

V Ø 753

BREED AIR BAG PROGRAM

1979 FORD LTD BUMPER TEST AT 4.5 MPH AND
CRASH TEST INTO A FIXED BARRIER AT 30.0 MPH

PREPARED BY:
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FINAL REPORT
JULY 1984

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
400 SEVENTH STREET, S.W.
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16. Abstract This test report documents a crash test conducted under NHTSA Contract DTNH22-82-A-08401 involving a 1979 Ford LTD 4-door sedan retrofitted with a Breed air bag and a knee bolster. The test vehicle underwent a 4.5 mph bumper test on June 25, 1984 at an ambient temperature of 78°F. The vehicle was then impacted into a fixed, non-yielding barrier at 30 mph on June 26, 1984 at an ambient temperature of 81°F. Vehicle accelerations and air bag sensors were measured for the bumper test. For the barrier crash, vehicle accelerations, air bag sensors and occupant responses were measured. All testing was conducted at the TRCO Crash Test Facility in East Liberty, Ohio.					
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol When You Know Multiply by To Find Symbol

LENGTH

in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km

AREA

in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha

MASS (weight)

oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons	0.9	metric ton	t
	(2000 lb)			

VOLUME

tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
in ³	cubic inches	16	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³

TEMPERATURE (exact)

°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C
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Approximate Conversions from Metric Measures

Symbol When You Know Multiply by To Find Symbol

LENGTH

mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi

AREA

cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares	2.5	acres	
	(10 000 m ²)			

MASS (weight)

g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton	1.1	short tons	
	(1000 kg)			

VOLUME

ml	milliliters	0.03	fluid ounces	fl oz
ml	milliliters	0.06	cubic inches	in ³
l	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³

TEMPERATURE (exact)

°C	degrees Celsius	9/5 (then degrees add 32)	degrees Fahrenheit	°F
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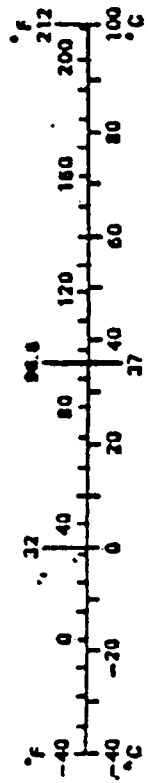


TABLE OF CONTENTS

	<u>Page</u>
1.0 PURPOSE AND INTRODUCTION	1-1
2.0 GENERAL TEST AND VEHICLE PARAMETER DATA	2-1
3.0 DATA REQUIRED BY R&D	3-1
APPENDIX A PHOTOGRAPHS - TEST 840625	A-1
APPENDIX B PHOTOGRAPHS - TEST 840626	B-1
APPENDIX C DATA PLOT PRESENTATION - TEST 840625	C-1
APPENDIX D DATA PLOT PRESENTATION - TEST 840626	D-1
APPENDIX E DUMMY CERTIFICATION	E-1

LIST OF PHOTOGRAPHS

<u>Figure</u>	<u>Page</u>
A-1. PRE-TEST DRIVER SIDE VIEW	A-2
A-2. PRE-TEST PASSENGER SIDE VIEW	A-2
A-3. POST-TEST DRIVER SIDE VIEW	A-3
A-4. POST-TEST PASSENGER SIDE VIEW	A-3
A-5. POST-TEST CLOSE-UP	A-4
B-1. PRE-TEST DRIVER SIDE VIEW	B-2
B-2. PRE-TEST REAR VIEW	B-2
B-3. PRE-TEST PASSENGER SIDE VIEW	B-3
B-4. PRE-TEST DRIVER SIDE CLOSE-UP	B-3
B-5. PRE-TEST PASSENGER SIDE CLOSE-UP	B-4
B-6. PRE-TEST DUMMY - VIEW 1	B-4
B-7. PRE-TEST DUMMY - VIEW 2	B-5
B-8. PRE-TEST DUMMY - VIEW 3	B-5
B-9. PRE-TEST DUMMY - VIEW 4	B-6
B-10. PRE-TEST DUMMY - VIEW 5	B-6
B-11. PRE-TEST DUMMY - VIEW 6	B-7
B-12. POST-TEST DRIVER SIDE VIEW	B-7
B-13. POST-TEST REAR VIEW	B-8
B-14. POST-TEST PASSENGER SIDE VIEW	B-8
B-15. POST-TEST DUMMY - VIEW 1	B-9
B-16. POST-TEST DUMMY - VIEW 2	B-9
B-17. POST-TEST DUMMY - VIEW 3	B-10
B-18. POST-TEST DUMMY - VIEW 4	B-10

LIST OF PHOTOGRAPHS CONTD

<u>Figure</u>	<u>Page</u>
B-19. POST-TEST STEERING COLUMN - VIEW 1	B-11
B-20. POST-TEST STEERING COLUMN - VIEW 2	B-11
B-21. POST-TEST STEERING COLUMN - VIEW 3	B-12
B-22. POST-TEST KNEE BOLSTER - VIEW 1	B-12
B-23. POST-TEST KNEE BOLSTER - VIEW 2	B-13
B-24. WINDSHIELD DAMAGE	B-13

SECTION 1.0
PURPOSE AND INTRODUCTION

PURPOSE

The purpose of this crash test was to demonstrate the effectiveness of the Breed All Mechanical Air Bag System and knee restraint when retrofitted in an otherwise unmodified vehicle. The vehicle was tested using conditions in excess of those currently contained in a Federal Motor Vehicle Safety Standard.

INTRODUCTION

A 1979 Ford LTD 4-door Sedan which was supplied by NHTSA underwent a 4.5 mph bumper test on June 25, 1984 and then was towed into a fixed, rigid barrier at 30 mph on June 26, 1984. These tests were conducted to determine the firing velocity of the air bag and to demonstrate the effectiveness of the Breed air bag and knee restraint system when used without the vehicle's production belt restraint. Additionally, a standard Romeo-Kojyo air bag sensor was mounted on the left front inner fender wall to determine firing time and acceleration levels for this non-standard position. The intended test speeds were 4.8 and 30 mph respectively; actual speeds were 4.5 and 30 mph.

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains data required by R & D. Appendix A contains pre-test and post-test vehicle and dummy photographs for test 840625. Appendix B contains pre-test and post-test vehicle and dummy photographs for test 840626. Appendix C contains Data Plots for test 840625. Appendix D contains Data Plots for test 840626. Appendix E contains Dummy Certification Data.

SECTION 2.0
GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test and Vehicle Parameter Data.

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Ford Motor Company

MAKE/MODEL: Ford LTD

VIN: 9U63F169437

BODY STYLE: 4-Door Sedan

MODEL YEAR: 1979

NHTSA NO.: R & D

COLOR: Grey

ENGINE DATA: TYPE: V8 CYLINDERS: 8 DISPLACEMENT 302 CID

TRANSMISSION DATA: 3-speed Automatic

DATE VEHICLE RECEIVED: 5/16/84

ODOMETER READING: 77238

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	Yes
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	Yes
POWER SEATS	No	TILTING STEERING WHEEL	Yes
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	No	AIR CONDITIONING	Yes
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	Yes
OTHER			

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

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

VEHICLE MANUFACTURED BY: Ford Motor Company

DATE OF MANUFACTURE: 1/79

GVWR: 5347 LBS.,

GAWR: FRONT 2714 LBS., REAR 2683 LBS.

VEHICLE TIRE DATA

RECOMMENDED COLD TIRE PRESSURE: FRONT 28 psi; REAR 32 psi

TIRES ON VEHICLE (MFGR. & LINE, SIZE): Goodyear Tiempo P 205/75 R 14

BIAS PLY, BELTED, OR RADIAL: Radial

PLY RATING: 4

IS SPARE TIRE "SPACE SAVER"? Yes

IS SPARE TIRE STANDARD EQUIPMENT? Yes

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

RIGHT FRONT	1030	LBS.	RIGHT REAR	840	LBS.
LEFT FRONT	1080	LBS.	LEFT REAR	850	LBS.
TOTAL FRONT WEIGHT	2110	LBS.	(55.5 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1690	LBS.	(44.5 % OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	3800	LBS.			

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	RF 28	;LF 27 13/16	;RR 26	;LR 26 1/16
PRE-TEST ATTITUDE:	RF 27 3/16	;LF 27 7/8	;RR 23 15/16	;LR 24 1/16
POST-TEST ATTITUDE:	RF 30 1/4	;LF 29 1/2	;RR 23 3/4	;LR 25 1/2

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 200 LBS. CARGO:

RIGHT FRONT	1050	LBS.	RIGHT REAR	1000	LBS.
LEFT FRONT	1100	LBS.	LEFT REAR	1000	LBS.
TOTAL FRONT WEIGHT	2150	LBS.	(51.8 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	2000	LBS.	(48.2 % OF TOTAL VEHICLE WEIGHT)		
TOTAL TEST WEIGHT	4150	LBS.			

WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 25 LBS.

TEST FLUID DATA

TEST FLUID TYPE: RED STODDARD SOLVENT #2; SPEC. GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: NA GALLONS

TEST VOLUME: 17.7 GALLONS (92-94% OF USEABLE)

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 19.0 GALLONS

DETAILS OF FUEL SYSTEM: DNA

ELECTRIC FUEL PUMP: No . FUEL INJECTION: No

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING?

VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES)

OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: R 209.75 ;L 209.75

POST-TEST: R 187.55 ;L 193.65

TOTAL CRUSH: R 22.2 ;L 16.1

FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER IMPACT: CENTER: NA ;R 47 1/2 ;L 46 3/8

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVEBOX, ETC.

VEHICLE LOAD (UP TO CAPACITY): FRONT 28 psi; REAR 32 psi

RECOMMENDED TIRE SIZE: P205/75R14 LOAD RANGE X B, C,

VEHICLE CAPACITY: TYPES OF SEATS: Bench

NUMBER OF OCCUPANTS (DESIGNATED SEATING CAPACITY): 3 FRONT

 3 REAR

CARGO LOAD NA LBS.

 6 TOTAL

TOTAL NA LBS.

*WITH ENTIRE FUEL SYSTEM FILLED WITH FUEL TANK THROUGH CARBURETOR BOWL.

TEST CONDITIONS

TEST NUMBER: 840625

DATE OF TEST: 6/25/84

TIME OF TEST: 16:15

WIND VELOCITY: DNA

HUMIDITY: DNA

AMBIENT TEMPERATURE AT IMPACT AREA:

78°F

SUBJECT VEHICLE DATA

	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (LBS.)	4150	4164
VEHICLE ORIENTATION (DEGREES)	0	0
VEHICLE VELOCITY (mph)	4.5	4.8

DUMMIES - DNA

TEST CONDITIONS

TEST NUMBER: 840626

DATE OF TEST: 6/26/84

TIME OF TEST: 16:15

WIND VELOCITY: DNA

HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA:

81°F

TEMPERATURE IN OCCUPANT COMPARTMENT:

78°F

SUBJECT VEHICLE DATA

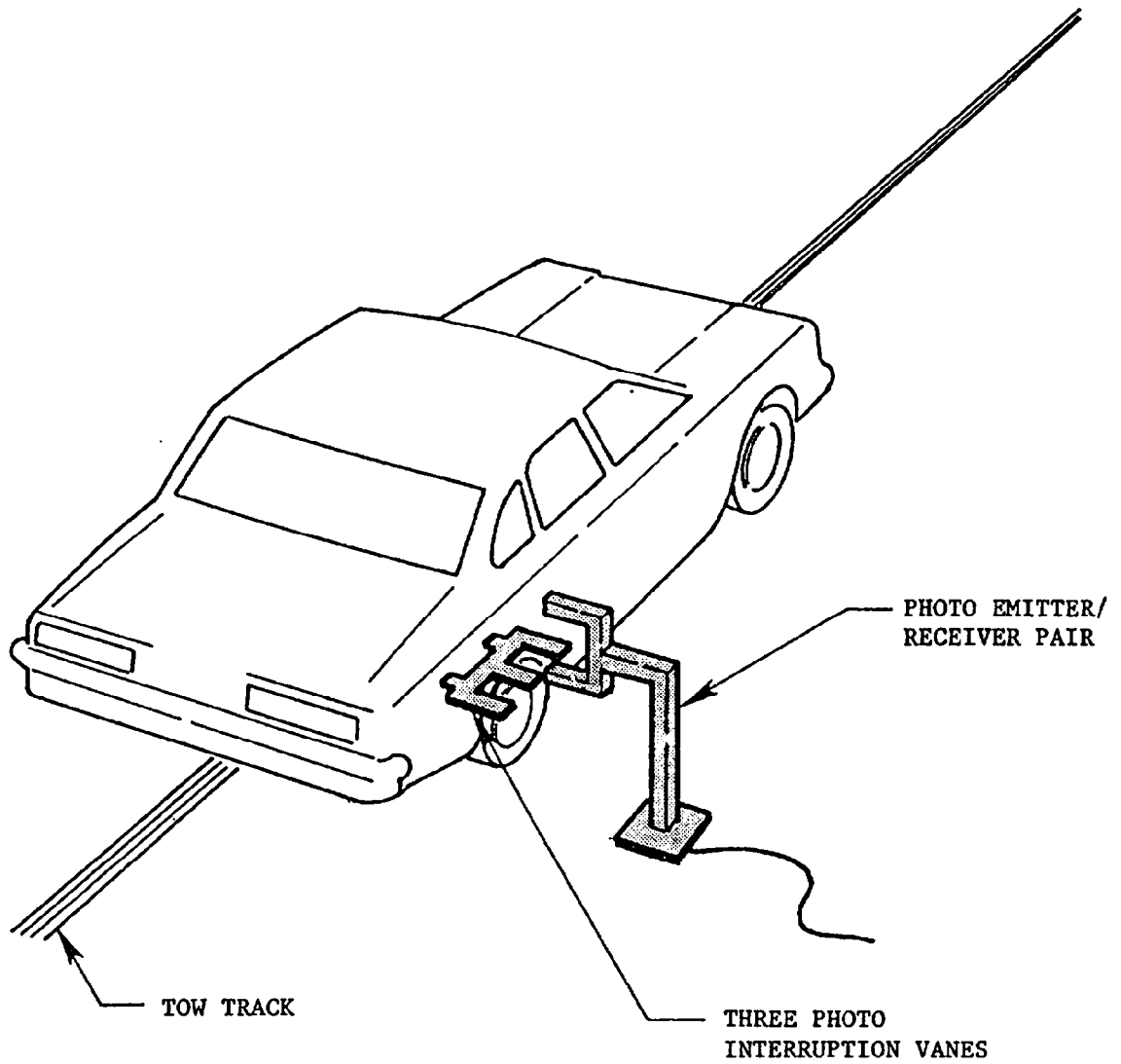
	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (LBS.)	4150	4164
VEHICLE ORIENTATION (DEGREES)	0	0
VEHICLE VELOCITY (mph)	30.0	30.0

DUMMIES

	<u>DRIVER</u>	<u>MIDDLE PASSENGER</u>	<u>RT. FRONT PASSENGER</u>	<u>LEFT REAR PASSENGER</u>	<u>RT. REAR PASSENGER</u>
TYPE:	572				
SERIAL NO.:	187				
INSTRUMENTATION:					
HEAD ACCEL.:	Yes				
CHEST ACCEL.:	Yes				
FEMUR L.C.'S:	Yes				
OTHER:	Pelvis				
RESTRAINT SYSTEM:	Breed Air Bag and Knee Bolster				

REMARKS:

IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane is located two inches before impact.

The vanes have one foot spacing.

VEHICLE TEST WEIGHT CALCULATION

$$\begin{aligned} \text{Test Weight} &= \text{Unloaded Delivered Weight} + \\ &\quad \text{Number of Dummies X 164 lbs.} + \\ &\quad \text{Cargo Weight} \\ &= 3800 + 1 \times 164 + 200 \text{ lbs.} \\ &= 4164 \text{ lbs.} \end{aligned}$$

To achieve test weight, 25 pounds of sand ballast was added in the trunk. The weight of the test vehicle was measured by placing each wheel on a Loadmeter Corporation Hiway Loadometer.

TEST ANOMALIES

The following accelerometer cables were severed during impact in the 30 mph test:

LPBZG - Left B Pillar, "Z" Axis

FILXG - Left Inner Fender Well, "X" Axis

FILZG - Left Inner Fender Well, "Z" Axis

The change in velocity and distance for the Left Inner Fender Well are therefore not reported.

The "Y" accelerometer mounted in the dummy head, HEDYG1, was found to be defective. The plot from this channel is not included in the report. Therefore, the resultant was calculated using only the "X" and "Z" axis accelerometers.

SECTION 3.0
DATA REQUIRED BY R&D

The following pages are included in this section:

1. Dummy temperature control and positioning data
2. Dummy kinematic summary
3. Vehicle crush data
4. Dummy and vehicle accelerometer location and data summary
5. High speed camera information

DUMMY TEMPERATURE CONTROL AND POSITIONING

The vehicle was kept inside the temperature controlled crash test building until approximately 30 minutes prior to the test. Temperature inside the vehicle and ambient temperature in the crash building were recorded. Dummy temperature while outside the crash test building was maintained portably until approximately 1 minute prior to the test.

The following table summarizes the steps taken to position the instrumented, calibrated dummy in the test vehicle.

DUMMY PLACEMENT AND POSITIONING

PART 572
DUMMY

DRIVER DSP

PASSENGER DSP

HEAD	Surface of transverse instrument mounting platform is horizontal & midsagittal plane falls in longitudinal plane.	Surface of transverse instrument mounting platform is horizontal & midsagittal plane falls in longitudinal plane.
UPPER TORSO	Placed against seat back. Midsagittal plane is vertical & longitudinal & passes through center point of steering wheel rim.	Placed against seat back. Midsagittal plane is vertical, longitudinal, & the same distance from vehicle longitudinal centerline as driver dummy midsagittal plane.
UPPER ARMS	Initially placed against seat back & tangent to side of upper torso. Push arms rearward into seat back with bending at elbows.	Initially placed against seat back & tangent to side of upper torso. Push arms rearward into seat back with bending at elbows. Remains tangent.
LOWER ARMS	Initially placed against the outside of the thighs. Centerline as close as possible in a vertical plane.	Initially placed against the outside of the thighs. Centerline as close as possible in a vertical plane.
HAND PALMS	Palms contact outer part of steering wheel rim at horizontal centerline.	Palms contact the outsides of the thighs.
HAND THUMBS	Placed over steering wheel rim.	
HAND LITTLE FINGERS		Barely in contact with the seat cushion.
LOWER TORSO	Centered on bucket seat cushion. Midsagittal plane is vertical & longitudinal. For bench seat, midsagittal plane is vertical & longitudinal & passes through center point of plane described by steering wheel rim.	Centered on bucket seat cushion. Midsagittal plane is vertical & longitudinal. For bench seat, midsagittal plane is vertical, and same distance from vehicle longitudinal centerline as driver dummy midsagittal plane.
UPPER LEGS (thighs or femurs)	Placed against seat cushion. Plane defined by femur and tibia centerlines is as close as possible to vertical.	Placed against seat cushion. Plane defined by femur and tibia centerlines is as close as possible to vertical.
RIGHT KNEE	Knees initially set 14.5" apart between pivot bolt head outer surfaces.	Located so that plane defined by femur and tibia centerlines is as close as possible to vertical.

DUMMY PLACEMENT AND POSITIONING (CONTINUED)

PART 572
DUMMY

DRIVER DSP

PASSENGER DSP

LEFT KNEE Outer surface of pivot bolt head is 5.9" from midsagittal plane of dummy.

Located as above.

LOWER LEGS Plane defined by femur and tibia centerlines is as close as possible to vertical longitudinal plane.

Plane defined by femur and tibia centerlines is as close as possible to vertical longitudinal plane.

RIGHT FOOT Placed on undepressed accelerometer pedal -- rearmost point of heel on floorpan in plane of pedal.

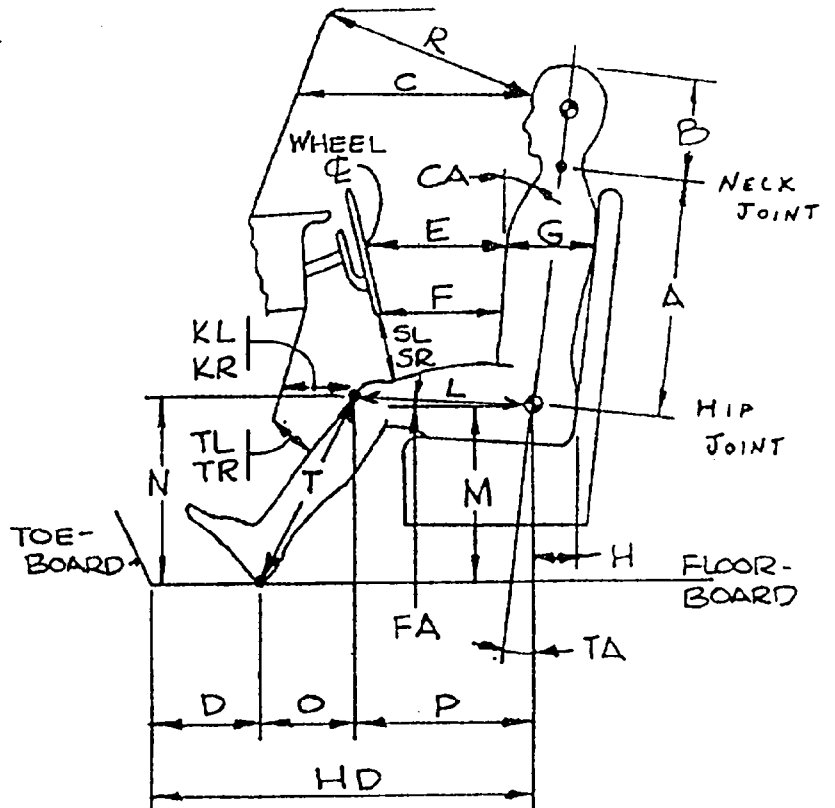
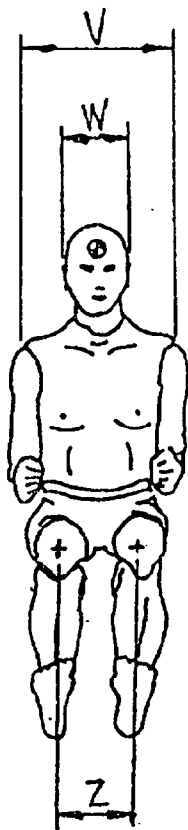
Centerline falls in vertical longitudinal plane. Placed on toeboard -- rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan.

LEFT FOOT Placed on toeboard -- rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan. Centerline falls in vertical longitudinal plane.

Centerline falls in vertical longitudinal plane. Placed on toeboard -- rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

BREED VERSION (Not Standard)



Seat @ Mid-Postion

ALL MEASUREMENTS TO THE NEAREST 1/4 INCH, AND WHOLE DEGREE.

Measurements A,B,L are parallel to the dummy inclination; SL,SR,TL,TR,R are "shortest distance" measurements; all the rest are horizontal and vertical.

A = 21.5	B = 10	KL = 5.5	L = 18	T = N/A
C = 20	E = 11	KR = 6	G = 9.3	
M = 6.5	N = 12	F = 5.5	P = 18	
R = 17	V = 14	O = 12	Z = 10	
HD = 27.5	CA = 23 °	W = 6	FA = 15 °	
D = N/A	TR = 4	TA = 18 °	SR = 4.5	
H = 4	TL = 3.5	LA = N/A	SL = 4	

DUMMY KINEMATIC SUMMARY

DRIVER

During impact, the dummy rotated forward until the upper torso and head contacted and were enfolded by the air bag. The dummy rebounded from the air bag, striking the head restraint and the top of the seat back with the back of his head.

Also during impact, the dummy's knees were forced forward into the knee bolster. As the dummy rebounded from the air bag, the knees came upward, still in contact with the knee bolster.

The dummy came to rest sitting upright and facing forward with the air bag touching the upper torso. Contact was maintained between the knees and the knee bolster.

PART 572 DUMMY DATA SUMMARY

TEST NO. 840626

	DRIVER DUMMY			
	POSITIVE DIRECTIONS*		NEGATIVE DIRECTIONS**	
	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
HEAD ACCELERATION				
LONGITUDINAL	4.04	147.63	38.42	75.13
LATERAL	---	---	---	---
VERTICAL	11.06	53.75	19.62	112.88
RESULTANT		38.42 max @	75.13	
HIC		246.63 from	63.63 to	122.13
DELTA V (MPH)		-37.7 @	133.63	
DELTA X (INCHES)		-40.9 @	180.00	

CHEST ACCELERATION				
LONGITUDINAL	1.07	174.25	46.53	99.38
LATERAL	5.05	106.00	2.55	129.00
VERTICAL	6.51	94.75	12.30	141.50
RESULTANT		46.69 max @	99.38	
DELTA V (MPH)		-40.2 @	143.00	
DISPLACEMENT (IN.)		-41.7 @	180.00	

PELVIS ACCELERATION				
LONGITUDINAL	0.66	147.63	53.64	83.88
LATERAL	6.75	72.63	5.84	56.00
VERTICAL	6.04	96.63	17.87	94.50
RESULTANT		53.74 @	83.88	
DELTA V (MPH)		-35.2 @	180.00	
DELTA X (INCHES)		-40.5 @	180.00	

	MAX (lb)	TIME (msec)	MAX (lb)	TIME (msec)
FEMUR FORCE***				
LEFT	438.53	42.25	1453.66	82.50
RIGHT	570.46	42.38	1822.33	83.88

* LONGITUDINAL: FORWARD
 LATERAL: RIGHTWARD
 VERTICAL: DOWNWARD

** LONGITUDINAL: REARWARD
 LATERAL: LEFTWARD
 VERTICAL: UPWARD

*** COMPRESSION: NEGATIVE

γ See TEST ANOMALIES

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY
TEST NO. 840625

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	LEFT INNER FENDER WELL (LONGITUDINAL)	187.31	-29.25	32.75	1.02	175.25	5.32	26.75
	(LATERAL)				1.11	39.13	2.22	26.75
	(VERTICAL)				4.75	38.63	1.81	141.13
	(RESULTANT)					5.94 @	26.75	
2	LOWER STEERING COLUMN (POSTERIOR)	144.00	-15.38	25.25	0.91	126.25	4.62	50.63
	(LATERAL)				1.31	62.00	0.79	40.75
	(INFERIOR)				3.89	27.63	0.46	180.00
	(RESULTANT)					5.61 @	29.38	
3	UPPER STEERING COLUMN (POSTERIOR)	126.75	-15.13	35.38	1.30	126.25	4.64	49.50
	(INFERIOR)				3.22	54.50	2.28	99.13
4	LEFT B-PILLAR (LONGITUDINAL)	103.25	-30.25	18.00	0.50	169.50	4.33	52.13
	(LATERAL)				1.19	56.38	0.66	21.75
	(VERTICAL)				0.63	27.25	1.00	54.50
	(RESULTANT)					4.45 @	52.38	

* REFERENCE: X - REAR BUMPER (+ FORWARD), Y - VEHICLE CENTERLINE (+ TO RIGHT)
Z - GROUND (+ UP)
ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS IN INCHES

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY
TEST NO. 840626

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	LEFT INNER FENDER WELL (LONGITUDINAL)	187.31	-29.25	32.75	---	---	---	---
	(LATERAL)				---	---	---	---
	(VERTICAL)				70.93	42.25	38.77	37.00
	(RESULTANT)				---	---	---	---
2	LOWER STEERING COLUMN (POSTERIOR)	144.00	-15.38	25.25	19.29	80.38	43.40	72.88
	(LATERAL)				36.34	69.13	14.48	76.00
	(INFERIOR)				21.64	73.38	15.55	99.63
	(RESULTANT)				---	---	---	---
3	UPPER STEERING COLUMN (POSTERIOR)	126.75	-15.13	35.38	12.01	76.75	41.18	96.25
	(INFERIOR)				39.84	98.50	18.77	66.13
	(LATERAL)				---	---	---	---
4	LEFT B-PILLAR (LONGITUDINAL)	103.25	-30.25	18.00	2.67	179.13	27.30	63.38
	(LATERAL)				6.12	34.75	4.56	84.25
	(VERTICAL)				---	---	---	---
	(RESULTANT)				---	---	---	---

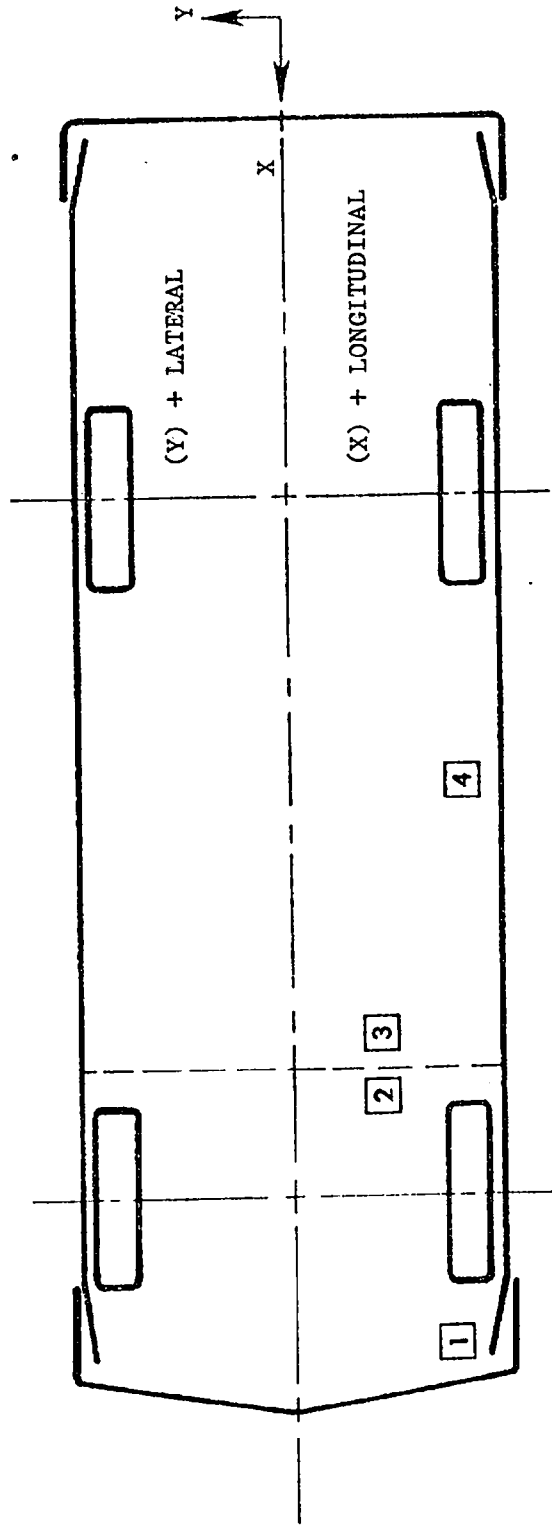
SENSOR FIRING TIME = 52.63 msec

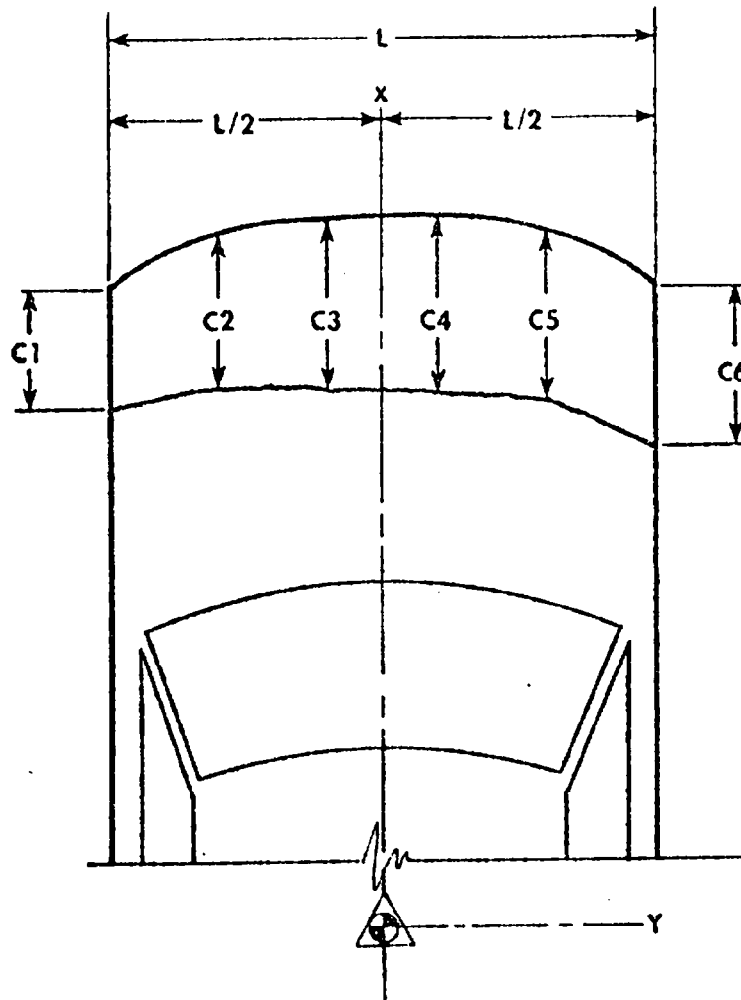
* REFERENCE: X - REAR BUMPER (+ FORWARD), Y - VEHICLE CENTERLINE (+ TO RIGHT)
Z - GROUND (+ UP)

ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS IN INCHES

γ See TEST ANOMALIES

VEHICLE ACCELEROMETER LOCATIONS





NOTE: C1 through C6 are spaced equally apart

VEHICLE 1979 Ford LTD

<u>PRE-TEST</u>		<u>POST-TEST</u>		<u>CRUSH</u>	
L	76.6	L	76.6	L	0
C1	47.6	C1	63.7	C1	16.1
C2	40	C2	61.1	C2	21.1
C3	38.3	C3	61.2	C3	22.9
C4	38	C4	62.2	C4	24.2
C5	40	C5	63.2	C5	23.2
C6	47.2	C6	69.4	C6	22.2
D	0	D	0	D	0

NOTE: Reference line 16' forward of rear axle (192 inches)

HIGH SPEED CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right Side	Kodak	16	24	Vehicle approach & crash
2	Onboard - Window	Photosonic 1B	8	1000	Dummy kinematics
3	Onboard - Roof	Photosonic 1B	8	1000	Dummy kinematics
4	Left - Wide View	Photosonic 1B	13	1000	Overall view at crash area

NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE OF FILM.
 (24 fps) REAL TIME MOVIE FILM COVERAGE OF PRE-CRASH, POST-CRASH
 AND CRASH EVENT SPLICED AT START AND END OF FILM.

APPENDIX A
PHOTOGRAPHS - TEST 840625

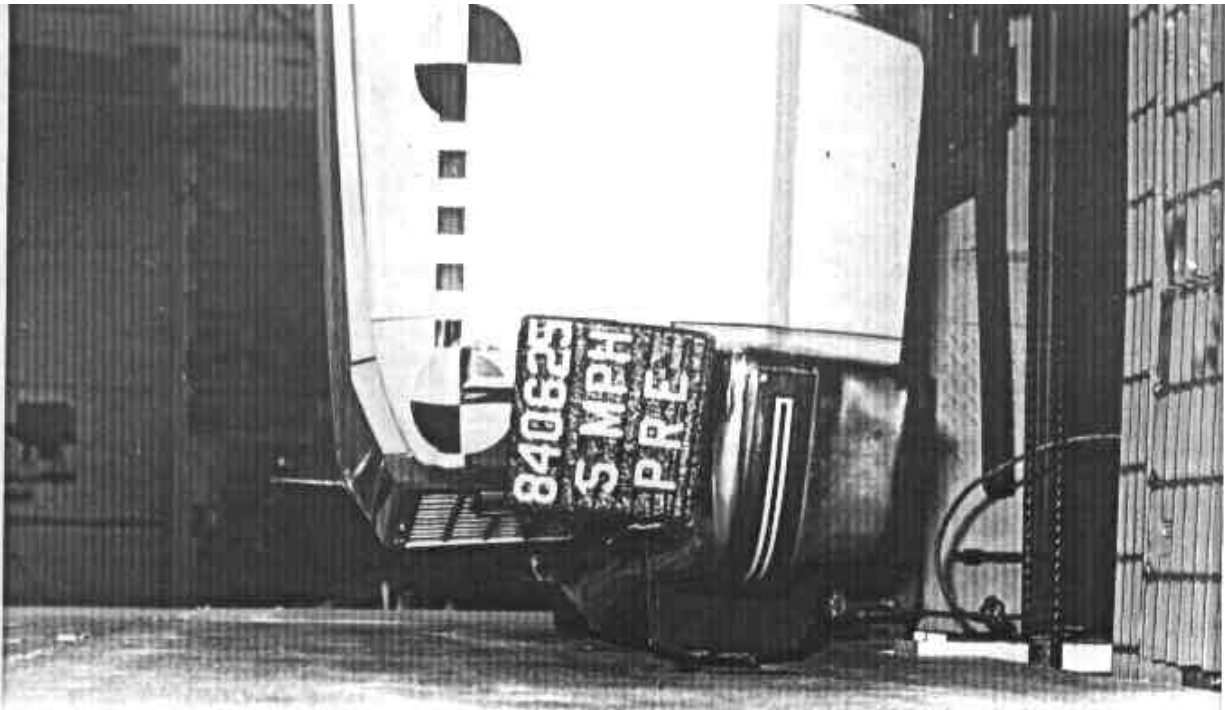


Figure A-1. PRE-TEST DRIVER SIDE VIEW

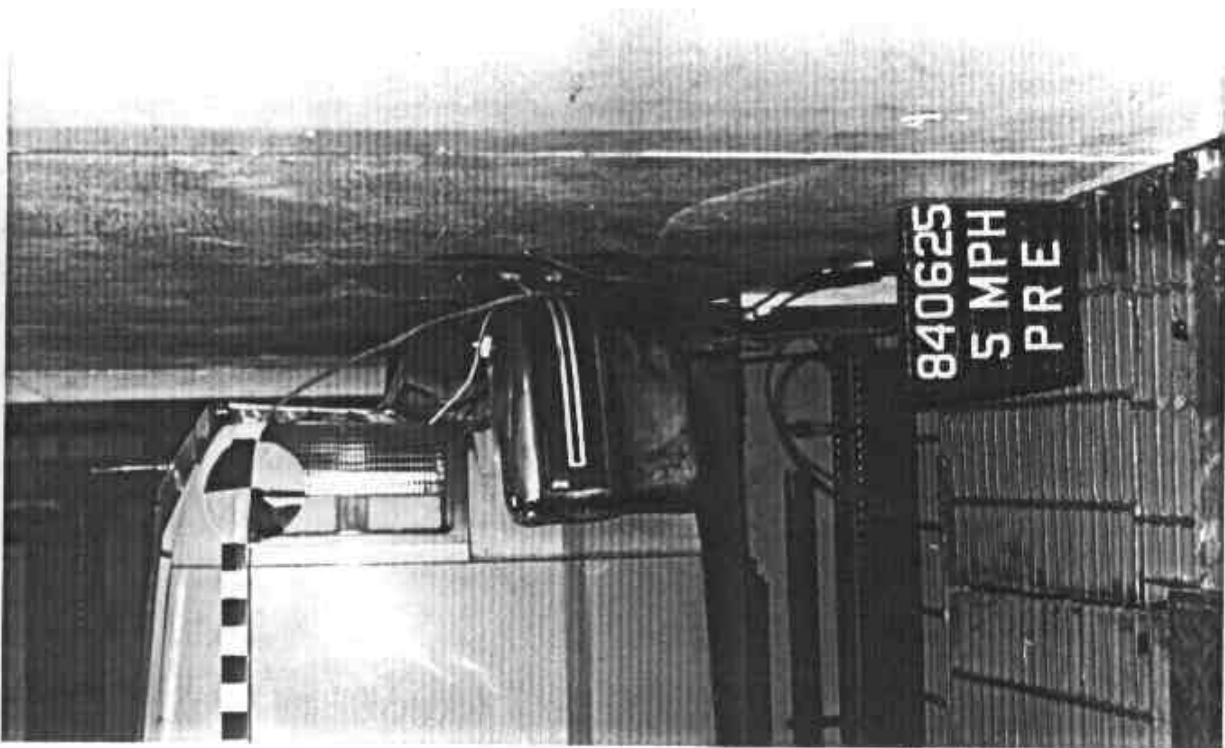


Figure A-2. PRE-TEST PASSENGER SIDE VIEW
A-2

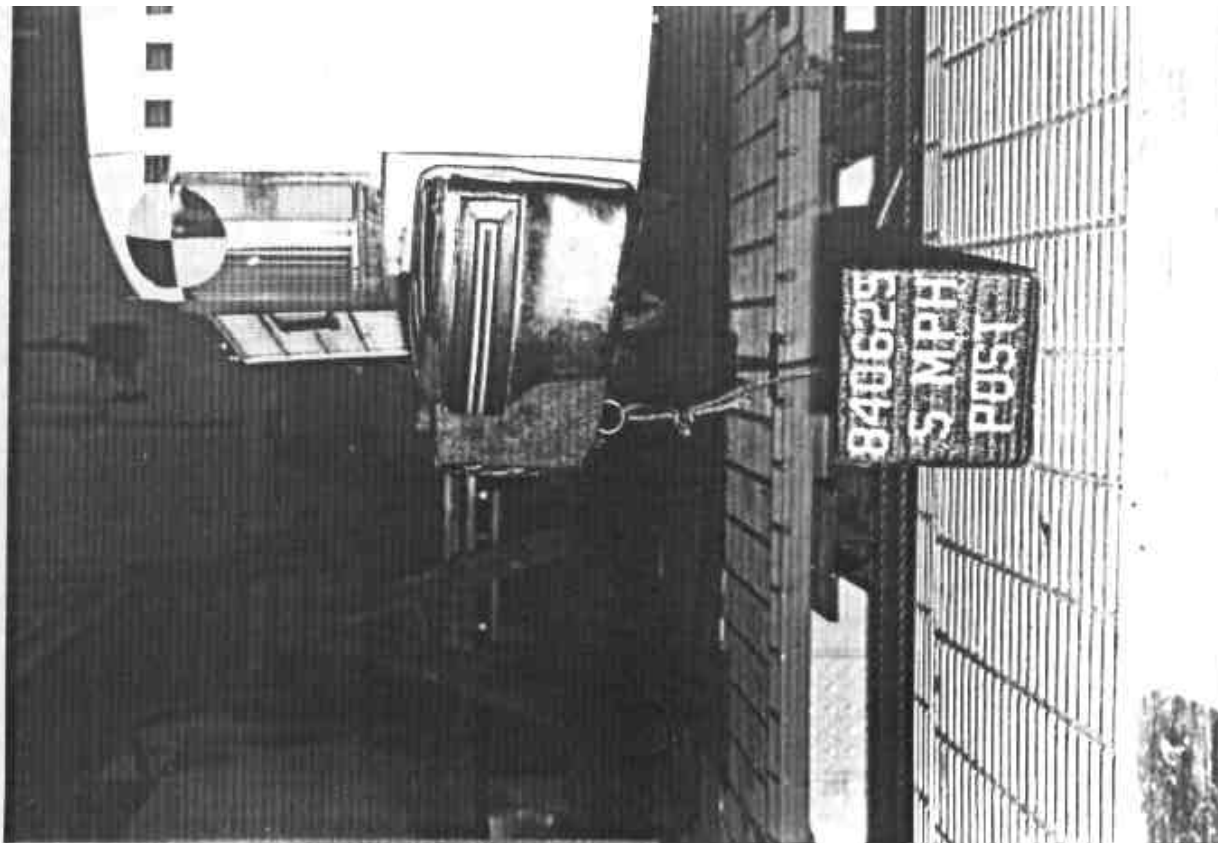


Figure A-3. POST-TEST DRIVER SIDE VIEW



Figure A-4. POST-TEST PASSENGER SIDE VIEW
A-3



Figure A-5. POST-TEST CLOSEUP



Figure B-1. PRE-TEST DRIVER SIDE VIEW

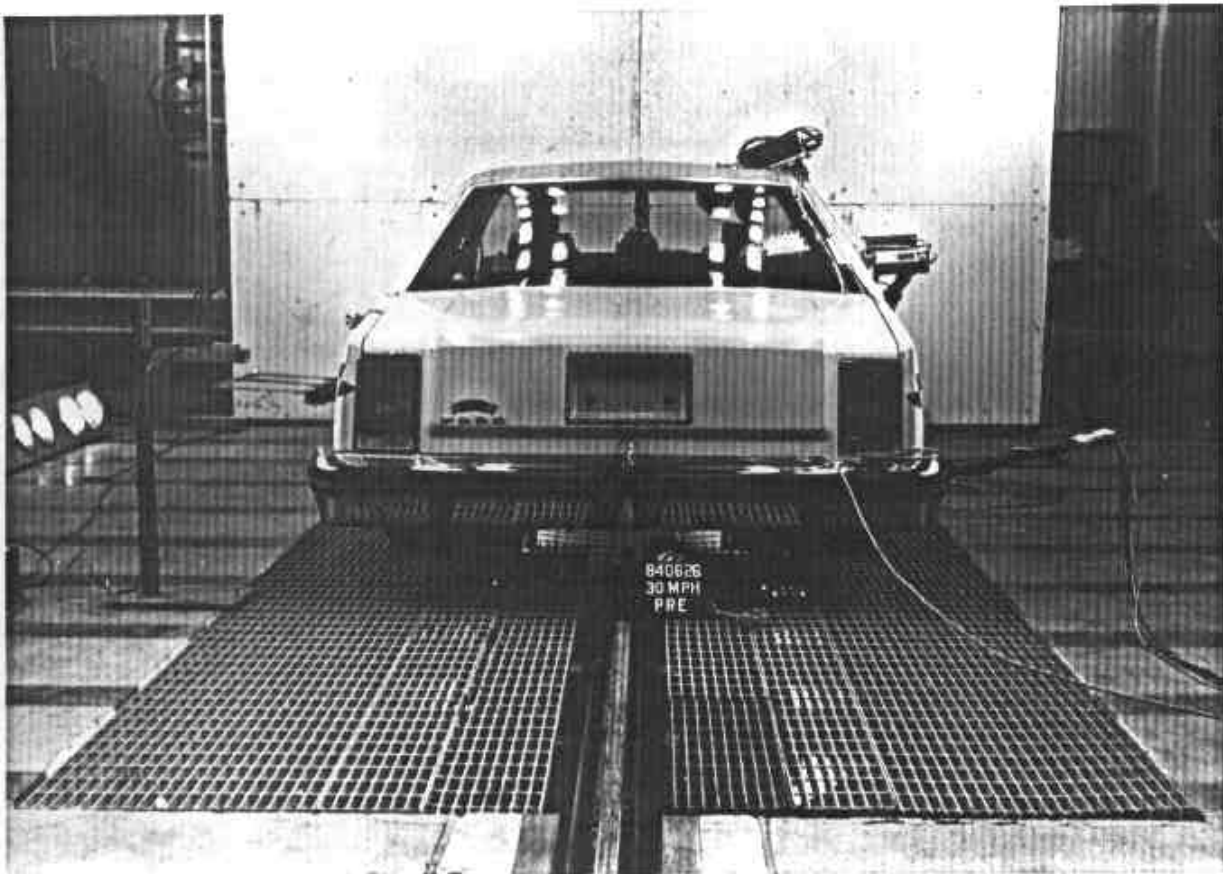


Figure B-2. PRE-TEST REAR VIEW
B-2



Figure B-3. PRE-TEST PASSENGER SIDE VIEW

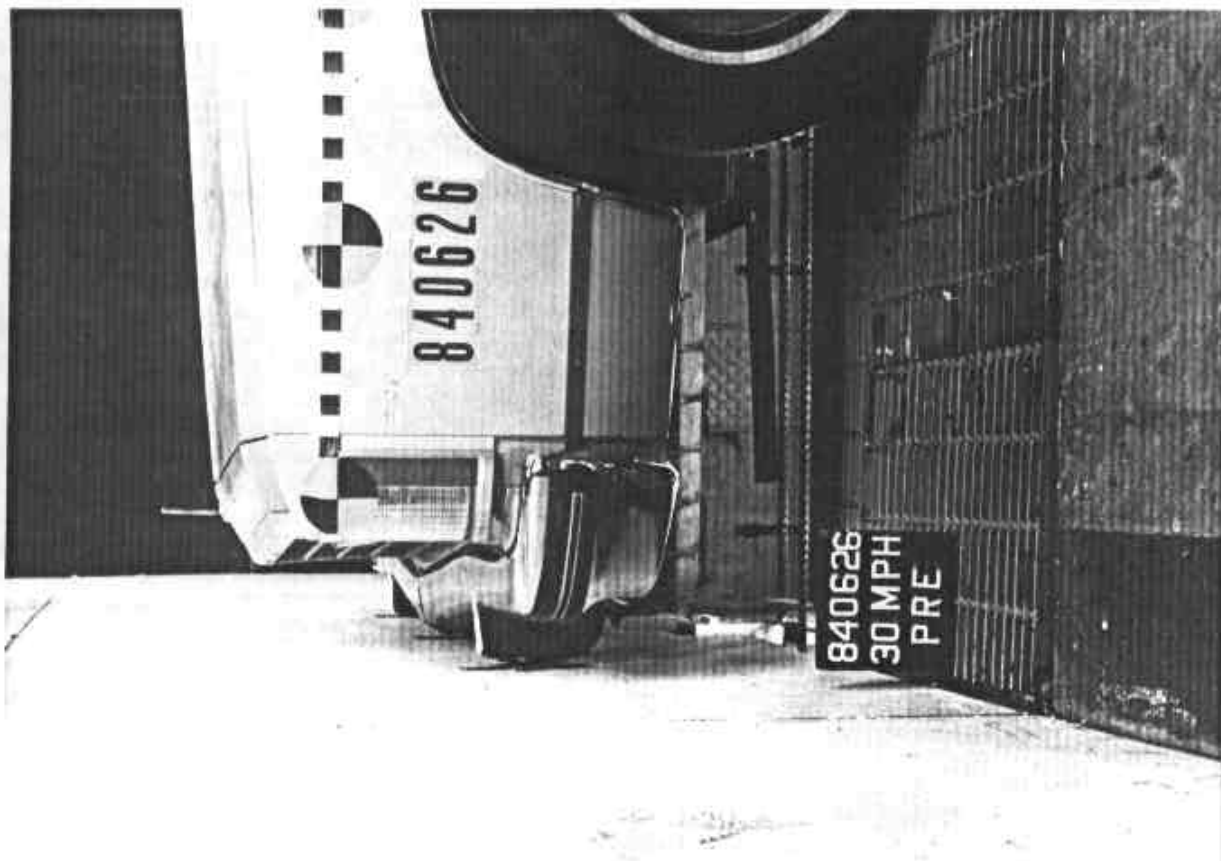


Figure B-4. PRE-TEST DRIVER SIDE CLOSE-UP
B-3

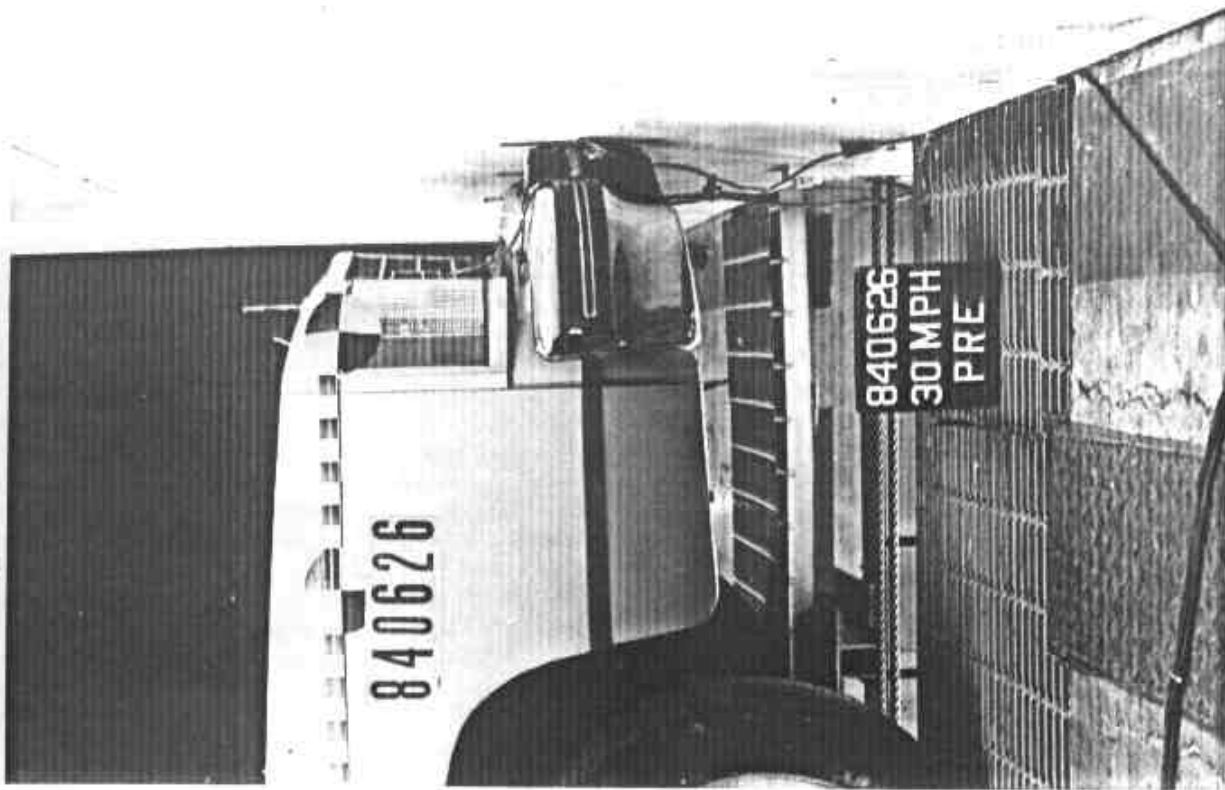


Figure B-5. PRE-TEST PASSENGER SIDE CLOSE-UP



Figure B-6. PRE-TEST DUMMY - VIEW 1
B-4

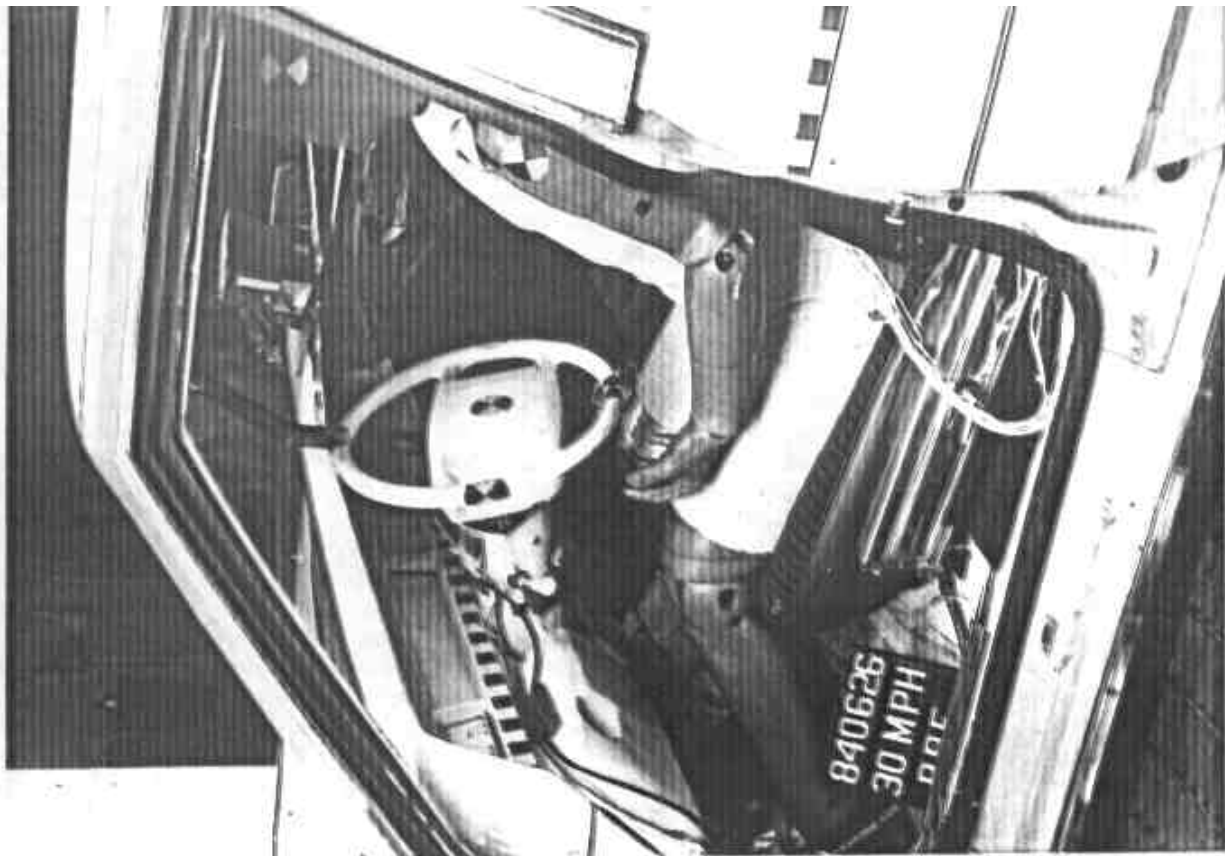


Figure B-7. PRE-TEST DUMMY - VIEW 2



Figure B-8. PRE-TEST DUMMY - VIEW 3
B-5

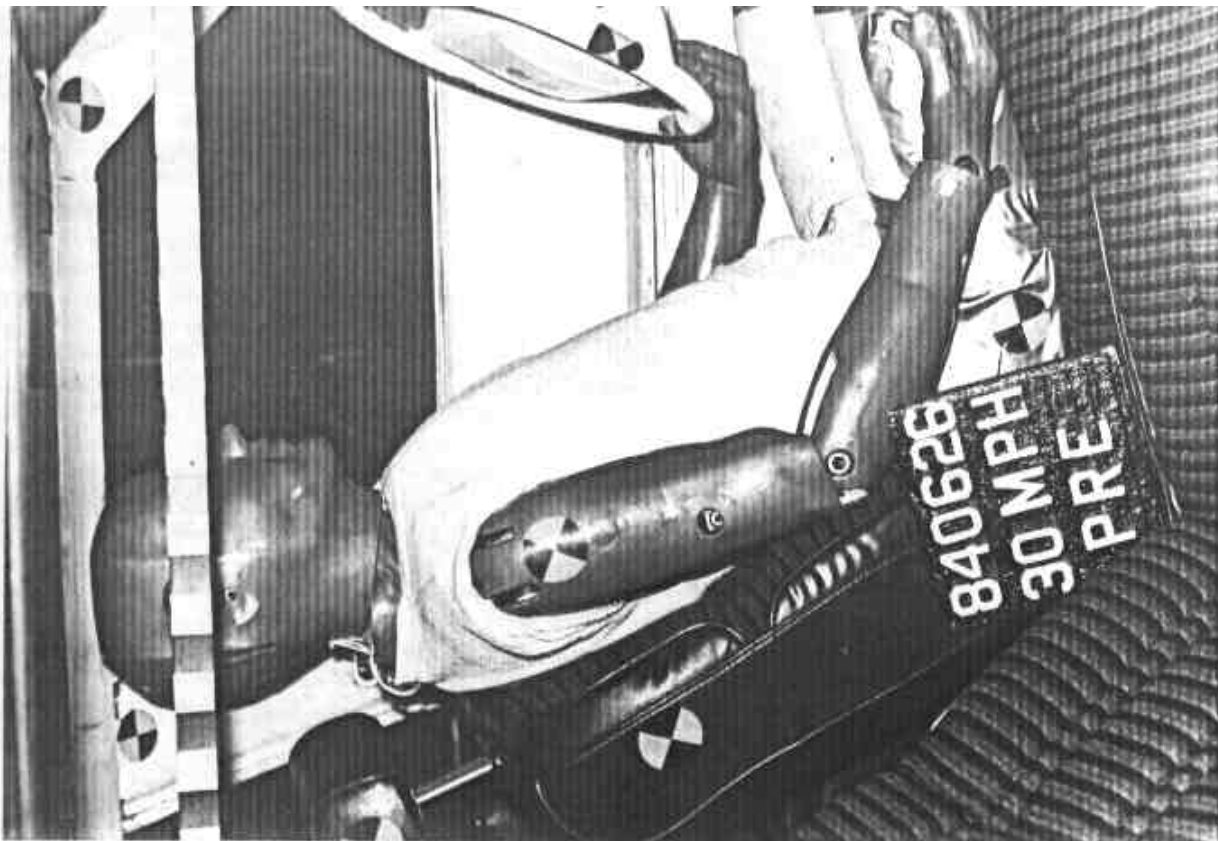


Figure B-9. PRE-TEST DUMMY - VIEW 4

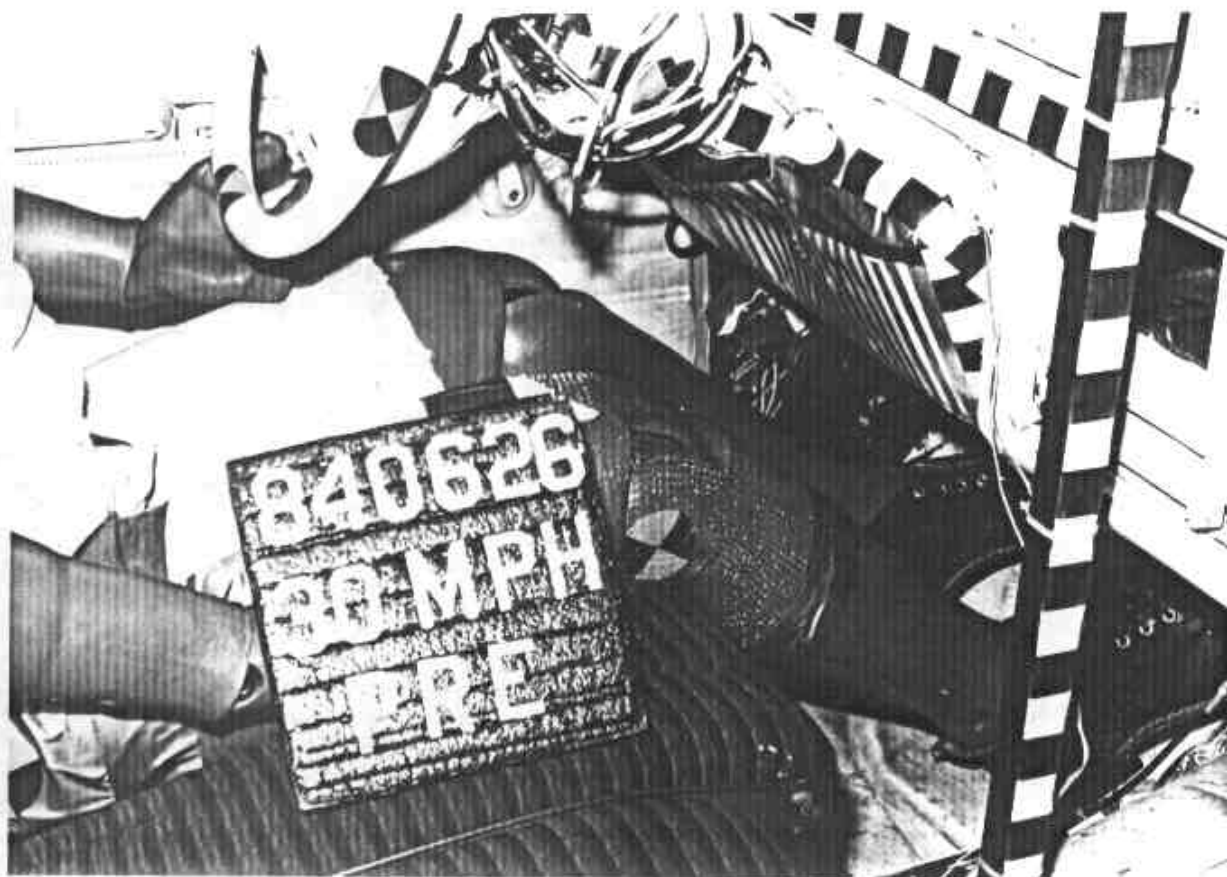


Figure B-10. PRE-TEST DUMMY - VIEW 5
B-6

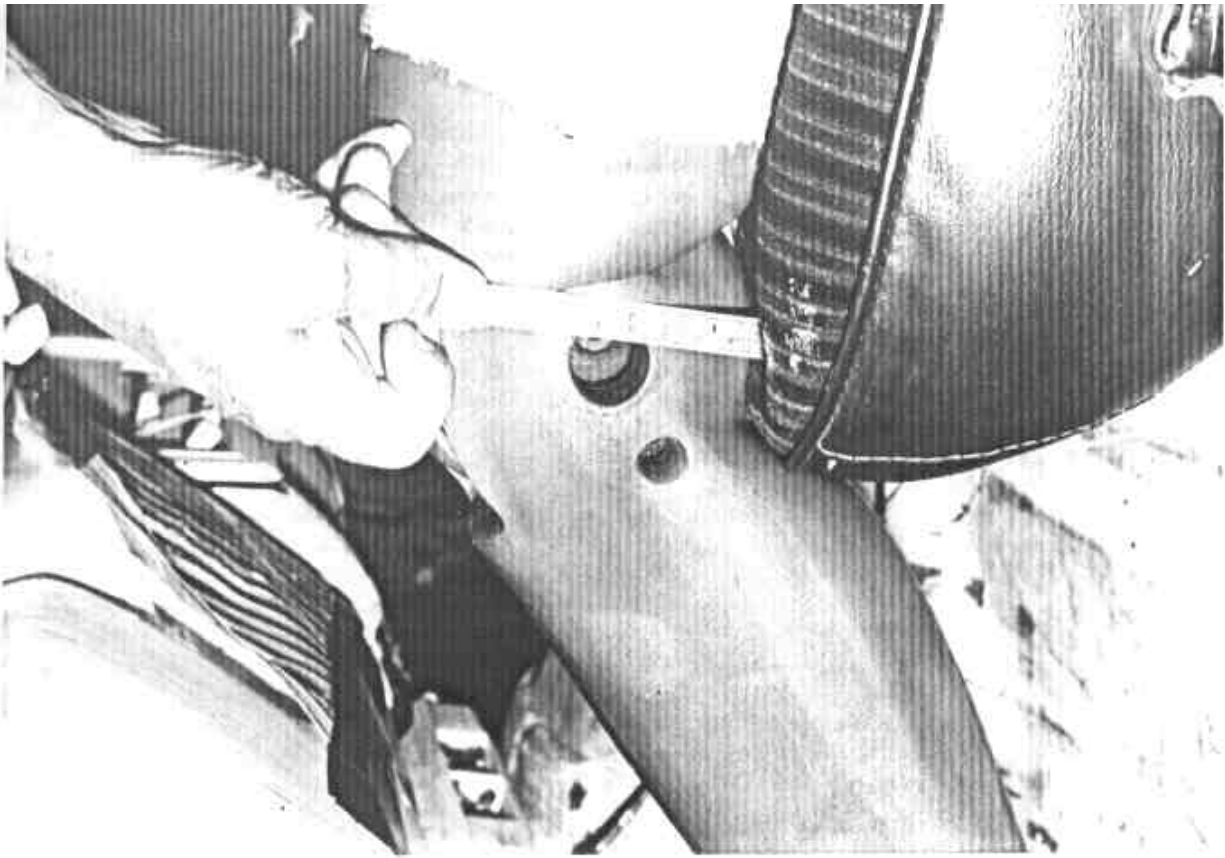


Figure B-11. PRE-TEST DUMMY - VIEW 6



Figure B-12. POST-TEST DRIVER SIDE VIEW
B-7

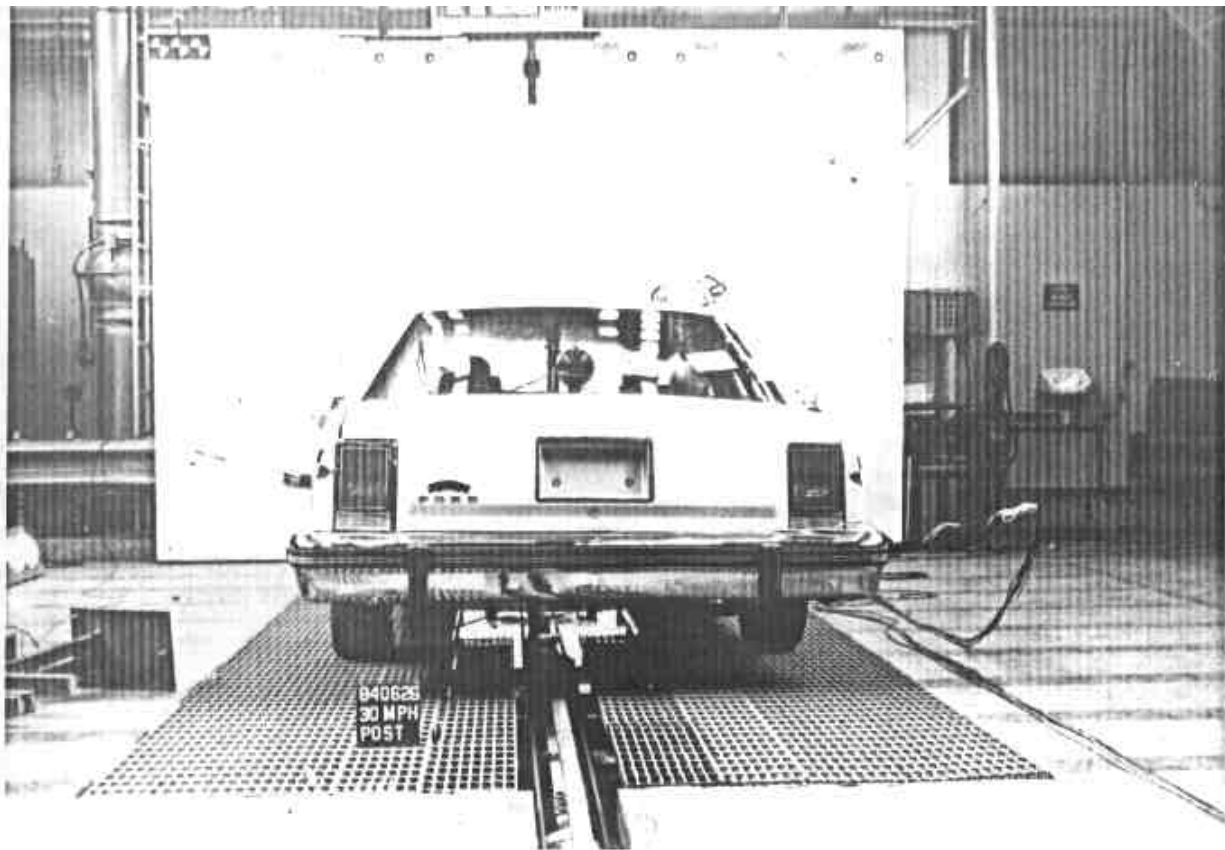


Figure B-13. POST-TEST REAR VIEW



Figure B-14. POST-TEST PASSENGER SIDE VIEW
B-8



Figure B-15. POST-TEST DUMMY - VIEW 1

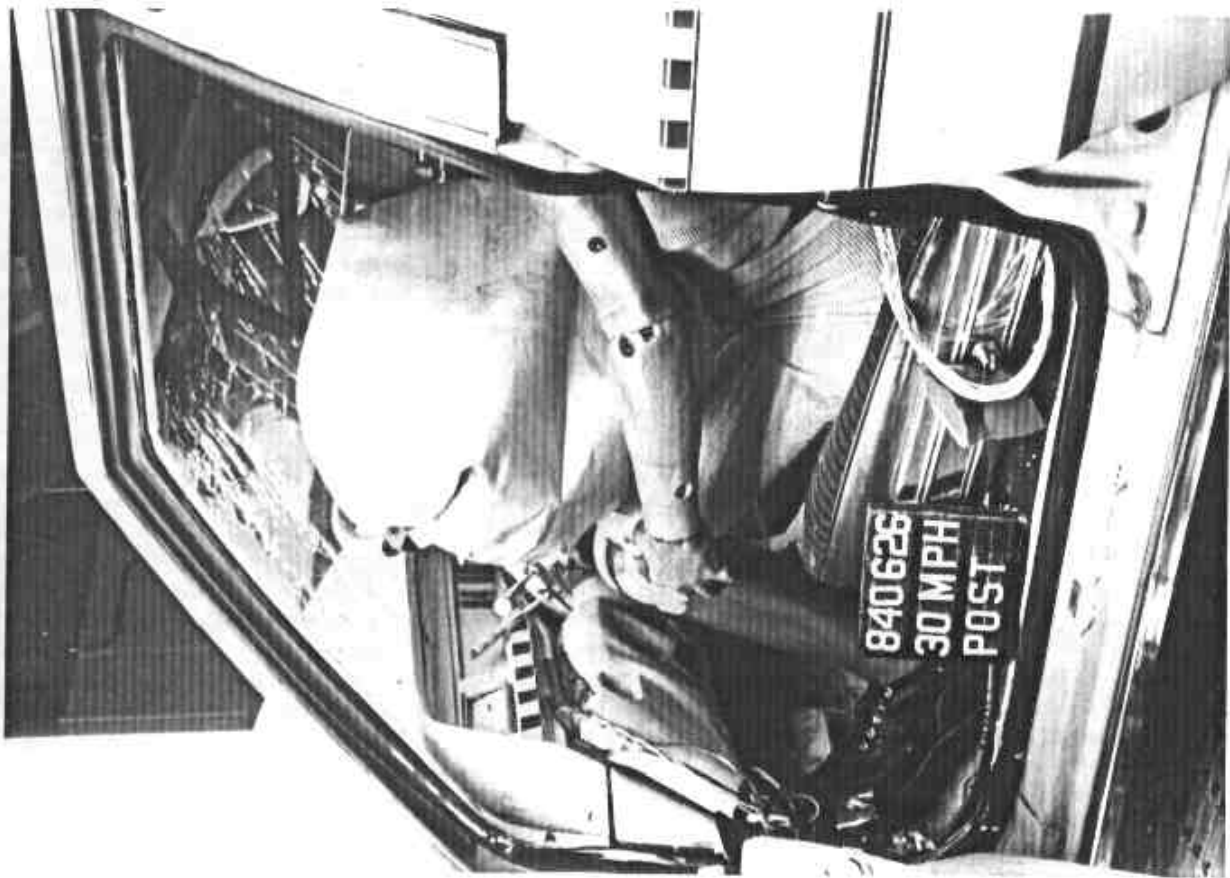


Figure B-16. POST-TEST DUMMY - VIEW 2
B-9

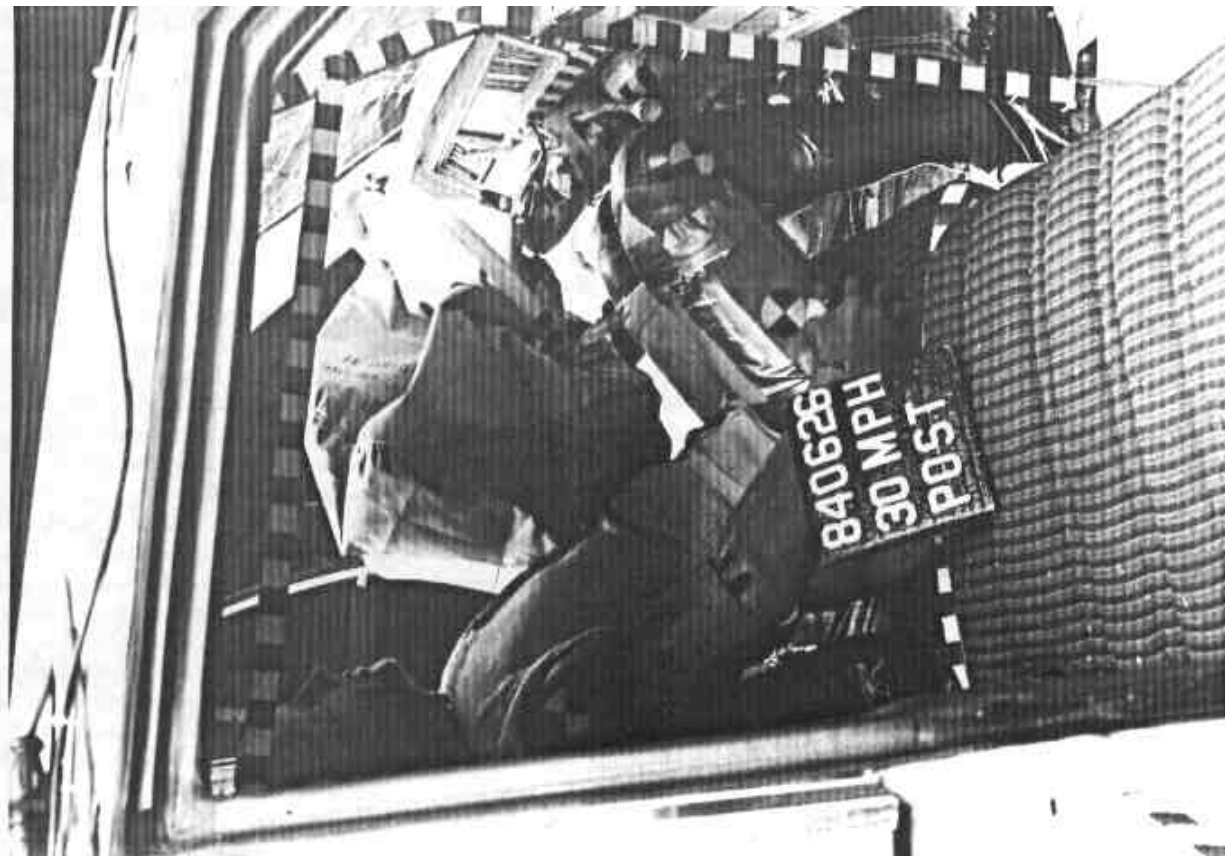


Figure B-17. POST-TEST DUMMY - VIEW 3

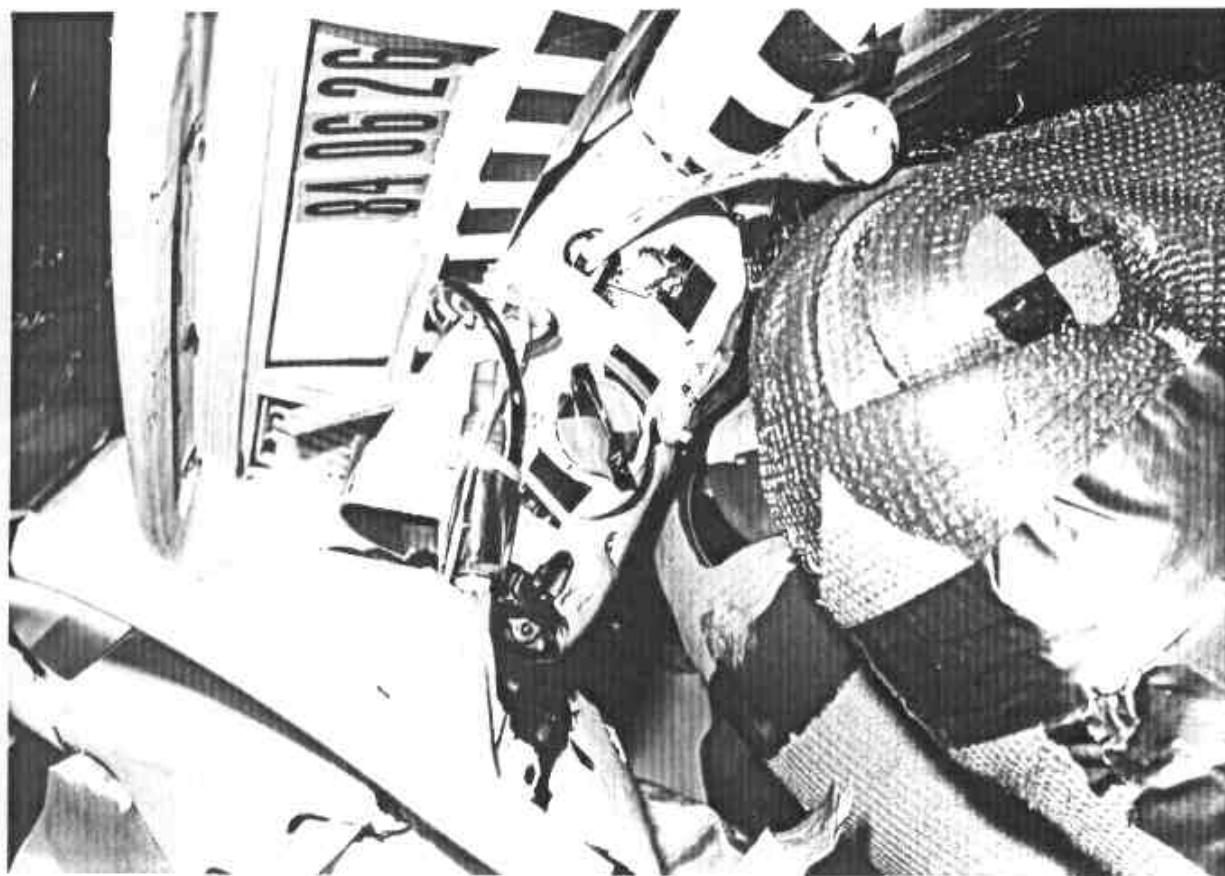


Figure B-18. POST-TEST DUMMY - VIEW 4
B-10

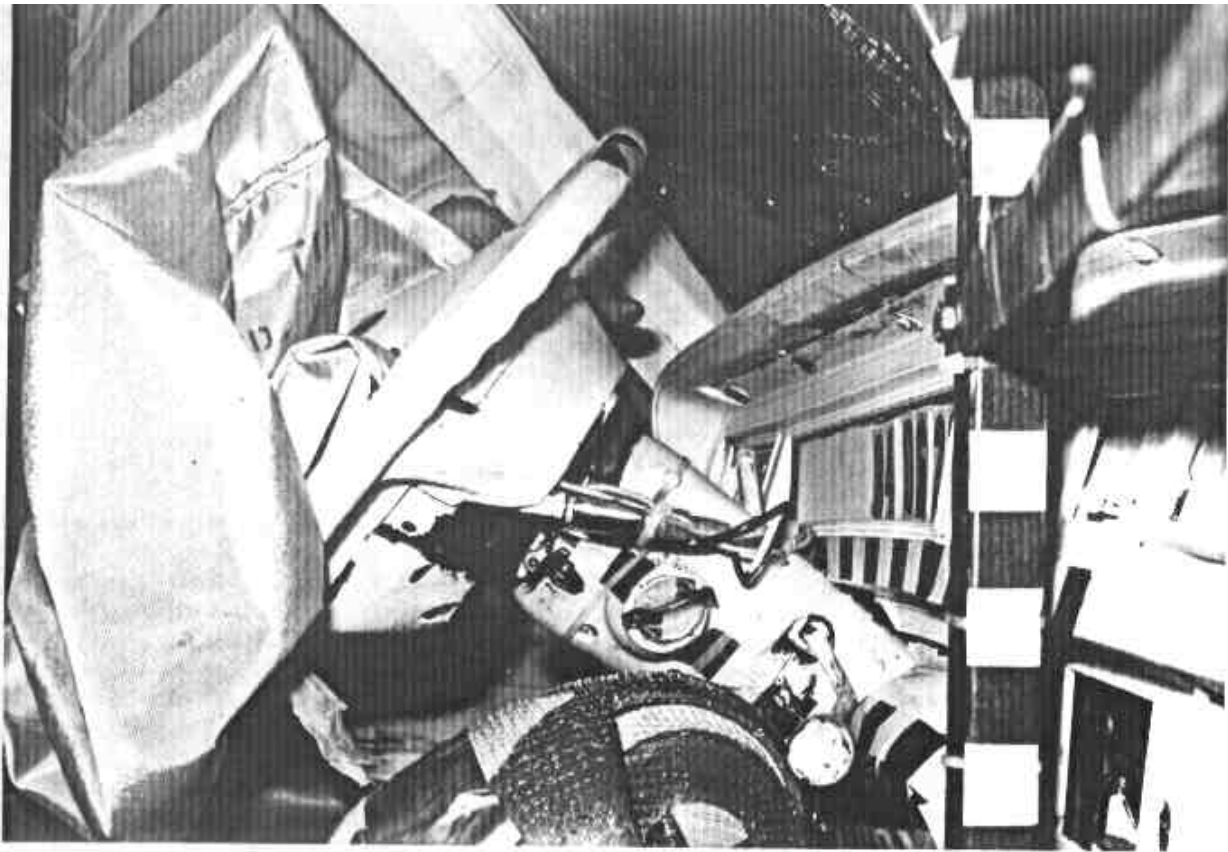


Figure B-19. POST-TEST STEERING COLUMN - VIEW 1

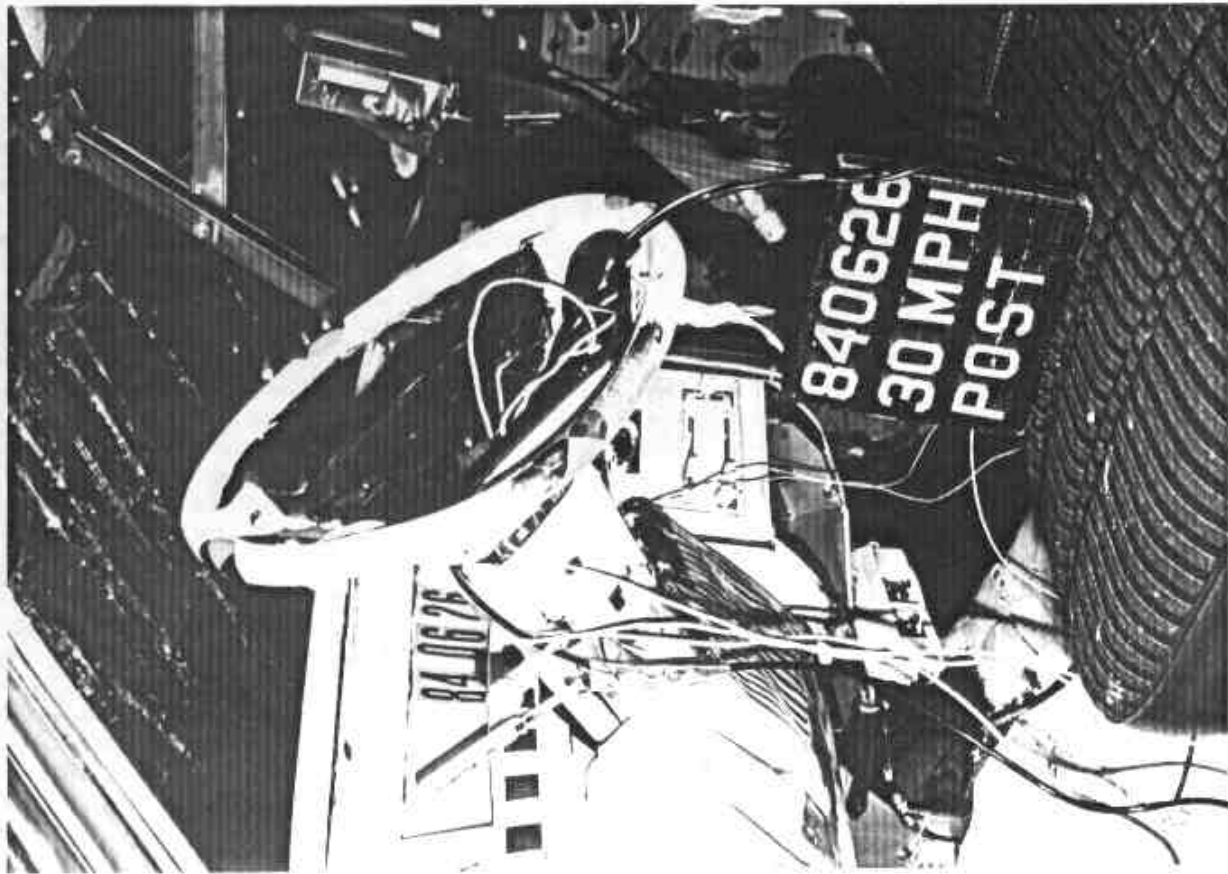


Figure B-20. POST-TEST STEERING COLUMN - VIEW 2
B-11

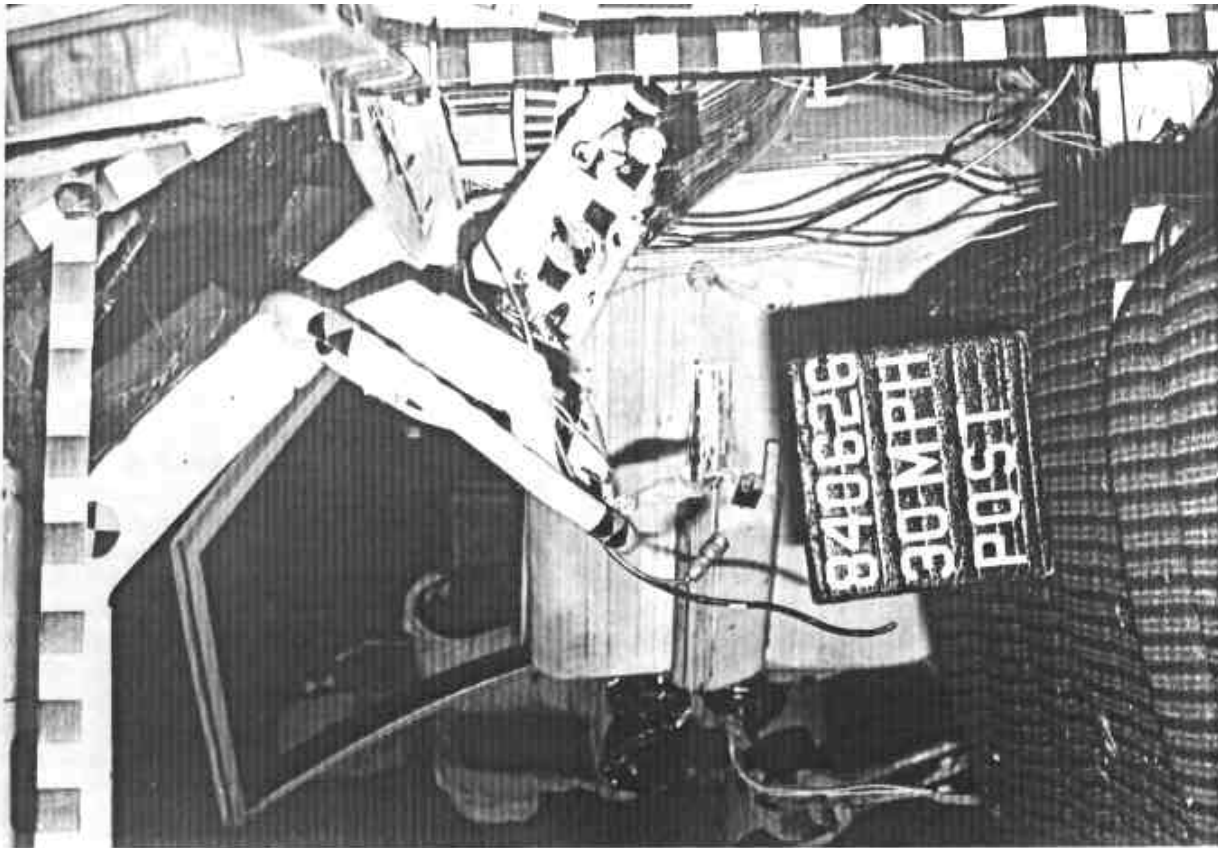


Figure B-21. POST-TEST STEERING COLUMN - VIEW 3

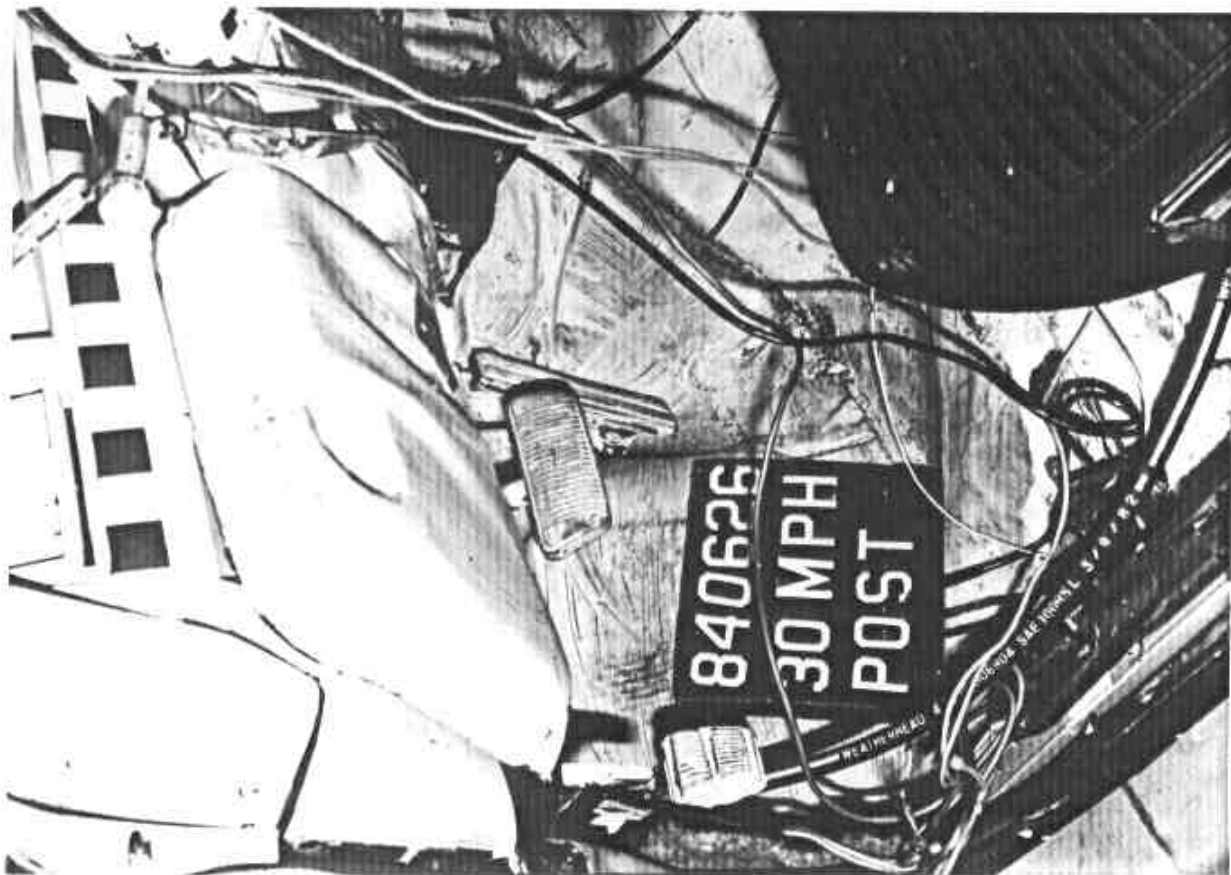


Figure B-22. POST-TEST KNEE BOLSTER - VIEW 1



Figure B-23. POST-TEST KNEE BOLSTER - VIEW 2



Figure B-24. WINDSHIELD DAMAGE
B-13

APPENDIX C

DATA PLOT PRESENTATION - TEST 840625

Data plots generated from the bumper test data are presented on the following pages. All data are recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data were filtered according to SAE J211.

TRC
84177000000
LPBXG

BREED AIR BAG PROGRAM

PLUT DATE 17-AUG-84 14:16:17

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -4.33e 0.50 e 169.50

45.00

30.00

15.00

0.00

-15.00

-30.00

-45.00

-50.00

-55.00

-60.00

ACCELERATION (G)

75.00 80.00 85.00 90.00 95.00 100.00 105.00 110.00 115.00 120.00 125.00 130.00 135.00 140.00 145.00 150.00 155.00 160.00 165.00 170.00 175.00 180.00

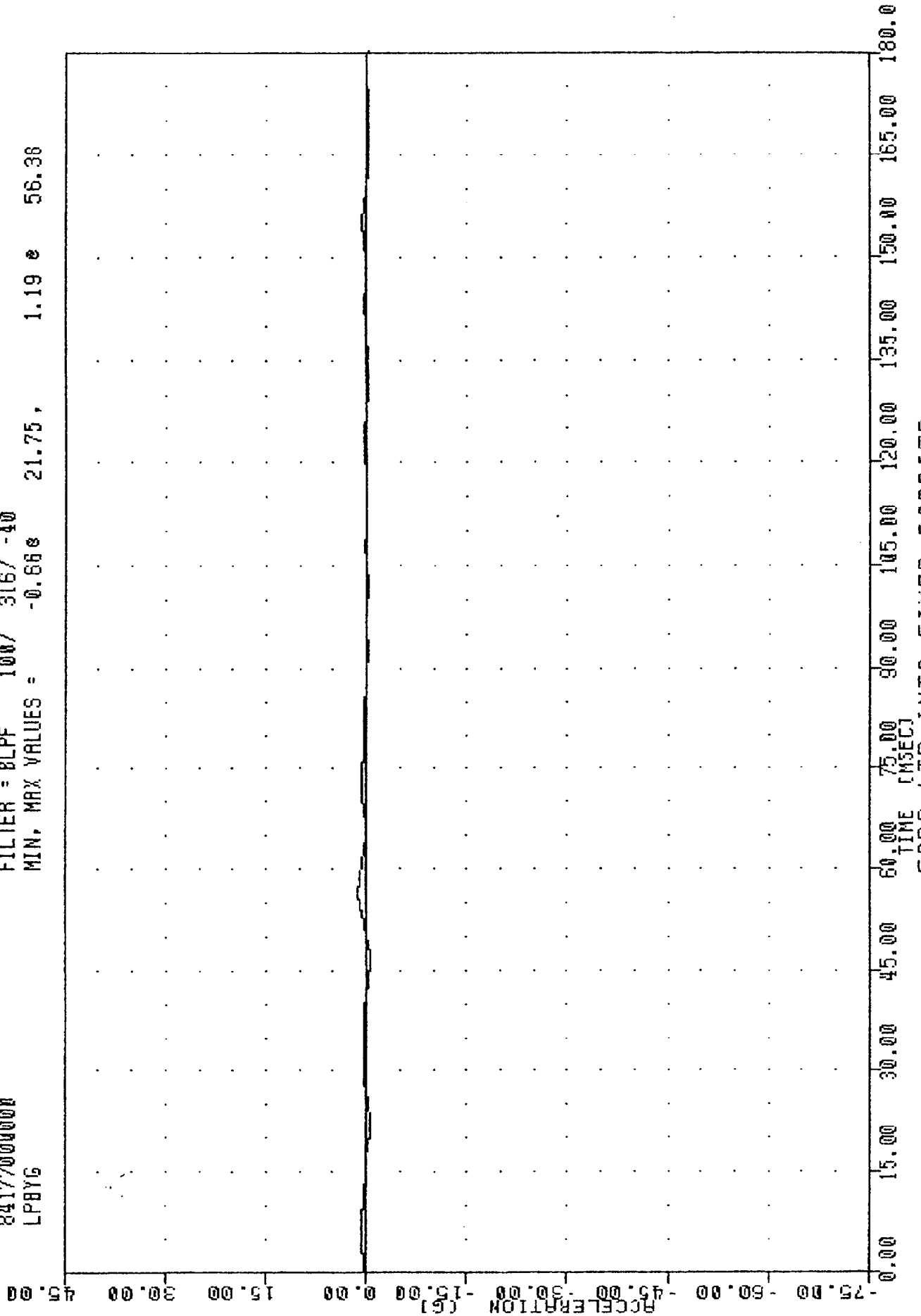
TIME (MSEC)

FORD LTD INTO FIXED BARRIER
LEFT B PILLAR ACCELERATION X AXIS

TPL
840625
BREED AIR BAG PROGRAM
84177000000
LPBYG

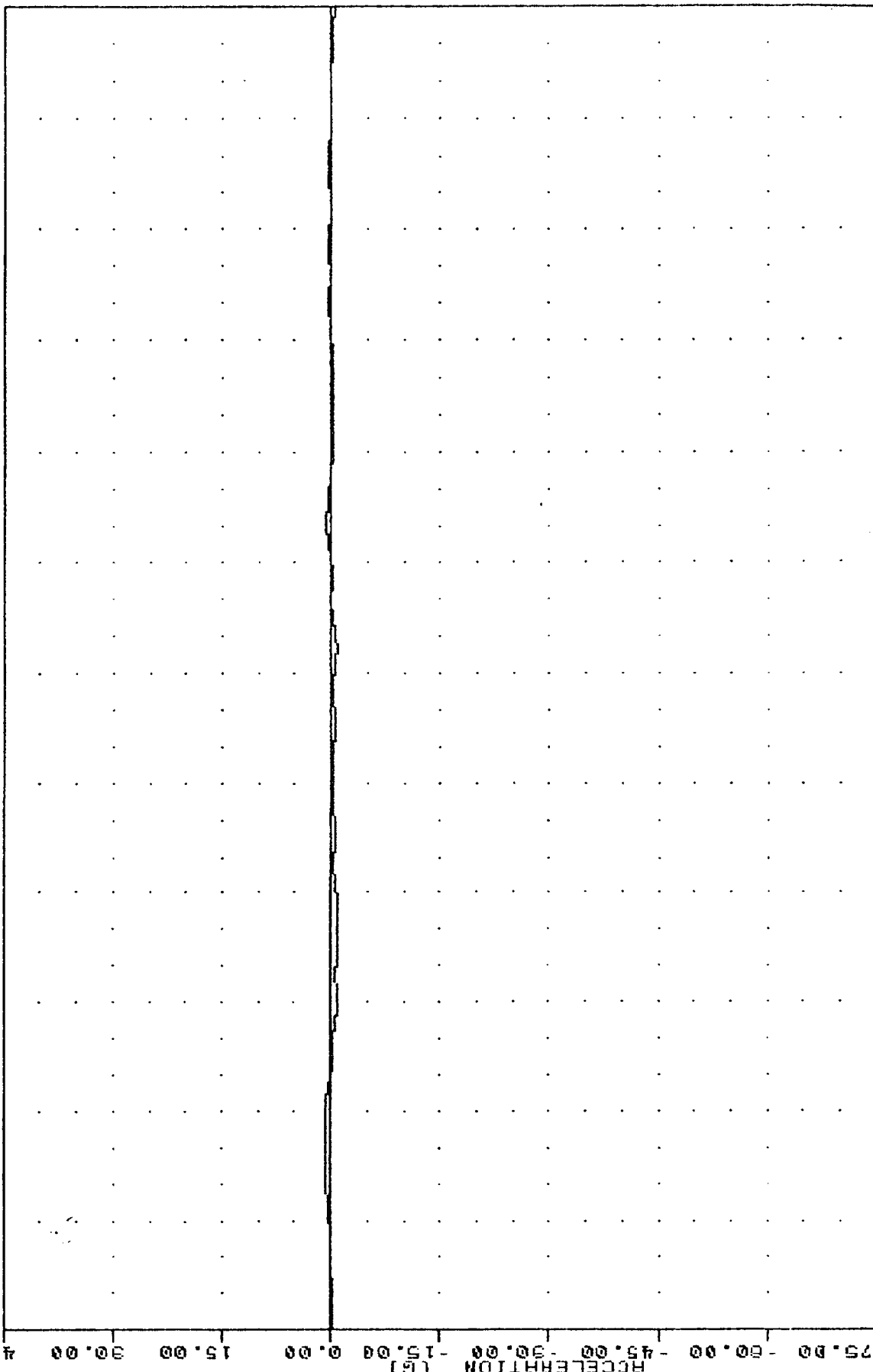
PLOT DATE 17-AUG-84 14:16:17

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -0.66e 1.19e 56.38



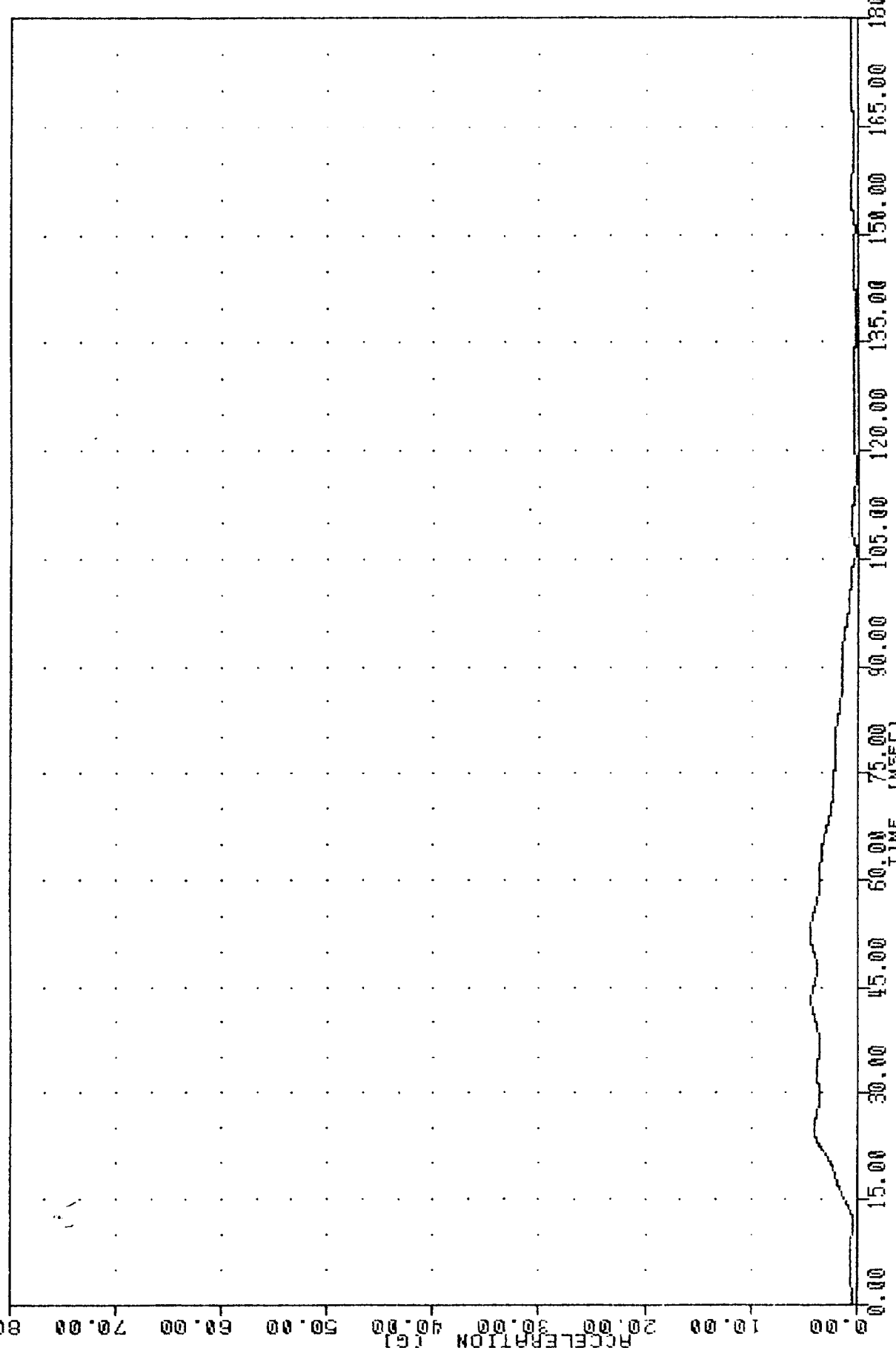
FORD LTD INTO FIXED BARRIER
LEFT B PILLAR ACCELERATION Y AXIS

THC
 BREED AIR BAG PROGRAM
 84177000000
 LPBZS
 840625
 17-AUG-84
 14:16:17
 FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -1.00e 54.50, 0.63 e 27.25



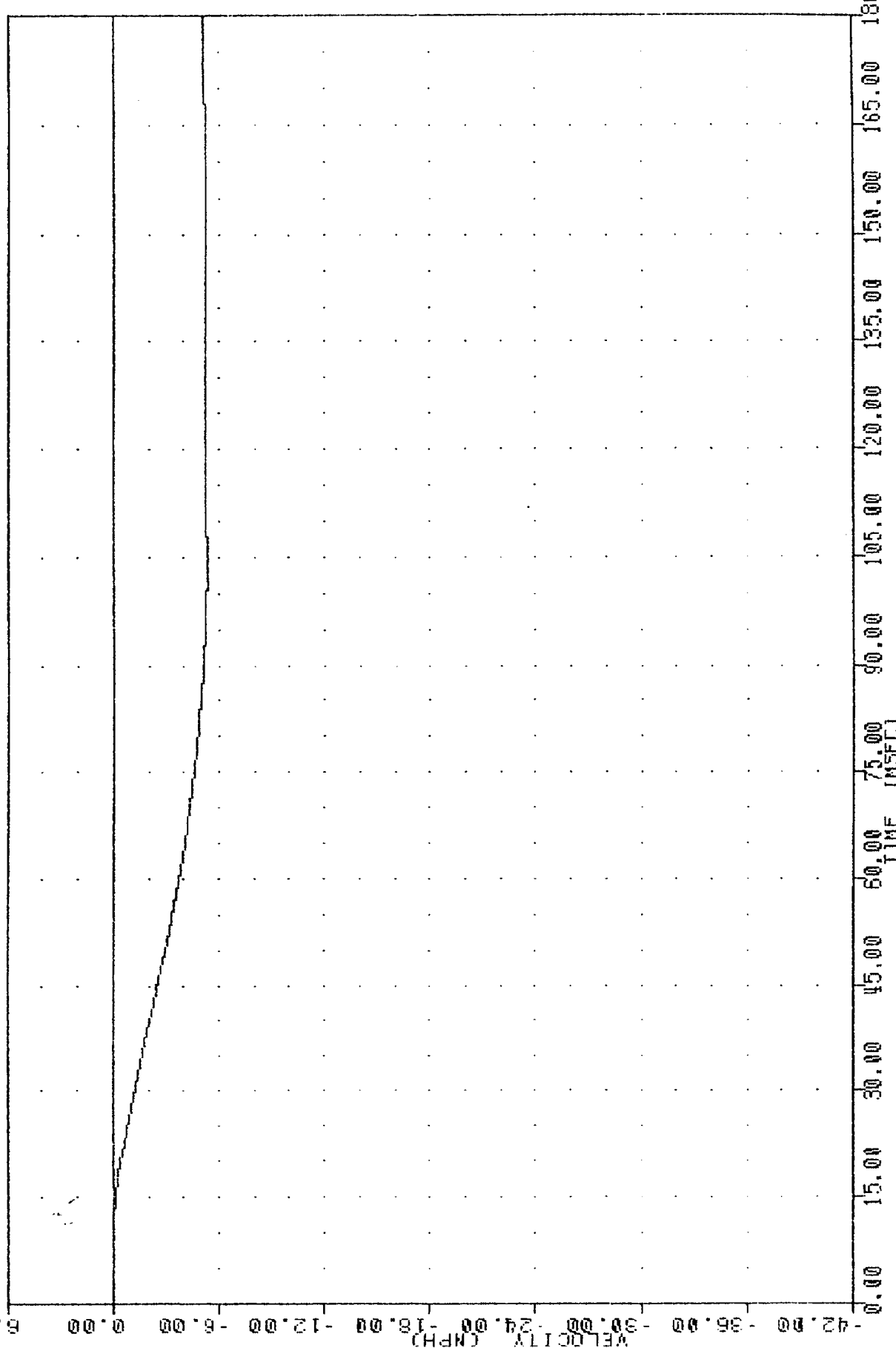
0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (MSEC)
 FORD LTD INTO FIXED BARRIER
 LEFT B PILLAR ACCELERATION Z AXIS

TRC
 84177000000
 LPBRG
 BREED AIR BAG PROGRAM
 840625
 PLOT DATE 17-AUG-84 14:16:17
 FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = 0.138 117.38, 4.45 e 52.38



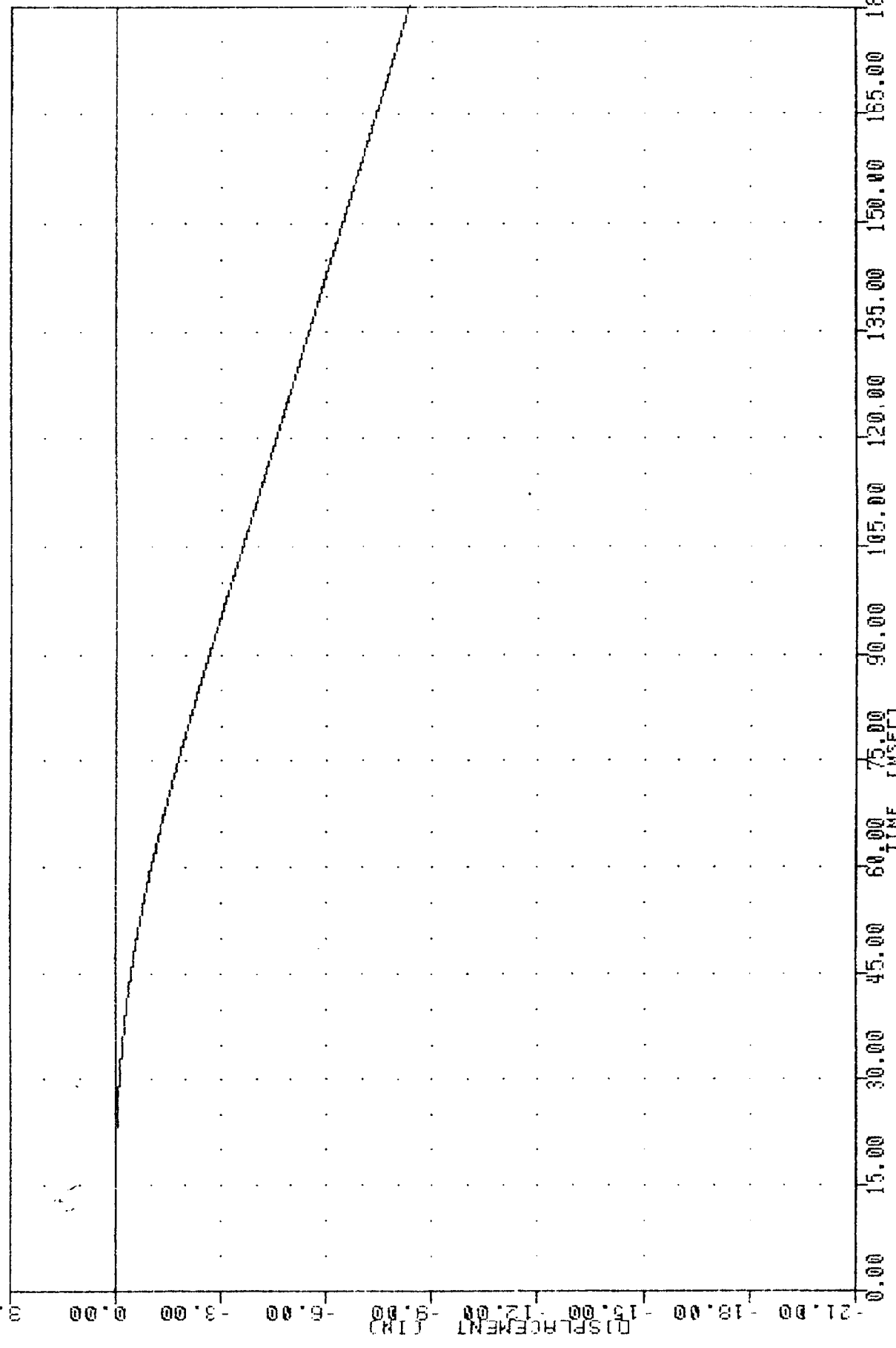
FORD LTD INTO FIXED BARRIER
 LEFT B PILLAR RESULTANT

INL 0623 17 AUG 84 14:17:30
 BREED AIR BAG PROGRAM
 0417700000
 LPBXV
 FILTER = BLPF 300/ 949/ -40
 MIN, MAX VALUES = -5.33e 102.88, 0.00 e 7.63



FORD LTD INTO FIXED BARRIER
 DELTA V USING LPBXG

TRC 840625 PLOT DATE 17-AUG-84 14:17:35
 BREED AIR BAG PROGRAM
 84177000000
 LPBXD
 FILTER = BLPF 300/ 949/ -40
 MIN. MAX VALUES = -8.33e 180.00 0.00 e 0.00

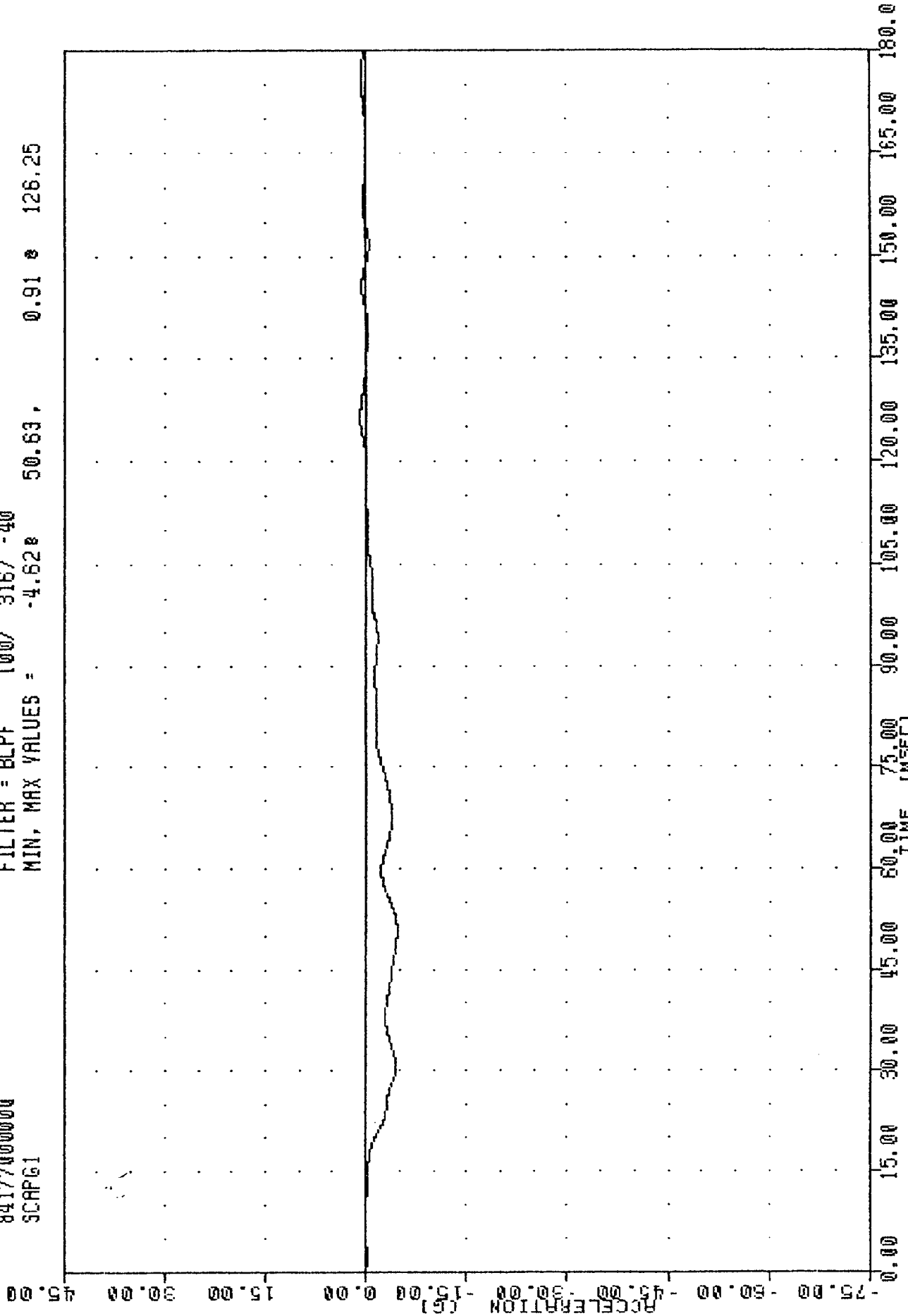


FORD LTD INTO FIXED BARRIER
 DELTA X USING LPBXV

TRC
8410625
BREED AIR BAG PROGRAM
8417700000
SCAPG1

PLOT DATE 17-AUG-84 14:16:17

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -4.62e 50.63, 0.91 e 126.25



FORD LTD INTO FIXED BARRIER
STEERING COLUMN ACCELERATION LOWER POSTERIOR

TAC
840625
BREED AIR BAG PROGRAM
8417700000
SCALE1

PLOT DATE 17-AUG-84 14:16:17

FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = -0.79e 40.75, 1.31 e 62.00

45.00

30.00

15.00

0.00

-15.00

-30.00

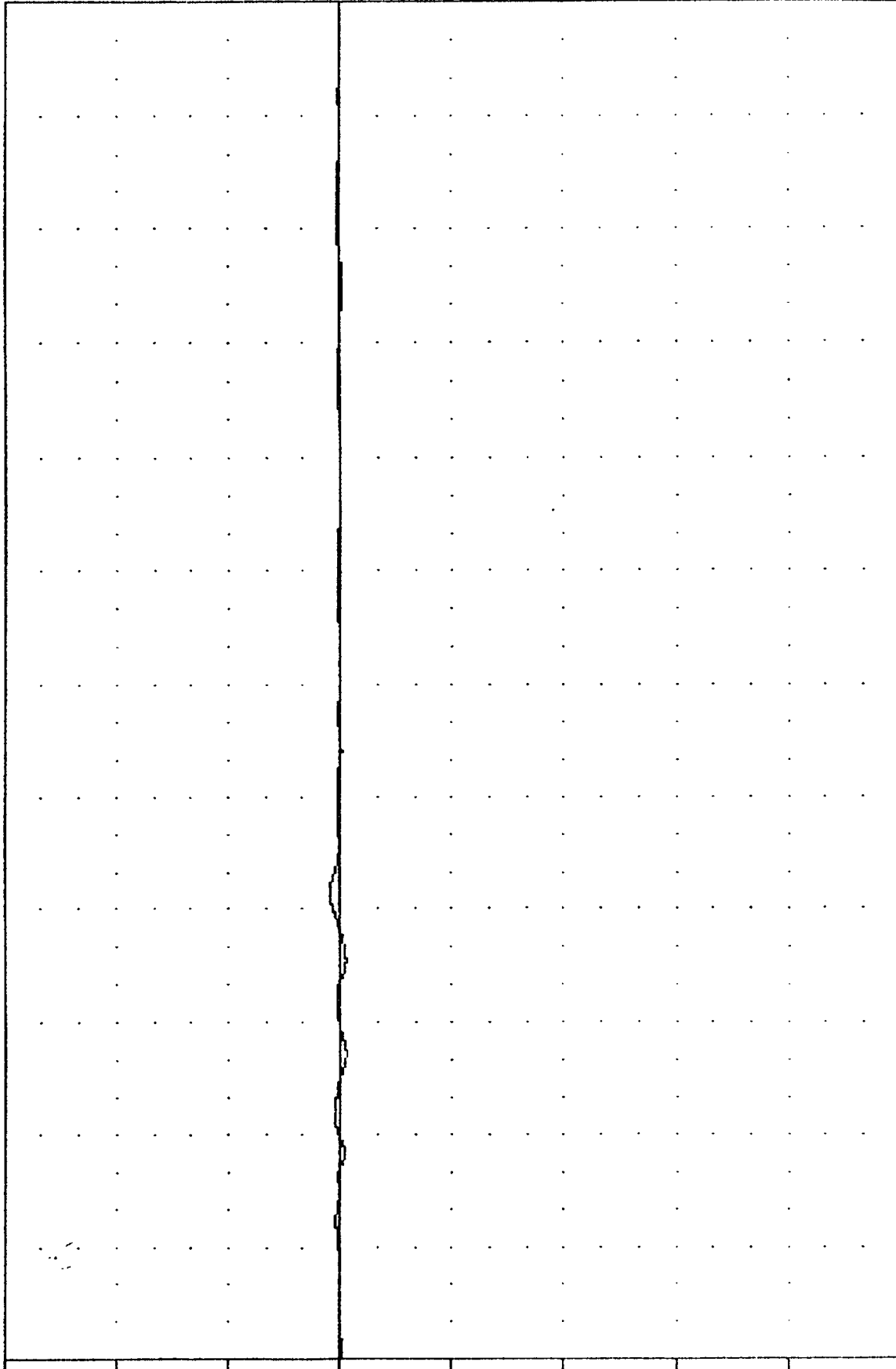
-45.00

-60.00

-75.00

6-3

ACCELERATION [G]



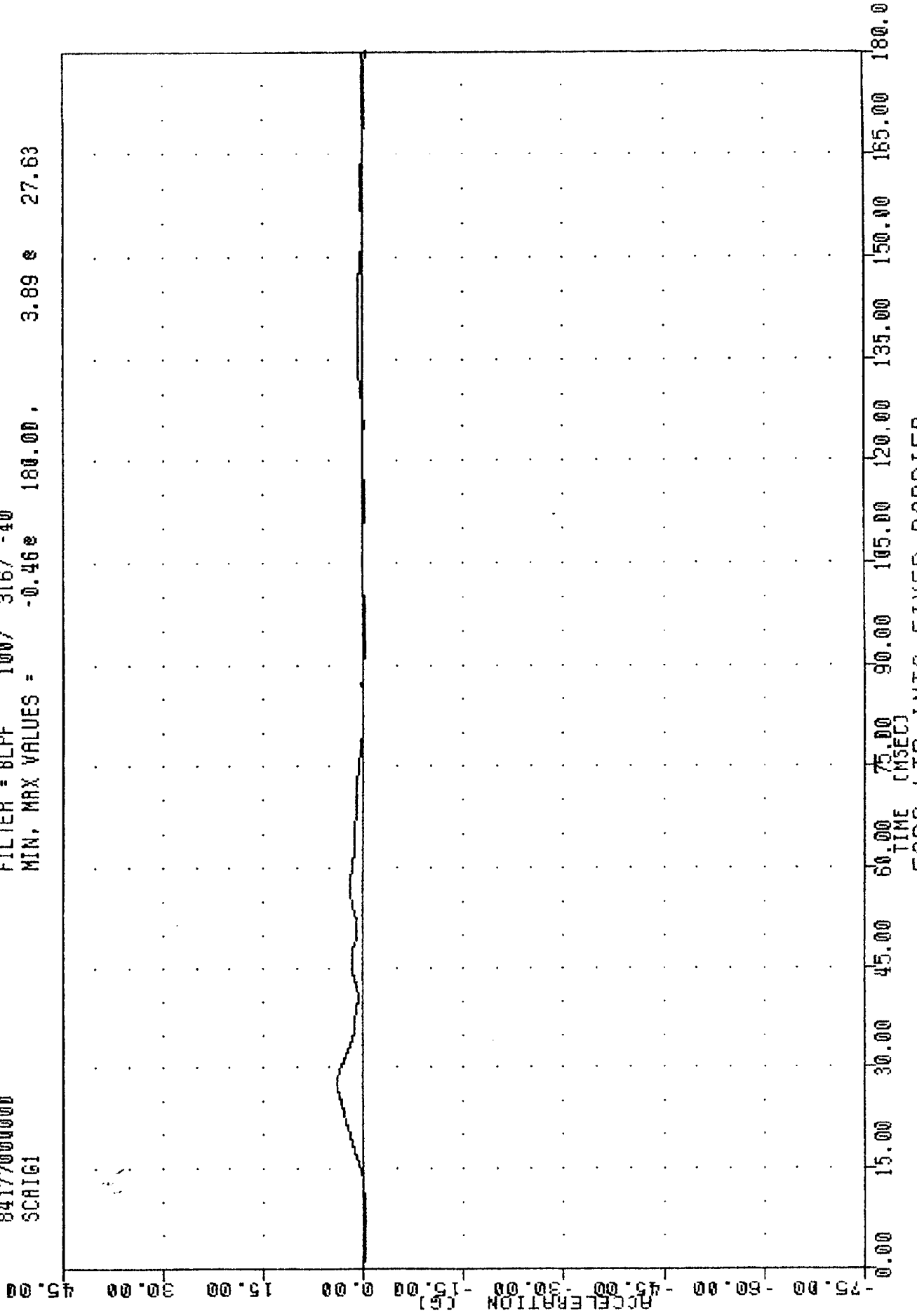
0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00

FORD LTD INTO FIXED BARRIER
STEERING COLUMN ACCELERATION LOWER LATERAL

TRC 840625 17-AUG-84 14:16:17

BREED AIR BAG PROGRAM
8417700000
SCAIG1

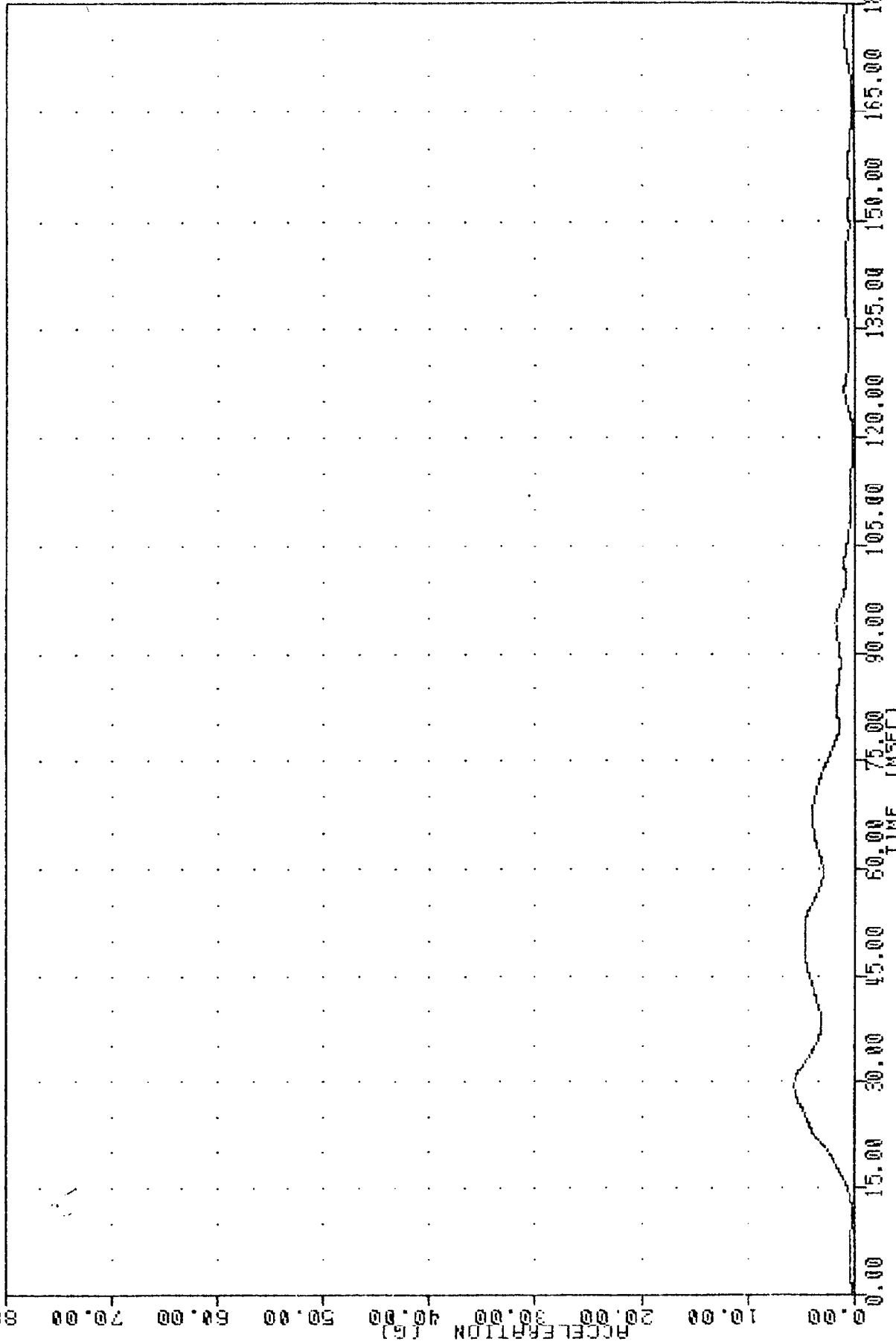
FILTER = 8LPF 100/ 316/ -40
MIN, MAX VALUES = -0.46e 180.00, 3.89 e 27.63



FORD LTD INTO FIXED BARRIER
STEERING COLUMN ACCELERATION LOWER INFERIOR

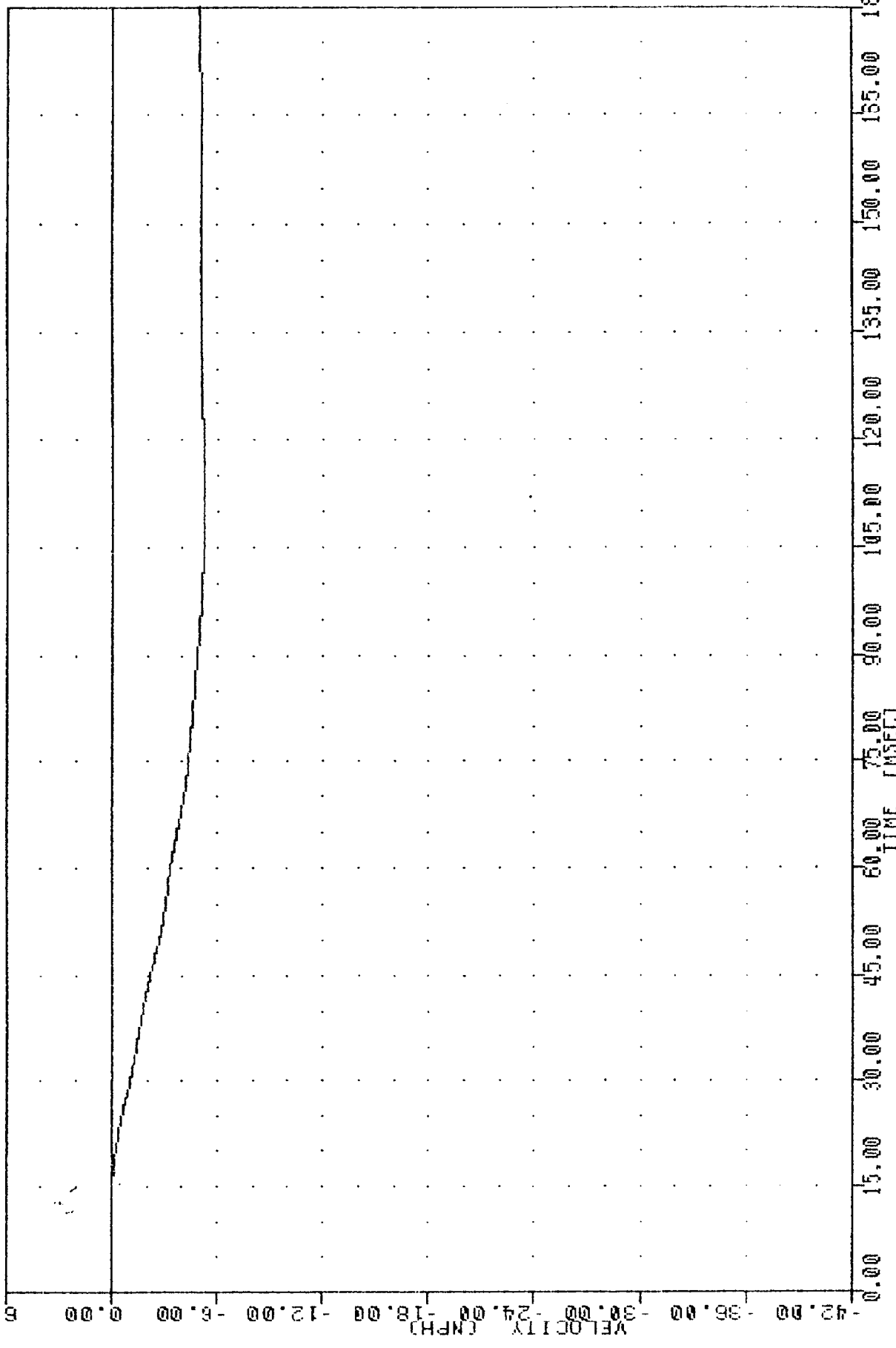
TRC 840625 20-HUG-84 15:34:48
BREED AIR BAG PROGRAM
8417700000
SCARG1

FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = 0.08g 118.00, 5.61g 29.38



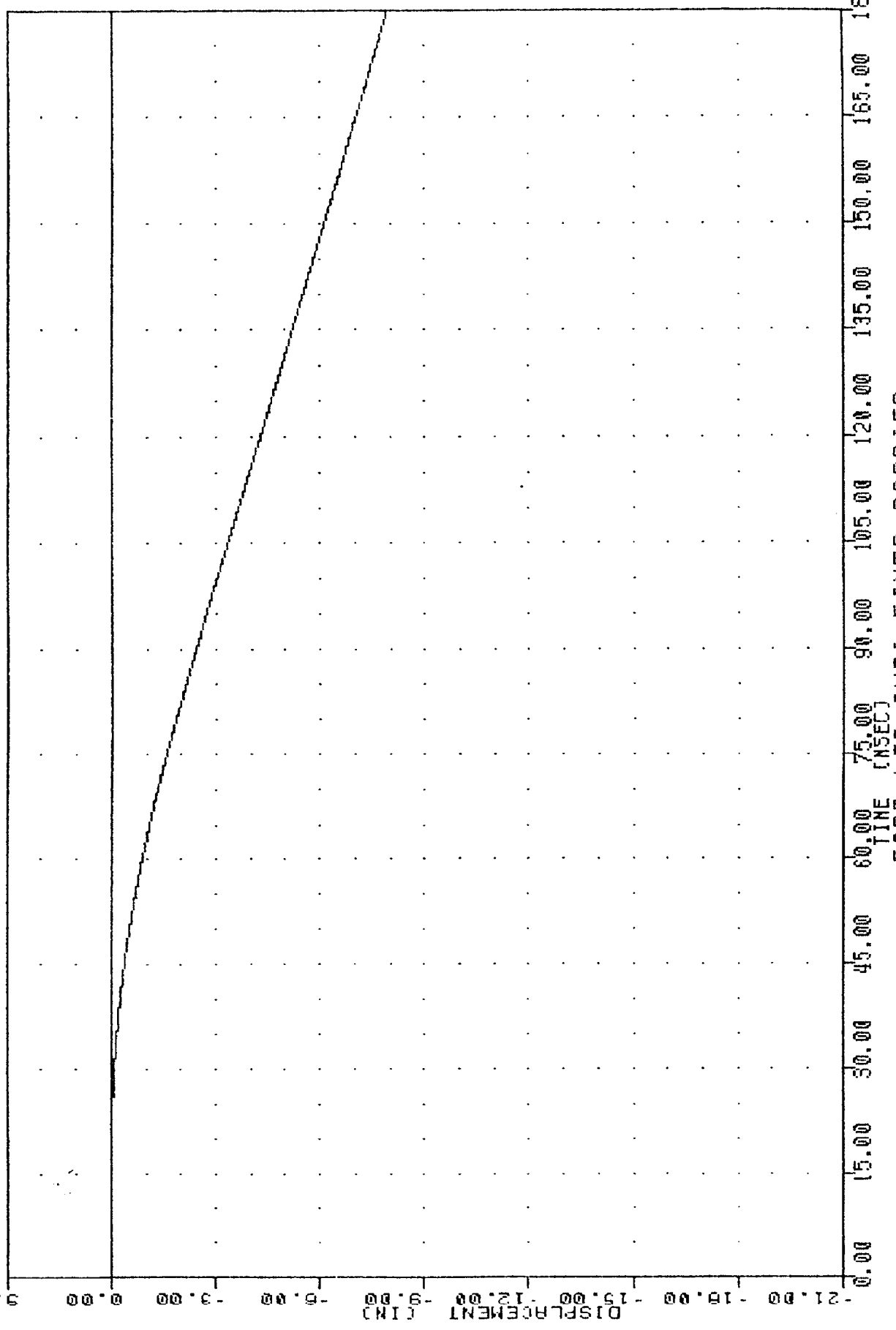
FORD LTD INTO FIXED BARRIER
LOWER STEERING COLUMN RESULTANT

PLOT DATE 17-AUG-84 14:17:35
 BREED AIR BAG PROGRAM
 84177000000
 SCRPV1
 FILTER = 8LPF 30N/ 949/ -40
 MIN, MAX VALUES = -5.24e 109.88, -0.01 e 7.75



FORD LTD INTO FIXED BARRIER
 DELTA V USING SCRPV1

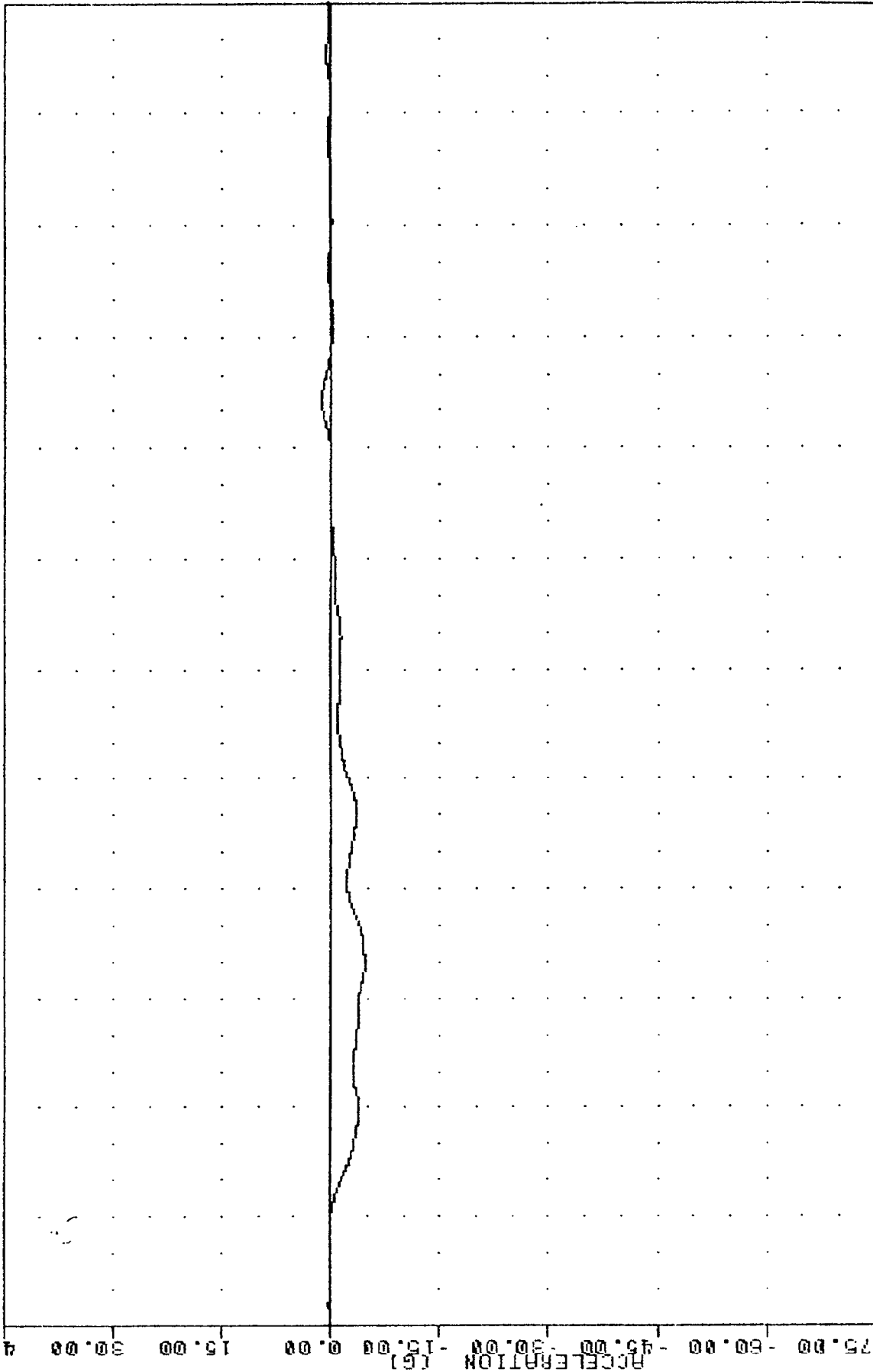
THE [REDACTED] 0620 [REDACTED] 17-AUG-84 [REDACTED] 14:17:35
 BREED AIR BAG PROGRAM
 84177000000
 SCAP01
 FILTER = BLPF 300/ 849/ -40
 MIN. MAX VALUES = -7.95e 180.00 0.00 e 0.00



FORD LTD INTO FIXED BARRIER
 DELTA X USING SCAPV1

TRC 840625 17-AUG-84 14:16:17
 BREED AIR BAG PROGRAM
 8417700000
 SCAPG2

FILTER = BLPF 10N/ 316/ -40
 MIN. MAX VALUES = -4.64e 49.50, 1.30 e 126.25



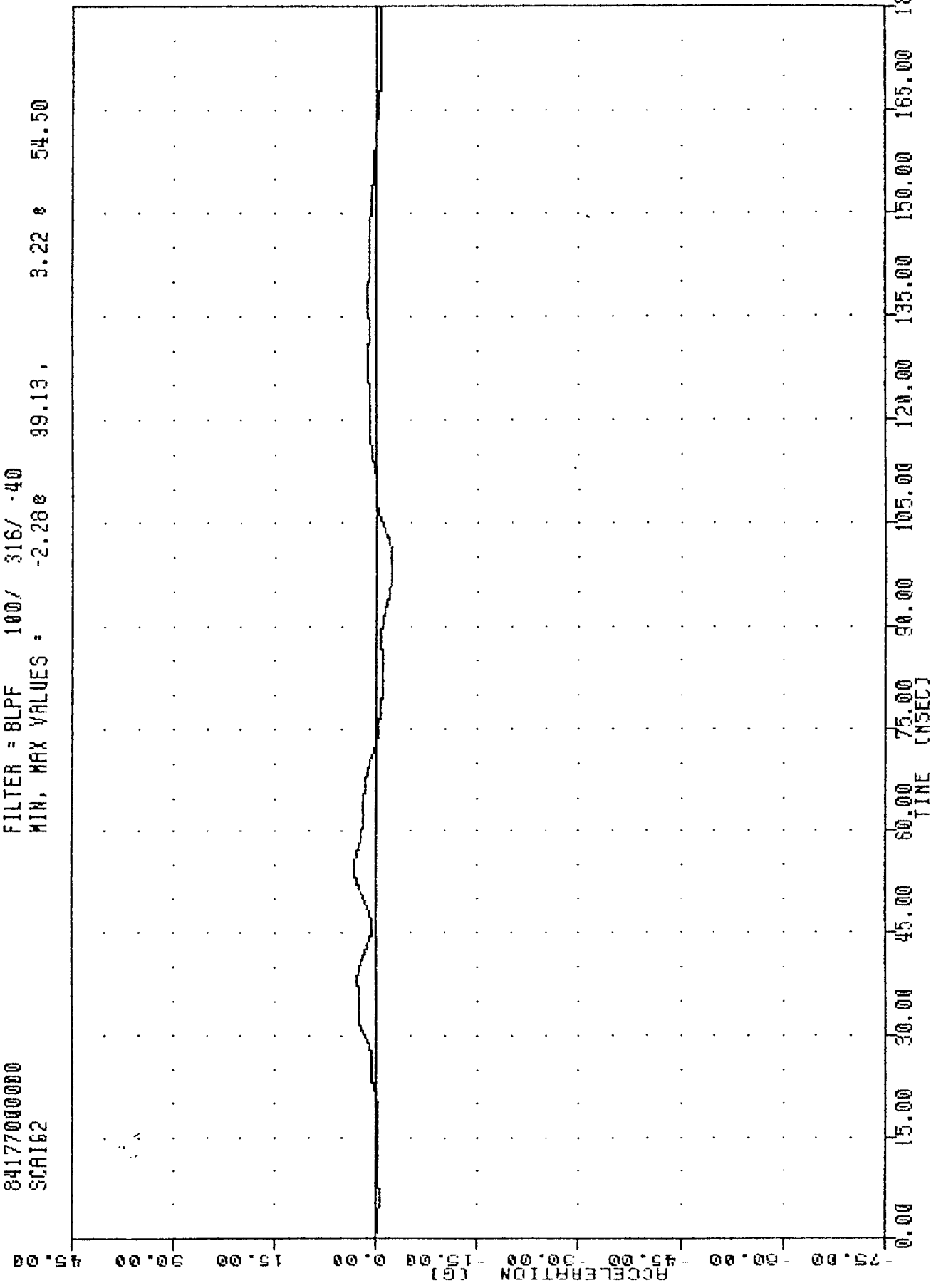
ACCELERATION (G) 45.00 30.00 15.00 0.00 -15.00 -30.00 -45.00 -60.00 -75.00

TIME (MSEC) 0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00

FORD LTD INTO FIXED BARRIER
 STEERING COLUMN ACCELERATION UPPER POSTERIOR

THE [REDACTED] 040623 [REDACTED] 17 AUG 84 [REDACTED] 14:16:17
 BREED AIR BAG PROGRAM
 8417700000
 SCRI62

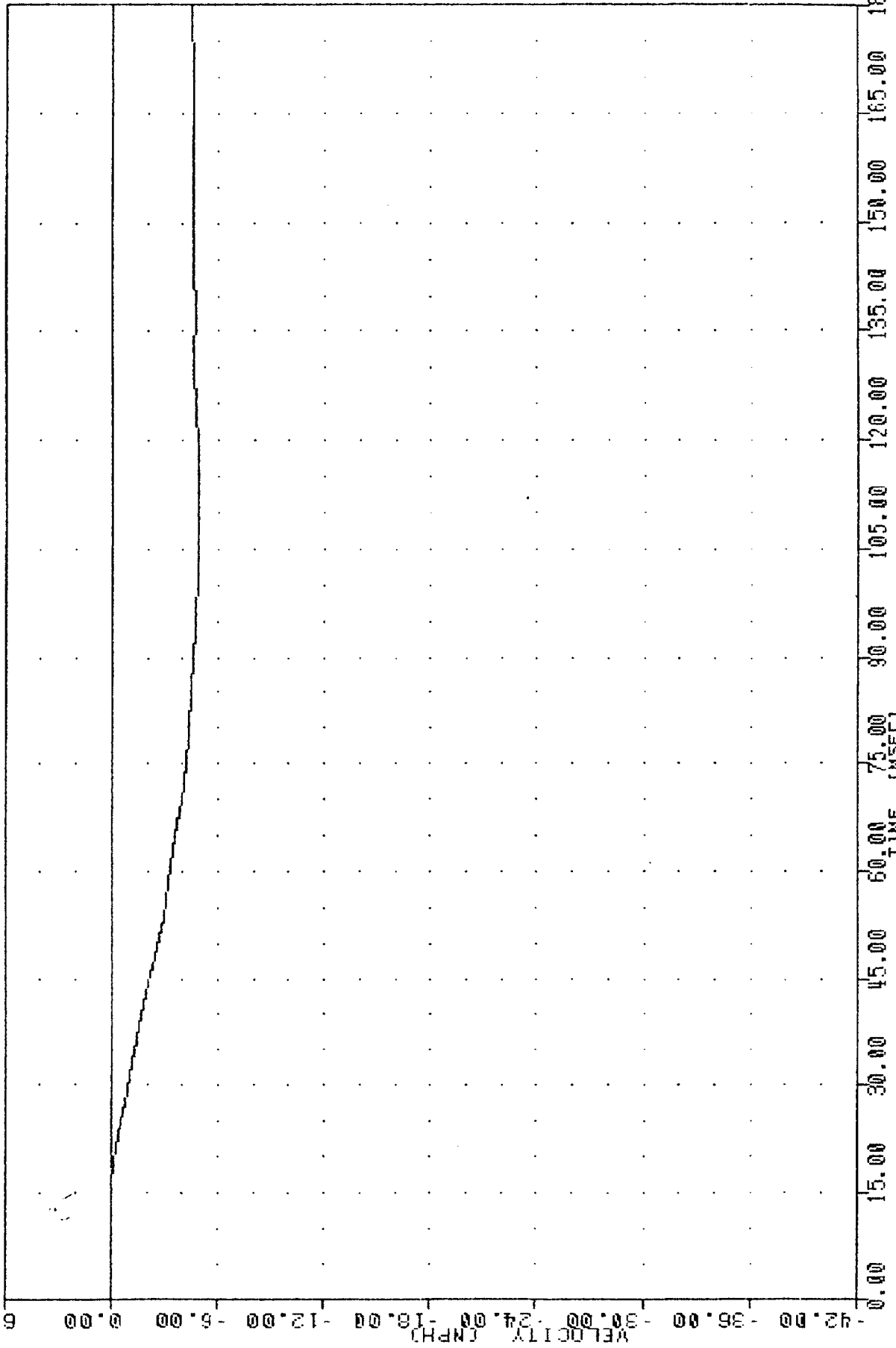
FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES : -2.28e 99.13 , 3.22 e 54.50



51-C

FORD LTD INTO FIXED BARRIER
 STEERING COLUMN ACCELERATION UPPER INFERIOR

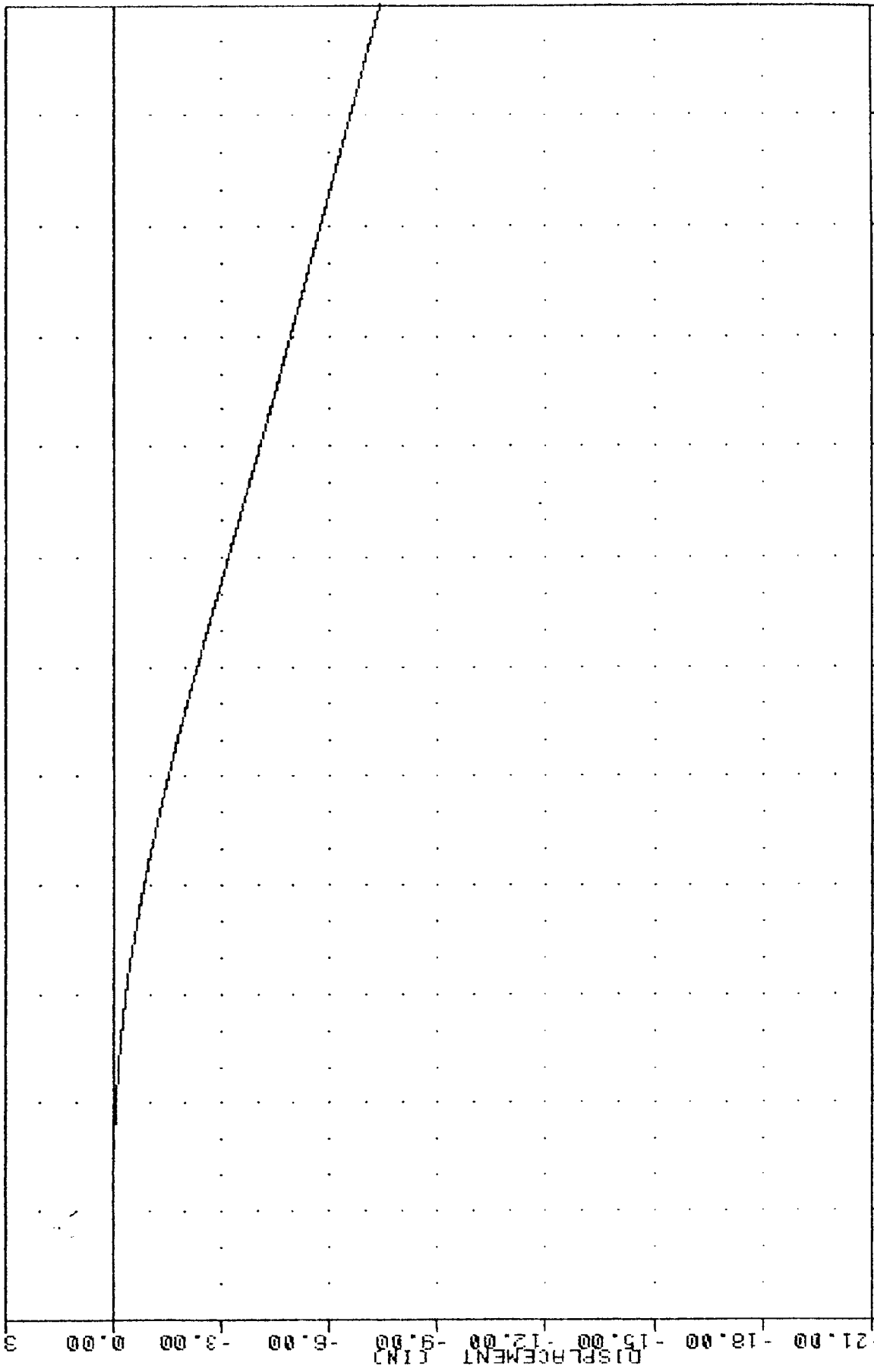
TRC ██████████ PLOT DATE 17-AUG-84 14:17:35
 BREED AIR BAG PROGRAM
 84177000000
 SCAPV2
 FILTER = BLPF 300/ 949/ -40
 MIN. MAX VALUES = -4.88E 107.88, 0.00 e 2.75



FORD LTD INTO FIXED BARRIER
 DELTA V USING SCAPG2

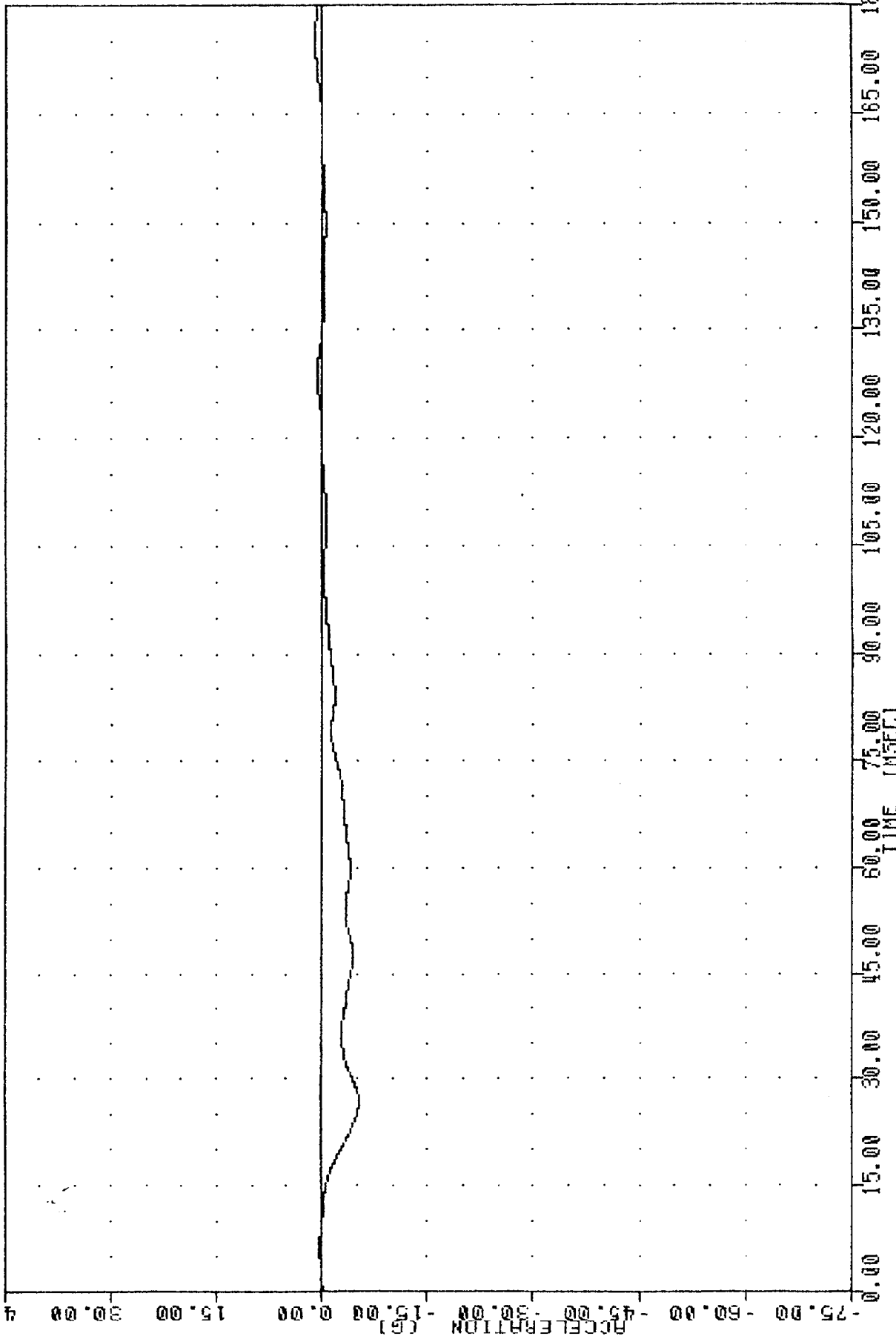
INC 7040623 PLOT DATE 17 AUG 69 14:17:50
 BREED AIR BAG PROGRAM
 8417000000
 SCAPD2

FILTER = BLPF 300 / 949 / -40
 MIN, MAX VALUES = -7.418 180.00, 0.00 & 0.00



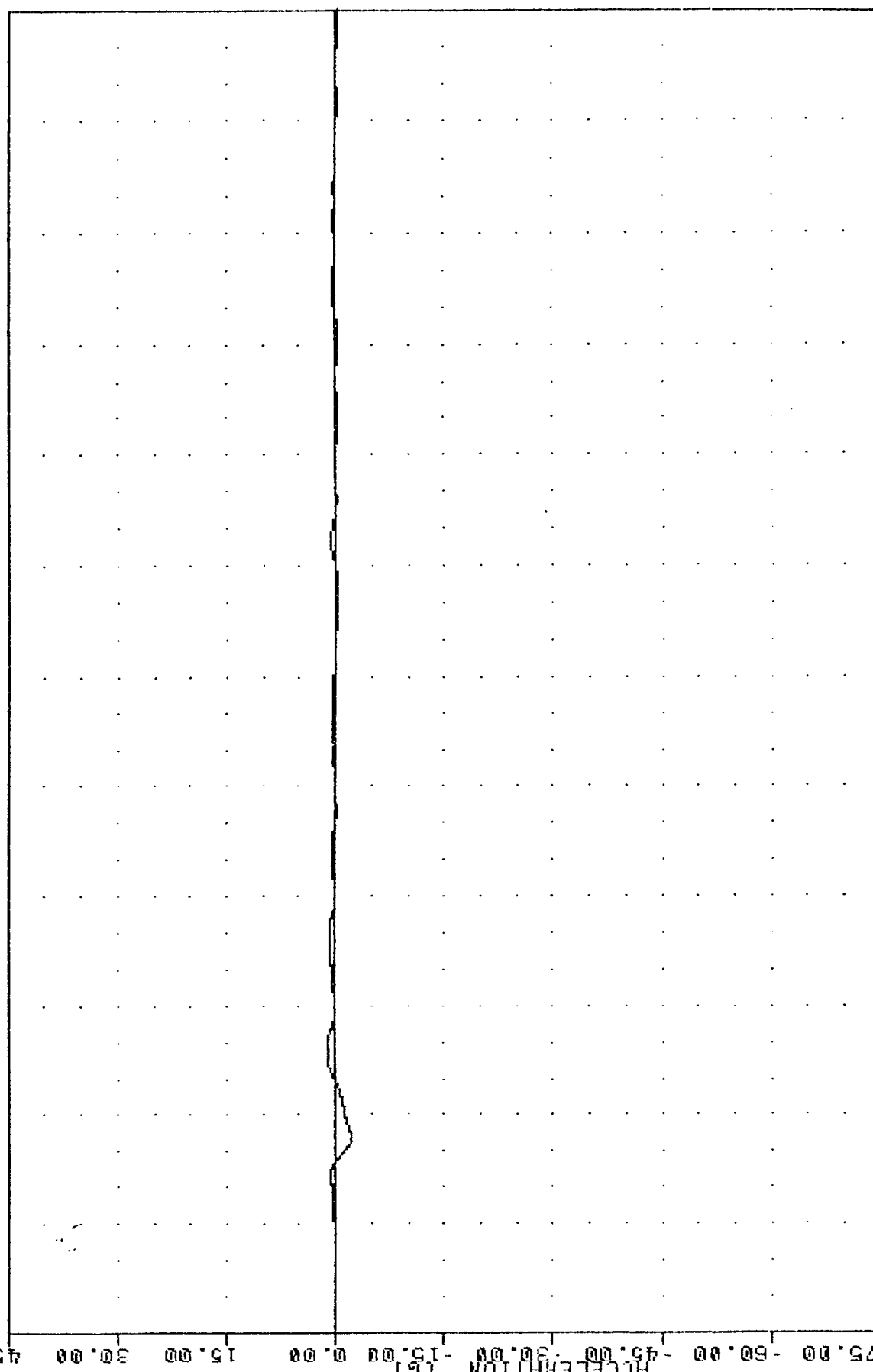
0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (MSECS)
 FORD LTD INTO FIXED BARRIER
 DELTA X USING SCAPV2

TRC 840625 PLOT DATE 17-AUG-84 14:16:17
 BREED AIR BAG PROGRAM
 84177000000
 FILXG
 FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -5.32e 26.75. 1.02 e 175.25



FORD LTD INTO FIXED BARRIER
 LEFT FENDER WELL INNER ACCELERATION X AXIS

TRC
 BREED AIR BAG PROGRAM
 84177000000
 FILYG
 840625
 PLUT DATE 17-AUG-84 14:16:17
 FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -2.22e 26.75, 1.11 e 39.13

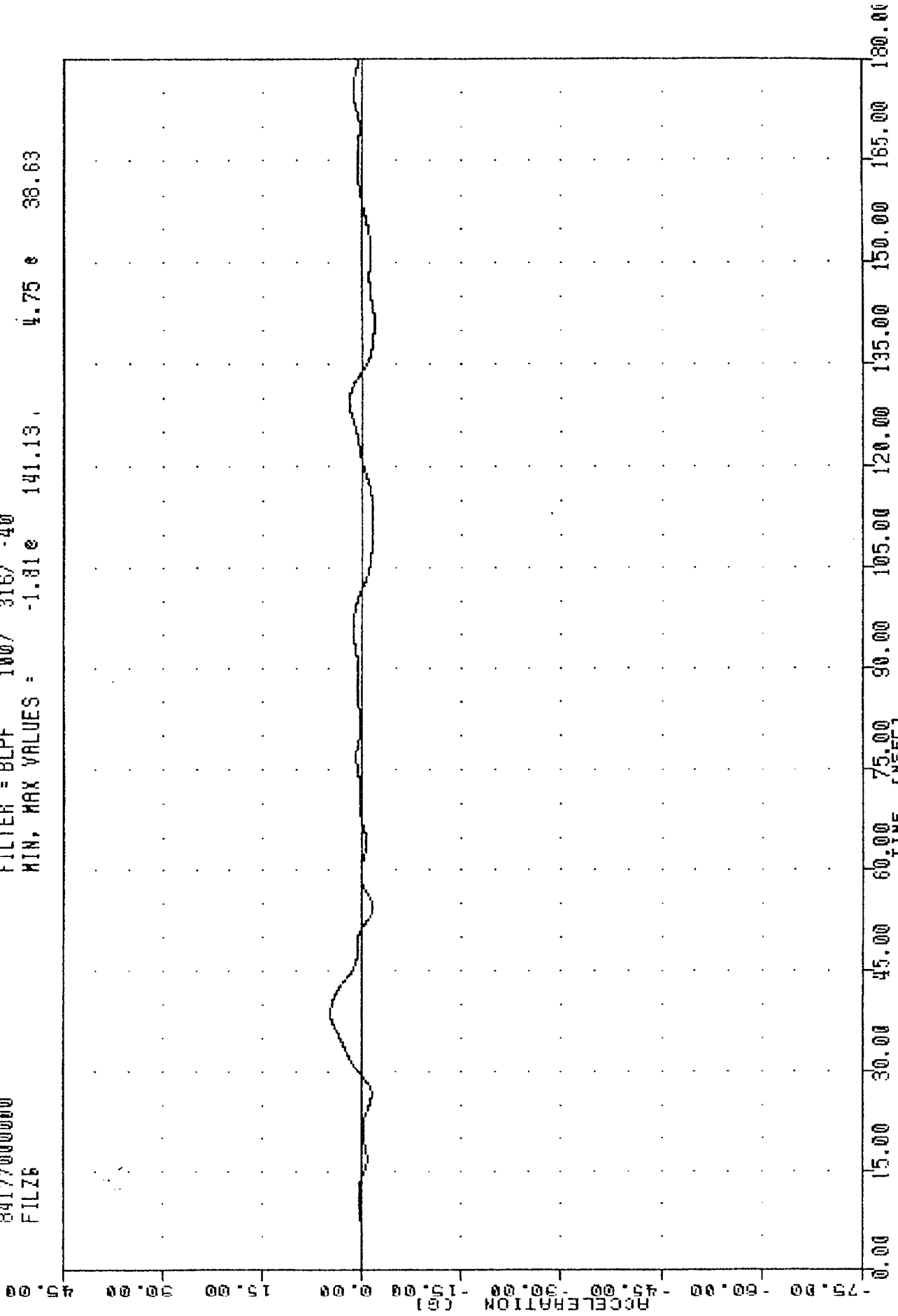


0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (MSEC)
 ACCELERATION (G)
 FORD LTD INTO FIXED BARRIER
 LEFT FENDER WELL INNER ACCELERATION Y AXIS

TRC
840625
BREED AIR BAG PROGRAM
84177000000
FILZE

PLOT DATE 17-AUG-84 14:16:17

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -1.81e 141.13, 4.75 e 38.63

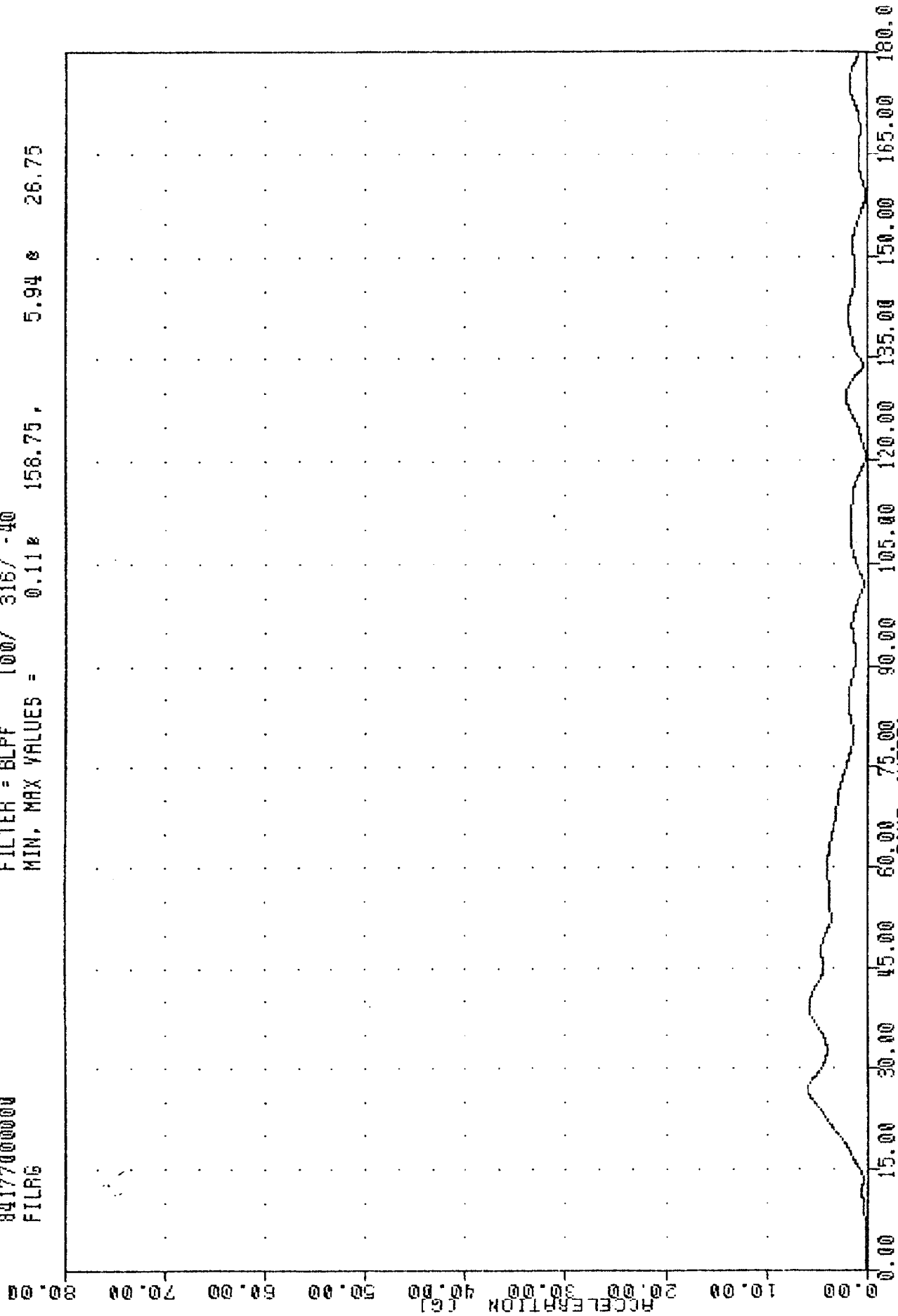


FORD LTD INTO FIXED BARRIER
LEFT FENDER WELL INNER ACCELERATION Z AXIS

TRC
BREED AIR BAG PROGRAM
84177000000
FILRG

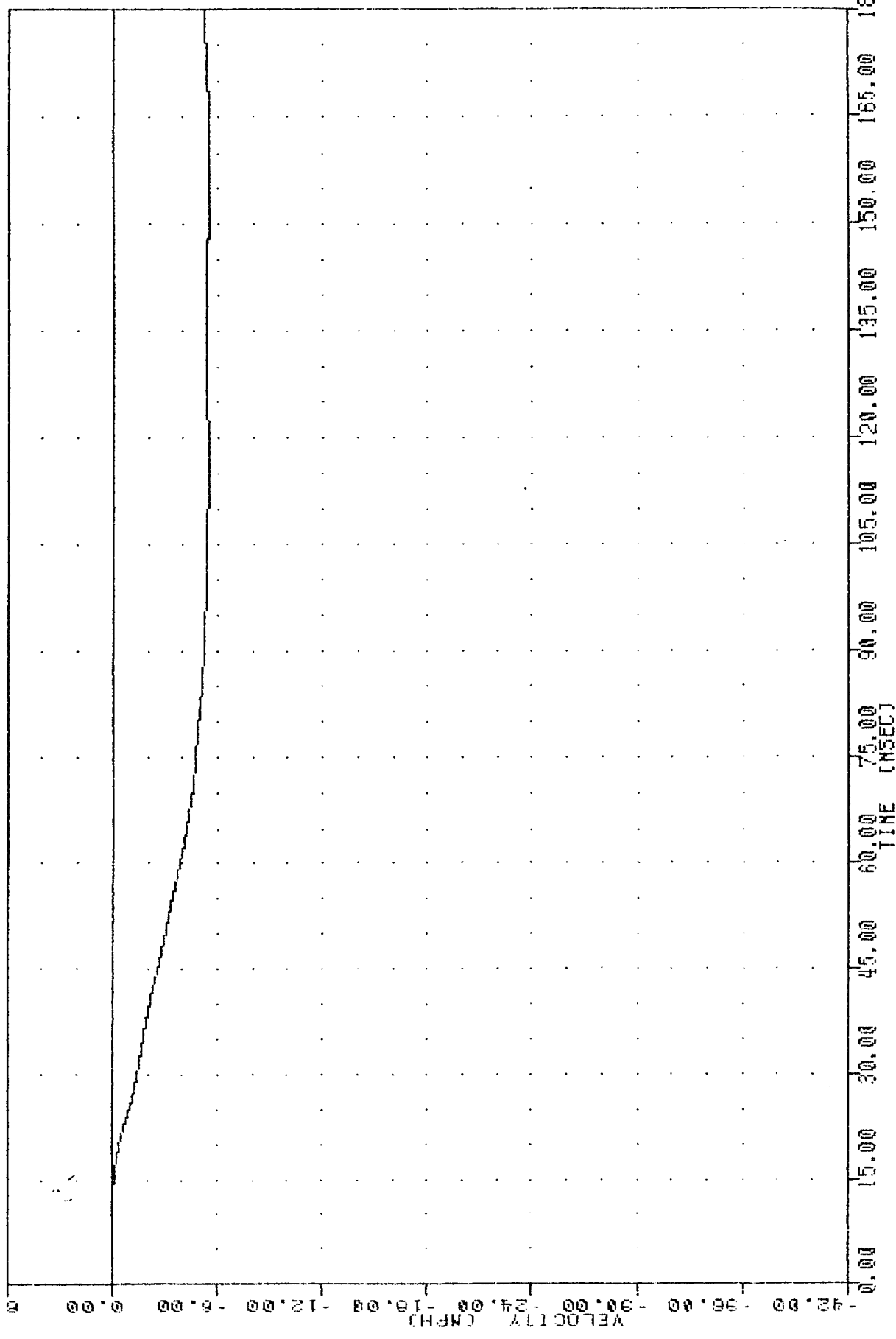
PLOT DATE 17-AUG-84 14:16:17

FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = 0.11# 158.75, 5.94 # 26.75



FORD LTD INTO FIXED BARRIER
LEFT FENDER WELL INNER RESULTANT

TAC 840625 17-NOV-84 14:17:39
 BREED AIR BAG PROGRAM
 84177000000
 FILXY
 FILTER = BLPF 300/ 949/ -40
 MIN, MAX VALUES = -5.49e 161.00, -0.01 e 7.25



FORD LTD INTO FIXED BARRIER
 DELTA W USING FILXG

TRC 840625 17-AUG-84 14:17:35

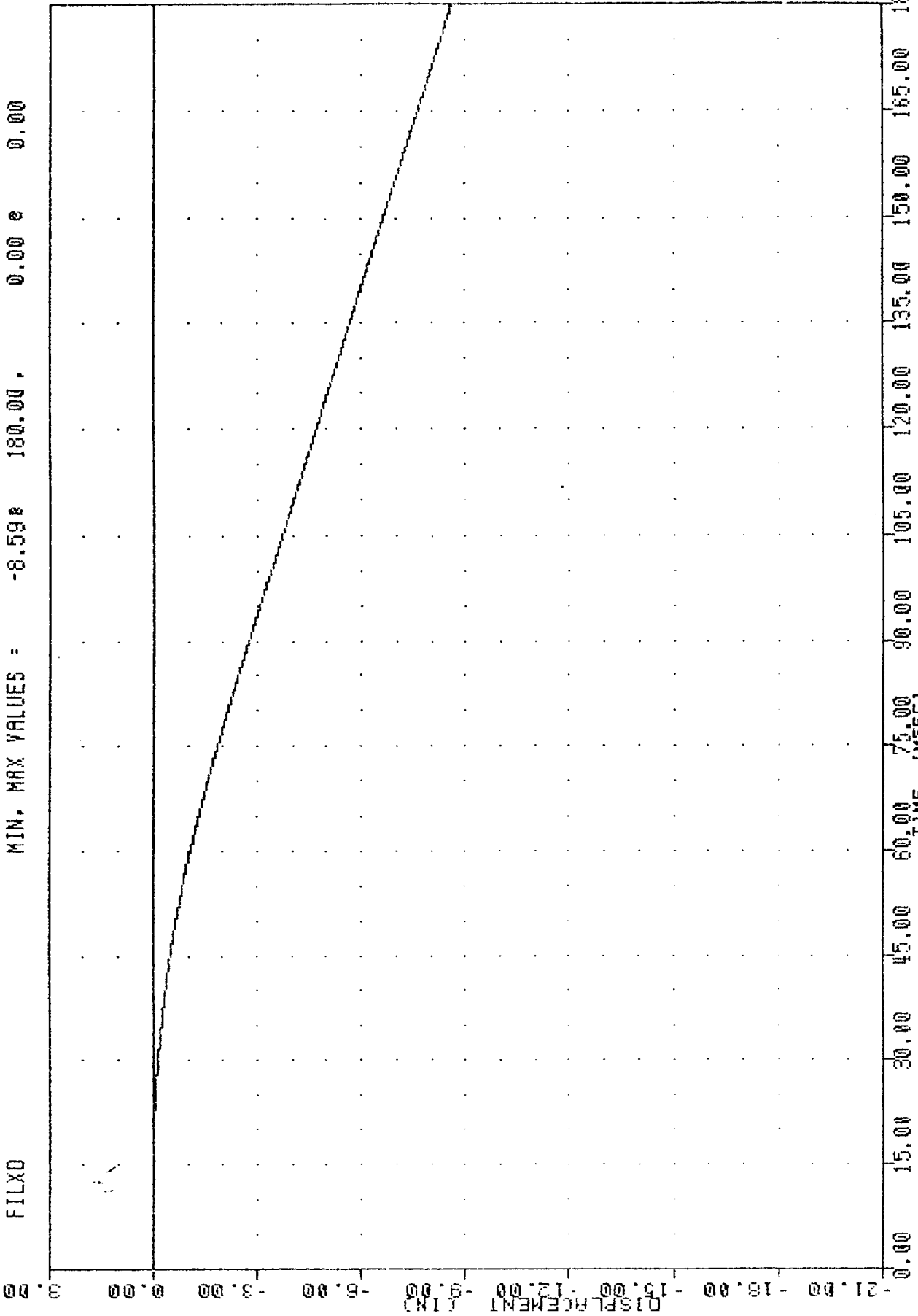
BREED AIR BAG PROGRAM

8417700000

FILXD

FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = -8.59e 180.00, 0.00 e 0.00

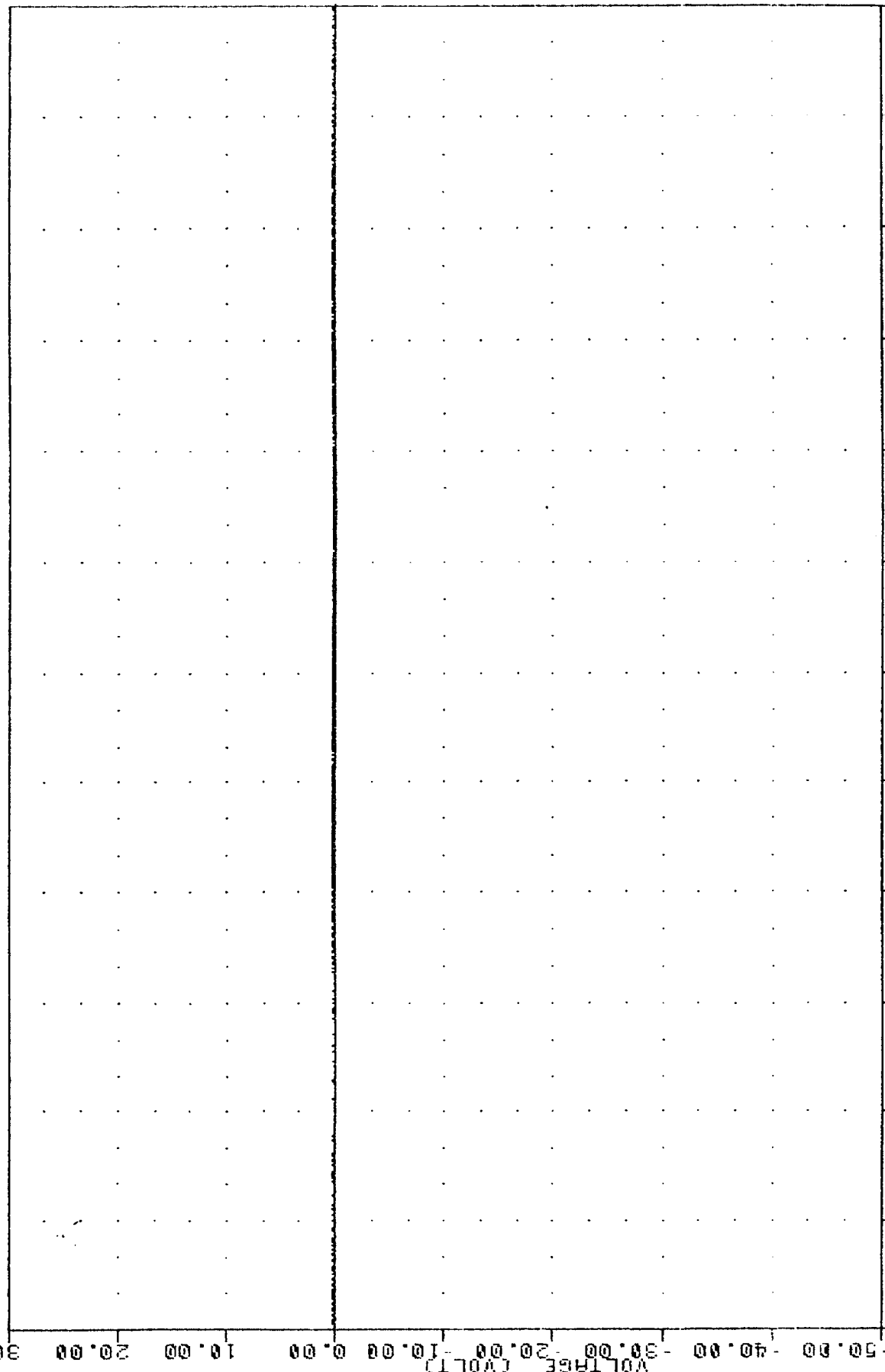


FORD LTD INTO FIXED BARRIER
DELTA X USING FILXY

TRC 840625 17-AUG-84 14:16:17

BREED AIR BAG PROGRAM
8417700000
ABT1

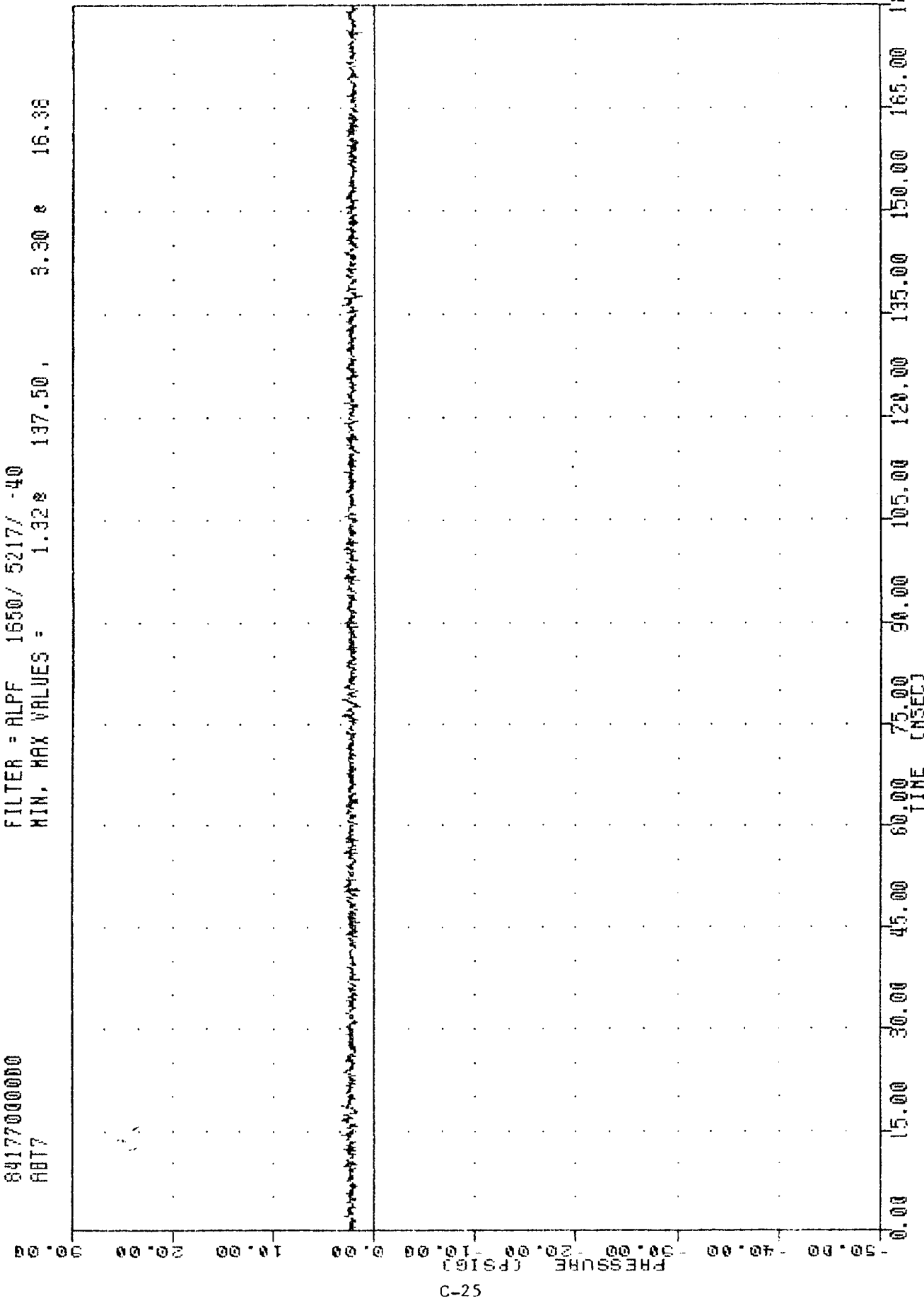
FILTER = ALPF 1650 / 5217 / -40
MIN, MAX VALUES = 0.07e 174.50, 0.19e 92.25



0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00

FORD LTD INTO FIXED BARRIER
ROMEO LEFT FRONT SENSOR

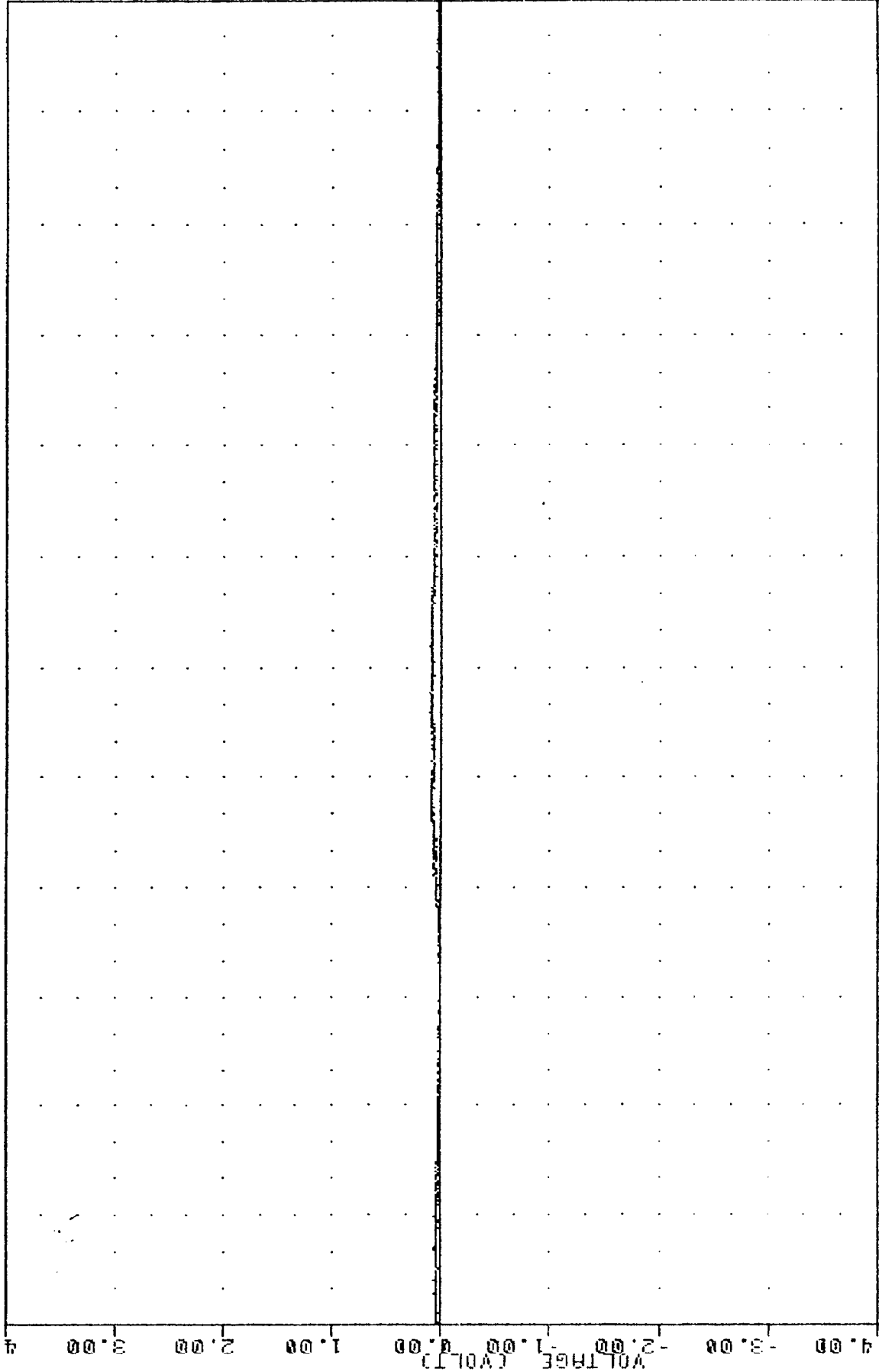
THE [REDACTED] 040620 [REDACTED] PLOT DATE 17 NOV 64 14:16:17
 BREED AIR BRG PROGRAM
 84177000000
 ABT7
 FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = 1.328 137.50 , 3.30 & 16.38



0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (MSEC)
 FORD LTD INTO FIXED BARRIER
 PRESSURE TRANSDUCER

THE [REDACTED] 040623 [REDACTED] PLOT ORAL [REDACTED] 20 JUN 68 [REDACTED] 13:34:50 [REDACTED]
 BREED AIR BAG PROGRAM
 84177000000
 ABT3

FILTER = ALPF 165V/ 5217/ -40
 MIN. MAX VALUES = 0.00e 46.38, 0.11 e 86.38



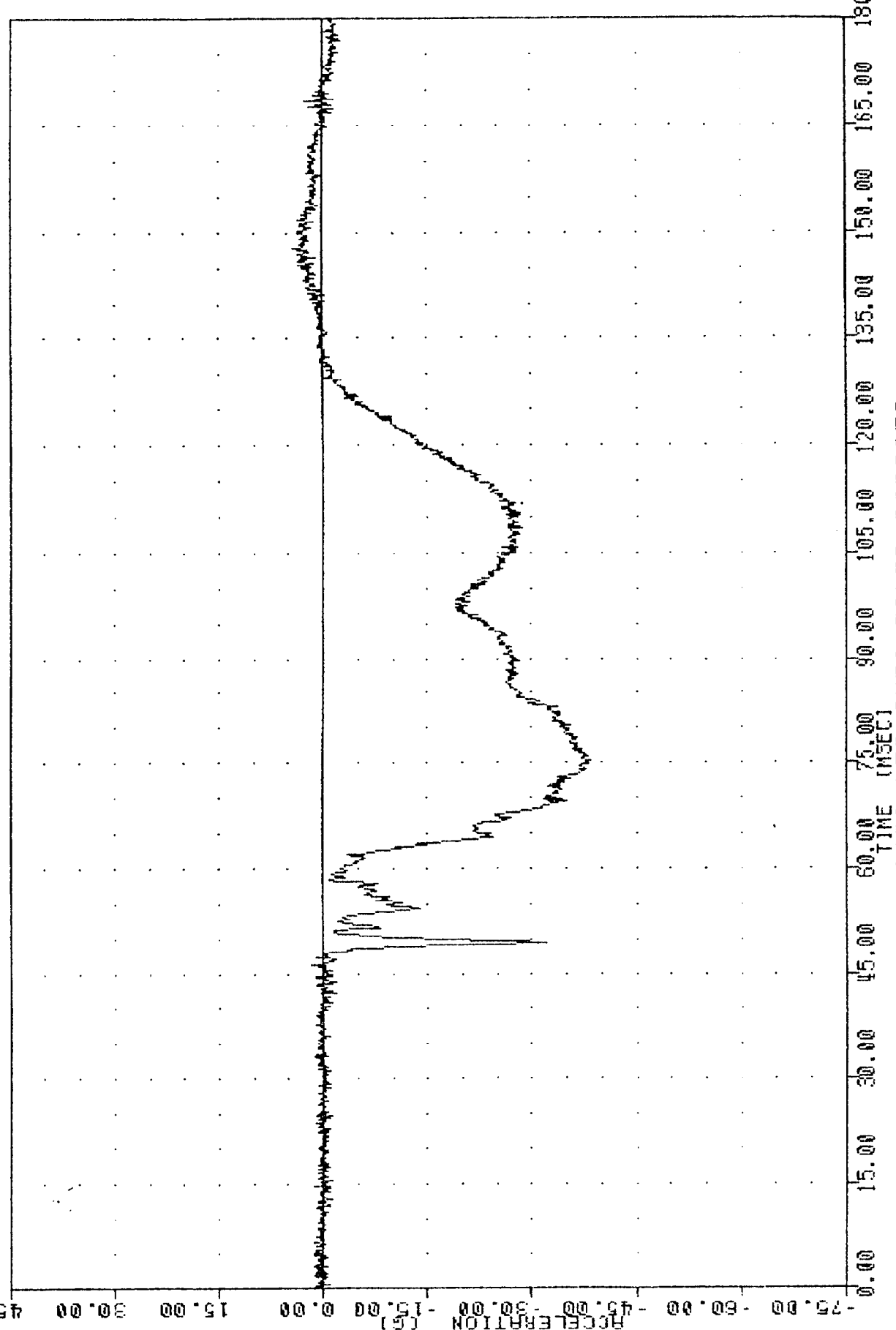
0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (MSEC)
 FORD LTD INTO FIXED BARRIER
 ACOUSTICAL SENSOR

APPENDIX D

DATA PLOT PRESENTATION - TEST 840626

Data plots generated from the crash test data are presented on the following pages. All data are recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data were filtered according to SAE J211.

TRC
 BREED AIR BAG PROGRAM
 0417800000
 HEXG1
 840626
 20-HUG-84
 15:38:22
 FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = -38.42g 75.13, 4.04g 147.63

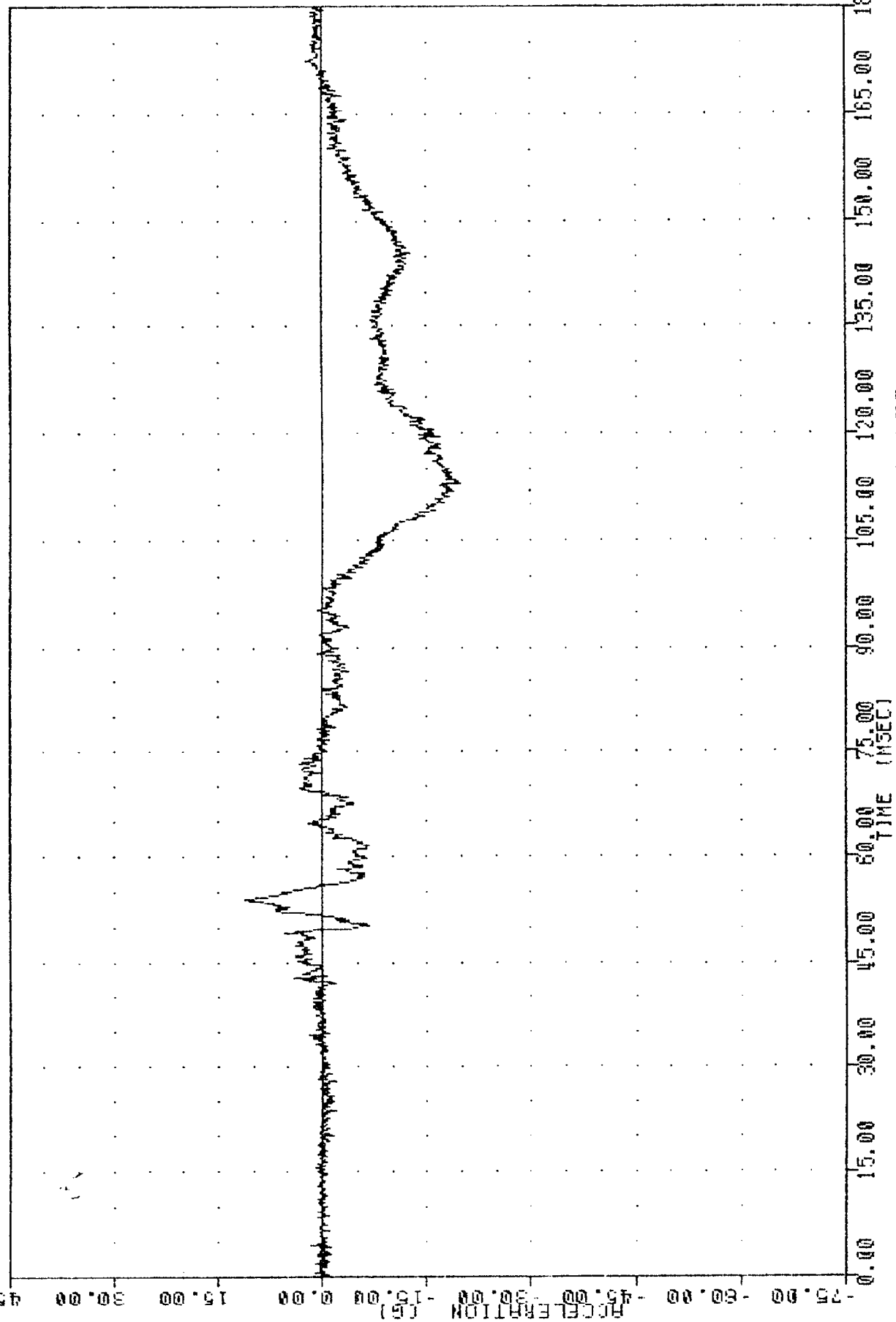


FORD LTD INTO FIXED BARRIER
 DRIVER HEAD ACCELERATION X AXIS

THC
BREED AIR BAG PROGRAM
84178000000
HEDZG1

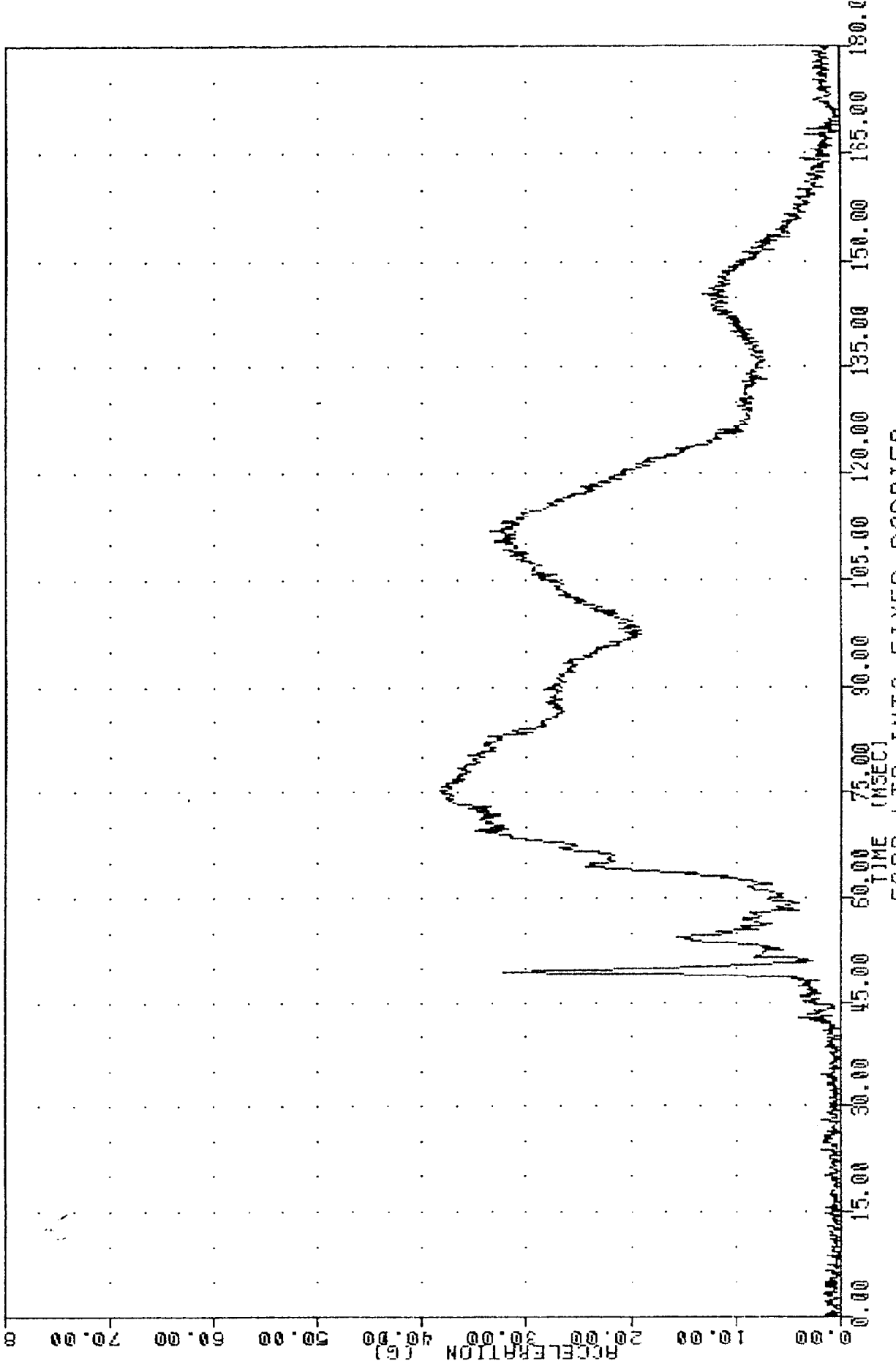
040620
20 AUG 84
10:08:23

FILTER = ALPF 1650/ 5217/ -40
MIN. MAX VALUES = -19.62% 112.88, 11.06 e 53.75



FORD LTD INTO FIXED BARRIER
DRIVER HEAD ACCELERATION Z AXIS

TRC
 BREED AIR BAG PROGRAM
 8417800000
 HEDRG1
 PLOT DATE 17-AUG-84 11:34:03
 FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = 0.038 14.88, 38.42 s 75.13

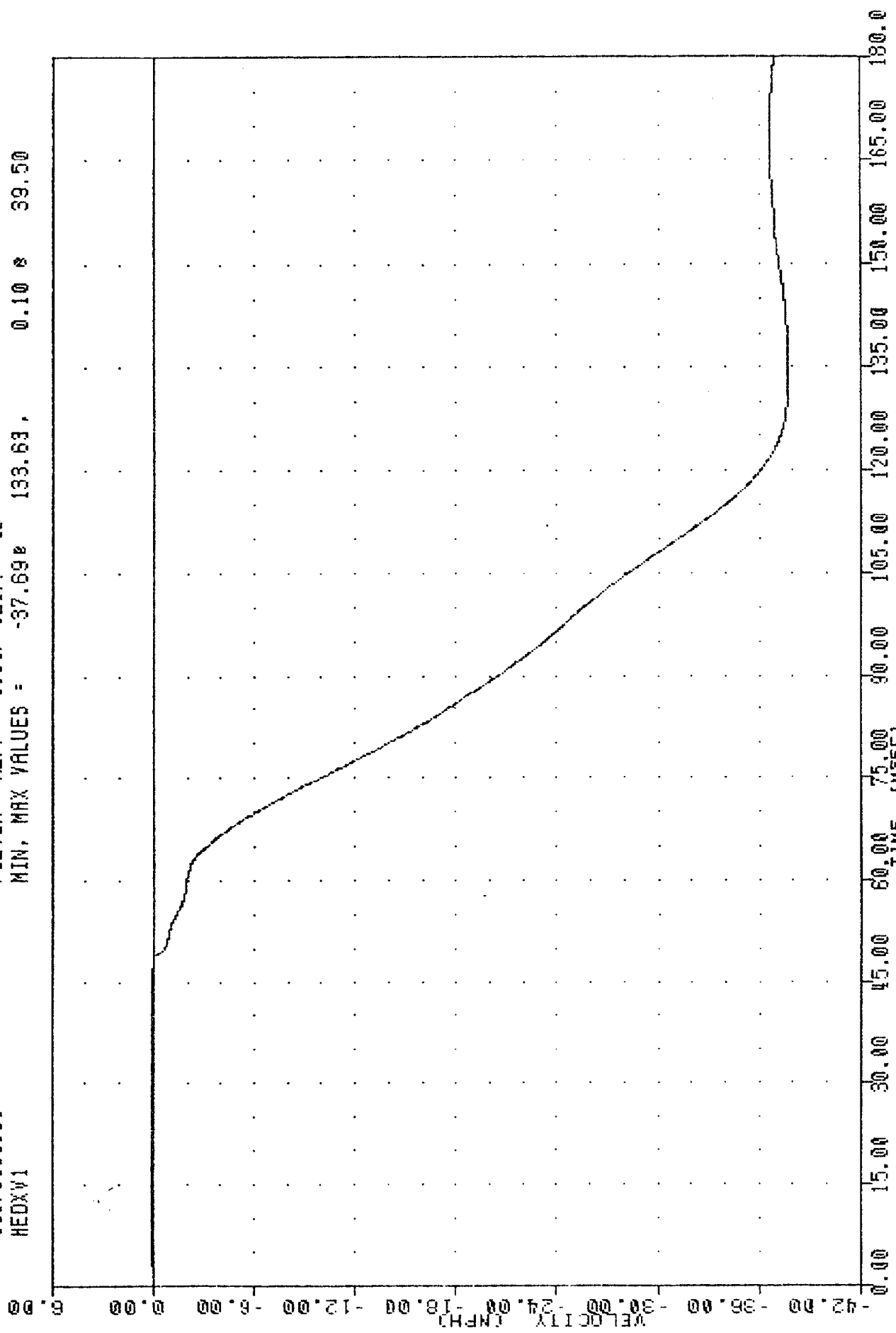


FORD LTD INTO FIXED BARRIER
 DRIVER HEAD RESULTANT USING ONLY X AND Z

TRC
84178000000
BREED AIR BAG PROGRAM
HEDXV1

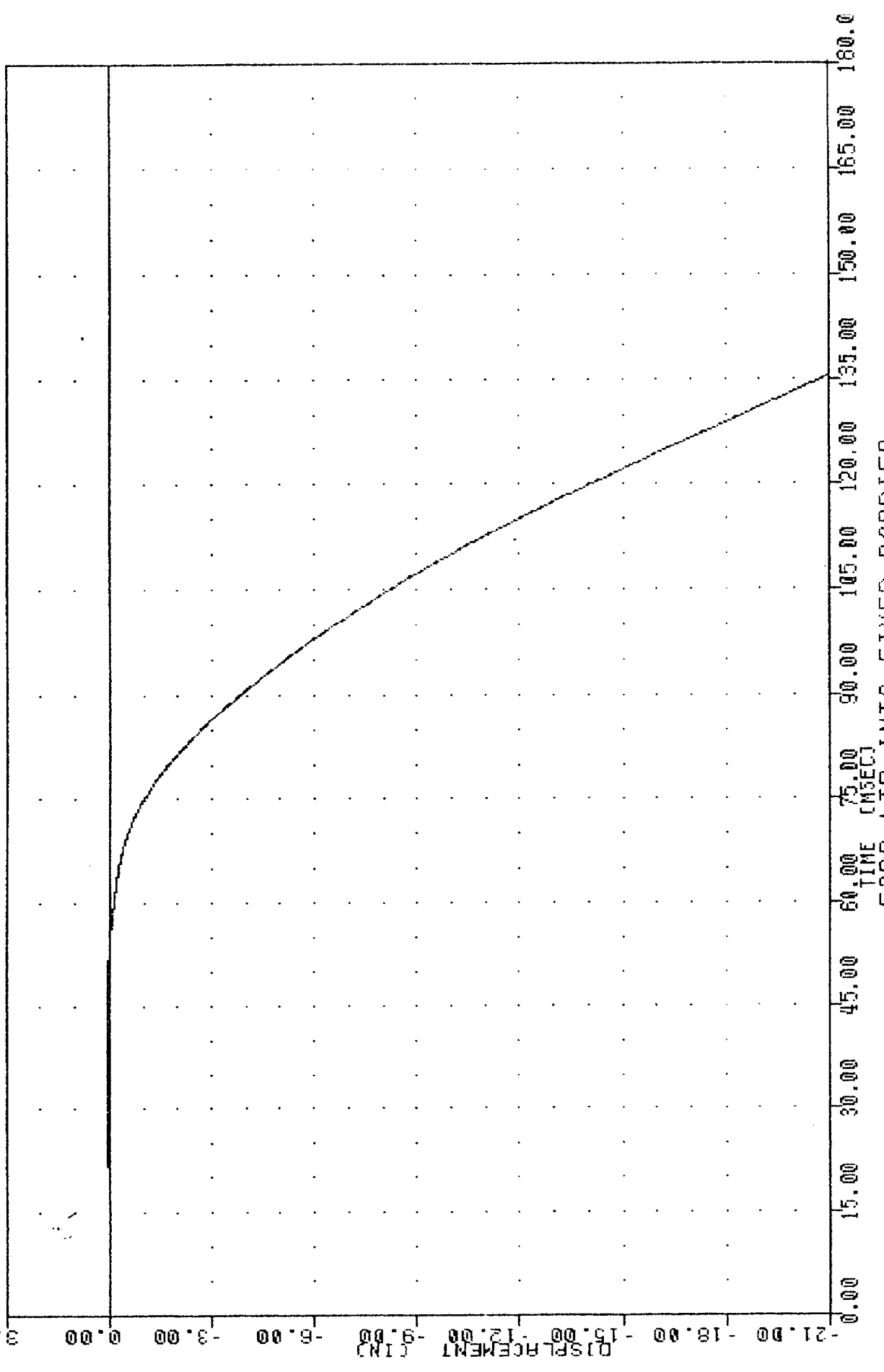
PLOT DATE 17-AUG-84 11:40:34

FILTER = ALPF 1650/ 5217/ -40
MIN, MAX VALUES = -37.69# 133.63, 0.10 # 39.50



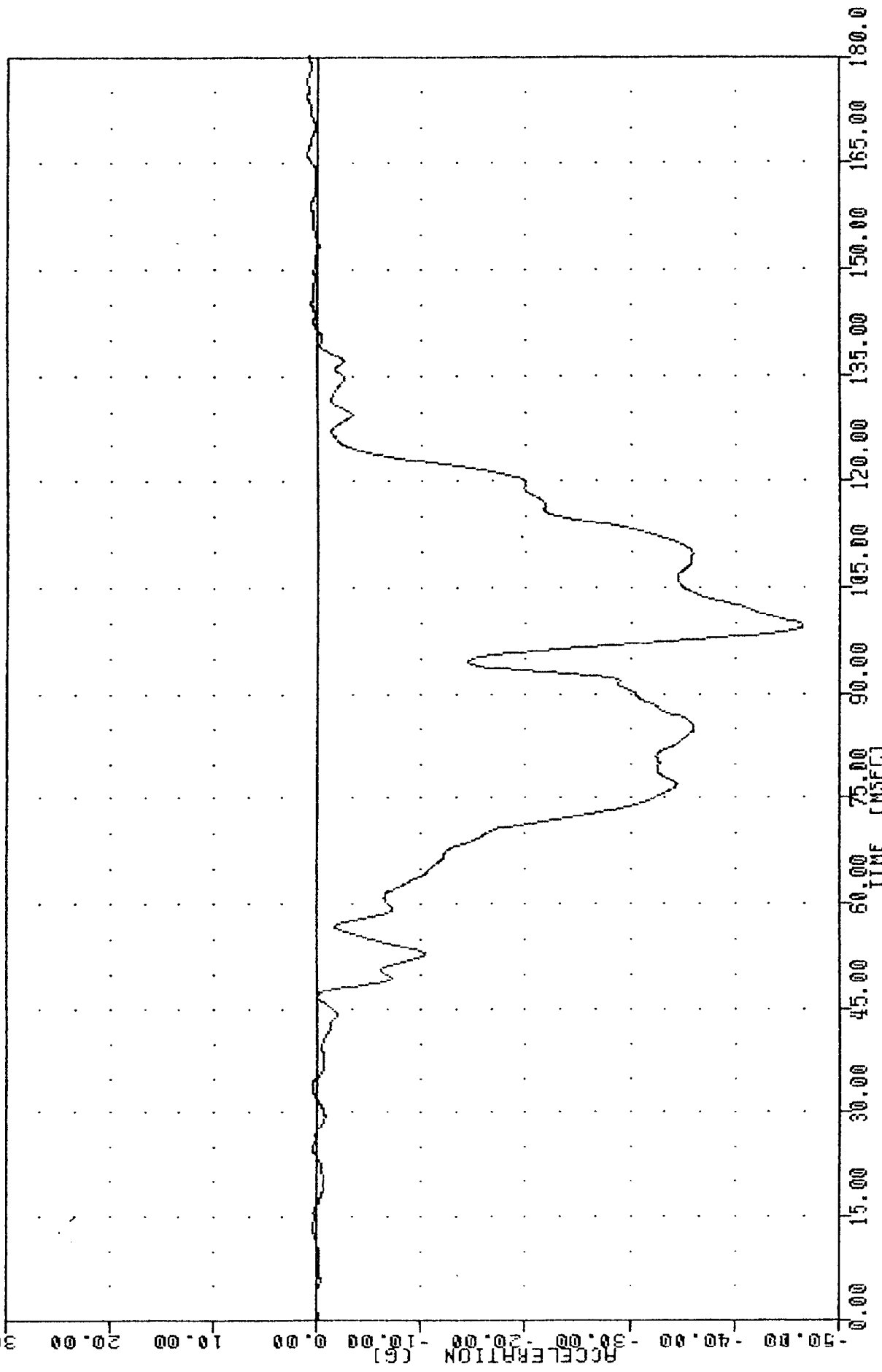
FORD LTO INTO FIXED BARRIER
DELTA V USING HEDXGI

TRC
 BRECO AIR BAG PROGRAM
 8417800000
 HEDXD1
 840626
 PLOT DATE 17-AUG-84 11:40:34
 FILTER = ALPF 1650/ 5217/ -10
 MIN. MAX VALUES = -40.85s 180.00, 0.04 e 48.25



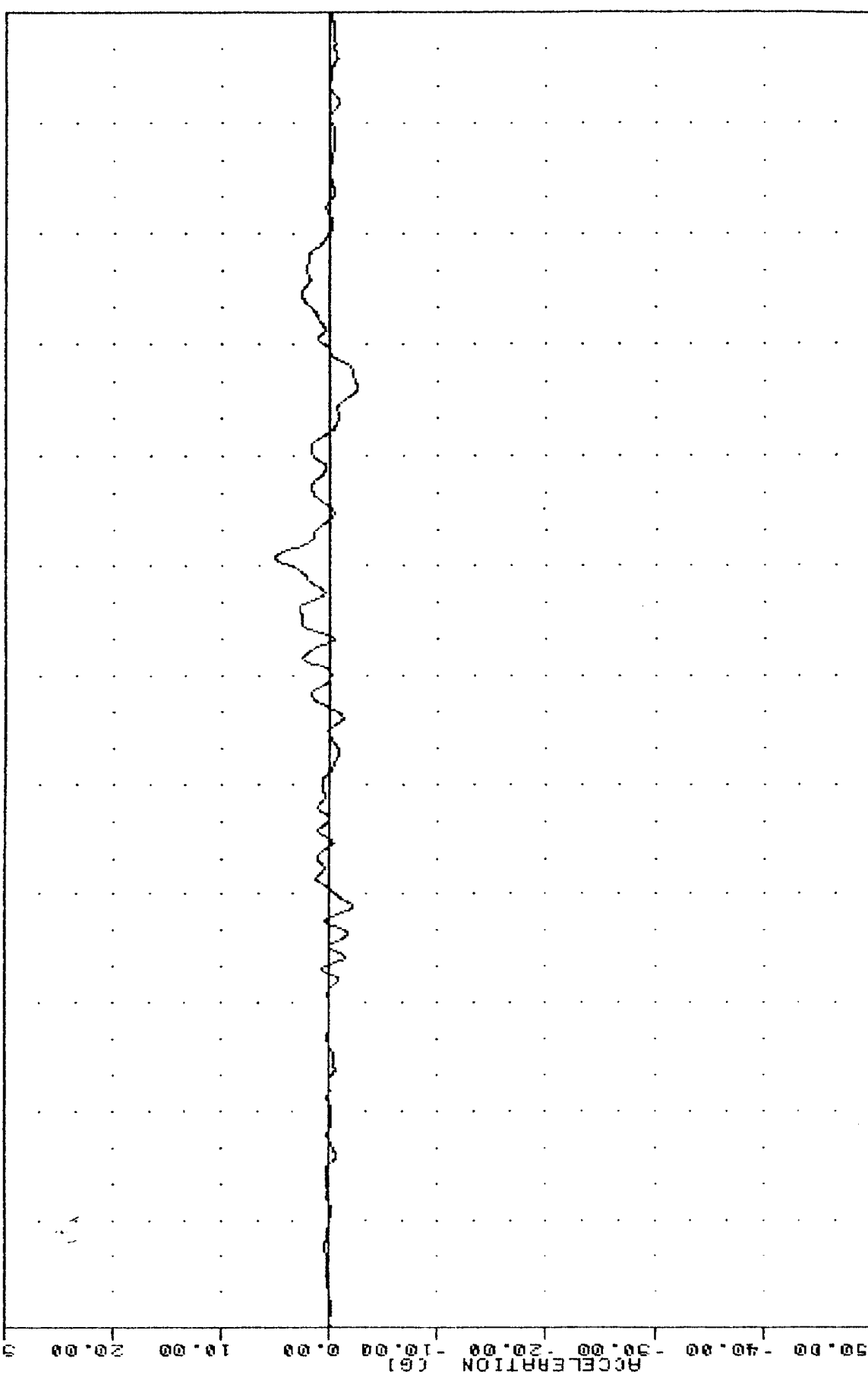
FORD LTD INTO FIXED BARRIER
 DELTA X USING HEDXV1

TRC
 840626
 BREED AIR BAG PROGRAM
 84178000000
 CSTXG1
 FILTER = 8LPF 30N/ 949/ -40
 MIN. MAX VALUES : -46.53e 99.38, 1.07 e 174.25
 PLOT DATE 16 AUG 84 13:02:39



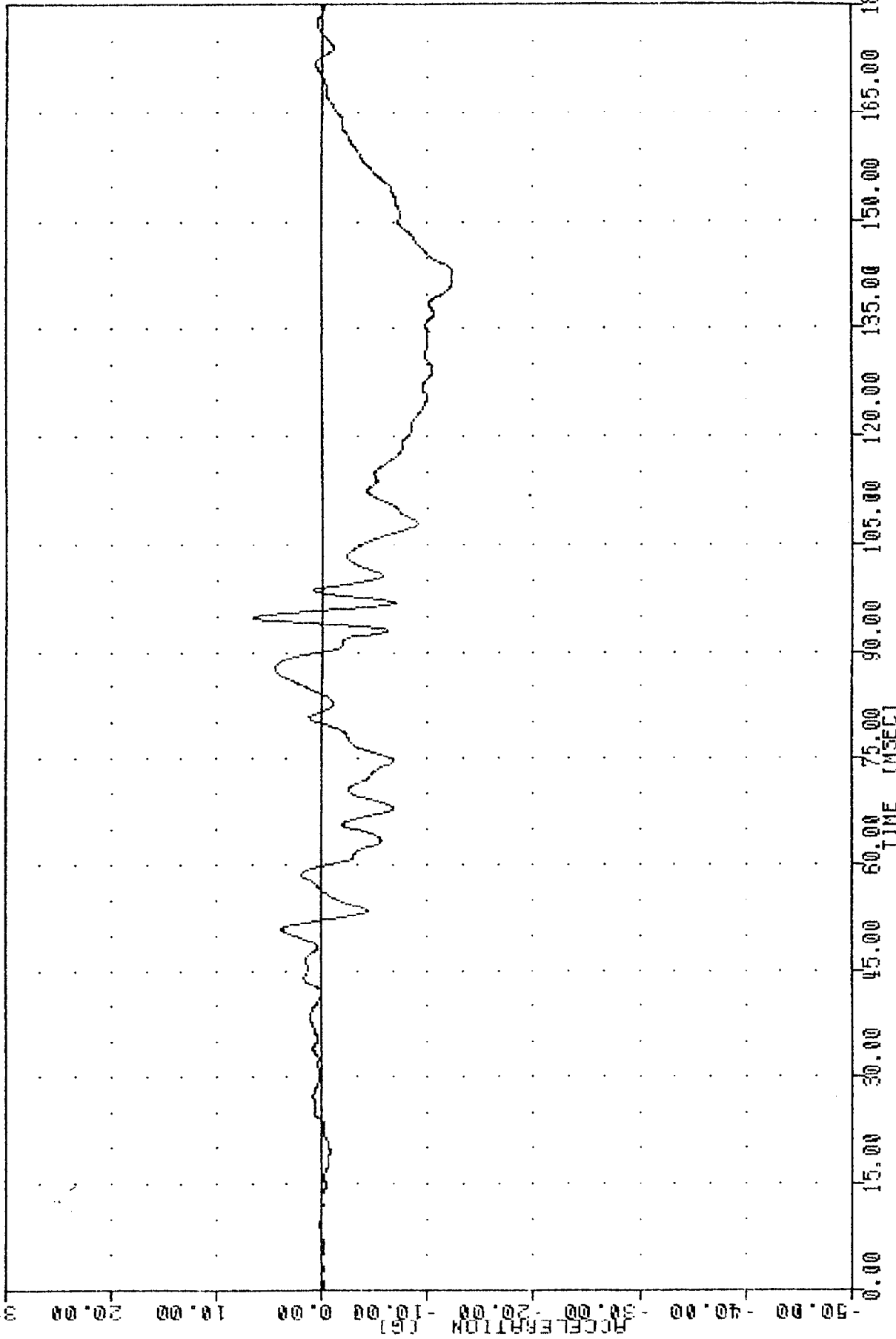
FORD LTD INTO FIXED BARRIER
 DRIVER CHEST ACCELERATION X AXIS

THE [REDACTED] 040620 [REDACTED] 16 AUG 84 [REDACTED] 13:02:39 [REDACTED]
 BREED AIR BAG PROGRAM
 84178000000
 CSTY61
 FILTER = BLPF 300/ 949/ .40
 MIN. MAX VALUES = -2.558 129.00, 5.05 & 106.00



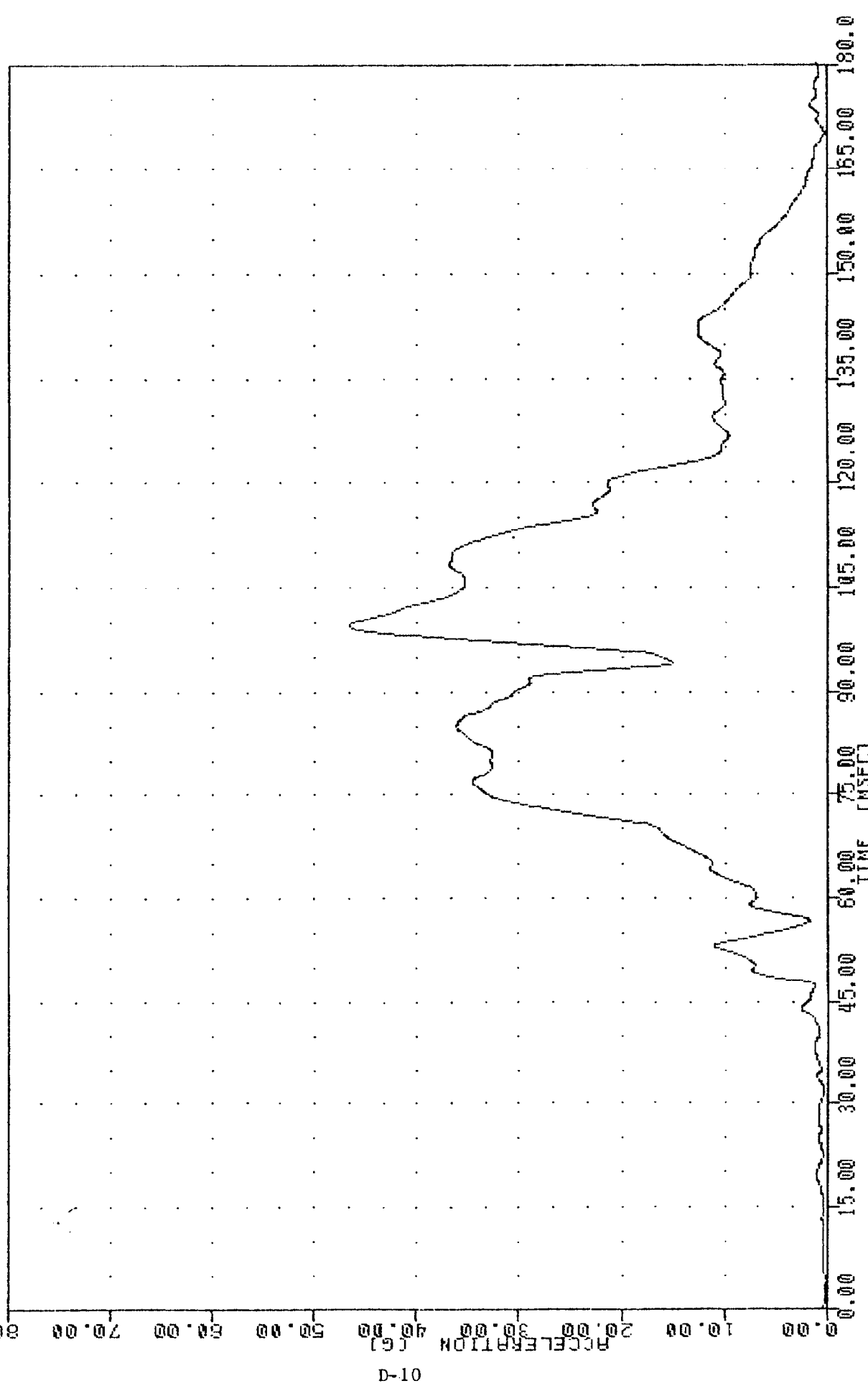
0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (MSEC)
 FORD LTD INTO FIXED BARRIER
 DRIVER CHEST ACCELERATION Y AXIS

INC. 040620 16 AUG 84 13:02:59
 BREED AIR BAG PROGRAM
 84178000000
 CSTZG1
 FILTER = BLPF 300/ 949/ -40
 MIN, MAX VALUES = -12.30e 141.50, 6.51e 94.75



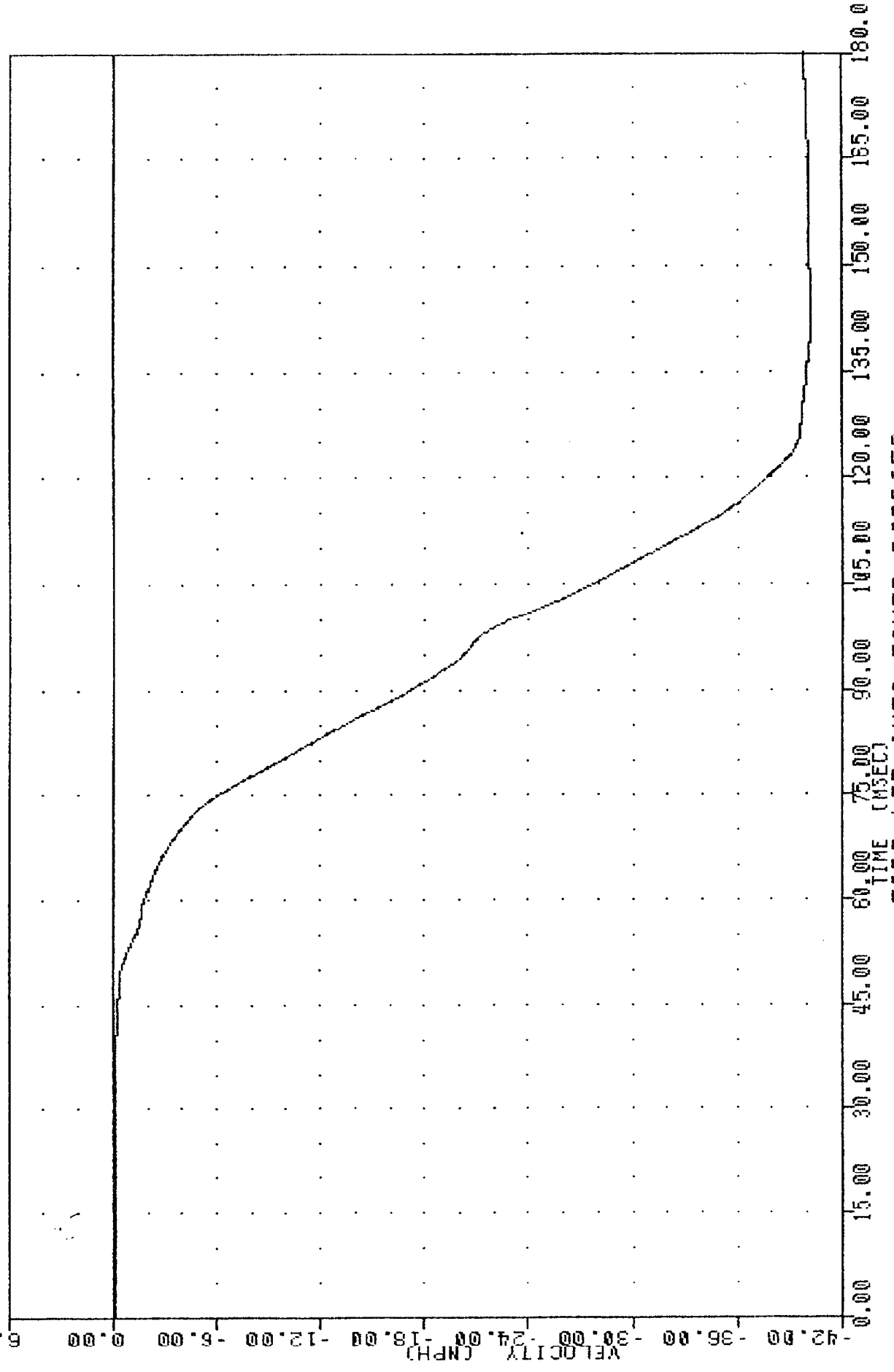
FORD LTD INTO FIXED BARRIER
 DRIVER CHEST ACCELERATION Z AXIS

TRC
 BREED AIR BAG PROGRAM
 84178000000
 CSTRG1
 840626
 16-AUG-84
 13:02:38
 FILTER = BLPF 300/ 949/ -40
 MIN. MAX VALUES = 0.05s 4.13, 46.69 e 99.38



FORD LTD INTO FIXED BARRIER
 DRIVER CHEST RESULTANT

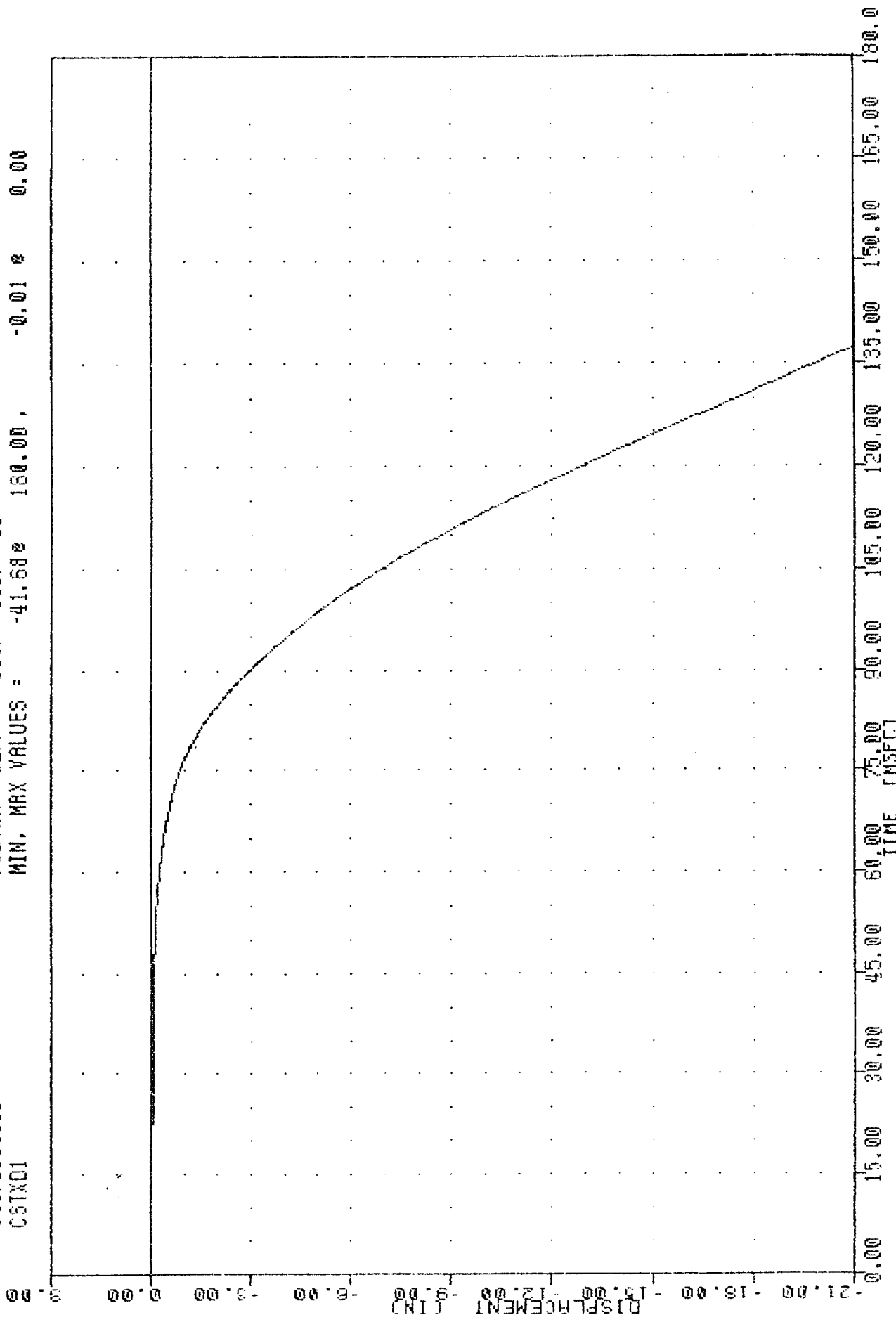
TRC
 BREED AIR BAG PROGRAM
 84178000000
 CSTXV1
 840625
 PLOT DATE 17-AUG-84 11:40:34
 FILTER = 8LPF 300/ 949/ -40
 MIN. MAX VALUES = -40.23e 143.00, -0.10 e 0.00



FORD LTD INTO FIXED BARRIER
 DELTA V USING CSTXGI

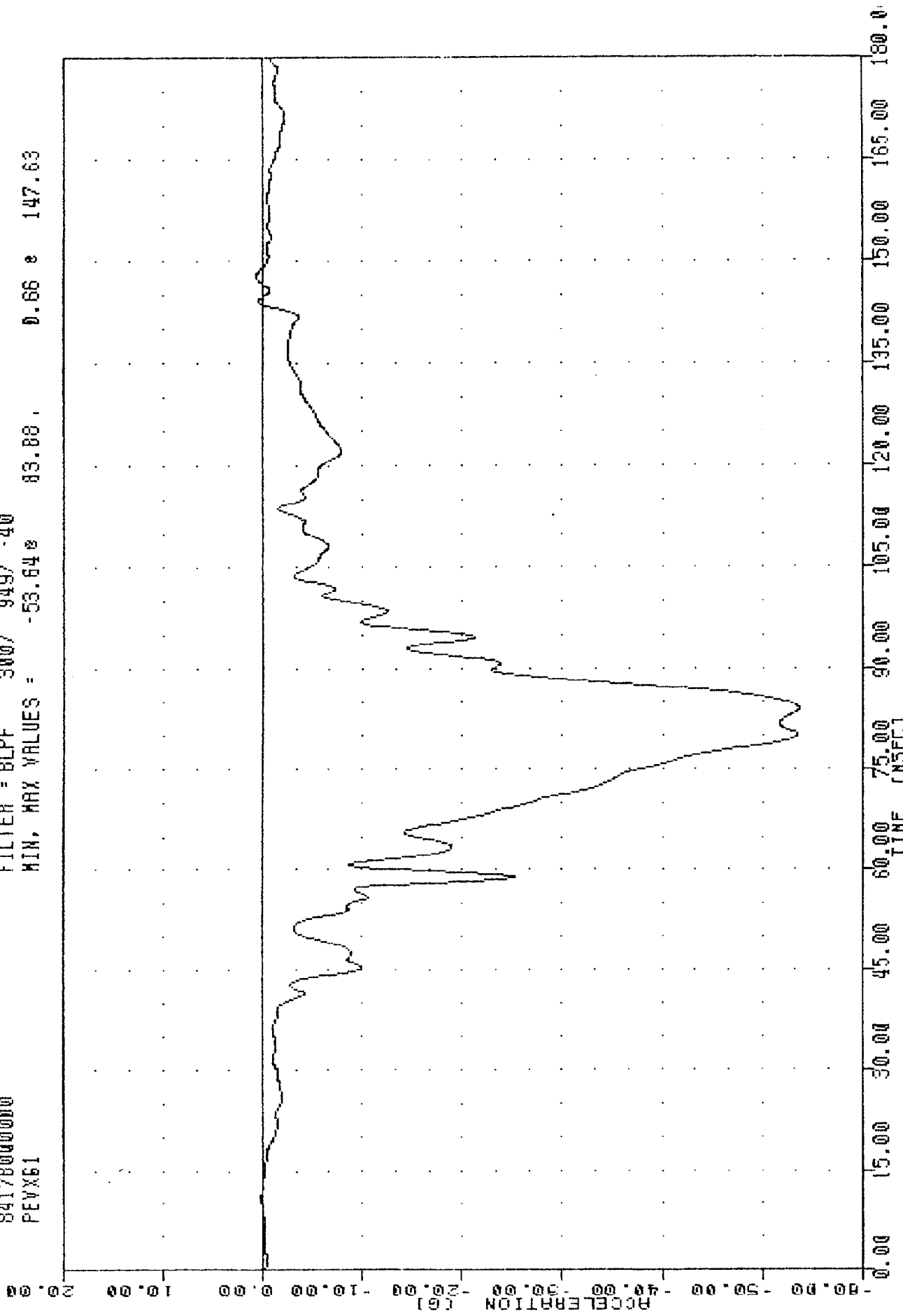
THE [REDACTED] 0620 [REDACTED] PLOT DATE 28 AUG 84 10:08:40
 BREED AIR BAG PROGRAM
 8417800000
 CSTXD1

FILTER = BLFF 300/ 949/ -40
 MIN. MAX VALUES = -41.68e 180.00, -0.01e 0.00



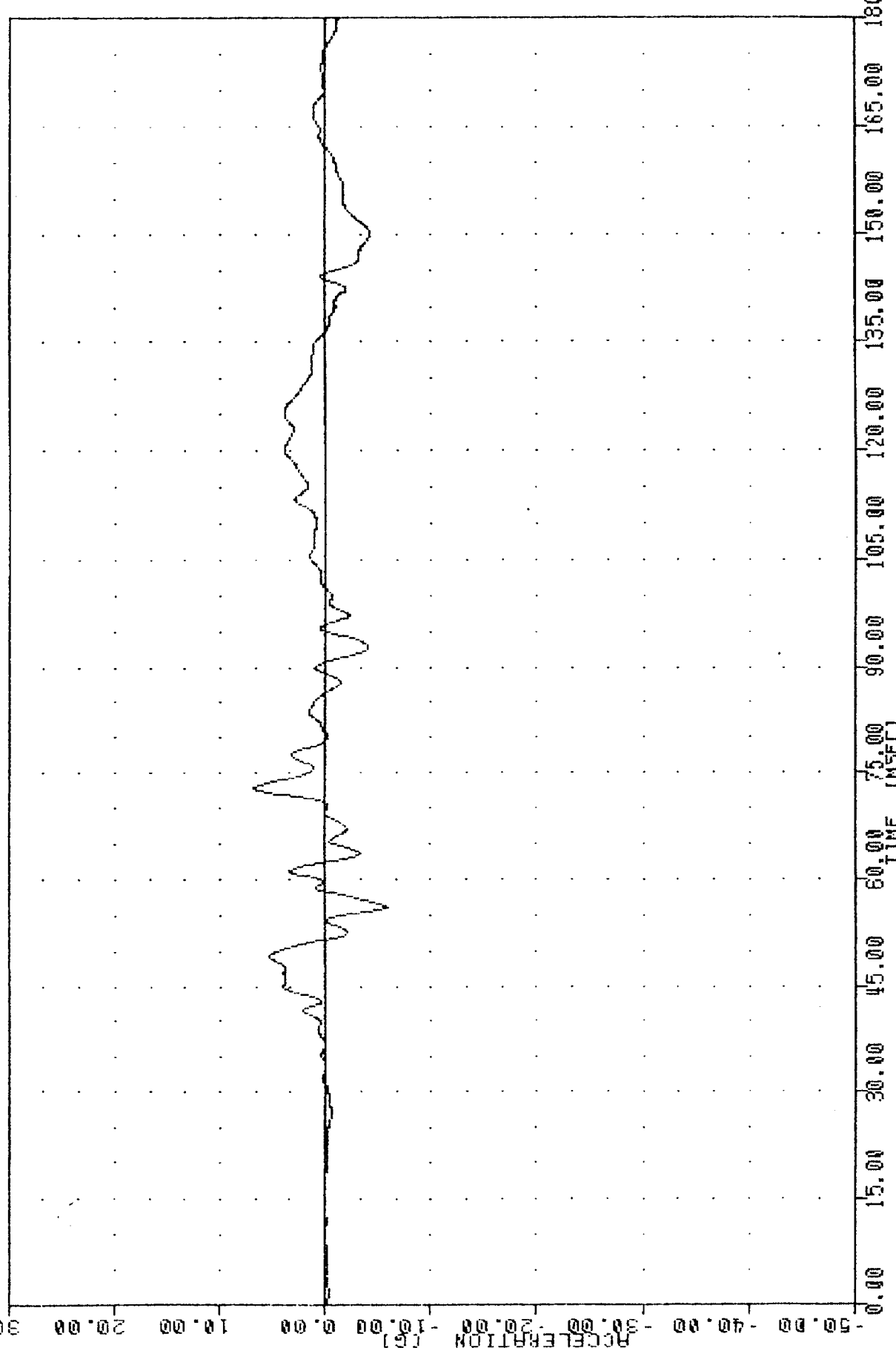
FORD LTD INTO FIXED BARRIER
 DELTA X USING CSTXVI

TAC 840626
BREED AIR BAG PROGRAM
8417800000
PEVX61
PLOT DATE 16-AUG-84 13:02:39
FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = -53.64 83.88 0.66 147.63



FORD LTD INTO FIXED BARRIER
DRIVER PELVIS ACCELERATION X AXIS

TRC
 BREED AIR BAG PROGRAM
 84178000000
 PEYGI
 810626
 16-AUG-84
 13:02:39
 FILTER = BLPF 300/ 949/ -40
 MIN, MAX VALUES = -5.84e 56.00, 6.75e 72.63

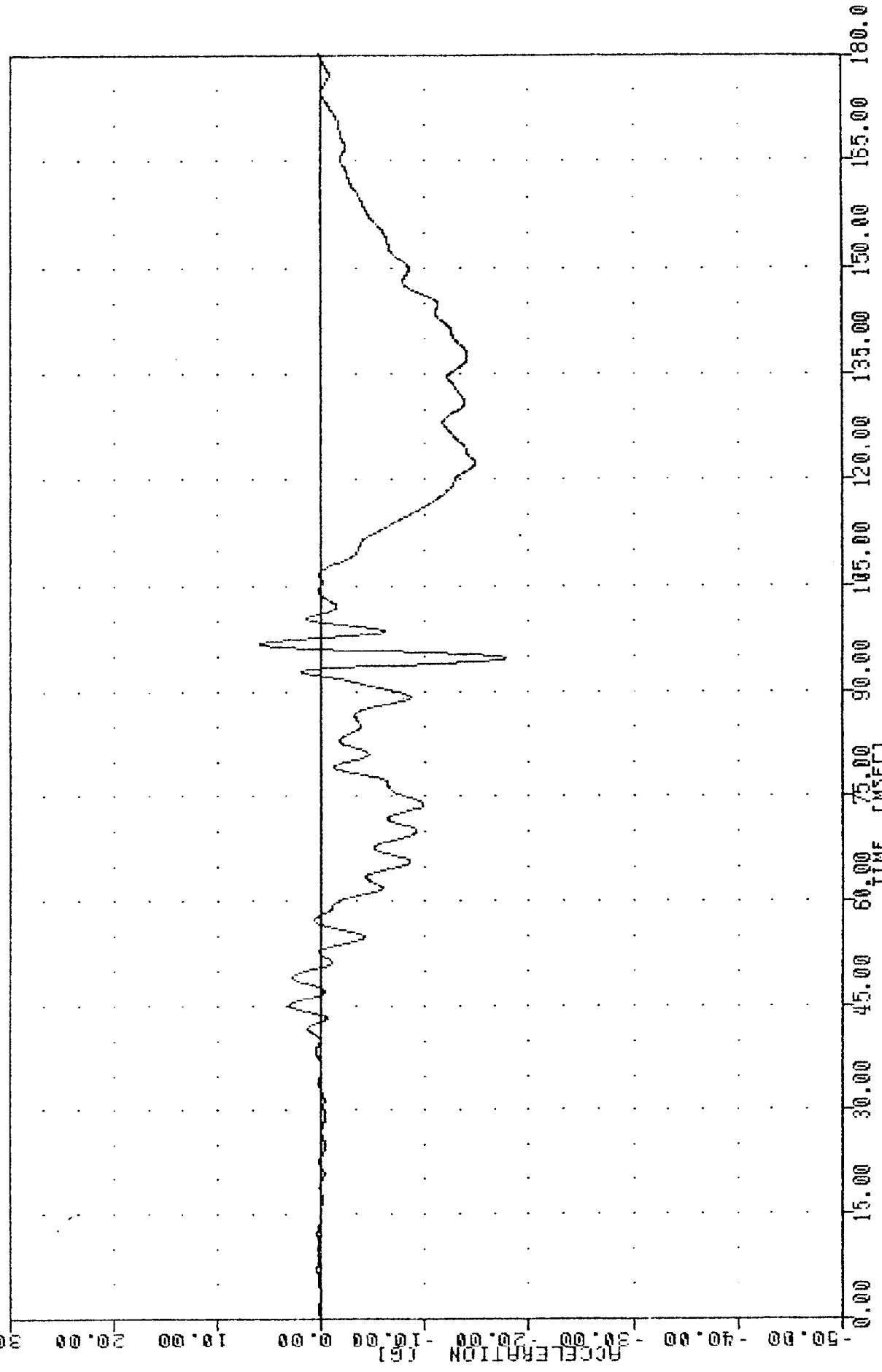


FORD LTD INTO FIXED BARRIER
 DRIVER PELVIS ACCELERATION Y AXIS

TRC
BREED AIR BAG PROGRAM
84178000000
PEVZG1

840626
16-AUG-84 13:02:39

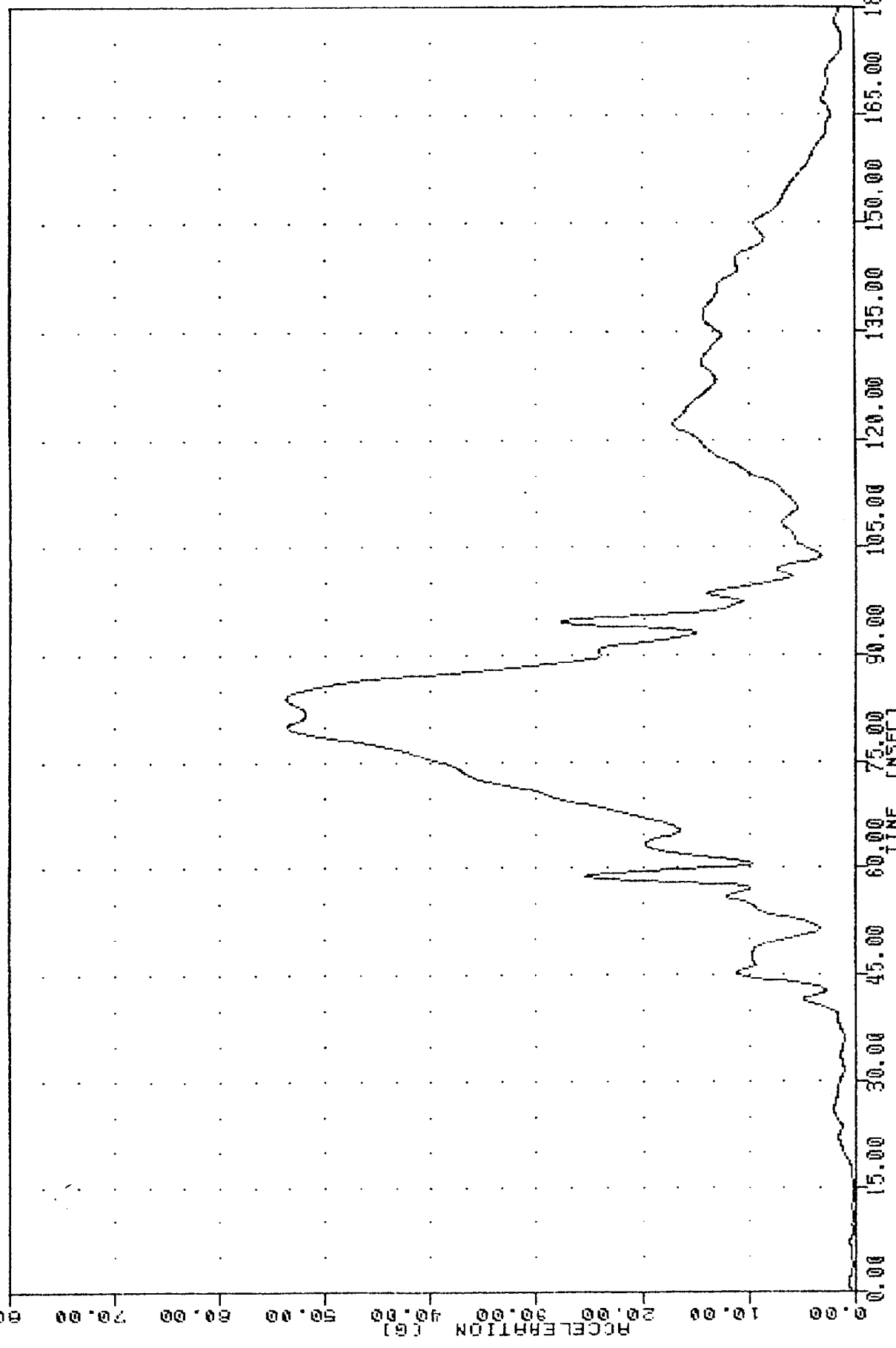
FILTER = 8LFF 300/ 949/ -40
MIN. MAX VALUES = -17.87e 94.50, 6.04 e 96.63



51-D

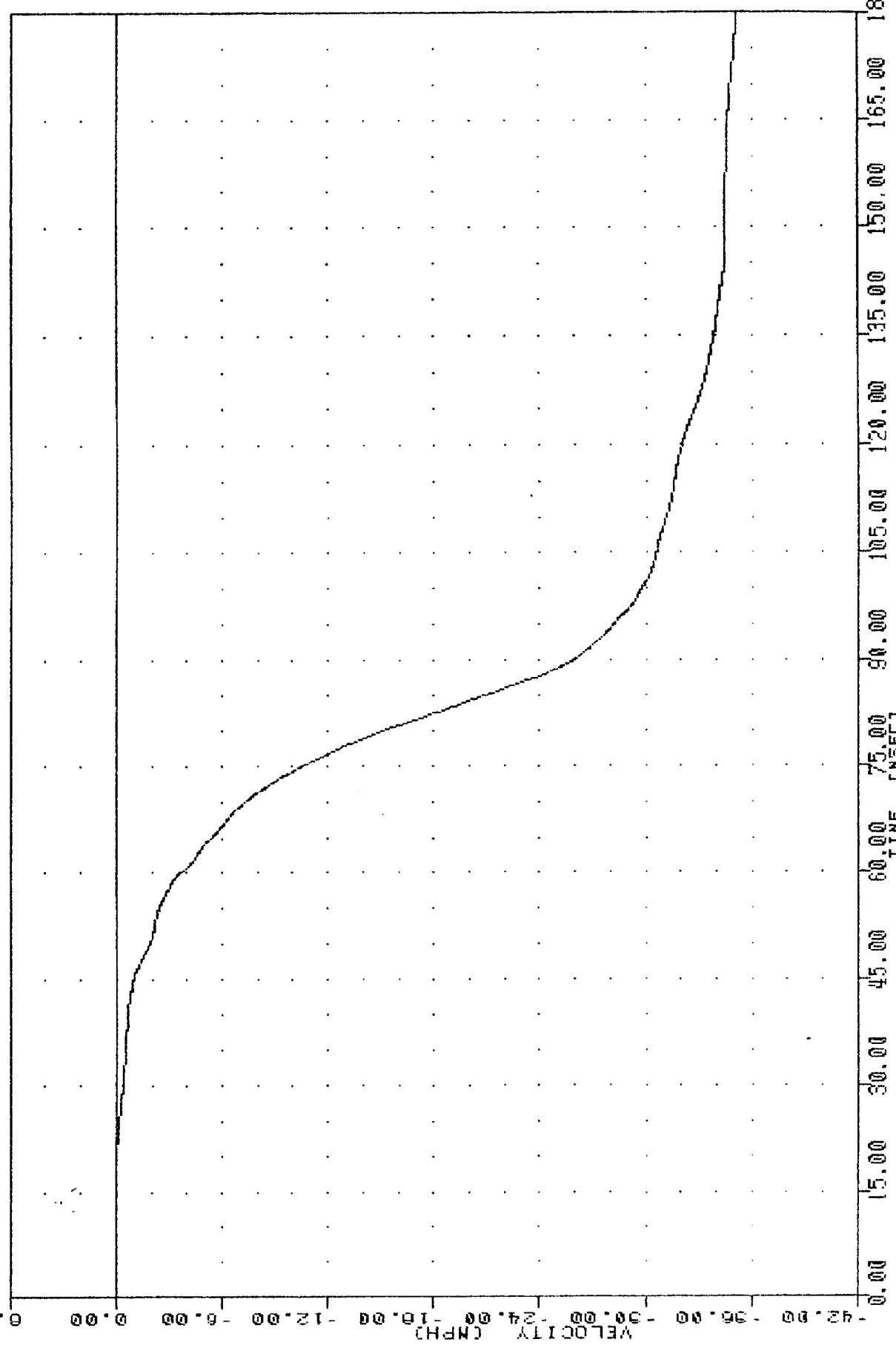
FORD LTD INTO FIXED BARRIER
DRIVER PELVIS ACCELERATION Z AXIS

TAC 840626 PLOT DATE 16-AUG-84 13:02:39
BREED AIR BAG PROGRAM
8417800000 FILTER = BLPF 300/ 949/ -40
PEVRS1 MIN. MAX VALUES = 0.11g 13.50, 53.74 & 83.88



FORD LTD INTO FIXED BARRIER
DRIVER PELVIS RESULTANT

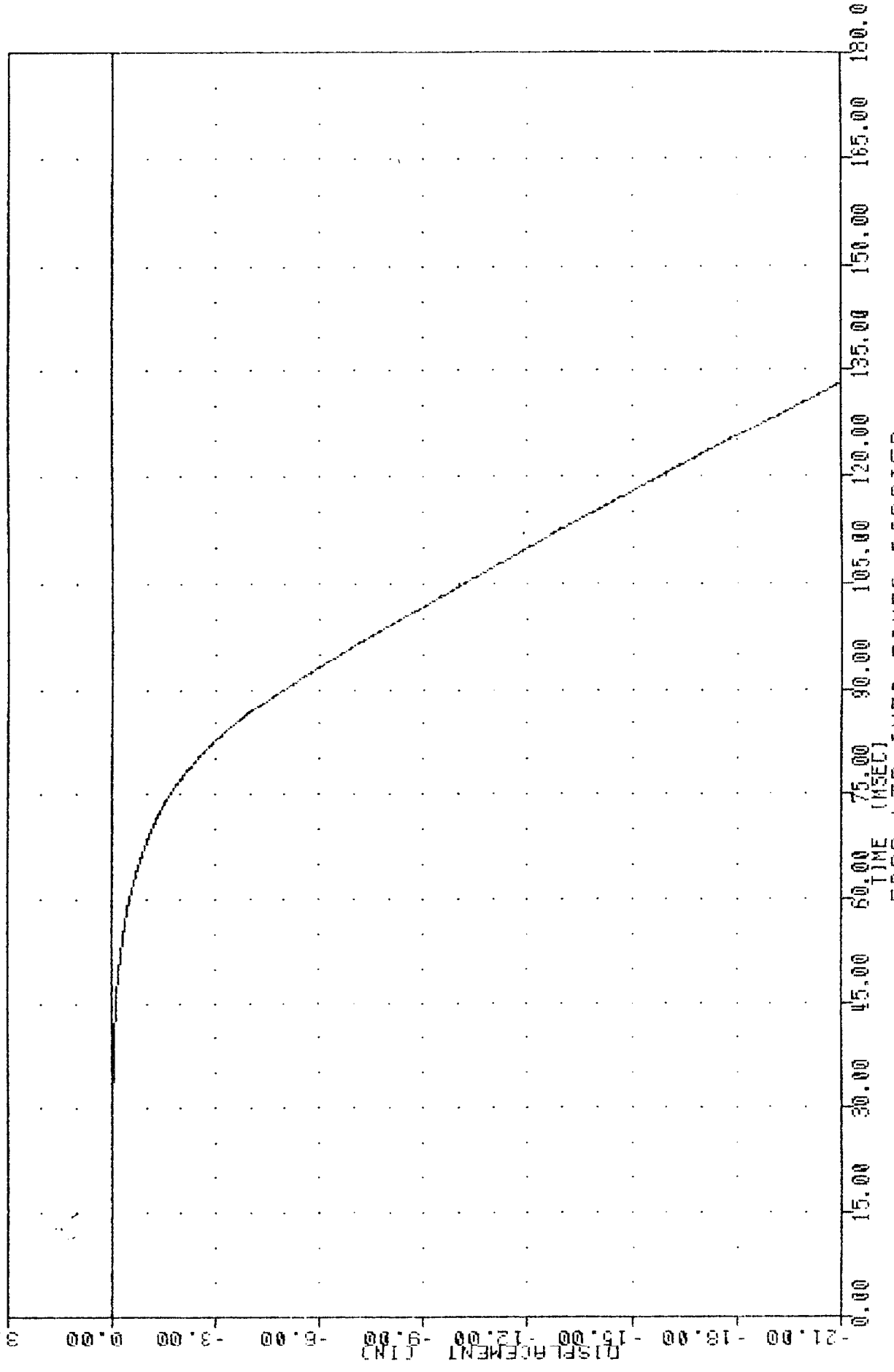
THC
 BREED AIR BAG PROGRAM
 84178000000
 PEVXY1
 840626
 PLOT DATE 17-AUG-84 11:40:34
 FILTER = BLPF 300/ 949/ -40
 MIN. MAX VALUES = -35.18e 180.00. 0.03 e 0.00



71-D

FORD LTD INTO FIXED BARRIER
 DELTA V USING PEVXG1

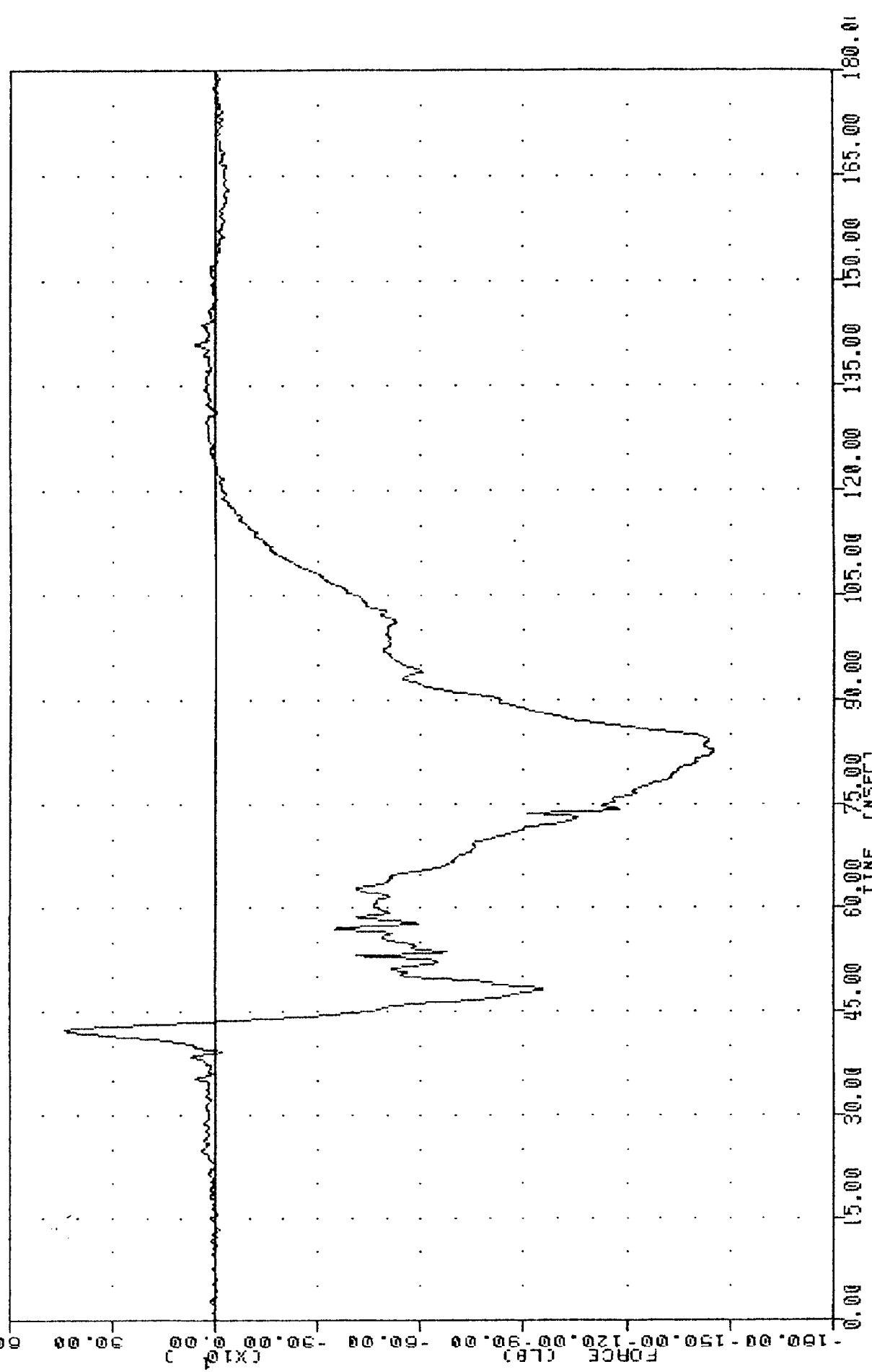
TRC
 BREED AIR BAG PROGRAM
 8417800000
 PEVXD1
 840626
 PLOT DATE 20-AUG-84 16:08:40
 FILTER = BLPF 300/ 949/ -40
 MIN. MAX VALUES = -40.51e 180.00, 0.00 e 3.88



FORD LTD INTO FIXED BARRIER
 DELTA X USING PEVXV1

TRC ██████████, 840625 ██████████ PLOT DATE 16-AUG-84 13:02:39
 BREED AIR BAG PROGRAM
 84178000000
 LFMF

FILTER = BLPF 1000/ 3162/ -40
 MIN. MAX VALUES = -1453.66e 82.50, 438.53 e 42.25

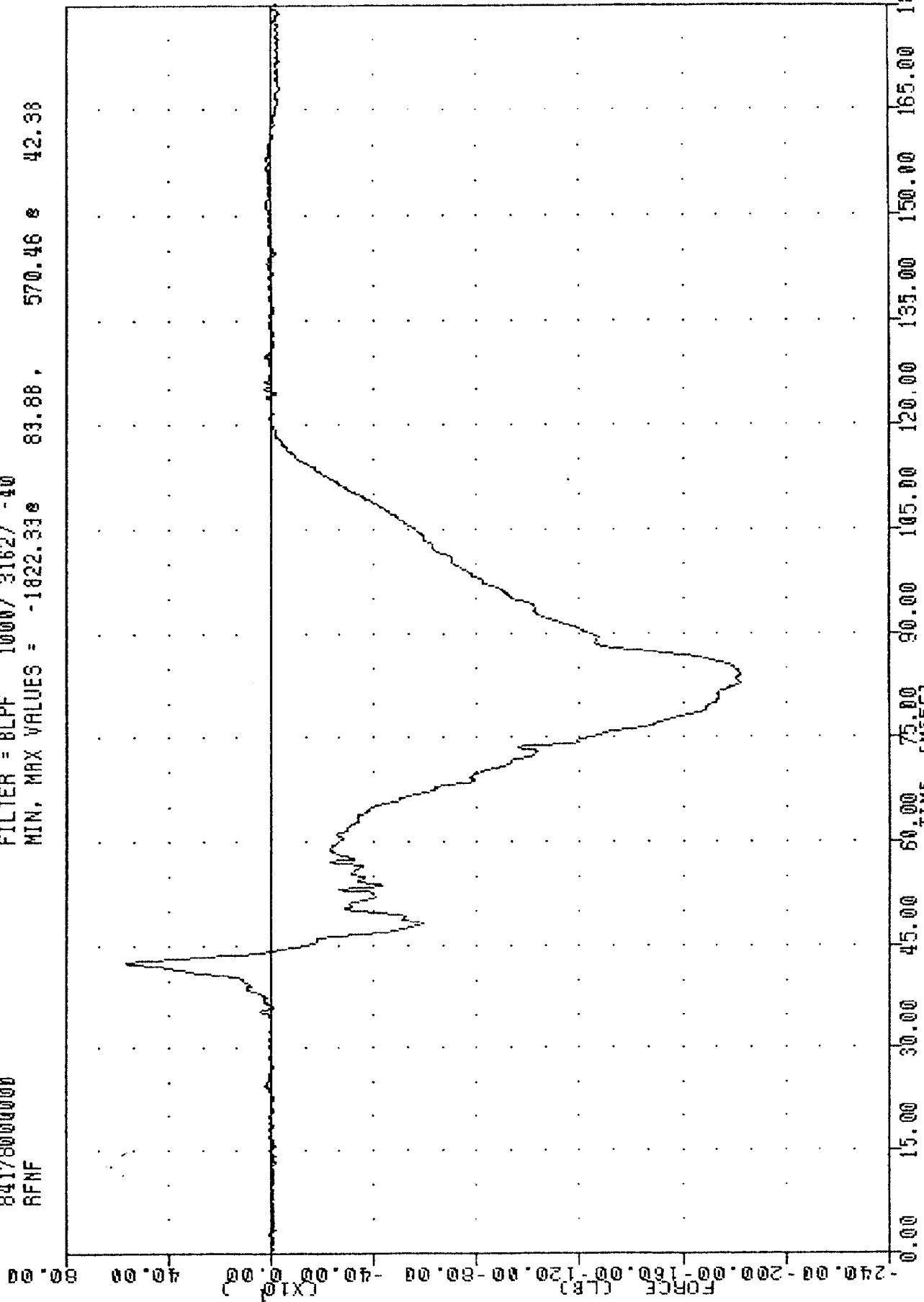


FORD LTD INTO FIXED BARRIER
 DRIVER LEFT FEMUR LOAD CELL

TRC
840626
BREED AIR BAG PROGRAM
8417600000
RFNF

PLOT DATE 16-AUG-84 13:02:39

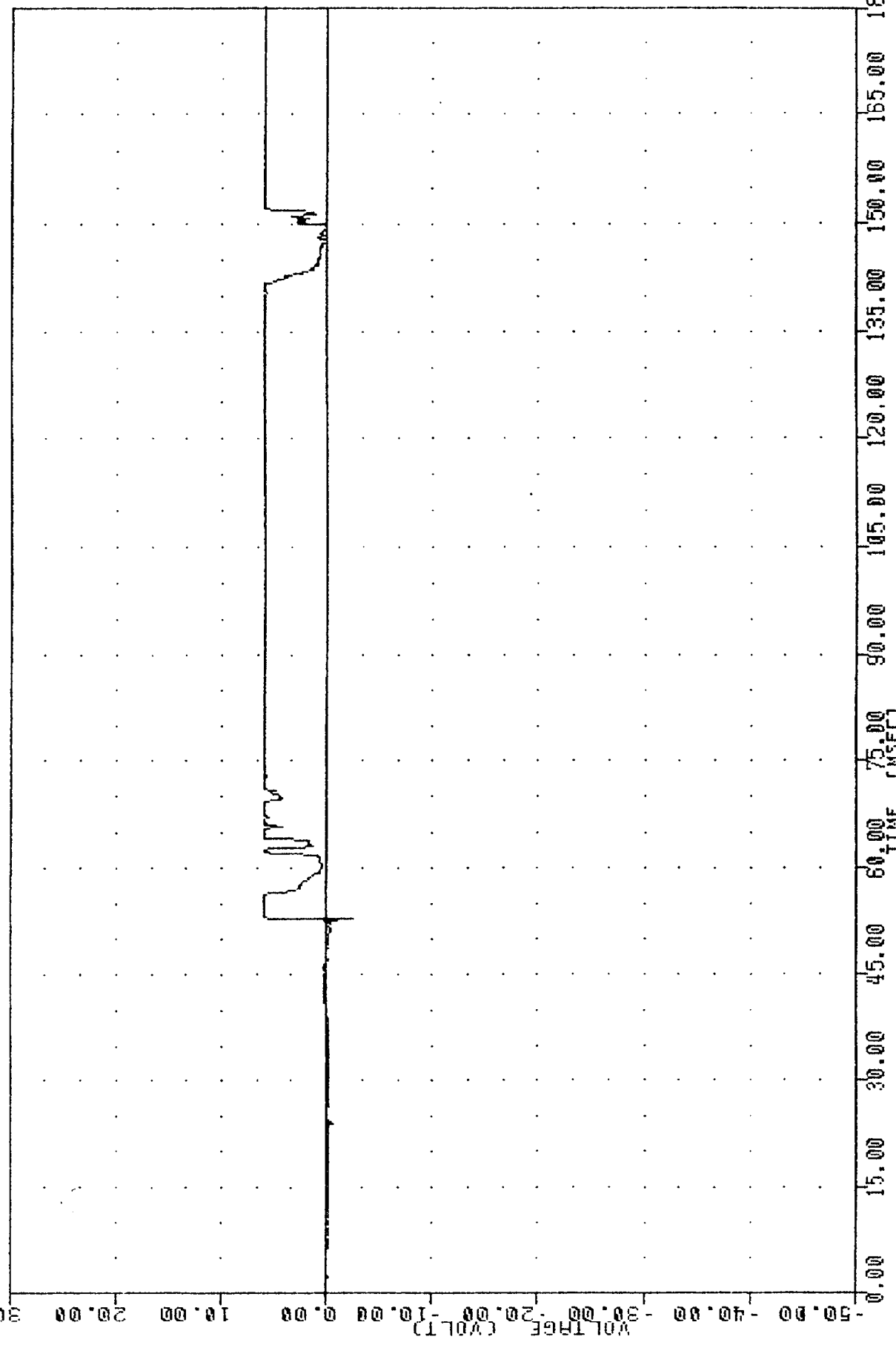
FILTER = 8LPF 1000/ 3162/ -40
MIN. MAX VALUES = -1822.318 83.88, 570.46 s 42.38



0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
TIME (MSEC)
FORD LTD INTO FIXED BARRIER
DRIVER RIGHT FEMUR LOAD CELL

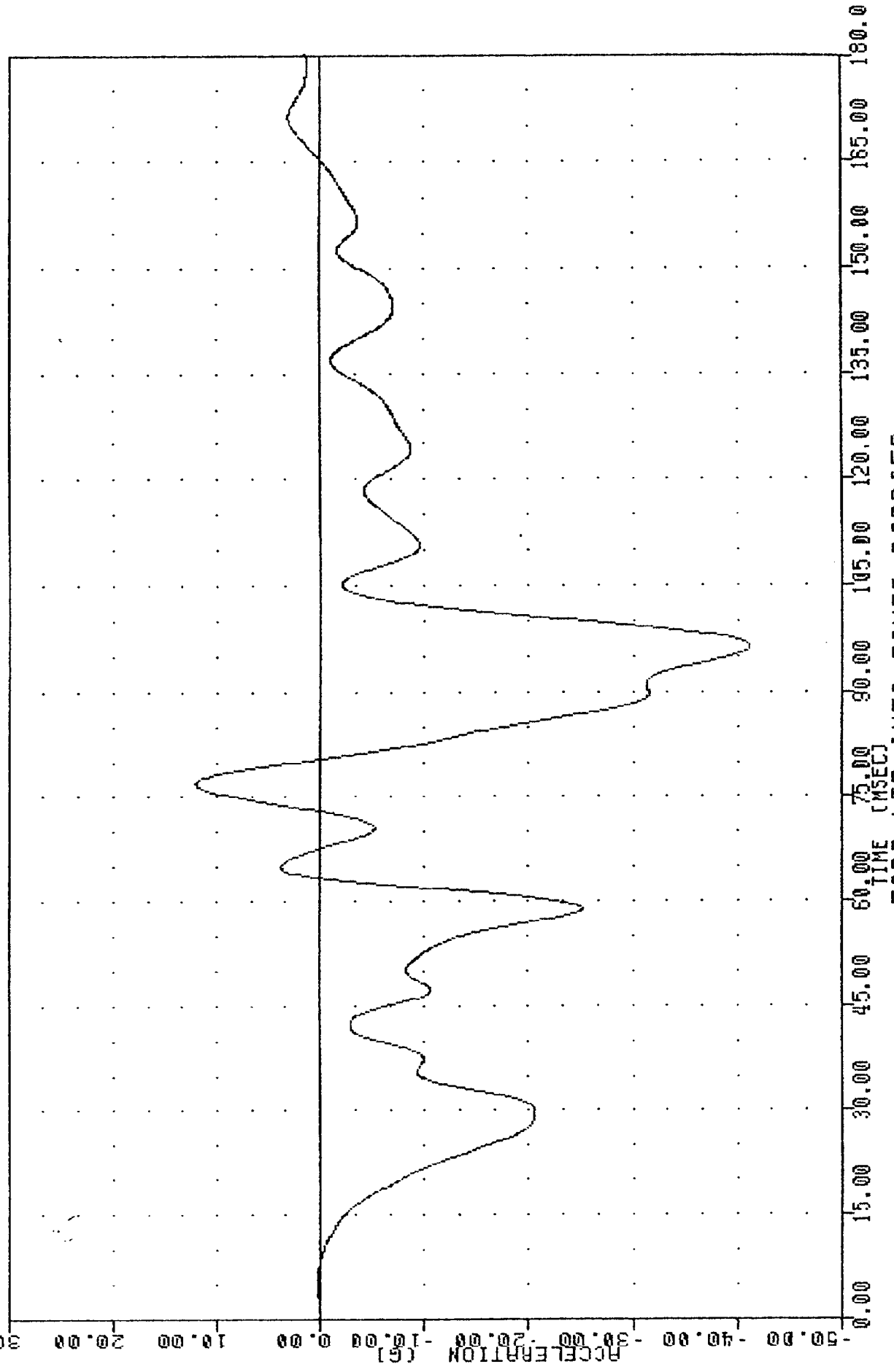
TIC 840626 16-AUG-84 13:02:39

BREED AIR BAG PROGRAM
84178000000
KNR1
FILTER = ALPF 1650/ 5217/ -40
MIN. MAX VALUES = -2.63e 52.63, 6.00 e 53.00



FORD LTD INTO FIXED BARRIER
RIGHT KNEE CONTACT SWITCH

TRC
BREED AIR BAG PROGRAM
8417800000
SCAPG2
PLOT DATE 16-AUG-84 13:02:39
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -41.18e 96.25, 12.01 e 76.75

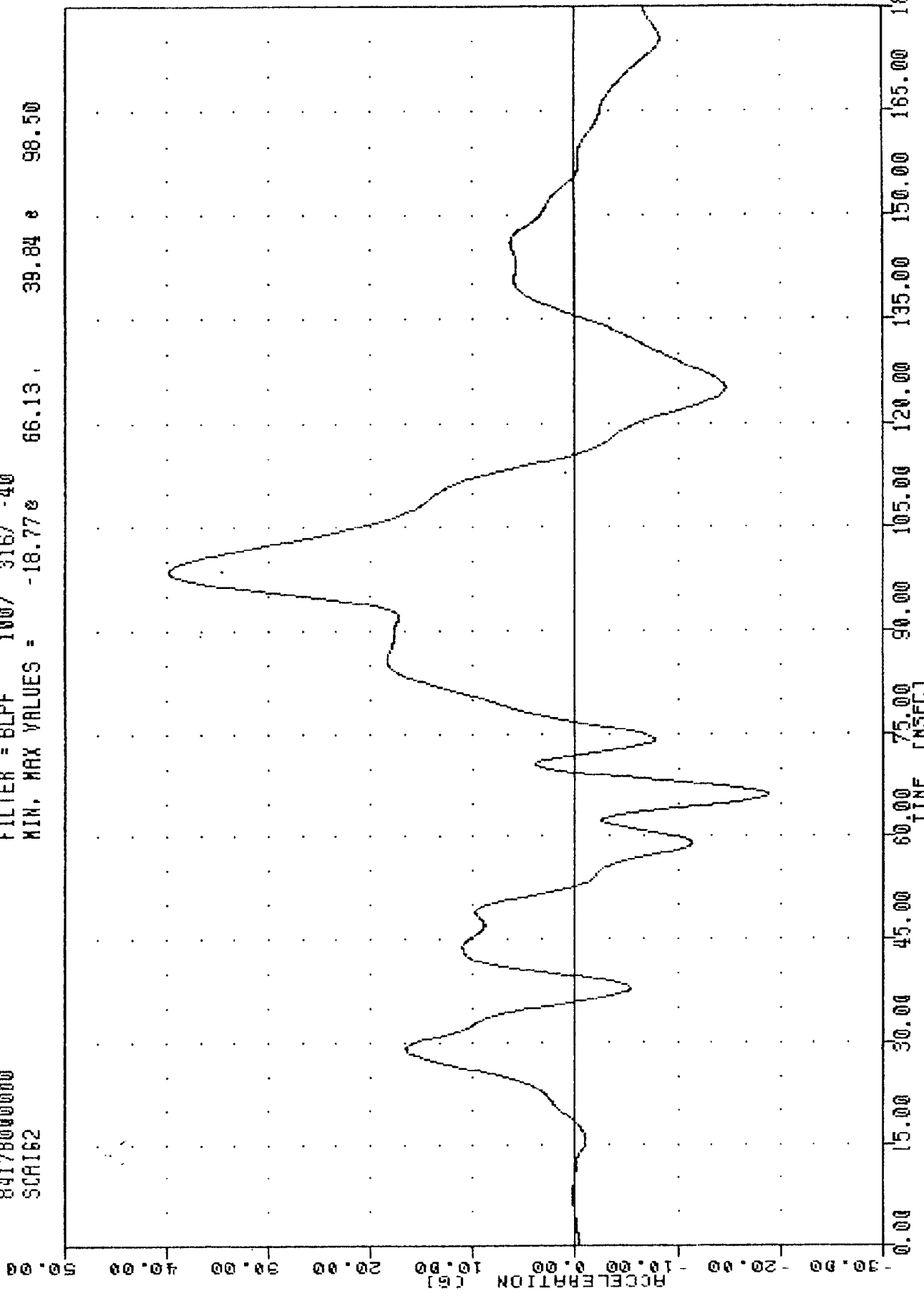


FORD LTD INTO FIXED BARRIER
STEERING COLUMN ACCELERATION UPPER POSTERIOR

TAC
BREED AIR BAG PROGRAM
84178000000
SCA162

840626
16-AUG-84 13:02:39

FILTER = 6LPF 100/ 316/ -40
MIN, MAX VALUES = -18.77e 66.13, 39.84 e 98.50

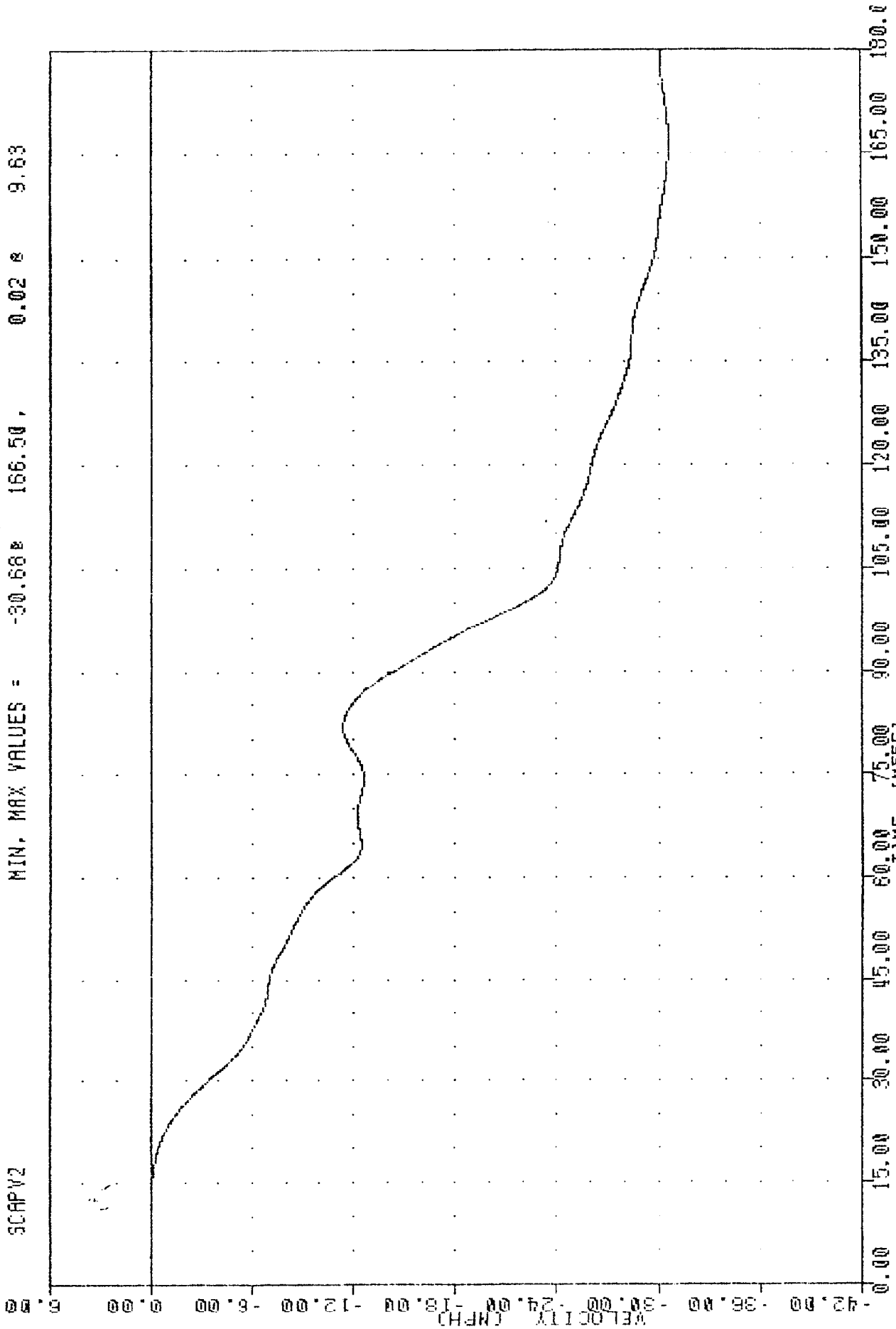


FORD LTD INTO FIXED BARRIER
STEERING COLUMN ACCELERATION UPPER INFERIOR

TAC
84178000000
SCAPV2

PLOT DATE 17-AUG-84 11:40:34

FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = -30.68 166.50 0.02 9.63

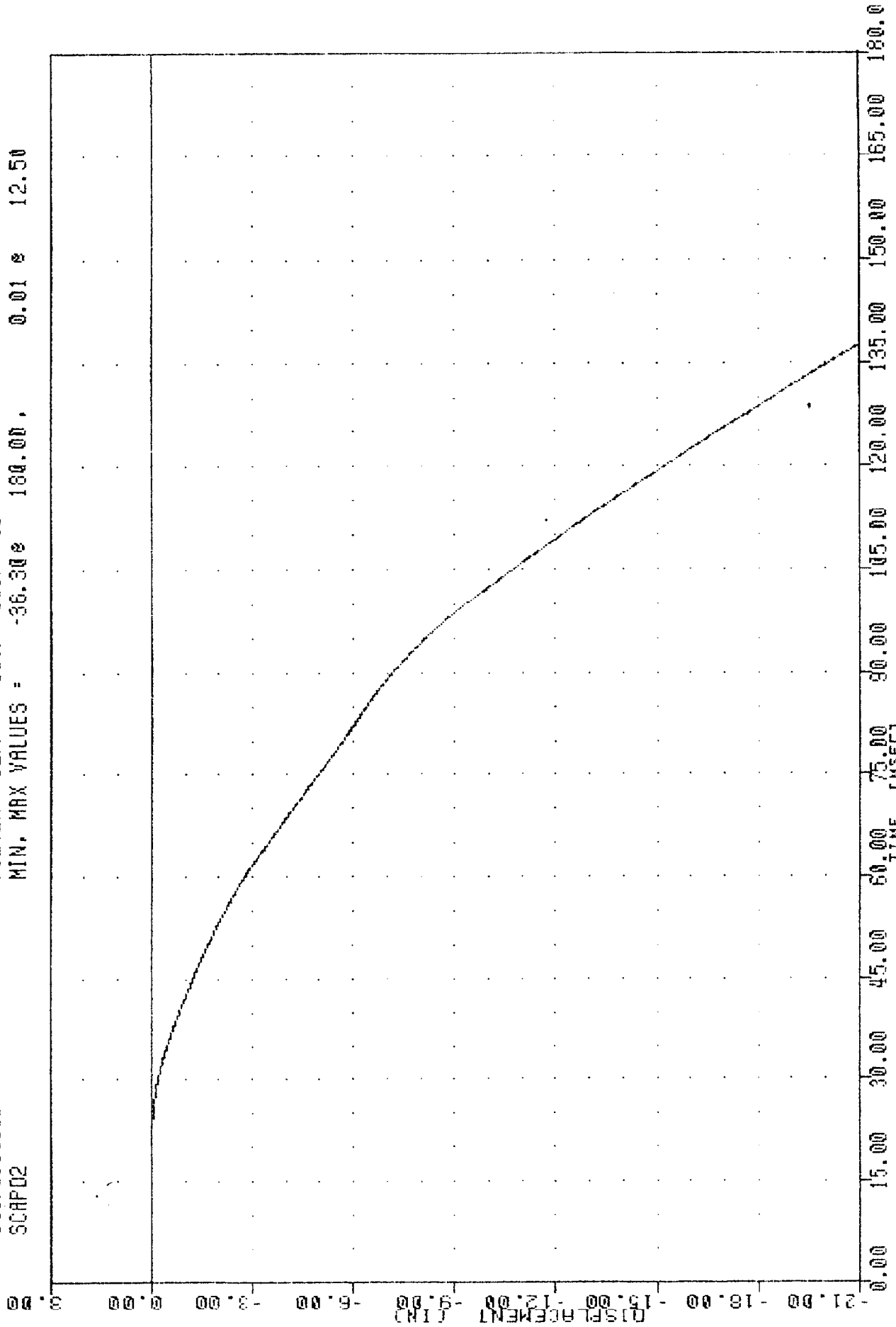


FORD LTD INTO FIXED BARRIER
DELTA V USING SCAPG2

TRC
840626
BREED AIR BAG PROGRAM
8417800000
SCAPD2

PLOT DATE 17-AUG-84 11:40:34

FILTER = 6LFF 300/ 849/ -40
MIN. MAX VALUES = -36.30e 180.00, 0.01 e 12.50

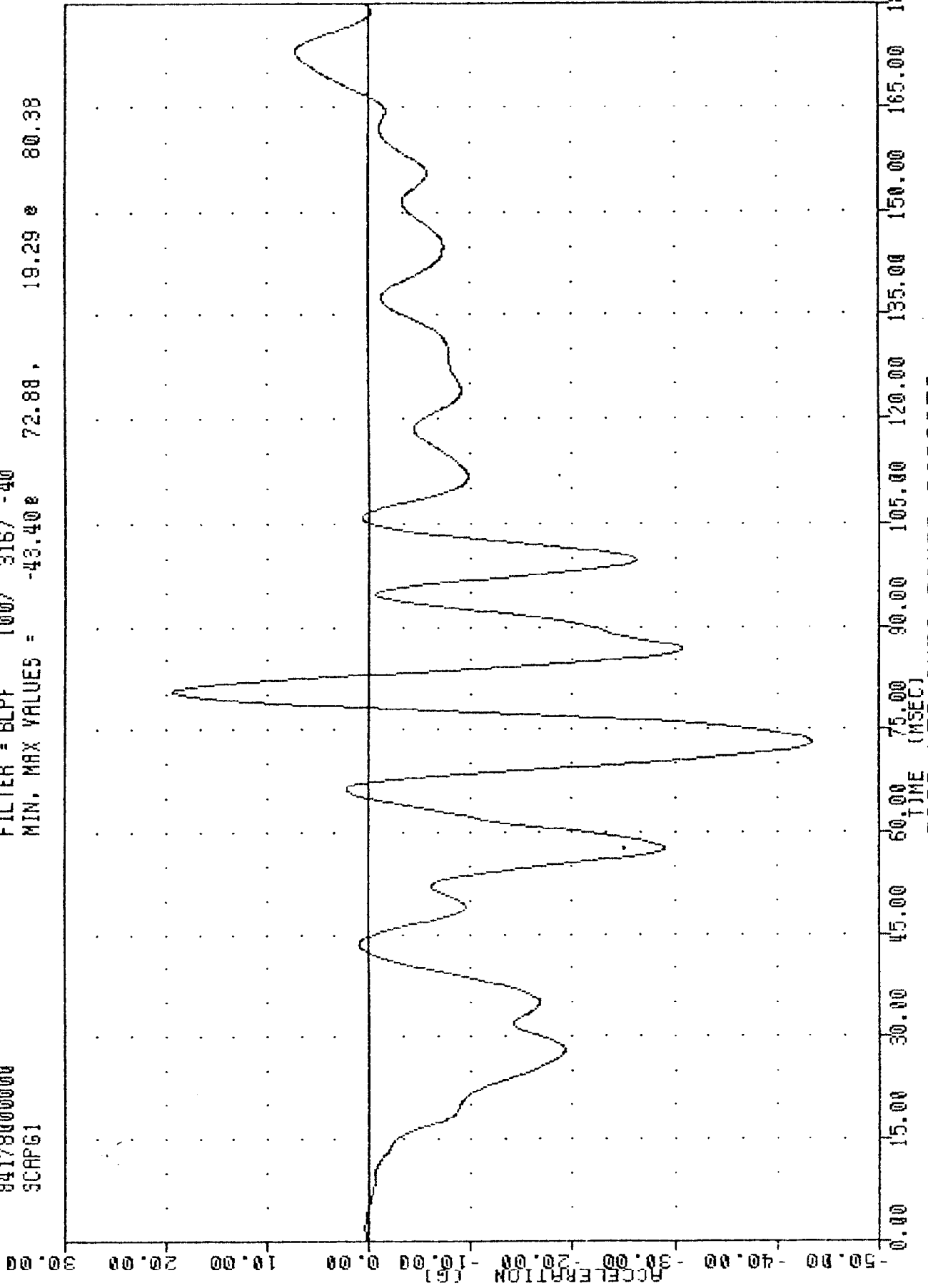


FORD LTD INTO FIXED BARRIER
DELTA X USING SCAPY2

TRC
84178000000
BREED AIR BAG PROGRAM
840626

PLOT DATE 16-AUG-84 13:02:39

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -43.40e 72.88, 19.29 e 80.38

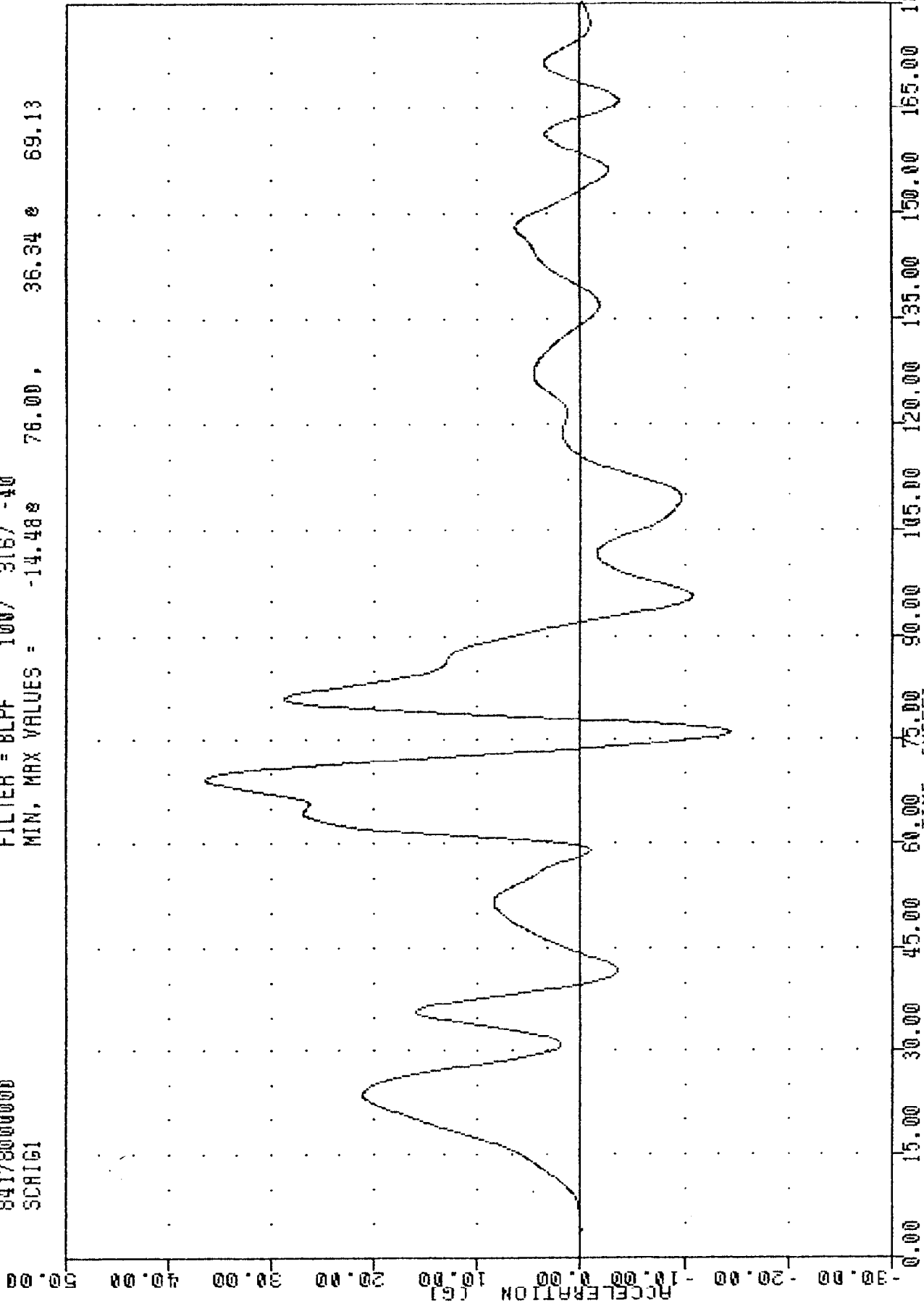


FORD LTD INTO FIXED BARRIER
STEERING COLUMN ACCELERATION LOWER POSTERIOR

TRC
84178000000
84178000000
BREED AIR BAG PROGRAM
. 840626

PLOT DATE 16-AUG-84 13:02:39

FILTER = 8LPF 100/ 316/ -40
MIN, MAX VALUES = -14.488 76.00, 36.34 @ 69.13

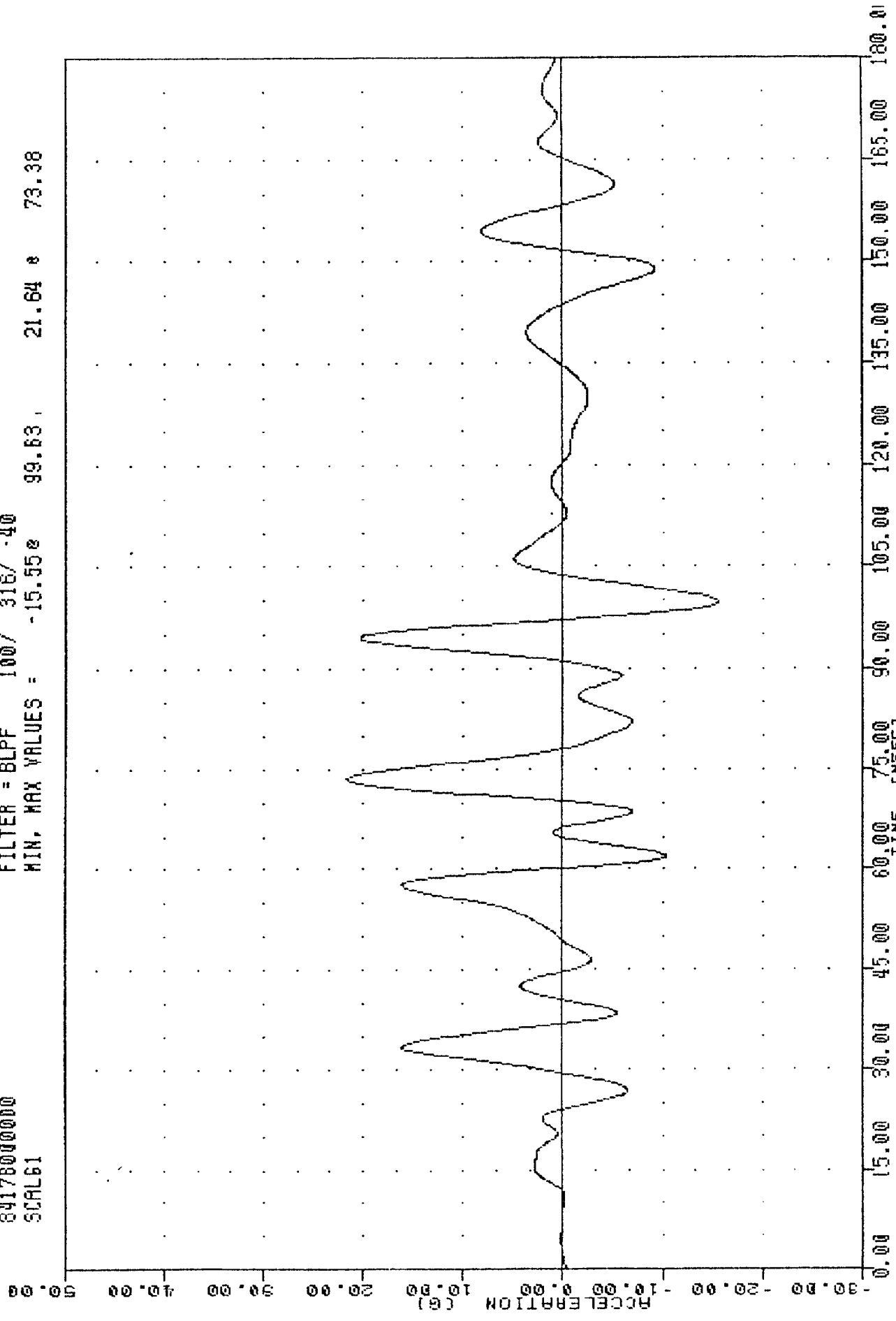


FORD LTD INTO FIXED BARRIER
STEERING COLUMN ACCELERATION LOWER INTERIOR

TAC
840626
BREED AIR BAG PROGRAM
04178000000
SCALE1

PLOT DATE 16-AUG-84 13:02:39

FILTER = BLPF 100 / 316 / -40
MIN. MAX VALUES = -15.55e 99.63 21.64 e 73.38

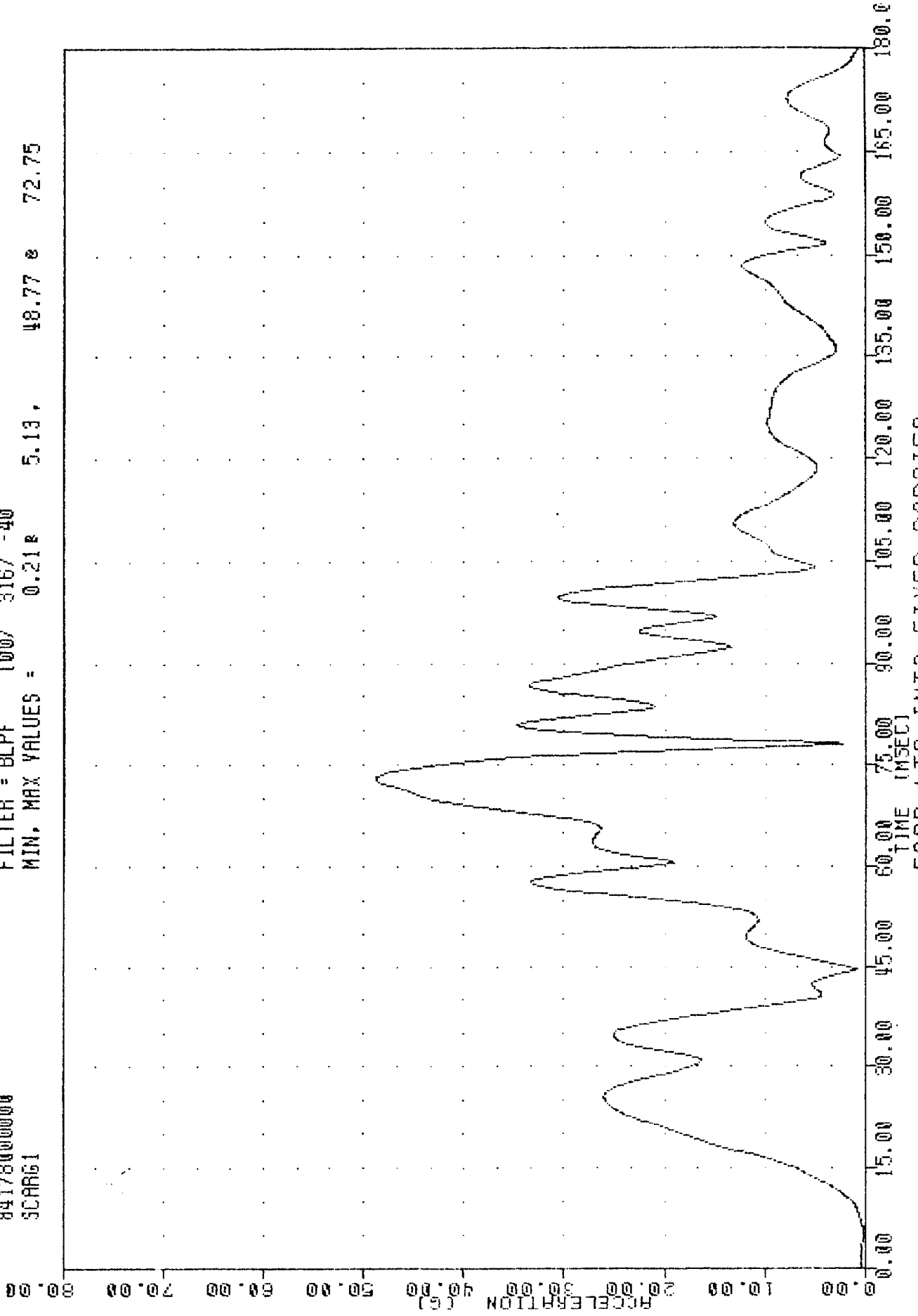


FORD LTD INTO FIXED BARRIER
STEERING COLUMN ACCELERATION LOWER LATERAL

TRC
840626
BREED AIR BAG PROGRAM
8417800000
SCARGI

PLOT DATE 20-AUG-84 15:54:04

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = 0.21R 5.13, 48.77 e 72.75

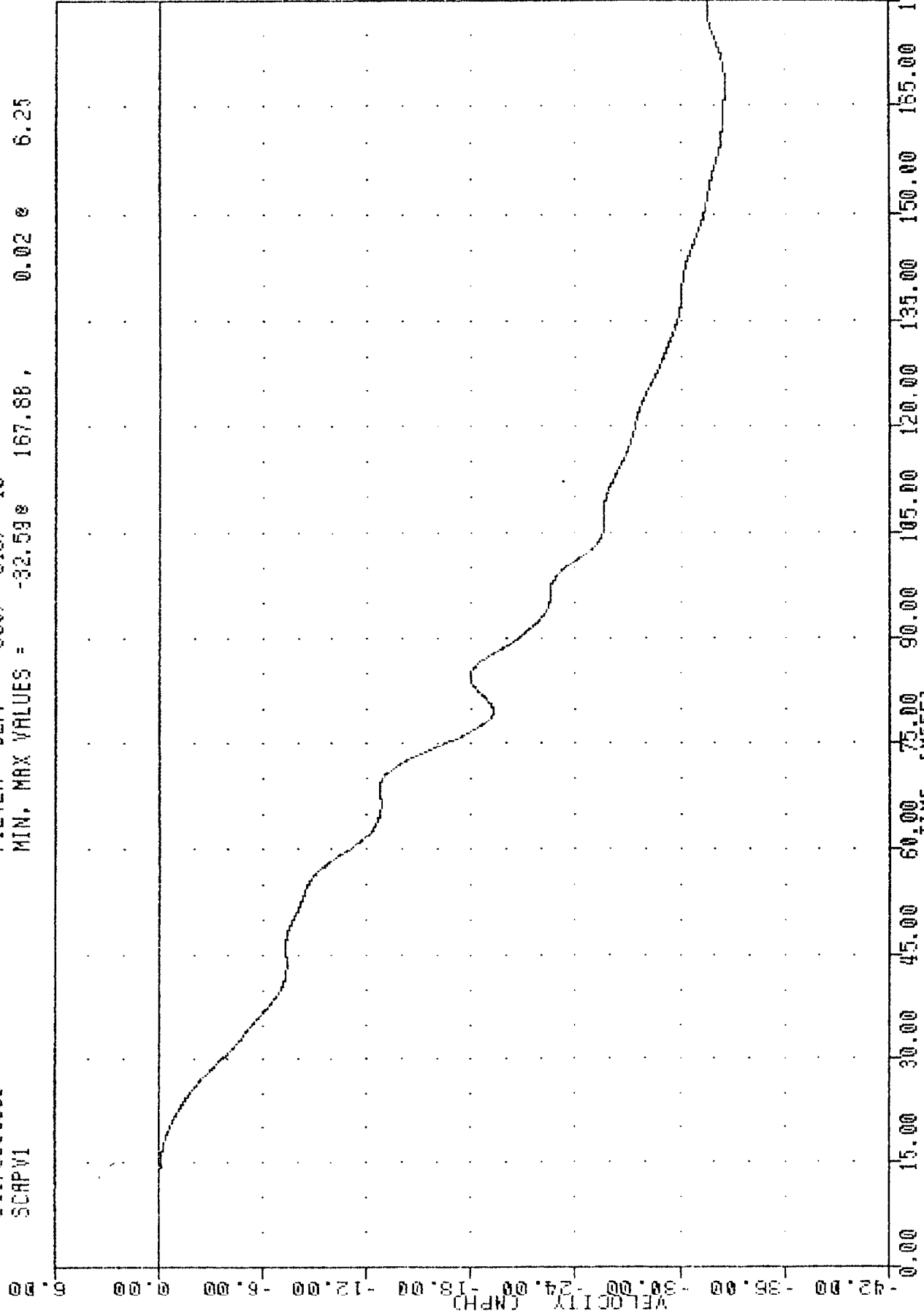


FORD LTD INTO FIXED BARRIER
LOWER STEERING COLUMN RESULTANT

TRC
BREED AIR BAG PROGRAM
84178000000
SCRAPV1

PLOT DATE 17-AUG-84 11:40:34

FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = -32.53 167.88, 0.02 6.25

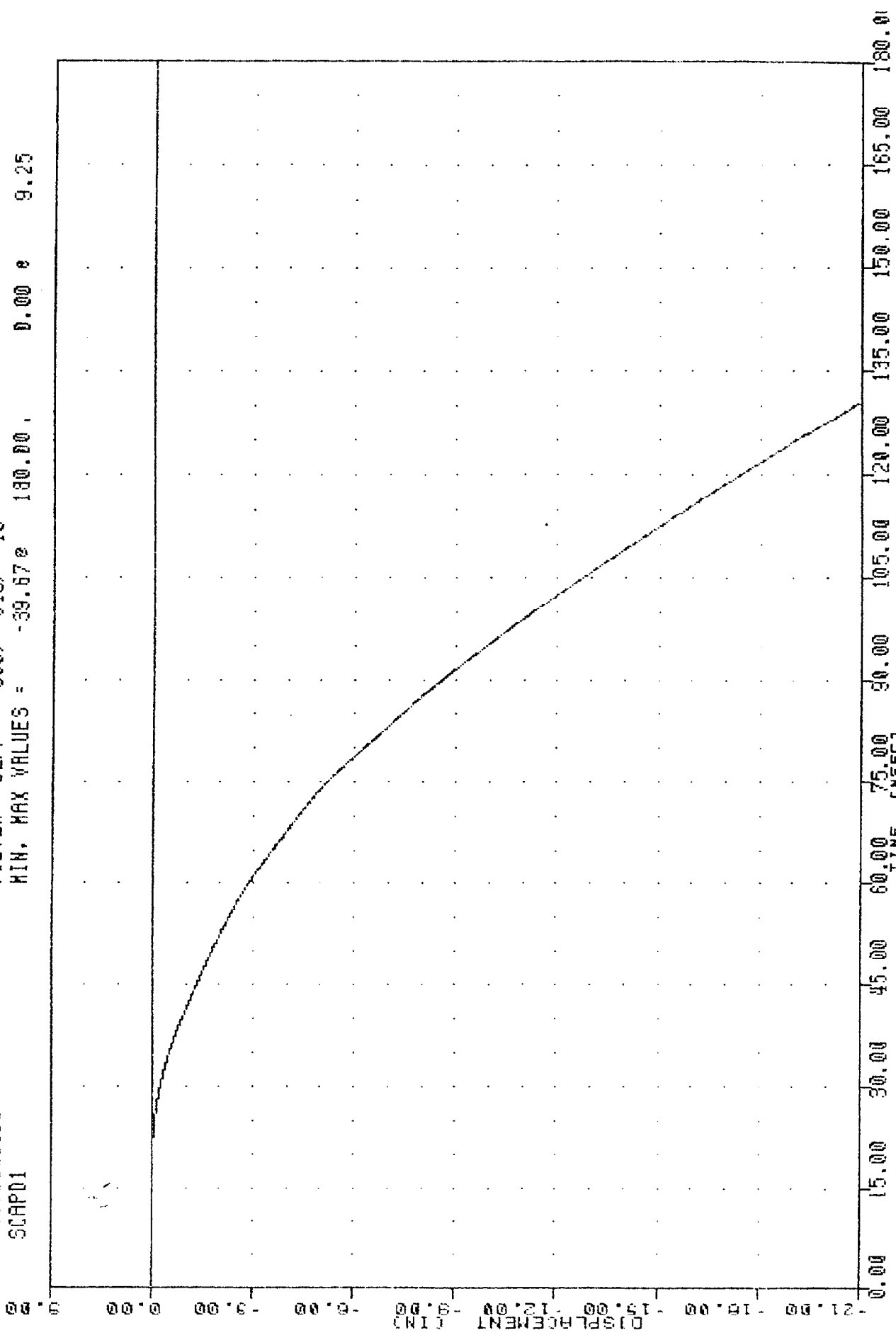


FORD LTD INTO FIXED BARRIER
DELTA V USING SCAPG1

TAC
840626
BREED AIR BAG PROGRAM
84178000000
SCAP01

PLOT DATE 17-AUG-84 11:40:34

FILTER = 8LFF 300/ 949/ -40
MIN. MAX VALUES = -39.672 180.00 0.00 9.25



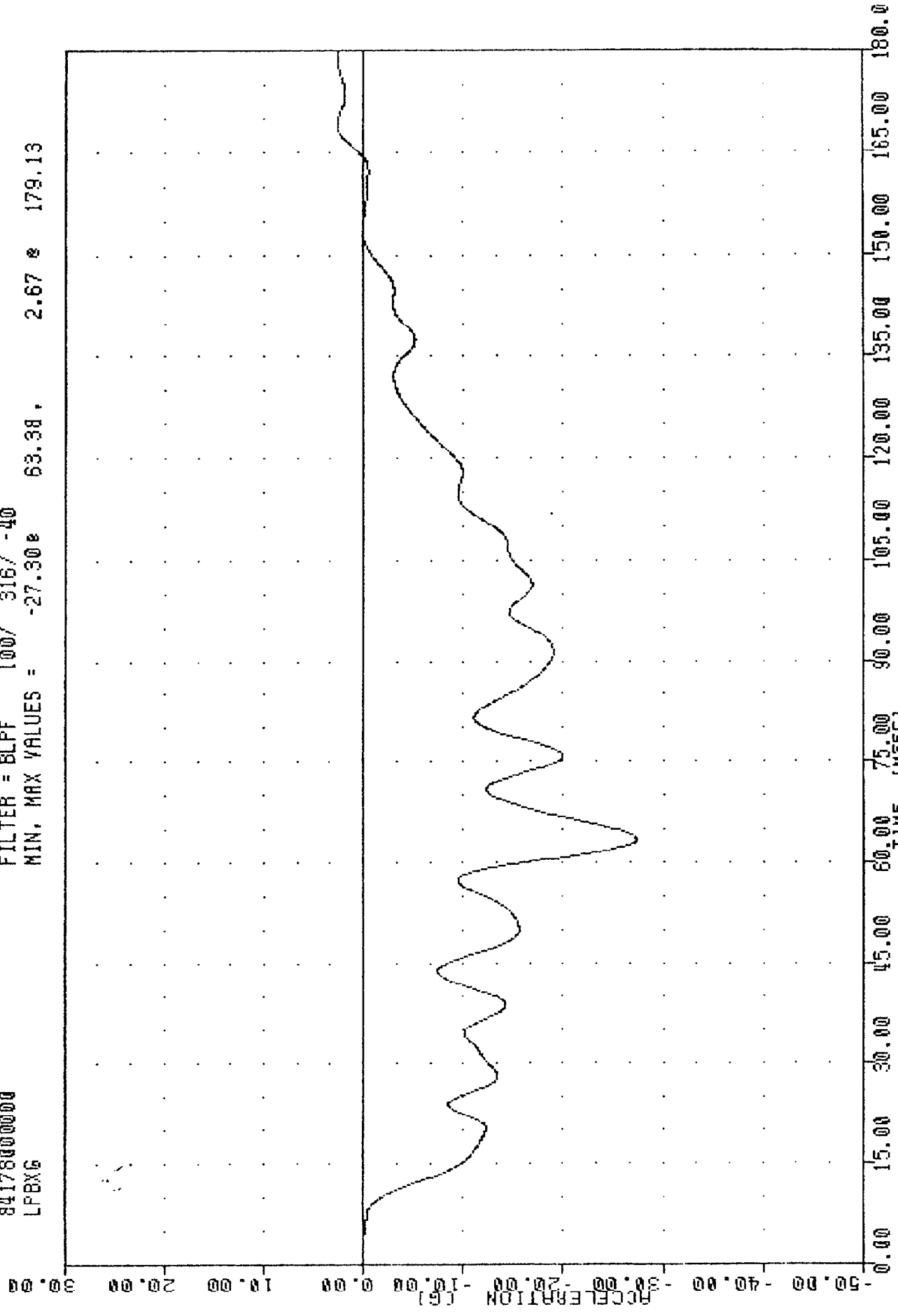
D-31

FORD LTD INTO FIXED BARRIER
DELTA X USING SCAPV1

TRC
840525
BREED AIR BAG PROGRAM
84178000000
LPBX6

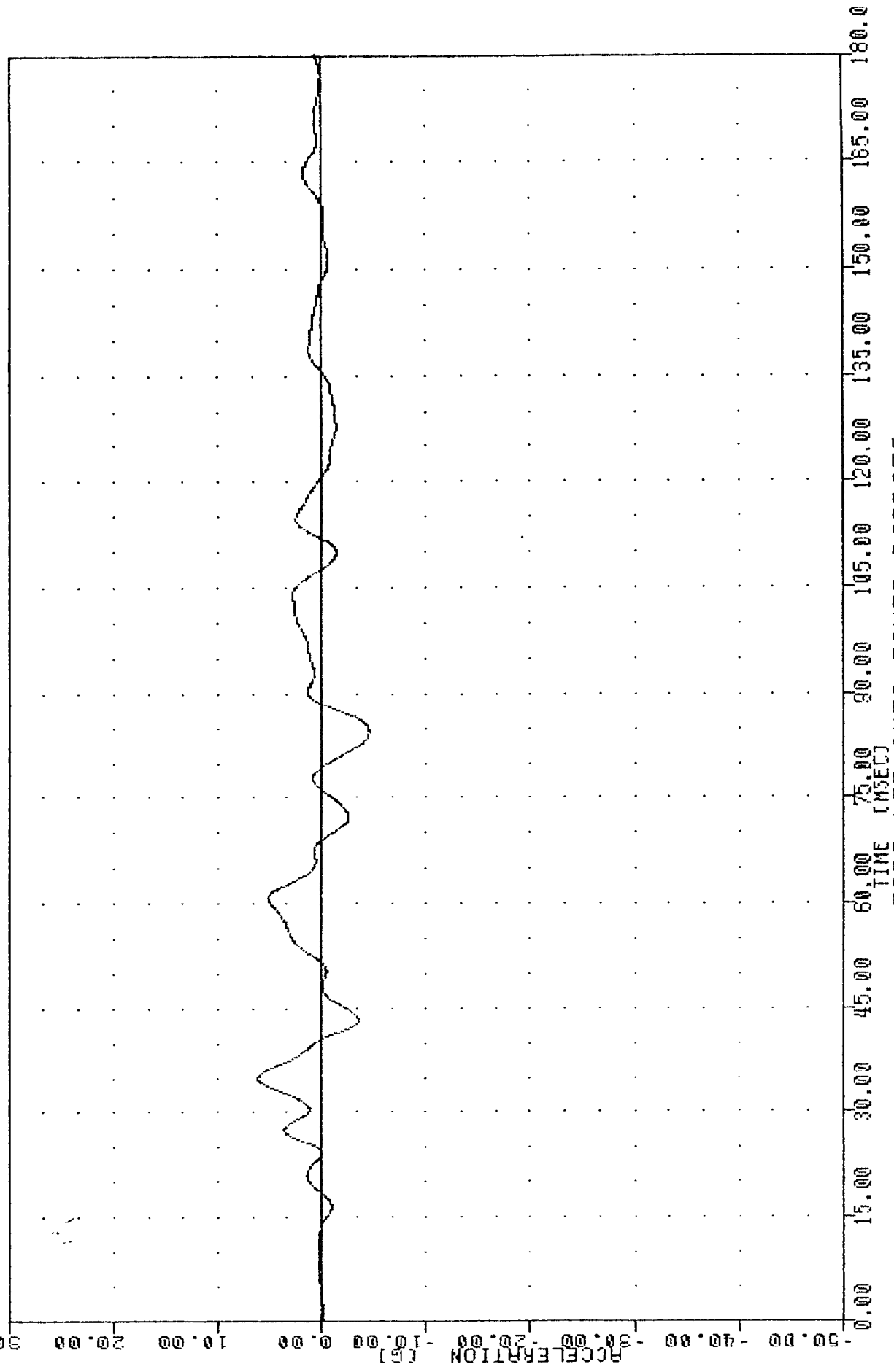
PLOT DATE 16-AUG-84 13:02:39

FILTER = 8LFF 100/ 316/ -40
MIN. MAX VALUES = -27.30e 63.38, 2.67 e 179.13



FORD LTD INTO FIXED BARRIER
LEFT B PILLAR ACCELERATION X AXIS

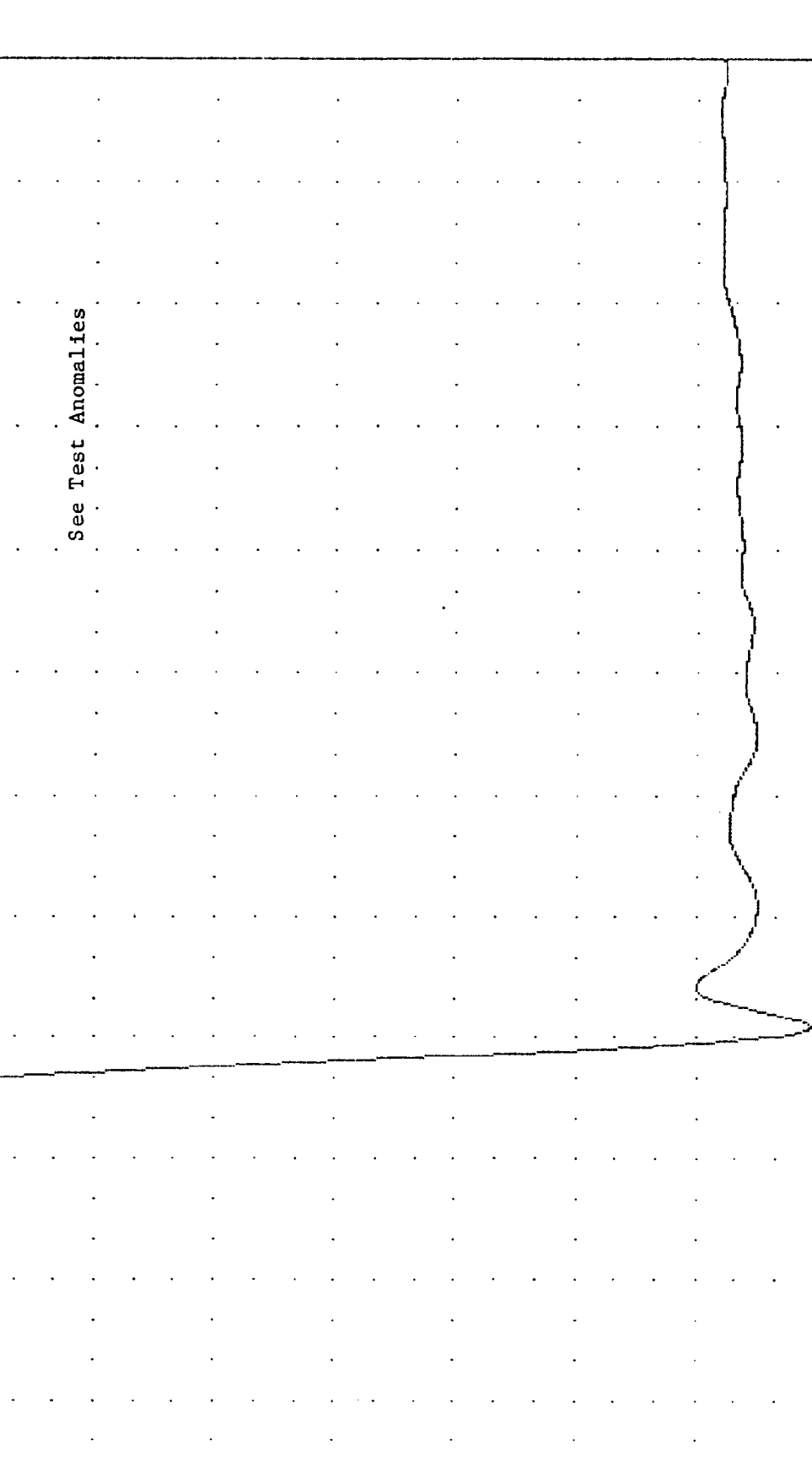
TRC: 840626 16-AUG-84 13:02:39
BREED AIR BAG PROGRAM
8417800000
LFBYG
FILTER = 8LPF 100/ 316/ -40
MIN. MAX VALUES = -4.56e 84.25, 6.12e 34.75



FORD LTD INTO FIXED BARRIER
LEFT B PILLAR ACCELERATION Y AXIS

TAC 840626
 BREED AIR BAG PROGRAM
 84178000000
 LPBZ6

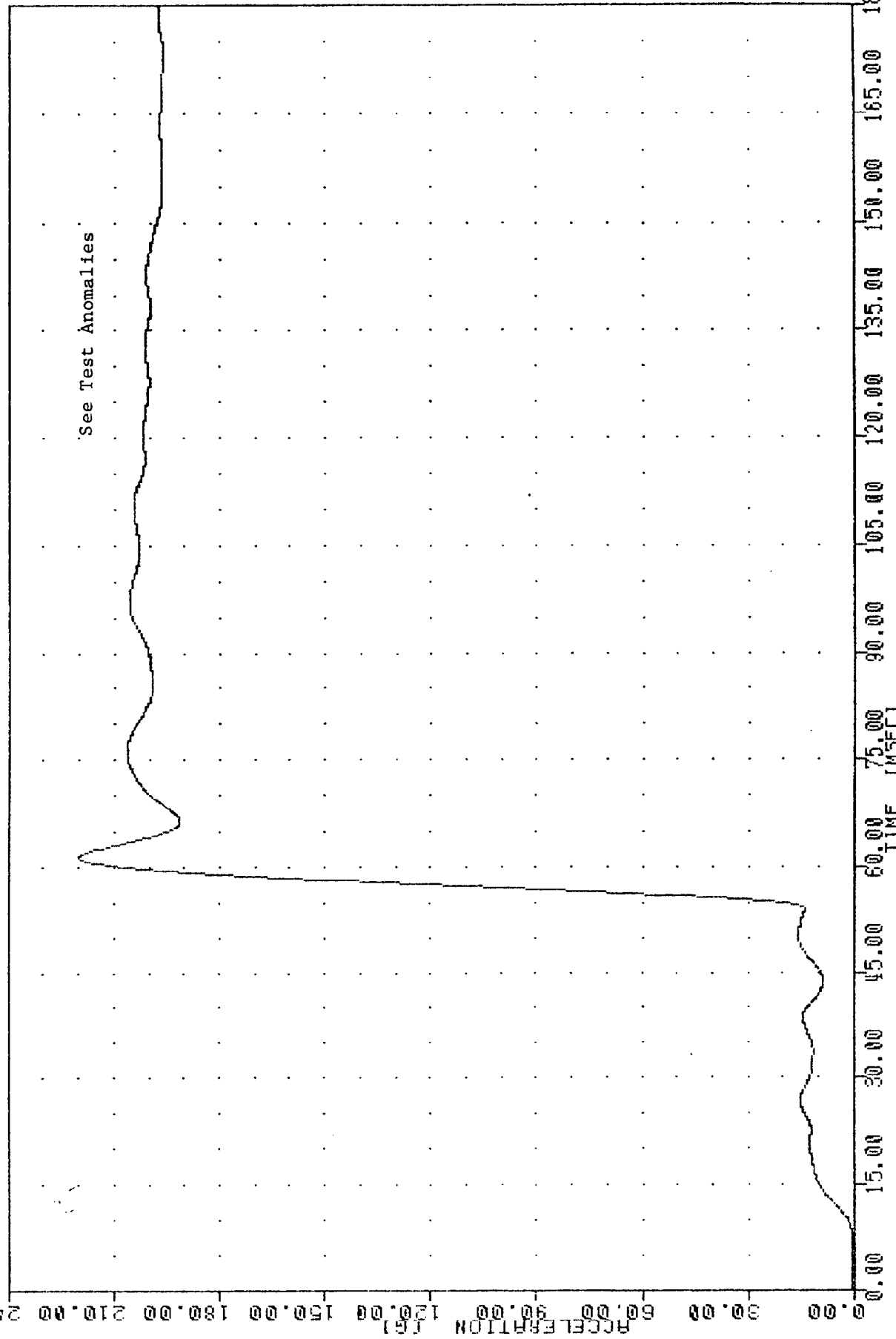
PLUT DATE 16-AUG-84 13:02:39
 FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -218.66e 61.25, 10.53 e 24.88



See Test Anomalies

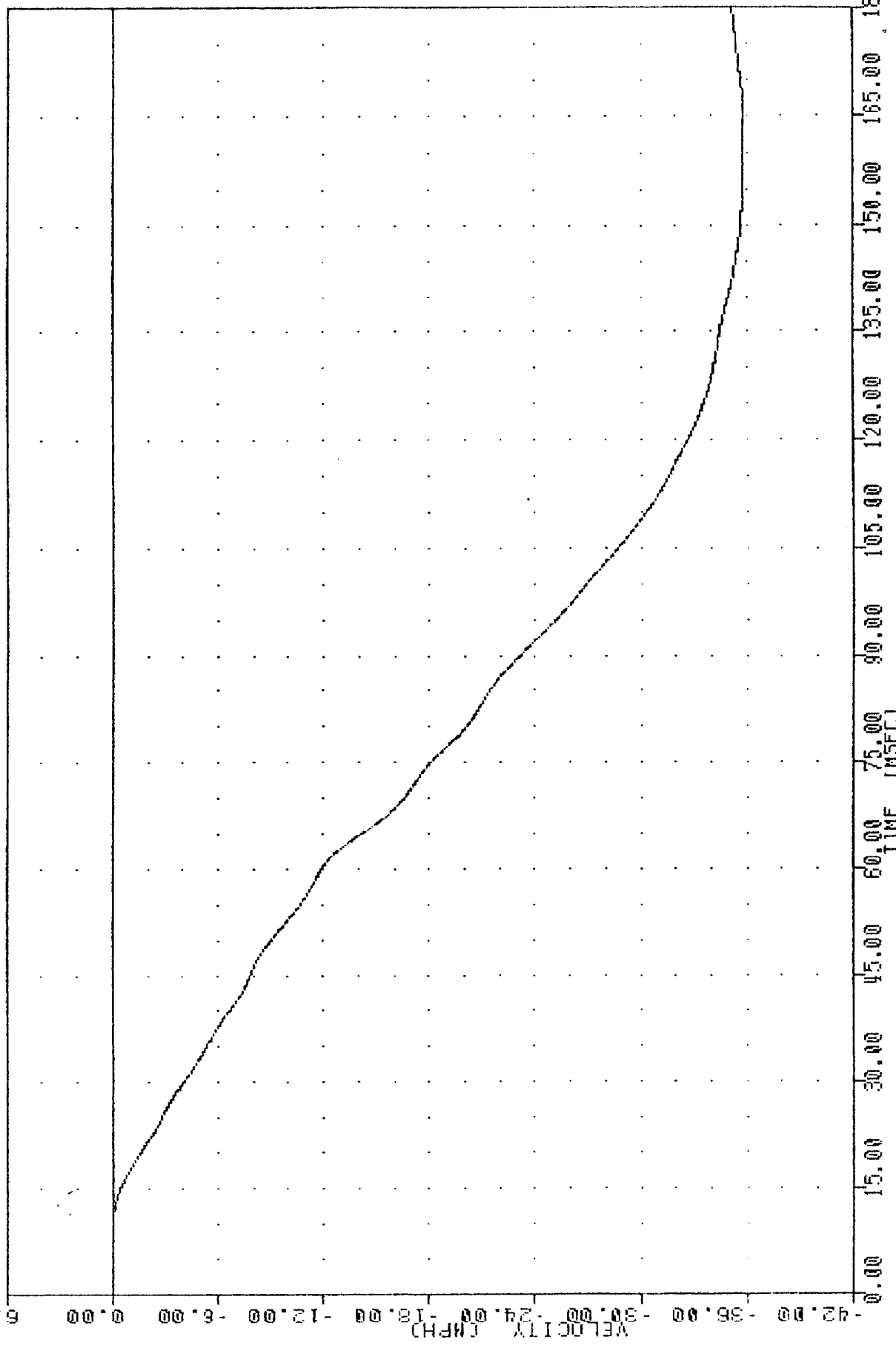
ACCELERATION (G)
 220.00 190.00 160.00 130.00 100.00 70.00 40.00 10.00 20.00
 0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (CNSEC)
 FORD LTD INTO FIXED BARRIER
 LEFT B PILLAR ACCELERATION Z AXIS

TRC
 BREED AIR BAG PROGRAM
 84178000000
 LPBRG
 PLOT DATE 15-HUG-84 13:02:39
 FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = 0.25e 4.13, 219.88 e 61.25



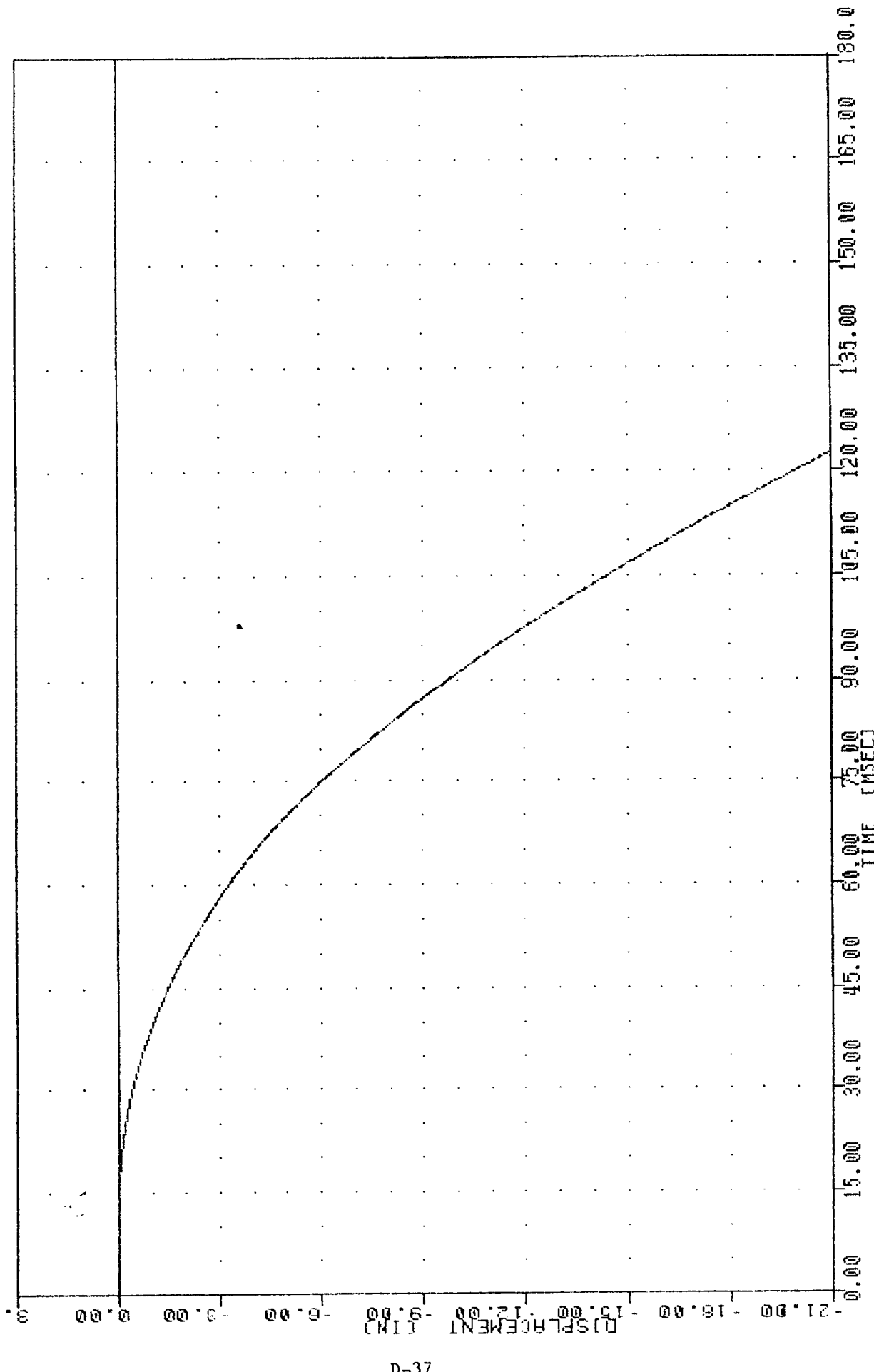
FORD LTD INTO FIXED BARRIER
 LEFT B PILLAR RESULTANT

TRC
 BREED AIR BAG PROGRAM
 84178000000
 LPBXV
 840626
 17-AUG-84
 11:40:34
 FILTER = 5LFF 300/ 949/ -40
 MIN, MAX VALUES = -35.798 165.50, -0.01 e 4.38



FORD LTD INTO FIXED BARRIER
 DELTA V USING LPEXG

TRC 840626 17 AUG 84 11:40:34
 SPEED AIR BAG PROGRAM
 8417800000
 LPBXD
 FILTER = 8LPF 300/ 949/ -10
 MIN, MAX VALUES = -45.27e 180.00, 0.00 e 0.00

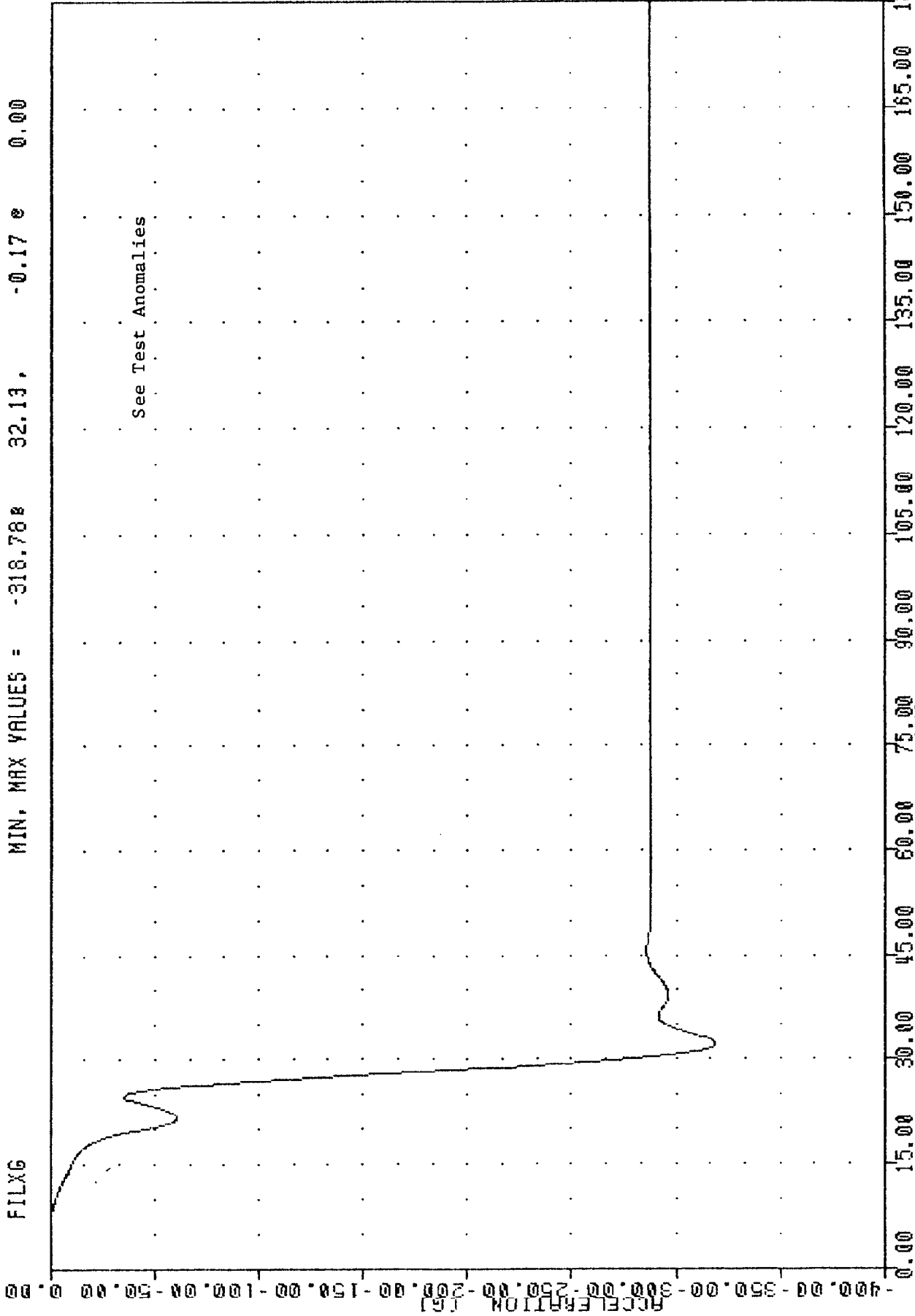


FORD LTD INTO FIXED BARRIER
 DELTA X USING LPBXV

TRC
84178000000
BREED AIR BAG PROGRAM
840626

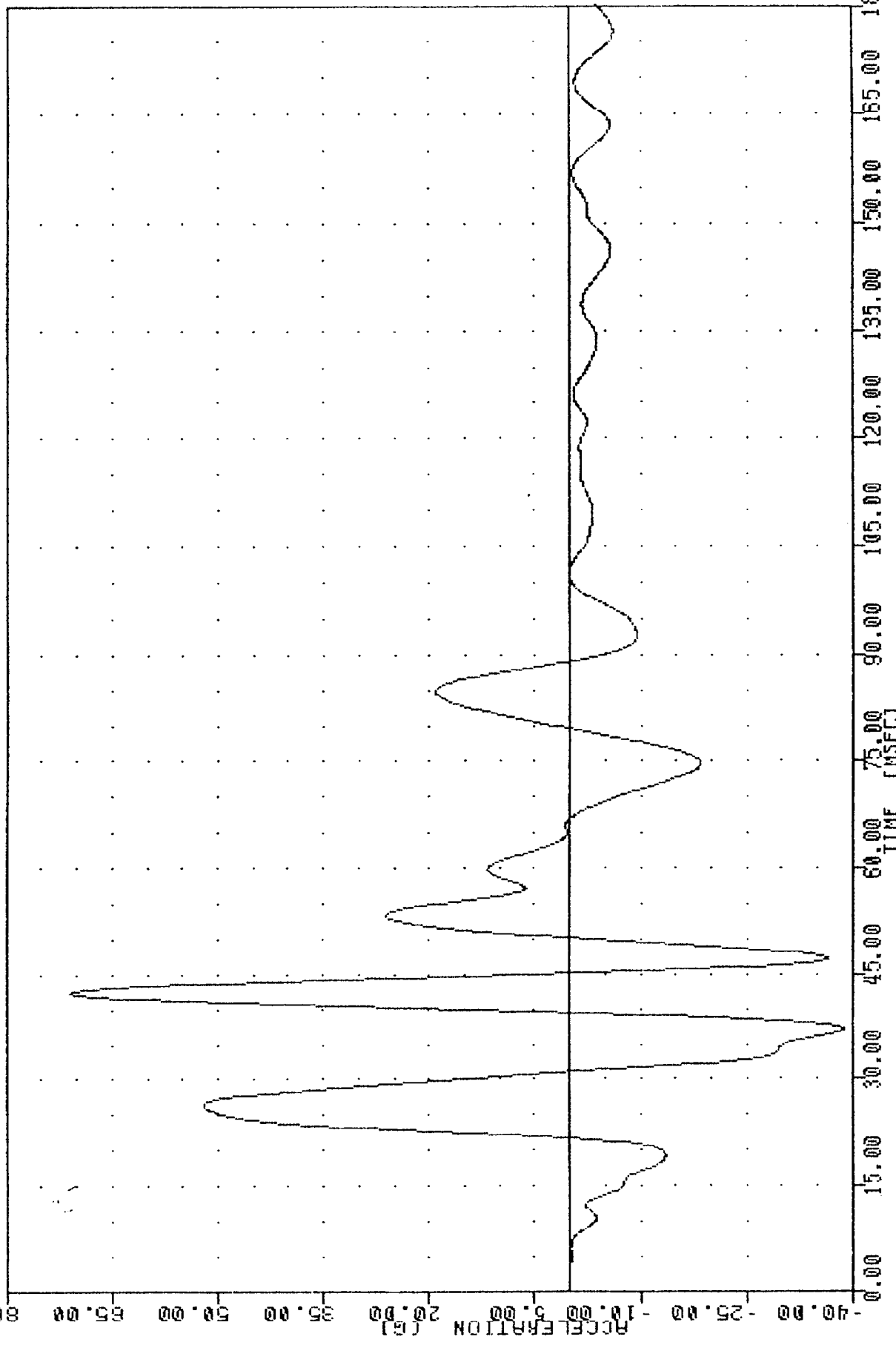
PLOT DATE 16-AUG-84 13:02:39

FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = -318.78# 32.13, -0.17 e 0.00



FORD LTD INTO FIXED BARRIER
LEFT FENDER WELL INNER ACC X AXIS

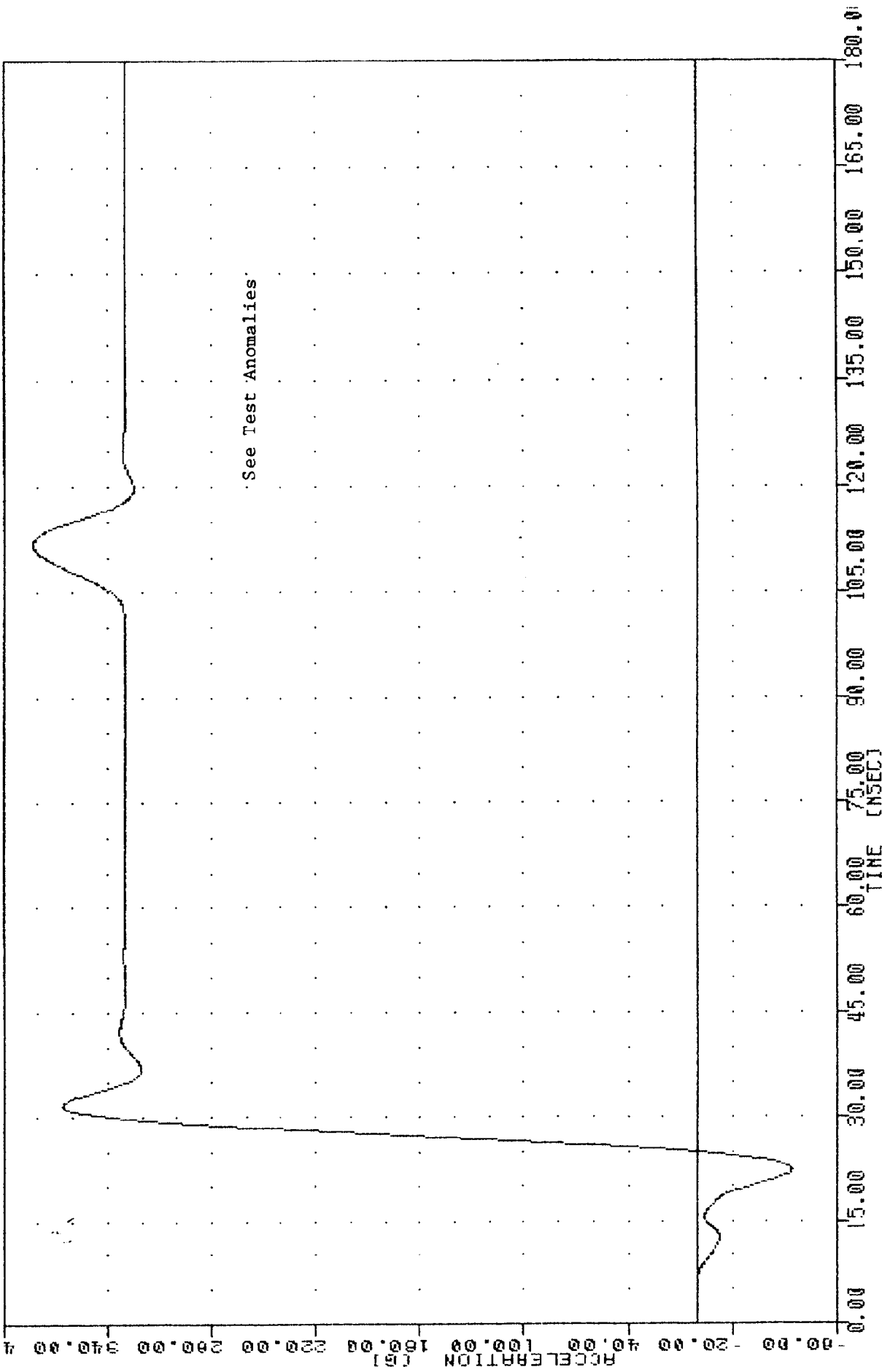
TRC 840626 16-HUG-84 13:02:39
 BREED AIR BAG PROGRAM
 8417800000
 FILYG
 FILTER = BLPF 10W/ 316/ -10
 MIN. MAX VALUES = -38.77e 70.93 e 42.25



FORD LTD INTO FIXED BARRIER
 LEFT FENDER WELL INNER ACC Y AXIS

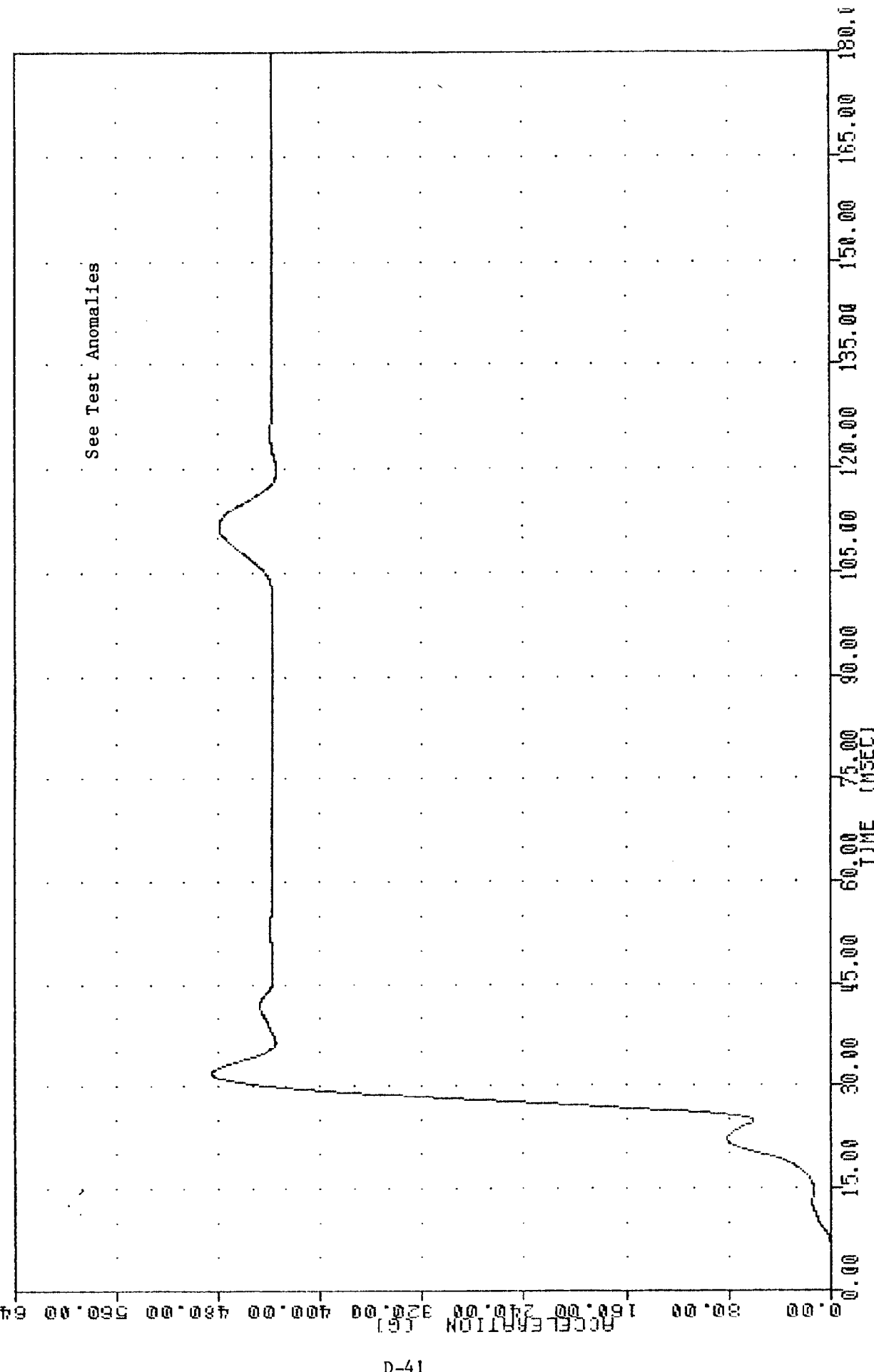
TAC 040620 16-AUG-84 15:02:39
 BREED AIR BAG PROGRAM
 84178000000
 FILZ6

FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -54.130 22.13, 383.17 e 111.63



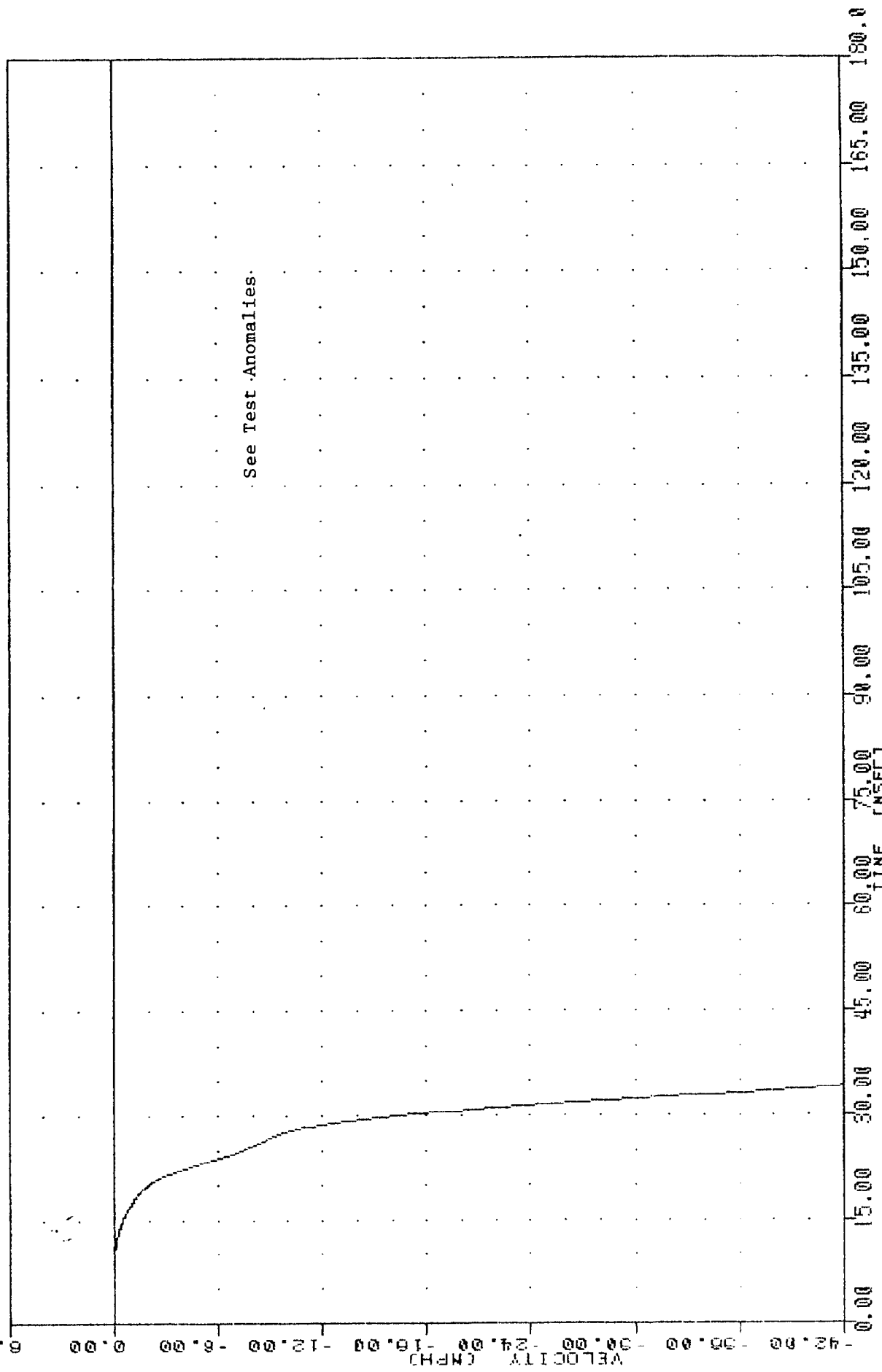
FORD LTD INTO FIXED BARRIER
 LEFT FENDER WELL INNER ACC Z AXIS

INC 040620
 BREED AIR BAG PROGRAM
 84178000000
 FILRG
 Plot DATE 10 AUG 84 13:02:33
 FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = 0.00, 484.62 s 31.75



FORD LTD INTO FIXED BARRIER
 LEFT FENDER WELL INNER RESULTANT

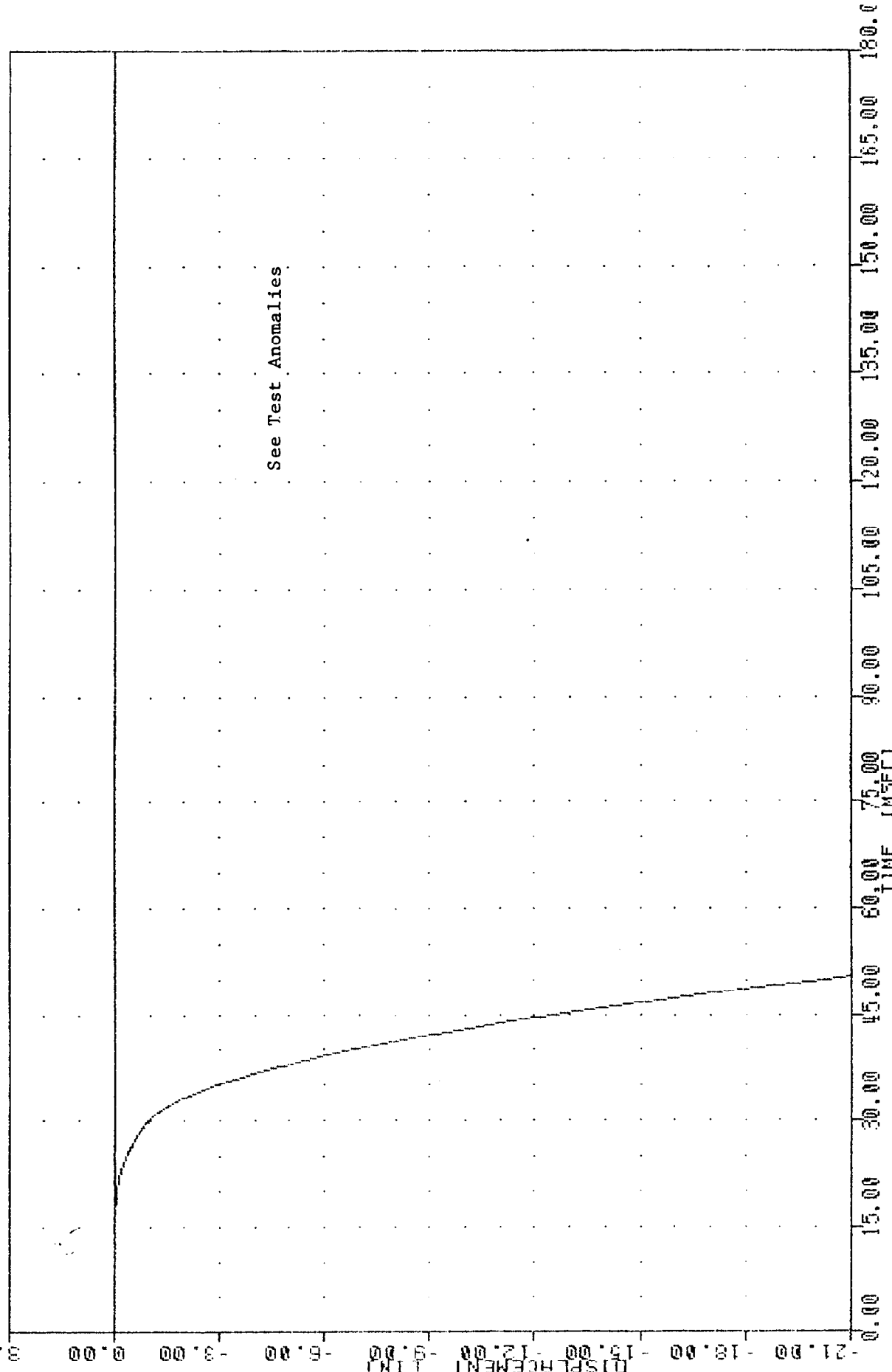
TAC ██████████ 840626 ██████████ PLUT DATE 17-NOV-64 11:40:34
 BREED AIR BAG PROGRAM
 84178000000
 FILXY
 FILTER = BLPF 300/ 949/ -40
 MIN, MAX VALUES = -965.58 180.00, 0.00 e 0.00



See Test Anomalies.

FORD LTD INTO FIXED BARRIER
 DELTA V USING FILXG

TRC
 BREED AIR BAG PROGRAM
 8417800000
 FILXD
 840626
 17-HUG-84
 11:40:34
 FILTER = BLPF 300/ 949/ -40
 MIN, MAX VALUES = -887.19e 180.00, 0.00 s 0.38

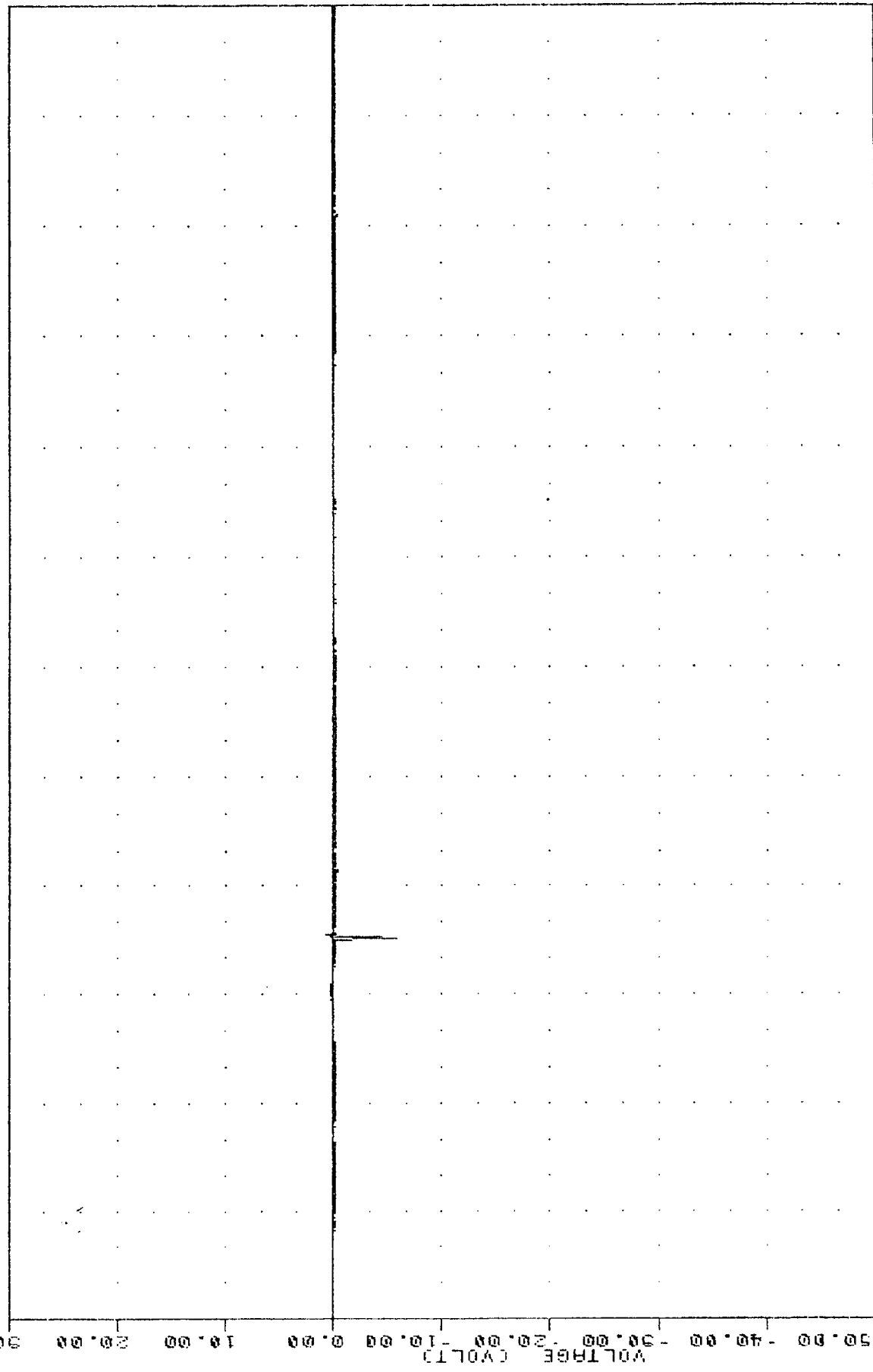


See Test Anomalies

FORD LTD INTO FIXED BARRIER
 DELTA X USING FILXY

THE 040620 16 JUN 69 13:02:59
 BREED AIR BAG PROGRAM
 84178000000
 ABT1

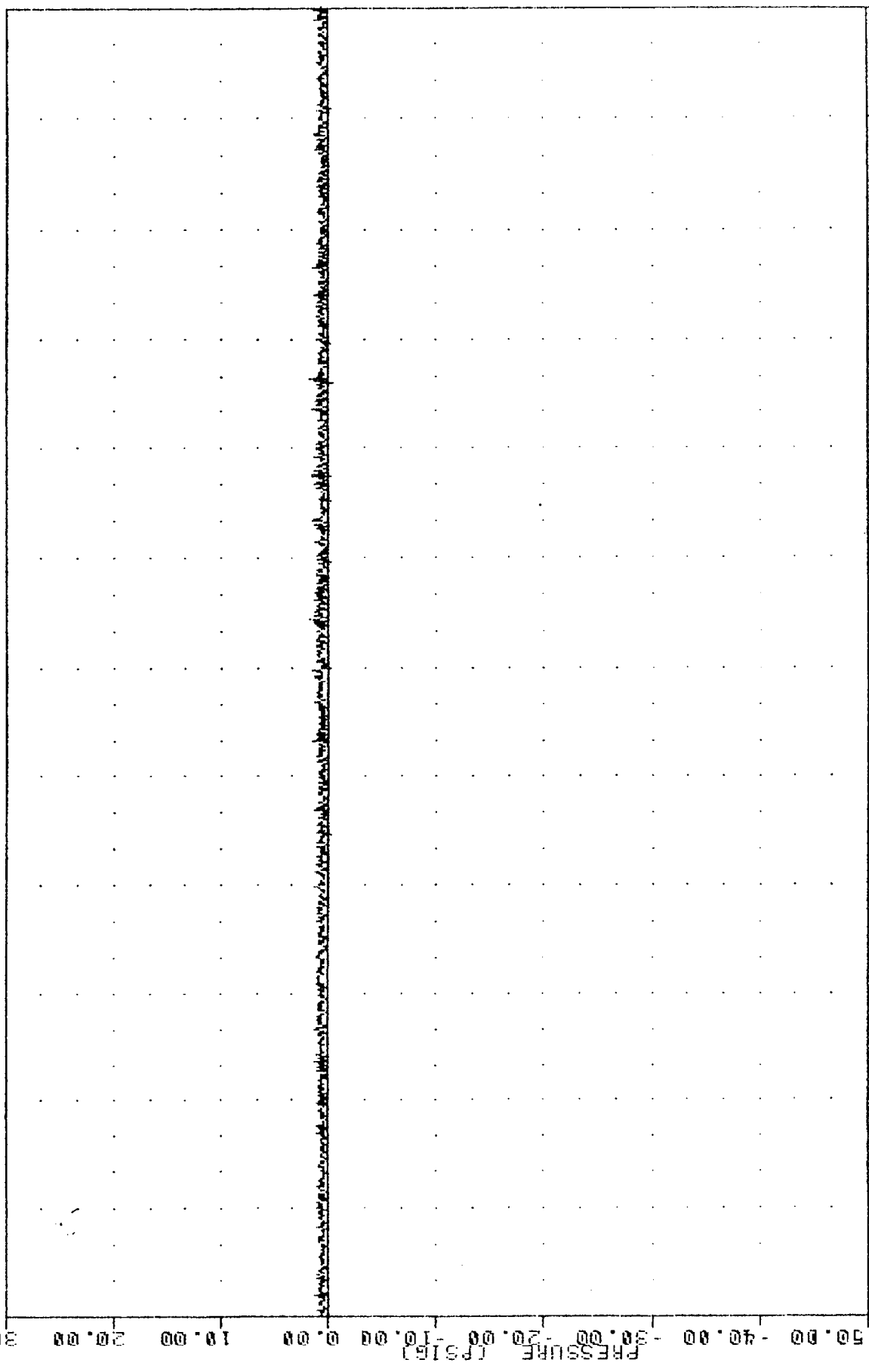
FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES : -5.98% 52.63, 0.65 * 53.00



60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (MSEC)
 FORD LTD INTO FIXED BARRIER
 ROMEO LEFT FRONT SENSOR

TAC 040626
 BREED AIR BAG PROGRAM
 84178000000
 AB77

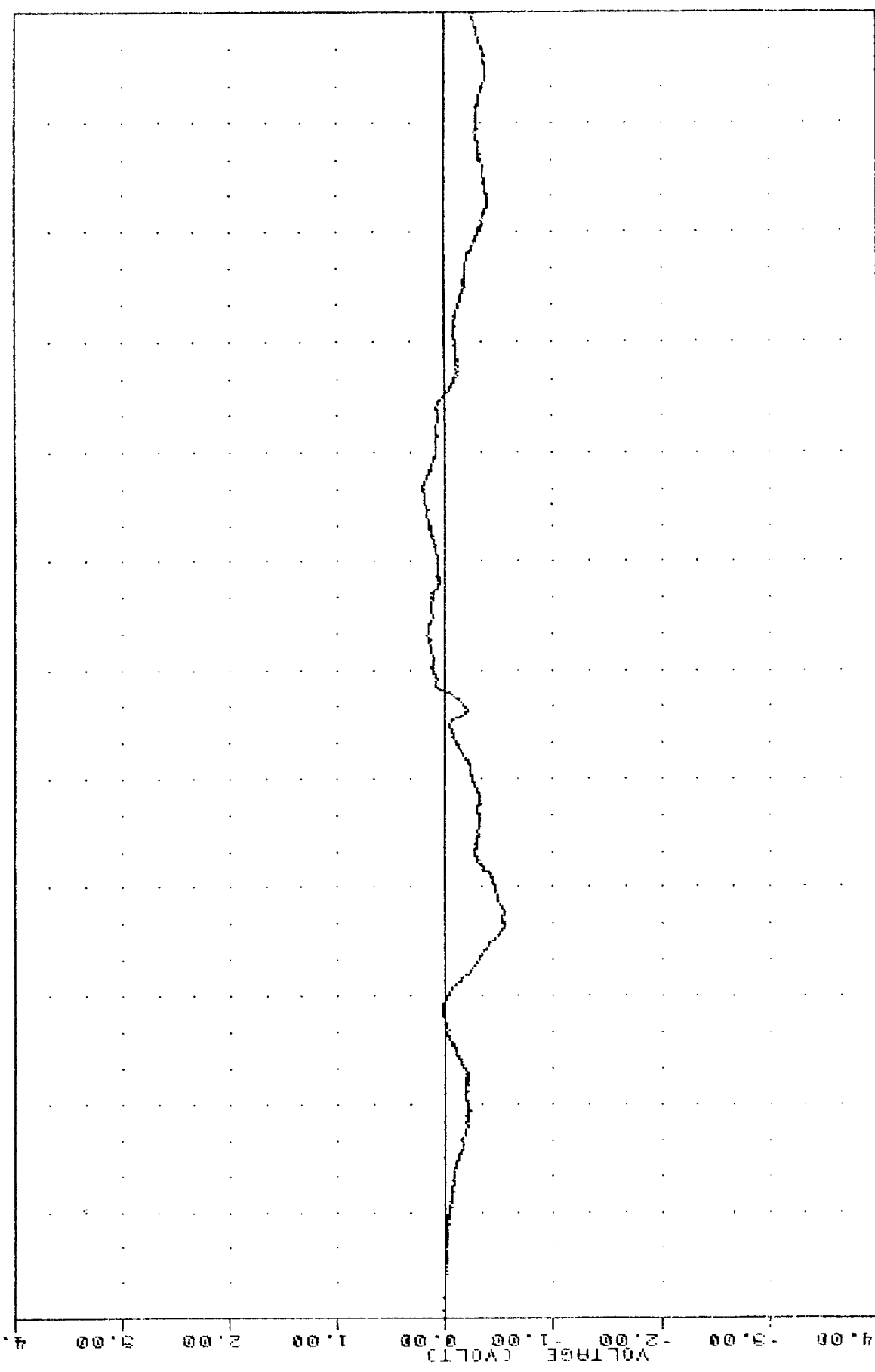
PLOT DATE 20 AUG 64 13:38:22
 FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = -0.468 129.00, 1.68 e 96.38



0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
 TIME (MSEC)
 FORD LTD INTO FIXED BARRIER
 PRESSURE TRANSDUCER

THE [REDACTED] 840620 [REDACTED] 20 JUN 64 13:38:22
BREED AIR BAG PROGRAM
8417800000
ABT3

FILTER = ALPF 1650/ 5217/ -40
MIN. MAX VALUES = -0.55e 58.25, 0.22 e 114.63



4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
VOLTAGE (VOLTS)

0.00 15.00 30.00 45.00 60.00 75.00 90.00 105.00 120.00 135.00 150.00 165.00 180.00
TIME (MSEC)

FORD LTD INTO FIXED BARRIER
ACOUSTICAL SENSOR

APPENDIX E
DUMMY CERTIFICATION

TRANSPORTATION RESEARCH CENTER OF OHIO
DUMMY CALIBRATION LABORATORY

MEASUREMENTS, TEST DATA, PARTS IDENTIFICATIONS AND CERTIFICATIONS

PART 572
HYBRID II DUMMY

SERIAL NO.: 187

DATE: June 22, 1984

PART 572 - HYBRID II DUMMY

Serial No.: 187

Date of Calibration: 6-15-84

HEAD DROP TEST

RESULTS

<u>Parameter</u>	<u>Specification</u>	<u>1st Test</u>	<u>2nd Test</u>	<u>3rd Test</u>	<u>Mean</u>
Peak Resultant Accel	<u>210 - 260g</u>	<u>223.70</u>	<u> </u>	<u> </u>	<u> </u>
Peak Lateral Accel	<u>10g max.</u>	<u>-4.95</u>	<u> </u>	<u> </u>	<u> </u>
Time Above 100g (Resultant)	<u>0.9 - 1.5ms</u>	<u>1.30</u>	<u> </u>	<u> </u>	<u> </u>
Temperature	<u>66 - 78° F</u>	<u>76</u>	<u> </u>	<u> </u>	<u> </u>
Relative Humidity	<u>10 - 70%</u>	<u>51</u>	<u> </u>	<u> </u>	<u> </u>

NECK TEST

RESULTS

<u>Parameter</u>	<u>Specification</u>	<u>1st Test</u>	<u>2nd Test</u>	<u>3rd Test</u>	<u>Mean</u>
Pendulum Velocity	<u>21.5-25.5 fps</u>	<u>23.53</u>	<u> </u>	<u> </u>	<u> </u>
Average Decel t_2-t_3	<u>20 - 24g</u>	<u>23.51</u>	<u> </u>	<u> </u>	<u> </u>
Pendulum Decel t_2-t_1	<u>3 ms max.</u>	<u>1.76</u>	<u> </u>	<u> </u>	<u> </u>
Pendulum Decel t_3-t_2	<u>25 - 30 ms</u>	<u>28.35</u>	<u> </u>	<u> </u>	<u> </u>
Pendulum Decel t_4-t_3	<u>10 ms max.</u>	<u>3.28</u>	<u> </u>	<u> </u>	<u> </u>
Pendulum Reversal	<u>123 ms min.</u>	<u>>123</u>	<u> </u>	<u> </u>	<u> </u>
Peak Head Resultant	<u>26g max.</u>	<u>24.78</u>	<u> </u>	<u> </u>	<u> </u>
Peak Head Rotation	<u>63 - 73° F</u>	<u>66.70</u>	<u> </u>	<u> </u>	<u> </u>

NECK TEST (continued)RESULTS

<u>Parameter</u>	<u>Specification</u>	<u>1st Test</u>	<u>2nd Test</u>	<u>3rd Test</u>	<u>Mean</u>
Chordal Displacement:					
<u>Head Angle</u>					
0°	Time	2.0 - 2.0ms	0.0		
	Displ	0.5 - 0.5in	.01		
30°	Time	25.6 - 34.4ms	28.08		
	Displ	2.1 - 3.1in	2.38		
60°	Time	40.3 - 51.7ms	43.17		
	Displ	4.3 - 5.3in	4.38		
Max (73°)	Time	53.2 - 66.8ms	57.63		
	Displ	5.0 - 6.0in	5.11		
60°	Time	67.0 - 83.0ms	69.08		
	Displ	4.3 - 5.3in	4.63		
30°	Time	85.4 - 104.6ms	89.24		
	Displ	2.1 - 3.1in	2.24		
0°	Time	101.0 - 123.0ms	102.59		
	Displ	0.5 - 0.5in	.15		
Temperature		66 - 78° F	72		
Relative Humidity		10 - 70%	54		

ABDOMINAL COMPRESSION TESTRESULTS

<u>Parameter</u>	<u>Specification</u>	<u>1st Test</u>	<u>2nd Test</u>	<u>3rd Test</u>	<u>Mean</u>
Force at 0.0 in	10 lbs.	10			
Force at 1.0 in	50 - 63 lbs.	54.8			
Force at 1.3 in	73 - 88 lbs.	78.7			
Temperature	66 - 78° F	76			
Relative Humidity	10 - 70%	51			

THORAX IMPACT TESTRESULTS

<u>Parameter</u>	<u>Specification</u>	<u>1st Test</u>	<u>2nd Test</u>	<u>3rd Test</u>	<u>Mean</u>
<u>High Speed:</u>					
Probe Velocity	<u>21.78-22.22fps</u>	<u>22.22</u>	_____	_____	_____
Peak Sternum					
Deflection	<u>1.7 in. max.</u>	<u>1.68</u>	_____	_____	_____
Peak Resistive Force	<u>2250 lb. max.</u>	<u>1889</u>	_____	_____	_____
Internal Hysteresis	<u>50 - 70%</u>	<u>53.4</u>	_____	_____	_____
Temperature	<u>66 - 78° F</u>	<u>74</u>	_____	_____	_____
Relative Humidity	<u>10 - 70%</u>	<u>46</u>	_____	_____	_____
<u>Low Speed:</u>					
Probe Velocity	<u>13.86-14.14fps</u>	<u>14.04</u>	_____	_____	_____
Peak Sternum					
Deflection	<u>1.1 in. max.</u>	<u>1.076</u>	_____	_____	_____
Peak Resistive Force	<u>1450 lb. max.</u>	<u>1221</u>	_____	_____	_____
Internal Hysteresis	<u>50 - 70%</u>	<u>52.9</u>	_____	_____	_____
Temperature	<u>66 - 78° F</u>	<u>73</u>	_____	_____	_____
Relative Humidity	<u>10 - 70%</u>	<u>45</u>	_____	_____	_____

LUMBAR FLEXION TESTRESULTS

<u>Parameter</u>	<u>Specification</u>	<u>1st Test</u>	<u>2nd Test</u>	<u>3rd Test</u>	<u>Mean</u>
Force at 20°	<u>22 - 34 lbs</u>	<u>31</u>	_____	_____	_____
Force at 30°	<u>34 - 46 lbs</u>	<u>40</u>	_____	_____	_____
Force at 40°	<u>46 - 58 lbs</u>	<u>49</u>	_____	_____	_____
Return Angle	<u>12° max.</u>	<u>6.2</u>	_____	_____	_____
Temperature	<u>66 - 78° F</u>	<u>76</u>	_____	_____	_____
Relative Humidity	<u>10 - 70%</u>	<u>51</u>	_____	_____	_____

RIGHT KNEE IMPACT RESPONSE

RESULTS

<u>Parameter</u>	<u>Specification</u>	<u>1st Test</u>	<u>2nd Test</u>	<u>3rd Test</u>	<u>Mean</u>
Probe Velocity	<u>6.76-7.04fps</u>	<u>6.83</u>	_____	_____	_____
Peak Force	<u>1850-2500lbs</u>	<u>1996</u>	_____	_____	_____
Time Above 1000 Lbs.	<u>1.7 ms min.</u>	<u>1.85</u>	_____	_____	_____
Temperature	<u>66 - 78° F</u>	<u>74</u>	_____	_____	_____
Relative Humidity	<u>10 - 70%</u>	<u>45</u>	_____	_____	_____

LEFT KNEE IMPACT RESPONSE

RESULTS

<u>Parameter</u>	<u>Specification</u>	<u>1st Test</u>	<u>2nd Test</u>	<u>3rd Test</u>	<u>Mean</u>
Probe Velocity	<u>6.76-7.04fps</u>	<u>6.84</u>	_____	_____	_____
Peak Force	<u>1850-2500lbs</u>	<u>2213.4</u>	_____	_____	_____
Time Above 1000 Lbs.	<u>1.7 ms min.</u>	<u>1.84</u>	_____	_____	_____
Temperature	<u>66 - 78° F</u>	<u>74</u>	_____	_____	_____
Relative Humidity	<u>10 - 70%</u>	<u>46</u>	_____	_____	_____

TRANSPORTATION RESEARCH CENTER OF OHIO
EXTERNAL DIMENSIONS
50TH PERCENTILE ADULT MALE (PART 572)

Dummy S/N 187

Manufacturer _____

Date 13 June 1984

Description	Specification	Actual
Sitting Height	35.7" ± .1"	35.65
Shoulder Pivot Height	22.1" ± .3"	22.4"
Hip Pivot Height	3.9" (ref.)	3.9"
Hip Pivot From Backline	4.8" (ref.)	4.8"
Knee Pivot From Backline	20.4" ± .3"	20.5"
Rear of Head From Backline	1.7" (ref.)	1.7"
Chest Depth	9.3" ± .2"	9.5"
Shoulder Width	18.1" ± .3"	18.2"
Chest Circumference Over Nipples	37.4" ± .6"	37.7"
Waist Circumference at Min. Girth	32.0" ± .6"	32.0"
Hip Width	14.7" ± .7"	14.9"
Knee Pivot From Floor	19.6" ± .3"	19.5"

Pass/Fail Pass

COMMENTS: Adjust height by adding spacer. 35.5"/35.65"

Technician _____ Date _____

Test Engineer Mike Bebe Date _____