

REPORT NO. 6525-V-5

NEW CAR ASSESSMENT AND STANDARDS

ENFORCEMENT INDICANT TESTING

FMVSS NOS. 212, 219 AND 301-75

VOLKSWAGEN OF AMERICA, INC.
1979 VW RABBIT 2-DOOR HATCHBACK
NHTSA-308-T5-441

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DOT 6525-V-5

July 10, 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
Washington, D. C. 20590

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Contract Technical Manager

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16. Abstract A frontal barrier test of a 1979 VW Rabbit, 2-Door Hatchback, was performed at Calspan Corporation, Advanced Technology Center, Transportation Research Department facility for the New Car Assessment and Standards Enforcement Indicant Testing of FMVSS 212 - Windshield Mounting; FMVSS 219 - Windshield Zone Intrusion; FMVSS 301-75 - Fuel Standard Integrity for the Office of Vehicle Safety Compliance, the Office of Automotive Ratings and for Research and Development. Impact Speed was 34.8 mph. Post-impact maximum vehicle crush was 22.7. Compartment intrusion was 9.6". The vehicle complied in all respects with FMVSS 212, FMVSS 219 and FMVSS 301-75. Driver 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 1979 Volkswagen Rabbit, 2-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 TEST NUMBER 5

Test number 5 was a frontal barrier impact of a 1979 Volkswagen Rabbit 2-door Hatchback traveling at 34.8 mph. Table 1 presents pertinent crash test information. Maximum crush of the vehicle was 22.7 inches measured at the vehicle centerline (position X1 in Figure 1 and Table 4). The average crush measured from the rear surface to right side of front bumper (position X19) and rear surface to left side of front bumper (position X20) is 21.9 inches. Vehicle pre- and post-impact photographs are found in Appendix A.

The driver and right front passenger positions were occupied by two Part 572 50th percentile anthropometric test devices (ATDs) and both were restrained with production 2-point passive torso belt systems. An Alderson VIP-6C 6-year old size ATD was positioned as the right rear passenger and restrained with a lap belt. These three ATDs were instrumented in the head and chest regions with triaxial accelerometers and the 50th percentile ATDs were also equipped with femur load cells. Dummy injury criteria measurements are presented in Table 3 and the response data traces are found in Appendix B.

The 50th percentile ATDs used in this crash had been certified prior to the last crash test (308-T4-440). Currently there are no certification procedures defined for the six-year-old size ATD. Since neither of the 50th percentile ATDs failed to comply with FMVSS 208 injury criteria on the previous test, it was not necessary to re-certify them before the current crash test (308-T5-441). All certification data are presented in Appendix C.

Post-test observations are discussed under General Comments.

Table 1

CRASH TEST SUMMARYTEST NO. 308-T5-441 PROJECT: NEW CAR ASSESSMENT PROGRAMDATE: 7-10-79 TIME: 15:39 TEMP: 78°VEHICLE 1979 Volkswagen Rabbit, 2-Door HatchbackTEST WEIGHT (lbs) 2600IMPACT ANGLE (deg)* 0IMPACT VELOCITY (mph)** 34.8 51.04 fpsMAX. CRUSH (in) 22.7MAX. INTRUSION (in) 9.6"

DUMMIES

TYPE HYBRID II PART 572 HYBRID II PART 572 ALDERSON VIP-6CLOCATION LF(1) RF(2) RR(3)RESTRAINT 2-POINT PASSIVE 2-POINT PASSIVE LAP BELT

TORSO BELT

TORSO BELT

NUMBER OF DATA CHANNELS 36NUMBER OF HIGH SPEED CAMERAS 8 + 1 Real Time

*With respect to tow track Centerline

**Speed trap measurement ($\pm .05\%$ accuracy)

GENERAL COMMENTS

The Volkswagen Rabbit complied with FMVSS Nos. 212, 219 and 301-75. There was 100% windshield retention (FMVSS 212), no windshield intrusion (FMVSS 219) and no fuel leakage after impact or during rollover test (FMVSS 301-75).

The right front passenger experienced no head contact with the vehicle interior and complied with FMVSS 208 injury criteria. The driver ATD did not comply in both the head and chest areas as he sustained contact with the steering wheel as the steering column was forced upward and into the occupant compartment during impact. The driver ATD head contacted with the hub of the steering wheel and ATD chest contact deformed the lower rim of the steering wheel. Steering wheel deformation is evident in Figure 5A and 9A.

The 6-year old size ATD positioned as the right rear passenger and restrained with a lap belt generated a HIC number of over 2000 due to an apparent head contact with the back of the front seat. A post-test photograph of the child position can be reviewed in Figure 8A.

Some general post-impact observations:

- Vehicle complied in all respects with FMVSS Nos. 212, 219 and 301-75.
- Windshield damage consisted of a few central cracks (Figure 7A).
- The side and rear windows remained intact.
- Right and left front tires were pinched by vehicle crush but remained inflated (Figure 2A).

Table 2
VEHICLE TEST WEIGHTS AS TESTED

Left Front	710 lbs
Right Front	760 lbs
Total Front	<u>1470 lbs</u>

Left Rear	580 lbs
Right Rear	550 lbs
Total Rear	<u>1130 lbs</u>

Total Weight = 1470 + 1130 = 2600 lbs

Wheel Base = 94.5 inches

$Cg_{F.W.} = \frac{1130 \text{ lbs} \cdot 94.5 \text{ inches}}{2600 \text{ lbs}} = 41.07 \text{ inches}$

CALCULATION FOR TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
UDW = Unloaded Delivered Weight (1960 lbs)
VCW = Vehicle Capacity Weight (862 lbs)
DSC = Designated Seating Capacity (4)

RCLW = VCW - 150 (DSC)
RCLW = 862 - 150(4) = 262 LBS

TEST WEIGHT = UDW + RCLW + (NO. 50th DUMMIES X 164 LBS) + (NO. 6-YEAR DUMMIES X 48 LBS)
TEST WEIGHT = 1960 + 262 + 328 + 48
TEST WEIGHT = 2598 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)	-78	-28	72.5	90	-59	-36	-14	67	59			
DUMMY (2)	-11	23	46	47	-31	23	- 5	33	36			
DUMMY (3)	-65	-67	85	103	-28	-15	50	52				
DUMMY (4)												

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	630	1170
DUMMY (2)	1460	937
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)	1837		
DUMMY (2)	1837		
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)	1023.9	.0762	.0945	79.3	1306.7	
DUMMY (2)	428.8	.0606	.1296	32.9	541.5	
DUMMY (3)	2192.5	.0735	.14250	63.2	2695.6	
DUMMY (4)						

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

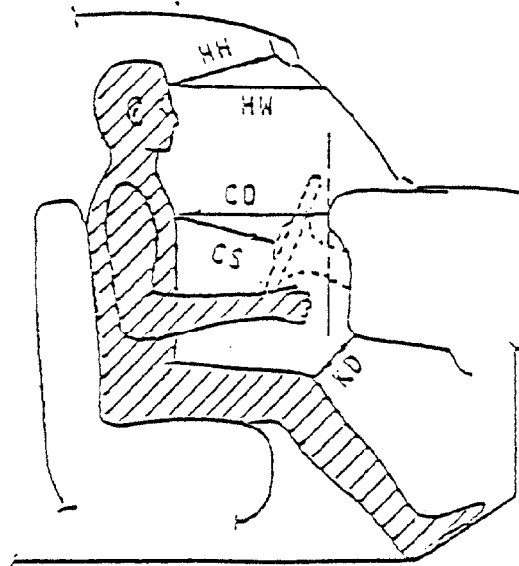
PRE-TEST AND POST-TEST MEASUREMENT POINTS



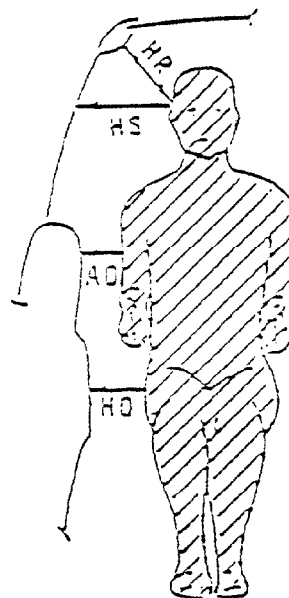
Table 4

	NO.	TYPE OF MEASUREMENT	ALL DIMENSIONS IN INCHES	
			PRE- TEST	POST TEST
	X1	Total Length of Vehicle at Centerline	154.2	131.5
	X2	Rear Surface of Vehicle to Front of Engine	136.7	127.25
	X3	Rear Surface of Vehicle to Firewall	114.4	108.25
	X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	102.5	102.5
	X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	102.4	102.25
	X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	102.6	102.0
	X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	102.5	102.0
	X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	58.7	58.7
	X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	58.6	58.6
	X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	58.5	58.0
	X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	58.4	58.0
	X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	101.7	101.25
	X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	101.5	101.0
	X14	Rear Surface of Vehicle to Firewall - Right Side	113.5	107.5
	X15	Rear Surface of Vehicle to Firewall - Left Side	114.4	104.75
	X16	Rear Surface of Vehicle to Steering Column	93.2	93.25
	X17	Center of Steering Column to "A" Post	14.0	14.0
	X18	Center of Steering Column to Headliner	20.2	17.25
	X19	Rear Surface of Vehicle to Right Side of Front Bumper	153.3	131.2
	X20	Rear Surface of Vehicle to Left Side of Front Bumper	153.2	131.5
	X21	Length of Engine Block	22	20.5
	X22	ENGINE TO FIREWALL	2.6	0.0

	<u>DRIVER</u>	<u>PASS</u>
HH	19.0	18.5
HW	23.5	23.0
CD	22.7	24.0
CS	15.0	N/A
KDL	3.7	3.5
KDR	3.9	3.6



HR	7.0	6.5
HS	8.5	8.1
AD	4.5	4.0
HD	7.0	5.2



ALL DIMENSIONS ARE IN INCHES

FIGURE 2 OCCUPANT CLEARANCE DIMENSIONS

FIGURE 3

CAMERA POSITIONS FOR FRONTAL IMPACTS

Note: Camera information shown in Table 5.

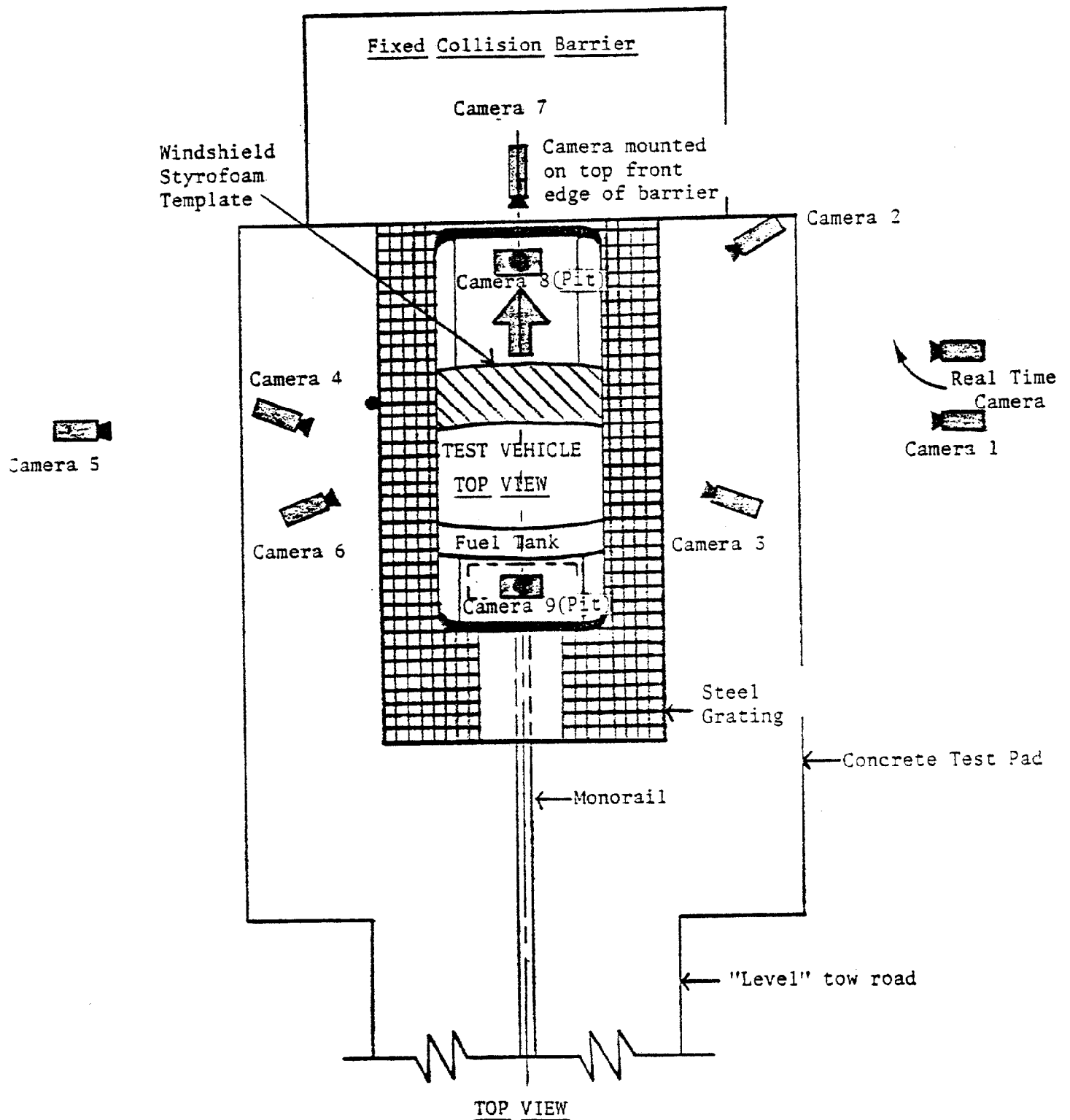


Table 5

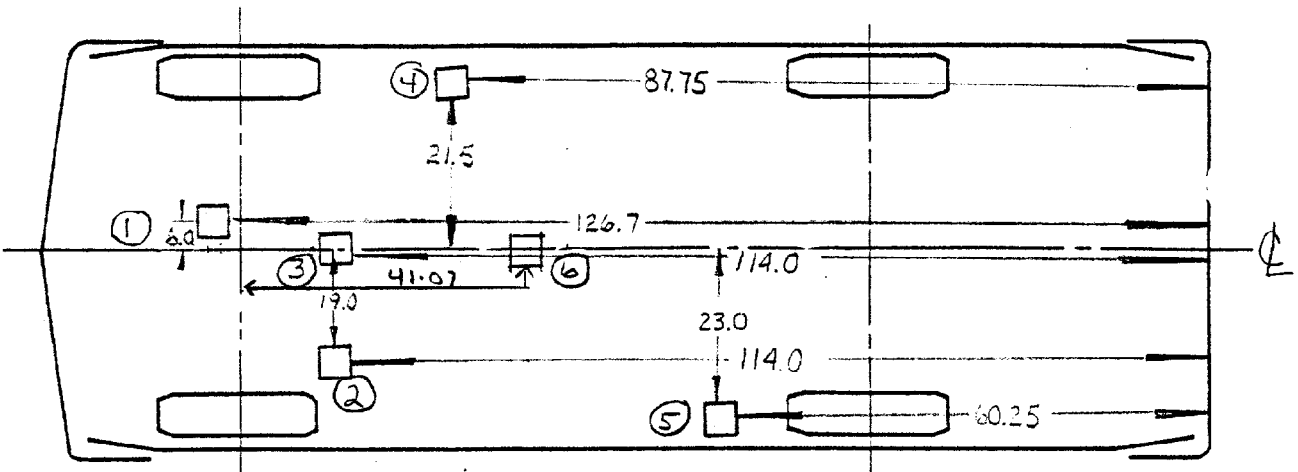
HIGH SPEED CAMERA INFORMATION

308-T5-441

1979 VW RABBIT - FRONTAL

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)
1	SOUTH WIDE	FASTEX	25 MM	1300
2	SOUTH WINDSHIELD	FASTEX	50 MM	1400
3	SOUTH DUMMY	FASTEX	50 MM	NO PULSE
4	NORTH DUMMY	FASTEX	50 MM	1350
5	NORTH WIDE	HYCAM	25 MM	1750
6	REAR DUMMY	HYCAM	25 MM	NO PULSE
7	BARRIER FACE	PHOTOSONIC	8 MM	1000
8	PIT FRONT	PHOTOSONIC	13 MM	975
9	PIT REAR	PHOTOSONIC	13 MM	525

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



ACCELEROMETER NUMBER *	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
①	Engine	x		x
②	Firewall Above Steering Column	x		x
③	Firewall At Vehicle Centerline	x		x
④	Front Seat "Crossbeam"	x		
⑤	Rear Seat "Crossbeam"	x		x
⑥	CG	x	x	x

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

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 CONDITIONS

TEST VEHICLE INFORMATION:

Vehicle Manufacturer: VOLKSWAGEN OF AMERICA, INC.
Make/Model: VW RABBIT
Body Style: 2-Door Hatchback; Model Year: 1979
VIN: 1793857442; Build Date: May 1979
NHTSA No.: 308-T5-441; Color: LT/BLUE
Engine Data: 4 cylinders; 89 cu. in. in³/cc displacement
Transmission Data: 4 speed (☒) Manual/ (☐) Automatic
Date Vehicle Received by Laboratory: June 25, 1979
Dealer's Name & Address: JIM KELLY 3325 GENESEE STREET, BUFFALO, N. Y.

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

Vehicle Manufactured By: VOLKSWAGEN OF AMERICA, INC.
Date of Manufacture: May 1979; VIN: 1793857442
GVWR: 2822 lbs.; GAWR: Front = 1609 lbs.; Rear = 1278 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>27</u> psi	<u>31</u> psi	<u>155SR13</u>	<u>B</u> C D
Vehicle Capacity:				
Type of Seats -	☐ Bench	Number of Occupants = <u>2</u> Front		
	☒ Bucket	(Designated Seating <u>2</u> Rear		
	☐ Split Bench	Capacity) <u>4</u> Total		
CARGO LOAD =	<u>862</u> lbs.			
TOTAL =	<u>2162</u> lbs.			

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

Right Front = <u>630</u> lbs.	Right Rear = <u>330</u> lbs.
Left Front = <u>630</u> lbs.	Left Rear = <u>370</u> lbs.
TOTAL FRONT WEIGHT = <u>1260</u> lbs. (<u>64.3</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>700</u> lbs. (<u>35.7</u> % of Total Vehicle Weight)	
TOTAL DELV. WEIGHT = <u>1960</u> lbs.	

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 264 lbs. CARGO:

Right Front = <u>760</u> lbs.	Right Rear = <u>550</u> lbs.
Left Front = <u>710</u> lbs.	Left Rear = <u>580</u> lbs.
TOTAL FRONT WEIGHT = <u>1470</u> lbs. (<u>56.5</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>1130</u> lbs. (<u>43.5</u> % of Total Vehicle Weight)	
TOTAL TEST WEIGHT = <u>2600</u> lbs.	

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

TEST CONDITIONS:

Date of Test: 7-10-79; Time of Test: 15:39 am/pm
Ambient Temperature: 78 °F at impact area.
Temp. In Occ. Compart.: 78 °F.; W/Shld. Mldg. Temp.: 79 °F.

VEHICLE ATTITUDE: (all dimensions in inches)Delivered Attitude: RF 25" ; LF 25" ; RR 25" ; LR 25"Test Attitude: RF 23-1/8 LF 23-3/4 RR 22 ; LR 22-1/8VEHICLE TIRE DATA:Recommended Cold Tire Pressure: Front = 27 psi
Rear = 31 psiRecommended Tire Size: 155SR13Load Range: BTires on Vehicle: 155SR13Is Spare Tire a "Space Saver": NO (yes/no)Is Spare Tire standard equipment: YES (yes/no)TEST FLUID DATA:Test Fluid Type: Red Stoddard Solvent #2; Spec. Grav.: 0.764Kinematic Viscosity: 0.96 CENTISTOKESSpill Point Volume: 10.5 Gallons (SPV)Test Volume: 9.55 Gallons (90 to 91% of SPV)Fuel System Capacity (data from Owner's Manual): 10.5 gal.Details of fuel system: Fuel Filler Cap is on right rear side of carElectric Fuel Pump: X Yes; No; Fuel Injection: X Yes; NoDoes electric fuel pump operate with ignition switch "on" and
the engine not operating: Yes; X NoVEHICLE REBOUND AND CRUSH:Overall Length of Test Vehicle: Pre-Test = R153.3/L153.2 inchesCRUSH=R 22.1 /L 21.7Post-Test= R131.2/L131.5 inchesFOR FRONTAL IMPACTS, distance from front of test vehicle to
the barrier after impact = 11.9 inches*With entire fuel system filled from fuel tank through carburetor
bowl.

PCST IMPACT DATA - STES. 219 & 301DATA 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: 7-10-79; TIME: 15:39; TEMP.: 78 °F.

● VEH. NHESA NO.: 308-T5-441; VIN: 1793857442

● REQUIRED VEH. VELOCITY RANGE: 34.5 to 35.5 mph

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

Trap #1 = 34.8 mph; Trap #2 = FAILED mph

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

exiting the vehicle velocity measurement device = 18 inches.

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

Driver's Side = 21.7 in.; Passenger's Side = 22.1 in.

Average = 21.9 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 = 12.4 inches; Pass. Side = 11.4 inches

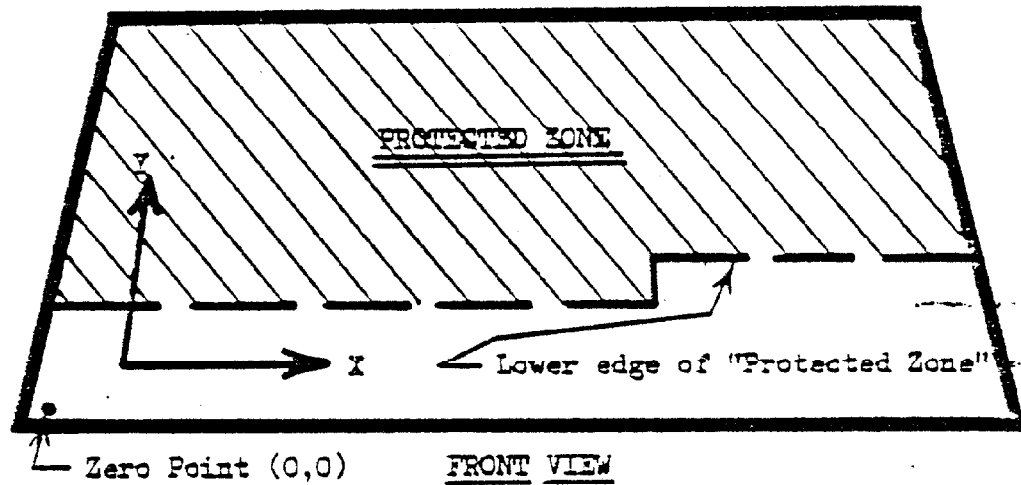
Average = 11.9 inches

● 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:

- (A) 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

X	Y

NONE

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

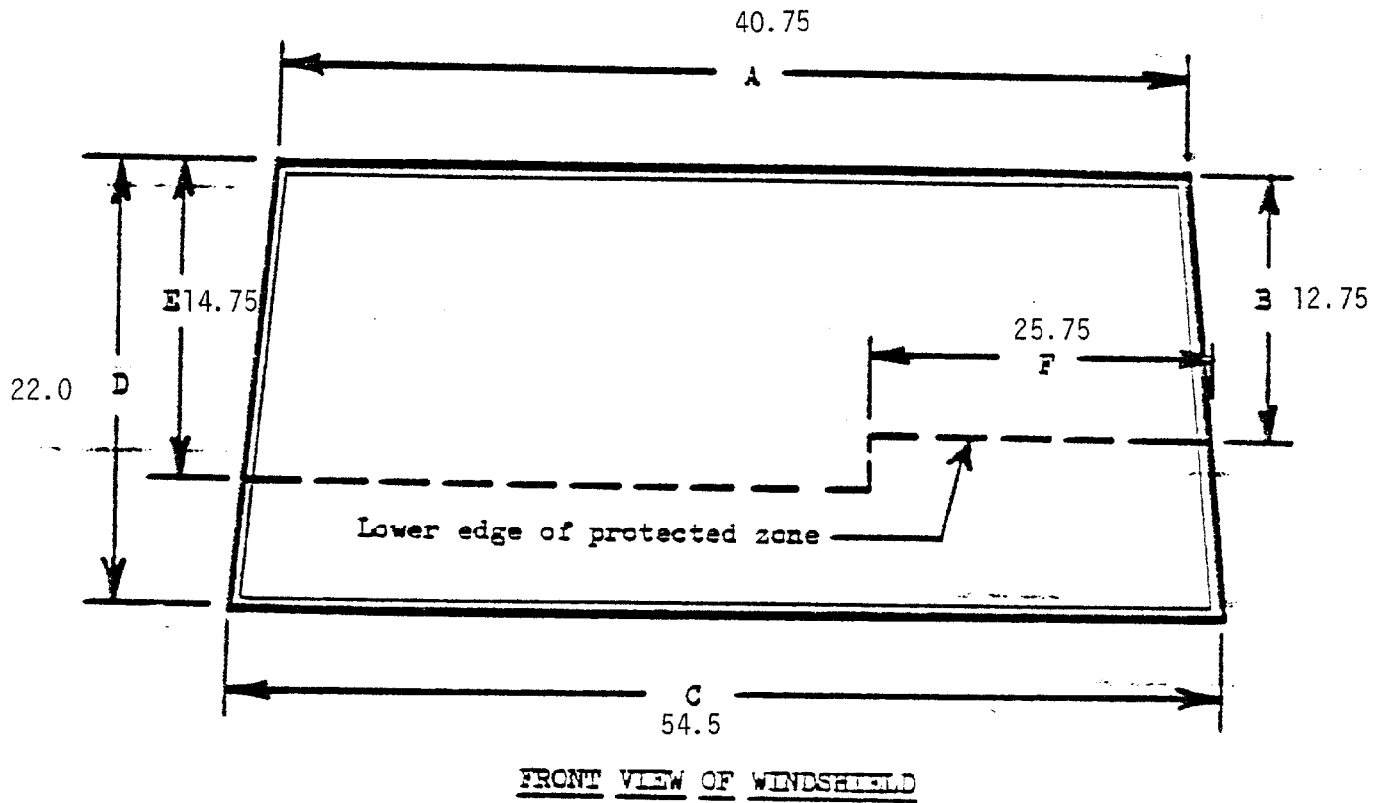
Coordinates

X	Y

NONE

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

FIGURE 6 PROTECTED ZONE



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.):

RUBBER MOLDING HOLDING WINDSHIELD

	WINDSHIELD PERIPHERY	
	PRETEST	POST TEST
RIGHT SIDE	69.6	69.6
LEFT SIDE	69.6	69.6
TOTAL	139.2	139.2

100%

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:

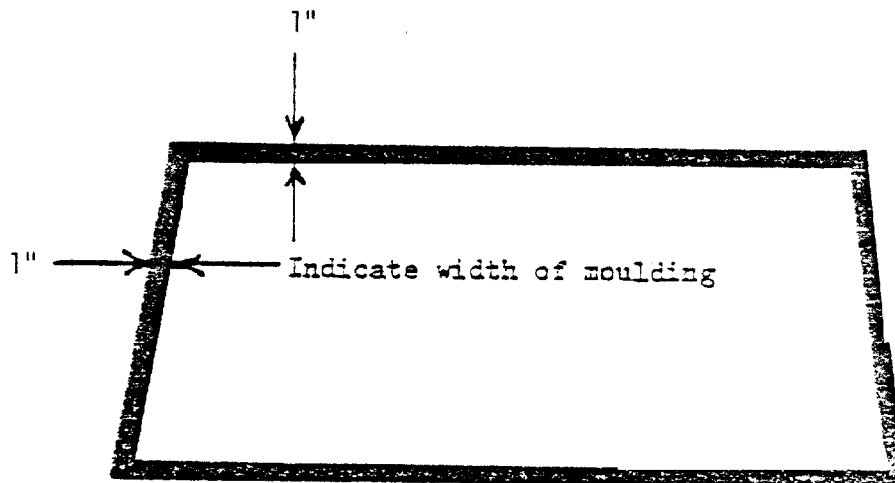


Table 8

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

TEST VEHICLE NHTSA NO.

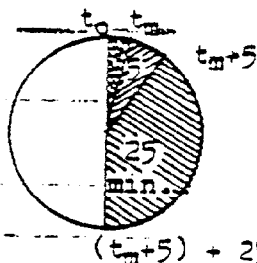
3	0	8	T	5	4	4	1
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 ; TEST DATE: 7-10-79
 VEH. MFR./MAKE/MODEL: 1979 VOLKSWAGEN RABBIT

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 (35 mph)
☐ Oblique (35 mph) with _____° barrier face first contacting _____ (driver/passenger) side.
☐ Rear Moving Barrier (35 mph)
☐ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT - - -



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

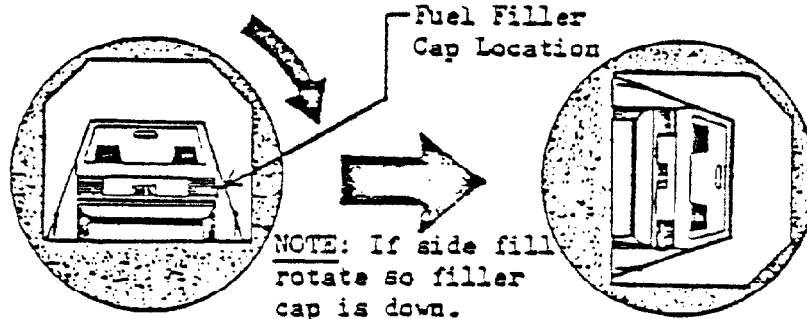
Table 8A

VEH. NHTSA ID NO.

3	0	8	T	5	4	4	1
---	---	---	---	---	---	---	---

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE:



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

 Rollover Fixture 90° Rotation Time - - = 2 minutes, 4 5 seconds
 (Spec. Range = 1 to 3 minutes)

 FMVSS 301-75 Position Hold Time - - - = 5 minutes, 0 0 seconds

 TOTAL - - - - - = 7 minutes, 4 5 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.

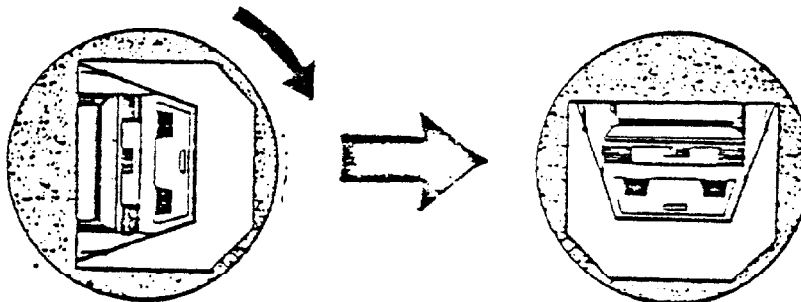
IV. SOLVENT SPILLAGE LOCATION(S):

3	0	8	T	5	4	4	1
---	---	---	---	---	---	---	---

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, 41 seconds
 (Spec. Range = 1 to 3 minutes)

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

TOTAL - - - - - = 7 minutes, 41 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):

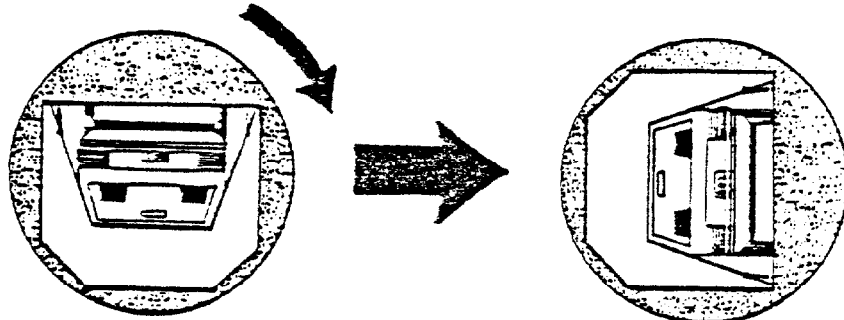
FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

3	0	8	T	5	4	4	1
---	---	---	---	---	---	---	---

TEST PHASE:

180°

270°

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:
 Rollover Fixture 90° Rotation Time - - = 2 minutes, 49 seconds
 (Spec. Range = 1 to 3 minutes)

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

 TOTAL - - - - - = 7 minutes, 49 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

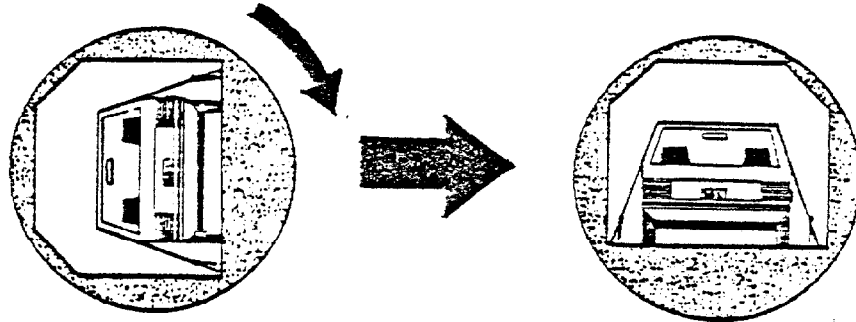
FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

3	0	8	T	5	4	4	1
---	---	---	---	---	---	---	---

TEST PHASE:

270°

360°

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time - - = 2 minutes, 33 seconds
(Spec. Range = 1 to 3 minutes)

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

TOTAL - - - - - = 7 minutes, 33 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



FIGURE 2A FULL FRONT, SIDE, REAR AND THREE-QUARTER POST-VIEW
A-3

6525-V-5

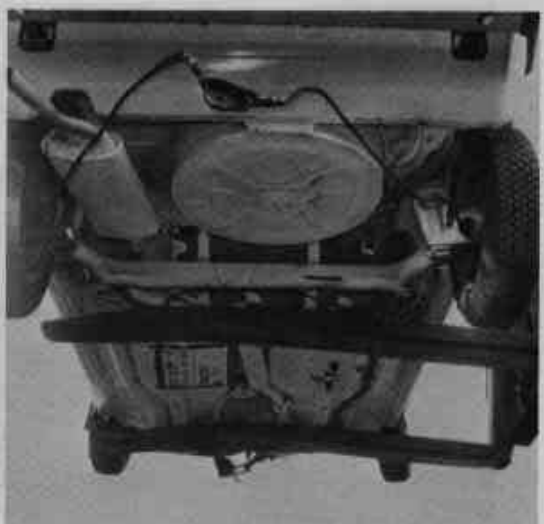


FIGURE 3A PRE- AND POST-VIEW OF UNDERBODY

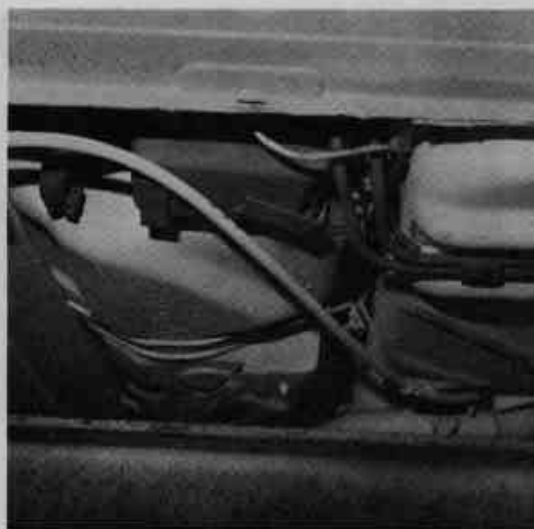
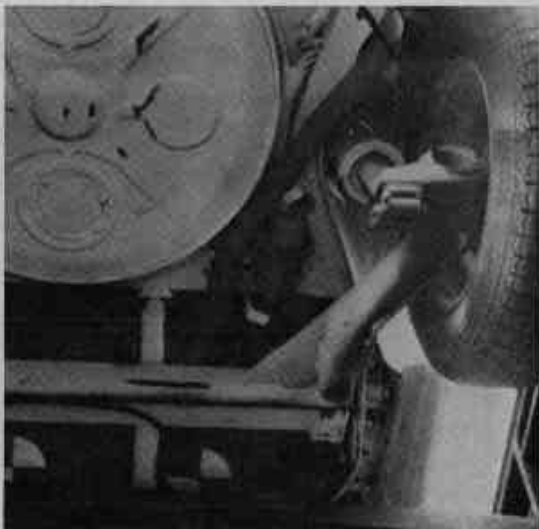


FIGURE 4A VIEW OF FUEL PUMP AND FUEL LINES



FIGURE 5A PRE- AND POST-VIEW OF DRIVER AND PASSENGER POSITIONS



FIGURE 6A FULL WINDSHIELD VIEW



FIGURE 7A POST-VIEW OF WINDSHIELD CRACK



FIGURE 8A POST-VIEW OF CHILD POSITION



FIGURE 9A POST-VIEW OF INTERIOR

DRIVER'S SIDE VIEW OF CHILD AND PASSENGER POSITION

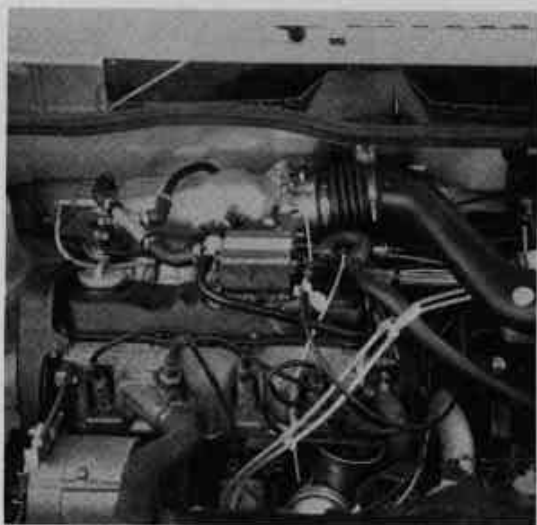


FIGURE 10A ENGINE BLOCK ACCELEROMETER

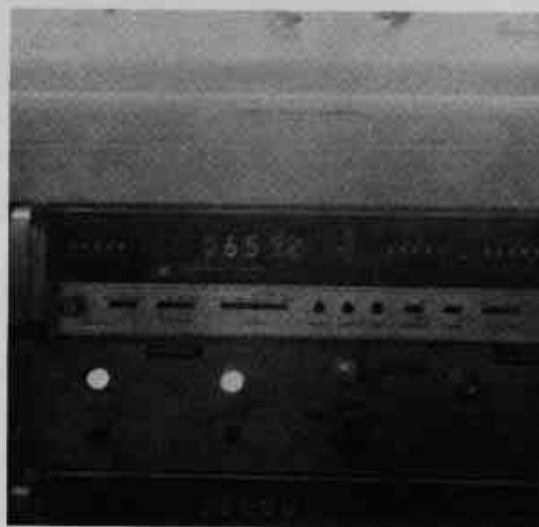
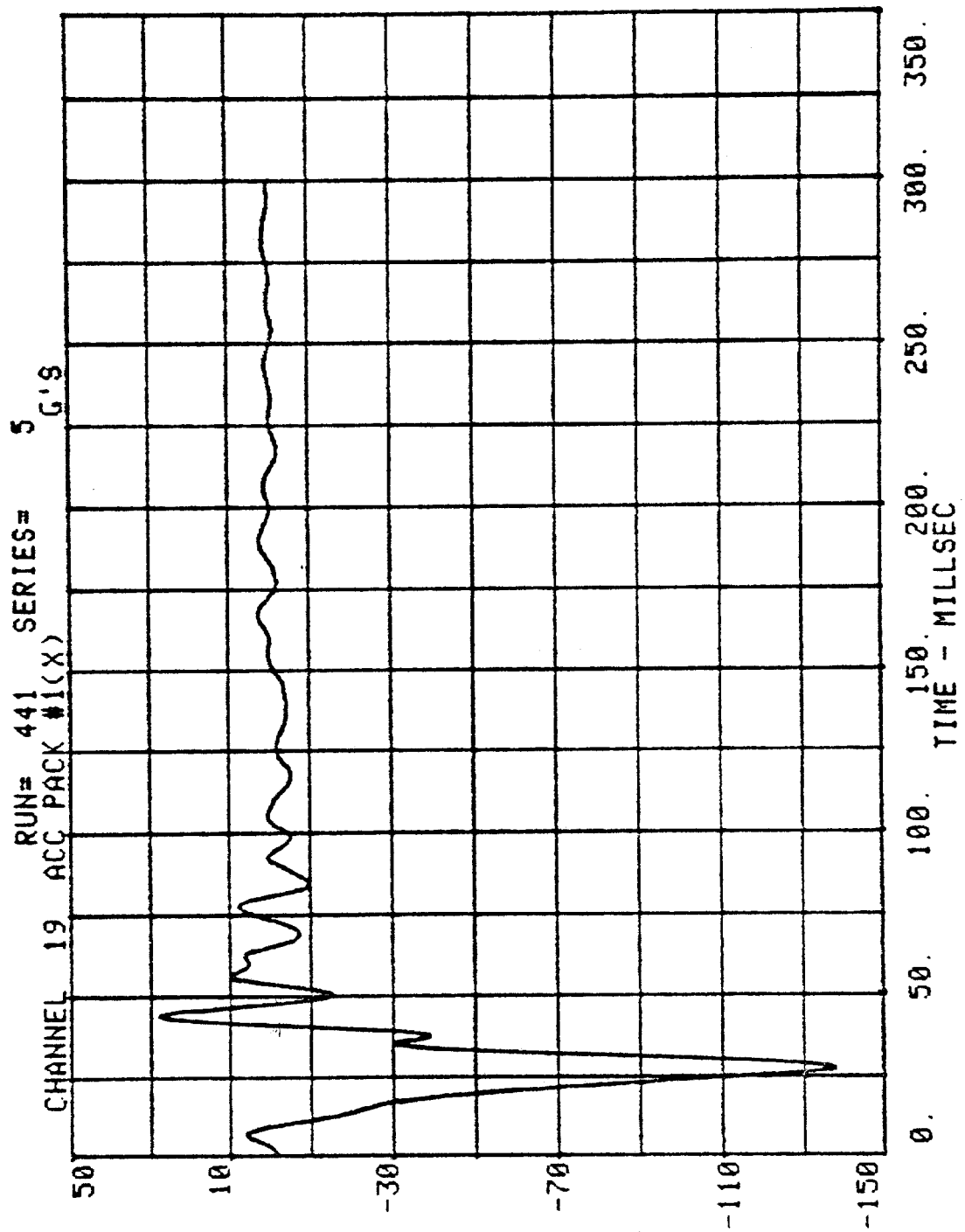
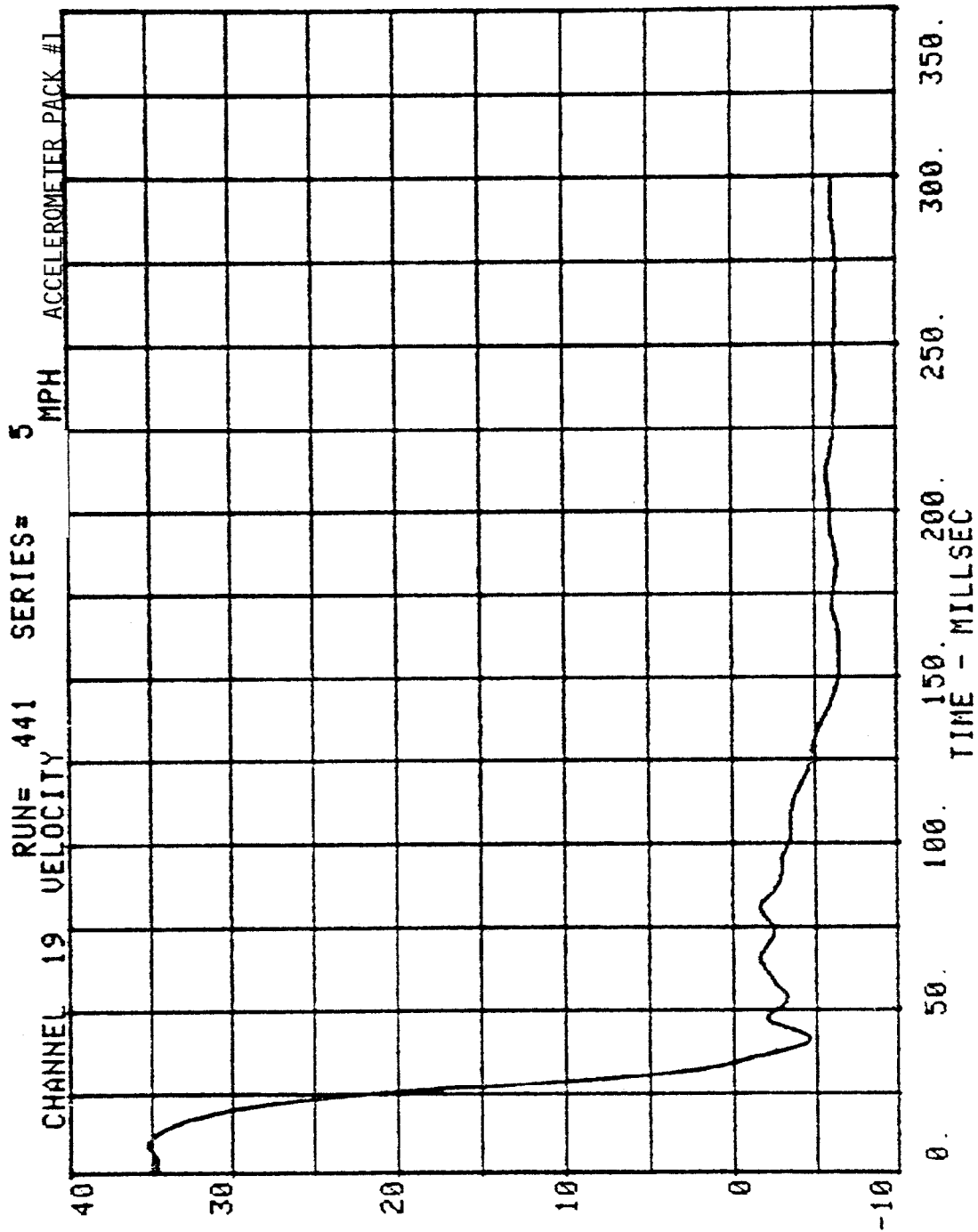


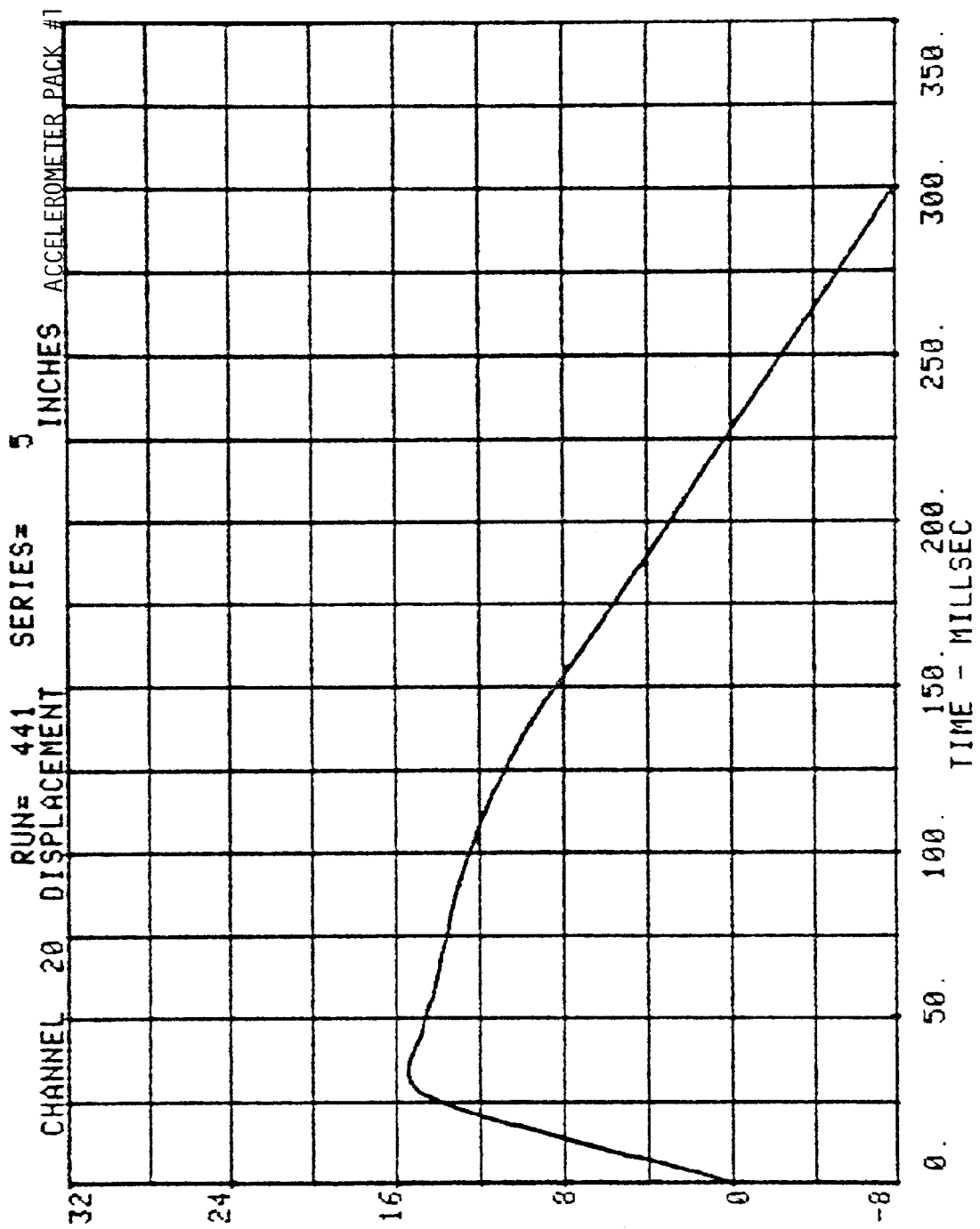
FIGURE 11A VELOCITY TRAP COUNTER DISPLAY

APPENDIX B

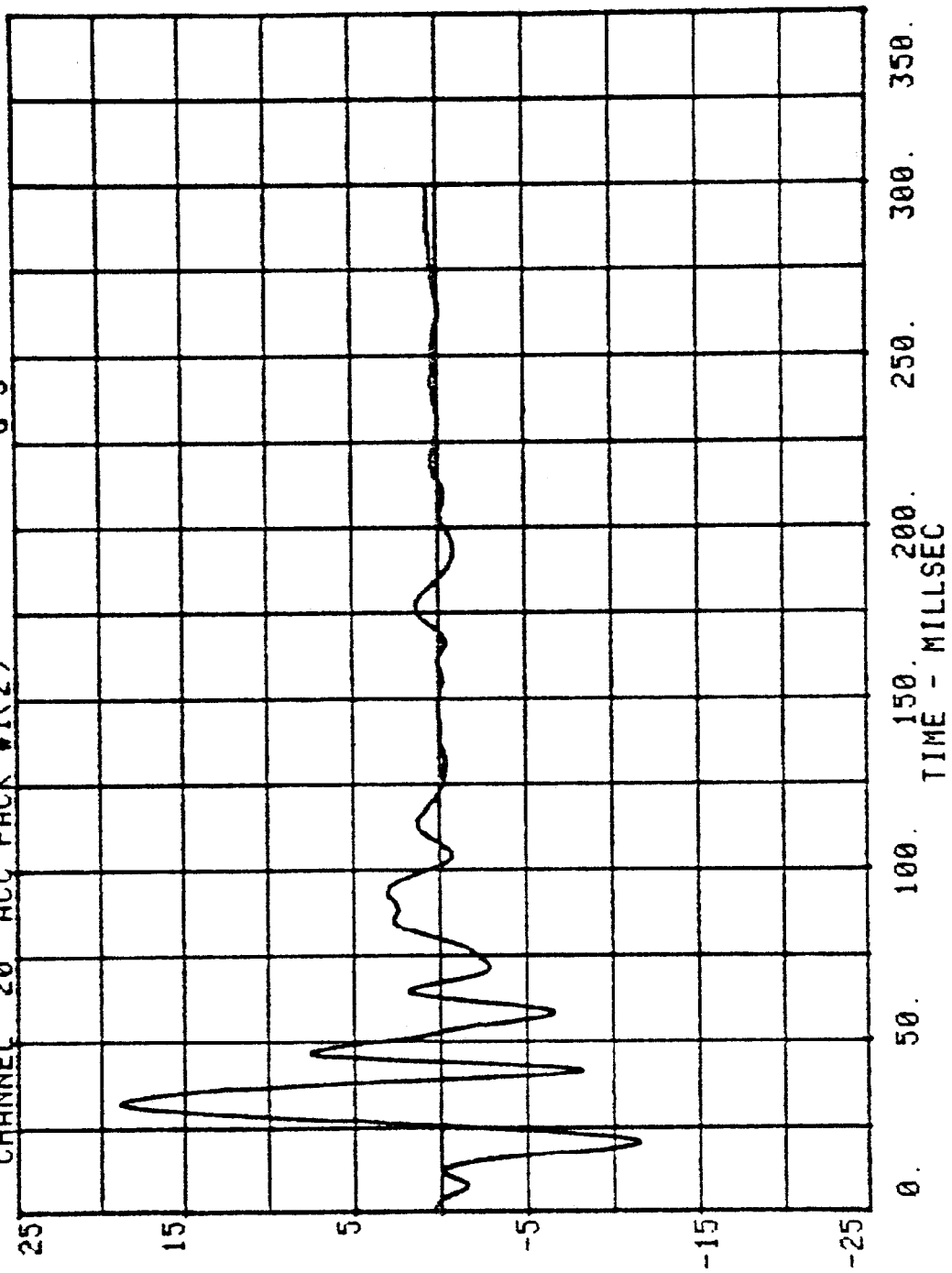
VEHICLE AND DUMMY RESPONSE DATA

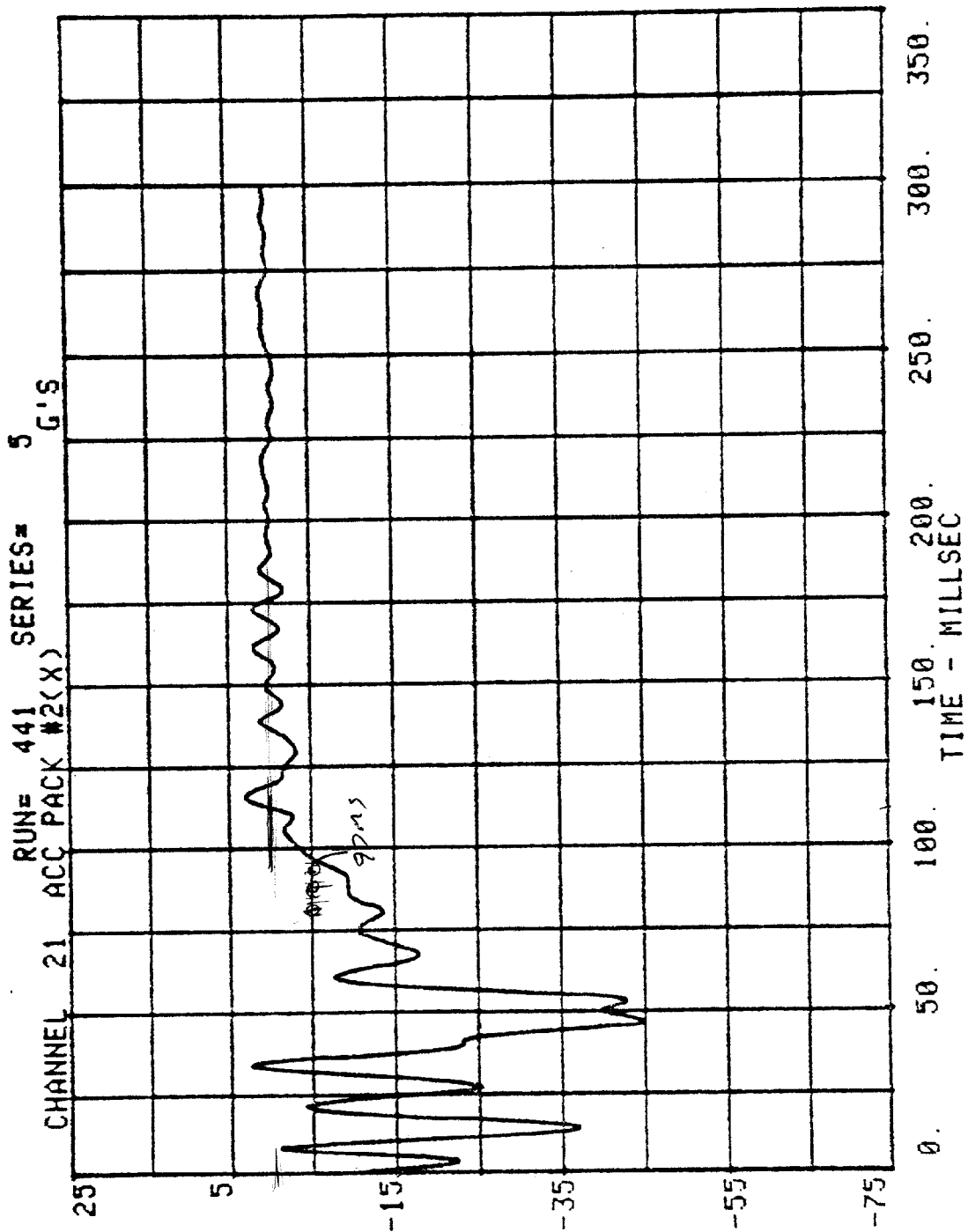


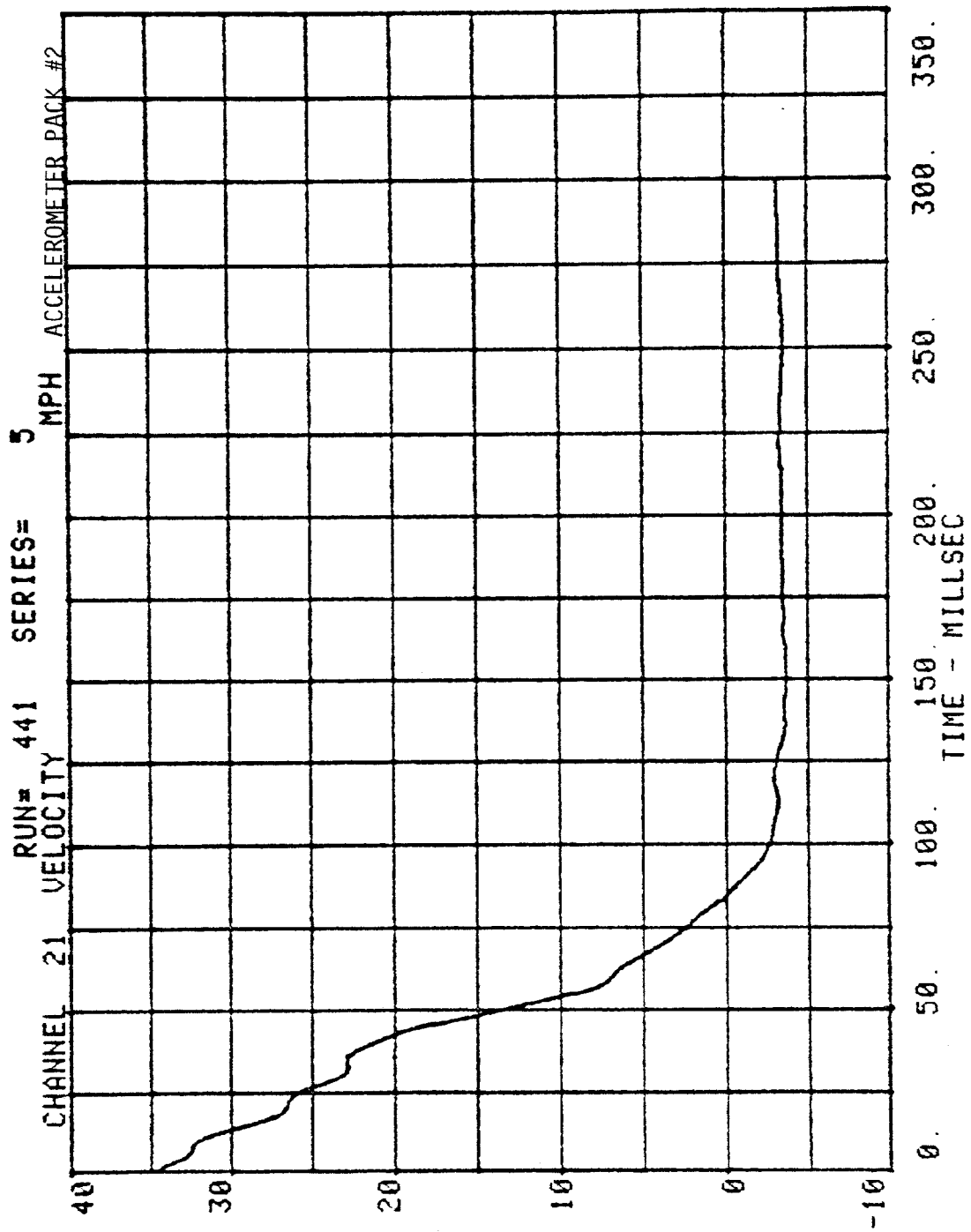


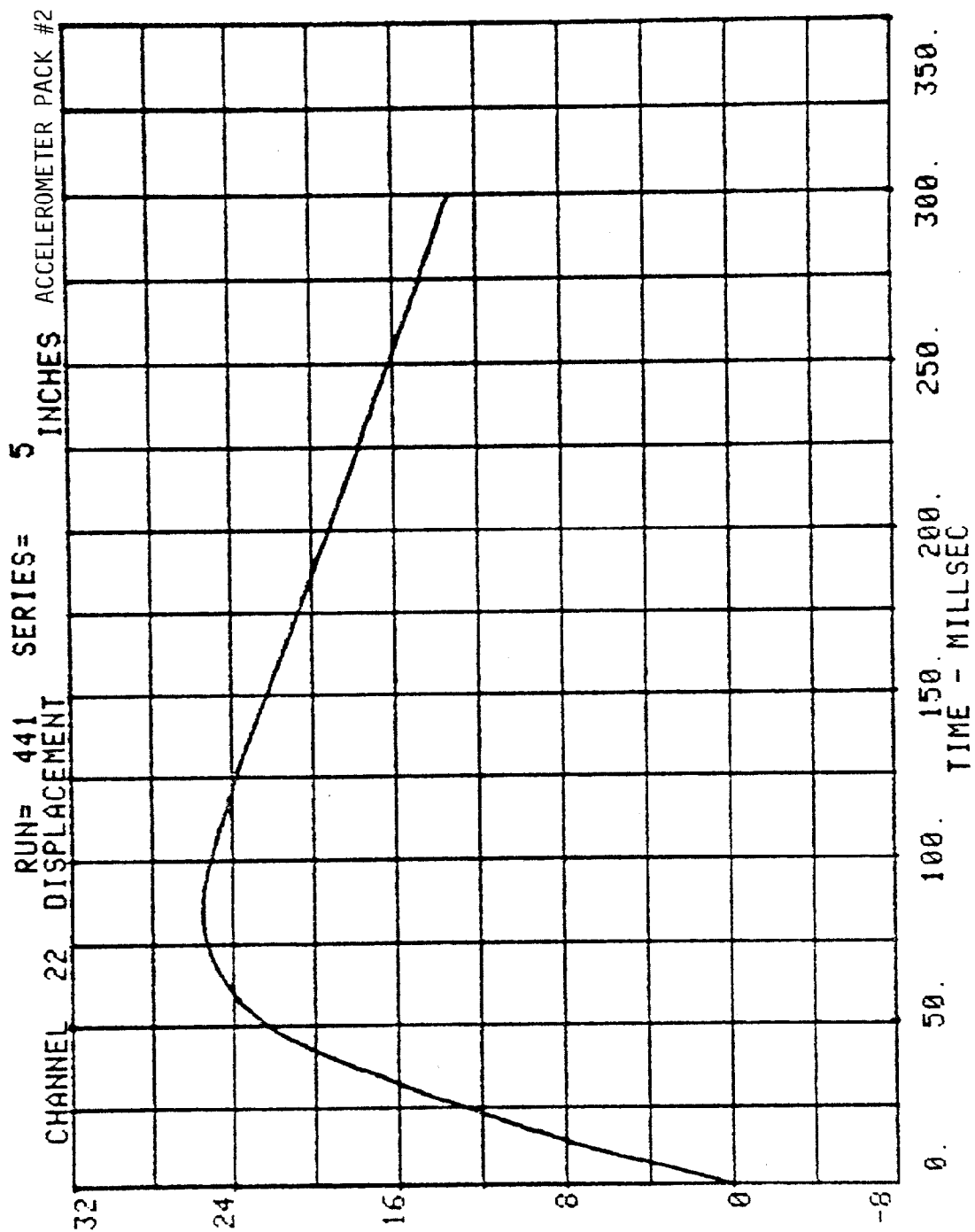


RUN= 441 SERIES= 5
CHANNEL 20 ACC PACK #1(Z) G'S

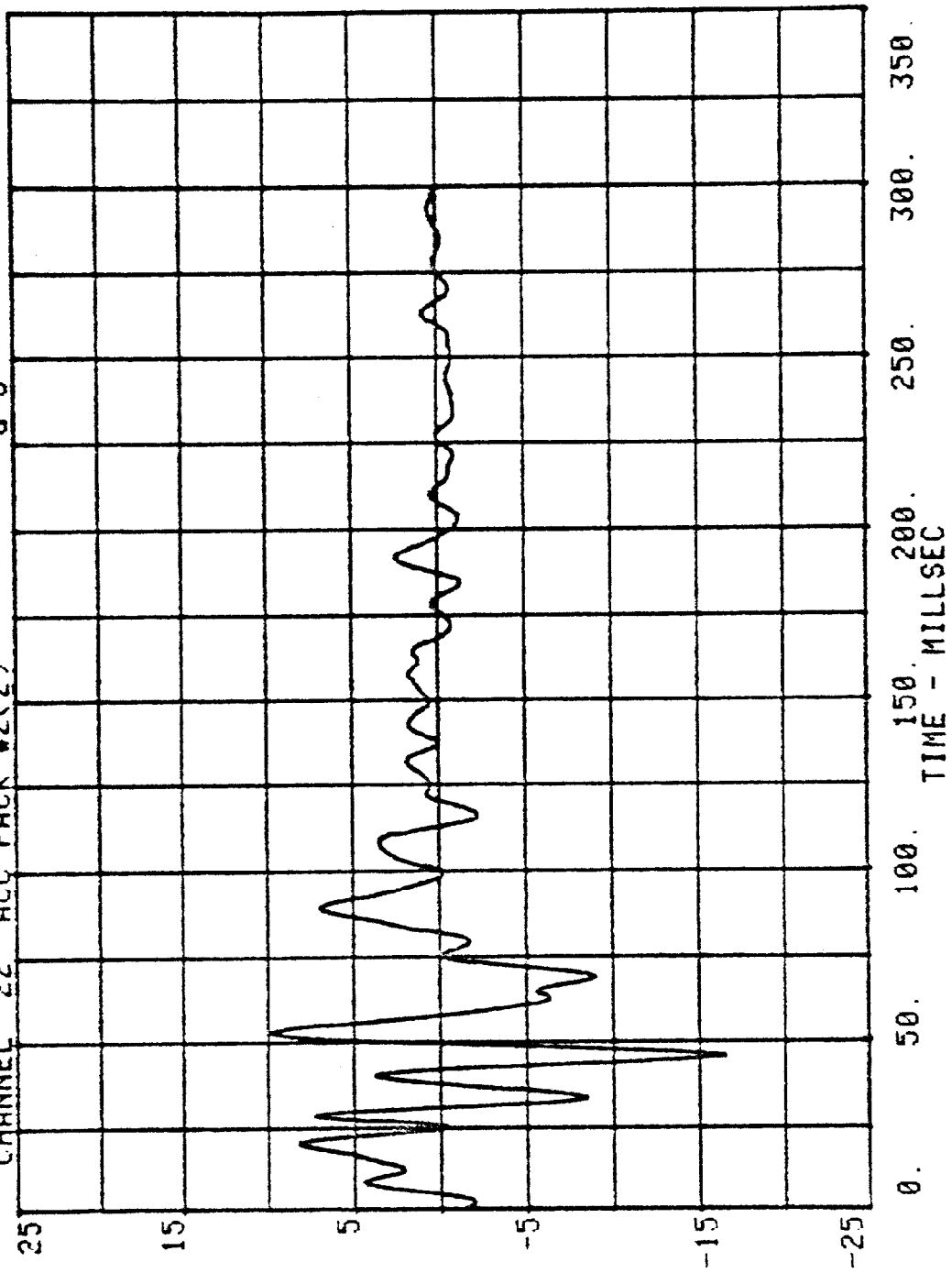


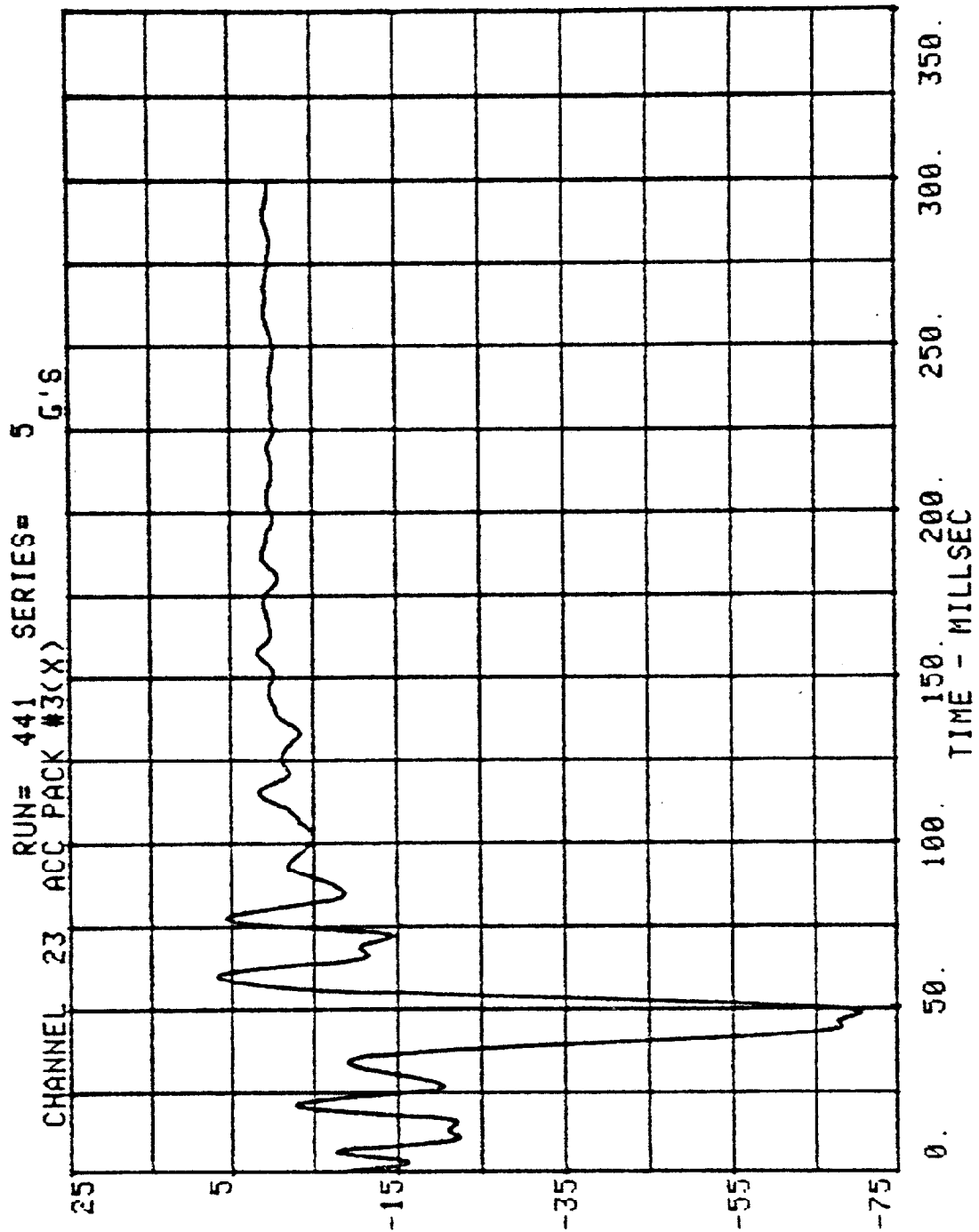


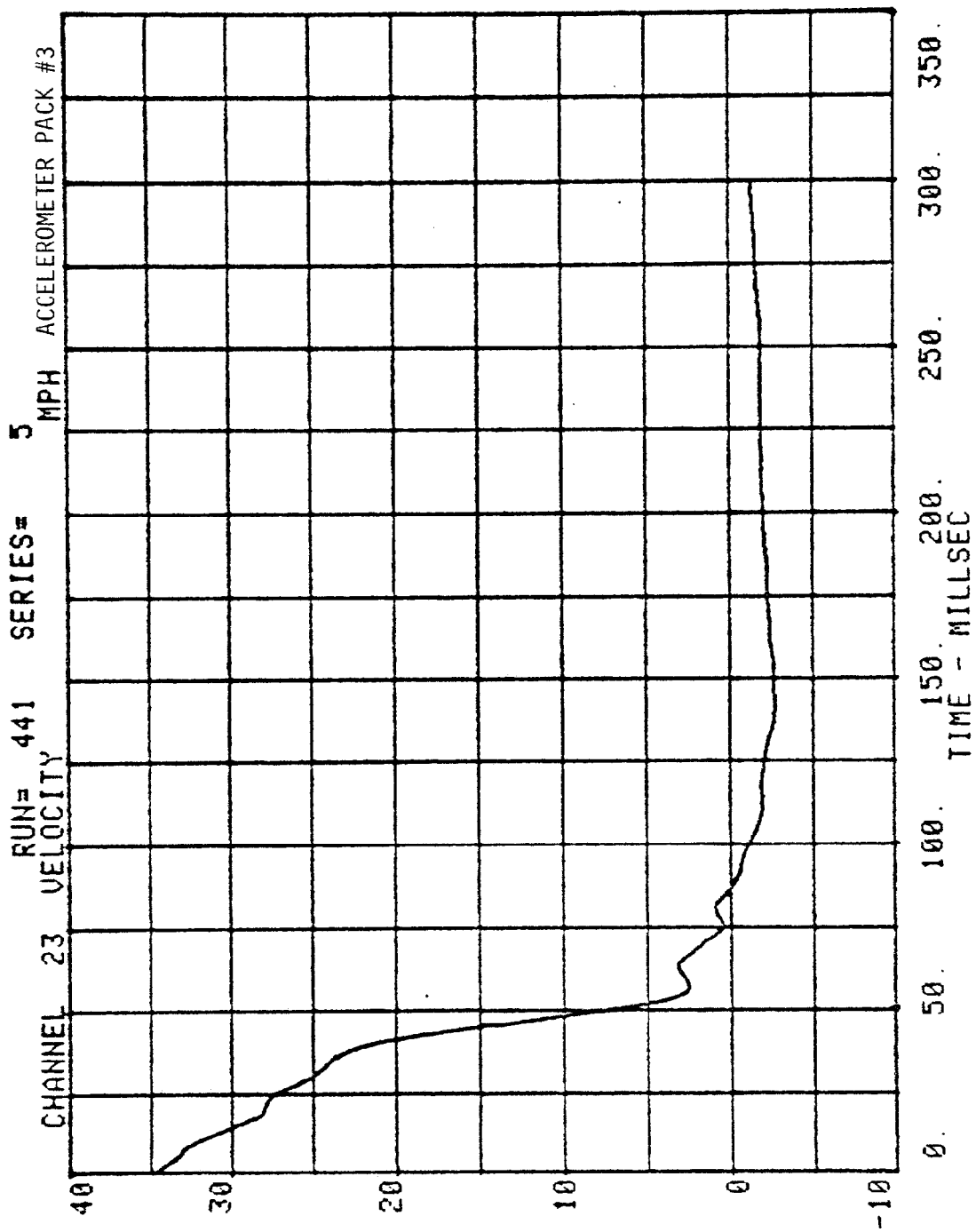


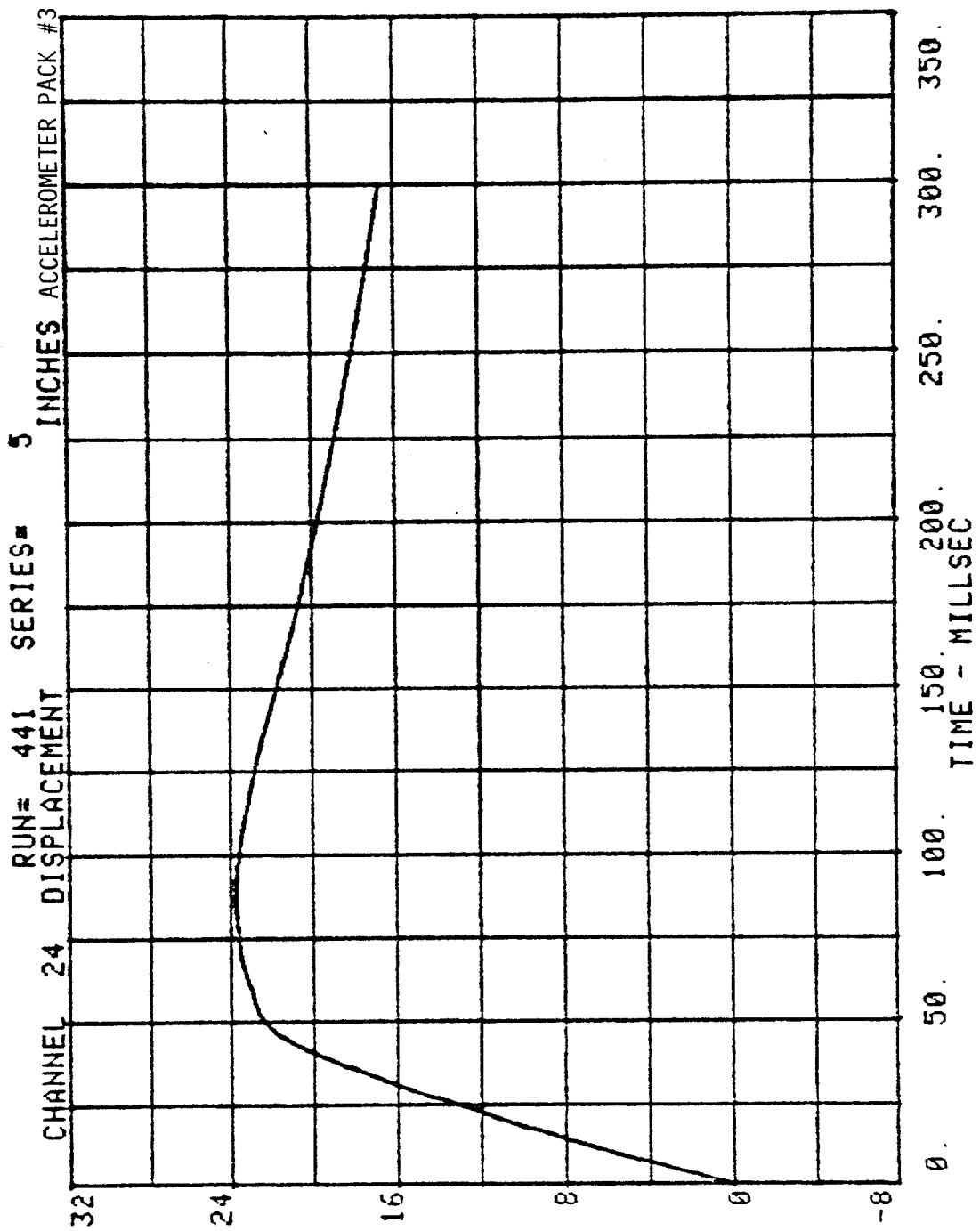


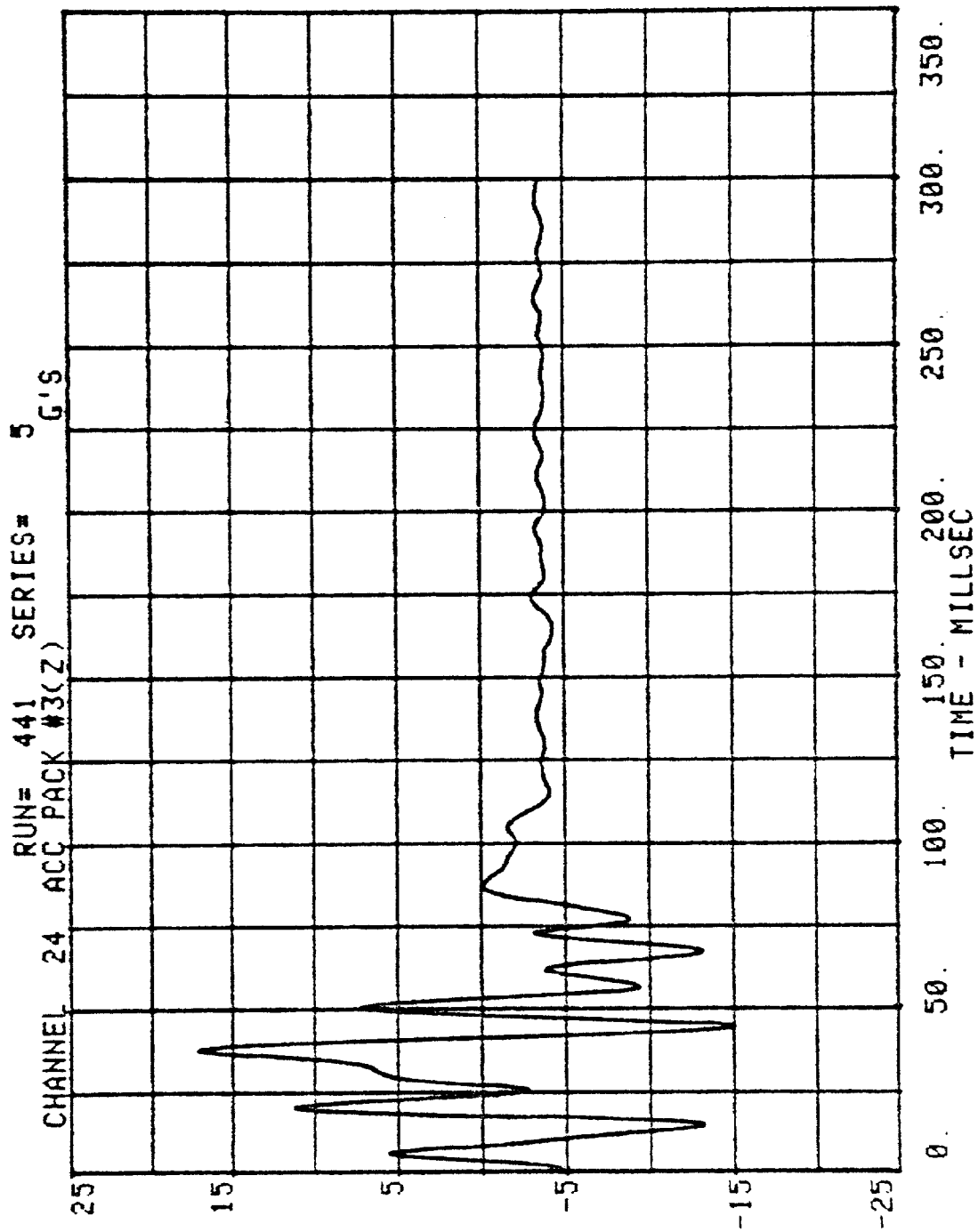
RUN= 441 SERIES= 3
CHANNEL 22 ACC PACK #2(Z) G'S



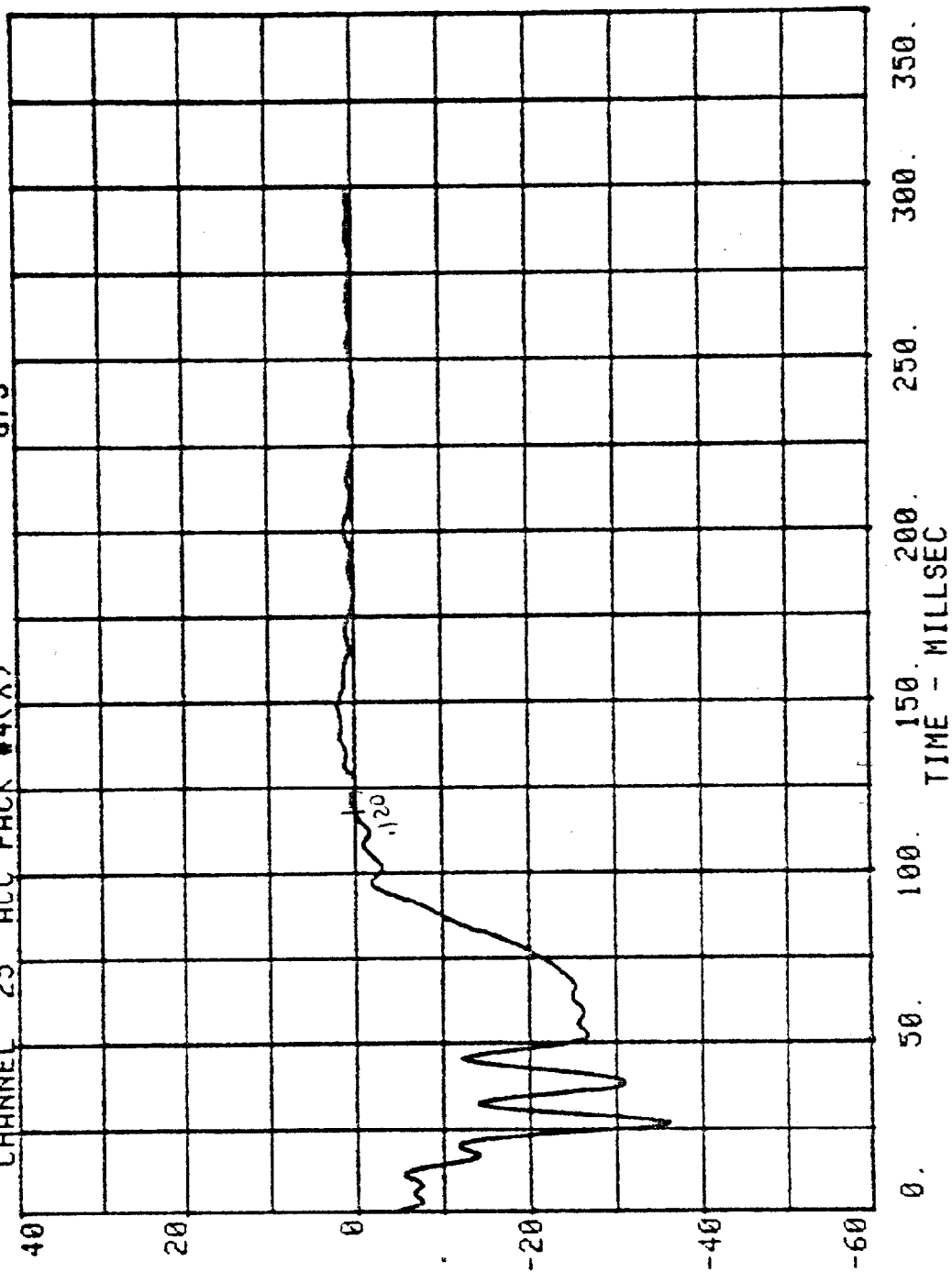


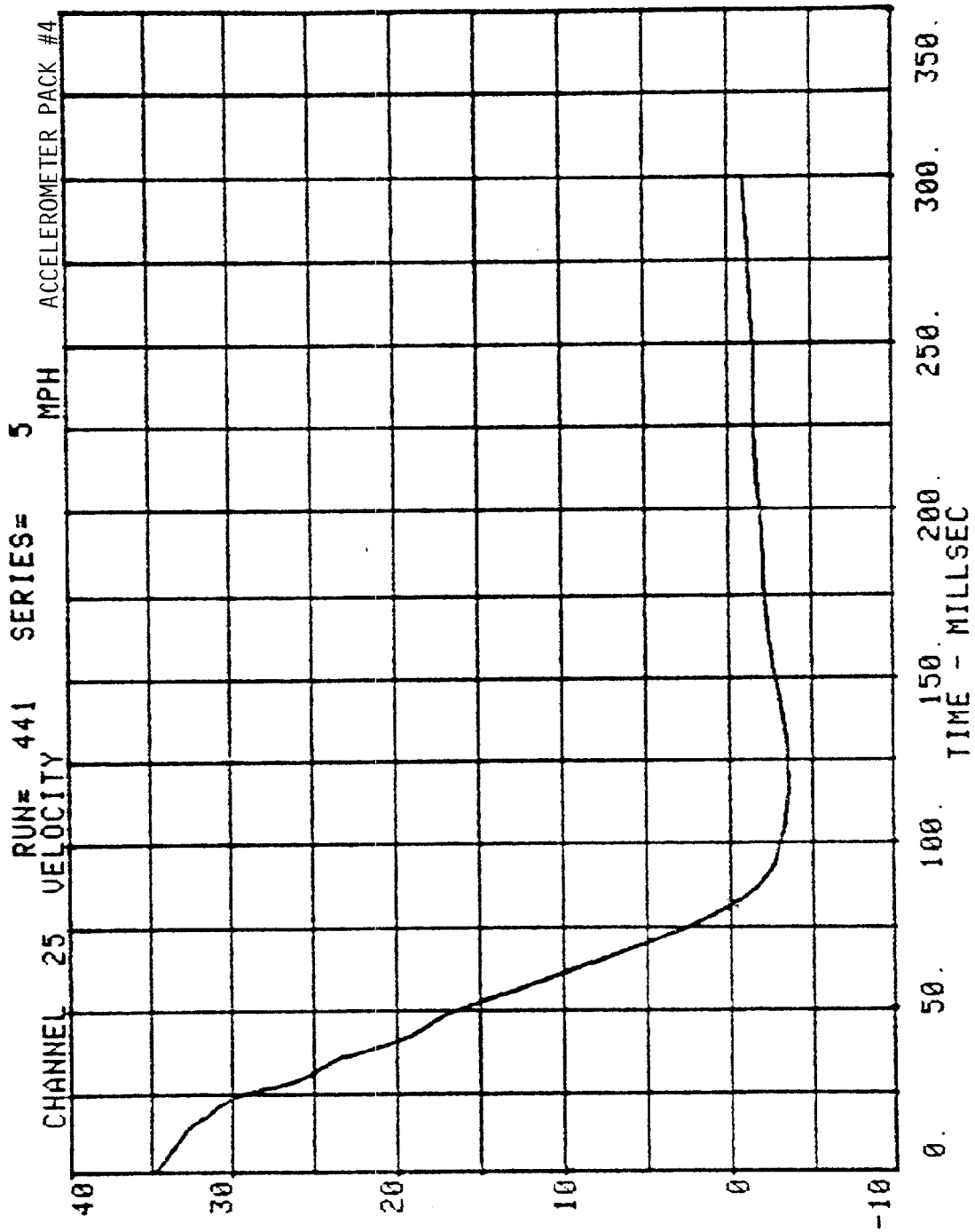


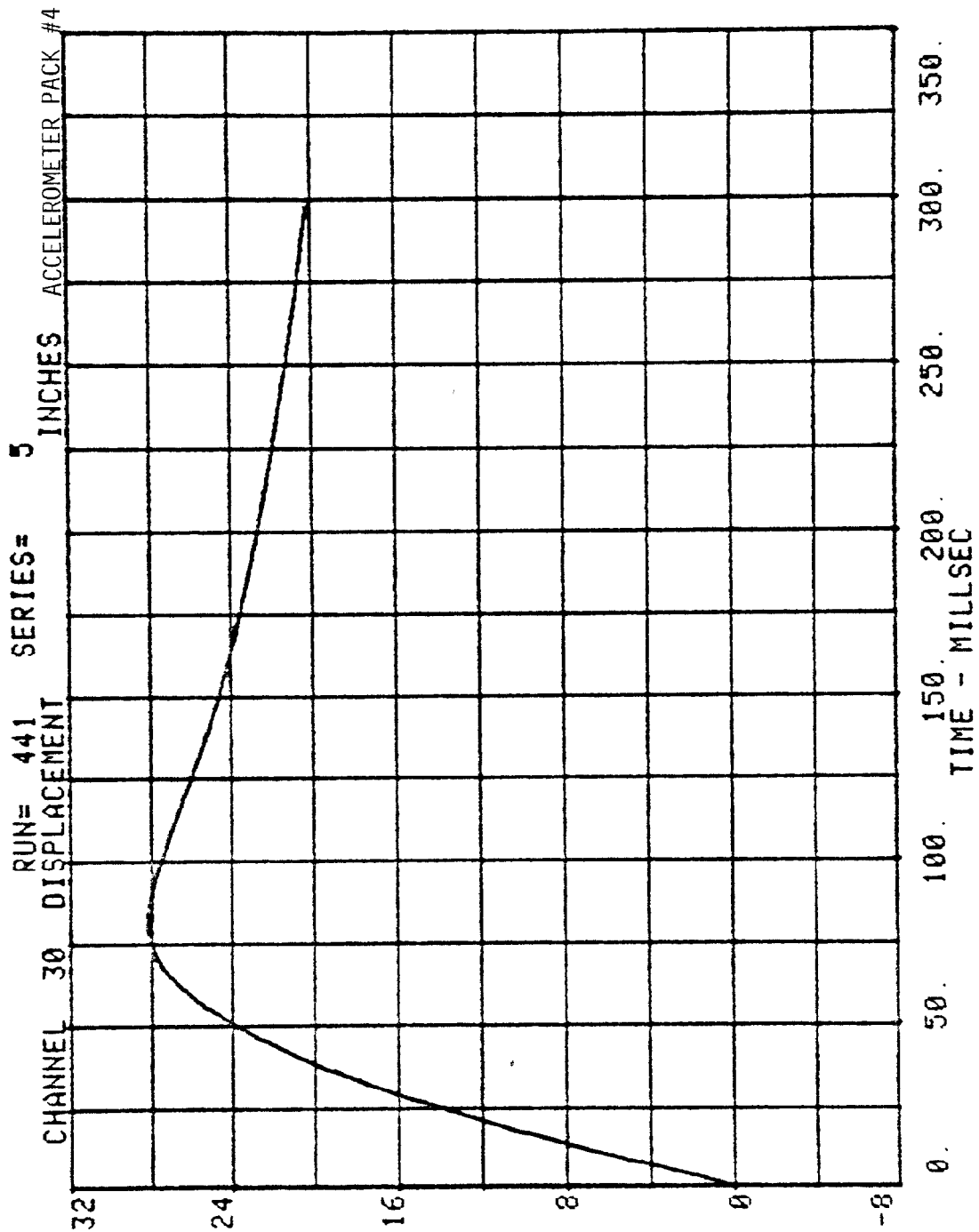


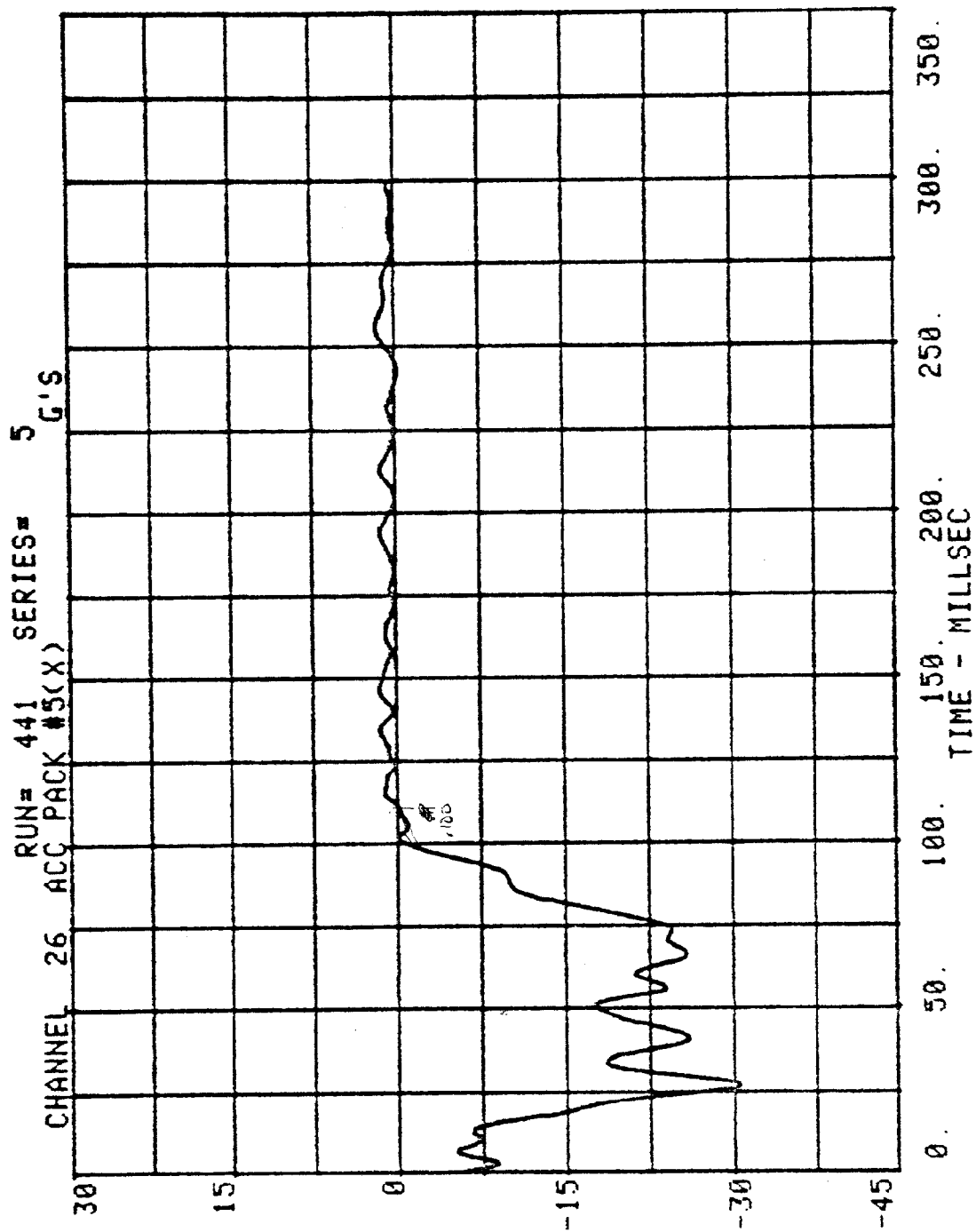


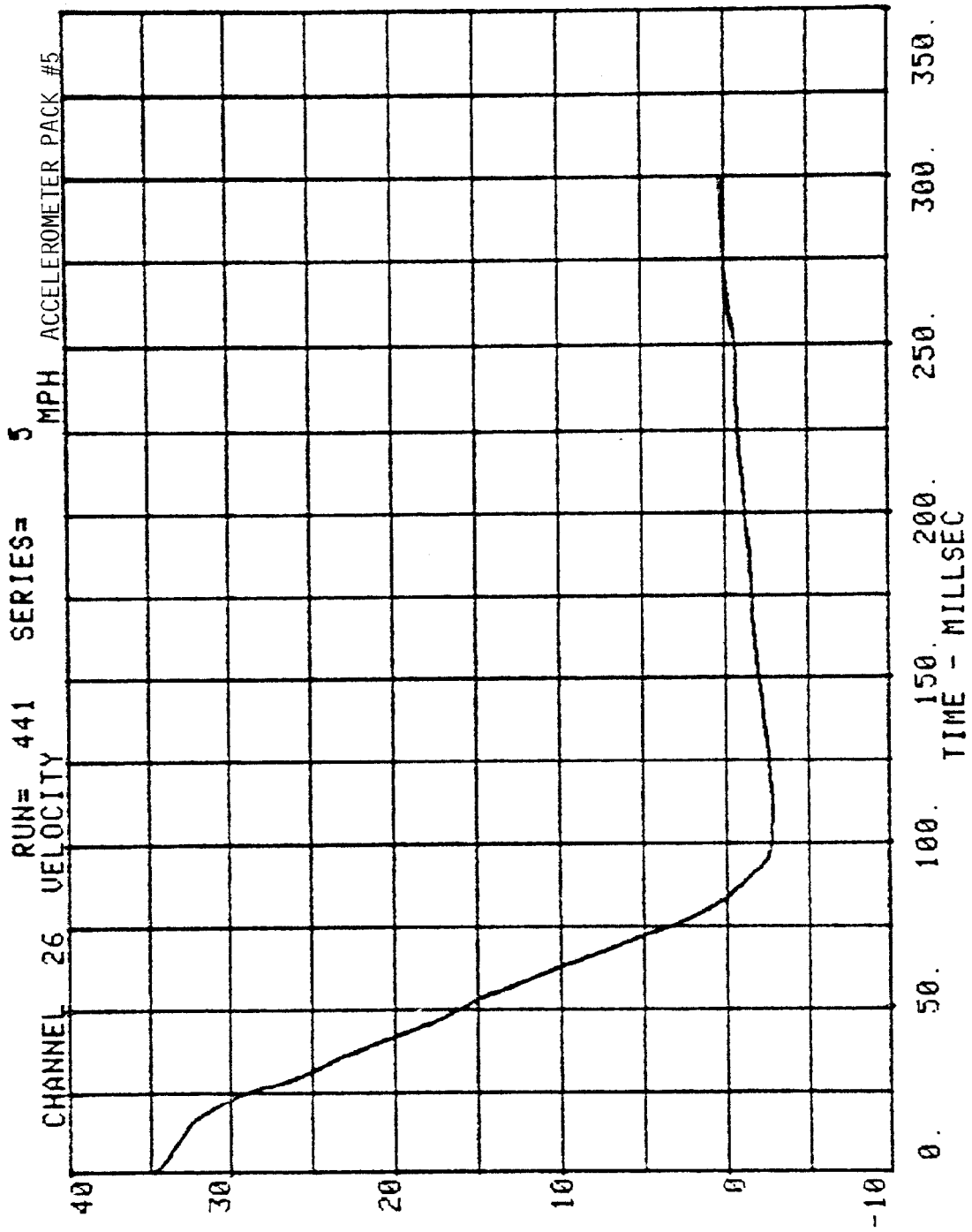
RUN= 441 SERIES= 5 G7S
CHANNEL 25 ACC PACK #4(X)

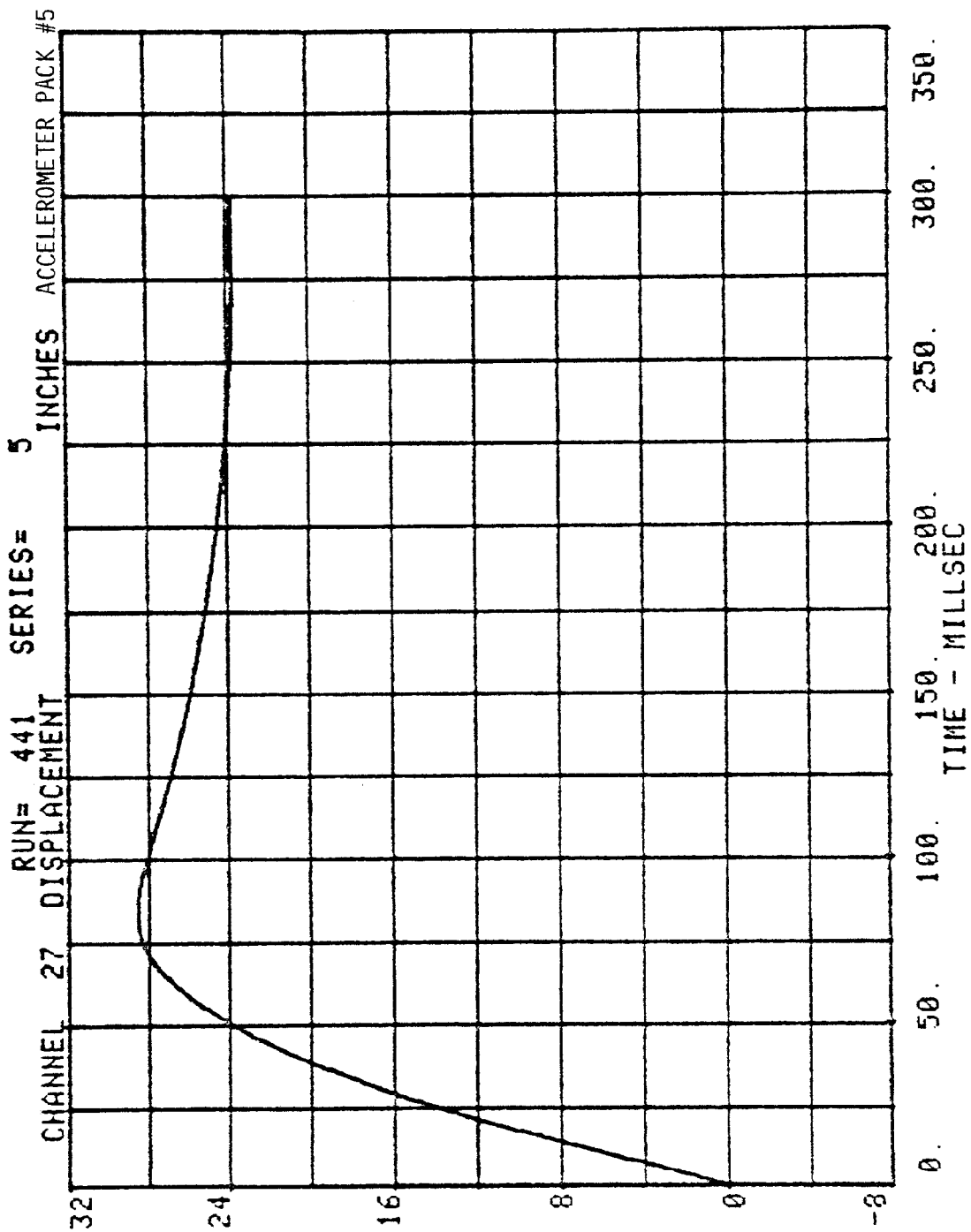




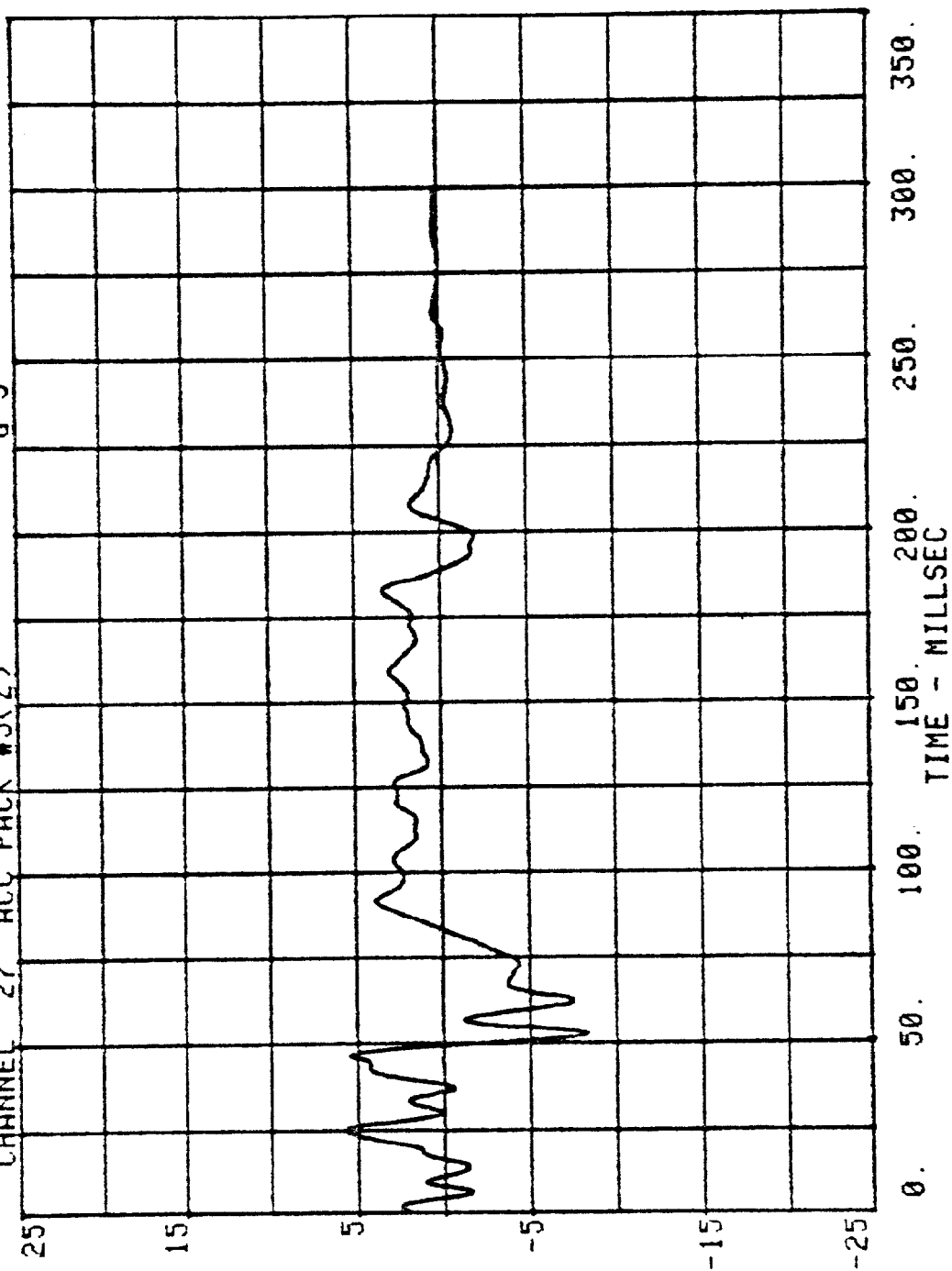


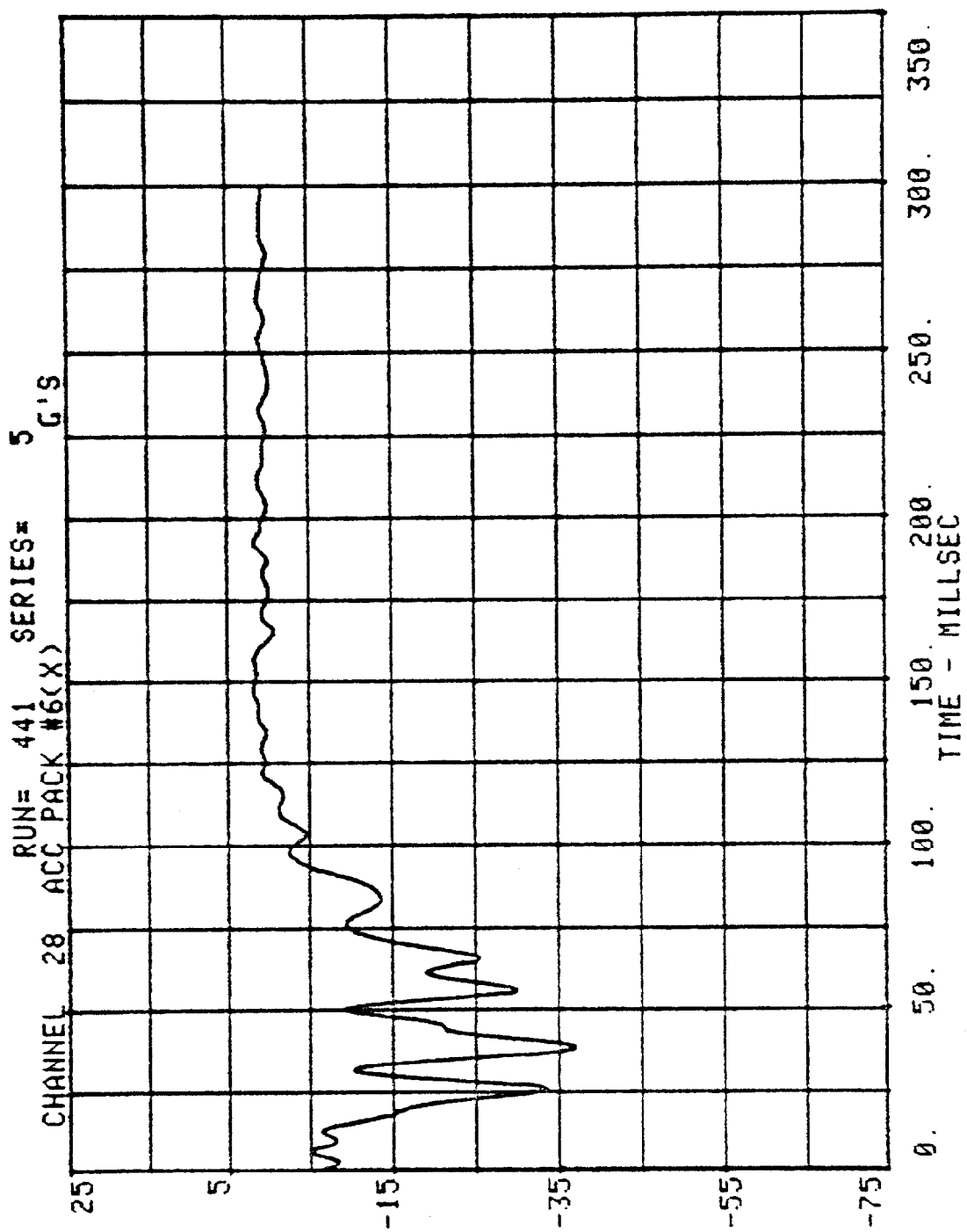


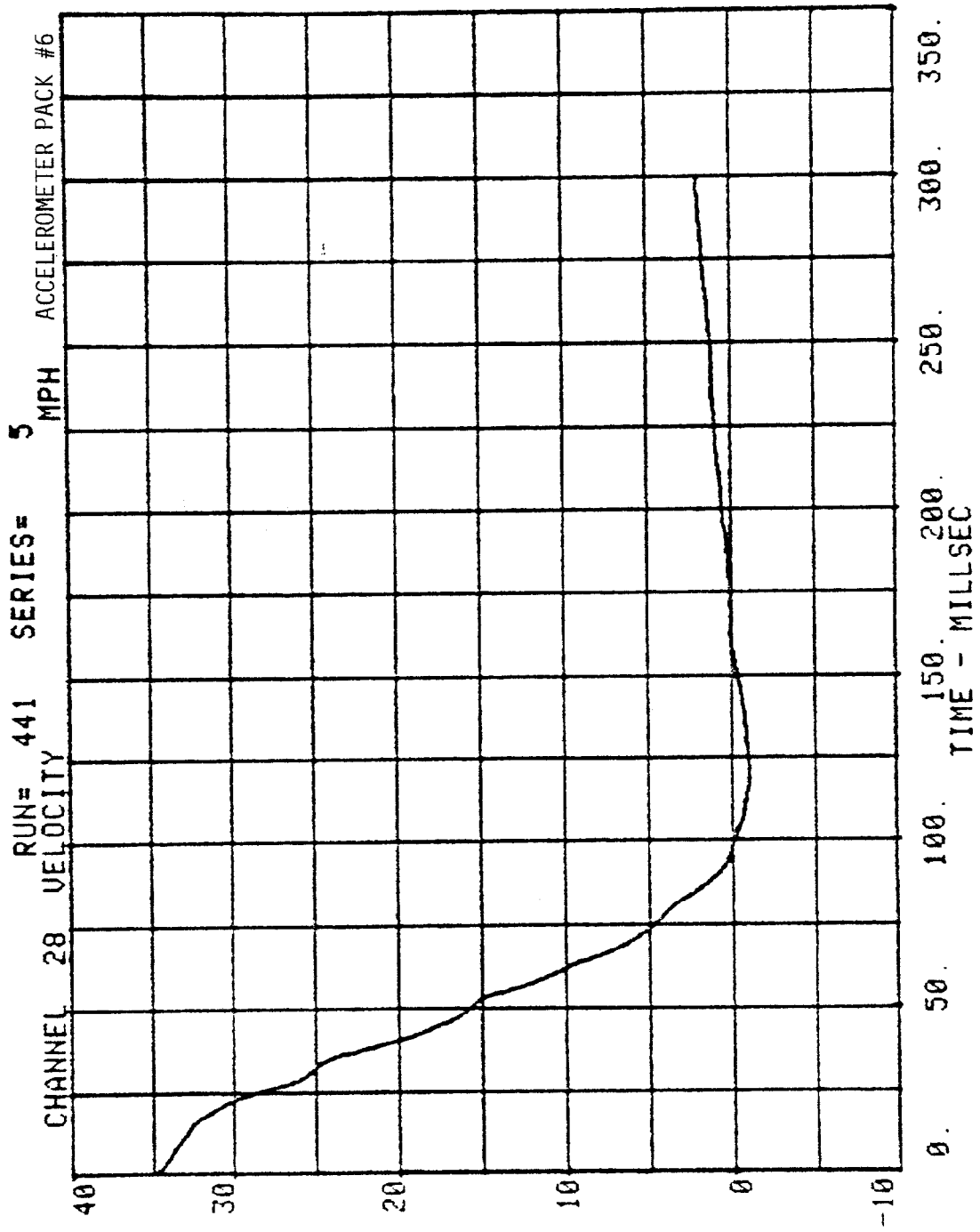


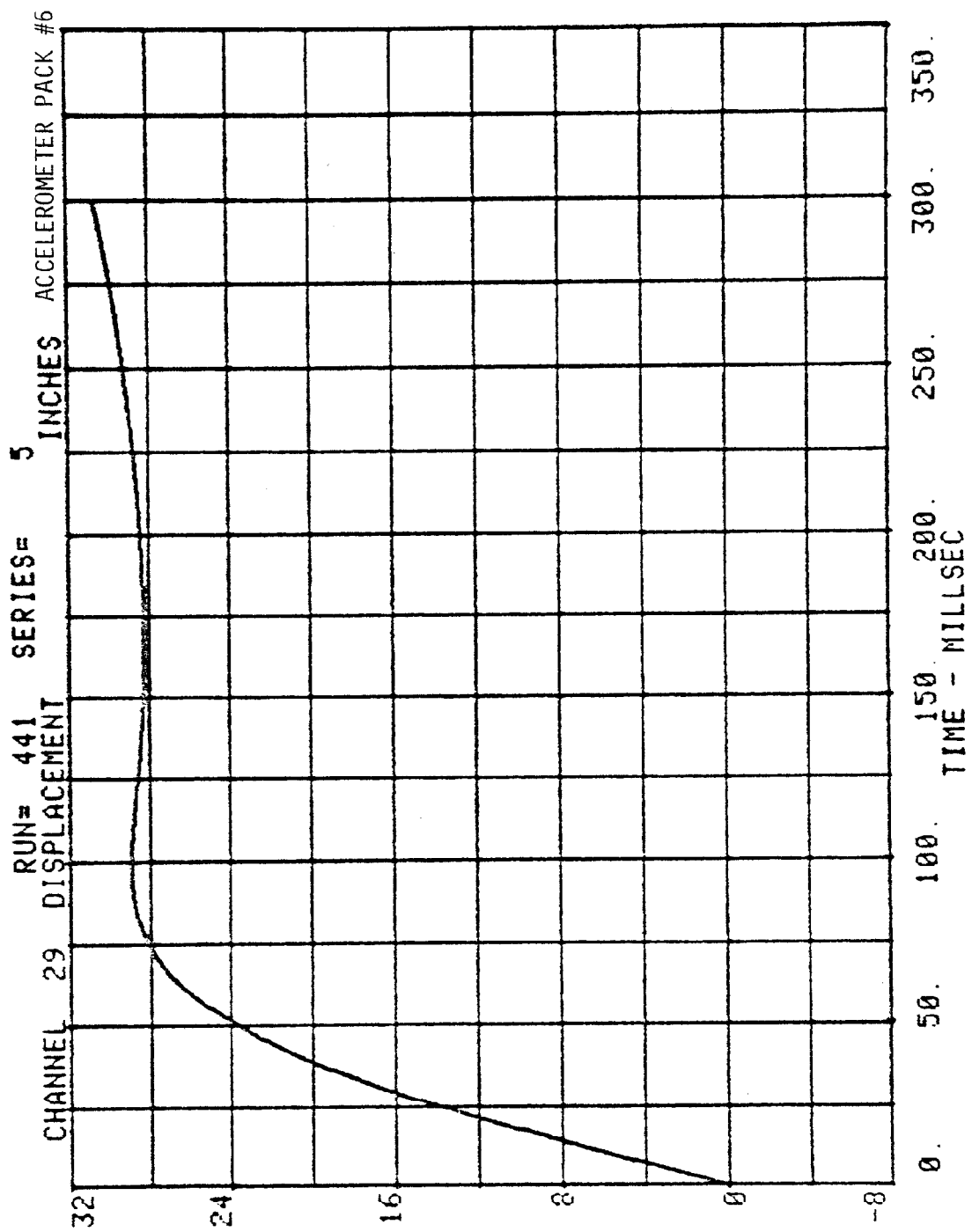


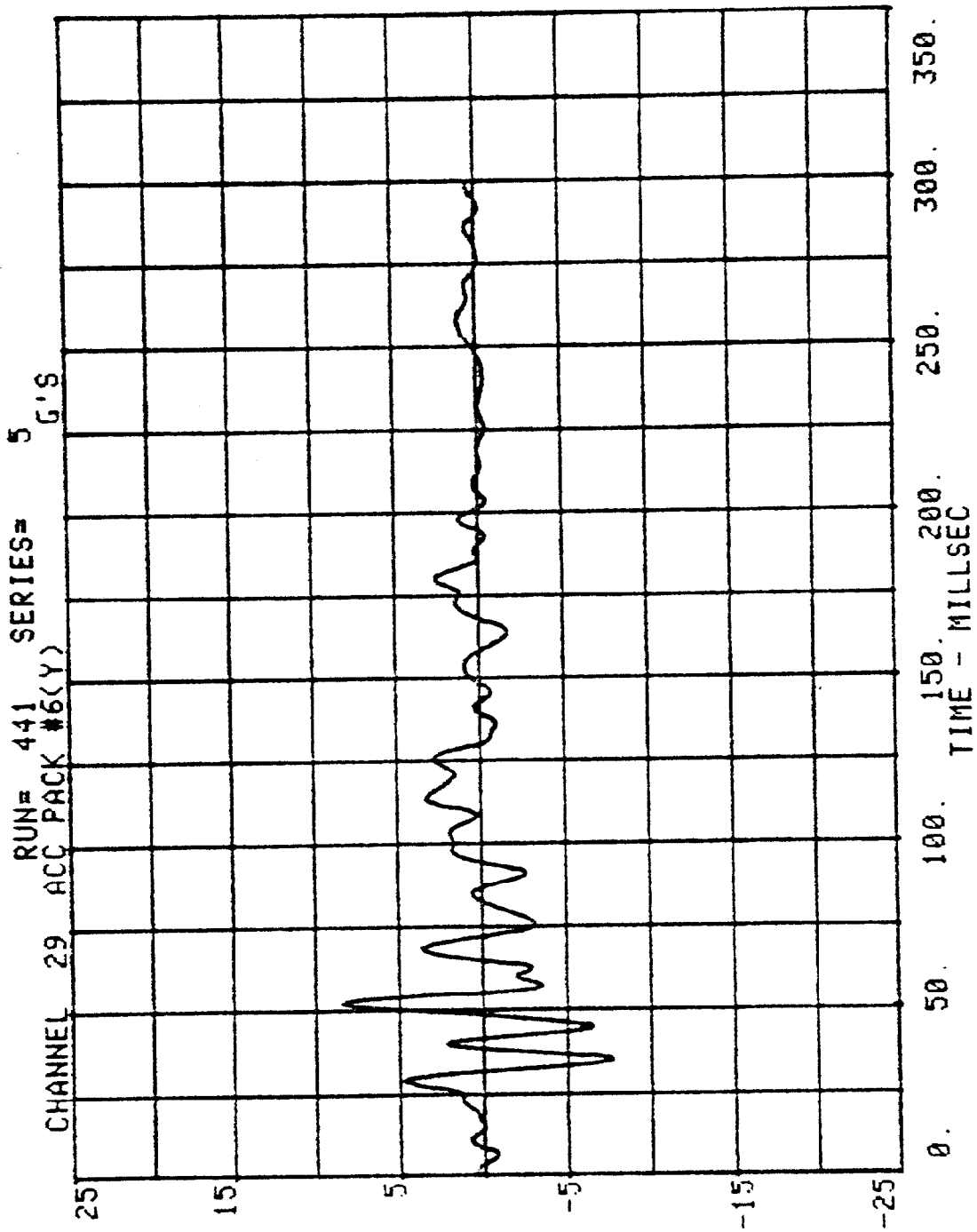
CHANNEL 27 ACC PACK #5(2) RUN# 441 SERIES# 5 G'S

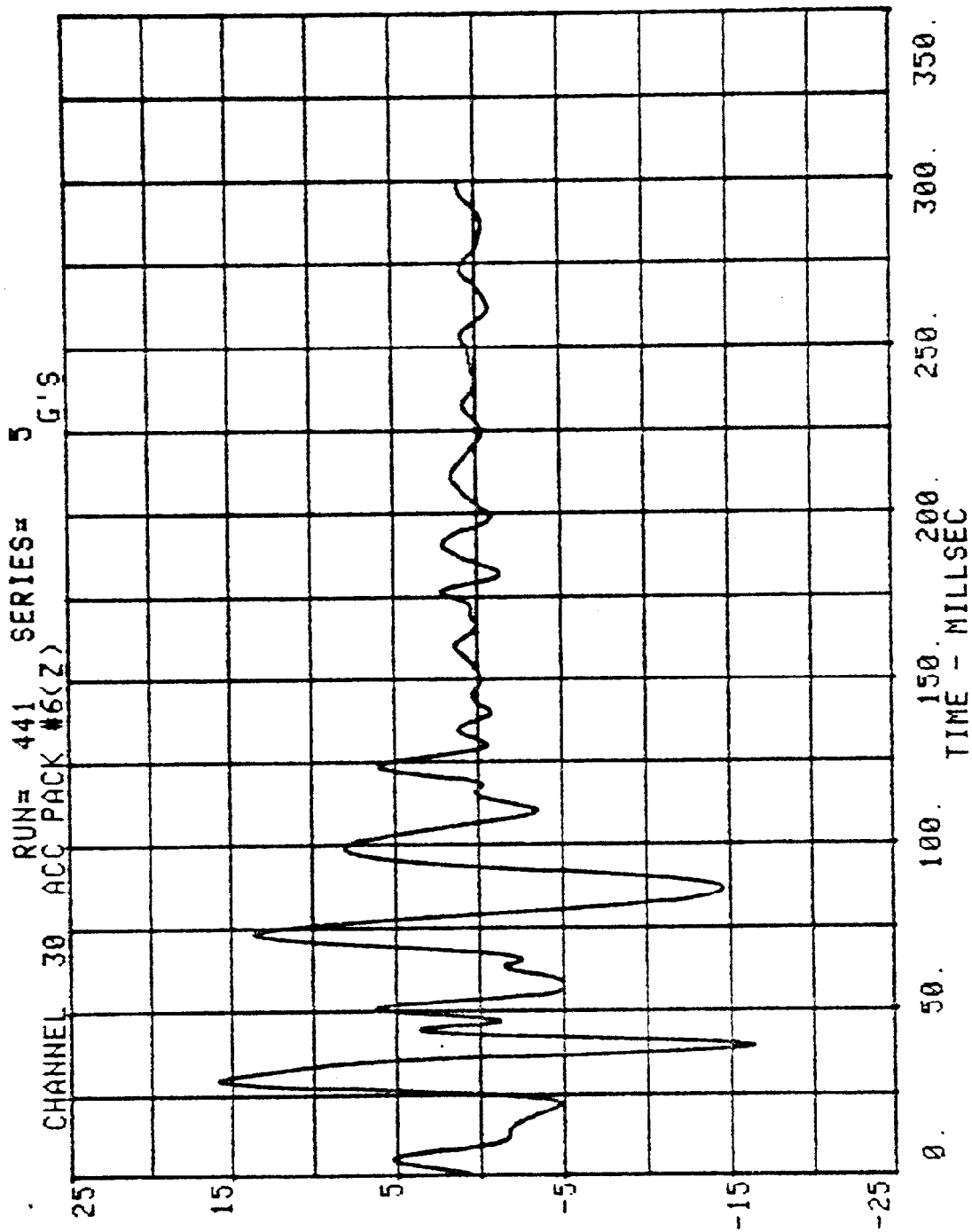












HEAD INJURY CRITERION
HEAD SEVERITY INDEX

BOA #5 RABBIT BARRIER TEST

RUN= 441

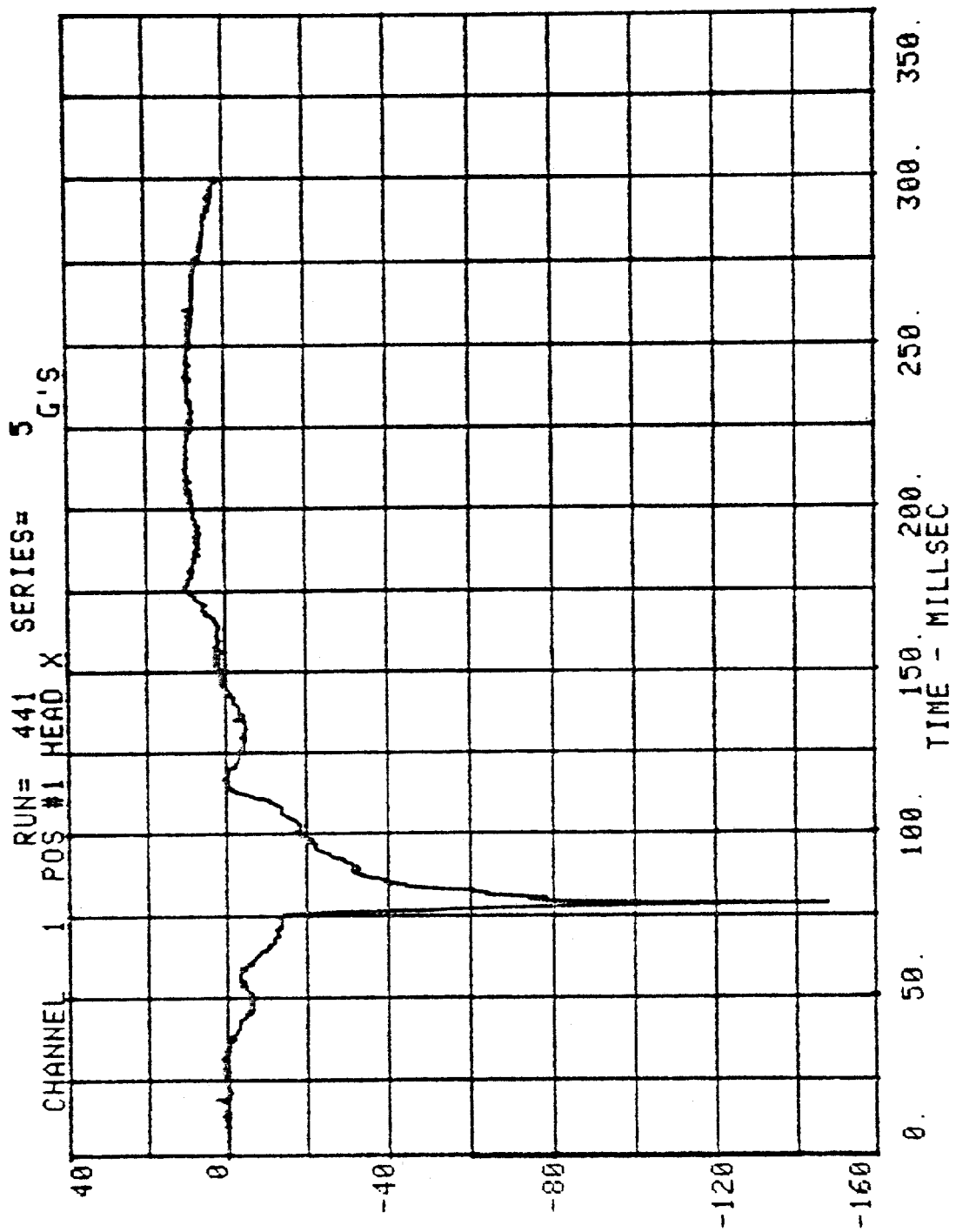
POS #1 HEAD RESULTANT

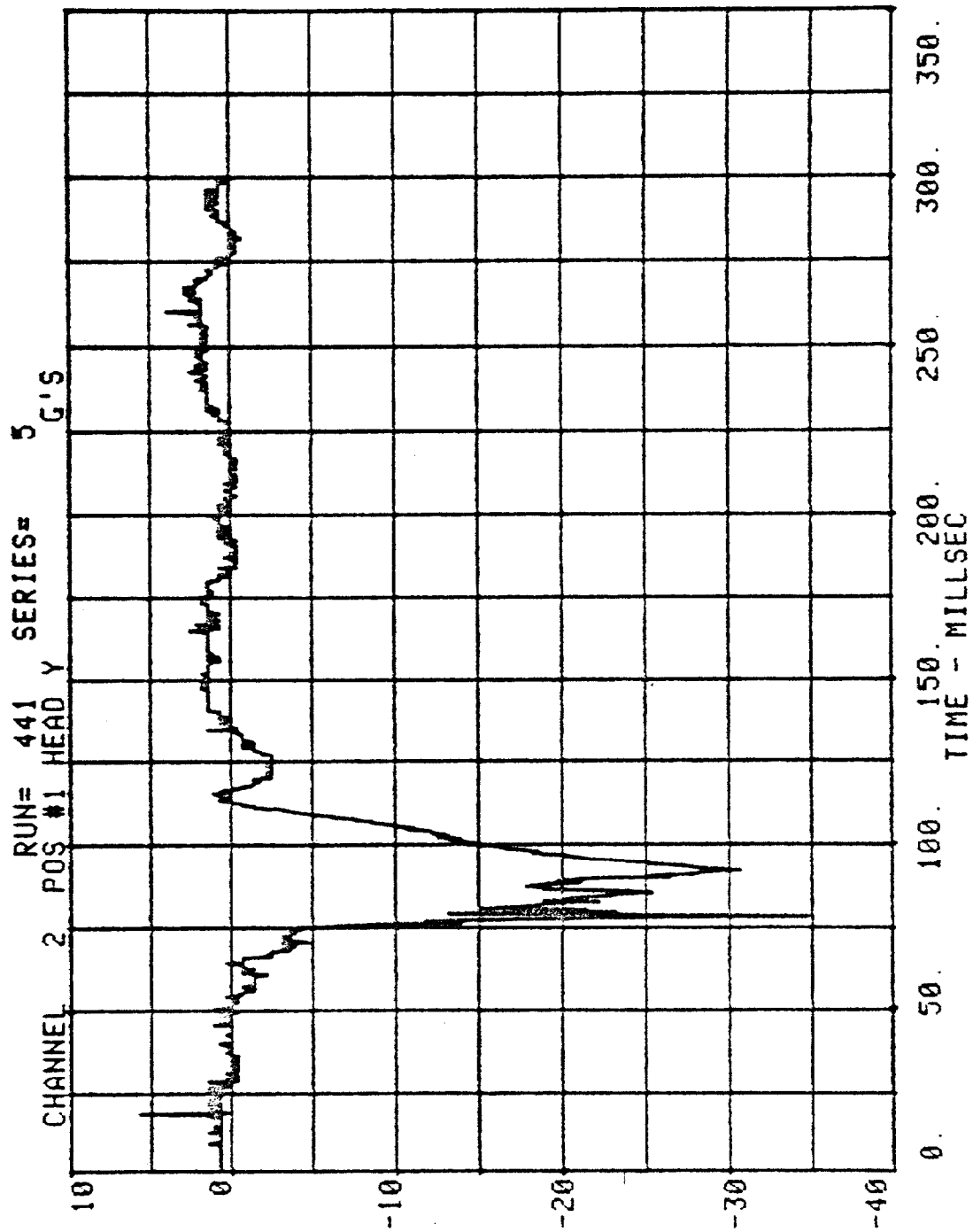
HIC=1023.9 FROM T1= .07620 TO T2= .09450

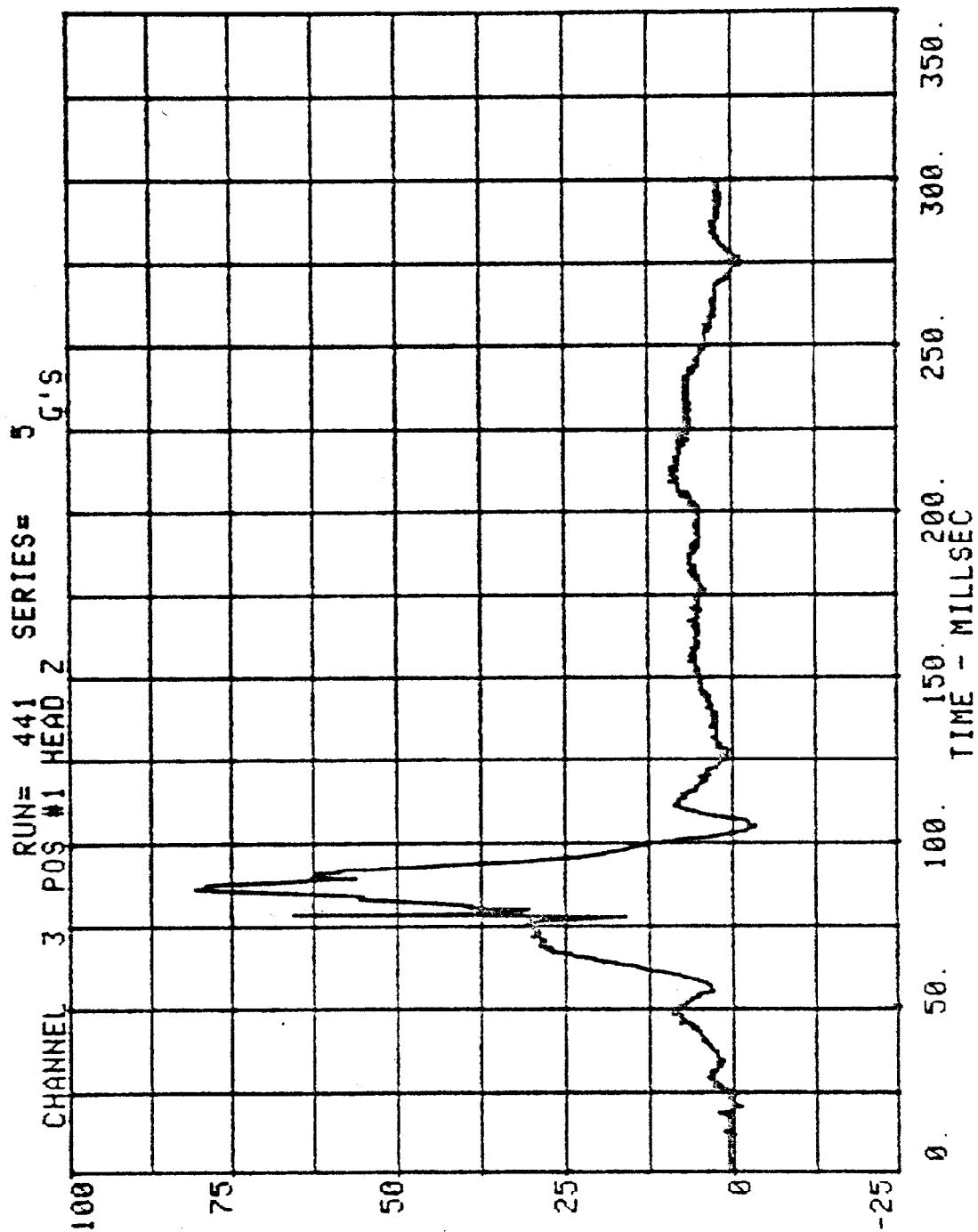
AVERAGE ACCELERATION BETWEEN T1 AND T2= 79.3G'S

EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1306.7

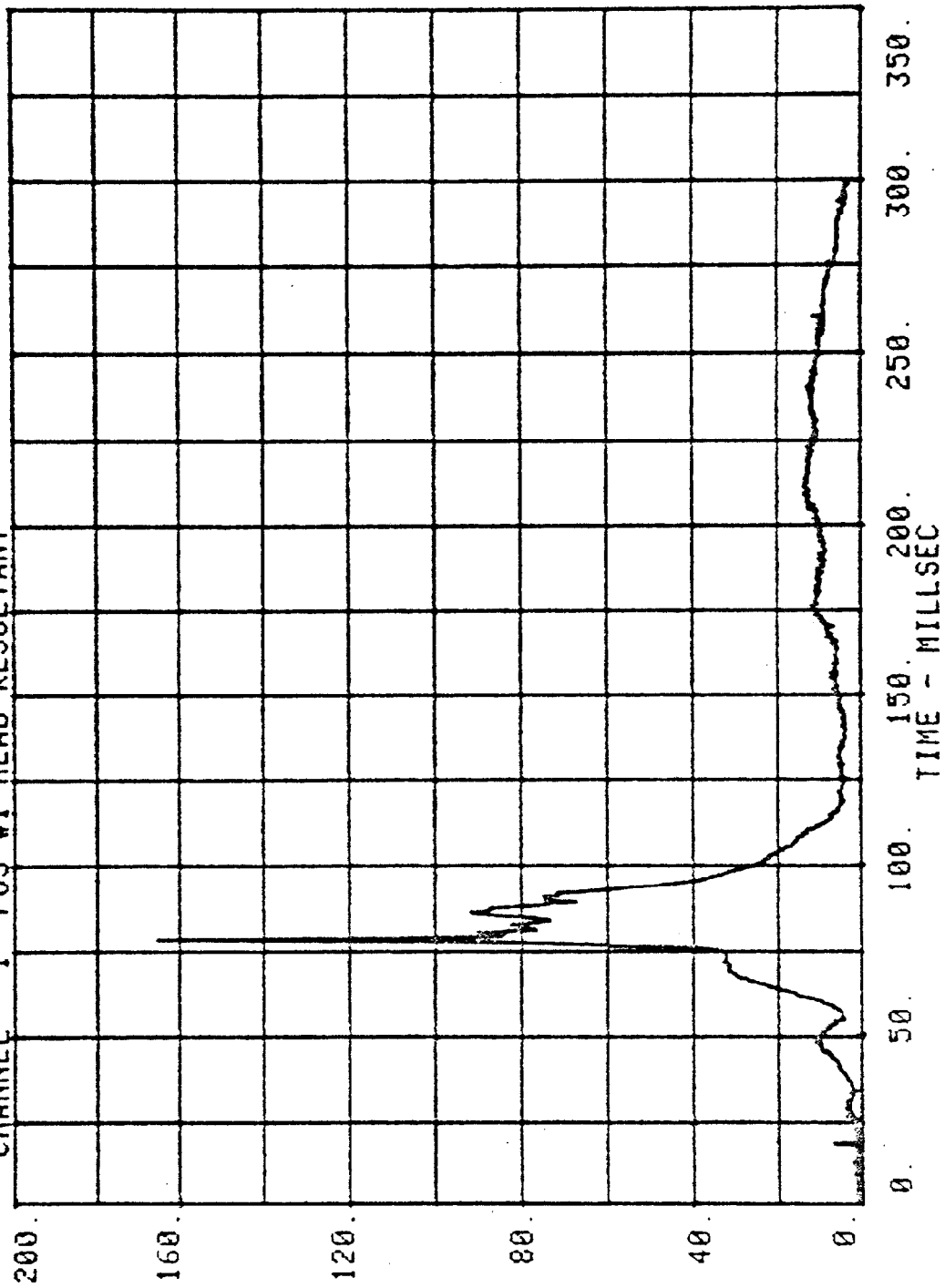


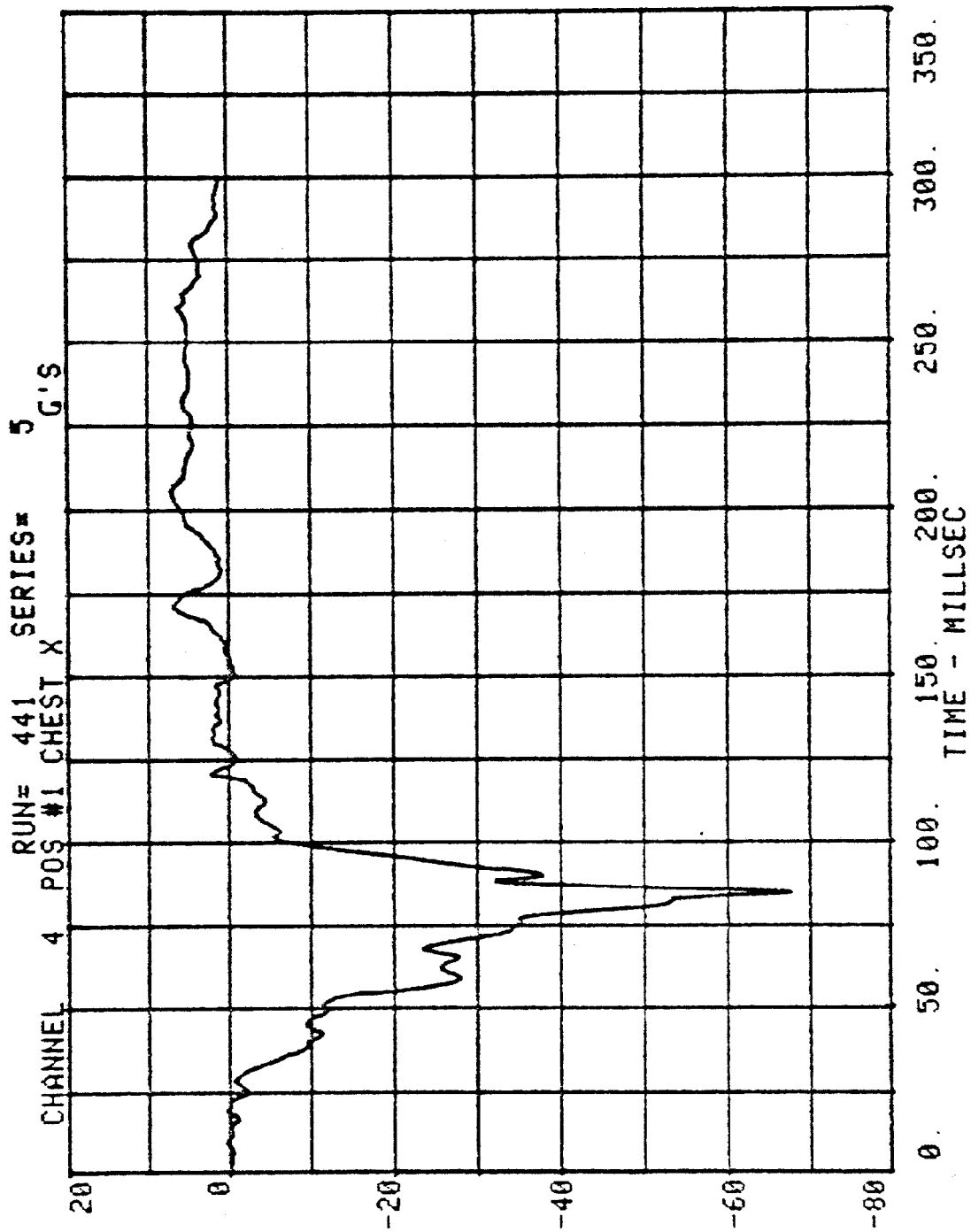


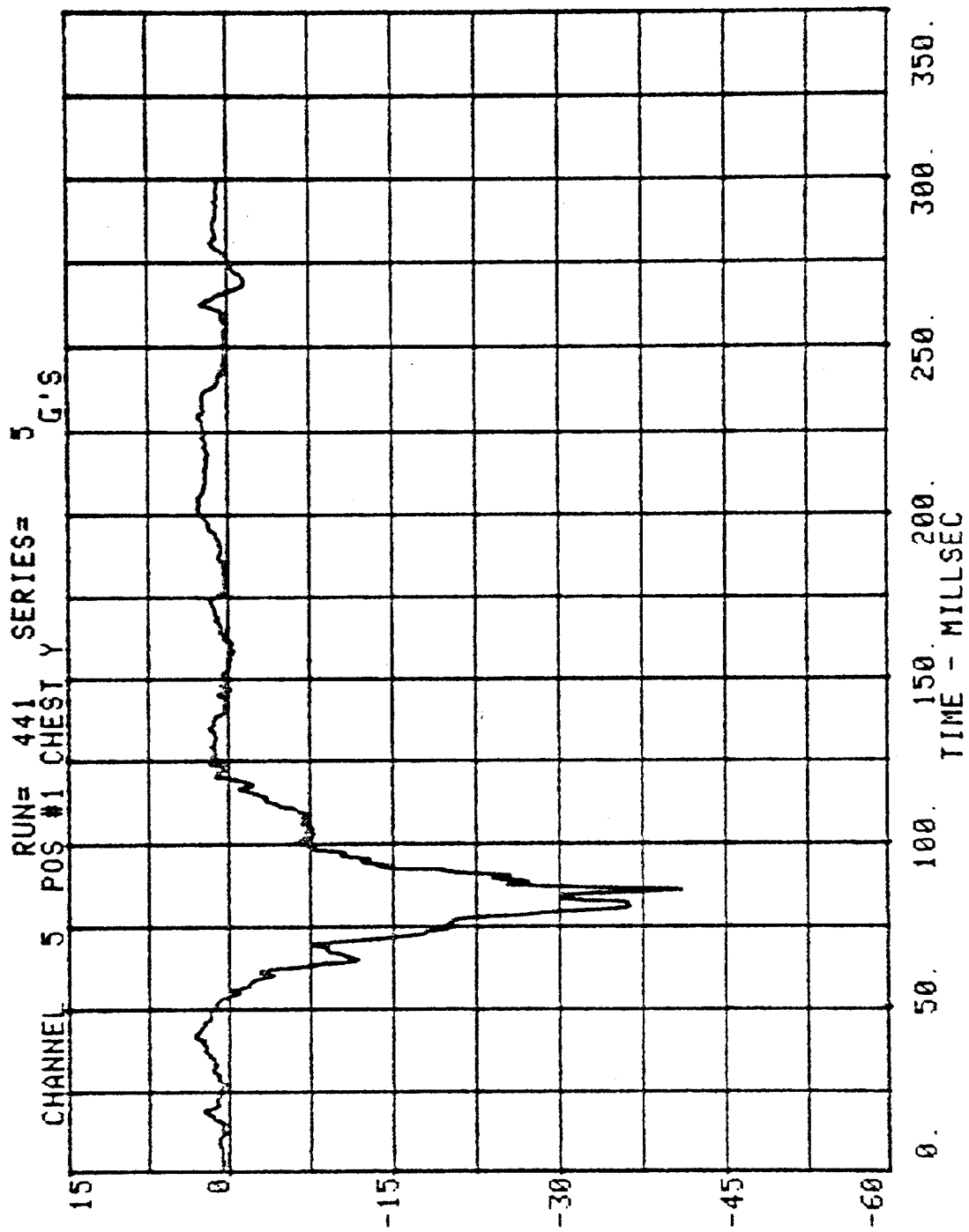


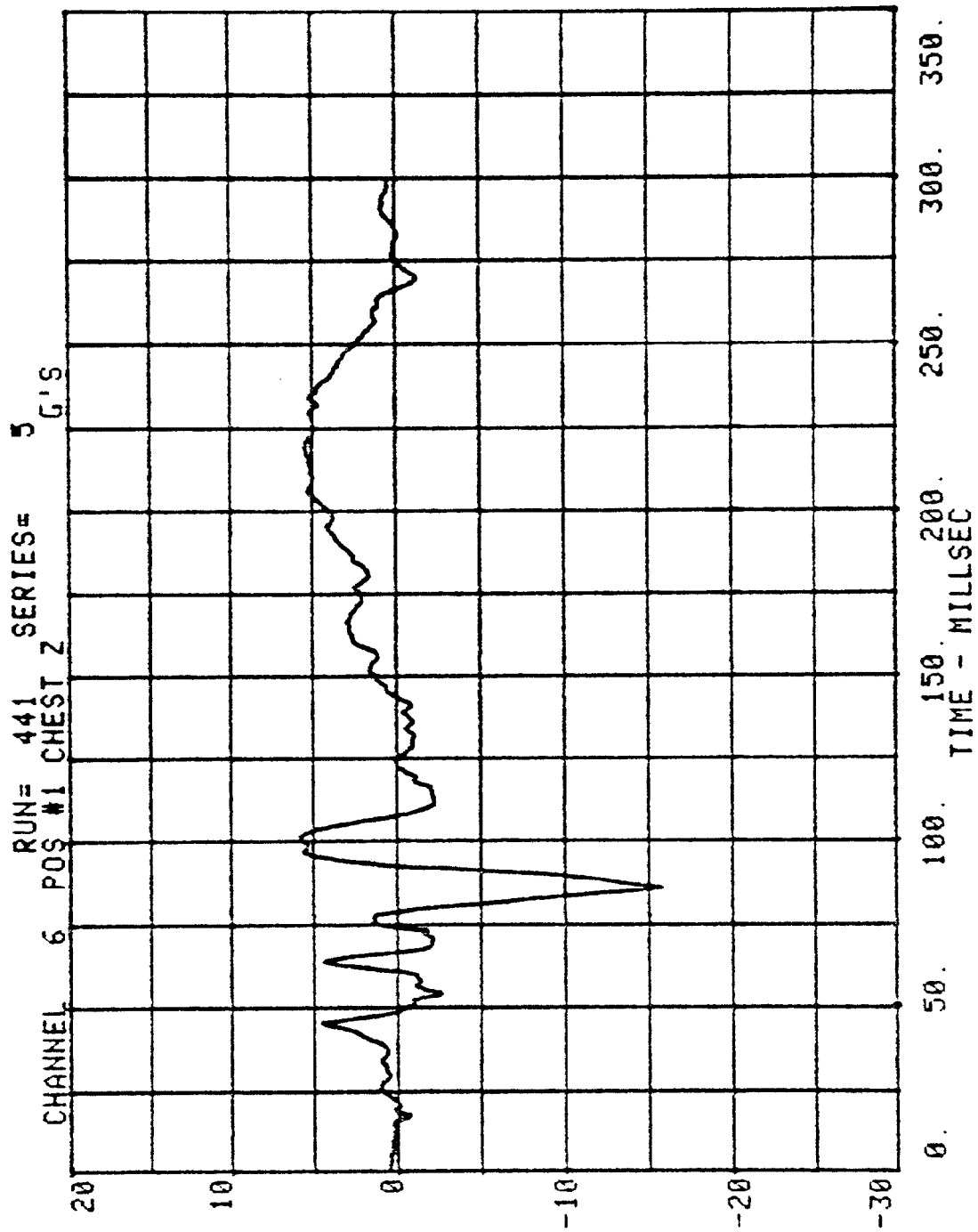
5

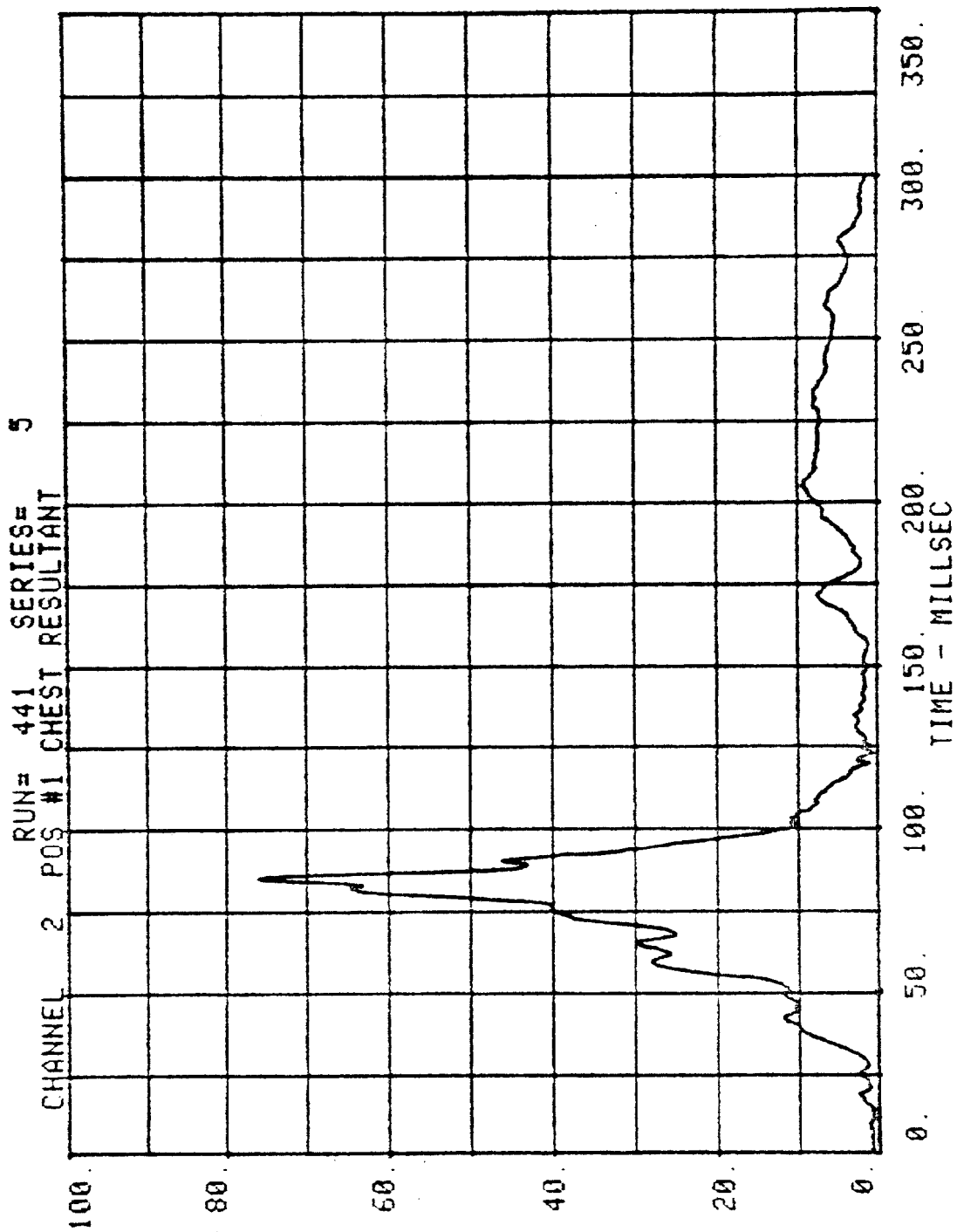
RUN= 441 SERIES= 5
CHANNEL 1 POS #1 HEAD RESULTANT

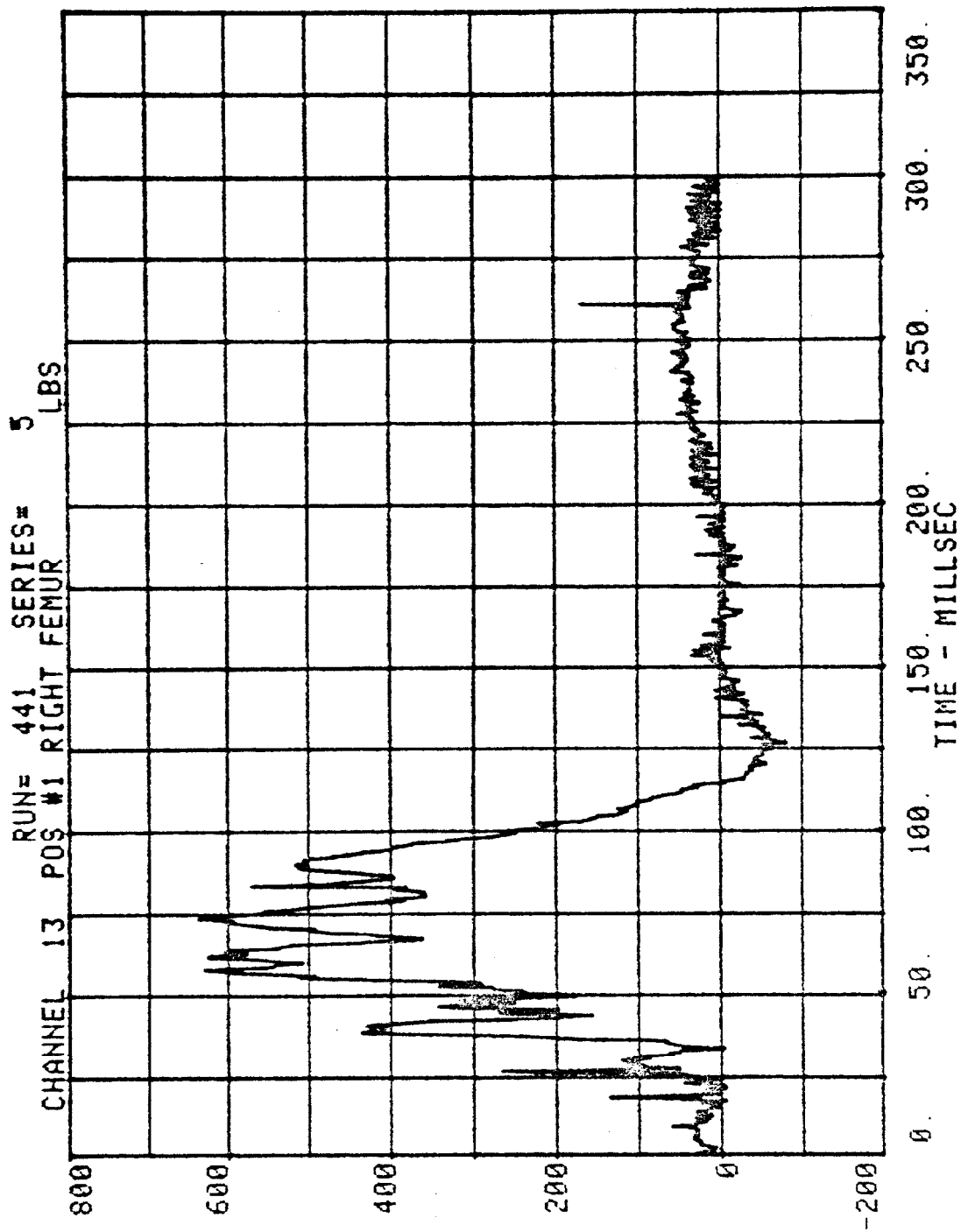


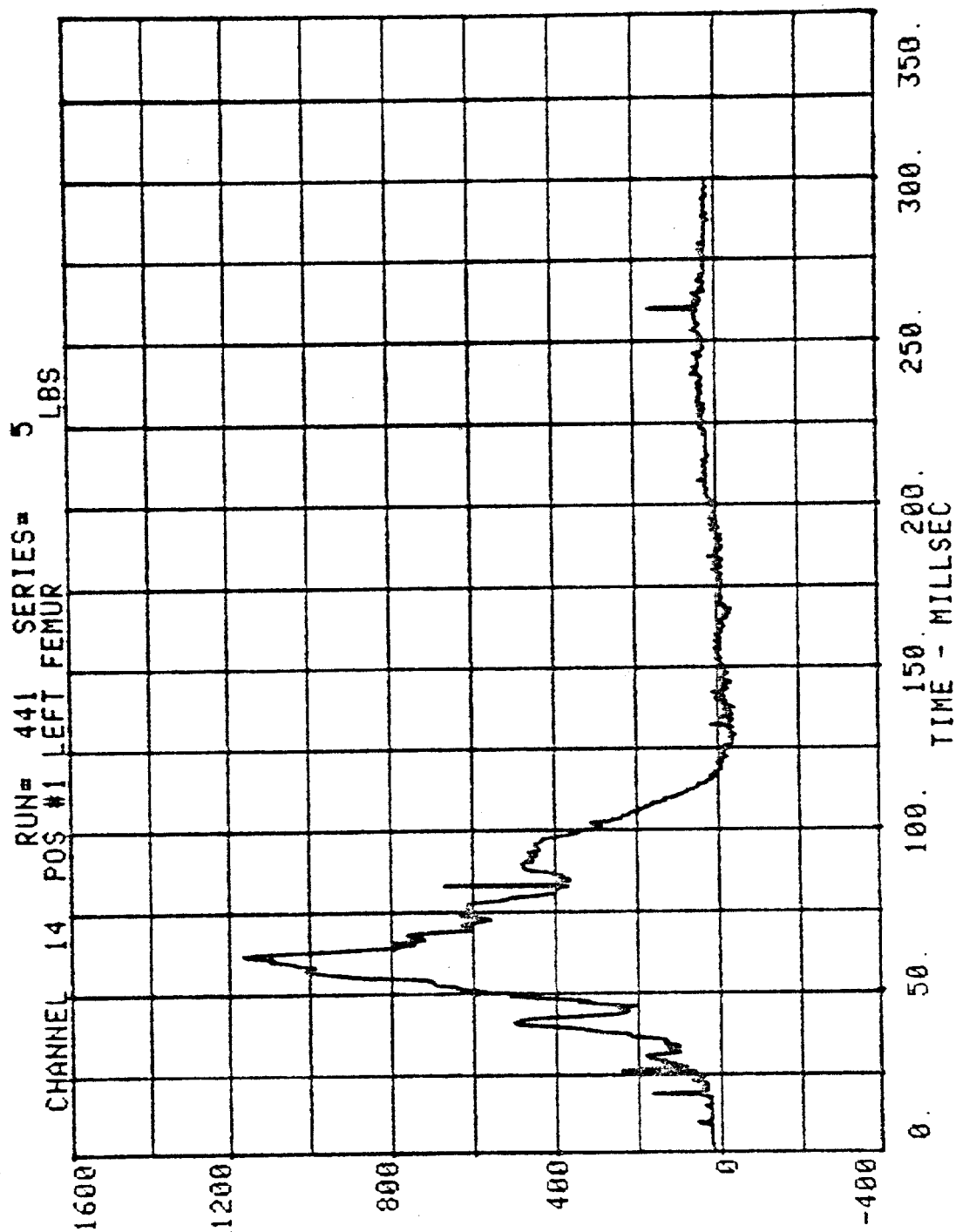


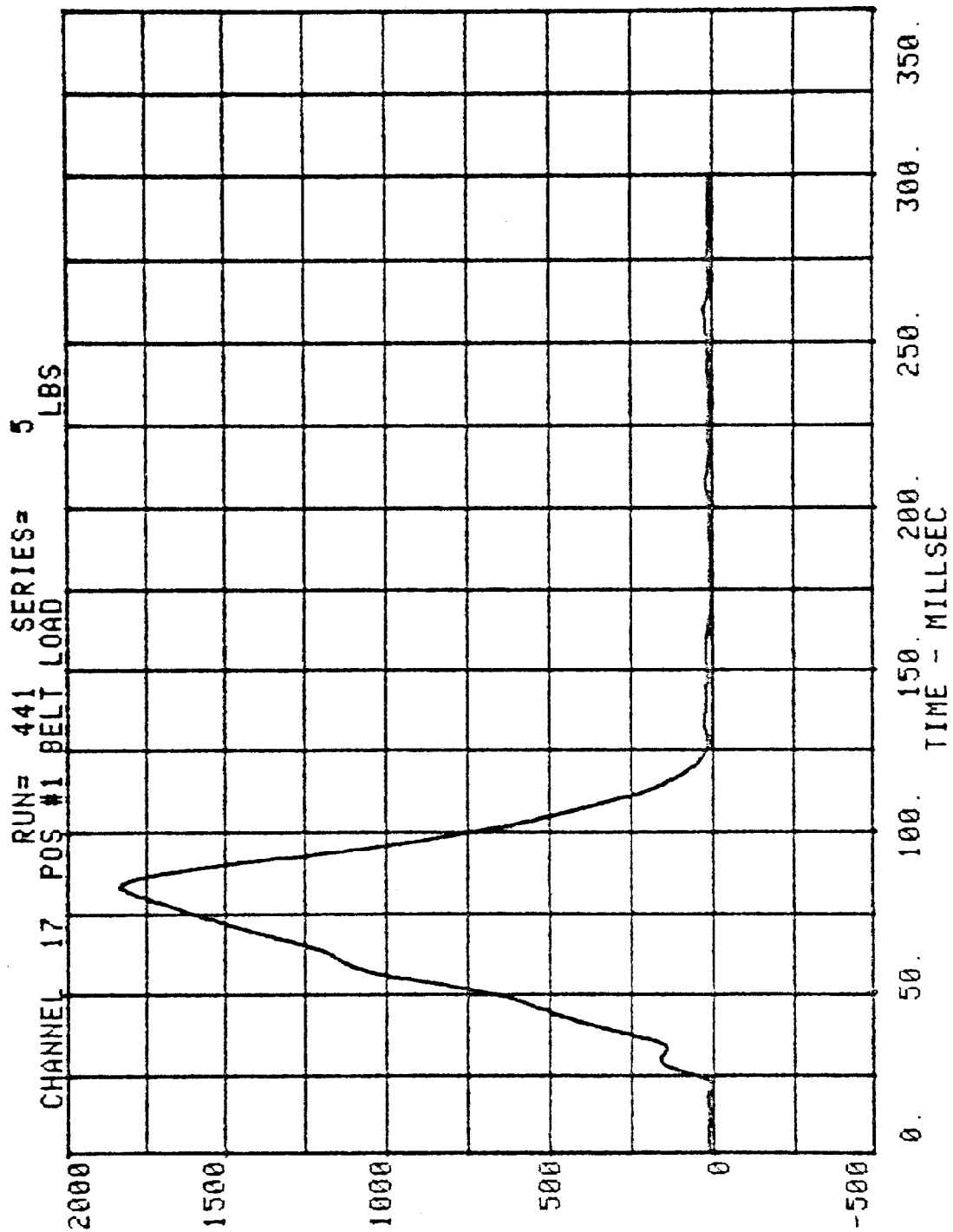












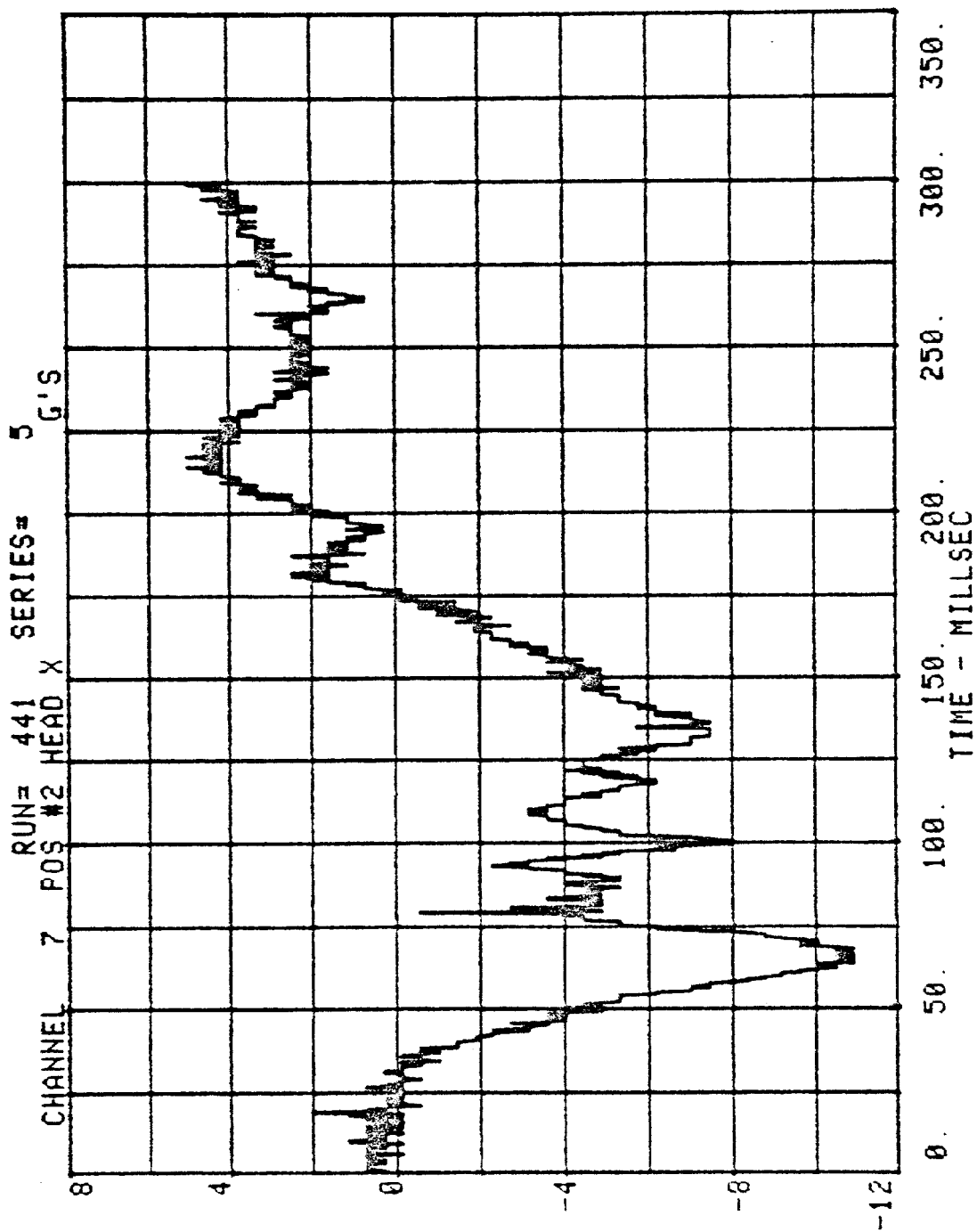
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

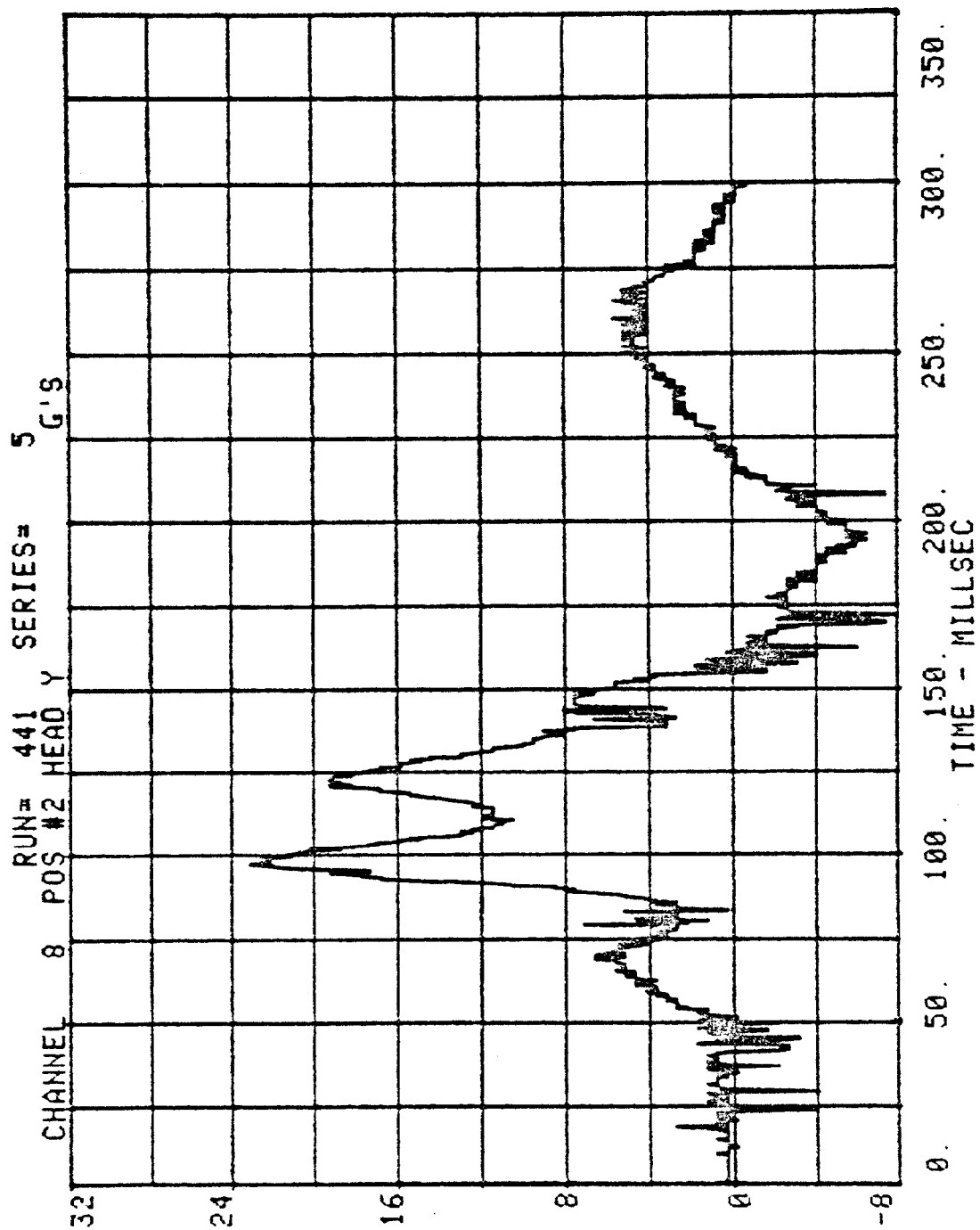
BOA #5 RABBIT BARRIER TEST

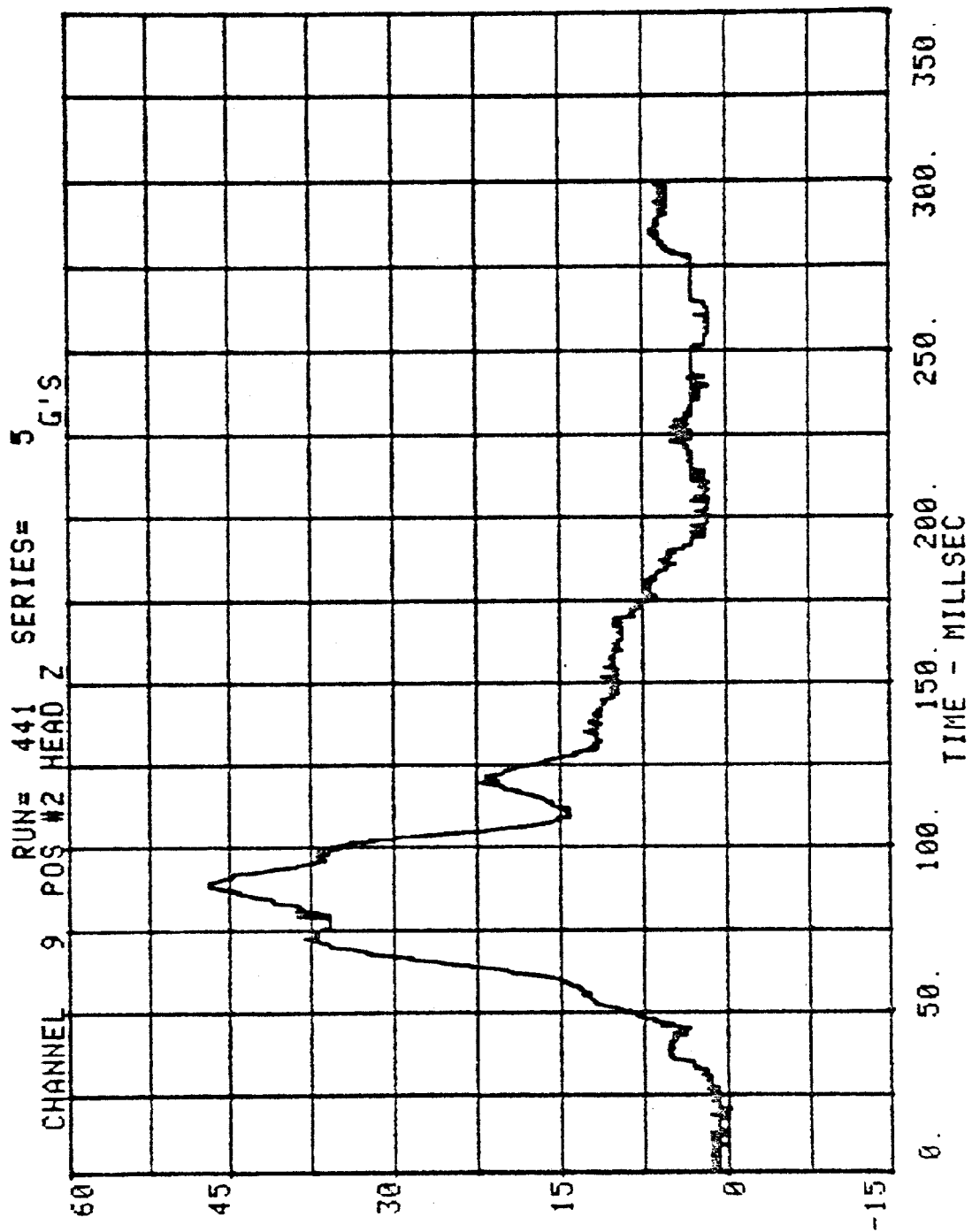
RUN= 441

POS #2 HEAD RESULTANT

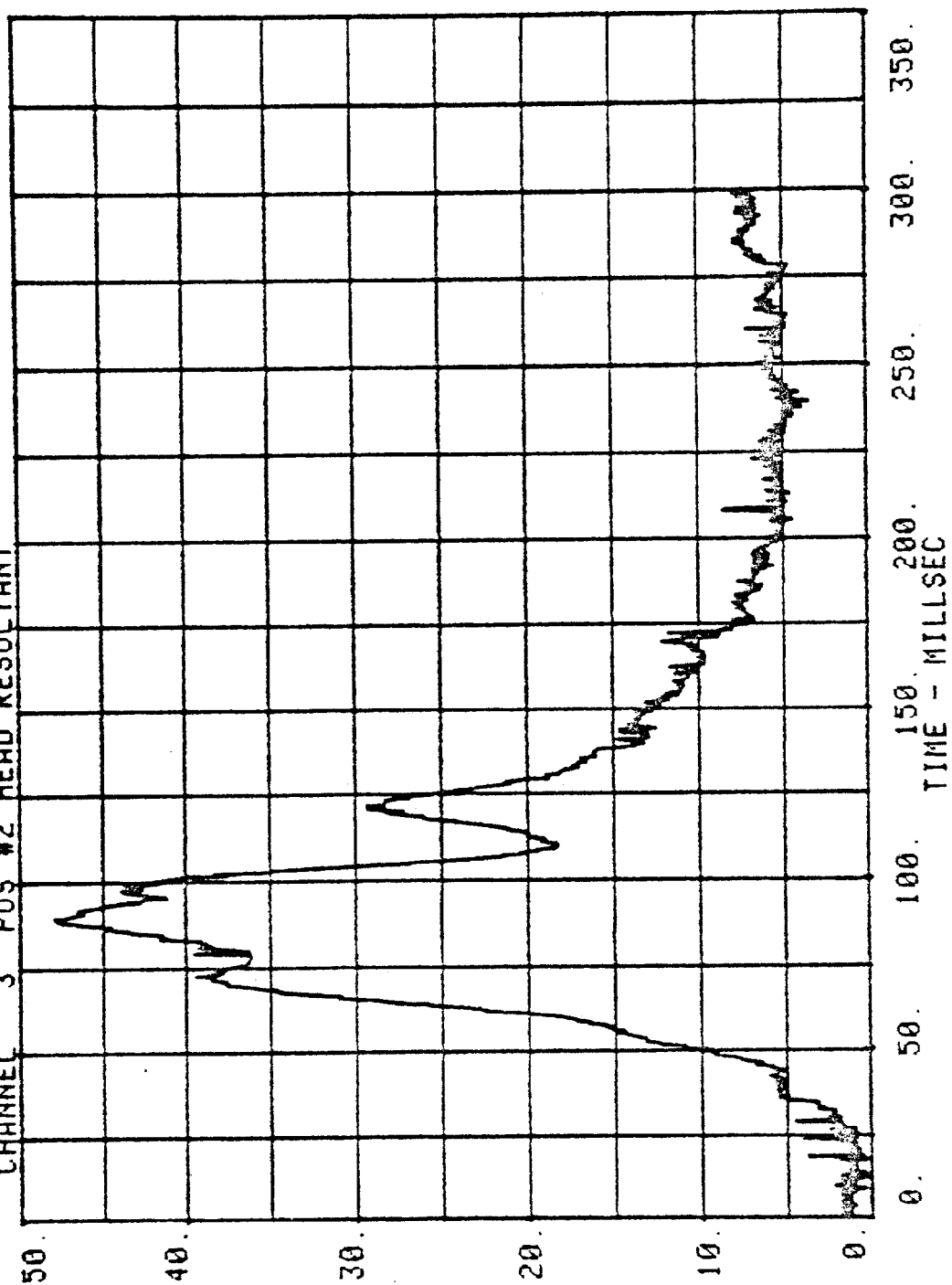
HIC= 428.8 FROM T1= .06060 TO T2= .12960
AVERAGE ACCELERATION BETWEEN T1 AND T2= 32.9G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 541.5

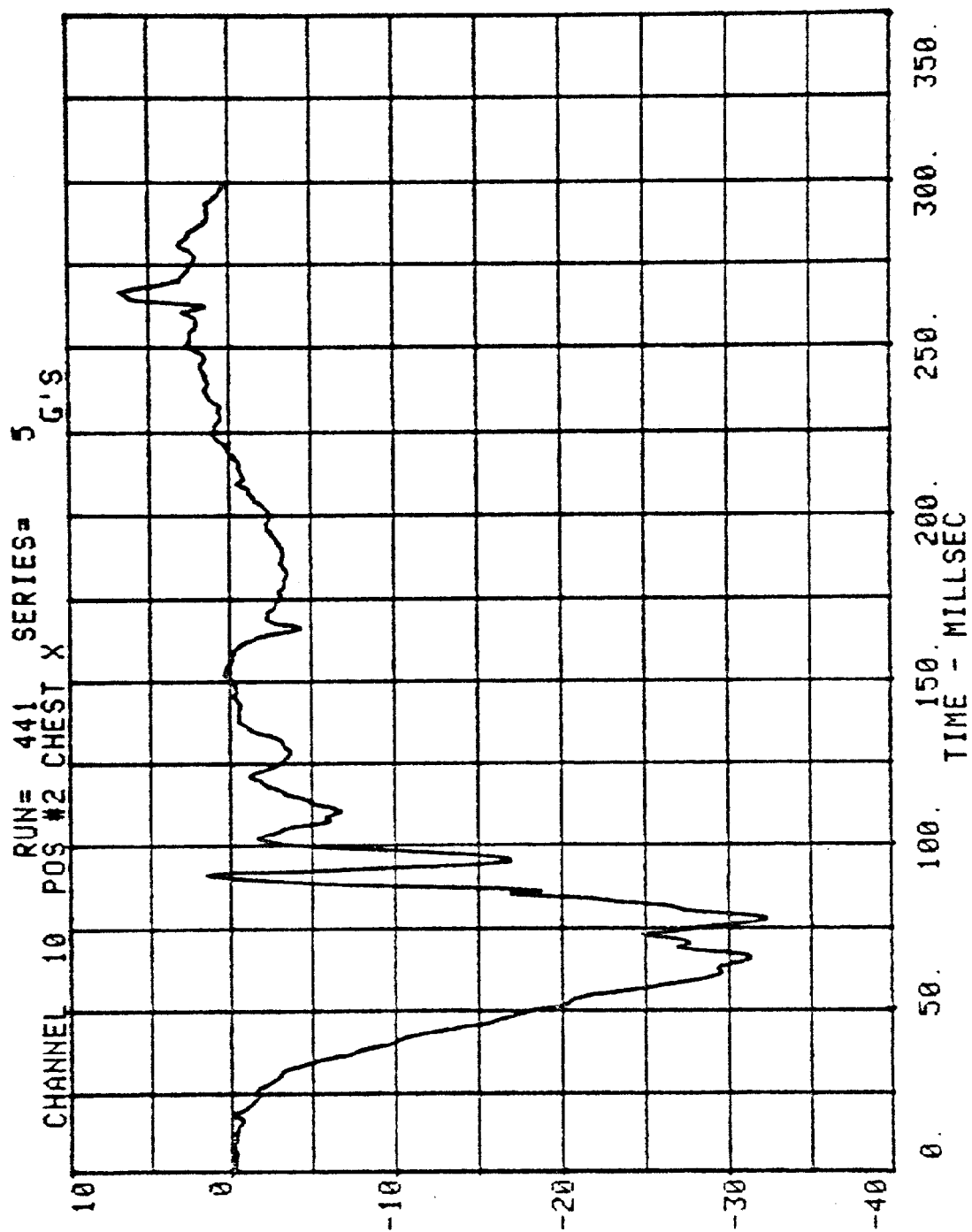


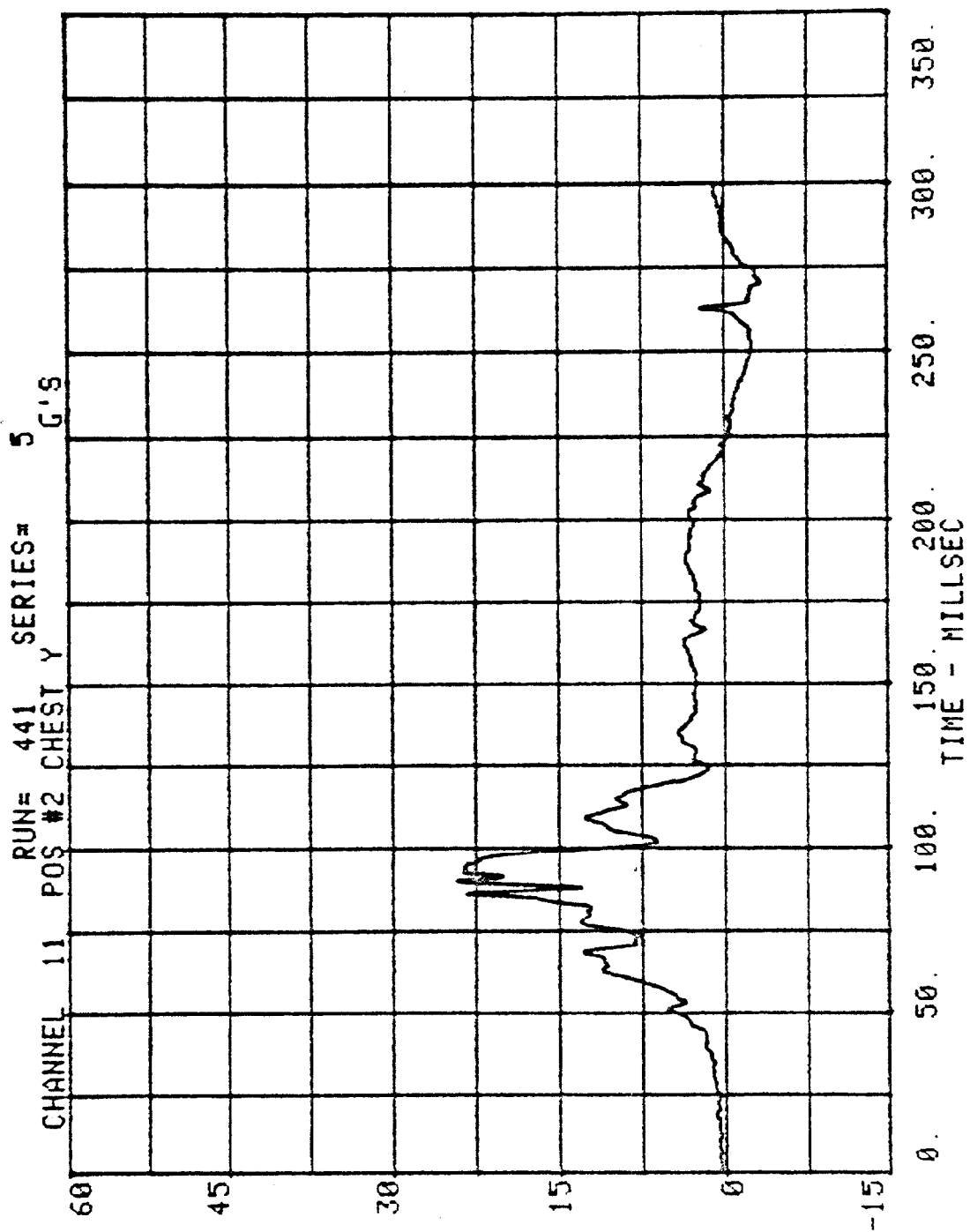


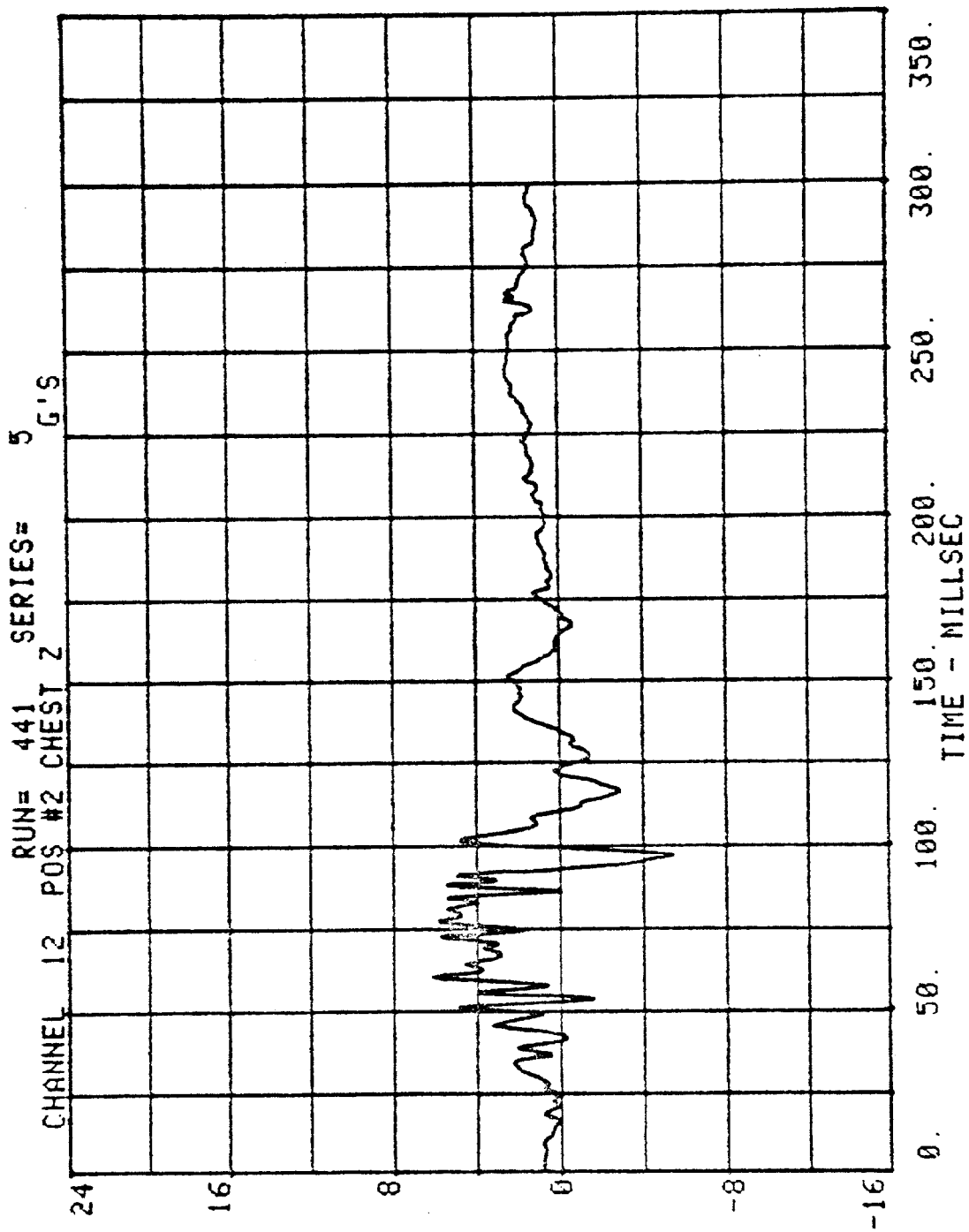


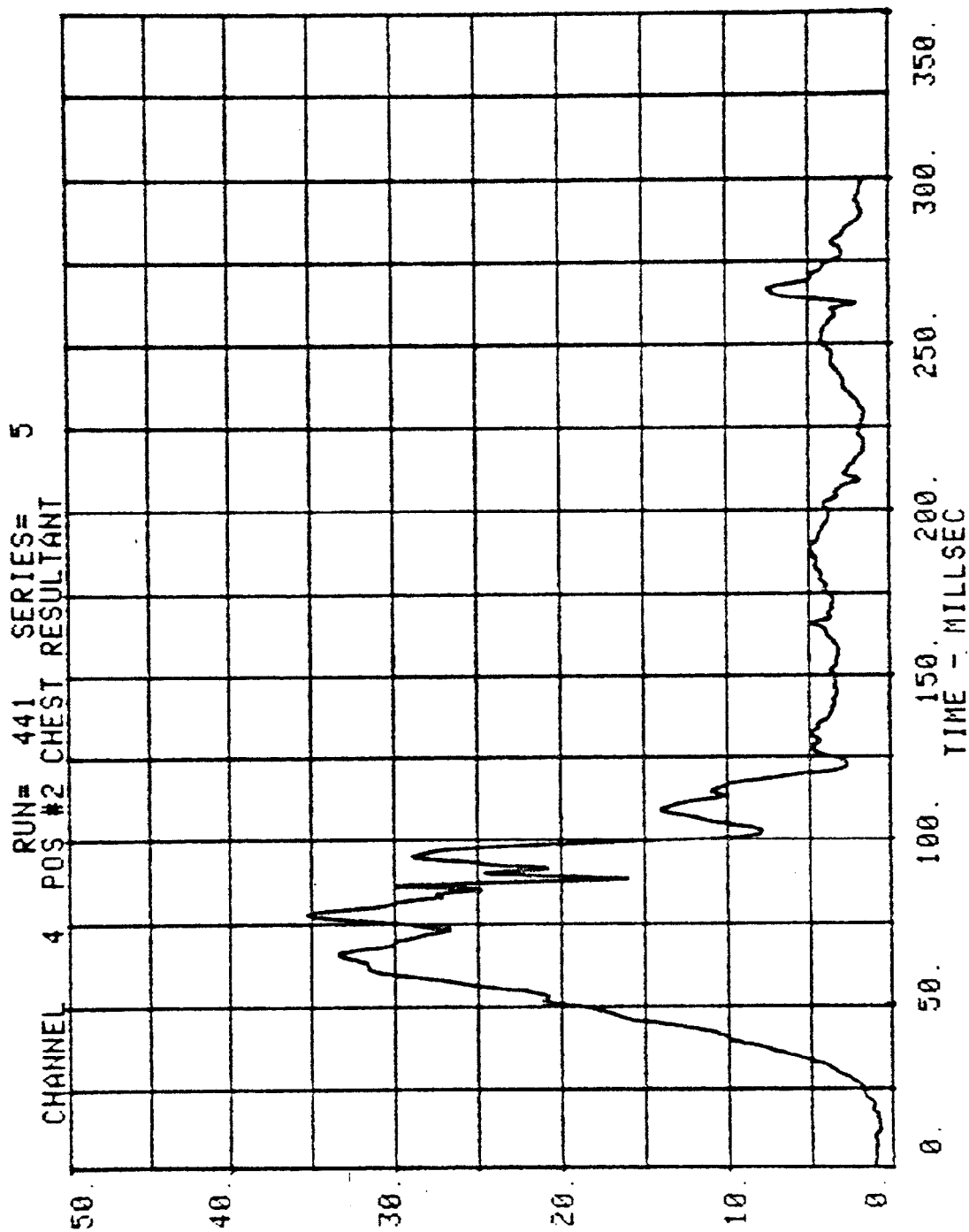
CHANNEL 3 POS #2 HEAD RESULTANT RUN= 441 SERIES= 5

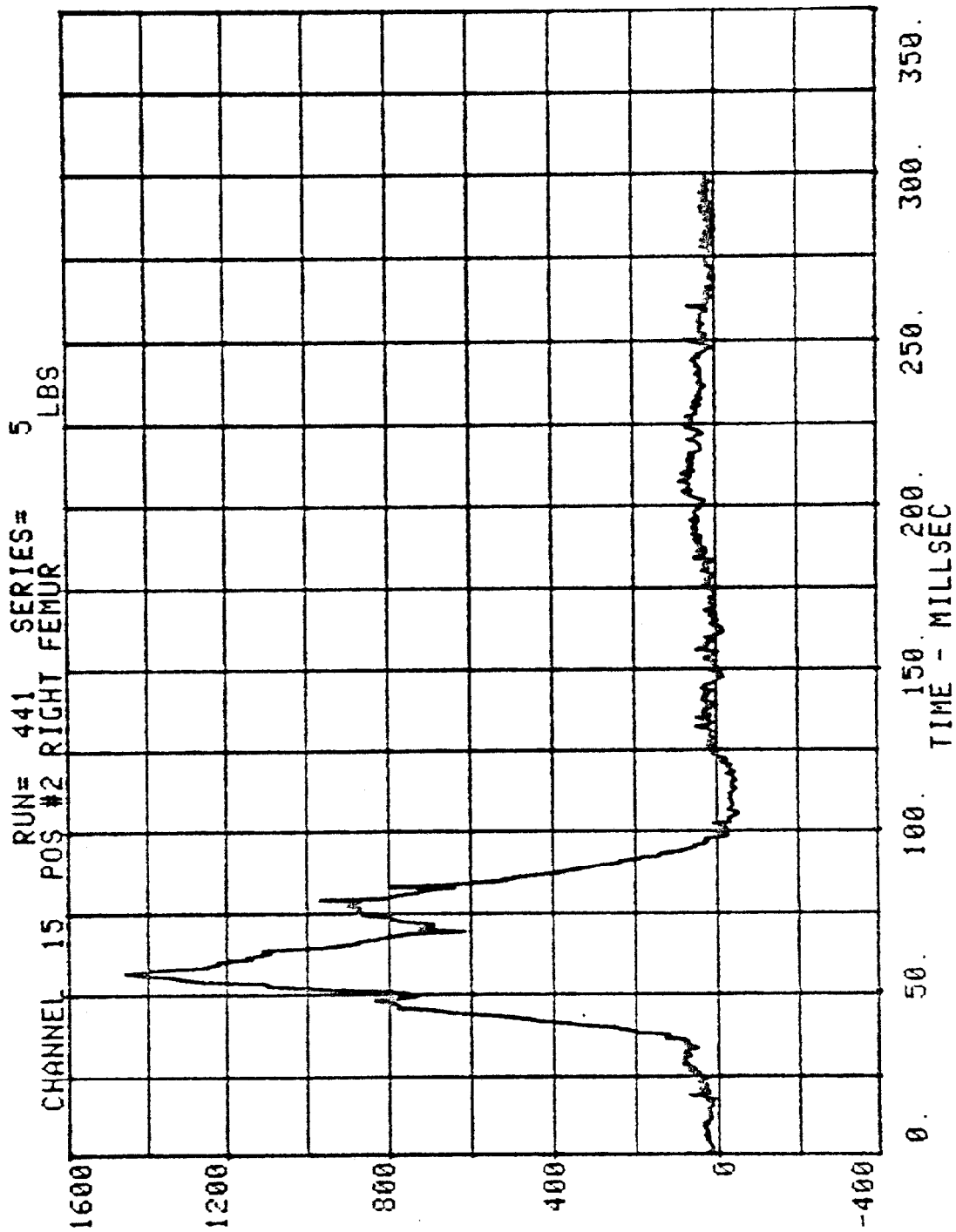


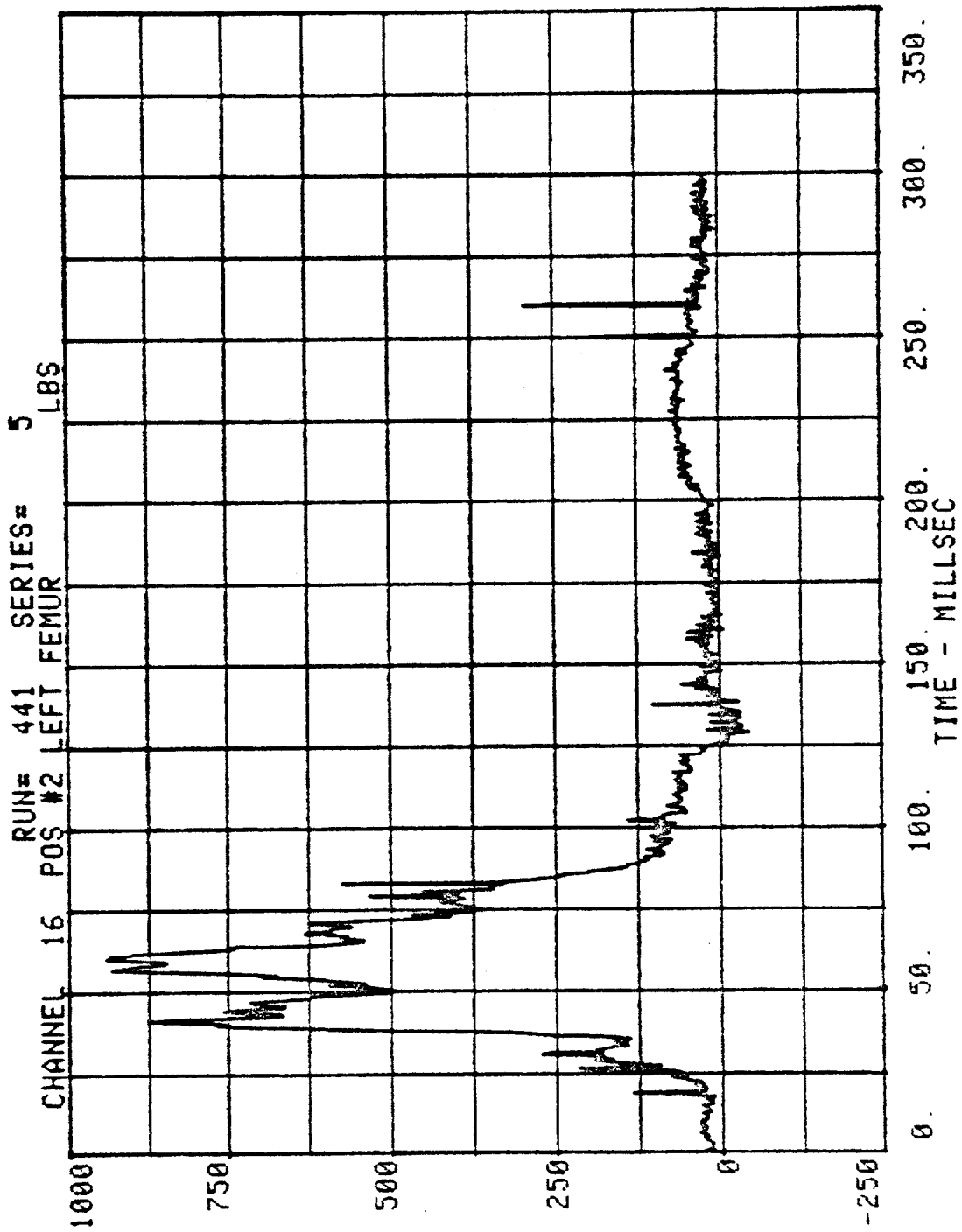


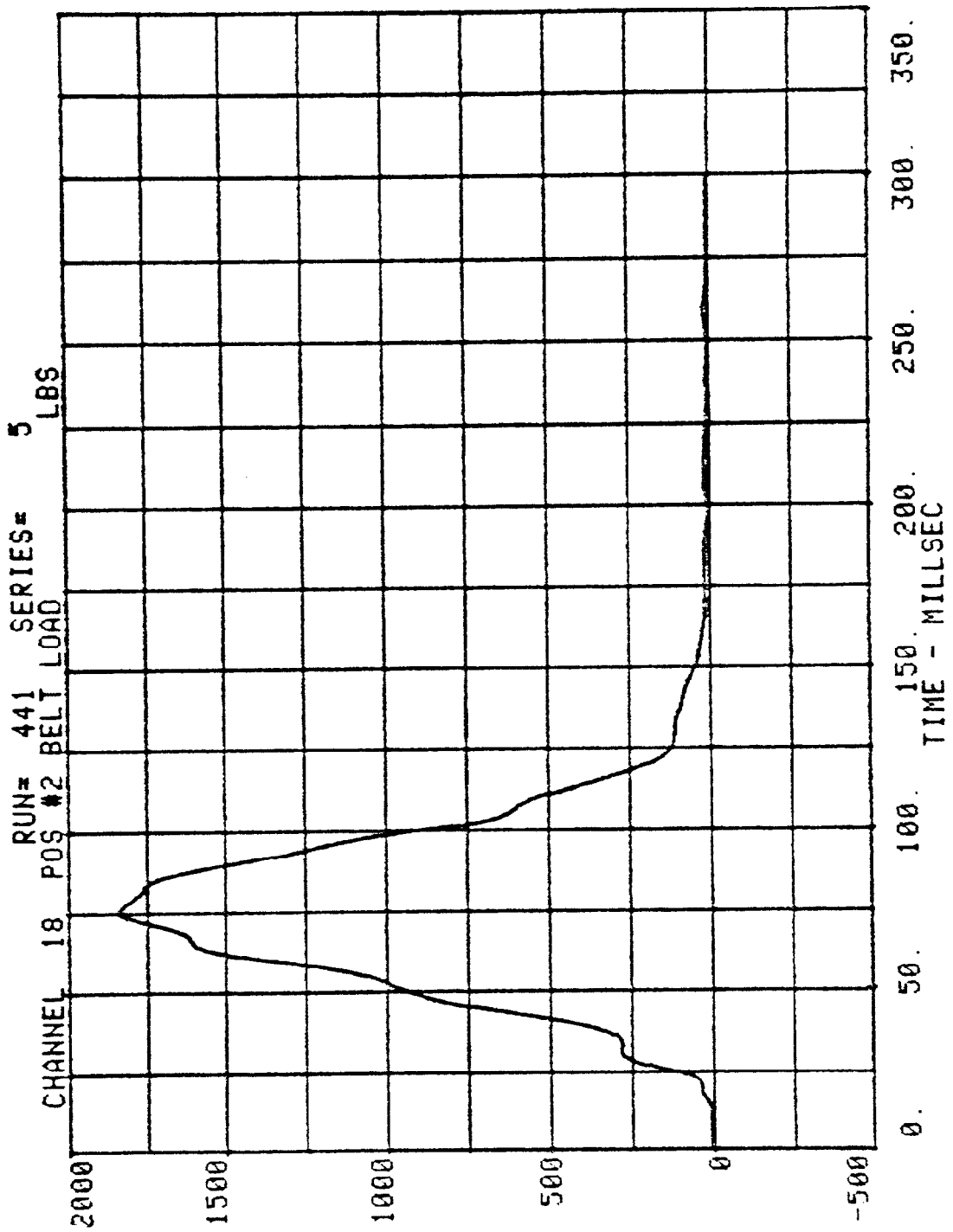












HEAD INJURY CRITERION
HEAD SEVERITY INDEX

BOA #5 RABBIT BARRIER TEST

RUN= 441

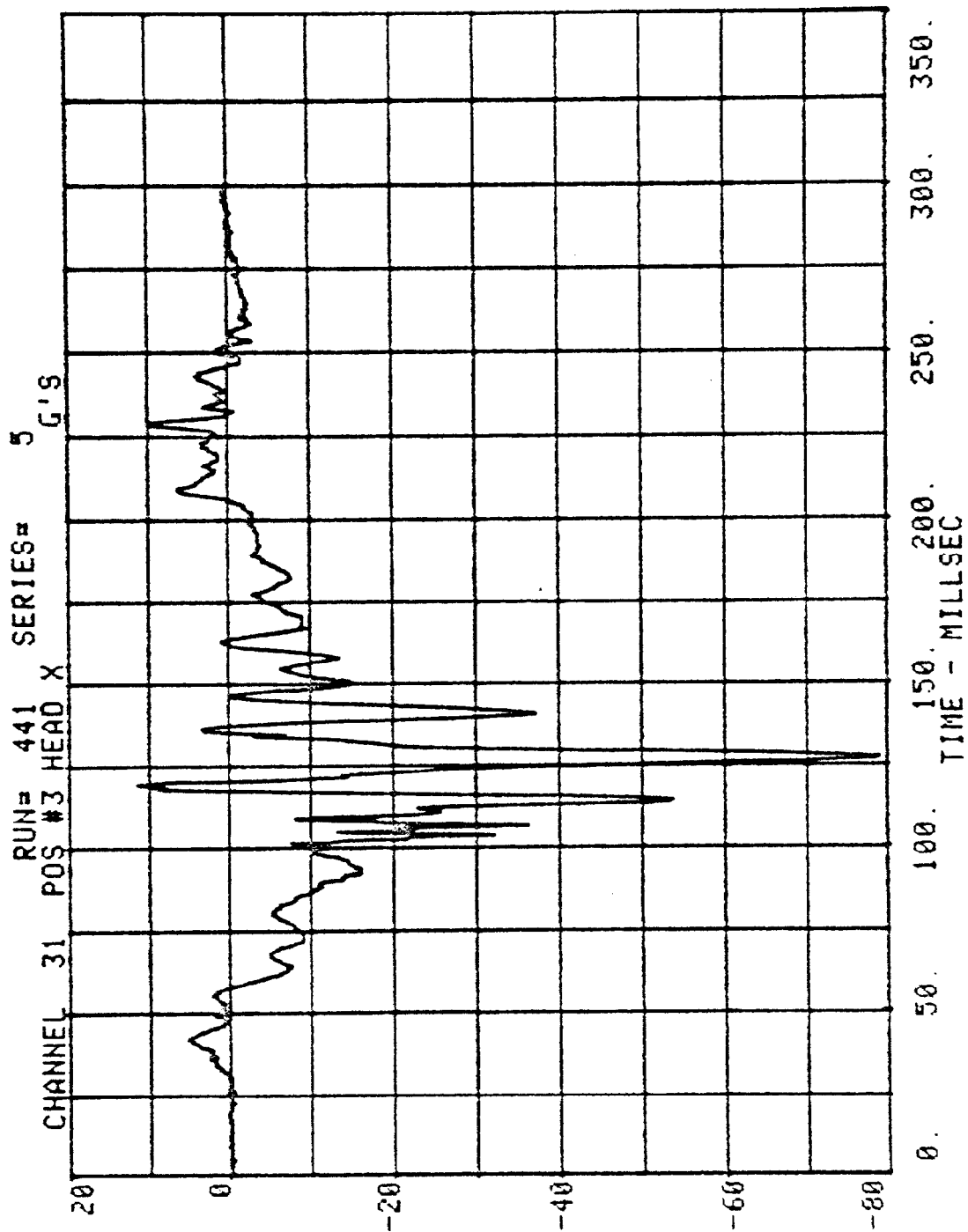
POS #3 HEAD RESULTANT

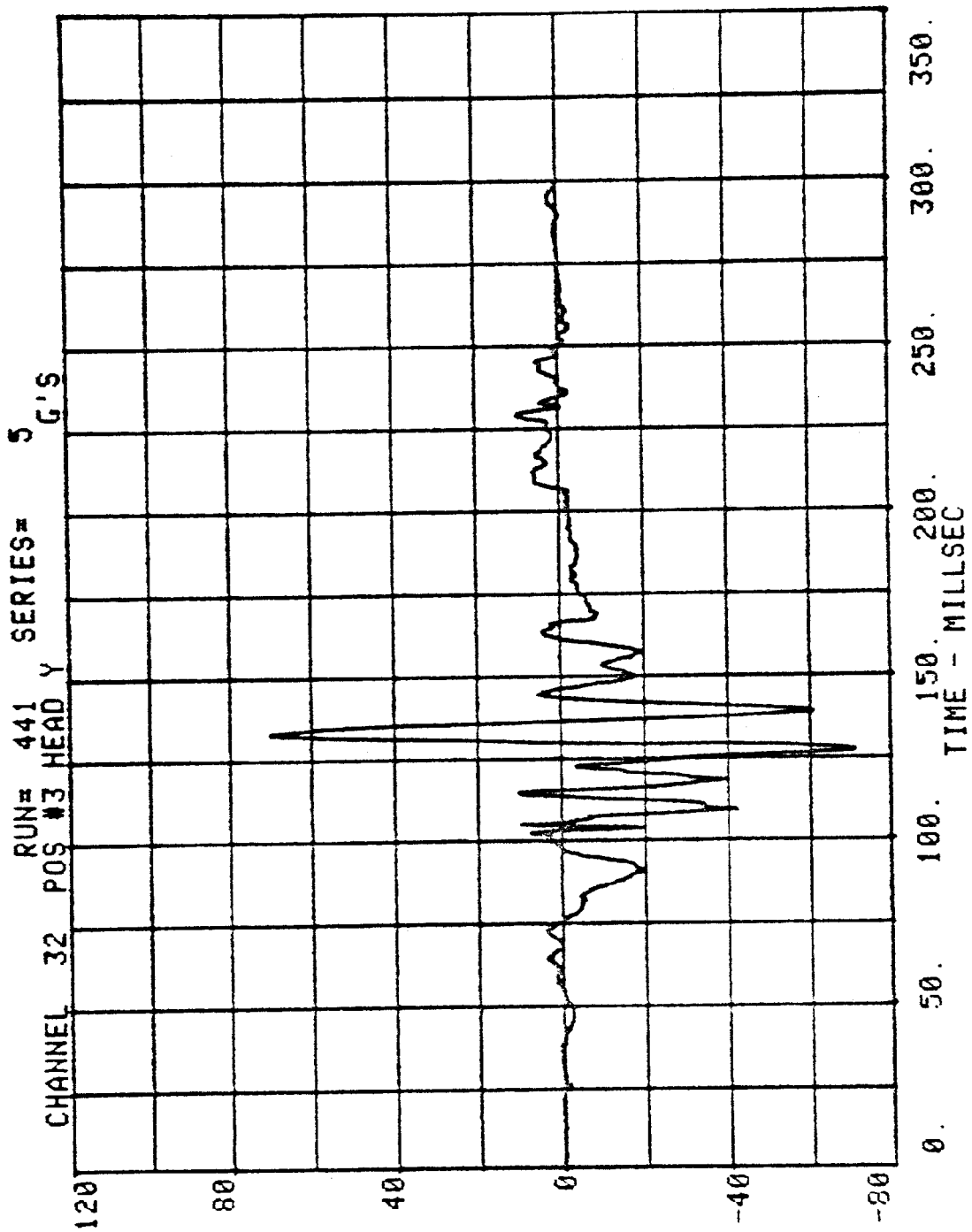
HIC=2192.5 FROM T1= .07350 TO T2= .14250

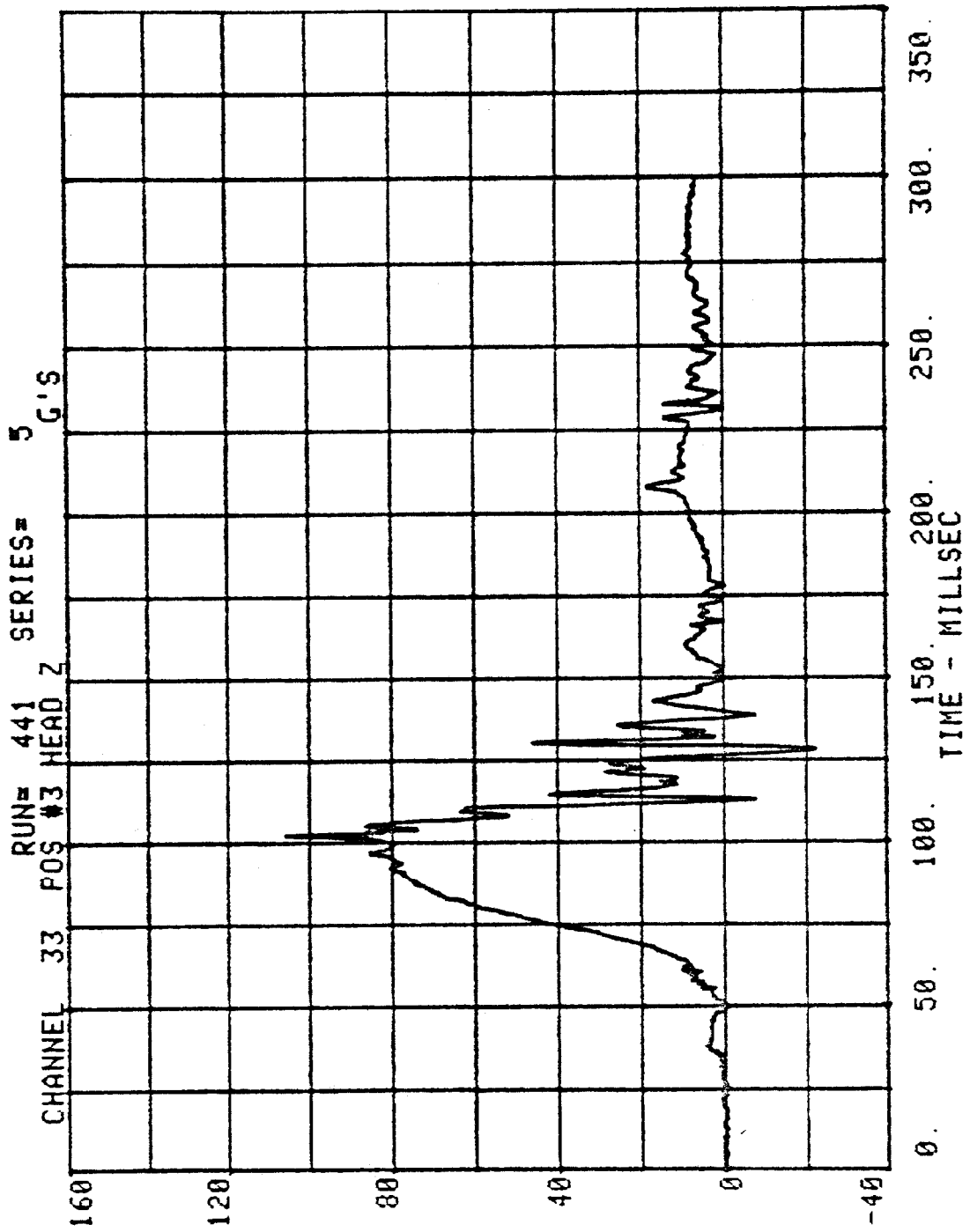
AVERAGE ACCELERATION BETWEEN T1 AND T2= 63.2G'S

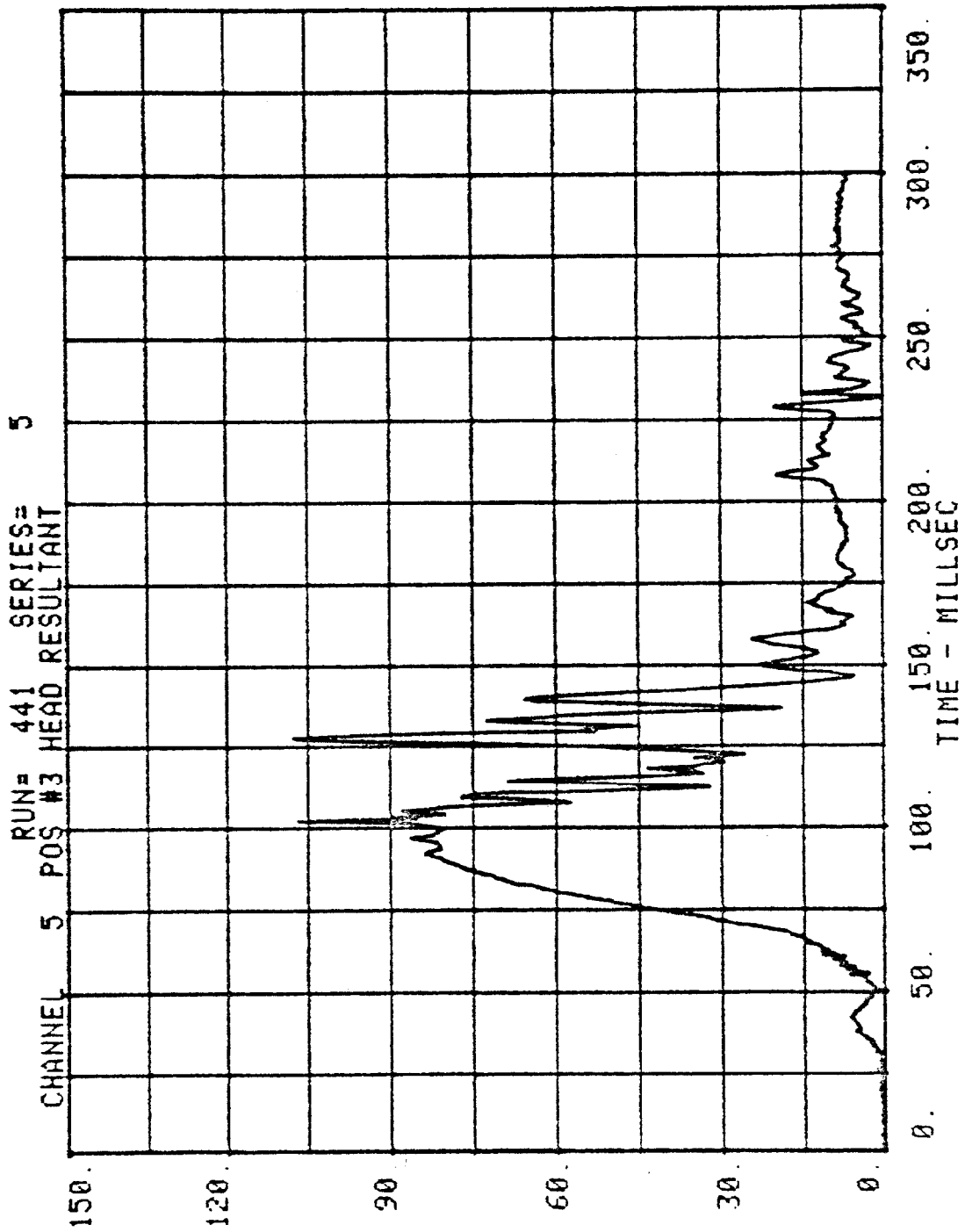
EVENT TIME= 300.0 MSEC

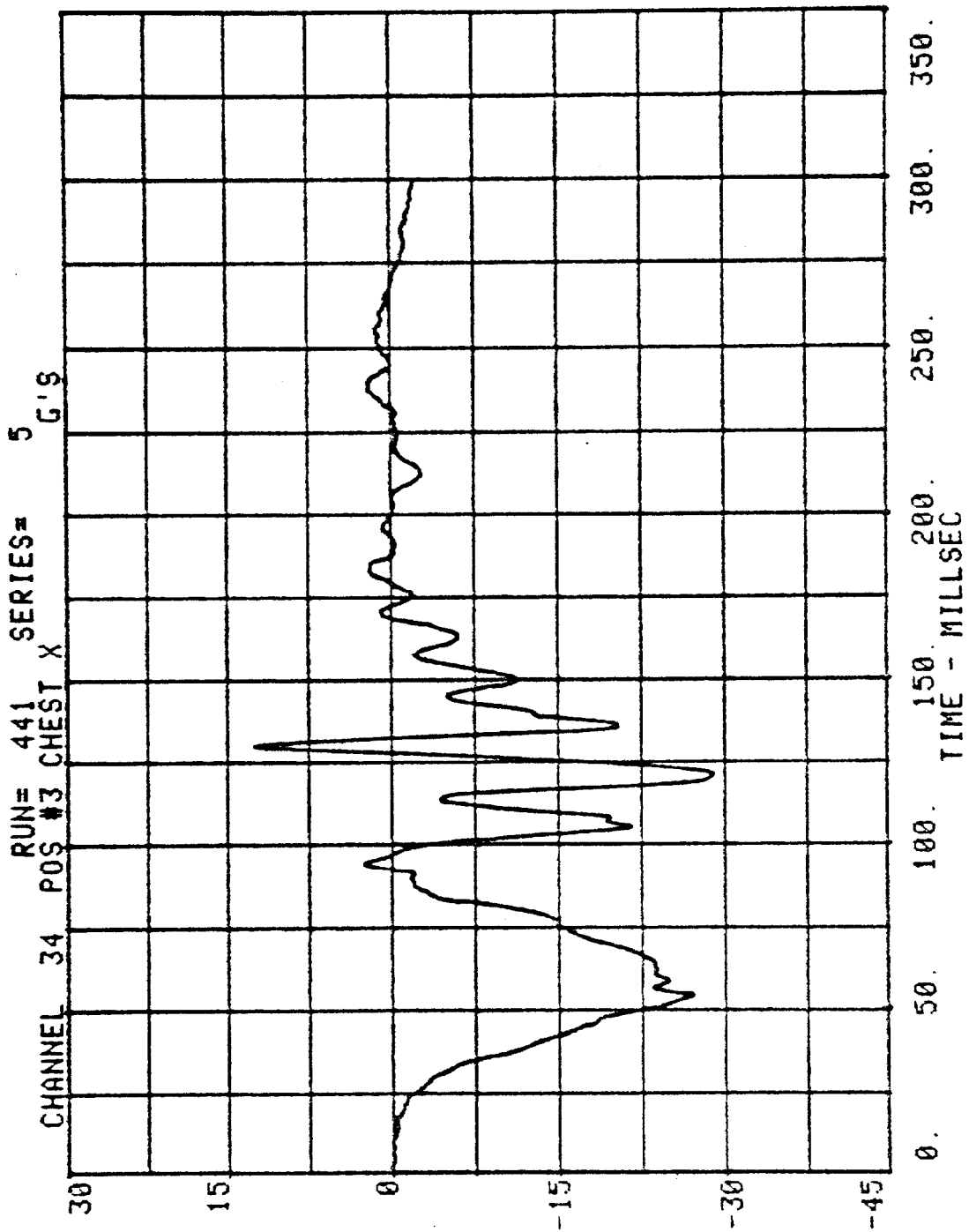
SEVERITY INDEX=2695.6

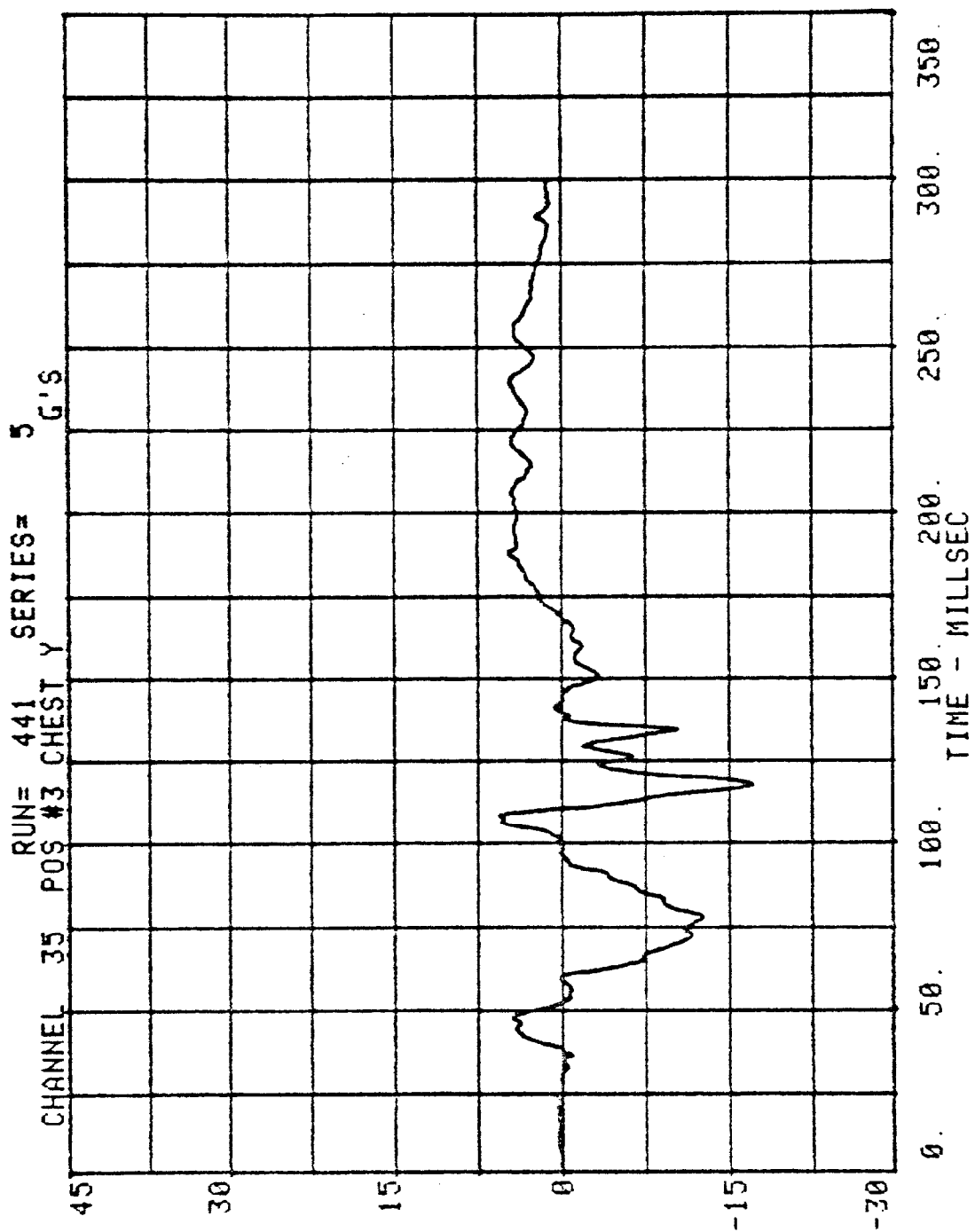


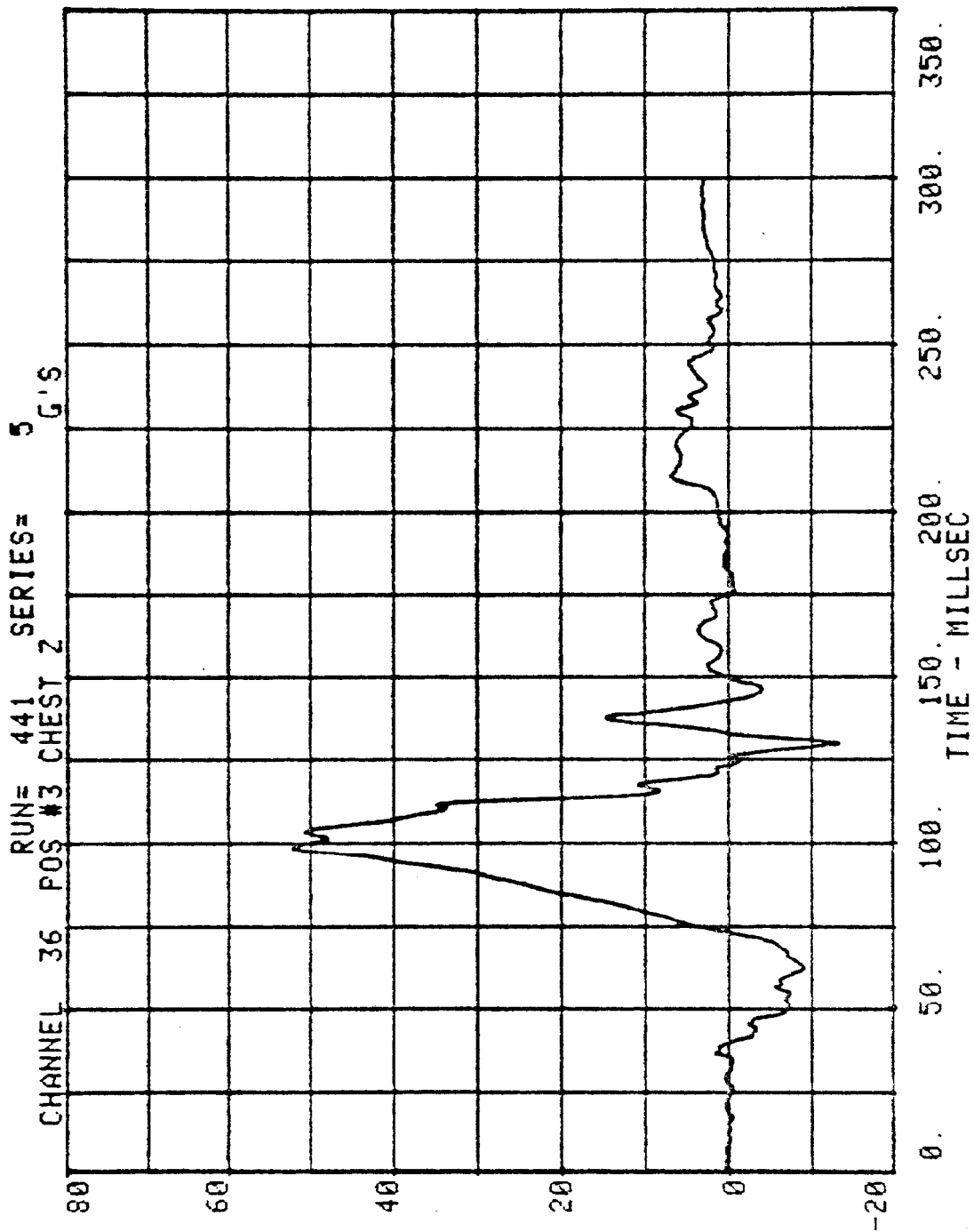




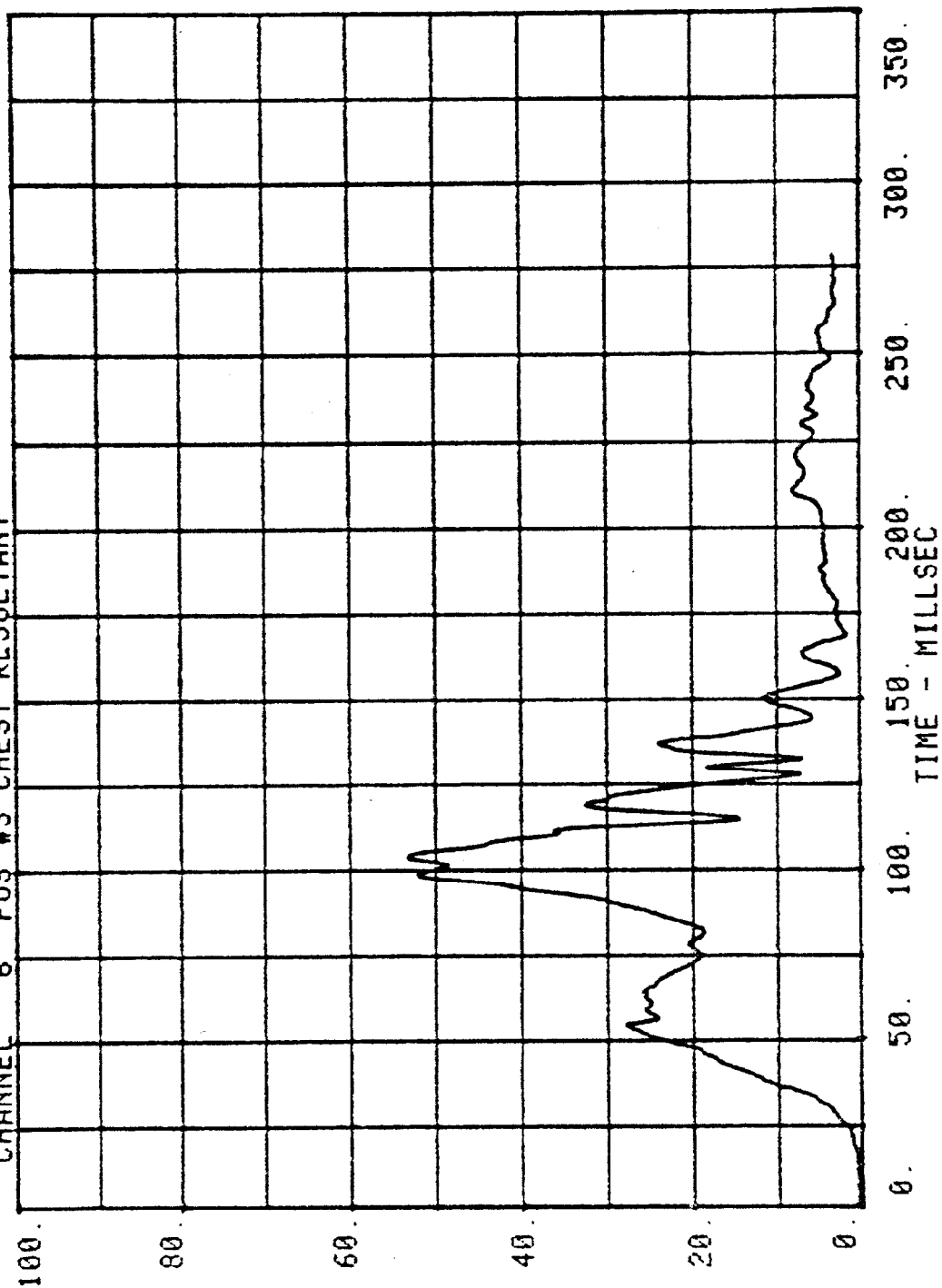








CHANNEL 6 POS #3 CHEST RESULTANT RUN# 441 SERIES= 5



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 29 and July 2, 1979, respectively. 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
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LABORATORY TECHNICIAN: FRED JULIANO

APPROVED BY:

Bruce Dannelly

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		29 June 1979	
Calibration Sequential Number for Dummy - - - -			
Temperature in Lab. (Spec. = 66 to 78°F) - - - -			78°
Relative Humidity in Lab. (Spec. = 10 to 70%) -			68%
TEST PARAMETER	SPECIFICATION		
1. <u>HEAD DROP TEST:</u>			
a. Peak Resultant Accel. -	210 to 260G		228
b. Peak Lateral Accel. - -	≤10G		8
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		23.60
b. Pendulum Avg. Decel. (over t ₃ - t ₂) - - - -	20 to 24G		23
c. Peak Resultant Head Acceleration - - - -	26G maximum		17
d. Pendulum Decel. (t ₂ -t ₁)	≤3 ms		2
e. Pendulum Decel. (t ₃ -t ₂)	25 to 30 ms		27
f. Pendulum Decel. (t ₄ -t ₃)	≤10 ms		7
g. Pendulum Direction Reversal Time - - - -	≥123 ms		113
h. Max. Head Rotation - -	63 to 73°		63.5
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	26
	Displ.	2.1 to 3.1 in.	2.8
60°	Time	40.3 to 51.7 ms	45
	Displ.	4.3 to 5.3 in.	4.95
Maximum (°)	Time	53.2 to 66.8 ms	61
	Displ.	5.0 to 6.0 in.	5.25

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			
<u>Continued</u>			
i. Chordal Displacement:			
Head Rotation Angle --			
60°	Time	67.0 to 83.0 ms	88
	Displ.	4.3 to 5.3 in.	4.9
30°	Time	85.4 to 104.6 ms	92
	Displ.	2.1 to 3.1 in.	2.35
0°	Time	101.0 to 123.0 ms	109
	Displ.	-.5 to 0.5 in.	.5
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - - -	50 to 63 lbs.		58
b. Force @ 1.3" - - - - -	73 to 88 lbs.		86
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - - -	22 to 34 lbs.		30
b. Force @ 30° - - - - -	34 to 46 lbs.		39
c. Force @ 40° - - - - -	46 to 58 lbs.		50
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		1.45
(3) Peak Resistive Force - - - - -	2250 lbs. maximum		1916
(4) Internal Hysteresis - - - - -	50 to 70%		51%
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps		13.88
(2) Peak Deflection -	1.1" maximum		1.0
(3) Peak Resistive Force - - - - -	1450 lbs. maximum		1201
(4) Internal Hysteresis - - - - -	50 to 70%		50%

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		6.94
(2) Maximum Force - -	1850 to 2500 lbs		1850
(3) Time Above 1000#	1.7 ms minimum		2.1
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps		7.03
(2) Maximum Force - -	1850 to 2500 lbs.		2500
(3) Time Above 1000#	1.7 ms minimum		2

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	CK54	1-79	1-80
ENDEVCO	CF82	4-79	1-80
ENDEVCO	CE76	4-79	1-80
CEC	17938	1-79	1-80
ENDEVCO	CG05	1-79	1-80
CEC	21480	1-79	1-80
HUMANOID SPECIAL			
GSE	306	1-79	1-80
GSE	310	1-79	1-80
B&H	17547	2-79	1-80
B&H	16928	1-79	1-80
BLH	73141		
BLH	72952		
CIC	567-11		
C-6			

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY I.D. NO.:

3	2	0
---	---	---

LABORATORY TECHNICIAN: FRED JULIANO

APPROVED BY: Bruce Dammelf

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		2 July 1979	
Calibration Sequential Number for Dummy - - - -			
Temperature in Lab. (Spec. = 66 to 78°F) - - - -			72
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		212
b. Peak Lateral Accel. - -	≤10G		18
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		23.68
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G		24
c. Peak Resultant Head Acceleration - - - -	26G maximum		18
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms		1.5
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms		26
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms		.7
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	30
	Displ.	2.1 to 3.1 in.	2.95
60°	Time	40.3 to 51.7 ms	47
	Displ.	4.3 to 5.3 in.	5.05
Maximum	Time	53.2 to 66.8 ms	64
(°)	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	83
	Displ.	4.3 to 5.3 in.	4.9
30°	Time	85.4 to 104.6 ms	103
	Displ.	2.1 to 3.1 in.	2.25
0°	Time	101.0 to 123.0 ms	119
	Displ.	-.5 to 0.5 in.	.3

3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - - -	50 to 63 lbs.		54
b. Force @ 1.3" - - - - -	73 to 88 lbs.		76
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - - -	22 to 34 lbs.		26
b. Force @ 30° - - - - -	34 to 46 lbs.		37
c. Force @ 40° - - - - -	46 to 58 lbs.		52.5
d. Return Angle - - - - -	12° maximum		6°
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed - - -	21.78-22.22 fps		22.03
(2) Peak Deflection -	1.7" maximum		1.54
(3) Peak Resistive Force - - - - -	2250 lbs. maximum		2124
(4) Internal Hysteresis - - - - -	50 to 70%		64%
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps		14.12
(2) Peak Deflection -	1.1" maximum		1.07
(3) Peak Resistive Force - - - - -	1450 lbs. maximum		1227.6
(4) Internal Hysteresis - - - - -	50 to 70%		50%

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. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps		6.98
(2) Maximum Force - -	1850 to 2500 lbs		2200
(3) Time Above 1000#	1.7 ms minimum		1.9
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps		6.98
(2) Maximum Force - -	1850 to 2500 lbs.		2375
(3) Time Above 1000#	1.7 ms minimum		2

INSTRUMENT CALIBRATION INFORMATION

DUMMY I.D. NO.:

3	2	0
---	---	---

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	1-80
ENDEVCO	CG34	1-79	1-80
ENDEVCO	CK11	1-79	1-80
CEC	18118	4-79	1-80
ENDEVCO	AA07	4-79	1-80
CEC	22292	4-79	1-80
HUMANOID SPECIAL			1-80
GSE	311	1-79	1-80
GSE	312	1-79	1-80
B&H	17547	2-79	1-80
B&H	16928	1-79	1-80
BLH	73141		
BLH	72952		
CIC	567-11		
C-10			

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.

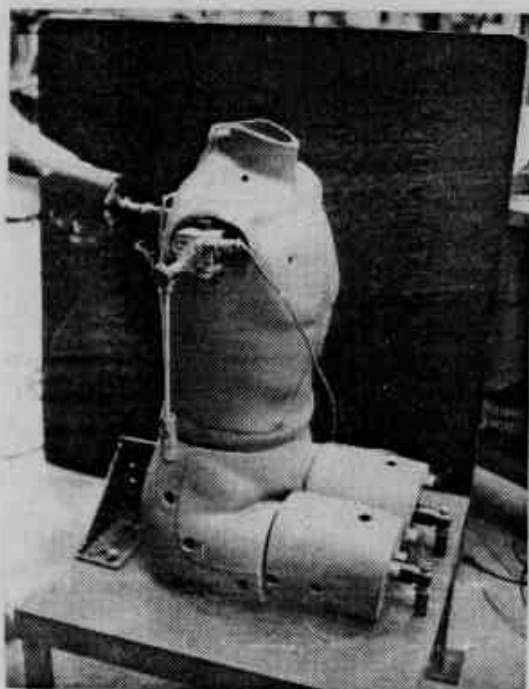


FIGURE C-1

LUMBAR SPINE FLEXION TEST APPARATUS

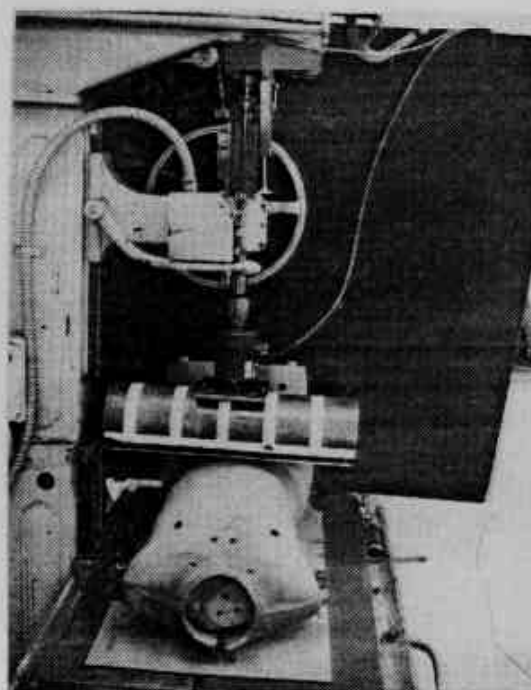


FIGURE C-2

ABDOMEN PRESS TEST APPARATUS

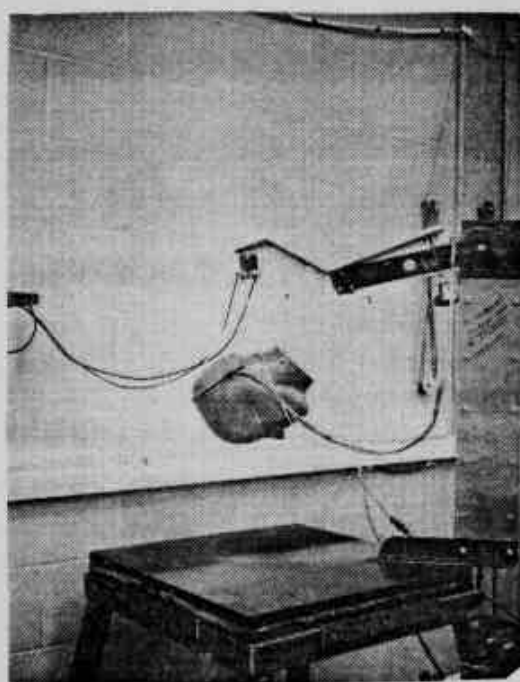


FIGURE C-3

HEAD DROP TEST APPARATUS

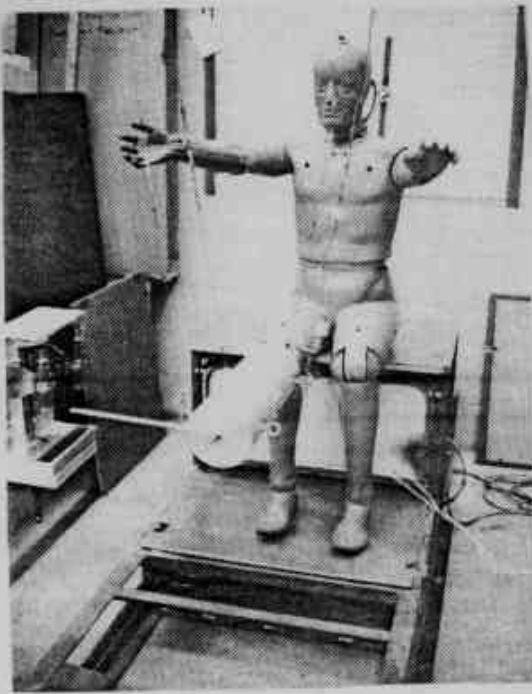


FIGURE C-4
KNEE IMPACT TEST APPARATUS

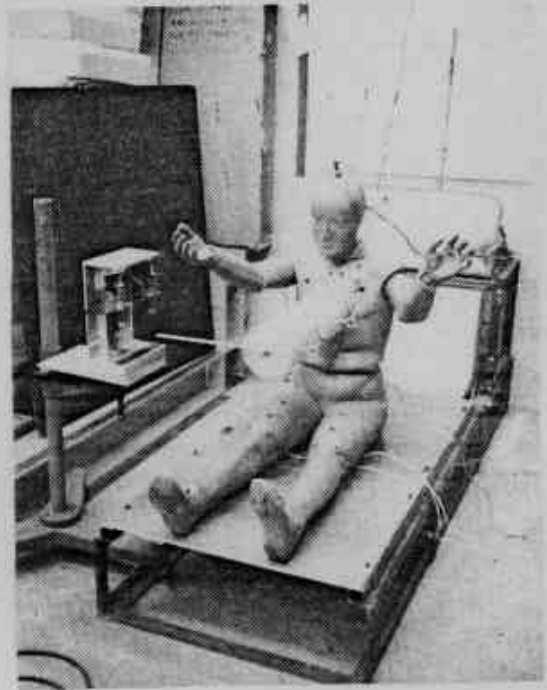


FIGURE C-5
THORAX IMPACT TEST APPARATUS

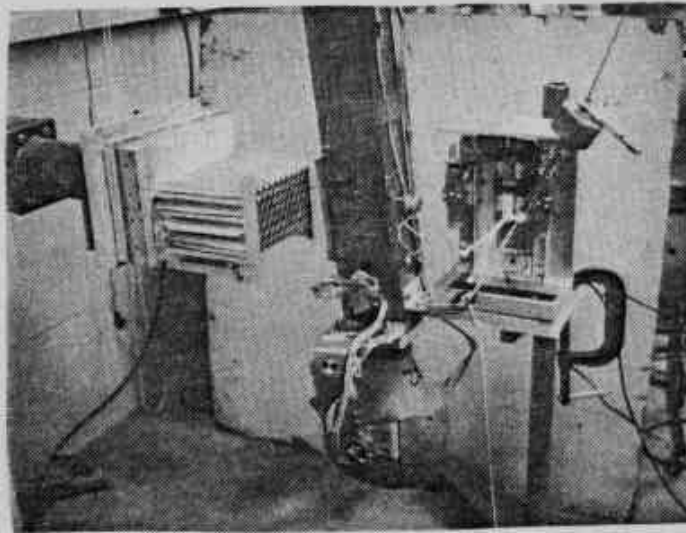


Figure C-6
NECK IMPACT TEST APPARATUS

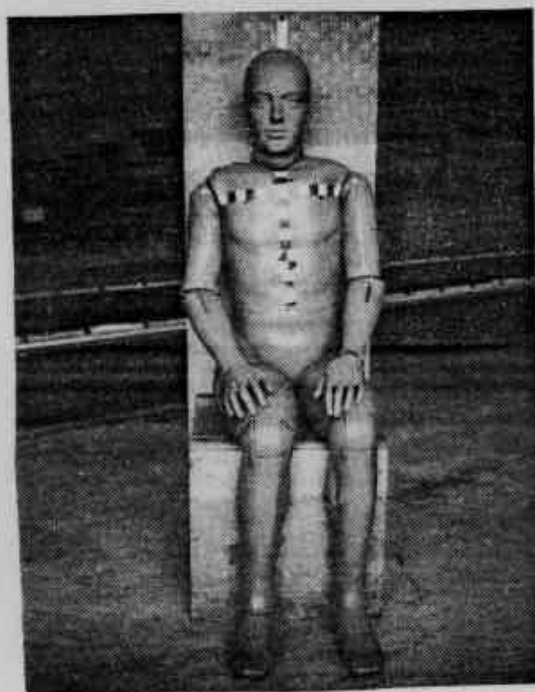


FIGURE C-7

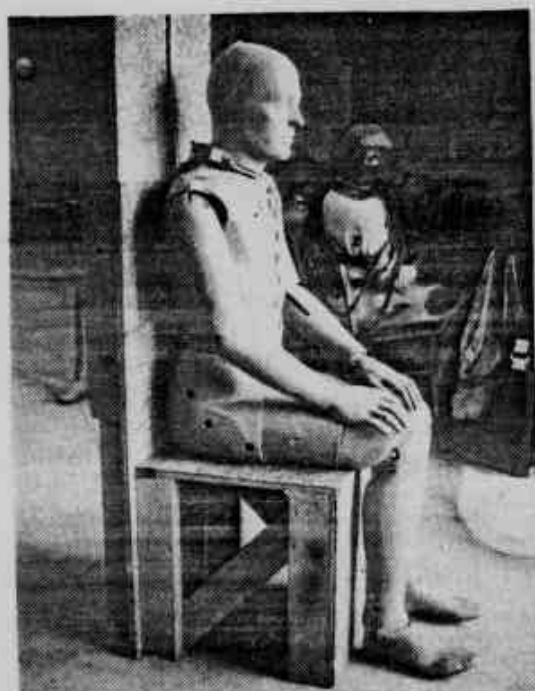


FIGURE C-7
PART 572 TEST DUMMY
FRONT & SIDE VIEW

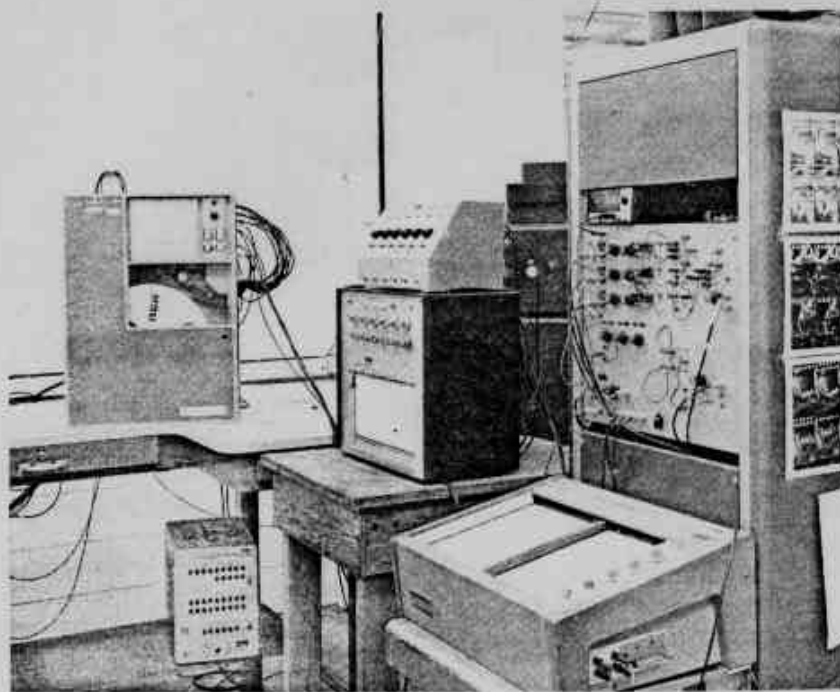


Figure C-8 ELECTRONIC TEST EQUIPMENT