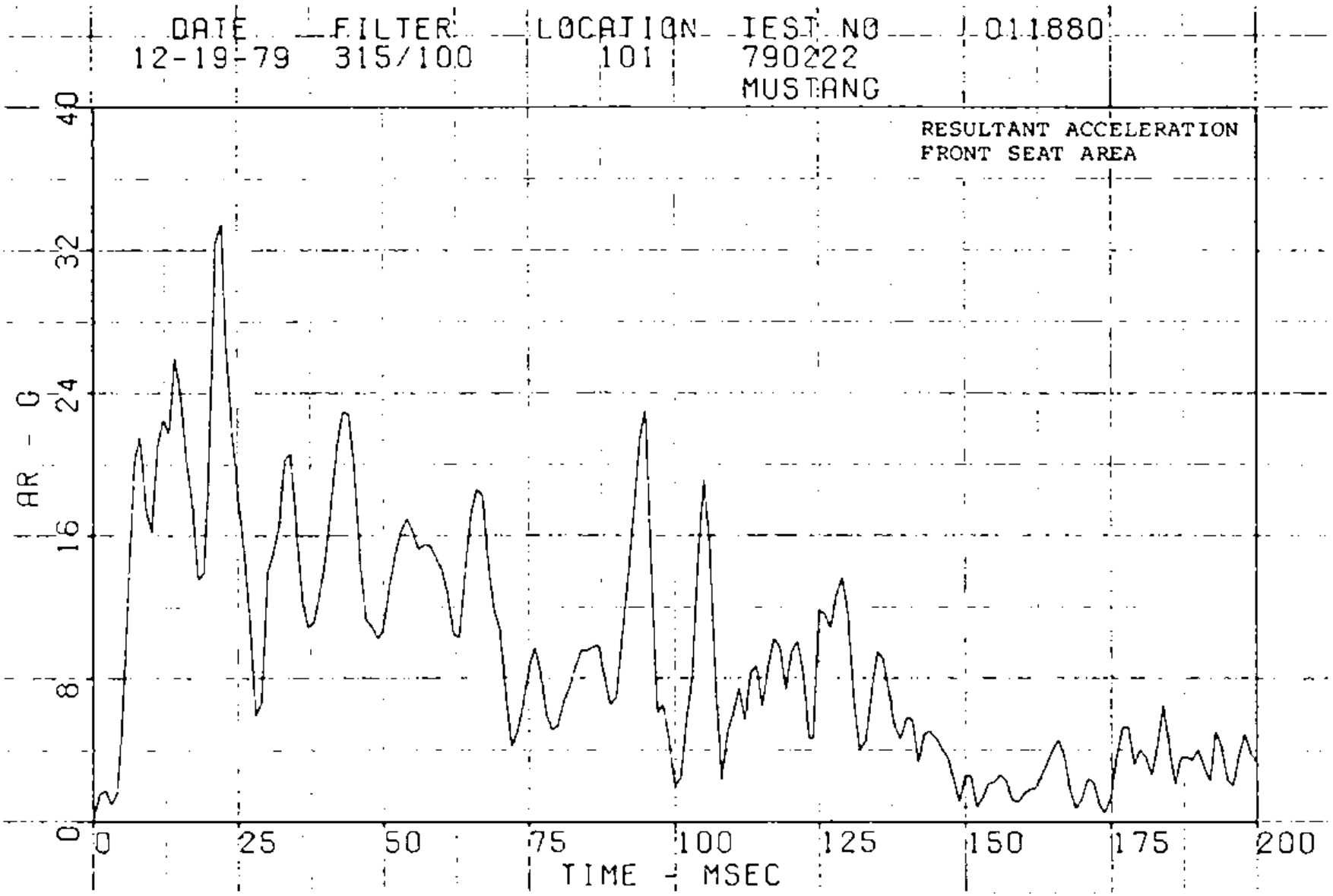

DATE
12-19-79
FILTER
315
LOCATION
1103
TEST NO
790222
011780
MUSTANG
RIGHT FRONT PASSENGER
LATERAL AND VERTICAL
CHEST ACCELERATION
ACCELERATION - G
15
10
5
0
-5
-10
0
25
50
75
100
125
150
175
200
TIME - MSEC

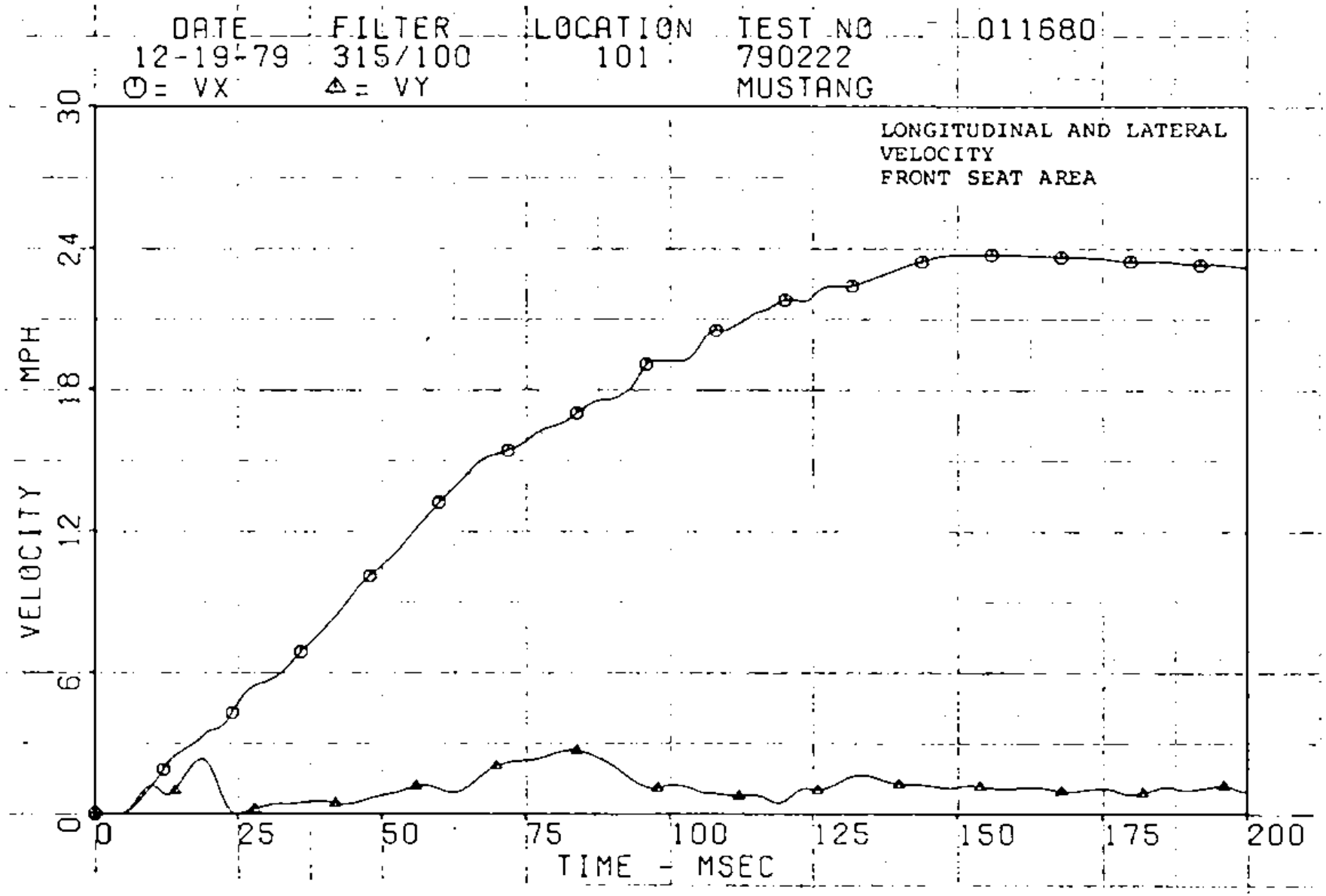

DATE
12-19-79
FILTER
315
LOCATION
1103
TEST NO
790222
MUSTANG
01780
RIGHT FRONT PASSENGER
RESULTANT CHEST
ACCELERATION
AR - G
0
10
20
30
40
50
0
25
50
75
100
125
150
175
200
TIME - MSEC

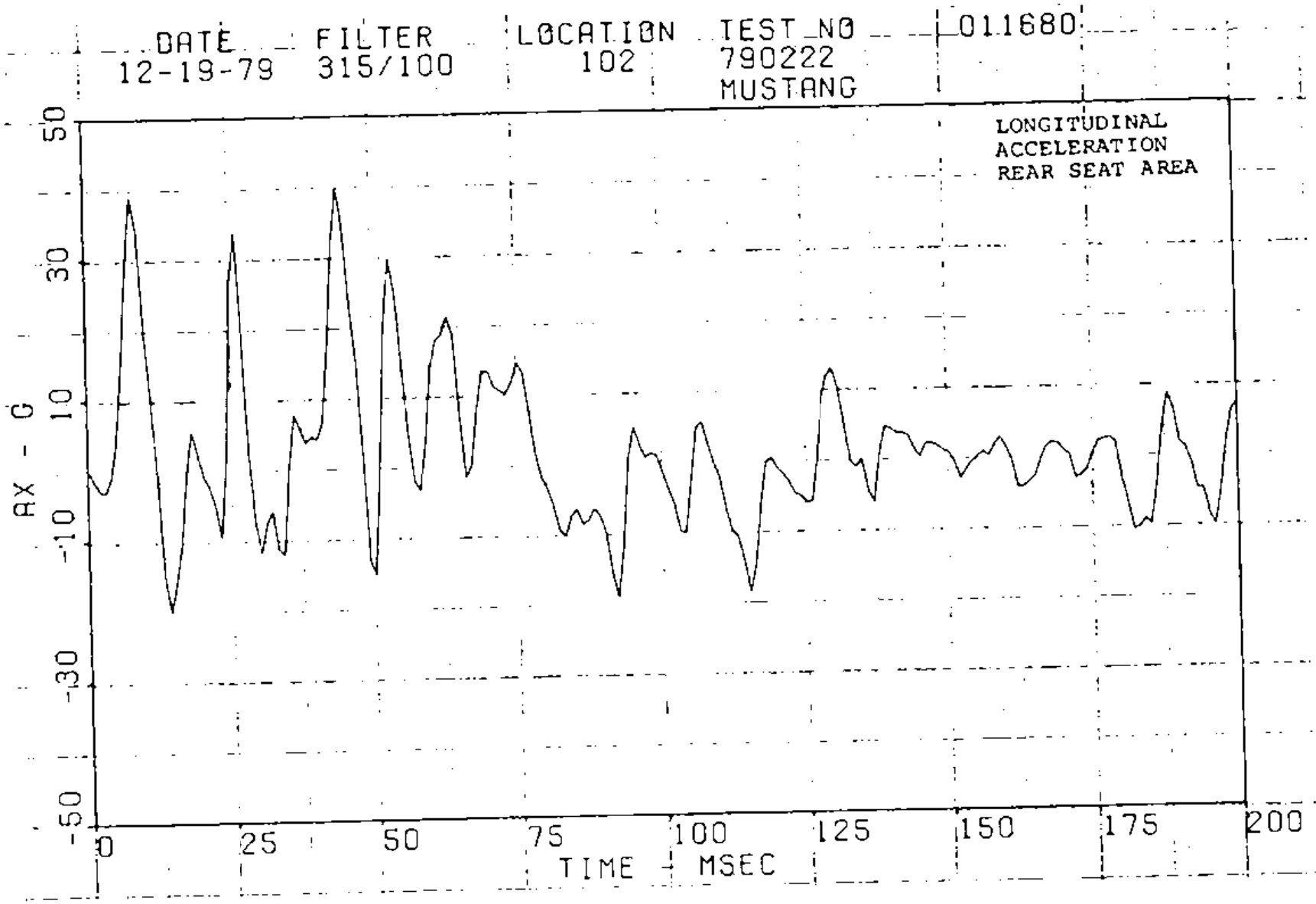

DATE
12-19-79
FILTER
315
LOCATION
1103
TEST NO
790222
MUSTANG
011780
RIGHT FRONT PASSENGER
CHEST SEVERITY INDEX
SI
0
50
100
150
200
250
0
25
50
75
100
125
150
175
200
TIME - MSEC

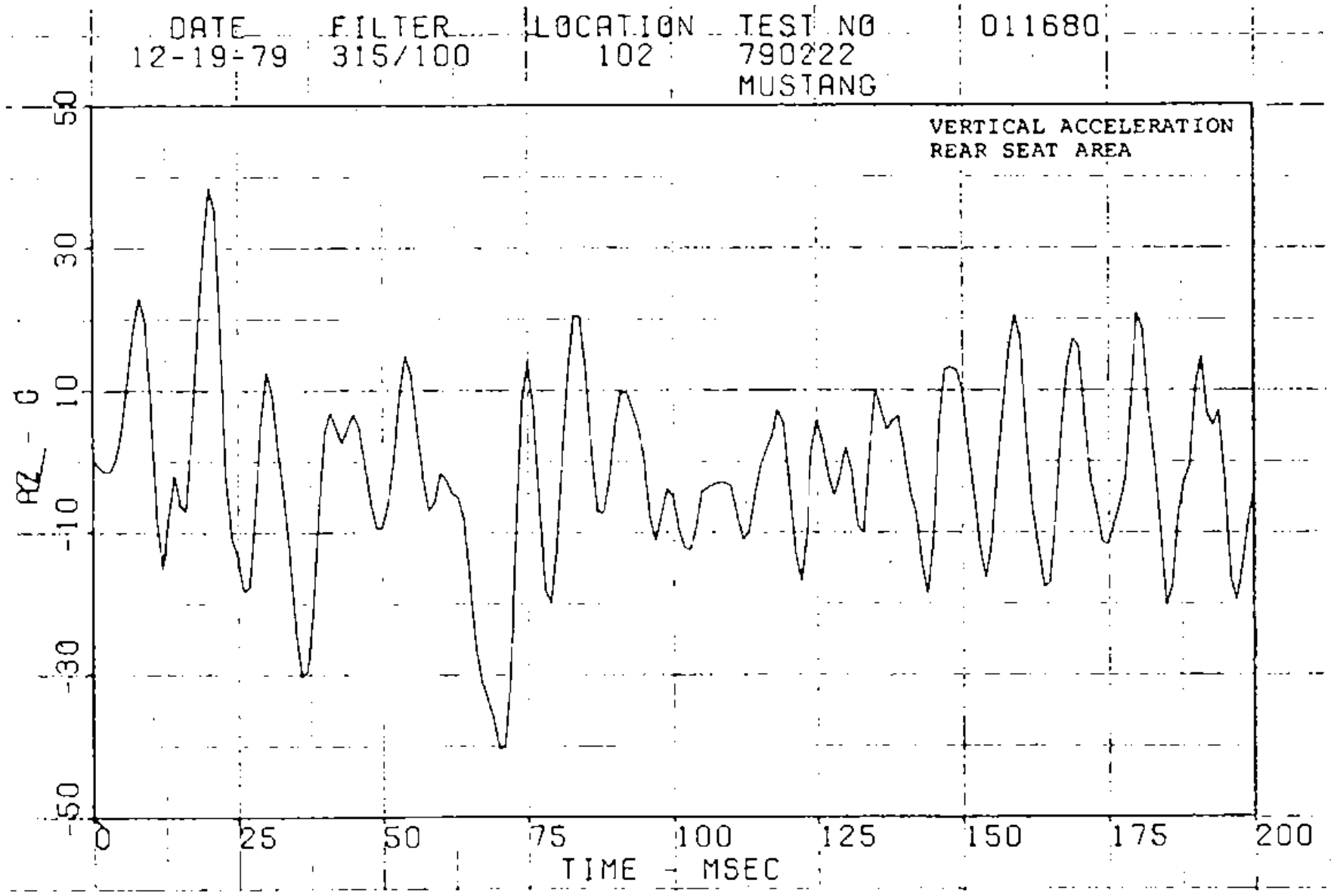

DATE
12-19-79
FILTER
315/100
LOCATION
101
TEST NO
790222
MUSTANG
011680
LONGITUDINAL
ACCELERATION
FRONT SEAT AREA
AX - G
20
10
0
-10
-20
-30
0
25
50
75
100
125
150
175
200
TIME - MSEC

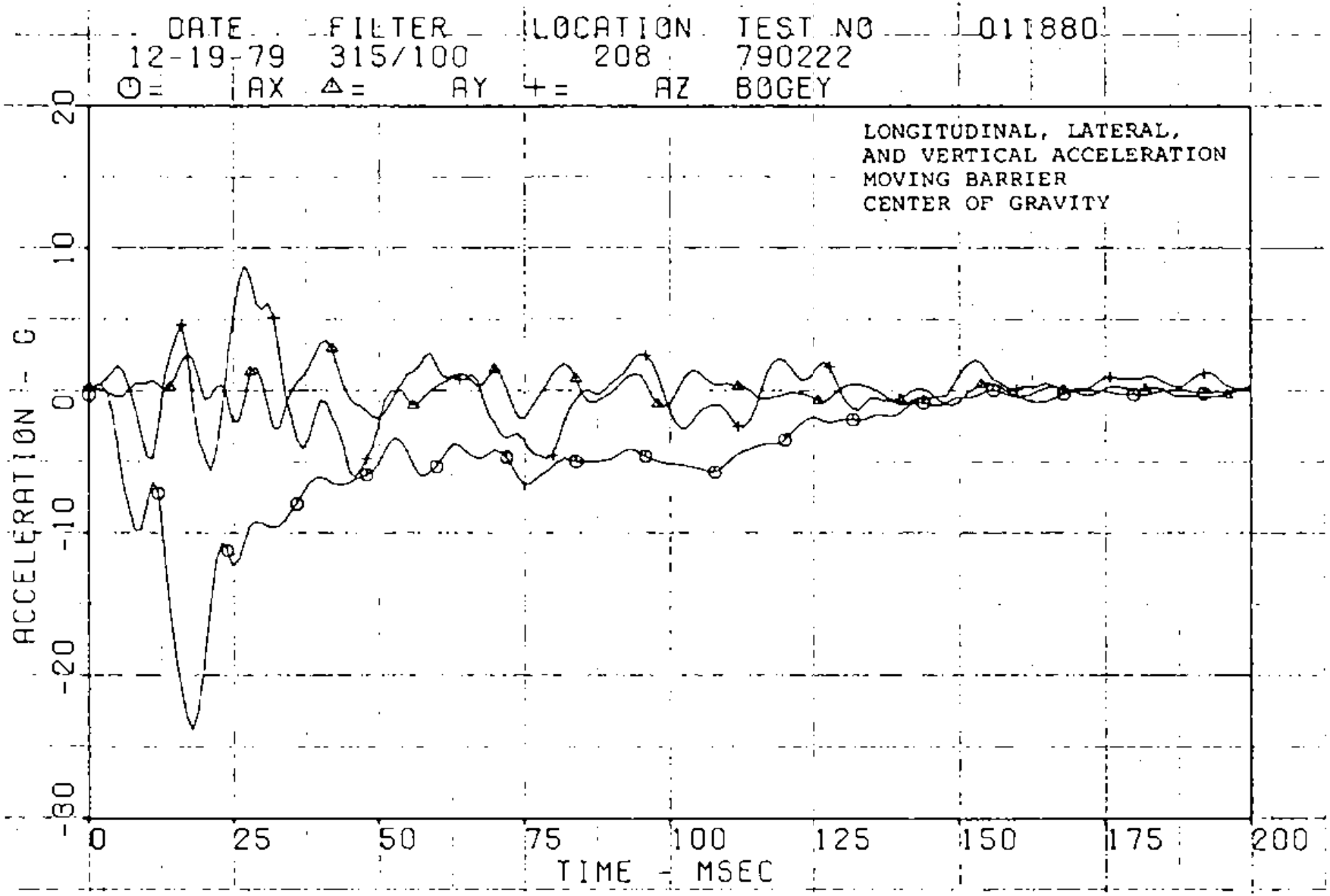

DATE
12-19-79
FILTER
315/100
LOCATION
101
TEST NO
790222
011680
MUSTANG
⊖ = AY
△ = AZ
LATERAL AND VERTICAL
ACCELERATION
FRONT SEAT AREA
ACCELERATION - G
20
10
0
-10
-20
-30
0
25
50
75
100
125
150
175
200
TIME - MSEC

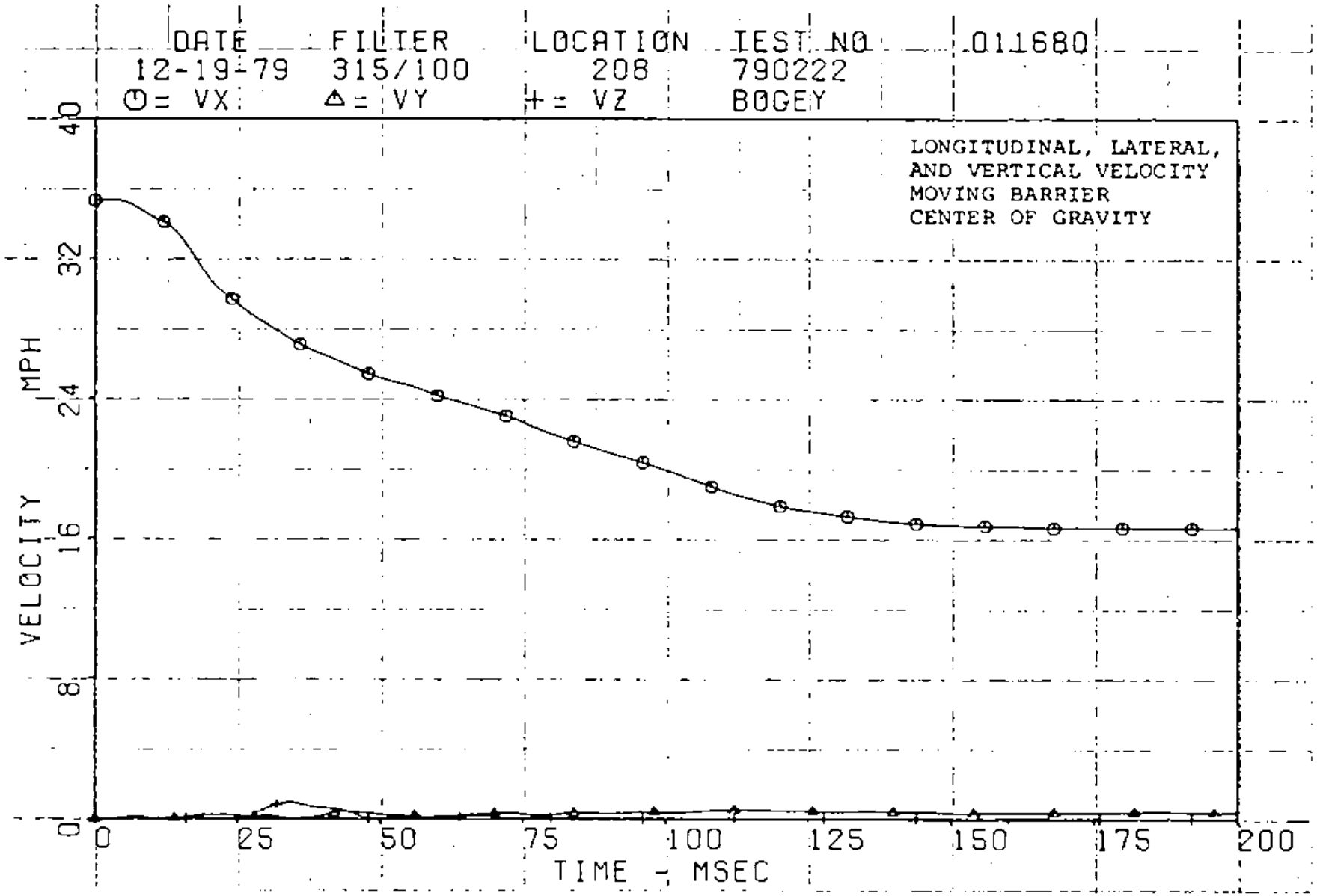

DATE
12-19-79
FILTER
315/100
LOCATION
101
TEST NO
790222
MUSTANG
011880
RESULTANT ACCELERATION
FRONT SEAT AREA
AR - G
0
8
16
24
32
40
0
25
50
75
100
125
150
175
200
TIME - MSEC


DATE
12-19-79
FILTER
315/100
LOCATION
101
TEST NO
790222
011680
MUSTANG
○ = VX
△ = VY
LONGITUDINAL AND LATERAL
VELOCITY
FRONT SEAT AREA
VELOCITY - MPH
0
6
12
18
24
30
0
25
50
75
100
125
150
175
200
TIME - MSEC


DATE
12-19-79
FILTER
315/100
LOCATION
102
TEST NO
790222
MUSTANG
011680
LONGITUDINAL
ACCELERATION
REAR SEAT AREA
AX - G
50
30
10
-10
-30
-50
0
25
50
75
100
125
150
175
200
TIME - MSEC


DATE
12-19-79
FILTER
315/100
LOCATION
102
TEST NO
790222
MUSTANG
011680
VERTICAL ACCELERATION
REAR SEAT AREA
AZ - G
50
30
10
-10
-30
-50
0
25
50
75
100
125
150
175
200
TIME - MSEC


DATE
12-19-79
FILTER
315/100
LOCATION
208
TEST NO
011880
790222
○ = AX △ = AY + = AZ BOGEY
LONGITUDINAL, LATERAL,
AND VERTICAL ACCELERATION
MOVING BARRIER
CENTER OF GRAVITY
ACCELERATION - G
20
10
0
-10
-20
-30
0
25
50
75
100
125
150
175
200
TIME - MSEC


DATE
12-19-79
FILTER
315/100
LOCATION
208
TEST NO
790222
011680
⊖ = VX
△ = VY
+ = VZ
BOGEY
LONGITUDINAL, LATERAL,
AND VERTICAL VELOCITY
MOVING BARRIER
CENTER OF GRAVITY
VELOCITY MPH
0
8
16
24
32
40
0
25
50
75
100
125
150
175
200
TIME - MSEC

Test Anomalies: None