REPORT NO. CAL-88-N17

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

SAAB SCANIA AB

1988 SAAB 900S
2-DOOR HATCHBACK

NHTSA NO. MJ0502

CALSPAN TEST NO. 7626-17

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225

April 27, 1988

FINAL REPORT

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
400 SEVENTH STREET, S.W.
ROOM NO. 5313 (NRM-20)
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Prepared: Michael J. Kilgallon

Michael J. Kilgallon, Project Engineer

Approved: Walter E. Levan

Walter E. Levan, Program Manager
Transportation Research/
Physical Sciences Department

FINAL REPORT ACCEPTED BY:

L. Smalen

Manager, New Car Assessment Program (NCAP)

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16. Abstract

A frontal load cell barrier test of a 1988 Saab 900S 2-Door Hatchback was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on April 27, 1988.

Impact speed was 35.3 mph and the ambient temperature at the barrier face at the time of the impact was 57°F. The maximum post-test vehicle crush was 22.0 inches.

The 1988 Saab 900S 2-Door Hatchback was equipped with a passive shoulder belt and a manual lap belt. The shoulder belt and lap belt were used on each occupant in this test.

With regard to FMVSS No. 208, "Occupant Crash Protection," injury criteria, the driver dummy appeared to satisfy the head, chest and femur requirements. The passenger dummy appeared to exceed the head requirement but did satisfy the chest and femur requirements.

17. Key Words	18. Distribution Statement
35 mph Frontal Barrier Impact Test, New Car Assessment Program (NCAP)	**Copies of this report are available from: Technical Reference Division, National Highway Traffic Safety Admin., Nassif Building, Room S108, 400 Seventh St., S.W., Washington, DC 20590**

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Section 1
PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 88 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-87-D-02012. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 30 mph requirement.

The 35 mph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test Procedure.

Section 2
SUMMARY OF TEST NUMBER MJ0502

A load cell barrier consisting of 36 load cells was impacted by a 1988 Saab 900S 2-Door Hatchback at a velocity of 35.3 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 27, 1988. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 13 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs) were placed in the driver and right-front passenger seating positions, according to dummy placement instructions specified in Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 1021) had been used in one previous test (MJ5400) and the Injury Criteria Values were not exceeded in that test. The passenger ATD (Serial No. 1022) was certified prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 65 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

The driver's head struck the steering wheel hub; the HIC was 718. The maximum chest deceleration over 3 milliseconds was 46 g's, and femur loads were 1395 and 1776 pounds.

The right-front passenger HIC was 1250 and maximum chest deceleration over 3 milliseconds was 35 g's. Right femur load was 1535 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1988 Saab 900S 2-Door Hatchback

NHTSA NO.: MJ0502 VIN.: YS3AK35D1J3011142

BODY COLOR: White DATE OF MANUFACTURE: 11-87

Engine: 4 cylinders; - C.I.D.; 2.0 Liters; - CC
X Gas; - Diesel; - Turbocharged
X Longitudinal; - Transverse

Transmission: 5 Speed X Manual; - Automatic; - Overdrive
Final Drive: X Front Wheel; - Rear Wheel; - Four Wheel

Date Received: NA Odometer Reading: 34
X A/C; X P/S; X P/B; X P/wdo.; - Tilt Wheel
- P/seats; X Cruise Control

Type of Occupant Restraint: Passive shoulder restraint/manual lap belt

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 29 psi, Rear 30 psi

Recommended Tire Size: 185/65R15 87T

Recommended Cold Tire Pressure: Front 29 psi, Rear 30 psi

Tires on Vehicle: 185/65R15 87T ; Manufacturer: Pirelli

Number of Occupants: 2 Front; 3 Rear; - 3rd Seat; 5 TOTAL

Type of Front Seats: X Bucket; - Bench; - Split Bench

Type of Front Seat Back: - Fixed; X Adj. With - Lever X Rot. Knob

Vehicle Capacity Weight (VCW) = 930 lbs. (A)

No. of Occupants x 150 lbs. = 750 lbs. (B)

Rated Cargo and Luggage Weight (RCLW) A-B = 180 lbs.

GVWR 3770 lbs. GAWR: Front 2120 lbs. Rear 2010 lbs.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 850 lbs. Right Rear = 590 lbs.

Left Front = 840 lbs. Left Rear = 560 lbs.

TOTAL FRONT WEIGHT = 1690 lbs. (59 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1150 lbs. (41 % of Total Vehicle Weight)

TOTAL DELIVERY WEIGHT = 2840 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (2840 lbs.)

VCW = Vehicle Capacity Weight (930 lbs.)

DSC = Designated Seating Capacity (5)

RCLW = VCW - 150 (DSC) = 180 lbs.

Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)

Target Test Weight = 3348 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 172 POUNDS CARGO:

Right Front = 920 lbs. Right Rear = 750 lbs.

Left Front = 930 lbs. Left Rear = 740 lbs.

TOTAL FRONT WEIGHT = 1850 lbs. (55 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1490 lbs. (45 % of Total Vehicle Weight)

TOTAL TEST WEIGHT = 3340 lbs.

Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 26.9 LF 27.0 RR 26.1 LR 26.0

Test Attitude: RF 26.6 LF 26.6 RR 25.0 LR 24.8

Wheel Base: 98.9 in.; C.G. = 44.1 in. rearward of front wheel C/L

Remarks: None

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °

Date of Test: 4/27/88 Time of Test: 12:20

Ambient Temperature: 57 °F at impact area

Temperature in Occupant Compartment: 73 °F.

Windshield Molding Temperature: 74 °F.

Required Impact Velocity Range: 34.5 to 35.5 mph

Impact Velocity: primary = 35.3 mph, secondary = 35.4 mph

Distance From Front Bumper to Barrier Face When Entering Speed Trap: 52 inches; Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:							
Pre-test	= R	180.1	C_L	184.1	L	179.8
Post-test	= R	158.4	C_L	162.1	L	161.1
Crush	= R	21.7	C_L	22.0	L	18.7

Distance from front of test vehicle to point of impact:

R 11.4 C/L 10.3 L 10.0

VISIBLE DUMMY CONTACT POINTS:

	Driver	Passenger
Head	Steering Hub	Dash
Chest	None	None
Abdomen	None	None
Left Knee	Dash	Dash
Right Knee	Dash	Dash

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	Front	
	Left	Right
Door Opening	Operable	Operable

	Front	
Seat Movement	Left	Right
Seat Back Failure	None	None
Seat Shift (in.)	0.0	0.0

Glazing Damage

Backlight/Windshield — 11" windshield retention lost on bottom of driver side; 20" windshield retention lost on bottom of passenger side

Occupant and Vehicle Information

I. OMI DATA

1. Dummy Injury Criteria Data Summary
2. Dummy Positioning Data
3. Seat Belt Positioning Data
4. Seat Belt Performance Assessment Data
5. Driver Dummy to Steering Column Dimensions
6. Camera Locations
7. Vehicle Target Locations

II. OVR DATA

1. Load Cell Barrier Data
2. Vehicle Accelerometer Data
3. Test Vehicle Measurements

Table 2

DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DUMMY (1)	-71	-30	68	101	-47	-25	19	46
DUMMY (2)	-89	54	136	167	-35	25	23	35
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	1395	1776
DUMMY (2)	1535	Invalidated
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)	1873	-	643
DUMMY (2)	2139	696	-
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**			
		36 millisecond max.		AVE. ACC. (g)
	HIC	t_1 (SEC)	t_2 (SEC)	t_1 TO t_2
DUMMY (1)	718	.07942	.11542	52.5
DUMMY (2)	1250	.08662	.10500	85.7
DUMMY (3)				
DUMMY (4)				

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Figure 1

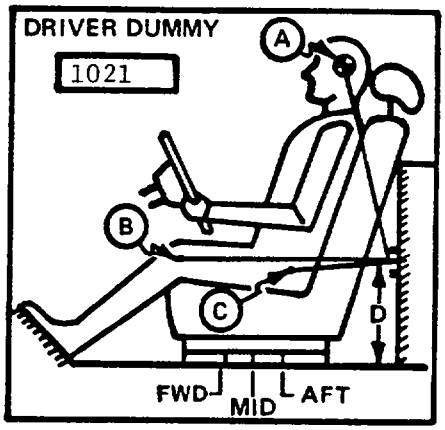
PART 572 DUMMY IN-VEHICLE POSITION

TEST NO.: MJ0502 VEHICLE: 1988 Saab 900S

SEAT TYPE:
- ____ Bench
- X Bucket
- ____ Split Bench

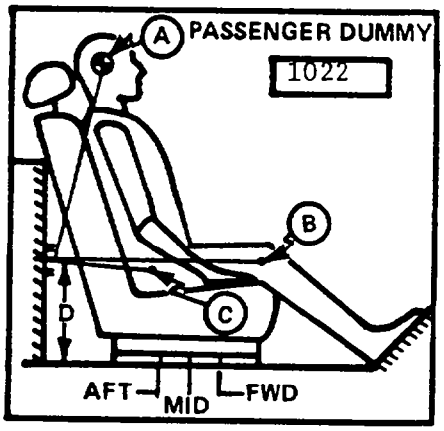
ADJUSTER TYPE:
- X Manual
- ____ Power

BUCKET SEAT BACK TYPE:
- ____ Fixed
- X Adjustable Reclining

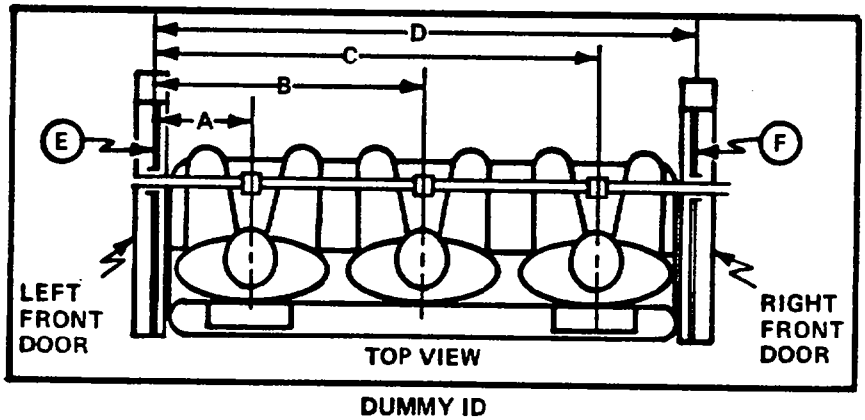


MEASUREMENT LOCATION

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



A =	21.3	in.	15	Degrees	A =	21.0 in.	13 Degrees
B =	30.3	in.	95	Degrees	B =	30.3 in.	96 Degrees
C =	15.4	in.	115	Degrees	C =	15.1 in.	114 Degrees
D =	14.5	in.			D =	14.5 in.	



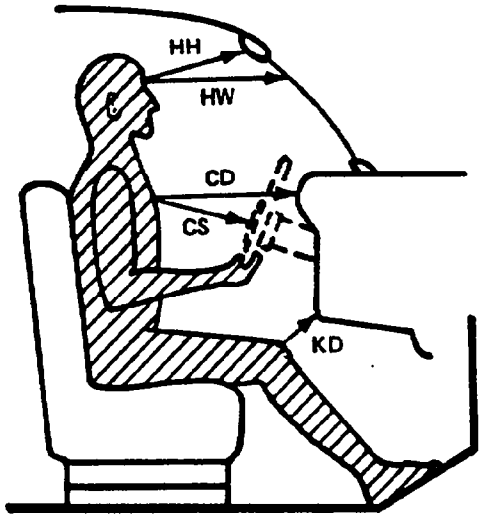
DUMMY ID

		1021	1022
A	=	Left Door to Driver Centerline	12.3 in.
B	=	Left Door to Center Passenger Centerline	- in.
C	=	Left Door to Right Passenger Centerline	38.6 in.
D	=	Left Door to Right Door	50.6 in.
E, F	=	Window Glass Height (Right and Left Must Be Equal)	10.3 in.

Figure 2

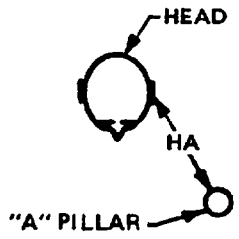
OCCUPANT CLEARANCE DIMENSIONS

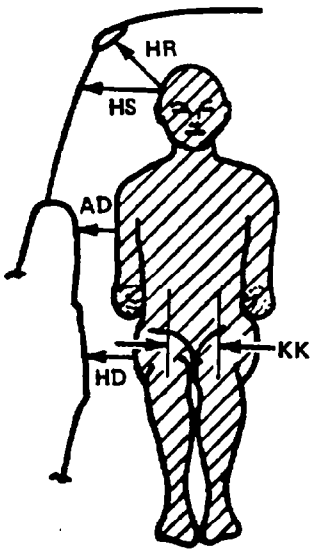
	DRIVER	PASSENGER
HH	23.3	23.5
HW	27.5	27.3
CD	25.4	22.9
CS	18.0	-
KDL	6.9	7.1
KDR	7.7	7.0
SA	25°	25°
TA	24°	23°



HH = Head to Windshield Header
HW = Head to Windshield
CD = Chest to Dash
CS = Chest to Steering Wheel
KD(L/R)= Knee to Dash (Left/Right)
SA = Seat Back Angle
TA = Torso Angle

HA = Head Target to "A" Pillar
HR = Head to Side Roof
HS = Head to Side Window
AD = Arm to Door
HD = Hip to Door
KK = Knee to Knee





	DRIVER	PASSENGER
HR	5.6	5.9
HS	8.9	9.1
AD	3.3	4.5
HD	8.1	8.0
KK	9.0	7.4
HA	23.6	23.3

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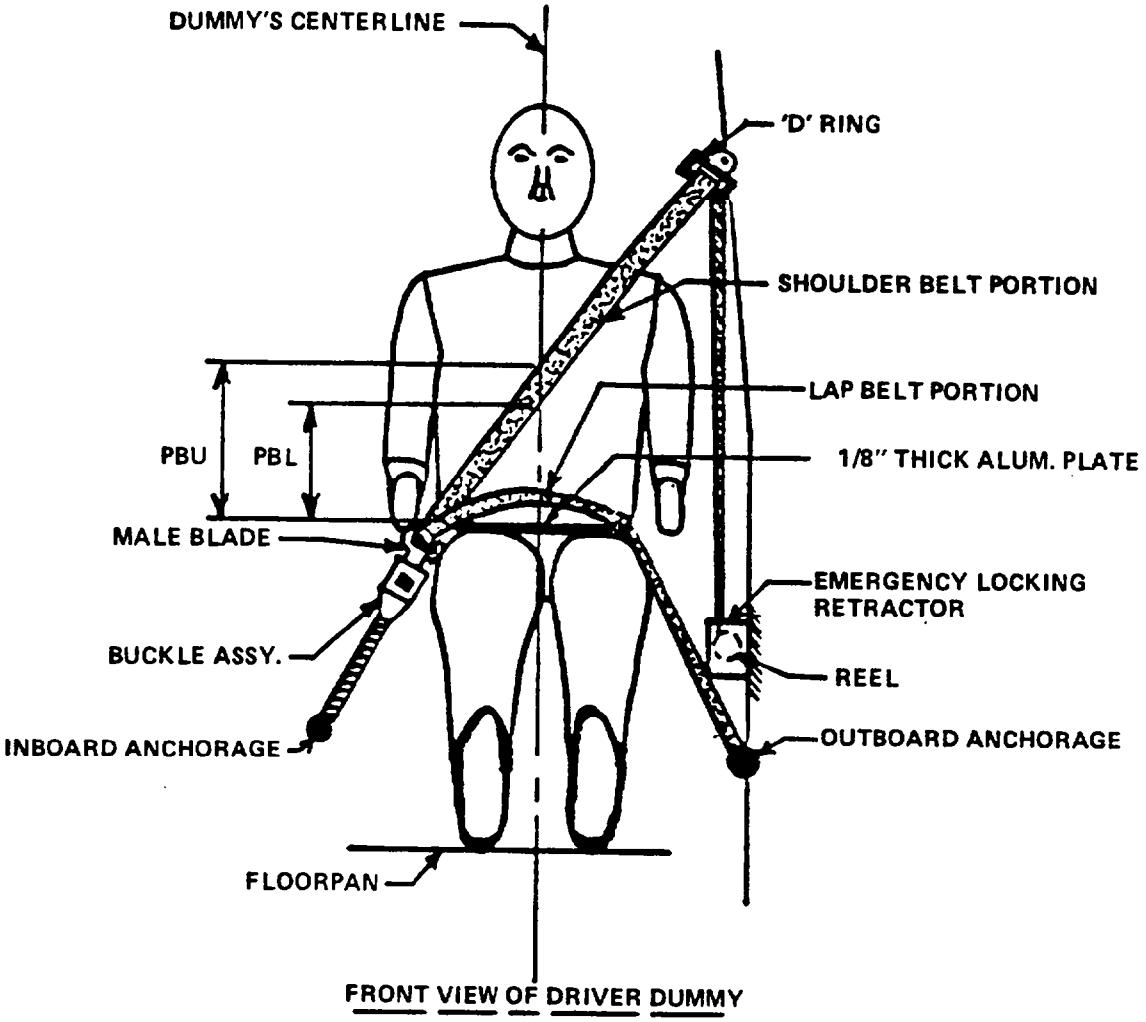
Figure 3.

SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
PBU -- Top surface of alum. plate to upper edge	14.7	14.7
PBL -- Top surface of alum. plate to belt lower edge	11.5	11.5
LAP BELT TENSION	2.0 lbs.	1.5 lbs.
SHOULDER BELT TENSION	2.0 lbs.	2.0 lbs.

Table 3

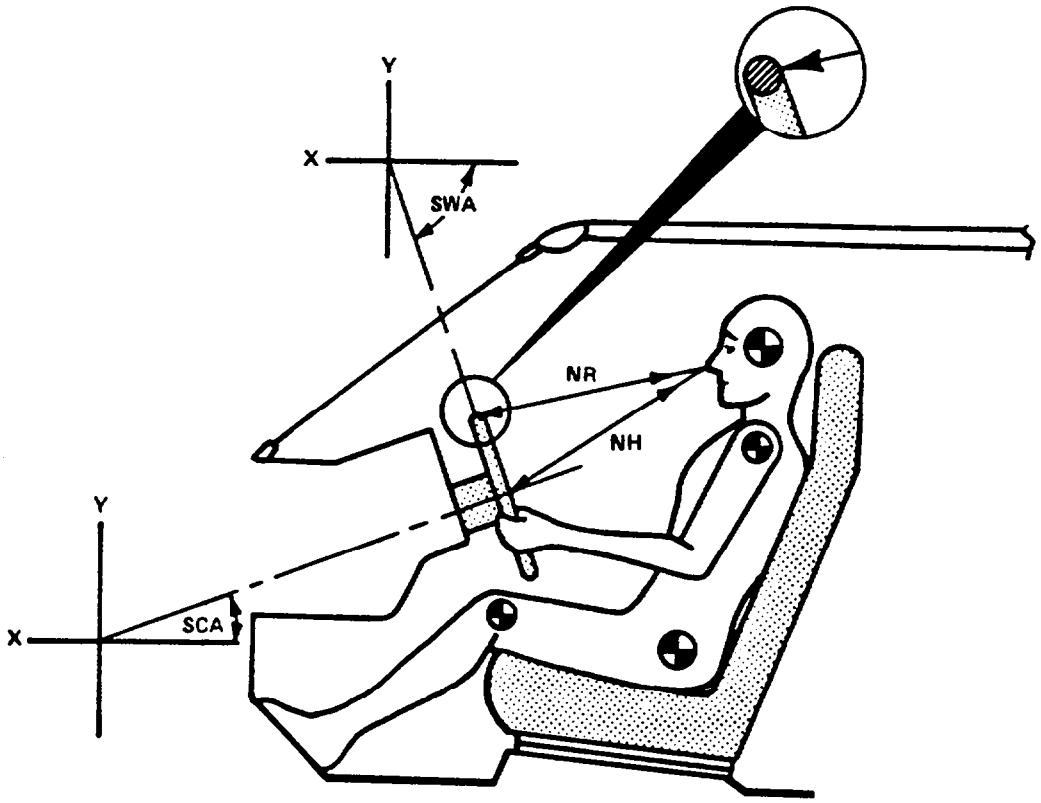
SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:	DRIVER	PASSENGER
Should belt length as measured on Part 572 Dummy.	39.2	39.5
Lap belt length as measured on Part 572 Dummy.	26.0	26.0
TORSO BELT SPOOL-OFF DATA:		
As determined mechanically.	Not Available	3.6
LAP BELT SPOOL-OFF DATA:		
As determined mechanically	1.7	3.4
BELT STRETCH DATA:		
Measured electronically between shoulder belt load cell and the "D" ring.	.86 in/ft	1.34 in/ft
Measured Mechanically	0.0 in/ft	0.0 in/ft

Note: All dimensions are in inches unless otherwise specified.

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



LEFT SIDE VIEW

	MEASUREMENTS	
NR -- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	22.3	Inches
NH -- Distance from tip of dummy's nose to center of steering column hub	22.6	Inches
SCA -- Angle of steering column relative to the horizontal X axis	26	Degrees
SWA -- Angle of steering wheel relative to the horizontal X axis	-64	Degrees

Figure 5

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

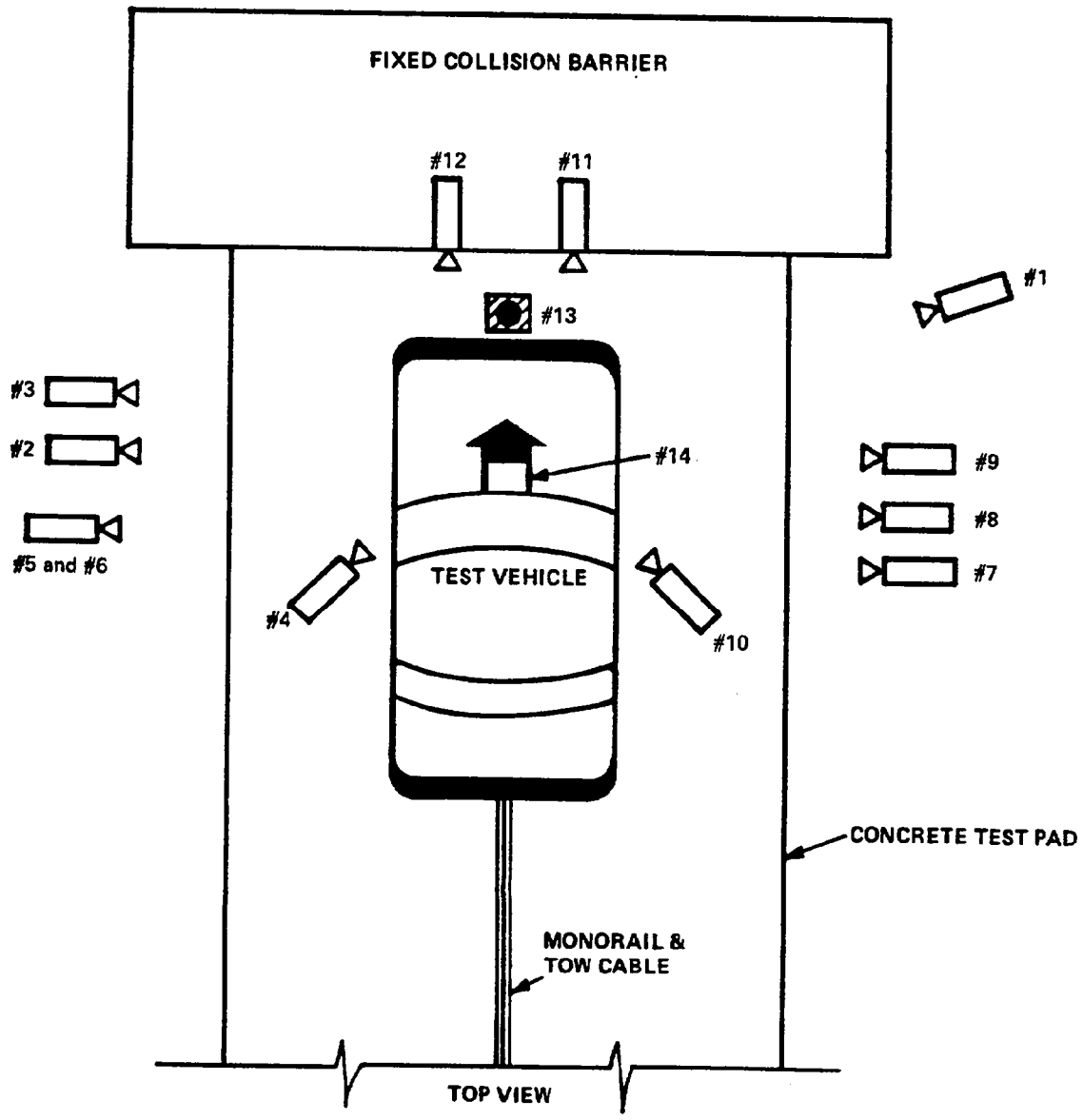


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Table 4
HIGH-SPEED CAMERA LOCATIONS

Test No. MJ0502 Vehicle 1988 Saab 900S 2-Door Hatchback

CAMERA NO.	VIEW	CAMERA POSITIONS (in)* X	Y	Z	ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	241	58	42	-4	-	13	540
3	Left Side View	305	39	44	-4	-	25	540
4	Driver and Interior View	104	98	71	-16	88	13	775
5	Steering Column (Bottom)	294	69	51.5	-3	278	25	550
6	Steering Column (Top)	294	69	75.5	-9	-	25	550
7	Overall Right Side	244	67	42.5	-2	-	13	800
8	Right Side View	258	44	42	-1	-	25	750
9	Right Passenger View	287	73	52	-2	271	35	740
10	Passenger and Interior View	89	106	68	-16	73	25	605
11	Passenger Front View	24	5	72	-33	-	13	550
12	Driver Front View	24	5	72	-34	-	13	550
13	Windshield View	0	0	126	-45	-	13	525
14	Pit View of Engine	0	30	-120	90	-	13	850

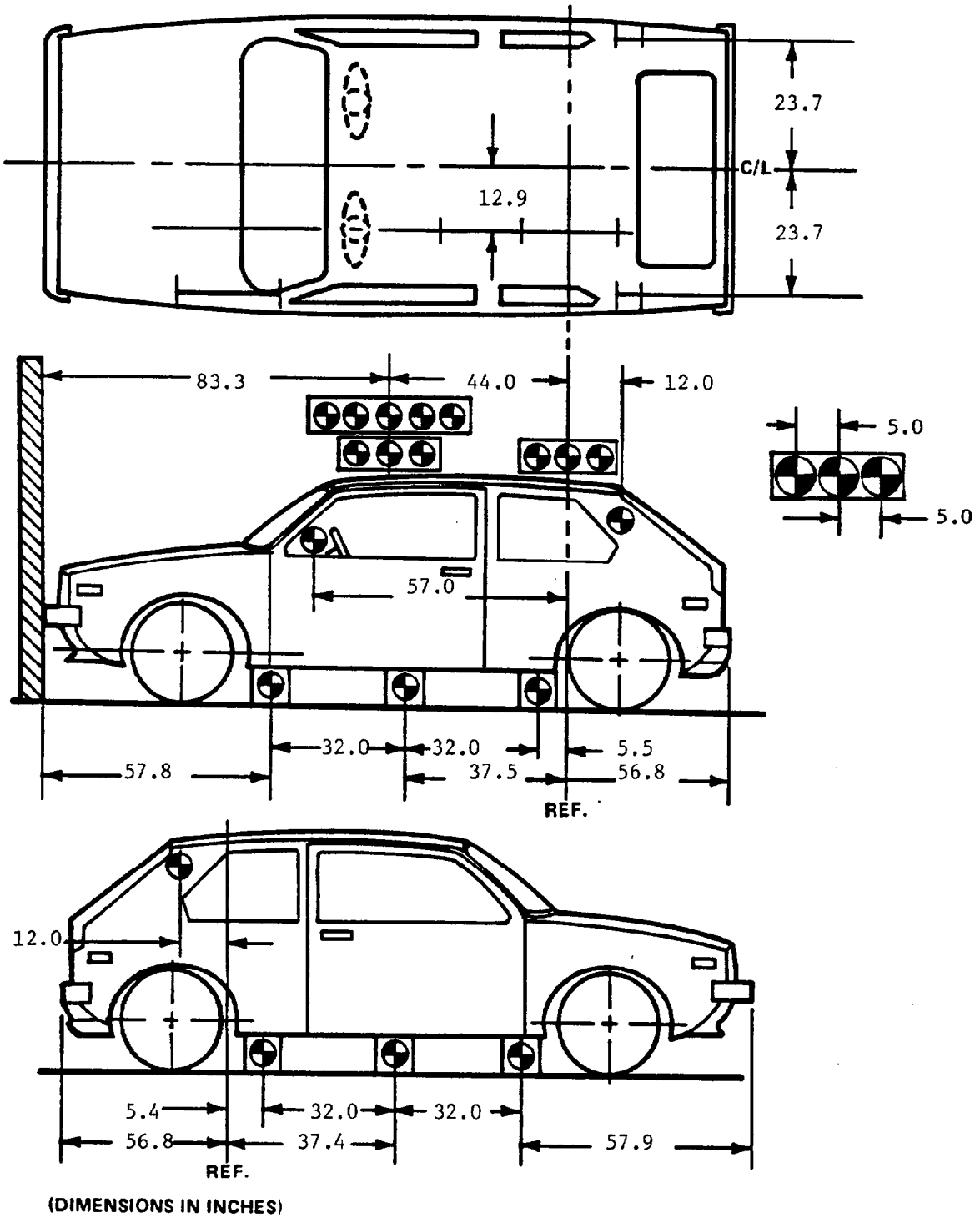
See Note

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

Note: Timing did not record on film. Frame per second speed in an estimate.

Figure 6

VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

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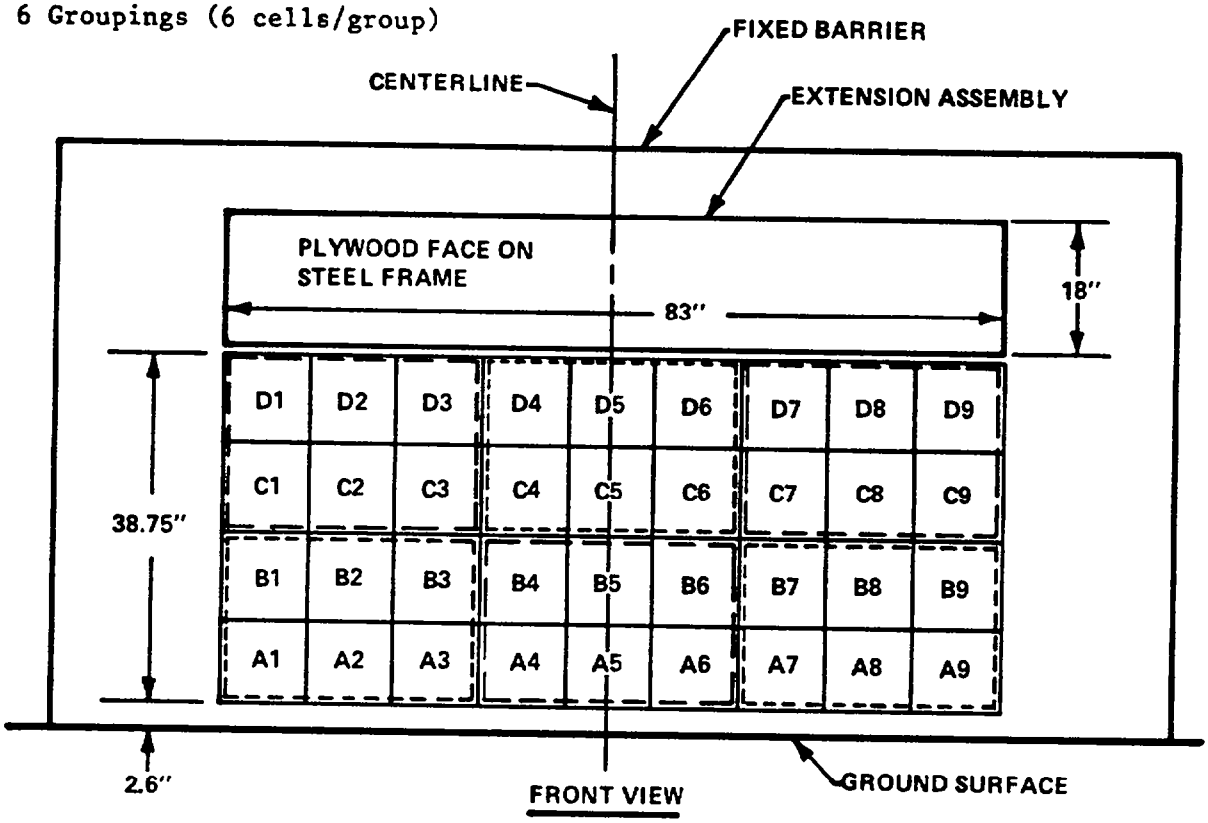
Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells
4 Rows
9 Columns
6 Groupings (6 cells/group)



6 GROUPS OF 6 LOAD CELLS EACH

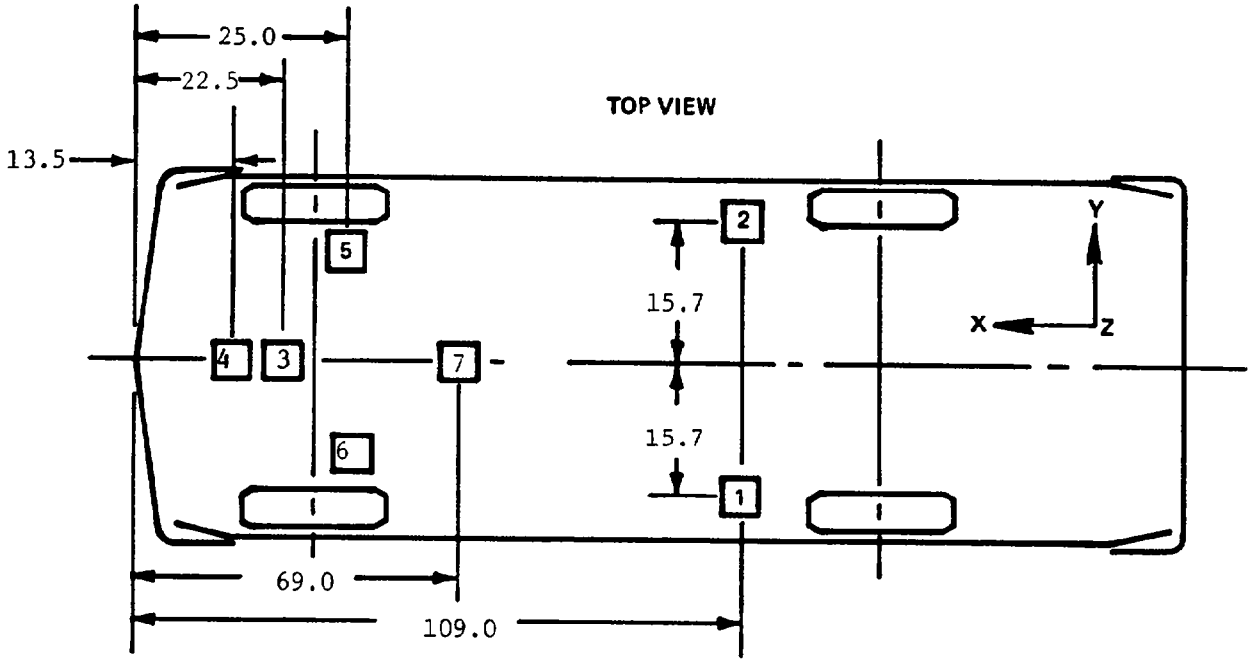
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

The following data is presented in Appendix B:

(1) Data from 36 individual load cells
(2) Total or Sum of 36 individual load cells
(3) Data from 6 Groupings shown above (6 cells/group)

Figure 8

VEHICLE ACCELEROMETER LOCATIONS



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Left Rear Seat Crossmember	X		
2	Right Rear Seat Crossmember	X		
3	Top of Engine	X		
4	Bottom of Engine	X		
5	Right Disc Brake Caliper	X		
6	Left Disc Brake Caliper	X		
7	Instrument Panel	X		

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

Figure 9

TEST VEHICLE MEASUREMENTS

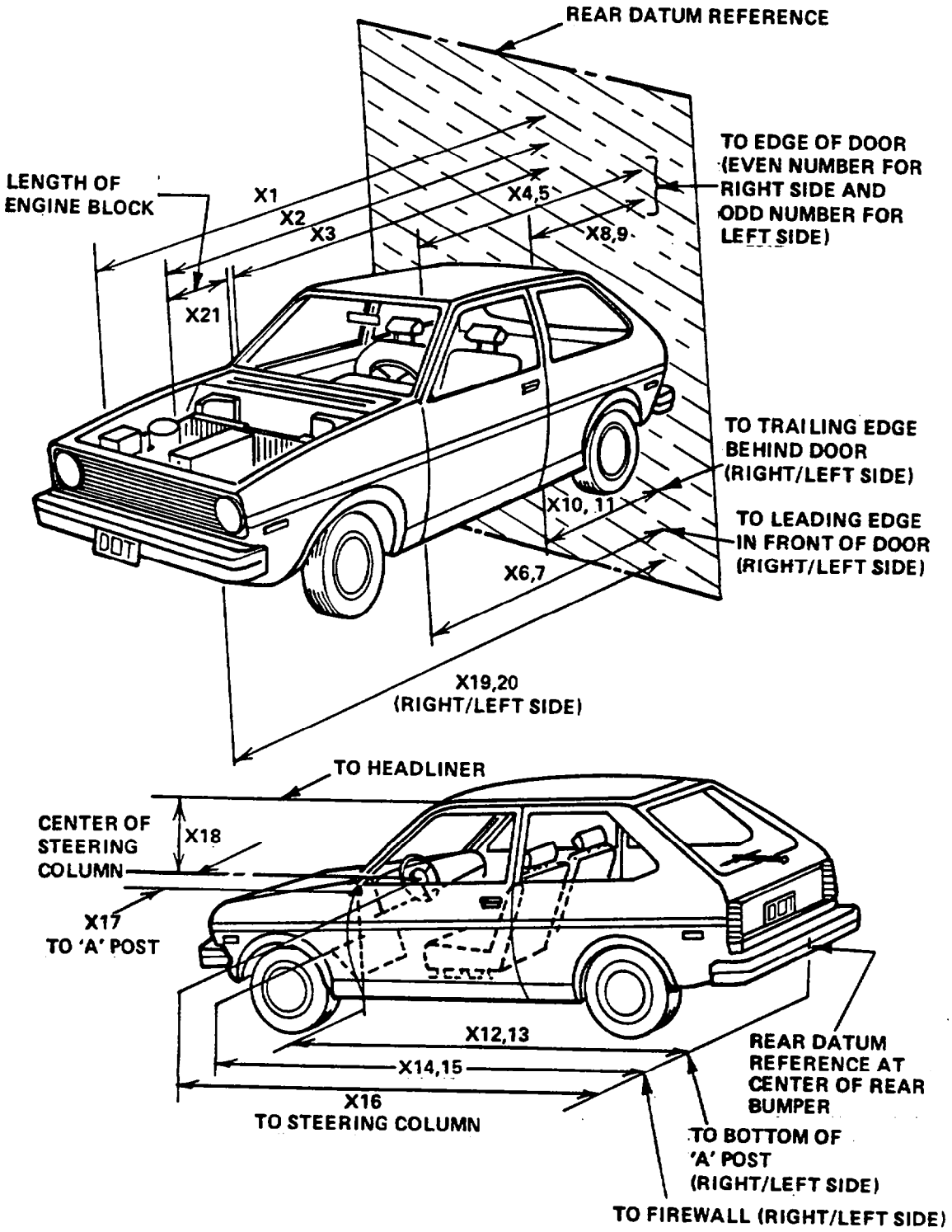


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Table 5

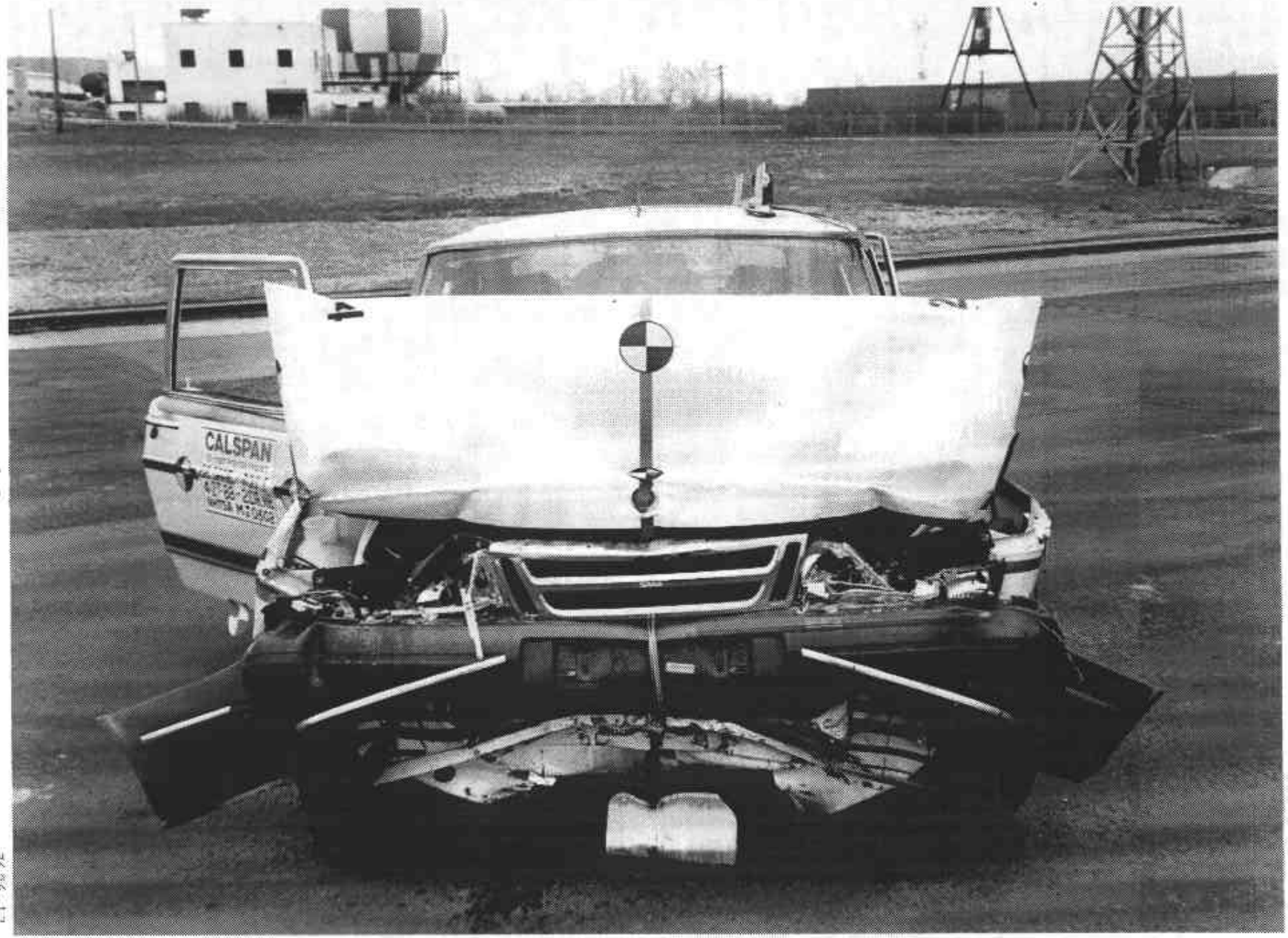
VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	184.1	162.1	22.0
X2	Rear Surface of Vehicle to Front of Engine	159.9	151.6	8.3
X3	Rear Surface of Vehicle to Firewall	130.1	128.8	1.3
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	118.1	116.5	1.6
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	117.8	116.5	1.3
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	119.8	117.9	1.9
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	118.8	118.9	-0.1
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	78.4	76.9	1.5
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	78.0	77.4	0.6
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	83.0	82.1	0.9
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	82.0	81.7	0.3
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	119.9	118.5	1.4
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	118.9	118.9	0.0
X14	Rear Surface of Vehicle to Firewall, Right Side	134.5	128.5	6.0
X15	Rear Surface of Vehicle to Firewall, Left Side	133.5	130.6	2.9
X16	Rear Surface of Vehicle to Steering Column	109.6	108.8	0.8
X17	Center of Steering Column to "A" Post	13.0	13.1	-0.1
X18	Center of Steering Column to Headliner	17.2	17.0	0.2
X19	Rear Surface of Vehicle to Right Side of Front Bumper	180.1	158.4	21.7
X20	Rear Surface of Vehicle to Left Side of Front Bumper	179.8	161.1	18.7
X21	Length of Engine Block	21.5	21.5	0.0

Appendix A

PHOTOGRAPHS

A-1 PRE-TEST FRONT VIEW



A-2 POST-TEST FRONT VIEW

A-3 PRE-TEST LEFT SIDE VIEW

A-4 POST-TEST LEFT SIDE VIEW

A-5 PRE-TEST RIGHT SIDE VIEW

A-6 POST-TEST RIGHT SIDE VIEW

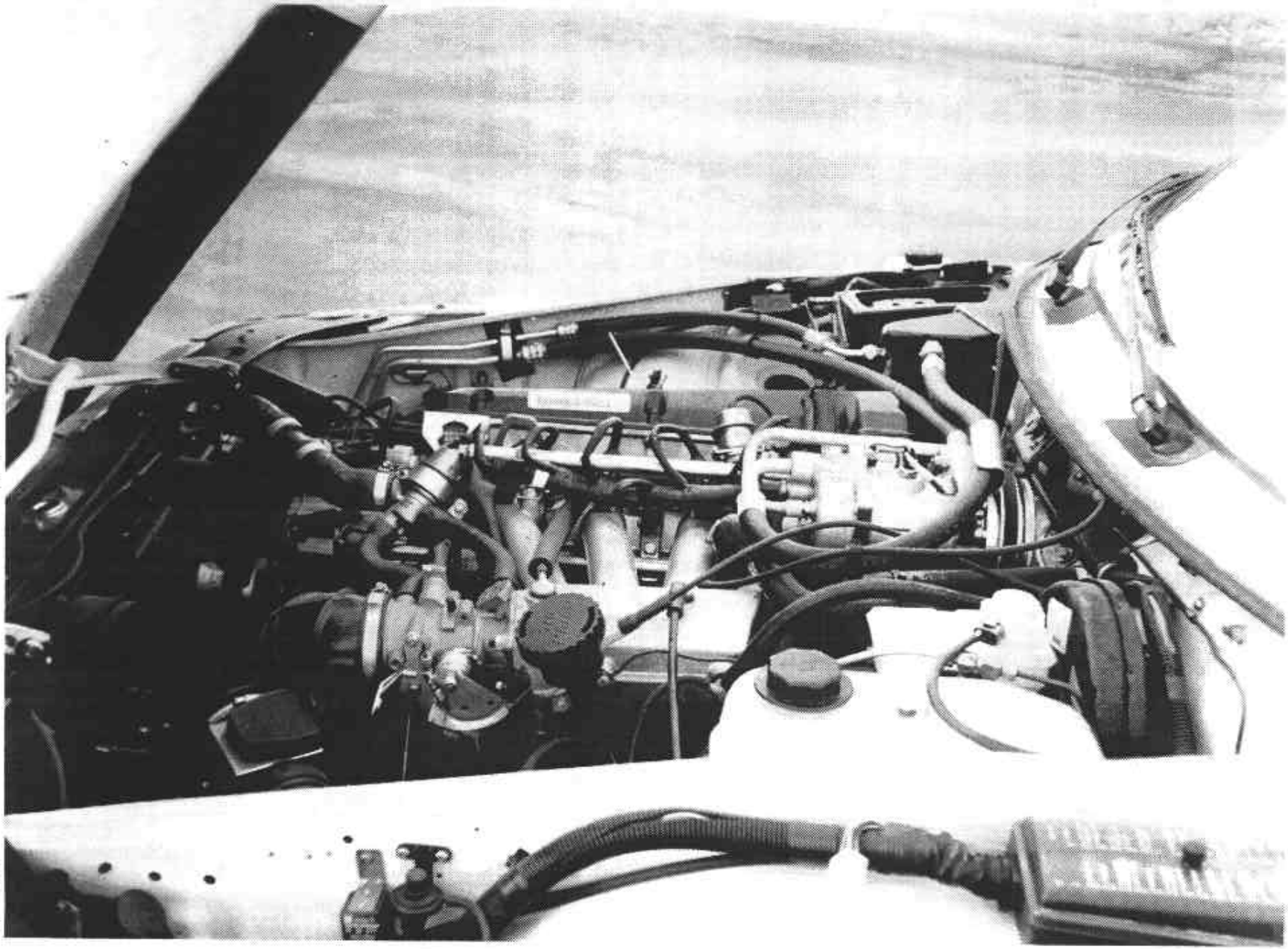
A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

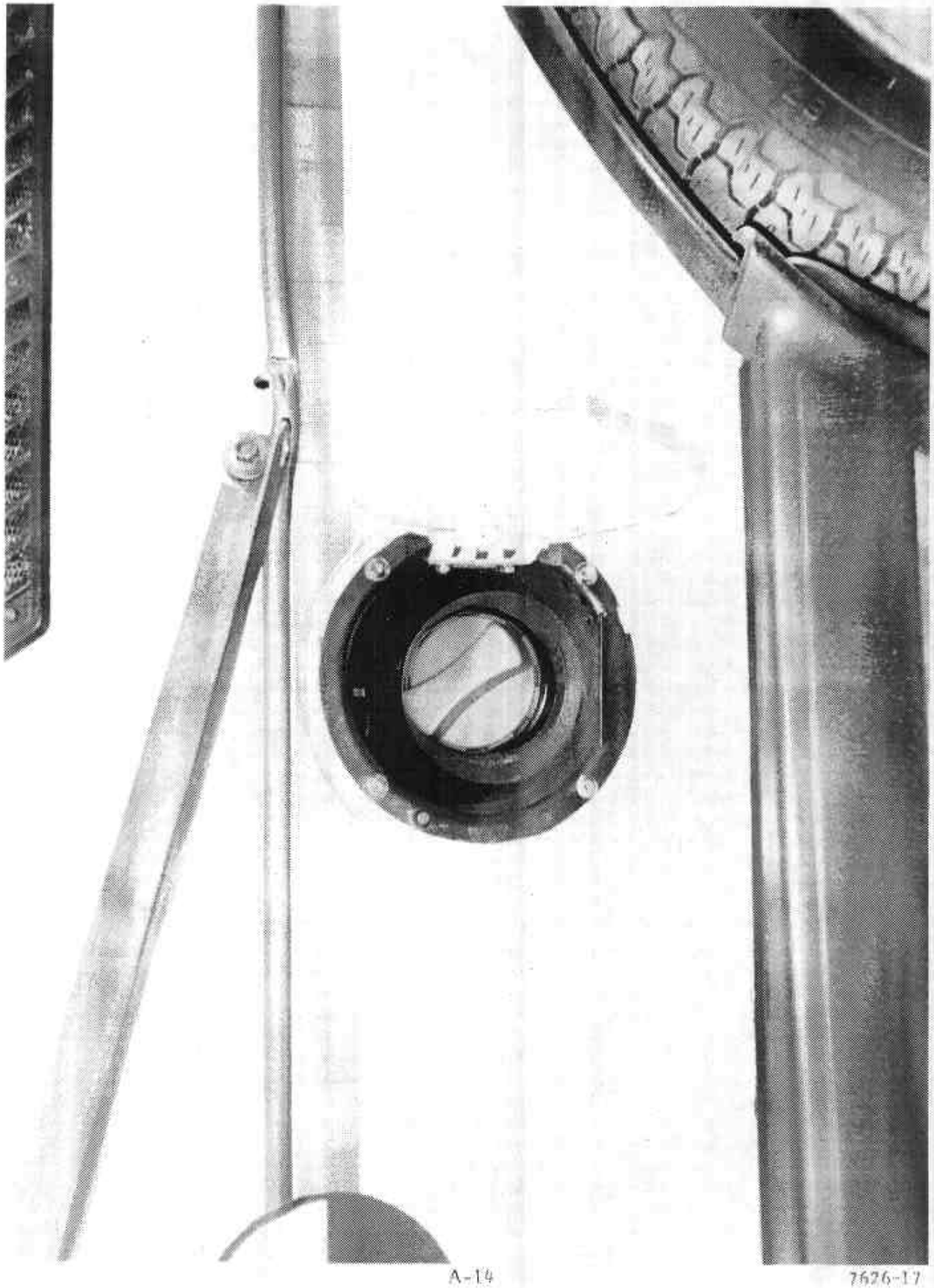
A-9 PRE-TEST LEFT REAR THREE QUARTER VIEW

A-10 POST-TEST LEFT REAR THREE QUARTER VIEW

A-11 PRE-TEST WINDSHIELD VIEW

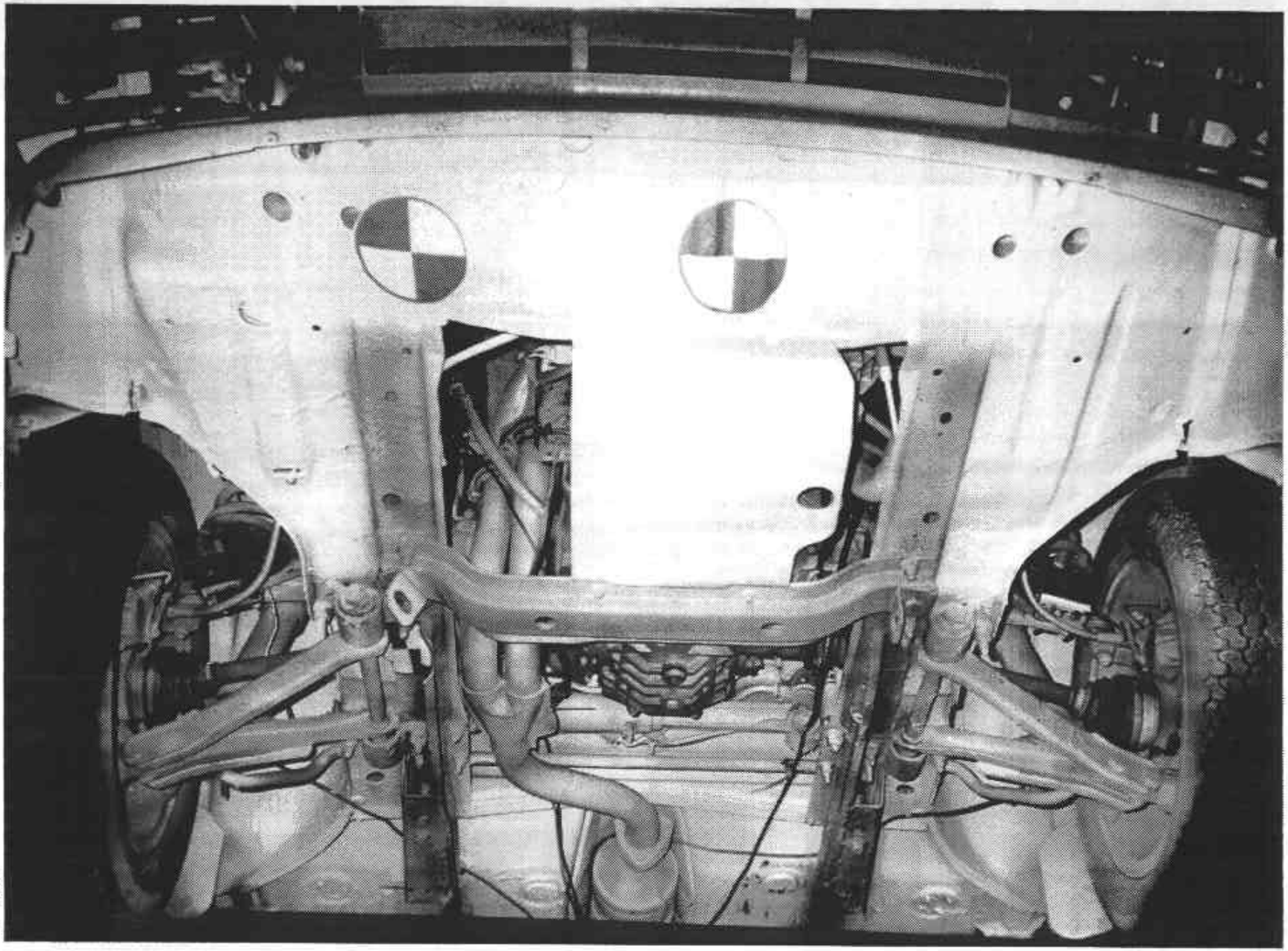


A-12 PRE-TEST ENGINE COMPARTMENT VIEW

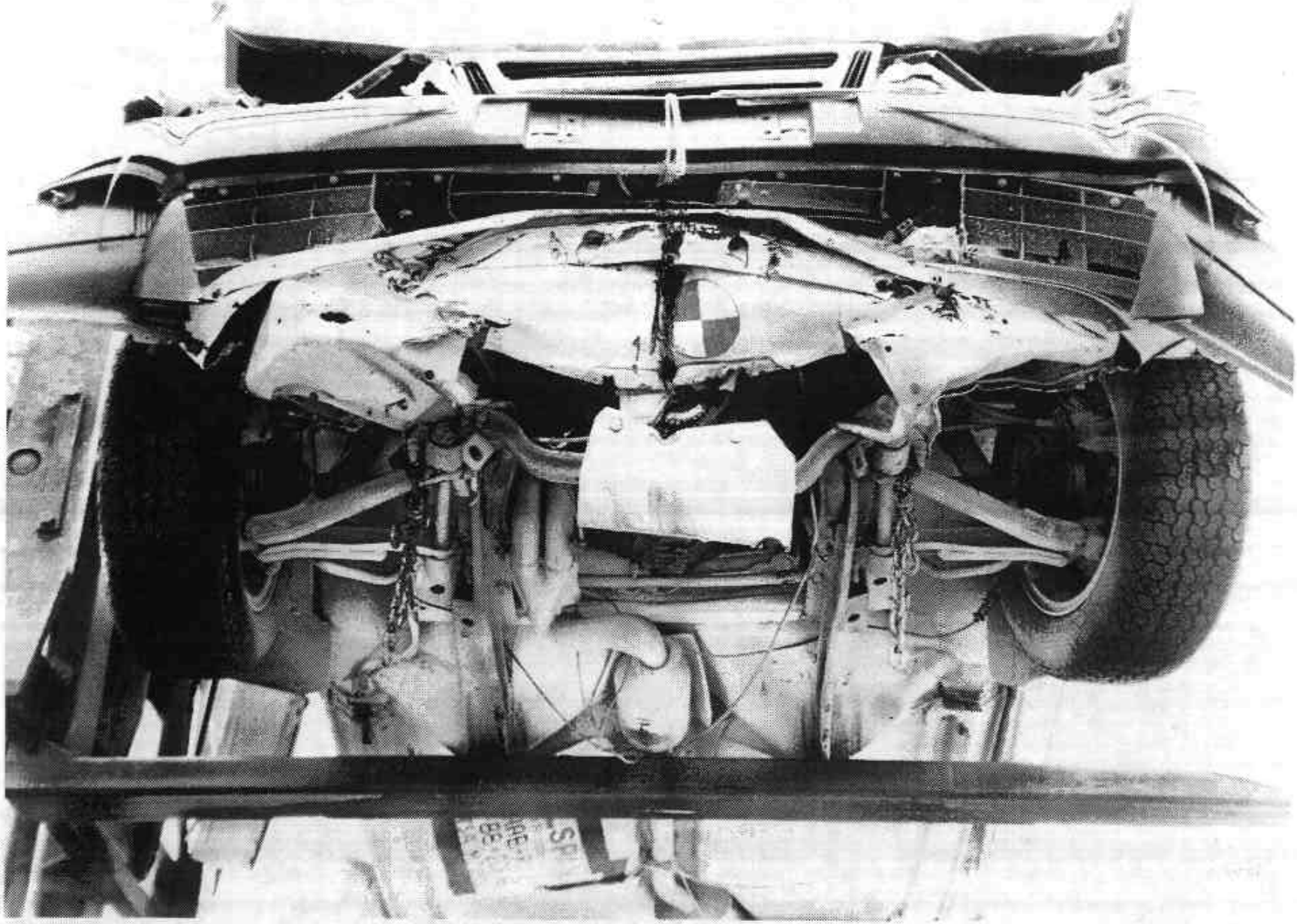


A-13 PRE-TEST FUEL CAP VIEW

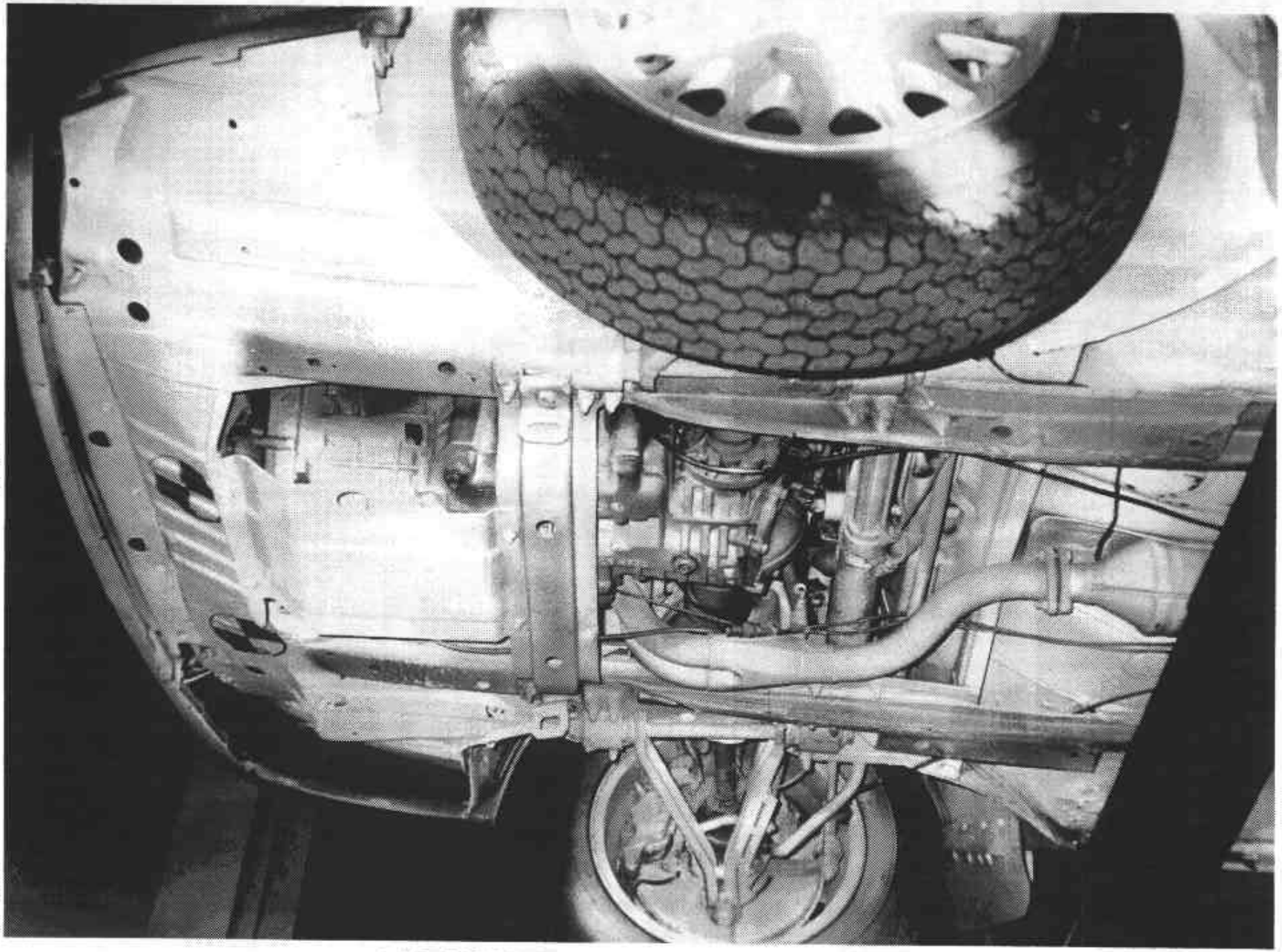
7626-17



A-14 PRE-TEST FRONT-UNDERBODY VIEW

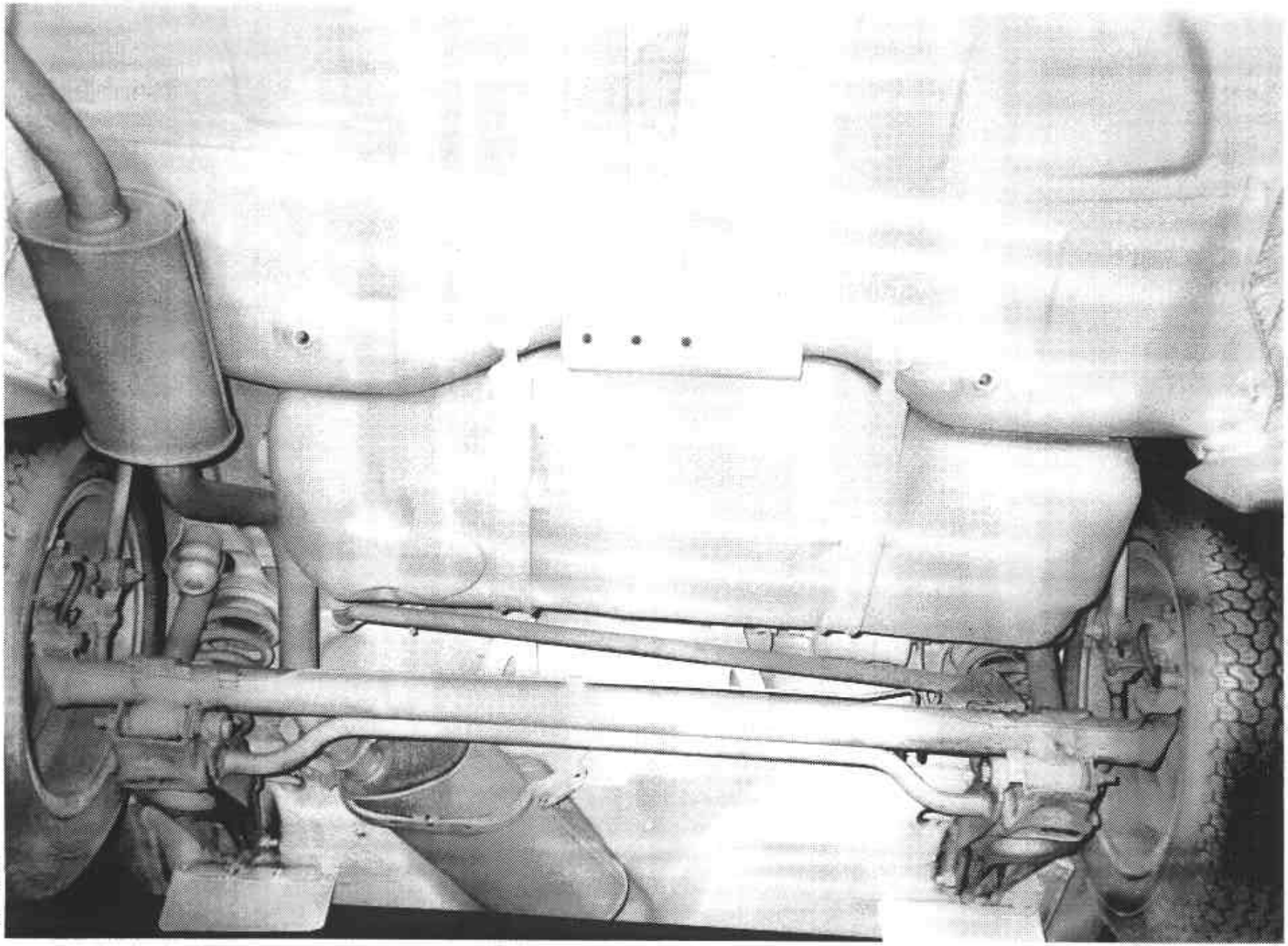


A-15 POST-TEST FRONT-UNDERBODY VIEW

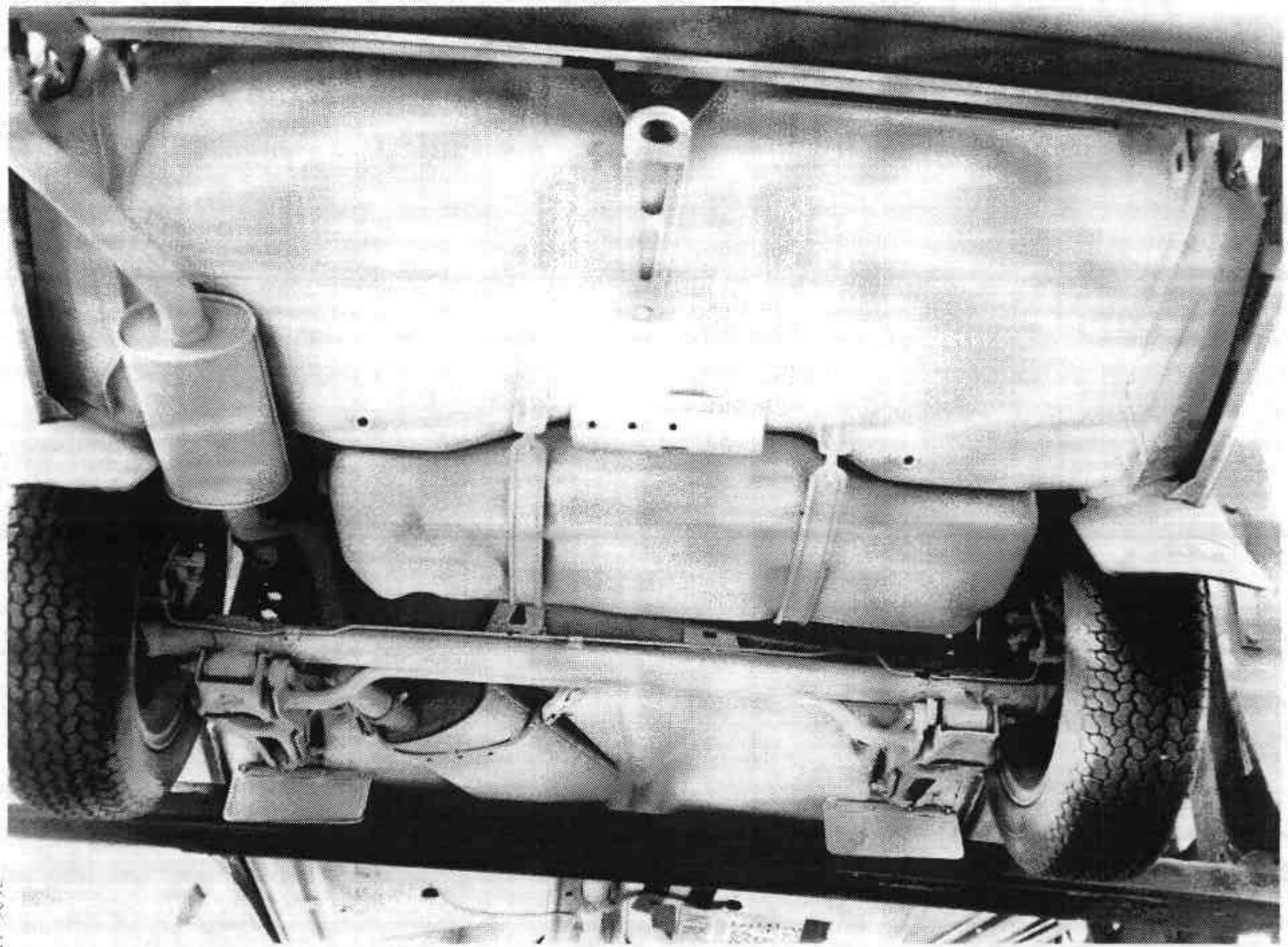


A-16 PRE-TEST FRONT SIDE UNDERBODY VIEW

A-17 POST-TEST FRONT SIDE UNDERBODY VIEW



A-18 PRE-TEST REAR UNDERBODY VIEW



A-19 POST-TEST REAR UNDERBODY VIEW

A-20 PRE-TEST DRIVER POSITION VIEW

A-21 POST-TEST DRIVER POSITION VIEW

A-23

766-83

A-22 PRE-TEST PASSENGER POSITION VIEW

A-23 POST-TEST PASSENGER POSITION VIEW

A-25

7626-17

A-24 PRE-TEST DRIVER AND INTERIOR VIEW

A-25 POST-TEST DRIVER AND INTERIOR VIEW

A-26 PRE-TEST PASSENGER AND INTERIOR VIEW

A-27 POST-TEST PASSENGER AND INTERIOR VIEW

Appendix B

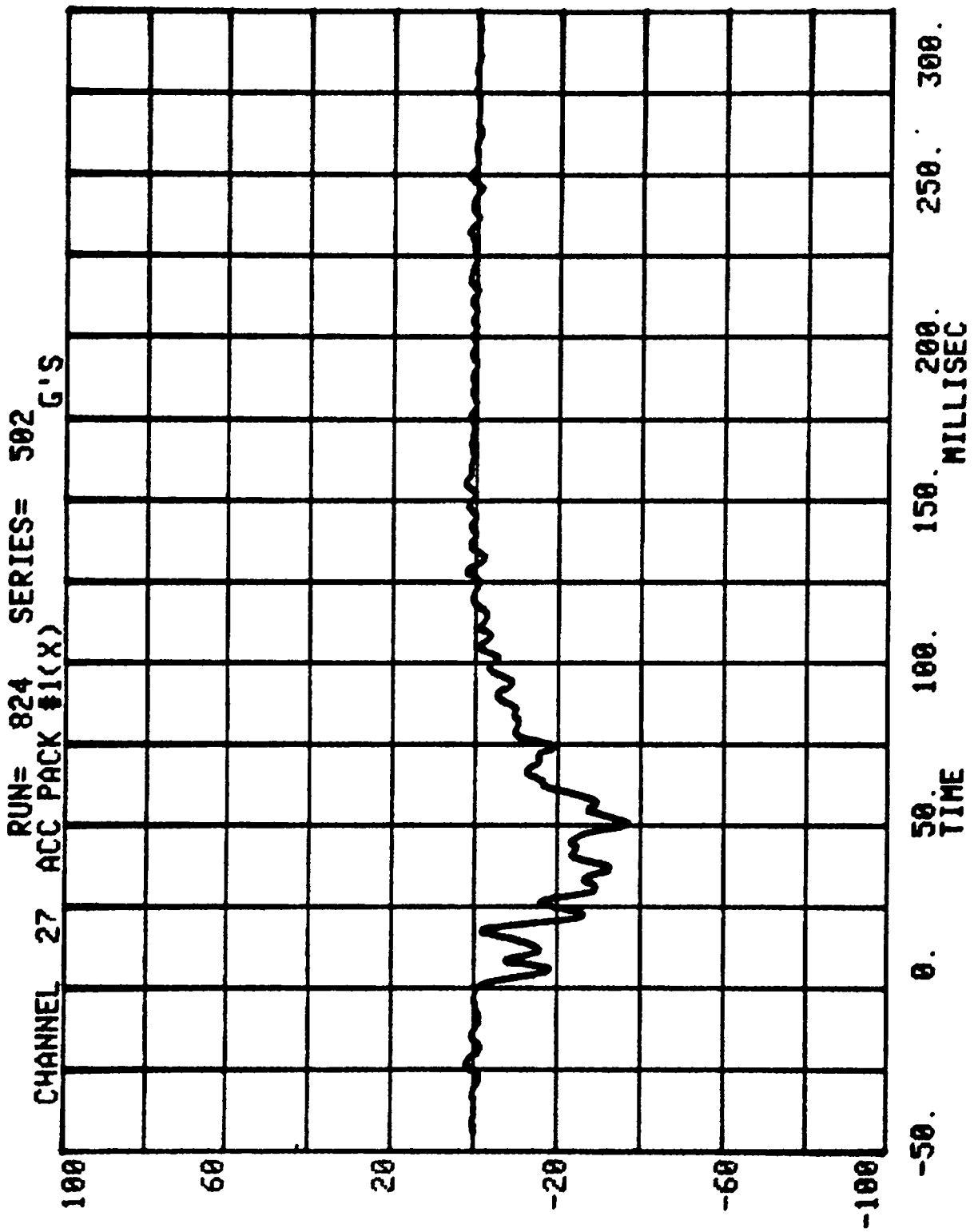
VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MJ0502

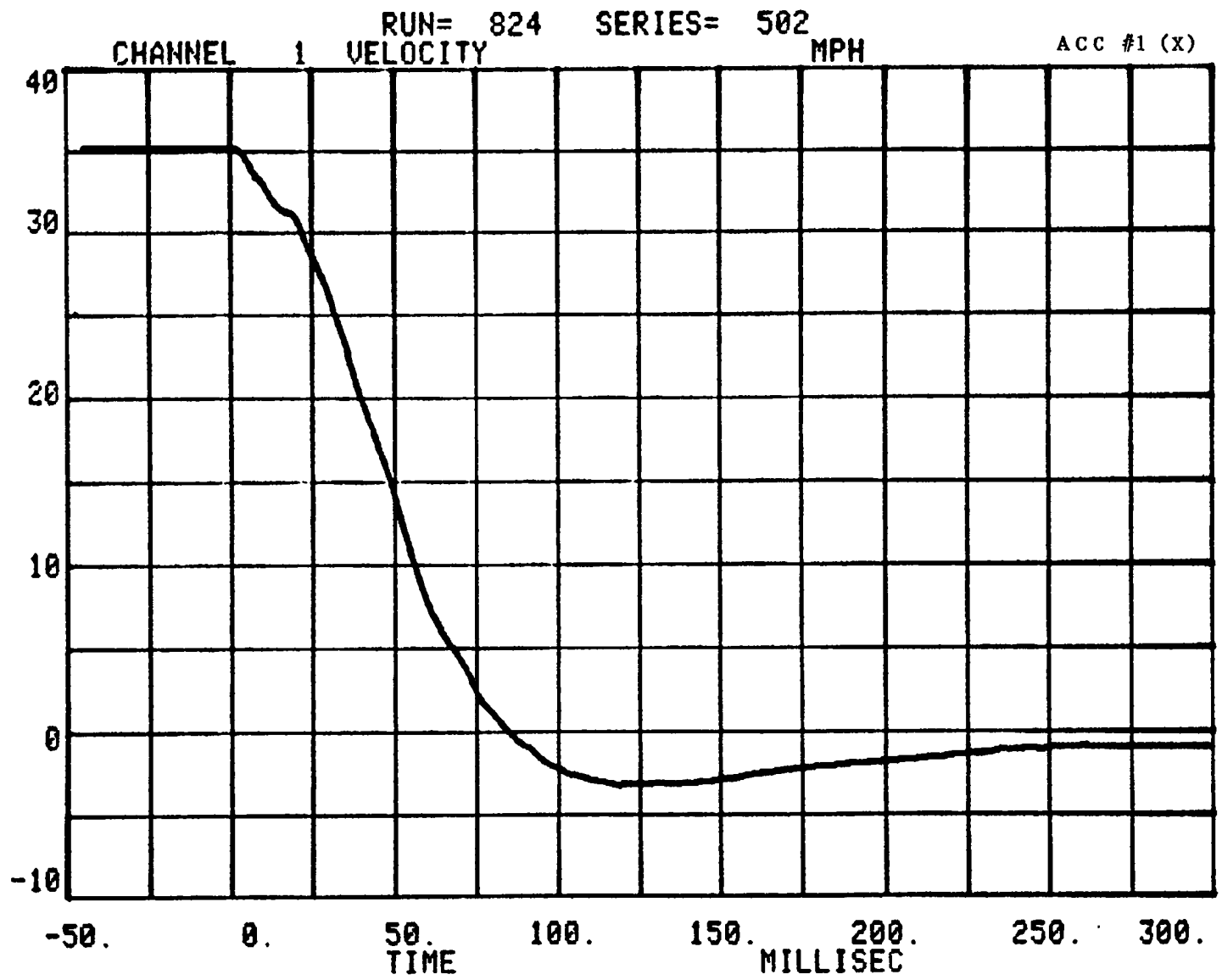
VEHICLE DATA

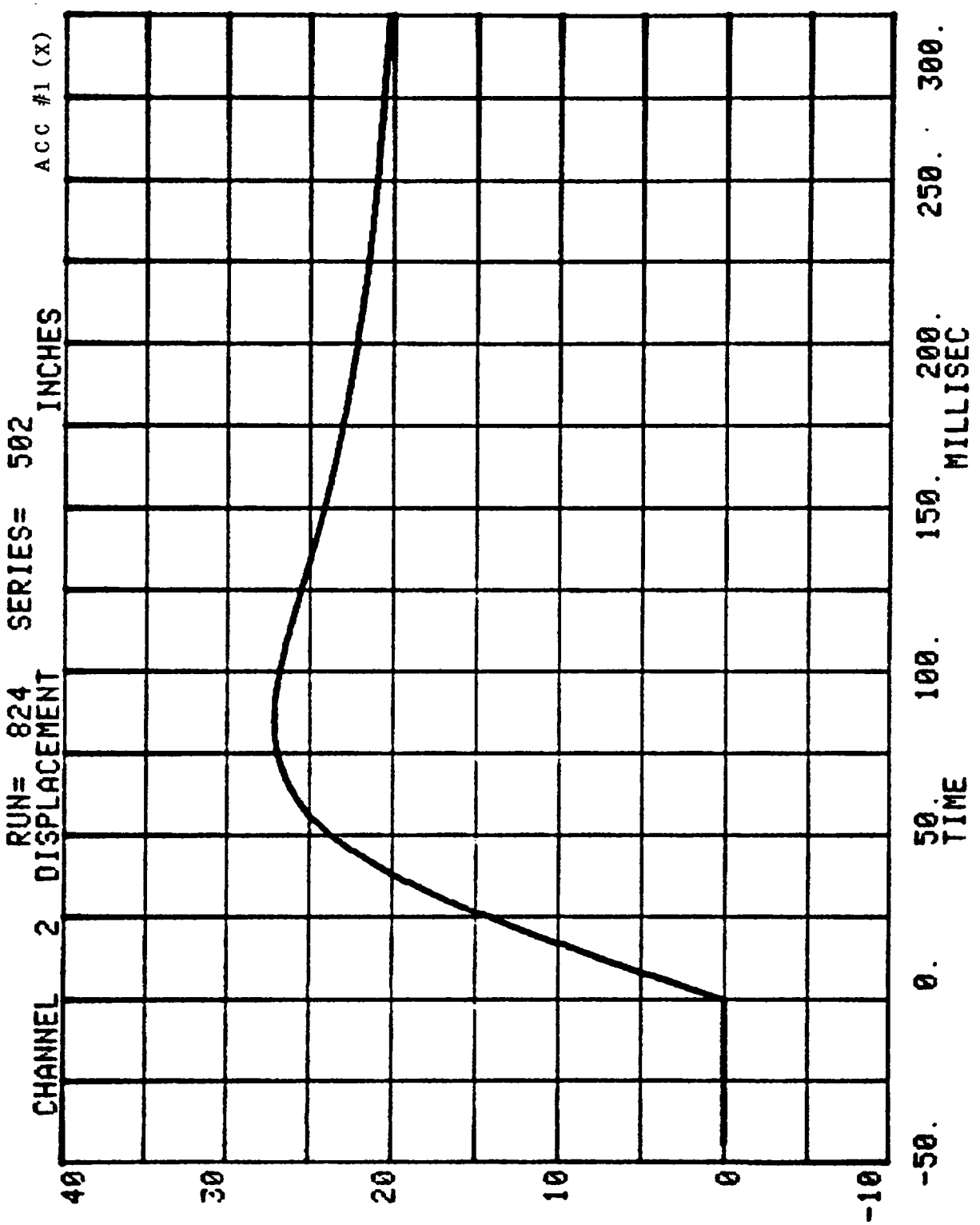
FILTER CHANNEL CLASS

60

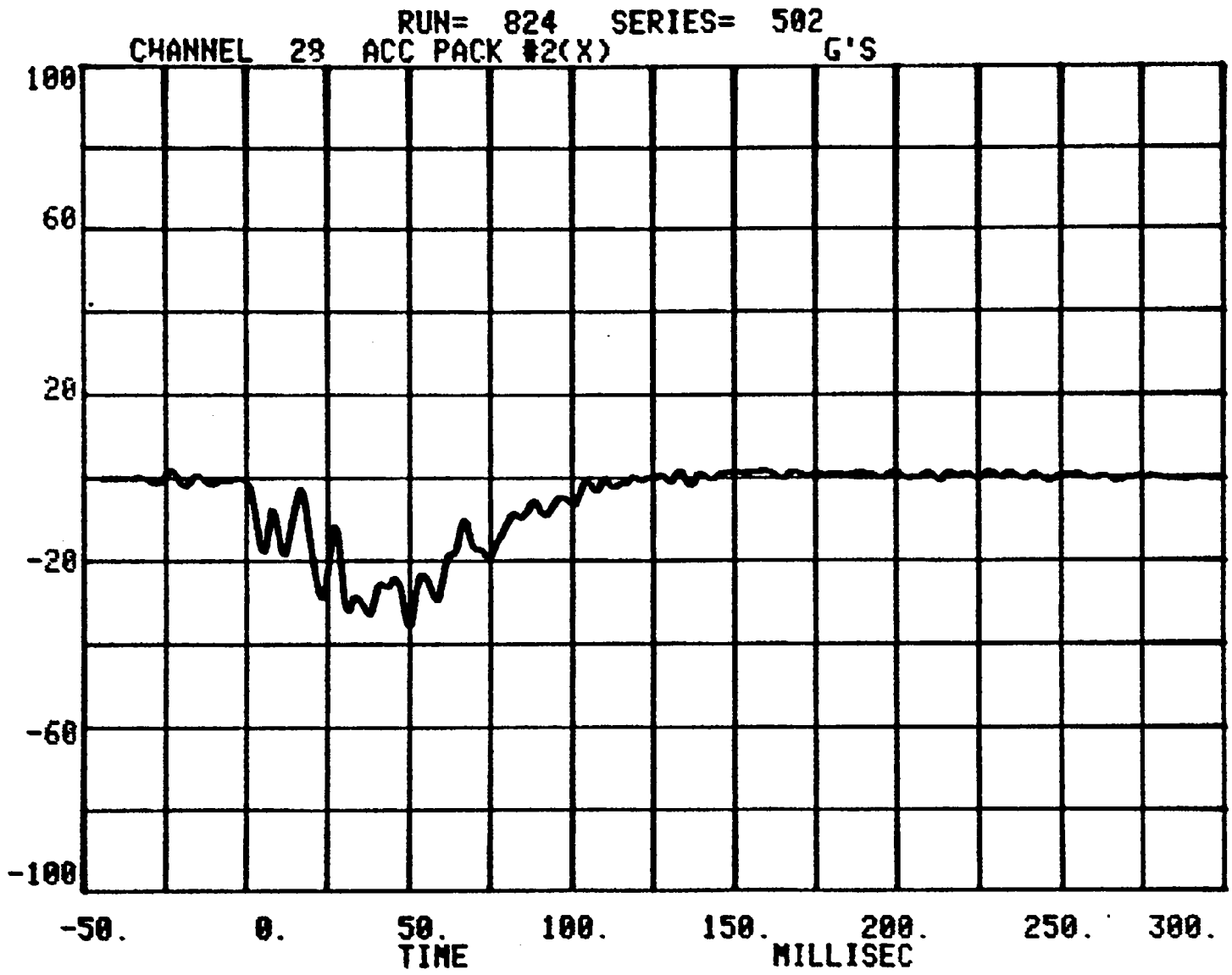

CHANNEL 27 ACC PACK #1(X)
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

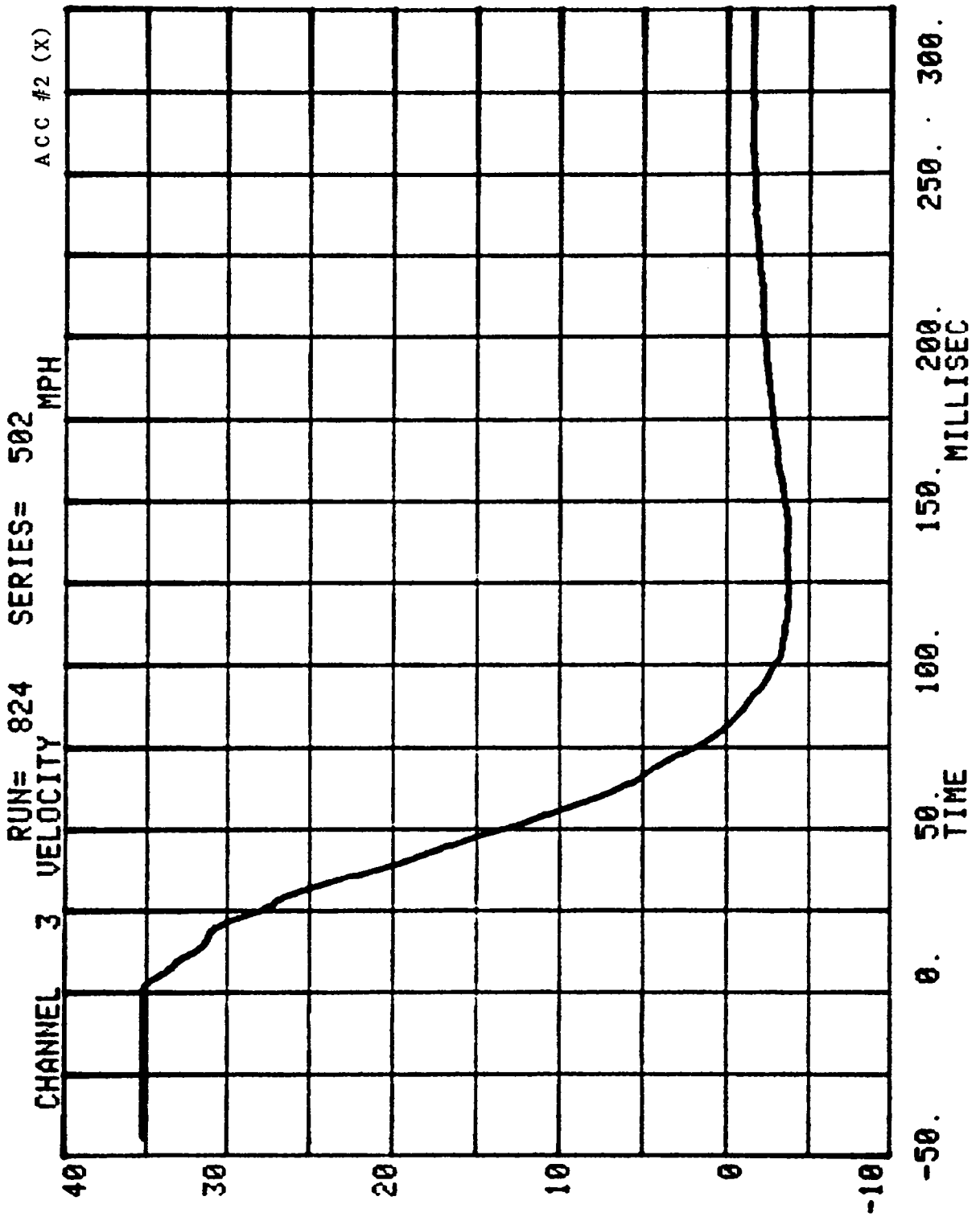

RUN= 824 SERIES= 502
CHANNEL 1 VELOCITY
MPH
ACC #1 (X)
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


ACC #1 (X)
CHANNEL 2 DISPLACEMENT
RUN= 824 SERIES= 502
INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

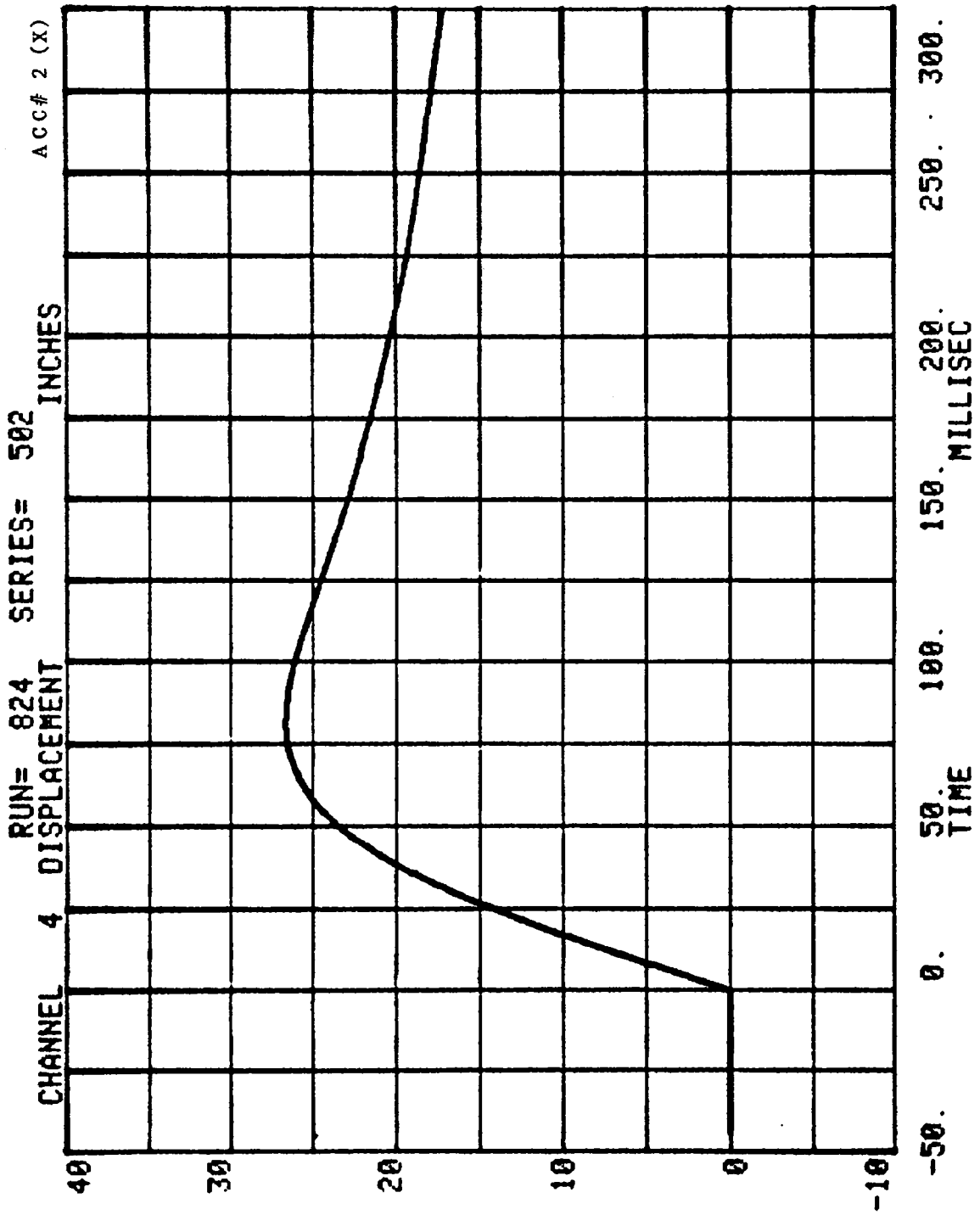
7626-17


RUN= 824 SERIES= 502
CHANNEL 28 ACC PACK #2(X) G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

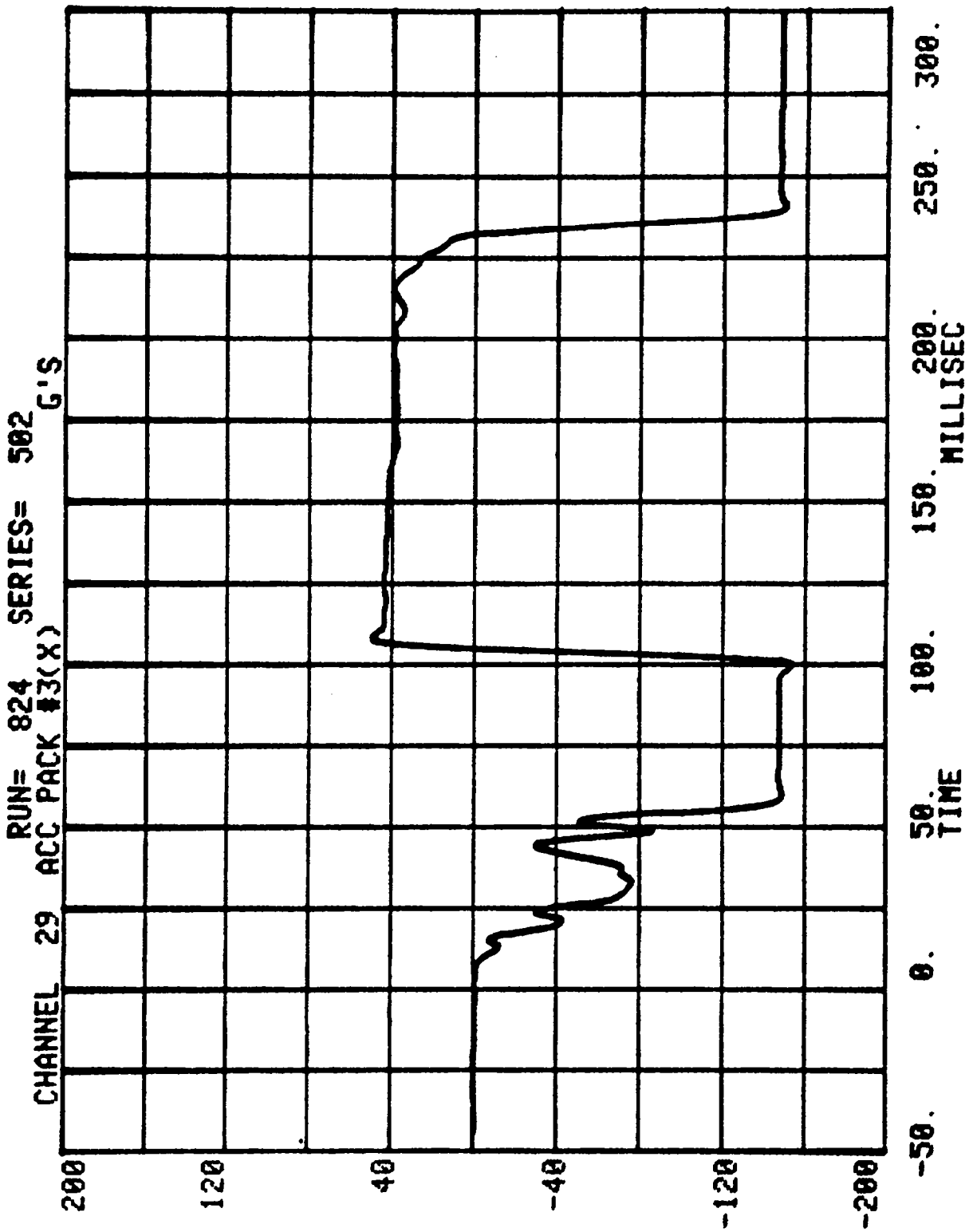
7626-17


ACC #2 (X)
CHANNEL 3 VELOCITY
RUN= 824 SERIES= 502
MPH
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

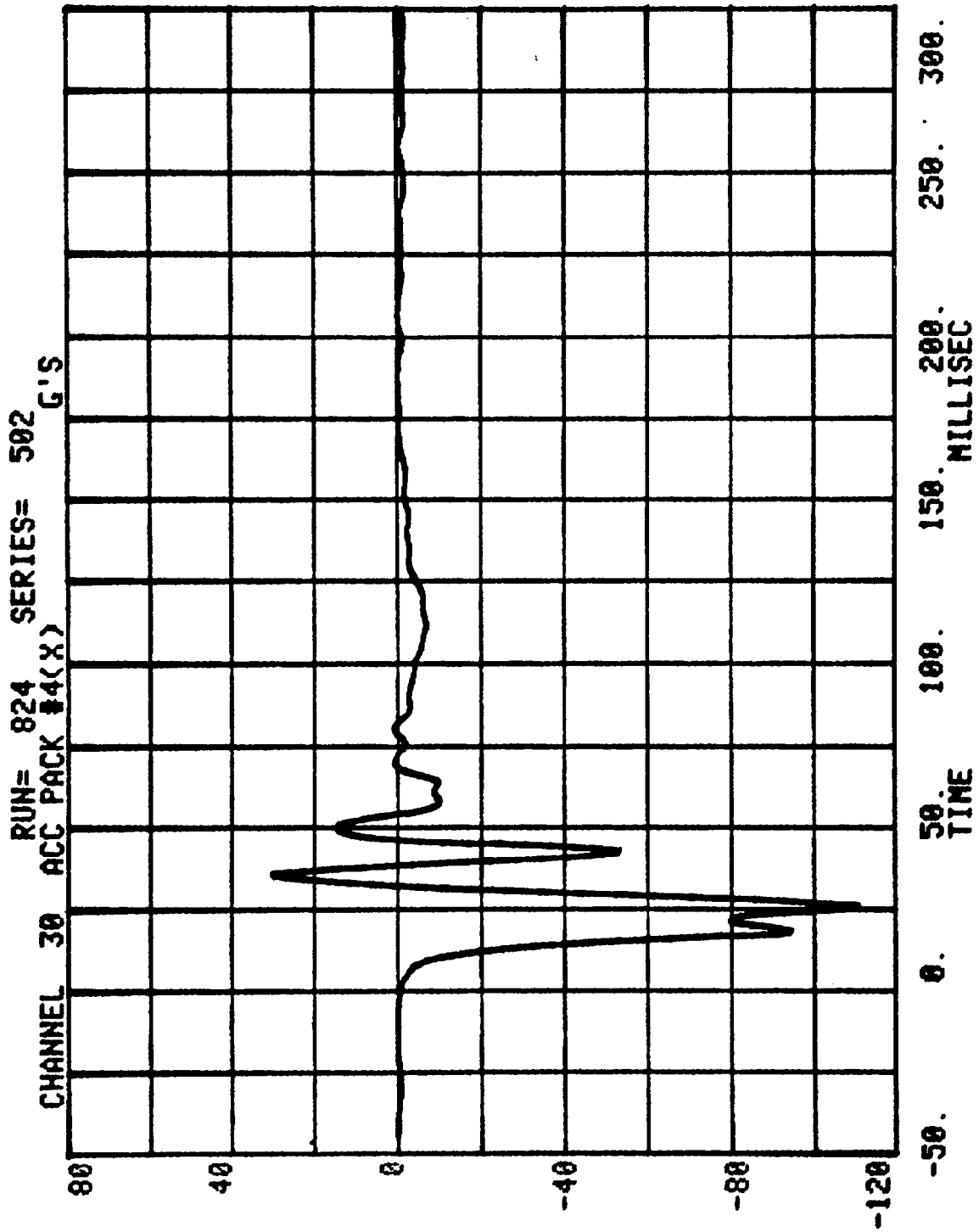
7626-17


ACC# 2 (X)
CHANNEL 4 DISPLACEMENT
RUN= 824 SERIES= 502
INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

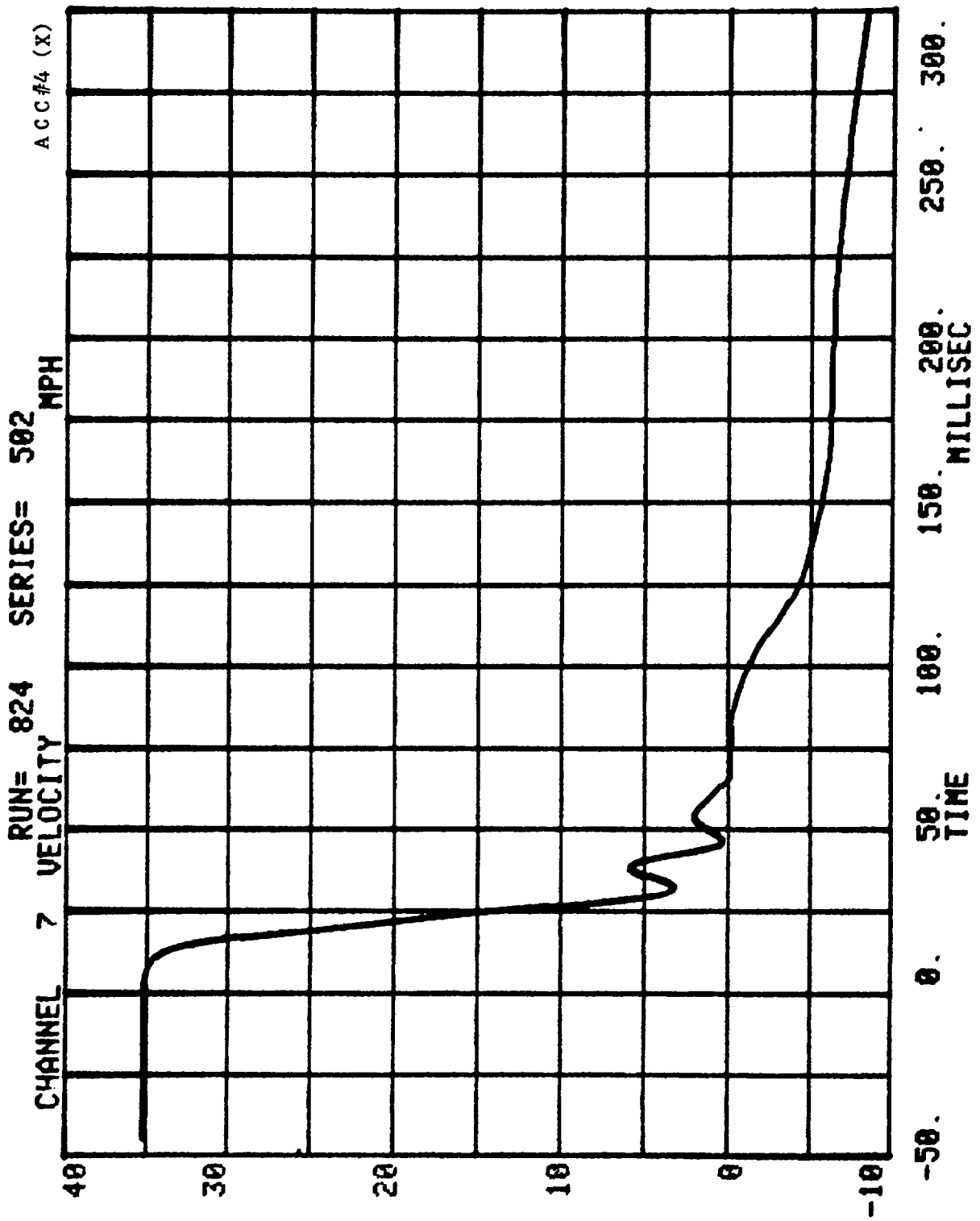
7626-17


CHANNEL 29 ACC PACK #3(X)
RUN= 824 SERIES= 502
G'S
200
120
40
-40
-120
-200
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

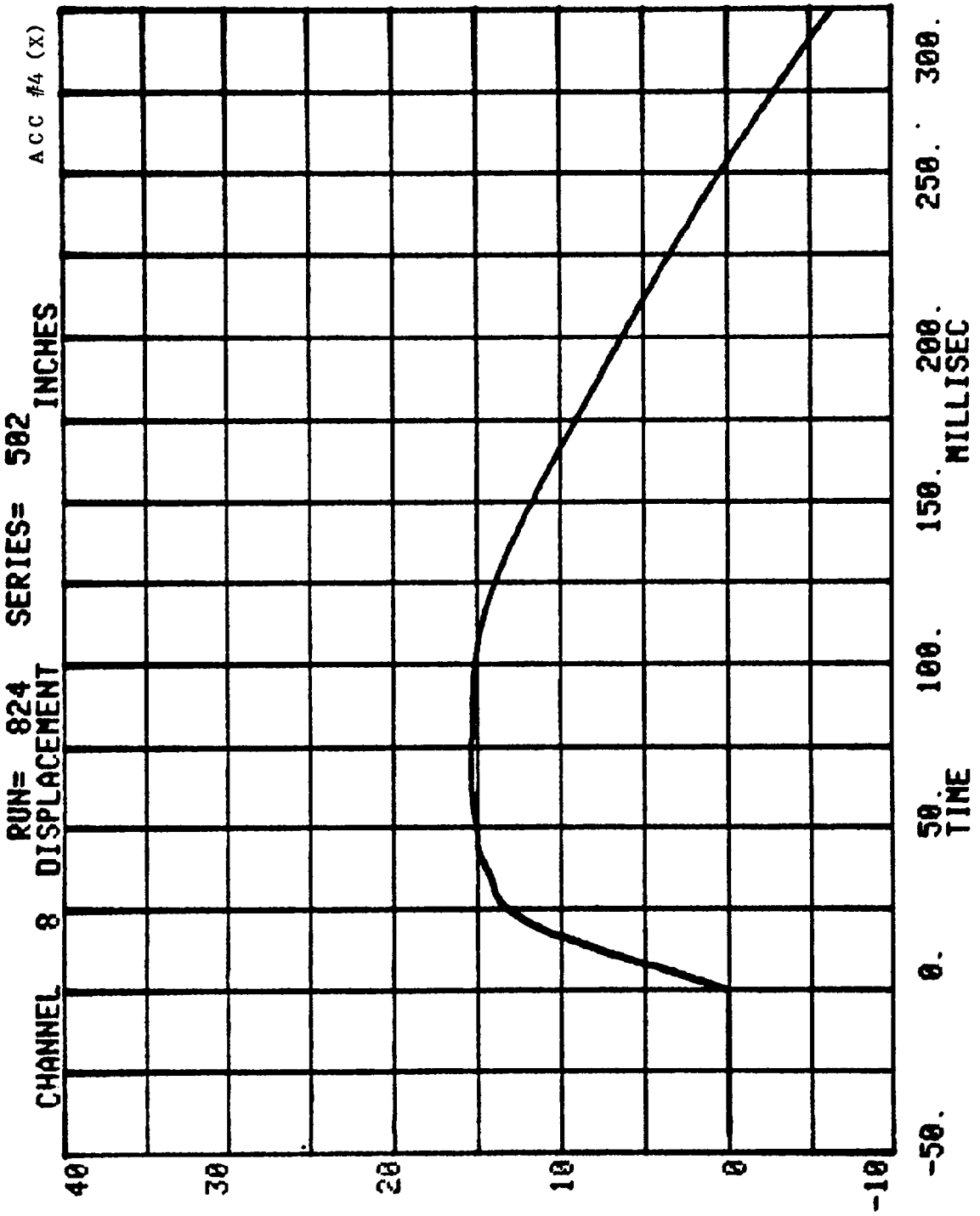
7626-17


CHANNEL 30 ACC PACK #4(X)
RUN= 824 SERIES= 502
G'S
80
40
0
-40
-80
-120
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

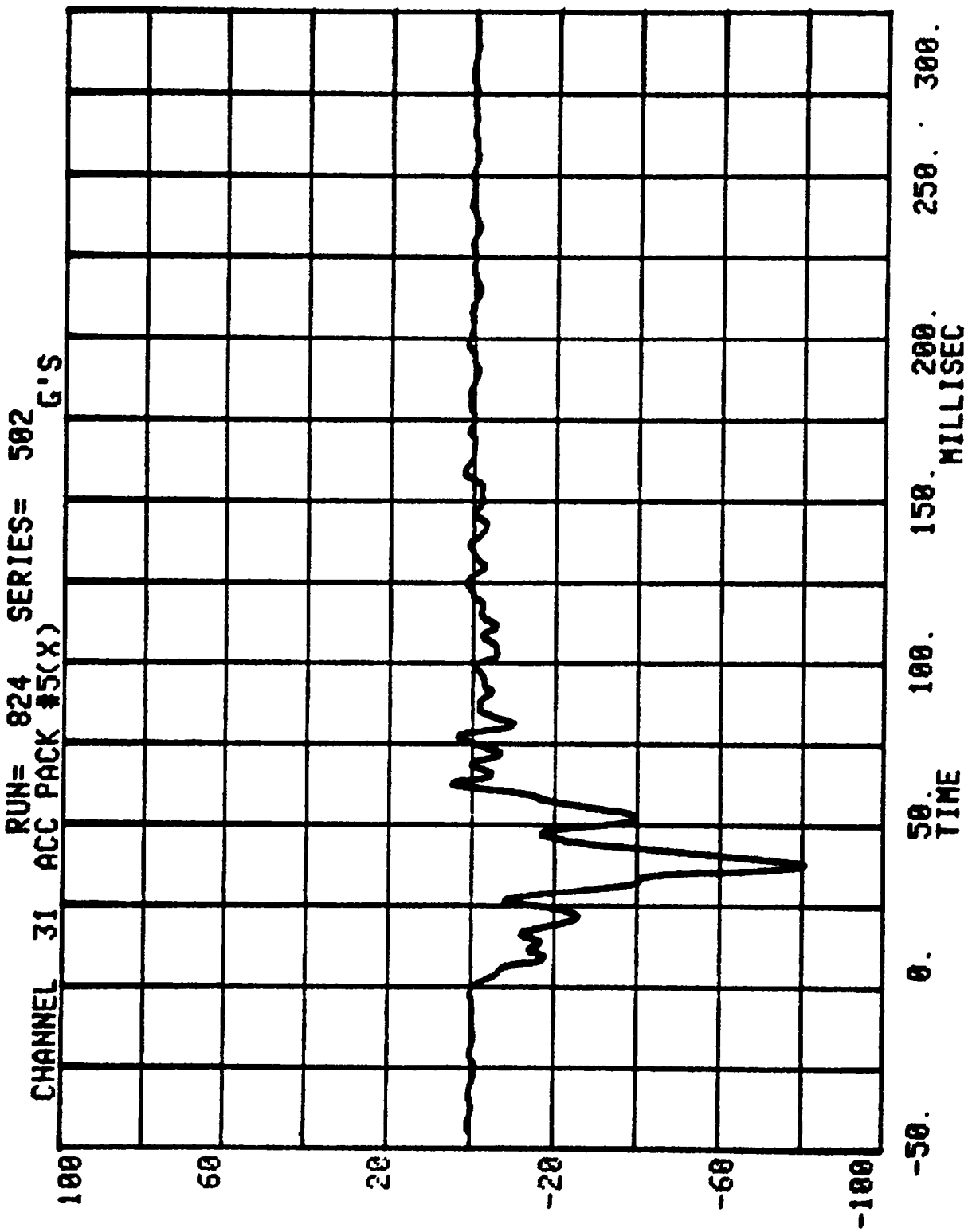
7626-17


ACC#4 (X)
CHANNEL 7 VELOCITY
RUN= 824 SERIES= 502
MPH
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

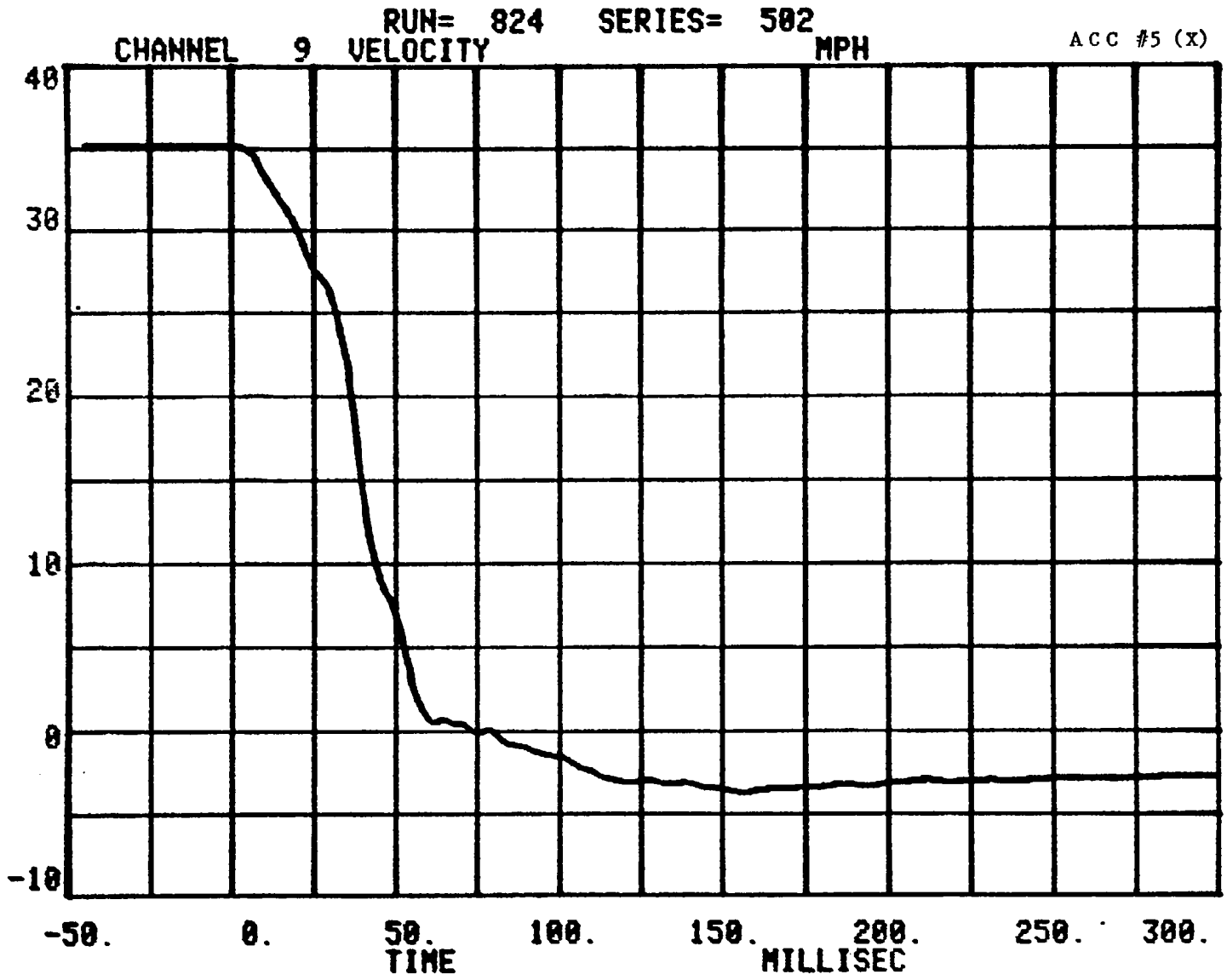
7626-17

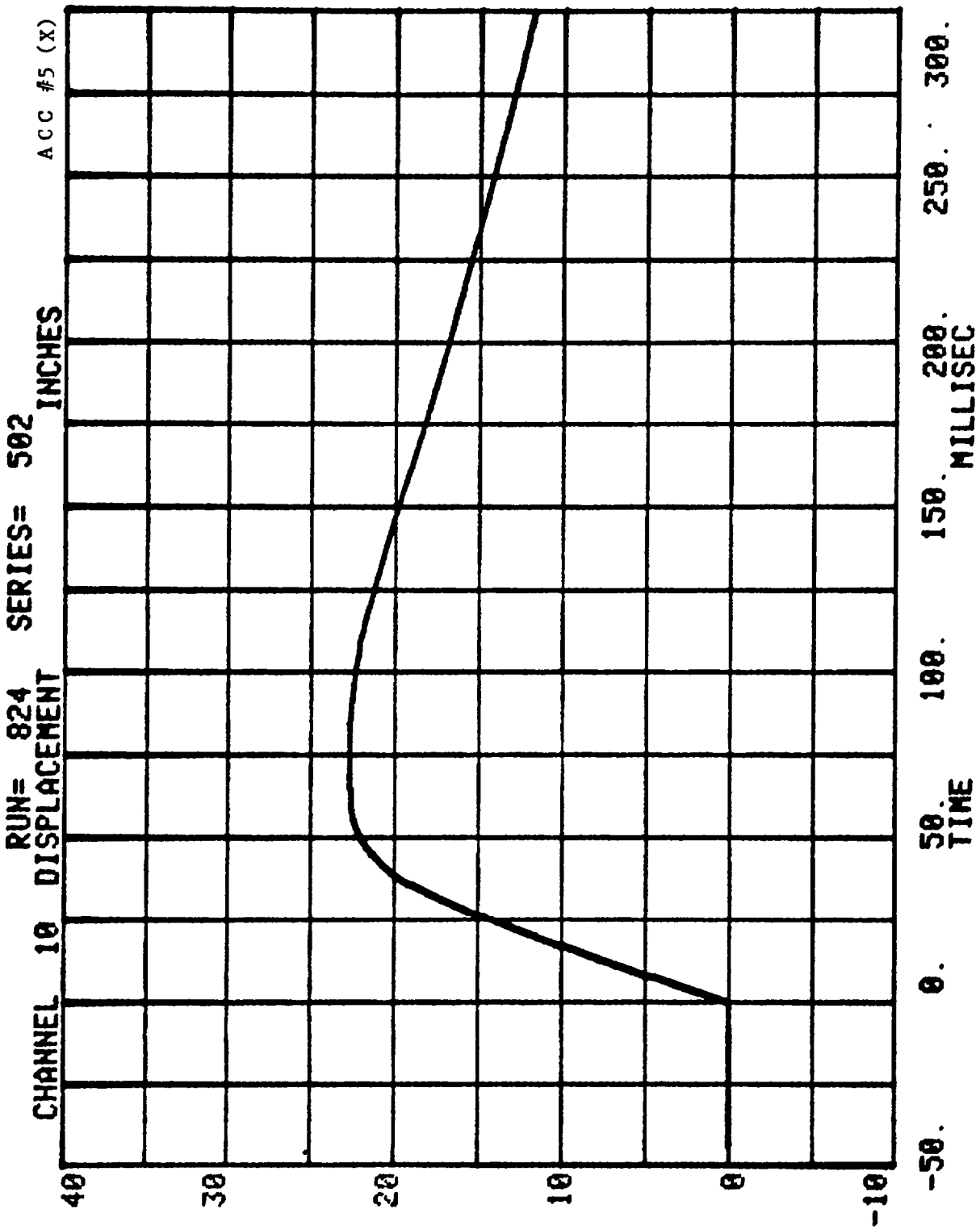

ACC #4 (X)
CHANNEL 8 DISPLACEMENT
RUN= 824 SERIES= 502
INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

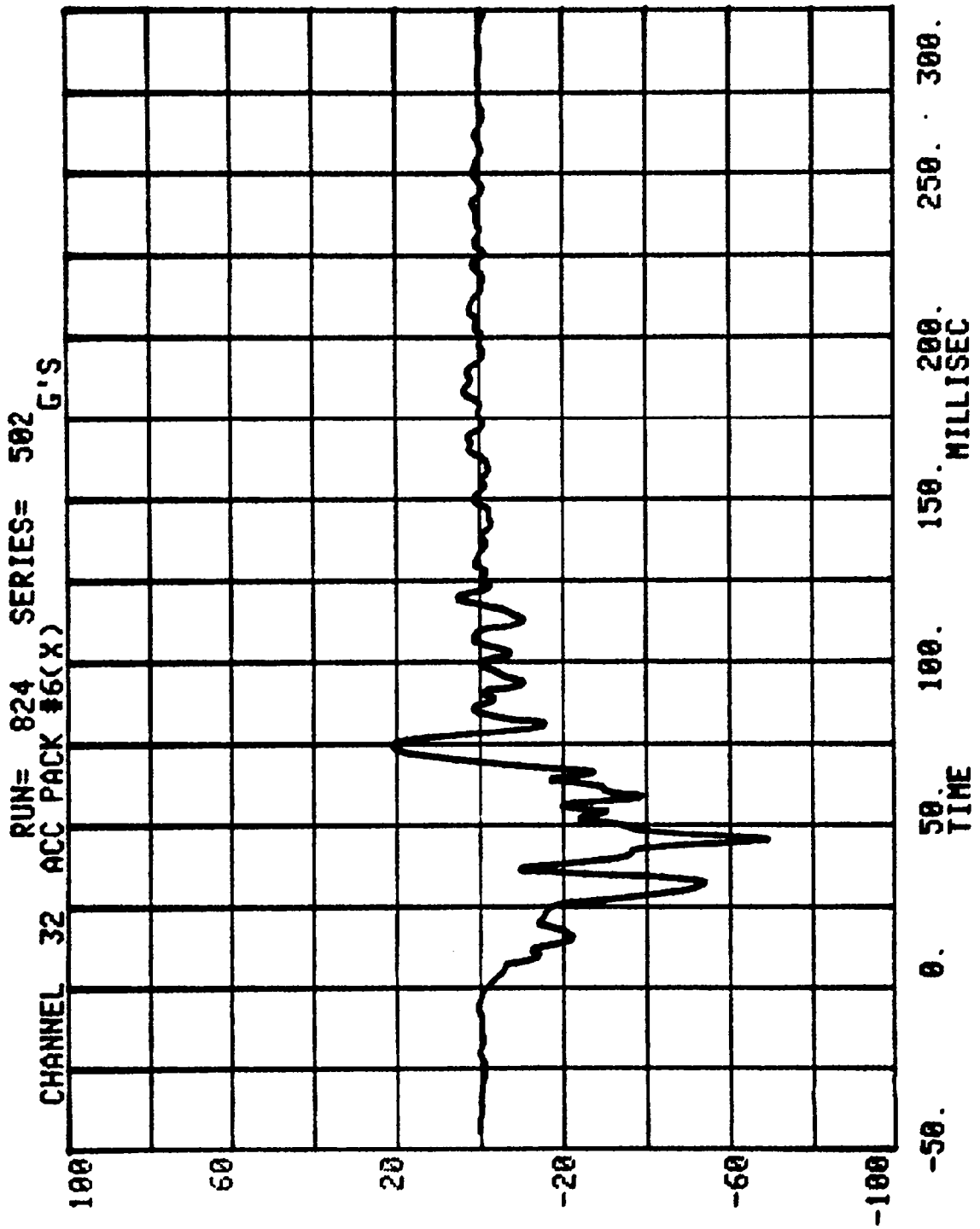

CHANNEL 31 ACC PACK #5(X)
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

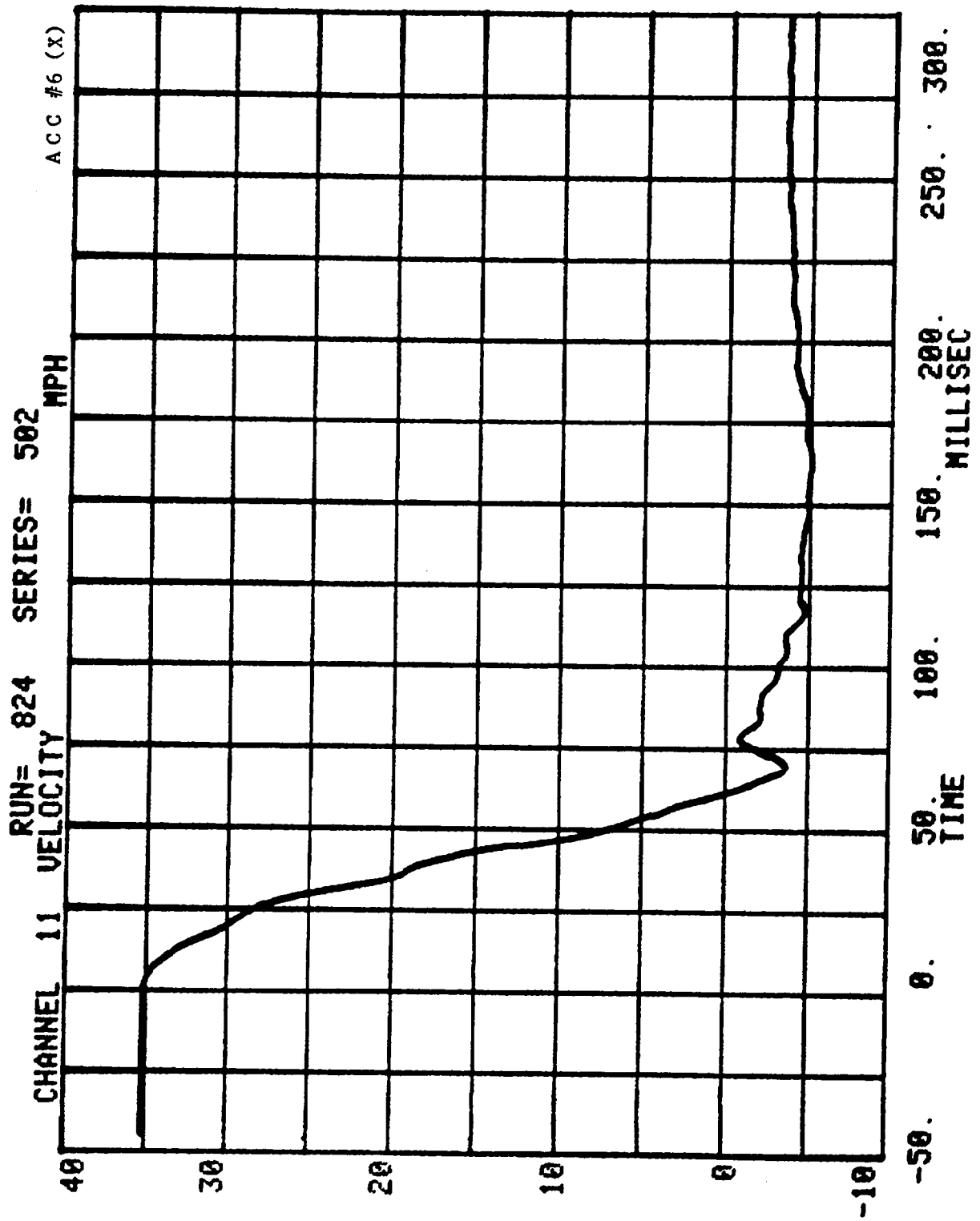

RUN= 824 SERIES= 502
CHANNEL 9 VELOCITY
MPH
ACC #5 (X)
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 10 DISPLACEMENT
RUN= 824 SERIES= 502
INCHES
ACC #5 (X)
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

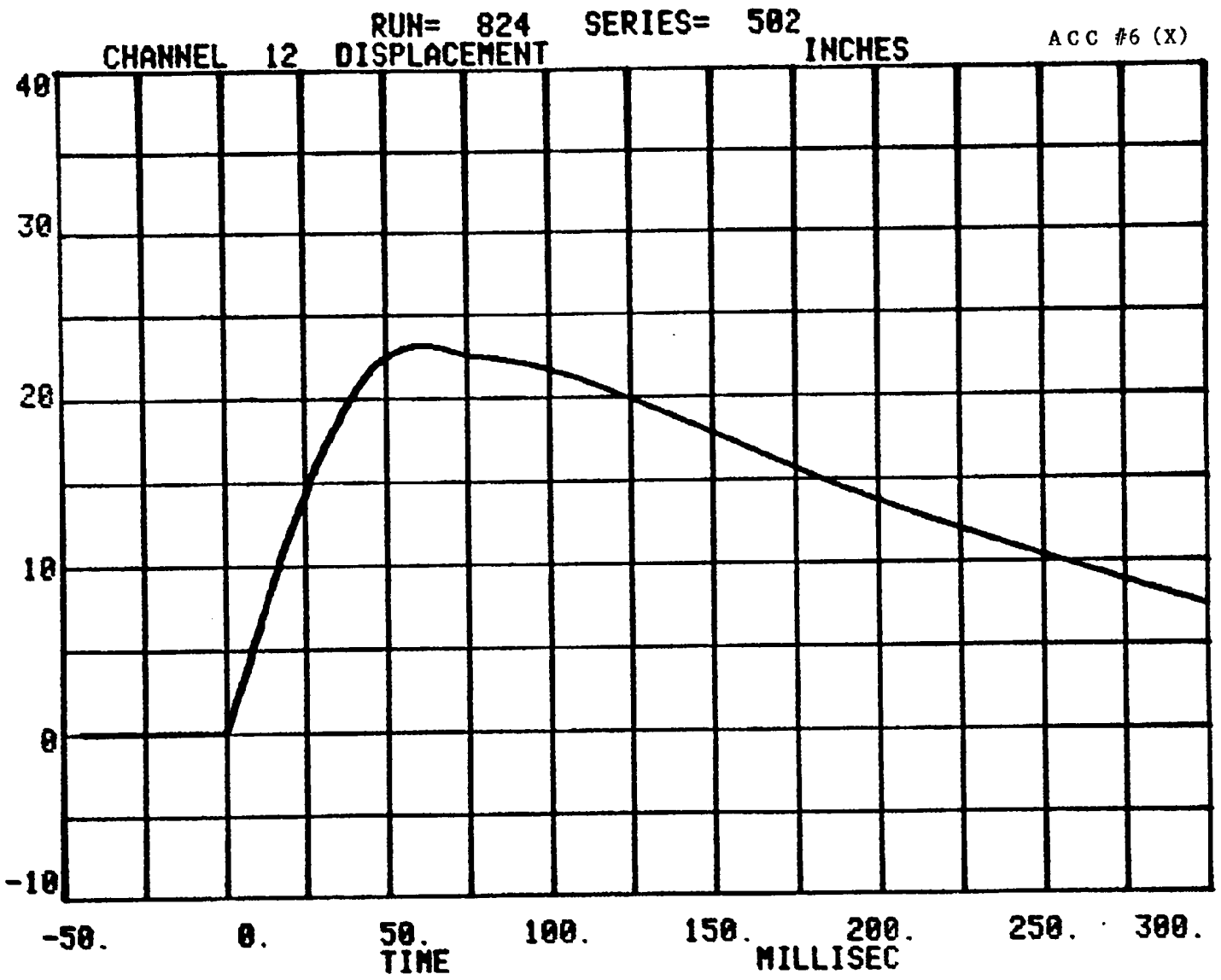
7626-17

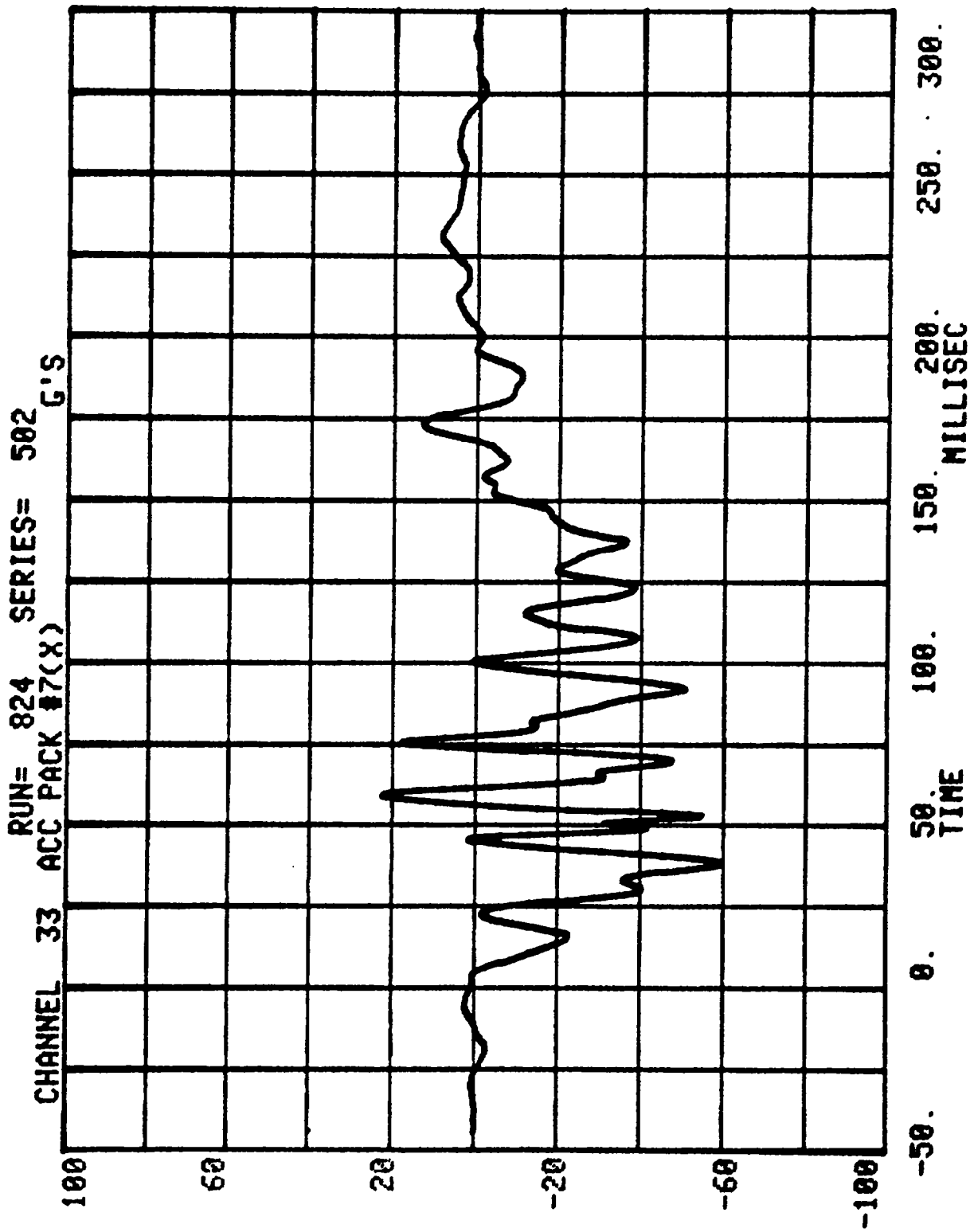

CHANNEL 32 ACC PACK #6(X)
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

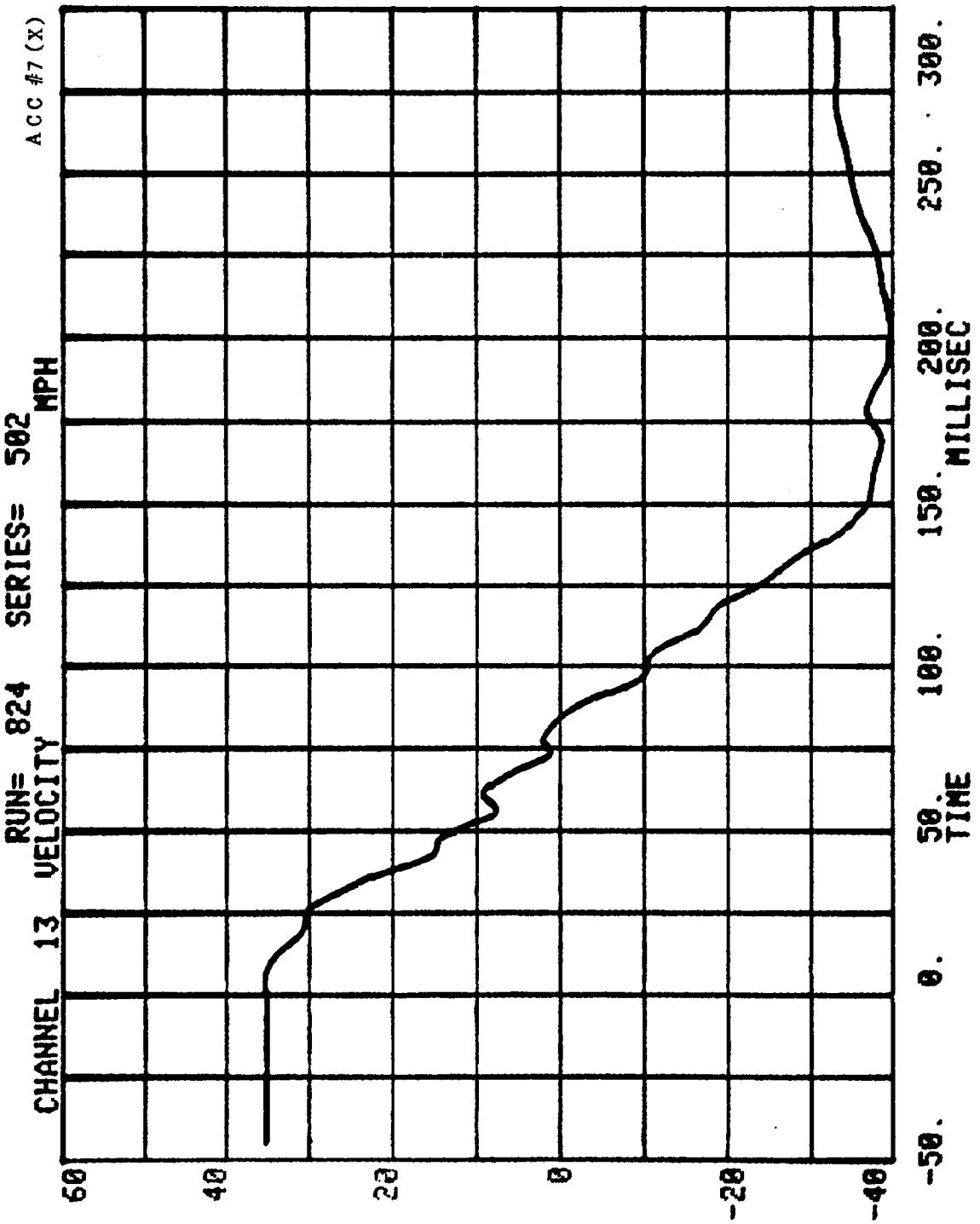

ACC #6 (X)
CHANNEL 11 VELOCITY
RUN= 824 SERIES= 502
MPH
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

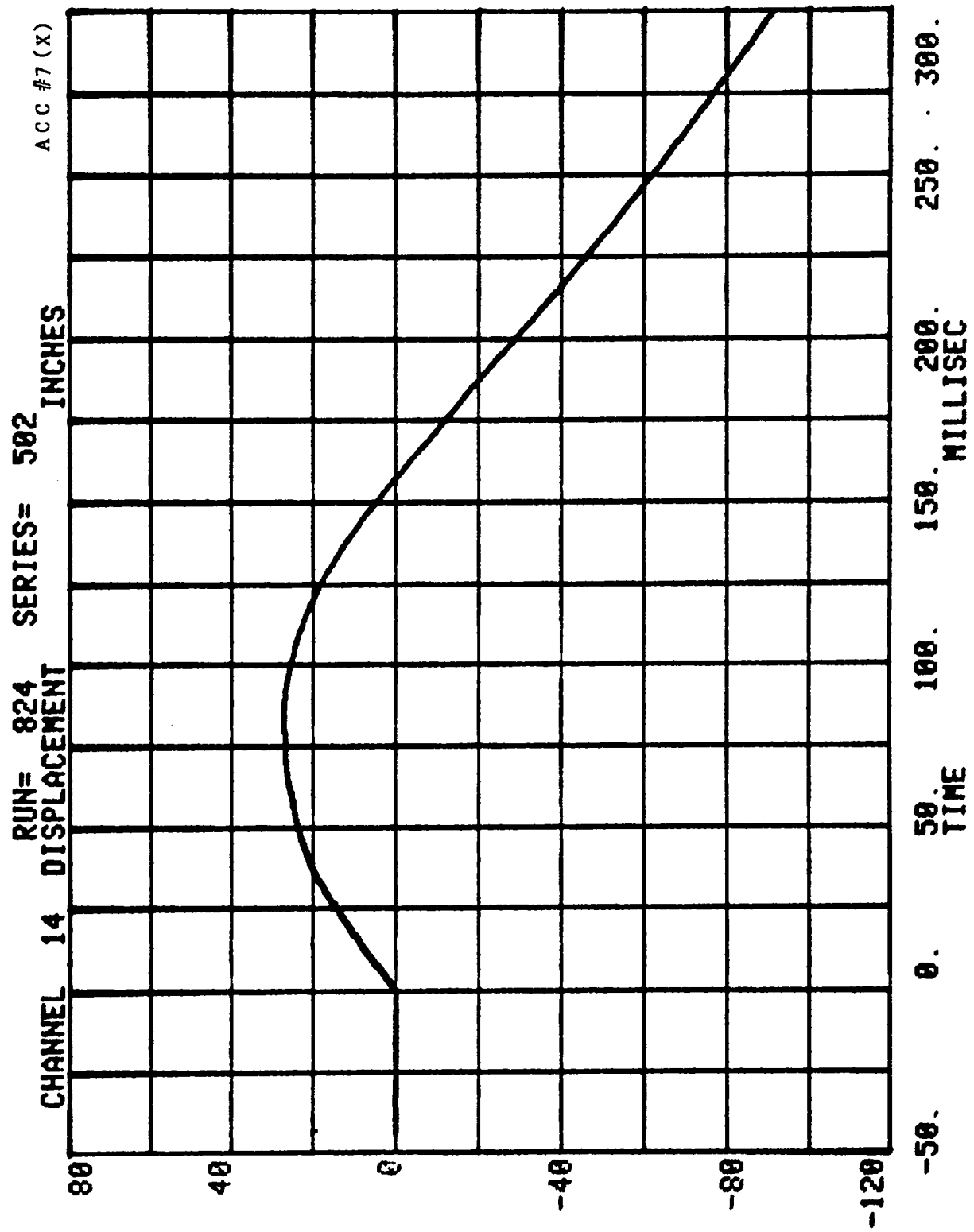

RUN= 824 SERIES= 502
CHANNEL 12 DISPLACEMENT INCHES
ACC #6 (X)
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME MILLISEC


CHANNEL 33 ACC PACK #7(X)
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17


ACC #7 (X)
CHANNEL 13 VELOCITY
RUN= 824 SERIES= 502 MPH
60
40
20
0
-20
-40
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

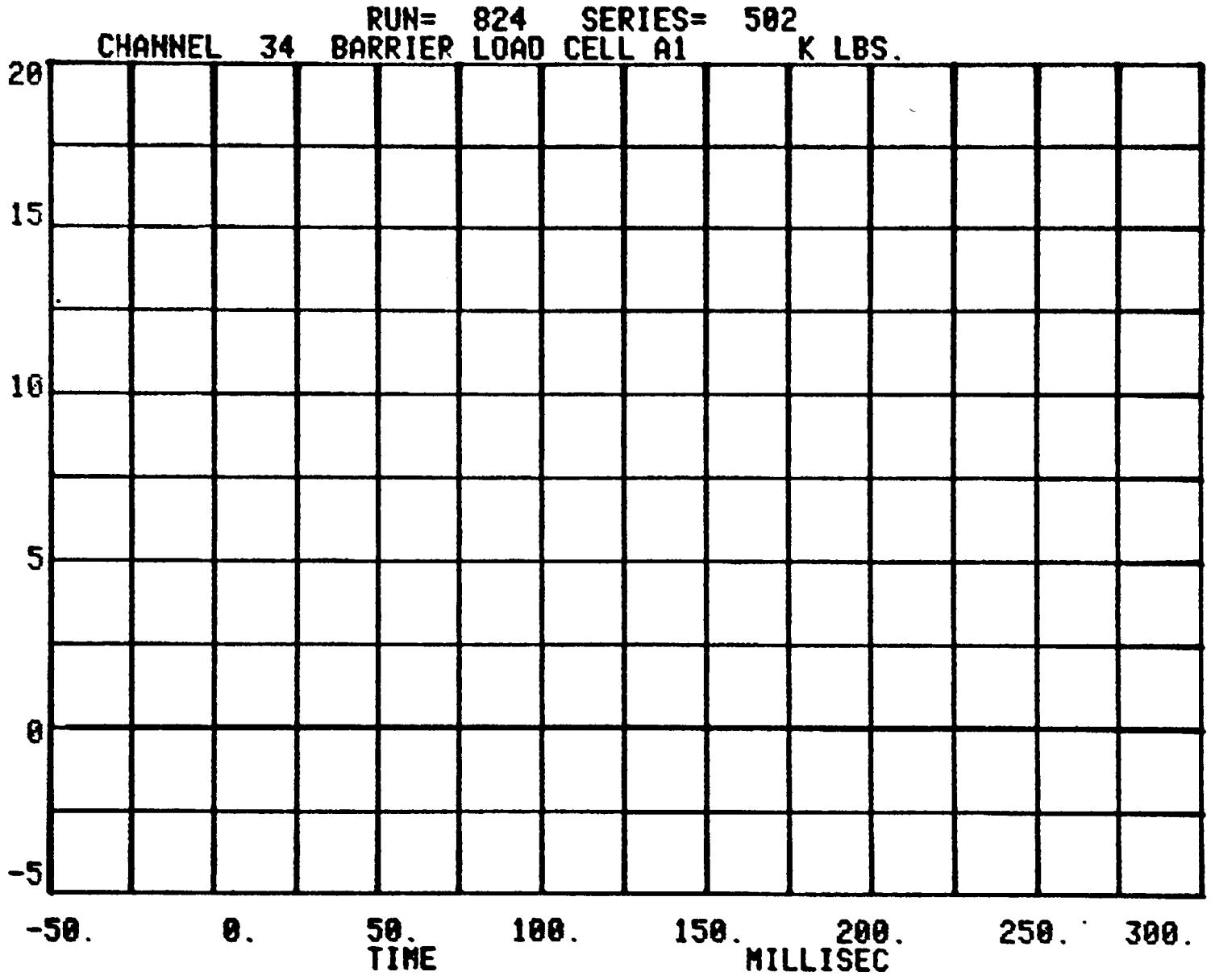

ACC #7 (X)
CHANNEL 14 DISPLACEMENT
RUN= 824 SERIES= 502
INCHES
80
40
0
-40
-80
-120
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

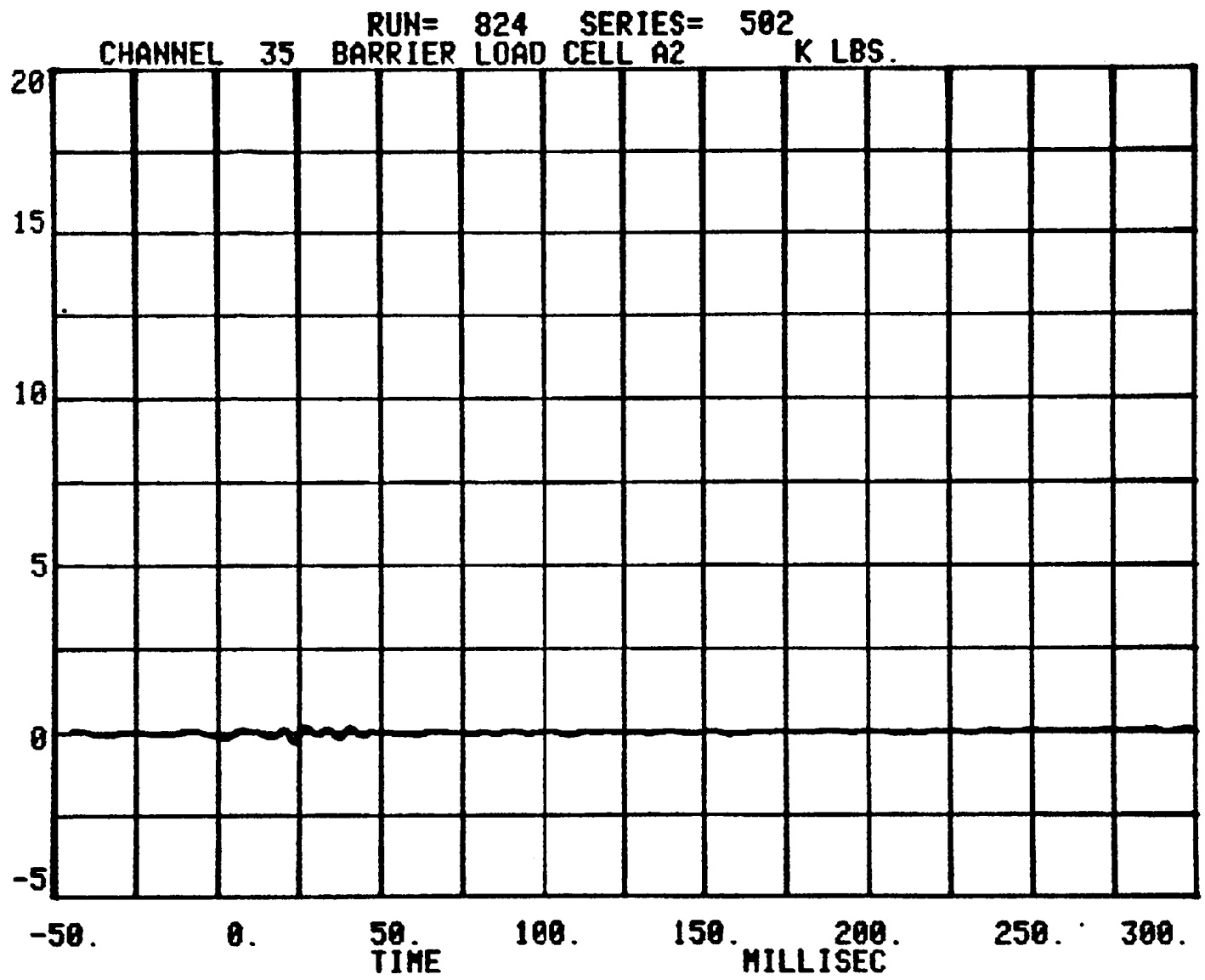
TEST NO. MJ0502

LOAD CELL BARRIER DATA

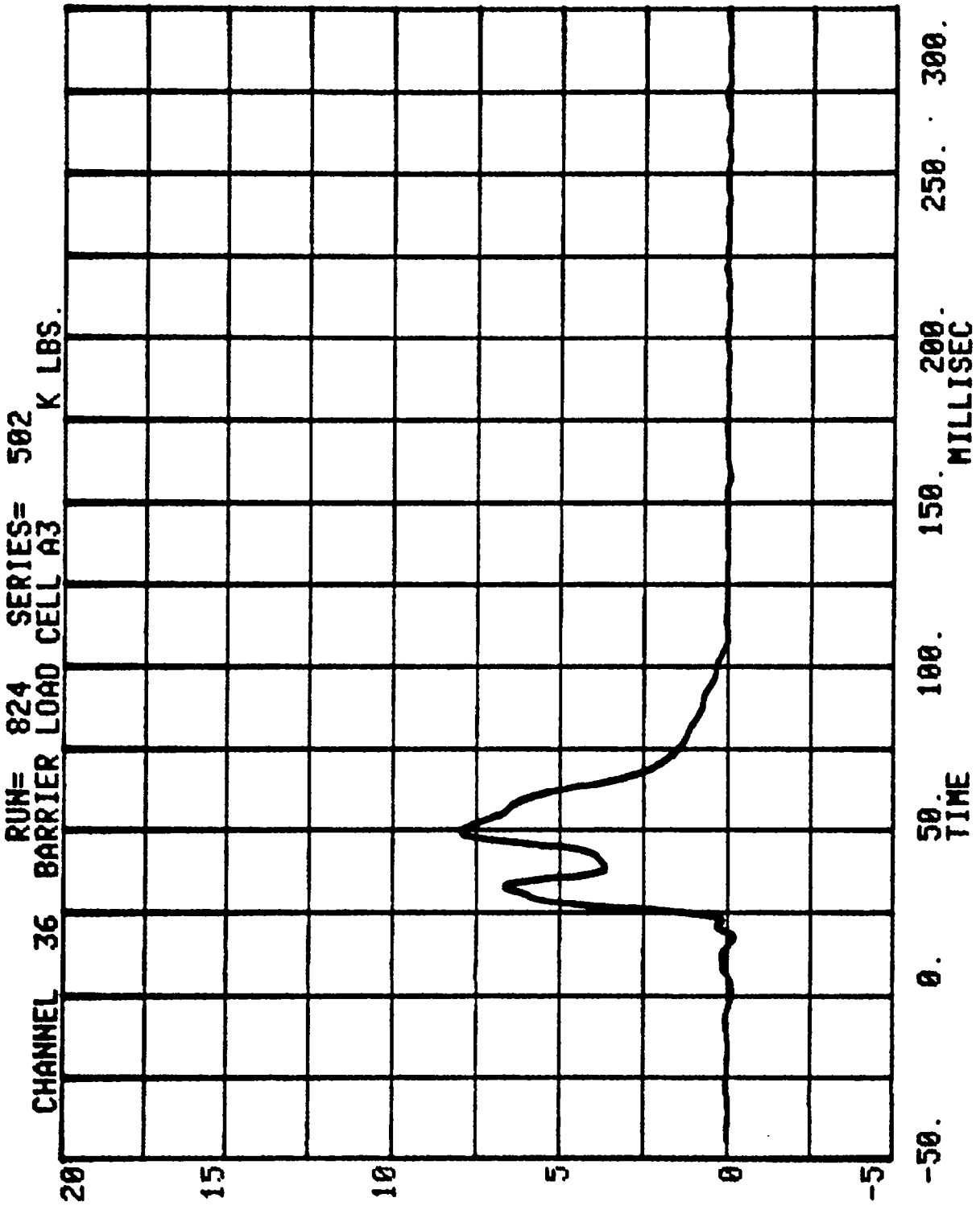
FILTER CHANNEL CLASS

60

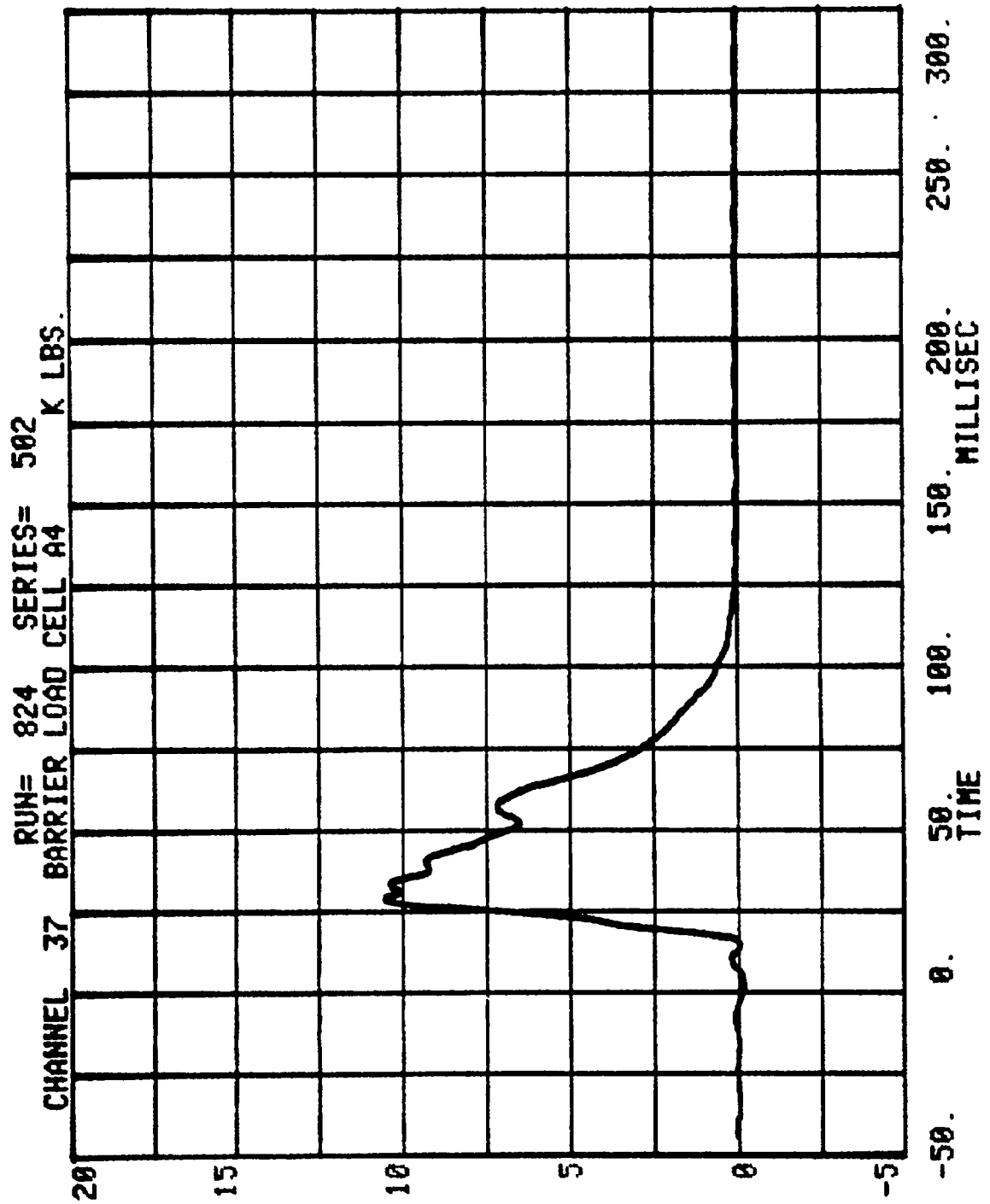

RUN= 824 SERIES= 502
CHANNEL 34 BARRIER LOAD CELL A1 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 824 SERIES= 502
CHANNEL 35 BARRIER LOAD CELL A2
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

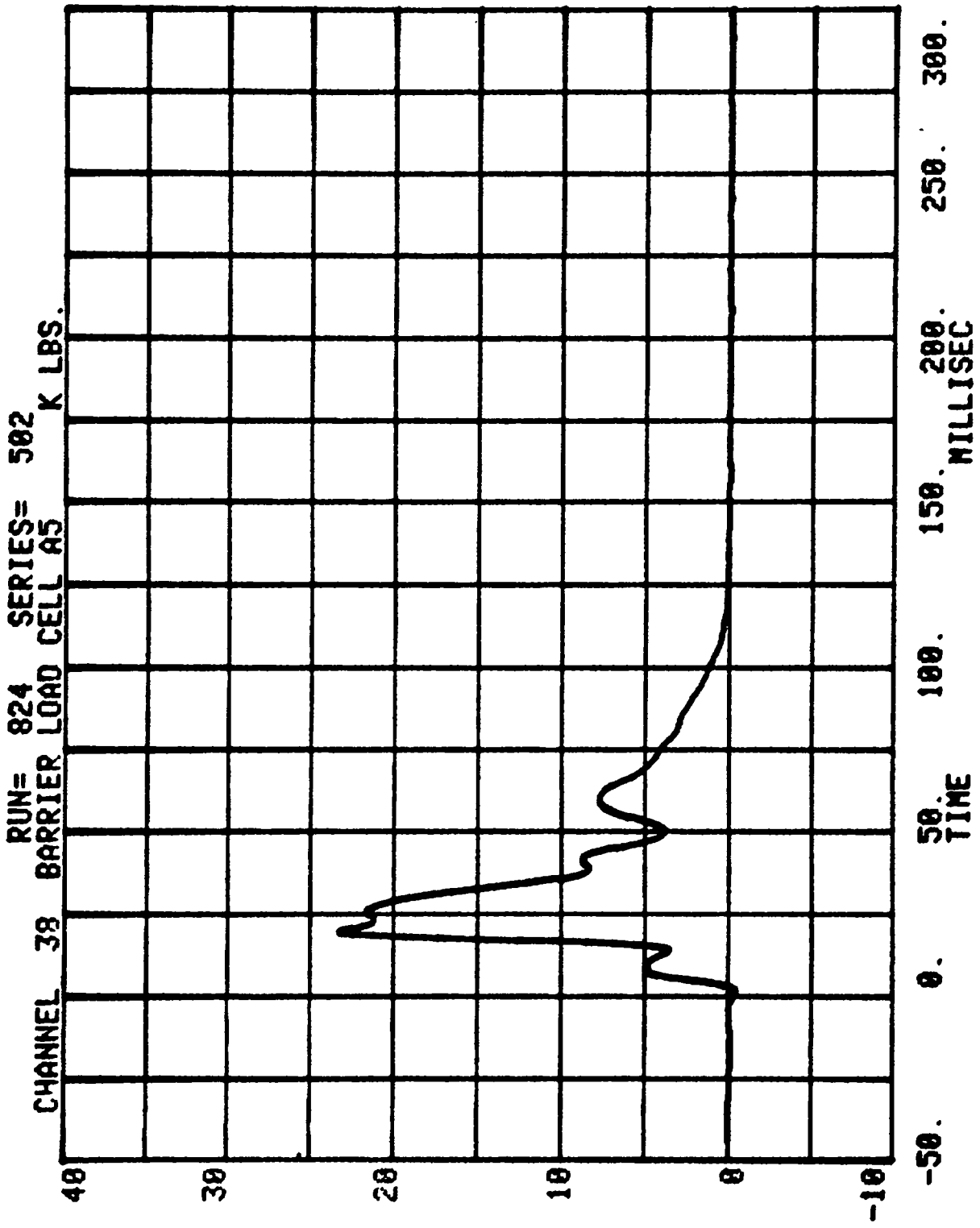
7626-17

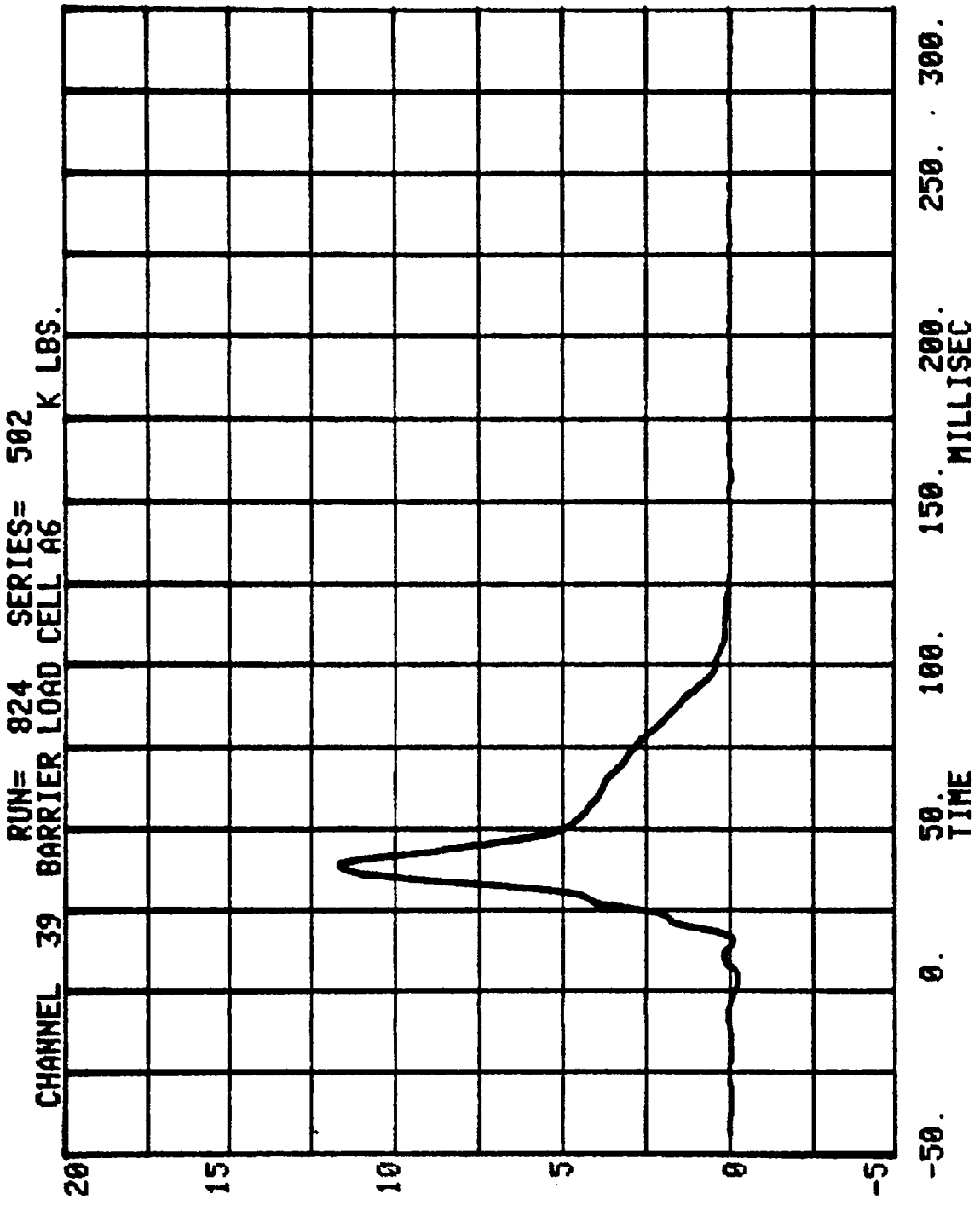

CHANNEL 36 BARRIER LOAD CELL A3
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

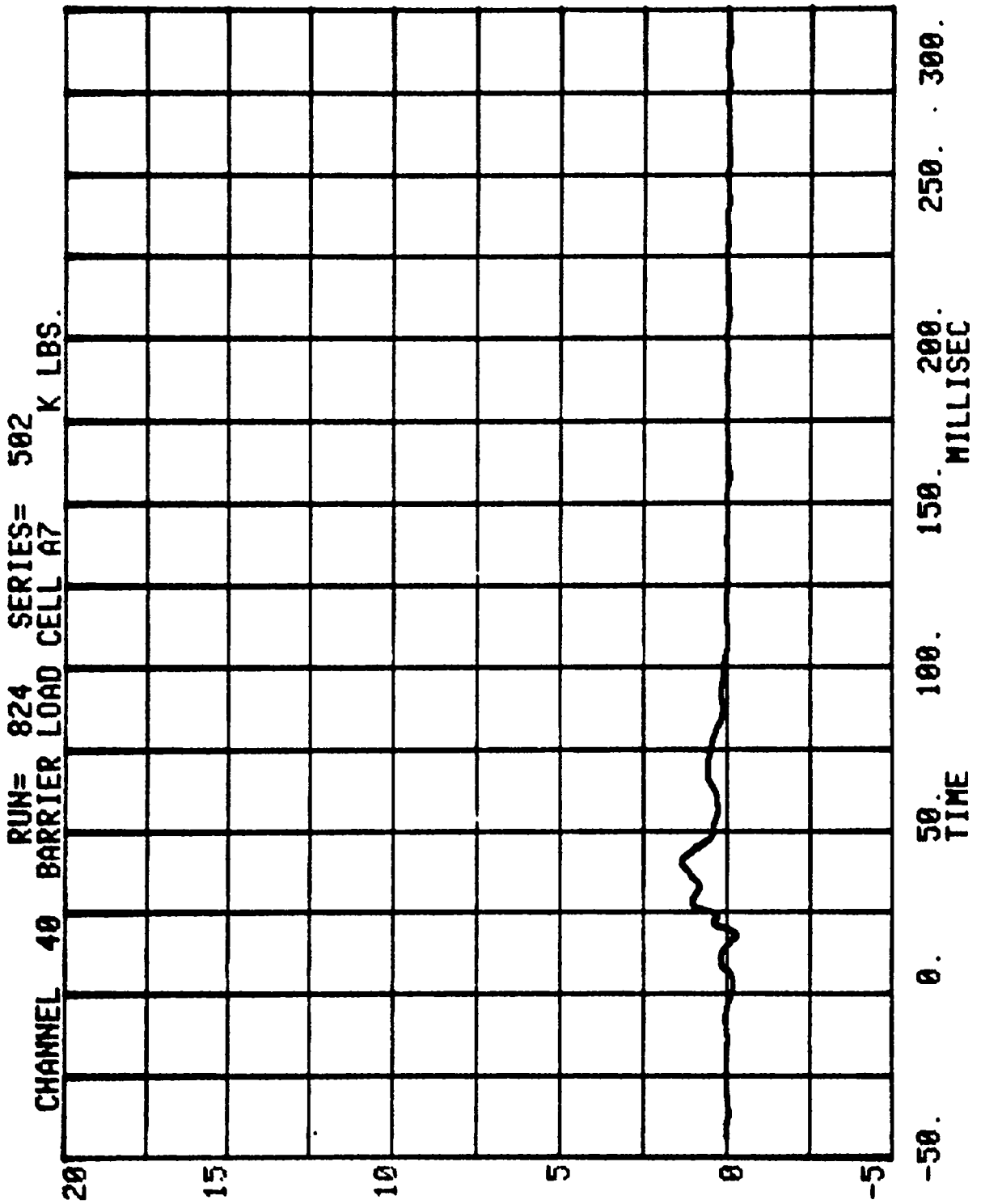

CHANNEL 37 BARRIER LOAD CELL A4
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

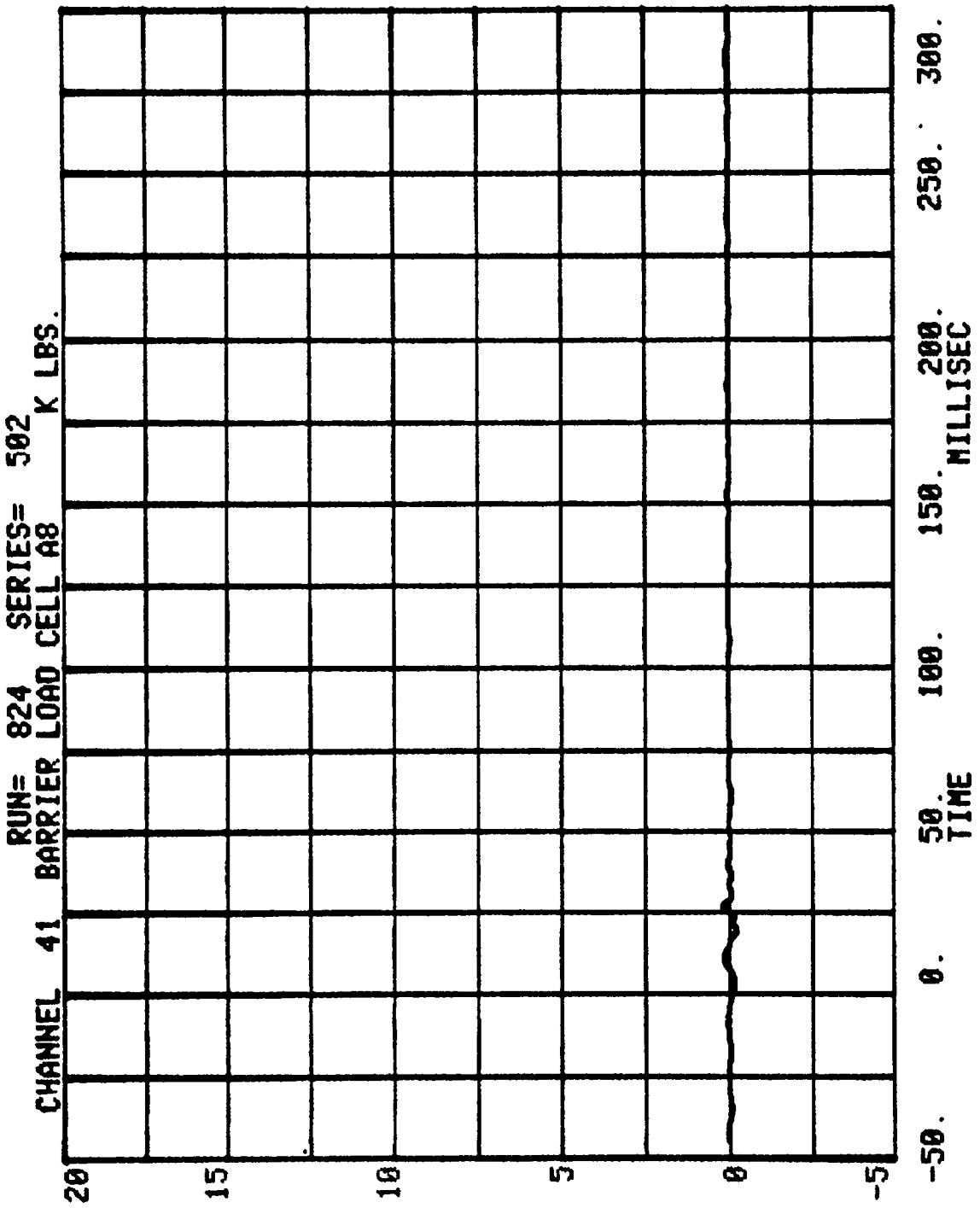

CHANNEL 39 BARRIER LOAD CELL A5
RUN= 824 SERIES= 502
K LBS.
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 39 BARRIER LOAD CELL A6
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

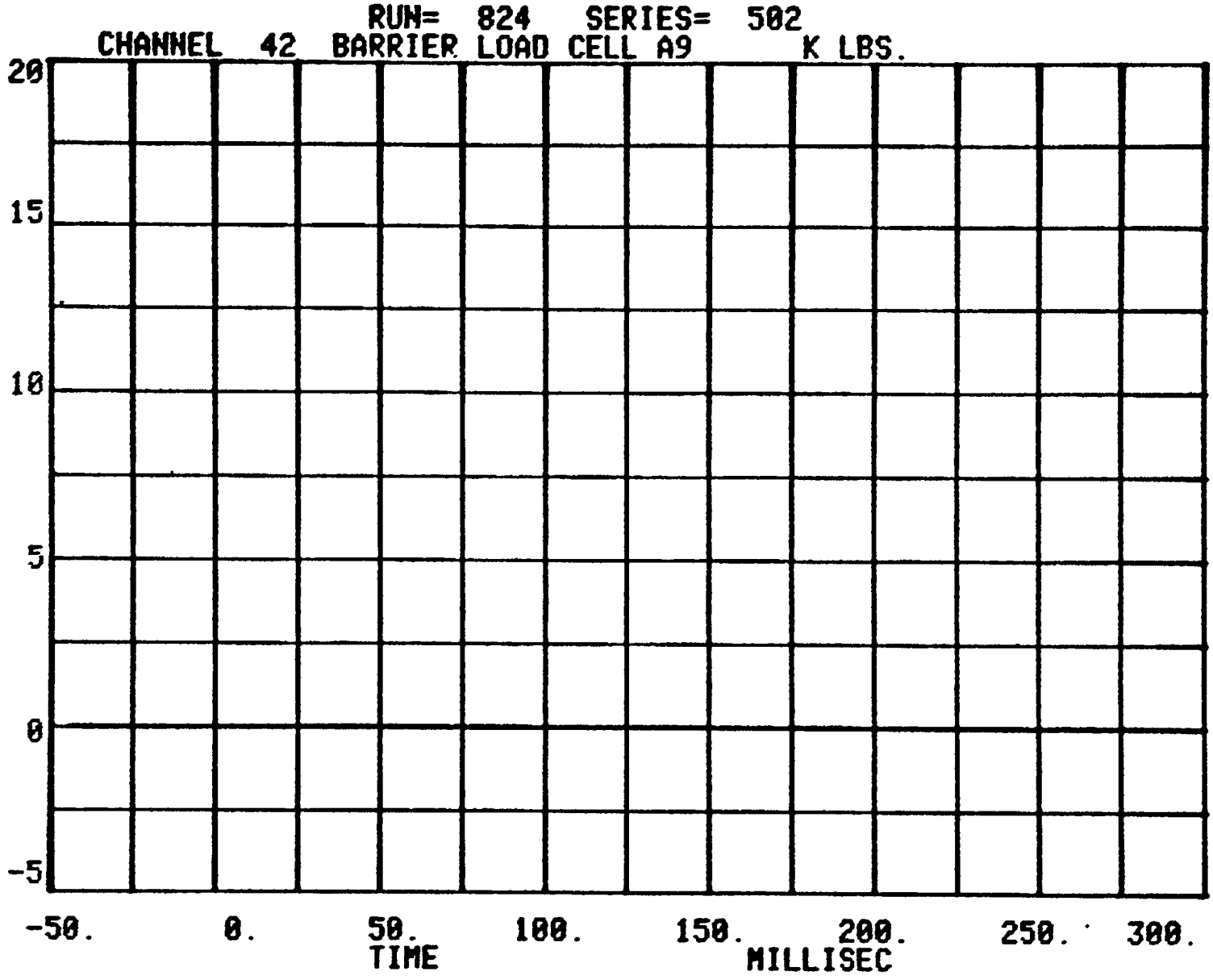
7626-17

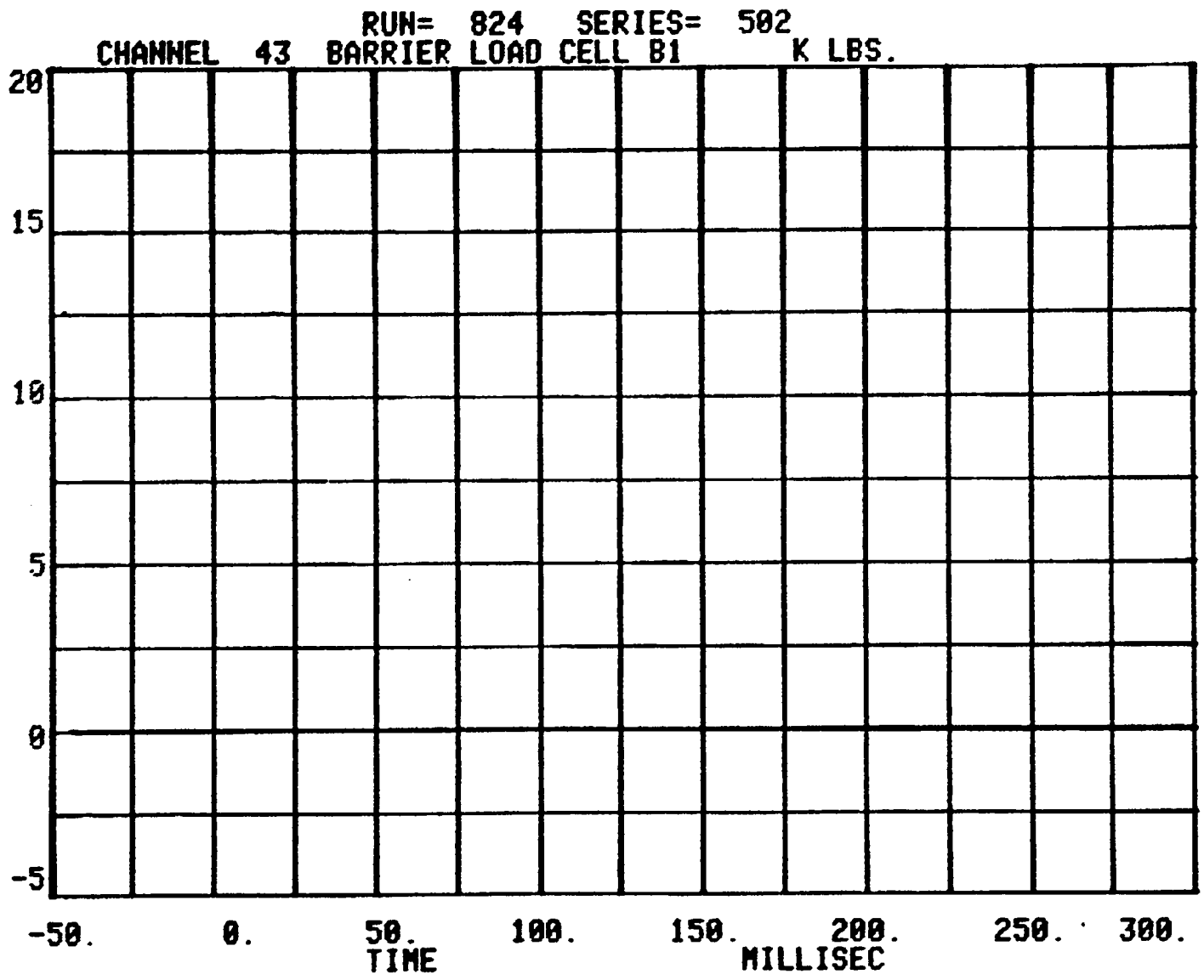

CHANNEL 40 BARRIER LOAD CELL A7
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

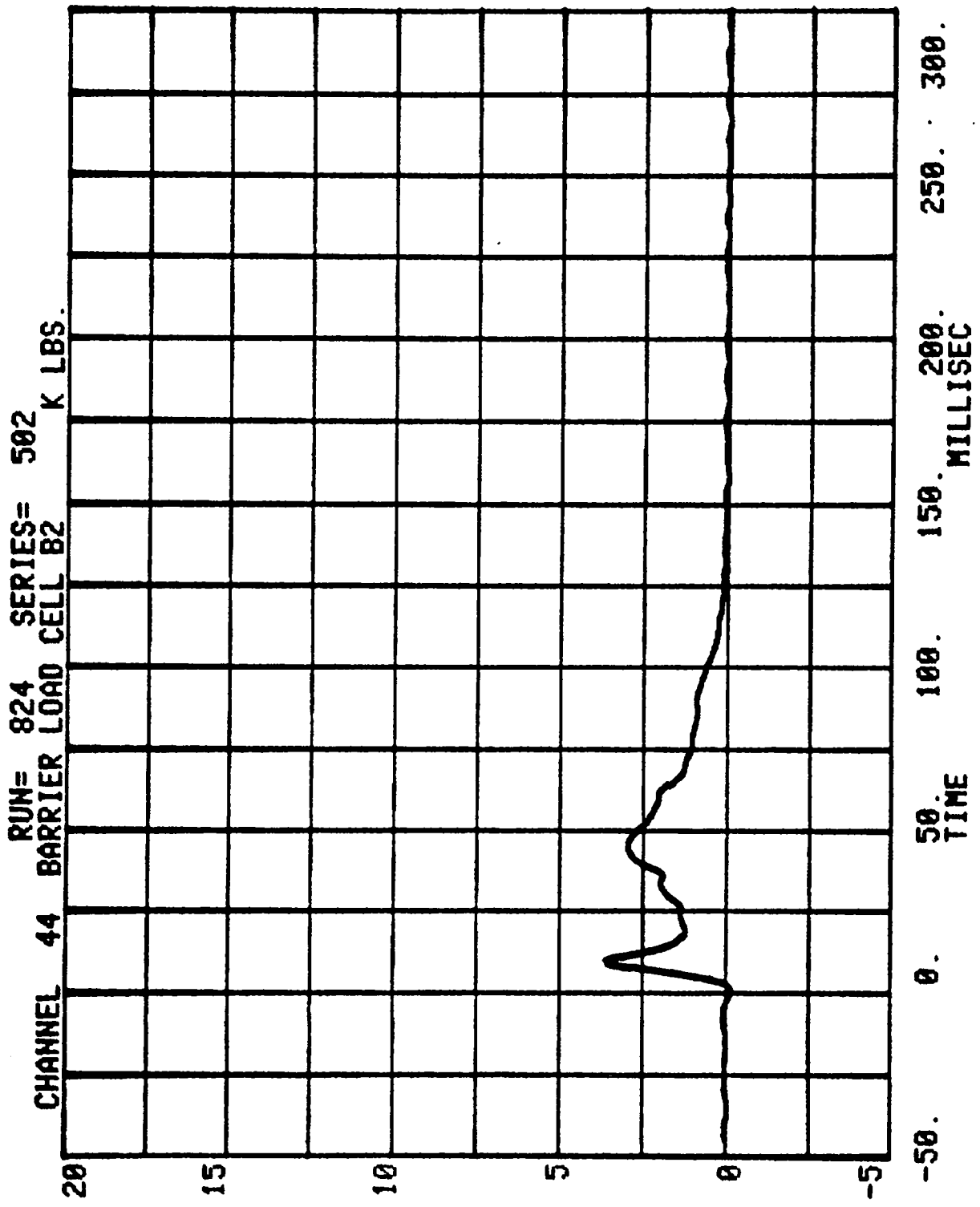

CHANNEL 41 BARRIER LOAD CELL A8
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

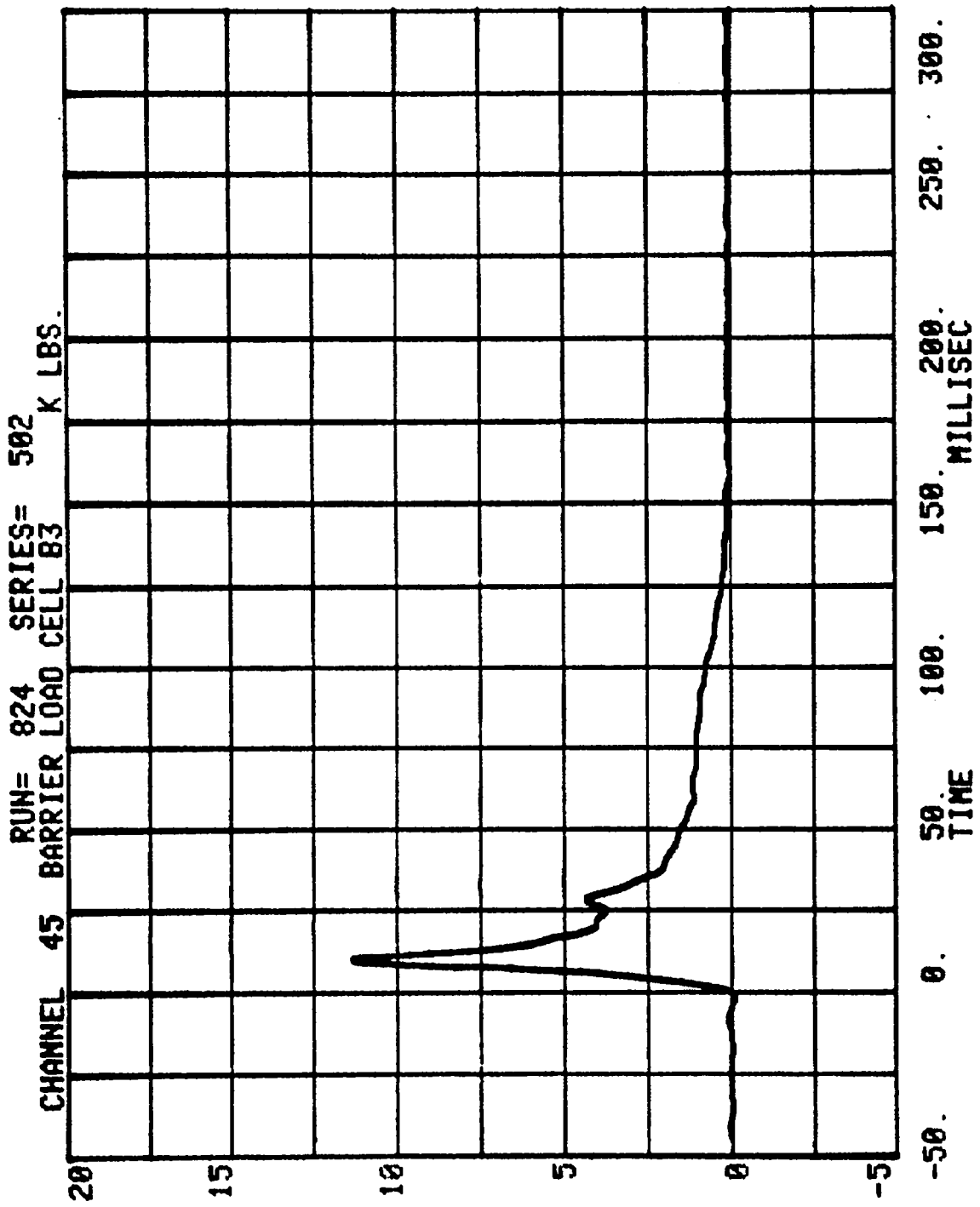
7626-17


RUN= 824 SERIES= 502
CHANNEL 42 BARRIER LOAD CELL A9 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

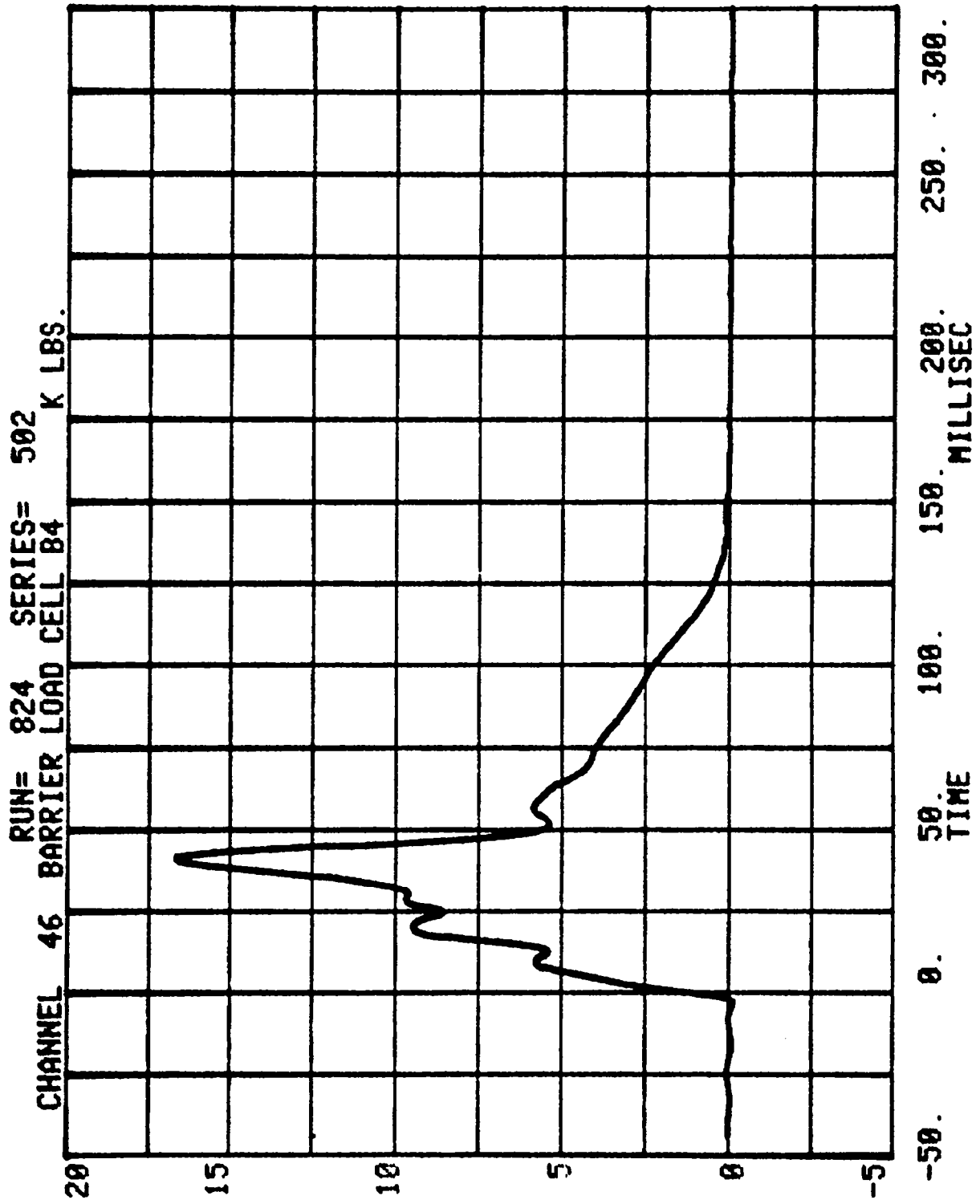

RUN= 824 SERIES= 502
CHANNEL 43 BARRIER LOAD CELL B1 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

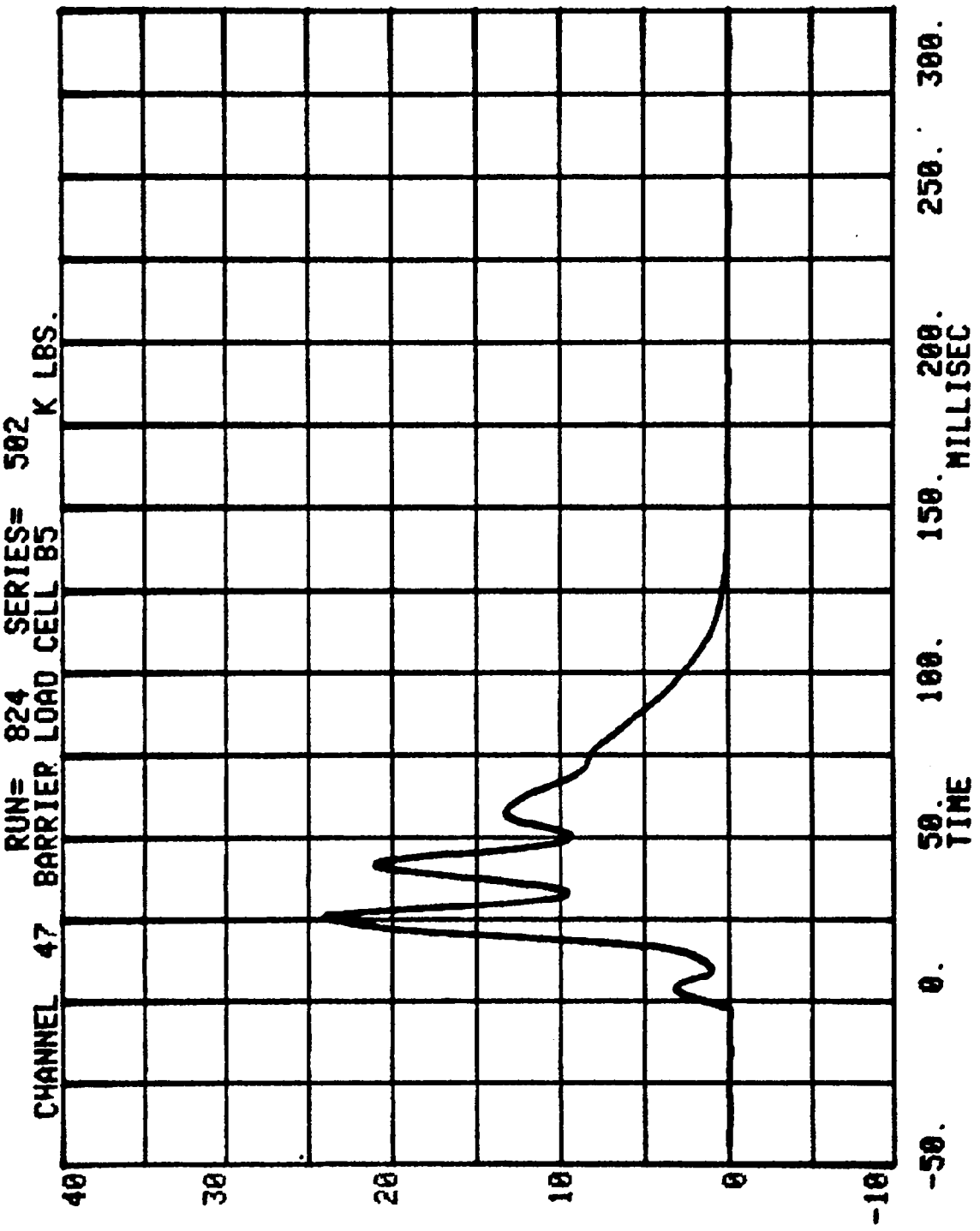

CHANNEL 44 BARRIER LOAD CELL B2
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

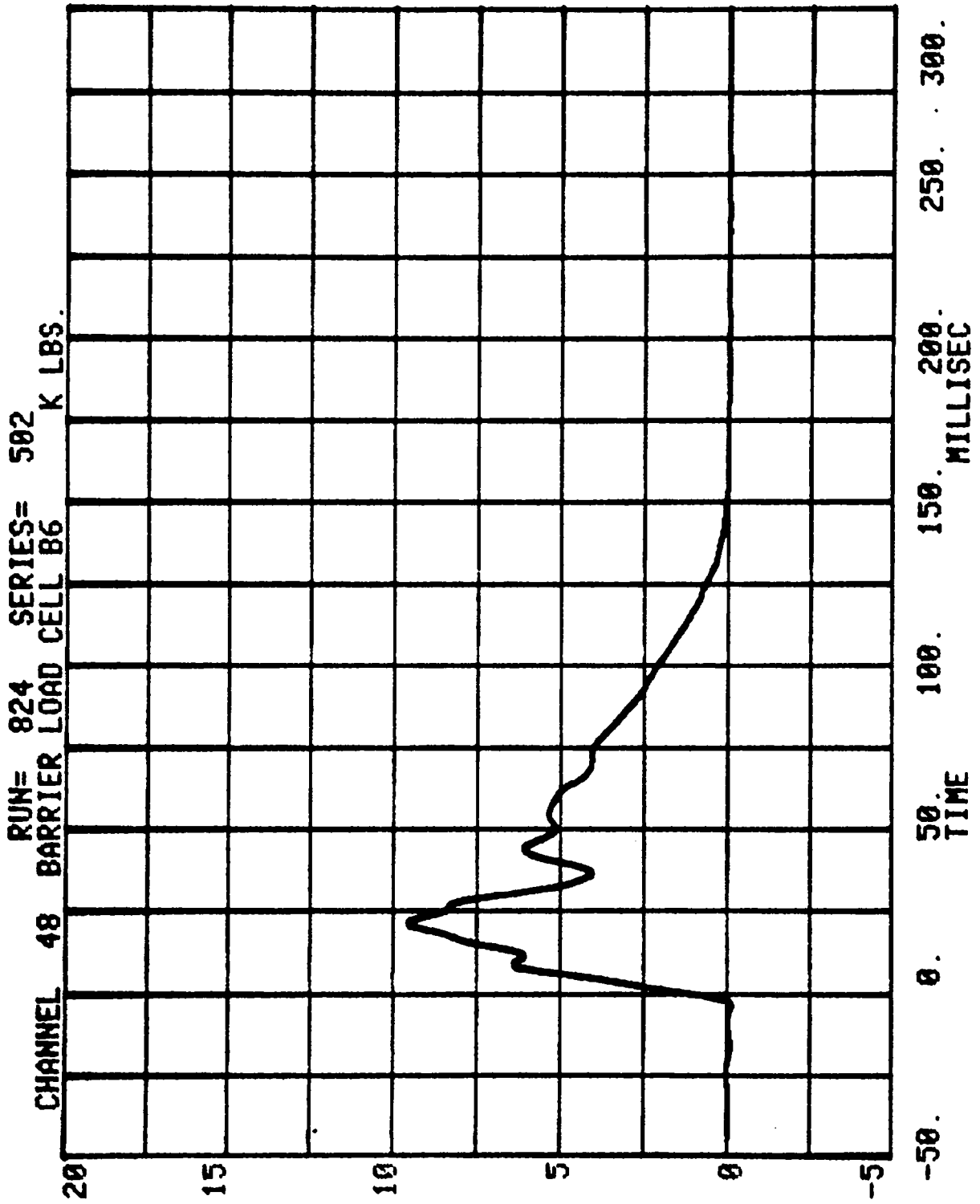

CHANNEL 45 BARRIER LOAD CELL 83
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

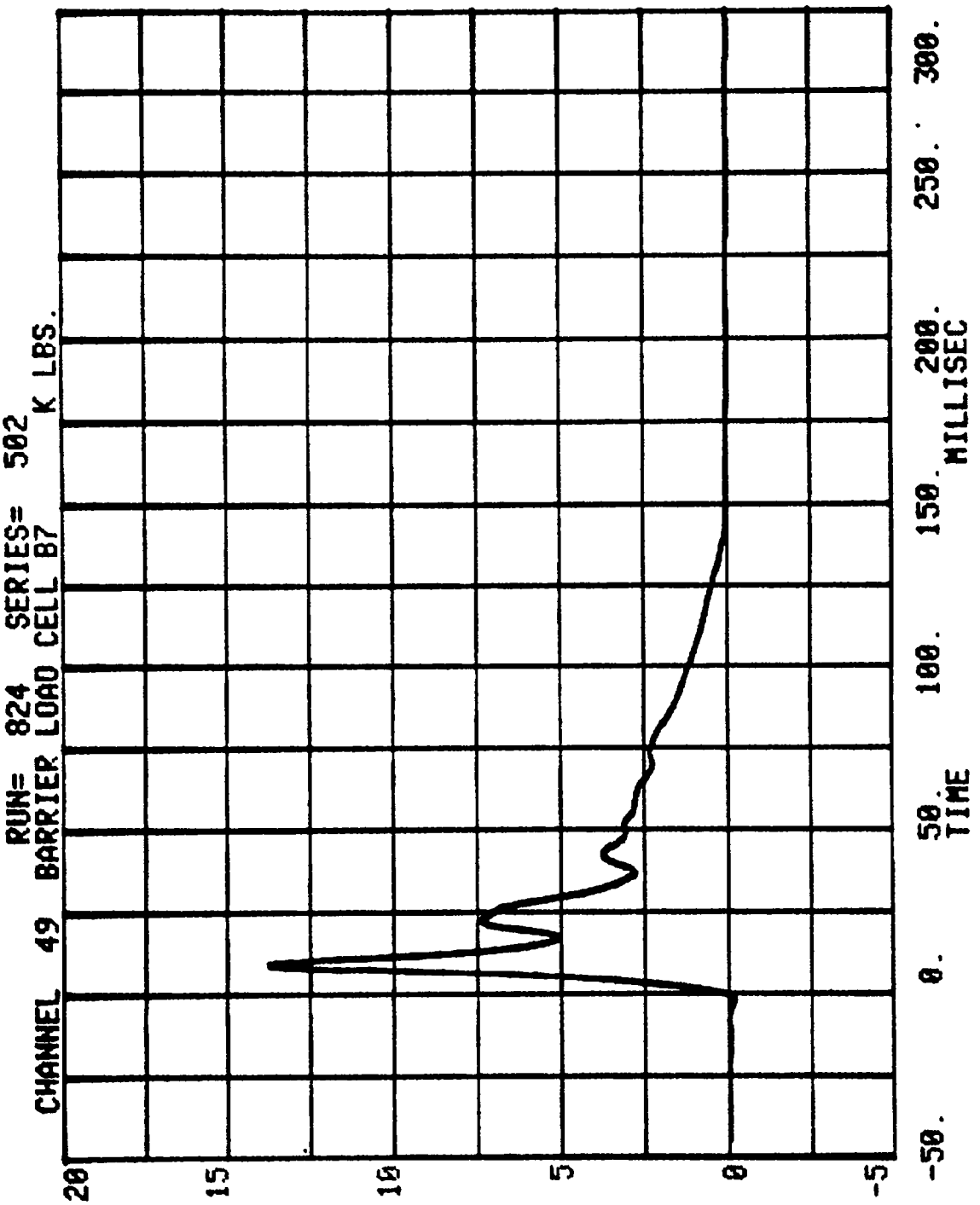

CHANNEL 46 BARRIER LOAD CELL B4
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

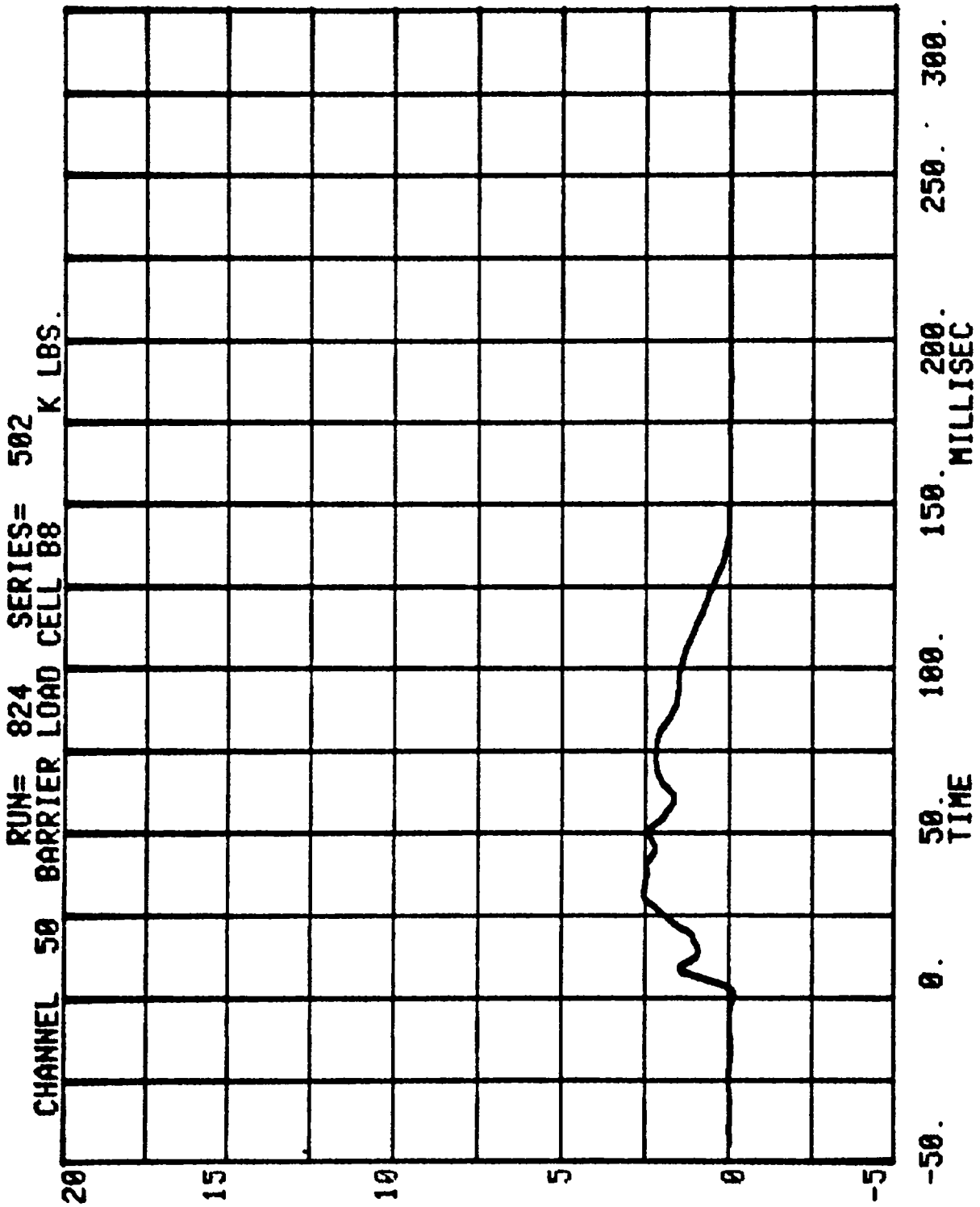

CHANNEL 47 BARRIER LOAD CELL B5
RUN= 824 SERIES= 502
K LBS.
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

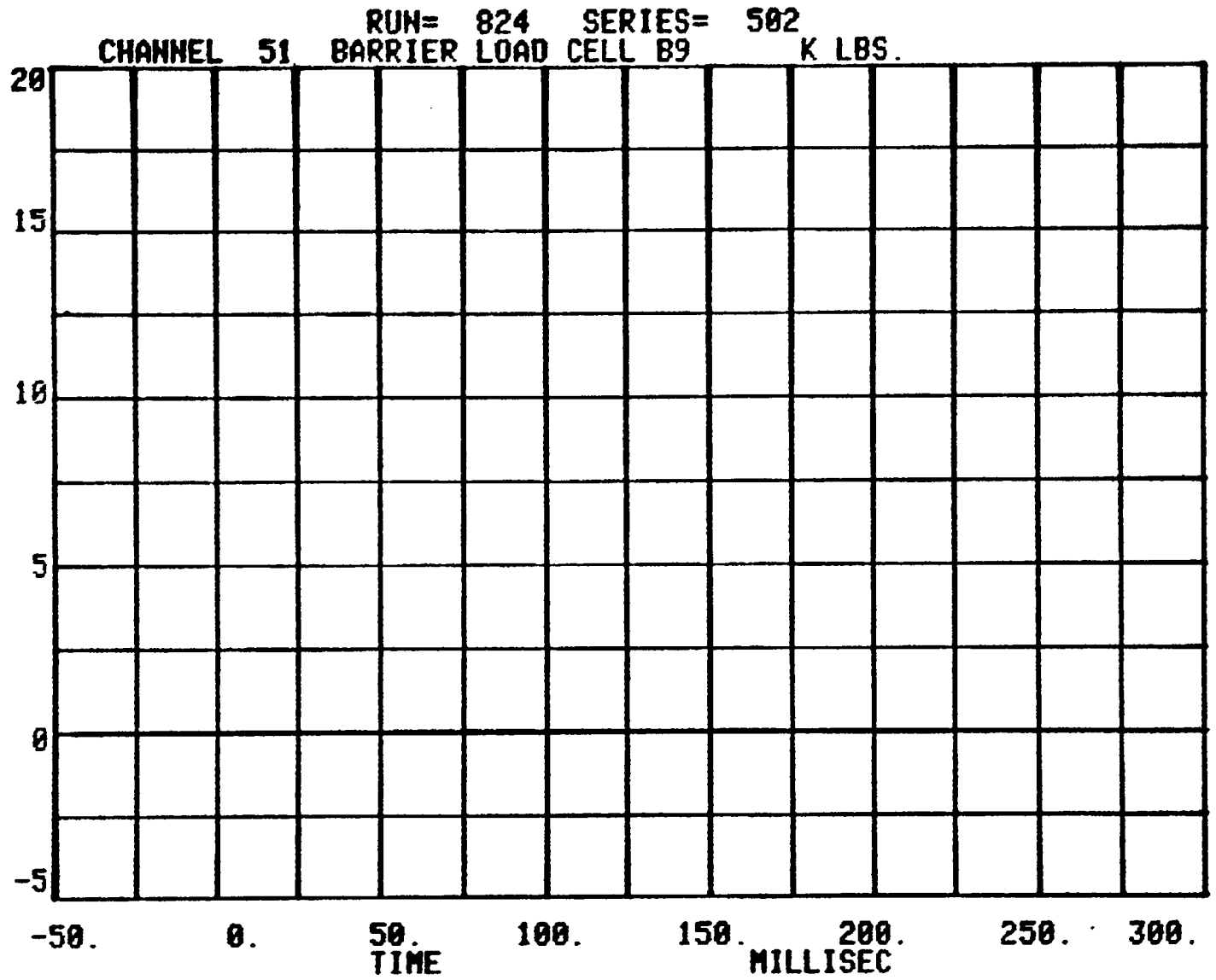

CHANNEL 48 BARRIER LOAD CELL B6
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

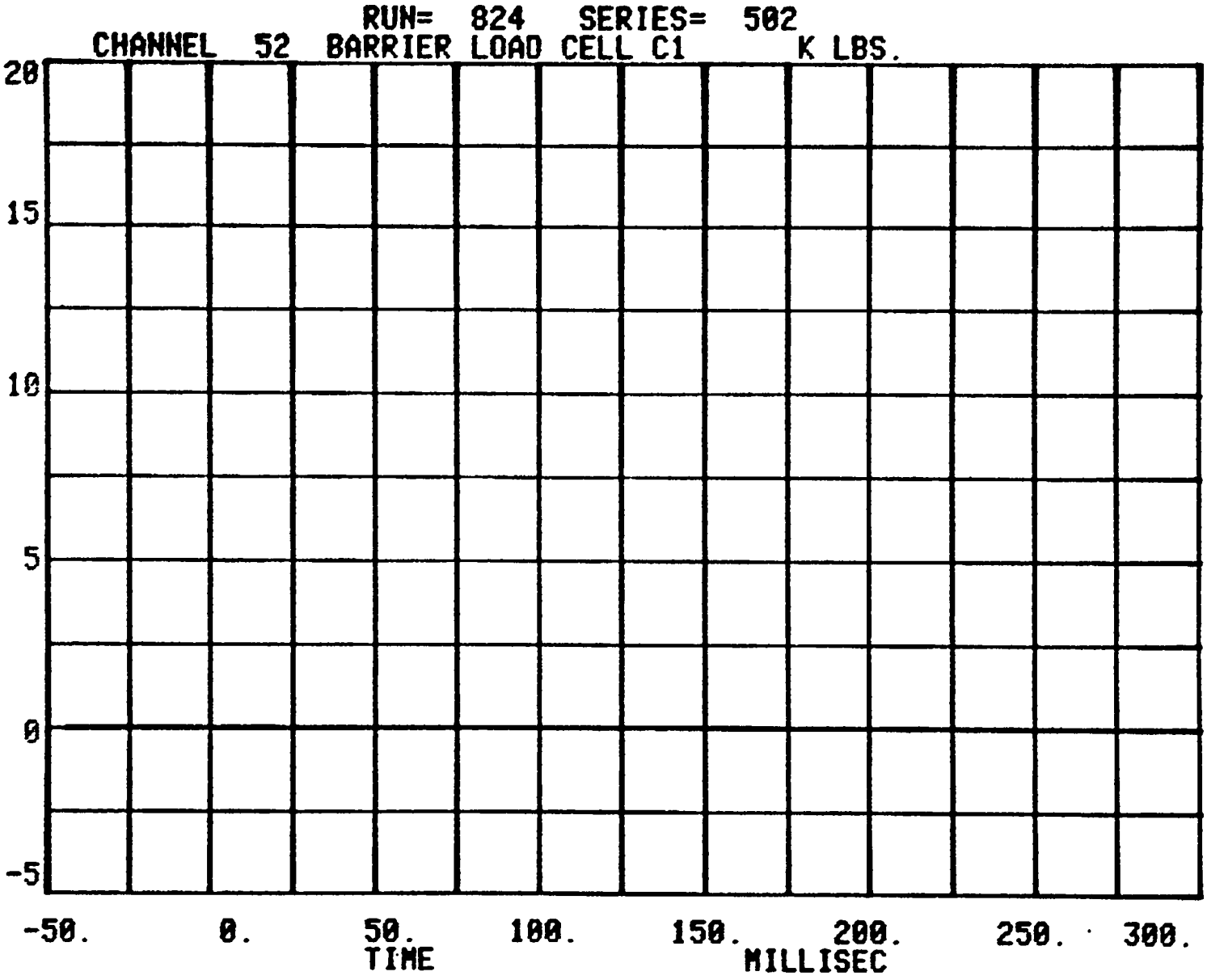
7626-17

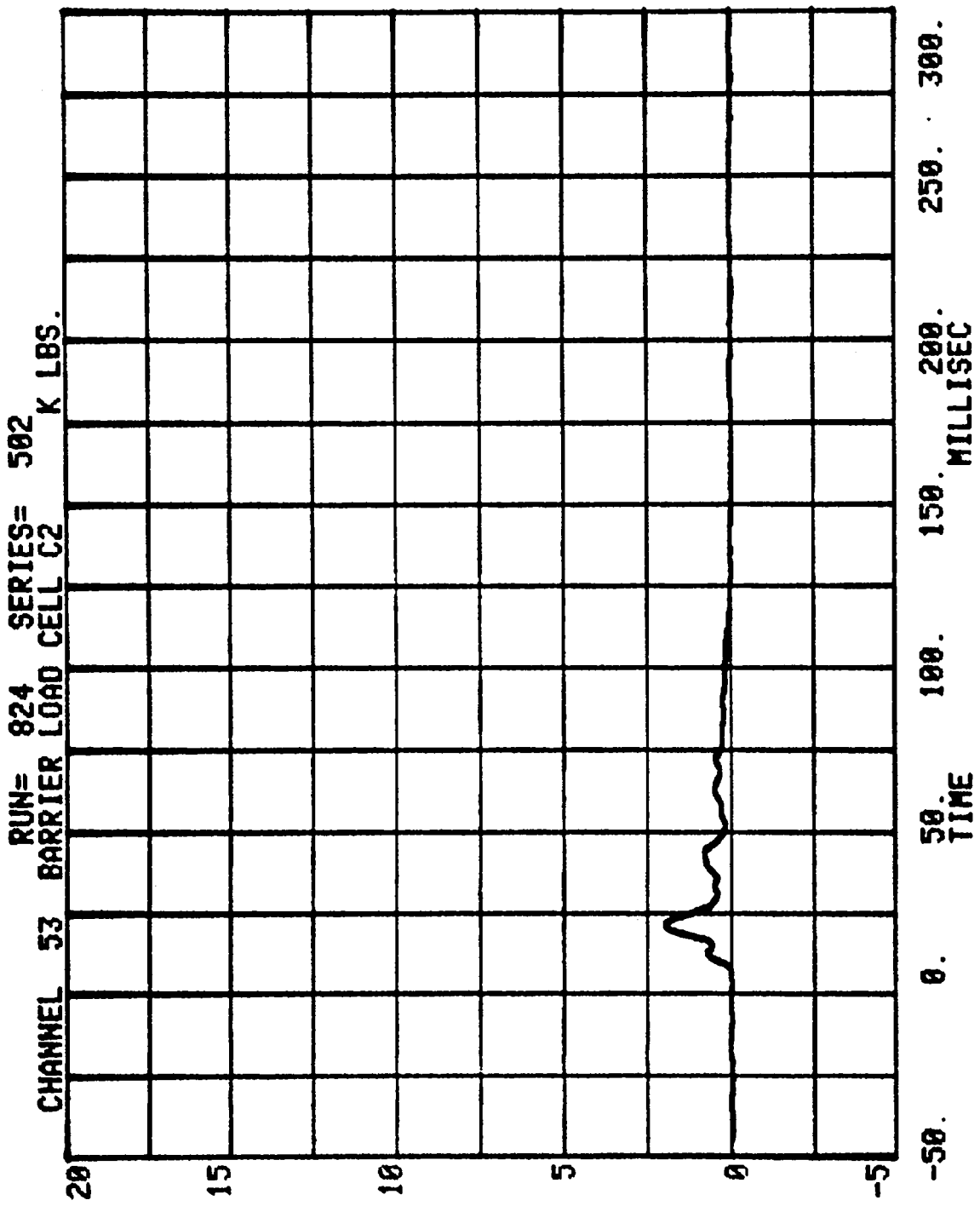

CHANNEL 49 BARRIER LOAD CELL B7
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

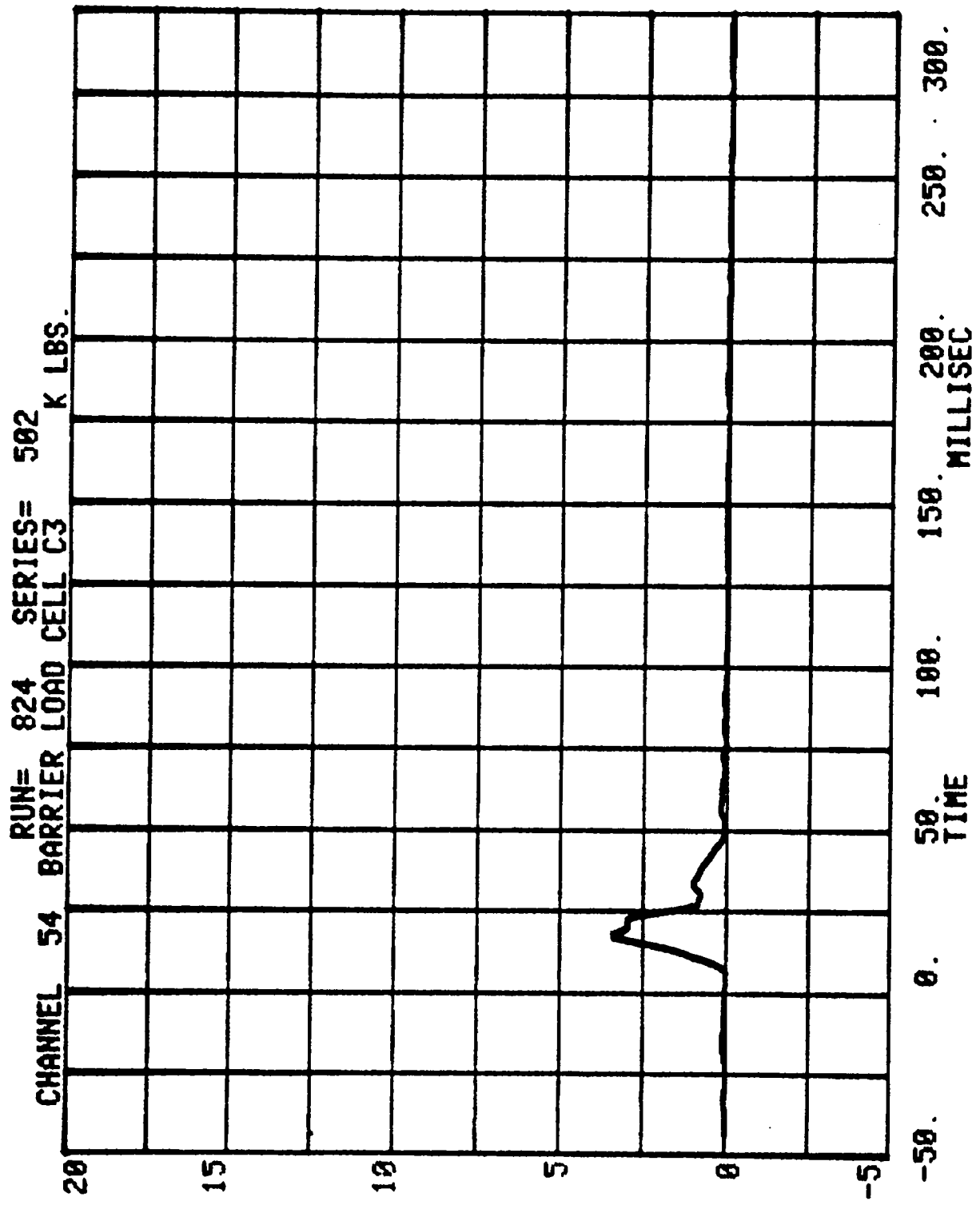
7626-17

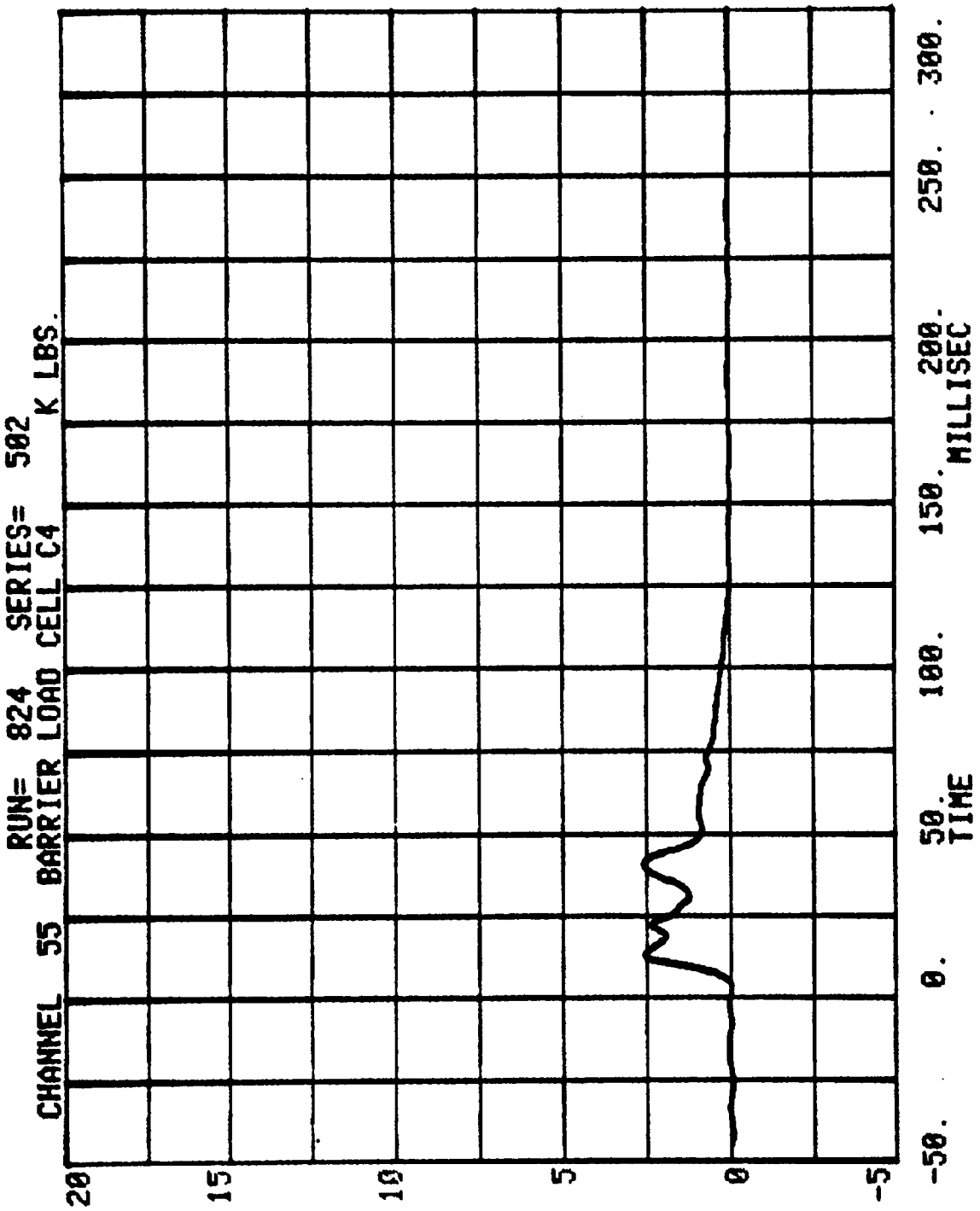

CHANNEL 50 BARRIER LOAD CELL B8
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 824 SERIES= 502
CHANNEL 51 BARRIER LOAD CELL B9 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

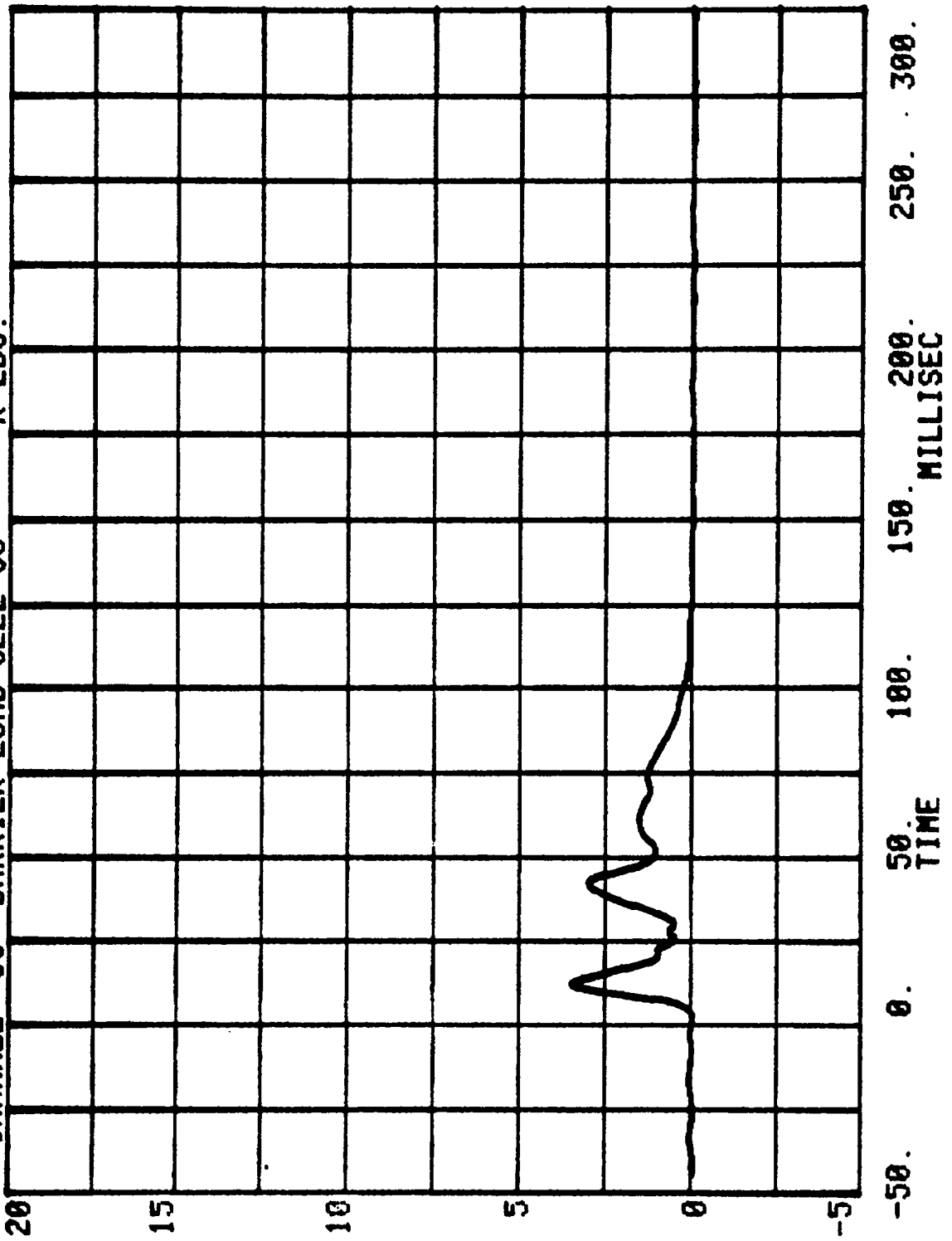

RUN= 824 SERIES= 502
CHANNEL 52 BARRIER LOAD CELL C1 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

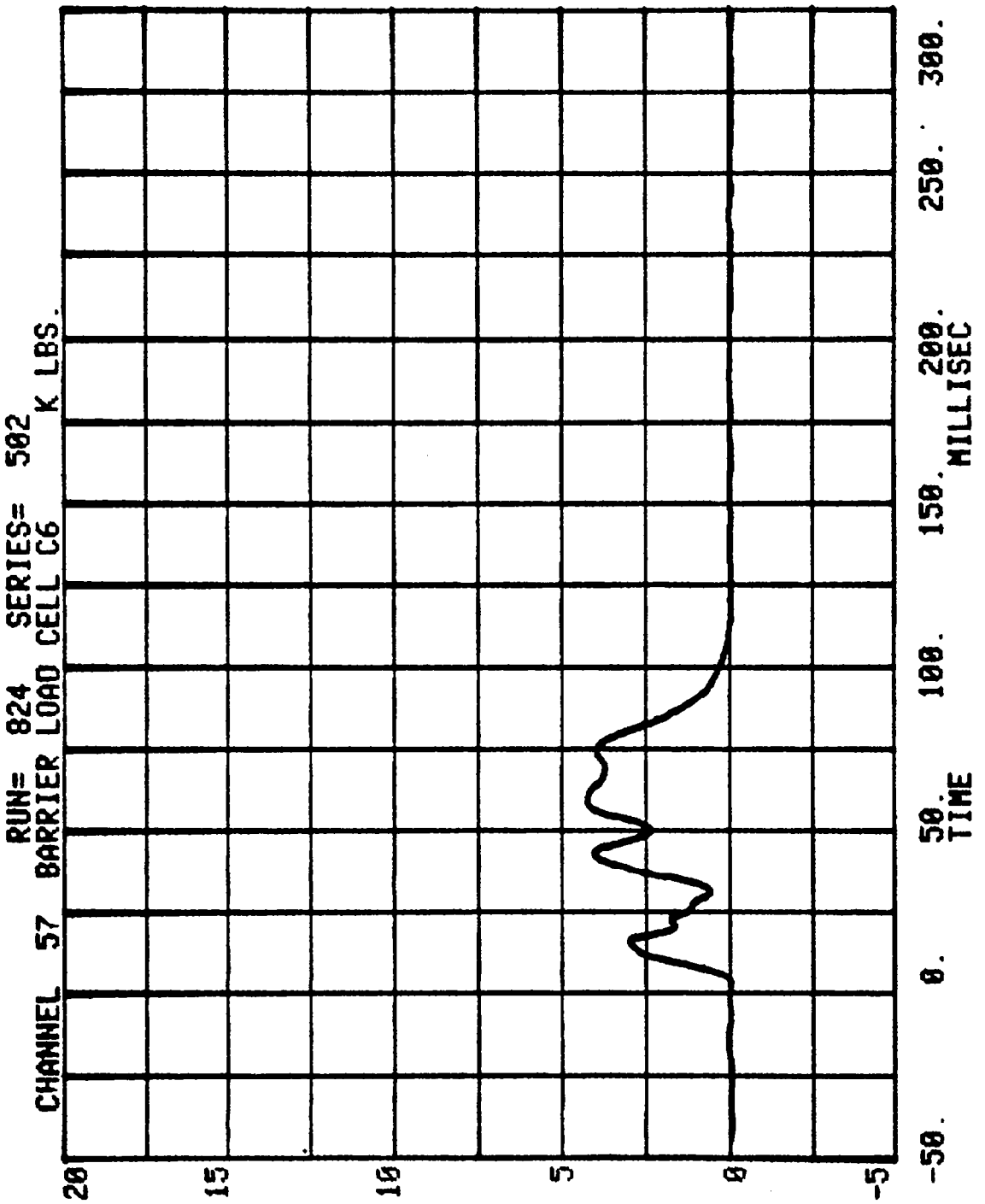

CHANNEL 53 BARRIER LOAD CELL C2
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

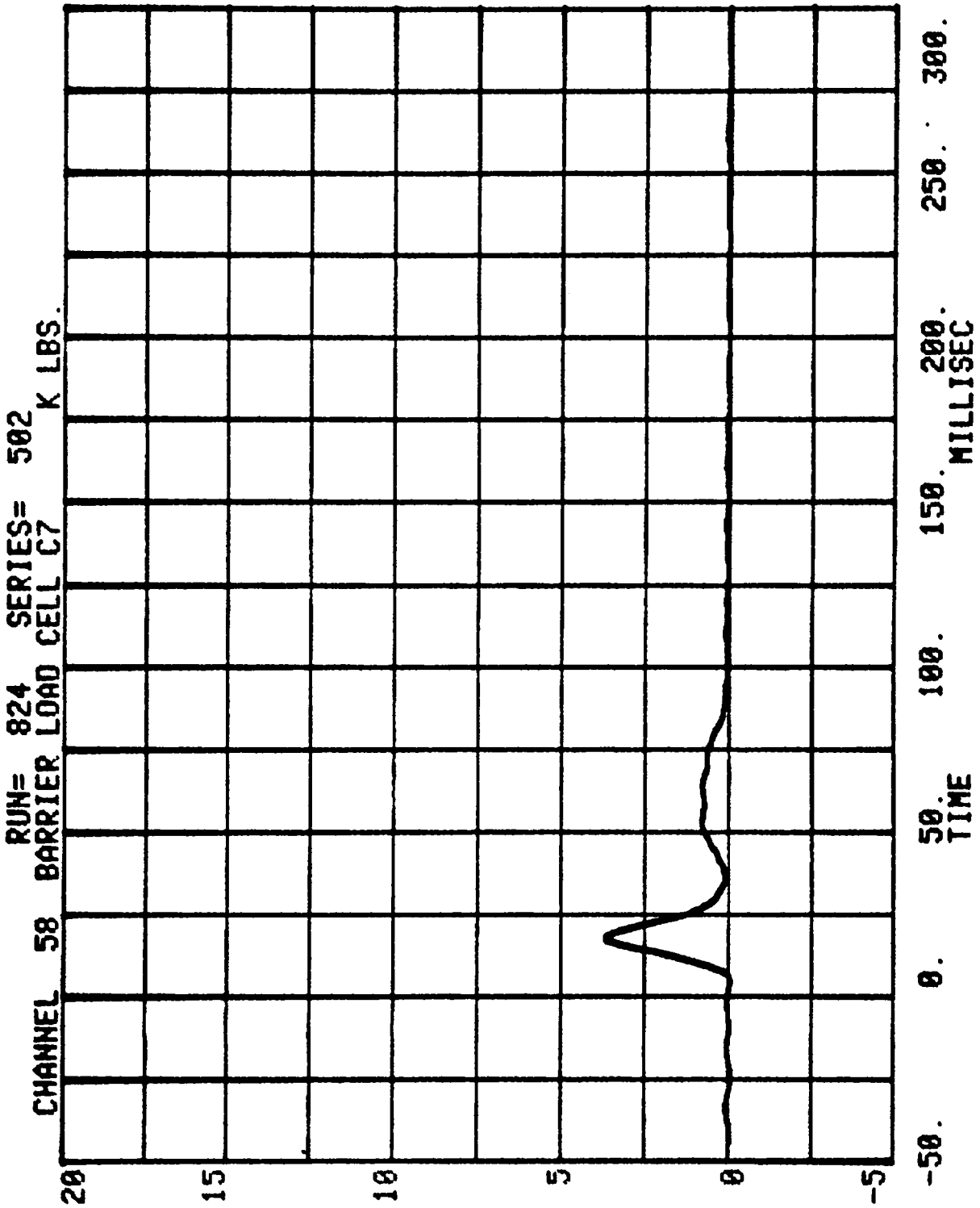

CHANNEL 54 BARRIER LOAD CELL C3
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 55 BARRIER LOAD CELL C4
RUN= 824 SERIES= 502 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

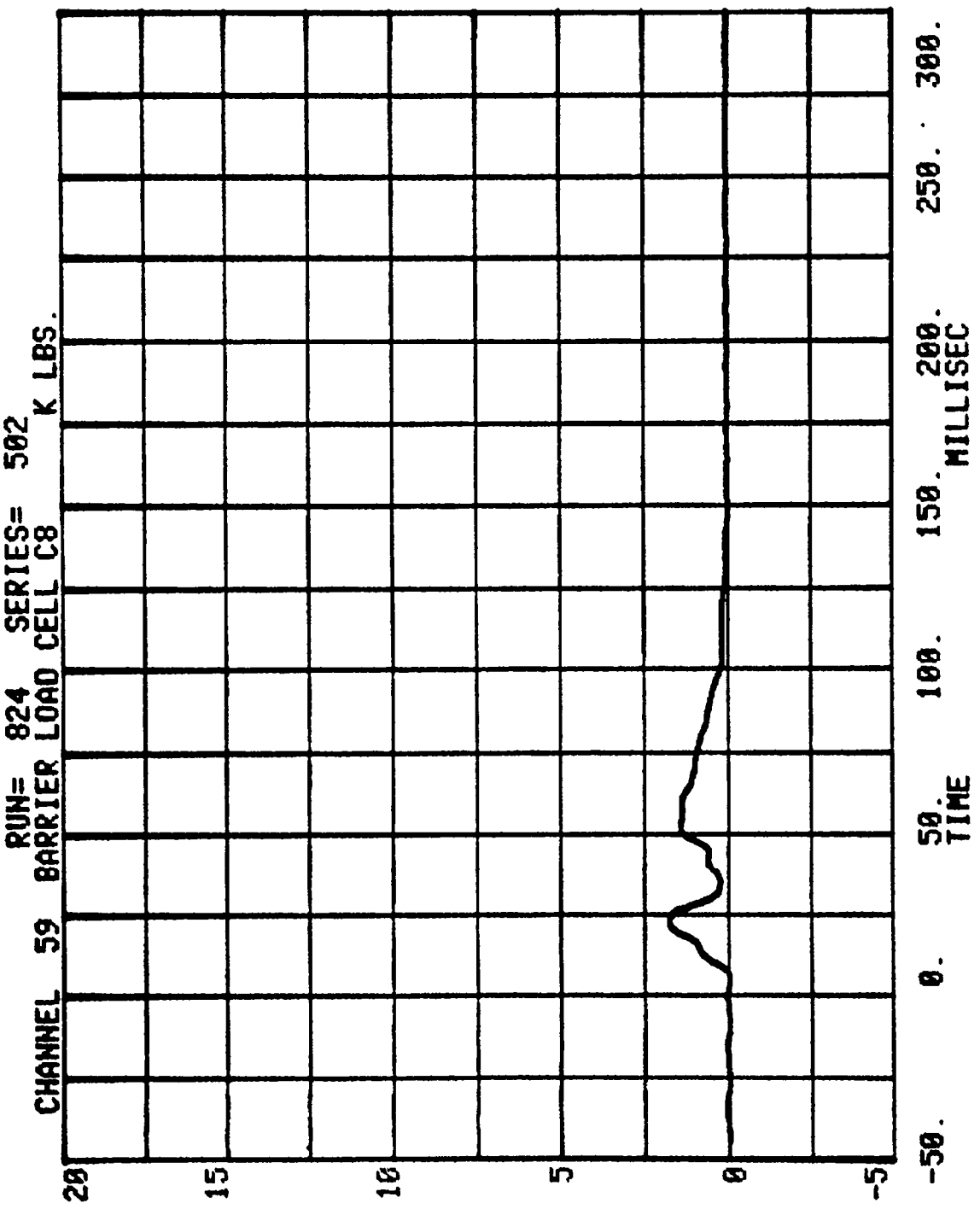
7626-17


CHANNEL 56 BARRIER LOAD CELL C5
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

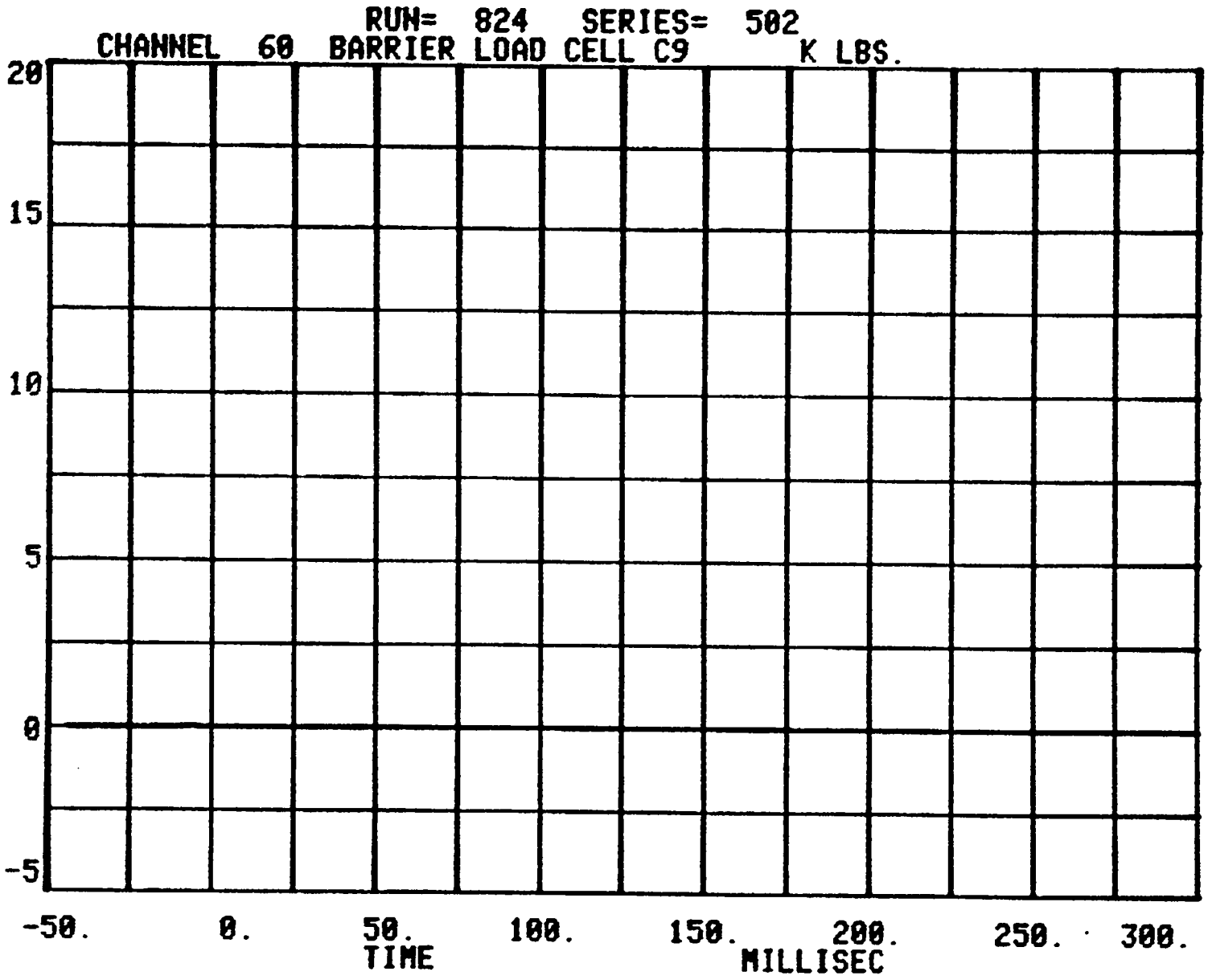

CHANNEL 57
RUN= 824
BARRIER LOAD CELL C6
SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

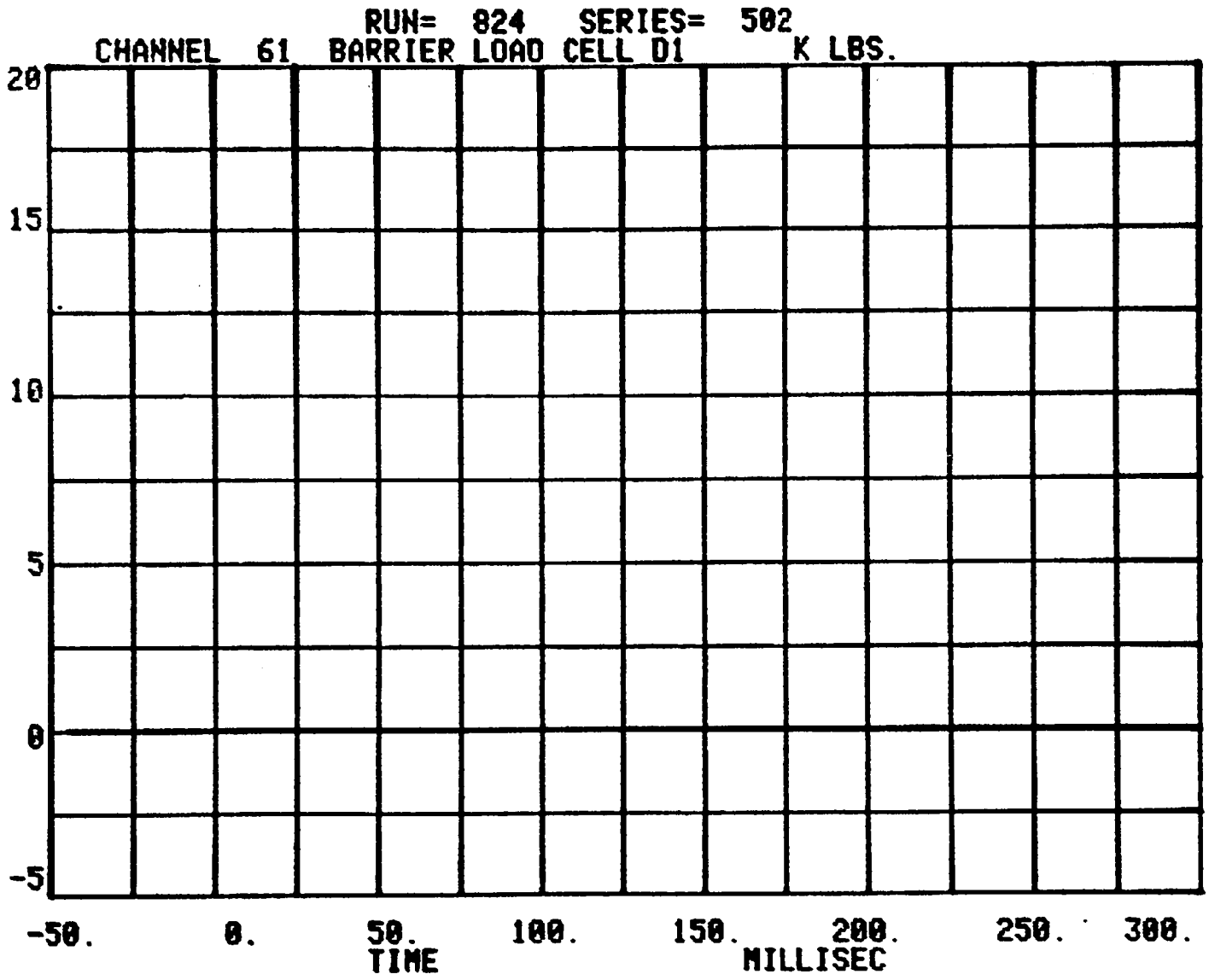

CHANNEL 58 BARRIER LOAD CELL C7
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

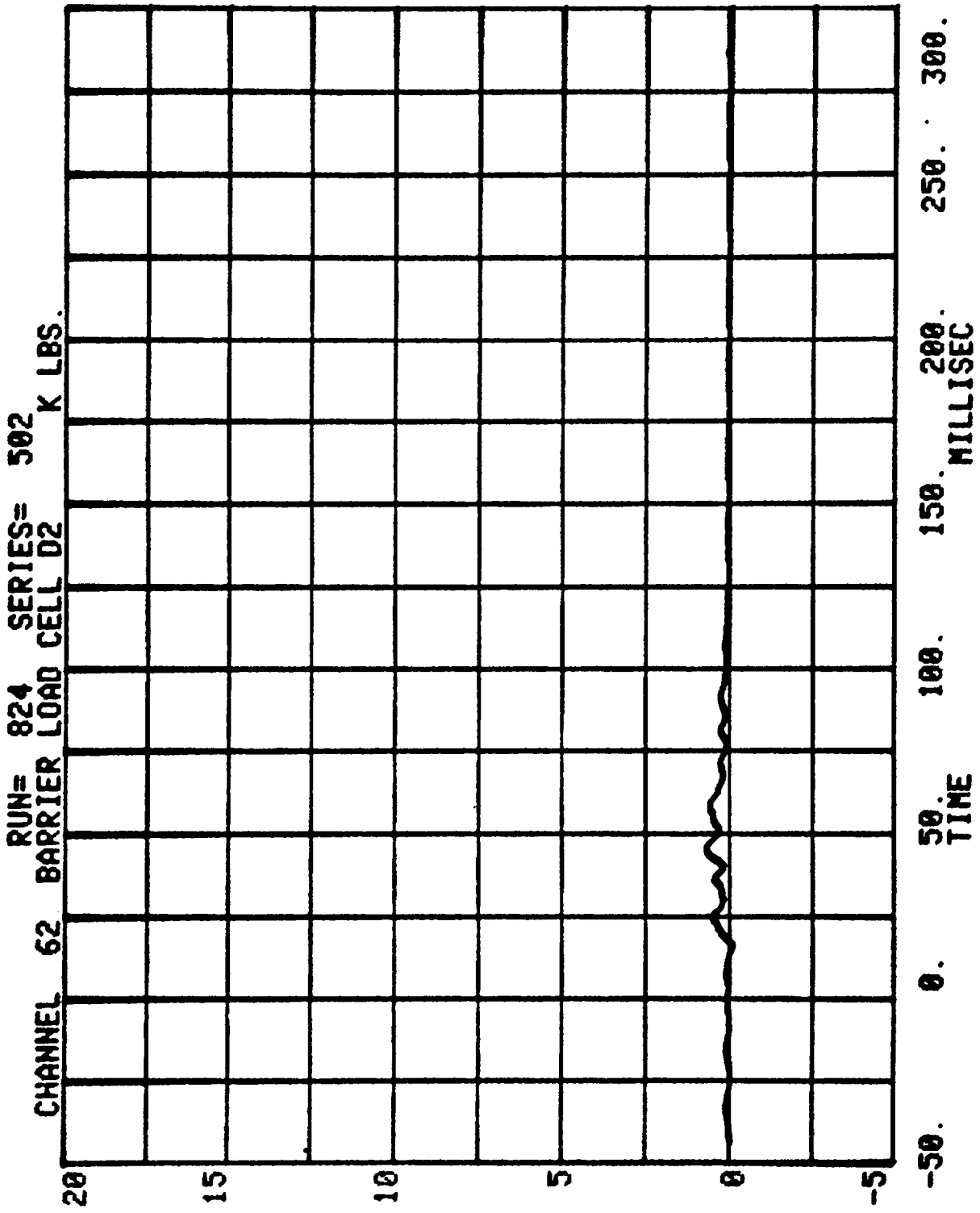
7626-17


RUN= 824 SERIES= 502
BARRIER LOAD CELL C8
CHANNEL 59
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

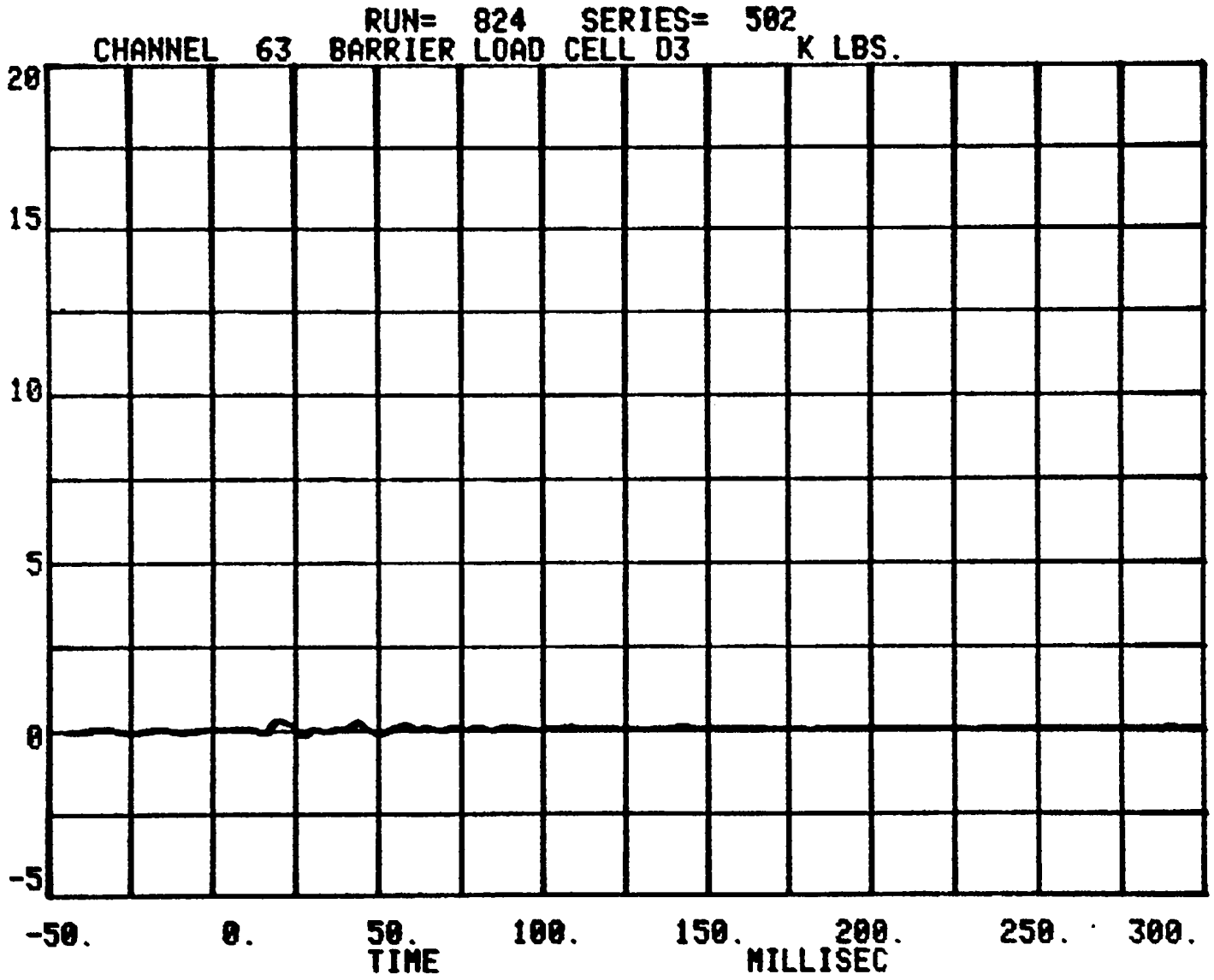
7626-17

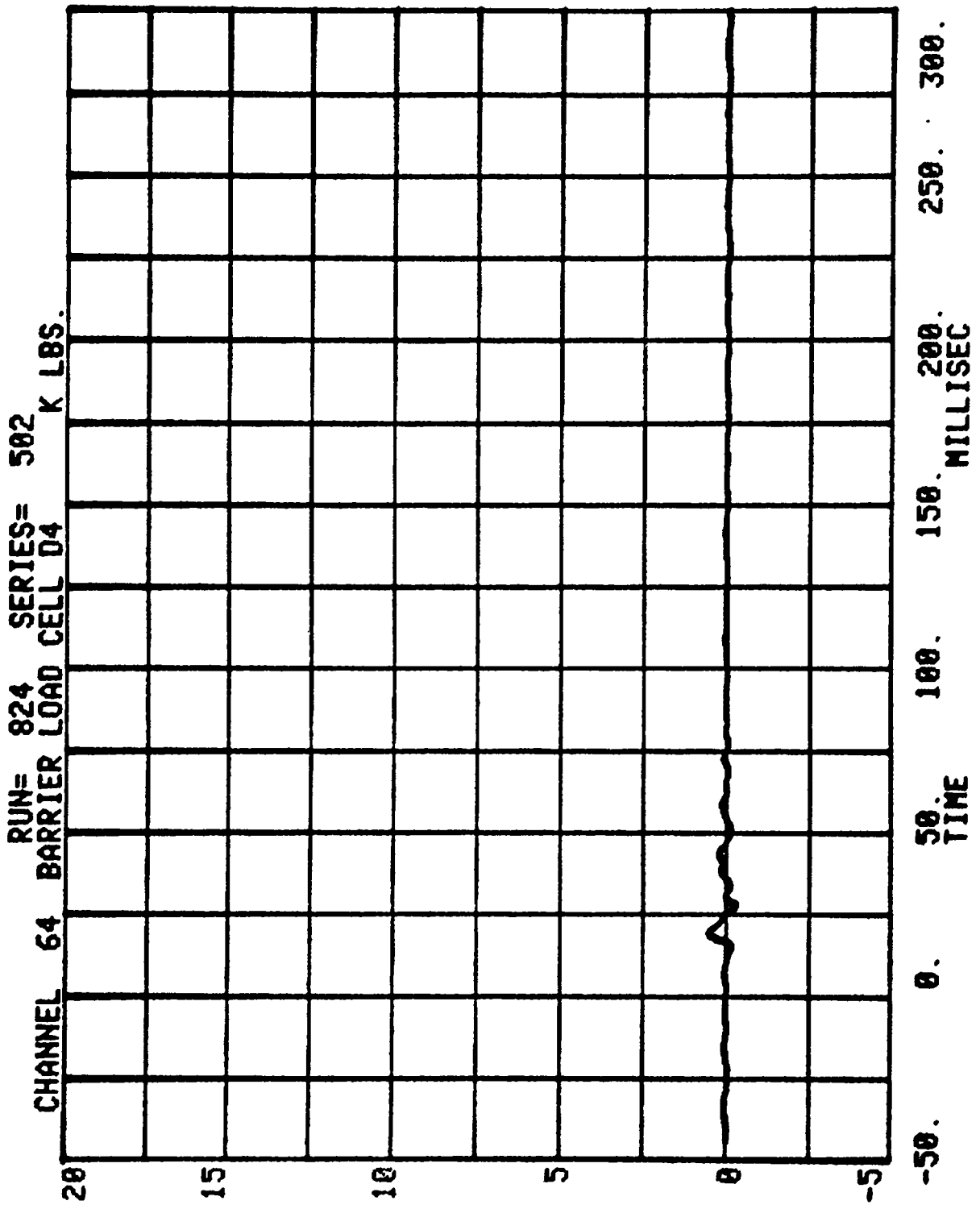

RUN= 824 SERIES= 502
CHANNEL 60 BARRIER LOAD CELL C9 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

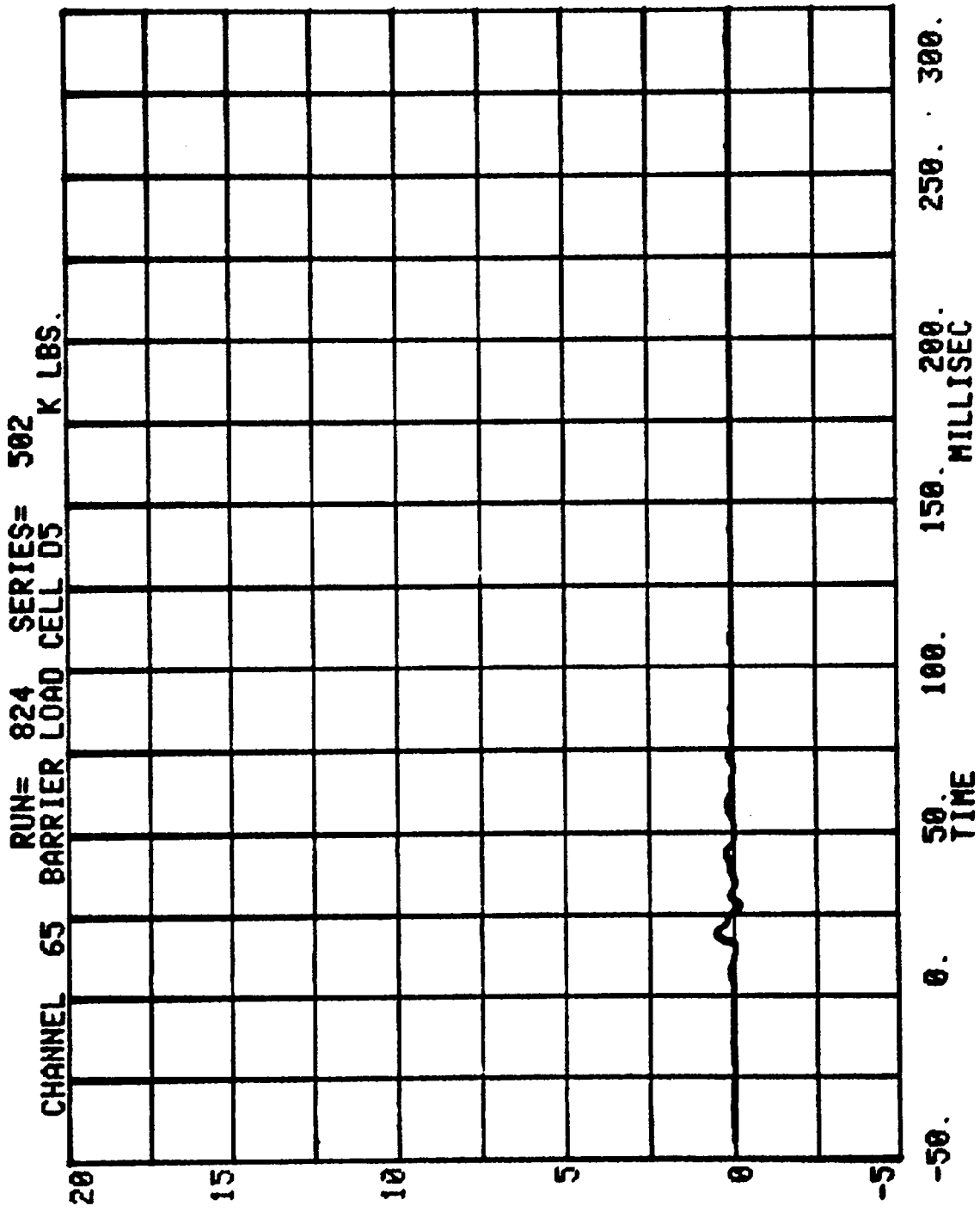

RUN= 824 SERIES= 502
CHANNEL 61 BARRIER LOAD CELL D1
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 62 BARRIER LOAD CELL D2
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

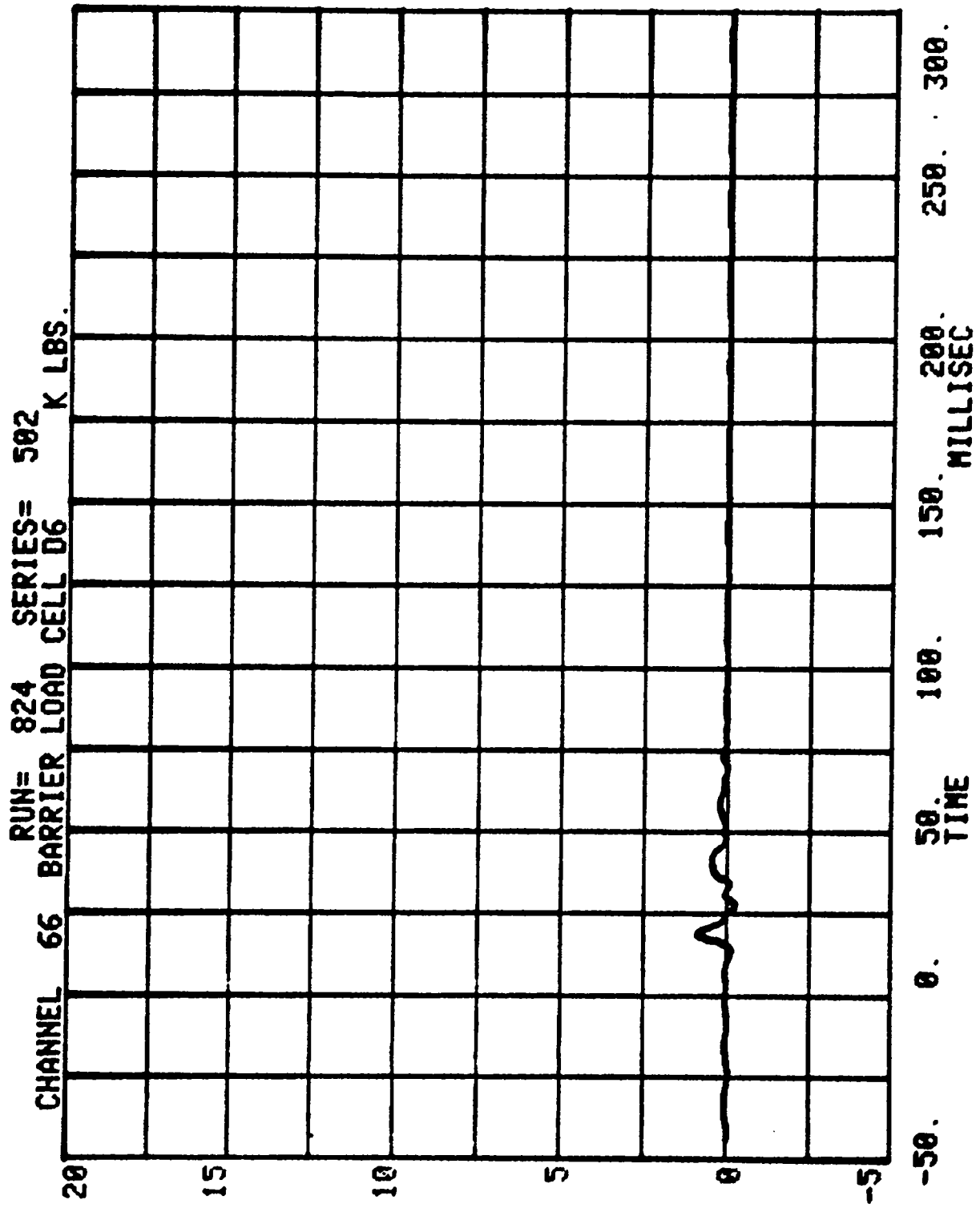
7626-17

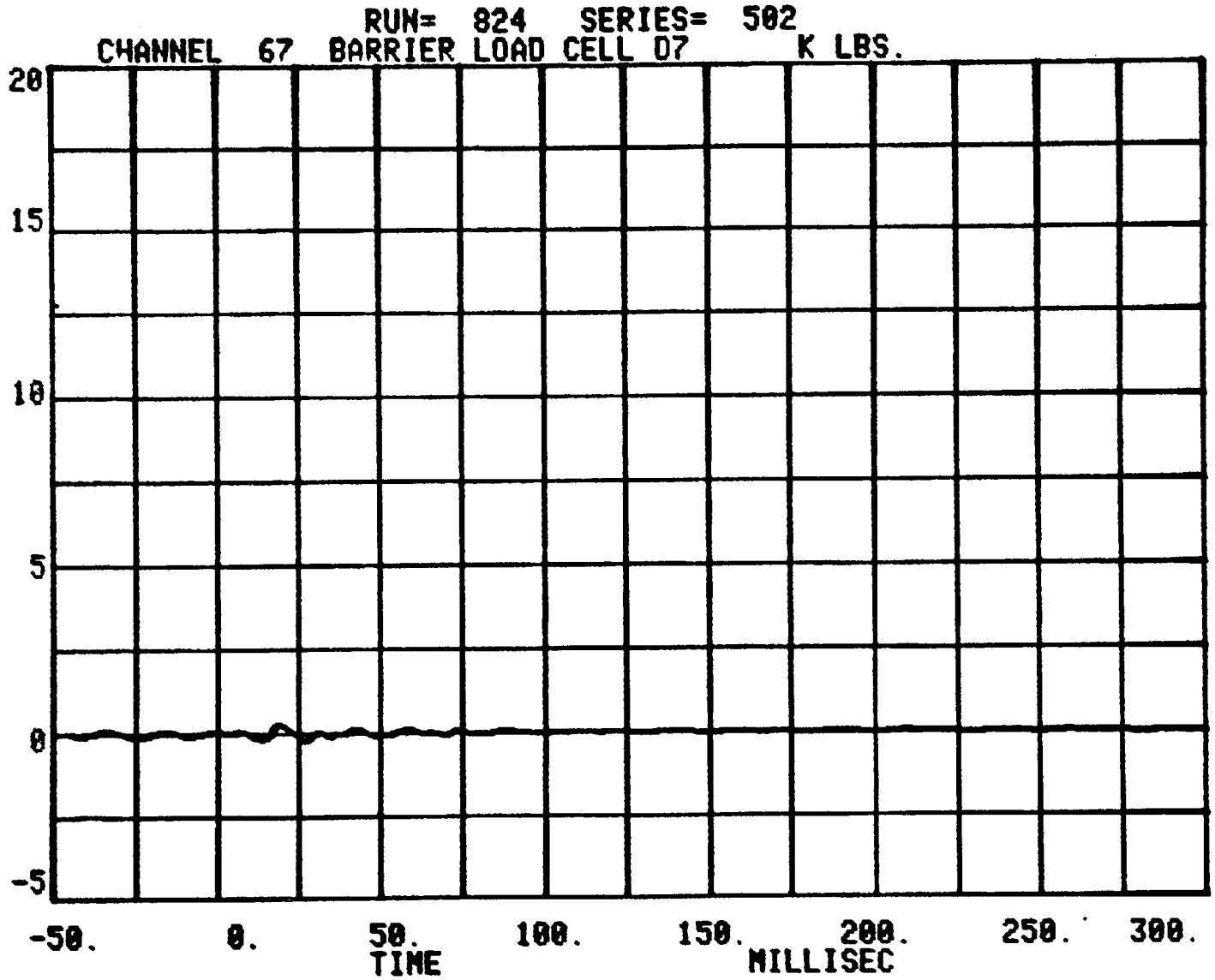

RUN= 824 SERIES= 502
CHANNEL 63 BARRIER LOAD CELL 03 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

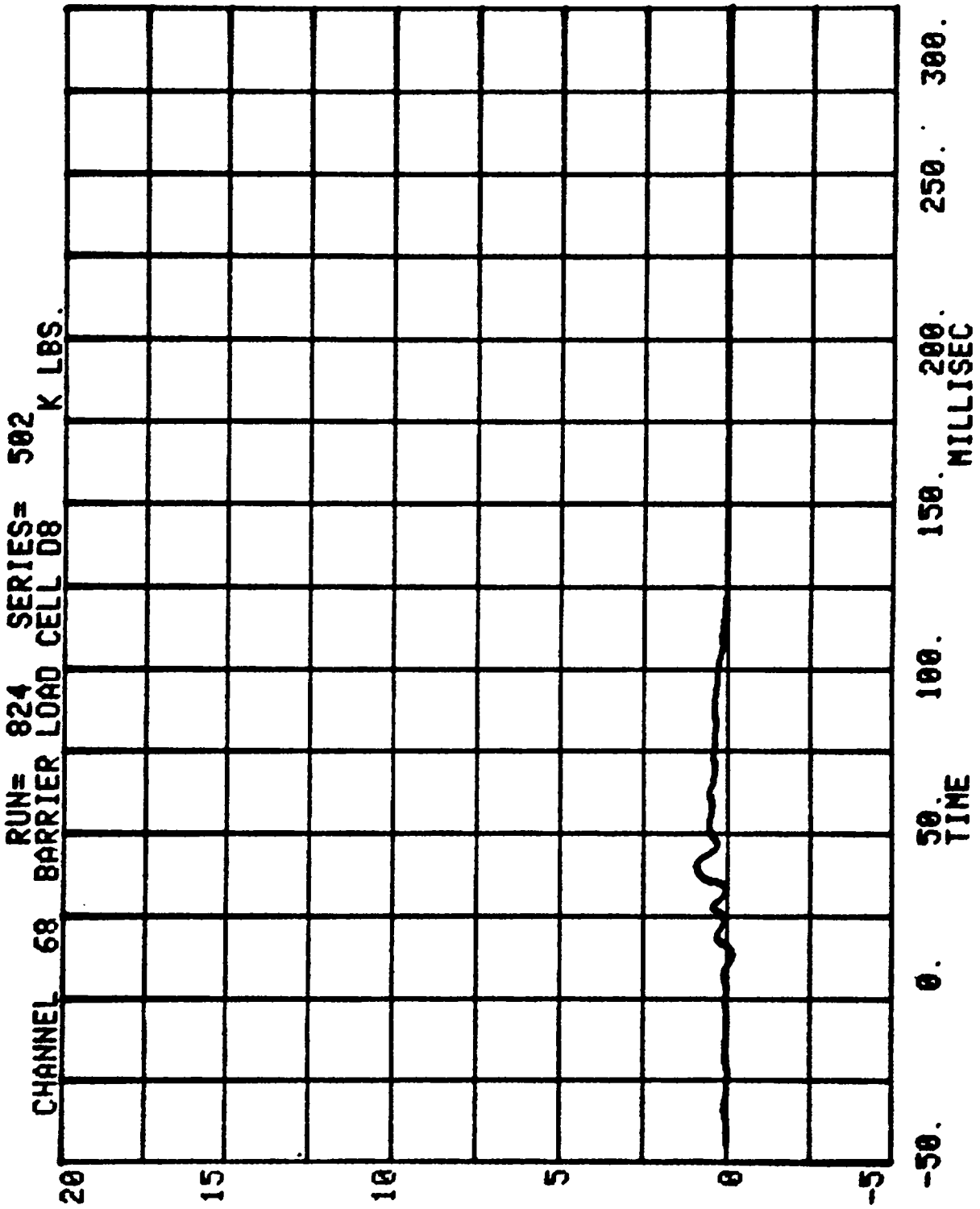

CHANNEL 64 BARRIER LOAD CELL D4
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 824 SERIES= 502
CHANNEL 65 BARRIER LOAD CELL D5
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

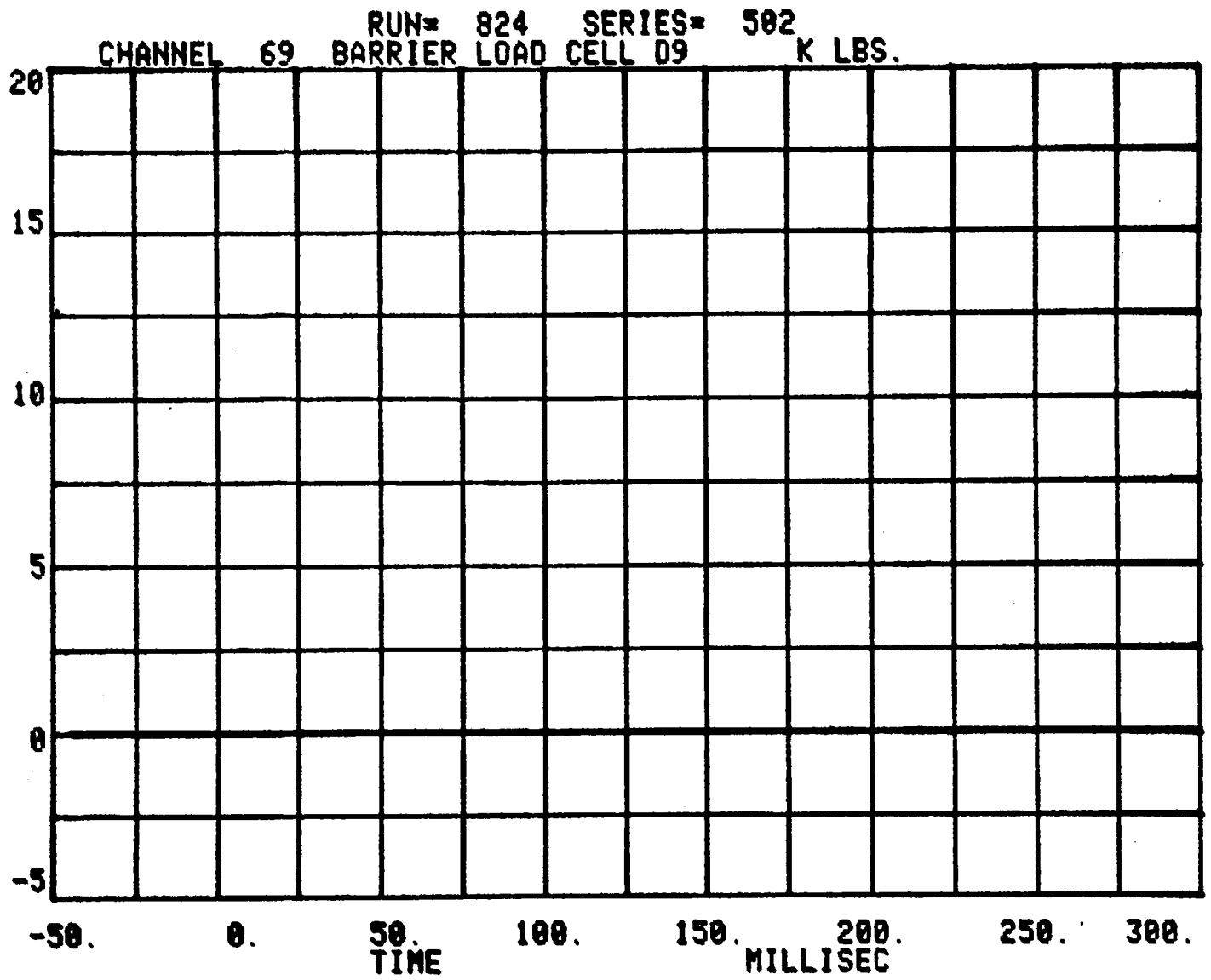
7626-17


CHANNEL 66 BARRIER LOAD CELL D6
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 824 SERIES= 502
CHANNEL 67 BARRIER LOAD CELL 07 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 68 BARRIER LOAD CELL D8
RUN= 824 SERIES= 502
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

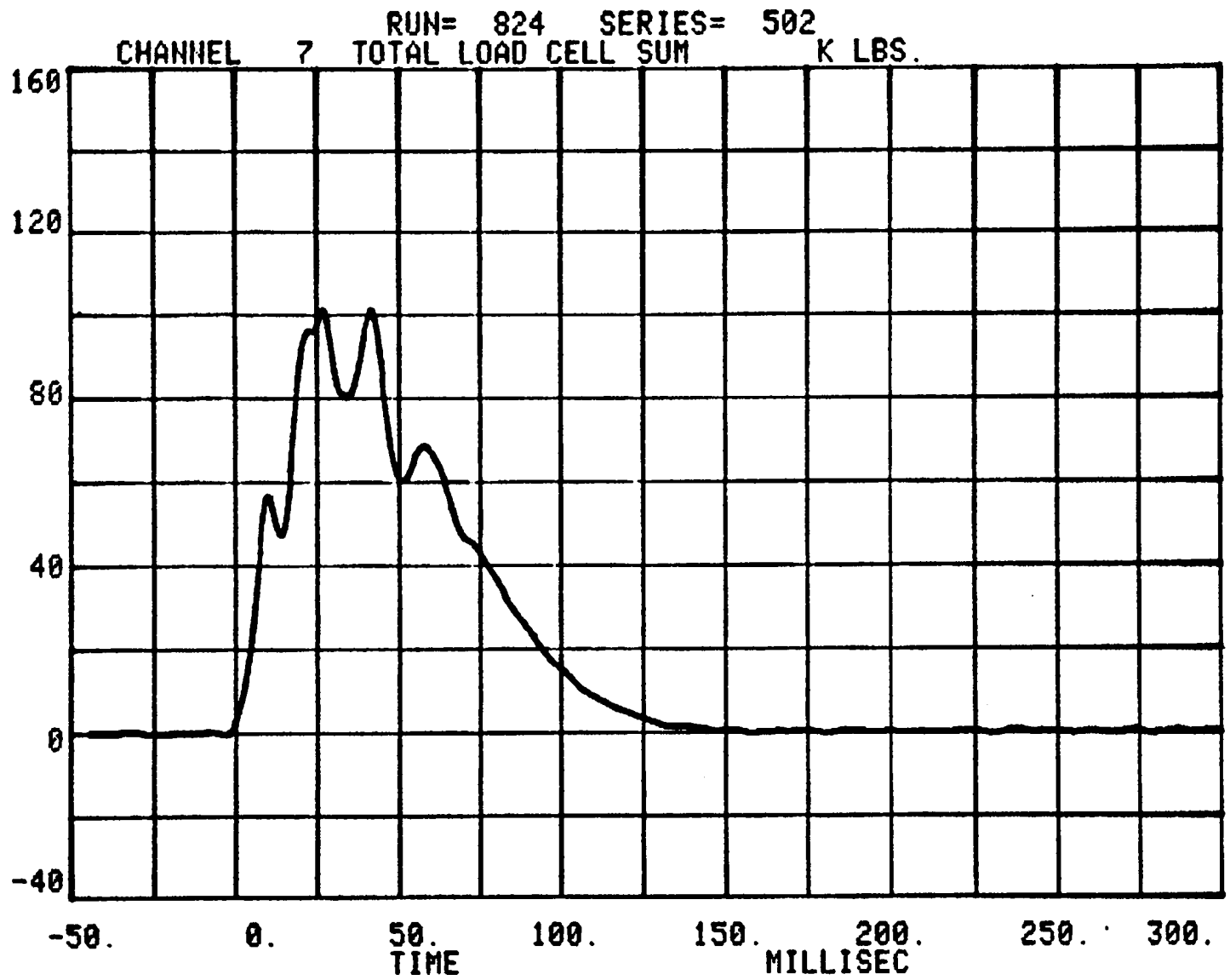
7626-17


RUN= 824 SERIES= 502
CHANNEL 69 BARRIER LOAD CELL 09 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

NEW CAR ASSESSMENT BARRIER TEST - 1988

RUN # 824 SERIES # 502

CHAN	TITLE	MINIMUM	MAXIMUM
7	TOTAL LOAD CELL SUM	-.306	101.462 K LBS.


RUN= 824 SERIES= 502
CHANNEL 7 TOTAL LOAD CELL SUM K LBS.
160
120
80
40
0
-40
-50.
0.
50.
100.
150.
200.
250.
300.
TIME MILLISEC

7626-17

TEST NO. MJ0502

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

NEW CAR ASSESSMENT BARRIER TEST - 1988

RUN= 824

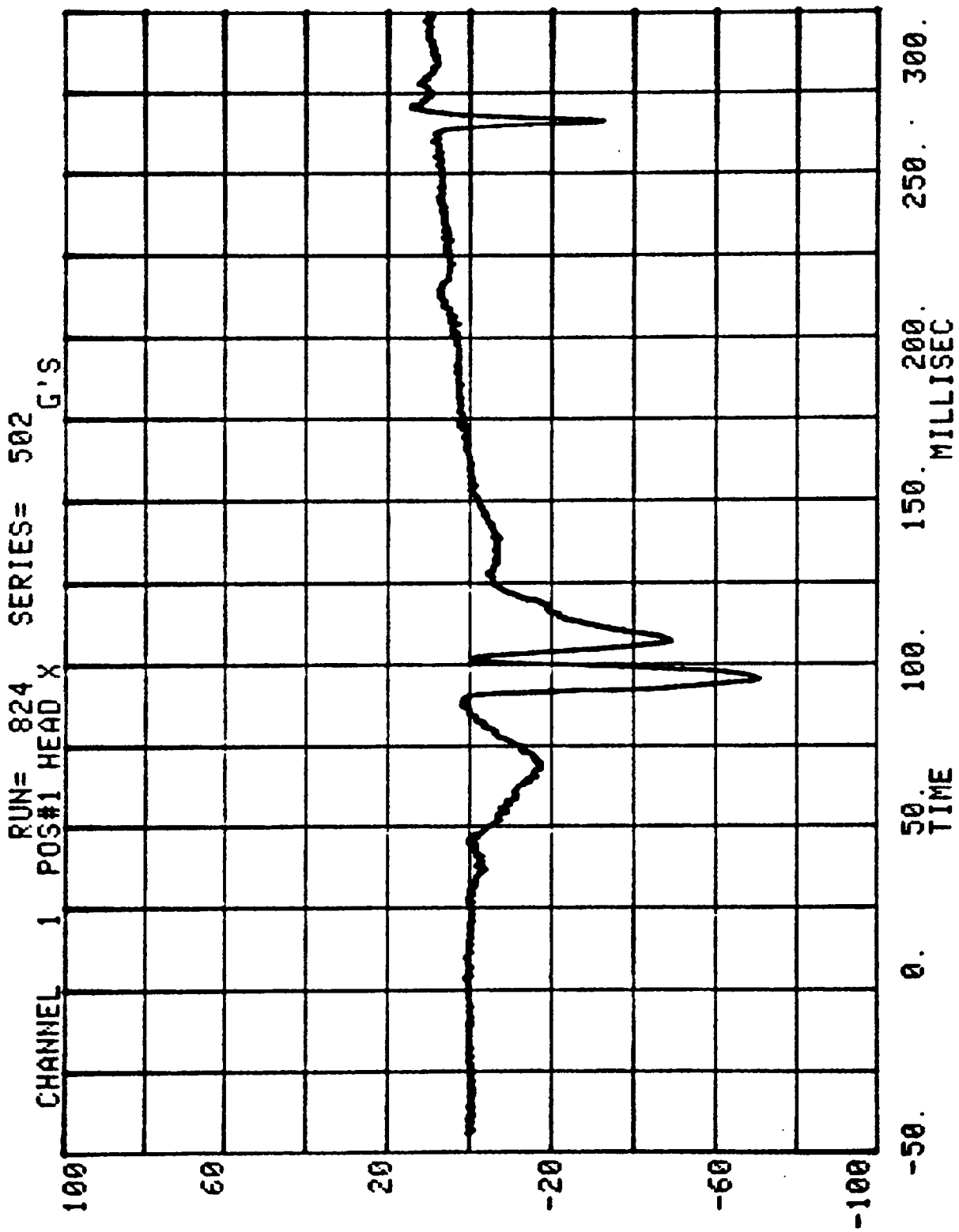
POS#1 HEAD R

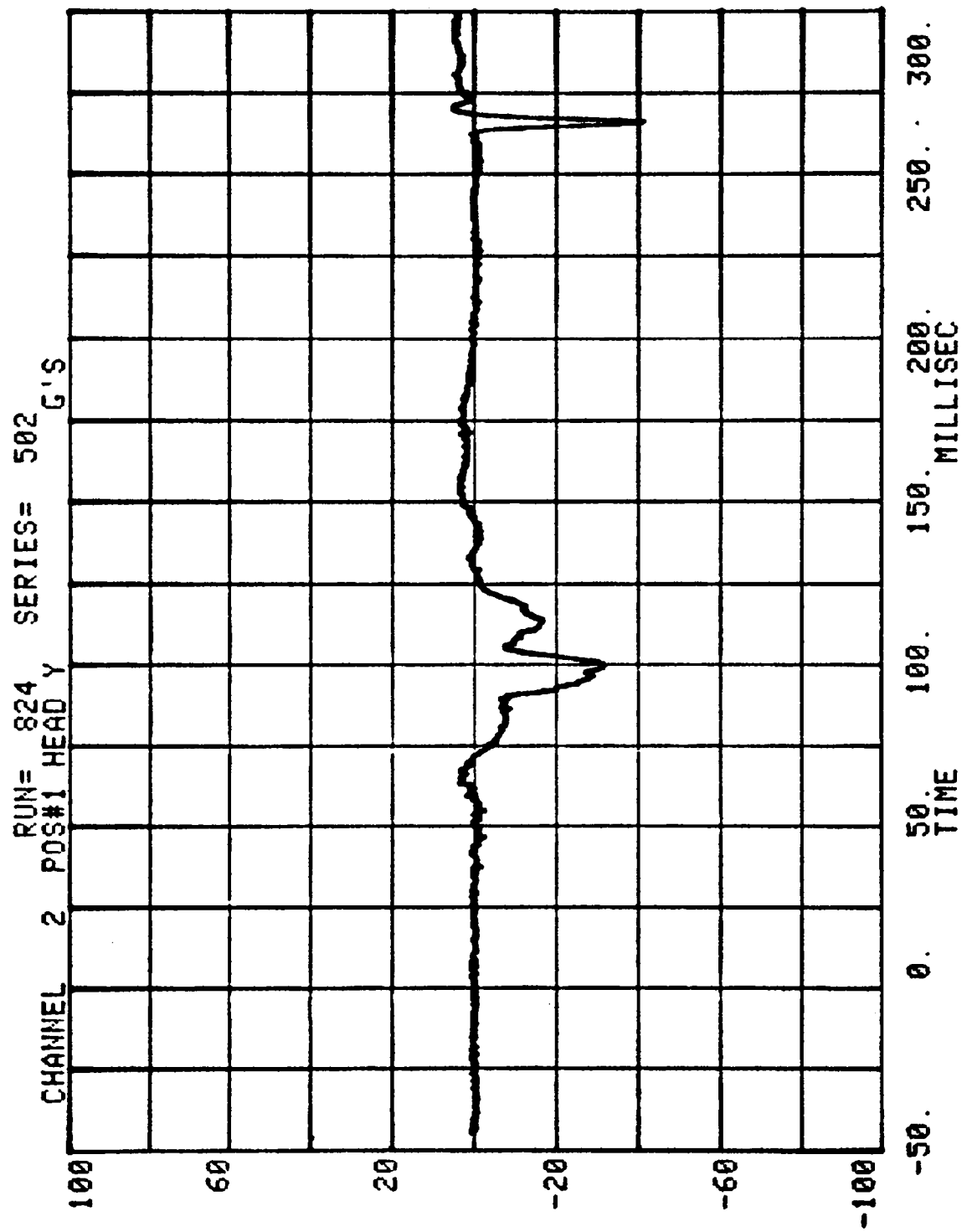
HIC= 718.1 FROM T1= .07942 TO T2= .11542

AVERAGE ACCELERATION BETWEEN T1 AND T2= 52.5G'S

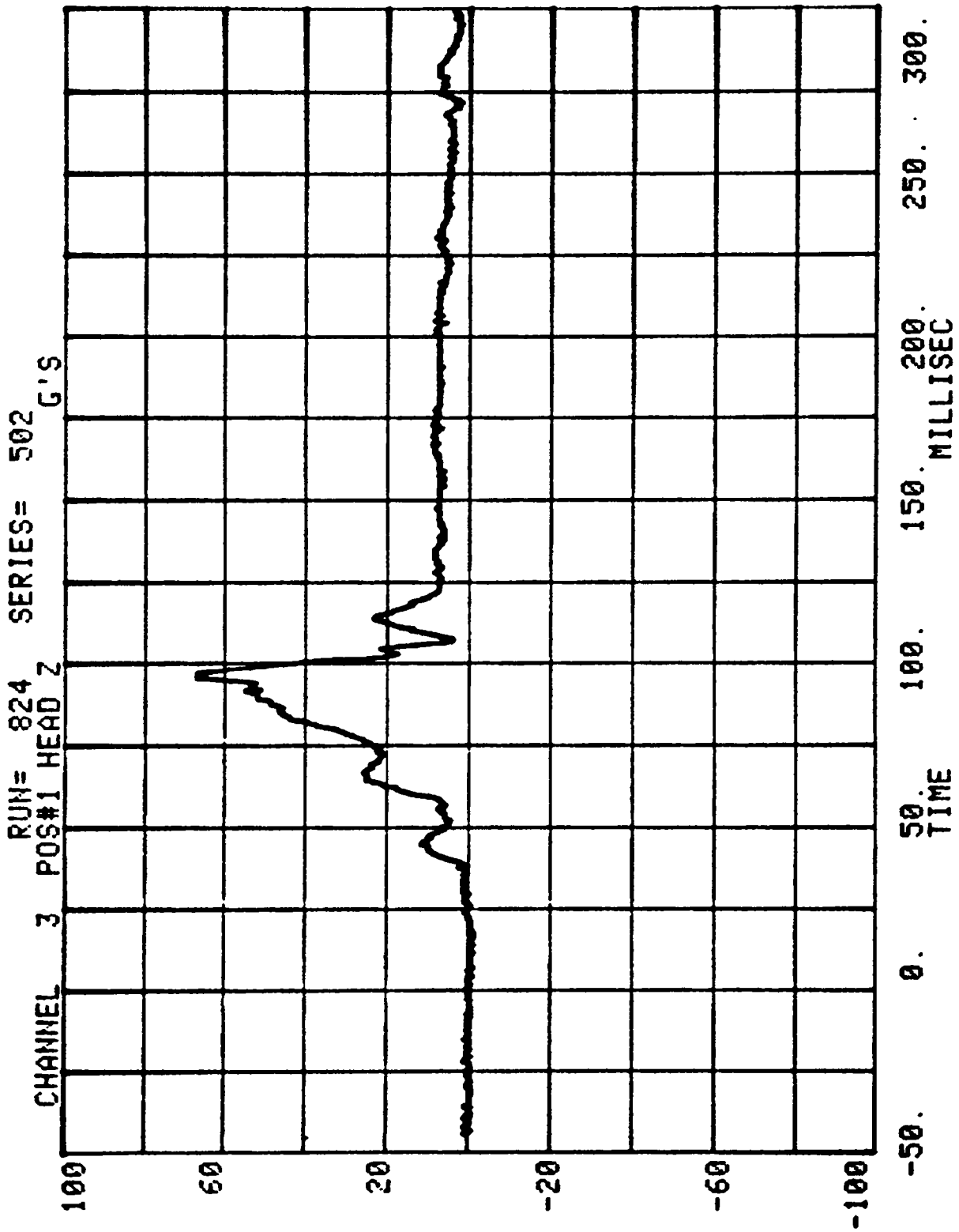
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1100.1

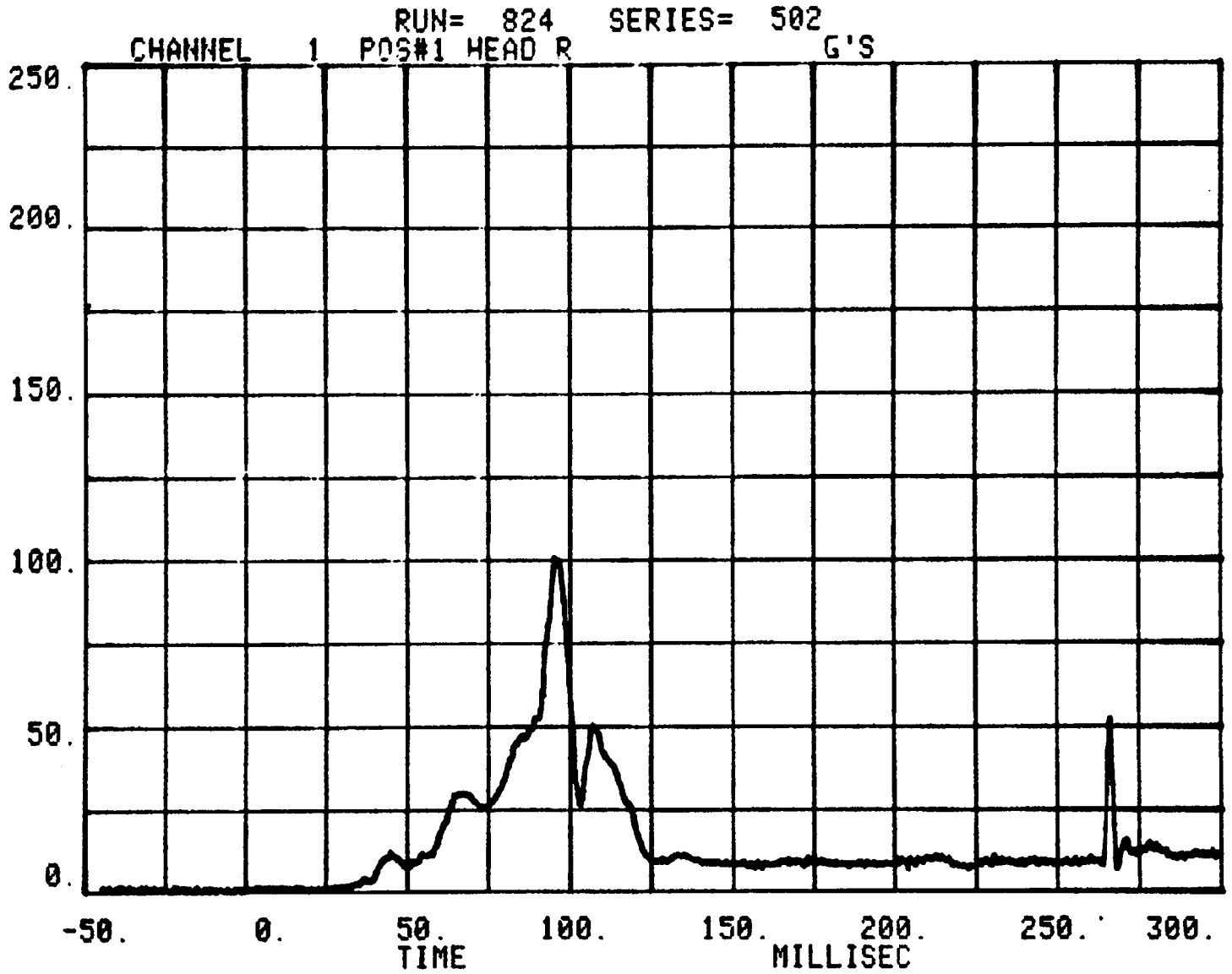

CHANNEL 1 POS#1 HEAD X
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 2 RUN= 824 SERIES= 502
POS#1 HEAD Y G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

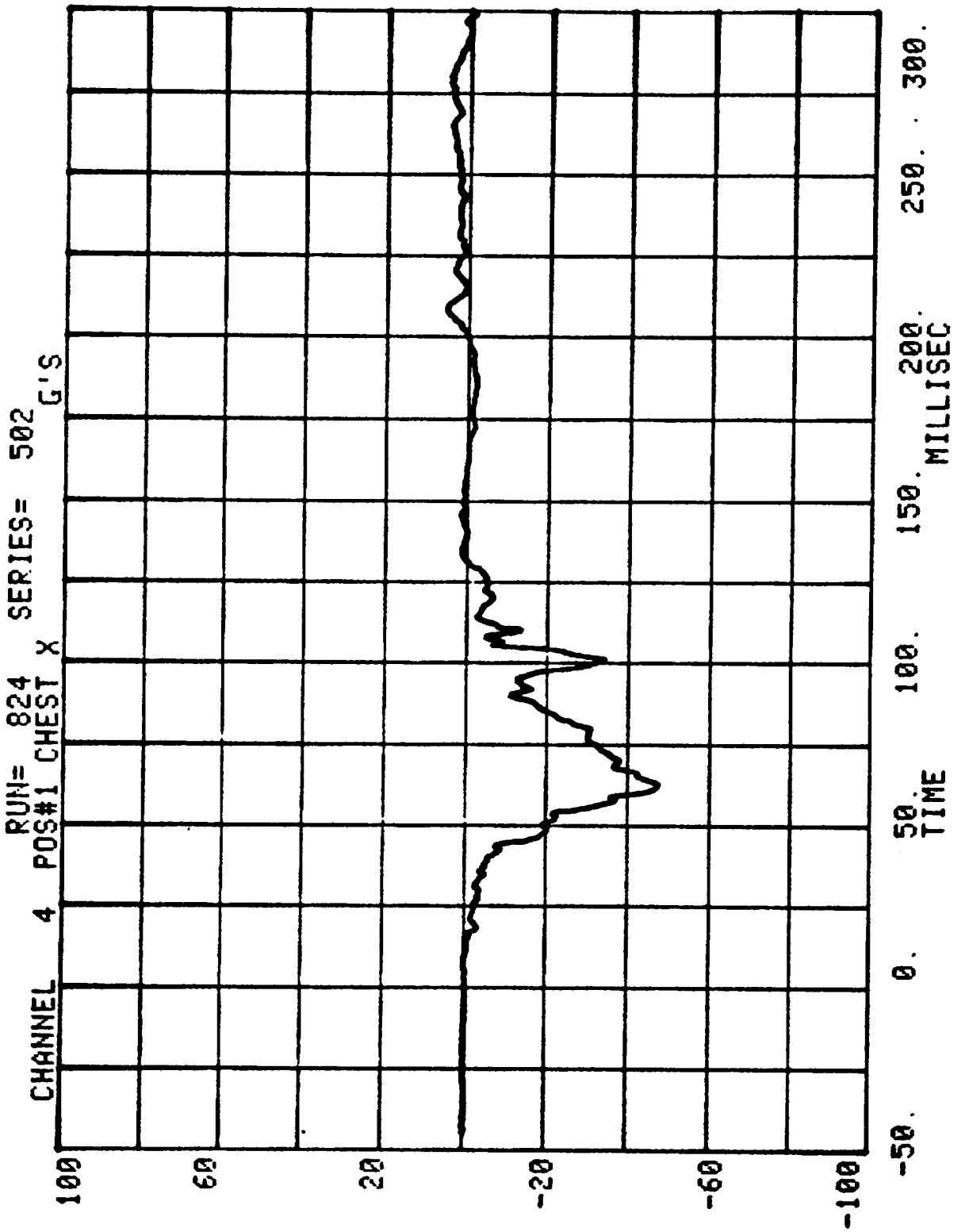
7626-17


CHANNEL 3 POS#1 HEAD Z
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

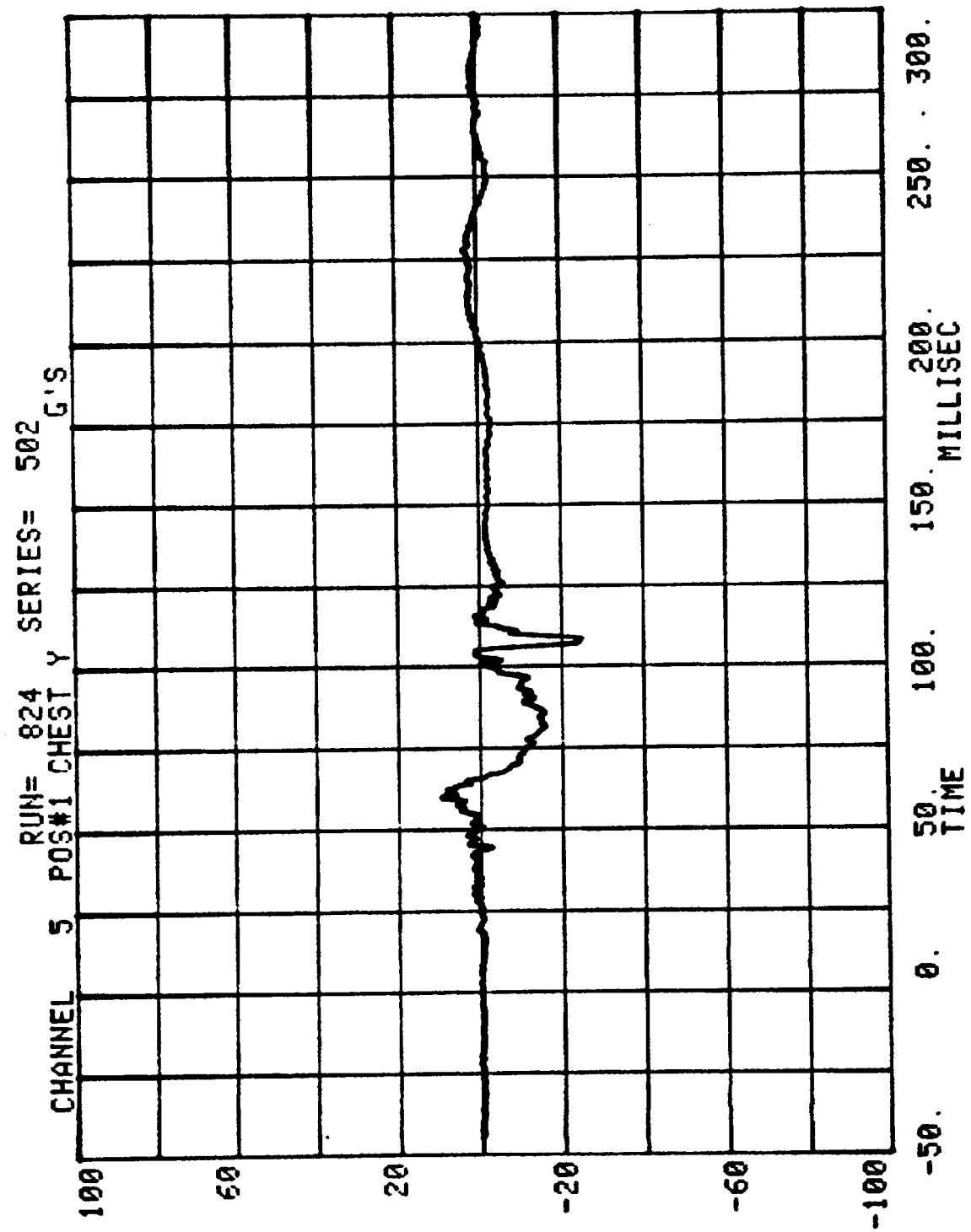
7626-17


RUN= 824 SERIES= 502
CHANNEL 1 POS#1 HEAD R
G'S
250.
200.
150.
100.
50.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

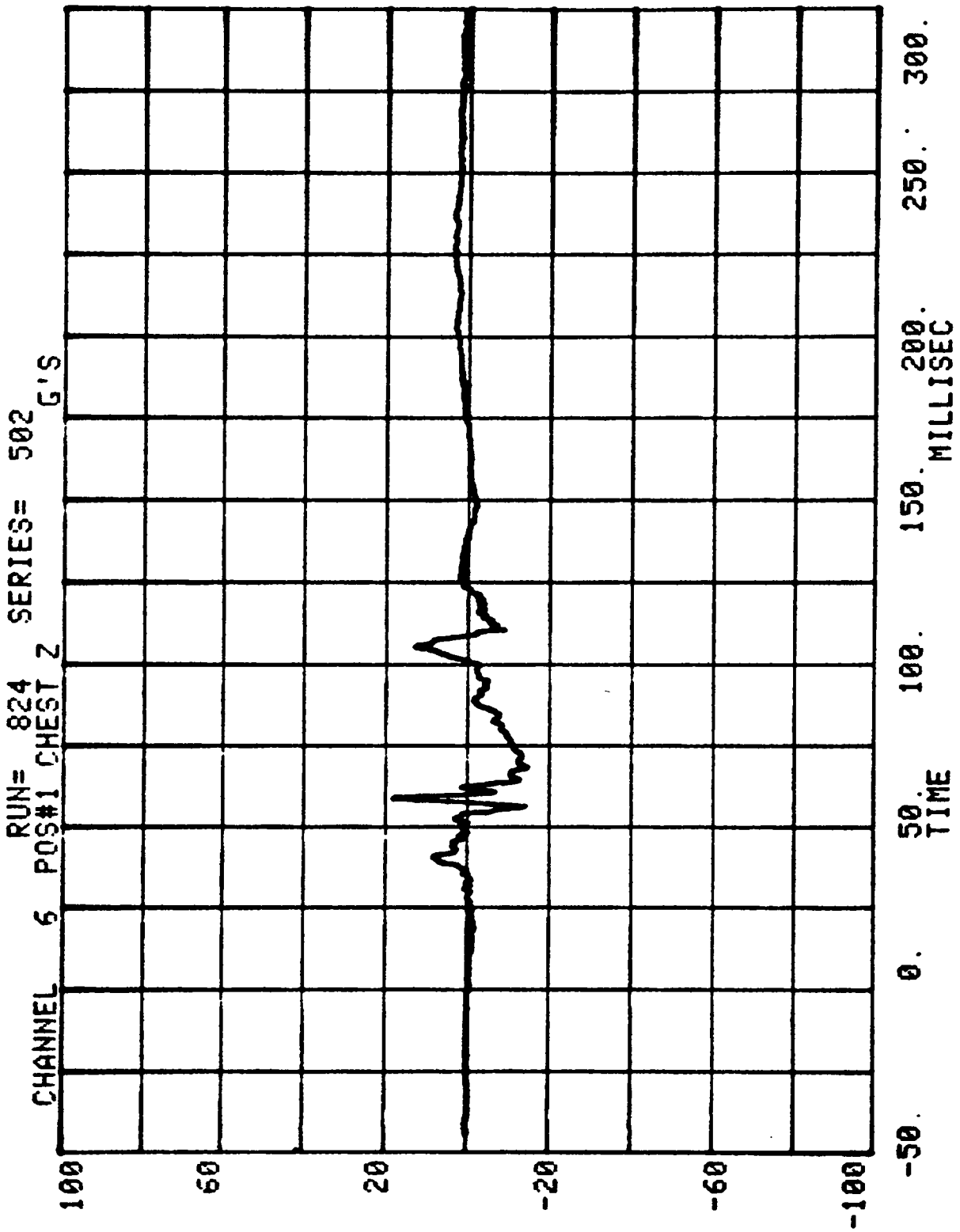
7626-17

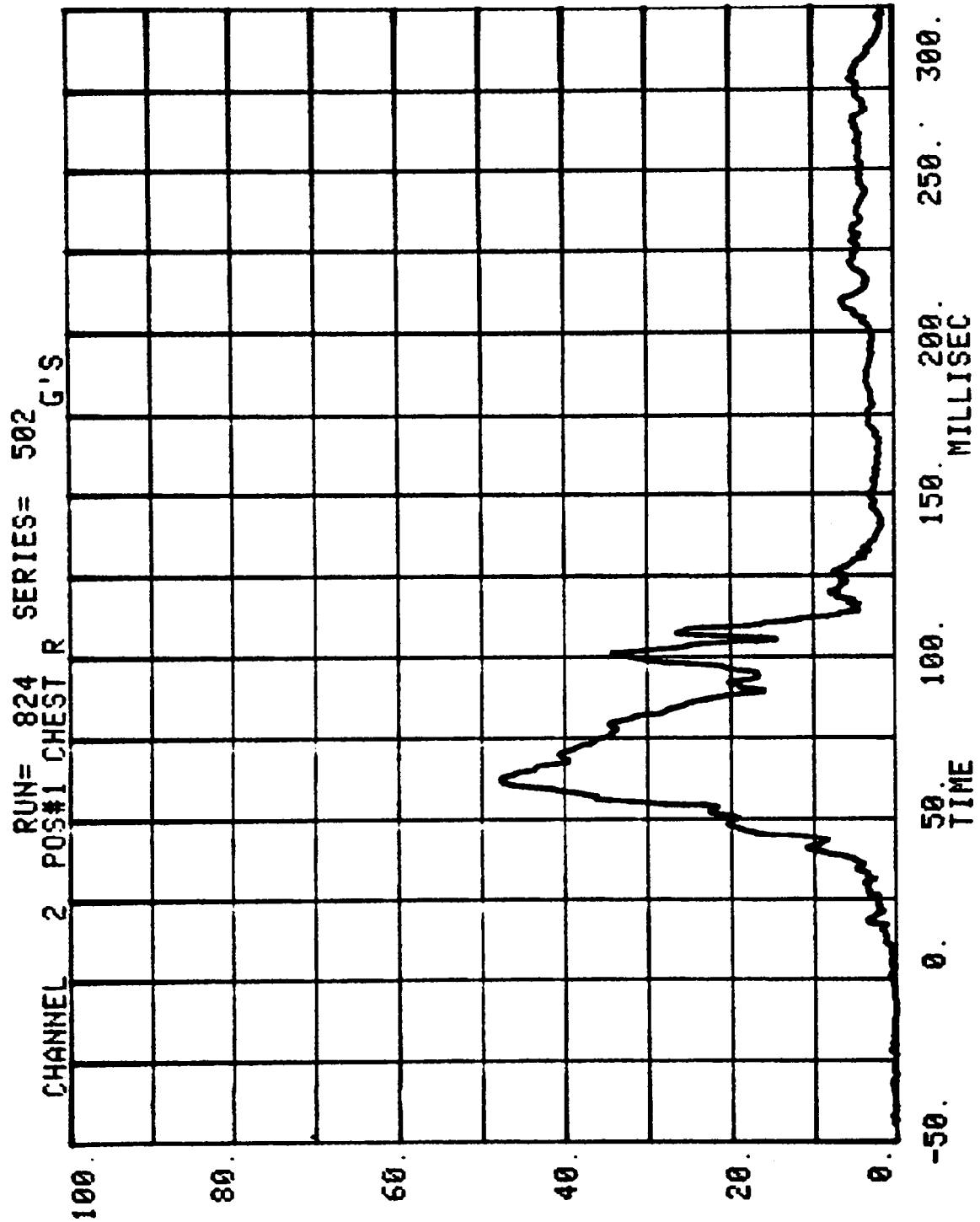

CHANNEL 4 RUN= 824 SERIES= 502
POS#1 CHEST X
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

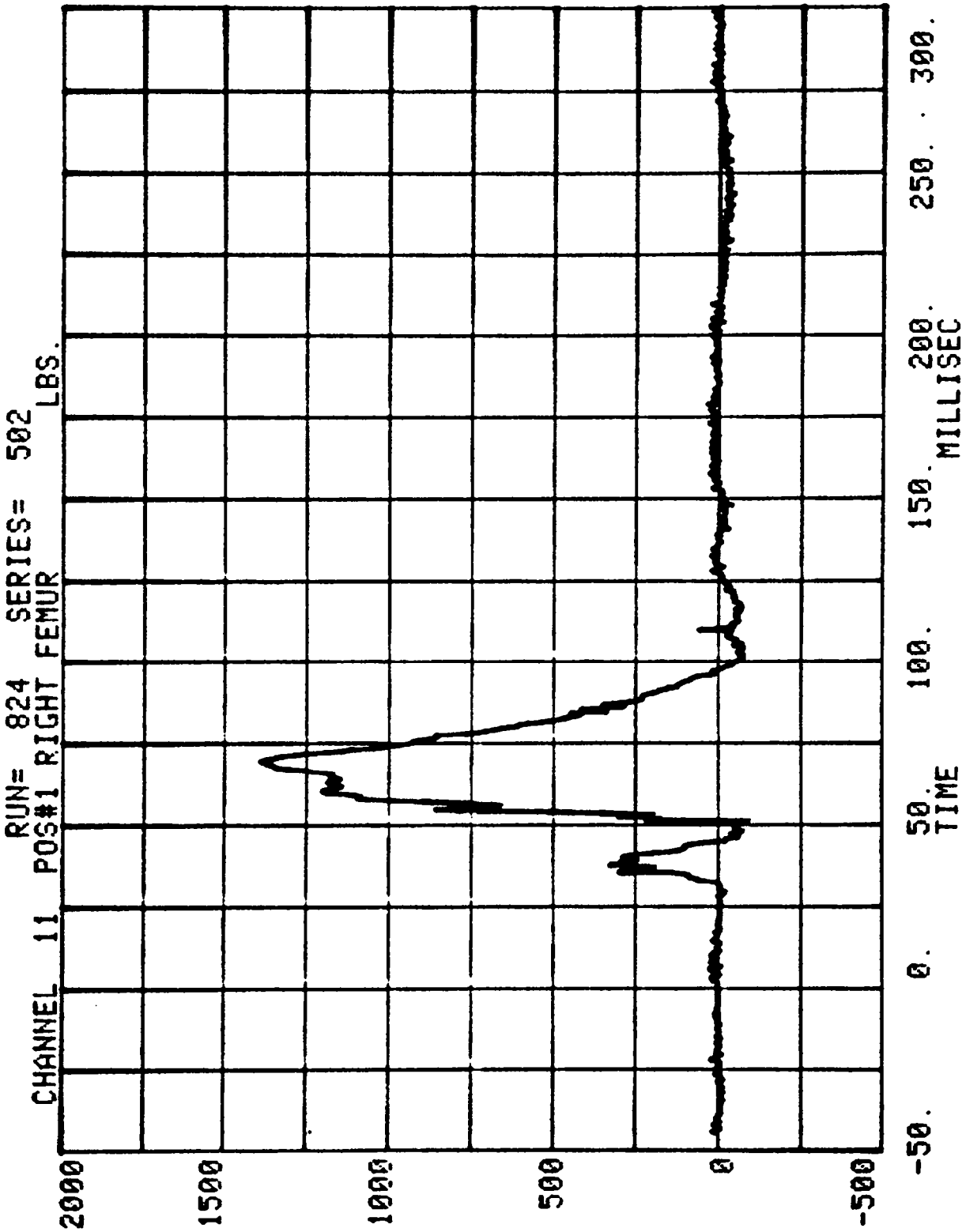
7626-17


CHANNEL 5 RUN= 824 SERIES= 502
POS#1 CHEST Y
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

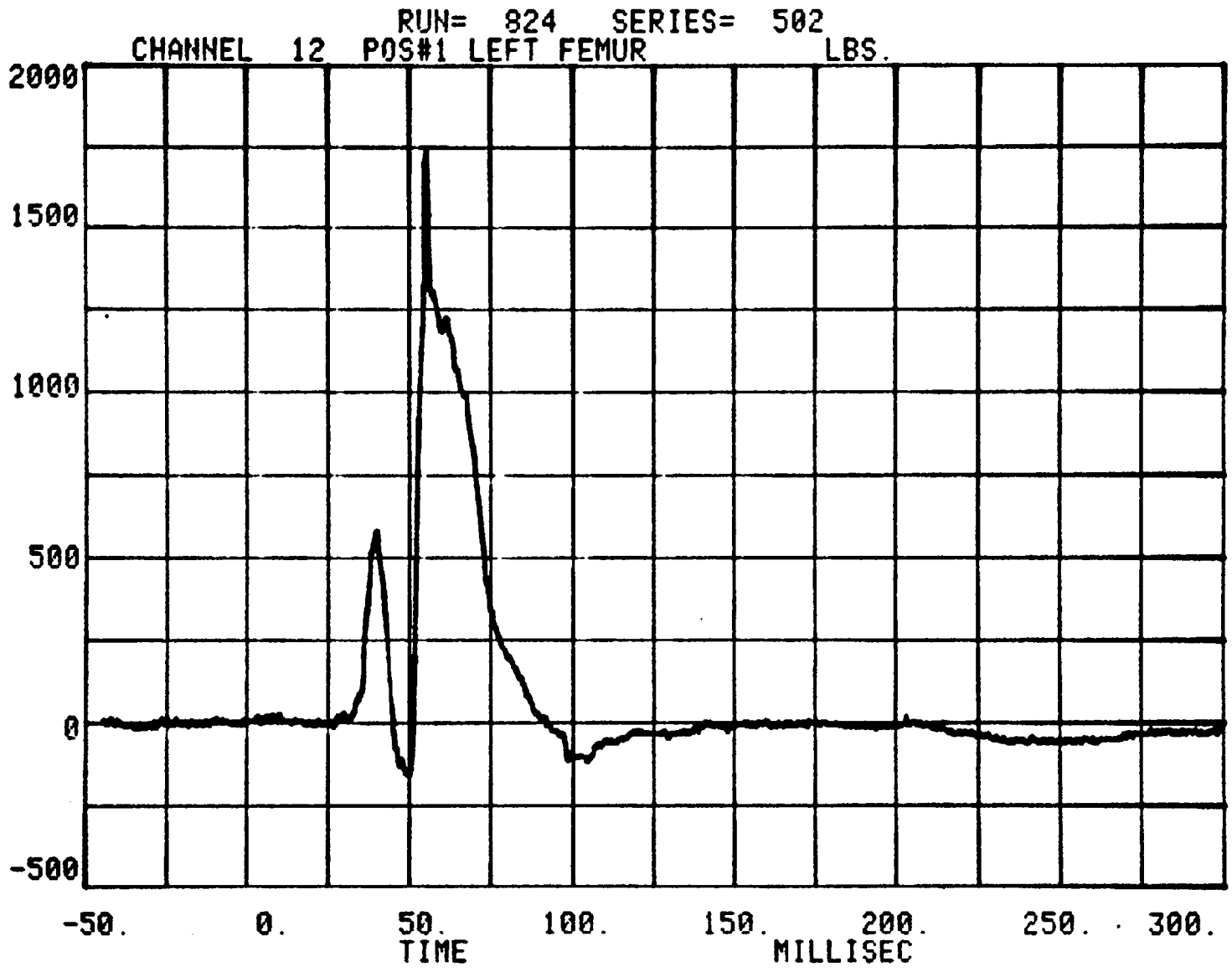
7626-17

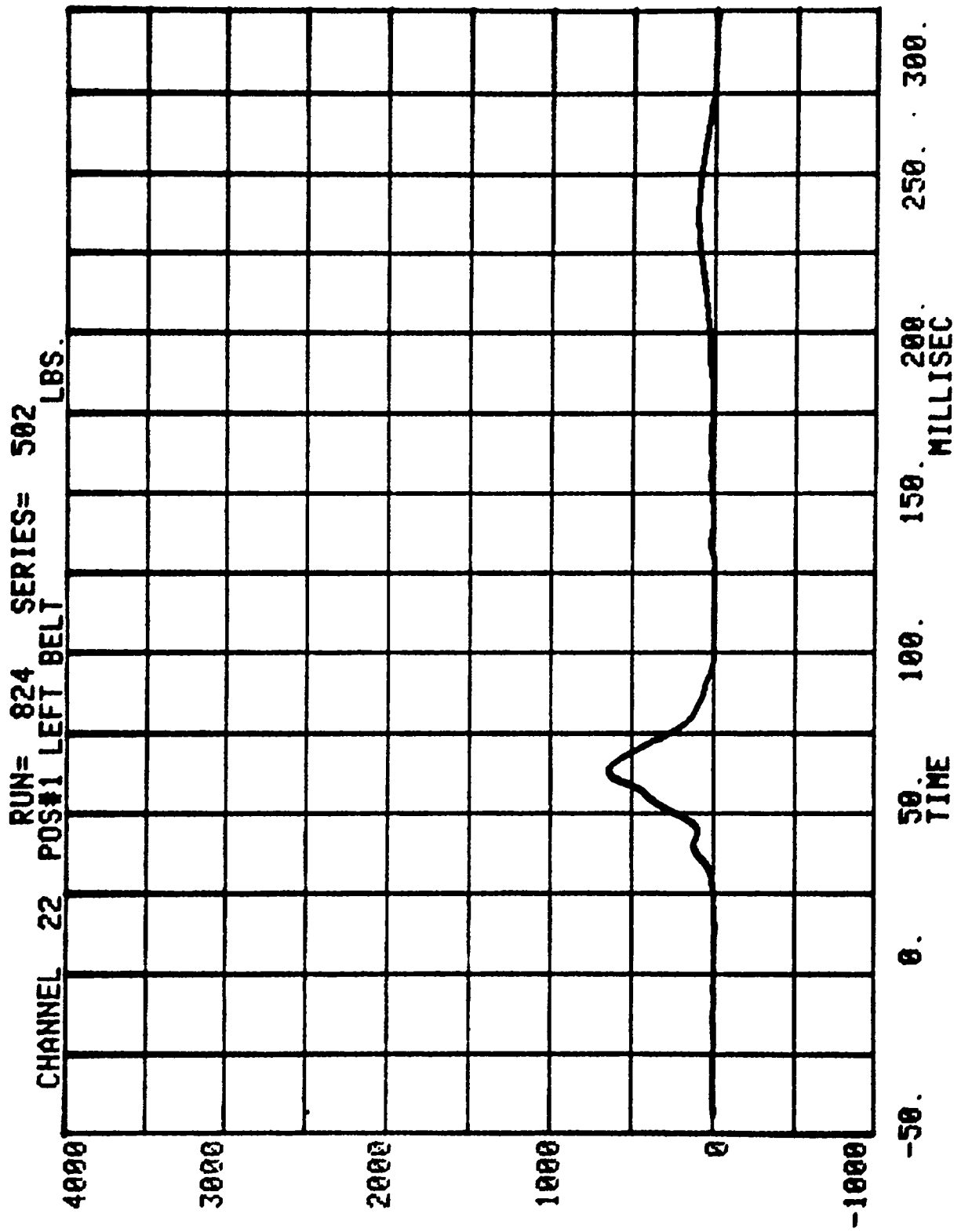

CHANNEL 6 POS#1 CHEST Z
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 2 POS#1 CHEST R
RUN= 824 SERIES= 502
G'S
100.
80.
60.
40.
20.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

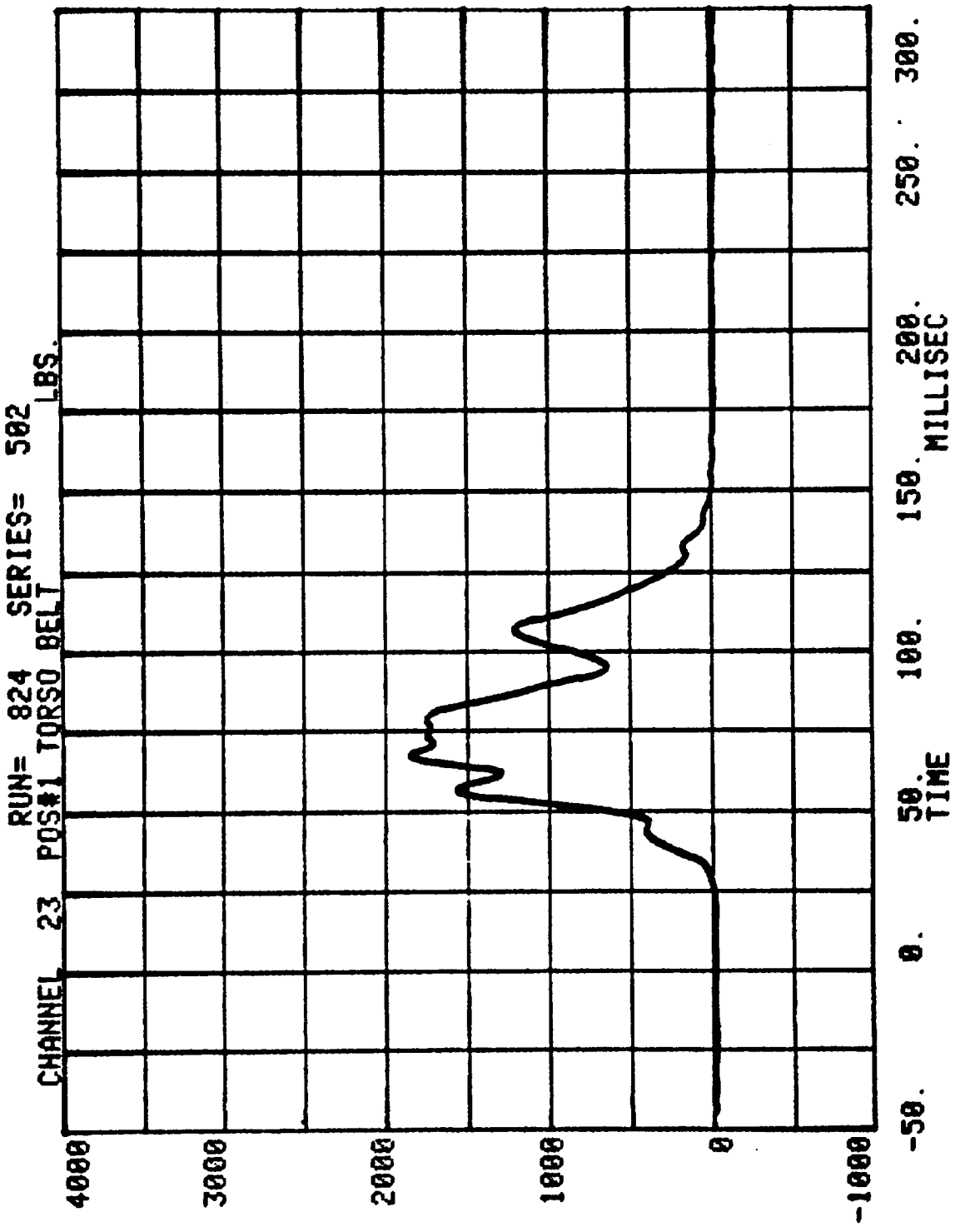

CHANNEL 11 POS#1 RIGHT FEMUR
RUN= 824 SERIES= 502
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

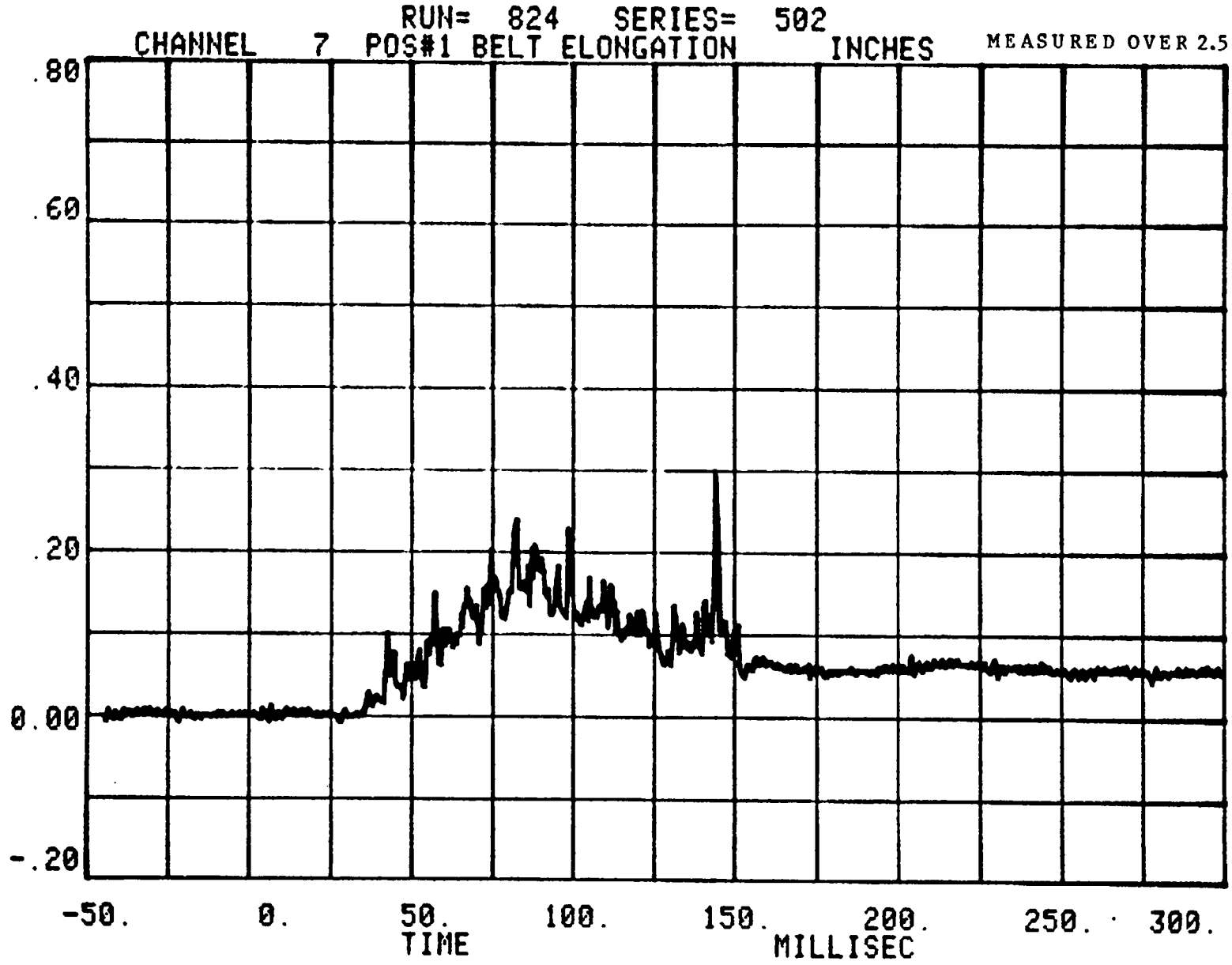

RUN= 824 SERIES= 502
CHANNEL 12 POS#1 LEFT FEMUR LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 22 POS#1 LEFT BELT
RUN= 824 SERIES= 502
LBS.
4000
3000
2000
1000
0
-1000
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17


CHANNEL 23 POS#1 TORSO BELT
RUN= 824 SERIES= 502
LBS.
4000
3000
2000
1000
0
-1000
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17


RUN= 824 SERIES= 502
CHANNEL 7 POS#1 BELT ELONGATION INCHES
MEASURED OVER 2.5 INCHES
.80
.60
.40
.20
0.00
-.20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

NEW CAR ASSESSMENT BARRIER TEST - 1988

RUN= 924

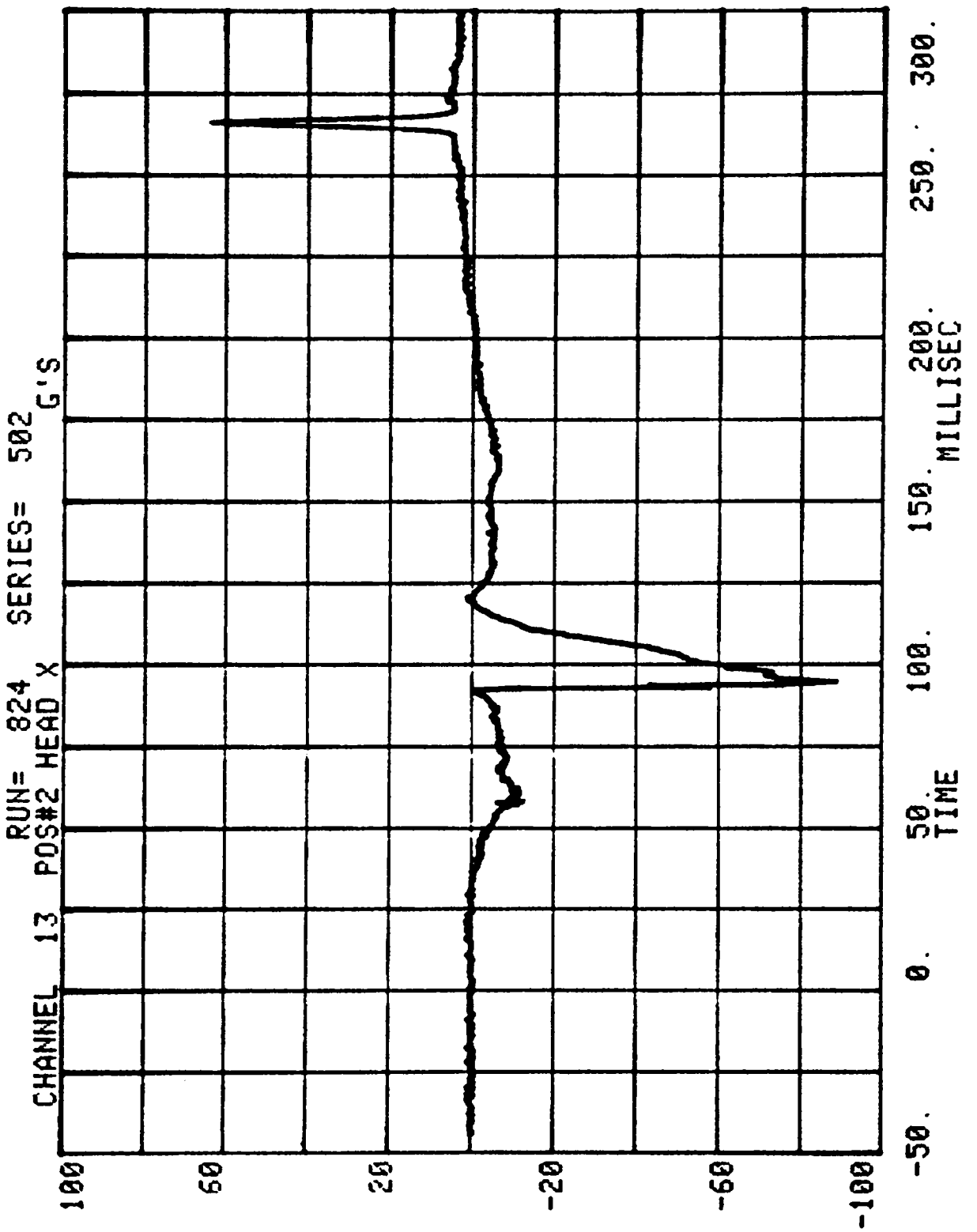
POS#2 HEAD R

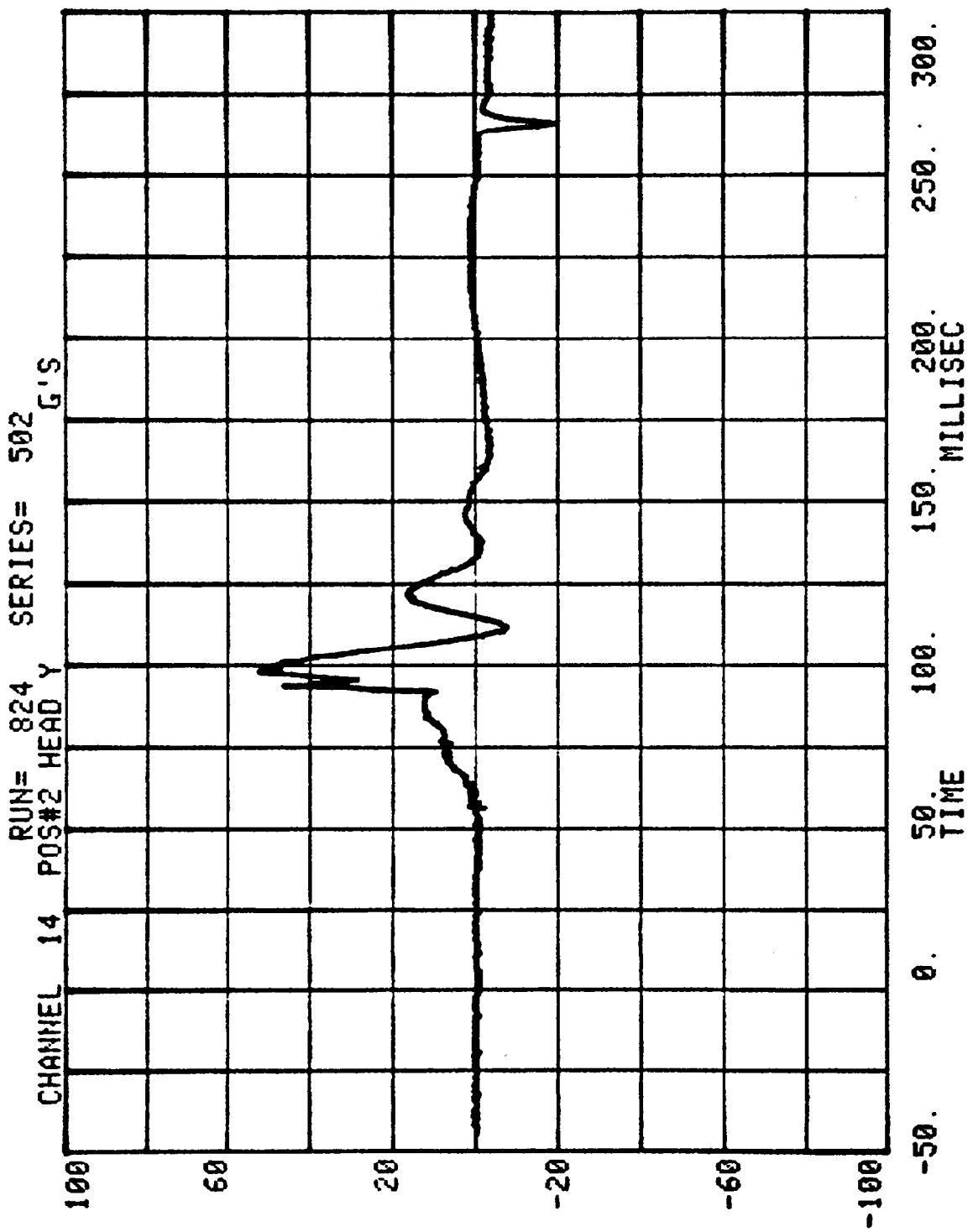
HIC=1249.8 FROM T1= .08662 TO T2= .10500

AVERAGE ACCELERATION BETWEEN T1 AND T2= 85.7G'S

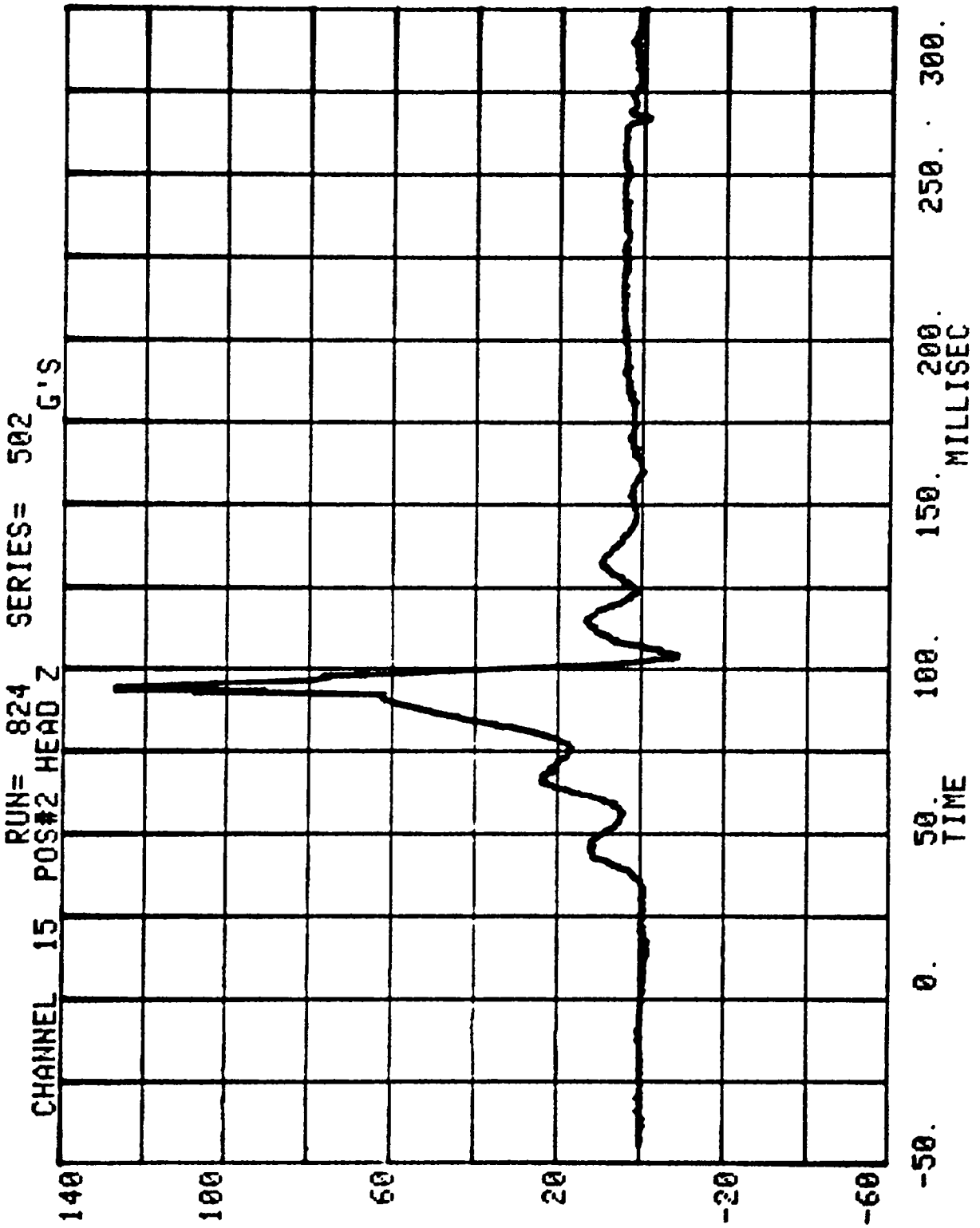
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1845.1

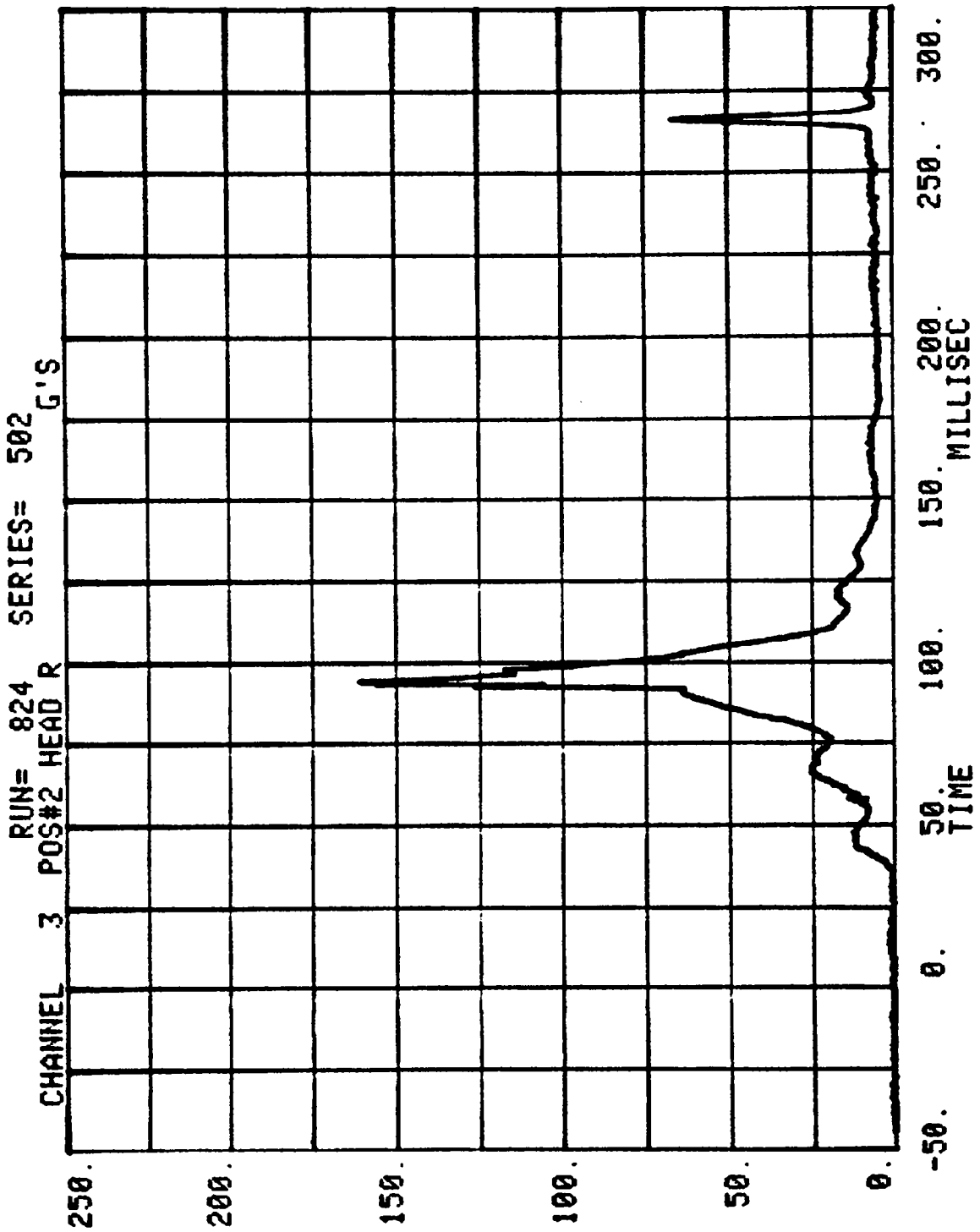

CHANNEL 13 POS#2 HEAD X
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 14 POS#2 HEAD Y
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

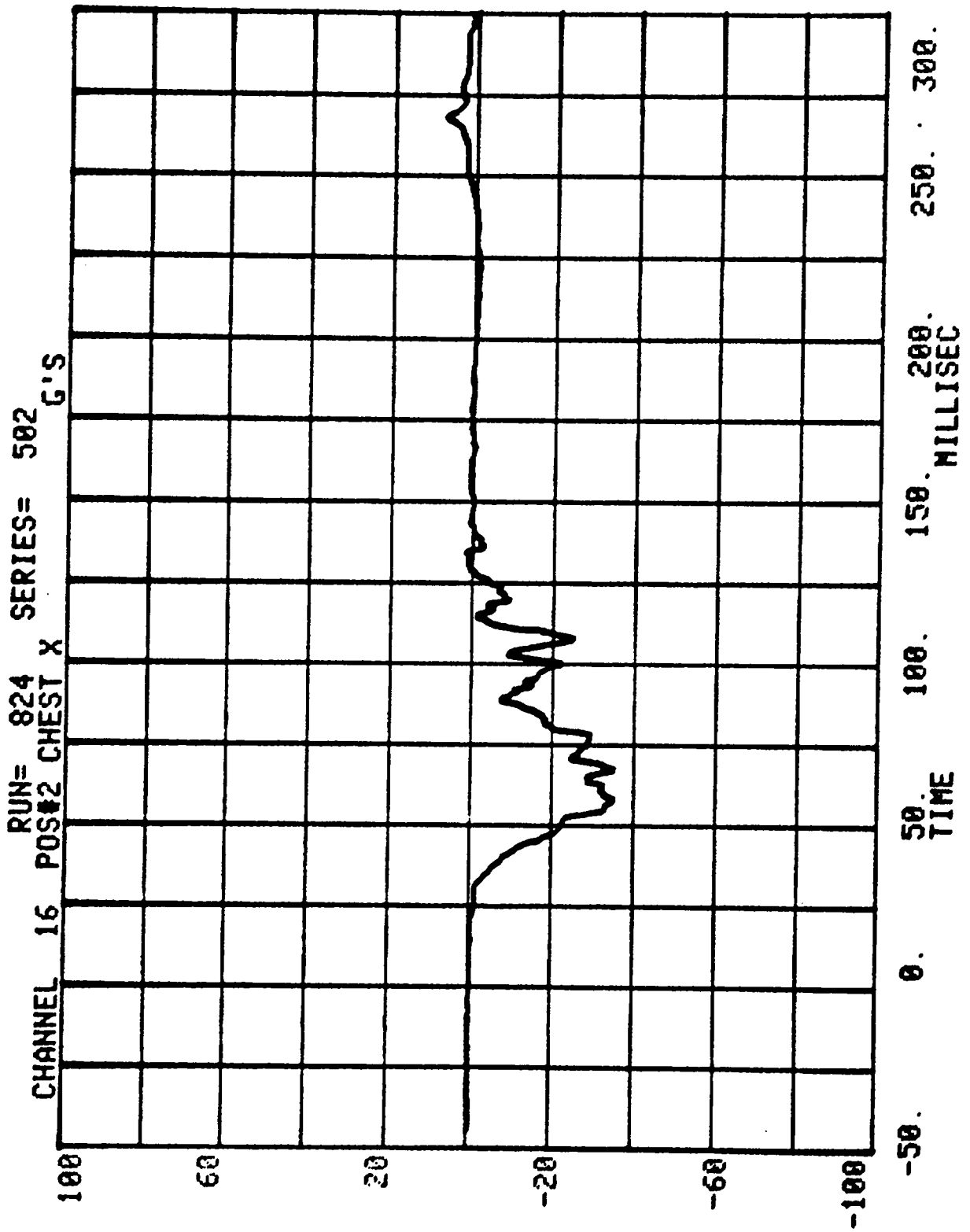
7626-17

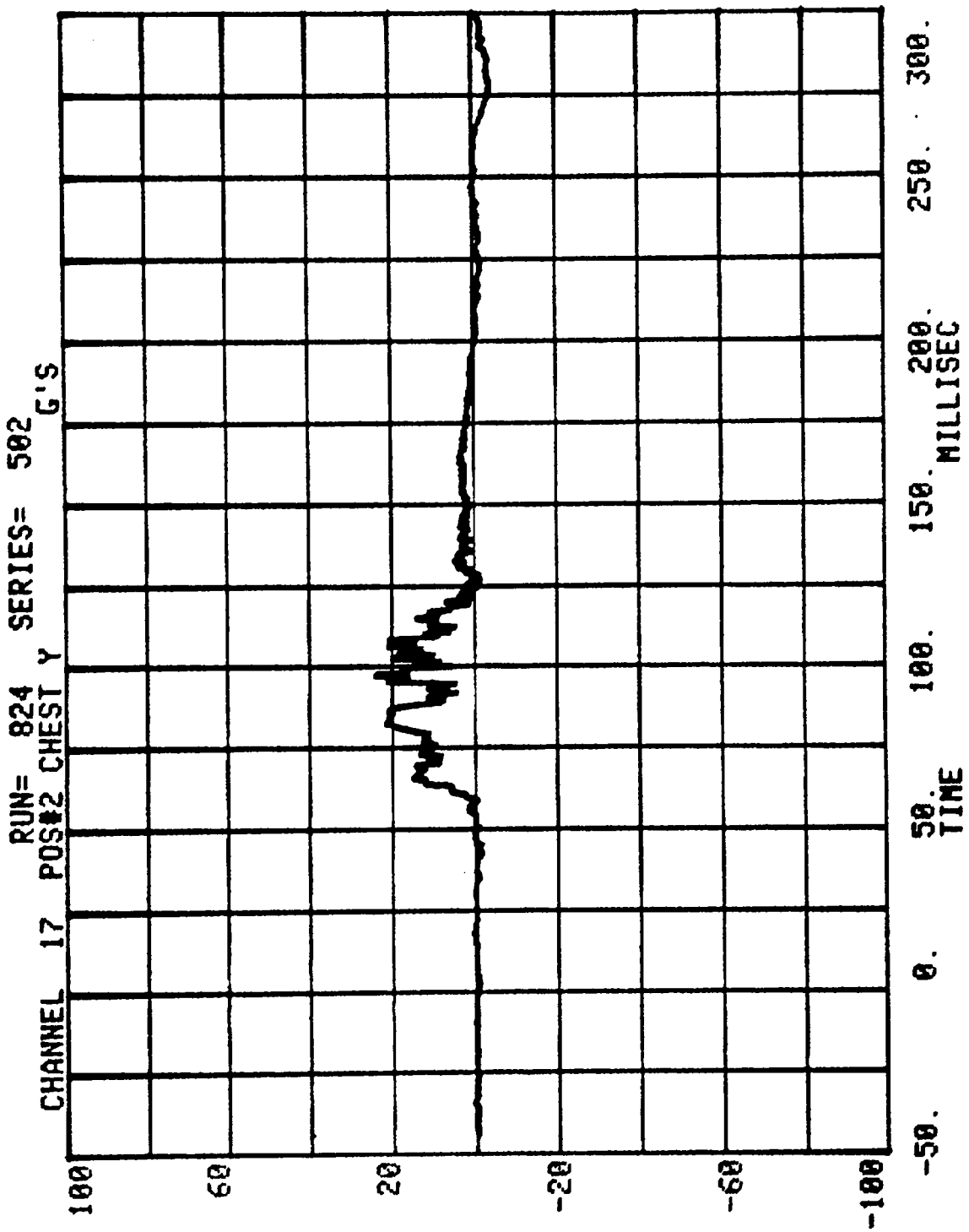

CHANNEL 15 POS#2 HEAD Z
RUN= 824 SERIES= 502
G'S
140
100
60
20
-20
-60
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

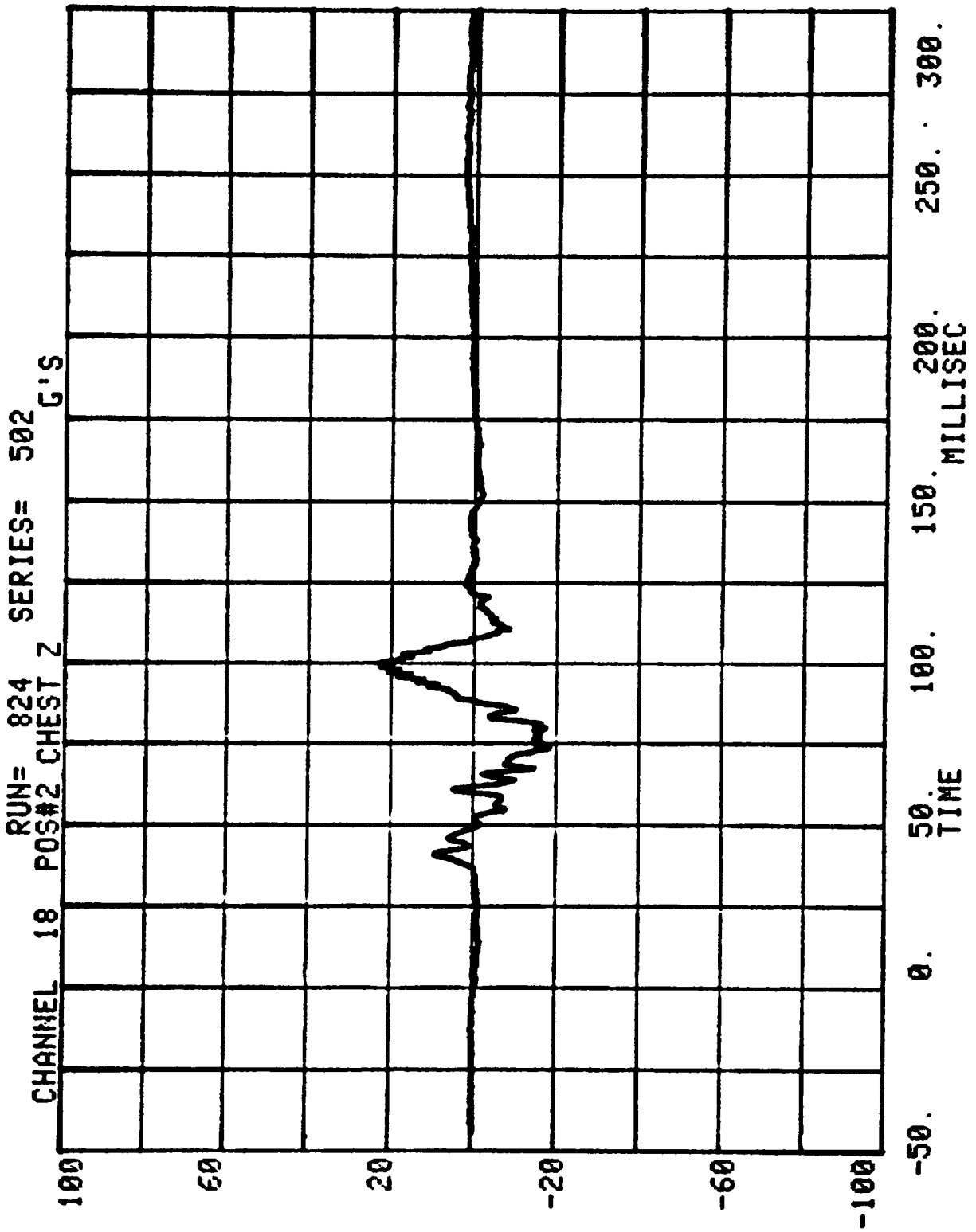

CHANNEL 3 POS#2 HEAD R
RUN= 824 SERIES= 502
G'S
250.
200.
150.
100.
50.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

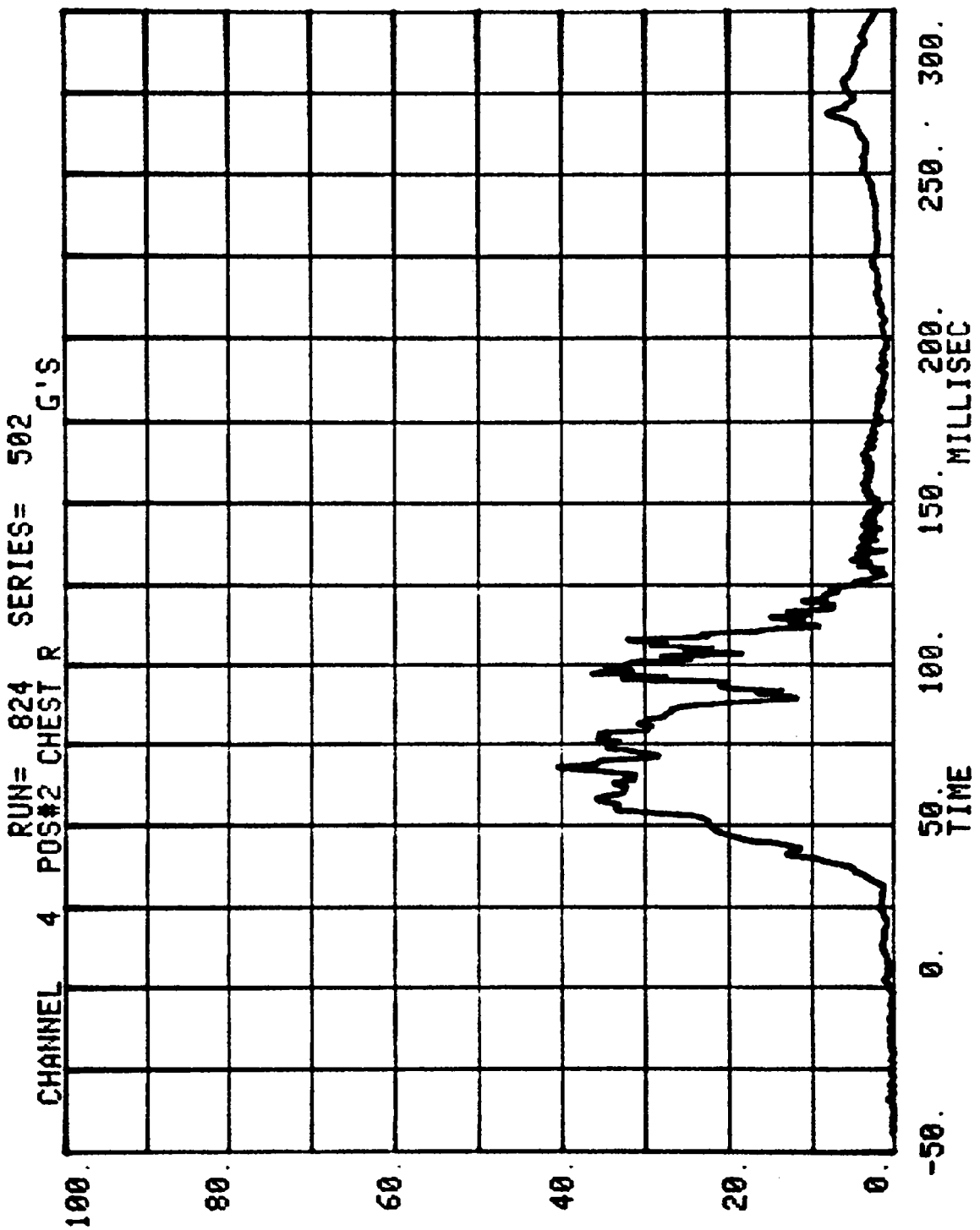

CHANNEL 16 POS#2 CHEST X
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

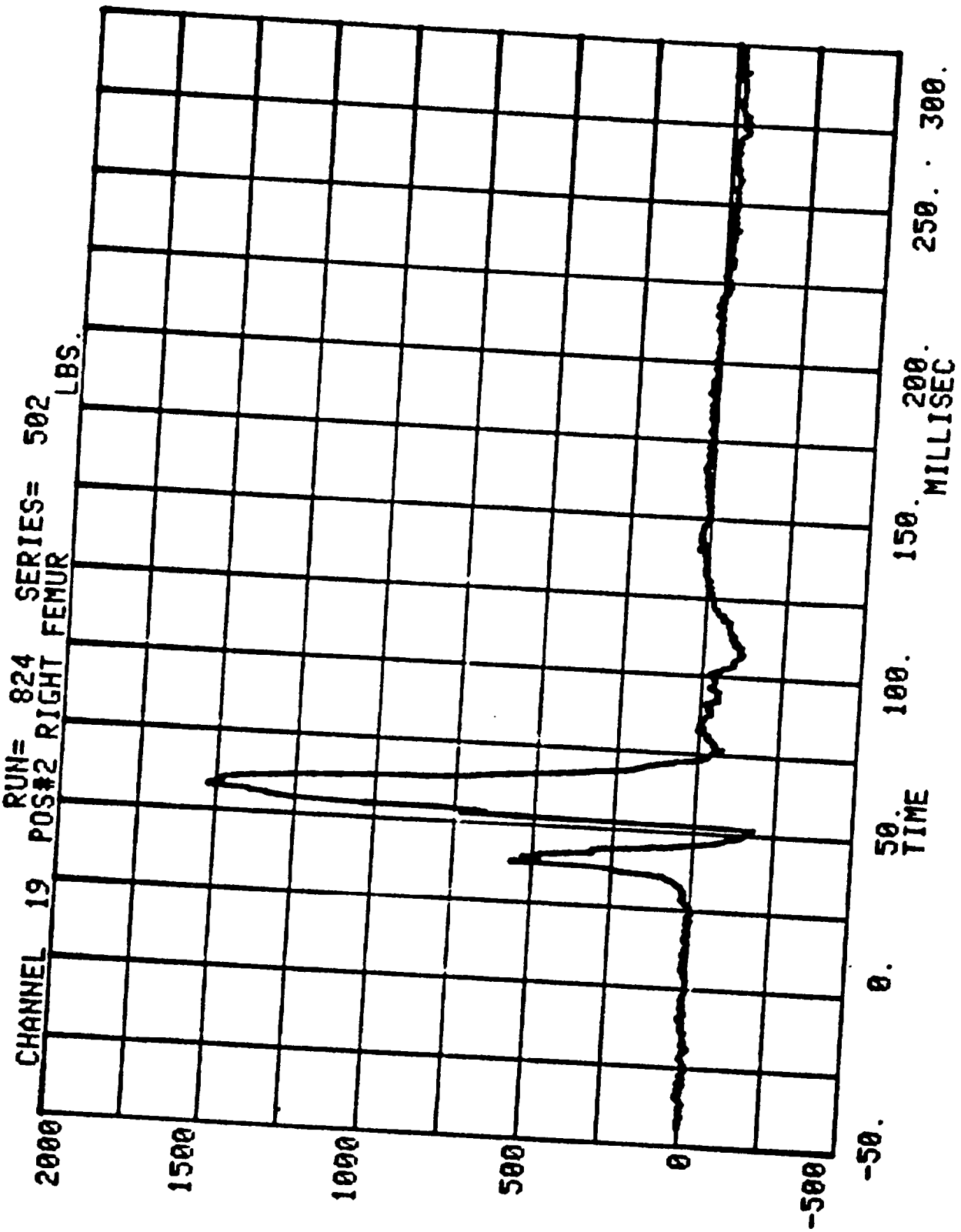

CHANNEL 17 POS#2 CHEST Y
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

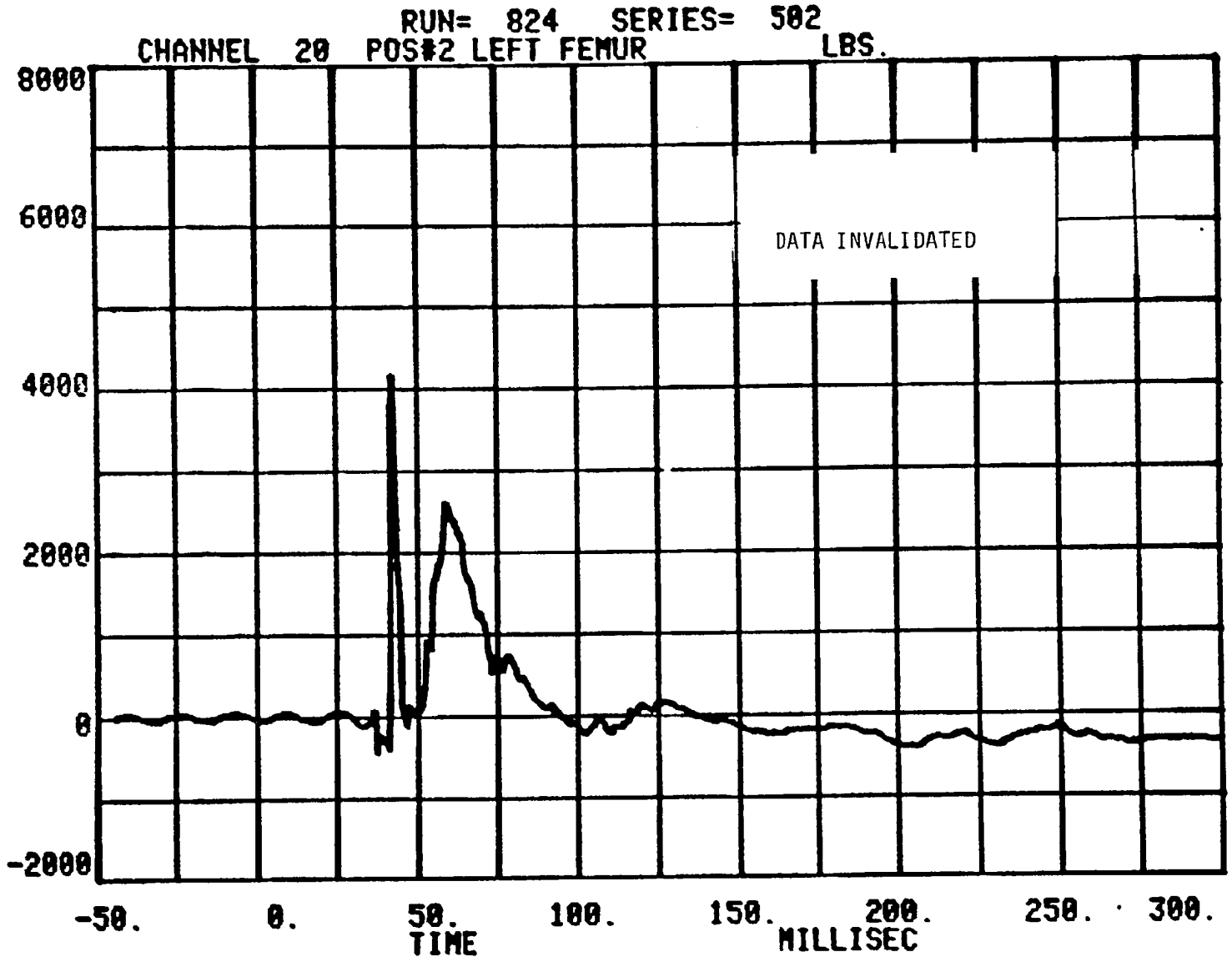

CHANNEL 18 POS#2 CHEST Z
RUN= 824 SERIES= 502
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

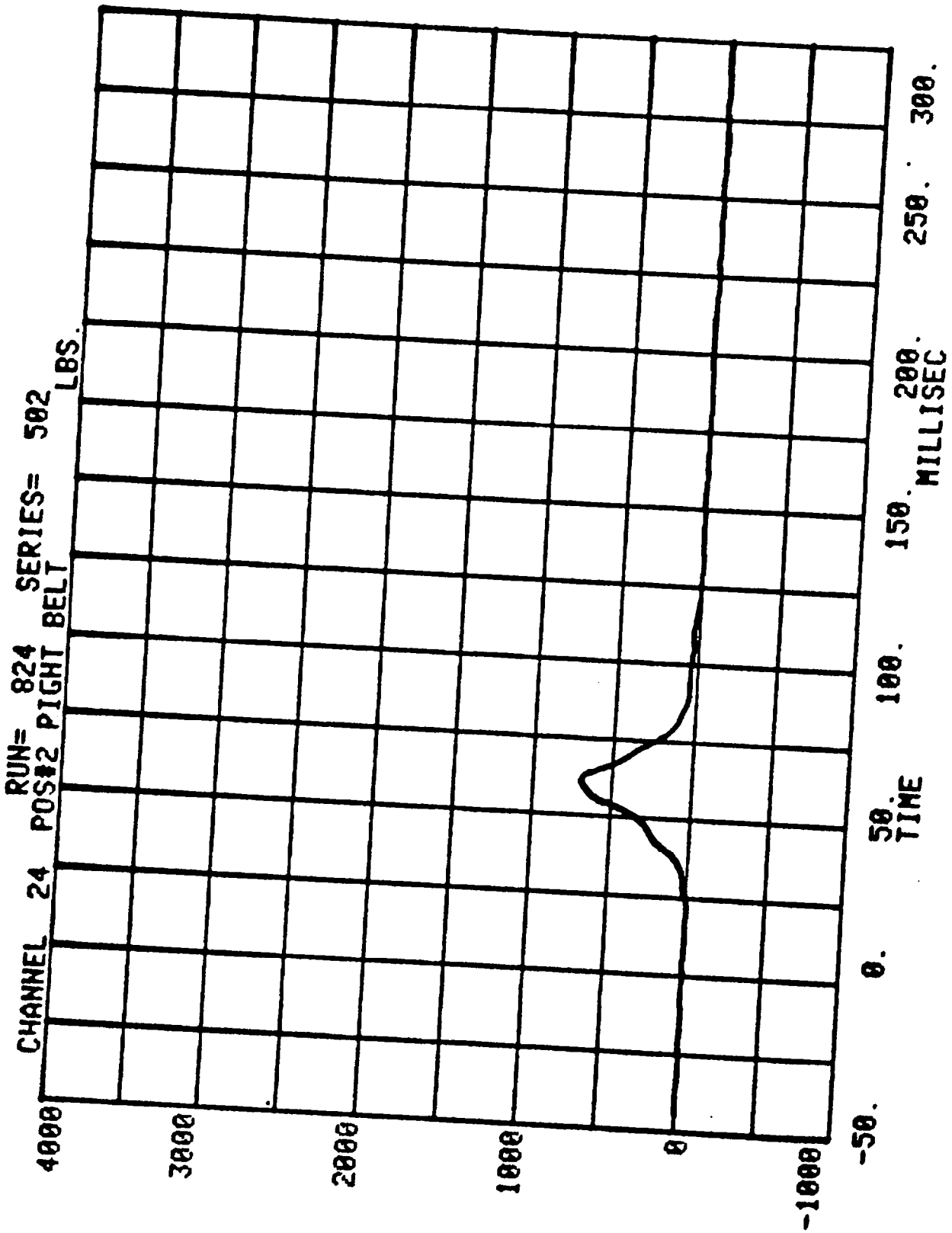

CHANNEL 4 POS#2 CHEST R
RUN= 824 SERIES= 502
G'S
100.
80.
60.
40.
20.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 19 RUN= 824 SERIES= 502
POS#2 RIGHT FEMUR
LBS.
2000
1500
1000
500
0
-500
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

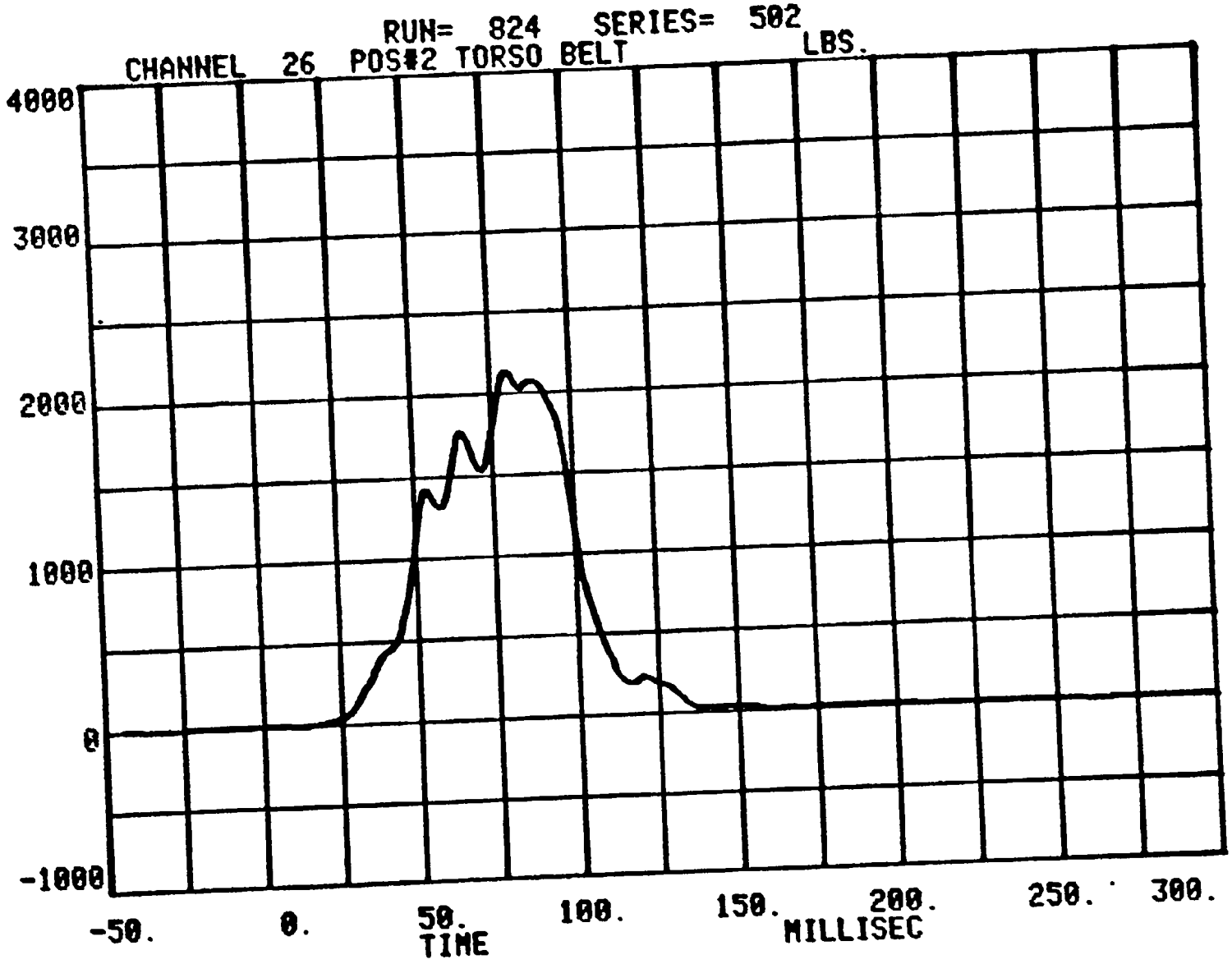
7626-17

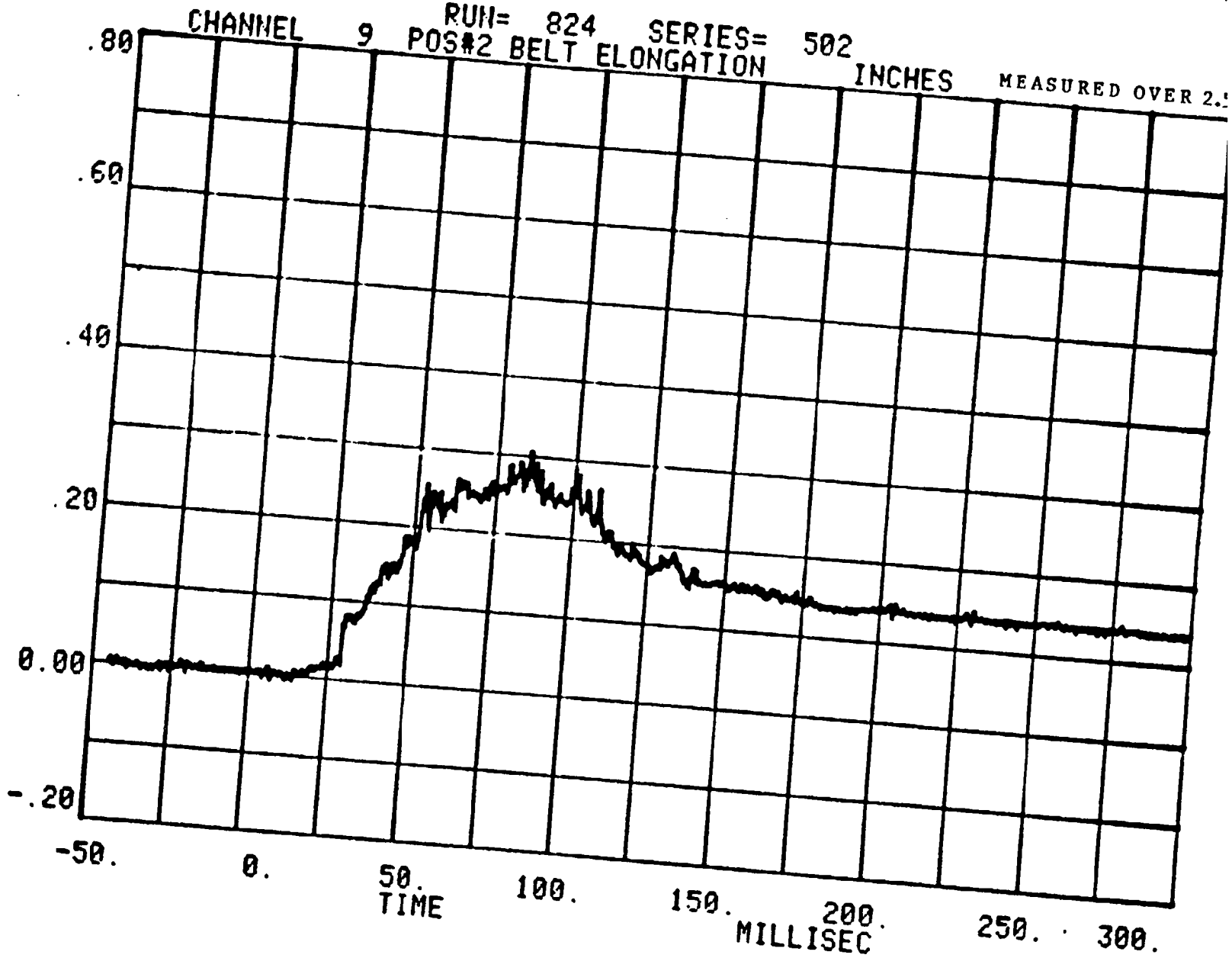

RUN= 824 SERIES= 502
CHANNEL 20 POS#2 LEFT FEMUR LBS.
8000
6000
4000
2000
0
-2000
DATA INVALIDATED
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17


CHANNEL 24 POS#2 RIGHT BELT
RUN= 824 SERIES= 502
LBS.
4000
3000
2000
1000
0
-1000
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17


RUN= 824 SERIES= 502
CHANNEL 26 POS#2 TORSO BELT
LBS.
4000
3000
2000
1000
0
-1000
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 9 RUN= 824 SERIES= 502
POS#2 BELT ELONGATION INCHES
MEASURED OVER 2.
.80
.60
.40
.20
0.00
-.20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7626-17

Appendix C

DUMMY CERTIFICATION TESTS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropomorphic 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, Volume 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.

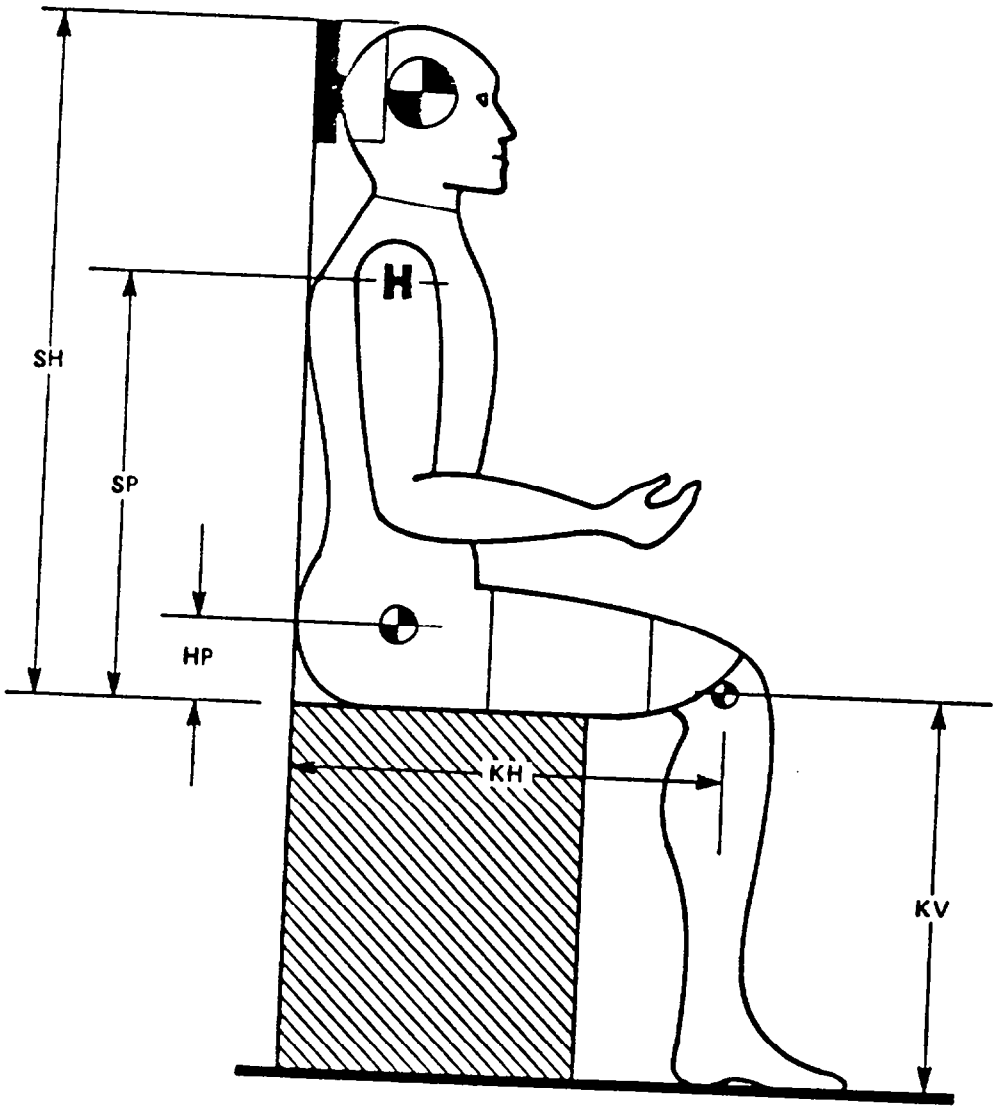
Dummy serial numbers and certification dates are:

Serial No.	Completion Date
1021	4-20-88
1022	4-22-88

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.

Figure 10 DUMMY CONFIGURATION DIMENSIONS



PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 1021

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXX	4-20-88	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXX	5	
SH - Seated Height	35.6 to 35.8"	35.6 "	
SP - Shoulder Pivot Height	21.8 to 22.4"	22.1 "	
HP - Hip Pivot Height	3.9" ref.	3.9 "	
KH - Knee Pivot from Back Line	20.1 to 20.7"	20.5 "	
KV - Knee Pivot from floor	19.3 to 19.9"	19.5 "	
SW - Shoulder Width	17.8 to 18.4"	18.0 "	
HW - Hip Width	14.0 to 15.4"	14.8 "	

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		4-20-88	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		5	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-70 deg	
VERIFICATION LAB HUMIDITY (10 TO 70 %)		32-36 %	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	230 G's	
b. peak lateral accel.	<= 10 G's	3 G's	
c. Time above 100 G's	0.9 to 1.5 ms.	1.2 ms	

* Sequential number beginning with "1" at the start of each fiscal years's crash test program.

TECHNICIAN'S NAME: D. White

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1021

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	22.2 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	22 G's	
c. Peak Resultant Head Acceleration		26 G's max.	20 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	25.5 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	5 ms	
g. Max. Head Rotation		63 to 73 deg.	66 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	29.9 ms	
	Displ.	2.1 to 3.1"	2.7 "	
60 deg.	Time	40.3 to 51.7 ms.	45.8 ms	
	Displ.	4.3 to 5.3"	5.2 "	
Maximum (66 deg)	Time	53.2 to 66.8 ms.	56 ms	
	Displ.	5.0 to 6.0"	5.8 "	
60 deg.	Time	67.0 to 83.0 ms.	72.1 ms	
	Displ.	4.3 to 5.3"	5.2 "	
30 deg.	Time	85.4 to 104.6 ms.	92.9 ms	
	Displ.	2.1 to 3.1"	2.1 "	
0 deg.	Time	101.0 - 123.0 ms.	109.2 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: D. Weiss

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1021

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
3. ABDOMINAL COMPRESSION TEST: (preload = 50 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	24 lbs	
b. Force @ 0.75"	36 to 50 lbs.	37 lbs	
c. Force @ 1.0"	50 to 63 lbs.	52 lbs	
d. Force @ 1.3"	73 to 88 lbs.	74 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	29.5 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	39 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	50.5 lbs	
d. Return Angle	12 deg. maximum	8 deg.	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	22.0 fps	
(2) Peak Deflection	1.7" maximum	1.28 "	
(3) Peak Resistive Force	2250 lbs maximum	2158 lbs	
(4) Internal Hysteresis	50 to 70%	51.8 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.0 fps	
(2) Peak Deflection	1.1" maximum	.88 "	
(3) Peak Resistive Force	1450 lbs maximum	1300 lbs	
(4) Internal Hysteresis	50 to 70%	58.6 %	

TECHNICIAN'S NAME: DW Hess

NHTSA DUMMY I.D. NUMBER: 1021

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
6. KNEE IMPACT TEST			
A. Right Side			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	1950 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.85 ms	
B. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	6.9 fps	
(2) Maximum Force	1850 to 2500 lbs	1950 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.8 ms	

REMARKS:

TECHNICIAN'S NAME: DW Hood

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER ____1021_____

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CJ22	2-88	8-88
HY LATERAL--	ENDEVCO	CS41	2-88	8-88
HZ VERTICAL--	ENDEVCO	CH31	2-88	8-88
2. CHEST ACCELEROMETER-				
CX LONGITUDINAL--	CEC	A73	2-88	8-88
CY LATERAL--	ENDEVCO	CE06	2-88	8-88
CZ VERTICAL--	CEC	A44	2-88	8-88
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	552	5-88	11-88
LEFT SIDE	GSE	551	5-88	11-88
CALIBRATION LABORATORY INSRUTMENTS--				
1. PENDULUM ACC.--	CEC	A144	12-87	6-88
2. TEST PROBE ACCELEROMETER--	CEC	A142	12-87	6-88
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS-DUCER INC	20051	11-87	5-88
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	11-87	5-88
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	11-87	5-88

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXX	4-22-88	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXX	4	
SH - Seated Height	35.6 to 35.8"	35.7"	
SP - Shoulder Pivot Height	21.8 to 22.4"	22.0"	
HP - Hip Pivot Height	3.9" ref.	3.9"	
KH - Knee Pivot from Back Line	20.1 to 20.7"	20.4"	
KV - Knee Pivot from floor	19.3 to 19.9"	19.5"	
SW - Shoulder Width	17.8 to 18.4"	18.1"	
HW - Hip Width	14.0 to 15.4"	14.8"	

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required
DATE OF PERFORMANCE VERIFICATION		4-22-88	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		4	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-72 deg	
VERIFICATION LAB HUMIDITY (10 TO 70 %)		30-36 %	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	250 G's	
b. peak lateral accel.	<= 10 G's	10 G's	
c. Time above 100 G's	0.9 to 1.5 ms.	1.2 ms	

* Sequential number beginning with "1" at the start of each fiscal years's crash test program.

TECHNICIAN'S NAME: D. W. Hess

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	22.3 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	22.5 G's	
c. Peak Resultant Head Acceleration		26 G's max.	26 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	25.9 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	2.8 ms	
g. Max. Head Rotation		63 to 73 deg.	66 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	28.8 ms	
	Displ.	2.1 to 3.1"	2.7 "	
60 deg.	Time	40.3 to 51.7 ms.	44 ms	
	Displ.	4.3 to 5.3"	5.1 "	
Maximum (66 deg)	Time	53.2 to 66.8 ms.	56.8 ms	
	Displ.	5.0 to 6.0"	5.6 "	
60 deg.	Time	67.0 to 83.0 ms.	68.1 ms	
	Displ.	4.3 to 5.3"	5.1 "	
30 deg.	Time	85.4 to 104.6 ms.	88 ms	
	Displ.	2.1 to 3.1"	2.1 "	
0 deg.	Time	101.0 - 123.0 ms.	104 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: D W Hess

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
3. ABDOMINAL COMPRESSION			
TEST: (preload = 50 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	28 lbs	
b. Force @ 0.75"	36 to 50 lbs.	45 lbs	
c. Force @ 1.0"	50 to 63 lbs.	63 lbs	
d. Force @ 1.3"	73 to 88 lbs.	87 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	28.5 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	39 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	51 lbs	
d. Return Angle	12 deg. maximum	8 deg	
5. CHEST IMPACT TESTS:			
A.High Speed			
(1) Probe Speed	21.78-22.22 fps.	22.0 fps	
(2) Peak Deflection	1.7" maximum	1.56 "	
(3) Peak Resistive Force	2250 lbs maximum	2080 lbs	
(4) Internal Hysteresis	50 to 70%	50.3 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	13.9 fps	
(2) Peak Deflection	1.1" maximum	1.02 "	
(3) Peak Resistive Force	1450 lbs maximum	1300 lbs	
(4) Internal Hysteresis	50 to 70%	62.3 %	

TECHNICIAN'S NAME: D W Hess

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required
6. KNEE IMPACT TEST			
A.Right Side			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2350 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.7 ms	
B. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2150 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.8 ms	

REMARKS:

TECHNICIAN'S NAME: D. L. Hess

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER ____1022_____

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CK54	2-88	8-88
HY LATERAL--	ENDEVCO	CK78	2-88	8-88
HZ VERTICAL--	ENDEVCO	CD75	2-88	8-88
2. CHEST ACCELEROMETER-				
CX LONGITUDINAL--	CEC	A115	4-88	10-88
CY LATERAL--	ENDEVCO	CS09	4-88	10-88
CZ VERTICAL--	CEC	A29	4-88	10-88
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	077	5-88	11-88
LEFT SIDE	GSE	076	5-88	11-88
CALIBRATION LABORATORY INSRUTMENTS--				
1. PENDULUM ACC.--	CEC	A144	12-87	6-88
2. TEST PROBE ACCELEROMETER--	CEC	A142	12-87	6-88
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS-DUCER INC	20051	11-87	5-88
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	11-87	5-88
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	11-87	5-88

APPENDIX D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

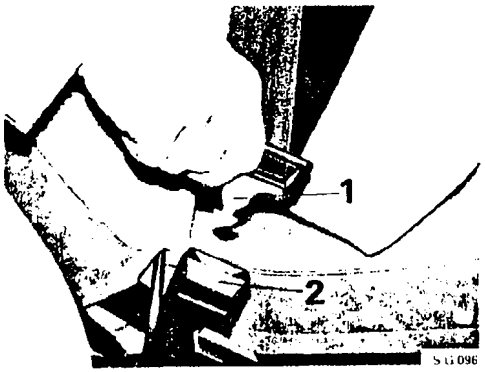
Manual seat belt system

NOTE! Seat belts, properly worn, reduce the risk of serious occupant injury in an accident or emergency maneuver. Belt type restraints are provided at all seating positions. Use them for your comfort and protection.

Inertia reel-type three point manual belts are provided at the front and outboard rear seating positions. A manually adjusted lap belt is provided for the center rear position.

Seat belt, front seat

1. Latch tongue
2. Latch stalk



Using manual lap and shoulder belts

Each lap and shoulder (three point) restraint consists of a continuous belt, a latch stalk, and a locking retractor mechanism which allows passenger movement under normal circumstances and locks the belt in emergency situations.

To put the belt on, first grasp it near the shoulder belt guide loop and pull out a sufficient length of belt to reach the latch mechanism between the front seats. One section of the belt should now be lying low over the hips and the other well in on the shoulder but not too close to the neck. Position the latch tongue on the belt so that it can be inserted into the latch stalk.

Pull up on the upper portion of the belt to take up any slack in the lap portion. The retractor mechanism will automatically adjust the shoulder portion. The belt is released by pressing the red button. The retractor will return the belt to its stored position.

NOTE! Pregnant women should use the belt as described above paying special attention to applying the lap portion of the belt as low and snug over the hips as possible.

When the belts are in use the retractor mechanism is normally unlocked. This allows freedom of movement for the restrained occupant automatically The belt locking mechanism is activated by rapid belt motion and/or sudden vehicle deceleration. The belts will lock during hard braking or when the vehicle is climbing or descending steep grades.

Seat belt reminder system

This vehicle is equipped with a seat belt reminder system as required by Federal Motor Vehicle Safety Standard 208, Occupant Crash Protection. The purpose of this standard is to reduce the number and severity of traffic accident injuries by promoting increased usage of seat belt systems. The vehicle may be started whether or not the seat belts are fastened. The reminder light on the instrument panel will glow for about 8 seconds. The audible buzzer will sound until this light goes out or the driver's seat belt is fastened, whichever occurs first.

Passive seat belt system

Passive seat belt system

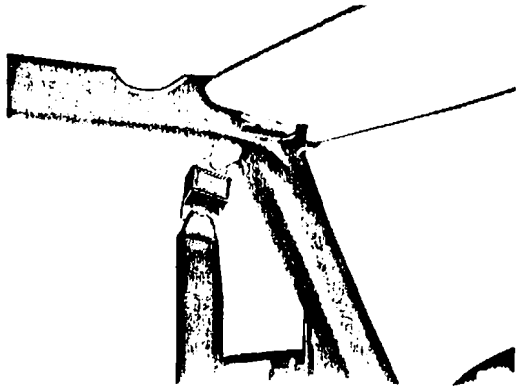
The front seats of some Saab 900 variants are equipped with a passive seat belt system. The system consists of a two-point, motor-driven diagonal strap and a manually fastened lap strap.

The automatic portion of this seat belt system is controlled by the position of the doors and the ignition switch.

WARNING!

- The front seat passive belts are not designed to hold a child safety seat.
- To avoid injury, keep hands well clear of the guide rail when operating the passive seat belts.

When someone gets into the car, the upper belt mounting is in the forward position, next to the windshield. However, on the passenger side, the belt can be "parked" in the rear position, if the passenger gets out of the car and shuts the door while the ignition switch is on. In this case, the belt will move to the forward position when the door on the passenger side is reopened. For best protection always fasten the lap belt after the automatic shoulder belt is in place.



Using the passive belts

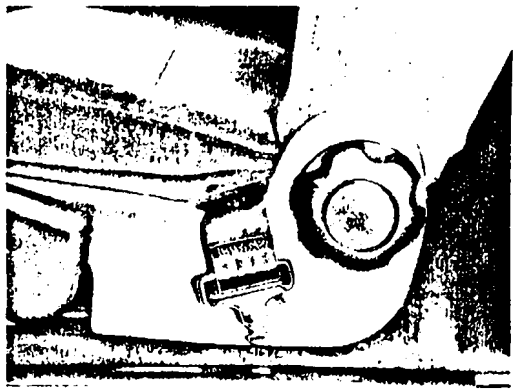
1 When the ignition switch is turned on, the belt moves to the rear position. Simultaneously, a warning lamp in the right-hand indicator lamp panel of the combined instrument blinks and a buzzer sounds.

When the belt is locked into the rear position, the warning lamp and buzzer will shut off.

2 **Fasten the lap belt after the automatic shoulder belt is in place.**

For maximum protection adjust the shoulder belt well in on the shoulder but not too close to the neck and also adjust the hip portion low across the hips.

If the lap strap has not been fastened, the buzzer will sound for a few more seconds. The seat belt warning lamp on the dashboard (under the fan switch) will light up for around 8 seconds as a reminder to fasten the lap strap.



WARNING!

If the warning lamp in the combined instrument starts blinking when the car is in motion, the passive seat belt system is defective. Have the system repaired by an authorized Saab dealer immediately.

3 When the ignition is shut off or when the driver's door is opened, the driver's seat belt will return to the forward position.

However, if the gear selector lever is in the reverse position and the ignition is on, the belt will not return to the forward position, thus allowing the driver to open the door for better visibility while backing up.

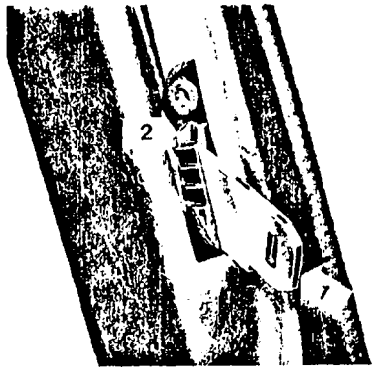
The belt on the passenger side will start moving towards the forward position as soon as the passenger door is opened.

NOTE! The inertia reel in the seat frame senses hard braking or cornering. If the ignition is switched off during these conditions the belt is not permitted to return to it's parked position. This locking can be cleared by switching on the ignition briefly.

System malfunction

In case of a malfunction in the passive seat belt system:

Check the two 20A fuses under the back seat on the left-hand side. See page 26 to raise the rear seat. The electrical distribution box in the engine compartment contains spare fuses. If the fuses are intact, you can still use the seat belts manually with extra locking tongues. You'll find them in the tool kit located in the trunk. The locking tongues are different for the right-hand and left-hand sides.



1 Fasten the locking tongue (1) and make sure it is held in place by the latch (2) on the upper side (to release the locking tongue, the latch must first be moved to the side).

2 Remove the seat belt at the upper mounting point by pressing the red button marked "PRESS".

3 Fasten the seat belt in the extra locking tongue. Make sure the belt is not twisted.

If the diagonal belt is rolled up on the retractor instead of being fastened, the warning lamp in the combined instrument will light up with a steady glow.

4 When you get out of the car, press the red button marked "PRESS" to release the belt from the extra locking tongue.

In the case of a defect, have the system repaired by an authorized Saab dealer immediately.

NOTE! The retractor on the automatic shoulder belt may lock if the car undergoes an abrupt motion when parking or is parked on a steep incline. This would cause the belt to stall when it should go forward to permit exit. If this happens, switch the ignition key on or release the belt at the emergency latch. To prevent this under the circumstances, check that the belt moves freely before switching the ignition off (or opening the door, passenger side).