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**DOT HS 807 774
Final Report**

November 1990

Final Report of 315° Contoured Moving Barrier Impact Into a 1984 Oldsmobile Delta 88 2-Door Sedan in Support of Crash III Damage Algorithm Reformation

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15. Supplementary Notes																				
16. Abstract Two 315° contoured moving barrier impact tests were conducted for research and development in support of the crash III damage algorithm reformulation. These tests were conducted on a 1984 Oldsmobile Delta 88 2-door sedan, VIN 1G3AN37Y3EX385930, at the Transportation Research Center of Ohio. The following four tests were conducted on the vehicle:																				
<table border="1"> <thead> <tr> <th>TEST NO.</th> <th>DATE</th> <th>TIME</th> <th>SPEED (mph)</th> <th>MAXIMUM CUMULATIVE CRUSH (in.)</th> </tr> </thead> <tbody> <tr> <td>901005-1</td> <td>10/05/90</td> <td>1107</td> <td>20.0</td> <td>11.1</td> </tr> <tr> <td>901005-2</td> <td>10/05/90</td> <td>1338</td> <td>30.1</td> <td>27.0</td> </tr> </tbody> </table>						TEST NO.	DATE	TIME	SPEED (mph)	MAXIMUM CUMULATIVE CRUSH (in.)	901005-1	10/05/90	1107	20.0	11.1	901005-2	10/05/90	1338	30.1	27.0
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17. Key Words 315° Contoured Moving Barrier Impact Crash III Damage Algorithm Reformulation.			18. Distribution Statement Document is available to the public from the National Technical Information Service, Springfield, Virginia 22161																	
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TABLE OF CONTENTS

SECTION	TITLE	PAGE
1.0	PURPOSE AND TEST SUMMMARY	1-1
2.0	VEHICLE AND TEST DATA	2-1
3.0	TEST #901005-1 SUMMARY	3-1
4.0	TEST #901005-2 SUMMARY	4-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	DATA PLOTS	B-1
APPENDIX C	MISCELLANEOUS TEST INFORMATION	C-1

SECTION 1.0
PURPOSE AND TEST SUMMARY

The purpose of the two 315° contoured moving barrier impact tests was for research and development in support of the CRASH III damage algorithm reformulation.

The 1984 Oldsmobile Delta 88 was equipped with a 5.0 liter, 8-cylinder, inline, gasoline engine with a 3-speed automatic transmission. The intended total test weight of the vehicle was 3662 pounds. The actual weight was 3662 pounds.

The contoured moving barrier actual weight was 3665 pounds, frontal width was 67.0 inches, barrier height was 31.5 inches, bumper width was 6.0 inches and height of the bumper centerline was 17.5 inches. The contoured moving barrier was intended to impact the driver's side of the vehicle at 315°. The initial point of impact was 26.5 inches behind the vehicle's front wheel centerline.

The impacted vehicle was instrumented with four (4) accelerometers to measure vehicle X-axis and Y-axis acceleration and two accelerometers to measure acceleration perpendicular and parallel to the direction of impact.

The moving barrier was instrumented with two accelerometers to measure X-axis and Y-axis acceleration.

The crash test event was recorded by two (2) high speed motion picture cameras.

SECTION 2.0

VEHICLE INFORMATION

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: General Motors Corporation

MAKE/MODEL: Oldsmobile Delta 88

VIN: 1G3AN37Y3EX385930

BODY STYLE: 2-door sedan

MODEL YEAR: 1984

NHTSA NO.: NA

COLOR: Tan

ENGINE DATA: TYPE: inline CYLINDERS: 8 DISPLACEMENT: 5.0 liter

TRANSMISSION DATA: 3 SPEED, MANUAL, X AUTOMATIC, FWD, X RWD, 4WD

DATE VEHICLE RECEIVED: 9/27/90

ODOMETER READING: 79,388

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING Yes
POWER BRAKES Yes
POWER SEATS No
POWER WINDOWS No
TINTED GLASS Yes
RADIO Yes
CLOCK Yes
OTHER None

AUTOMATIC TRANSMISSION Yes
AUTOMATIC SPEED CONTROL Yes
TILTING STEERING WHEEL Yes
TELESCOPING STEERING WHEEL No
AIR CONDITIONING Yes
ANTI-SKID BRAKE No
REAR WINDOW DEFROSTER Yes

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? Yes
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

CERTIFICATION DATA FROM VEHICLE'S LABEL: *

VEHICLE MANUFACTURED BY:

DATE OF MANUFACTURE:

VIN:

GVWR: LBS

GAWR: FRONT: LBS., REAR: LBS.

* THE VEHICLE'S CERTIFICATION LABEL WAS NOT LEGIBLE.

TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Uniroyal Steeler P205/75R15

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 35 PSI
REAR: 35 PSI

SPARE TIRE (MFR., LINE, SIZE): 28/60D16

TYPE OF SEATS: FRONT: Split bench
REAR: Bench

TYPE OF FRONT SEAT BACKS: Non-adjustable

MAXIMUM WIDTH: 75.8 INCHES

WHEELBASE: 115.5 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA: Driver's door

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P205/75R15

RECOMMENDED COLD TIRE PRESSURE: FRONT: 35 PSI; REAR: 35 PSI

DESIGNATED SEATING CAPACITY: 3 FRONT 3 REAR 6 TOTAL

VEHICLE CAPACITY WEIGHT: 1100 LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE: LF 27.6 ; RF 27.5 ; LR 29.6 ; RR 29.2

PRE-TEST ATTITUDE: LF 28.0 ; RF 28.1 ; LR 29.5 ; RR 29.5

TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE AS RECEIVED (WITH MAXIMUM FLUIDS):

RIGHT FRONT	1074 LBS.	RIGHT REAR	754 LBS.
LEFT FRONT	1081 LBS.	LEFT REAR	749 LBS.
TOTAL FRONT WEIGHT	2155 LBS.	(58.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1503 LBS.	(41.1% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT 3658 LBS.			

VEHICLE'S TARGET TEST WEIGHT:

TARGET TEST WEIGHT = 3662 LBS

WEIGHT OF TEST VEHICLE:

RIGHT FRONT	1066 LBS.	RIGHT REAR	766 LBS.
LEFT FRONT	1059 LBS.	LEFT REAR	771 LBS.
TOTAL FRONT WEIGHT	2125 LBS.	(58.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1537 LBS.	(42.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3662 LBS.	(0.0% UNDER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE: None LBS.

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 48.5 INCHES REARWARD OF FRONT WHEEL CENTERLINE

*The target test weight was established as the weight of the vehicle as delivered plus instrumentation.

VEHICLE FRONT CRUSH MEASUREMENTS AT VEHICLE BUMPER HEIGHT (19.5 INCHES)

LOCATION	0	1	2	3	4	5	6	7	8									
	X	Y	X	Y	X	Y	X	Y	X	Y								
PRE-TEST	14.2	13.8	13.4	16.3	13.4	19.2	13.1	22.2	13.1	25.3	13.2	28.3	13.2	31.4	12.6	34.4	12.0	37.2
POST-TEST 1	14.6	14.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
POST-TEST 2	15.0	11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

LOCATION	9	10	11	12	13	14	15	16	17									
	X	Y	X	Y	X	Y	X	Y	X	Y								
PRE-TEST	10.5	40.0	10.8	43.1	10.6	46.1	10.4	49.0	11.0	52.0	11.3	54.7	11.9	57.8	12.2	60.8	12.8	63.6
POST-TEST 1	NA	NA	NA	NA	NA	NA	9.2	48.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
POST-TEST 2	NA	NA	NA	NA	NA	NA	9.9	47.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

LOCATION	18	19	20	21	22	23	24	25	26									
	X	Y	X	Y	X	Y	X	Y	X	Y								
PRE-TEST	13.0	66.8	13.2	69.8	13.4	72.8	13.4	75.8	13.6	78.8	14.2	81.8	16.0	83.4	19.2	84.2	19.4	84.2
POST-TEST 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.2	82.2	NA	NA	NA	NA	NA	NA
POST-TEST 2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12.9	79.5	NA	NA	NA	NA	NA	NA

All measurements are in inches. Column readings are three inches apart from left to right on vehicle.
 All X-axis measurements taken from a reference plane 224 inches from and parallel to the rear bumper.
 All Y-axis measurements taken from a reference plane 48 inches from and parallel to the vehicle longitudinal centerline.

VEHICLE LEFT SIDE CRUSH MEASUREMENTS AT MOVING BARRIER BUMPER HEIGHT (17.5 INCHES)

LOCATION	1		2		3		4		5		6		7		8		9	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
PRE-TEST	17.0	12.8	19.8	12.1	22.9	11.8	26.0	13.3	29.1	13.0	31.8	12.5	35.0	12.5	37.8	11.7	40.9	10.8
POST-TEST 1	17.0	12.8	19.8	12.1	22.9	11.8	26.0	13.3	29.1	13.0	31.8	12.5	35.0	12.5	37.8	11.7	40.9	10.8
POST-TEST 2	18.4	9.8	20.2	9.4	24.2	9.0	30.1	10.2	33.1	10.2	36.1	10.2	39.1	10.1	42.0	10.0	45.2	9.1

LOCATION	10		11		12		13		14		15		16		17		18	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
PRE-TEST	43.8	10.4	46.8	10.2	49.8	10.2	52.8	10.0	55.9	9.9	58.6	9.9	61.8	9.9	64.6	10.9	67.8	11.4
POST-TEST 1	43.8	10.4	46.8	10.2	49.8	10.2	52.8	10.0	57.1	9.5	59.6	9.8	62.8	9.9	65.8	10.1	69.1	10.6
POST-TEST 2	48.1	9.1	51.6	9.4	54.7	9.6	57.7	9.8	60.8	10.1	63.8	10.2	66.4	10.8	69.8	11.6	73.2	12.3

LOCATION	19		20		21		22		23		24		25		26		27	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
PRE-TEST	70.8	12.2	73.6	12.5	76.8	12.3	79.8	12.2	82.5	12.2	85.6	12.2	89.0	12.2	91.8	12.2	94.8	12.2
POST-TEST 1	42.4	12.6	75.0	13.9	77.2	15.8	85.4	22.6	88.2	22.5	91.4	22.6	94.3	22.6	96.9	21.4	99.5	19.6
POST-TEST 2	75.8	14.8	78.5	16.6	83.4	19.0	84.4	23.2	105.0	33.2	106.0	36.1	106.8	38.6	108.4	40.5	111.0	41.5

All measurements are in inches. Column readings are three inches apart from front to rear on vehicle.

All X-axis measurements taken from a reference plane 224 inches from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 48 inches from and parallel to the vehicle longitudinal centerline.

VEHICLE LEFT SIDE CRUSH MEASUREMENTS AT MOVING BARRIER BUMPER HEIGHT (17.5 INCHES)

LOCATION	28	29	30	31	32	33	34	35	36
	X	Y	X	Y	X	Y	X	Y	Y
PRE-TEST	97.8	12.2 100.9	12.2 103.6	12.2 106.9	12.1 109.8	12.1 112.9	12.2 115.0	12.2 118.5	12.1 121.8
POST-TEST 1	101.5	17.8 103.6	15.9 104.7	14.9 107.0	12.9 110.0	12.1 113.0	12.2 115.9	12.6 118.1	12.0 121.3
POST-TEST 2	112.8	42.4 116.8	41.8 117.6	40.3 119.8	38.2 122.1	36.4 123.5	35.2 126.4	34.1 129.2	32.5 131.0

LOCATION	37	38	39	40	41	42	43	44	45
	X	Y	X	Y	X	Y	X	Y	Y
PRE-TEST	124.0	12.0 127.6	12.0 130.5	12.0 133.6	12.2 136.8	12.1 139.8	12.2 142.6	12.2 145.5	12.2 148.8
POST-TEST 1	124.2	11.8 127.2	11.9 130.2	11.8 133.4	11.9 136.1	12.0 139.4	12.8 142.2	12.6 145.0	12.6 148.2
POST-TEST 2	133.5	29.1 136.9	28.1 136.9	26.2 138.8	24.1 140.0	21.6 143.8	18.9 145.5	16.7 147.7	14.5 150.0

LOCATION	46	47	48	49	50	51	52	53	54
	X	Y	X	Y	X	Y	X	Y	Y
PRE-TEST	151.8	12.2 154.8	10.1 157.8	9.5 160.8	9.2 163.8	9.4 162.2	9.5 170.0	9.2 173.2	9.4 176.2
POST-TEST 1	151.2	12.4 154.2	10.3 157.2	9.2 160.3	9.6 163.8	9.4 162.2	9.5 170.0	9.2 173.2	9.4 176.2
POST-TEST 2	152.9	12.3 155.8	10.6 158.1	10.0 160.1	9.6 164.1	9.5 167.5	9.6 170.4	9.1 173.4	9.8 176.4

All measurements are in inches. Column readings are three inches apart from front to rear on vehicle.
 All X-axis measurements taken from a reference plane 224 inches from and parallel to the rear bumper.
 All Y-axis measurements taken from a reference plane 48 inches from and parallel to the vehicle longitudinal centerline.

VEHICLE LEFT SIDE CRUSH MEASUREMENTS AT MOVING BARRIER BUMPER HEIGHT (17.5 INCHES)

LOCATION	55		56		57		58		59		60		61		62		63	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
PRE-TEST	179.0	9.8	181.9	10.2	184.8	13.2	187.8	13.5	190.6	13.8	193.9	13.8	197.0	14.0	200.0	14.2	203.2	14.2
POST-TEST 1	179.0	9.8	181.9	10.2	184.8	13.2	187.8	13.5	190.6	13.8	193.9	13.8	197.0	14.0	200.0	14.2	203.2	14.2
POST-TEST 2	179.4	10.0	182.2	10.1	184.8	13.2	187.8	13.5	190.6	13.8	193.9	13.8	197.0	14.0	200.0	14.2	203.2	14.2

LOCATION	64		65	
	X	Y	X	Y
PRE-TEST	206.5	14.0	209.2	14.1
POST-TEST 1	206.5	14.0	209.2	14.1
POST-TEST 2	206.5	14.0	209.2	14.1

All measurements are in inches. Column readings are three inches apart from front to rear on vehicle.
 All X-axis measurements taken from a reference plane 224 inches from and parallel to the rear bumper.
 All Y-axis measurements taken from a reference plane 48 inches from and parallel to the vehicle longitudinal centerline.

VEHICLE LEFT SIDE CRUSH MEASUREMENTS AT SILL HEIGHT (11.2 INCHES)

LOCATION	1	2	3	4	5	6	7	8	9
	X	Y	X	Y	X	Y	X	Y	X
PRE-TEST	NA	NA	NA	NA	NA	NA	NA	NA	NA
POST-TEST 1	NA	NA	NA	NA	NA	NA	NA	NA	NA
POST-TEST 2	NA	NA	NA	NA	NA	NA	NA	NA	NA

LOCATION	10	11	12	13	14	15	16	17	18
	X	Y	X	Y	X	Y	X	Y	X
PRE-TEST	NA	NA	NA	NA	NA	NA	NA	NA	NA
POST-TEST 1	NA	NA	NA	NA	NA	NA	NA	NA	NA
POST-TEST 2	NA	NA	NA	NA	NA	NA	NA	NA	NA

LOCATION	19	20	21	22	23	24	25	26	27
	X	Y	X	Y	X	Y	X	Y	X
PRE-TEST	71.0	15.0	73.8	14.8	76.8	15.0	80.0	15.0	83.1
POST-TEST 1	72.5	14.9	75.4	14.6	78.4	15.1	81.0	16.9	83.5
POST-TEST 2	76.3	15.1	79.5	16.2	82.1	17.4	84.2	18.2	84.4

All measurements are in inches. Column readings are three inches apart from front to rear on vehicle.

All X-axis measurements taken from a reference plane 224 inches from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 48 inches from and parallel to the vehicle longitudinal centerline.

VEHICLE LEFT SIDE CRUSH MEASUREMENTS AT SILL HEIGHT (11.2 INCHES)

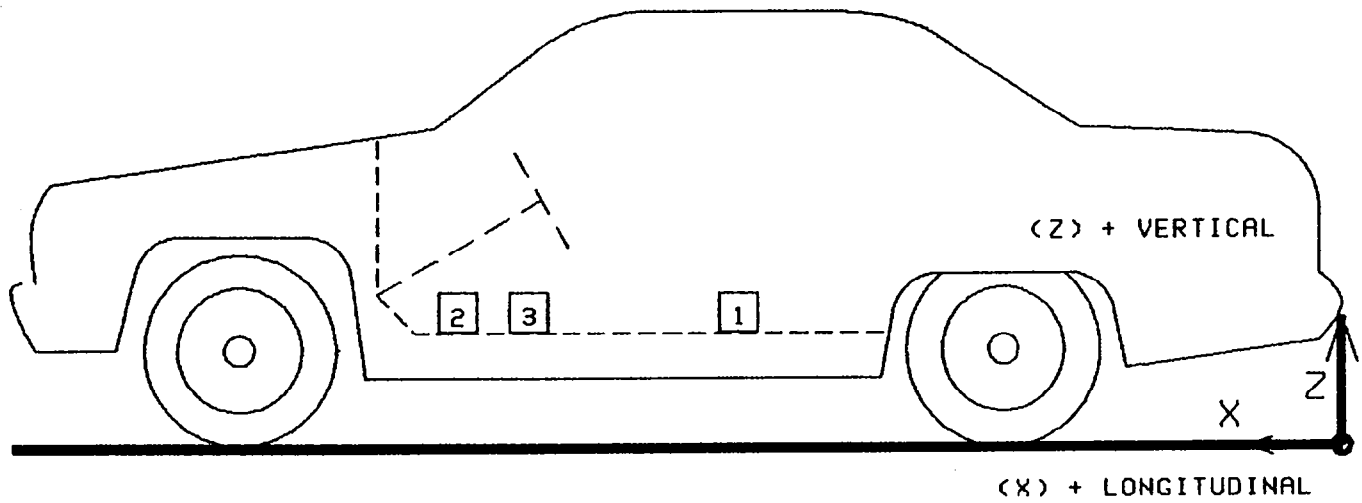
LOCATION	28	29	30	31	32	33	34	35	36
	X	Y	X	Y	X	Y	X	Y	X
PRE-TEST	97.8	15.2	101.2	15.2	103.9	15.2	106.9	15.4	110.0
POST-TEST 1	97.8	15.9	100.9	15.5	104.0	15.4	106.9	15.4	109.9
POST-TEST 2	97.8	16.1	100.7	15.9	103.8	15.8	107.0	15.8	110.0

LOCATION	37	38	39	40	41	42	43	44	45
	X	Y	X	Y	X	Y	X	Y	X
PRE-TEST	125.2	15.2	128.0	15.4	130.9	15.2	133.8	15.2	136.9
POST-TEST 1	125.2	15.2	128.0	15.4	130.9	15.2	133.8	15.2	136.8
POST-TEST 2	124.9	17.0	127.8	17.4	130.8	17.8	133.6	17.2	136.9

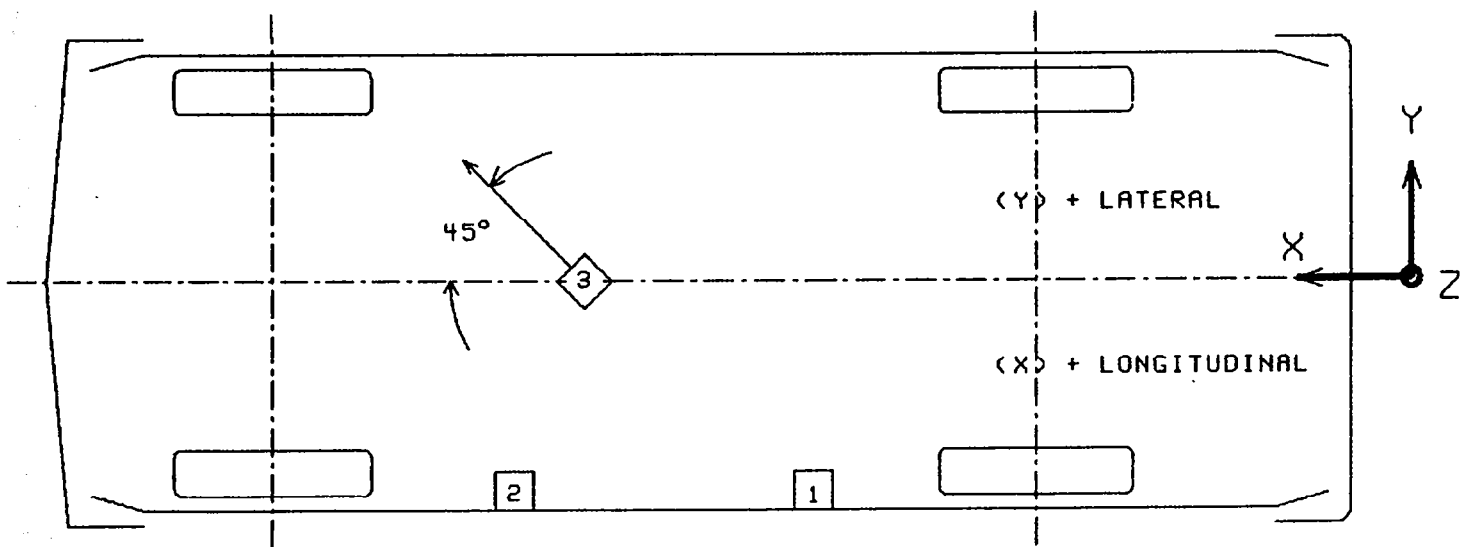
LOCATION	46	47	48	49	50	51	52	53	54
	X	Y	X	Y	X	Y	X	Y	X
PRE-TEST	152.0	15.0	NA	NA	NA	NA	NA	NA	NA
POST-TEST 1	152.7	15.8	NA	NA	NA	NA	NA	NA	NA
POST-TEST 2	152.7	15.8	NA	NA	NA	NA	NA	NA	NA

All measurements are in inches. Column readings are three inches apart from front to rear on vehicle.
 All X-axis measurements taken from a reference plane 224 inches from and parallel to the rear bumper.
 All Y-axis measurements taken from a reference plane 48 inches from and parallel to the vehicle longitudinal centerline.

VEHICLE ACCELEROMETER PLACEMENT

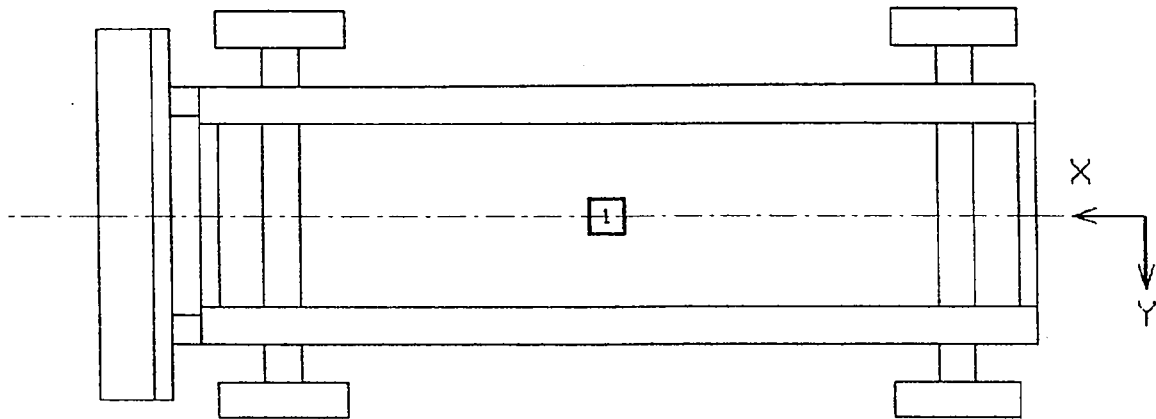


SIDE VIEW

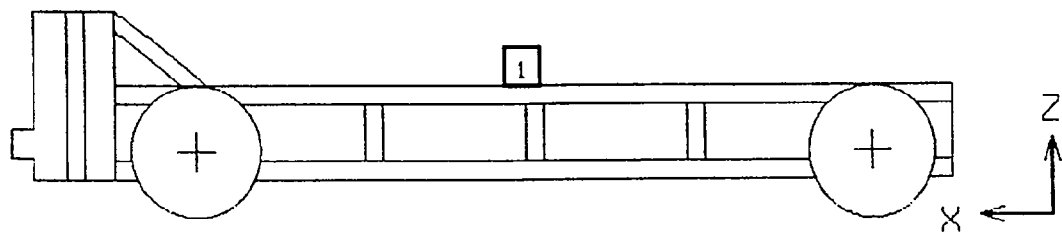


BOTTOM VIEW

MOVING BARRIER
ACCELEROMETER PLACEMENT

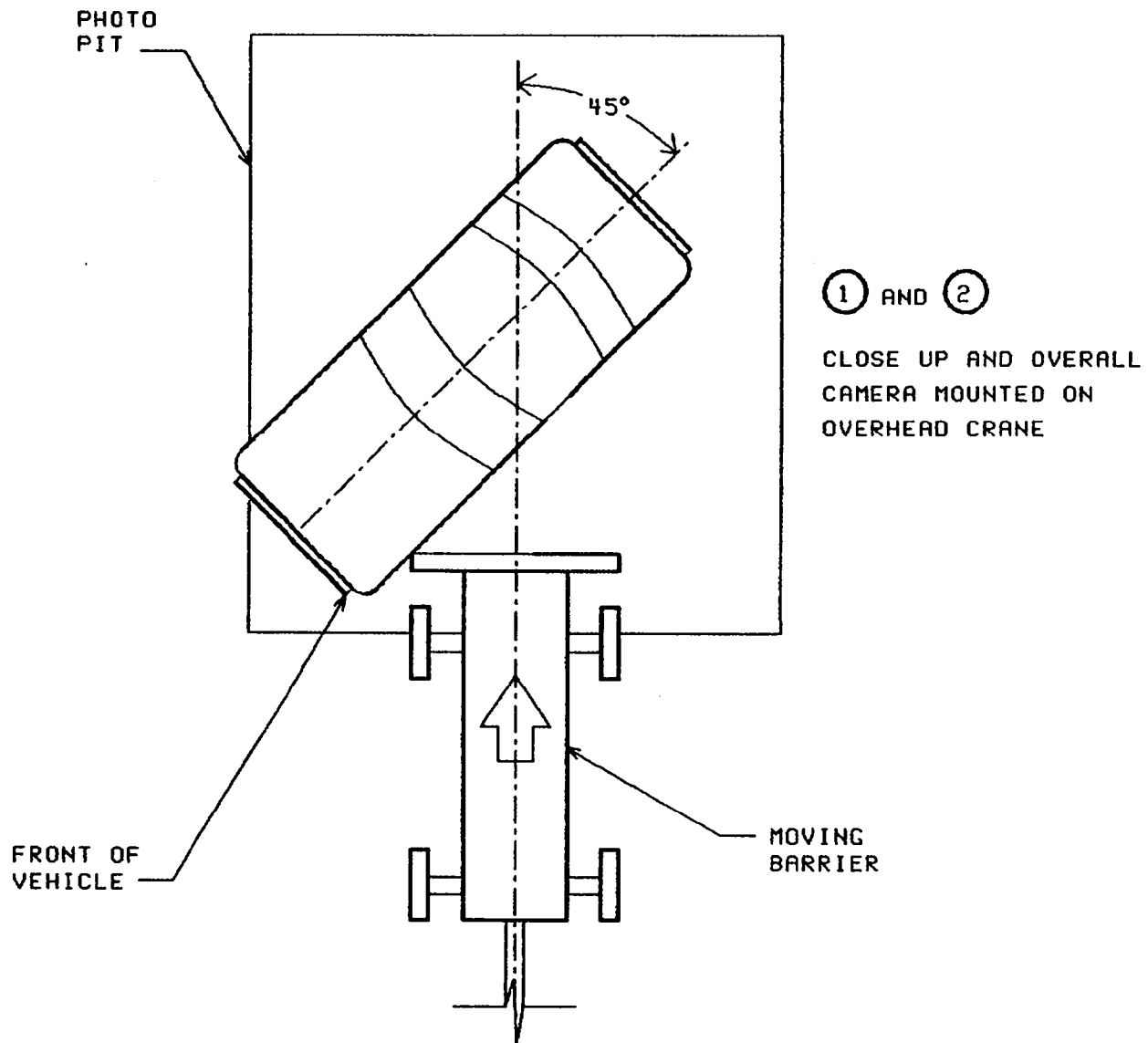


TOP VIEW



SIDE VIEW

CAMERA POSITIONS



SECTION 3.0

TEST 901005-1 SUMMARY

TEST CONDITIONS

TEST NUMBER: 901005-1

DATE OF TEST: 10/05/90

TIME OF TEST: 1107

AMBIENT TEMPERATURE AT IMPACT AREA: 65° F

INTENDED MOVING BARRIER VELOCITY: 20.0 MPH

ACTUAL MOVING BARRIER VELOCITY: 20.0 MPH

SUBJECT VEHICLE DATA

LENGTH OF DIRECT CONTACT DAMAGE 26.0

MAXIMUM CUMULATIVE CRUSH AT MOVING
BARRIER BUMPER HEIGHT 11.1

MAXIMUM CUMULATIVE CRUSH AT VEHICLE
SILL HEIGHT 3.3

VEHICLE ATTITUDES:

POST-TEST: LF: 29.0; RF: 27.8; LR: 30.0; RR: 28.4

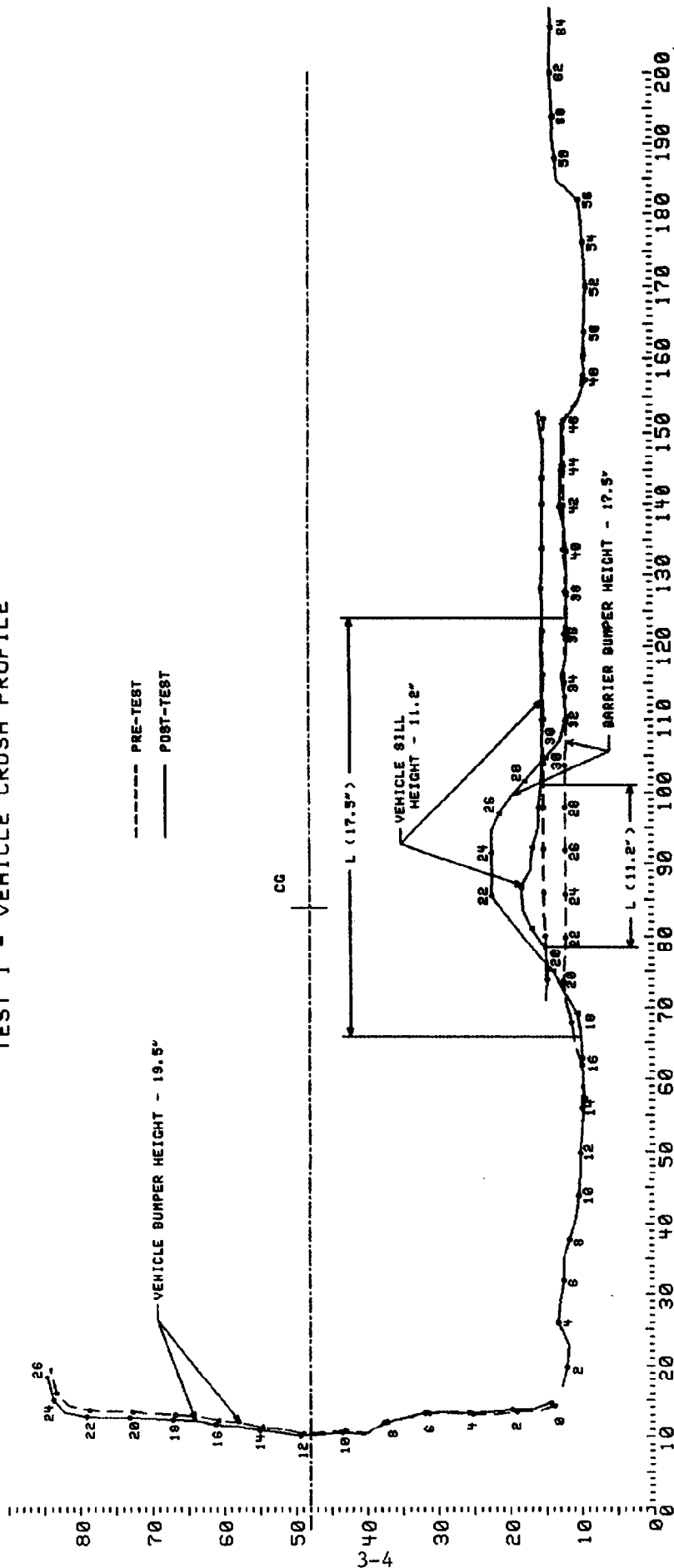
ALL DISTANCE MEASUREMENTS ARE IN INCHES.

IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Oldsmobile/Delta 88 TEST NUMBER: 901005-1

NO.	TYPE OF MEASUREMENT	ALL MEASUREMENTS ARE IN INCHES		
		PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	218.0	217.5	0.5
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	183.8	182.0	1.8
X3	REAR SURFACE OF VEHICLE TO FIREWALL	152.0	152.0	0.0
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	144.1	143.6	0.5
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	143.9	142.2	1.7
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	146.0	145.8	0.2
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	146.0	137.2	8.8
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	89.4	89.1	0.3
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	89.2	87.2	2.0
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	88.0	87.7	0.3
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	88.0	88.5	-0.5
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	143.5	143.1	0.4
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	143.3	142.8	0.5
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	150.5	150.6	-0.1
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	153.5	153.5	0.0
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	127.5	127.2	0.3
X17	CENTER OF STEERING COLUMN TO "A" POST	14.5	14.5	0.0
X18	CENTER OF STEERING COLUMN TO HEADLINER	15.6	15.0	0.6
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	214.0	213.6	0.4
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	213.0	212.8	0.2
X21	LENGTH OF ENGINE BLOCK	27.0	27.0	0.0

TEST 1 - VEHICLE CRUSH PROFILE



NOTE: L INDICATES LENGTH OF DAMAGED SURFACE

VEHICLE CRUSH

TEST NO. 901005-1

AT MOVING BARRIER BUMPER HEIGHT

L	<u>67.8</u>
C1	<u>0.0</u>
C2	<u>0.6</u>
C3	<u>3.9</u>
C4	<u>11.1</u>
C5	<u>5.6</u>
C6	<u>0.0</u>

AT VEHICLE SILL HEIGHT

L	<u>26.7</u>
S1	<u>0.0</u>
S2	<u>0.8</u>
S3	<u>0.8</u>
S4	<u>2.5</u>
S5	<u>3.3</u>
S6	<u>0.0</u>

DETERMINATION OF VEHICLE CRUSH:

A reference line was constructed connecting the end points of the vehicle's damaged surface. Six equally spaced points were defined along the reference line and labeled C1 through C6 (or S1 through S6 for sill height crush) with the rearmost point of the damaged surface defined as C1 (or S1) and the forwardmost point defined as C6 (or S6). The actual crush distance is a measurement taken perpendicular to and from the reference line at each point (C1 through C6 or S1 through S6) to the vehicle's damaged surface.

NOTES: L is total length of damage surface

C1 through C6 and S1 through S6 are spaced equally apart

ALL MEASUREMENTS ARE IN INCHES

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 901005-1

No. LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
				MAX G	MSEC	MAX G	MSEC
1 RIGHT REAR SILL	166.5	-23.0	11.8				
ACCELERATION							
LONGITUDINAL				6.9	30.8	11.5	25.3
LATERAL				1.5	198.5	7.1	55.8
RESULTANT				11.5	25.3		
2 RIGHT FRONT SILL	215.5	-25.5	13.0				
ACCELERATION							
LONGITUDINAL				4.2	31.1	9.1	25.8
LATERAL				4.3	24.6	9.3	31.4
RESULTANT				10.1	31.3		
3 VEHICLE CG	198.5	0.0	16.5				
ACCELERATION							
PARALLEL TO IMPACT				4.7	30.0	13.3	24.4
PERPENDICULAR TO IMPACT				7.5	26.1	11.2	31.4
RESULTANT				14.2	24.6		

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM VEHICLE'S REAR BUMPER
Y: + LEFTWARD FROM VEHICLE'S LONGITUDINAL CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

MOVING BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 901005-1

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX	G MSEC	MAX	G MSEC
1	MOVING BARRIER	75.2	0.0	12.3				
	CG ACCELERATION							
	LONGITUDINAL				0.1	316.4	6.2	41.8
	LATERAL				2.4	150.6	4.5	85.3
	RESULTANT				6.3	42.0		

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM VEHICLE'S REAR SURFACE
Y: + LEFTWARD FROM VEHICLE'S LONGITUDINAL CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

TEST #901005-1

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Overhead wide	Photosonic 1B	13	500	Impact overall
2	Overhead tight	Photosonic 1B	25	500	Impact close-up

SECTION 4.0

TEST 901005-2 SUMMARY

TEST CONDITIONS

TEST NUMBER: 901005-2

DATE OF TEST: 10/05/90

TIME OF TEST: 1338

AMBIENT TEMPERATURE AT IMPACT AREA: 65° F

INTENDED MOVING BARRIER VELOCITY: 30.0 MPH

ACTUAL MOVING BARRIER VELOCITY: 30.1 MPH

SUBJECT VEHICLE DATA

LENGTH OF DIRECT CONTACT DAMAGE 78.0

MAXIMUM CUMULATIVE CRUSH AT MOVING
BARRIER BUMPER HEIGHT 27.0

MAXIMUM CUMULATIVE CRUSH AT VEHICLE
SILL HEIGHT 3.2

VEHICLE ATTITUDES:

POST-TEST: LF: 27.7; RF: 27.9; LR: 31.6; RR: 27.7

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

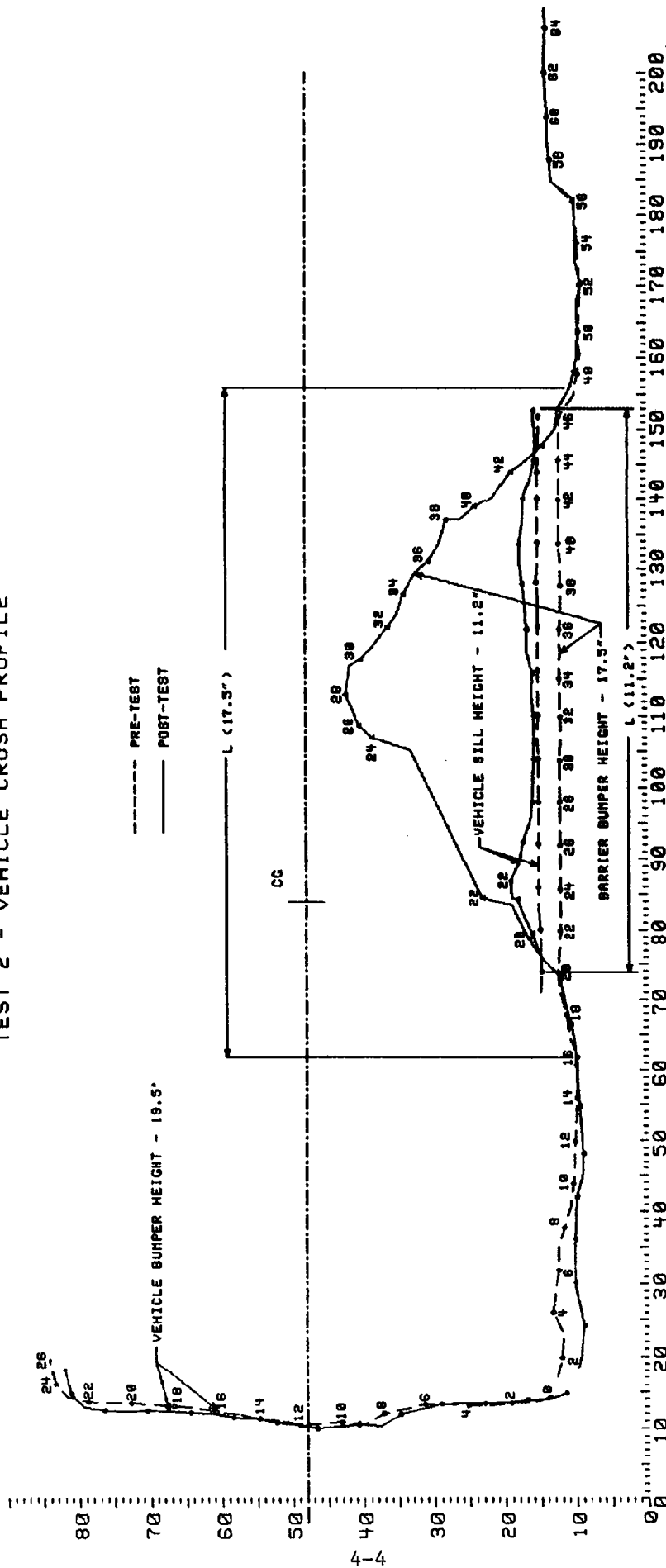
IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Oldsmobile/Delta 88 TEST NUMBER: 901005-2

NO.	TYPE OF MEASUREMENT	ALL MEASUREMENTS ARE IN INCHES		
		PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	218.0	217.0	1.0
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	183.8	181.8	2.0
X3	REAR SURFACE OF VEHICLE TO FIREWALL	152.0	151.0	1.0
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	144.1	143.8	0.3
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	143.9	122.5	21.4
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	146.0	146.0	0.0
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	146.0	120.8	25.2
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	89.4	89.3	0.1
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	89.2	82.5	6.7
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	88.0	87.8	0.2
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	88.0	89.8	-1.8
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	143.5	144.2	-0.7
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	143.3	140.4	2.9
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	150.5	150.5	0.0
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	153.5	150.8	2.7
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	127.5	123.5	4.0
X17	CENTER OF STEERING COLUMN TO "A" POST	14.5	14.5	0.0
X18	CENTER OF STEERING COLUMN TO HEADLINER	15.6	13.0	2.6
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	214.0	213.8	0.2
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	213.0	211.8	1.2
X21	LENGTH OF ENGINE BLOCK	27.0	27.0	0.0

NOTE: PRE-TEST VEHICLE MEASUREMENTS ARE FOR THE UNDEFORMED VEHICLE.

TEST 2 - VEHICLE CRUSH PROFILE



NOTE: L INDICATES LENGTH OF DAMAGED SURFACE

VEHICLE CRUSH

TEST NO. 901005-2

AT MOVING BARRIER BUMPER HEIGHT

L	<u>91.6</u>
C1	<u>0.0</u>
C2	<u>17.7</u>
C3	<u>27.0</u>
C4	<u>19.6</u>
C5	<u>7.1</u>
C6	<u>0.0</u>

AT VEHICLE SILL HEIGHT

L	<u>76.2</u>
S1	<u>0.0</u>
S2	<u>2.9</u>
S3	<u>2.1</u>
S4	<u>1.1</u>
S5	<u>3.2</u>
S6	<u>0.0</u>

DETERMINATION OF VEHICLE CRUSH:

A reference line was constructed connecting the end points of the vehicle's damaged surface. Six equally spaced points were defined along the reference line and labeled C1 through C6 (or S1 through S6 for sill height crush) with the rearmost point of the damaged surface defined as C1 (or S1) and the forwardmost point defined as C6 (or S6). The actual crush distance is a measurement taken perpendicular to and from the reference line at each point (C1 through C6 or S1 through S6) to the vehicle's damaged surface.

NOTES: L is total length of damage surface

C1 through C6 and S1 through S6 are spaced equally apart

ALL MEASUREMENTS ARE IN INCHES

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 901005-2

No. LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
				MAX	G MSEC	MAX	G MSEC
1 RIGHT REAR SILL	166.5	-23.0	11.8				
ACCELERATION							
LONGITUDINAL				5.3	36.9	8.2	82.9
LATERAL				1.9	68.1	12.1	80.8
RESULTANT				13.8	81.5		
2 RIGHT FRONT SILL	215.5	-25.5	13.0				
ACCELERATION							
LONGITUDINAL				5.0	36.8	8.5	82.9
LATERAL				4.8	46.8	9.0	19.8
RESULTANT				10.2	84.0		
3 VEHICLE CG	198.5	0.0	16.5				
ACCELERATION							
PARALLEL TO IMPACT				11.0	99.5	18.2	81.4
PERPENDICULAR TO IMPACT				6.8	122.6	7.1	18.3
RESULTANT				18.2	81.5		

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM VEHICLE'S REAR BUMPER
Y: + LEFTWARD FROM VEHICLE'S LONGITUDINAL CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

MOVING BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 901005-2

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX	G MSEC	MAX	G MSEC
1	MOVING BARRIER	75.2	0.0	12.3				
	CG ACCELERATION							
	LONGITUDINAL				0.3	220.0	8.6	92.0
	LATERAL				3.5	158.6	8.0	22.6
	RESULTANT				9.2	22.6		

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM VEHICLE'S REAR SURFACE
Y: + LEFTWARD FROM VEHICLE'S LONGITUDINAL CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

TEST #901005-2

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Overhead wide	Photosonic 1B	13	500	Impact overall
2	Overhead tight	Photosonic 1B	25	500	Impact close-up

APPENDIX A

PHOTOGRAPHS

TEST #901005-1
LIST OF PHOTOGRAPHS

- 1 PRE-TEST FRONT VIEW
2. POST-TEST FRONT VIEW
3. PRE-TEST LEFT SIDE VIEW
4. PRE-TEST LEFT SIDE CLOSE-UP VIEW
5. POST-TEST LEFT SIDE CLOSEUP - VIEW 1
6. POST-TEST LEFT SIDE CLOSEUP - VIEW 2
7. PRE-TEST RIGHT SIDE VIEW
8. POST-TEST RIGHT SIDE VIEW
9. PRE-TEST LEFT REAR THREE-QUARTER VIEW
10. POST-TEST LEFT REAR THREE-QUARTER VIEW
11. PRE-TEST LEFT FRONT THREE-QUARTER VIEW
12. POST-TEST LEFT FRONT THREE-QUARTER VIEW
13. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW
14. POST-TEST RIGHT FRONT THREE-QUARTER VIEW
15. PRE-TEST REAR VIEW
16. POST-TEST REAR VIEW



Figure A-1. PRE-TEST FRONT VIEW



Figure A-2. POST-TEST FRONT VIEW



Figure A-3. PRE-TEST LEFT SIDE VIEW

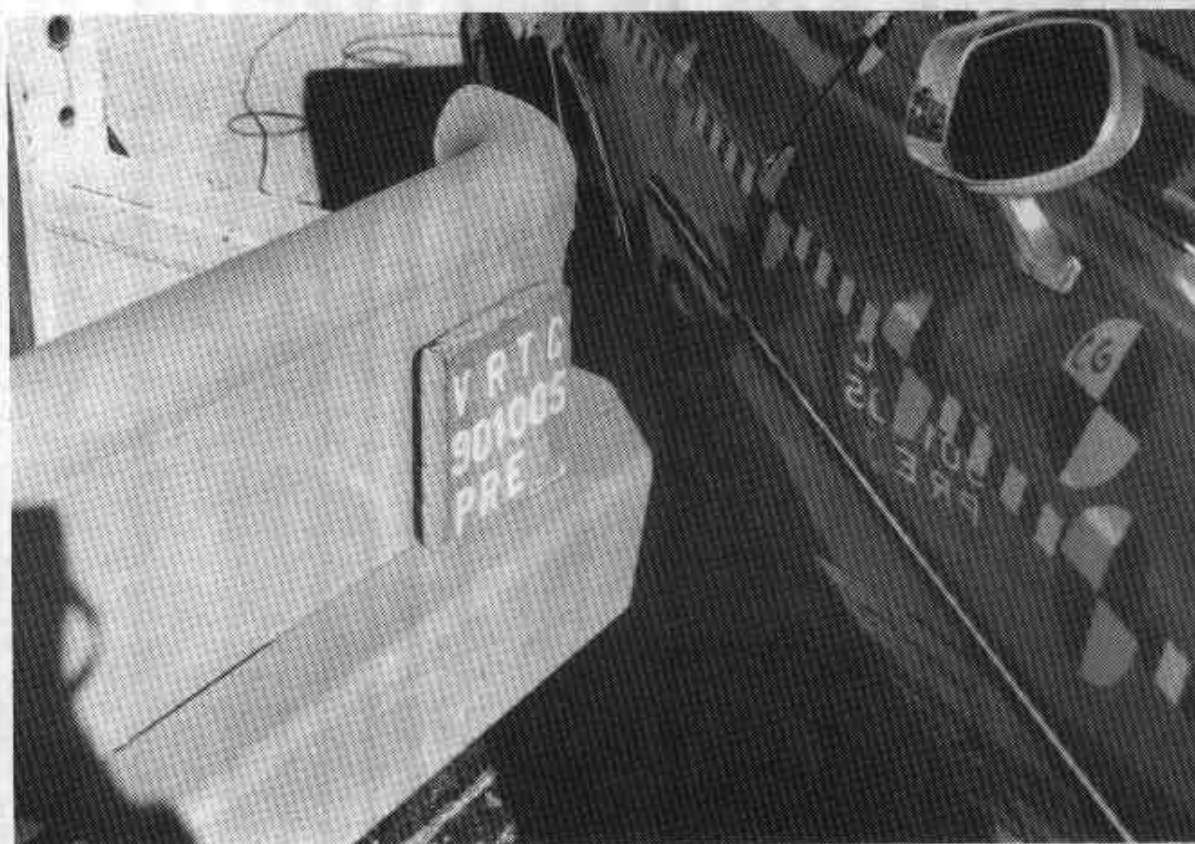


Figure A-4. PRE-TEST LEFT SIDE CLOSE-UP VIEW



Figure A-5. POST-TEST LEFT SIDE CLOSE-UP - VIEW 1



Figure A-6. POST-TEST LEFT SIDE CLOSE-UP - VIEW 2



Figure A-7. PRE-TEST RIGHT SIDE VIEW



Figure A-8. POST-TEST RIGHT SIDE VIEW



Figure A-9. PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-10. POST-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-11. PRE-TEST LEFT FRONT THREE-QUARTER VIEW



Figure A-12. POST-TEST LEFT FRONT THREE-QUARTER VIEW



Figure A-13. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-14. POST-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-15. PRE-TEST REAR VIEW



Figure A-16. POST-TEST REAR VIEW

TEST #901005-2
LIST OF PHOTOGRAPHS

1. POST-TEST FRONT VIEW
2. PRE-TEST LEFT SIDE CLOSE-UP VIEW
3. POST-TEST LEFT SIDE VIEW
4. POST-TEST LEFT SIDE CLOSEUP - VIEW 1
5. POST-TEST LEFT SIDE CLOSEUP - VIEW 2
6. POST-TEST RIGHT SIDE VIEW
7. POST-TEST LEFT REAR THREE-QUARTER VIEW
8. POST-TEST LEFT FRONT THREE-QUARTER VIEW
9. POST-TEST RIGHT FRONT THREE-QUARTER VIEW
10. POST-TEST REAR VIEW



Figure A-1. POST-TEST FRONT VIEW

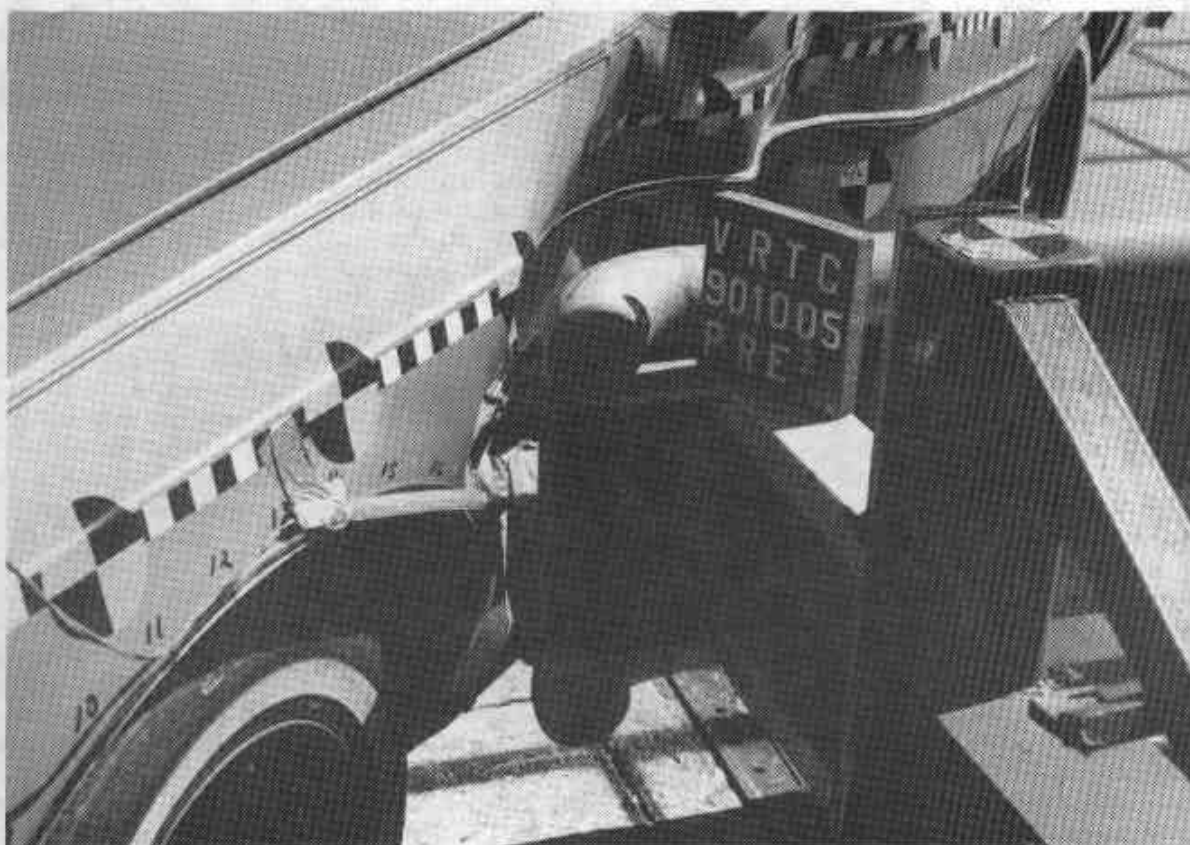


Figure A-2. PRE-TEST LEFT SIDE CLOSE-UP VIEW

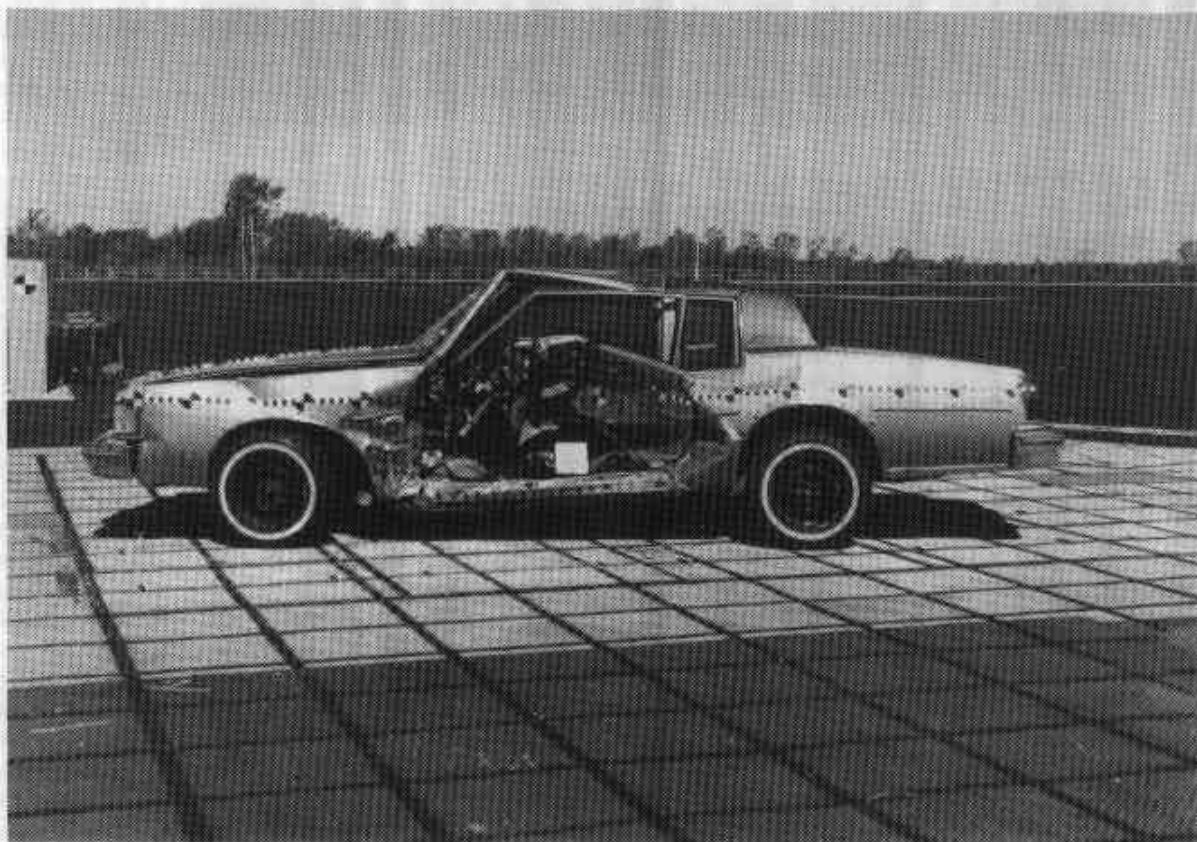


Figure A-3. POST-TEST LEFT SIDE VIEW



Figure A-4. POST-TEST LEFT SIDE CLOSE-UP - VIEW 1



Figure A-5. POST-TEST LEFT SIDE CLOSE-UP - VIEW 2



Figure A-6. POST-TEST RIGHT SIDE VIEW



Figure A-7. POST-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-8. POST-TEST LEFT FRONT THREE-QUARTER VIEW



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



Figure A-10. POST-TEST REAR VIEW

APPENDIX B

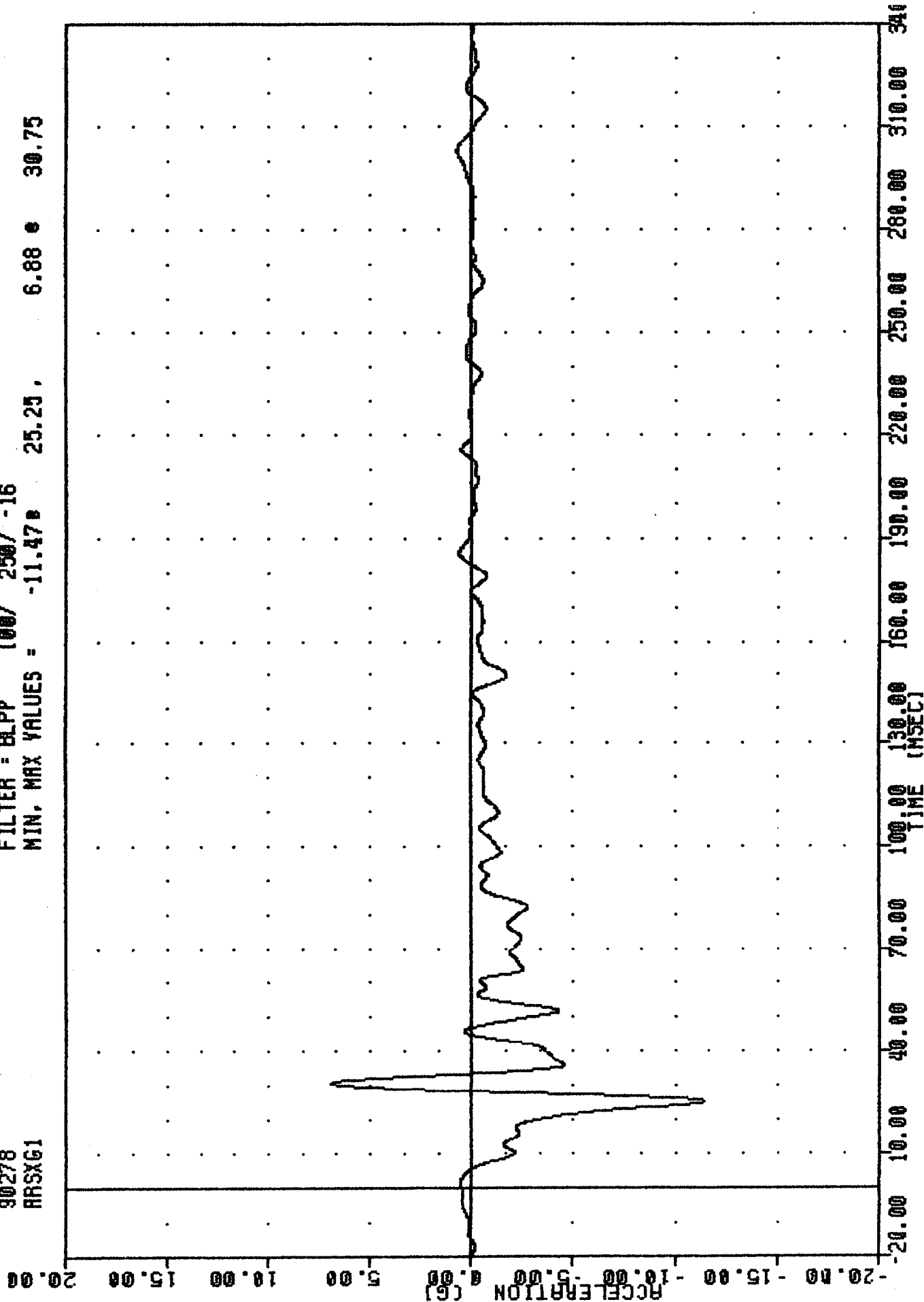
DATA PLOTS

TEST #901005-1

CRASH III DAMAGE ALGORITHM

90278
ARSXG1

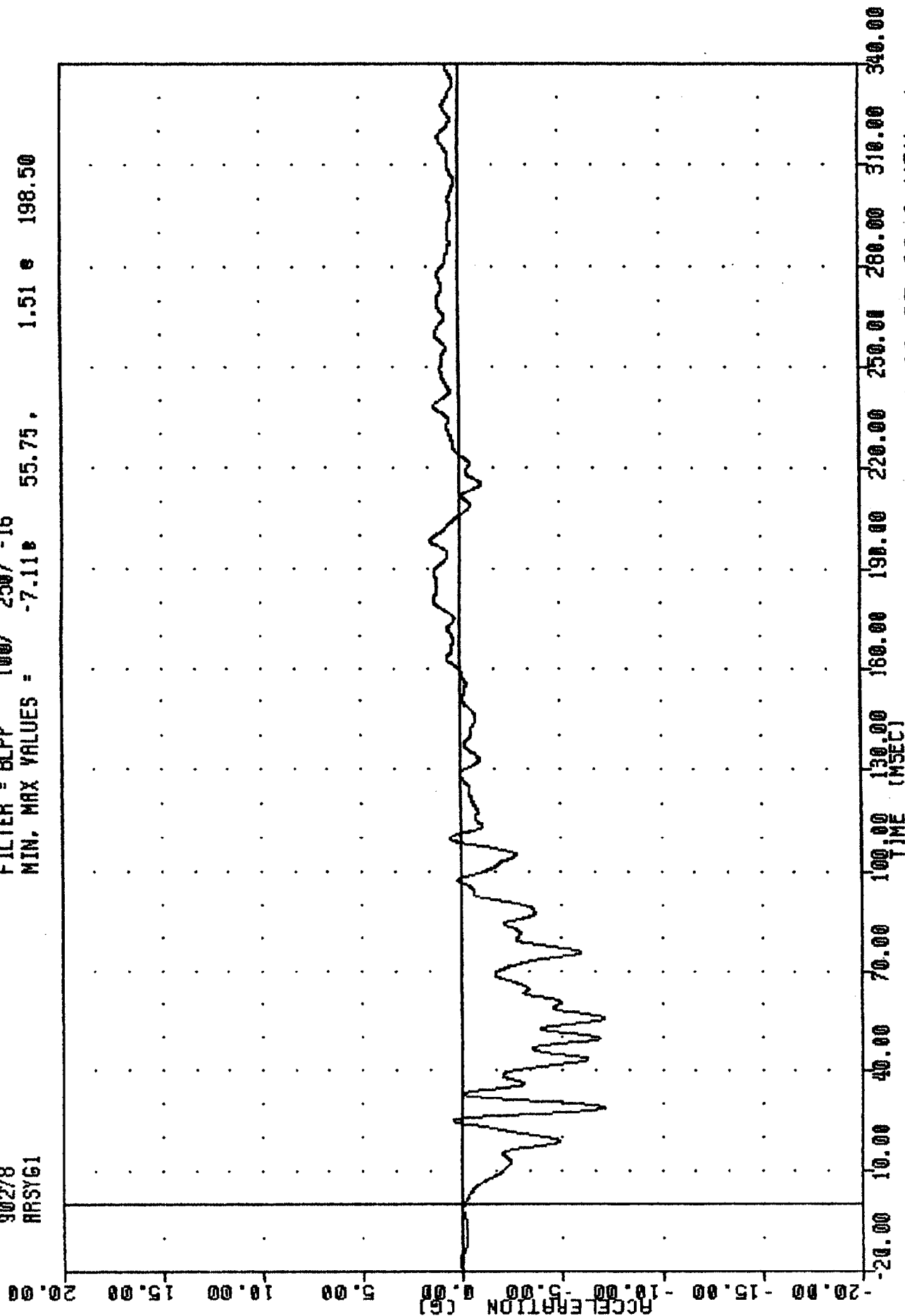
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -11.47 25.25, 6.88 30.75



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH *1
RIGHT REAR SILL X-AXIS ACCELERATION

901005-1 , TRC
CRASH III DAMAGE ALGORITHM
90278
RRSY61

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -7.11e 55.75, 1.51 e 198.50



CRASH III DAMAGE ALGORITHM

90278

RRSR61

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = 0.03 -20.00 11.48 25.25

20.00

15.00

10.00

5.00

0.00

ACCELERATION (G)

-5.00

-10.00

-15.00

-20.00

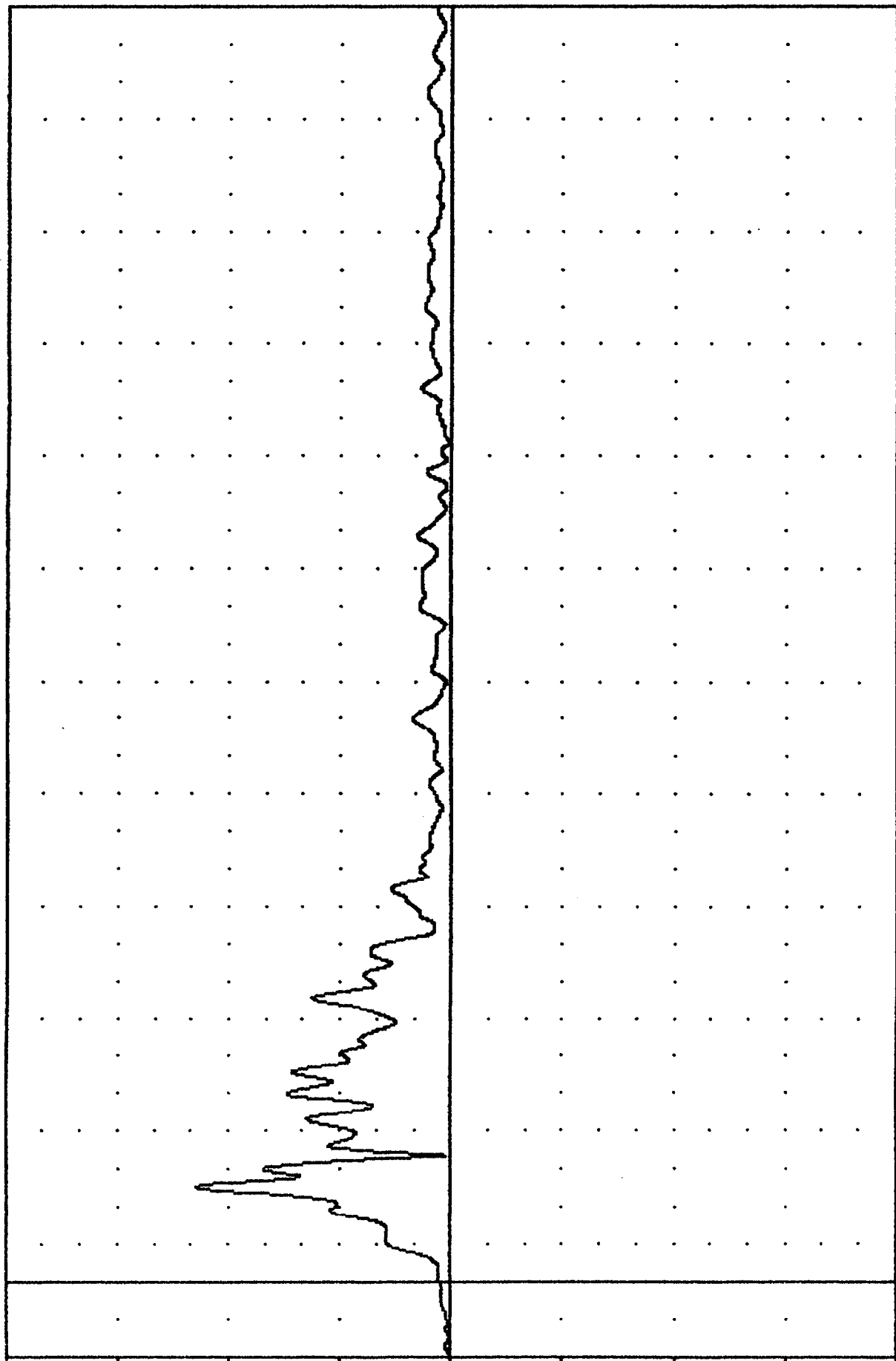
-20.00

-15.00

-10.00

-5.00

0.00



-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

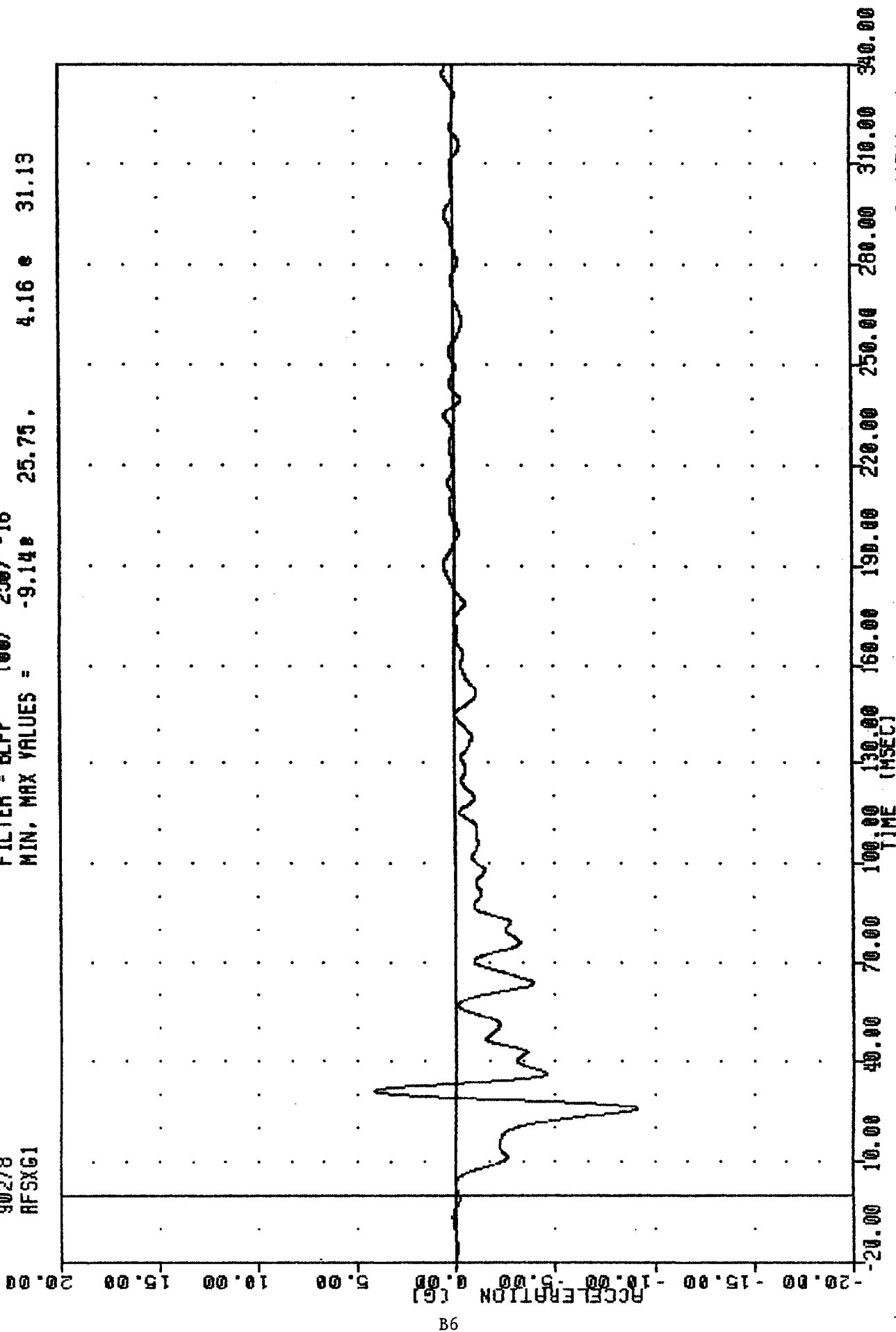
TIME (MSEC)

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH *1

RIGHT REAR SILL RESULTANT ACCELERATION

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 RFSXG1

FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -9.14e 25.75. 4.16 e 31.13

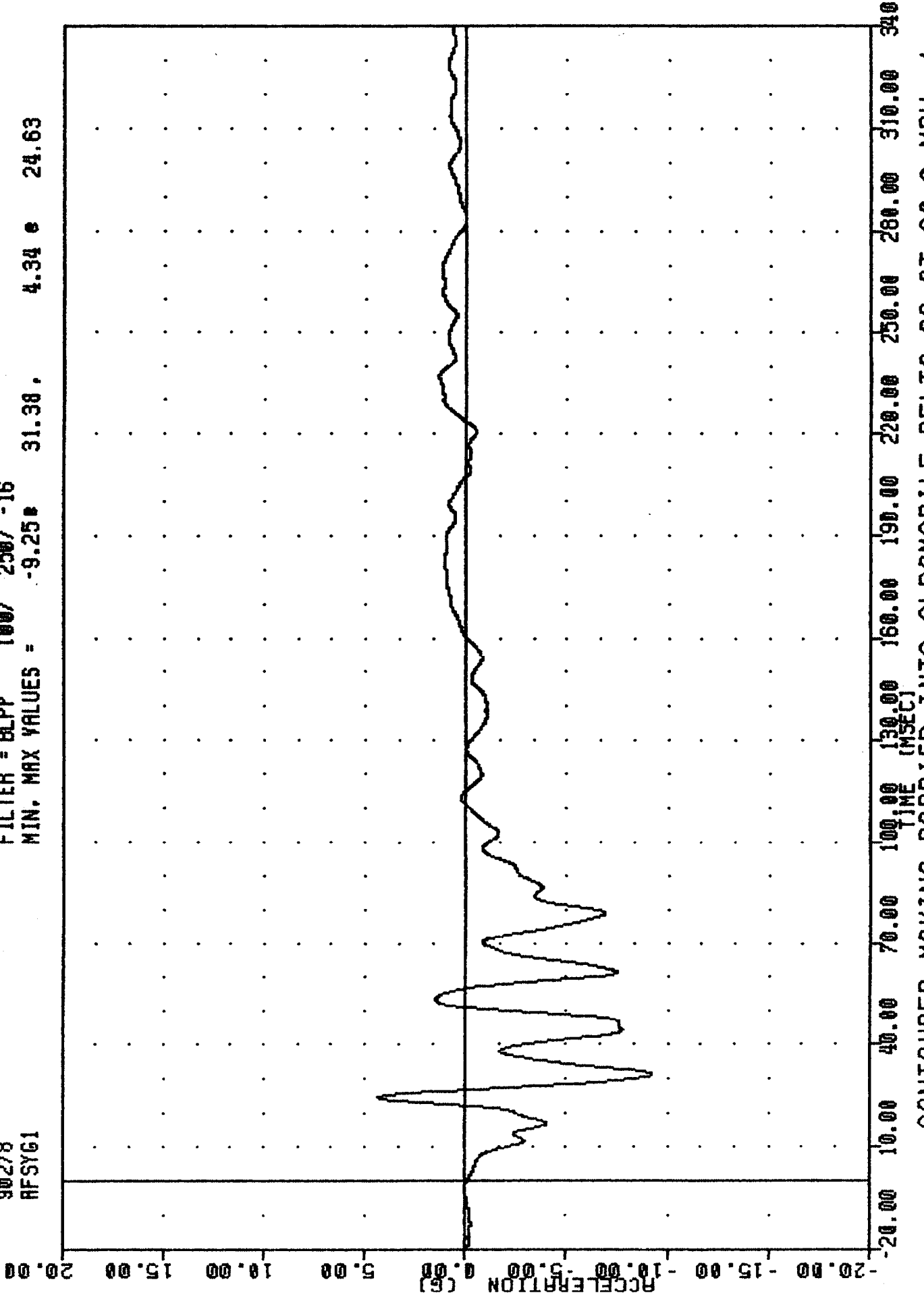


CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
 RIGHT FRONT SILL X-AXIS ACCELERATION

CRASH III DAMAGE ALGORITHM

90278
RFSYG1

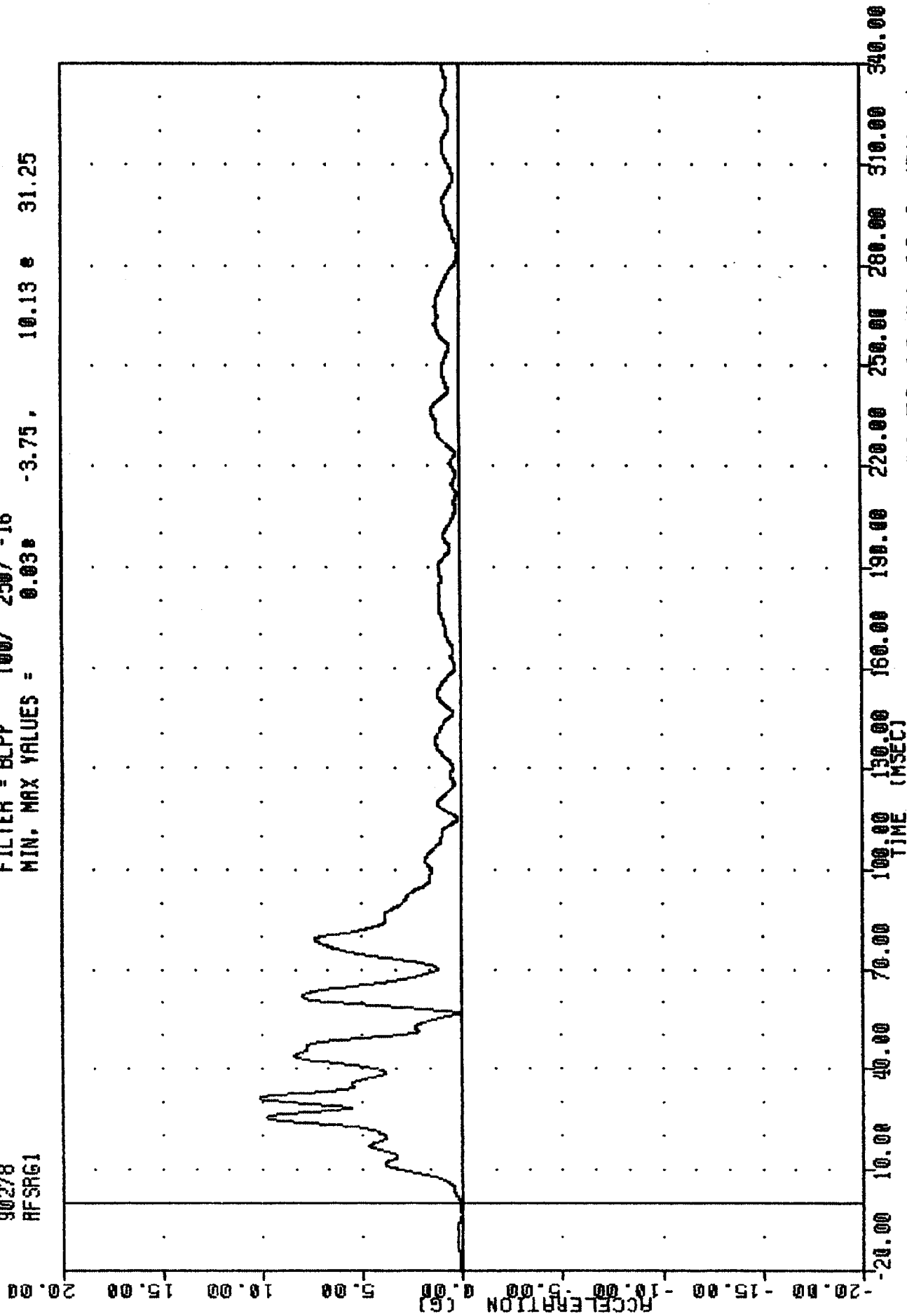
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -9.25 31.38 4.34 24.63



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
RIGHT FRONT SILL Y-AXIS ACCELERATION

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 RFSRG1

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = 0.038 -3.75, 10.13 e 31.25



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
 , RIGHT FRONT SILL RESULTANT ACCELERATION

CRASH III DAMAGE ALGORITHM

90278

YCGXG1

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -13.34 24.38 4.70 30.00

20.00

15.00

10.00

5.00

0.00

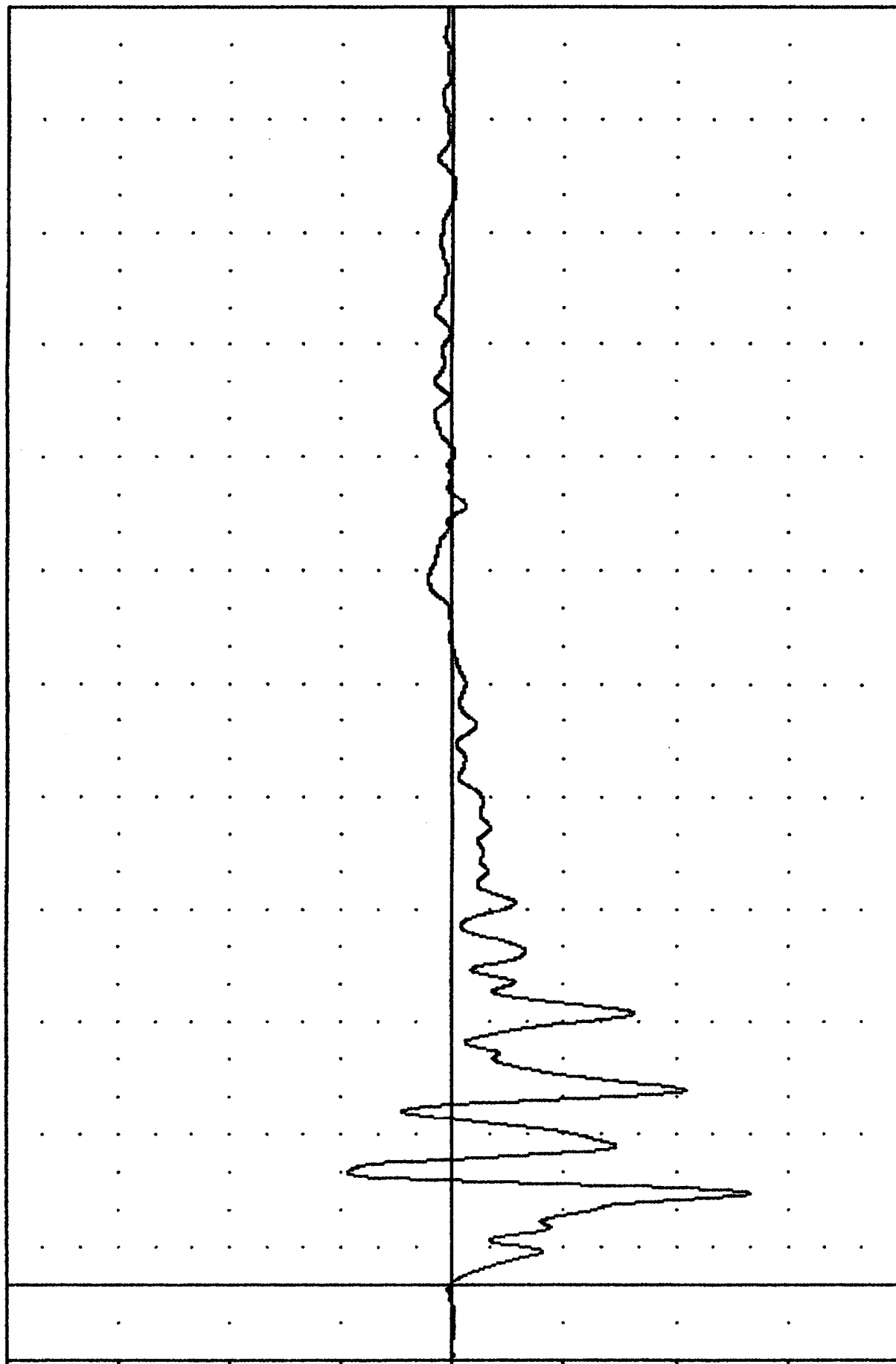
-5.00

-10.00

-15.00

-20.00

ACCELERATION (G)

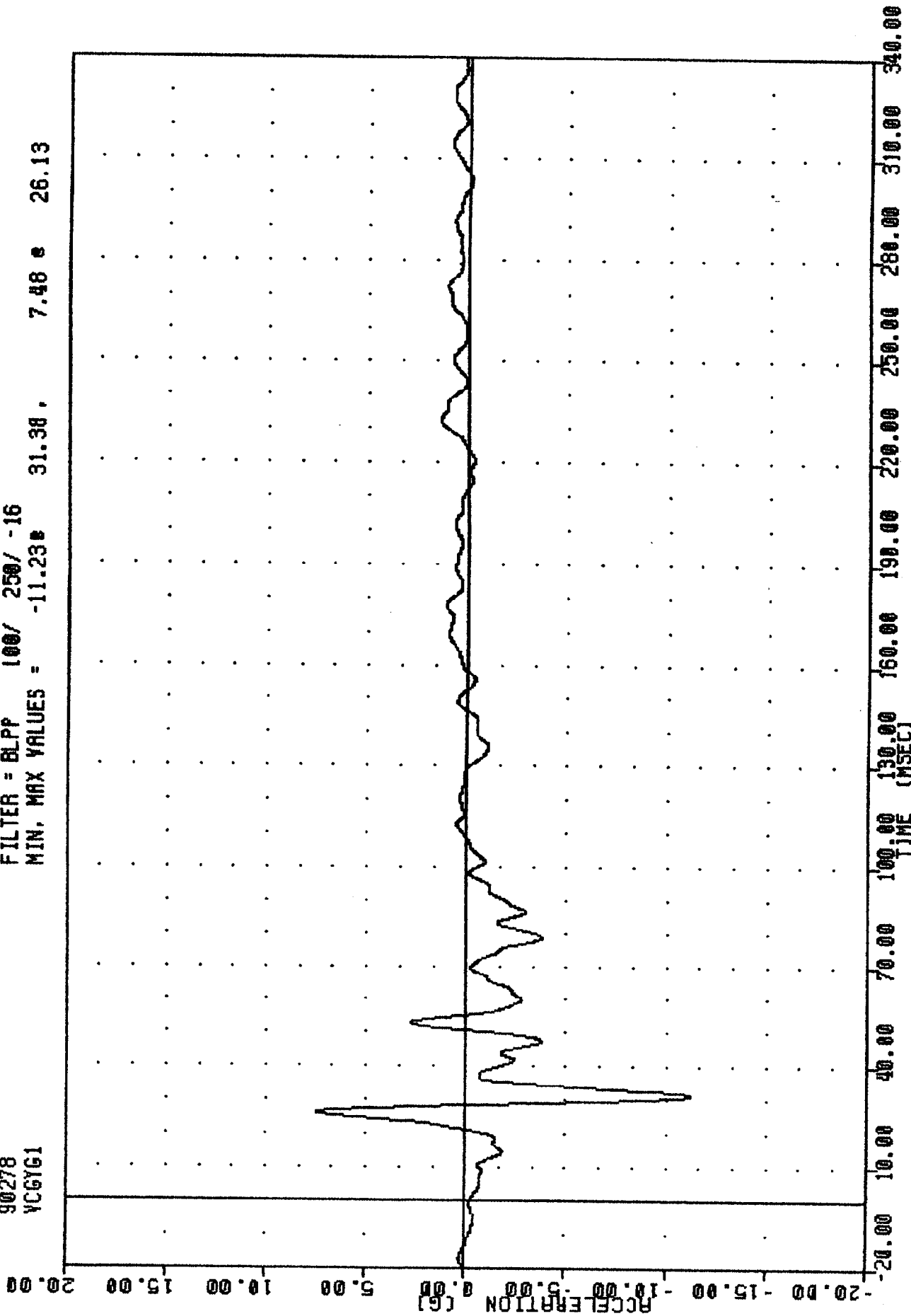


-20.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH $\approx$ 1
VEHICLE CG X-AXIS ACCELERATION (IMPACT DIRECTION)

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 YC6YG1

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -11.23 31.38 7.48 26.13



B10

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH ±1
 VEHICLE CG Y-AXIS ACCELERATION (PERPENDICULAR TO IMPACT DIRECTION)

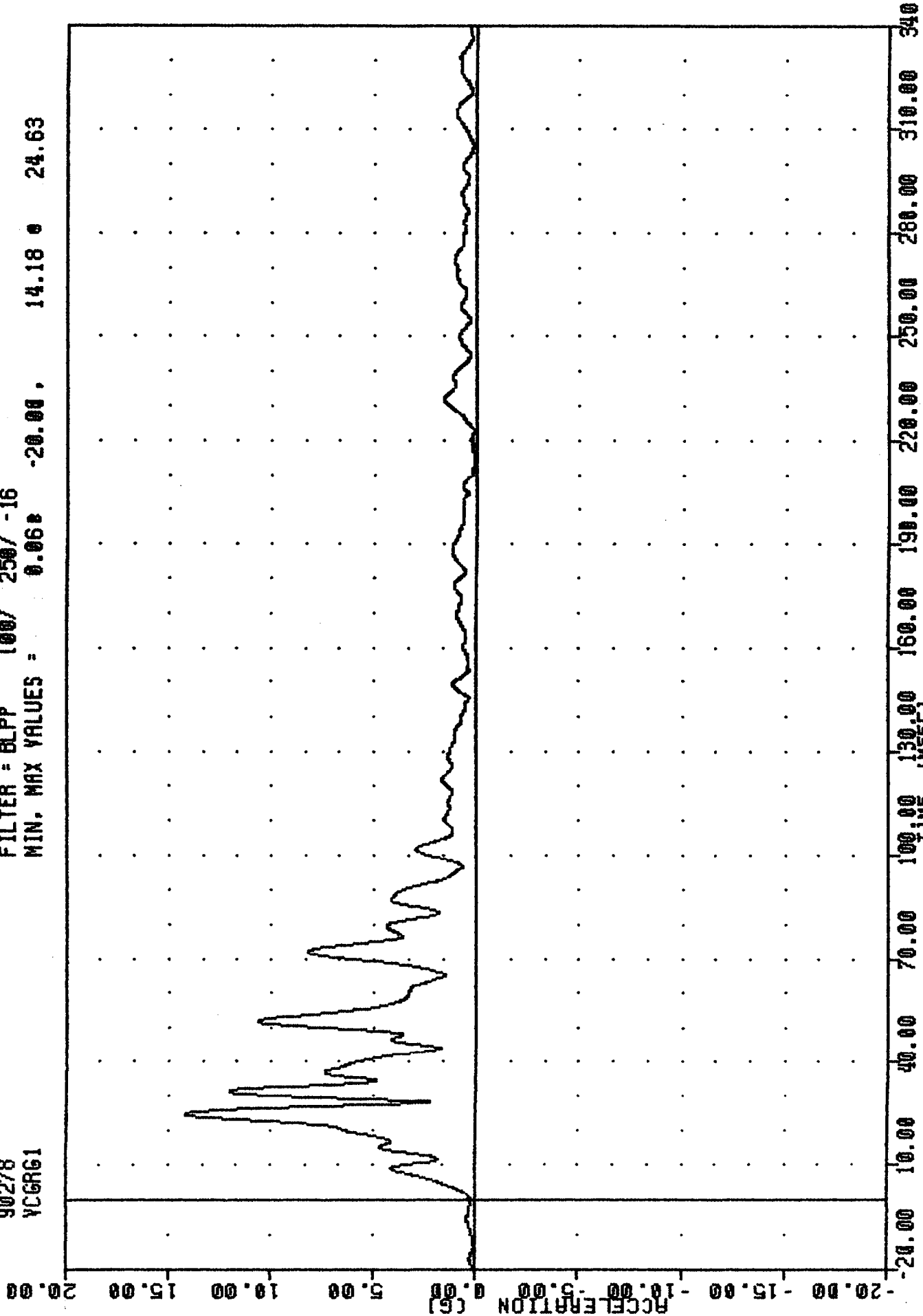
CRASH III DAMAGE ALGORITHM

90278

VCGR61

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = 0.068 -20.00 14.18 24.63

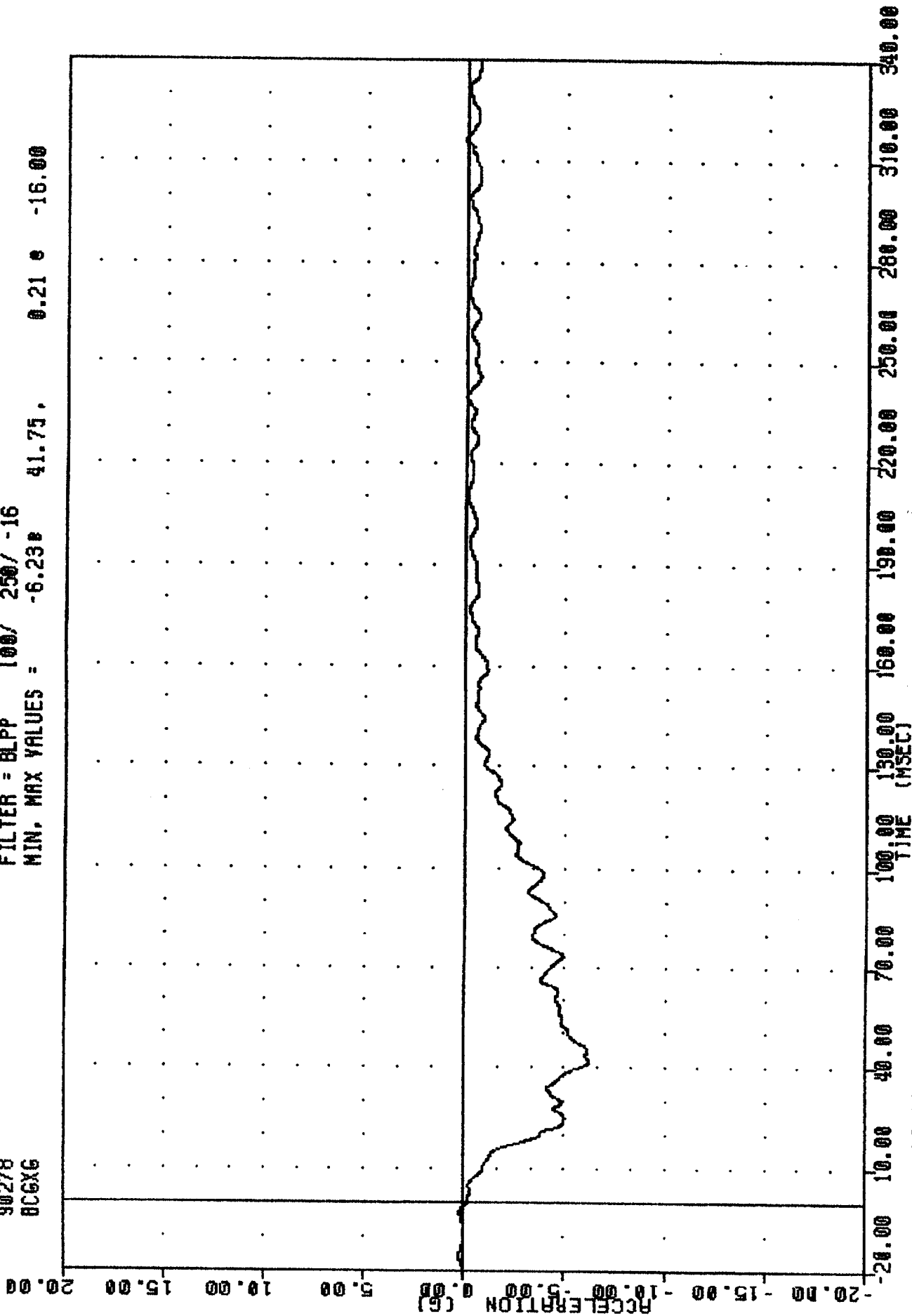


B11

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH *1
VEHICLE CG RESULTANT ACCELERATION

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 BCGXG

FILTER = 8LPP 100/ 250/ -16
 MIN. MAX VALUES = -6.23 41.75 0.21 0 -16.00



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH ± 1
 MOVING BARRIER CENTER OF GRAVITY X-AXIS ACCELERATION

CRASH III DAMAGE ALGORITHM

90278
BCGYG

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -4.46 85.25

2.41 e 150.63

20.00

15.00

10.00

5.00

0.00

-5.00

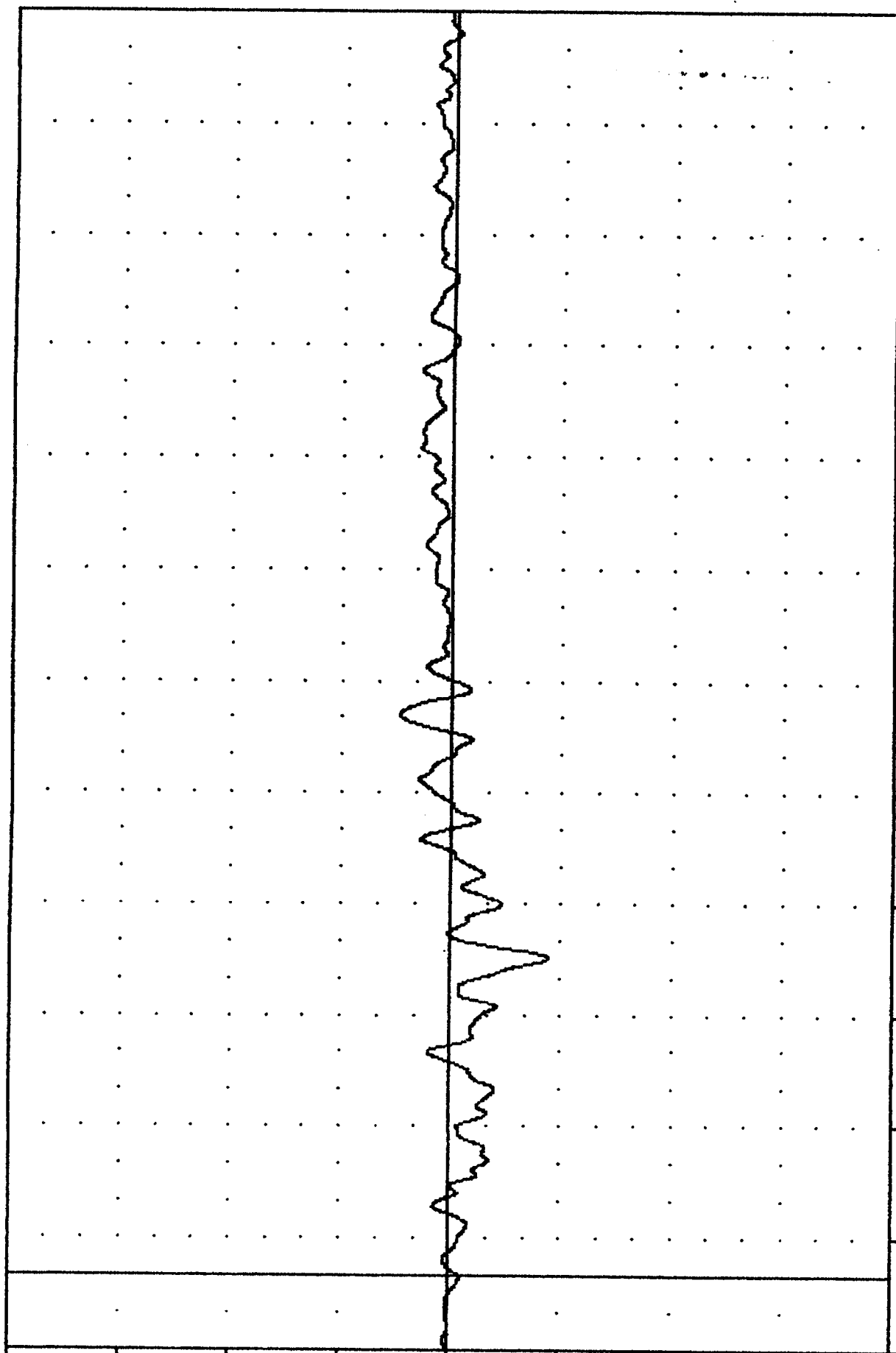
-10.00

-15.00

-20.00

ACCELERATION (G)

B13



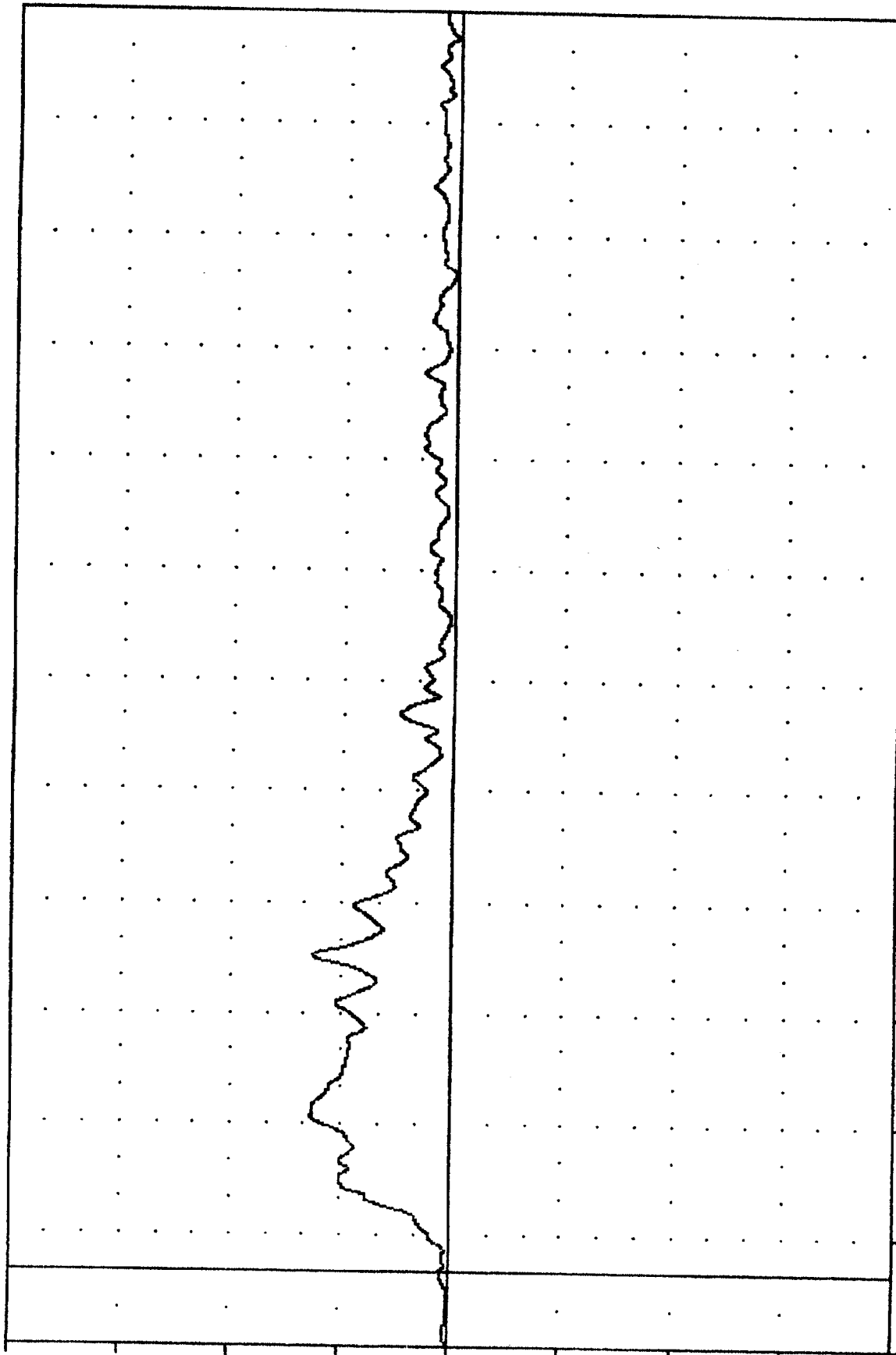
-20.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
MOVING BARRIER CENTER OF GRAVITY Y-AXIS ACCELERATION

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 BCGRG

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = 0.07 -20.00, 6.35 42.00

ACCELERATION (G)



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH ±1
 MOVING BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION

CRASH III DAMAGE ALGORITHM

90278

RRSXV1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -5.08 293.25 0.05 7.00

20.00

15.00

10.00

5.00

0.00

-5.00

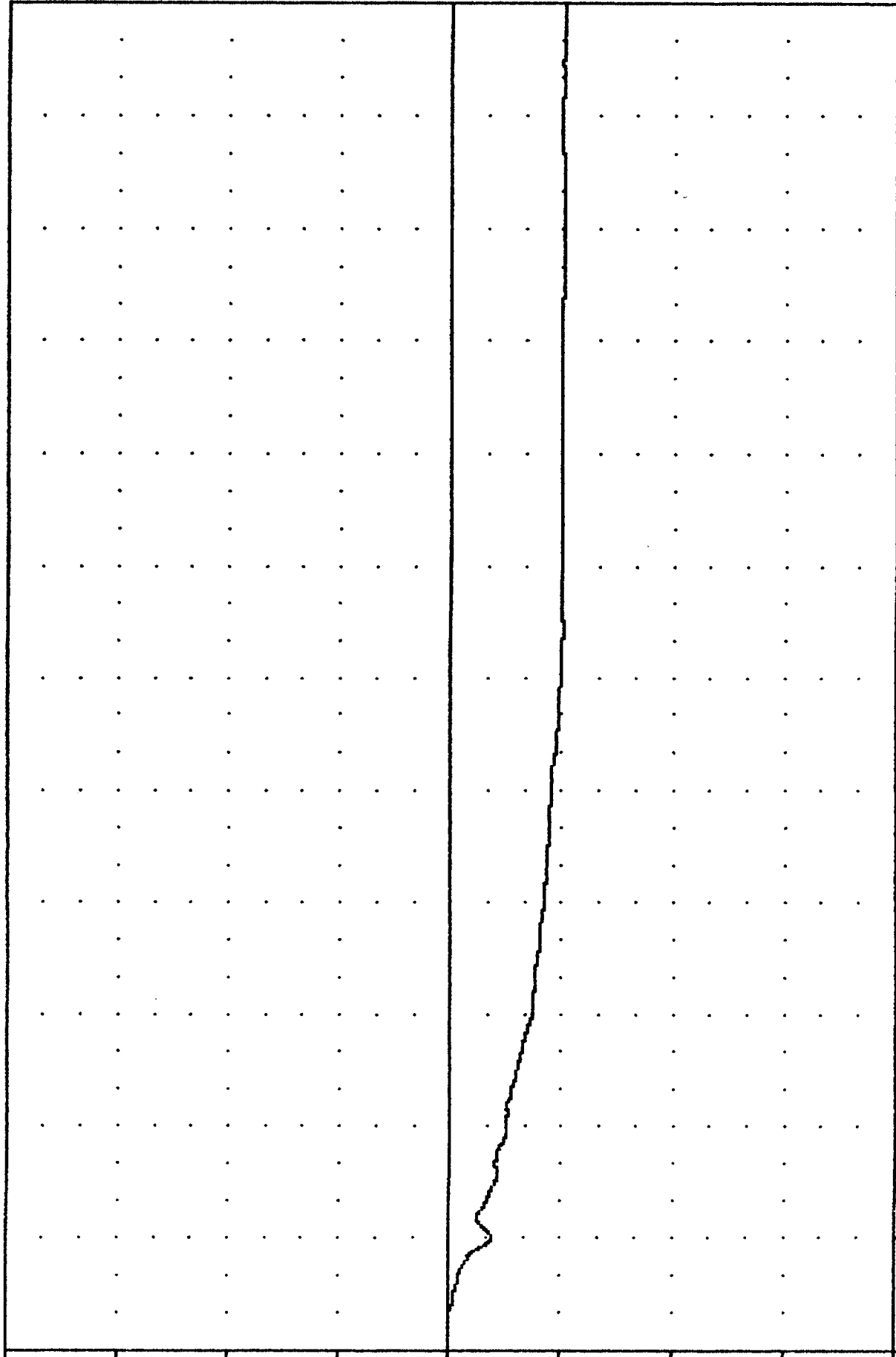
-10.00

-15.00

-20.00

B15

VELOCITY (MPH)



0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

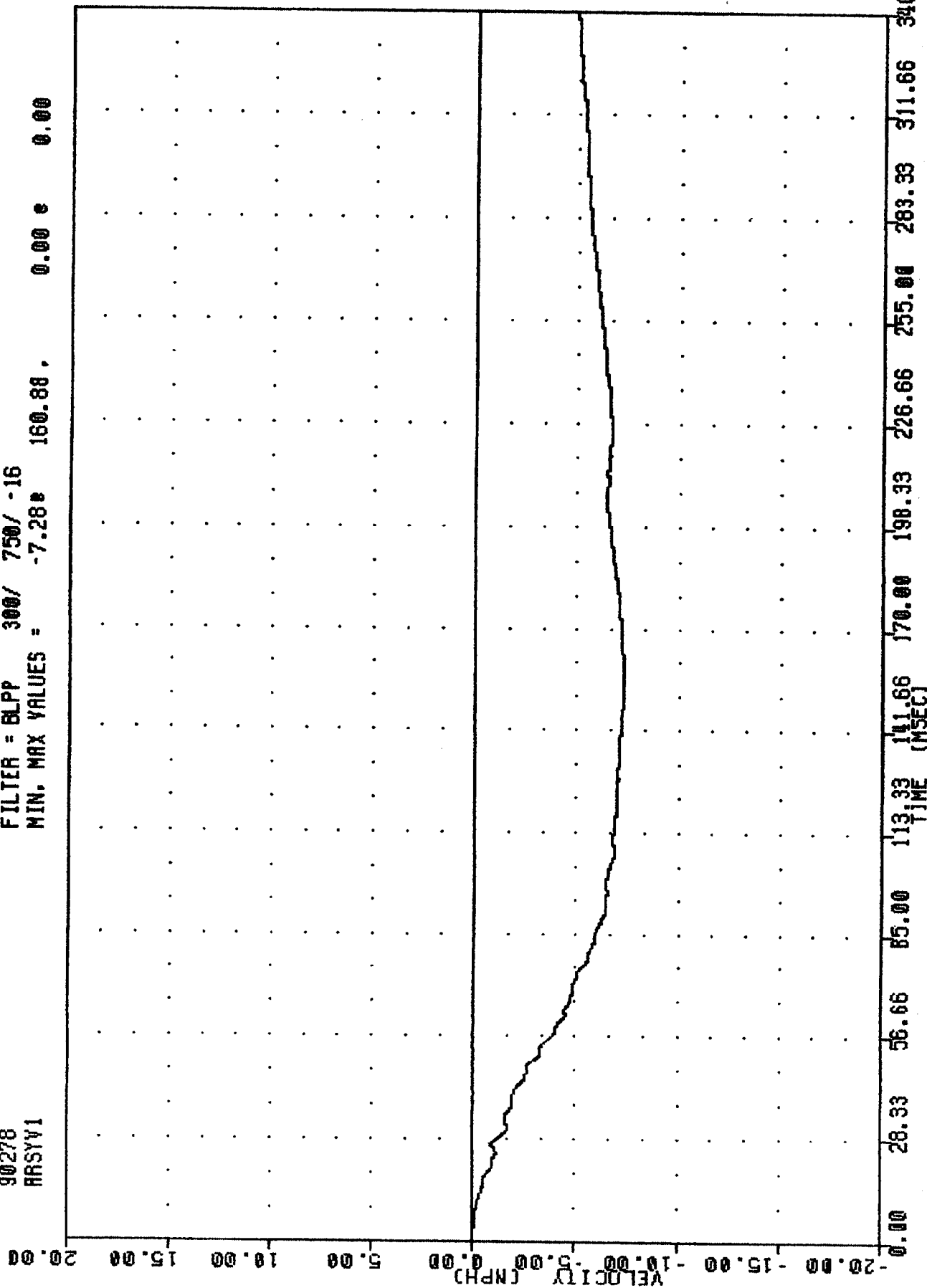
TIME (MSEC)

CONTOURED MOVING BARRIER INTO OLD3MOBILE DELTA 88 AT 20.0 MPH #1

RIGHT REAR SILL X-AXIS VELOCITY

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 ARSYV1

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -7.28 160.88 , 0.00 0.00

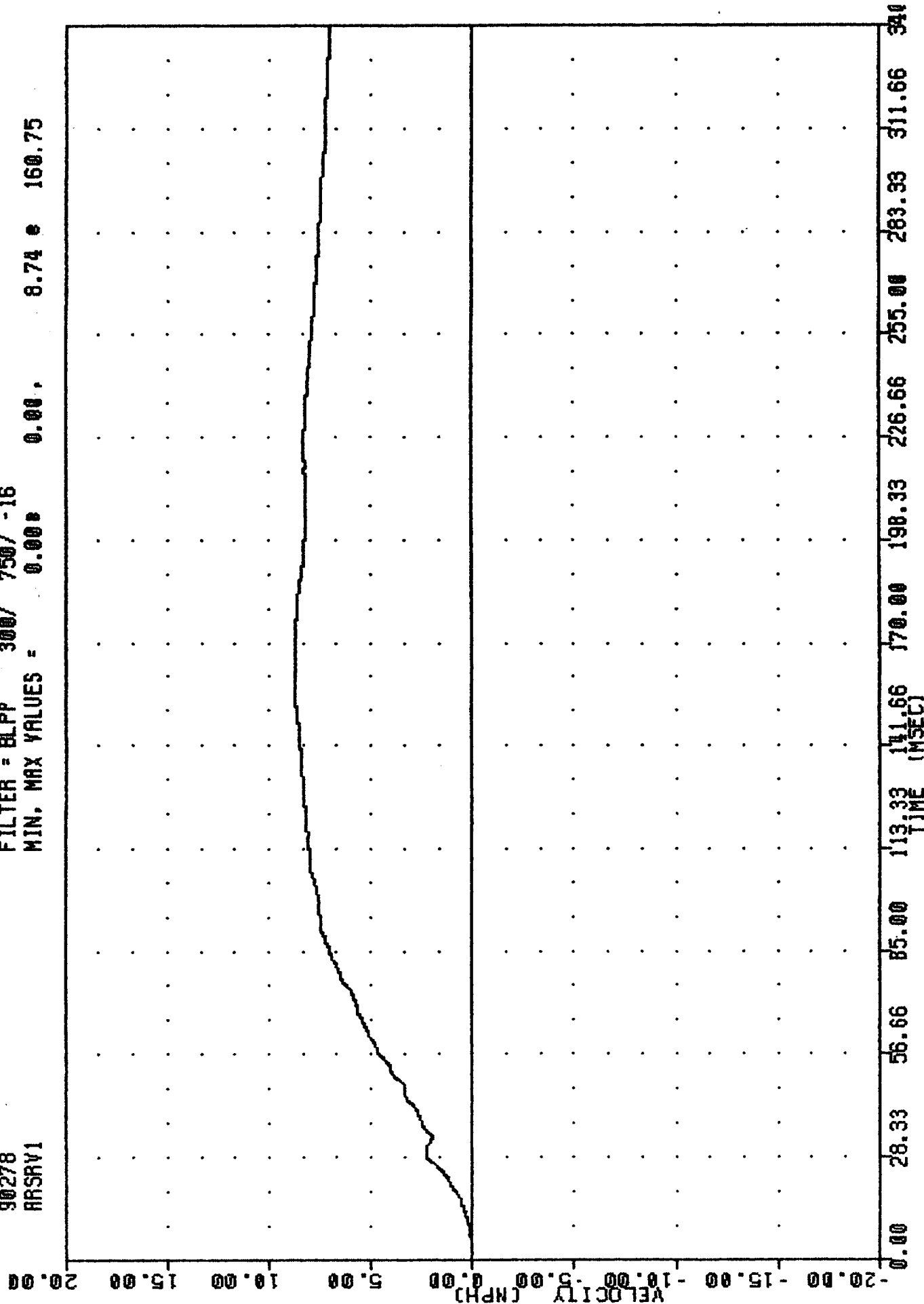


CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
 , RIGHT REAR SILL Y-AXIS VELOCITY

CRASH III DAMAGE ALGORITHM

90278
ARSPV1

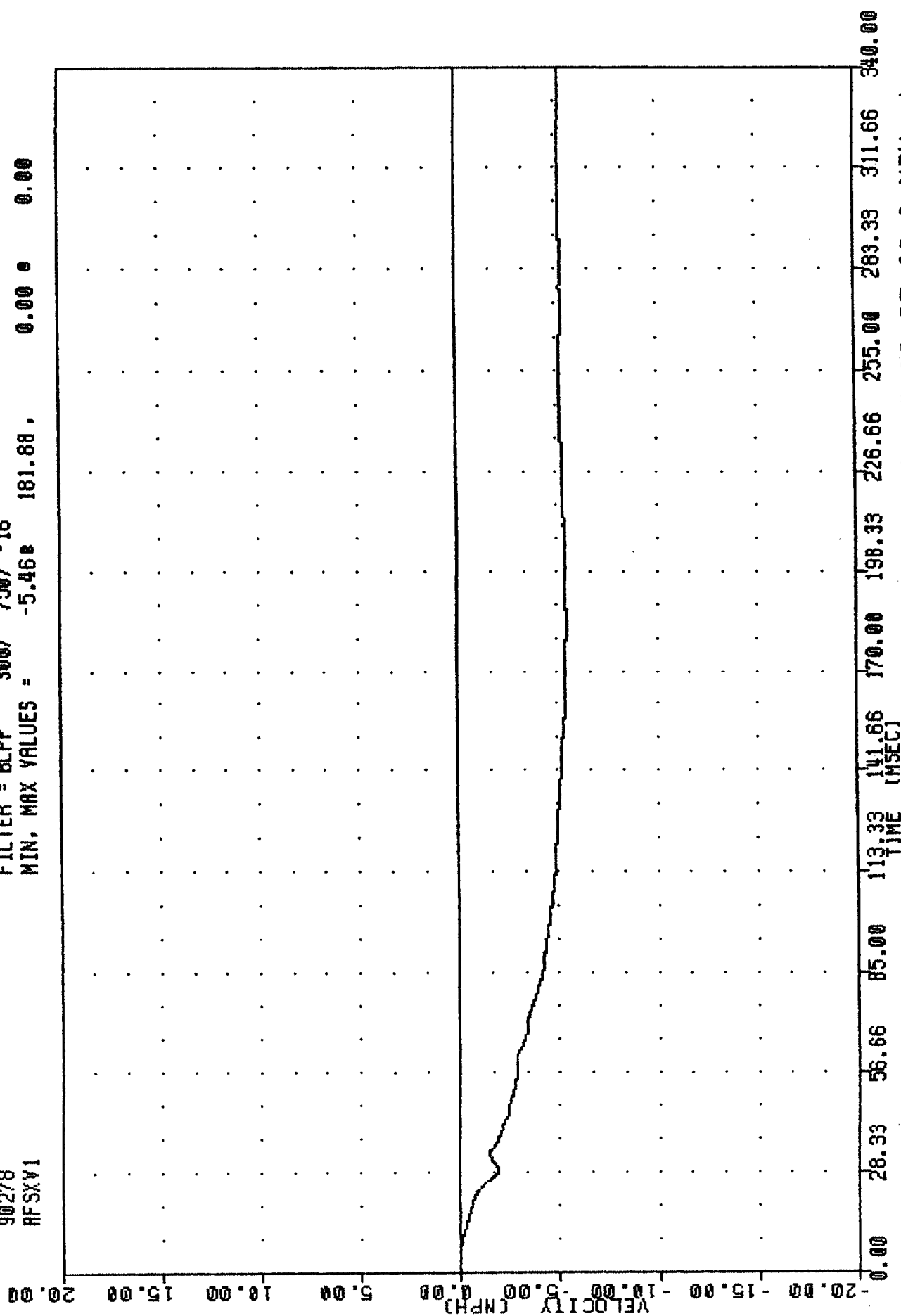
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = 0.00 0.00 8.74 160.75



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
RIGHT REAR SILL RESULTANT VELOCITY

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 RFSXV1

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -5.46 181.88, 0.00 0.00



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH *1
 RIGHT FRONT SILL X-AXIS VELOCITY,

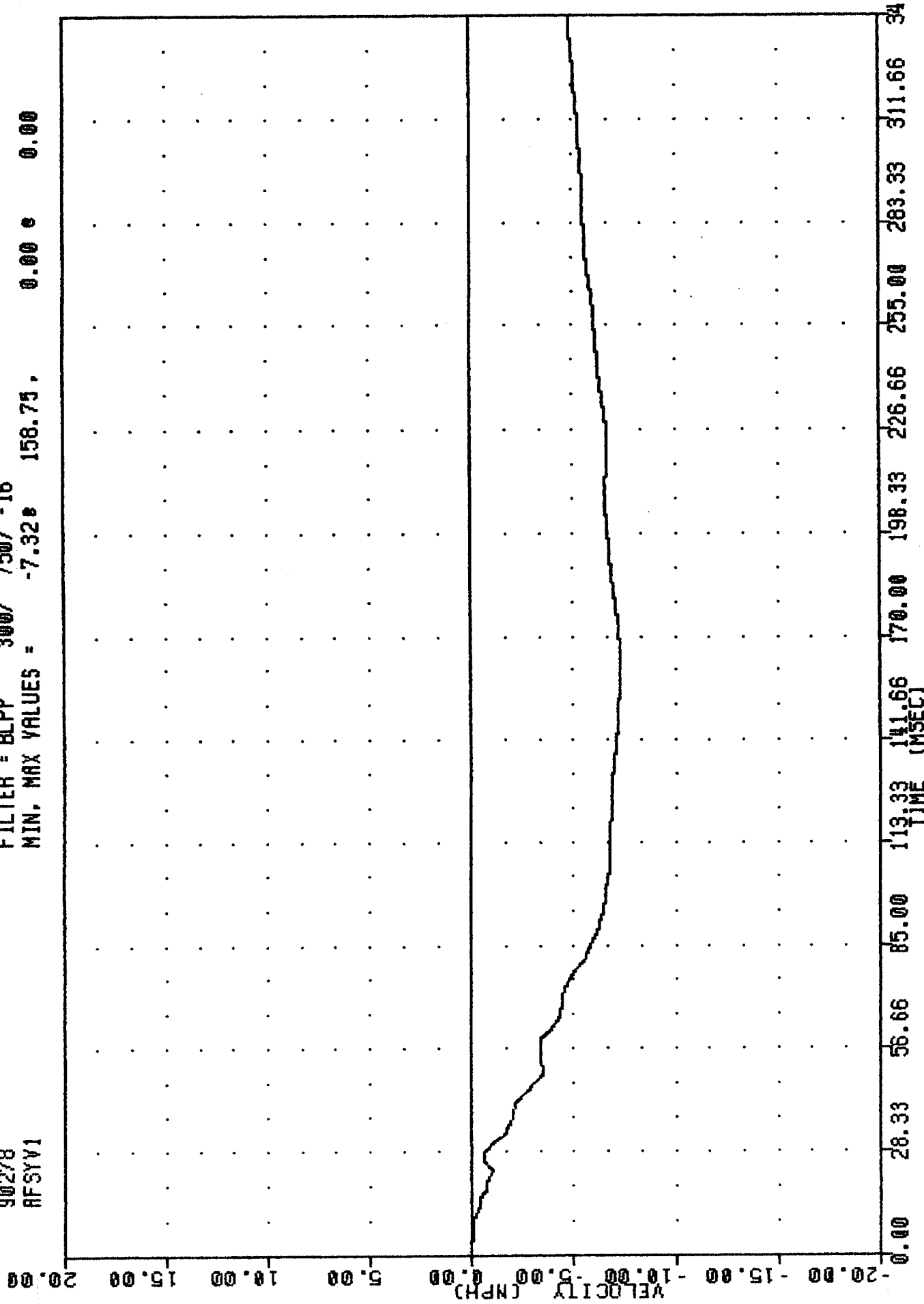
CRASH III DAMAGE ALGORITHM

90278

AFSYV1

FILTER = BLPP 300/ 750/ -16

MIN, MAX VALUES = -7.32 158.73, 0.00 0.00

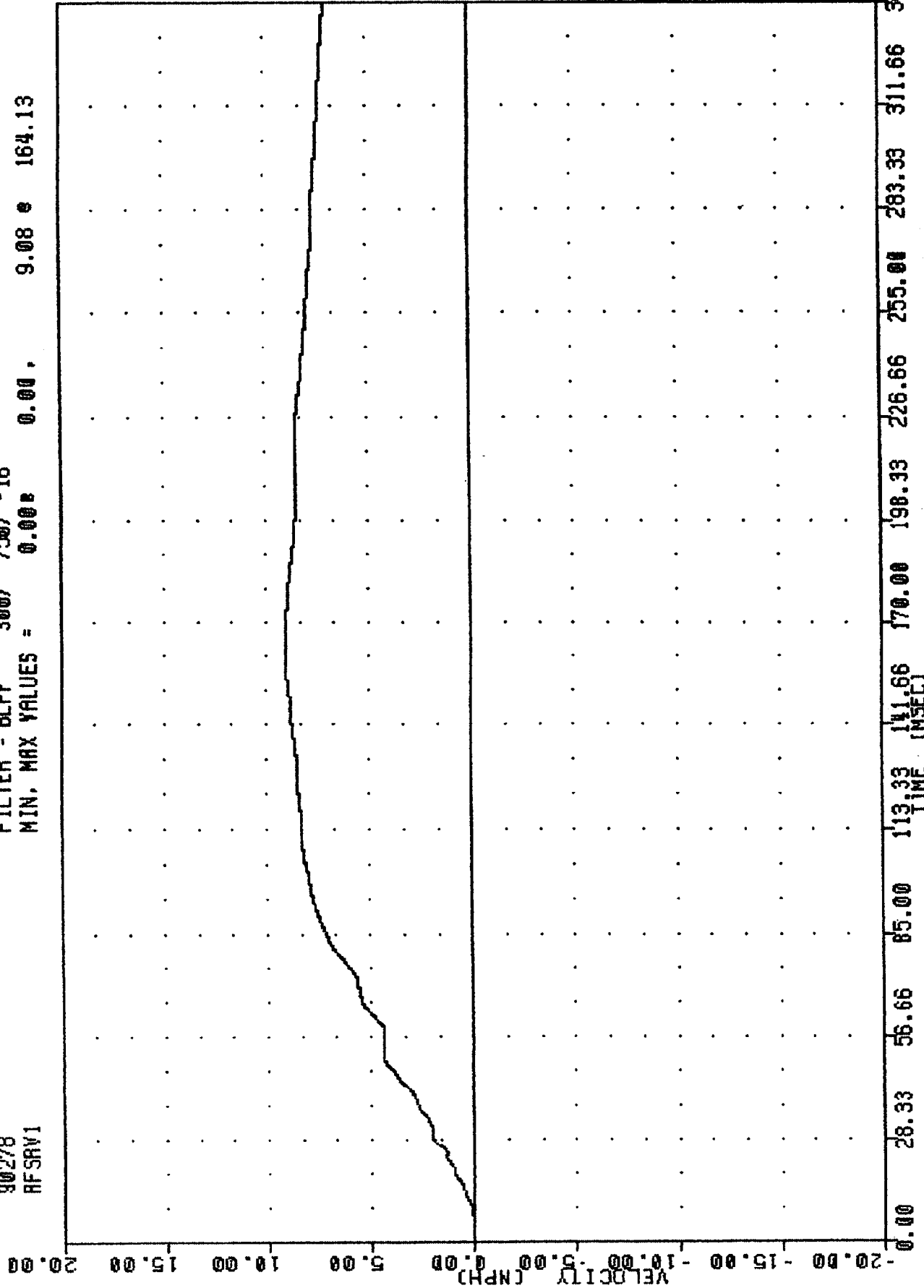


B19

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH ±1
RIGHT FRONT SILL Y-AXIS VELOCITY

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 RFSRV1

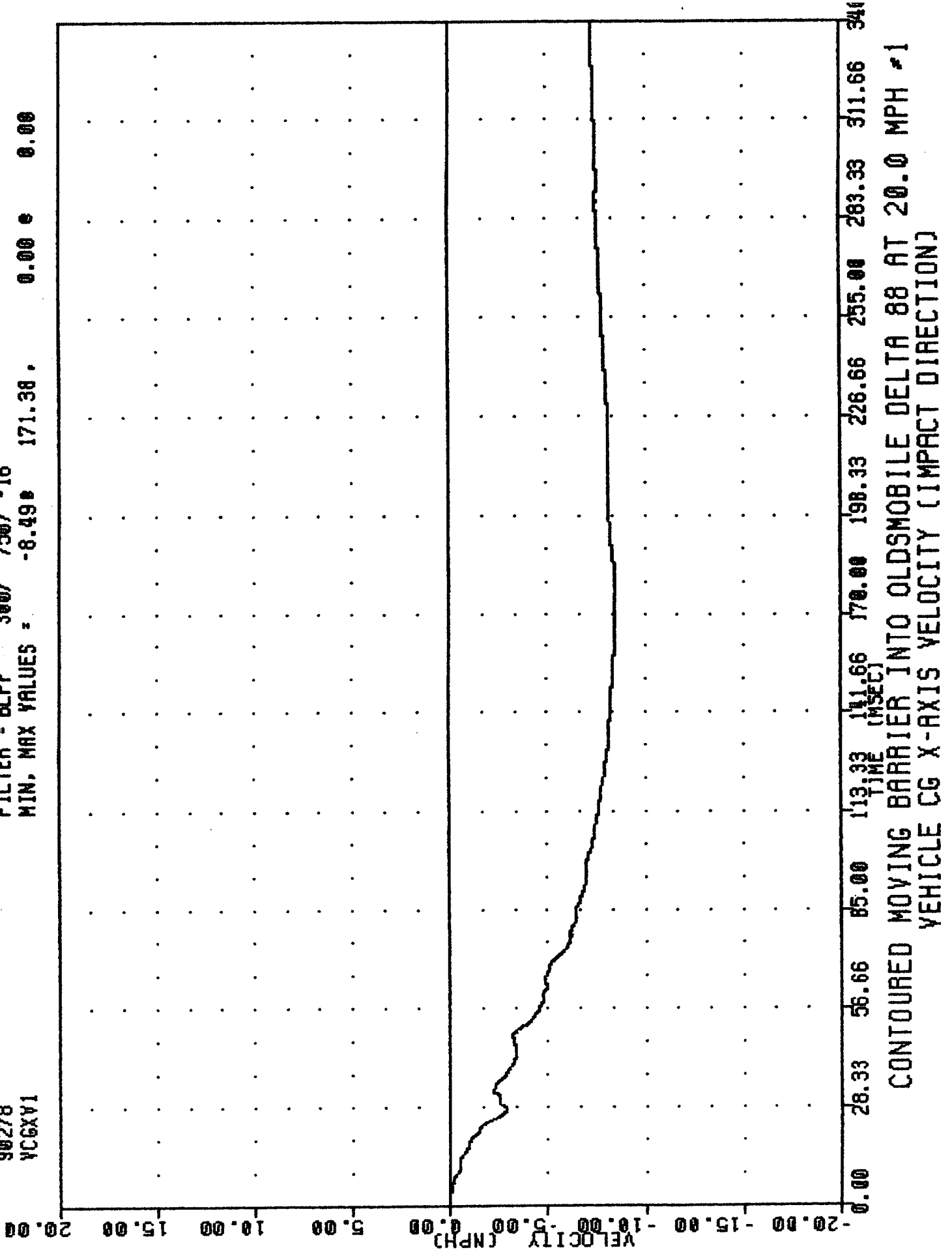
FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = 0.00 0.00 , 9.08 164.13



CONTOURED MOVING BARRIER INTO OLD9MOBILE DELTA 88 AT 20.0 MPH #1
 , RIGHT FRONT SILL RESULTANT VELOCITY

CRASH III DAMAGE ALGORITHM
 90278
 YCGXV1

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -8.49 171.38 0.00 0.00



901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 VCGYV1

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -3.26 145.25 0.29 29.13

20.00

15.00

10.00

5.00

0.00

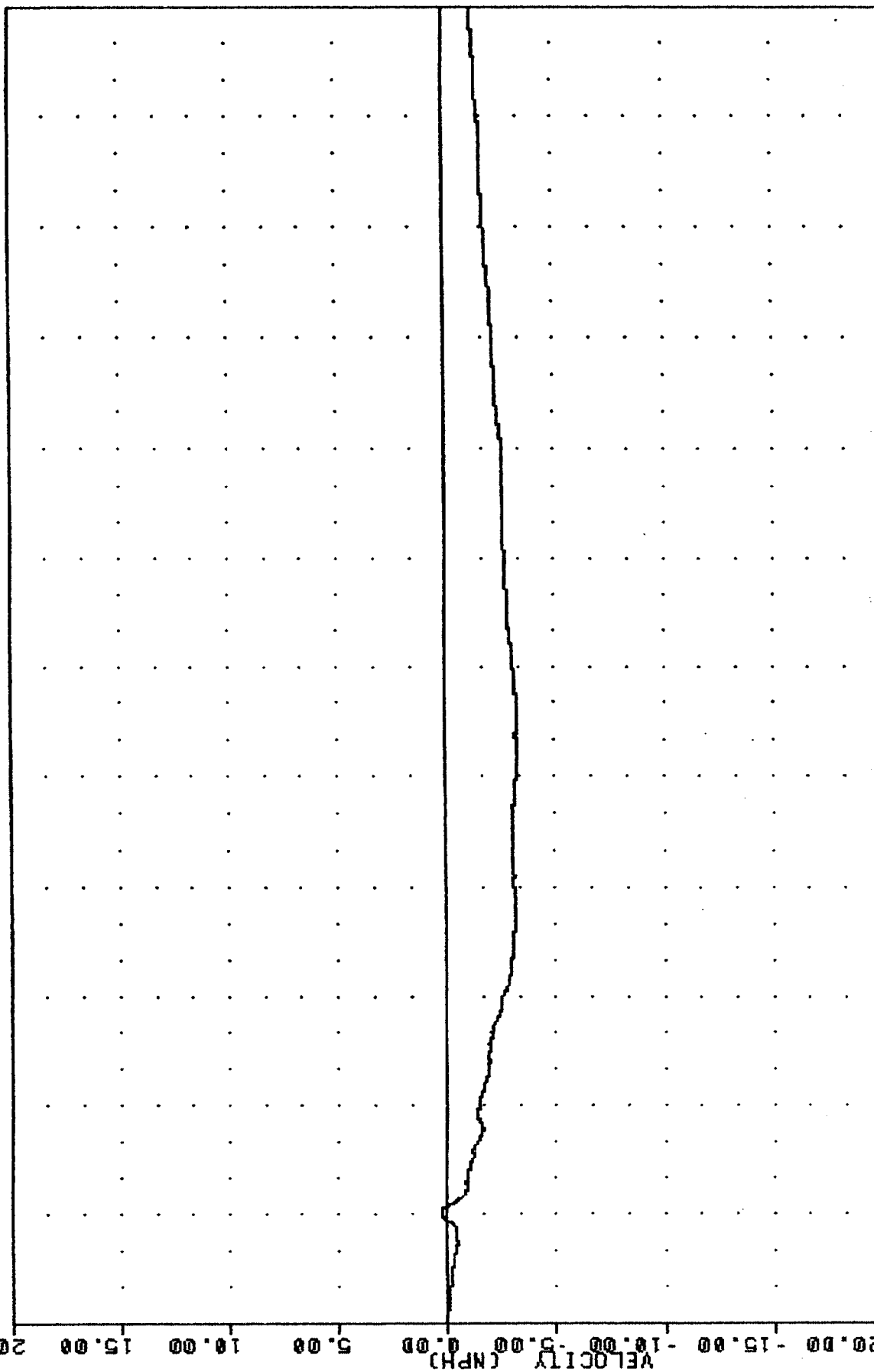
-5.00

-10.00

-15.00

-20.00

B22



0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
 VEHICLE CG Y-AXIS VELOCITY (PERPENDICULAR TO IMPACT DIRECTION)

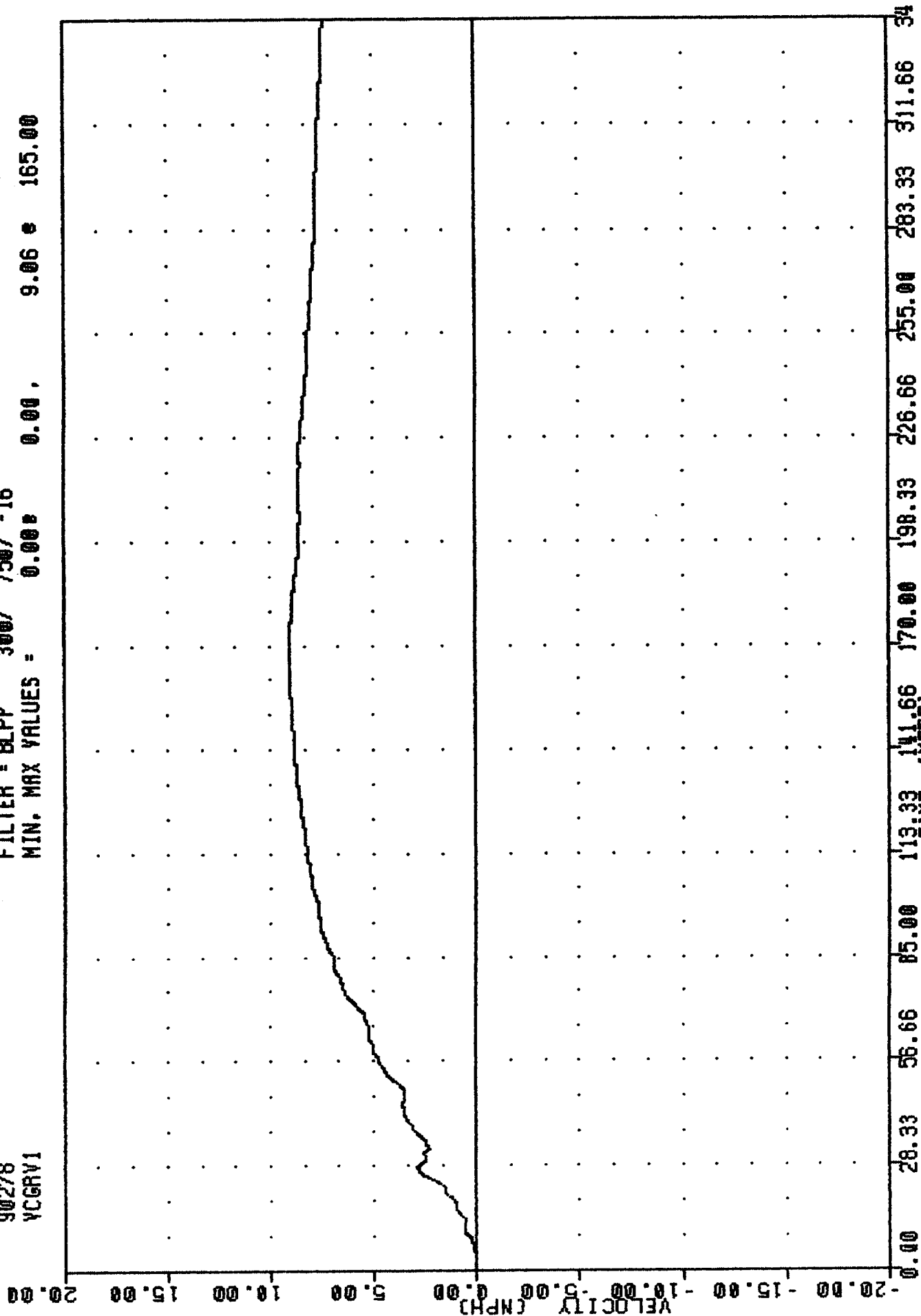
CRASH III DAMAGE ALGORITHM

90278

VCGRV1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = 0.00 0.00 9.06 165.00



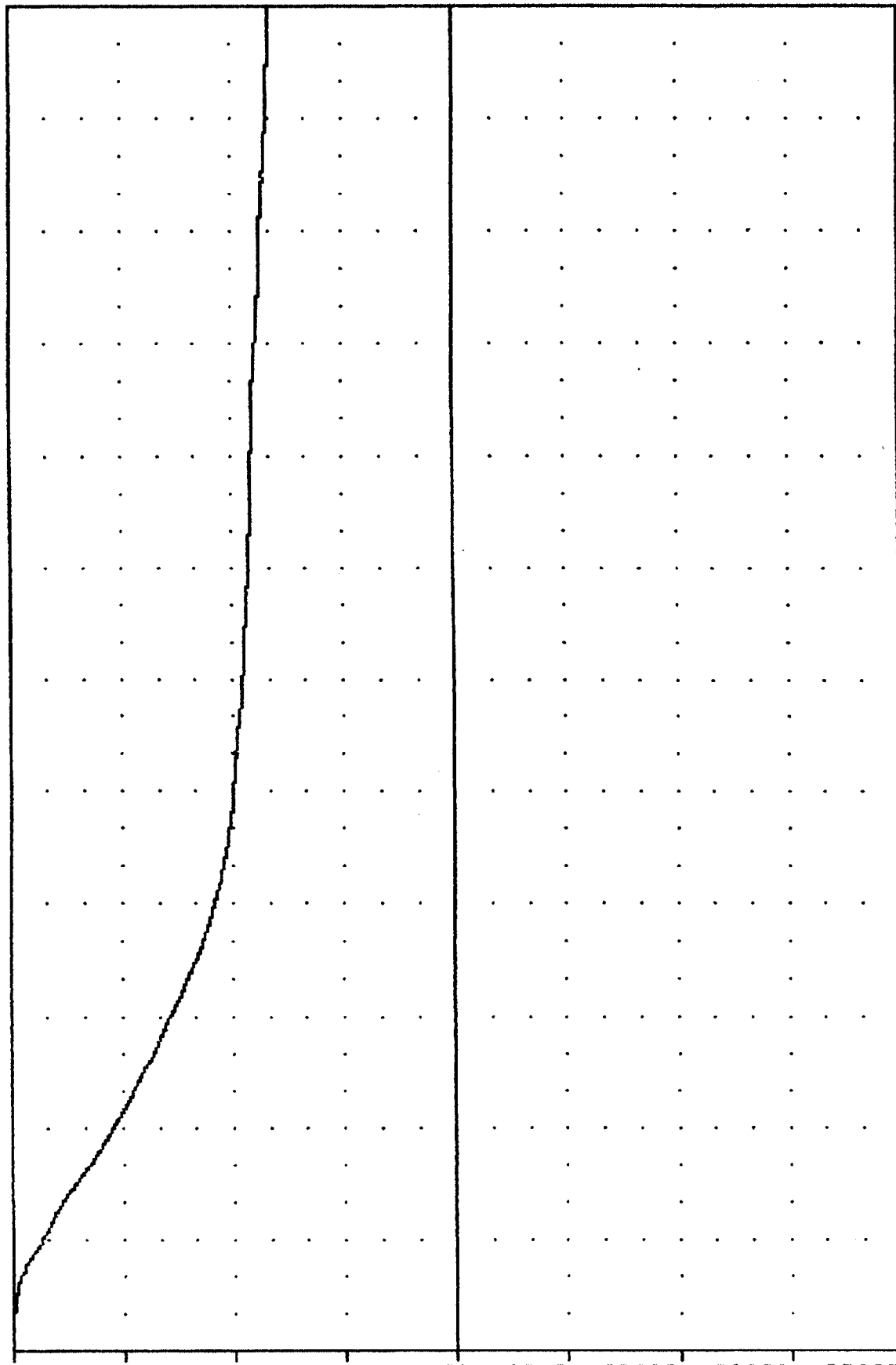
B23

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
VEHICLE CG RESULTANT VELOCITY

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 BCGXY

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = 8.25e 340.00, 20.00 e 2.13

VELOCITY (MPH)



0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1
 MOVING BARRIER CENTER OF GRAVITY X-AXIS VELOCITY

CRASH III DAMAGE ALGORITHM

90278

BCGV

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -2.34 115.50, 0.43 332.63

20.00

15.00

10.00

5.00

0.00

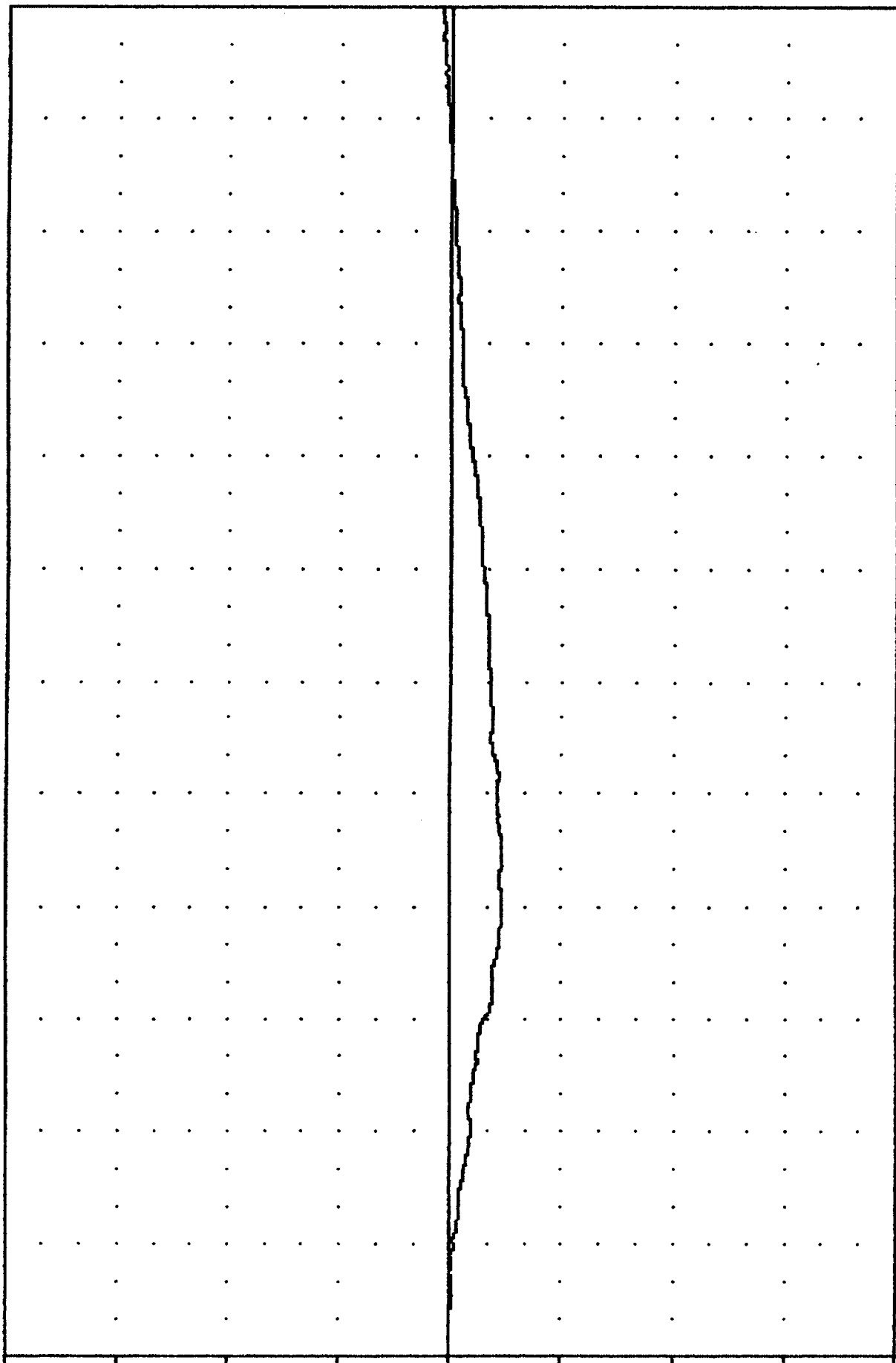
VELOCITY (MPH)

-5.00

-10.00

-15.00

-20.00



0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

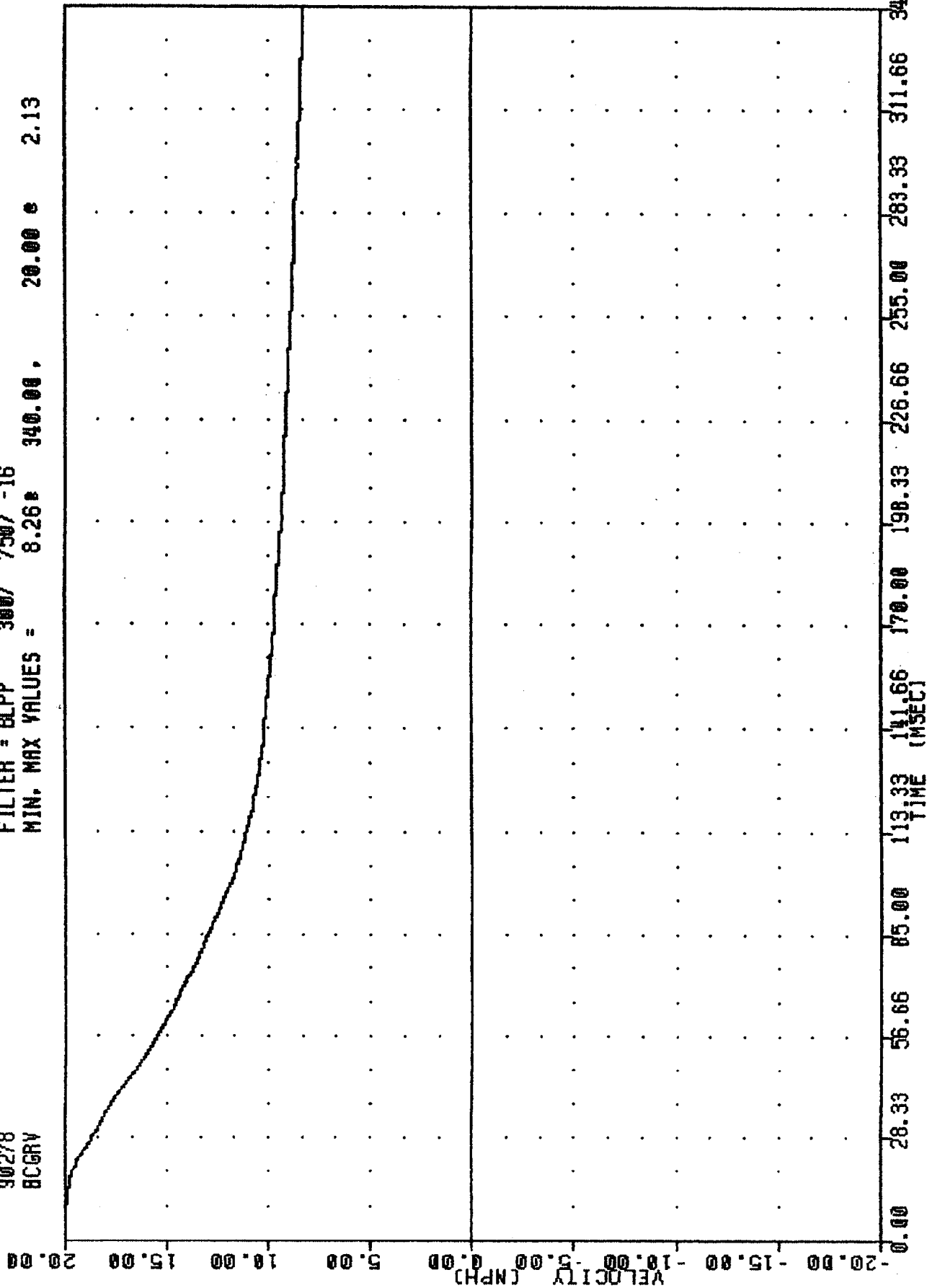
TIME (MSEC)

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH #1

MOVING BARRIER CENTER OF GRAVITY Y-AXIS VELOCITY

901005-1 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 BCGRV

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = 8.26 340.00 20.00 2.13

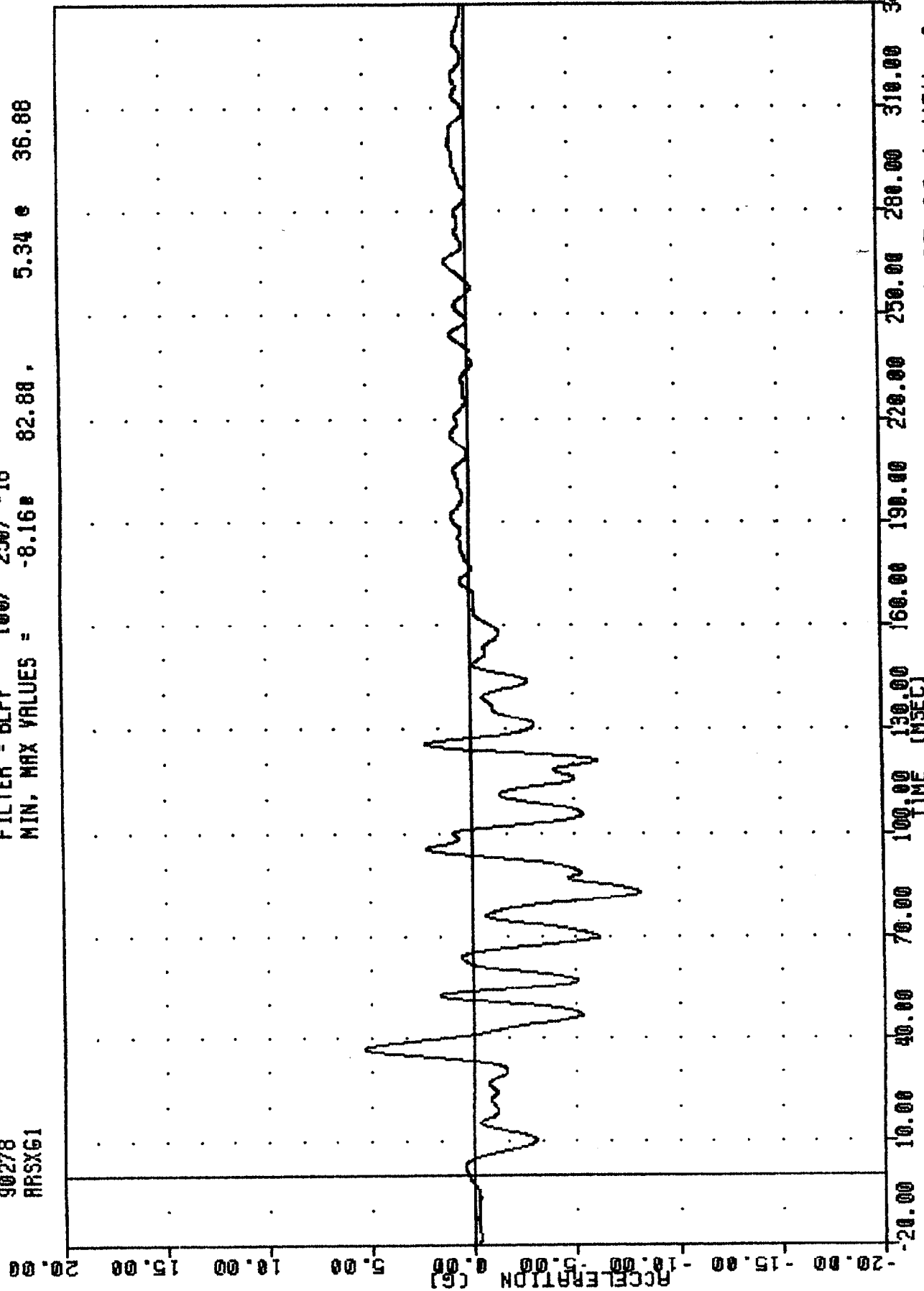


CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 20.0 MPH *1
 MOVING BARRIER CENTER OF GRAVITY RESULTANT VELOCITY

TEST #901005-2

901005-2 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 ARSXG1

FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -8.16 82.88 5.34 36.88

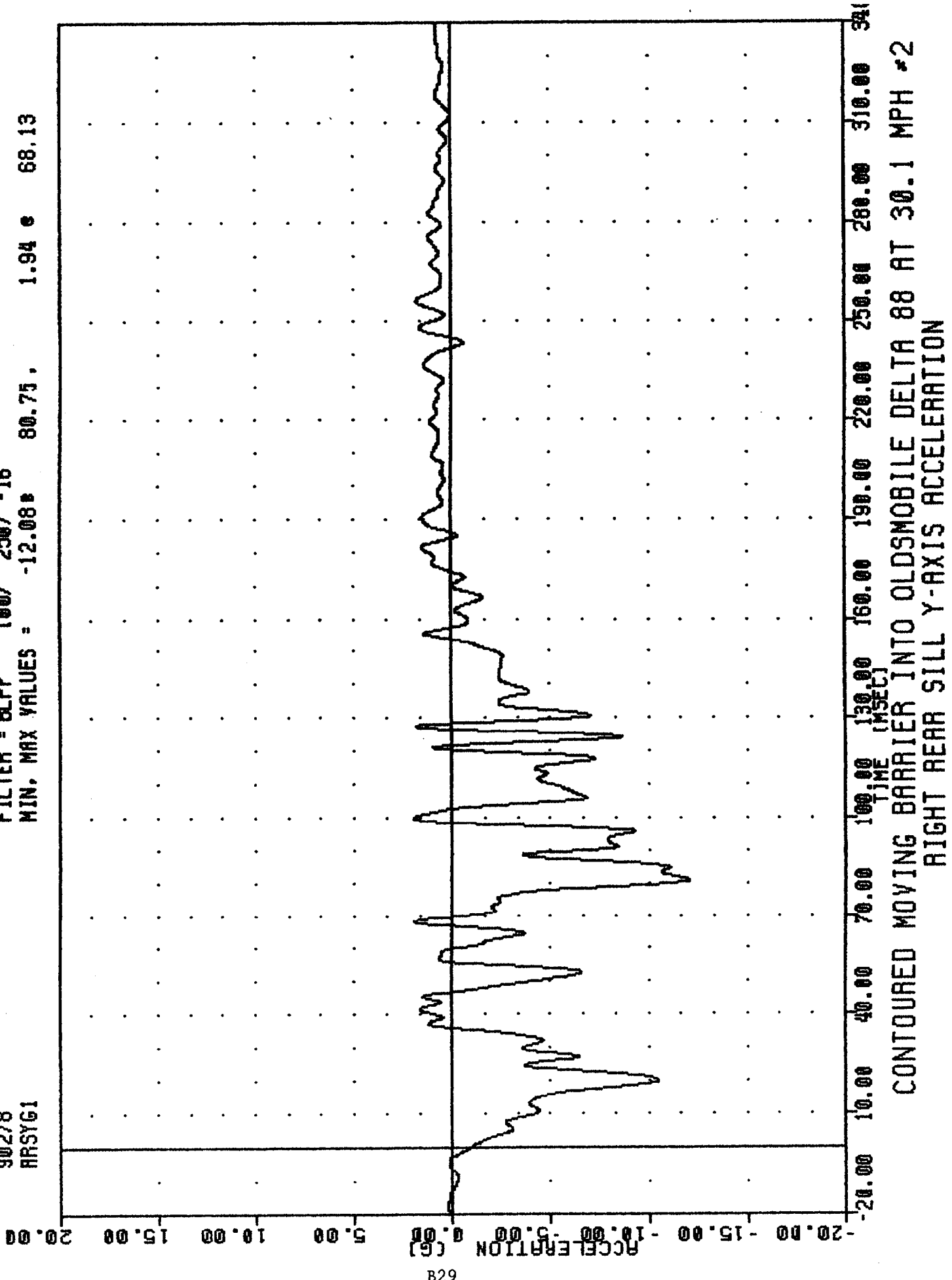


CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 , RIGHT REAR SILL X-AXIS ACCELERATION

CRASH III DAMAGE ALGORITHM

90278
ARSYG1

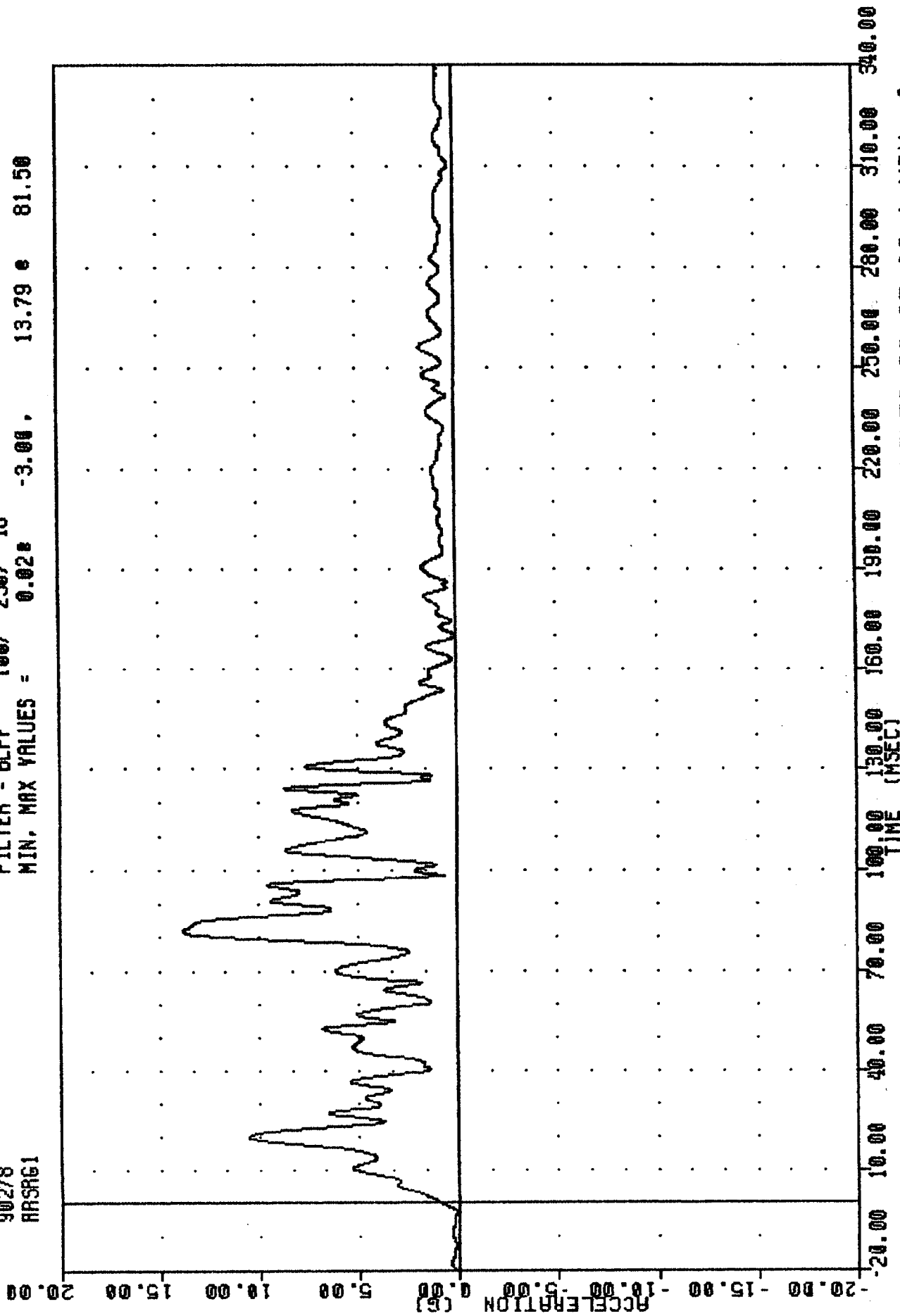
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -12.08 80.75. 1.94 e 68.13



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
RIGHT REAR SILL Y-AXIS ACCELERATION

901005-2 .TRC
CRASH III DAMAGE ALGORITHM
90278
RPSRG1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = 0.028 -3.00 13.79 e 81.50



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
RIGHT REAR SILL RESULTANT ACCELERATION

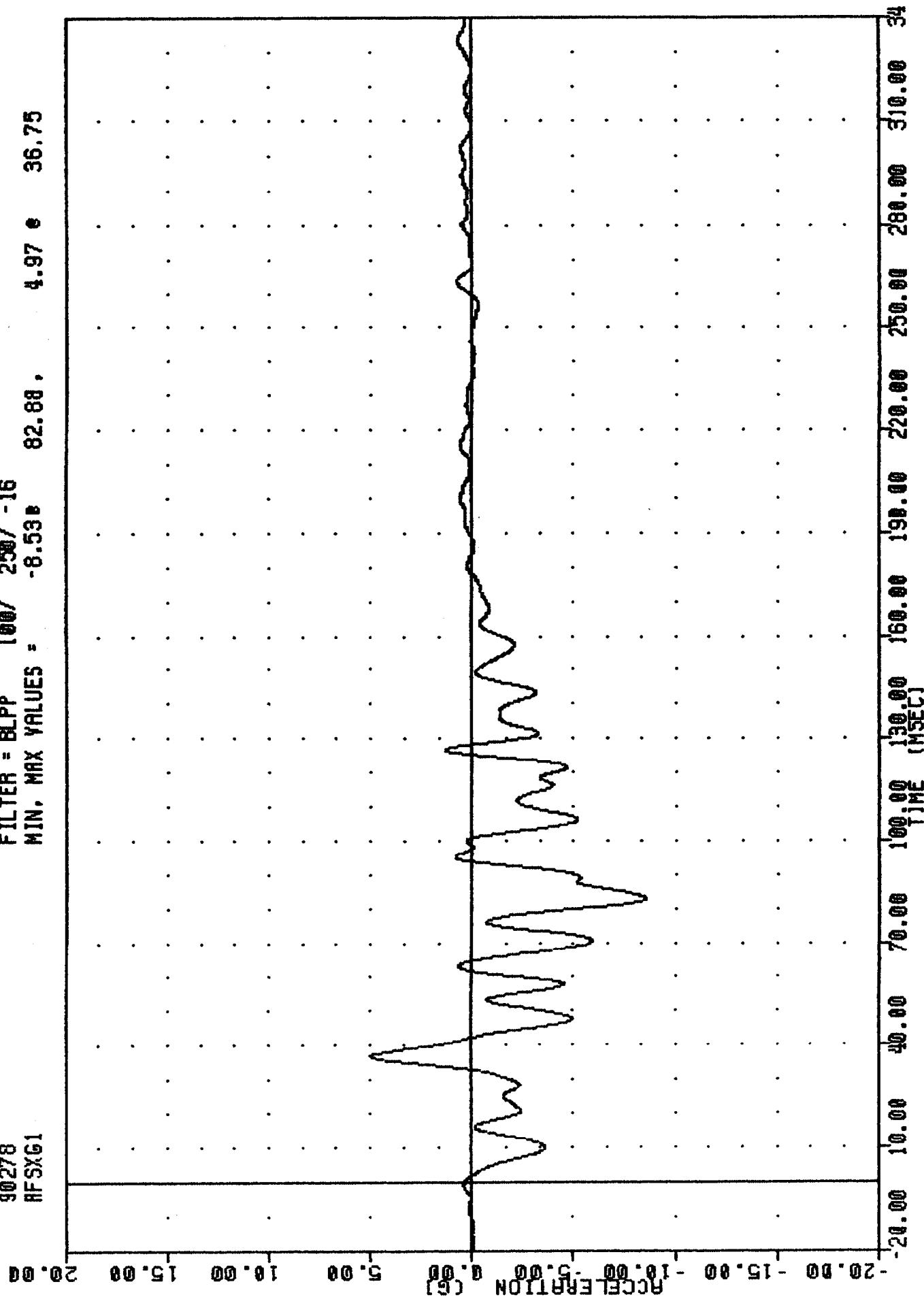
CRASH III DAMAGE ALGORITHM

90278

RFSXG1

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -8.53 82.88, 4.97 36.75

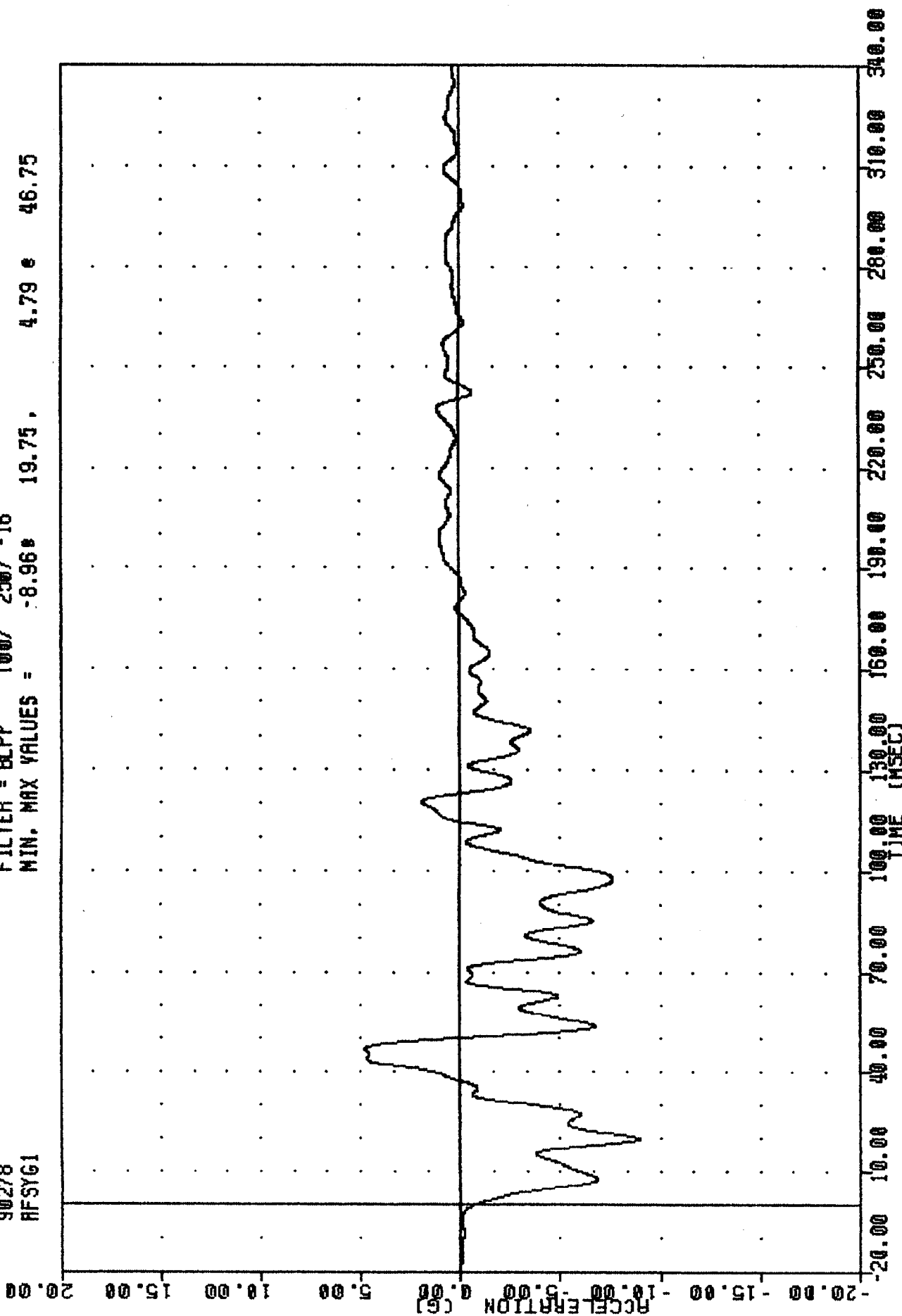


B31

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
RIGHT FRONT SILL X-AXIS ACCELERATION

901005-2 , TRC
CRASH III DAMAGE ALGORITHM
90278
AFSYG1

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -8.96 19.75 4.79 46.75



B32

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
RIGHT FRONT SILL Y-AXIS ACCELERATION

CRASH III DAMAGE ALGORITHM

90278

RF5RG1

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = 0.03 245.00 10.19 84.00

20.00

15.00

10.00

5.00

0.00

-5.00

-10.00

-15.00

-20.00

-20.00

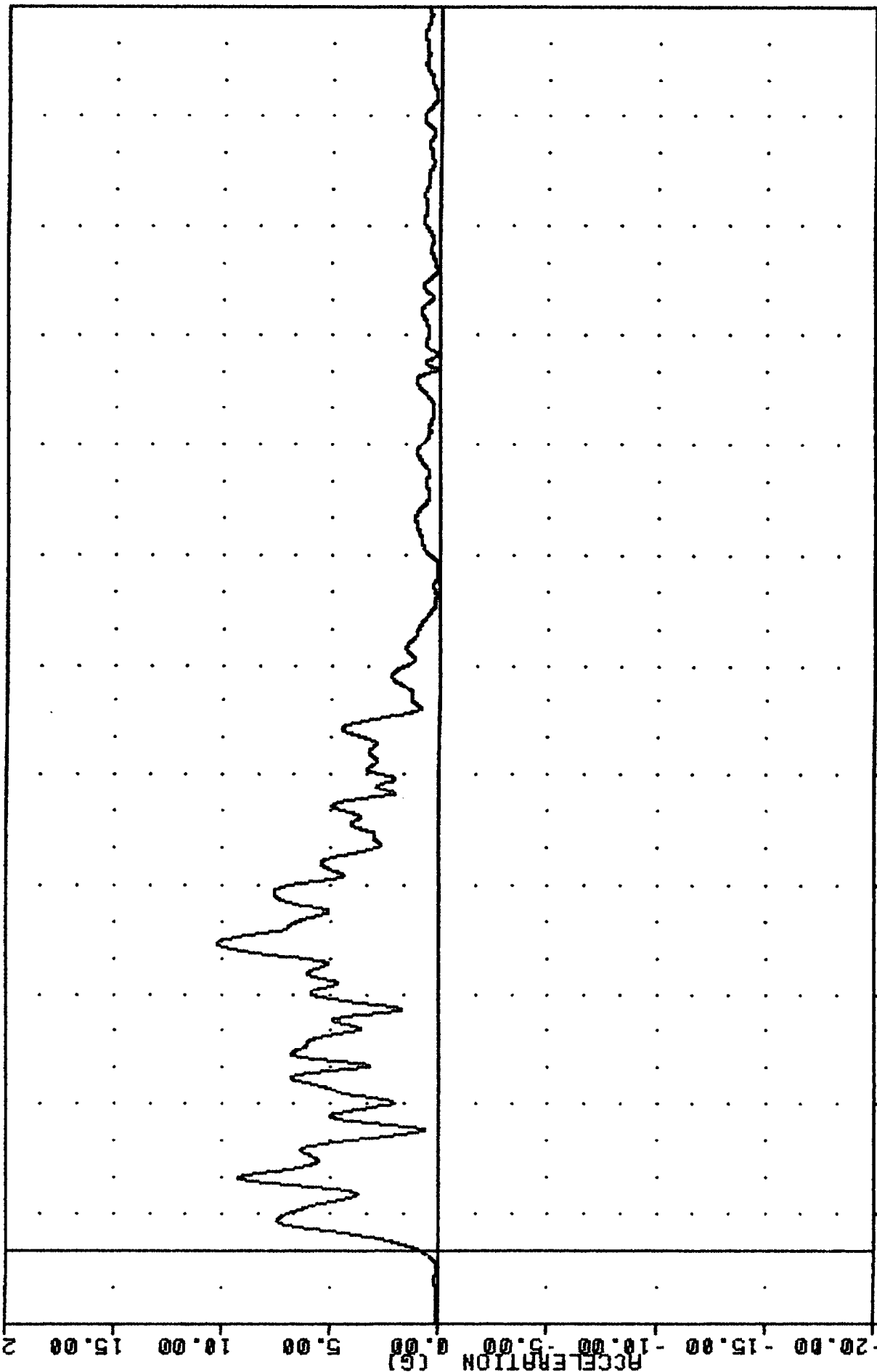
-15.00

-10.00

-5.00

0.00

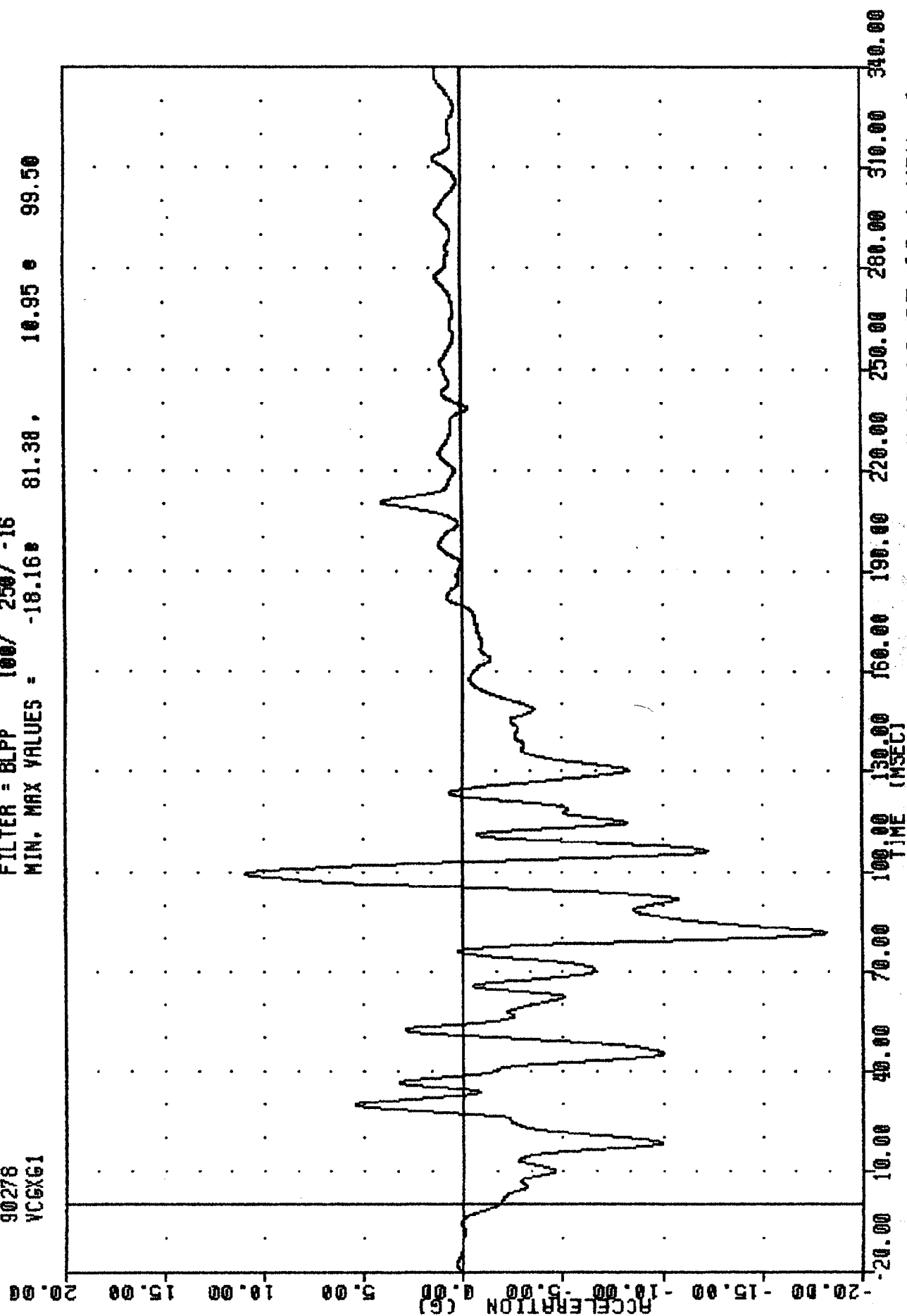
B33



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
RIGHT FRONT SILL RESULTANT ACCELERATION

901005-2 . TAC
 CRASH III DAMAGE ALGORITHM
 90278
 YCGXG1

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -18.16 81.38 10.95 99.50



B34

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 VEHICLE CG X-AXIS ACCELERATION (IMPACT DIRECTION)

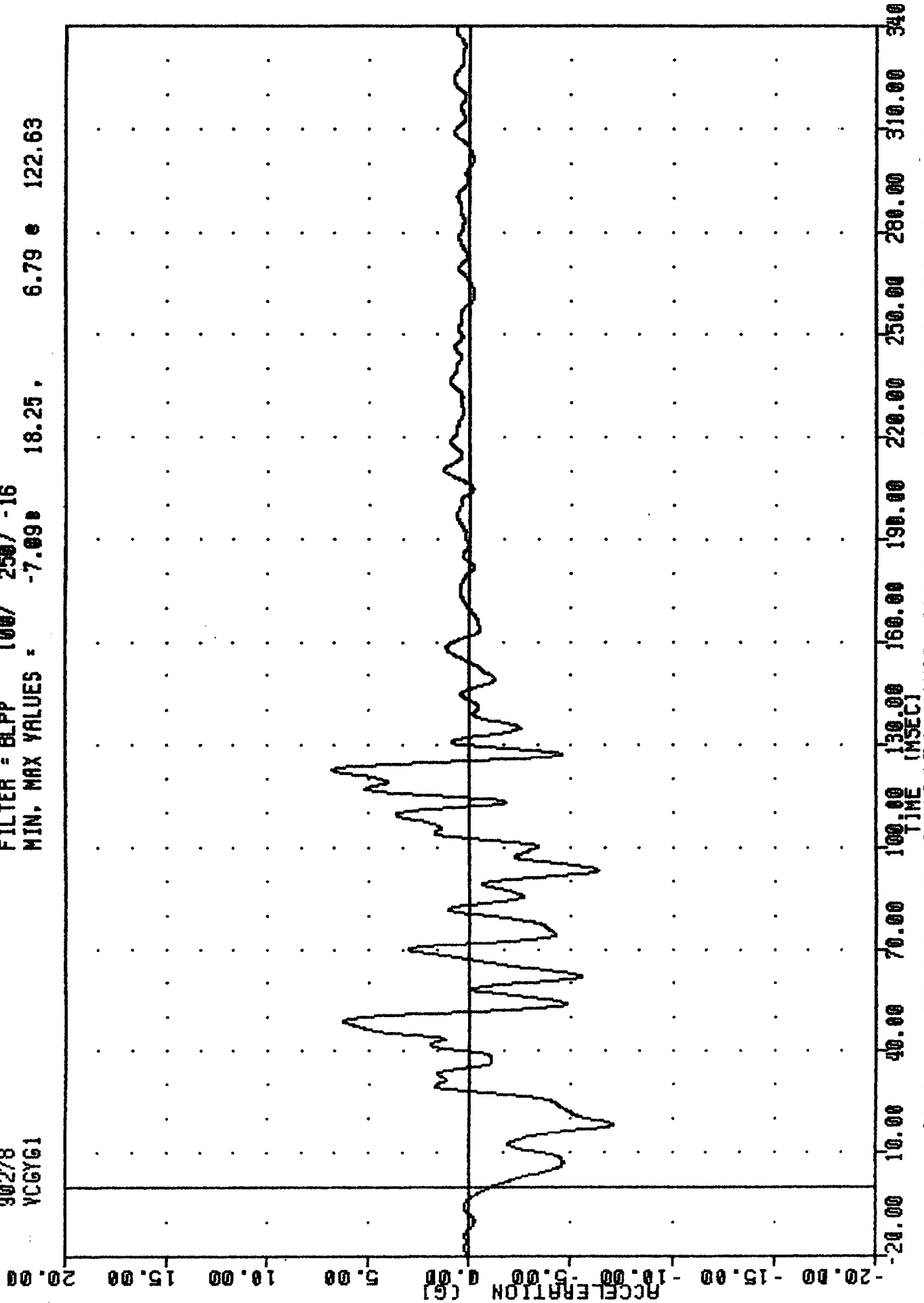
CRASH III DAMAGE ALGORITHM

90278

VCGYG1

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -7.09 18.25 6.79 122.63

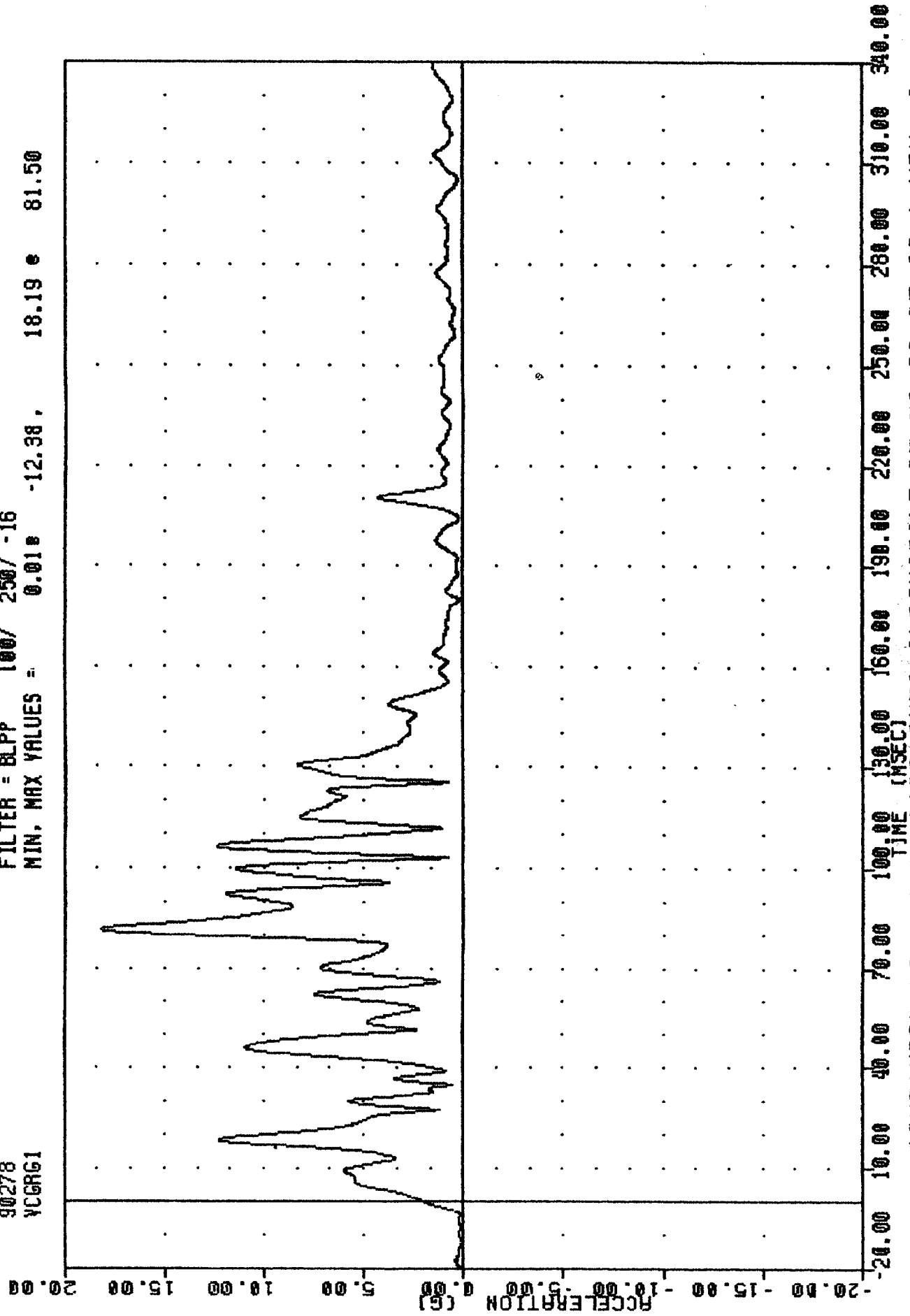


B35

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
VEHICLE CG Y-AXIS ACCELERATION (PERPENDICULAR TO IMPACT DIRECTION)

901005-2 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 YCGRG1

FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = 0.01e -12.38, 18.19 e 81.50



B36

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 , VEHICLE CG RESULTANT ACCELERATION

UNION 111 WARRIOR ALUMINUM

90278

BCXG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -8.65 92.00, 0.28 220.00

20.00

15.00

10.00

5.00

0.00

-5.00

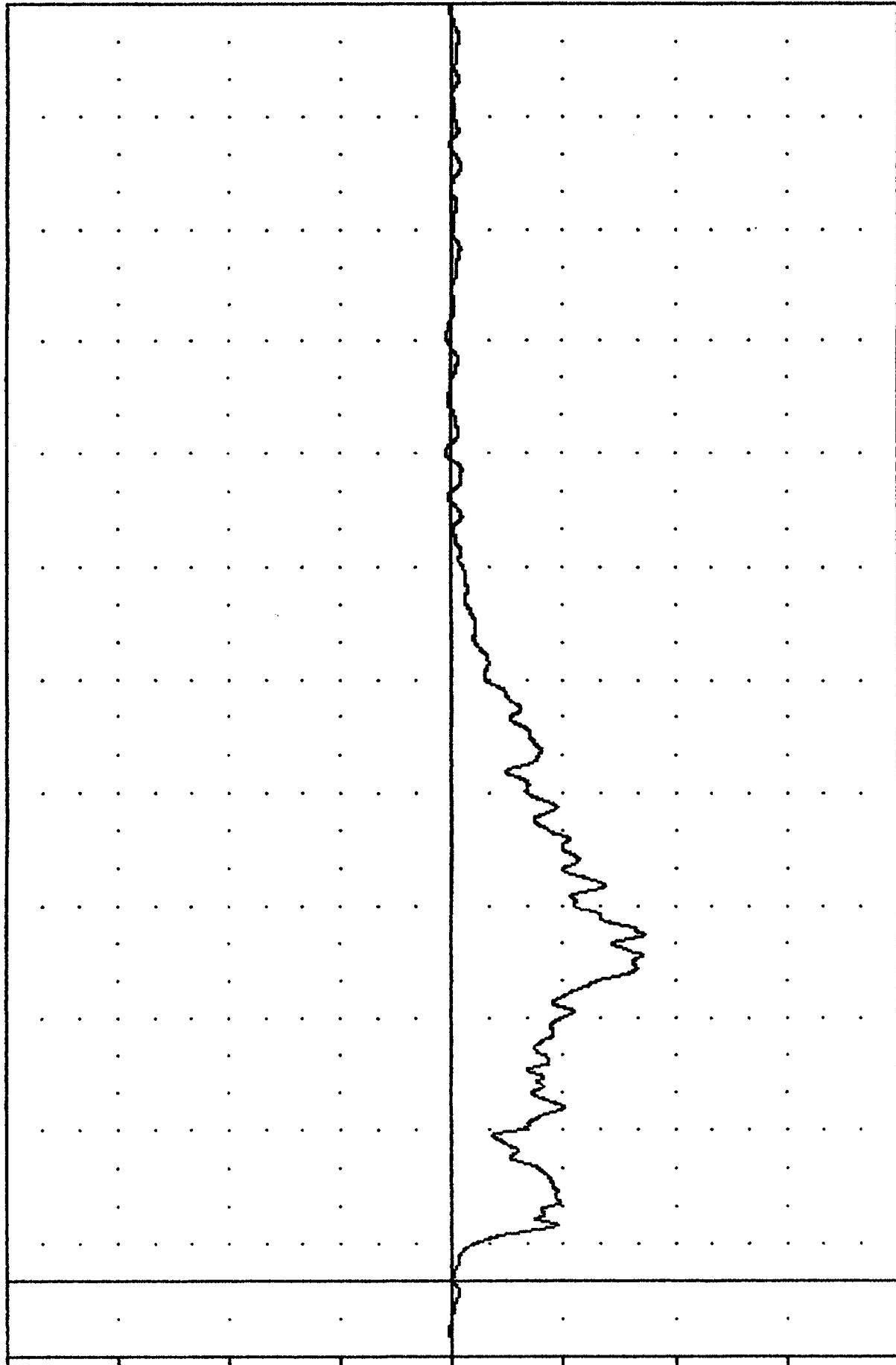
-10.00

-15.00

-20.00

B37

ACCELERATION (G)

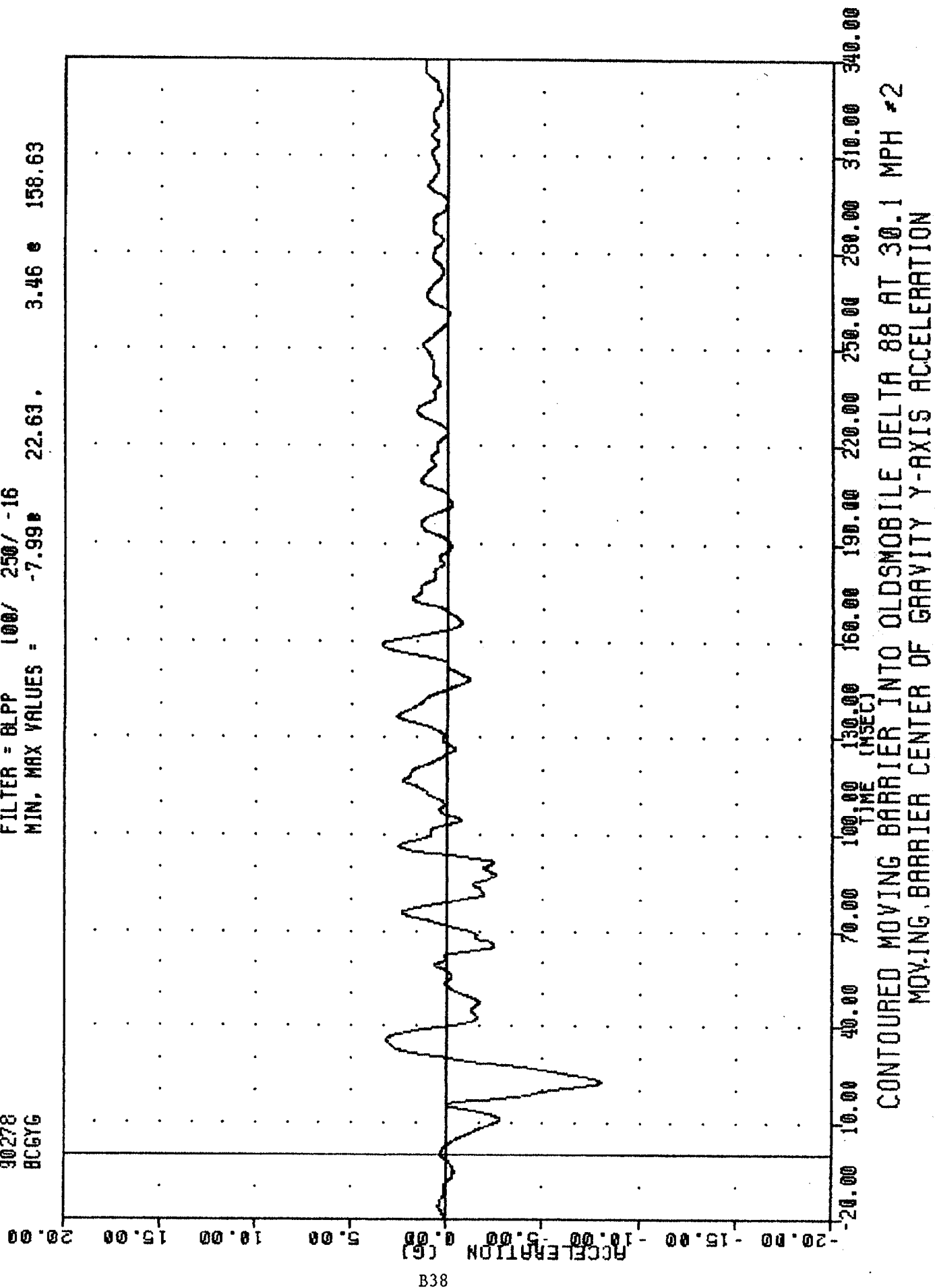


-20.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
MOVING BARRIER CENTER OF GRAVITY X-AXIS ACCELERATION

301005-2 , TRC
 CRASH III DAMAGE ALGORITHM
 30278
 BCGYG

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -7.99 22.63 3.46 e 158.63



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 MOVING BARRIER CENTER OF GRAVITY Y-AXIS ACCELERATION

UNION 111 UNINAME PL000111M

90278

BCGRG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = 0.028 -8.88 , 9.22 22.63

20.00

15.00

10.00

5.00

0.00

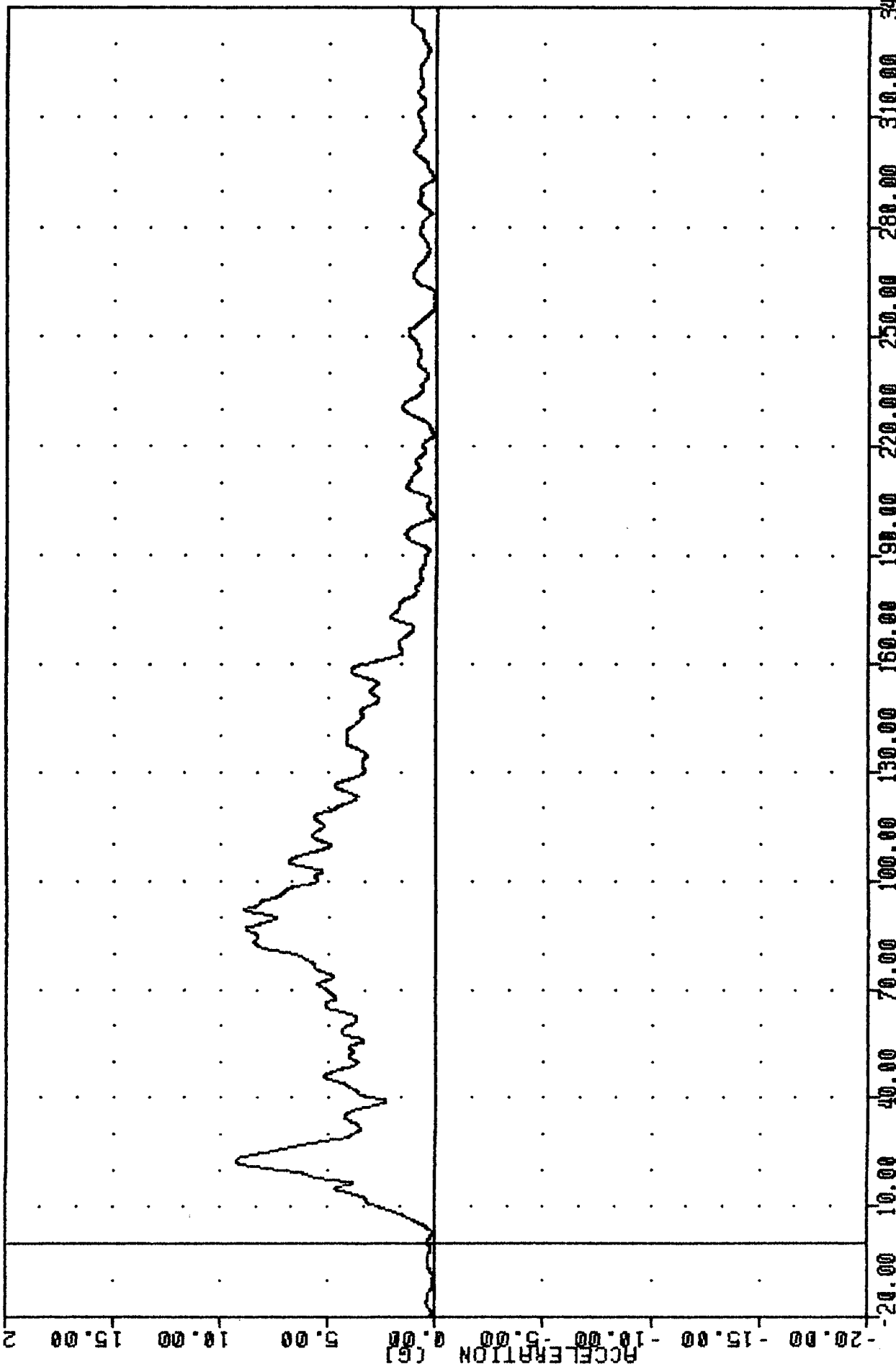
-5.00

-10.00

-15.00

-20.00

B39

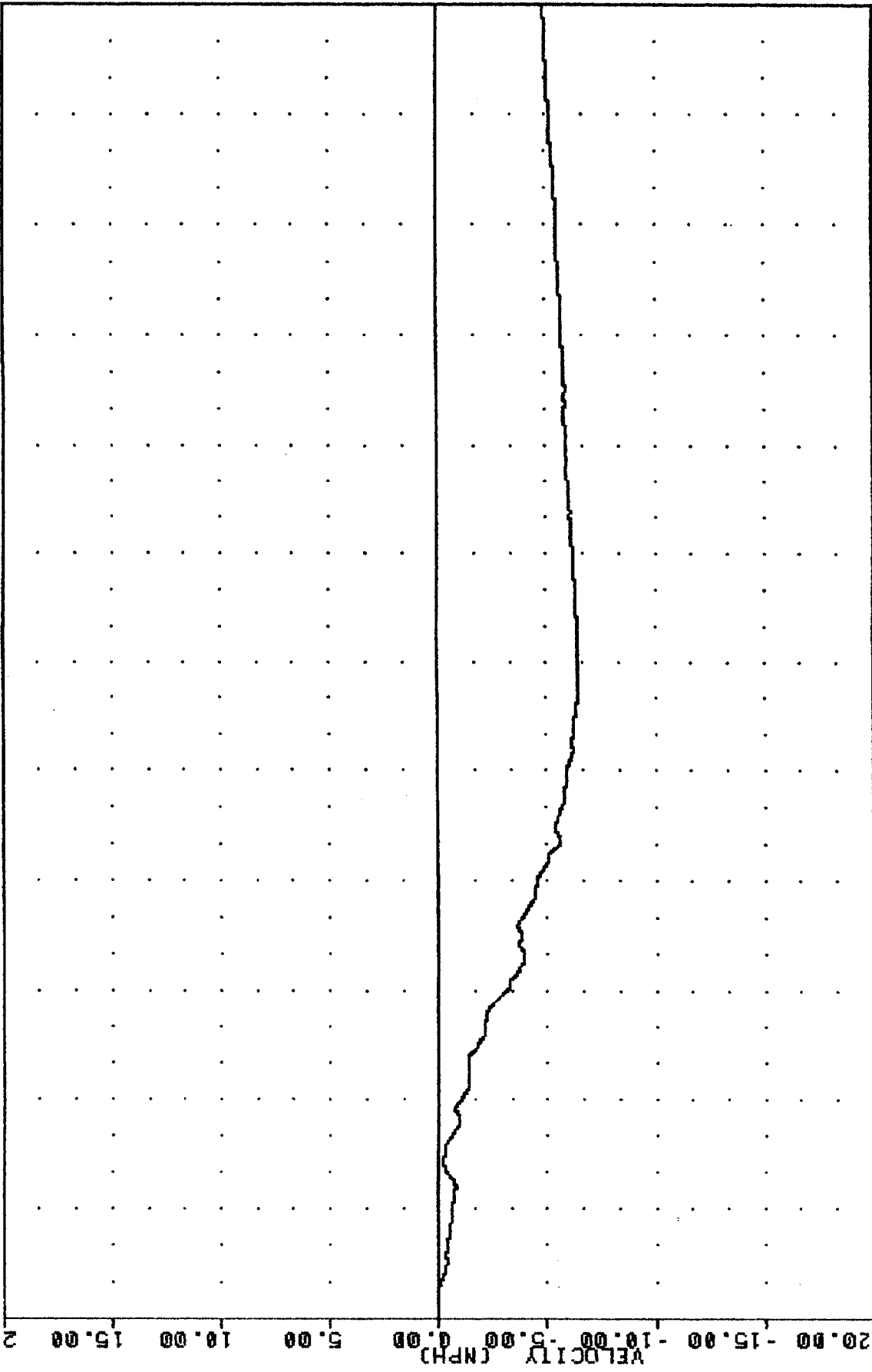


CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
MOVING BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION

901005-2 , TAC
 CRASH III DAMAGE ALGORITHM
 90278
 RRSXV1

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -6.46 170.50 0.04 6.00

20.00



B40

0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 RIGHT REAR SILL X-AXIS VELOCITY

LMHSH 111 UNMAGE PLGWH111MR

90278

RRSYV1

FILTER = BLPP 300/ 750/ -16

MIN, MAX VALUES = -12.54 0.00 0.00 0.00

20.00

15.00

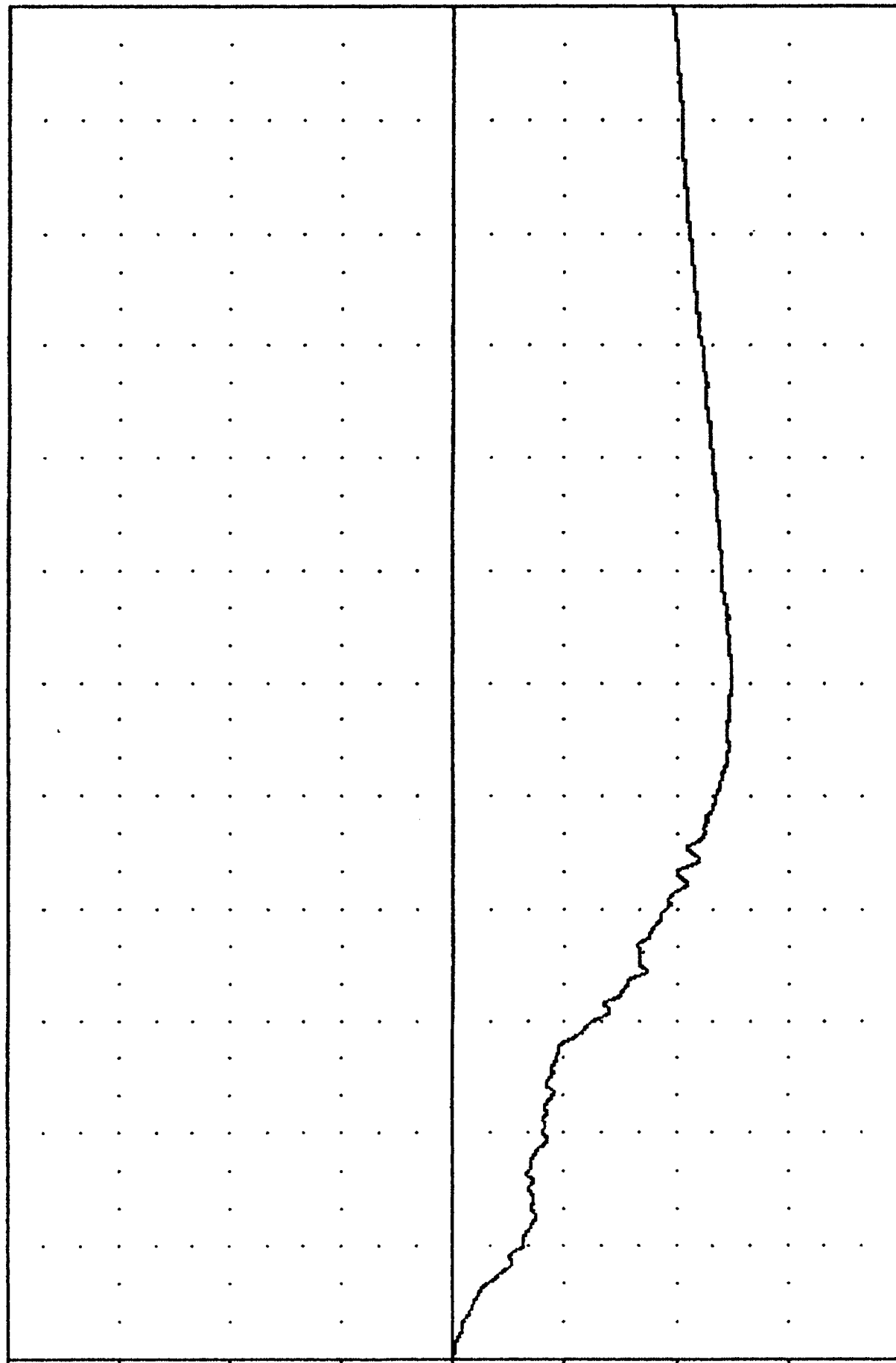
10.00

5.00

0.00

VELOCITY (MPH)

B41



0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

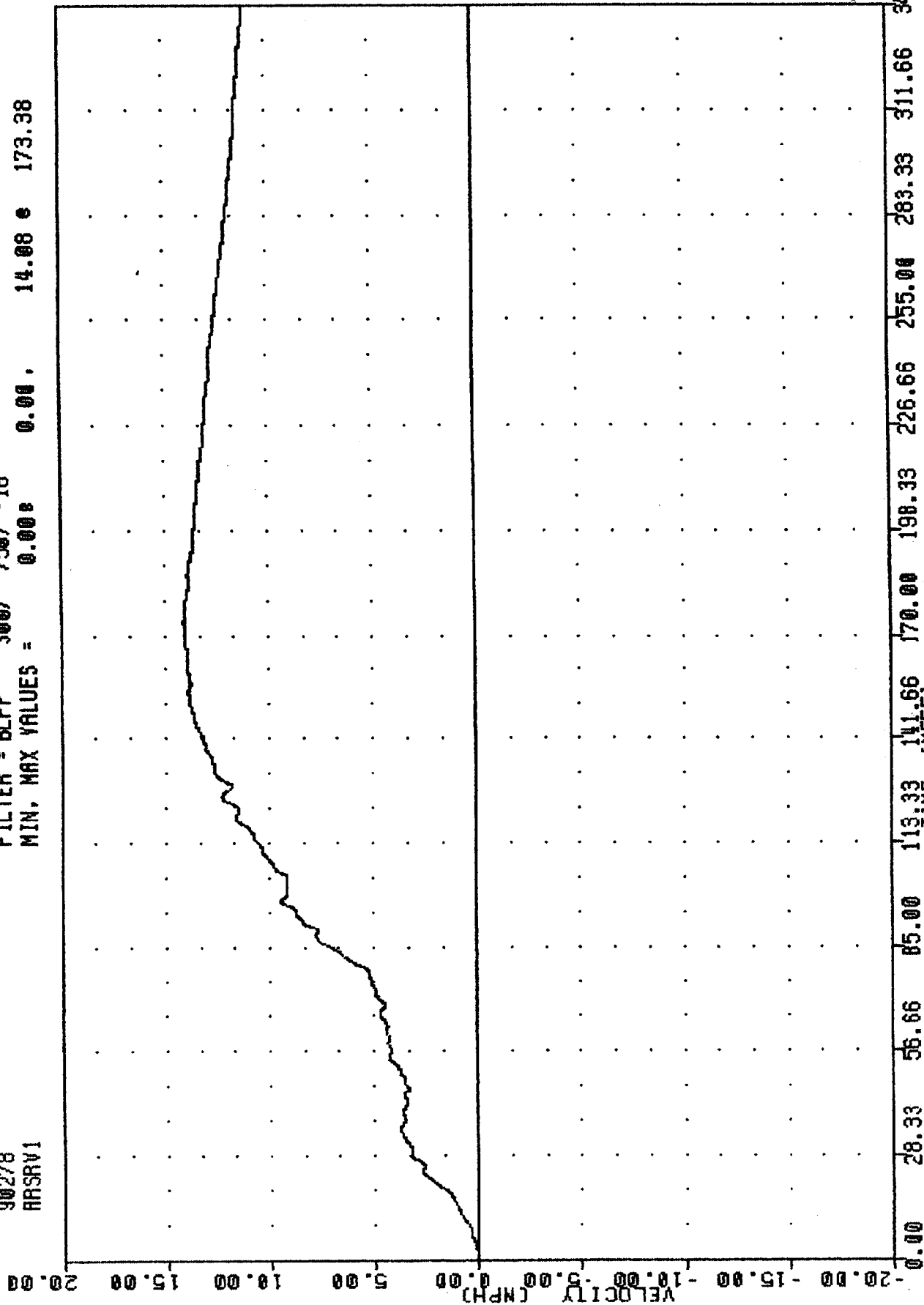
TIME (MSEC)

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2

RIGHT REAR SILL Y-AXIS VELOCITY

901005-2 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 ARSRV1

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = 0.00 14.00 173.38



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 , RIGHT REAR SILL RESULTANT VELOCITY

UNION III DAMAGE MEASUREMENT

90278

RFSXV1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -7.66 177.88,

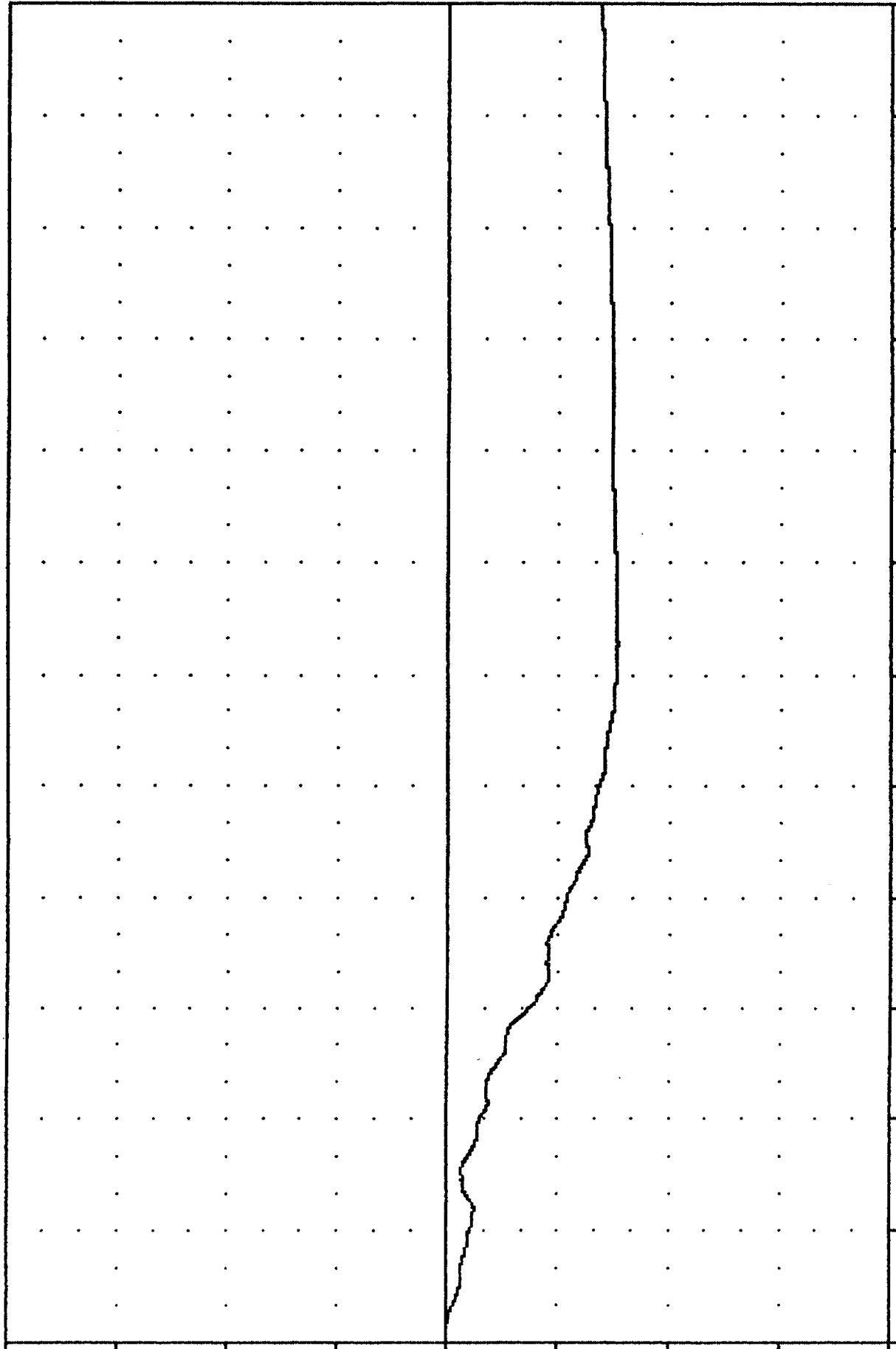
0.01 e

1.88

B43

20.00 15.00 10.00 5.00 0.00 -5.00 -10.00 -15.00 -20.00

VELOCITY (MPH)

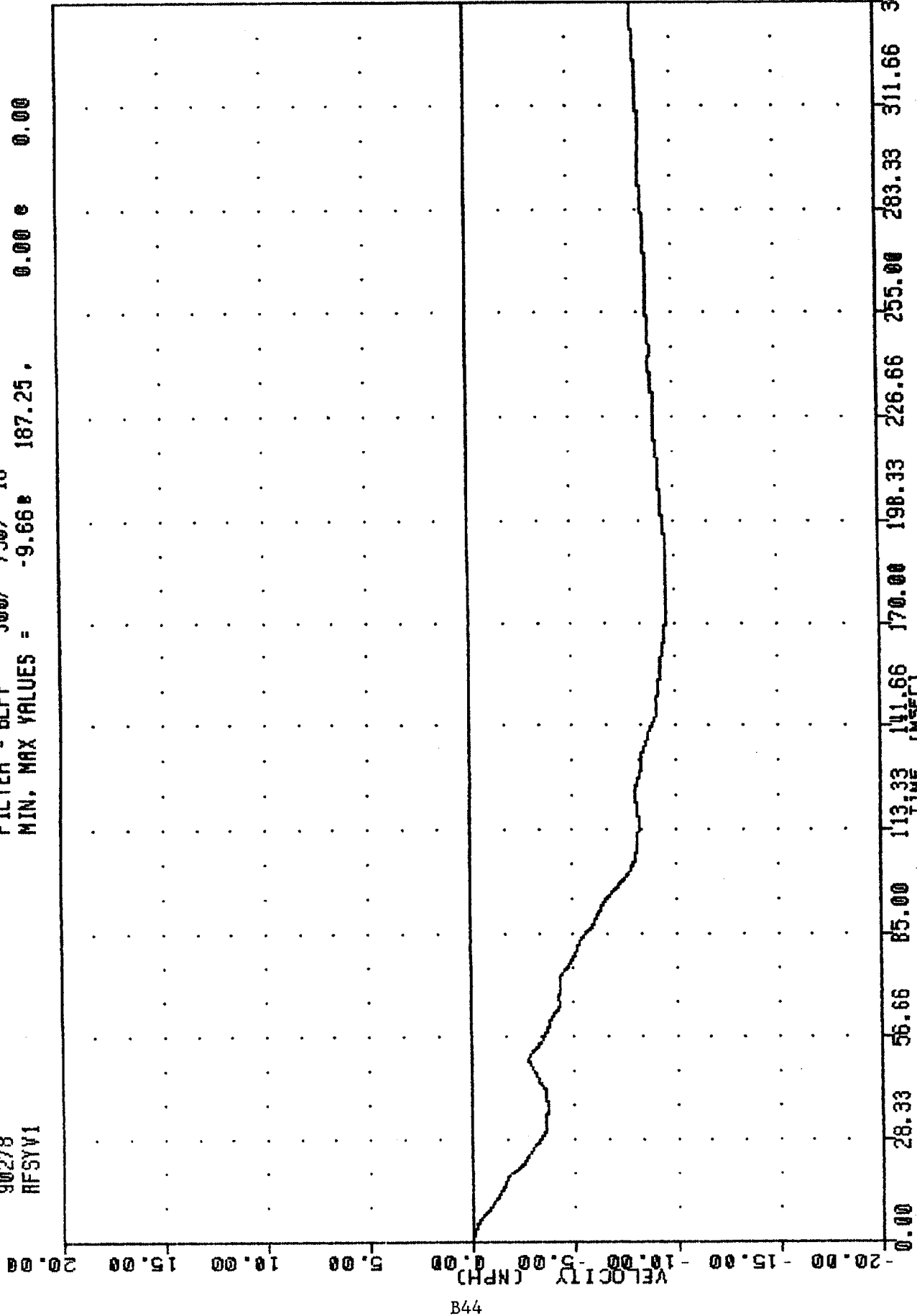


0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00
TIME (MSEC)

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
RIGHT FRONT SILL X-AXIS VELOCITY

901005-2 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 RFSYV1

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -9.66 187.25 0.00 0.00



B44

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 , RIGHT FRONT SILL Y-AXIS VELOCITY.

CRASH III DAMAGE ALGORITHM

90278

RFSRV1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = 0.00 0.00, 12.32 187.63

20.00

15.00

10.00

5.00

0.00

B45

VELOCITY (MPH)

-20.00

-15.00

-10.00

-5.00

0.00

5.00

10.00

15.00

20.00

0.00 28.33 56.66 85.00 113.33 141.66 170.00 198.33 226.66 255.00 283.33 311.66 340.00

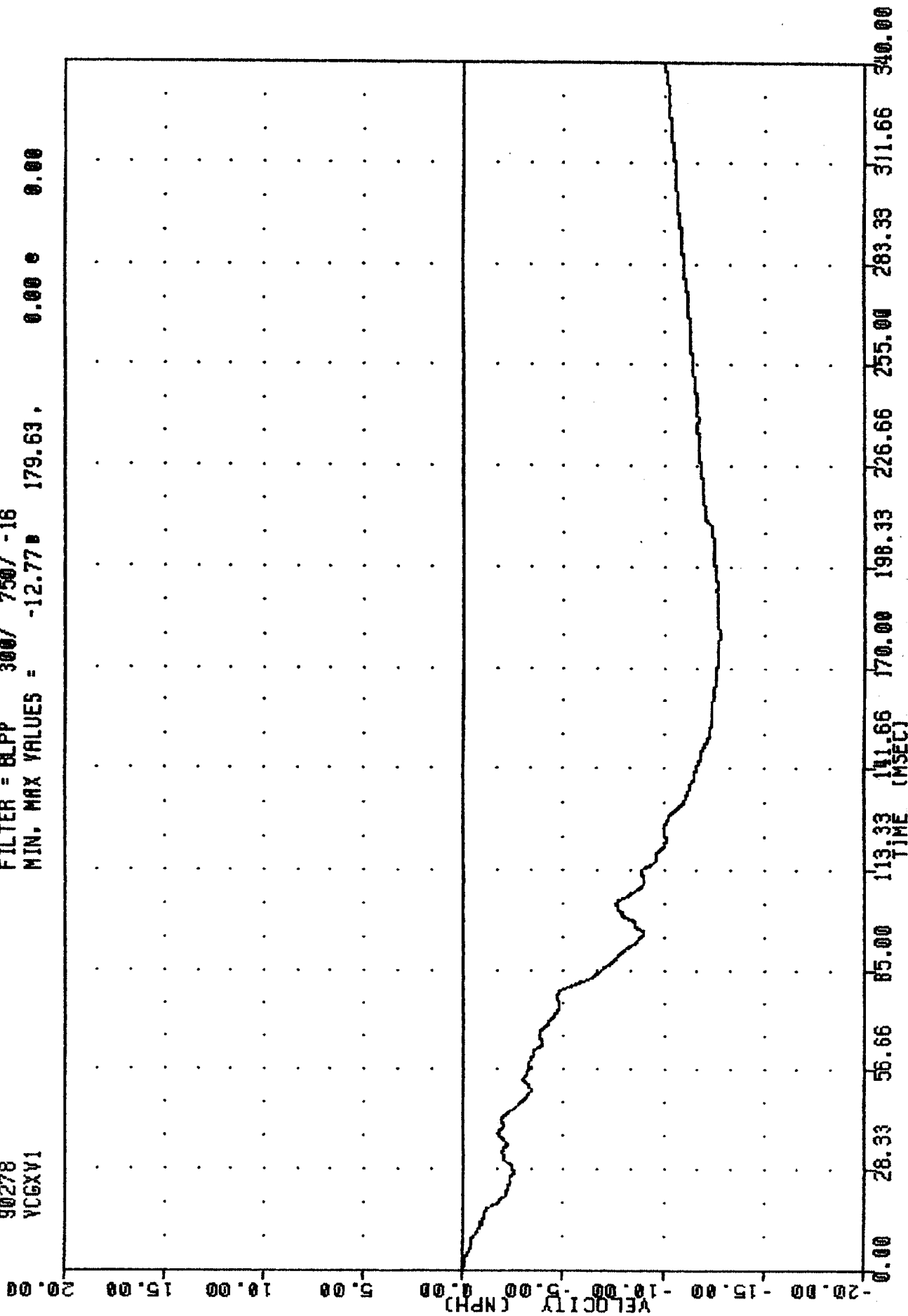
TIME (MSEC)

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2

RIGHT FRONT SILL RESULTANT VELOCITY

901005-2 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 YCGXV1

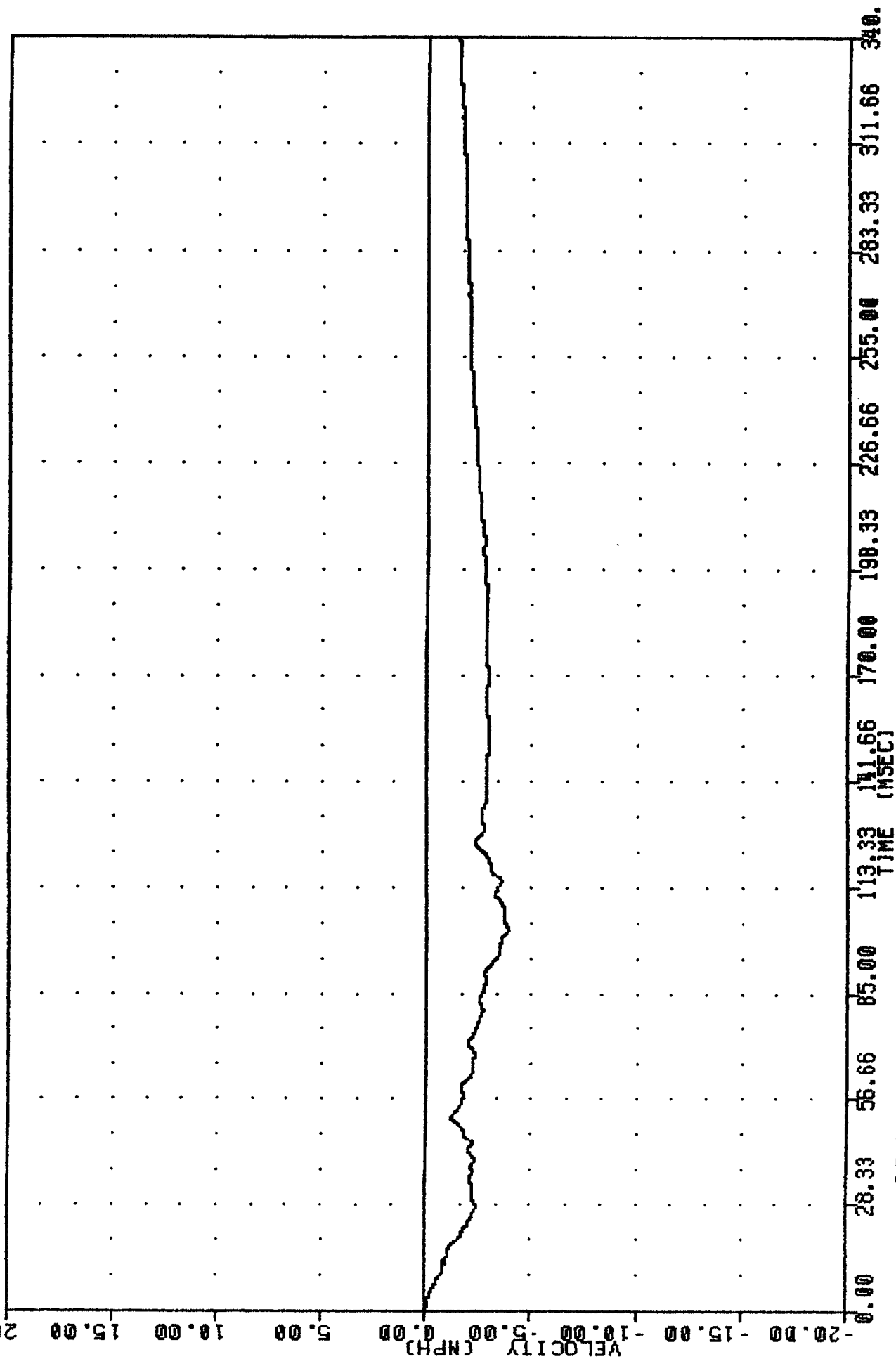
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -12.77 179.63 0.00 0.00



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 VEHICLE CG X-AXIS VELOCITY (IMPACT DIRECTION)

90278 YCGYV1

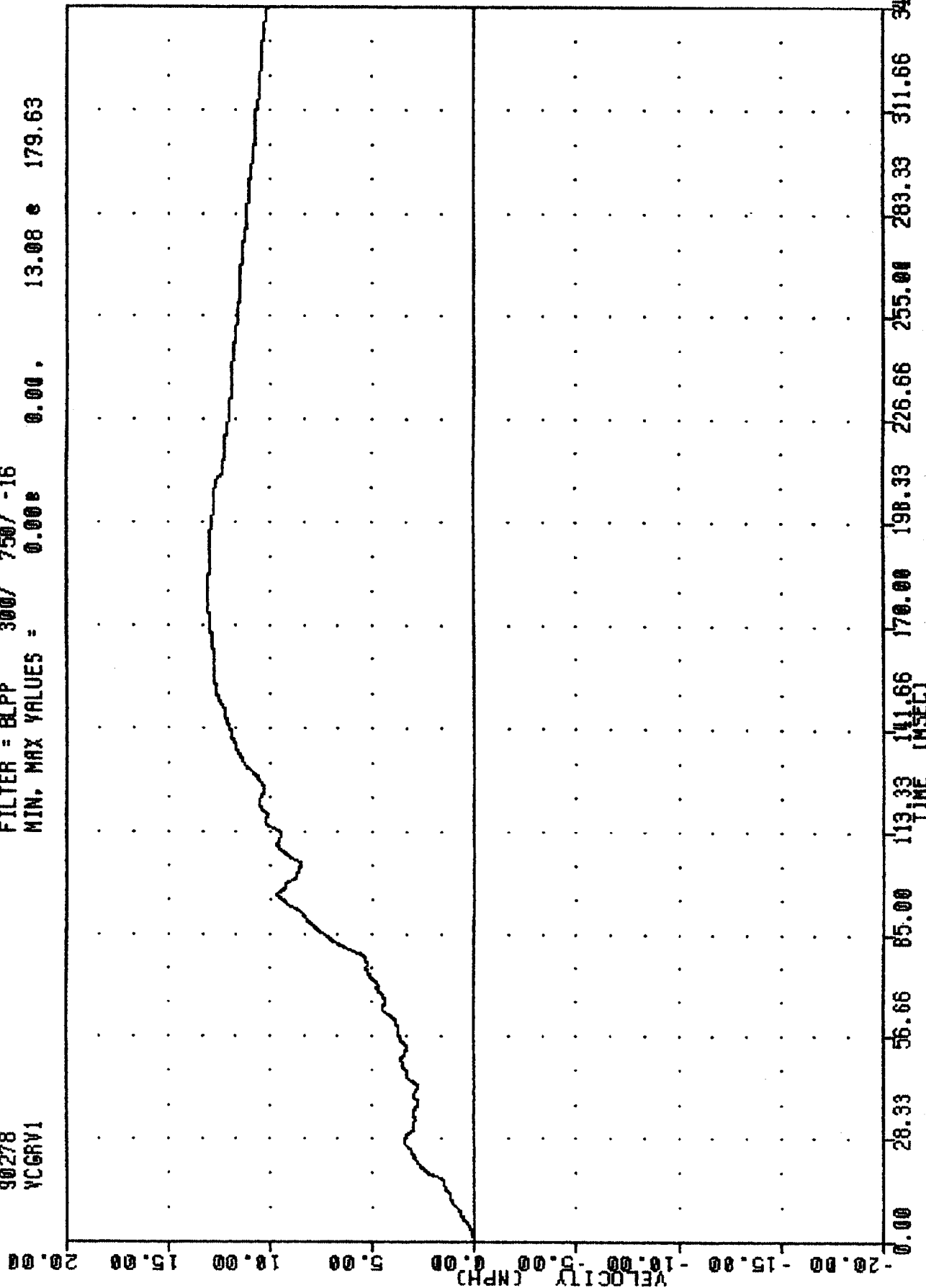
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -3.87 102.00 0.00 0.00



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
VEHICLE CG Y-AXIS VELOCITY (PERPENDICULAR TO IMPACT DIRECTION)

901005-2 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 YCGRY1

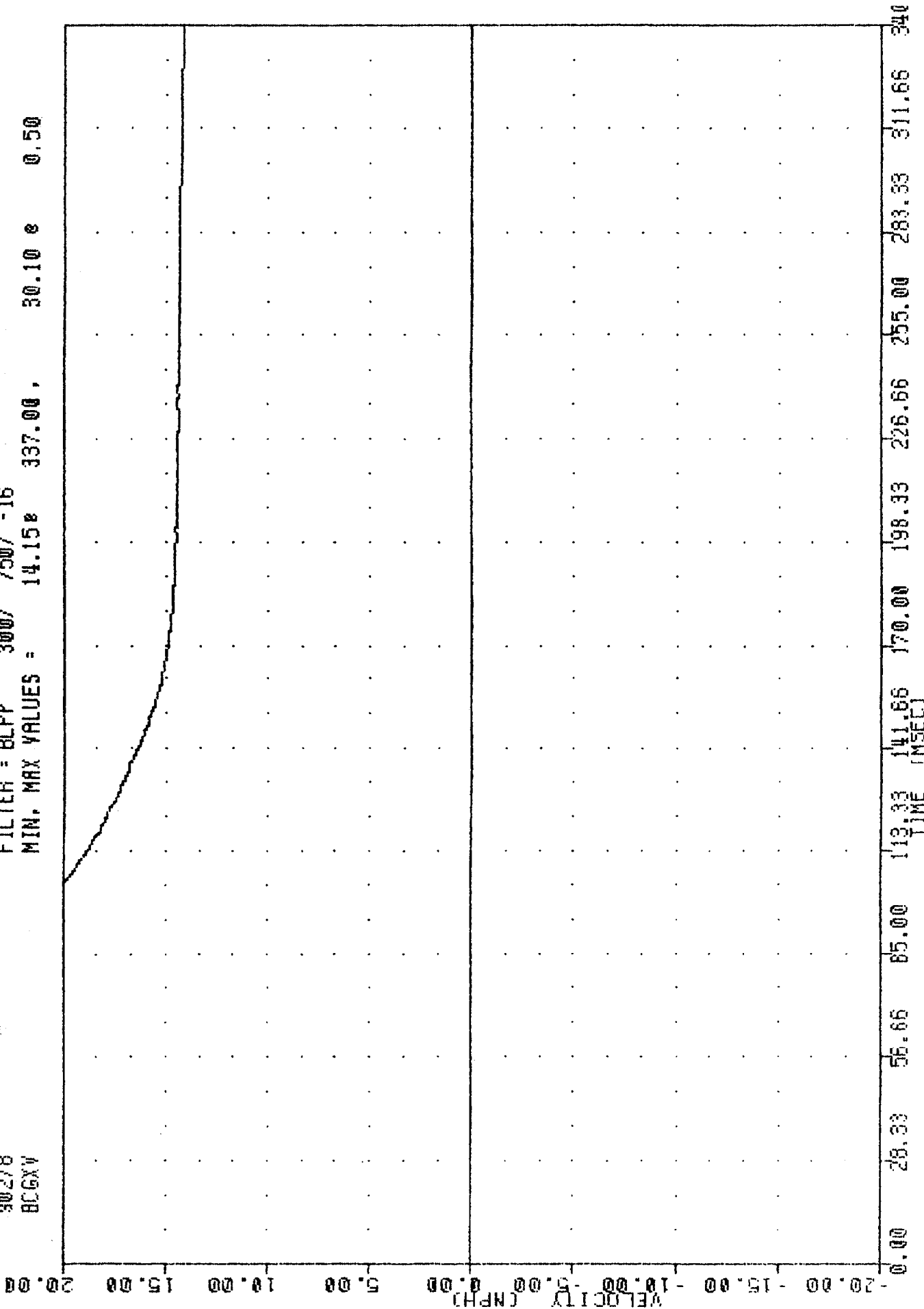
FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = 0.00 13.08 e 179.63



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 VEHICLE CG RESULTANT VELOCITY

30278
BCGXV

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = 14.15 337.00 , 30.10 0.50



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
MOVING BARRIER CENTER OF GRAVITY X-AXIS VELOCITY

901005-2 , TRC
 CRASH III DAMAGE ALGORITHM
 90278
 BCGYV

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -2.29e 94.00 . 1.66 e 340.00

20.00

15.00

10.00

5.00

0.00

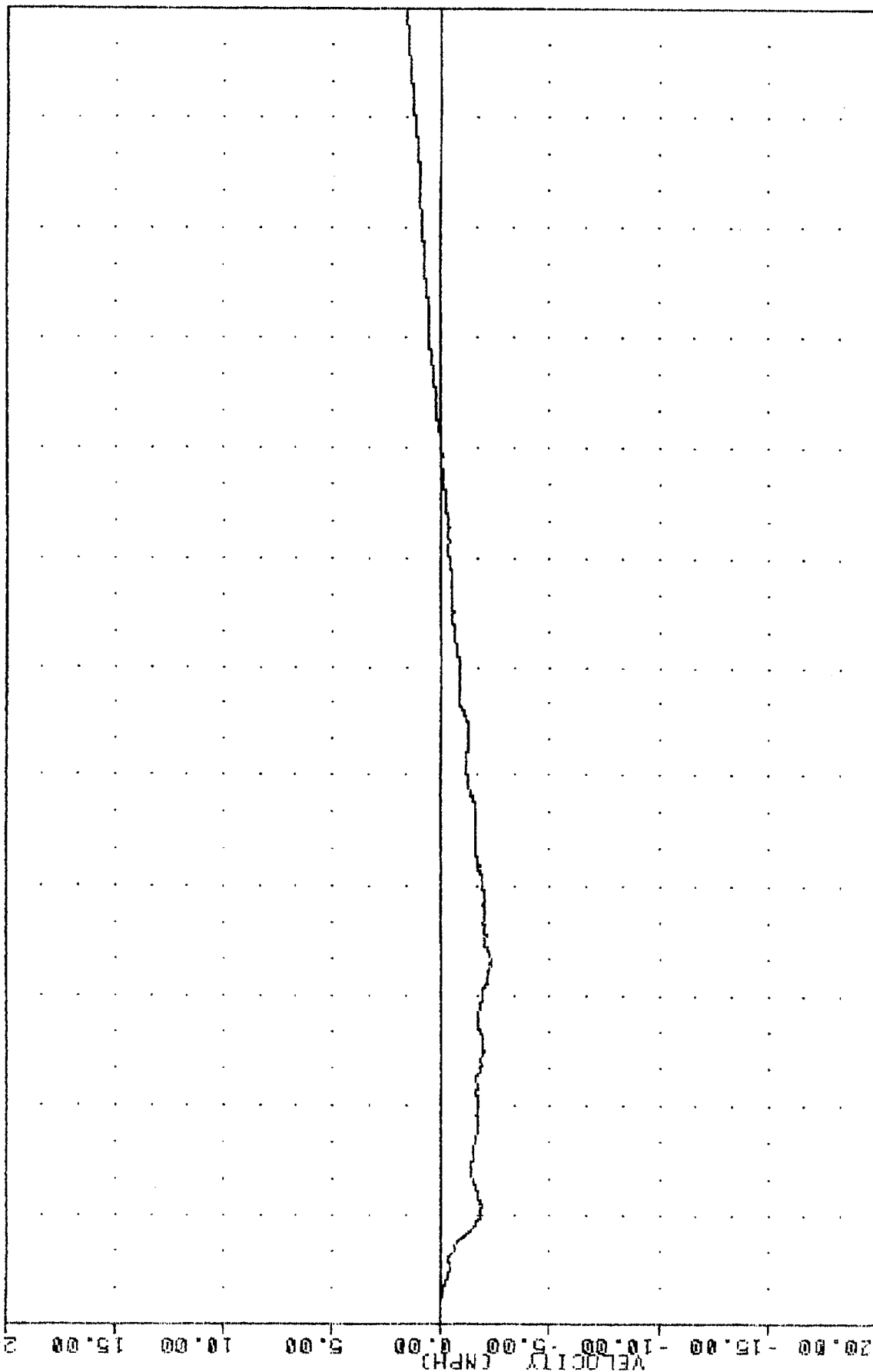
-5.00

-10.00

-15.00

-20.00

B50



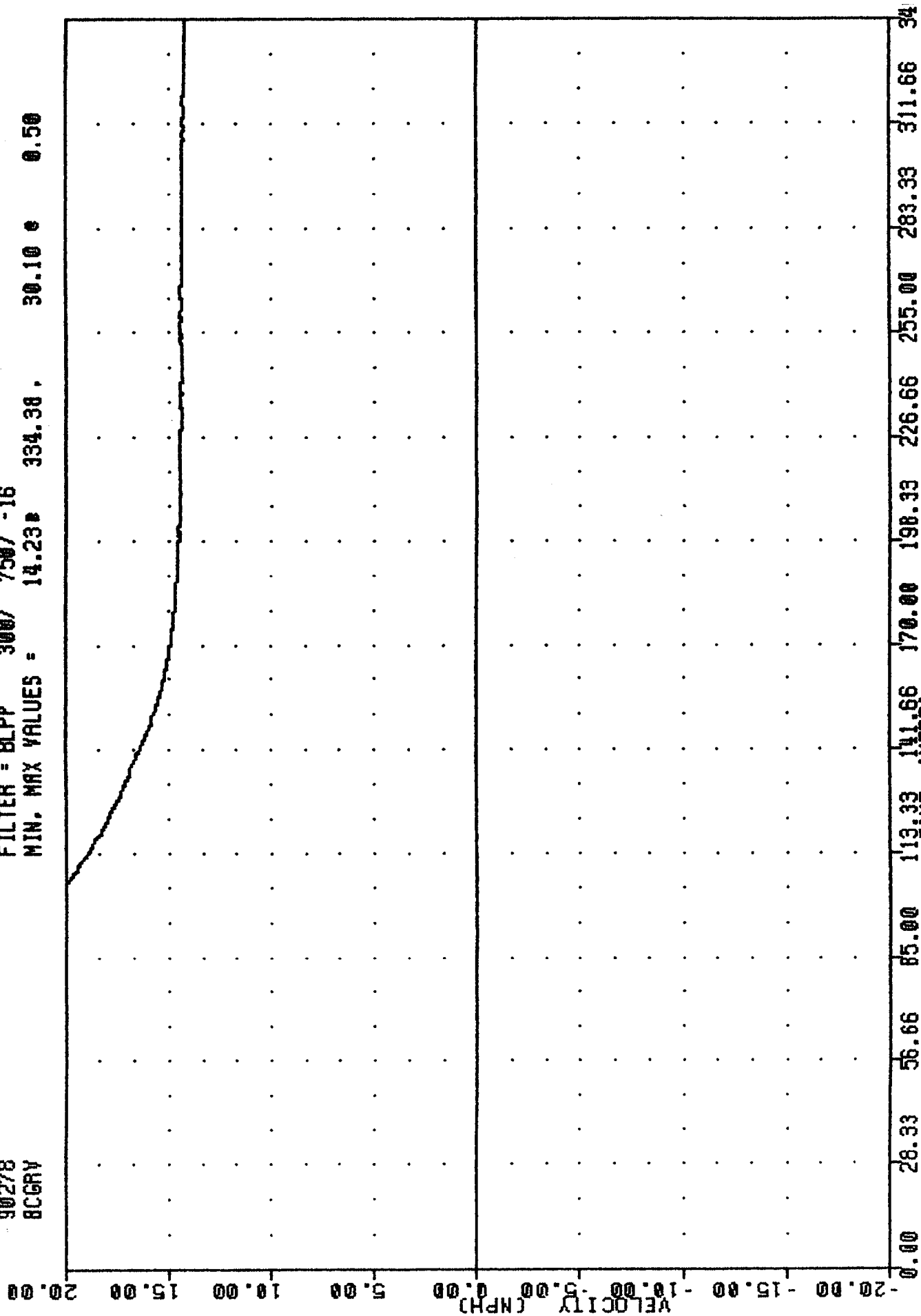
0.00 25.33 50.66 75.99 101.32 126.65 151.98 177.31 202.64 227.97 253.30 278.63 303.96 329.29 354.62

CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
 MOVING BARRIER CENTER OF GRAVITY Y-AXIS VELOCITY

CRASH III DAMAGE ALGORITHM

90278
BCGRY

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = 14.23 334.38 30.10 0.50



CONTOURED MOVING BARRIER INTO OLDSMOBILE DELTA 88 AT 30.1 MPH #2
MOVING BARRIER CENTER OF GRAVITY RESULTANT VELOCITY

APPENDIX C

MISCELLANEOUS TEST INFORMATION

VEHICLE ACCELEROMETER INFORMATION

NO.	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
1	RIGHT REAR SILL	X	ENDEVCO	7264	CK09H	REAR
	RIGHT REAR SILL	Y	ENDEVCO	7264	BP34J	LEFT
2	RIGHT FRONT SILL	X	ENDEVCO	7264	CF11H	REAR
	RIGHT FRONT SILL	Y	ENDEVCO	7264	CB25H	LEFT
3	VEHICLE CENTER/GRAVITY	IMPACT DIRECTION	7264	CJ34H		FORWARD
	VEHICLE CENTER/GRAVITY	PERPENDICULAR TO				
		IMPACT DIRECTION	7264	CL73H		LEFT

MOVING BARRIER ACCELEROMETER INFORMATION

NO.	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
1	MOVING BARRIER					
	CENTER OF GRAVITY	X	ENDEVCO	7264	CF93H	FORWARD
	MOVING BARRIER					
	CENTER OF GRAVITY	Y	ENDEVCO	7264	CJ04H	LEFT

SIGN CONVENTION

ALL DUMMY, BARRIER AND VEHICLE CHANNELS:

+X: FORWARD
+Y: LEFTWARD
+Z: UPWARD
+FORCE: TENSION