REPORT NO. CAL-87-N11

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

SAAB SCANIA
1987 SAAB 9000S
4-Door Hatchback

NHTSA NO. MH0501

CALSPAN TEST NO. 7556-11

Calspan Corporation
Advanced Technology Center
P.O. Box 400
Buffalo, NY 14225

APRIL 29, 1987

FINAL REPORT

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
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15. Supplementary Notes

16. Abstract

A frontal load cell barrier test of a 1987 Saab 9000S 4-Door Hatchback was performed at the Calspan Corporation, Advanced Technology Center Crash Test Facility in Buffalo, New York, on April 29, 1987.

Impact speed was 34.6 mph and the ambient temperature at the barrier face at the time of impact was 58°F. The maximum post-test vehicle crush was 24.2 inches.

Type of Restraint System 3-point continuous-manual belt system equipped with automatic belt tensioners.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Section 1

PURPOSE AND TEST PROCEDURE

This 35-mph frontal barrier impact test is part of the Composite FY 87 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.

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 MH0501

A load cell barrier consisting of 36 load cells was impacted by a 1987 Saab 9000S 4-Door Hatchback at a velocity of 34.6 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 29, 1987. 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 15 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. 1020) had been used in two previous tests (MH5400 and MH5100) and the Passenger ATD (Serial No. 1022) was also used in Test MH5100. The Injury Criteria Values were not exceeded in these tests. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 59 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 rim and hub. The driver's HIC was 584. The maximum chest deceleration over 3 milliseconds was 37 g's and femur loads were 346 and 120 pounds.

The right front passenger's HIC was 440. The maximum chest deceleration over 3 milliseconds was 35 g's and femur loads were 638 and 435 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1987 Saab 9000S 4-Door Hatchback

NHTSA NO.: MH0501 VIN.: YS36S55DXH1013014

BODY COLOR: Bronze DATE OF MANUFACTURE: 11-86

Engine: 4 cylinders; 121.1 C.I.D.; 2.0 Liters; -- CC
x Gas; -- Diesel; -- Turbocharged
-- Longitudinal; x Transverse

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

Date Received: 2/14 Odometer Reading: 20
x A/C; x P/S; x P/B; x P/wdo.; - Tilt Wheel
- P/seats; x Cruise Control

Type of Occupant Restraint: 3-Point Continuous Belt

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 38 psi, Rear 38 psi

Recommended Tire Size: 195/60 15 86H

Recommended Cold Tire Pressure: Front 32 psi, Rear 32 psi

Tires on Vehicle: 195/60 15; Manufacturer: Michelin

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. Knot

Vehicle Capacity Weight (VCW) = 970 lbs. (A)

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

Rated Cargo and Luggage Weight (RCLW) A-B = 220 lbs.

GVWR 4010 lbs. GAWR: Front 2200 lbs. Rear 2030 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 = 900 lbs. Right Rear = 610 lbs.

Left Front = 890 lbs. Left Rear = 590 lbs.

TOTAL FRONT WEIGHT = 1790 lbs. (59.9 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1200 lbs. (40.1 % of Total Vehicle Weight)

TOTAL DELIVERY WEIGHT = 2990 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (2990 lbs.)

VCW = Vehicle Capacity Weight (970 lbs.)

DSC = Designated Seating Capacity (5)

RCLW = VCW - 150 (DSC) = 220 lbs.

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

Target Test Weight = 3538 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 202 POUNDS CARGO:

Right Front = 1020 lbs. Right Rear = 760 lbs.

Left Front = 990 lbs. Left Rear = 750 lbs.

TOTAL FRONT WEIGHT = 2010 lbs. (57.1 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1510 lbs. (42.9 % of Total Vehicle Weight)

TOTAL TEST WEIGHT = 3520 lbs.

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

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 27.8 LF 27.8 RR 26.2 LR 26.1

Test Attitude: RF 25.7 LF 25.7 RR 25.1 LR 25.1

Wheel Base: 105.2 in.; C.G. = 45.1 in. rearward of front wheel C/L

Remarks: 16.6 gallons of solvent in fuel tank.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °

Date of Test: 4-29-87 Time of Test: 1200

Ambient Temperature: 58 °F at impact area

Temperature in Occupant Compartment: 72 °F.

Windshield Molding Temperature: 72 °F.

Required Impact Velocity Range: 34.5 to 35.5 mph

Impact Velocity: primary = 34.6 mph, secondary = 34.6 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	179.6	C_L	181.9	L	179.6
	Post-test	= R	157.7	C_L	157.7	L	157.6
	Crush	= R	21.9	C_L	24.2	L	22.0

Distance from front of test vehicle to point of impact:

R 12.9 C/L 13.6 L 14.2

VISIBLE DUMMY CONTACT POINTS:

	Driver	Passenger
Head	Steering Wheel Upper Rim & Hub	Glove Compartment Door
Chest	None	None
Abdomen	None	None
Left Knee	Dash Panel	Glove Compartment Door
Right Knee	Dash Panel	Glove Compartment Door

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	Front		Rear	
	Left	Right	Left	Right
Door Opening	Not Operable	Not Operable	Operable	Operable

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

Section 3

OMI FINAL DATA

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)	-68	-26	106	128	-38	-15	13	37
DUMMY (2)	-40	18	42	52	-37	15	15	35
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	346	120
DUMMY (2)	638	435
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)	See Note	-	See Note
DUMMY (2)	See Note	See Note	-
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**			
	HIC	t_1 (SEC)	t_2 (SEC)	AVE. ACC. (g) t_1 TO t_2
DUMMY (1)	584	.07822	.10267	56
DUMMY (2)	440	.07972	.11572	43
DUMMY (3)				
DUMMY (4)				

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

NOTE: Belt stretch and belt spool off were not measured electrically as requested by CTM.

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

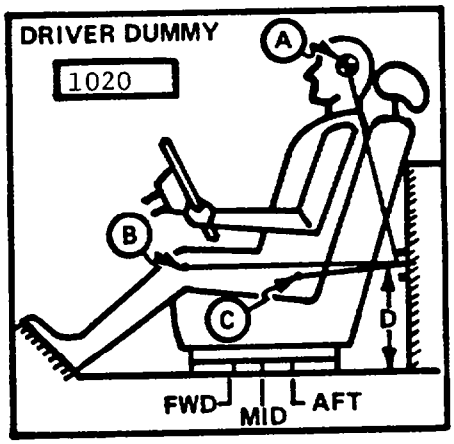
TEST NO.: MH0501

VEHICLE: 1987 Saab 9000S 4-Dr Hatchback

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

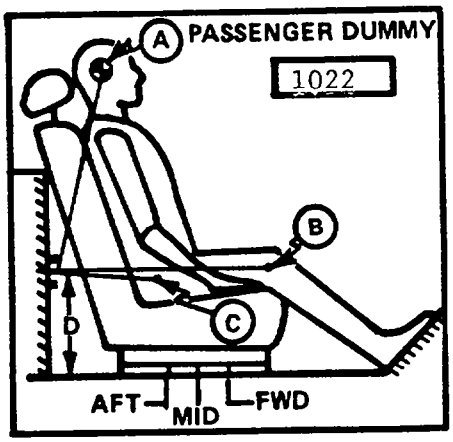
ADJUSTER TYPE:
- x Manual
- ____ Power

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

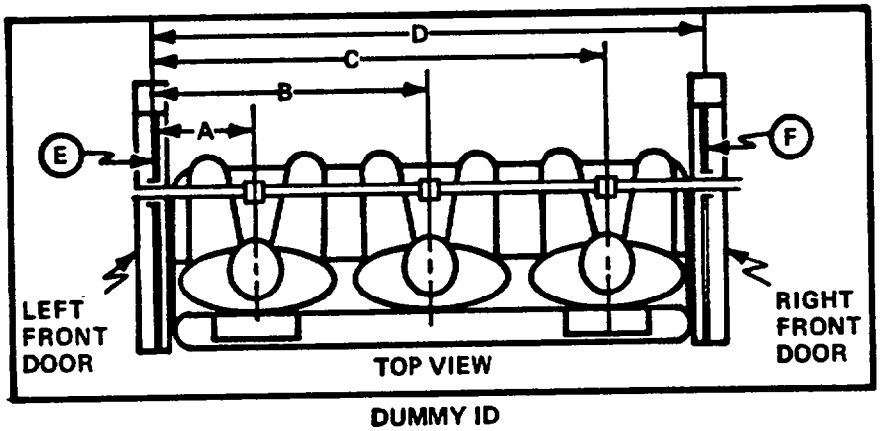


MEASUREMENT LOCATION

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



A =	17.2	in.	9.0	Degrees	A =	17.4	in. 7.0 Degrees
B =	24.1	in.	107	Degrees	B =	25.7	in. 107 Degrees
C =	12.6	in.	138	Degrees	C =	13.1	in. 140 Degrees
D =	18.5	in.			D =	18.5	in.



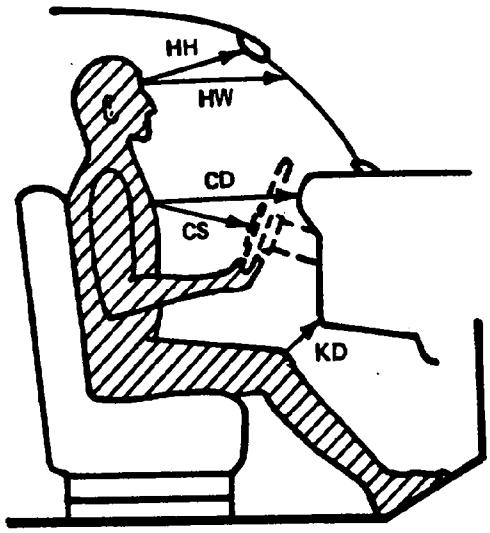
DUMMY ID

		1020	1022
A	= Left Door to Driver Centerline	13.9 in.	
B	= Left Door to Center Passenger Centerline	-- in.	
C	= Left Door to Right Passenger Centerline	41.2 in.	
D	= Left Door to Right Door	54.2 in.	
E, F	= Window Glass Height (Right and Left Must Be Equal)	11.5 in.	

Figure 2

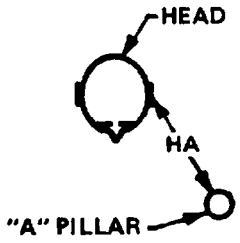
OCCUPANT CLEARANCE DIMENSIONS

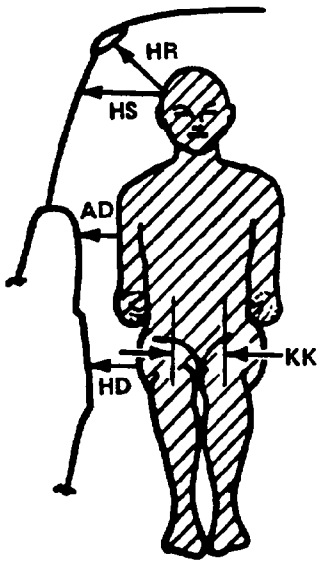
	DRIVER	PASSENGER
HH	14.9	14.6
HW	21.9	21.6
CD	23.4	23.1
CS	15.0	--
KDL	5.4	5.9
KDR	4.9	5.9
SA	25°	25°
TA	21°	21°



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



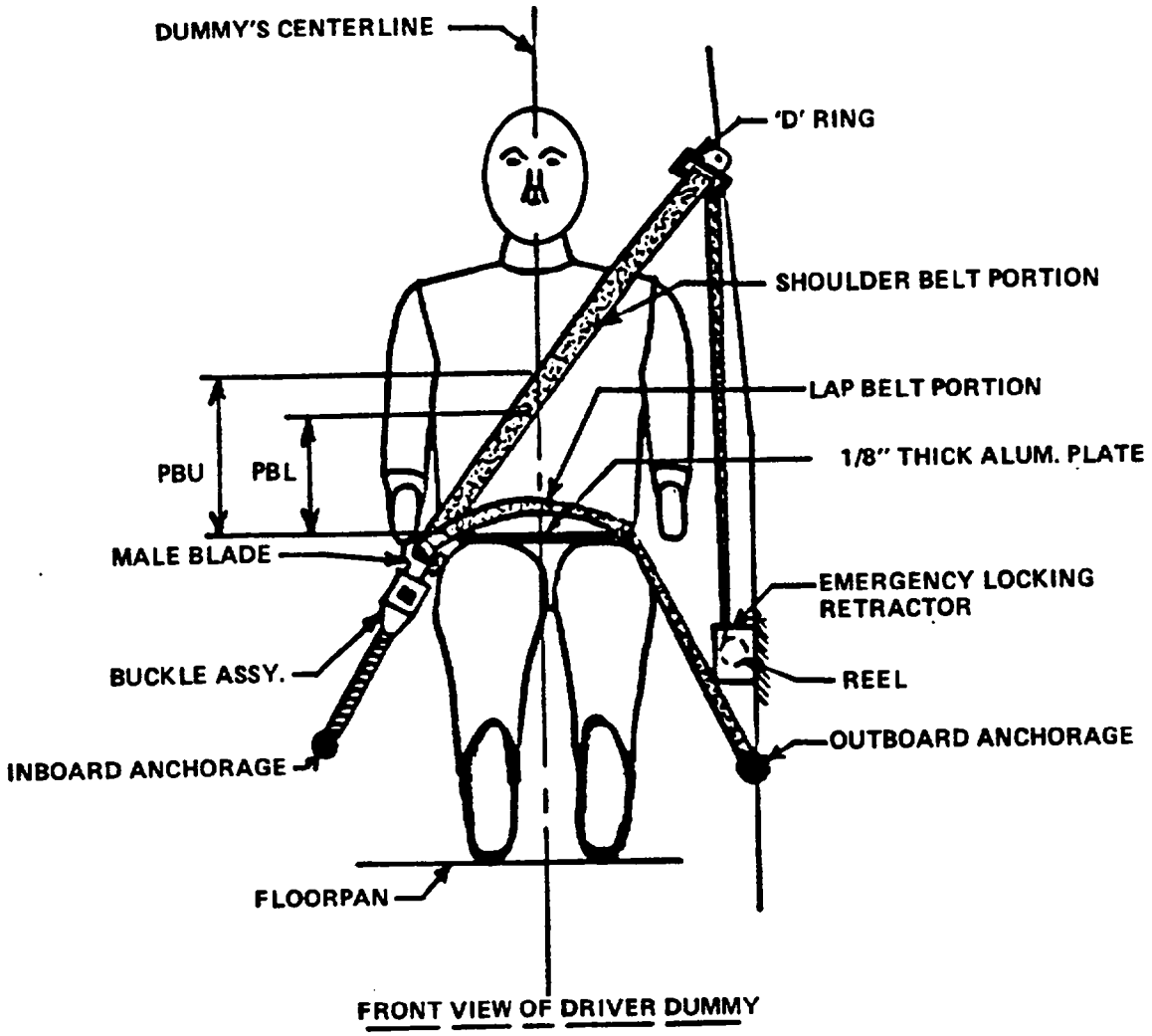


	DRIVER	PASSENGER
HR	6.6	6.3
HS	10.4	9.7
AD	5.0	5.3
HD	7.1	7.0
KK	10.5	8.7
HA	22.2	22.5

7556-11

Figure 3

SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
PBU -- Top surface of alum. plate to upper edge	12.2	12.5
PBL -- Top surface of alum. plate to belt lower edge	15.2	15.7
LAP BELT TENSION	--	--
SHOULDER BELT TENSION	2.3	2.3

Table 3

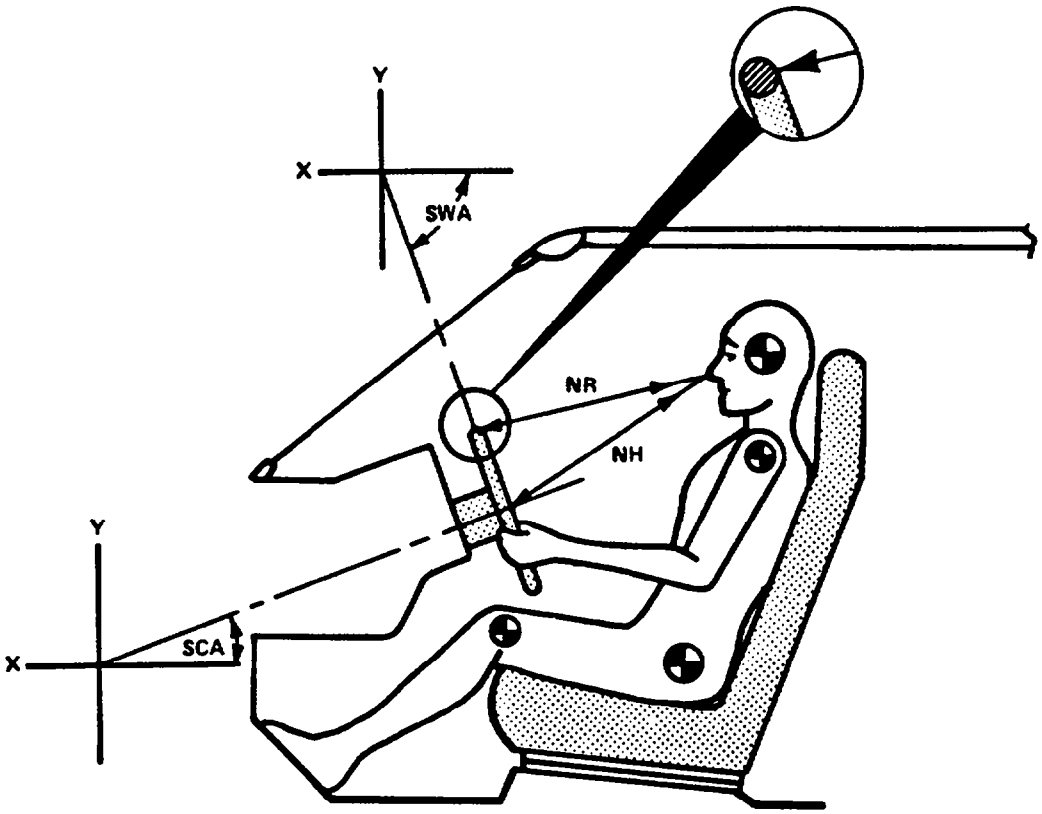
SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

	Driver	Passenger
BELT LENGTH DATA:		
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	63.7	64.2
Should belt length as measured on Part 572 Dummy.	34.5	35.0
Lap belt length as measured on Part 572 Dummy.	24.0	24.0
BELT SPOOL-OFF DATA:		
As determined by film analysis.	No spool-off was observed	
As determined mechanically.	No spool-off was measured	
As determined electronically.	See Note	See Note
BELT STRETCH DATA:		
Measured electronically between shoulder belt load cell and the "D" ring.	See Note	See Note
Measured Mechanically	0	0

NOTE: Belt stretch and belt spool off were not measured electrically as requested by CTM.

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	19.2	Inches
NH -- Distance from tip of dummy's nose to center of steering column hub	20.1	Inches
SCA -- Angle of steering column relative to the horizontal X axis	27	Degrees
SWA -- Angle of steering wheel relative to the horizontal X axis	-63	Degrees

The fore and aft adjustment of the steering column was set in the mid position.

NOTE: Camera Information Shown on Table

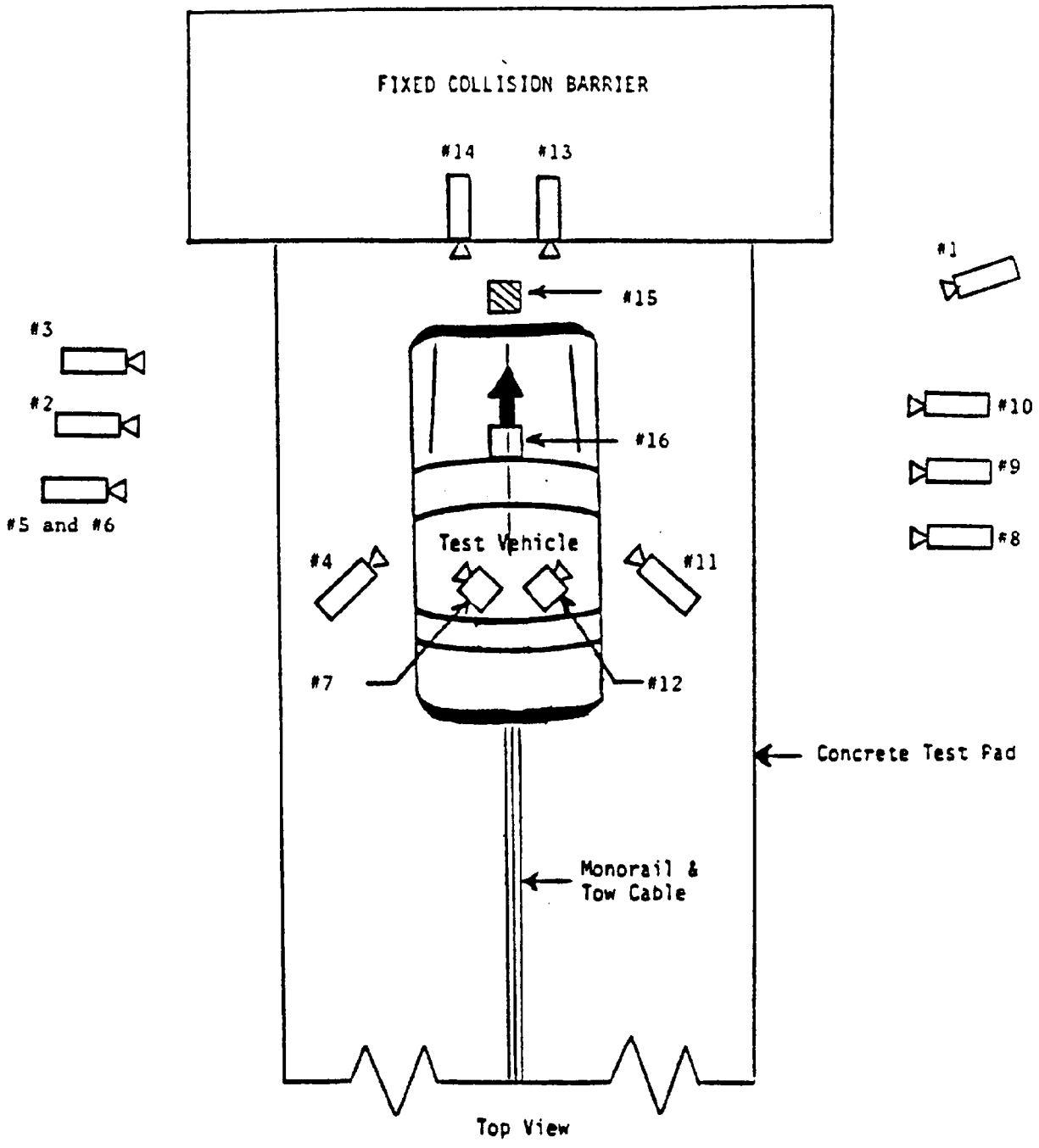


Figure 5 CAMERA POSITION FOR FRONTAL IMPACTS

Table 4
HIGH-SPEED CAMERA LOCATIONS

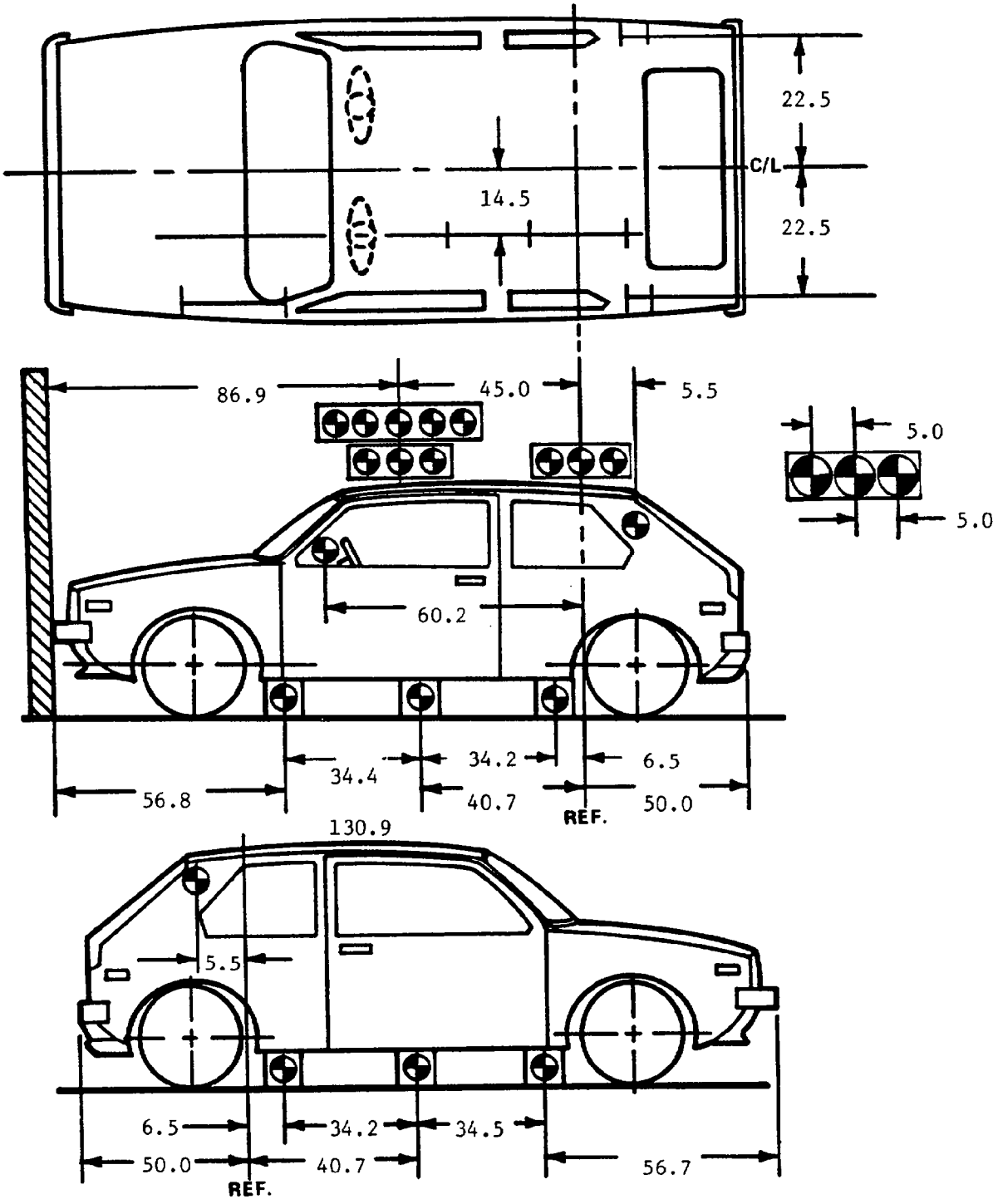
Test No. MH0501 Vehicle 1987 Saab 9000S 4-Door Hatchback

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	262	45	42	-2	-	13	525
3	Left Side View	251	40	43	-5	-	25	525
4	Driver and Interior View	105	114	70	-16	-	13	650
5	Steering Column (Bottom)	240	78	52	-6	223	25	550
6	Steering Column (Top)	240	78	77	-13	223	25	550
7	Left Belt	-	-	-	-	-	8	675
8	Overall Right Side	246	47	43	-1	-	13	800
9	Right Side View	260	70	44	-4	-	25	770
10	Right Passenger View	276	86	42	-3	258	35	740
11	Passenger & Interior View	87	101	66	-15	-	25	590
12	Right Belt	-	-	-	-	-	8	790
13	Passenger Front View	24	0	72	-40	-	13	550
14	Driver Front View	24	0	72	-40	-	13	580
15	Windshield View	0	0	126	-55	-	13	540
16	Pit View of Engine	0	32	-120	90	-	13	770
17								

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

Figure 6

VEHICLE TARGET LOCATIONS

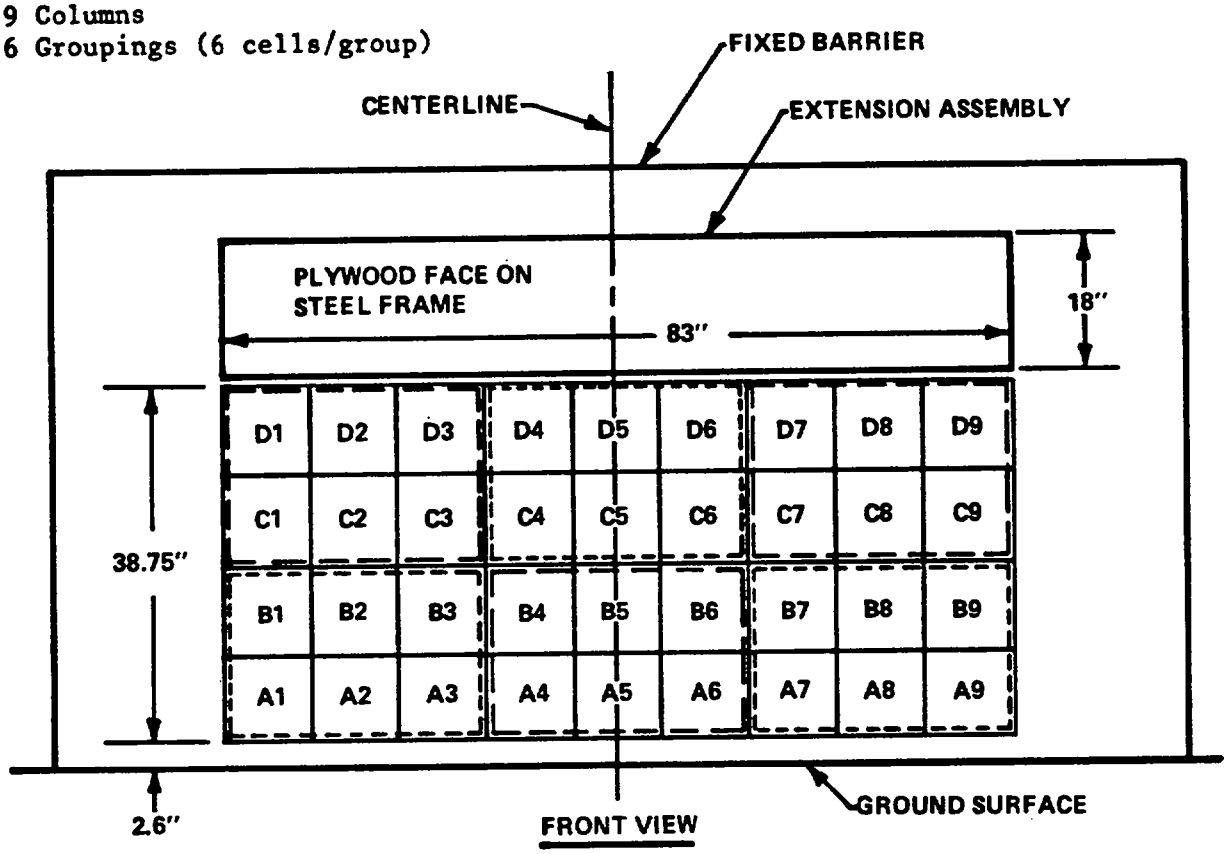


(DIMENSIONS IN INCHES)

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

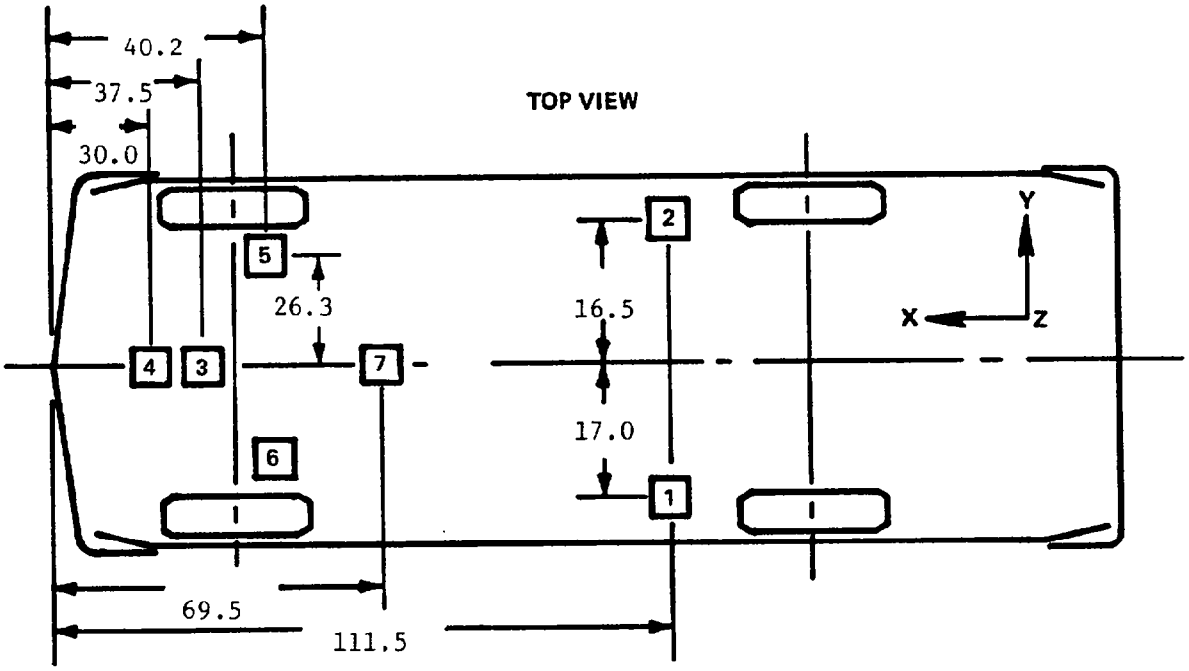
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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

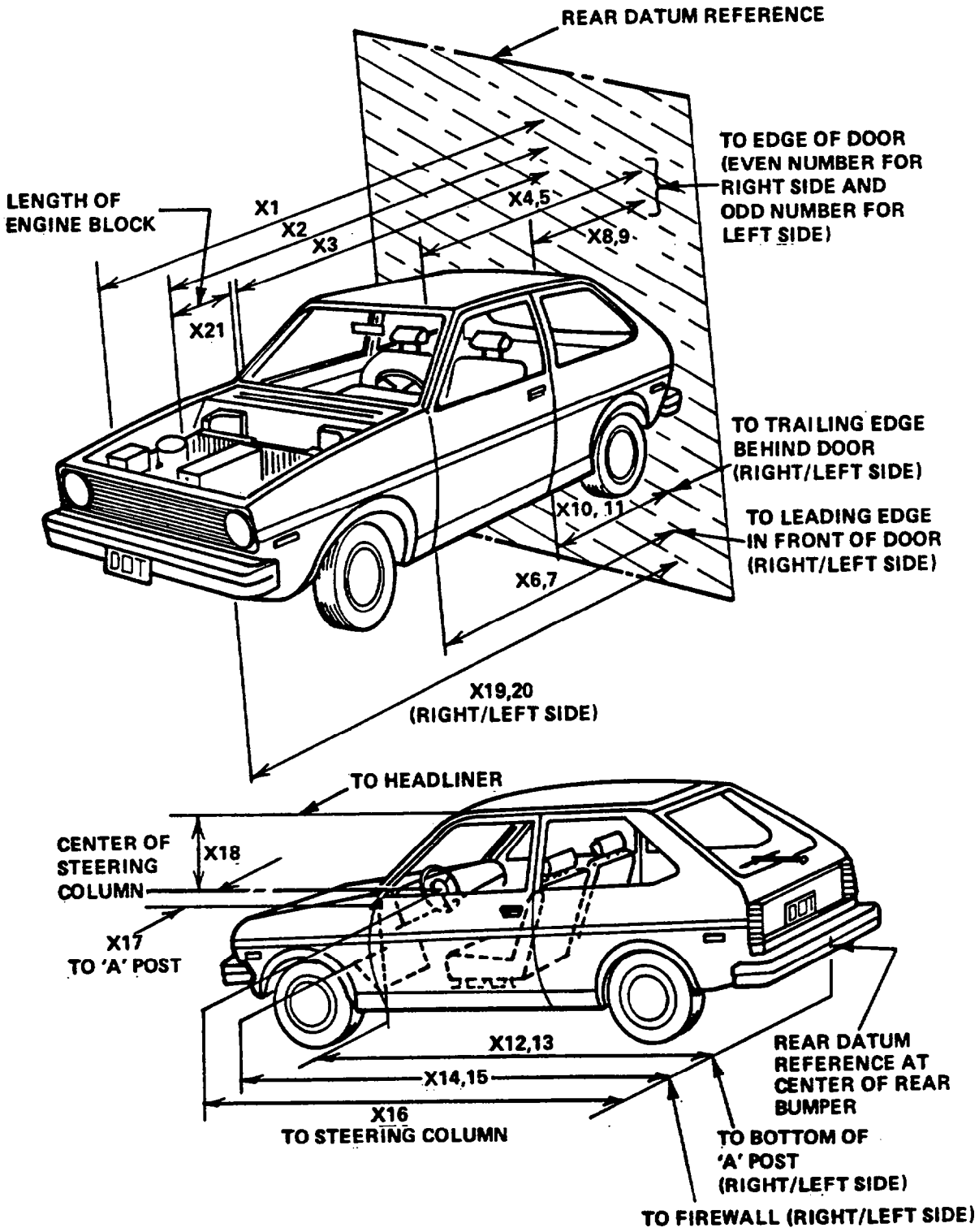


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	181.9	157.7	24.2
X2	Rear Surface of Vehicle to Front of Engine	160.8	148.9	11.9
X3	Rear Surface of Vehicle to Firewall	139.9	133.2	6.7
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	122.9	122.9	0
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	123.6	121.6	2.0
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	123.5	122.9	.6
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	123.3	121.8	1.5
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	81.6	81.4	.2
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	81.4	80.1	1.3
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	82.9	82.0	.9
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	82.5	81.0	1.5
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	123.3	122.4	.9
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	123.0	121.0	2.0
X14	Rear Surface of Vehicle to Firewall, Right Side	132.5	126.3	6.2
X15	Rear Surface of Vehicle to Firewall, Left Side	132.1	128.9	3.2
X16	Rear Surface of Vehicle to Steering Column	106.8	104.4	2.4
X17	Center of Steering Column to "A" Post	17.0	15.5	1.5
X18	Center of Steering Column to Headliner	18.8	18.3	.5
X19	Rear Surface of Vehicle to Right Side of Front Bumper	179.6	157.7	21.9
X20	Rear Surface of Vehicle to Left Side of Front Bumper	179.6	157.6	22.0
X21	Length of Engine Block	20.0	20.0	0.0

Appendix A

PHOTOGRAPHS

Figure 1 PRE-TEST FRONT VIEW

Figure 2 POST-TEST FRONT VIEW

Figure 4 POST-TEST LEFT SIDE VIEW

Figure 6 POST-TEST RIGHT SIDE VIEW

7556-11

Figure 8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

Figure 10 POST-TEST LEFT REAR THREE-QUARTER VIEW

Figure 12 PRE-TEST ENGINE COMPARTMENT VIEW

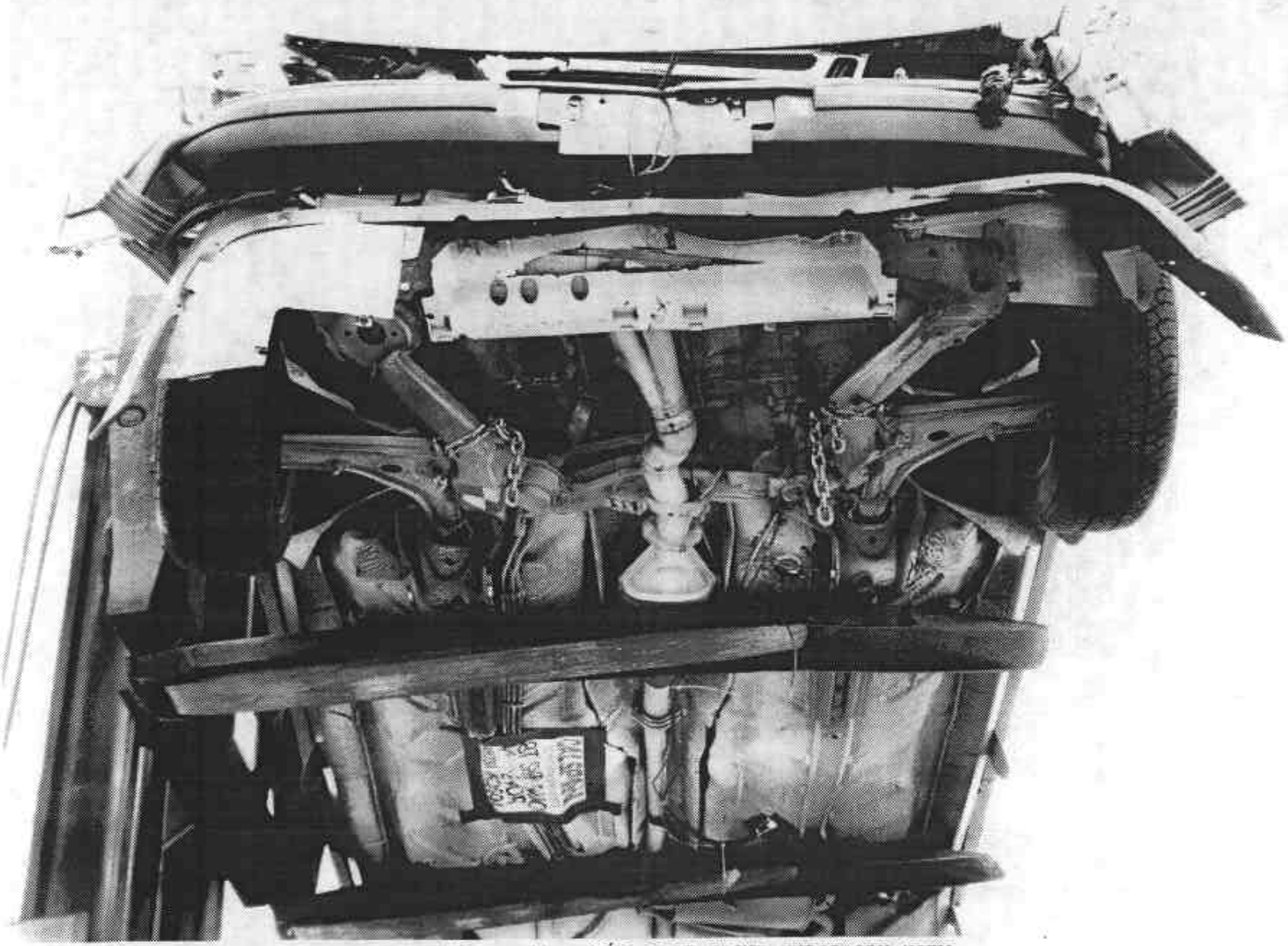


Figure 14 POST-TEST FRONT UNDERBODY VIEW

A-17

7536-11

Figure 16 POST-TEST FRONT-SIDE UNDERBODY VIEW

Figure 18 POST-TEST REAR UNDERBODY VIEW

Figure 20 POST-TEST DRIVER POSITION VIEW

Figure 22 POST-TEST PASSENGER POSITION VIEW

Figure 24 POST-TEST DRIVER AND INTERIOR VIEW

7556-11

Figure 26 POST-TEST PASSENGER AND INTERIOR VIEW

Appendix B

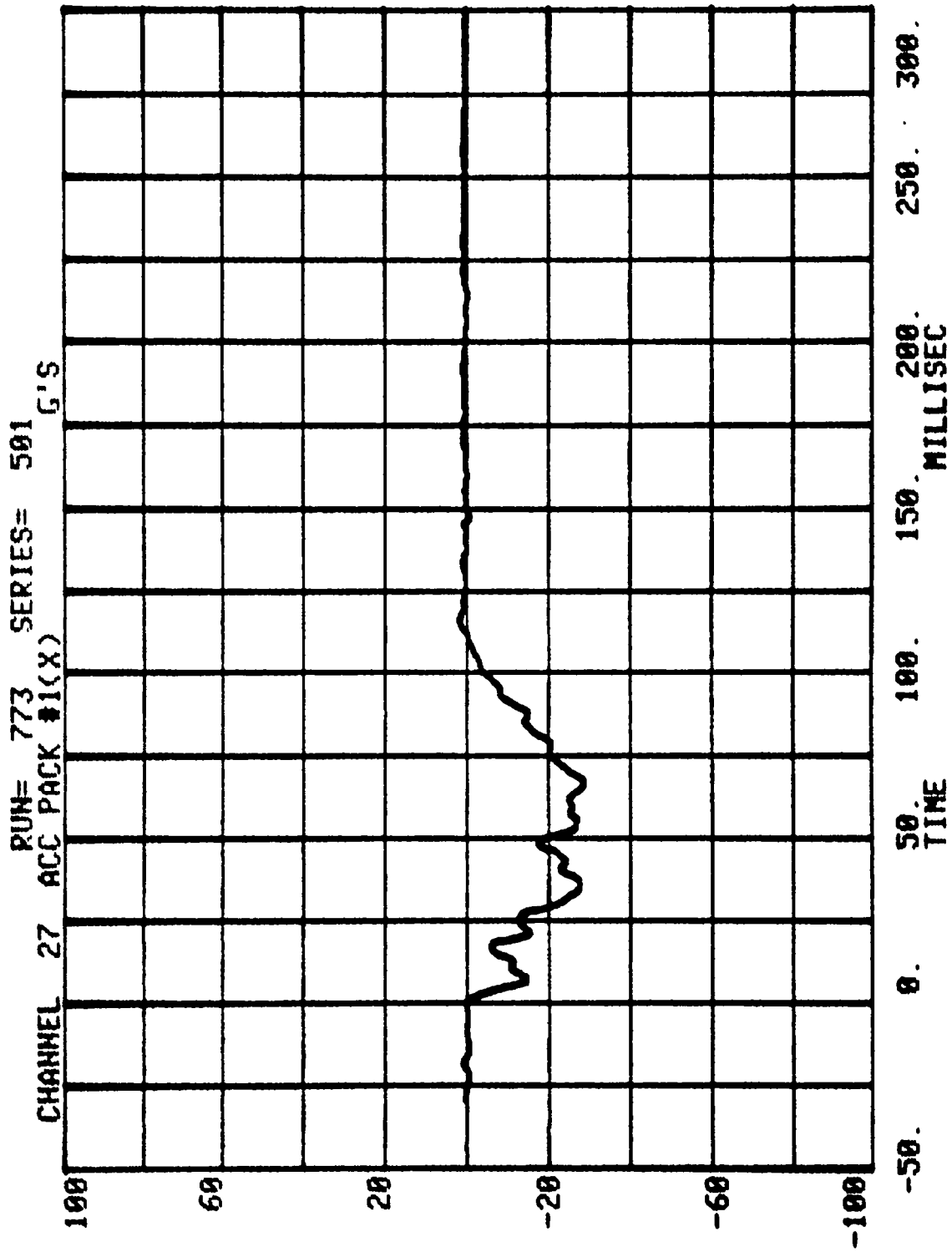
VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

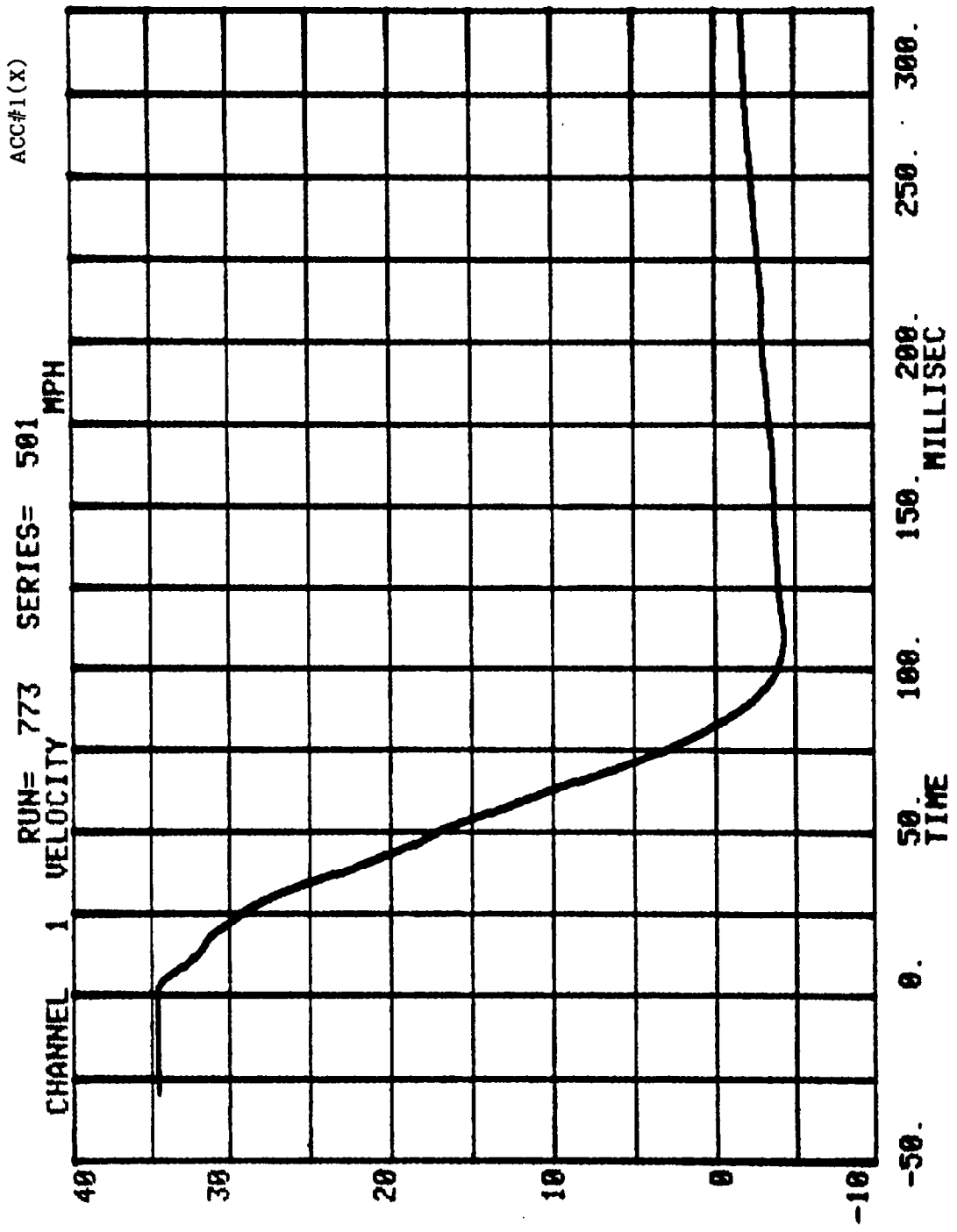
TEST NO. MH0501

VEHICLE DATA

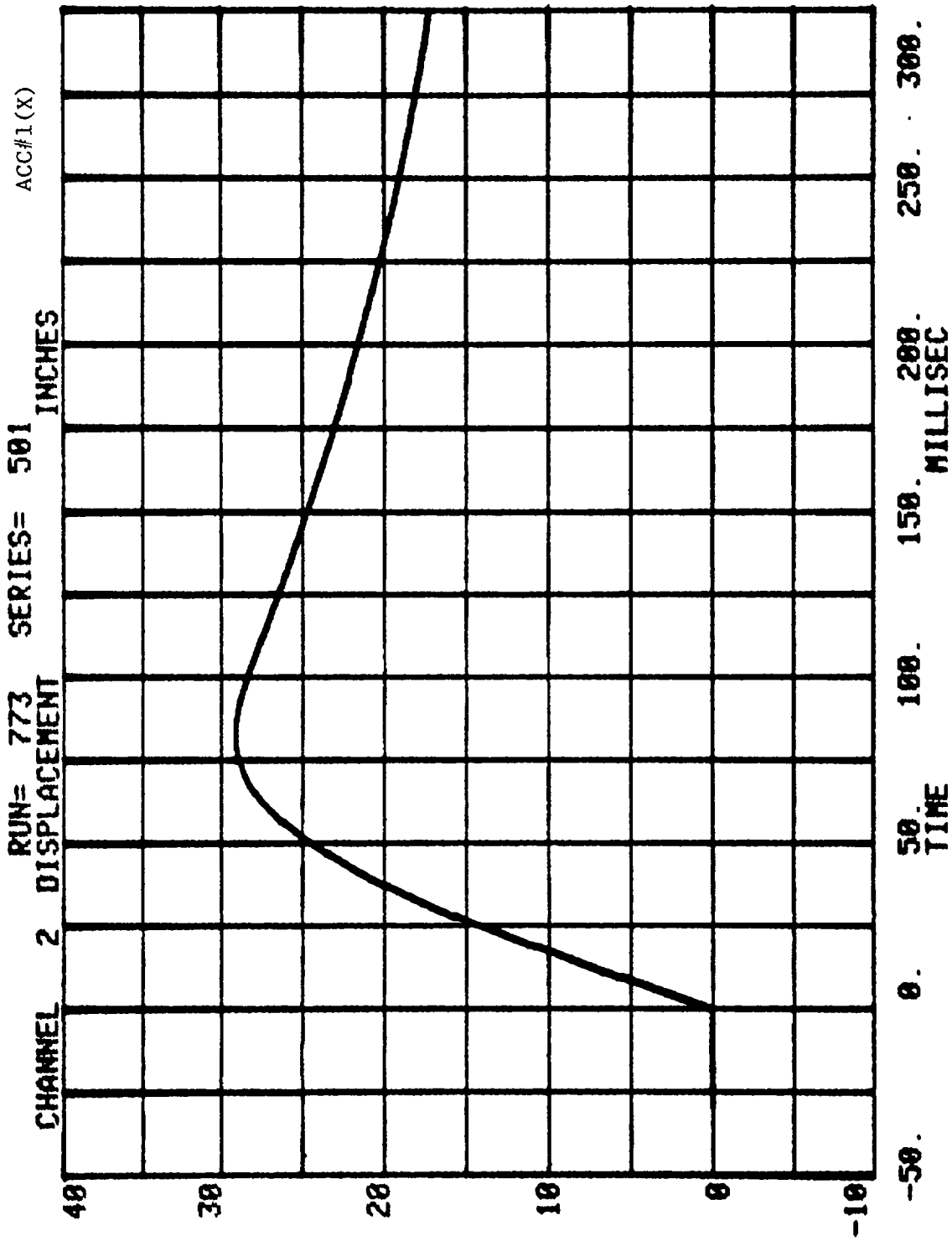
FILTER CHANNEL CLASS

60

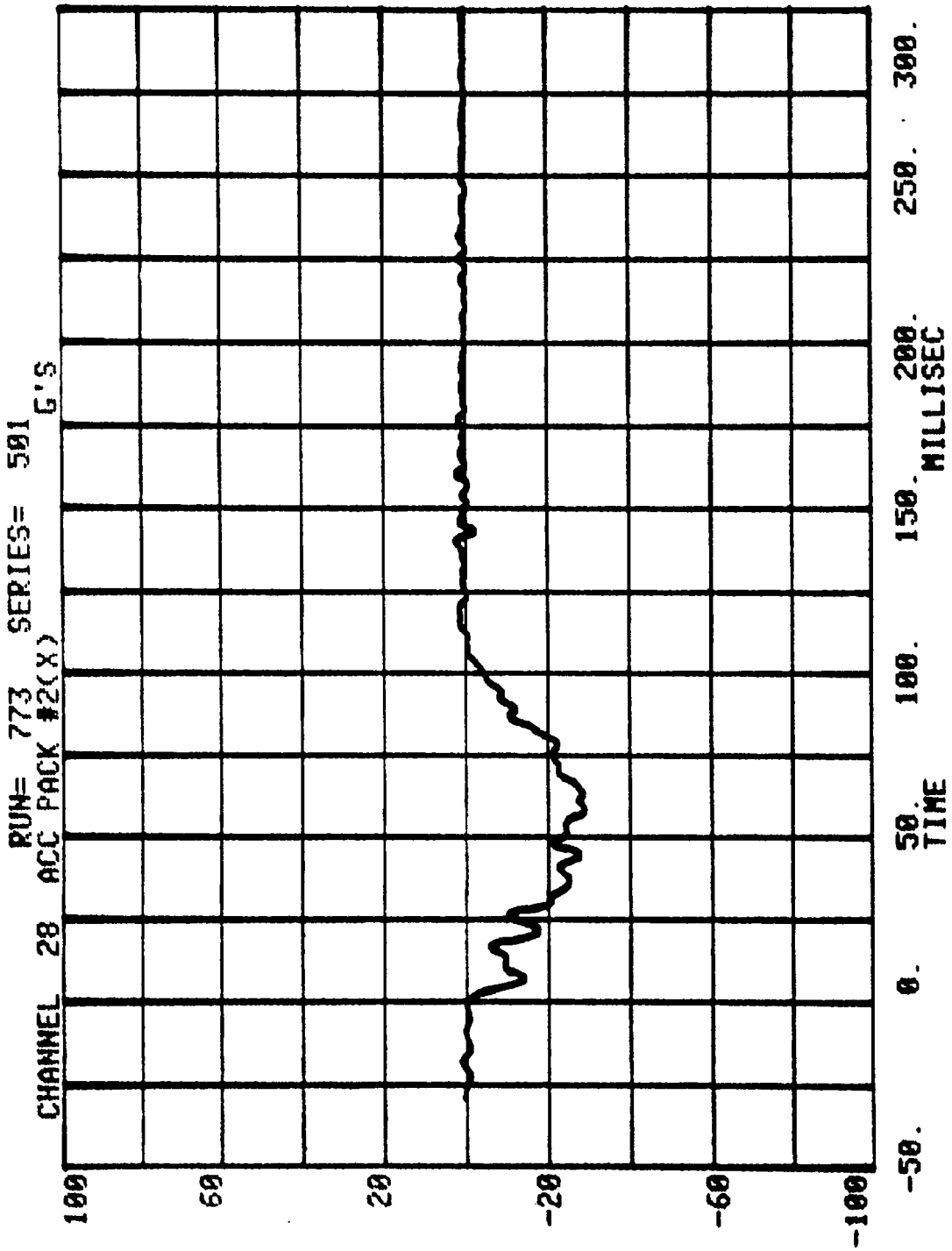

CHANNEL 27 ACC PACK #1(X)
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


ACC#1(X)
CHANNEL 1 VELOCITY
RUN= 773 SERIES= 501 MPH
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

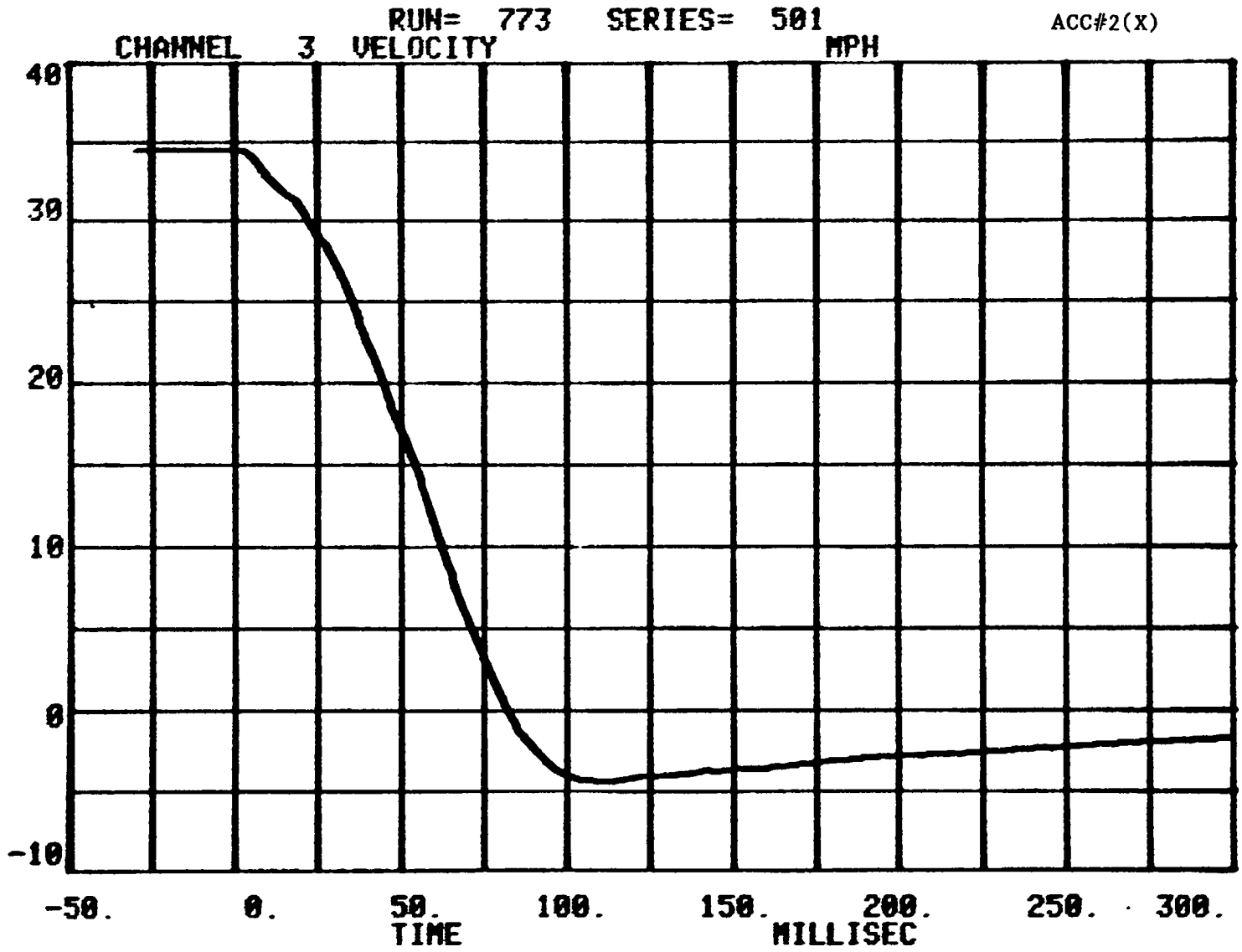
7556-11

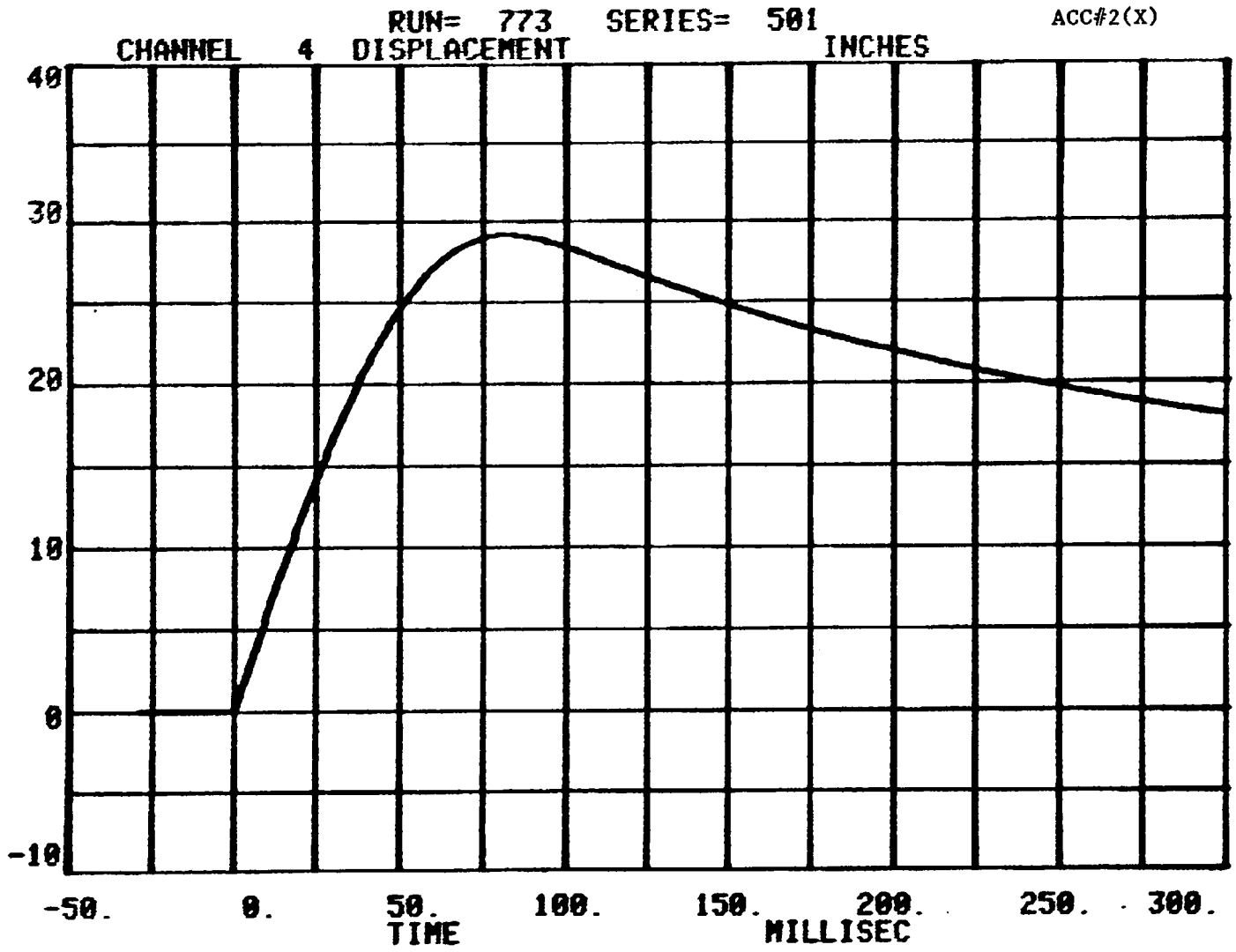

ACC#1(X)
CHANNEL 2 DISPLACEMENT
RUN= 773 SERIES= 501 INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

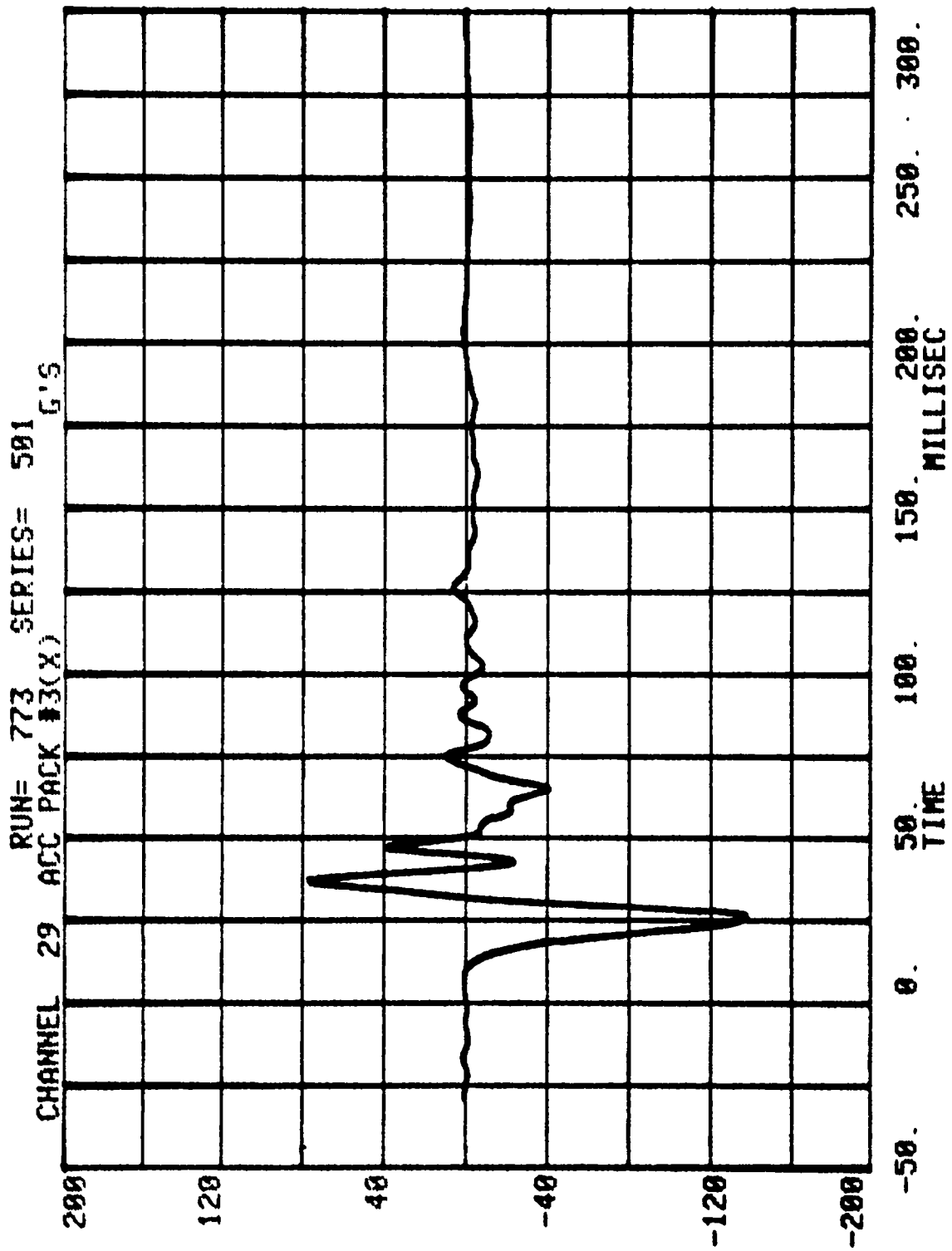
7556-11


CHANNEL 28 ACC PACK #2(X)
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

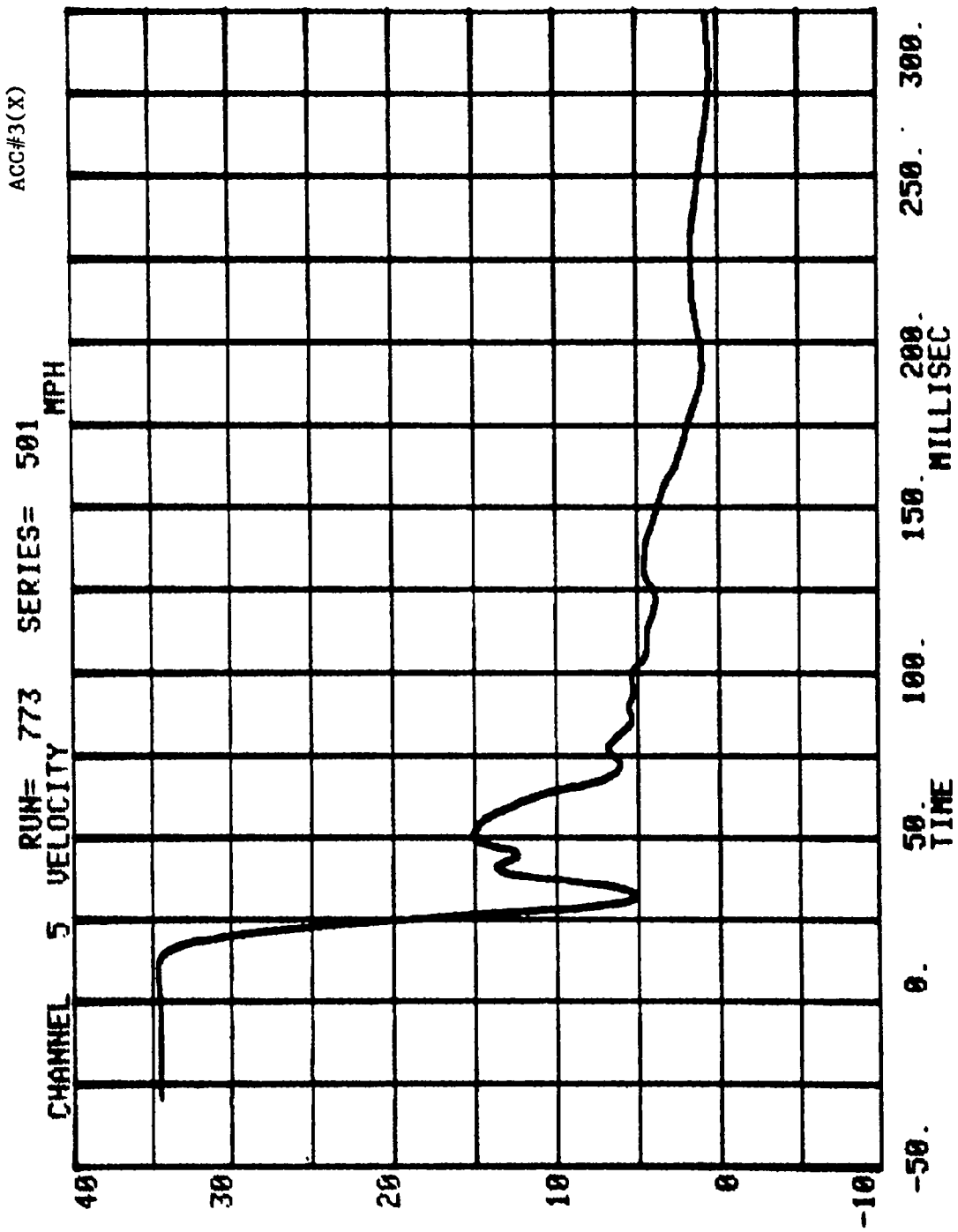
7556-11


RUN= 773 SERIES= 501
ACC#2(X)
CHANNEL 3 VELOCITY
MPH
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

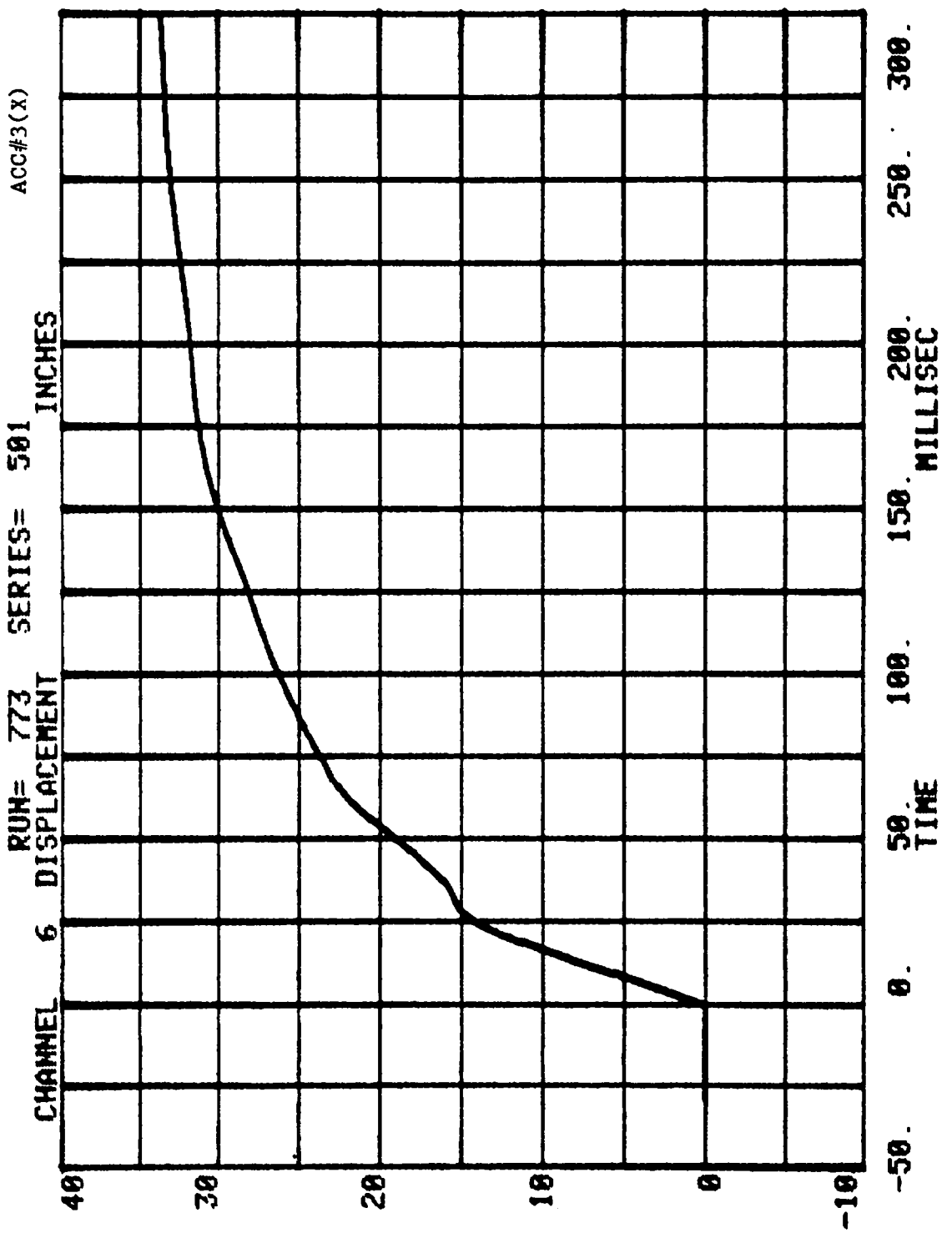

RUN= 773 SERIES= 501
ACC#2(X)
CHANNEL 4 DISPLACEMENT
INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

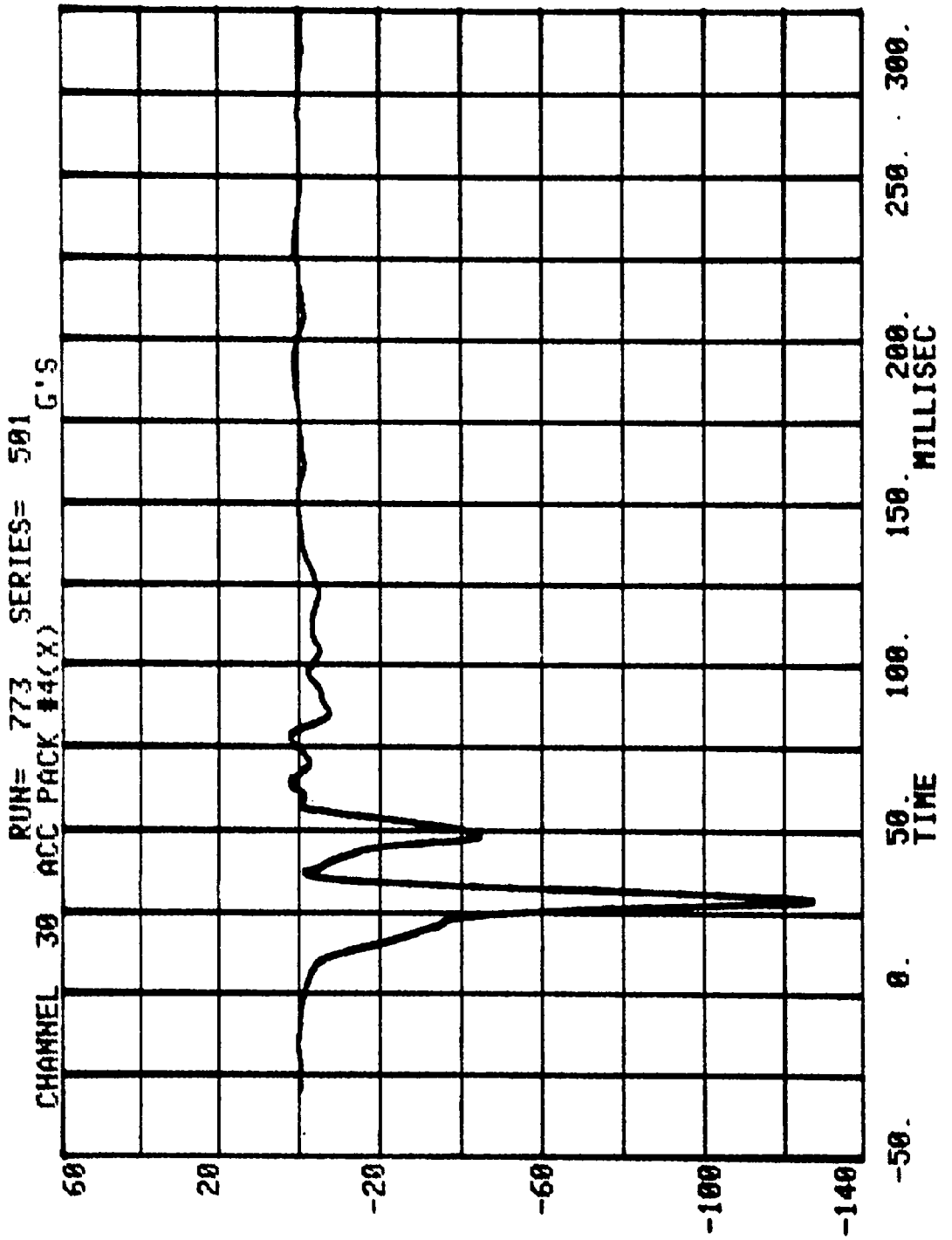

RUN= 773 SERIES= 501
CHANNEL 29 ACC PACK #3(X)
G'S
200
120
40
-40
-120
-200
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

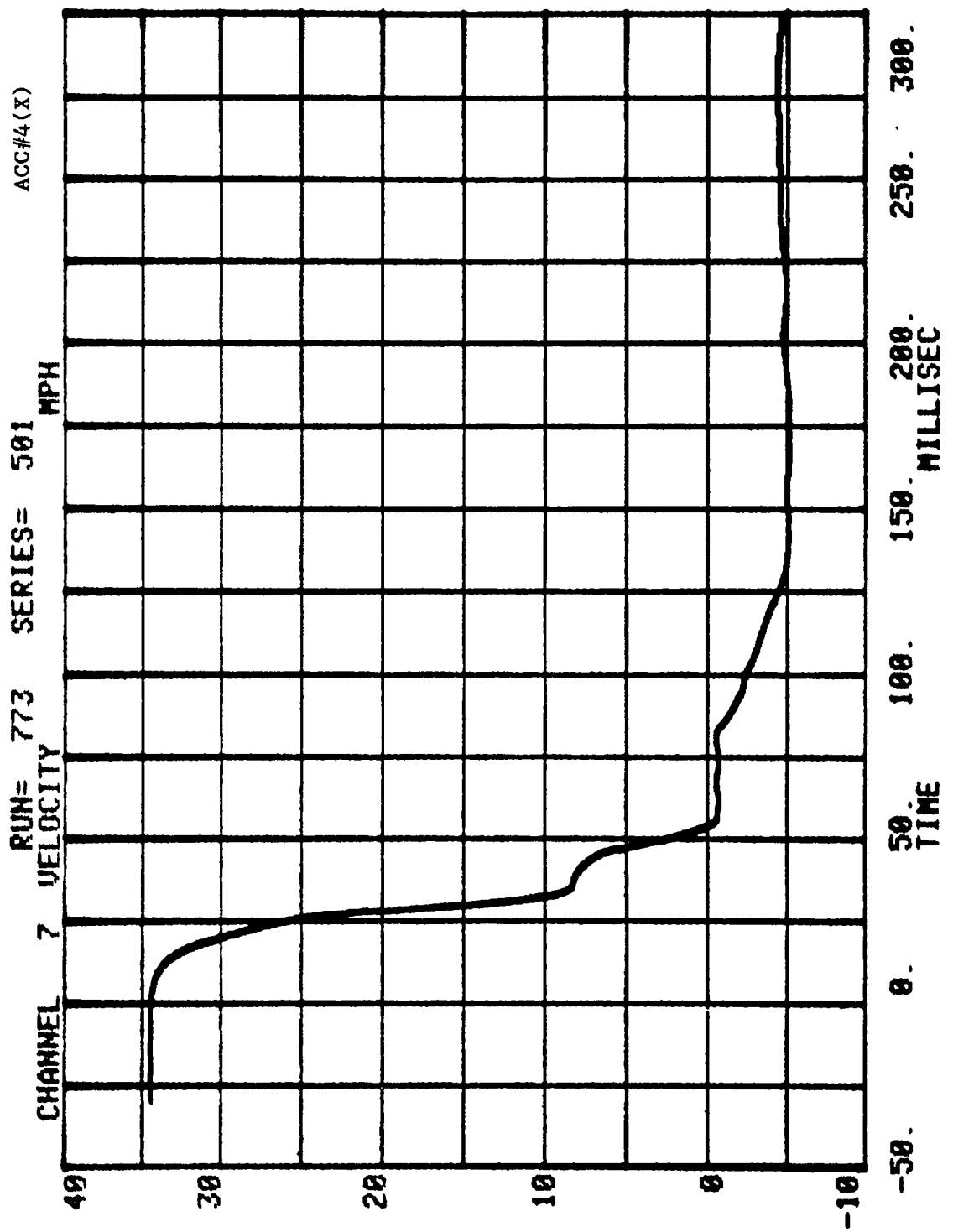

ACC#3(X)
CHANNEL 5 VELOCITY
RUN= 773 SERIES= 501 MPH
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

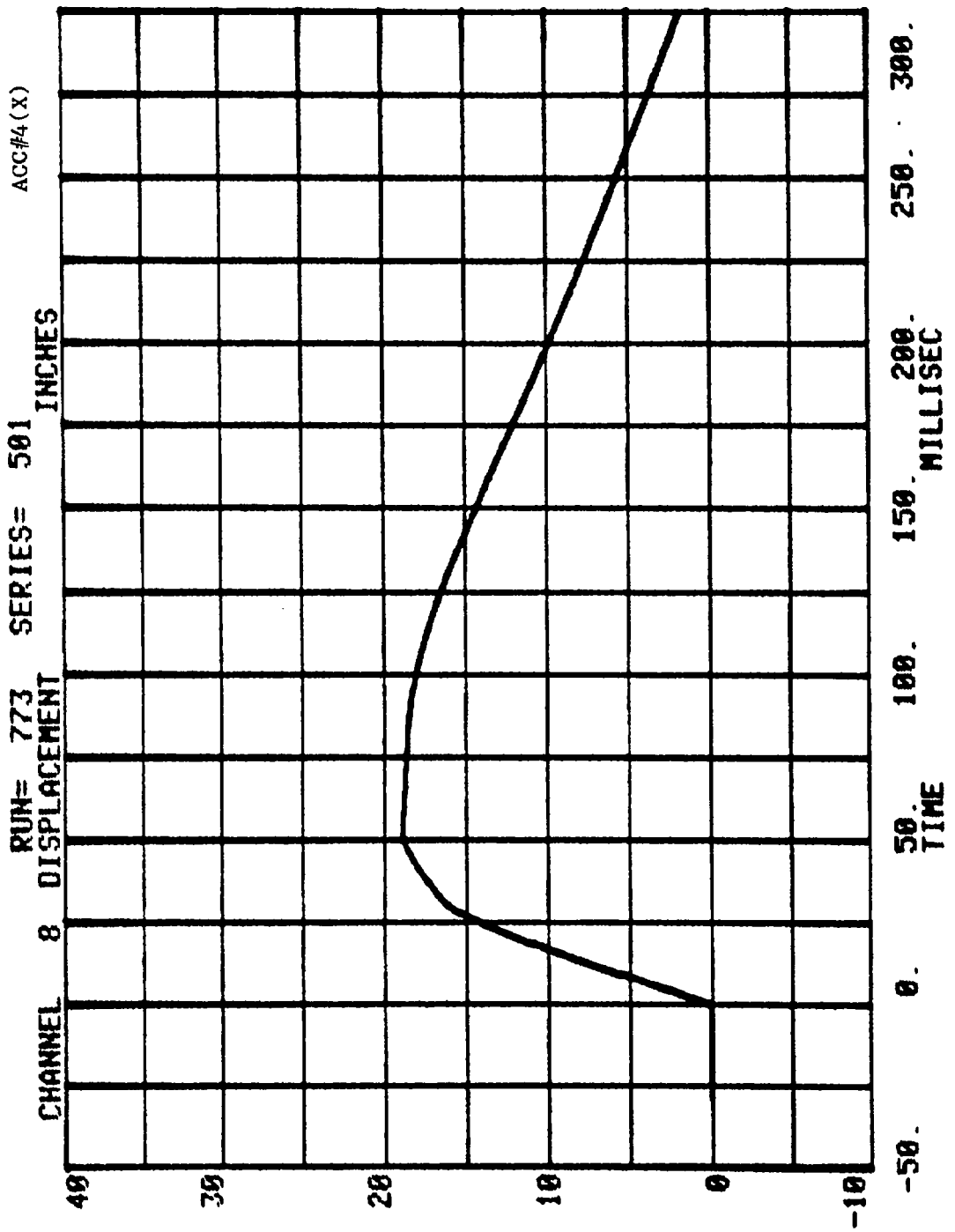

ACC#3(X)
CHANNEL 6 DISPLACEMENT
RUN= 773 SERIES= 501
INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 30 ACC PACK #4(X)
RUN= 773 SERIES= 501
G'S
60
20
-20
-60
-100
-140
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

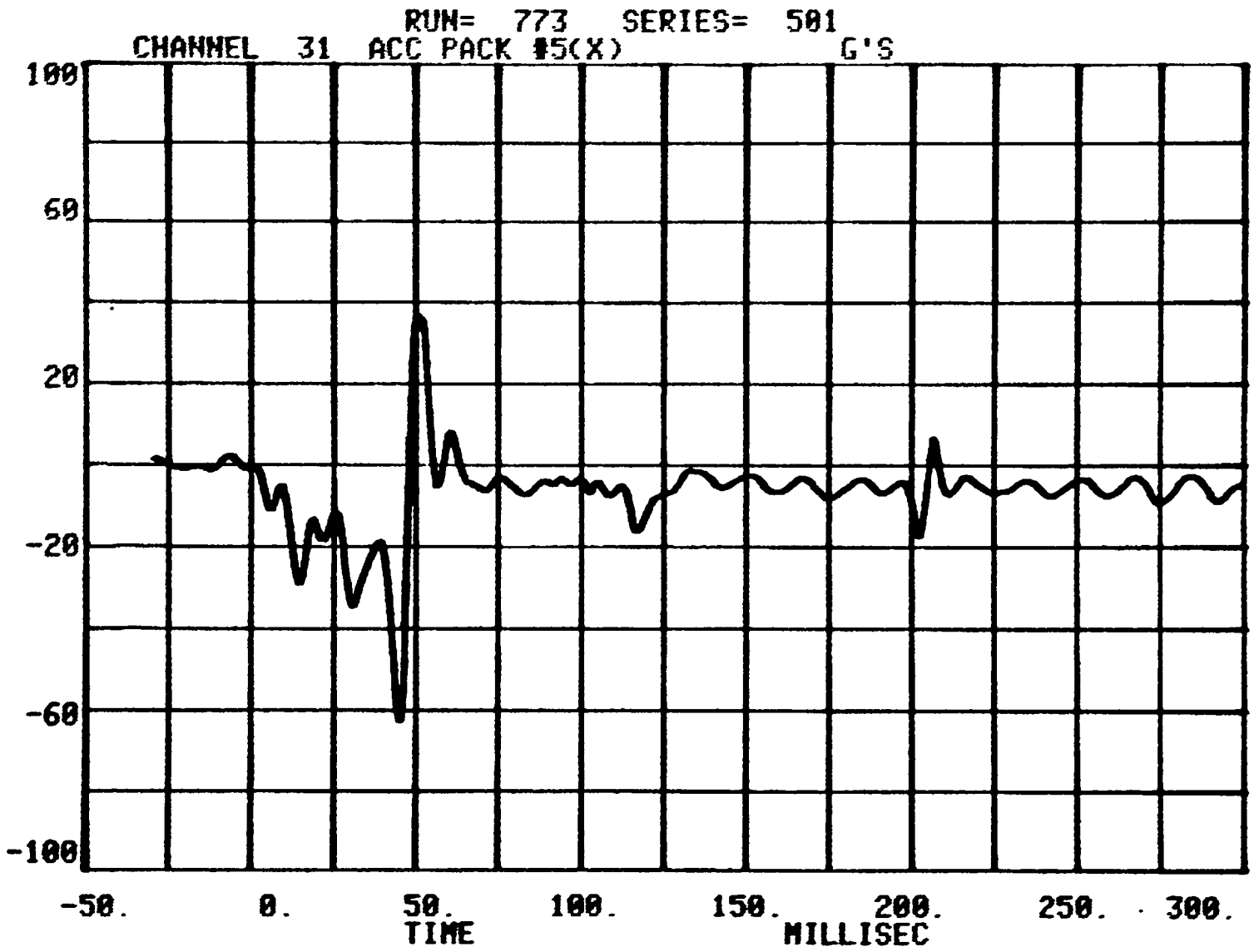
7556-11

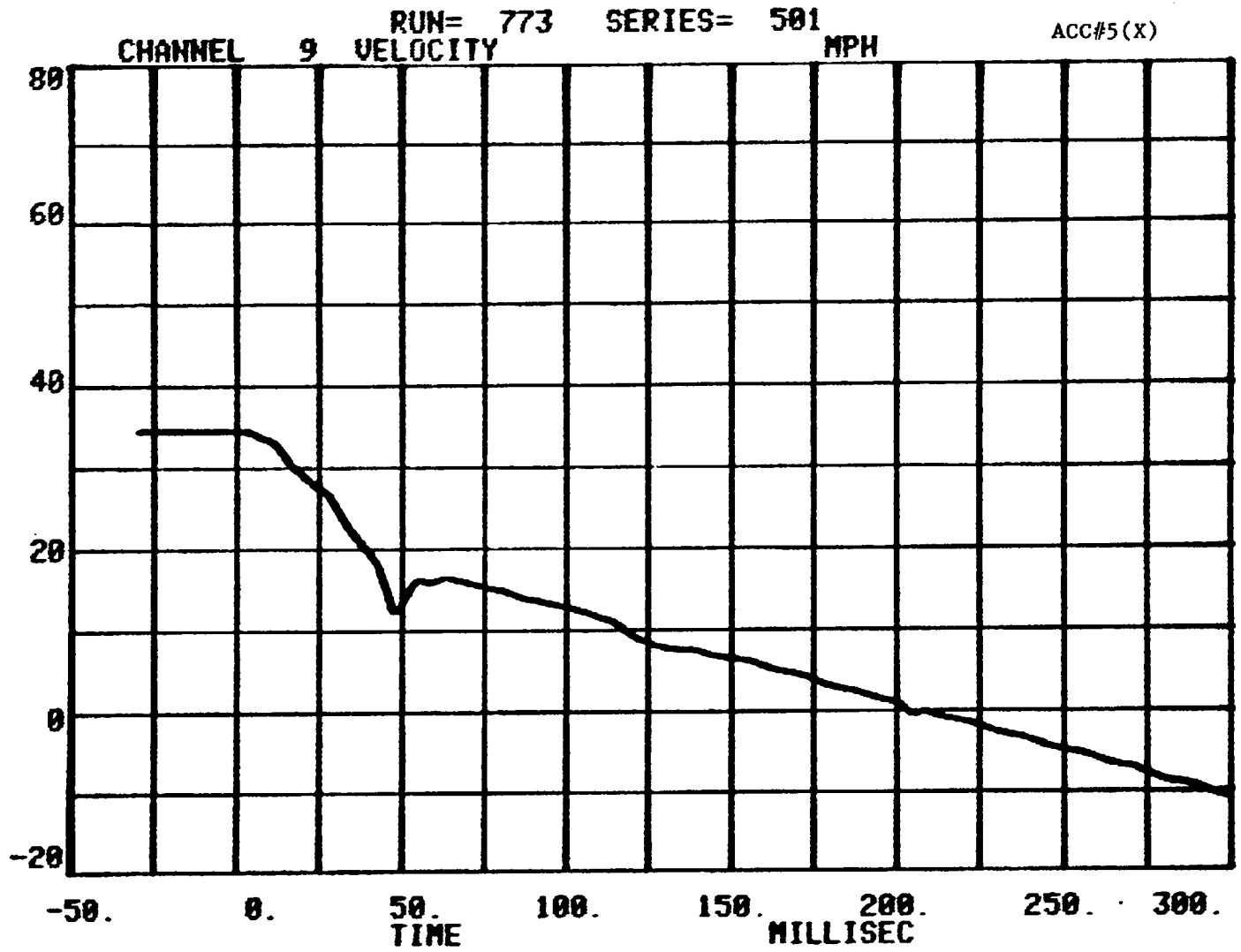

ACC#4(X)
CHANNEL 7 VELOCITY
RUN= 773 SERIES= 501
MPH
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

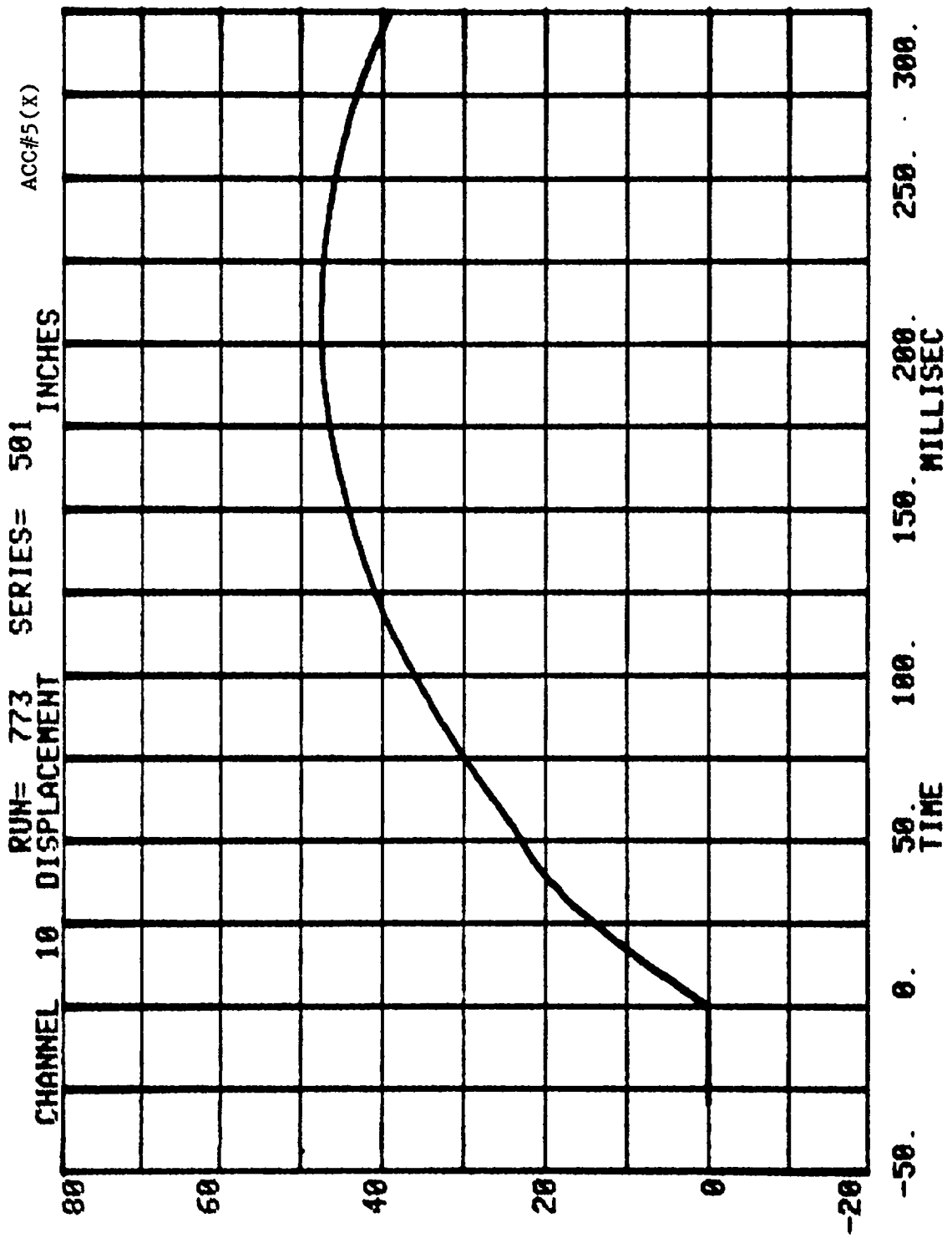

ACC#4(X)
CHANNEL 8 DISPLACEMENT
RUN= 773 SERIES= 501
INCHES
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

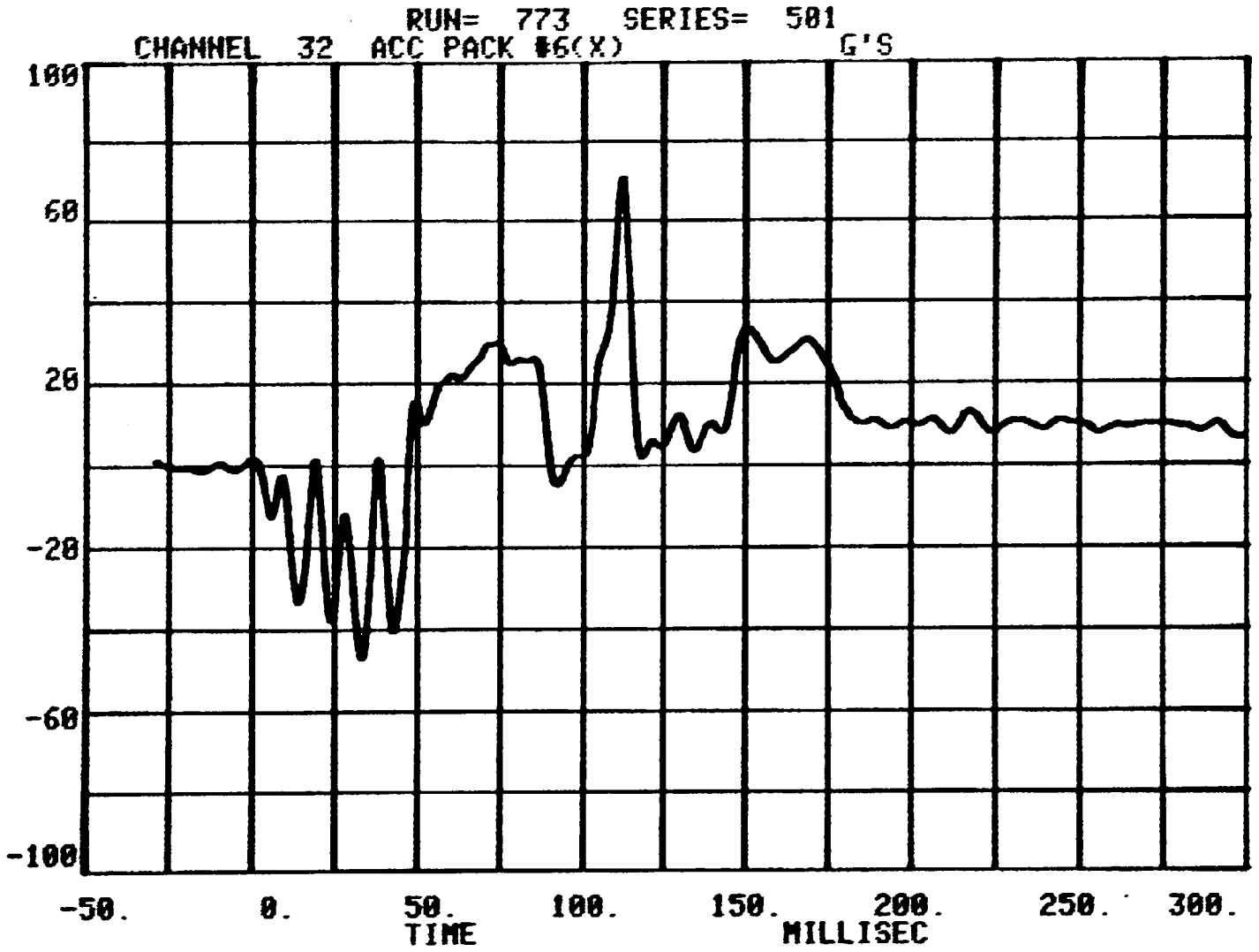
7556-11

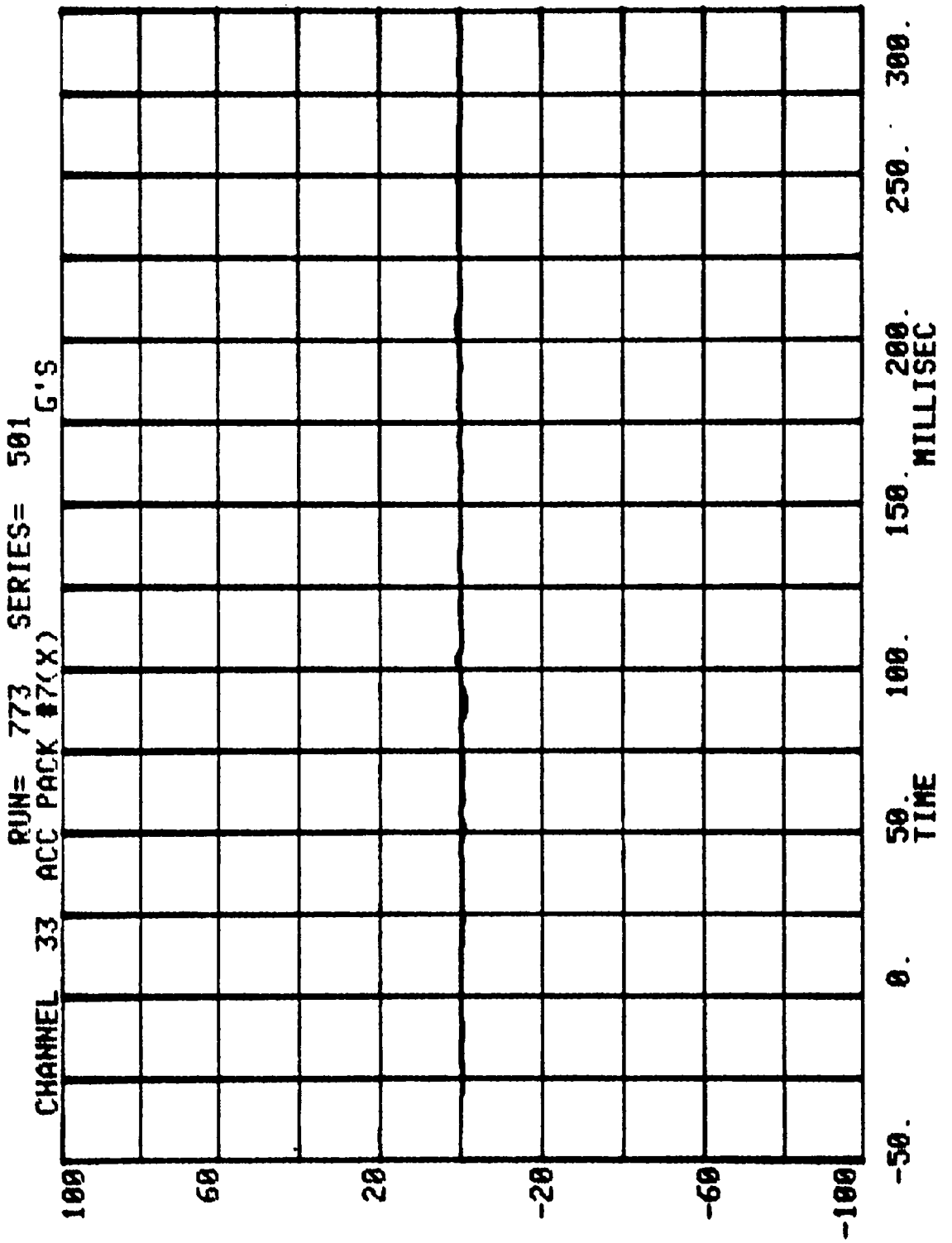

RUN= 773 SERIES= 501
CHANNEL 31 ACC PACK #5(X) G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 773 SERIES= 501
CHANNEL 9 VELOCITY
MPH
ACC#5(X)
80
60
40
20
0
-20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11


ACC#5(X)
CHANNEL 10 DISPLACEMENT
RUN= 773 SERIES= 501
INCHES
80
60
40
20
0
-20
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 773 SERIES= 501
CHANNEL 32 ACC PACK #6(X)
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 33 ACC PACK #7(X)
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

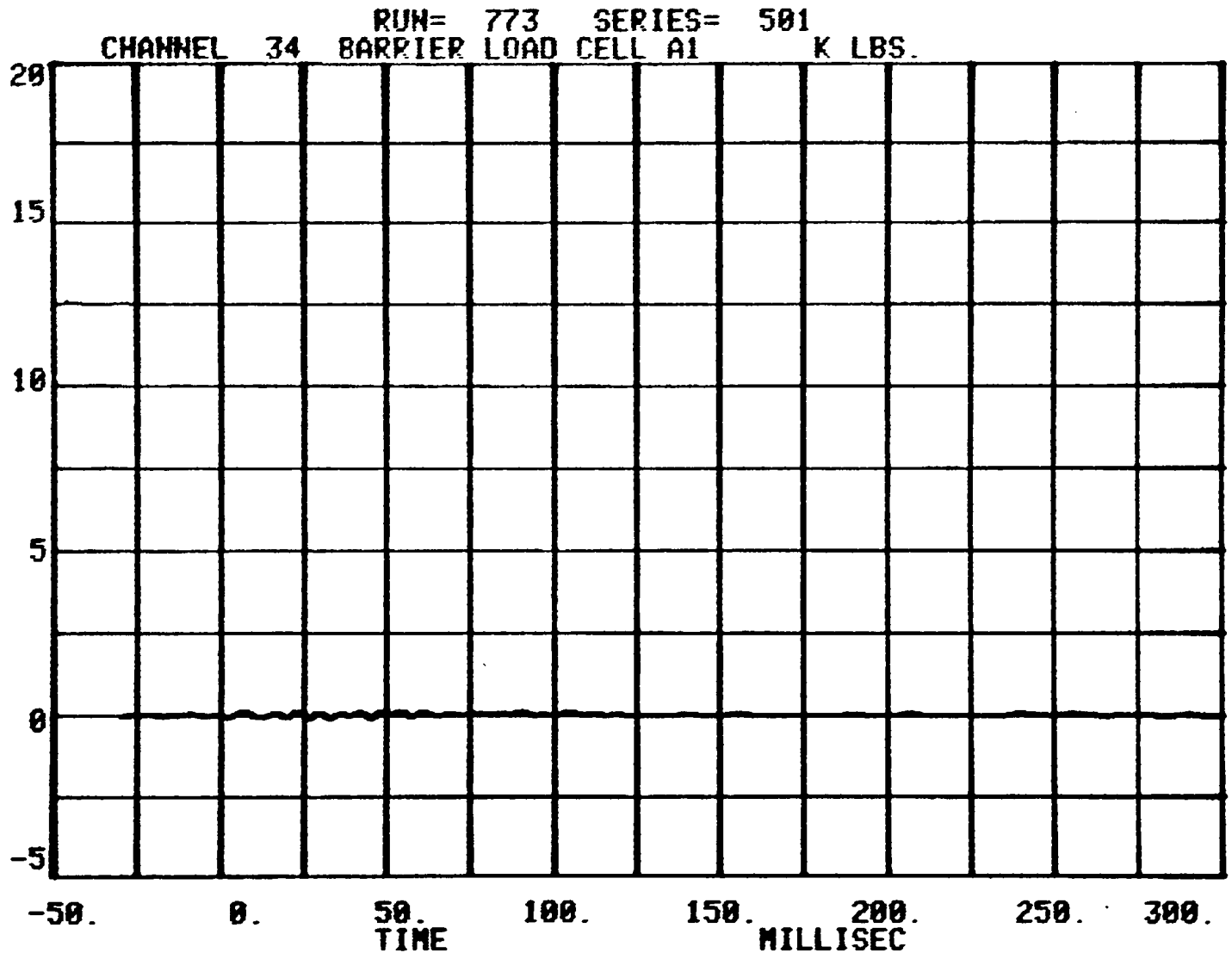
7556-11

TEST NO. MH0501

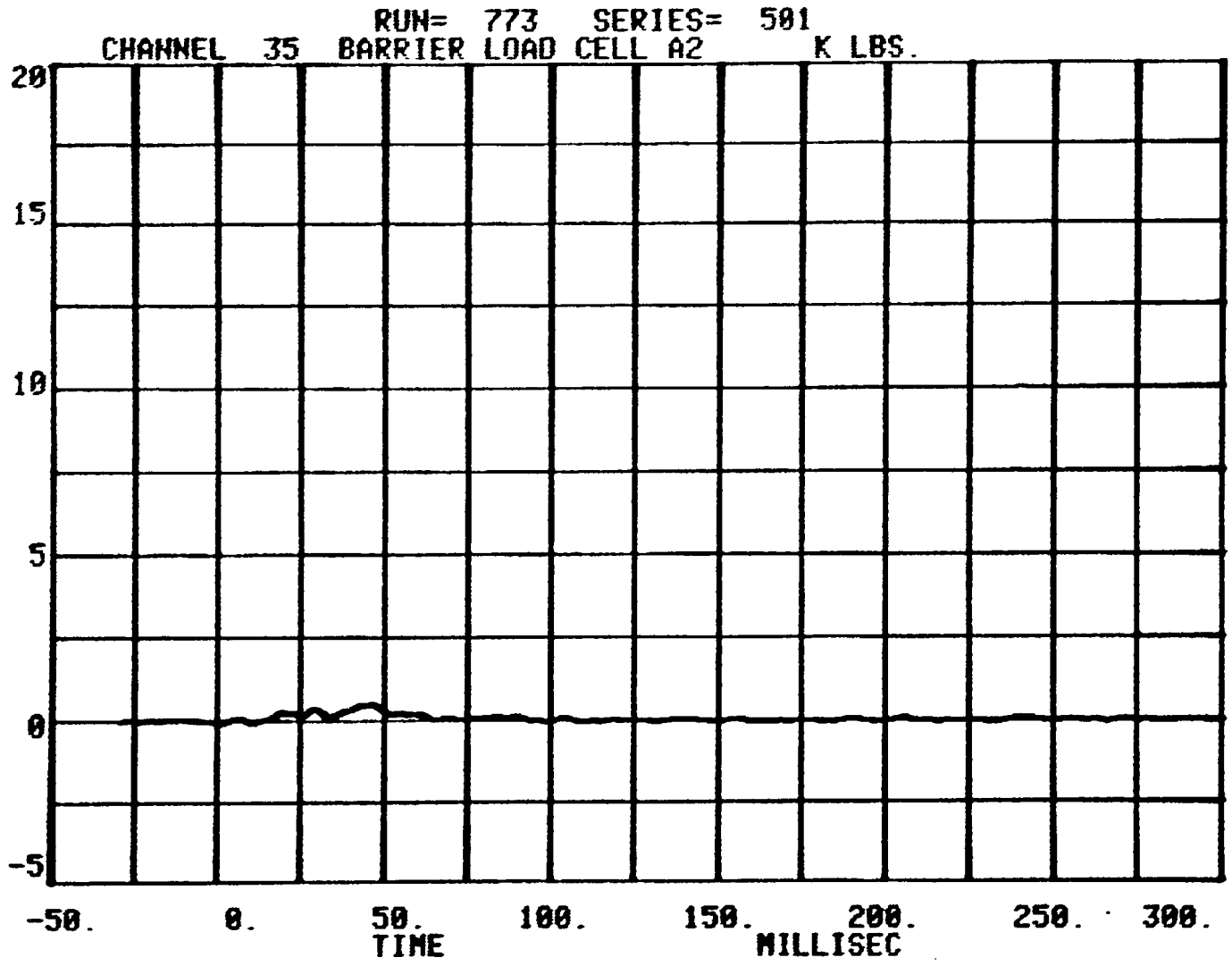
LOAD CELL BARRIER DATA

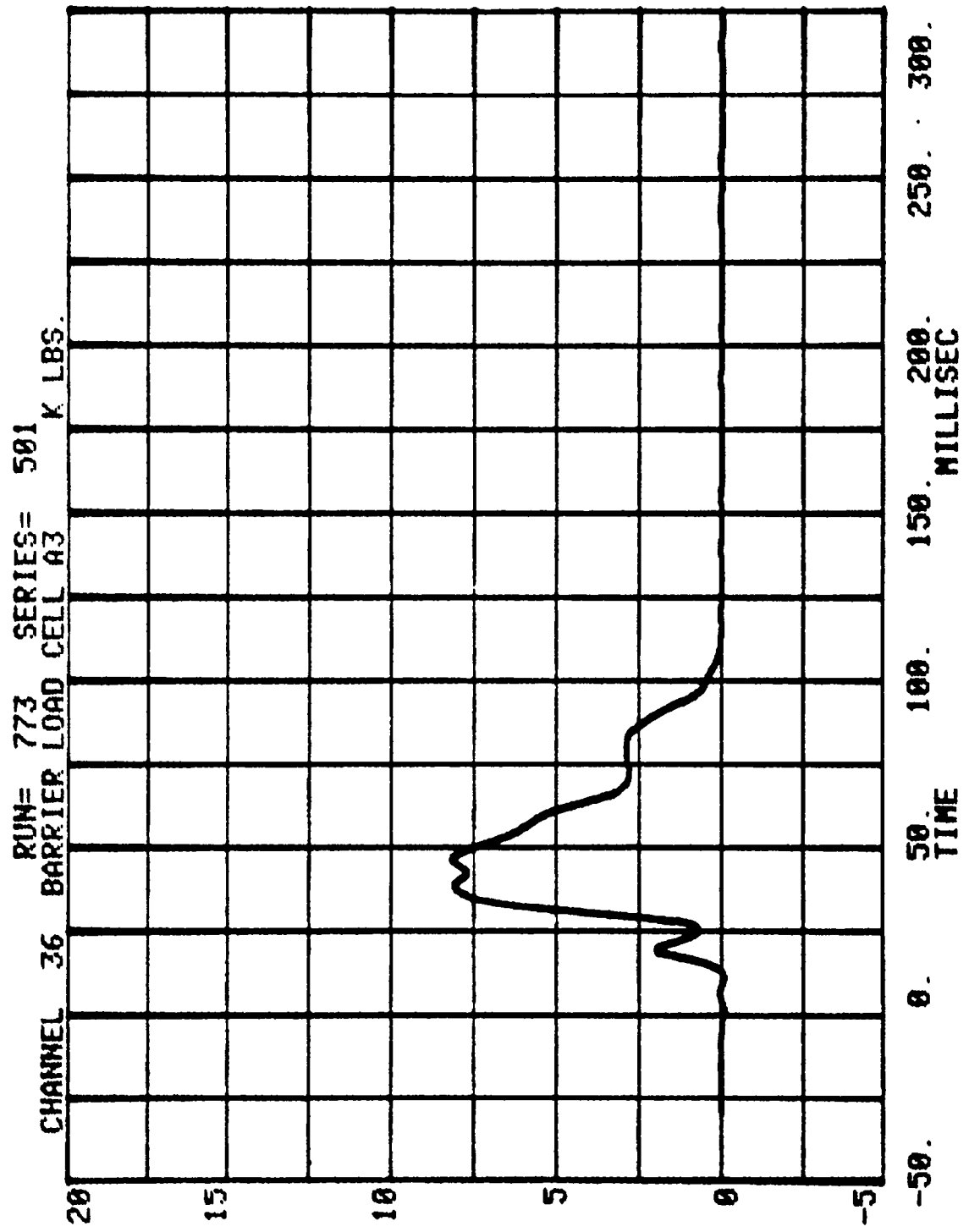
FILTER CHANNEL CLASS

60

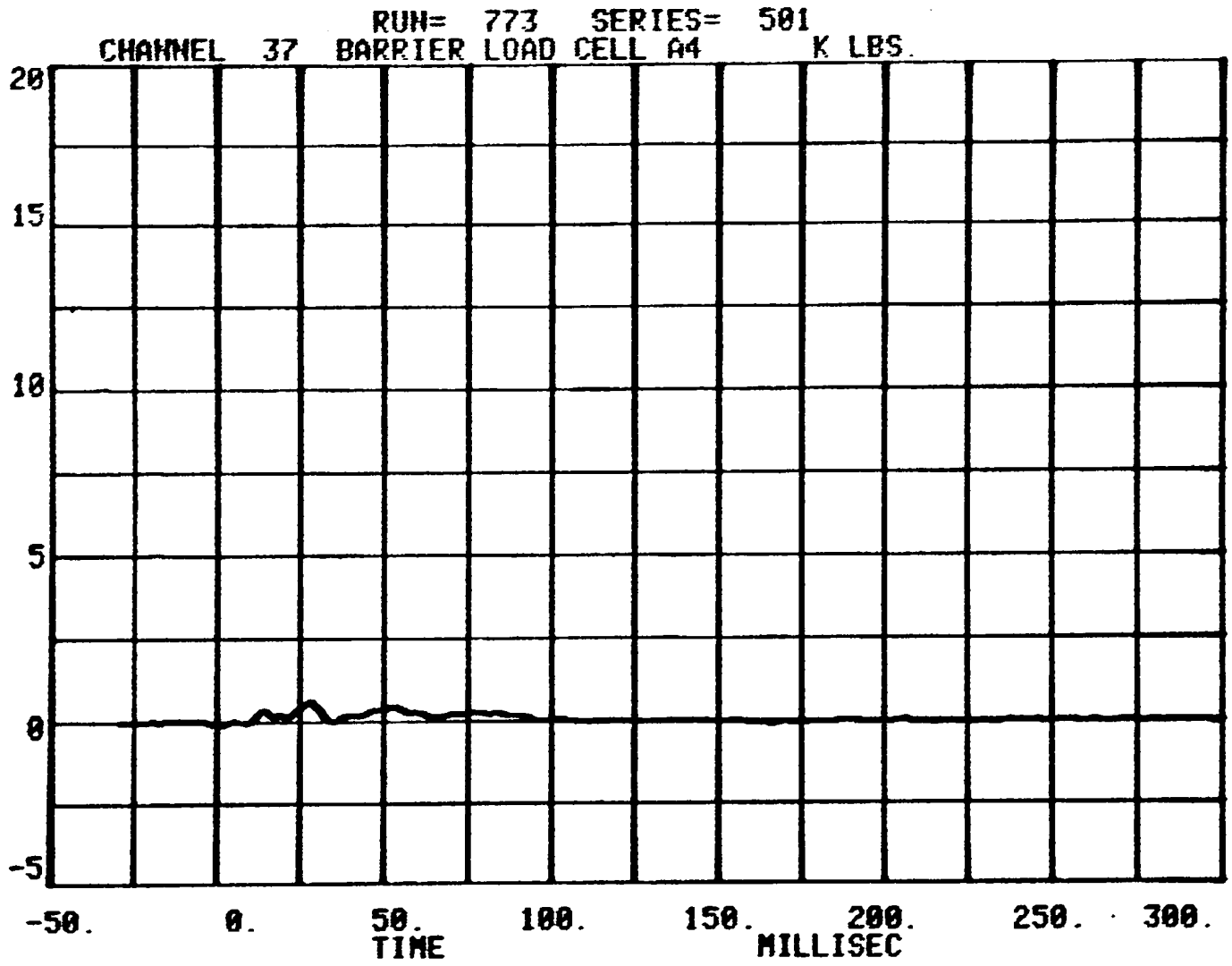

RUN= 773 SERIES= 501
CHANNEL 34 BARRIER LOAD CELL A1 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

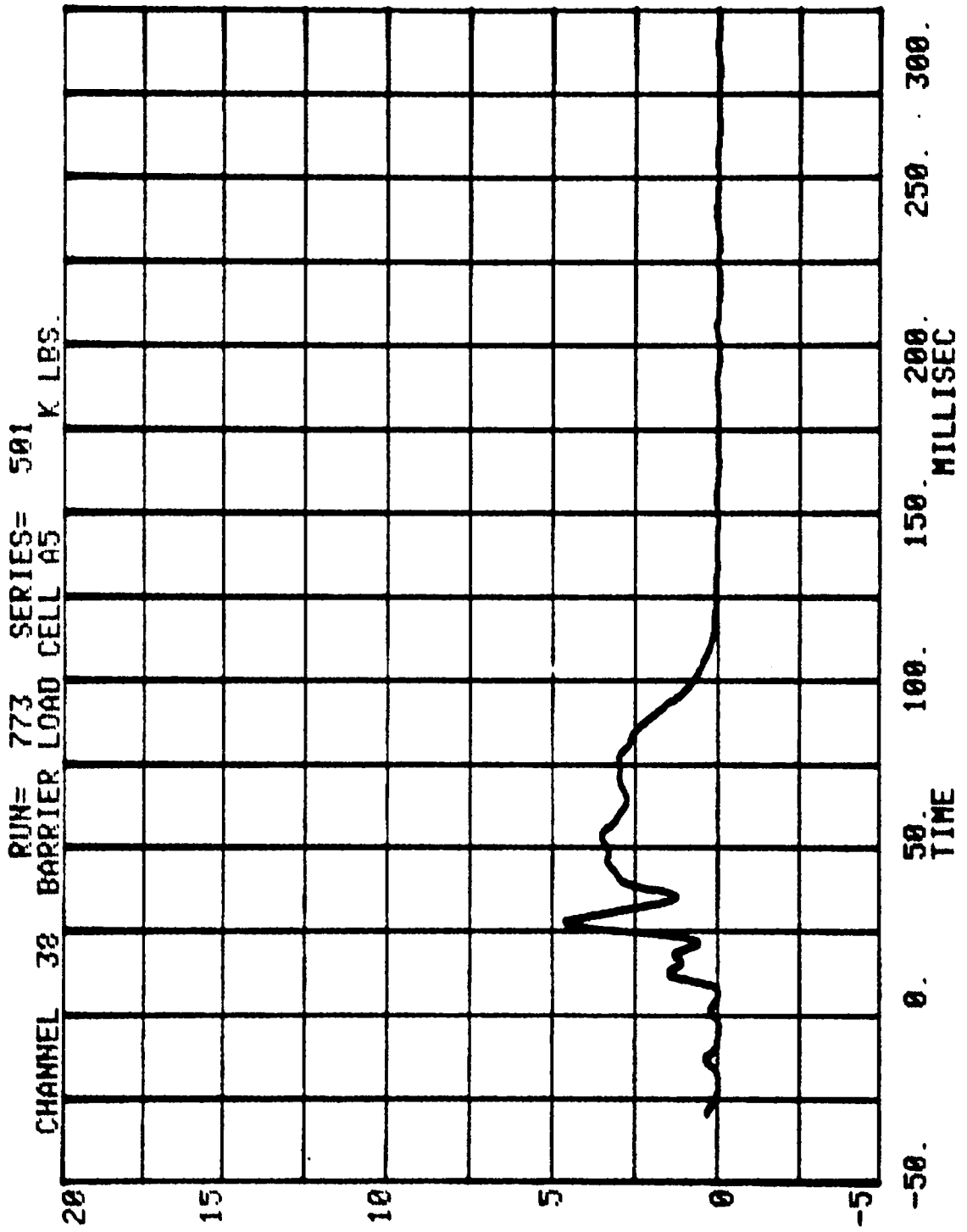
7556-11

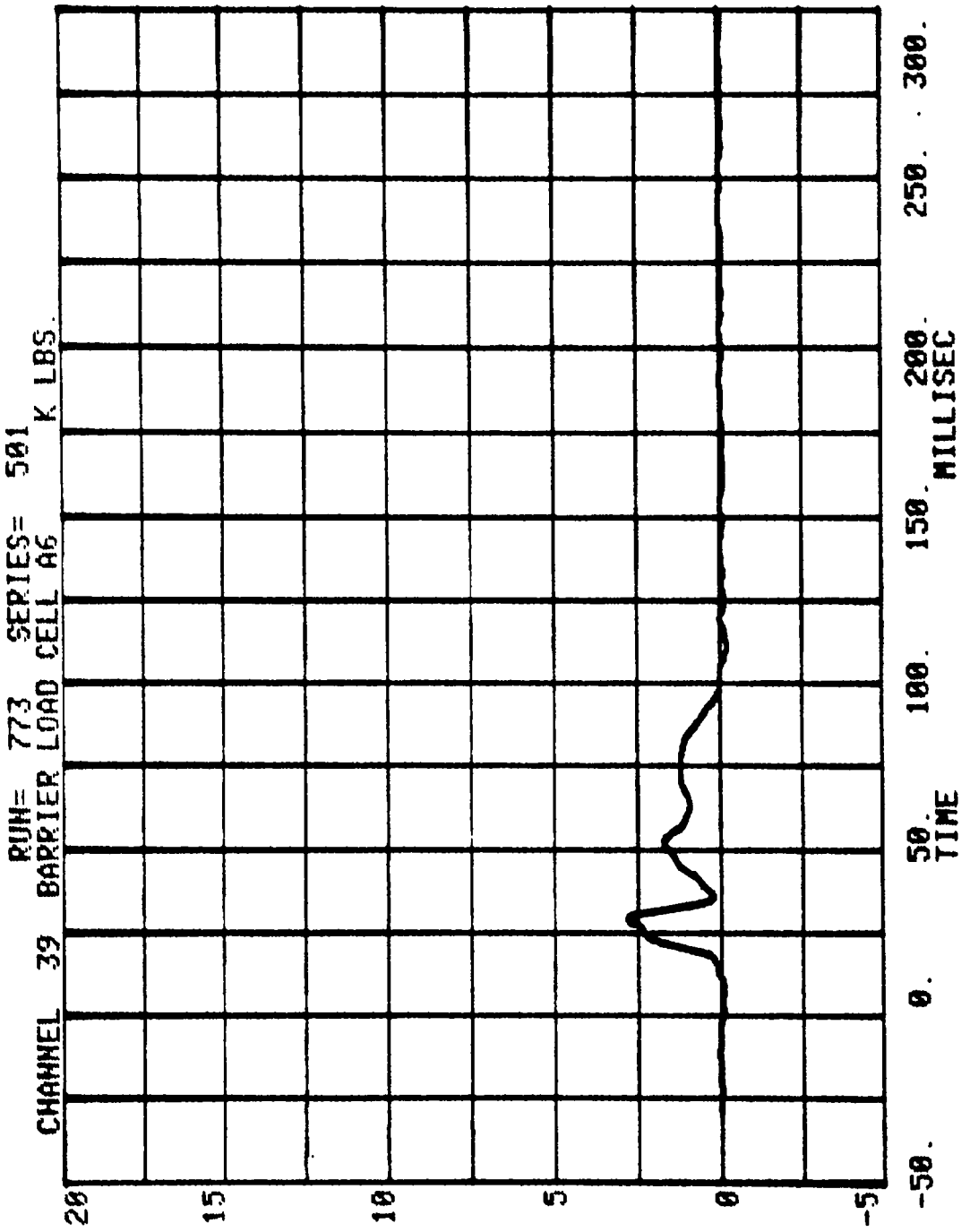

RUN= 773 SERIES= 501
CHANNEL 35 BARRIER LOAD CELL A2
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 36 BARRIER LOAD CELL A3
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

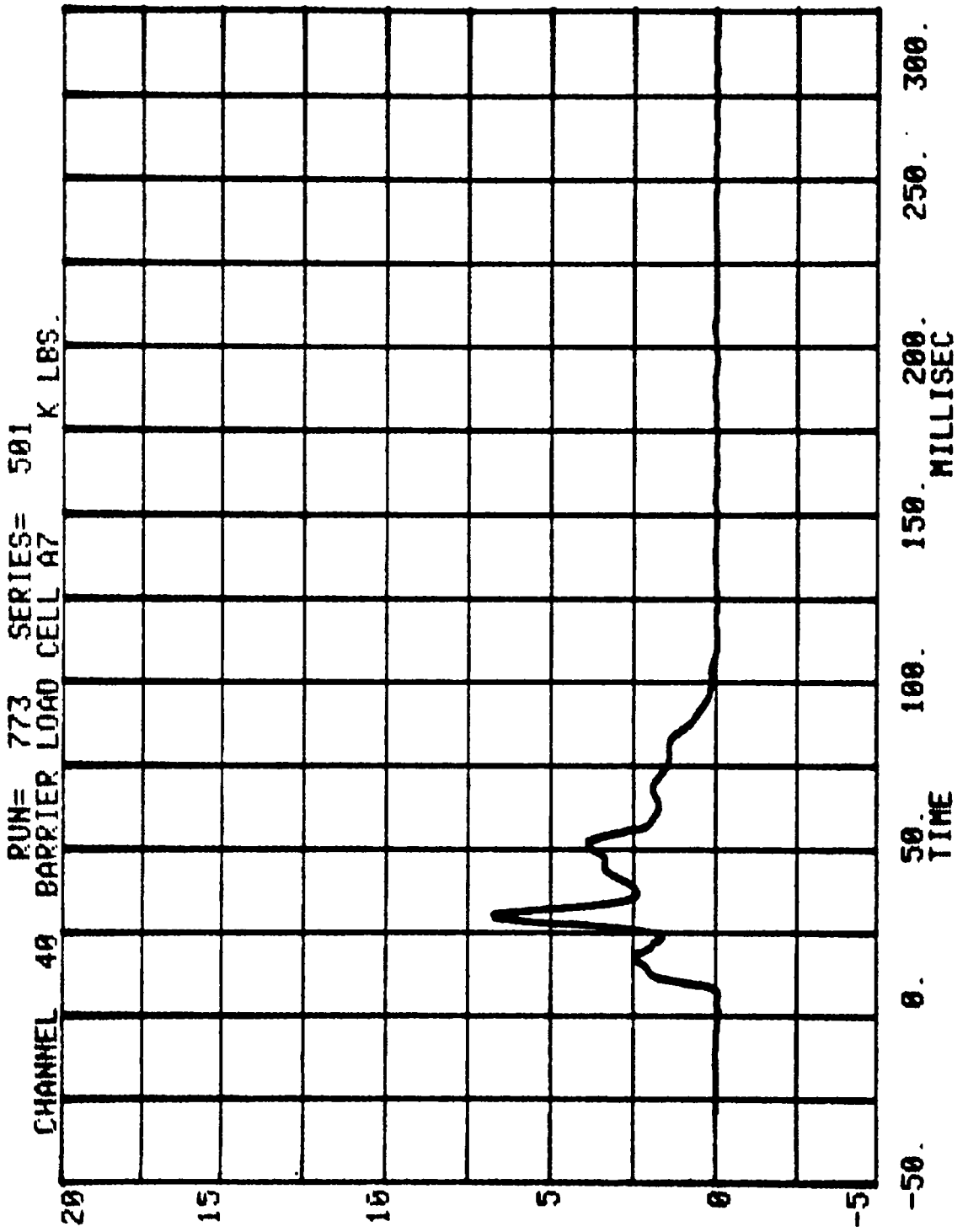
7556-11


RUN= 773 SERIES= 501
CHANNEL 37 BARRIER LOAD CELL A4 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

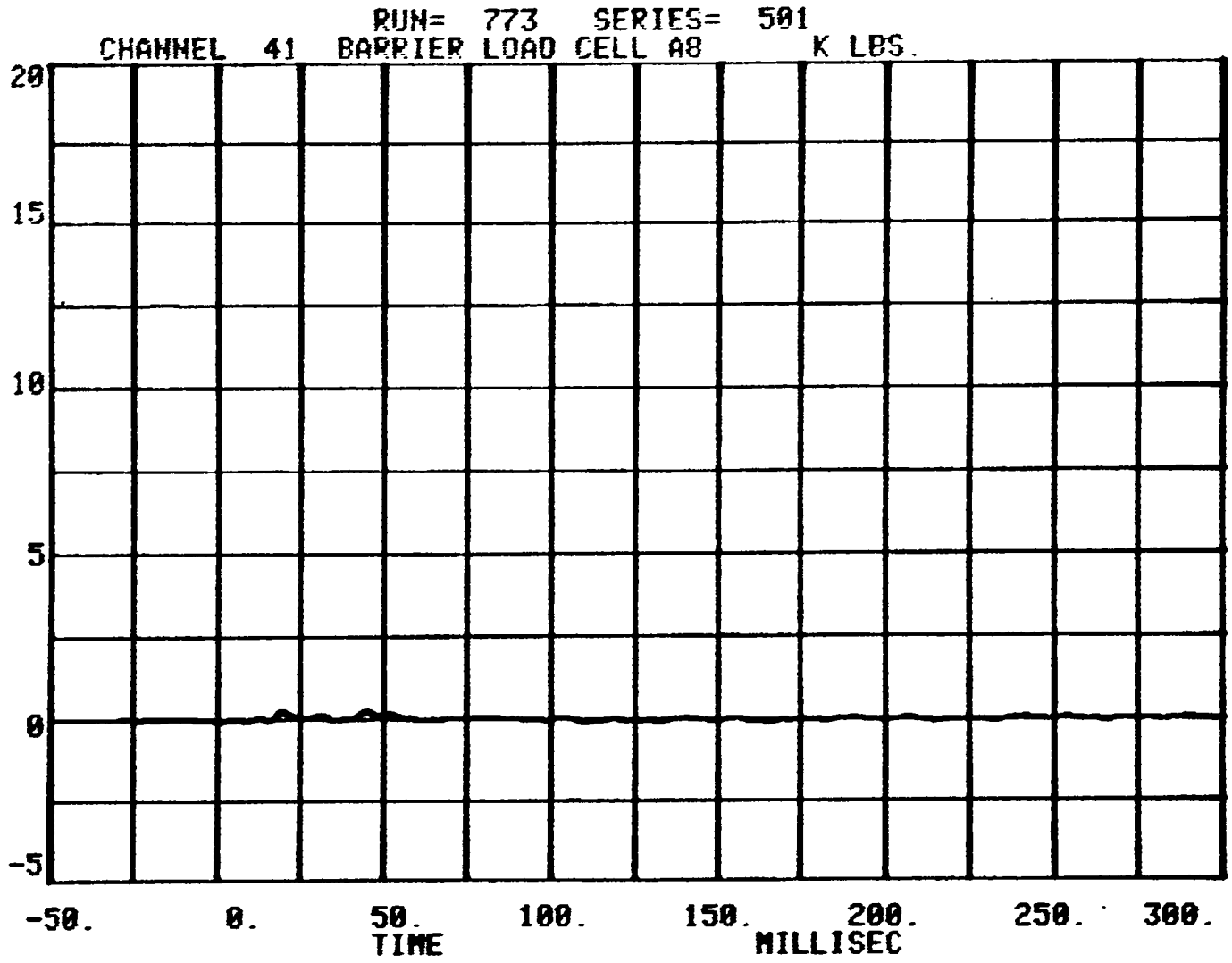

CHANNEL 32 BARRIER LOAD CELL A5
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

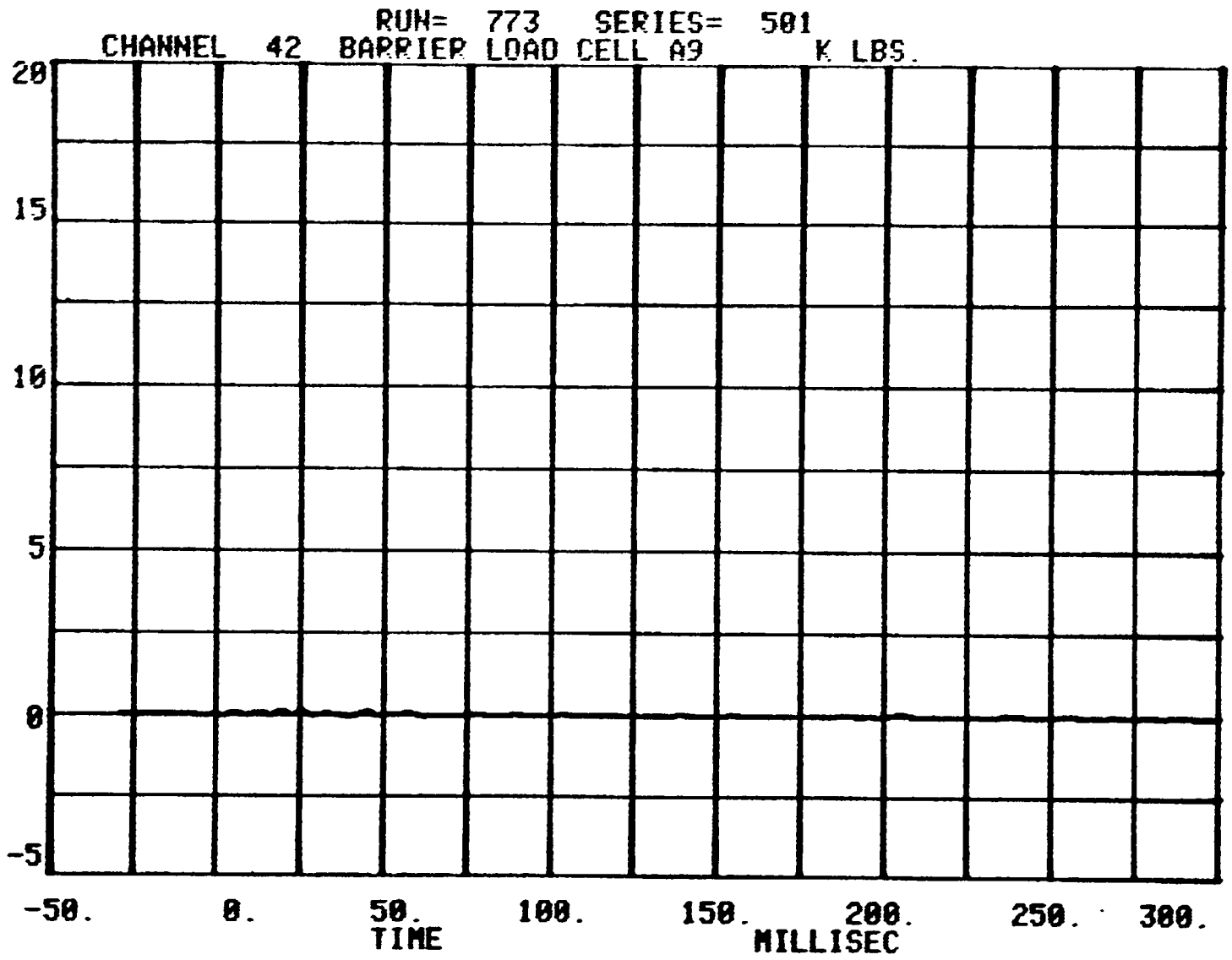

CHANNEL 39 RUN= 773 SERIES= 501
BARRIER LOAD CELL A6 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

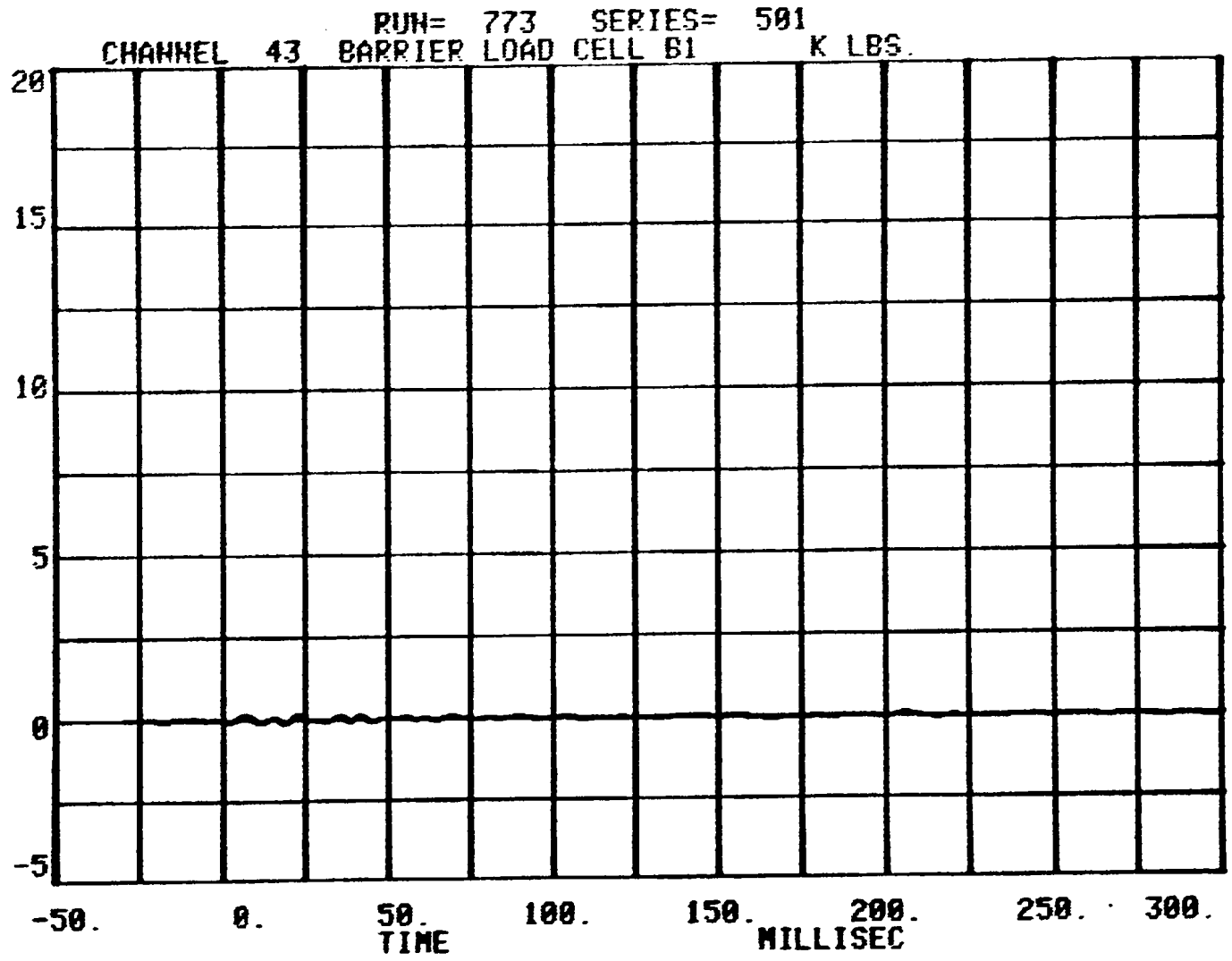
7556-11

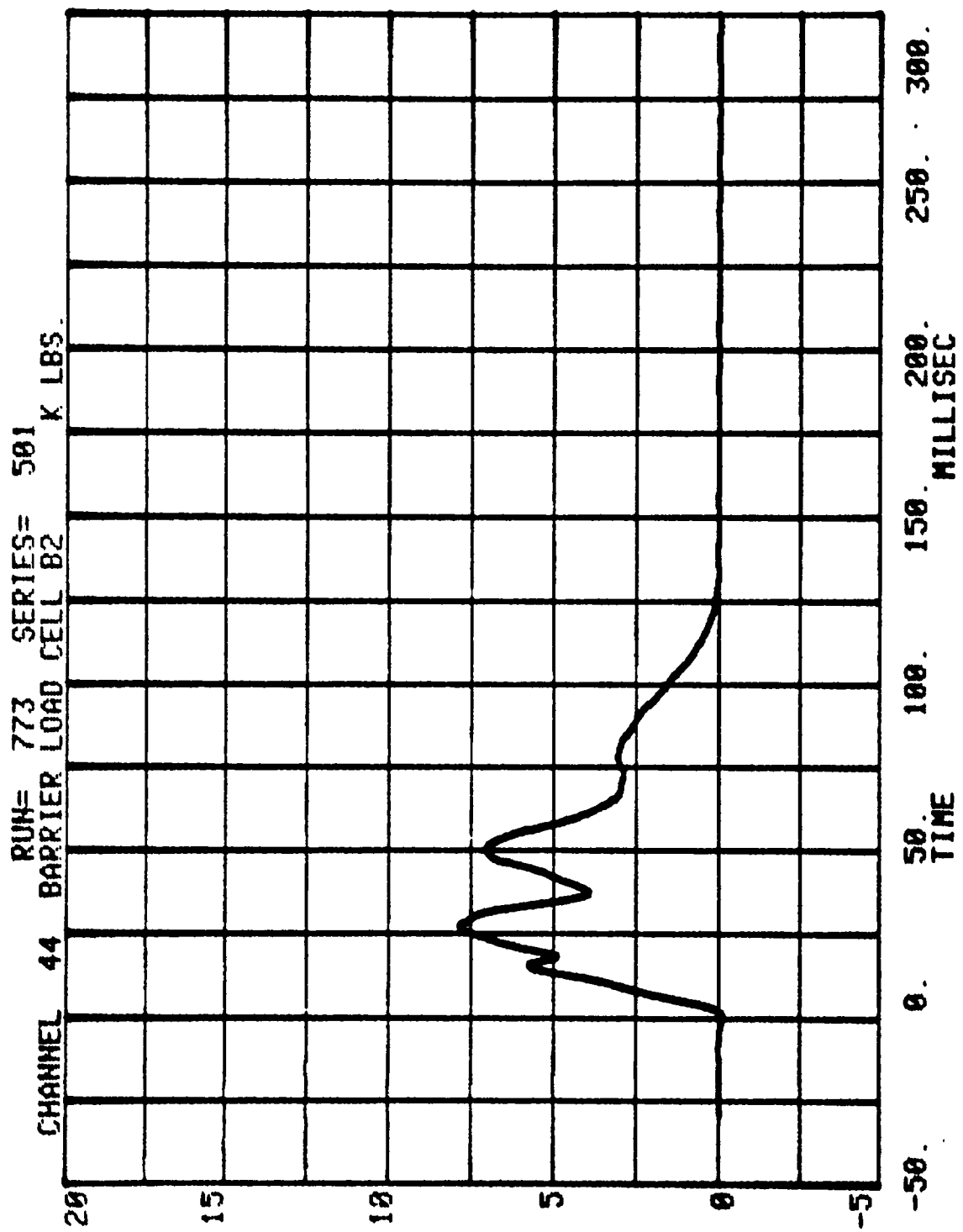

CHANNEL 40 BARRIER LOAD CELL A7
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

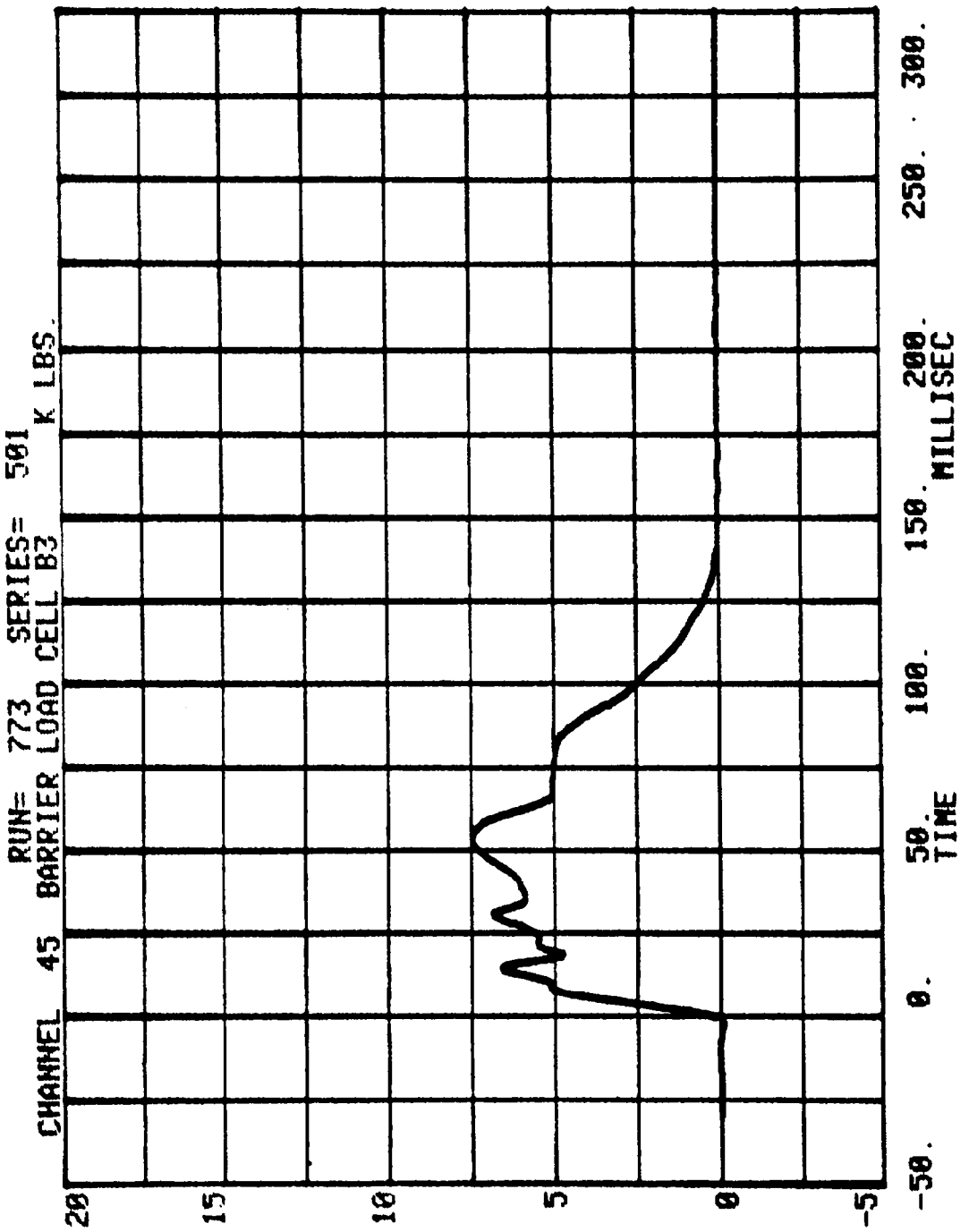
7556-11


RUN= 773 SERIES= 501
CHANNEL 41 BARRIER LOAD CELL A8
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

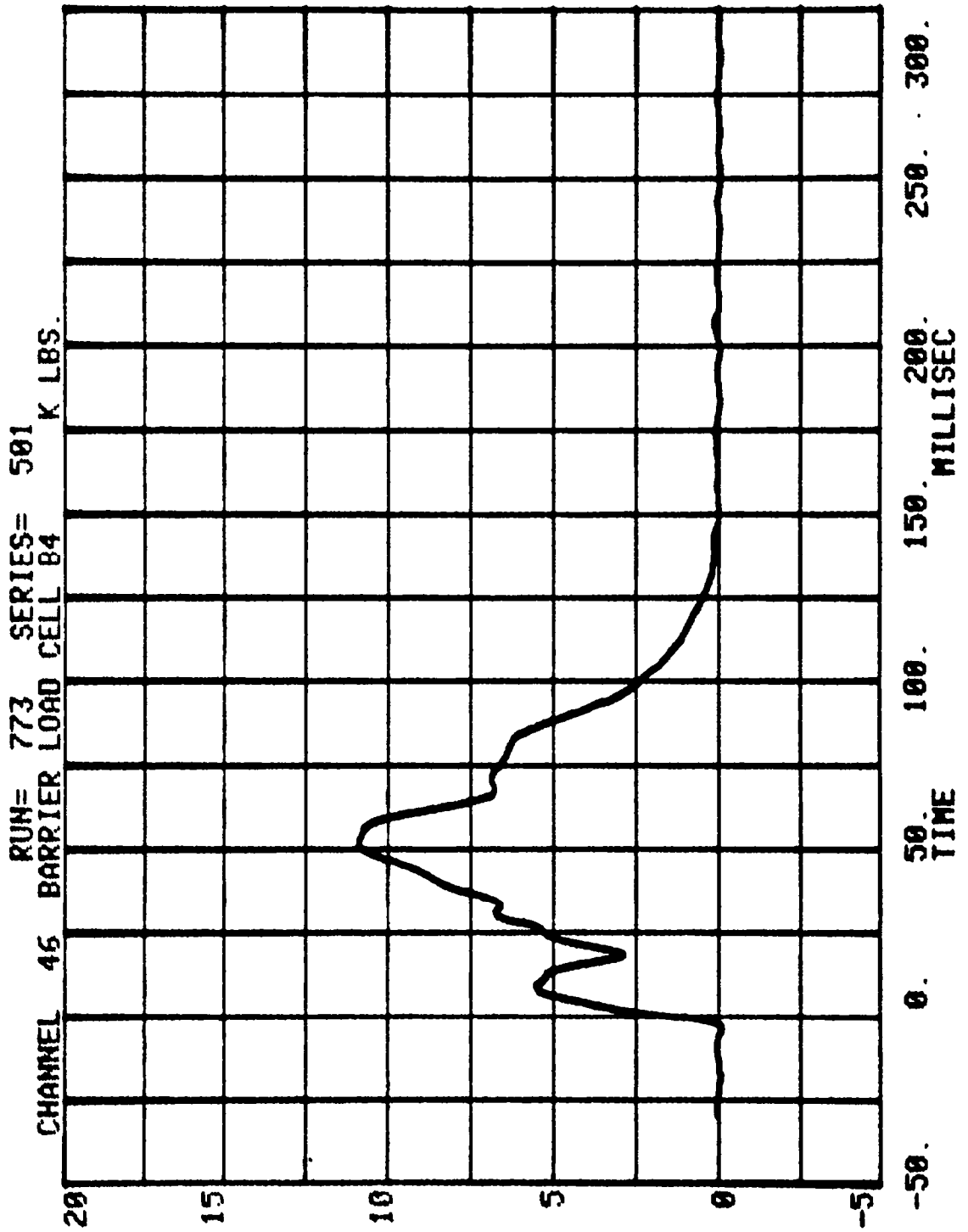

RUN= 773 SERIES= 501
CHANNEL 42 BARRIER LOAD CELL A9
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

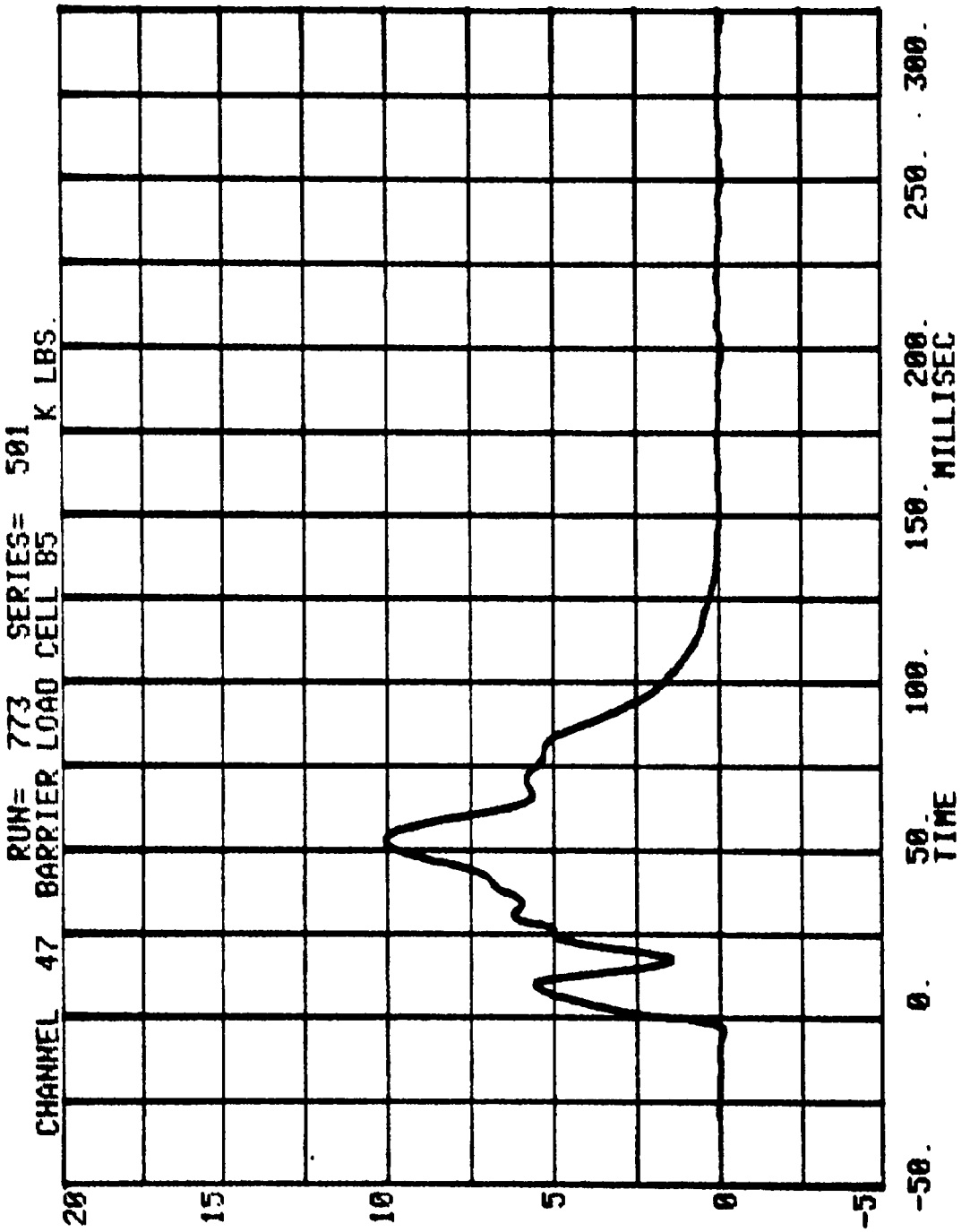

RUN= 773 SERIES= 501
CHANNEL 43 BARRIER LOAD CELL B1 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

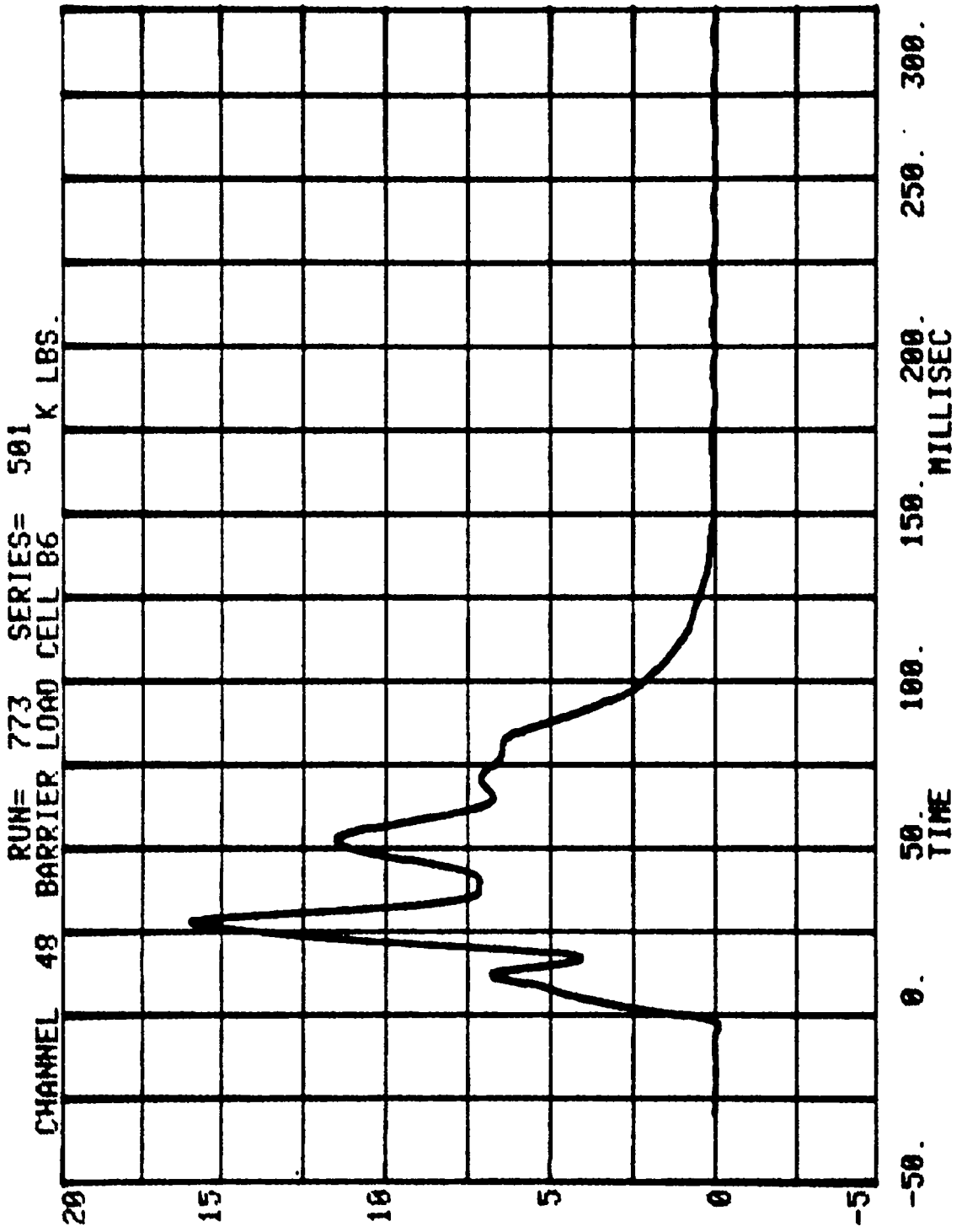

CHANNEL 44 BARRIER LOAD CELL B2
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 45 BARRIER LOAD CELL B3
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

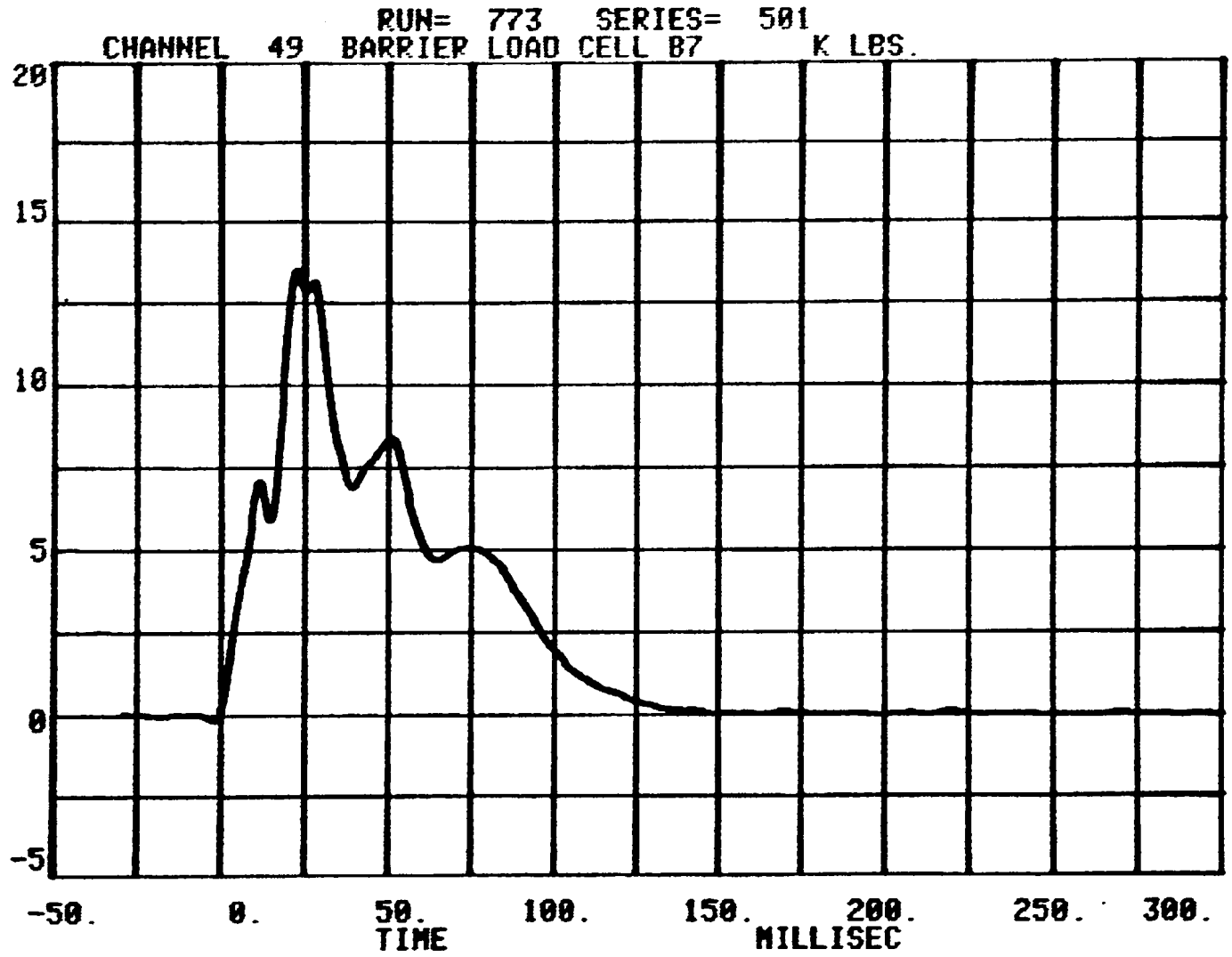
7556-11

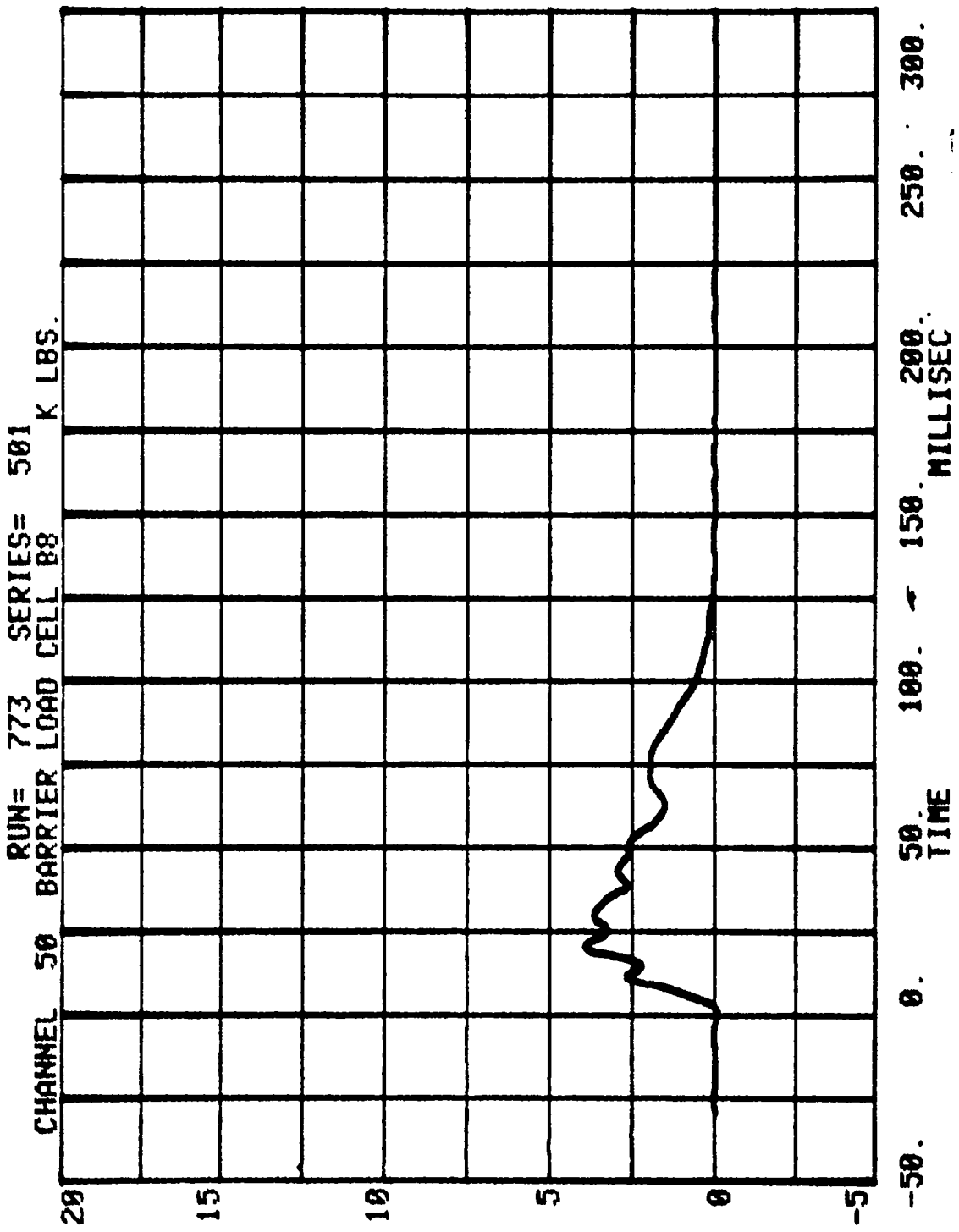

CHANNEL 46 BARRIER LOAD CELL B4
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

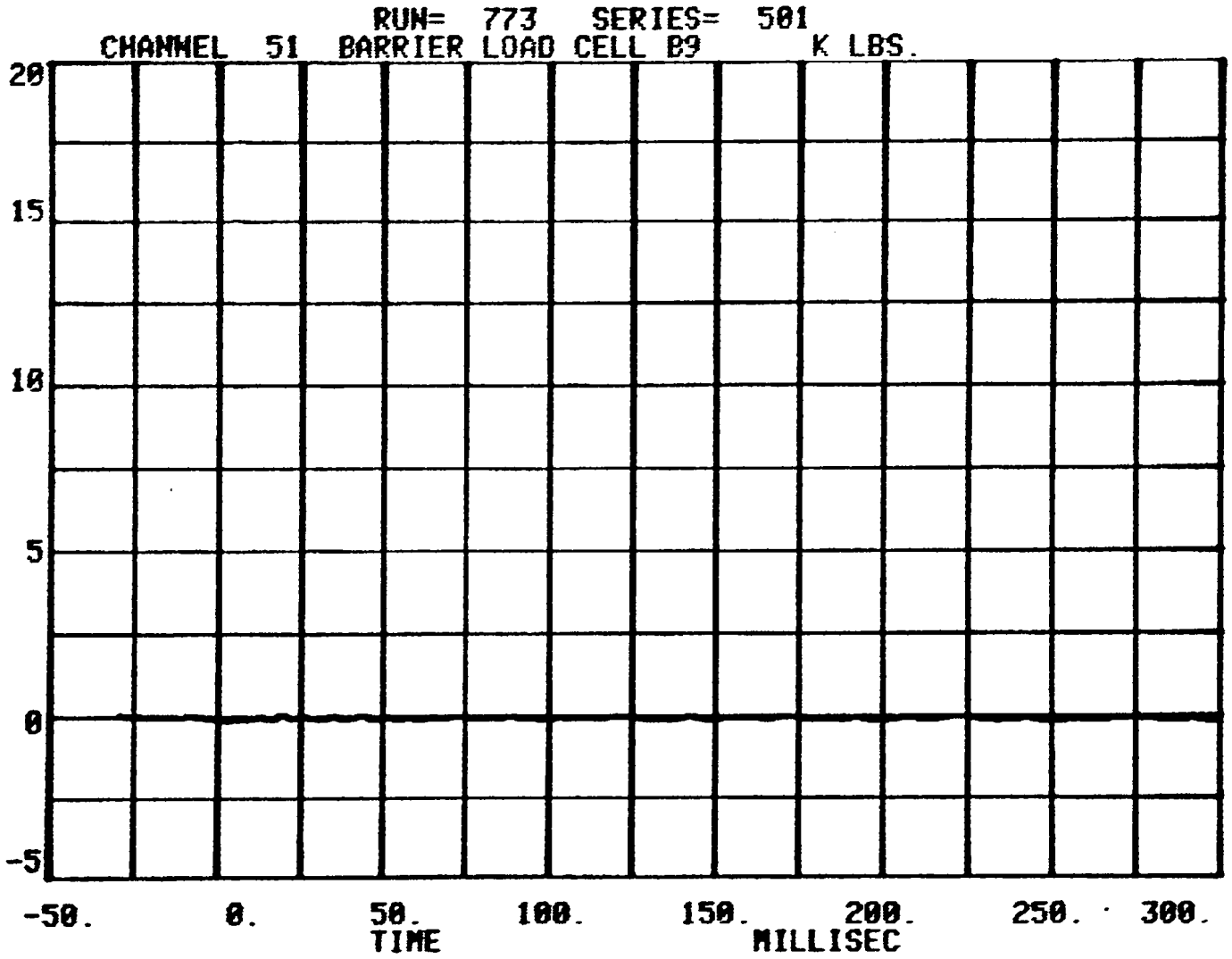

CHANNEL 47 BARRIER LOAD CELL B5
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

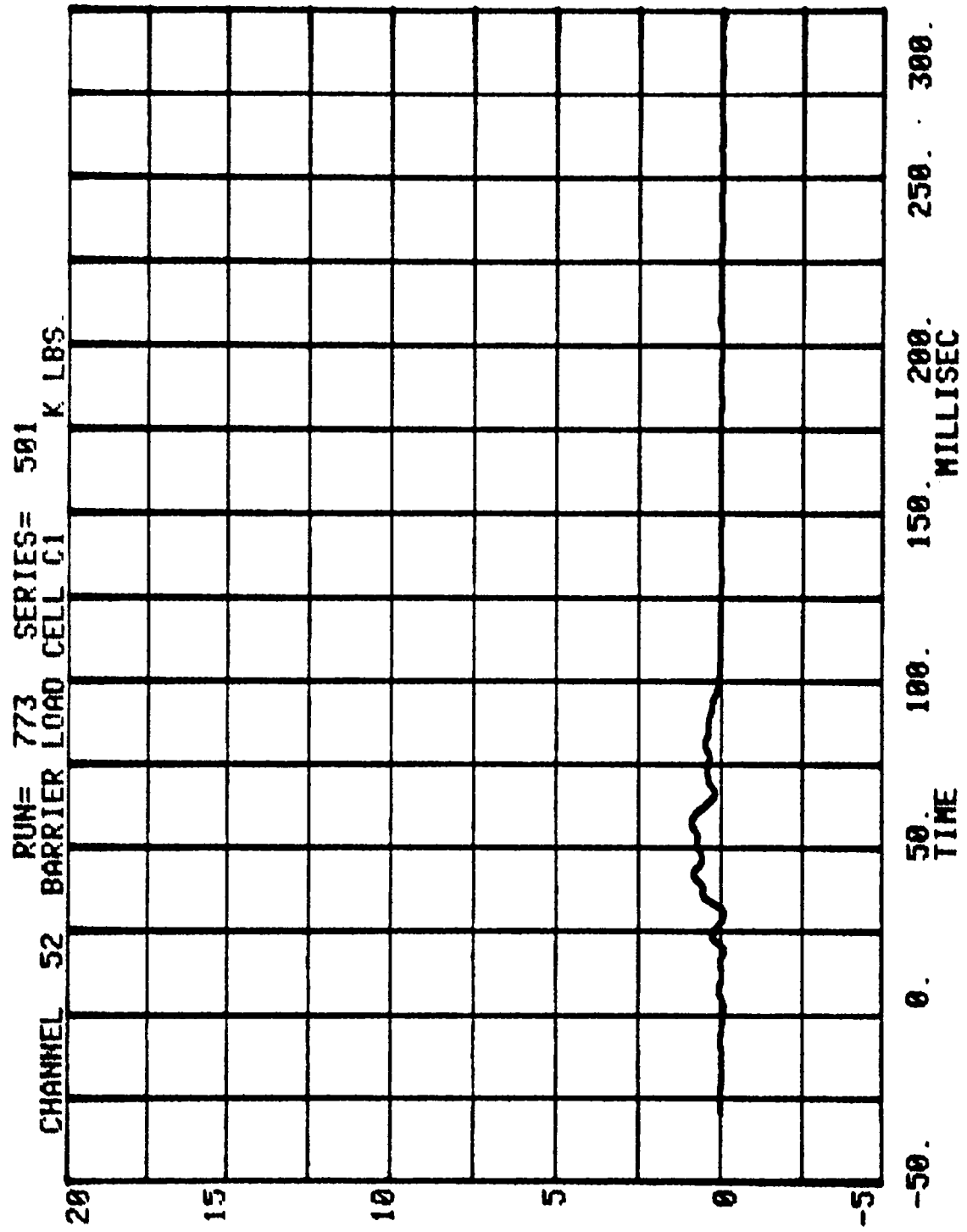

CHANNEL 48 BARRIER LOAD CELL B6
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

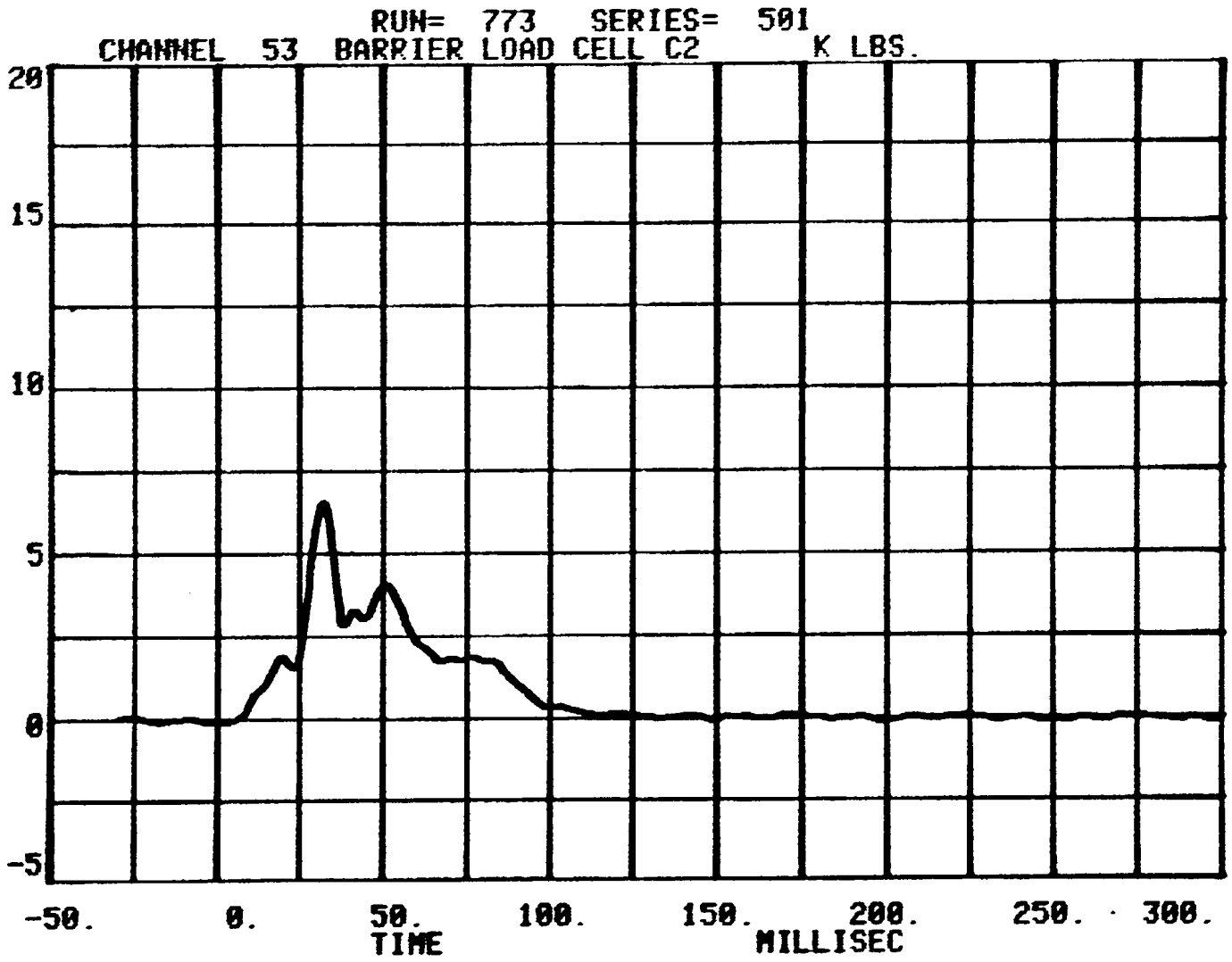

RUN= 773 SERIES= 501
CHANNEL 49 BARRIER LOAD CELL B7 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

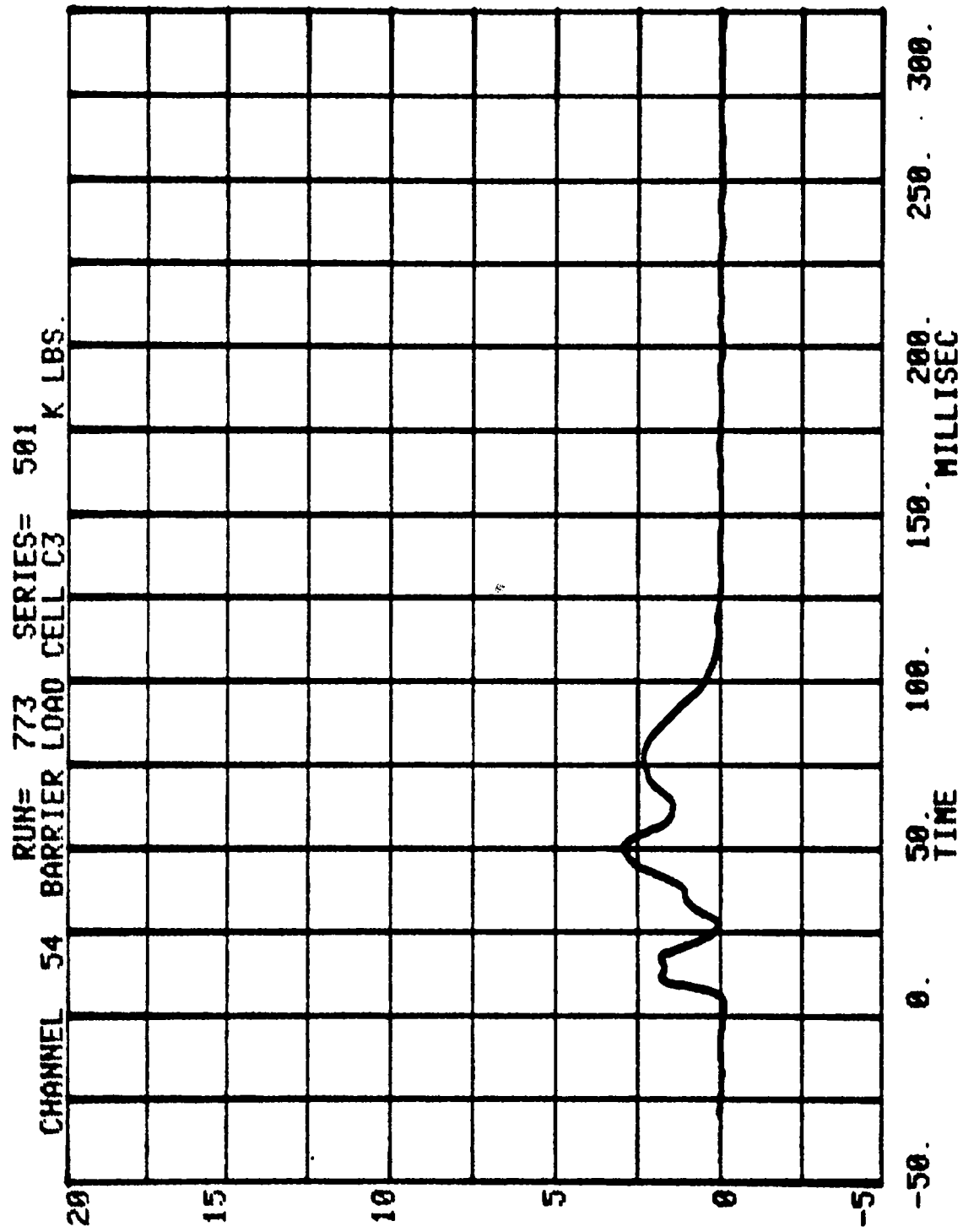

CHANNEL 50 BARRIER
RUN= 773 LOAD CELL
SERIES= 501 B8
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 773 SERIES= 501
CHANNEL 51 BARRIER LOAD CELL B9 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

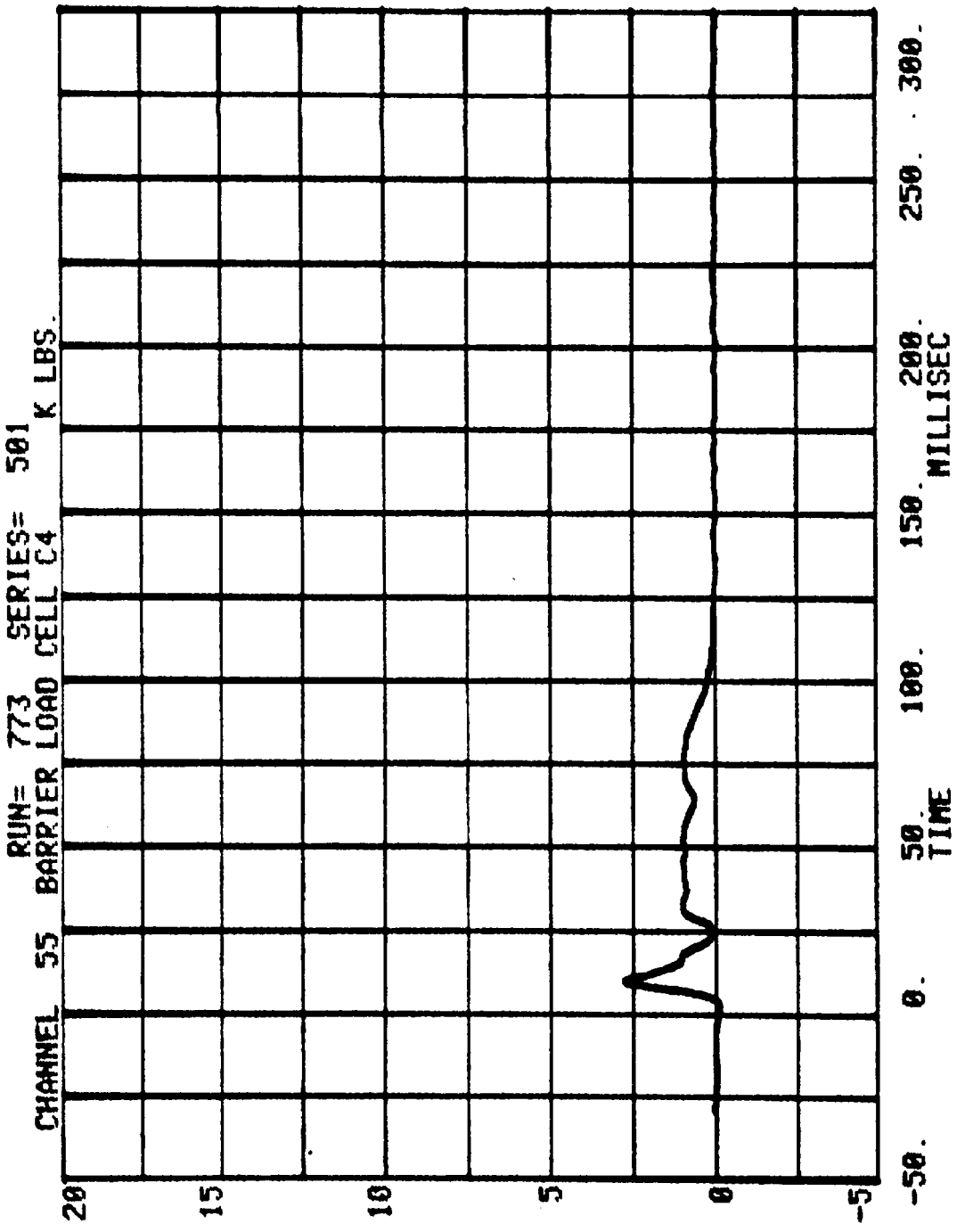

CHANNEL 52 BARRIER LOAD CELL C1
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

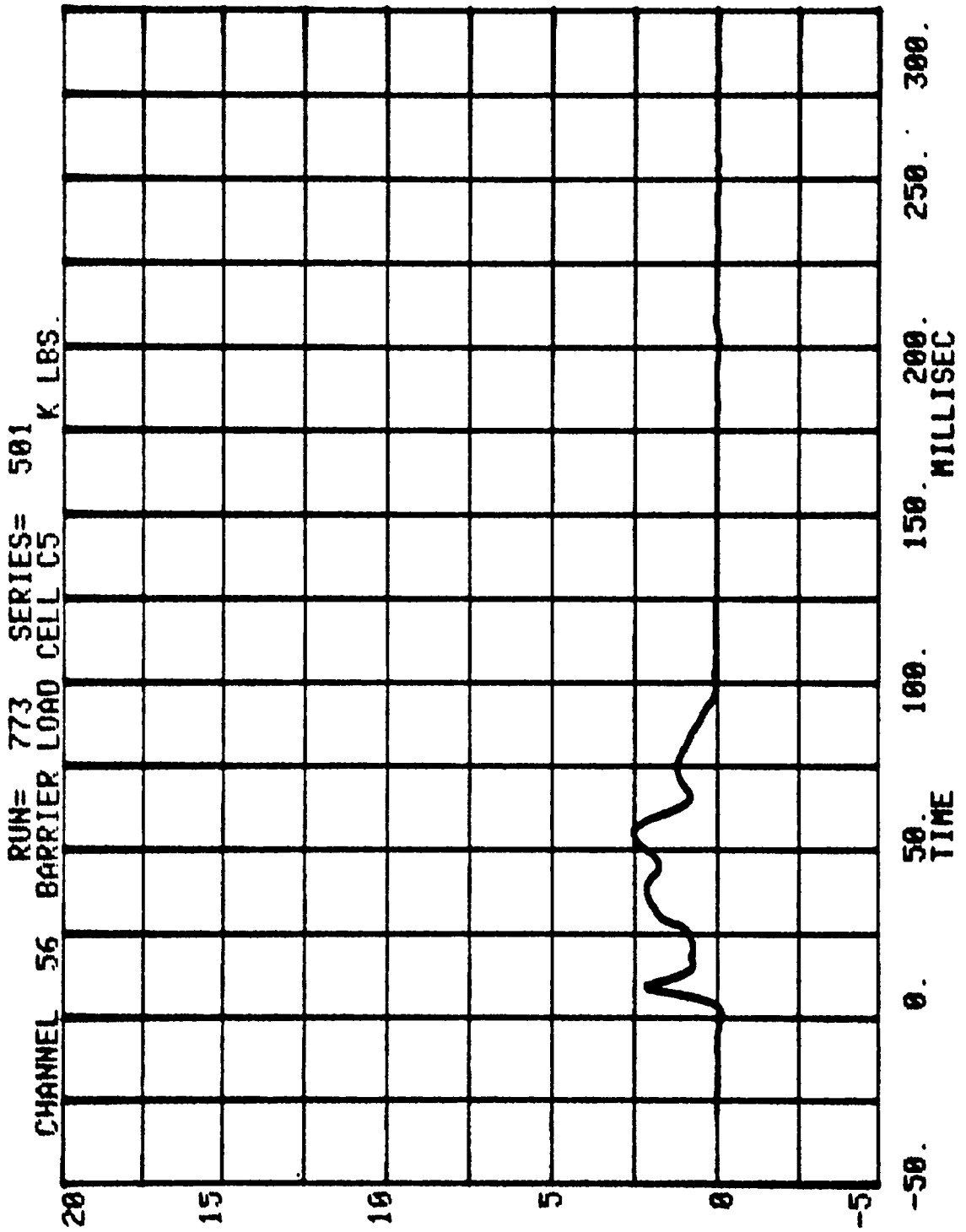

RUN= 773 SERIES= 501
CHANNEL 53 BARRIER LOAD CELL C2 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

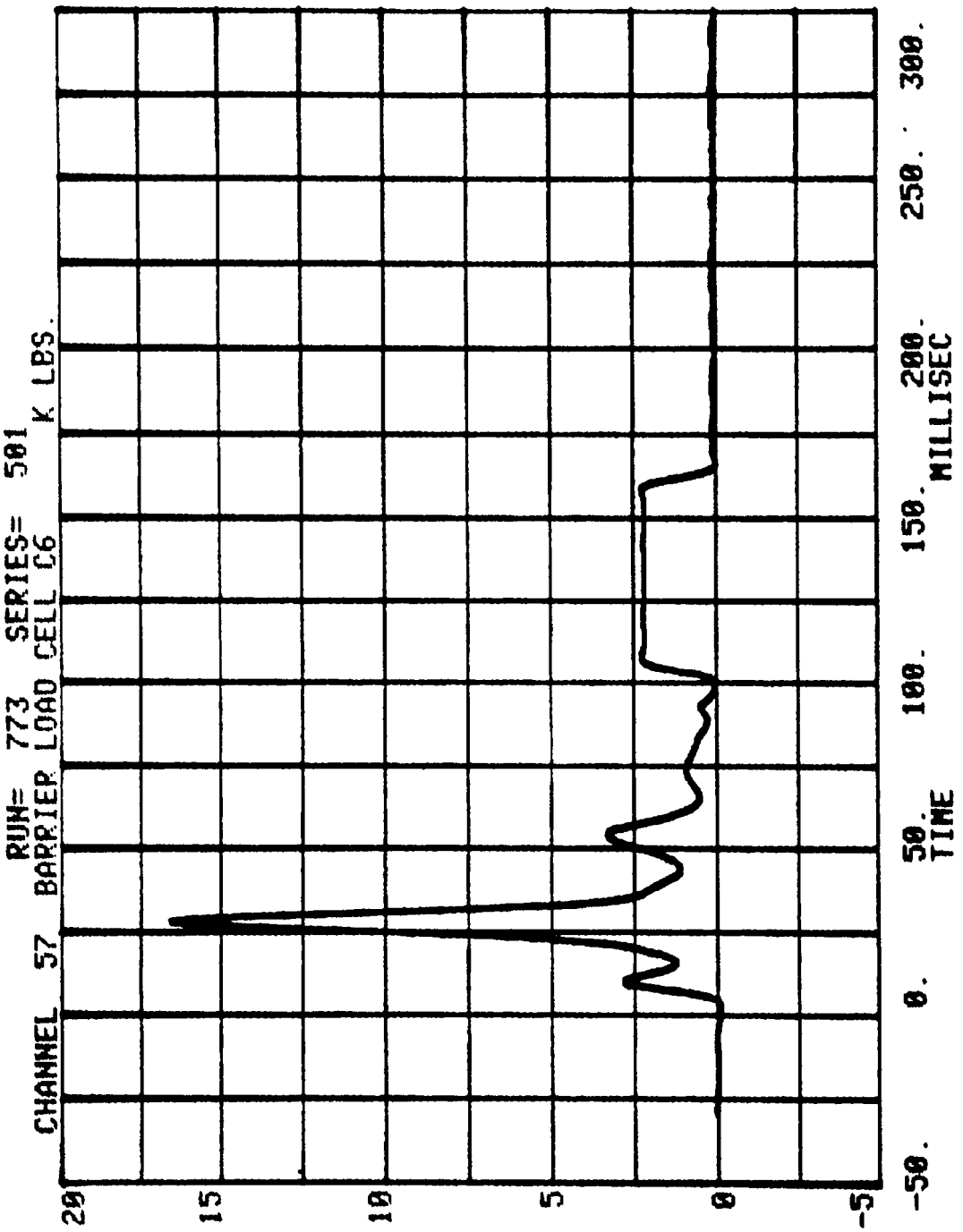

CHANNEL 54 RUN= 773 SERIES= 501
BARRIER LOAD CELL C3 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

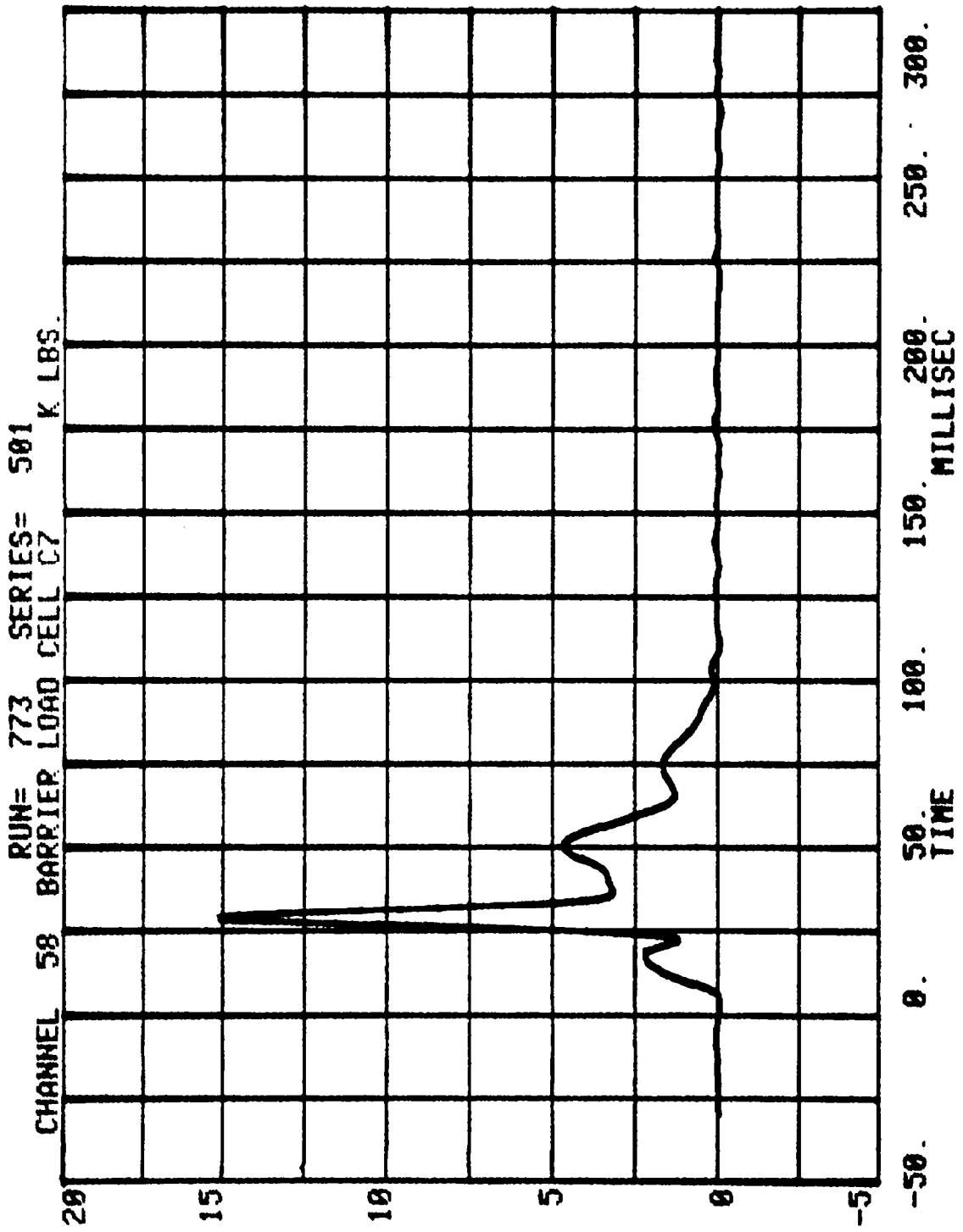

CHANNEL 55 RUN= 773 SERIES= 501
BARRIER LOAD CELL C4
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

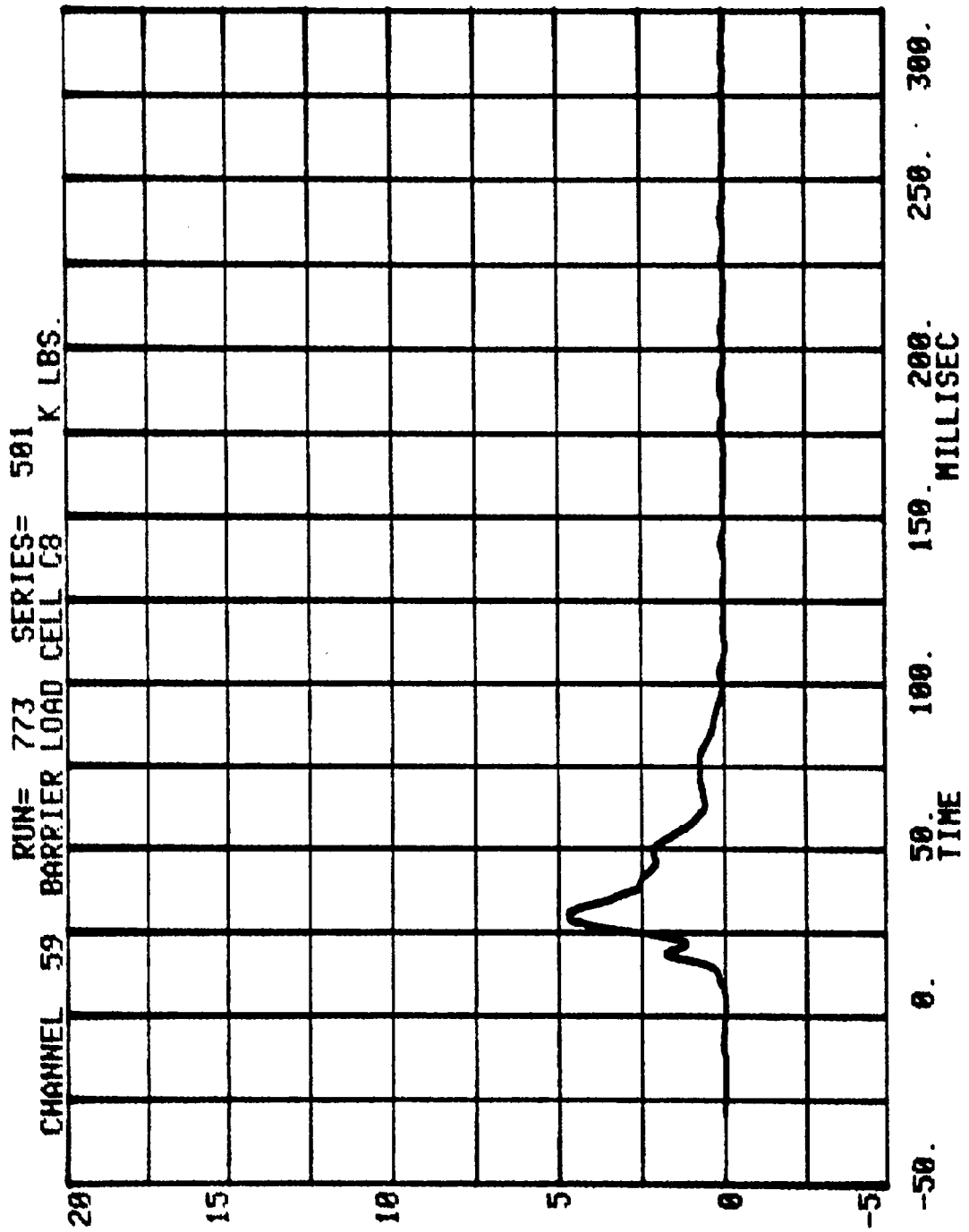

CHANNEL 56
RUN= 773
BARRIER LOAD CELL C5
SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 57
RUN= 773
BARRIER LOAD CELL C6
SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

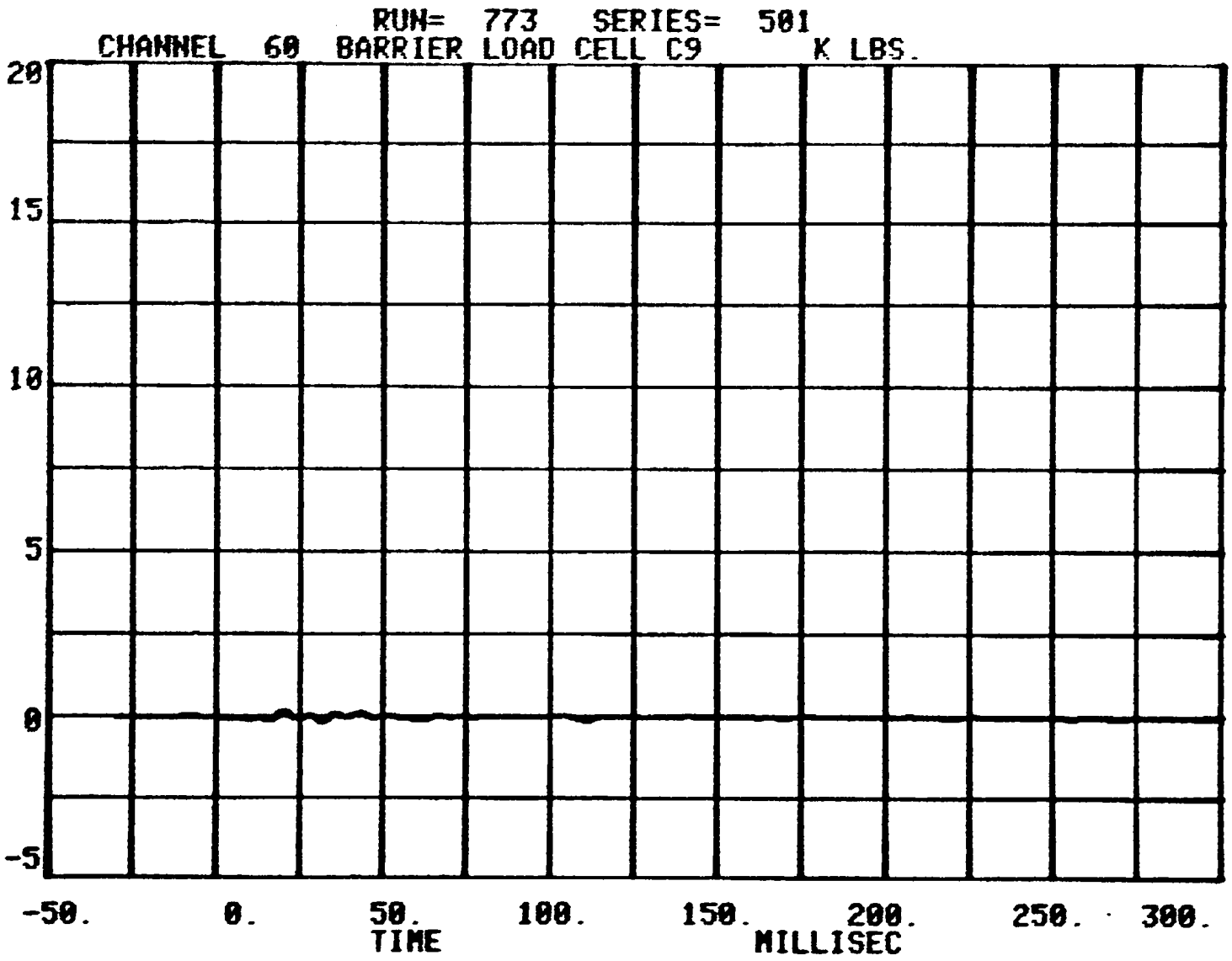
7556-11

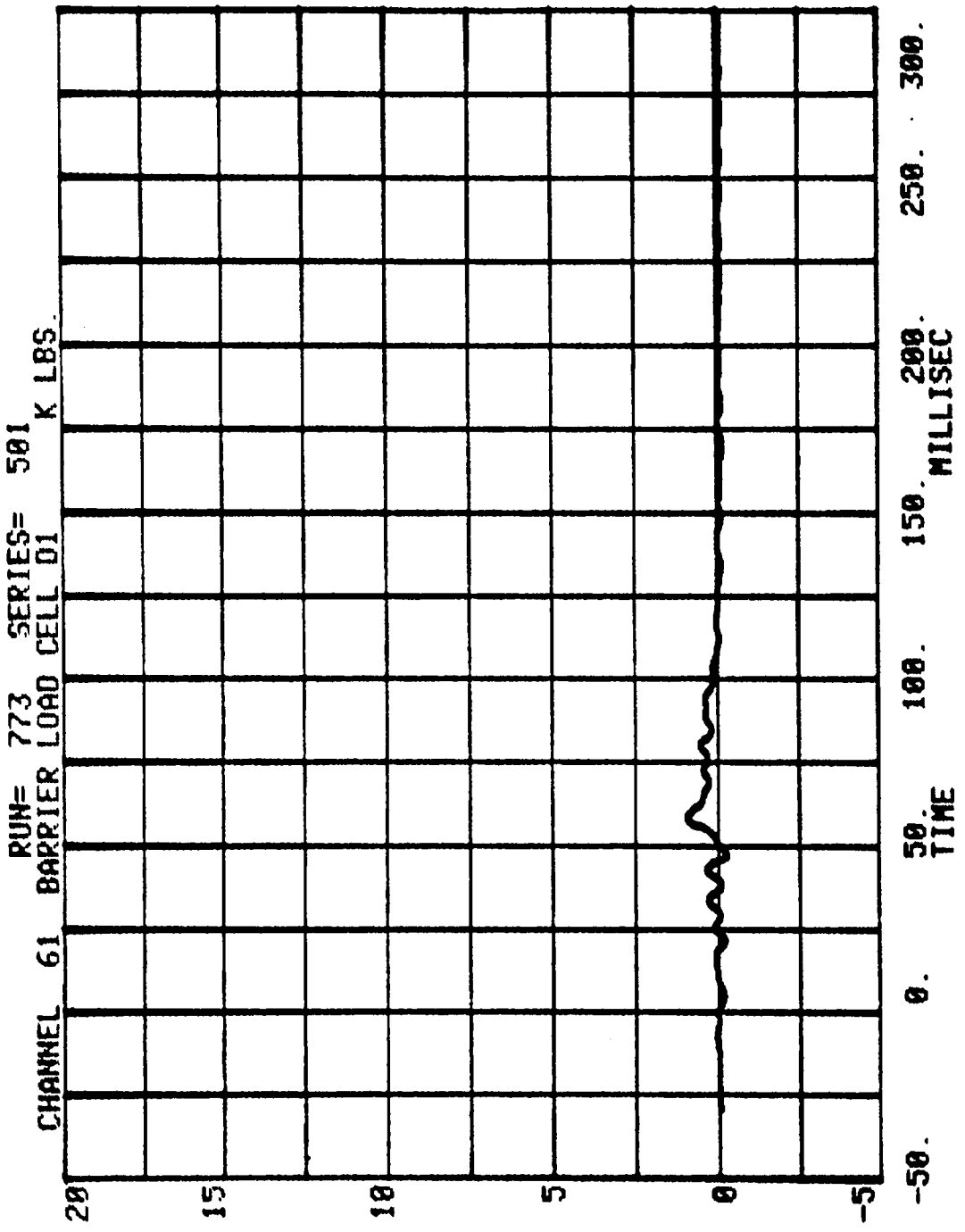

CHANNEL 58
RUN= 773 SERIES= 501
BARRIER LOAD CELL C7
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

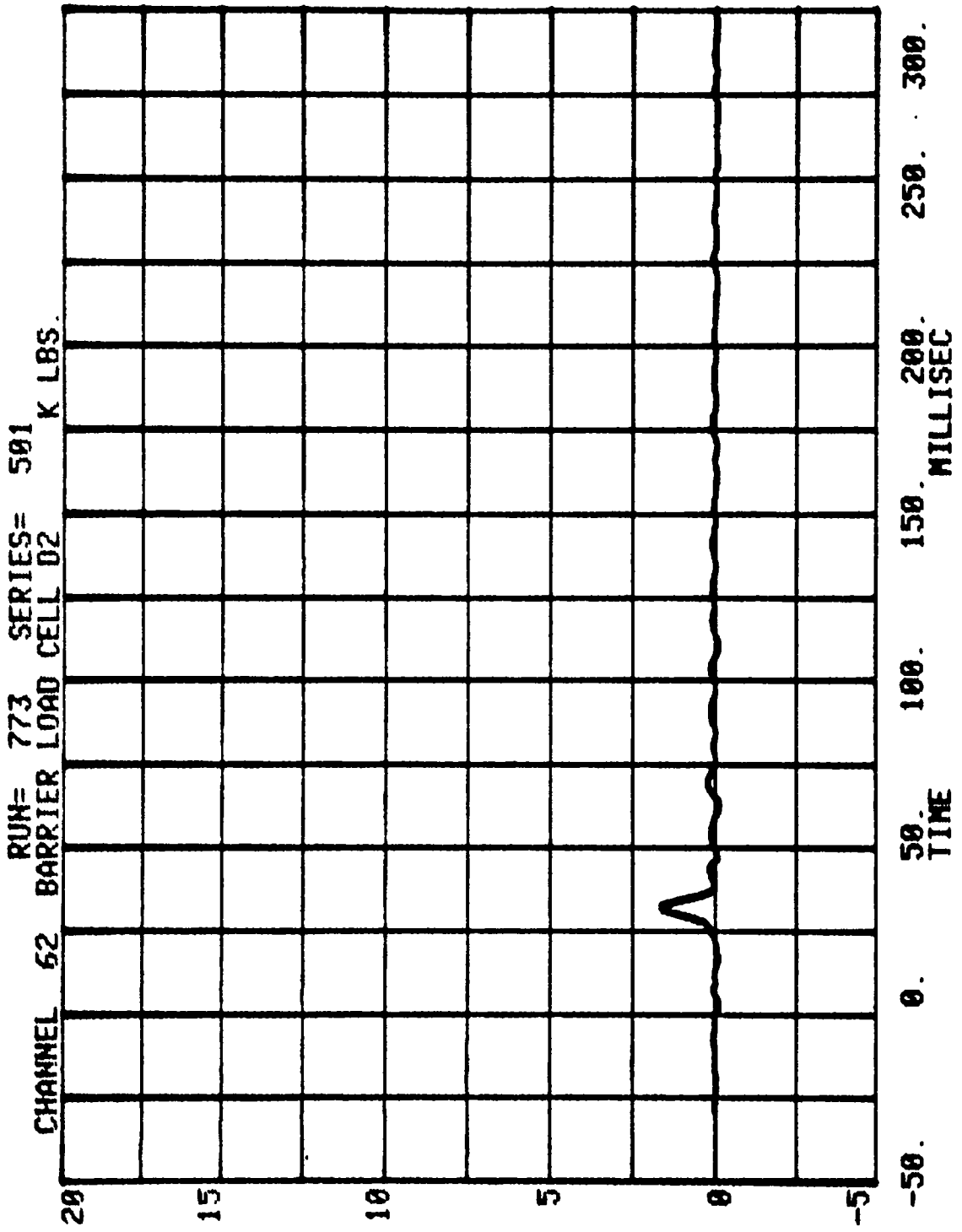
7556-11

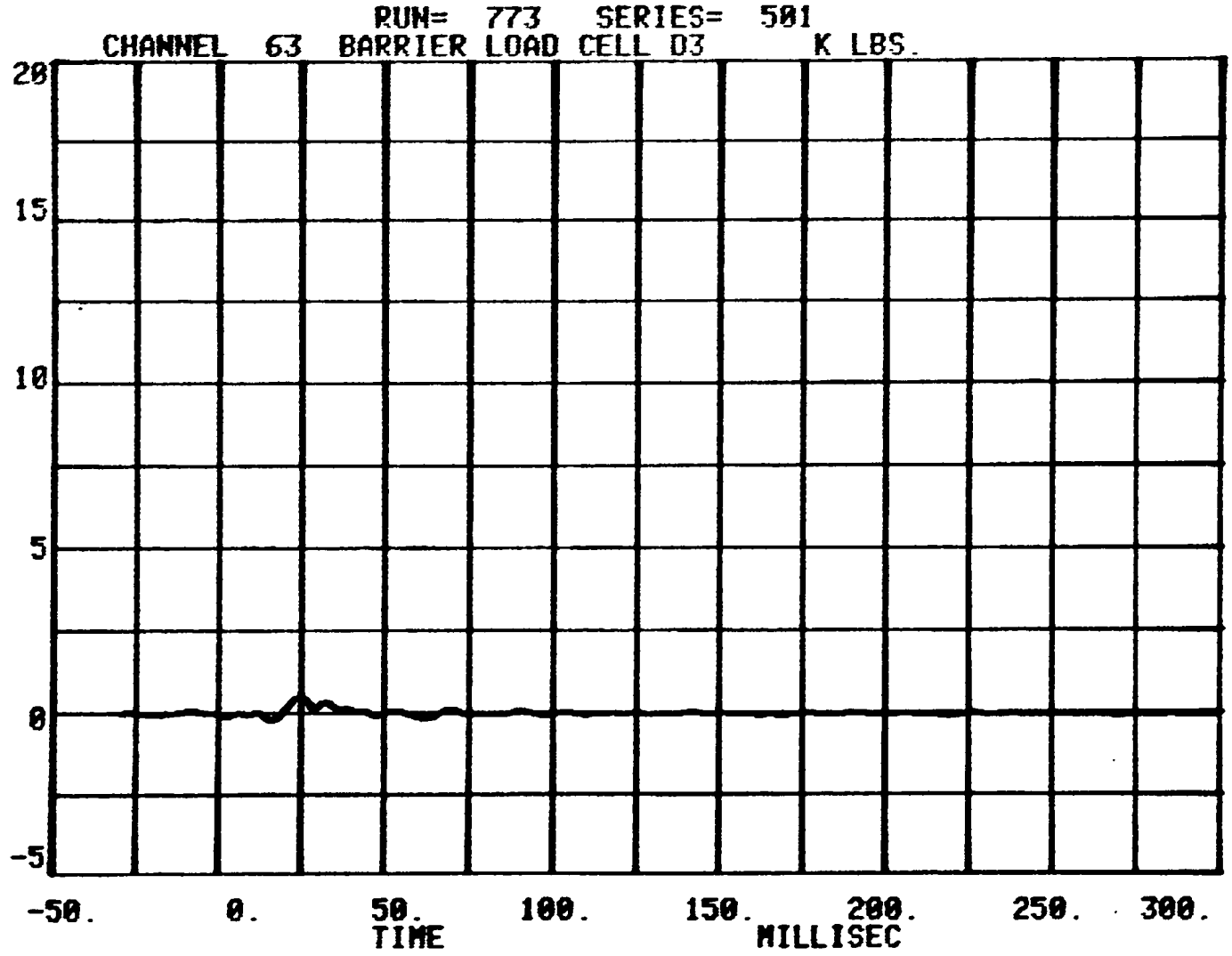

CHANNEL 59
RUN= 773
BARRIER LOAD CELL C8
SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

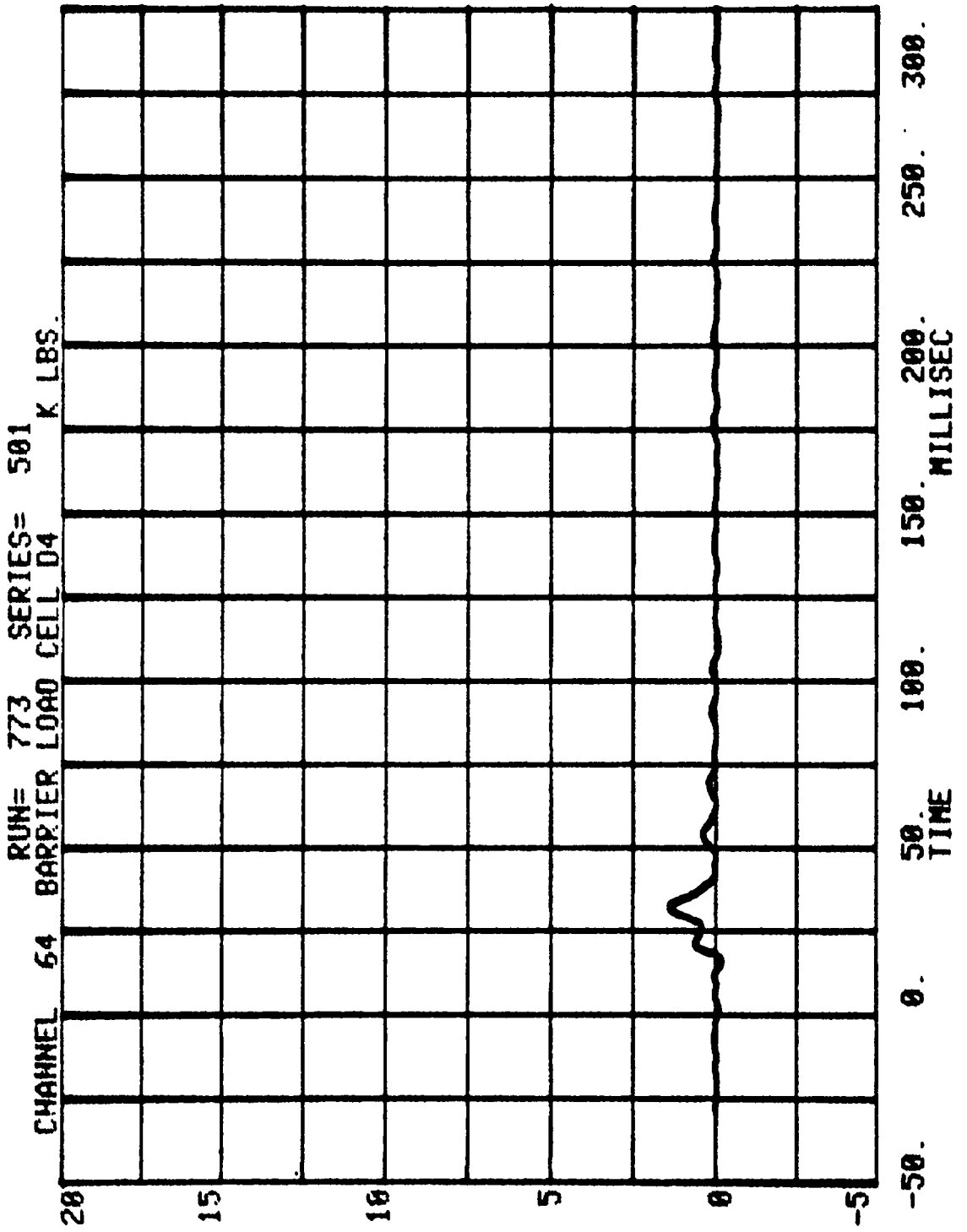
7556-11

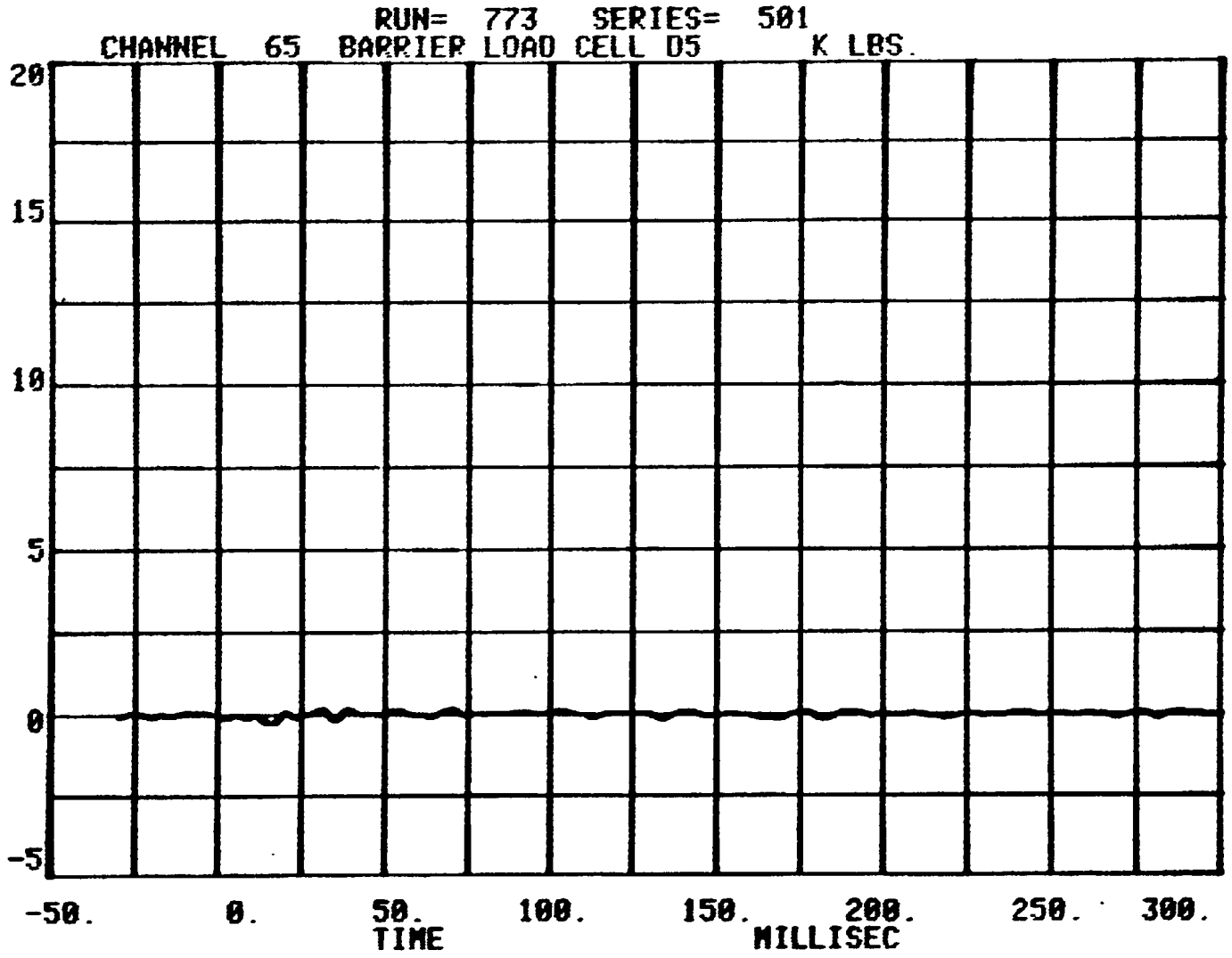

RUN= 773 SERIES= 501
CHANNEL 60 BARRIER LOAD CELL C9 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

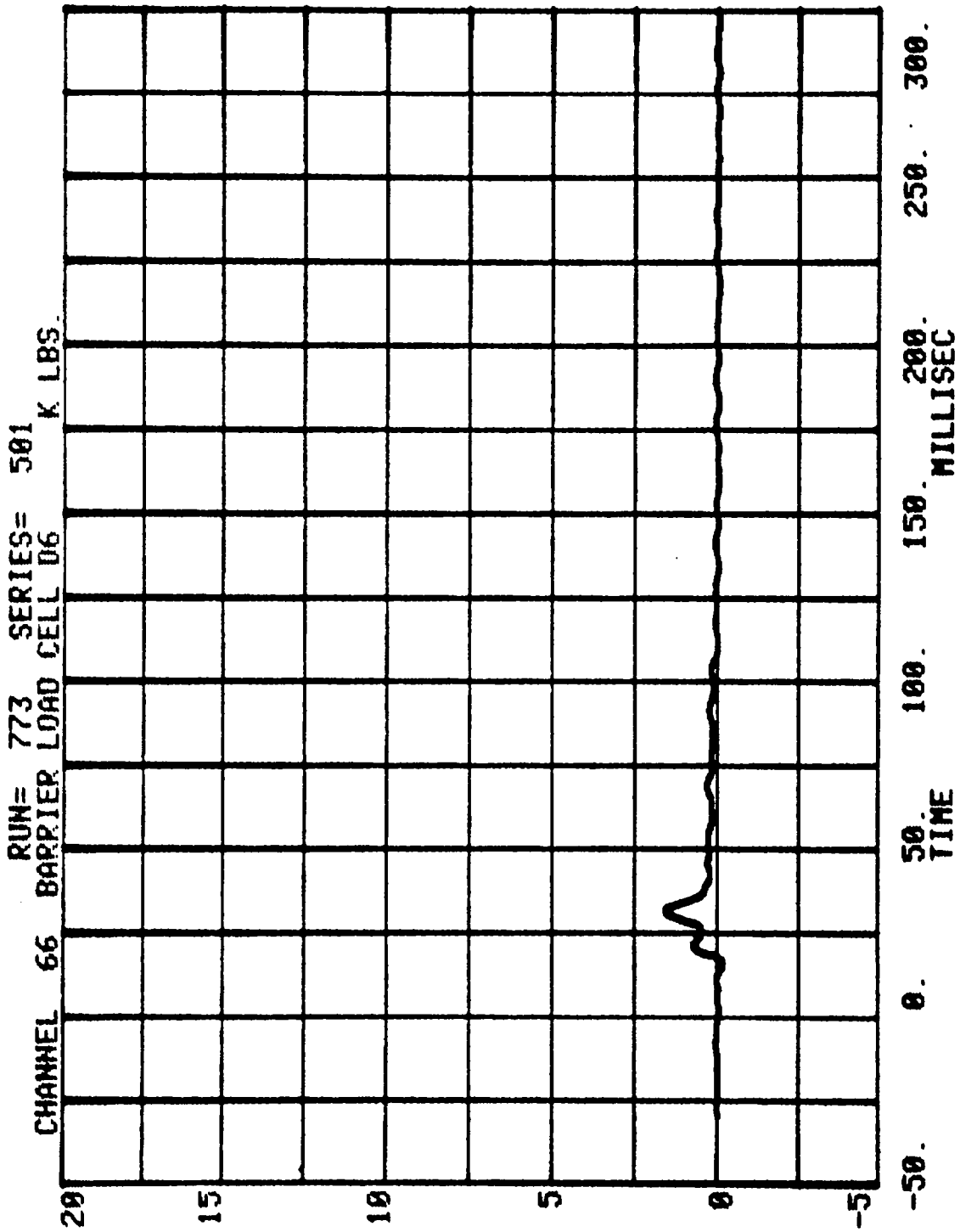

CHANNEL 61 BARRIER LOAD CELL 01
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

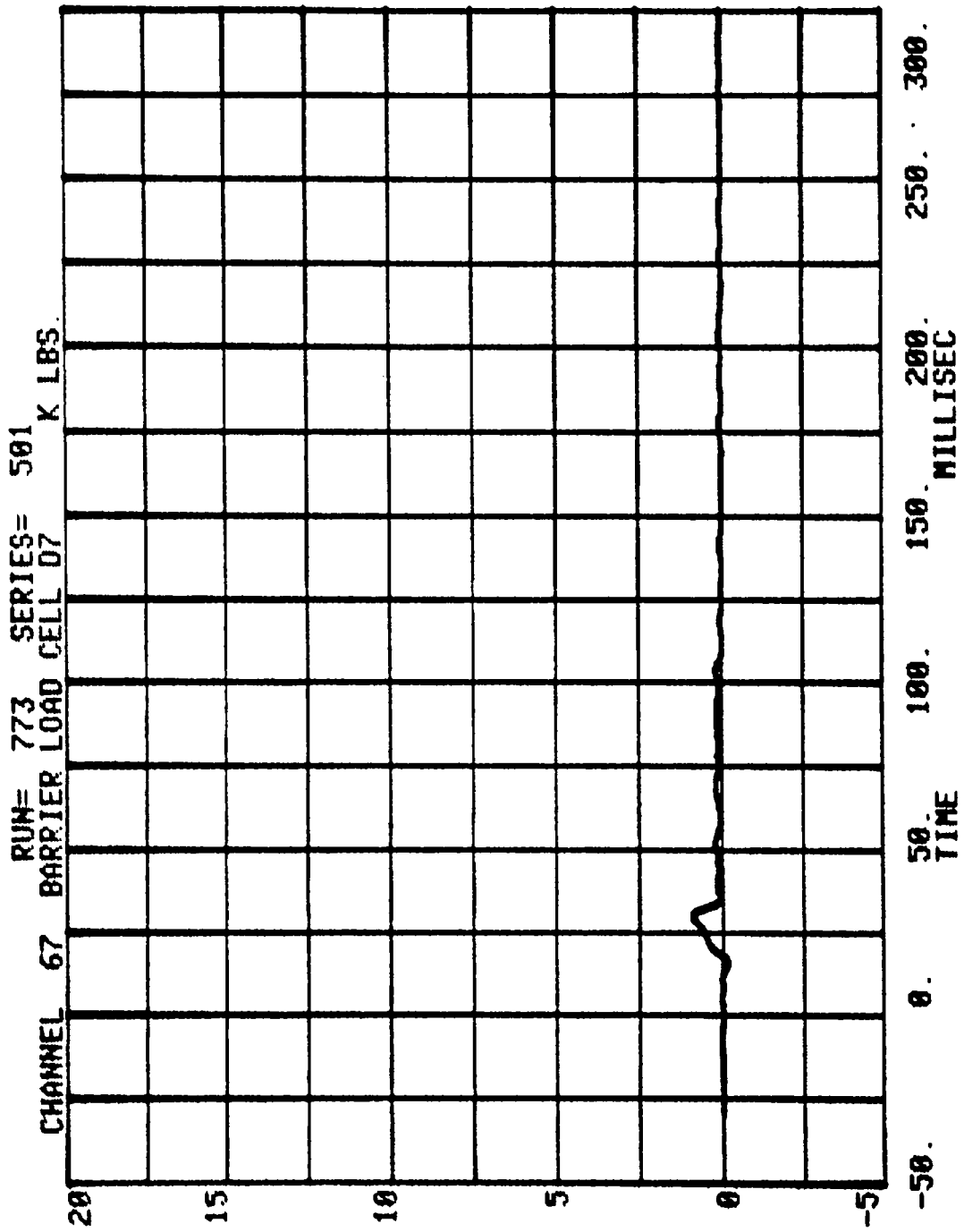

CHANNEL 62 BARRIER LOAD CELL 02
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 773 SERIES= 501
CHANNEL 63 BARRIER LOAD CELL D3 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

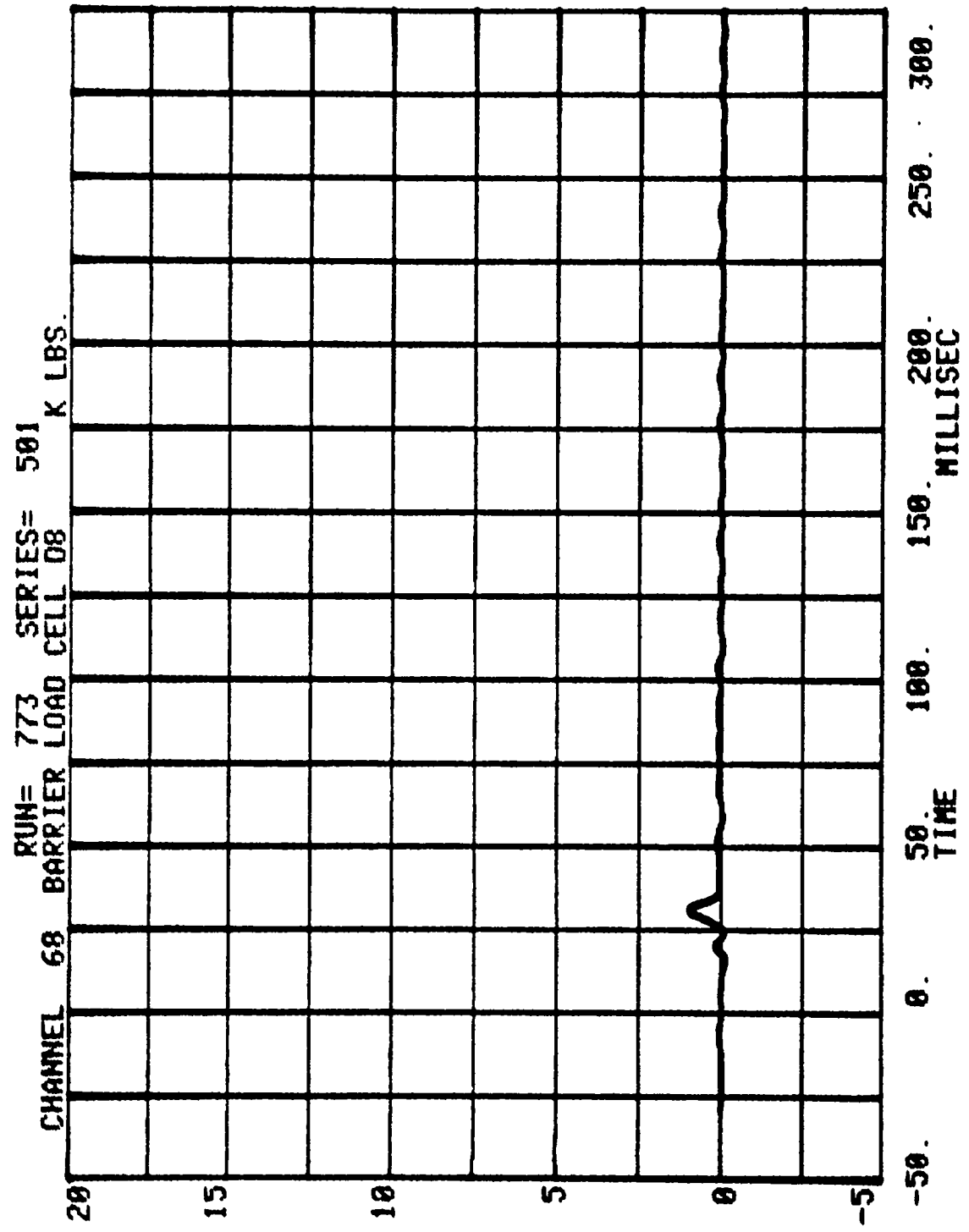

CHANNEL 64 RUN= 773 SERIES= 501
BARRIER LOAD CELL D4
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 773 SERIES= 501
CHANNEL 65 BARRIER LOAD CELL D5 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

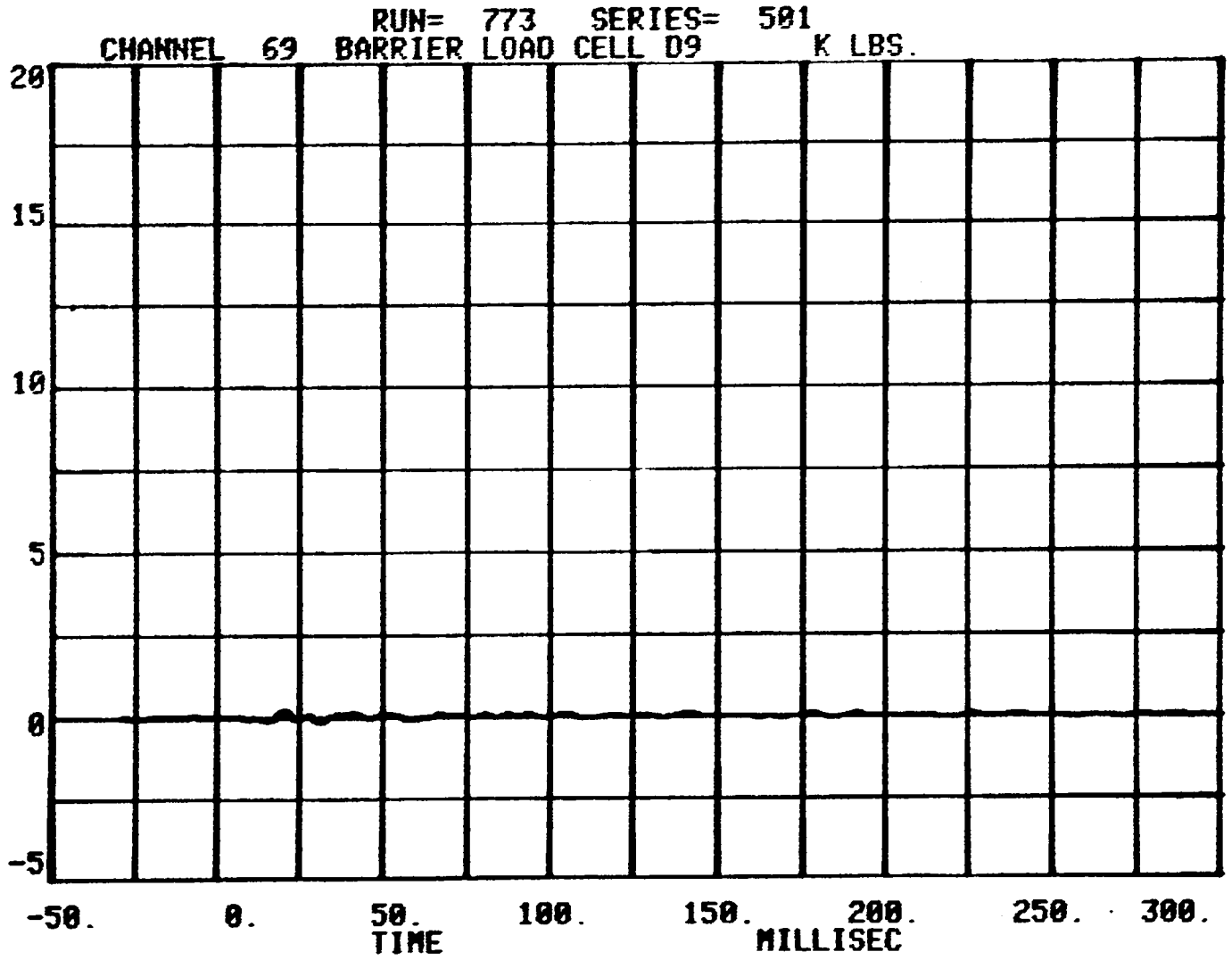

CHANNEL 66 BARRIER LOAD CELL 06
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 67
RUN= 773 SERIES= 501
BARRIER LOAD CELL 07
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11


CHANNEL 68 BARRIER LOAD CELL 08
RUN= 773 SERIES= 501
K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

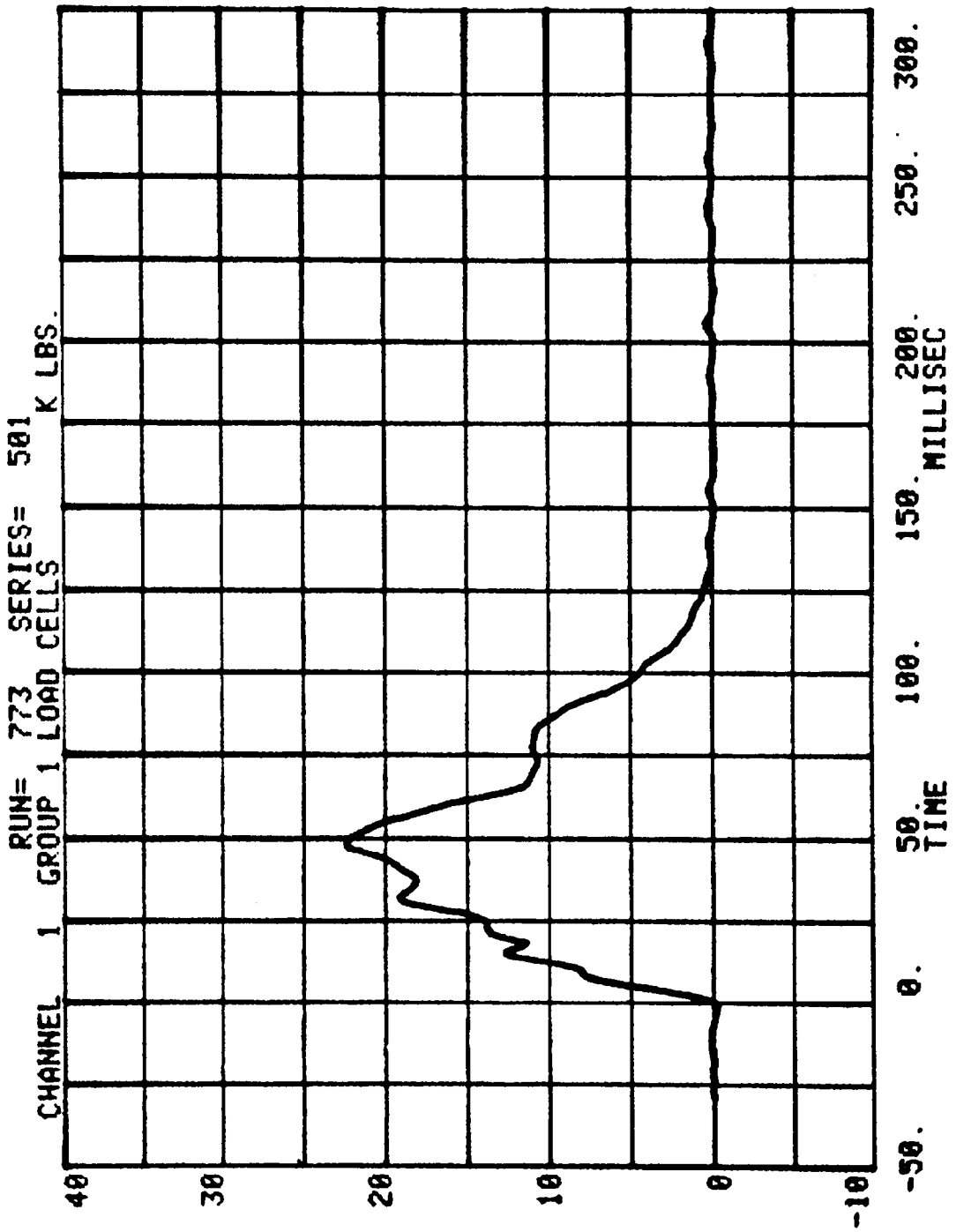
7556-11

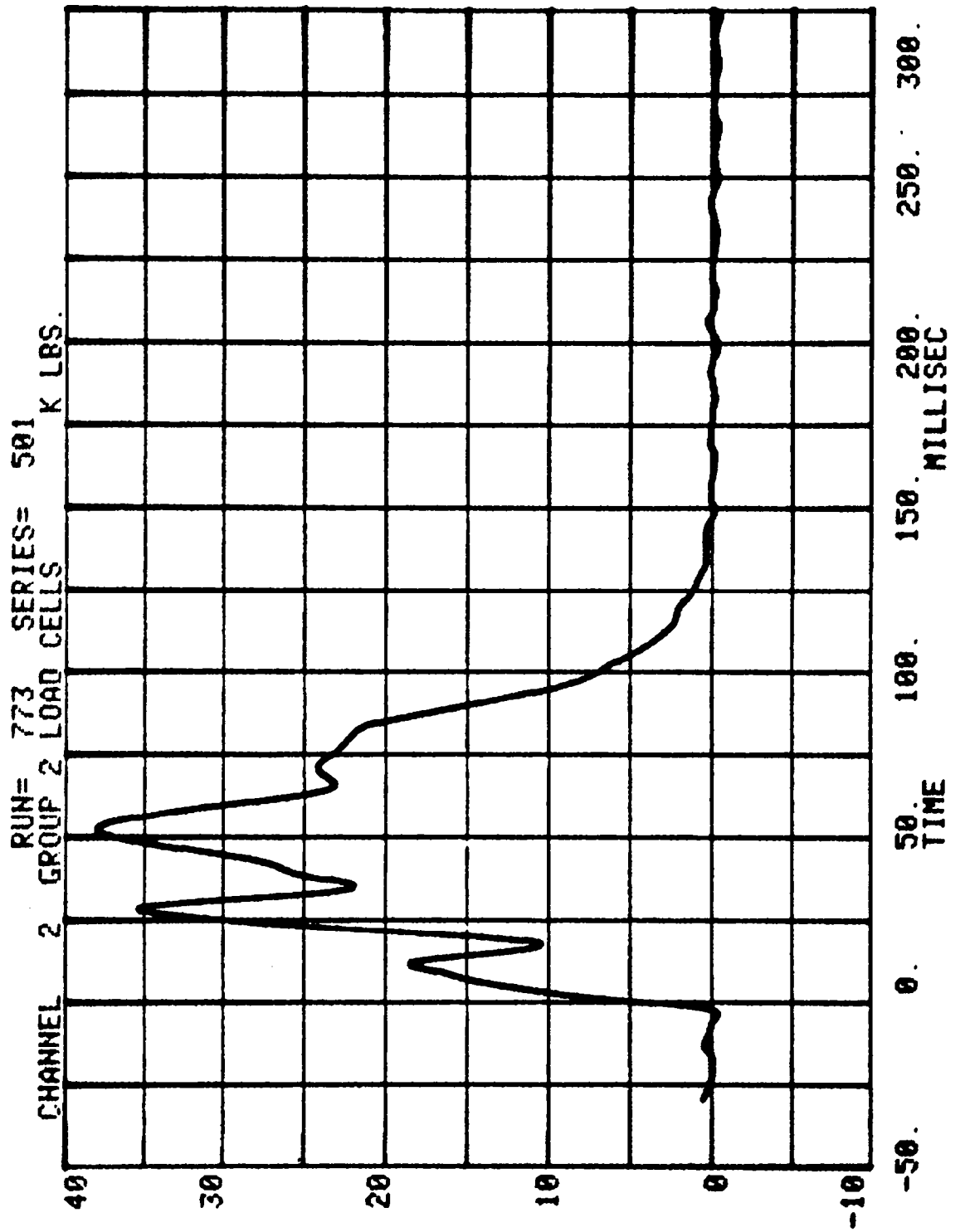

RUN= 773 SERIES= 501
CHANNEL 69 BARRIER LOAD CELL D9 K LBS.
20
15
10
5
0
-5
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

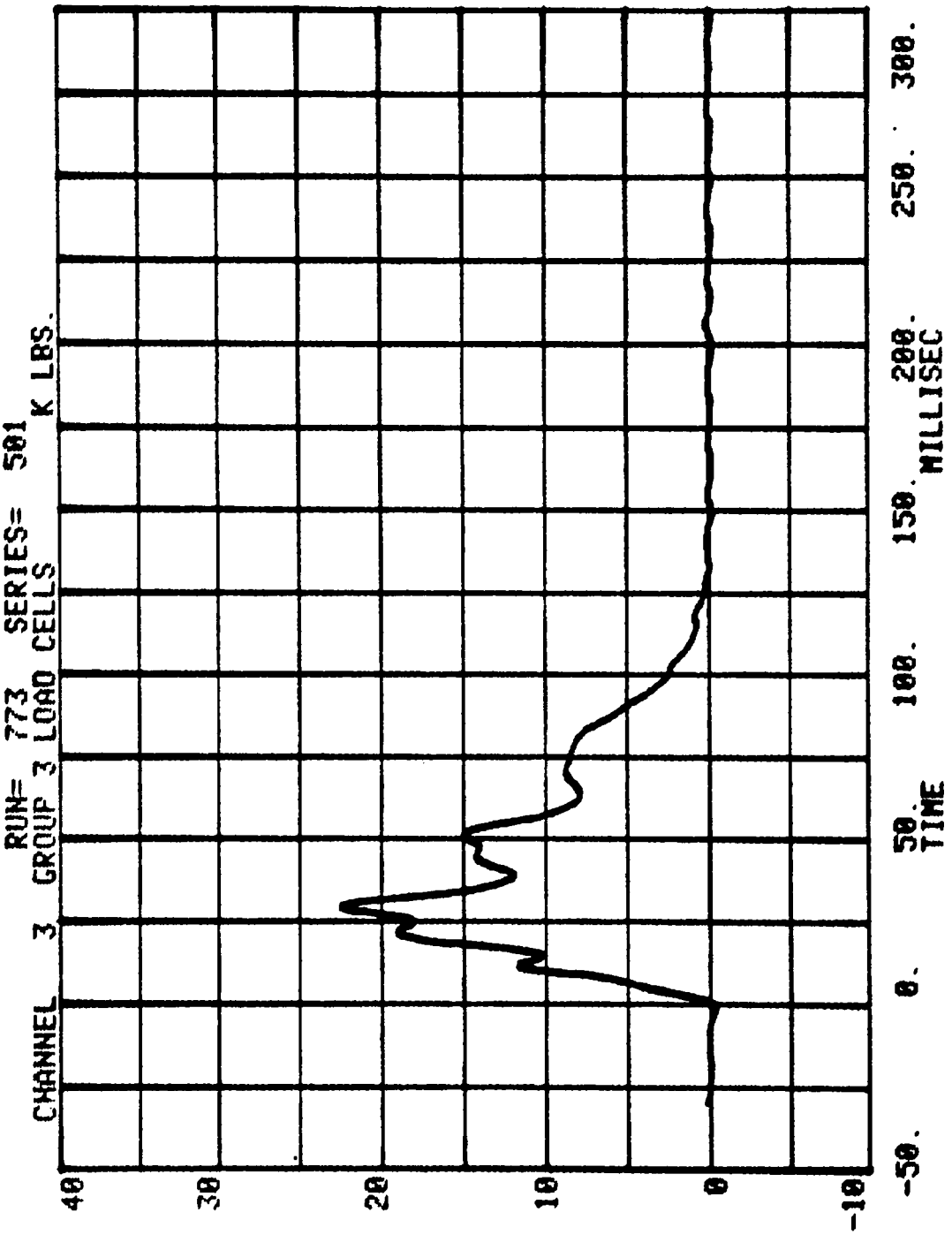
NEW CAR ASSESSMENT BARRIER TESTS - 1987

RUN # 773 SERIES # 501

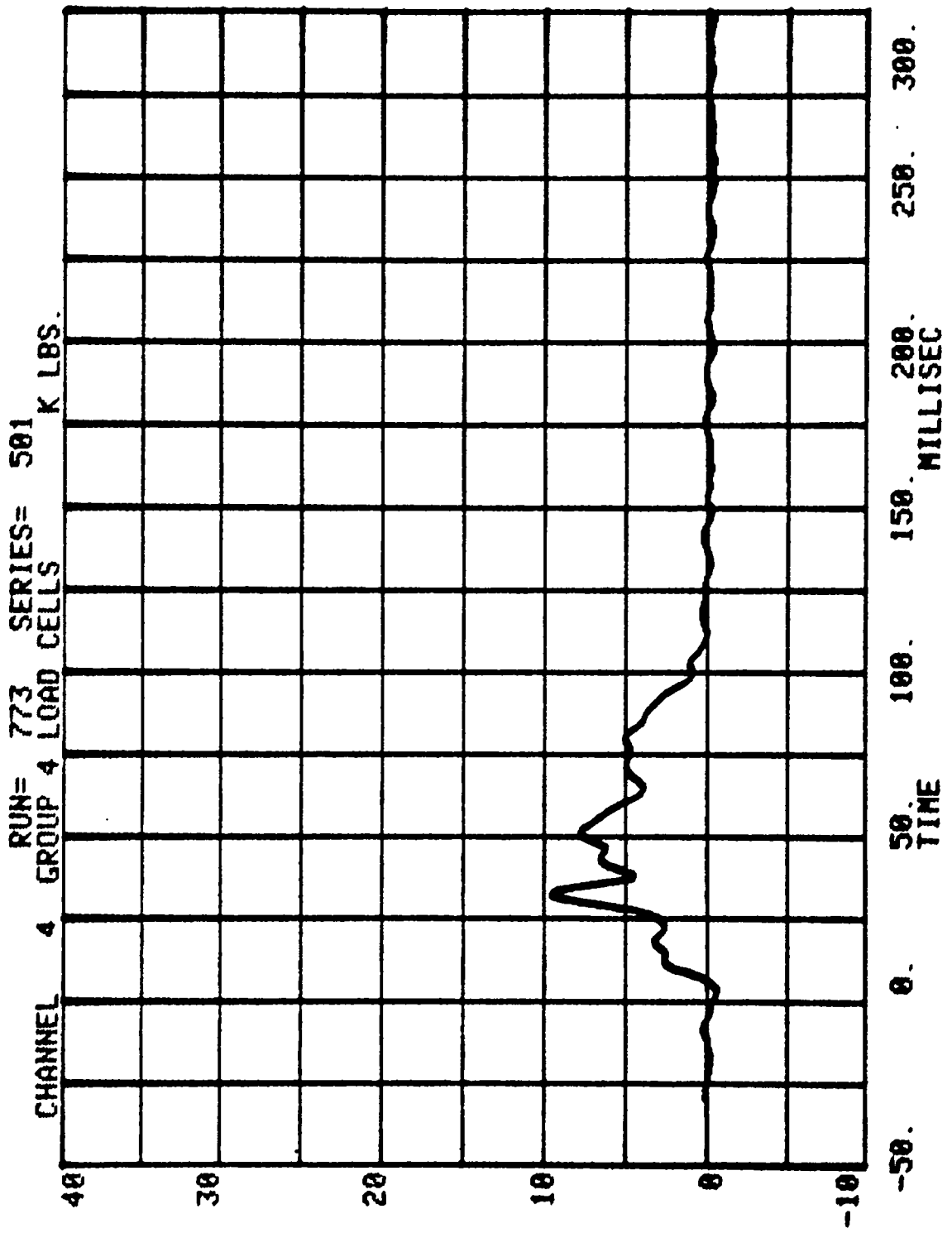
CHAN	TITLE	MINIMUM	MAXIMUM
1	GROUP 1 LOAD CELLS	-.233	22.489 K LBS.
2	GROUP 2 LOAD CELLS	-.352	38.164 K LBS.
3	GROUP 3 LOAD CELLS	-.380	22.503 K LBS.
4	GROUP 4 LOAD CELLS	-.592	9.584 K LBS.
5	GROUP 5 LOAD CELLS	-.599	19.882 K LBS.
6	GROUP 6 LOAD CELLS	-.369	21.272 K LBS.
7	TOTAL LOAD CELL SUM	-1.266	121.560 K LBS.


CHANNEL 1 GROUP 1 LOAD CELLS
RUN= 773 SERIES= 501
K LBS.
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

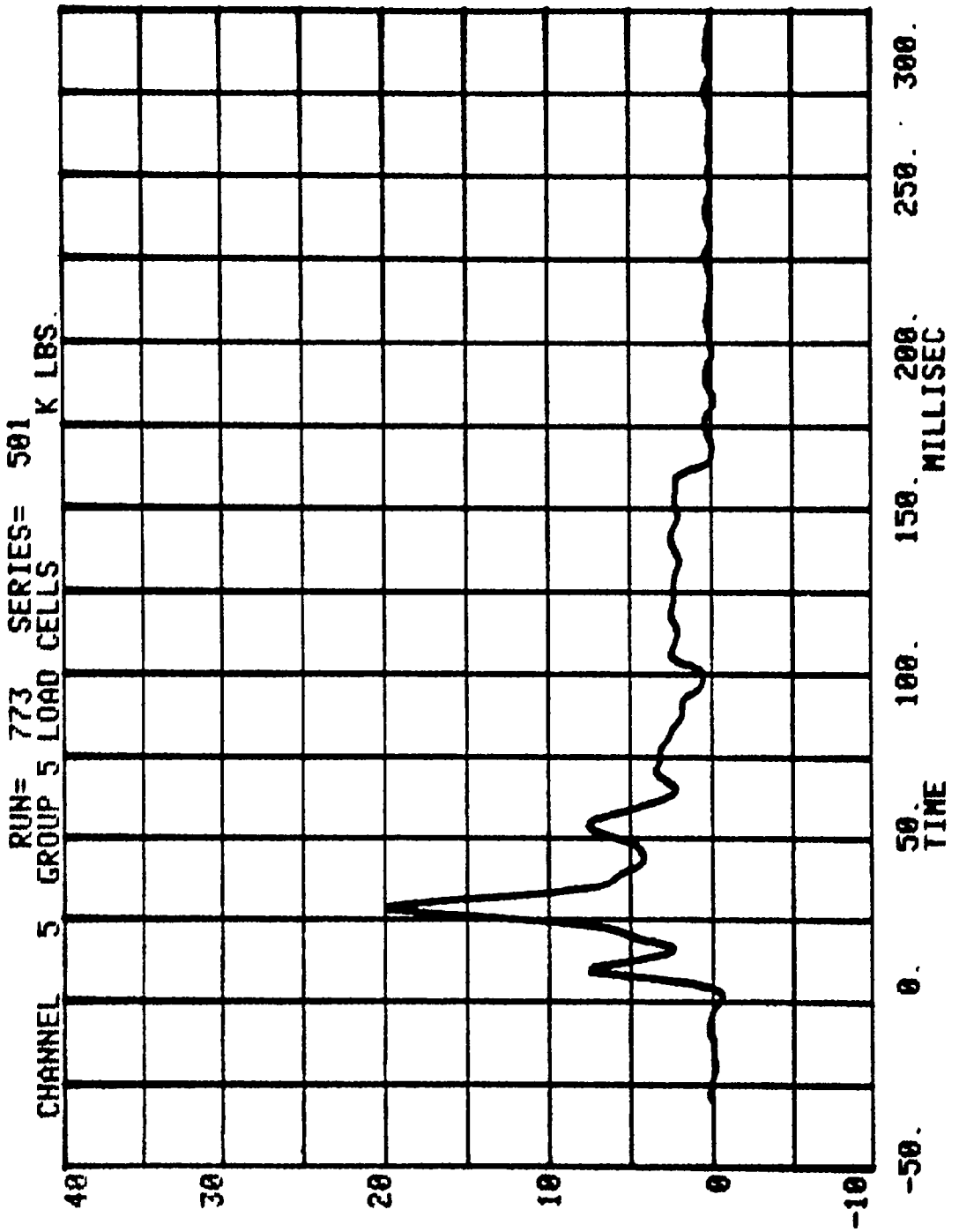

CHANNEL 2
GROUP 2 LOAD CELLS
RUN= 773 SERIES= 501
K LBS.
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 3 GROUP 3 LOAD CELLS
RUN= 773 SERIES= 501
K LBS.
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

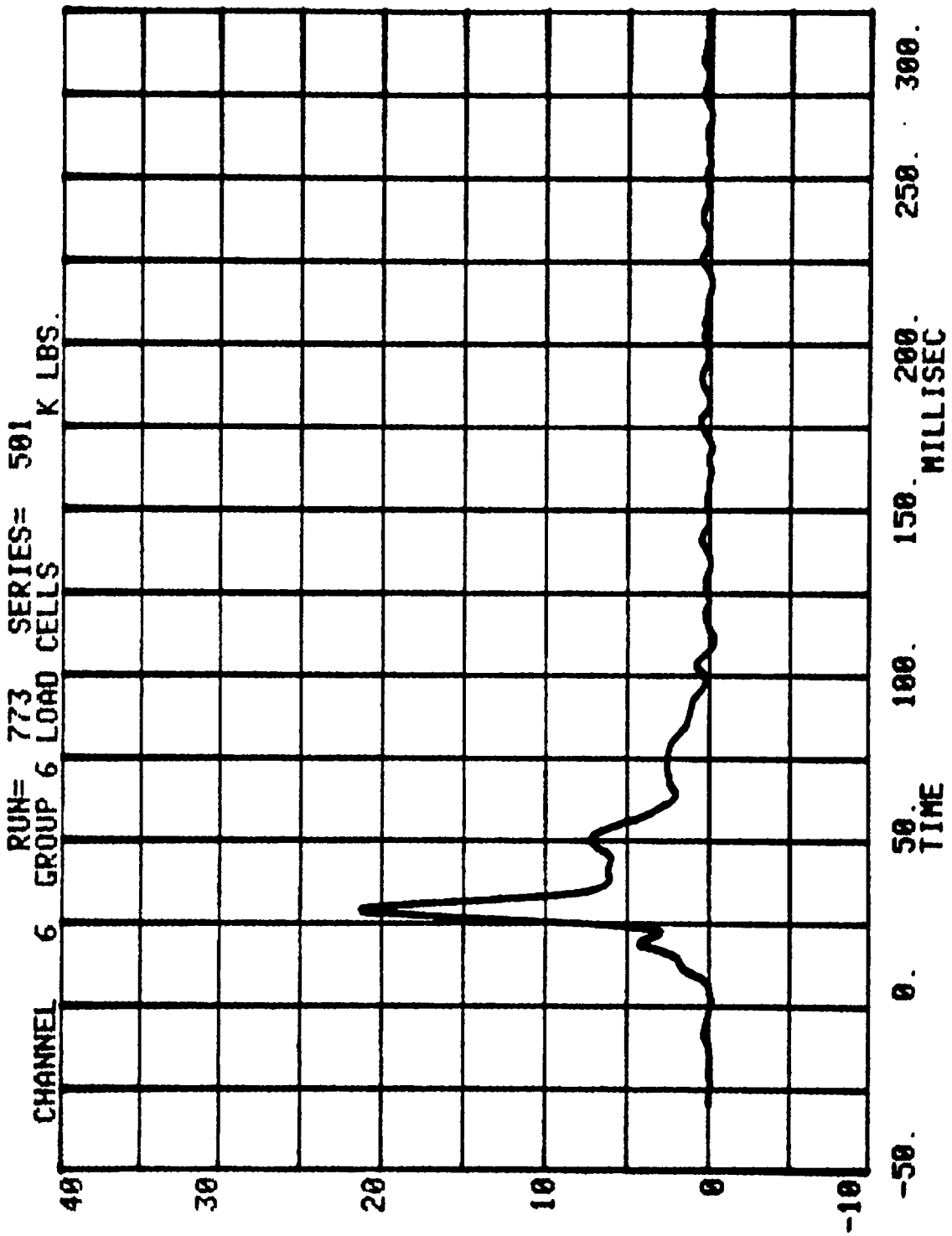
7556-11

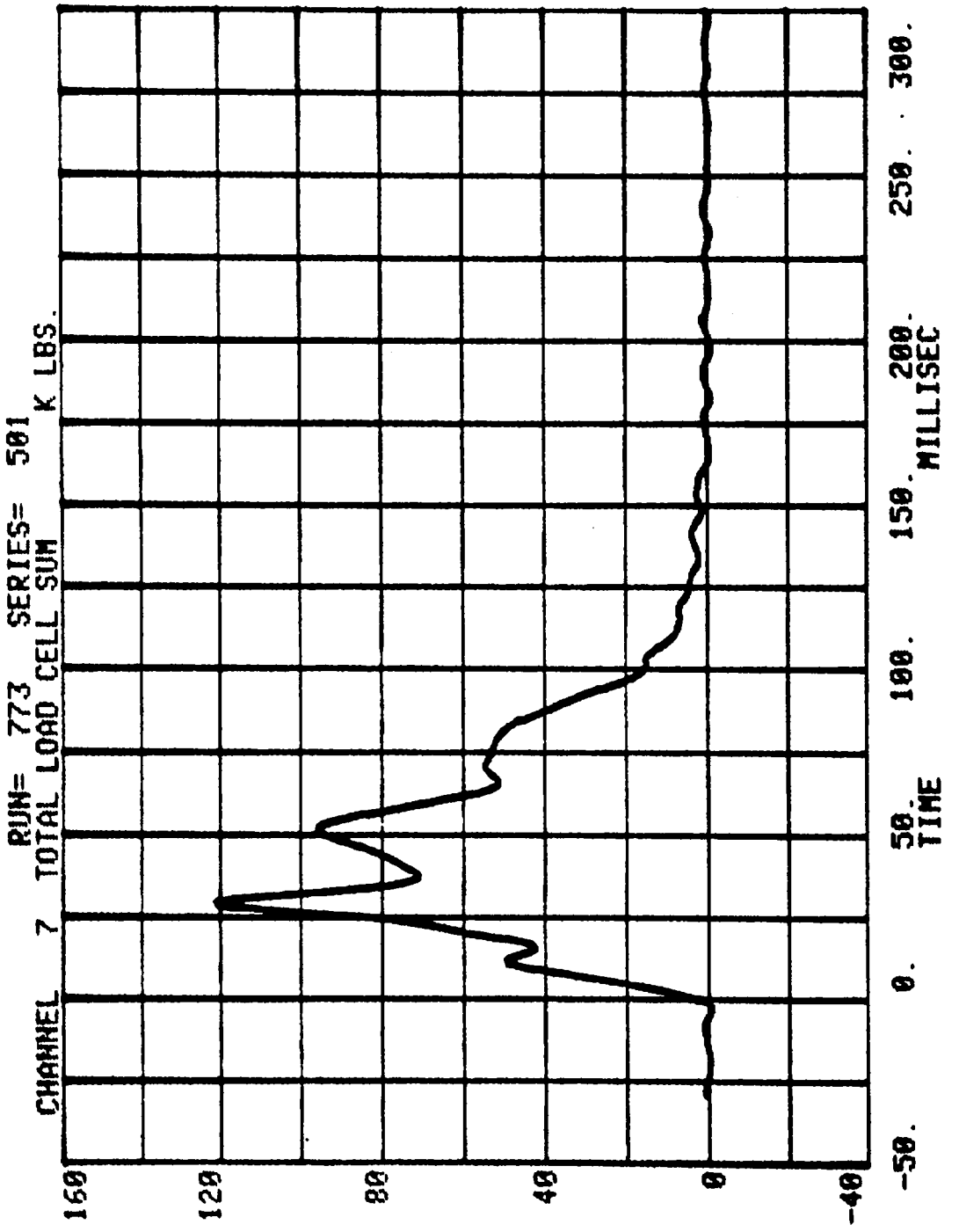

CHANNEL 4 GROUP 4 LOAD CELLS
RUN= 773 SERIES= 501
K LBS.
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11


CHANNEL 5 GROUP 5 LOAD CELLS
RUN= 773 SERIES= 501
K LBS.
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11


CHANNEL 6 GROUP 6 LOAD CELLS
RUN= 773 SERIES= 501
K LBS.
40
30
20
10
0
-10
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 7 TOTAL LOAD CELL SUM
RUN= 773 SERIES= 501
K LBS.
160
120
80
40
0
-40
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

TEST NO. MH0501

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1987

RUN= 773

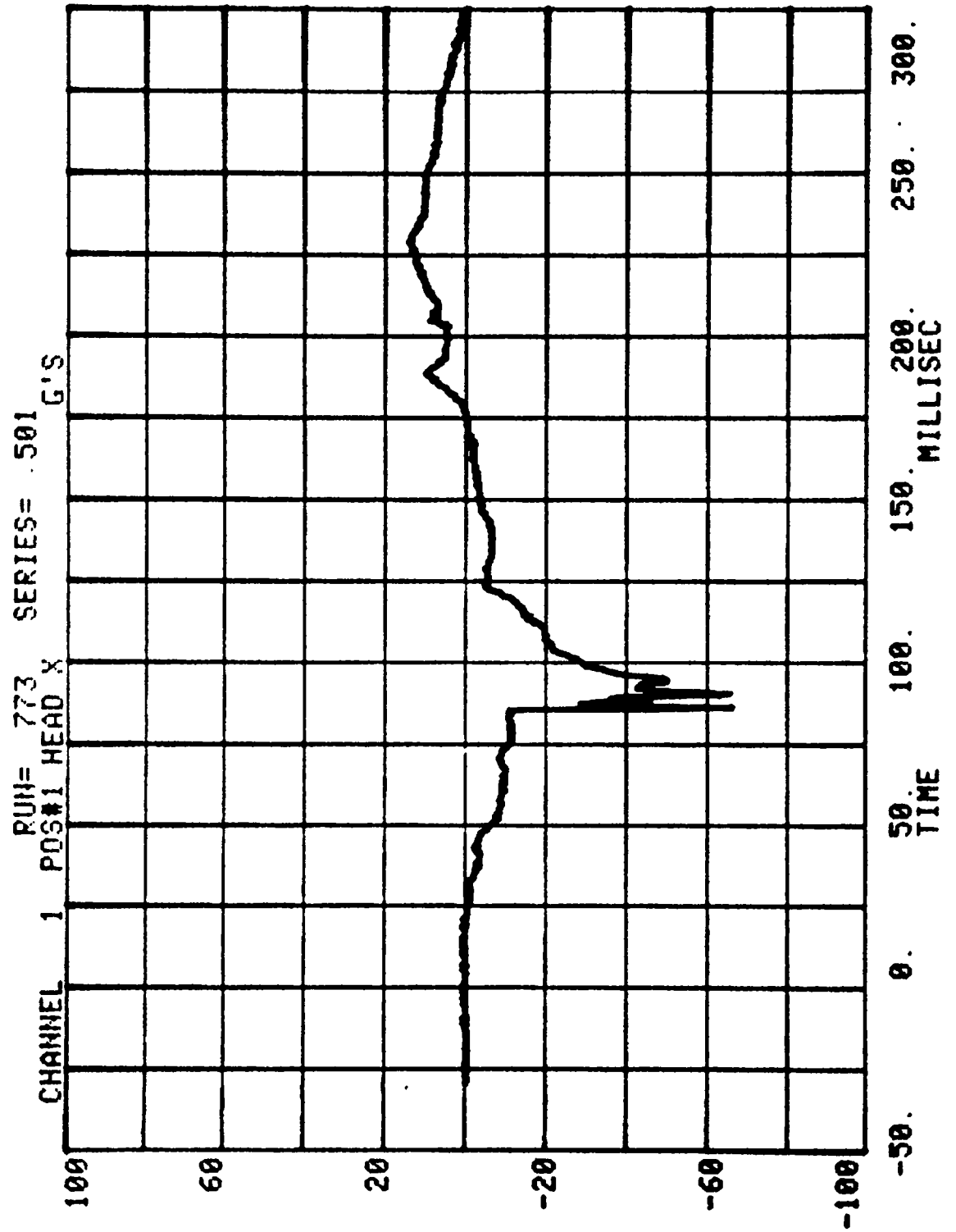
POS#1 HEAD R

HIC= 584.1 FROM T1= .07822 TO T2= .10267

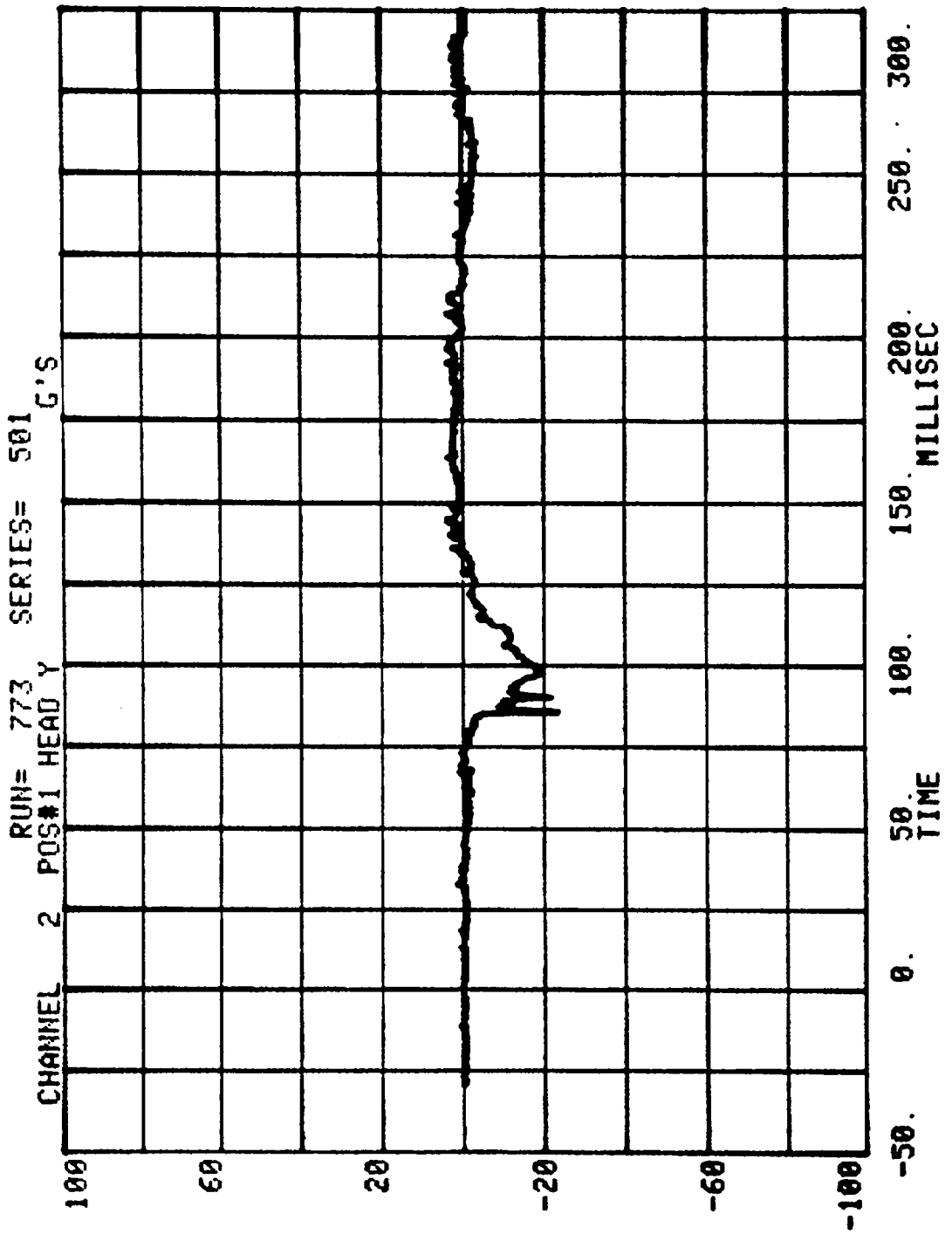
AVERAGE ACCELERATION BETWEEN T1 AND T2= 56.4G'S

EVENT TIME= 300.0 MSEC

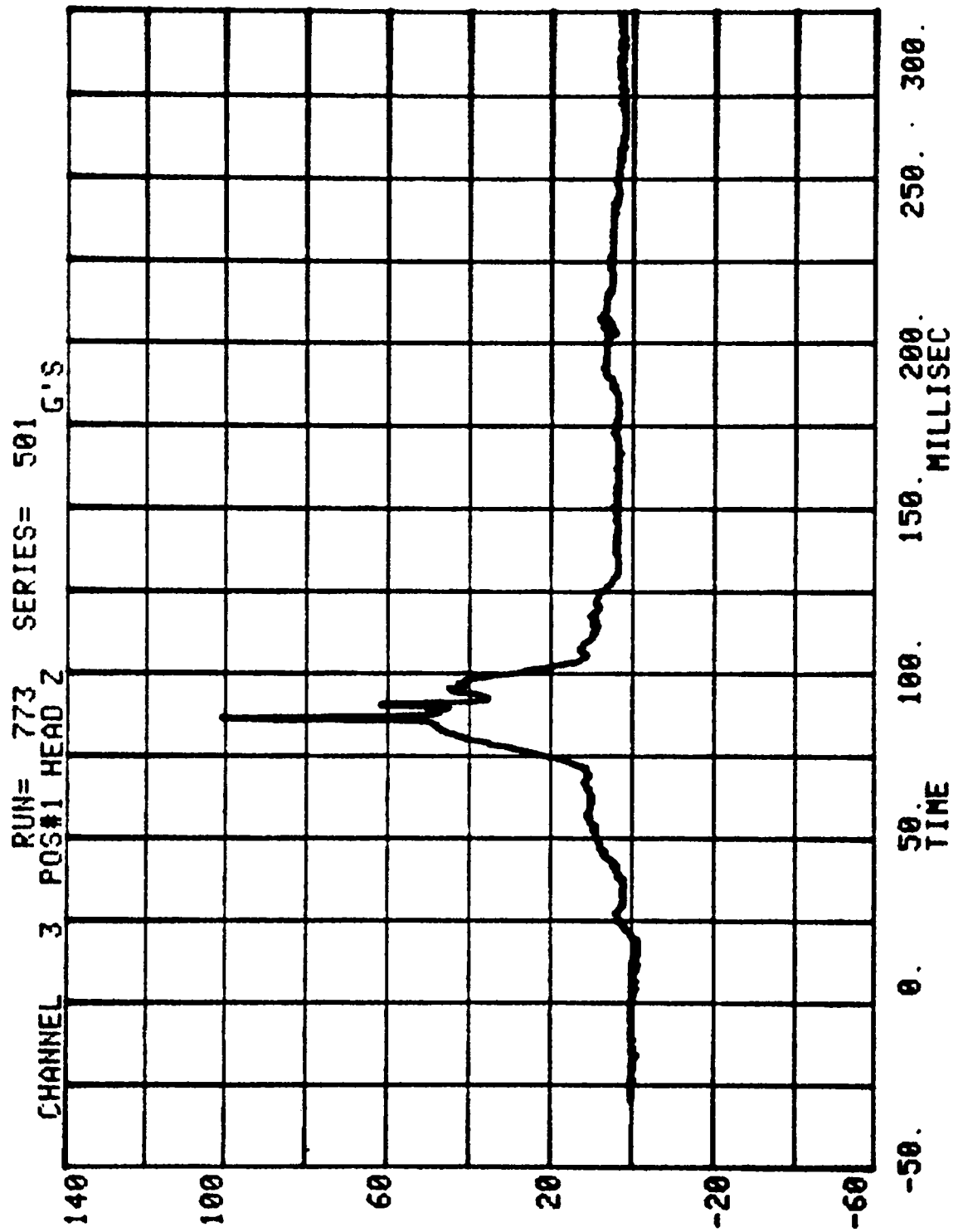
SEVERITY INDEX= 805.0


CHANNEL 1 POS#1 HEAD X
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

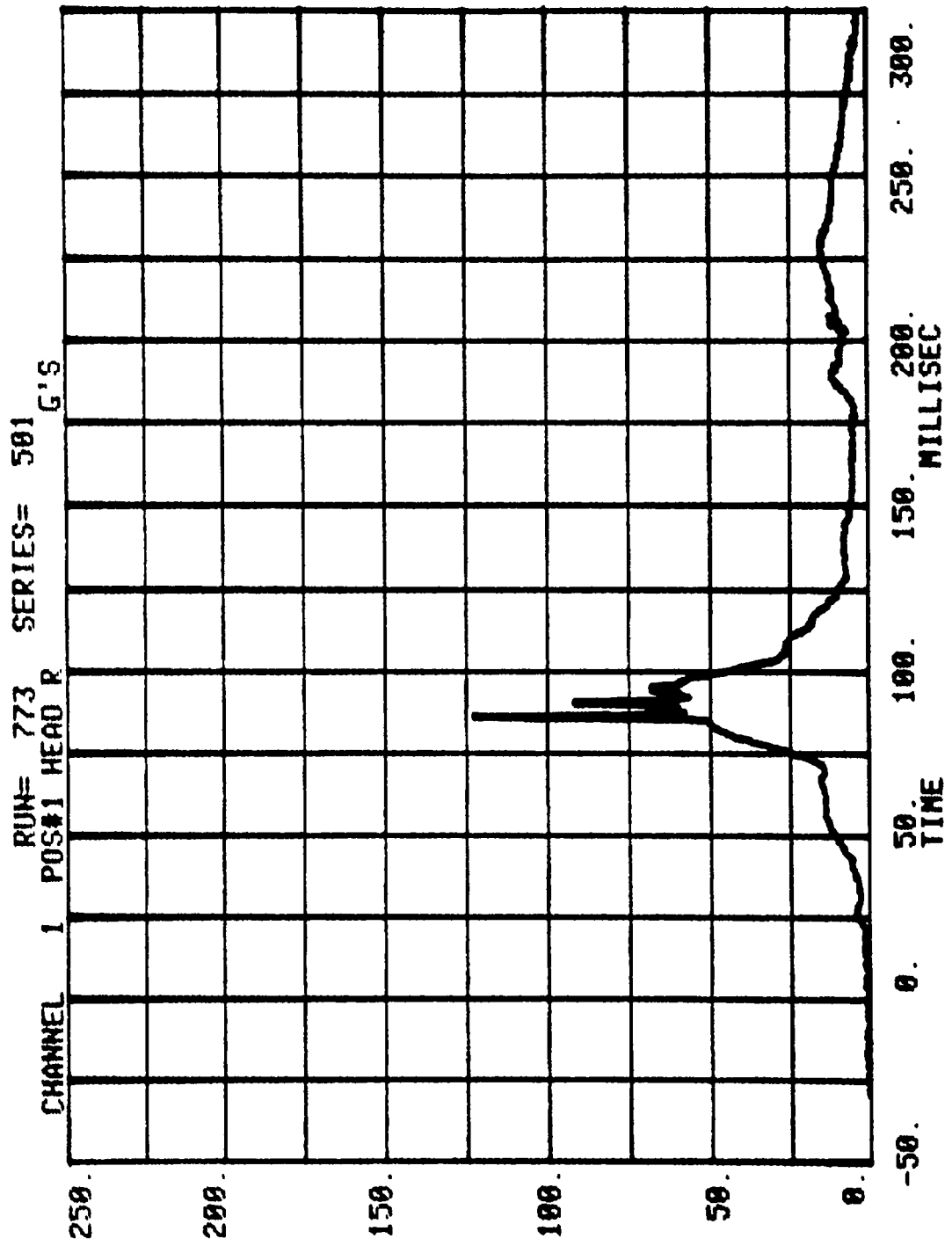
7556-11


CHANNEL 2 POS#1 HEAD Y
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

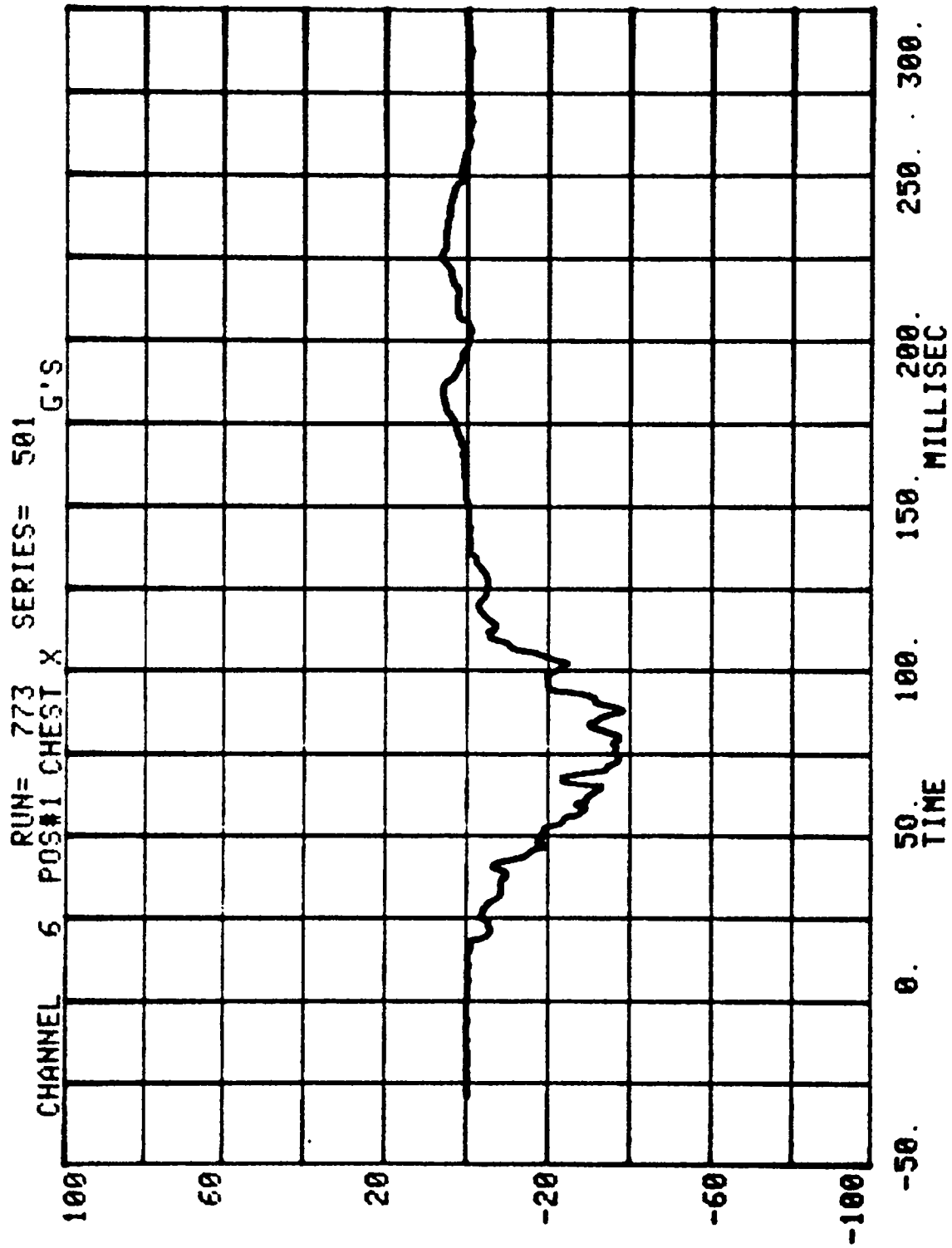
7556-11

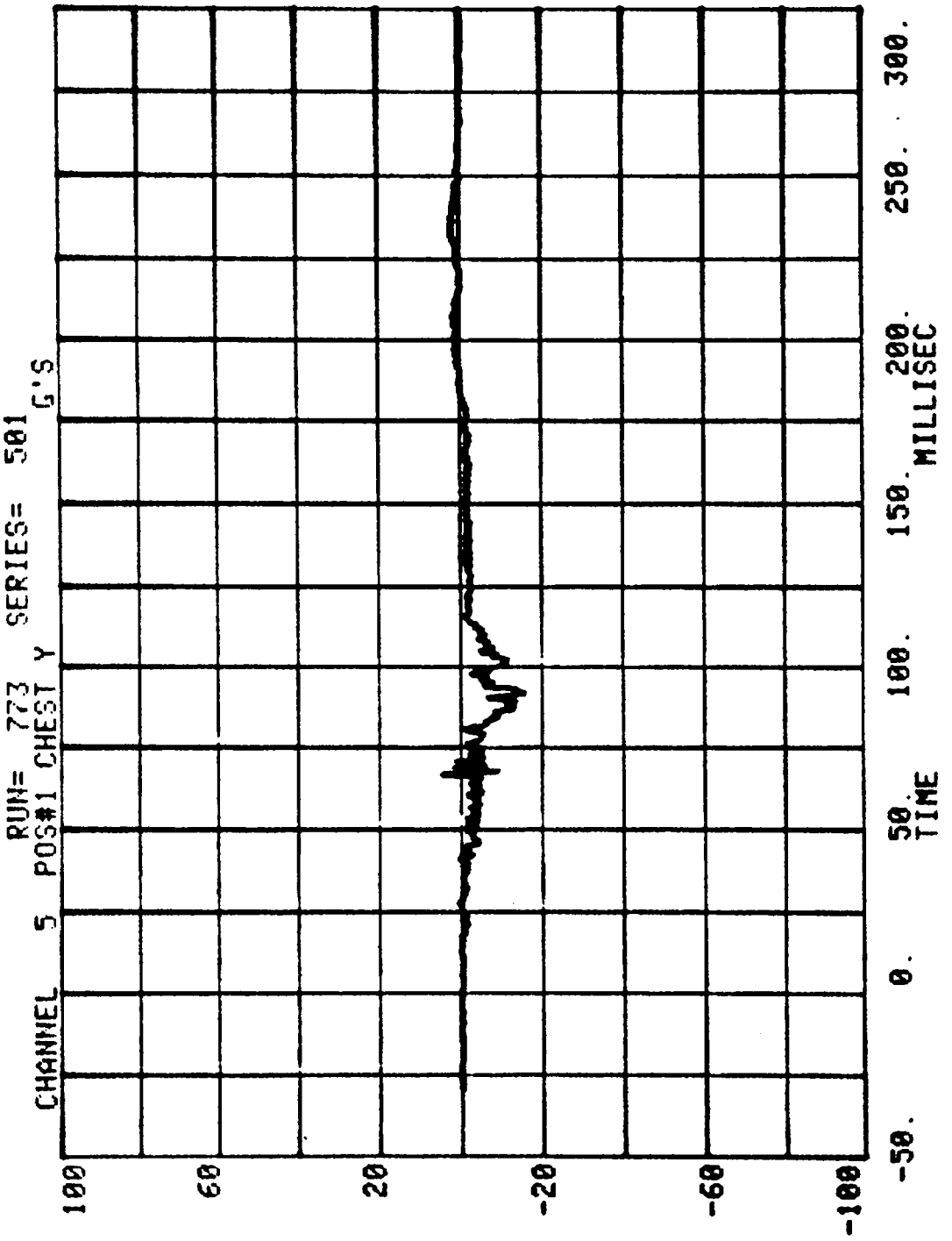

CHANNEL 3 POS#1 HEAD 2
RUN= 773 SERIES= 501
G'S
140
100
60
20
-20
-60
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

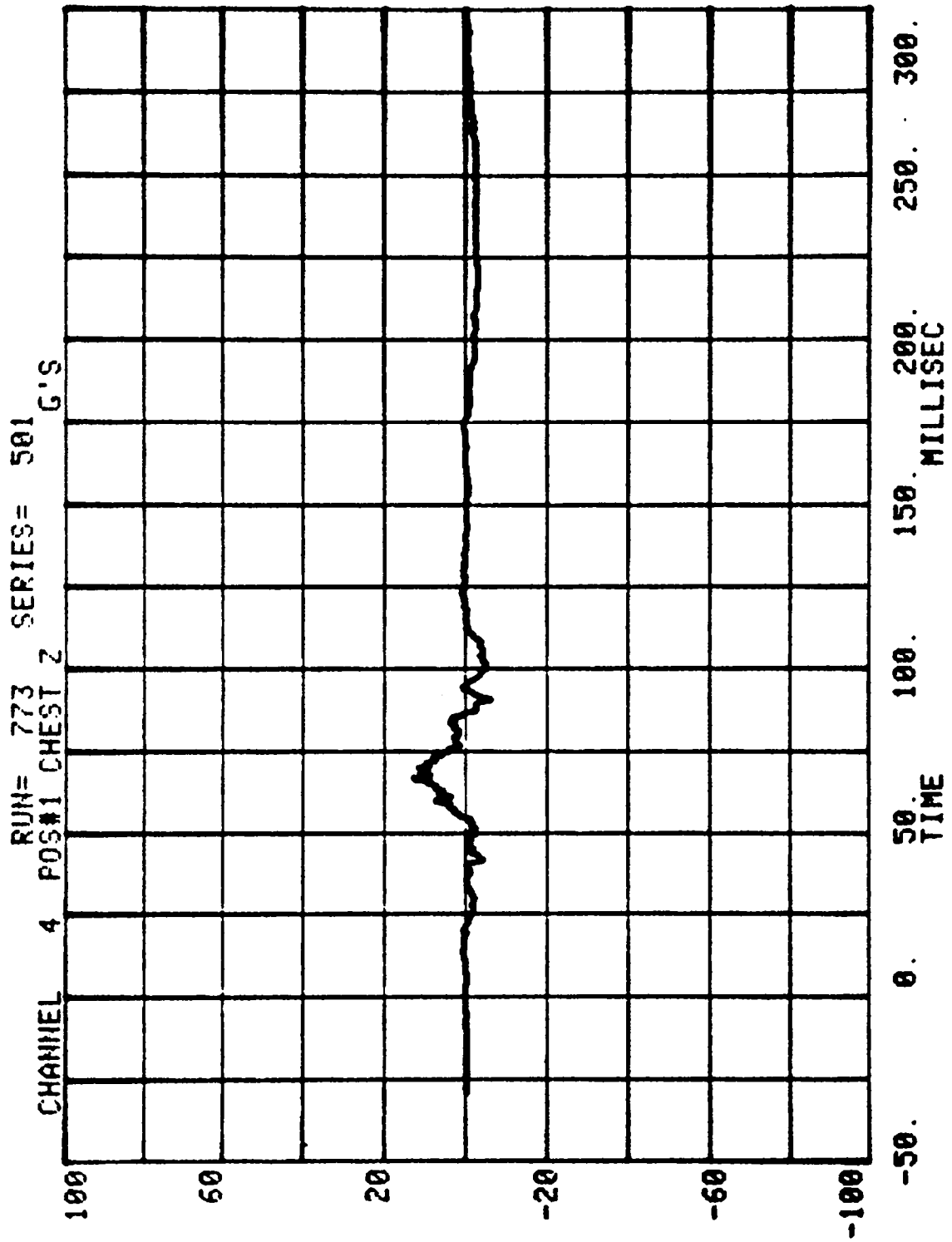
7556-11

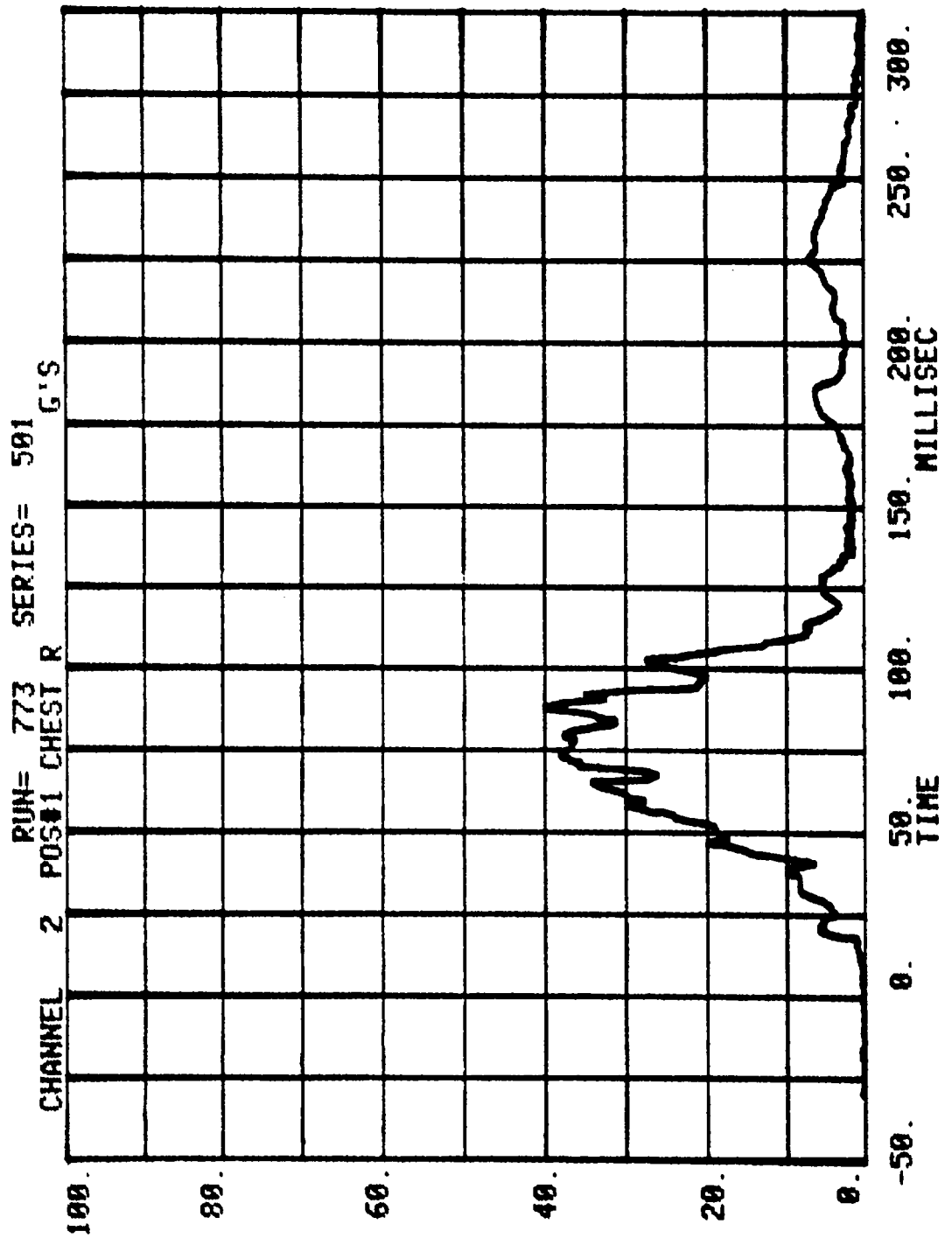

CHANNEL 1 POS#1 HEAD R
RUN= 773 SERIES= 501
G'S
250.
200.
150.
100.
50.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

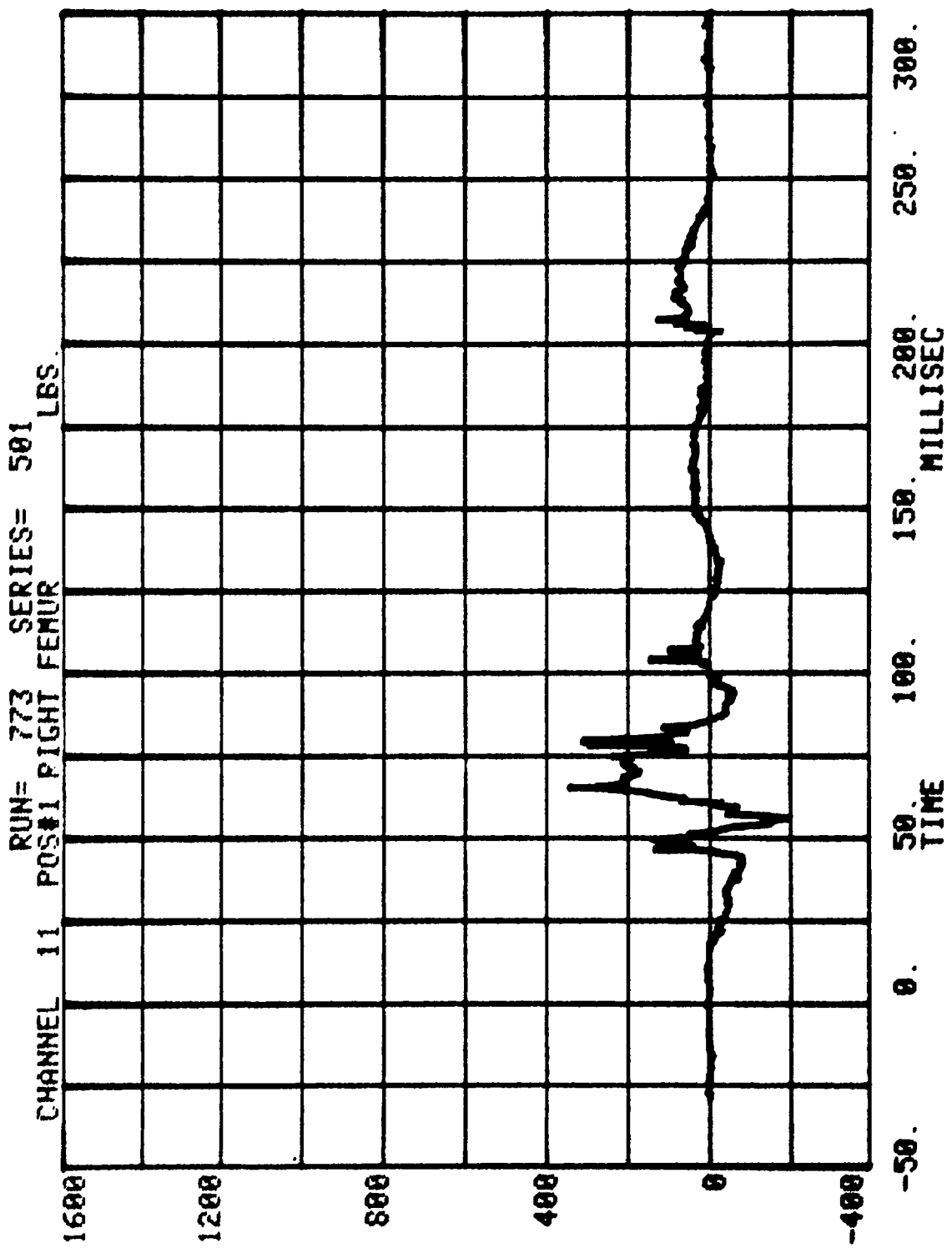

CHANNEL 6 POS#1 CHEST X
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 5 POS#1 CHEST Y
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

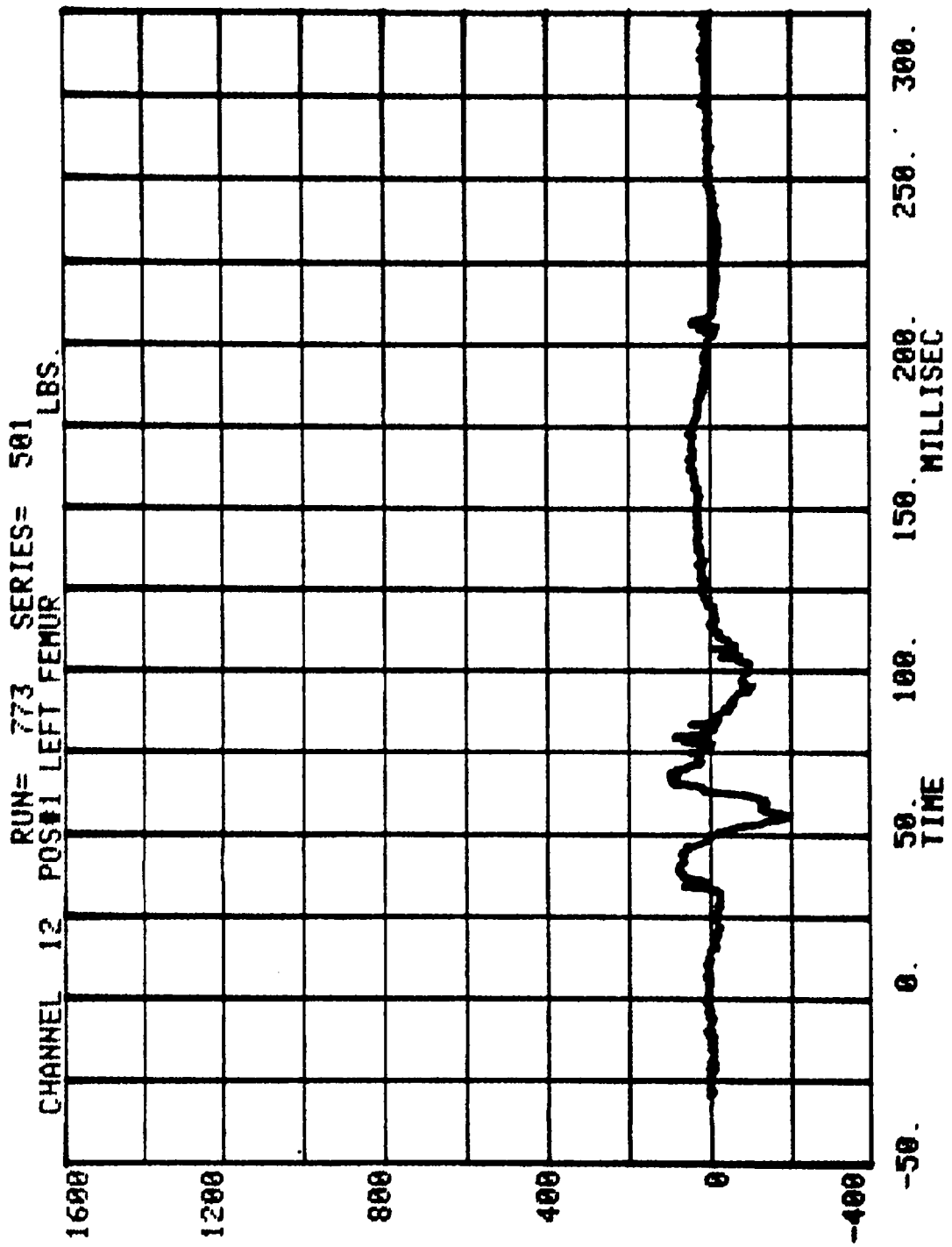

CHANNEL 4 RUN= 773 SERIES= 501
POS#1 CHEST Z G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 2 POS#1 CHEST R
RUN= 773 SERIES= 501
G'S
100.
80.
60.
40.
20.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11


CHANNEL 11 POS#1 RIGHT FEMUR
RUN= 773 SERIES= 501
LBS.
1600
1200
800
400
0
-400
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11


CHANNEL 12 POS#1 LEFT FEMUR
RUN= 773 SERIES= 501
LBS.
1600
1200
800
400
0
-400
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1987

RUN= 773

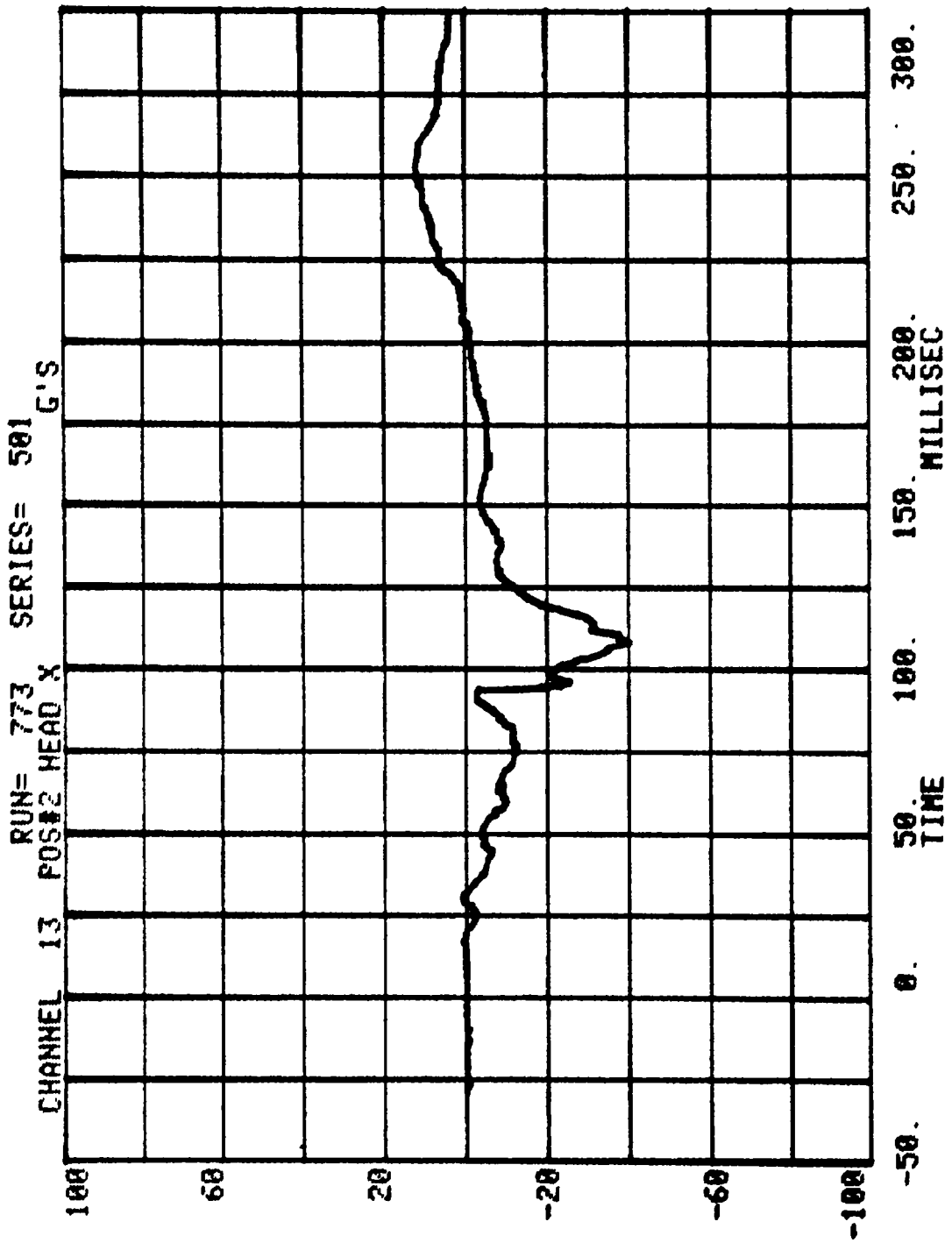
POS#2 HEAD R

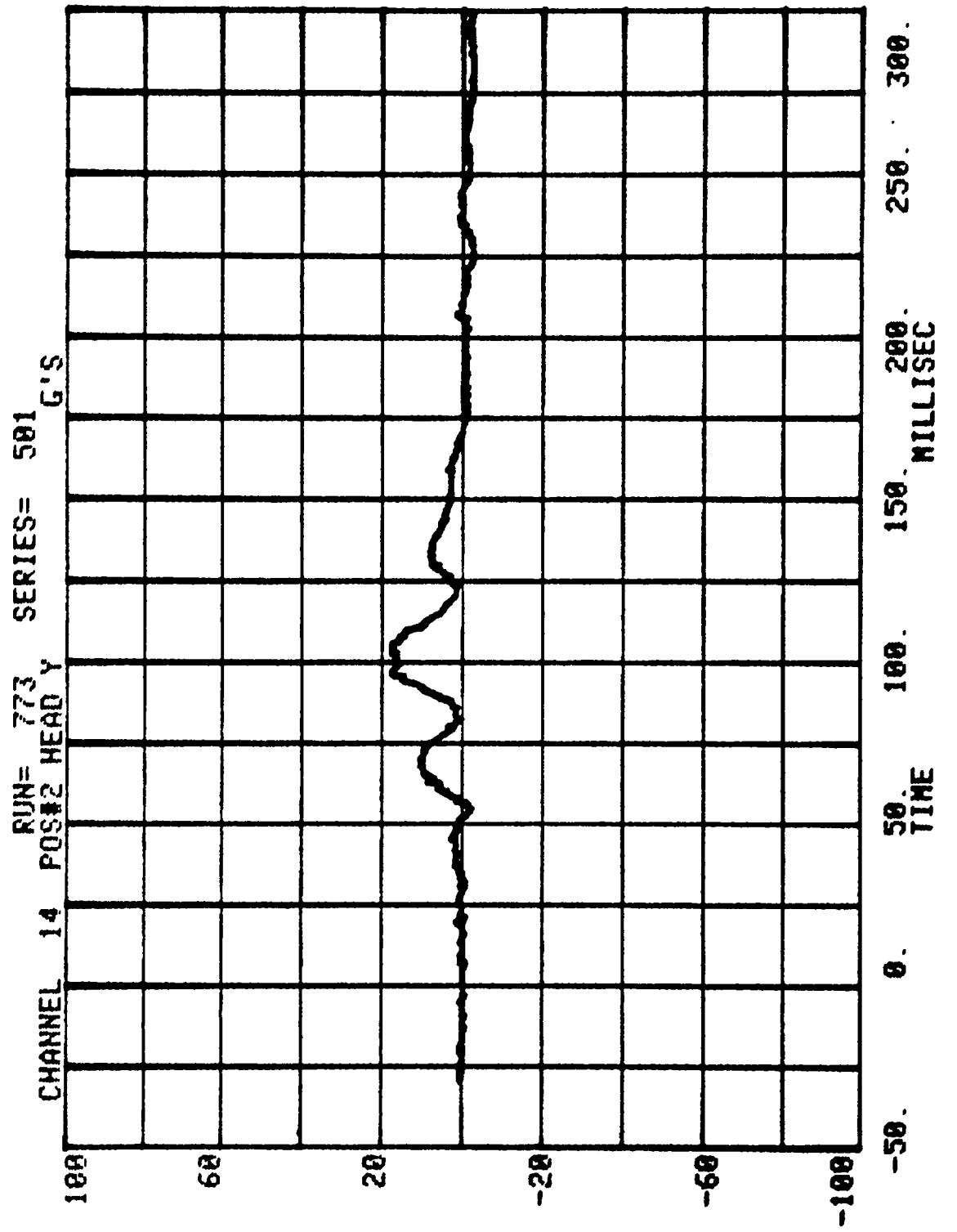
HIC= 439.8 FROM T1= .07972 TO T2= .11572

AVERAGE ACCELERATION BETWEEN T1 AND T2= 43.1G'S

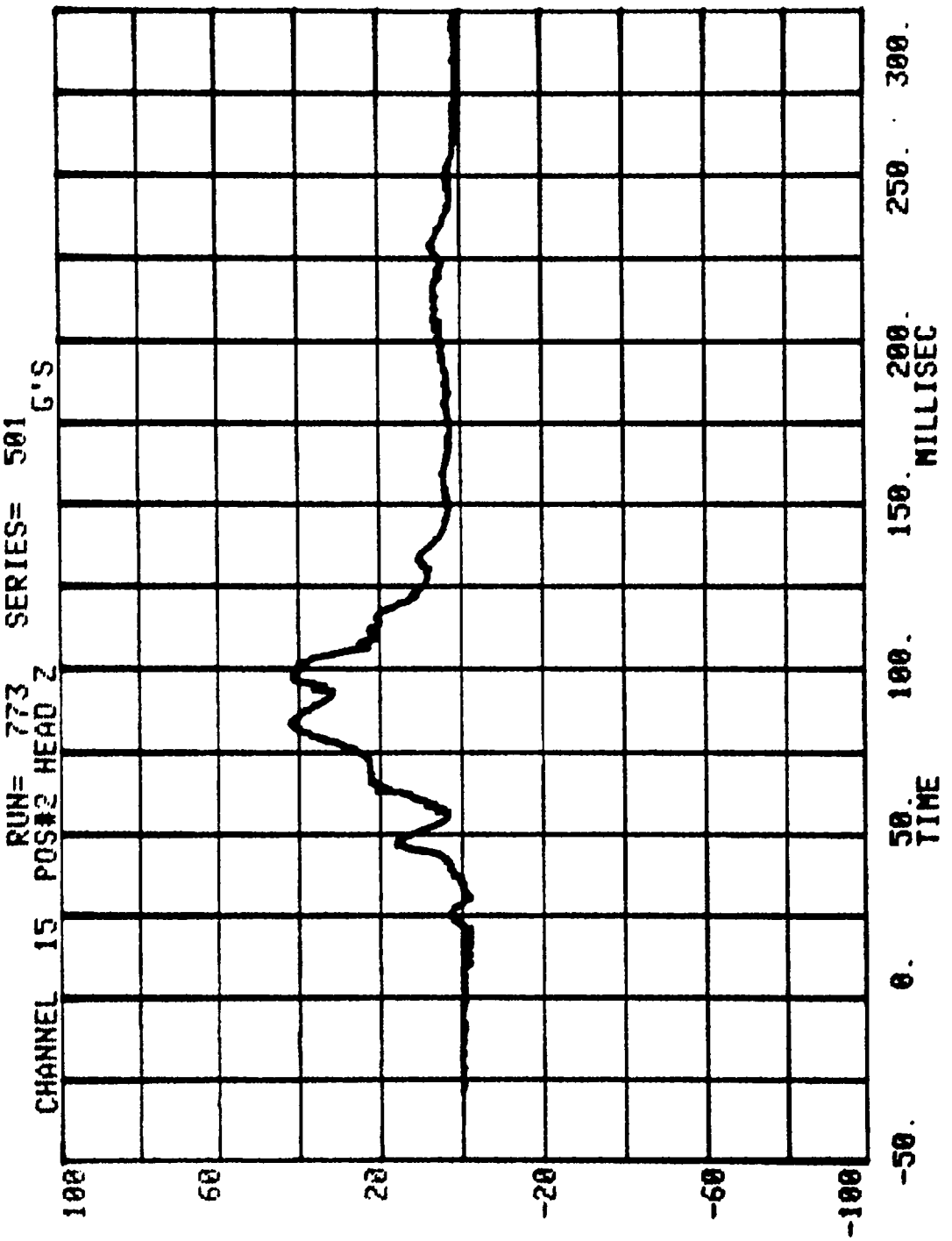
EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 607.0

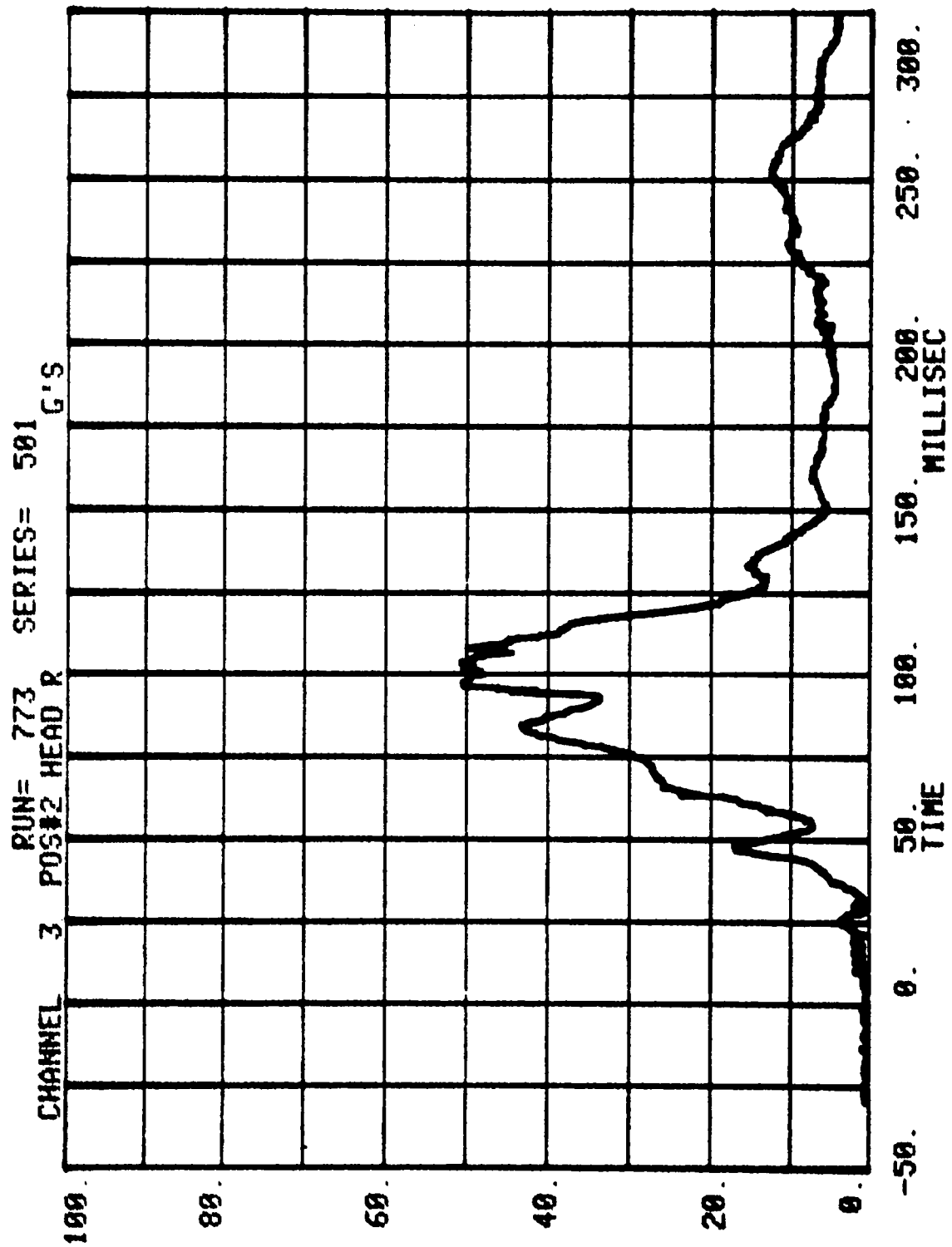

CHANNEL 13 POS#2 HEAD X
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

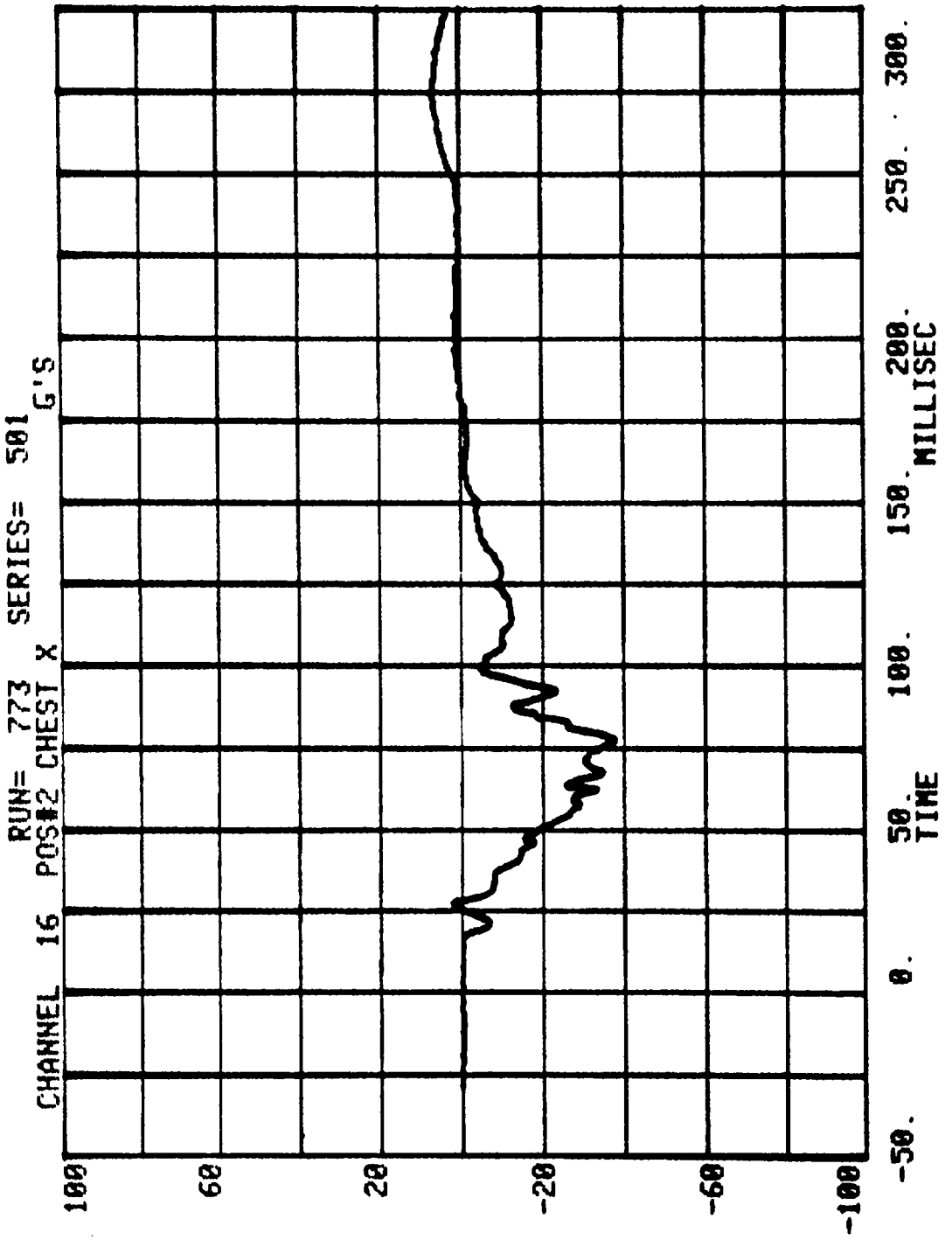

CHANNEL 14 POS#2 HEAD Y
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

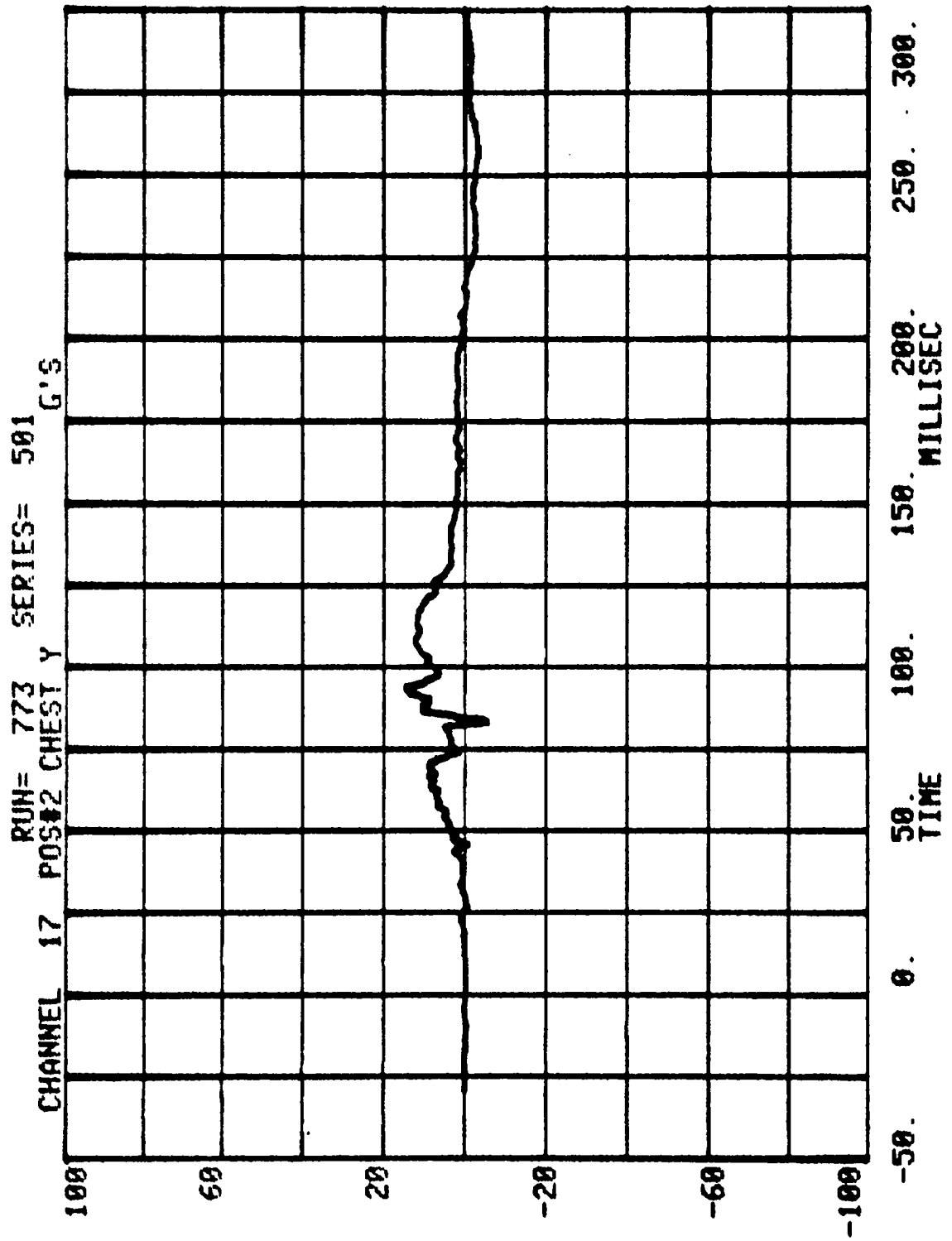
7556-11


CHANNEL 15 RUN= 773 SERIES= 501
POS#2 HEAD 2
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

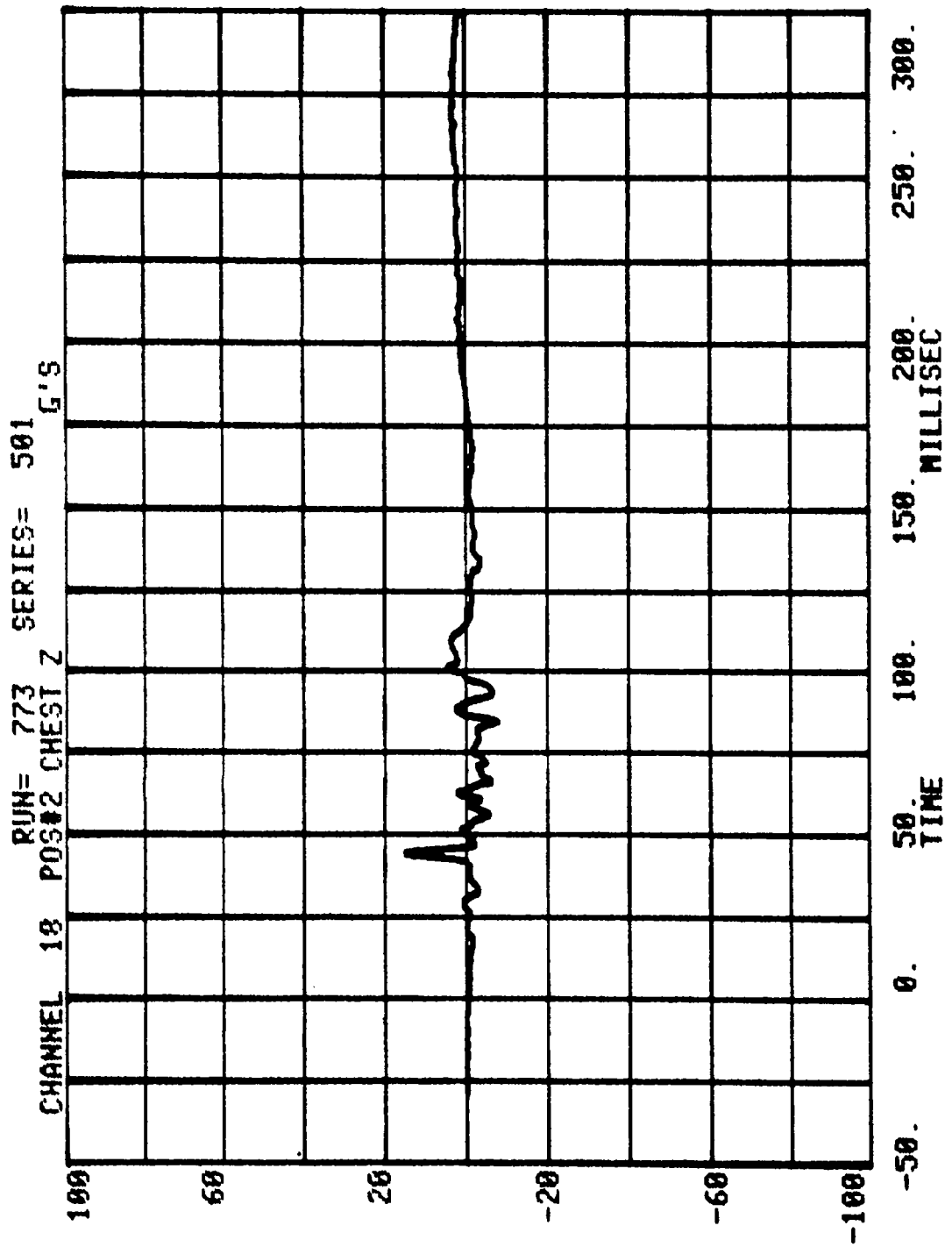
7556-11

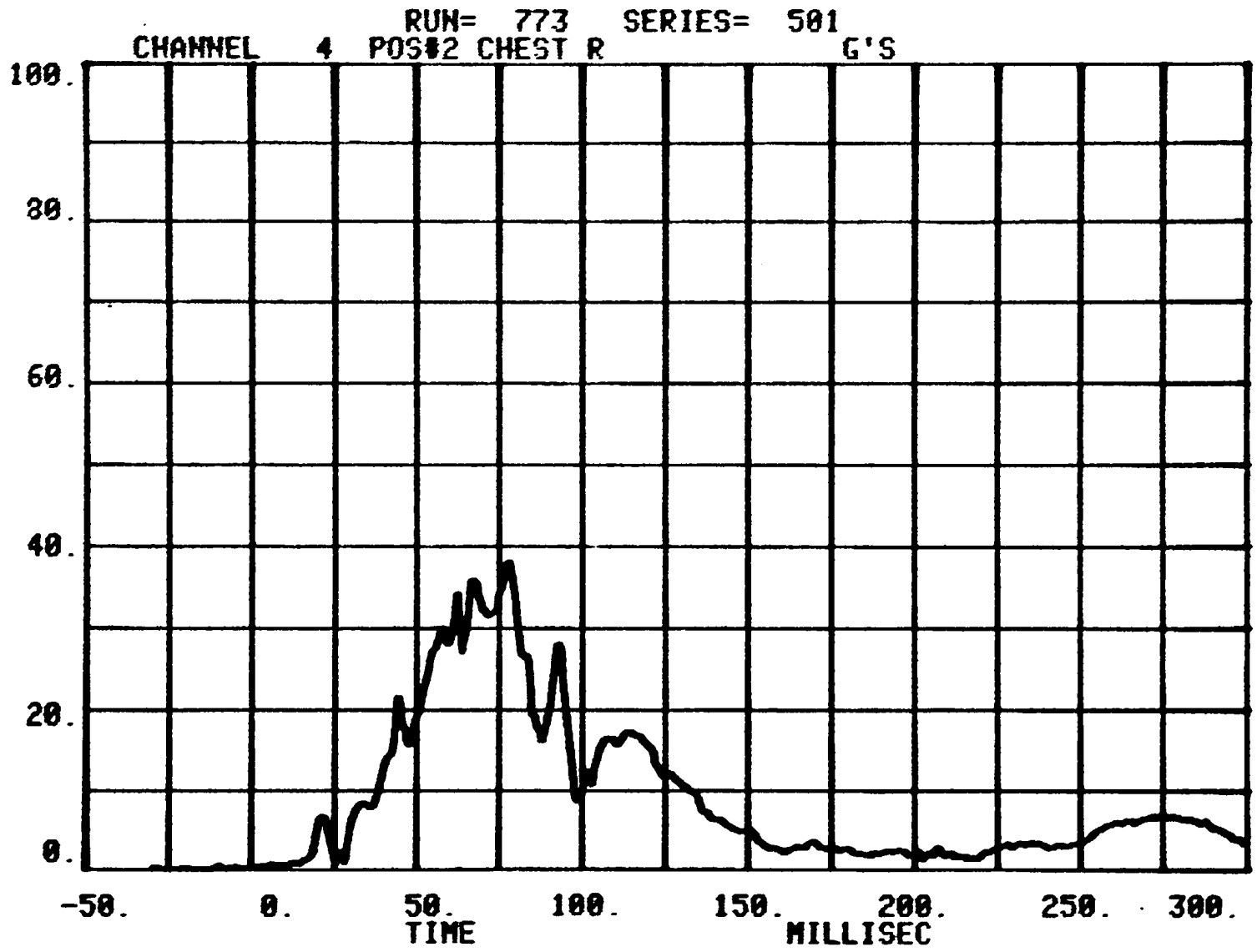

CHANNEL 3 POS#2 HEAD R
RUN= 773 SERIES= 501
G'S
100.
80.
60.
40.
20.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

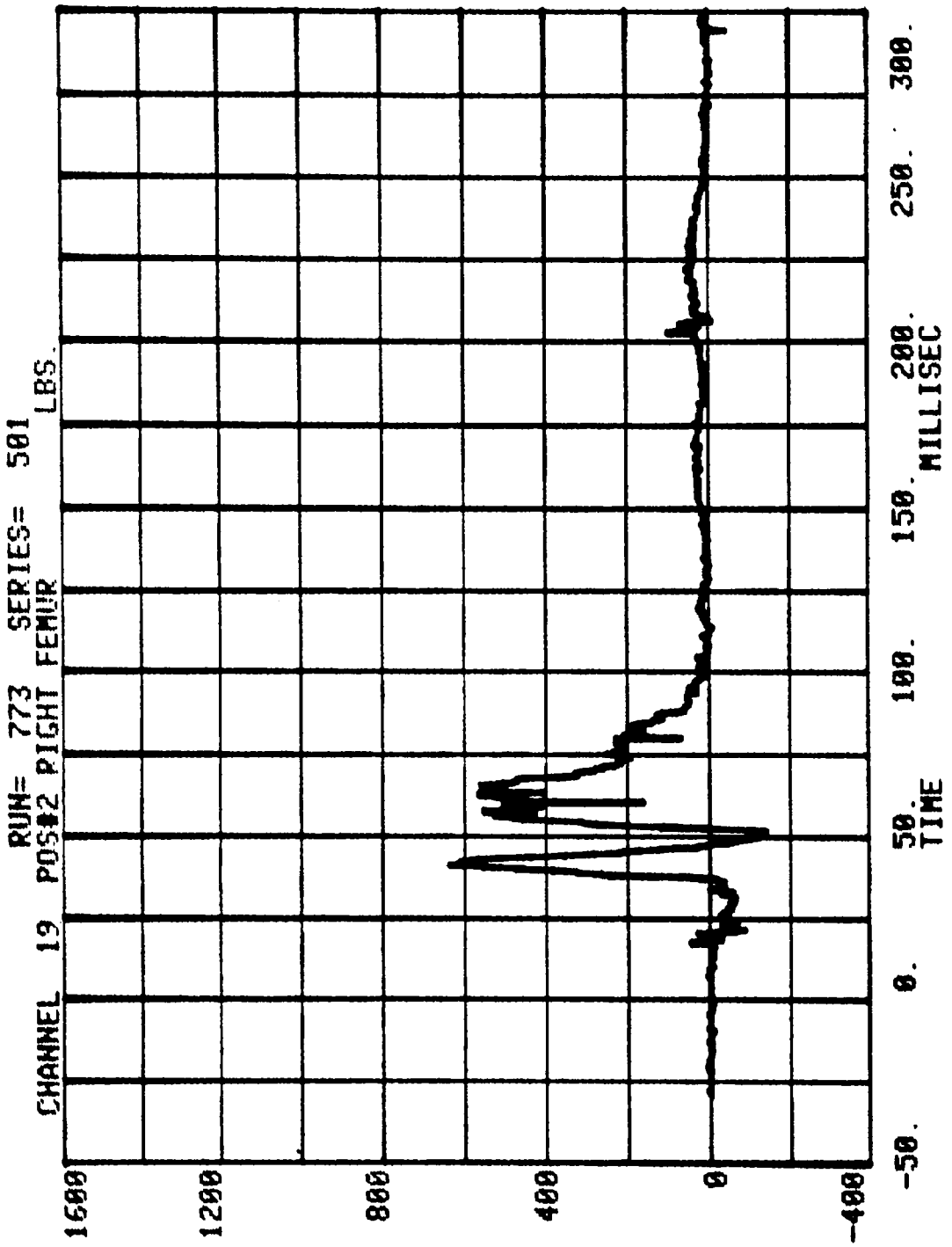

CHANNEL 16 POS#2 CHEST X
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 17 POS#2 CHEST Y
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

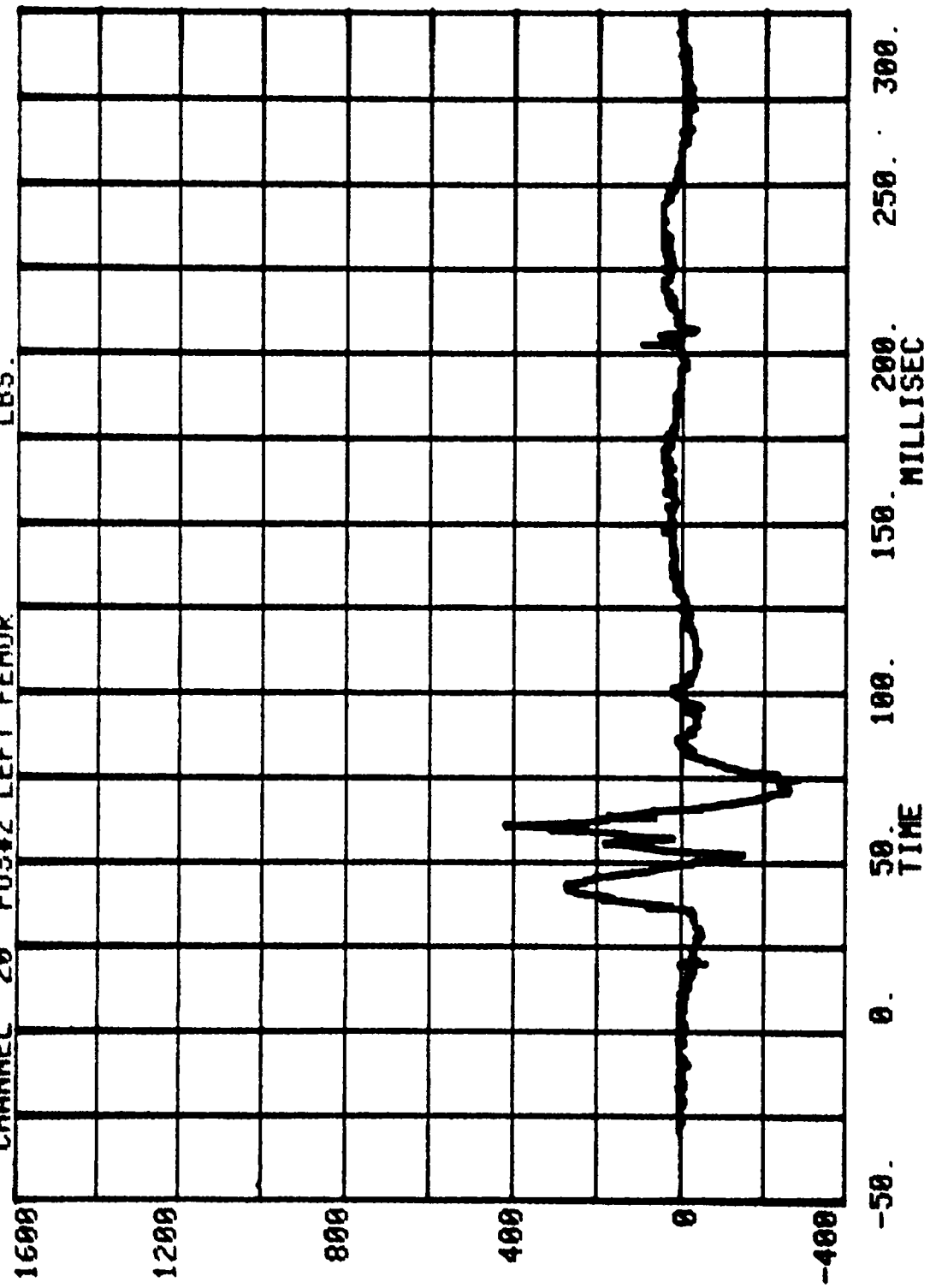
7556-11


CHANNEL 18 POS#2 CHEST Z
RUN= 773 SERIES= 501
G'S
100
60
20
-20
-60
-100
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


RUN= 773 SERIES= 501
CHANNEL 4 POS#2 CHEST R
G'S
100.
80.
60.
40.
20.
0.
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC


CHANNEL 19 POS#2 RIGHT FEMUR
RUN= 773 SERIES= 501
LBS.
1600
1200
800
400
0
-400
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11


CHANNEL 20 POS#2 LEFT FEMUR
RUN= 773 SERIES= 501
LBS.
1600
1200
800
400
0
-400
-50.
0.
50.
100.
150.
200.
250.
300.
TIME
MILLISEC

7556-11

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 the Appendix.

Dummy serial numbers and certification dates are:

Serial No.	Completion Date
1020	4/7/87
1022	4/7/87

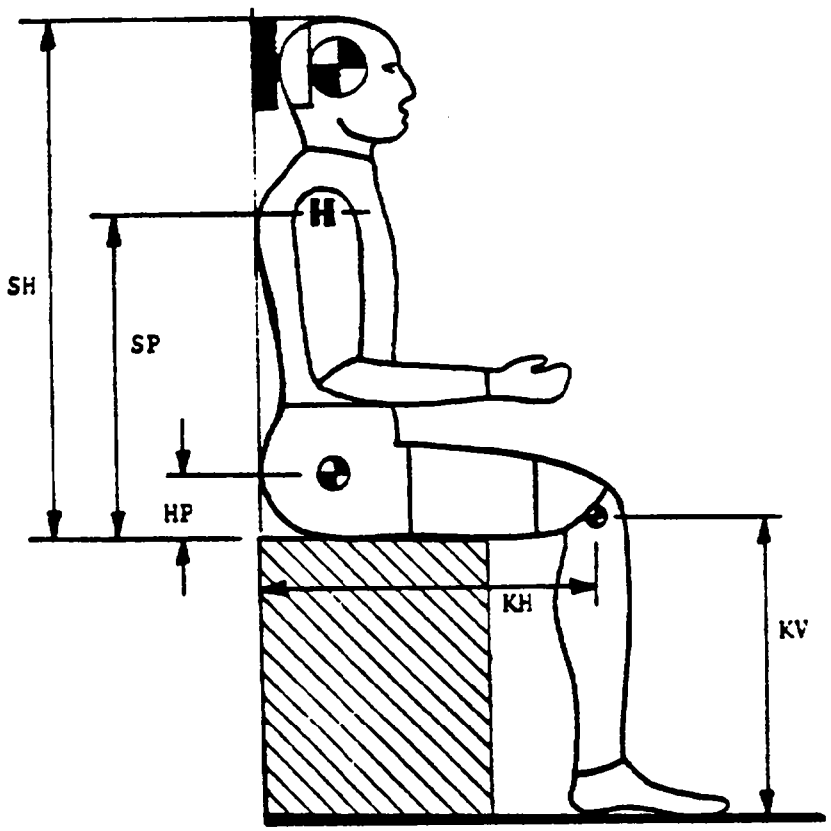
Electronic Test Equipment

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.

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 1020

I. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		4/7/87	
VERIFICATION NUMBER FOR DUMMY*		2	
SH - Seated Height- - - - - - - -	35.6 to 35.8"	35.7"	
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"	20.4"	
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"	14.5"	

TECHNICIAN'S NAME: D. W. Hess

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

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA: NHTSA DUMMY I.D. NO.: 1020

TECHNICIAN'S NAME: D. W. Hess

			PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION----------			4/7/87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*------			2	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----			70-73 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)			25-44 %	%
TEST PARAMETER		SPECIFICATION		
1. HEAD DROP TEST--				
a. Peak Resultant Accel.-		210 to 260G	230 g	
b. Peak Lateral Accel.- -		≤ - 10G	7 g	
c. Time above 100G- - - -		0.9 to 1.5ms	1.12 ms	
2. NECK BENDING TEST--				
a. Pendulum Speed - - - -		21.5 to 25.5 fps	21.97 fps	
b. Pend. Avg. Decel. over $t_3 - t_2$		20 to 24G	23 g	
c. Peak Resultant Head Acceleration - - - - -		26G max.	25.5 g	
d. Pendulum Decel.(t_2-t_1)		≤ - 3ms	2.5 ms	
e. Pendulum Decel.(t_3-t_2)		25 to 30 ms	27.2 ms	
f. Pendulum Decel.(t_4-t_3)		≤ - 10ms	3.5 ms	
g. Max. Head Rotation - -		63 to 73°	71°	
h. Chordal Displacement-- Head Rotation Angle-				
0°	Time- -	-2 to 2 ms	0.0 ms	
	Displ.-	-.5 to .5"	0.0"	
30°	Time- -	25.6 to 34.4ms	27.5 ms	
	Displ.-	2.1 to 3.1"	2.9"	
60°	Time- -	40.3 to 51.7ms	43 ms	
	Displ.-	4.3 to 5.3"	5.2 in	
Maximum (71 °)	Time- -	53.2 to 66.8ms	59 ms	
	Displ.-	5.0 to 6.0"	6.0"	

*beginning with "1" at the start of each fiscal year's crash test program

II. PERFORMANCE VERIFICATION DATA (Continued) NHTSA DUMMY I.D. NO.: 1020

TECHNICIAN'S NAME: D. W. Hess

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST.... Continued:				
h. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	76 ms	
	Displ.	4.3 to 5.3 in.	4.9 in	
30°	Time	85.4 to 104.6 ms	93 ms	
	Displ.	2.1 to 3.1 in.	2.4"	
0°	Time	101.0 to 123.0 ms	107 ms	
	Displ.	-.5 to 0.5 in.	0.0"	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ .5" - - - - -		23 to 36 lbs.	23.5 lbs.	
b. Force @ .75" - - - - -		36 to 50 lbs.	36.5 lbs.	
c. Force @ 1.0" - - - - -		50 to 63 lbs.	52 lbs.	
d. Force @ 1.5" - - - - -		73 to 88 lbs.	76 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - - -		22 to 34 lbs.	32 lbs.	
b. Force @ 30° - - - - -		34 to 46 lbs.	43 lbs.	
c. Force @ 40° - - - - -		46 to 58 lbs.	54 lbs.	
d. Return Angle - - - - -		12° maximum	9°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed- - -		21.78-22.22 fps	21.9 fps	
(2) Peak Deflection-		1.7" maximum	1.31"	
(3) Peak Resistive Force- - - - - -		2250 lbs. maximum	2132 lbs.	
(4) Internal Hysteresis - - -		50 to 70%	52.5%	
b. Low Speed				
(1) Probe Speed- - -		13.86-14.14 fps	14.04 fps	
(2) Peak Deflection-		1.1" maximum	.94"	
(3) Peak Resistive Force- - - - - -		1450 lbs. maximum	1222 lbs.	
(4) Internal Hyster.		50 to 70%	55.7%	

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued) NHTSA DUMMY I.D. NO.: 1020

TECHNICIAN'S NAME: D. W. Hess

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.04 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2200 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.76 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.87 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1850 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.84 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

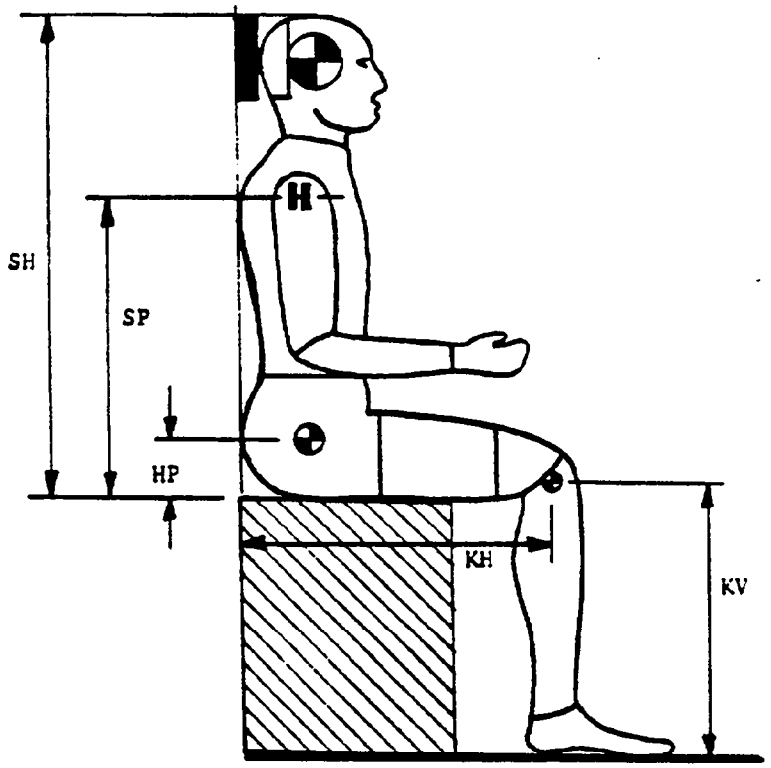
NHTSA DUMMY ID NO. 1020 CALIB. SEQ. NOS. FOR DUMMY: 2 & _____

	MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
A. DUMMY INSTRUMENTS:				
1. Head Accelerometers --				
a. Triaxial unit - - - - -	NA	------	------	------
b. Uniaxial units				
(1) Longitudinal (A_x) -	Endevco	CS70	2-87	8-87
(2) Lateral (A_y) - - -	"	CH35	2-87	8-87
(3) Vertical (A_z) - - -	"	CU88	2-87	8-87
2. Chest Accelerometers -- (Vehicle Crash Test Usage)				
a. Triaxial unit - - - - -	NA	------	------	------
b. Uniaxial units				
(1) Longitudinal (A_x) -	CEC	A84	2-87	8-87
(2) Lateral (A_y) - - -	Endevco	CY71	2-87	8-87
(3) Vertical (A_z) - - -	CEC	A86	2-87	8-87
3. Chest Potentiometer - - -	NA	------	------	------
4. Femur Load Cells --				
a. Right Side - - - - - - -	GSE	551	2-87	8-87
b. Left Side - - - - - - -	GSE	552	2-87	8-87
B. CALIB. LAB. INSTRUMENTS:				
1. Pendulum Accelerometer - - -	CED	18259	2-87	8-87
2. Test Probe Accelerometer - - -	CED	17815	2-87	8-87
3. Lumbar Flexion Test Push Force Gauge - - - - - - - - - -	Transducer Inc.	20051	2-87	8-87
4. Abdominal Compression Test Force Gauge - - - - - - - - - -	BLH	72952	2-87	8-87
5. Abdominal Compression Test Displacement Gauge - - - - -	CIC	567-11	2-87	8-87

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 1022

I. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		4/7/87	
VERIFICATION NUMBER FOR DUMMY*		2	
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"	14.6"	

TECHNICIAN'S NAME: D. W. Hess

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

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA: NHTSA DUMMY I.D. NO.: 1022

TECHNICIAN'S NAME: D. W. Hess

			PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION----------			4/7/87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*------			2	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----			70-74 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)			35-50 %	%
TEST PARAMETER		SPECIFICATION		
1. HEAD DROP TEST--				
a. Peak Resultant Accel.-		210 to 260G	240 g	
b. Peak Lateral Accel.- -		≤ - 10G	8 g	
c. Time above 100G- - - -		0.9 to 1.5ms	1.12 ms	
2. NECK BENDING TEST--				
a. Pendulum Speed - - - -		21.5 to 25.5 fps	21.61 fps	
b. Pend. Avg. Decel. over $t_3 - t_2$		20 to 24G	23 g	
c. Peak Resultant Head Acceleration - - - - -		26G max.	25.5 g	
d. Pendulum Decel.(t_2-t_1)		≤ - 3ms	2 ms	
e. Pendulum Decel.(t_3-t_2)		25 to 30 ms	27 ms	
f. Pendulum Decel.(t_4-t_3)		≤ - 10ms	4 ms	
g. Max. Head Rotation - -		63 to 73°	67°	
h. Chordal Displacement-- Head Rotation Angle-				
0°	Time- -	-2 to 2 ms	0.0 ms	
	Displ.-	-.5 to .5"	0.0"	
30°	Time- -	25.6 to 34.4ms	29 ms	
	Displ.-	2.1 to 3.1"	2.9"	
60°	Time- -	40.3 to 51.7ms	44 ms	
	Displ.-	4.3 to 5.3"	5.1"	
Maximum (67°)	Time- -	53.2 to 66.8ms	56 ms	
	Displ.-	5.0 to 6.0"	5.5"	

*beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued) NHTSA DUMMY I.D. NO.: 1022

TECHNICIAN'S NAME: D. W. Hess

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST.... Continued:				
h. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	69 ms	
	Displ.	4.3 to 5.3 in.	5.0"	
30°	Time	85.4 to 104.6 ms	89 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.	0.0"	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ .5" - - - - -		23 to 36 lbs.	26.5 lbs.	
b. Force @ .75" - - - - -		36 to 50 lbs.	39.5 lbs.	
c. Force @ 1.0" - - - - -		50 to 63 lbs.	58.5 lbs.	
d. Force @ 1.3" - - - - -		73 to 88 lbs.	85.5 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - - -		22 to ¾ lbs.	34 lbs.	
b. Force @ 30° - - - - -		¾ to 46 lbs.	40.5 lbs.	
c. Force @ 40° - - - - -		46 to 58 lbs.	50.5 lbs.	
d. Return Angle - - - - -		12° maximum	10°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed- - -		21.78-22.22 fps	22.04 fps	
(2) Peak Deflection-		1.7" maximum	1.42"	
(3) Peak Resistive Force- - - - - -		2250 lbs. maximum	2080 lbs.	
(4) Internal Hysteresis - - -		50 to 70%	57.8%	
b. Low Speed				
(1) Probe Speed- - -		13.86-14.14 fps	13.92 fps	
(2) Peak Deflection-		1.1" maximum	.74"	
(3) Peak Resistive Force- - - - - -		1450 lbs. maximum	1222 lbs.	
(4) Internal Hyster.		50 to 70%	61.5%	

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued) NHTSA DUMMY I.D. NO.: 1022

TECHNICIAN'S NAME: D. W. Hess

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.03 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2250 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.75 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.03 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1880 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.99 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 1022 CALIB. SEQ. NOS. FOR DUMMY: 2 & _____

	MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
A. DUMMY INSTRUMENTS:				
1. Head Accelerometers --				
a. Triaxial unit - - - - -	NA	------	------	------
b. Uniaxial units				
(1) Longitudinal (A_x) -	Endevco	DB47	2-87	8-87
(2) Lateral (A_y) - - -	"	CX05	2-87	8-87
(3) Vertical (A_z) - - -	"	CJ54	2-87	8-87
2. Chest Accelerometers -- (Vehicle Crash Test Usage)				
a. Triaxial unit - - - - -	NA	------	------	------
b. Uniaxial units				
(1) Longitudinal (A_x) -	CEC	A115	2-87	8-87
(2) Lateral (A_y) - - -	Endevco	CS09	2-87	8-87
(3) Vertical (A_z) - - -	CEC	A29	2-87	8-87
3. Chest Potentiometer - - -	NA	------	------	------
4. Femur Load Cells --				
a. Right Side - - - - - -	GSE	75	2-87	8-87
b. Left Side - - - - - -	GSE	74	2-87	8-87
B. CALIB. LAB. INSTRUMENTS:				
1. Pendulum Accelerometer - - -	CED	18259	2-87	8-87
2. Test Probe Accelerometer - - -	CED	17815	2-87	8-87
3. Lumbar Flexion Test Push Force Gauge - - - - - - - - -	Transducer Inc.	20051	2-87	8-87
4. Abdominal Compression Test Force Gauge - - - - - - - - -	BLH	72952	2-87	8-87
5. Abdominal Compression Test Displacement Gauge - - - - -	CIC	567-11	2-87	8-87

Appendix D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Seat belts

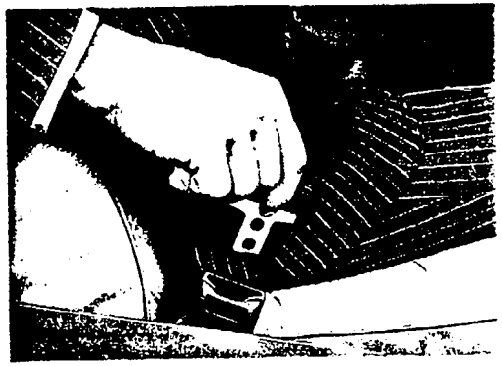
Seat belts should be worn at all times. Contrary to popular belief, research has established that it is equally dangerous for rear-seat passengers not to wear seat belts. In the event of a collision, unrestrained rear-seat passengers are thrown violently forward against the front-seat backrests. This doubles the force put on the front-seat occupants and seat belts, frequently resulting in injury to all the occupants. Each belt may only be worn by one person at a time.

The front-seat belts are equipped with automatic belt tensioners which will tension the belt in a head-on collision. Side and rear collisions, overturning and minor indentation will normally not activate the seat belt pretensioner. The device contains a small explosive charge which is fired by a signal from a sensor. The belt tensioner must be replaced by your Saab dealer after the explosive charge has been fired or if the device has been damaged.

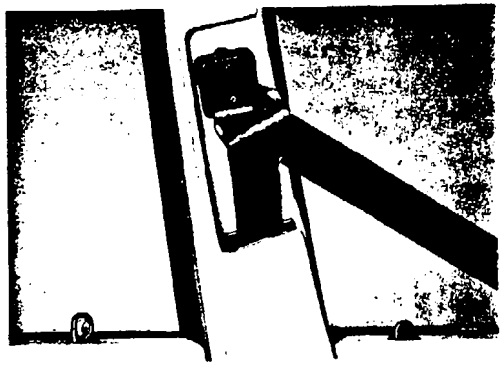
The belt tensioner must be inspected by an authorized Saab dealer during the year specified on the label located at the bottom of the door pillar.

Other belts should also be inspected and, if necessary, replaced after an accident prior to the car being put back into service. Ensure that the retractor locks when the belt webbing is pulled and the belt retracts smoothly when released. If the webbing won't retract fully and hangs from the guide ring the retractor may have been damaged or the webbing stretched in the accident. If so, replace the belt assembly.

Front seat belt



Belt guide on door pillar (top position - NORMAL)



WARNING!

All service and repair work on the seat belt pretensioner system must be performed by an authorized Saab dealer. In case of change of ownership or scrapping of the car, the new owner or the scrapping firm respectively must pay attention to the safety instructions regarding seat belt pretensioners, which are classified as pyrotechnical goods. The safety instructions are available at your Saab dealer.

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.

Apart from the belt for the middle rear-seat passenger, the seat belts are of the inertia reel type. To fasten a seat belt, pull the strap gently out of the retractor and insert the buckle in the lock. Make sure that the buckle is properly secured. The bottom anchorage points for the front seat belts are fitted to the seats and therefore move with the seat when the legroom is being adjusted.

The height of the belt guide on the door pillar is adjustable. It is normally set in the upper position. This setting provides the greatest protection. On short persons, the diagonal strap may run too close to the neck. The belt guide can then be lowered

until the strap runs across the body somewhat below the neck, to maintain the same level of pretection. To alter the height of the guide, squeeze the sliding piece as indicated by the arrows and move it to the desired position. Make sure that the guide is securely locked in the new position.

For maximum protection, the seat belt should be worn with the lap portion low across the hips and the top strap across the middle of the shoulder. Make sure that the belt is not twisted nor rubbing against any sharp edges. To release the buckle, press the red button marked PRESS.

NOTE! Expectant mothers should take care to fit the belt such that it does not apply pressure to the stomach. The lap portion should be as low as possible across the hips.

Most of the time when the belt is being worn the retractor will not be locked, thus allowing freedom of movement. However, the retractor will lock if the strap is jerked or withdrawn sharply, if the car is tilted at a steep angle, or if the car brakes hard or is involved in a collision.

The belt for the middle rear-seat passenger is of the lap-belt type and can be adjusted manually. If required, lengthen the belt before fastening it by holding the buckle at

Lengthening the lap belt

right angles to the strap and pulling the strap out. Tighten the belt by pulling the free end until the belt fits snugly against the body. To release the belt, press the red button on the buckle lock.

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. A seat belt warning light on the overhead panel will glow for about 8 seconds. The audible buzzer will sound until this light goes out or until the front occupants' seat belts are fastened, whichever occurs first.

NOTE! Make sure that the belts do not become trapped when the rear-seat cushion is tipped forward or folded back.

Child safety

Holding your small child is not safe. Children under 5 years old and weighing less than 40 lbs. should be restrained in a suitable safety seat/restraint designed for that purpose. Follow seat manufacturer's instructions which are based on the size and weight of the child. If the child safety seat is designed to be restrained by a lap belt, use it in the center rear seating position. Restraining a child safety seat with a 3-point belt may require a special clip (contact the seat manufacturer) to restrict belt movement and prevent the seat from tipping over. Refer to the instructions to determine clip necessity and availability. Child seats with top tether straps are not recommended. For further information on child restraint systems for your car write to: U.S. Dept. of Transportation, Washington, D.C. 20590.