REPORT NO. 6851-V-6

NEW CAR ASSESSMENT AND STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS NOS. 212, 219 AND 301-75

SAAB SCANIA

1982 SAAB 900

4-DOOR SEDAN

NHTSA 703-6-541

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April 22, 1982

FINAL REPORT

Prepared for:

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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WASHINGTON, DC 20590

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.	2. Government Accession No.	3. Recipient's Catalog No.
6851-V-6		

4. Title and Subtitle	5. Report Date
New Car Assessment and Standards Enforcement Indicant Testing - FMVSS 212, 219 and 301-75	June 1982
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Walter E. Levan	
9. Performing Organization Name and Address	10. Work Unit No.
Calspan Advanced Technology Center P.O. Box 400 Buffalo, NY 14225	703 Series
	11. Contract or Grant No. DTNH22-81-C-87088
12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U. S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance 400 Seventh Street, S.W., Washington, DC 20590	Final Report June 1982
	14. Sponsoring Agency Code

15. Supplementary Notes

Approved Donald Alianello Head, Experimental Operations Section
Transportation Research Department

16. Abstract

A frontal load cell barrier test of a 1982 Saab 900, 4-door sedan was performed at Calspan Corporation, Advanced Technology Center, Transportation Research Department facility for the New Car Assessment and Standards Enforcement Indicant Testing of FMVSS 212 - Windshield Mounting; FMVSS 219 - Windshield Zone Intrusion; FMVSS 301-75 - Fuel System Integrity for the Office of Vehicle Safety Compliance, the Office of Automotive Rating and for Research and Development.

Impact speed was 35.3 mph.
Ambient temperature on test date was 50°F.
Post-test vehicle crush was 23.9 inches.
Intrusion of firewall into compartment was 6.7 inches.

Test vehicle complied in all respects with the following:

FMVSS 212 - Windshield Retention
FMVSS 219 - Windshield Intrusion
FMVSS 301-75 - Fuel System Integrity
FMVSS 208 - Injury Criteria
Driver - Passed
Right Front Passenger - Failed Head - HIC No. 1164

17. Key Words	18. Distribution Statement
Load Cell Barrier Frontal Impact FMVSS Compliance Testing	Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., SW, Washington, DC 20590

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified		

Form DOT F 1700.7 (8-69)

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SECTION 1

PURPOSE AND TEST PROCEDURE

The purpose of this test was to determine whether the subject vehicle (a 1982 Saab 900, 4-door sedan) meets the requirements of FMVSS Nos. 212, 219, and 301-75 at a higher test speed and also to obtain structural information and dummy injury criteria values for Research and Development and the Office of Automotive Ratings of the NHTSA. This test is part of the New Car Assessment Program B.O.A., Task 1, sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract DTNH22-81-C-87088.

The Calspan Corporation, Advanced Technology Center, Transportation Research Department Test Procedure for the New Car Assessment Crash Tests submitted to and approved by the Contract Technical Manager (CTM) contains the specific procedures used to perform this test.

With the exception of a higher test speed, this procedure is not in conflict with any portion of FMVSS Procedures issued by the Office of Standard Enforcement and the amendments in effect as noted by the applicable contract.

SECTION 2

SUMMARY OF TEST NUMBER 703-6-541

A load cell barrier consisting of 36 load cells (Figure 9) was impacted by a 1982 Saab 900, 4-door sedan, at a velocity of 35.3 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 22, 1982. Pre- and post-test photographs of the vehicle and occupants can be found in Appendix A. Table 1 presents pertinent crash test information.

Two 572, 50th percentile male Anthropomorphic Test Devices (ATDs) were placed in the driver and right front passenger positions, according to dummy placement procedures specific in Laboratory Procedures for Vehicle Assessment TP-212-02.

The occupant dummies were instrumented with head and chest triaxial accelerometers and femur load cells. Belt type load cells were also placed on the lap and shoulder belts to measure dummy torso and lap loading. The right front passenger ATD (Serial No. 153) had been used in a previous test (703-5-540), and the FMVSS 208 Injury Criteria Value was not exceeded in that test. The driver ATD (Serial No. 109) had been certified prior to this test, and certification details along with instrumentation calibration are found in Appendix C of this report.

The crash test was recorded by one real time camera and 12 high-speed cameras. Camera No. 7 (left side impact view) failed to operate due to film breakage. Locations of cameras and other pertinent camera information are found in Section 4 of this report.

The 71 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle and dummy response data traces, and the Injury Criteria Values are presented in Table 9. All 71 data channels checked out prior to the test, and the only data anomalies experienced during impact were Position No. 2, torso belt load cell (intermittent @ 137.5 msec.)

and Acc. Pack. #6 (X) (cut wire @ 200 msec.). Since the impact event duration is 125 msec. and the data anamalies did not occur until after 125 msec., the above two data channels can be considered valid.

Table 1

CRASH TEST SUMMARY

TEST NO. 703-6-541 PROJECT: NEW CAR ASSESSMENT PROGRAM

DATE: 4/22/82 TIME: 1420 TEMP: 50°F

VEHICLE	1982 Saab 900, 4-door sedan
TEST WEIGHT (lbs)	3220
IMPACT ANGLE (deg)*	0
IMPACT VELOCITY (mph)**	35.3
MAX. CRUSH (in) static	23.9
MAX. INTRUSION (in) static	6.7

DUMMIES

TYPE	Hybrid II Part 572	Hybrid II Part 572
LOCATION	LF (1) 109	RF (2) 153
RESTRAINT	Production 3-point belt system	Production 3-point belt system

NUMBER OF DATA CHANNELS	71
NUMBER OF HIGH SPEED CAMERAS	12 + 1 real time

*With respect to tow track Centerline

**Speed trap measurement (± .05% accuracy)

GENERAL COMMENTS

The 1982 Saab 900, 4-door sedan, was equipped with a 121 cubic inch, 4-cylinder engine; 5-speed manual transmission; power steering and power brakes. The total test weight with two dummies, instrumentation and cameras was 3,220 pounds.

The 1982 Saab 900 involved in a frontal load cell barrier crash at a velocity of 35.3 mph complied with FMVSS Nos. 212, Windshield Mounting; 219, Windshield Zone Intrusion; and 301-75, Fuel System Integrity. There was 100 percent windshield retention, no intrusion into the protected zone and no fuel leakage after impact or any phase of the rollover test.

The vehicle sustained 23.9 inches of static crush and approximately 31.5 inches of dynamic crush. Maximum post-test firewall intrusion into occupant compartment was 6.7 inches. The maximum load cell barrier forces measured at the 36 load cells was 79,500 pounds at 30 msec.

At impact the windshield cracked on the driver and right front passenger side (Figure A-8 and A-9); all other windows remained intact. After impact neither front door could be opened.

The driver head contacted the center hub of the steering wheel (Figure A-10) and the femurs contacted with dash panel. The driver did comply with all FMVSS 208 Injury Criteria with a HIC of 733, maximum chest deceleration over 3 msec. of 39 g's and femur loads of 725 and 990 pounds. Belt spool-out was 5.3 inches and belt stretch was .86 inches per foot as measured between the retractor and "D" ring.

The right front passenger head struck the dash panel (Figure A-11) and failed to comply with the FMVSS 208 Head Injury Criteria with a HIC of 1164 but did comply with a maximum chest deceleration over 3 msec. of 35 g's

and femur loads of 1275 and 800 pounds. The belt spool-out was 4.5 inches and belt stretch was .67 inches per foot also measured between the retractor and "D" ring.

Table 2

VEHICLE TEST WEIGHTS AS TESTED

Left Front	910 lbs	Left Rear	720 lbs
Right Front	900 lbs	Right Rear	690 lbs
TOTAL FRONT	1810 lbs	TOTAL REAR	1410 lbs

Total Weight = 1810 + 1410 = 3220 lbs

Wheel Base = 99.1 inches

$$Cg_{F.W.} = \frac{1410 \text{ lbs} \quad 99.1 \text{ inches}}{3220 \text{ lbs}} = 44.4 \text{ inches}$$

CALCULATION FOR TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
UDW = Unloaded Delivered Weight (2720 lbs)
VCW = Vehicle Capacity Weight (930 lbs)
DSC = Designated Seating Capacity (5)

RCLW = VCW - 150 (DSC)
RCLW = 930 - 150 (5) = 180 lbs

TEST WEIGHT = UDW + RCLW + (No. Dummies x 164 lbs)
TEST WEIGHT = 2720 lbs + 180 lbs + 2 (164 lbs)
TEST WEIGHT = 3228 lbs (calculated)

SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION

Vehicle Manufacturer Saab Scania

Make/Model Saab 900

Body Style 4-door sedan Model Year 1982

VIN YS3AGA3S3C1014311 Build Date 11/81

NHTSA No. 703-6-541 Color white

Engine Data: 4 cylinders 121 cubic inches displacement

Transmission Data: 5 speed (X) Manual ( ) Automatic

Date Rec'd 4/5/82 Air Cond. no PW. STR. yes PW. BR. yes

Dealer's Name & Address Drake Street Motors, Elba, NY

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

Vehicle Manufactured by Saab Scania

Date of Manufacture 11/81 VIN YS3AGA3S3C1014311

GVRW 3640 lbs GAWR: Front 2030 lbs Rear 2010 lbs

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

Vehicle Load (up to capacity) - Front 30 psi
Rear 32 psi

Recommended Tire Size 185/65 SR/15 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 = 180 lbs

TOTAL = 930 lbs

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

Right Front = 820 lbs Right Rear = 540 lbs

Left Front = 820 lbs Left Rear = 540 lbs

TOTAL FRONT WEIGHT = 1640 lbs (60 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1080 lbs (40 % of Total Vehicle Weight)

TOTAL DELV. WEIGHT = 2720 lbs

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 172 lbs CARGO

Right Front = 900 lbs Right Rear = 690 lbs

Left Front = 910 lbs Left Rear = 720 lbs

TOTAL FRONT WEIGHT = 1810 lbs (56.2 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1410 lbs (43.8 % of Total Vehicle Weight)

TOTAL TEST WEIGHT = 3220 lbs

Weight of ballast secured in vehicle trunk area = 0 lbs

Table 3

SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS

Date of Test 4/22/82 Time of Test 2:20 ~~am~~/pm

Ambient Temperature 50 °F at impact area

Temperature in Occupant Compartment 69 °F

Windshield Molding Temperature 59 °F

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 28 LF 27 1/4 RR 26 1/4 LR 26 1/8

Test Attitude: RF 26.2 LF 26.2 RR 25 LR 25.2

VEHICLE TIRE DATA

Recommended Cold Tire Pressure: Front = 30 psi Rear = 32 psi

Recommended Tire Size 185/65 SR/15 Load Range B

Tires on Vehicle 185/65 SR/15

Is Spare Tire a "Space Saver" X yes _____ 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* 16.6 gal

Test Volume 15.5 gal (93% of EPA Capacity)

Fuel System Capacity (data from Owner's Manual) 16.6 gal

Details of fuel system Electrically operated fuel pump. Fuel tank is located aft of rear wheels and held in place by two tank straps. The filler tube is on the right side of vehicle and sealed by a screw cap which is concealed by a hinged access door.

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 183.0 /L 183.4 inches

Post-Test = R 162.0 /L 161.4 inches

Crush = R 21 /L 22

FOR FRONTAL IMPACTS, distance from front of test vehicle to the barrier after impact = 7.1 inches (average)

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

SECTION 3

SUMMARY OF FMVSS NOS. 212, 219 AND 301-75

- Post-Impact Data
- Windshield Zone Intrusion FMVSS 219
- Protected Zone
- Summary of FMVSS 212 Data
- Fuel System Integrity FMVSS 301-75

Table 4

POST-IMPACT DATA - STANDARDS 219 AND 301

DATA SHEET

TYPE OF TEST __X__ Frontal (90°) Impact

_____ Oblique (____°) Impact on _____ Left (Driver's) Side

_____ Right Side

_____ Lateral or Side Impact on _____ Left (Driver's) Side

_____ Right Side

_____ Rear Impact

DATE OF TEST 4/22/82 TIME 1420 TEMP 50 °F

VEHICLE NHTSA NO. 703-6-541 VIN YS3AG43S3C1014311

REQUIRED VEHICLE VELOCITY RANGE 34.5 to 35.5 mph

IMPACT VELOCITY (traps within 5 feet of impact event) 35.3

Trap No. 1 = 35.3 mph Trap No. 2 = 35.3 mph

Distance from the vehicle's front bumper to the barrier face entering the vehicle velocity measurement device = 58

exiting the vehicle velocity measurement device = 18

VEHICLE STATIC CRUSH (for frontal and rear impacts only)

Driver's Side = 22 in Passenger's Side = 21 in

Average = 21.5 in

Crush Details:

VEHICLE STATIC CRUSH (for side impacts only)

Amount of Crush = --- inches on --- side

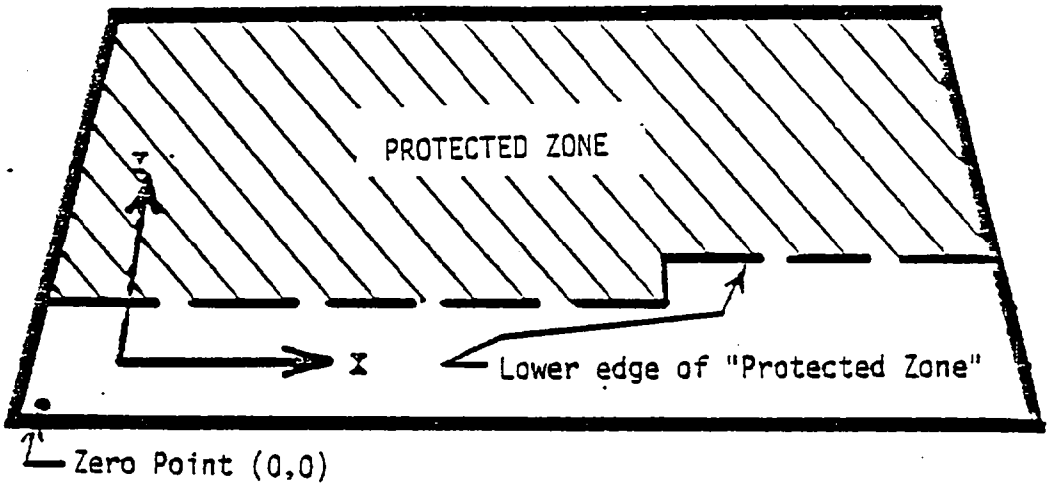
Crush Details:

VEHICLE REBOUND (from rigid barrier only)

Driver's Side = 7.6 in Passenger's Side = 6.6 in

Average = 7.1 in

REMARKS



FRONT VIEW

With the zero coordinate for the X-Y grid located at the lower right corner (passenger side) of the windshield, record the following positions:

(1) The area that the "Protected Zone" template was penetrated more than .25 inches by a vehicle component other than one which is normally in contact with the windshield.

NONE

Coordinates	
X	Y

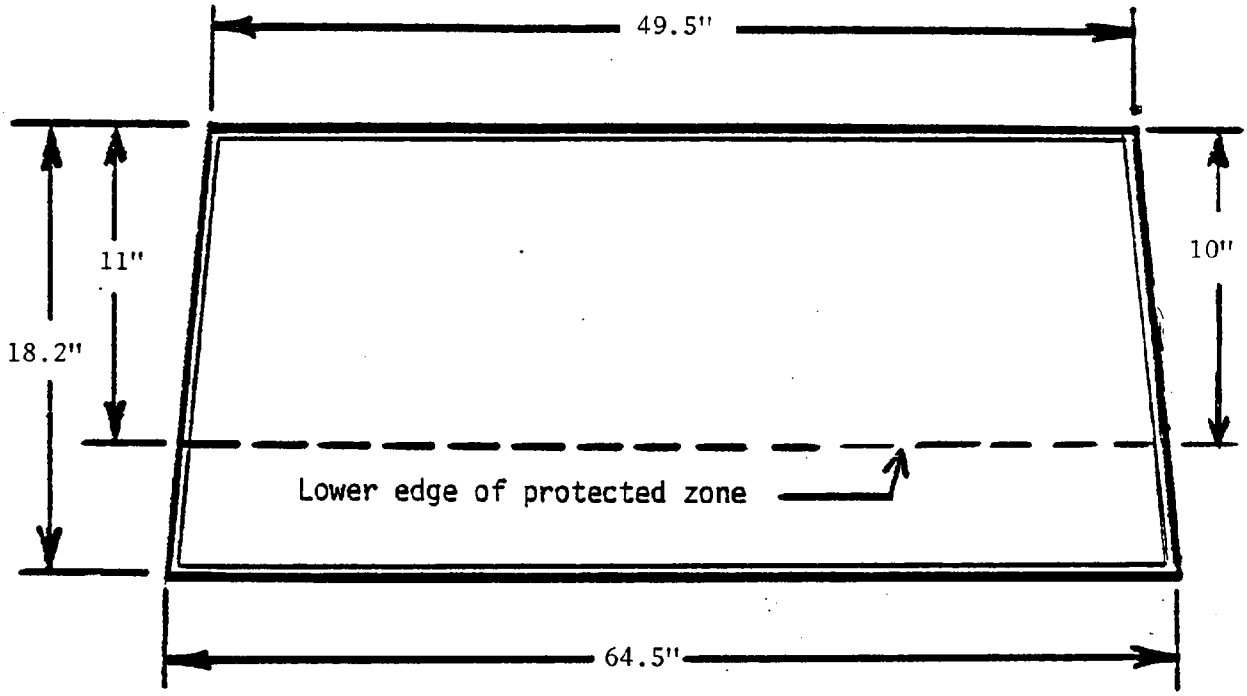
(2) The area beneath the "Protected Zone" that the inner surface of the windshield was penetrated by a vehicle component.

NONE

Coordinates	
X	Y

(3) Record any windshield retention clips or brackets used to insure that the windshield would not disengage from the body.

Figure 1 WINDSHIELD ZONE INTRUSION, FMVSS 219 - DATA SHEET



FRONT VIEW OF WINDSHIELD

Provide all dimensions necessary to reproduce the protected zone.

Method of adhering styrofoam to the windshield:

RTV adhesive applied to windshield surface and to back of styroforam which is then clamped in place until dry.

Figure 2 PROTECTED ZONE

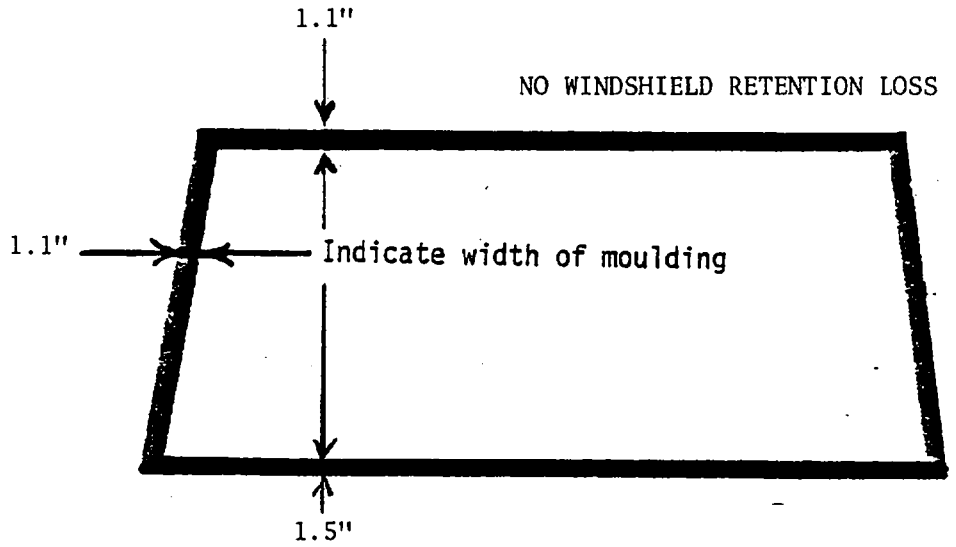
Details of windshield mounting (method of retention, type of trim, etc.):

The windshield is held in place by a rubber molding which has a plastic chrome strip around the perimeter of the rubber molding.

	Windshield Periphery		
	Pre-Test	Post-Test	Retention %
Right Side	75.2	75.2	100
Left Side	75.2	75.2	100
TOTAL	150.4	150.4	100

The standard requires that Post-Test be a minimum of 75 percent of the Pre-Test total periphery measurement for vehicle not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

AREA OF RETENTION FAILURE



FRONT VIEW

Figure 3 SUMMARY OF FMVSS 212 DATA

Table 5

"FUEL SYSTEM INTEGRITY" POST-IMPACT TEST DATA

FMVSS No. 301-75

TEST VEHICLE NHTSA NO. 703-6-541 Test Date 4/22/82

Vehicle Manufacture/Make/Model Saab Scania - 1982 Saab 900 - 4-door sedan

Test vehicle fuel tank filled to 90-91% of capacity with Stoddard Solvent and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE

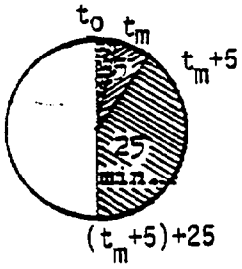
X Frontal (35 mph)

_____ Oblique (30 mph) with _____° barrier face first contacting _____ driver _____ passenger side

_____ Rear Moving Barrier (35 mph)

_____ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT



	Actual	Max. Allow.
From impact until vehicle motion ceases	0	1 oz
For 5 min. period after vehicle motion ceases	0	5 oz
For next 25 min.	0	1 oz/1 min

TEST VEHICLE STATIC ROLLOVER

Test information will be added to the following static rollover data sheets

(1) Figure 8A - Rollover data for 0° to 90° test phase

(2) Figure 8B - Rollover data for 90° to 180° test phase

(3) Figure 8C - Rollover data for 180° to 270° test phase

(4) Figure 8D - Rollover data for 270° to 360° test phase

SOLVENT SPILLAGE DETAILS

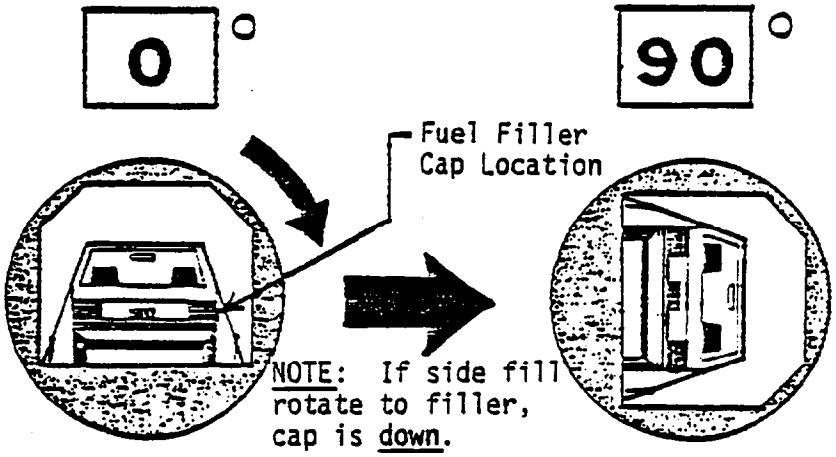
None.

VEHICLE NHTSA ID NO. _____

Table 5A

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 min.)	=	2	minutes	56 seconds
FMVSS 301-75 Position Hold Time	=	5	minutes	00 seconds
TOTAL	=	7	minutes	56 seconds
Next Whole Minute Interval	=	8	minutes	

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

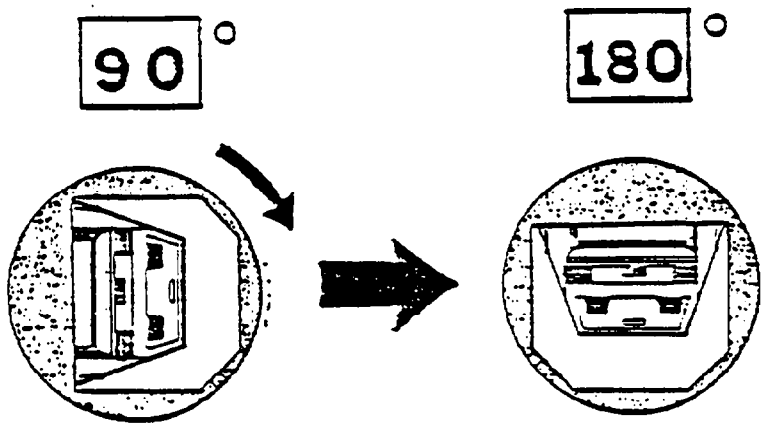
None.

VEHICLE NHTSA ID NO. 703-6-541

Table 5B

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 min.)	=	2 minutes	54	seconds
FMVSS 301-75 Position Hold Time	=	5 minutes	00	seconds
TOTAL	=	7 minutes	54	seconds
Next Whole Minute Interval	=	8 minutes		

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

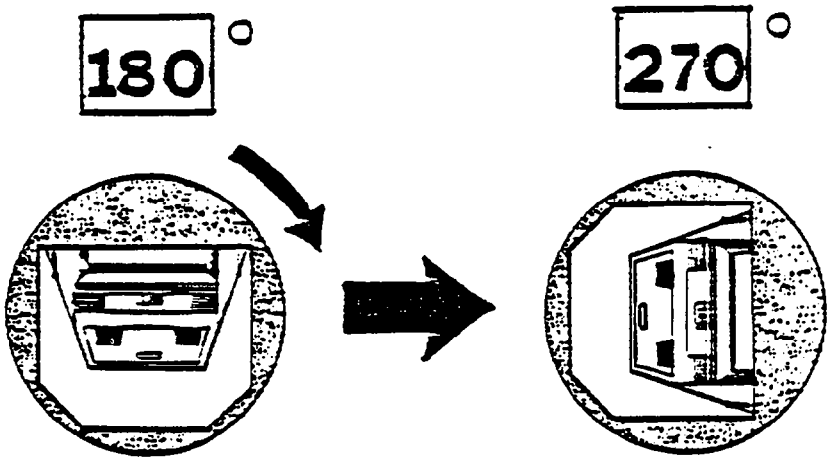
None.

VEHICLE NHTSA ID NO. 703-6-541

Table 5C

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 min.)	=	2 minutes	57	seconds
FMVSS 301-75 Position Hold Time	=	5 minutes	00	seconds
TOTAL	=	7 minutes	57	seconds
Next Whole Minute Interval	=	8 minutes		

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

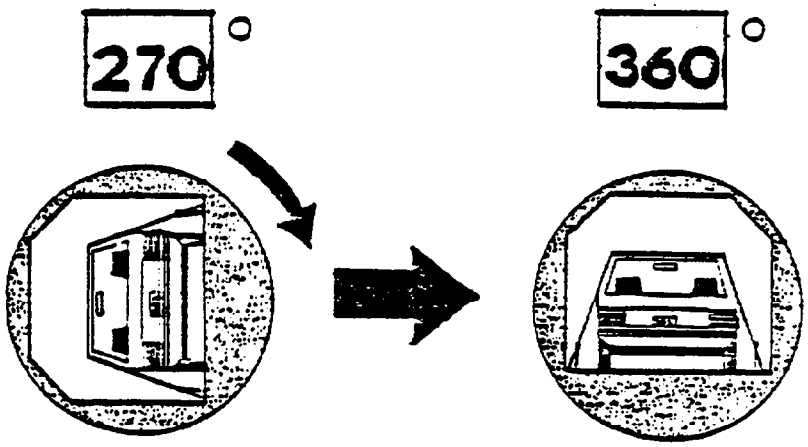
None.

VEHICLE NHTSA ID NO. 703-6-541

Table 5D

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 min.)	=	2 minutes	58	seconds
FMVSS 301-75 Position Hold Time	=	5 minutes	00	seconds
TOTAL	=	7 minutes	58	seconds
Next Whole Minute Interval	=	8 minutes		

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

None.

SECTION 4

OCCUPANT AND VEHICLE INFORMATION

- Vehicle Measurements
- Vehicle Accelerometer Locations
- Camera Positions and Locations
- Dummy In-Vehicle Position
- Dummy Injury Criteria Values
- Fixed Load Cell Barrier - Load Cell Locations

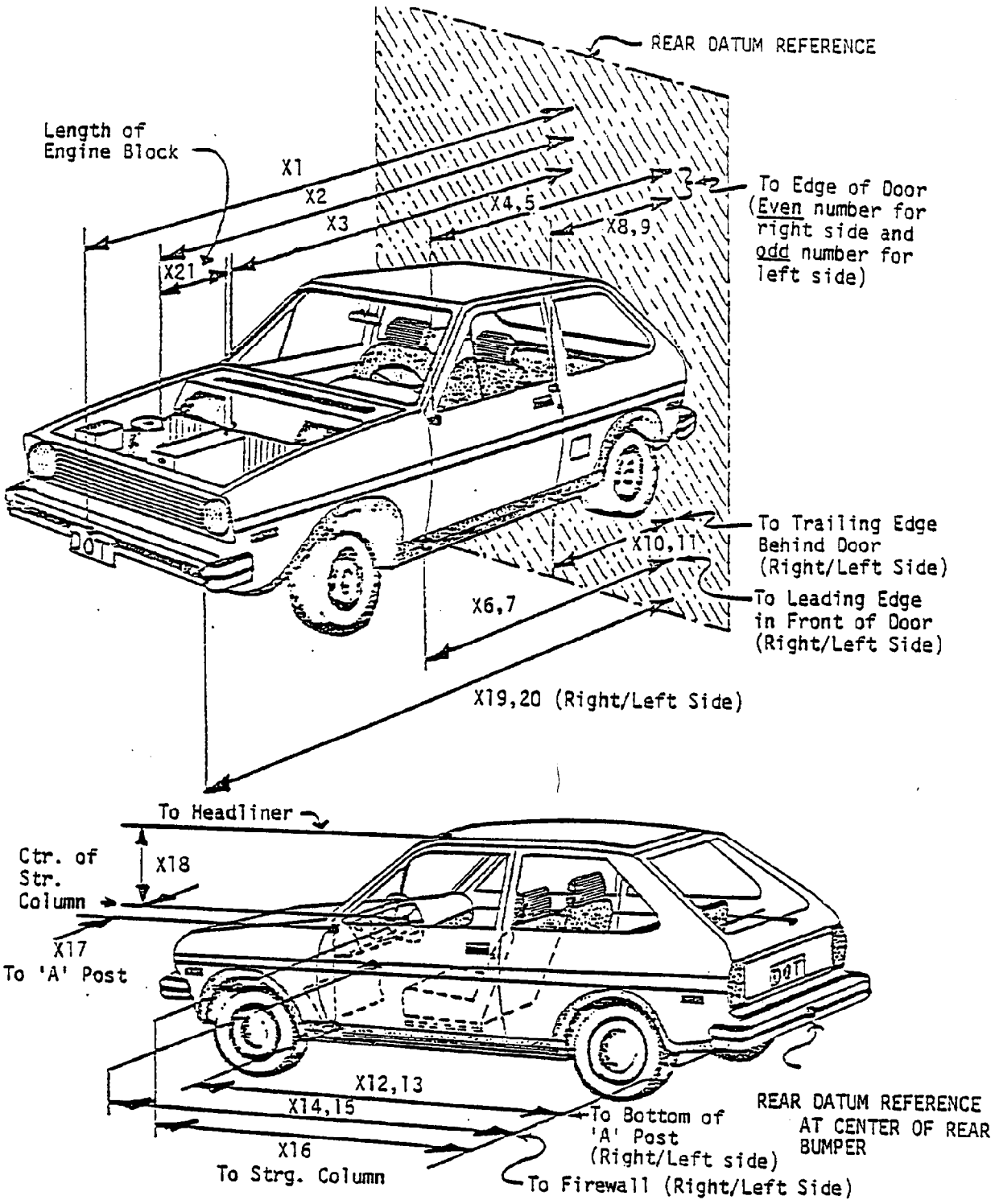


Figure 4 PRE-TEST AND POST-TEST MEASUREMENT POINTS

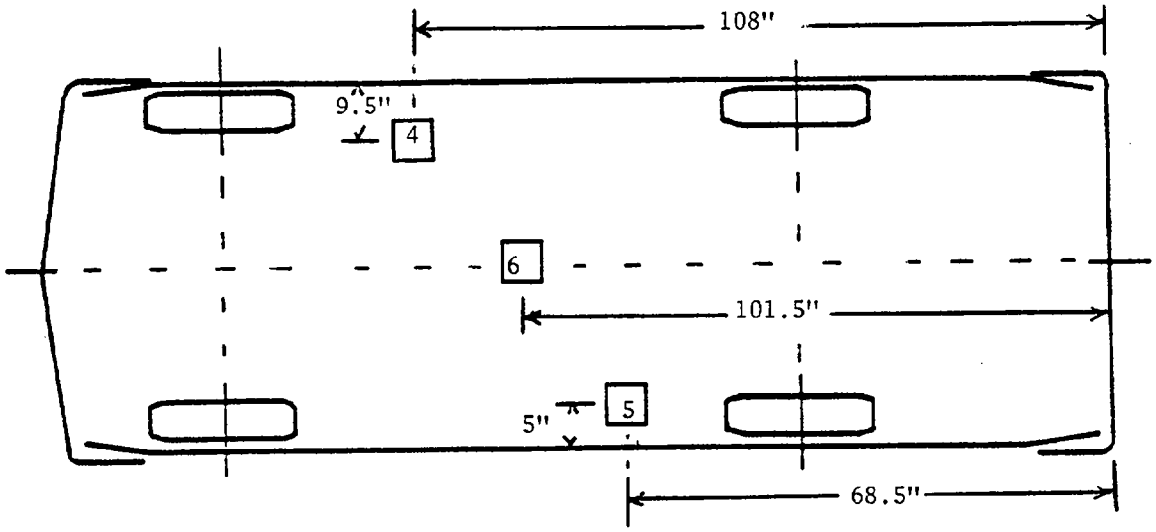
Table 6

VEHICLE MEASUREMENTS

All Dimensions in Inches

	1982 Saab 900 - 4-door sedan	Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	186.6	162.7	23.9
X2	Rear Surface of Vehicle to Front of Engine	171.3	155.3	16.0
X3	Rear Surface of Vehicle to Firewall	135.3	128.6	6.7
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	120.2	119.5	.7
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	120.5	118.5	2.0
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	121.2	121.2	0.0
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	122.0	120.2	1.8
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	88.7	88.0	.7
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	89.4	87.2	2.2
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	89.5	89.5	0.0
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	90.2	88.5	1.7
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	121.5	121.5	0.0
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	122.2	120.7	1.5
X14	Rear Surface of Vehicle to Firewall, Right Side	137.7	133.1	4.6
X15	Rear Surface of Vehicle to Firewall, Left Side	138.7	132.0	6.7
X16	Rear Surface of Vehicle to Steering Column	112.5	112.2	0.3
X17	Center of Steering Column to "A" Post	11.0	10.3	.7
X18	Center of Steering Column to Headliner	17.4	15.9	1.5
X19	Rear Surface of Vehicle to Right Side of Front Bumper	183.0	162.0	21.0
X20	Rear Surface of Vehicle to Left Side of Front Bumper	183.4	161.4	22.0
X21	Length of Engine Block	29.0	29.0	0.0

31.5"



ACCELEROMETER NUMBER *	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
4	Front Seat Crossmember	x		x
4(X)R	Same as 4 (redundant)	x		
5	Rear Seat Crossmember	x		x
5(X)R	Same as 5 (redundant)	x		
6	Center of Gravity			

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

FIGURE 5 VEHICLE ACCELEROMETER LOCATIONS

NOTE: Camera Information Shown on Table 7 and 8.

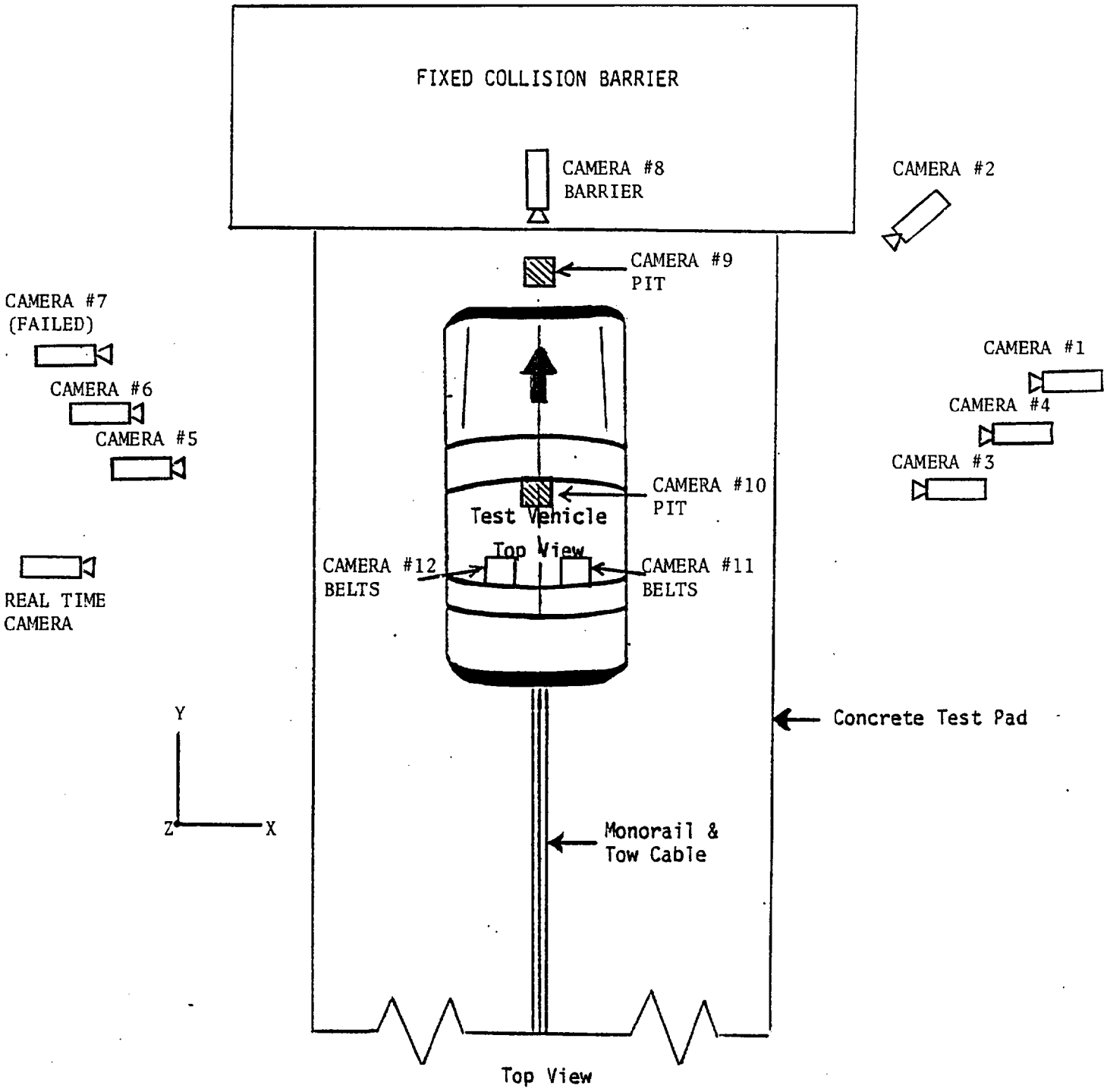


Figure 6 CAMERA POSITION FOR FRONTAL IMPACTS

Table 7

HIGH SPEED CAMERA LOCATIONS

Test No.: 703-6-541 Vehicle 1982 Saab 900

CAMERA NUMBER	VIEW	CAMERA POSITIONS (IN)* X	Y	Z	CAMERA ANGLE (DEG)**	FILM PLANE TO HEAD TARGET (IN) X
1	Impact-Vehicle Right Side	348	36	43	-3	---
2	Windshield	120	-18	41	-3	---
3	Right Front Passenger	246	84	41	-2	277
4	Vehicle Right Side	324	66	41	0	305
5	Driver	204	96	40	-3	185
6	Vehicle Left Side	264	60	41	-3	245
7	Impact Left Side	FAILED				
8	Front Impact (Barrier)	0	-9	59	-24	---
9	Pit Front-Engine	0	24	120	90	---
10	Pit Rear-Fuel Tank	0	96	120	90	---
11	Right Belt Retractor	---	--	---	--	---
12	Left Belt Retractor	---	--	---	--	---

*X = film plane to monorail centerline
Y = film plane to impact location
Z = film plane to ground

**Referenced to Horizontal Plane

Table 8

HIGH SPEED CAMERA INFORMATION (TEST 703-6-541)

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)
1	Impact RT Side	Photosonic	13 mm	1100
2	Windshield	Photosonic	13 mm	1000
3	RT Front Passenger	Photosonic	25 mm	900
4	Vehicle Right Side	Photosonic	35 mm	900
5	Driver	Photosonic	25 mm	900
6	Vehicle Left Side	Photosonic	35 mm	900
8	Front Impact (Barrier)	Photosonic	8 mm	900
9	Pit Front	Photosonic	13 mm	900
10	Pit Rear	Photosonic	13 mm	No timing
11	RT Belt	Stalex	8 mm	1300
12	LT Belt	Stalex	8 mm	1500

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.

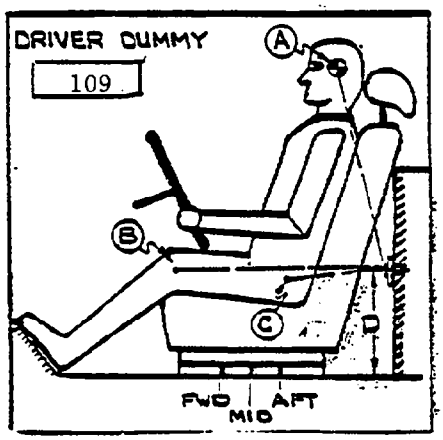
FIGURE 7
PART 572 DUMMY IN-VEHICLE POSITION

Test No. 703-6-541 Vehicle 1982 Saab 900

SEAT TYPE:
___ Bench
_X_ Bucket
___ Split Bench

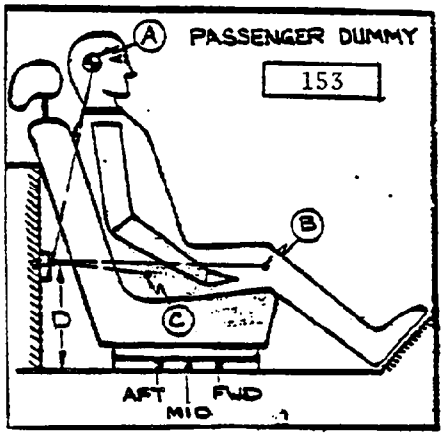
ADJUSTER TYPE:
_X_ Manual
___ Power

BUCKET SEAT BACK TYPE:
___ Fixed
_X_ Adjustable Reclining



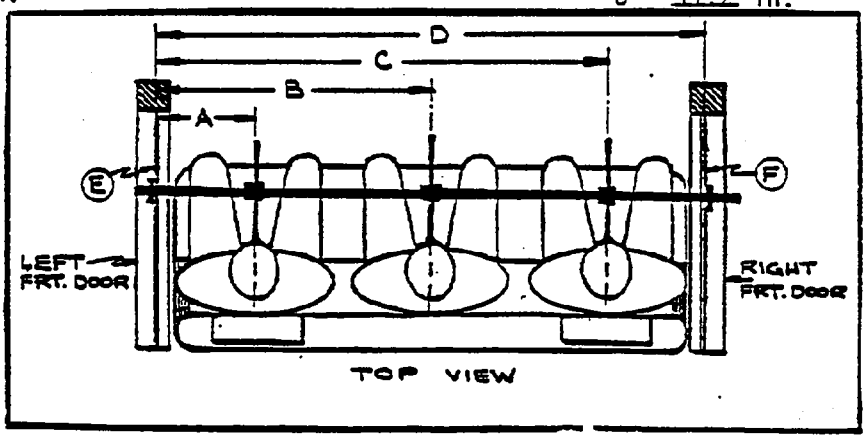
MEASUREMENT LOCATION

A - Head Target
B - Knee Joint
C - Approximate 'H' Point
D - Sill to Reference Point



A = 18.0 in. 15 Degrees
B = 25.5 in. 105 Degrees
C = 10.0 in. 145 Degrees
D = 17.2 in.

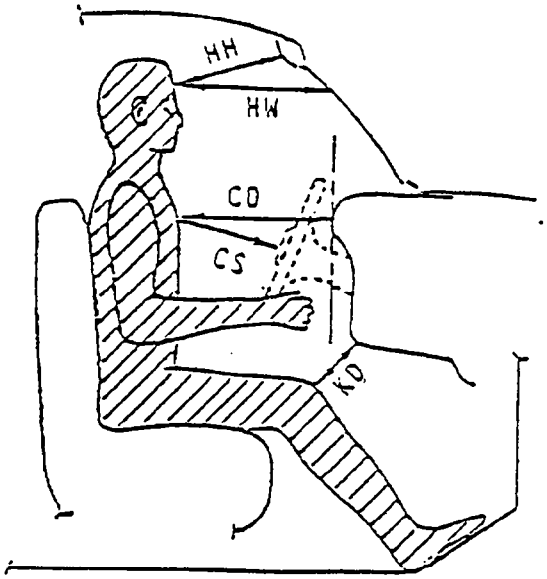
A = 18.5 in. 18 Degrees
B = 25.7 in. 108 Degrees
C = 10.9 in. 145 Degrees
D = 17.2 in.



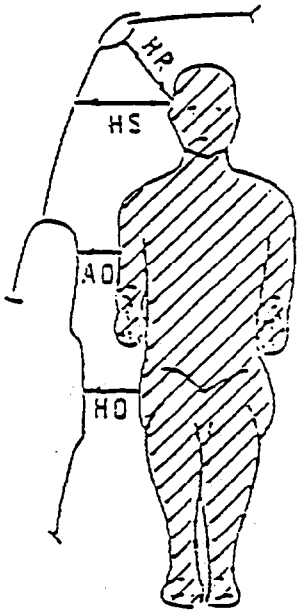
DUMMY ID

		109	--	153
A	=	Left Door to Driver Centerline	13.2	in.
B	=	Left Door to Center Passenger Centerline	--	in.
C	=	Left Door to Right Passenger Centerline	38.2	in.
D	=	Left Door to Right Door	50.7	in.
E, F	=	Window Glass Height (Right and Left Must be Equal)	11.0	in.

	DRIVER	PASS
HH	19.5	18.7
HW	23.5	23.0
CD	21.5	19.7
CS	14.5	----
KDL	3.2	4.0
KDR	4.1	4.0



HR	6.5	6.3
HS	9.5	9.5
AD	4.0	4.1
HD	7.0	7.0



1982 Saab 900

Figure 8 OCCUPANT CLEARANCE DIMENSIONS

DUMMY INJURY CRITERIA VALUES

1982 Saab 900 Table 9

	MAXIMUM ACCELERATION ("G") *							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R
DUMMY (1)	-76	-12	54	90	-38	-13	10	39
DUMMY (2)	-85	6	73	112	-33	9	19	35
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	725	990
DUMMY (2)	1275	800
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)	1200	950	1075
DUMMY (2)	1450	850	925
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)	733.4	.0774	.1044	59.4	988.3
DUMMY (2)	1164.5	.0903	.1035	95.1	1546.4
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION
**AS DEFINED IN FMVSS NO. 208

36 LOAD CELLS
4 ROWS
9 COLUMNS

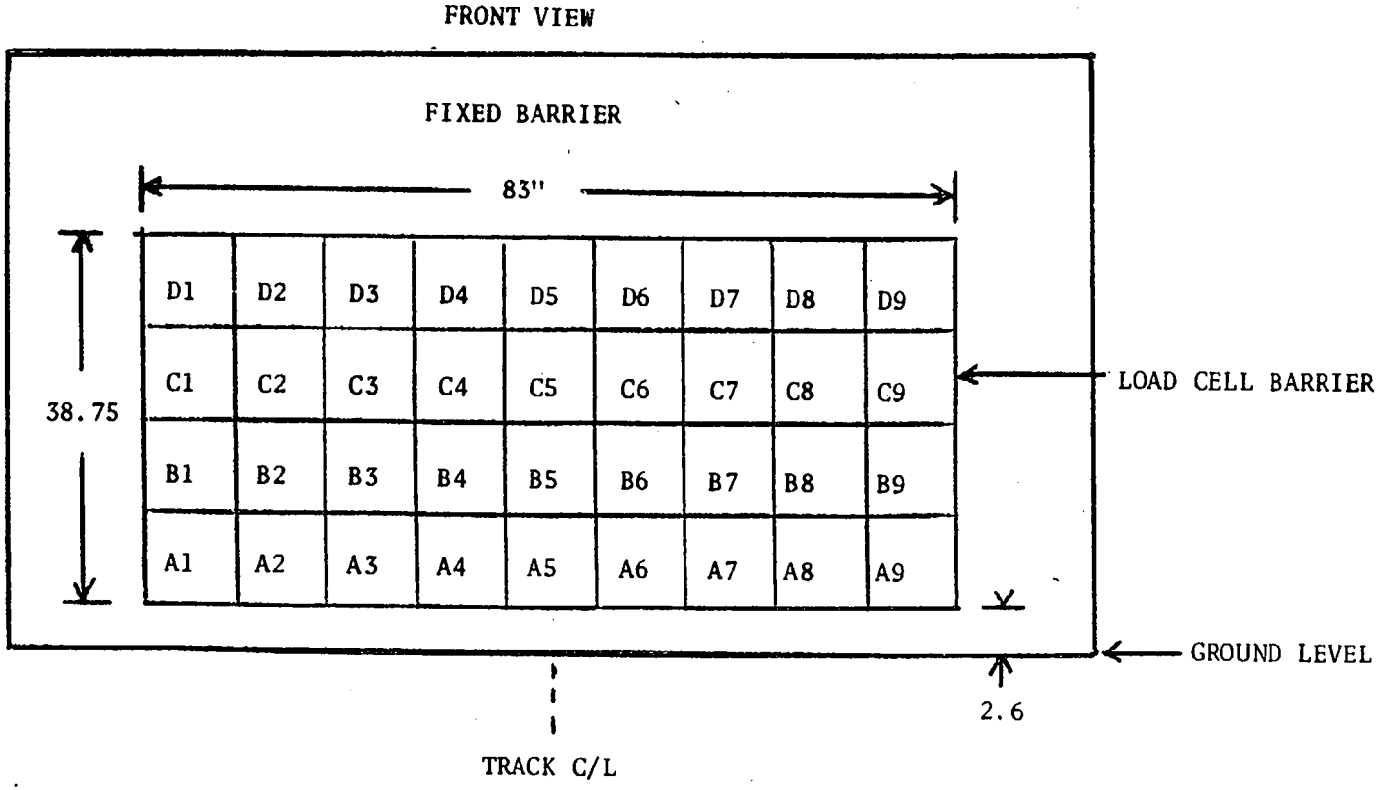


Figure 9 FIXED LOAD CELL BARRIER-LOAD CELL LOCATIONS

APPENDIX A

PHOTOGRAPHS

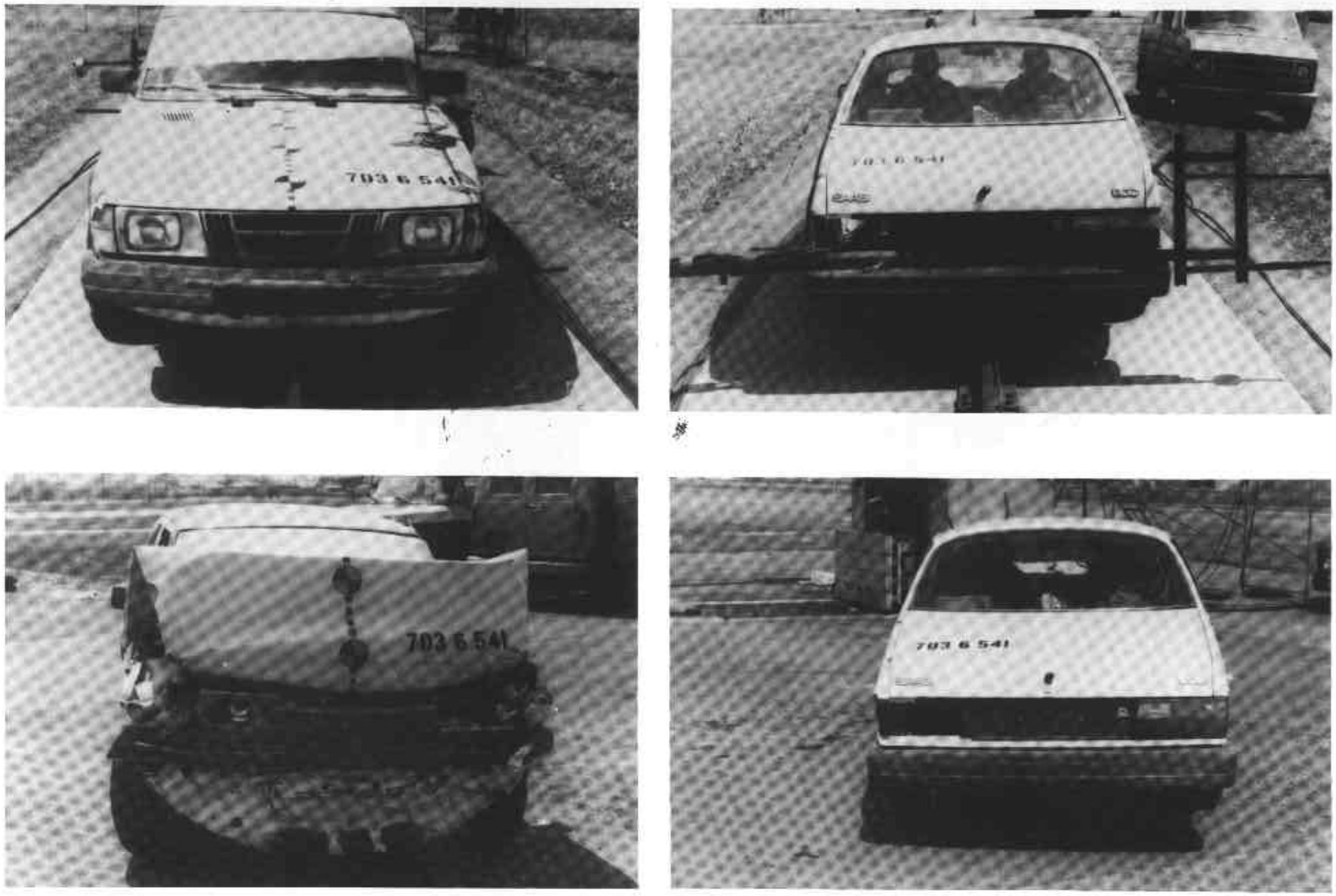


Figure A-1 Pre- and Post-Test Front and Rear Views

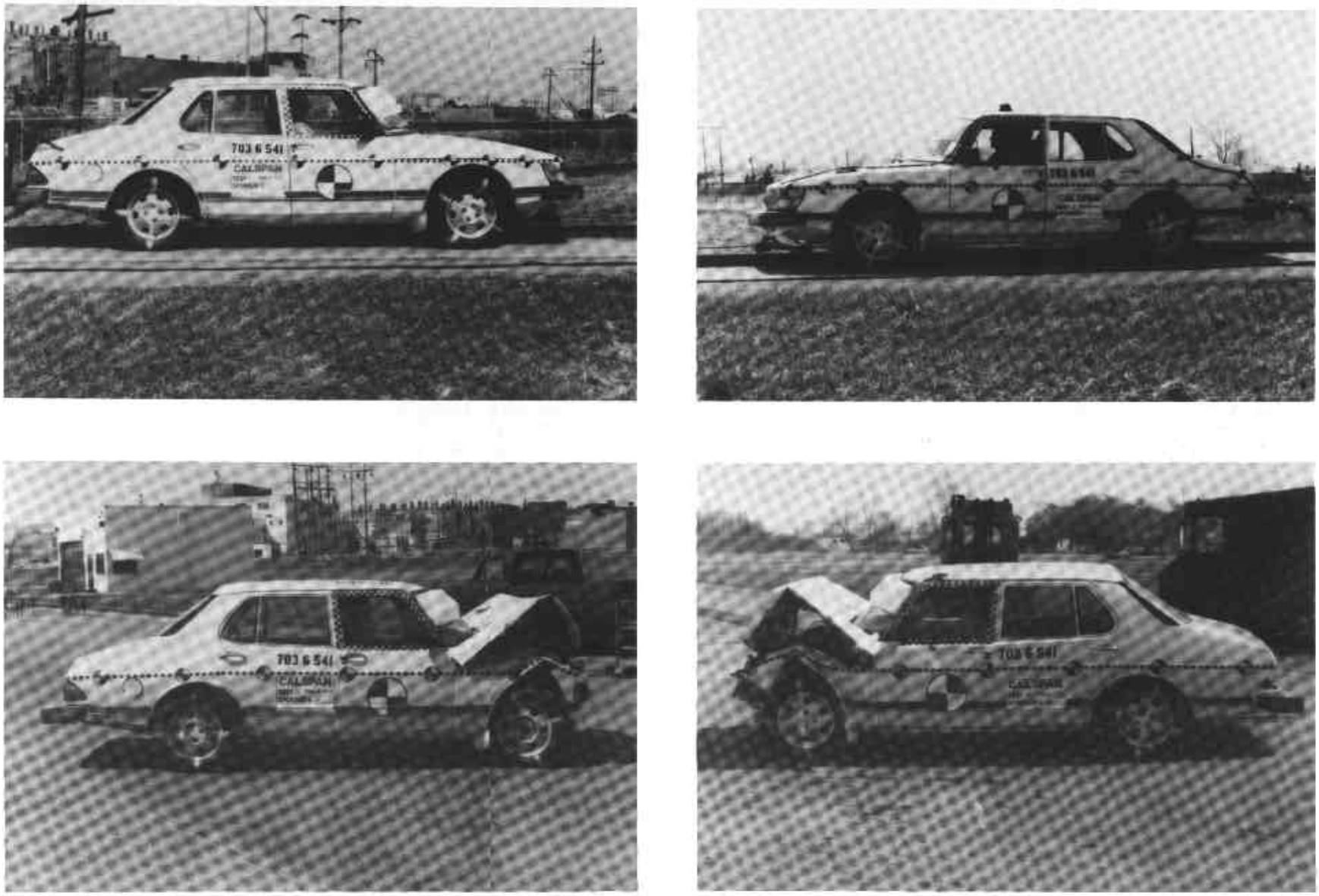


Figure A-2 Pre- and Post-Test Right and Left Side Views

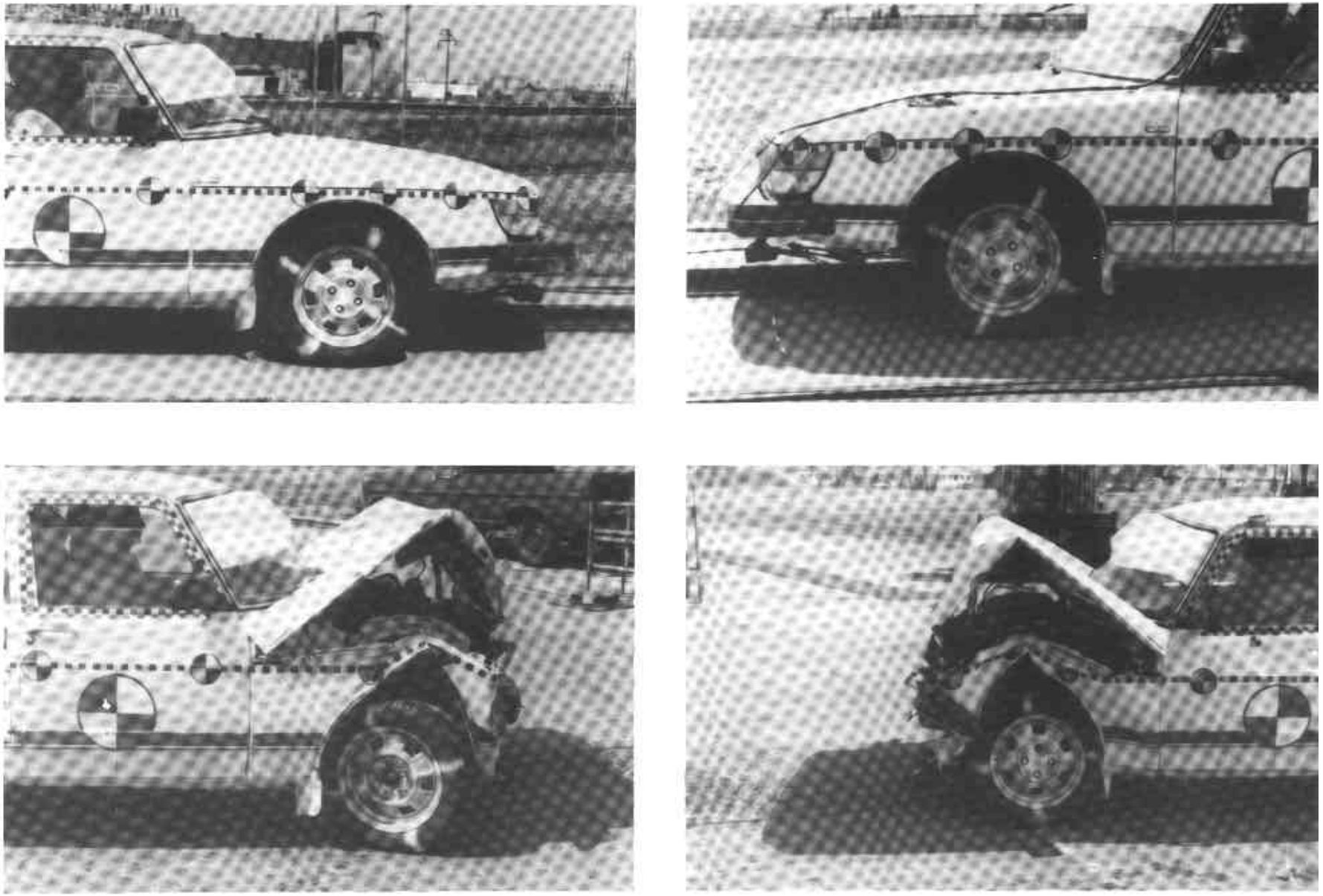


Figure A-3 Pre- and Post-Test Right and Left Front Quarter Panel Views

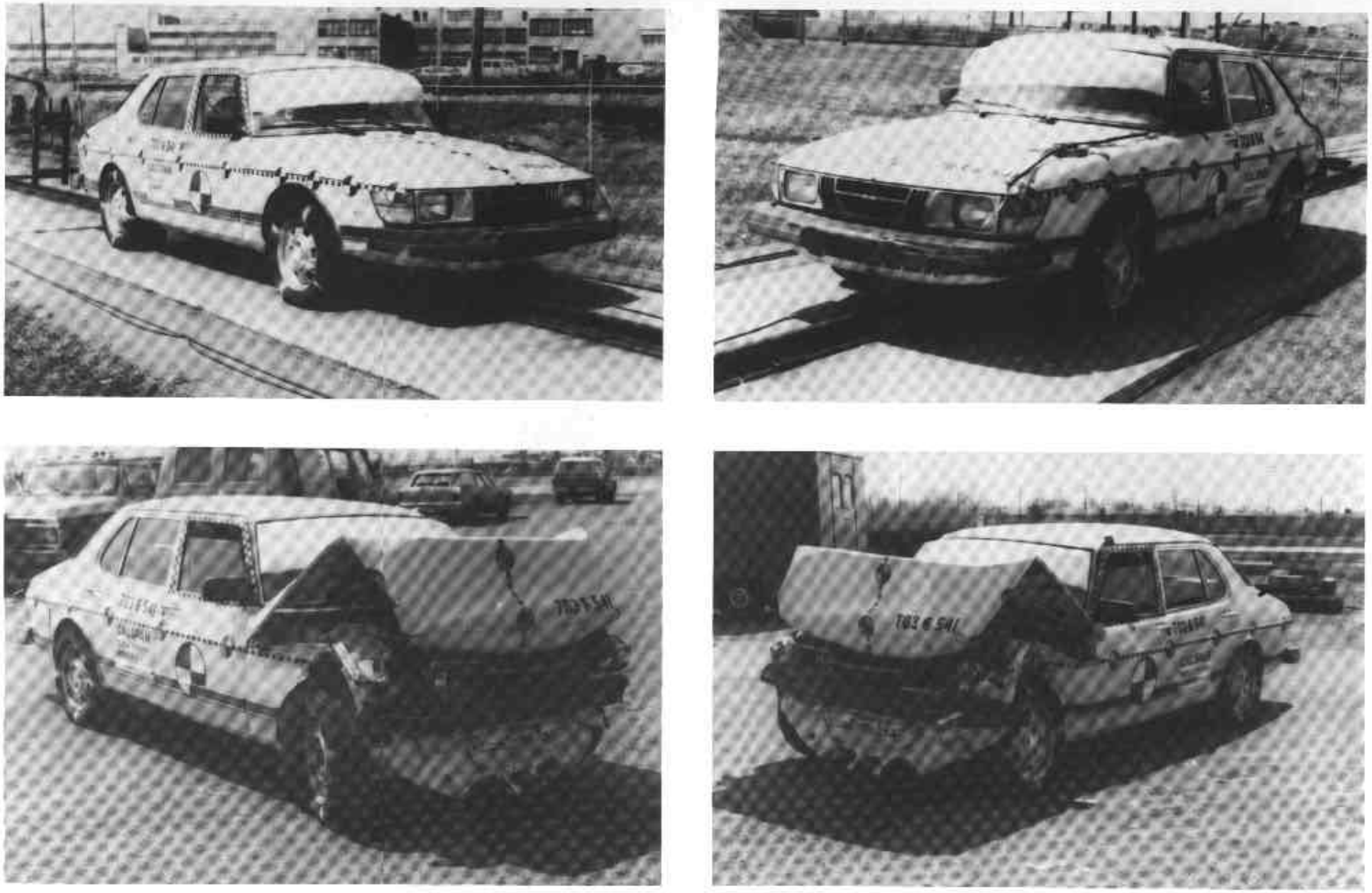


Figure A-4 Pre- and Post-Test Right and Left Front Three-Quarter Views

Figure A-5 Pre- and Post-Test Right and Left Rear Three-Quarter Views

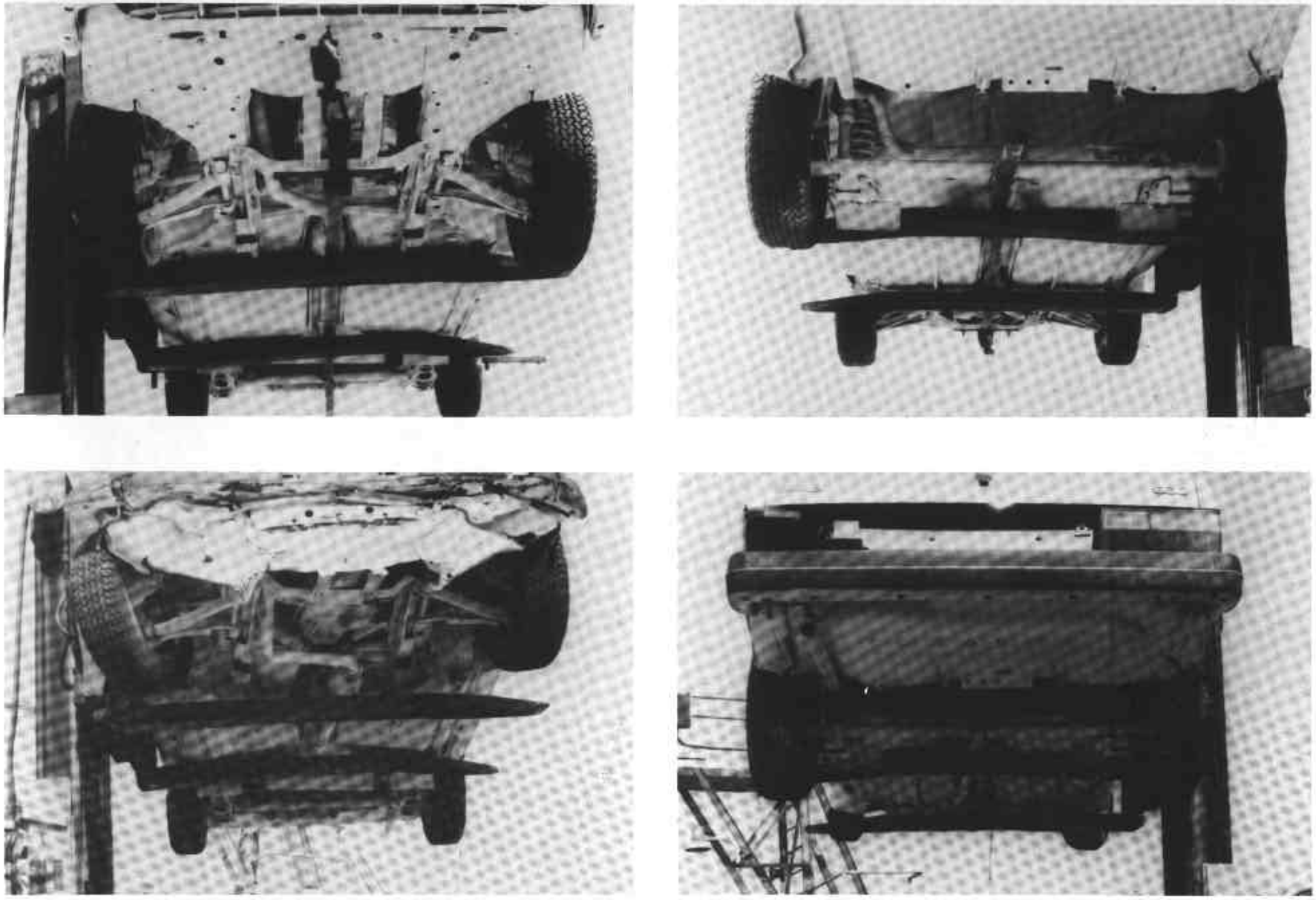


Figure A-6 Pre- and Post-Test Front and Rear Underbody Views

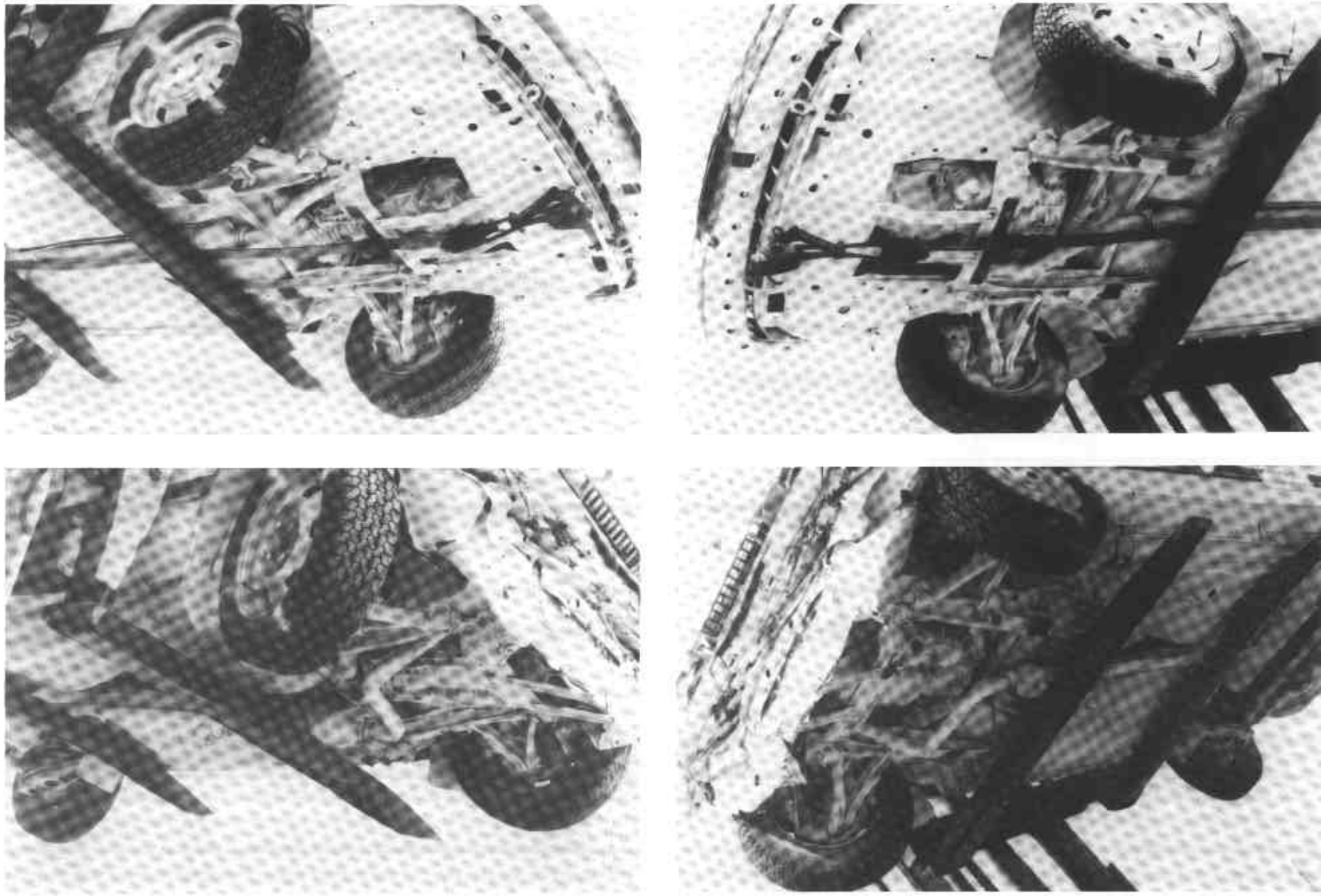


Figure A-7 Pre- and Post-Test Right and Left Underbody Views

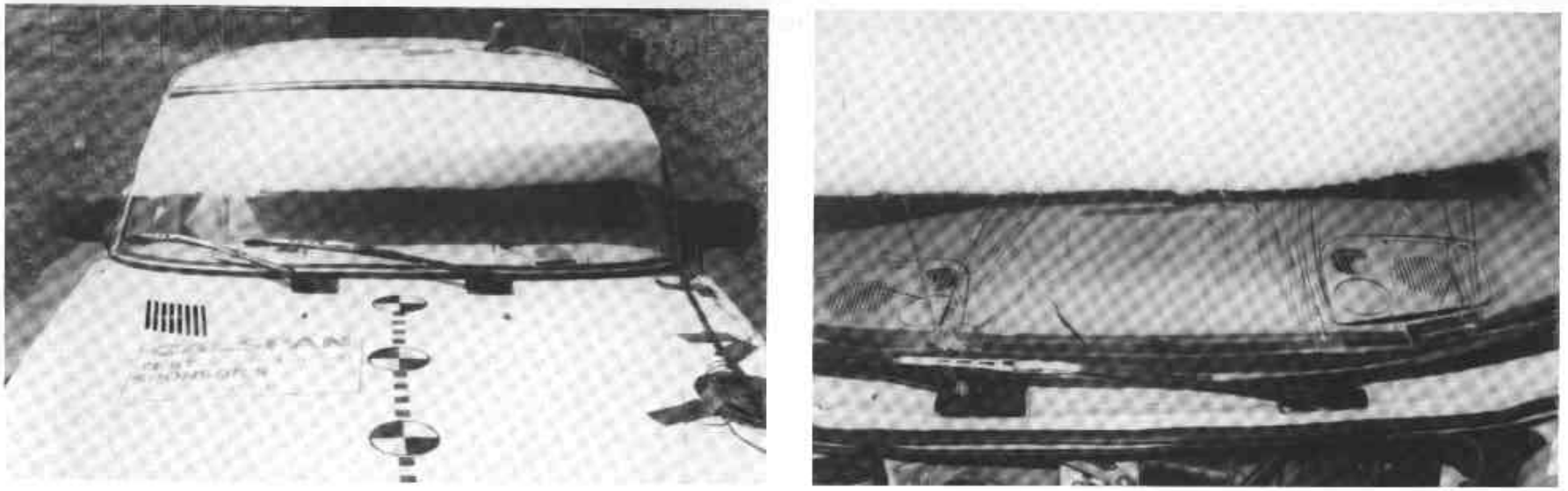


Figure A-8 Pre- and Post-Test Windshield and Styrofoam Front Views

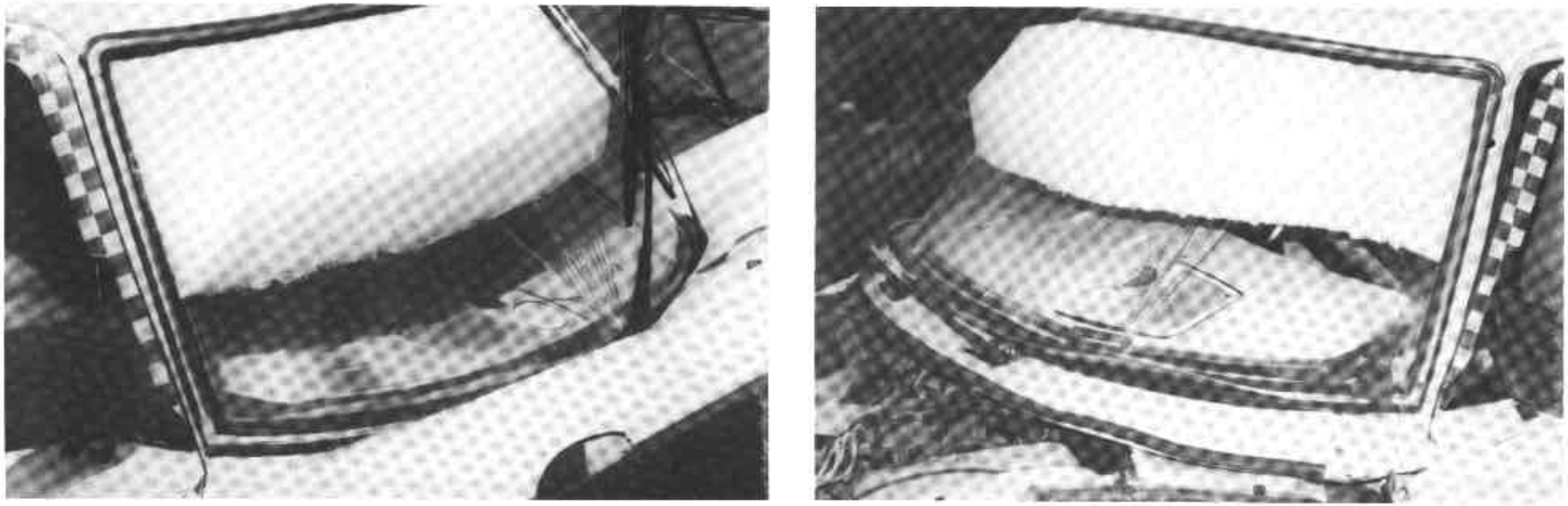


Figure A-9 Post-Test Right and Left Windshield Views

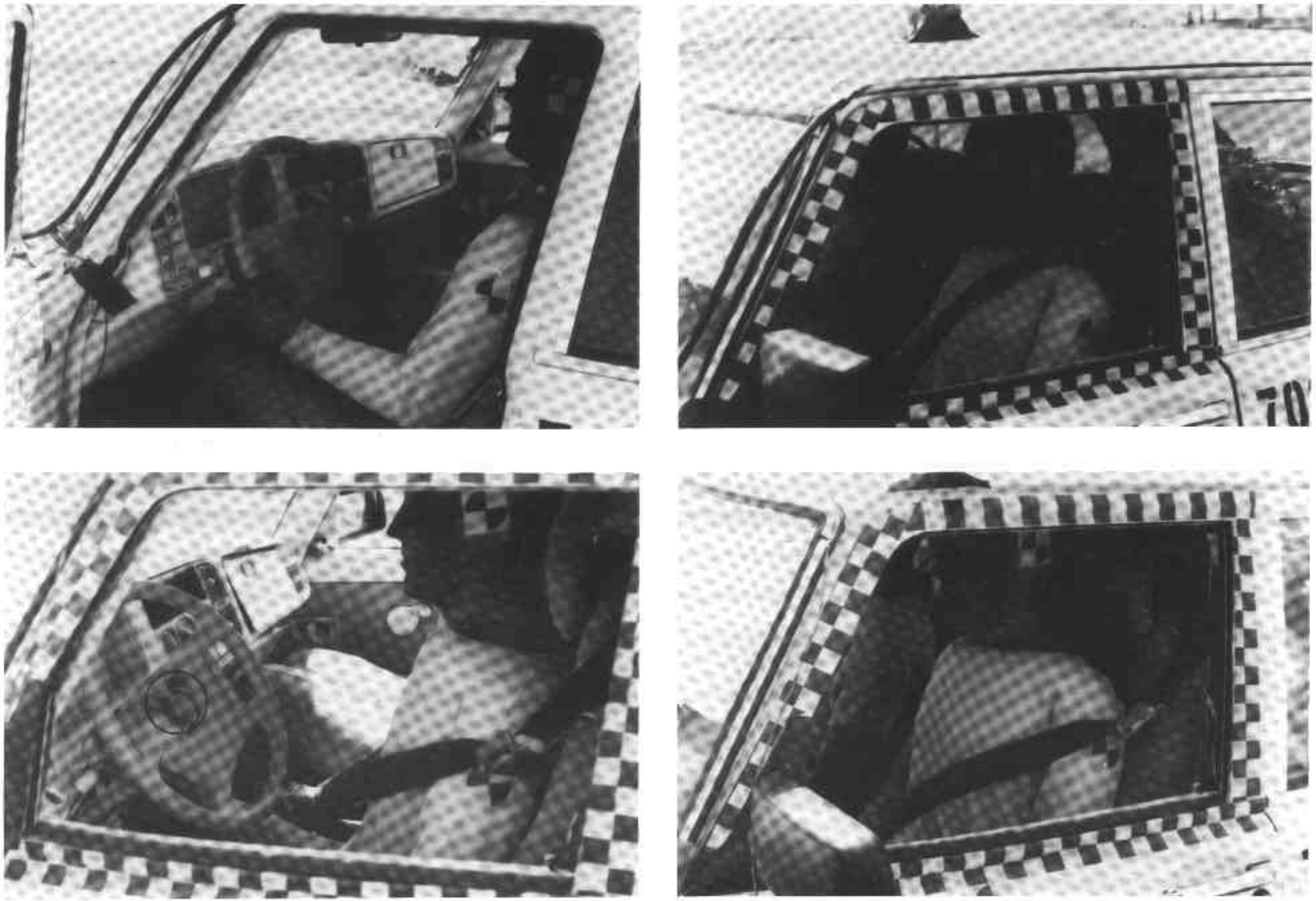


Figure A-10 Pre- and Post-Test Driver Views

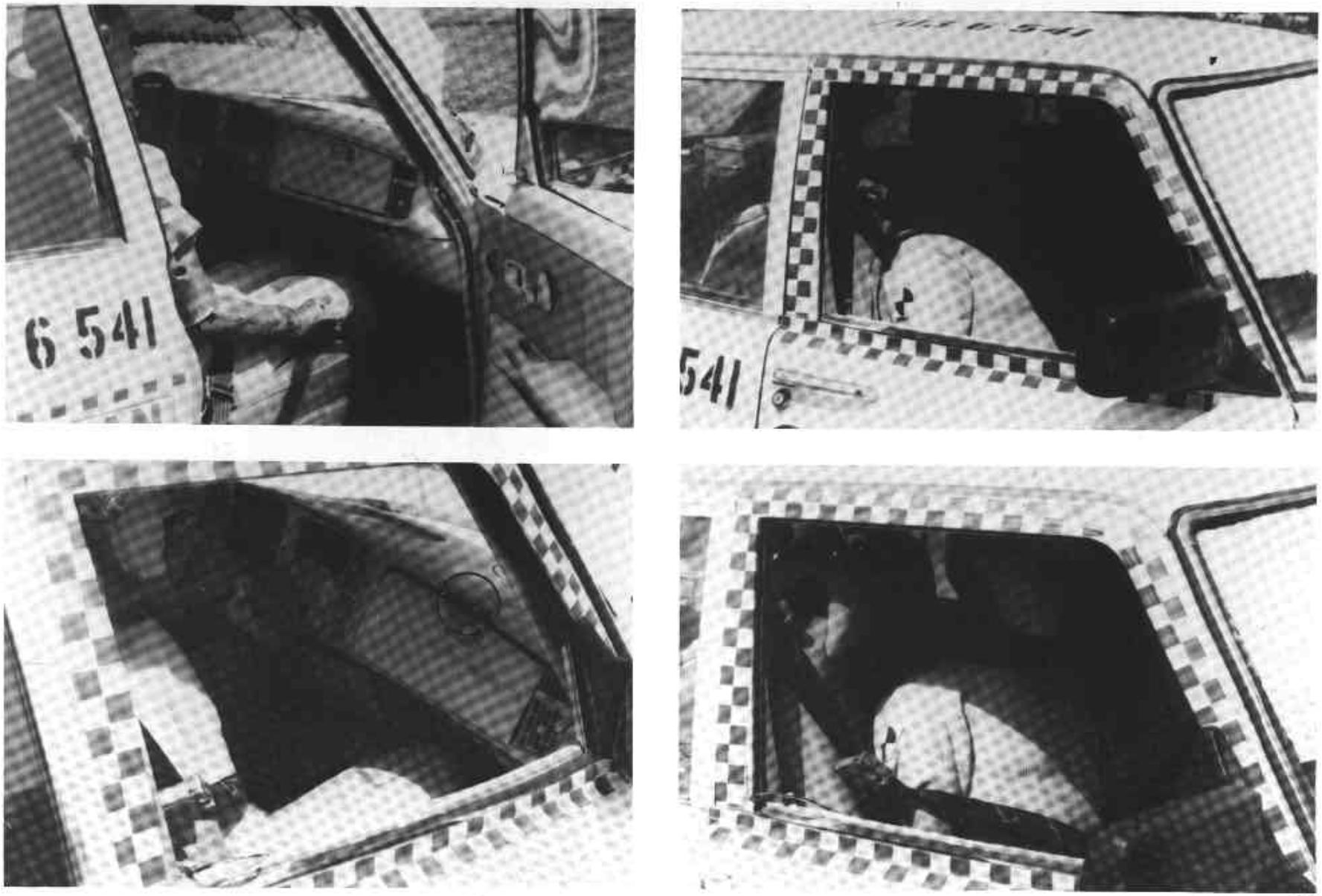


Figure A-11 Pre- and Post-Test Right Front Passenger Views

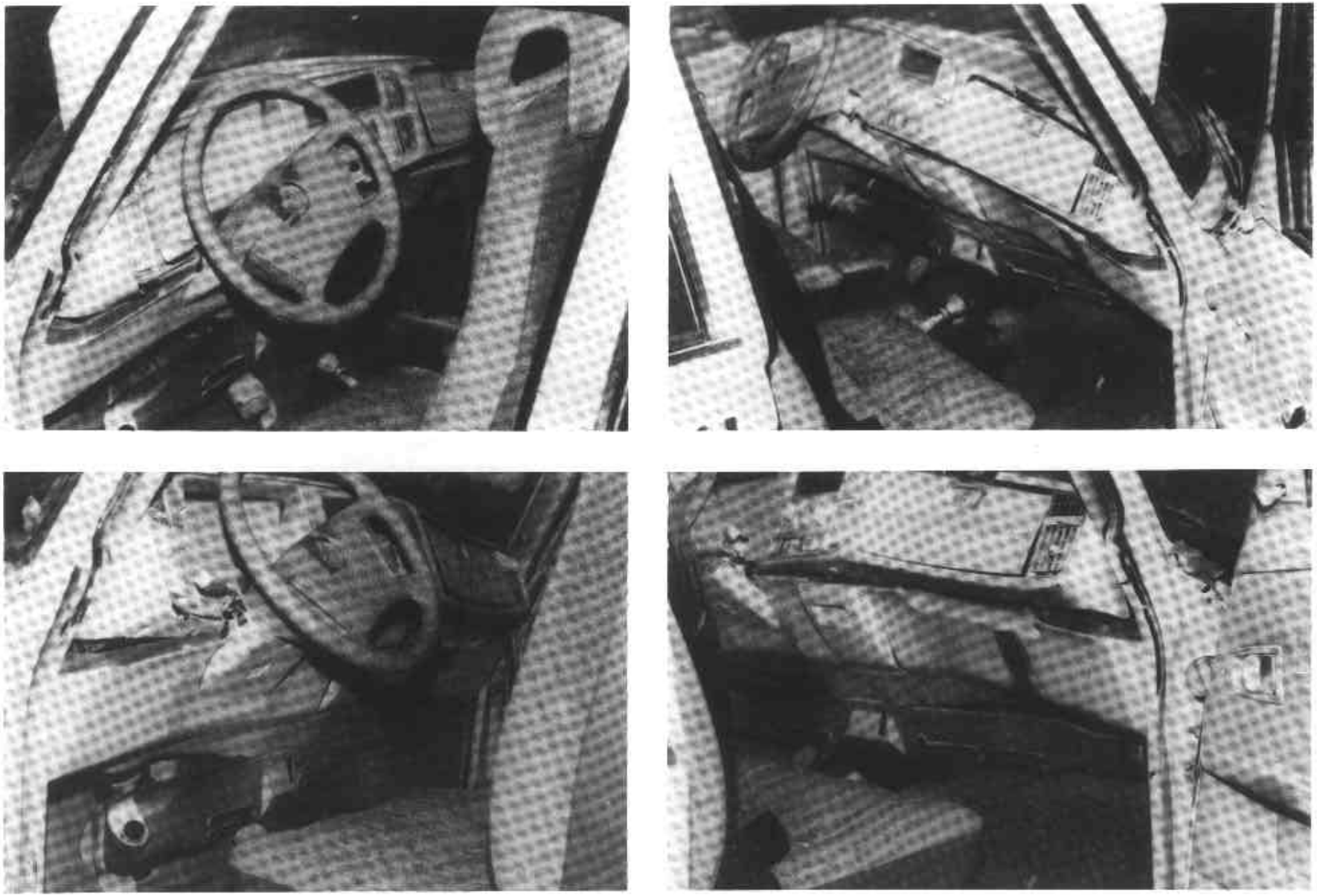


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Figure A-12 Post-Test Vehicle Interior Views

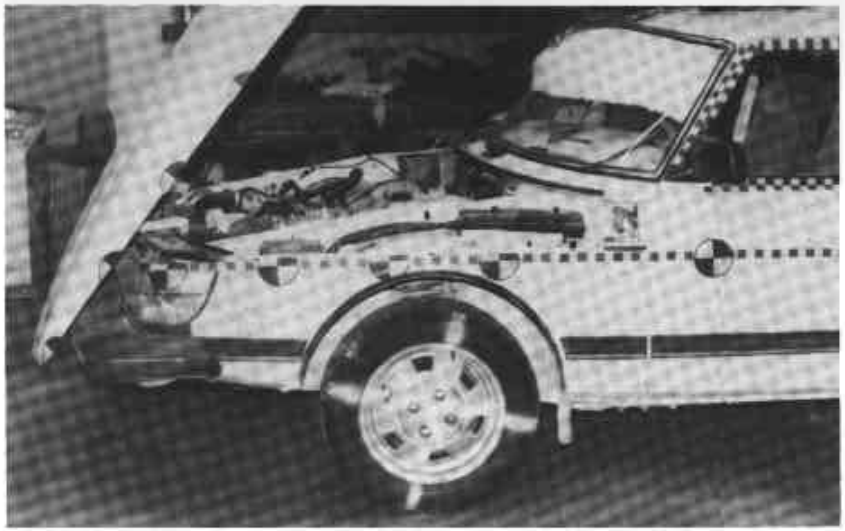


Figure A-13 Pre-Test View of Raised Hood

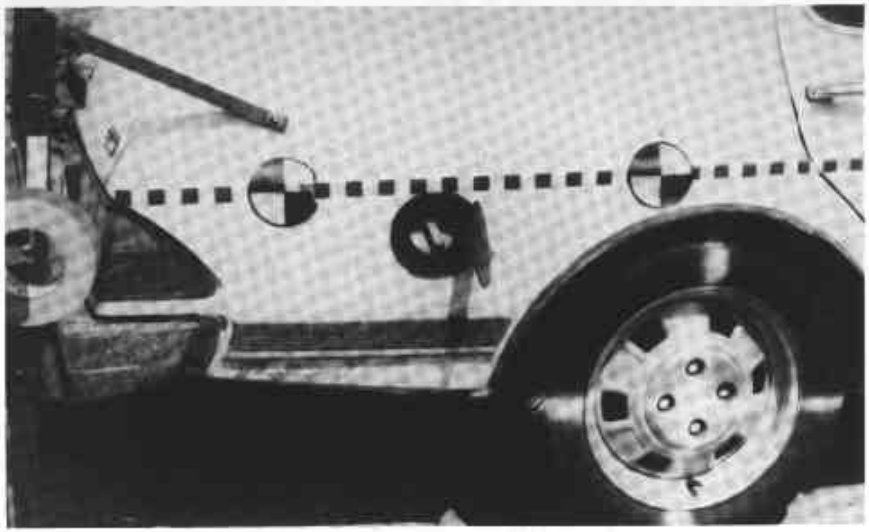


Figure A-14 Pre-Test View of Filler Cap

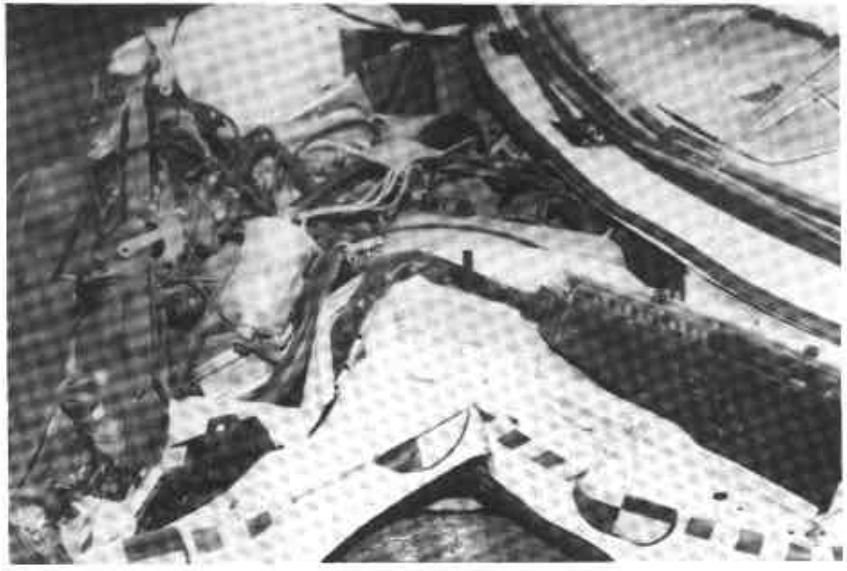


Figure A-15 Post-Test Engine Compartment View

Figure A-16 Velocity Trap Counter

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA

Test No. 703-6-541

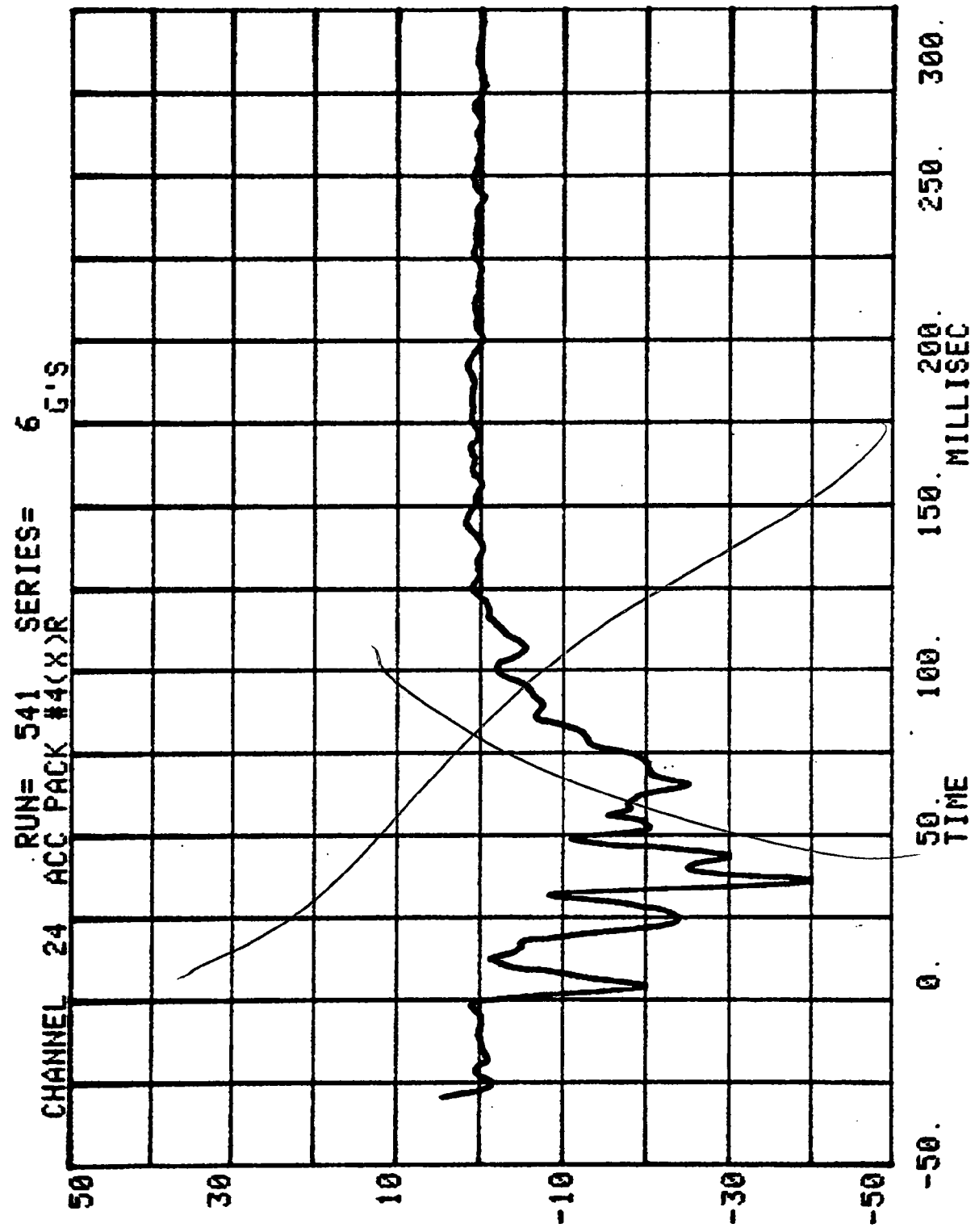
1982 Saab 900

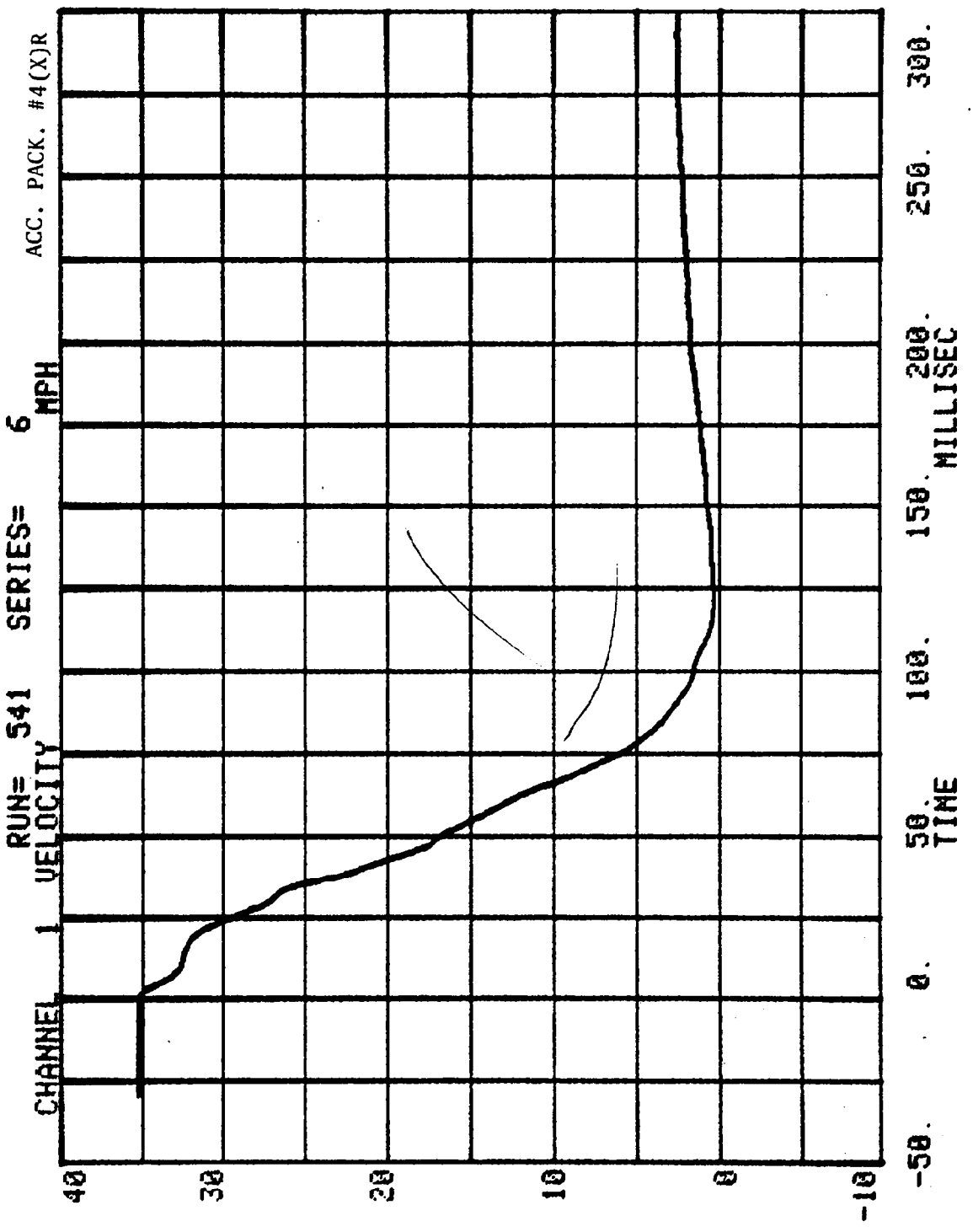
VEHICLE DATA

VEHICLE DATA

FILTER CHANNEL CLASS

60


CHANNEL 24 ACC PACK #4(X)R
RUN= 541 SERIES= 6
G'S
50
30
10
-10
-30
-50
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 1 VELOCITY
RUN= 541 SERIES= 6
ACC. PACK. #4(X)R
MPH
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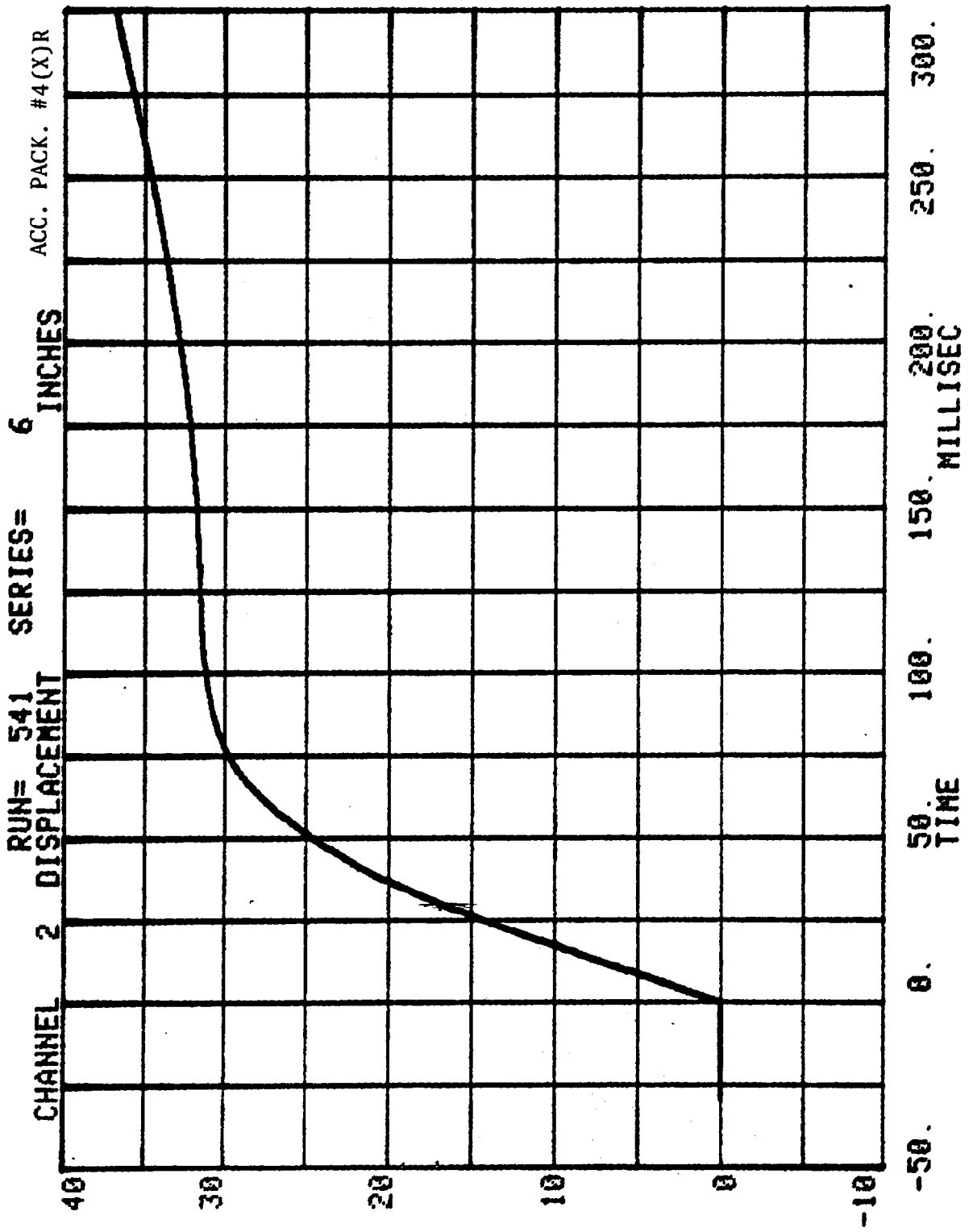
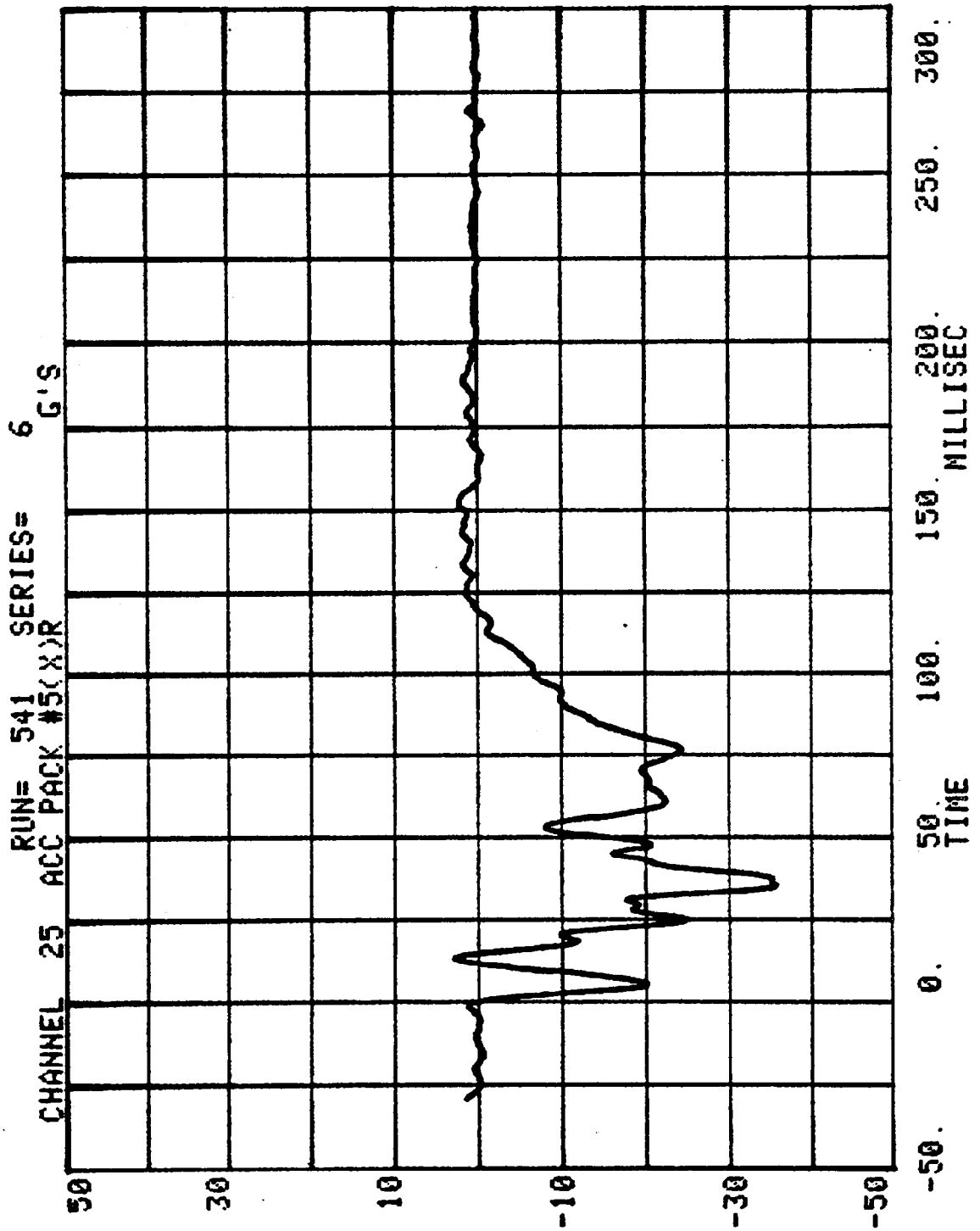
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


ACC. PACK. #4(X)R
RUN= 541 SERIES= 6
CHANNEL 2 DISPLACEMENT INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME MILLISEC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RUN= 541 SERIES= 6
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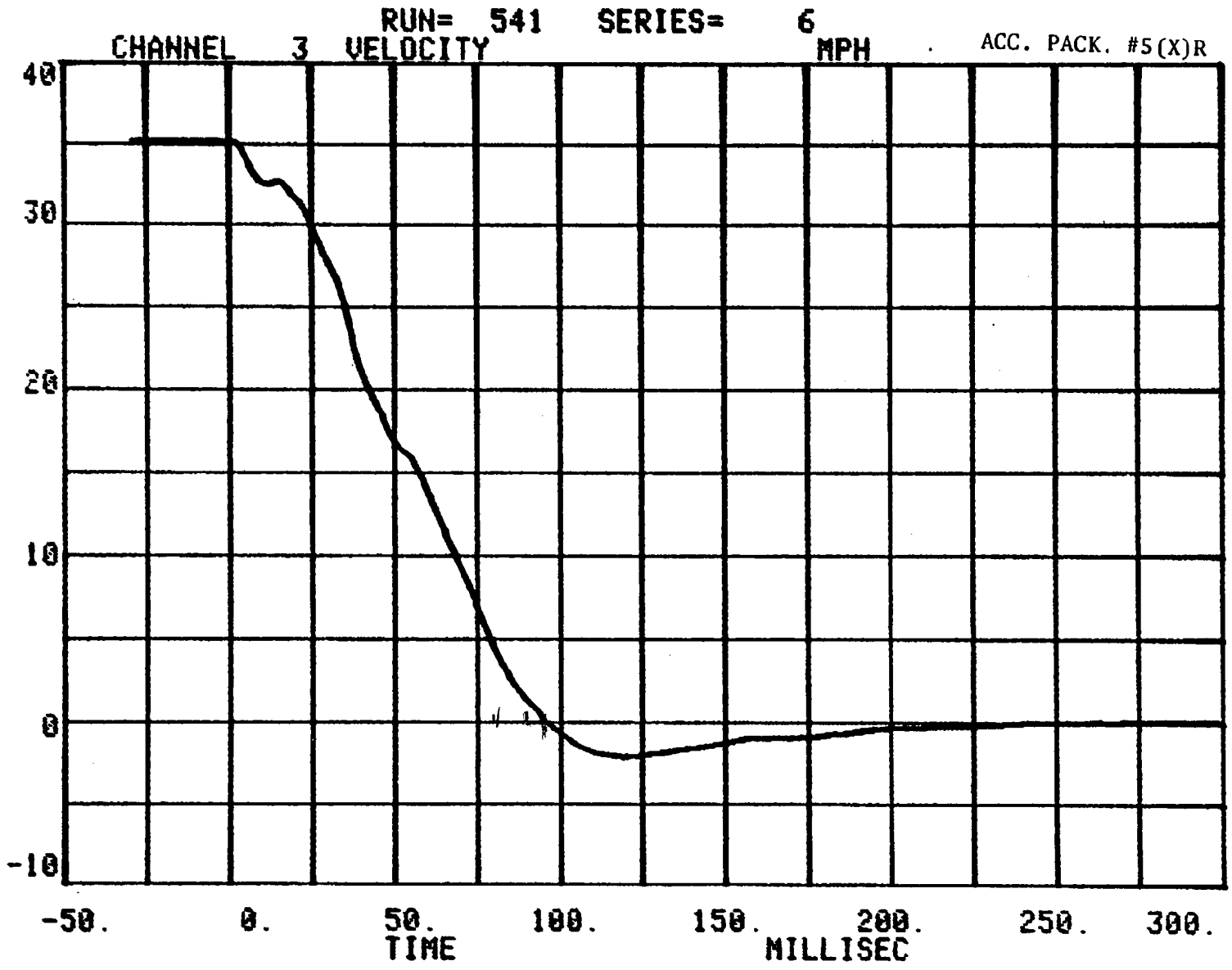
30
10
-10
-30
-50
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 541 SERIES= 6
CHANNEL 3 VELOCITY
MPH
ACC. PACK. #5(X)R
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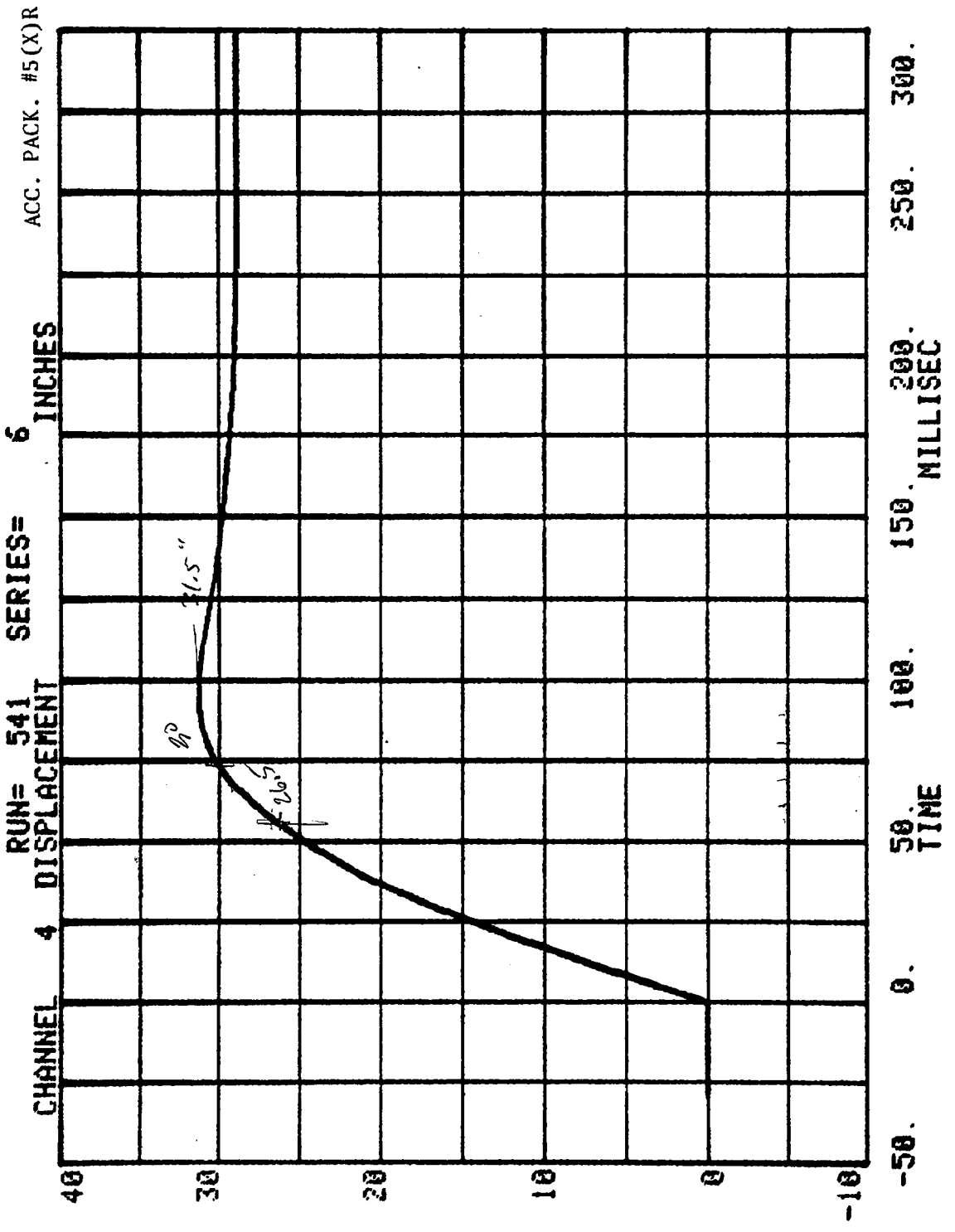
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


ACC. PACK. #5(X)R
CHANNEL 4 DISPLACEMENT
RUN= 541 SERIES= 6
INCHES
MILLISEC
TIME
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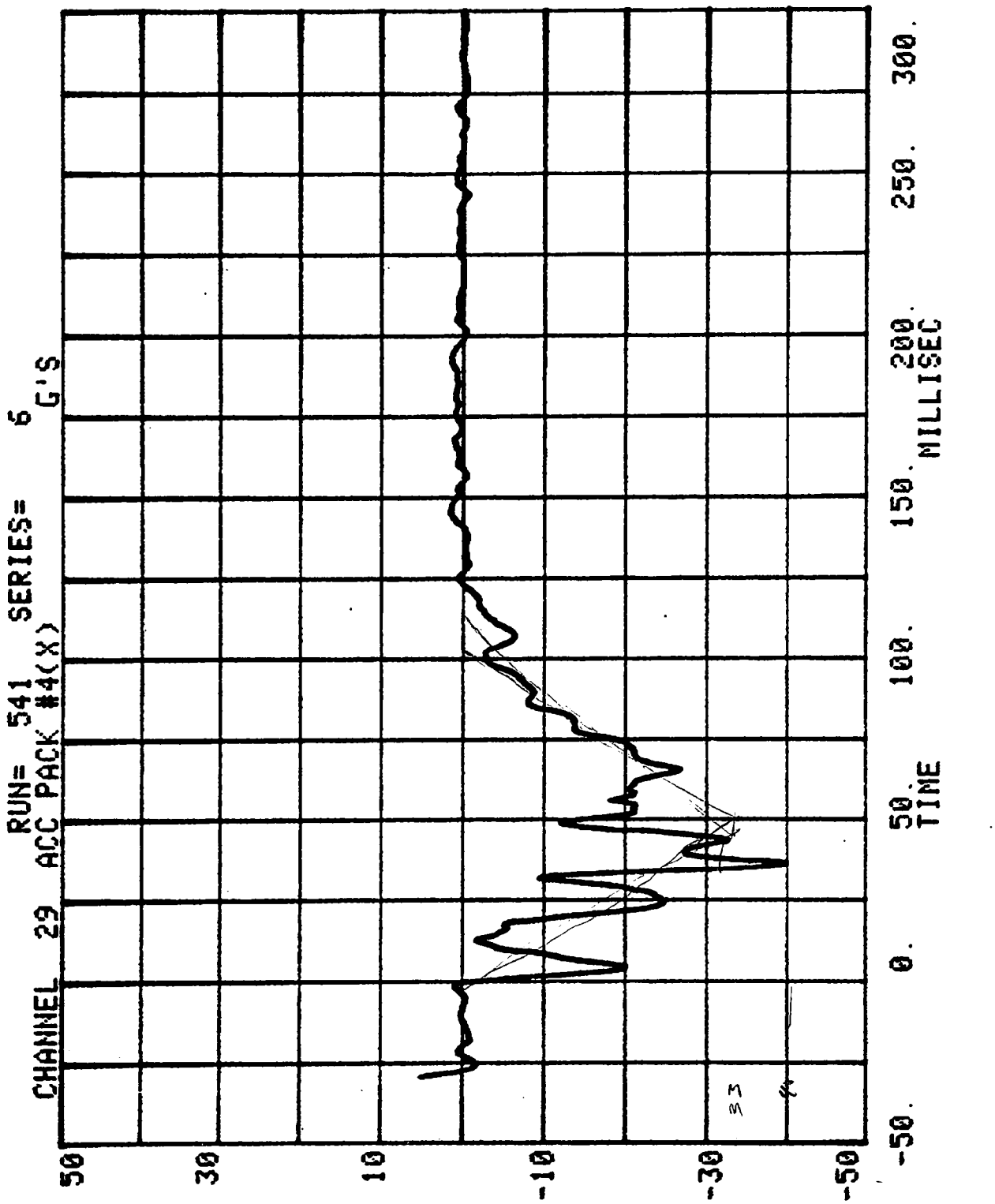
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
1.5"
2.0"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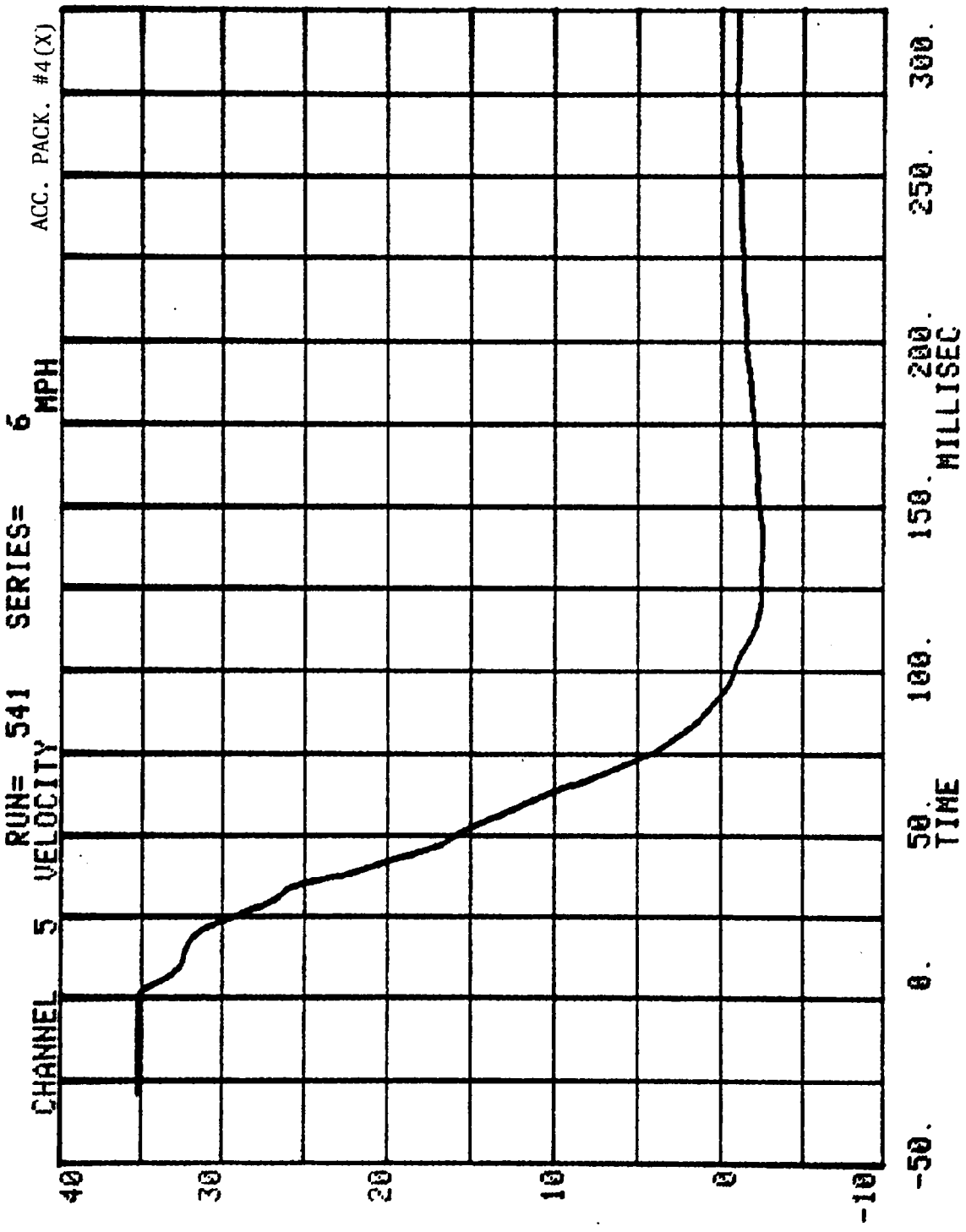
10
-10
-30
-50
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


ACC. PACK. #4(X)
CHANNEL 5 VELOCITY
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MPH
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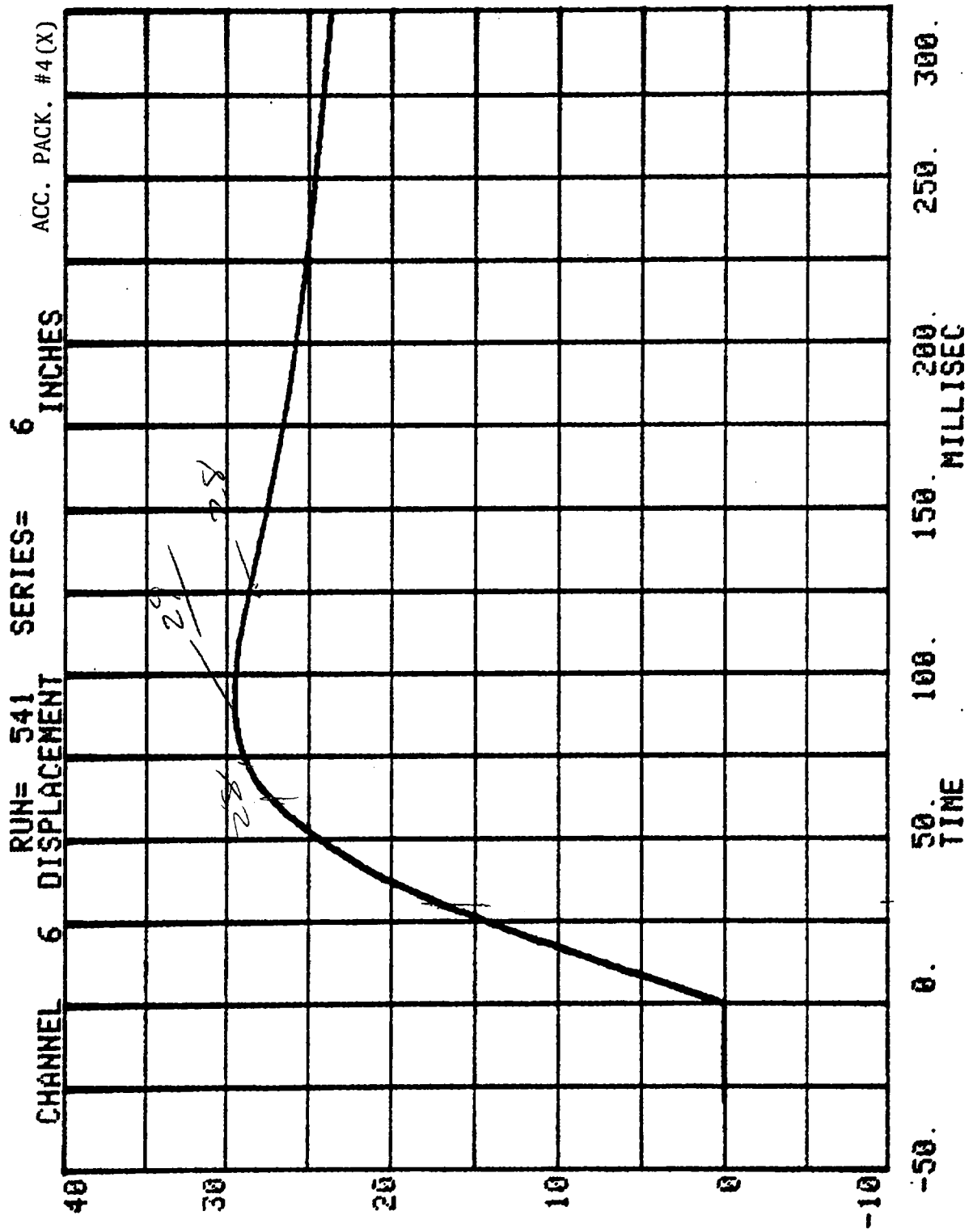
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC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-10
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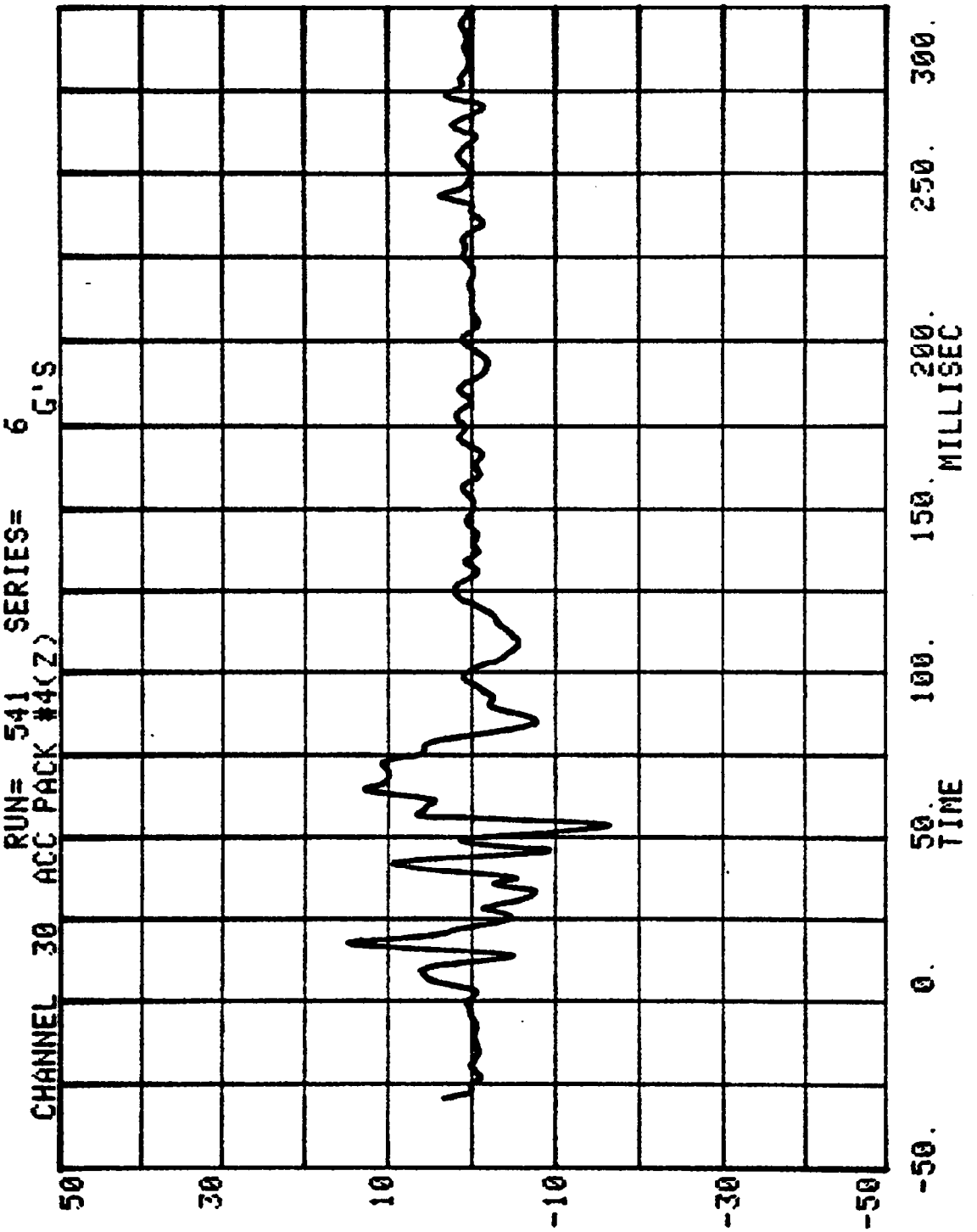
50.
100.
150.
200.
250.
300.
TIME
MILLISEC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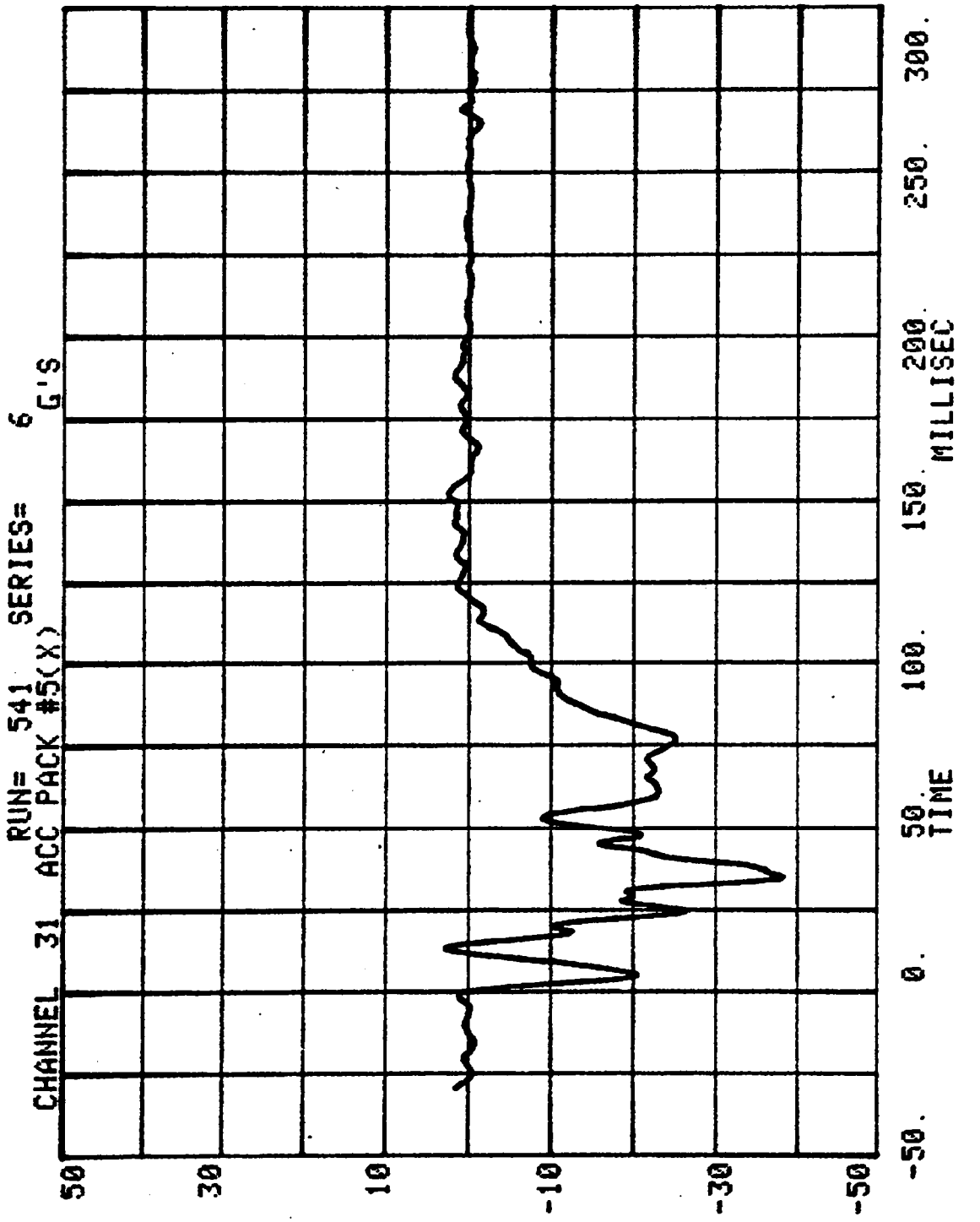
150.
200.
250.
300.
TIME
MILLISEC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10
-10
-30
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-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

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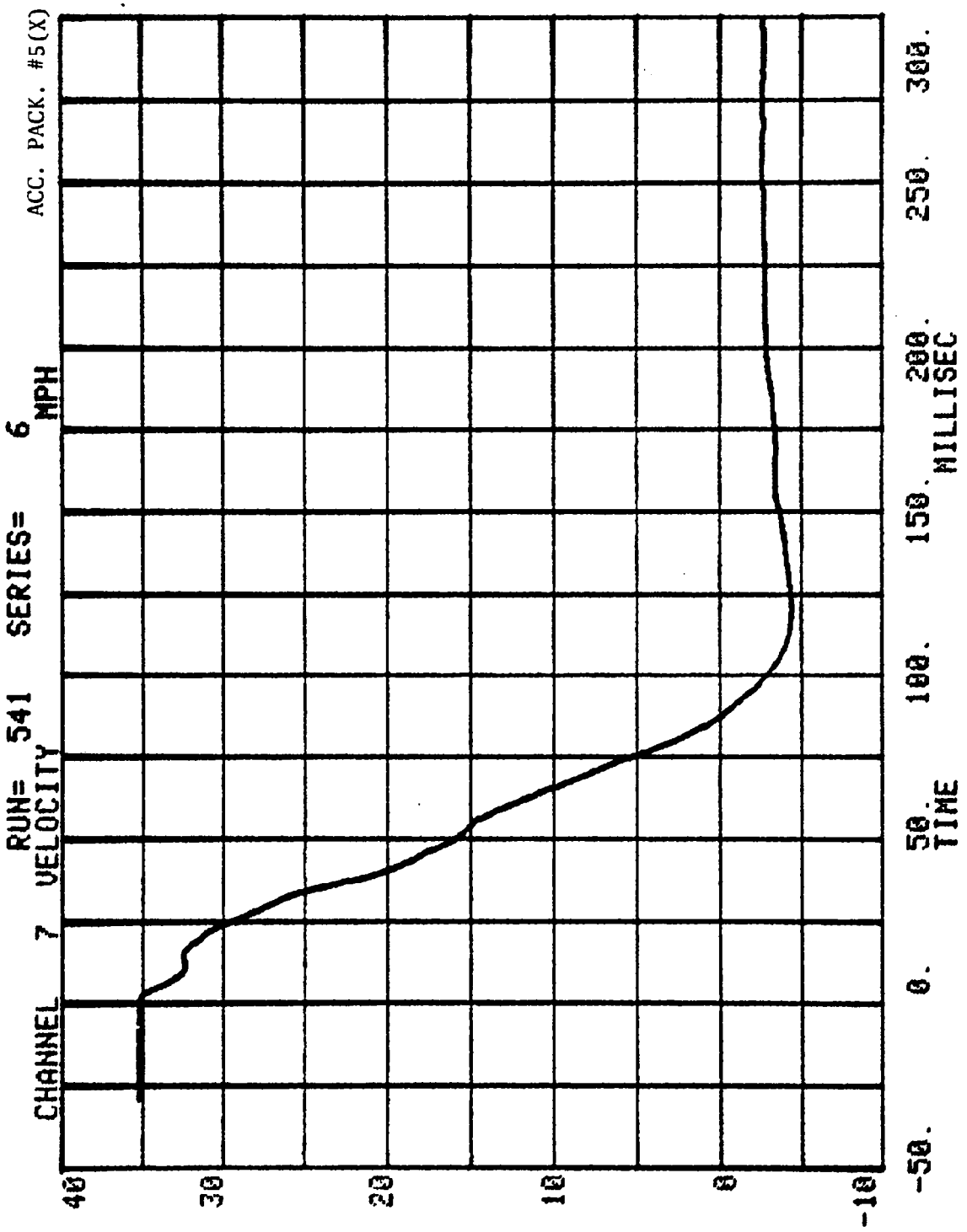
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CHANNEL 7 VELOCITY
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MPH
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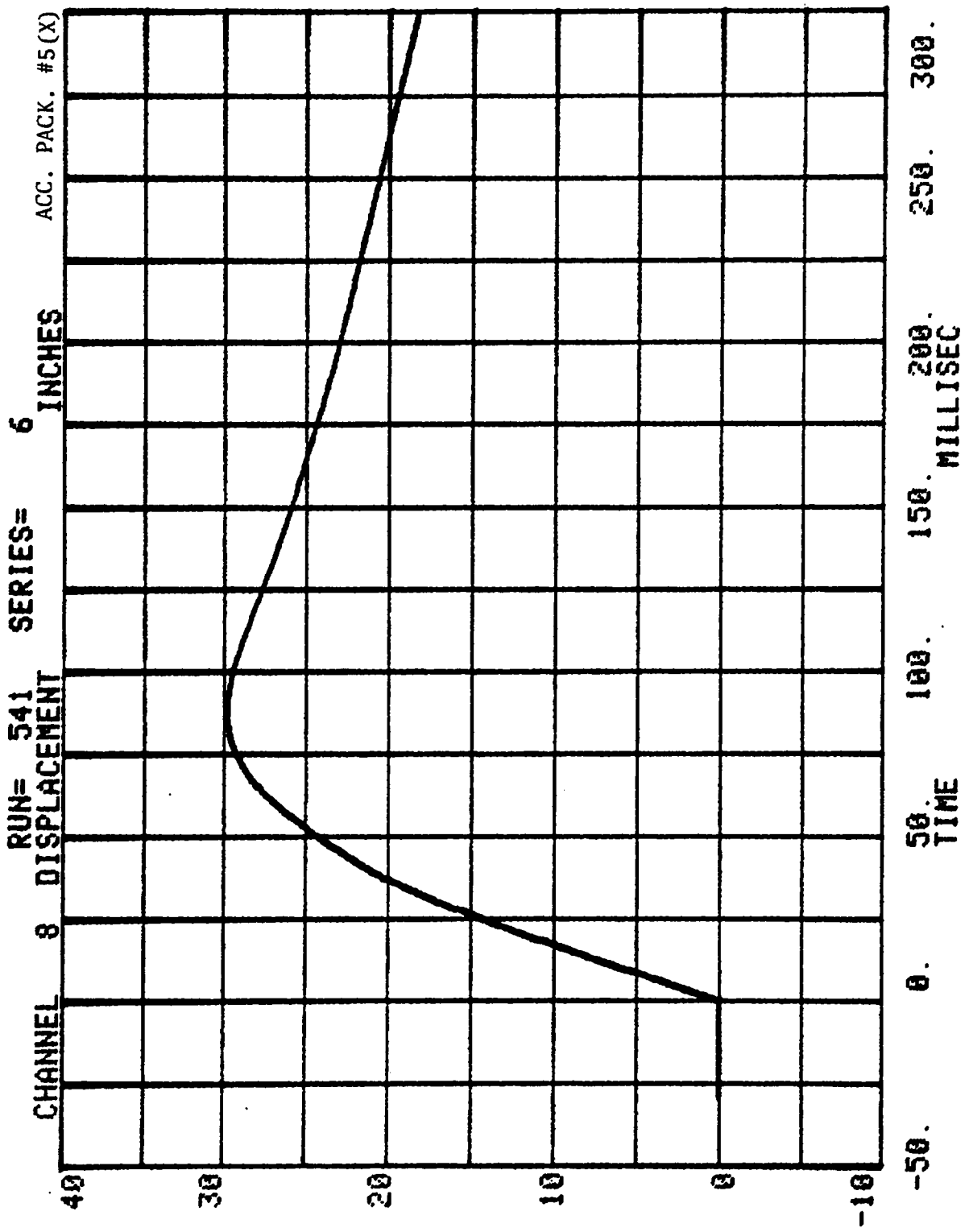
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 8 DISPLACEMENT
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ACC. PACK. #5(X)
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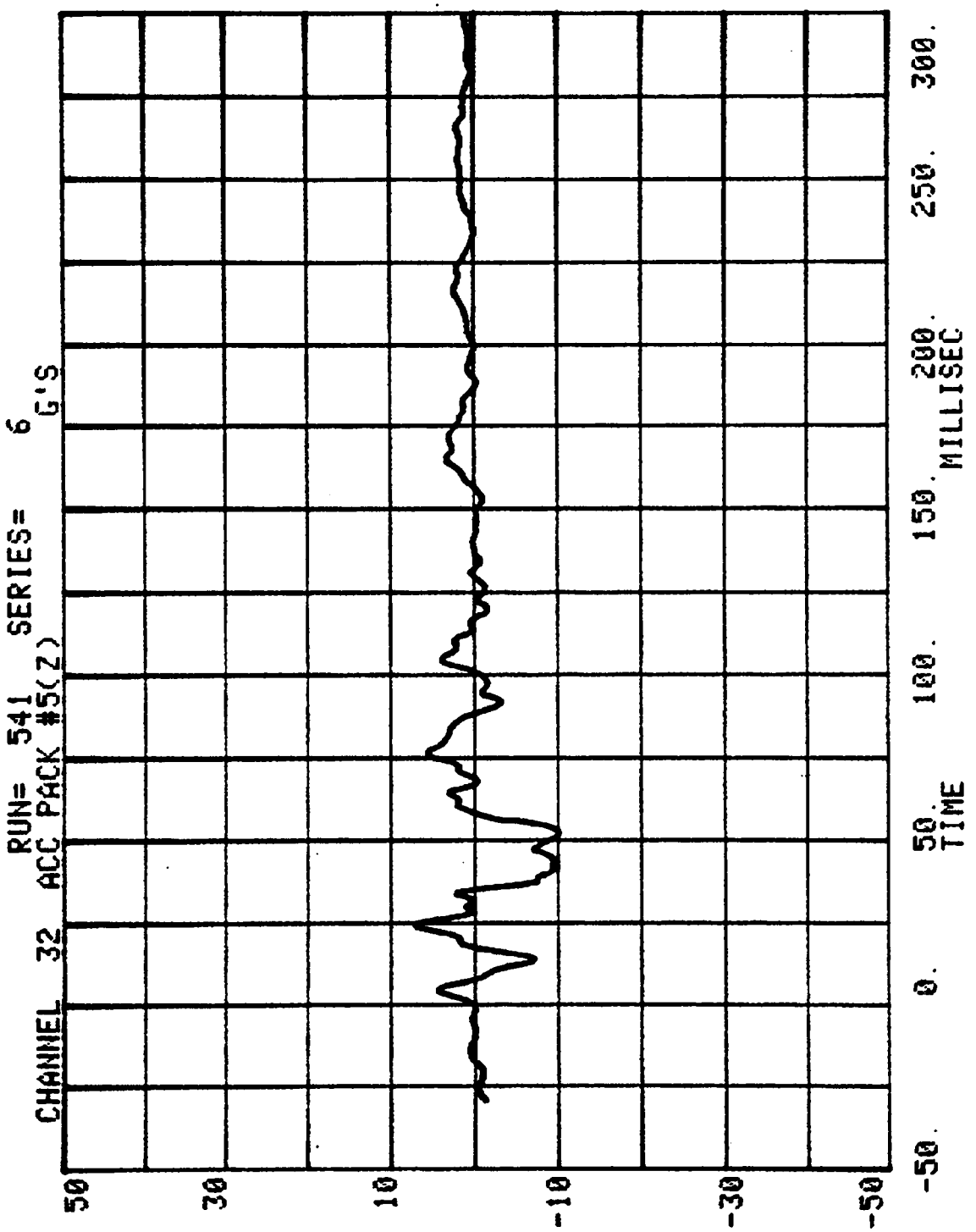
50.
100.
150.
200.
250.
300.
TIME
MILLISEC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-10
-30
-50
-50.
0.
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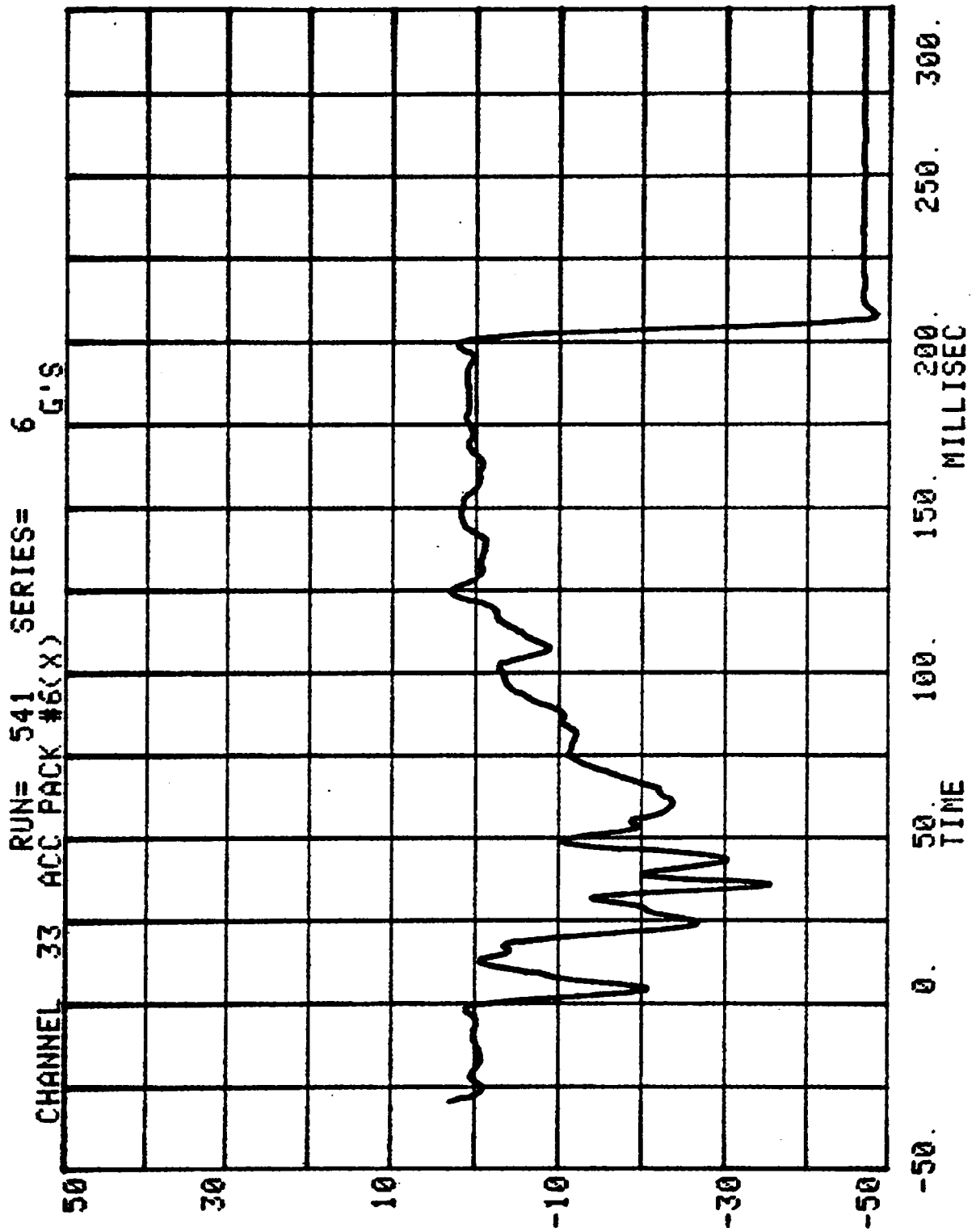
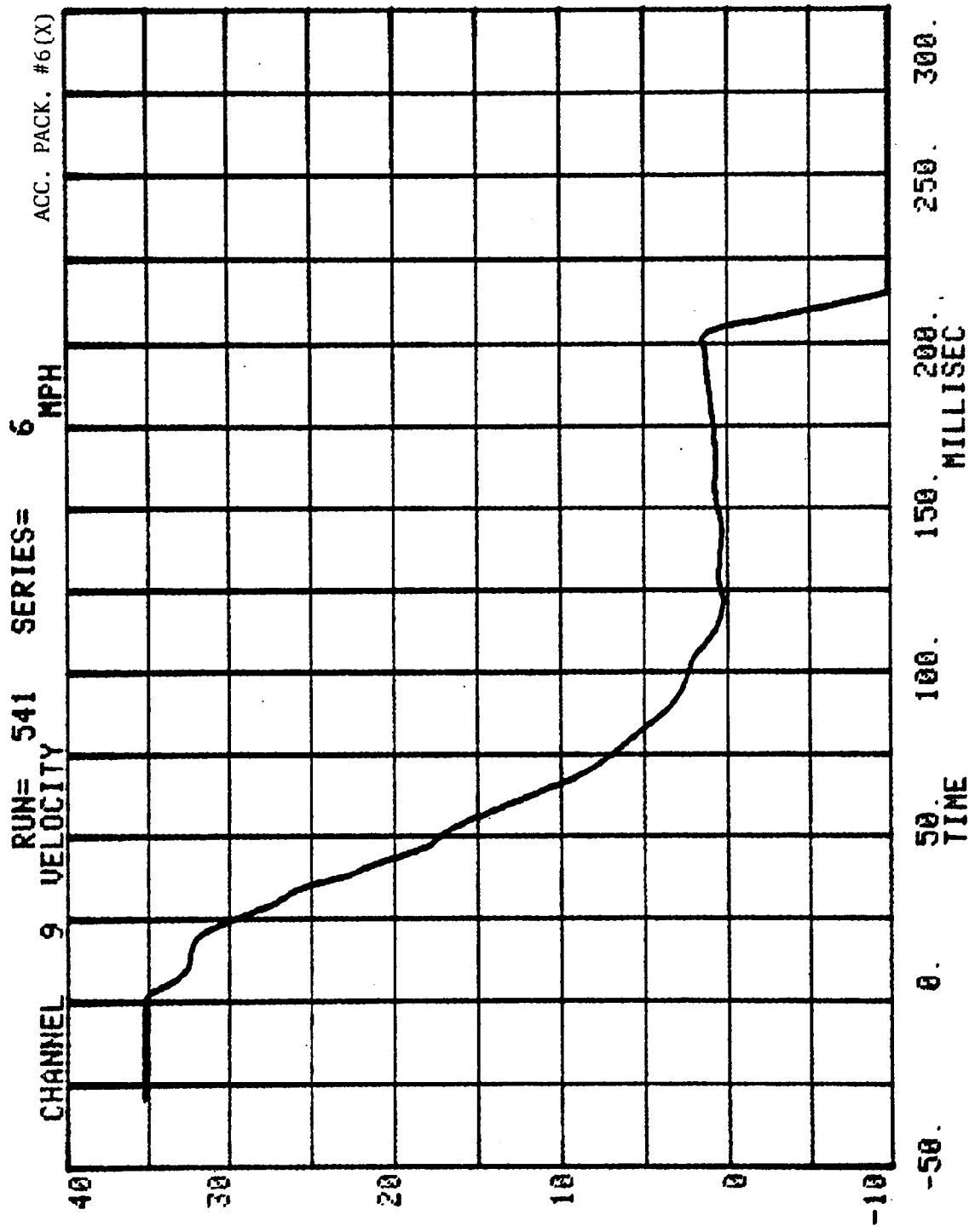
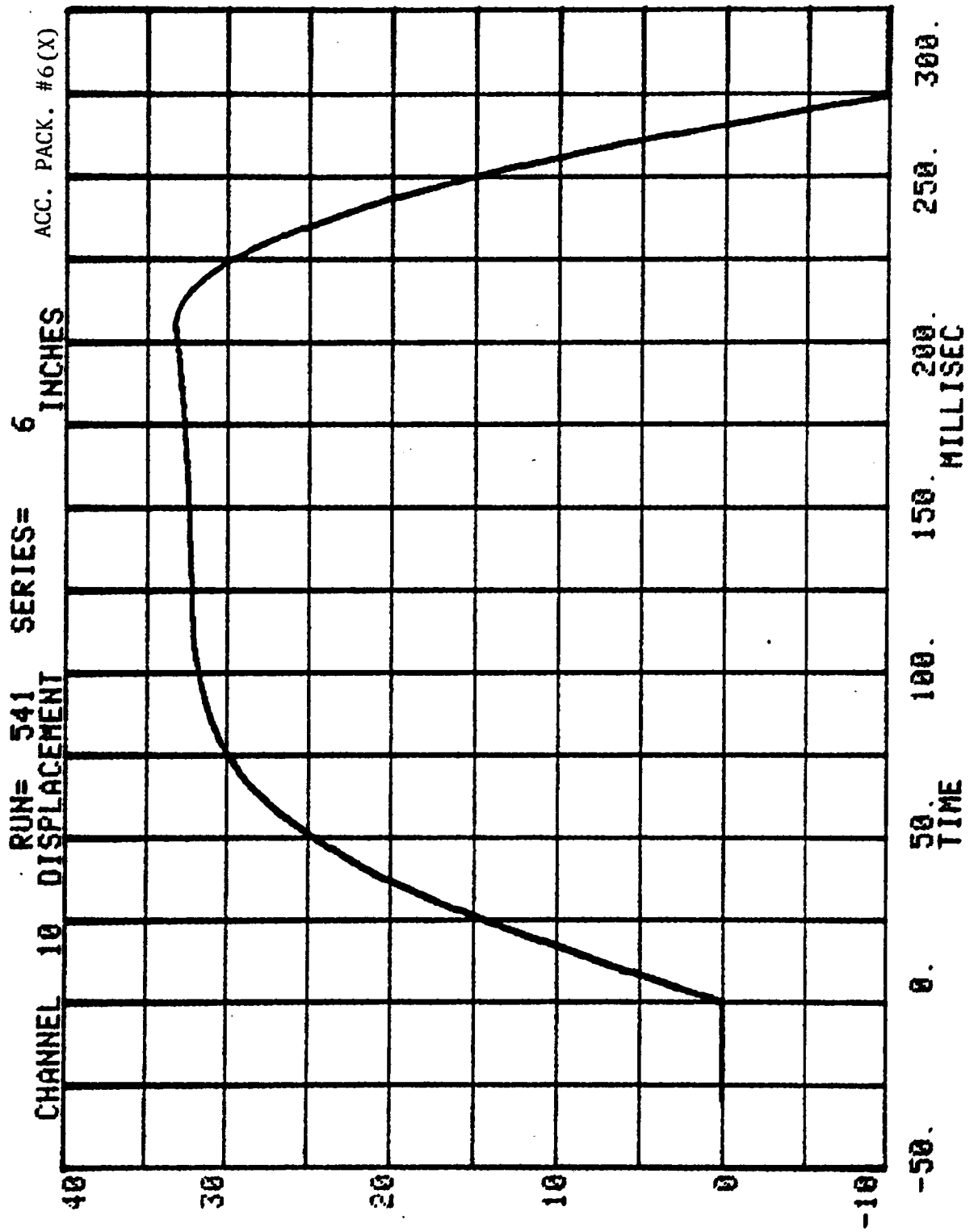
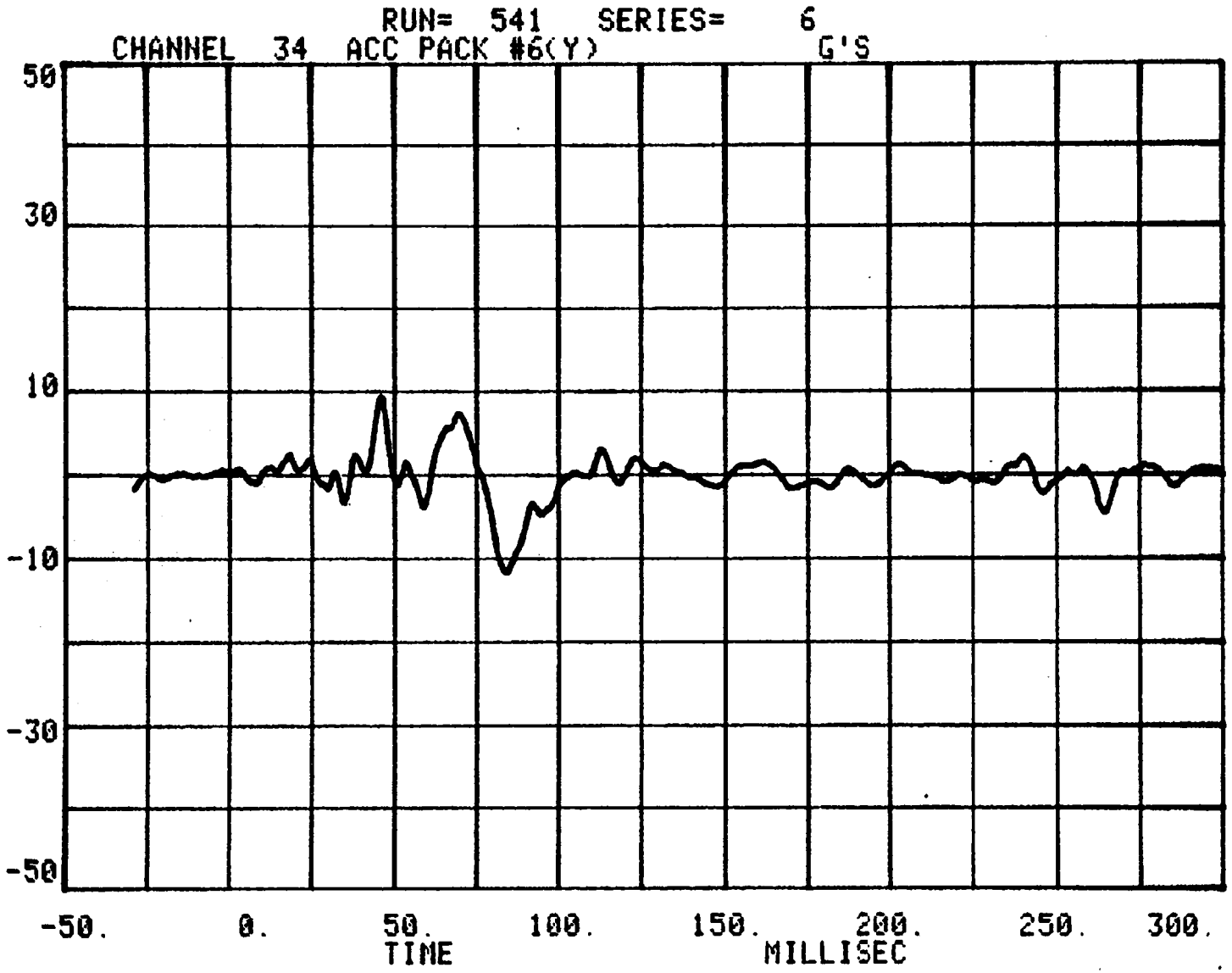
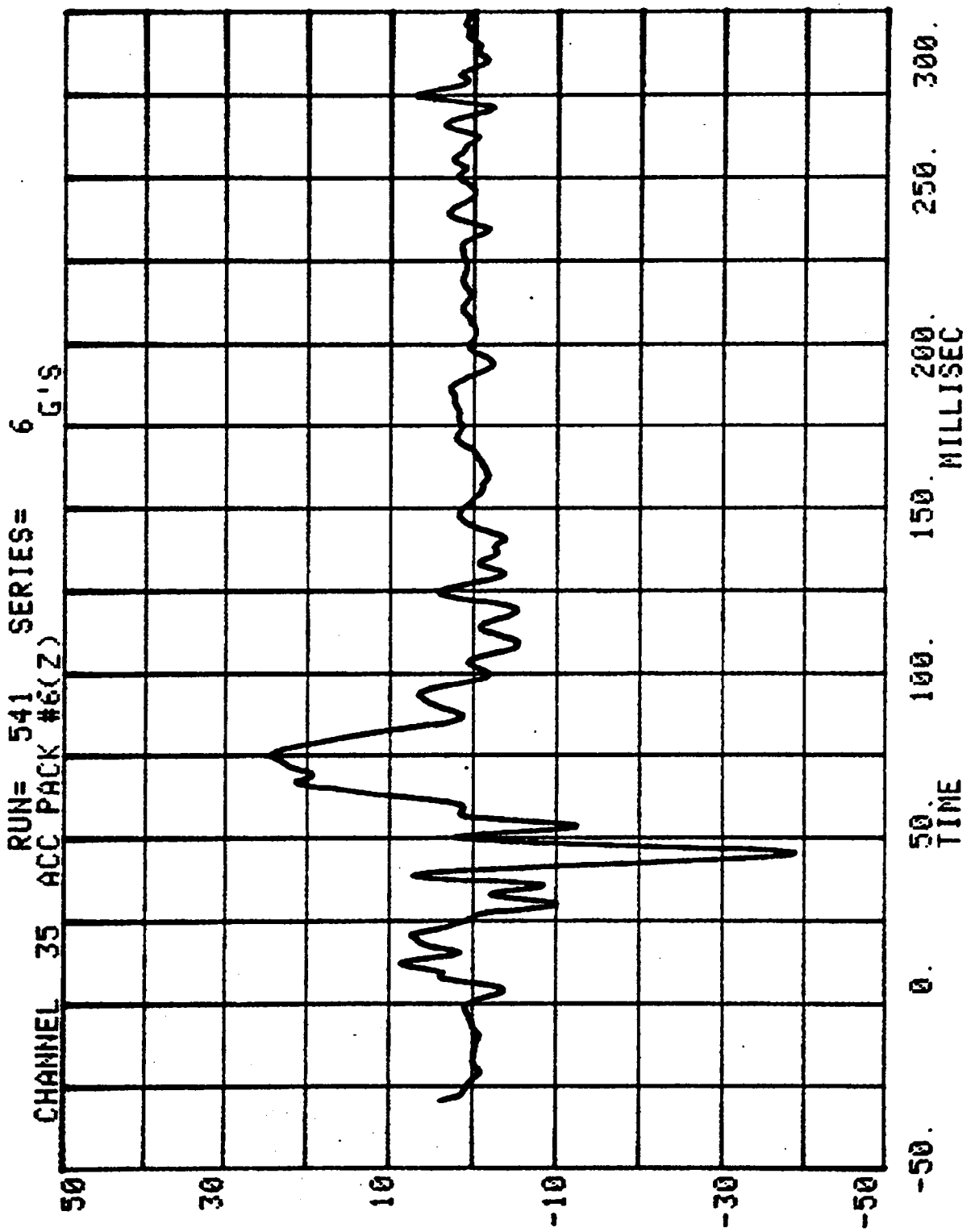
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 33 ACC PACK #6(X)
RUN= 541 SERIES= 6
G'S
50
30
10
-10
-30
-50
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


ACC. PACK. #6(X)
CHANNEL 9 VELOCITY
RUN= 541 SERIES= 6
MPH
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 10 DISPLACEMENT
RUN= 541 SERIES= 6
ACC. PACK. #6(X)
INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 541 SERIES= 6
CHANNEL 34 ACC PACK #6(Y) G'S
50
30
10
-10
-30
-50
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 35 ACC PACK #6(Z)
RUN= 541 SERIES= 6
G'S
50
30
10
-10
-30
-50
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

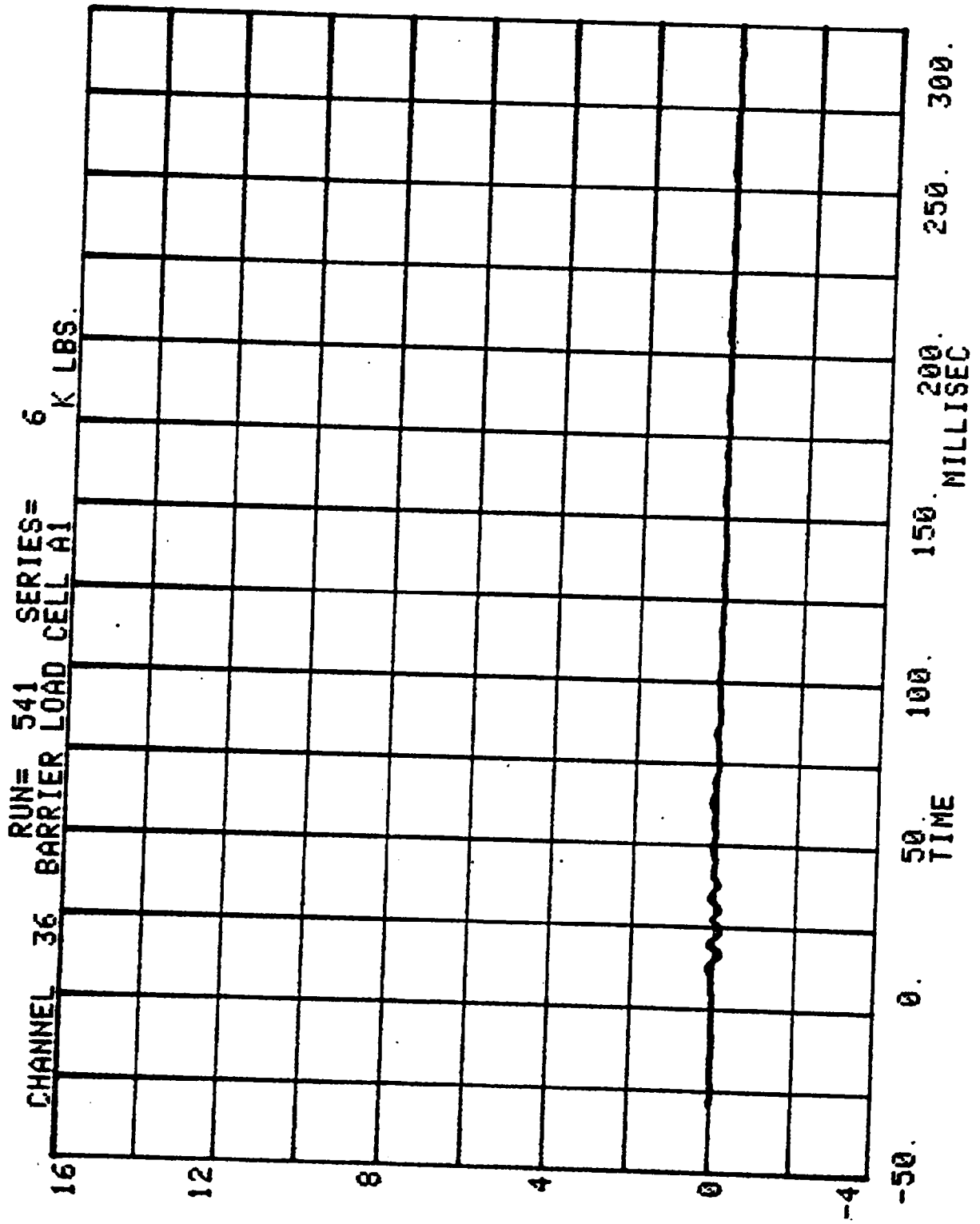
Test No. 703-6-541

1982 Saab 900

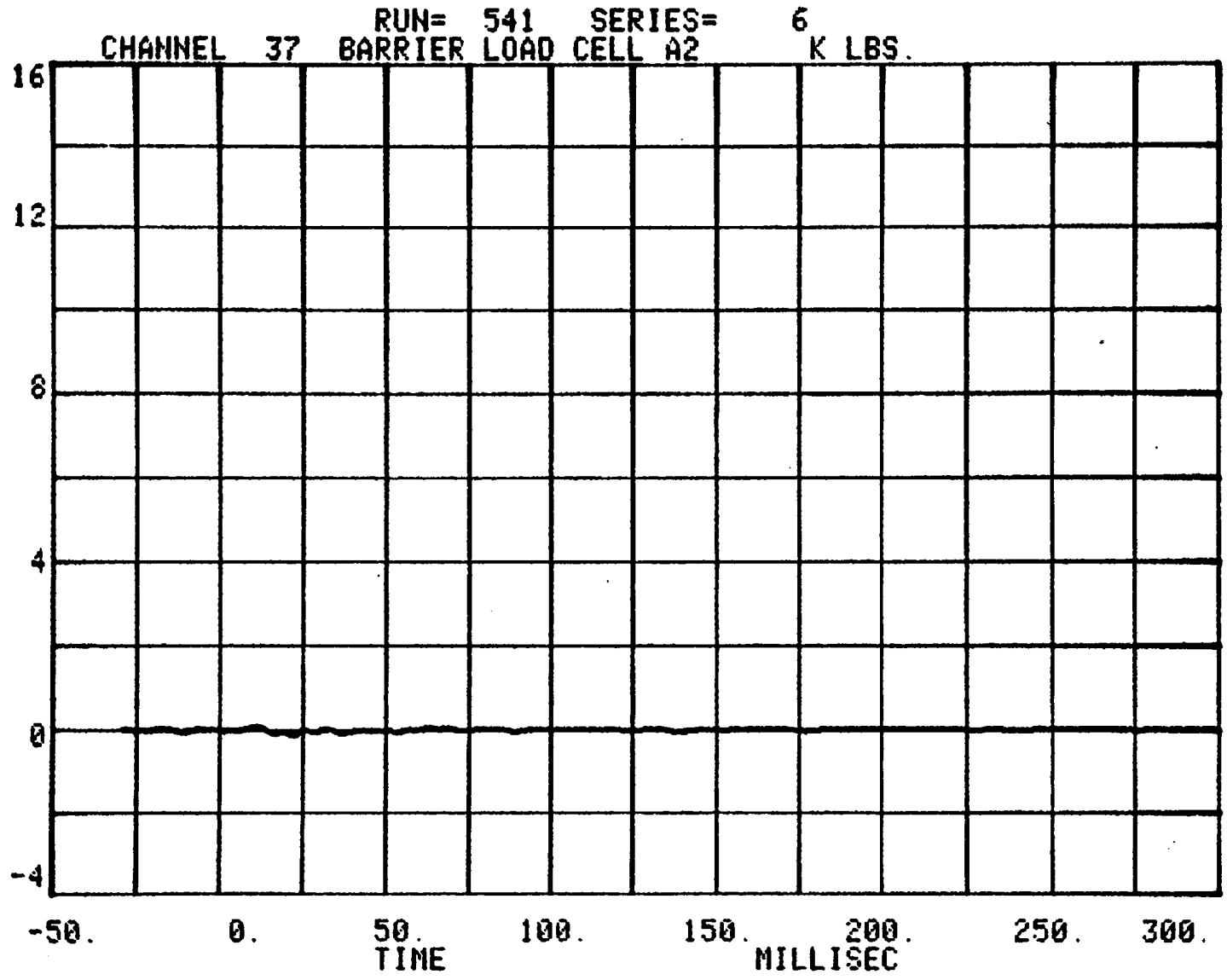
LOAD CELL BARRIER DATA

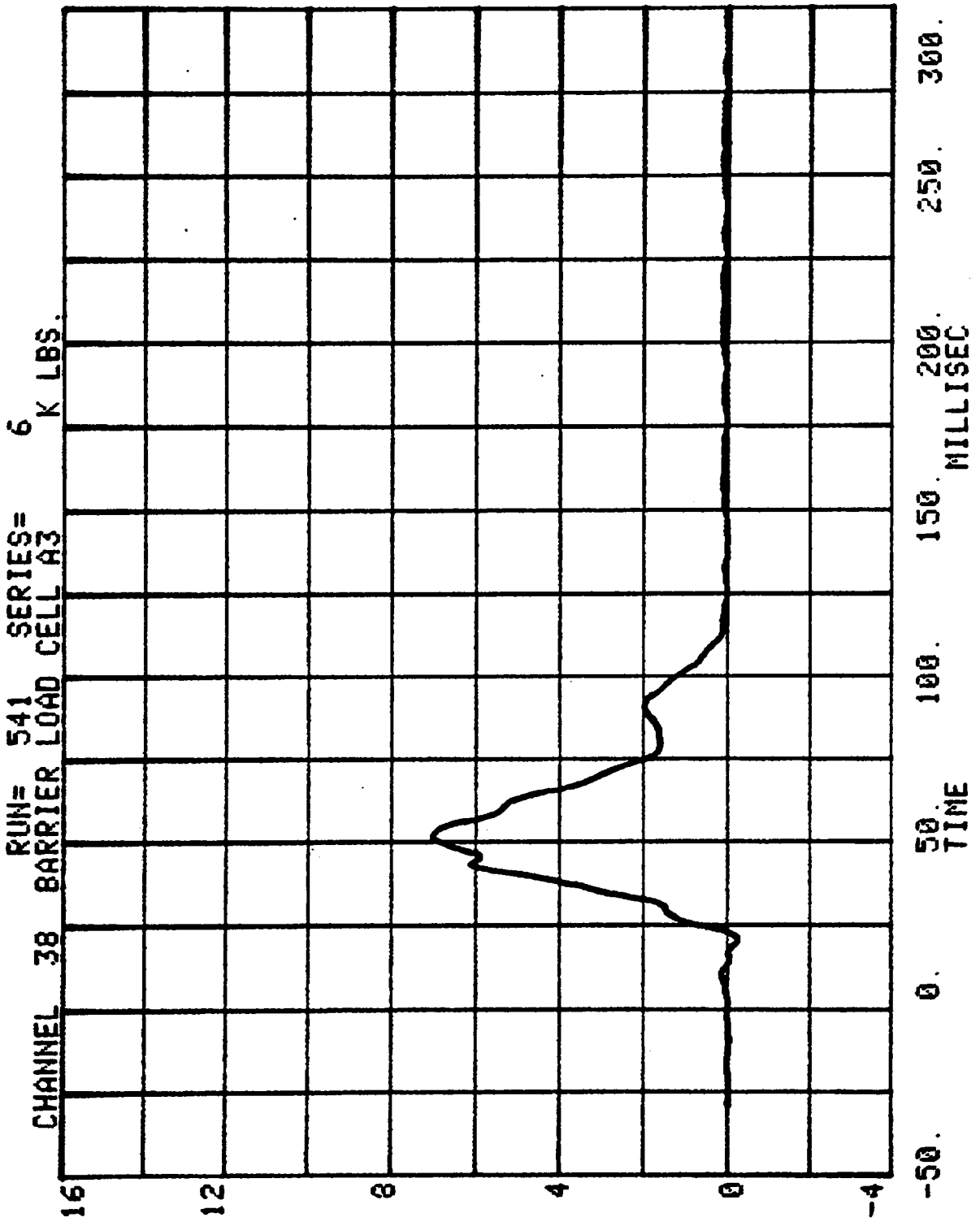
FILTER CHANNEL CLASS

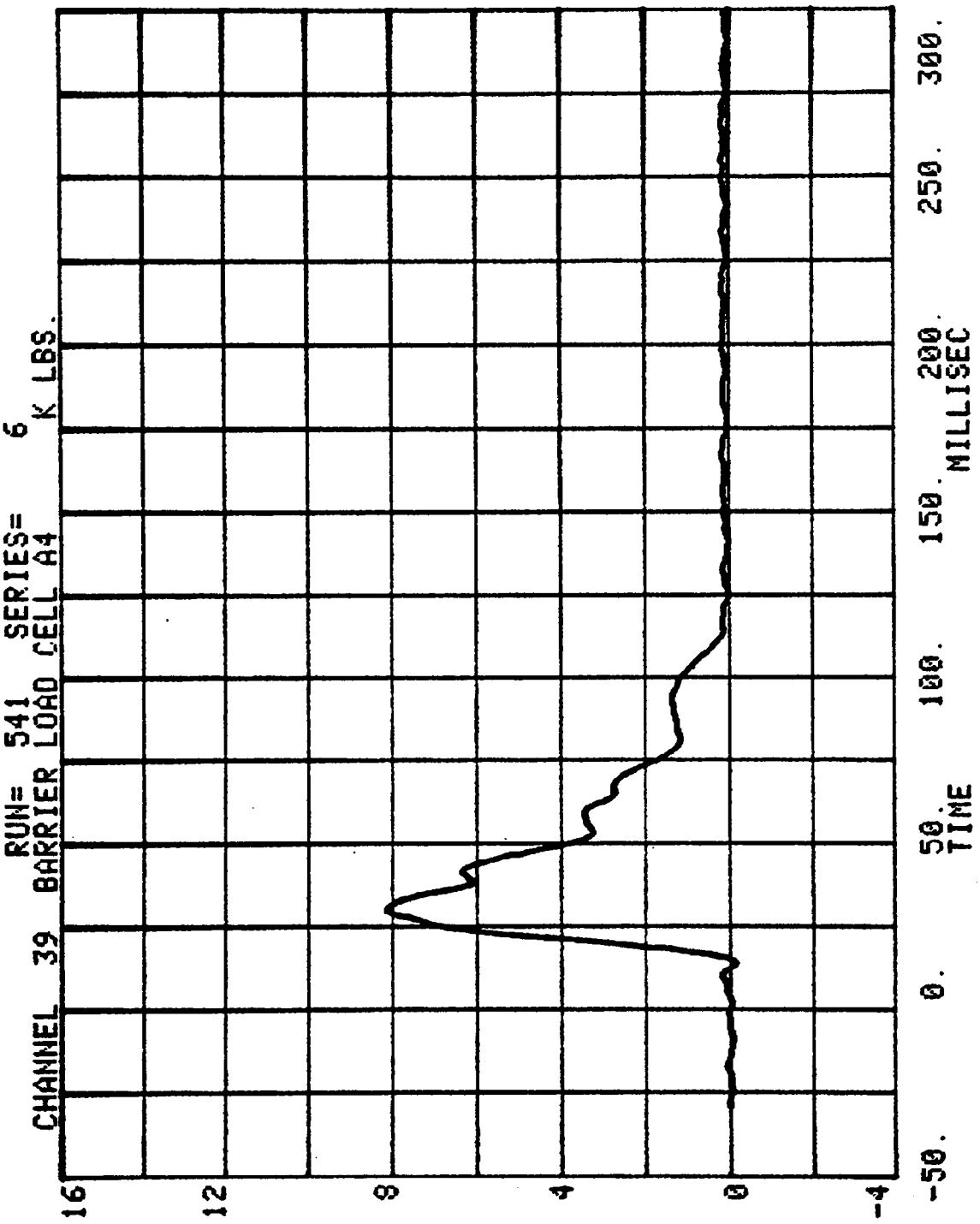
60

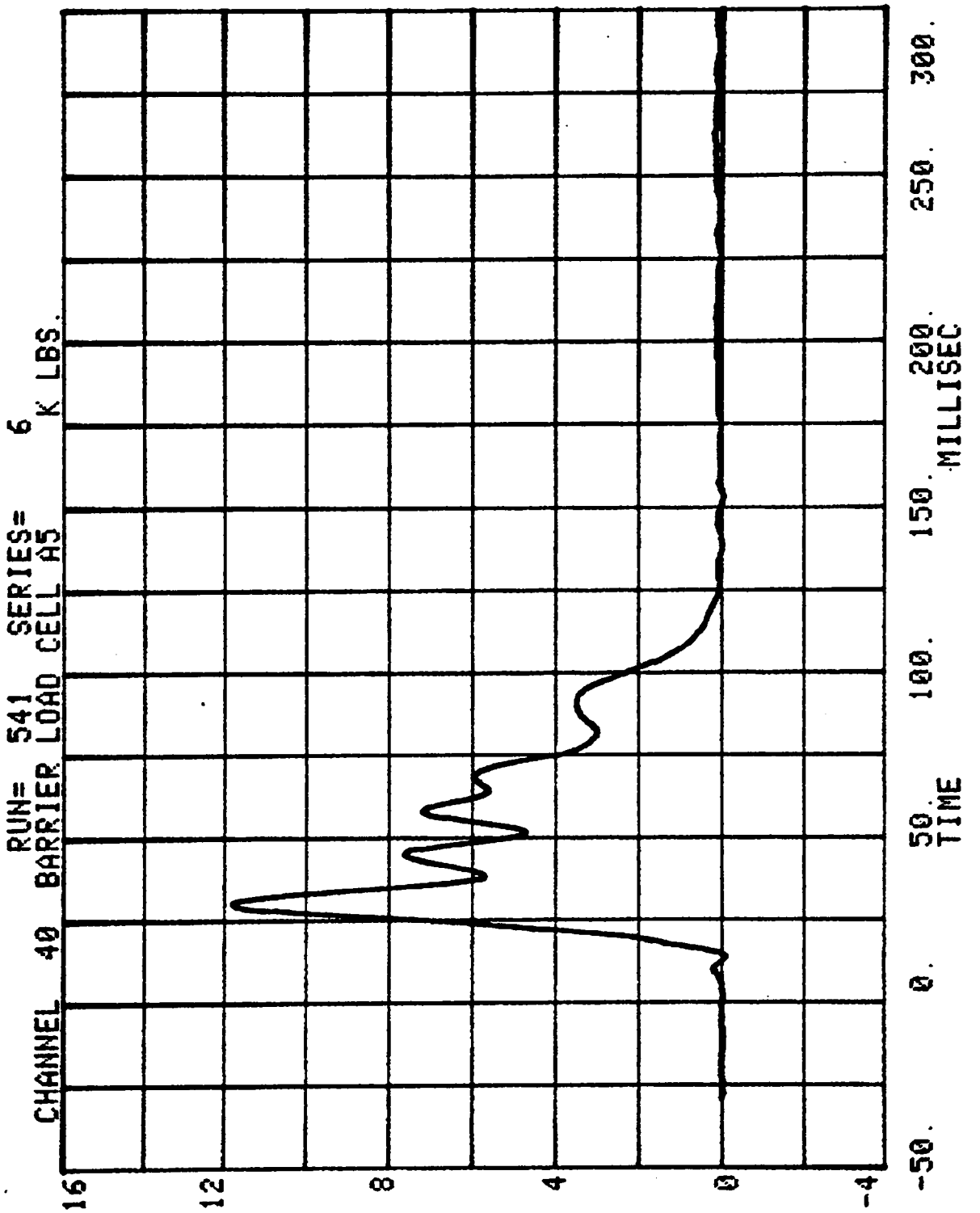

CHANNEL 36 RUN= 541 SERIES= 6
BARRIER LOAD CELL A1
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

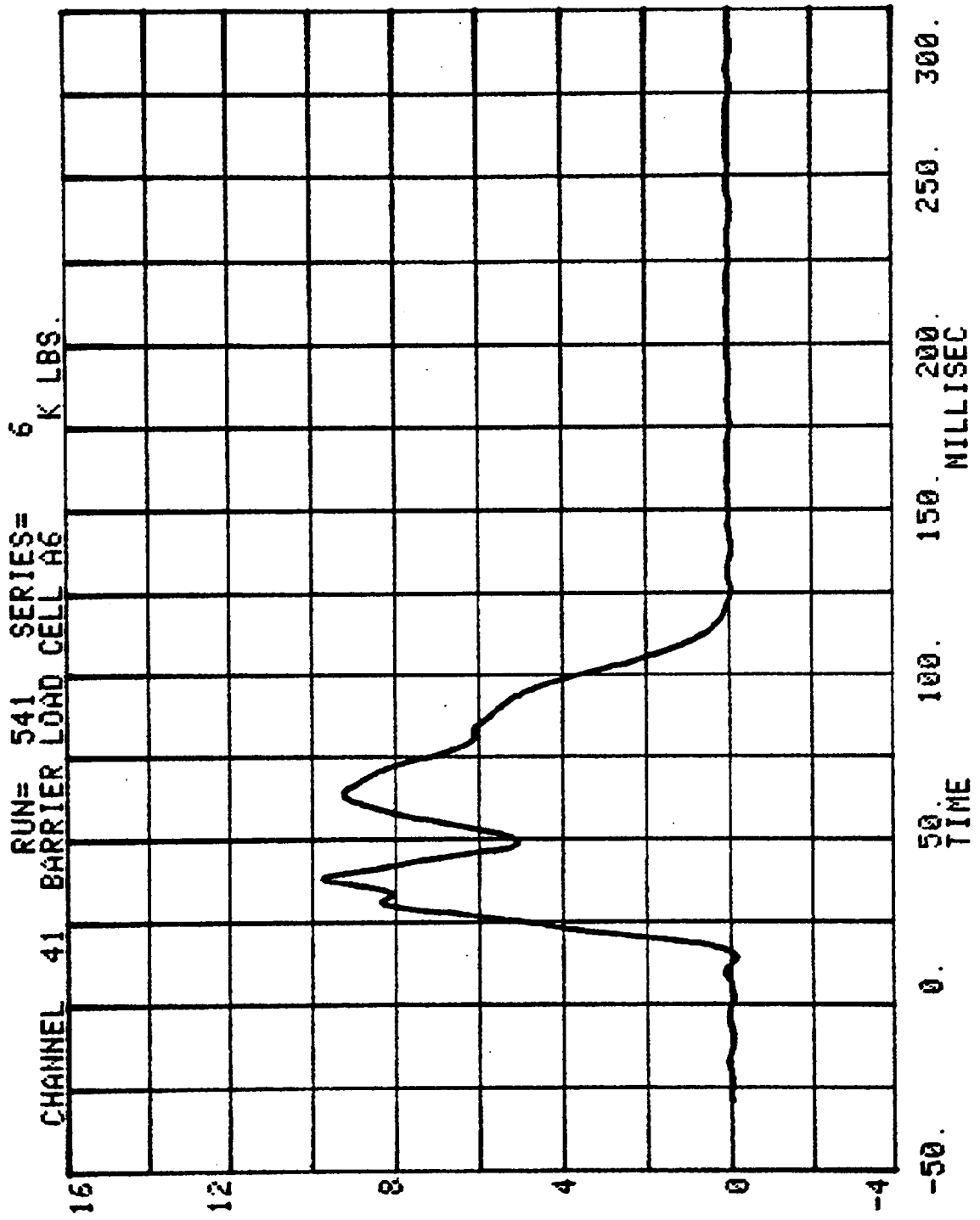
6851-V-6

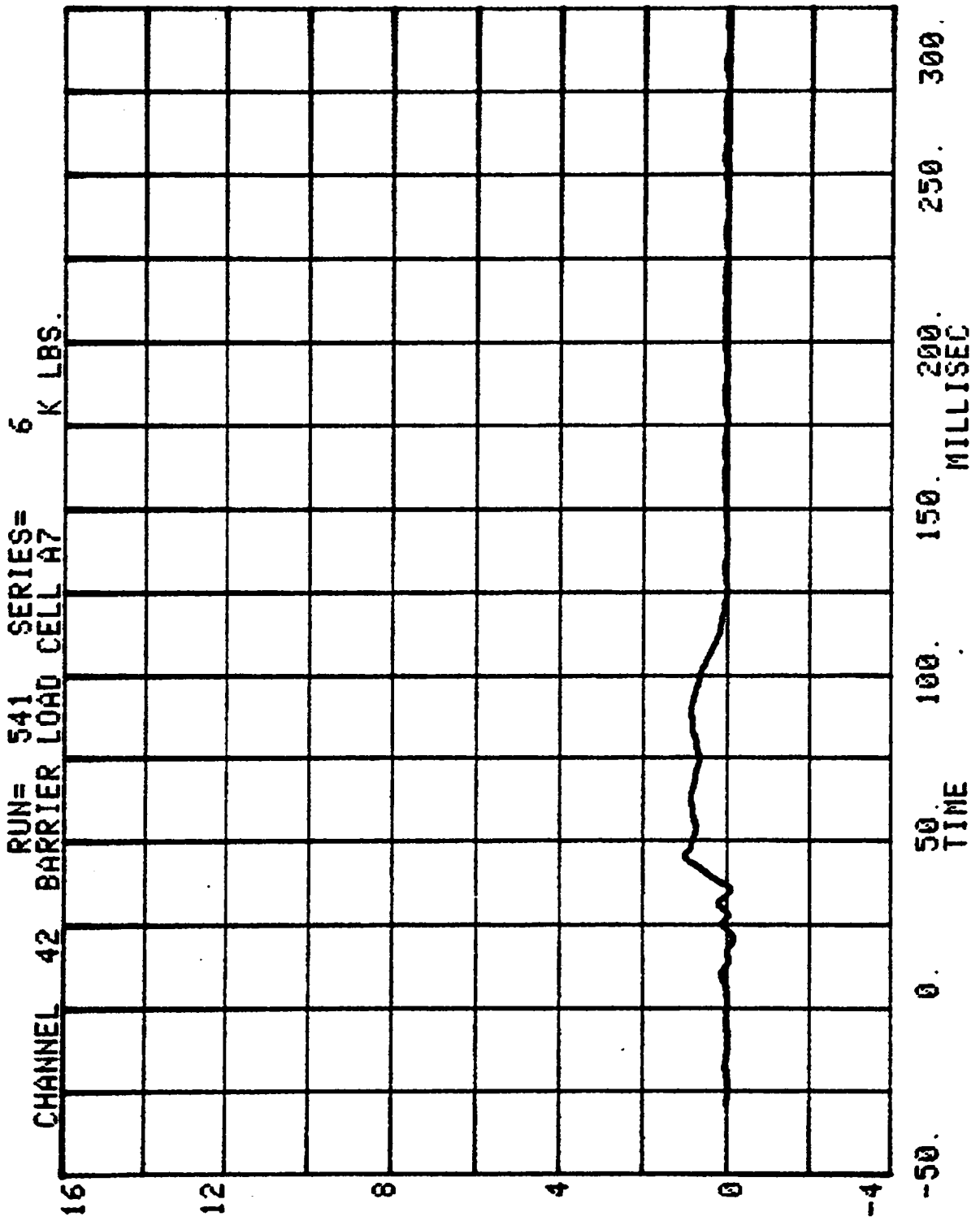

RUN= 541 SERIES= 6
CHANNEL 37 BARRIER LOAD CELL A2 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 38 BARRIER LOAD CELL A3
RUN= 541 SERIES= 6 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

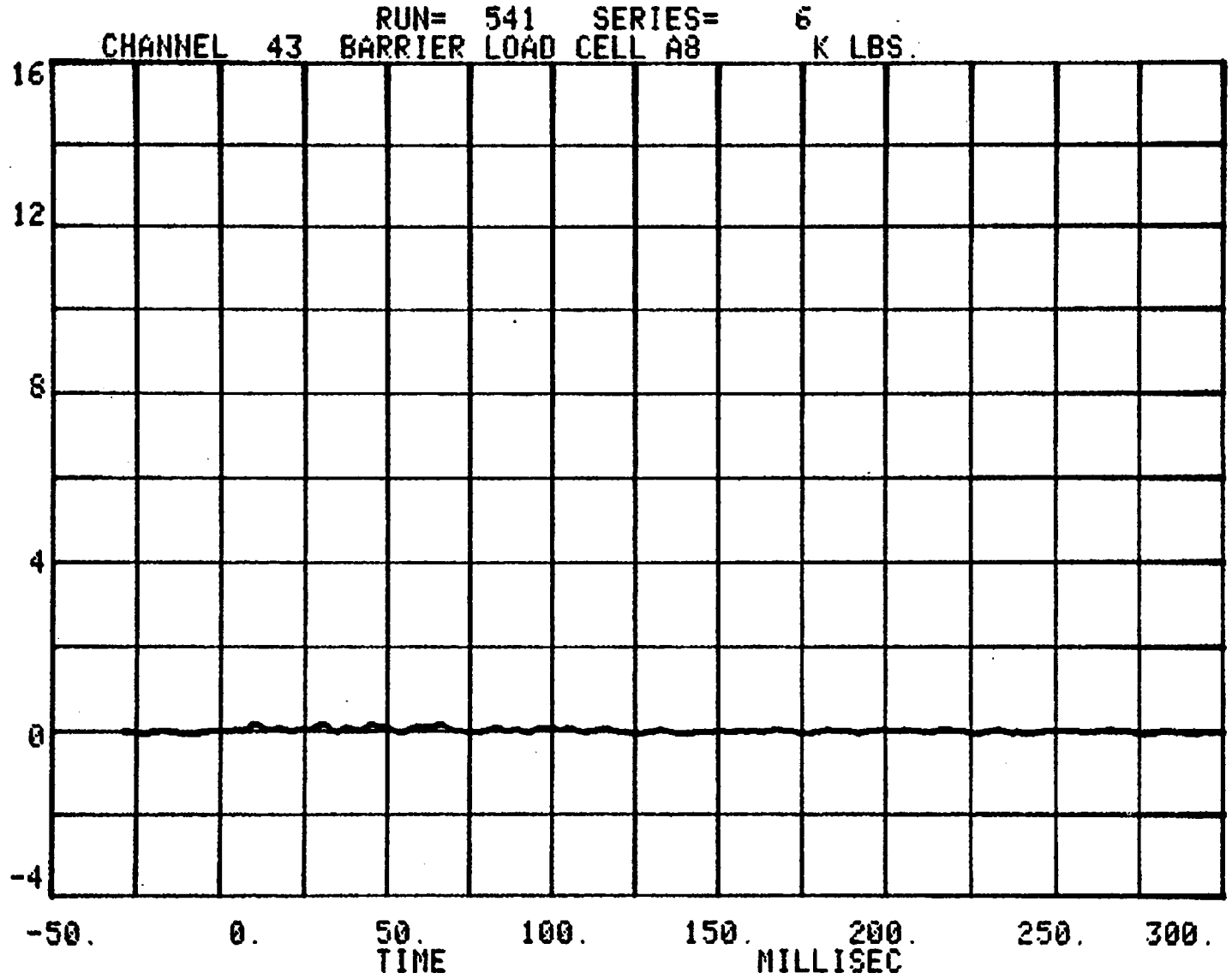

CHANNEL 39 BARRIER LOAD CELL A4
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

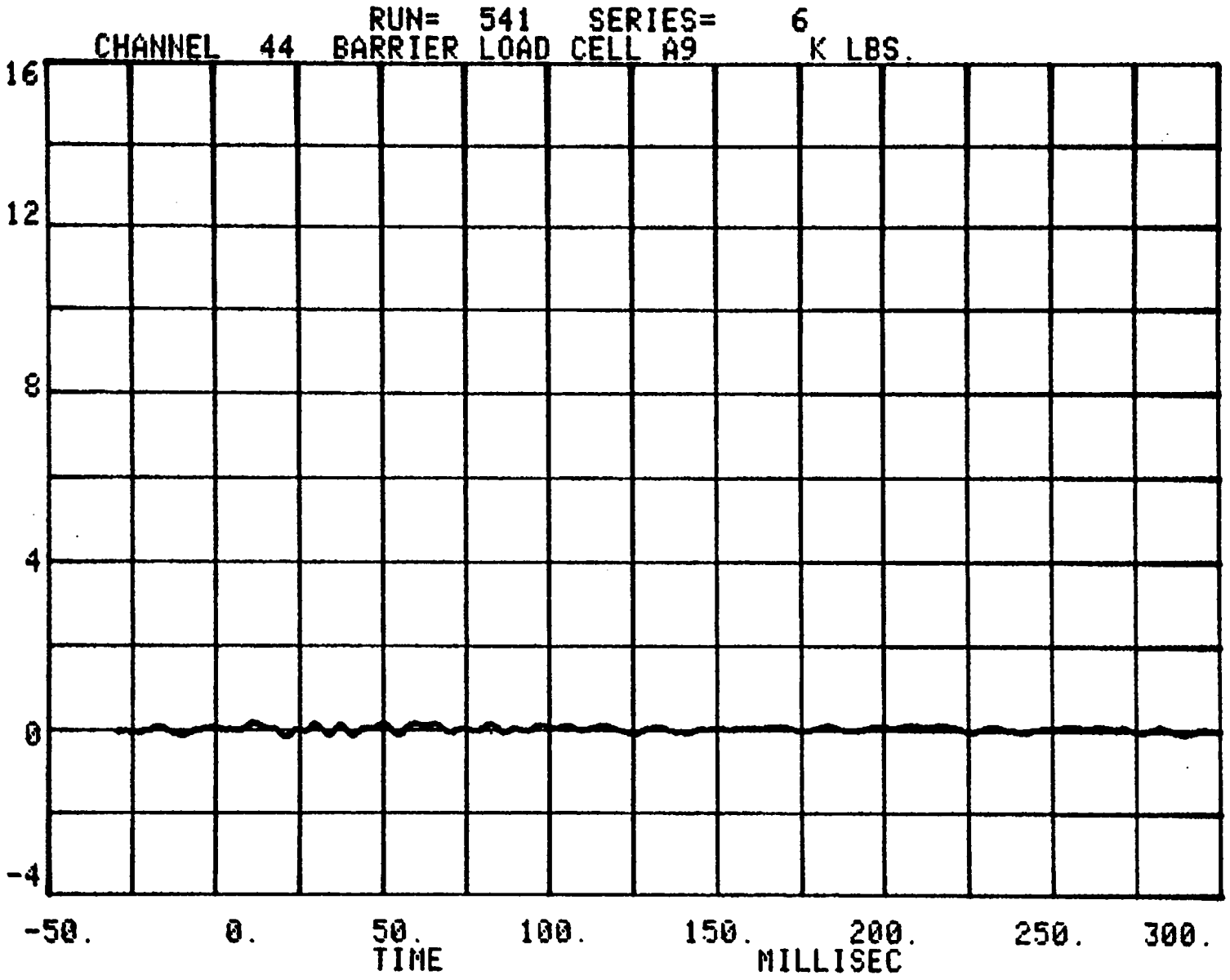

CHANNEL 40 BARRIER LOAD CELL A5
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

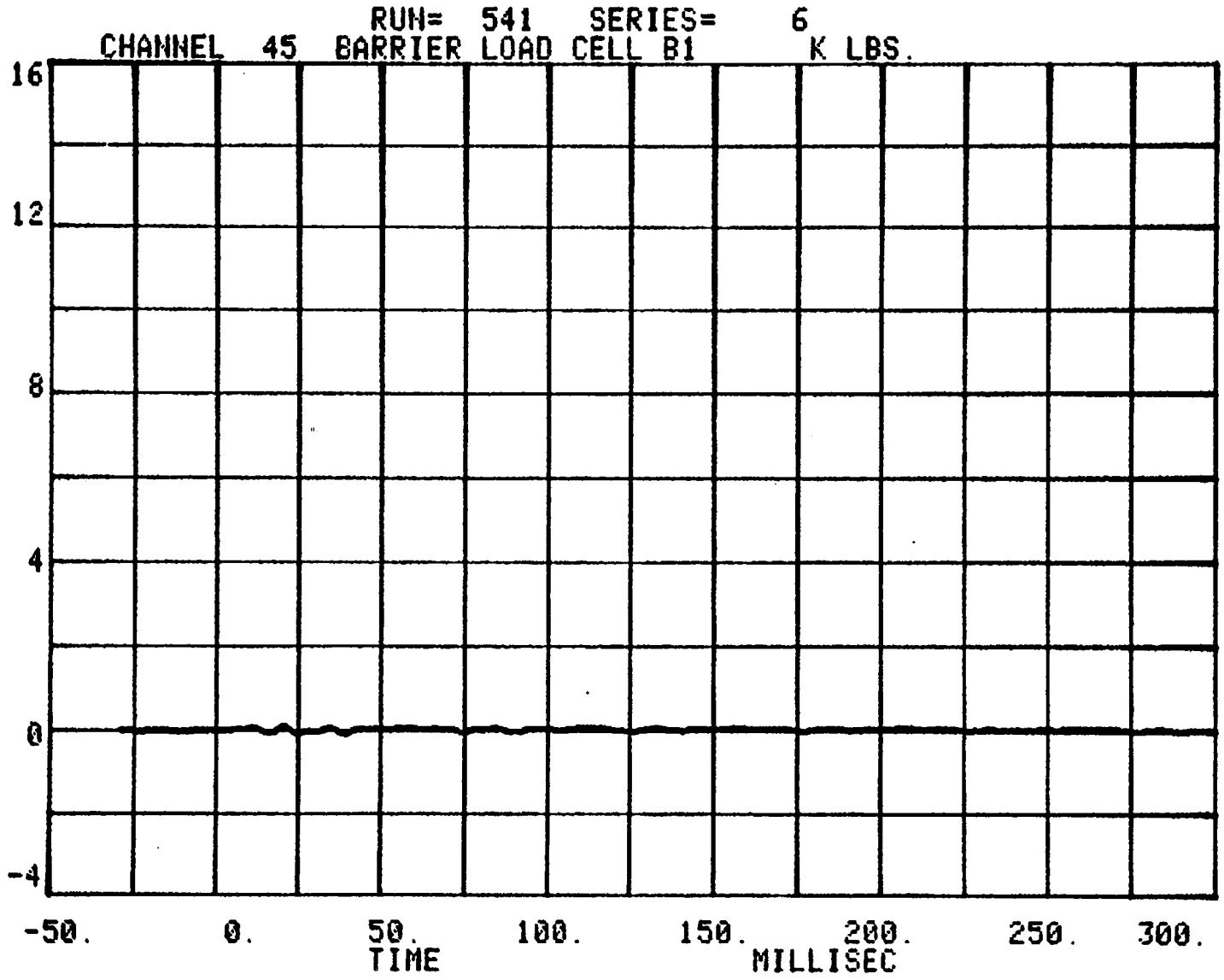

CHANNEL 41 BARRIER LOAD CELL A6
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

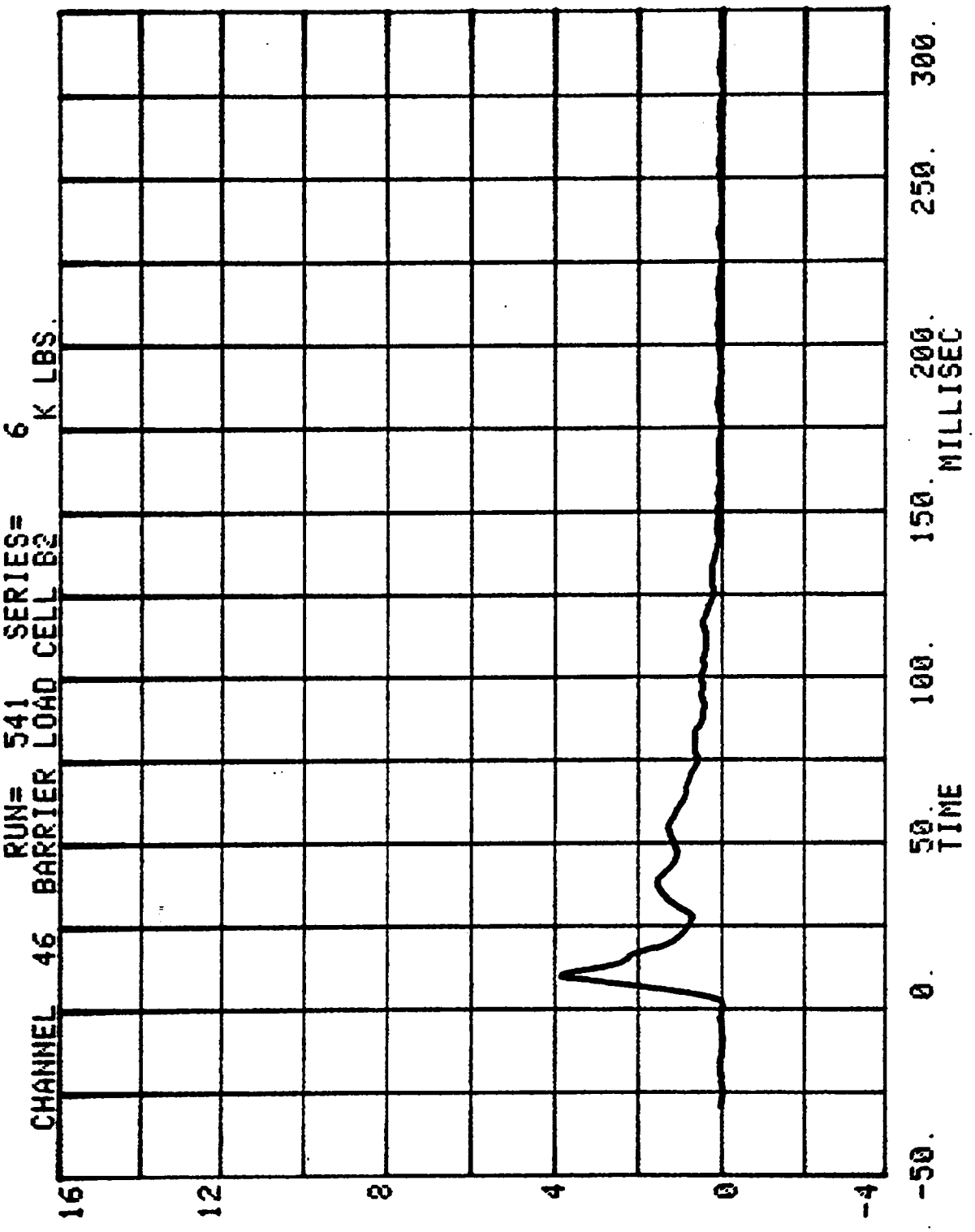

CHANNEL 42 BARRIER LOAD CELL A7
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

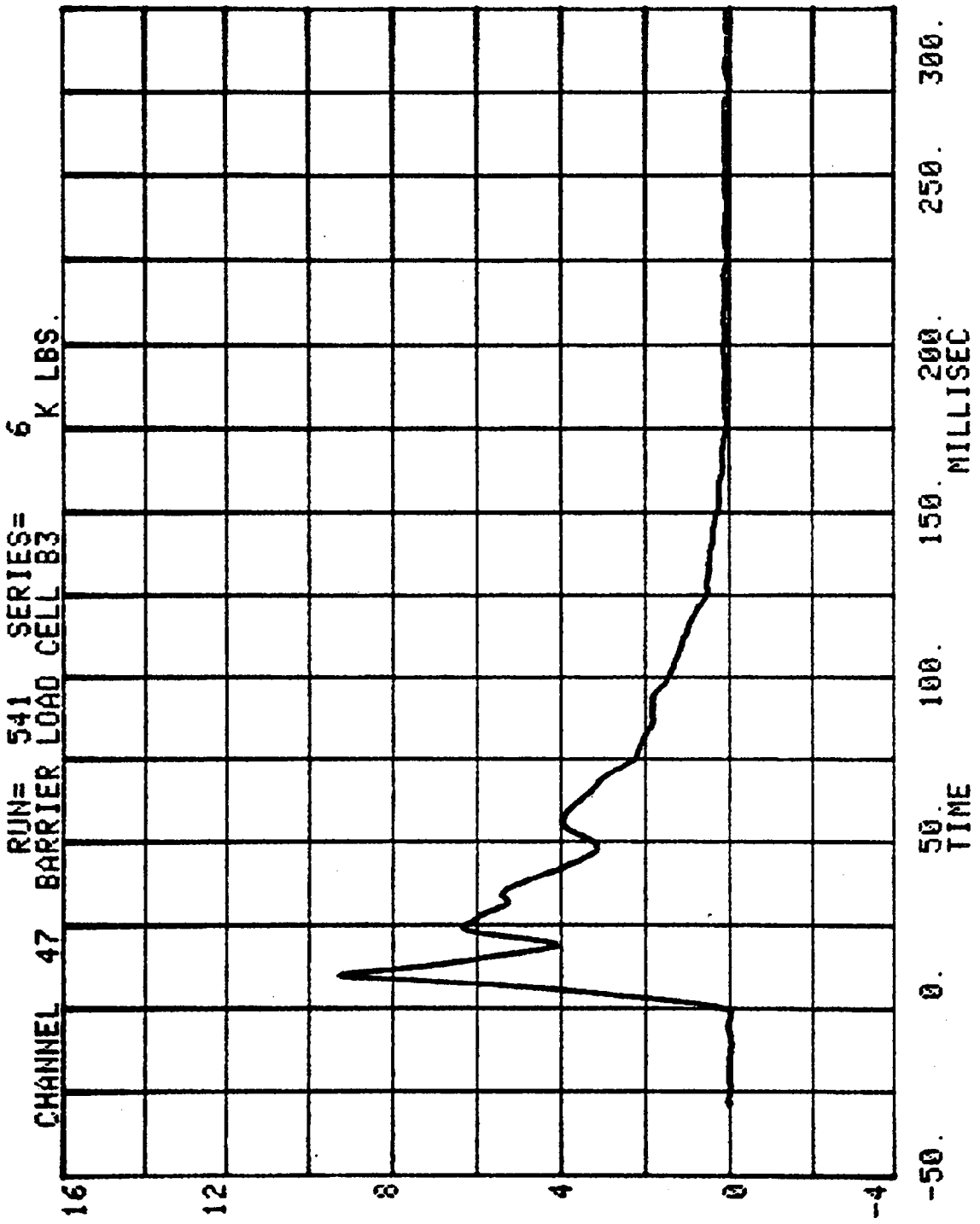
6851-V-6


RUN= 541 SERIES= 6
CHANNEL 43 BARRIER LOAD CELL A8 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

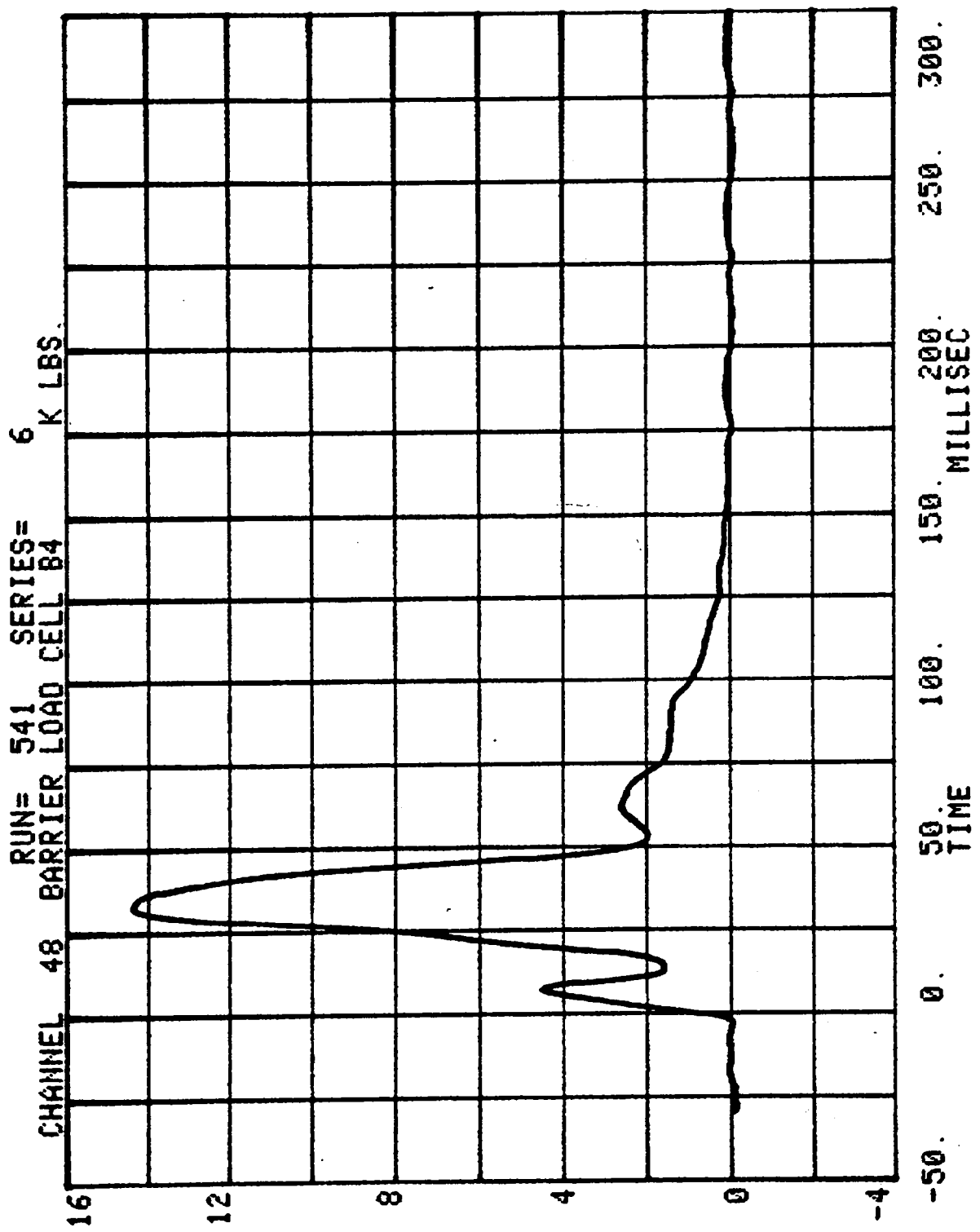

RUN= 541 SERIES= 6
CHANNEL 44 BARRIER LOAD CELL A9
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

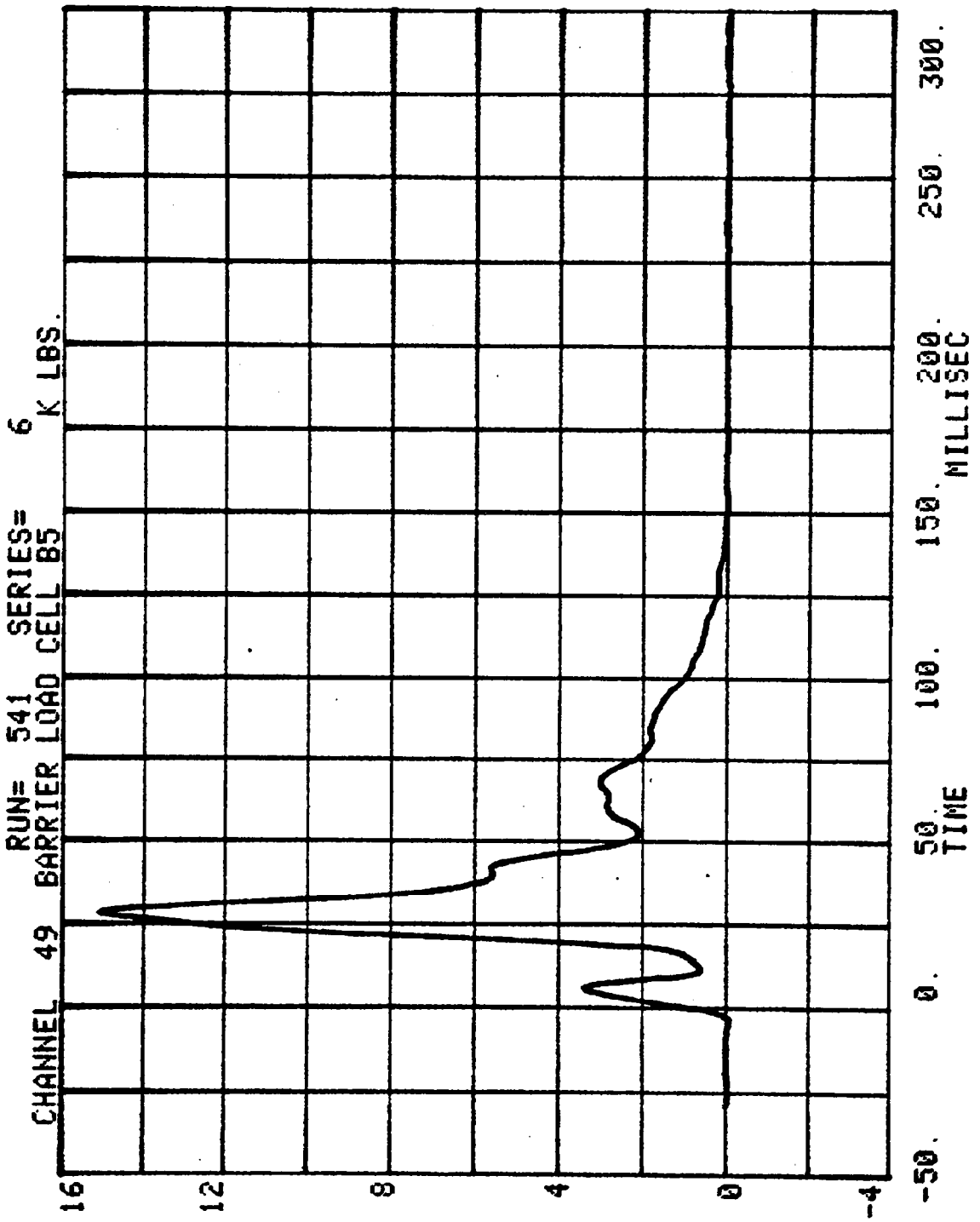

RUN= 541 SERIES= 6
CHANNEL 45 BARRIER LOAD CELL B1 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

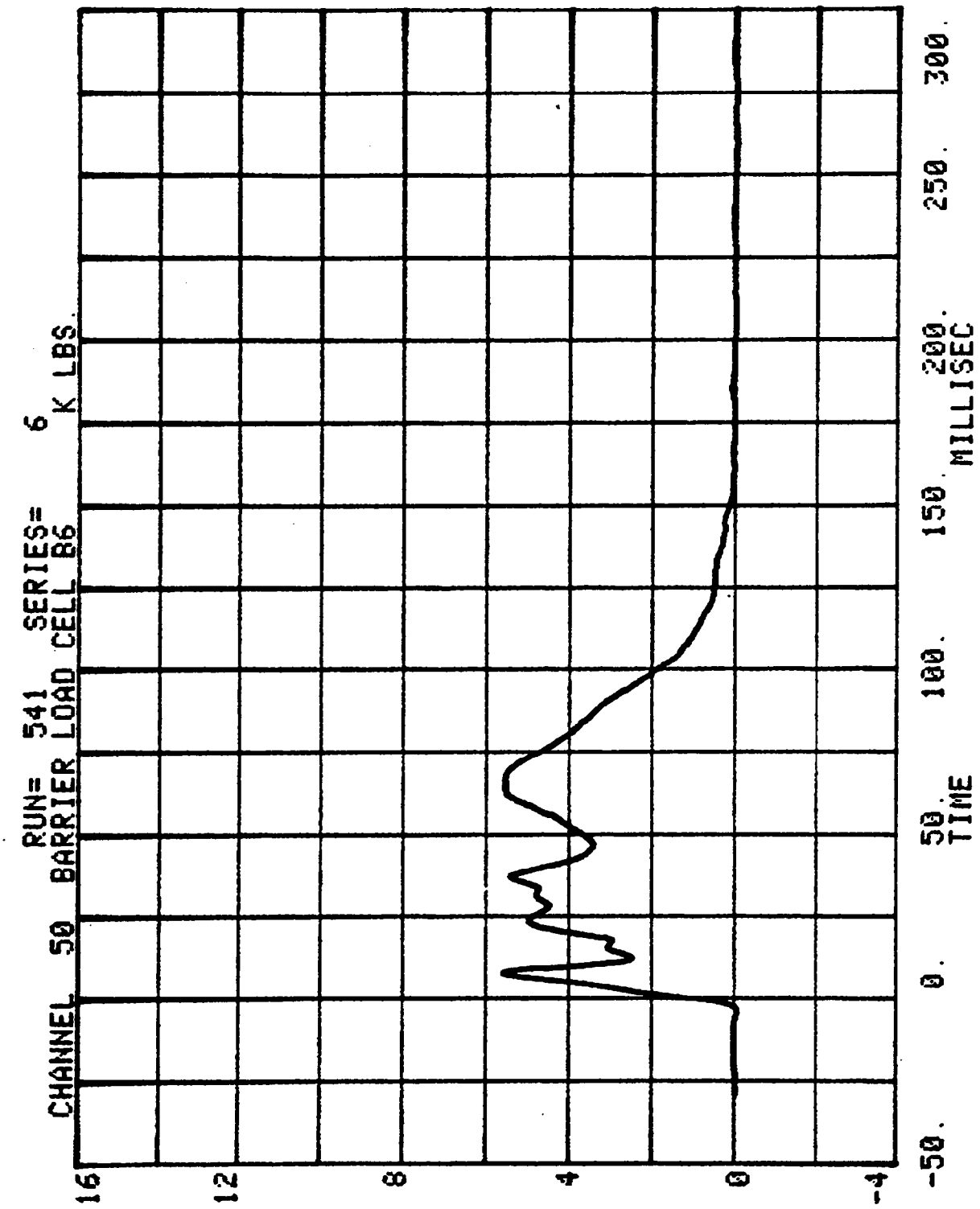

CHANNEL 46 BARRIER LOAD CELL B2
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

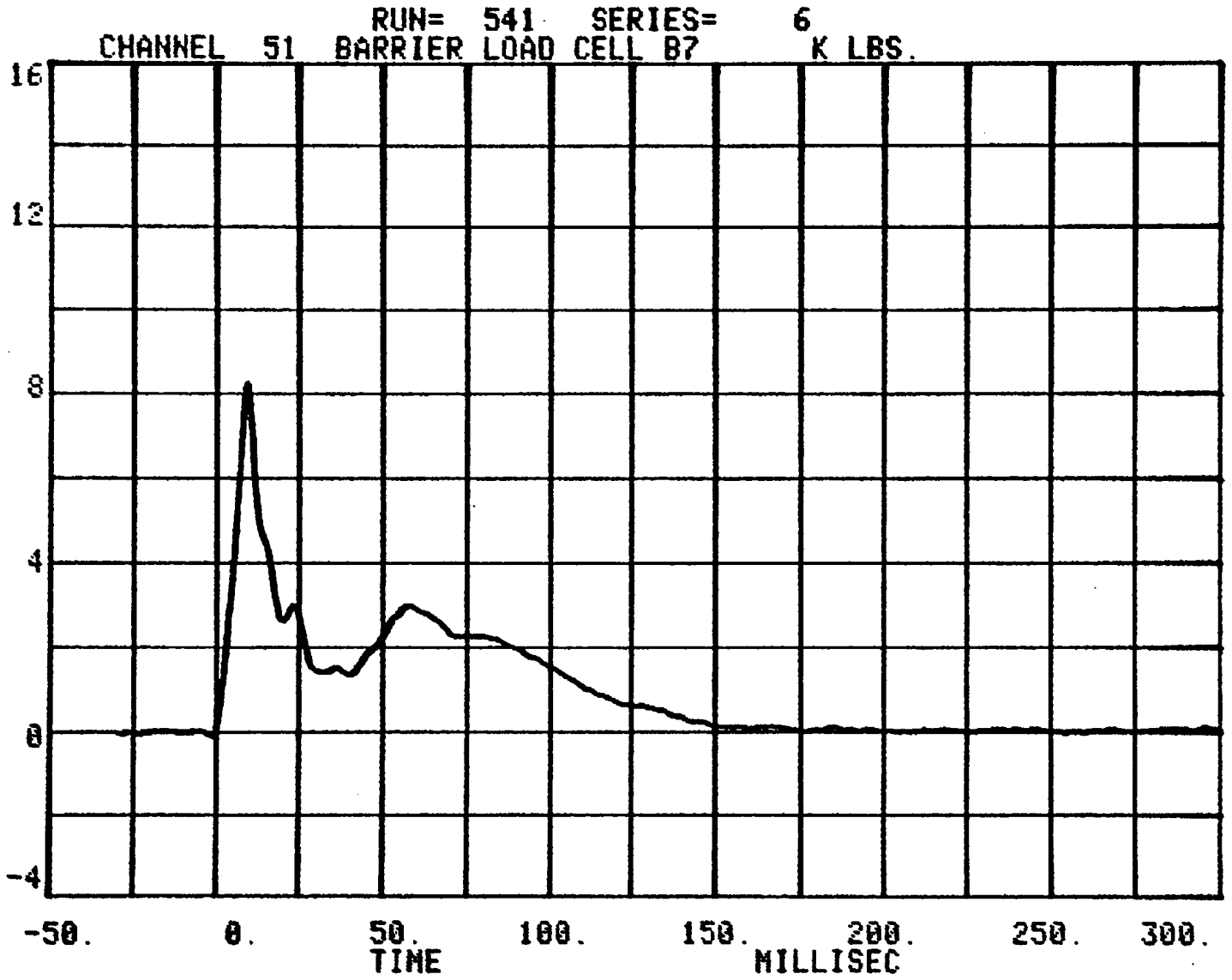

CHANNEL 47 BARRIER LOAD CELL B3
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

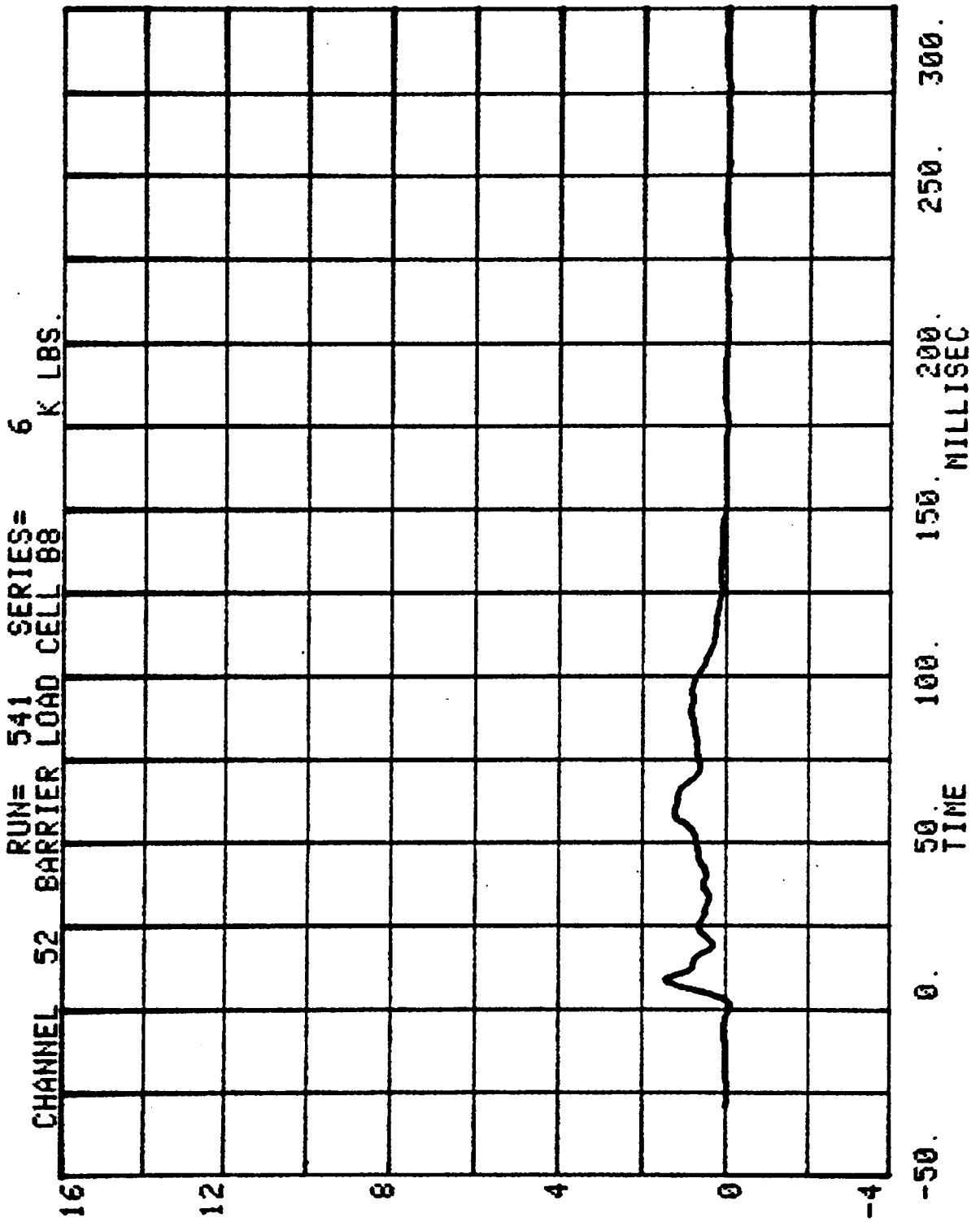
6851-V-6

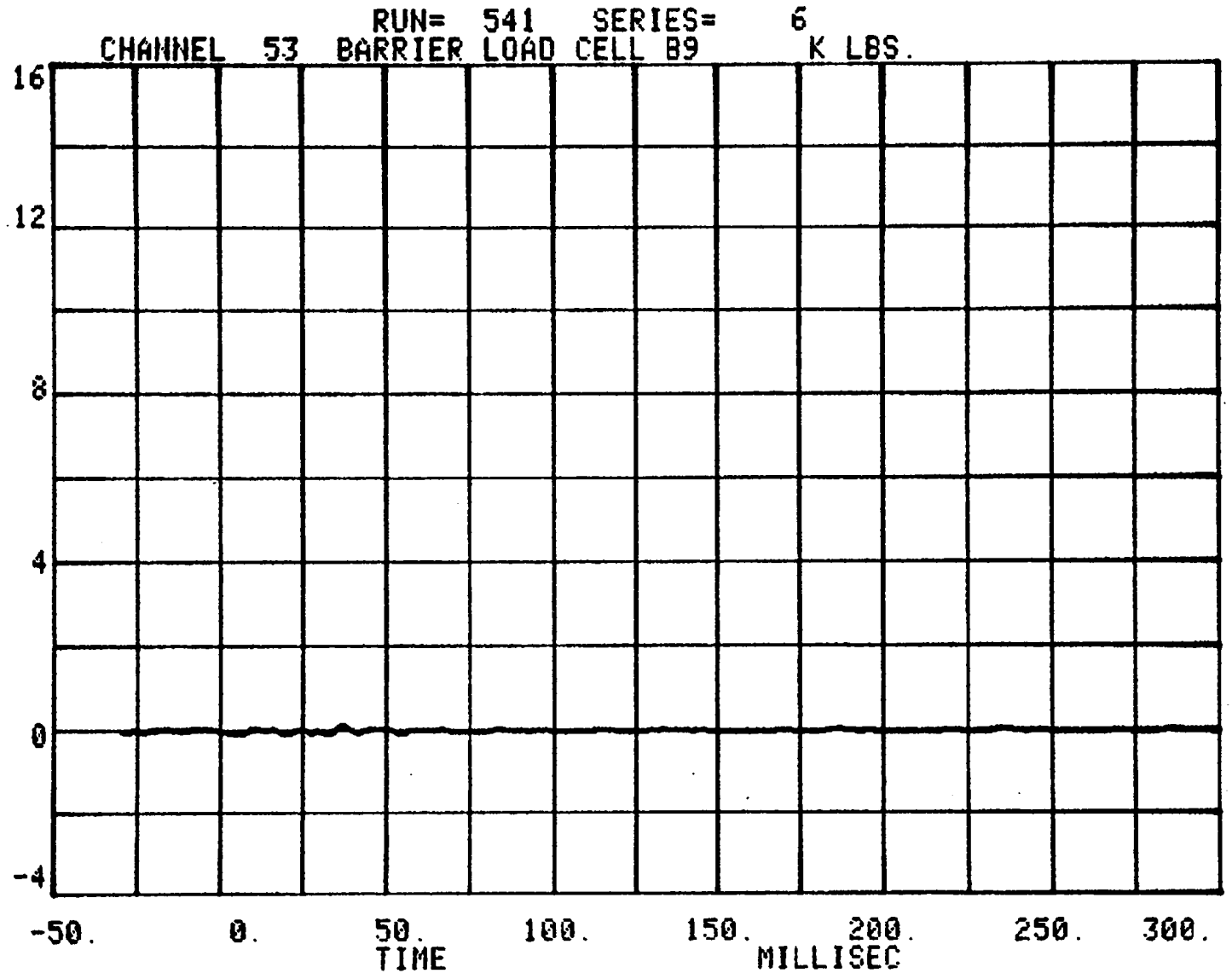

CHANNEL 48 RUN= 541 SERIES= 6
BARRIER LOAD CELL B4 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 49 BARRIER LOAD CELL B5
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

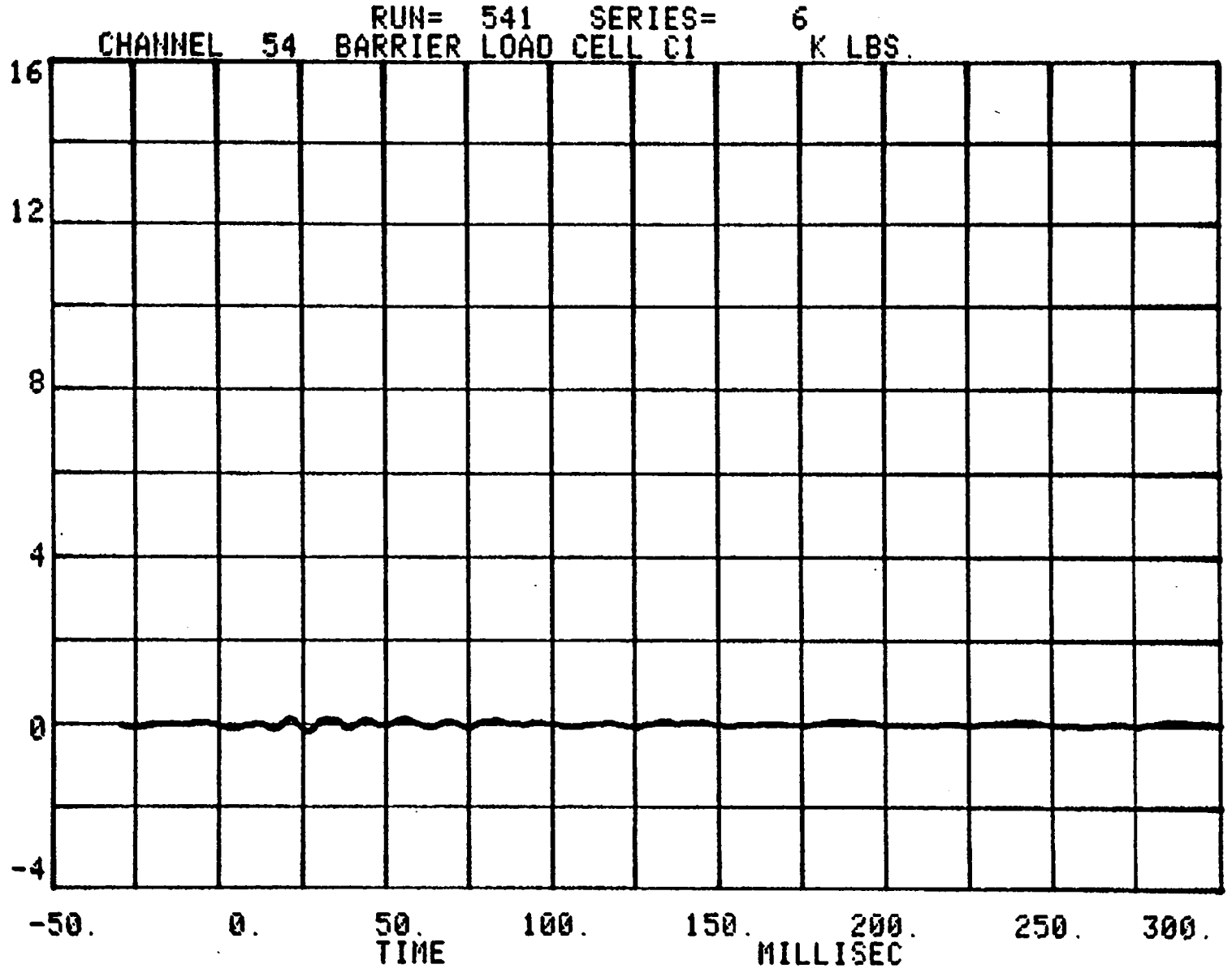

CHANNEL 50 BARRIER LOAD CELL 86
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

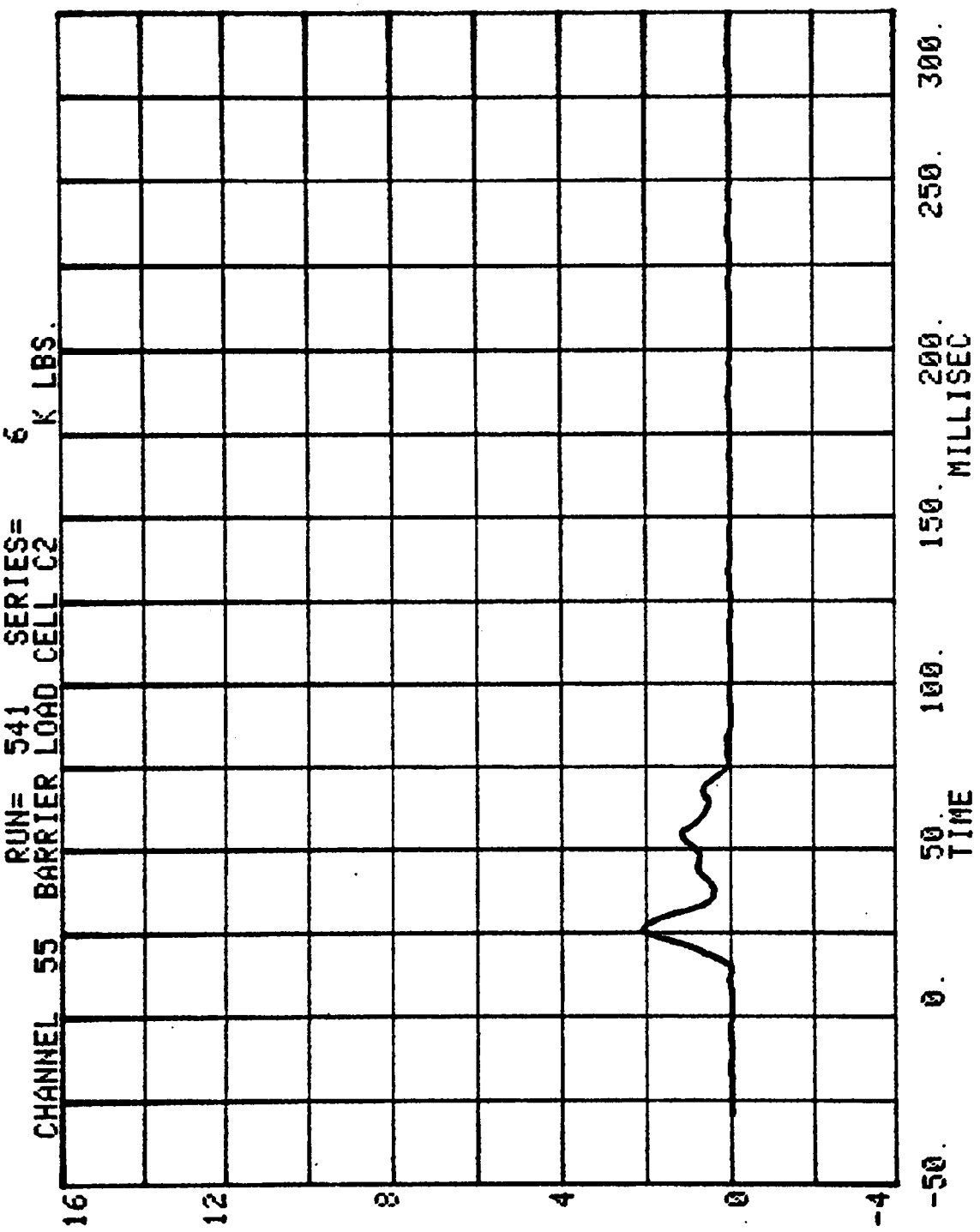

RUN= 541 SERIES= 6
CHANNEL 51 BARRIER LOAD CELL B7 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 52 BARRIER LOAD CELL 88
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

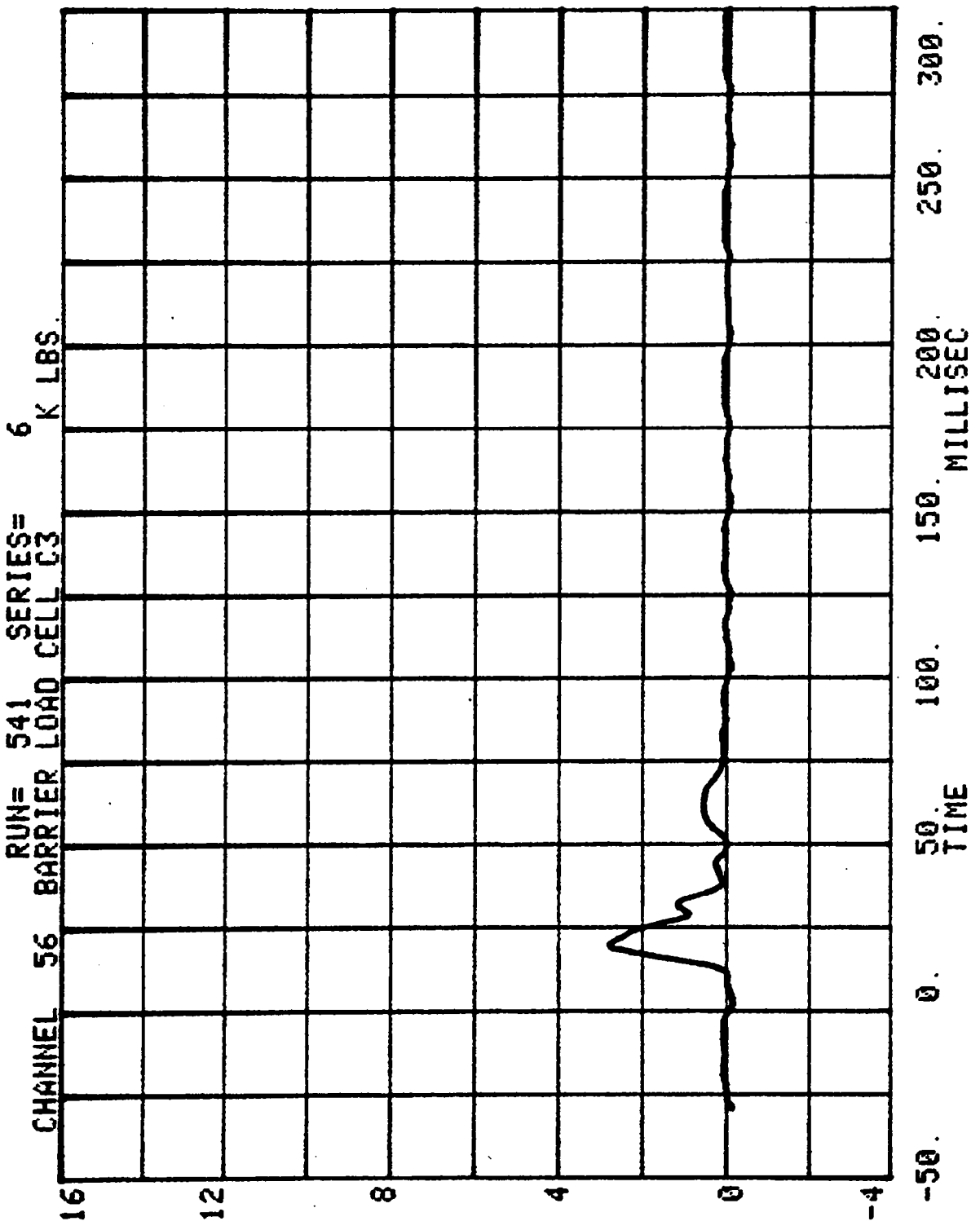

RUN= 541 SERIES= 6
CHANNEL 53 BARRIER LOAD CELL B9 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

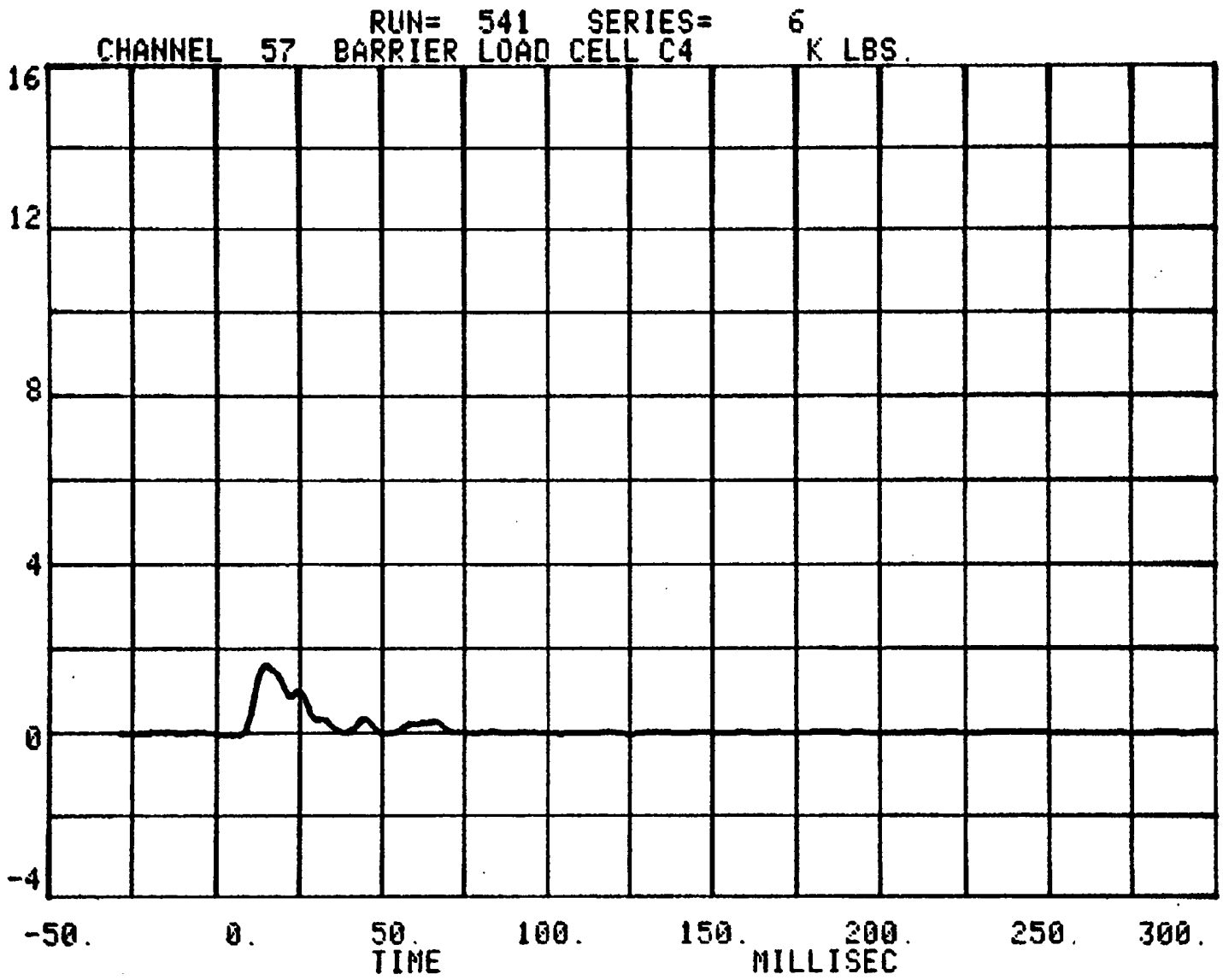
6851-V-6

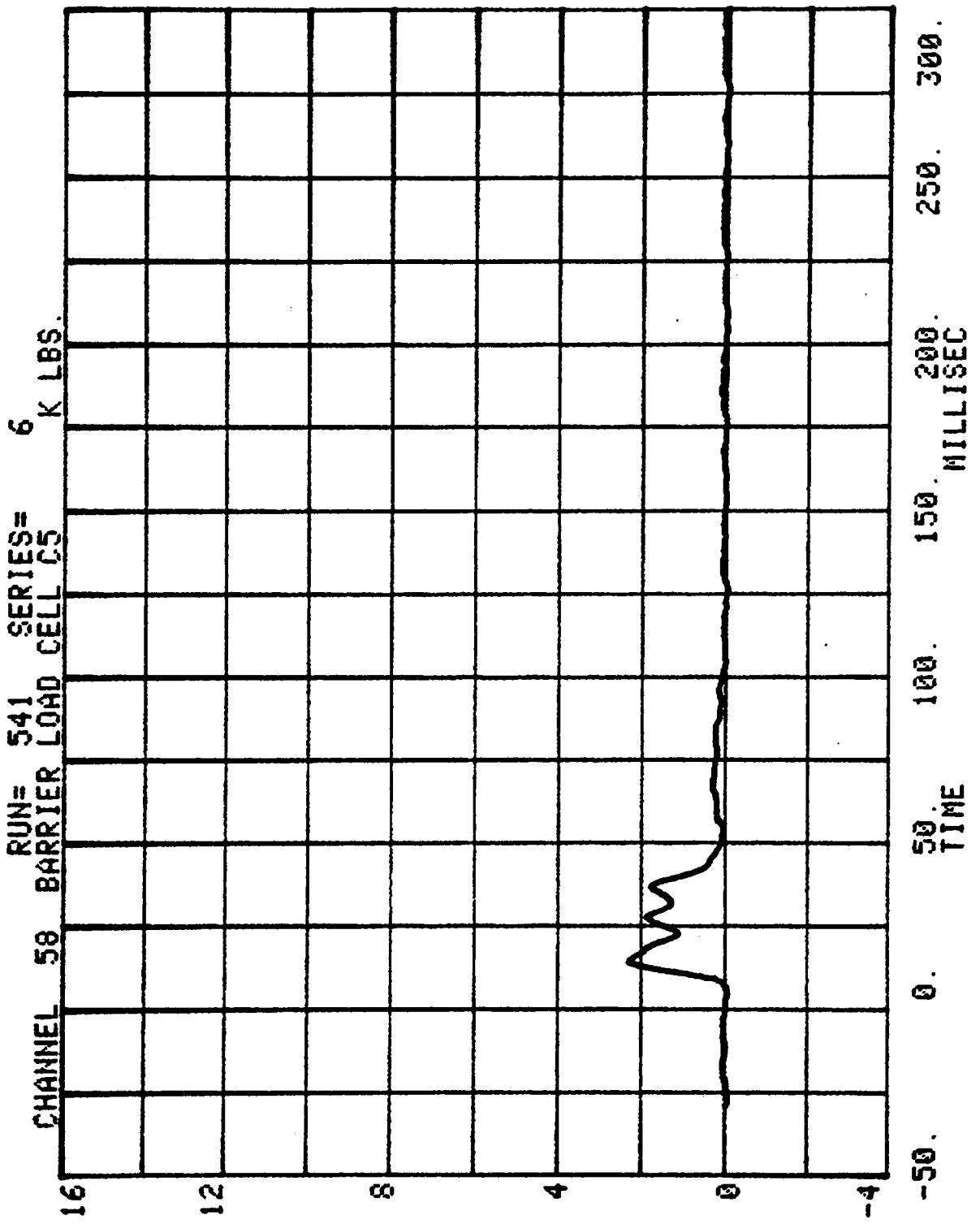

RUN= 541 SERIES= 6
CHANNEL 54 BARRIER LOAD CELL C1 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 55 BARRIER LOAD CELL C2
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

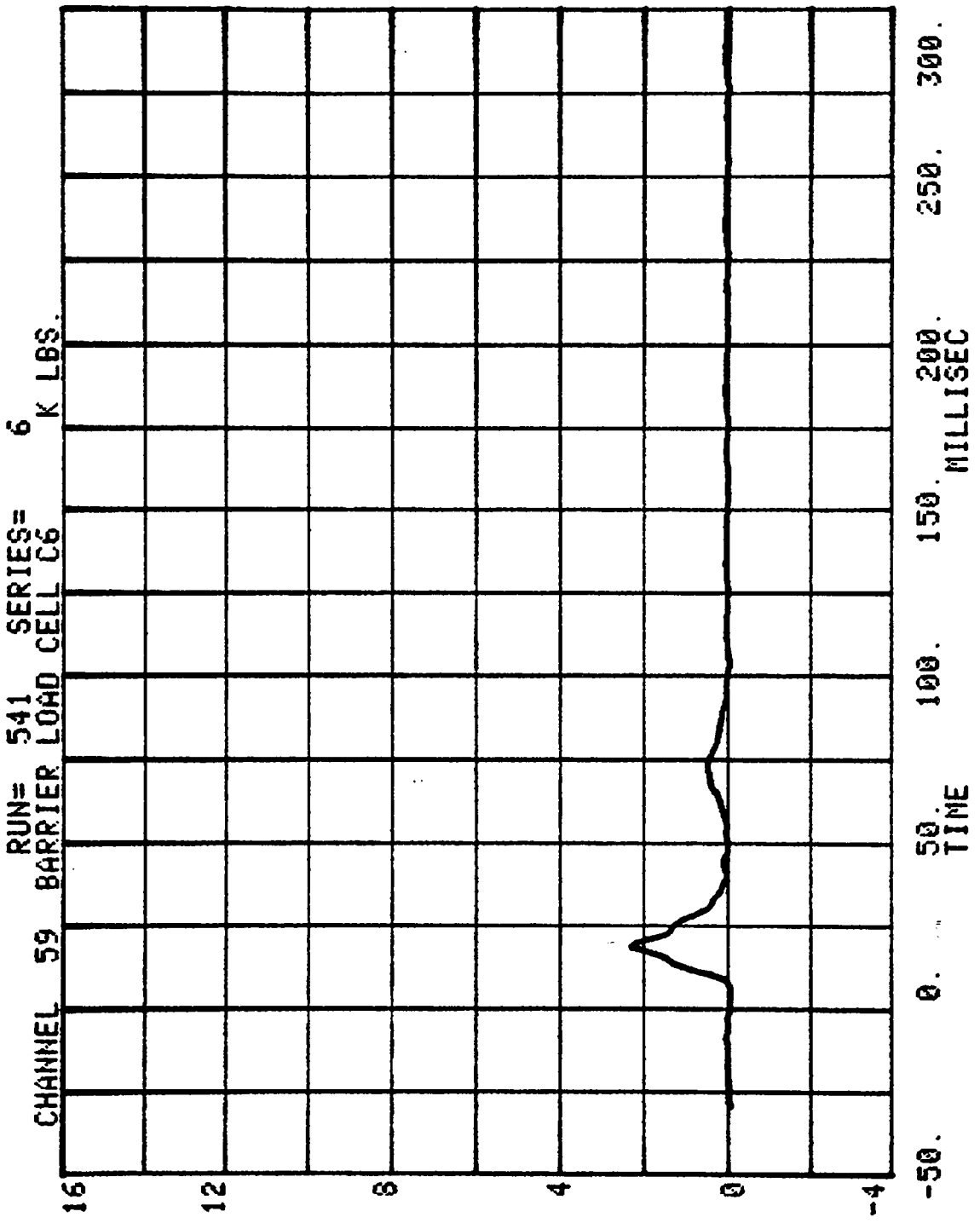
6851-V-6

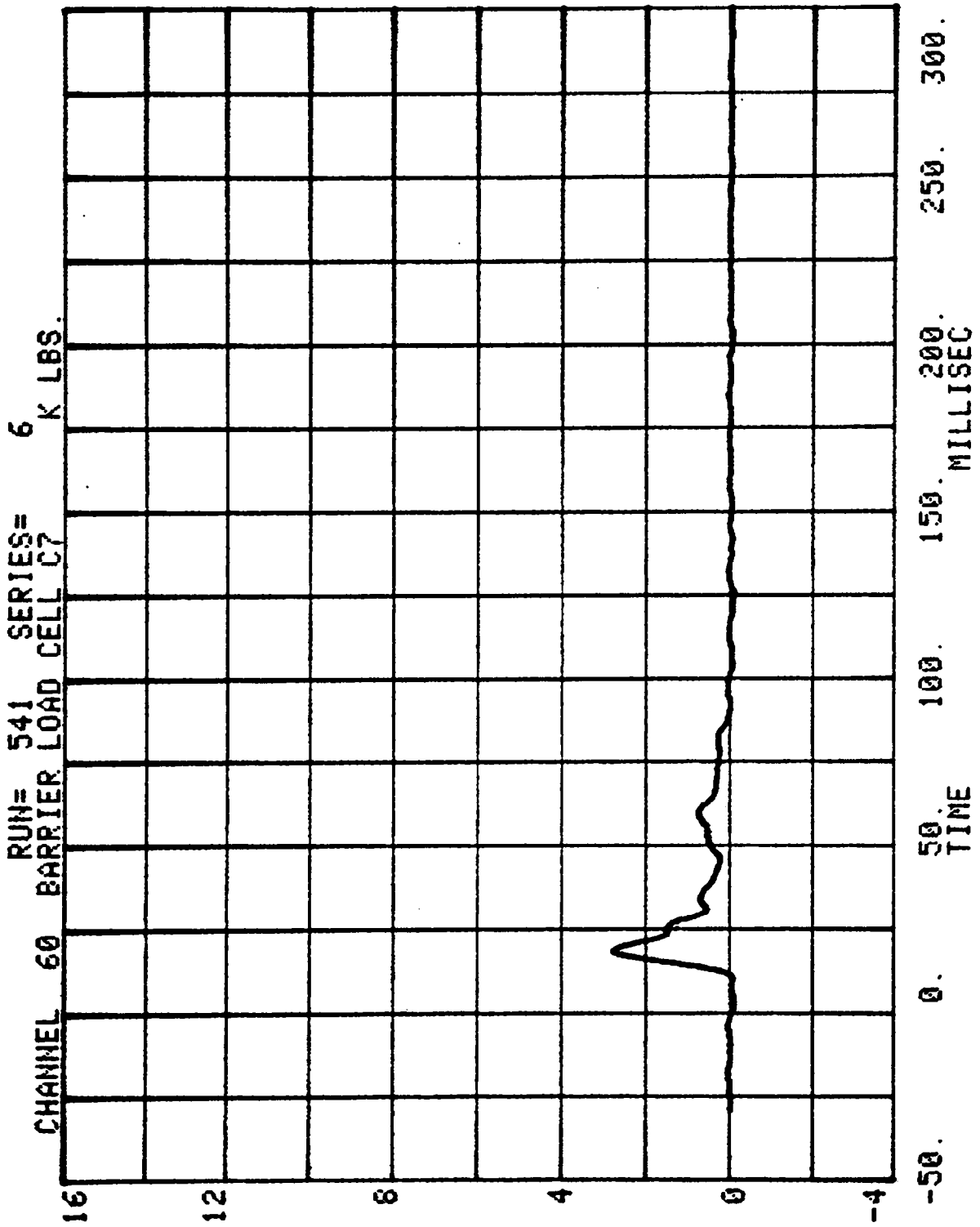

CHANNEL 56 BARRIER LOAD CELL C3
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

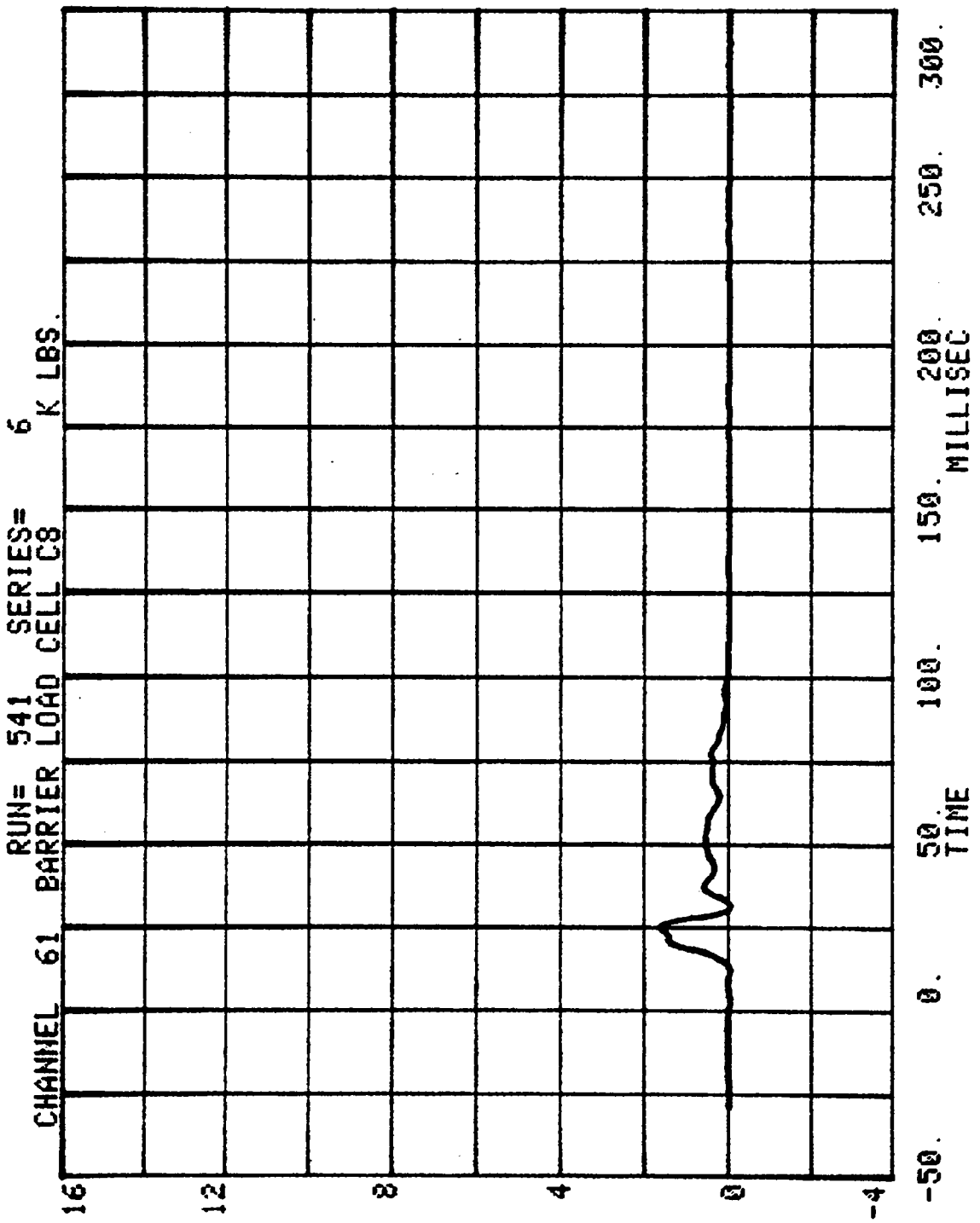

RUN= 541 SERIES= 6
CHANNEL 57 BARRIER LOAD CELL C4 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 58 BARRIER LOAD CELL C5
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6


CHANNEL 59 BARRIER LOAD CELL C6
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 60 BARRIER LOAD CELL C7
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 61 BARRIER LOAD CELL C8
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
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-4
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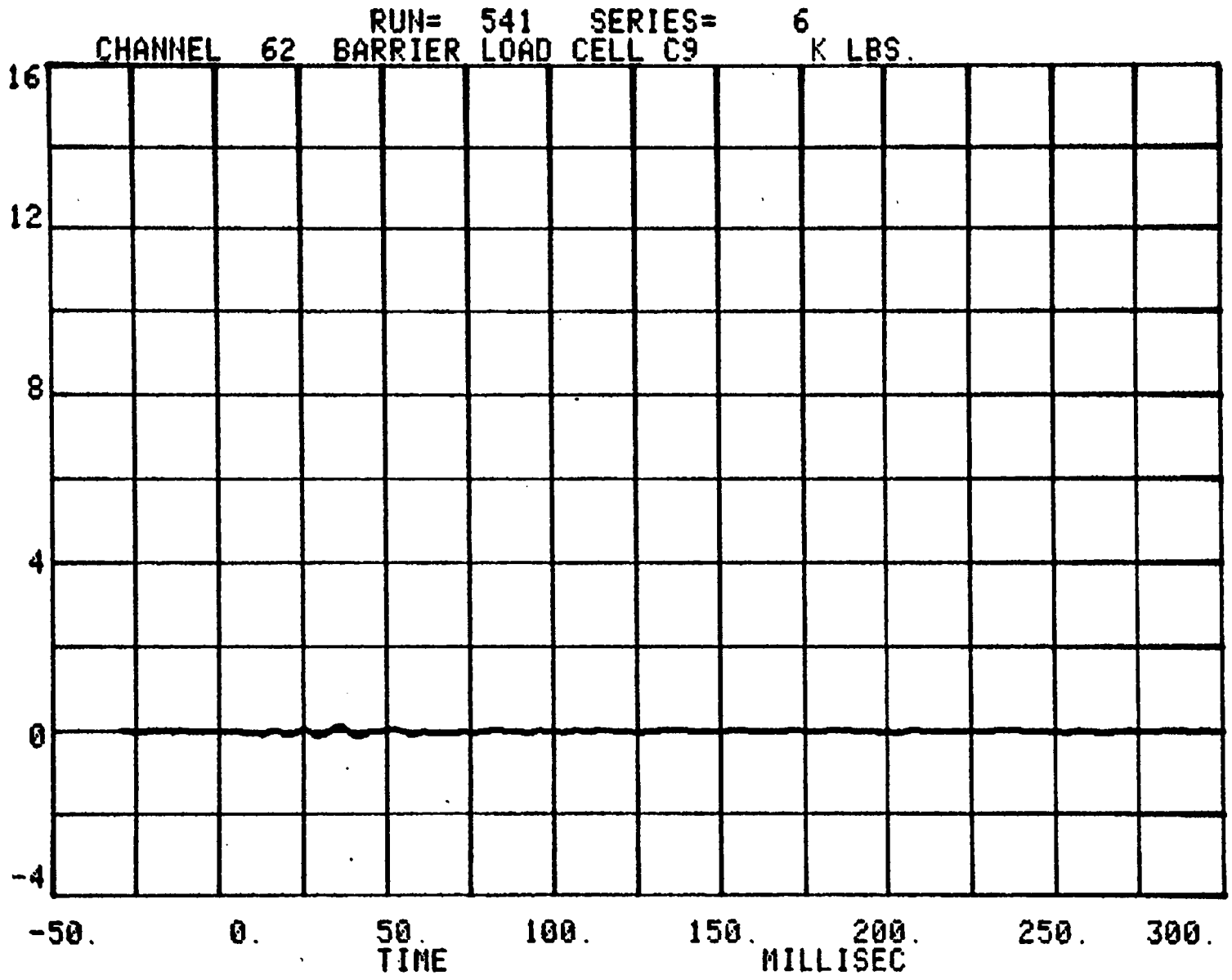
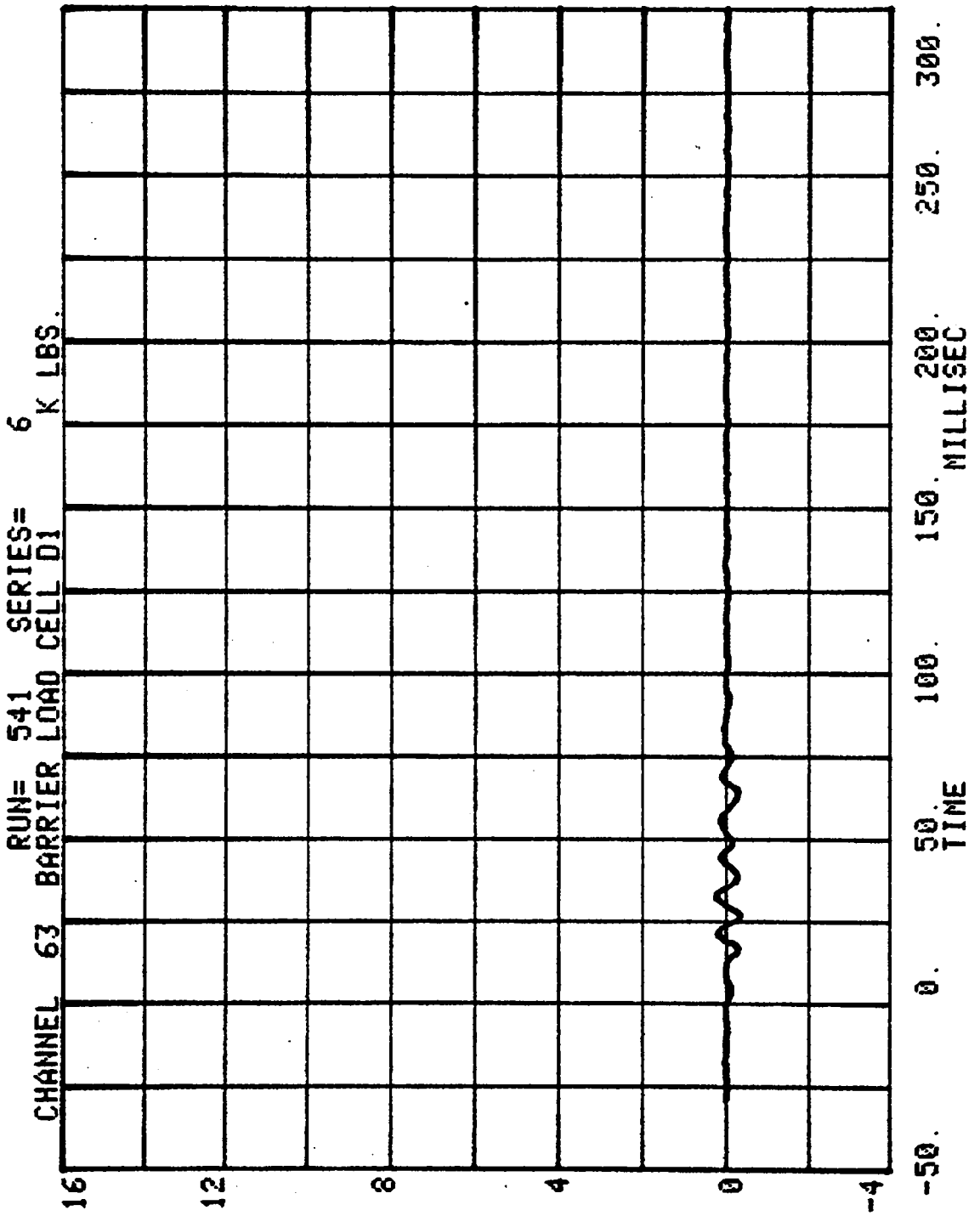
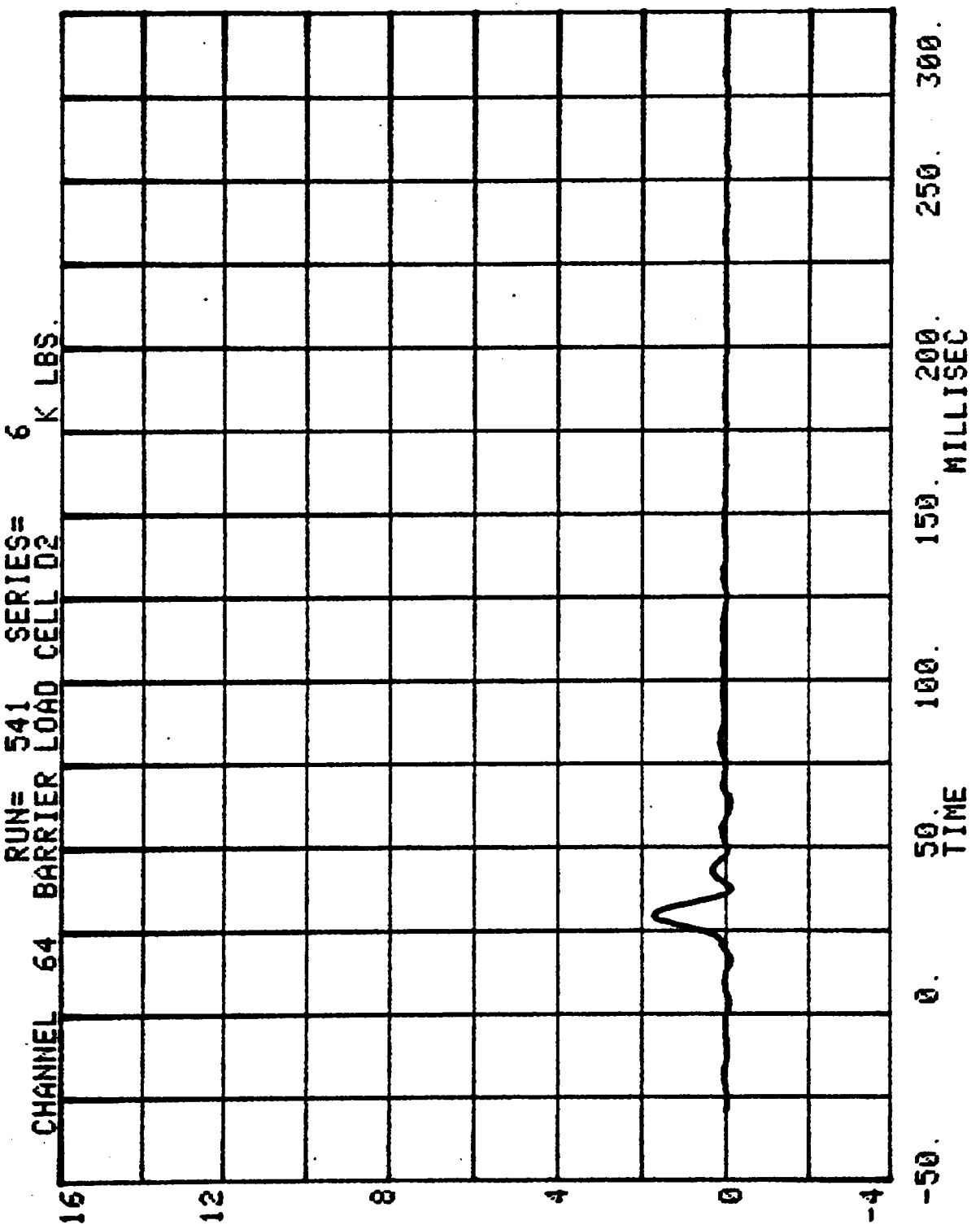
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6


RUN= 541 SERIES= 6
CHANNEL 62 BARRIER LOAD CELL C9 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 63
RUN= 541 SERIES= 6
BARRIER LOAD CELL D1
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 64 BARRIER LOAD CELL D2
RUN= 541 SERIES= 6
K LBS.
16
12
8
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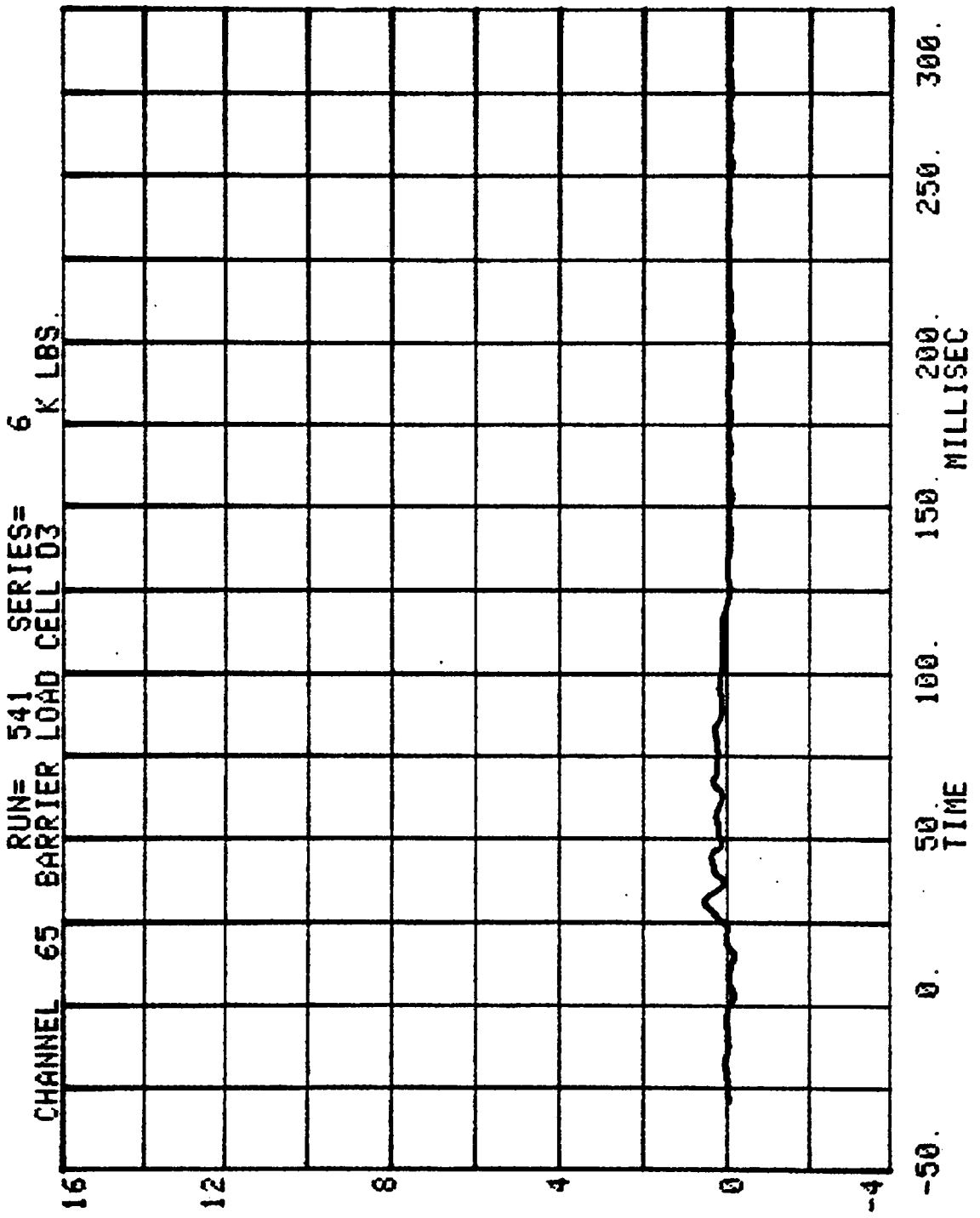
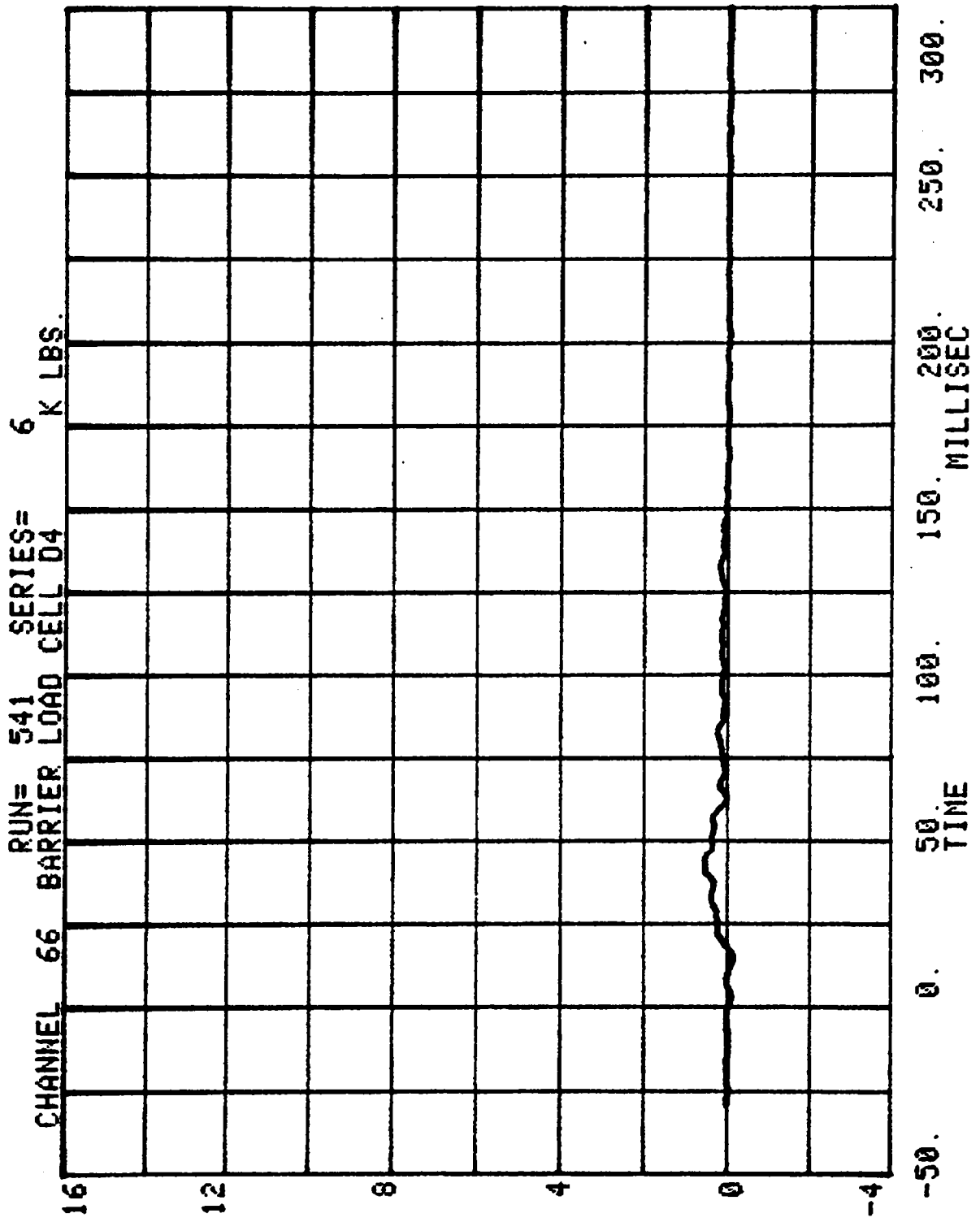
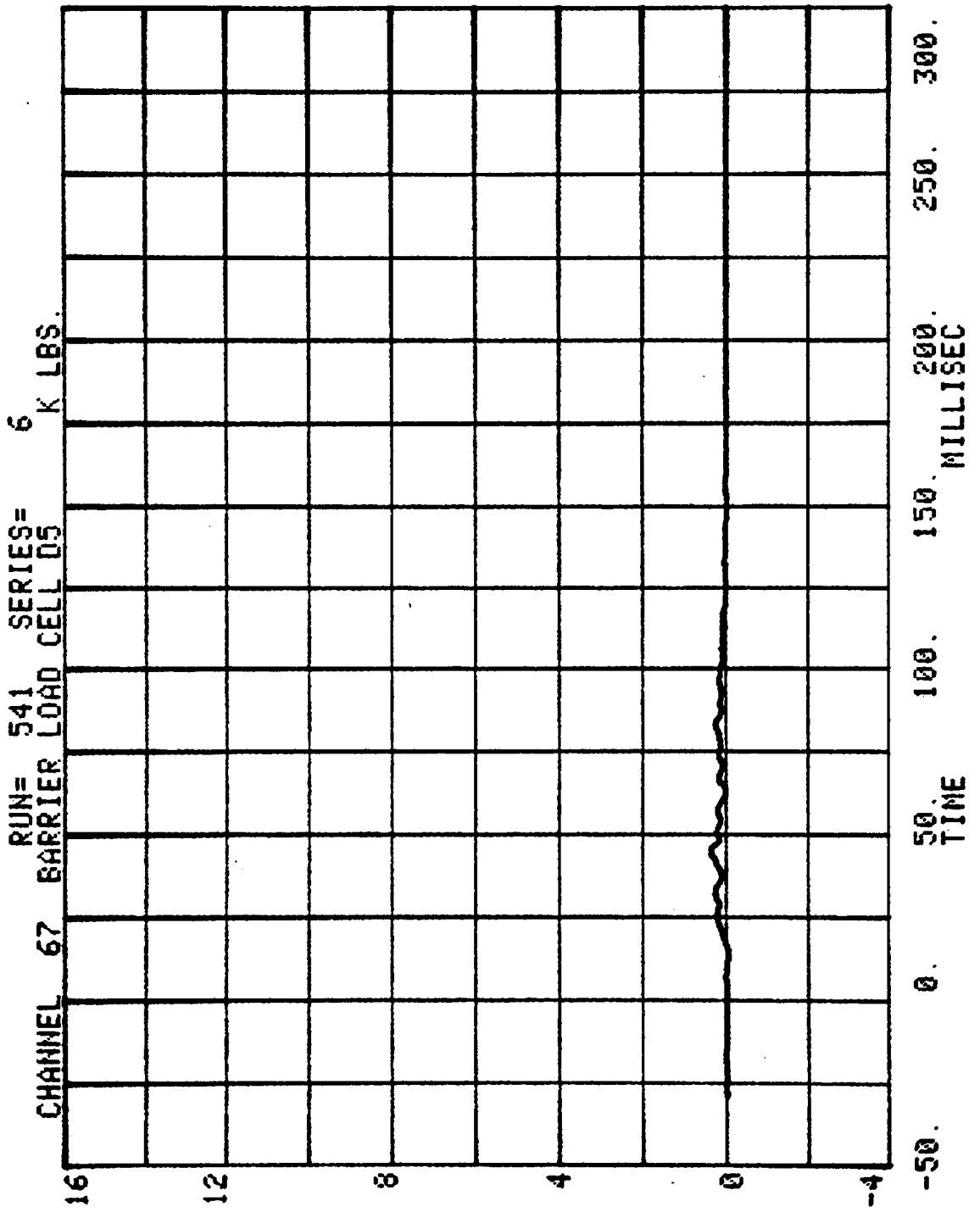
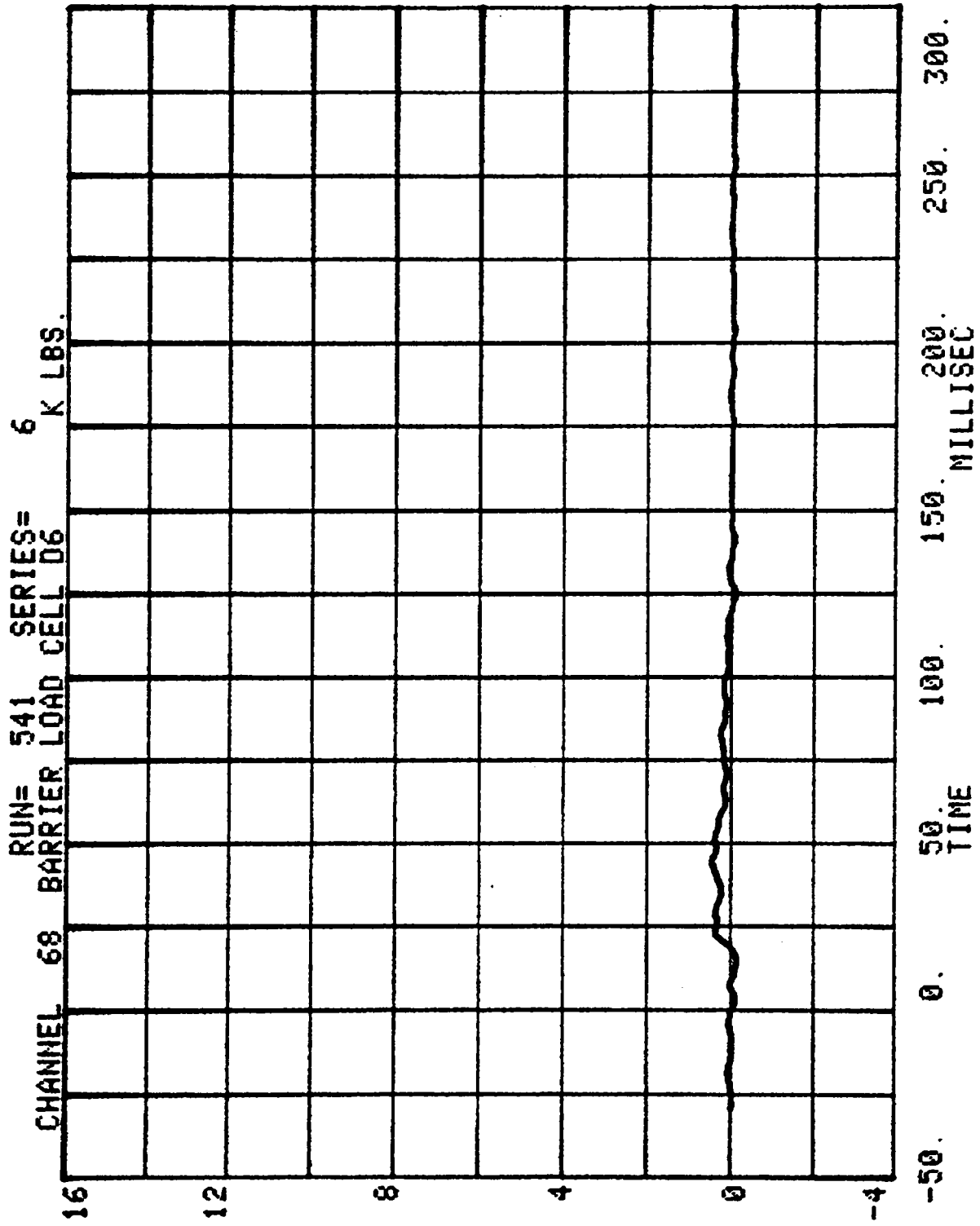
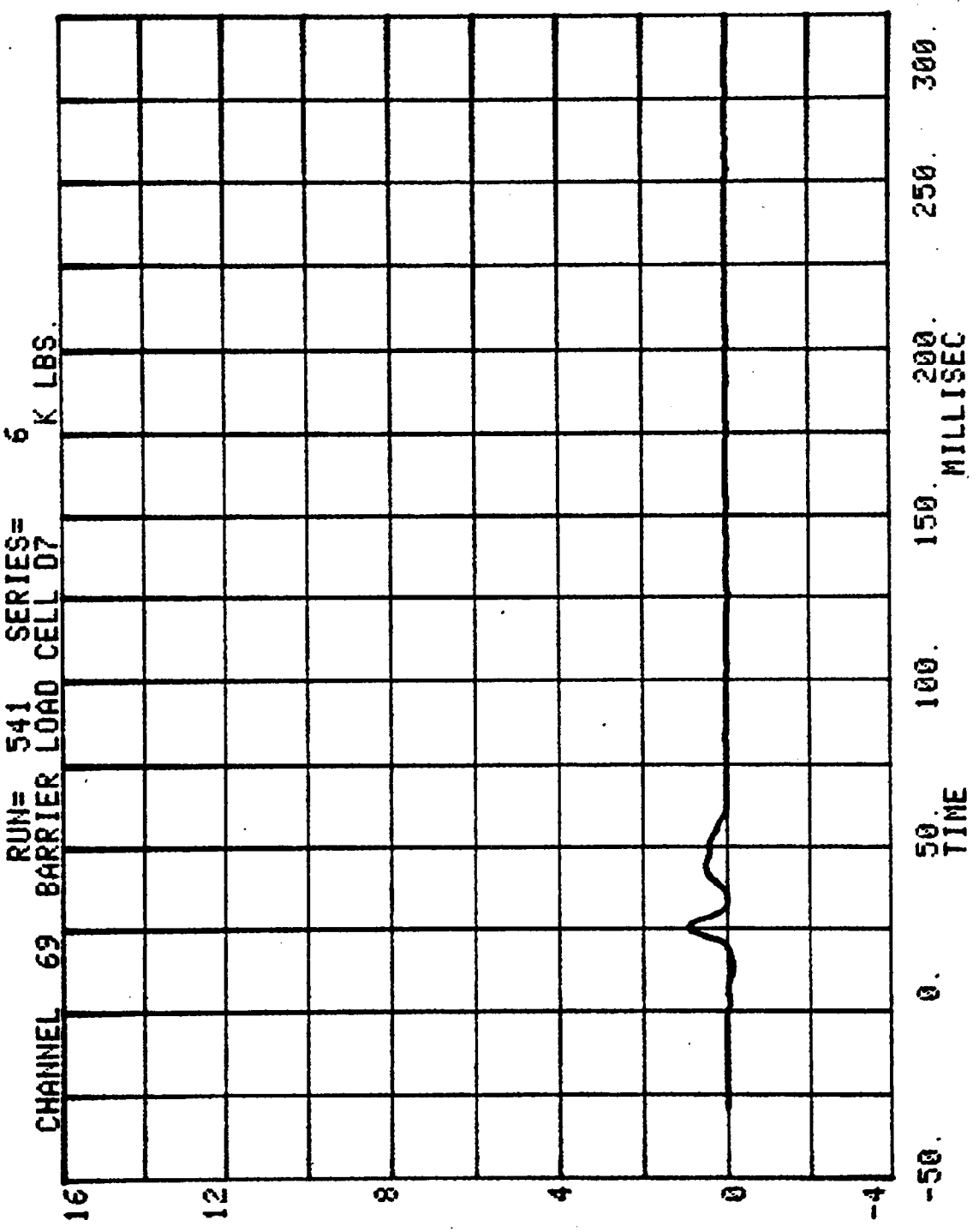
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

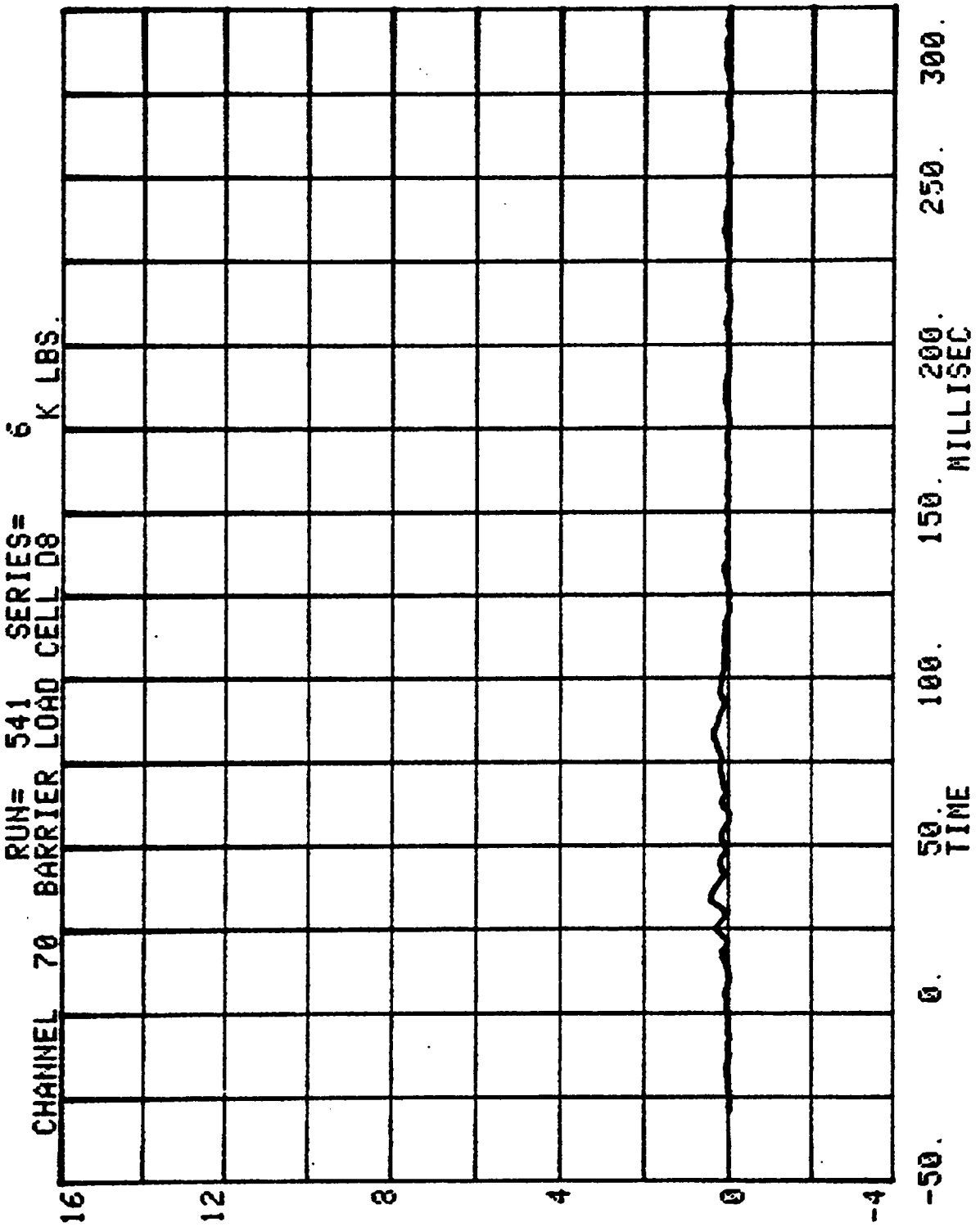

CHANNEL 65 BARRIER LOAD CELL 03
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

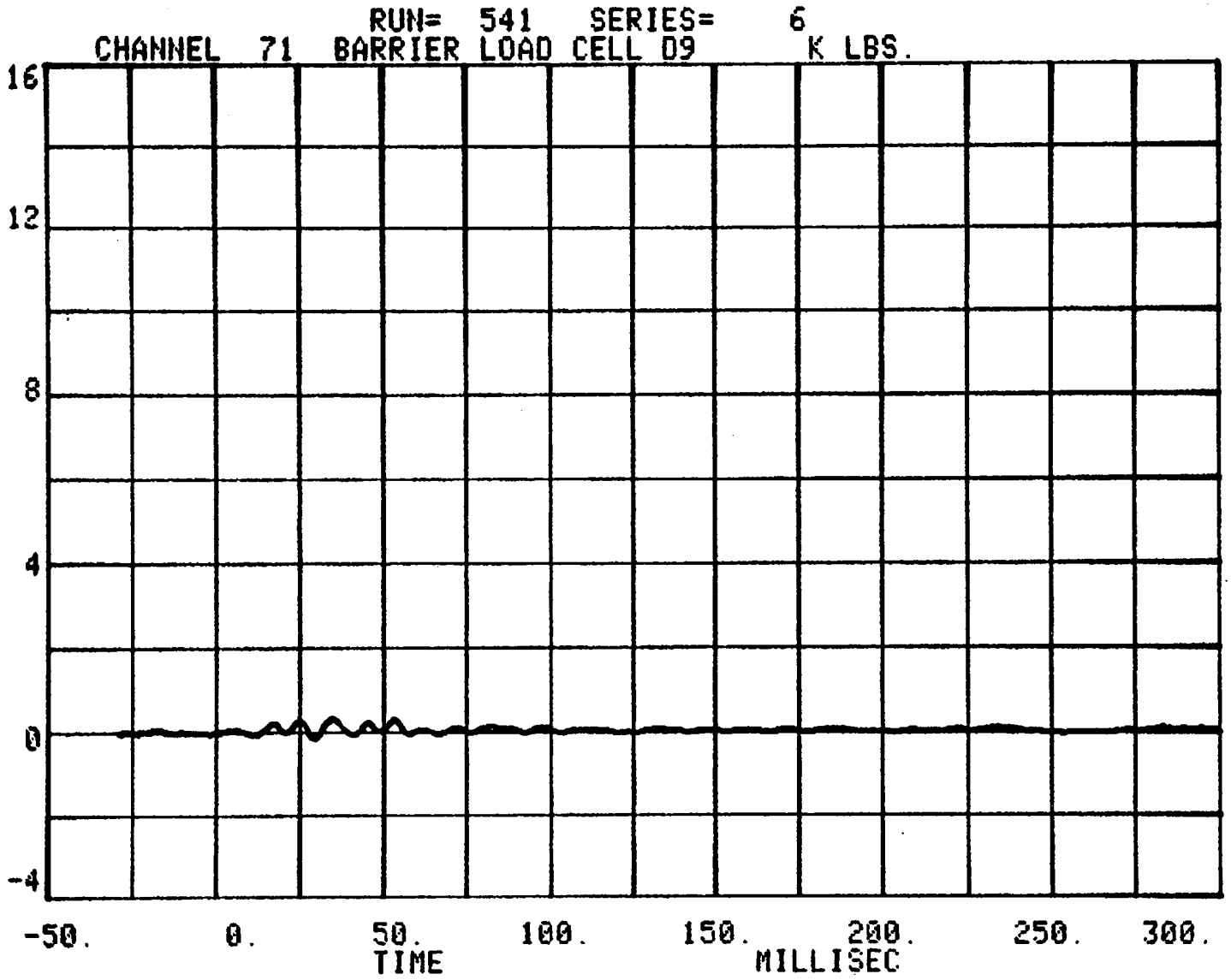

CHANNEL 66 BARRIER LOAD CELL D4
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

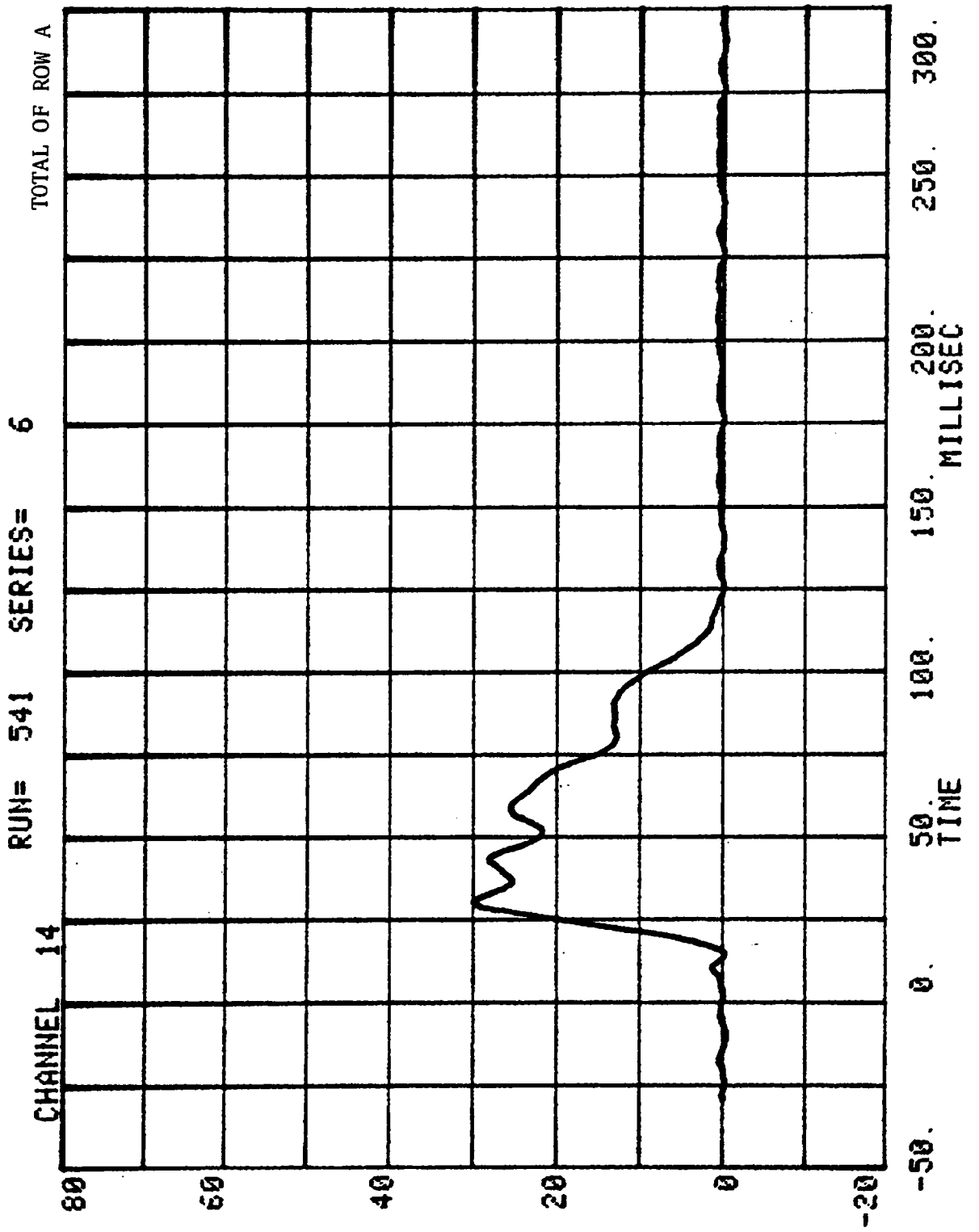

CHANNEL 67
RUN= 541 SERIES= 6
BARRIER LOAD CELL 05
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

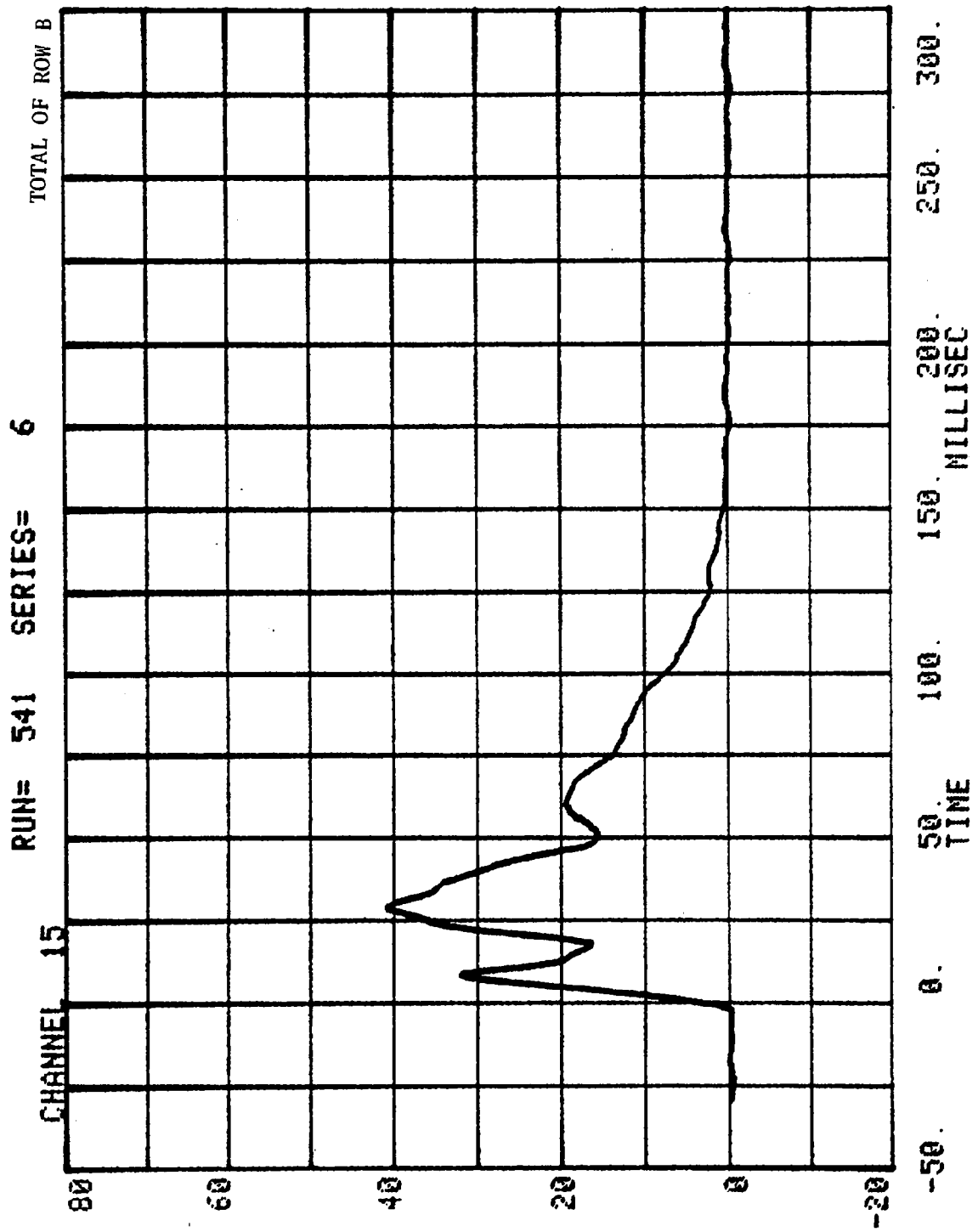

CHANNEL 68 RUN= 541 SERIES= 6
BARRIER LOAD CELL 06 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 69 BARRIER LOAD CELL 07
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

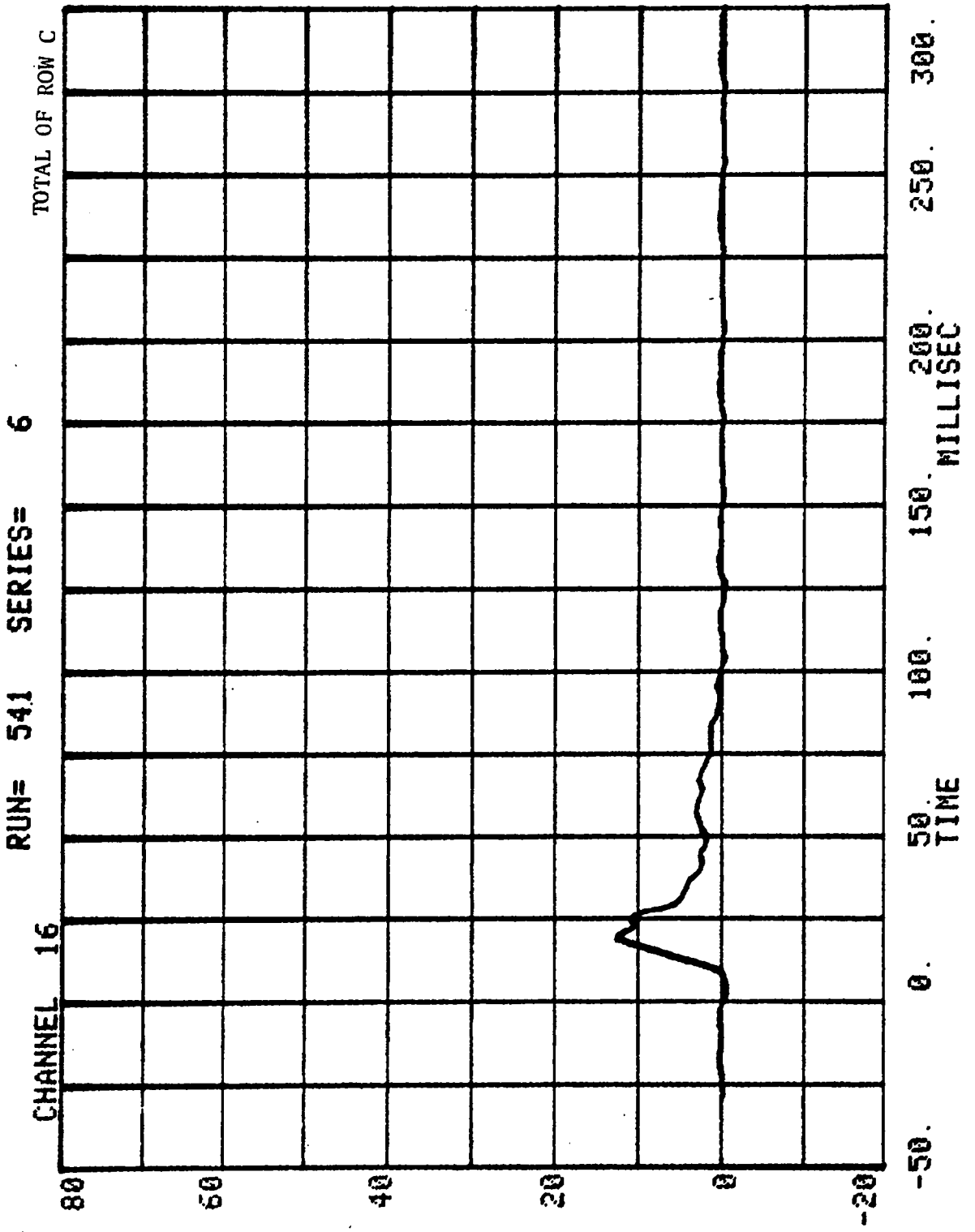

CHANNEL 70 BARRIER LOAD CELL 08
RUN= 541 SERIES= 6
K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

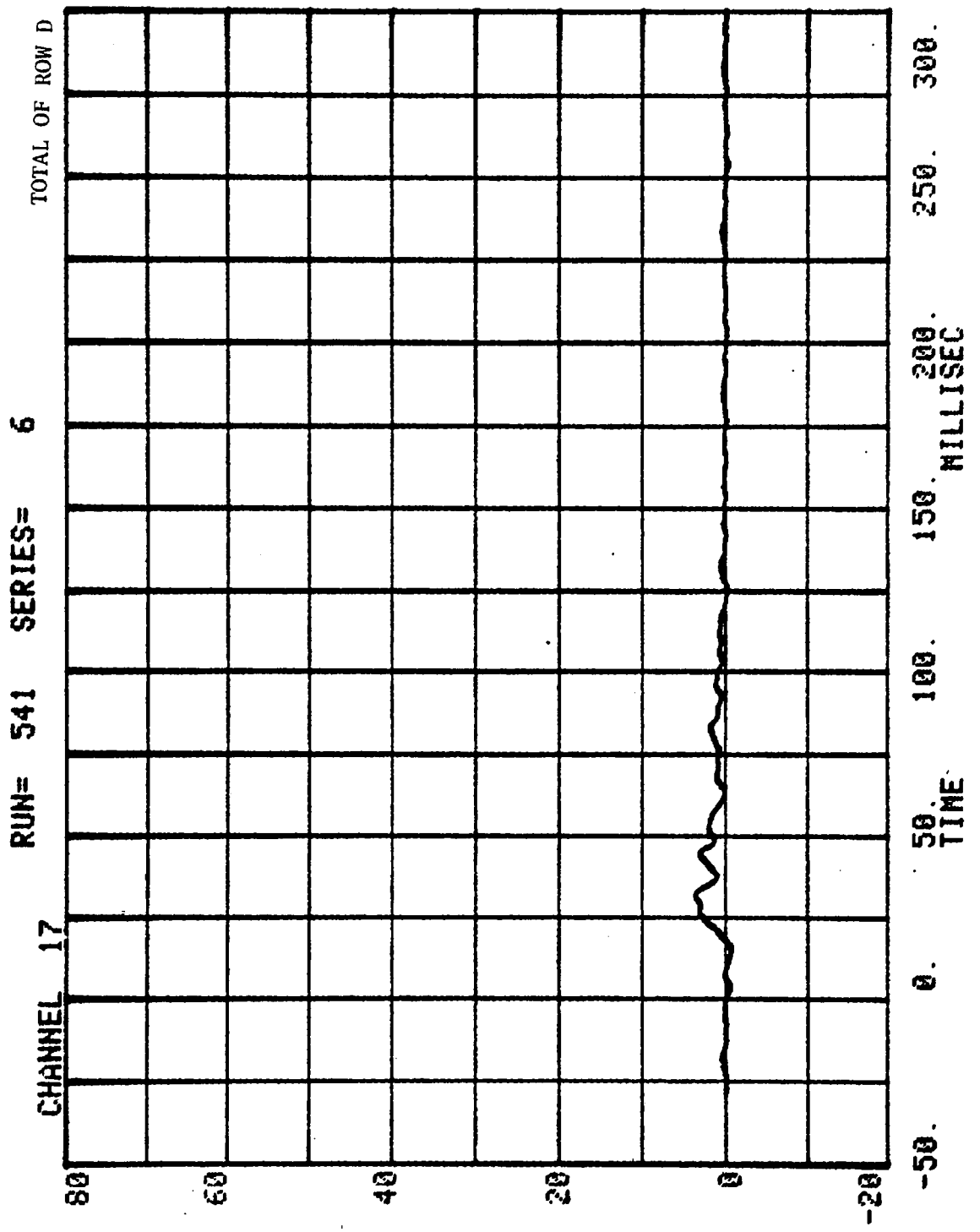

RUN= 541 SERIES= 6
CHANNEL 71 BARRIER LOAD CELL 09 K LBS.
16
12
8
4
0
-4
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

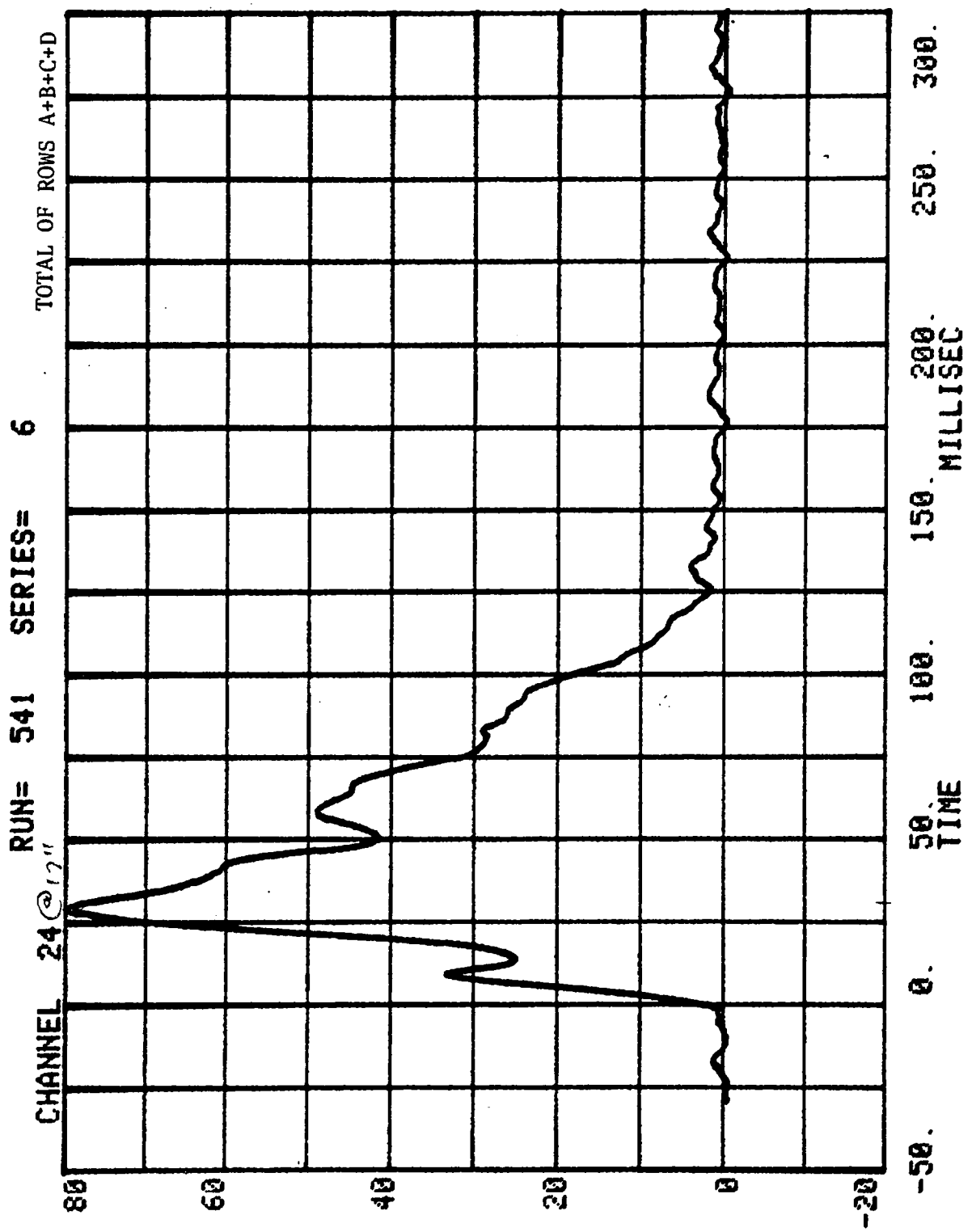

TOTAL OF ROW A
RUN= 541 SERIES= 6
CHANNEL 14
80
60
40
20
0
-20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


TOTAL OF ROW B
RUN= 541 SERIES= 6
CHANNEL 15
80
60
40
20
0
-20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6


TOTAL OF ROW C
RUN= 541 SERIES= 6
CHANNEL 16
80
60
40
20
0
-20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


TOTAL OF ROW D
CHANNEL 17
RUN= 541 SERIES= 6
80
60
40
20
0
-20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 24@12"
RUN= 541 SERIES= 6
TOTAL OF ROWS A+B+C+D
80
60
40
20
0
-20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

Test No. 703-6-541

1982 Saab 900

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NCA TEST #6 - FRONTAL BARRIER

RUN= 541

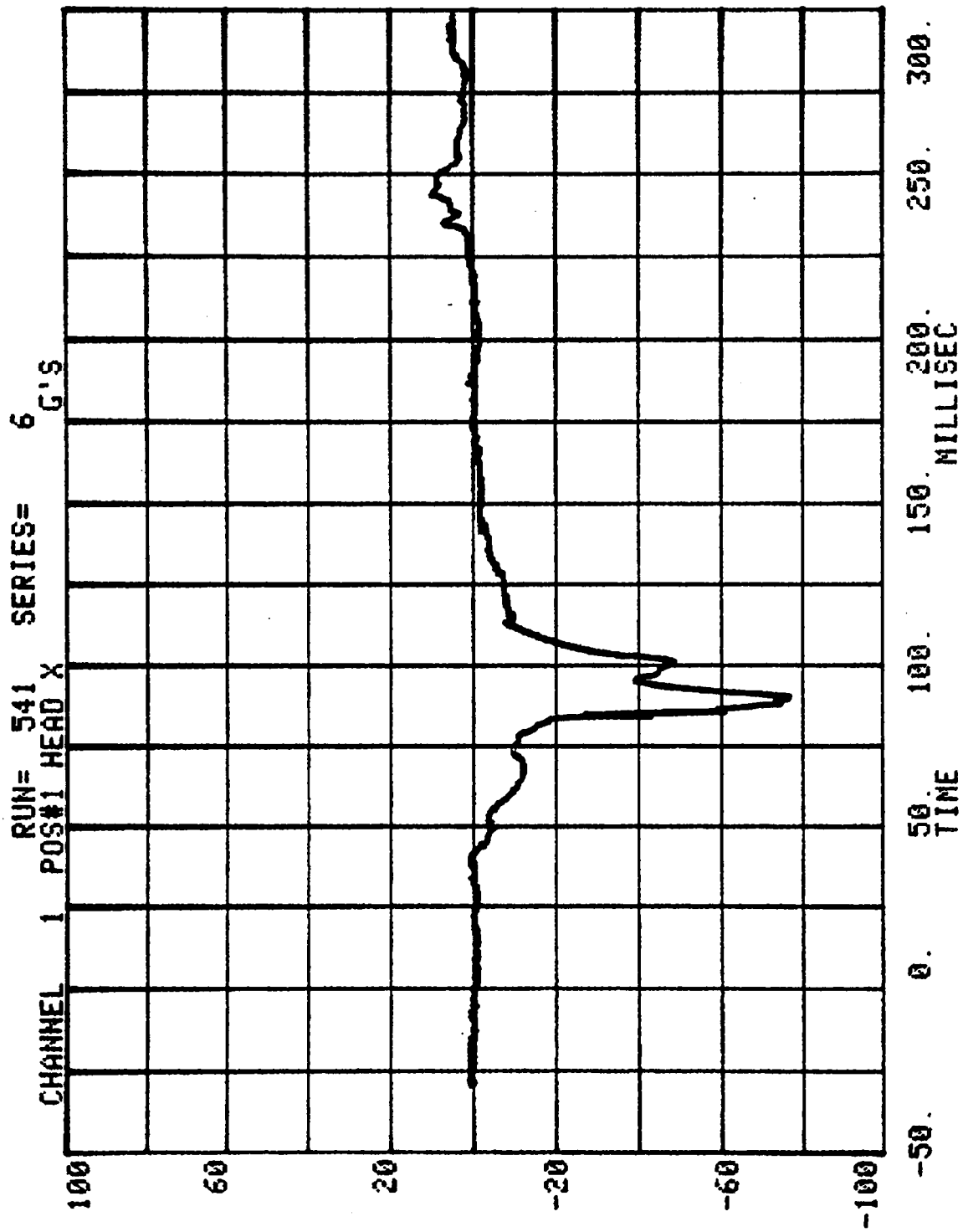
POS#1 HEAD RESULTANT

HIC= 733.4 FROM T1= .07740 TO T2= .10440

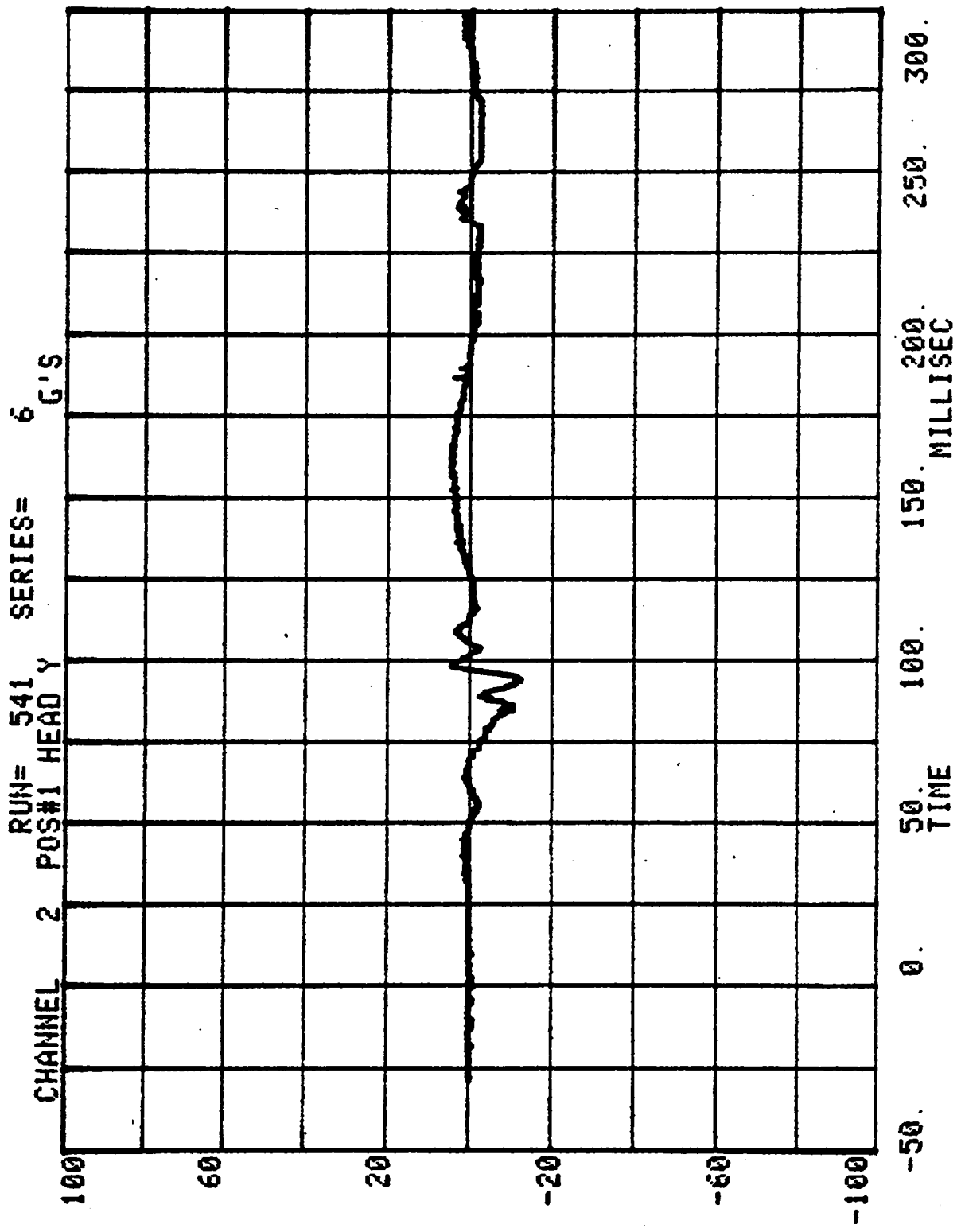
AVERAGE ACCELERATION BETWEEN T1 AND T2= 59.4G'S

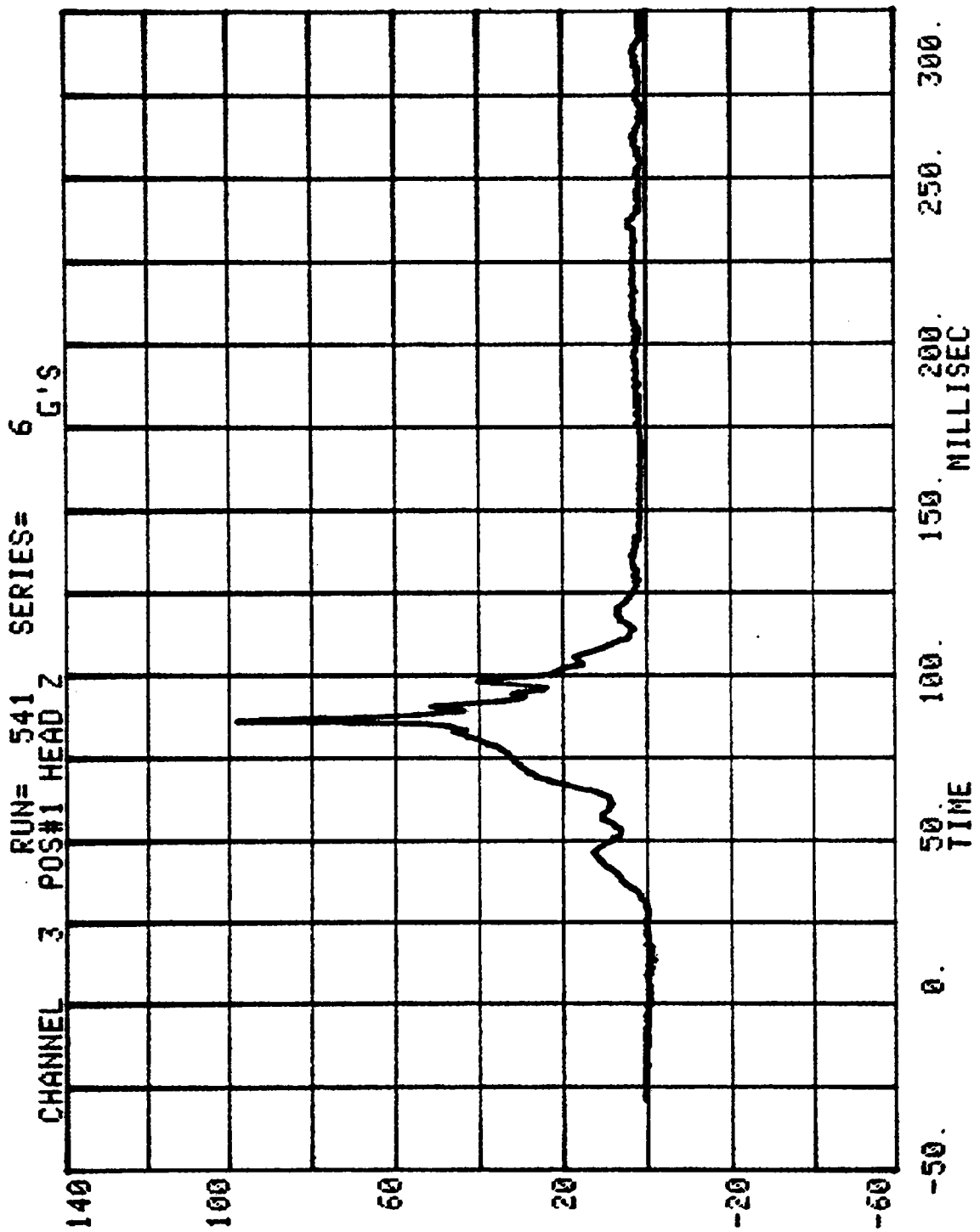
EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 988.3

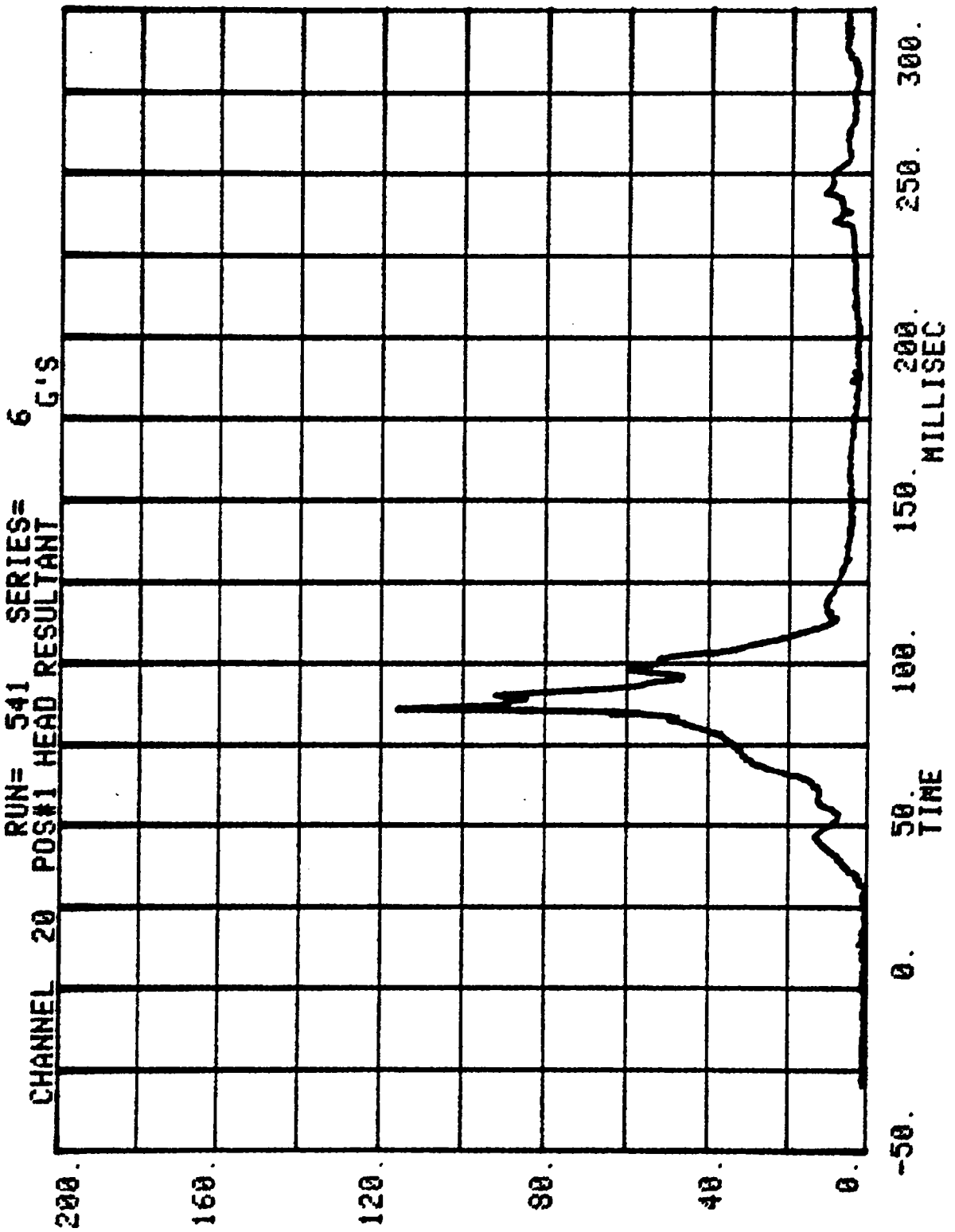

CHANNEL 1 POS#1 HEAD X
RUN= 541 SERIES= 6
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

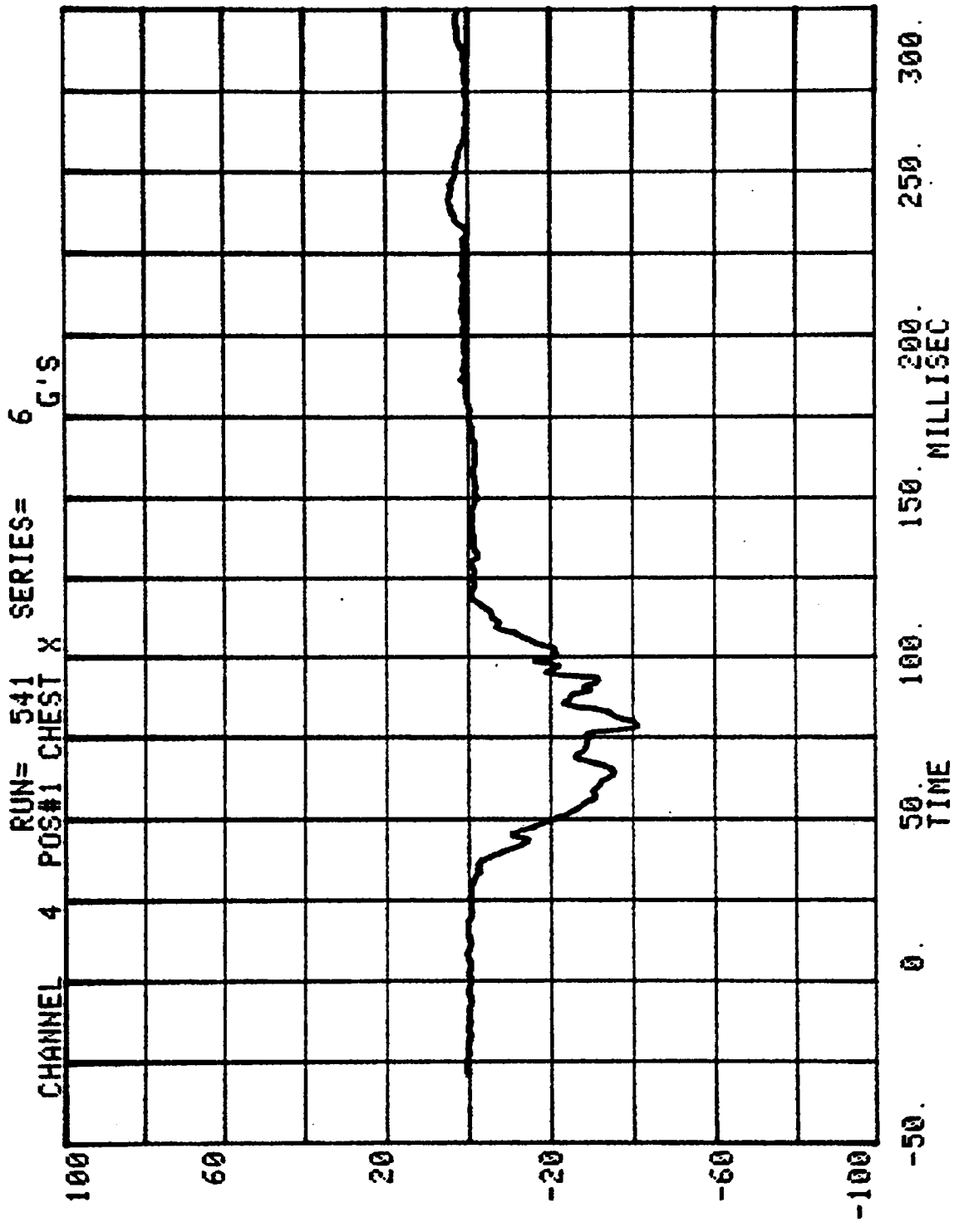
6851-V-6


CHANNEL 2 POS#1 HEAD Y
RUN= 541 SERIES= 6
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
TIME
100.
150.
200.
MILLISEC
250.
300.

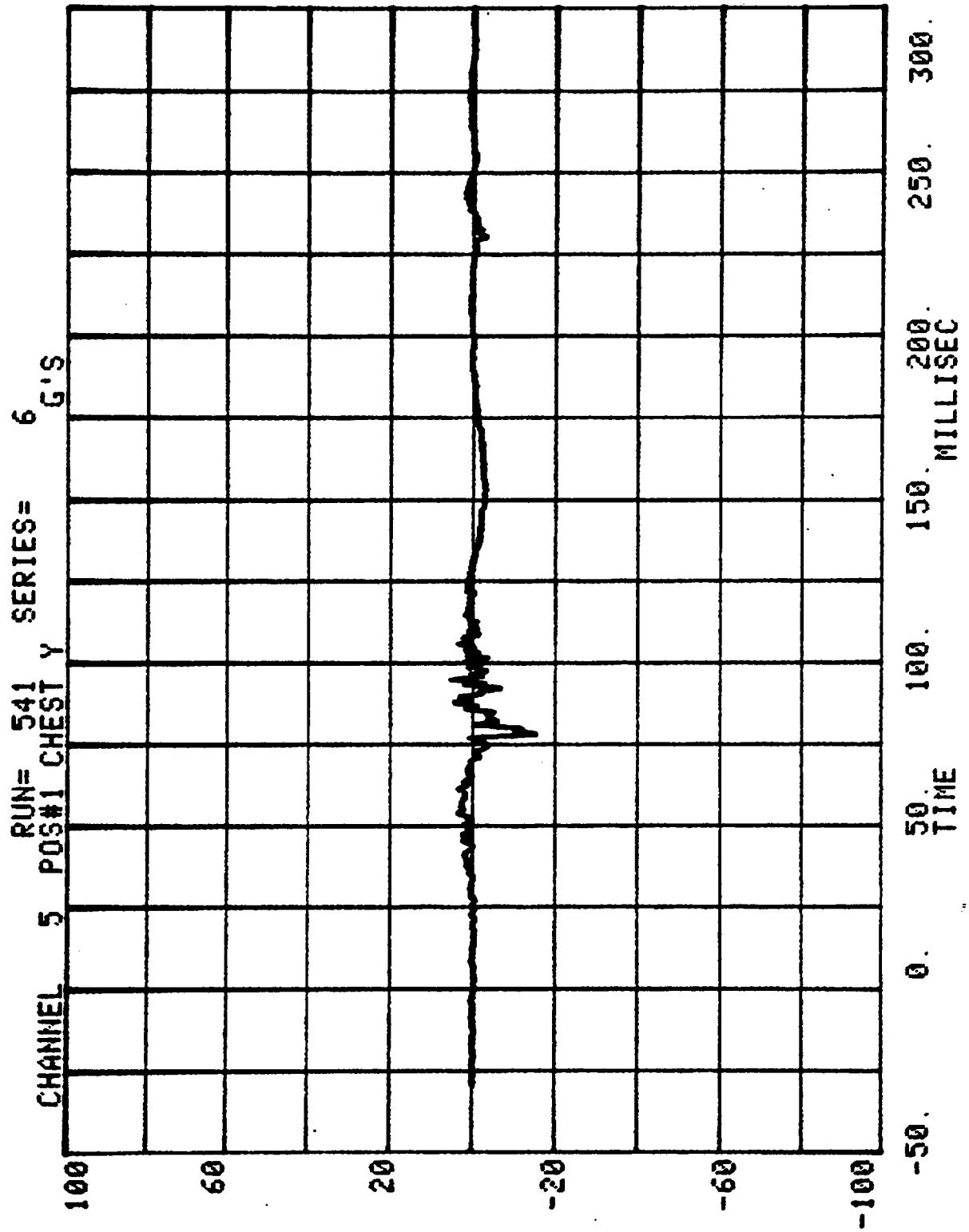

CHANNEL 3 POS#1 HEAD Z
RUN= 541 SERIES= 6
G'S
140
100
60
20
-20
-60
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

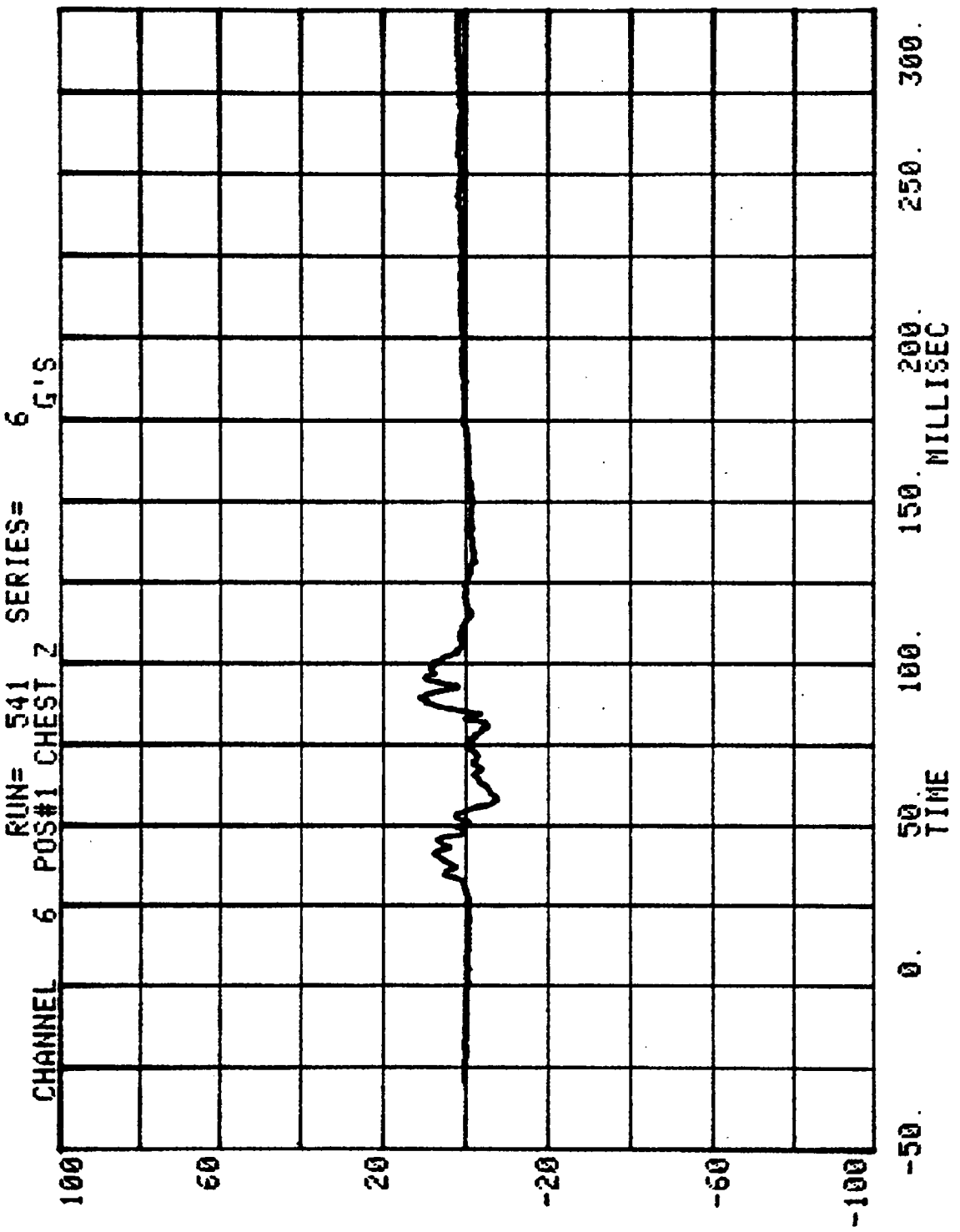
6851-V-6

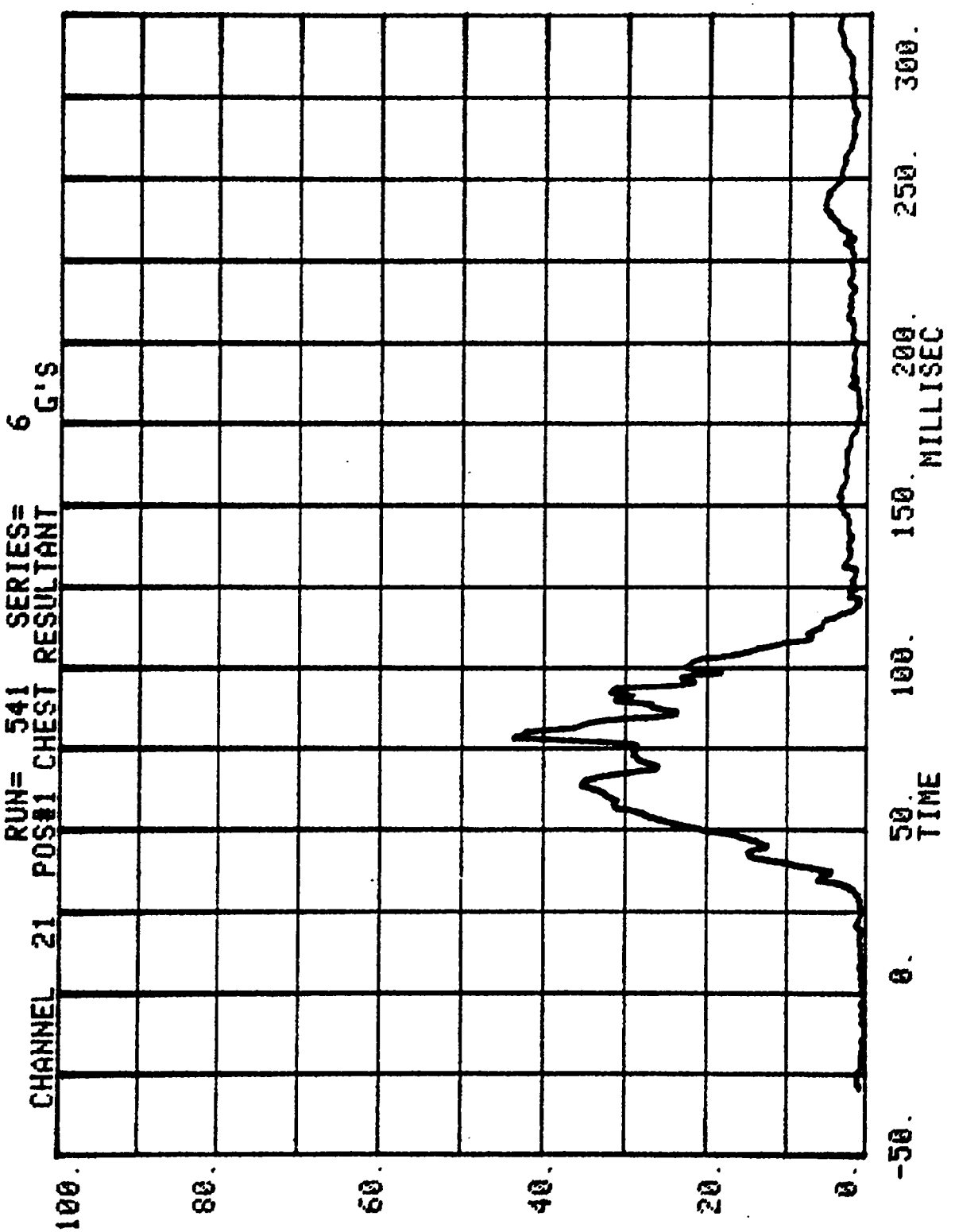

CHANNEL 20 POS#1 HEAD RESULTANT
RUN= 541 SERIES= 6
G'S
200.
160.
120.
80.
40.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 4 RUN= 541 SERIES= 6
POS#1 CHEST X G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

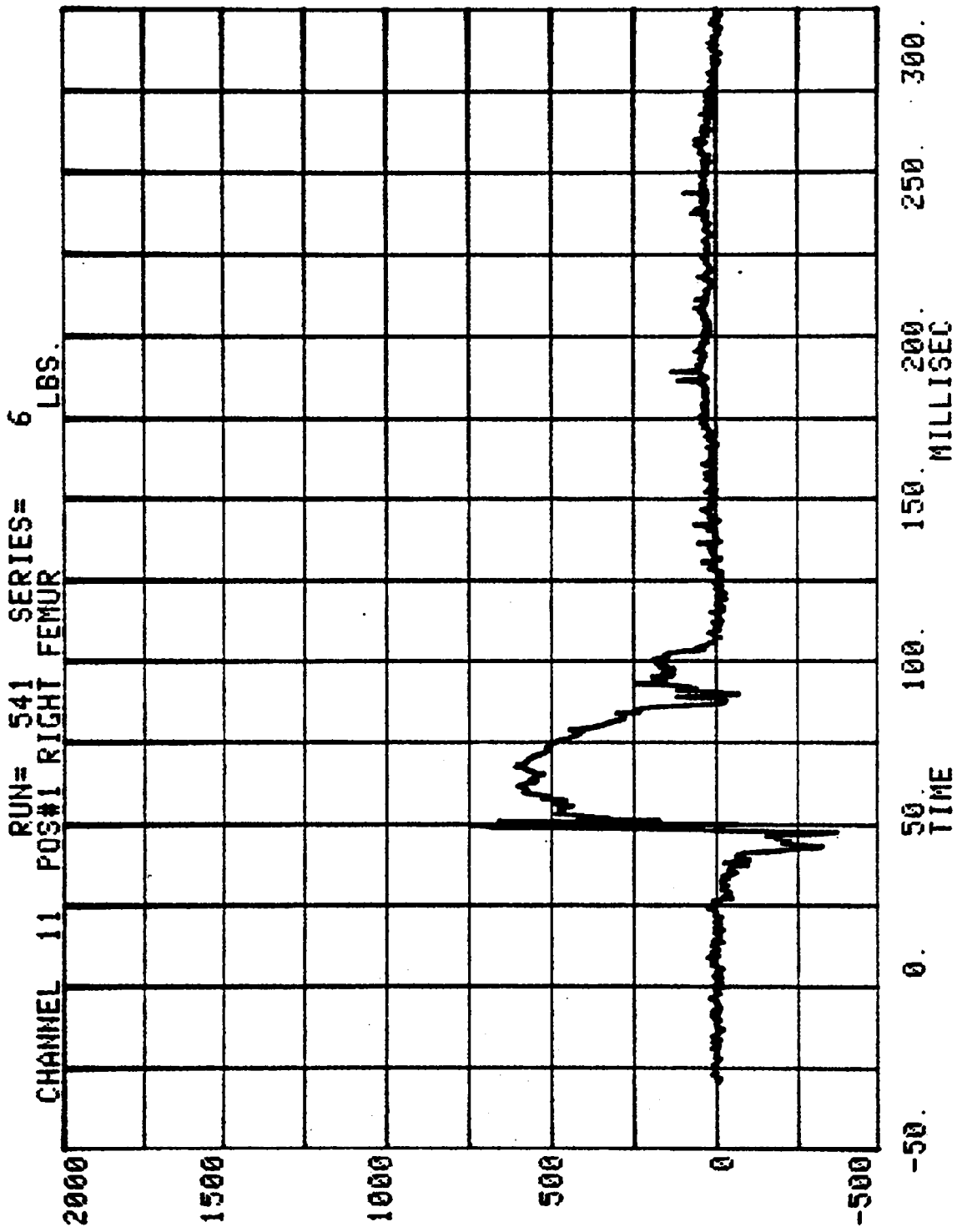
6851-V-6

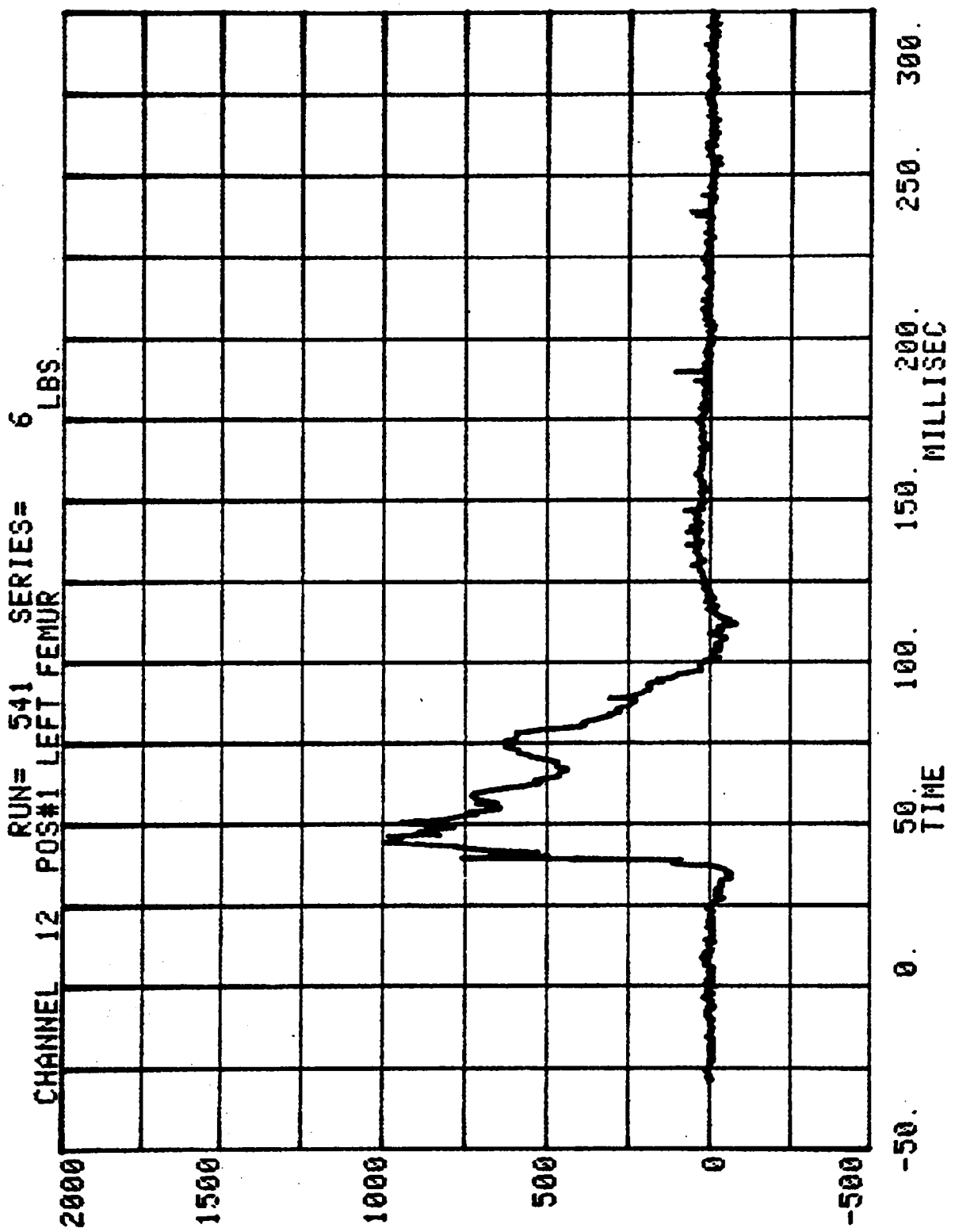

CHANNEL 5 POS#1 CHEST Y
RUN= 541 SERIES= 6
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 6 POS#1 CHEST Z
RUN= 541 SERIES= 6
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

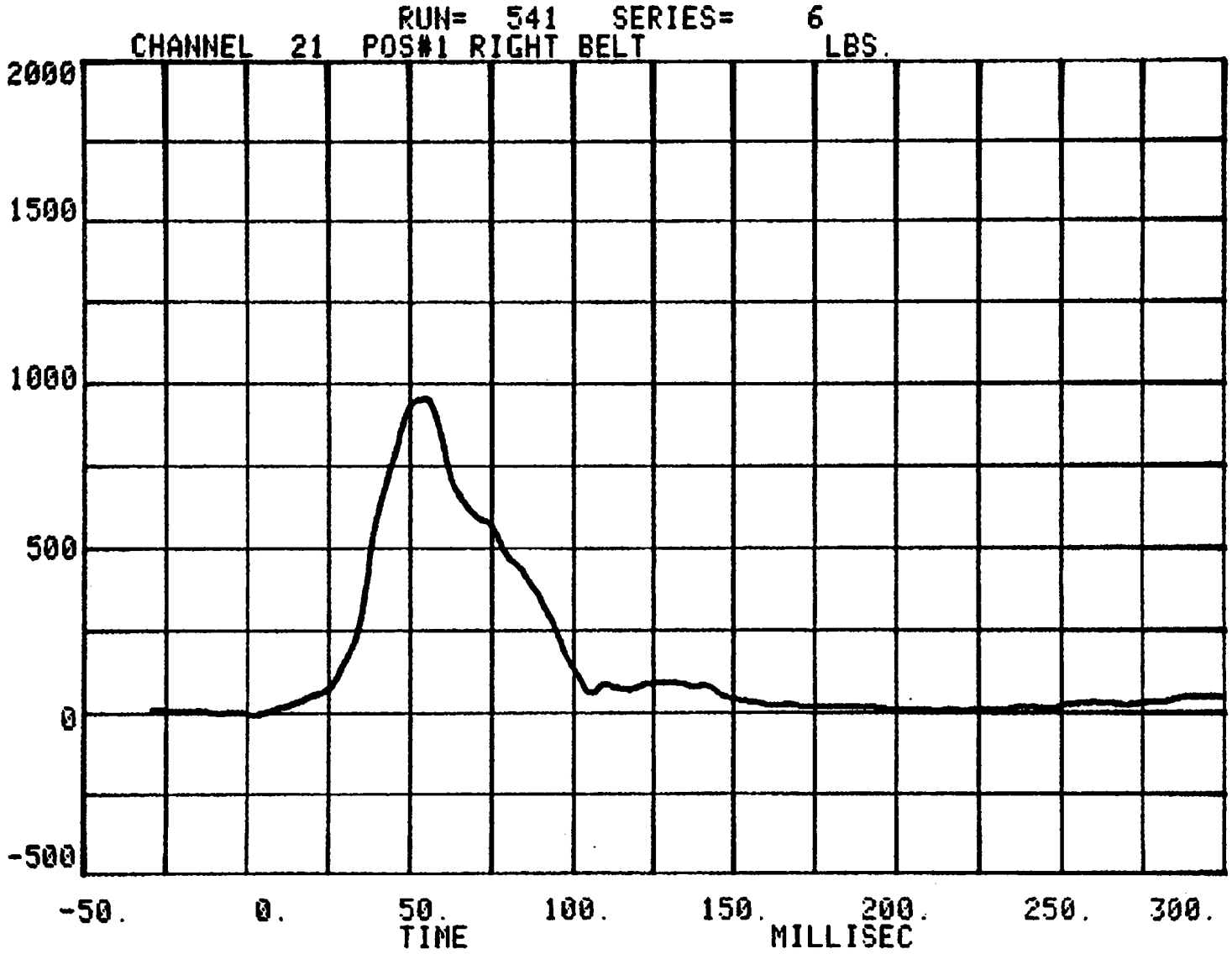

CHANNEL 21 POS#1 CHEST RESULTANT
RUN= 541 SERIES= 6
G'S
100.
80.
60.
40.
20.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6

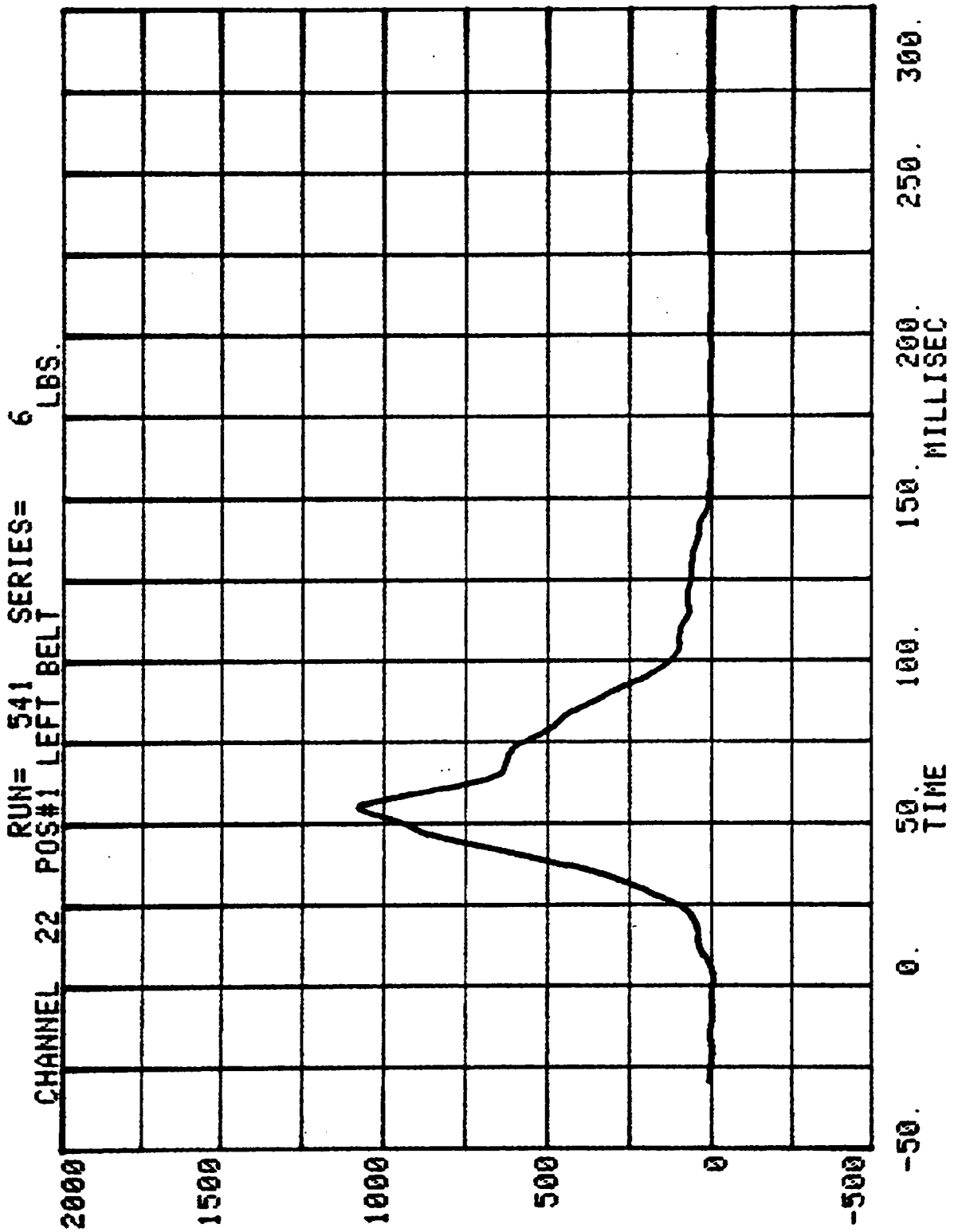

CHANNEL 11 POS#1 RIGHT FEMUR
RUN= 541 SERIES= 6
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

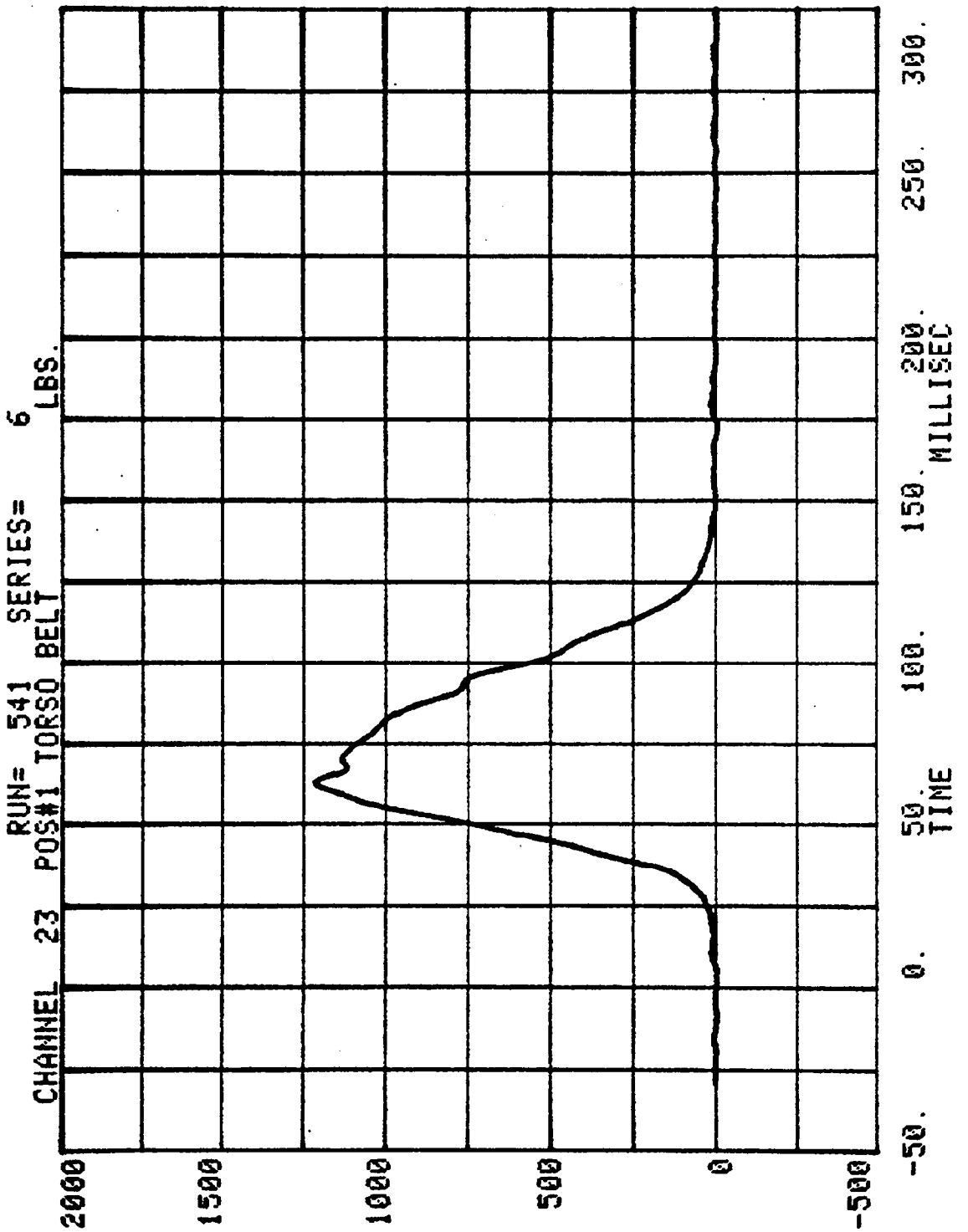

CHANNEL 12 POS#1 LEFT FEMUR
RUN= 541 SERIES= 6
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

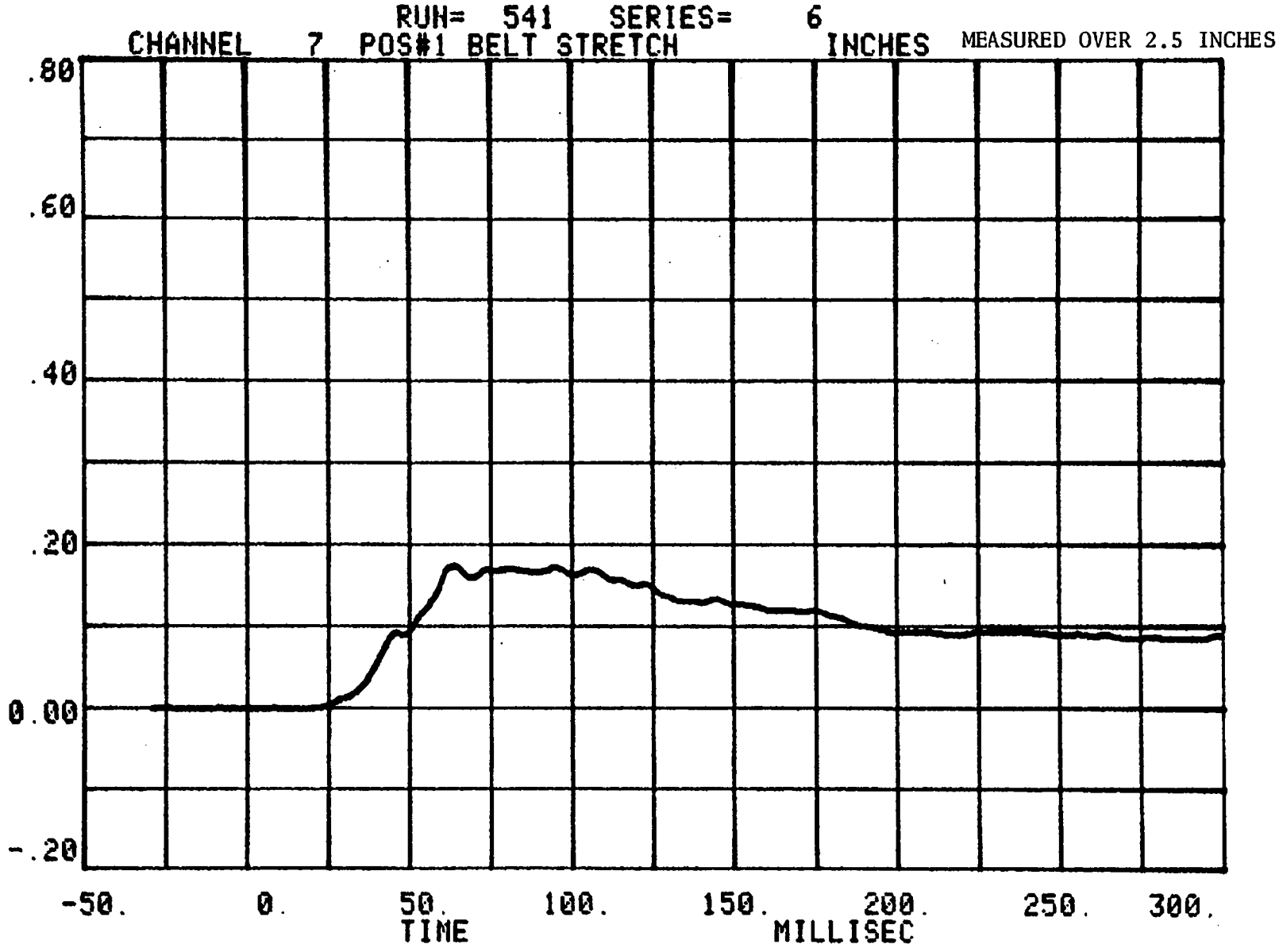
6851-V-6

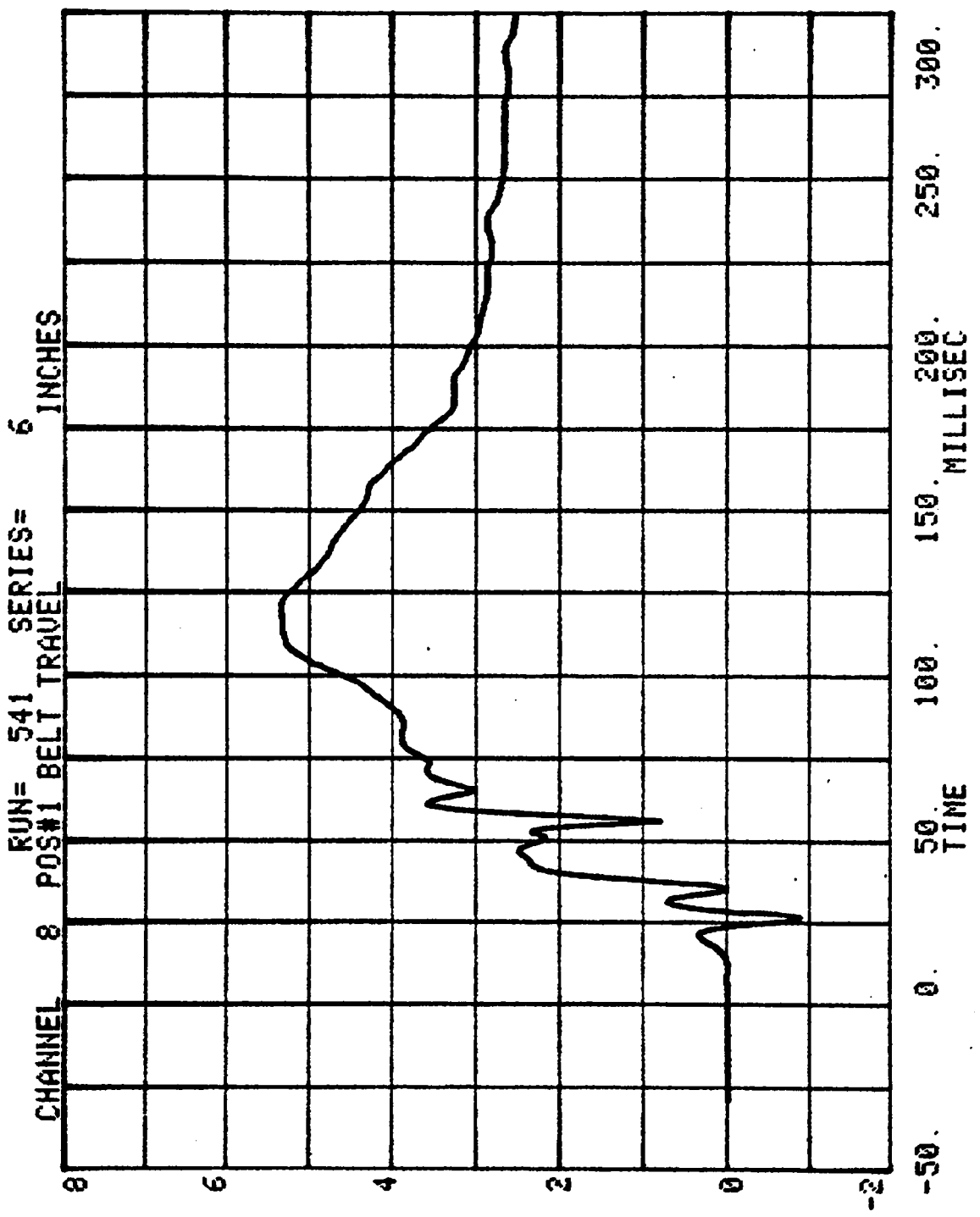

RUN= 541 SERIES= 6
CHANNEL 21 POS#1 RIGHT BELT LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6


CHANNEL 22 POS#1 LEFT BELT
RUN= 541 SERIES= 6
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 23 POS#1 TORSO BELT
RUN= 541 SERIES= 6
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 541 SERIES= 6
CHANNEL 7 POS#1 BELT STRETCH INCHES
MEASURED OVER 2.5 INCHES
.80
.60
.40
.20
0.00
-.20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 8 POS#1 BELT TRAVEL
RUN= 541 SERIES= 6
INCHES
8
6
4
2
0
-2
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NCA TEST #6 - FRONTAL BARRIER

RUN= 541

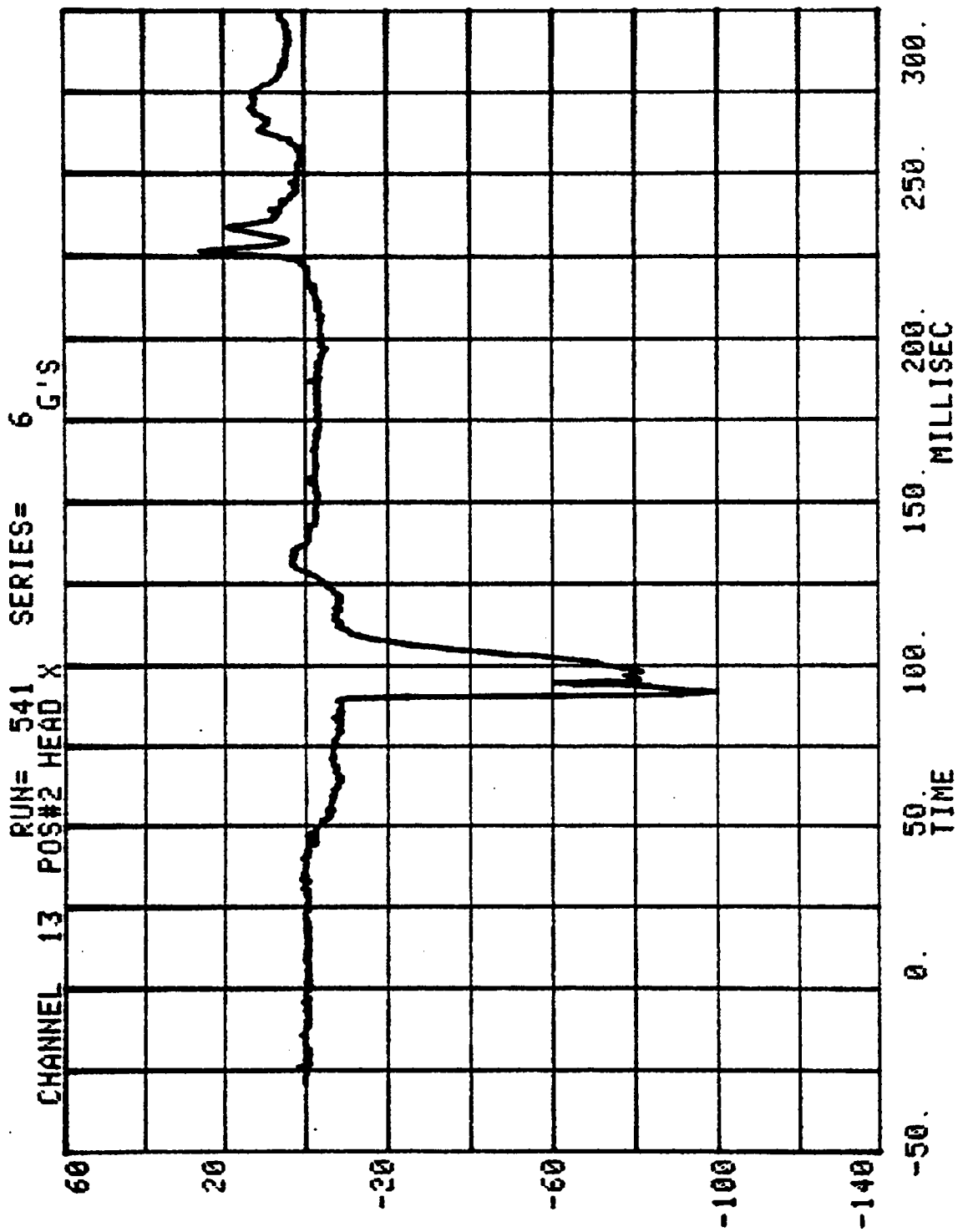
POS#2 HEAD RESULTANT

HIC=1164.5 FROM T1= .09030 TO T2= .10350

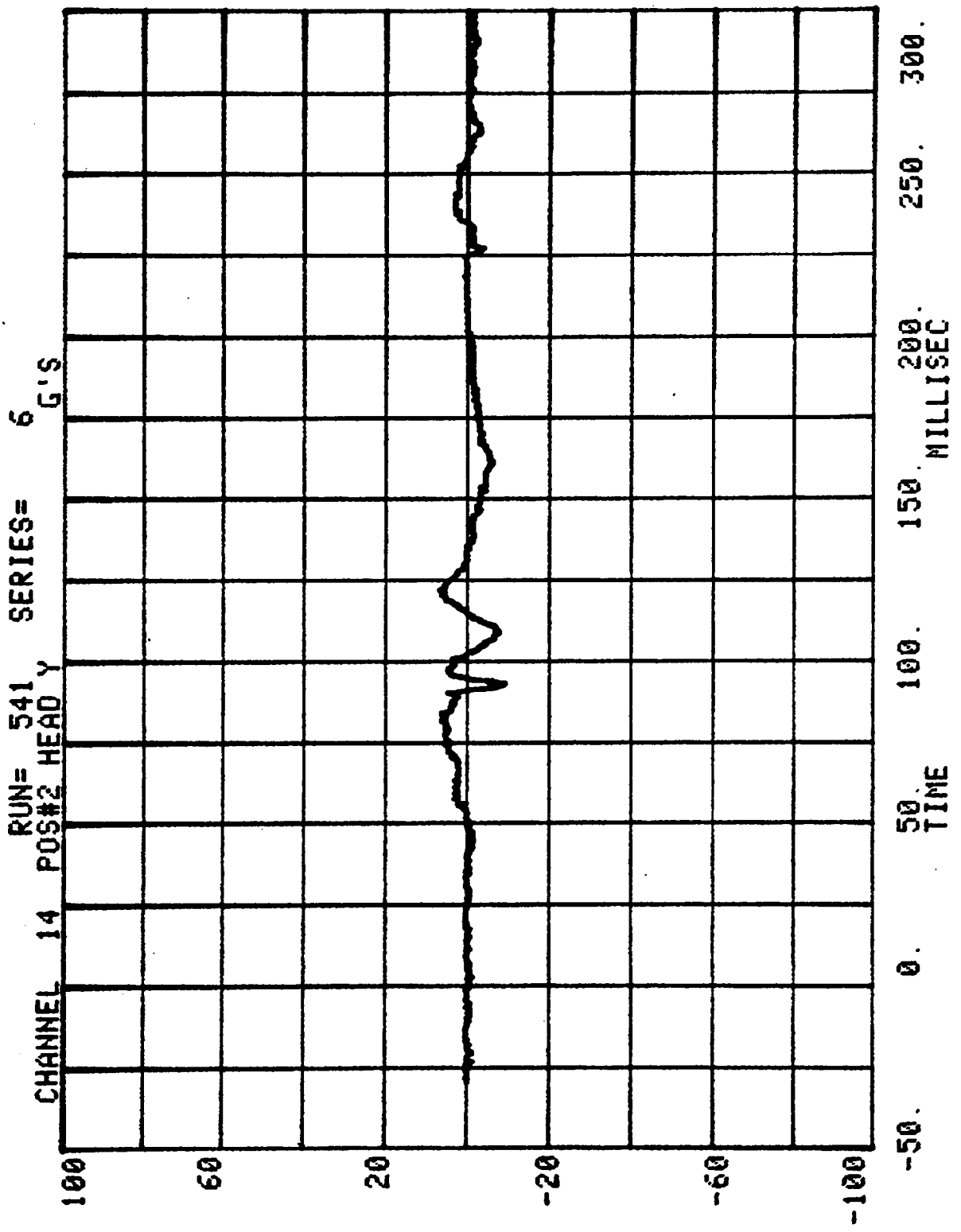
AVERAGE ACCELERATION BETWEEN T1 AND T2= 95.1G'S

EVENT TIME= 300.0 MSEC

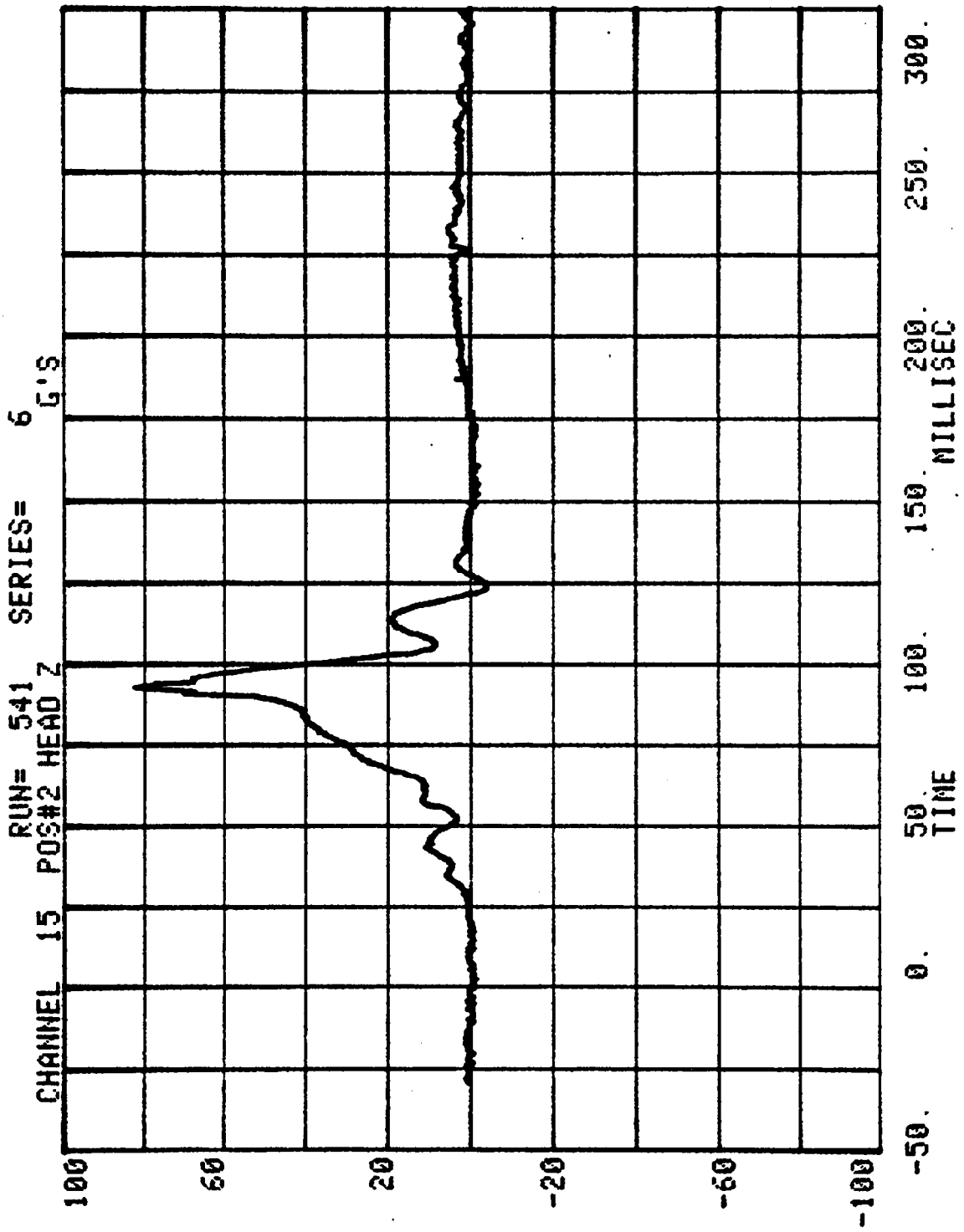
SEVERITY INDEX=1546.4


CHANNEL 13 POS#2 HEAD X
RUN= 541 SERIES= 6
G'S
60
20
-20
-60
-100
-140
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

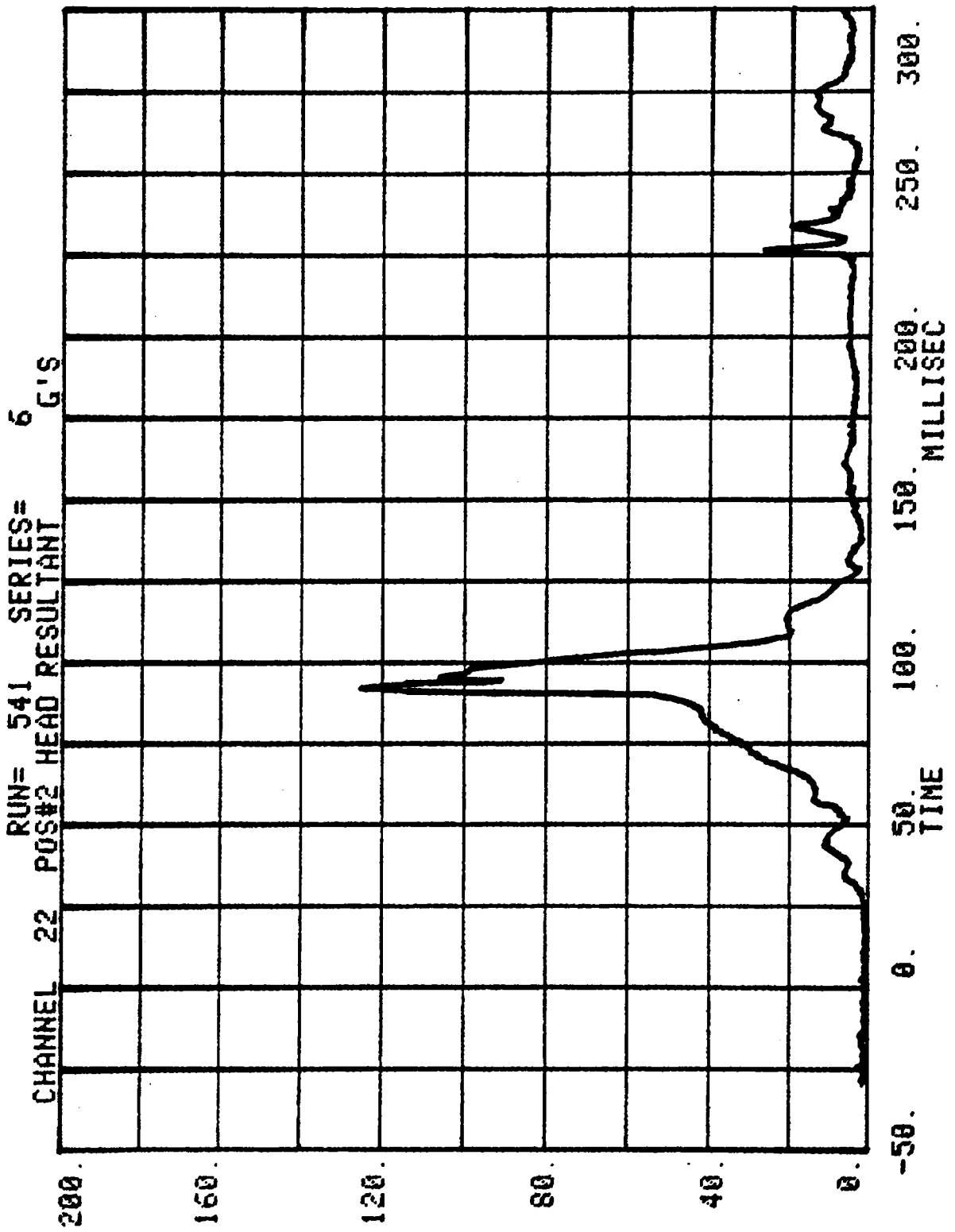
6851-V-6

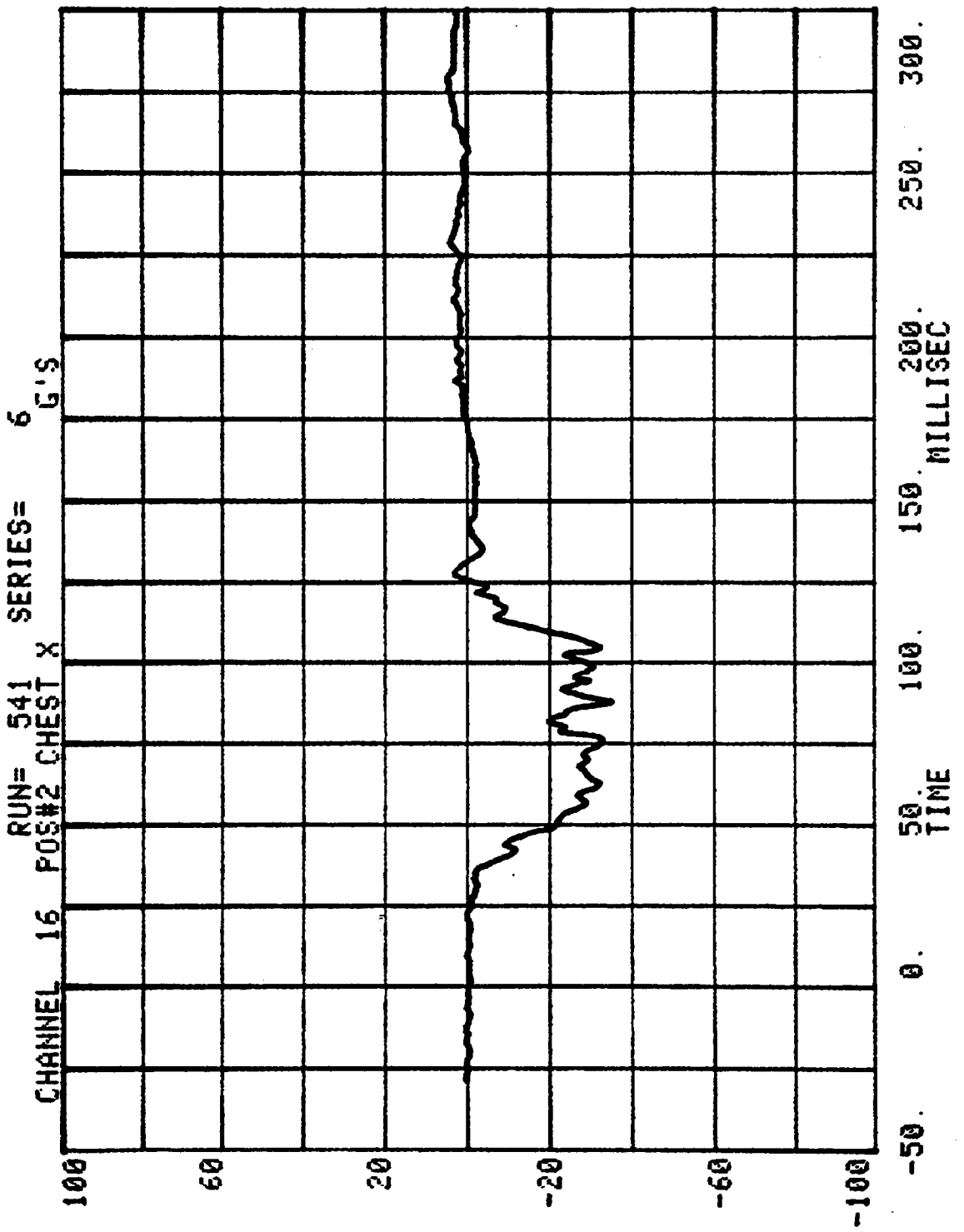

CHANNEL 14 POS#2 HEAD Y
RUN= 541 SERIES= 6
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6

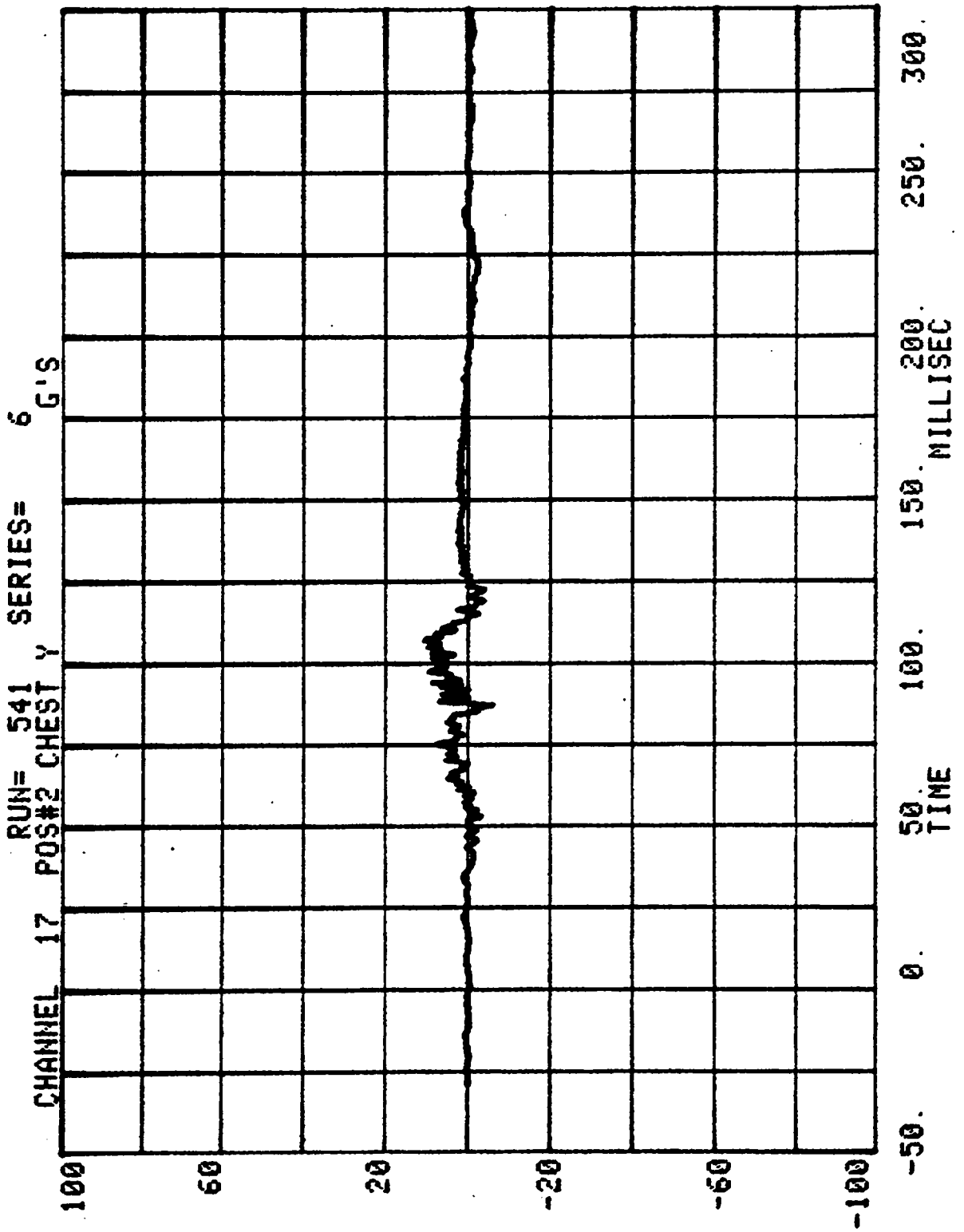

CHANNEL 15 POS#2 HEAD 2
RUN= 541 SERIES= 6
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

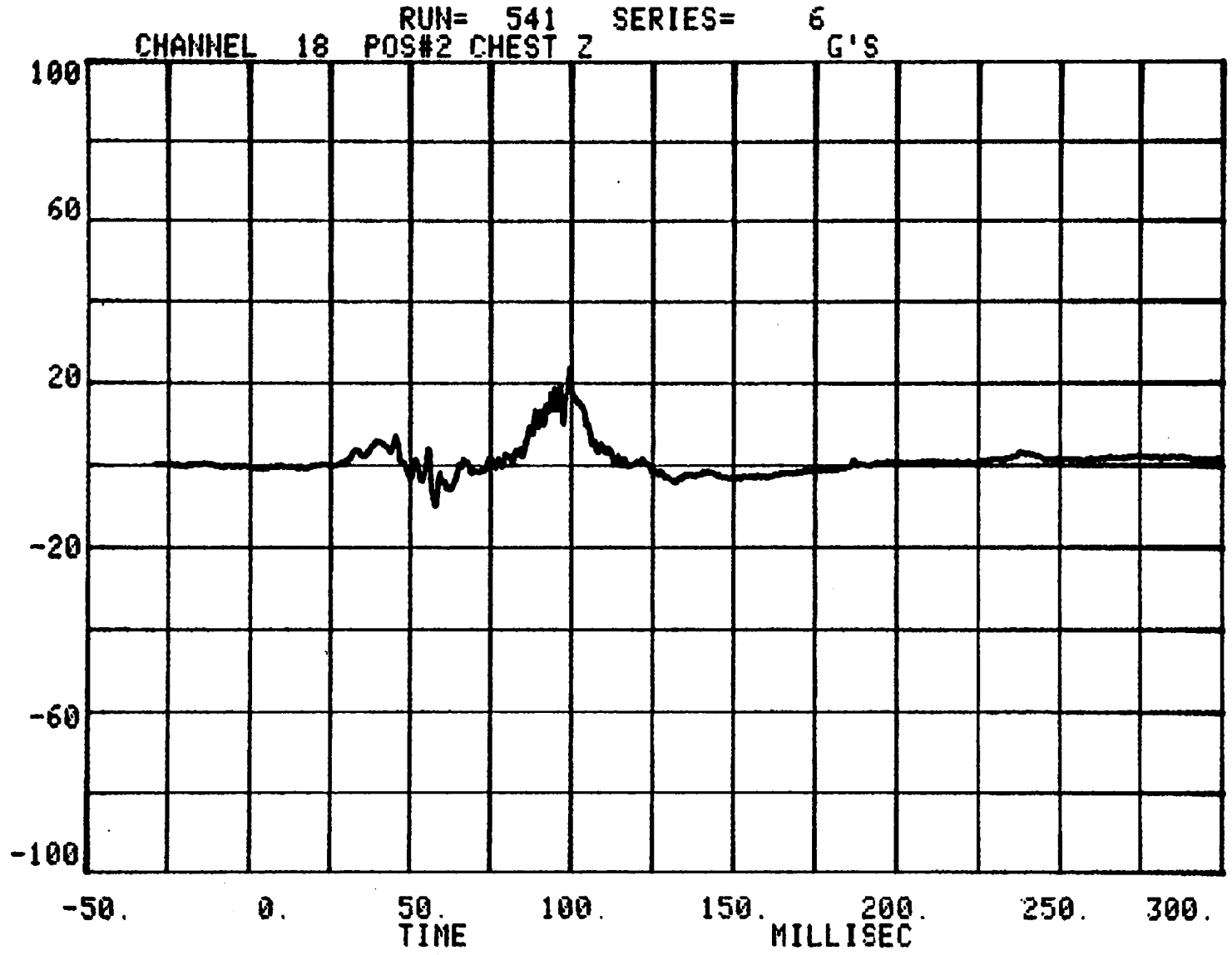
6851-V-6

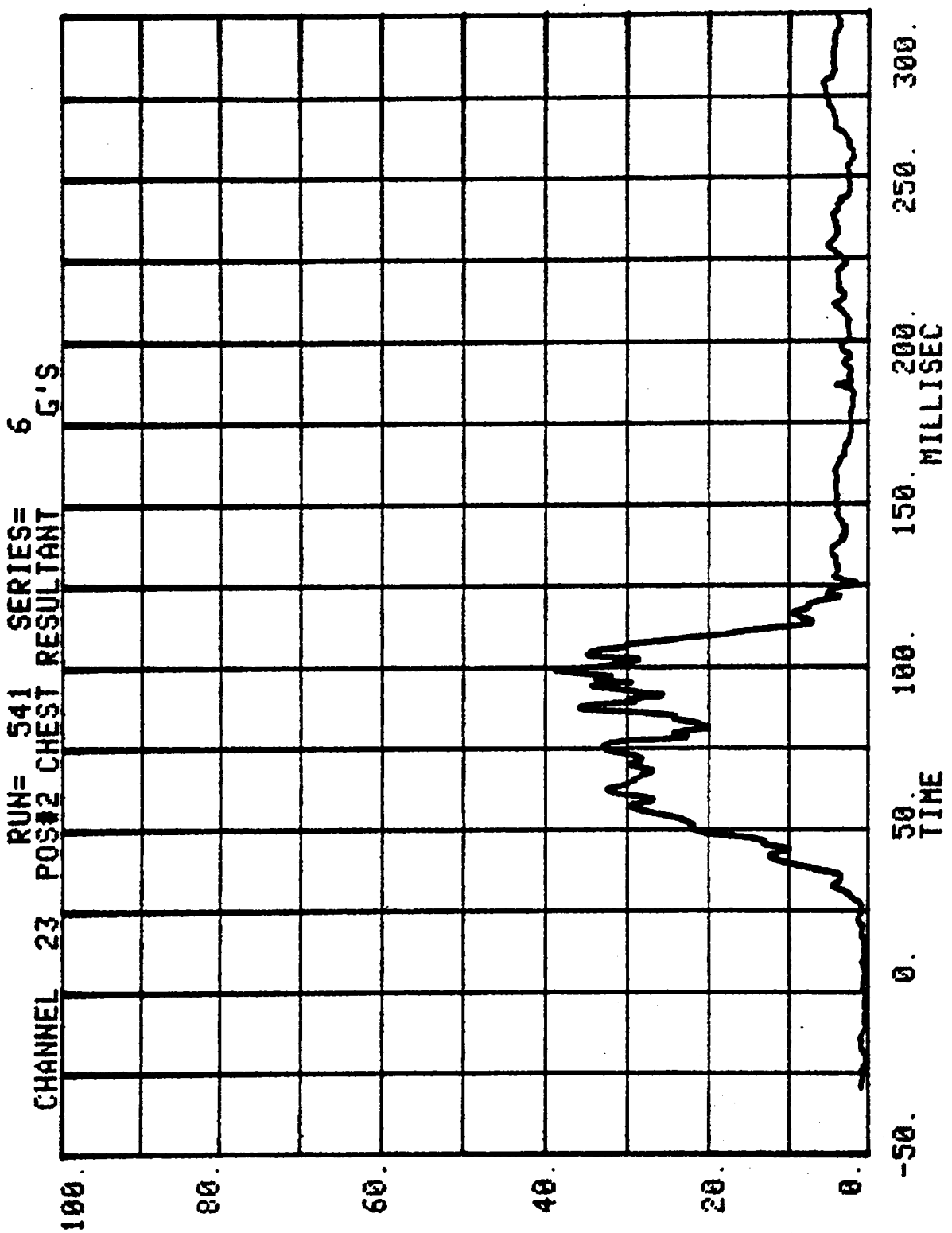

CHANNEL 22 POS#2 HEAD RESULTANT
RUN= 541 SERIES= 6
G'S
200.
160.
120.
80.
40.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 16 POS#2 CHEST X
RUN= 541 SERIES= 6
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

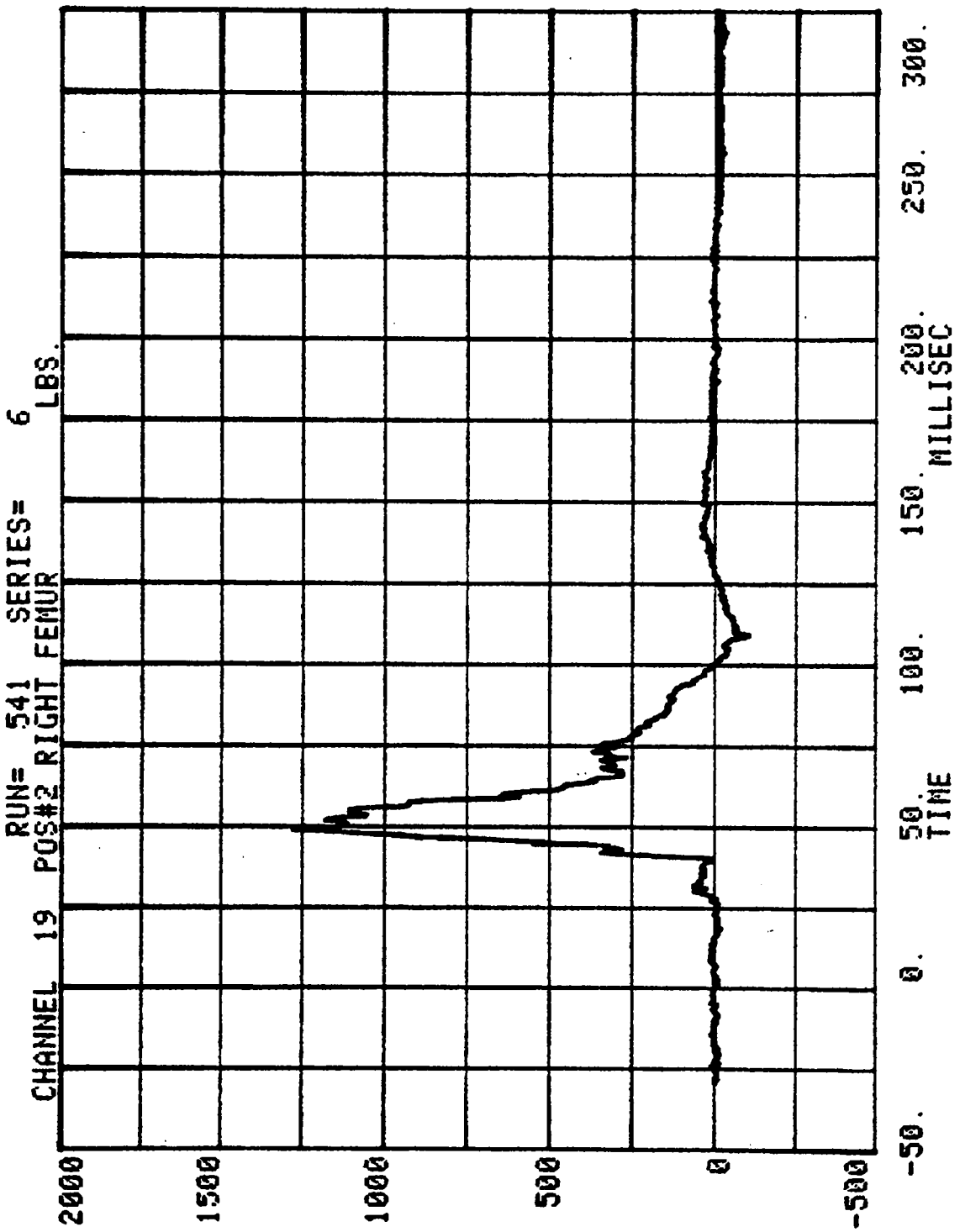
6851-V-6

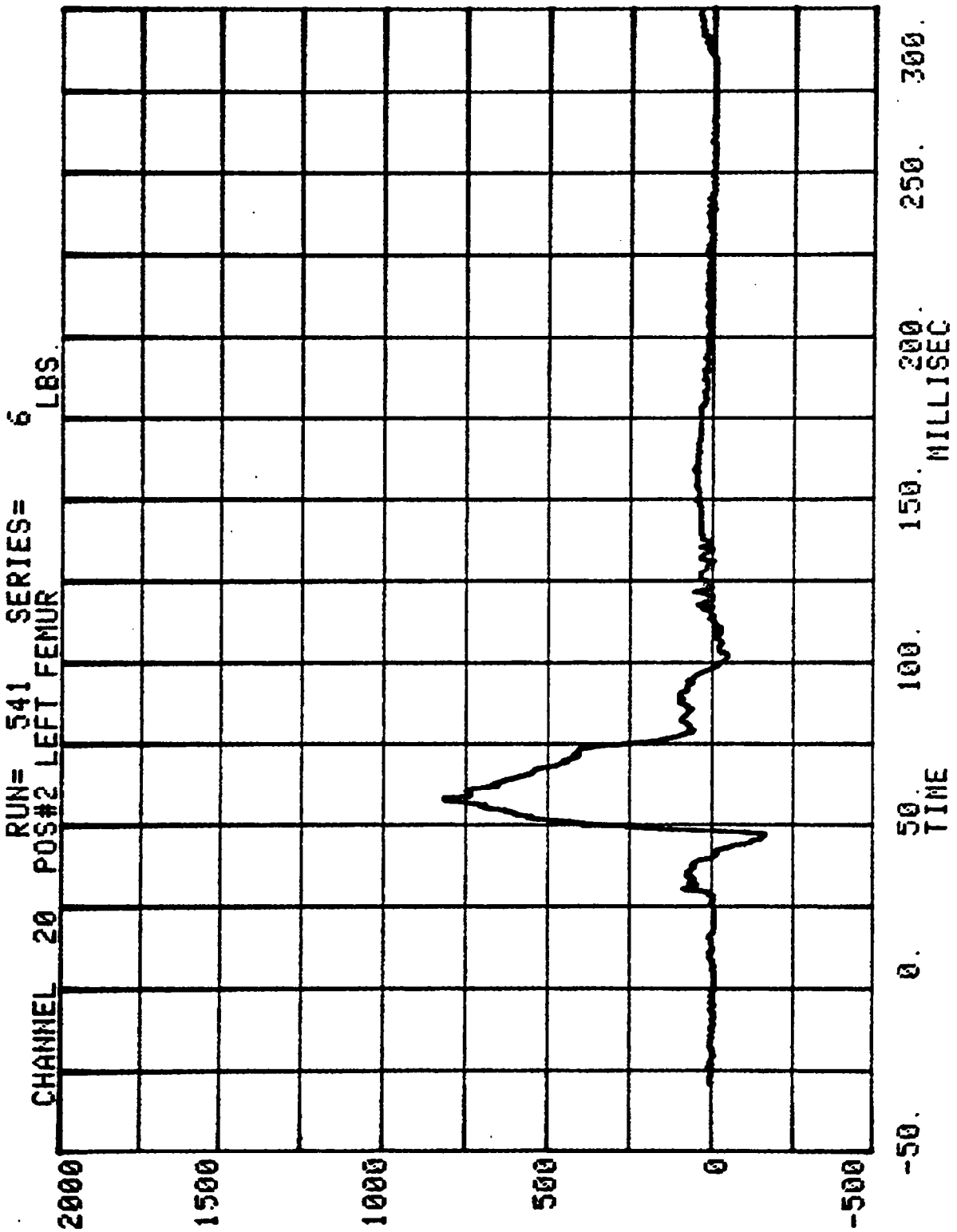

CHANNEL 17 POS#2 CHEST Y
RUN= 541 SERIES= 6
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

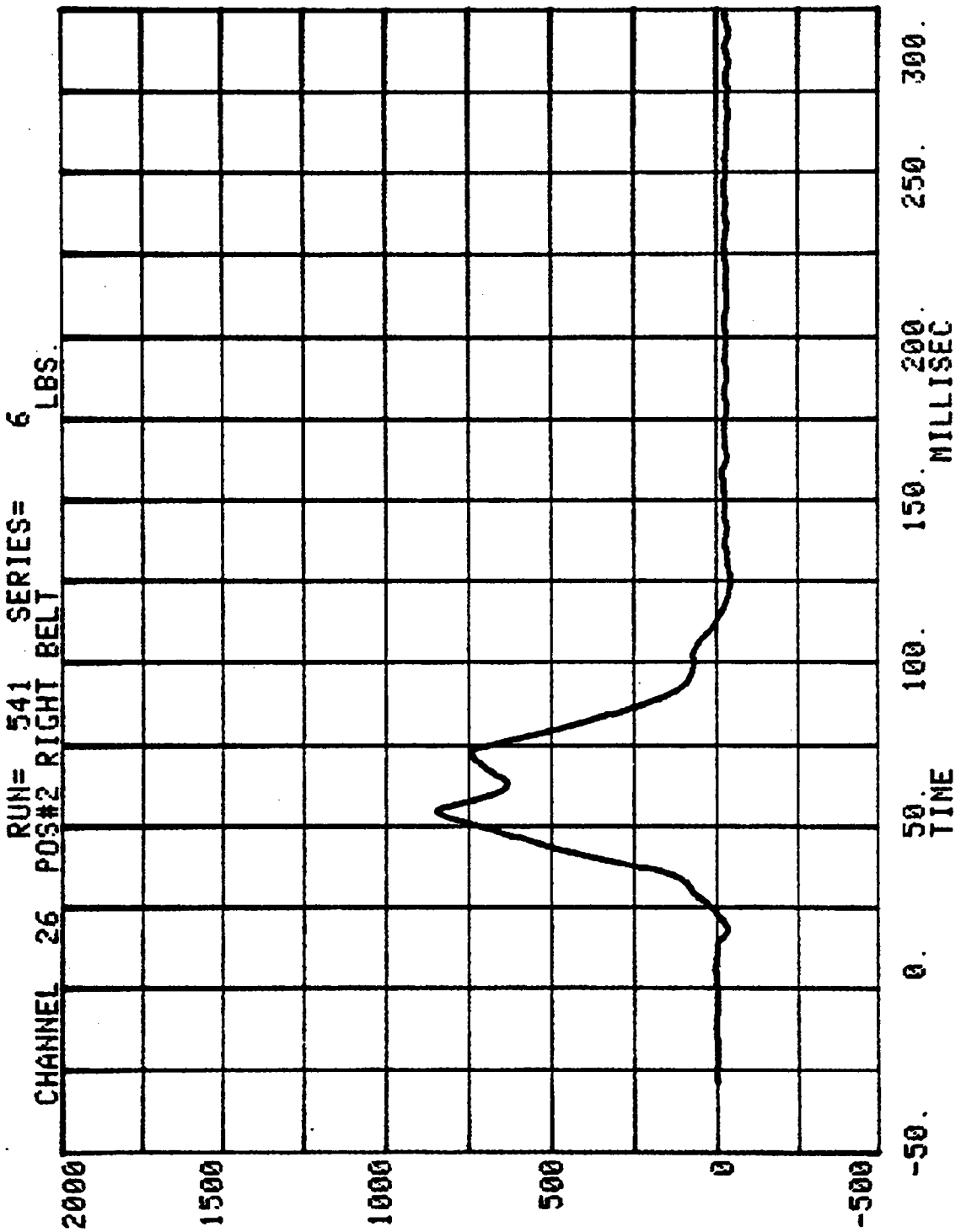

RUN= 541 SERIES= 6
CHANNEL 18 POS#2 CHEST Z G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME MILLISEC

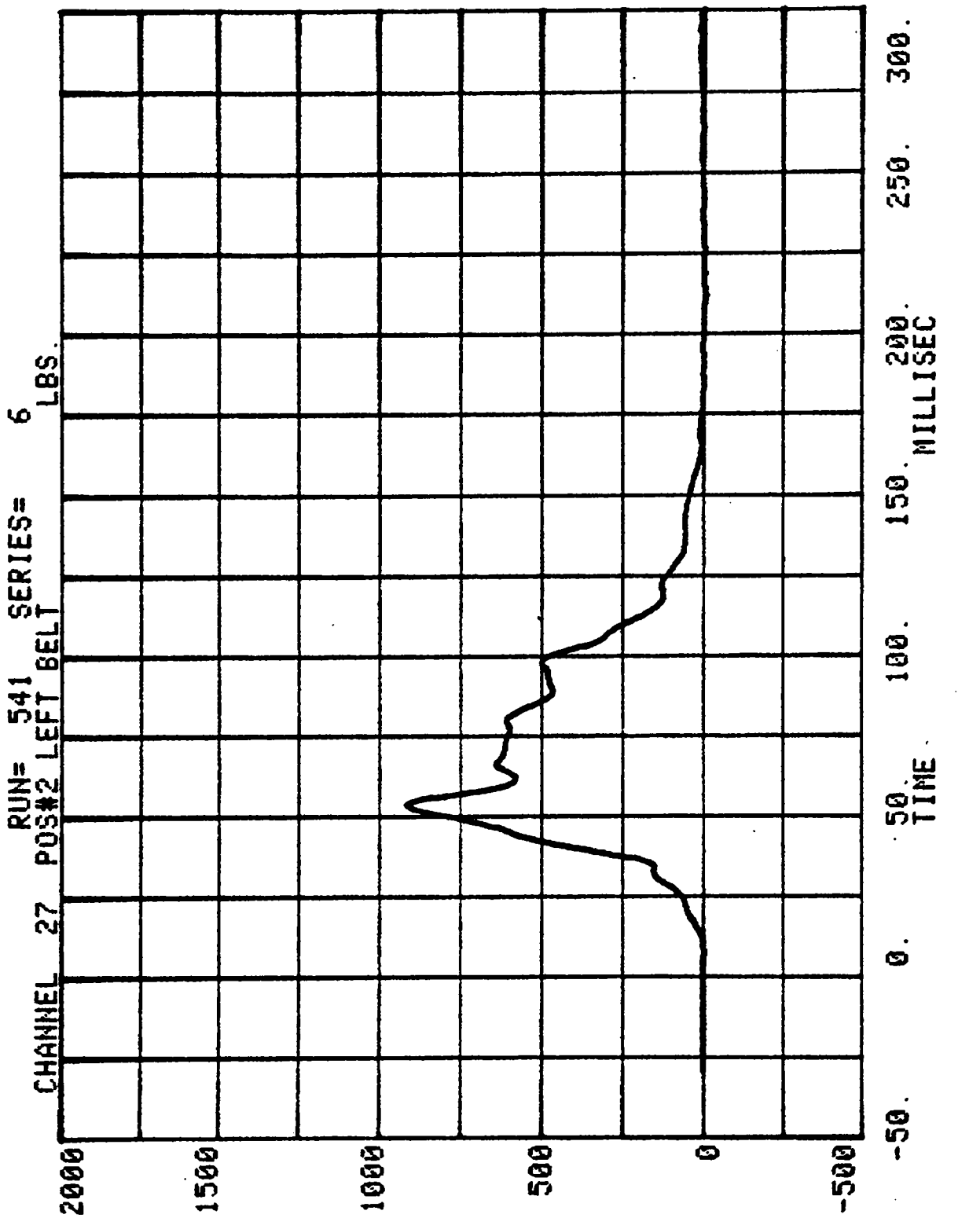

CHANNEL 23 RUN= 541 SERIES= 6
POS#2 CHEST RESULTANT G'S
100.
80.
60.
40.
20.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6

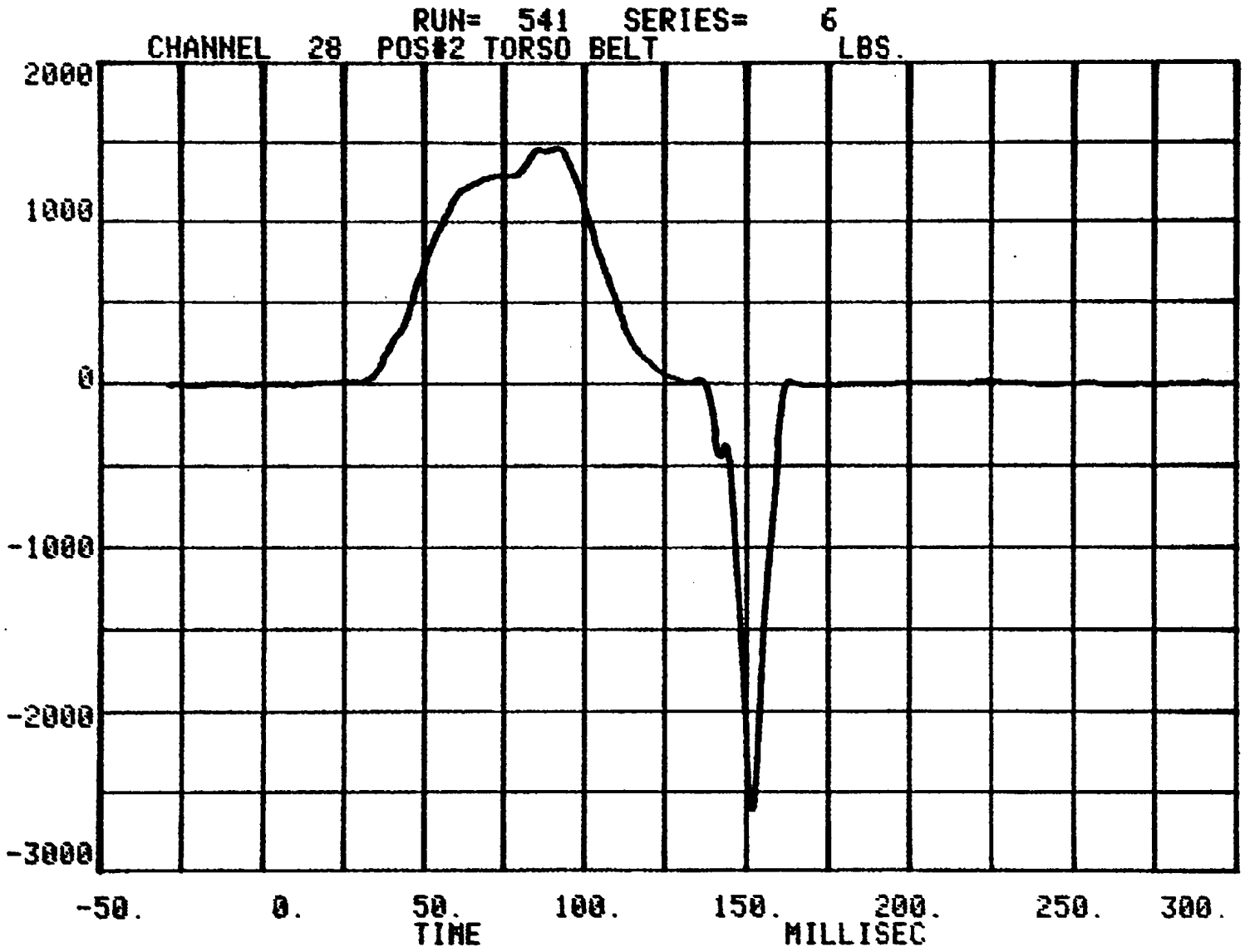

CHANNEL 19 POS#2 RIGHT FEMUR
RUN= 541 SERIES= 6
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 20 RUN= 541 SERIES= 6
POS#2 LEFT FEMUR
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

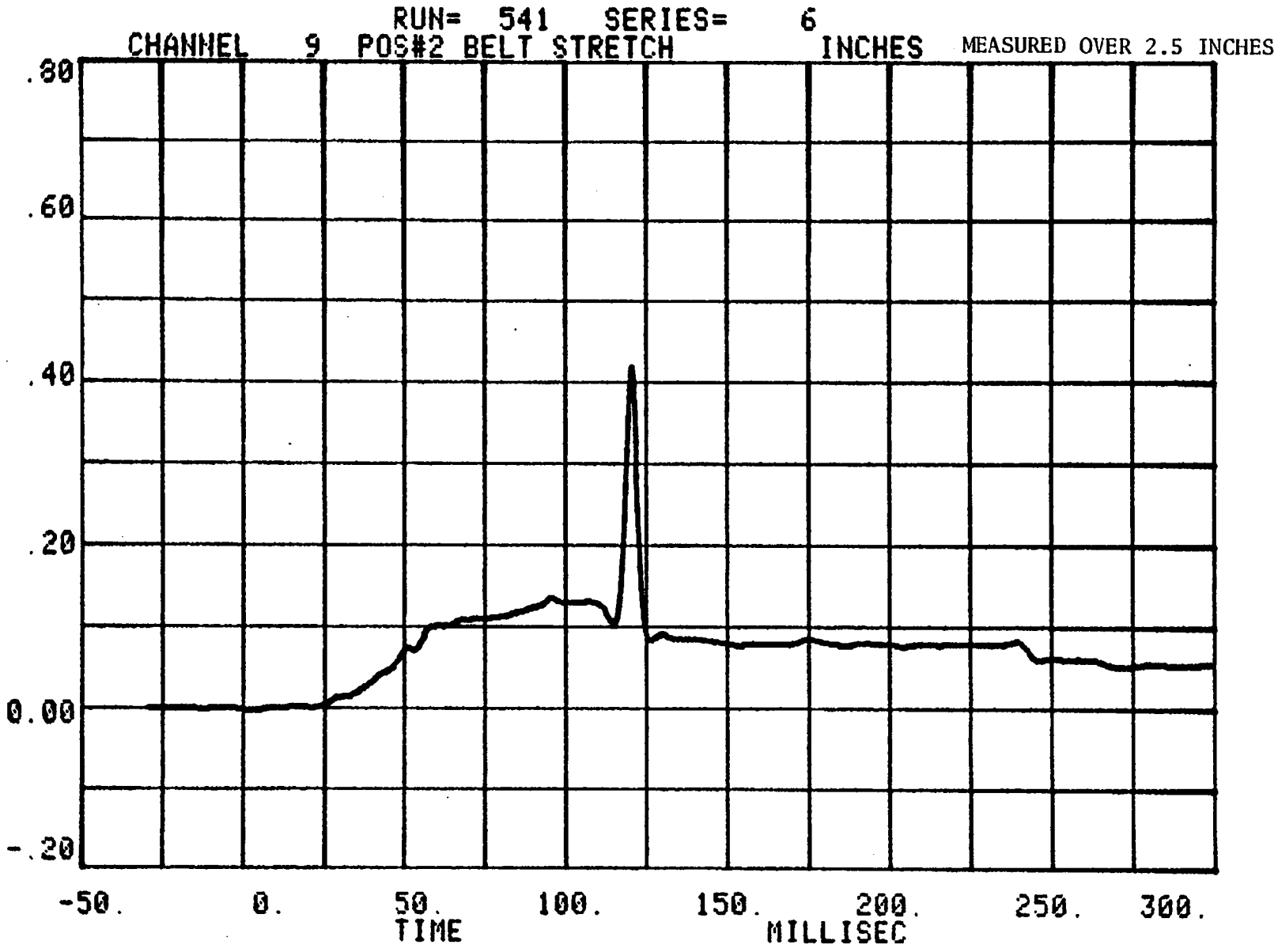

CHANNEL 26 POS#2 RIGHT BELT
RUN= 541 SERIES= 6
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

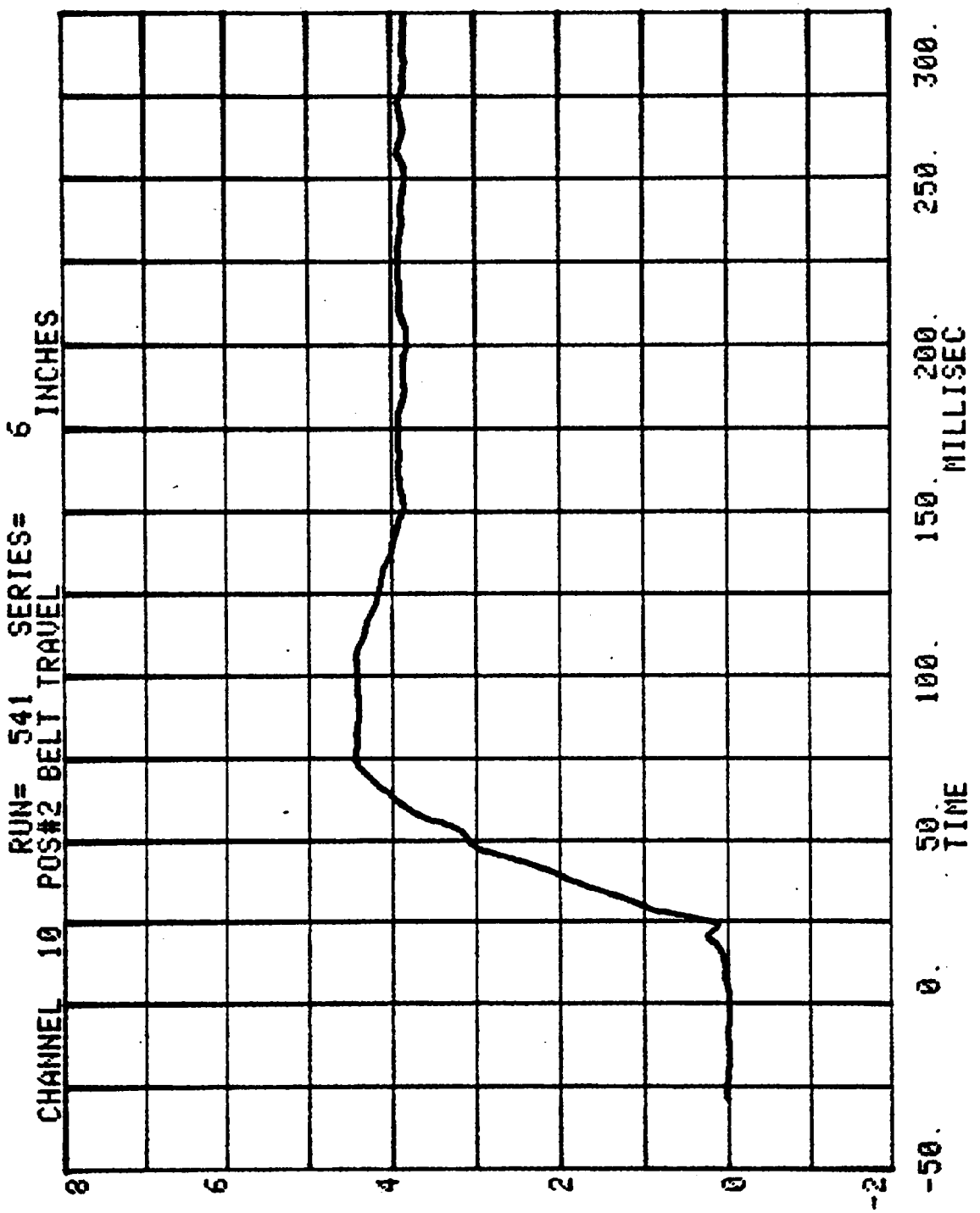

CHANNEL 27 POS#2 LEFT BELT
RUN= 541 SERIES= 6
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

6851-V-6


RUN= 541 SERIES= 6
CHANNEL 28 POS#2 TORSO BELT LBS.
2000
1000
0
-1000
-2000
-3000
-50.
0.
50.
100.
150.
200.
250.
300.
TIME MILLISEC

6851-V-6


RUN= 541 SERIES= 6
CHANNEL 9 POS#2 BELT STRETCH INCHES
MEASURED OVER 2.5 INCHES
.80
.60
.40
.20
0.00
-.20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 10 POS#2 BELT TRAVEL
RUN= 541 SERIES= 5
INCHES
8
6
4
2
0
-2
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

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:

Serial No.	Completion Date
109	4/16/82
153	4/16/82

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. 153

LABORATORY TECHNICIAN: Gary Gestwick

APPROVED BY: _____

			Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - - - - - - - - -			4/12-4/16/82	
Calibration Sequential Number for Dummy - - - -			4	
Temperature in Lab. (Spec. = 66 to 78°F)- - - -			68 to 70°F	
Relative Humidity in Lab. (Spec. = 10 to 70%) -			42 to 56%	
TEST PARAMETER		SPECIFICATION		
1. HEAD DROP TEST:				
a. Peak Resultant Accel. -		210 to 260G	210 g	
b. Peak Lateral Accel. - -		≤10G	3 g	
c. Time above 100G - - - -		0.9 to 1.5 ms	1.28 ms	
2. NECK BENDING TEST:				
a. Pendulum Speed - - - -		21.5 to 25.5 fps	23.4 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -		20 to 24G	22.5 g	see 163 10/1/81 Tape 1031
c. Peak Resultant Head Acceleration - - - -		26G maximum	24 g	
d. Pendulum Decel. (t_2-t_1)		≤3 ms	1.25 ms	
e. Pendulum Decel. (t_3-t_2)		25 to 30 ms	28.1 ms	
f. Pendulum Decel. (t_4-t_3)		≤10 ms	5 ms	
g. Pendulum Direction Reversal Time - - - -		≥123 ms	103 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 in	
30°	Time	25.6 to 34.4 ms	29.5 ms	
	Displ.	2.1 to 3.1 in.	2.7 in	
60°	Time	40.3 to 51.7 ms	45.5 ms	
	Displ.	4.3 to 5.3 in.	4.8 in	
Maximum (°)	Time	53.2 to 66.8 ms	57.5 ms	
	Displ.	5.0 to 6.0 in.	5.2 in	

Continued

P, 572 DUMMY CALIBRATION TEST DATA .... Continued:

NHTSA DUMMY ID NO. 153

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	67.5 ms	
	Displ.	4.3 to 5.3 in.	4.8 in.	
30°	Time	85.4 to 104.6 ms	87 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.	57.0 lbs.	
b. Force @ 1.3" - - - -		73 to 88 lbs.	84.0 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - -		22 to 34 lbs.	30.5 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	42.0 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	54.0 lbs.	
d. Return Angle - - -		12° maximum	3.5°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed - -		21.78-22.22 fps	21.88 fps	
(2) Peak Delfection -		1.7" maximum	1.52 in.	
(3) Peak Resistive Force - - - - - -		2250 lbs. maximum	1917 lbs.	
(4) Internal - - - - Hysteresis		50 to 70%	52.49%	
b. Low Speed				
(1) Probe Speed - - -		13.86-14.14 fps	13.98 fps	
(2) Peak Deflection -		1.1" maximum	1.03 in.	
(3) Peak Resistive Force - - - - - -		1450 lbs. maximum	1217 lbs.	
(4) Internal Hysteresis- - - -		50 to 70%	54.10%	

P.572 DUMMY CALIBRATION TEST DATA .....Continued:

NHTSA DUMMY ID NO. 153

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.96 fps	
(2) Maximum Force - -	1850 to 2500 lbs	1975 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.0 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.91 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1950 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.08 fps	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 153 CALIB. SEQ. NOS. FOR DUMMY: _____ & _____

	MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
A. DUMMY INSTRUMENTS:				
1. Head Accelerometers--				
a. Triaxial unit - - - - -				
b. Uniaxial units				
(1) Longitudinal (A_x) -	ENDEVCO	CX05	1/82	7/82
(2) Lateral (A_y) - - -	ENDEVCO	DB47	1/82	7/82
(3) Vertical (A_z) - - -	ENDEVCO	CJ54	1/82	7/82
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 - - - - - -	GSE	312	1/82	7/82
b. Left Side	GSE	311	1/82	7/82
B. CALIB. LAB. INSTRUMENTS:				
1. Pendulum Accelerometer - -	CEC	16929	1/82	7/82
2. Test Probe Accelerometer -	CEC	22958	1/82	7/82
3. Lumbar Flexion Test Push Force Gauge - - - - - - -	TRANSDUCER INC	20051	1/82	7/82
4. Abdominal Compression Test Force Gauge - - - - - - -	BLH	72952	1/82	7/82
5. Abdominal Compression Test Displacement Gauge - - - -	CIC	567-11	1/82	7/82

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 109

LABORATORY TECHNICIAN: Gary Gestwick

APPROVED BY: _____

			Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - - - - - - - - -			4/12-4/16/82	
Calibration Sequential Number for Dummy - - - -			14	
Temperature in Lab. (Spec. = 66 to 78°F)- - - -			66° - 70°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -			50% - 64%	
TEST PARAMETER			SPECIFICATION	
1. HEAD DROP TEST:				
a. Peak Resultant Accel. -			210 to 260G	240 g
b. Peak Lateral Accel. - -			≤10G	10 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	22.86 fps
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -			20 to 24G	22.5 g
c. Peak Resultant Head Acceleration - - - -			26G maximum	26 g
d. Pendulum Decel. (t_2-t_1)			≤3 ms	1.25 ms
e. Pendulum Decel. (t_3-t_2)			25 to 30 ms	28.1 ms
f. Pendulum Decel. (t_4-t_3)			≤10 ms	5.3 ms
g. Pendulum Direction Reversal Time - - - -				105 ms
h. Max. Head Rotation - -			63 to 73°	70°
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	27.5 ms
	Displ.		2.1 to 3.1 in.	2.5"
60°	Time		40.3 to 51.7 ms	41.5 ms
	Displ.		4.3 to 5.3 in.	4.5"
Maximum (°)	Time		53.2 to 66.8 ms	55.5 ms
	Displ.		5.0 to 6.0 in.	5.2"

Continued

P, 572 DUMMY CALIBRATION TEST DATA .... Continued:

NHTSA DUMMY ID NO. 109

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	74 ms	
	Displ.	4.3 to 5.3 in.	4.5"	
30°	Time	85.4 to 104.6 ms	90.5 ms	
	Displ.	2.1 to 3.1 in.	2.4"	
0°	Time	101.0 to 123.0 ms	104 ms	
	Displ.	-.5 to 0.5 in.	-.2 "	
3. ABDOMINAL COMPRESSION TEST: (Preload = 10 pounds)				
a. Force @ 1" - - - - -		50 to 63 lbs.	54 lbs.	
b. Force @ 1.3" - - - -		73 to 88 lbs.	80 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - -		22 to 34 lbs.	27.0 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	42.0 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	51.0 lbs.	
d. Return Angle - - -		12° maximum	3.5°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed - -		21.78-22.22 fps	22.02 fps	
(2) Peak Delfection -		1.7" maximum	1.56"	
(3) Peak Resistive Force - - - - - -		2250 lbs. maximum	1813 lbs.	
(4) Internal Hysteresis - - - -		50 to 70%	57.9%	
b. Low Speed				
(1) Probe Speed - - -		13.86-14.14 fps	13.97 fps	
(2) Peak Deflection -		1.1" maximum	1.05"	
(3) Peak Resistive Force - - - - - -		1450 lbs. maximum	1217 lbs.	
(4) Internal Hysteresis- - - -		50 to 70%	60.18%	

P.572 DUMMY CALIBRATION TEST DATA .....Continued:

NHTSA DUMMY ID NO. 109

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.99 fps	
(2) Maximum Force - -	1850 to 2500 lbs	2100 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.0 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.00 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1900 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.15 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 109 CALIB. SEQ. NOS. FOR DUMMY: _____ & _____

	MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
A. DUMMY INSTRUMENTS:				
1. Head Accelerometers--				
a. Triaxial unit - - - - -				
b. Uniaxial units				
(1) Longitudinal (A_x) -	ENDEVCO	CX05	1/82	7/82
(2) Lateral (A_y) - - -	ENDEVCO	DB47	1/82	7/82
(3) Vertical (A_z) - - -	ENDEVCO	CJ54	1/82	7/82
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 - - - - - -	GSE	312	1/82	7/82
b. Left Side	GSE	311	1/82	7/82
B. CALIB. LAB. INSTRUMENTS:				
1. Pendulum Accelerometer - -	CEC	16929	1/82	7/82
2. Test Probe Accelerometer -	CEC	22958	1/82	7/82
3. Lumbar Flexion Test Push Force Gauge - - - - - - -	TRANSDUCER INC	20051	1/82	7/82
4. Abdominal Compression Test Force Gauge - - - - - - -	BLH	72952	1/82	7/82
5. Abdominal Compression Test Displacement Gauge - - - -	CIC	567-11	1/82	7/82