

ARVIN/CALSPAN

EVALUATION OF AGGRESSIVENESS TEST TECHNIQUES

Walter E. Levan

CALSPAN REPORT NO. 6892-V-6



TEST NO. 752-6-555
TYPE OF TEST: SYMMETRIC FRONTAL CAR-TO-BARRIER TEST
1982 FIAT STRADA
DEFORMABLE MOVING BARRIER
TEST DATE: OCTOBER 19, 1982
CONTRACT NO.: DTNH22-81-C-87088
TASK ORDER NO.: 2

Prepared for:

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
WASHINGTON, DC 20590

ADVANCED TECHNOLOGY CENTER

P.O. BOX 400, BUFFALO, NEW YORK 14225 TEL. (716) 632-7500

APPLIED
TECHNOLOGY
GROUP



This Final Test Report was prepared for the U. S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-81-C-87088. This document is disseminated under the sponsorship of the U. S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

FINAL REPORT ACCEPTED BY:

Contract Technical Manager

Date of Report Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. 6892-V-6		2. Government Accession No.		3. Recipient's Catalog No.									
4. Title and Subtitle Evaluation of Aggressiveness Test Techniques/ Deformable Barrier Baseline Test - Frontal Impact 65.8 mph Closing Speed				5. Report Date December 1982									
				6. Performing Organization Code									
7. Author(s) Walter E. Levan, Test Engineer				8. Performing Organization Report No.									
9. Performing Organization Name and Address Calspan Advanced Technology Center P. O. Box 400 Buffalo, New York 14225				10. Work Unit No. 752 Series									
				11. Contract or Grant No. DTNH22-81-C-87088									
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance 400 Seventh Street, S.W., Washington, DC 20590				13. Type of Report and Period Covered Final Report November-December 1982									
				14. Sponsoring Agency Code									
15. Supplementary Notes Approved: <u>Donald Alianella</u> Head, Experimental Operations Section Transportation Research Department													
16. Abstract A symmetric frontal impact of a 1982 Fiat Strada and a deformable moving barrier was performed at Calspan Corporation, Advanced Technology Center, Transportation Research Department, Buffalo, New York, on October 19, 1982. Impact Speed of each vehicle was 32.9 mph. Ambient temperature on the test date was 71°F. Maximum crush of the Fiat Strada was 33.2 inches and maximum firewall intrusion was 27.2 inches. Maximum crush of the honeycomb on the face of the moving barrier was 15 inches. The occupant performance with respect to the FMVSS 208 Injury Criteria was as follows: <table border="0"> <tr> <td><u>Driver Position #1</u></td> <td><u>Passenger Position #2</u></td> </tr> <tr> <td>Head - failed</td> <td>Head - failed</td> </tr> <tr> <td>Chest - failed</td> <td>Chest - failed</td> </tr> <tr> <td>Femurs - failed (left)</td> <td>Femurs - failed (left)</td> </tr> </table>						<u>Driver Position #1</u>	<u>Passenger Position #2</u>	Head - failed	Head - failed	Chest - failed	Chest - failed	Femurs - failed (left)	Femurs - failed (left)
<u>Driver Position #1</u>	<u>Passenger Position #2</u>												
Head - failed	Head - failed												
Chest - failed	Chest - failed												
Femurs - failed (left)	Femurs - failed (left)												
17. Key Words Deformable Barrier Car-to-Moving Barrier Aggressiveness			18. Distribution Statement Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., S.W., Washington, DC 20590										
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 22. Price									

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	TEST OBJECTIVE	1-1
2	SUMMARY OF TEST NO. 6	2-1
3	VEHICLE AND OCCUPANT INFORMATION	3-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE AND DUMMY RESPONSE DATA	B-1
APPENDIX C	DUMMY CERTIFICATION TESTS	C-1

LIST OF FIGURES

<u>Figure No.</u>		<u>Page No.</u>
1	Pre- and Post-Test Measurement Points	3-3
2	Rear Target Displacement with Respect to Fixed Ground Reference	3-7
3	Vehicle Accelerometer Locations	3-8
4	Vehicle No. 2 - Moving Barrier Transducer Locations	3-10
5	Camera Positions for Car-to-Barrier Impacts	3-11
6	Driver Seat Position	3-14
7	Part 572 Dummy In-Vehicle Position	3-15
8	Occupant Clearance Dimensions	3-16
A-1	Vehicle Nos. 1 and 2 - Pre- and Post-Test Impact Configuration	A-2
A-2	Vehicle No. 1 - Pre- and Post-Test Front and Rear Views	A-3
A-3	Vehicle No. 1 - Pre- and Post-Test Right and Left Side Views	A-4
A-4	Vehicle No. 1 - Pre- and Post-Test Front Three-Quarter Views	A-5
A-5	Vehicle No. 1 - Pre- and Post-Test Rear Three-Quarter Views	A-6
A-6	Vehicle No. 1 - Pre- and Post-Test Views of Front Underbody	A-7
A-7	Vehicle No. 1 - Post-Test Views of Right and Left Front Underbody	A-7
A-8	Vehicle No. 1 - Pre- and Post-Test Views of Driver Position	A-8
A-9	Vehicle No. 1 - Pre- and Post-Test Views of Right Front Passenger Position	A-9
A-10	Vehicle No. 1 - Post-Test Views of Windshield and Hood Intrusion	A-10
A-11	Vehicle No. 1 - Post-Test Rear View of Occupants	A-10
A-12	Velocity Counter Display	A-10
A-13	Vehicle No. 2 - Pre- and Post-Test Front and Side Views of Barrier Honeycomb	A-11

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
1	Crash Test Summary	2-3
2	Vehicle Test Weights as Tested	2-5
3	Summary of Test Conditions	2-6
4	Vehicle Measurements	3-4
5	Vertical Heights - Vehicle No. 1	3-5
6	Vertical Heights - Vehicle No. 2	3-6
7	Vehicle Transducer Location Measurements	3-9
8	High Speed Camera Locations	3-12
9	High Speed Camera Information (Test 752-6-555)	3-13
10	Dummy Injury Criteria Values	3-17
11	Test Procedure Checklist	3-18

SECTION 1
TEST OBJECTIVE

The test objective was to obtain baseline data, using a deformable moving barrier impacting vehicles judged to have dissimilar aggressivity. Secondly, it was to determine the feasibility of using such a barrier to evaluate vehicle aggressiveness.

This test was a symmetric frontal impact of a 1982 Fiat Strada and a deformable moving barrier with a nominal closing speed of 65.8 mph. This test was performed at Calspan Corporation, Advanced Technology Center on October 19, 1982.

The test program is part of the National Highway Traffic Safety Administration (NHTSA) Contract No. DTNH22-81-C-87088, Task 2, to evaluate aggressiveness test techniques.

SECTION 2
SUMMARY OF TEST NO. 572-6-555

A symmetric frontal impact of a 1982 Fiat Strada and a Deformable Moving Barrier (Figure A-1) with a closing speed of 65.8 mph was performed at the Calspan Corporation, Advanced Technology Center, on October 19, 1982. A summary of the test conditions can be found in Table 1, while pre- and post-test photographs constitute Appendix A.

The 1982 Fiat Strada was occupied by two Part 572, 50th percentile male Anthropometric Test Devices (ATD's) placed in the driver and right-front passenger seating positions, according to dummy placement procedures specified in Laboratory Procedures for Vehicle Assessment TP-212-02.

The occupant dummies were instrumented with head and chest triaxial accelerometers and femur load cells. Load cells were also placed on the lap and shoulder belts to measure dummy torso and lap loading. Both occupant dummies had been used in previous tests. The driver ATD (Serial No. 110) in Test No. 752-2-544 and the right-front passenger ATD (Serial No. 320) was used in 752-4-532. Neither ATD exceeded FMVSS 208 Injury Criteria Values in these tests. Certification details along with instrumentation calibration data, are found in Appendix C.

The crash event was recorded by one real-time and eleven high-speed cameras. Camera locations and other pertinent camera information are found in Section 3 of this report.

The 51 channels of data were recorded on four 14-channel FM tape recorders. Appendix B contains the vehicle and dummy response data traces, and the Injury Criteria Values are presented in Table 10. All 51 data channels checked out prior to the test. The moving barrier umbilical cable was snagged and cut just prior to impact, and, as a result, all data from the moving barrier was lost.

The folloiwng are data losses experienced during impact for the 1982 Fiat Strada:

- Accelerometer 11(X) (left brake caliper) - cut wire @ 25 milliseconds.
- Accelerometer 12(X) and (Z) (dash panel) - cut wire @ 50 milliseconds.

Table 1

CRASH TEST SUMMARY

TEST NO. 752-6-555 PROJECT Evaluation of Aggressiveness
Test Techniques

DATE 10/19/82 TIME 1347 TEMP. 71°F

TEST CONDITION Symmetric Frontal -65.8 mph Closing Speed

VEHICLE NO. 1 1982 Fiat Strada

VEHICLE NO. 2 Deformable Moving Barrier

	VEH. NO. 1	VEH. NO. 2
TEST WEIGHT (lbs)	<u>2650</u>	<u>3450</u>
IMPACT ANGLE (deg)*	<u>0</u>	<u>0</u>
IMPACT VELOCITY (mph)**	<u>32.9</u>	<u>32.9</u>
MAX. CRUSH (in) (static)	<u>33.2</u>	<u>15.0</u>
MAX. INTRUSION (in)	<u>27.2</u>	<u>----</u>
OCCUPANTS	<u>37.215 MPH</u> VEH. NO. 1	VEH. NO. 2
TYPE	<u>Part 572, 50th percentile male</u>	<u>None</u>
LOCATION	<u>LF(1), RF (2)</u>	<u>---</u>
RESTRAINT	<u>3-point belt system</u>	<u>---</u>
I.D. NO.	<u>110 and 320</u>	

NUMBER OF DATA CHANNELS 51

NUMBER OF HIGH SPEED CAMERAS 11 + 1 Real Time

* WITH RESPECT TO TOW TRACK CENTERLINE

** SPEED TRAP MEASUREMENT ($\pm 0.5\%$ ACCURACY)

OBSERVATIONS (VEHICLE NO. 1) - 1982 Fiat Strada

GLAZING Hood intruded into windshield (Figure A-10)

DOORS Both front doors were inoperable

SEAT ANCHORAGES intact

RESTRAINTS intact (see General Comments below)

OBSERVATIONS (VEHICLE NO. 2) - Deformable Moving Barrier

GLAZING ---

DOORS ---

SEAT ANCHORAGES ---

RESTRAINTS ---

GENERAL COMMENTS The production-type, 3-point retractor belt system was
modified to a fixed 3-point belt system.

Table 2

VEHICLE TEST WEIGHTS AS TESTED

1982 Fiat Strada

Left Front	780 lbs	Left Rear	550 lbs
Right Front	770 lbs	Right Rear	550 lbs
TOTAL FRONT	1550 lbs	TOTAL REAR	1100 lbs

Total Weight = $\frac{1550 + 1100}{1} = 2650$ lbs

Wheel Base = $\frac{96.5}{1}$ inches

$Cg_{F.W.} = \frac{1100 \text{ lbs} \times 96.5 \text{ inches}}{2650 \text{ lbs}} = 40.0$ inches

CALCULATION FOR TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
 UDW = Unloaded Delivered Weight ($\frac{2180}{1}$ lbs)
 VCW = Vehicle Capacity Weight ($\frac{900}{1}$ lbs)
 DSC = Designated Seating Capacity ($\frac{5}{1}$)

RCLW = VCW - 150 (DSC)

RCLW = $\frac{900}{1} - 150 (5) = 150$ lbs

TEST WEIGHT = UDW + RCLW + (No. Dummies x 164 lbs)

TEST WEIGHT = $\frac{2180}{1}$ lbs + $\frac{150}{1}$ lbs + 2 (164 lbs)

TEST WEIGHT = $\frac{2658}{1}$ lbs (calculated)

Table 3

SUMMARY OF TEST CONDITIONSTEST VEHICLE INFORMATION

Vehicle Manufacturer Fiat Auto S.P.A.
 Make/Model Strada Custom
 Body Style 5 Door Model Year 1982
 VIN ZFADE20A7C258282895 Build Date 4/81
 NHTSA No. 752-6-555 Color Blue
 Engine Data: 4 cylinders 91.4 in³/cc displacement
 Transmission Data: 5 speed (X) Manual () Automatic
 Date Rec'd 9/82 Air Cond. no PW. STR. no PW. BR. yes
 Dealer's Name & Address Checkpoint Car Sales, Inc.

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

Vehicle Manufactured by Fiat Auto S.P.A.
 Date of Manufacture 4/81 VIN ZFADE20A7C258282895
 GVRW 3160 lbs GAWR: Front 1670 lbs Rear 1490 lbs

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

Vehicle Load (up to capacity) - Front 32 psi
 Rear 32 psi
 Recommended Tire Size 145SR13 Load Range: X B C D
 Vehicle Capacity: Types of Seats Bench X Bucket Split Bench
 Number of Occupants (Designated Seating Capacity): 2 Front
3 Rear
5 TOTAL
 Cargo Load = 150 lbs
 TOTAL = 900 lbs

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS)

Right Front = 650 lbs Right Rear = 420 lbs
 Left Front = 699 lbs Left Rear = 420 lbs
 TOTAL FRONT WEIGHT = 1340 lbs (61.5 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 840 lbs (38.5 % of Total Vehicle Weight)
 TOTAL DELV. WEIGHT = 2180 lbs

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 142 lbs CARGO

Right Front = 770 lbs Right Rear = 550 lbs
 Left Front = 780 lbs Left Rear = 550 lbs
 TOTAL FRONT WEIGHT = 1550 lbs (58.5 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1100 lbs (41.5 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 2650 lbs
 Weight of ballast secured in vehicle trunk area = 0 lbs

Table 3
SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS

Date of Test 10/19/82 Time of Test 1347
Ambient Temperature 71 °F at impact area
Temperature in Occupant Compartment 71 °F
Windshield Molding Temperature 70 °F

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 27.5 LF 27.5 RR 24.0 LR 24.1
Test Attitude: RF 26.2 LF 26.0 RR 22.0 LR 22.2

VEHICLE TIRE DATA

Recommended Cold Tire Pressure: Front = 32 psi Rear = 32 psi
Recommended Tire Size 145SR13 Load Range B
Tires on Vehicle 145SR13
Is Spare Tire a "Space Saver" yes X no
Is Spare Tire Standard Equipment X yes no

TEST FLUID DATA

Test Fluid Type: Red Stoddard Solvent #2 Spec. Grav.: 0.764
Kinematic Viscosity 0.96 Centistokes
EPA Capacity* gal
Test Volume gal (93% of EPA Capacity)
Fuel System Capacity (data from Owner's Manual) 12.1 gal
Details of fuel system Fuel tank is located aft of rear wheels and the
filler tube is on the right side of vehicle. Fuel pump is located forward
of rear wheels on left side of car.

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 Yes X No

VEHICLE REBOUND AND CRUSH

Overall Length of Test Vehicle: Pre-Test = R 157.2 /L 157.1 inches
Post-Test = R 127.6 /L 123.9 inches
Crush = R 29.6 /L 33.2
FOR FRONTAL IMPACTS, distance from front of test vehicle to the barrier
after impact = inches

*With entire fuel system filled from fuel tank through carburetor bowl.

SECTION 3
VEHICLE AND OCCUPANT INFORMATION

The production-type, 3-point retractable belt system in the 1982 Fiat Strada was modified by cutting the belt at the retractor and replacing the "D" ring with a web-type clamp, for both the driver and right-front passenger position.

The driver's seat was adjusted with respect to the brake pedal using a box beam measuring 20.5 inches long, 3 inches high, and 2 inches wide. The box beam was placed on the driver seat cushion, and the seat was adjusted per instructions of the CTM as shown in Figure 6. The passenger seat was then adjusted so that the seat back was in line with the driver seat back.

Vehicle No. 1 - 1982 Fiat Strada

The 1982 Fiat Strada was a 4-door hatchback having a 91.4 cubic inch, four cylinder engine, equipped with a five-speed manual transmission and power brakes. The total test weight with two 50th percentile male dummies, instrumentation and two on-board cameras was 2,650 pounds.

Vehicle No. 2 - Deformable Moving Barrier

Vehicle No. 2 was a deformable moving barrier (Figure 4) weighing 3,450 pounds. The face of the moving barrier was fitted with honeycomb measuring 64 inches in length, 22 inches in height and 15 inches in depth. In addition, a 4 inch thicker honeycomb was placed in front to represent the front bumper. Five load cells which are located behind the backer plate record peak forces of the moving barrier at impact.

Post-Test Observations

Vehicle No. 1 - 1982 Fiat Strada

Both occupants exceeded FMVSS 208 Injury Criteria Value for the head, chest and femurs. The driver HIC was 2824, maximum chest decelerations over 3 milliseconds of 124 g's and femur loads of 1530 right and 4225 left. The right-front passenger HIC was 1781, maximum chest decelerations over 3 milliseconds of 88 g's and femur loads of 1197 right and 3500 left.

At impact the 1982 Fiat Strada dash panel and steering wheel moved rearward and upward, striking the head and chest of both occupants. Maximum static frontal crush was 33.2 inches and maximum occupant compartment intrusion was 27.2 inches. Occupant results are summarized in Table 10 and the data traces, along with vehicle data traces, are presented in Appendix B.

Maximum crush of the honeycomb on the face of the moving barrier was 15 inches. Pre- and post-test measurements of the 1982 Fiat Strada and the honeycomb are presented in Table 5 and 6. Pre- and post-test photographs of the vehicles and occupants are found in Appendix A.

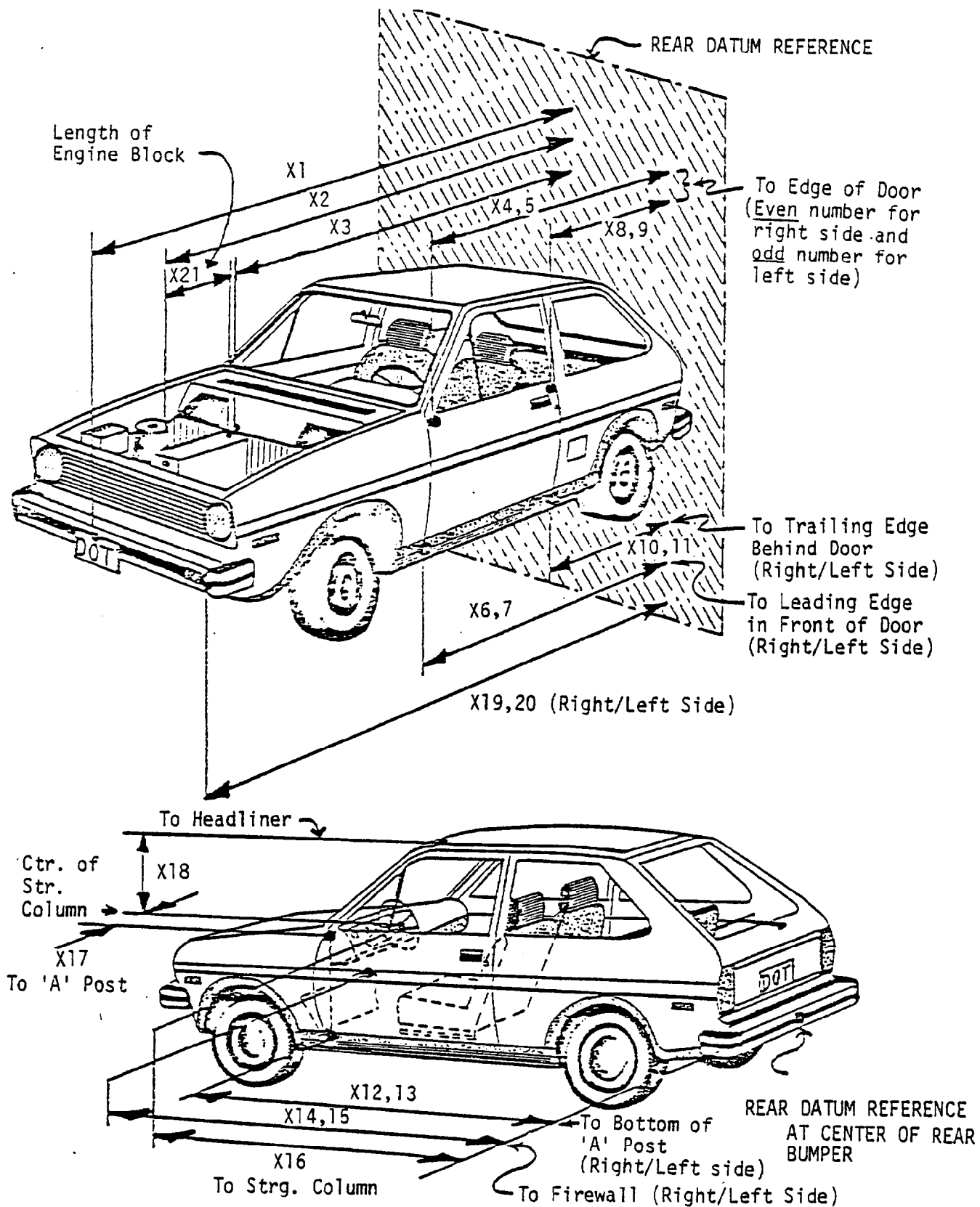


Figure 1 Pre- and Post-Test Measurement Points

Table 4

VEHICLE MEASUREMENTS

Test No. 752-6-555

1982 Fiat Strada		All Dimensions in Inches		
No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	161.2	128.8	32.4
X2	Rear Surface of Vehicle to Front of Engine	140.0	114.0	26.0
X3	Rear Surface of Vehicle to Firewall	111.9	84.7	27.2
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	105.5	103.8	1.7
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	105.5	105.0	0.5
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	109.1	106.2	2.9
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	109.2	102.9	6.3
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	69.7	70.5	-0.8
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	69.9	69.5	0.4
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	71.3	71.0	0.3
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	71.4	70.5	0.9
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	108.4	101.5	6.9
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	108.5	101.9	6.6
X14	Rear Surface of Vehicle to Firewall, Right Side	117.4	101.2	16.2
X15	Rear Surface of Vehicle to Firewall, Left Side	120.3	104.5	15.8
X16	Rear Surface of Vehicle to Steering Column	95.8	78.8	17.0
X17	Center of Steering Column to "A" Post	12.7	24.5	-11.8
X18	Center of Steering Column to Headliner	18.5	21.0	-2.5
X19	Rear Surface of Vehicle to Right Side of Front Bumper	157.2	127.6	29.6
X20	Rear Surface of Vehicle to Left Side of Front Bumper	157.1	123.9	33.2
X21	Length of Engine Block	10.5	10.5	0.0

Table 5

CAR 1982 Fiat Strada

DATE 10/11/82

REFERENCE DISTANCE FROM REAR 165 inches

VERTICAL HEIGHTS

		Inches Left					C/L	Inches Right						
		36	30	24	18	12	6	0	6	12	18	24	30	36
Lower Bumper	Pre			17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3		
	Post			<u>28.8</u>	<u>28.7</u>	<u>28.6</u>	<u>28.4</u>	<u>28.9</u>	<u>29.0</u>	<u>28.9</u>	<u>28.2</u>	<u>28.4</u>		
	Diff.			11.5	11.4	11.3	11.1	11.6	11.7	11.6	10.9	11.1		
Upper Bumper	Pre			20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5		
	Post			<u>22.5</u>	<u>23.5</u>	<u>23.6</u>	<u>24.0</u>	<u>24.6</u>	<u>24.8</u>	<u>24.9</u>	<u>24.3</u>	<u>22.7</u>		
	Diff.			2.0	3.0	3.1	3.5	4.1	4.3	4.4	3.8	2.2		
1/2 Bumper to Hood	Pre			23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7		
	Post			<u>21.5</u>	<u>22.5</u>	<u>22.7</u>	<u>22.5</u>	<u>22.3</u>	<u>22.3</u>	<u>22.2</u>	<u>21.9</u>	<u>20.4</u>		
	Diff.			-2.2	-1.2	-1.0	-1.2	-1.4	-1.4	-1.5	-1.8	-3.3		
Hood	Pre			28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5		
	Post			<u>35.2</u>	<u>34.0</u>	<u>33.6</u>	<u>33.5</u>	<u>33.3</u>	<u>33.3</u>	<u>33.0</u>	<u>33.0</u>	<u>34.0</u>		
	Diff.			6.7	5.5	5.1	5.0	4.8	4.8	4.5	4.5	5.5		

HORIZONTAL DISTANCE FROM REFERENCE

Lower Bumper	Pre			6.0	4.7	3.8	3.5	3.5	3.5	3.8	4.7	6.0		
	Post			40.2	39.5	39.1	38.2	38.4	37.8	36.9	36.5	37.4		
	Diff.			34.2	34.8	35.3	34.7	34.9	34.3	33.1	31.8	31.4		
Upper Bumper	Pre			6.0	4.7	3.8	3.5	3.5	3.5	3.8	4.7	6.0		
	Post			43.8	43.2	42.7	42.0	40.5	40.0	39.2	38.9	39.7		
	Diff.			37.8	38.5	38.9	38.5	37.0	36.5	35.4	34.2	33.7		
1/2 Bumper to Hood	Pre			11.8	10.6	8.0	7.7	7.3	7.7	8.0	10.6	11.8		
	Post			47.8	48.5	47.2	46.4	48.0	47.0	50.3	47.3	50.9		
	Diff.			36.0	37.9	39.2	38.7	40.7	39.3	2.3	36.7	39.1		
Hood	Pre			10.5	11.7	8.3	8.0	7.9	8.0	8.3	11.7	10.5		
	Post			47.0	49.6	47.4	47.8	48.0	48.3	48.7	53.5	52.8		
	Diff.			36.5	37.9	39.1	39.8	40.1	40.3	40.4	41.8	42.3		

Table 6

Test No. 752-6-555

CAR Deformable BarrierDATE 10/20/82REFERENCE DISTANCE FROM REAR 24.0 inches

VERTICAL HEIGHTS

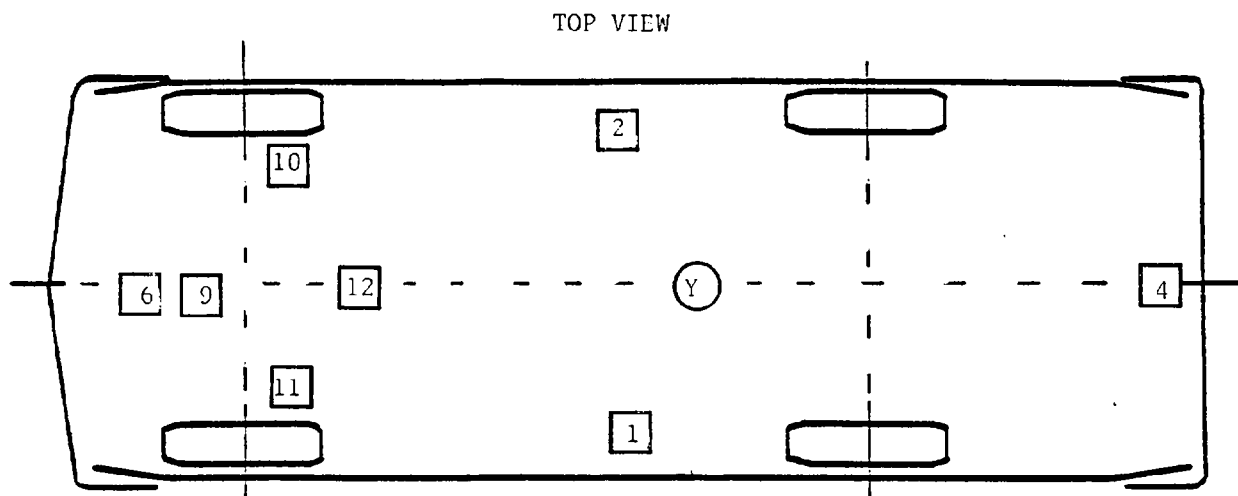
Inches Left															C/L		Inches Right					
		36	30	24	18	12	6	0	6	12	18	24	30	36								
Lower Bumper	Pre		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7									
	Post		13.4	14.3	16.4	16.8	16.2	16.3	15.4	15.2	15.2	14.4	13.7									
	Diff.		1.3	0.4	-1.7	-2.1	-1.5	-1.6	-0.7	-0.5	-0.5	0.3	1.0									
Upper Bumper	Pre		19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7									
	Post		16.3	17.1	19.3	19.4	19.1	19.6	18.6	18.1	18.1	17.4	16.6									
	Diff.		3.4	2.6	0.4	0.3	0.6	0.1	1.1	1.6	1.6	2.3	3.1									
1/2 Bumper To Hood	Pre		26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5									
	Post		26.6	26.6	27.2	27.3	27.5	27.8	27.7	27.6	27.5	27.4	26.3									
	Diff.		-0.1	-0.1	-0.7	-0.8	-1.0	-1.3	-1.2	-1.1	-1.0	-0.9	-0.2									
Hood	Pre		32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5									
	Post		31.7	31.7	31.9	32.1	32.1	32.1	32.2	32.2	32.2	32.3	31.0									
	Diff.		0.8	0.8	0.6	0.4	0.4	0.4	0.3	0.3	0.3	0.2	1.5									

HORIZONTAL DISTANCE FROM REFERENCE

Lower Bumper	Pre		2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	
	Post		14.0	14.9	17.1	17.6	17.2	17.9	16.9	16.8	16.8	16.1	15.6	
	Diff.		11.1	12.0	14.2	14.7	14.3	15.0	14.0	13.9	13.9	13.2	12.7	
Upper Bumper	Pre		2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	
	Post		10.0	10.9	13.0	13.1	13.1	13.8	12.9	12.5	12.7	12.0	11.5	
	Diff.		7.1	8.0	10.1	10.2	10.2	10.9	10.0	9.6	9.8	9.1	8.6	
1/2 Bumper To Hood	Pre		6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	
	Post		9.7	9.4	10.1	10.5	11.1	11.8	11.3	11.3	11.8	11.8	10.1	
	Diff.		2.8	2.5	3.2	3.6	4.2	4.9	4.4	4.4	4.9	4.9	3.2	
Hood	Pre		6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	
	Post		8.5	9.0	9.1	9.0	9.2	9.3	9.5	9.6	9.7	10.9	8.9	
	Diff.		1.6	2.1	2.2	2.1	2.3	2.4	2.6	2.7	2.8	4.0	2.0	



Figure 2 REAR TARGET DISPLACEMENT WITH RESPECT TO FIXED GROUND REFERENCE



ACCELEROMETER NUMBER *	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Rocker panel near LF "B" pillar	x		x
2	Rocker panel near RF "B" pillar	x		x
4	Rear bumper	x		x
6	Top of engine	x		x
9	Bottom of engine	x		x
10	RT brake caliper	x		
11	LF brake caliper	x		
12	Front of dash panel	x		x
Y	Yaw rate gyro			

*The accelerometer pack number can be correlated with the vehicle response data traces found in Appendix B.

FIGURE 3 VEHICLE ACCELEROMETER LOCATIONS

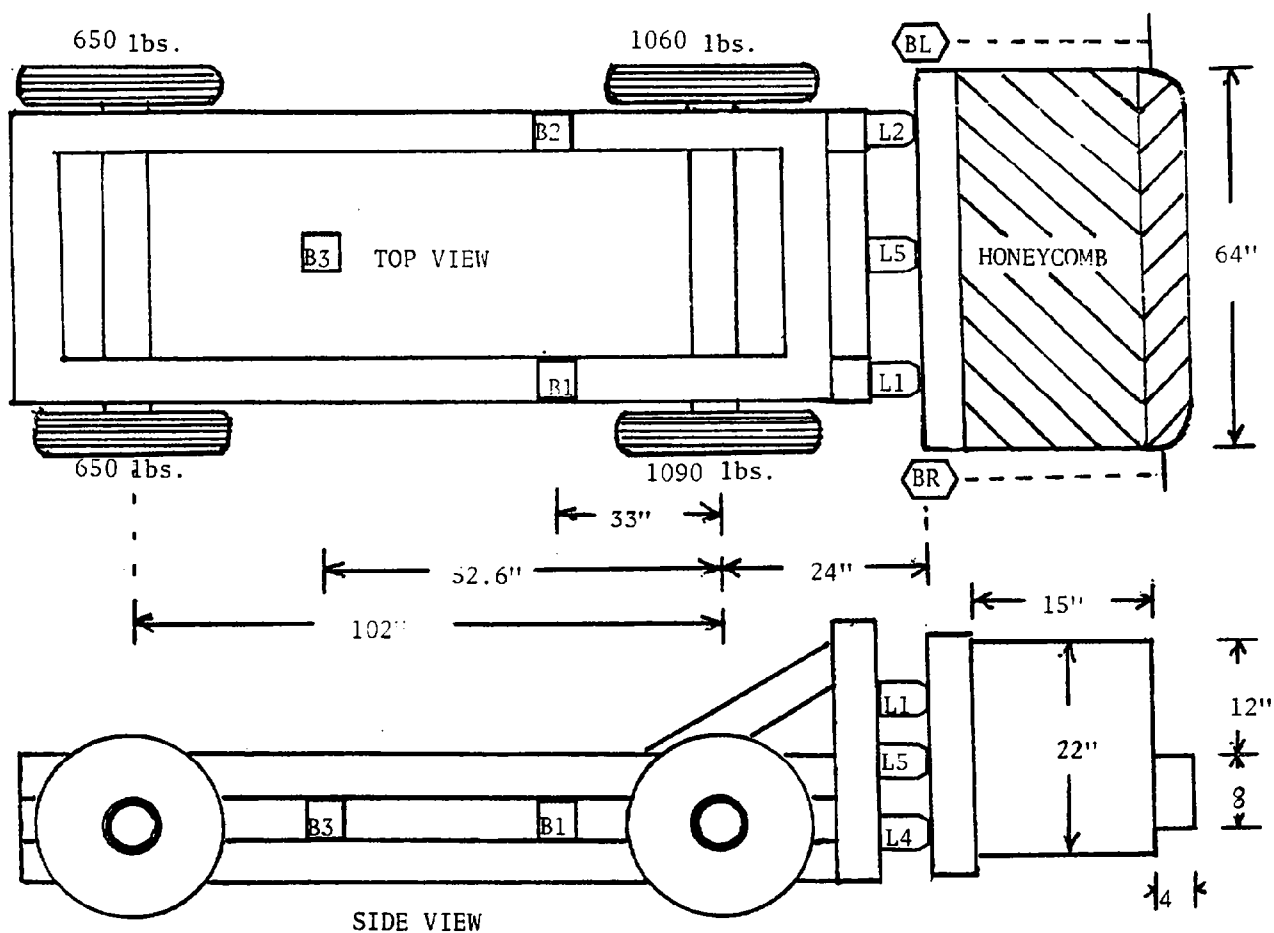
VEHICLE 1982 Fiat Strada

TEST No. 752-6-555

DATE 10/19/82

TRANSDUCER NUMBER	INCHES FROM REAR	INCHES LEFT OF C/L	ON C/L	INCHES RIGHT OF C/L
1	58	17		
2	58			17
4	10		X	
6	132			7
9	132			7
10	134			21
11	134	21		
12	99		X	

Table 7 VEHICLE TRANSDUCER LOCATION MEASUREMENTS



TRANSDUCER NUMBER*	TRANSDUCER LOCATION	DIRECTION		
		X	Y	Z
B1	RT upper frame rail accel.	x		x
B2	LT upper frame rail accel.	x		x
B3	C/G accel.	x	x	x
BR	Right bumper deflection	x		
BL	Left bumper deflection	x		
L1	Top right load cell	x		
L2	Top left load cell	x		
L3	Bottom left load cell	x		
L4	Bottom right load cell	x		

*The transducer pack number can be correlated with the vehicle response data traces found in Appendix B.

Figure 4 VEHICLE NO. 2 - MOVING BARRIER TRANSDUCER LOCATIONS

NOTE: Camera Information Shown on Table 8 and 9

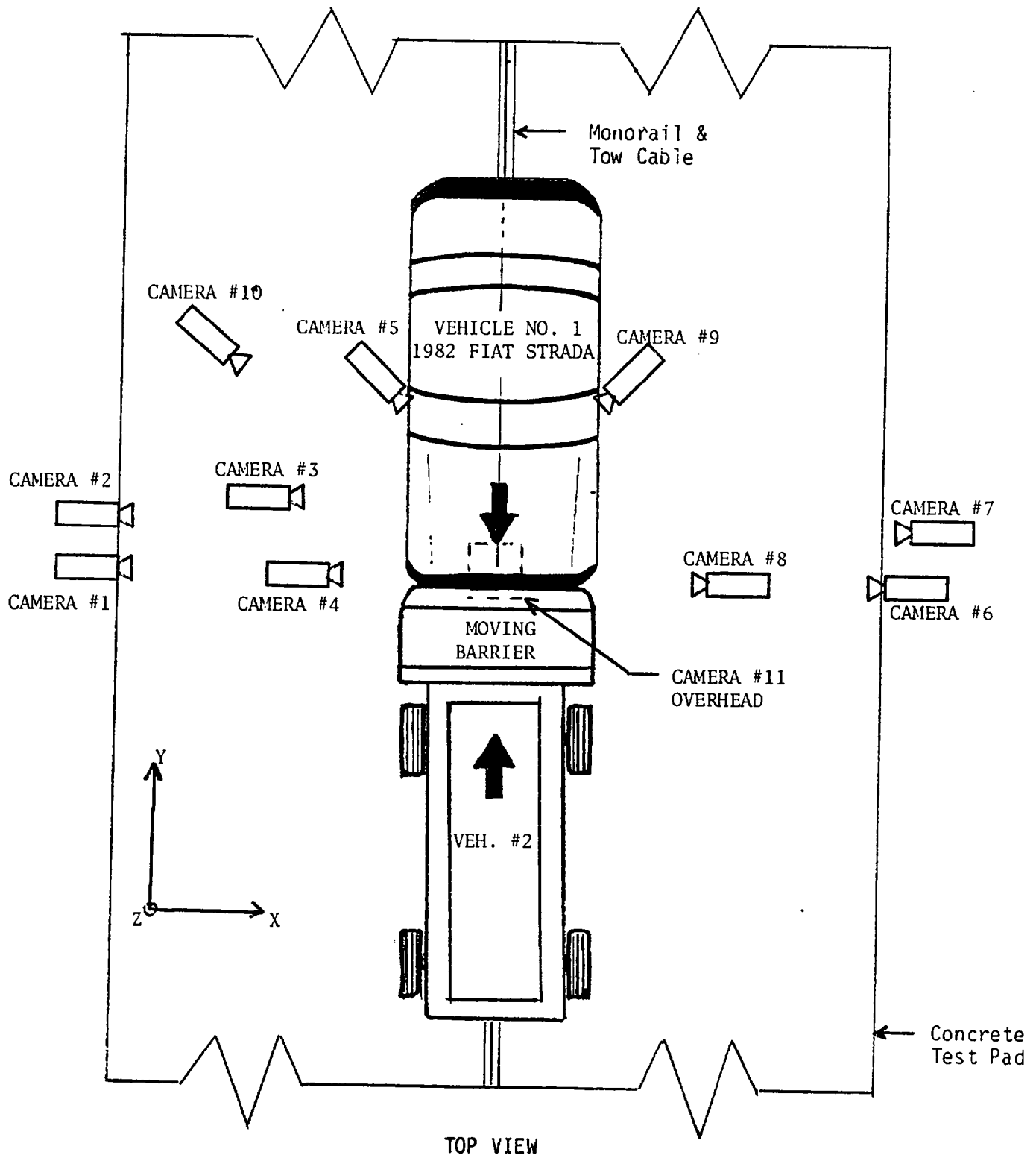


Figure 5 CAMERA POSITIONS FOR CAR-TO- BARRIER IMPACTS

Table 8

HIGH SPEED CAMERA LOCATIONSTest No.: 752-6-555Vehicle No. 1982 Fiat Strada

CAMERA NUMBER	VIEW	<u>CAMERA POSITIONS (IN)*</u>			CAMERA ANGLE (DEG)**	FILM PLANE TO HEAD TARGET (IN) X
		X	Y	Z		
1	Overall of Vehicle Nos. 1 and 2	521	13	53	-1	---
2	Front Three-Quarters of Veh. No. 1	516	12	54	-3	---
3	Front View of Vehicle No. 1	450	12	50	-2	---
4	Front of Vehicle Nos. 1 and 2	435	0	14	0	---
5	Right Front Passenger	---	---	---	---	---
6	Overall of Vehicle Nos. 1 and 2	504	0	41	1	---
7	Front Three-Quarters of Veh. 1 & 2	516	49	56	0	---
8	Front of Vehicle Nos. 1 and 2	341	0	14	3	---
9	Driver	---	---	---	---	---
10	Side View of Vehicle Nos. 1 and 2	222	131	120	22.5	---
11	Overhead of Vehicle Nos. 1 and 2	0	75	388	-82	---

* X = film plane to monorail centerline

Y = film plane to impact location

Z = film plane to ground

** Referenced to Horizontal Plane

Table 9

HIGH SPEED CAMERA INFORMATION (TEST 752-6-555)

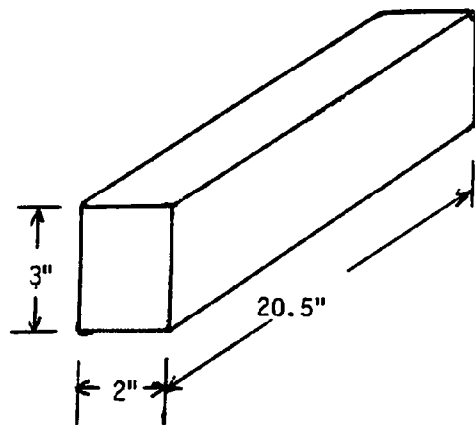
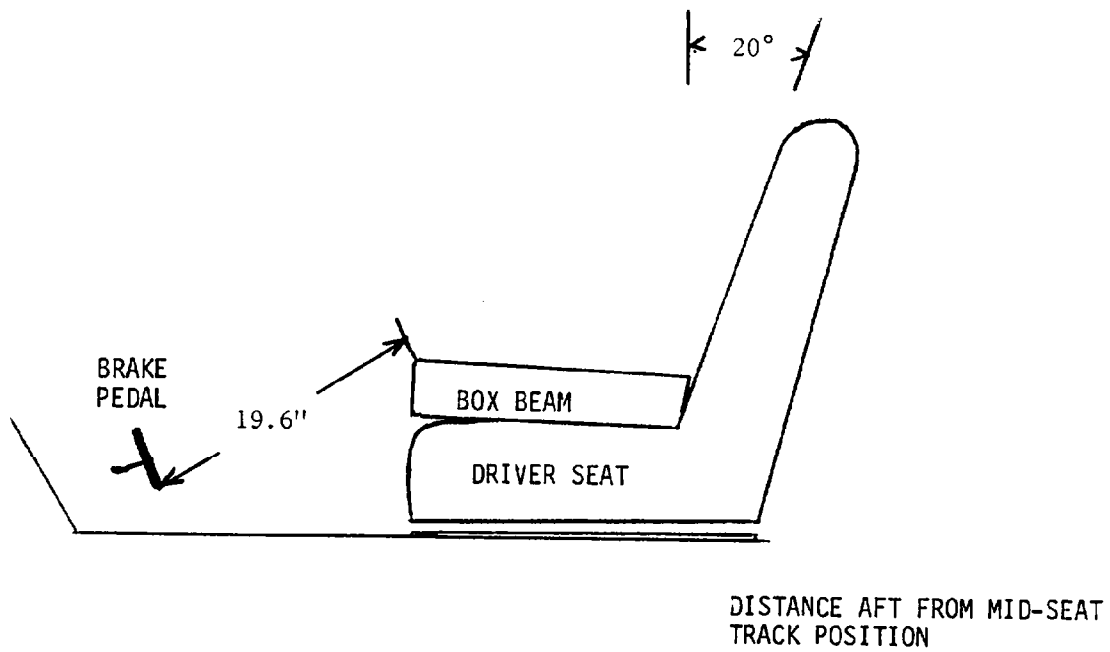
CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)
1	Vehicle Nos. 1 and 2	Photosonic	13	830
2	Vehicle No. 1	Photosonic	25	830
3	Vehicle No. 1 Front	Photosonic	25	900
4	Vehicle Nos. 1 and 2 Front	Photosonic	50	900
5	RT Front Passenger	Stalex	8	700
6	Vehicle Nos. 1 and 2	Photosonic	13	930
7	Vehicle Nos. 1 and 2	Photosonic	25	830
8	Vehicle Nos. 1 and 2	Photosonic	35	830
9	Driver	Stalex	8	900
10	Vehicle Nos. 1 and 2 Side View	Photosonic	25	830
11	Overhead	Photosonic	13	830

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 OF FILM.

TEST NO. 752-6-555

VEHICLE NO. 1 - 1982 Fiat Strada



BOX BEAM DIMENSIONS

FIGURE 6 DRIVER SEAT POSITION

FIGURE 7
PART 572 DUMMY IN-VEHICLE POSITION

Test No. 752-6-555

Vehicle 1982 Fiat Strada

SEAT TYPE:

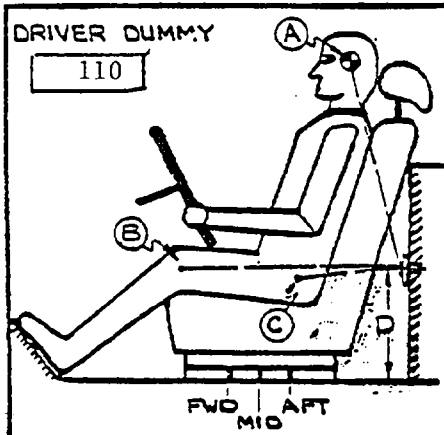
 Bench
 X Bucket
 Split Bench

ADJUSTER TYPE:

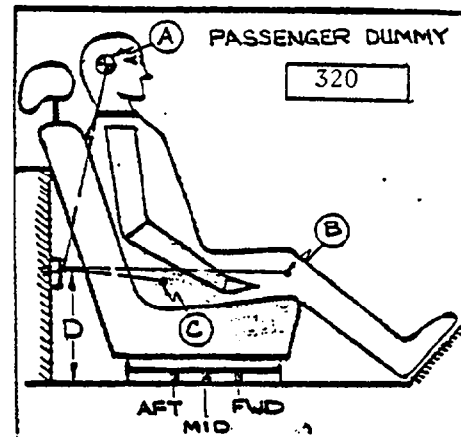
 X Manual
 Power

BUCKET SEAT BACK TYPE:

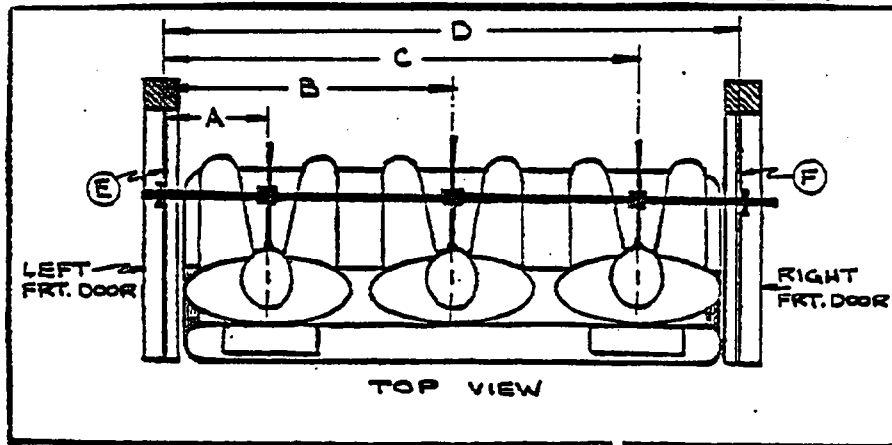
 Fixed
 X Adjustable Reclining



A = 18.0 in. 10 Degrees
B = 23.0 in. 115 Degrees
C = 9.2 in. 149 Degrees
D = 17.6 in.



A = 18.0 in. 12 Degrees
B = 22.7 in. 114 Degrees
C = 9.0 in. 148 Degrees
D = 17.6 in.



DUMMY ID

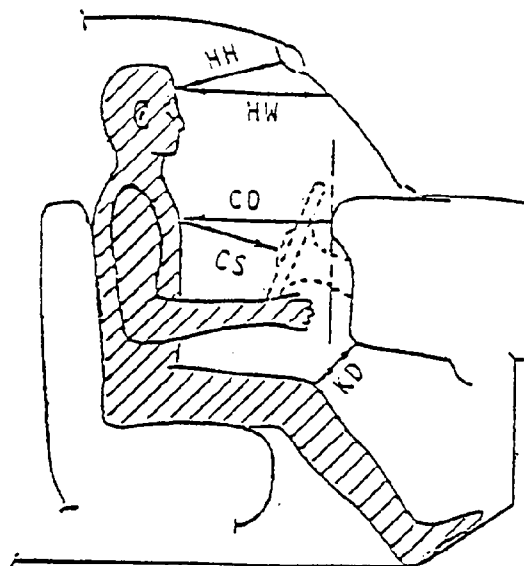
110

320

A = Left Door to Driver Centerline
B = Left Door to Center Passenger Centerline
C = Left Door to Right Passenger Centerline
D = Left Door to Right Door
E, F = Window Glass Height (Right and Left Must be Equal)

12.5 in.
 in.
39.0 in.
51.0 in.
9.5 in.

	<u>DRIVER</u>	<u>PASS</u>
HH	15.7	15.3
HW	20.7	20.7
CD	25.2	24.0
CS	18.6	---
KDL	9.2	9.6
KDR	8.5	9.6



HR	6.2	6.2
HS	7.9	7.7
AD	4.5	4.7
HD	6.7	6.2

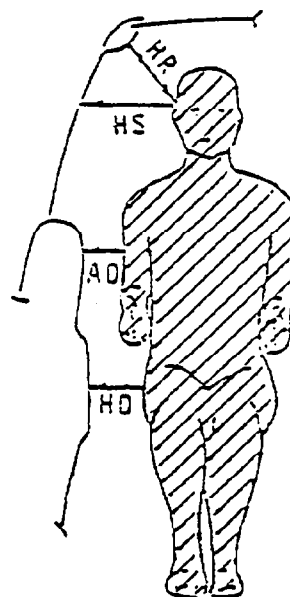


Figure 8 OCCUPANT CLEARANCE DIMENSIONS

DUMMY INJURY CRITERIA VALUES

Table 10

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DUMMY (1)	-272	-31	112	275	-188	444	27	124
DUMMY (2)	-268	54	82	277	-109	36	62	88
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	1530	4225
DUMMY (2)	1197	3500
DUMMY (3)		
DUMMY (4)		

	MAXIMUM FORCE-SEAT BELTS LOADS (LBS)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
DUMMY (1)	1330	4940	970
DUMMY (2)	1175	813	3000
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**				SEVERITY INDEX
	HIC	t ₁ (SEC)	t ₂ (SEC)	AVE. ACC. (g) t ₁ TO t ₂	HEAD
DUMMY (1)	2824.0	.06742	.08625	117.6	3621
DUMMY (2)	1781.7	.07327	.09915	86.1	3322
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Table 11
TEST PROCEDURE CHECK LIST

10/19/82

ITEM NO.	DESCRIPTION	CHECK BY	DATE	COMMENTS
1.	Inflate tires to recommended mfg's cold pressure for vehicle capacity weight (including spare). Check tires for recommended size.	M.R.	10-14	
2.	Fill out summary sheet. Apply identification number to vehicle.	M.R.	10-14	
3.	Inspect vehicle and record any damage or missing parts.	M.R.	10-14	
4.	Add fluids to specified levels or fill to capacity.	M.R.	10-14	
5.	Weigh vehicle and record weight at each wheel on summary sheet.	M.R.	10-14	
6.	Apply reference height marks at each wheel and record on summary sheet.	M.R.	10-14	
7.	Pump fuel from tank and run engine until fuel lines are empty.	M.R.	10-14	
8.	Drain following fluids from vehicle and check N/A if not applicable: ☒ a) coolant ☒ b) engine oil ☒ c) transmission fluid ☒ d) windshield washer fluid ☒ e) battery acid (drain & flush) ☒ f) power steering fluid	M.R.	10-14	
9.	Fill fuel tank to recommended EPA capacity with red dyed Stoddard solvent. Record volume of Stoddard on Summary Sheet. Crank engine to fill carburetor.	N.A.		
10.	Siphon 7% of solvent from fuel tank and record amount removed on Summary Sheet.	N.A.		

Table 11 (cont'd)

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
11.	Perform pre-test vehicle measurements	DWH	10-14	
12.	Mark forward-most and rear-most positions of seat. Measure and mark seat and sill mid-positions.	M.R.	10-14	
13.	Install mounting plates for accelerometers as specified in the Test Plan.	M.R.	10-14	
14.	Install mounting plate and instrumentation in trunk area.	M.R.	10-14	
15.	Install accelerometers.	M.R.	10-14	
16.	Place certified dummies in both front seats with seats in correct position.	DWH	10-15	
17.	Install seat belt load cells on lap and torso portions on both front seat belts and make provisions to remove weight of the load cells.	DWH	10-15	
18.	Install on-board lighting to illuminate field of view of ground cameras.	M.R.	10-15	
19.	Route and secure all electrical cables.	DWH	10-15	
20.	Install speed trap breaker bar on vehicle.	M.R.	10-15	
21.	Install guide rollers and abort straps to vehicle.	M.R.	10-15	
22.	Weigh vehicle and add ballast if required. Place ballast so that weight distribution will be as close as possible to delivered distribution. Record on Summary Sheet.	M.R.	10-15	
23.	Measure and record ride height.	M.R.	10-15	
24.	Apply targets and tape striping as specified in TP-212-02 - (Laboratory Procedure for Vehicle Assessment.)	M.R.	10-15	

Table 11 (cont'd)

AT IMPACT SITE

ITEM NO.	DESCRIPTION	CHECKED	DATE	COMMENTS
		BY		
25.	Position vehicle front to bumper at impact point.	M/L	10/19	
26.	Photograph the following:	M/L		
	a) Vehicle overall & closeup left and right views.			
	b) Windshields overall and close-up left and right quarter views			
	c) Real time documentary	✓		
27.	Align and focus stationary high speed cameras.	M/L		
28.	Measure and document camera positions.	M/L		
29.	Test operation of all high speed cameras.	M/L		
30.	Set up speed traps and measure breaker bar when vehicles are at impact point.	M/R	10-19	
31.	Check vehicle attitude and ride height and document on summary sheet.	M/L	10/19	
32.	Check speed traps operation.	DWH	10-19	
33.	Move test vehicles to starting point	M/R	10-19	

STARTING POINT PROCEDURE

34.	Adjust dummy positions as per dummy positioning check list and make required measurements.	M/L	10/19	
35.	Connect umbilical cables.	DWH	10-19	
36.	Make operation check of all instrumentation and calibrate system.	DWH	10-19	
37.	Take all pre-test photographs.	M/L	10/19	

Table 11 (cont'd)

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
38.	Check operation of camera interlock and flash bulbs correlation.	MLZ	10/19	
39.	Latch trunk and leave key in lock.	MLR	10 19	
40.	Verify that fuel tank cap is tight.			
41.	Place transmission in neutral. Release parking brake.	MLZ	10-19	
42.	Verify that hood latch is latched.	MLR	10-19	
43.	Close all windows & vents (except front windows).	MLZ	10/19	
44.	Close doors leave unlocked.	MLZ		
45.	Check operation of all systems.	MLZ		
46.	Record temperature of interior of vehicle.	MLZ		
47.	Complete countdown procedures and proceed with test.	MLZ	✓	
<u>POST-TEST PROCEDURES</u>				
48.	Make operational check of all instrumentation.	DWH	10-19	
49.	Photograph with real time camera:	MLZ	10/19	
a)	Post-test overall scene.	✓	✓	
b)	Close-up of pertinent damage to windshield or fuel system.	✓	✓	
c)	Dummies failed restraints or failed seat anchorages.	✓	✓	
d)	Any other type of failure.	✓	✓	
e)	Opening of vehicle doors.	✓	✓	

Table 11 (cont'd)

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
50.	Take post-test still photographs. Record visual observations of vehicle condition, dummy positions, any anomalies, etc.	MZ	10/19	
51.	Separate vehicles and photograph front of each vehicle.	MZ	10/19	
52.	Remove umbilicals.	DR	10-19	
	Remove vehicles from test track.	MZ	10-19	
		MZ	10-19	

APPENDIX A
PHOTOGRAPHS

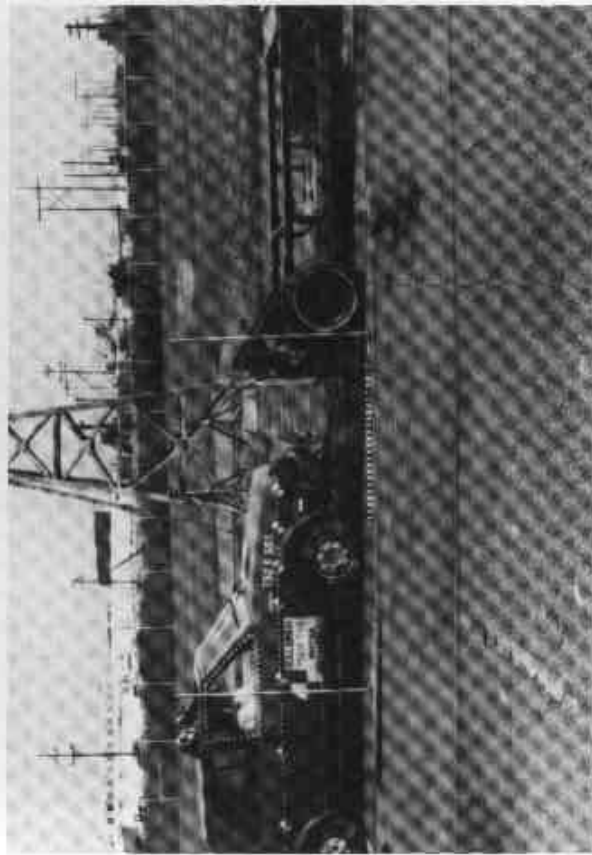
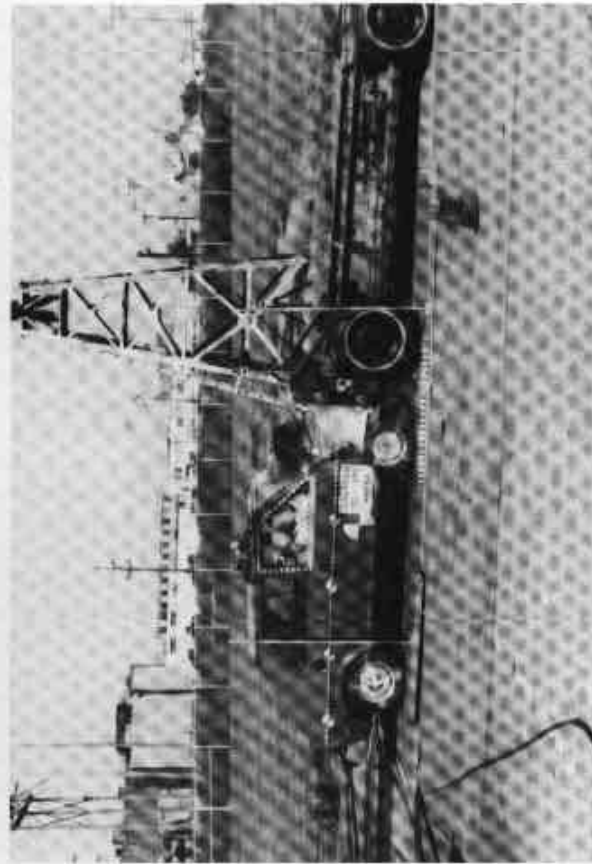
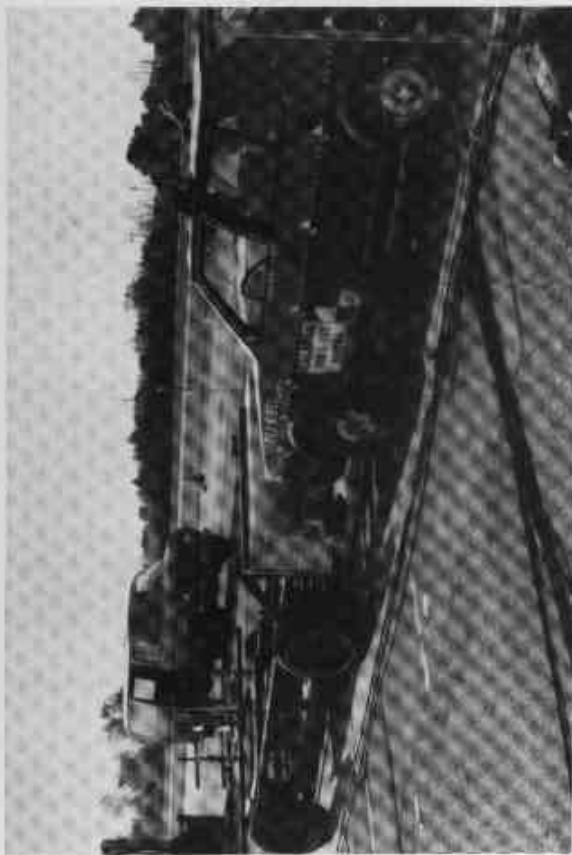
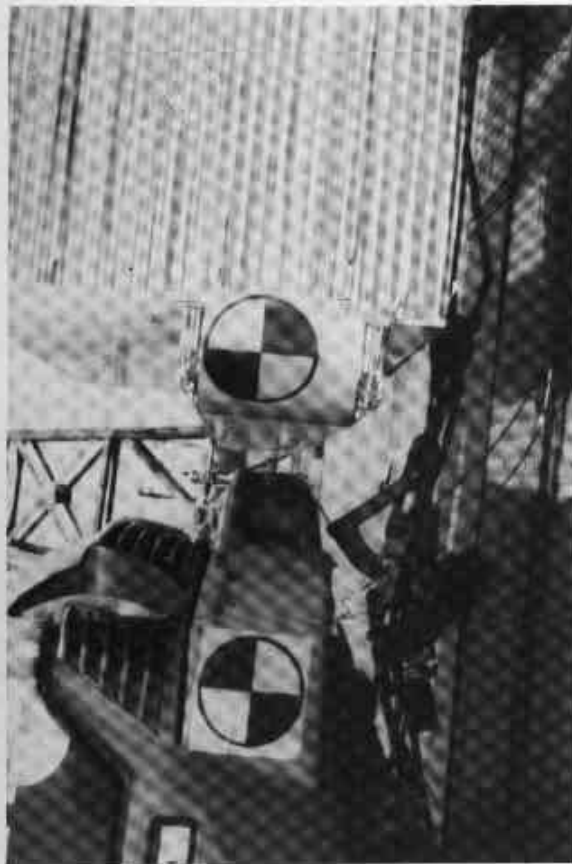


Figure A-1 VEHICLE NOS. 1 AND 2 - PRE- AND POST-TEST IMPACT CONFIGURATION

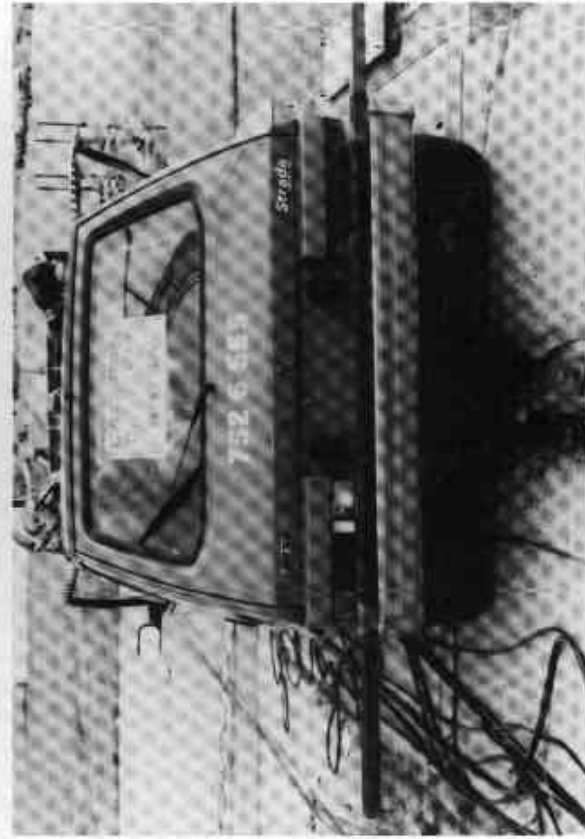
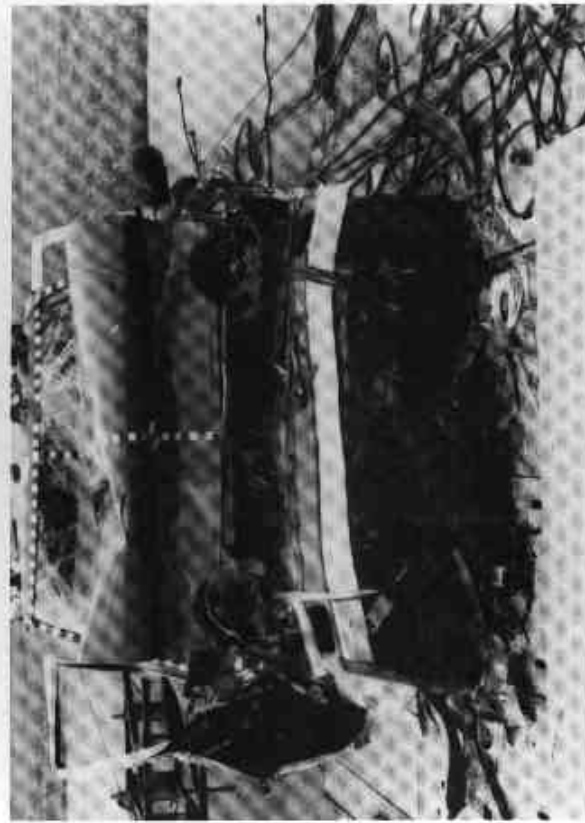


Figure A-2 VEHICLE NO. 1 - PRE- AND POST-TEST FRONT AND REAR VIEWS

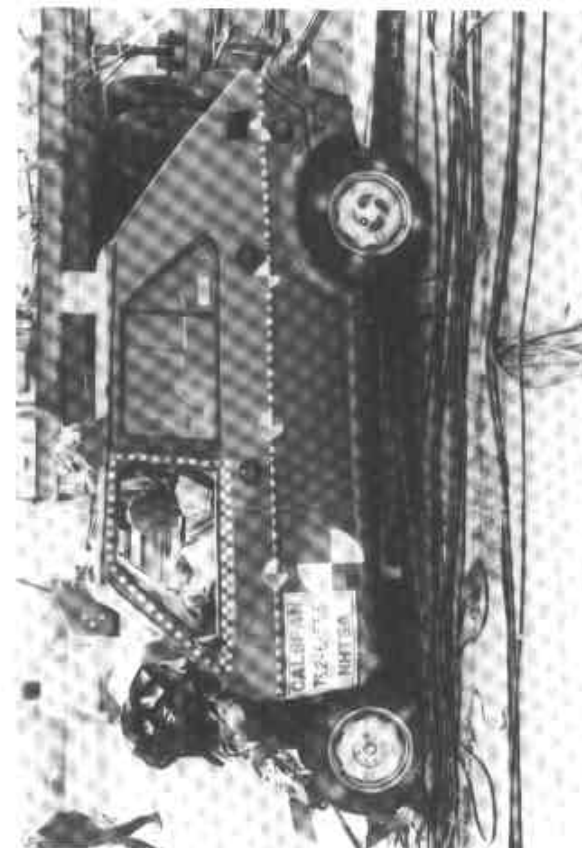
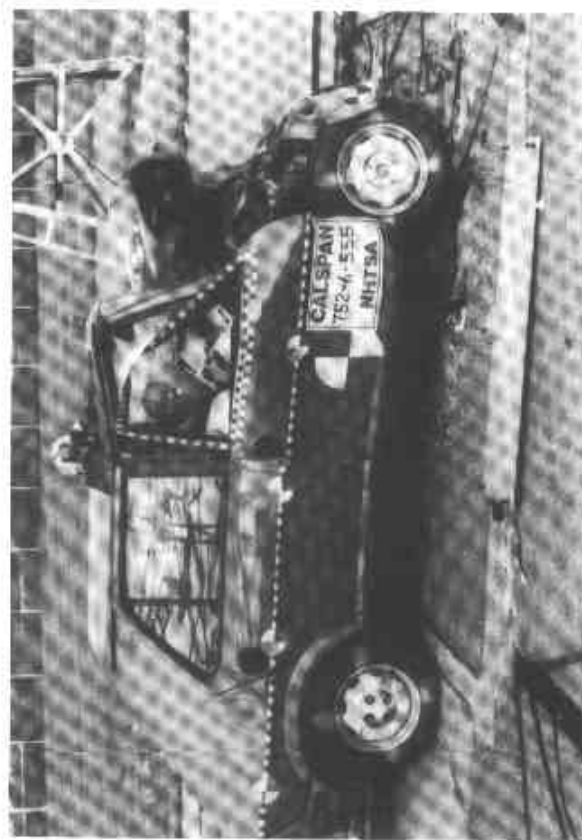
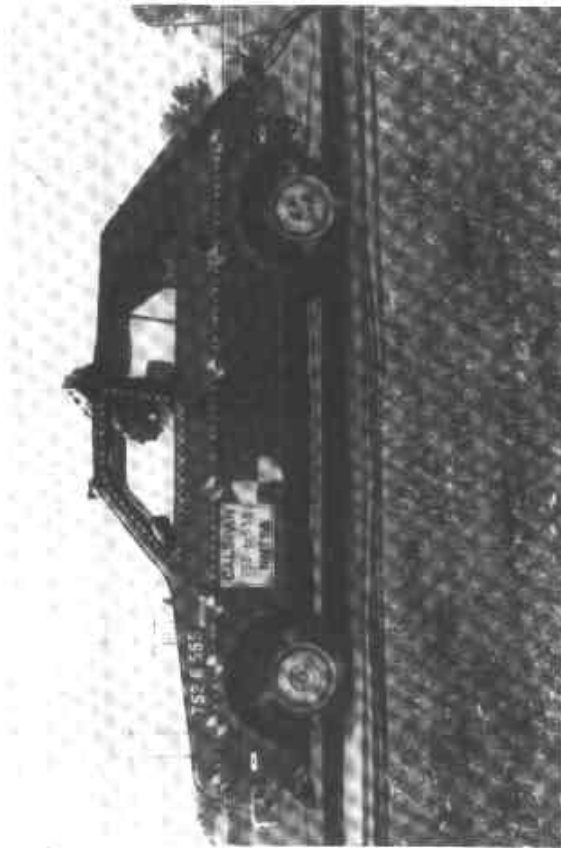


Figure A-3 VEHICLE NO. 1 - PRE- AND POST-TEST RIGHT AND LEFT SIDE VIEWS

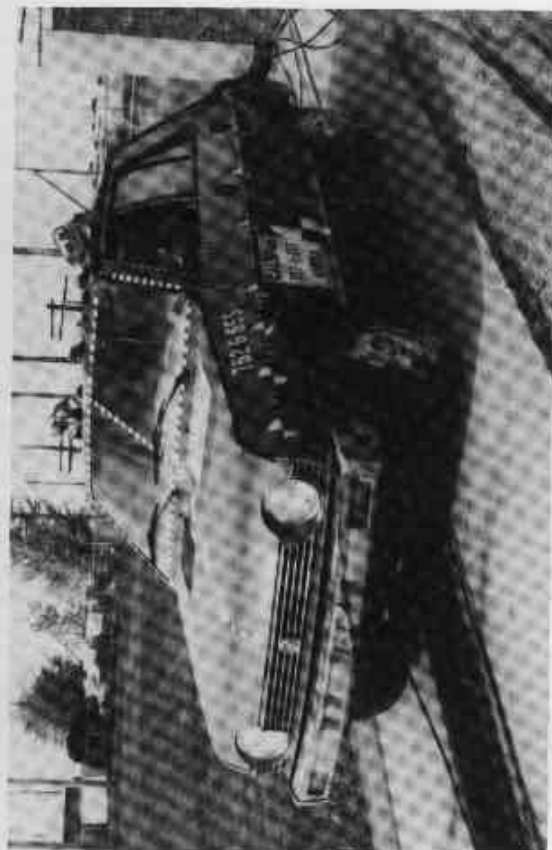
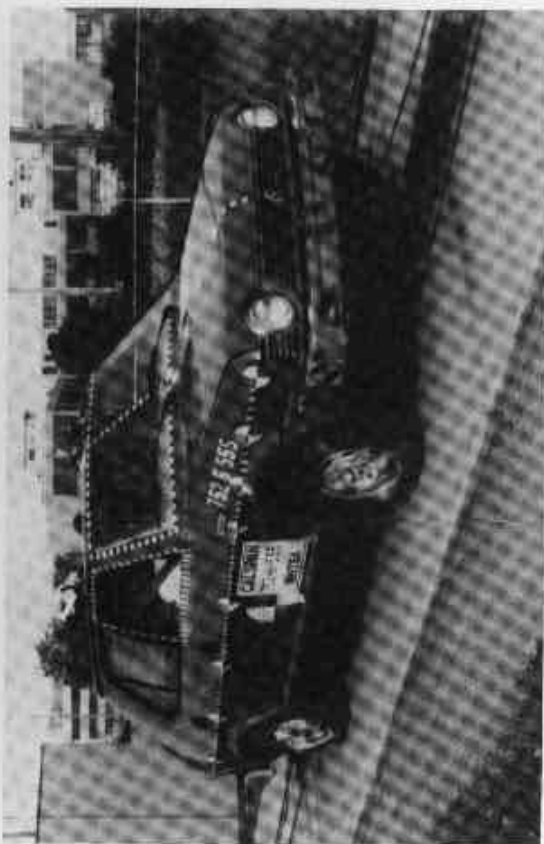


Figure A-4 VEHICLE NO. 1 - PRE- AND POST-TEST FRONT THREE-QUARTER VIEWS



Figure A-5. VEHICLE NO. 1 - PRE- AND POST-TEST REAR THREE-QUARTER VIEWS



Figure A-6 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT UNDERBODY



Figure A-7 VEHICLE NO. 1 - POST-TEST VIEWS OF RIGHT AND LEFT FRONT UNDERBODY

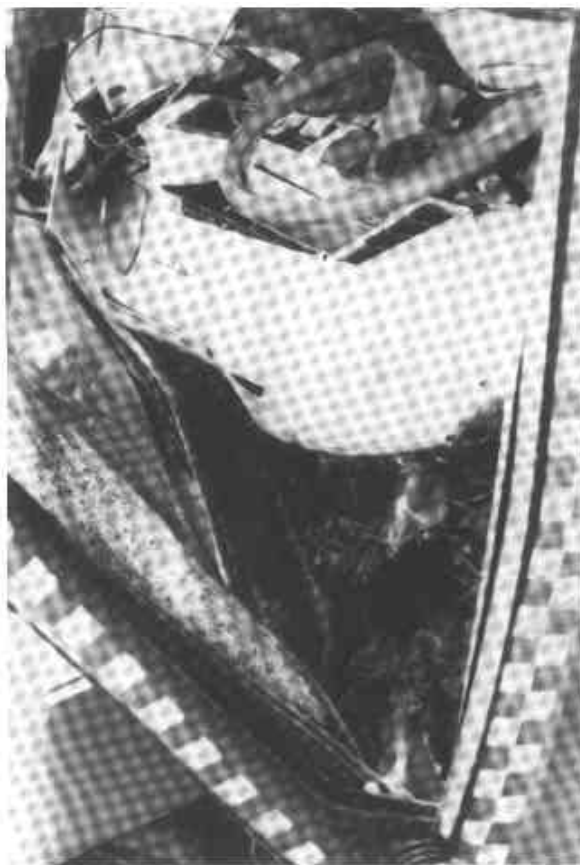


Figure A-8 VEHICLE NO. 1 - PRE-AND POST-TEST VIEWS OF DRIVER POSITION



Figure A-9 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF RIGHT FRONT PASSENGER POSITION



Figure A-10 VEHICLE NO. 1 - POST-TEST VIEWS OF WINDSHIELD AND HOOD INTRUSION



Figure A-11 VEHICLE NO. 1 - POST-TEST REAR VIEW OF OCCUPANTS

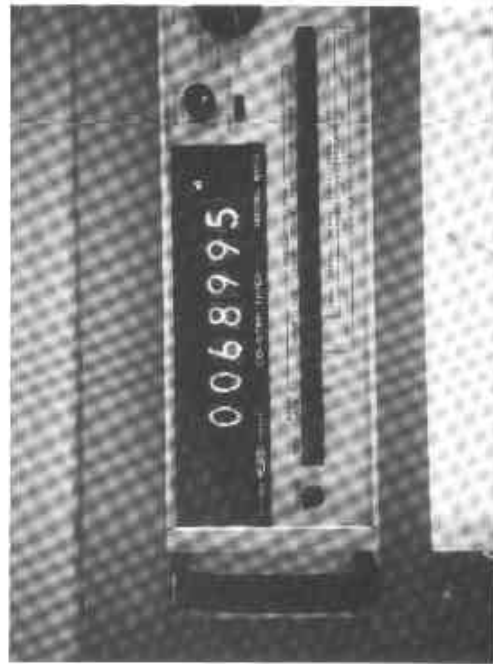


Figure A-12 VELOCITY COUNTER DISPLAY

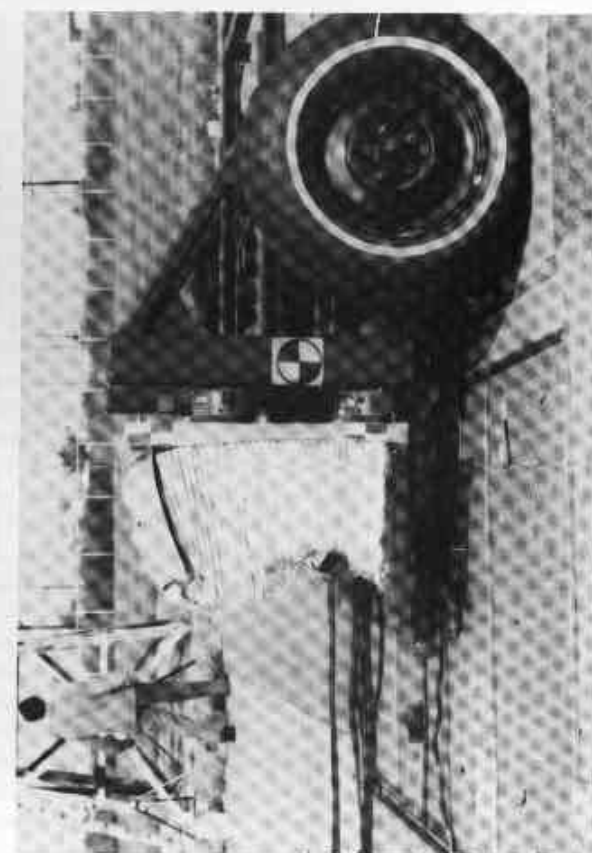
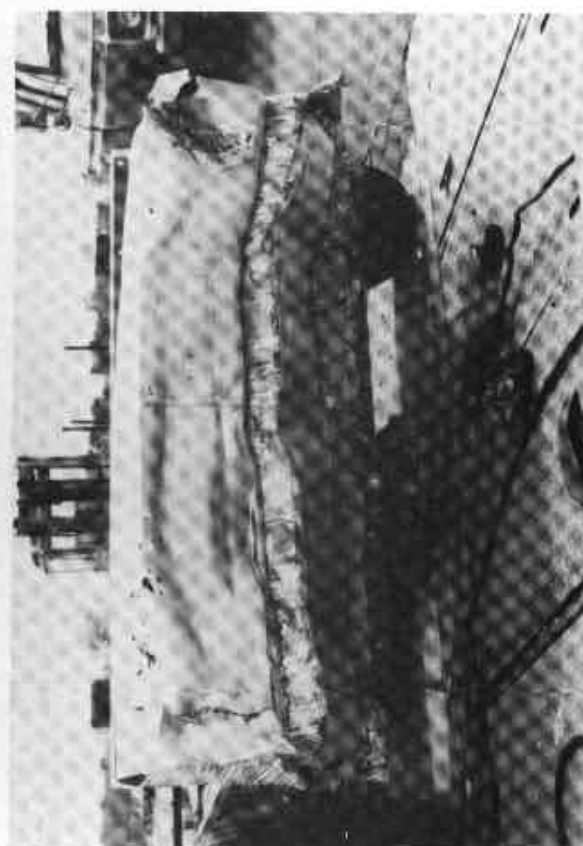
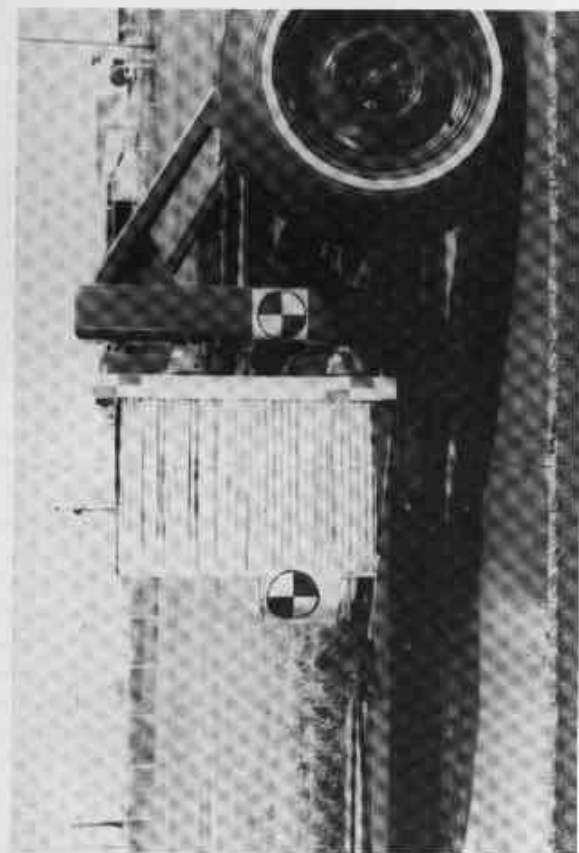
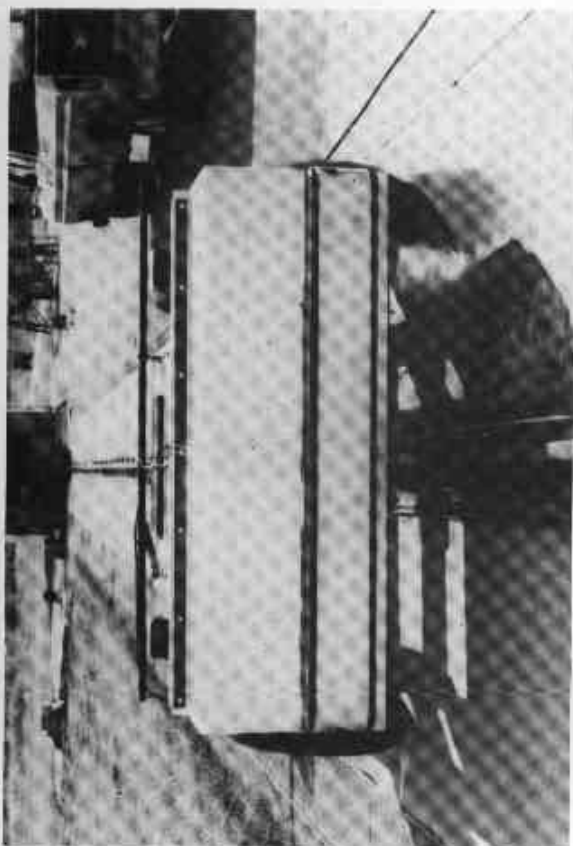
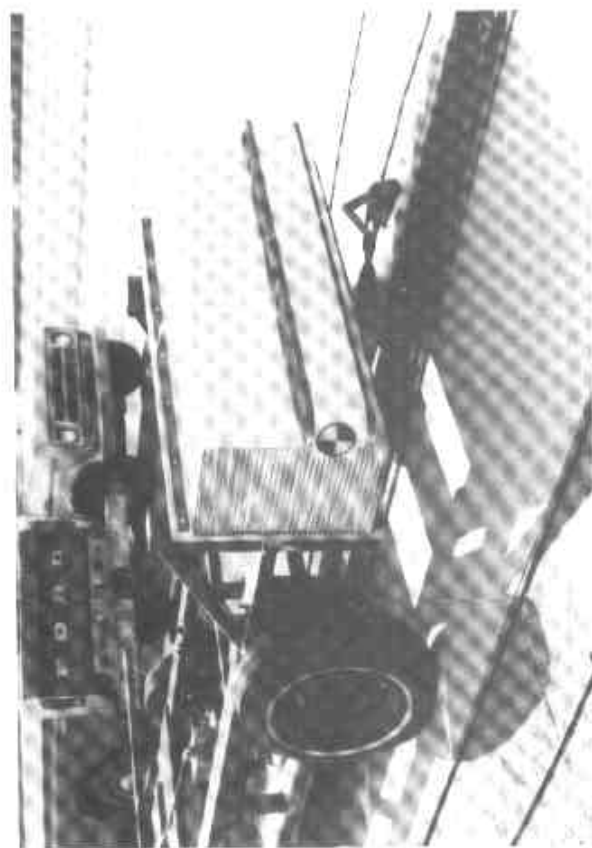
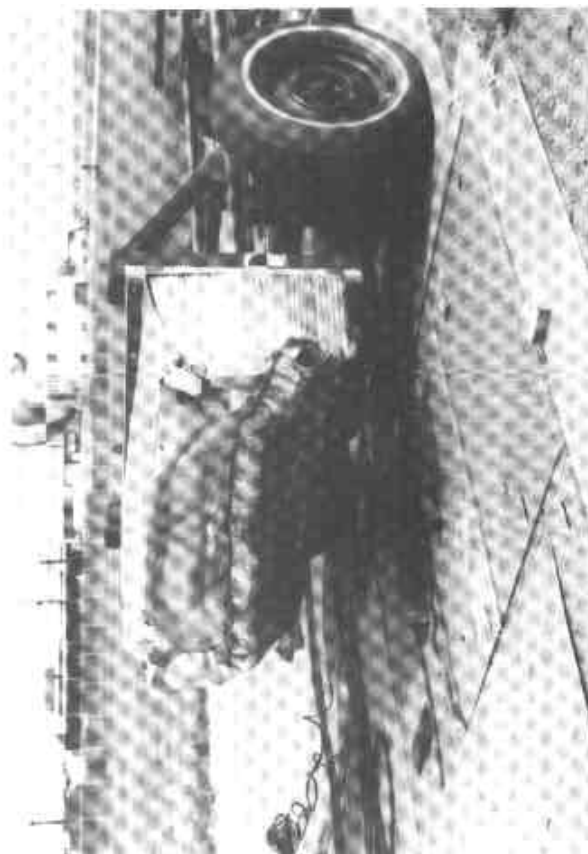


Figure A-13 VEHICLE NO. 2 - PRE- AND POST-TEST FRONT AND SIDE VIEWS OF BARRIER HONEYCOMB



A-12



6892-V-6

Figure A-14 VEHICLE NO. 2 - PRE- AND POST-TEST THREE-QUARTER VIEWS OF BARRIER HONEYCOMB

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA

TEST NO. 752-6-555

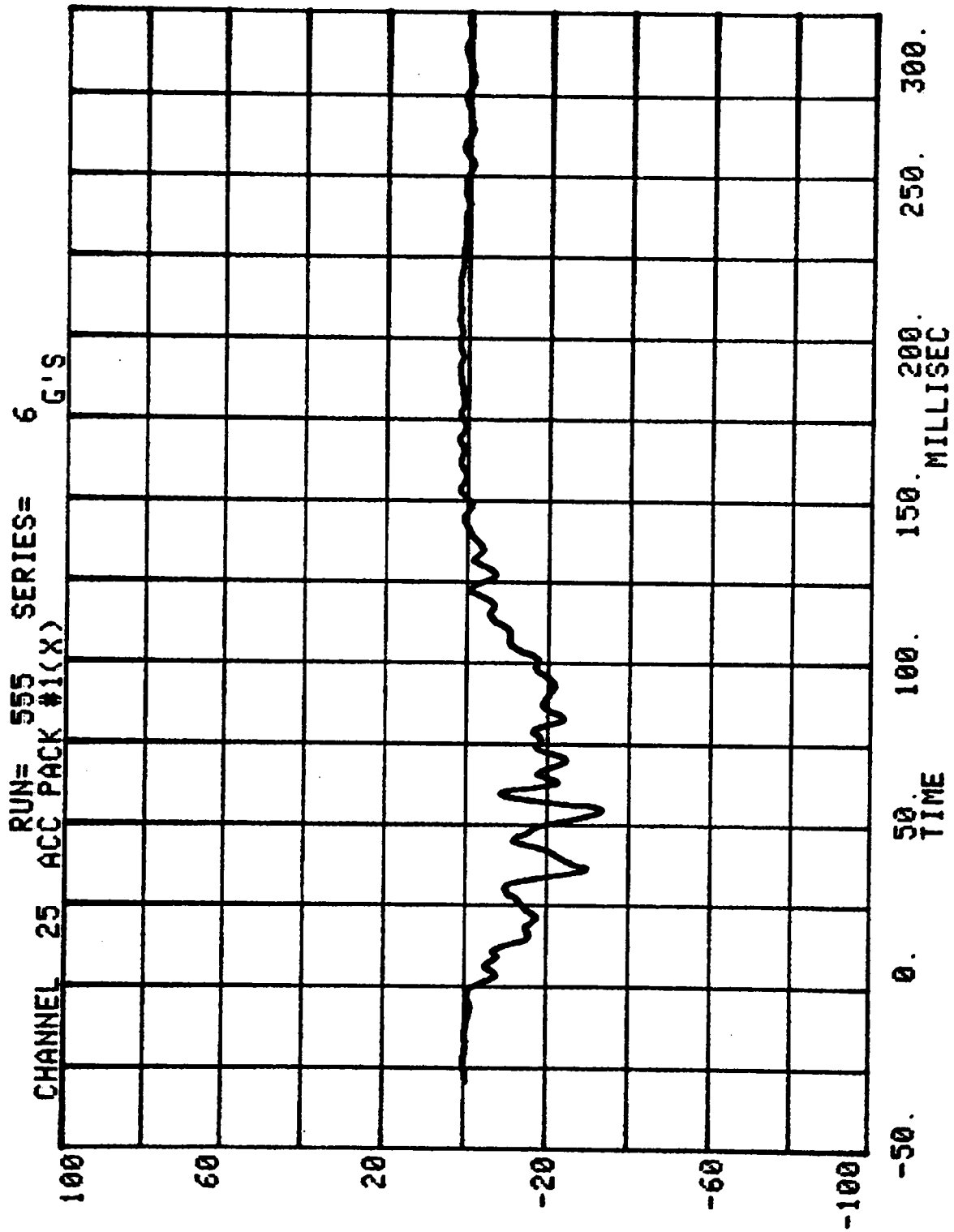
1982 FIAT STRADA

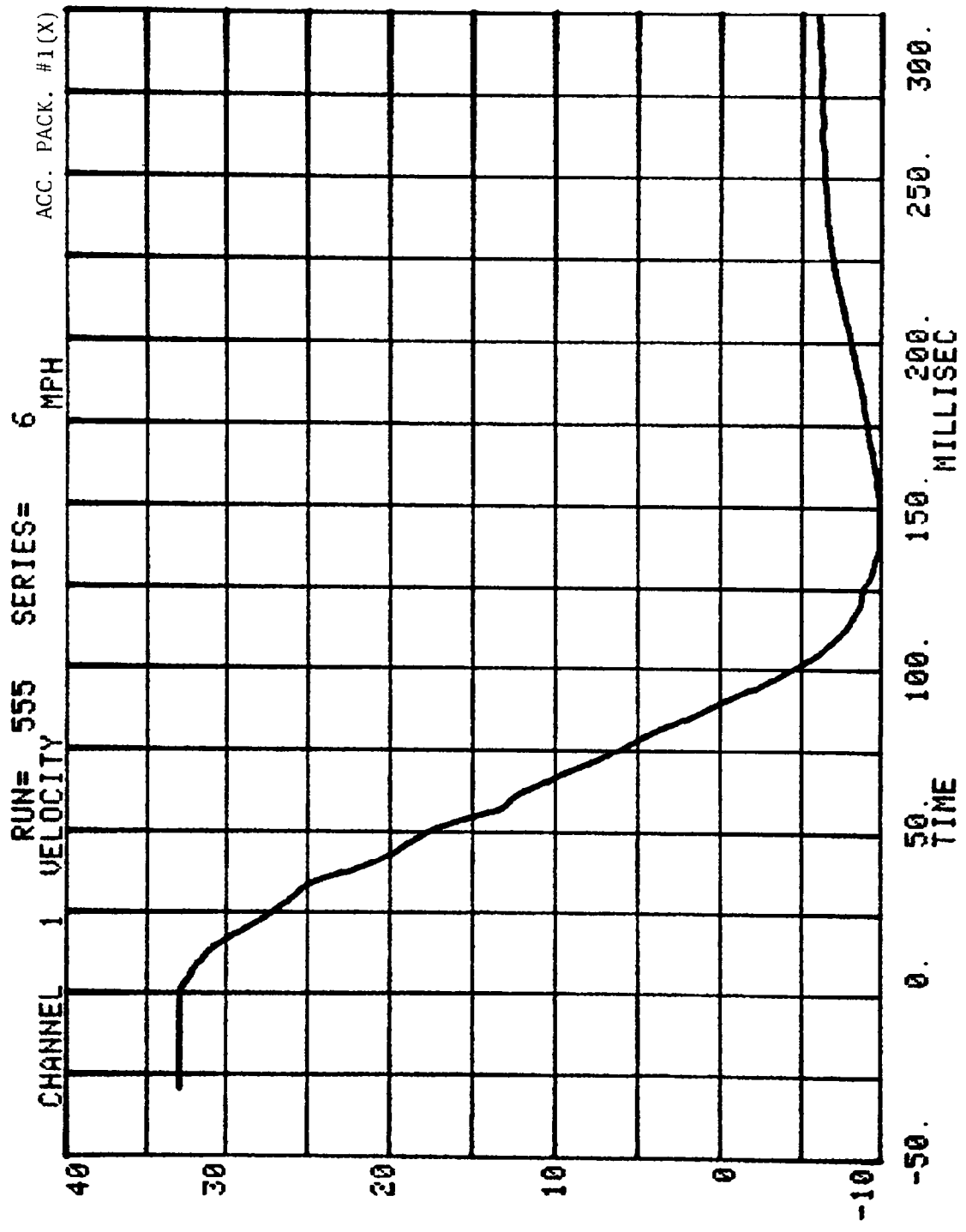
VEHICLE NO. 1 DATA

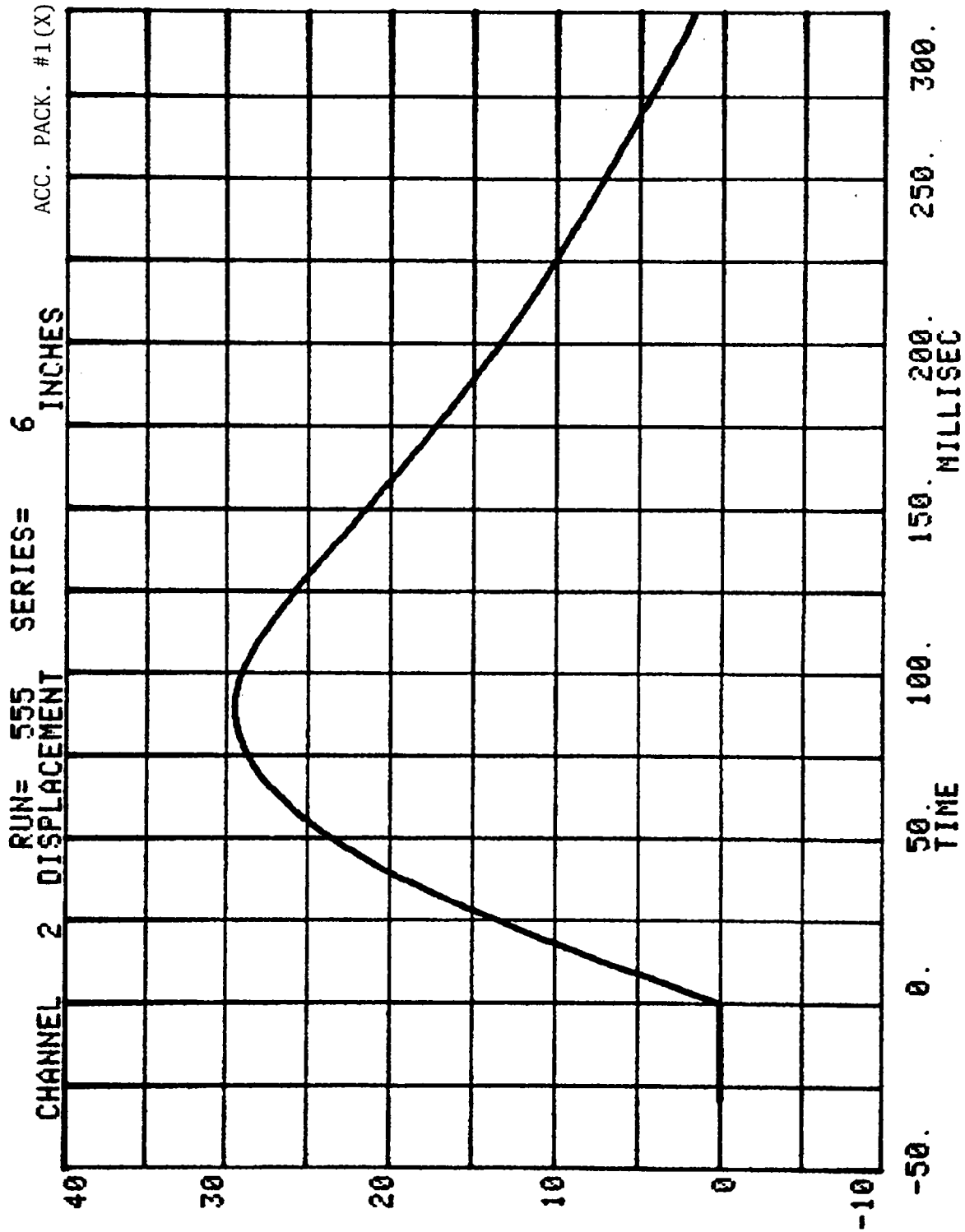
VEHICLE DATA

FILTER CHANNEL CLASS

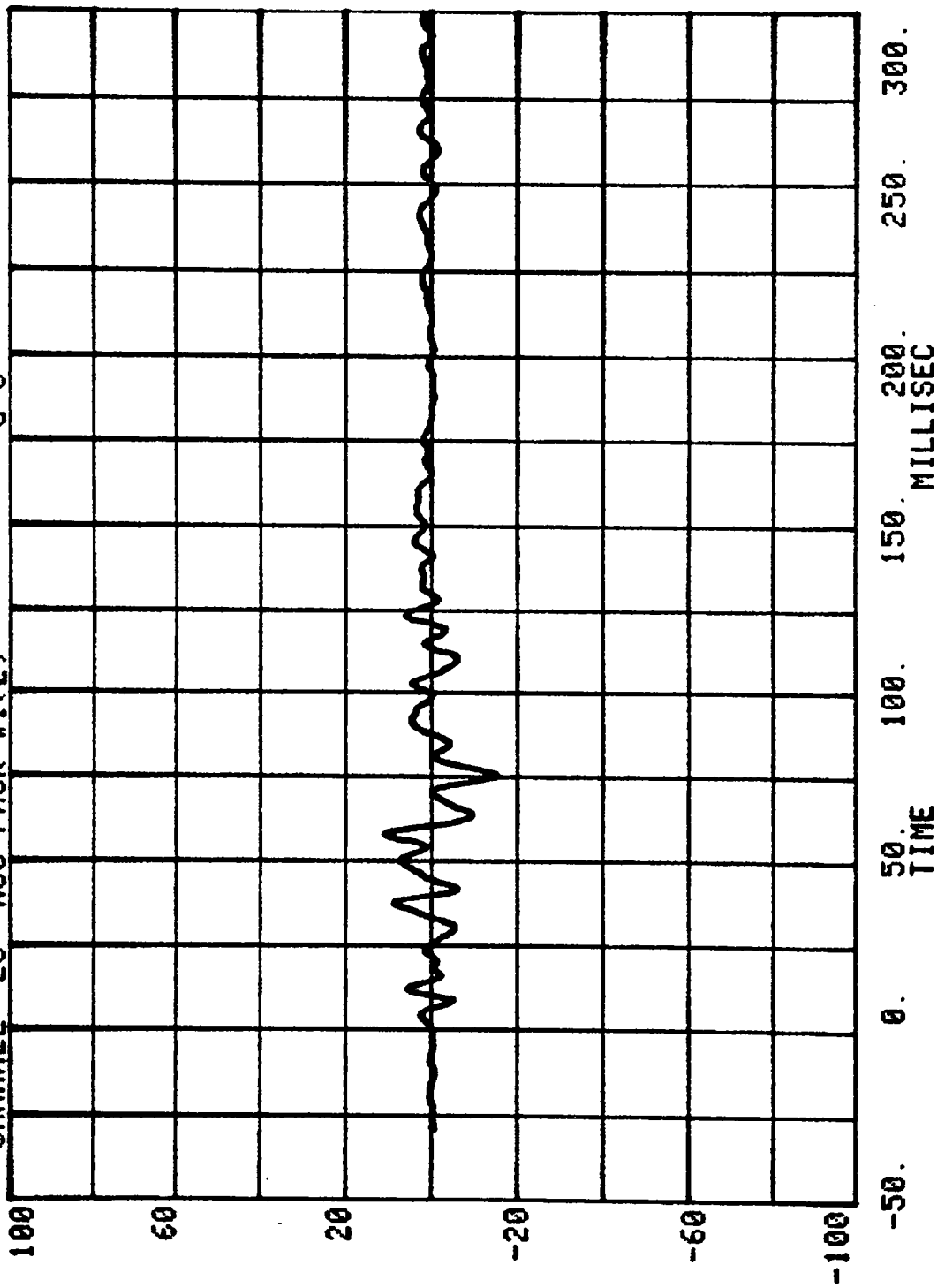
60



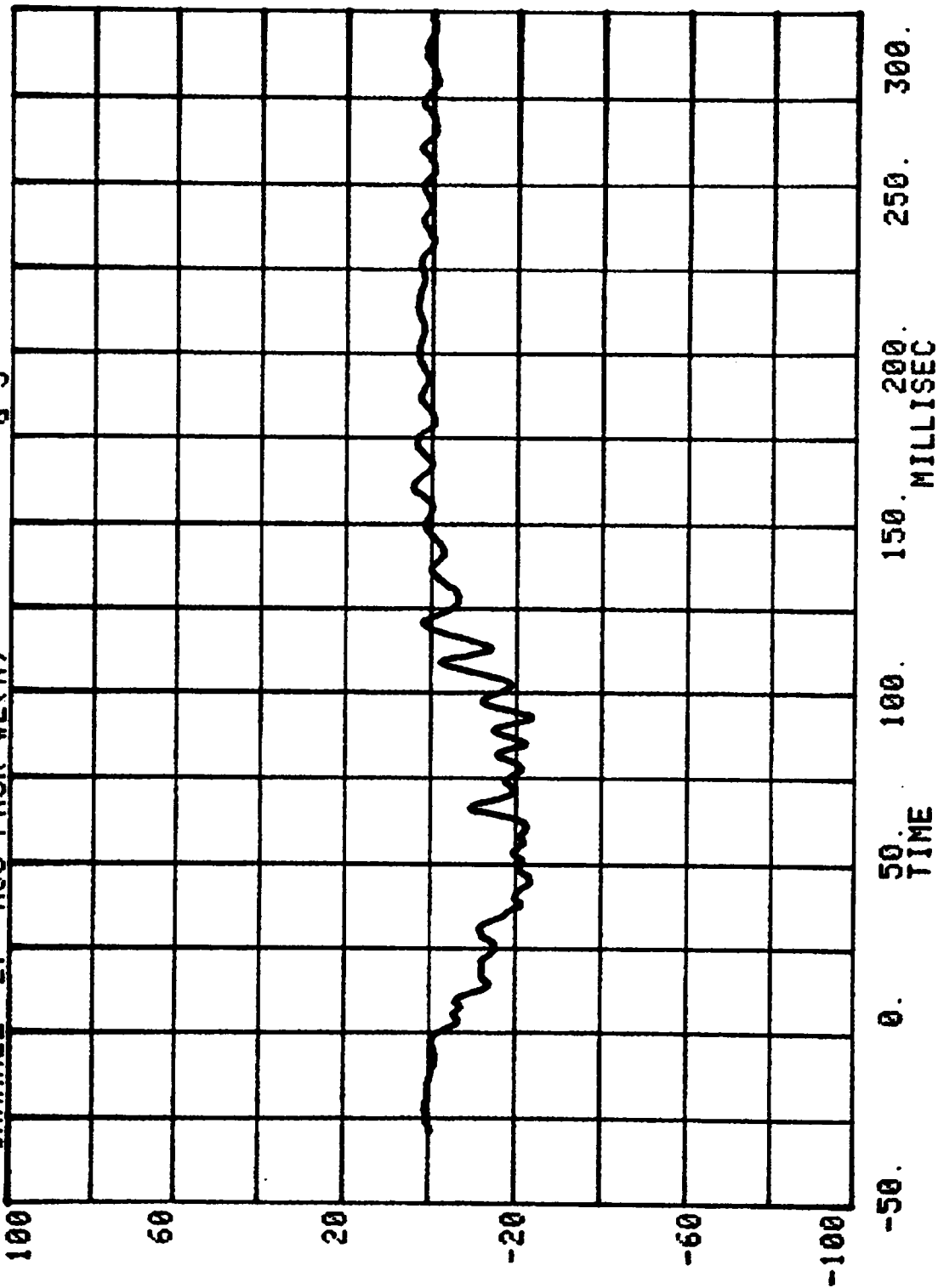




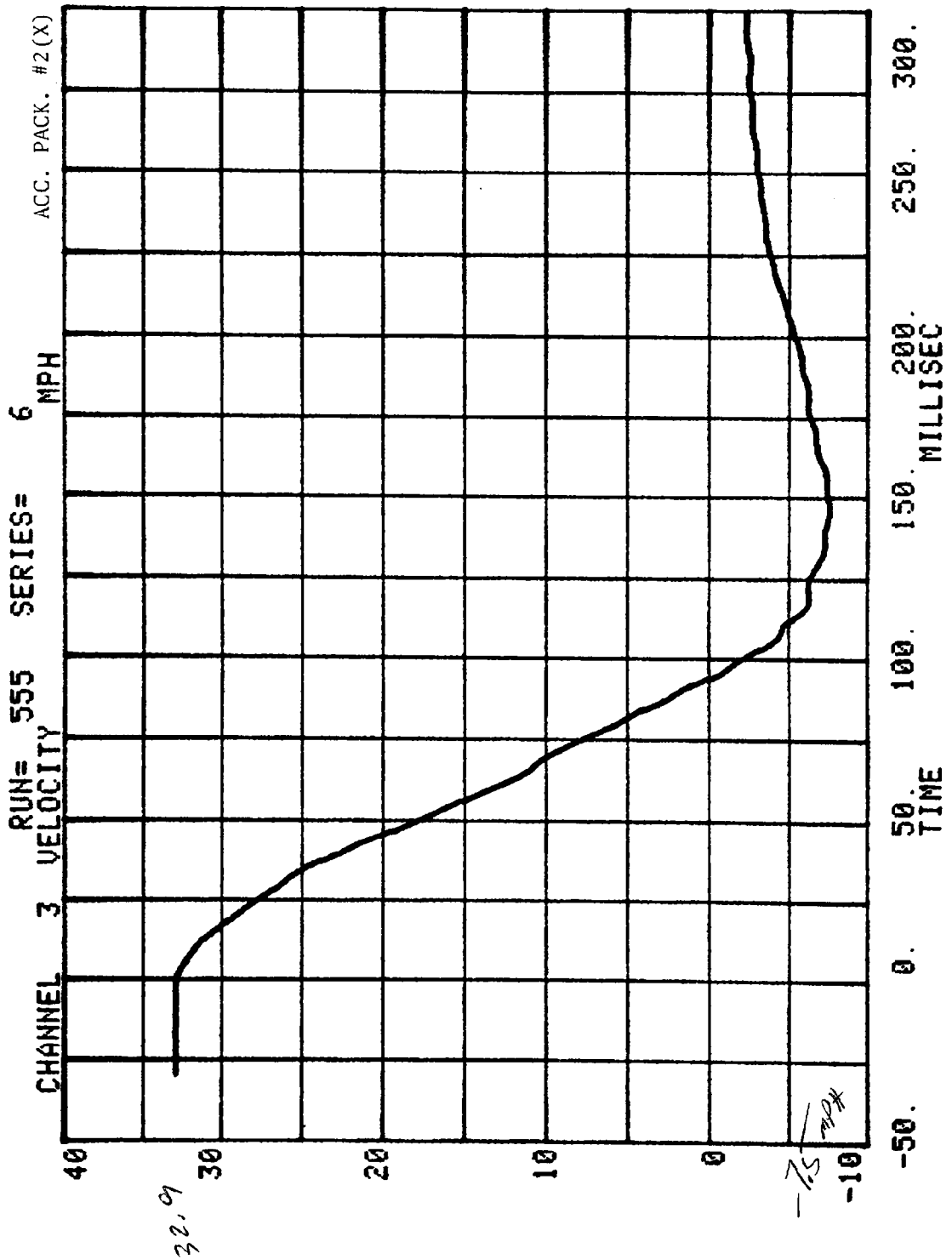
CHANNEL 26 ACC PACK #1(Z) RUN= 555 SERIES= 6 G'S

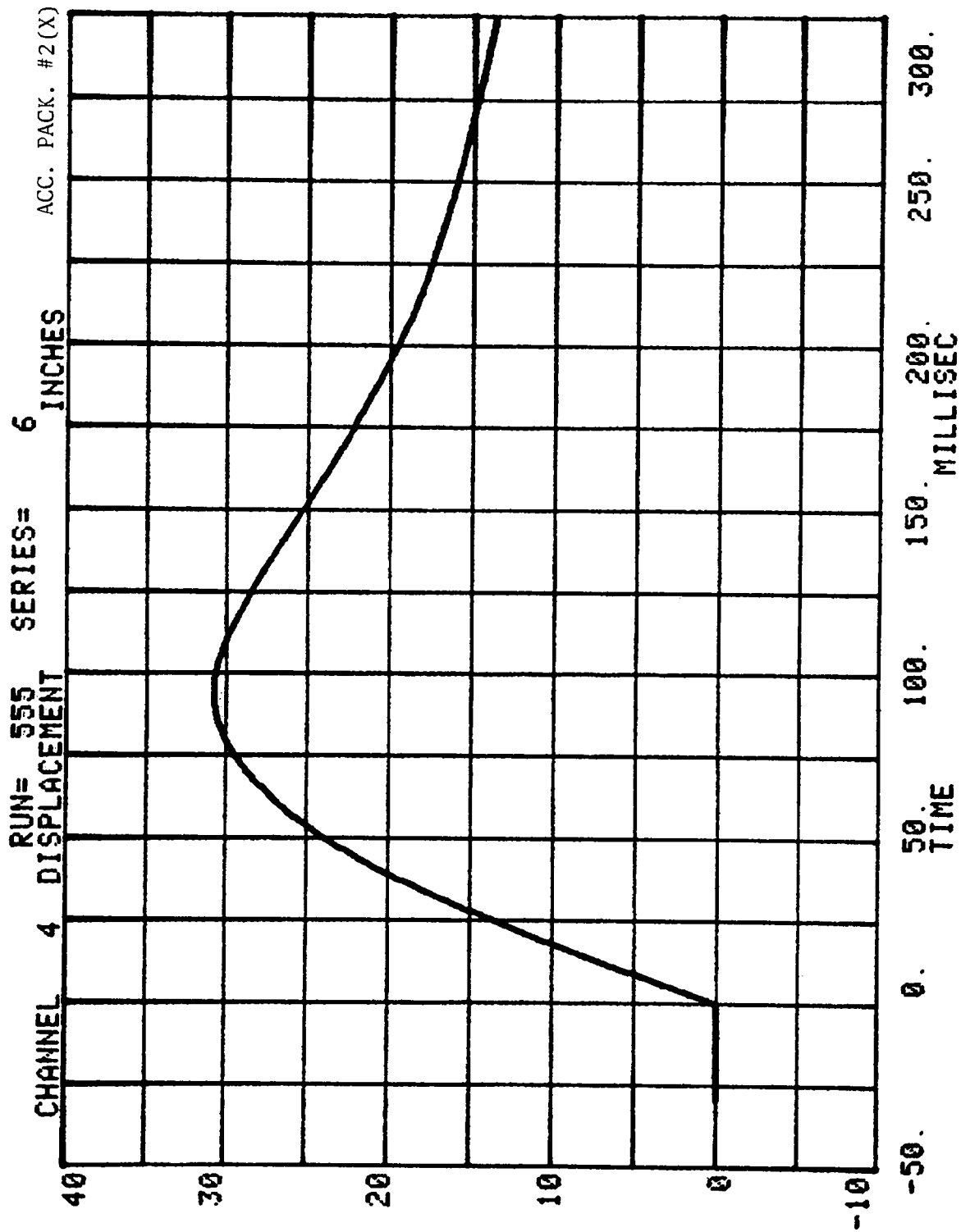


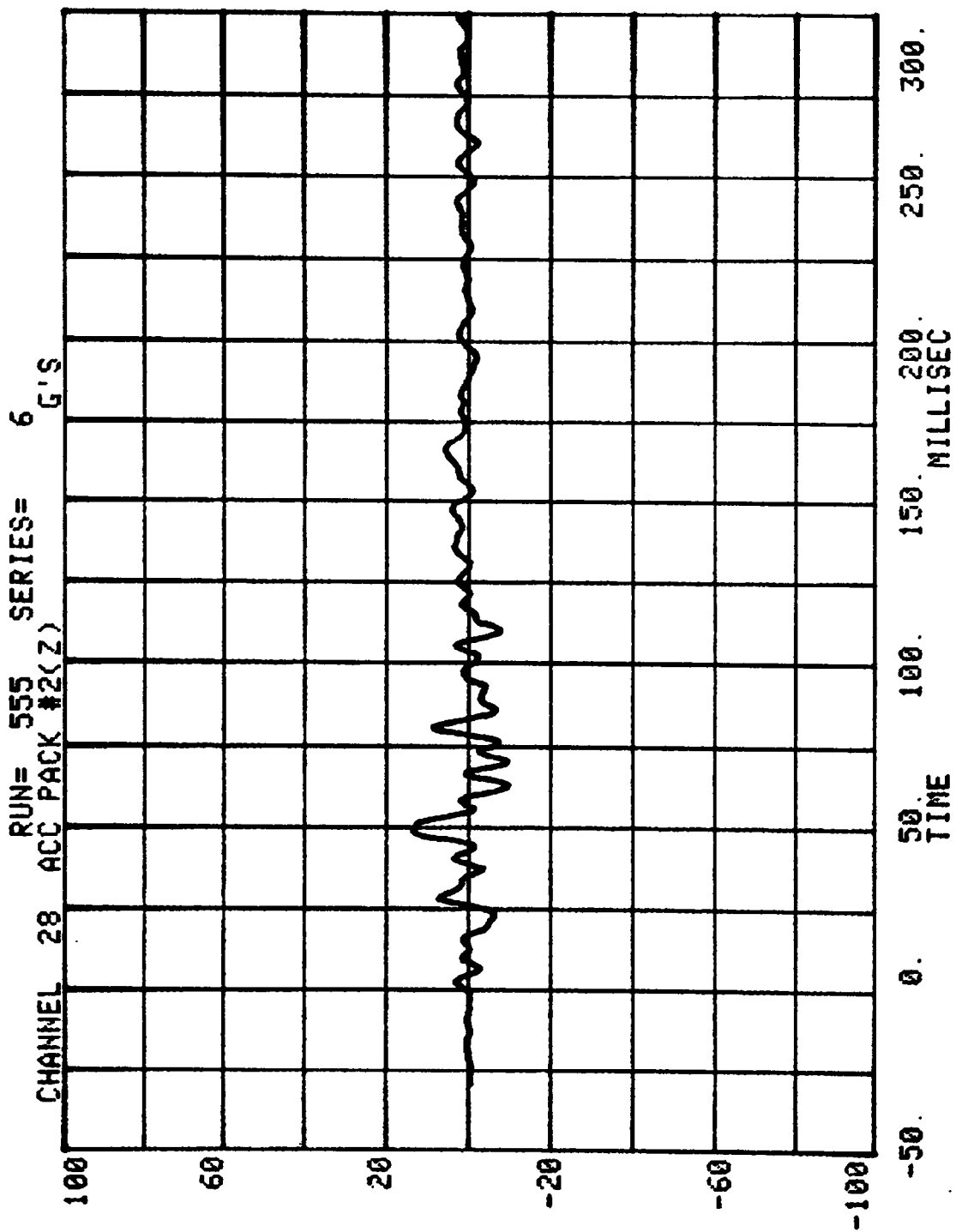
CHANNEL 27 ACC PACK #2(X) RUN= 555 SERIES= 6 G'S

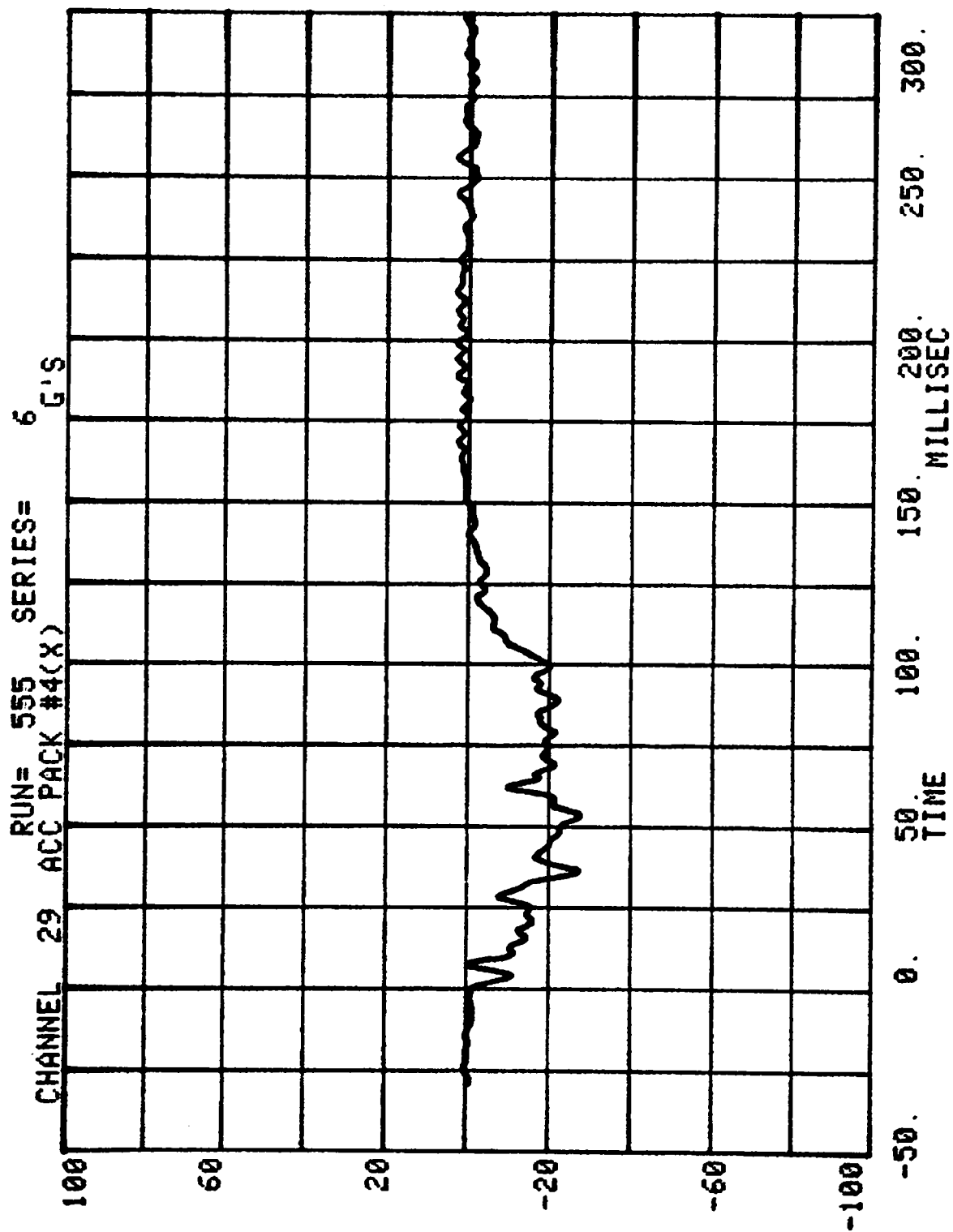


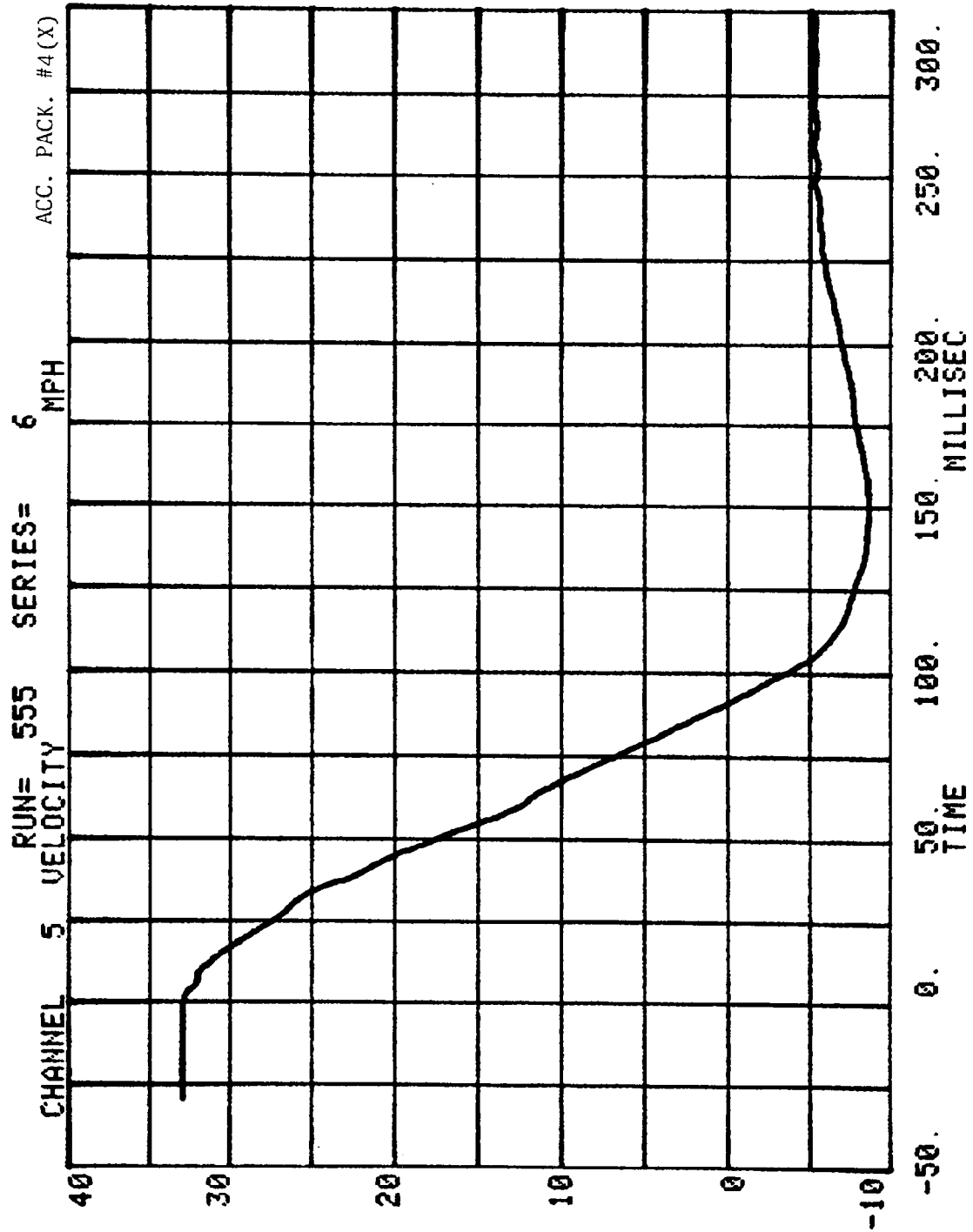
IMP-4871

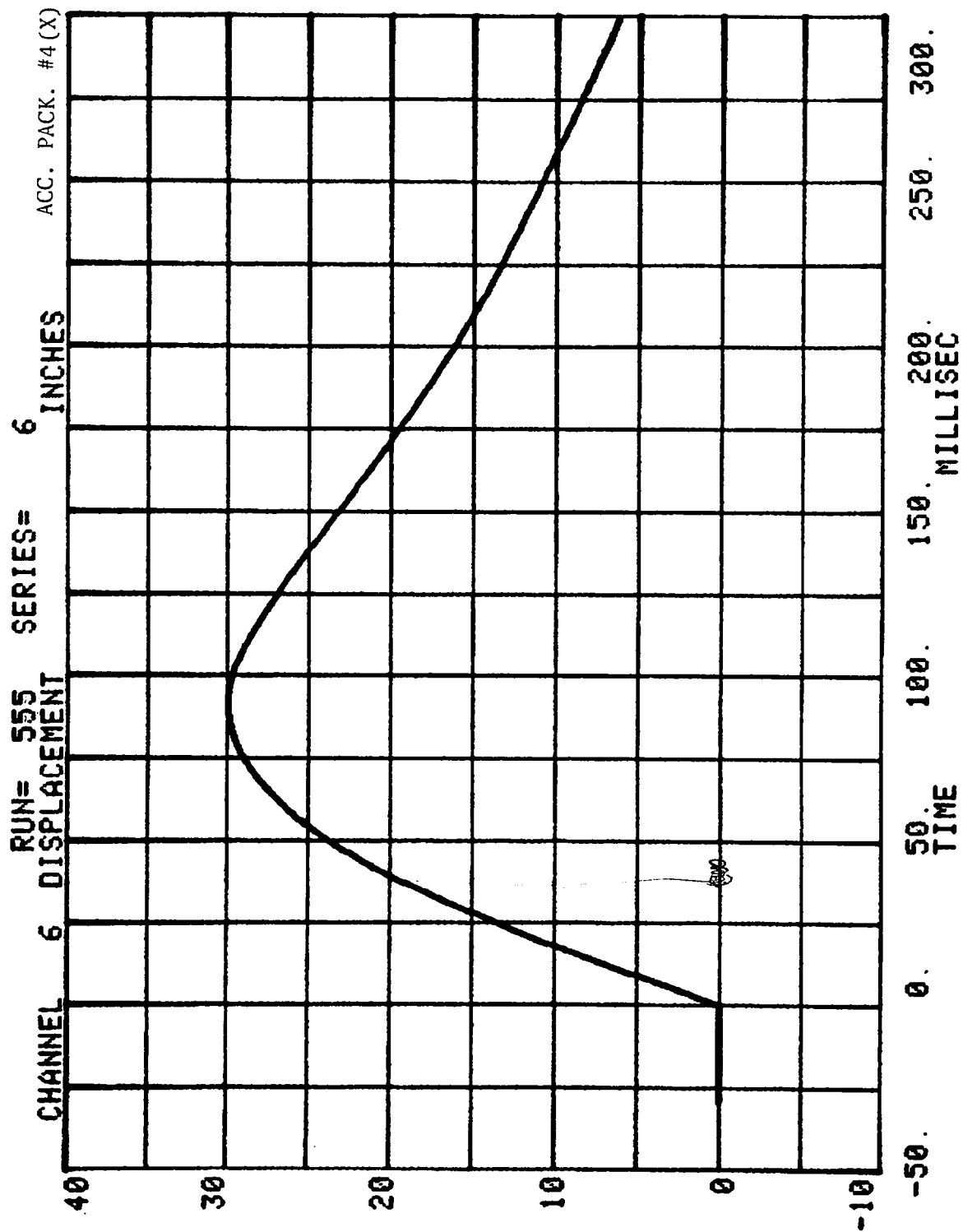


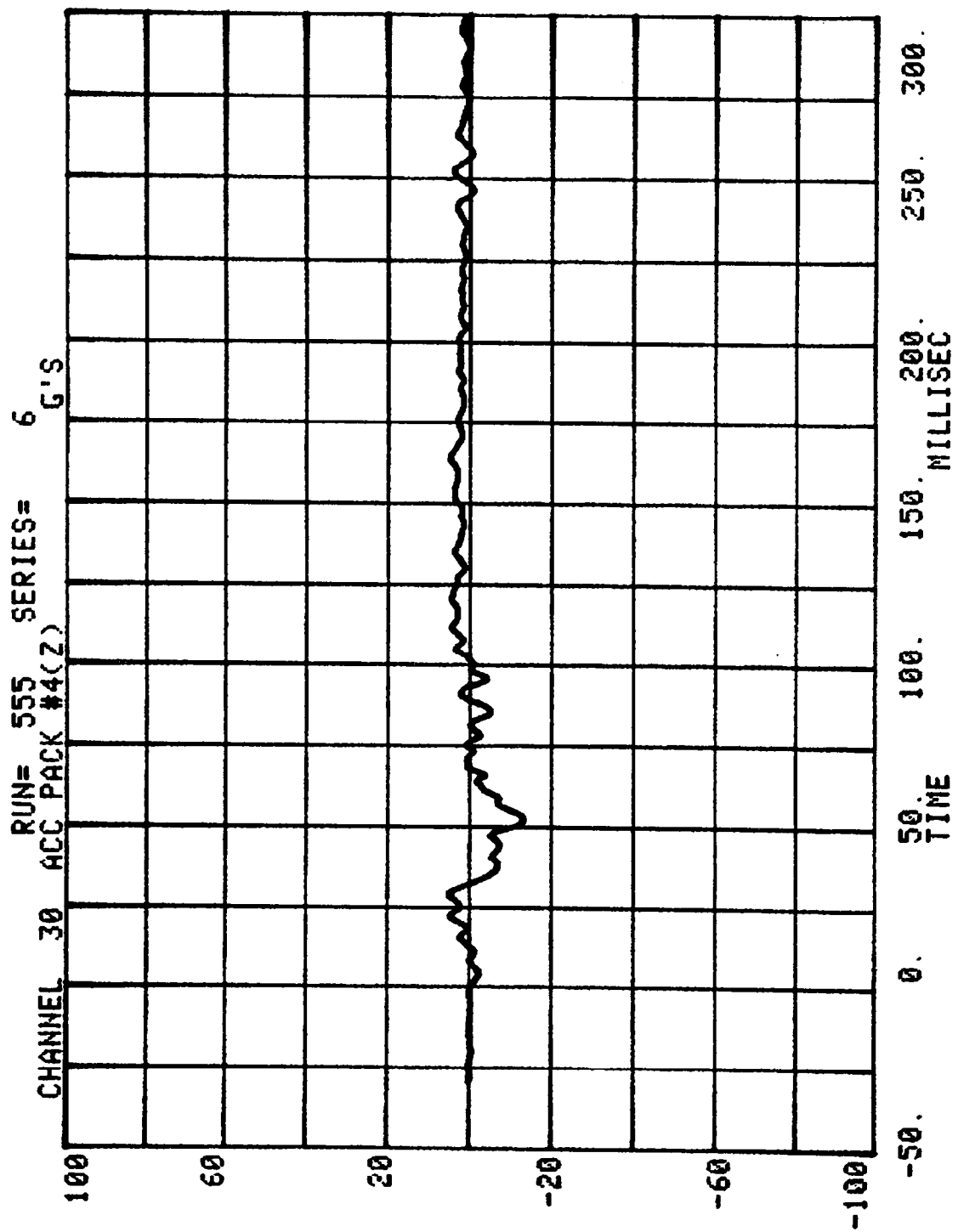


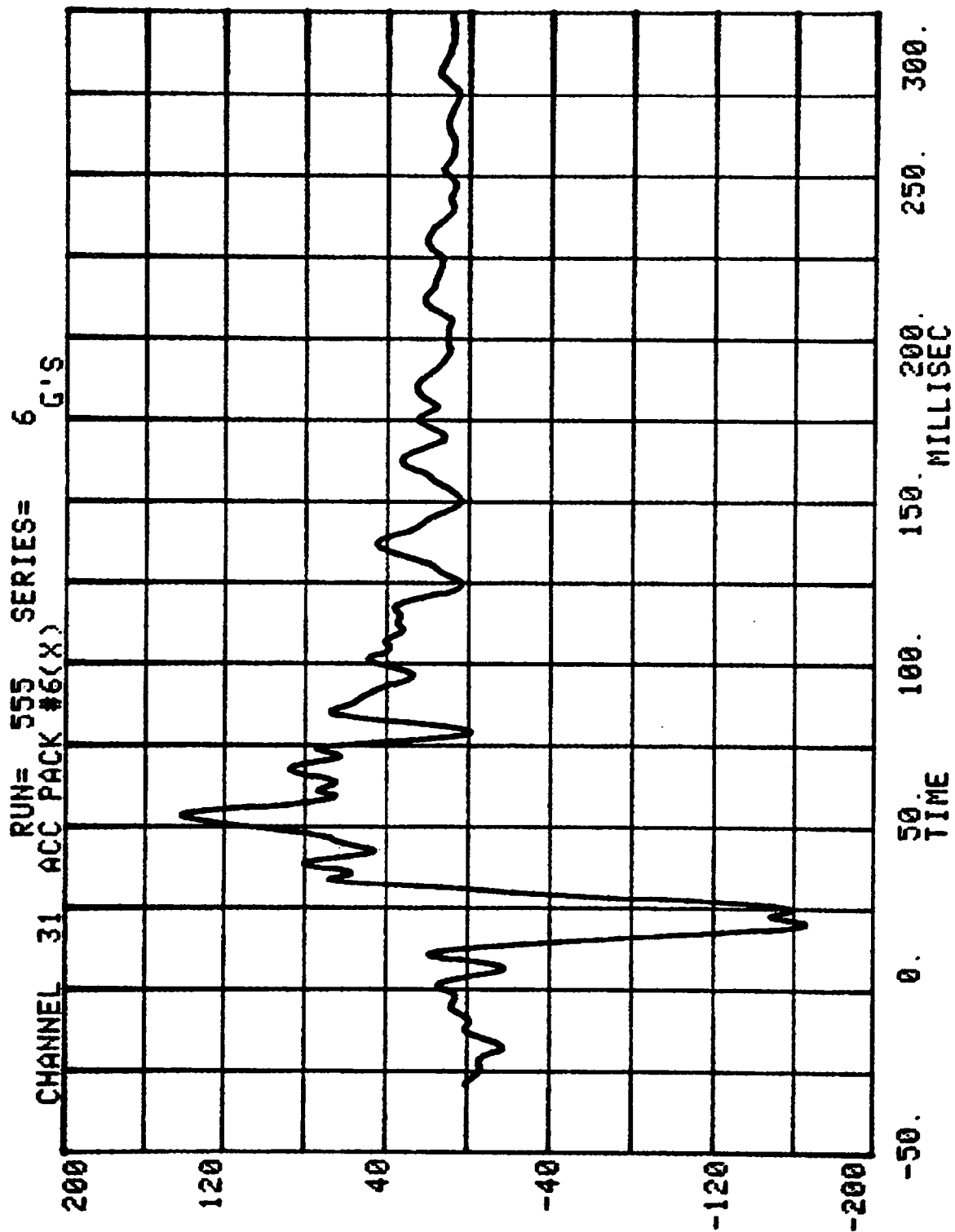


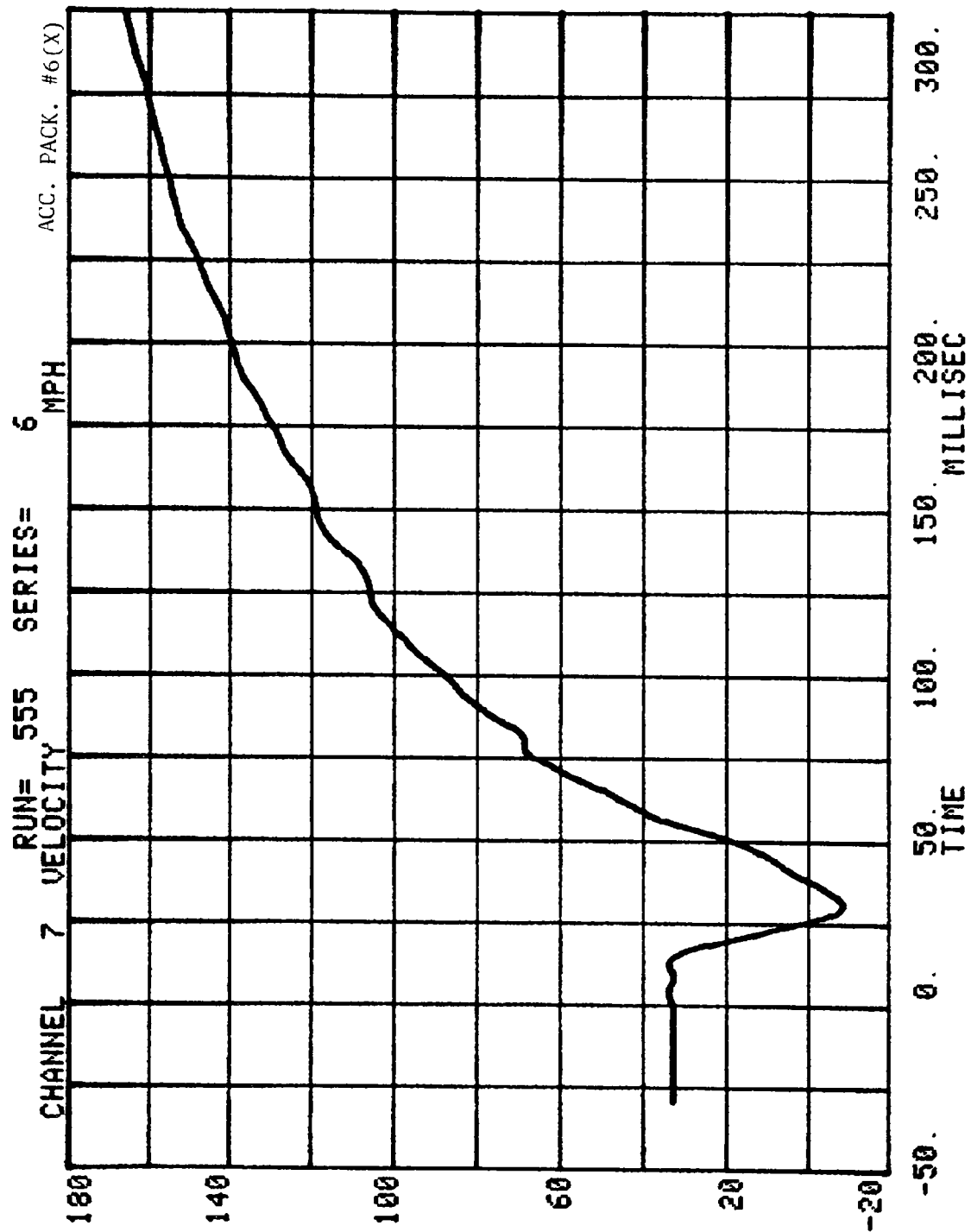


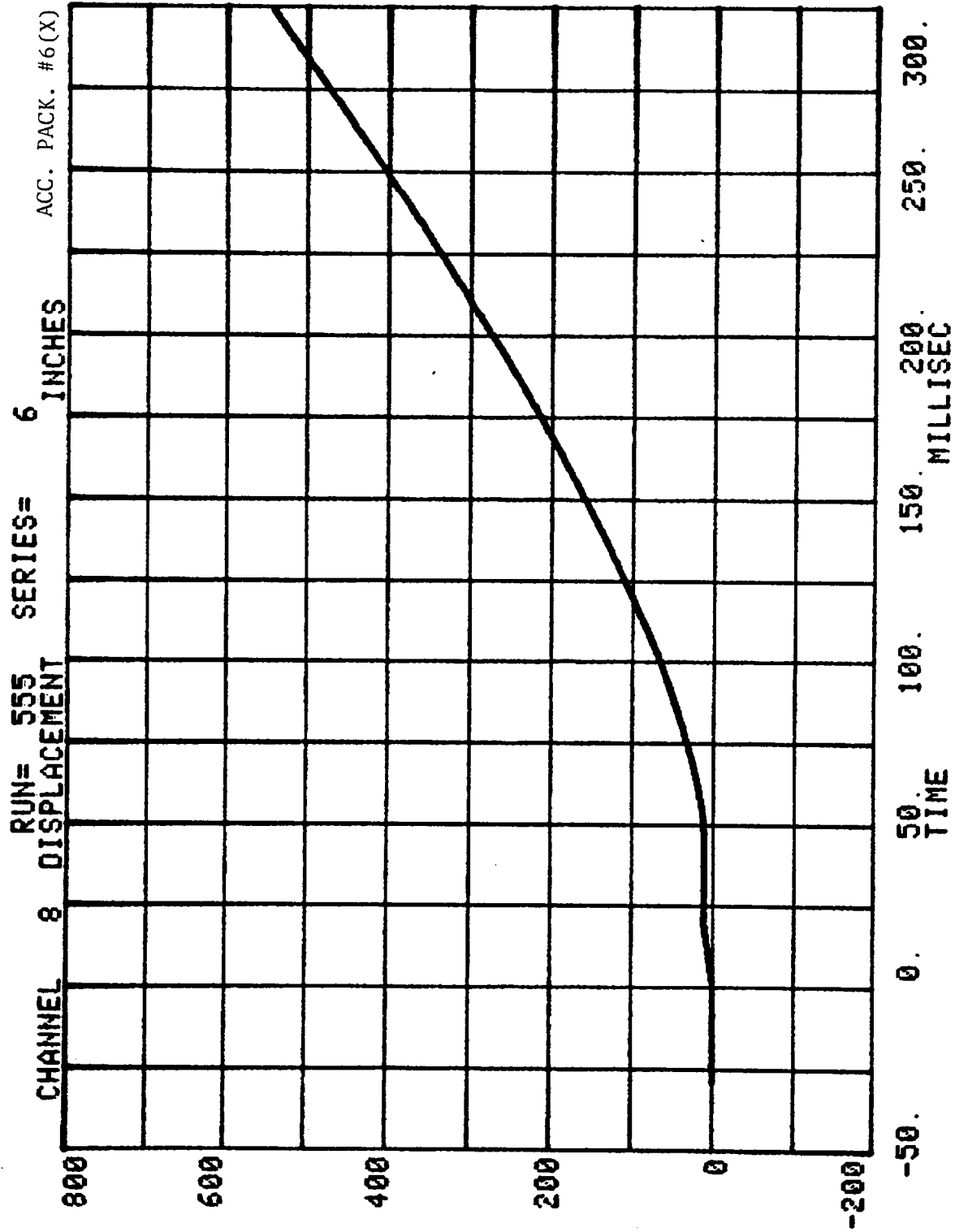


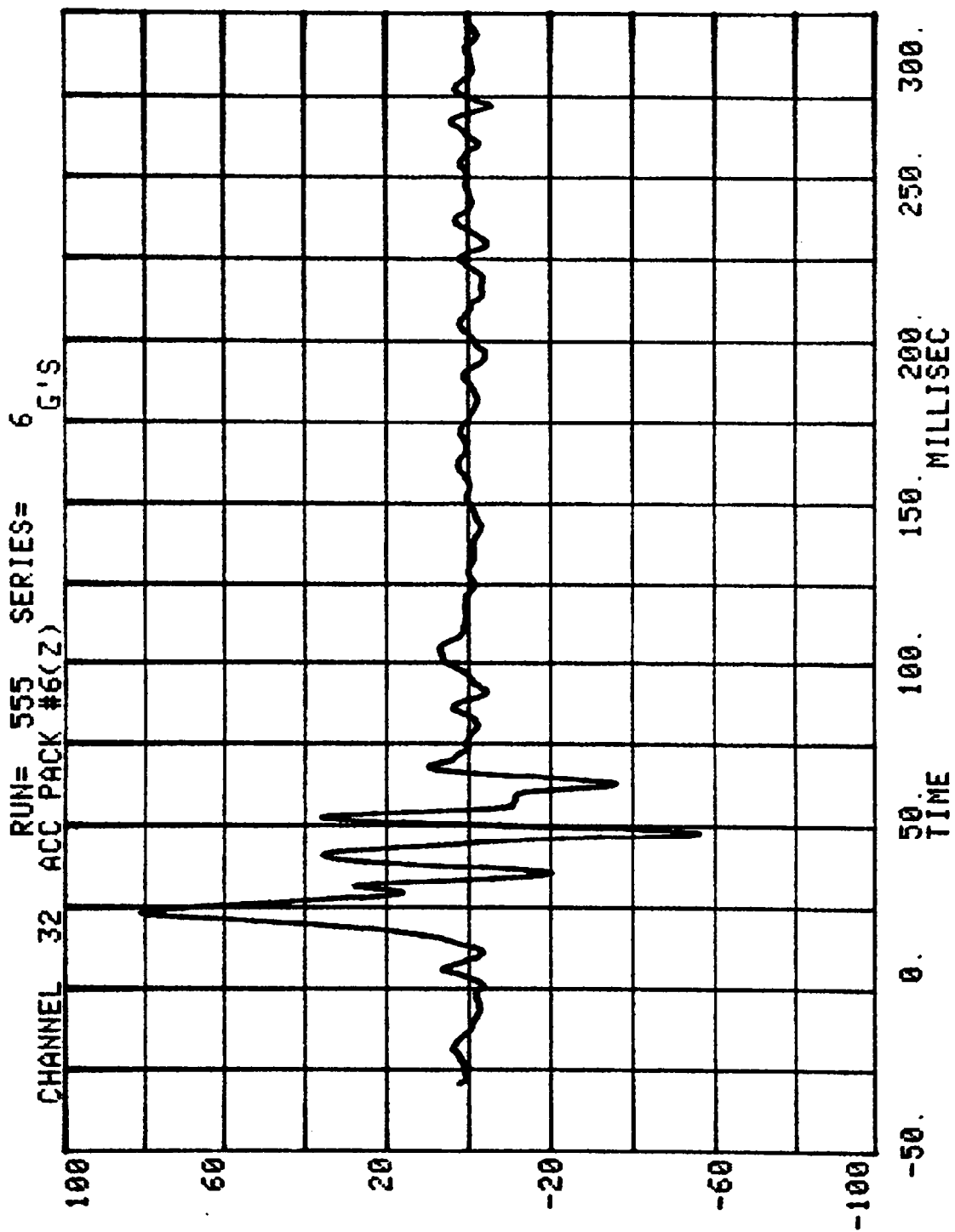


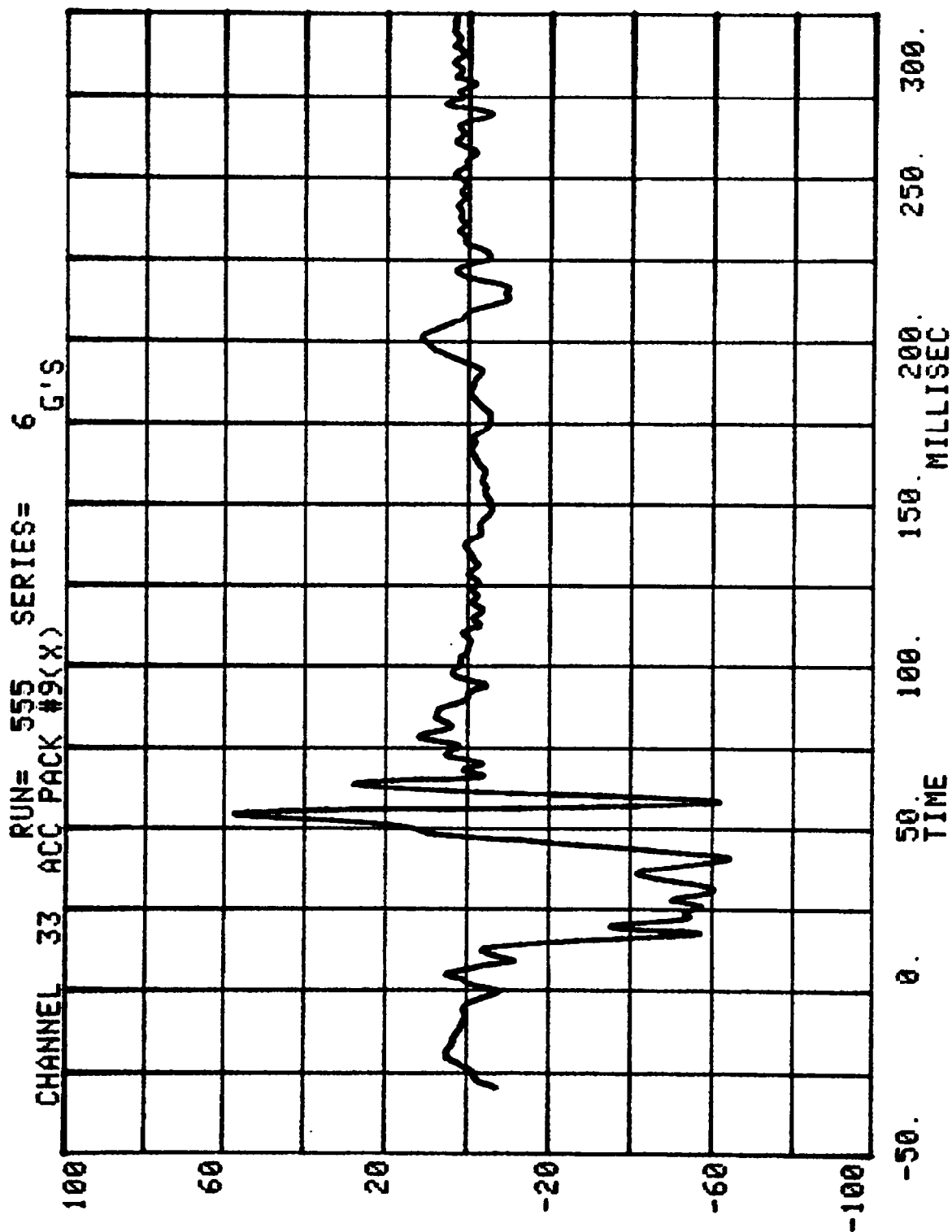


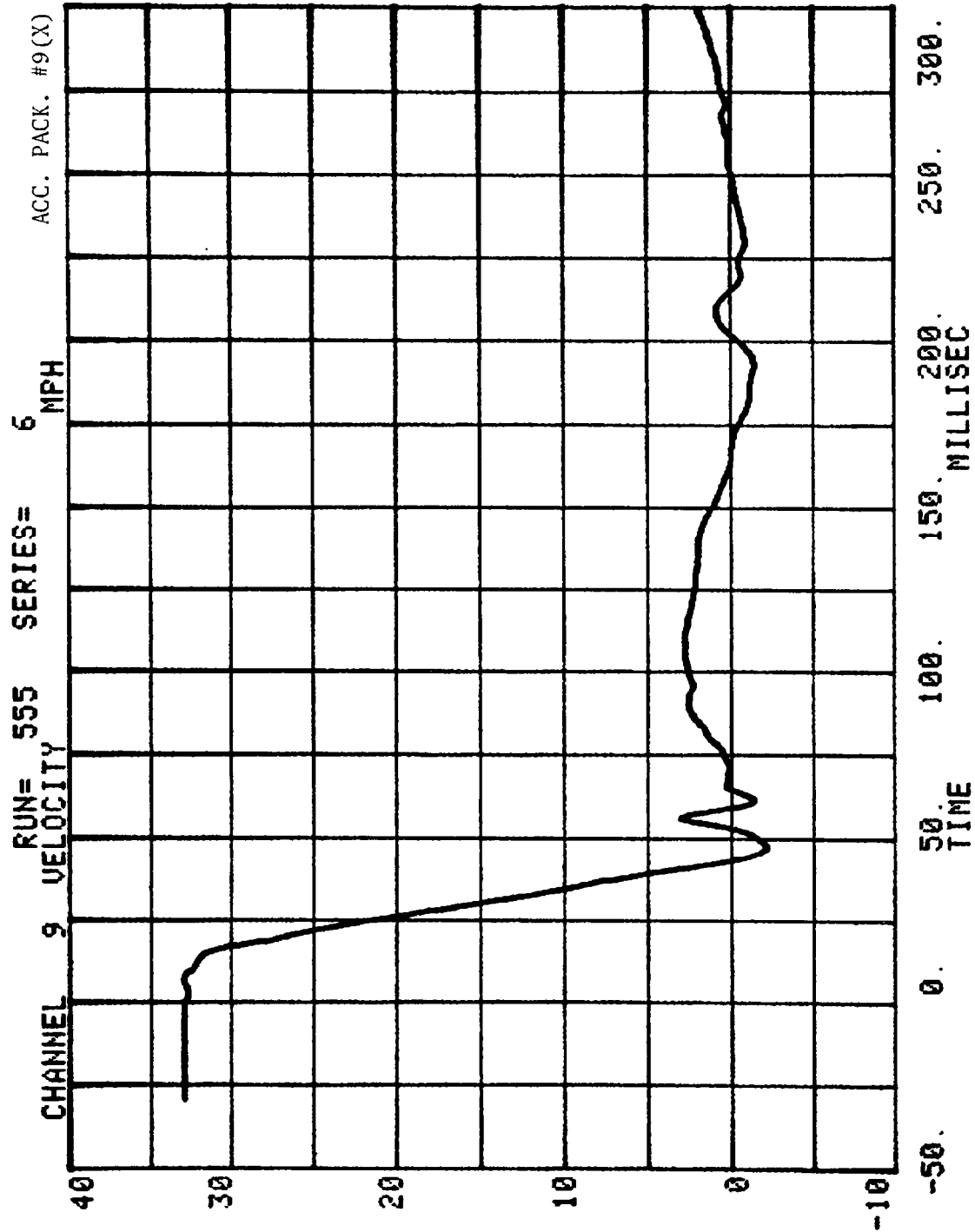


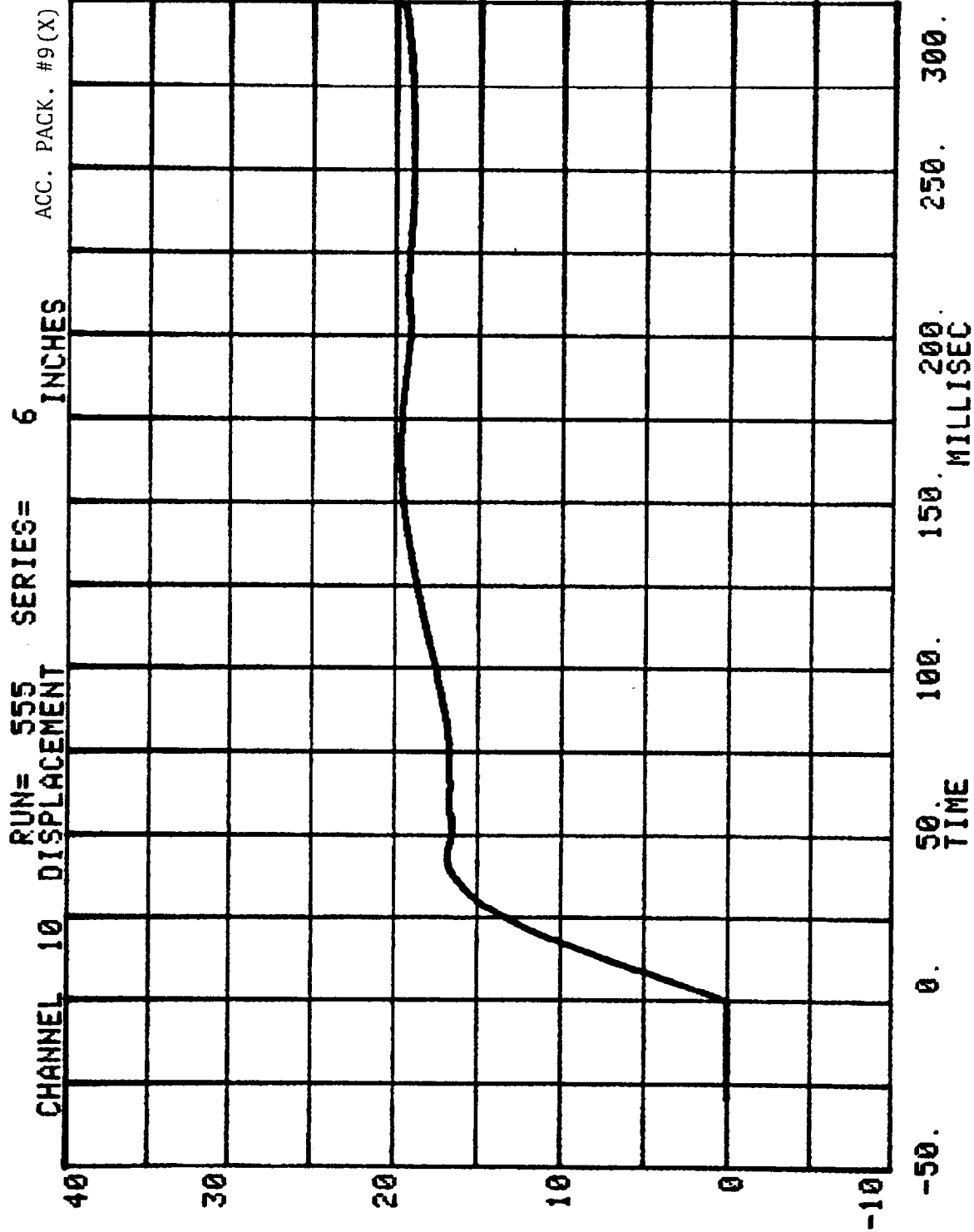


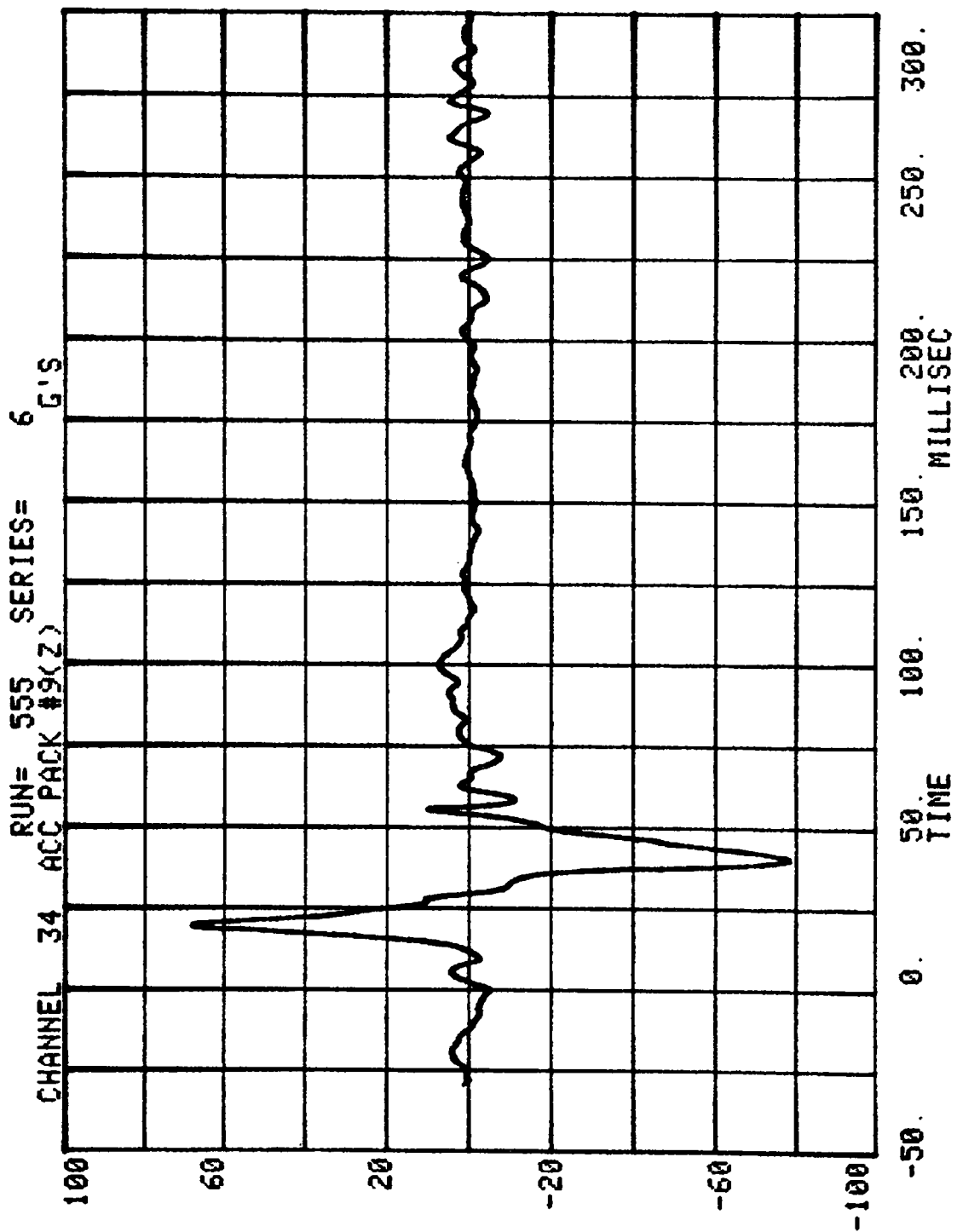




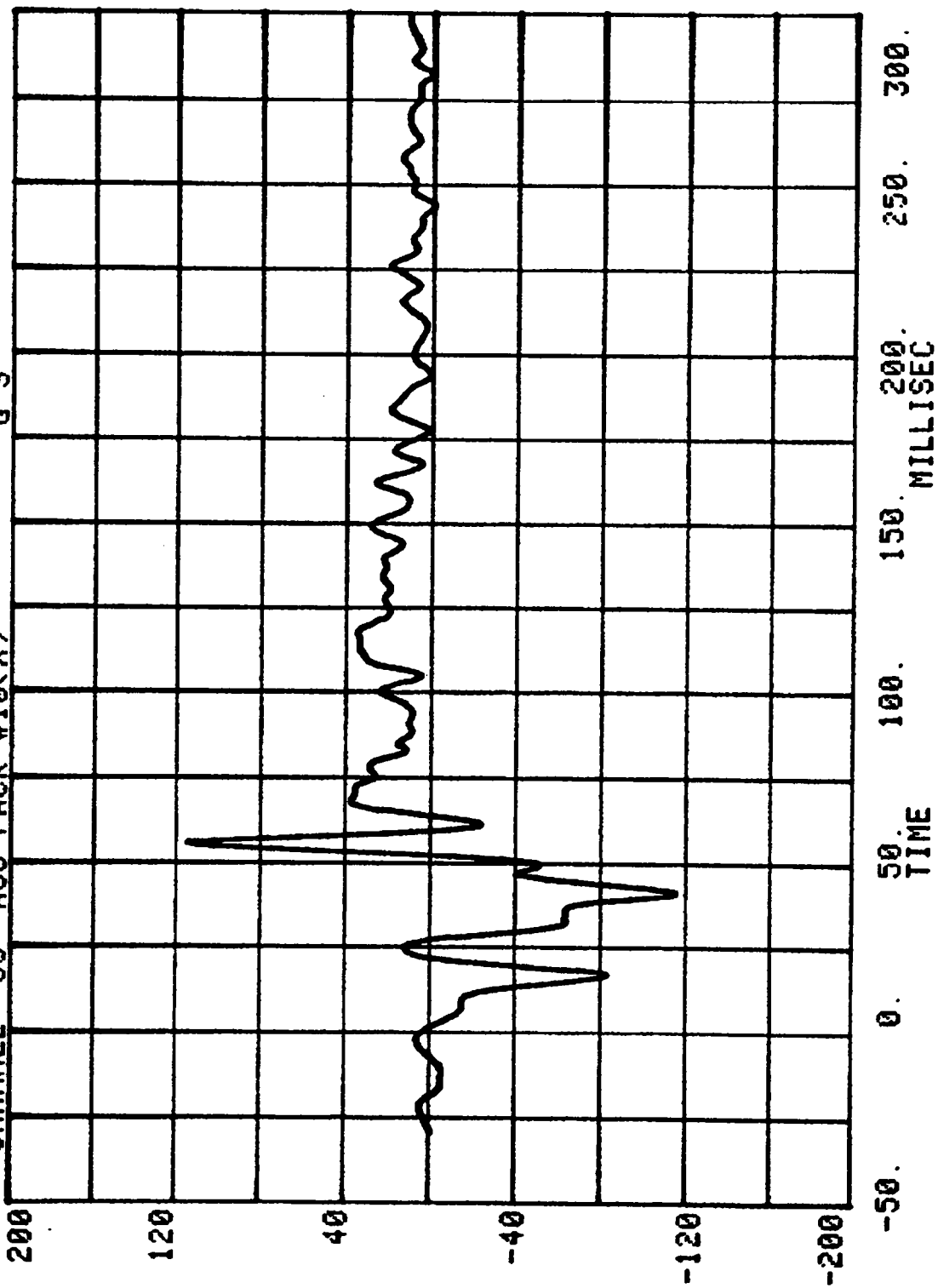


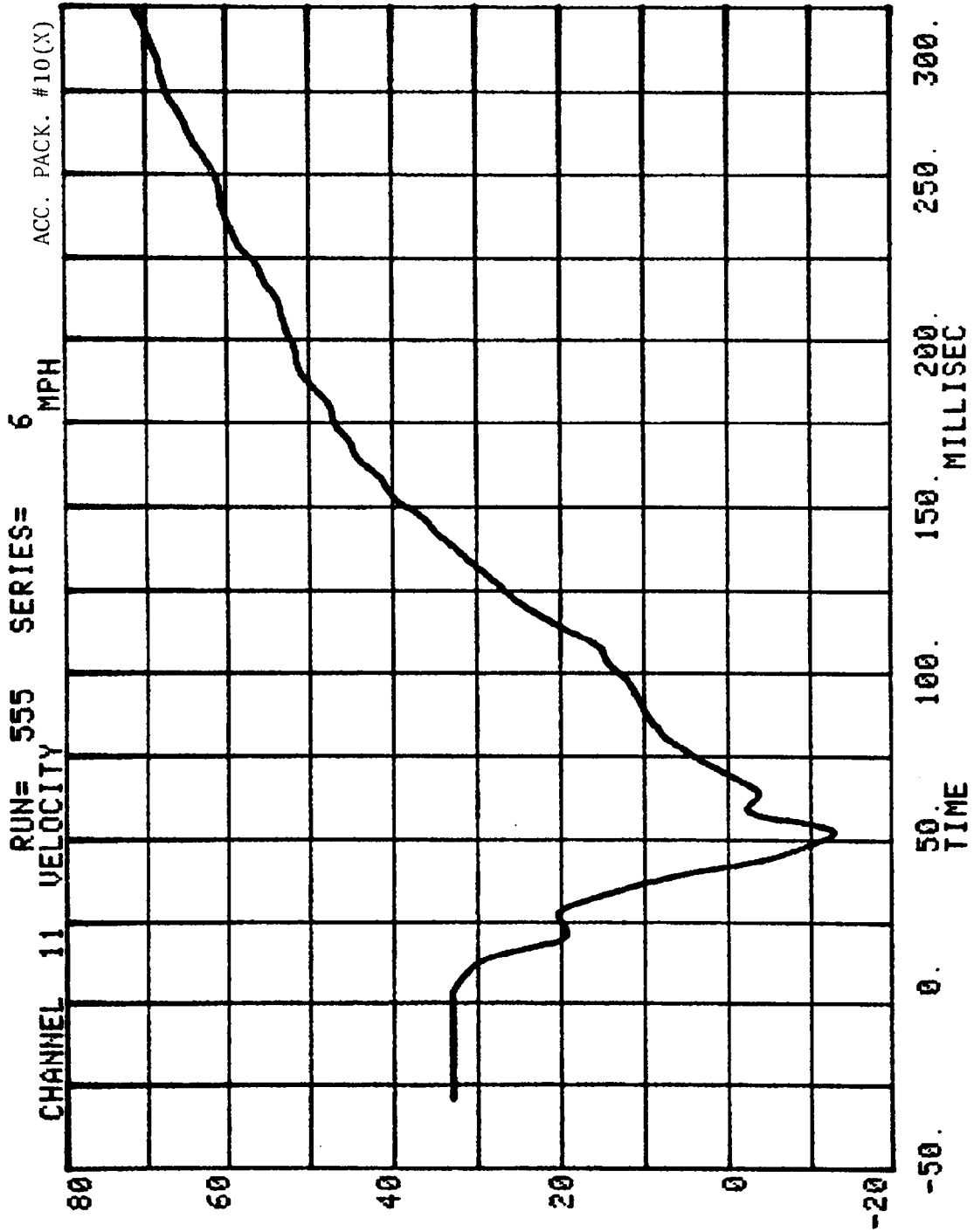


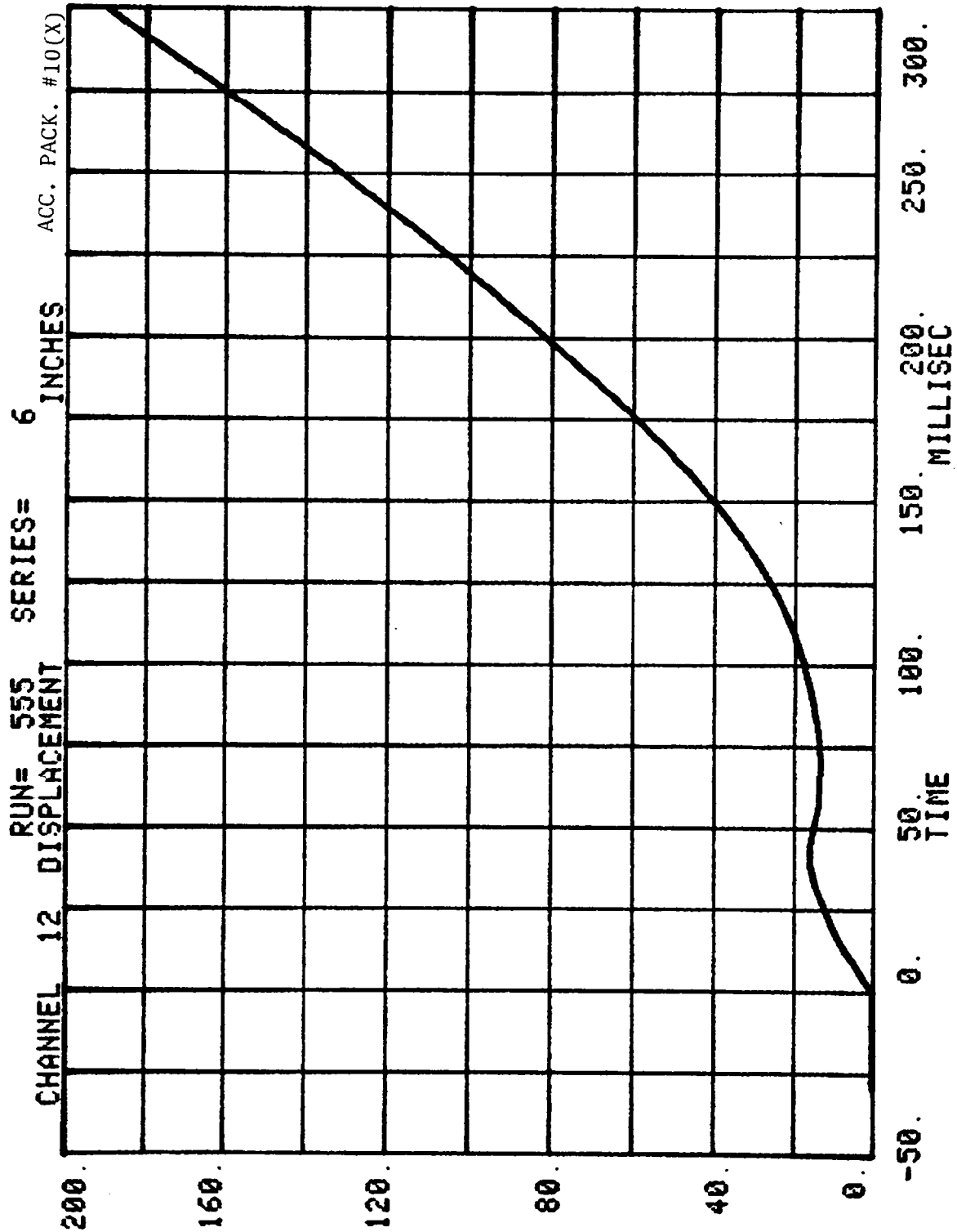


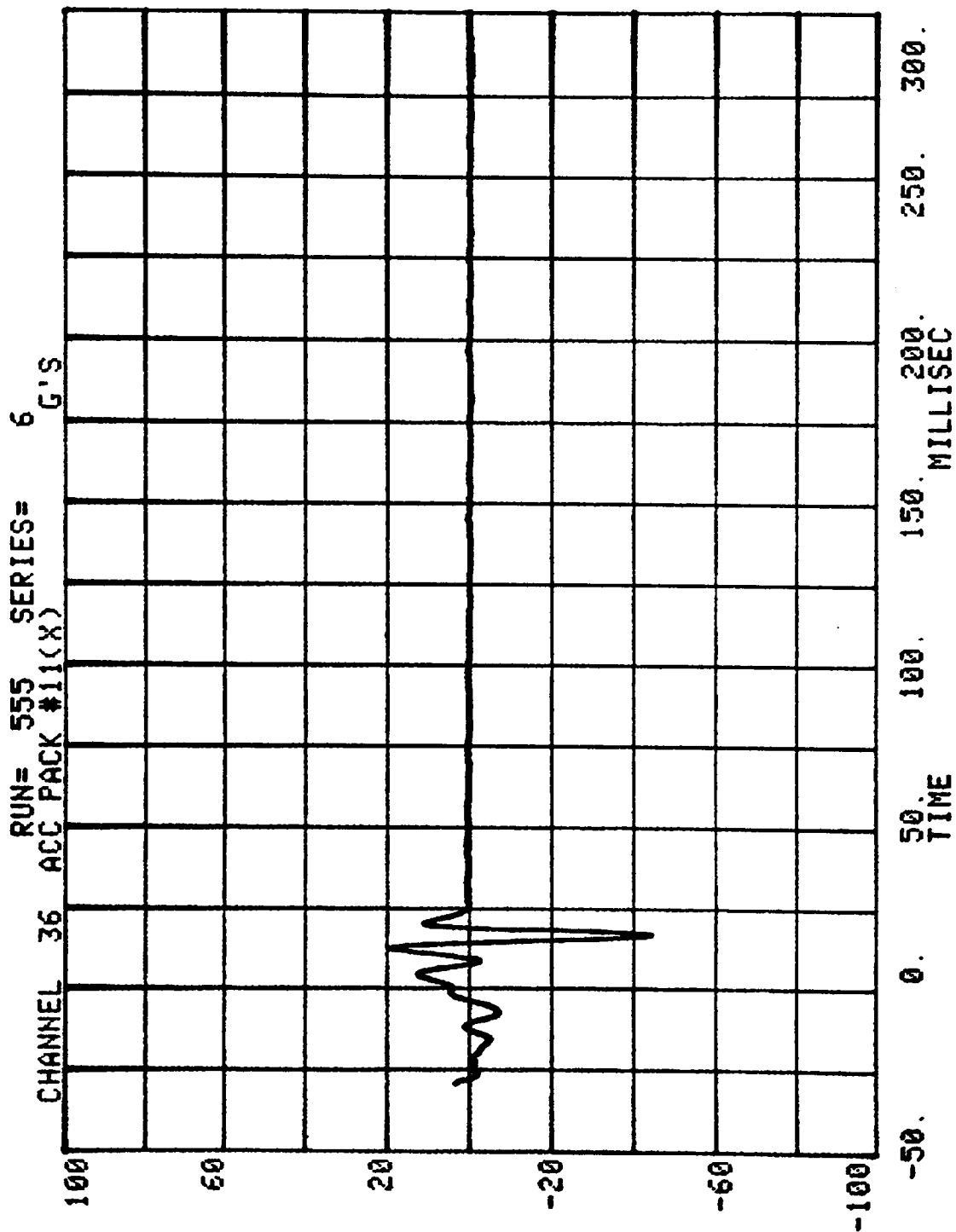


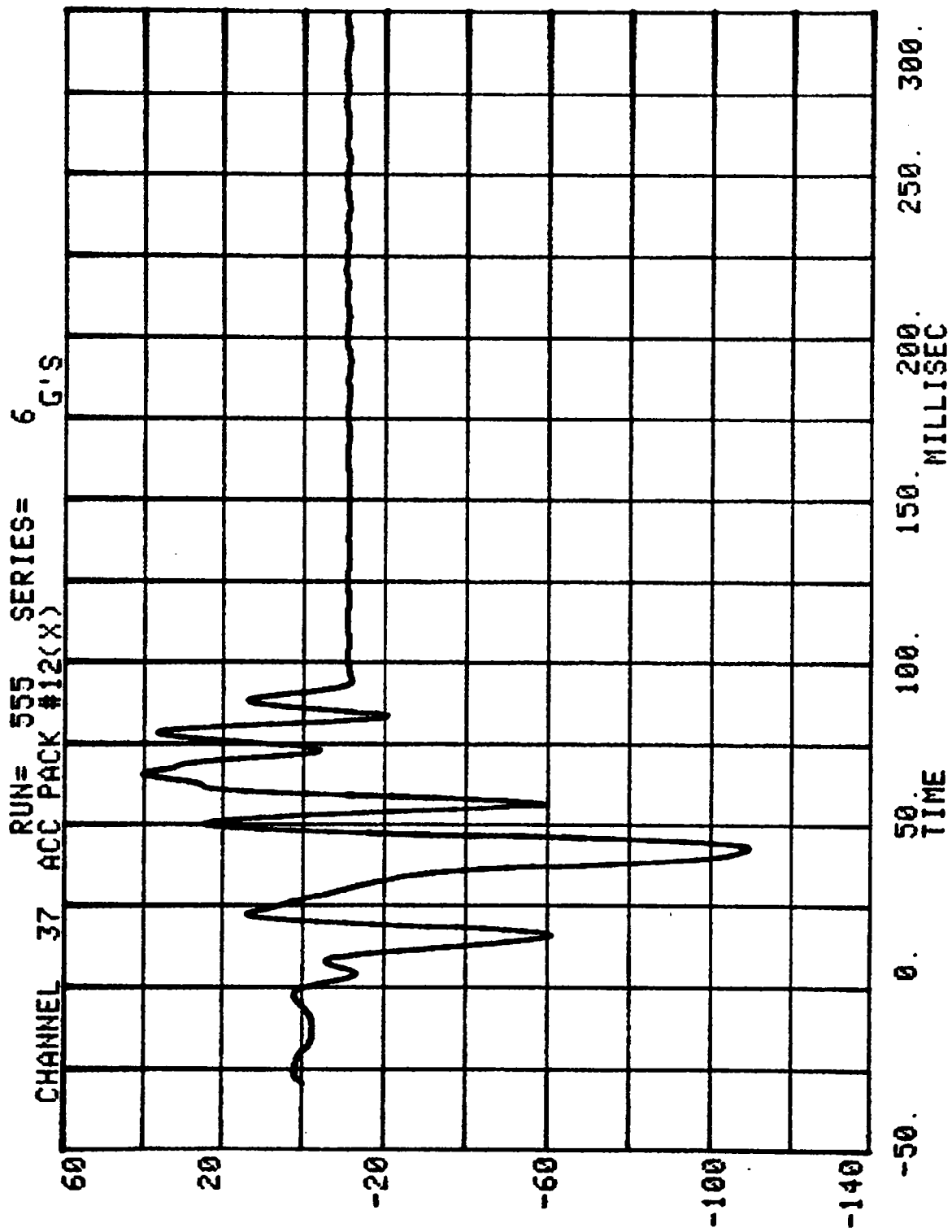
RUN= 555 SERIES= 6
CHANNEL 35 ACC PACK #10(X) G'S

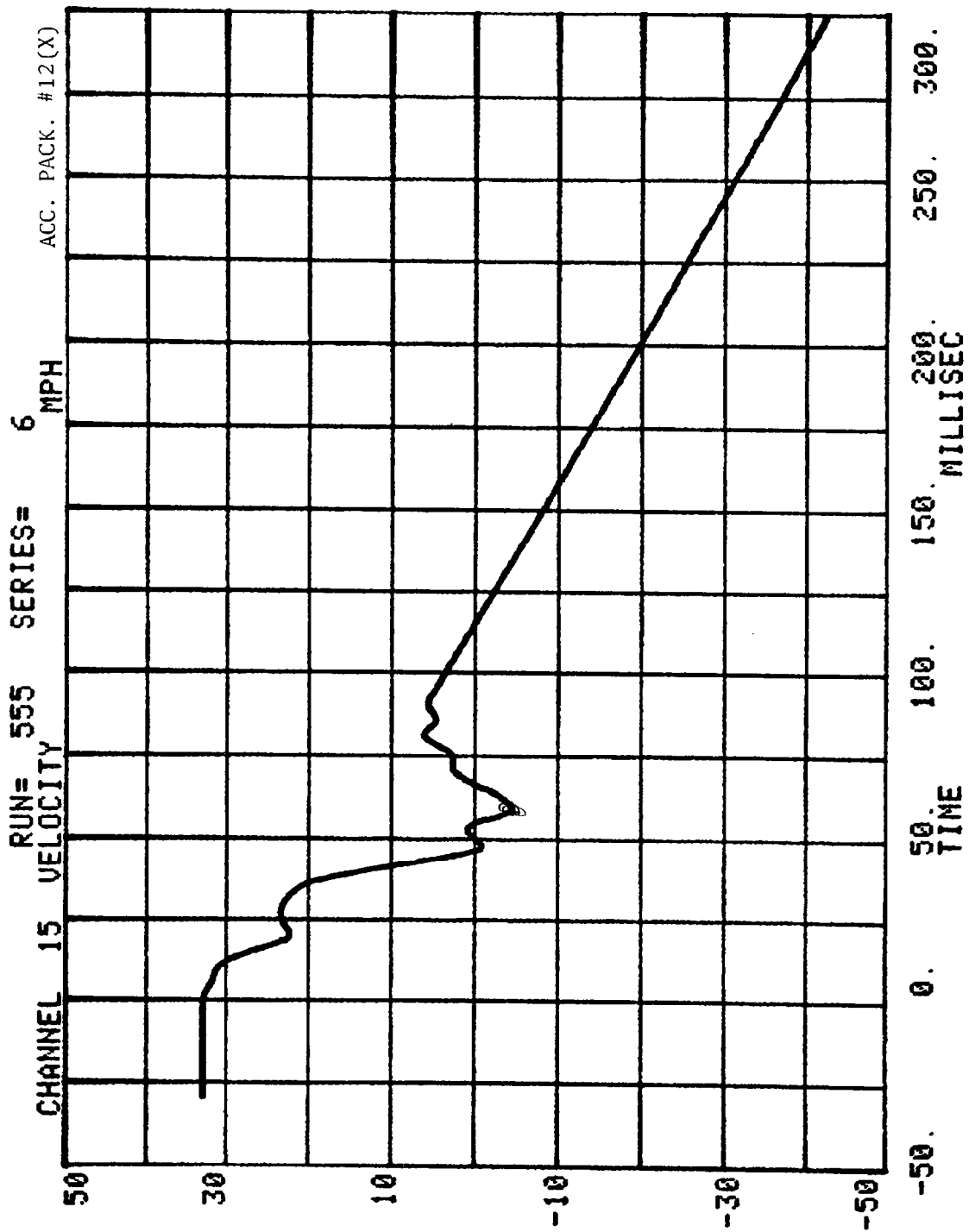


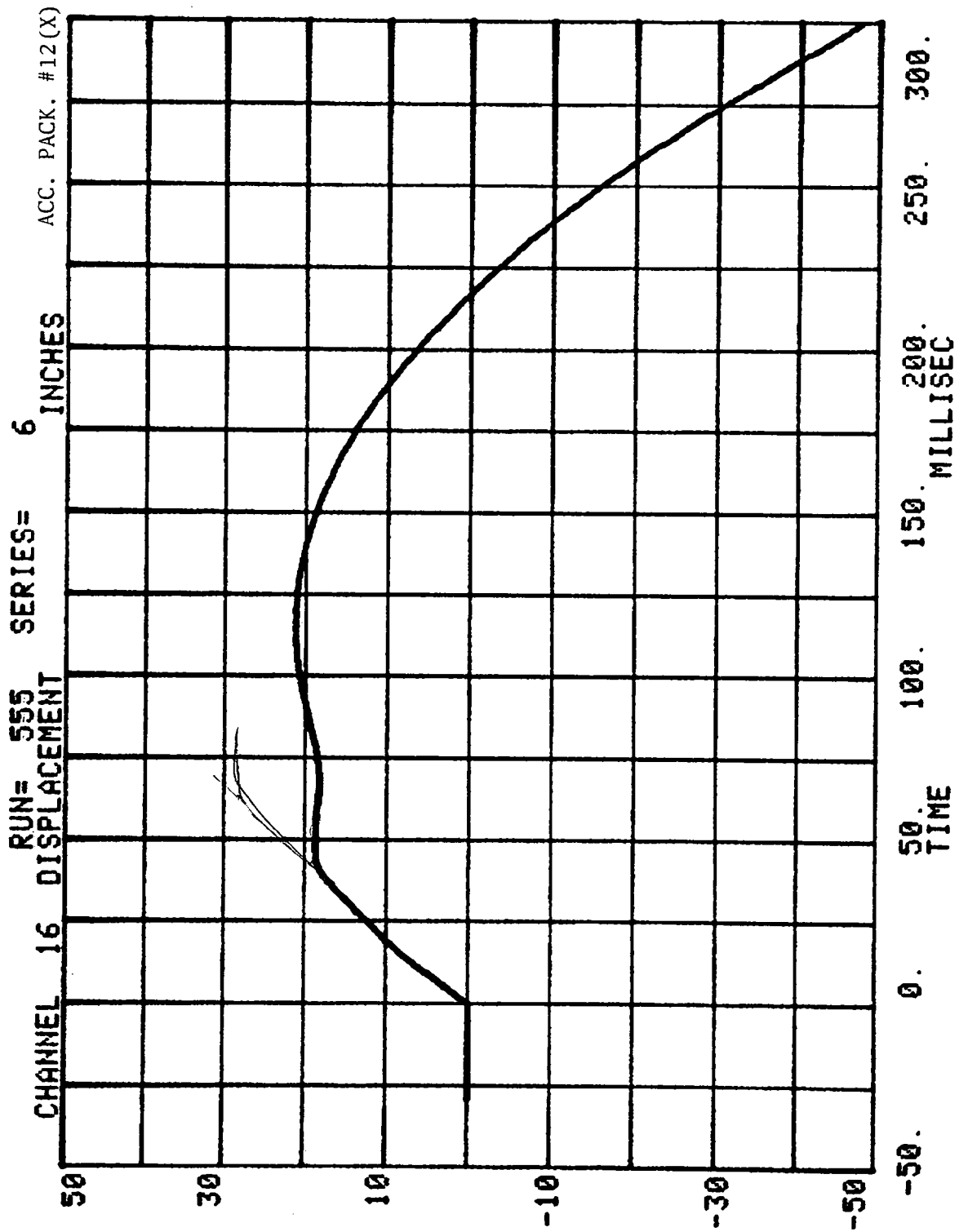


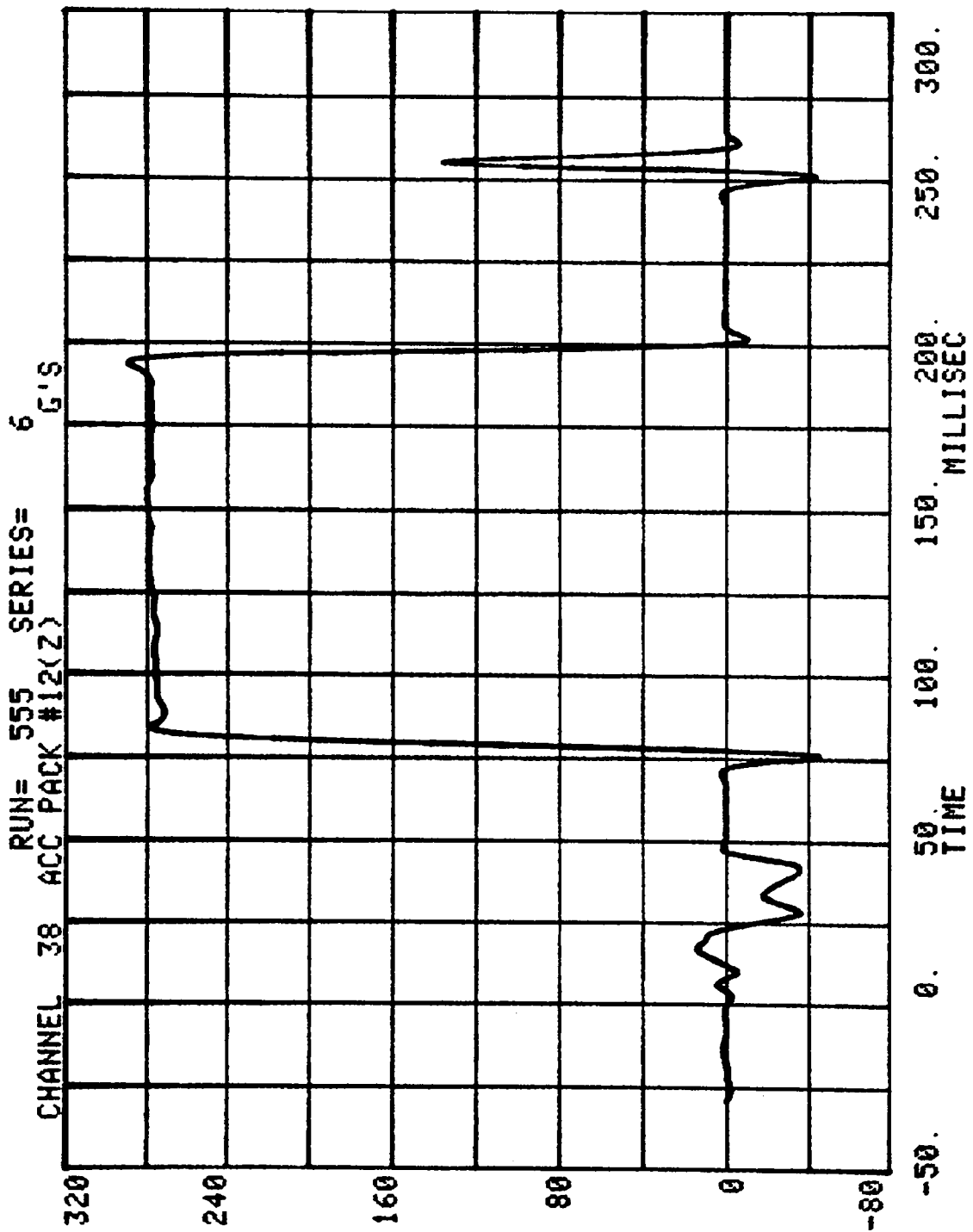


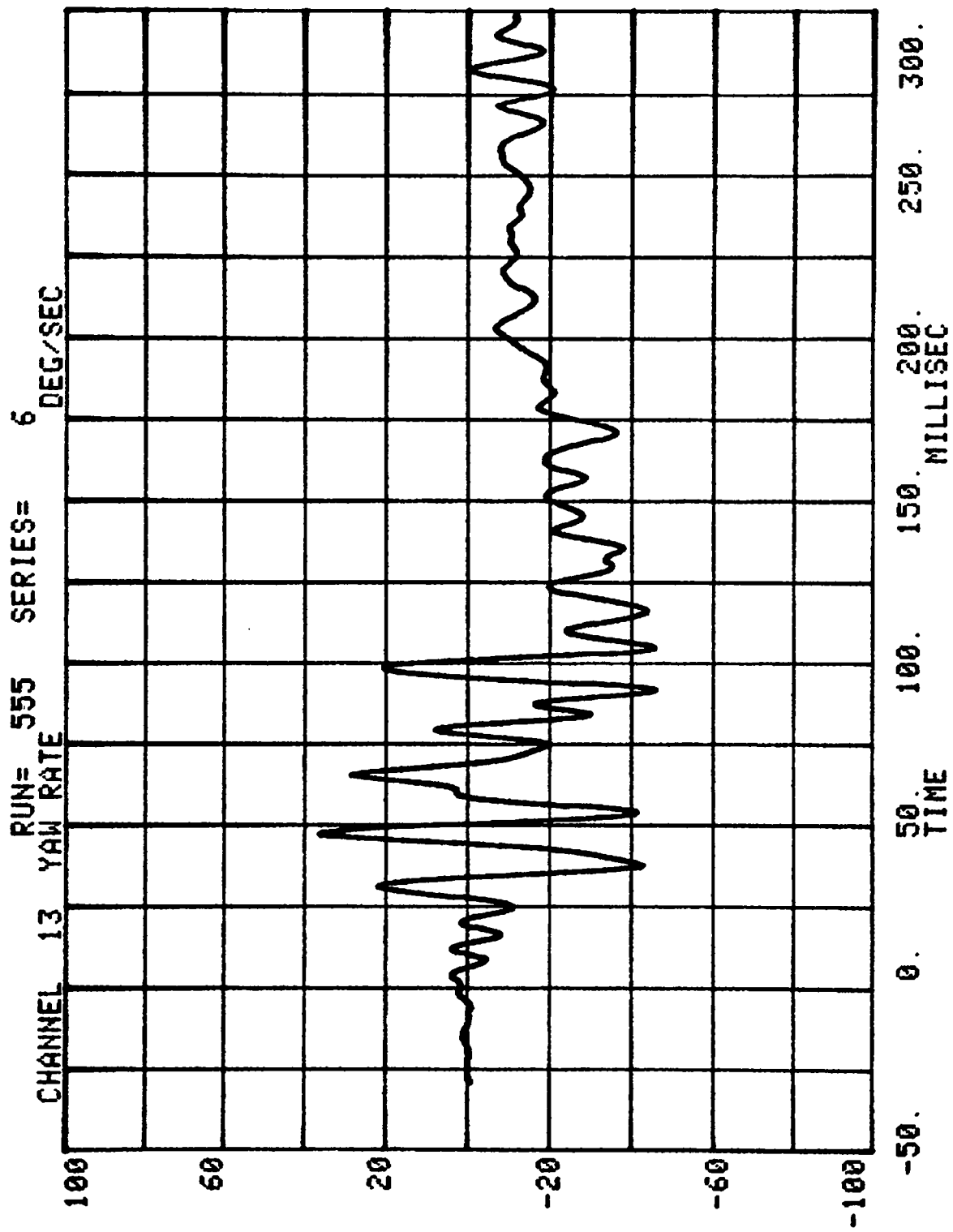


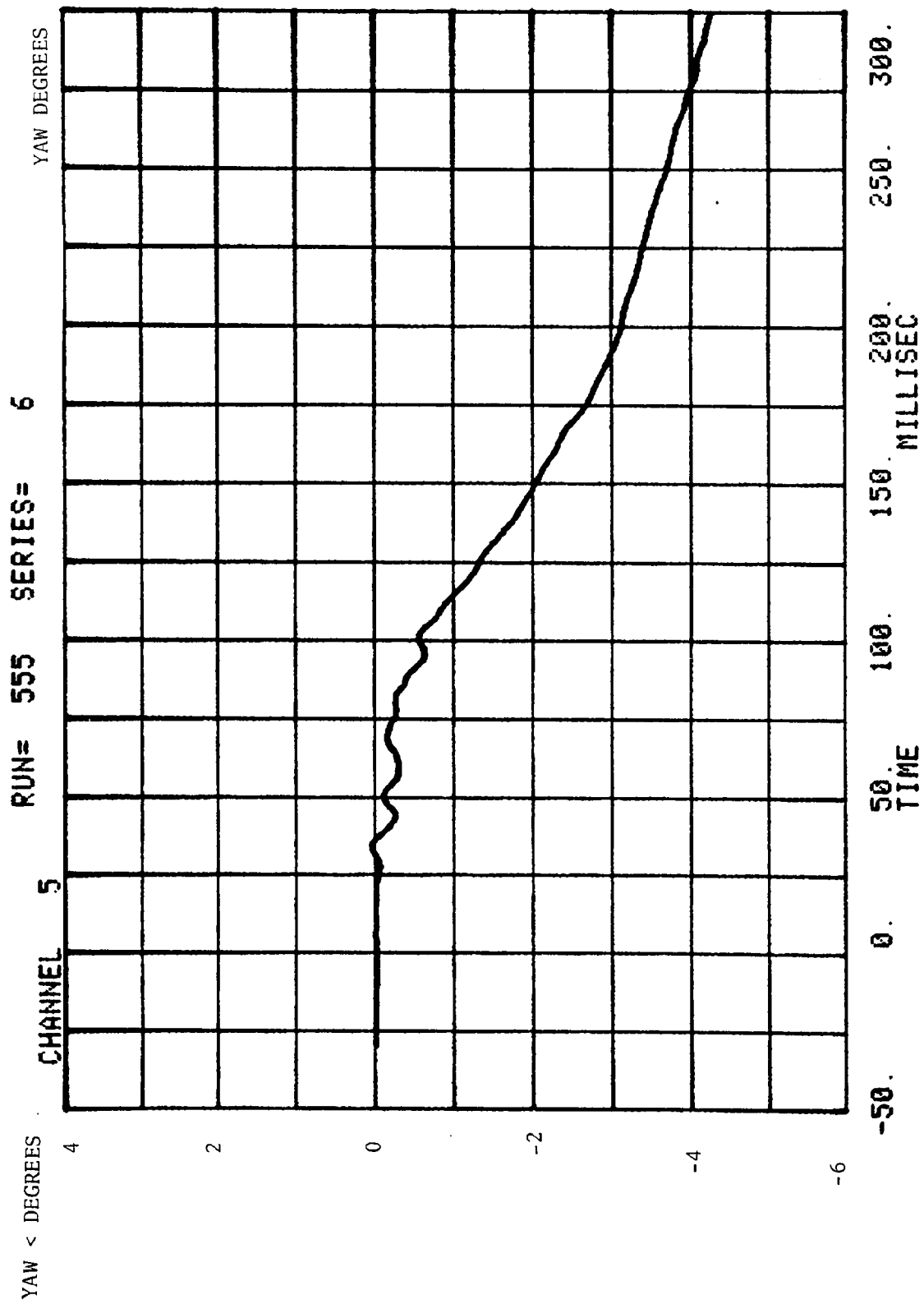








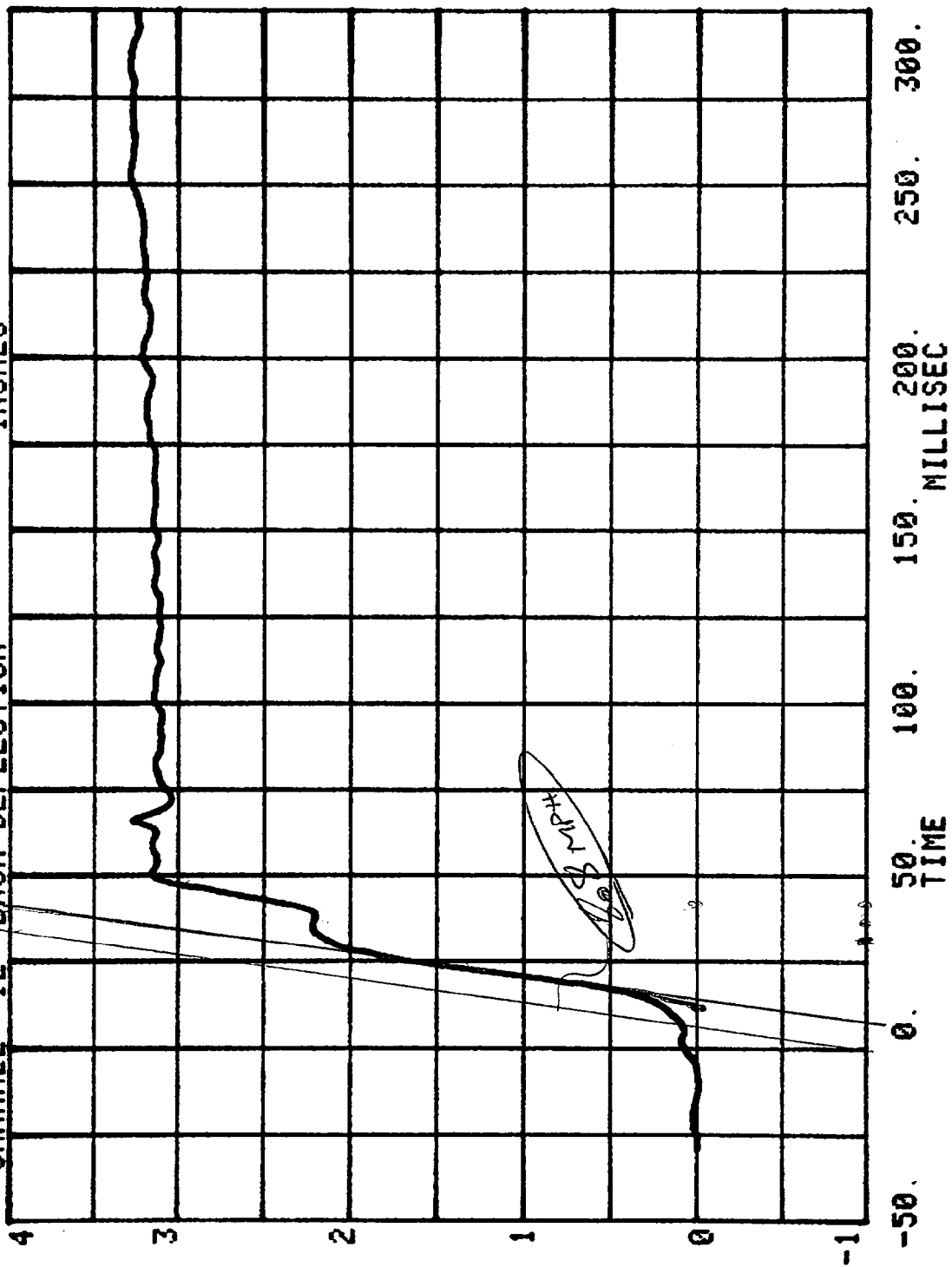




CHANNEL 12 DASH DEFLECTION

RUN= 555 SERIES= 6

INCHES



TEST NO. 752-6-555

1982 FIAT STRADA

DUMMY DATA

	FILTER CHANNEL CLASS
HEAD ACCELERATIONS	1000
CHEST ACCELERATIONS	180
FEMUR FORCES	600
BELT LOADS	60

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

DEFORMABLE BARRIER TEST #6

RUN= 555

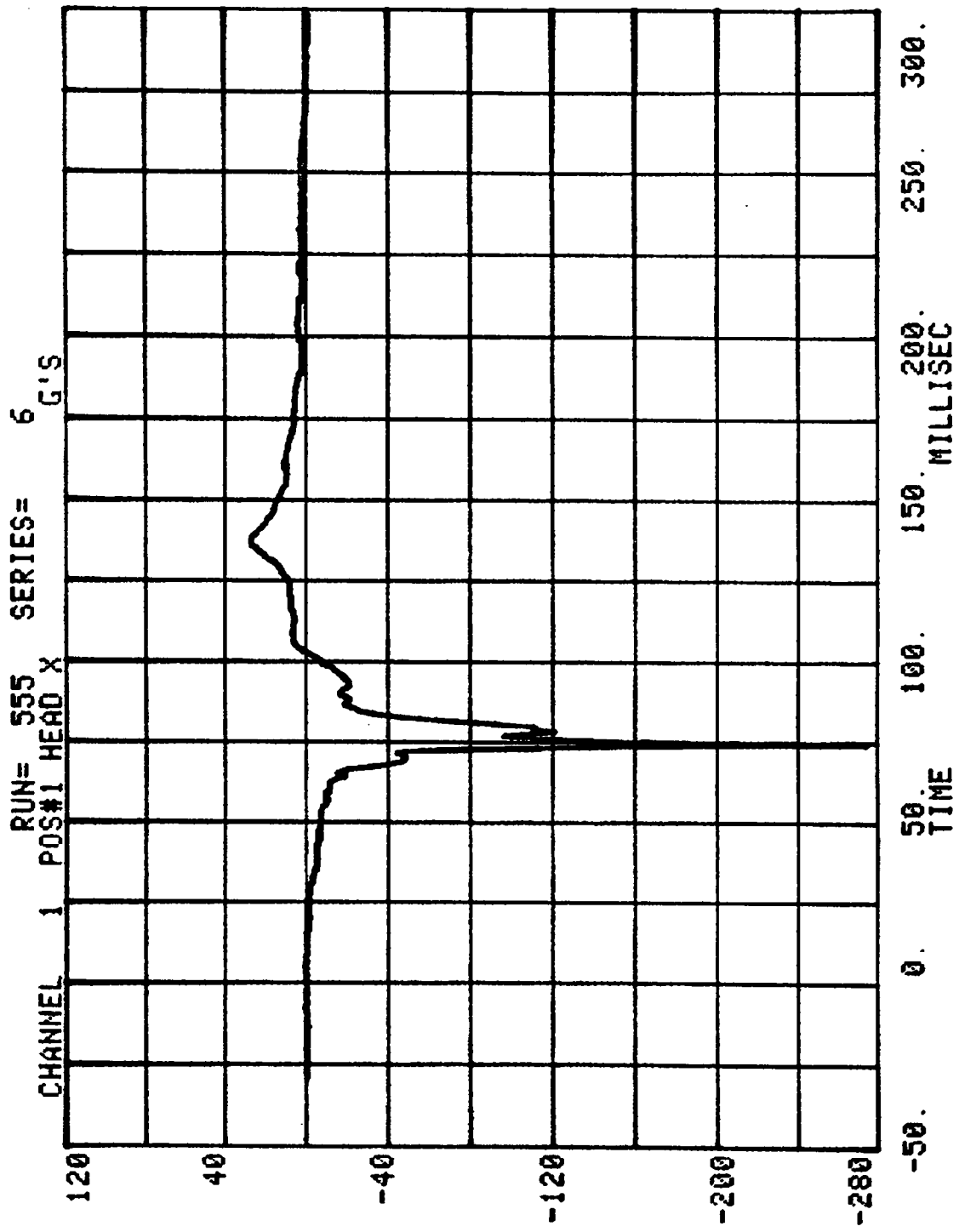
POS#1 HEAD RESULTANT

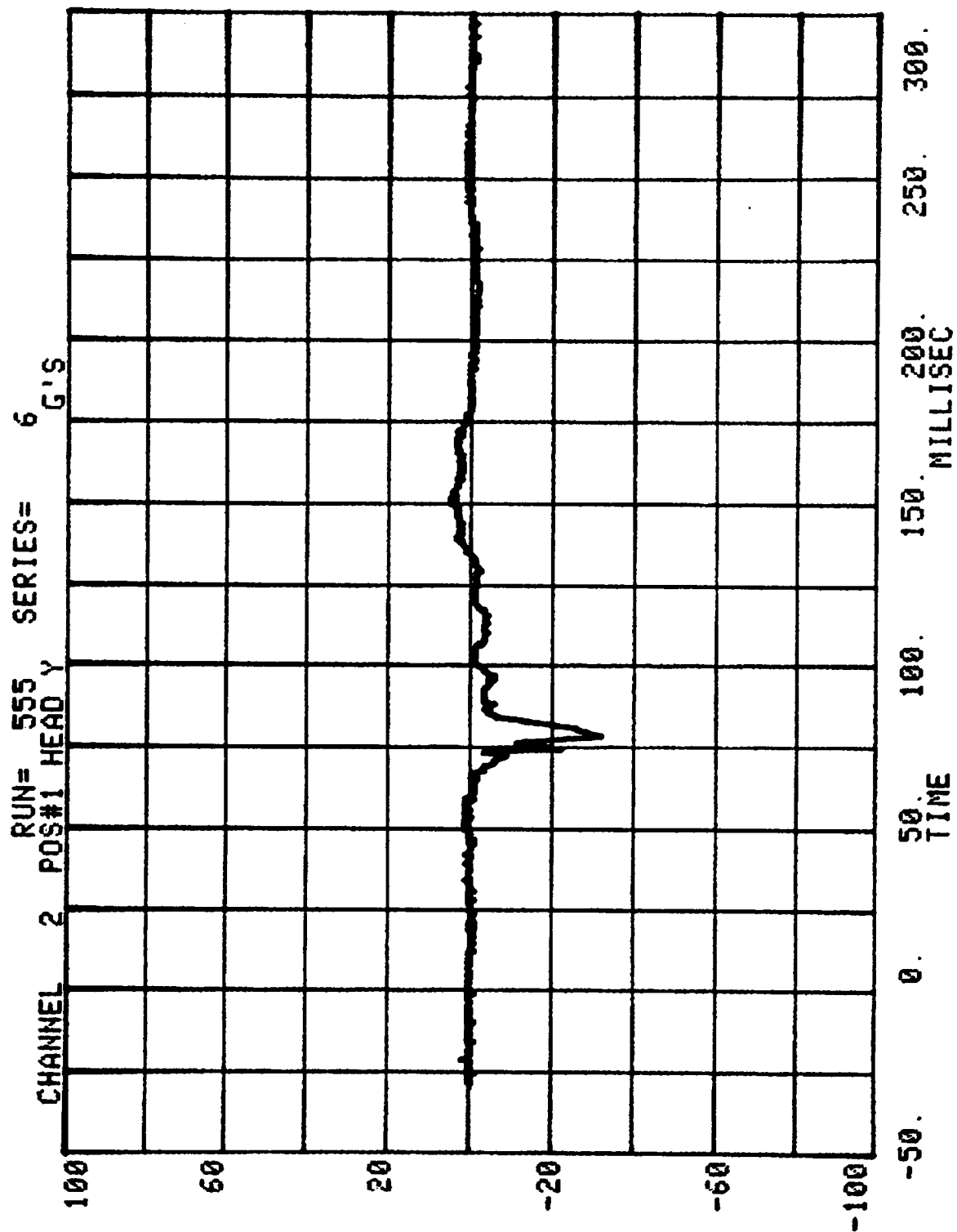
HIC=2824.0 FROM T1= .06742 TO T2= .08625

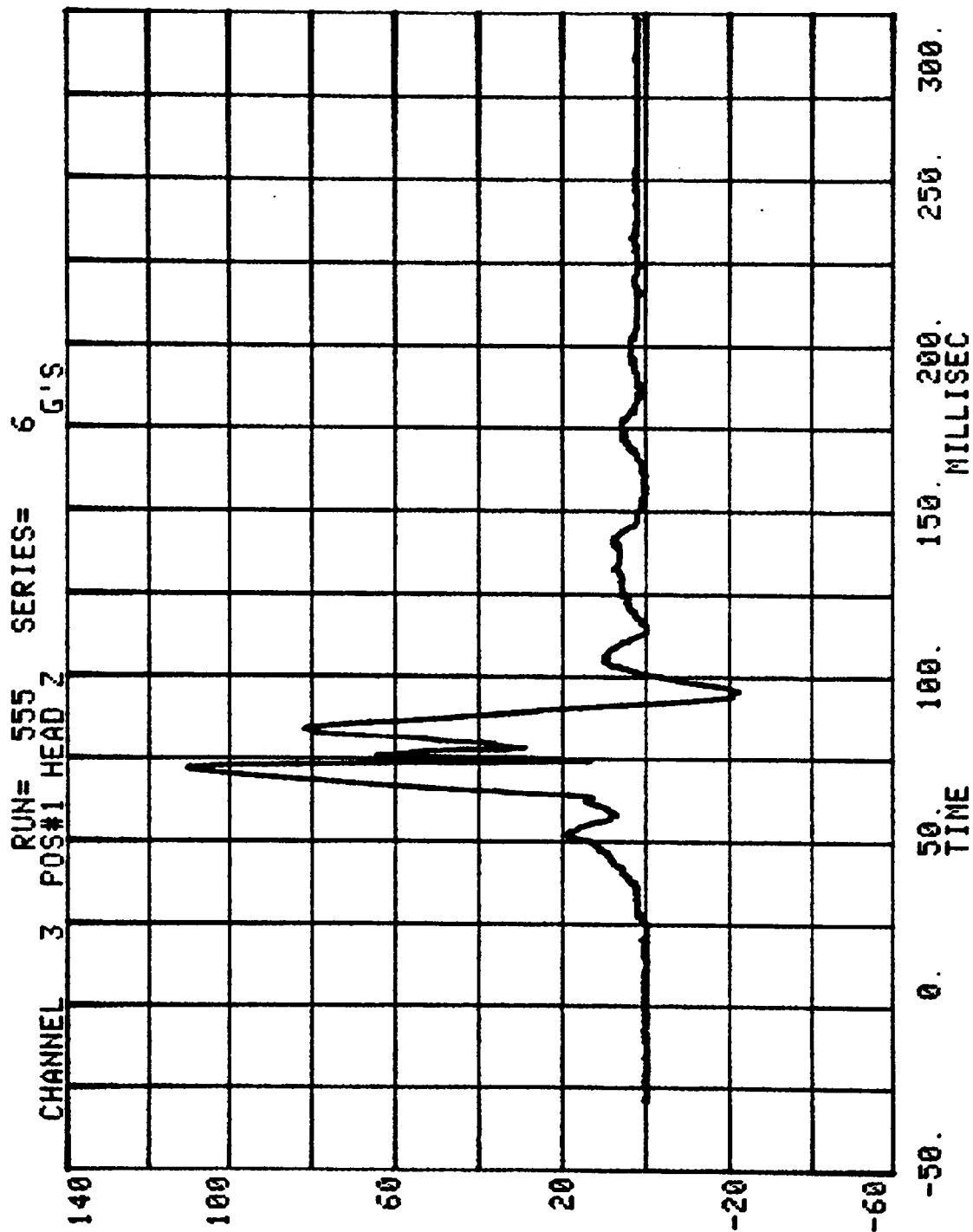
AVERAGE ACCELERATION BETWEEN T1 AND T2= 117.6G'S

EVENT TIME= 300.0 MSEC

SEVERITY INDEX=3621.0

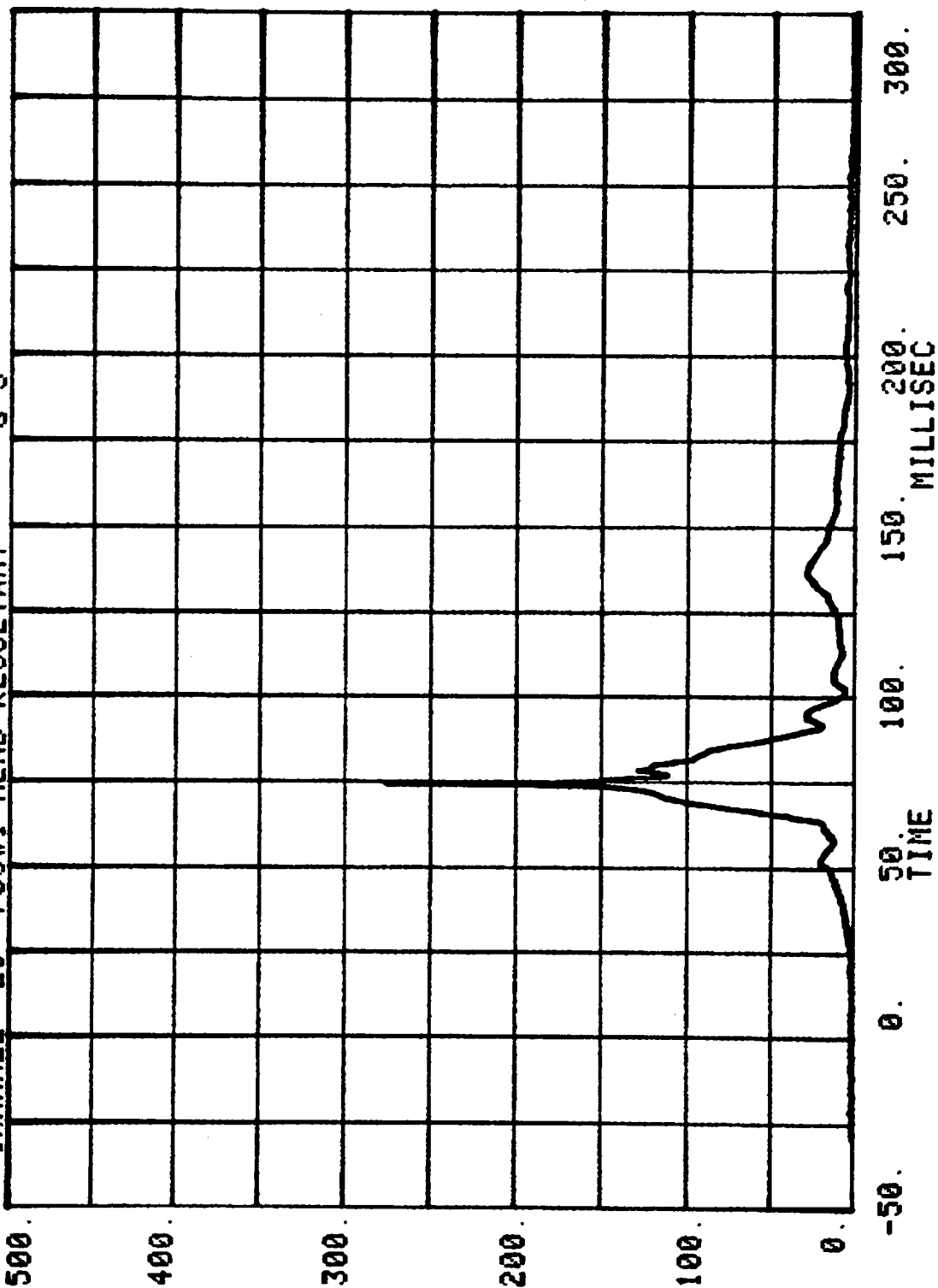


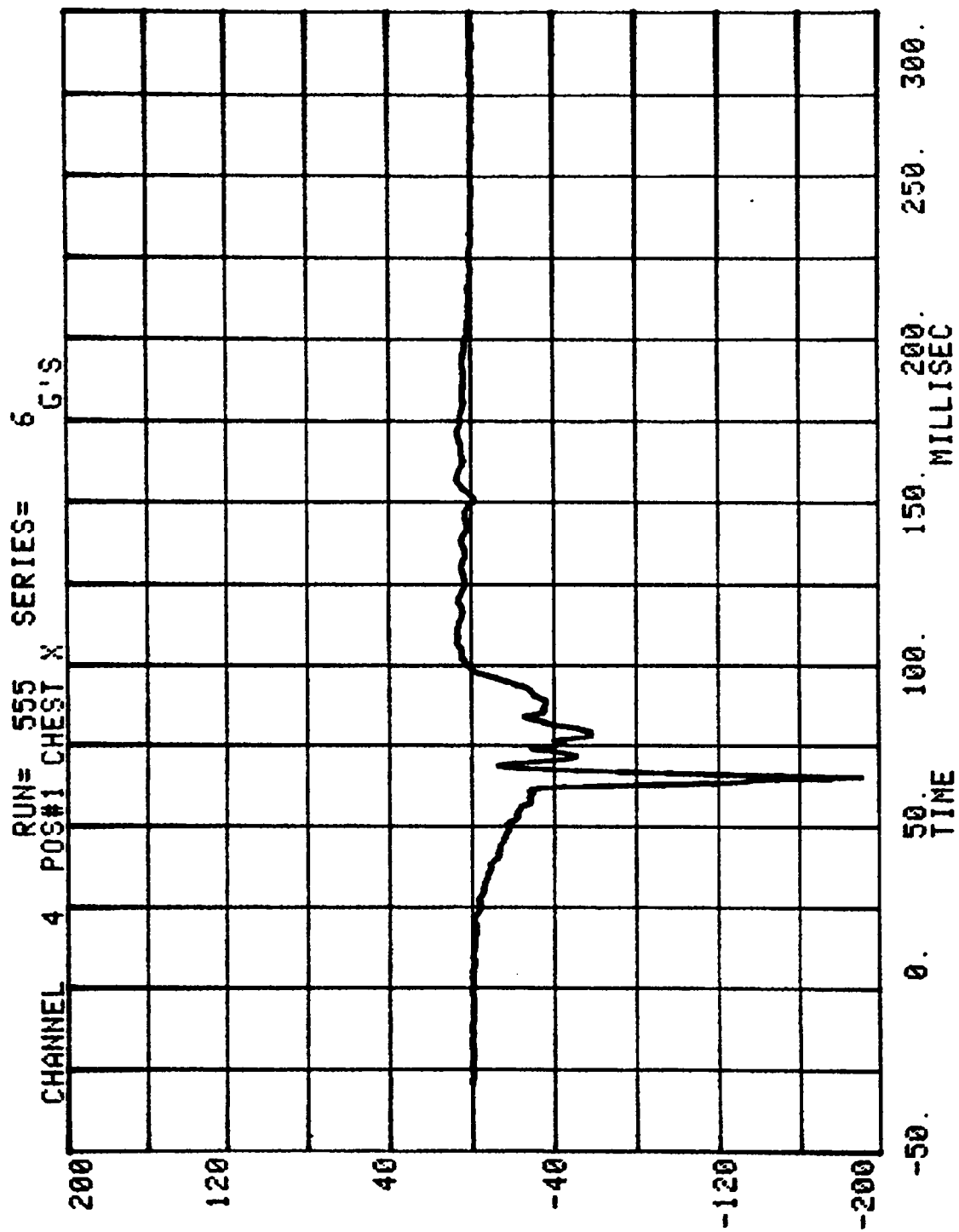


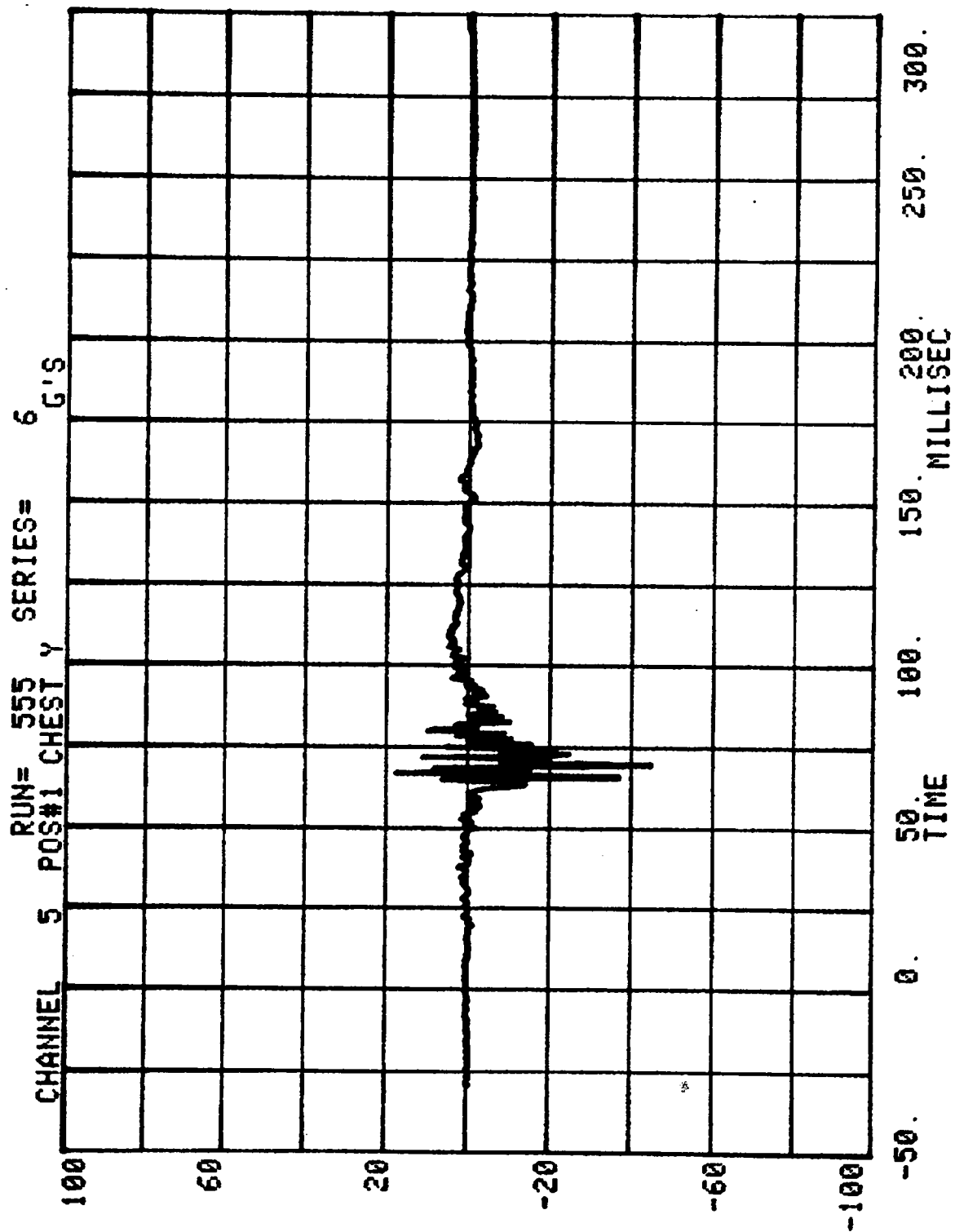


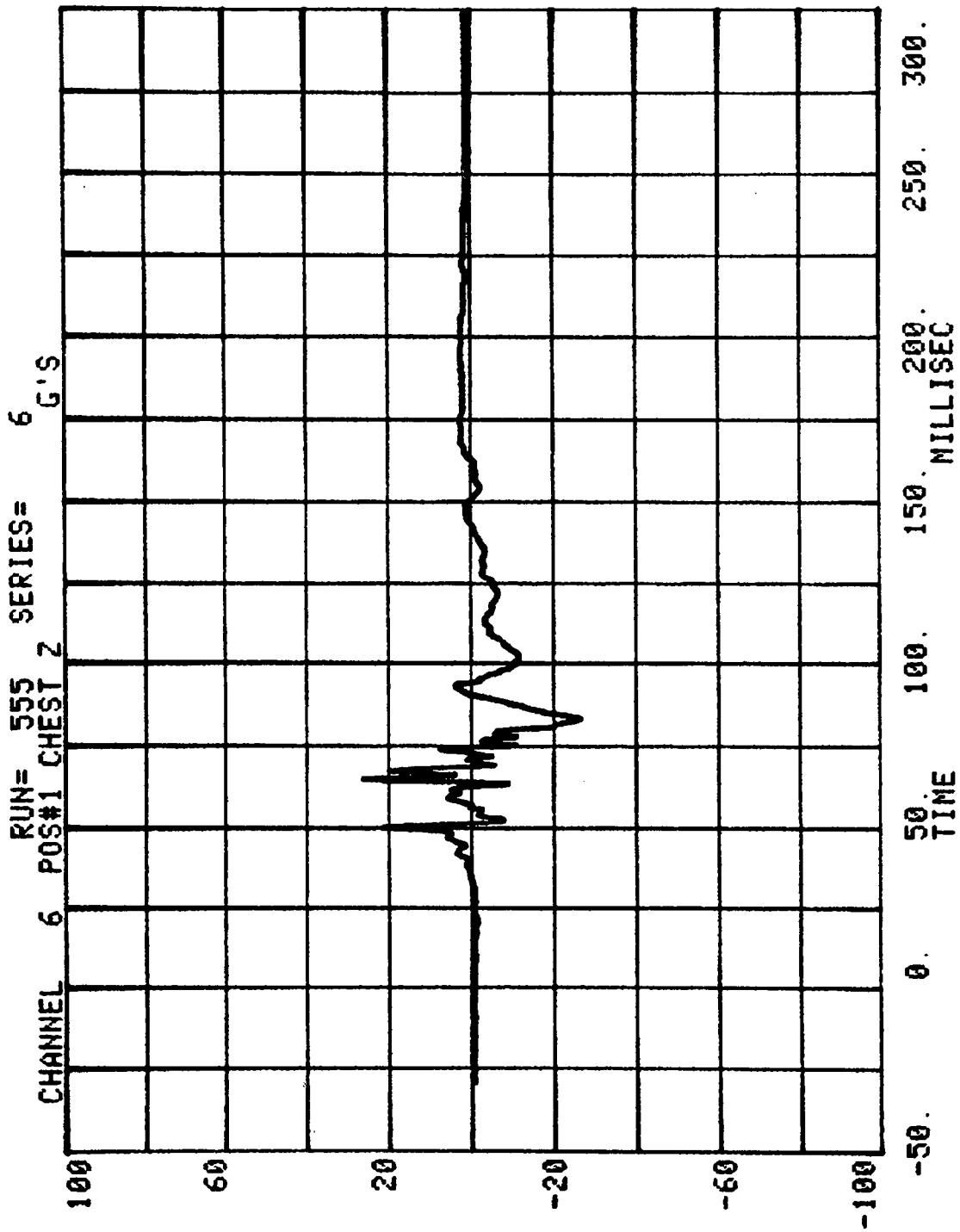
CHANNEL 20 POS#1 HEAD RESULT 6 G'S

RUN= 555 SERIES=



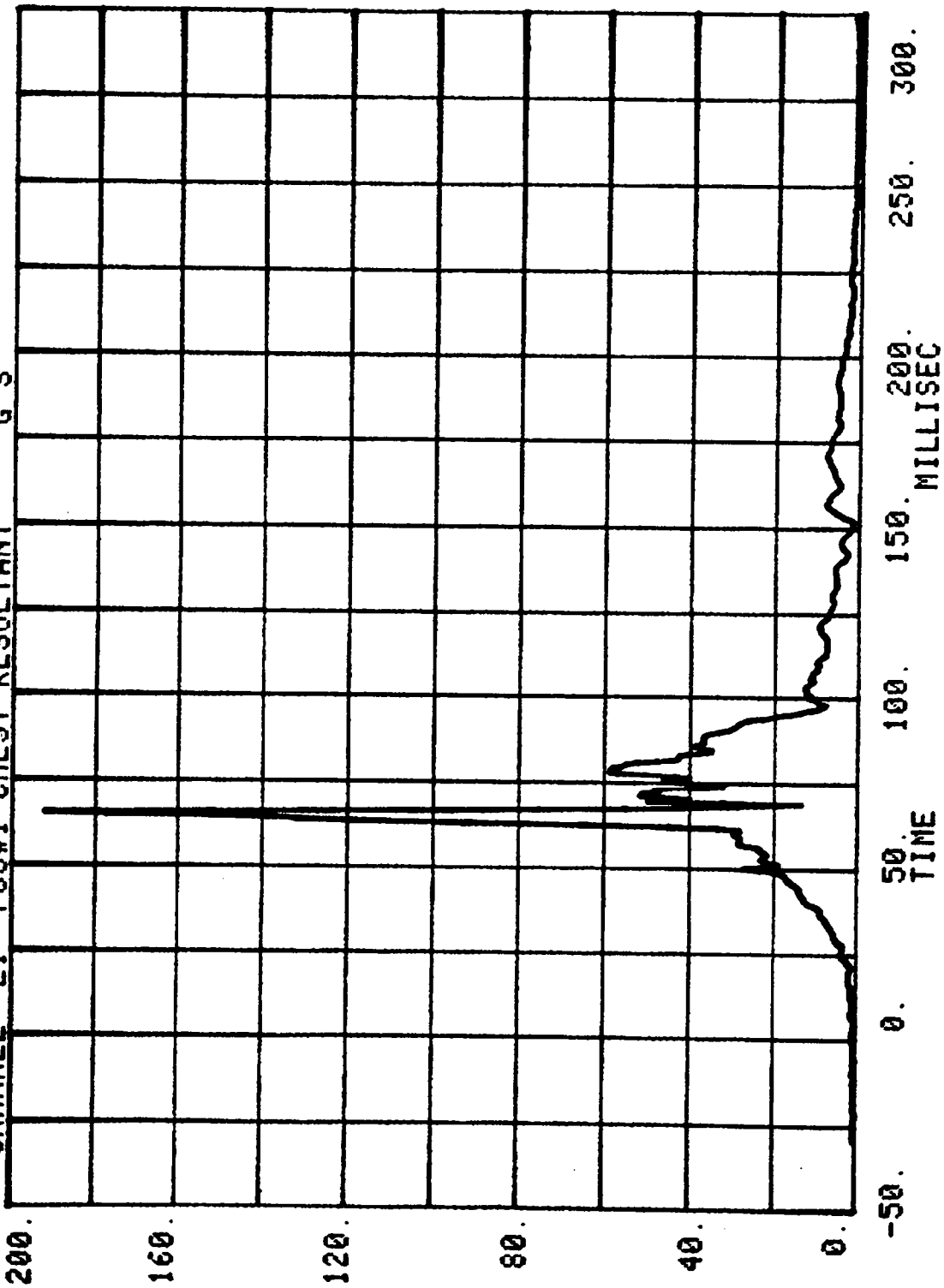


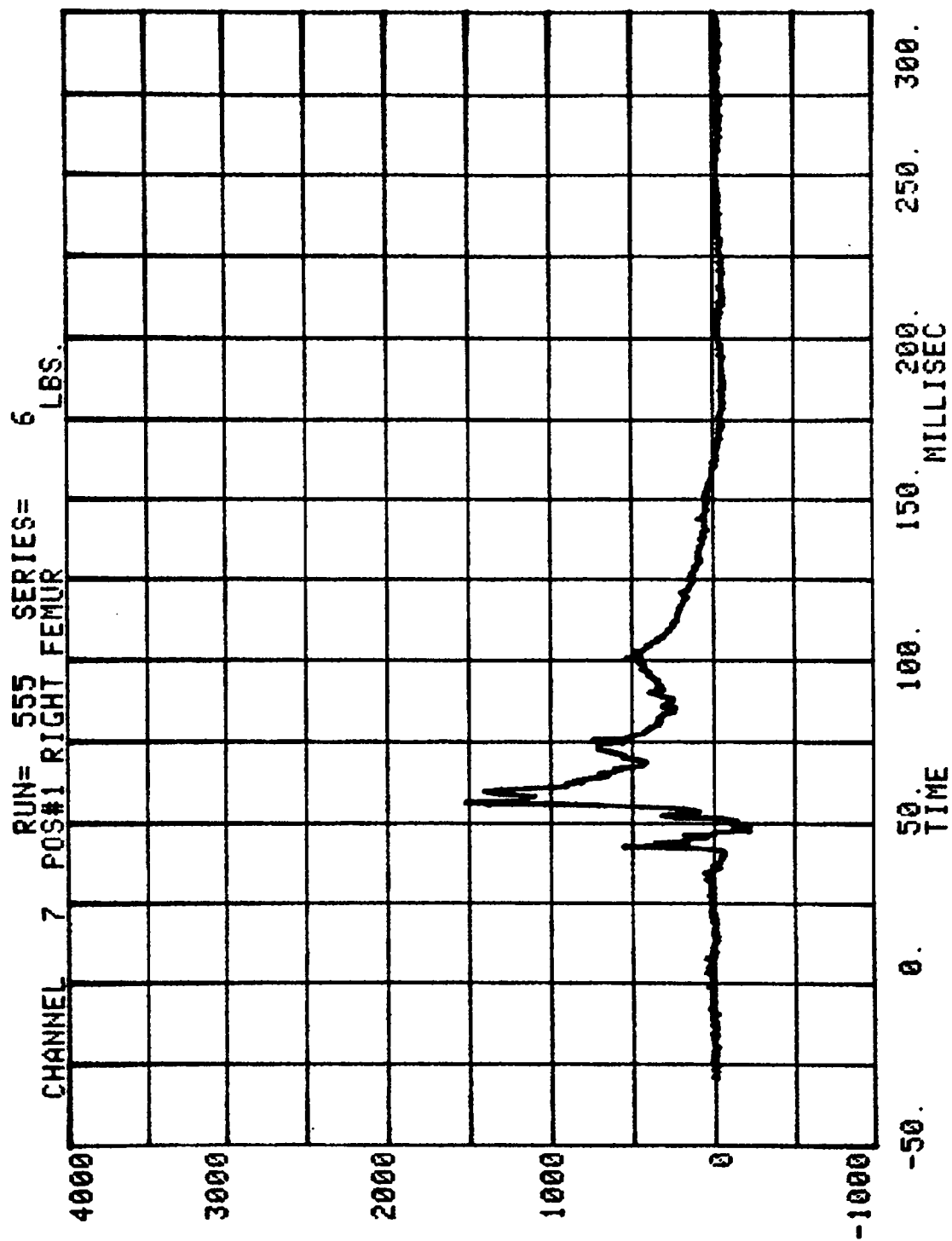


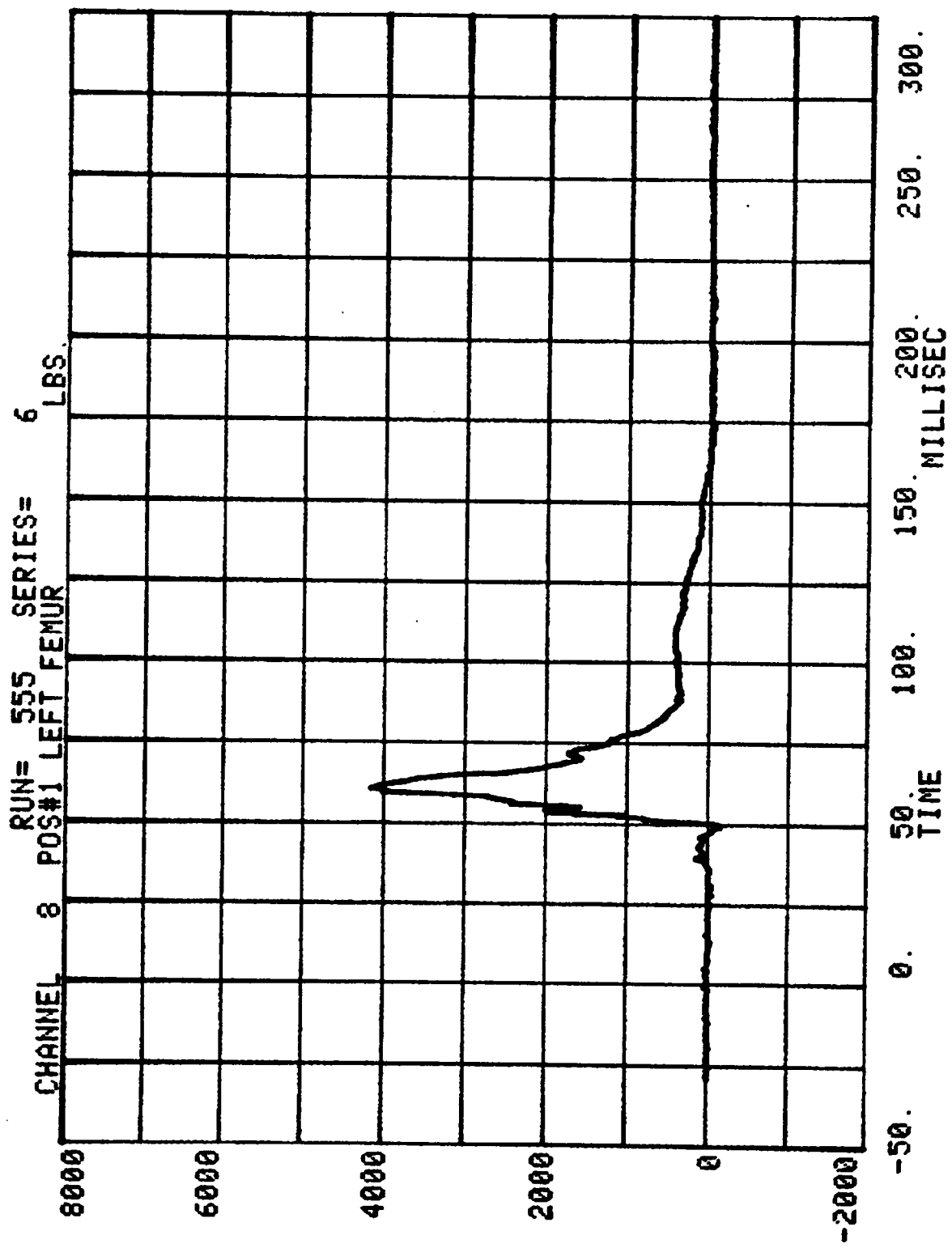


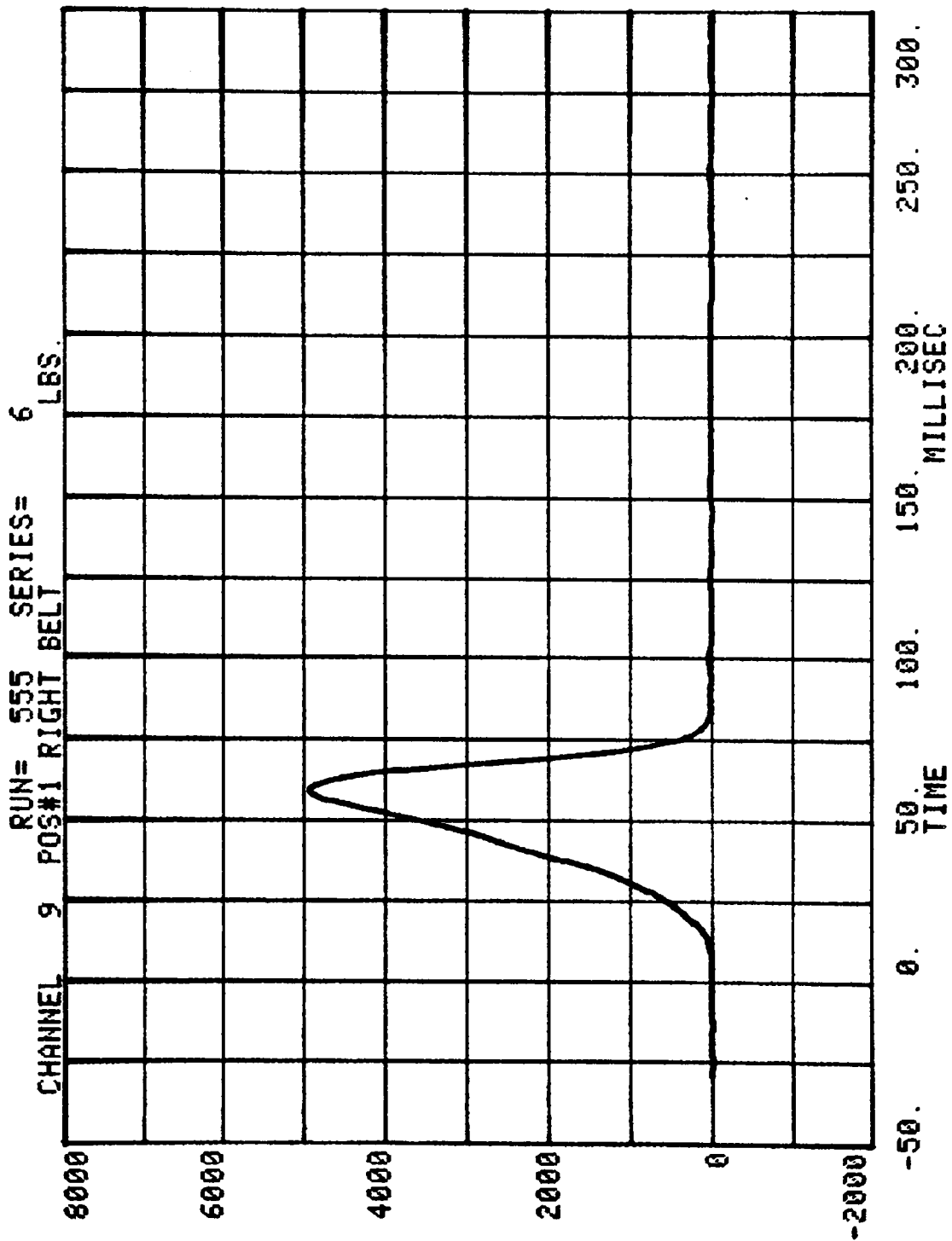
CHANNEL 21 POS#1 CHEST RESULTANT 6 G'S

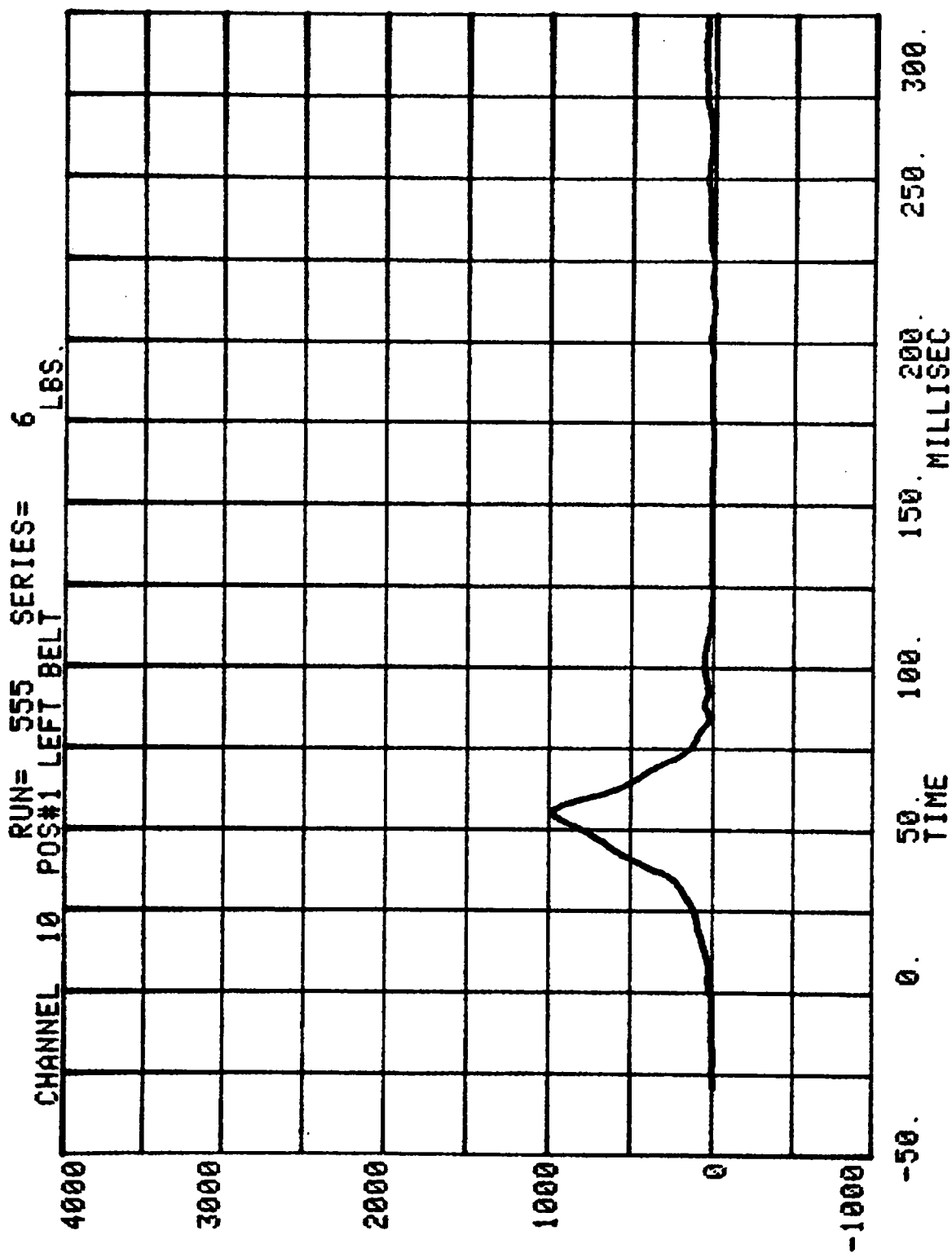
RUN= 555 SERIES=

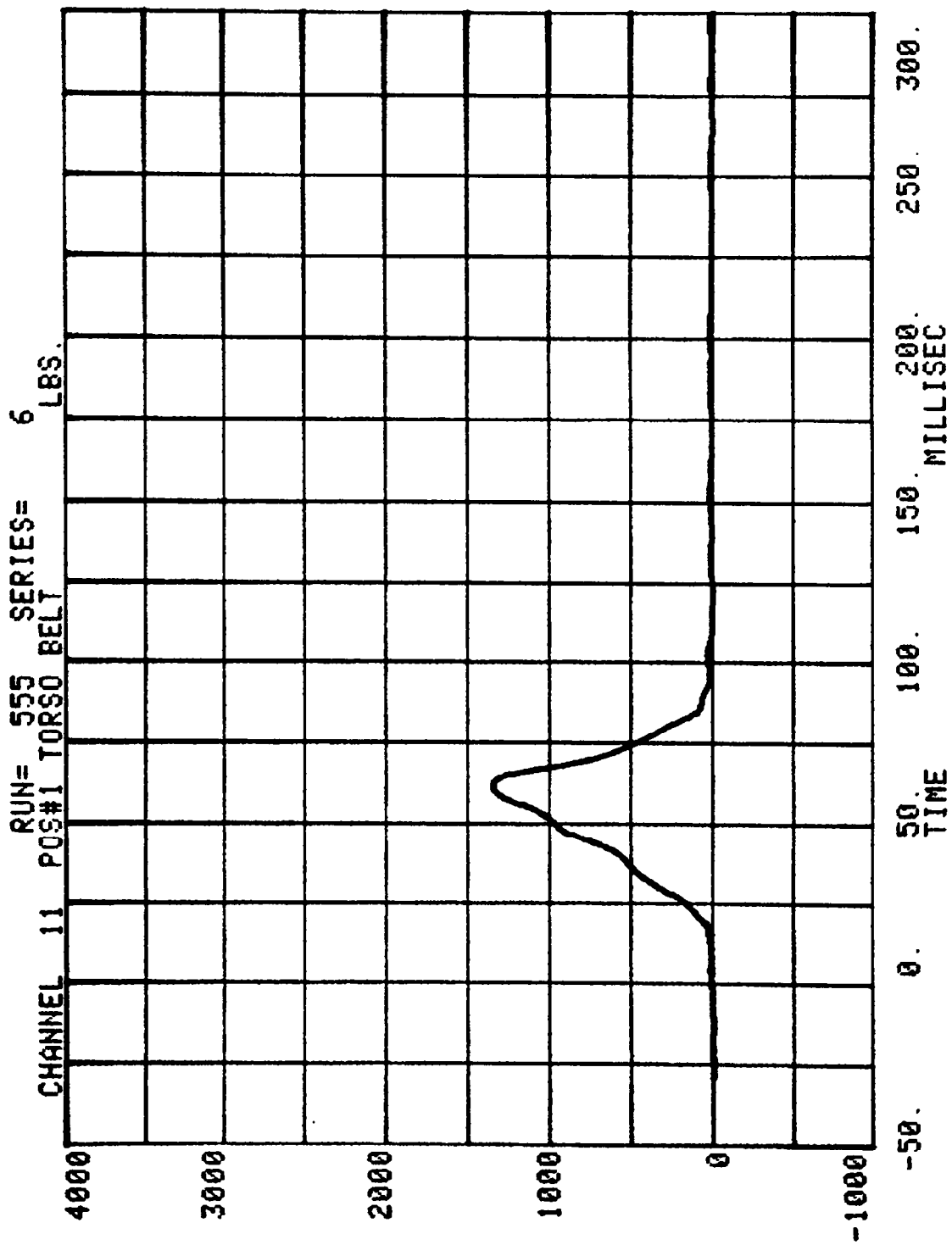












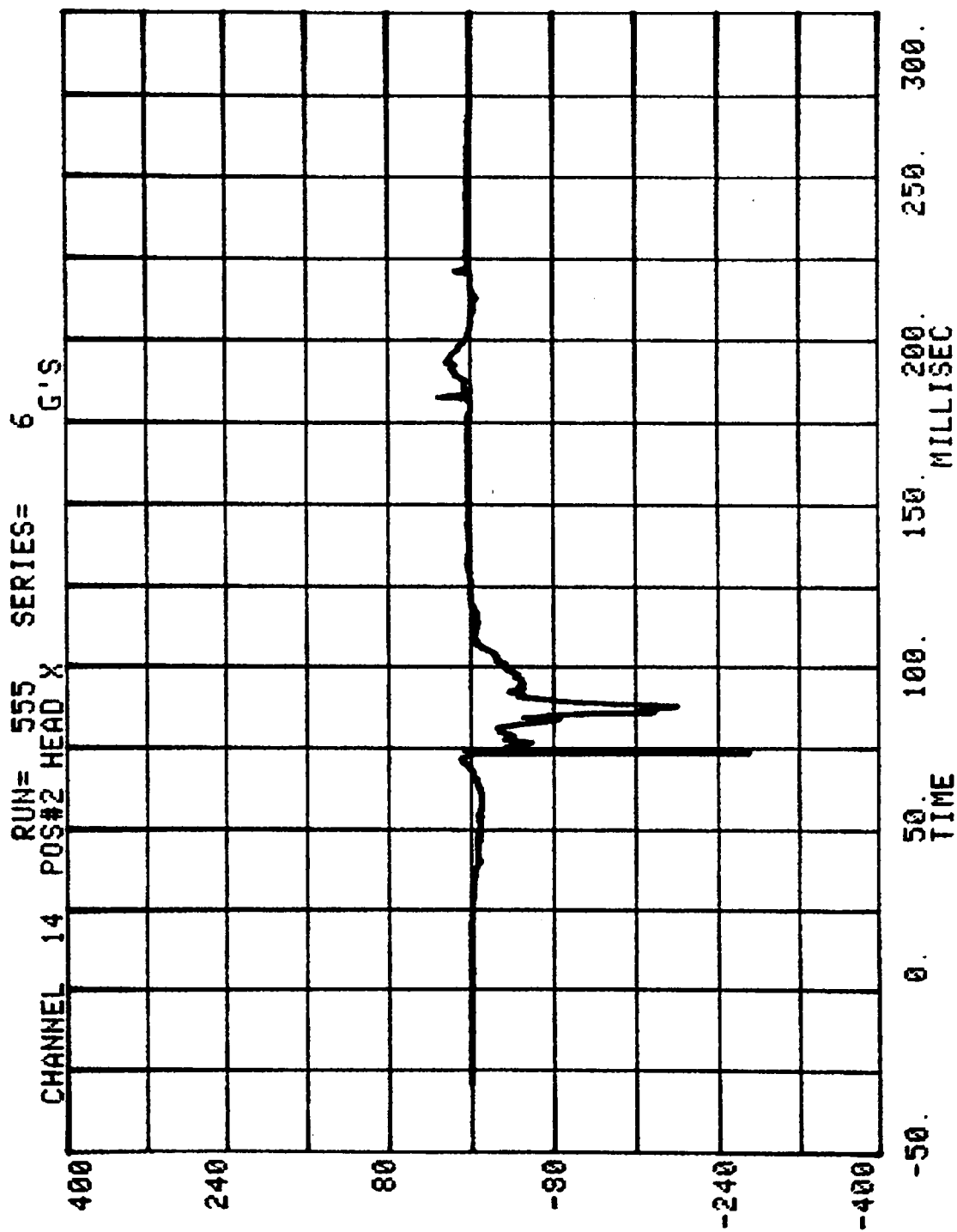
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

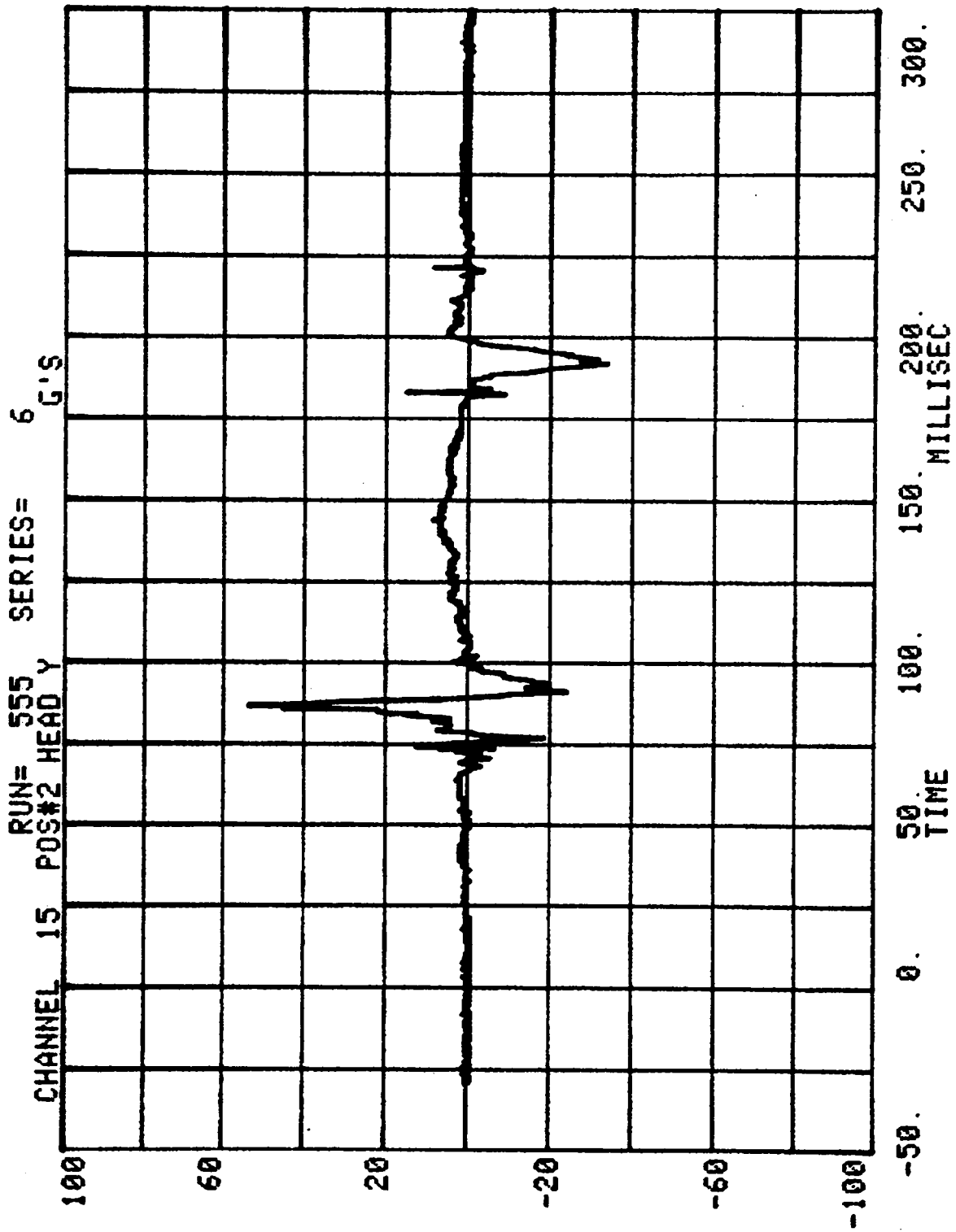
DEFORMABLE BARRIER TEST #6

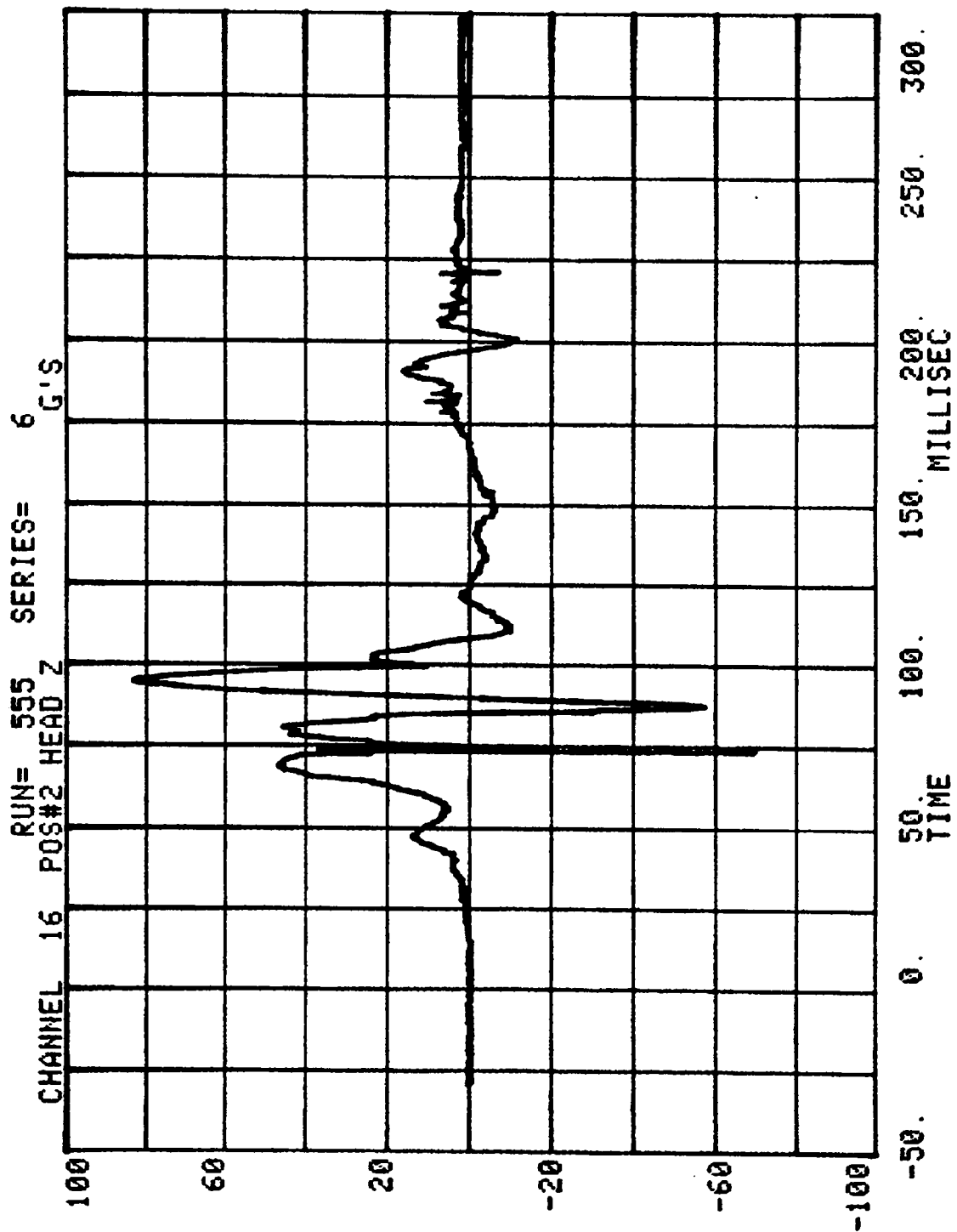
RUN= 555

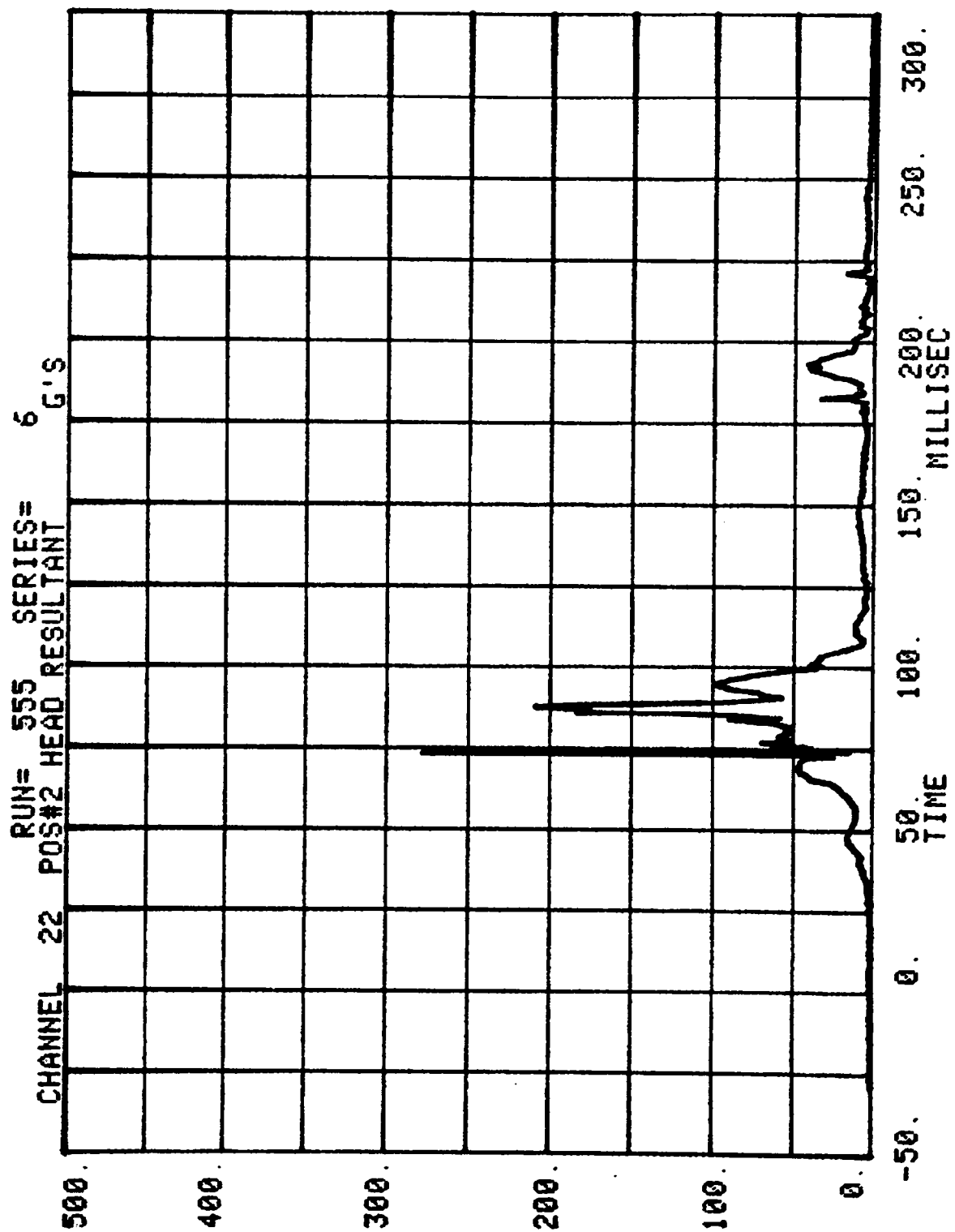
POS#2 HEAD RESULTANT

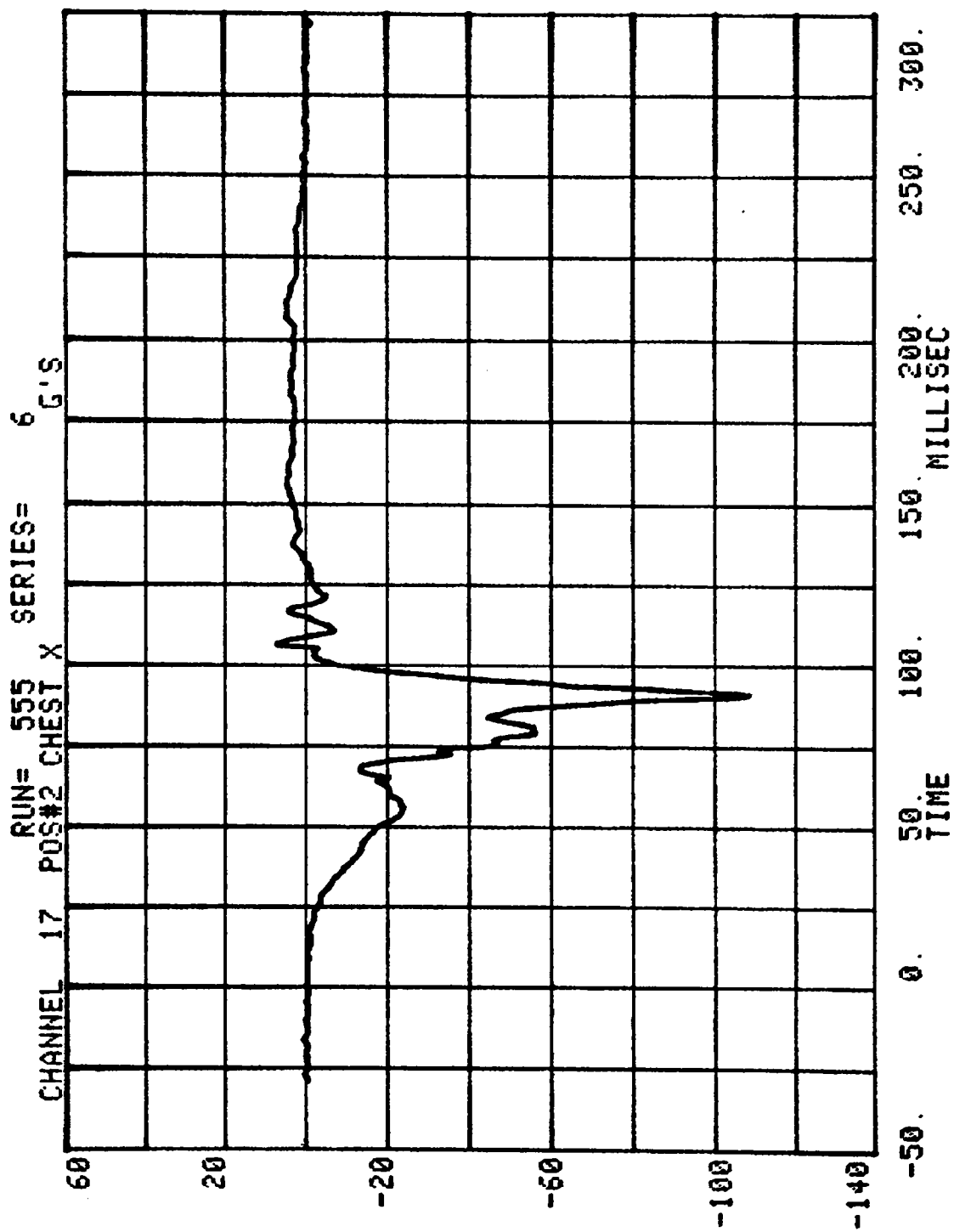
HIC=1781.7 FROM T1= .07327 TO T2= .09915
AVERAGE ACCELERATION BETWEEN T1 AND T2= 86.1G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=3322.8



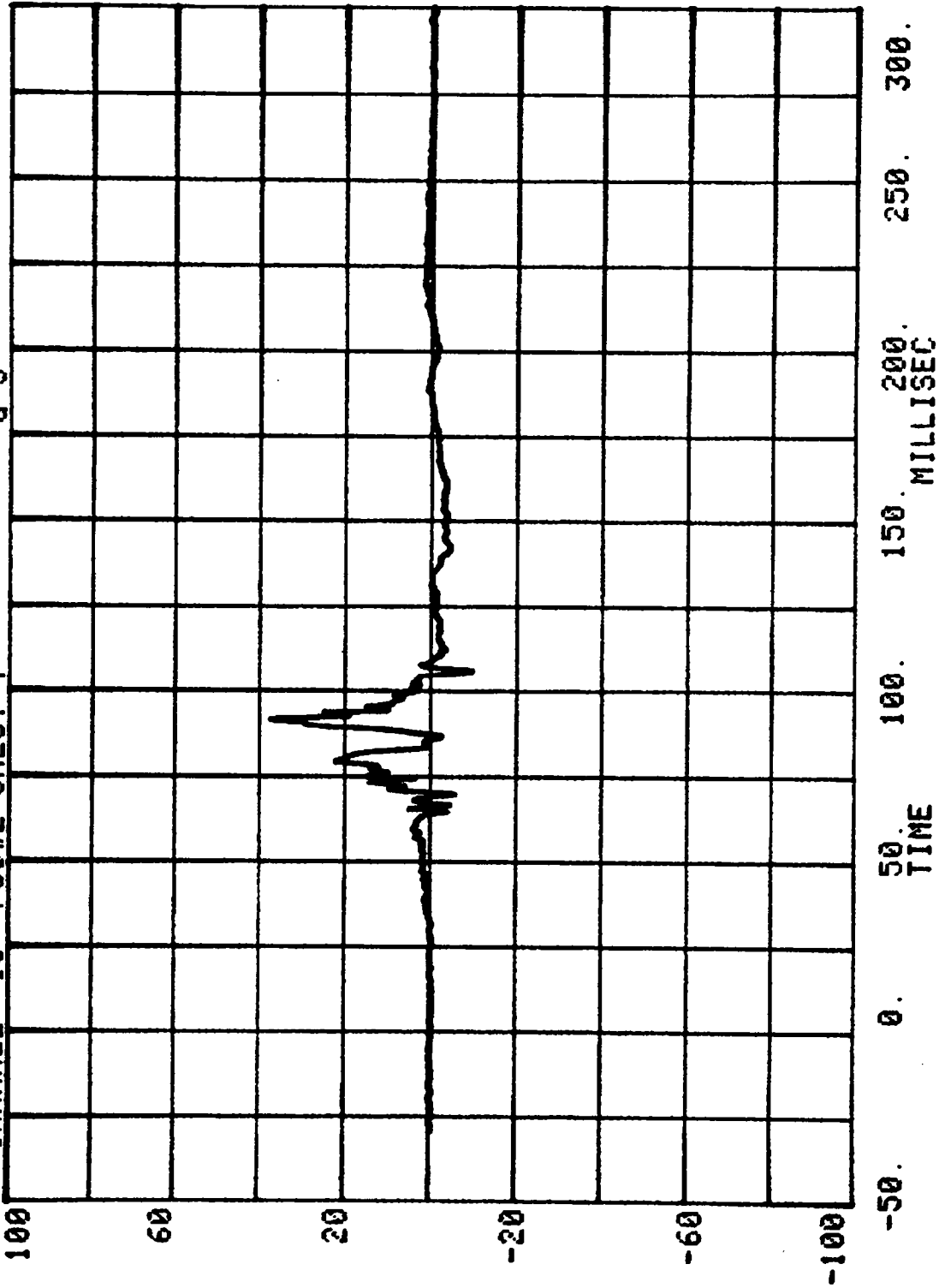


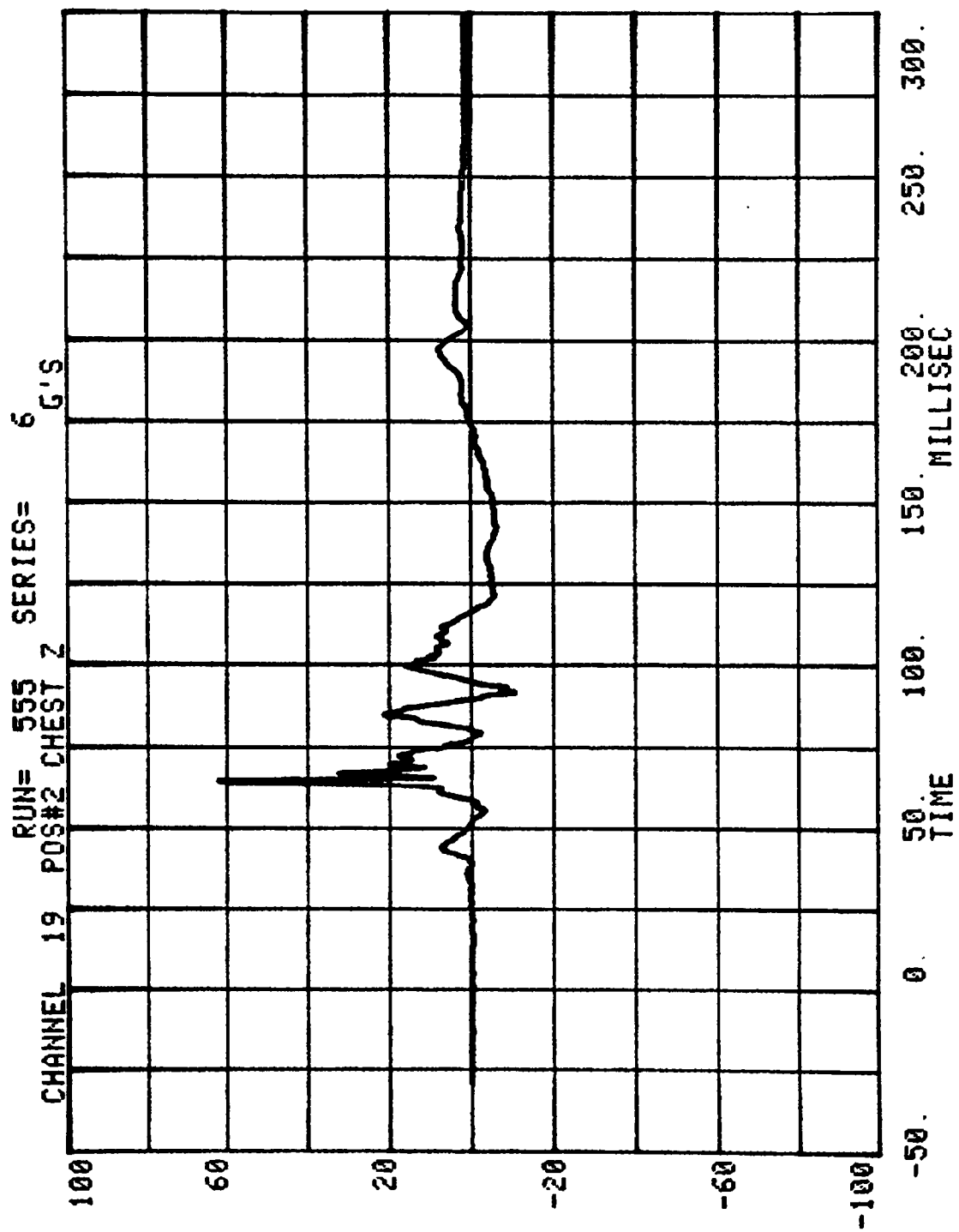


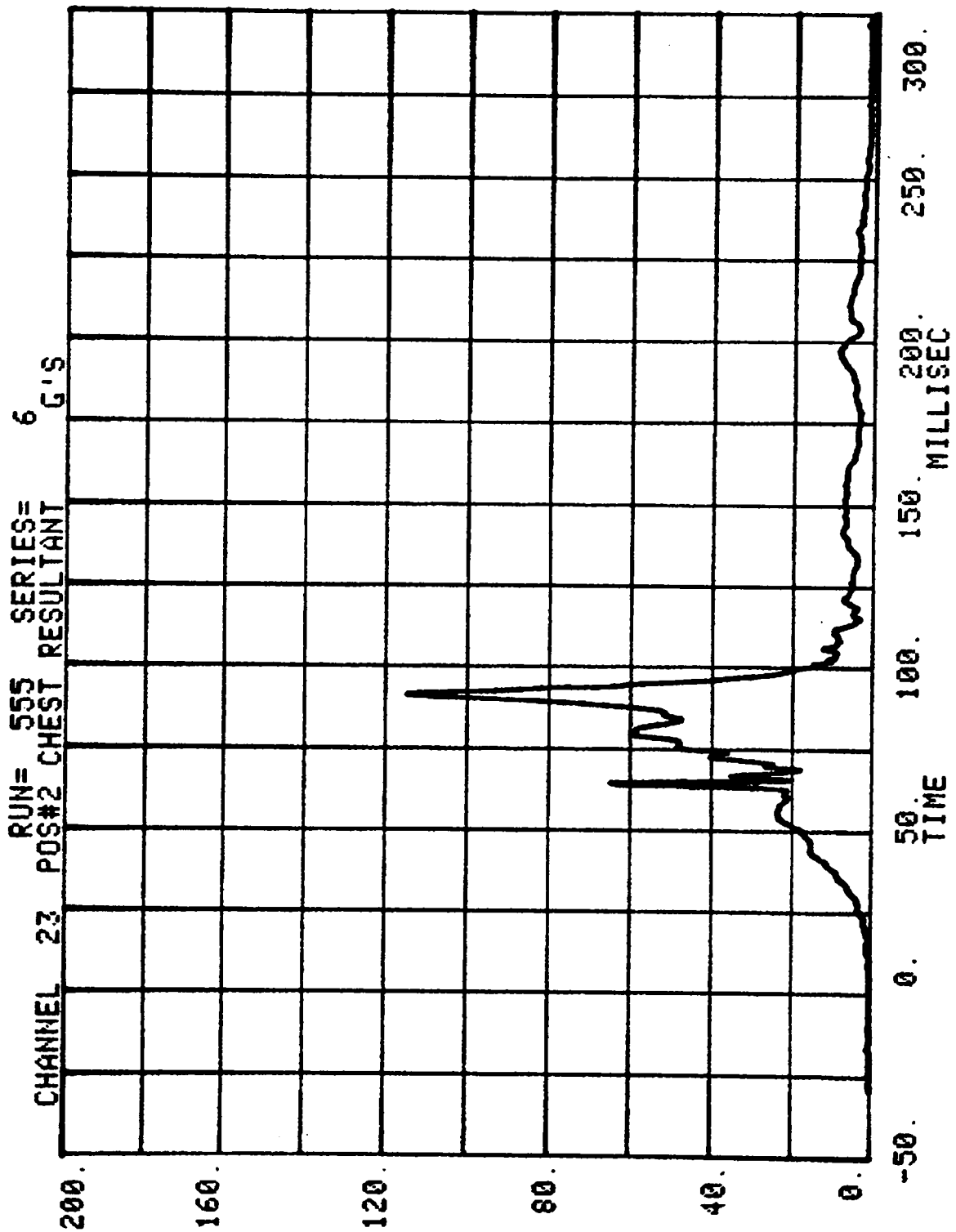


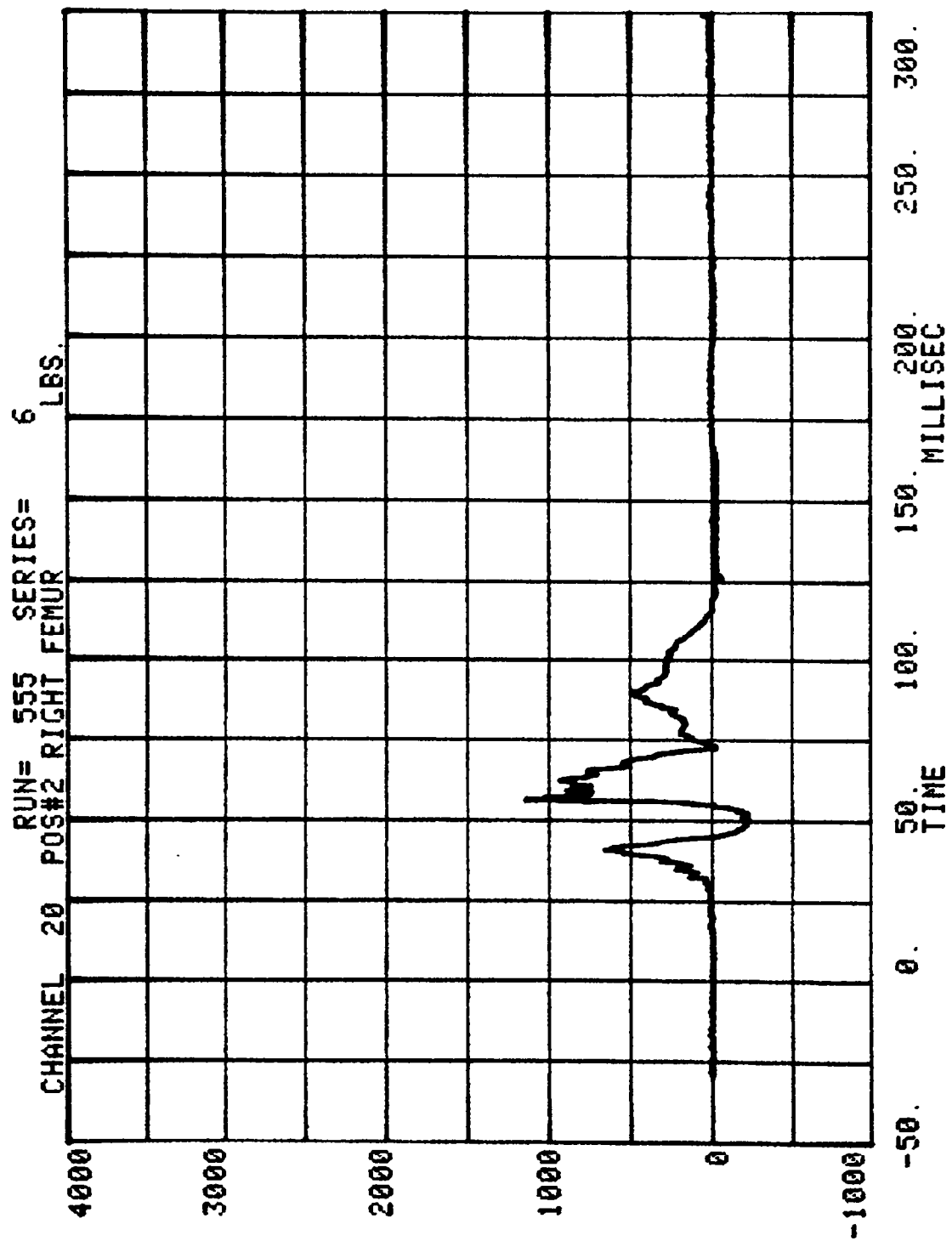


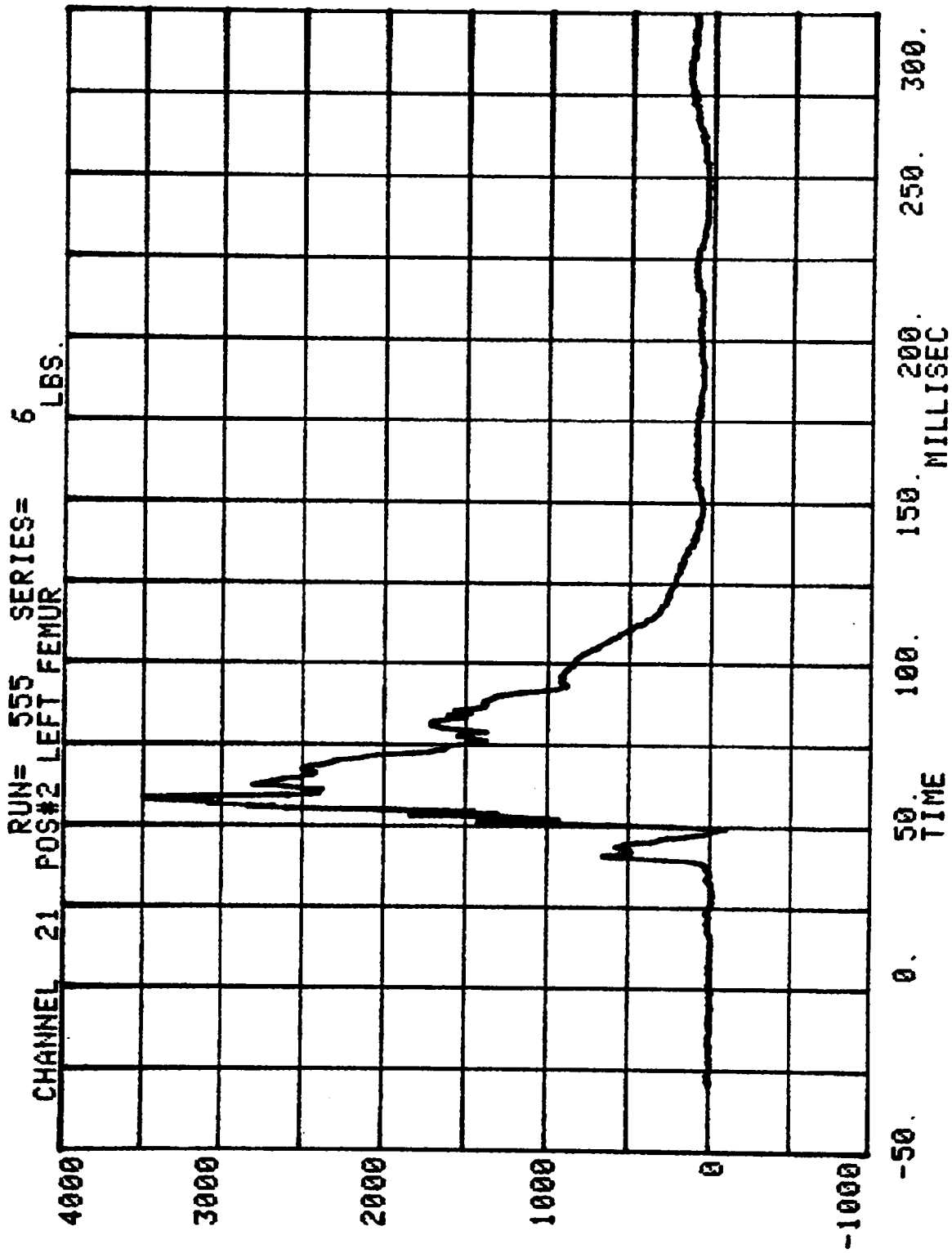
CHANNEL 18 POS#2 CHEST Y SERIES= 6 G'S







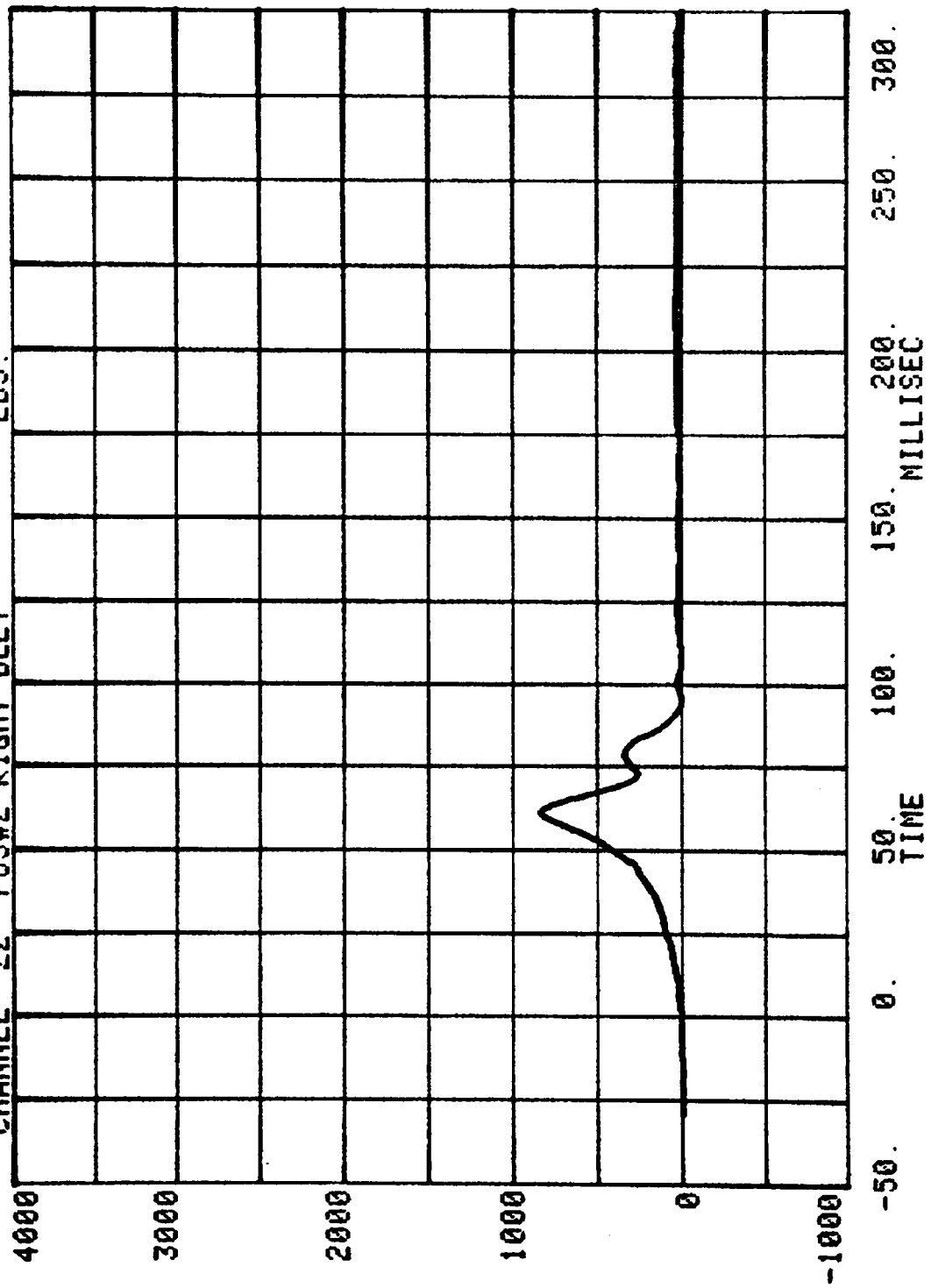


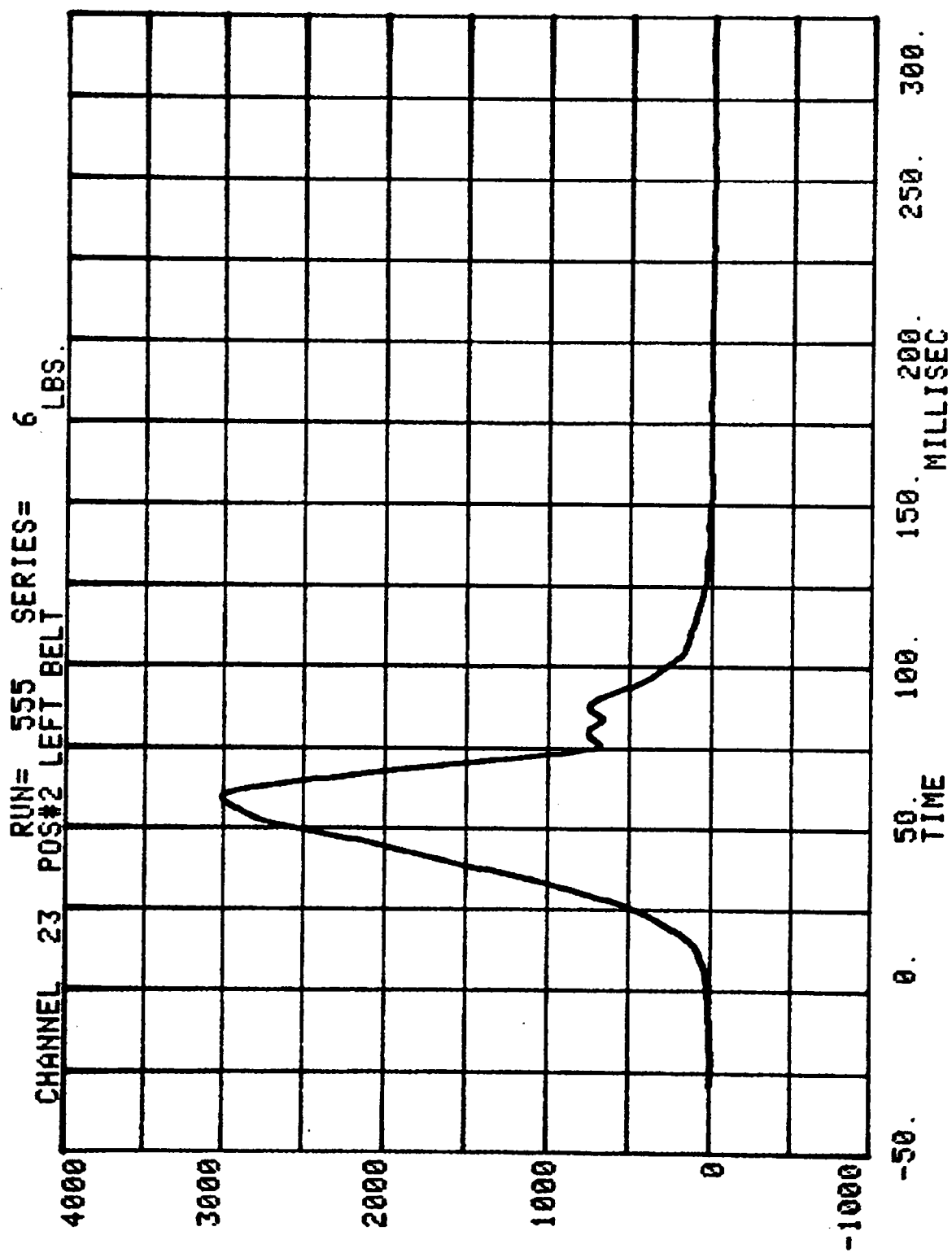


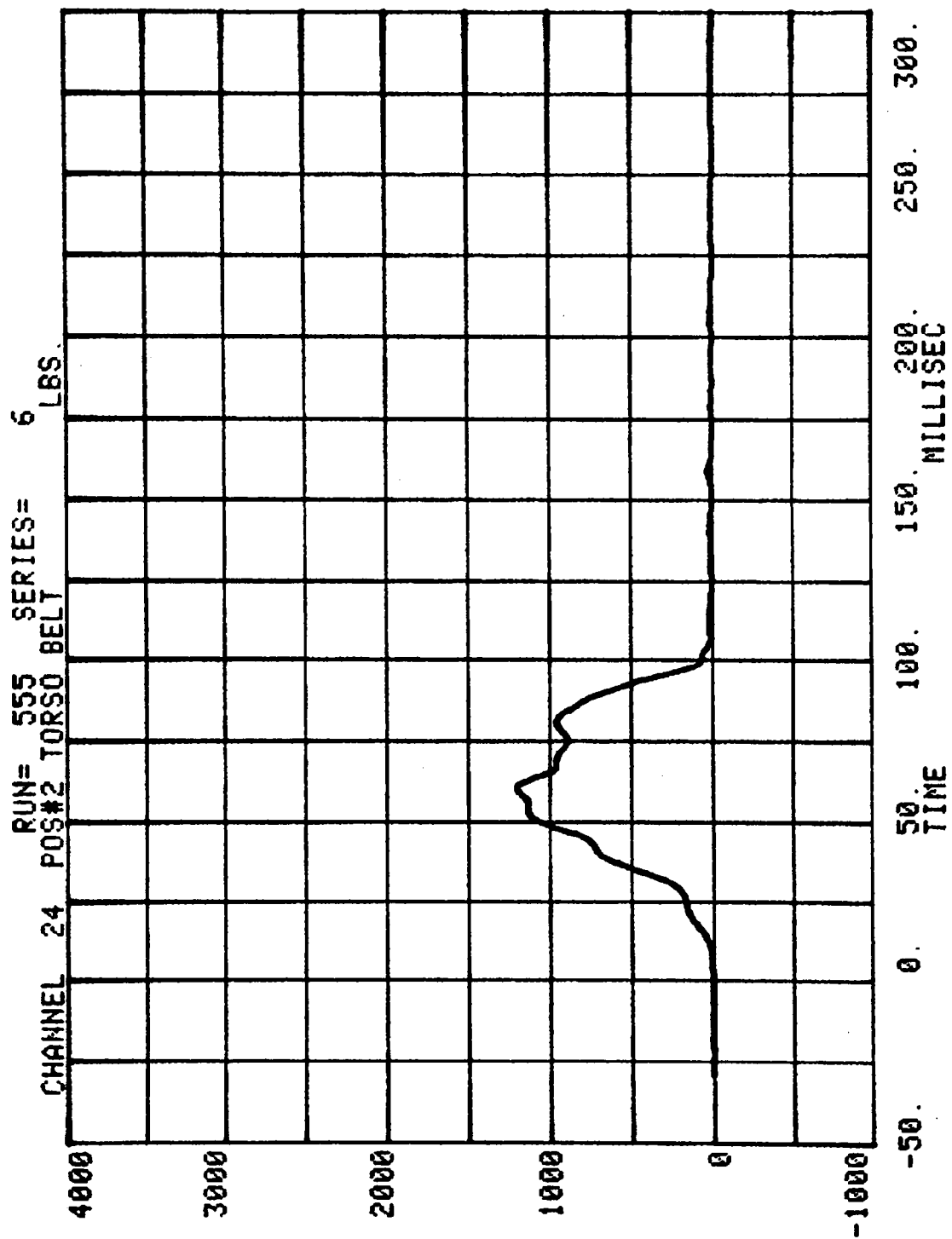
CHANNEL 22 POS#2 RIGHT BELT

RUN= 555 SERIES= 6

LBS.







APPENDIX C
DUMMY CERTIFICATION TESTS

Appendix C contains the results from certification tests performed on the Alderson Research Laboratories Model ATD 30034, 50th percentile male anthropometric test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Vol. 42, No. 25, dated February 7, 1977.

The tests were conducted at the Dummy Certification Test Facility of Calspan Corporation, Advanced Technology Center. A summary of the test results, Part 572 specifications and instrument calibration information is included in this Appendix.

Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
110	6/7/82
320	10/12/81

Electronic Test Equipment

The complement of signal conditioning recording and display equipment in conjunction with dummy certification testing can be found in New Car Assessment and Standards Indicant Testing Final Report, Report No. 6525-V-1.

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 110

LABORATORY TECHNICIAN: Gary Gestwick

APPROVED BY: D. C. Cunniff

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		5/31/82-6/7/82	
Calibration Sequential Number for Dummy - - -		13	
Temperature in Lab. (Spec. = 66 to 78°F)- - -		66° - 72°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		31% - 62%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	258 g	
b. Peak Lateral Accel. - -	≤10G	10 g	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.15 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	23.42 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	23 g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	24 g	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	2.8 ms	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	26.9 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	6.3 ms	
g. Pendulum Direction Reversal Time - - - -		104 ms	
h. Max. Head Rotation - -	63 to 73°	65°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in	0.0 in.
30°	Time	25.6 to 34.4 ms	28.5 ms
	Displ.	2.1 to 3.1 in.	2.6 in.
60°	Time	40.3 to 51.7 ms	45.5 ms
	Displ.	4.3 to 5.3 in.	5.0 in.
Maximum (°)	Time	53.2 to 66.8 ms	56.5 ms
	Displ.	5.0 to 6.0 in.	5.3 in.

Continued

C-3

6892-V-6

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST Continued				
i. Chordal Displacement:				
Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	67 ms	
	Displ.	4.3 to 5.3 in.	4.8 in.	
30°	Time	85.4 to 104.6 ms	86 ms	
	Displ.	2.1 to 3.1 in.	2.4 in.	
0°	Time	101.0 to 123.0 ms	101 ms	
	Displ.	-.5 to 0.5 in.	0.0 in.	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ 1" - - - - -		50 to 63 lbs.	60 lbs	
b. Force @ 1.3" - - - - -		73 to 88 lbs.	88 lbs	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - - -		22 to 34 lbs.	32.0 lbs	
b. Force @ 30° - - - - -		34 to 46 lbs.	42.0 lbs	
c. Force @ 40° - - - - -		46 to 58 lbs.	49.5 lbs	
d. Return Angle - - - - -		12° maximum	6°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed - - - - -		21.78-22.22 fps	21.92 fps	
(2) Peak Deflection - - - - -		1.7" maximum	1.58 in.	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	1890 lbs	
(4) Internal Hysteresis - - - - -		50 to 70%	63.7 %	
b. Low Speed				
(1) Probe Speed - - - - -		13.86-14.14 fps	13.92 fps	
(2) Peak Deflection - - - - -		1.1" maximum	1.02 in.	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1195 lbs	
(4) Internal Hysteresis - - - - -		50 to 70%	52.0 %	

P.572 DUMMY CALIBRATION TEST DATAContinued:

NHTSA DUMMY ID NO. 110

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.87 fps	
(2) Maximum Force - -	1850 to 2500 lbs	2475 lbs	
(3) Time Above 1000#	1.7 ms minimum	1.75 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.04 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2425 lbs	
(3) Time Above 1000#	1.7 ms minimum	1.93 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 110

CALIB. SEQ. NOS. FOR DUMMY: _____ & _____

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

2. Chest Accelerometers-- (Vehicle Crash Test Usage)

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

a. Right Side - - - - -

b. Left Side

B. CALIB. LAB. INSTRUMENTS:

1. Pendulum Accelerometer - -

2. Test Probe Accelerometer -

3. Lumbar Flexion Test Push
Force Gauge - - - - -

4. Abdominal Compression Test
Force Gauge - - - - -

5. Abdominal Compression Test
Displacement Gauge - - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	CX05	1/82	7/82
ENDEVCO	DB47	1/82	7/82
ENDEVCO	CJ54	1/82	7/82
GSE	312	1/82	7/82
GSE	311	1/82	7/82
CEC	16929	1/82	7/82
CEC	22958	1/82	7/82
TRANSDUCER INC	20051	1/82	7/82
BLH	72952	1/82	7/82
CIC	567-11	1/82	7/82

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 320

LABORATORY TECHNICIAN: Gary Gestwick

APPROVED BY: *[Signature]*

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		10/1/81 to	
Calibration Sequential Number for Dummy - - -		10/12/81	
Temperature in Lab. (Spec. = 66 to 78°F) - - -		1.5	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		66° - 70°	
		50% - 64%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	245 g	
b. Peak Lateral Accel. - -	≤10G	8 g	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.05 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	23.08 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	21.5 g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	22.5 g	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	2.19 ms	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	26.875 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	6.875 ms	
g. Pendulum Direction Reversal Time - - - -		110 ms	
h. Max. Head Rotation - -	63 to 73°	66°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in	0.0"
30°	Time	25.6 to 34.4 ms	30.5 ms
	Displ.	2.1 to 3.1 in.	2.8"
60°	Time	40.3 to 51.7 ms	46.5 ms
	Displ.	4.3 to 5.3 in.	4.8"
Maximum (°)	Time	53.2 to 66.8 ms	60 ms
	Displ.	5.0 to 6.0 in.	5.3"

Continued

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. <u>NECK BENDING TEST</u>				
<u>Continued</u>				
i. Chordal Displacement:				
Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	70.5 ms	
	Displ.	4.3 to 5.3 in.	5.0"	
30°	Time	85.4 to 104.6 ms	92 ms	
	Displ.	2.1 to 3.1 in.	2.6"	
0°	Time	101.0 to 123.0 ms	109 ms	
	Displ.	-.5 to 0.5 in.	.2"	
3. <u>ABDOMINAL COMPRESSION TEST:</u>				
(Preload = 10 pounds)				
a. Force @ 1" - - - -		50 to 63 lbs.	58 #s	
b. Force @ 1.3" - - - -		73 to 88 lbs.	87 #s	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20° - - - -		22 to 34 lbs.	34 #s	
b. Force @ 30° - - - -		34 to 46 lbs.	45 #s	
c. Force @ 40° - - - -		46 to 58 lbs.	55 #s	
d. Return Angle - - -		12° maximum	6°	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed - -		21.78-22.22 fps	21.99 fps	
(2) Peak Deflection -		1.7" maximum	1.56"	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	1890 #s	
(4) Internal - - - - Hysteresis		50 to 70%	51.11%	
b. Low Speed				
(1) Probe Speed - - -		13.86-14.14 fps	14.08 fps	
(2) Peak Deflection -		1.1" maximum	.96"	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1243 #s	
(4) Internal Hysteresis- - - -		50 to 7%	51.91%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

NHTSA DUMMY ID NO. 320

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.85 fps	
(2) Maximum Force - -	1850 to 2500 lbs	1875 #s	
(3) Time Above 1000#	1.7 ms minimum	1.92 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.89 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2025 #s	
(3) Time Above 1000#	1.7 ms minimum	1.92 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 320

CALIB. SEQ. NOS. FOR DUMMY: _____ & _____

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

2. Chest Accelerometers-- (Vehicle Crash Test Usage)

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

a. Right Side - - - - -

b. Left Side

B. CALIB. LAB. INSTRUMENTS:

1. Pendulum Accelerometer - -

2. Test Probe Accelerometer -

3. Lumbar Flexion Test Push
Force Gauge - - - - -

4. Abdominal Compression Test
Force Gauge - - - - -

5. Abdominal Compression Test
Displacement Gauge - - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	CS75	7/81	1/82
ENDEVCO	C462	7/81	1/82
ENDEVCO	CE18	7/81	1/82
GSE	312	7/81	1/82
GSE	311	7/81	1/82
CEC	22958	7/81	1/82
CEC	26929	7/81	1/82
TRANSDUCER INC.	20051	7/81	1/82
BLH	72952	7/81	1/82
CIC	567-11	7/81	1/82