

REPORT NO. 6525-V-3

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DOT 645

NEW CAR ASSESSMENT AND STANDARDS
ENFORCEMENT INDICANT TESTING
FMVSS NOS. 212, 219 AND 301-75

General Motors Corporation
1980 Chevrolet Citation 5-Door Hatchback
NHTSA 308-T3-432

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



June 12, 1979

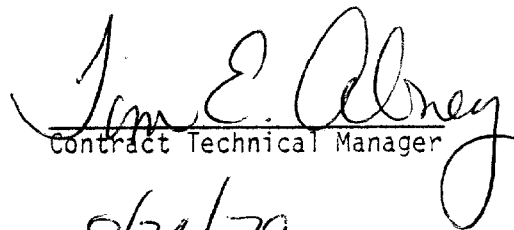
FINAL REPORT

Prepared For

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Enforcement
Office of Vehicle Safety Compliance
2100 Second Street, S. W., Transpoint Building
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FINAL REPORT ACCEPTED BY:


Contract Technical Manager

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16. Abstract A frontal barrier test of a 1980 Chevrolet Citation, 5-Door Hatchback, was performed at Calspan Corporation, Advanced Technology Center, Transportation Research Department facility for New Car Assessment and Standards Enforcement Indicant Testing for FMVSS 212 - Windshield Mounting; FMVSS 219 - Windshield Zone Intrusion; FMVSS 301 - Fuel Standard Integrity for the Office of Vehicle Safety Compliance and for the Office of Automotive Ratings and for Research and Development. The impact speed was 35.0 mph. The post-test vehicle crush was 21.3 inches. This vehicle complied in all respects with FMVSS 212 - Windshield Retention, FMVSS 219 - Windshield Zone Intrusion, and FMVSS 301 - Fuel Integrity. Both Driver (1) and Passenger (2) passed FMVSS 208 - Injury Criteria for Head, Chest and Femurs. The 6-year old right rear passenger exceeded FMVSS 208 - Injury Criteria for Head and Chest.					
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SECTION 1

PURPOSE AND TEST PROCEDURE

PURPOSE: The purpose of this test was to determine whether the subject vehicle (a 1980 Chevrolet Citation 5-door hatchback) meets the requirements of FMVSS Nos. 212, 219 and 301-75 at a higher test speed and also to obtain structural and dummy information for Research and Development and the Office of Automotive Ratings of the NHTSA. This test is part of the New Car Assessment Program B.O.A., Task 2, sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract DOT-HS-8-01938.

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

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

SECTION 2

SUMMARY OF RESULTS OF BARRIER TEST

Table 1

CRASH TEST SUMMARY

TEST NO. 308-T3-432 PROJECT: NEW CAR ASSESSMENT PROGRAM

DATE: 6-12-79 TIME: 1358 TEMP: 66°F

VEHICLE Chevrolet Citation 5-Door Hatchback

TEST WEIGHT (lbs) 3260

IMPACT ANGLE (deg)* 0

IMPACT VELOCITY (mph)** 35.0 *51,353 f.p.s.*

MAX. CRUSH (in) 21.4

MAX. INTRUSION (in) 8.1

DUMMIES

TYPE HYBRID II, PART 572 & 6-YEAR OLD

LOCATION LF(1), RF(2), CENTER REAR (6)

RESTRAINT PRODUCTION 3-POINT SYSTEM

NUMBER OF DATA CHANNELS 37

NUMBER OF HIGH SPEED CAMERAS 7 + 1 Real Time

*With respect to tow track Centerline

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

GENERAL COMMENTS

- (1) The test vehicle complied with the following requirements:
FMVSS 212 100% Windshield Retention
FMVSS 219 No Windshield Intrusion
FMVSS 301-75 No Fuel Leakage
- (2) Driver and Passenger passed FMVSS 208 Injury Criteria. The 6-year old (center rear position) failed to pass FMVSS 208 for Head and Chest.
- (3) Driver chest Y accelerometer sustained a zero shift of 20G after 155 milliseconds.
- (4) Both Driver and Passenger door opened after impact.
- (5) Barrier camera failed.

Table 2

VEHICLE TEST WEIGHTS AS TESTED

Left Front	930 lbs
Right Front	1000 lbs
Total Front	<u>1930 lbs</u>

Left Rear	660 lbs
Right Rear	670 lbs
Total Rear	<u>1330 lbs</u>

Total Weight = 1930 + 1330 = 3260 lbs

Wheel Base = 104.5 inches

$Cg_{F.W.} = \frac{1330 \text{ lbs} \cdot 104.5 \text{ inches}}{3260 \text{ lbs}} = 42.6 \text{ inches}$

CALCULATION FOR TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
 UDW = Unloaded Delivery Weight (2750 lbs)
 VCW = Vehicle Capacity Weight (895 lbs)
 DSC = Designated Seating Capacity (5)

$RCLW = VCW - 150 (DSC)$

$RCLW = 895 - 150(5)$

$RCLW = 145 \text{ lbs}$

TEST WEIGHT = UDW + RCLW + NO. of DUMMIES X 164 LBS

TEST WEIGHT = 2750 + 145 + 2 (164) + 48 child

TEST WEIGHT = 3271 LBS

Table 3
DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G") *											
	HEAD				CHEST *				PELVIS			
	X	Y	Z	R	X	Y	Z	R	X	Y	Z	R
DUMMY (1)	-67	11	55	79	-44	11	10	48				
DUMMY (2)	-24	-6.5	63	64	-34	-9	-10.5	34.5				
DUMMY (3)	-92	17	-80	105	-46	4	47	61				
DUMMY (4)												

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	760	560
DUMMY (2)	350	1040
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)	1540		
DUMMY (2)	1520		
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**				SEVERITY INDEX	
	HIC	t ₁ (SEC)	t ₂ (SEC)	AVE. ACC. (g) t ₁ TO t ₂	HEAD	CHEST
DUMMY (1)	845	.0705	.1005	60.2	1109	
DUMMY (2)	623	.0633	.1233	40.4	868	
DUMMY (3)	1450	.0798	.1227	64.8	1748	
DUMMY (4)						

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

FIGURE 1

PRE-TEST AND POST-TEST MEASUREMENT POINTS

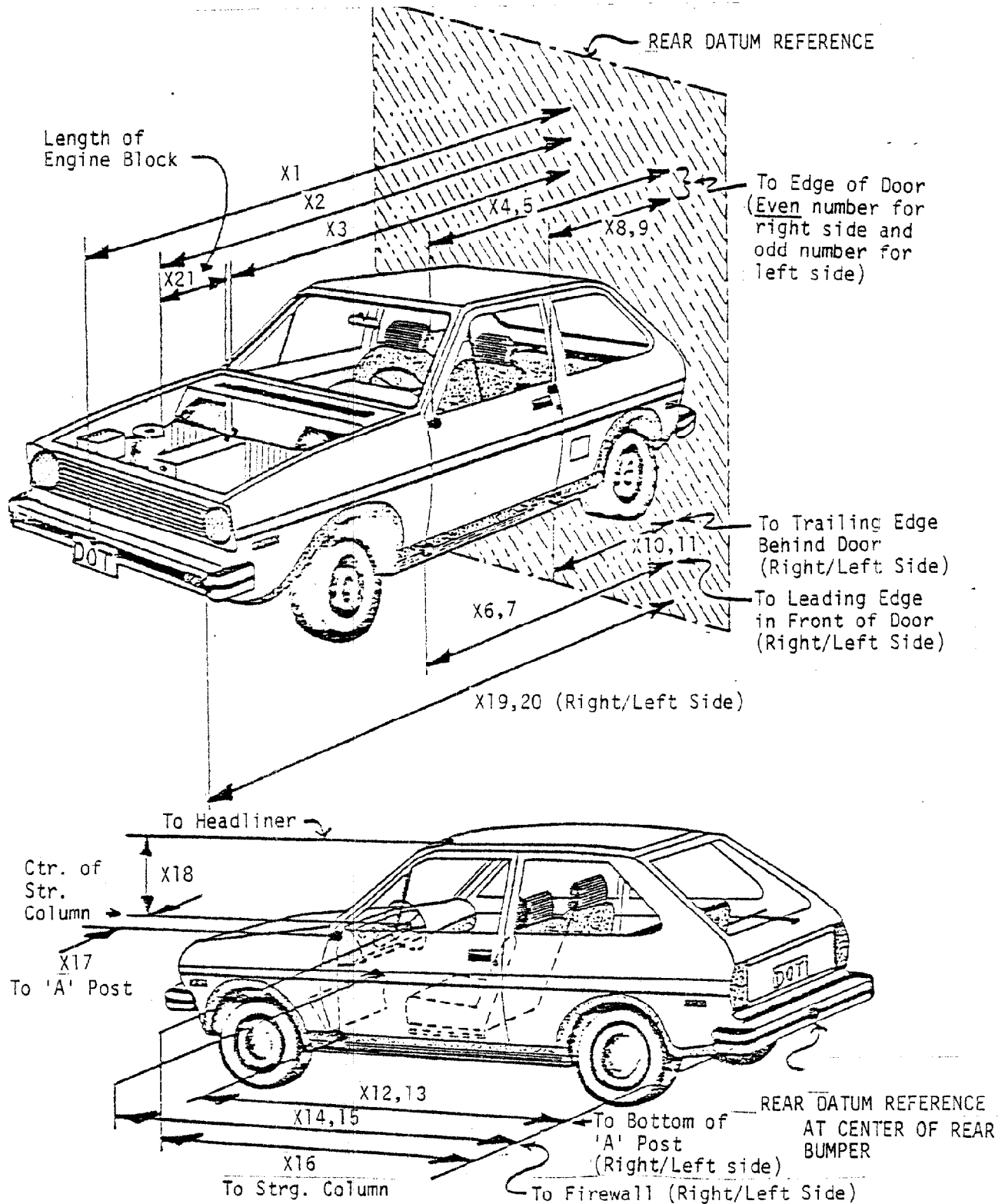


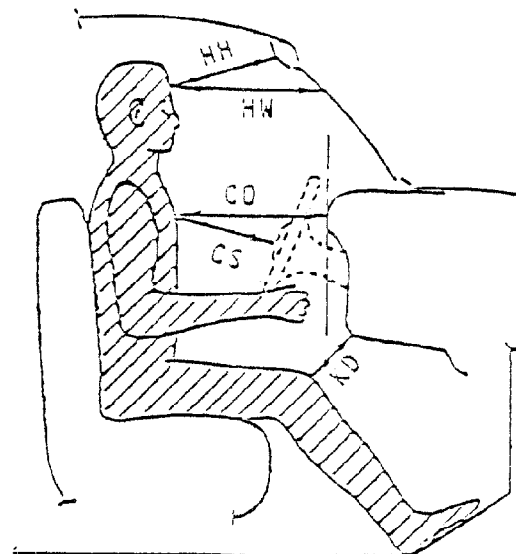
Table 4

NO.	TYPE OF MEASUREMENT	ALL DIMENSIONS IN INCHES	
		PRE-TEST	POST-TEST
X1	Total Length of Vehicle at Centerline	178.0	155.2
X2	Rear Surface of Vehicle to Front of Engine	160.2	147.5
X3	Rear Surface of Vehicle to Firewall	132.7	127.5
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	122.7	122.2
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	122.7	122.4
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	122.2	121.7
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	121.9	121.9
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	81.0	80.6
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	80.9	80.6
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	82.6	82.4
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	82.2	82.2
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	121.0	121.0
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	120.9	120.7
X14	Rear Surface of Vehicle to Firewall - Right Side	133.5	125.4
X15	Rear Surface of Vehicle to Firewall - Left Side	133.4	127.2
X16	Rear Surface of Vehicle to Steering Column	105.1	104.9
X17	Center of Steering Column to "A" Post	15.6	15.1
X18	Center of Steering Column to Headliner	15.9	15.5
X19	Rear Surface of Vehicle to Right Side of Front Bumper	175.7	154.4
X20	Rear Surface of Vehicle to Left Side of Front Bumper	175.9	154.5
X21	Length of Engine Block	18.1	17.5

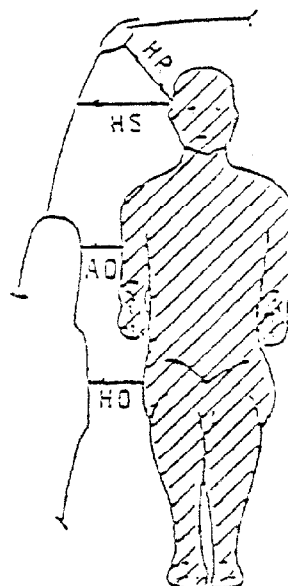
22.8

21.3

	<u>DRIVER</u>	<u>PASS</u>
HH	14	14.5
HW	18.9	18.7
CD	23.7	26.7
CS	15.2	--
KDL	5.7	8.2
KDR	6.5	8.6



HR	6.5	6.5
HS	8.2	8.5
AD	4.7	6.2
HD	7.2	8.9



NOTE: ALL DIMENSIONS IN INCHES

FIGURE 2 OCCUPANT CLEARANCE DIMENSIONS

FIGURE 3
CAMERA POSITIONS FOR FRONTAL/OBLIQUE IMPACTS

Note: Camera information shown in Table 5 on next page.

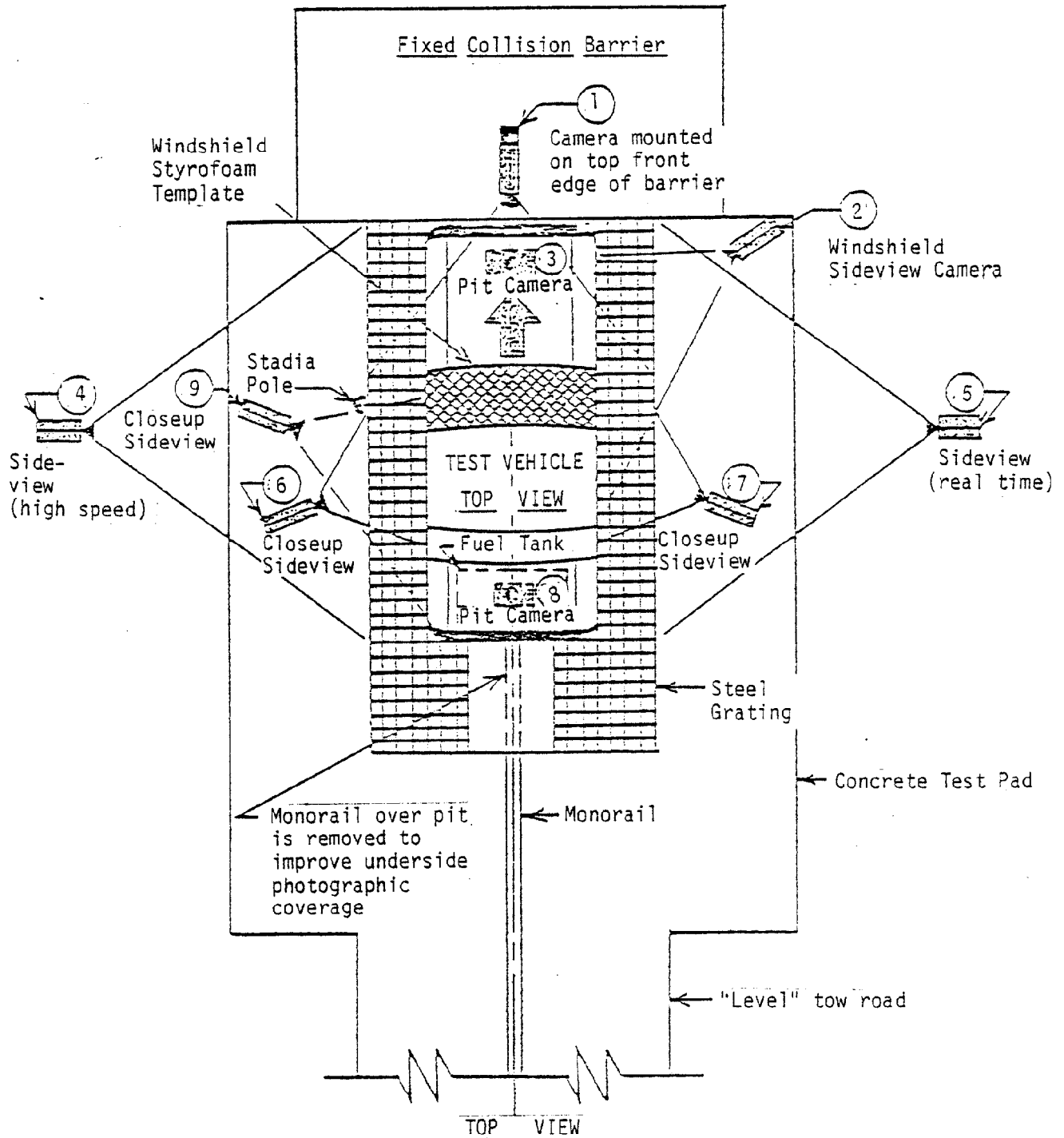


Table 5
HIGH SPEED CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)
1	BARRIER FACE	FAILED	--	--
2	SOUTH WINDSHIELD	PHOTOSONIC	13 MM	500
3	PIT FRONT	PHOTOSONIC	13 MM	600
4	NORTH WIDE	PHOTOSONIC	13 MM	NO PULSE
5	SOUTH WIDE	REAL TIME	--	24
6	NORTH DUMMY	FASTEX	50 MM	2200
7	SOUTH DUMMY	FASTEX	50 MM	NO PULUSE
8	PIT REAR	PHOTOSONIC	13 MM	600
9	NORTH REAR DUMMY	FASTEX	50 MM	2200

NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE OF FILM.

(24 fps) REAL TIME MOVIE FILM COVERAGE OF PRE-CRASH, POST-CRASH
AND CRASH EVENT SPLICED AT START AND END OF FILM.

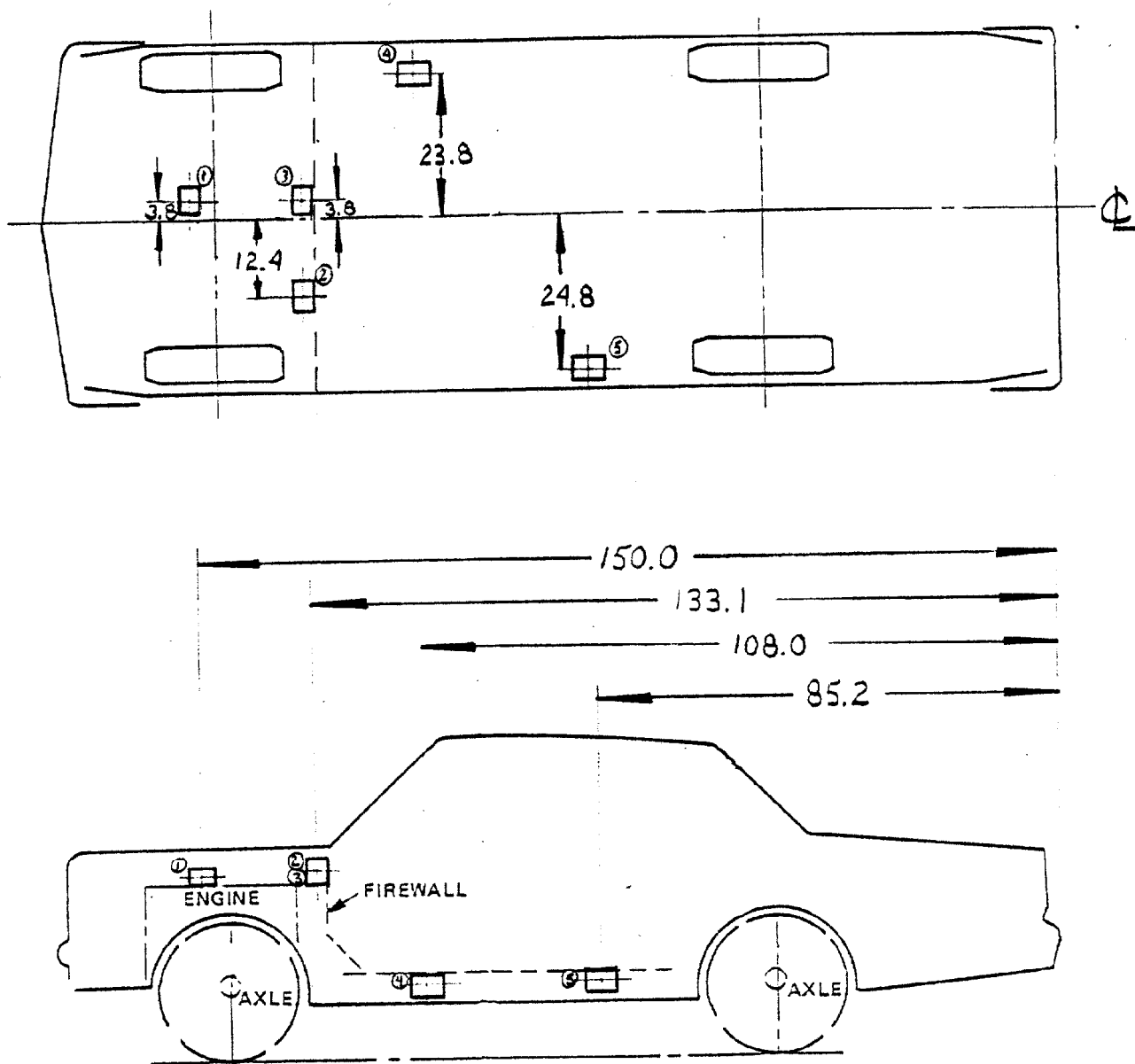


FIGURE 4 VEHICLE ACCELEROMETER LOCATIONS

SECTION 3

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

- Summary of Test Conditions
- Post Impact Data
- Windshield Zone Intrusion, FMVSS 219
- Protected Zone
- Summary of FMVSS Data
- Fuel System Integrity Post-Impact

Table 6

SUMMARY OF TEST CONDITIONSTEST VEHICLE INFORMATION:

Vehicle Manufacturer: GENERAL MOTORS
 Make/Model: CITATION 1XX68
 Body Style: 5-Door Hatchback; Model Year: 1980
 VIN: 1X687AT117457; Build Date: April 1979
 NETSA No.: 308-T3-432; Color: CINNAMON
 Engine Data: 6 cylinders; 2.8 LTR in³/cc displacement
 Transmission Data: 3 speed () Manual/ (X) Automatic
 Date Vehicle Received by Laboratory: 6-4-79
 Dealer's Name & Address: J. K. J. CHEVROLET VIENNA VA.

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

Vehicle Manufactured By: GENERAL MOTORS
 Date of Manufacture: April 1979; VIN: 1X687AT117457
 GVWR: 3711 lbs.; GAWR: Front = 2035 lbs.; Rear = 1676 lbs

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

Vehicle Load:	FRONT	REAR	RECOMMENDED TIRE SIZE:	LOAD RANGE:
Up to Capacity	<u>26</u> psi	<u>26</u> psi	P185/80R13	B <u>C</u> D

Vehicle Capacity:

Type of Seats -	☐ Bench	Number of Occupants =	<u>2</u> Front
	☒ Bucket	(Designated Seating	<u>3</u> Rear
	☐ Split Bench	Capacity)	<u>5</u> Total

CARGO LOAD = 145 lbs.
 TOTAL = 0895 lbs.

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with max. fluids):

Right Front = 880 lbs. Right Rear = 510 lbs.
 Left Front = 890 lbs. Left Rear = 470 lbs.
 TOTAL FRONT WEIGHT = 1770 lbs. (64.3 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 980 lbs. (35.6 % of Total Vehicle Weight)
 TOTAL DELV. WEIGHT = 2750 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 34 lbs. CARGO:

Right Front = 1000 lbs. Right Rear = 670 lbs.
 Left Front = 930 lbs. Left Rear = 660 lbs.
 TOTAL FRONT WEIGHT = 1930 lbs. (59.2 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1330 lbs. (40.8 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 3260 lbs.

Weight of ballast secured in vehicle trunk area = 000 lbs.

TEST CONDITIONS:

Date of Test: 6-12-79; Time of Test: 1358 am/pm
 Ambient Temperature: 66 °F at impact area.
 Temp. In Occ. Compart.: 66 °F.; W/Shld. Mldg. Temp.: 69 °F.

Table 6 - continued

VEHICLE ATTITUDE: (all dimensions in inches)

Delivered Attitude: RF26-1/2; LF26-3/8; RR26-5/8; LR 26-3/4

Test Attitude: RF25-3/8; LF25-3/8; RR24-5/8; LR 24-3/4

VEHICLE TIRE DATA:

Recommended Cold Tire Pressure: Front = 26 psi

Rear = 26 psi

Recommended Tire Size: P185/80R13

Load Range: C

Tires on Vehicle: FIRESTONE P185/80R13

Is Spare Tire a "Space Saver": YES (yes/no)

Is Spare Tire standard equipment: YES (yes/no)

TEST FLUID DATA:

Test Fluid Type: Red Stoddard Solvent; Spec. Grav.: 0.764

Kinematic Viscosity: 0.96 CENTISTOKES

Spill Point Volume: 14.15 Gallons (SPV)

Test Volume: 12.78 Gallons (90 to 91% of SPV)

Fuel System Capacity (data from Owner's Manual): 14 gal.

Details of fuel system: _____

Electric Fuel Pump: Yes; X No; Fuel Injection: Yes; X No

Does electric fuel pump operate with ignition switch "on" and
the engine not operating: Yes; No

VEHICLE REBOUND AND CRUSH:

Overall Length of Test Vehicle: Pre-Test = 2175.7/L175.9 inches

CRUSH=R 21.3 /L 21.4 Post-Test= R154.4/L154.5 inches

FOR FRONTAL IMPACTS, distance from front of test vehicle to
the barrier after impact = 14.95 inches

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

Table 7

POST IMPACT DATA - STDS. 219 & 301

DATA SHEET

- TYPE OF TEST: ☒ Frontal (90°) Impact
☐ Oblique (___°) Impact on ☐ Left (Driver's) Side
☐ Right Side
☐ Lateral or Side Impact on ☐ Left (Driver's) Side ☐
☐ Right Side
☐ Rear Impact

● DATE OF TEST: 6-12-79 ; TIME: 1410 ; TEMP.: 66 °F.

● VEH. NHTSA NO.: 301-T3-432 ; VIN: 1X687AT117457

● REQUIRED VEH. VELOCITY RANGE: 34.5 to 35.5 mph

● IMPACT VELOCITY: (traps within 5 feet of impact event) _____

Trap #1 = 35.1 mph; Trap #2 = 35.0 mph

Distance from the vehicle's front bumper to the barrier face
 entering the vehicle velocity measurement device = 64 inches
 exiting the vehicle velocity measurement device = 24 inches

● VEH. STATIC CRUSH: (for Frontal and Rear Impacts Only)

Driver's Side = 21.4 in.; Passenger's Side = 21.3 in.

Average = 21.35 inches

Crush Details:

● VEH. STATIC CRUSH: (for Side Impacts Only)

Amount of Crush = _____ inches on _____ side

Crush Details:

● VEH. REBOUND: (from rigid barrier only)

Driver's Side = 14.5 inches; Pass. Side = 15.4 inches

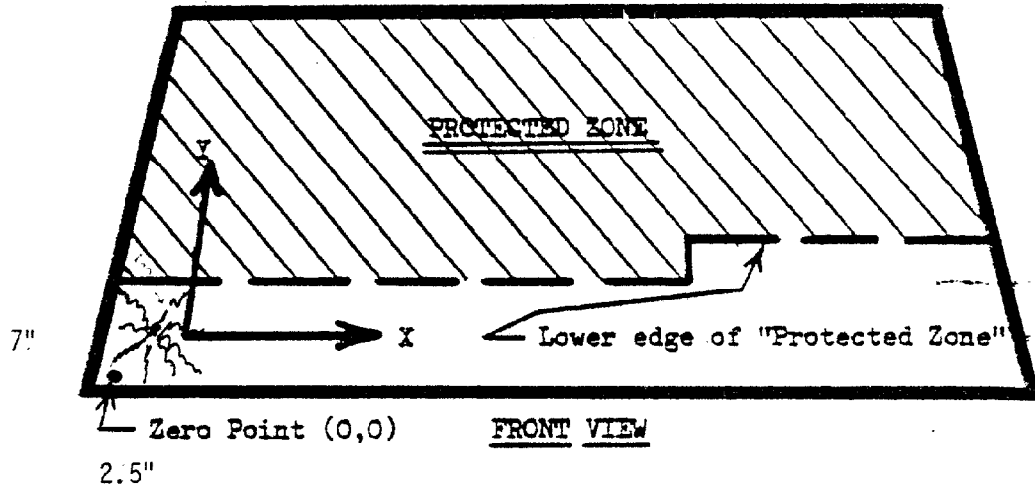
Average = 14.95 inches

● REMARKS:

FIGURE 5

WINDSHIELD ZONE INTRUSION, FMVSS 219

DATA SHEET



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

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

Coordinates

NONE

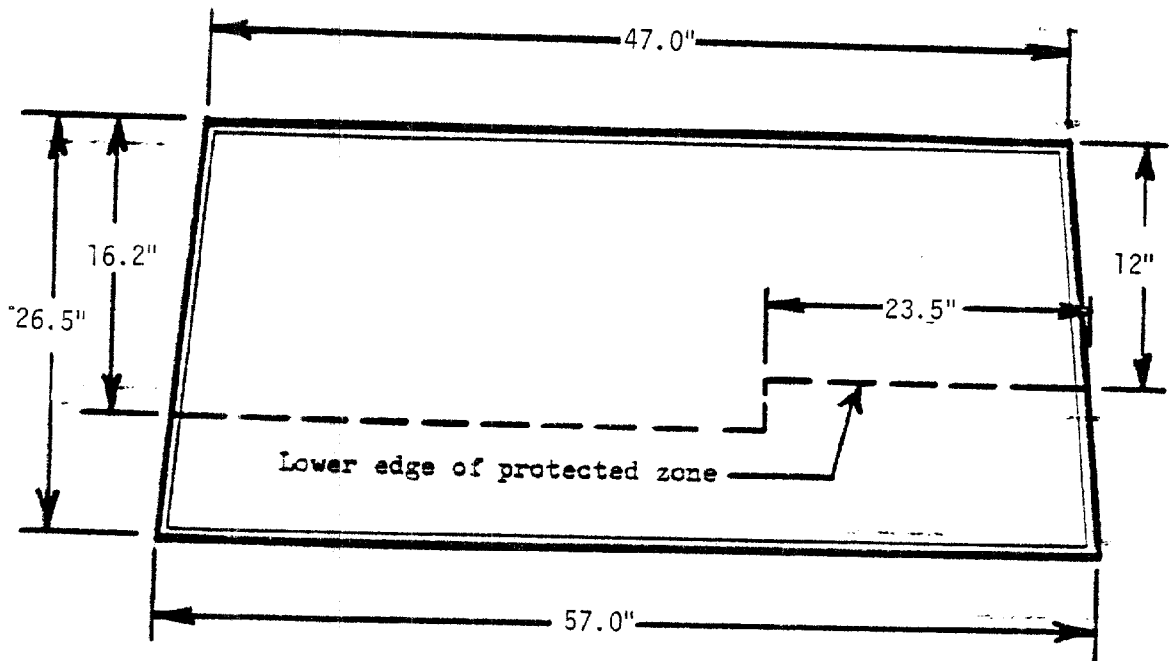
X	Y

- Ⓑ The area beneath the "Protected Zone" that the inner surface of the windshield was penetrated by a vehicle component.

Coordinates

X	Y
2.5"	7"

FIGURE 6 PROTECTED ZONE



FRONT VIEW OF WINDSHIELD

Provide all dimensions necessary to reproduce the protected zone.

Method of adhering styrofoam to the windshield:

Construction adhesive applied to window surface and to
back side of styrofoam, then clamped in place until dry.

FIGURE 7

SUMMARY OF FMVSS 212 DATA

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

The windshield is bonded in place and has chrome trim piece around the perimeter of the window.

	WINDSHIELD PERIPHERY		
	PRETEST	POST TEST	
RIGHT SIDE	78.5	78.5	
LEFT SIDE	78.5	78.5	100%
TOTAL	157.0	157.0	

The standard requires that POST TEST be a minimum of 75 percent of the PRETEST total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

AREA OF RETENTION FAILURE:

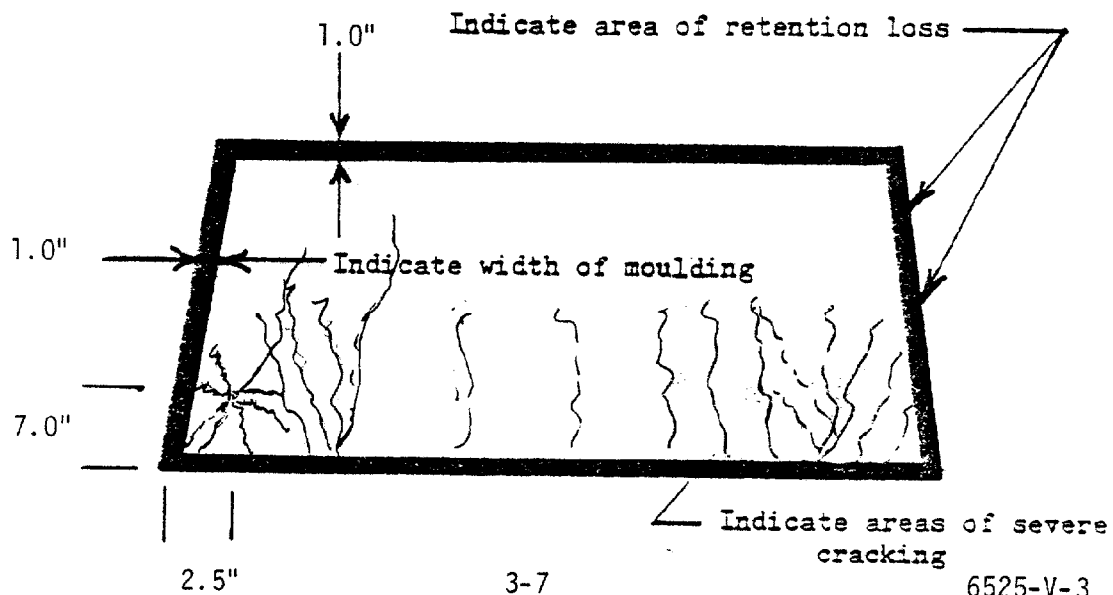


Table 8

"FUEL SYSTEM INTEGRITY" POST-IMPACT
TEST DATA, FMVSS No. 301-75

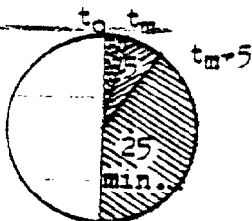
TEST VEHICLE NHTSA NO.: 3 0 8 T 3 4 3 2; TEST DATE: 6-12-79

VEH. MFR./MAKE/MODEL: 1980 CHEVROLET CITATION

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

- A. TEST VEHICLE IMPACT TYPE:**
- ☒ Frontal (30 mph)
- ☐ Oblique (30 mph) with ° barrier face first contacting (driver/passenger) side.
- ☐ Rear Moving Barrier (30 mph)
- ☐ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT - - -



$(t_m + 5) + 25$

1. From impact until vehicle motion ceases - - - - -
2. For 5 minute period after veh. motion ceases - - -
3. For next 25 minutes - - -

ACTUAL	MAX. ALLOW.
0	1 oz.
0	5 oz.
0	1 oz./1 min.

B. TEST VEHICLE STATIC ROLLOVER:

TEST INFORMATION WILL BE ADDED TO THE FOLLOWING STATIC ROLLOVER DATA SHEETS:

- (1) FIGURE 10A - Rollover data for 0° to 90° test phase.
- (2) FIGURE 10B - Rollover data for 90° to 180° test phase.
- (3) FIGURE 10C - Rollover data for 180° to 270° test phase.
- (4) FIGURE 10D - Rollover data for 270° to 360° test phase.

C. SOLVENT SPILLAGE DETAILS:

NONE

Table 8A

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

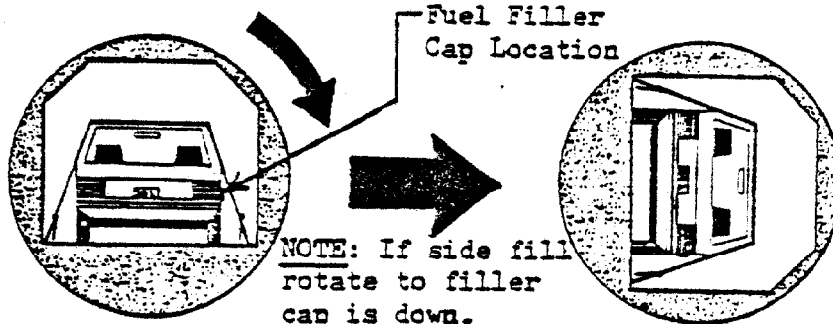
3 0

8	T	3	4	3	2
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TEST PHASE:

0°

90°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time - - = 2 minutes, 50 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301-75 Position Hold Time - - - = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 50 seconds

Next Whole Minute Interval - - - - - = 8 minutes

II. FMVSS 301-75 REQUIREMENTS:

(1) Time Period--

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

(2) Maximum Allowable Solvent Spillage--

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

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

IV. SOLVENT SPILLAGE LOCATION(S):

Table 8B

VEH. NHTSA ID NO.:

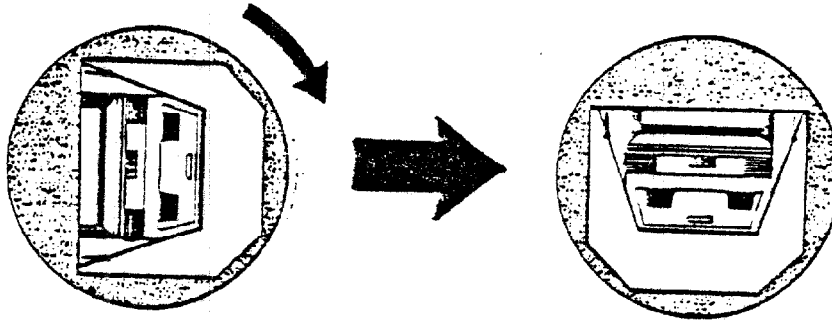
3 0

8	T	3	4	3	2
---	---	---	---	---	---

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEETTEST PHASE:

90°

180°

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:
 Rollover Fixture 90° Rotation Time - - = 2 minutes, 58 seconds
 (Spec. Range = 1 to 3 minutes)

 FMVSS 301-75 Position Hold Time - - - = 5 minutes, 00 seconds

 TOTAL - - - - - = 7 minutes, 58 seconds

 Next Whole Minute Interval - - - - - = 8 minutes
II. FMVSS 301-75 REQUIREMENTS:

(1) Time Period--

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

(2) Maximum Allowable Solvent Spillage--

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

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

IV. SOLVENT SPILLAGE LOCATION(S):

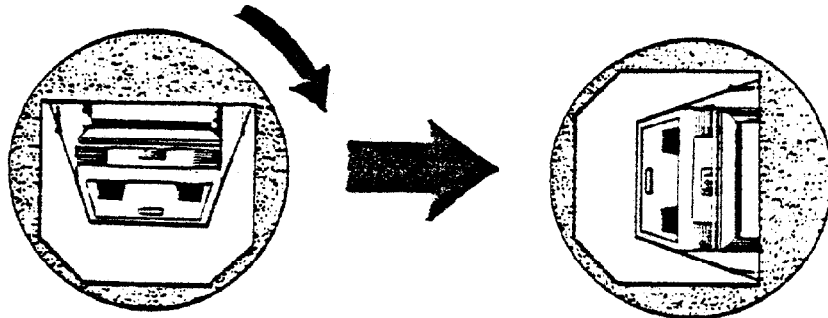
FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

3 0 8 T 3 4 3 2

TEST PHASE:

180°

270°

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90° Rotation Time - - = 2 minutes, 55 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301-75 Position Hold Time - - - = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 55 seconds

Next Whole Minute Interval - - - - - = 8 minutes

II. FMVSS 301-75 REQUIREMENTS:

(1) Time Period--

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

(2) Maximum Allowable Solvent Spillage--

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

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

IV. SOLVENT SPILLAGE LOCATION(S):

Table 8D

VEH. NHTSA ID NO.:

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

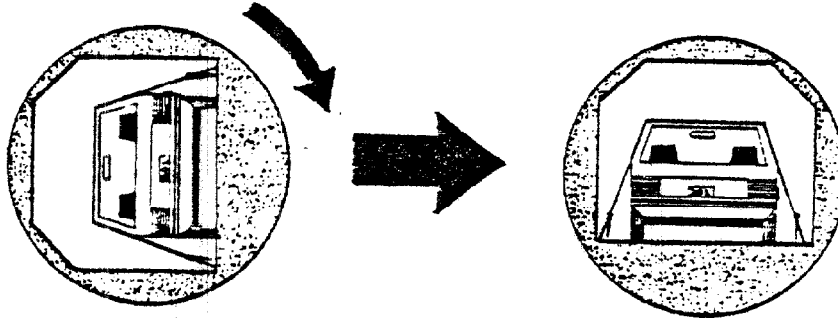
3 0

8	T	3	4	3	2
---	---	---	---	---	---

TEST PHASE:

270°

360°

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:
 Rollover Fixture 90° Rotation Time - - = 2 minutes, 58 seconds
 (Spec. Range = 1 to 3 minutes)

 FMVSS 301-75 Position Hold Time - - - = 5 minutes, 00 seconds

 TOTAL - - - - - = 7 minutes, 58 seconds

 Next Whole Minute Interval - - - - - = 8 minutes
II. FMVSS 301-75 REQUIREMENTS:

(1) Time Period--

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

(2) Maximum Allowable Solvent Spillage--

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

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

IV. SOLVENT SPILLAGE LOCATION(S):

APPENDIX A
STILL PHOTOGRAPHS



FIGURE 1A FULL FRONT, SIDE, REAR AND THREE-QUARTER EXTERIOR VIEW

A-2

6525-V-3



FIGURE 2A PRE- AND POST-TEST VIEWS OF WINDSHIELD STYROFOAM TEMPLATE



FIGURE 3A POST-TEST VIEWS OF SIDE AND THREE-QUARTER EXTERIOR



FIGURE 4A PRE- AND POST-TEST VIEW OF 6-YEAR OLD REAR SEAT OCCUPANT



FIGURE 5A ENGINE BLOCK ACCELEROMETER

VELOCITY TRAP COUNTER DISPLAY



FIGURE 6A PRE- AND POST-TEST VIEW OF DRIVER (1) AND PASSENGER (2) POSITIONS

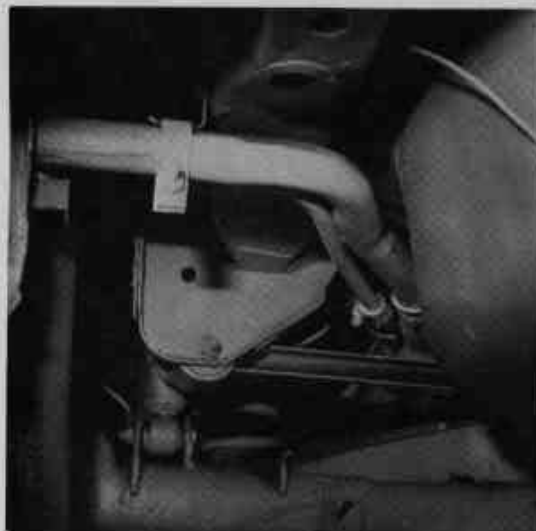


FIGURE 7A FUEL/VAPOR LINES AND FILLER PIPE

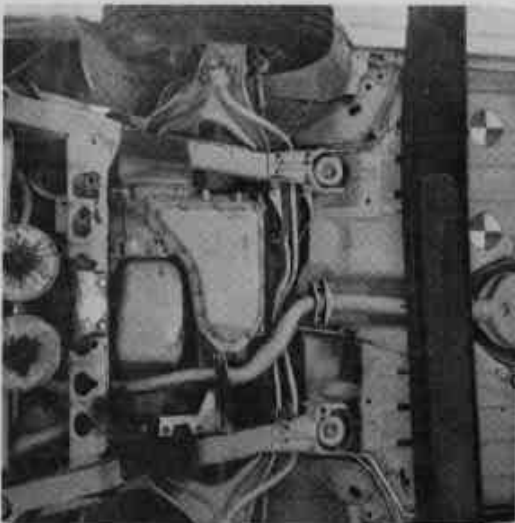
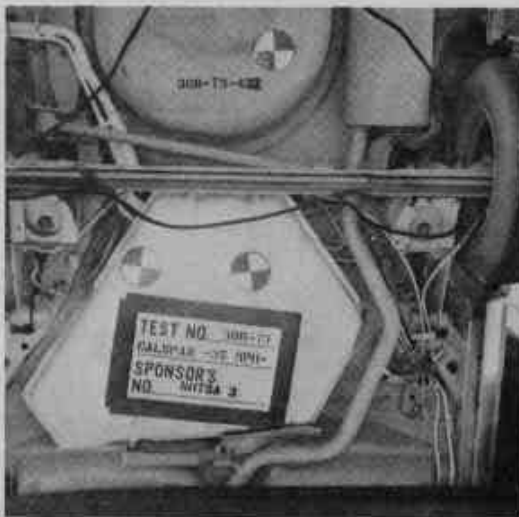


FIGURE 8A PRE- AND POST-TEST VIEW OF UNDERBODY

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA

TEST NO. 308-T3-432

1980 CHEVROLET CITATION

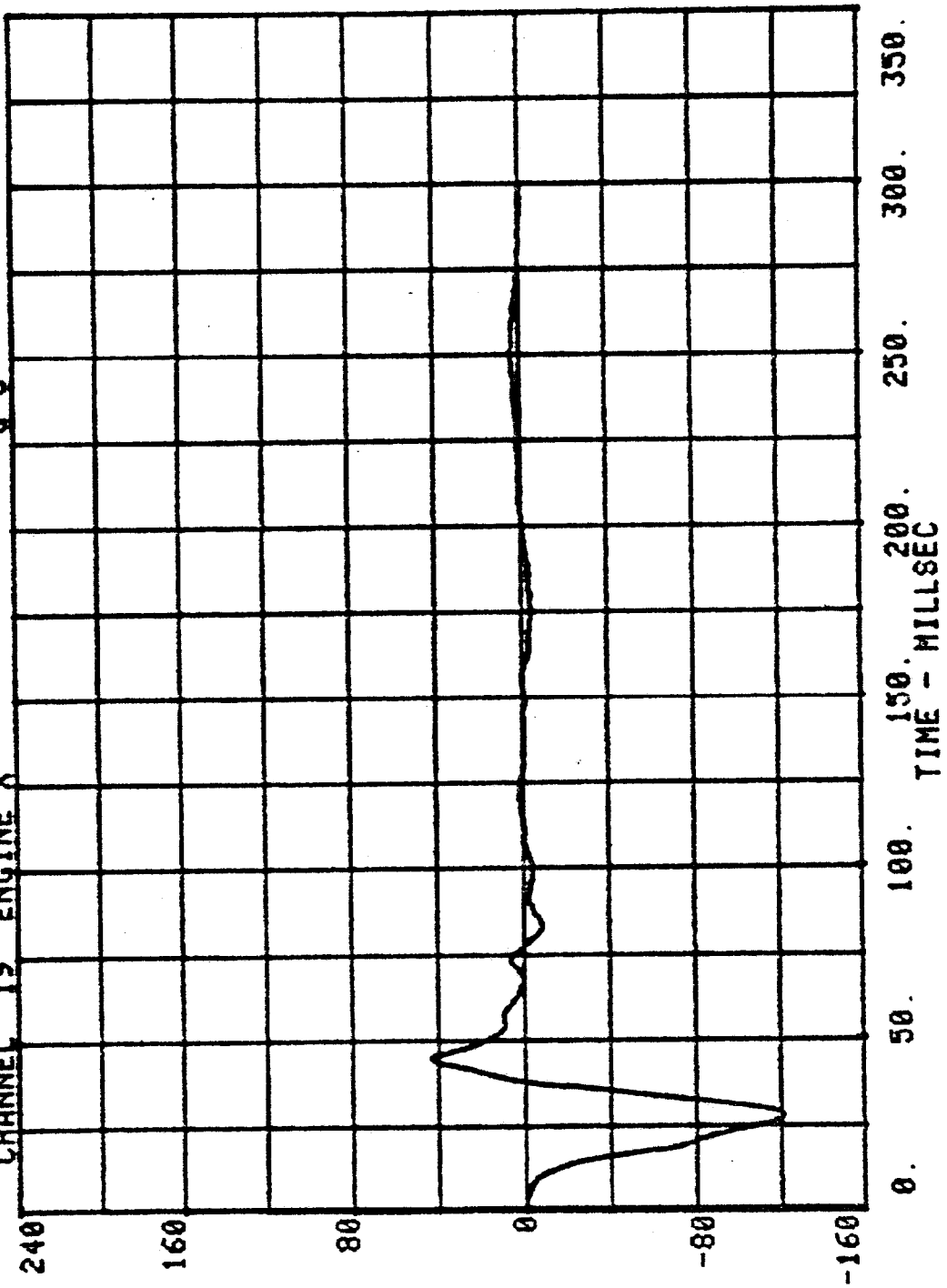
VEHICLE DATA

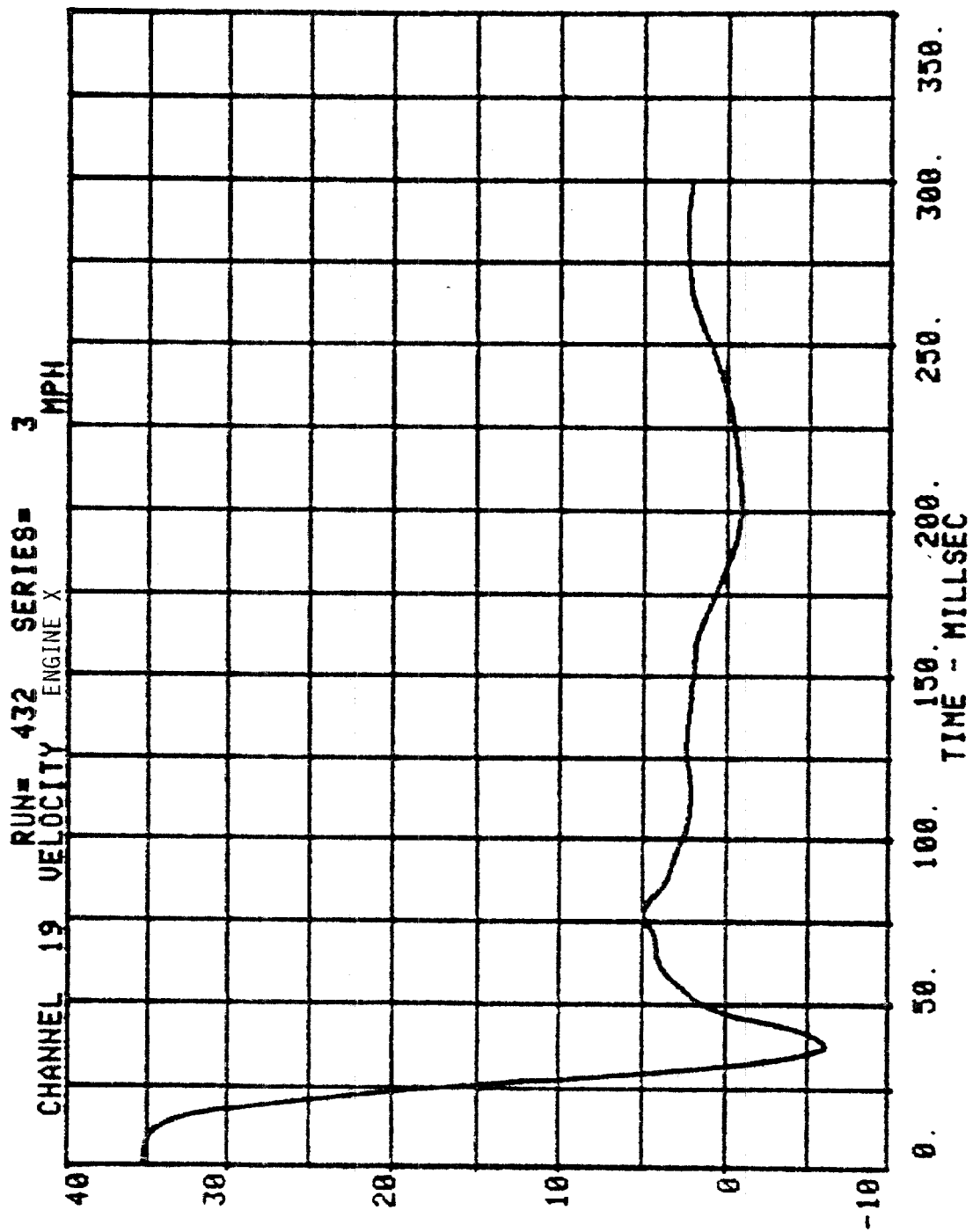
FILTER CHANNEL CLASS

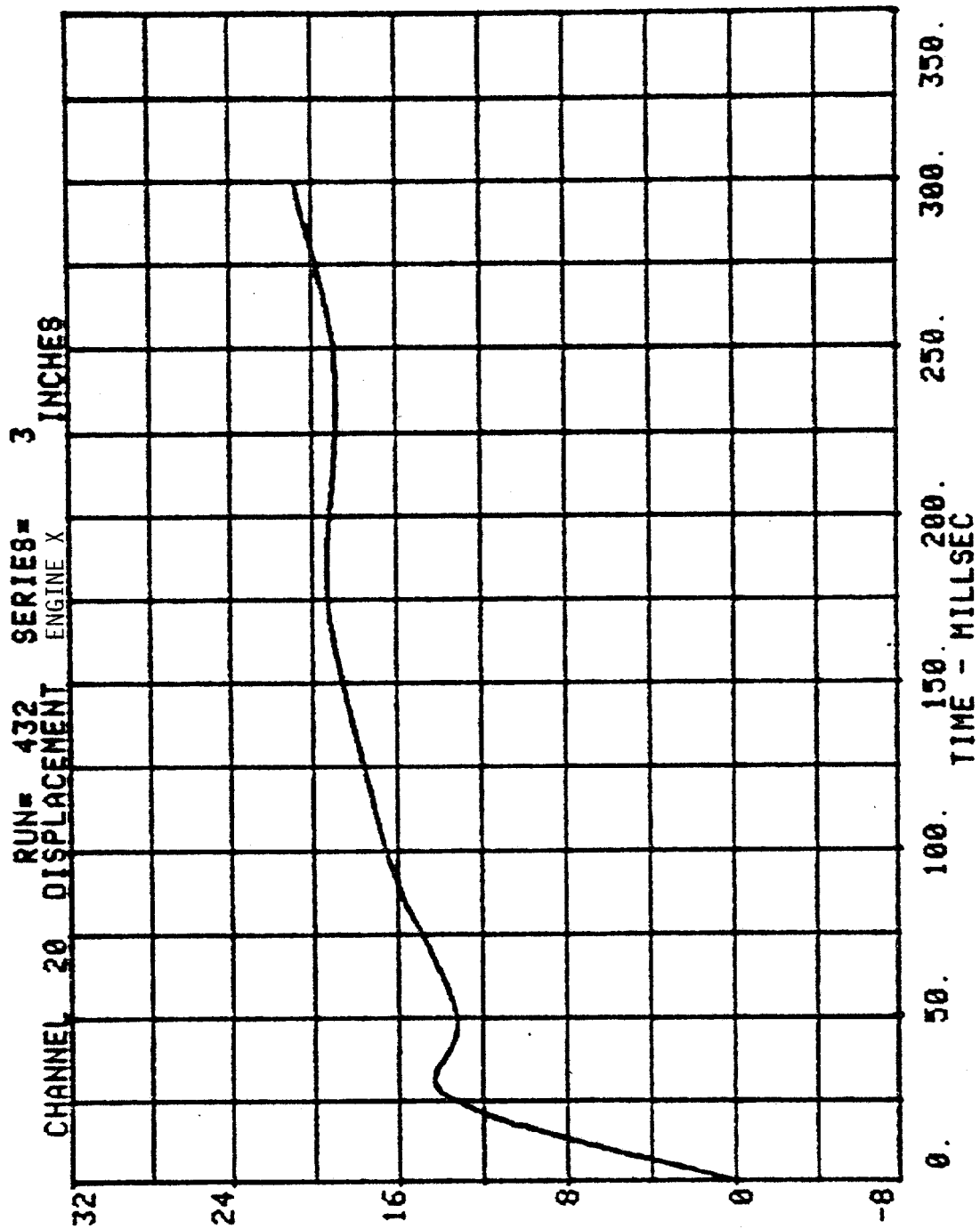
VEHICLE DATA

. 60

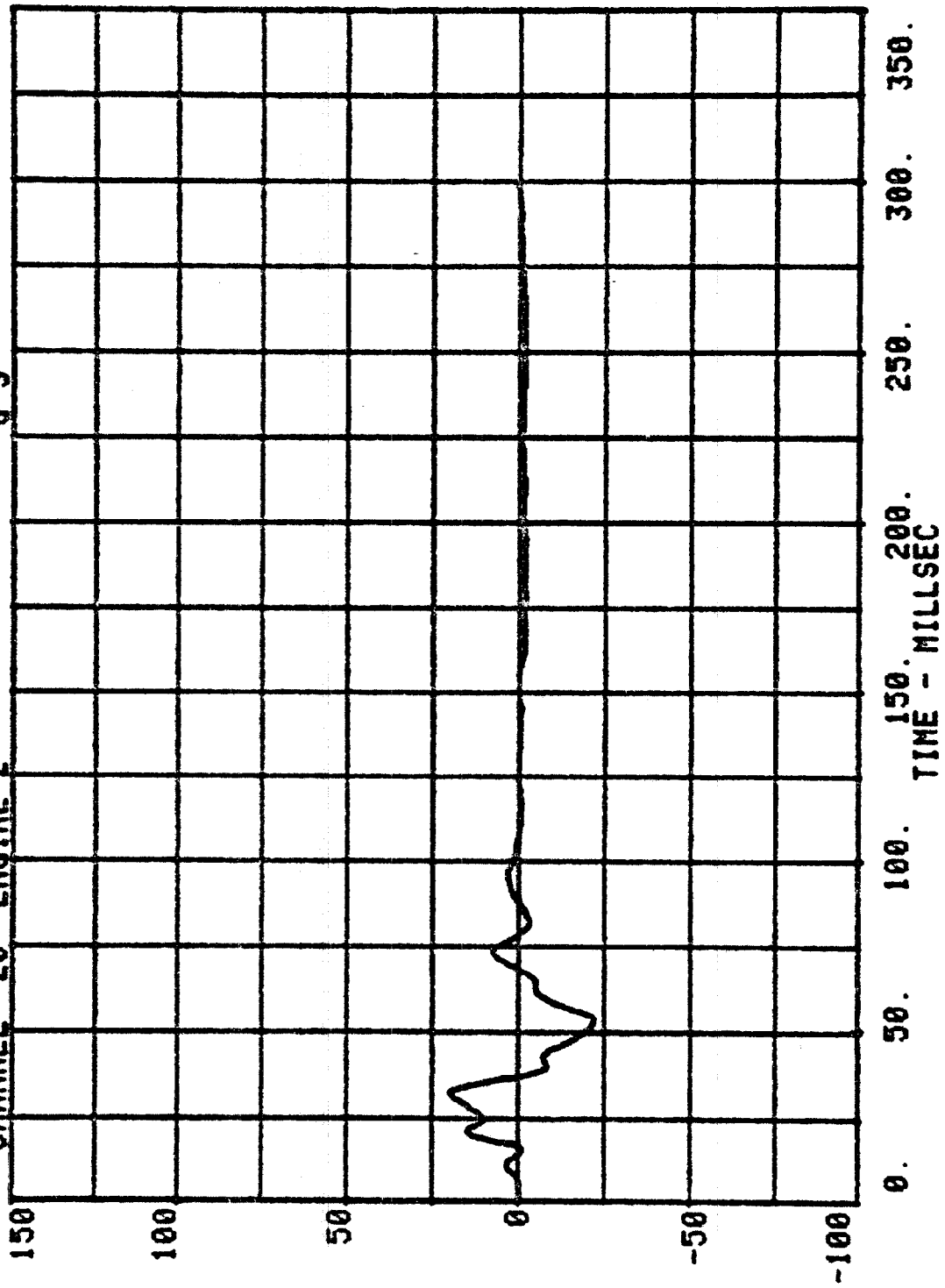
CHANNEL 19 ENGINE X RUN= 432 SERIES= 3 G'S



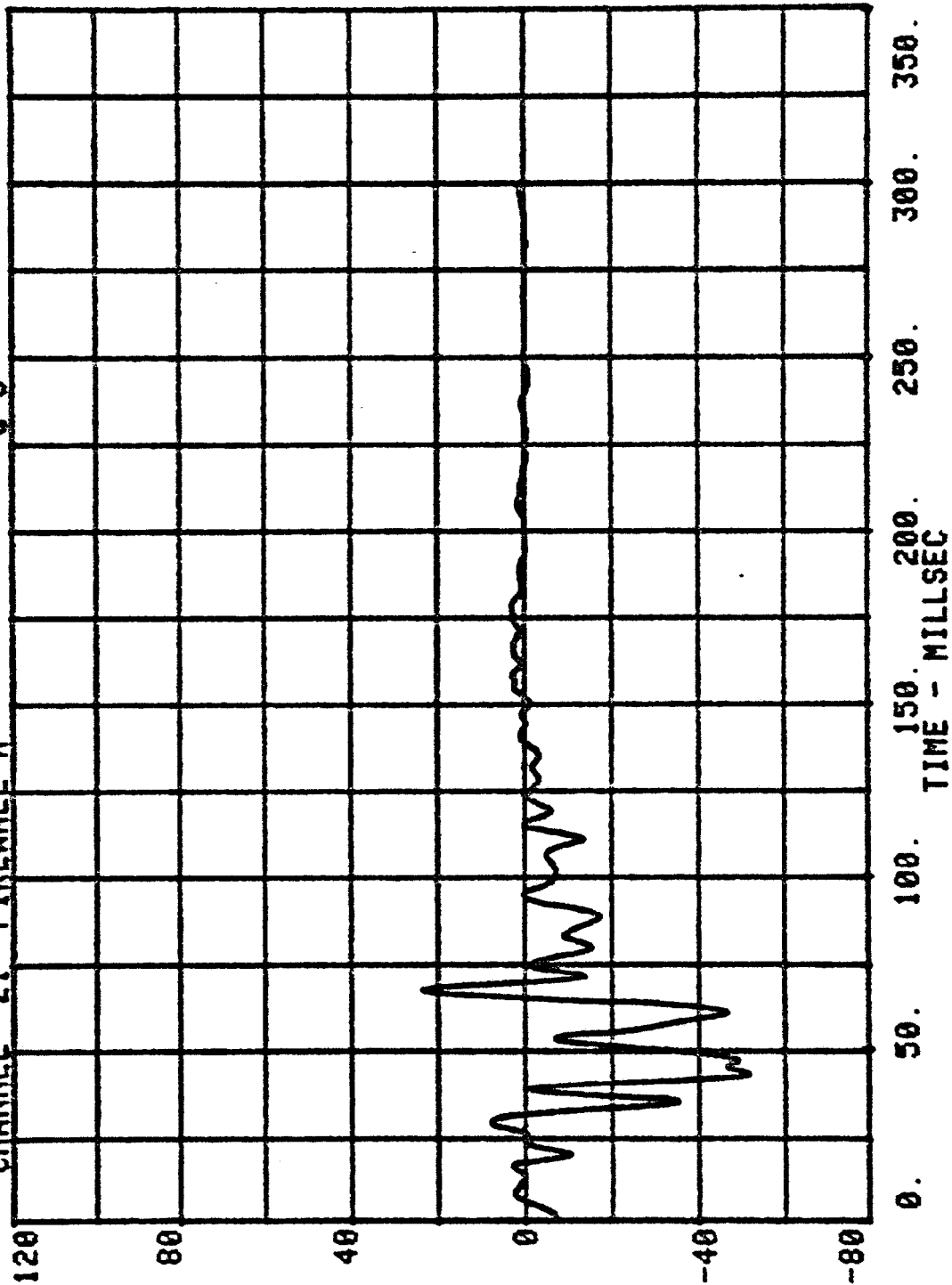


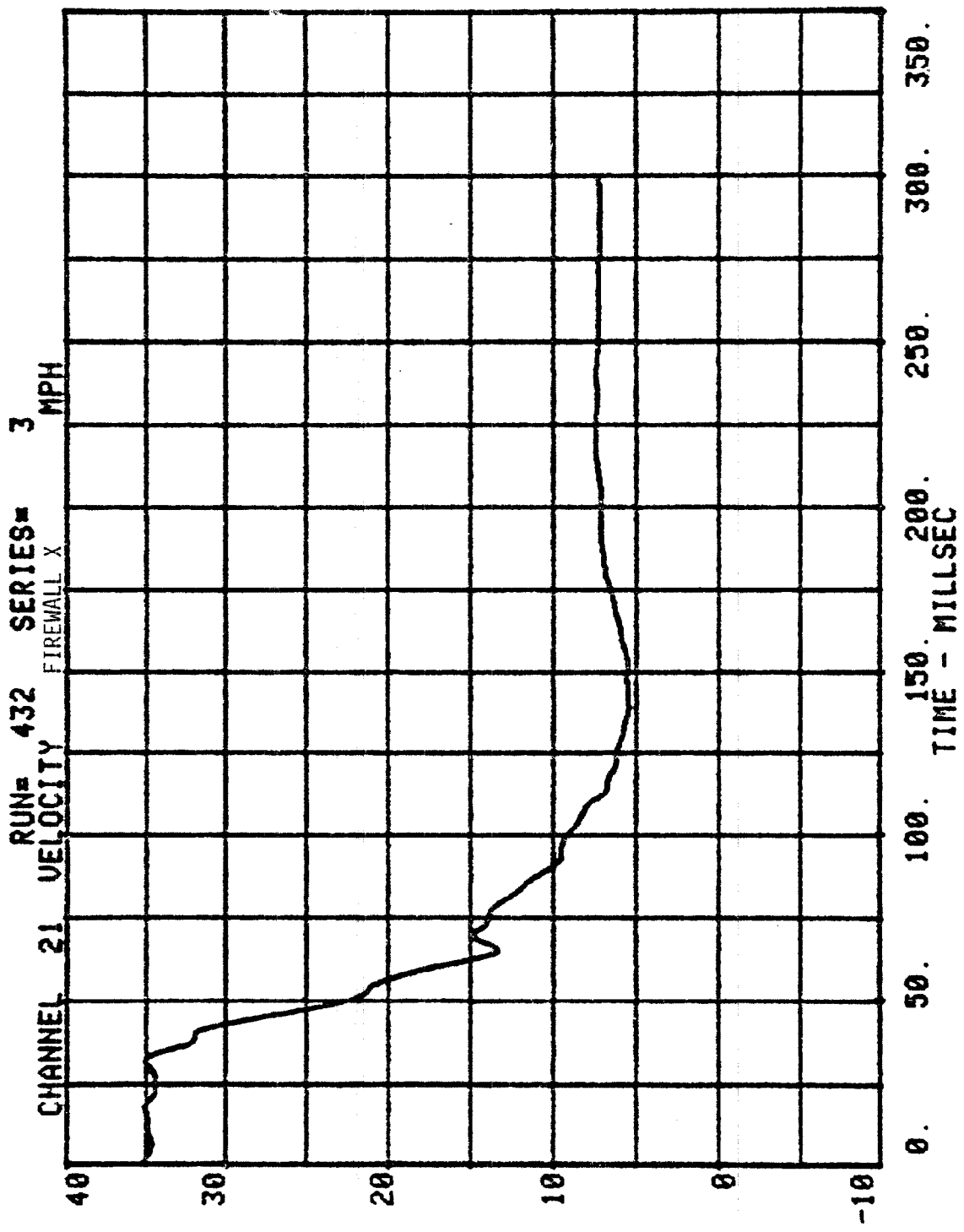


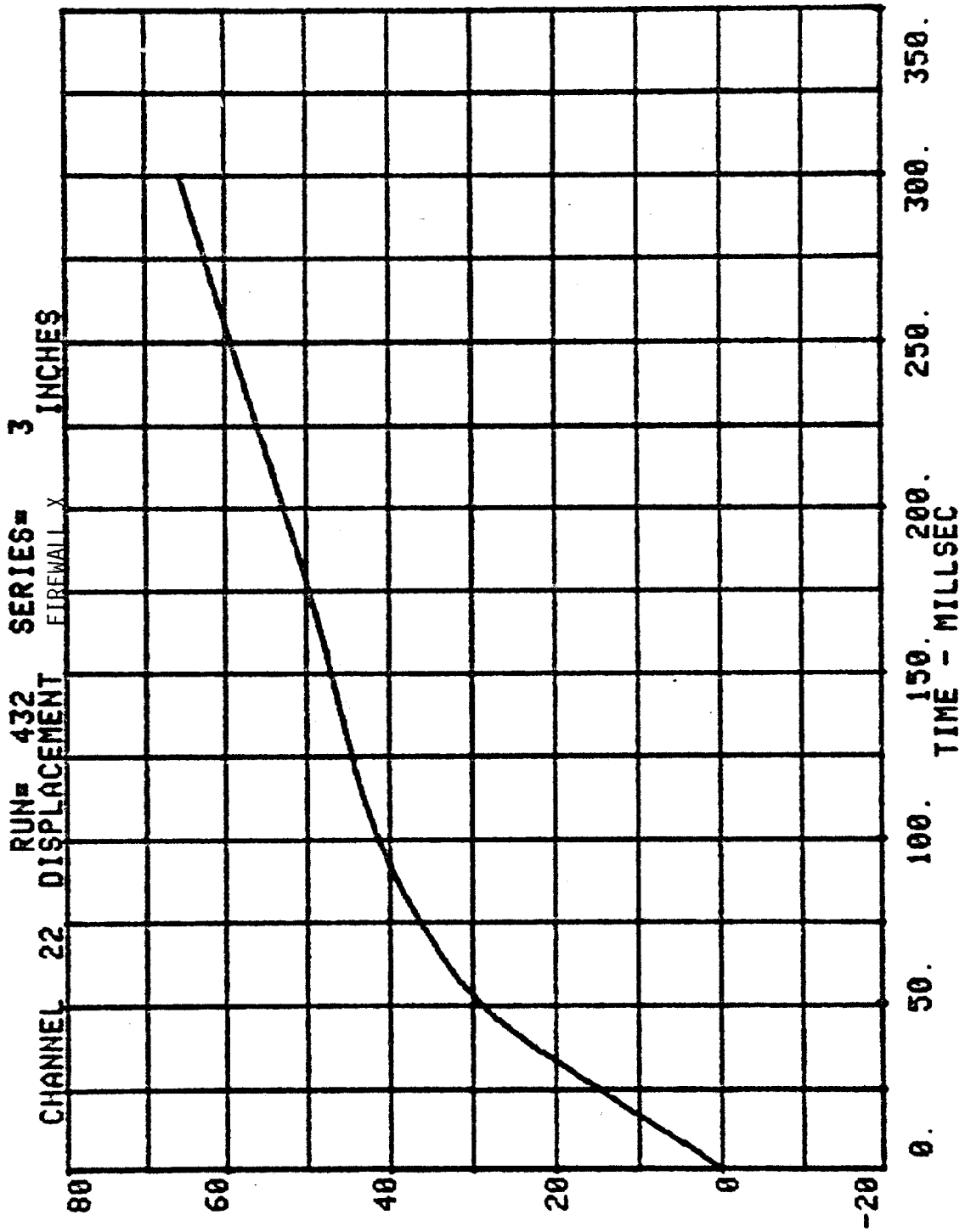
CHANNEL 20 ENGINE 2 RUN# 432 SERIES# 3 G'S

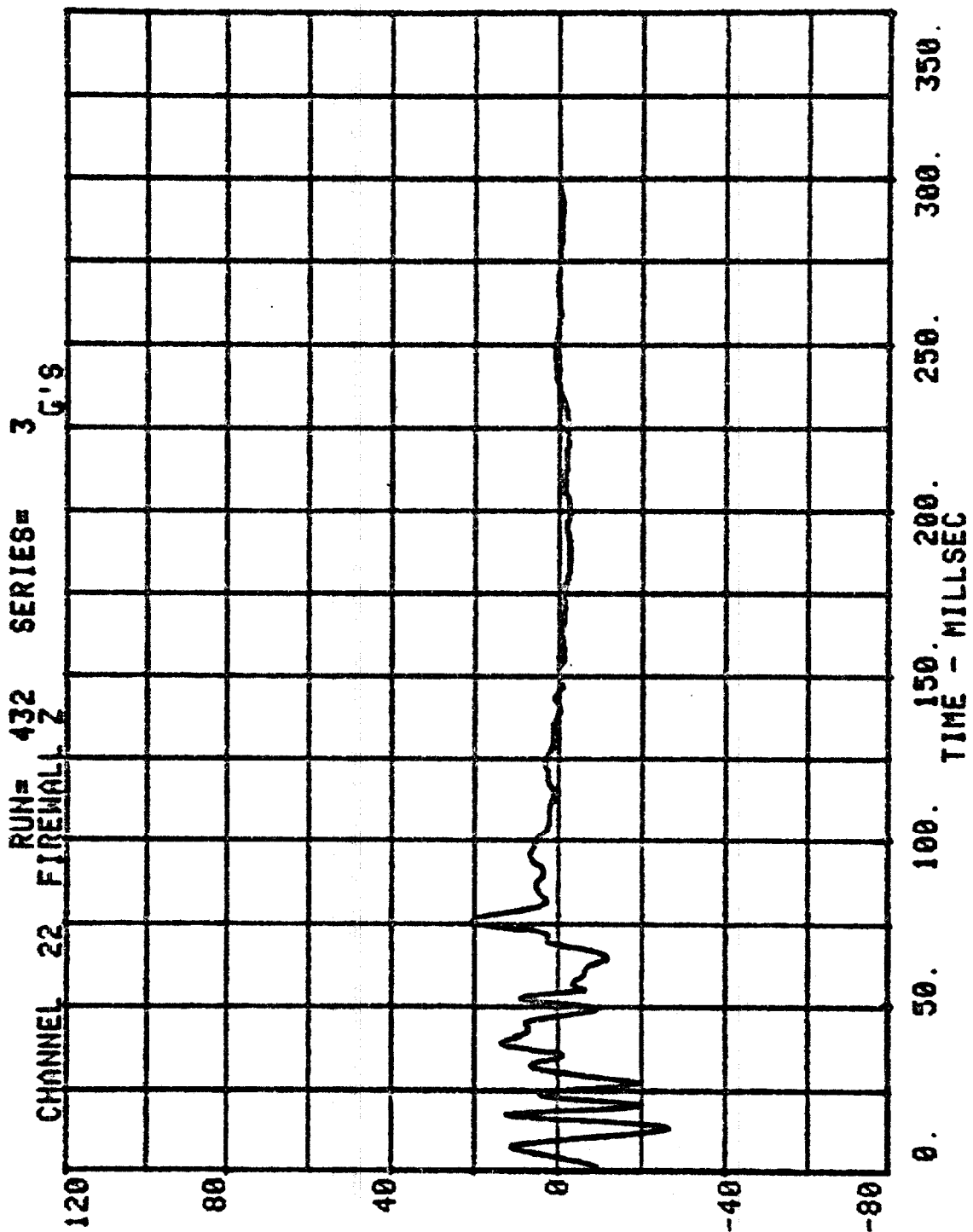


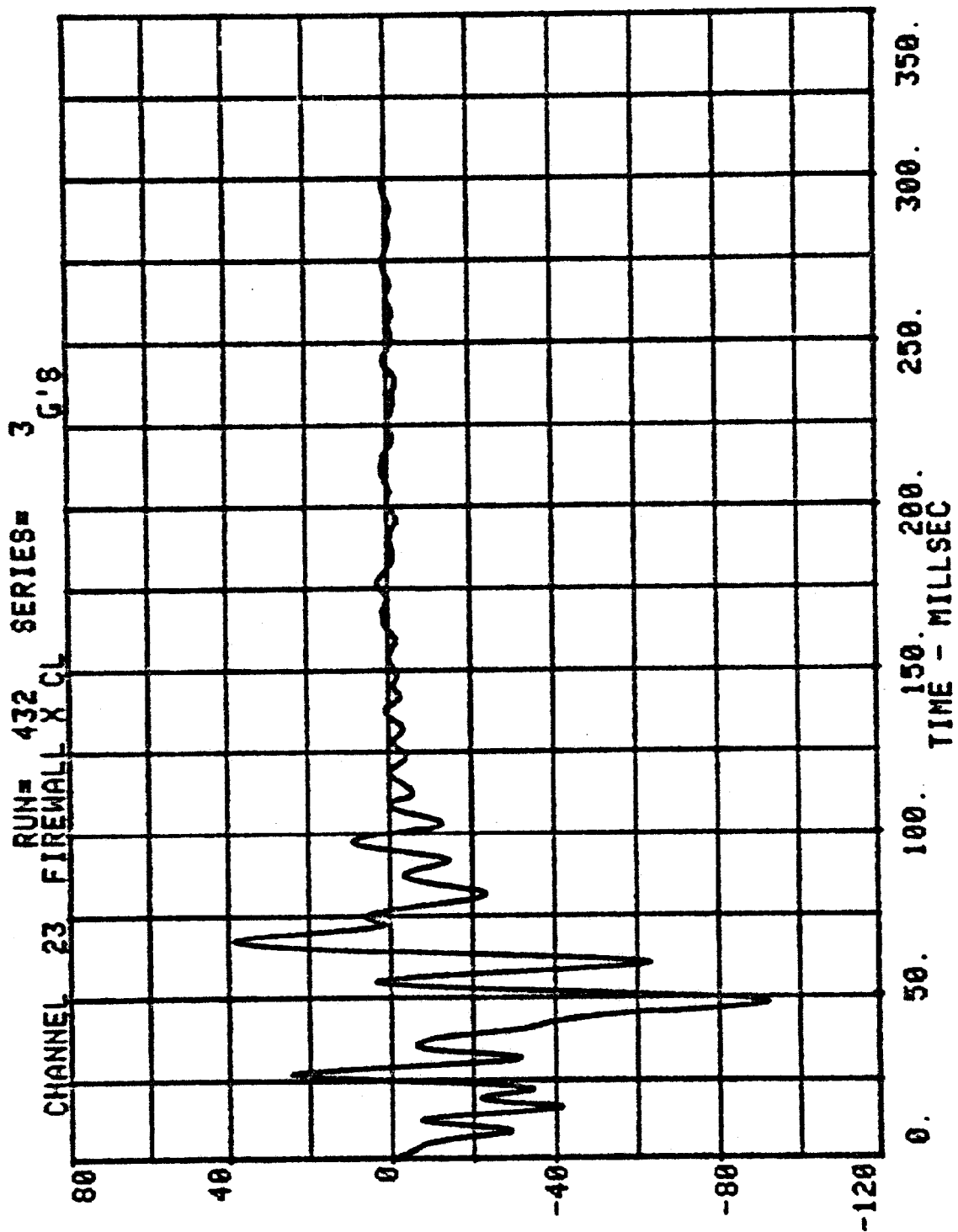
CHANNEL 21 FIREWALL X
RUN= 432 SERIES= 3 G'S

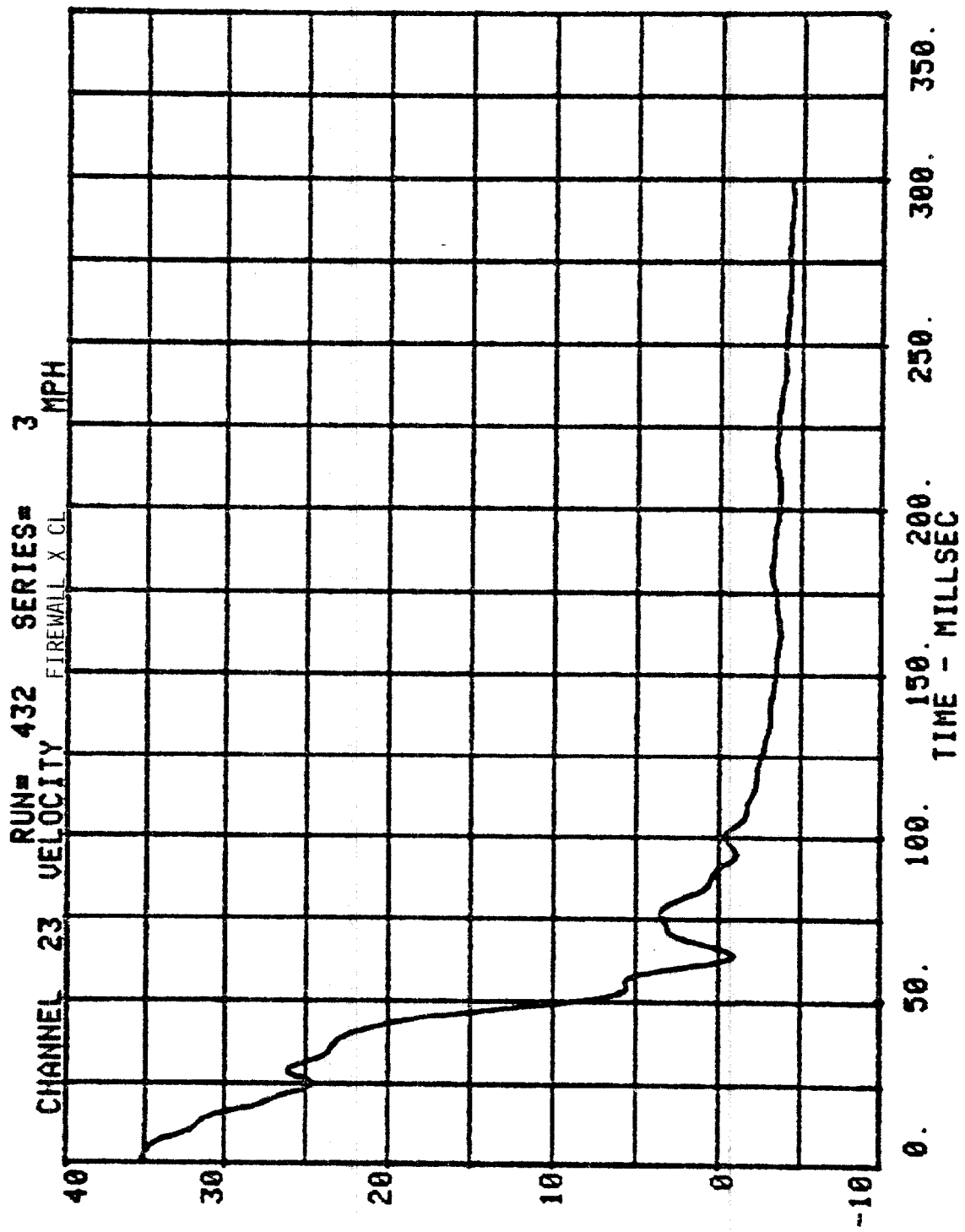






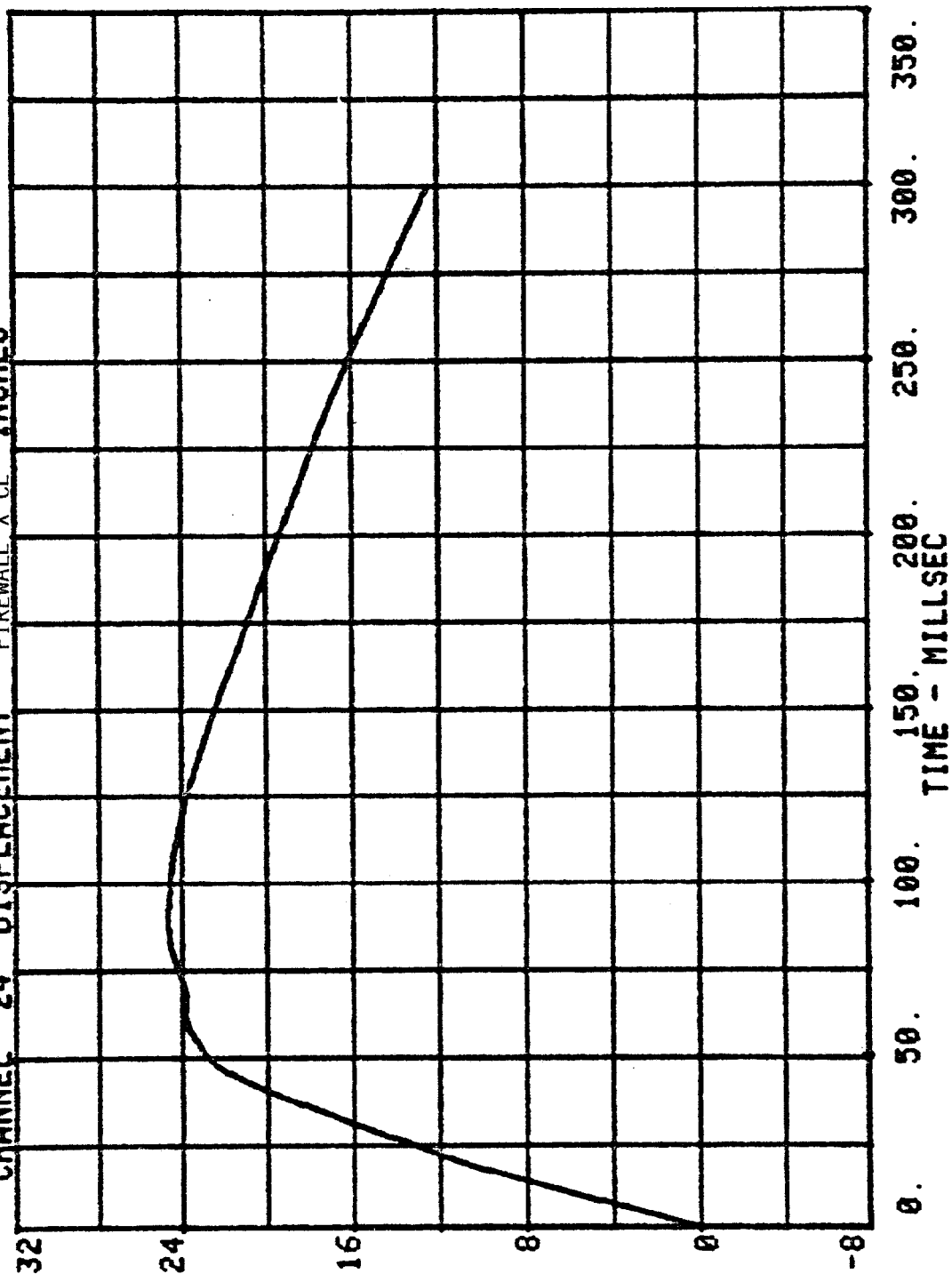


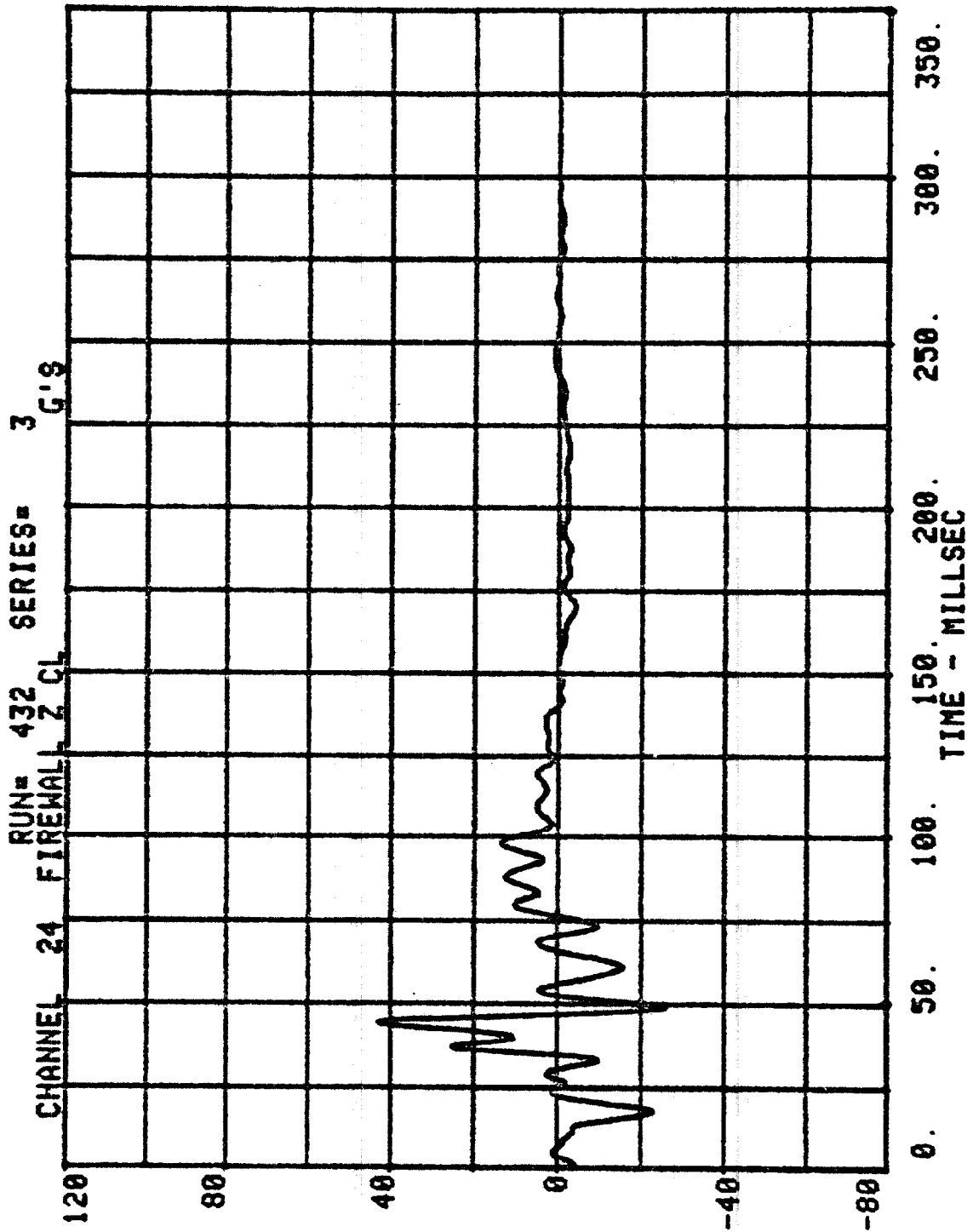


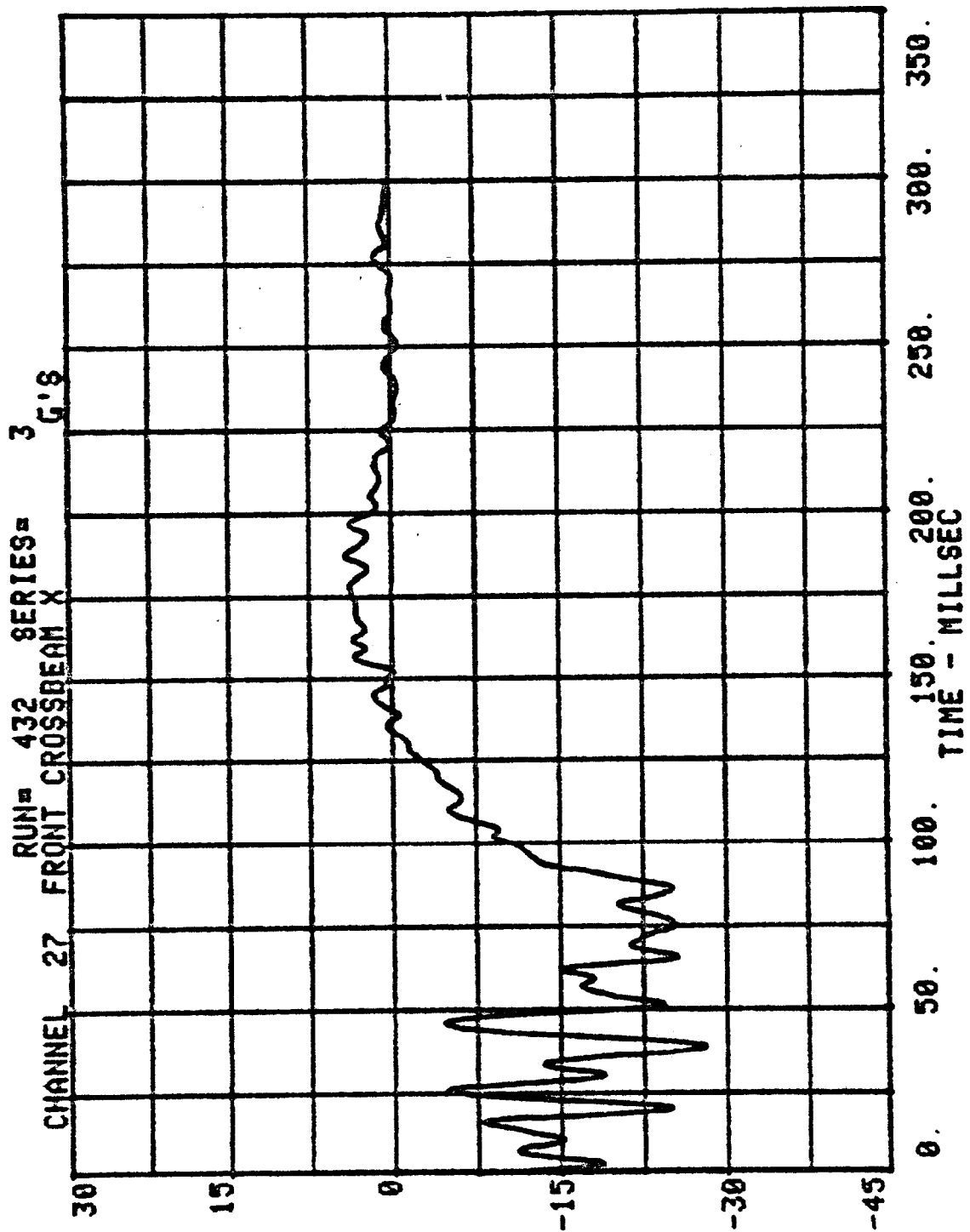


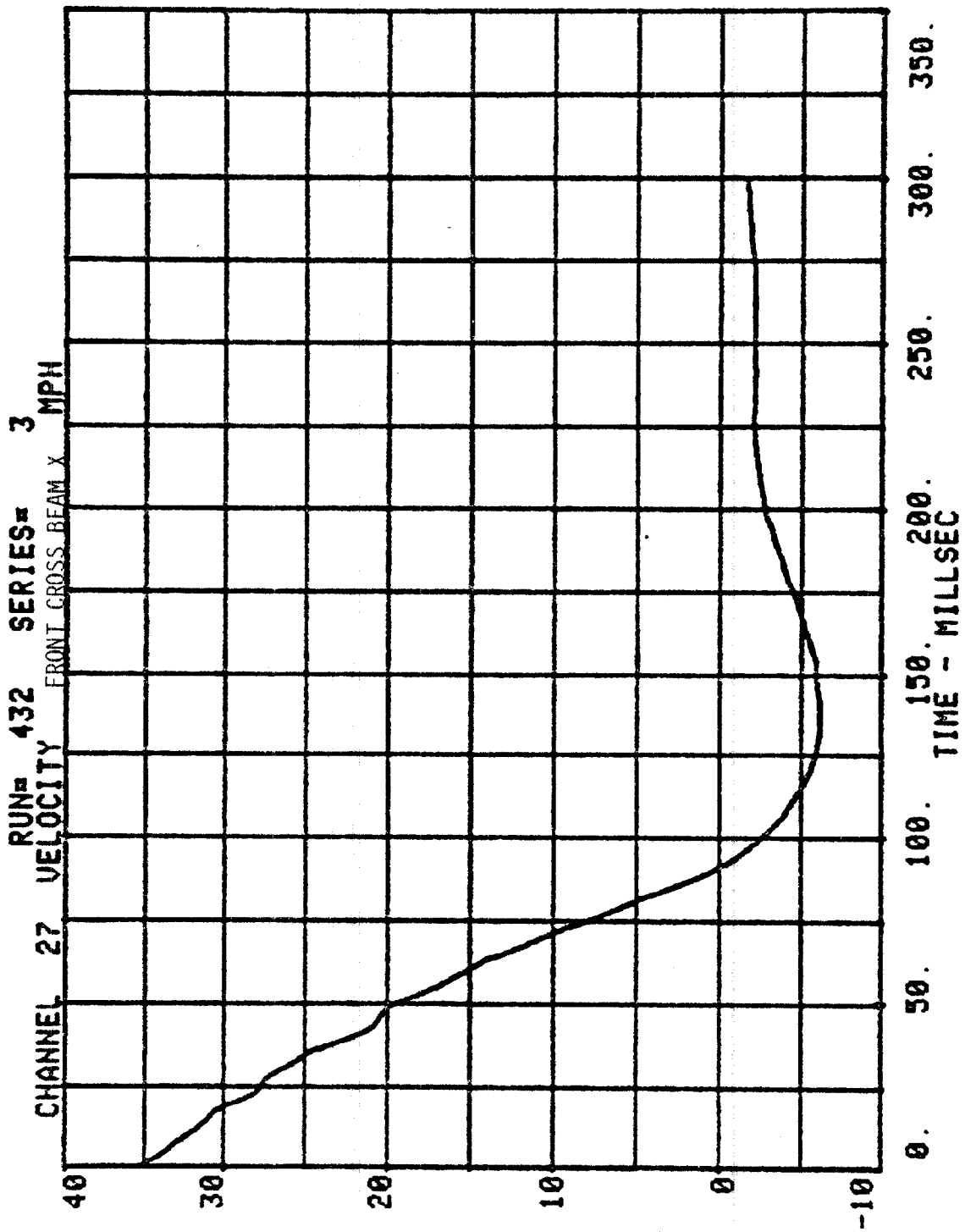
CHANNEL 24 DISPLACEMENT FIREWALL X CL INCHES

RUN# 432 SERIES# 3

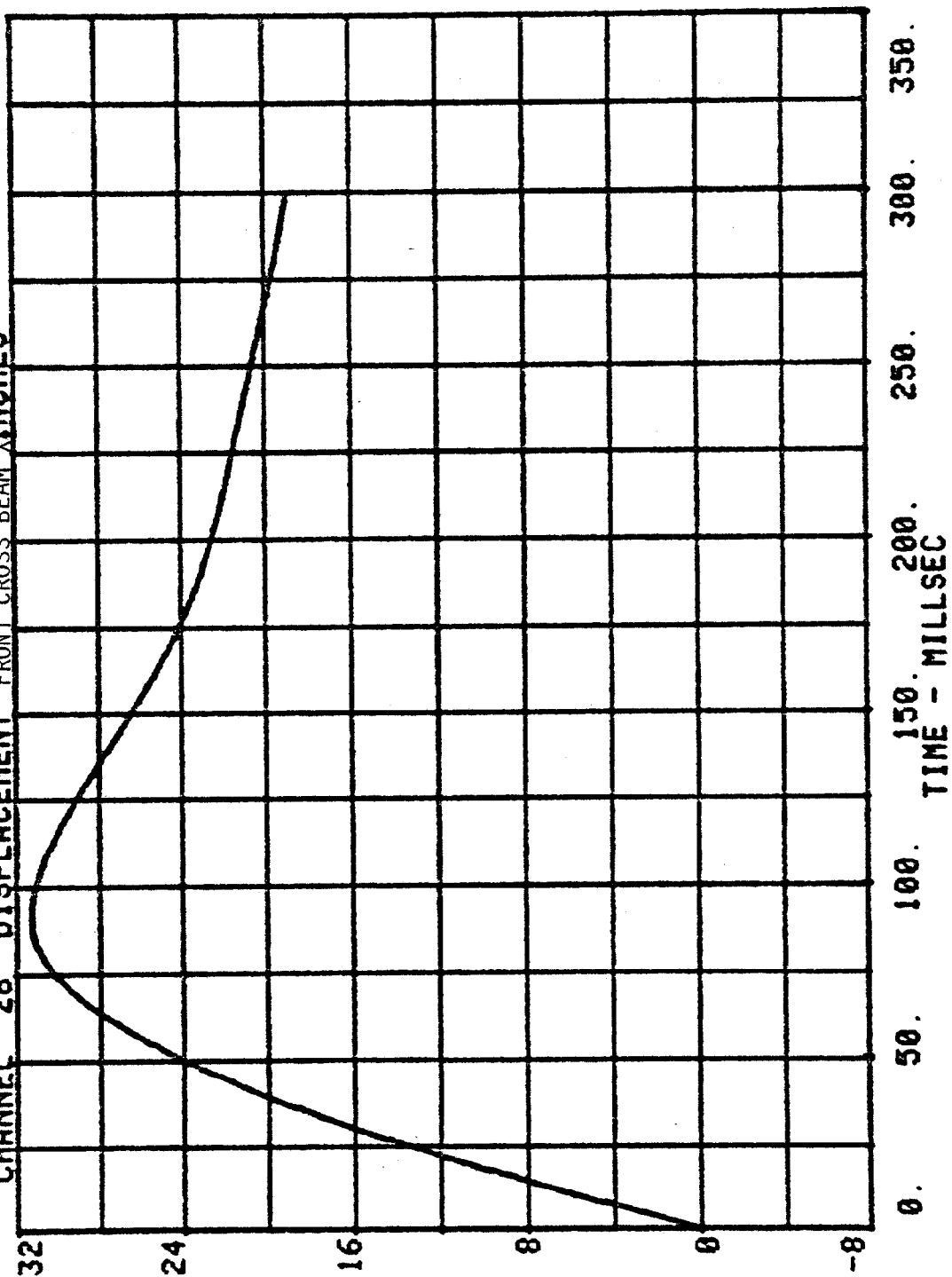


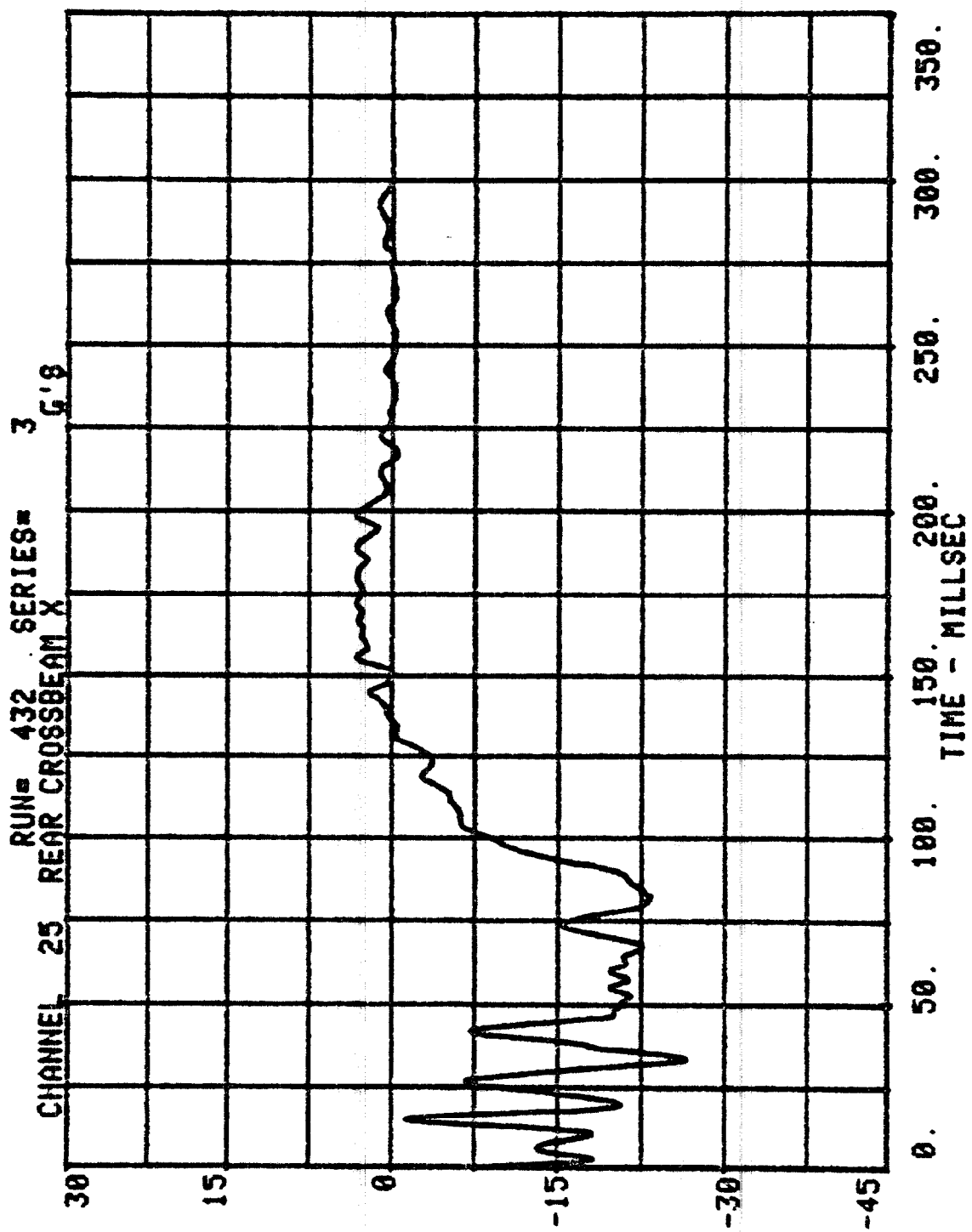




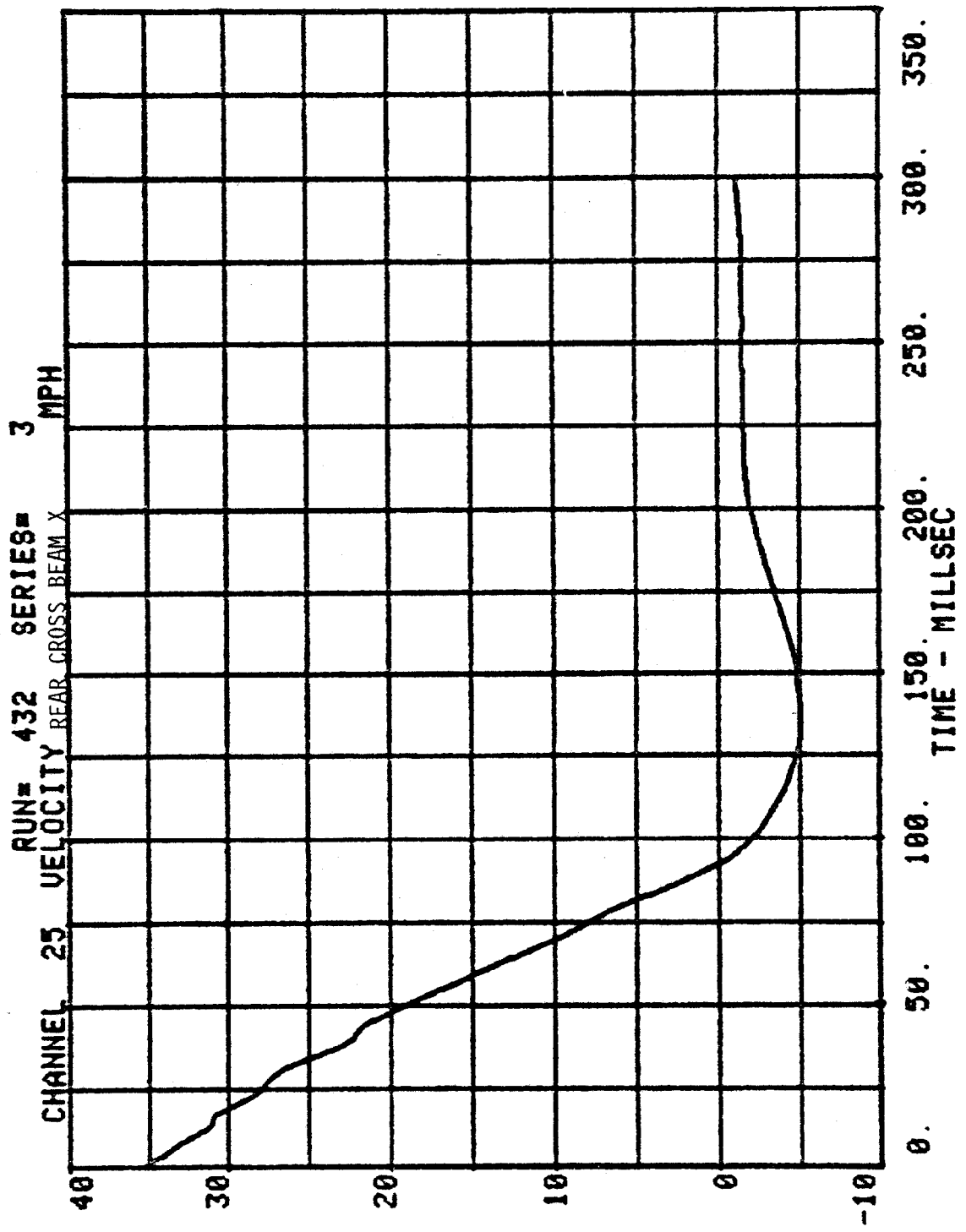


RUN= 432 SERIES= 3
CHANNEL 28 DISPLACEMENT FRONT CROSS BEAM X INCHES



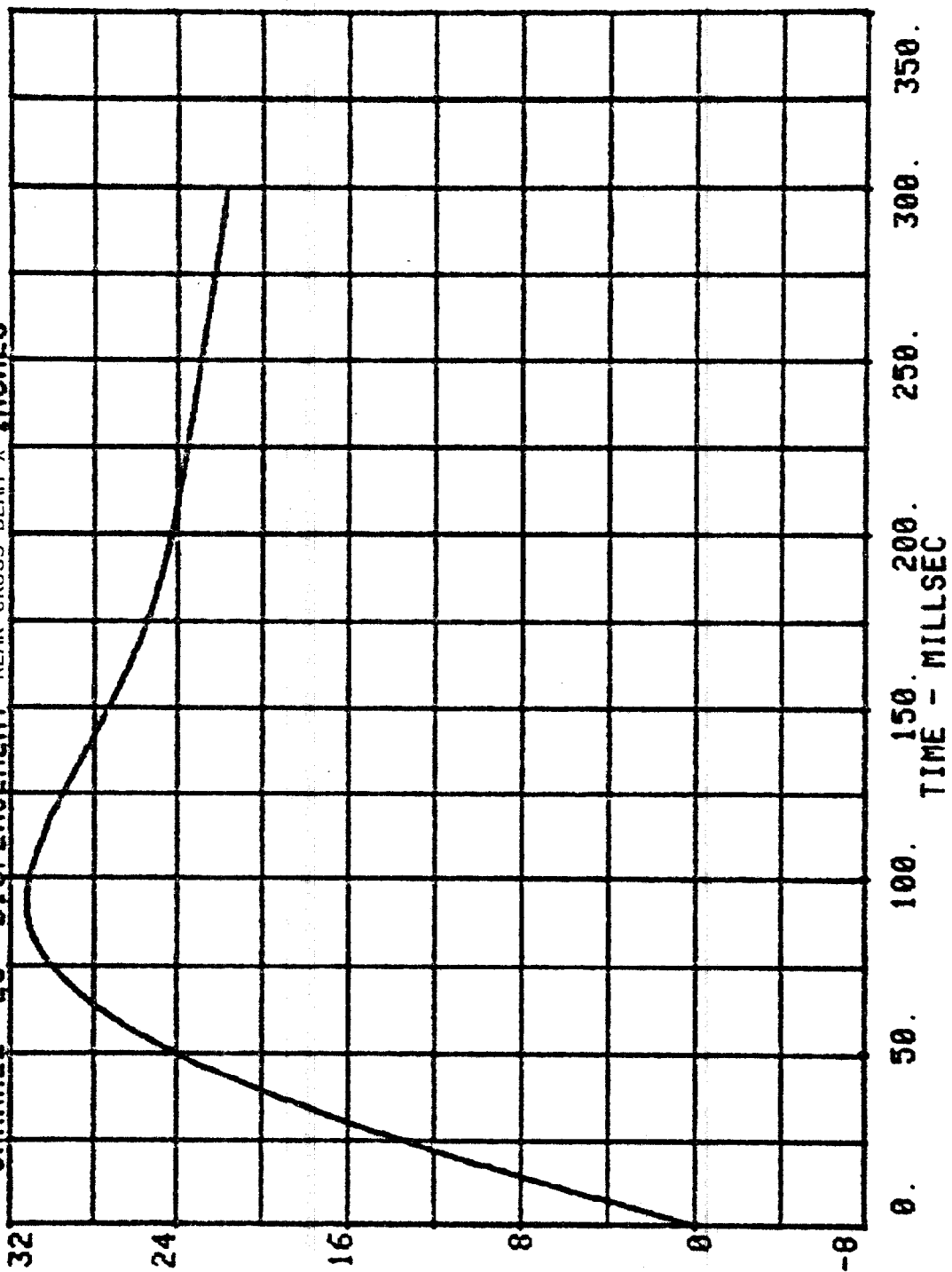


CHANNEL 25 VELOCITY REAR CROSS BEAM X 3 MPH

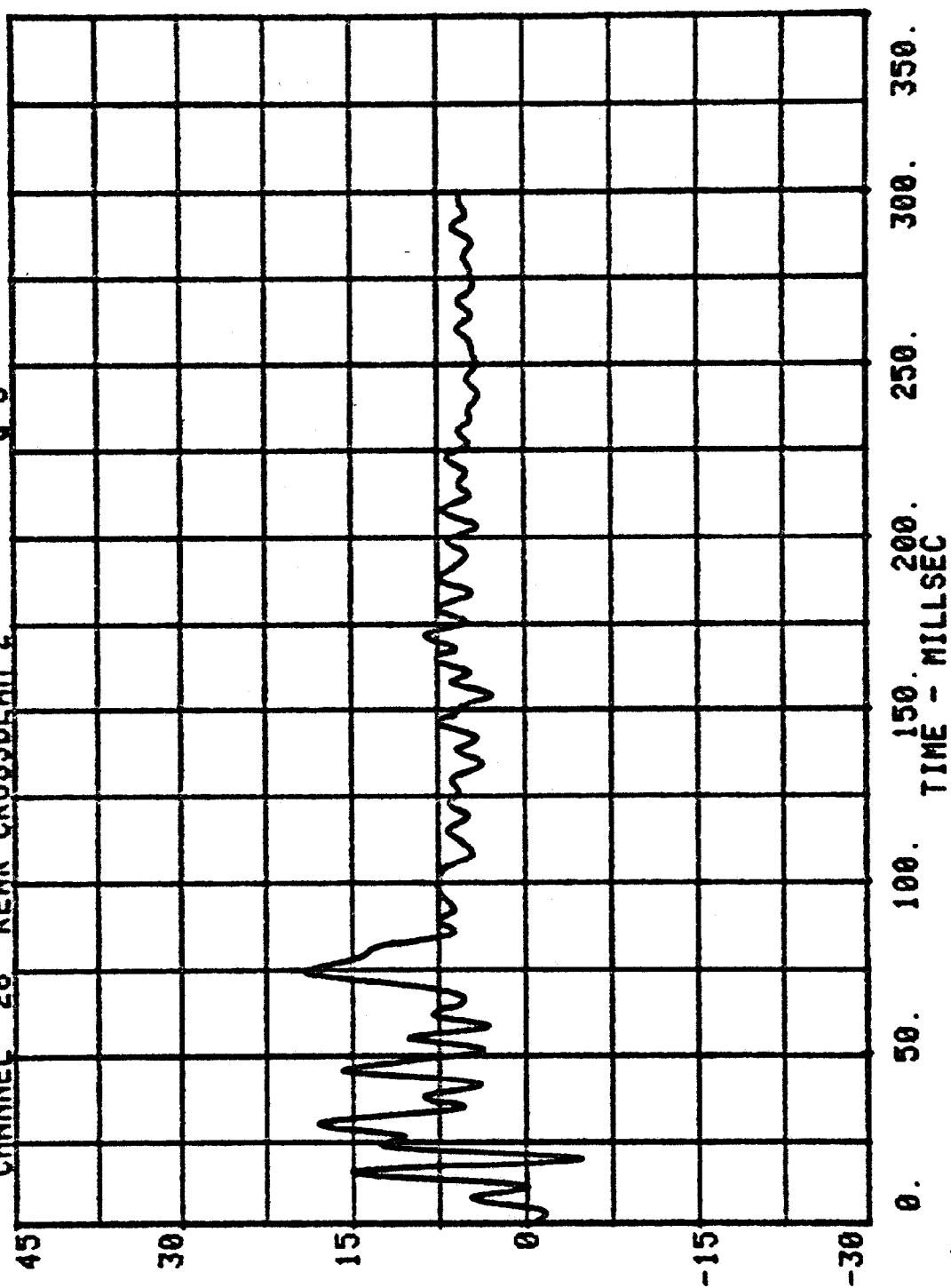


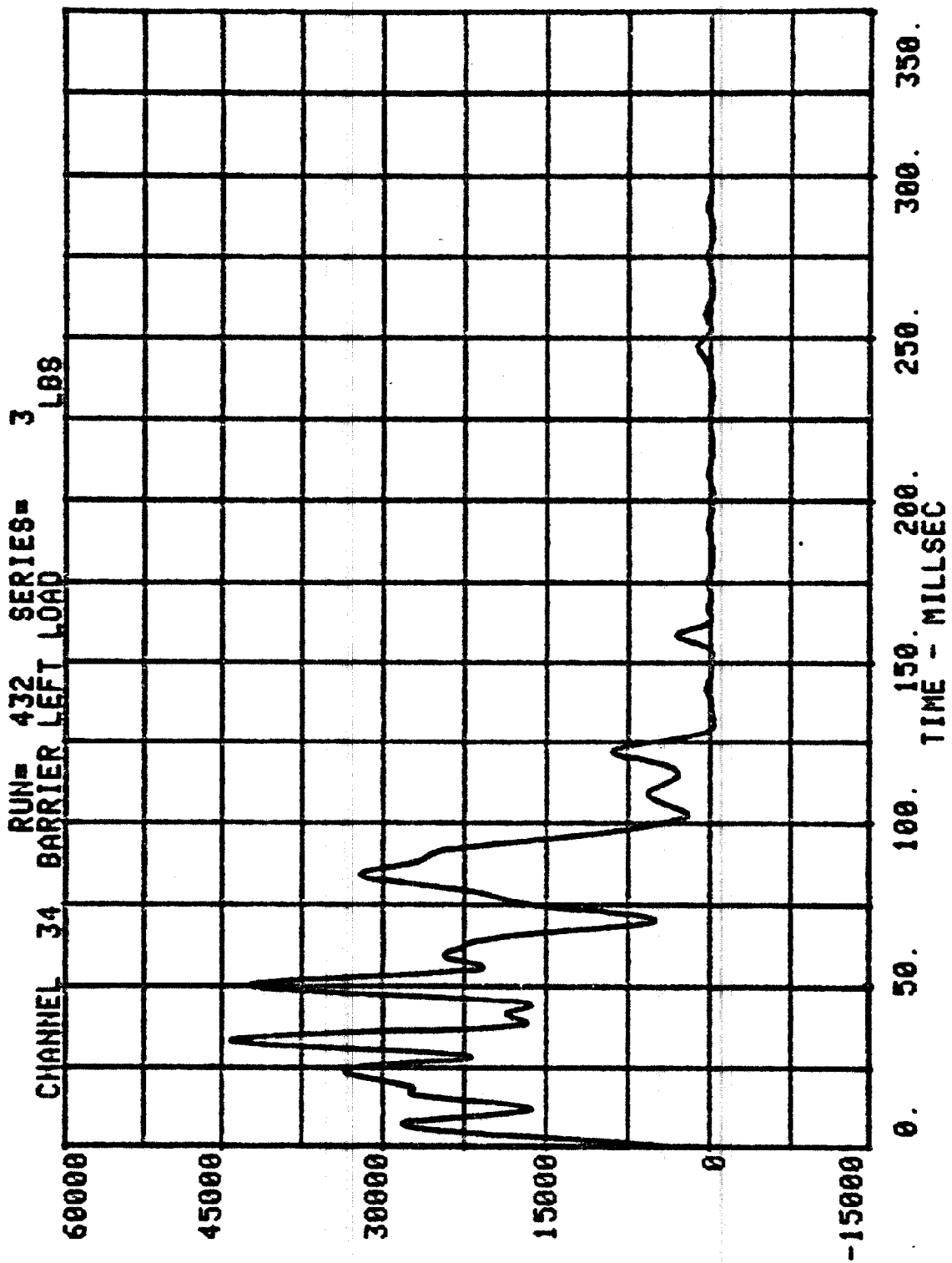
CHANNEL 26 DISPLACEMENT REAR CROSS BEAM X INCHES

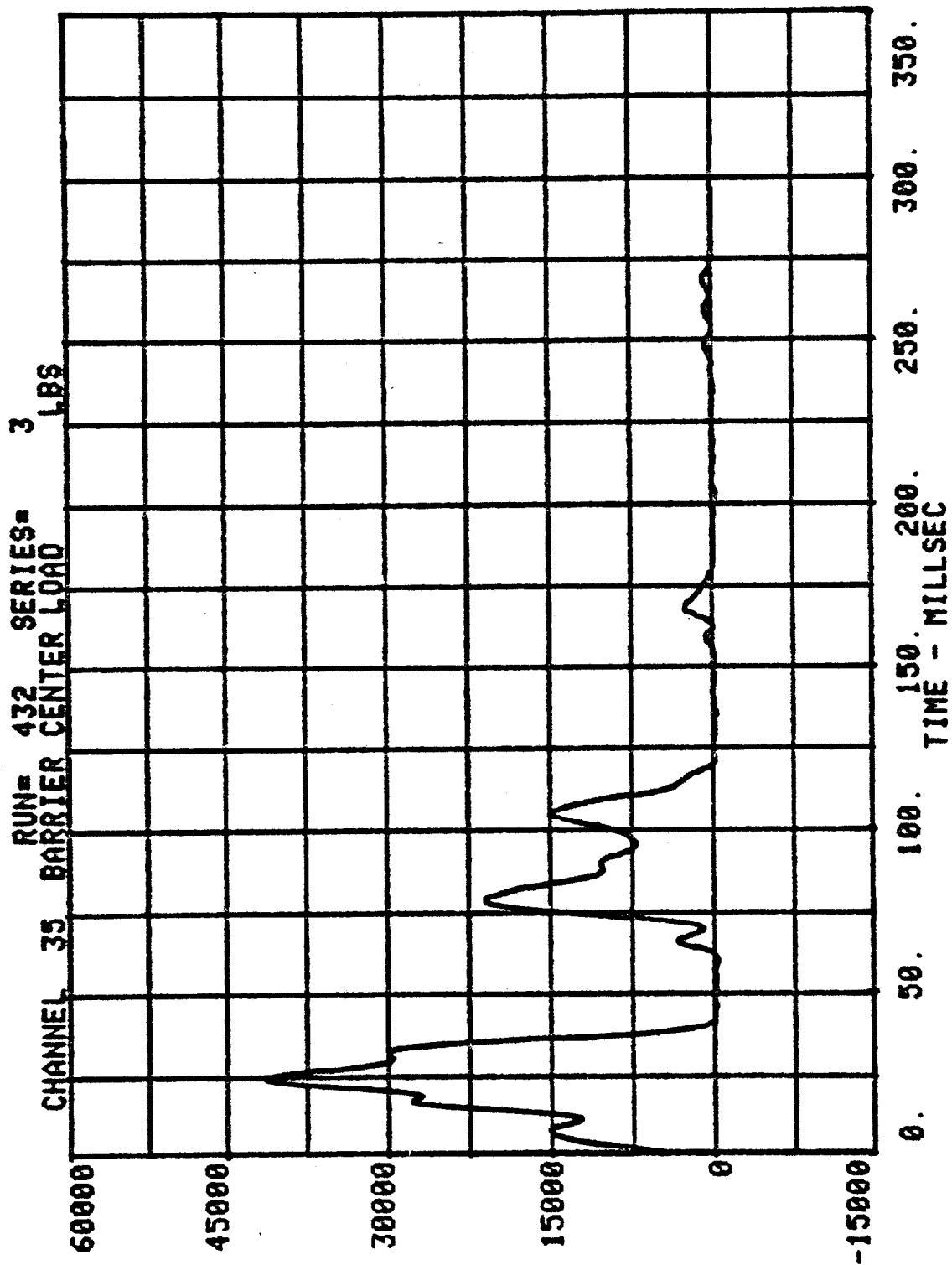
RUN# 432 SERIES# 3

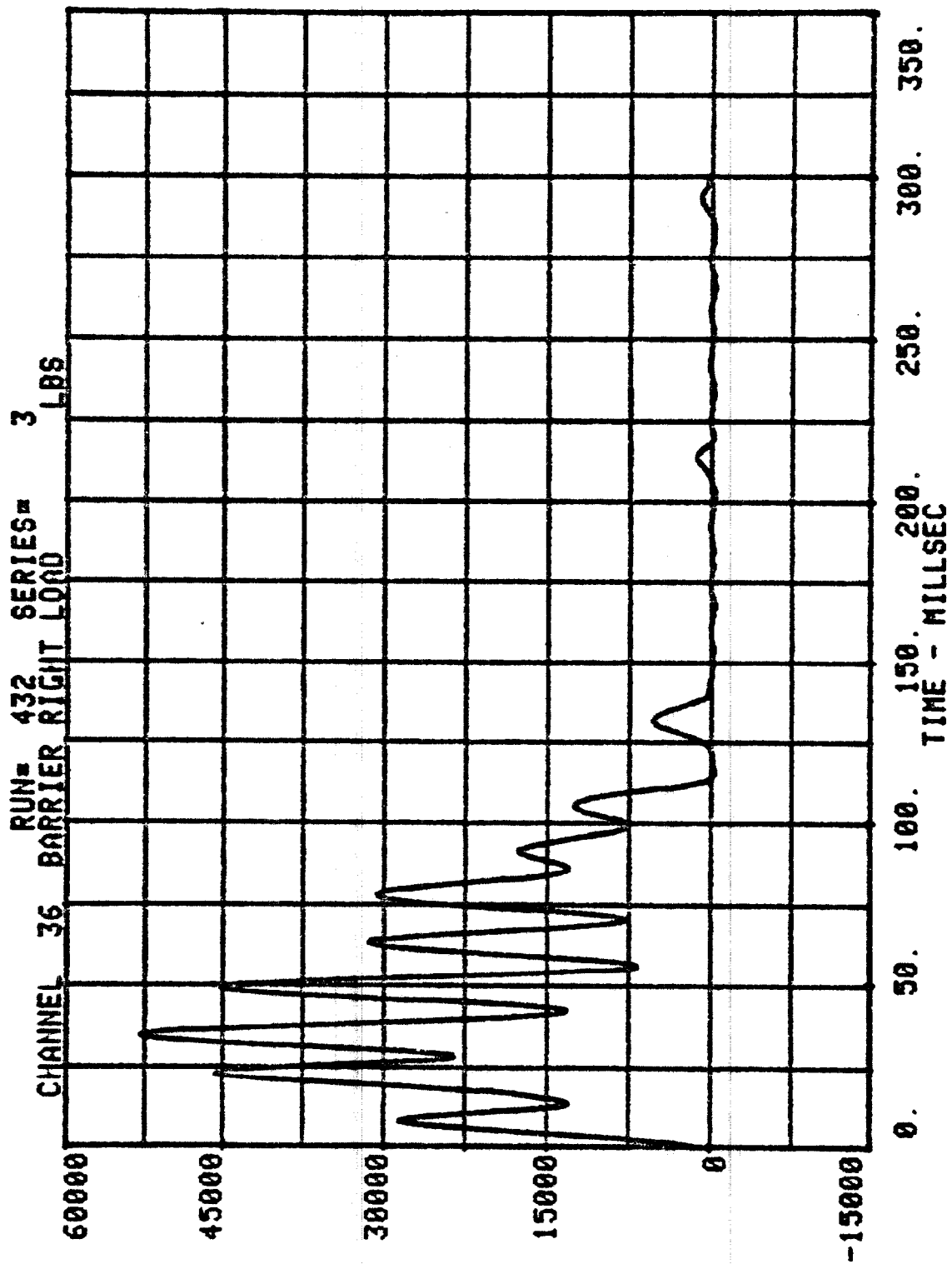


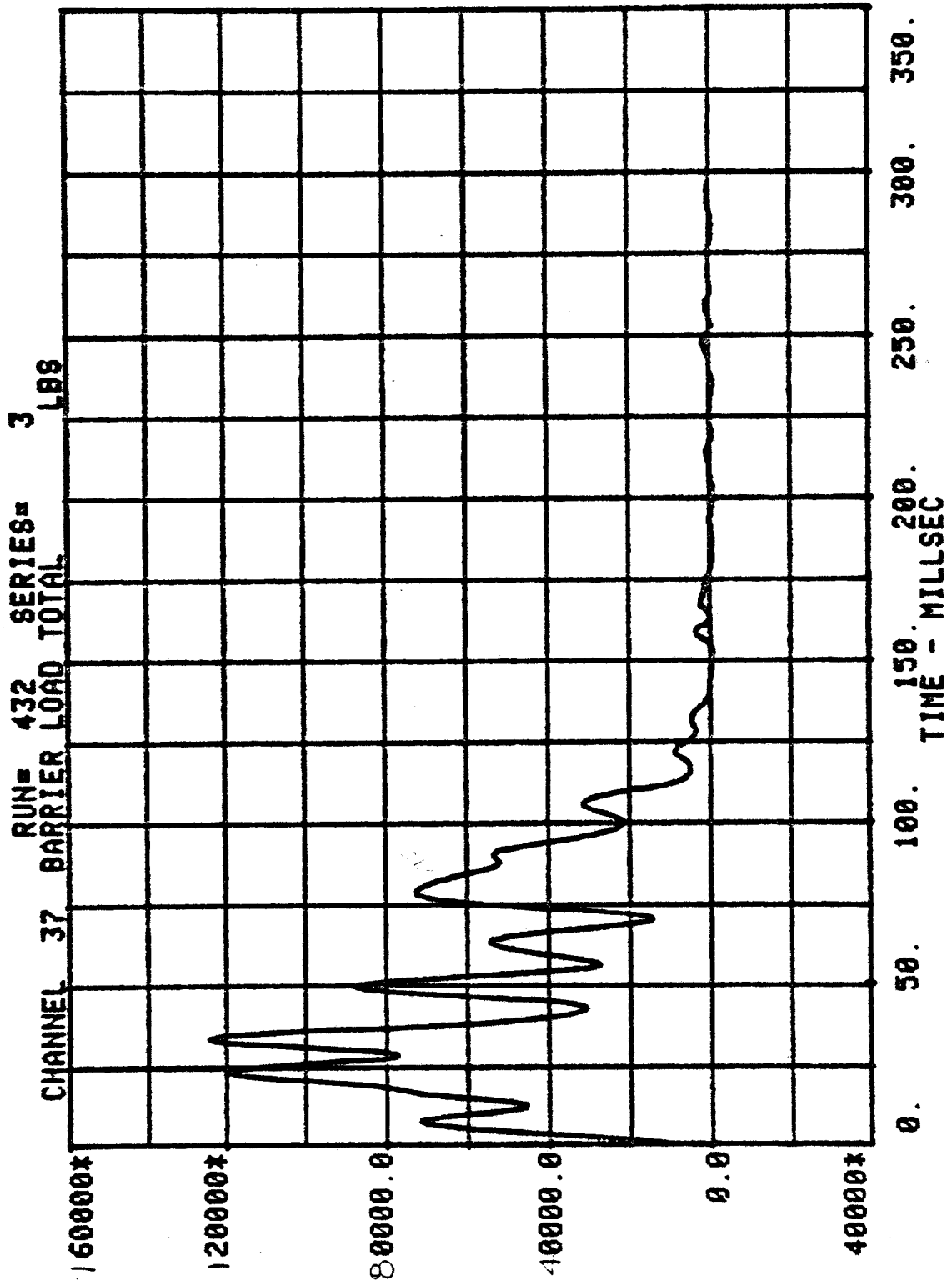
CHANNEL 26 REAR CROSSBEAM 2
RUN# 432 SERIES# 3 G'8











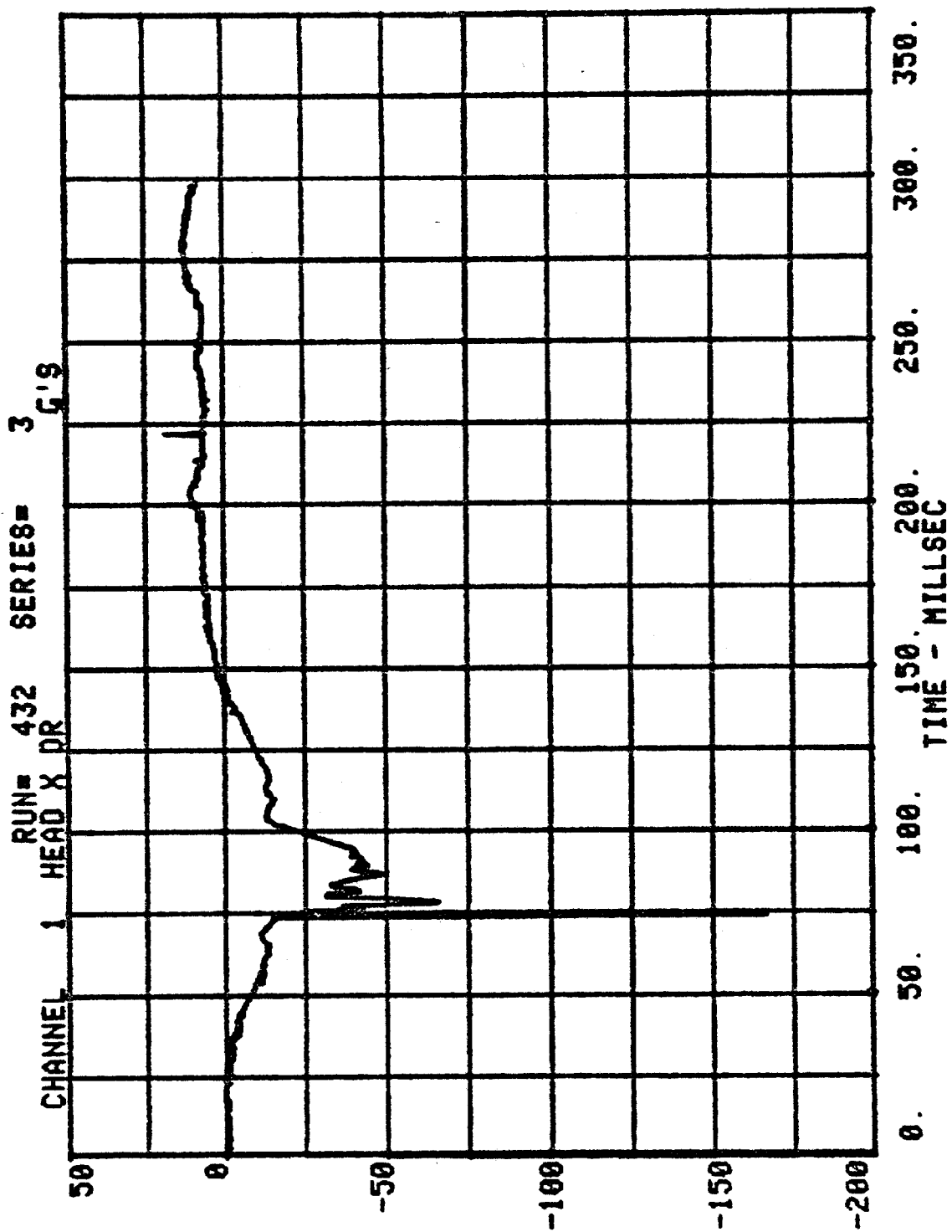
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

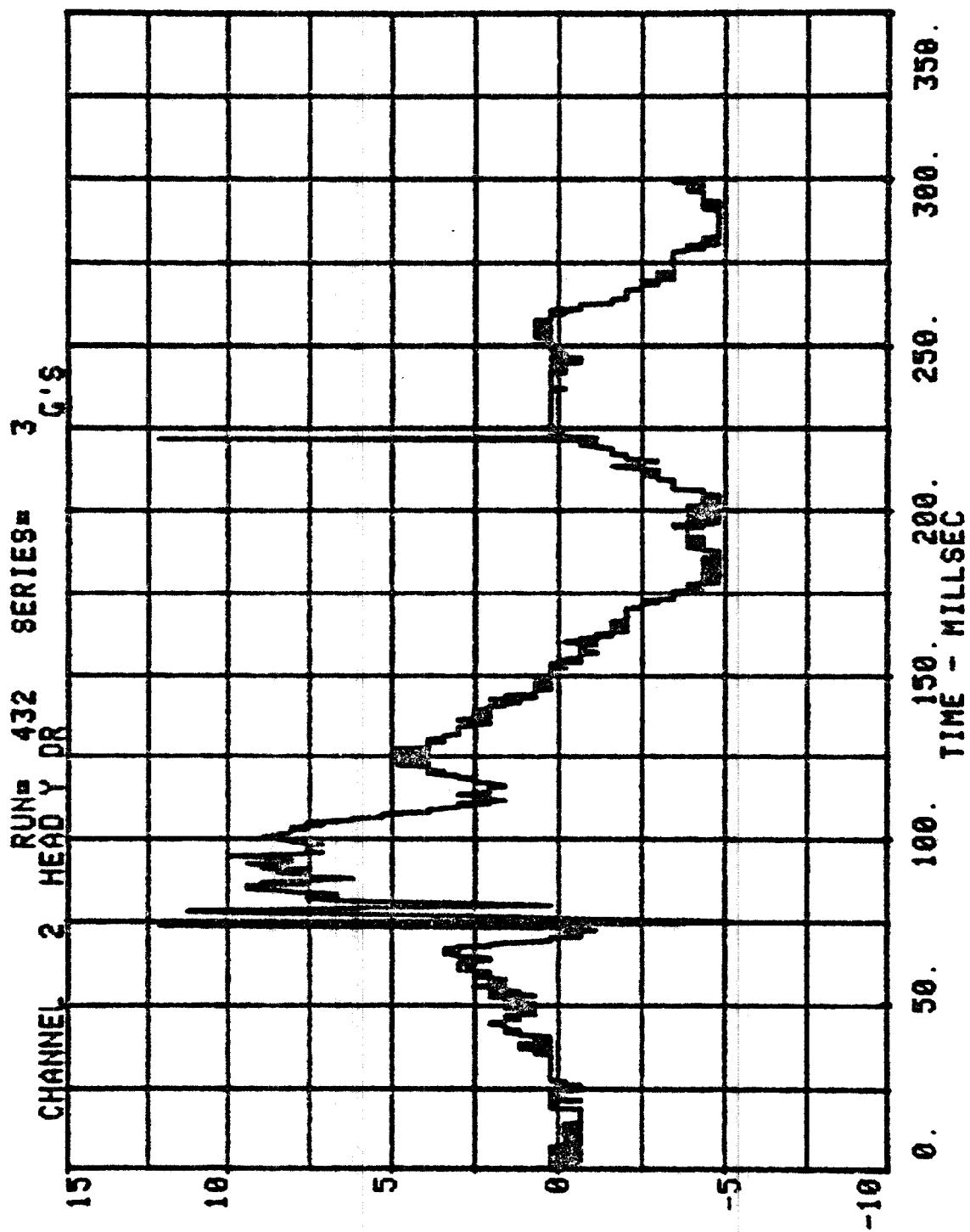
CITATION

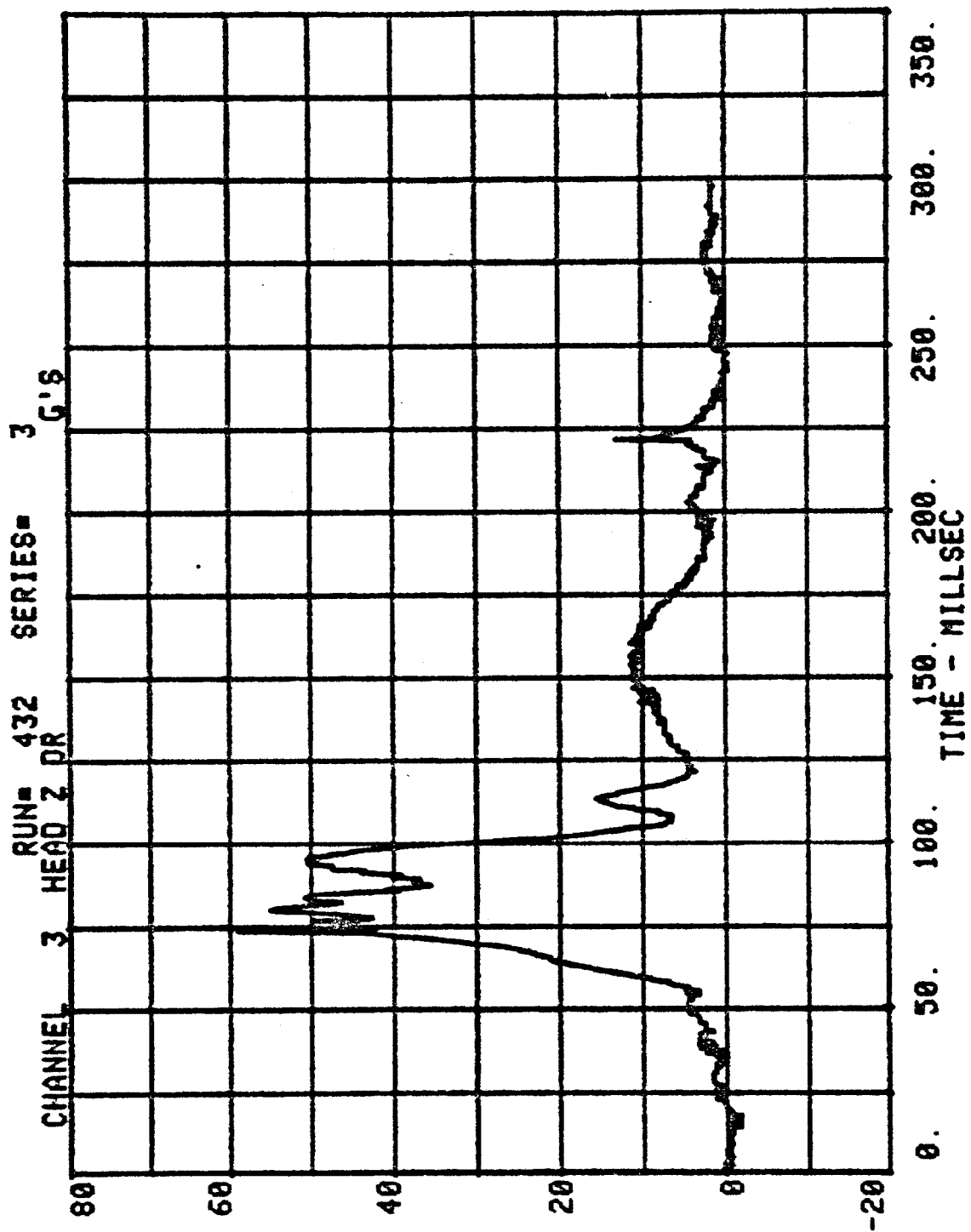
RUN= 432

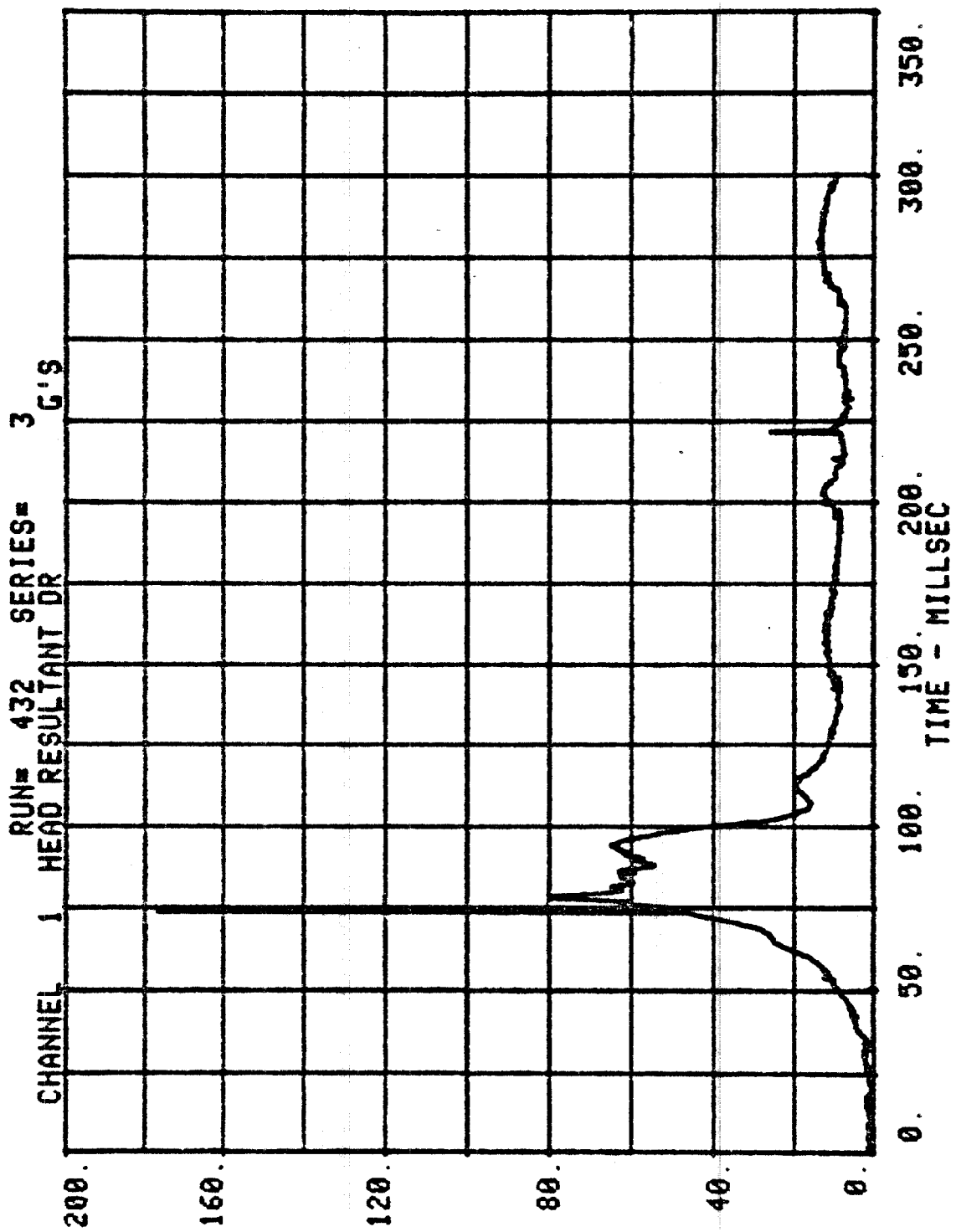
HEAD RESULTANT DR

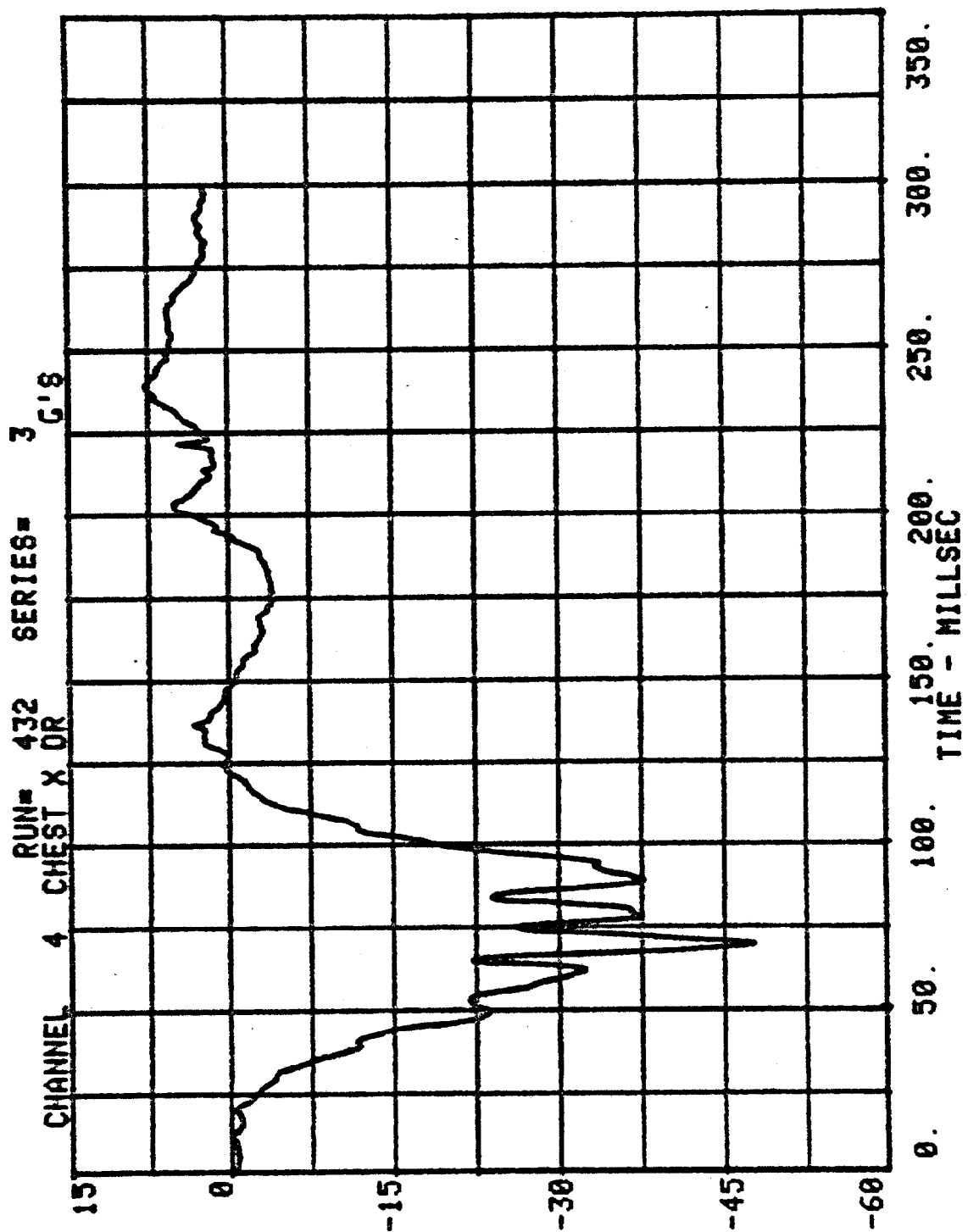
HIC= 845.0 FROM T1= .07050 TO T2= .10050
AVERAGE ACCELERATION BETWEEN T1 AND T2= 60.2G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1100.8

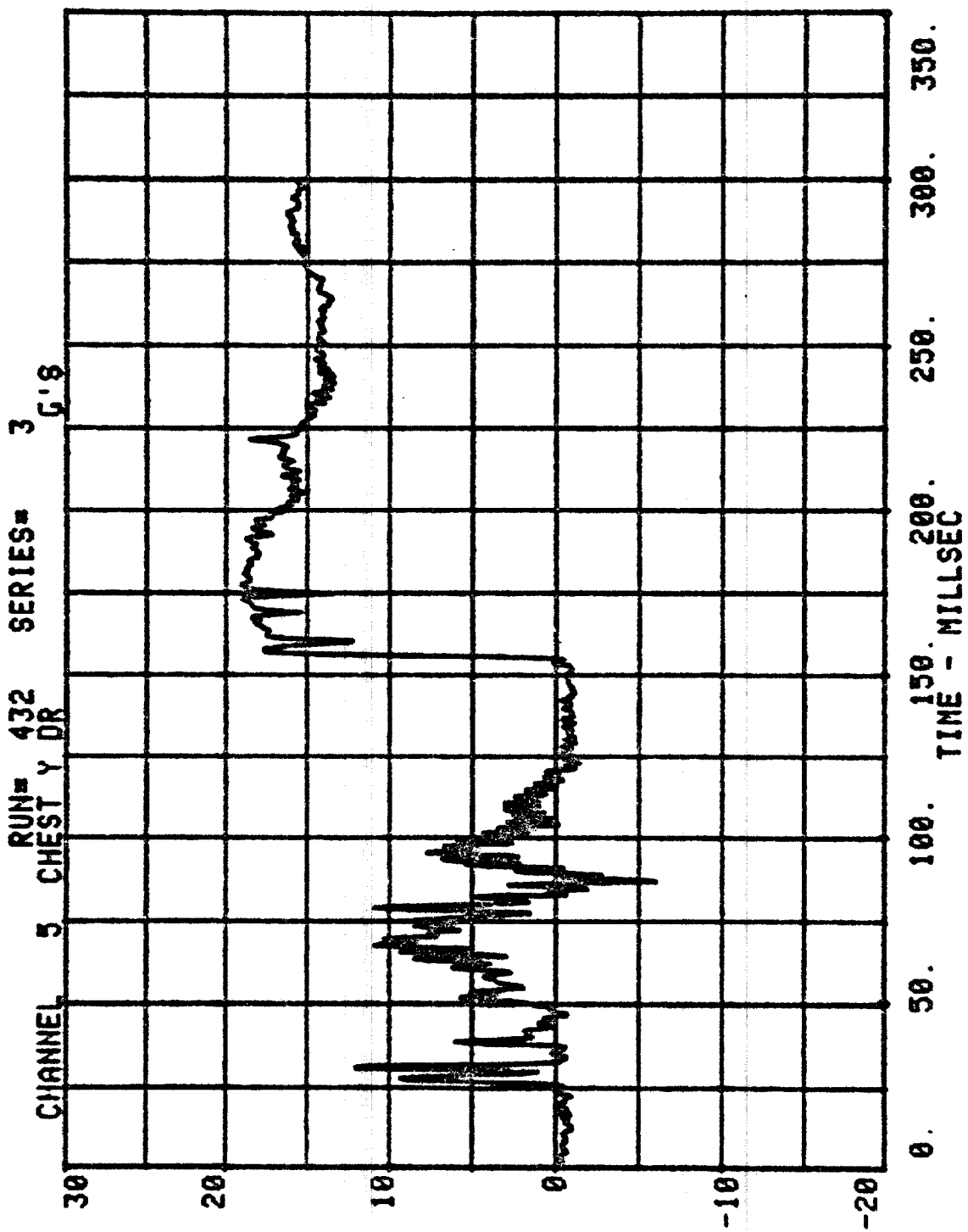


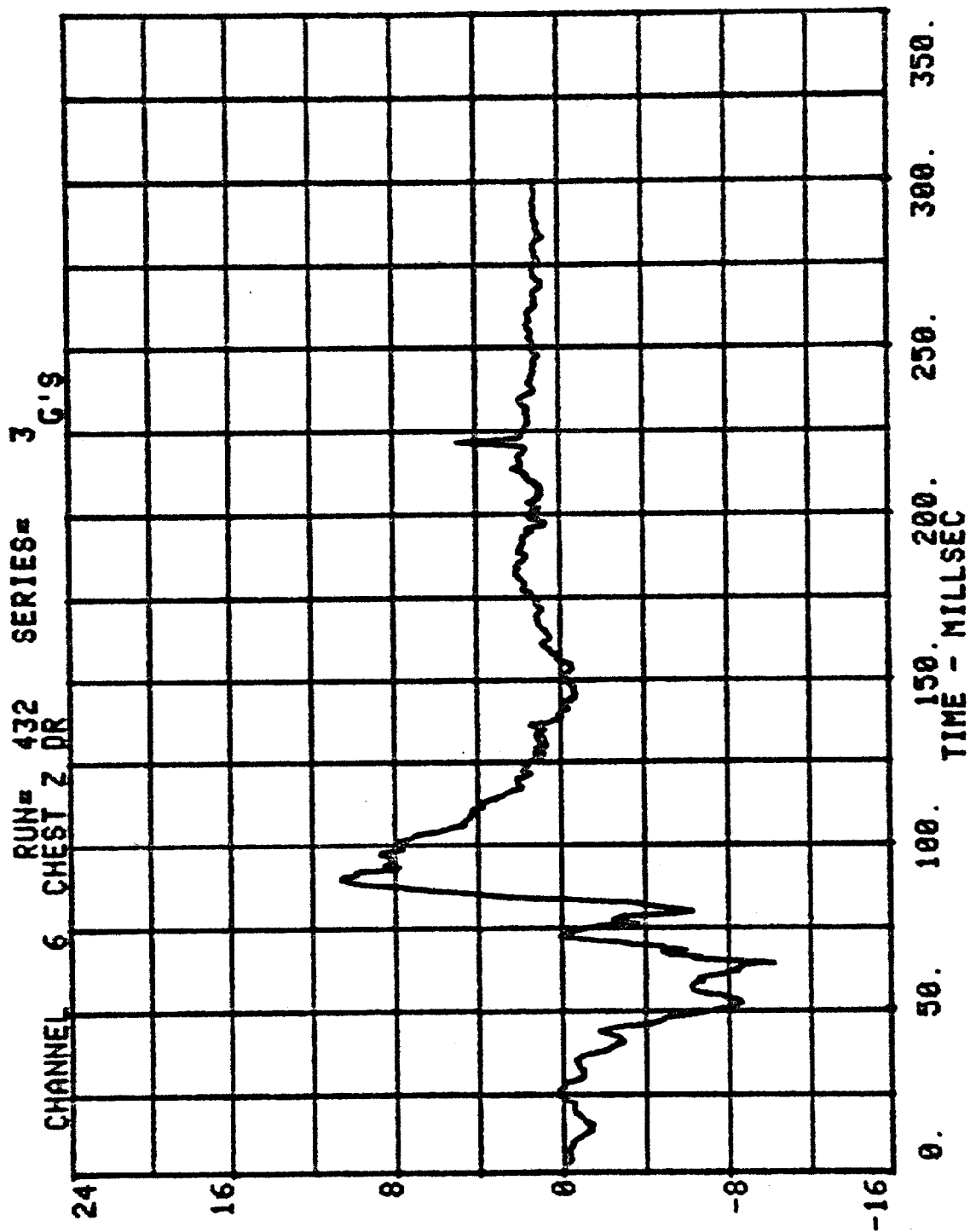


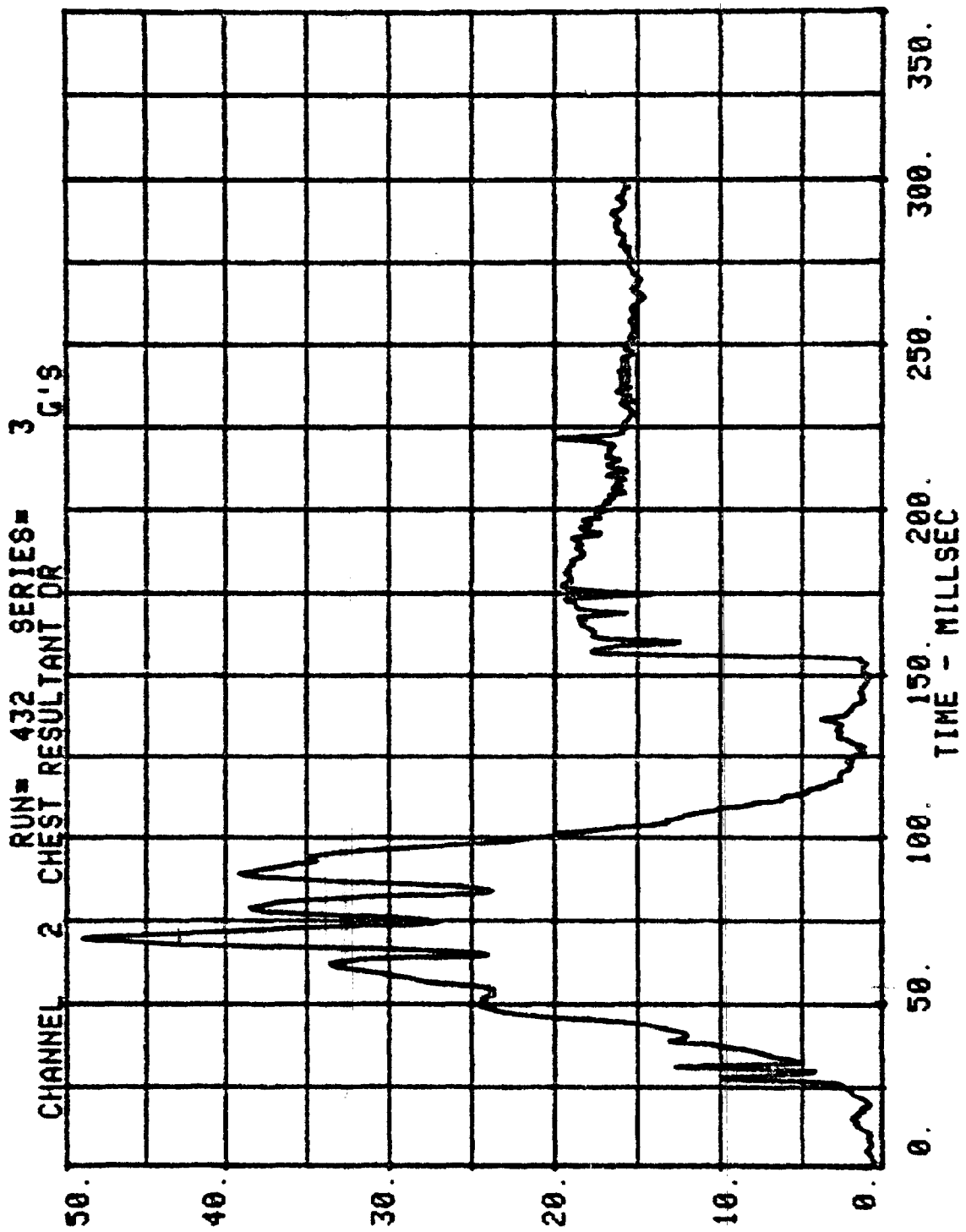




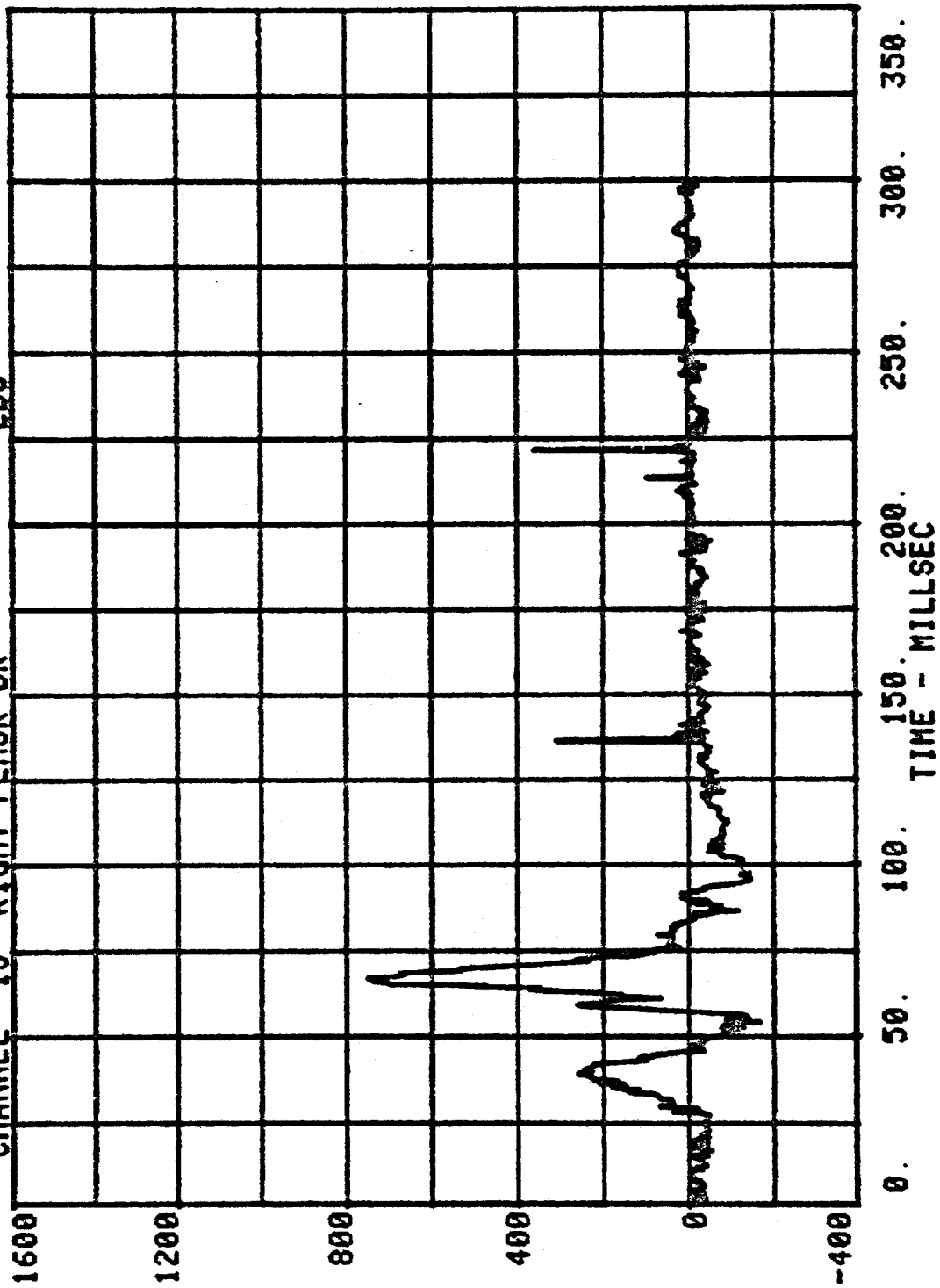


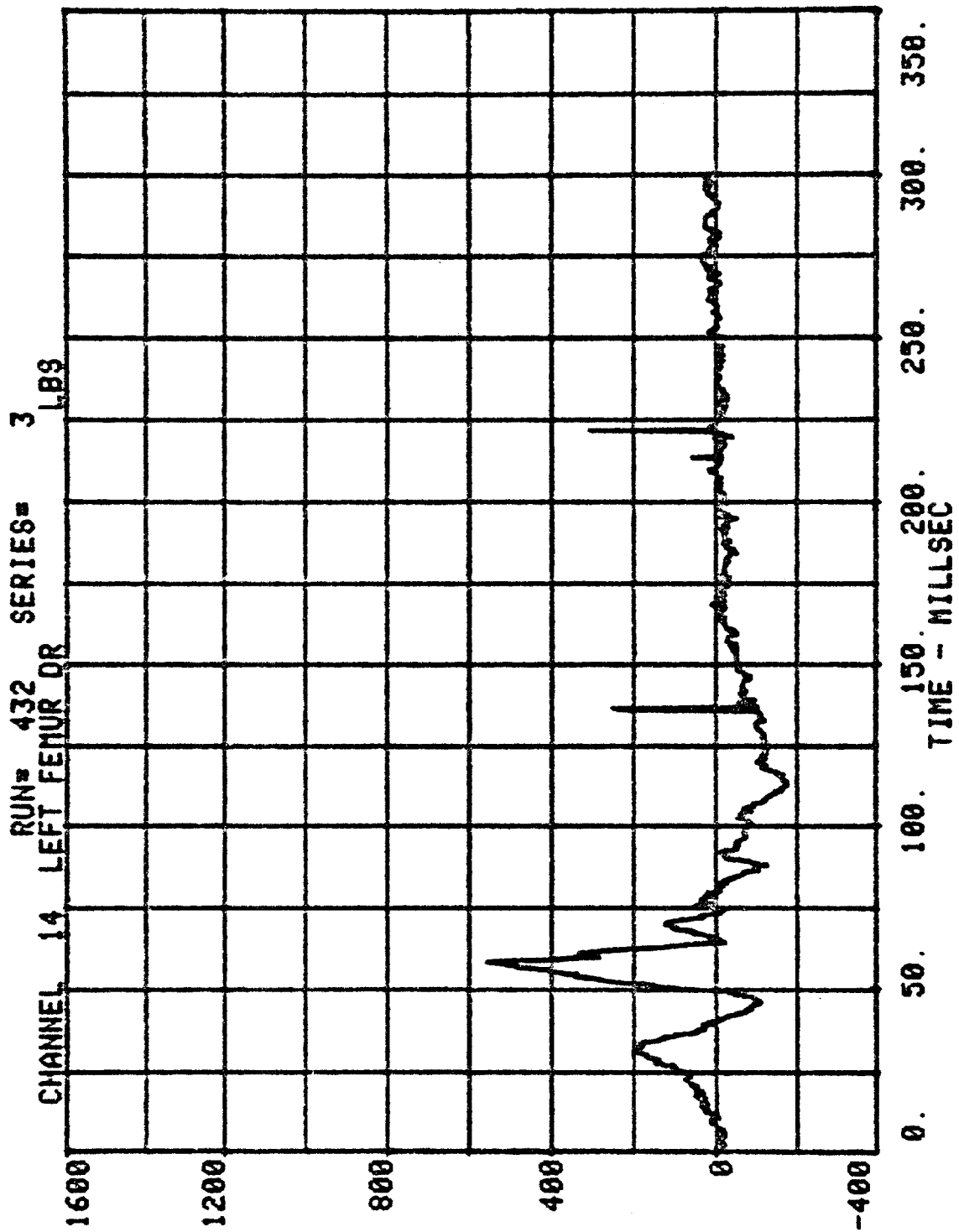


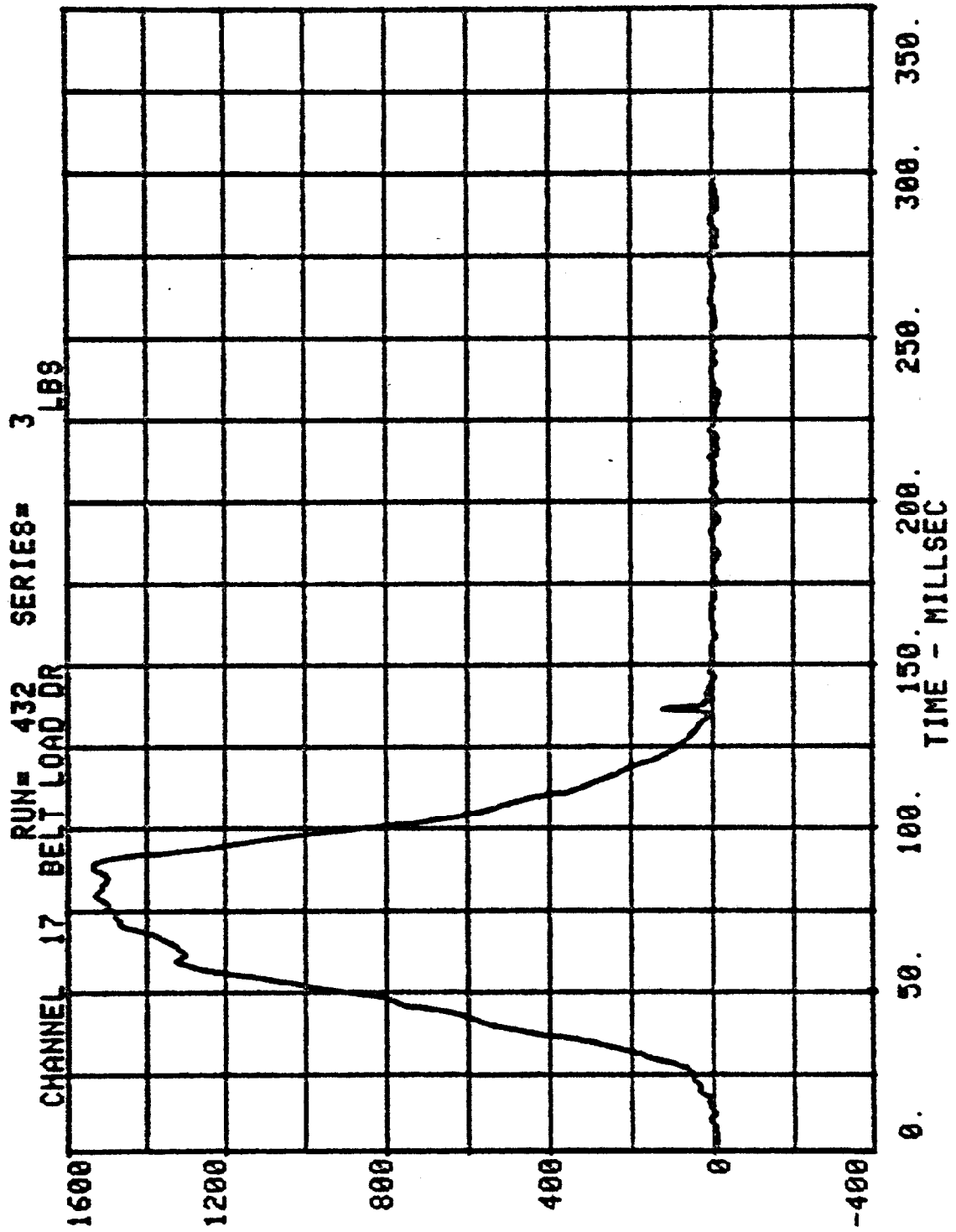




CHANNEL 13 RIGHT FEMUR DR RUN# 432 SERIES# 3 LBS







HEAD INJURY CRITERION.
HEAD SEVERITY INDEX

CITATION

RUN= 432

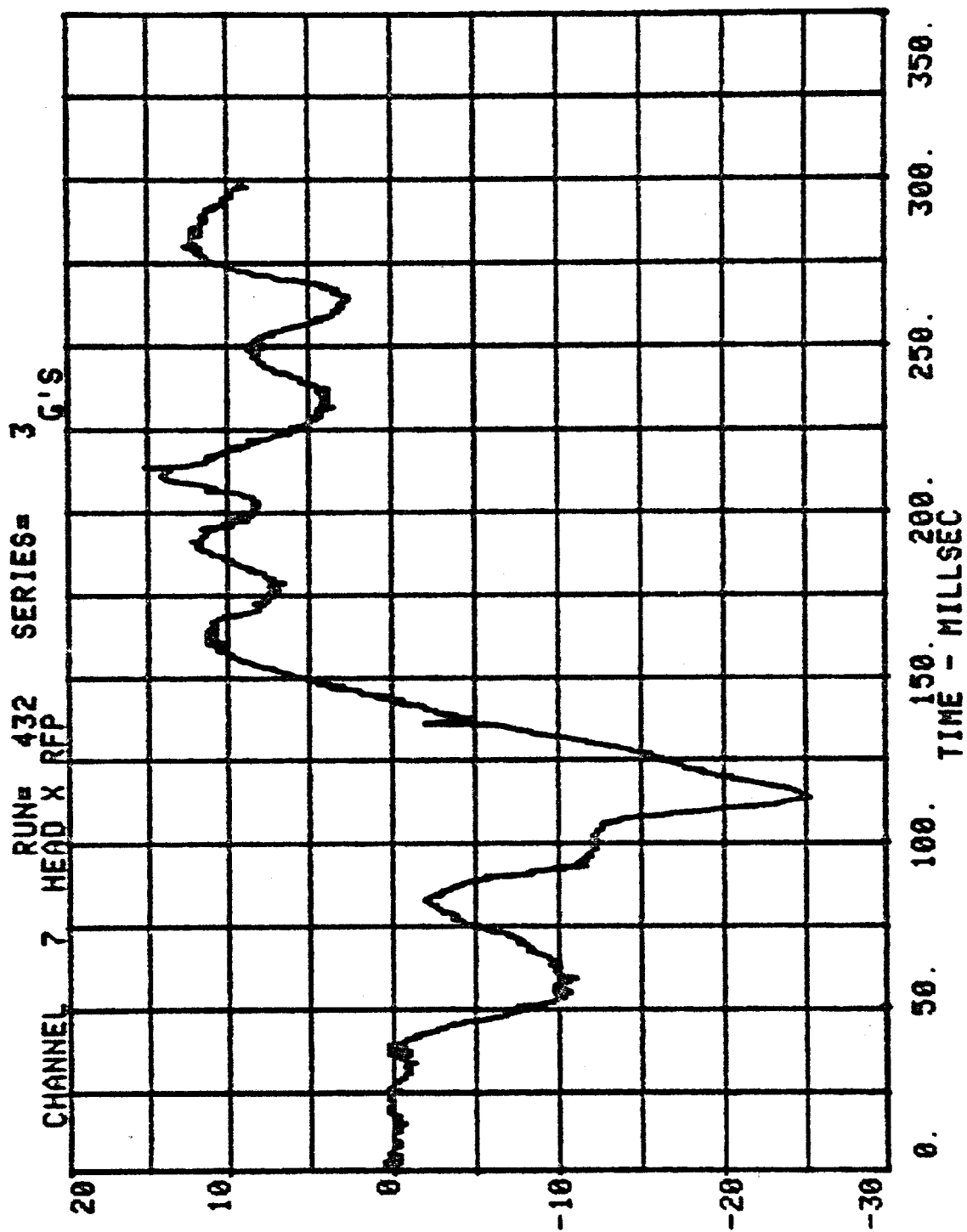
HEAD RESULTANT RFP

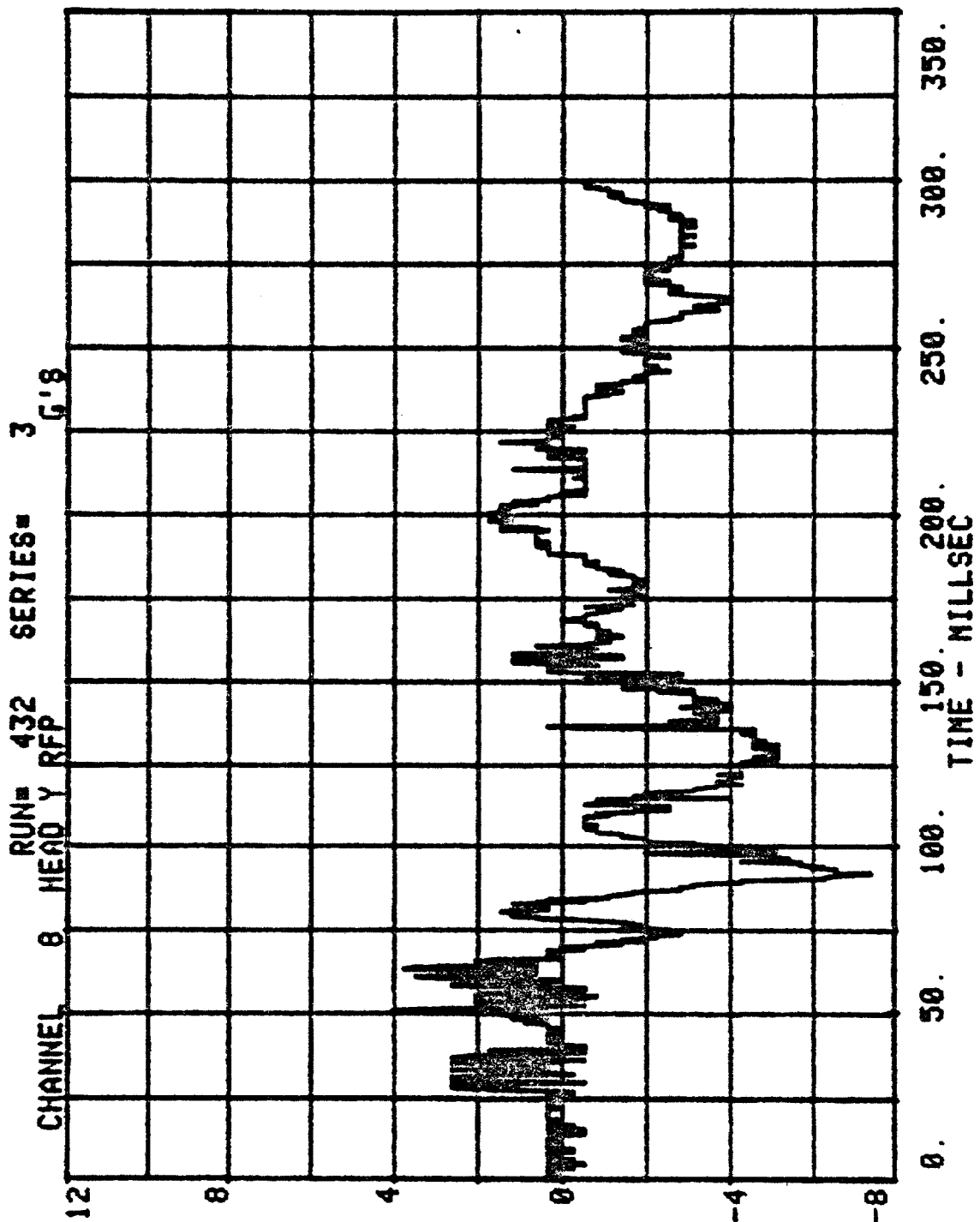
HIC= 623.3 FROM T1= .06330 TO T2= .12330

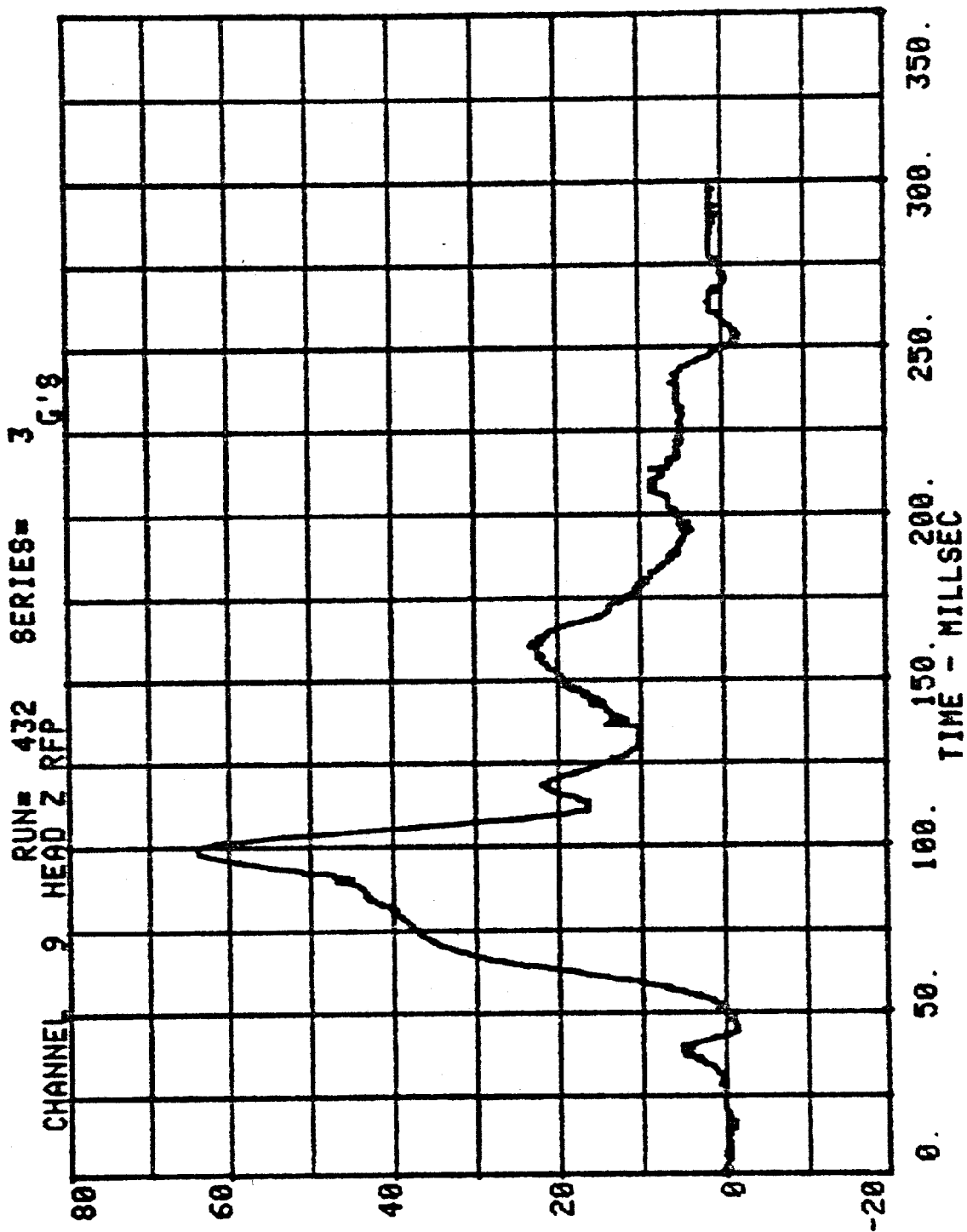
AVERAGE ACCELERATION BETWEEN T1 AND T2= 40.4G'S

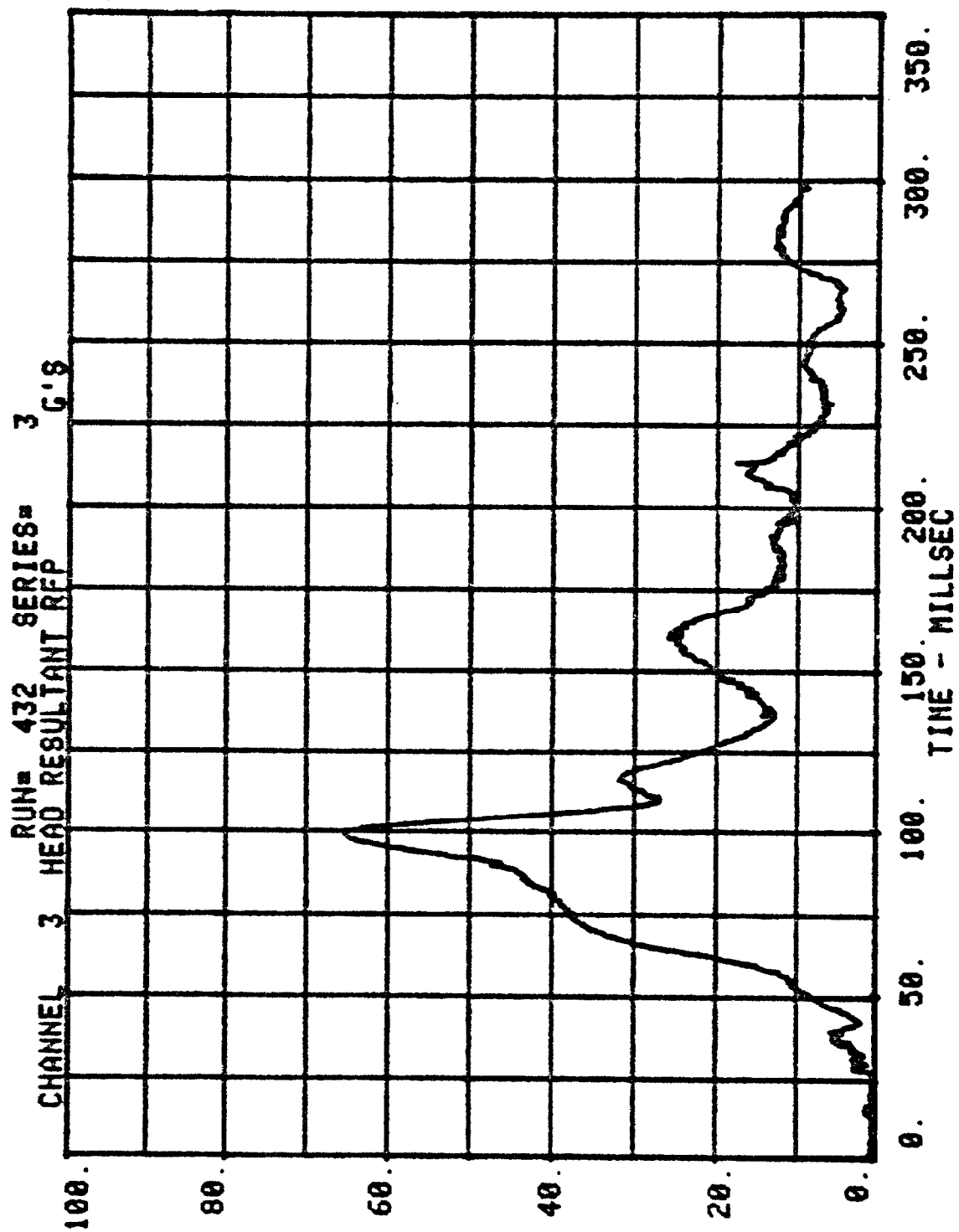
EVENT TIME= 300.0 MSEC

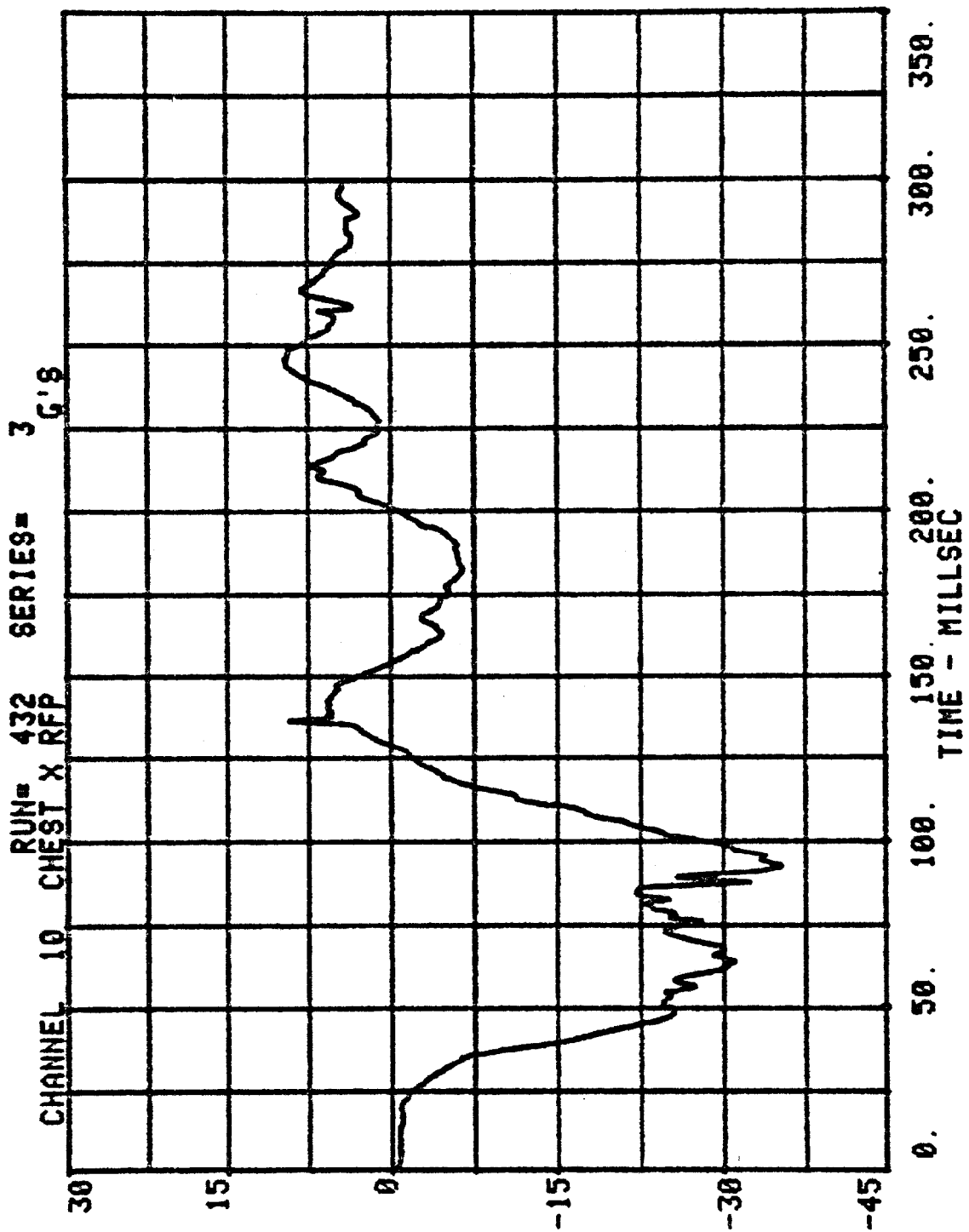
SEVERITY INDEX= 868.1

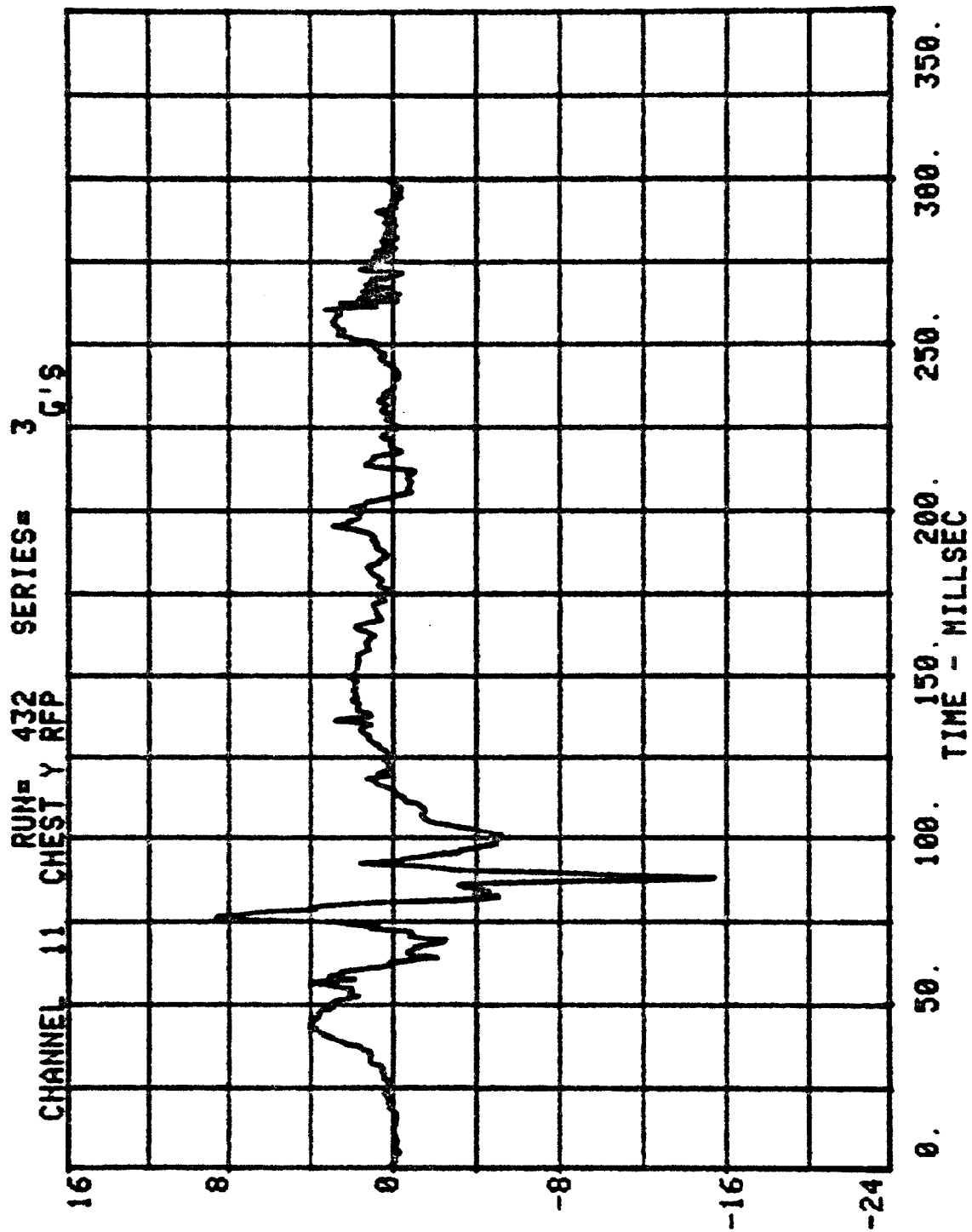


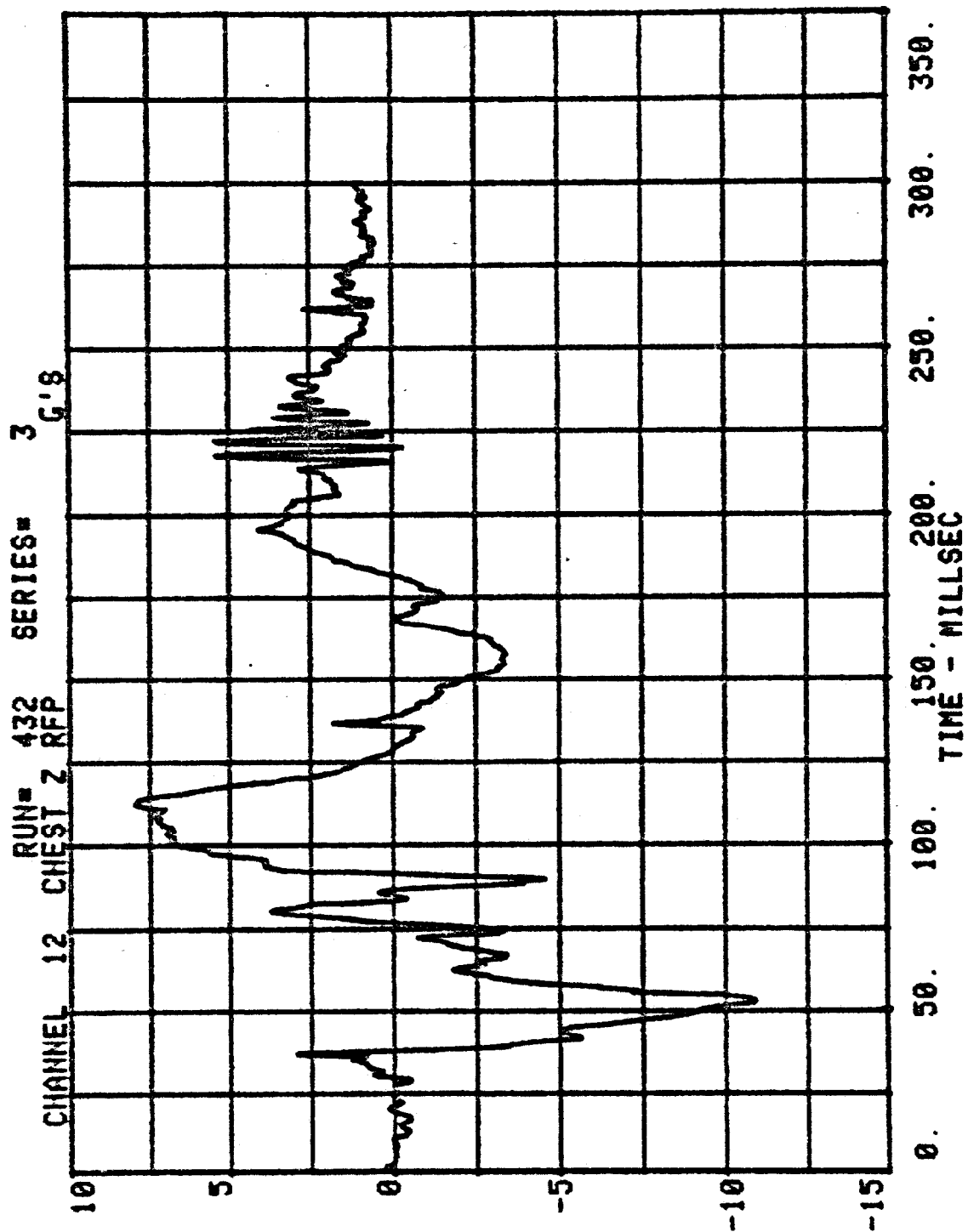


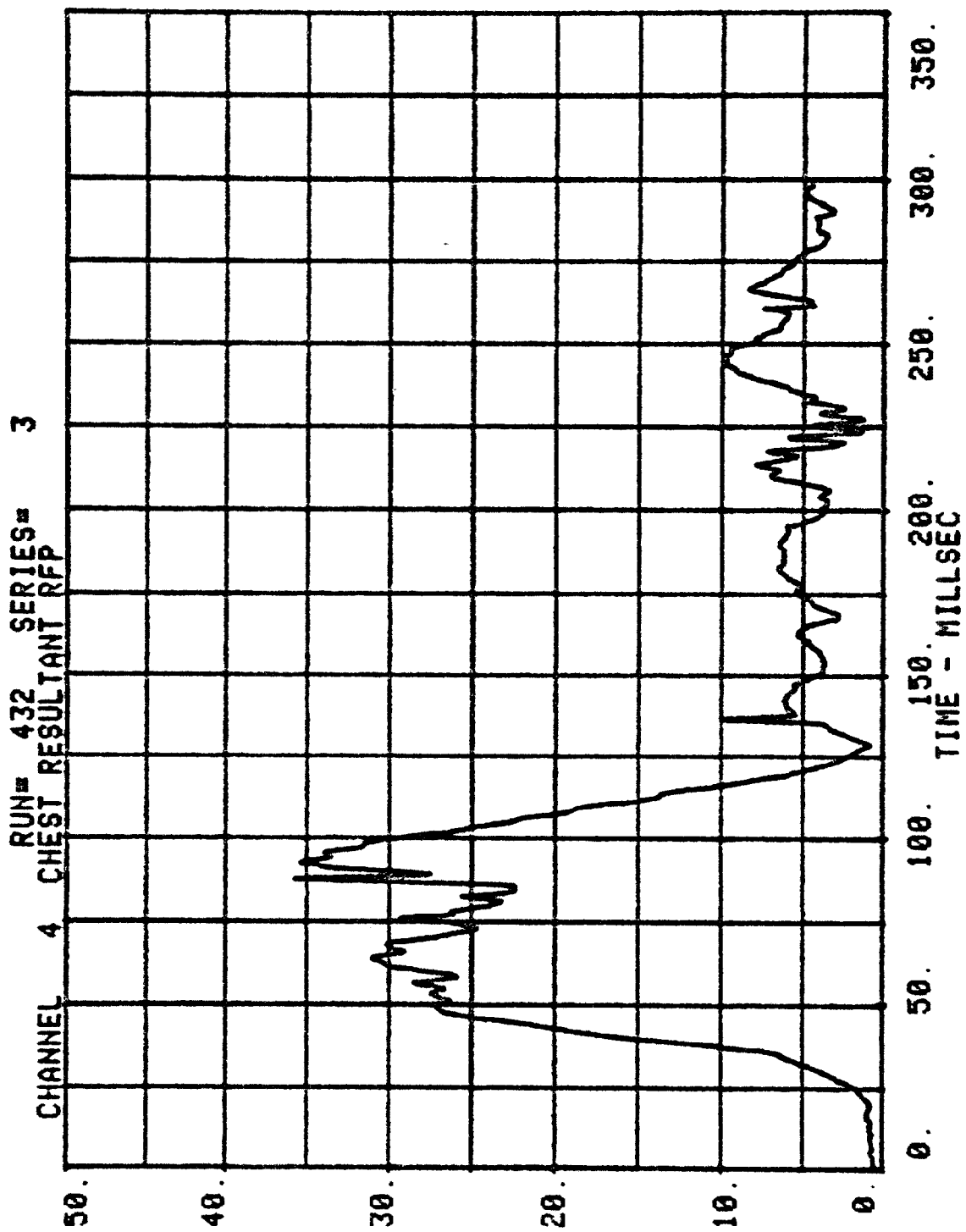












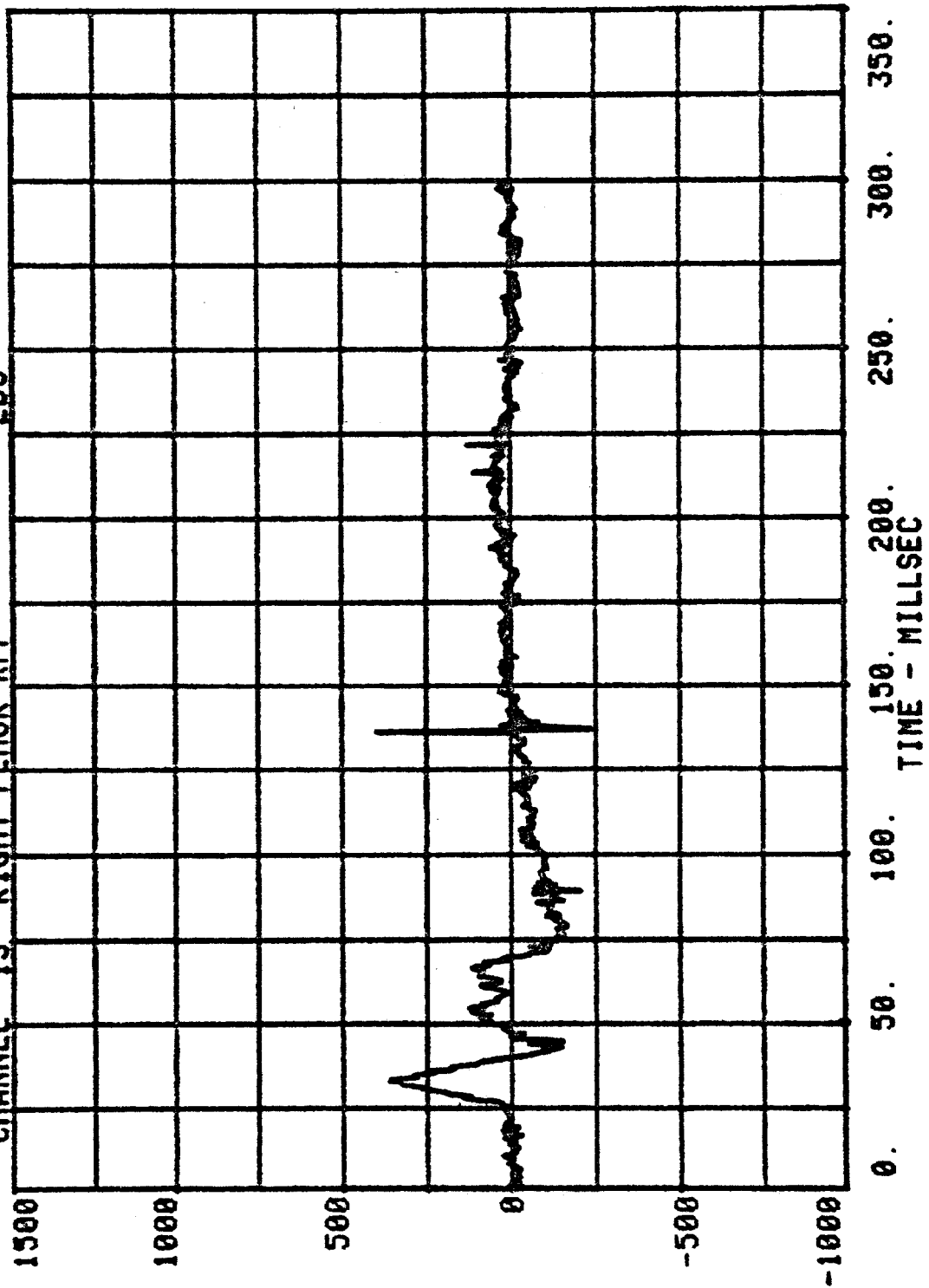
CHANNEL 15 RIGHT FEMUR RFP

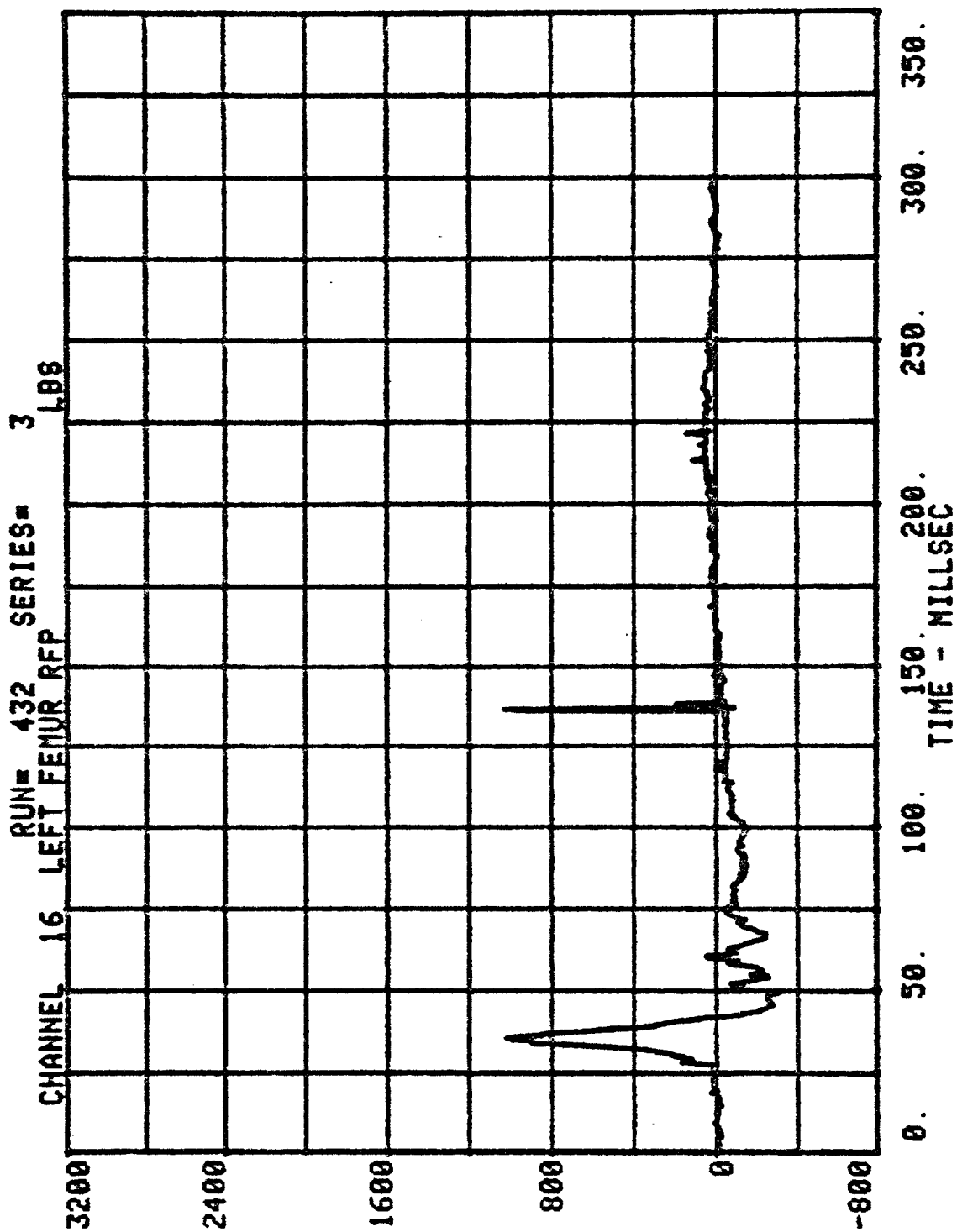
RUN= 432

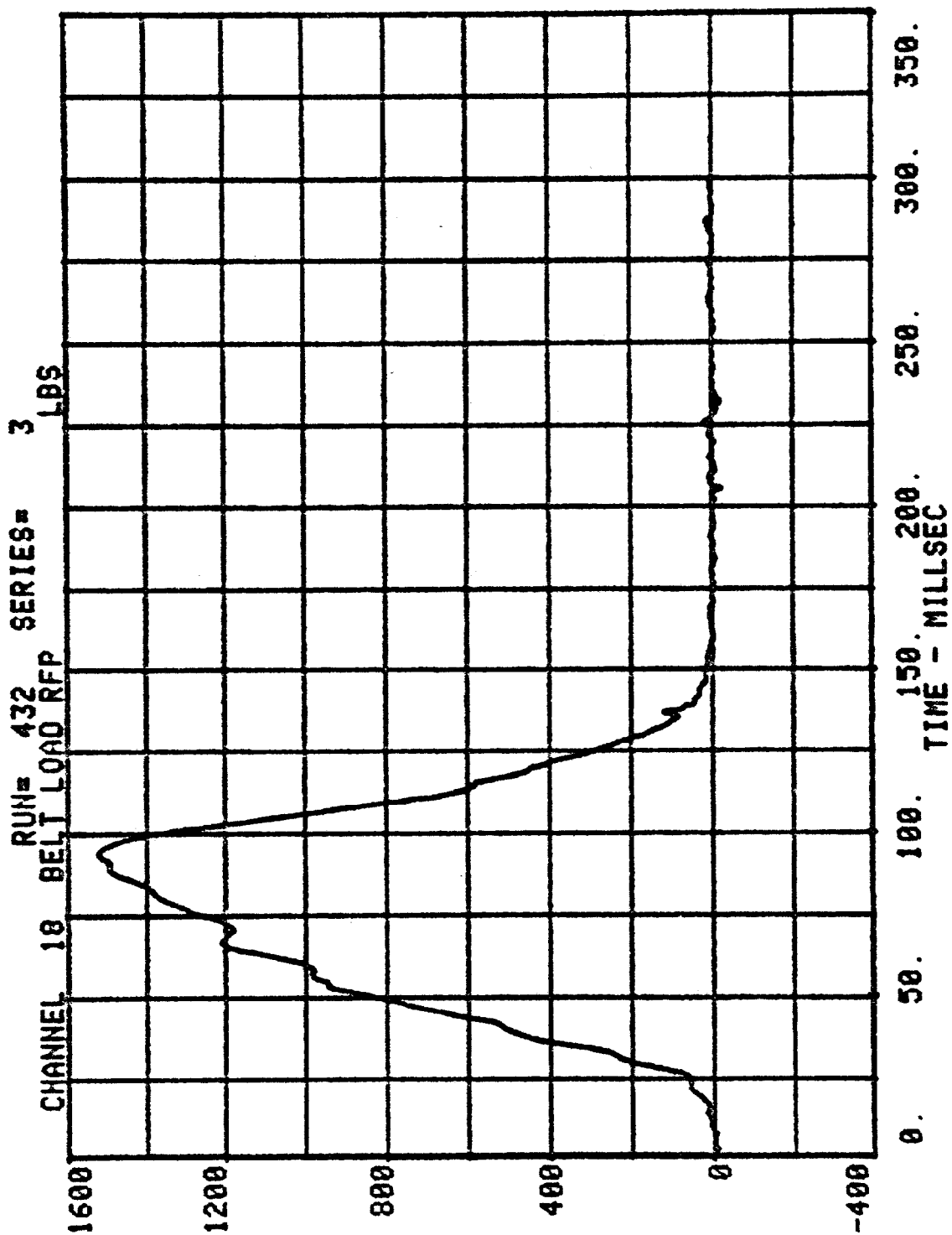
SERIES=

3

LBS







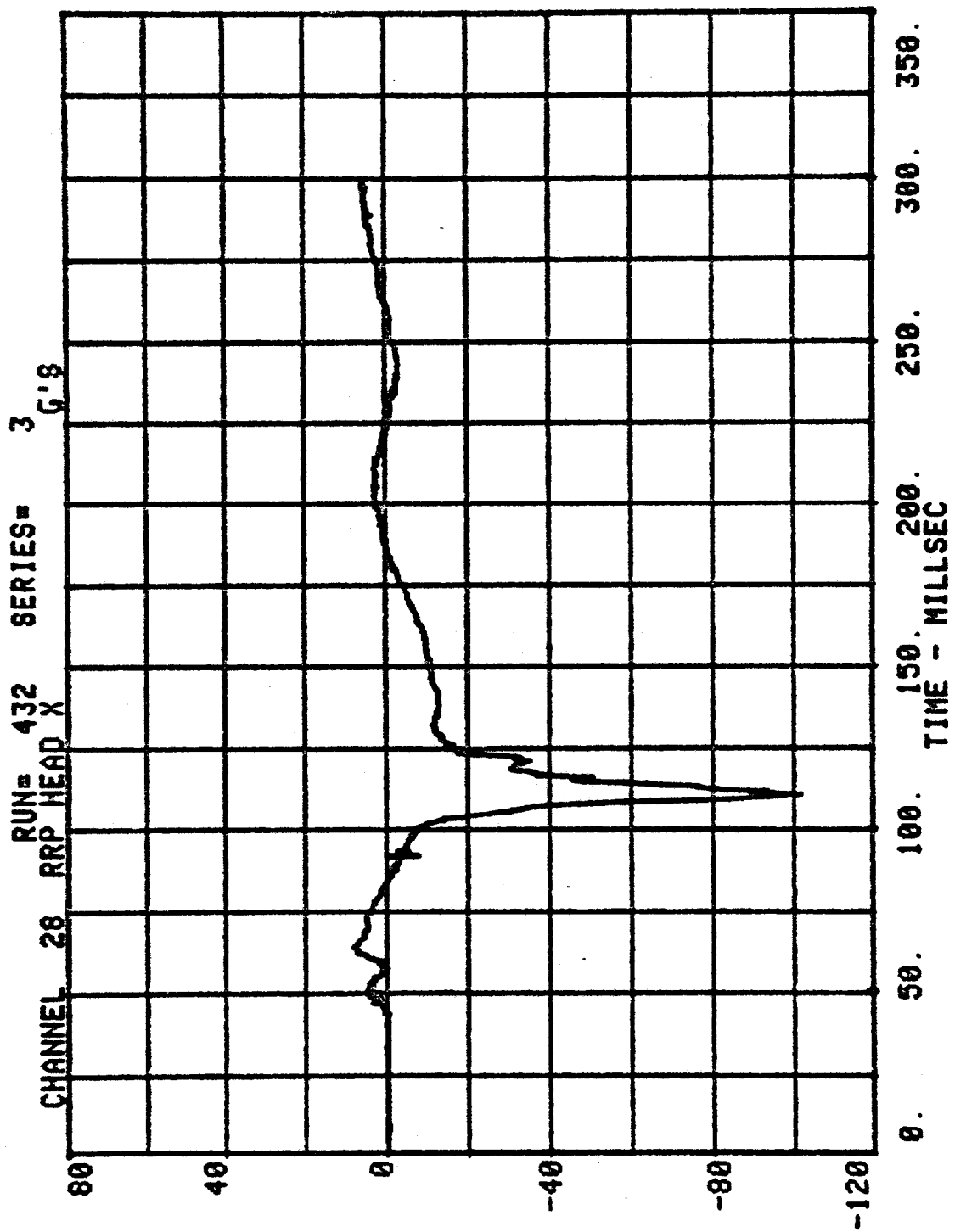
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

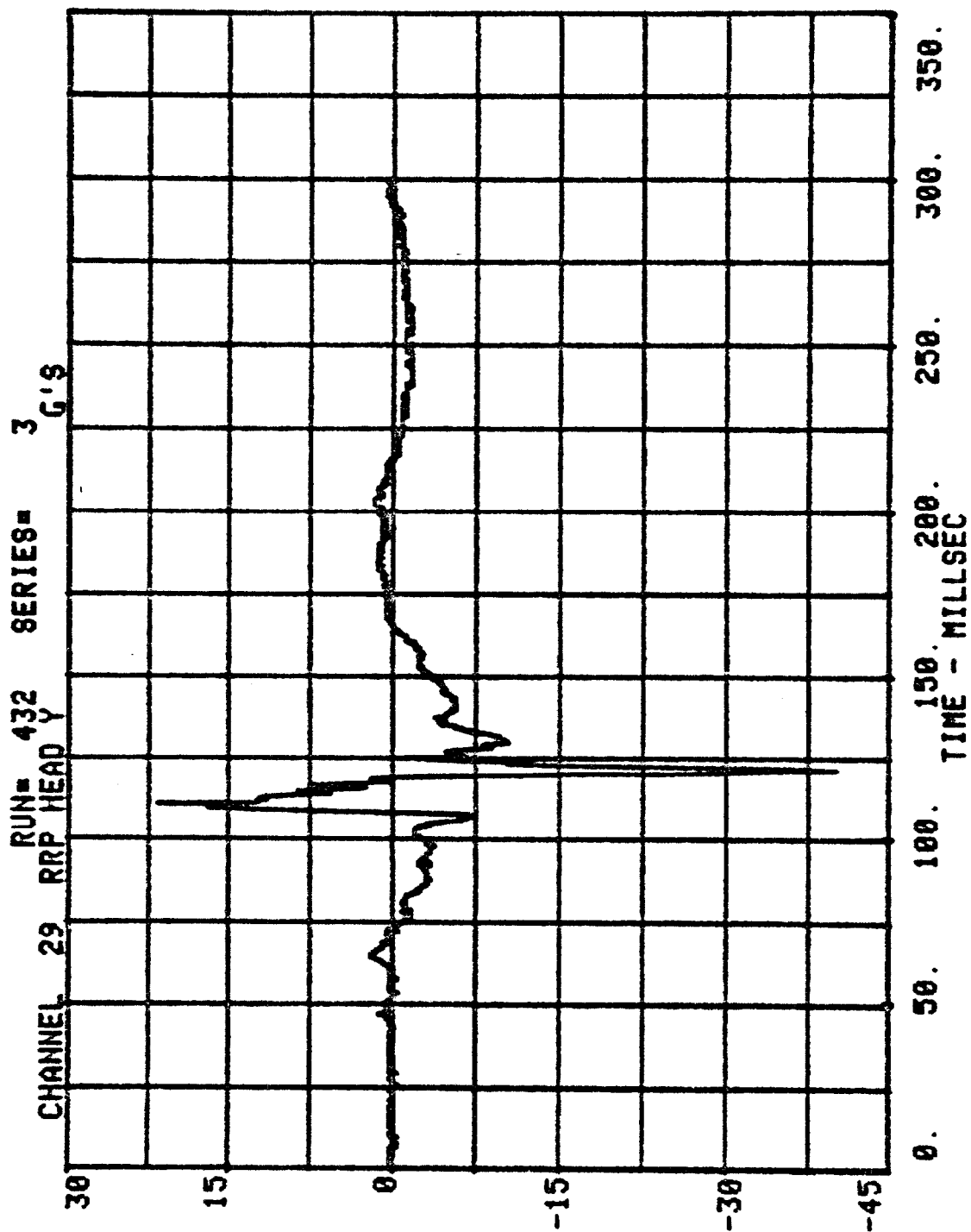
CITATION

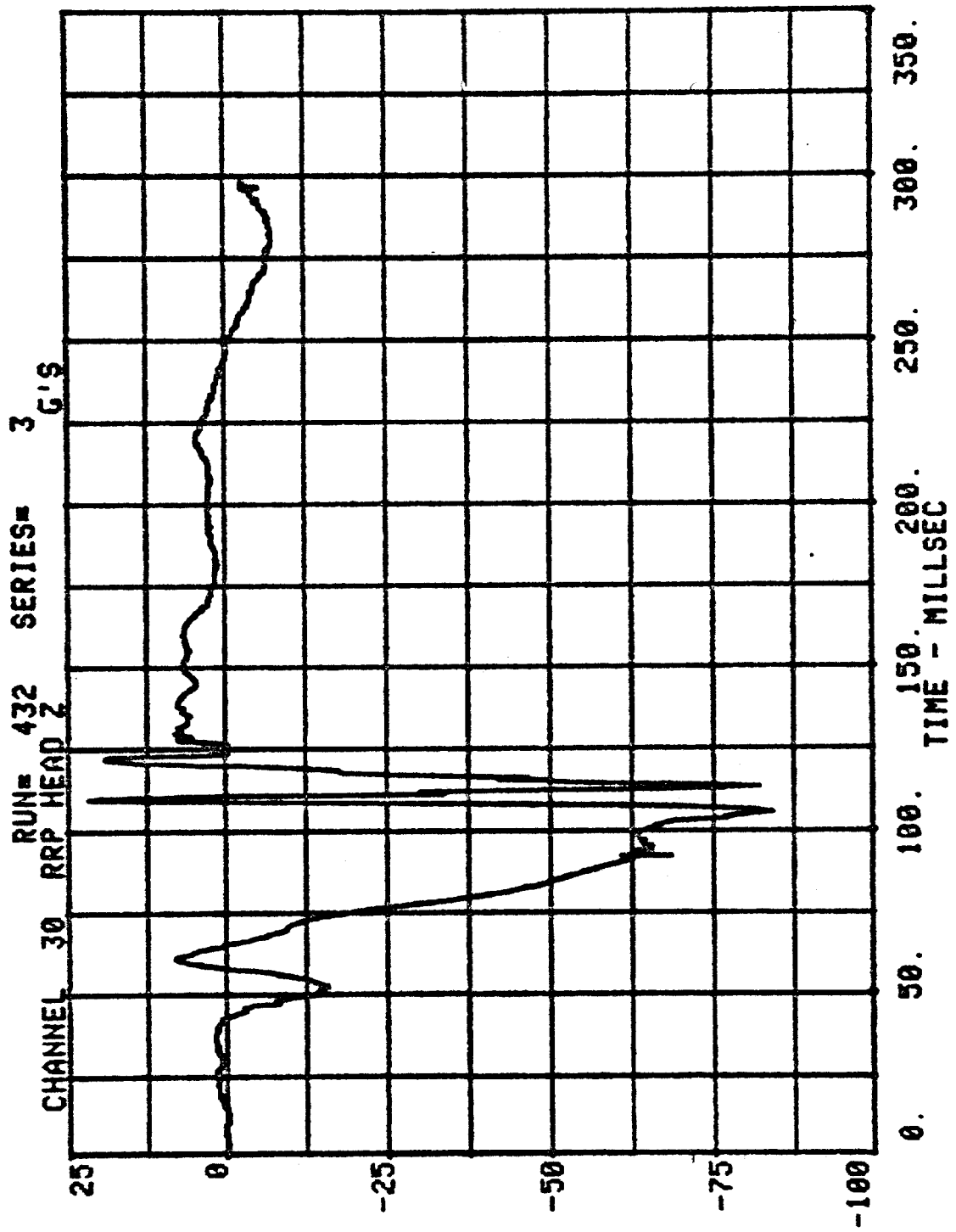
RUN= 432

6YR OLD HEAD RESULTANT

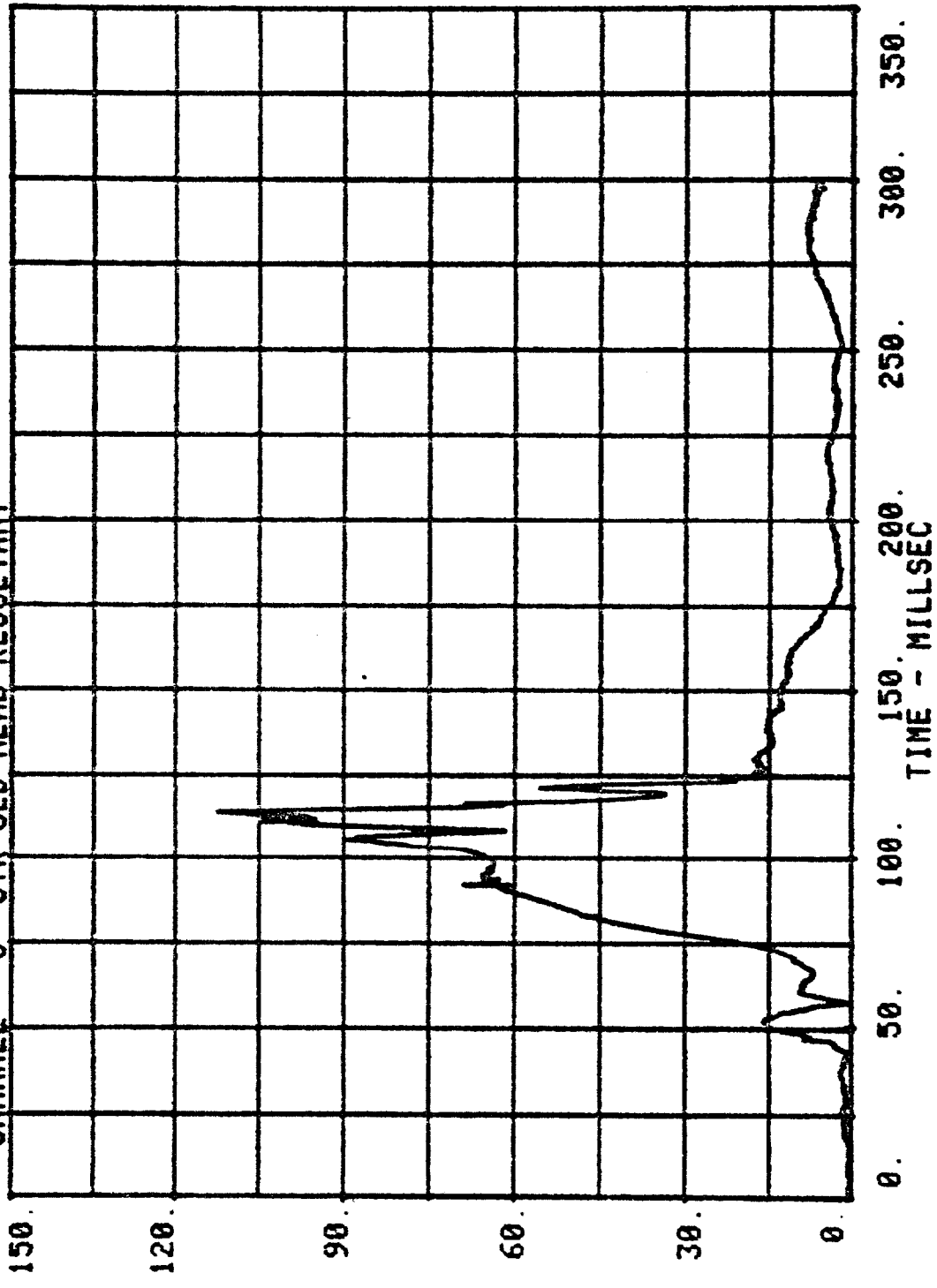
HIC=1450.5 FROM T1= .07980 TO T2= .12270
AVERAGE ACCELERATION BETWEEN T1 AND T2= 64.8G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1748.6

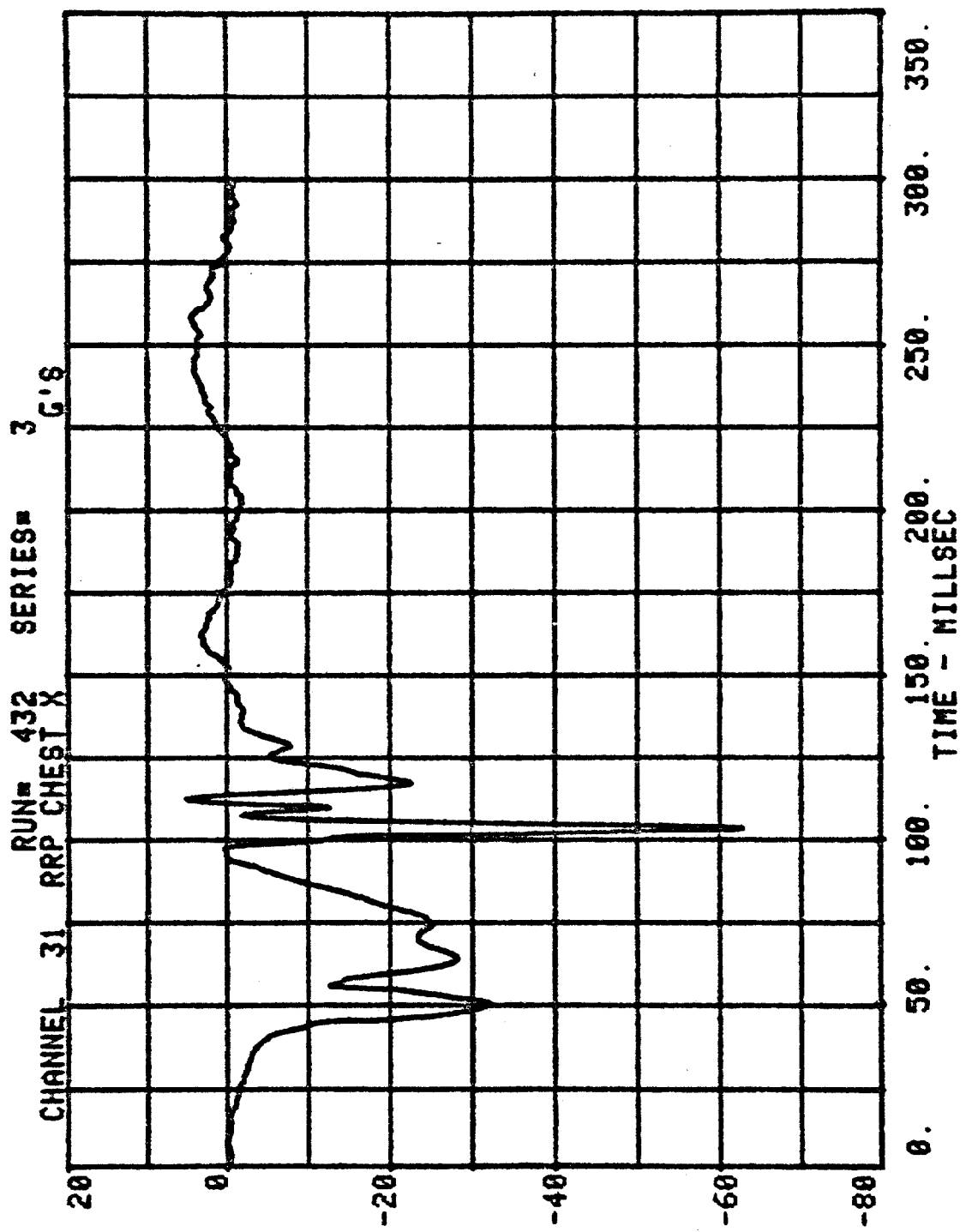


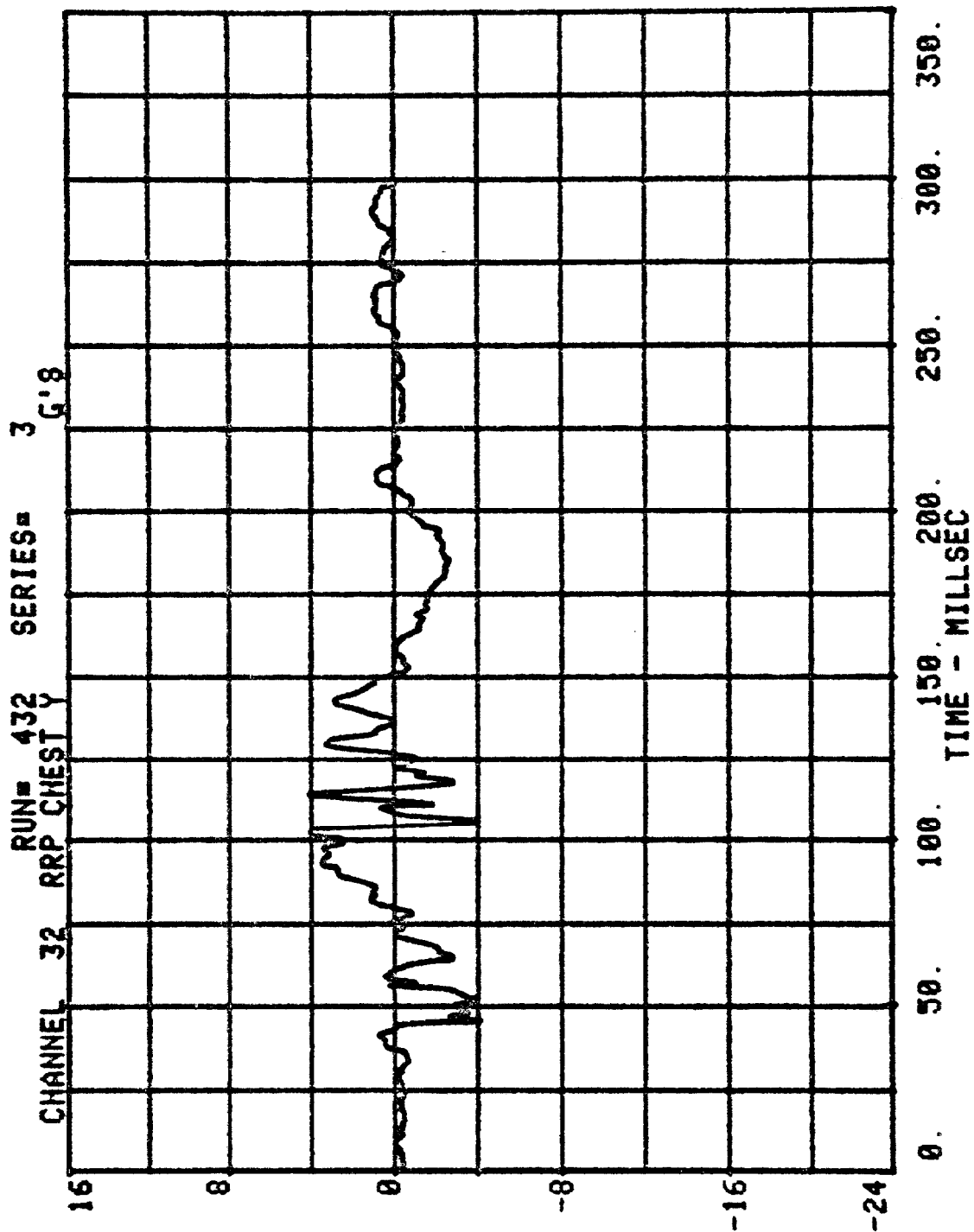


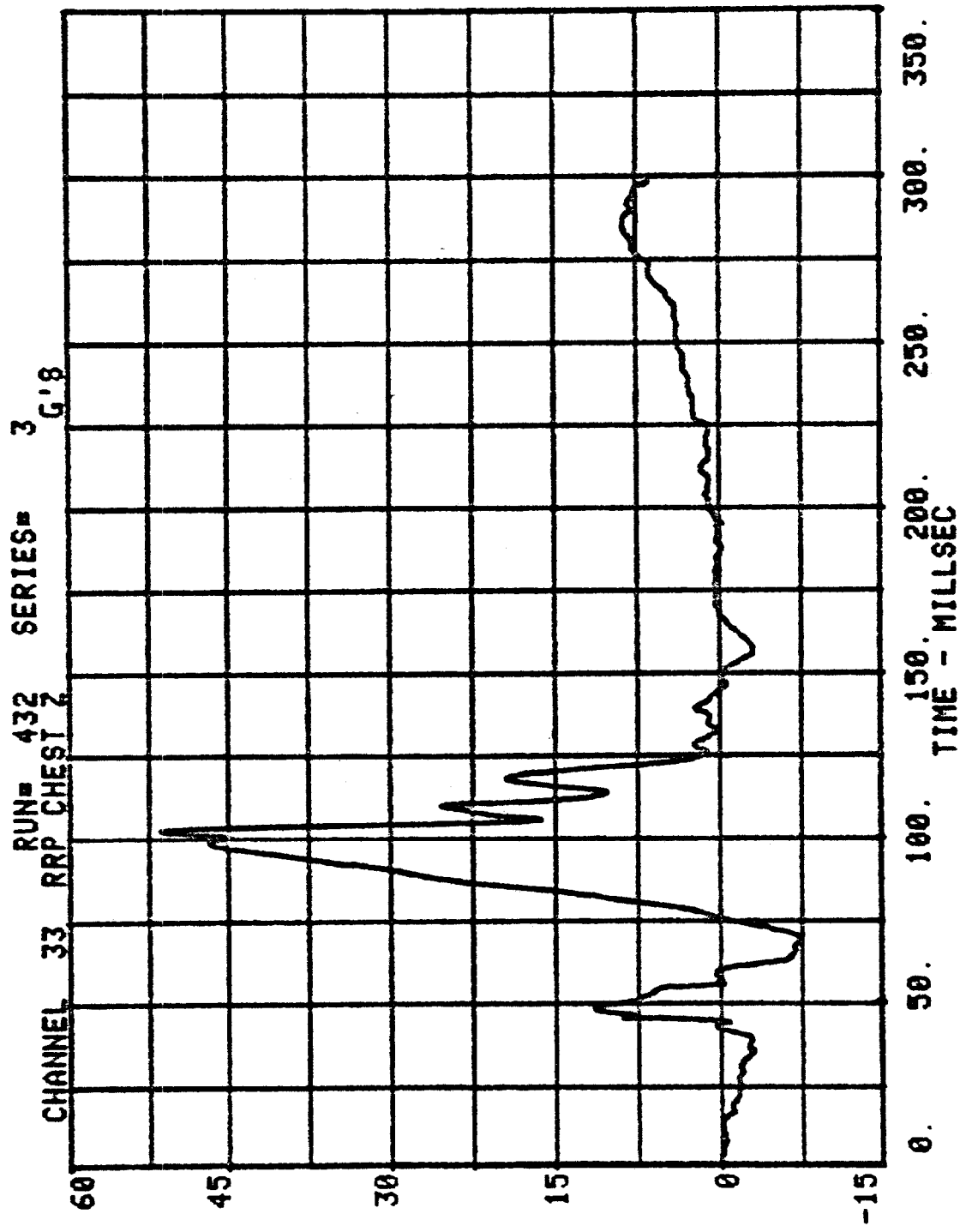


CHANNEL 5 RUN= 432 SERIES= 3
6 YR OLD HEAD RESULTANT

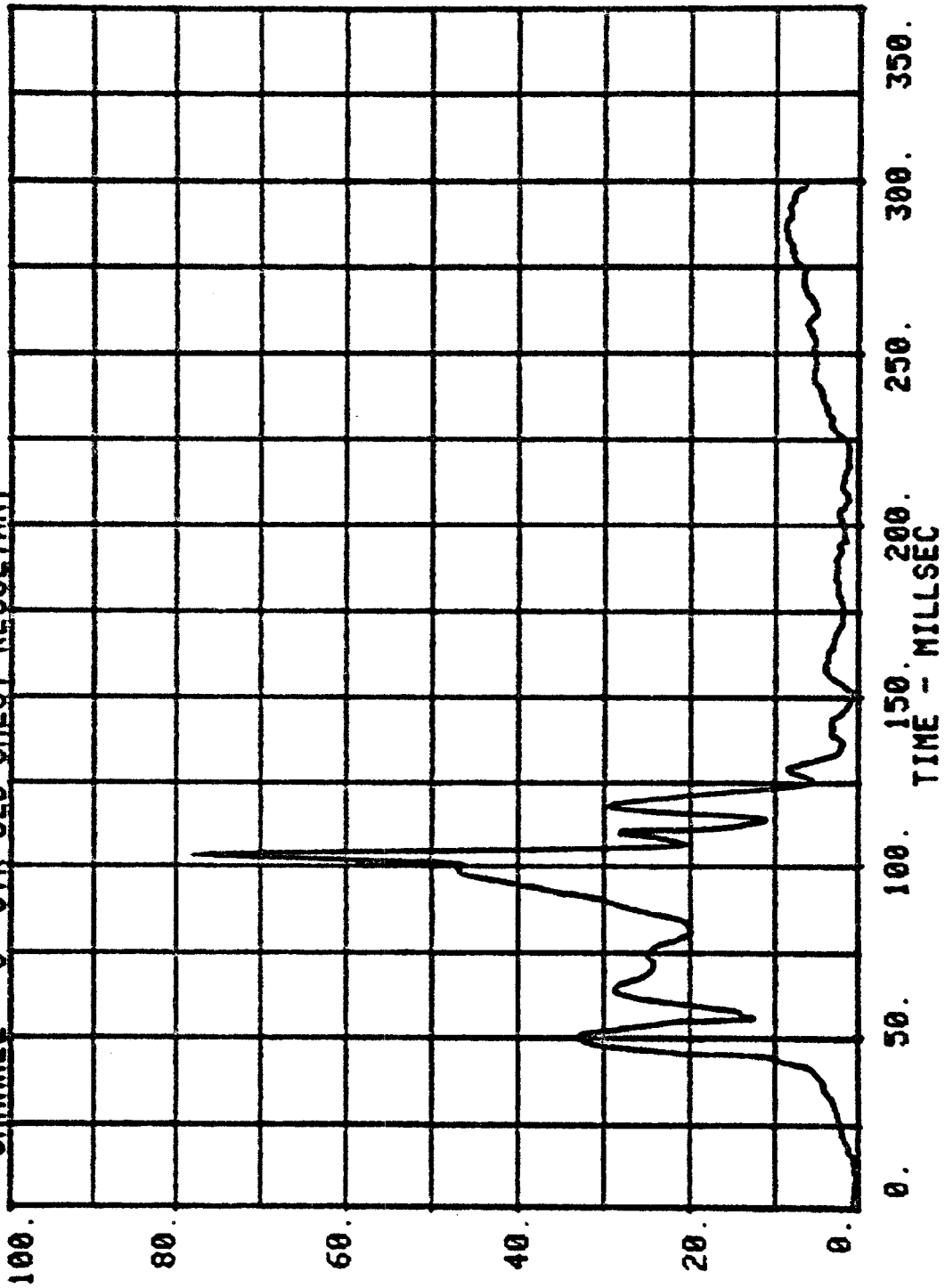








CHANNEL 6 6YR OLD CHEST RESULTANT RUN= 432 SERIES= 3



APPENDIX C
DUMMY CERTIFICATION TESTS

This test report contains results from certification tests performed on Alderson Research Laboratories Model ATD 30034, 50th percentile anthropomorphic test dummies, Serial Nos. 319, 320, which were completed on June 1, 1979. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Vol. 42, No. 25, dated February 7, 1977.

The tests were conducted at the Dummy Certification Test Facility of Calspan Corporation, Advanced Technology Center. A summary of the test results is presented in the following tables, Table 1C through 8C along with the Part 572 requirements.

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY I.D. NO.:

3	1	9
---	---	---

LABORATORY TECHNICIAN: FRED JULIANO

APPROVED BY:

Bruce Donnelly

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		6-8-79	
Calibration Sequential Number for Dummy - - - -		1	
Temperature in Lab. (Spec. = 66 to 78°F) - - - -		76°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		72%	
TEST PARAMETER	SPECIFICATION		
1. <u>HEAD DROP TEST:</u>			
a. Peak Resultant Accel. -	210 to 260G	215	
b. Peak Lateral Accel. - -	≤10G	4	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.2	
2. <u>NECK BENDING TEST:</u>			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	24.4	
b. Pendulum Avg. Decel. (over t ₃ - t ₂) - - - -	20 to 24G	20	
c. Peak Resultant Head Acceleration - - - -	26G maximum	19	
d. Pendulum Decel. (t ₂ -t ₁)	≤3 ms	1.9	
e. Pendulum Decel. (t ₃ -t ₂)	25 to 30 ms	25	
f. Pendulum Decel. (t ₄ -t ₃)	≤10 ms	10	
g. Pendulum Direction Reversal Time - - - -	≥123 ms	117	
h. Max. Head Rotation - -	63 to 73°	70°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0
	Displ.	-.5 to .5 in	0
30°	Time	25.6 to 34.4 ms	28
	Displ.	2.1 to 3.1 in.	2.7
60°	Time	40.3 to 51.7 ms	43
	Displ.	4.3 to 5.3 in.	4.9
Maximum (°)	Time	53.2 to 66.8 ms	61
	Displ.	5.0 to 6.0 in.	5.9

Continued

P, 572 DUMMY CALIBRATION TEST DATA Continued:

Dummy I.D. No.:

3	1	9
---	---	---

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST Continued				
i. Chordal Displacement: Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	78	
	Displ.	4.3 to 5.3 in.	4.9	
30°	Time	85.4 to 104.6 ms	96	
	Displ.	2.1 to 3.1 in.	2.5	
0°	Time	101.0 to 123.0 ms	111	
	Displ.	-.5 to 0.5 in.	.1	
3. ABDOMINAL COMPRESSION TEST: (Preload = 10 pounds)				
a. Force @ 1" - - - - -		50 to 63 lbs.	60	
b. Force @ 1.3" - - - - -		73 to 80 lbs.	87	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - - -		22 to 34 lbs.	27	
b. Force @ 30° - - - - -		34 to 46 lbs.	37	
c. Force @ 40° - - - - -		46 to 58 lbs.	51	
d. Return Angle - - - - -		12° maximum	6°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed - - - - -		21.78-22.22 fps	21.81	
(2) Peak Deflection - - - - -		1.7" maximum	1.2	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	2020	
(4) Internal Hysteresis - - - - -		50 to 70%	57%	
b. Low Speed				
(1) Probe Speed - - - - -		13.86-14.14 fps	13.94	
(2) Peak Deflection - - - - -		1.1" maximum	1.1	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1088	
(4) Internal Hysteresis - - - - -		50 to 7%	52%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

Dummy I.D. No.:

3	1	9
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TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.78	
(2) Maximum Force - -	1850 to 2500 lbs	24.75	
(3) Time Above 1000#	1.7 ms minimum	1.8	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.002	
(2) Maximum Force - -	1850 to 2500 lbs.	2125	
(3) Time Above 1000#	1.7 ms minimum	2.0	

INSTRUMENT CALIBRATION INFORMATION

DUMMY I.D. NO.:

3	1	9
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CALIB. SEQ. NOS. FOR DUMMY: _____ & _____

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

- a. Triaxial unit - - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

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

- a. Triaxial unit - - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

- a. Right Side - - - - -
- b. Left Side

B. CALIB. LAB. INSTRUMENTS:

- 1. Pendulum Accelerometer - -
- 2. Test Probe Accelerometer -
- 3. Lumbar Flexion Test Push
Force Gauge - - - - -
- 4. Abdominal Compression Test
Force Gauge - - - - -
- 5. Abdominal Compression Test
Displacement Gauge - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	CS09	1-79	
ENDEVCO	CS41	1-79	
ENDEVCO	CU62	1-79	
BELL HOWELL	A72	1-79	
ENDEVCO	CS75	4-79	
BELL HOWELL	A56	1-79	
OHMITE	JAIN 200P	6-79	
GSE	310	1-79	
GSE	306	1-79	
BELL HOWELL	17547	2-79	
BELL HOWELL	16928	1-79	
BLH ELECTRONICS	72952	6-79	
BLH ELECTRONICS	72952	6-79	
BOURNS	108	6-79	
C-6		6525-V-3	

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY I.D. NO.:

3	2	0
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LABORATORY TECHNICIAN: _____

APPROVED BY: _____

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		6-8-79	
Calibration Sequential Number for Dummy - - - -		2	
Temperature in Lab. (Spec. = 66 to 78°F) - - - -		76°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		72%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	211	
b. Peak Lateral Accel. - -	≤10G	2.0	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.1	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	24.66	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	21.0	
c. Peak Resultant Head Acceleration - - - -	26G maximum	21.5	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	1.5	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	25	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	10	
g. Pendulum Direction Reversal Time - - - -	≥123 ms	120	
h. Max. Head Rotation - -	63 to 73°	69°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0
	Displ.	-.5 to .5 in	0
30°	Time	25.6 to 34.4 ms	28
	Displ.	2.1 to 3.1 in.	2.7
60°	Time	40.3 to 51.7 ms	45
	Displ.	4.3 to 5.3 in.	5.0
Maximum (°)	Time	53.2 to 66.8 ms	61
	Displ.	5.0 to 6.0 in.	5.8

Continued

P, 572 DUMMY CALIBRATION TEST DATA Continued:

Dummy I.D. No.:

3	2	0
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TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST			
<u>Continued</u>			
i. Chordal Displacement:			
Head Rotation Angle --			
60°	Time	67.0 to 83.0 ms	77
	Displ.	4.3 to 5.3 in.	5.2
30°	Time	85.4 to 104.6 ms	97
	Displ.	2.1 to 3.1 in.	2.5
0°	Time	101.0 to 123.0 ms	112
	Displ.	-.5 to 0.5 in.	.15
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - - -	50 to 63 lbs.	57	
b. Force @ 1.3" - - - - -	73 to 80 lbs.	78	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - - -	22 to 34 lbs.	33	
b. Force @ 30° - - - - -	34 to 46 lbs.	44	
c. Force @ 40° - - - - -	46 to 58 lbs.	53	
d. Return Angle - - - - -	12° maximum	6	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed - - -	21.78-22.22 fps	21.83	
(2) Peak Deflection - -	1.7" maximum	1.55	
(3) Peak Resistive Force - - - - -	2250 lbs. maximum	1770	
(4) Internal Hysteresis - - - - -	50 to 70%	54%	
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps	13.91	
(2) Peak Deflection - -	1.1" maximum	.85"	
(3) Peak Resistive Force - - - - -	1450 lbs. maximum	1347	
(4) Internal Hysteresis - - - - -	50 to 7%	52%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

Dummy I.D. No.:

3	2	0
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TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.99	
(2) Maximum Force - -	1850 to 2500 lbs	2300	
(3) Time Above 1000#	1.7 ms minimum	1.9	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.96	
(2) Maximum Force - -	1850 to 2500 lbs.	206°	
(3) Time Above 1000#	1.7 ms minimum	2.0	

INSTRUMENT CALIBRATION INFORMATION

DUMMY I.D. NO.:

3	2	0
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CALIB. SEQ. NOS. FOR DUMMY: _____ & _____

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

- a. Triaxial unit - - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

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

- a. Triaxial unit - - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

- a. Right Side - - - - -
- b. Left Side

B. CALIB. LAB. INSTRUMENTS:

- 1. Pendulum Accelerometer - -
- 2. Test Probe Accelerometer -
- 3. Lumbar Flexion Test Push
Force Gauge - - - - -
- 4. Abdominal Compression Test
Force Gauge - - - - -
- 5. Abdominal Compression Test
Displacement Gauge - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	CL60	1-79	
ENDEVCO	CG34	1-79	
ENDEVCO	CK11	1-79	
BELL HOWELL	A126	4-79	
ENDEVCO	AA07	4-79	
BELL HOWELL	A27	4-79	
OHMITE	JAIN 200P	6-79	
GSE	312	1-79	
GSE	311	1-79	
BELL HOWELL	17547	2-79	
BELL HOWELL	16928	1-79	
BLH ELECTRONICS	72952	6-79	
BLH ELECTRONICS	72952	6-79	
BOURNS	108	6-79	
C-10		6525-V-3	

Electronic Test Equipment

The complement of signal conditioning recording and display equipment used in conjunction with dummy certification testing is shown in Figure 8.

- Data Acquisition - Sangamo Mod 3500 14 channel FM Tape Transport (recording Speed: 60 in/sec).
- Data Reduction - Brush Mark 260 6-channel recorder or Pace X-Y plotter.
- Signal Conditioning - Calspan designed and fabricated bridge amplifiers providing gain, balance, and shunt calibration of all sensor inputs.
- Computational Equipment - Calspan designed and fabricated analog computer consisting of operational amplifiers in circuit configurations providing continuous computation of acceleration vector magnitude and Severity Index relationships.
- Signal Filtering - Calspan designed and fabricated second order active filters (6 channels) with selectable frequency responses consistent with SAE J211b Class 60, 180, 600, and 1000 requirements. Filters are compensated for 32:1 real time expansion resulting from data recording at 60 in/sec and playback at 1-7/8 in/sec.
- Real Time Reference - Tektronix Time Mark Generator; 1 and 10 millisecond is synchronously recorded with all certification data and reproduced at playback on all strip chart records.

- The data acquisition, reproduction, and time reference equipment is maintained by Calspan's Equipment and Standards Laboratory (ESL), which is an NBS traceable calibration facility. Other special purpose equipment is maintained by qualified test facility personnel using support equipment maintained and standardized by all ESL.

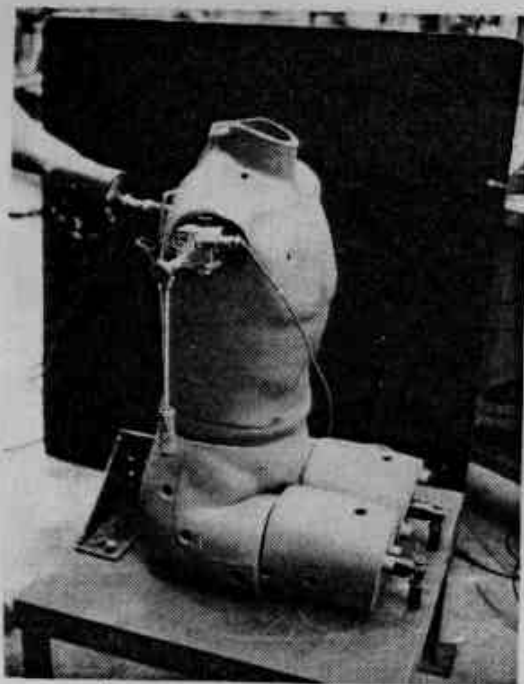


FIGURE C-1
LUMBAR SPINE FLEXION TEST APPARATUS

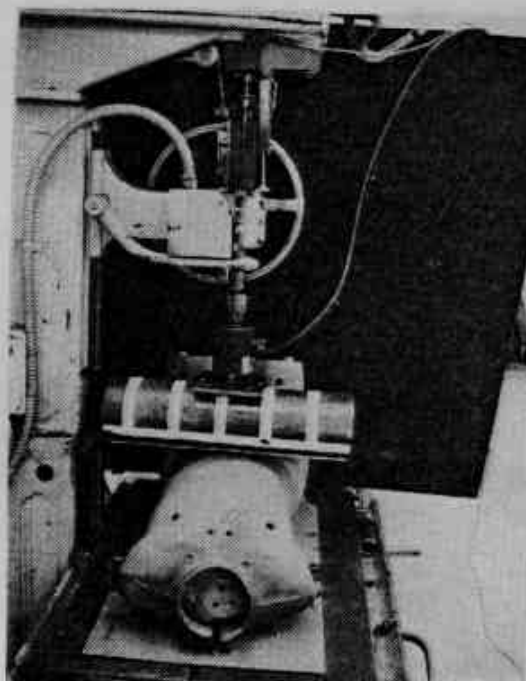


FIGURE C-2
ABDOMEN PRESS TEST APPARATUS

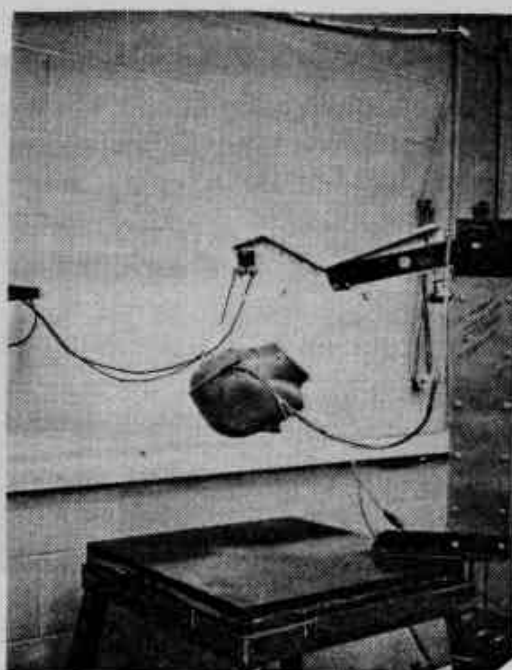


FIGURE C-3
HEAD DROP TEST APPARATUS

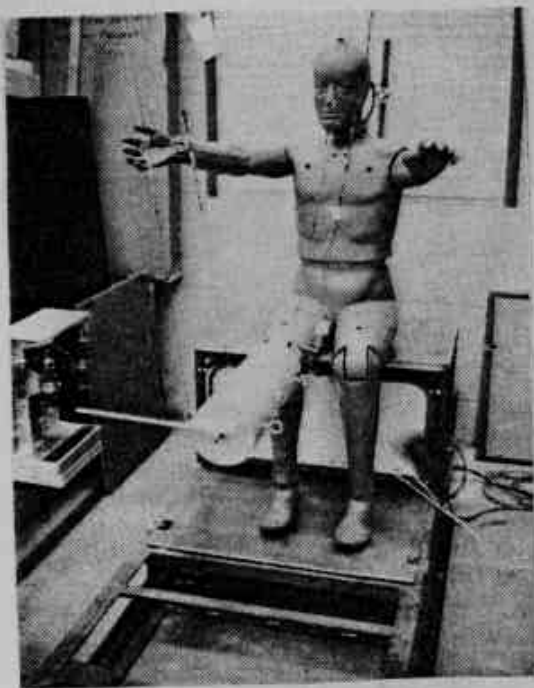


FIGURE C-4
KNEE IMPACT TEST APPARATUS

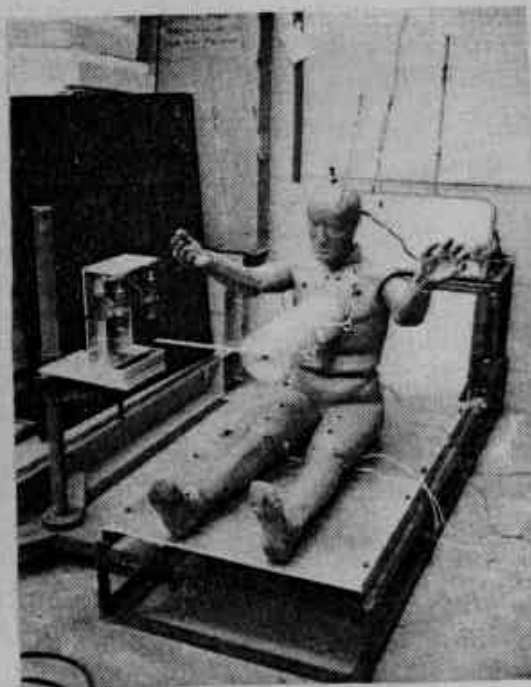


FIGURE C-5
THORAX IMPACT TEST APPARATUS

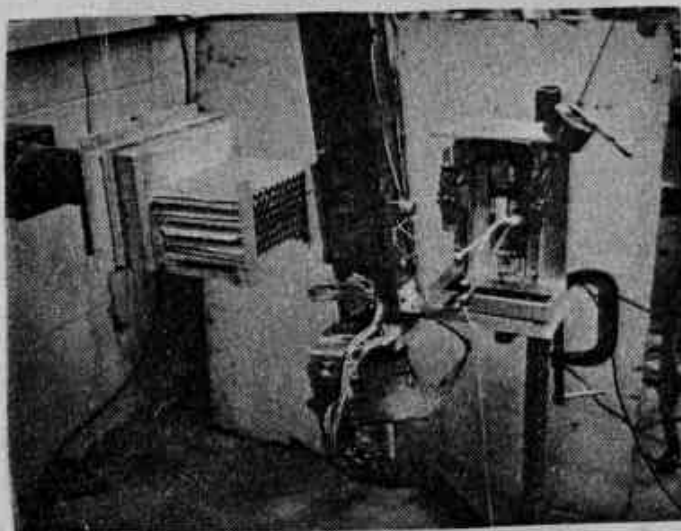


Figure C-6
NECK IMPACT TEST APPARATUS

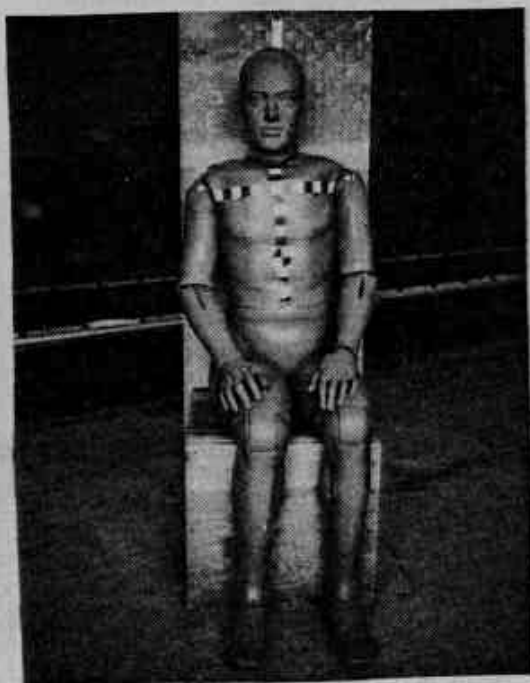


FIGURE C-7



FIGURE C-7
PART 572 TEST DUMMY
FRONT & SIDE VIEW

C-15

6525-V-3

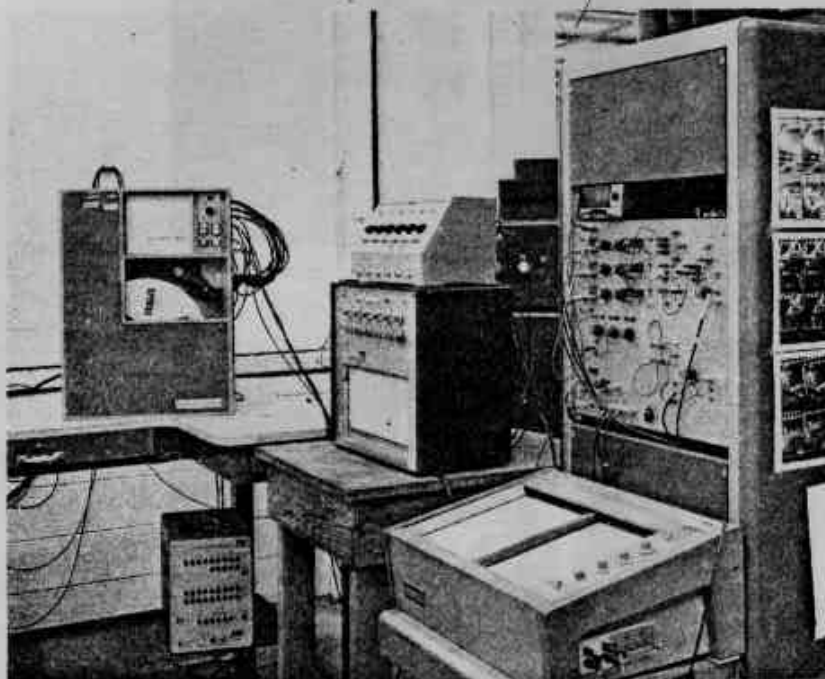


Figure C-8. ELECTRONIC TEST EQUIPMENT