

REPORT NUMBER: CAL-90-N20

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORPORATION
1990 PONTIAC
TRANS SPORT VAN

NHTSA NUMBER: ML0107

CALSPAN TEST NUMBER: 7776-20

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

May 15, 1990



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)
Washington, DC 20590

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-87-D-02012. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

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:

Vincent Quarles

Manager, New Car Assessment Program (NCAP)

AUG 30 1990

Date of Report Acceptance

7776-20

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. CAL-90-N20		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle NHTSA New Car Assessment Program (NCAP) Frontal Barrier Impact Test of a 1990 Pontiac Trans Sport Van				5. Report Date May 15, 1990	
				6. Performing Organization Code CAL	
7. Author(s) Michael J. Kilgallon, Project Engineer Walter E. Levan, Program Manager				8. Performing Organization Report No. 7776-20	
9. Performing Organization Name and Address Calspan Advanced Technology Center P.O. Box 400 Buffalo, New York 14225				10. Work Unit No. 948-20-989	
				11. Contract or Grant No. DTNH22-87-D-02012	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Market Incentives (NRM-20) 400 Seventh Street, S.W., Washington, DC 20590				13. Type of Report and Period Covered Final Report May-June	
				14. Sponsoring Agency Code DOT/NHTSA/RM/OMI	
15. Supplementary Notes					
16. Abstract A frontal load cell barrier test of a 1990 Pontiac Trans Sport Van was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on May 15, 1990. The impact speed was 35.1 mph and the ambient temperature at the barrier face at the time of impact was 72°F. The maximum post-test vehicle crush was 29.5 inches. The test vehicle was equipped with a 3-point continuous restraint system at each of the front outboard seating positions. With regard to FMVSS 208-"Occupant Crash Protection," injury criteria, both the driver and passenger dummies appear to comply with the head, chest and femur requirements.					
17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP)			18. Distribution Statement <u>Copies of this report are available from:</u> Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., S.W., Washington, DC 20590		
19. Security Classif. (of this report) UNCLASSIFIED		20. Security Classif. (of this page) UNCLASSIFIED		21. No. of Pages 22. Price	

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE AND TEST PROCEDURE	1-1
2	SUMMARY OF FRONTAL BARRIER IMPACT TEST	2-1
3	OCCUPANT AND VEHICLE INFORMATION	3-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA	B-1
APPENDIX C	DUMMY CONFIGURATION TESTS	C-1
APPENDIX D	VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS	D-1

LIST OF FIGURES

<u>Figure No.</u>		<u>Page No.</u>
1	Part 572 Dummy In-Vehicle Position	3-3
2	Occupant Clearance Dimensions	3-4
3	Seat Belt Positioning Data	3-5
4	Driver Dummy to Steering Column/Wheel Dimensions	3-7
5	Camera Positions for Frontal Impacts	3-8
6	Vehicle Target Locations	3-10
7	Load Cell Locations on Fixed Barrier	3-11
8	Vehicle Accelerometer Locations	3-12
9	Test Vehicle Measurements	3-13
10	Dummy Configuration Dimensions	C-3

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
1	General Test and Vehicle Data	2-2
2	Dummy Injury Criteria Values	3-2
3	Seat Belt Performance Assessment Test Data	3-6
4	High Speed Camera Locations	3-9
5	Vehicle Measurements	3-14

Section I

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 90 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 requirements.

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 ML0107

A load cell barrier consisting of 36 load cells was impacted by a 1990 Pontiac Trans Sport Van at a velocity of 35.1 mph. The test was performed at the Calspan Corporation Advanced Technology Center on May 15, 1990. 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 the 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. 45) and the right-front passenger ATD (Serial No. 150) were both used in two previous tests (ML0102 and ML0103) and Injury Criteria Values were not exceeded in these tests. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 81 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. Position #2 Neck Moment Z did not record accurately. Position #2 Belt Elongation contained questionable data between approximately 130 and 203 milliseconds.

The driver's head struck the steering wheel rim and his HIC was 761.3. The maximum chest deceleration over 3 milliseconds was 41.6 g's and femur loads were 1108.7 and 252.5 pounds.

The right front passenger's HIC was 594.7. The maximum chest deceleration over 3 milliseconds was 36.5 g's and femur loads were 912.7 and 287.3 pounds.

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1990 Pontiac Trans Sport Van
NHTSA No.: ML0107 VIN.: 1GMCU06D8LT204152
Body Color: Silver Date Of Manufacture: November 1989
Engine: 6 Cylinders; - C.I.D.; 3.1 Liters; - CC
X Gas; - Diesel; - Turbocharged
- Longitudinal; X Transverse
Transmission: 3 Speed; - Manual; X Automatic; - Overdrive
Final Drive: X Front Wheel; - Rear Wheel; - Four Wheel
Date Received: 11-28-89 Odometer Reading: 14
- A/C; X P/S; X P/B; - P/wdo.; - Tilt Wheel
- P/seats; - Cruise Control
Type of Occupant Restraint: 3 Point Continuous Restraint System.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 35 psi, Rear 35 psi
Recommended Tire Size: P205/70R14
Recommended Cold Tire Pressure: Front 35 psi, Rear 35 psi
Tires on Vehicle: P205/70R14; Manufacturer: General
Number of Occupants: 2 Front; 3 Rear; 2 3rd Seat; 7 TOTAL
Type of Front Seats: X Bucket; - Bench; - Split Bench
Type of Front Seat Back: - Fixed; X Adj. With - Lever X Rot. Knob
Rated Cargo and Luggage
Weight (RCLW) = 300 lbs.
GVWR 4710 lbs. GAWR: Front 2330 lbs. Rear 2380 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 = 1070 lbs. Right Rear = 820 lbs.
 Left Front = 1050 lbs. Left Rear = 800 lbs.
 TOTAL FRONT WEIGHT = 2120 lbs. (57 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1620 lbs. (43 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 3740 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3740 lbs.)
 DSC = Designated Seating Capacity (7)
 RCLW = 300 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
 Target Test Weight = 4368 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 352 POUNDS CARGO:

Right Front = 1190 lbs. Right Rear = 1100 lbs.
 Left Front = 1130 lbs. Left Rear = 1000 lbs.
 TOTAL FRONT WEIGHT = 2320 lbs. (52 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 2100 lbs. (48 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 4420 lbs.
 Weight of ballast secured in vehicle trunk area = 200 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 29.3 LF 29.4 RR 26.8 LR 27.0
 Test Attitude: RF 28.5 LF 28.6 RR 24.9 LR 25.3
 Wheel Base: 110.0 in.; C.G. = 52.8 in. rearward of front wheel C/L
 Remarks: 18 gallons of stoddard solution has been placed in the 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: May 15, 1990 Time of Test: 14:00
 Ambient Temperature: 72 °F at impact area
 Temperature in Occupant Compartment: 74 °F
 Windshield Molding Temperature: 78 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.1 mph, secondary = 35.1 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 <u>190.8</u>	C _L <u>194.2</u>	L <u>190.5</u>
	Post-test	= R <u>163.2</u>	C _L <u>164.7</u>	L <u>164.5</u>
	Crush	= R <u>27.6</u>	C _L <u>29.5</u>	L <u>26.0</u>

Distance from front of test vehicle to point of impact:

R 13.8" C_L 13.3" L 14.2"

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Steering Rim and Hub</u>	<u>Dash Panel</u>
Chest	<u>No Contact</u>	<u>No Contact</u>
Abdomen	<u>Lower Steering Rim</u>	<u>No Contact</u>
Left Knee	<u>Dash Panel</u>	<u>Dash Panel</u>
Right Knee	<u>Dash Panel</u>	<u>Dash Panel</u>

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>operable</u>	<u>operable</u>	<u>operable</u>	<u>operable</u>

	<u>Front</u>	
<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>
Seat Back Failure	<u>none</u>	<u>none</u>
Seat Shift (in.)	<u>0.0</u>	<u>0.0</u>

Glazing Damage

Backlight/Windshield: Windshield sustained stress fractures, but remained intact.

Other Notable impact Effects: -

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

NHTSA No.: ML0107 Vehicle: 1990 Pontiac Trans Sport Van

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-62.3	-16.2	35.8	67.7
Position #2 - Passenger	101.8	10.5	38.2	105.7

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-43.9	8.2	6.6	41.6
Position #2 - Passenger	-37.1	11.2	10.2	36.5

The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	1108.7	252.5
Position #2 - Passenger	912.7	287.3

	MAXIMUM FORCE - SEAT BELT LOADS (lbs.)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	1283.3	-	1107.1
Position #2 - Passenger	1501.4	1617.9	-

	HEAD INJURY CRITERIA (HIC)			
	HIC	t ₁ (SEC)	t ₂ (SEC)	Average Acceleration t ₁ TO t ₂
Position #1 - Driver	761.3	.07612	.11092	54.4
Position #2 - Passenger	594.7	.08197	.11797	48.7

HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds.

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

Test No.: ML0107 Vehicle: 1990 Pontiac Trans Sport Van

SEAT TYPE:

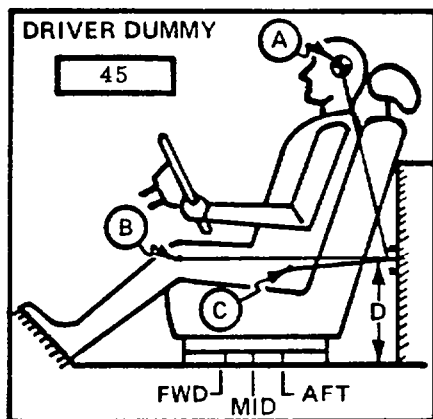
- Bench
X Bucket
- Split Bench

ADJUSTER TYPE:

X Manual
- Power

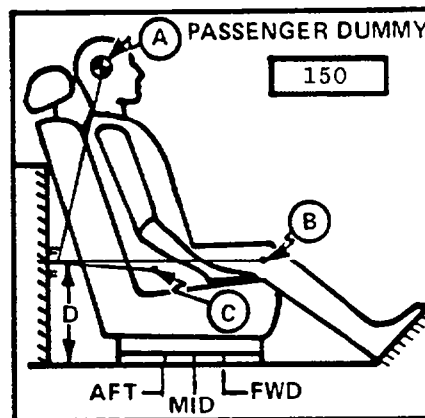
SEAT BACK TYPE:

- Fixed
X Adjustable Reclining



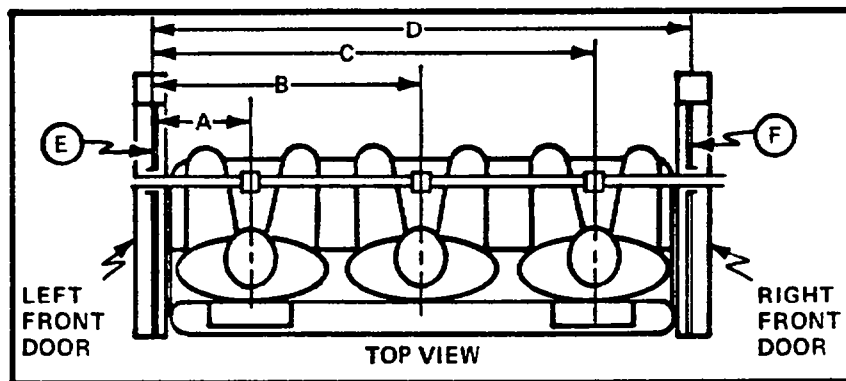
MEASUREMENT LOCATION

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



A = 24.0 in. 17 Degrees
 B = 25.7 in. 92 Degrees
 C = 9.7 in. 108 Degrees
 D = 18.1 in.

A = 24.0 in. 15 Degrees
 B = 25.2 in. 93 Degrees
 C = 9.3 in. 108 Degrees
 D = 18.1 in.



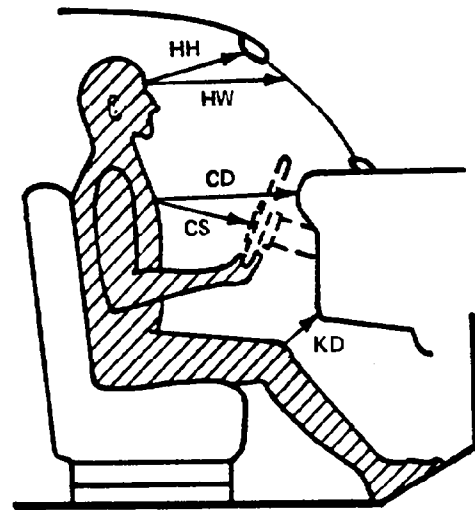
45 DUMMY ID 150

A = Left Door to Driver Centerline 16.2 in.
 B = Left Door to Center Passenger Centerline - in.
 C = Left Door to Right Passenger Centerline 46.8 in.
 D = Left Door to Right Door 62.3 in.
 E, F = Window Glass Height (Right and Left Must Be Equal) 11.0 in.

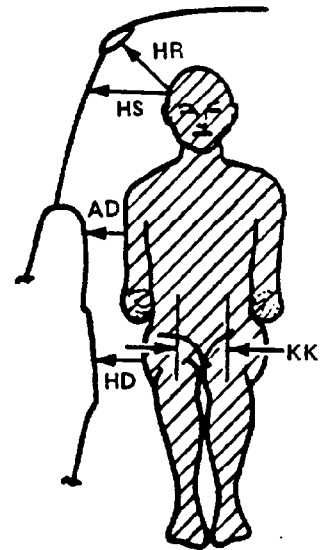
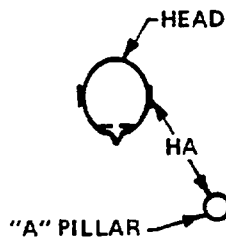
Figure 2

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	15.5	15.7
HW	28.6	28.4
CD	18.7	20.3
CS	11.5	—
KDL	4.8	6.6
KDR	4.2	6.3
SA	See Note	See Note
TA	22°	21°



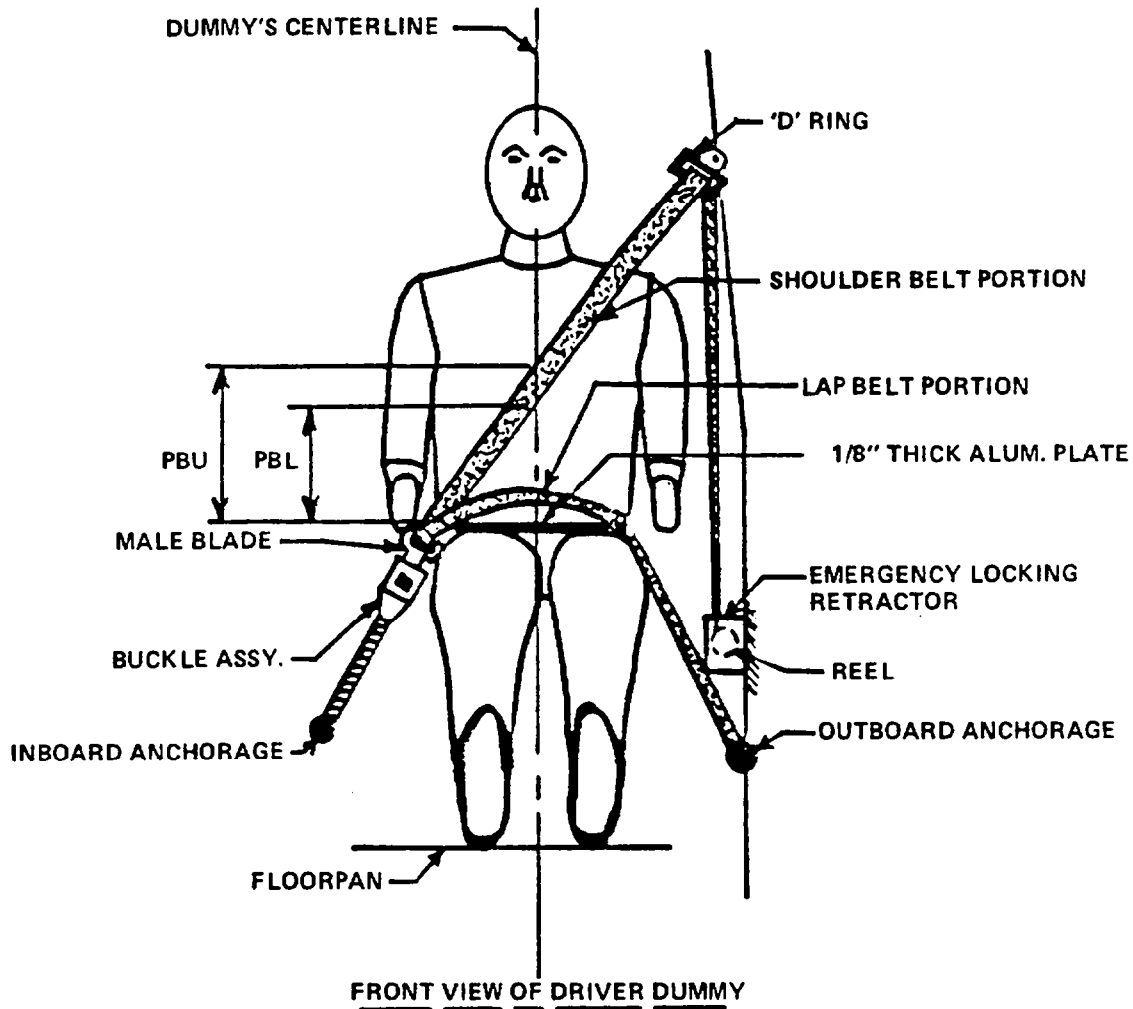
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R) = Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle
 HA = Head Target to "A" Pillar
 HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door
 KK = Knee to Knee



	DRIVER	PASSENGER
HR	9.6	8.8
HS	13.3	12.5
AD	5.1	4.8
HD	5.7	5.3
KK	7.9	7.2
HA	18.6	18.5

Note: Seat back angle was positioned according to manufacturer.

Figure 3
SEAT BELT POSITIONING DATA



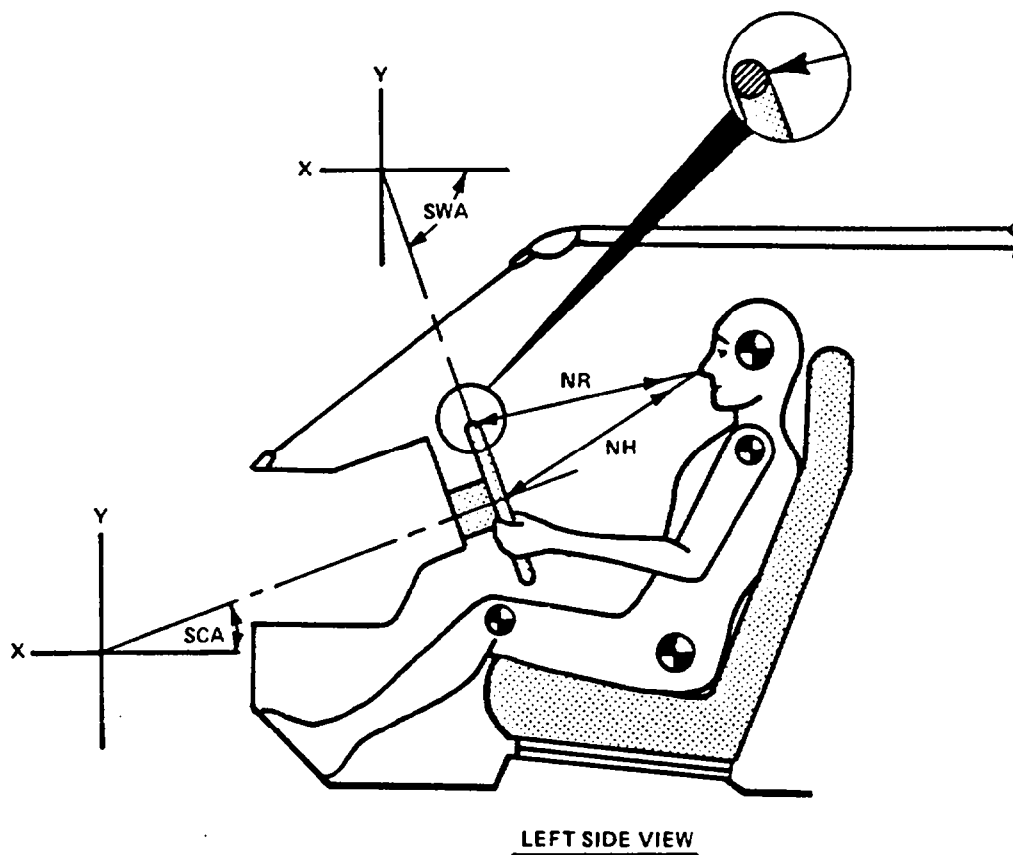
	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	12.8	12.9
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	9.8	9.9
<u>LAP BELT TENSION</u>	2.0 lbs.	2.0 lbs.
<u>SHOULDER BELT TENSION</u>	-	-

Table 3
SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>87.0"</u>	<u>85.0"</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>41.0"</u>	<u>40.0"</u>
Lap belt length as measured on Part 572 Dummy.	<u>31.0"</u>	<u>30.5"</u>
<u>SHOULDER BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>1.5"</u>	<u>1.5"</u>
As determined mechanically.	<u>1.0"</u>	<u>1.0"</u>
As determined electronically	<u>1.2"</u>	<u>2.0"</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>1.0 in/ft</u>	<u>1.1 in/ft</u>
Measured mechanically	<u>0.0 in/ft</u>	<u>0.0 in/ft</u>

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	14.0	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	15.2	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	27	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-63	Degrees

Figure 5
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

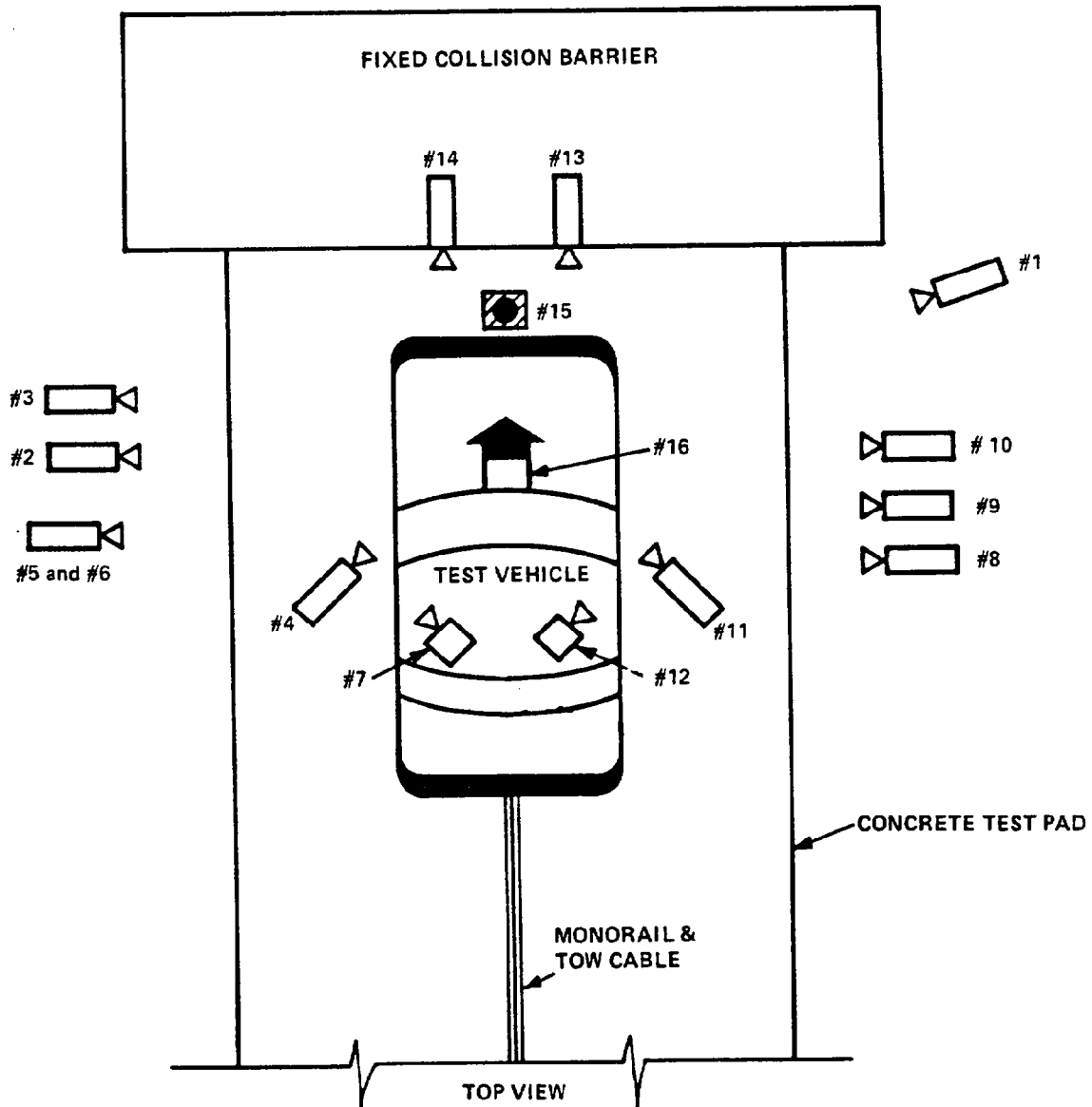


Table 4

HIGH-SPEED CAMERA LOCATIONS

Test No.	ML0107	Vehicle:	1990 Pontiac Trans Sport Van	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
CAMERA NO.	VIEW	X	Y	Z						
1	Real-Time Camera	-	-	-			-	-	-	24
2	Overall Left Side	246	67	41			-2	228	13	540
3	Left Side View	330	35	41			-2	312	25	535
4	Driver and Interior View	127	103	74			-14	109	13	630
5	Steering Column (Bottom)	314	91	46			-2	296	25	565
6	Steering Column (Top)	314	91	71			-8	296	25	555
7	Left Belt	-	-	-			-	-	8	550
8	Overall Right Side	242	75	42			-2	234	13	790
9	Right Side View	322	46	41			-2	304	25	750
10	Right Passenger View	322	66	59			-2	304	35	680
11	Passenger and Interior View	116	103	74			-16	98	25	645
12	Right Belt	-	-	-			-	-	8	600
13	Passenger Front View	24	-5	73			-38	-	13	540
14	Driver Front View	24	-5	73			-34	-	13	530
15	Windshield View	0	0	126			-45	-	13	500
16	Pit View of Engine	0	32	-120			90	-	13	825

*X = film plane to monorail centerline

Y = film plane to impact location

Z = film plane to ground

** = referenced to horizontal plane

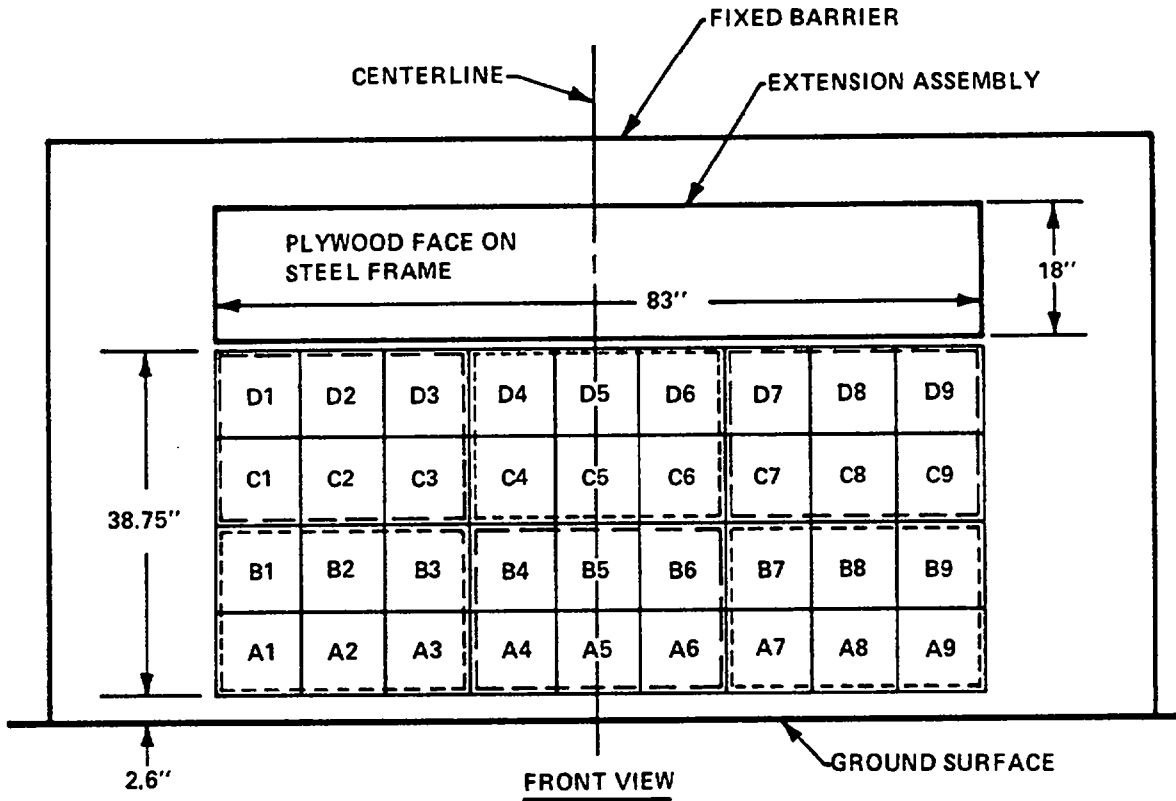
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
84



Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

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



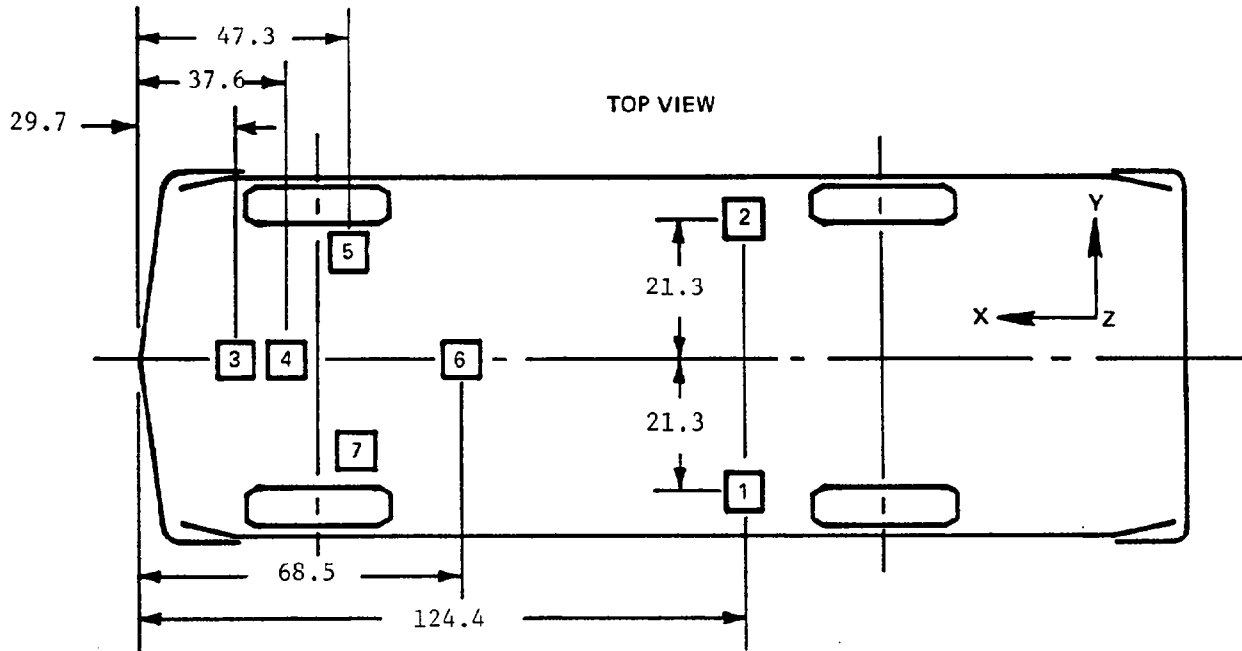
6 GROUPS OF 6 LOAD CELLS EACH

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	Instrument Panel	X		
7	Left Disc Brake Caliper	X		

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

Figure 9
TEST VEHICLE MEASUREMENTS

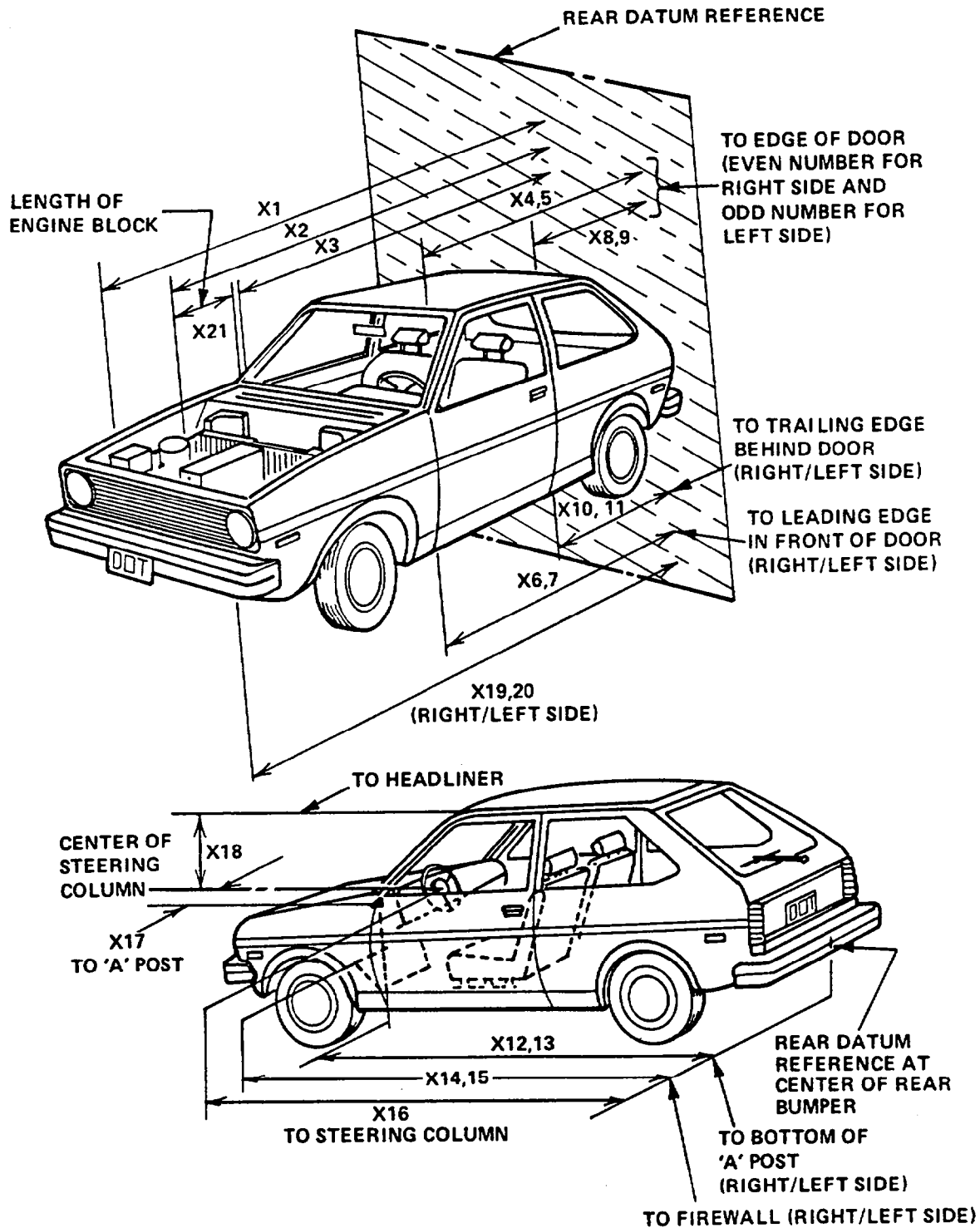


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	194.2	164.7	29.5
X2	Rear Surface of Vehicle to Front of Engine	167.0	155.7	11.3
X3	Rear Surface of Vehicle to Firewall	141.6	139.9	1.7
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	133.3	132.0	1.3
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	132.9	132.3	0.6
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	133.3	132.9	0.4
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	132.8	132.9	-0.1
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	86.4	83.3	3.1
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	86.1	83.4	2.7
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	91.7	91.6	0.1
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	91.1	91.5	-0.4
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	131.9	132.0	-0.1
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	131.9	132.2	-0.3
X14	Rear Surface of Vehicle to Firewall, Right Side	140.6	136.8	3.8
X15	Rear Surface of Vehicle to Firewall, Left Side	142.5	137.5	5.0
X16	Rear Surface of Vehicle to Steering Column	115.9	113.2	2.7
X17	Center of Steering Column to "A" Post	18.8	17.8	1.0
X18	Center of Steering Column to Headliner	18.7	19.4	-0.7
X19	Rear Surface of Vehicle to Right Side of Front Bumper	190.8	163.2	27.6
X20	Rear Surface of Vehicle to Left Side of Front Bumper	190.5	164.5	26.0
X21	Length of Engine Block	20.0	20.0	0.0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	126.3	121.6	4.7
CD	Rear Surface of Vehicle to Center of Dash Panel	127.2	123.9	3.3
LD	Rear Surface of Vehicle to Left Side of Dash Panel	126.3	124.6	1.7

Appendix A

PHOTOGRAPHS

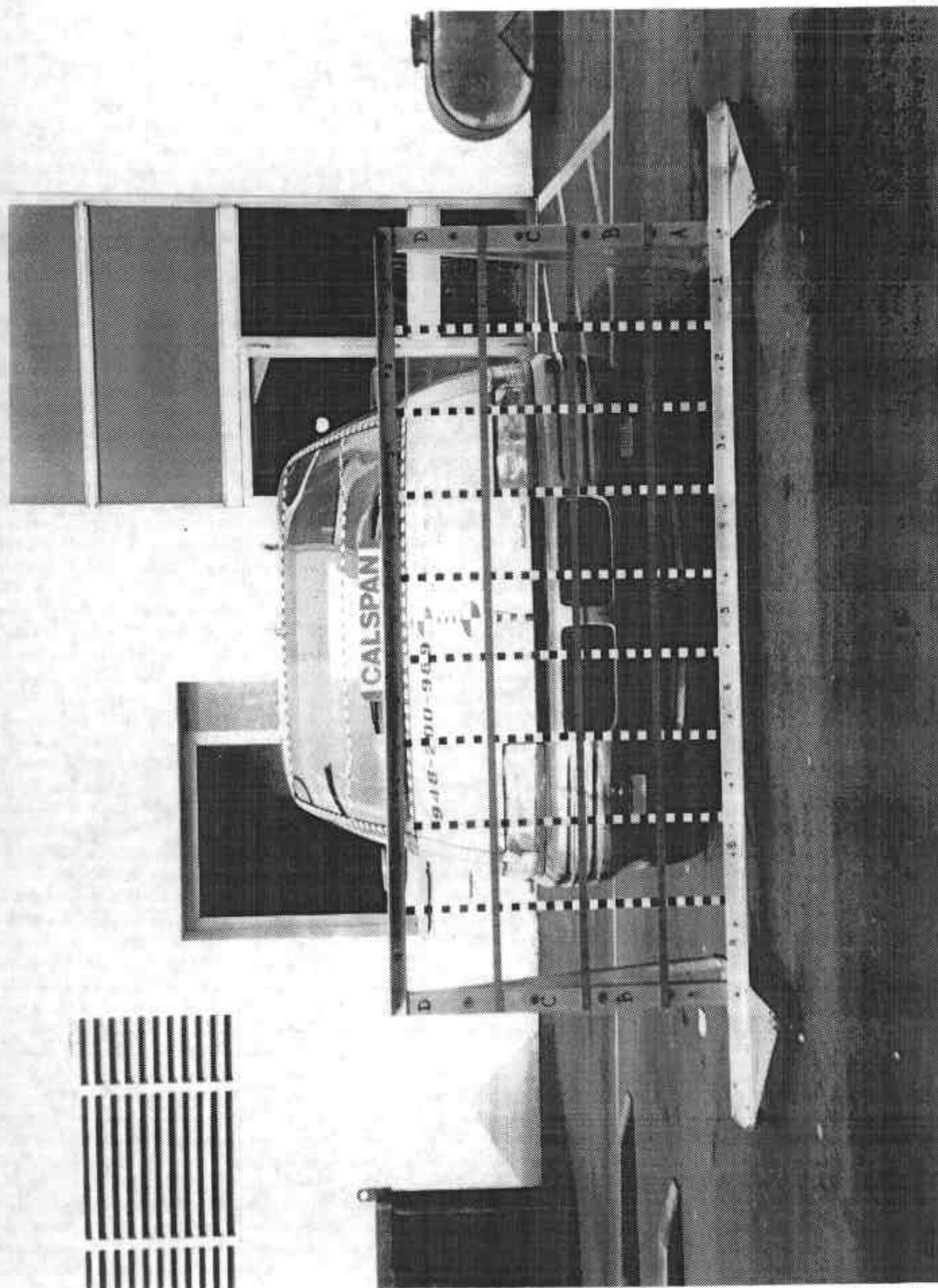


FIGURE A-1 LOAD CELL LOCATIONS

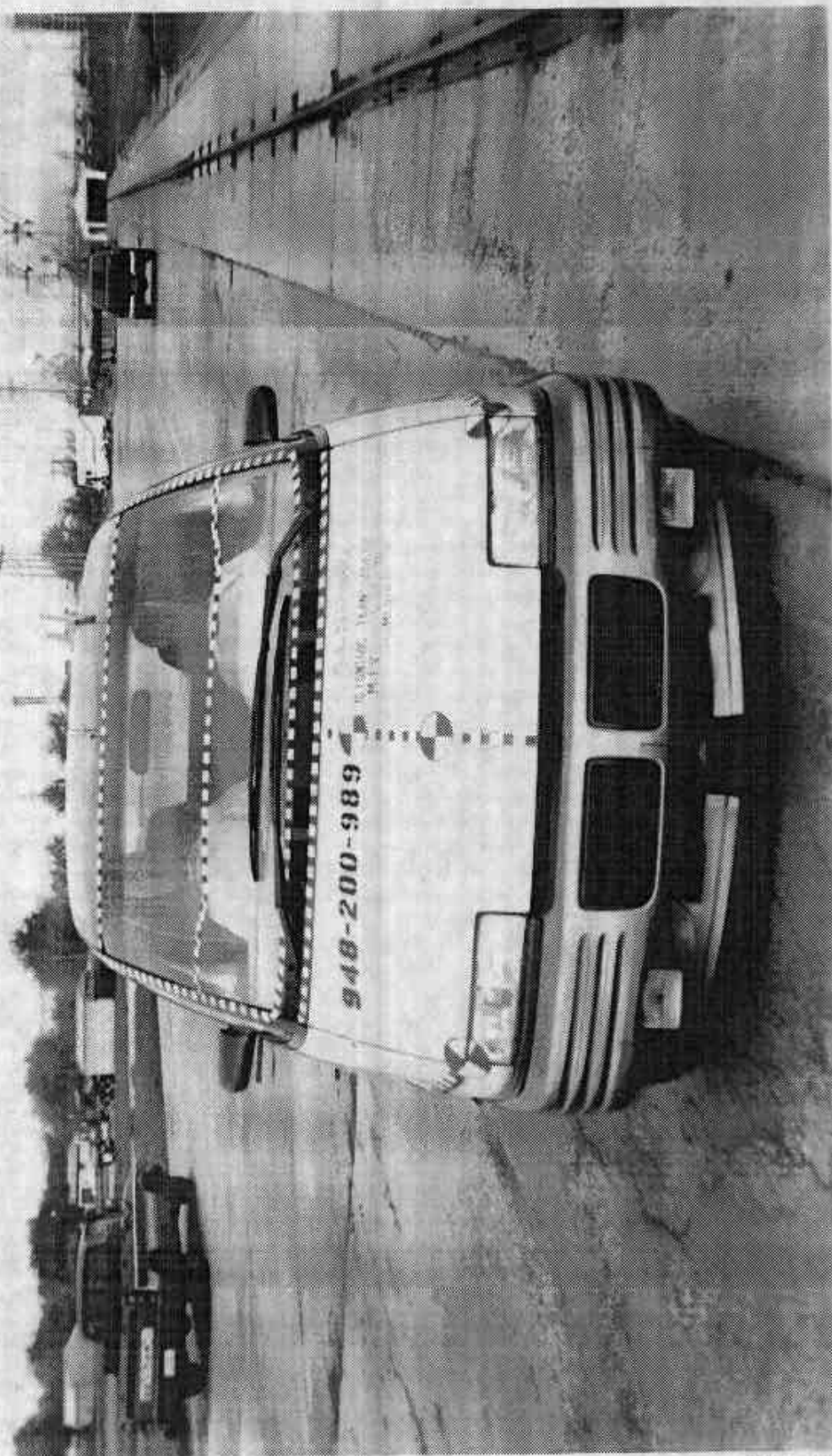


Figure A-2 PRE-TEST FRONT VIEW

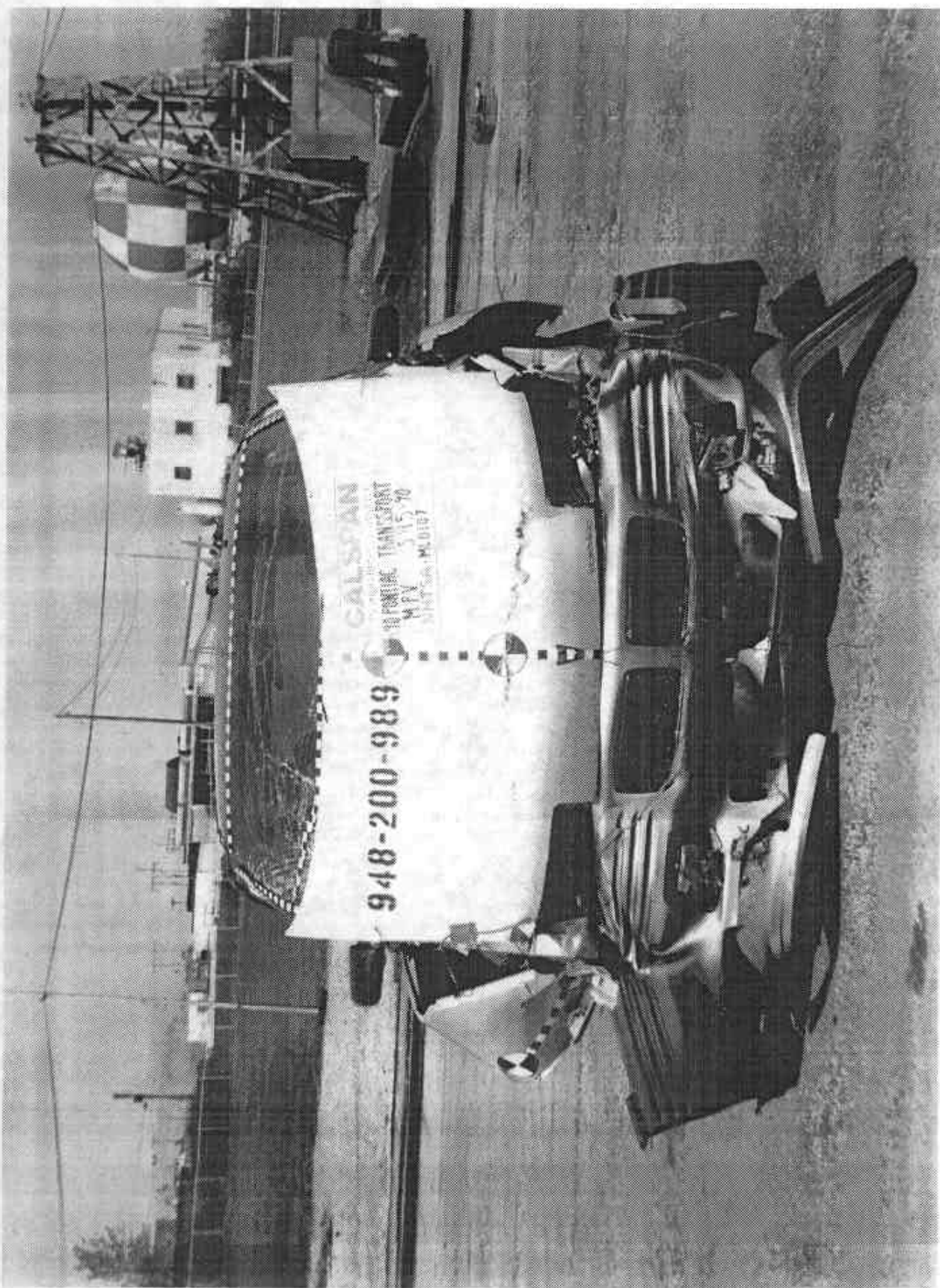


Figure A-3 POST TEST FRONT VIEW

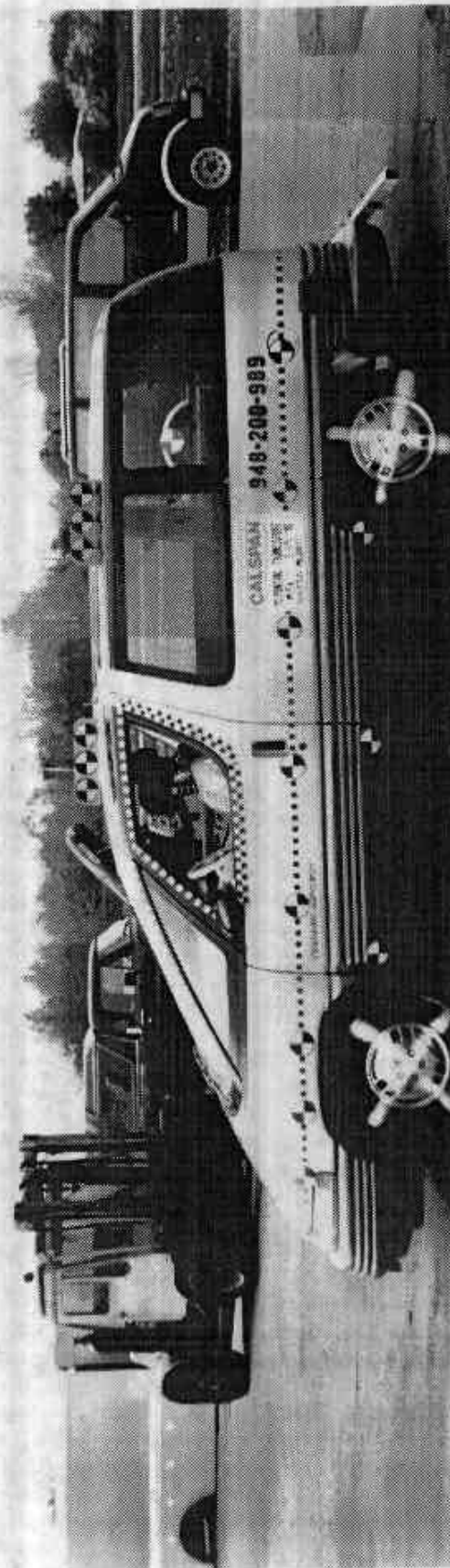


Figure A-4 PRE TEST LEFT SIDE VIEW

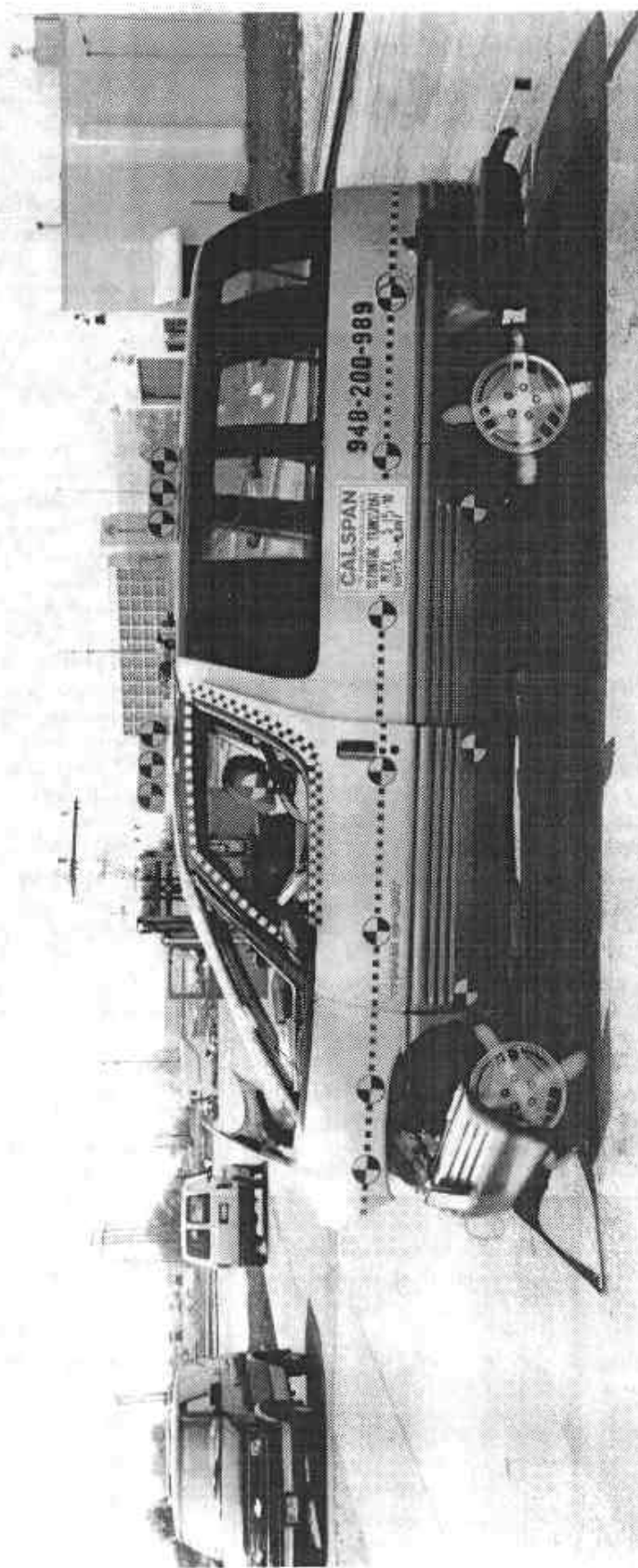


Figure A-5 POST TEST LEFT SIDE VIEW

A-5

7776-20

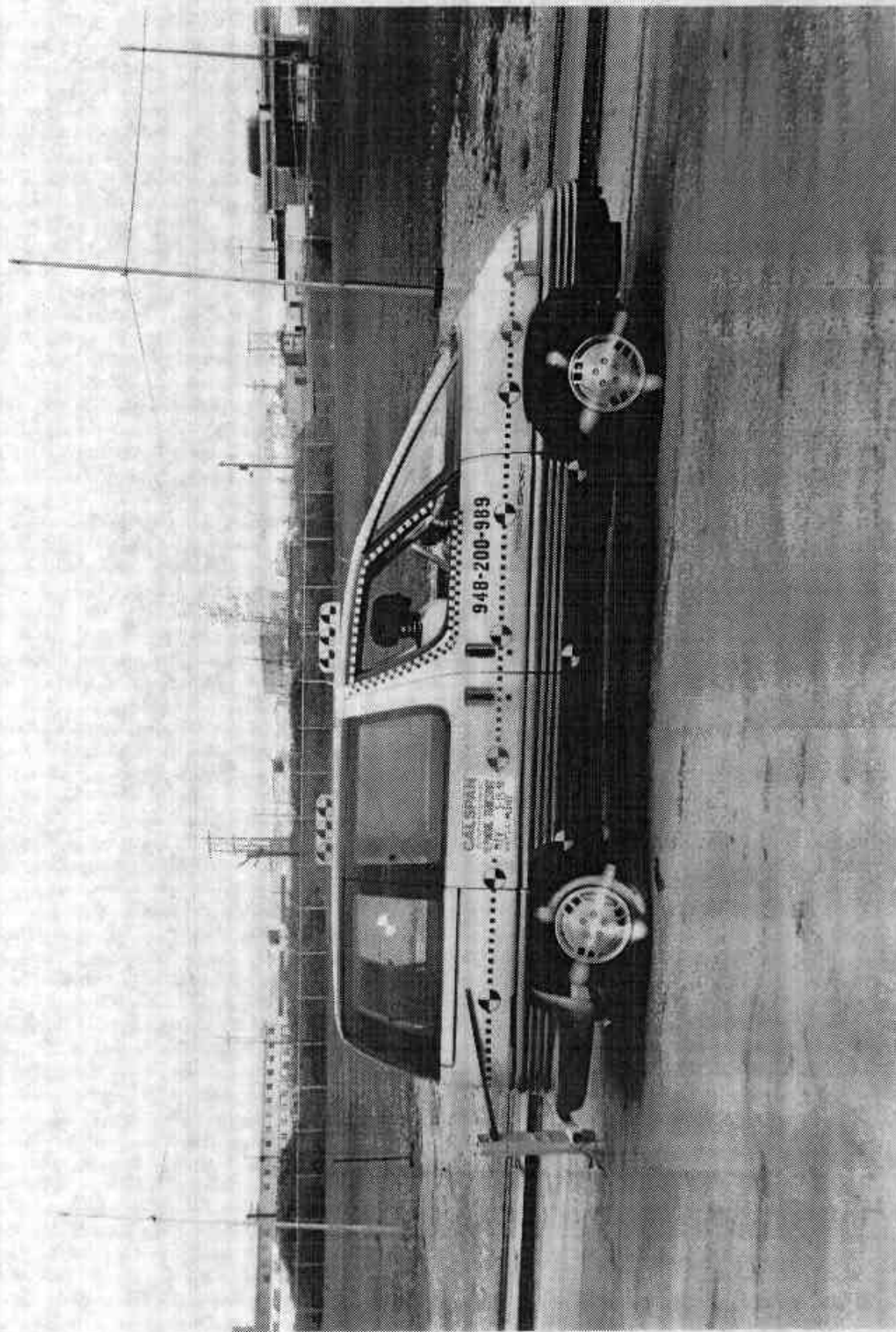


Figure A-6 PRE-TEST RIGHT SIDE VIEW

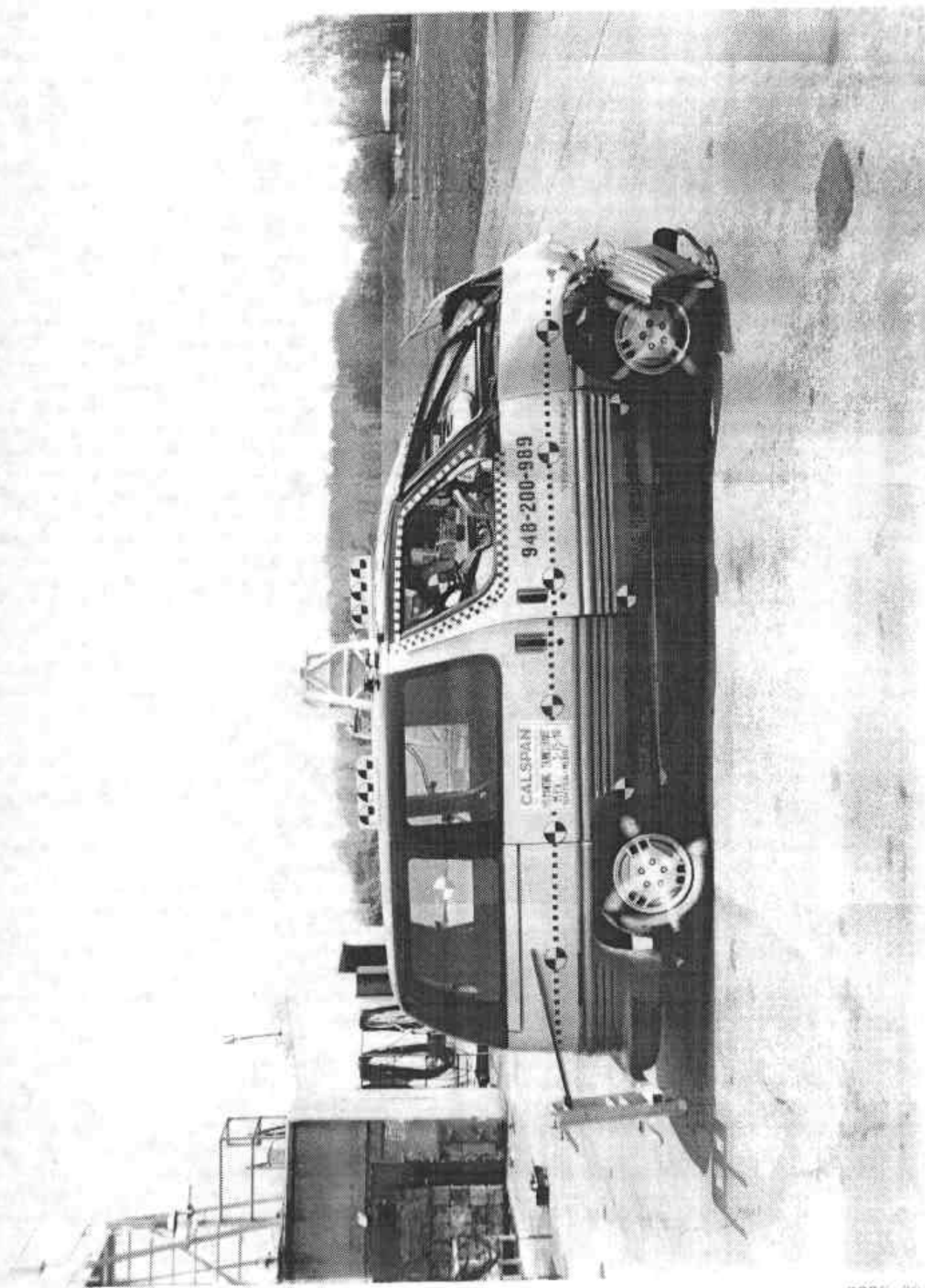


Figure A-7 POST-TEST RIGHT SIDE VIEW



Figure A-8 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

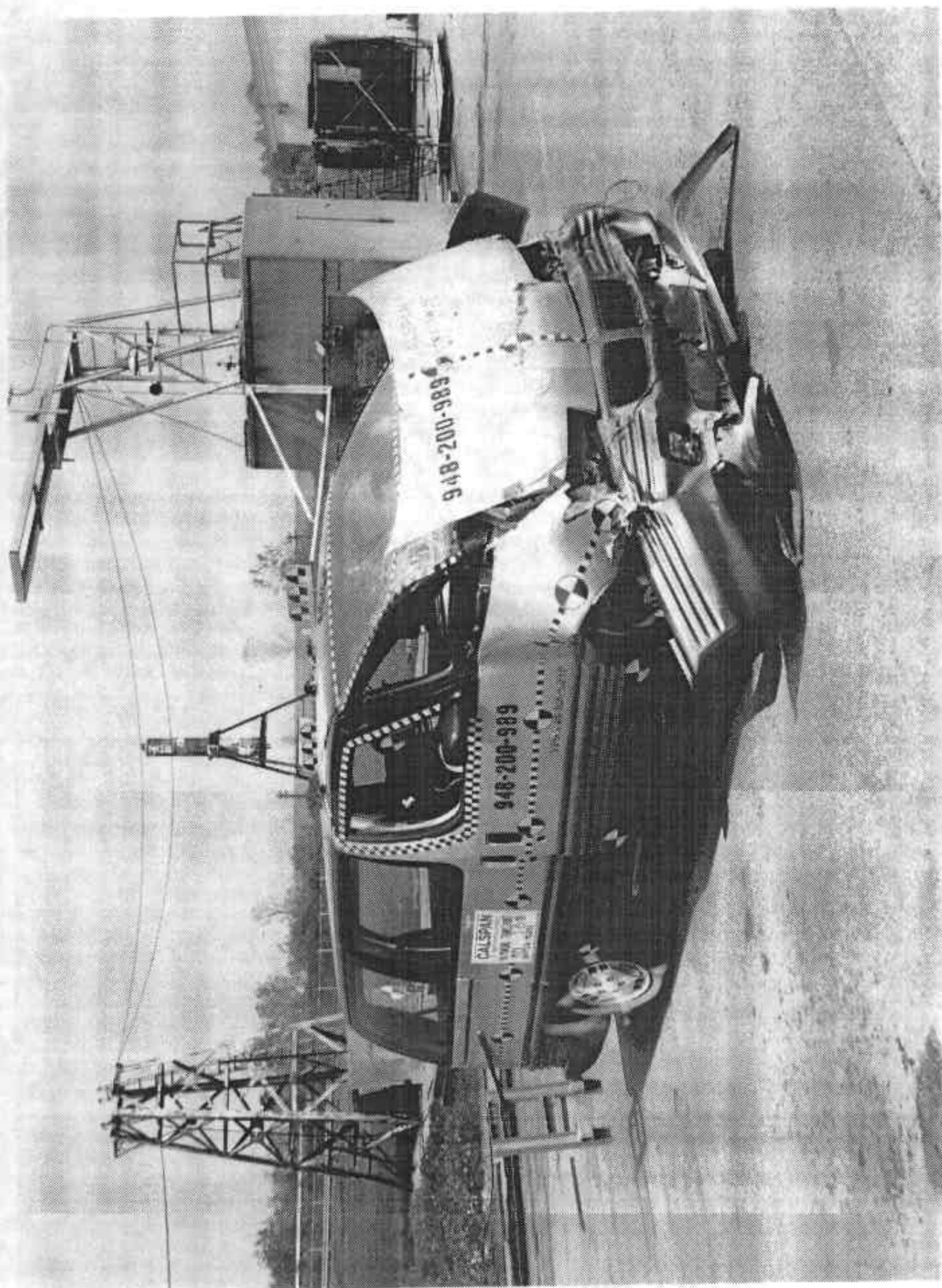


Figure A-9 POST-TEST RIGHT FRONT THREE-QUARTER VIEW



FIGURE A-10 PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-11 POST-TEST LEFT REAR THREE-QUARTER VIEW

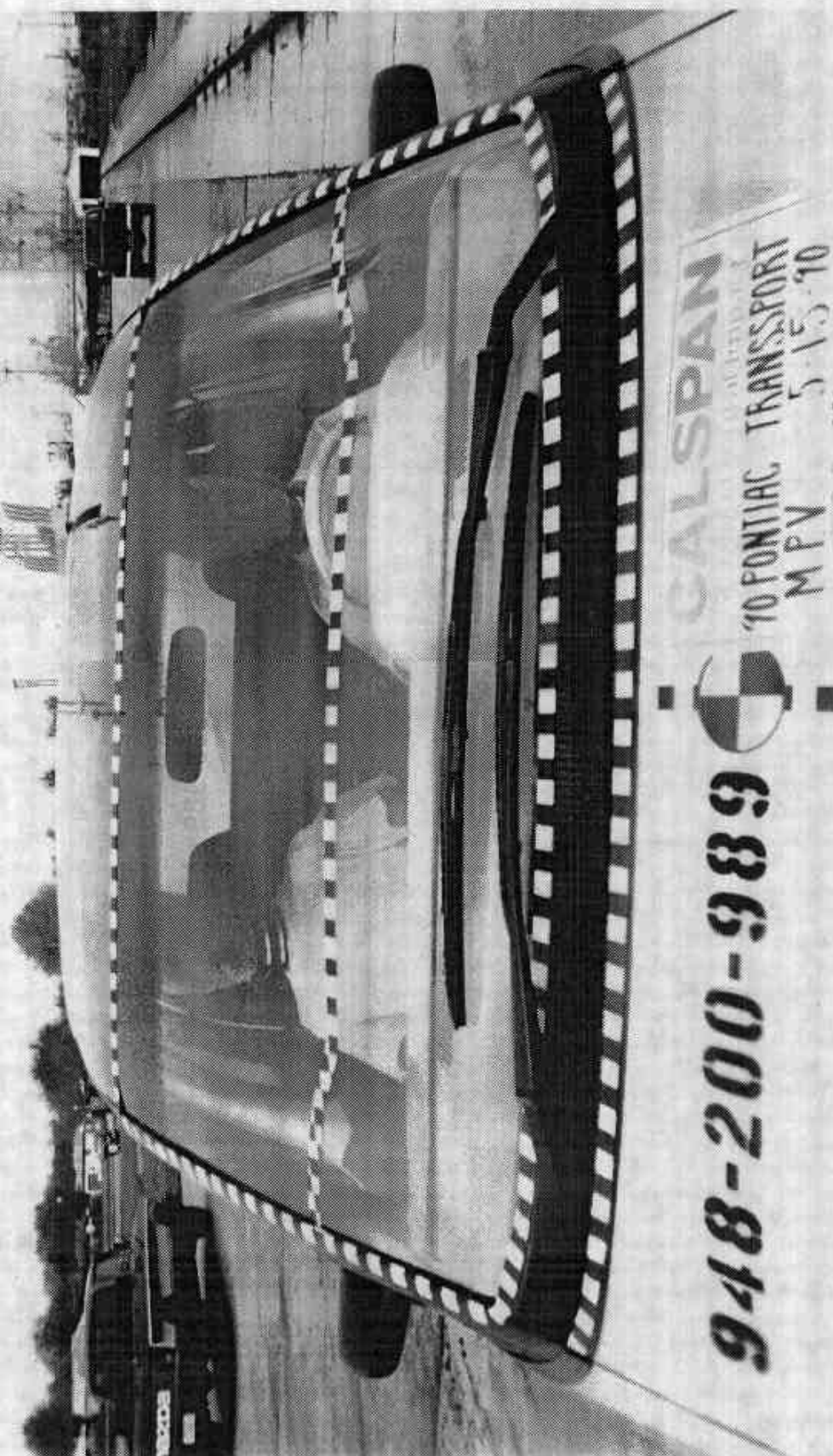


Figure A-12. PRE-TEST WINDSHIELD VIEW

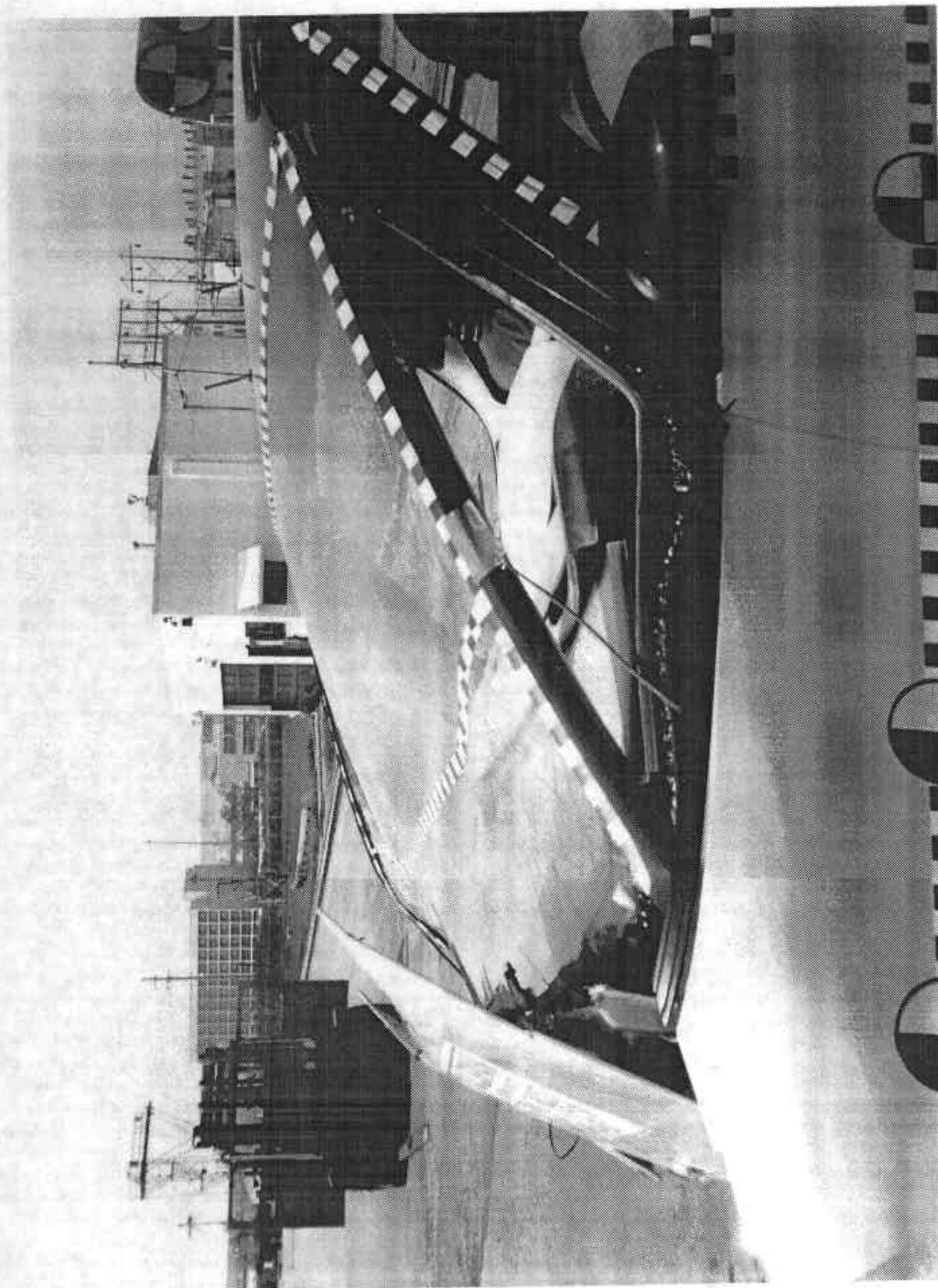


Figure A-13 POST-TEST WINDSHIELD VIEW

A-14

7776-20

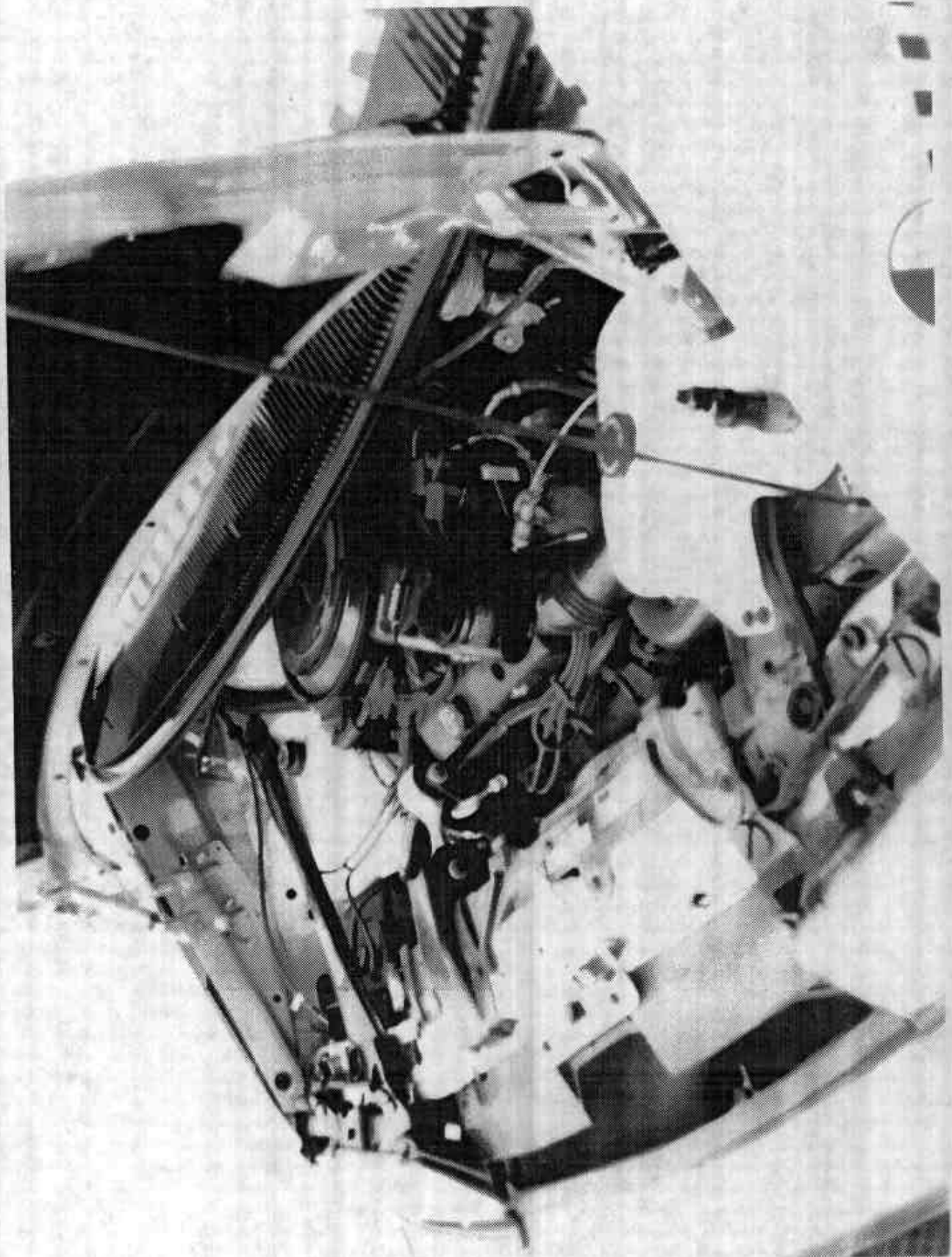
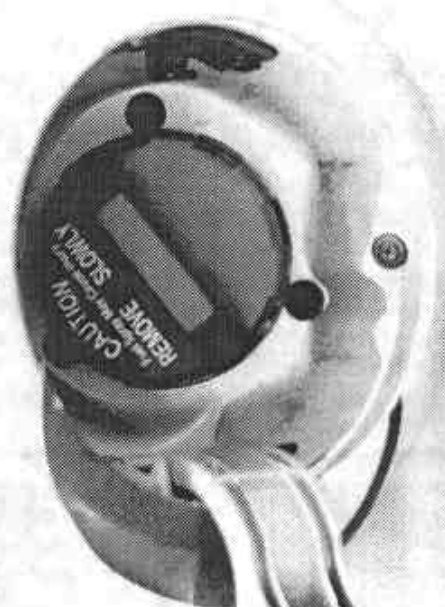


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

686



A-16

7770-20

Figure A-15 FUEL CAP VIEW

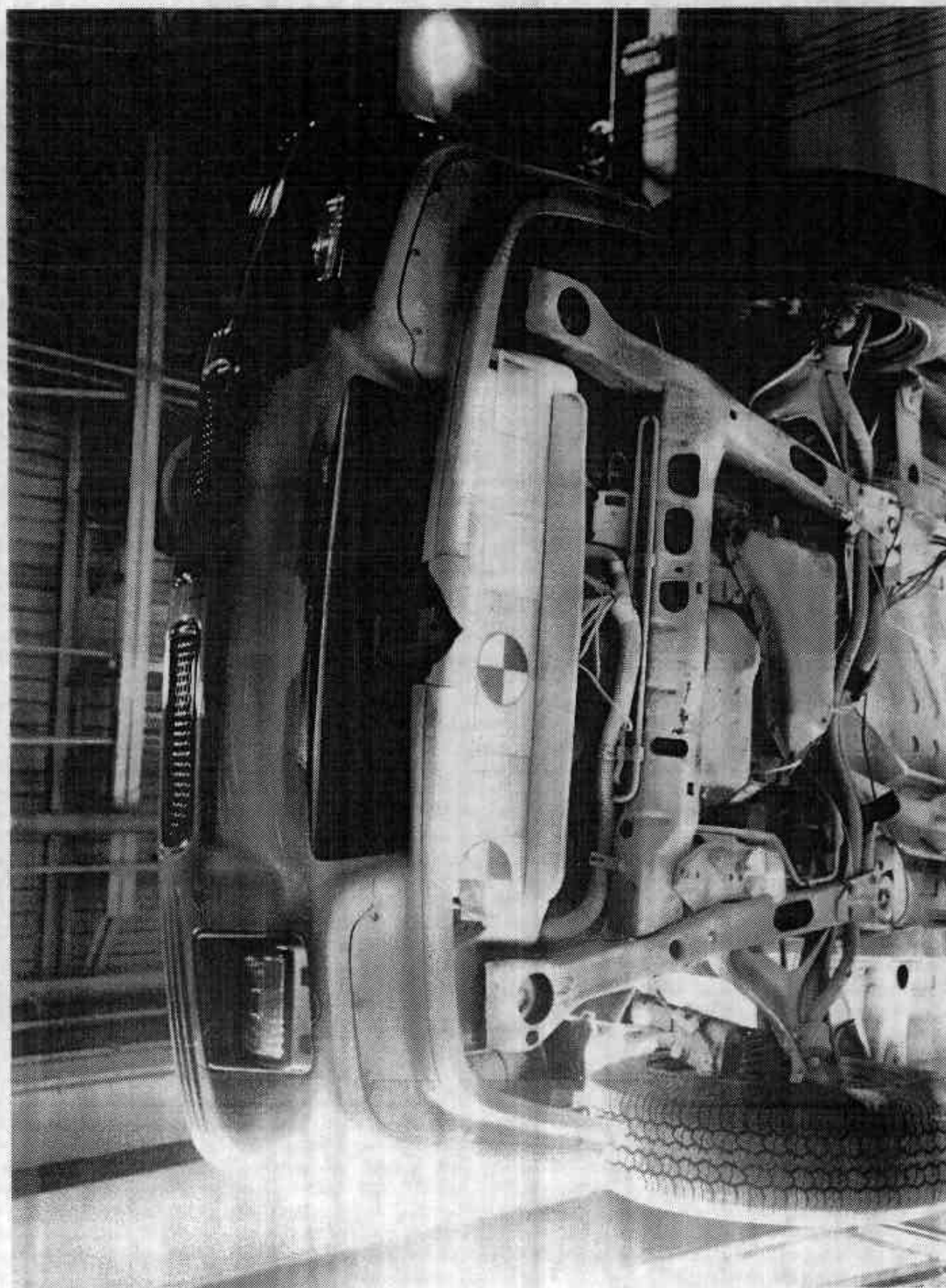


Figure A-16. PRE-TEST FRONT UNDERBODY VIEW

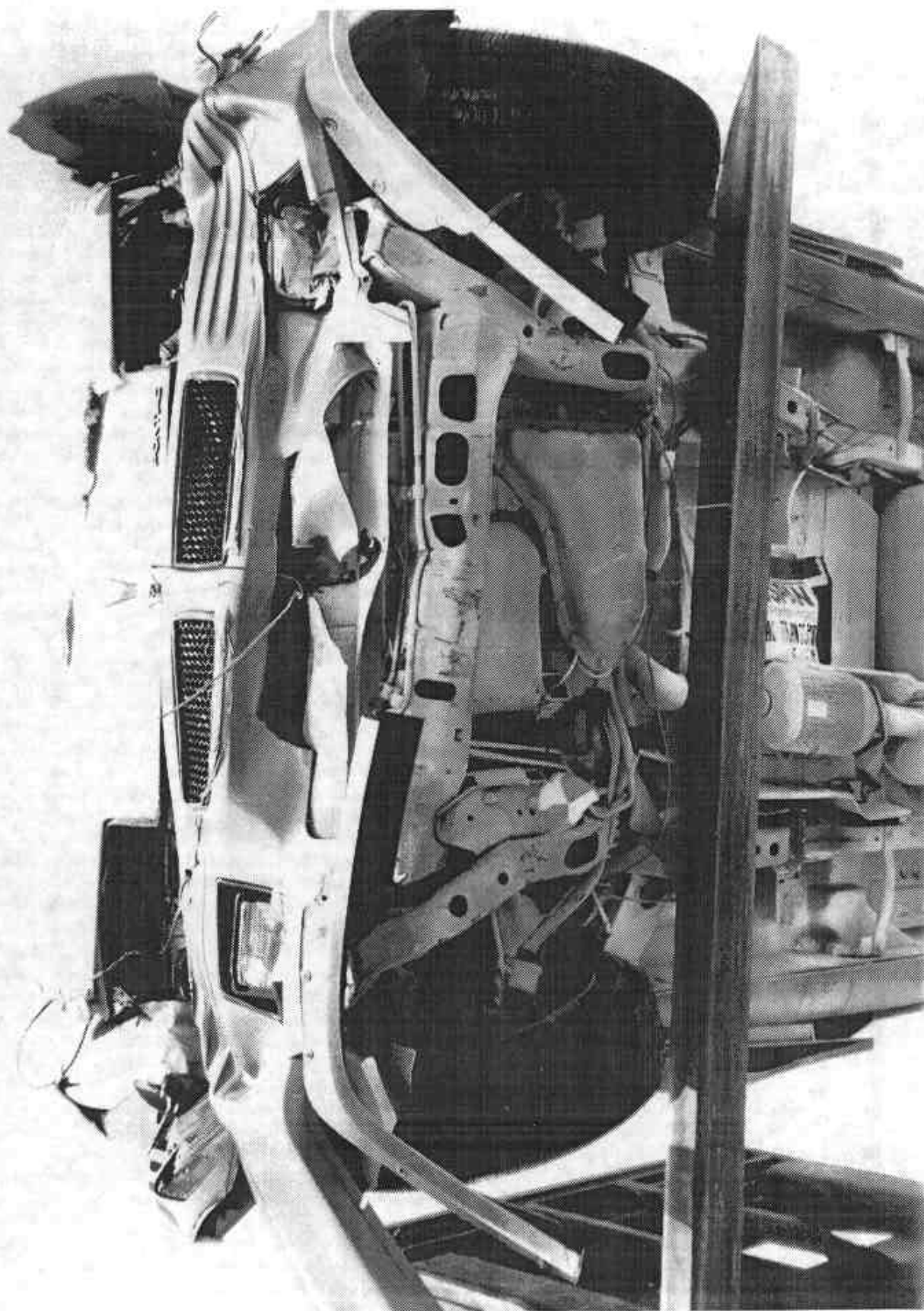


FIGURE A-17 POST-TEST FRONT UNDERBODY VIEW

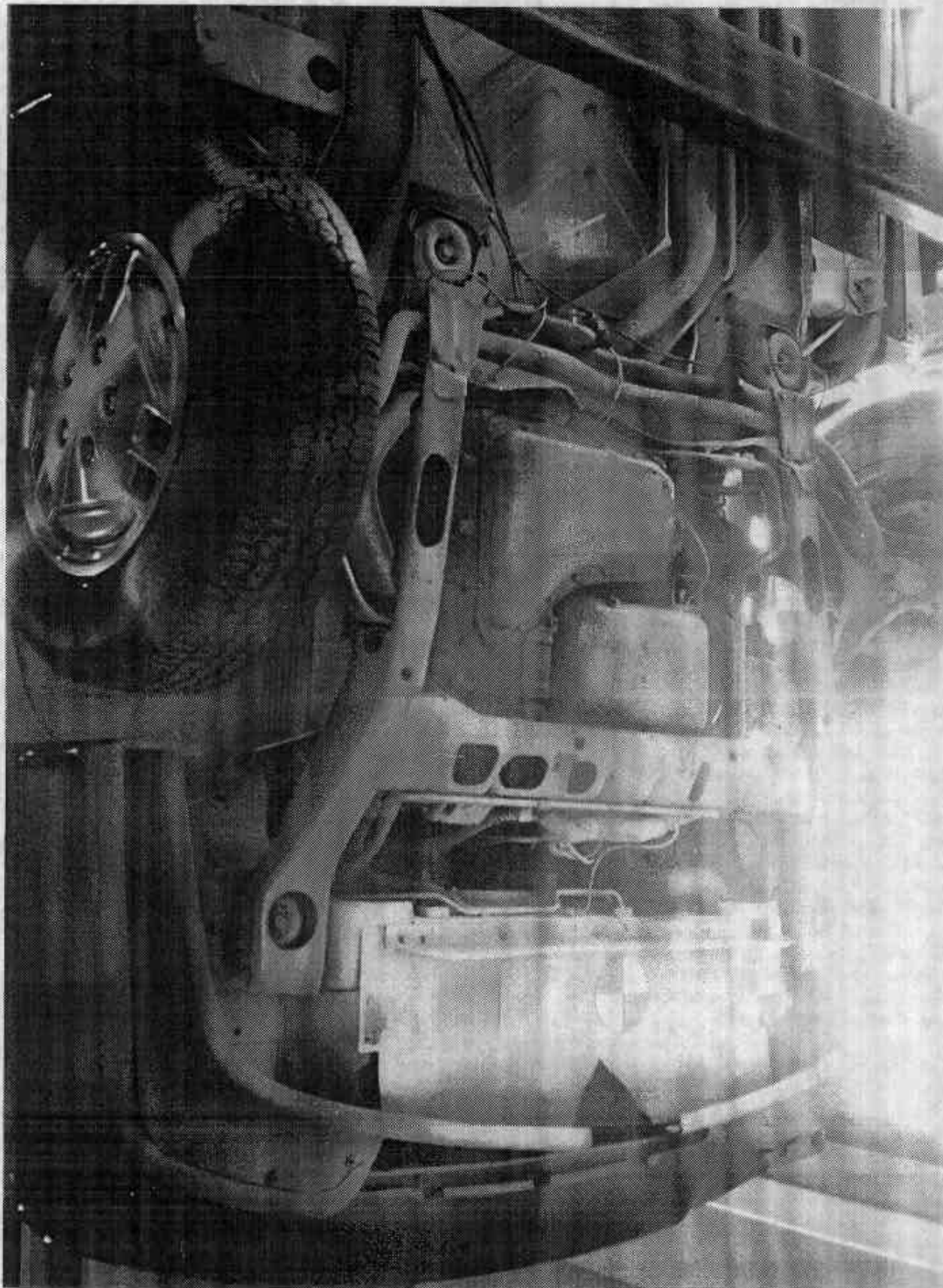


Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

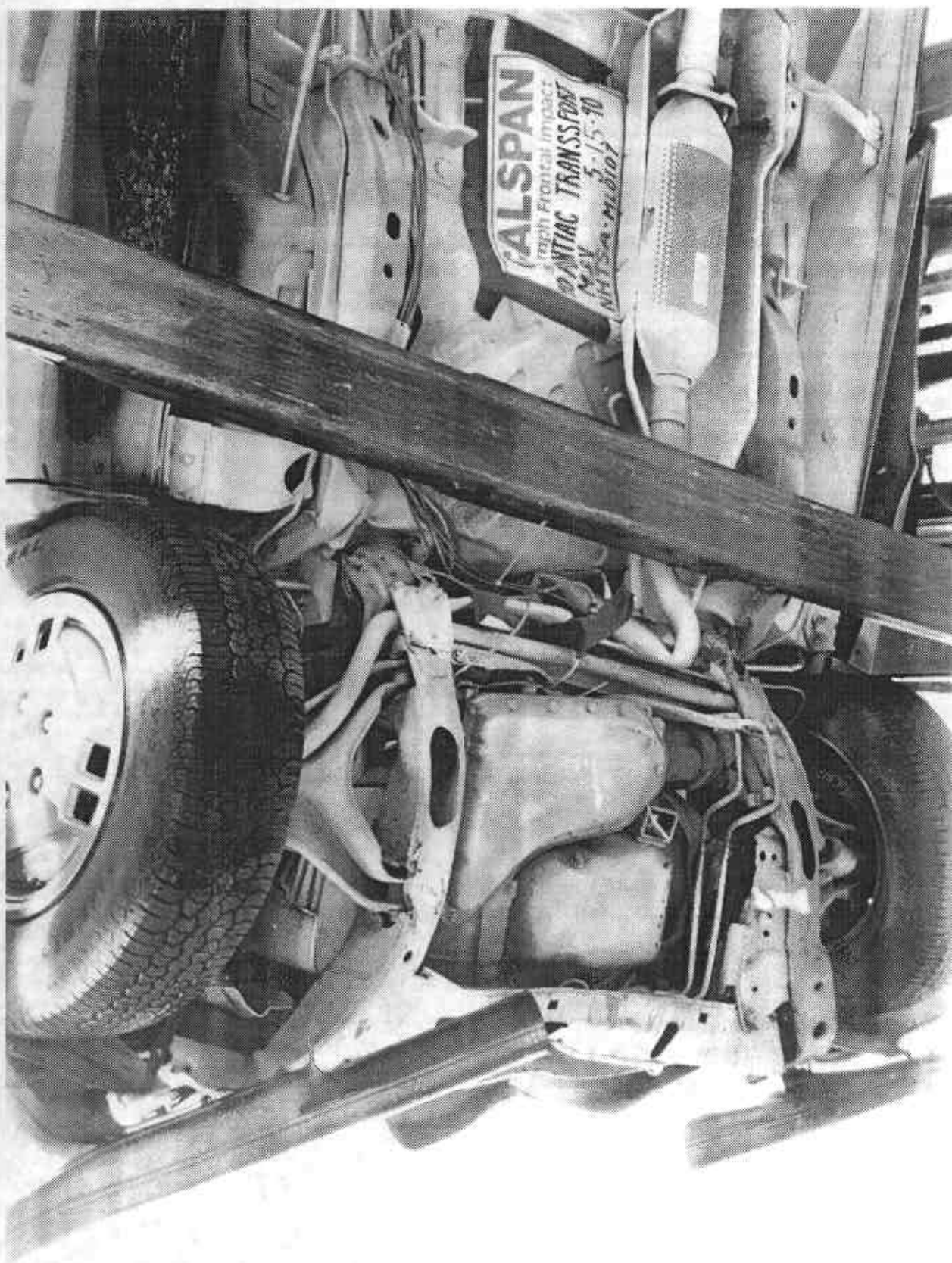


Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW

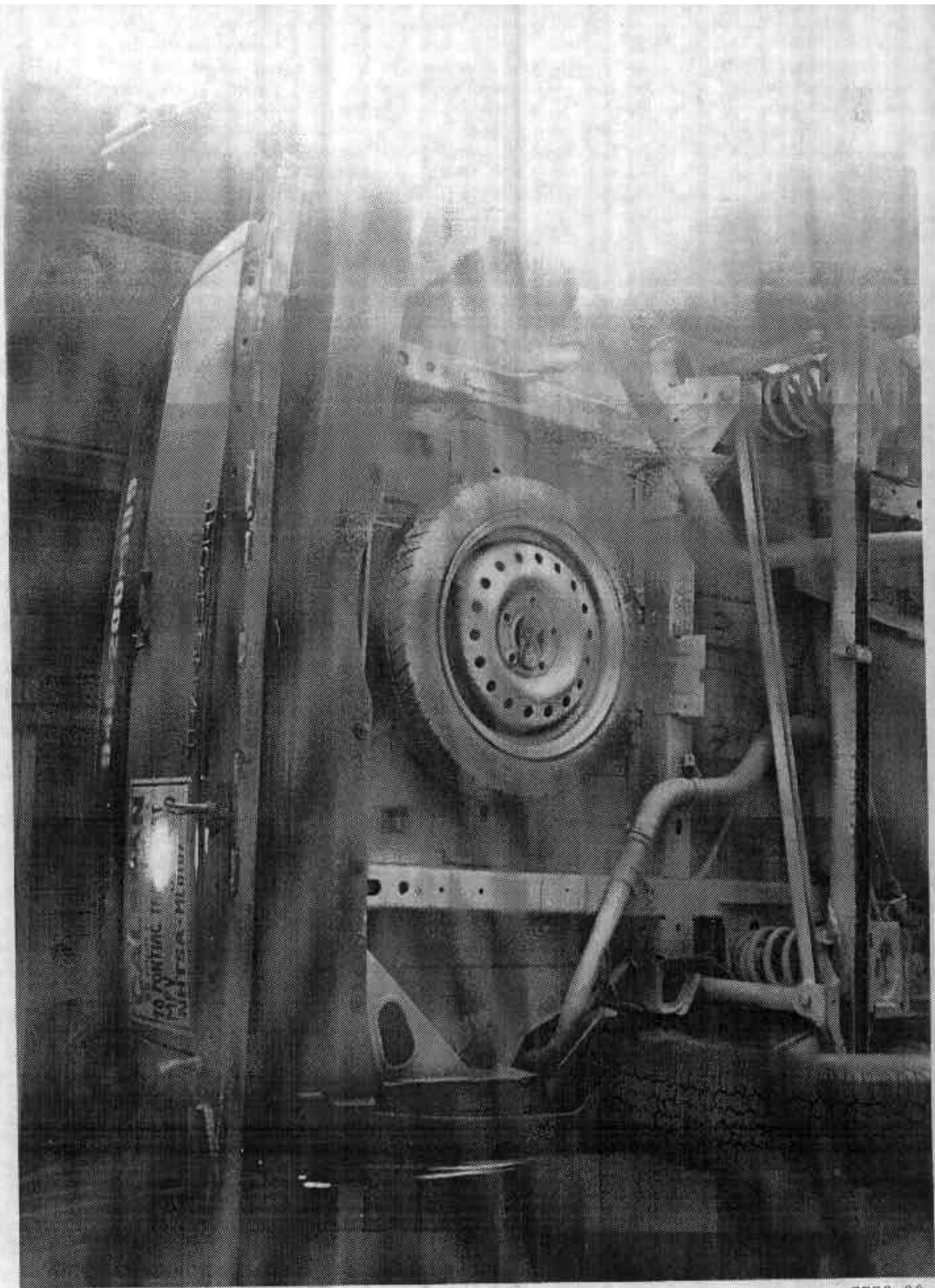


Figure A-20 PRE-TEST REAR UNDERBODY VIEW

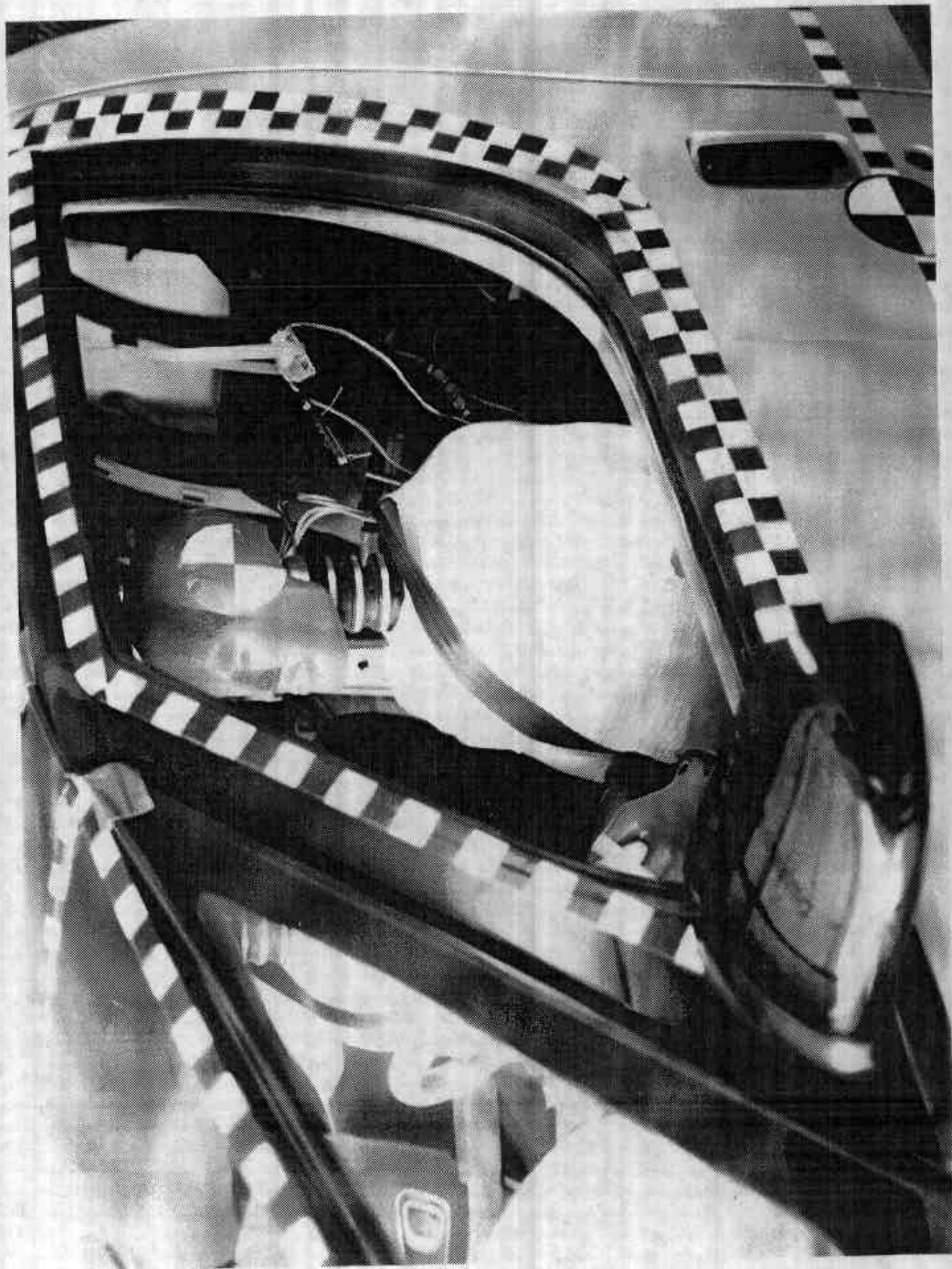


Figure A-22 PRE-TEST DRIVER POSITION VIEW

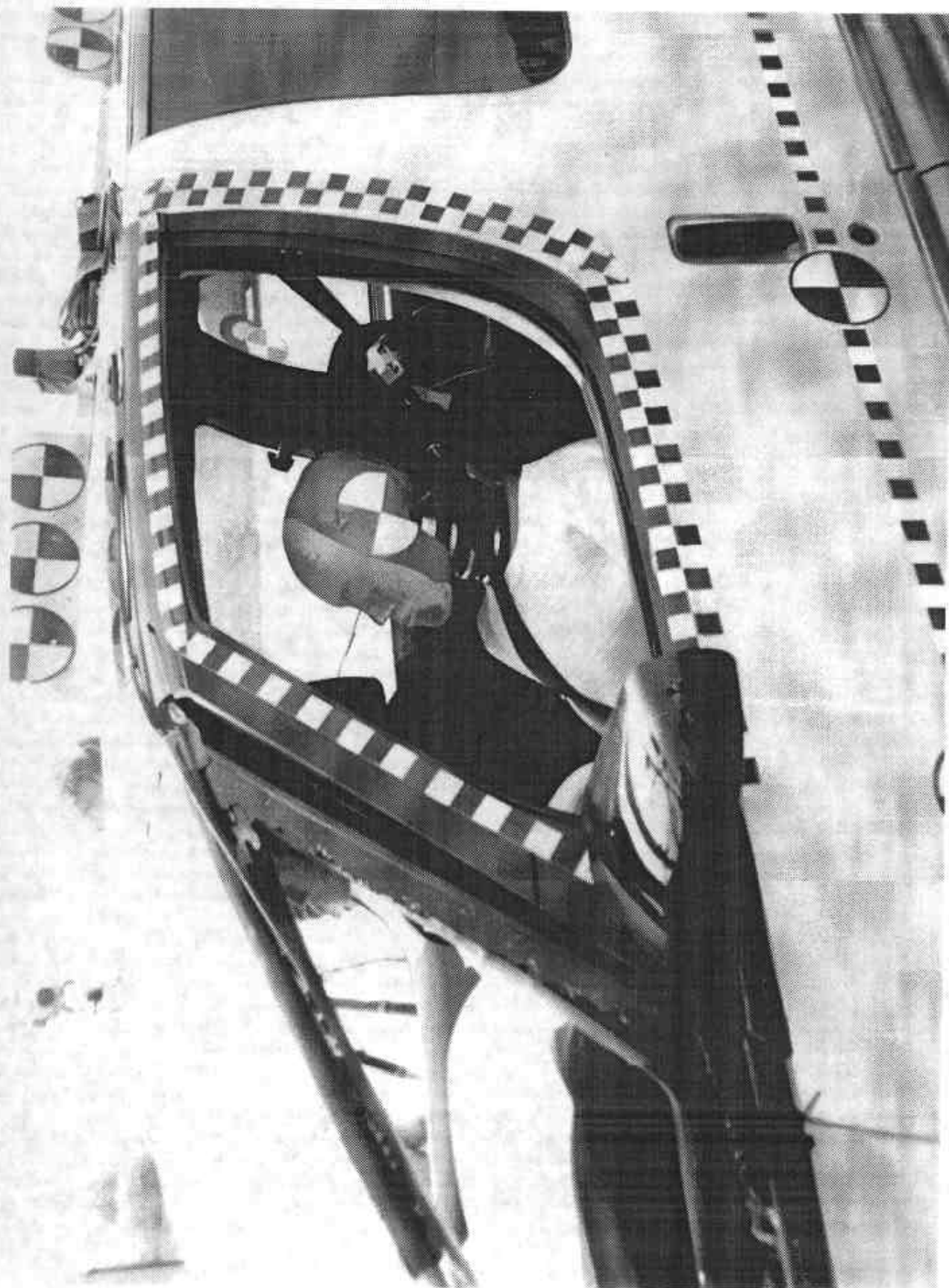


Figure A-23 POST-TEST DRIVER POSITION VIEW

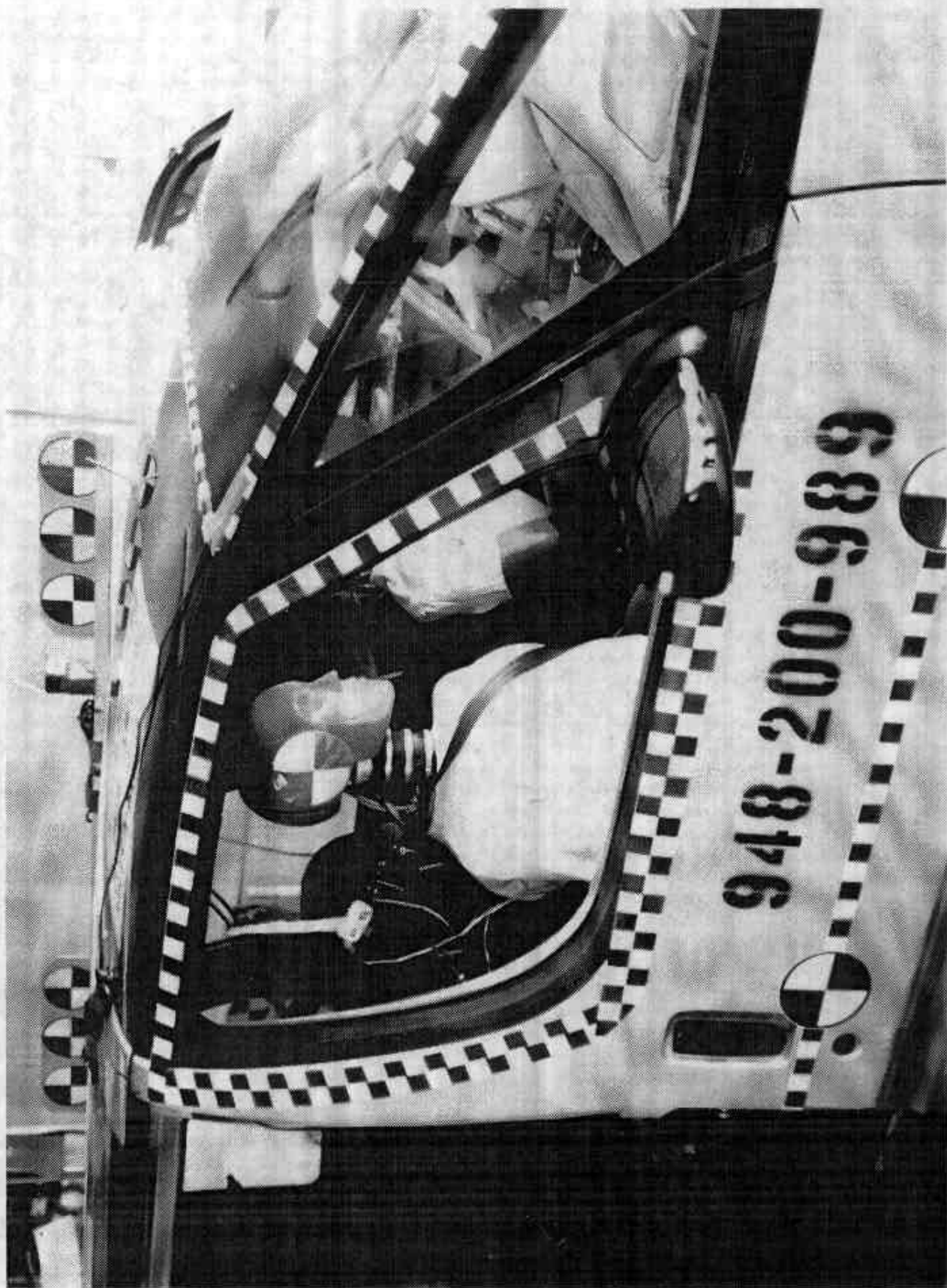


Figure A-24 PRE-TEST PASSENGER POSITION VIEW



Figure A-25 POST-TEST PASSENGER POSITION VIEW

A-26

7776-20

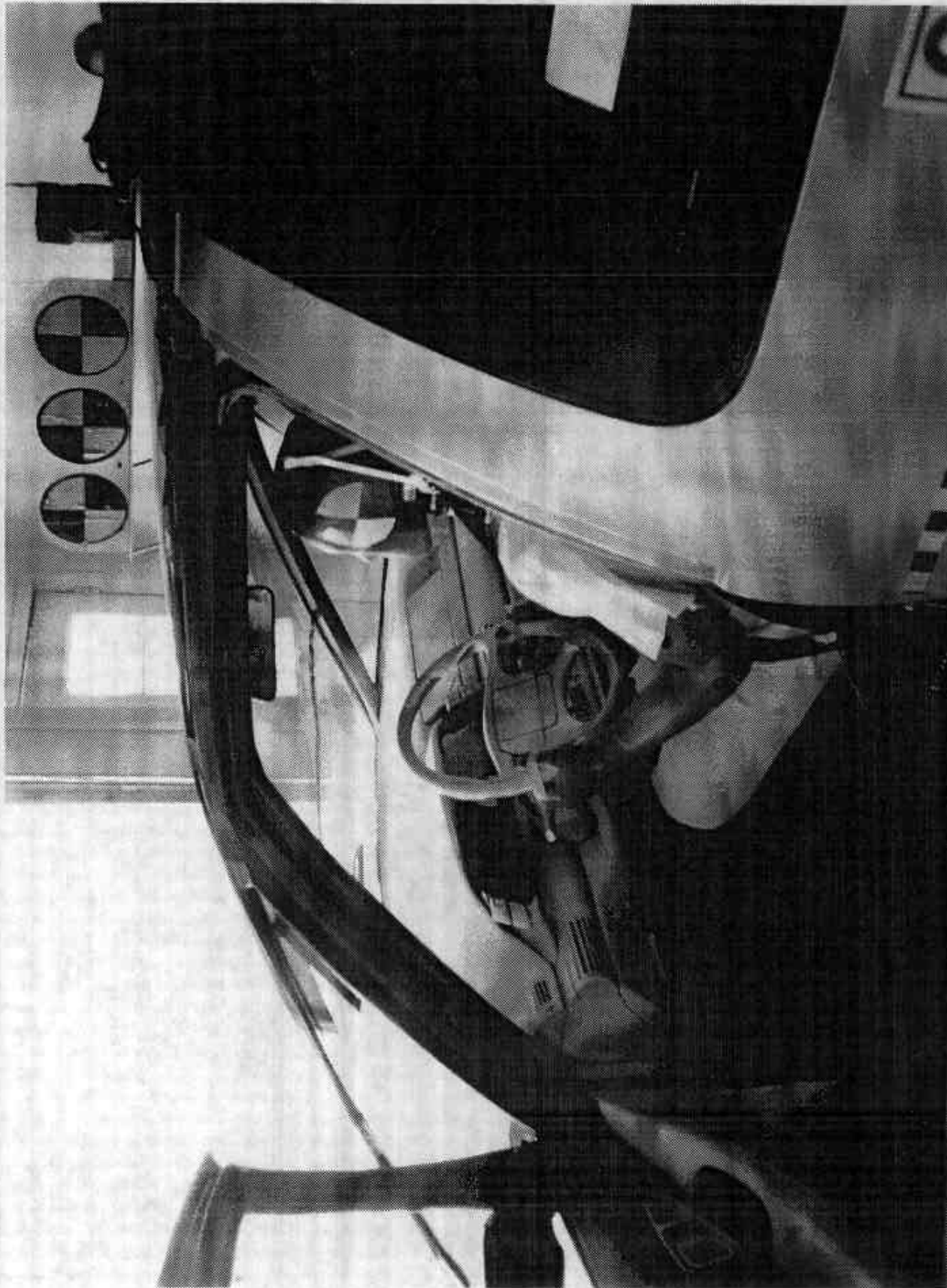


FIGURE A-26 PRE-TEST DRIVER AND INTERIOR VIEW

A-27

7770-20



Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW



FIGURE A-28 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

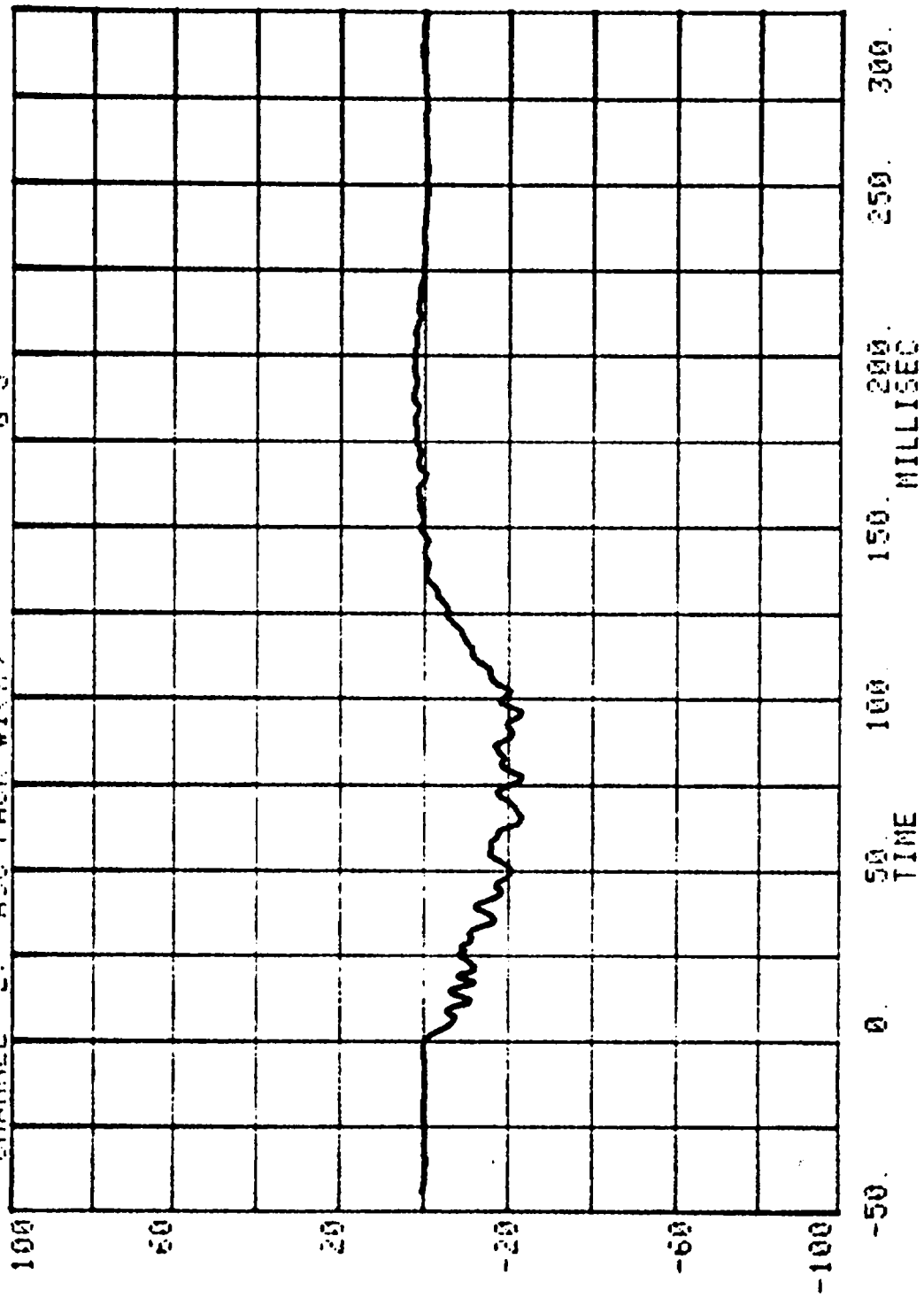
TEST NO. ML0107

VEHICLE DATA

FILTER CHANNEL CLASS

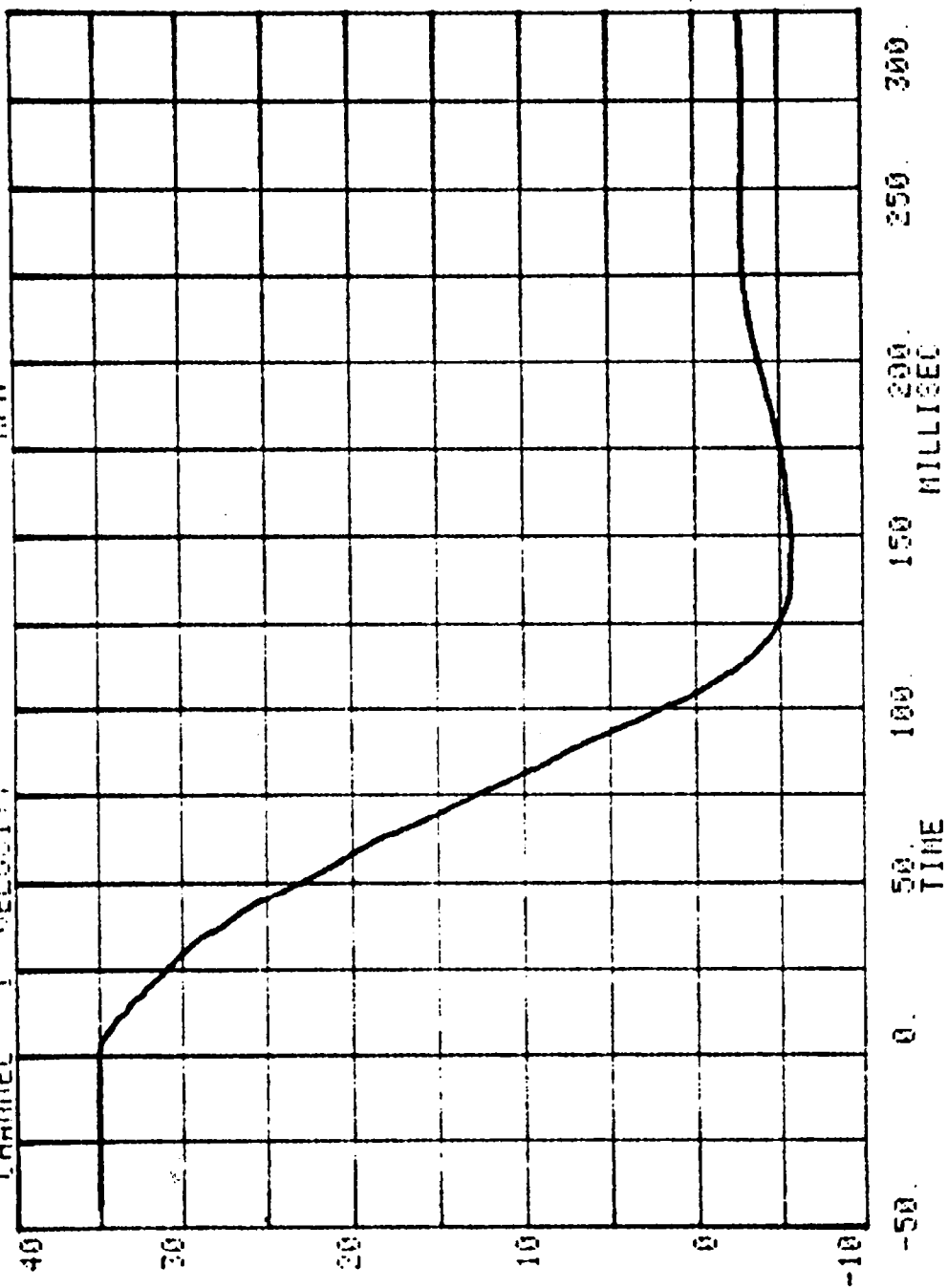
60

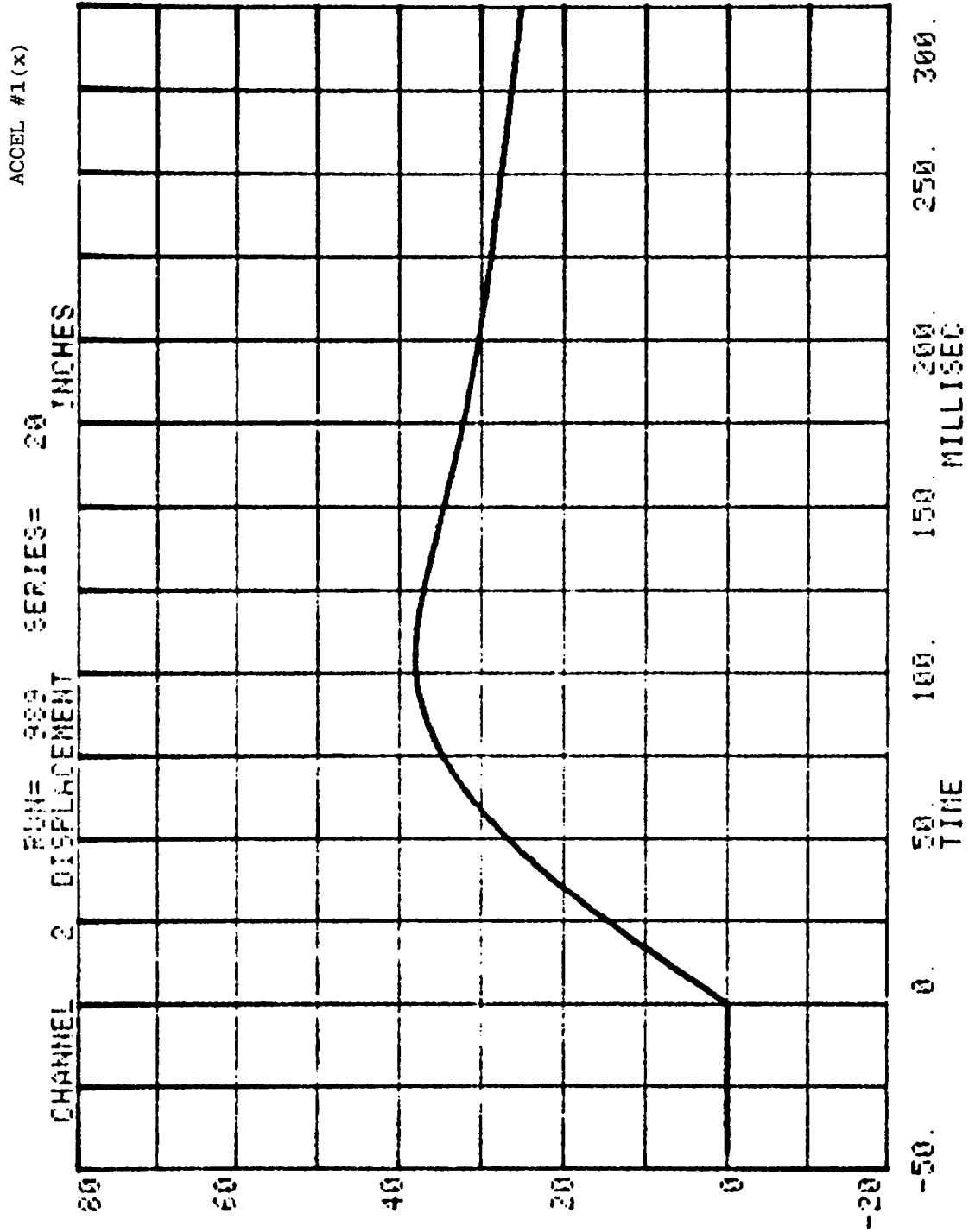
CHANNEL 27 ACC PAK #100
FUN= 982 SERIES= 20
5'S

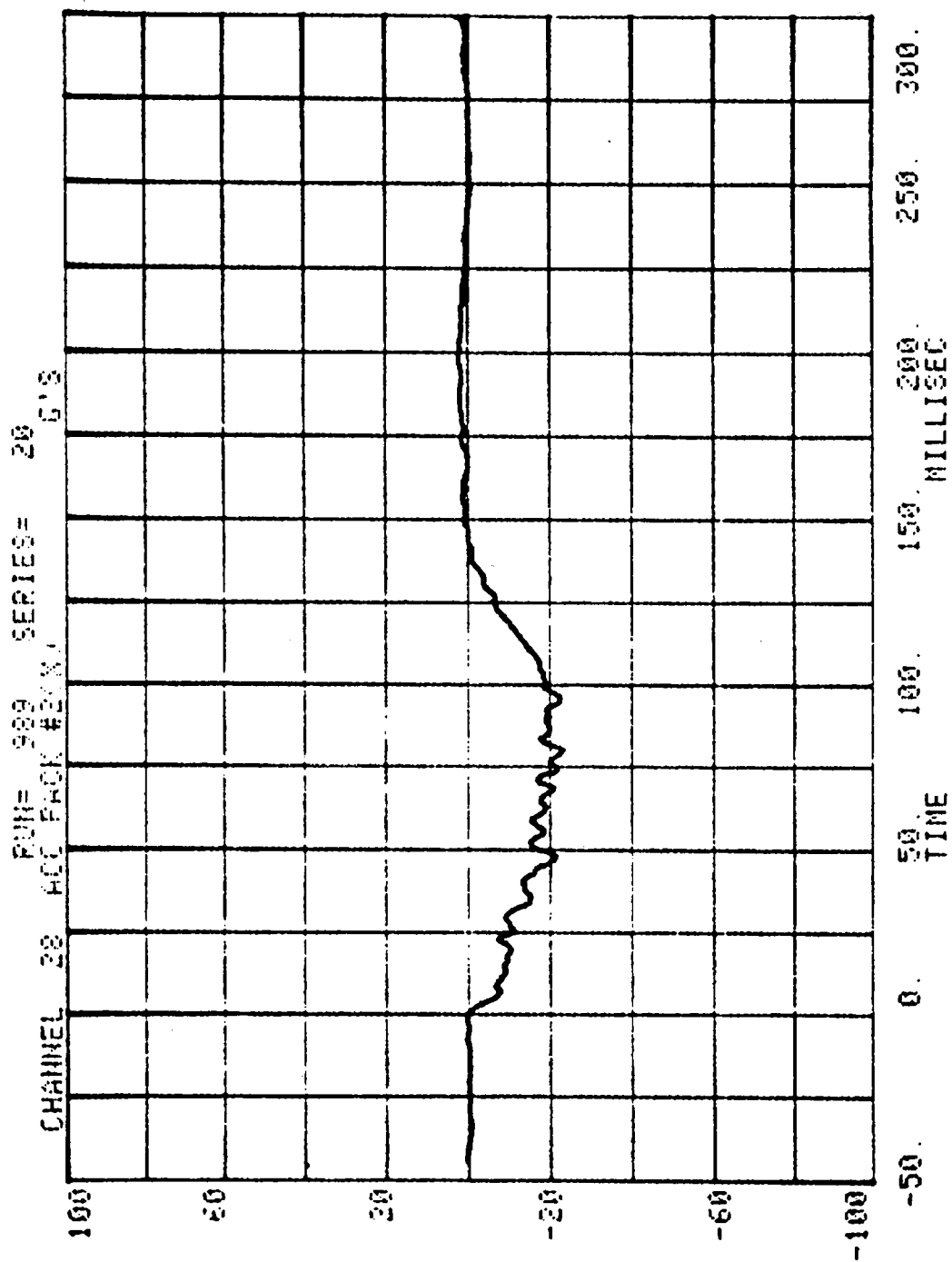


ACCEL #1(x)

CHANNEL 1 VELOCITY
FUN# 989 SERIES= 20 MPH





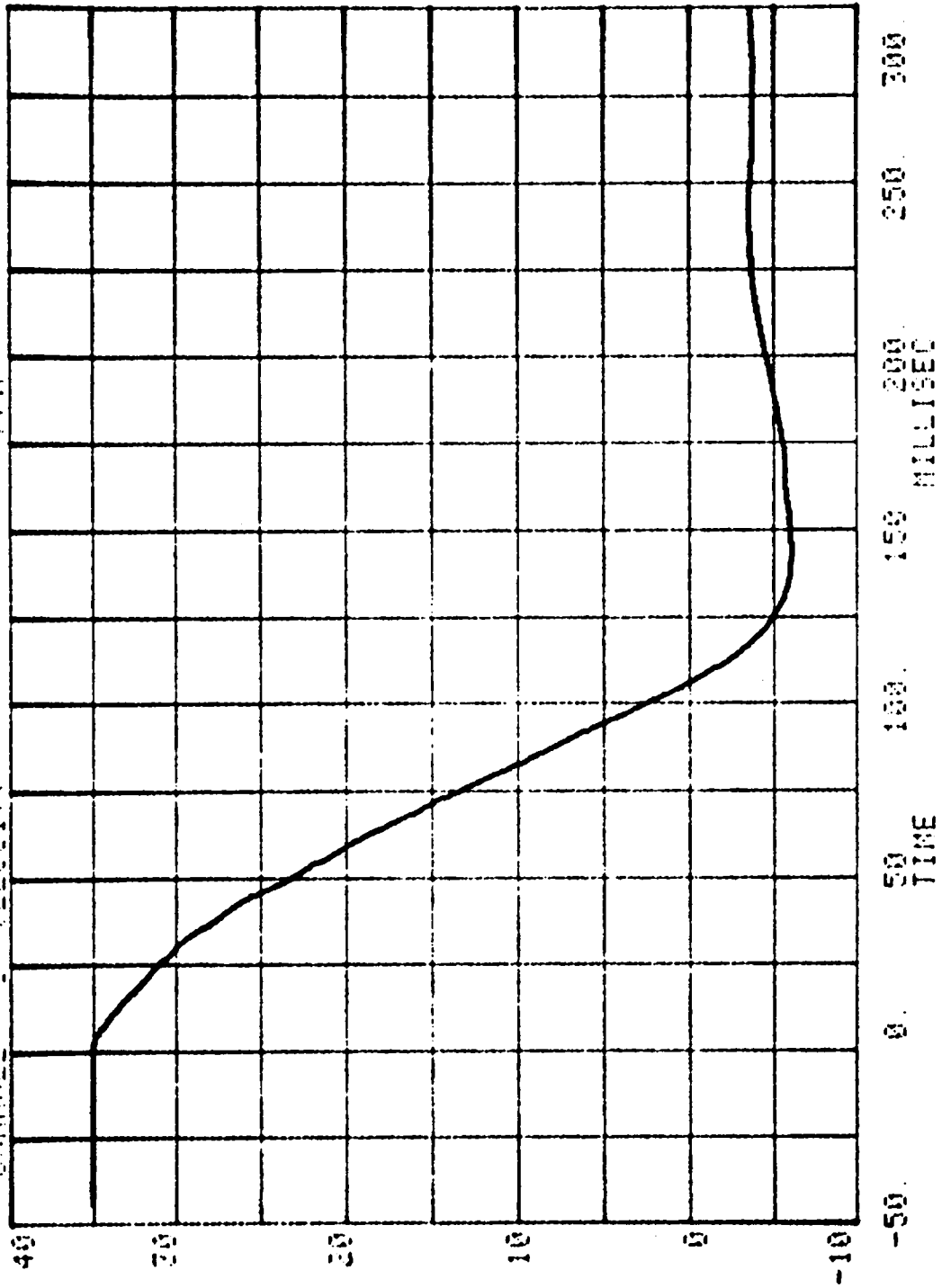


ACCEL #2 (x)

SERIES= 20 MPH

PUF= 999

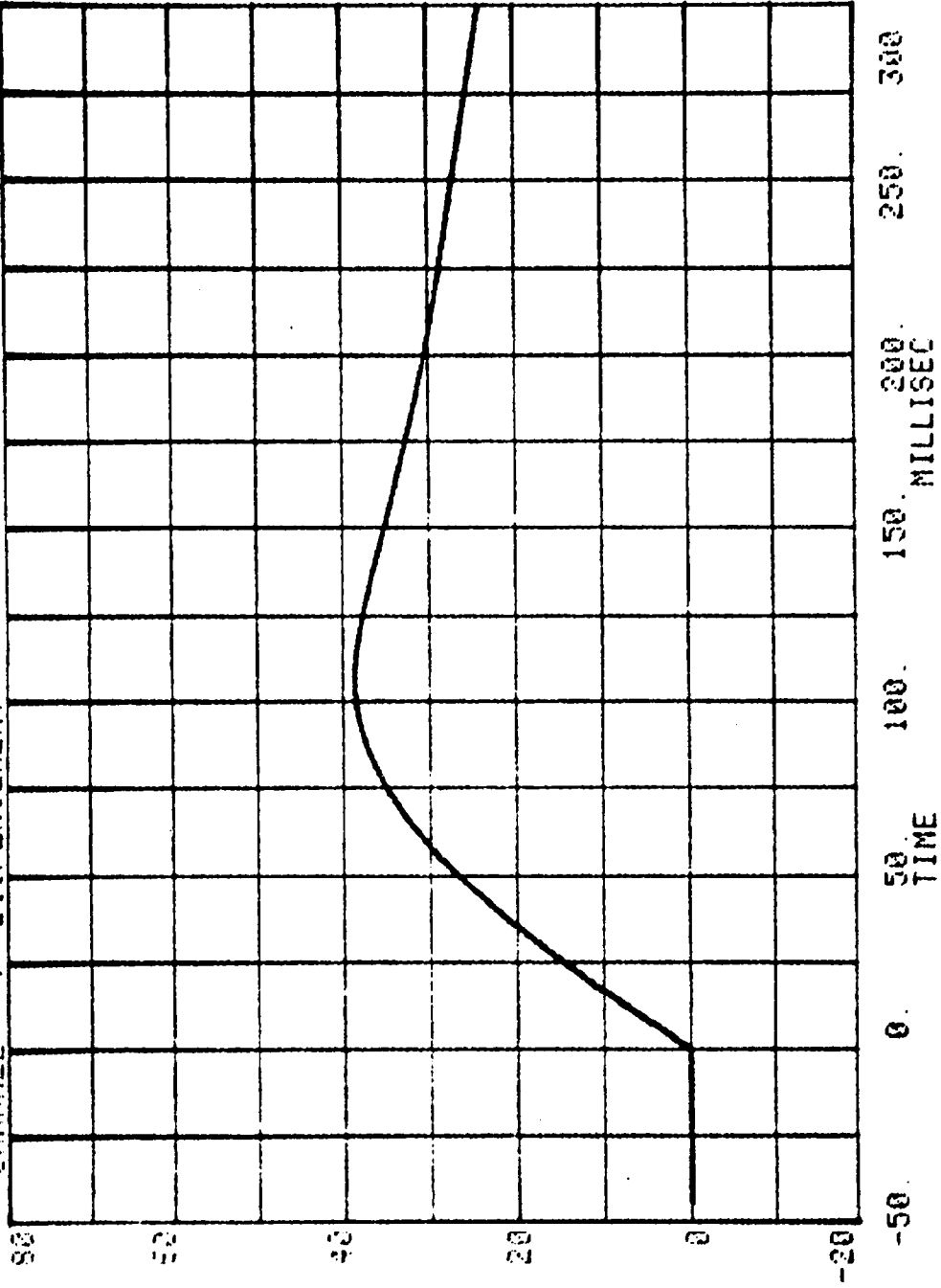
CHANNEL 7 VELOCITY



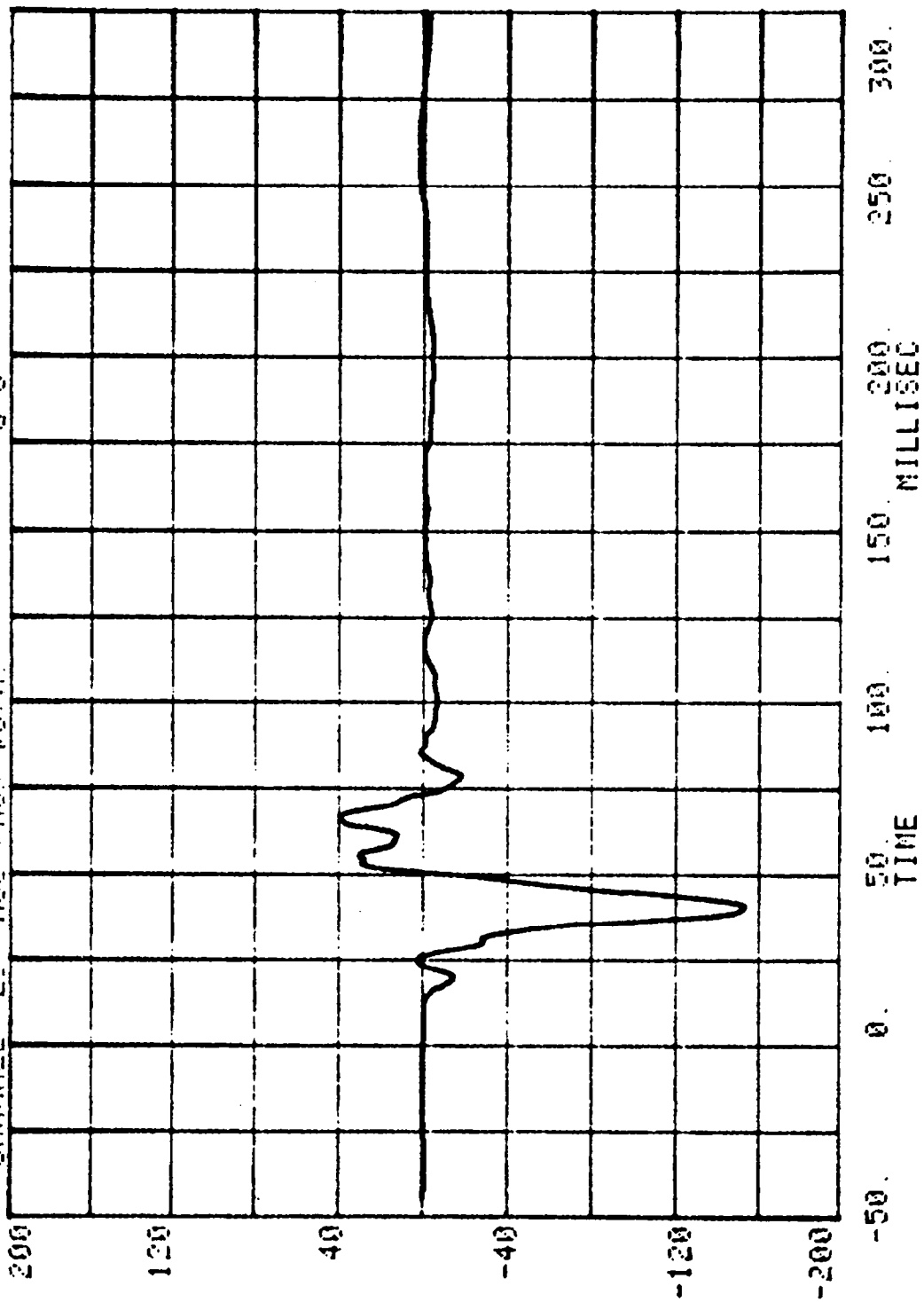
ACCEL #2 (x)

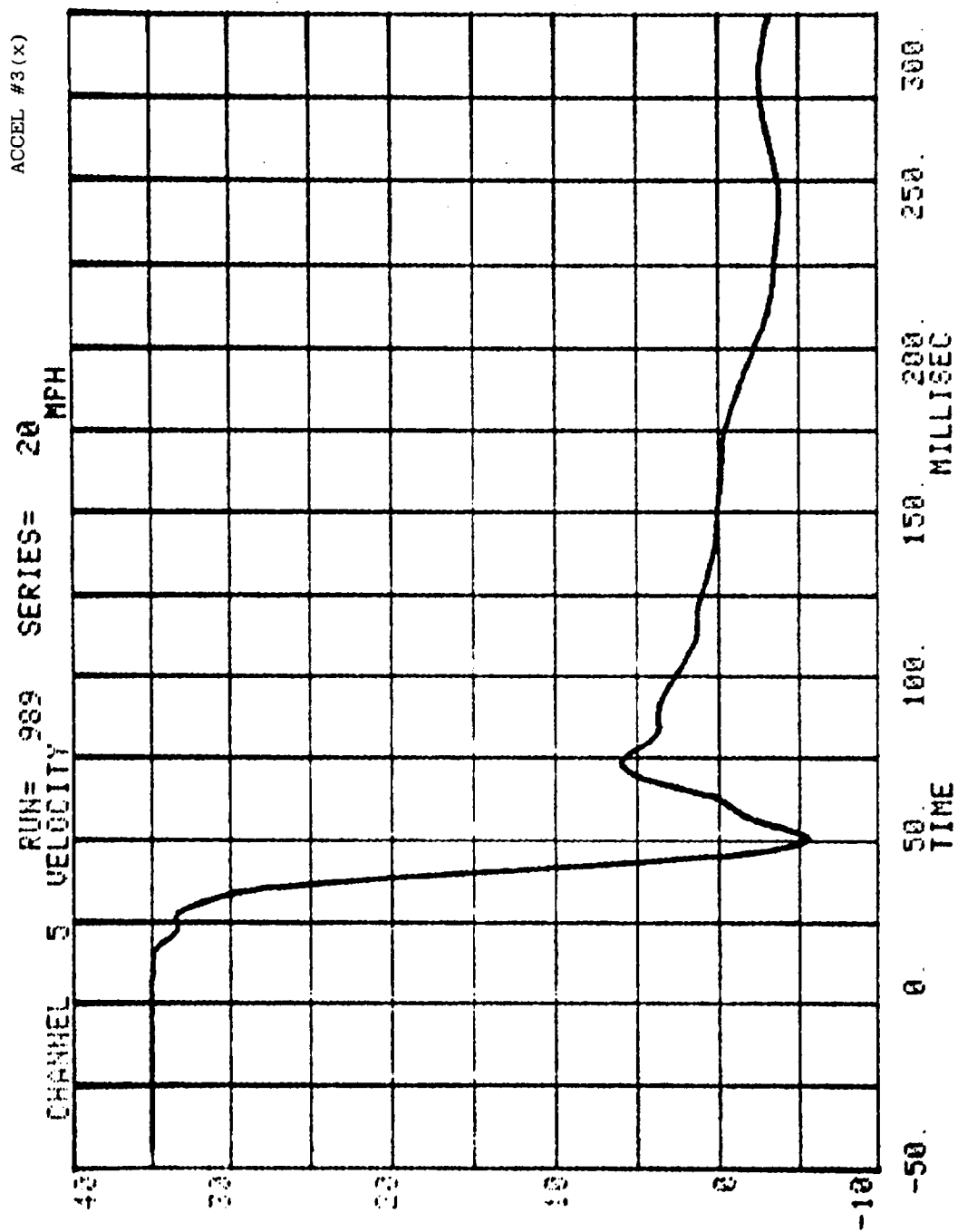
CHANNEL 4 DISPLACEMENT SERIES= 20 INCHES

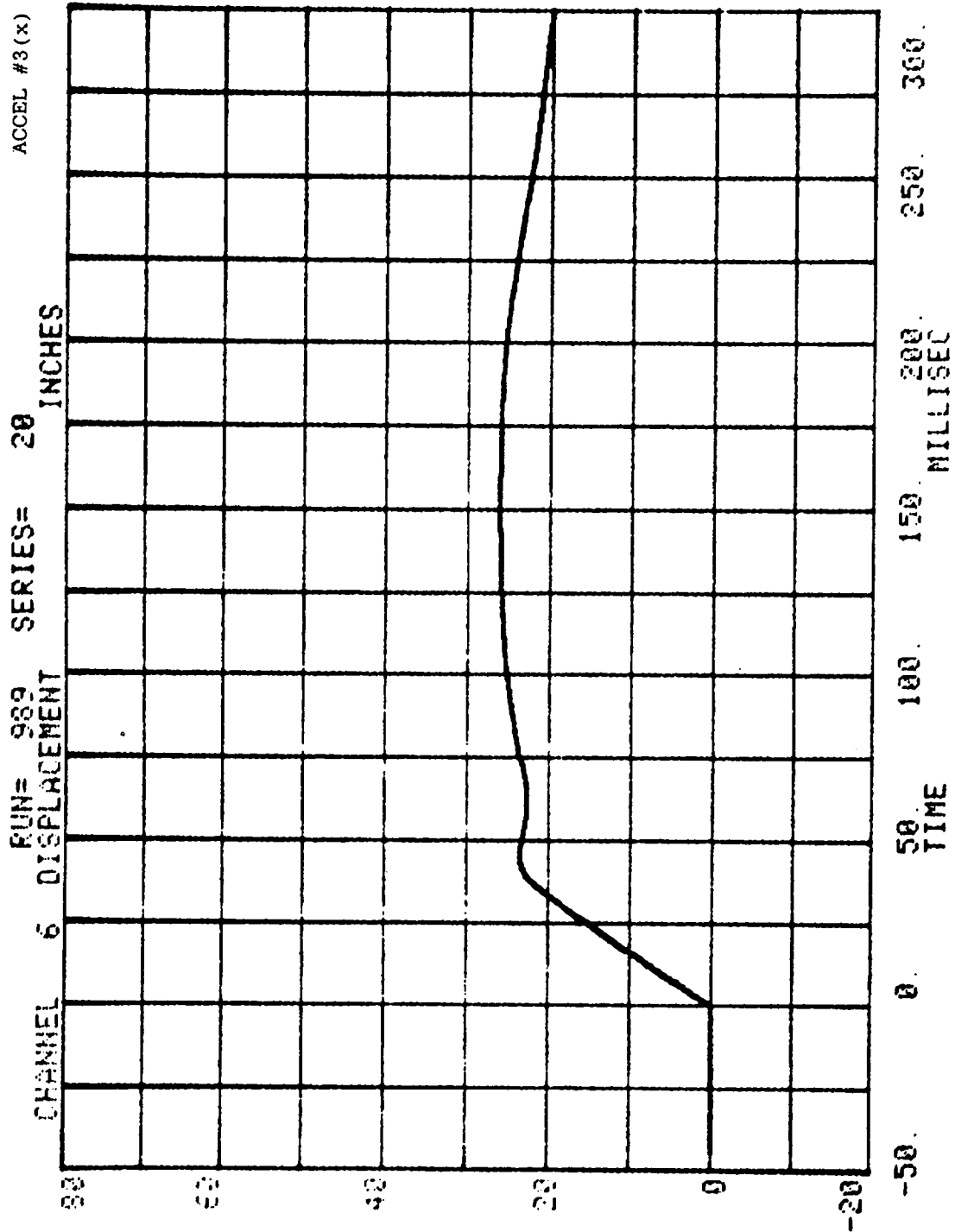
RUN= 982



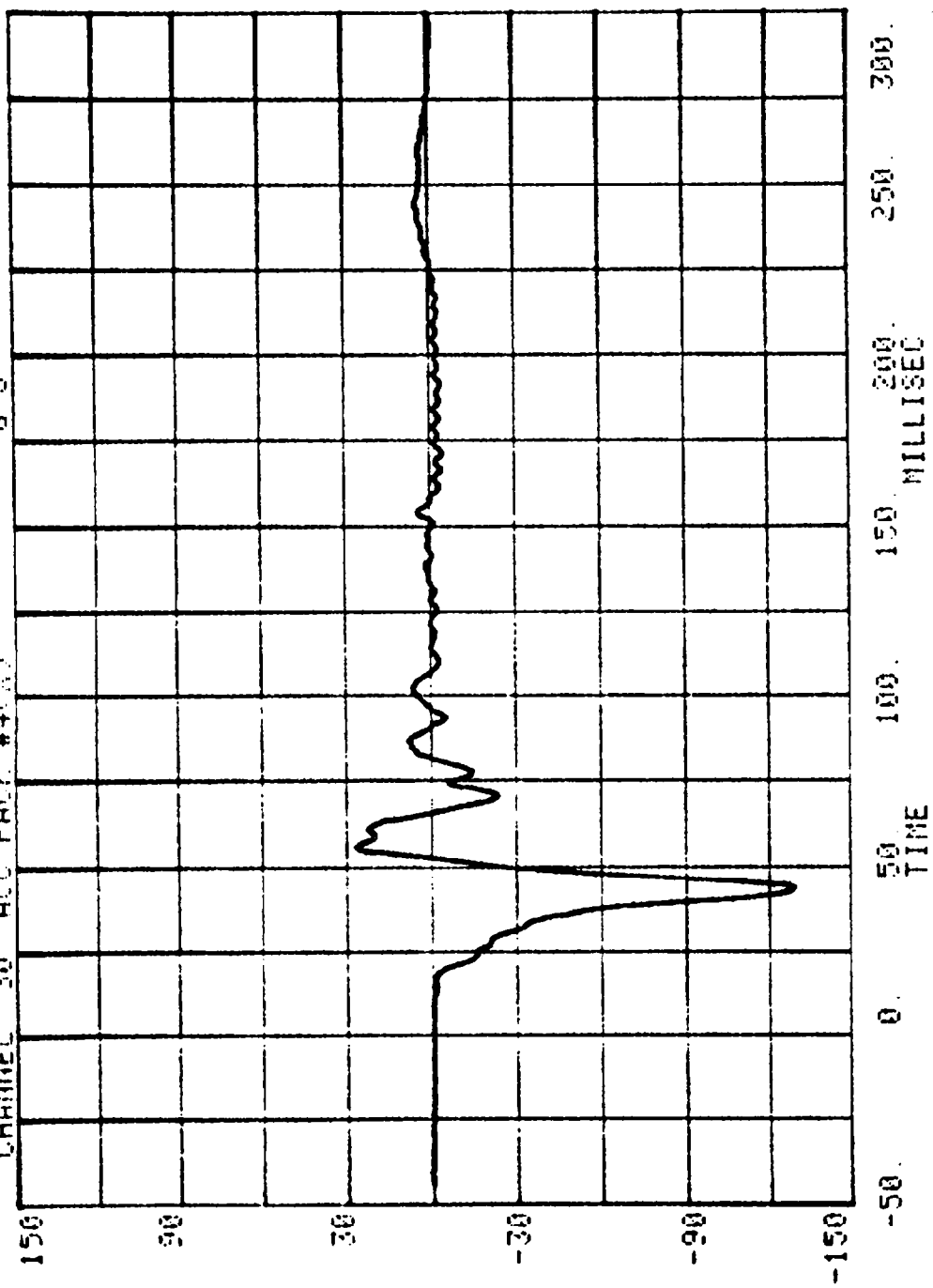
CHANNEL 29 ACC PACK #30X0 RUN= 999 SERIES= 20 G'S







CHANNEL 30 ACC PACT #400 RUN= 989 SERIES= 20 5'S



ACCEL #4 (x)

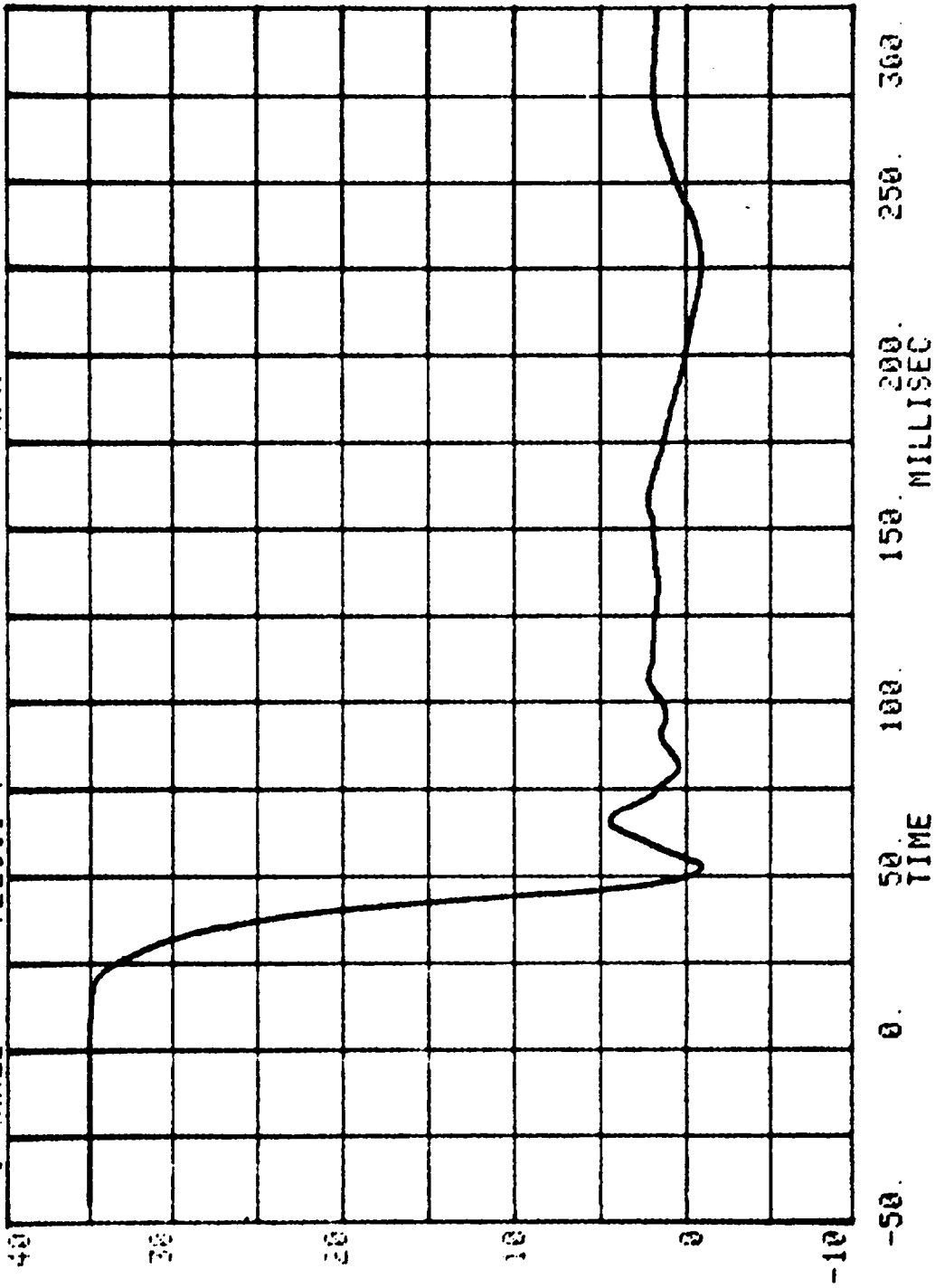
CHANNEL 7 VELOCITY

RUN= 939

SERIES=

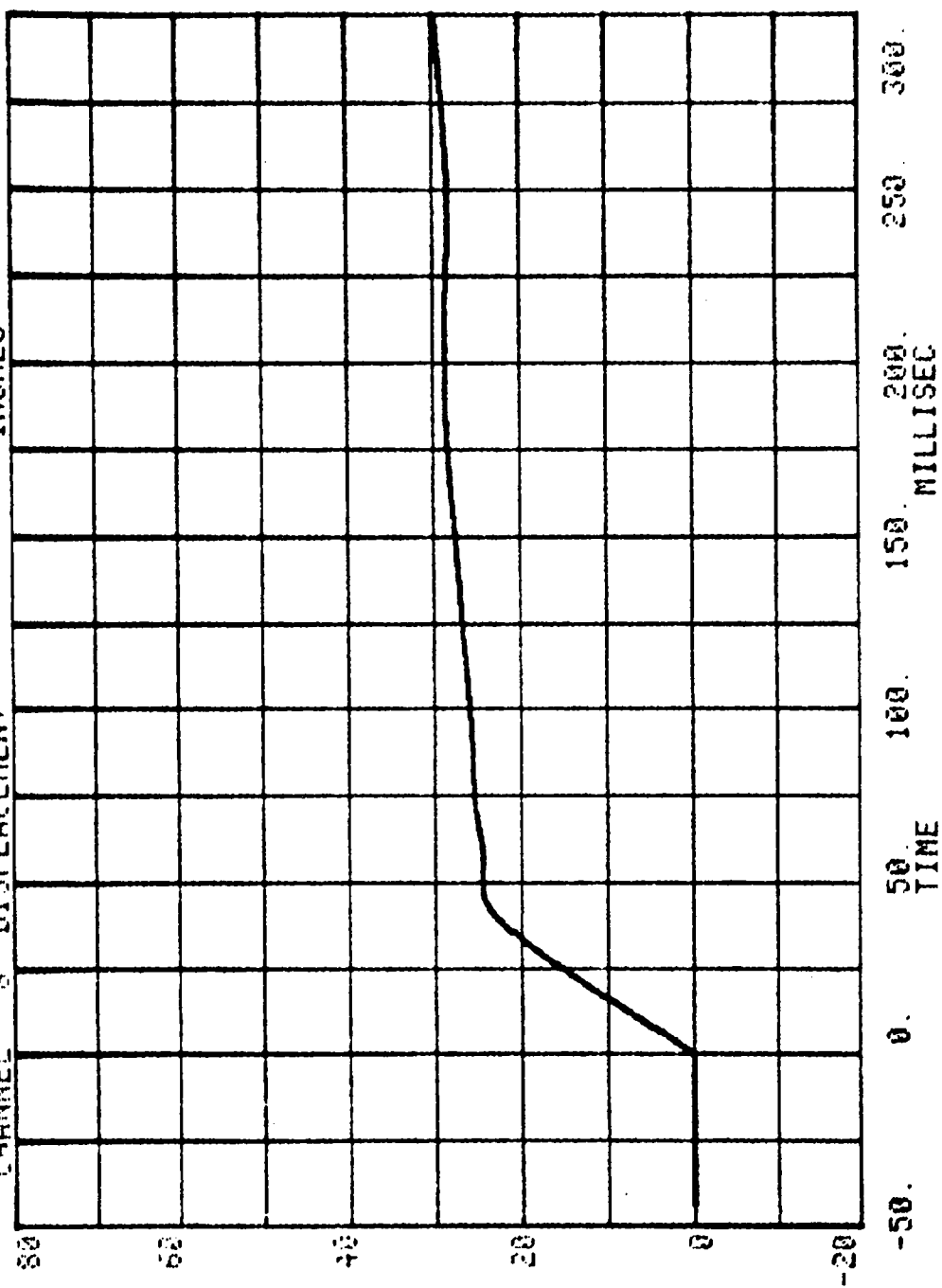
20

MPH

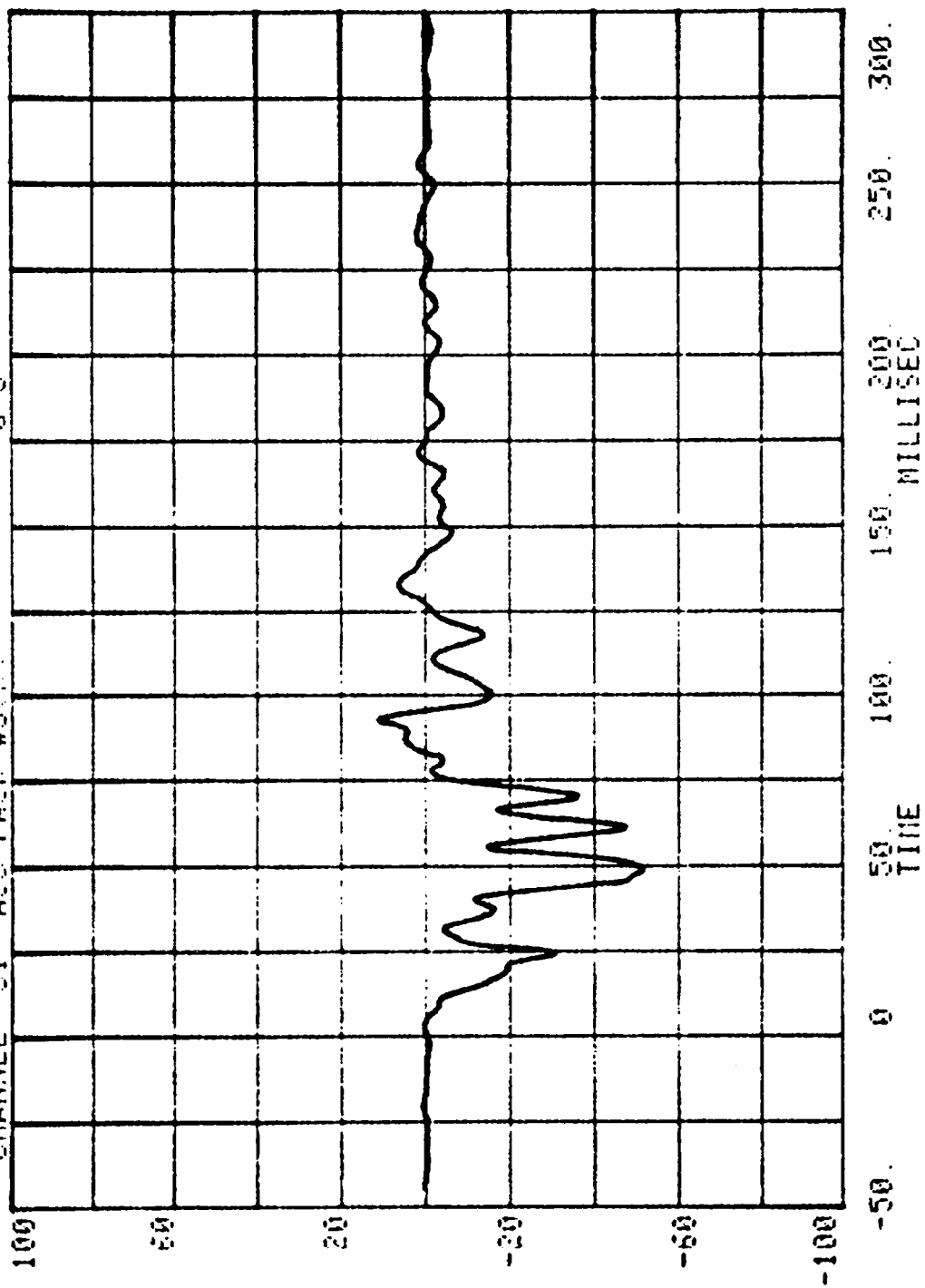


ACCEL #4 (x)

CHANNEL 8 DISPLACEMENT
RUN= 989 SERIES= 20 INCHES



CHANNEL 31 ACC PACK #50X) RUN= 999 SERIES= 20 G'S



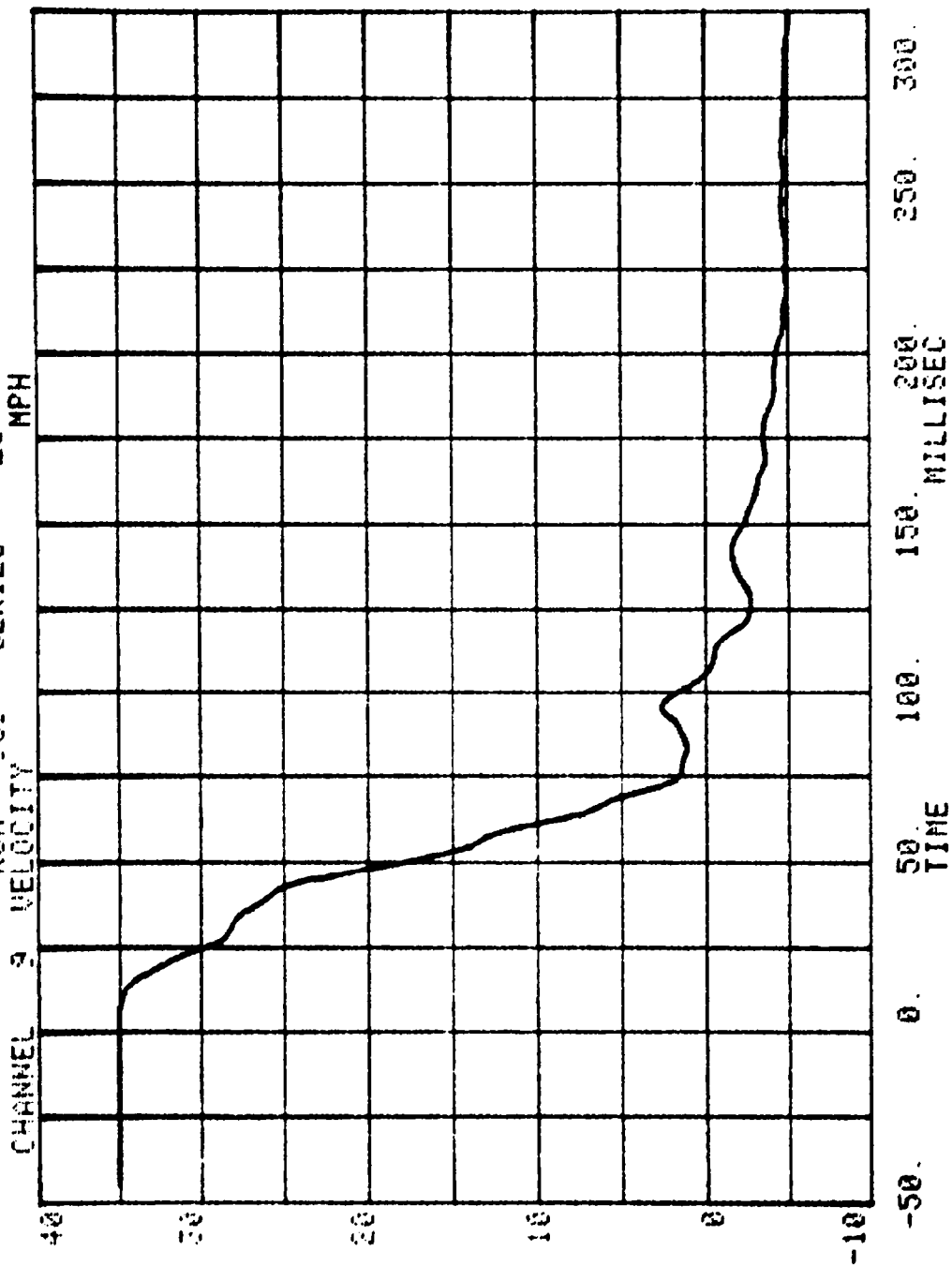
ACCEL #5 (*)

CHANNEL 3 VELOCITY 20 MPH

RUN= 983

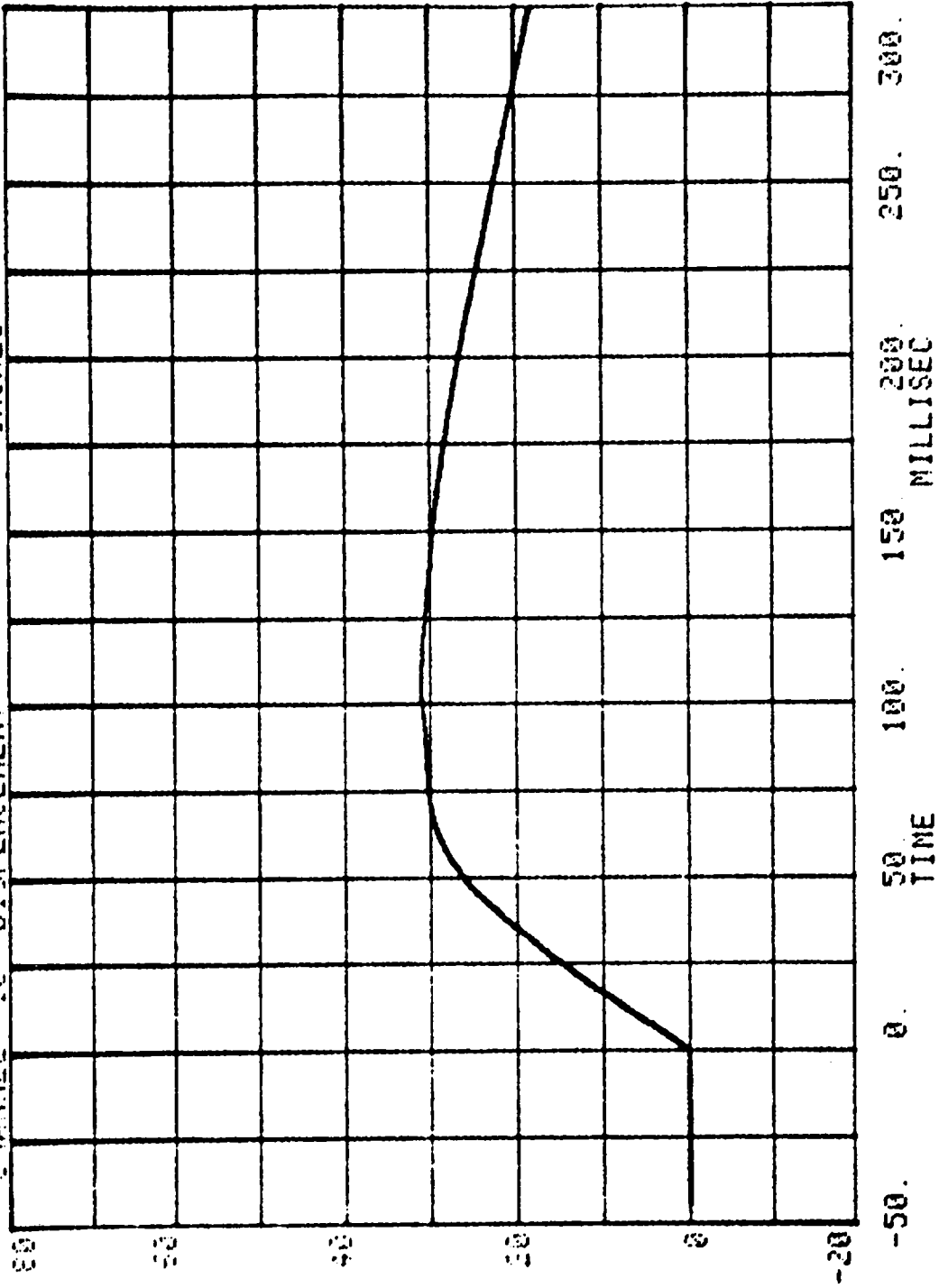
SERIES=

20

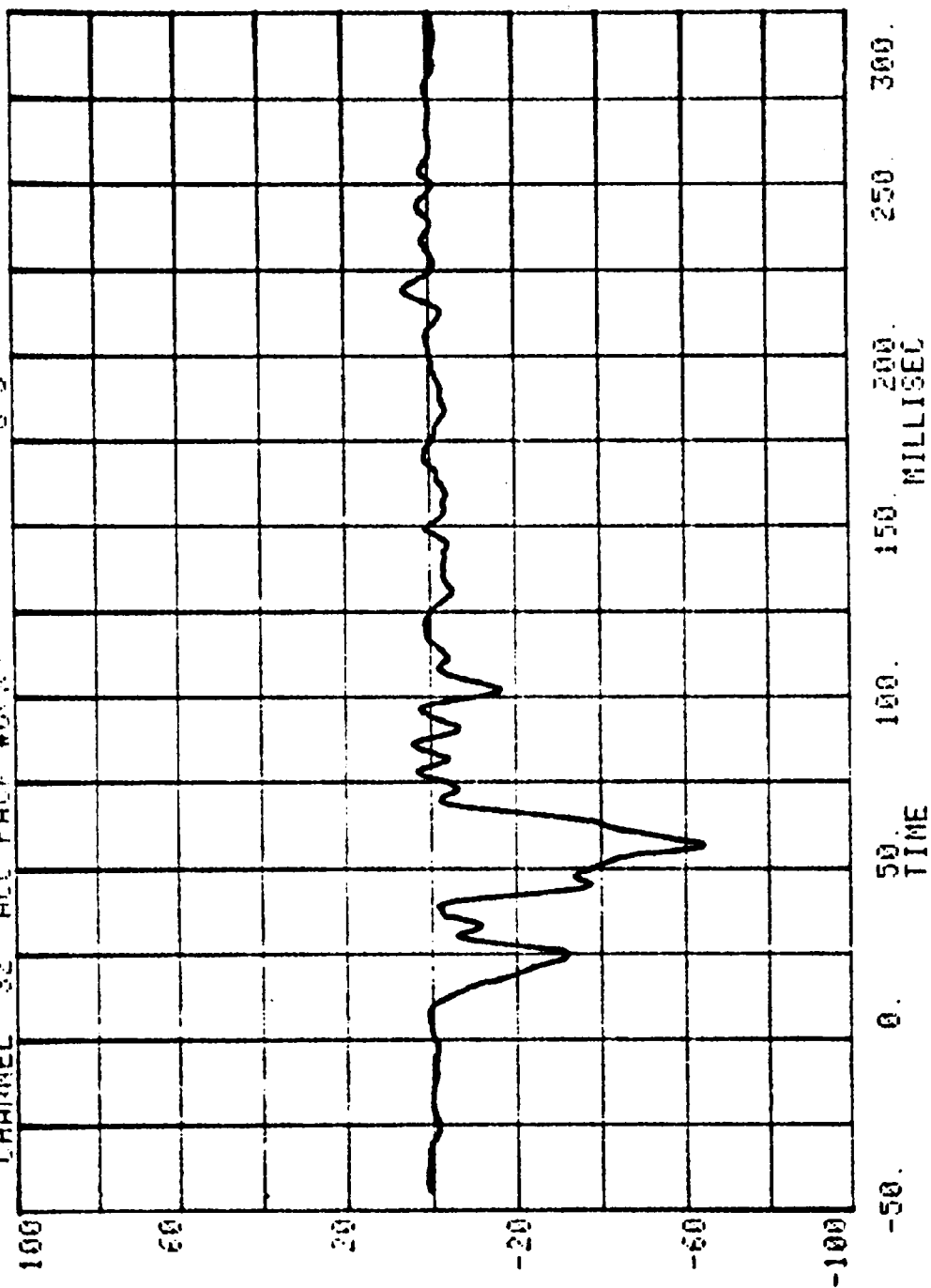


ACCEL #5 (x)

CHANNEL 10 DISPLACEMENT
RUN= 989 SERIES= 20 INCHES

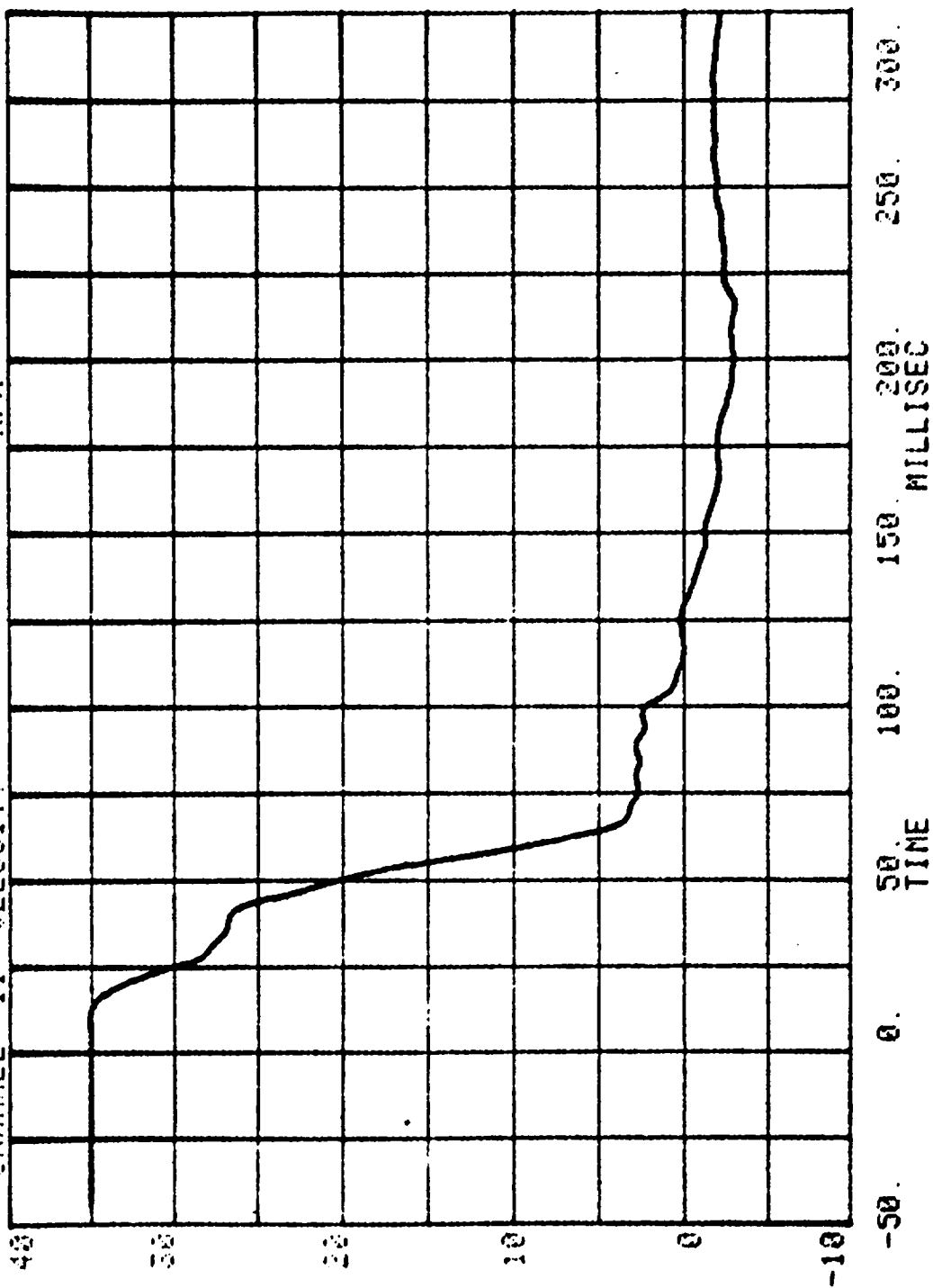


CHANNEL 32 FUN= 983 SERIES= 20 G'S
ACC PACK #5000



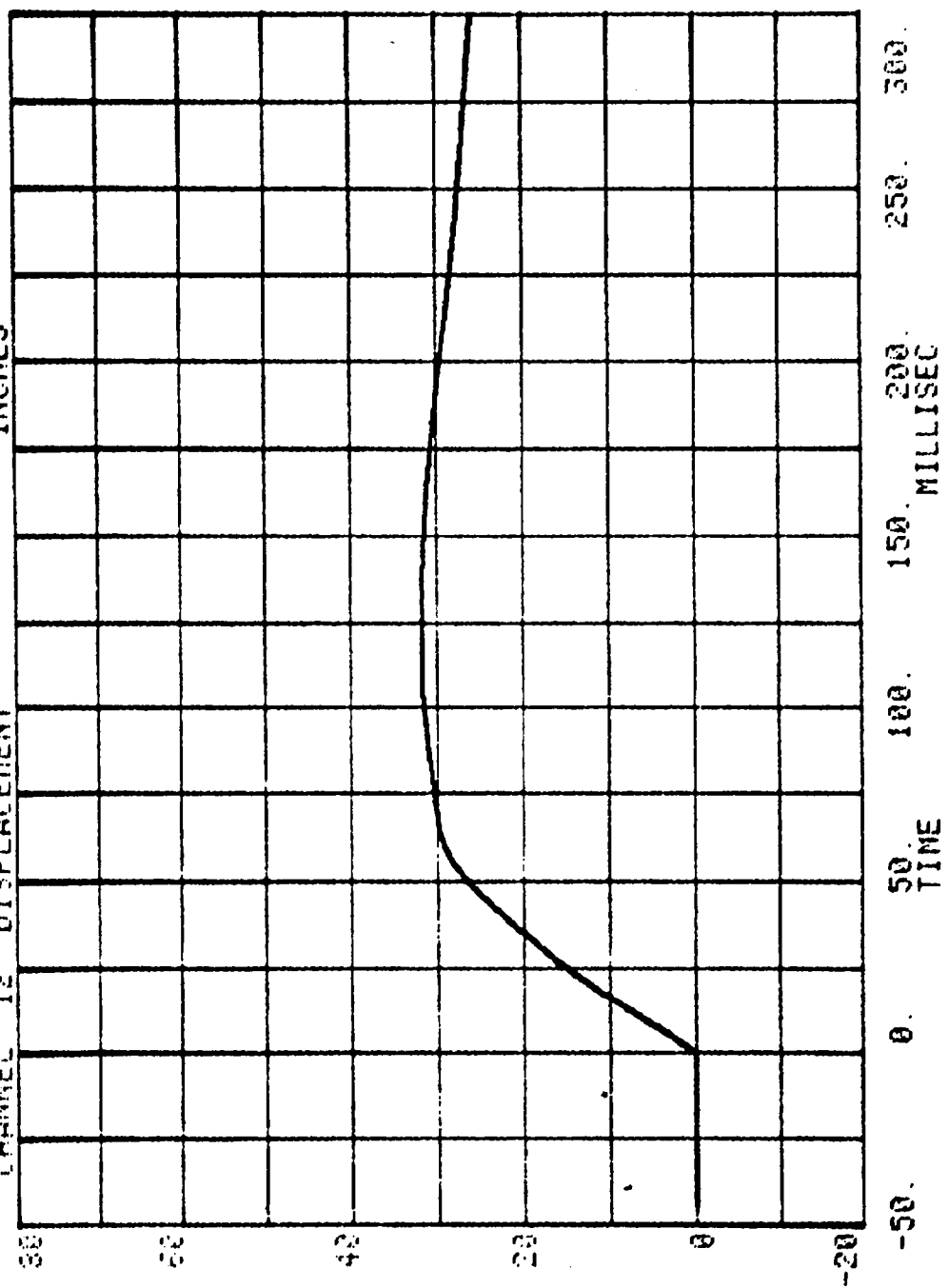
ACCEL #6 (x)

RUN= 989 SERIES= 20 MPH
CHANNEL 11 VELOCITY

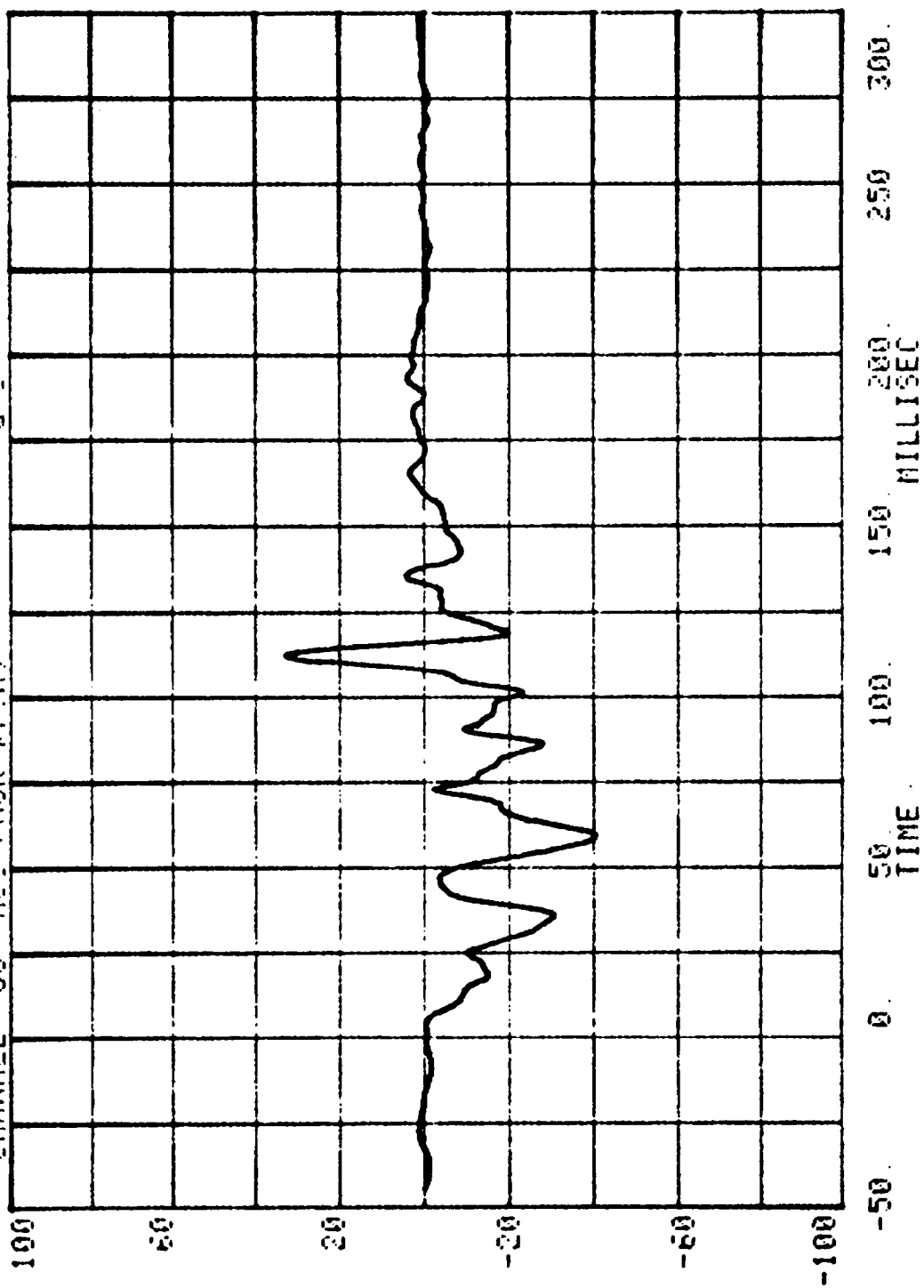


ACCEL #6 (x)

CHANNEL 12 DISPLACEMENT
RUN= 939 SERIES= 20 INCHES

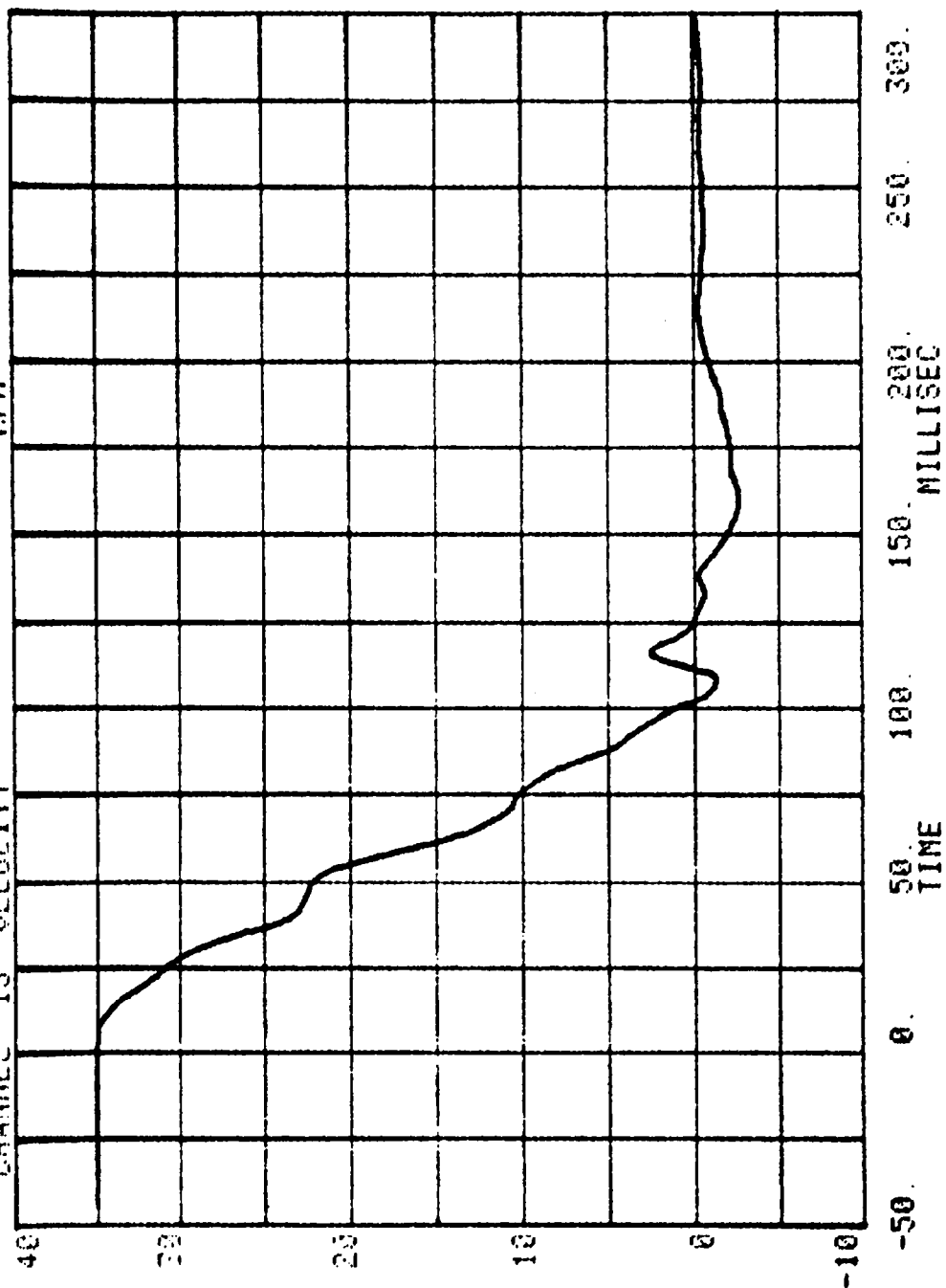


CHANNEL 33 ACC PACK #7000 RUN= 999 SERIES= 20 G'S



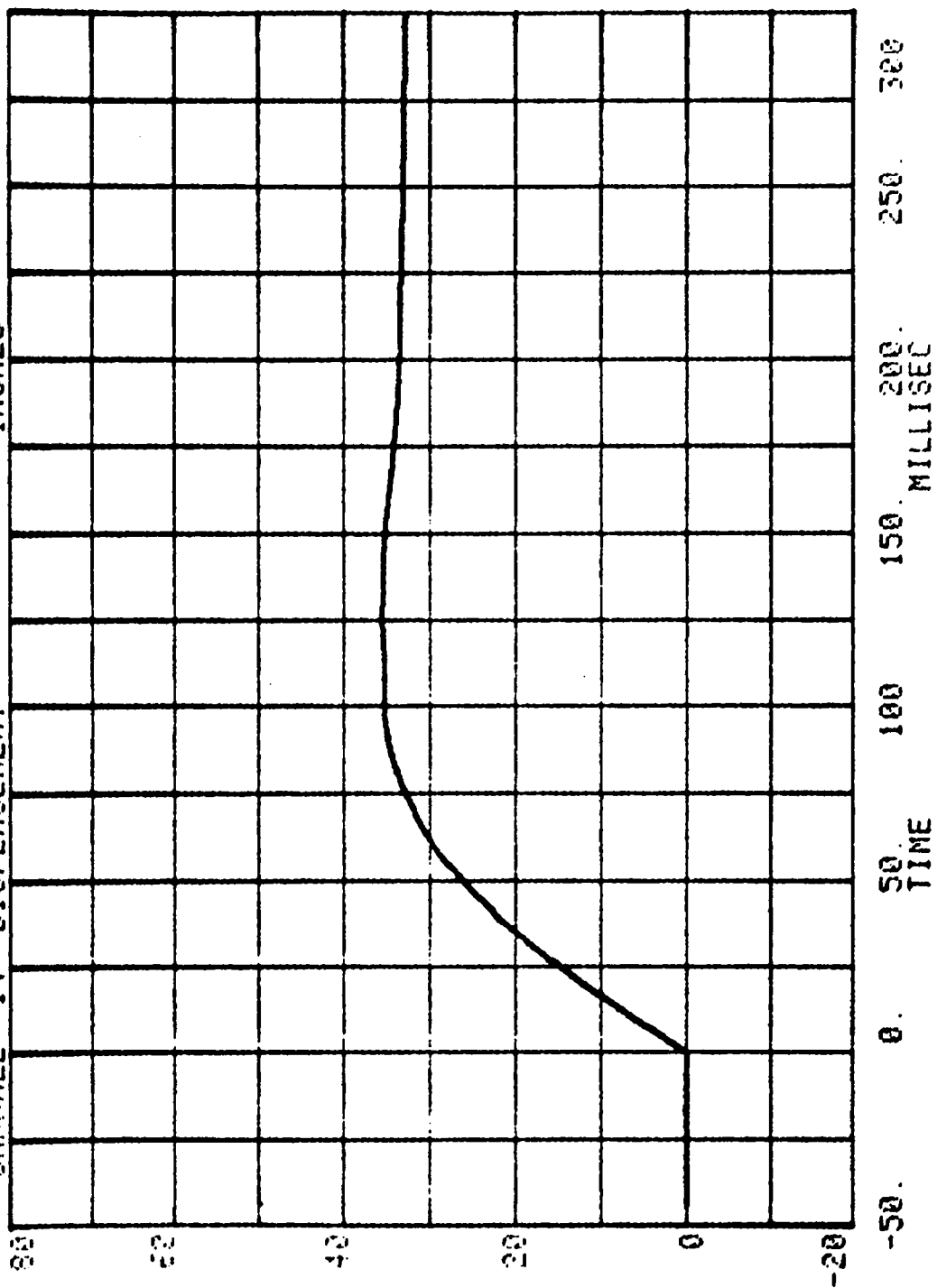
ACCEL #7 (x)

CHANNEL 13 VELOCITY
RUN= 389 SERIES= 20 MPH



ACCEL #7(x)

RUN= 983
CHANNEL 14 DISPLACEMENT
SERIES= 28 INCHES



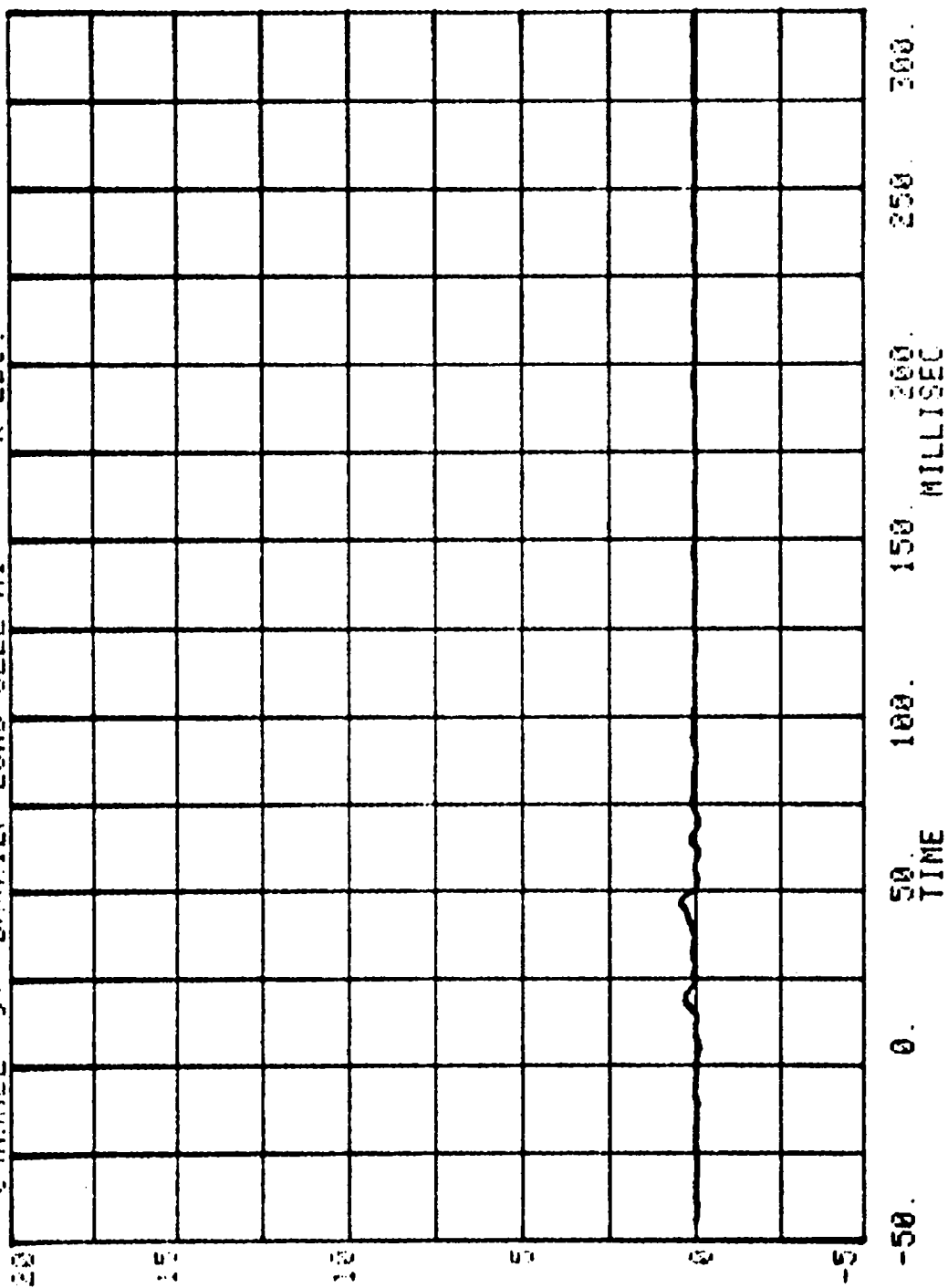
TEST NO. ML0107

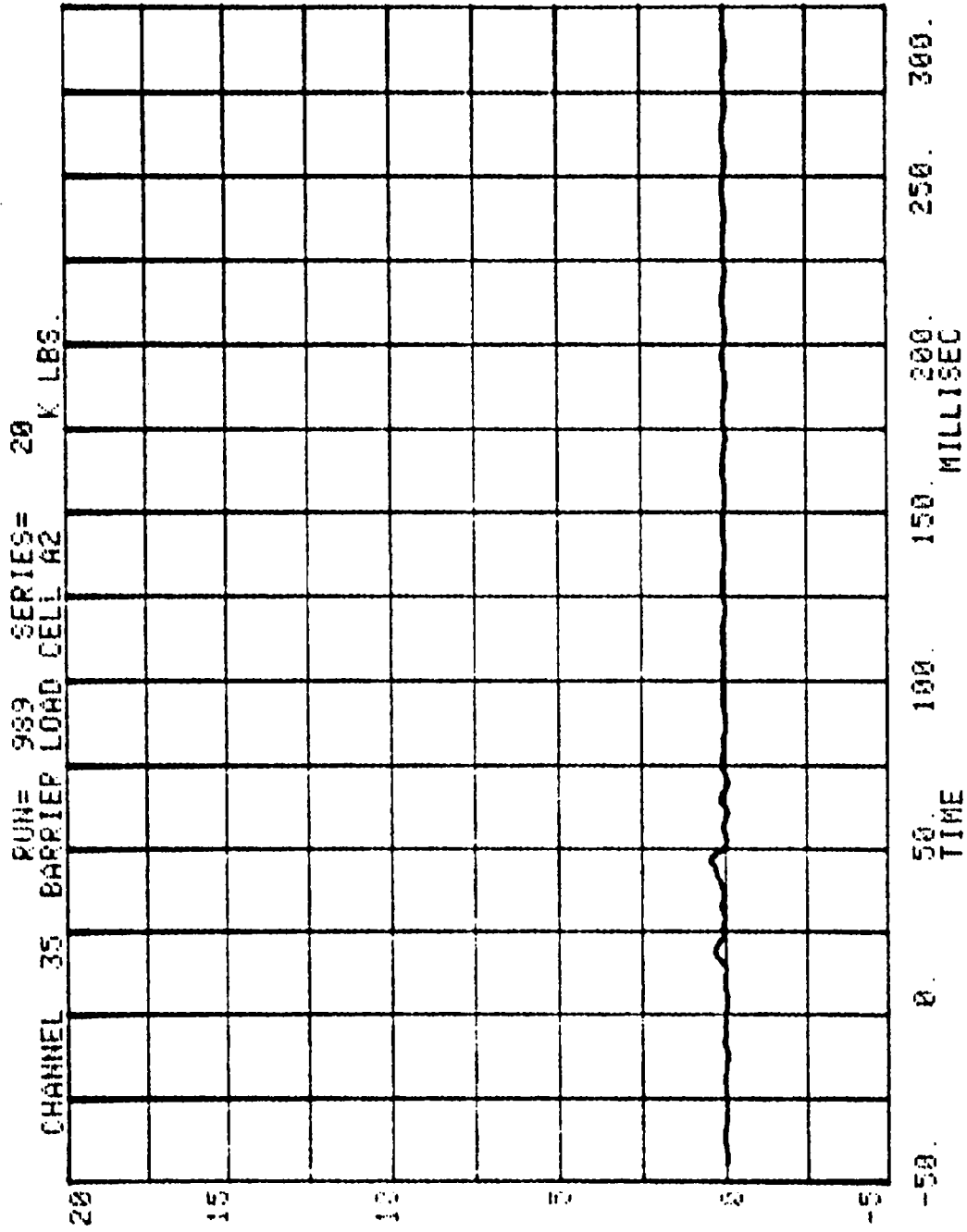
LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

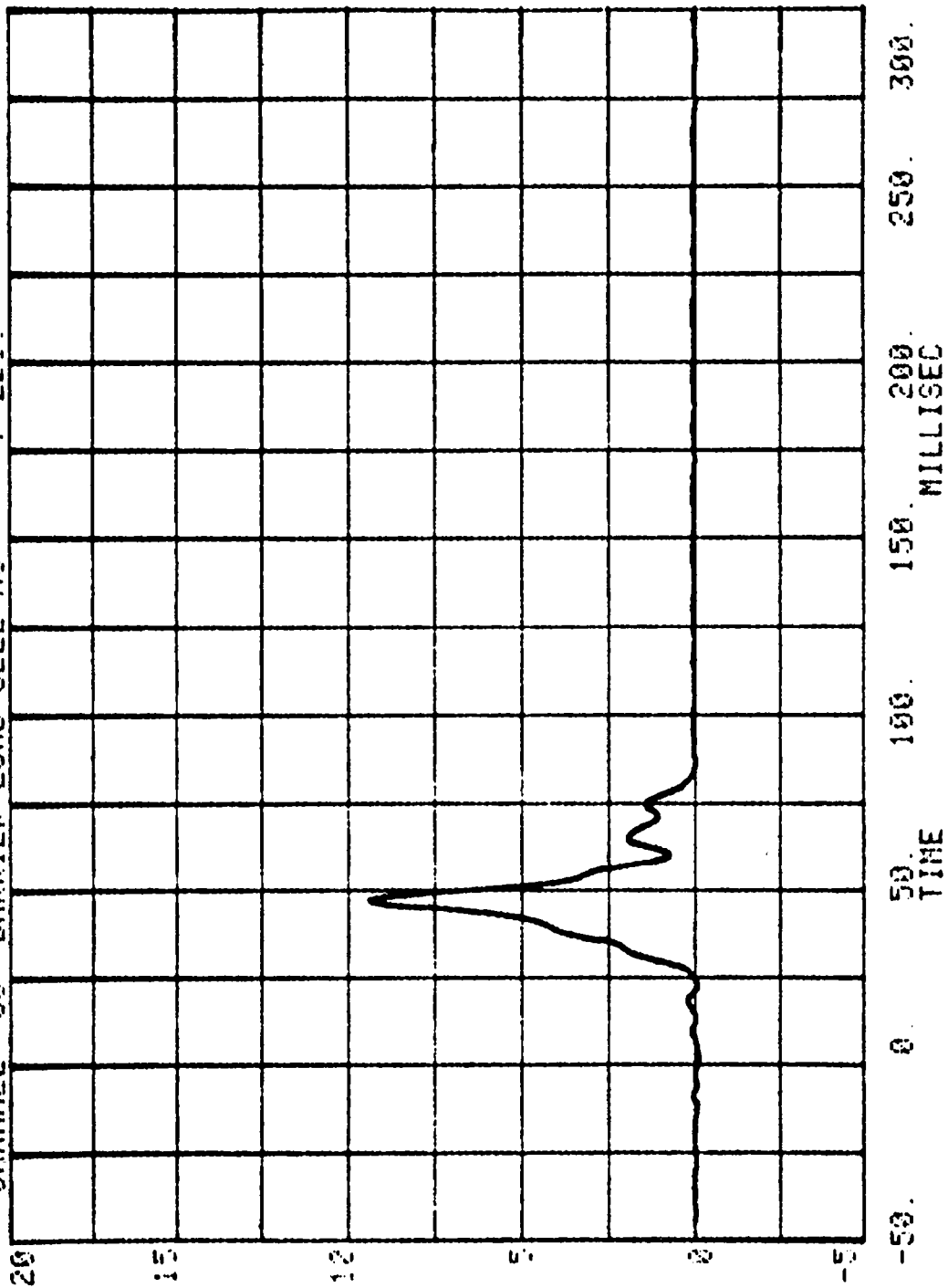
60

CHANNEL 34 BARRIER LOAD CELL A1 RUN= 999 SERIES= 20 K LBS.

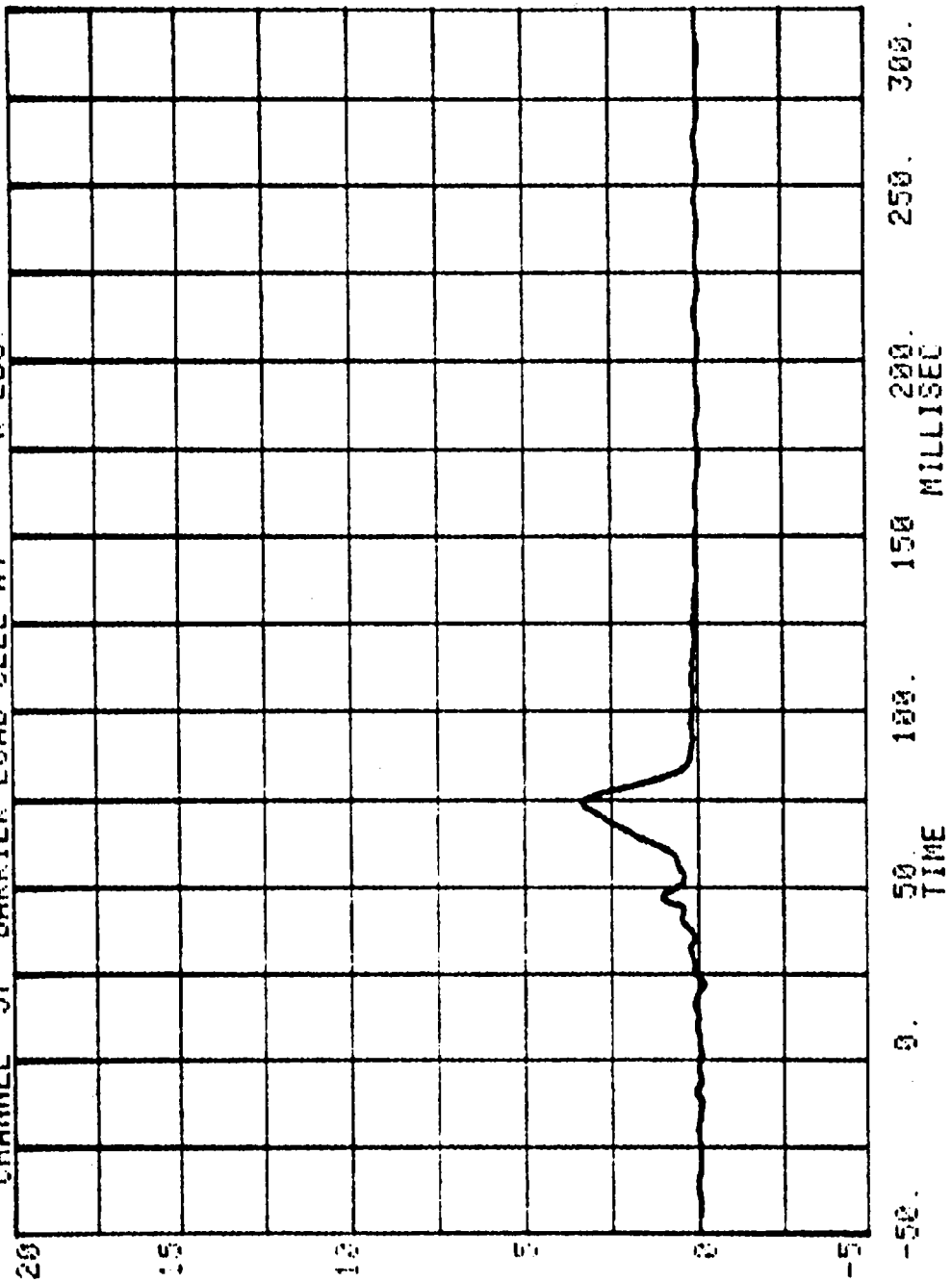




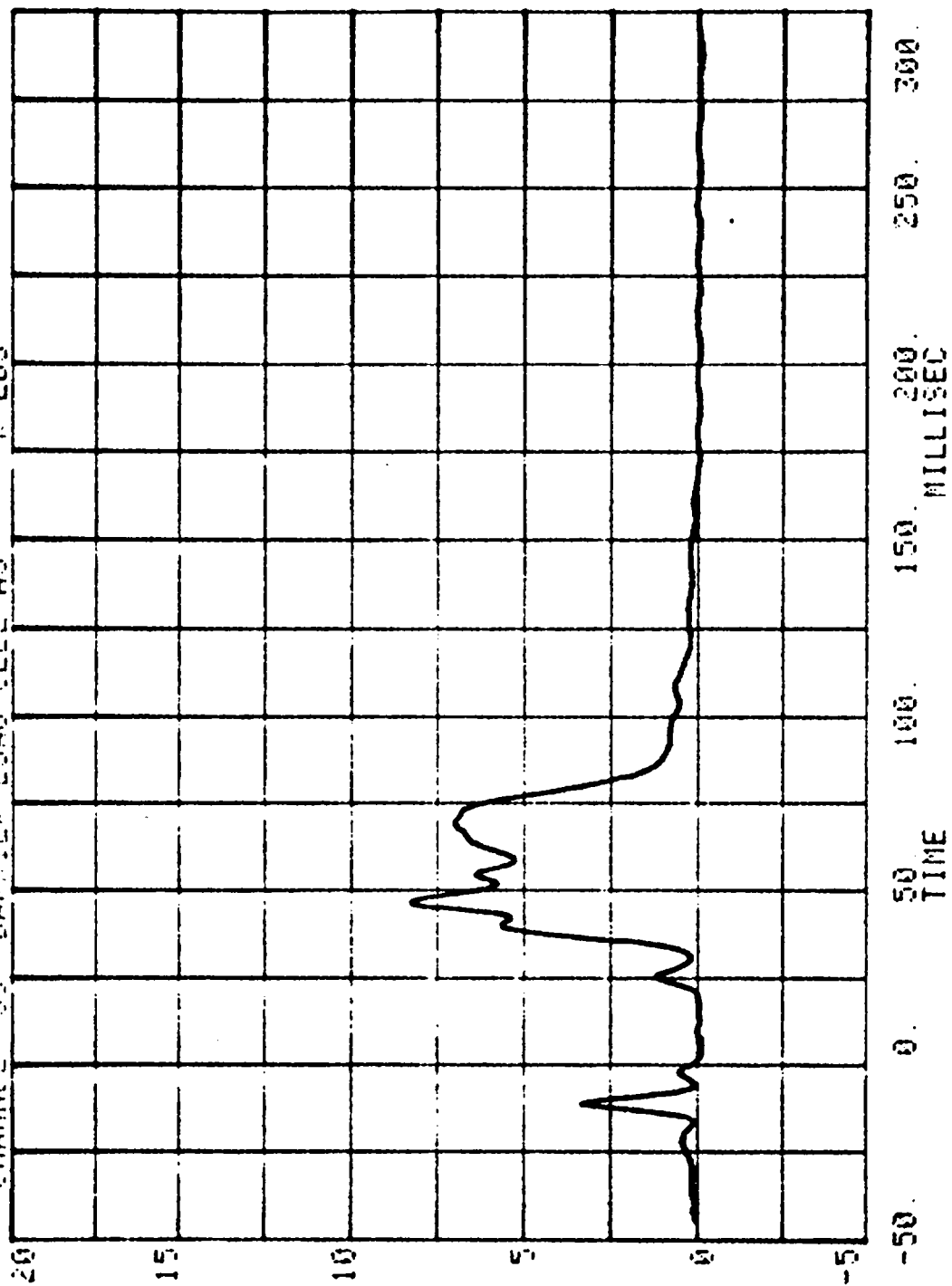
CHANNEL 36 BARRIER LOAD CELL A3 RUN= 989 SERIES= 20 K LBS.



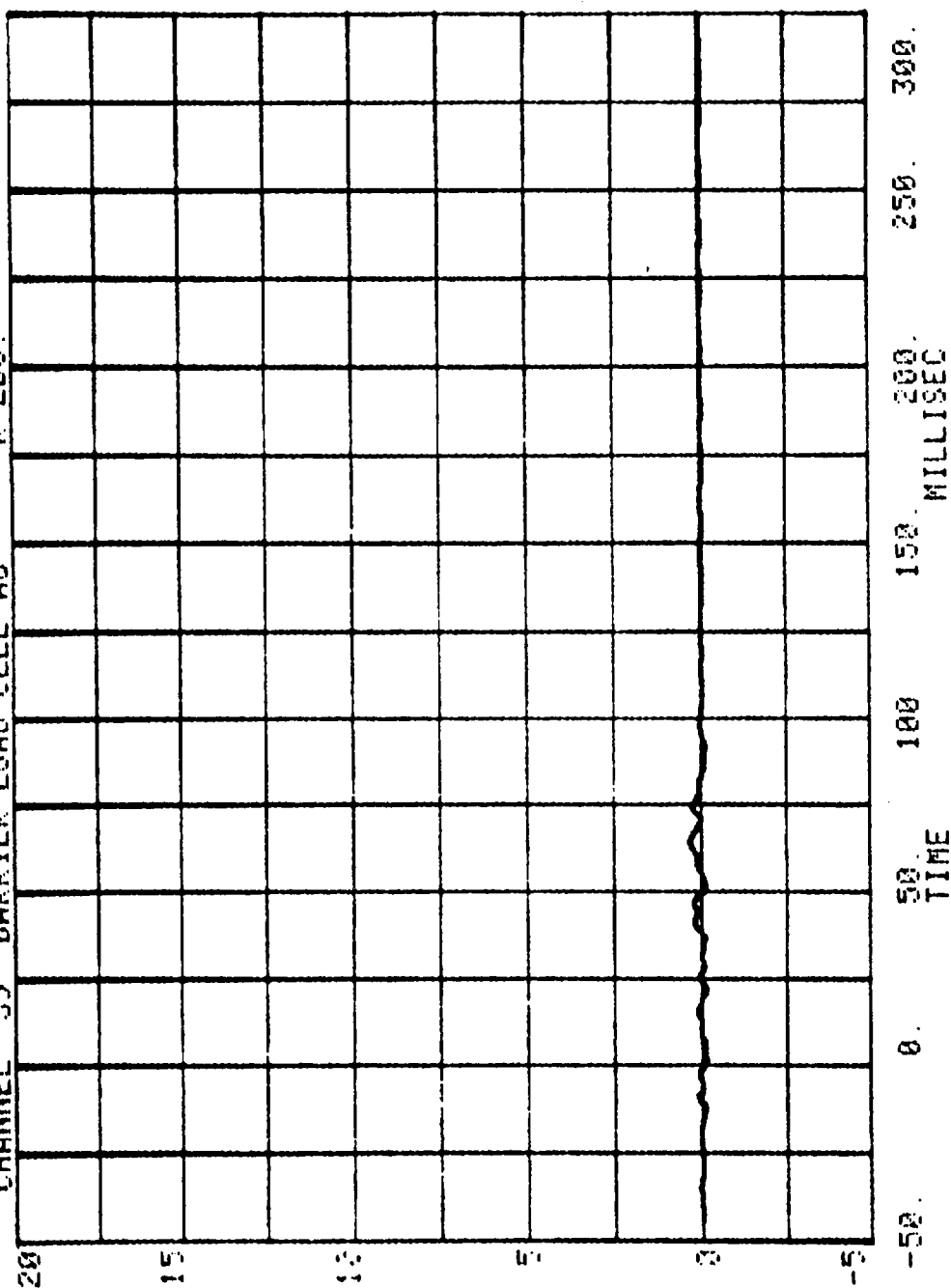
CHANNEL 37 BARRIER LOAD CELL A4 RUN= 989 SERIES= 20 K LBS.



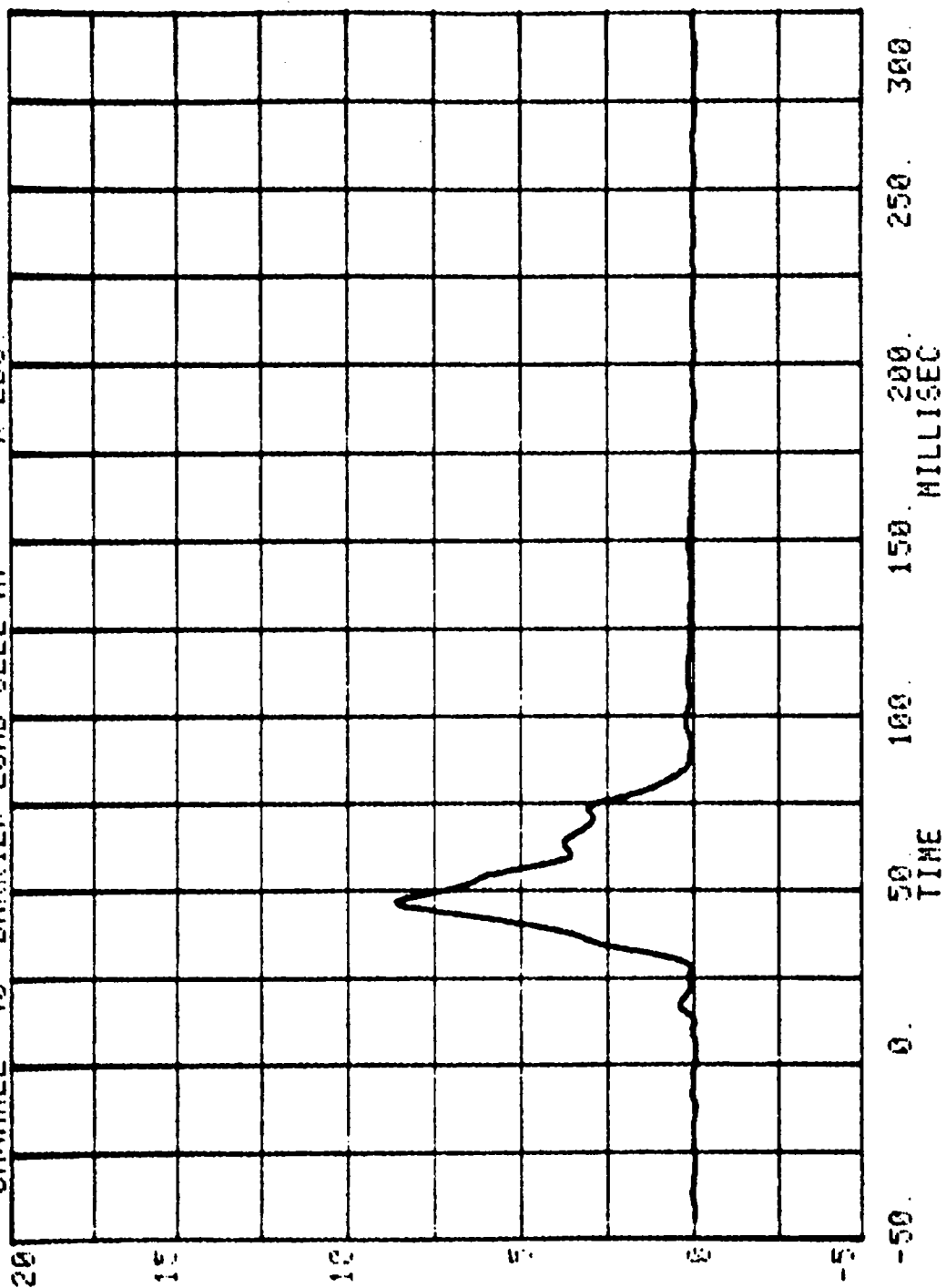
CHANNEL 33 BARRIER LOAD CELL A5 RUN= 999 SERIES= 20 K LB3



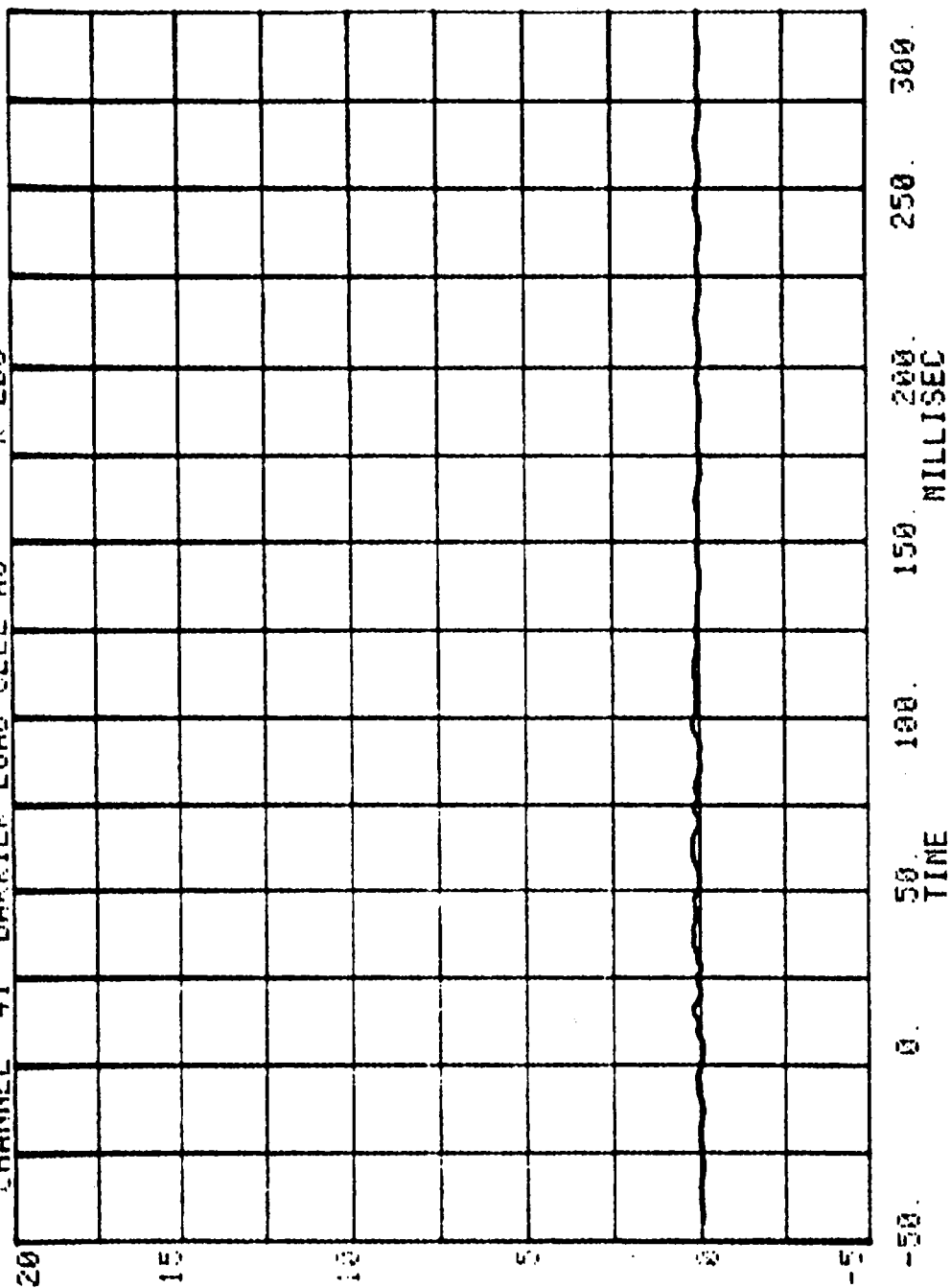
CHANNEL 39 BARRIER LOAD CELL A6 RUN= 989 SERIES= 20 K LBS.



CHANNEL 40 BARRIER LOAD CELL A7 RUN= 999 SERIES= 20 K LBS

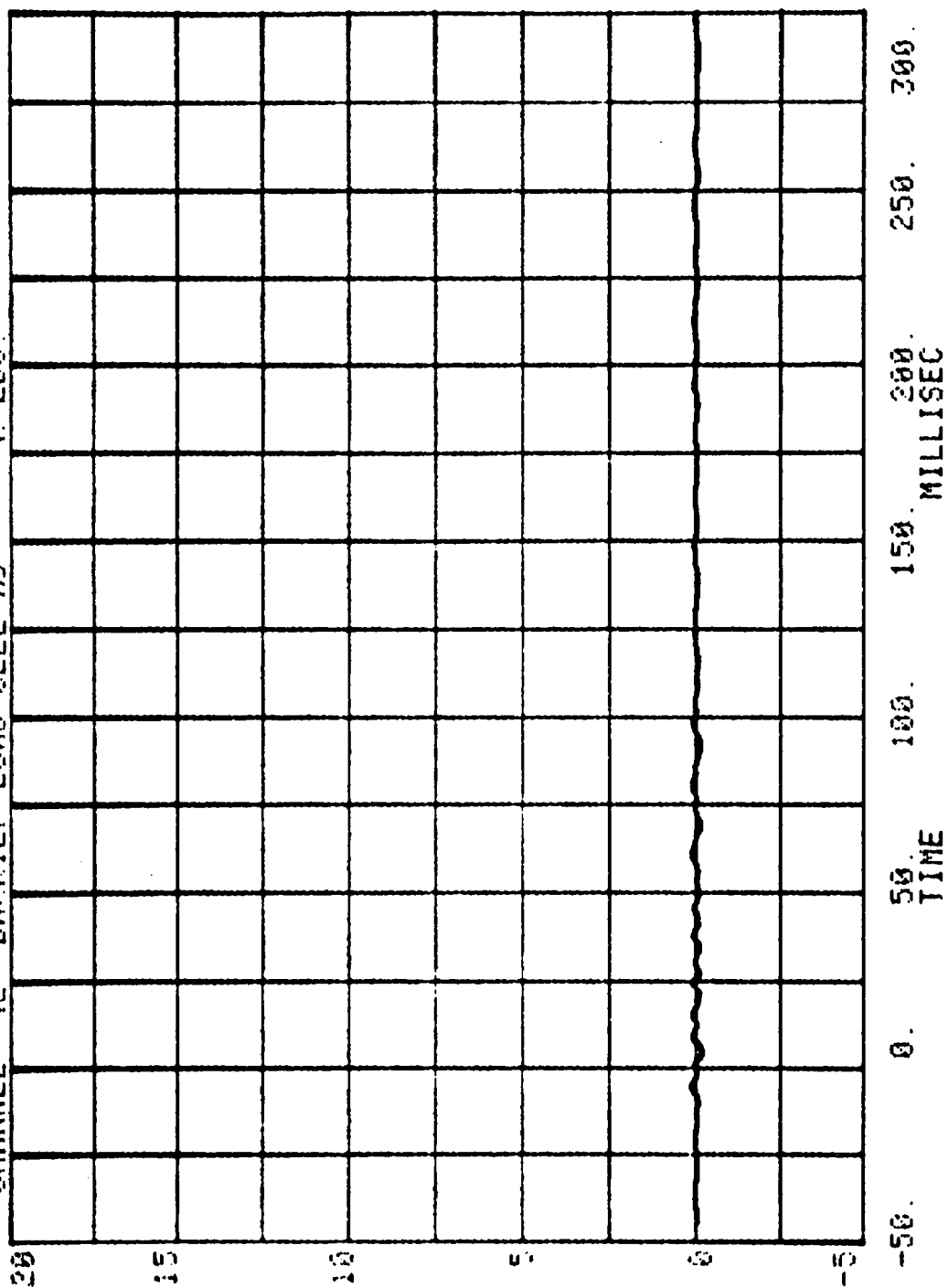


CHANNEL 41 BARRIER LOAD CELL A8 RUN= 989 SERIES= 20 K LBS

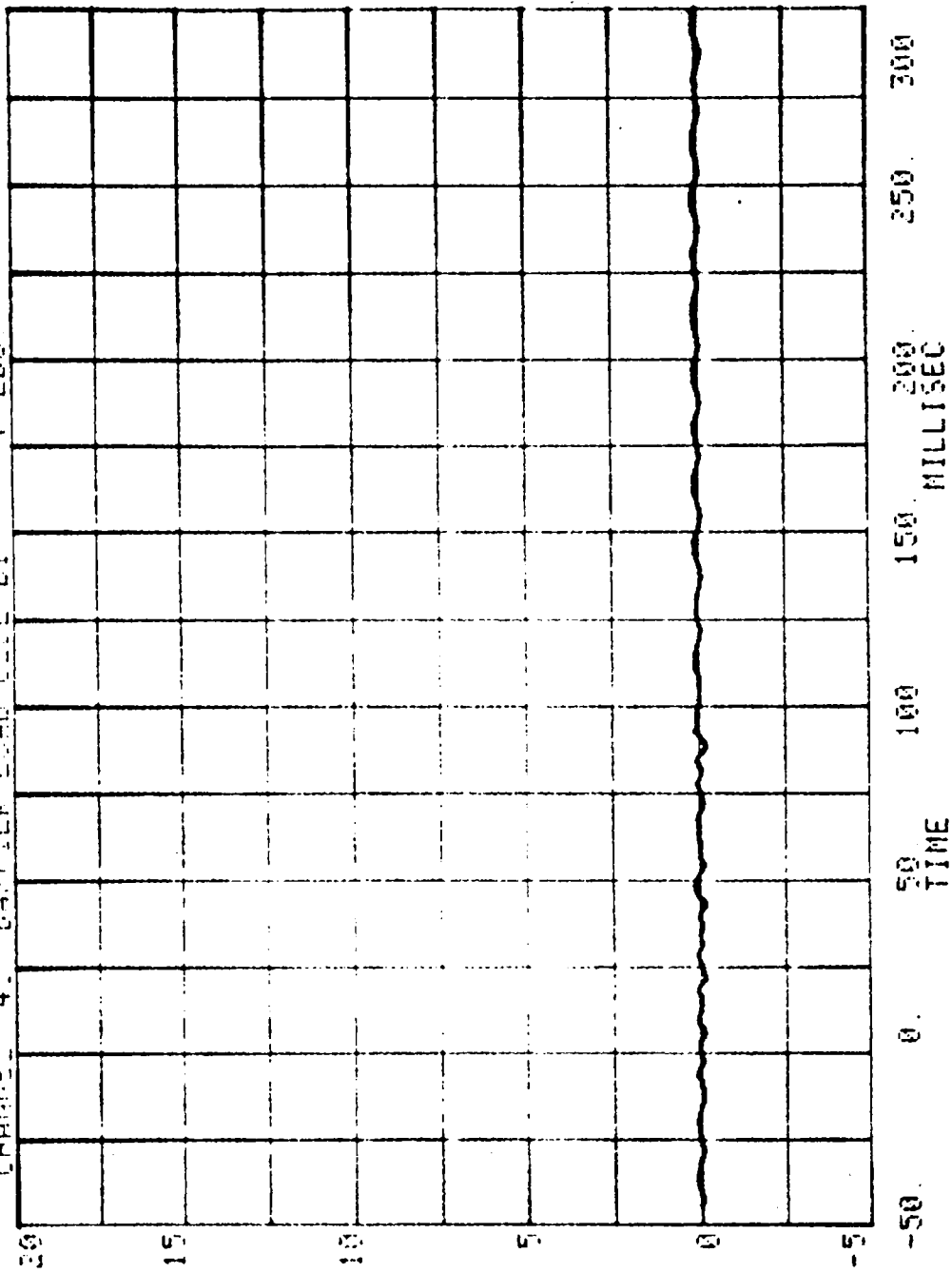


CHANNEL 42 BARRIER LOAD CELL A9 20 K LBS.

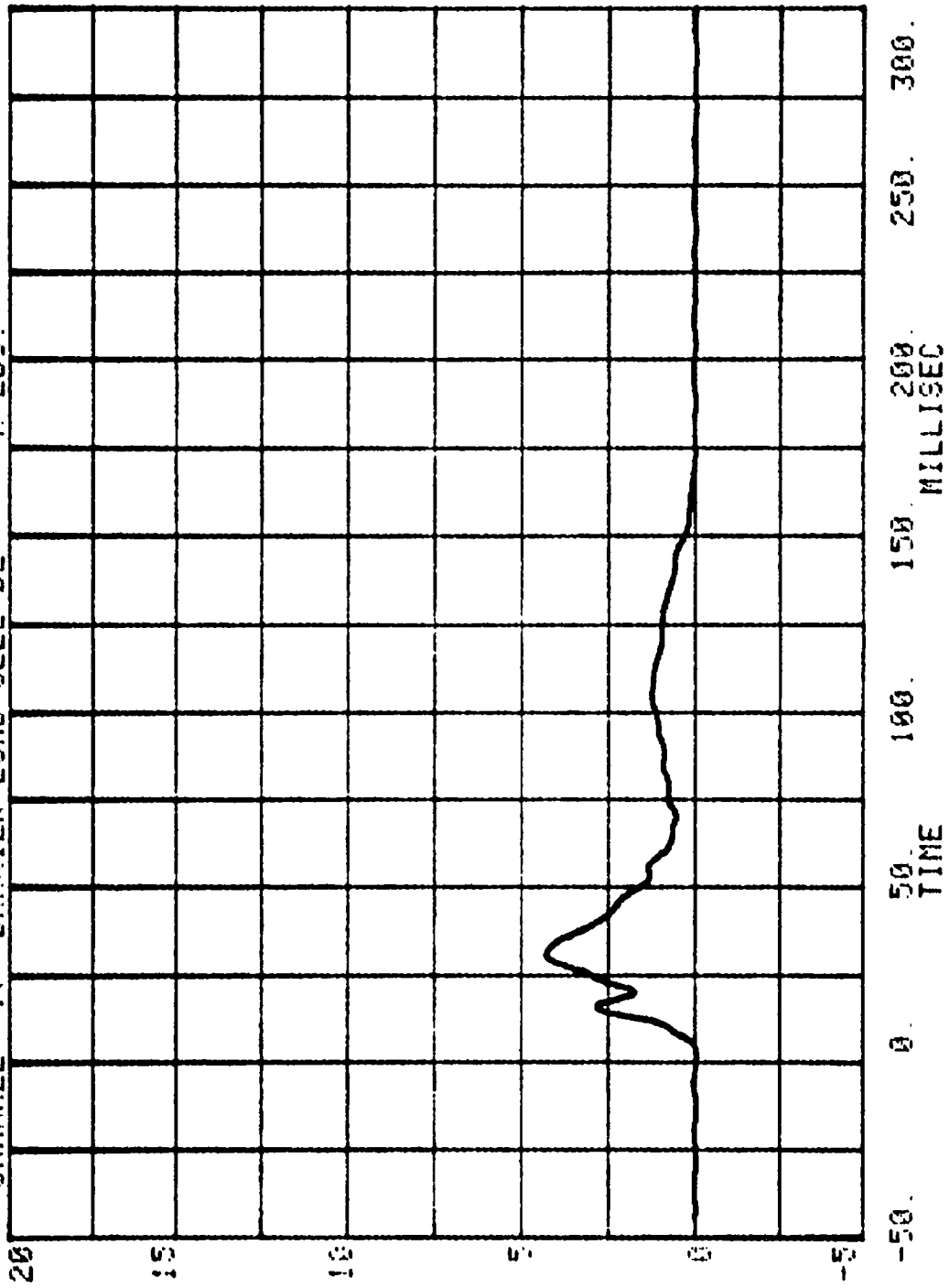
RUN= 989 SERIES= 20



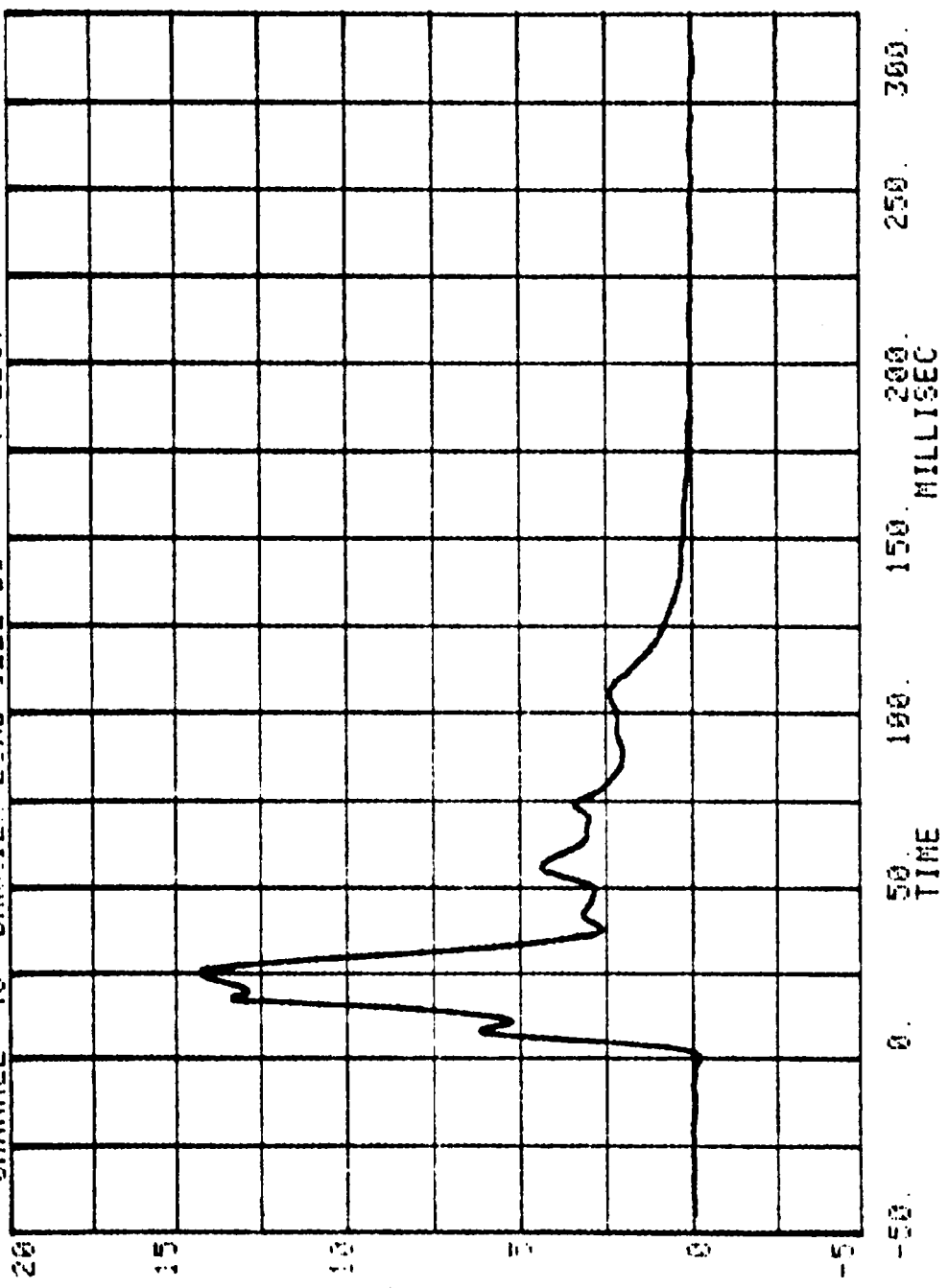
CHANNEL 47 SUPPLIER LOAD CELL BI 20 LBS



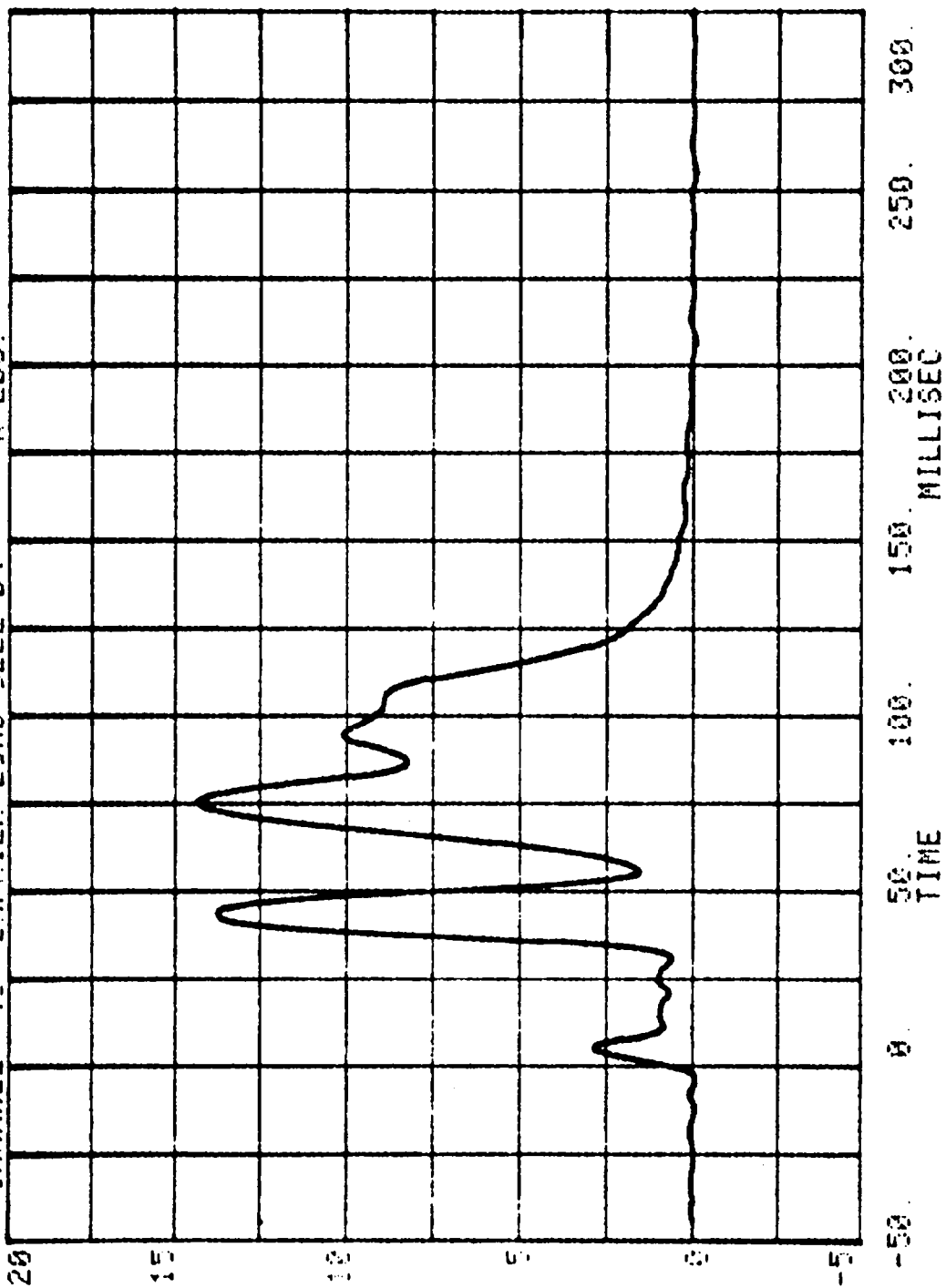
CHANNEL 44 BARRIER LOAD CELL 82 RUN= 989 SERIES= 20 K LBS.

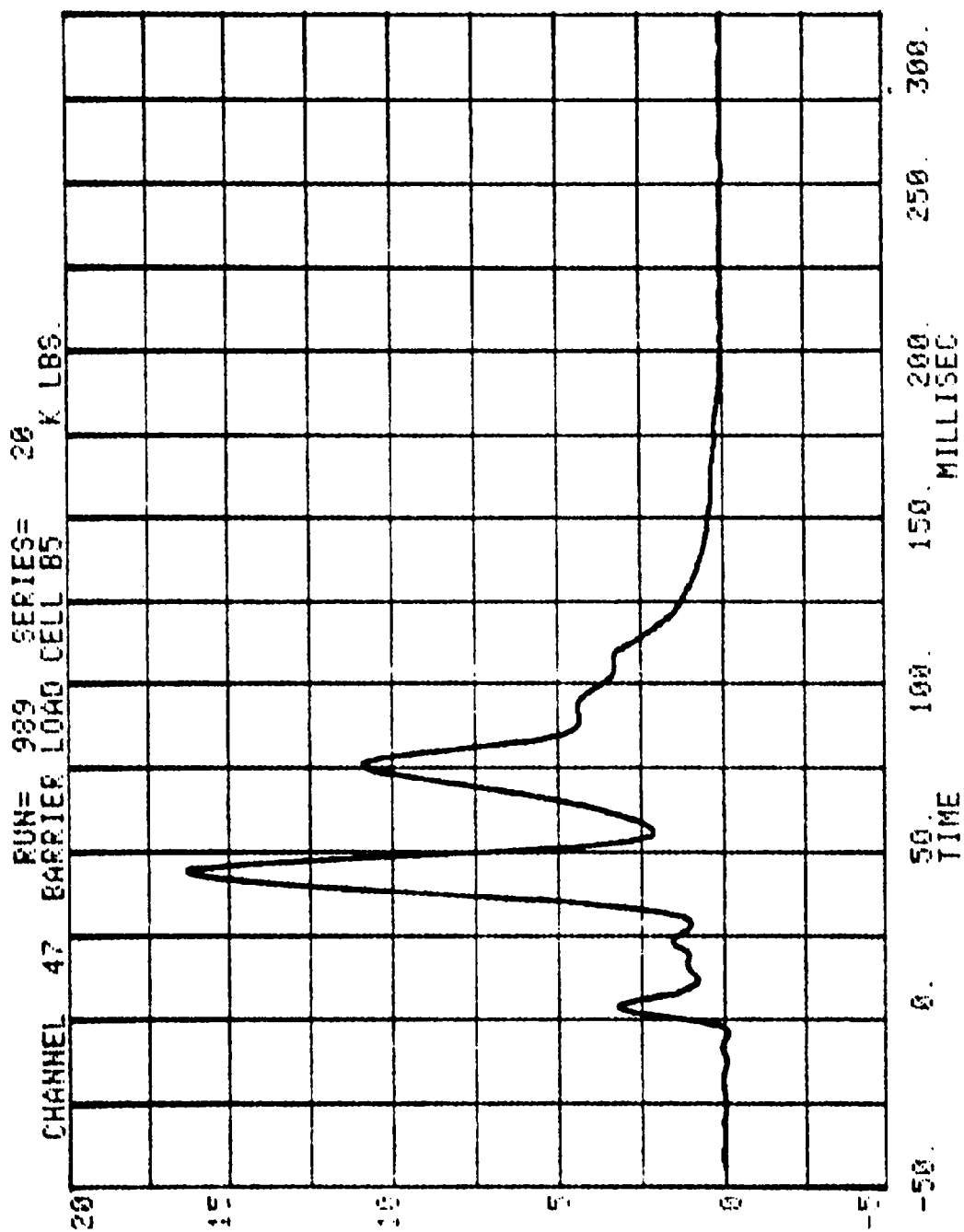


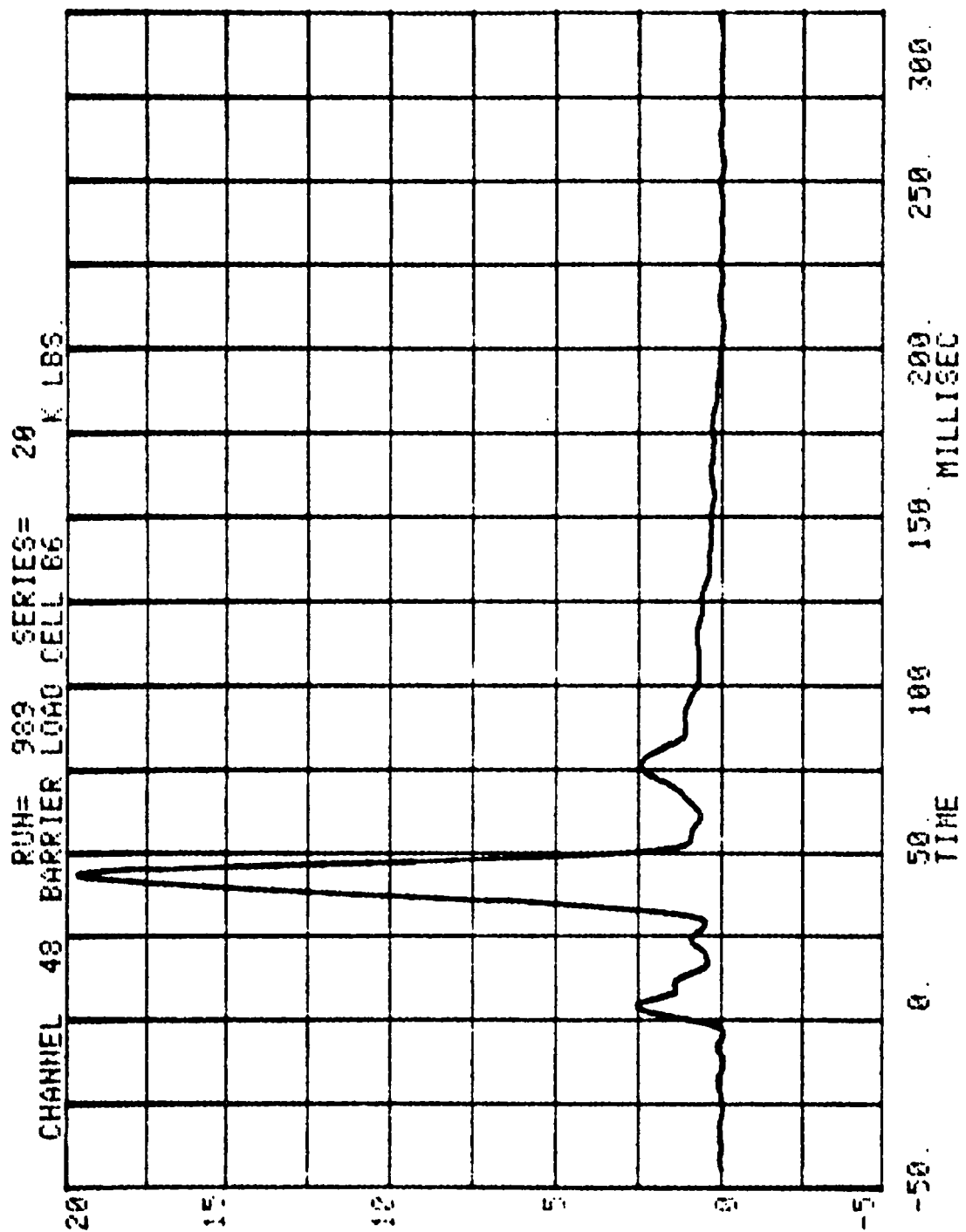
RUN= 989 SERIES= 20
CHANNEL 45 BARRIER LOAD CELL B3 Y LBS.

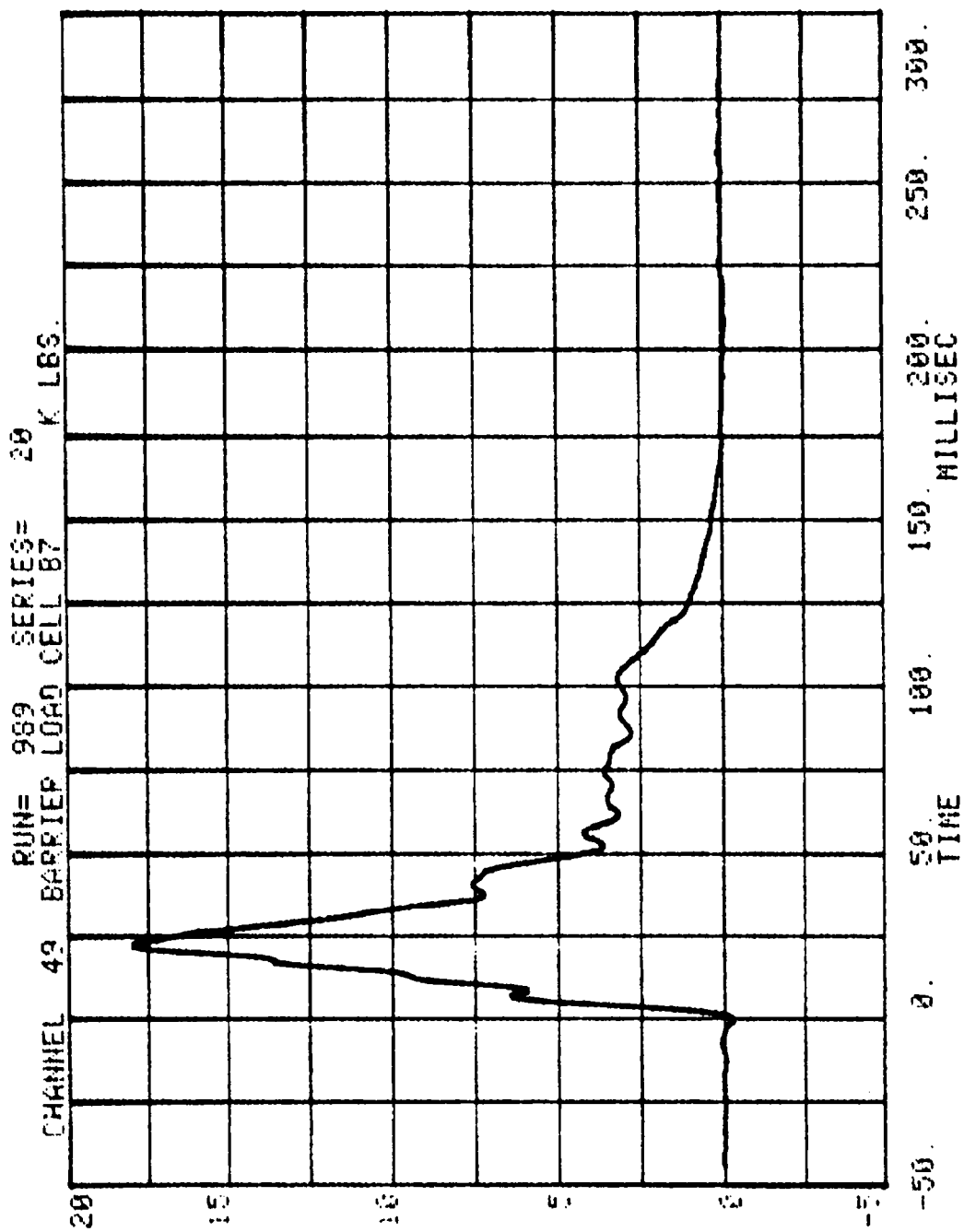


RUN= 989 SERIES= 20
CHANNEL 46 BARRIER LOAD CELL B4 K LBS.

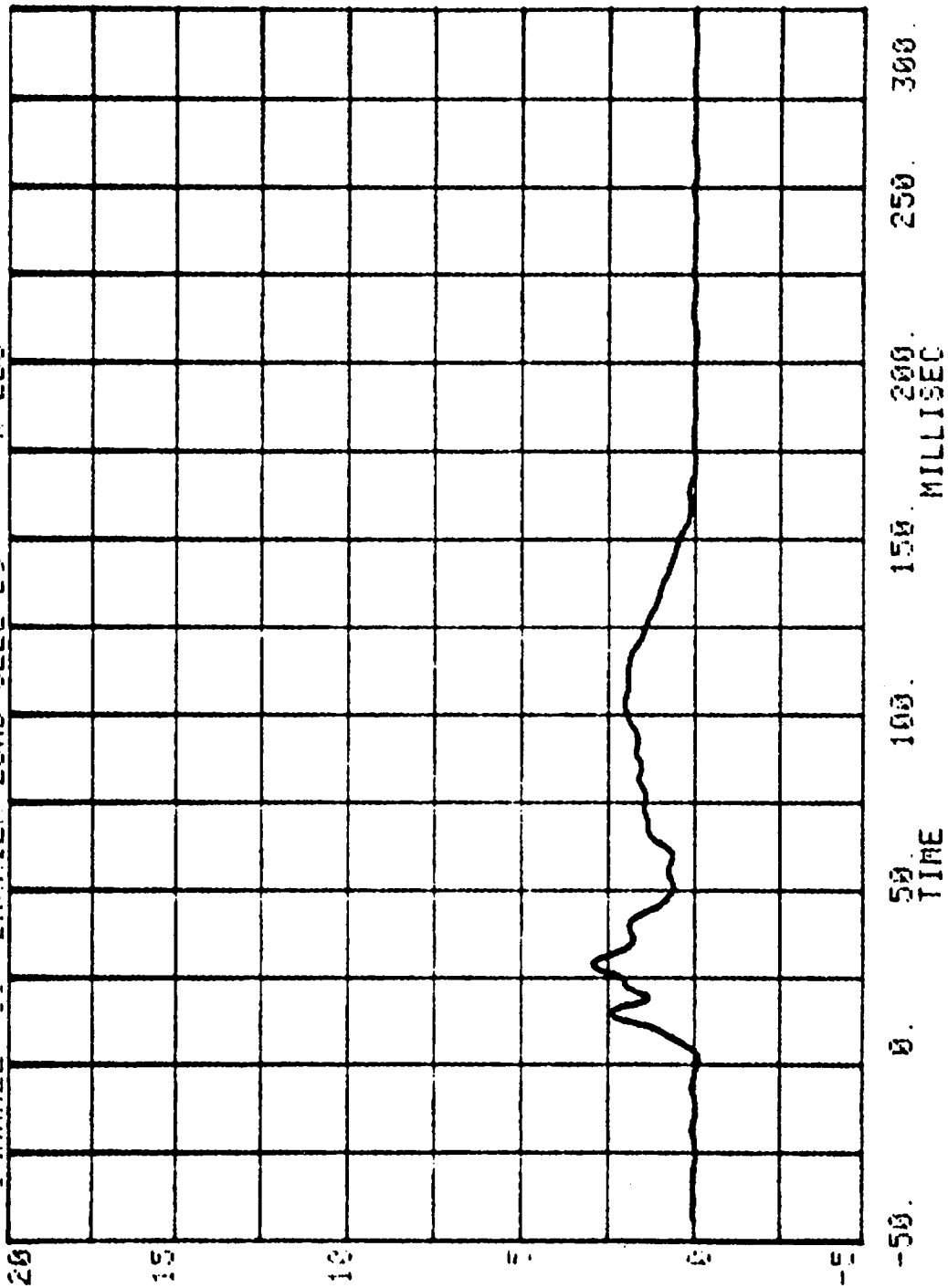




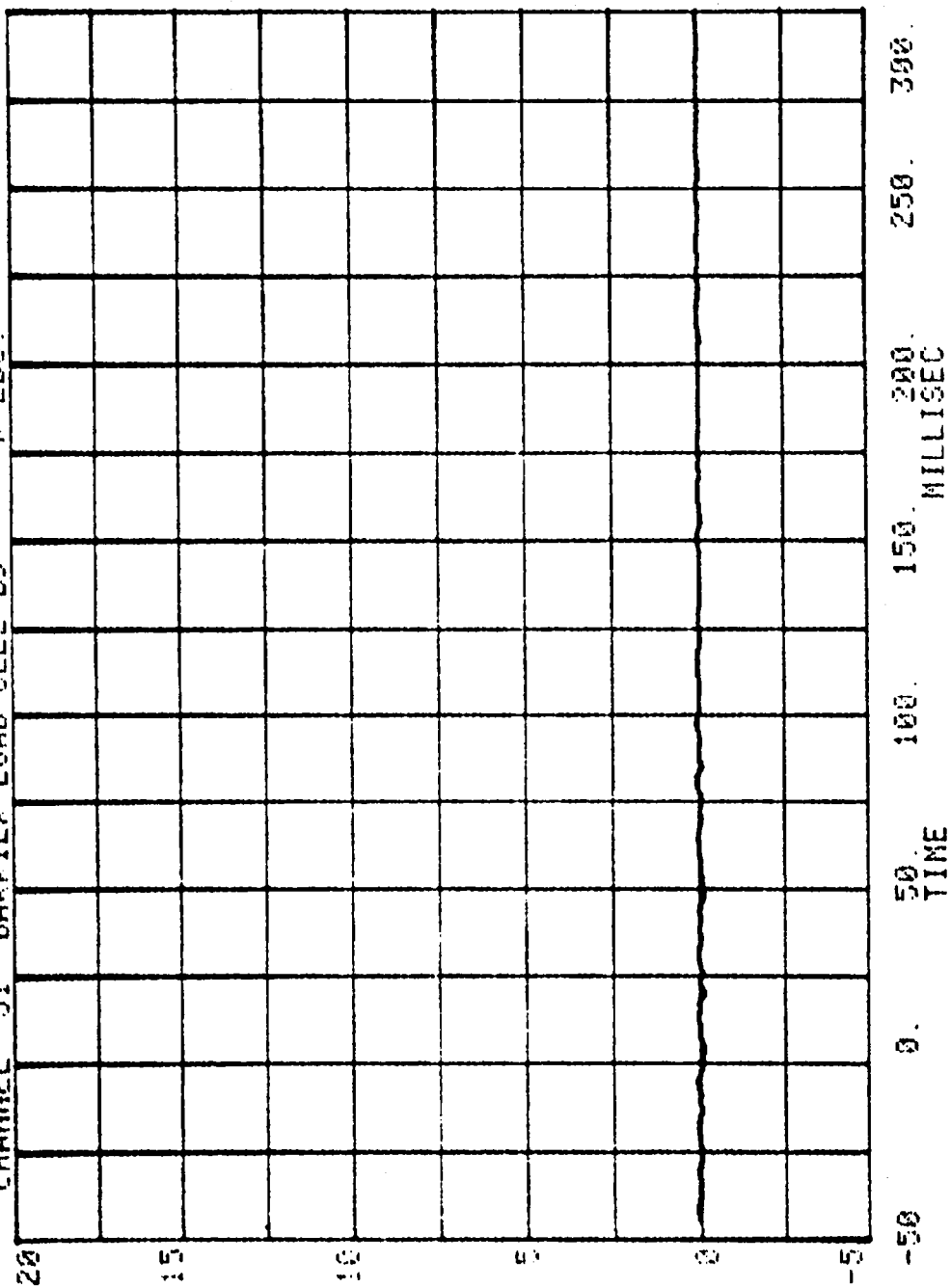




RUN= 989 SERIES= 20 K LBS
CHANNEL 50 BARRIER LOAD CELL B8



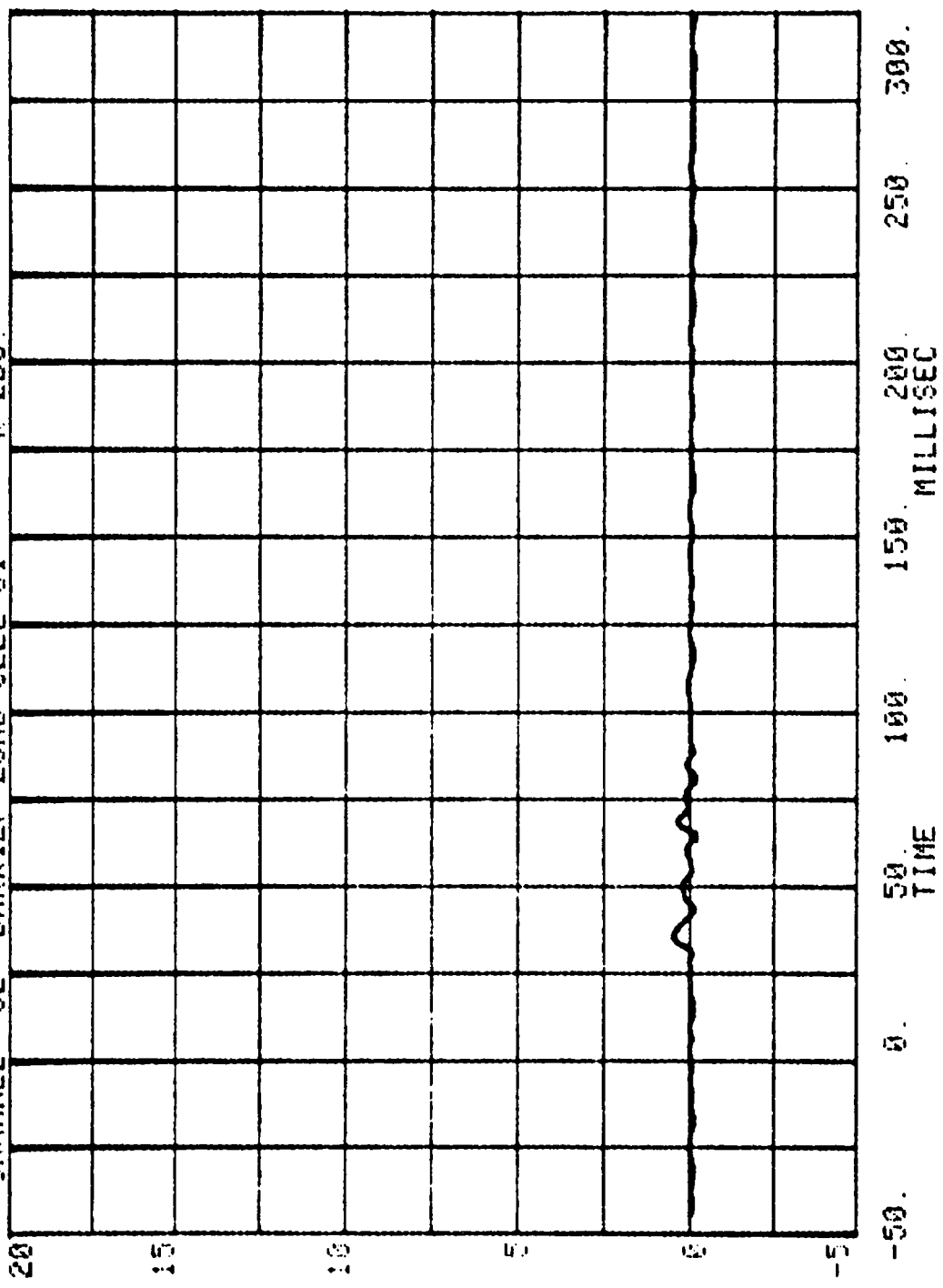
CHANNEL 51 BARRIER LOAD CELL B9
PUN= 989 SERIES= 20 K LBS.



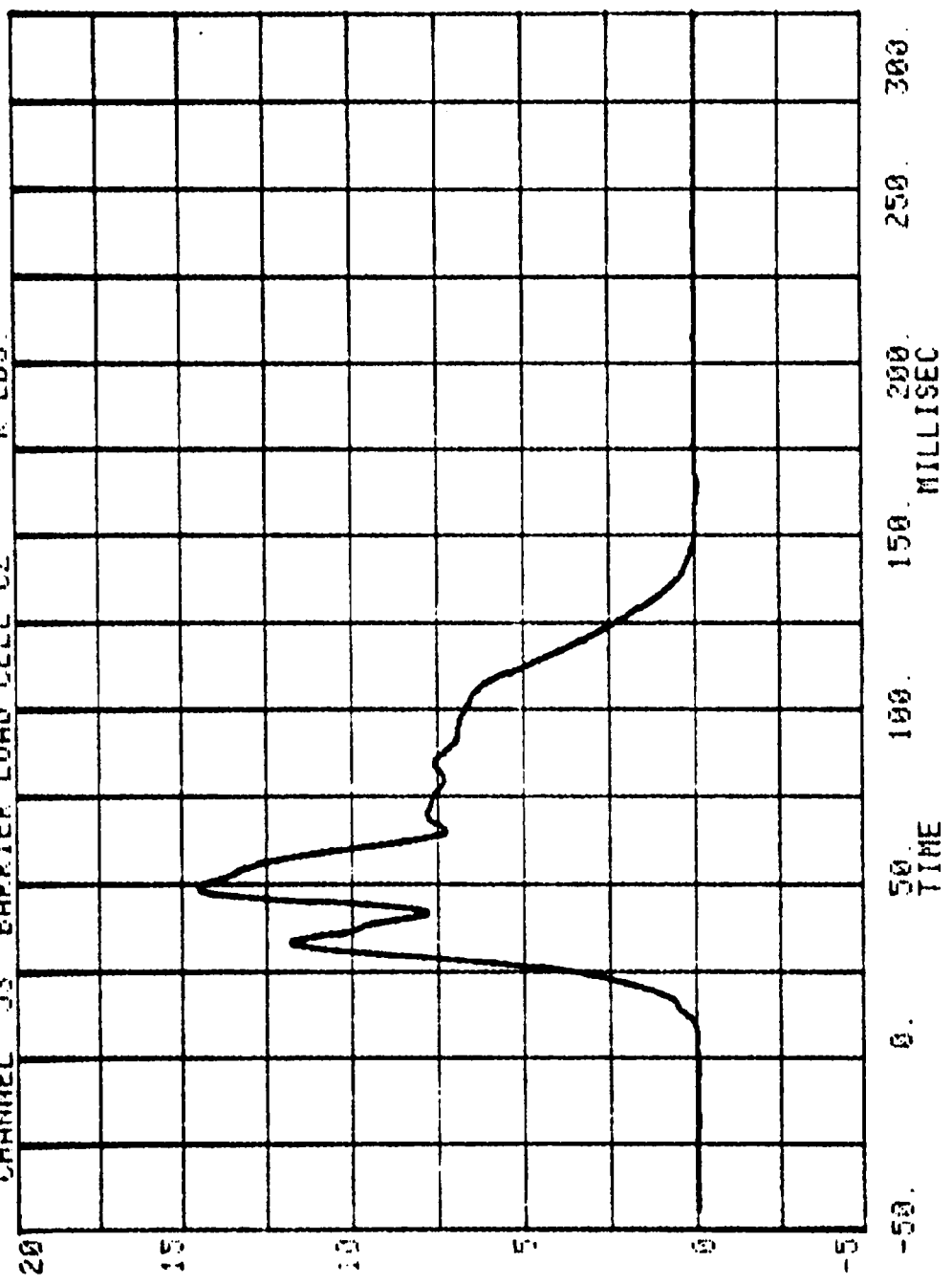
CHANNEL 52 BARRIER LOAD CELL 01

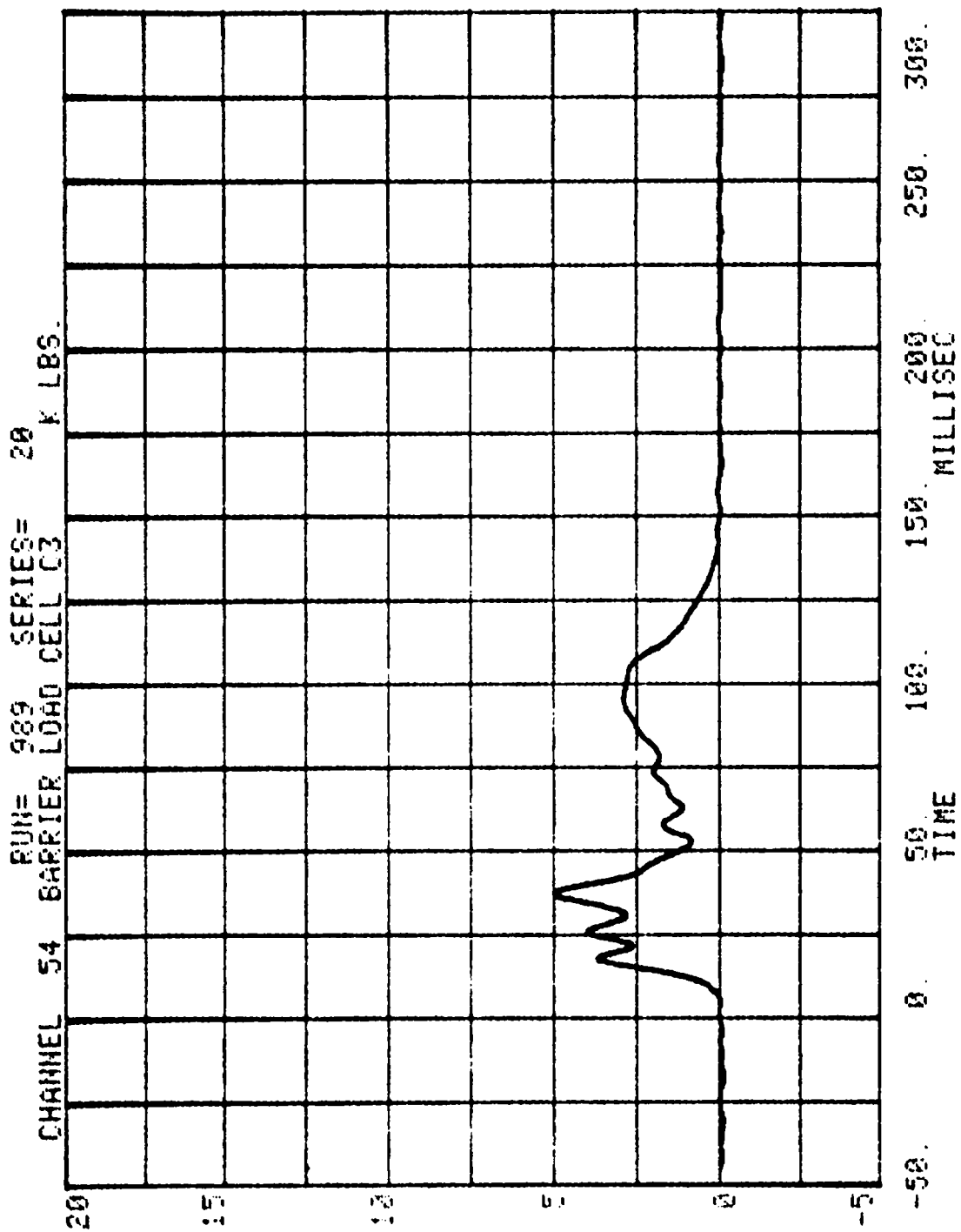
RUN= 989 SERIES= 20

K LBS.

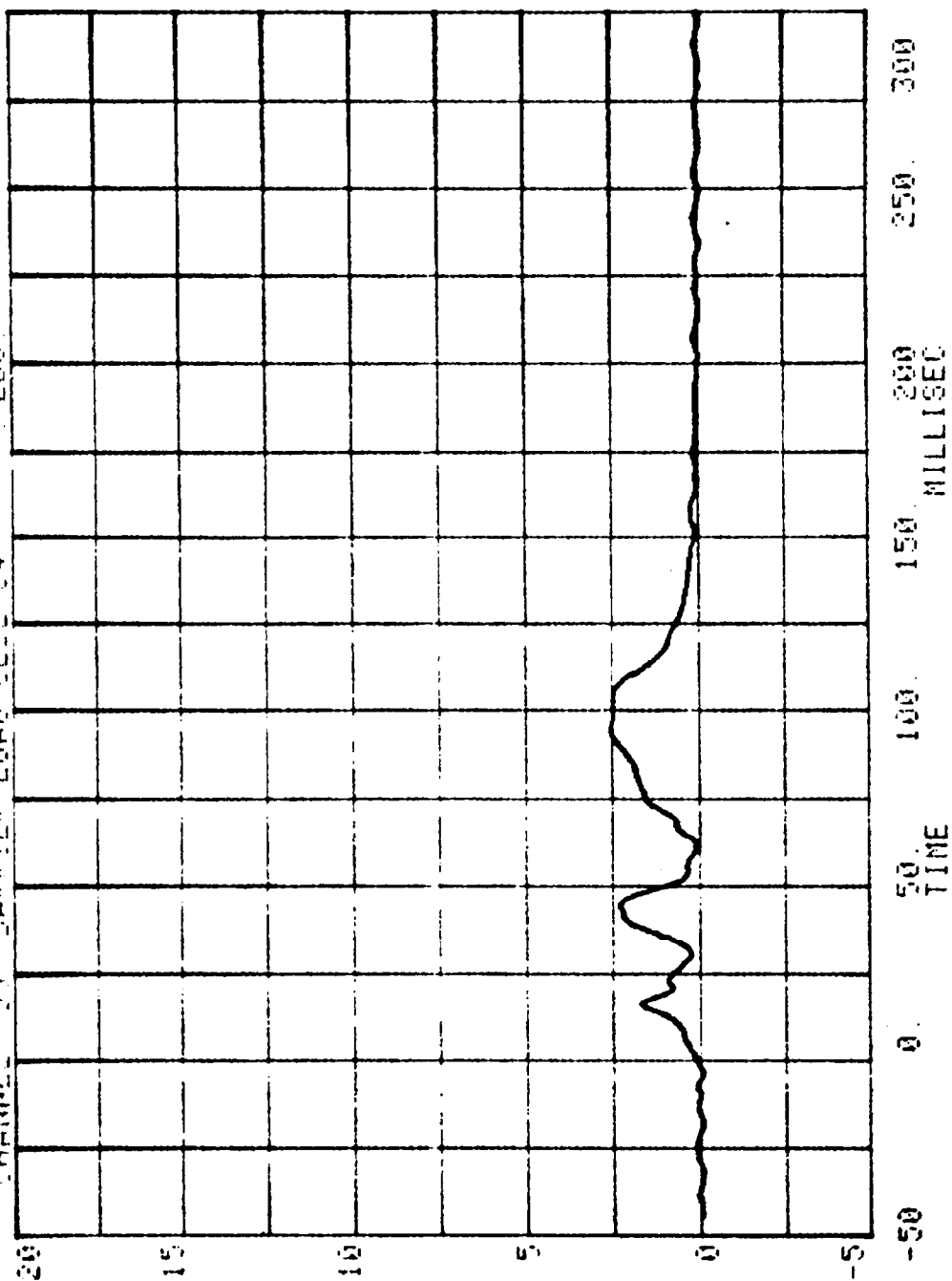


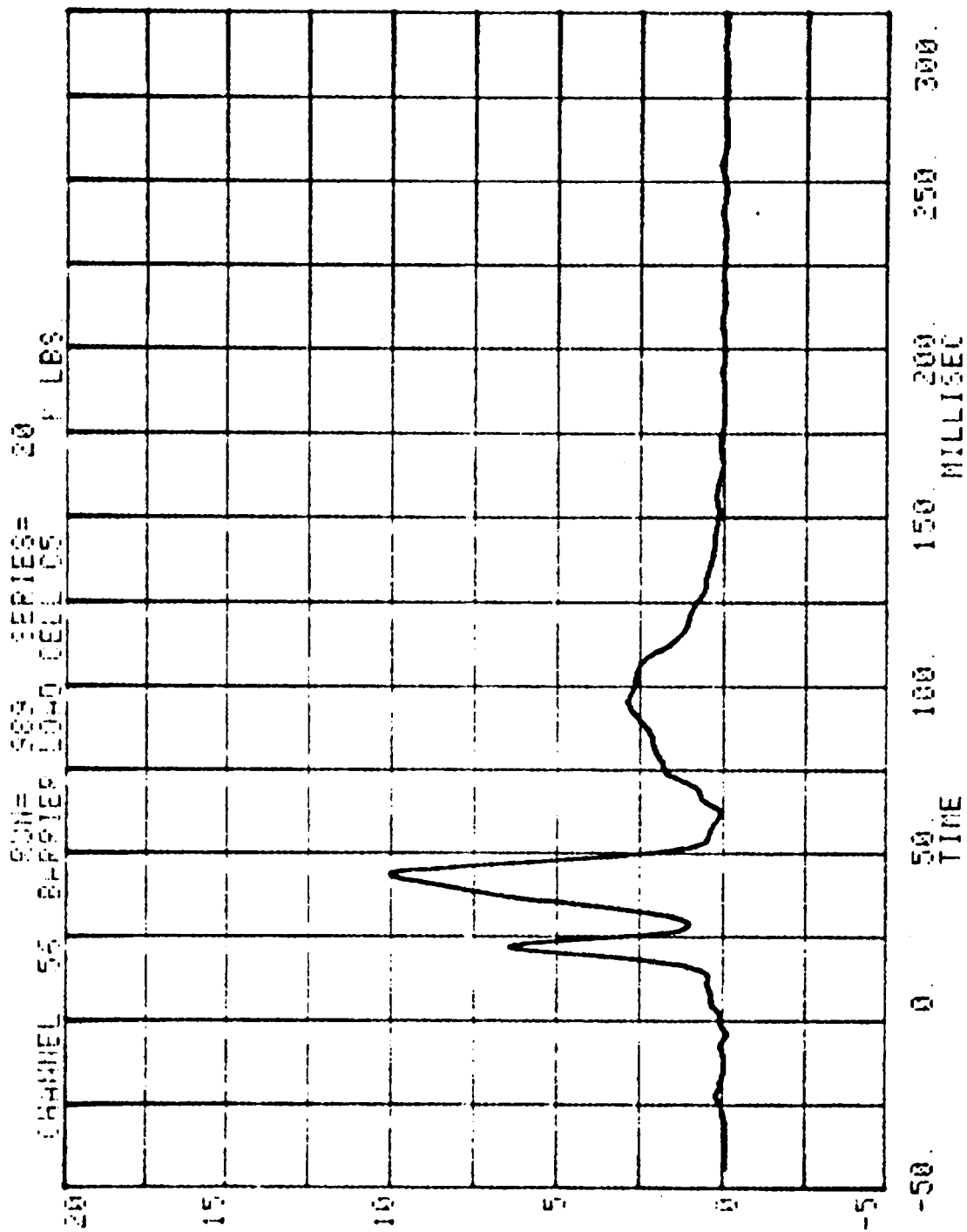
CHANNEL 53 BARRIER LOAD CELL C2 RUN= 989 SERIES= 28 K LBS.

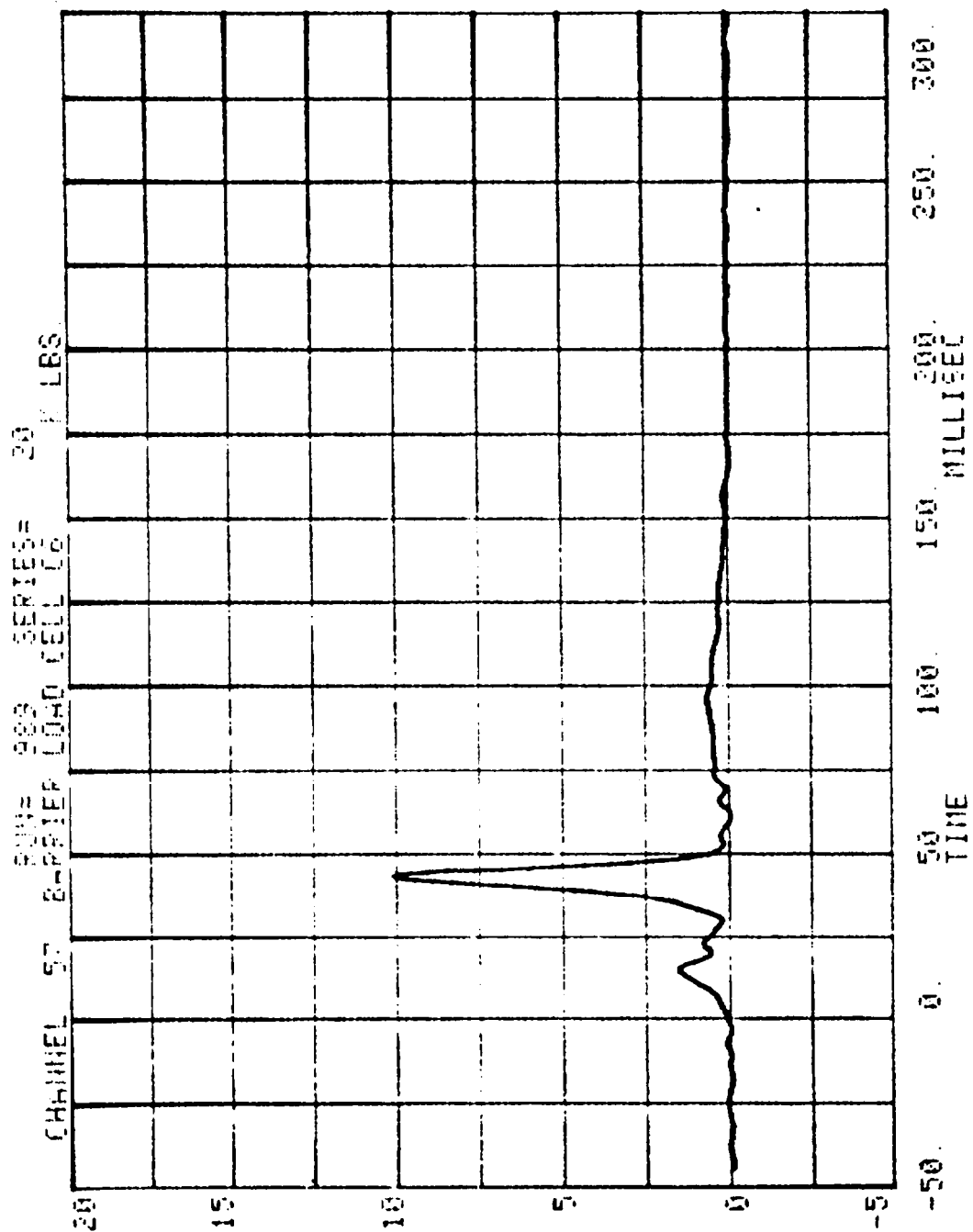




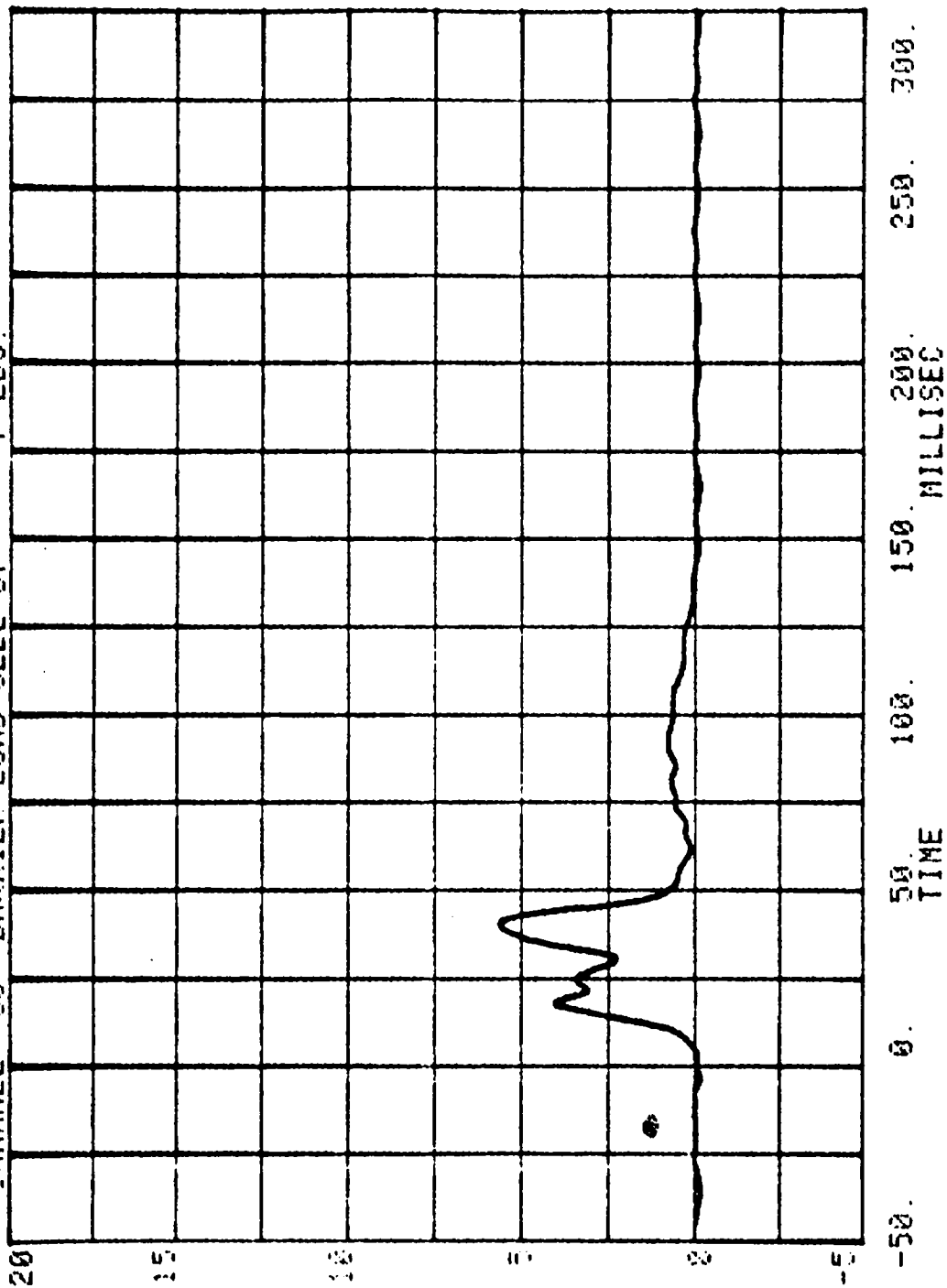
CHANNEL 55 3-2-81 9000 CELLS 20 LBS

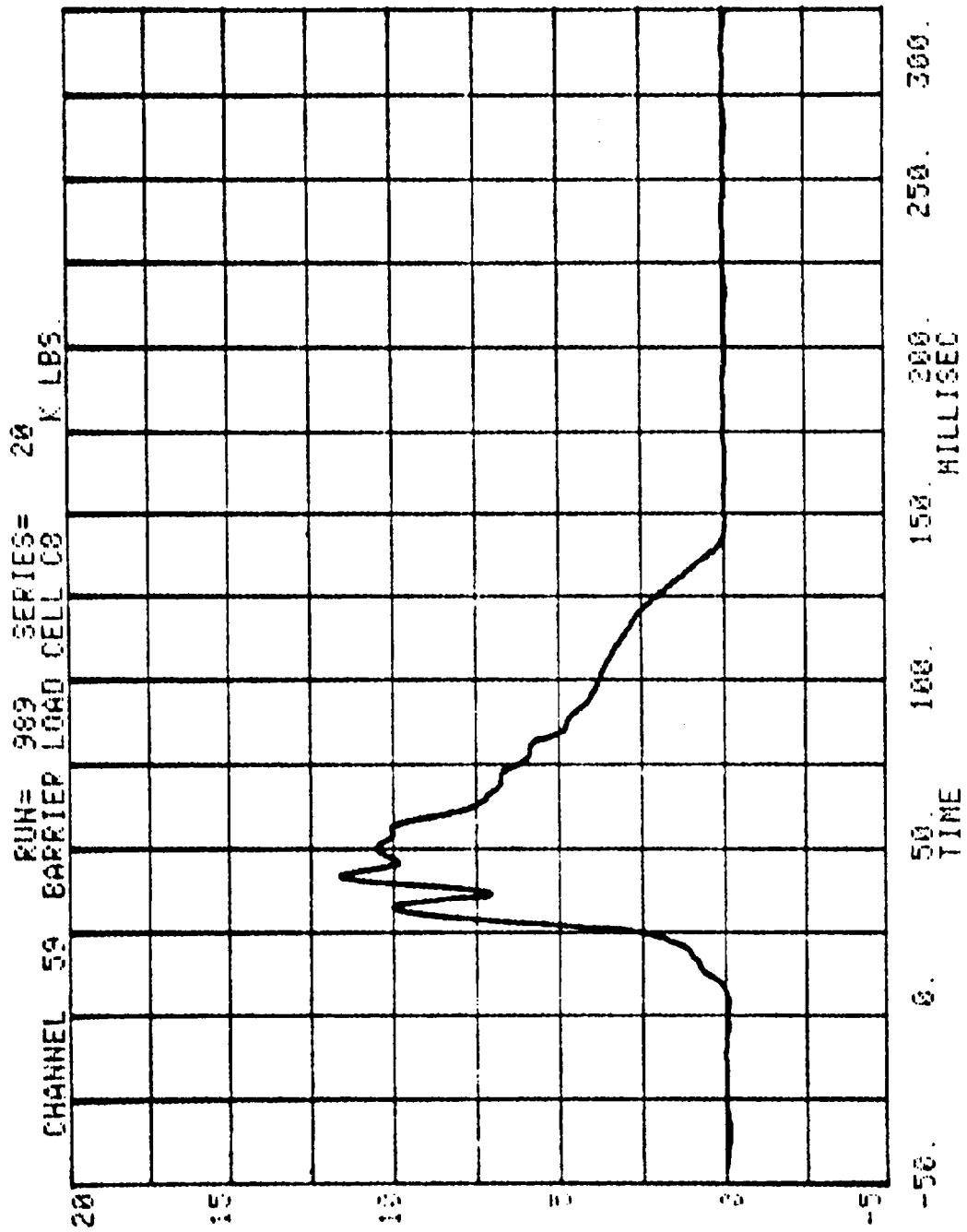




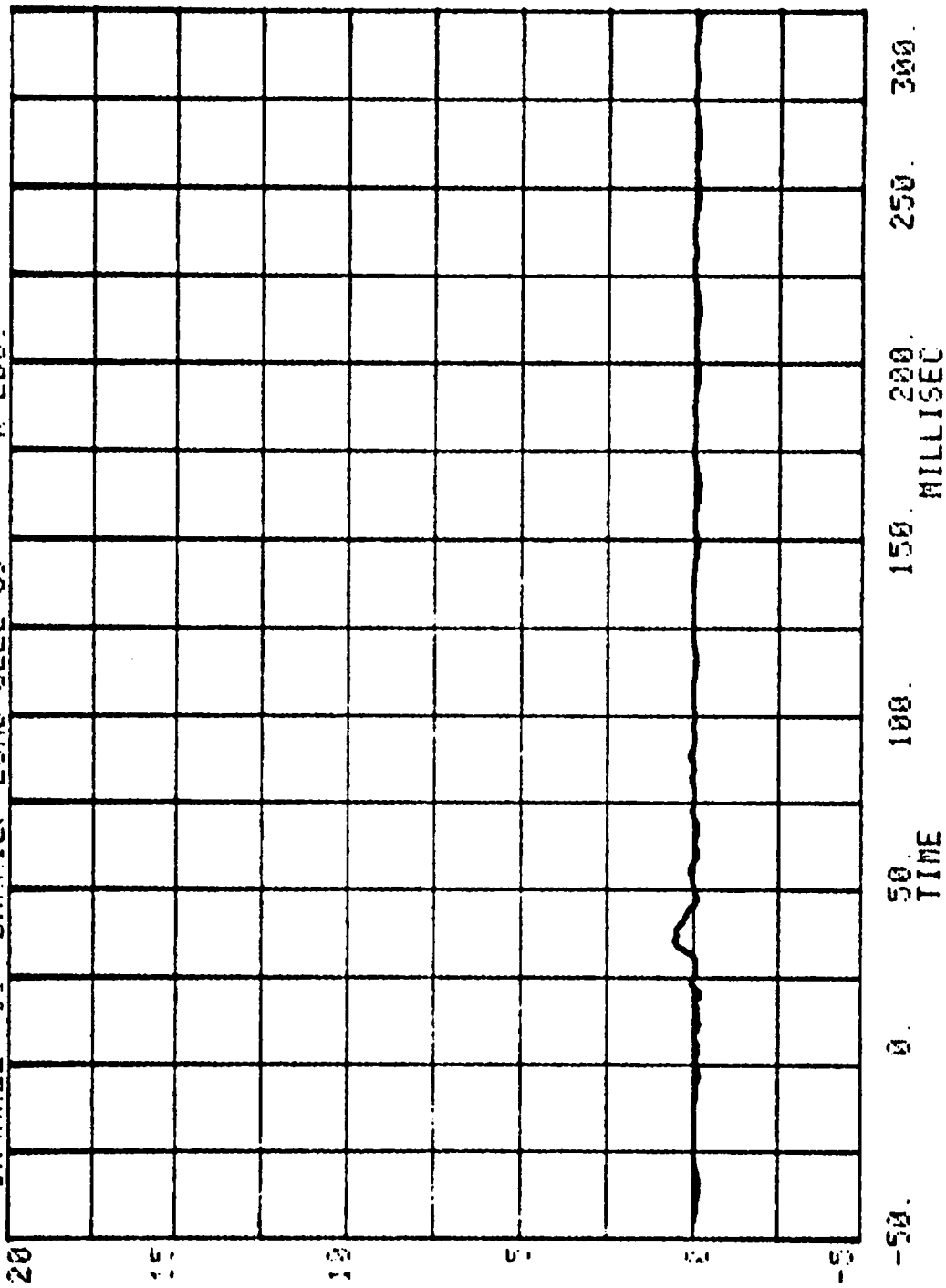


RUN= 989 SERIES= 20
CHANNEL 58 BARRIER LOAD CELL C7 K LBS.

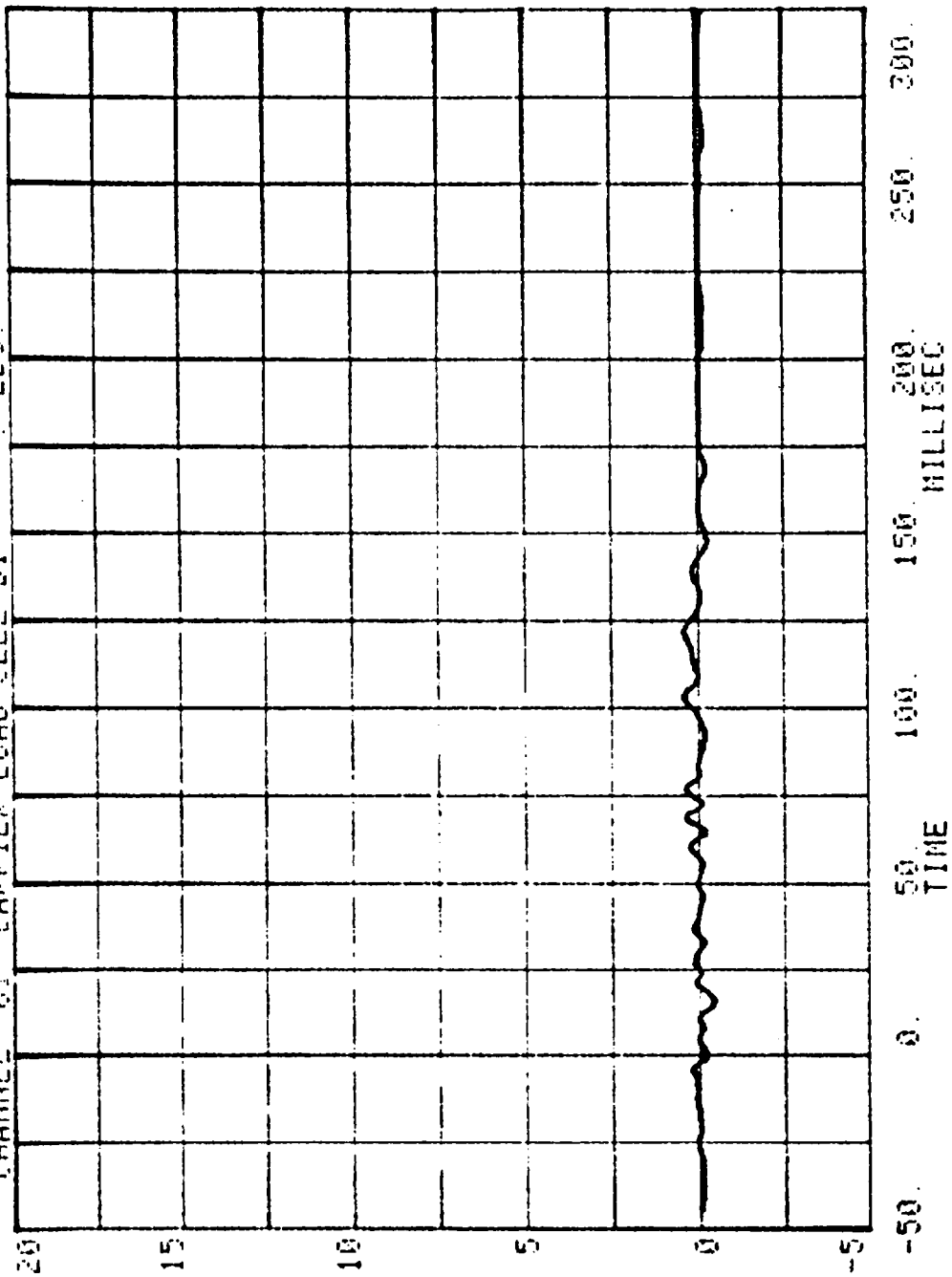




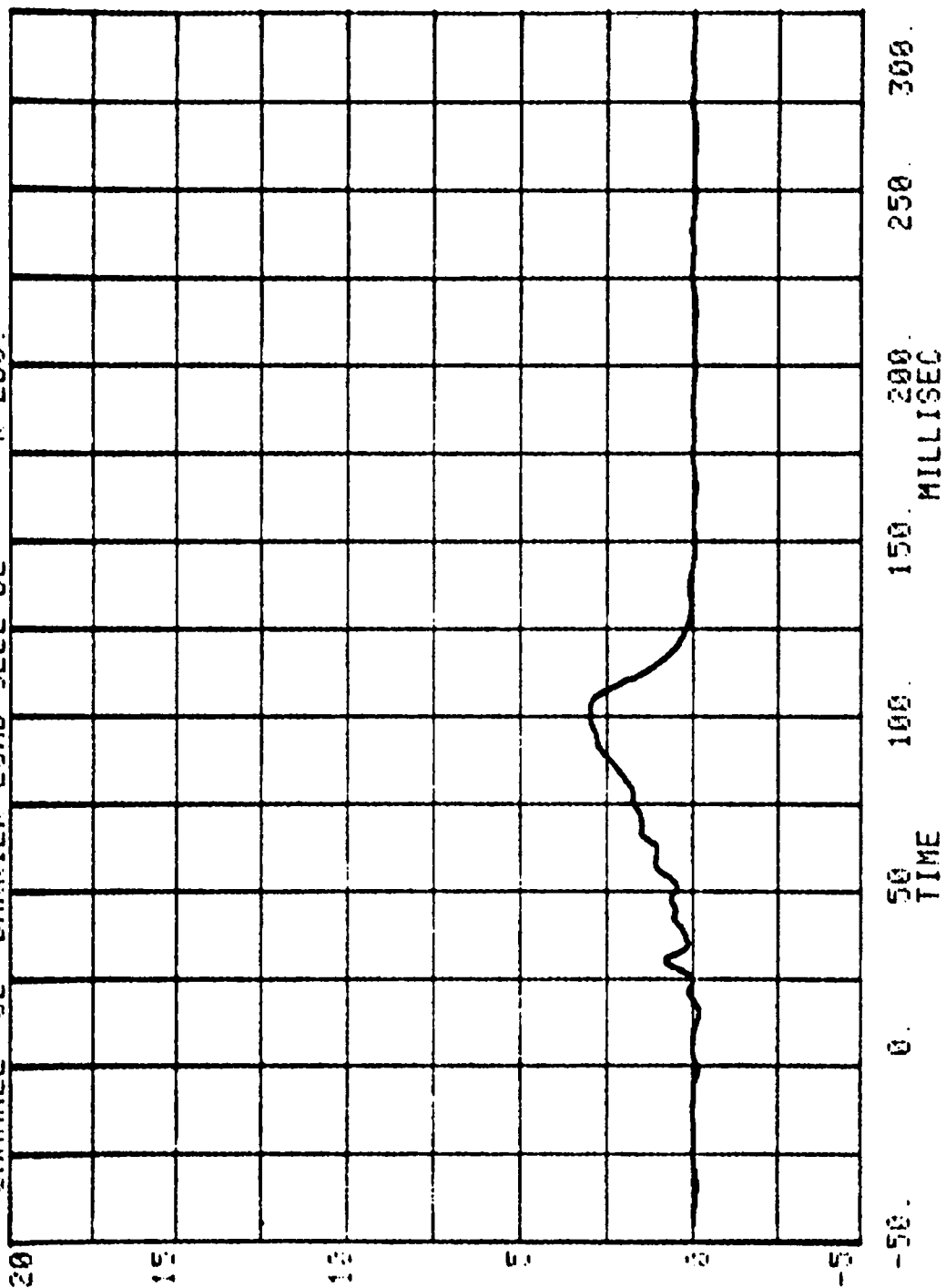
CHANNEL 68 BARRIER LOAD CELL C9 RUN= 989 SERIES= 28 K LBS.



CHANNEL 01 FORCE 100 SERIES= 20 F LBS.
CARRIER LOAD CELL 01

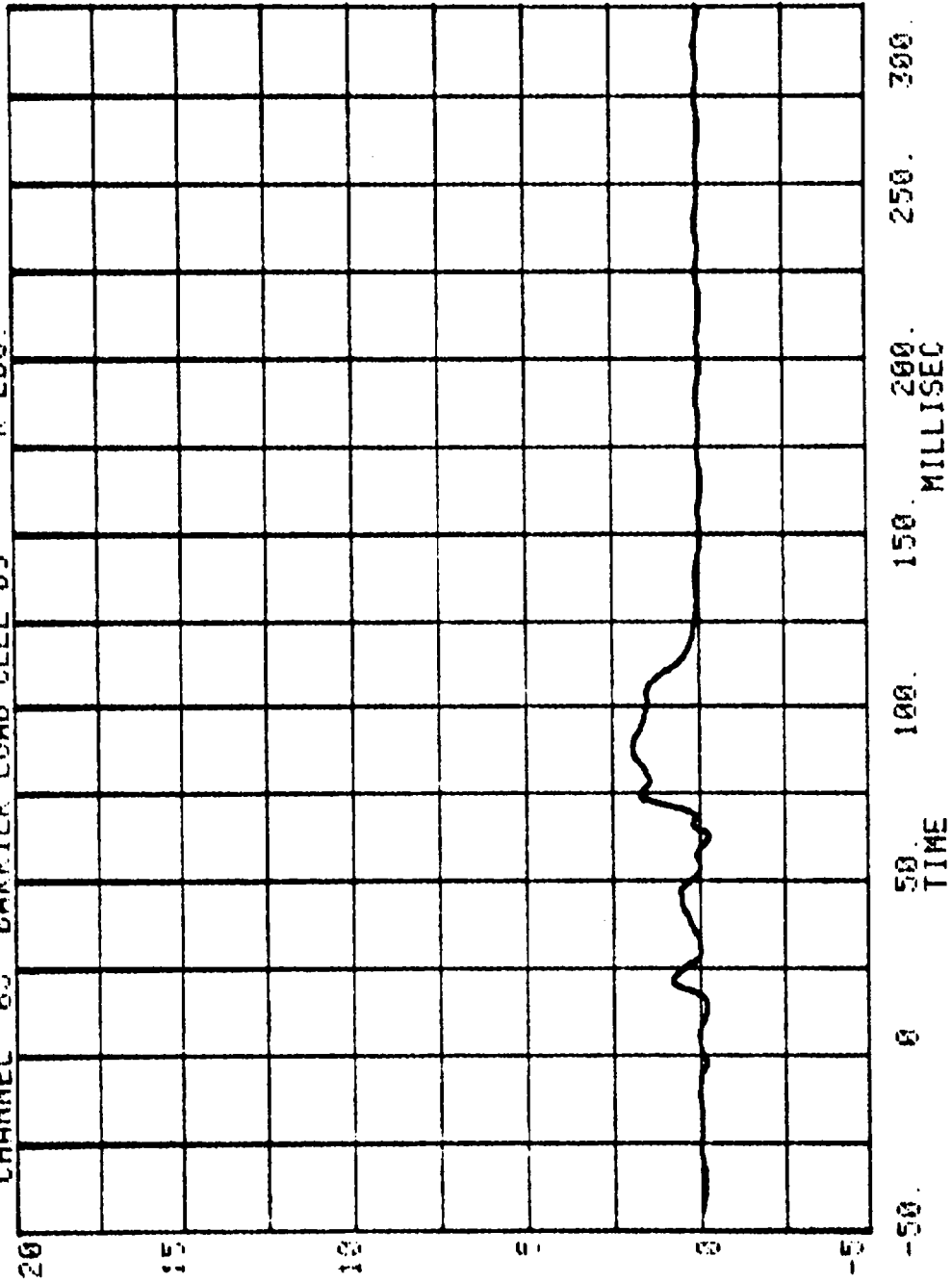


CHANNEL 62 BARRIER LOAD CELL 02 RUN= 989 SERIES= 20 K LBS.

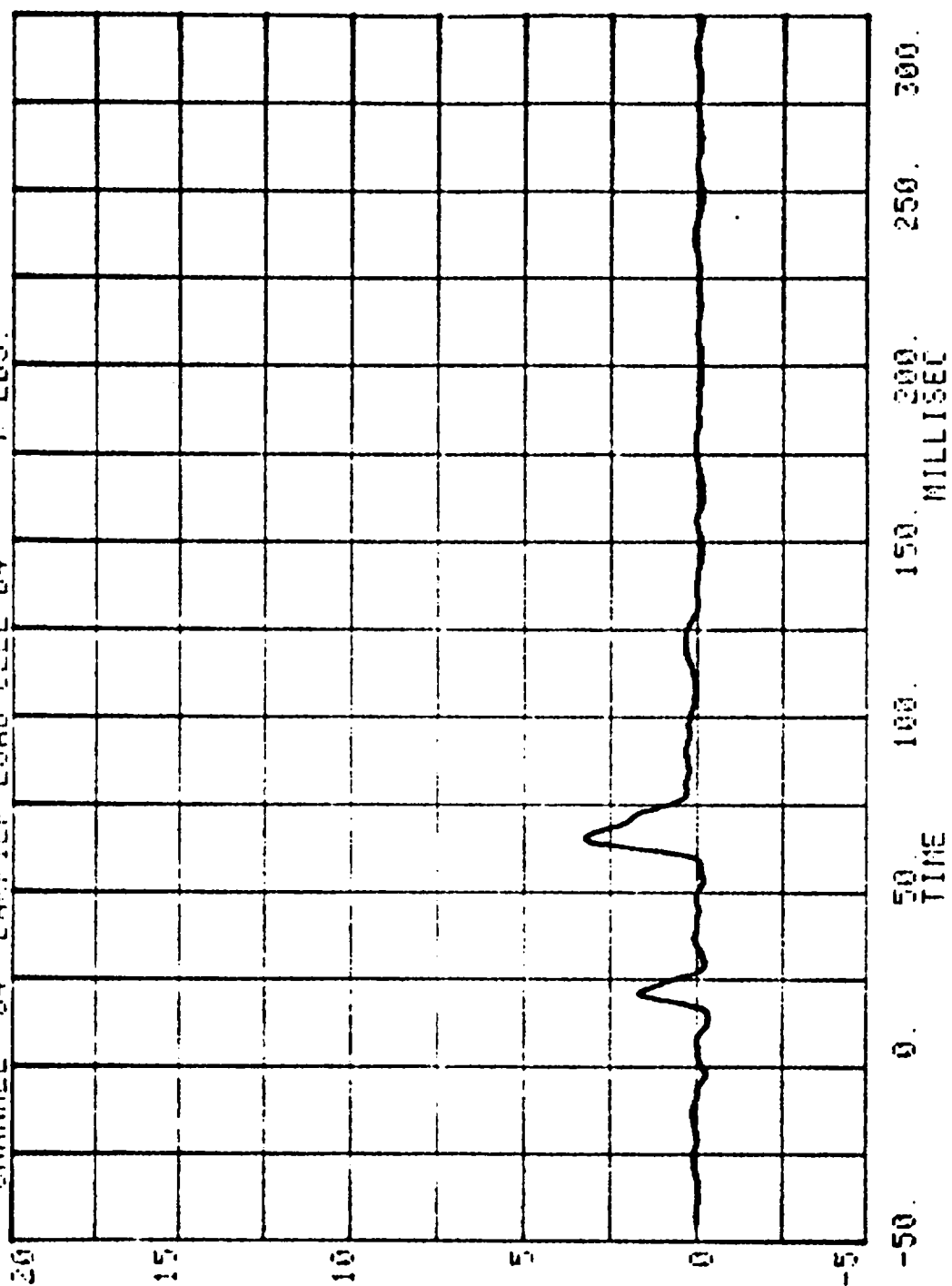


CHANNEL 63 BARRIER LOAD CELL 03 K LBS.

RUN= 989 SERIES= 20



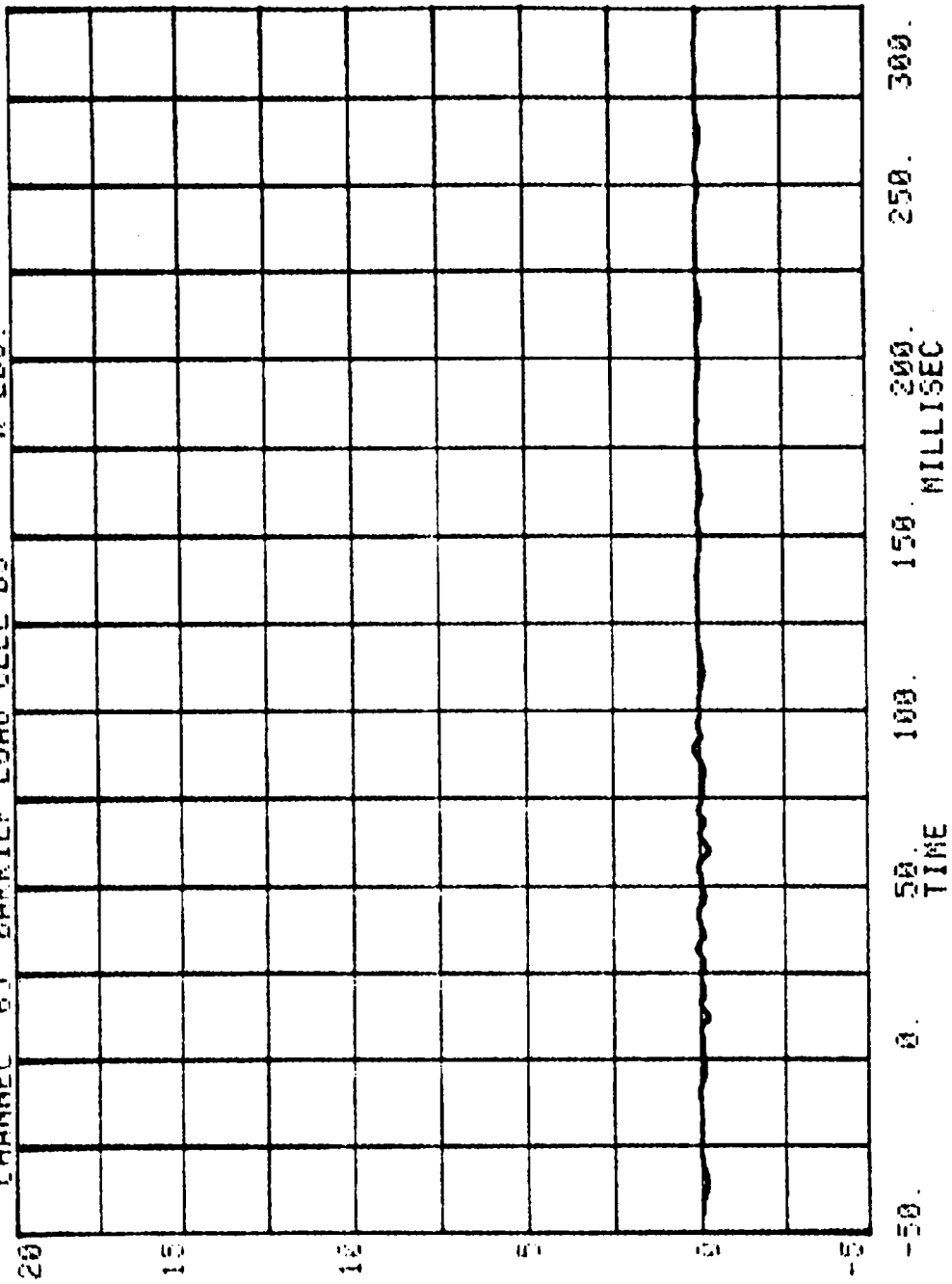
CHANNEL 64 BUFFER LOAD CELL 04 SUR= 909 SERIES= 20 K LBS.



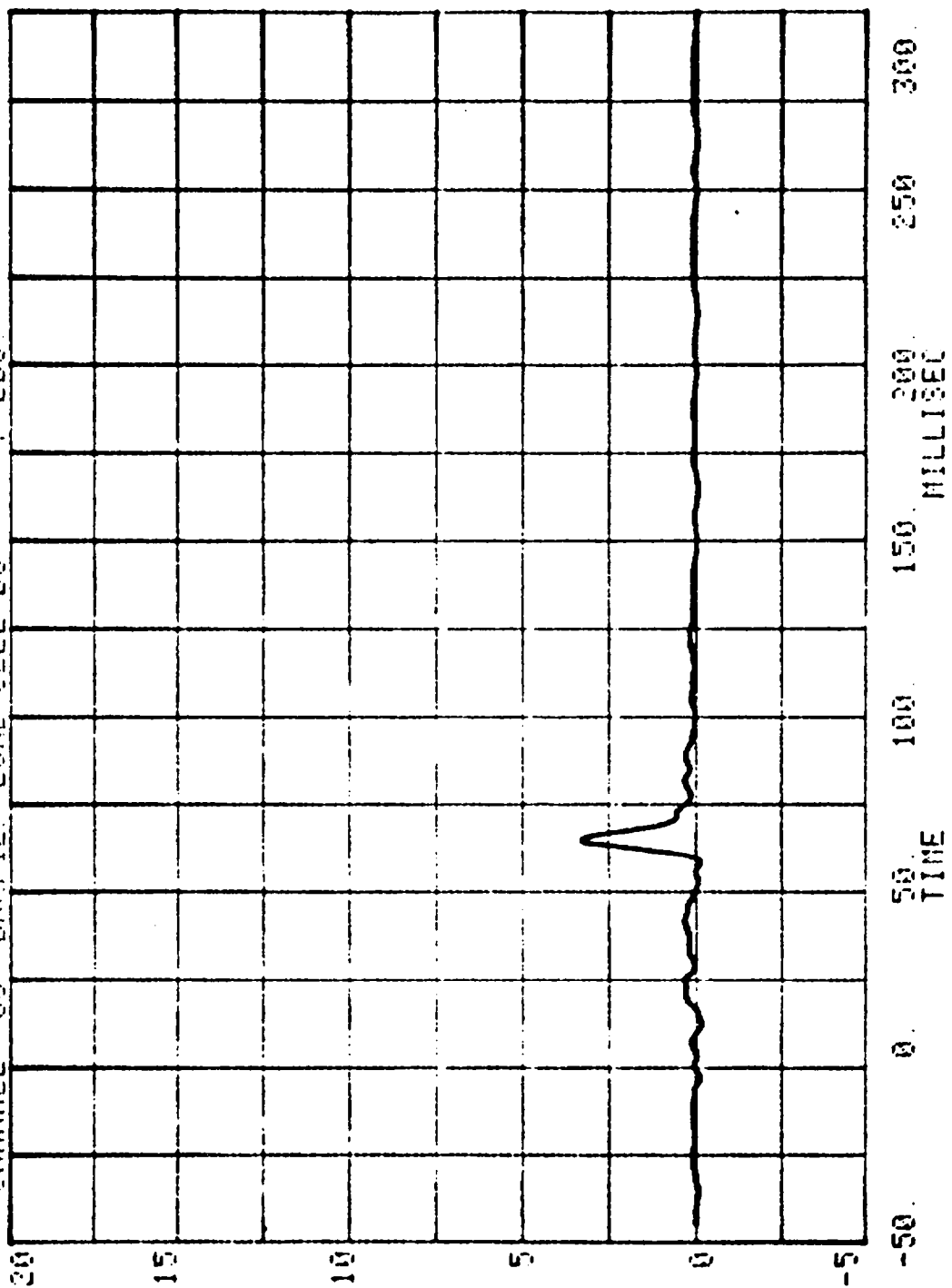
CHANNEL 65 BARRIER LOAD CELL D5

RUN= 989 SERIES= 20

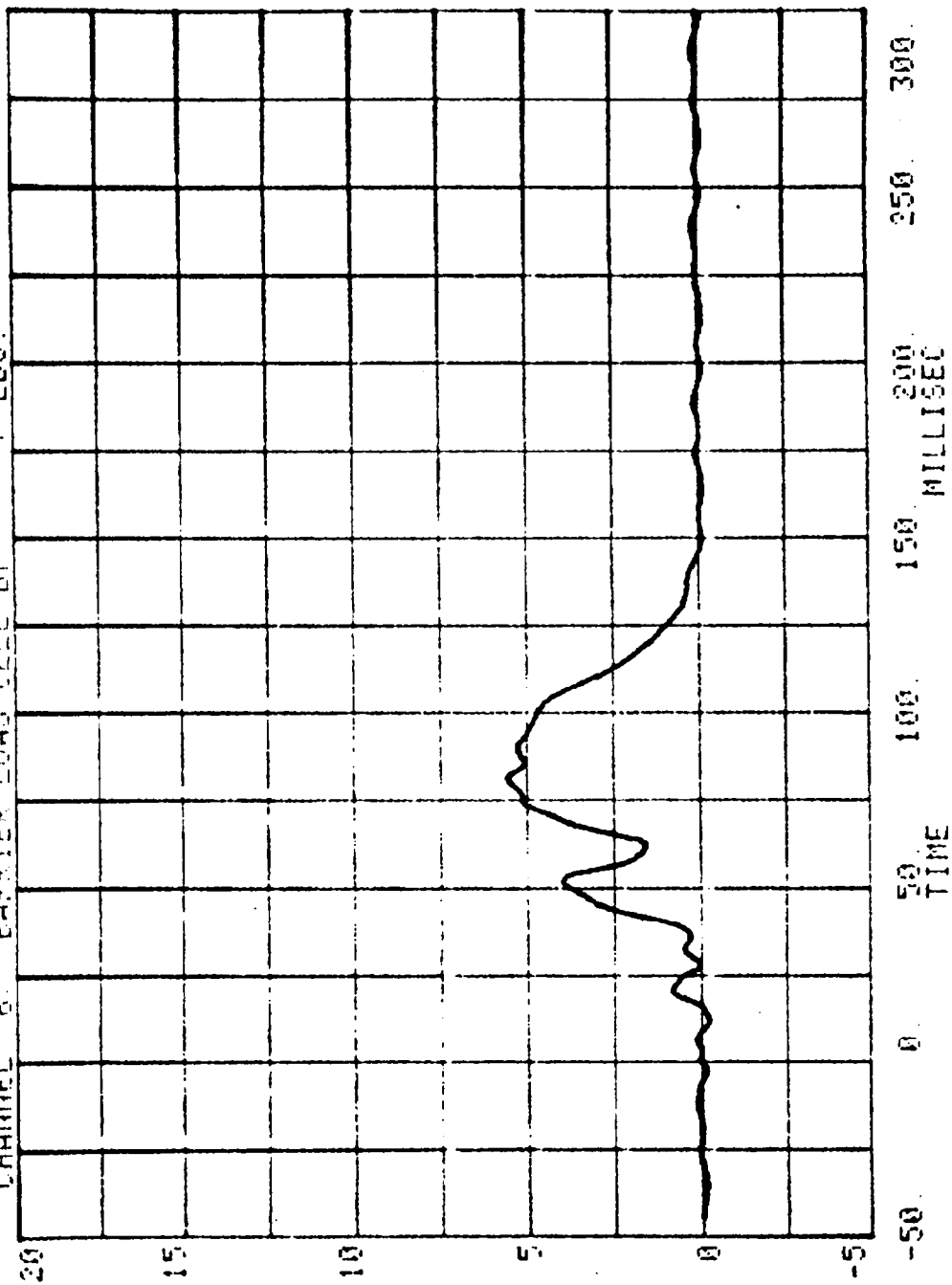
K LBS.



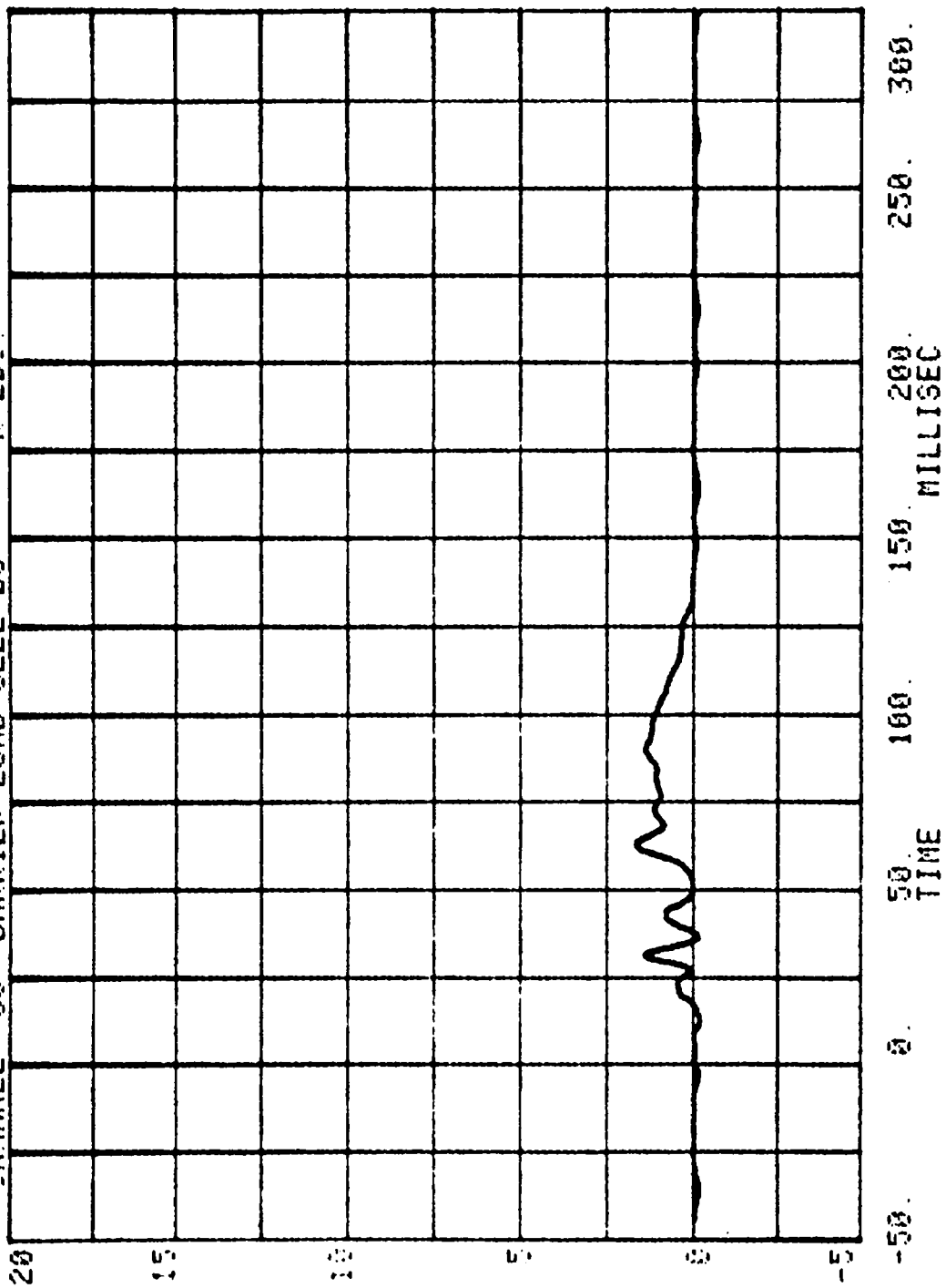
CHANNEL 66 BARRIER LOAD CELL D6
PULSE 999 SERIES= 20
K LBS



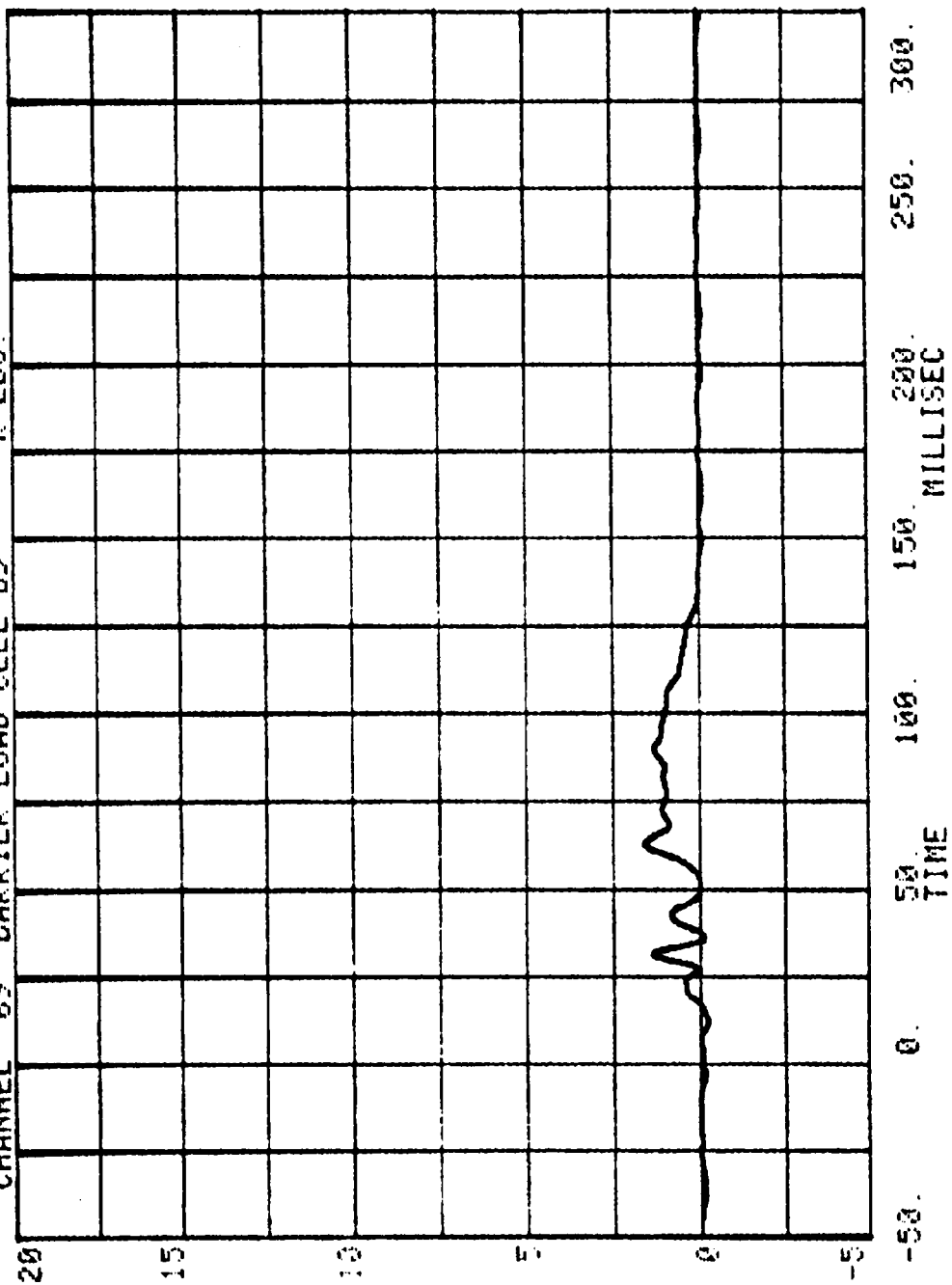
CHANNEL 67 BARRIER LOAD CELL 07
P LBS.



RUN= 989 SERIES= 20 K LBS.
CHANNEL 68 BARRIER LOAD CELL D8

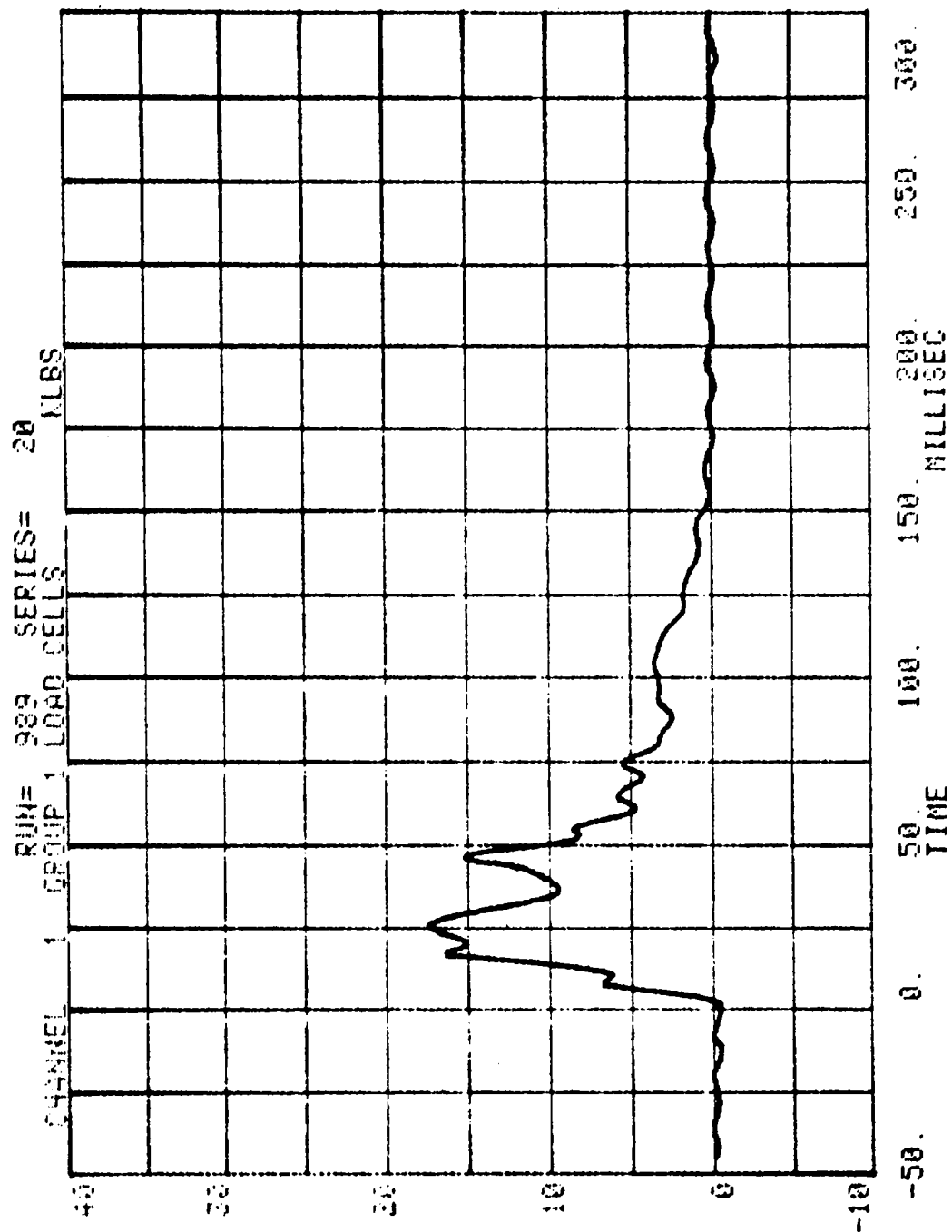


CHANNEL 69 BARRIER LOAD CELL 09 RUN= 999 SERIES= 20 K LBS.

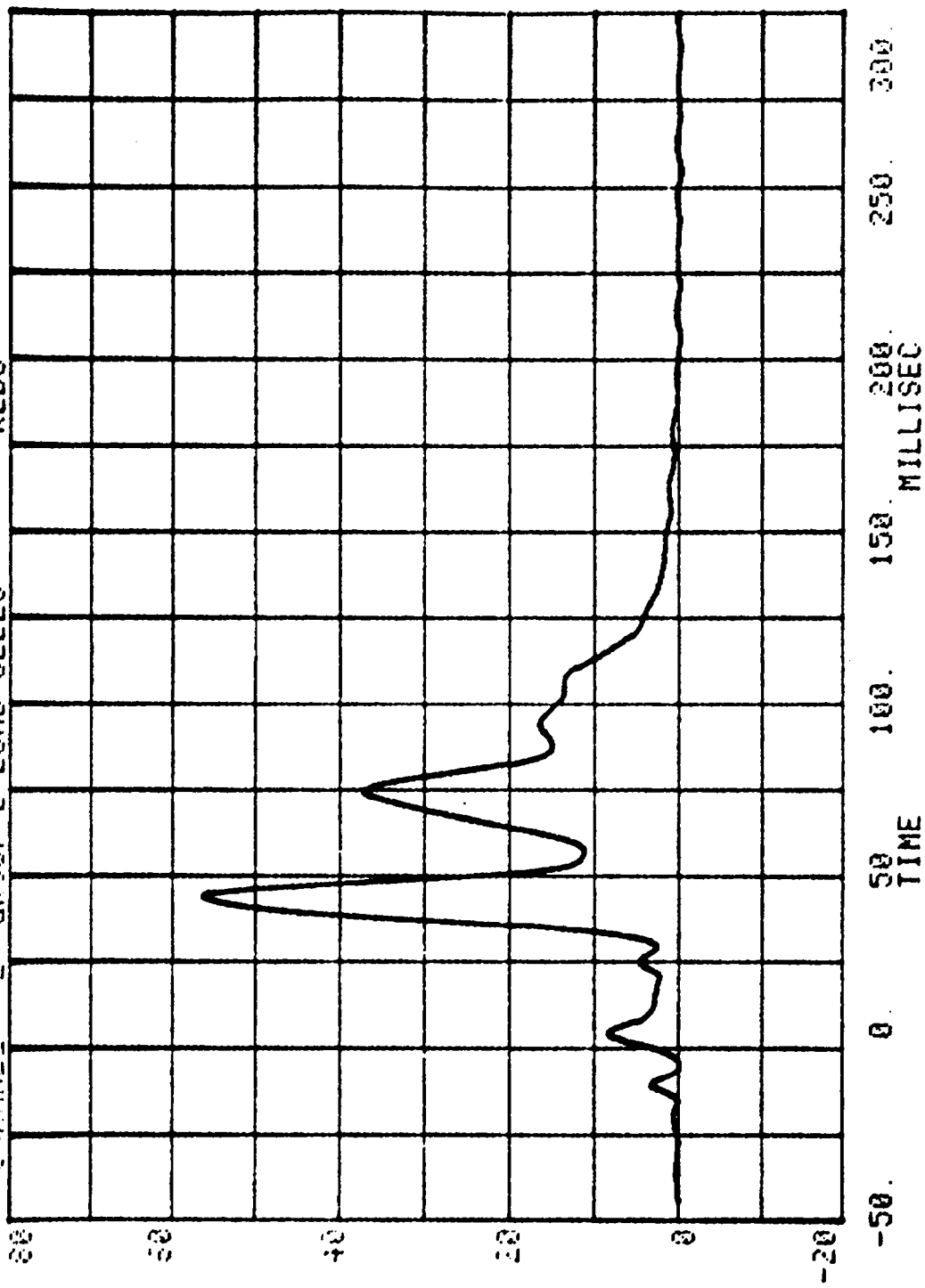


NCAP TEST #20

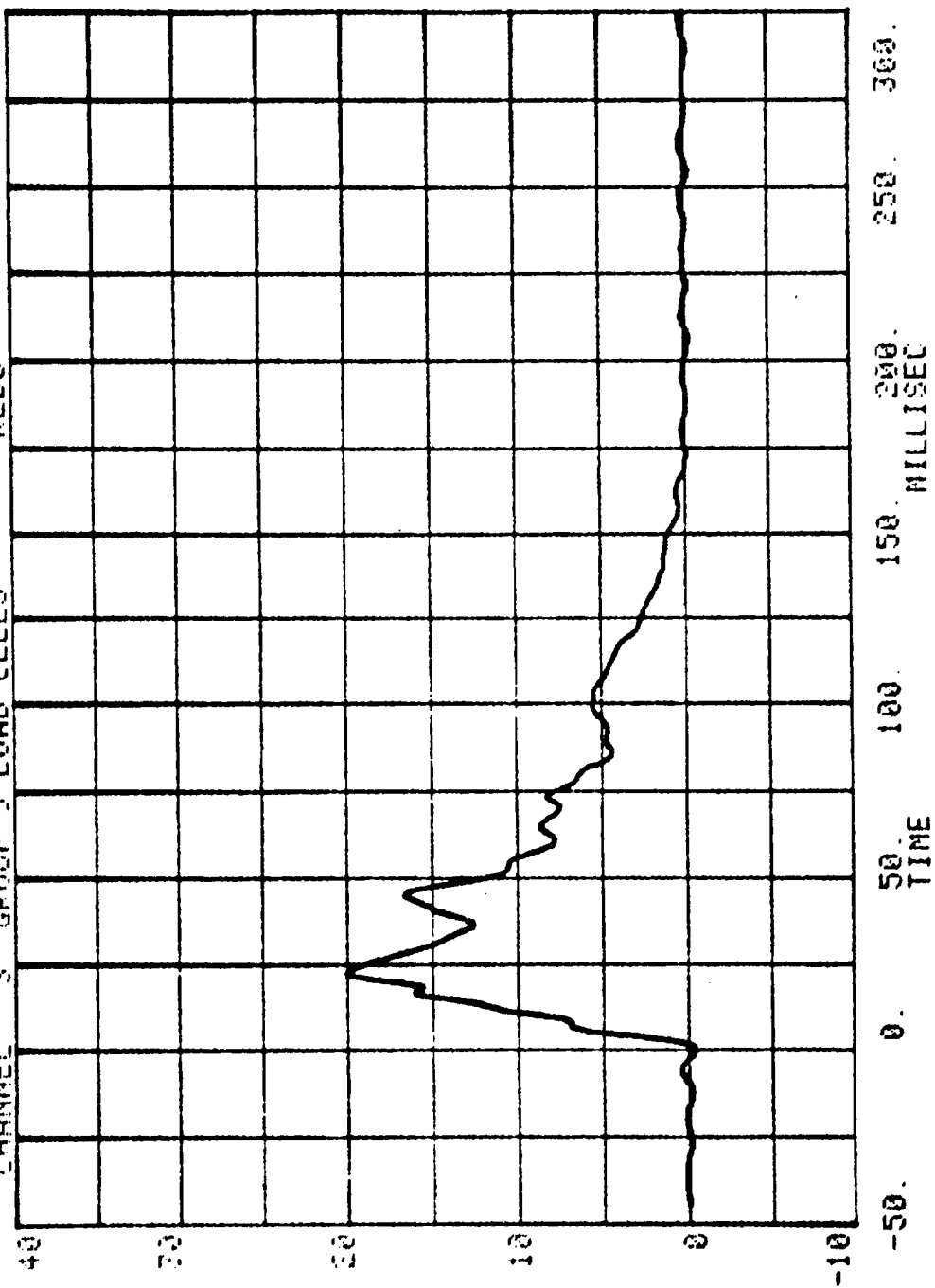
RUN # 985		SERIES # 20	
CHAN	TITLE	MINIMUM/MAXIMUM	AT TIME
1	GROUP 1 LOAD CELLS	-308 KLBS 17.614 KLBS	-11.62 MS. 25.95 MS.
2	GROUP 2 LOAD CELLS	-328 KLBS 56.519 KLBS	255.00 MS. 44.10 MS.
3	GROUP 3 LOAD CELLS	-374 KLBS 20.382 KLBS	.07 MS. 22.50 MS.
4	GROUP 4 LOAD CELLS	-614 KLBS 17.396 KLBS	300.00 MS. 43.22 MS.
5	GROUP 5 LOAD CELLS	-550 KLBS 22.784 KLBS	-3.23 MS. 43.35 MS.
6	GROUP 6 LOAD CELLS	-810 KLBS 20.641 KLBS	300.00 MS. 42.15 MS.
7	TOTAL LOAD CELL SUM	-1.163 KLBS 139.341 KLBS	-3.08 MS. 44.10 MS.

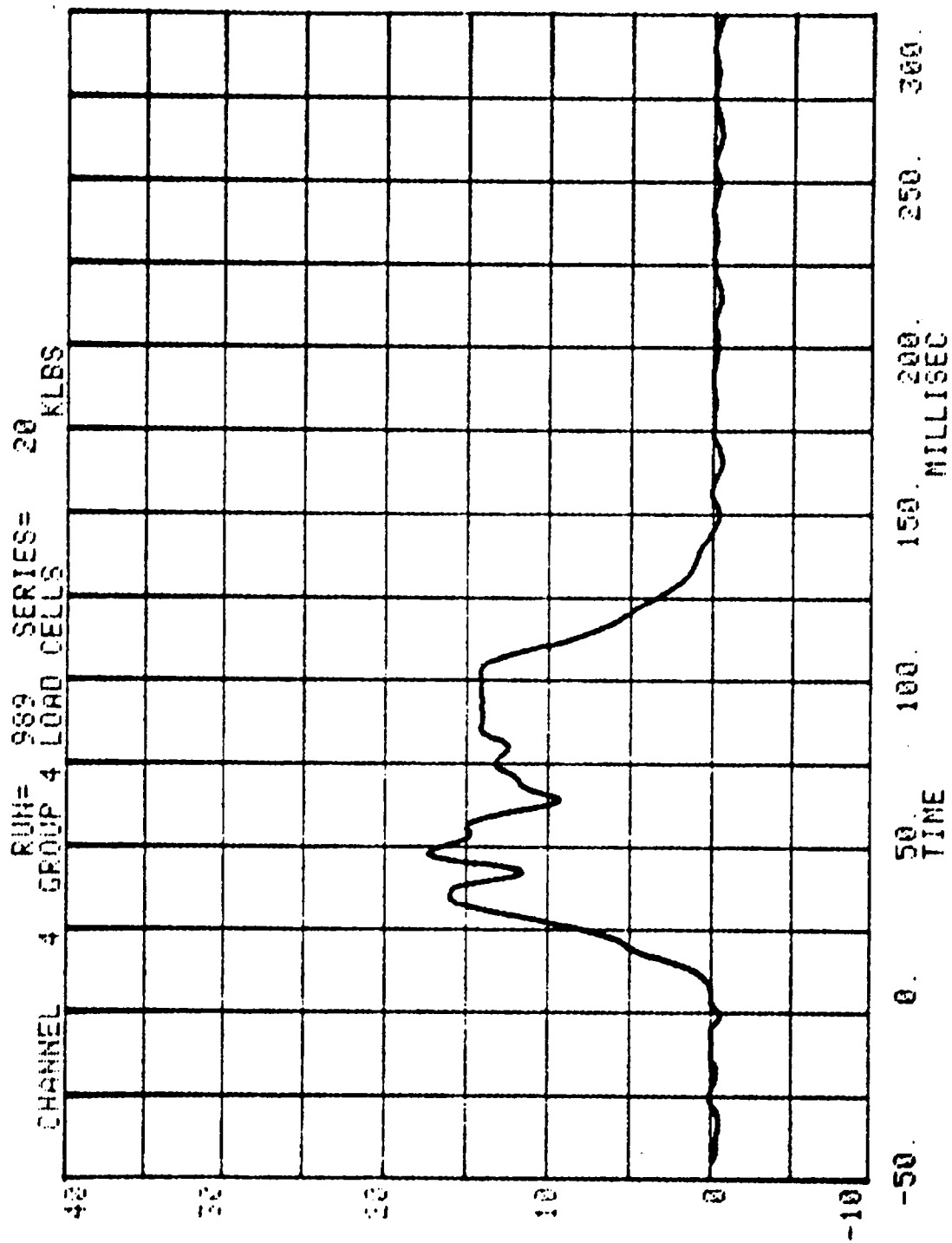


CHANNEL 2 GROUP 2 LOAD CELLS RUN= 989 SERIES= 20 KLBS

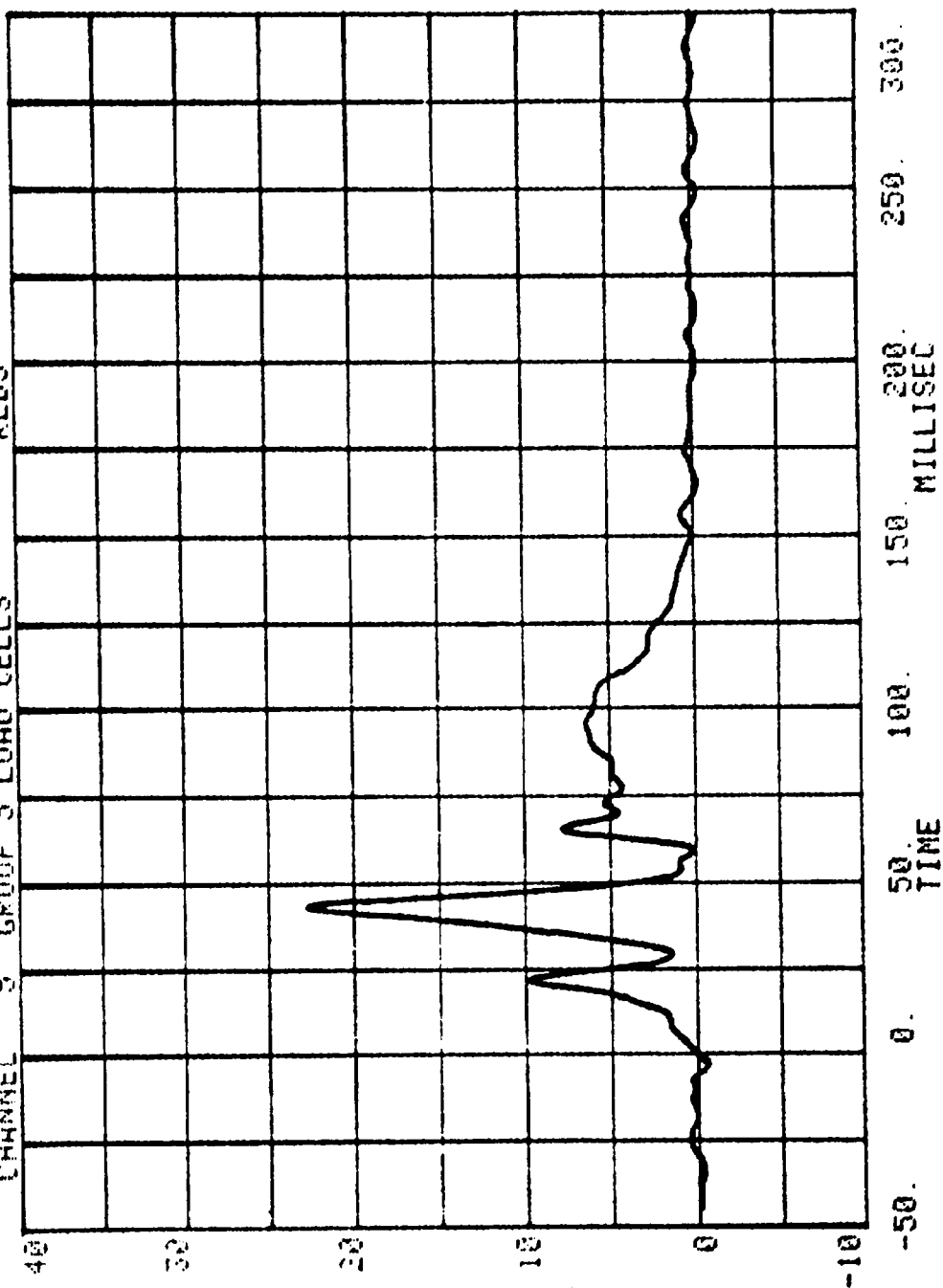


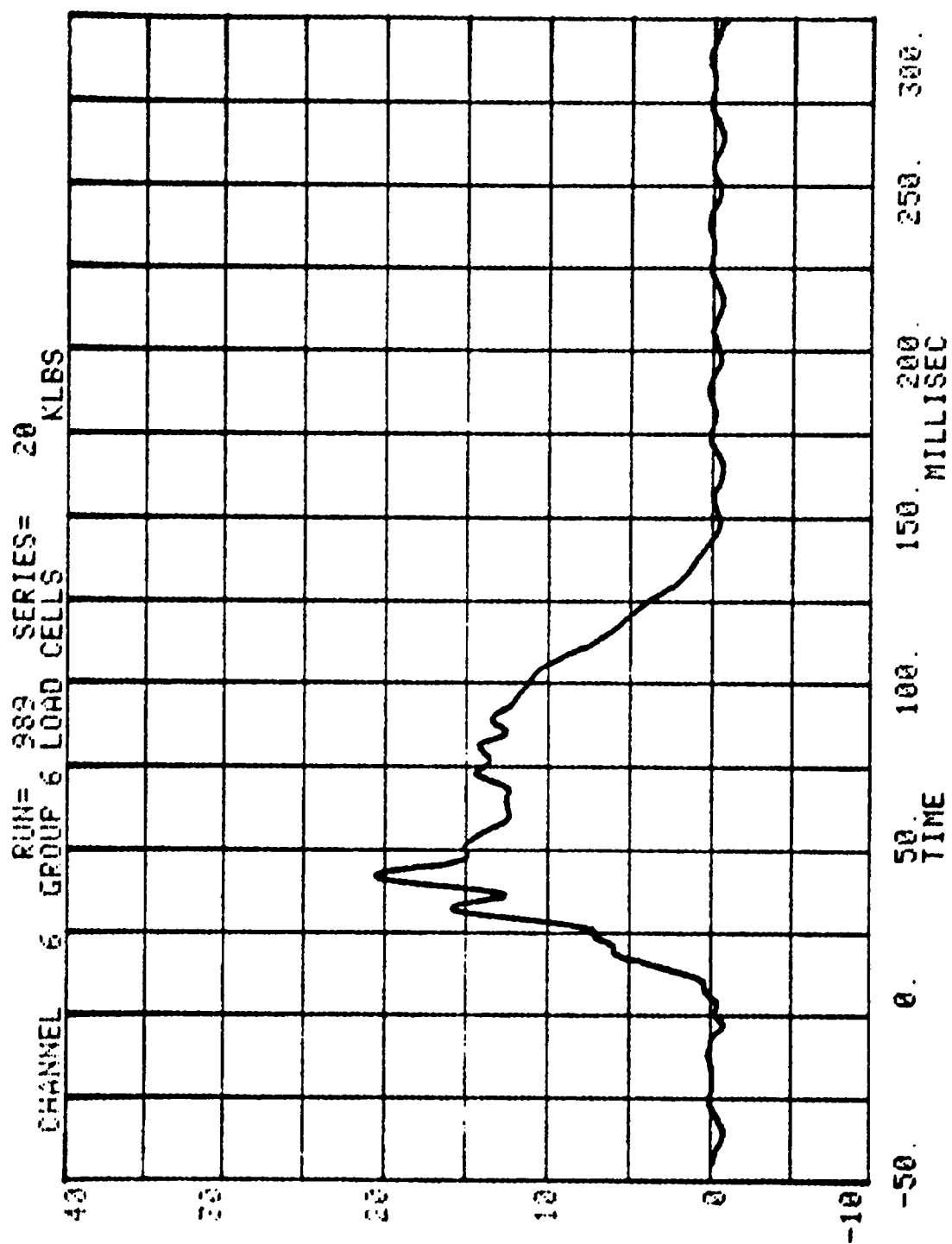
CHANNEL 3 GROUP 3 LOAD CELLS
RUN= 989 SERIES= 20 KLBS

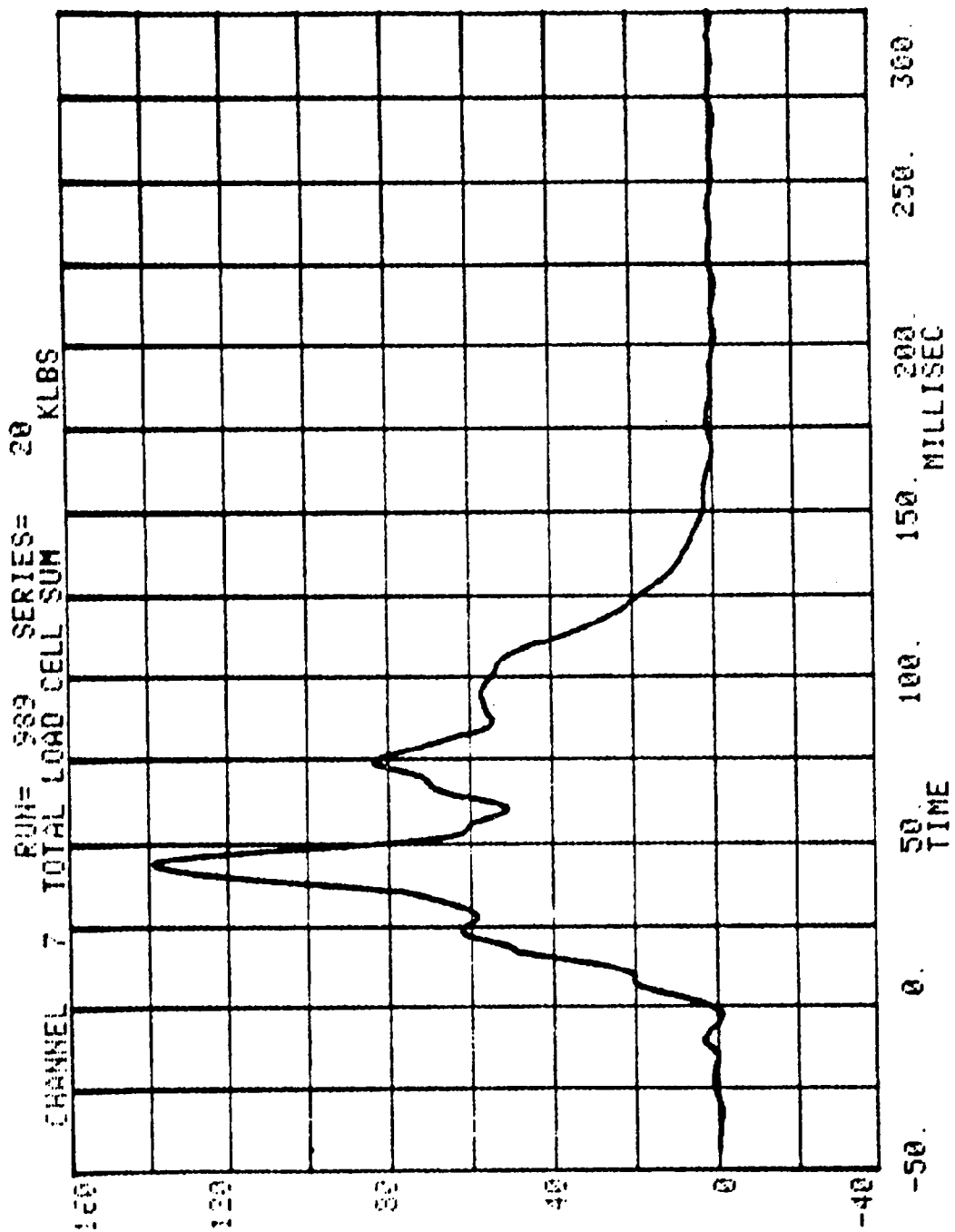




CHANNEL 5 GROUP 5 LOAD CELLS RUN= 989 SERIES= 20 KLBS







TEST NO. MLO107

DUMMY DATA

CLASS	FILTER CHANNEL
Head Accelerations	1000
Chest Accelerations	180
Femur Forces	600
Belt Loads	60

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
FMS. MAXIMUM DURATION

NCAP TEST #20

PUN= 999

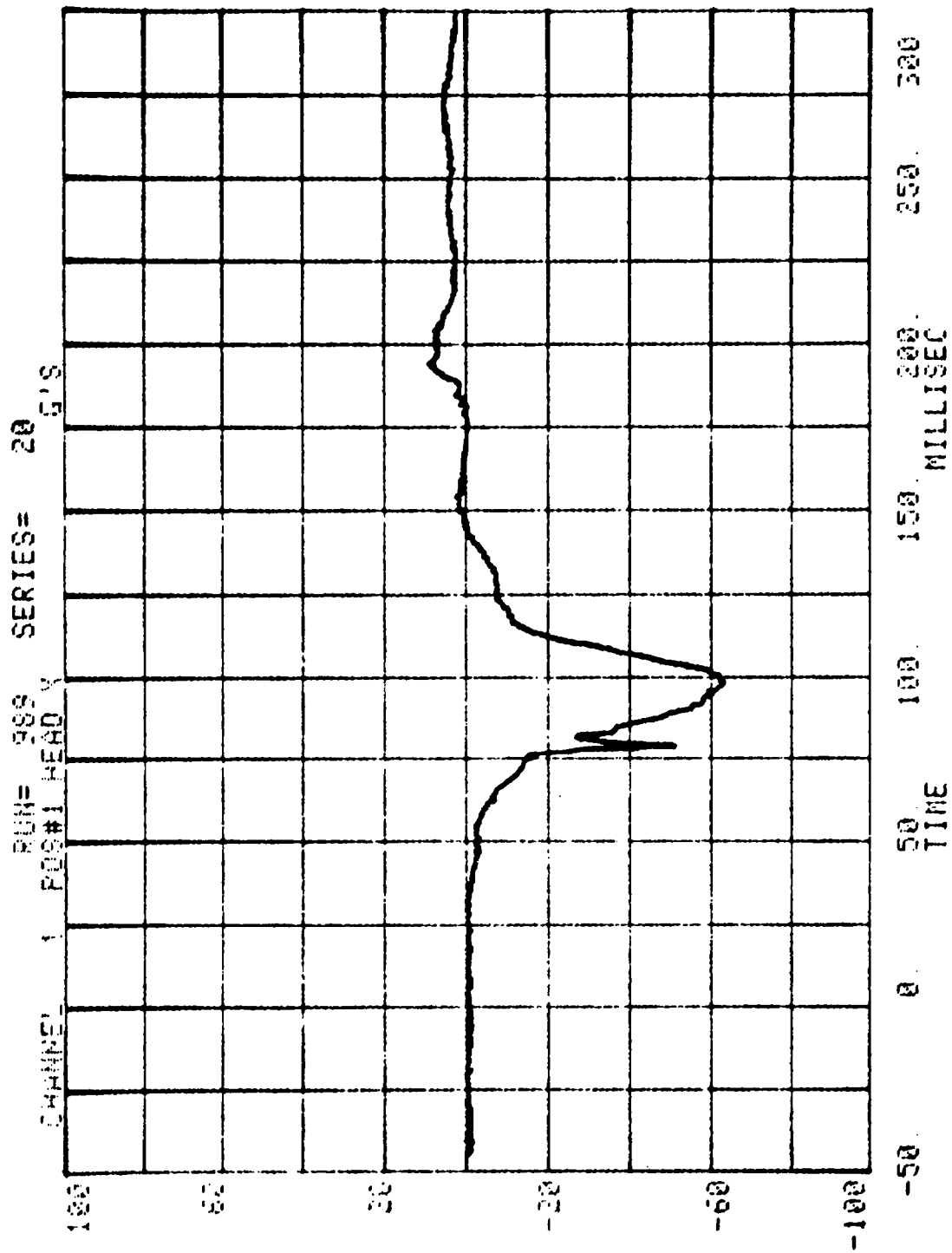
FOS #1 HEAD R

HIC= 761.3 FROM T1= .07612 TO T2= 11092

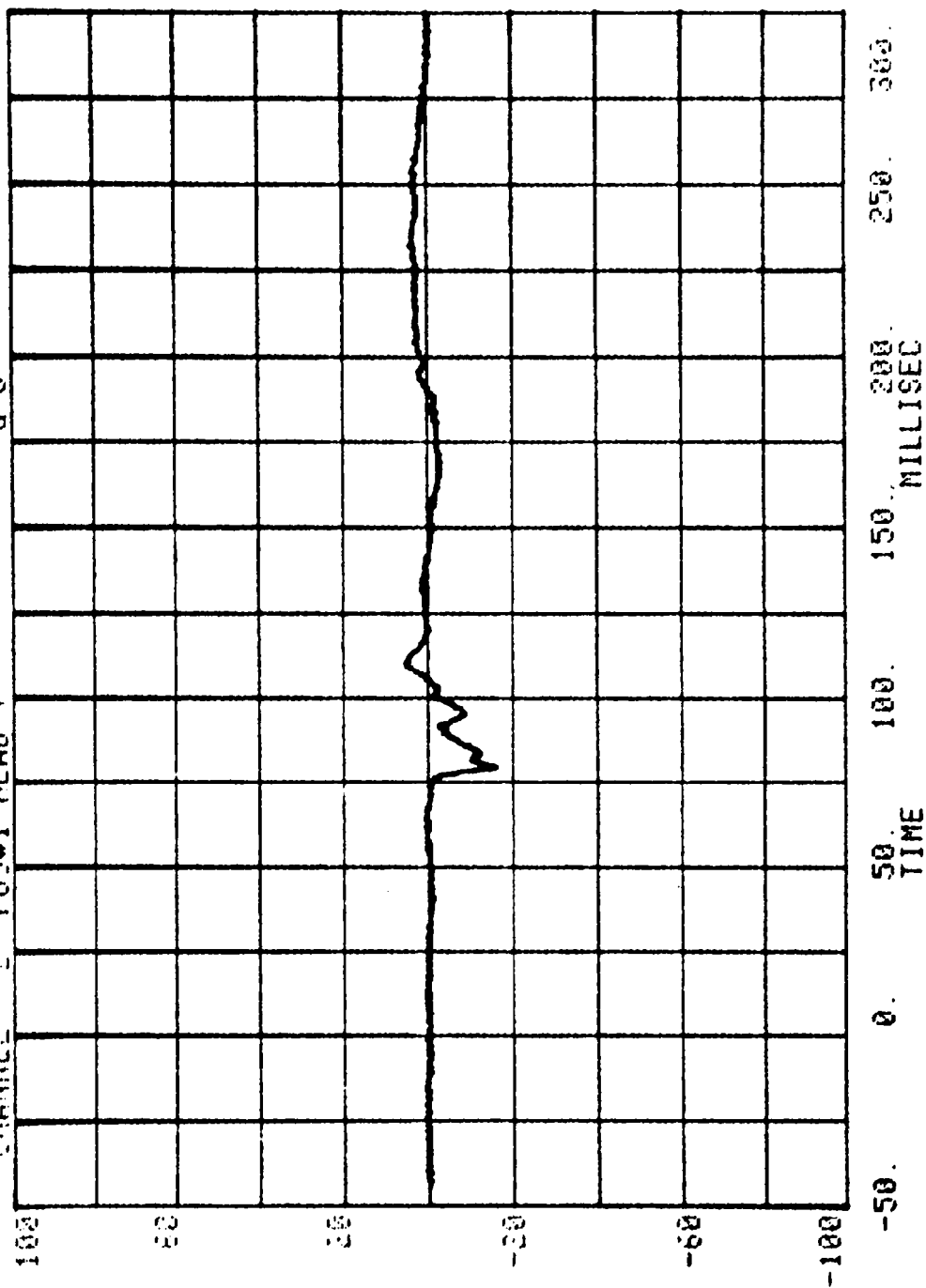
AVERAGE ACCELERATION BETWEEN T1 AND T2= 54.4G'S

EVENT TIME= 300.0 MSEC

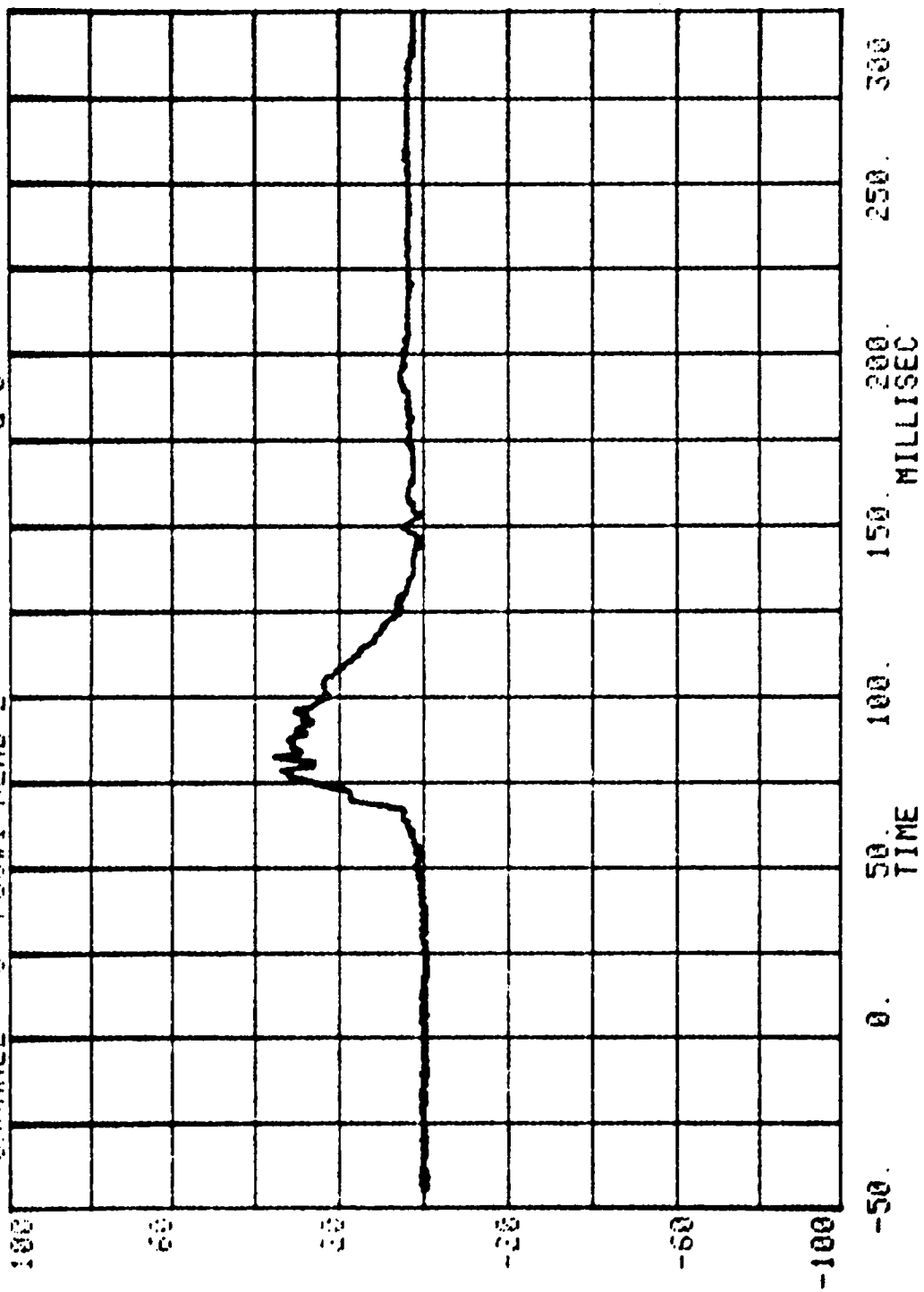
SEVERITY INDEX= 376.4

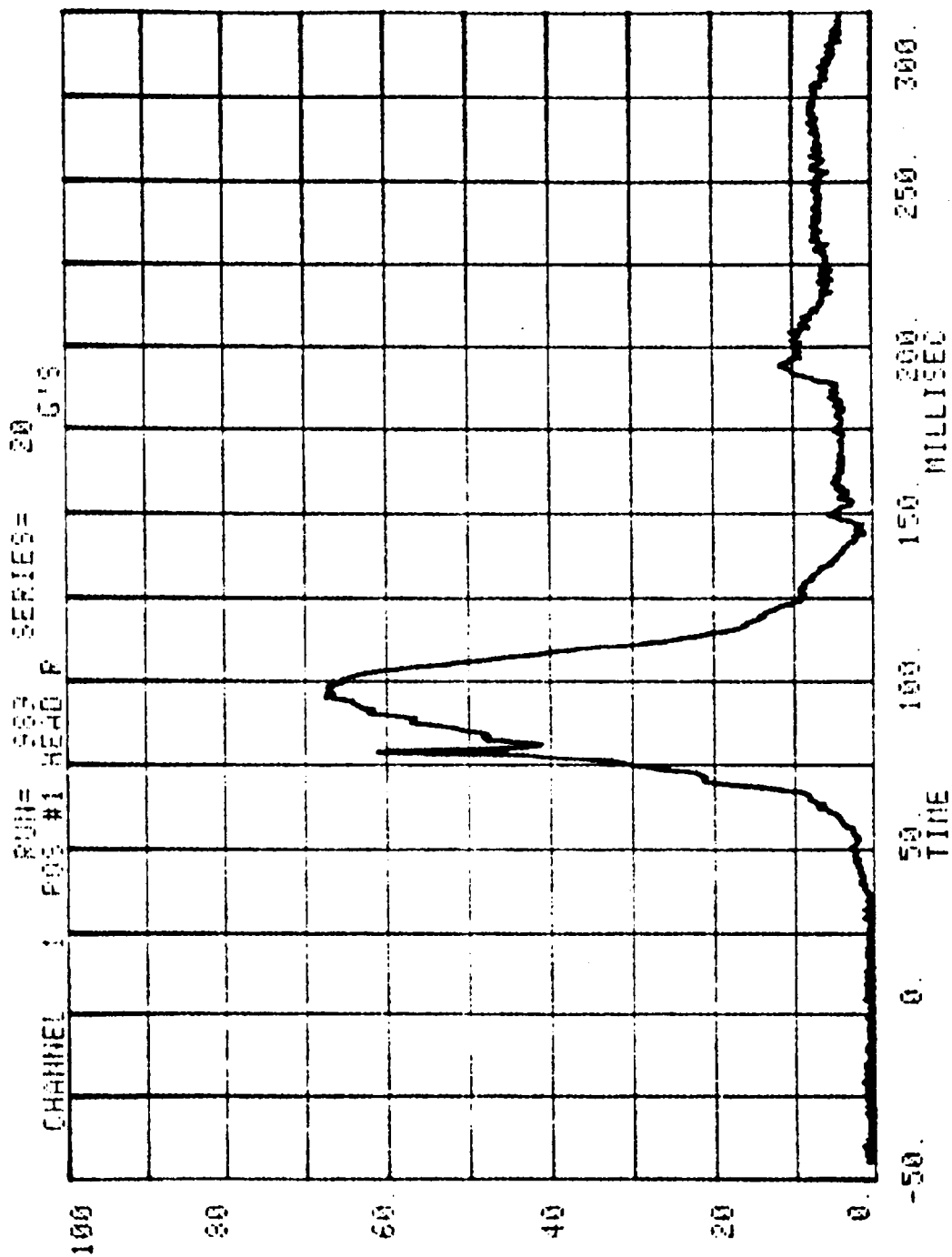


CHANNEL 2 RUN= 383 SERIES= 20 G'S
POS#1 HEAD Y

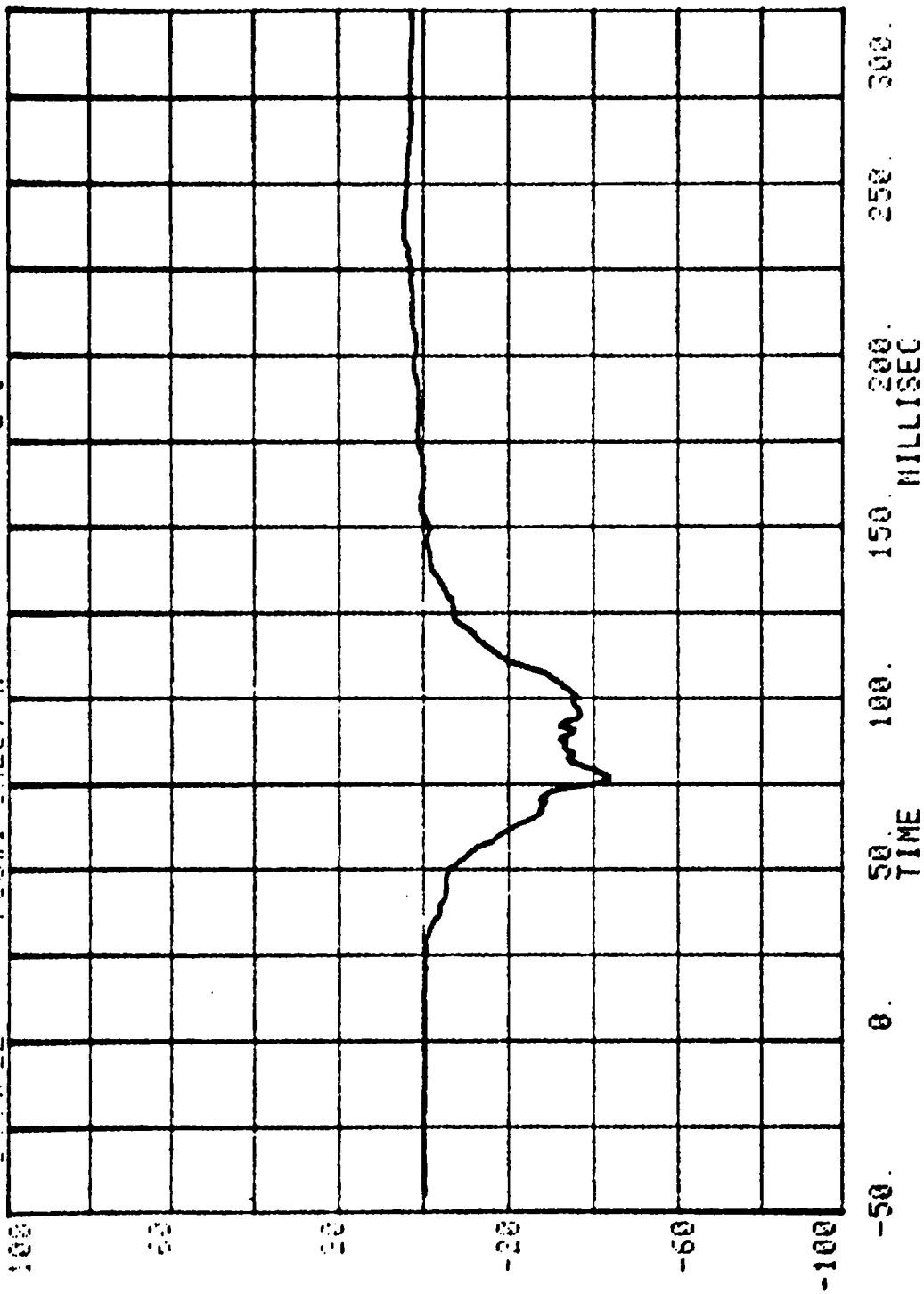


CHANNEL 3 POS#1 HEAD Z RUN= 989 SERIES= 20 G'S





CHANNEL 4 RUN= 989 SERIES= 20 G'S
PCS#1 CHEST X



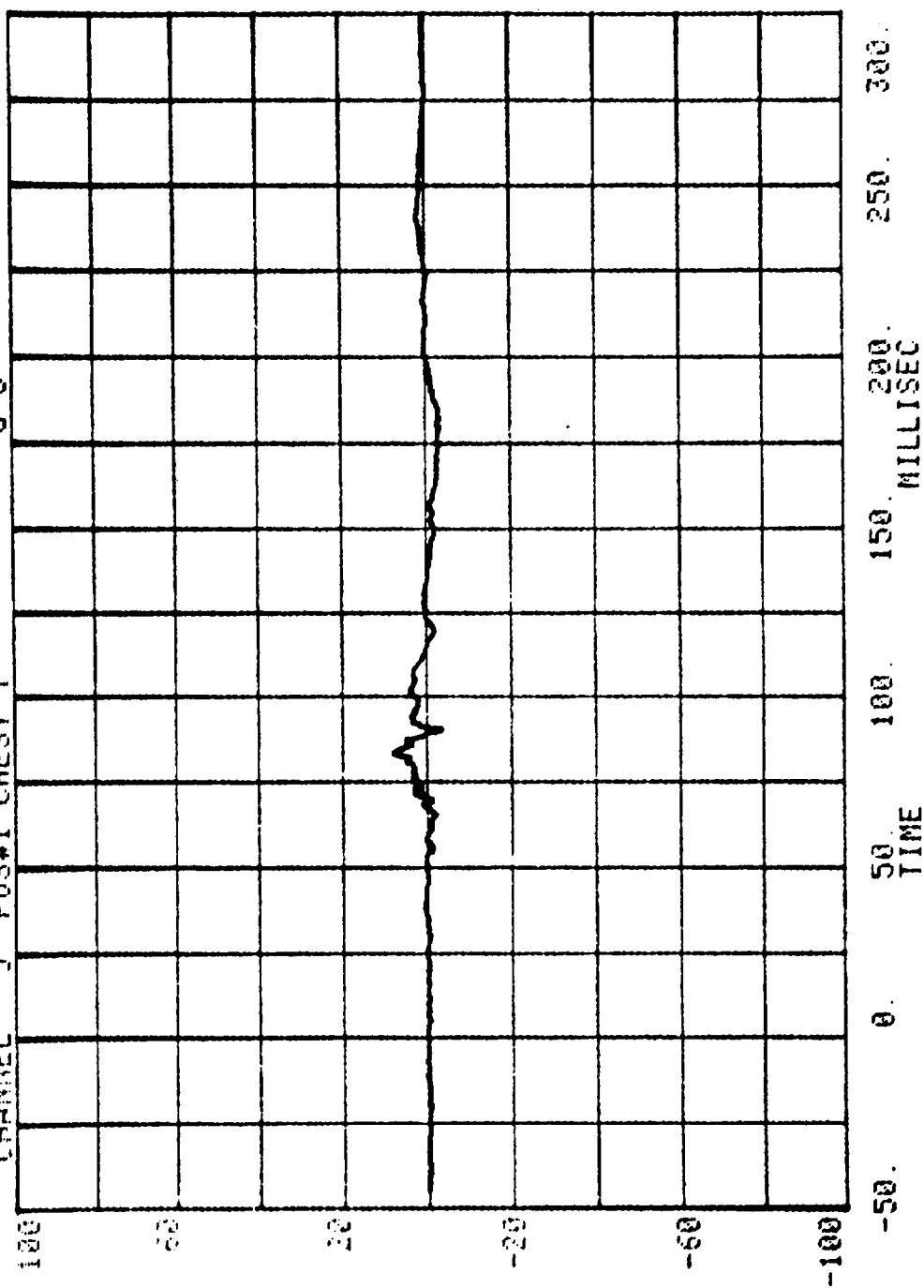
CHANNEL 5 POS#1 CHEST Y

RUN= 989

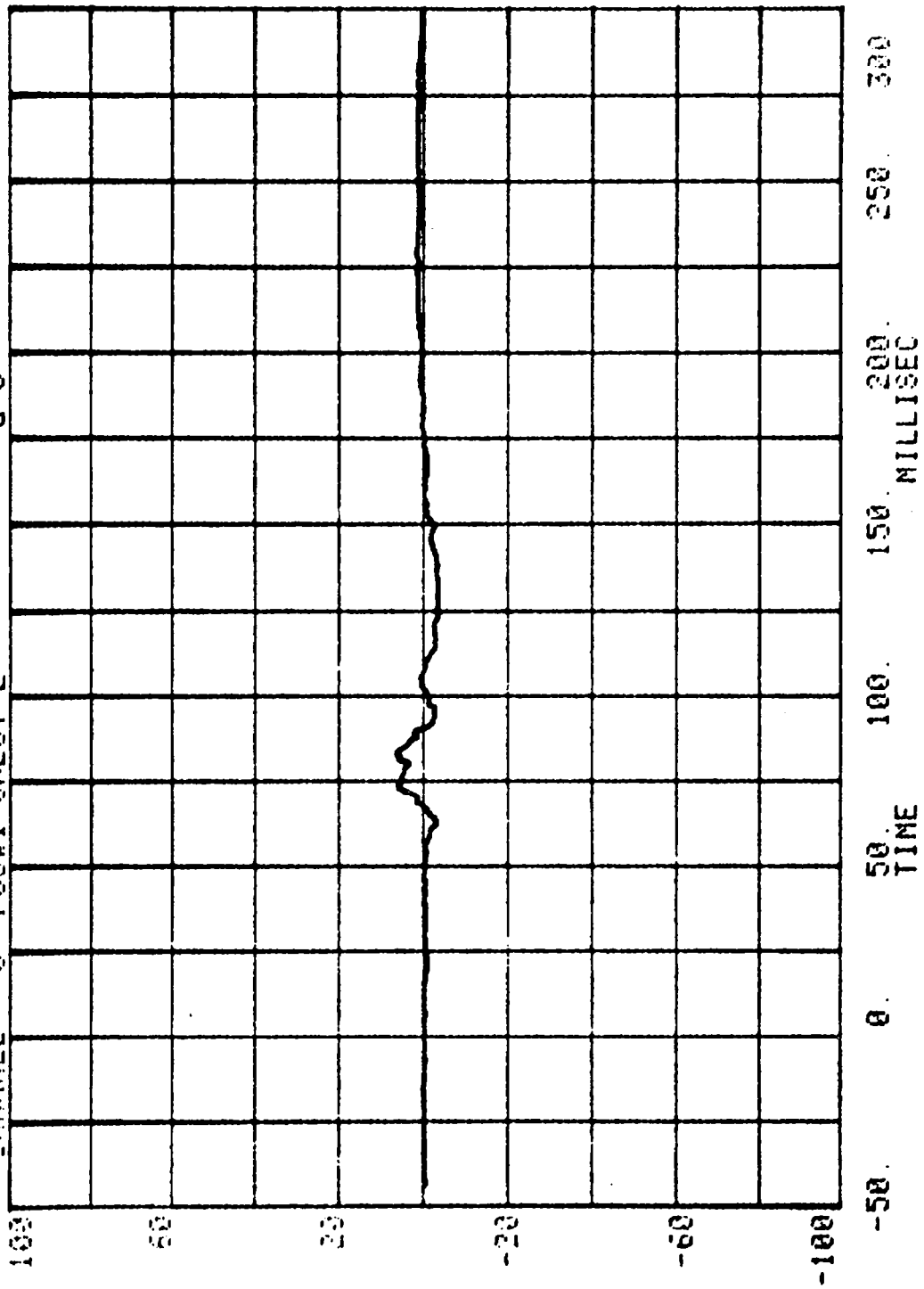
SERIES=

20

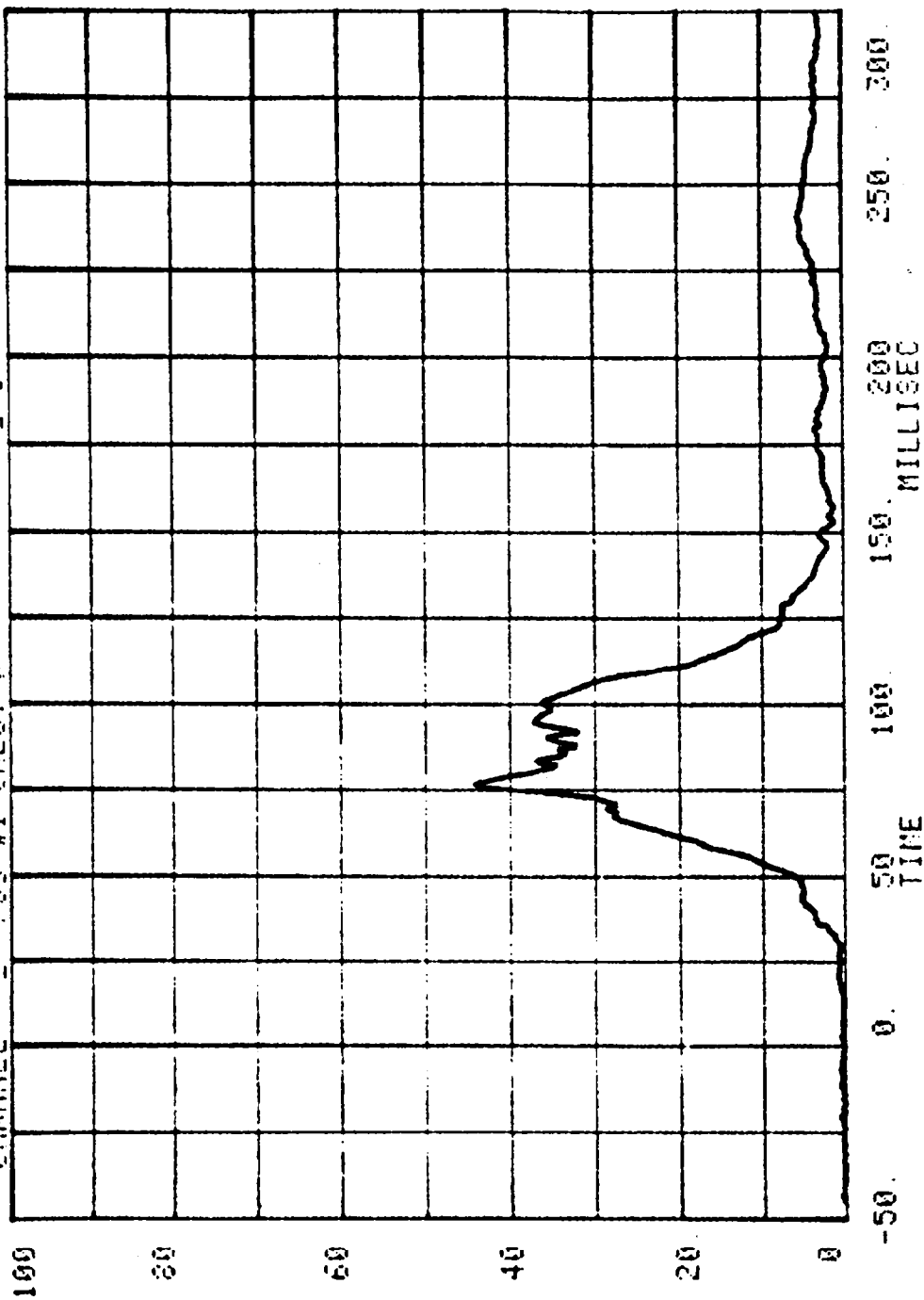
G'S



CHANNEL 6 POS#1 CHEST 2
RUN= 989 SERIES= 20 G'S



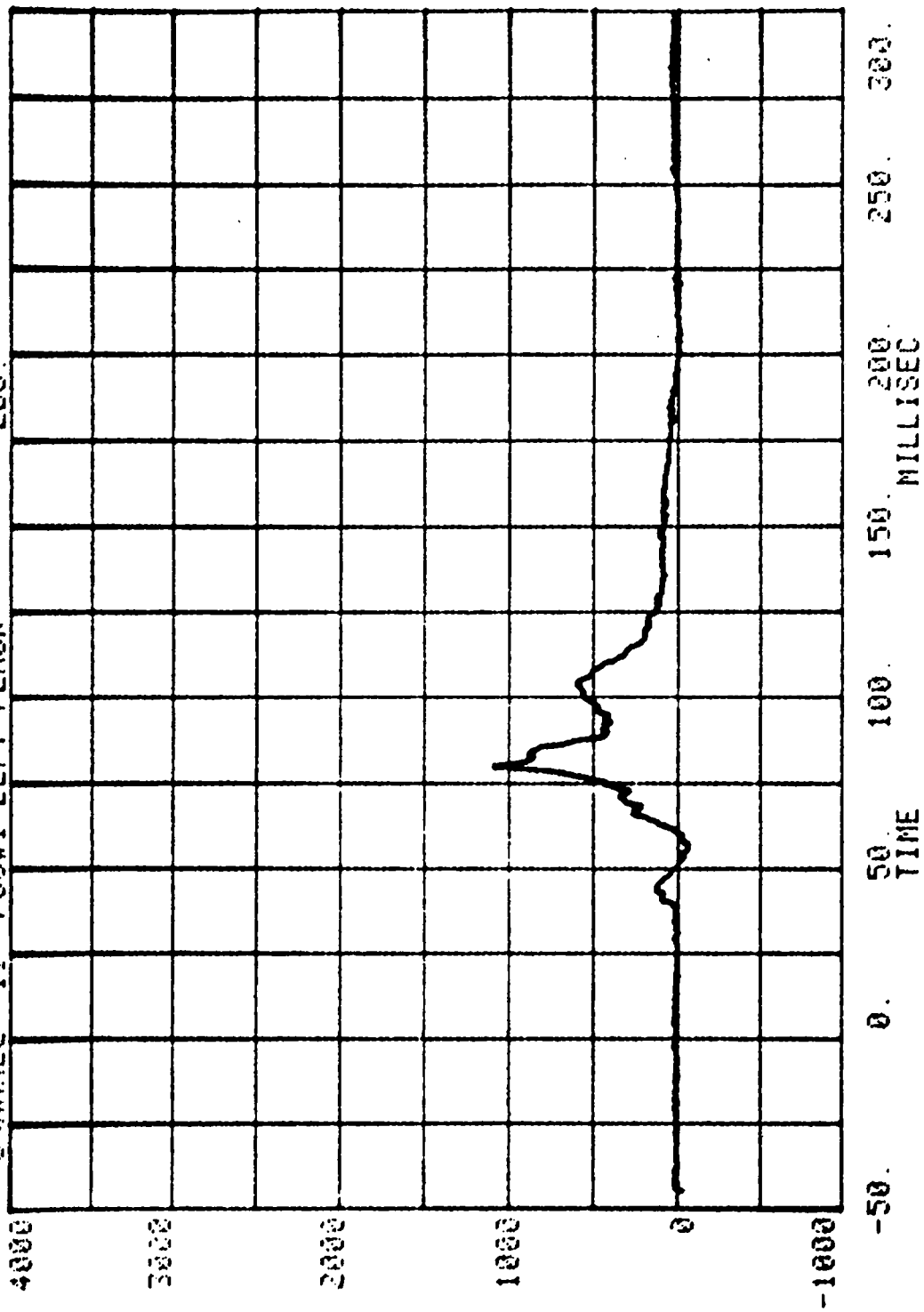
CHANNEL 2 PPS #1 CHEST R G'S



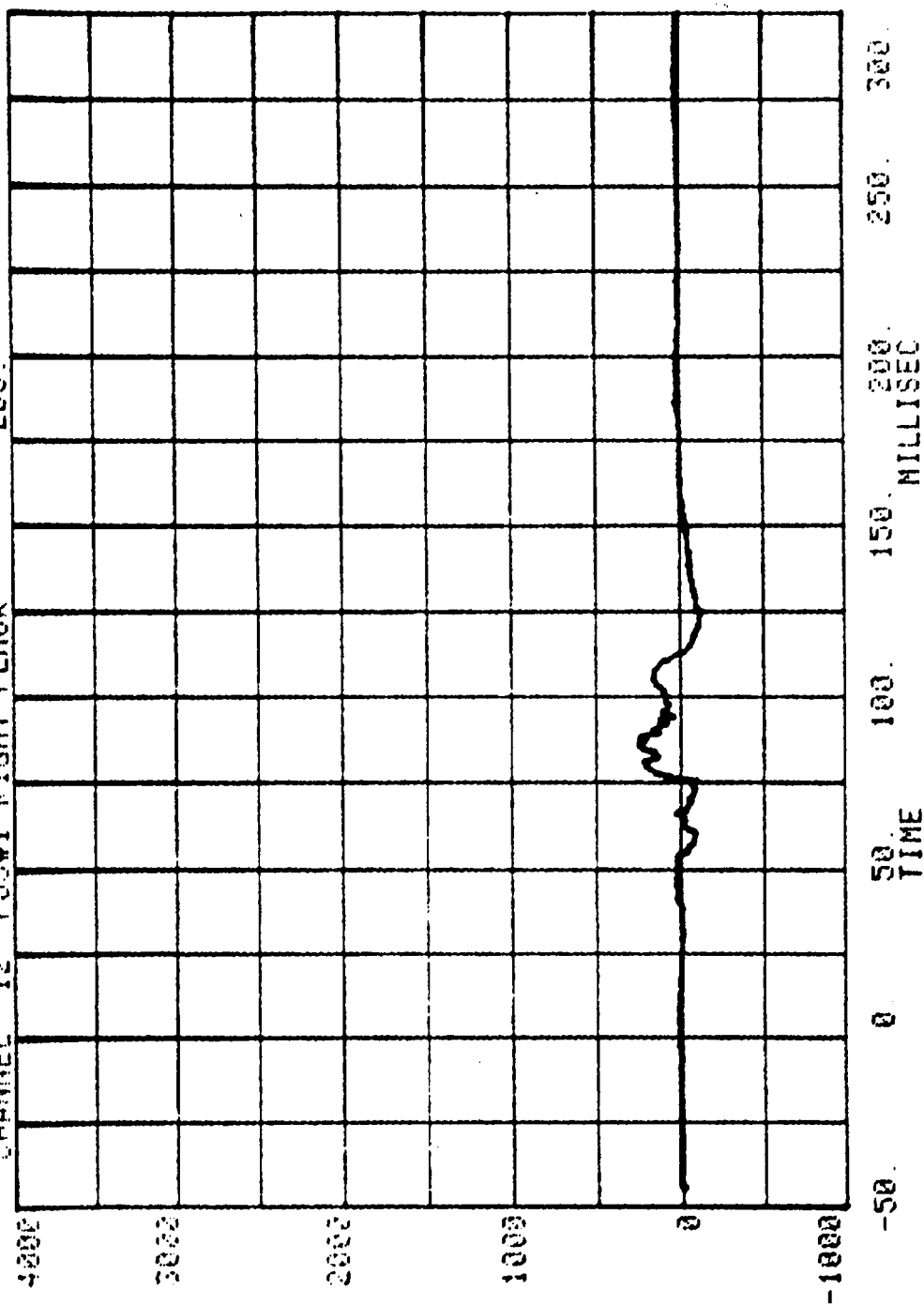
CHANNEL 11 POS#1 LEFT FEMUR

RUN= 989 SERIES= 20

LBS.

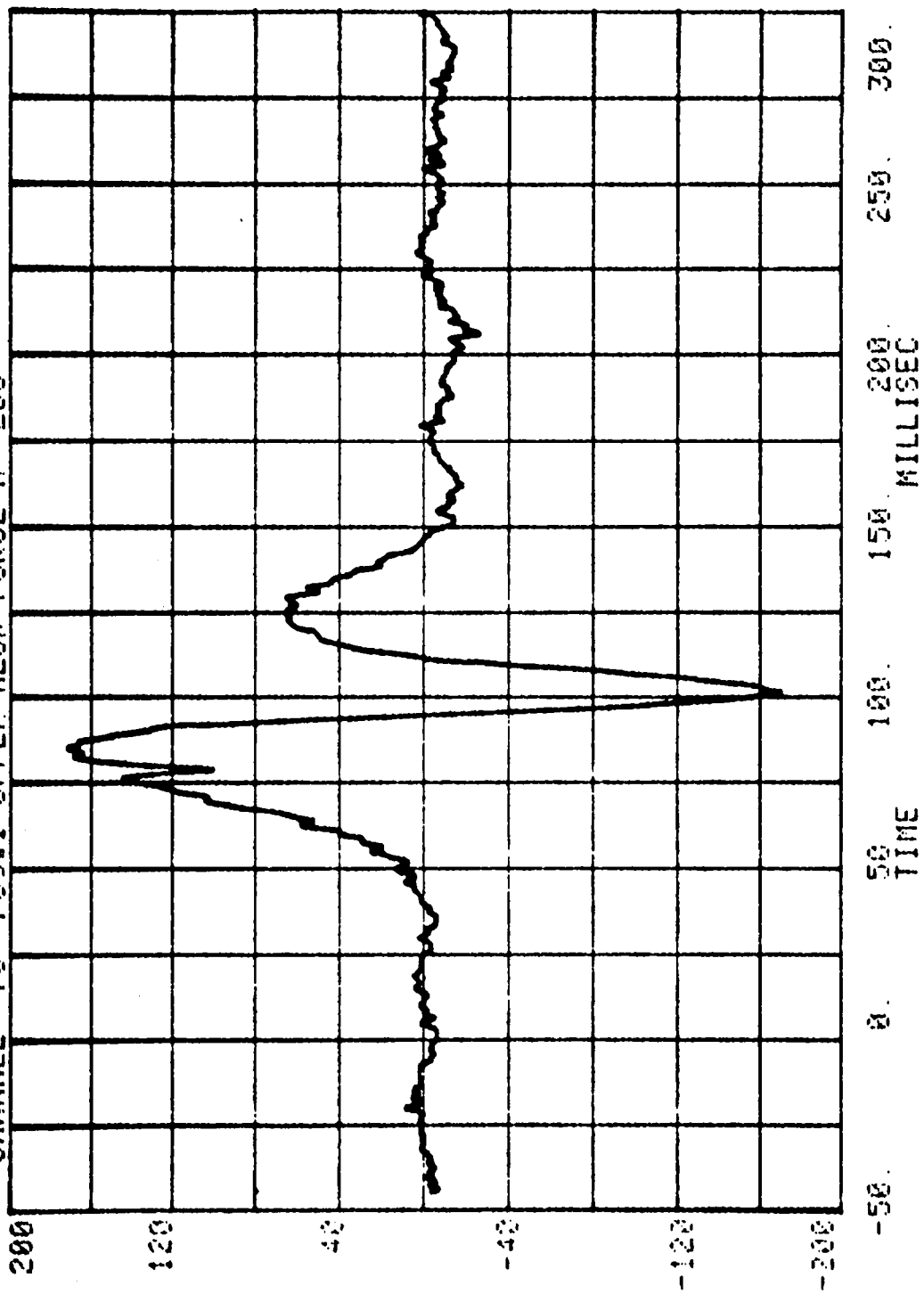


CHANNEL 12 POS#1 RIGHT FEMUR RUN= 989 SERIES= 20 LBS.



CHANNEL 70 POS#1 UPPER NECK FORCE X LBS

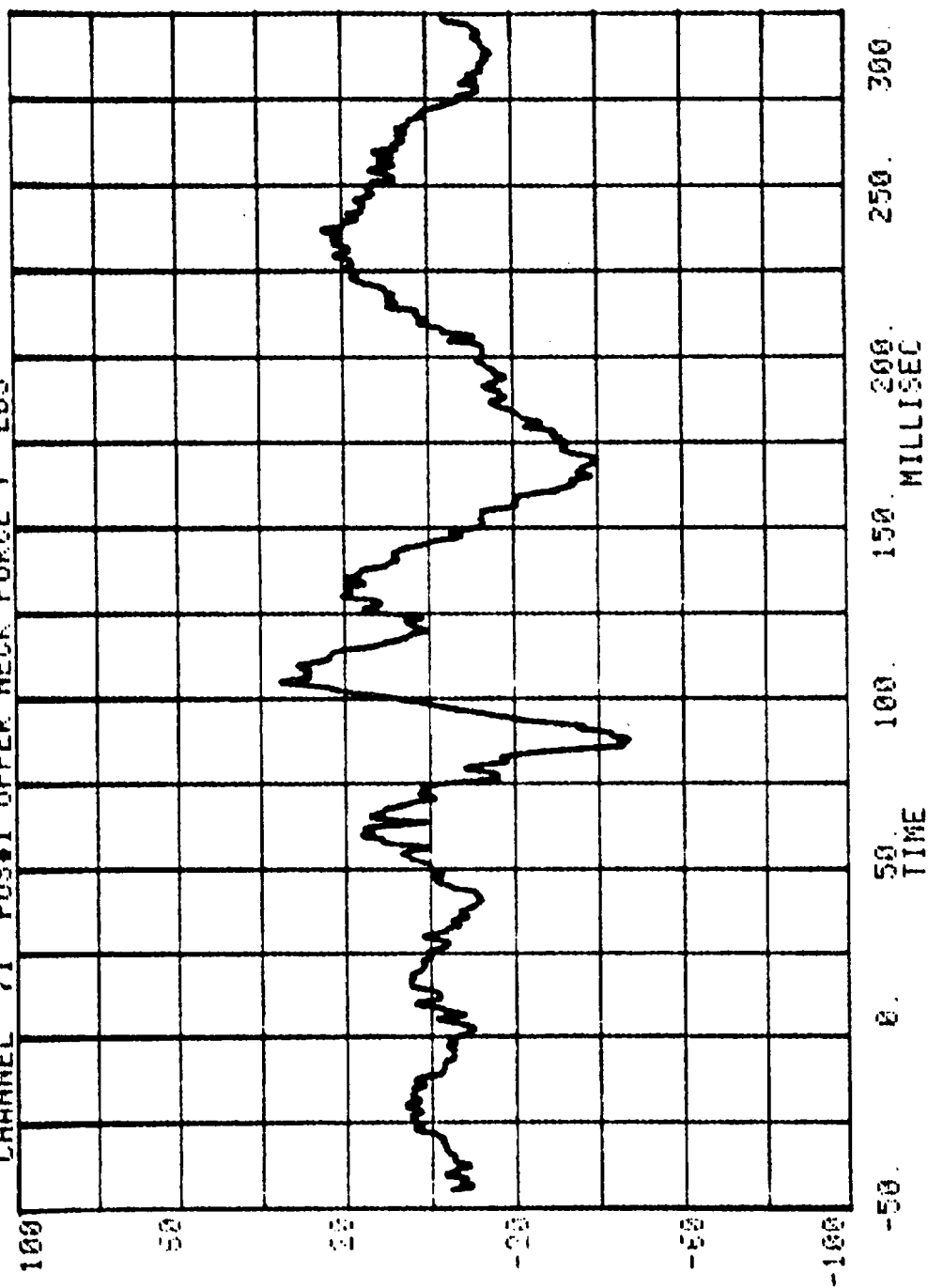
RUN= 989 SERIES= 28



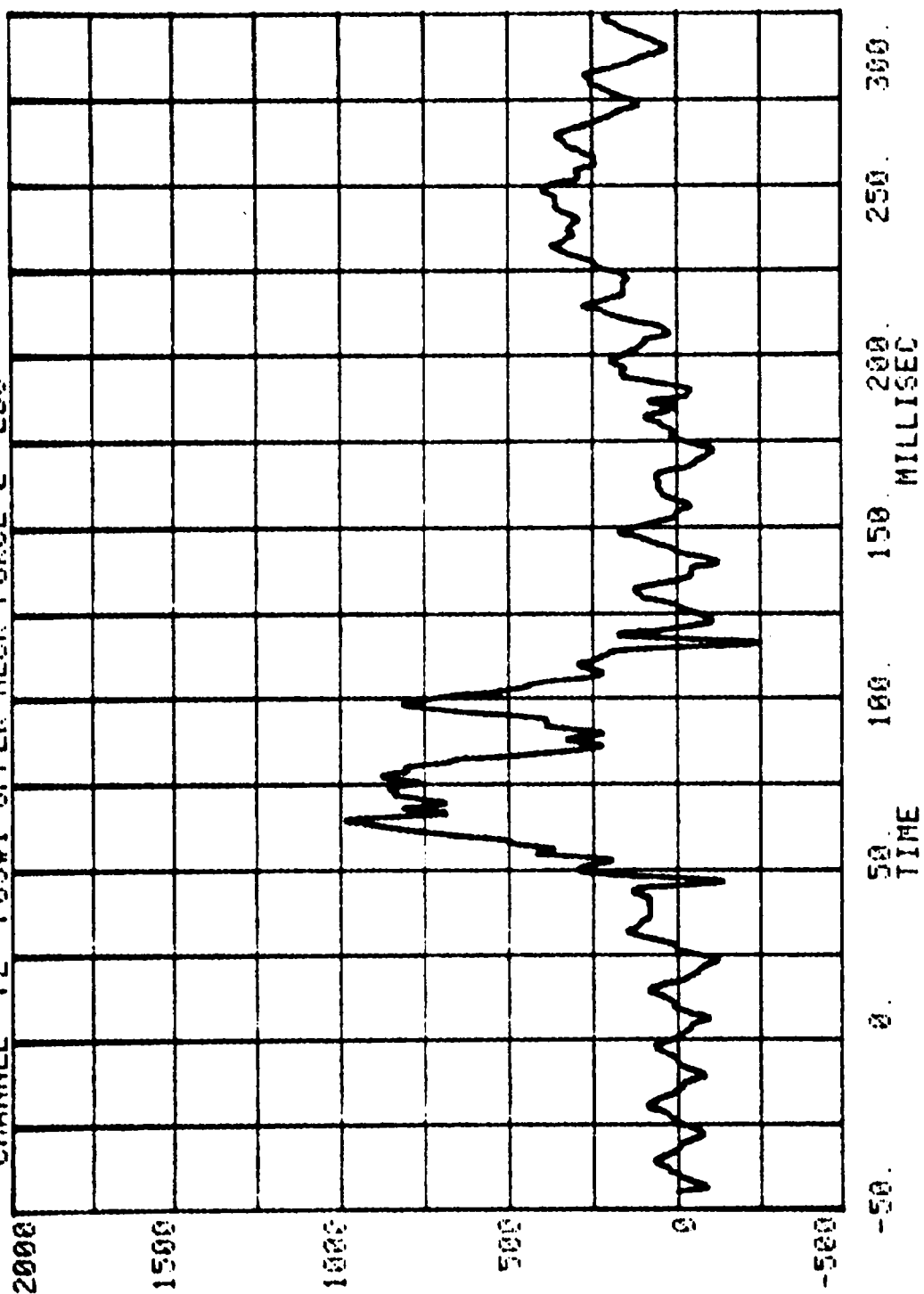
CHANNEL 71 POS#1 UPPER NECK FORCE Y LBS

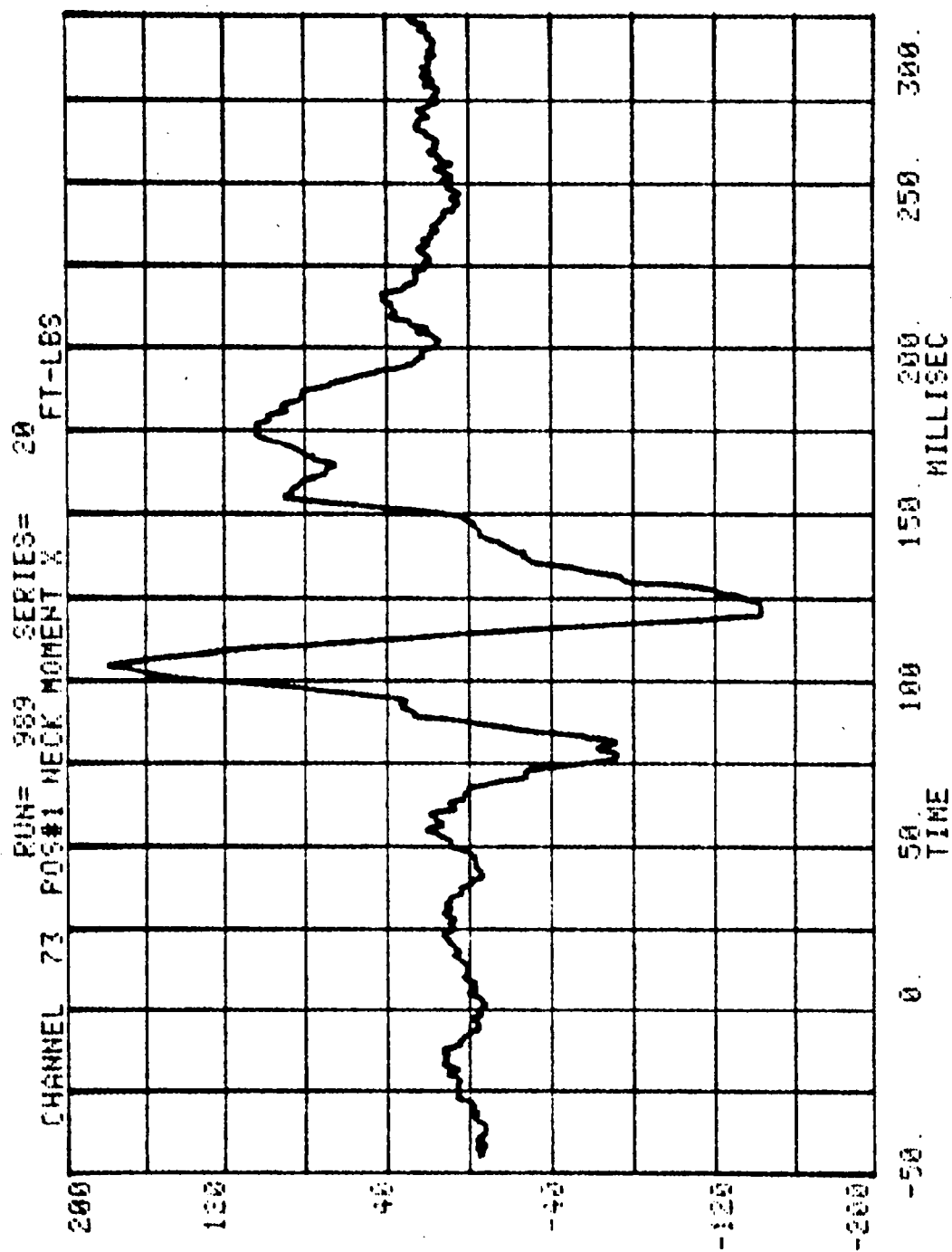
RUN= 989

SERIES= 20



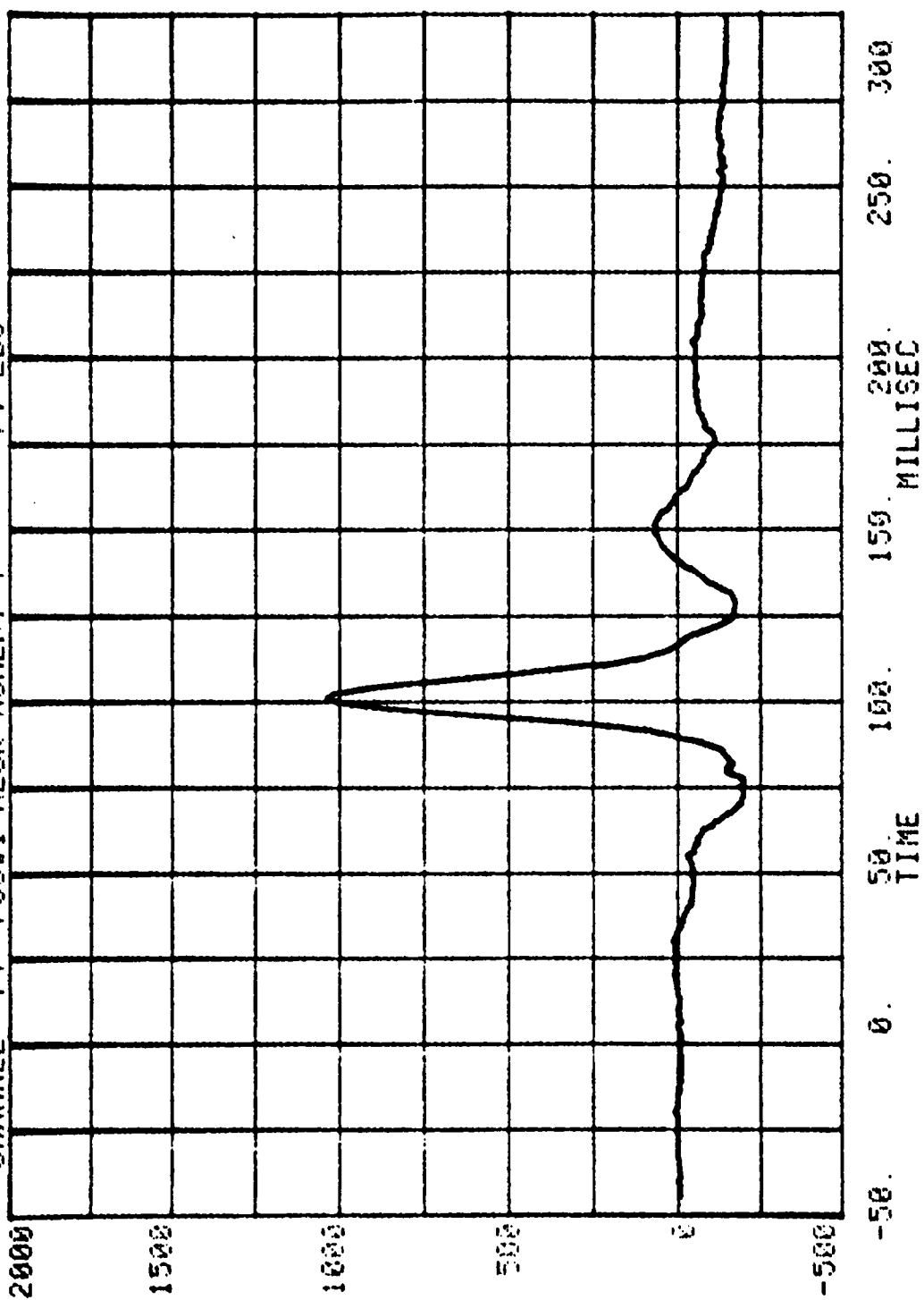
CHANNEL 72 RUN= 929 SERIES= 20
PGS#1 UPPER NECK FORCE Z LBS

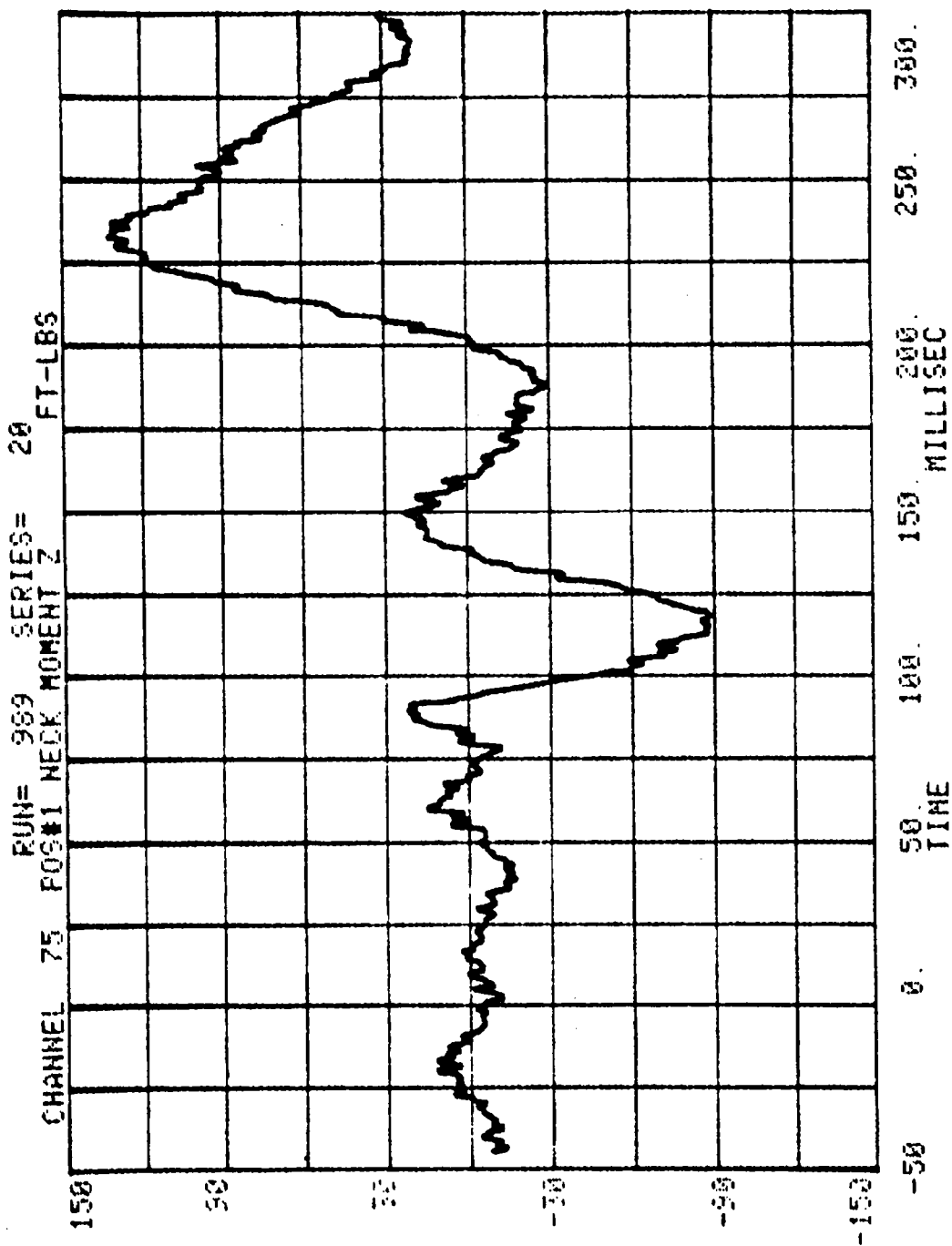




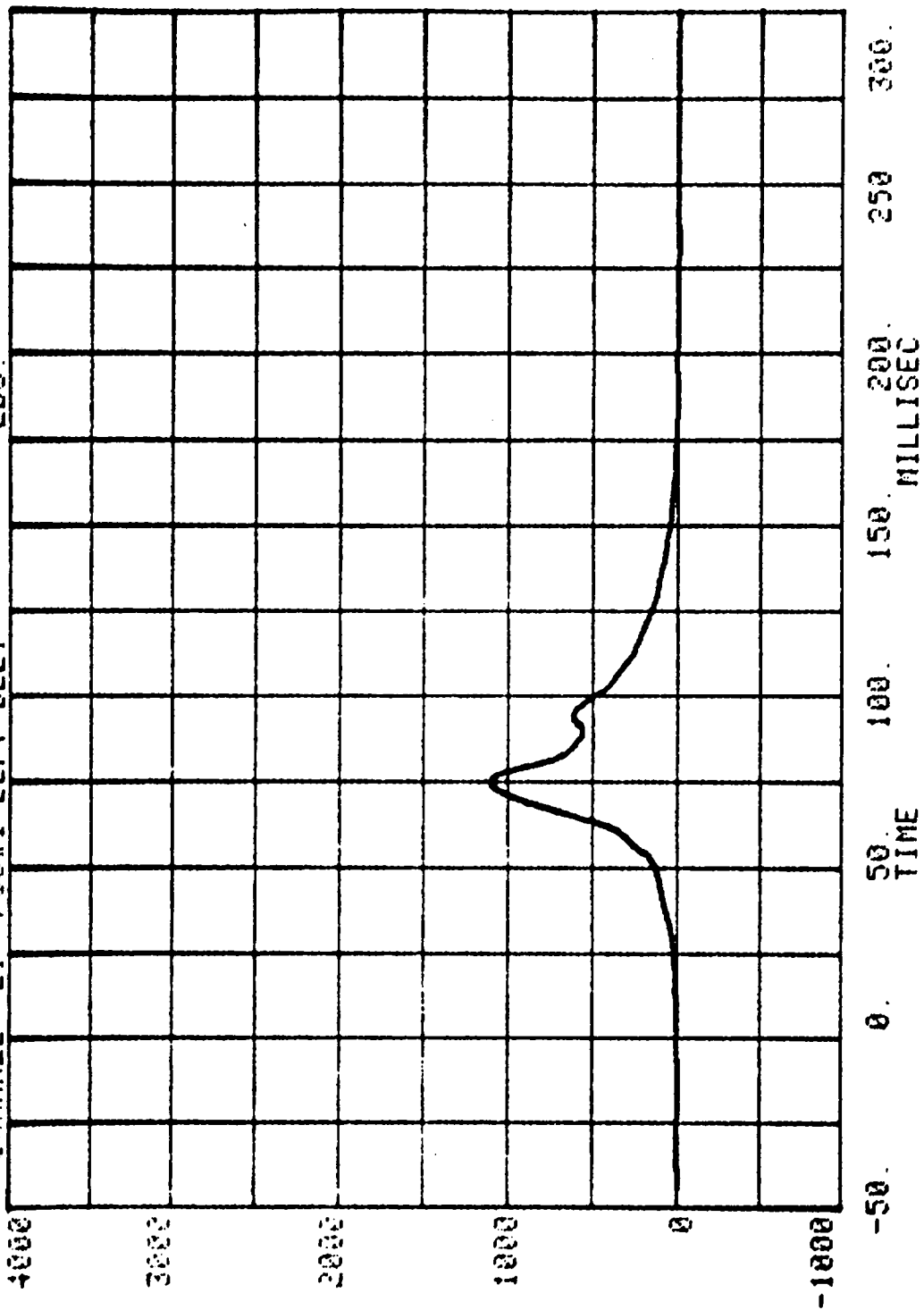
CHANNEL 74 POS#1 NECK MOMENT Y 20 FT-LBS

RUN= 989 SERIES=

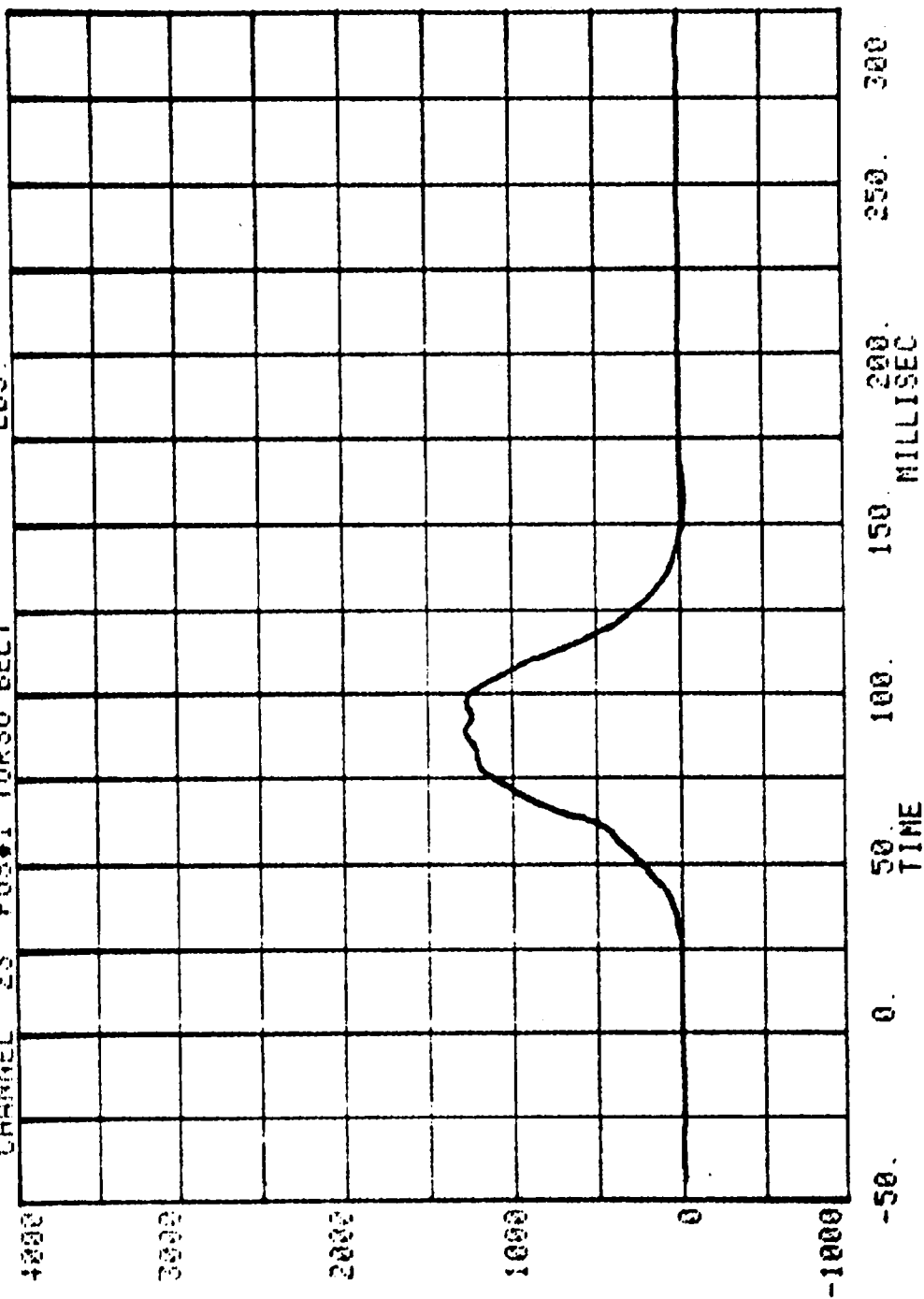




RUN= 989 SERIES= 20
CHANNEL 21 POS#1 LEFT BELT LBS.



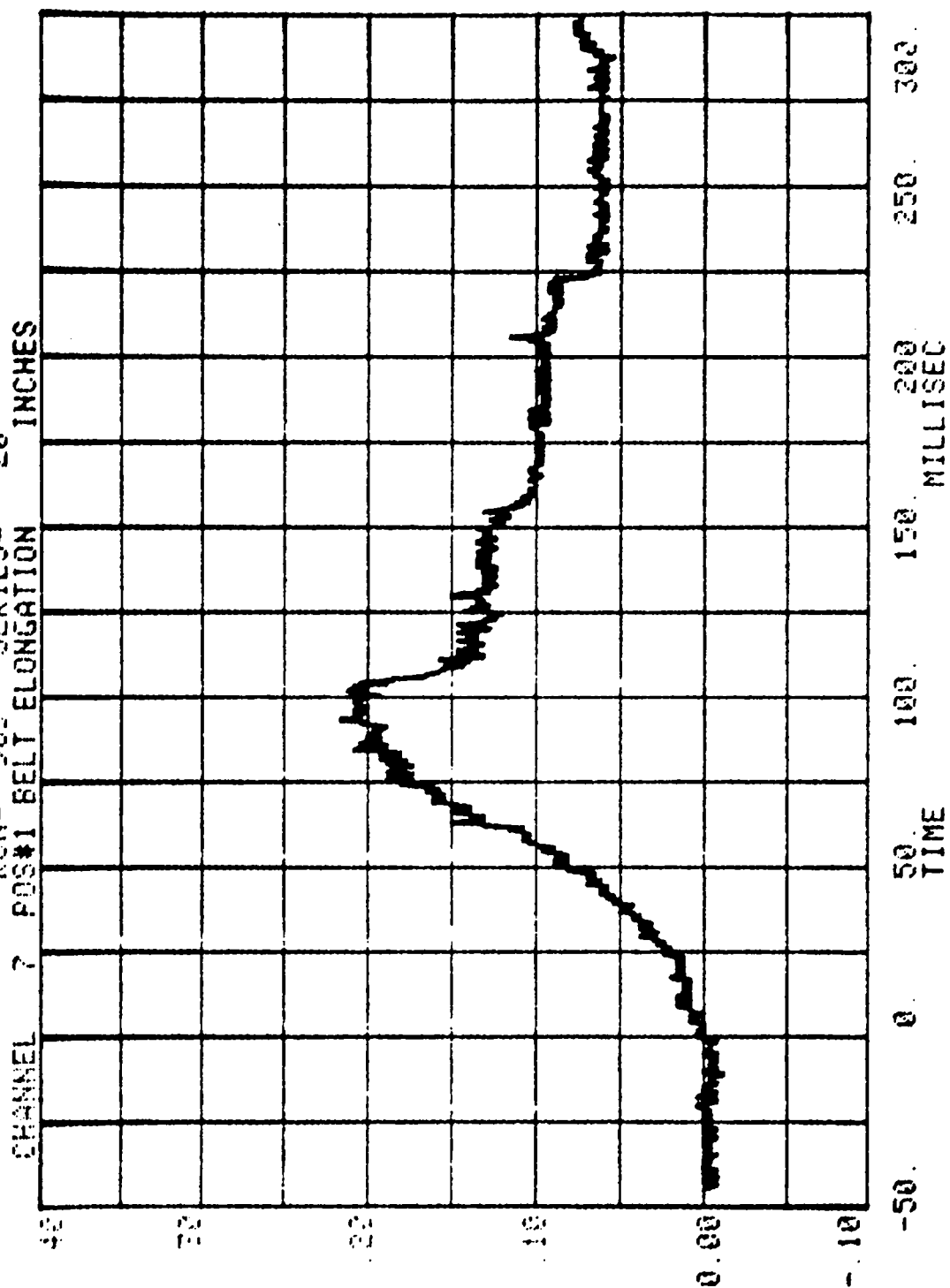
CHANNEL 23 POS#1 TORSO BELT
RUN= 939 SERIES= 20 LBS.

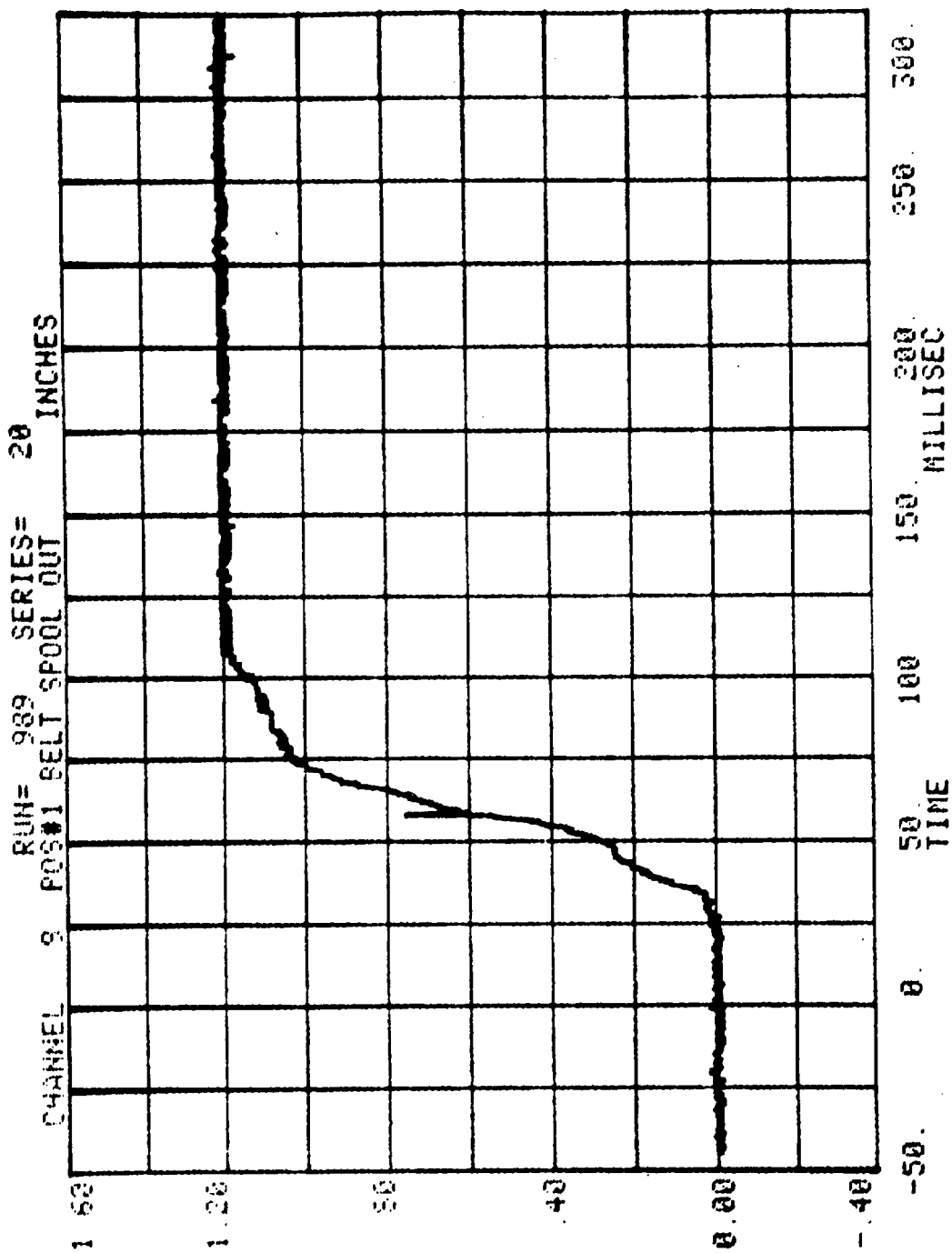


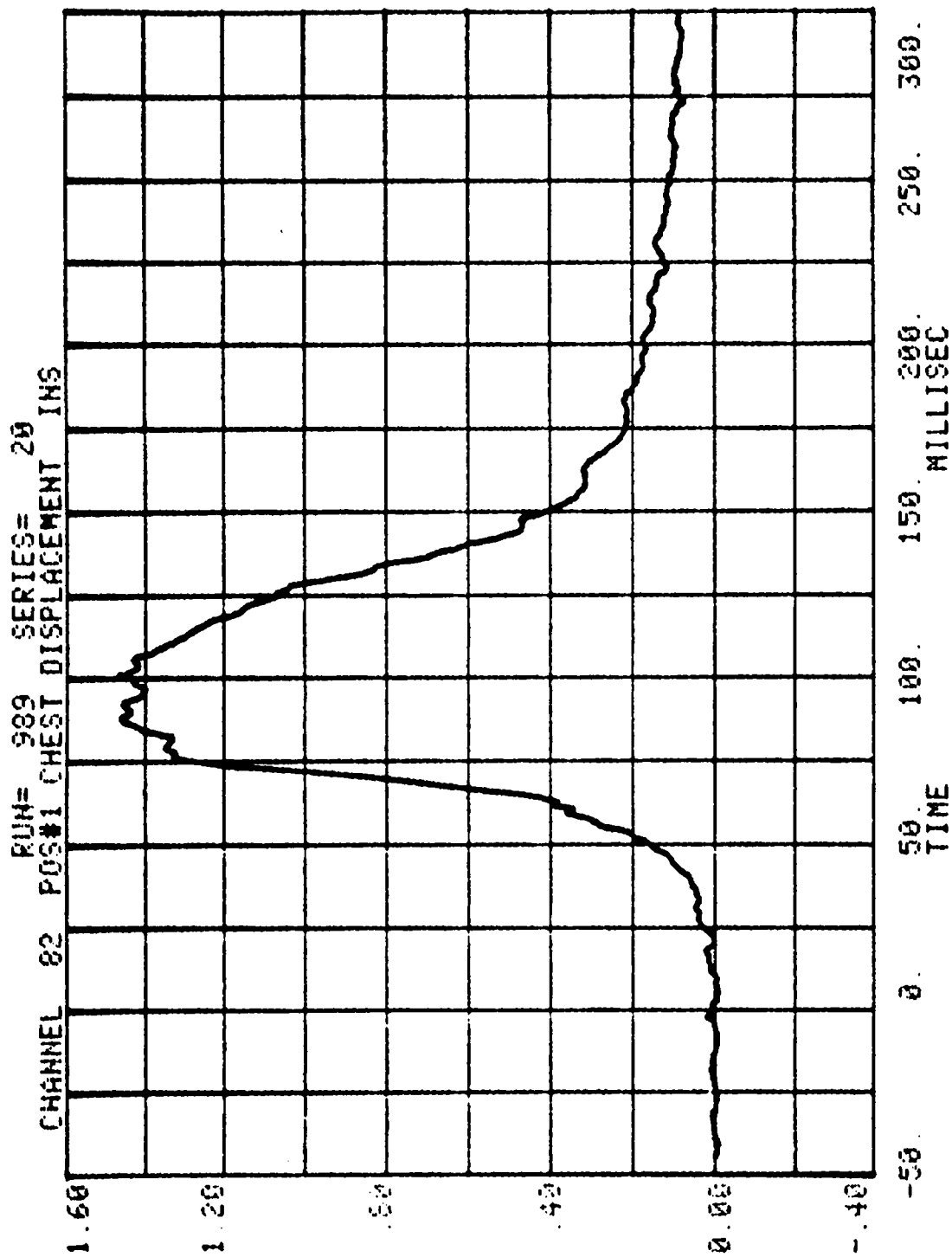
Measured over
2.5 inches

CHANNEL 7 POS#1 BELT ELONGATION

RUN= 929 SERIES= 20







HEAD INJURY CRITERION
HEAD SEVERITY INDEX
32MS MAXIMUM DURATION

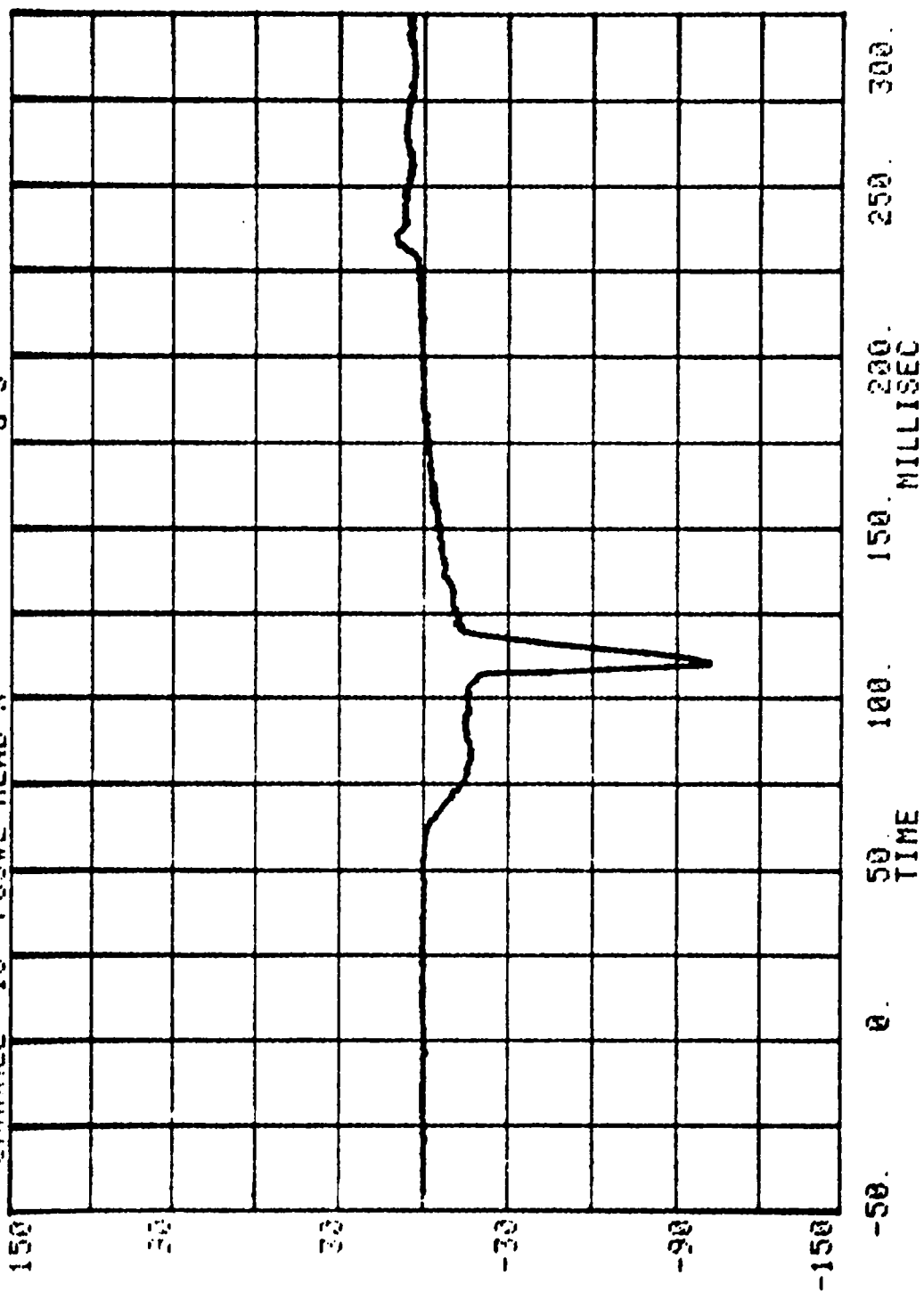
HICP TEST #20

PUN= 389

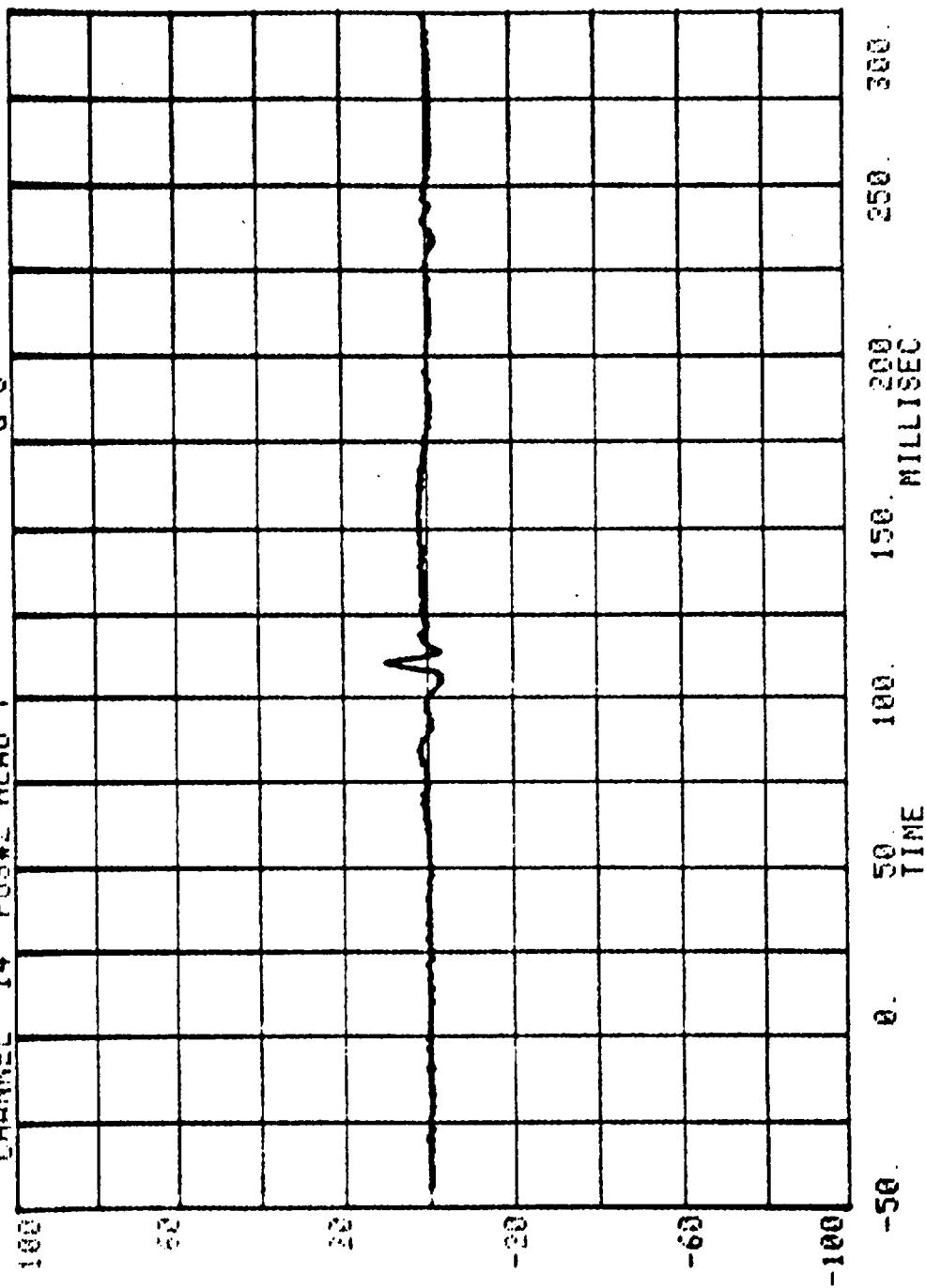
POS #2 HEAD R

HIC= 594.7 FROM T1= .08197 TO T2= .11797
AVERAGE ACCELERATION BETWEEN T1 AND T2= 48.75'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 389.1

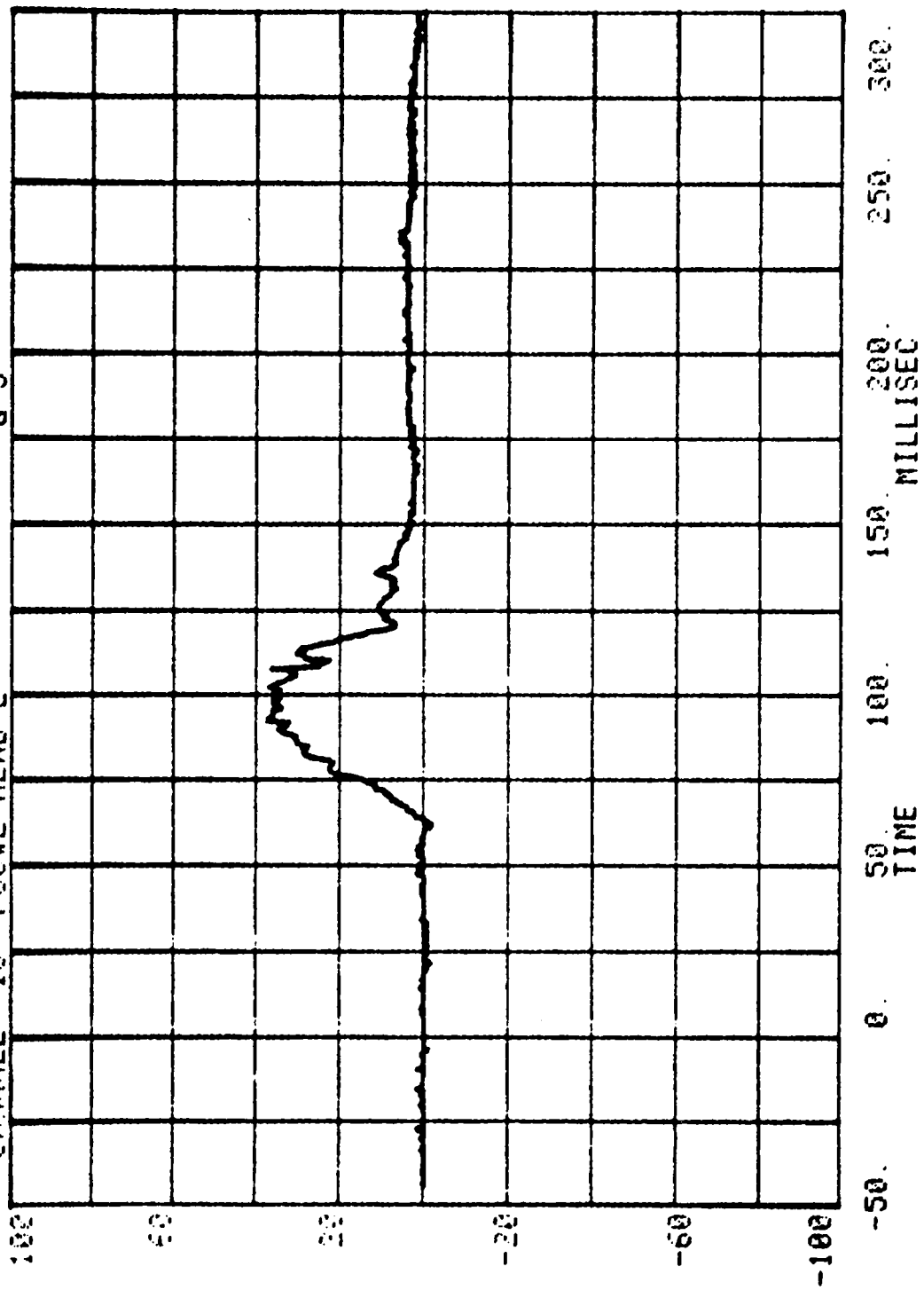
CHANNEL 13 POS#2 HEAD X
RUN= 989 SERIES= 20 G'S

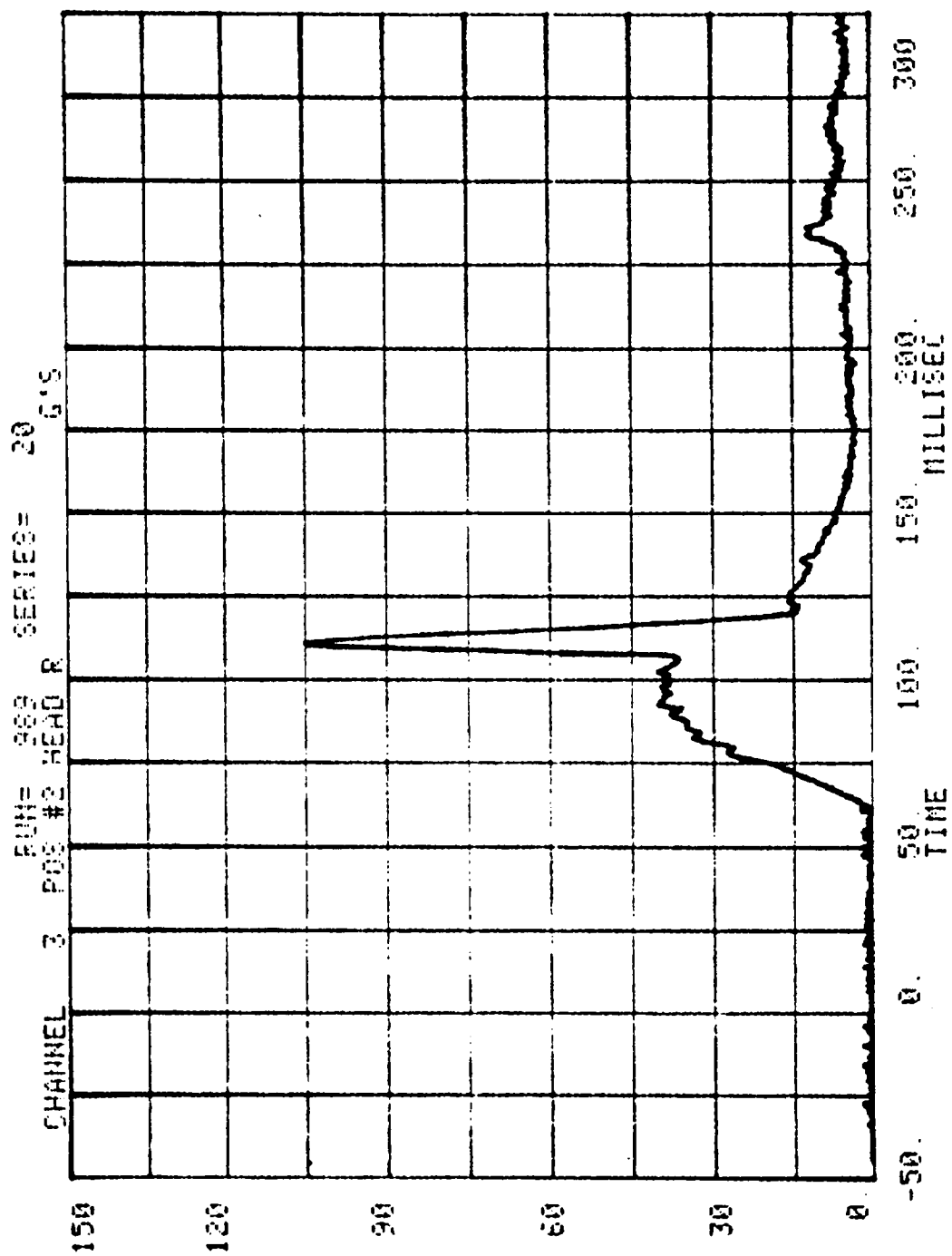


CHANNEL 14 POS#2 HEAD Y RUN= 989 SERIES= 20 G'S

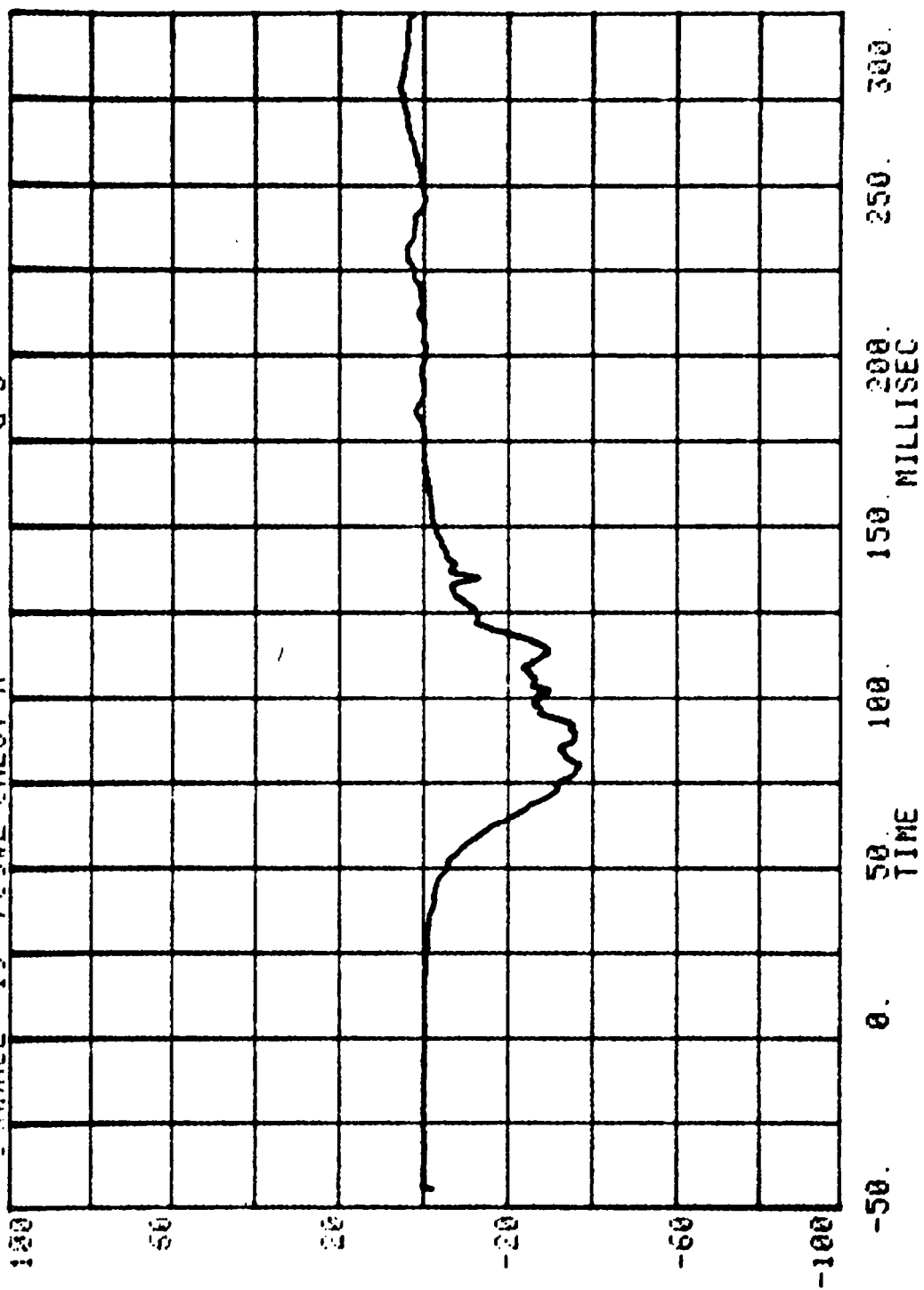


CHANNEL 15 POS#2 HEAD Z RUN= 989 SERIES= 20 G'S

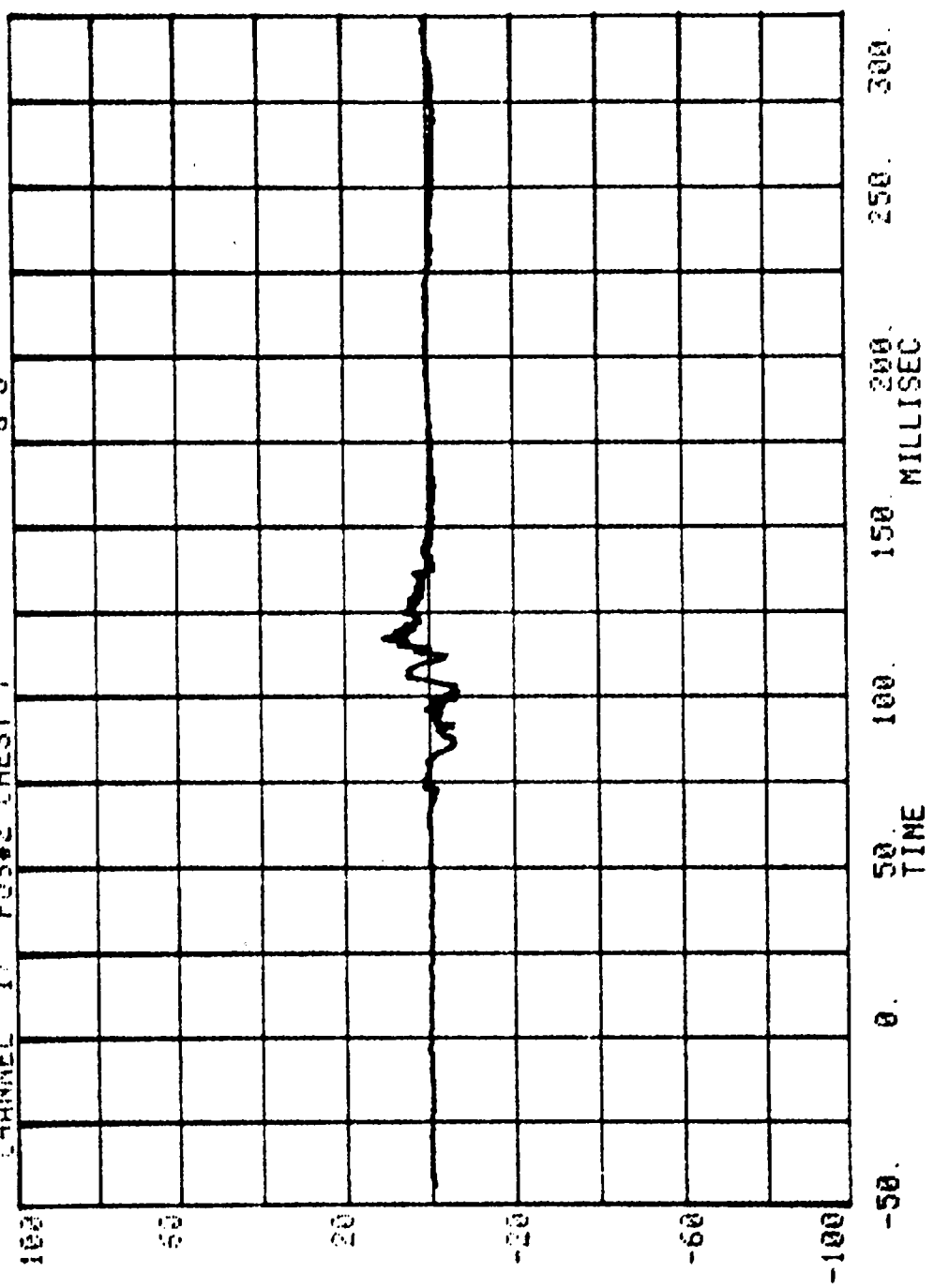




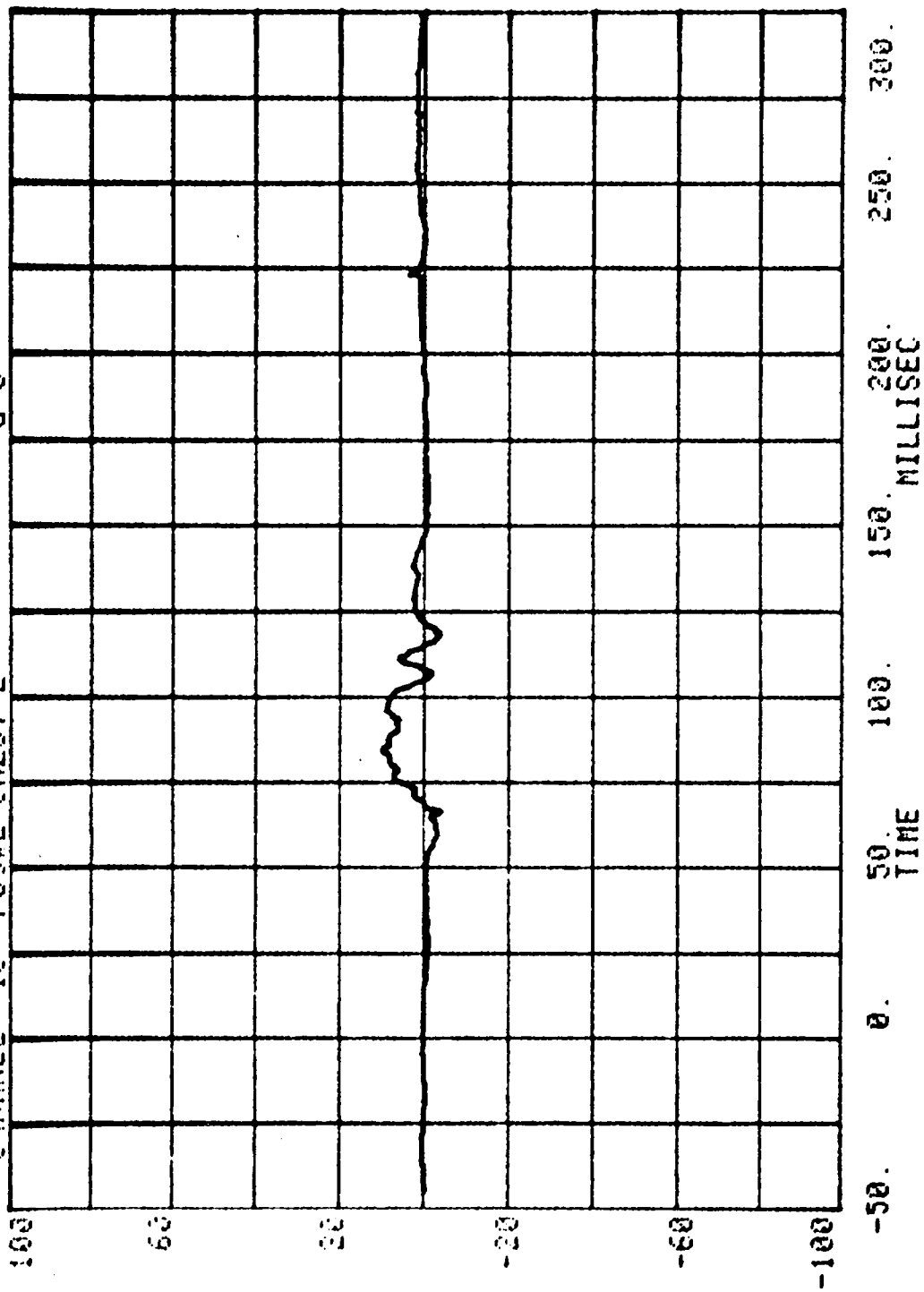
RUN= 989 SERIES= 20 G'S
CHANNEL 15 POS#2 CHEST X

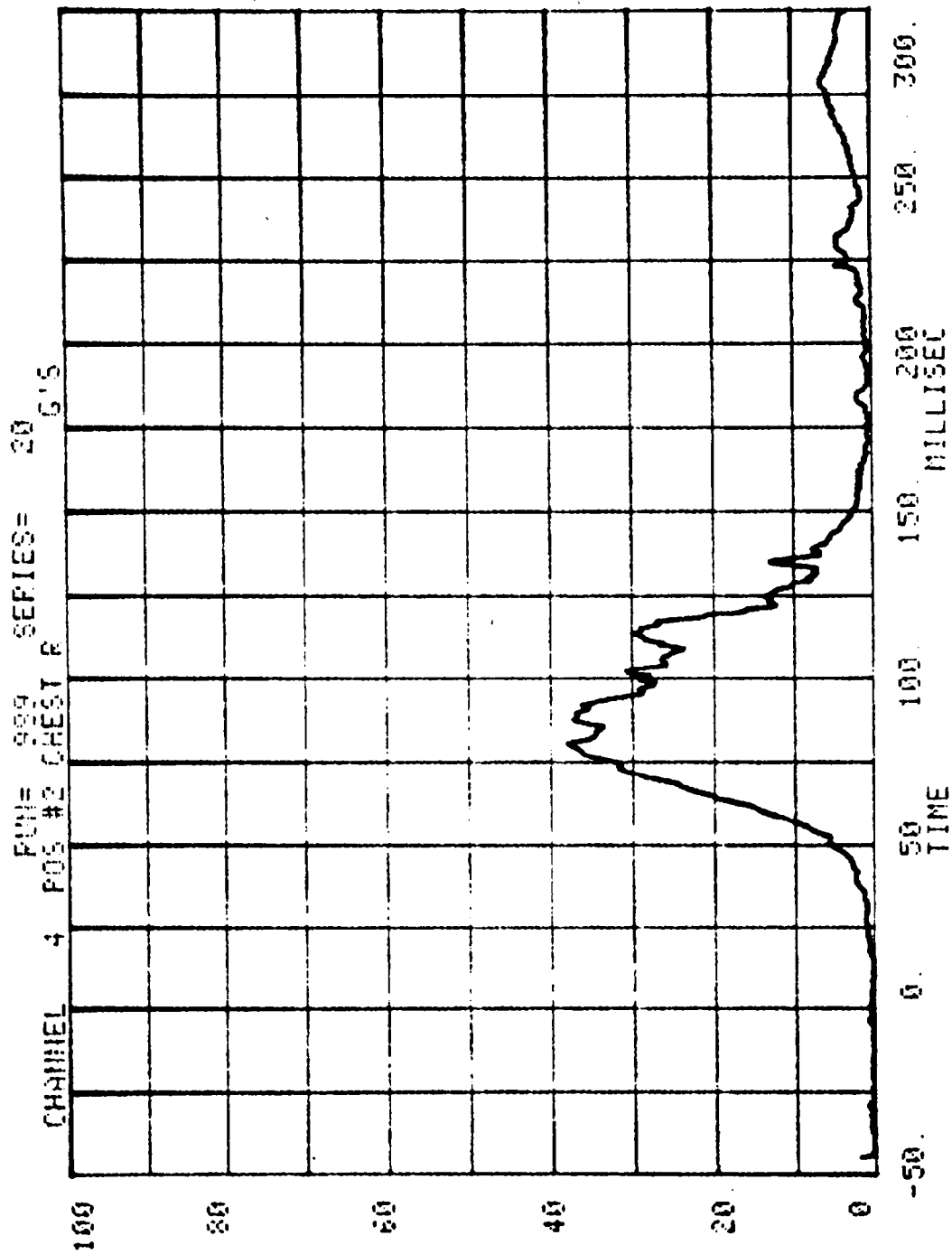


CHANNEL 17 RUN= 989 SERIES= 20 G'S
POS#2 CHEST Y

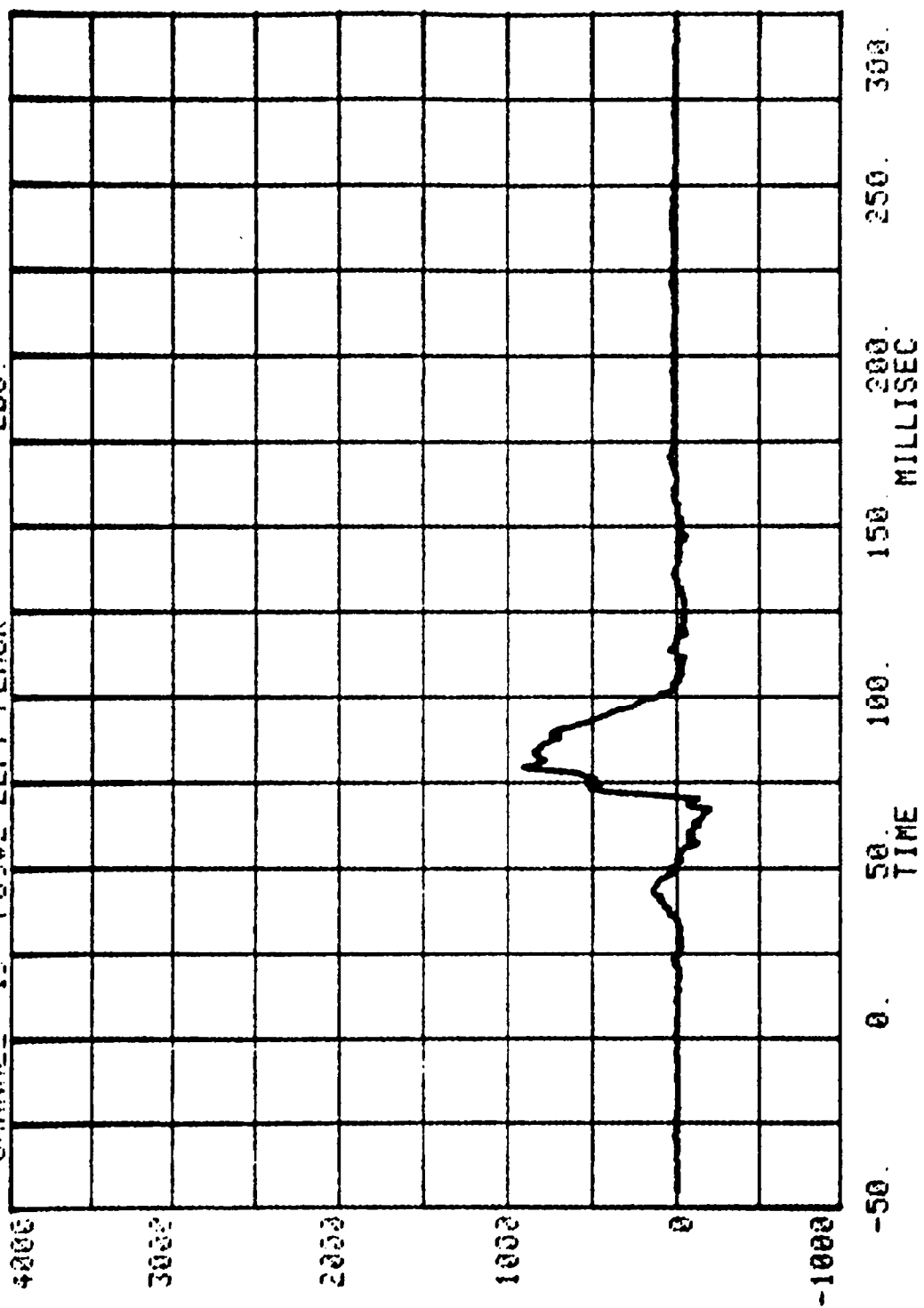


CHANNEL 18 POS#2 CHEST Z RUN= 389 SERIES= 20 G'S

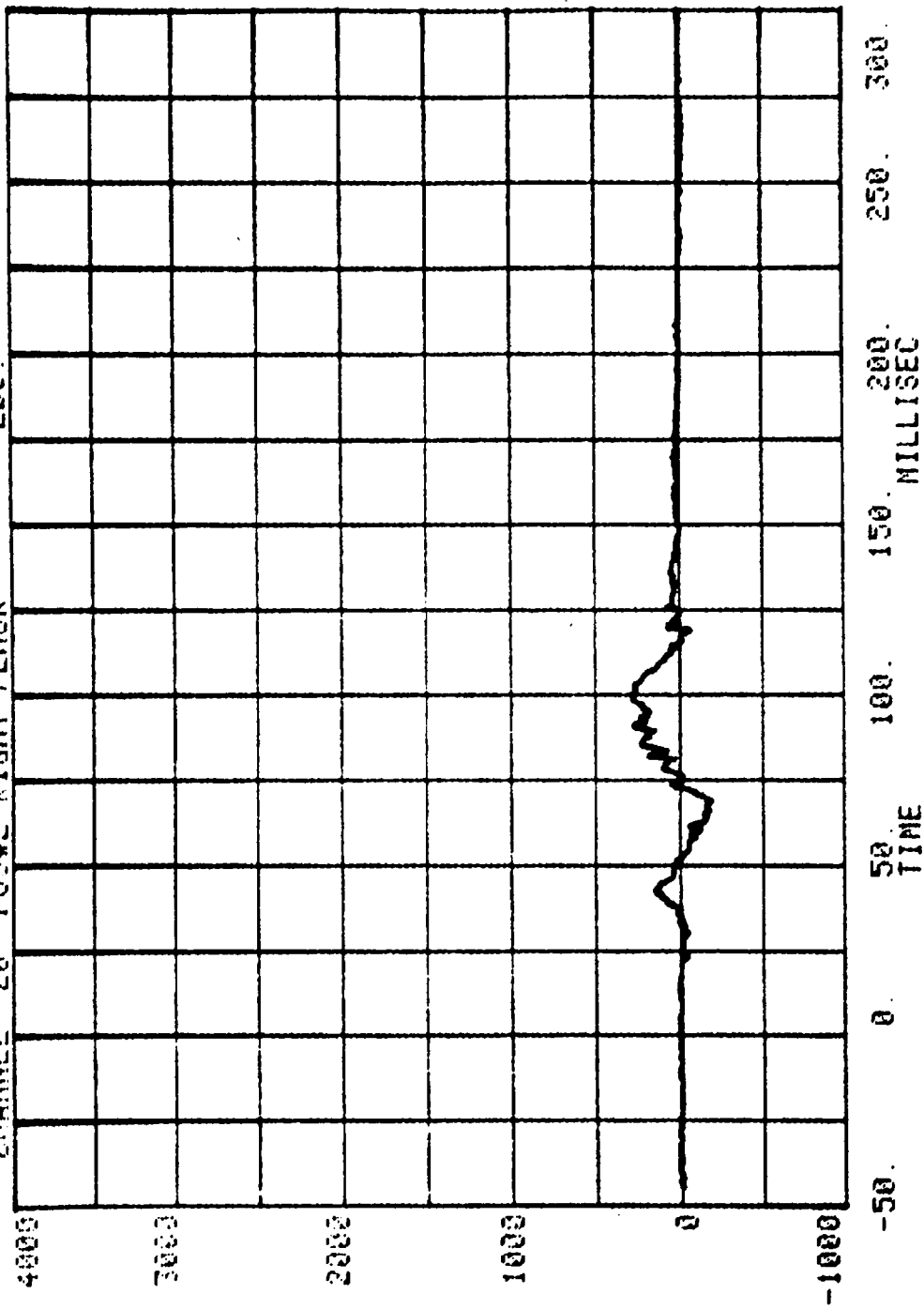


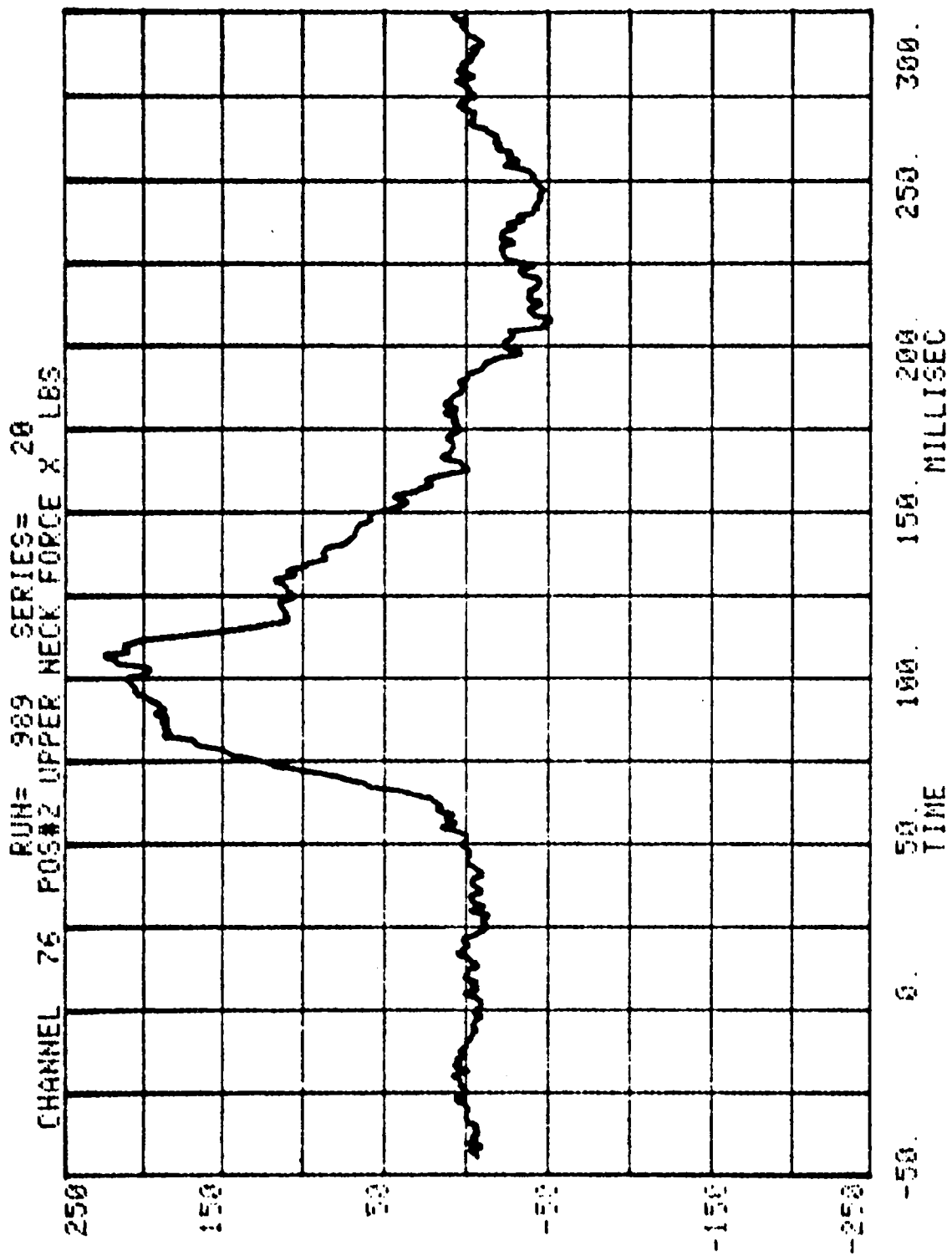


CHANNEL 19 POS#2 LEFT FEMUR
RUN= 389 SERIES= 20 LBS.



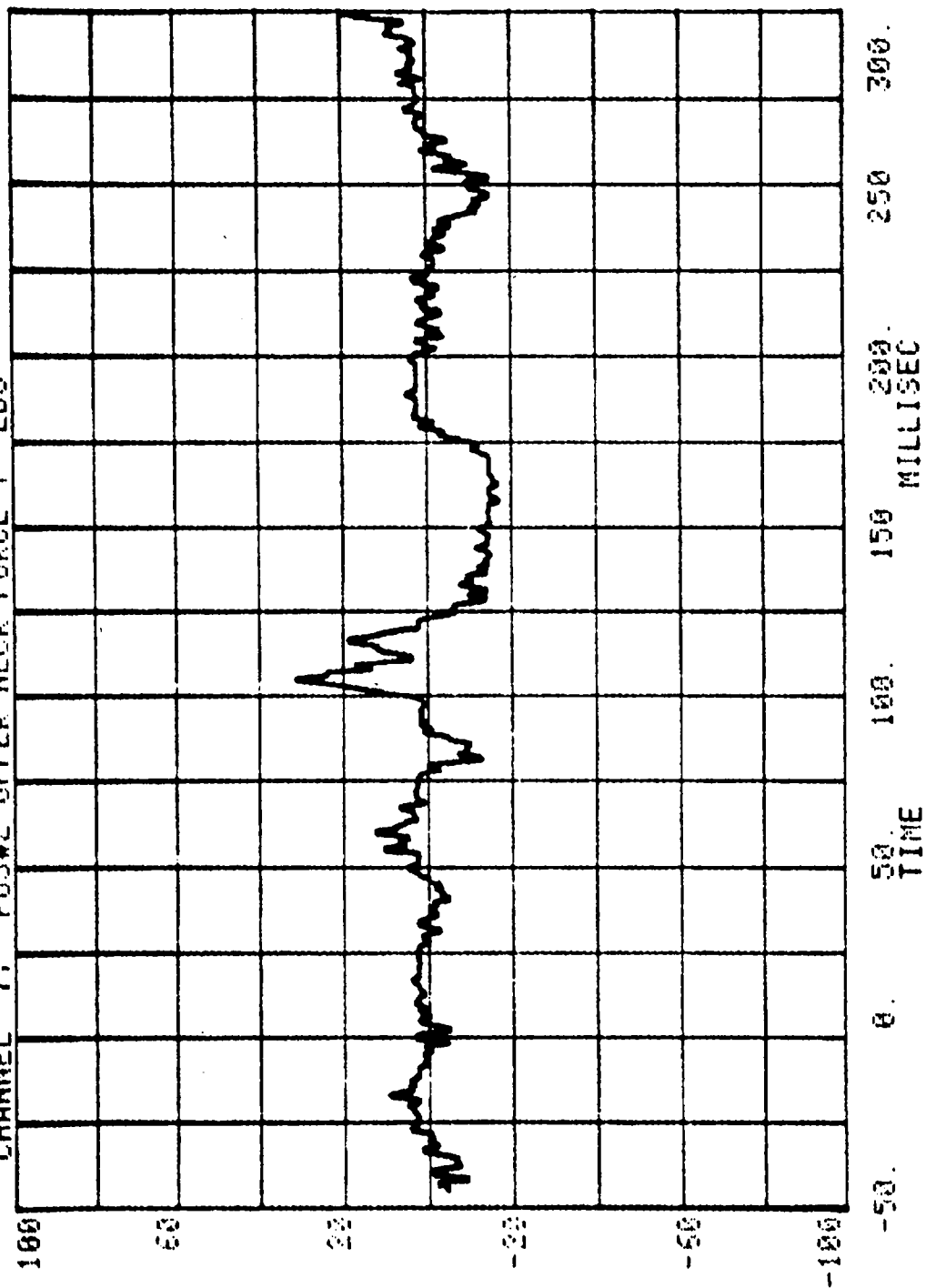
RUN= 983 SERIES= 20 LBS.
CHANNEL 20 POS#2 RIGHT FEMUR

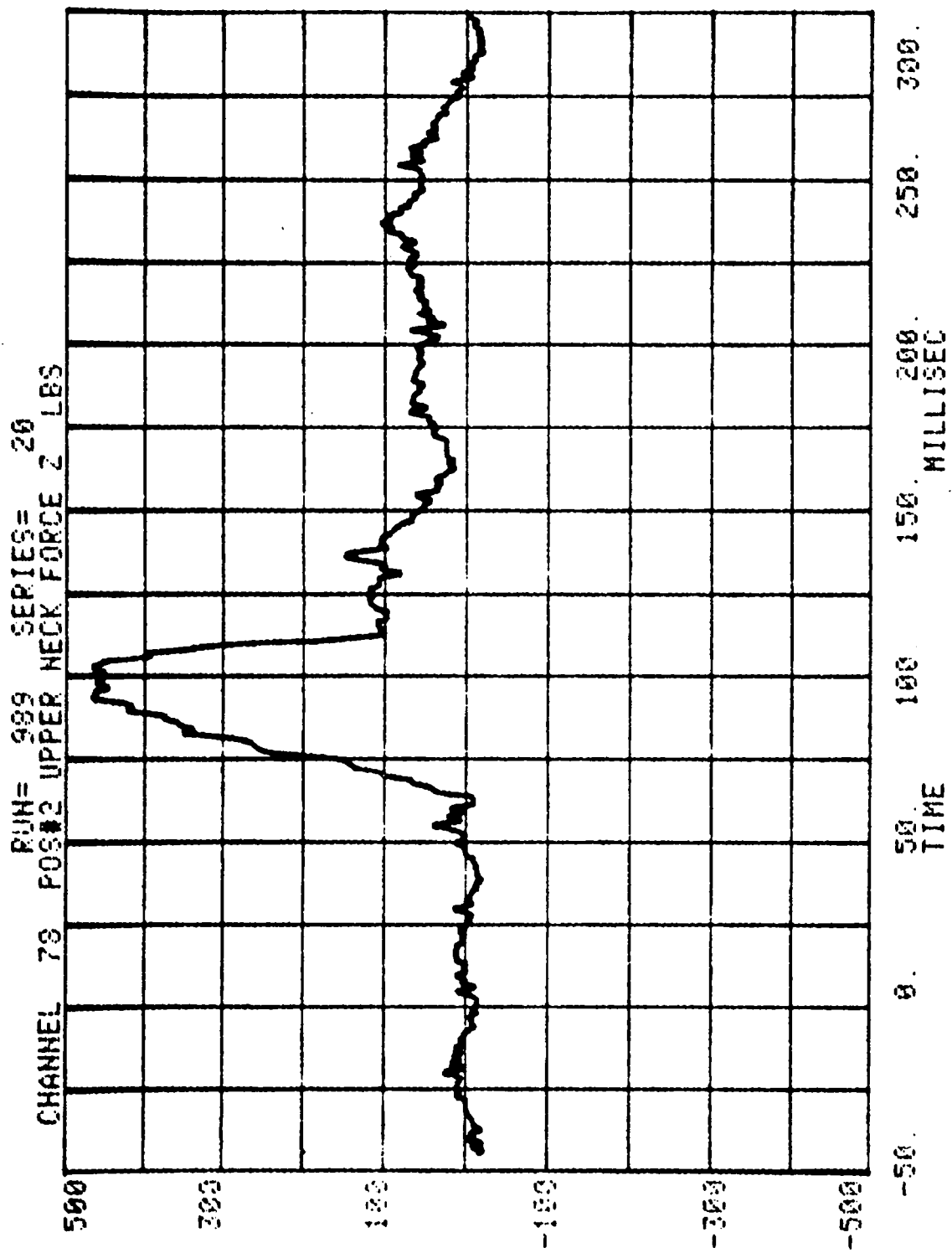


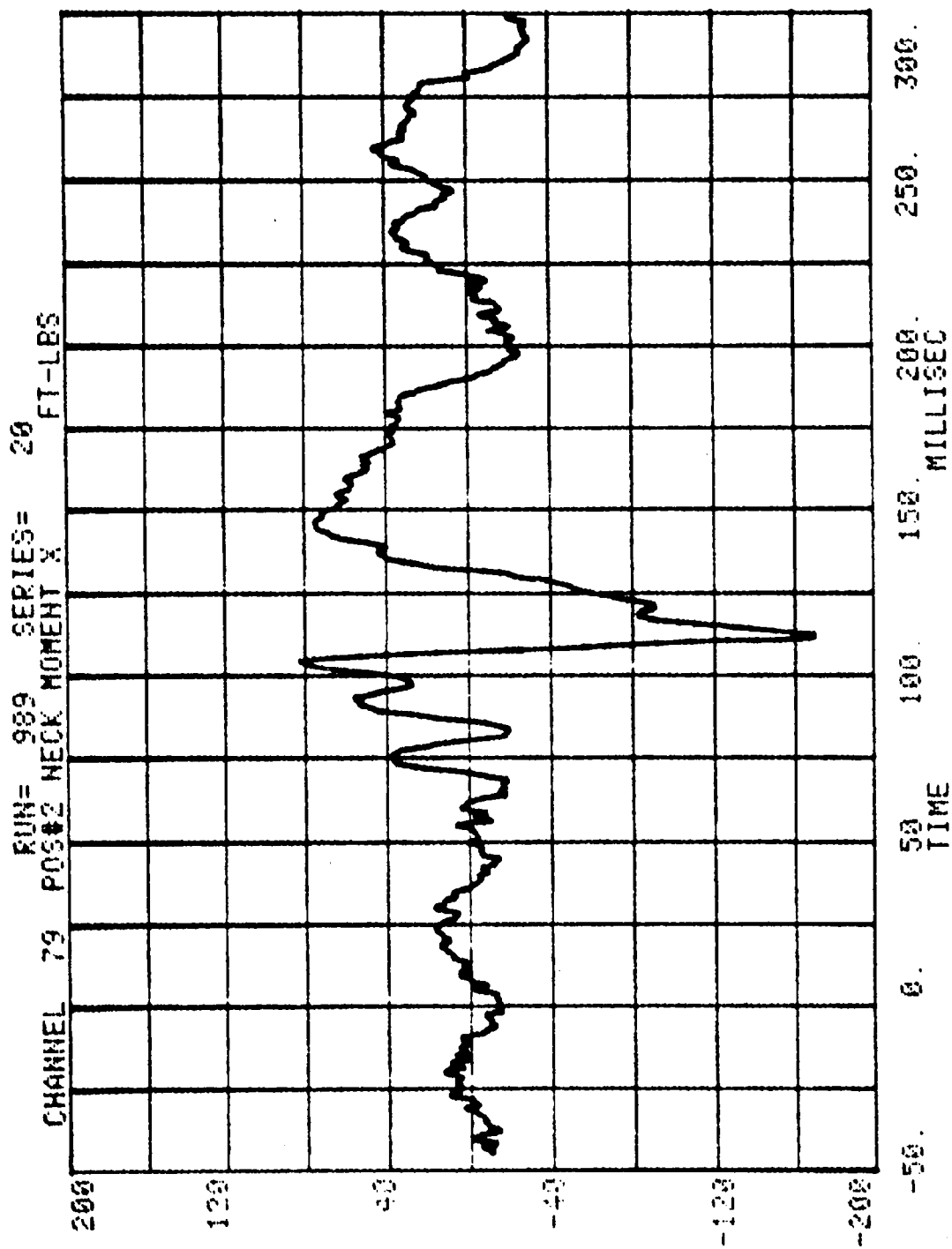


CHANNEL 77 POS#2 UPPER NECK FORCE Y LBS

RUN= 989 SERIES= 20

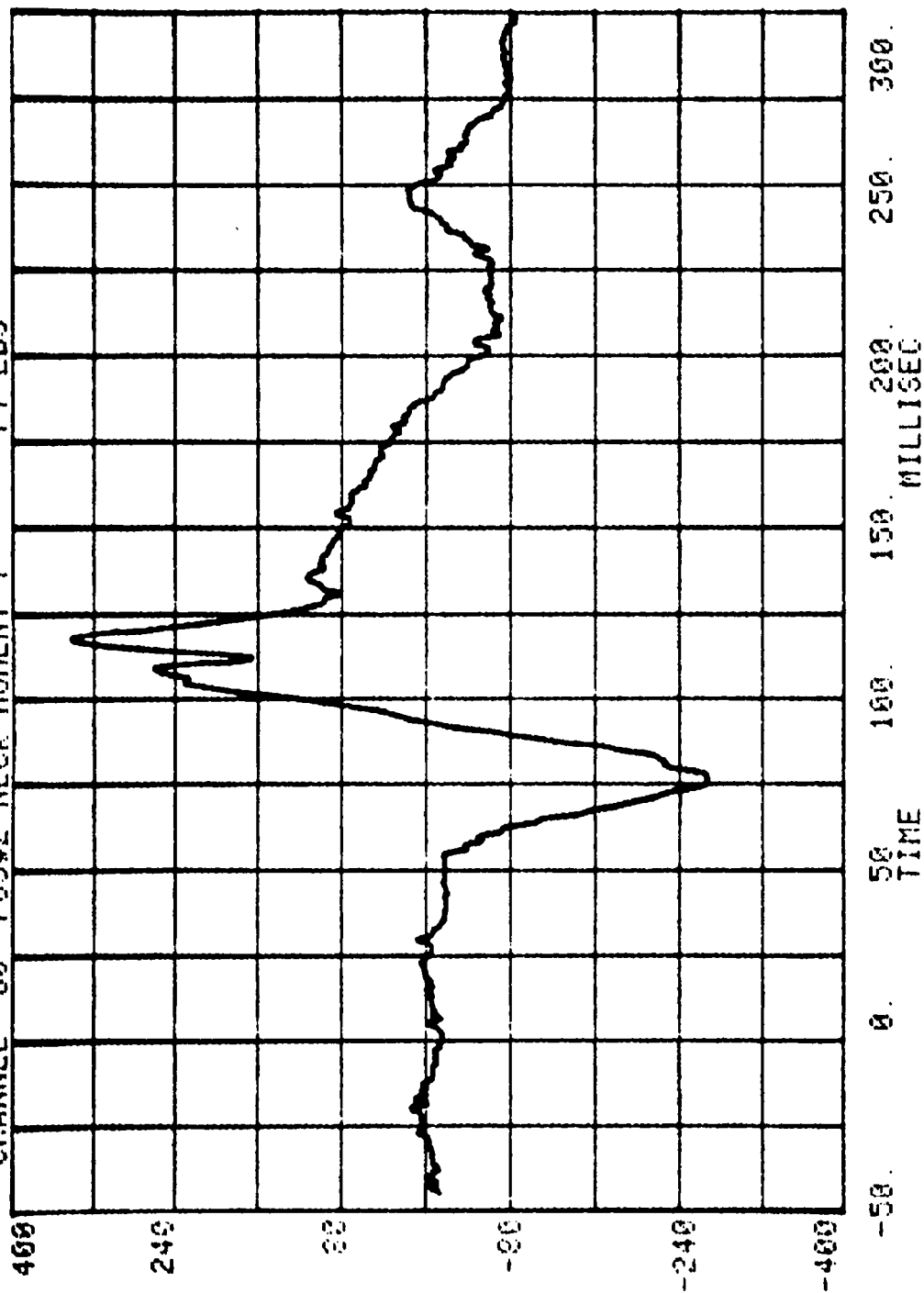


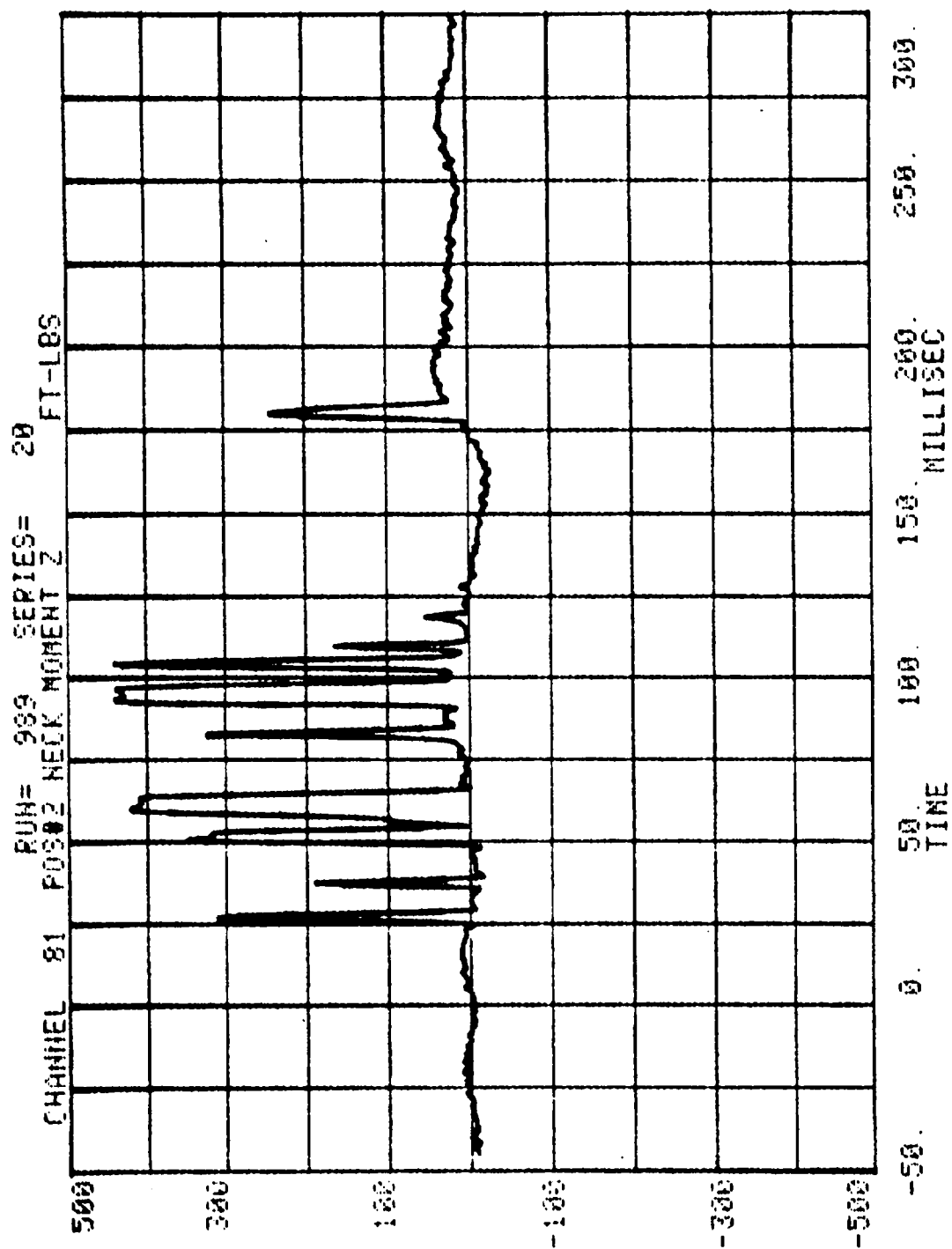




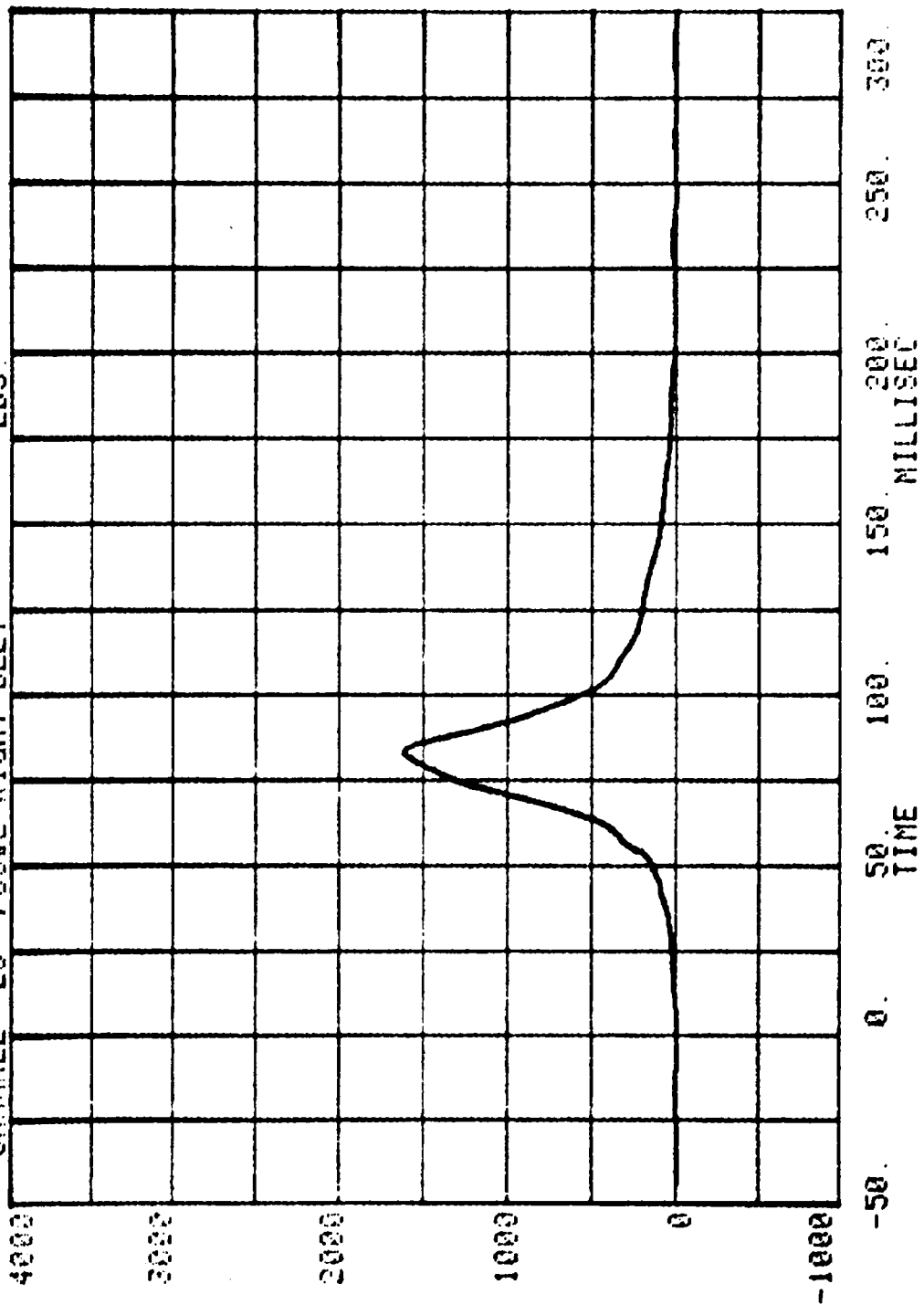
CHANNEL 80 POS#2 NECK MOMENT Y FT-LBS

RUN= 999 SERIES= 28





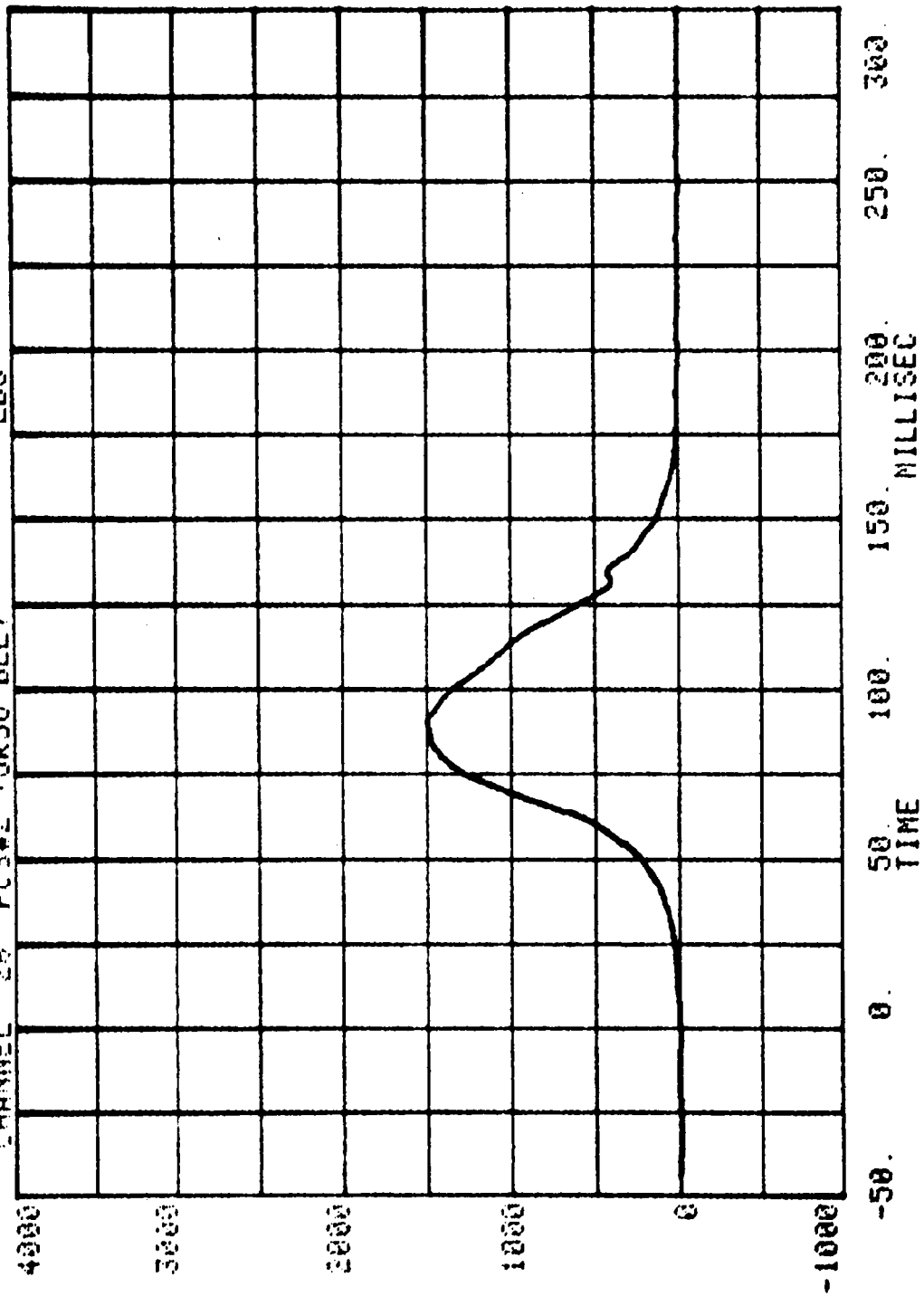
RUN= 989 SERIES= 20
CHANNEL 25 POS#2 RIGHT BELT LBS



CHANNEL 25 PCS#2 TORSO BELT

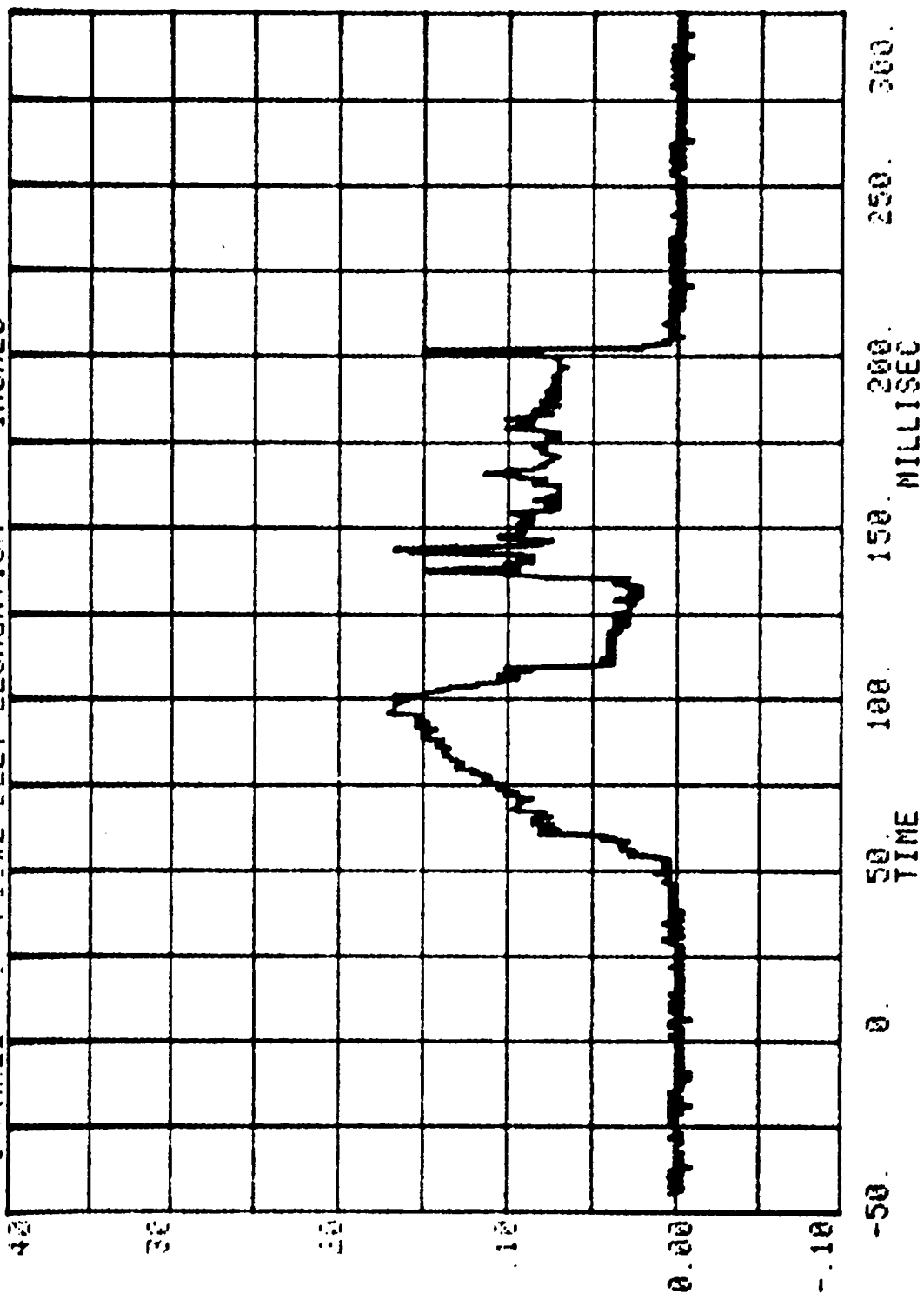
RUN= 989 SERIES= 20

LBS



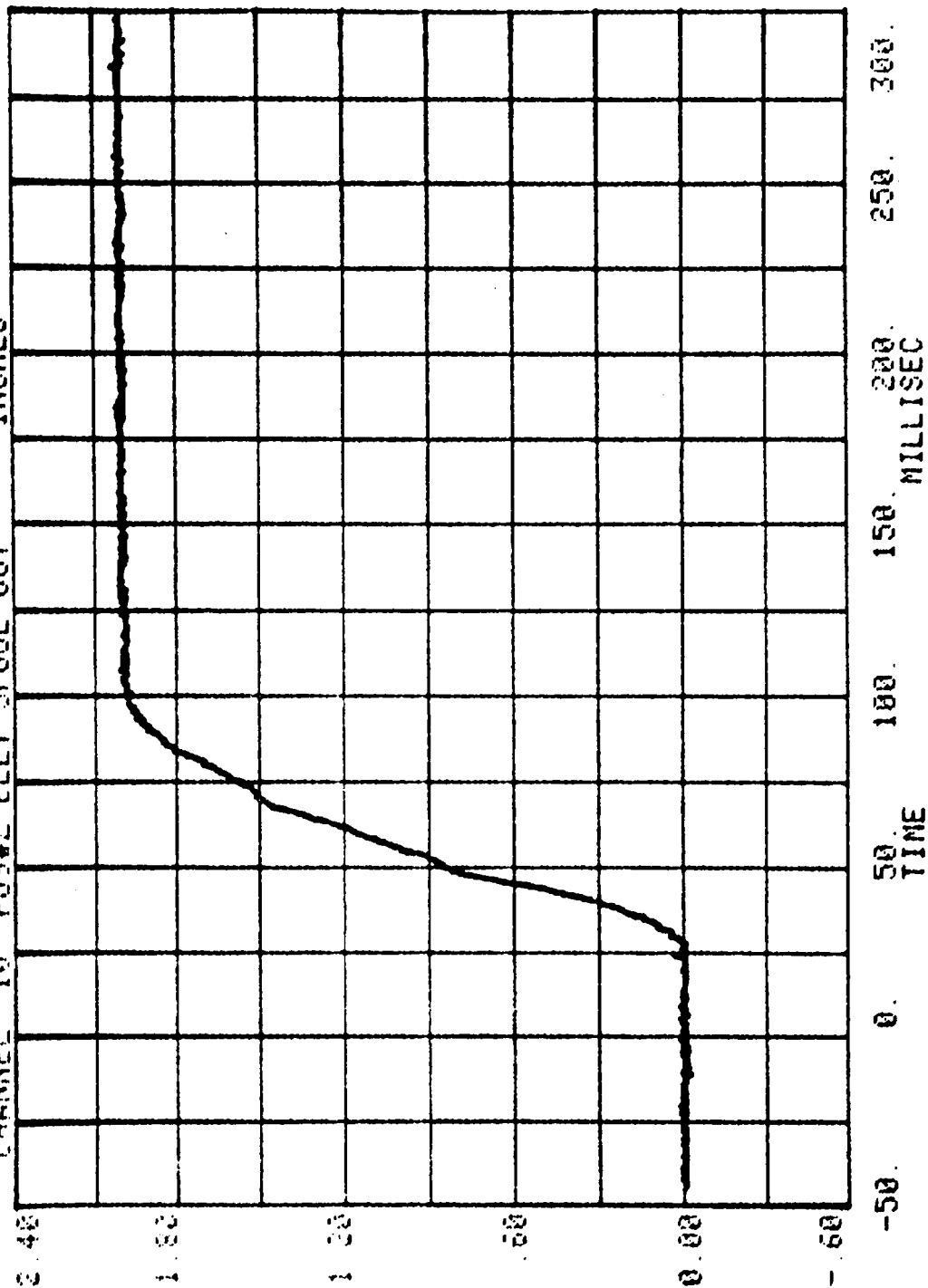
Measured over
2.5 inches

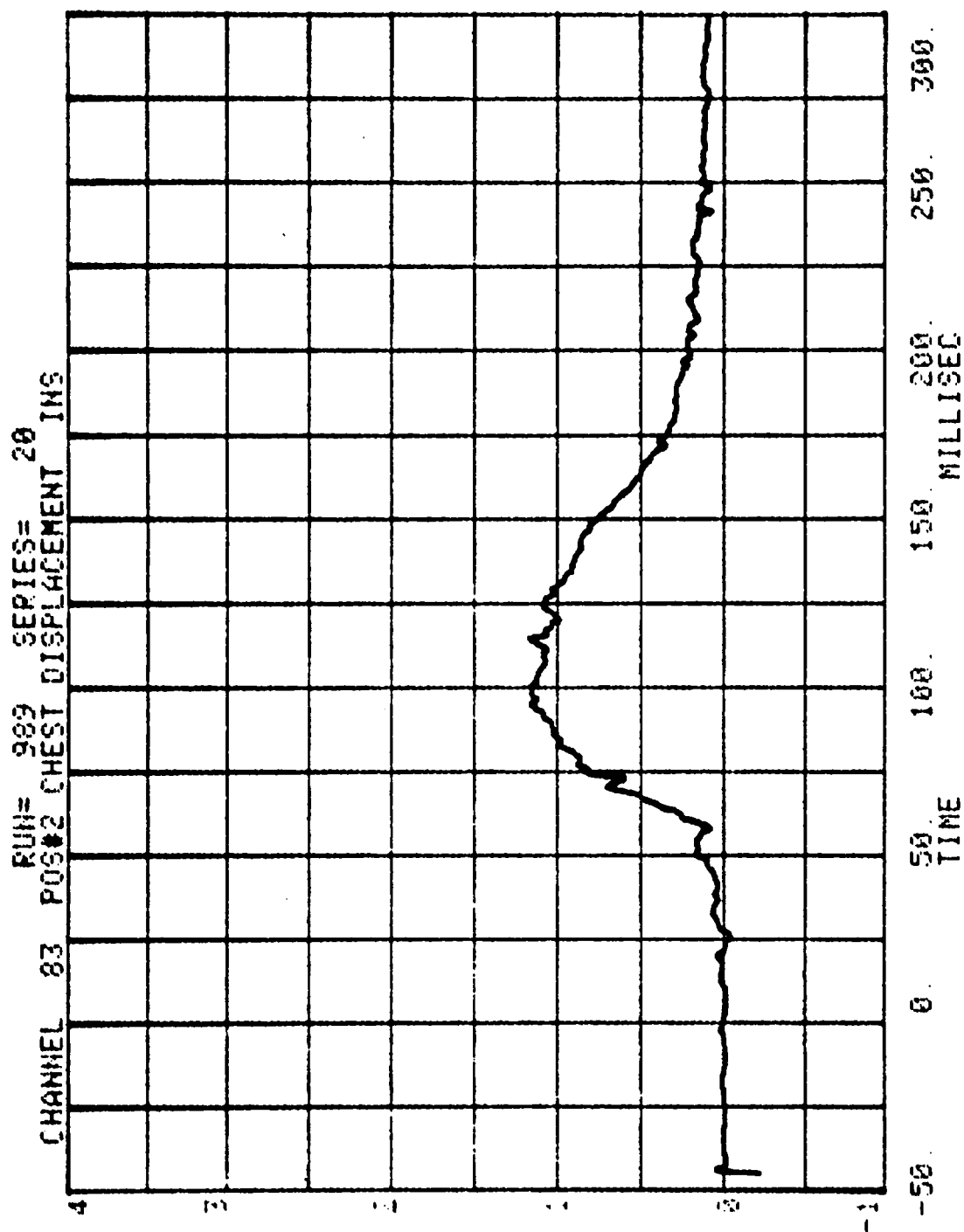
CHANNEL 3 RUN= 989 POS#2 BELT ELONGATION SERIES= 20 INCHES



CHANNEL 10 POS#2 BELT SPOOL OUT INCHES

RUN= 989 SERIES= 28





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.

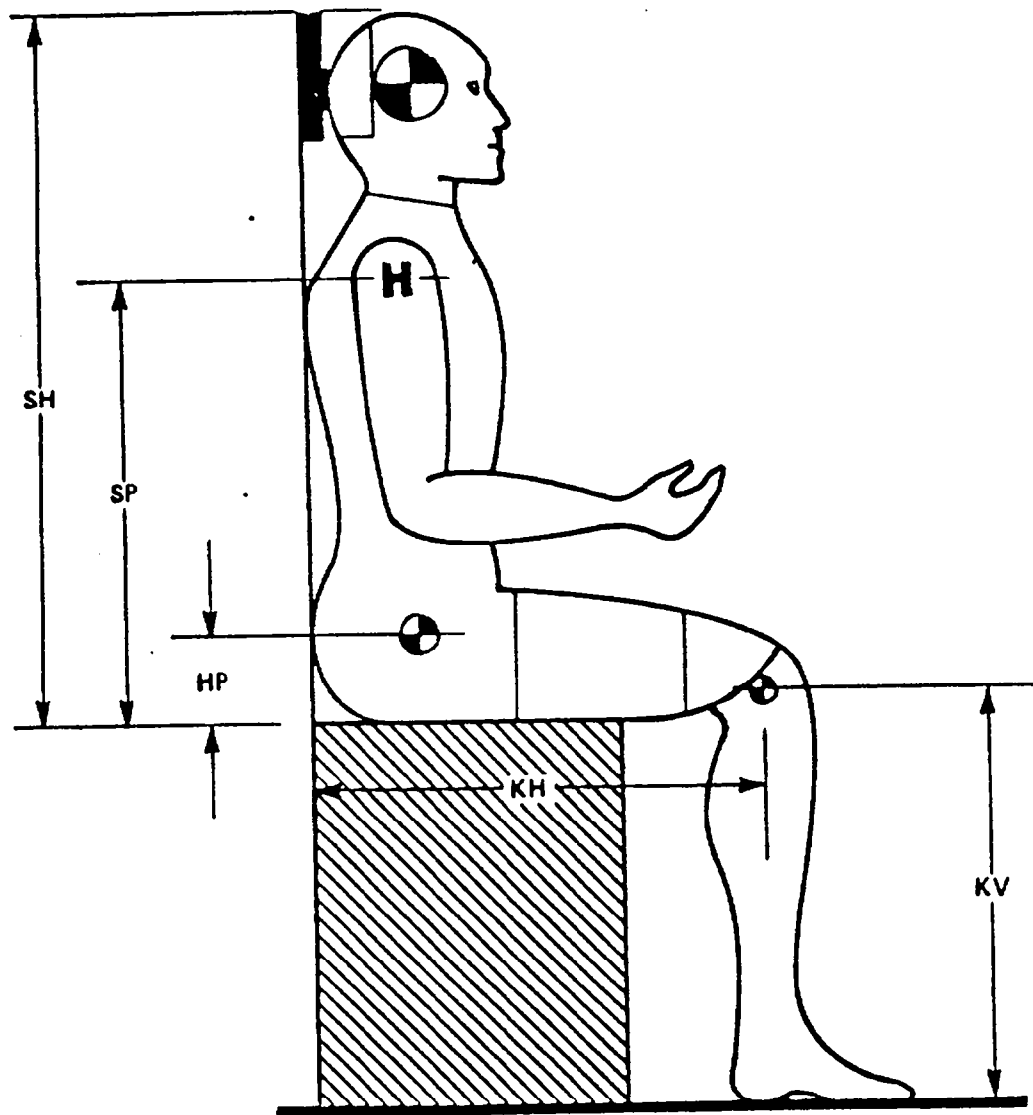
Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
45	04-17-90
150	04-17-90

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 No. 6525-V-1.

Figure 10
DUMMY CONFIGURATION DIMENSIONS



CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 4-17-90

KNEE : LEFT

CALSPAN

HY3 SN 45 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	38 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1133 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN _____IVAN MINKEWICZ_____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 4-17-90

KNEE : RIGHT

CALSPAN

HY3 SN 45 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	38 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1090 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN _____IVAN MINKEWICZ_____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
HEAD DROP TEST
HYBRID III

DATE : 4-17-90

CALSPAN

HY3 SN 45 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	70 DEG. F
RELATIVE HUMIDITY	10% - 70%	40 %
PEAK RESULTANT ACCELERATION	225 - 275 G	269.6 G
PEAK LATERAL ACCELERATION	15 G MAX	13.6 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN ____IVAN MINKEWICZ____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 4-12-90

CALSPAN

HY3 SN 45 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	27 %
PENDULUM VELOCITY	21.6 - 22.4 FT/SEC	21.7 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.51 INCHES
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1238 POUNDS
INTERNAL HYSTERESIS	69% - 85%	69 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN ____IVAN MINKEWICZ____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 4-16-90

6 AXIS NECK TRANSDUCER

CALSPAN

HY3 SN 45 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71 DEG. F
RELATIVE HUMIDITY		10% - 70%	32 %
IMPACT VELOCITY		19.50 - 20.30 FPS	20.3 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.2 G
	20 MS	14.00 - 19.00 G	16.91 G
	30 MS	11.00 - 16.00 G	12.99 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	12.99 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	45.88 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	101.31 DEG.
	TIME	72 - 82 MS	77 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-59.0/-39.0 FT.-LBS.	-57.84 FT.-LBS.
	TIME	65 - 79 MS	71.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	156.88 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	139.88 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK FLEXION TEST
HYBRID III

DATE : 4-16-90

6 AXIS NECK TRANSDUCER

CALSPAN

HY3 SN 45 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71 DEG. F
RELATIVE HUMIDITY		10% - 70%	32 %
IMPACT VELOCITY		22.6 - 23.4 FPS	23.4 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	24.0 G
	20 MS	17.60 - 22.60 G	21.93 G
	30 MS	12.50 - 18.50 G	16.37 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	16.37 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	39.88 MS
D PLANE	MAX	64 - 78 DEG.	76.8 DEG.
ROTATION	TIME	57 - 64 MS	58.63 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.-LBS.	79.09 FT.-LBS.
	TIME	47 - 58 MS	54.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	113.88 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	99.25 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 45

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CH83	11-89	5-90
HY LATERAL--	ENDEVCO	CU62	11-89	5-90
HZ VERTICAL--	ENDEVCO	CM86	11-89	5-90
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A73	11-89	5-90
CY LATERAL--	ENDEVCO	CE06	11-89	5-90
CZ VERTICAL--	CEC	A44	11-89	5-90
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	74	12-89	6-90
LEFT SIDE	GSE	1927	12-89	6-90
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	12-89	6-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	12-89	6-90
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	2-90	8-90
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	2-90	8-90
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	2-90	8-90

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
HEAD DROP TEST
HYBRID III

DATE : 4-17-90

CALSPAN

HY3 SN 150 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	40 %
PEAK RESULTANT ACCELERATION	225 - 275 G	228.9 G
PEAK LATERAL ACCELERATION	15 G MAX	8.4 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN ____IVAN MINKEWICZ_____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 4-17-90

KNEE : LEFT

CALSPAN

HY3 SN 150 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	38 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1132 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN _____IVAN MINKEWICZ_____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 4-17-90

KNEE : RIGHT

CALSPAN

HY3 SN 150 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	38 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1104 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN ____IVAN MINKEWICZ____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK FLEXION TEST
HYBRID III

DATE : 4-17-90

6 AXIS NECK TRANSDUCER

CALSPAN

HY3 SN 150 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY		10% - 70%	32 %
IMPACT VELOCITY		22.6 - 23.4 FPS	23.3 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	22.61 G
	20 MS	17.60 - 22.60 G	20.52 G
	30 MS	12.50 - 18.50 G	17.97 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	18.61 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	41.0 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	75.25 DEG.
	TIME	57 - 64 MS	59.88 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.-LBS.	79.26 FT.-LBS.
	TIME	47 - 58 MS	53.38 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	117.75 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	98.25 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 4-17-90

6 AXIS NECK TRANSDUCER

CALSPAN

HY3 SN 150 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70 DEG. F
RELATIVE HUMIDITY		10% - 70%	32 %
IMPACT VELOCITY		19.50 - 20.30 FPS	20.3 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.25 G
	20 MS	14.00 - 19.00 G	16.91 G
	30 MS	11.00 - 16.00 G	13.59 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	13.59 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	45.5 MS
D PLANE	MAX	81 - 106 DEG.	94.52 DEG.
ROTATION	TIME	72 - 82 MS	75.63 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-59.0/-39.0 FT.-LBS.	-49.33 FT.-LBS.
	TIME	65 - 79 MS	70.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	155.75 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	129 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 4-12-90

CALSPAN

HY3 SN 150 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	26 %
PENDULUM VELOCITY	21.6 - 22.4 FT/SEC	21.7 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.54 INCHES
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1229 POUNDS
INTERNAL HYSTERESIS	69% - 85%	76.1 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN ____IVAN MINKEWICZ____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 4-17-90

6 AXIS NECK TRANSDUCER

CALSPAN

HY3 SN 150 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70 DEG. F
RELATIVE HUMIDITY		10% - 70%	32 %
IMPACT VELOCITY		19.50 - 20.30 FPS	20.3 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.25 G
	20 MS	14.00 - 19.00 G	16.91 G
	30 MS	11.00 - 16.00 G	13.59 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	13.59 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	45.5 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	94.52 DEG.
	TIME	72 - 82 MS	75.63 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-59.0/-39.0 FT.-LBS.	-49.33 FT.-LBS.
	TIME	65 - 79 MS	70.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	155.75 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	129 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 150

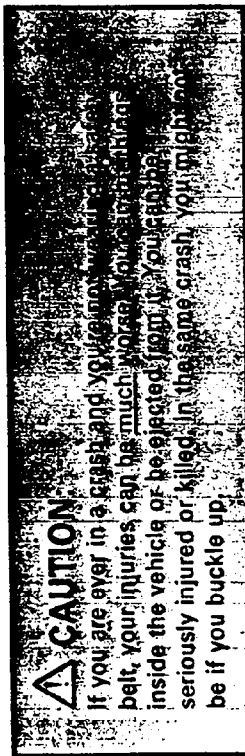
DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CS75	1-90	7-90
HY LATERAL--	ENDEVCO	CY89	1-90	7-90
HZ VERTICAL--	ENDEVCO	CE76	1-90	7-90
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A129	3-90	9-90
CY LATERAL--	ENDEVCO	CN64	3-90	9-90
CZ VERTICAL--	CEC	A56	3-90	9-90
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	311	12-89	6-90
LEFT SIDE	GSE	312	12-89	6-90
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	1-90	7-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	1-90	7-90
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	2-90	8-90
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	2-90	8-90
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	2-90	8-90

Appendix D

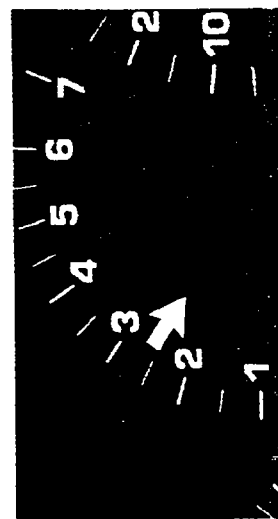
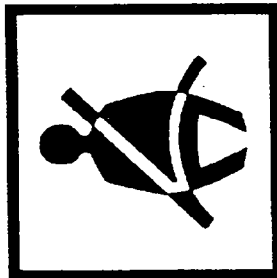
VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

SAFETY BELTS: THEY'RE FOR EVERYONE

This part of the manual tells you how to use safety belts properly. It also describes some things you should not do with belts.



This figure lights up when you turn the key to "Run" or "Start."



The light will stay on for a few seconds and you'll hear a buzzer or chime, too.

It's the reminder to buckle up. In many states, and in all Canadian provinces, the law says to wear belts. And here's why: They work.

You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.

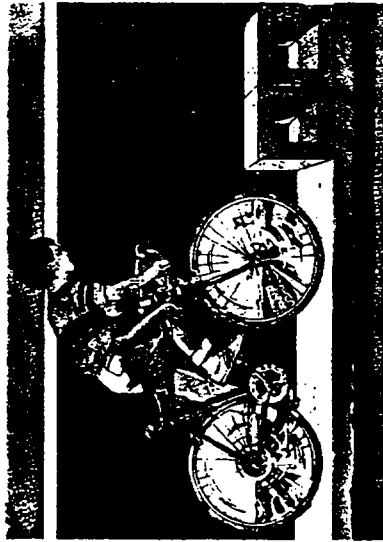
Of course, a few crashes are very mild. In them, you won't get hurt even if you're not buckled up. And some crashes can be so bad, like being hit by a freight train, that even buckled up a person wouldn't survive. But most crashes are in between. In many of them, people who buckle up can survive and sometimes walk away. Without belts they could be badly hurt or killed.



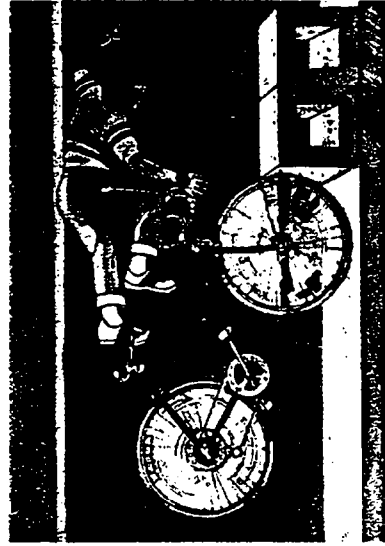
After 25 years of safety belts in cars, the facts are in. In most crashes buckling up does matter ... a lot!

WHY SAFETY BELTS WORK

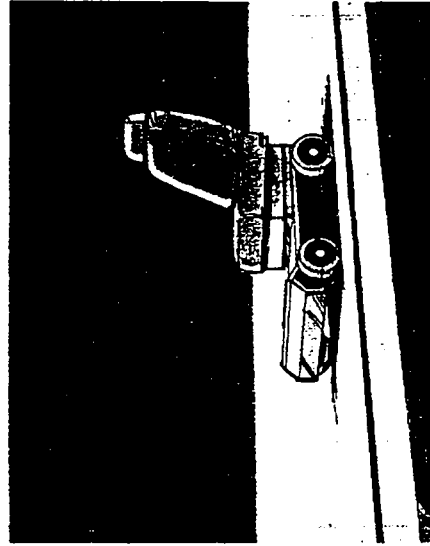
When you're riding in or on anything, you go as fast as it does.



If the bike is going 10 mph, so is the boy.

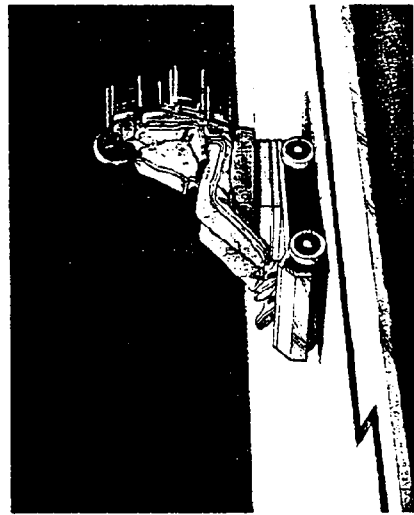


When the bike hits a block, it stops. But the child keeps going!

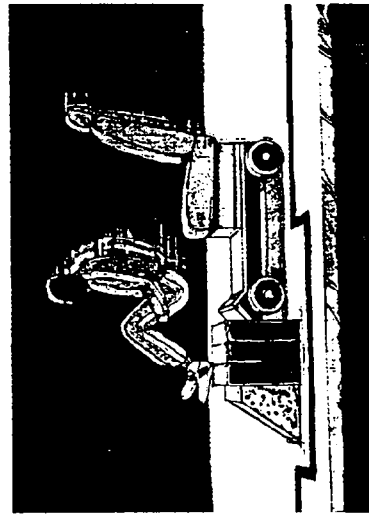


Take the simplest "car": Suppose it's just a seat on wheels.

WHY SAFETY BELTS WORK (Continued)



Put someone on it.



Get it up to speed. Then stop the "car."

D-4



The person keeps going until stopped by something.



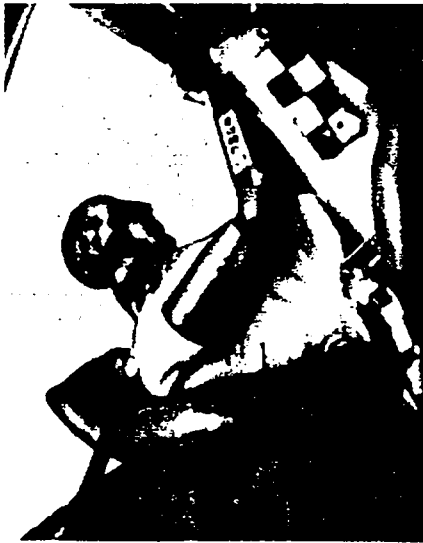
In a real vehicle, it could be the windshield ...

7776-20

WHY SAFETY BELTS WORK (Continued)



or the instrument panel ...



or the safety belts!

With belts, you slow down as the vehicle does. You get more time to stop. You stop over more distance, and your strongest bones take the forces.

HERE ARE QUESTIONS MANY PEOPLE ASK ABOUT SAFETY BELTS -- AND THE ANSWERS.

Q: *Won't I be trapped in the vehicle after an accident if I'm wearing a safety belt?*

A: You could be -- whether you're wearing a belt or not. But you can easily unbuckle a belt, even if you are upside down. And, your chance of being conscious during and after an accident, so you can unbuckle and get out, is much greater if you are belted.

Q: *Why not just put air bags in vehicles so people won't have to wear safety belts?*

A: "Air bags," or supplemental inflatable restraint systems, are in some cars today and will be in more vehicles in the future. But they work with safety belts. Every "air bag" system ever offered for sale has required the use of safety belts. Even if you're in a vehicle that has "air bags," you still have to buckle up to get the protection you need. That's true not only in frontal collisions, but especially for side collisions and other kinds of accidents.

Q: *If I'm a good driver and I never go very far from home, why should I wear safety belts?*

A: You may be an excellent driver, but if there is an accident, you and your passengers can be hurt. Just because you are a good driver does not protect you from things beyond your control or from bad drivers.

Most accidents occur within 25 miles (40 km) of home. And, the greatest number of serious injuries and deaths occur at speeds of less than 40 mph (65 km/h).

Safety belts are for everyone.

HOW TO WEAR SAFETY BELTS PROPERLY (Continued)

The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks only if there's a sudden stop or a crash.



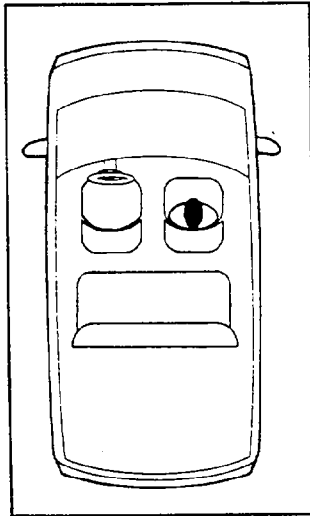
CAUTION:
You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much and that could increase injury. The shoulder belt should fit against your body.



5. To unlatch the belt, just push the button on the buckle.

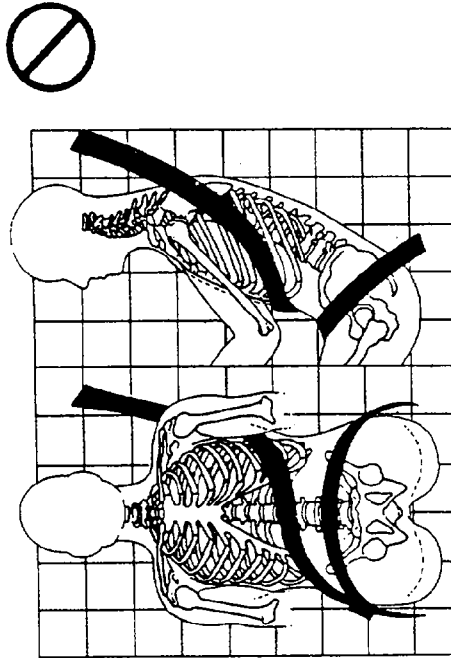
When you unbuckle it, the belt should go back out of the way. Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle's interior.

Right Front Passenger's Position



To see how the lap-shoulder belt for the right front passenger works, see above under Lap-Shoulder Belt.

Q: What's Wrong With This?



A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times.

HOW TO WEAR SAFETY BELTS PROPERLY

ADULTS

This part is only for people of adult size. If children will be riding in your Pontiac, see the section after this one, called "CHILDREN."

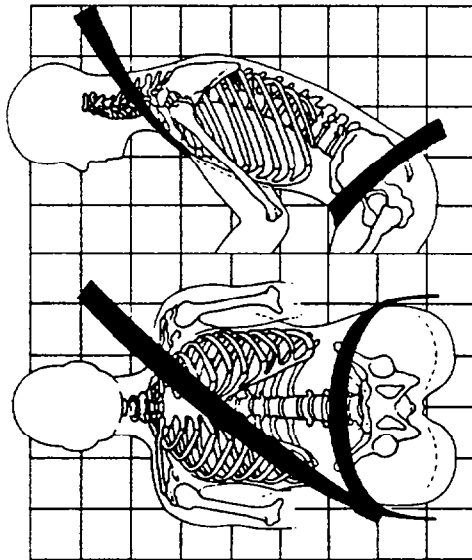


CAUTION:

There are special things to know about belts for children. And, there are different rules for infants, toddlers, and older children. Follow those rules for everyone's protection.

First, you'll want to know which restraint systems your MPV has. We'll start with the front seat.

LAP-SHOULDER BELT



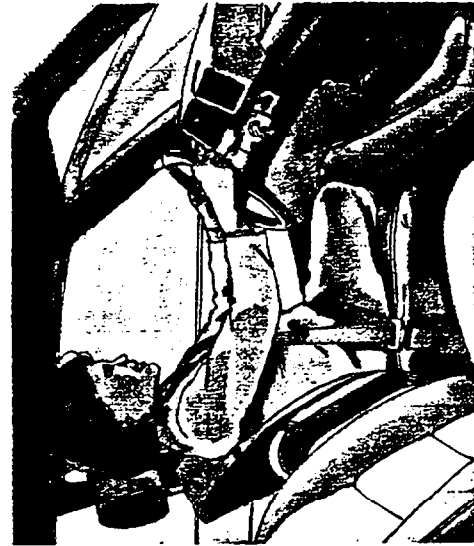
The driver has a lap-shoulder belt. It should be worn like this:

1. Adjust the seat so you can sit up straight.



2. Grasp the latch plate, and pull the belt across you (don't let it get twisted).

3. Push the latch plate into the buckle until it "clicks." If the belt is not long enough, see Safety Belt Extender at the end of this safety belt section.



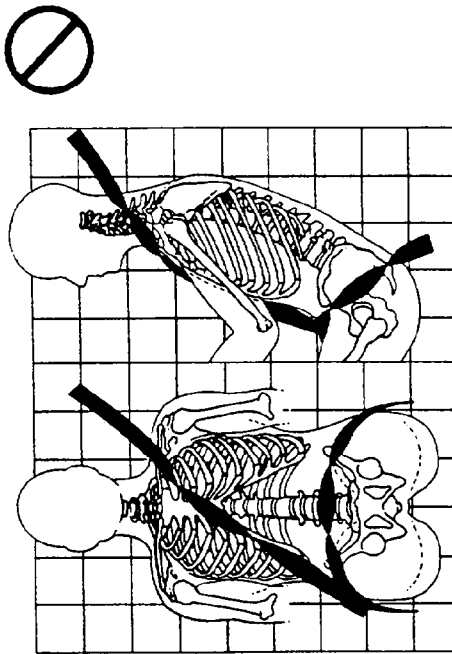
4. The lap part of the belt should be low. It needs to be snug below the hips, just touching the tops of the thighs. That applies belt force to the pelvic bones in a crash. And it means you'd be less likely to slide under the lap belt. If you slide under it, the belt would apply force to the abdomen. That could cause serious or even fatal injuries.

HOW TO WEAR SAFETY BELTS PROPERLY (Continued)

CAUTION:

You can be seriously injured if you wear the shoulder belt under your arm. In a crash, your body would move too far forward. That would increase the chance of head and neck injury. And, the belt would apply too much force to the ribs. Ribs aren't as strong as shoulder bones. You could also severely injure internal organs like your liver or spleen.

Q: What's Wrong With This?



A: The belt is twisted across the person's body.

D-8

CAUTION:

You can be seriously injured by twisted belts. In a crash, you wouldn't have the full width of the belt to take impact forces. The twisted belt against your body could injure you. If a belt is twisted, make it straight (or ask your dealer to do that) so it can work properly.

Q: What's Wrong With This?



A: The belt is torn.

CAUTION:

Torn or frayed belts may not protect you in a crash. They can rip apart under impact forces. If a belt is torn or frayed, get a new one right away.

HOW TO WEAR SAFETY BELTS PROPERLY (Continued)

Safety Belt Reminder Light

When the key is turned to "Run" or "Start," a light will come on for eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a chime will also sound.

SAFETY BELT USE DURING PREGNANCY

Safety belts work for everyone - including pregnant women. Like all occupants, they are more likely to be seriously injured if they don't wear safety belts. A pregnant woman should wear a lap-shoulder belt if at all possible. The lap portion should be worn as low as possible throughout the pregnancy.



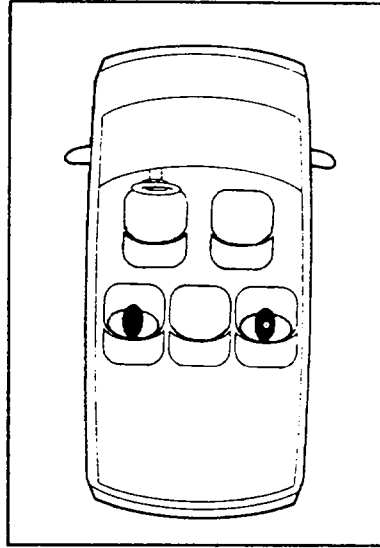
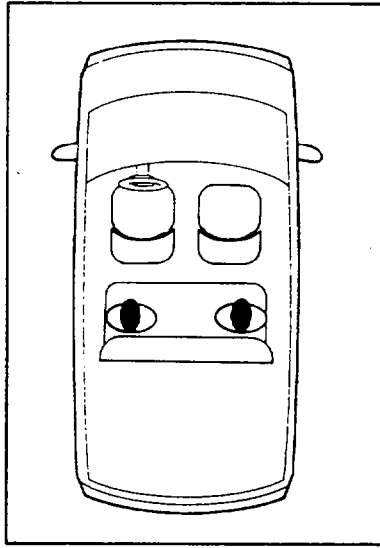
Remember, the best way to protect the fetus is to protect the mother. When a safety belt is worn properly, it's more likely that the fetus wouldn't be hurt in a crash. For pregnant women, as for anyone else, the key to making safety belts effective is wearing them properly.

SECOND SEAT

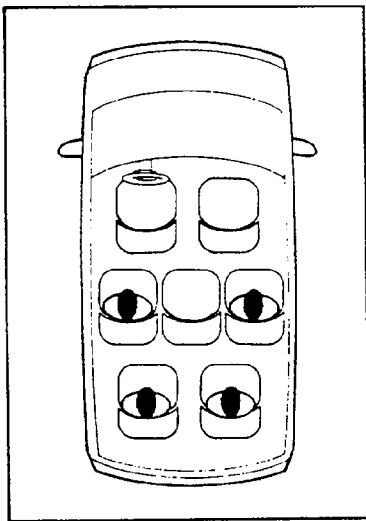
It's very important for rear seat occupants to buckle up too! Accident statistics show that unbelted people in the rear are hurt more often in crashes than those who are wearing safety belts.

- People who aren't belted can be thrown out of the vehicle in a crash.
- And, they can strike others in the vehicle who are belted.

Rear "Outside" Passengers' Positions



HOW TO WEAR SAFETY BELTS PROPERLY (Continued)



The positions next to windows have lap-shoulder belts.

To see how to wear them, see above under Lap-Shoulder Belt.

Center Position, Bench Seat



The center seat on the bench has a lap belt with no retractor. To make the belt longer, tilt the latch plate a little and pull it. If the belt is not long enough, see "Safety Belt Extender" later in this section.

To make it shorter, pull the belt like this. Wear this lap belt, and release it, just like the lap part of the driver's belt. (See above under "Driver's Position.") When you buckle up, make sure the buckle faces upward or outward so you could release it quickly if you ever had to.



"B" Bucket Seat



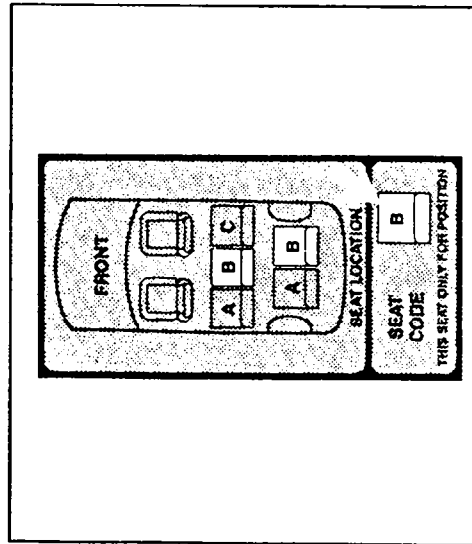
1. Grasp the latch plate and without stopping, pull the belt all the way across you and push the latch plate into the buckle until it "clicks." If the retractor locks before the belt reaches the buckle, let the belt fully retract then pull it out again. (Don't let the belt get twisted.) If the belt is not long enough, see "Safety Belt Extender" at the end of this safety belt section.

HOW TO WEAR SAFETY BELTS PROPERLY (Continued)



2. The lap belt should be positioned, worn, and released like the lap portion of the driver's safety belt.

Because it is the only bucket seat with a lap belt, and has a buckle on only one side, there are certain places a "B" type bucket seat should, and should not, be used. See the section on "Seats" earlier in this manual.



D-11

7776-20

40

CHILDREN



Everybody in a vehicle needs protection! That includes infants, and all children smaller than adult size. In fact, the law in every state and province says children up to some age have to be restrained.

CAUTION:

Children who are small enough should **ALWAYS** be restrained in an infant or child restraint. The instructions for that restraint will say whether a child is small enough for it. A very young child's hip bones are so small that a regular belt can't stay low on the hips, as it should. Instead, the belt will likely be over the small child's abdomen. That means that in a crash the belt would apply force right on the child's abdomen, which could cause serious or fatal injuries. So, be sure that children who are small enough for them are always properly restrained in an infant or child restraint.

41