DOT 1091

VEHICLE BARRIER IMPACT TESTING WITH HYBRID III DUMMIES IN A 1987 SUBARU XT 2-DOOR COUPE

PREPARED BY:

VEHICLE RESEARCH & TEST CENTER

U.S. RT. 33 LOGAN COUNTY

EAST LIBERTY, OHIO 43319

TEST REPORT

OCTOBER - NOVEMBER 1987

PREPARED FOR:

U.S DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

400 SEVENTH STREET, S.W.

WASHINGTON, DC 20590

1091

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16. Abstract

A 30 mph flat frontal barrier impact test was conducted on a 1987 Subaru XT 2-door coupe at the Transportation Research Center of Ohio on October 13, 1987, using Hybrid III driver and passenger dummies.

The barrier impact velocity was 29.5 mph.

The ambient temperature was 69°F.

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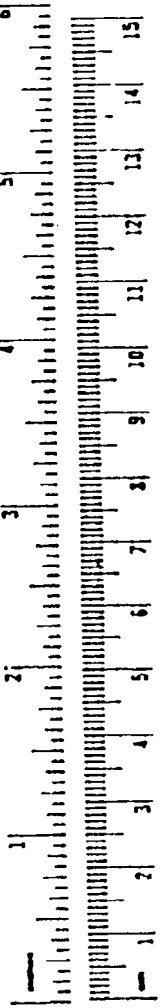
METRIC CONVERSION FACTORS

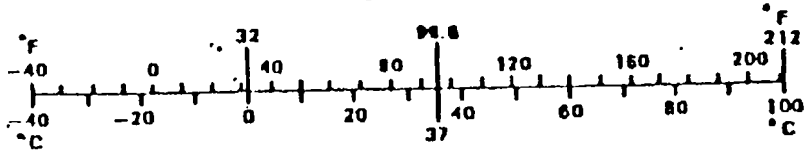
Approximate Conversions to Metric Measures

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	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
	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



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 (10 000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton (1000 kg)	1.1	short tons	
	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 add 32)	degrees Fahrenheit	°F



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SECTION 1.0

PURPOSE AND INTRODUCTION

PURPOSE

This 30 mph frontal barrier impact test is part of a program to document the response of Hybrid III occupant dummies conducted for the National Highway Traffic Safety Administration (NHTSA) by the Transportation Research Center of Ohio (TRC) under Contract No. DTNH22-85-C-08123. The purpose of this test was to determine Hybrid III dummy response in the subject vehicle, a 1987 Subaru XT 2-door coupe. The test was conducted in accordance with the FMVSS 208 portions of the Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-208-06 dated May 15, 1987, except for the use of Hybrid III dummies in place of Part 572 B dummies.

TEST SUMMARY

The 1987 Subaru XT 2-door coupe was equipped with a 1.8 liter transverse engine, manual transmission, and power brakes. The test weight of the vehicle was 2762 pounds. The Head Injury Criteria (HIC) calculation of the driver dummy was less than 1000, but the passenger dummy's HIC calculation was greater than 1000. The resultant accelerations of the thorax did not exceed 60 g's, and the compressive forces transmitted through the upper legs did not exceed 2,250 pounds as measured by Hybrid III dummies seated in the driver's and right front passenger's seats.

Two Hybrid III, 50th percentile, adult male anthropomorphic test devices (ATDs) were seated in the front outboard designated seating positions. The dummies were positioned according to the dummy placement procedures specified in FMVSS 208 Notice 45.

Both ATDs were instrumented with head and chest triaxial accelerometers oriented to measure accelerations in the longitudinal, lateral, and vertical directions, a chest displacement potentiometer, right and left femur load cells, and neck load cells oriented to measure longitudinal and vertical forces and moment about the lateral axis.

The vehicle was instrumented with seven longitudinal axis accelerometers. Seat belt load cells were installed on each occupant's passive seatbelt.

The crash event was recorded by one (1) real time panning camera and fourteen (14) high speed motion picture cameras operating at approximately 500 frames per second.

The thirty-three (33) channels of data were multiplexed and recorded on a 14-track tape drive. The data was digitally sampled at 8000 samples per second digitally processed per sections 12.8 and 12.9 of the laboratory procedure.

The vehicle was impacted into the rigid, flat frontal barrier at the Transportation Research Center of Ohio on October 13, 1987. The test vehicle's impact speed was 29.5 mph. The vehicle sustained 20.8 inches of static crush.

The camera information is presented in Section 3.0. Appendix A contains the still photographic prints. Appendix B contains the vehicle and dummy data plots. Appendix C contains the post-test dummy performance calibrations.

CRASH TEST SUMMARY

TEST NO.: 871013

DATE: October 13, 1987 TIME: 1321 TEMP: 69°F

VEHICLE: 1987 Subaru XT 2-door coupe

TEST WEIGHT (LBS): 2762

IMPACT ANGLE (DEG)*: 0

IMPACT VELOCITY (MPH)**: PRIMARY = 29.5 SECONDARY = 29.5

MAX CRUSH (IN) STATIC: 20.8

REBOUND (IN): 13.1

DUMMIES:	Driver	Passenger
TYPE:	Hybrid III	Hybrid III
LOCATION:	Front Left	Front Right
RESTRAINT:	Two-point passive belt	Two-point passive belt

NUMBER OF DATA CHANNELS: 33

NUMBER OF HIGH SPEED CAMERAS: 14 and 1 real-time camera

*With respect to tow track centerline.
**Speed trap measurement (± .05mph accuracy).

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Fuji Heavy Ind. LTD Japan

MAKE/MODEL: Subaru DL XT coupe VIN: JF1AX4224HB317081

BODY STYLE: 2-door sport coupe MODEL YEAR: 1987

COLOR: White

ENGINE DATA: TYPE: Transverse CYLINDERS: 4 DISPLACEMENT: 1800cc

X Gas, ____DIESEL, _____TURBOCHARGE

TRANSMISSION DATA: 5 SPEED, X MANUAL, ____AUTOMATIC, X FWD RWD

DATA VEHICLE RECEIVED: 10/05/87 ODOMETER READING: 634

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

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

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

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

VEHICLE MANUFACTURED BY: Fuji Heavy Ind. LTD Japan

DATE OF MANUFACTURER: 6/87

GVWR: 3090 LBS.

GAWR: FRONT 1630 LBS., REAR 1460 LBS.

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

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

RECOMMENDED TIRE SIZE: 165/SR13 LOAD RANGE X B, C, D

TIRES ON VEHICLE (MFGR. & LINE, SIZE): Bridgestone SF-405 Steel 195SR13

IS SPARE TIRE "SPACE SAVER"? Yes

IS SPARE TIRE STANDARD EQUIPMENT? No

VEHICLE CAPACITY: TYPES OF SEATS: Front bucket

TYPE OF FRONT SEAT BACKS Adjustable

NUMBER OF OCCUPANTS 2 FRONT 2 REAR 4 TOTAL

CARGO LOAD 60 LBS. TOTAL 660 LBS.

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

RIGHT FRONT	686 lbs.	RIGHT REAR	487 lbs.
LEFT FRONT	717 lbs.	LEFT REAR	488 lbs.

TOTAL FRONT WEIGHT 1,403 lbs. (59.0% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 975 lbs. (41.0% OF TOTAL VEHICLE WEIGHT)

TOTAL DELIVERED WEIGHT 2,378 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

RCLW + RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (2378 LBS)

VCW = VEHICLE CAPACITY WEIGHT (660 LBS)

DSC = DESIGNATED SEATING CAPACITY (4)

RCLW = VCW - (150) (DCS) = (60 LBS)

TARGET TEST WEIGHT = UDW + RCLW + (2 DUMMIES X 167 LBS/DUMMY)

= 2378 + 60 + 334 LBS

TARGET TEST WEIGHT = 2772 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 50 LBS. CARGO:

RIGHT FRONT	745 lbs.	RIGHT REAR	625 lbs.
LEFT FRONT	786 lbs.	LEFT REAR	606 lbs.

TOTAL FRONT WEIGHT 1,531 lbs. (55.4% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 1,231 lbs. (44.6% OF TOTAL VEHICLE WEIGHT)

TOTAL TEST WEIGHT 2,762 lbs. (0.4% UNDER TARGET WEIGHT)

WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 0 lbs.

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES): NONE

DELIVERED ATTITUDE:	LF	25.7;	RF	25.8;	LR	23.3;	RR 23.6
PRE-TEST ATTITUDE:	LF	25.6;	RF	25.6;	LR	22.9;	RR 23.0
POST-TEST ATTITUDE:	LF	30.6;	RF	27.2;	LR	22.7;	RR 21.6

WHEELBASE: 97.2 INCHES

MAX. WIDTH: 66.8 INCHES

CG = 43.3 INCHES REARWARD OF FRONT WHEEL CENTERLINE

TEST CONDITIONS

TEST NUMBER: 871013

DATE OF TEST: 10/13/87 TIME OF TEST: 1321

TYPE OF TEST: Frontal Barrier Impact IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA: 69°F

TEMPERATURE IN OCCUPANT COMPARTMENT: 69°F

IMPACT VELOCITY: PRIMARY = 29.5 MPH SECONDARY = 29.5 MPH

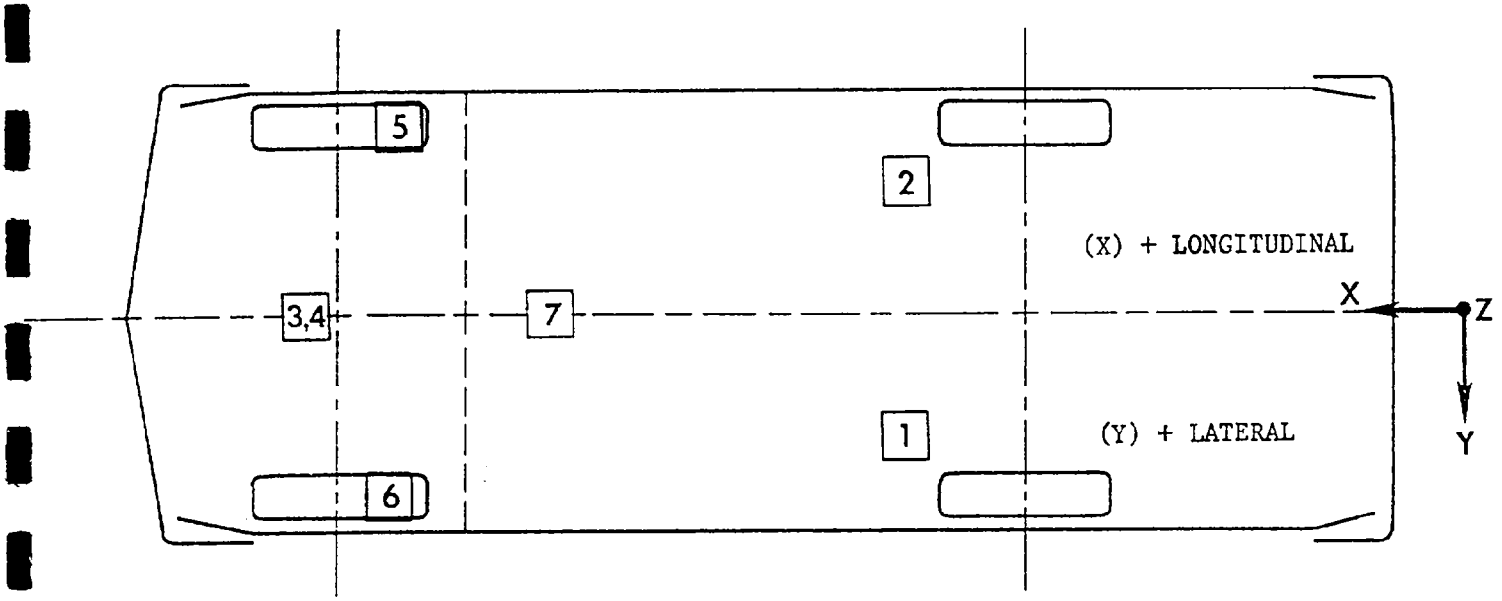
(SPECIFIED RANGE = 28.9 to 29.9 MPH)

VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES)

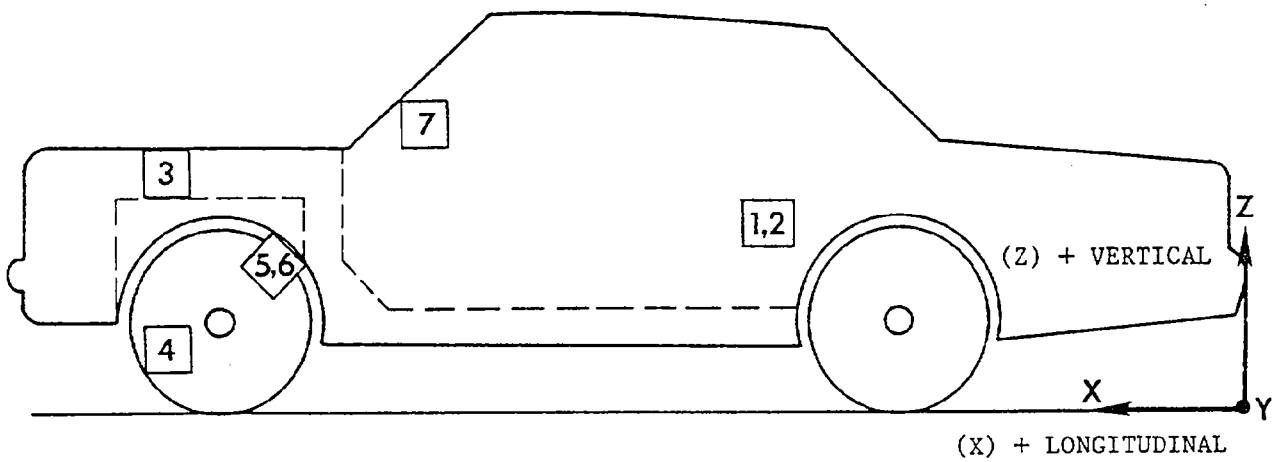
OVERALL LENGTH OF TEST VEHICLE:	PRE-TEST:	L	174.9	;C 177.5	;R	175.0
	POST-TEST:	L	157.0	;C 157.9	;R	155.9
	TOTAL CRUSH:	L	17.9	;C 19.6	;R	19.1

FOR FRONTAL IMPACT, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER IMPACT: L: 13.6 ;C: 12.2 ;R: 13.4 :AVG: 13.1

VEHICLE ACCELEROMETER LOCATIONS



TOP VIEW



SIDE VIEW

TEST NUMBER 871013

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

No.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	REAR SEAT CROSSMEMBER AT LEFT SIDE	PRE	65.5	17.8	13.1				
		POST	65.5	17.8	13.2				
	LONGITUDINAL					2.4	14.0	30.2	53.6
2	REAR SEAT CROSSMEMBER AT RIGHT SIDE	PRE	65.5	-17.5	13.0				
		POST	65.5	-17.5	13.1				
	LONGITUDINAL					3.2	14.3	29.5	53.6
3	TOP OF ENGINE BLOCK	PRE	150.5	3.7	21.5				
		POST	150.0	3.8	21.6				
	LONGITUDINAL					29.2	49.9	128.3	40.1
4	BOTTOM OF ENGINE	PRE	149.0	0.0	7.8				
		POST	144.5	0.0	9.0				
	LONGITUDINAL					31.1	49.9	106.1	39.6
5	BRAKE CALIPER AT RIGHT SIDE	PRE	131.6	-23.9	7.7				
		POST	131.6	-23.9	6.1				
	LONGITUDINAL					15.3	88.0	53.9	46.9
6	BRAKE CALIPER AT LEFT SIDE	PRE	131.8	23.9	7.5				
		POST	131.4	23.9	6.5				
	LONGITUDINAL					7.9	51.8	48.0	58.4
7	DASH PANEL	PRE	109.8	0.0	35.0				
		POST	109.9	0.0	35.1				
	LONGITUDINAL					16.9	75.3	39.9	86.4

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: FORWARD FROM REAR BUMPER
Y: LEFT FROM VEHICLE CENTERLINE
Z: UPWARD FROM GROUND LEVEL

ACCIDENT INVESTIGATION DIVISION DATA

FOR 30 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Subaru XT 2-door coupe

VEH. NHTSA NO.: _____; VIN: JF1AX4224HB317081

MODEL YEAR: 1987; BUILD DATE: 6/87; TEST DATE 10/13/87

VEH. SIZE CATEGORY: Two-seater; TEST WEIGHT: 2762 lbs.

VEH. WHEELBASE: 97.2 VEH. MAXIMUM WIDTH: 66.8 FRONTAL OVERHANG: 39.1

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE: 12FDEW3

F (Frontal)

CRUSH DEPTH DIMENSIONS:

C1 = 17.9 inches

C2 = 19.4 inches

C3 = 20.8 inches

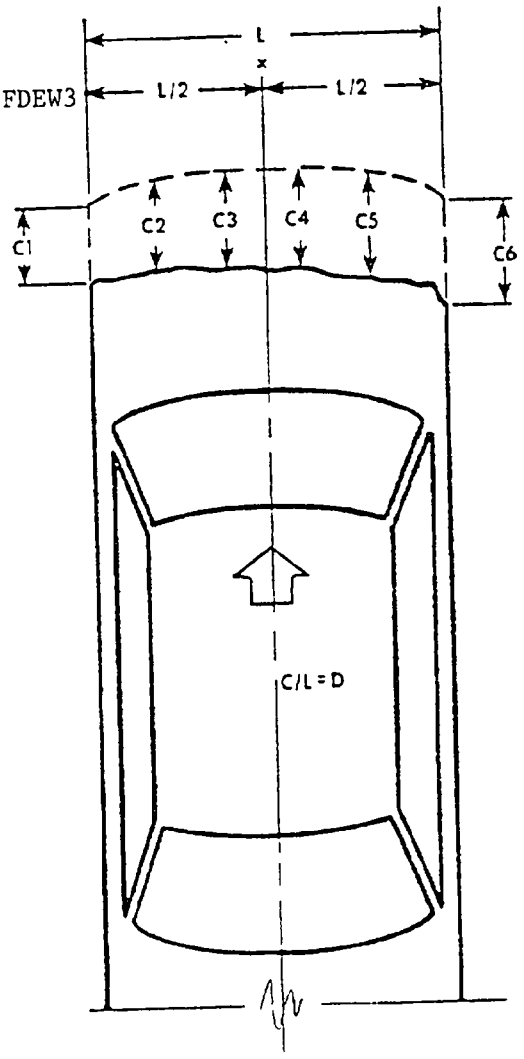
C4 = 20.4 inches

C5 = 20.0 inches

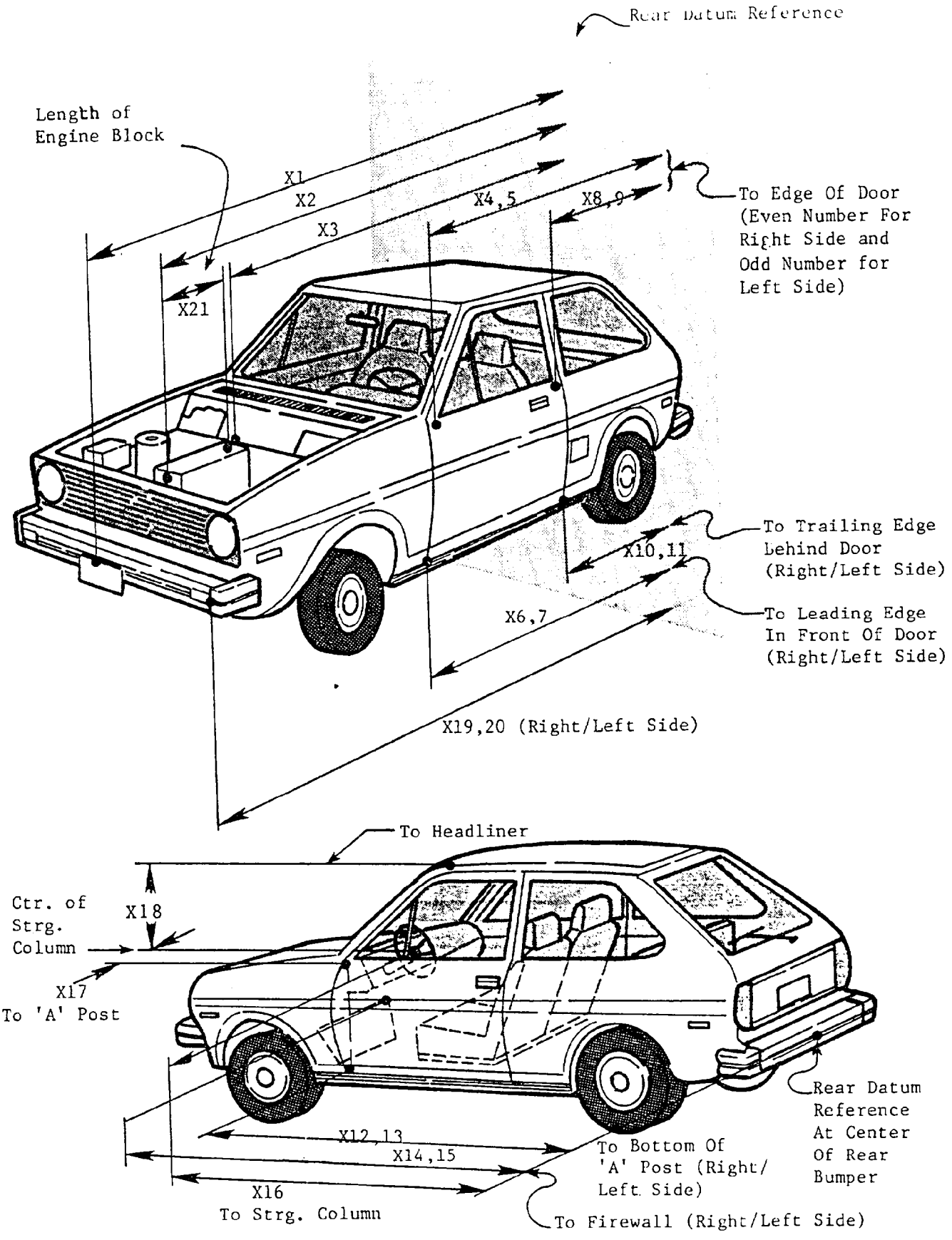
C6 = 19.1 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitudinal)

LENGTH OF DAMAGED REGION: L = 54.8 inches



PRE-TEST AND POST-TEST MEASUREMENT POINTS

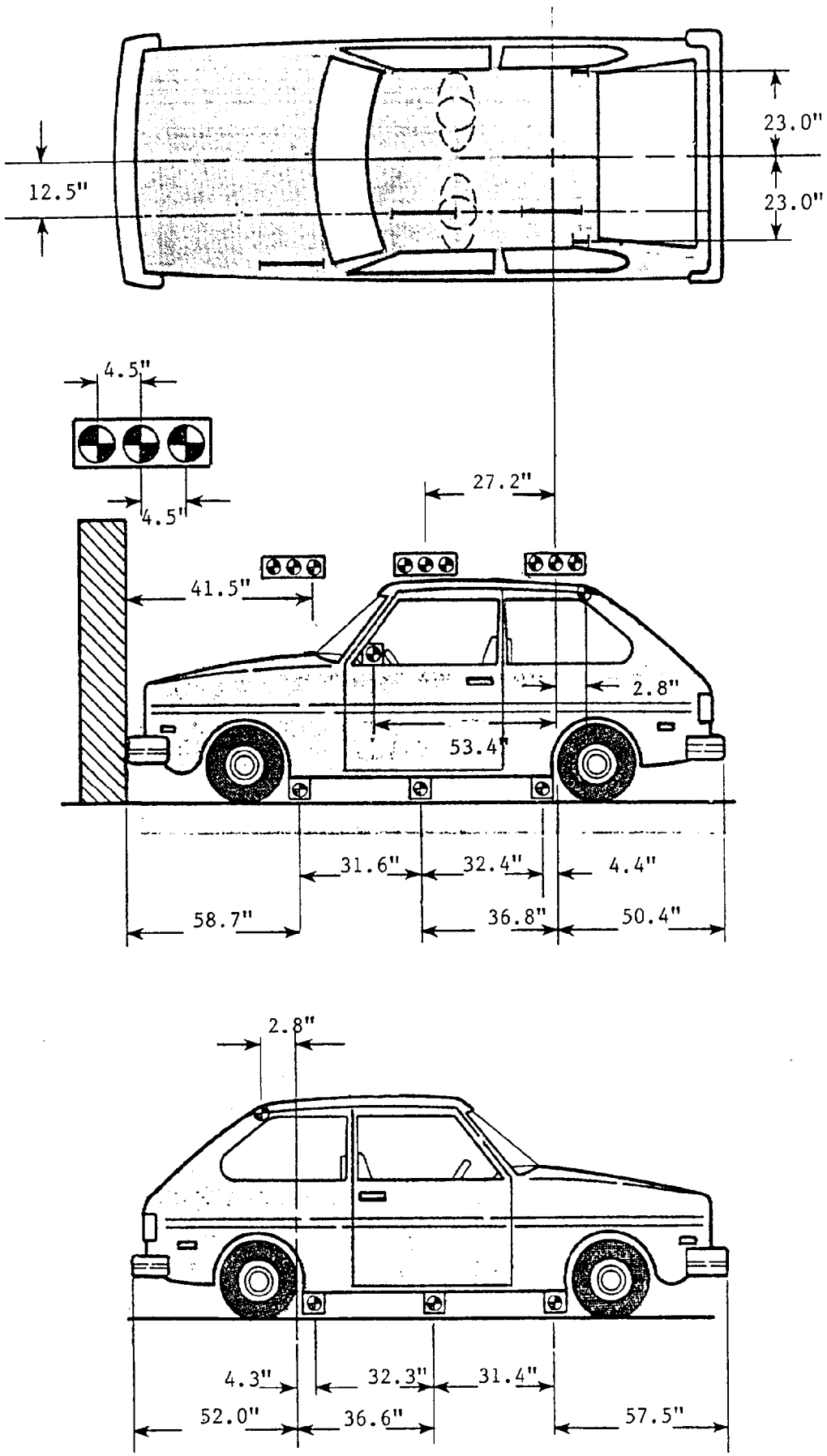


IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL Subaru XT TEST NUMBER 871013

NO.	TYPE OF MEASUREMENT	DIMENSIONS IN INCHES PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	177.5	157.9	19.6
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	155.0	147.8	7.2
X3	REAR SURFACE OF VEHICLE TO FIREWALL	124.0	122.8	1.2
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	116.1	116.0	0.1
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	116.0	116.0	0.0
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	118.2	118.2	0.0
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	118.1	118.2	-0.1
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	70.4	70.5	-0.1
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	70.2	70.4	-0.2
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	70.9	70.6	0.3
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	70.8	70.6	0.2
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	117.4	117.5	-0.1
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	117.7	117.2	0.5
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	127.0	126.8	0.2
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	126.9	126.3	0.6
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	98.1	98.3	-0.2
X17	CENTER OF STEERING COLUMN TO "A" POST	12.2	11.0	1.2
X18	CENTER OF STEERING COLUMN TO HEADLINING	15.9	14.0	1.9
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	175.0	155.9	19.1
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	174.9	157.0	17.9
X21	LENGTH OF ENGINE BLOCK	17.0	17.0	0.0

VEHICLE TARGET LOCATIONS



SECTION 2.0

SUMMARY OF TEST RESULTS

DATA SUMMARY

The driver's Head Injury Criteria, HIC, was 574. The driver's maximum chest deceleration over three milliseconds was 37.0 g. The driver's right and left compressive femur loads were 1081.5 pounds and 794.9 pounds, respectively. The driver's maximum chest displacement was 2.5 inches.

The right front passenger's Head Injury Criteria, HIC, was 1238. The right front passenger's maximum chest deceleration over three milliseconds was 34.9 g. The right front passenger's right and left compressive femur loads were 479.4 pounds and 549.9 pounds, respectively. The right front passenger's maximum chest displacement was 2.6 inches.

The vehicle's restraint system met the comfort and convenience requirements of FMVSS 208.

DUMMY DATA SUMMARY

	DRIVER DUMMY SN: 045				PASSENGER DUMMY SN: 143			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**		POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX	TIME	MAX	TIME	MAX	TIME	MAX	TIME
HEAD ACCELERATION (g)								
LONGITUDINAL	27.1	176.0	42.3	97.4	279.7	147.9	63.0	94.5
LATERAL	8.6	179.0	7.1	191.9	8.8	92.5	86.2	148.0
VERTICAL	2.4	18.1	49.9	79.8	5.0	149.8	116.4	147.8
RESULTANT	60.0	83.1			313.3	147.9		
HIC	574 from 65.4 to 101.4				1238 from 147.2 to 148.6			
NECK LOADS (lbs)								
SHEAR (X)	379.9	96.5	43.7	189.1	425.3	94.9	28.2	161.2
AXIAL (Z)	487.8	82.2	83.2	221.8	626.8	98.0	235.6	183.6
NECK MOMENTS (lb-ft)								
ABOUT LATERAL	63.5	93.2	28.9	225.4	94.7	93.0	45.1	190.1
CHEST ACCELERATION (g)								
LONGITUDINAL	5.7	134.1	37.6	79.9	8.7	136.9	35.1	66.5
LATERAL	5.4	68.5	2.7	98.4	2.8	92.2	4.0	80.8
VERTICAL	10.2	107.4	3.2	242.8	10.0	107.0	4.9	205.0
RESULTANT	37.7	75.4			35.2	66.5		
3 MSEC CLIP	37.0				34.9			
CHEST DISPLACEMENT (in)								
	2.5	82.2	0.0	6.1	2.6	78.4	0.0	2.2
FEMUR LOADS (lbs)								
LEFT	94.3	206.6	794.9	83.0	156.3	18.2	549.9	70.0
RIGHT	181.0	152.2	1081.5	83.0	118.6	238.1	479.4	104.6

*LONGITUDINAL:	FORWARD	**LONGITUDINAL:	REARWARD
LATERAL:	LEFTWARD	LATERAL:	RIGHTWARD
VERTICAL:	UPWARD	VERTICAL:	DOWNWARD
DISPLACEMENT:	INWARD	DISPLACEMENT:	OUTWARD
FORCE:	TENSION	FORCE:	COMPRESSION

SEAT BELT DATA SUMMARY

LOCATION	SEAT BELT TENSION MAX, LBS.	TIME,MSEC.
DRIVER PASSIVE BELT INBOARD	1589.6	81.9
RIGHT FRONT PASSENGER PASSIVE BELT INBOARD	1906.8	84.6

DRIVER DUMMY

Upon impact, the driver dummy translated forward on the seat impacting both knees into the dash panel. The dummy's head rotated forward, contacting the steering wheel hub and the chin contacting the chest, as the driver's chest was restrained by the two-point, motorized, passive seatbelt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seatback. The driver dummy came to rest seated in the driver's seat restrained by the two-point passive seatbelt.

PASSENGER DUMMY

Upon impact, the passenger dummy translated forward on the seat impacting both knees into the dash panel. The passenger's head rotated forward as the dummy's chest was restrained by the two-point, motorized, passive seatbelt. The dummy's chin contacted its upper chest. The dummy's head rotated rearward into the top of the seat back as the dummy rebounded into the seatback. The passenger dummy came to rest laying in the passenger's seat, facing forward and partially restrained by the two-point passive seatbelt.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER	PASSENGER
Head	Steering wheel	Chest
Chest	None	None
Abdomen	None	None
Left Knee	Instrument panel	Instrument panel
Right Knee	Instrument panel	Instrument panel

DOOR OPENING:

	LEFT	RIGHT
Front	Easy	Easy
Rear	NA	NA

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	Passenger's seat shifted rearward	None
Rear	NA	NA

GLAZING DAMAGE: The left side of windshield was cracked.

OTHER NOTABLE IMPACT EFFECTS:

The passenger's head restraint came off of the seat.

DUMMY POSITIONING DATA FOR

35 MPH FRONTAL BARRIER IMPACT TEST

PRE-IMPACT DATA:

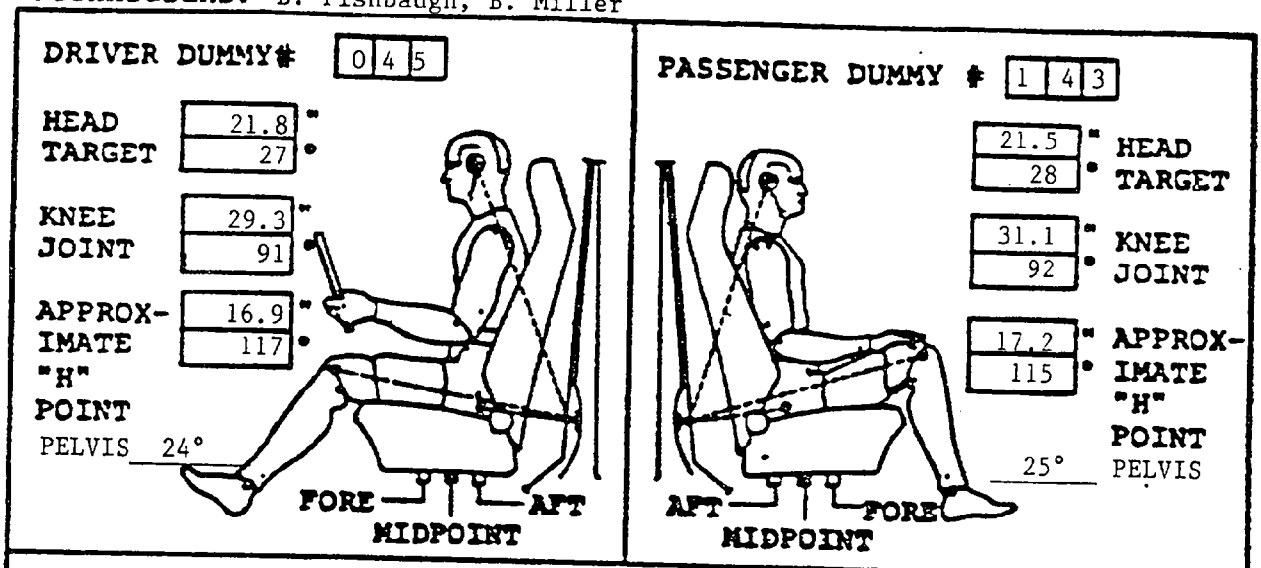
Make/Model: Subar/XT
Body Style: 2-door coupe **Model Year:** 1987
NHTSA No.: **Color:** White

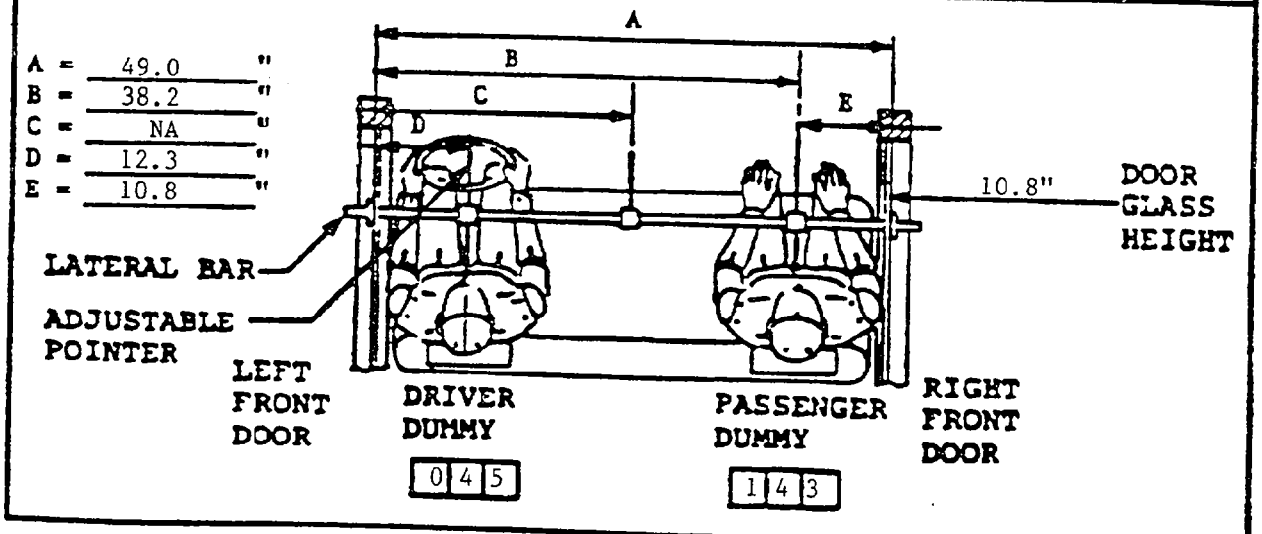
DATA FROM CERTIFICATION LABEL:

Vehicle Manufacturer: Fuji Heavy Ind.
Date of Manufacture: 6/87 ; **VIN:** JF1AX4224HB317081
GVWR: 3090 lb; **GAWR:** Front = 1630 lb; Rear = 1460 lb

POST-IMPACT DATA:

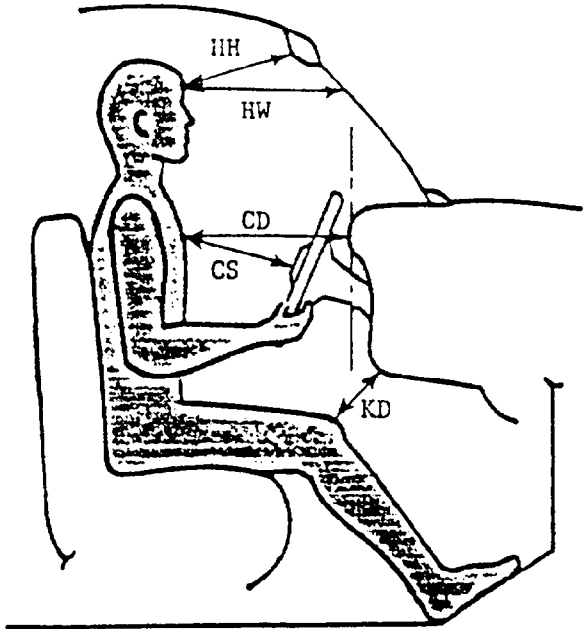
Date of Test: 10/13/87 **Time:** 1321 **Temperature** 69 °F
Required Impact Velocity Range: 28.9 to 29.9 mph
Impact Velocity: Primary = 29.5 mph Secondary = 29.5 mph
Seat Type: Bucket **Adjuster Type:** Manual
Bucket Seat Back Type: Adjustable
Technicians: B. Fishbaugh, B. Miller



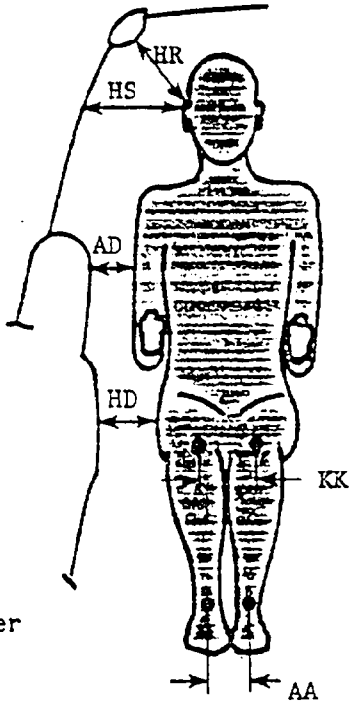


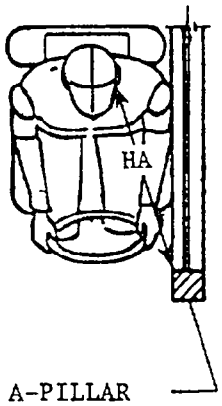
DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER 045	PASSENGER 143
HH	11.8	11.4
HW	16.8	18.6
CD	22.9	23.1
CS	11.9	NA
KDL	5.1	5.7
KDR	4.8	5.2
TA	15°	15°
SA	26°	26°
HA	10.1	11.6



	DRIVER 045	PASSENGER 134
HR	5.5	5.0
HS	9.1	7.6
AD	3.4	4.4
HD	7.4	7.9
KK	8.4	8.5
AA	8.5	8.0





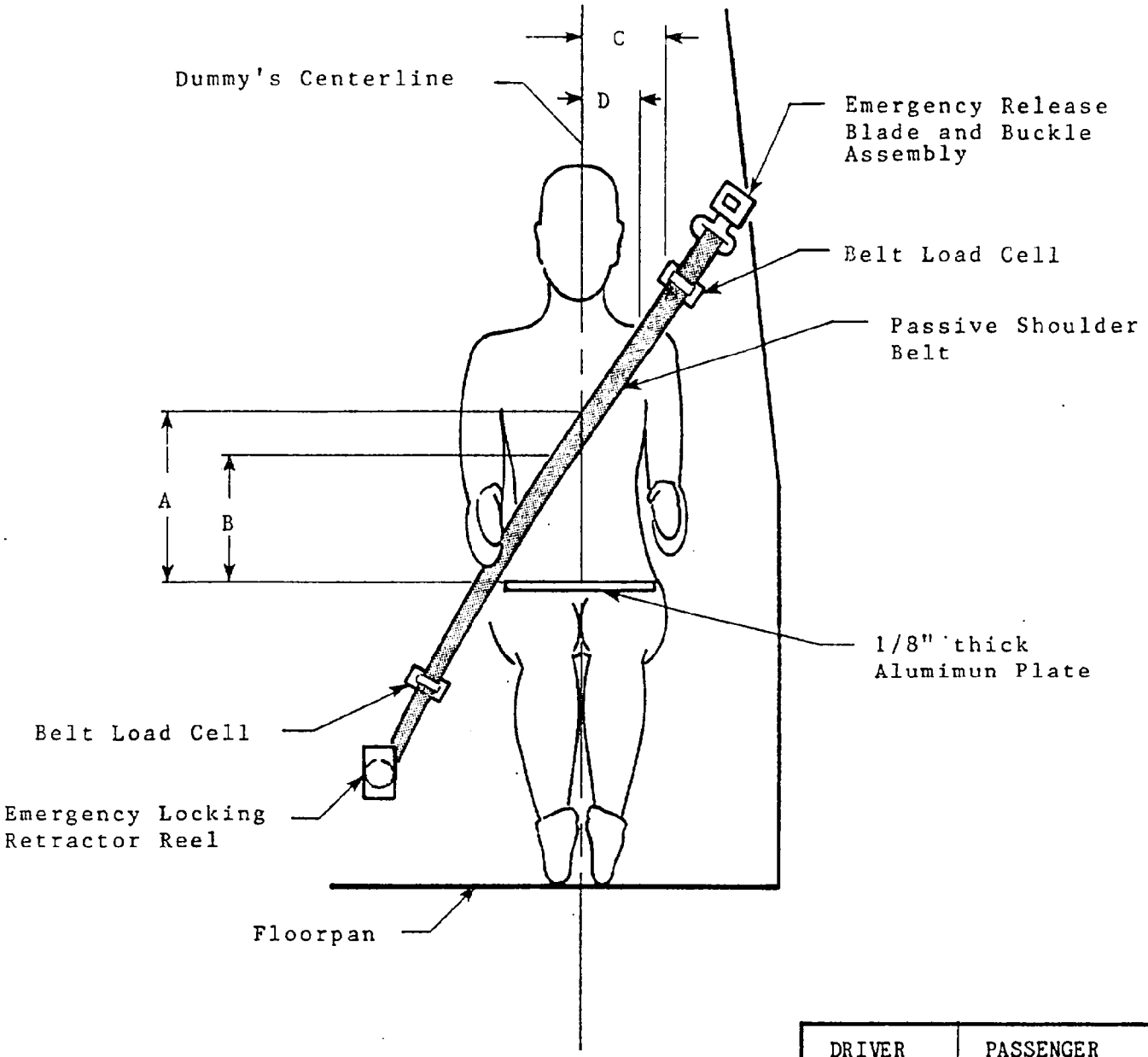
Knee outer bolt head to outer bolt head spacing:
Driver = 10.6
Passenger = 10.6

HH = Head to Windshield Header
HW = Head to Windshield
CD = Chest to Dash
CS = Chest to Steering Wheel
KD = Knee to Dash
TA = Torso Angle
SA = Seat Back Angle
HR = Head to Side Roof
HS = Head to Side Window
AD = Arm to Door
HD = Hip to Door
KK = Knee to Knee
AA = Ankle to Ankle
HA = Head to A Pillar

Torso and seat back angles are relative to vertical.

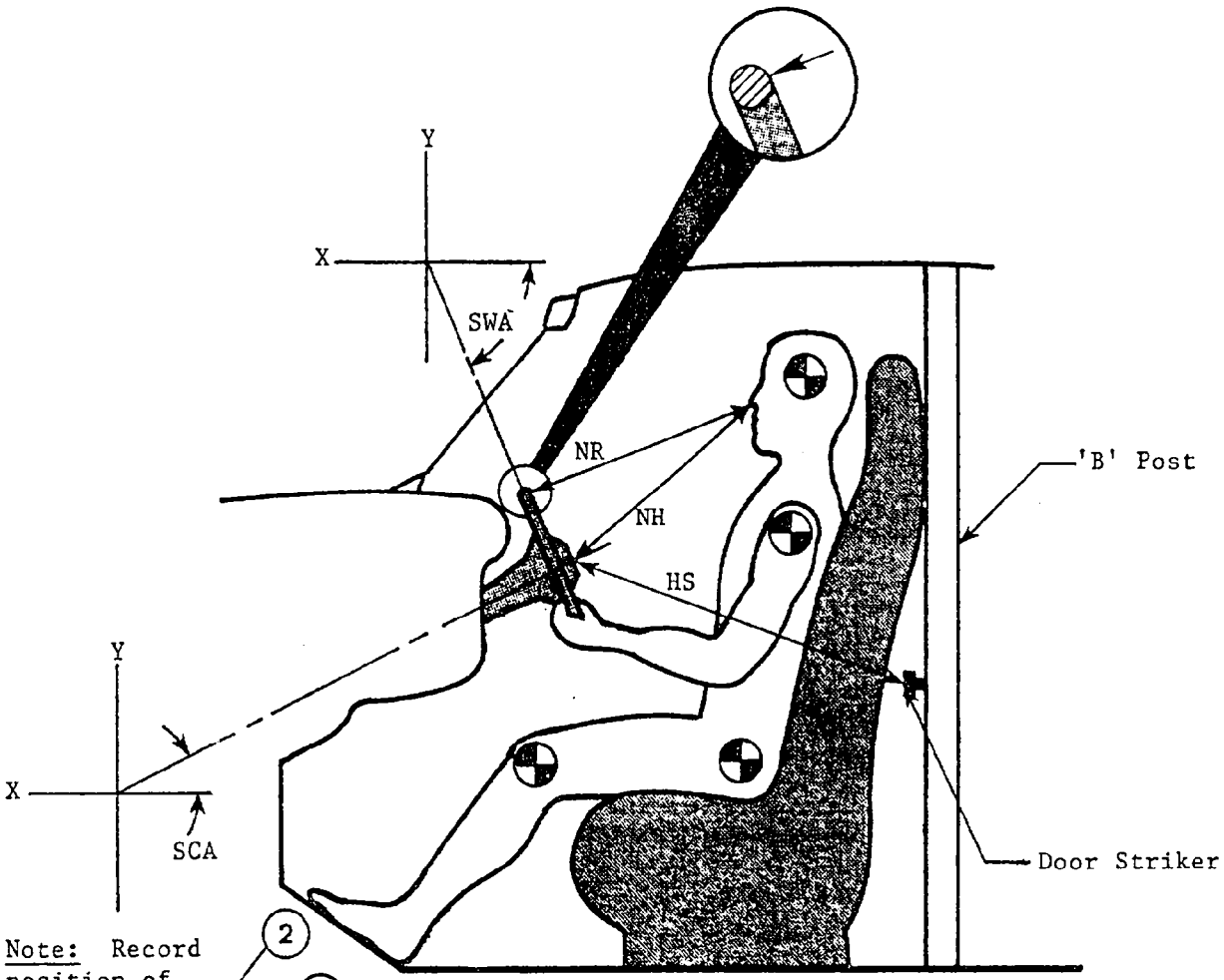
ALL DISTANCE MEASUREMENTS IN INCHES

SEAT BELT POSITIONING DATA

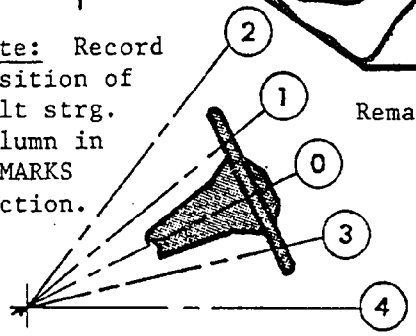


	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	12.6	11.8
B - Top surface of alum. plate to belt lower edge (in)	9.2	8.6
C - Dummy centerline to outer edge of belt at chest flesh top (in)	4.4	3.8
D - Dummy centerline to inner edge of belt at chest flesh top (in)	2.1	1.5

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



Note: Record position of tilt strg. column in REMARKS section.



Remarks: Steering column was placed in the midpoint of the infinitely - adjustable tilt range.

	MEASUREMENTS
NR - Distance from tip of dummy's nose to top rear surface of steering wheel rim.	14.7
NH - Distance from tip of dummy's nose to center of steering column hub.	15.0
HS - Distance from center of steering column hub to the forward surface of the door lock striker pin.	28.8
SCA - Angle of steering column relative to the horizontal X axis.	20°
SWA - Angle of steering wheel relative to the horizontal X axis.	70°

FMVSS 208 COMFORT AND CONVENIENCE DATA

VEHICLE VIN NO.: JF1AX4224HB317081

MAKE: Subaru MODEL: XT

VEHICLE BUILD DATE: 6/87 VEHICLE TYPE 2 door coupe

FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:

(check one): X Automatic belts

_____ Type 2 lap/shoulder belts

_____ Other

CONVENIENCE HOOKS: NA, vehicle's restraint system did not include convenince hooks.

WEBBING TENSION - RELIEVING DEVICE:

DO OUTBOARD SEATING POSITION BELTS HAVE TENSION - RELIEVING DEVICES?

No

MAXIMUM SLACK RECOMMMENDED IN OWNERS MANUAL: NA INCHES

DOES OWNER'S MANUAL WARN THAT INTRODUCING SLACK BEYOND THE AMOUNT SPECIFIED CAN SIGNIFICANTLY REDUCE THE EFFECTIVENESS OF THE SHOULDER BELT?

NA

IF NO, EXPLAIN

AUTOMATIC BELTS: IS TENSION - RELIEVING DEVICE CANCELLED EACH TIME THE ADJACENT DOOR IS OPENED? NA

IF NO, EXPLAIN:

BELT CONTACT FORCE:

FOR BELTS WITHOUT TENSION-RELIEVING DEVICES: BELT CONTACT FORCE:

.4 POUNDS

LATCHPATE ACCESS: NA

RETRACTION: NA

ACCESSIBILITY: NA

LATCH MECHANISM: NA

FMVSS NO. 208 SEAT BELT WARNING SYSTEM DATA

WITH OCCUPANT IN DRIVER'S POSITION AND LAP BELT IN STOWED POSITION AND IGNITION SWITCH PLACED IN "START/ON" POSITION:

Duration of audible warning signal = 8 sec.

Duration of reminder light operation = 8 sec.

WITH OCCUPANT IN DRIVER'S POSITION AND LAP BELT IN USE AND THE IGNITION SWITCH PLACED IN "START/ON" POSITION:

Duration of audible warning signal - 0 sec.

(Note: audible warning should not operate)

Duration of reminder light operation = 8 sec.

Wording of visual warning:

Fasten Seat Belt _____

Fasten Belt _____

Symbol 101-80 X

DESCRIBE LOCATION OF LABEL WHICH DESCRIBES MANUFACTURER'S MAINTENANCE OR REPLACEMENT SCHEDULE FOR CRASH-DEPLOYED OCCUPANT PROTECTION SYSTEM: NA, vehicle did not contain a crash-deployed occupant protection system.

FMVSS NO. 208 - READINESS INDICATOR DATA

AN OCCUPANT RESTRAINT SYSTEM THAT DEPLOYS IN THE EVENT OF A CRASH SHALL HAVE A MONITORING SYSTEM WITH A READINESS INDICATOR. A TOTALLY MECHANICAL SYSTEM IS EXEMPT FROM THIS REQUIREMENT. NA, vehicle did not contain a crash-deployed occupant protection system.

SECTION 3.0

CAMERA INFORMATION

HIGH SPEED CAMERA LOCATIONS

TEST NO.: 871013 VEHICLE: Subaru XT DL

CAMERA NO.	VIEW	CAMERA POSITIONS (IN)* X	Y	Z	ANGLE ** (DEG)	FILM PLANE TO HEAD TARGET	LENS (MM)	SPEED (FPS)
1	Real time panning	-142.0	504.0	61.0	NA	NA	16	24
2	Vehicle crush	-81.3	266.4	37.1	-2	NA	13	502
3	Dummy kinematics	-41.5	-295.0	44.0	-4	252.8	25	500
4	Windshield damage	-6.0	0.0	89.0	40	NA	13	505
5	Crush & fluid spillage	-50.5	0.0	-92.4	90	NA	13	1002
6	Fluid spillage	-99.3	0.0	-99.0	90	NA	13	502
7	Passenger kinematics	-4.5	13.8	93.0	-50	NA	17	505
8	Driver kinematics	-6.8	-14.5	93.0	-50	NA	17	1002
9	Driver kinematics	-157.3	116.0	87.0	-27	126.0	25	500
10	Passenger kinematics	-152.1	-116.0	87.0	-26	131.5	25	502
11	Windshield intrusion	-38.1	306.1	44.0	0	NA	50	502
12	Windshield intrusion	-53.0	-309.4	42.3	0	NA	50	502
13	Column movement	-139.0	-286.0	103.0	-14	NA	25	500
14	Column movement	-139.0	-286.0	75.1	-9	NA	25	501
15	Passenger kinematics	-38.8	293.0	45.3	-4	250.5	25	485

* X = Film plane to plane of barrier face
Y = Film plane to monorail centerline
Z = Film plane to ground
** Referenced to horizontal plane

APPENDIX A

PHOTOGRAPHS

1. PRE-TEST FRONT VIEW
2. PRE-TEST LEFT SIDE VIEW
3. POST-TEST LEFT SIDE VIEW
4. PRE-TEST RIGHT SIDE VIEW
5. POST-TEST RIGHT SIDE VIEW
6. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW
7. POST-TEST RIGHT FRONT THREE-QUARTER VIEW
8. PRE-TEST LEFT REAR THREE-QUARTER VIEW
9. PRE-TEST REAR VIEW
10. POST-TEST REAR VIEW
11. PRE-TEST WINDSHIELD VIEW
12. POST-TEST WINDSHIELD VIEW
13. PRE-TEST ENGINE COMPARTMENT VIEW
14. PRE-TEST FRONT UNDERBODY VIEW
15. POST-TEST FRONT UNDERBODY VIEW
16. PRE-TEST REAR UNDERBODY VIEW
17. POST-TEST REAR UNDERBODY VIEW
18. PRE-TEST DRIVER DUMMY POSITION VIEW
19. POST-TEST DRIVER DUMMY POSITION VIEW
20. PRE-TEST PASSENGER DUMMY POSITION VIEW
21. POST-TEST PASSENGER DUMMY POSITION VIEW
22. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW
23. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW
24. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW
25. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
26. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
27. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 1
28. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT _ VIEW 2
29. POST-TEST PASSENGER DUMMY HEAD/KNEE CONTACT - VIEW 1
30. POST-TEST PASSENGER DUMMY HEAD/KNEE CONTACT - VIEW 2
31. PRE-TEST VEHICLE TIRE LOAD AND CERTIFICATION LABEL VIEW

Figure 1. PRE-TEST FRONT VIEW

Figure 2. PRE-TEST LEFT SIDE VIEW

Figure 3. POST-TEST LEFT SIDE VIEW

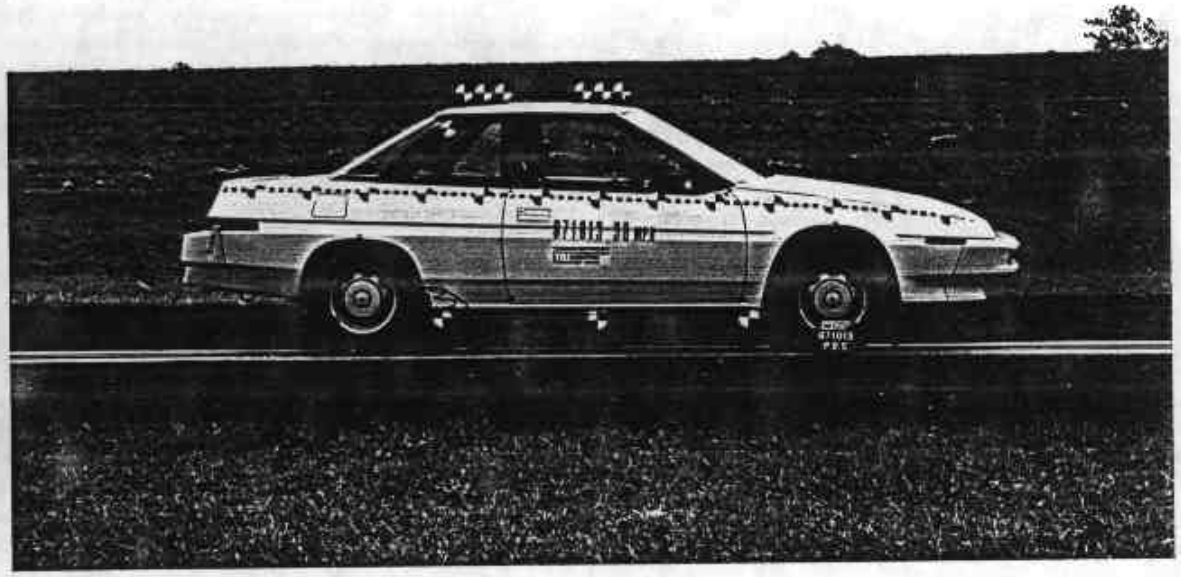


Figure 4. PRE-TEST RIGHT SIDE VIEW

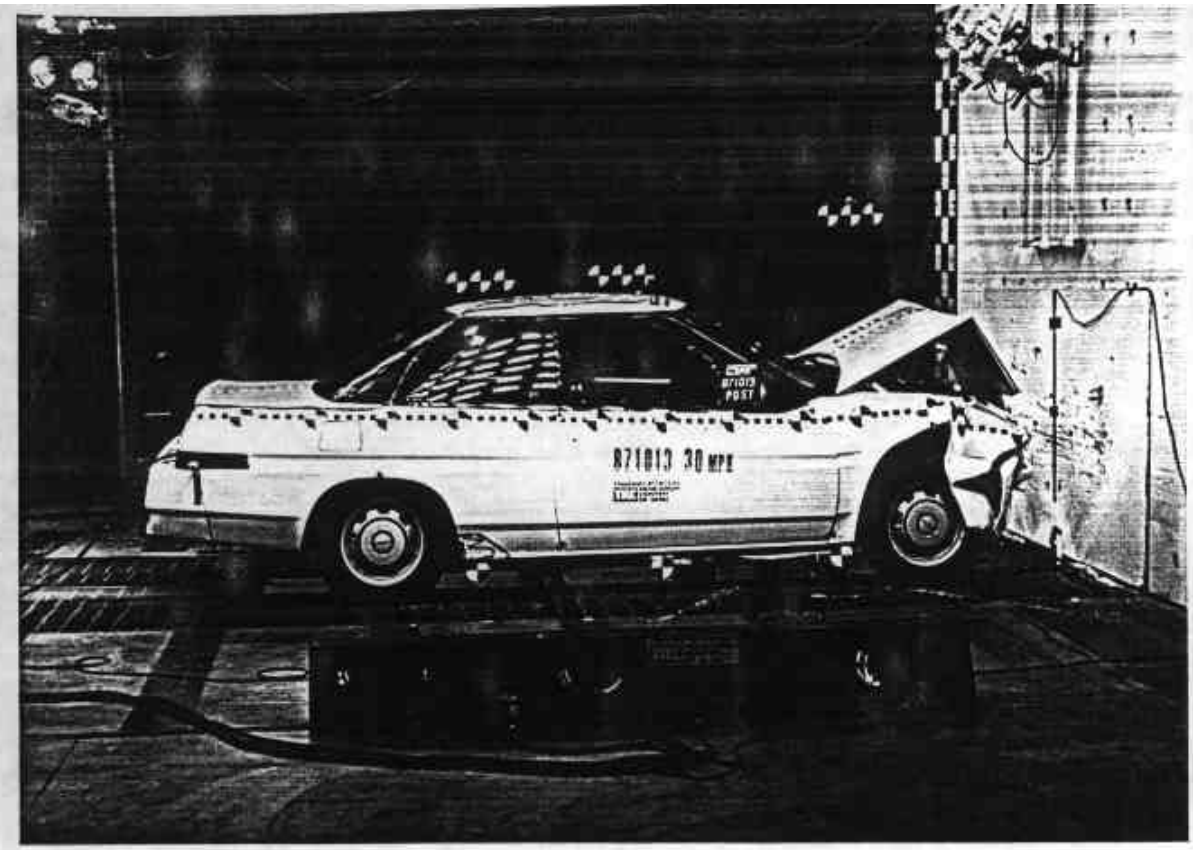


Figure 5. POST-TEST RIGHT SIDE VIEW

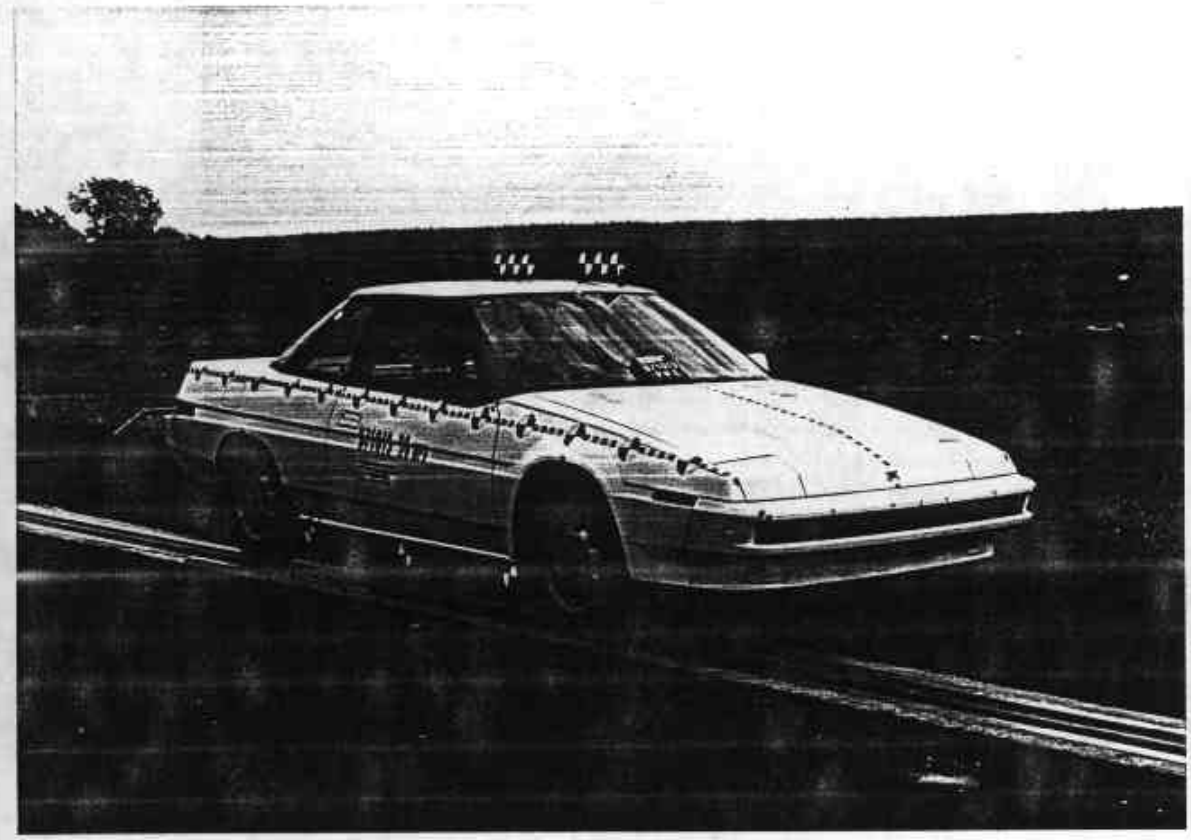


Figure 6. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

Figure 7. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

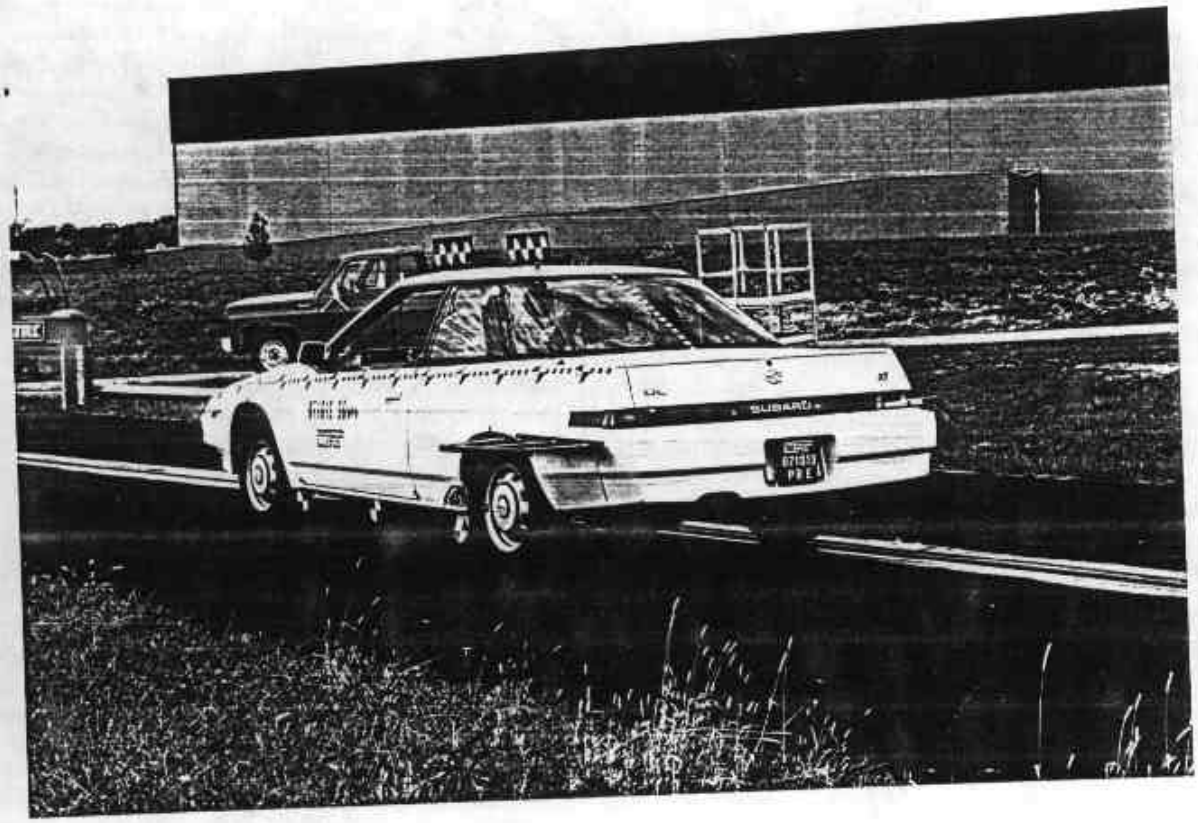


Figure 8. PRE-TEST LEFT REAR-QUARTER VIEW

Figure 9. PRE-TEST REAR VIEW

Figure 10. POST-TEST REAR VIEW

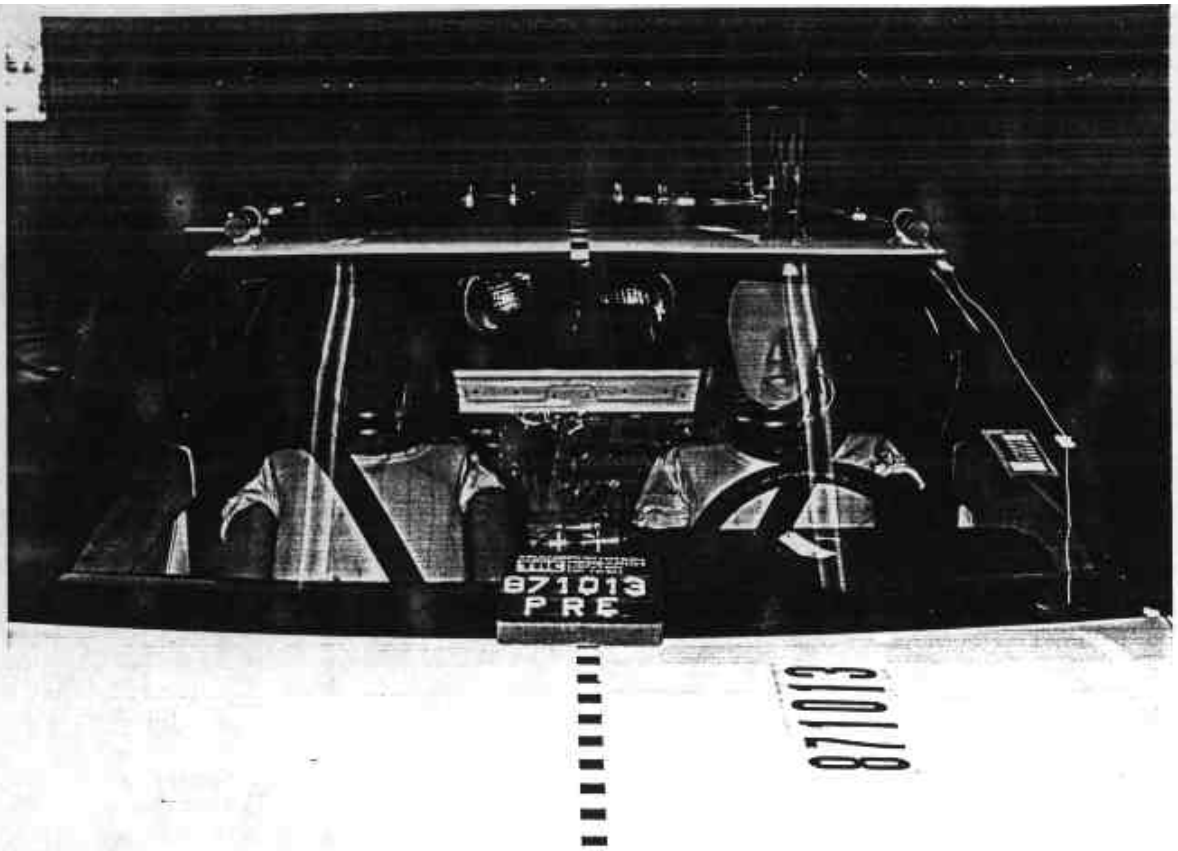


Figure 11. PRE-TEST WINDSHIELD VIEW

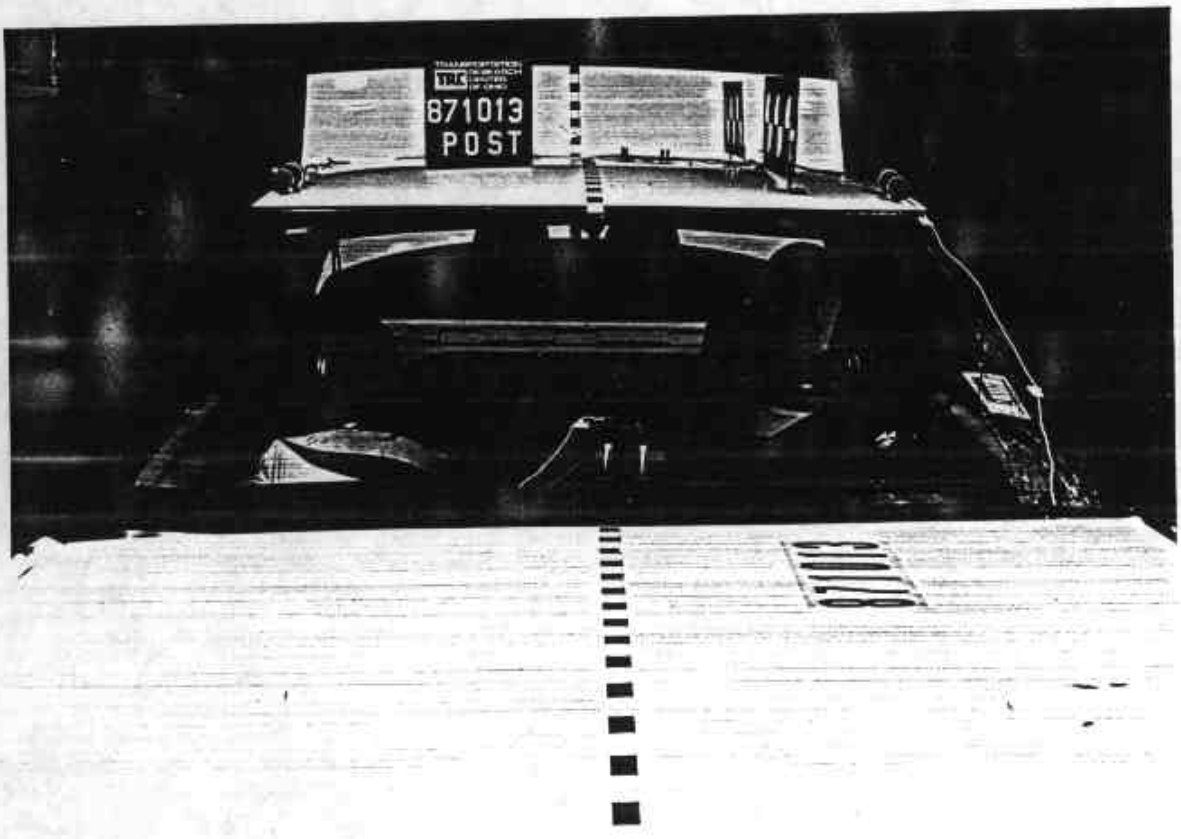


Figure 12. POST-TEST WINDSHIELD VIEW

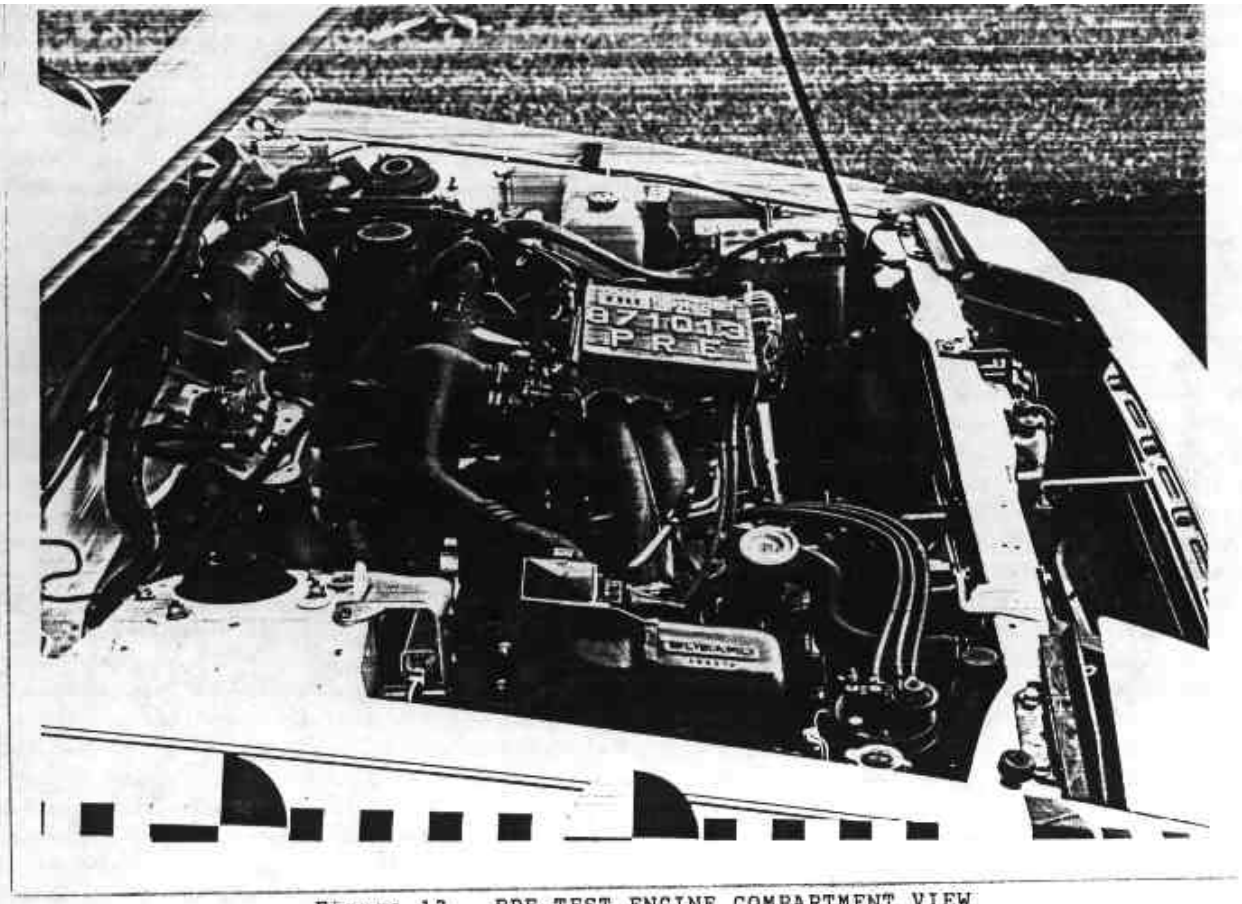


Figure 13. PRE-TEST ENGINE COMPARTMENT VIEW

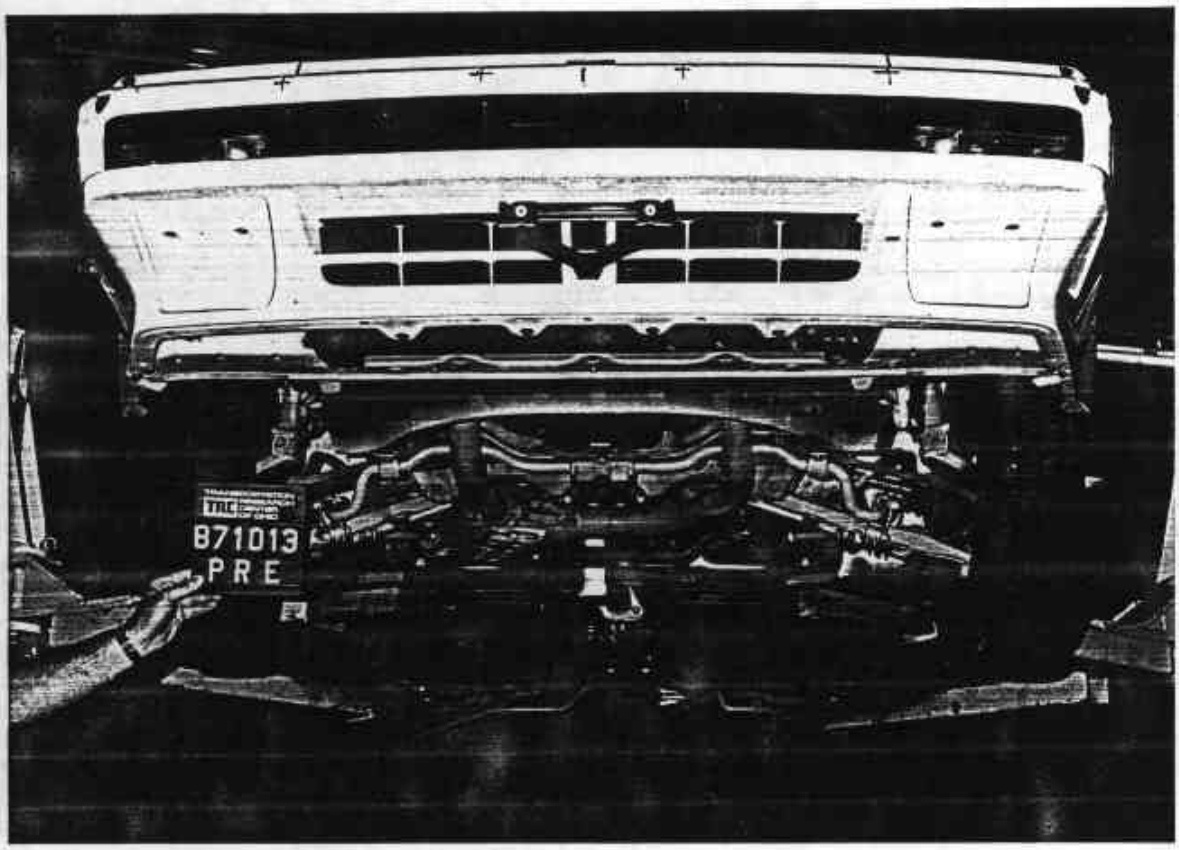


Figure 14. PRE-TEST FRONT UNDERBODY VIEW

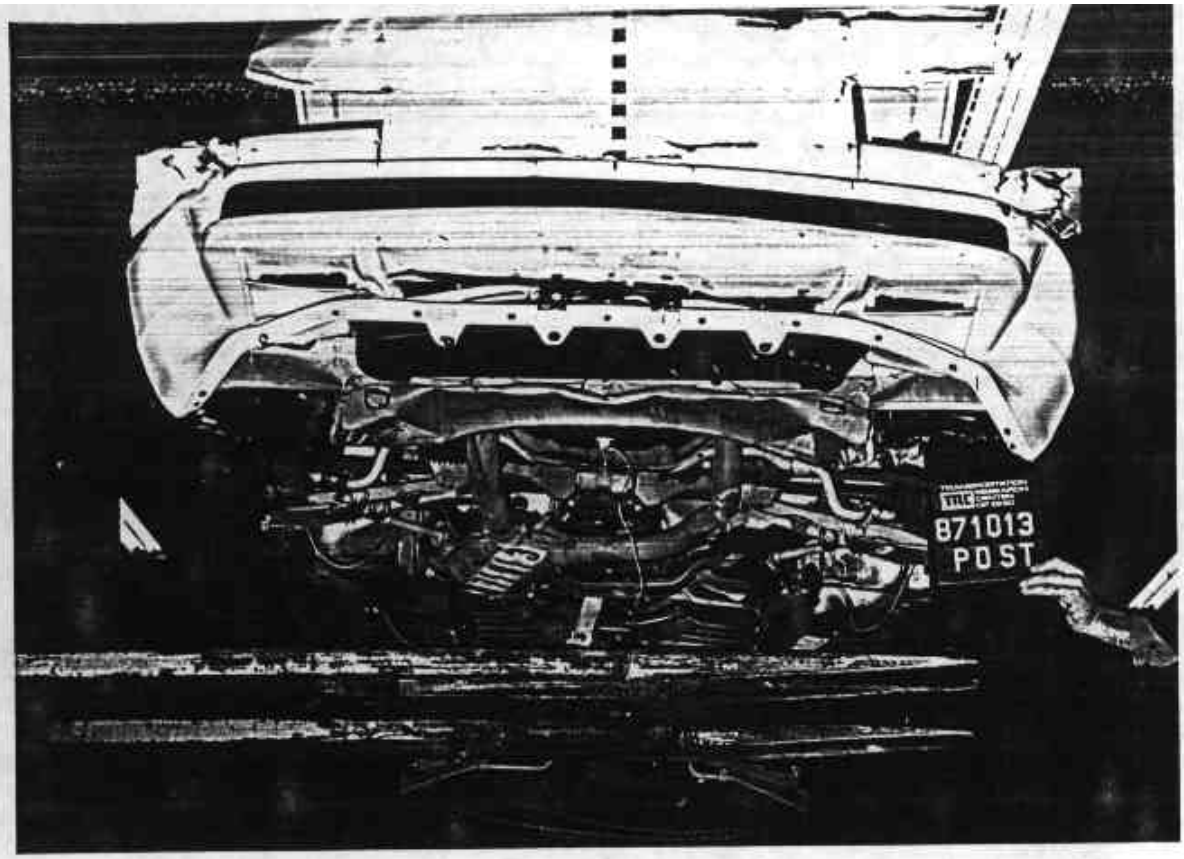


Figure 15. POST-TEST FRONT UNDERBODY VIEW

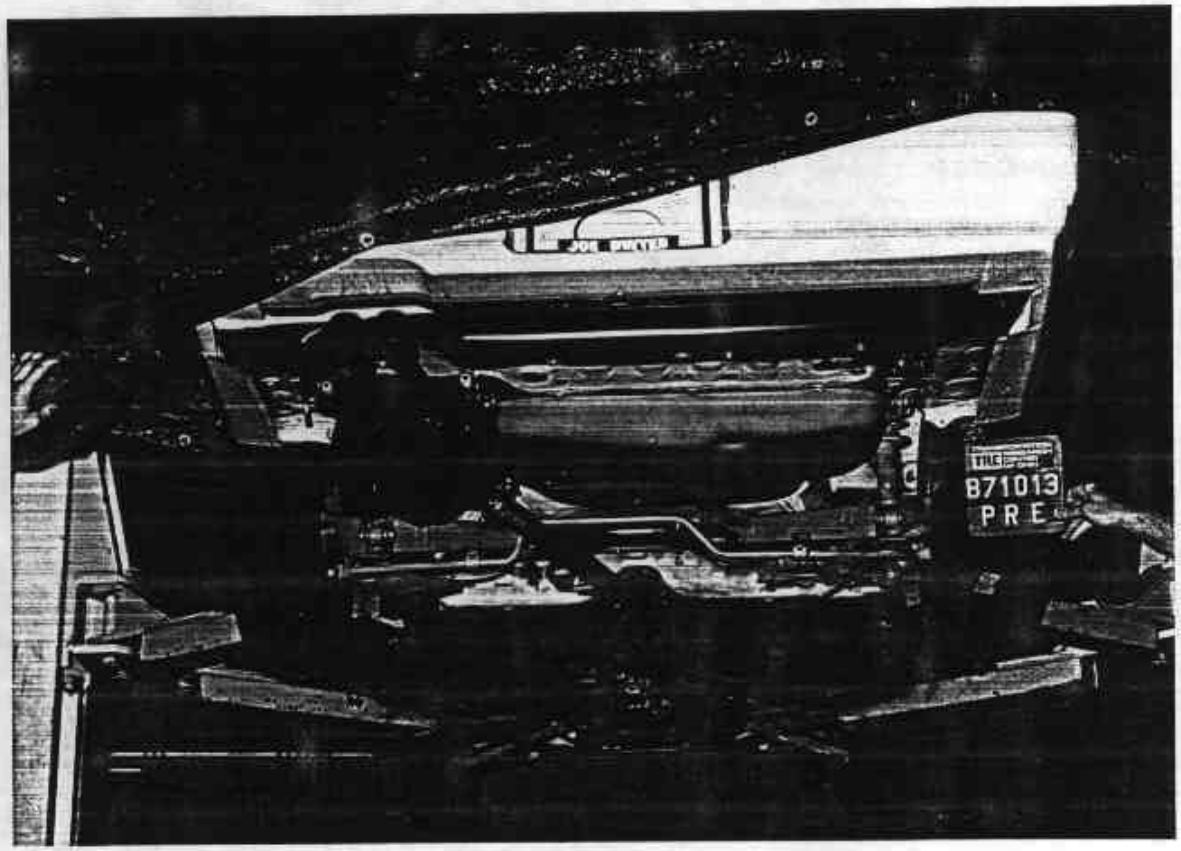


Figure 16. PRE-TEST REAR UNDERBODY VIEW

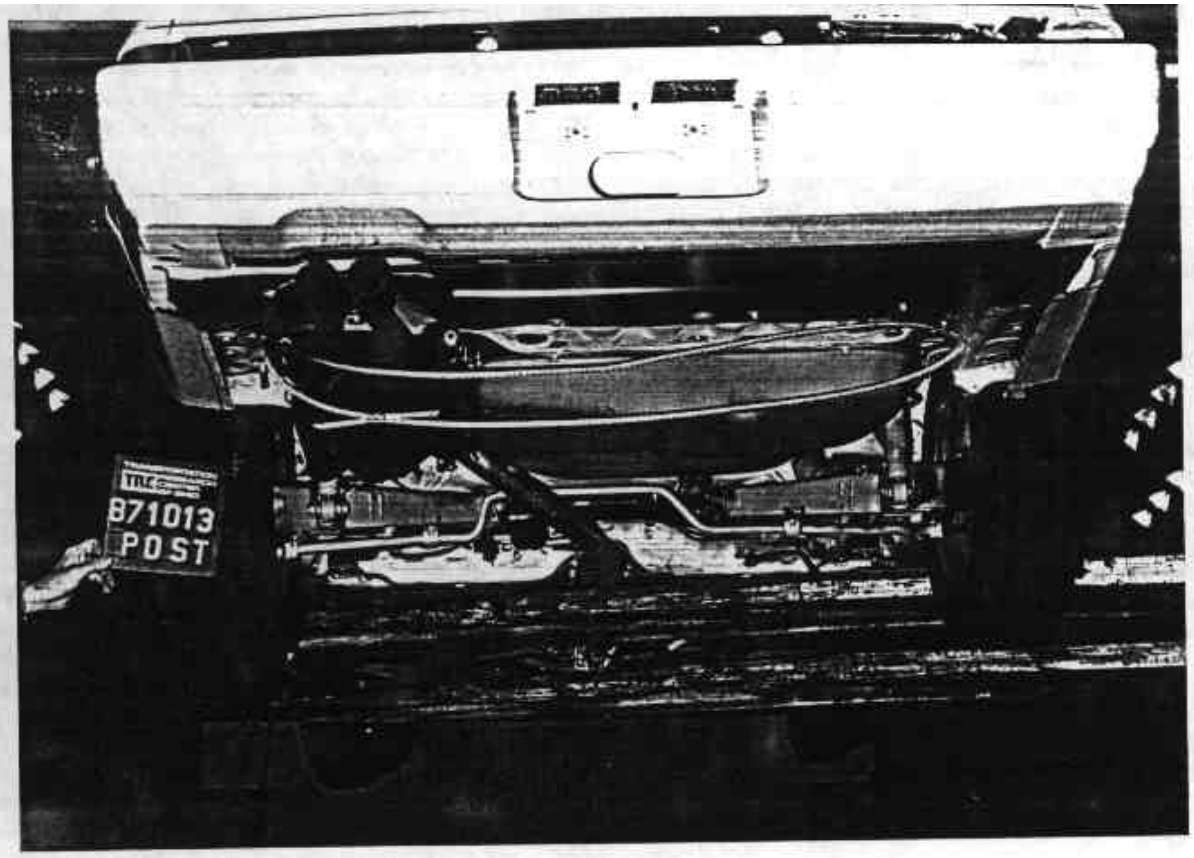


Figure 17. POST-TEST REAR UNDERBODY VIEW

Figure 18. PRE-TEST DRIVER DUMMY POSITION VIEW

Figure 19. POST-TEST DRIVER DUMMY POSITION VIEW

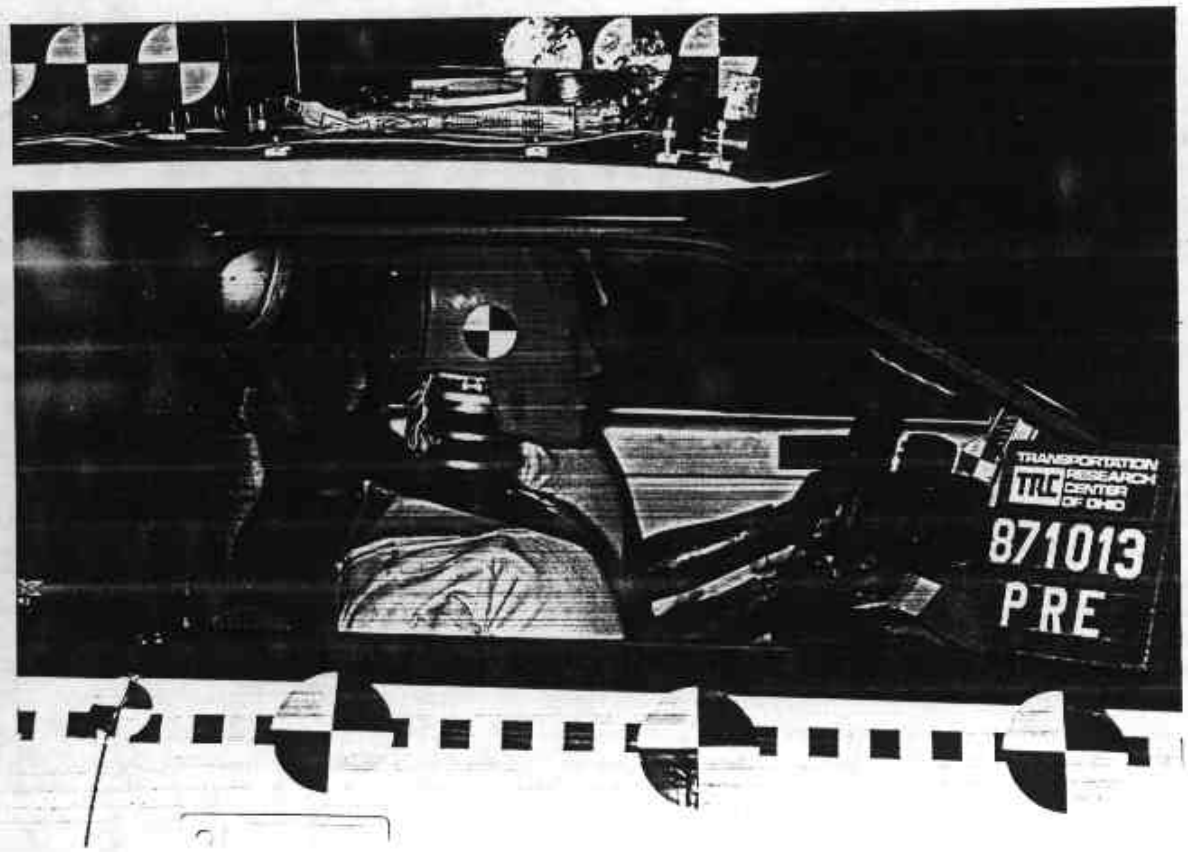


Figure 20. PRE-TEST PASSENGER DUMMY POSITION VIEW

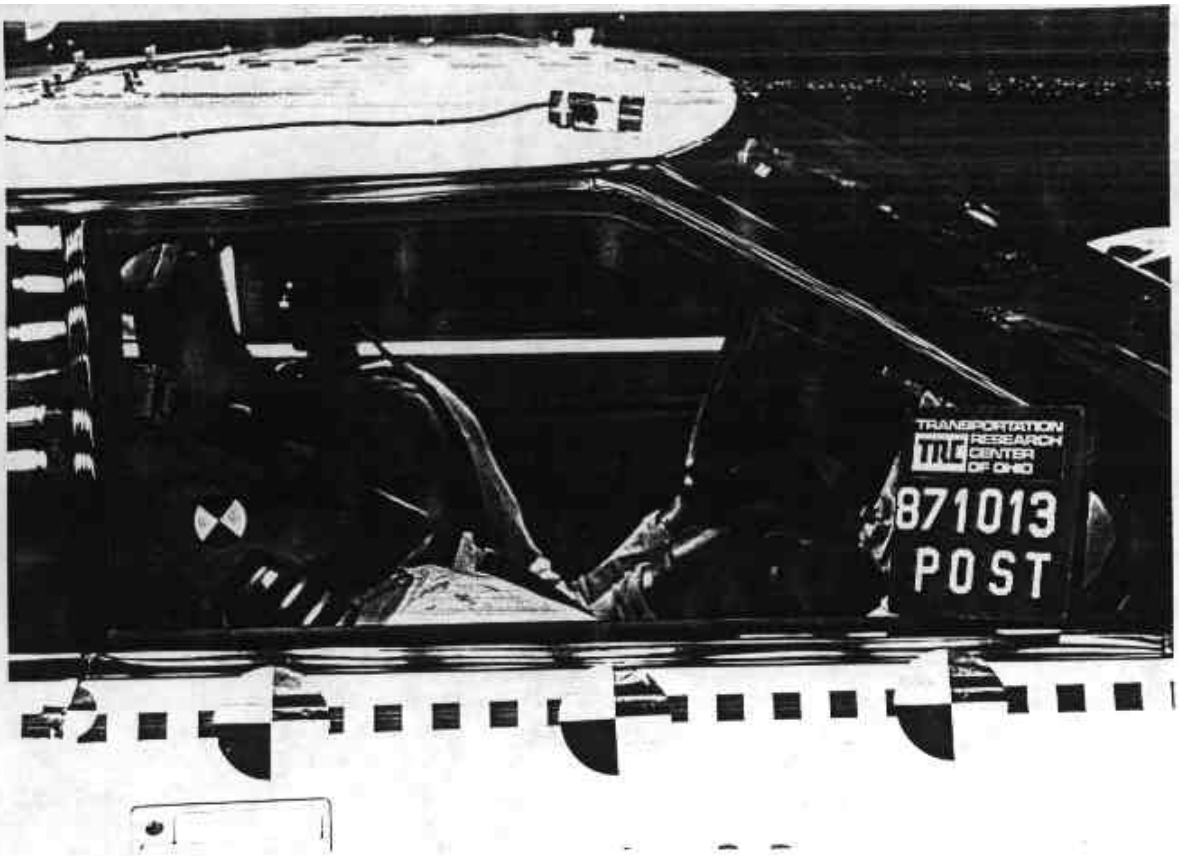


Figure 21. POST-TEST PASSENGER DUMMY POSITION VIEW

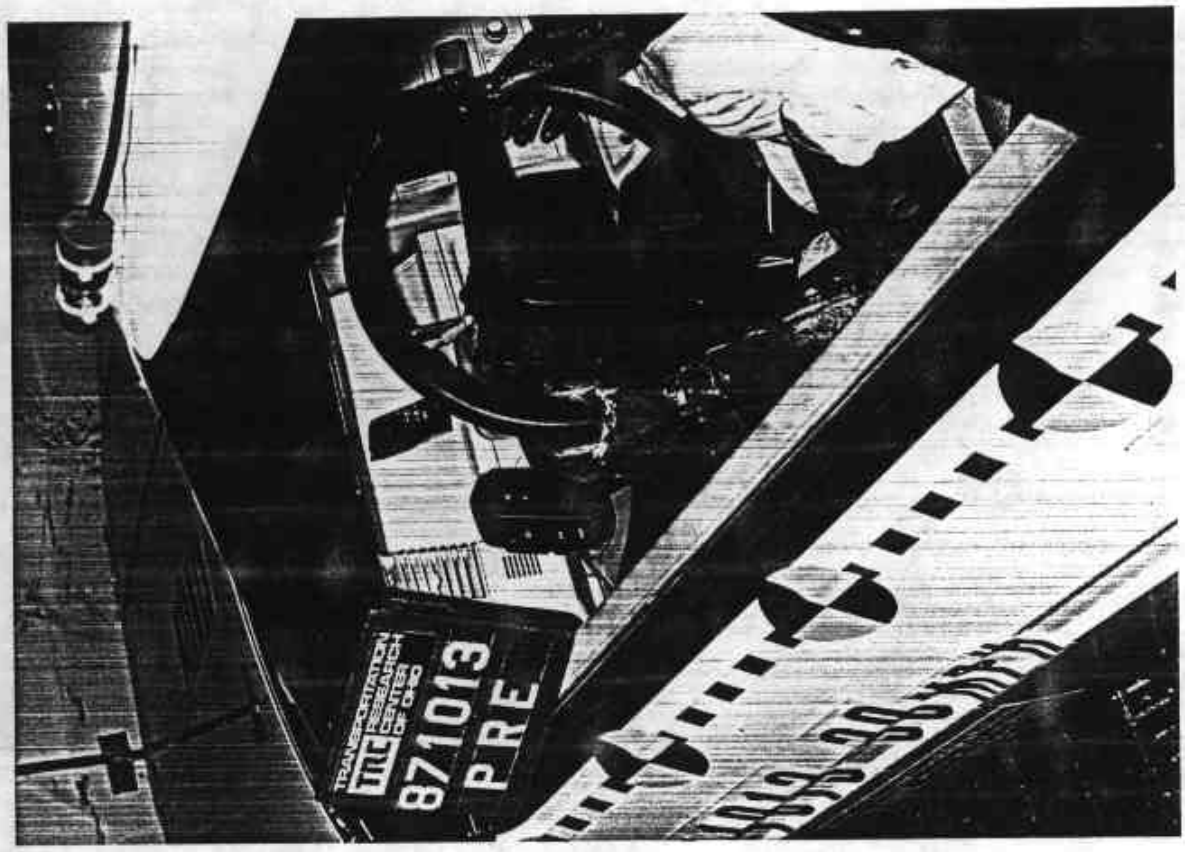


Figure 22. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW

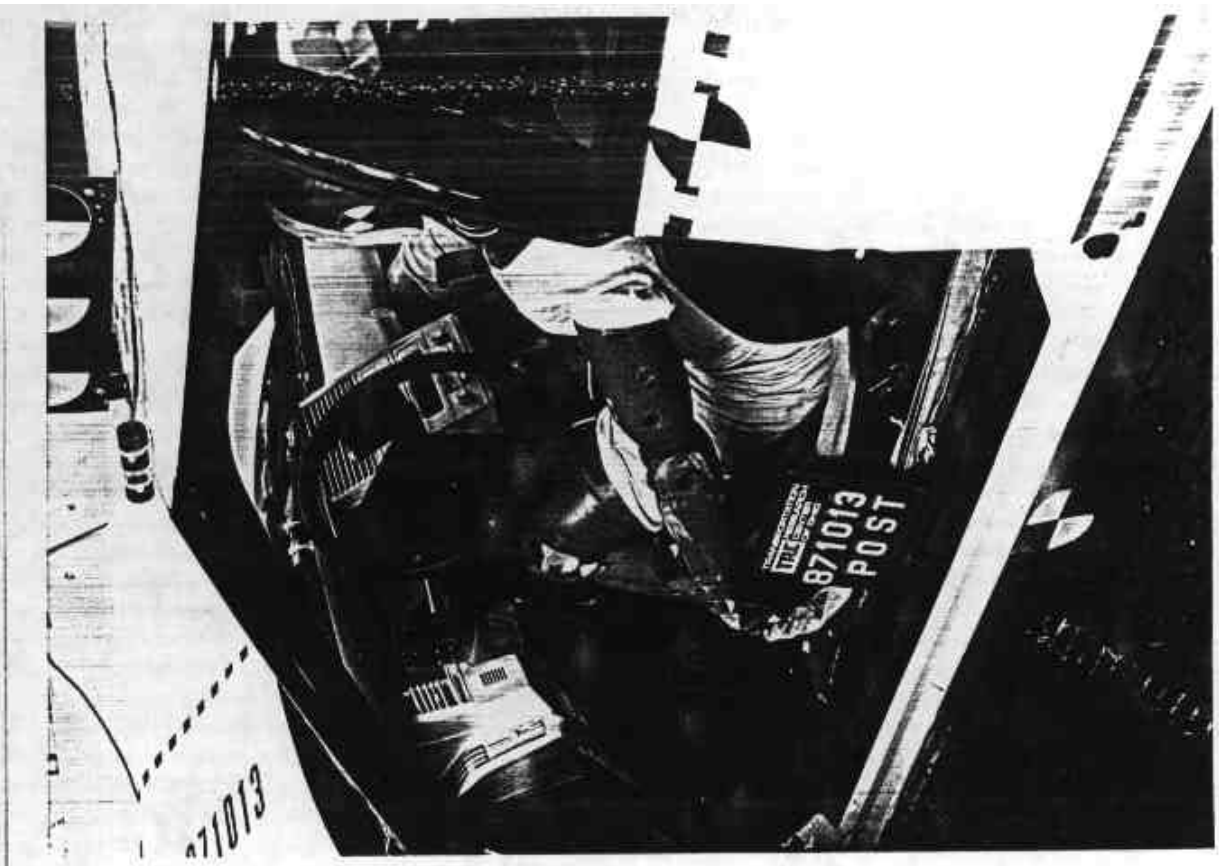


Figure 23. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW

Figure 24. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW

Figure 25. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

Figure 26. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

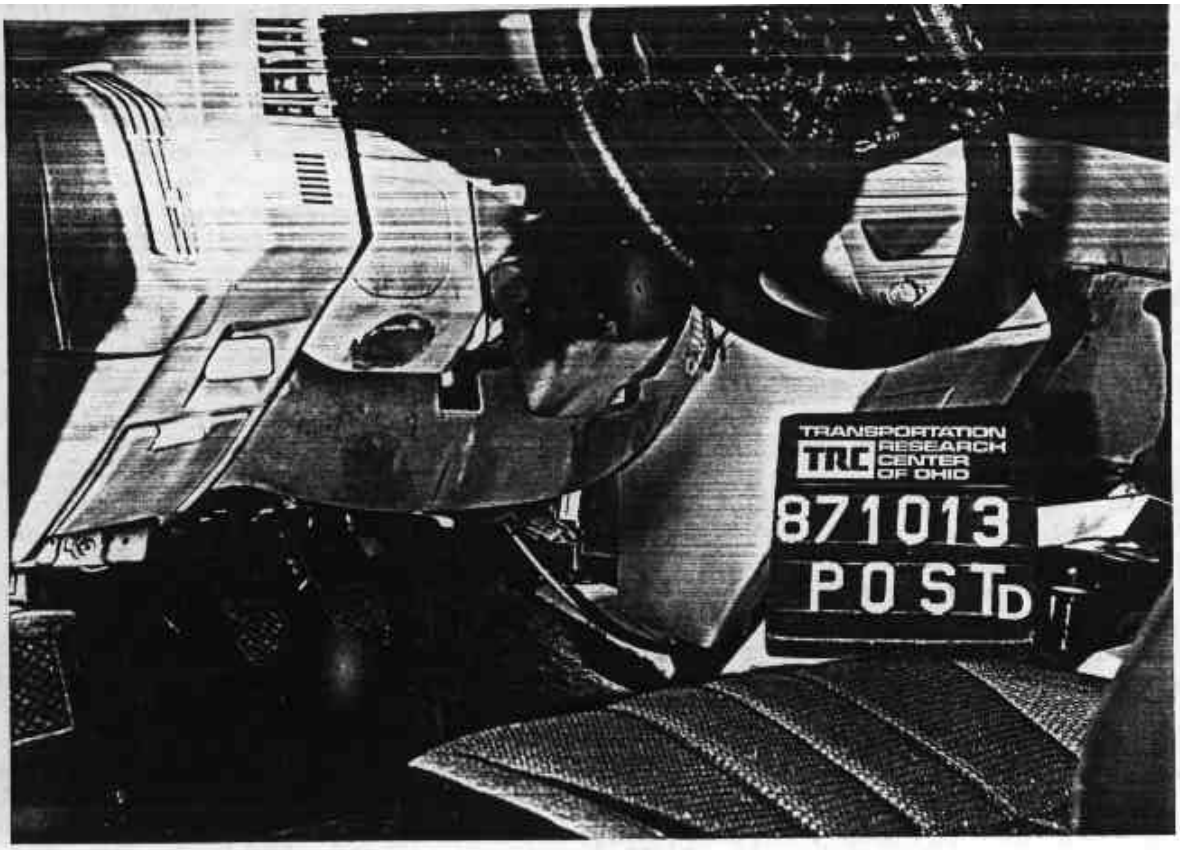


Figure 27. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 1

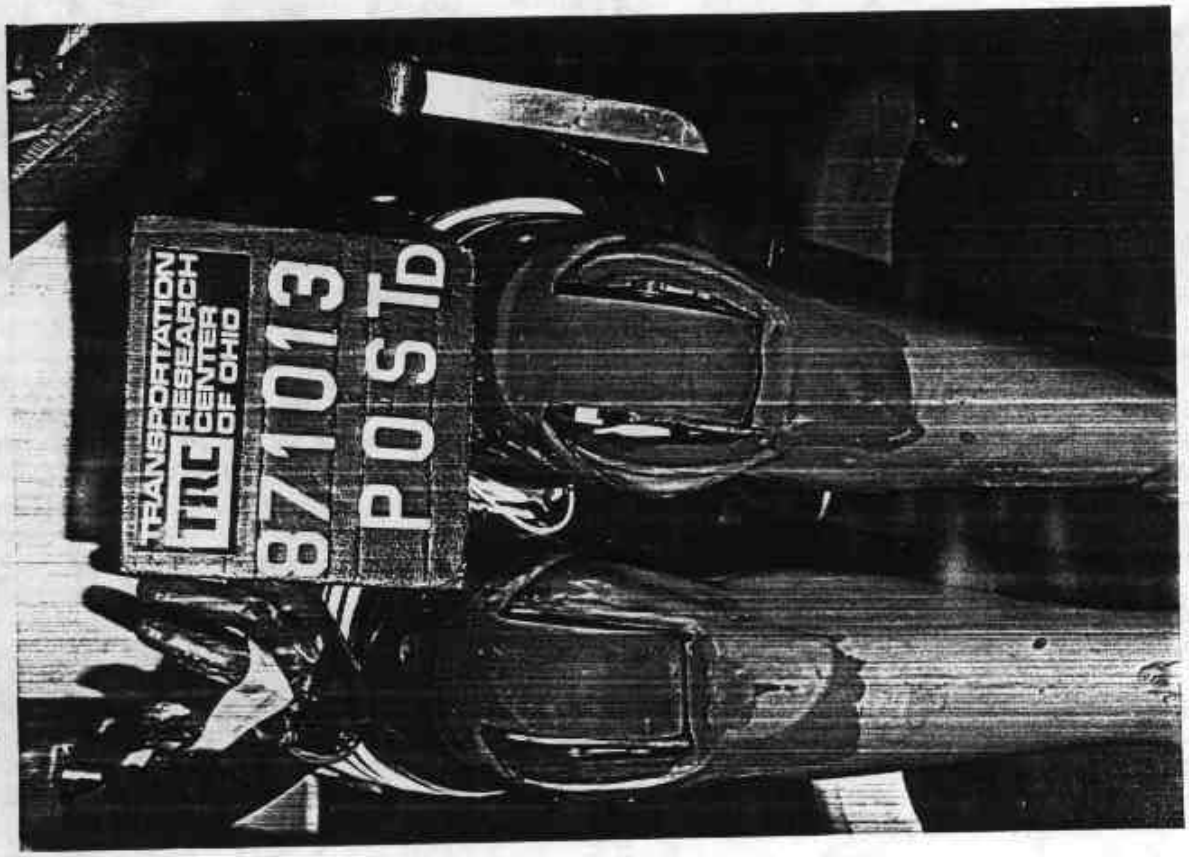


Figure 28. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 2

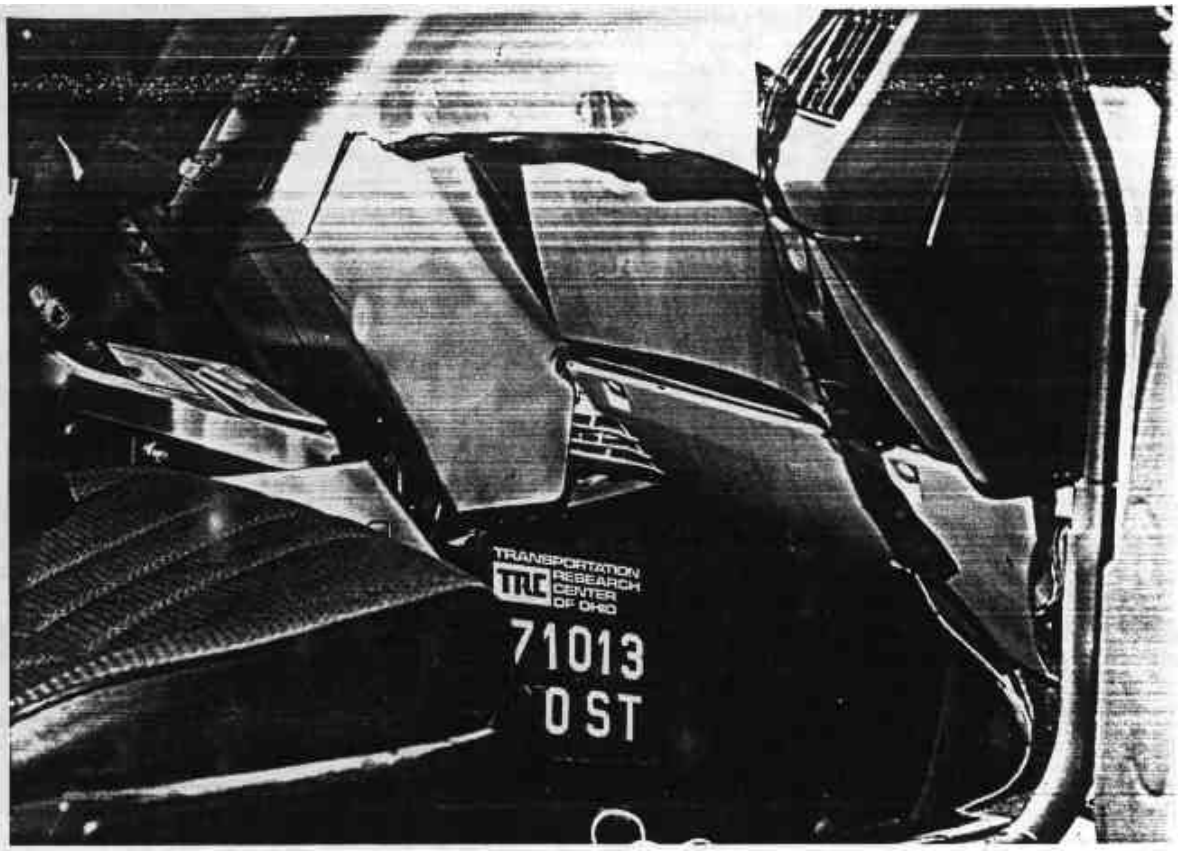


Figure 29. POST-TEST PASSENGER DUMMY HEAD/KNEE CONTACT - VIEW 1

Figure 30. POST-TEST PASSENGER DUMMY HEAD/KNEE CONTACT - VIEW 2

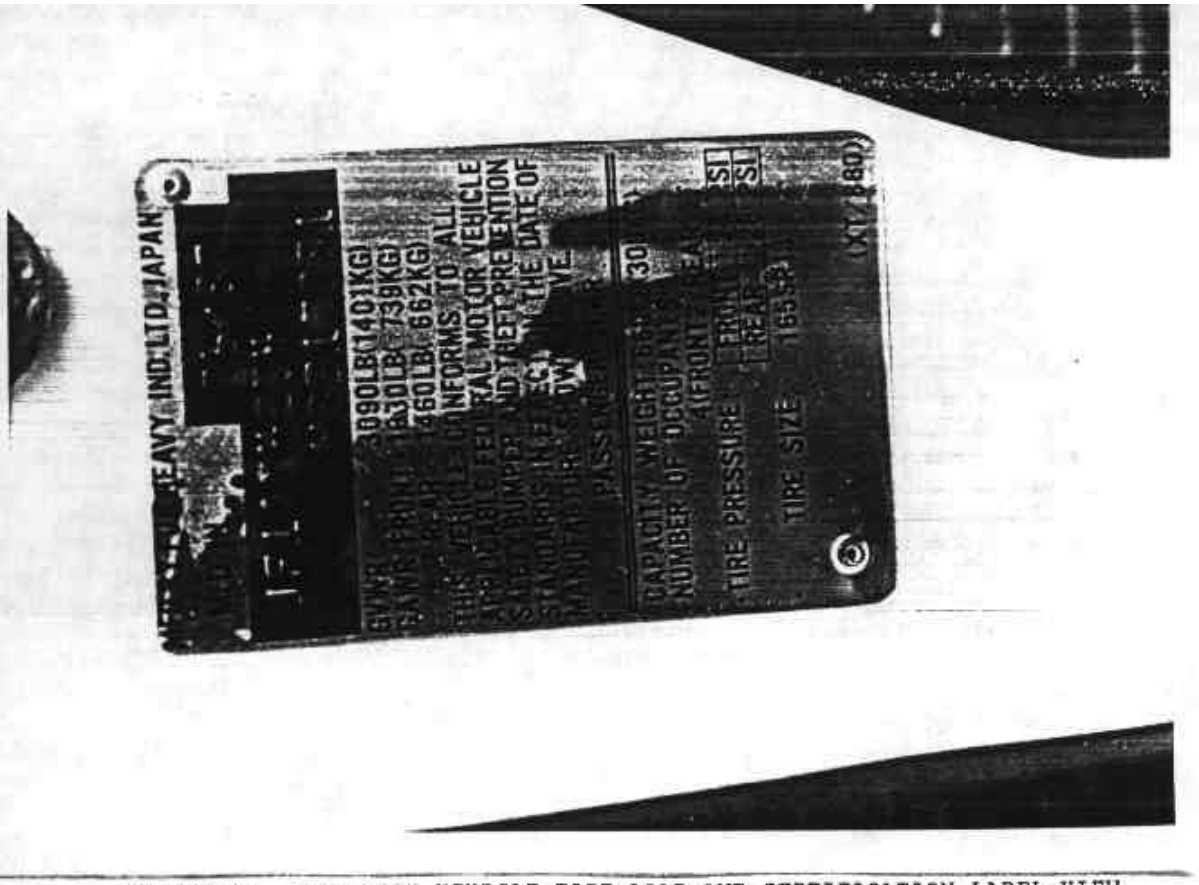


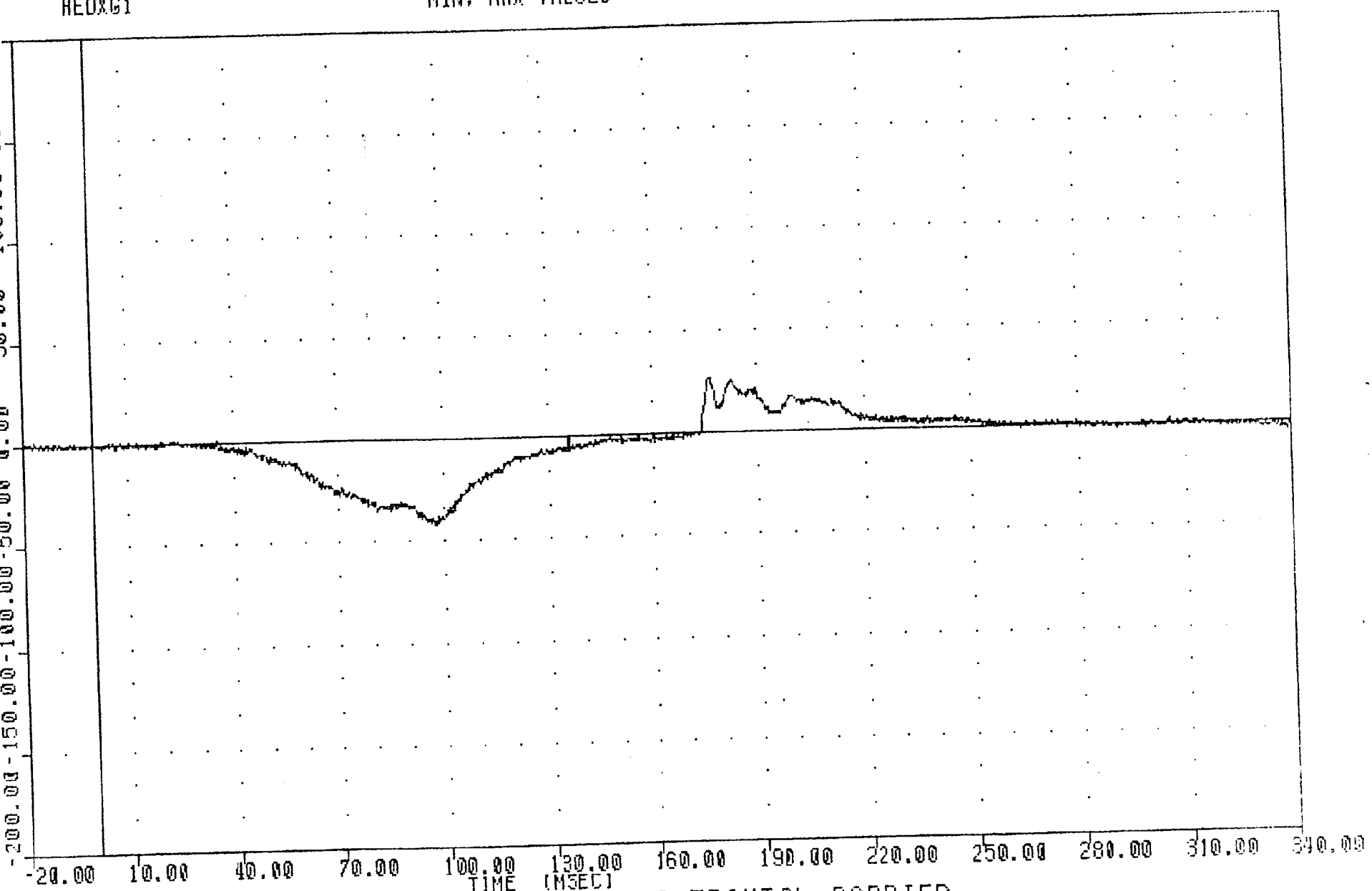
Figure 31. PRE-TEST VEHICLE TIRE LOAD AND CERTIFICATION LABEL VIEW

APPENDIX B

DATA PLOTS

TRC , 871013
208 FRONTAL CRASH TEST
87286
HEDXG1

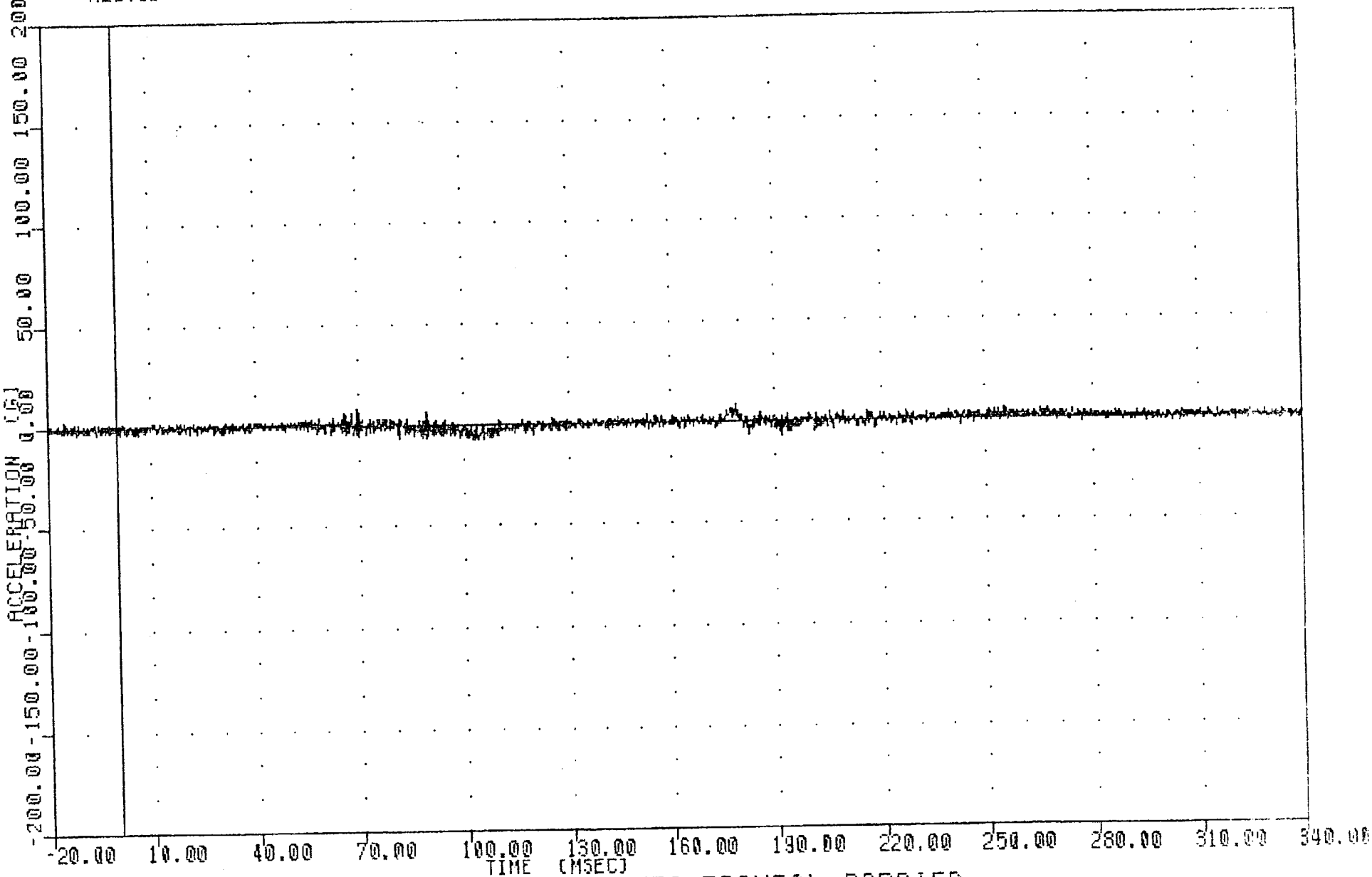
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -42.27 @ 97.38 , 27.08 @ 176.00



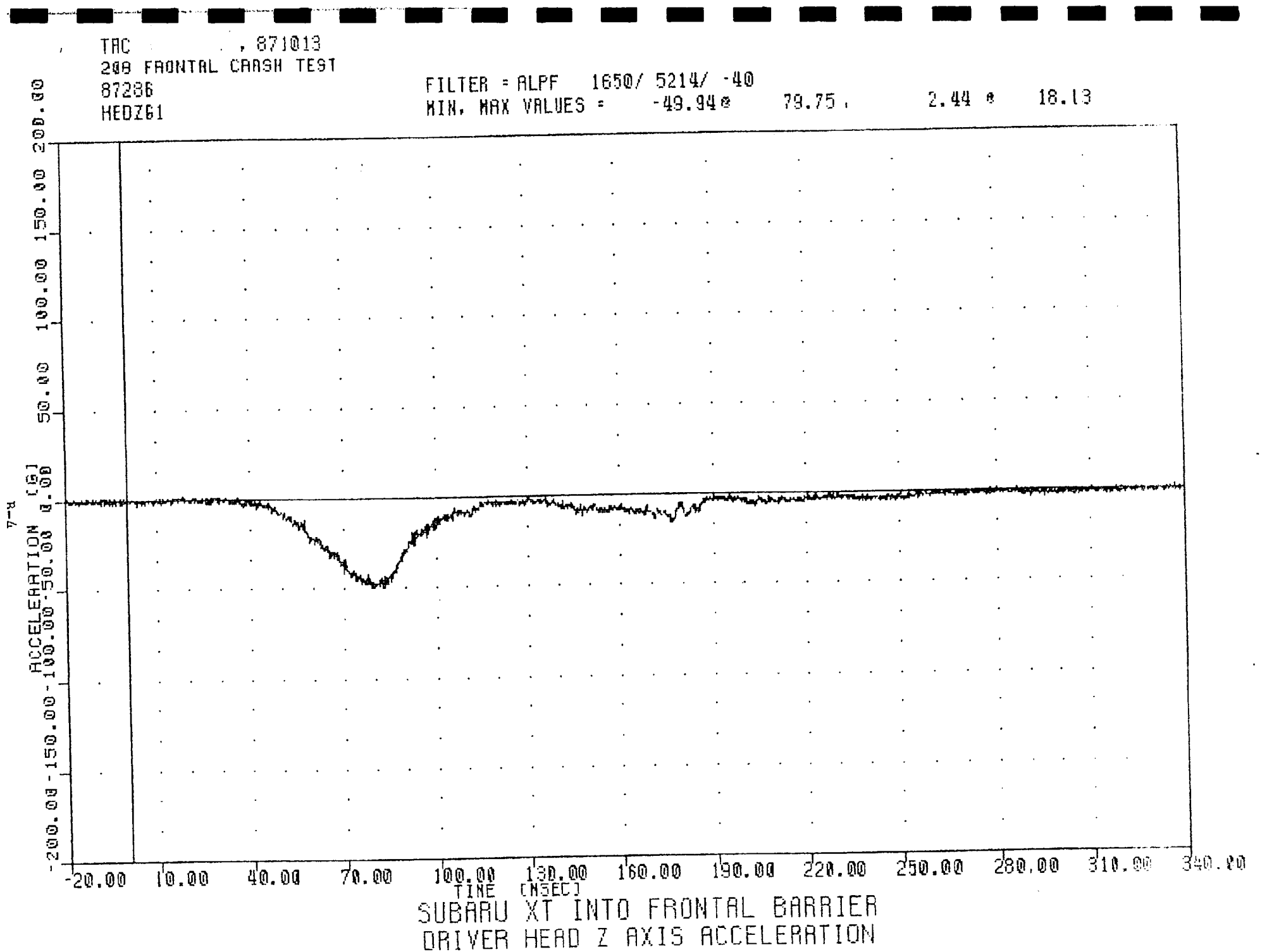
SUBARU XT INTO FRONTAL BARRIER
DRIVER HEAD X AXIS ACCCELERATION

TRC , 871013
20# FRONTAL CRASH TEST
87286
HEDYG1

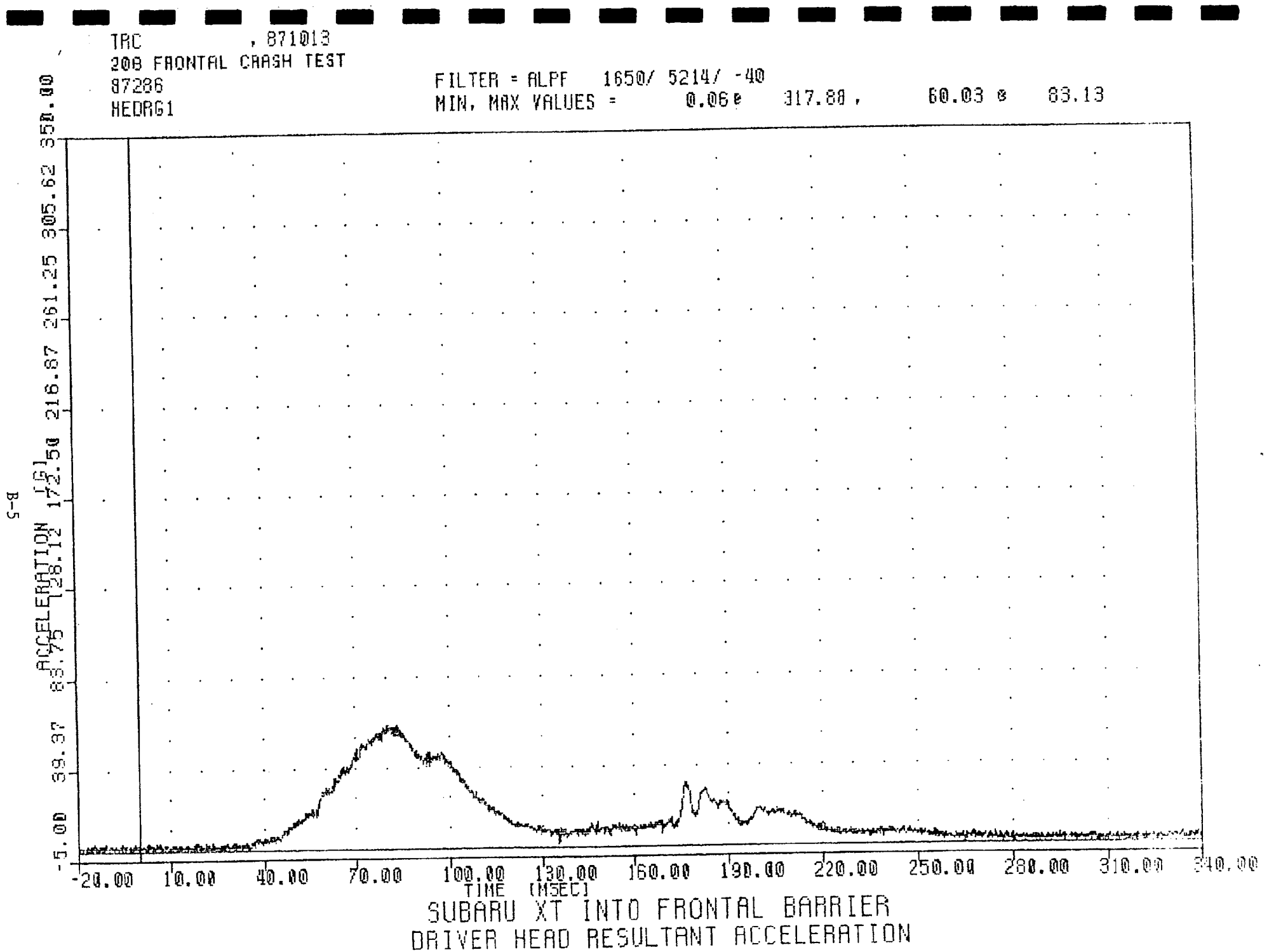
FILTER = ALFF 1650/ 5214/ -40
MIN, MAX VALUES = -7.10@ 191.88 , 8.60 @ 179.00



SUBARU XT INTO FRONTAL BARRIER
DRIVER HEAD Y AXIS ACCELERATION



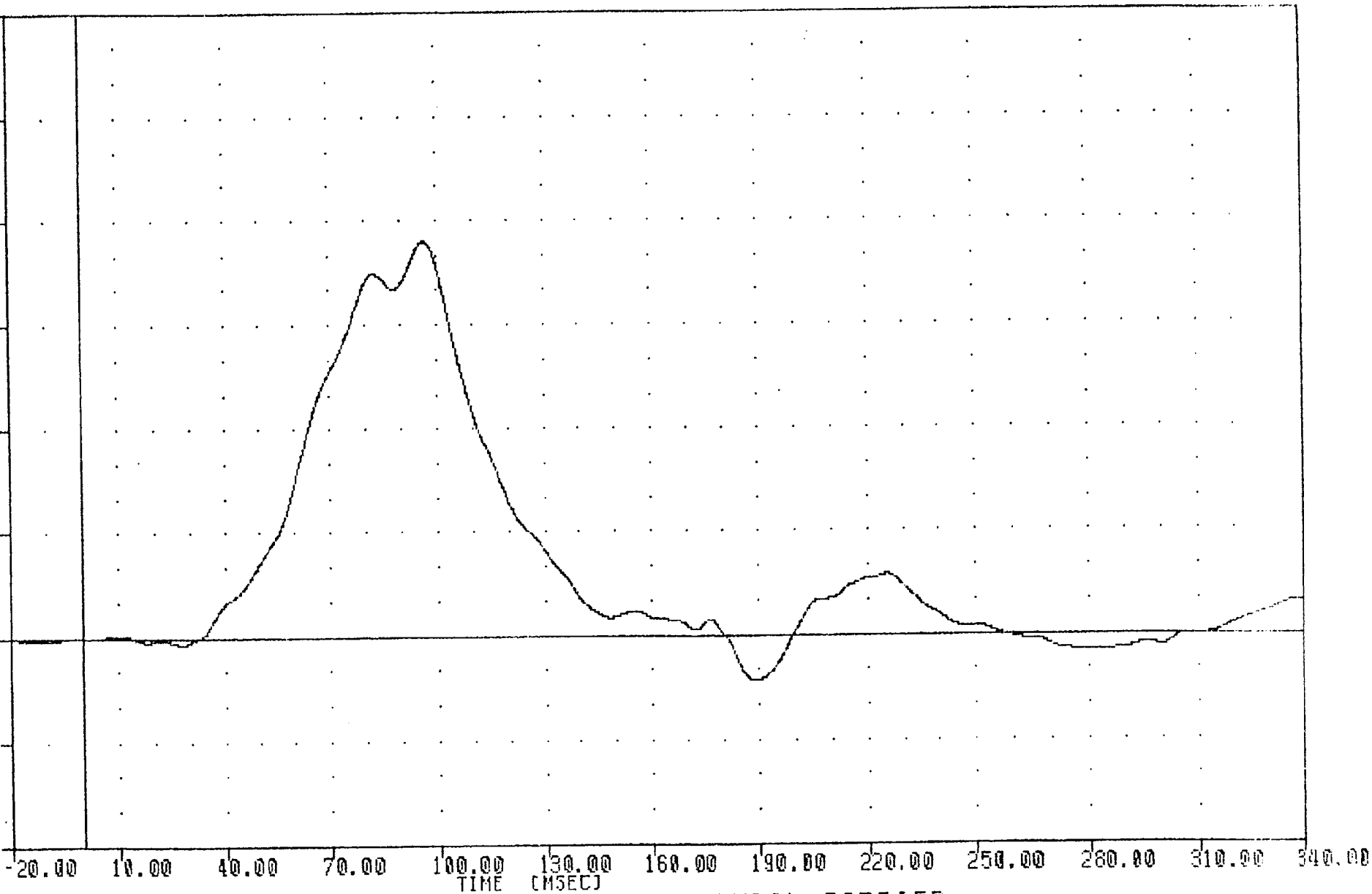
SUBARU XT INTO FRONTAL BARRIER
DRIVER HEAD Z AXIS ACCELERATION



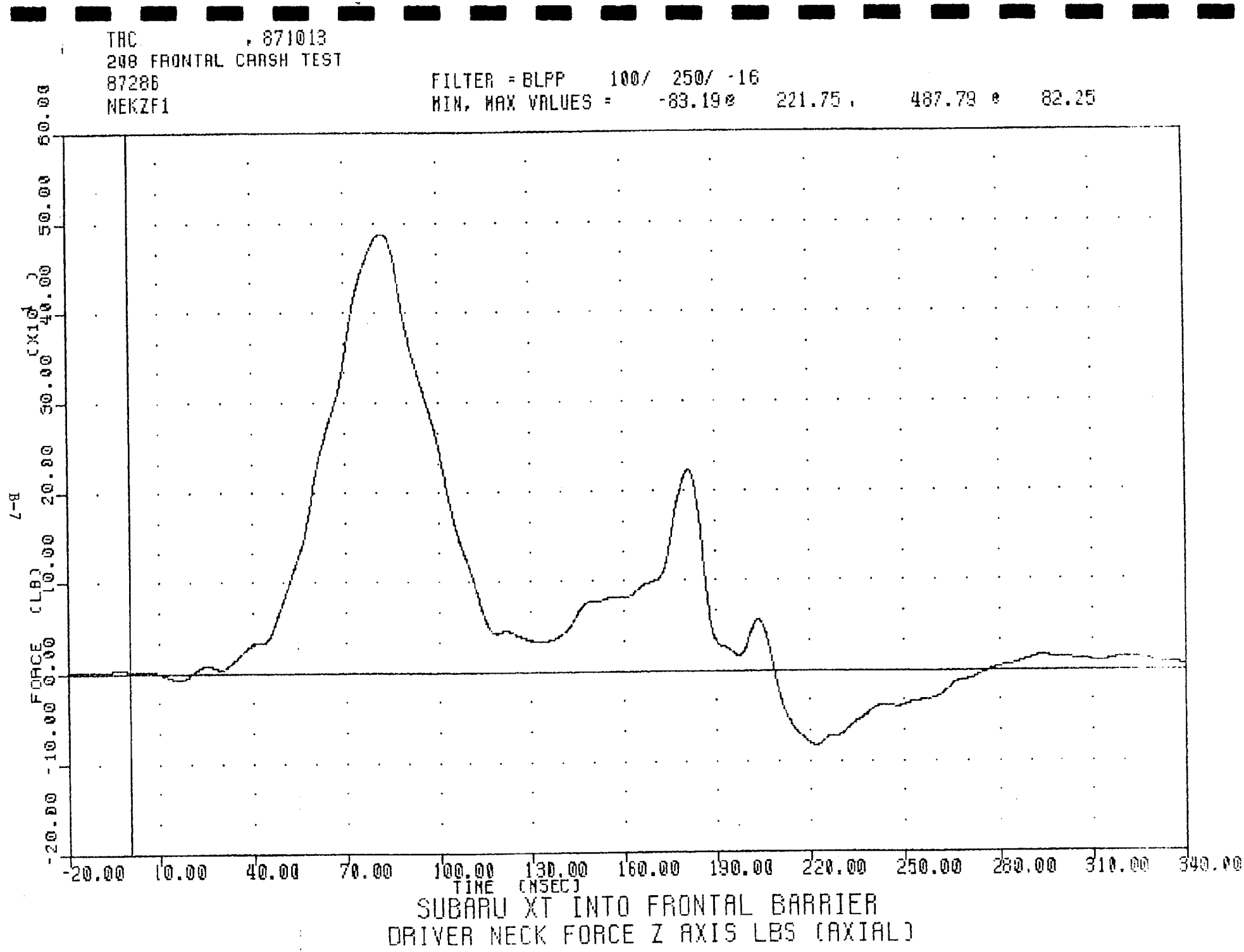
SUBARU XT INTO FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

TRC , 871013
208 FRONTAL CRASH TEST
87286
NEKXF1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -43.66 @ 189.13 , 379.91 @ 96.50

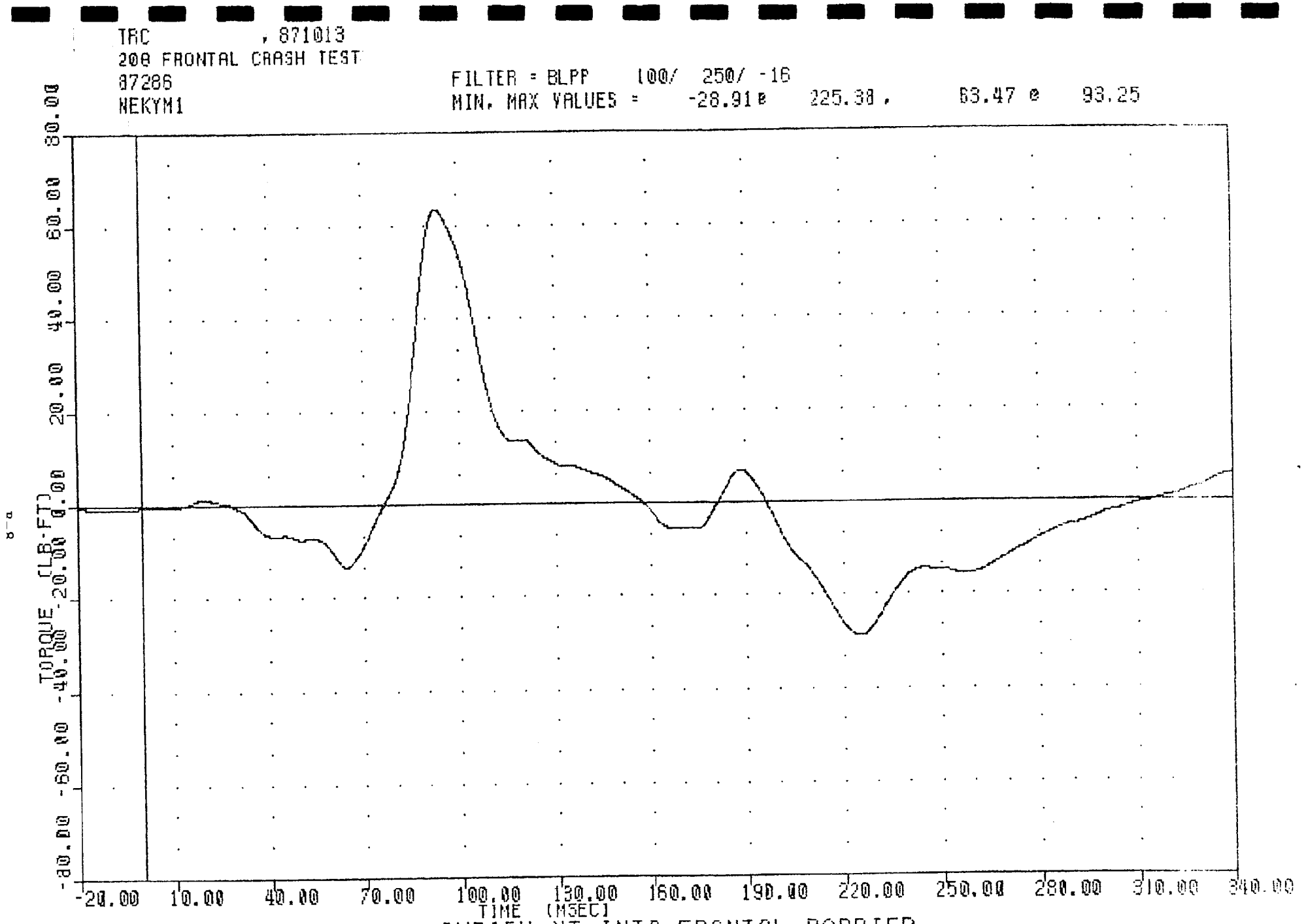


SUBARU XT INTO FRONTAL BARRIER
DRIVER NECK FORCE X AXIS LBS (SHEAR)

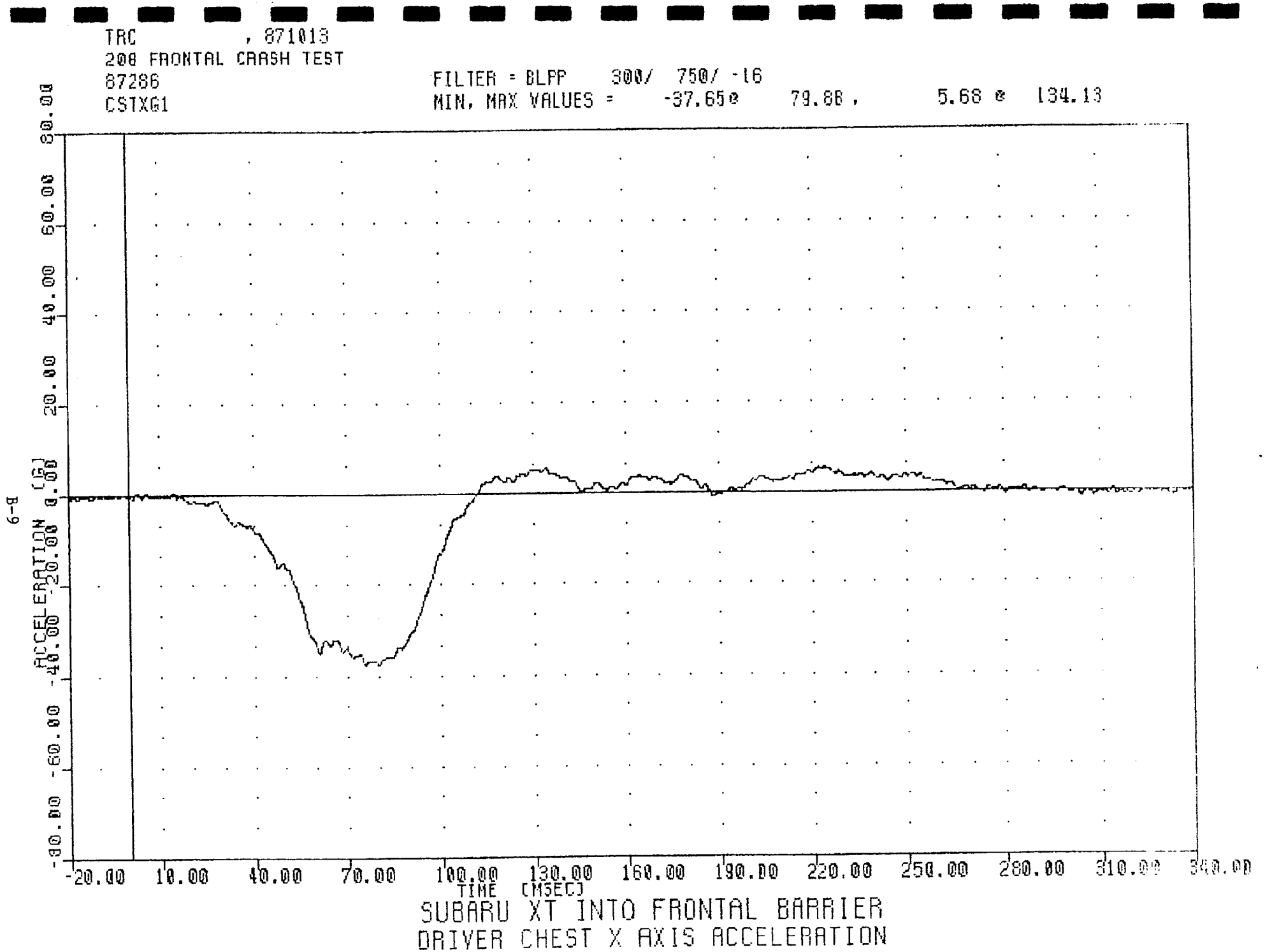


B-7

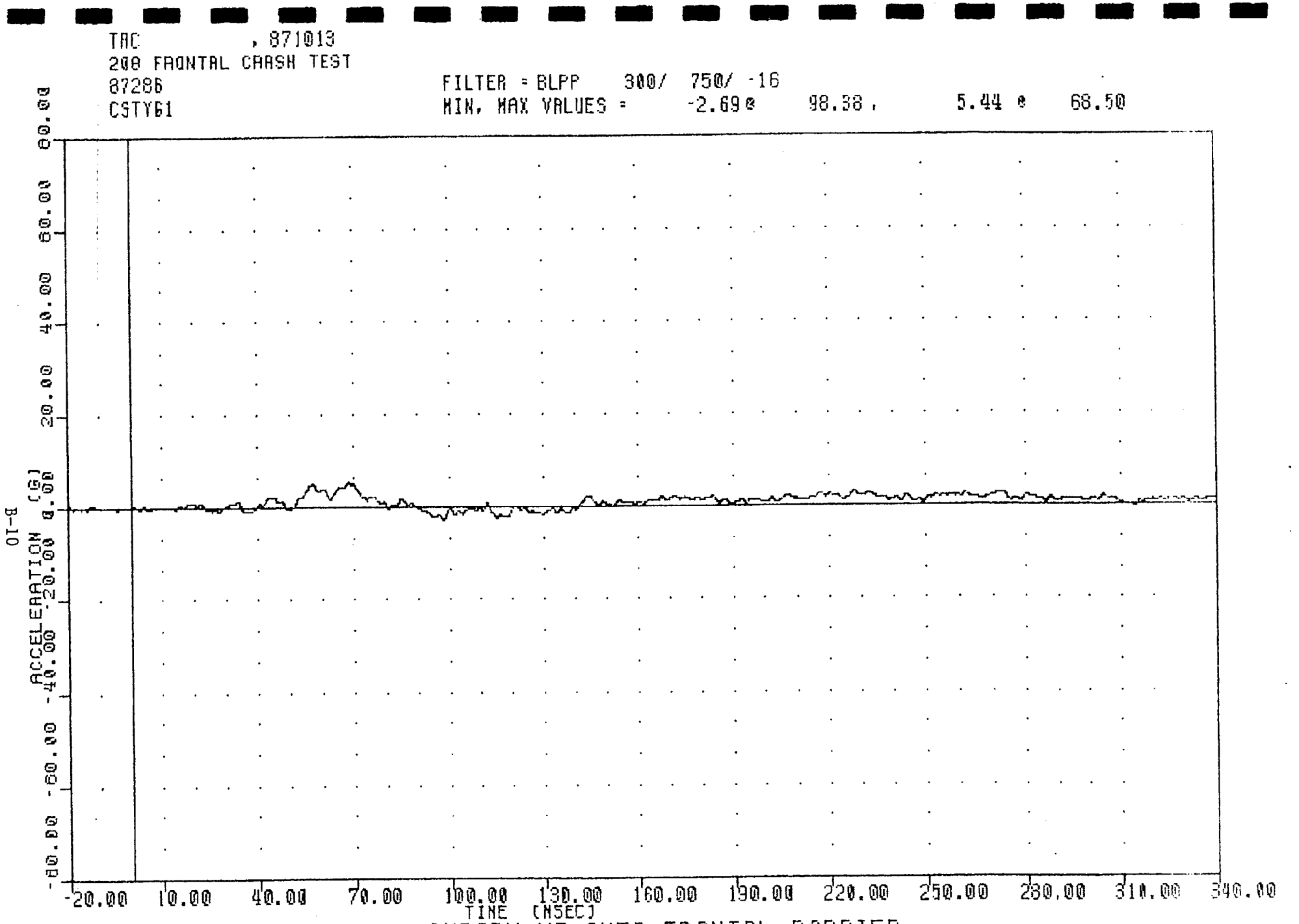
SUBARU XT INTO FRONTAL BARRIER
DRIVER NECK FORCE Z AXIS LBS (AXIAL)



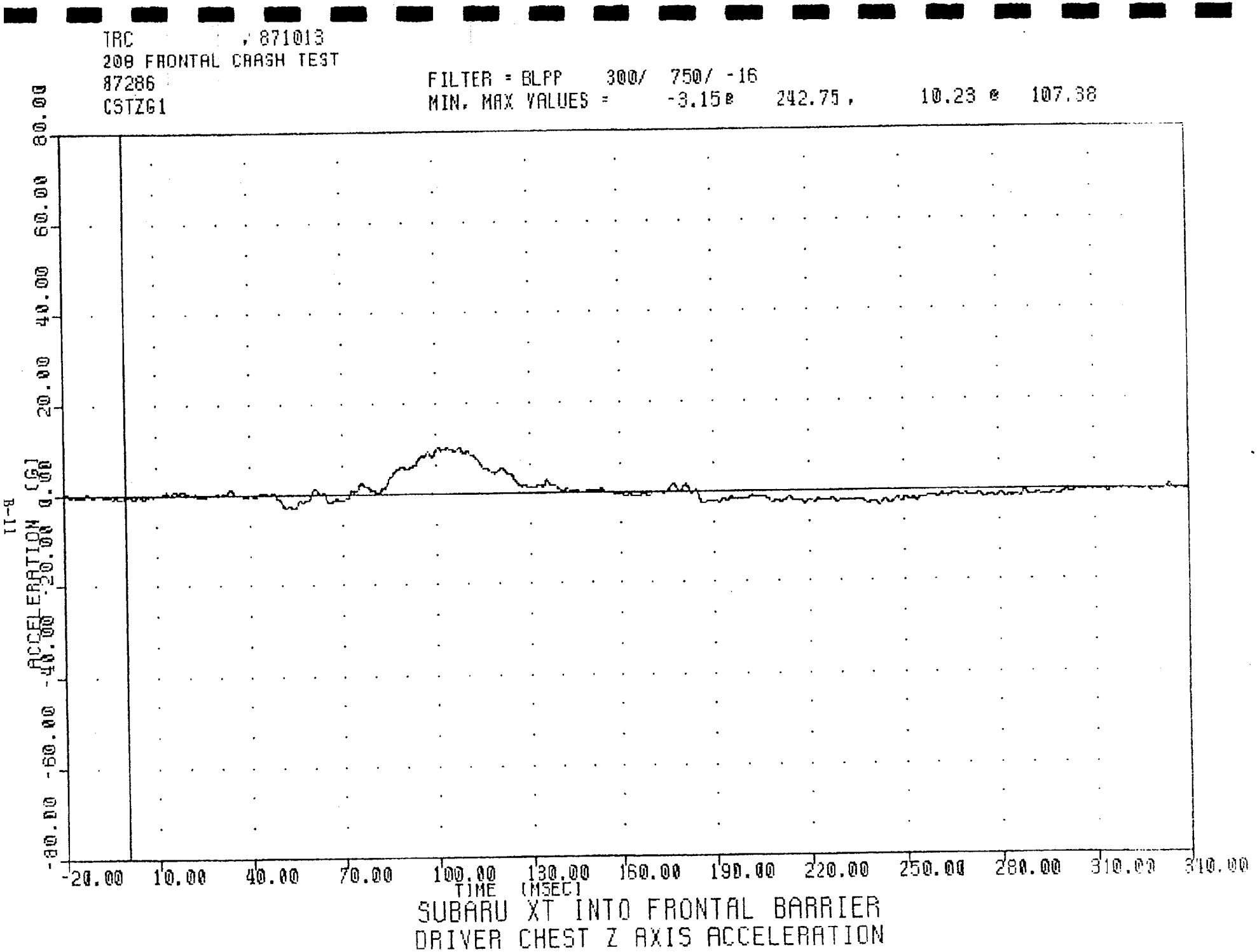
SUBARU XT INTO FRONTAL BARRIER
DRIVER NECK MOMENT Y AXIS FT-LBS



SUBARU XT INTO FRONTAL BARRIER
DRIVER CHEST X AXIS ACCELERATION

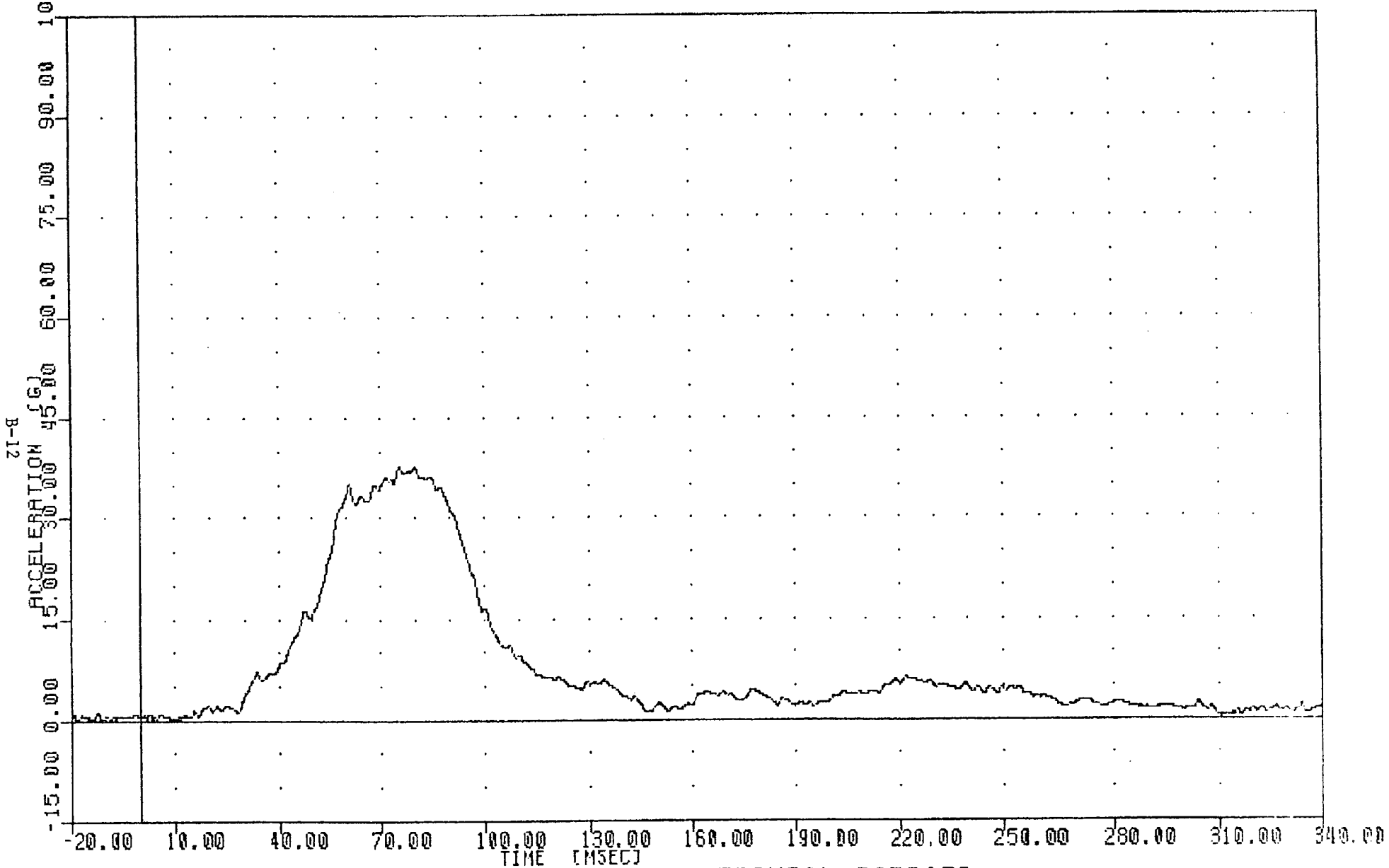


SUBARU XT INTO FRONTAL BARRIER
DRIVER CHEST Y AXIS ACCELERATION



SUBARU XT INTO FRONTAL BARRIER
DRIVER CHEST Z AXIS ACCELERATION

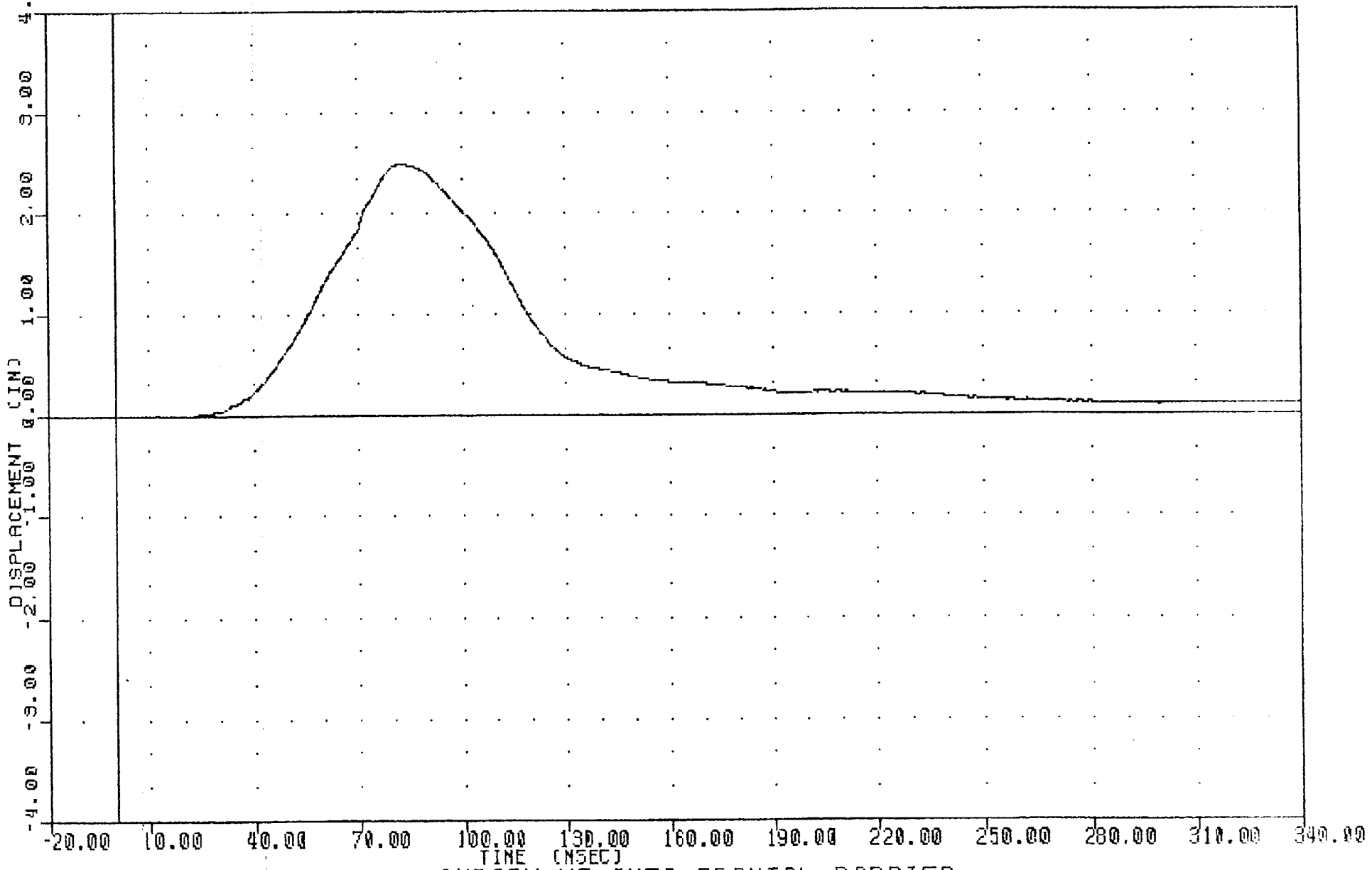
TRC , 871013
208 FRONTAL CRASH TEST
87286 FILTER = BLPP 300/ 750/ -16
CSTRG1 MIN, MAX VALUES = 0.16 @ 4.88 , 37.73 @ 75.38



SUBARU XT INTO FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

TRC , 871013
208 FRONTAL CRASH TEST
87286
CSTXD1

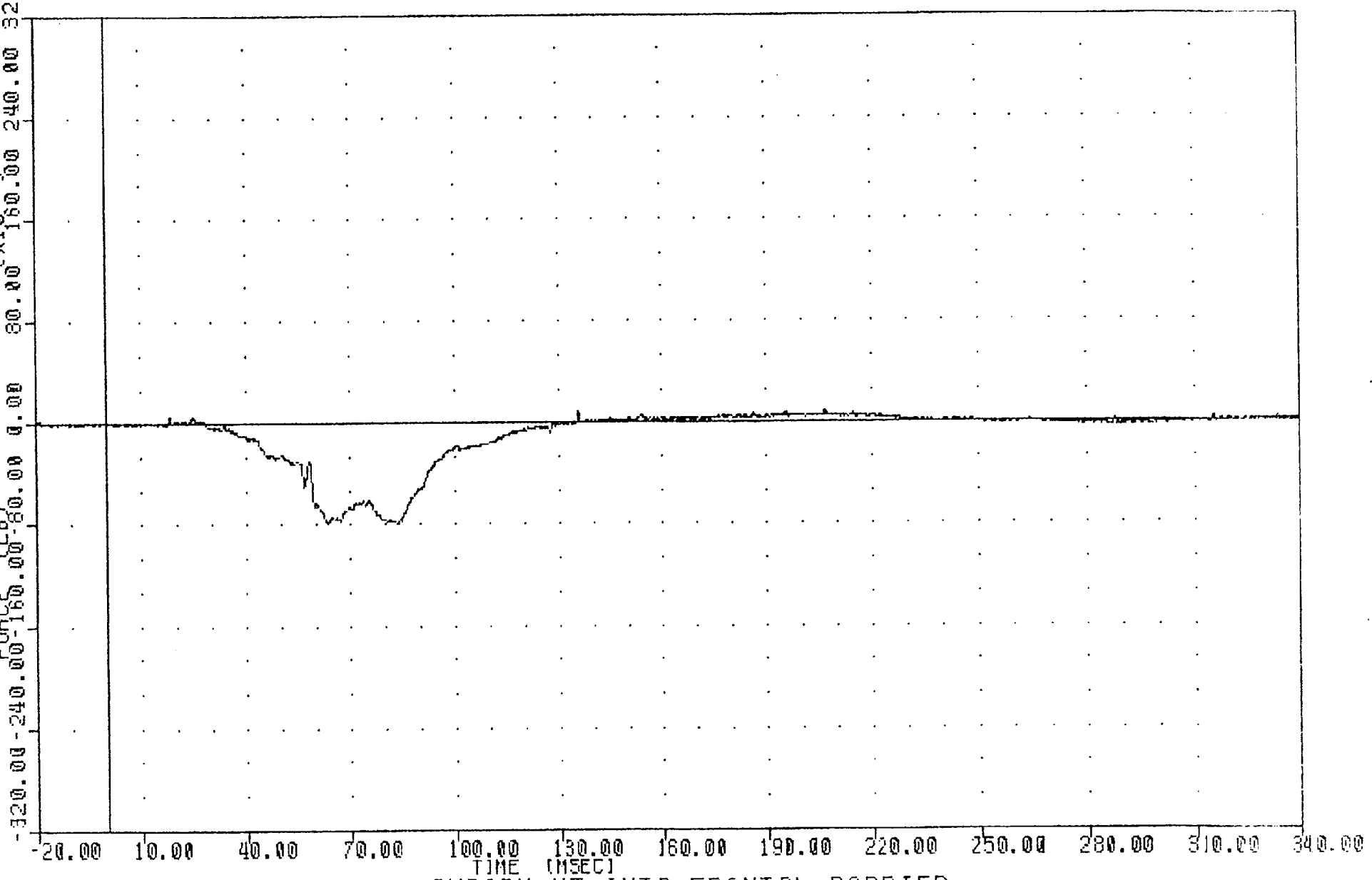
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = 0.00 @ 6.13 , 2.48 @ 82.25



SUBARU XT INTO FRONTAL BARRIER
DRIVER CHEST DISPLACEMENT INCHES

TRC , 871013
200 FRONTAL CRASH TEST
87286
LFMF1

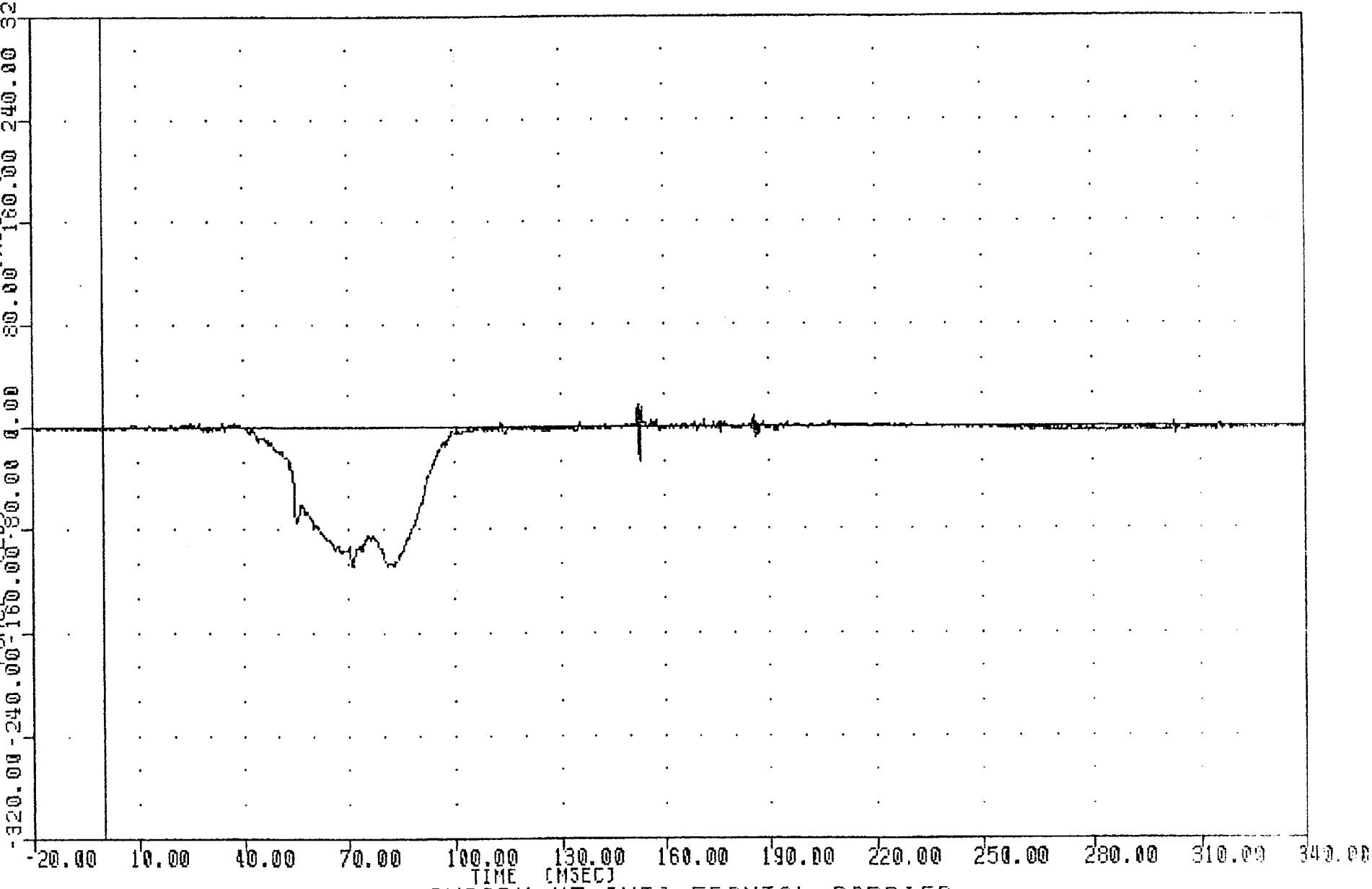
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -794.86 @ 83.00 , 94.30 @ 206.63



SUBARU XT INTO FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE LBS

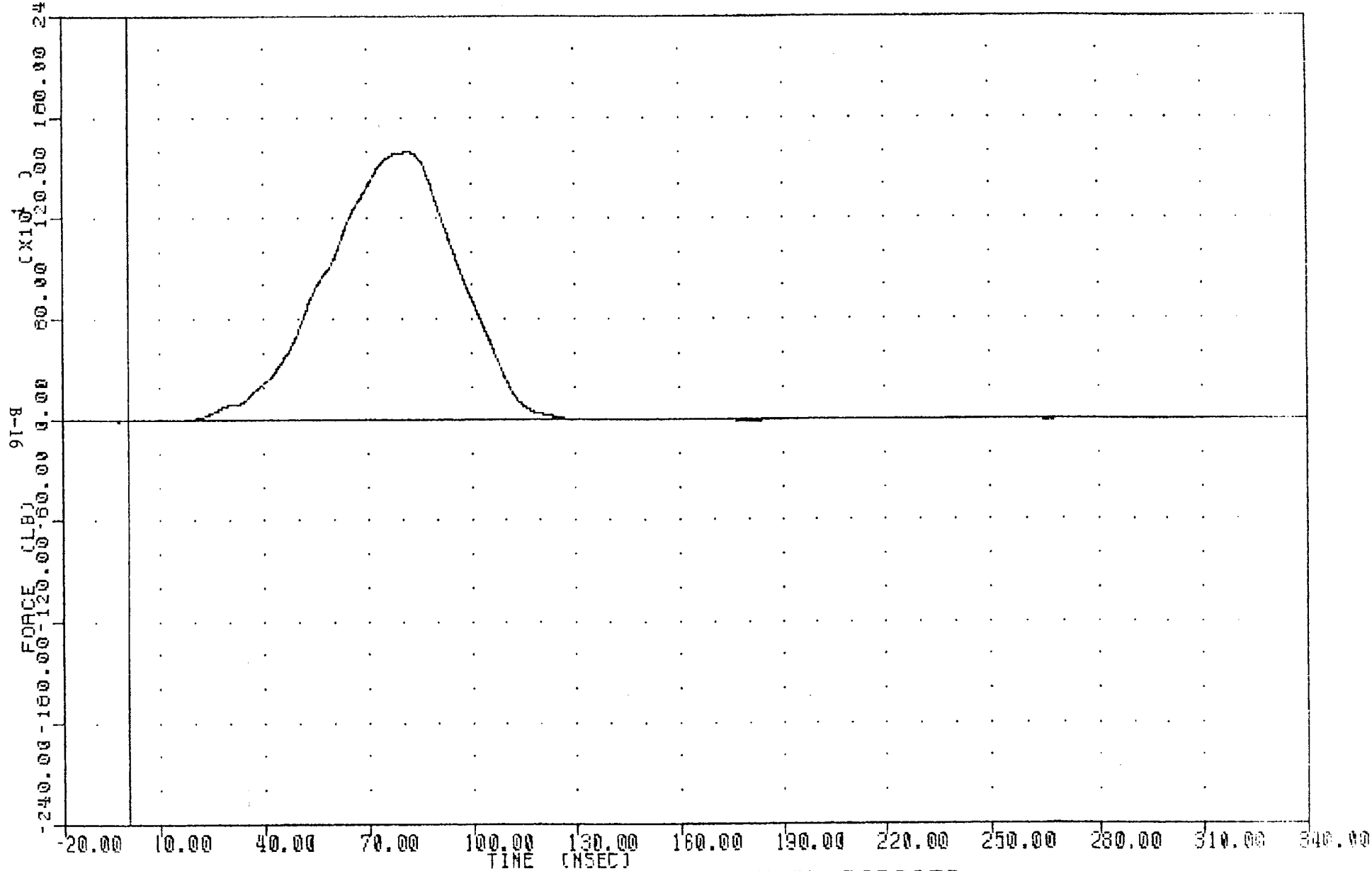
TRC , 871013
208 FRONTAL CRASH TEST
87286
RFNF1

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -1081.49 @ 83.00 , 180.96 @ 152.25



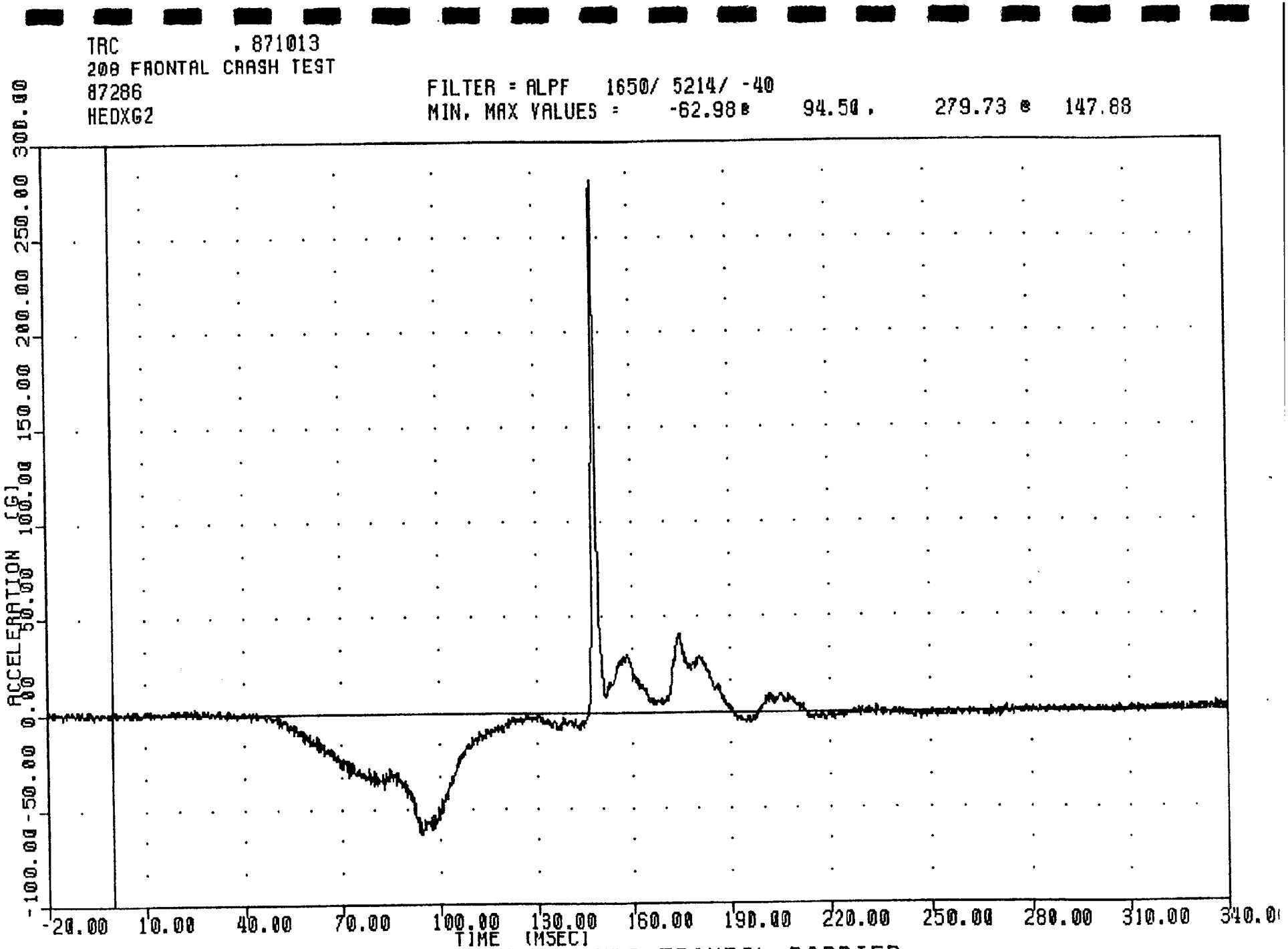
SUBARU XT INTO FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE LBS

TRC , 871013
200 FRONTAL CRASH TEST
87286 FILTER = BLPP 100/ 250/ -16
SHBF1 MIN, MAX VALUES = -5.32 @ 179.00 , 1589.59 @ 81.88



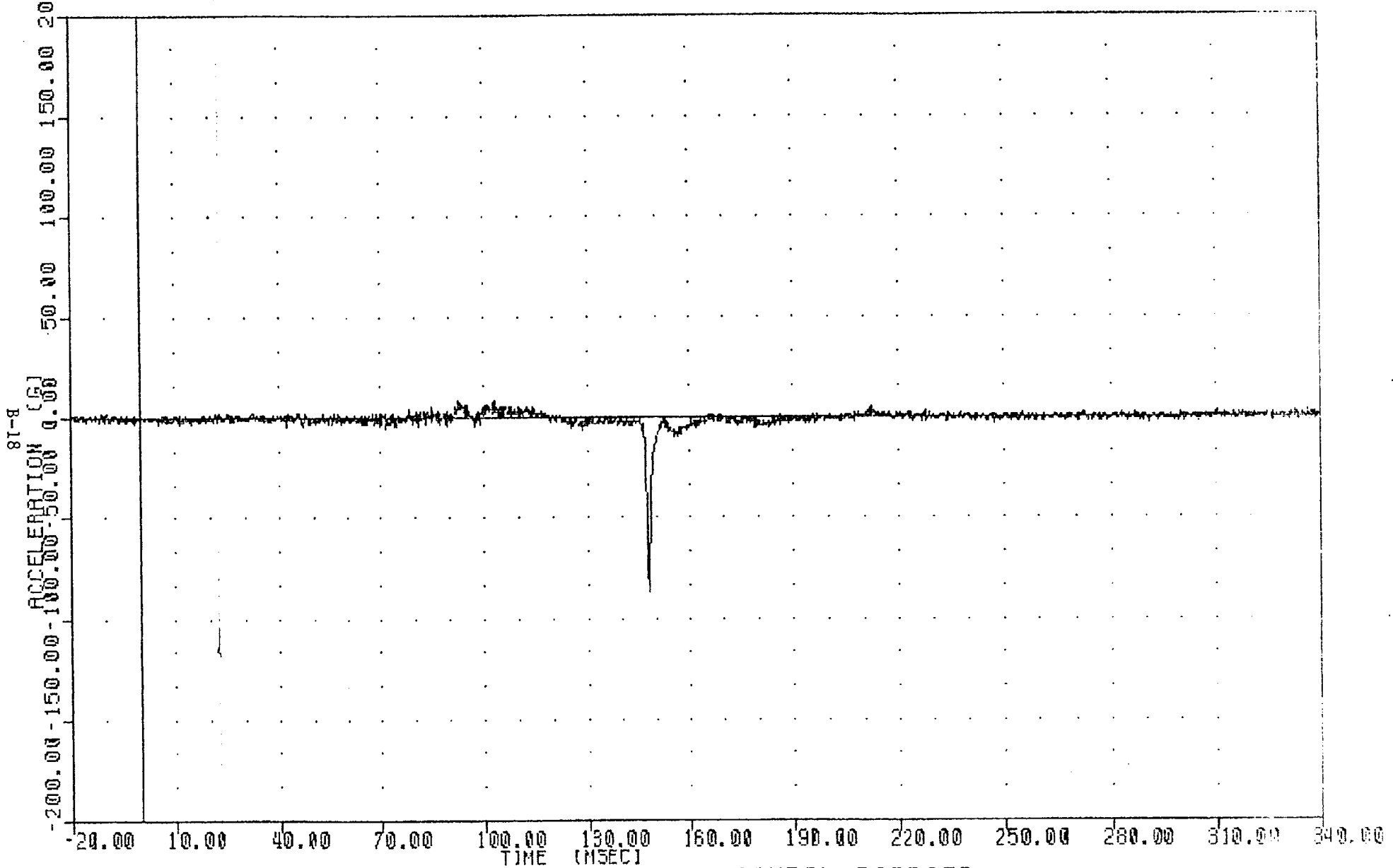
B-16

SUBARU XT INTO FRONTAL BARRIER
DRIVER'S PASSIVE BELT INBOARD FORCE LBS

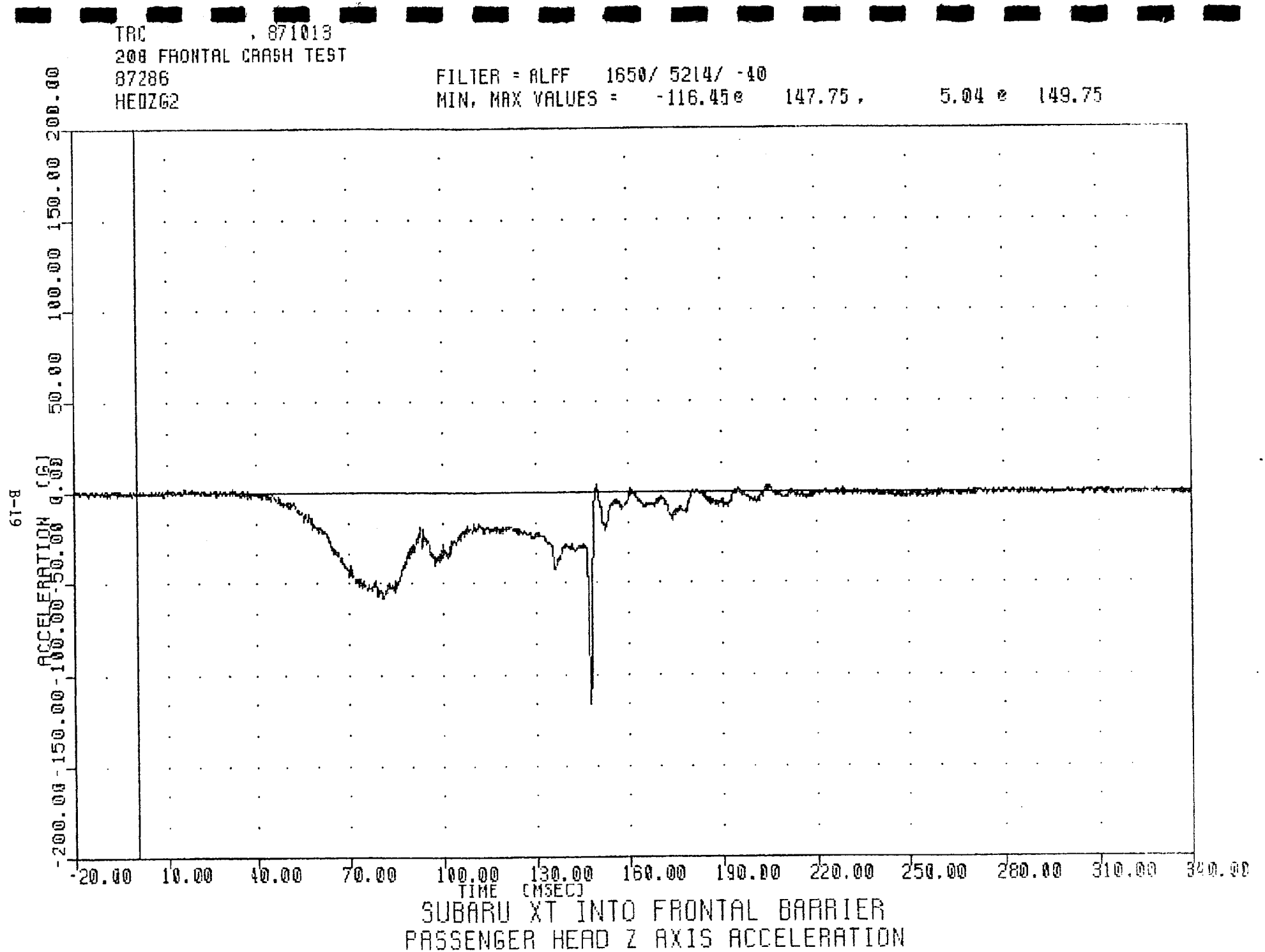


SUBARU XT INTO FRONTAL BARRIER
PASSENGER HEAD X AXIS ACCELERATION

TRC , 871013
20@ FRONTAL CRASH TEST
87286
HEDYG2
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -86.26 @ 148.00 , 8.76 @ 92.50



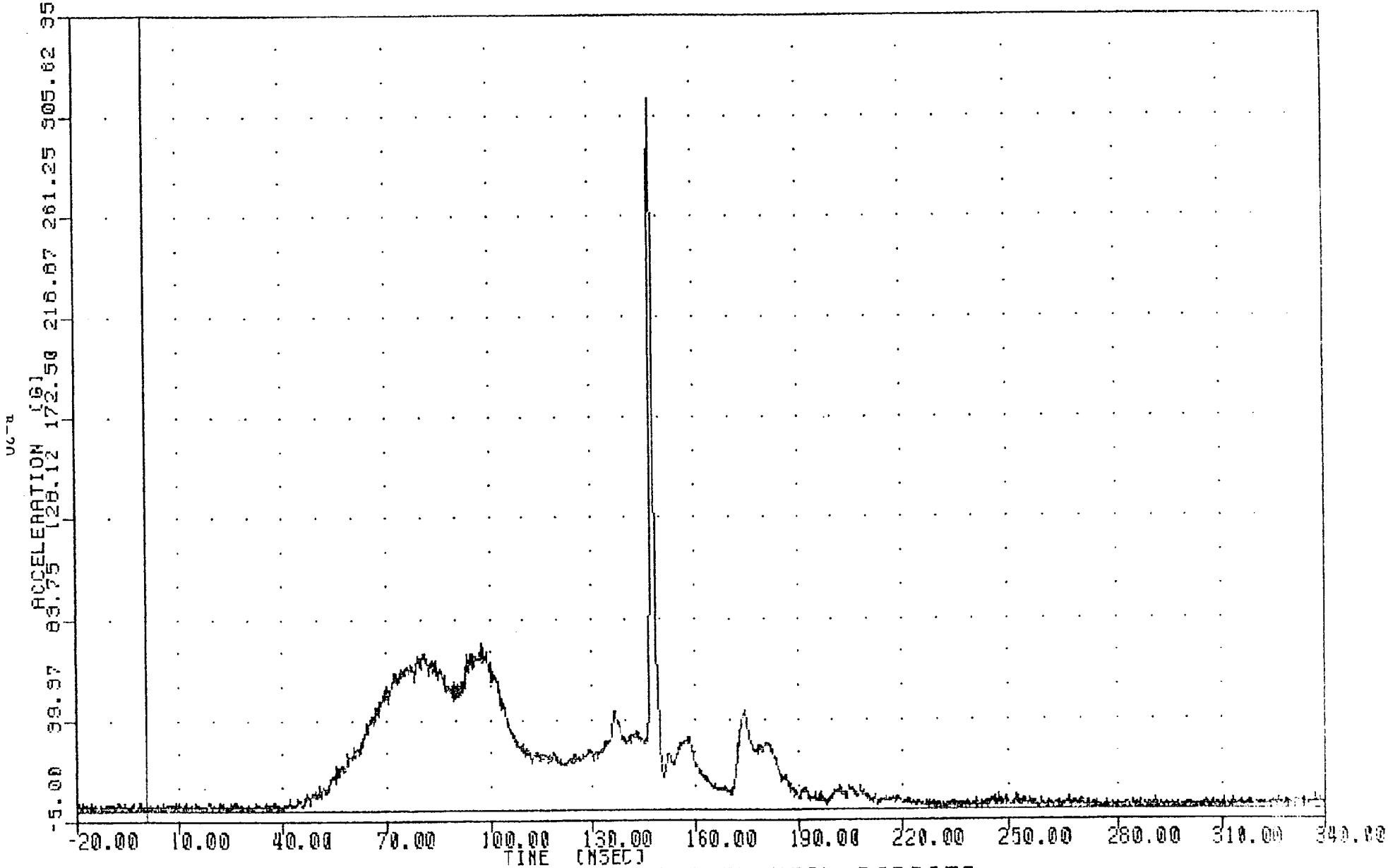
SUBARU XT INTO FRONTAL BARRIER
PASSENGER HEAD Y AXIS ACCELERATION



SUBARU XT INTO FRONTAL BARRIER
PASSENGER HEAD Z AXIS ACCELERATION

TRC , 871013
208 FRONTAL CRASH TEST
87286
HEDR62

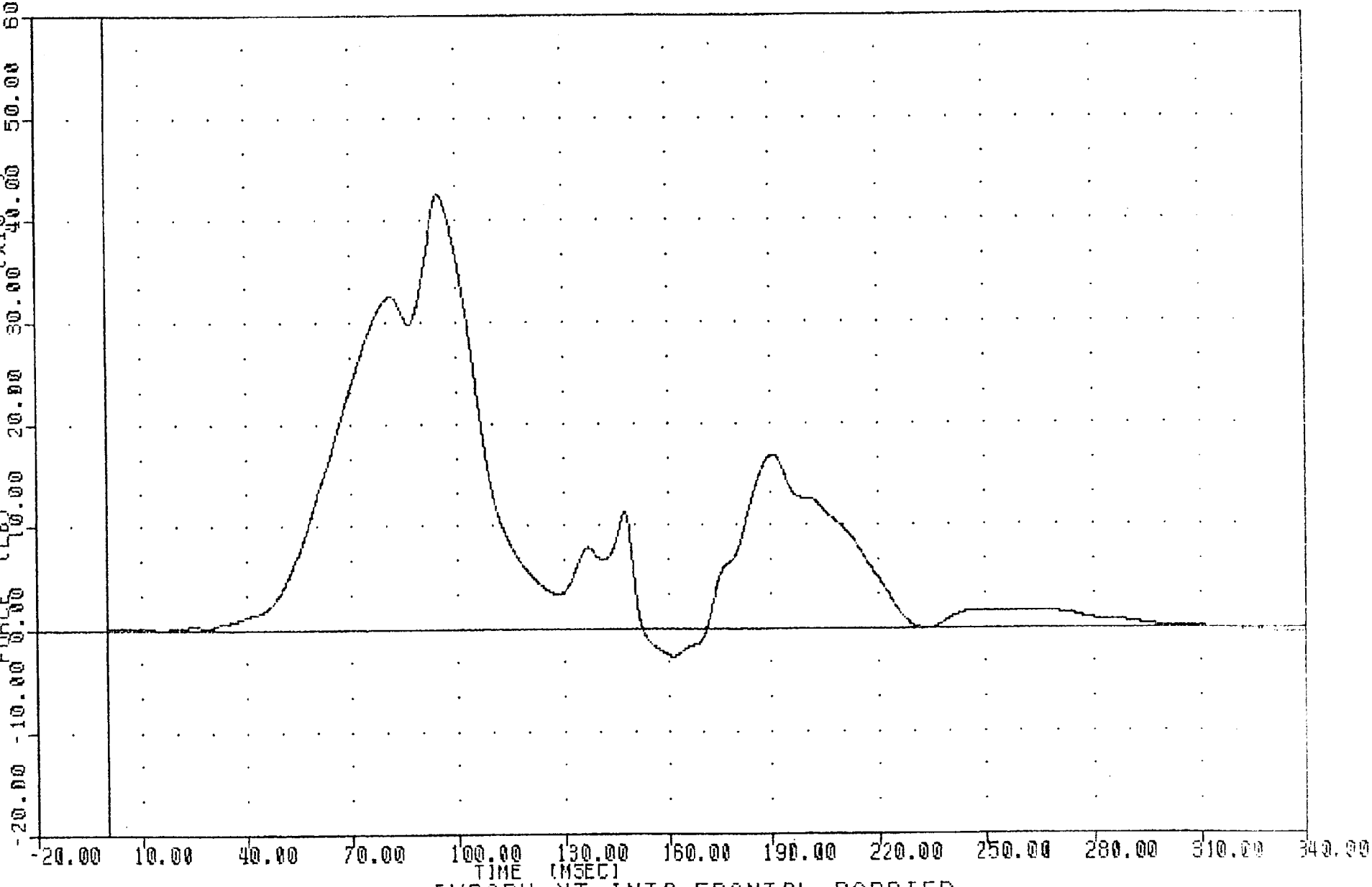
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.06 @ 0.00 , 313.32 @ 147.68



SUBARU XT INTO FRONTAL BARRIER
PASSENGER HEAD RESULTANT ACCELERATION

TRC , 871013
208 FRONTAL CRASH TEST
87286
NEKXF2

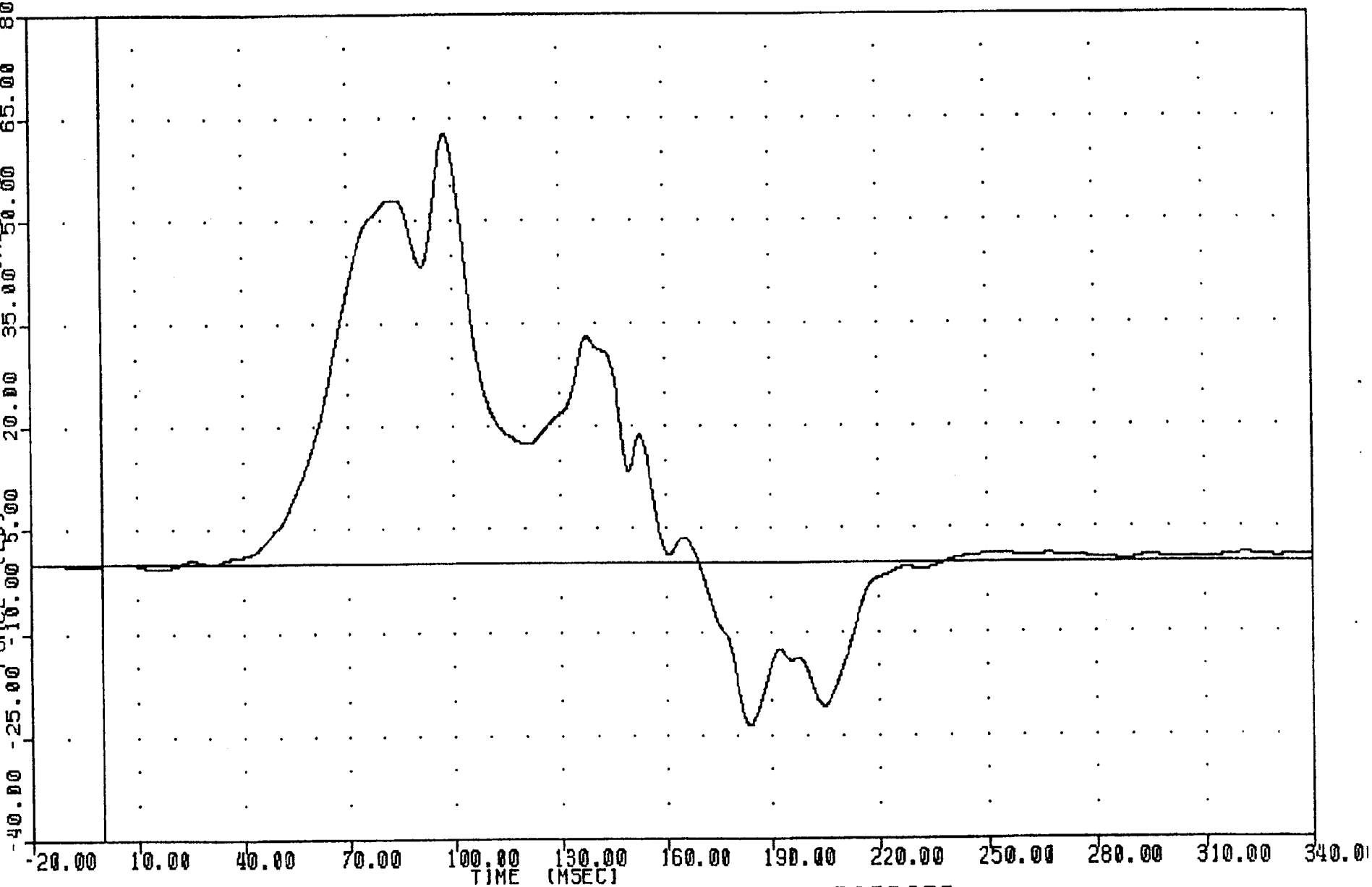
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -28.21 @ 161.25 , 425.29 @ 94.88



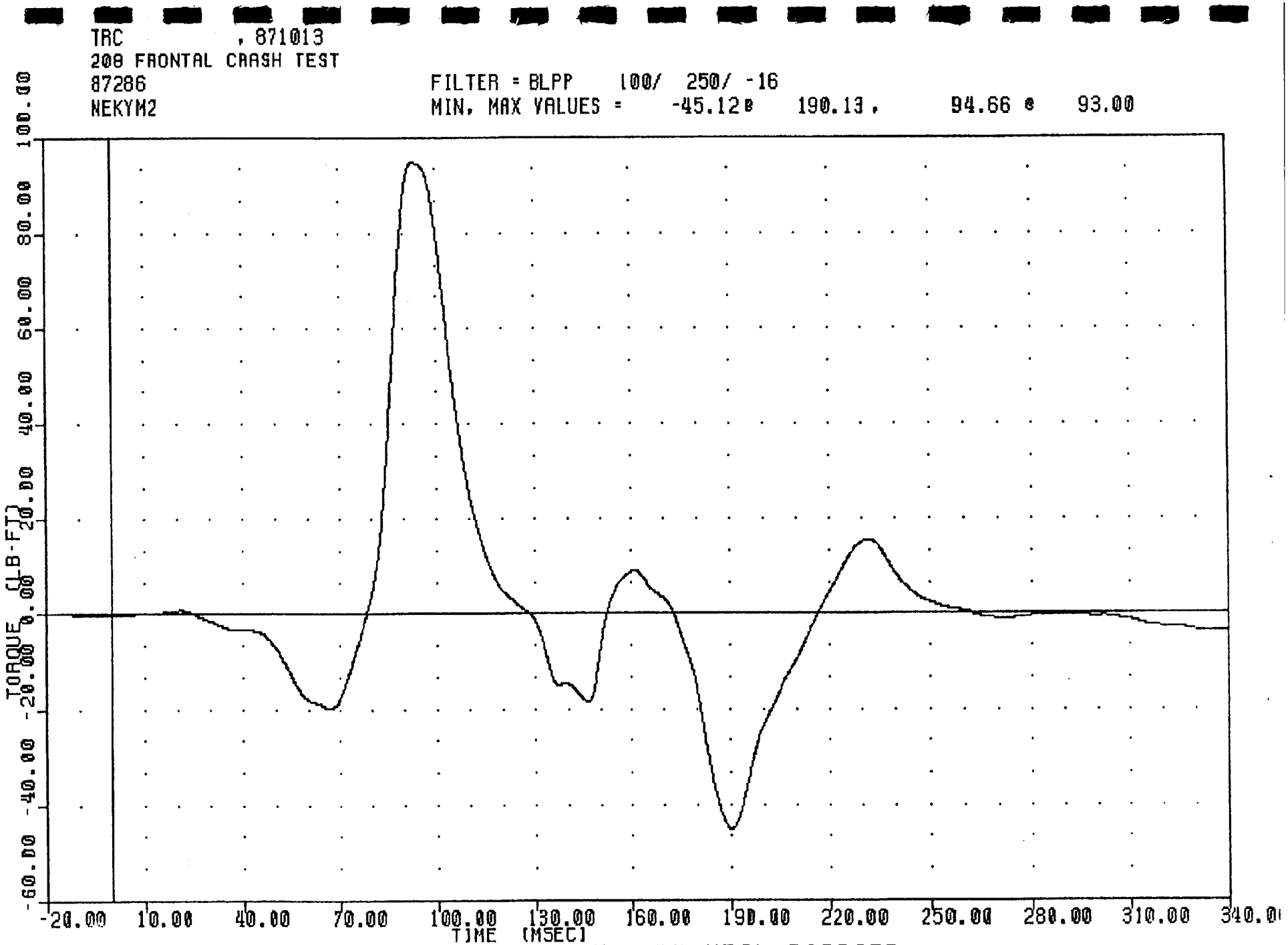
SUBARU XT INTO FRONTAL BARRIER
PASSENGER NECK FORCE X AXIS LBS (SHEAR)

TRC , 871013
200 FRONTAL CRASH TEST
87286
NEKZF2

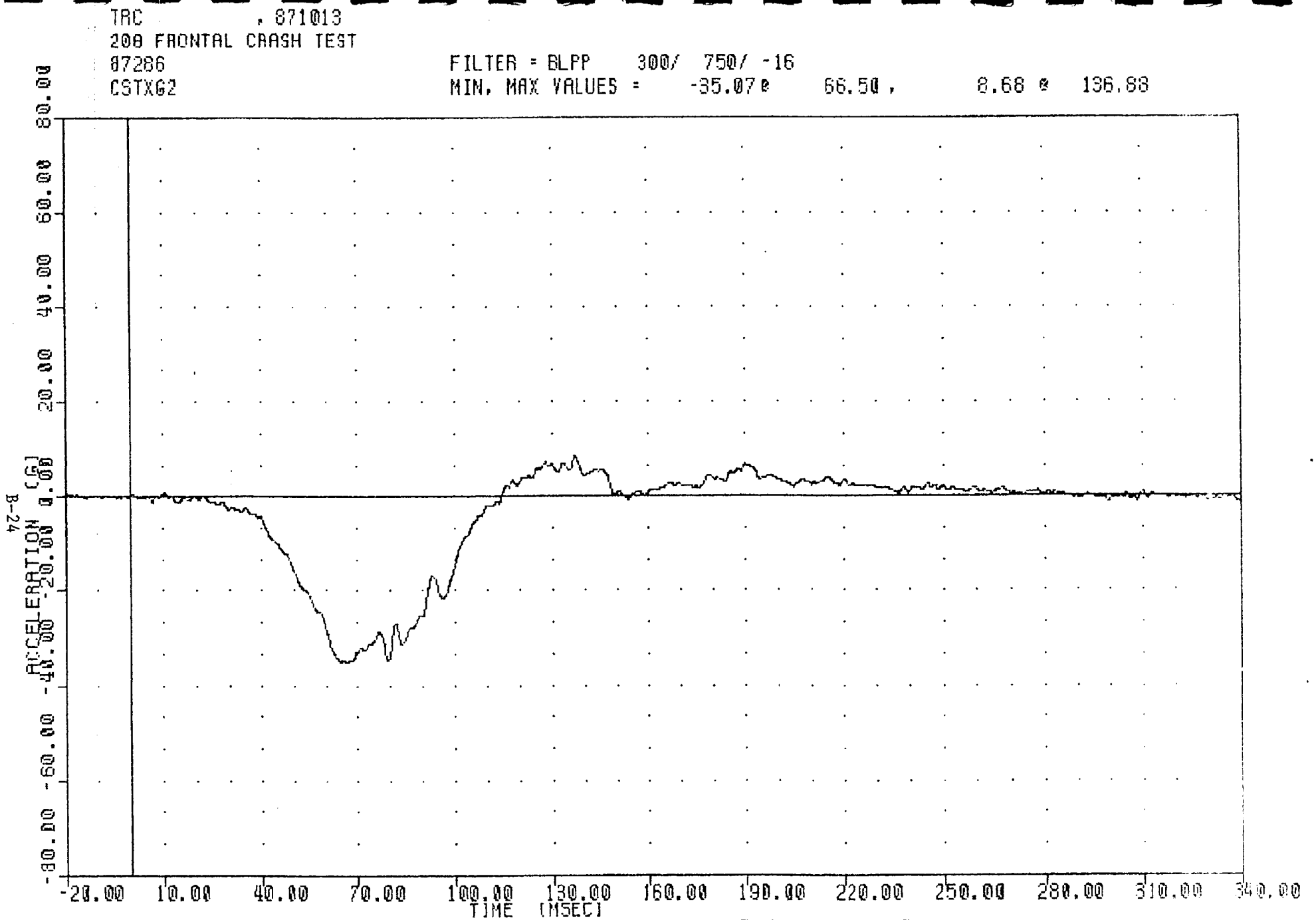
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -235.65 @ 183.63 , 626.82 @ 98.00



SUBARU XT INTO FRONTAL BARRIER
PASSENGER NECK FORCE Z AXIS LBS (AXIAL)



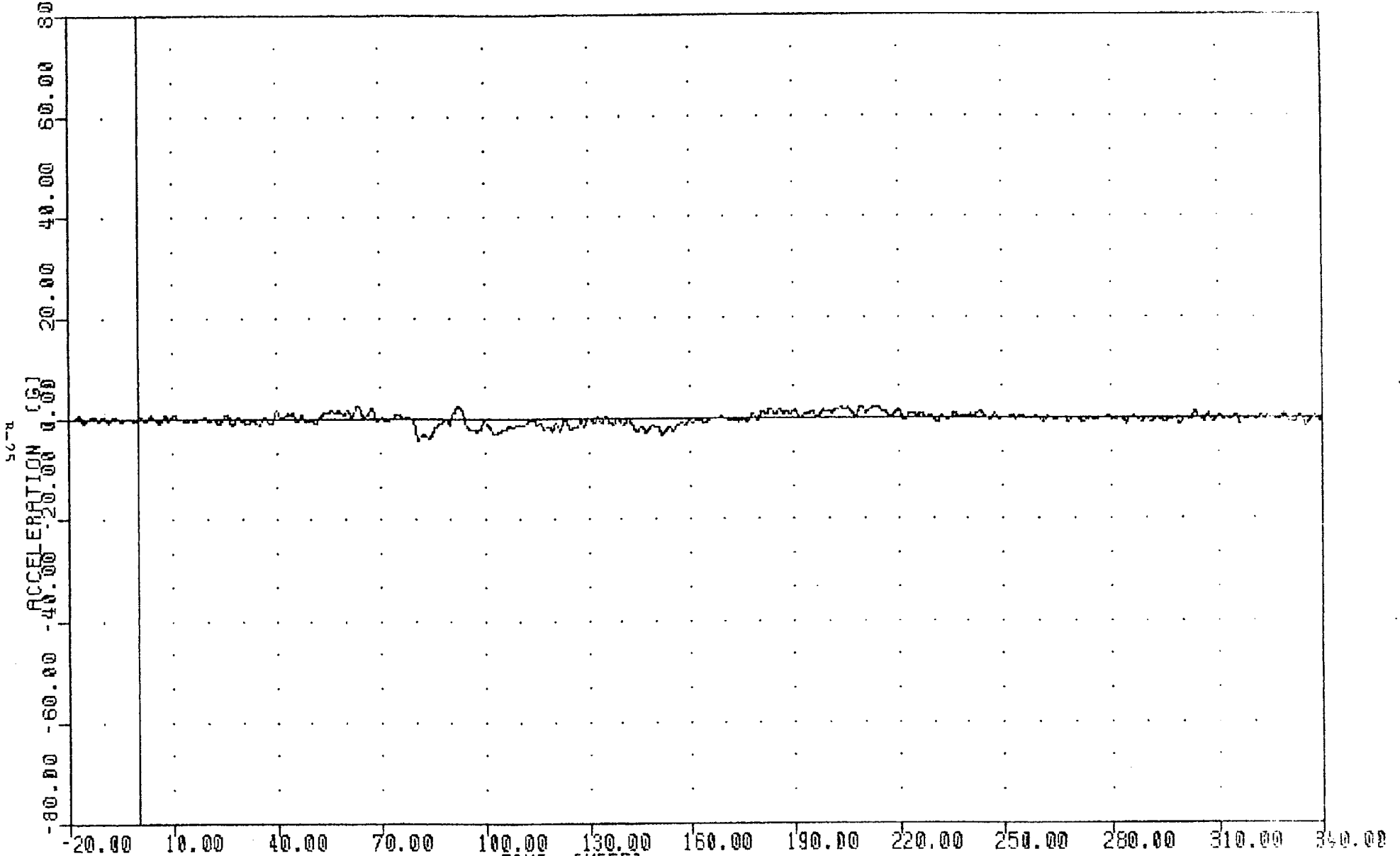
SUBARU XT INTO FRONTAL BARRIER
PASSENGER NECK MOMENT Y AXIS FT-LBS



SUBARU XT INTO FRONTAL BARRIER
PASSENGER CHEST X AXIS ACCELERATION

TRC , 871013
208 FRONTAL CRASH TEST
87286
CSTYG2

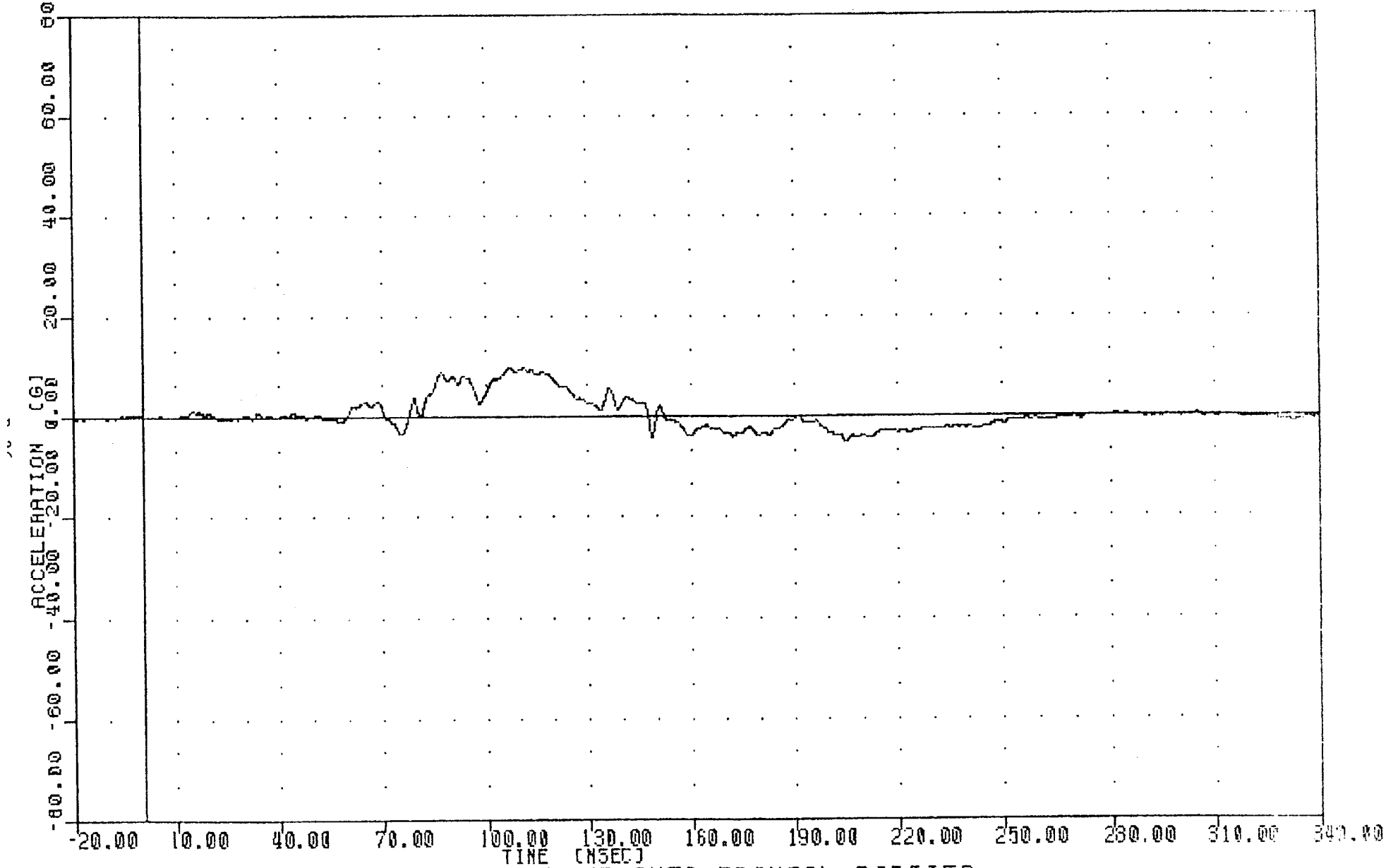
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -3.96 @ 80.75 , 2.77 @ 92.25



SUBARU XT INTO FRONTAL BARRIER
PASSENGER CHEST Y AXIS ACCELERATION

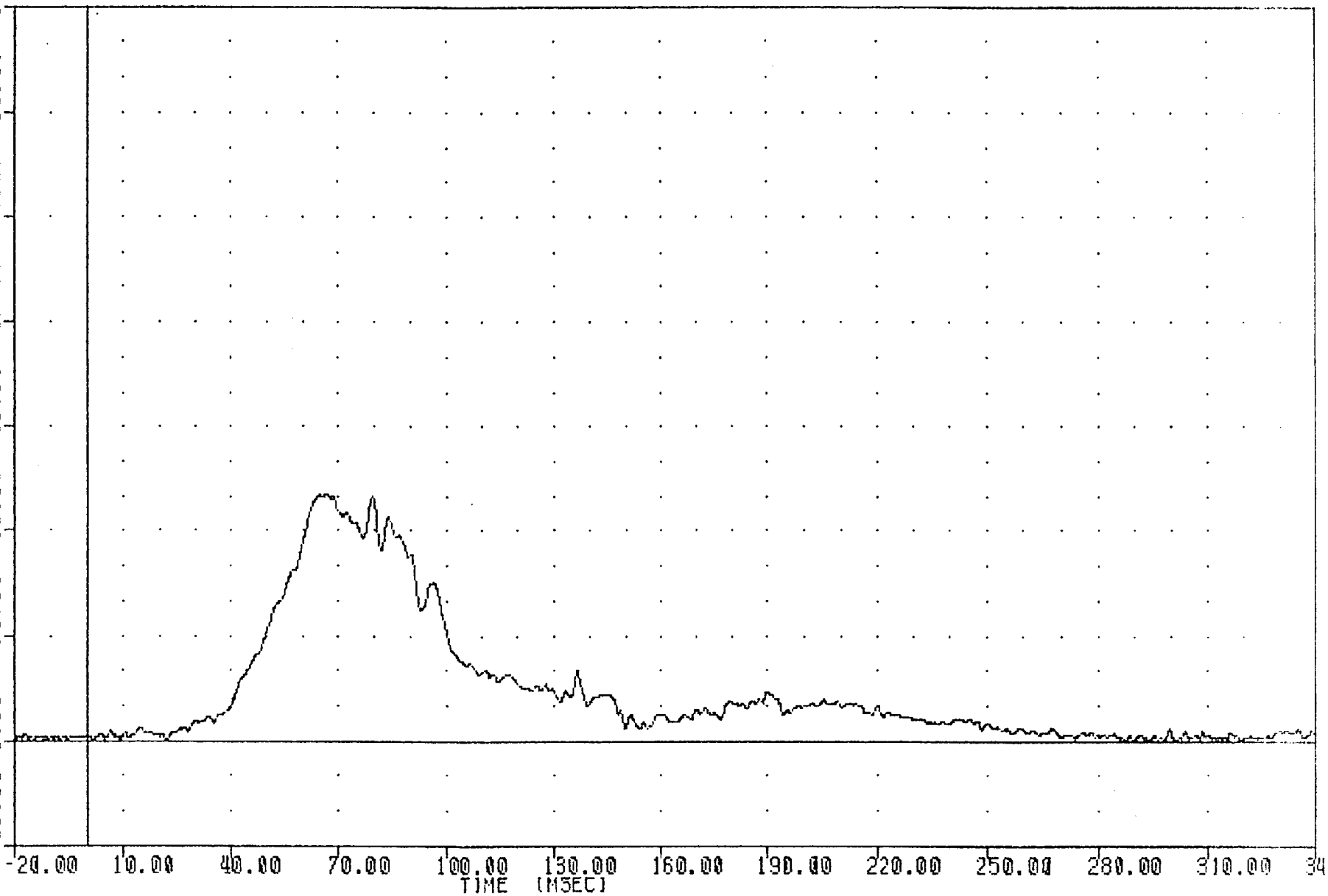
TRC , 871013
208 FRONTAL CRASH TEST
87286
CSTZG2

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -4.89 @ 205.00 , 9.99 @ 107.00



SUBARU XT INTO FRONTAL BARRIER
PASSENGER CHEST Z AXIS ACCELERATION

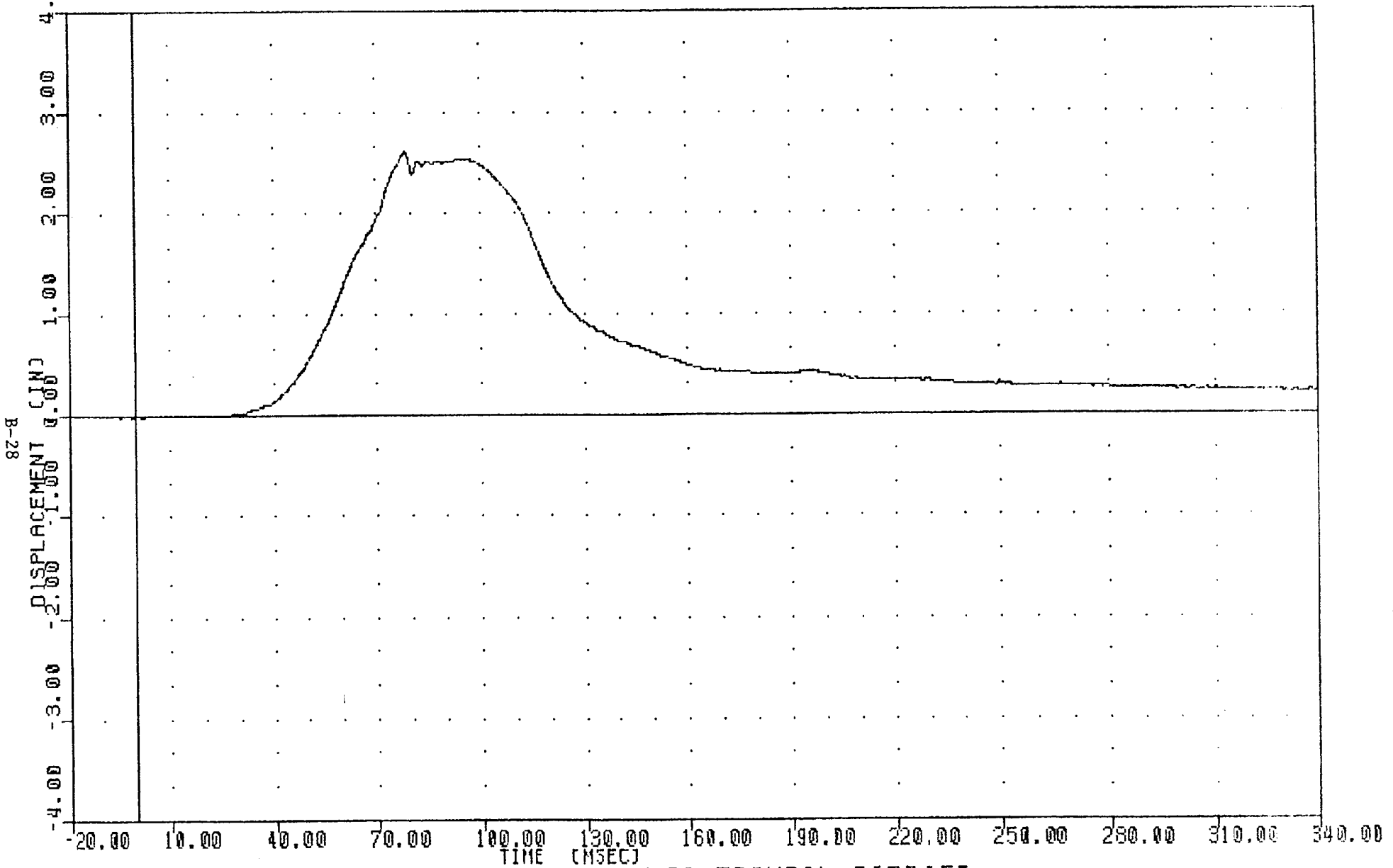
TRC , 871013
208 FRONTAL CRASH TEST
87286
CSTRG2
FILTER = BLPF 300/ 750/ -16
MIN. MAX VALUES = 0.03 @ -12.00 , 35.17 @ 66.50



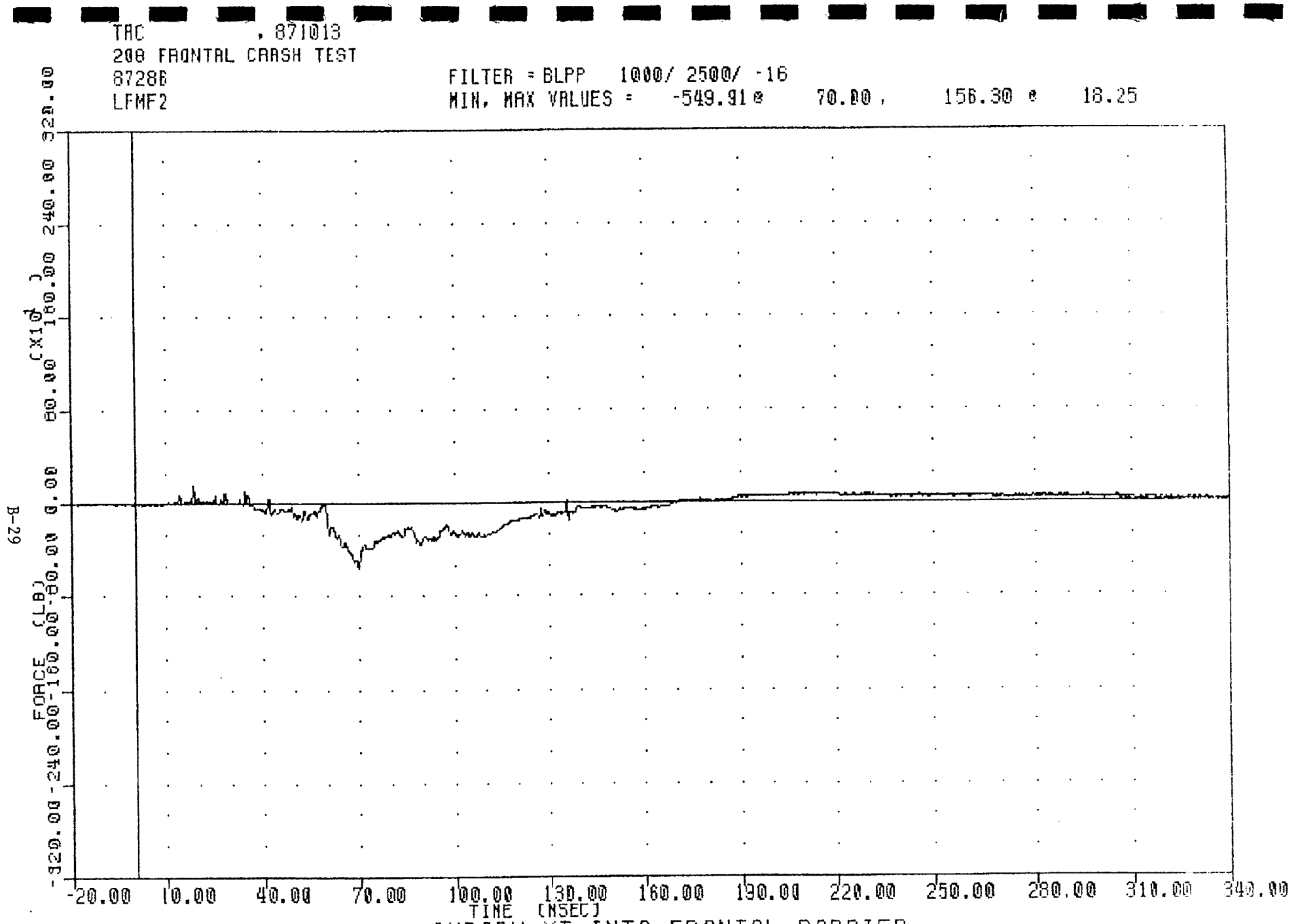
SUBARU XT INTO FRONTAL BARRIER
PASSENGER CHEST RESULTANT ACCELERATION

TRC , 871013
208 FRONTAL CRASH TEST
87286
CSTXD2

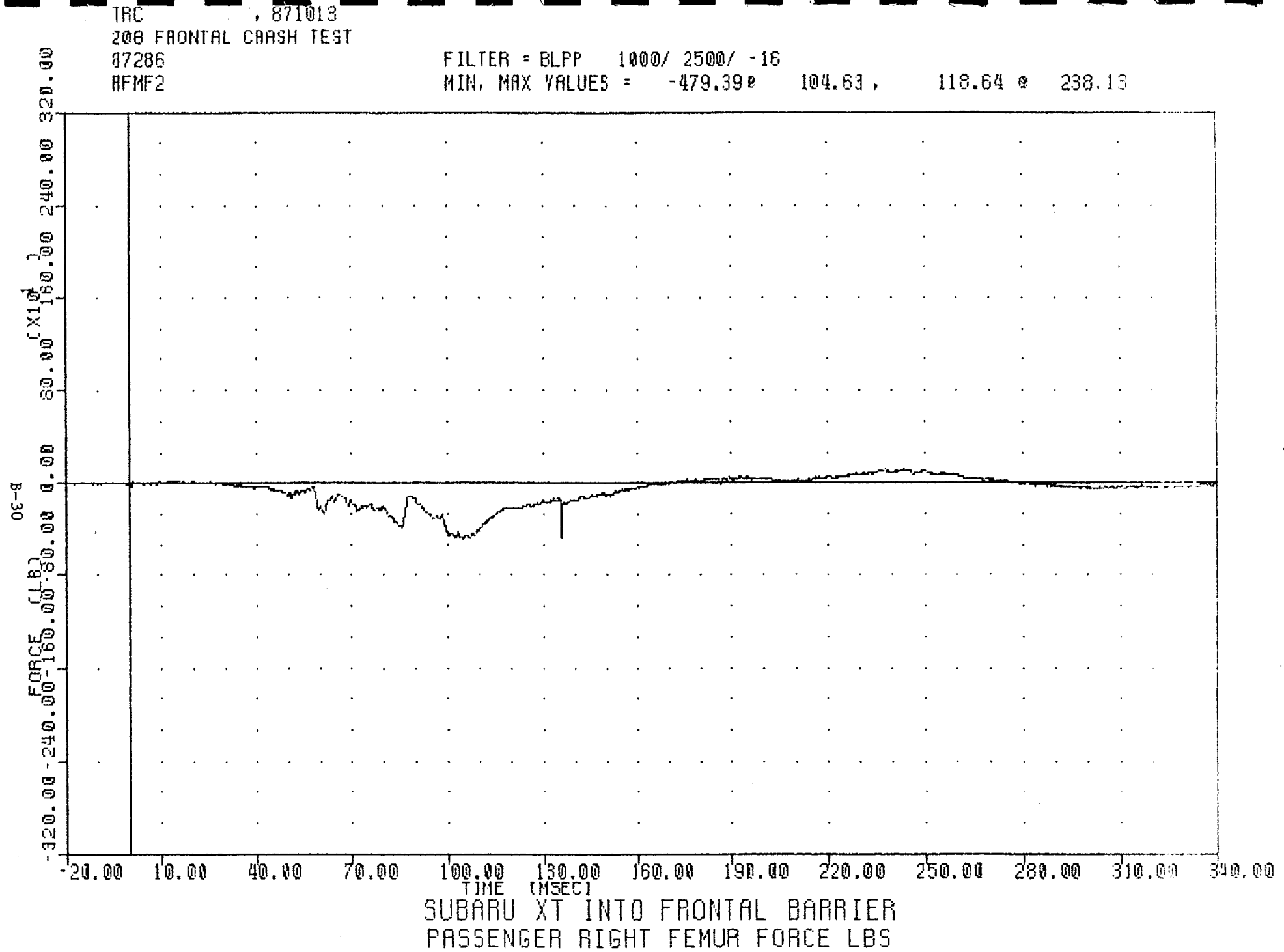
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -0.01@ 2.25 , 2.61 @ 78.38



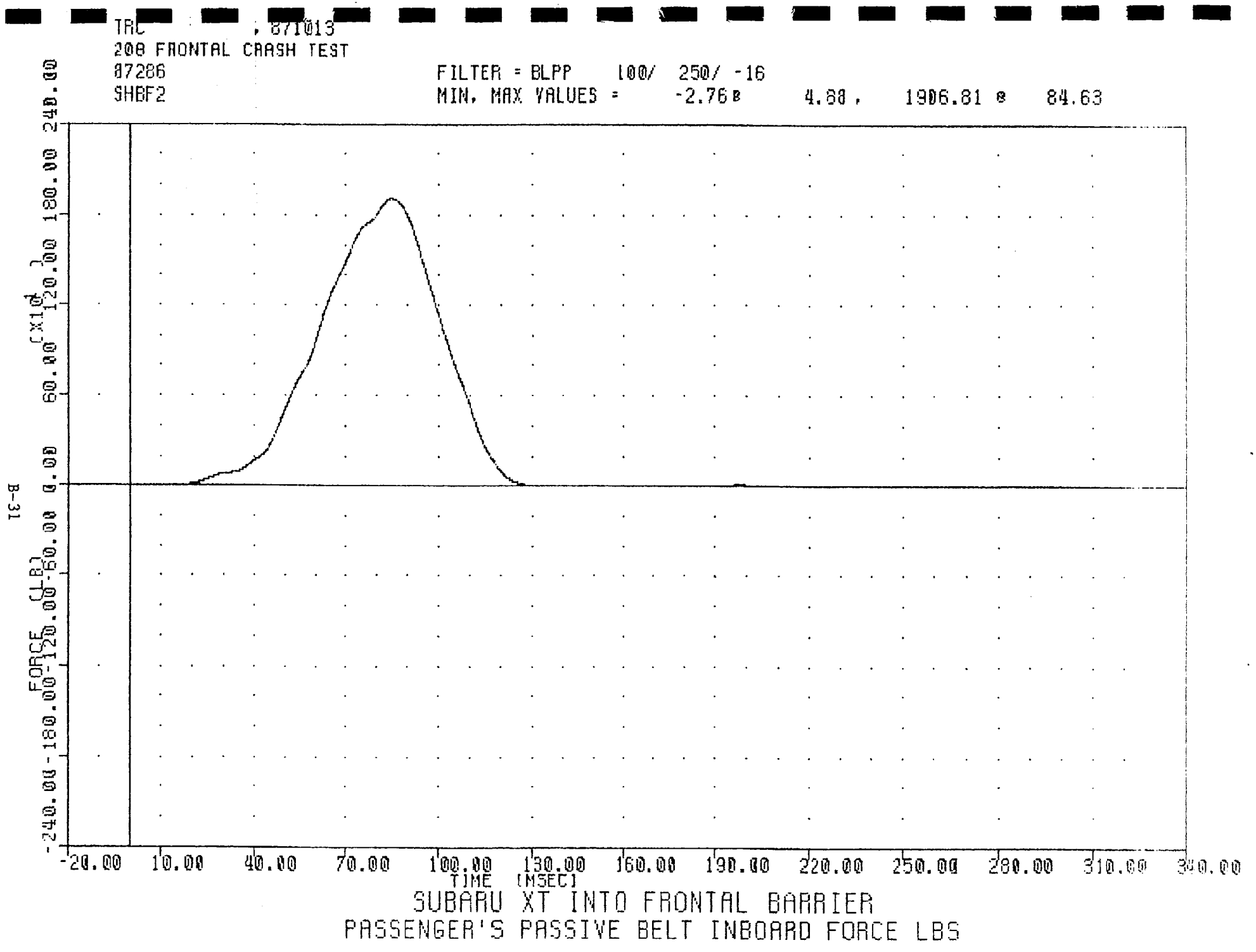
SUBARU XT INTO FRONTAL BARRIER
PASSENGER CHEST DISPLACEMENT INCHES



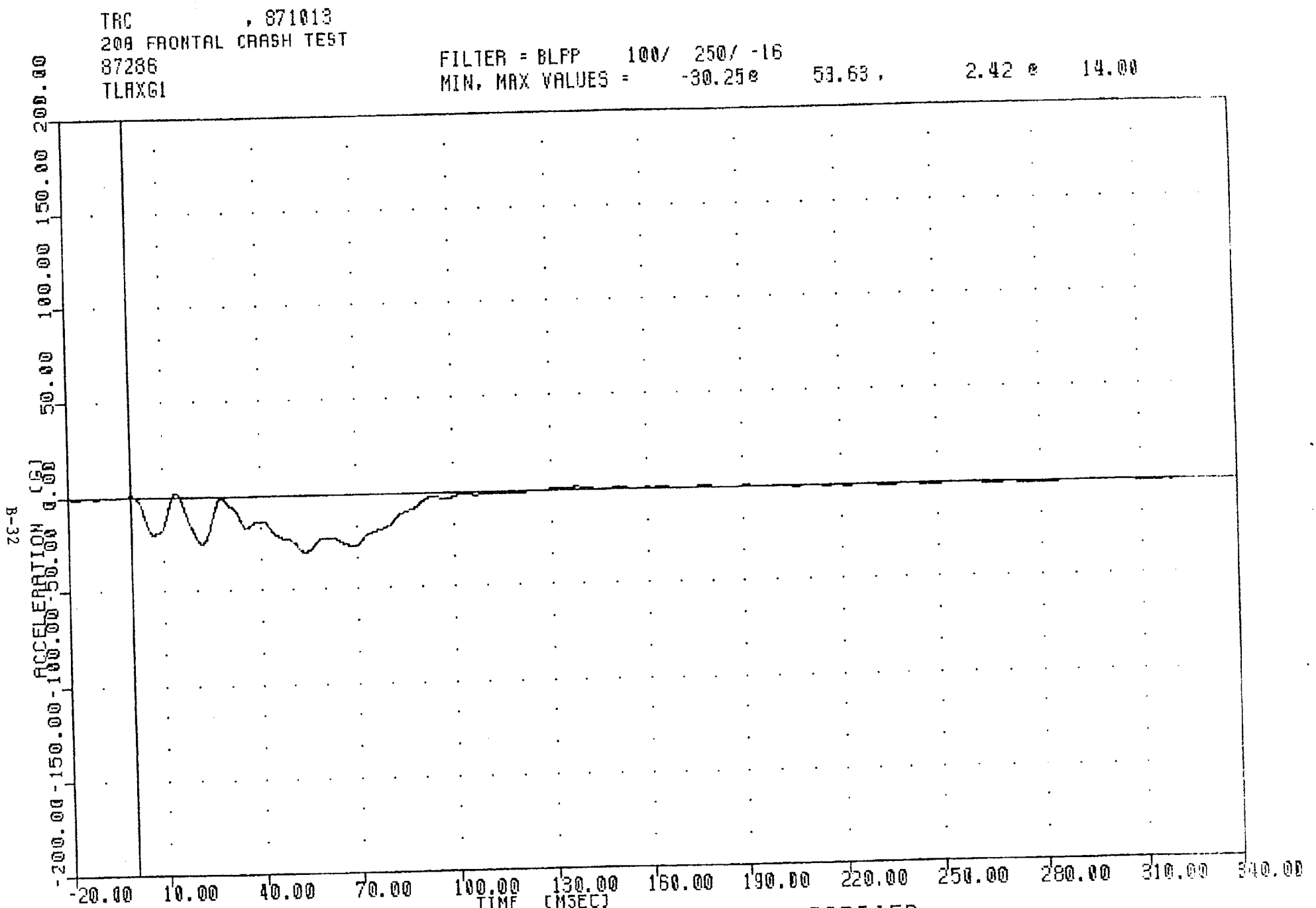
SUBARU XT INTO FRONTAL BARRIER
PASSENGER LEFT FEMUR FORCE LBS



SUBARU XT INTO FRONTAL BARRIER
PASSENGER RIGHT FEMUR FORCE LBS



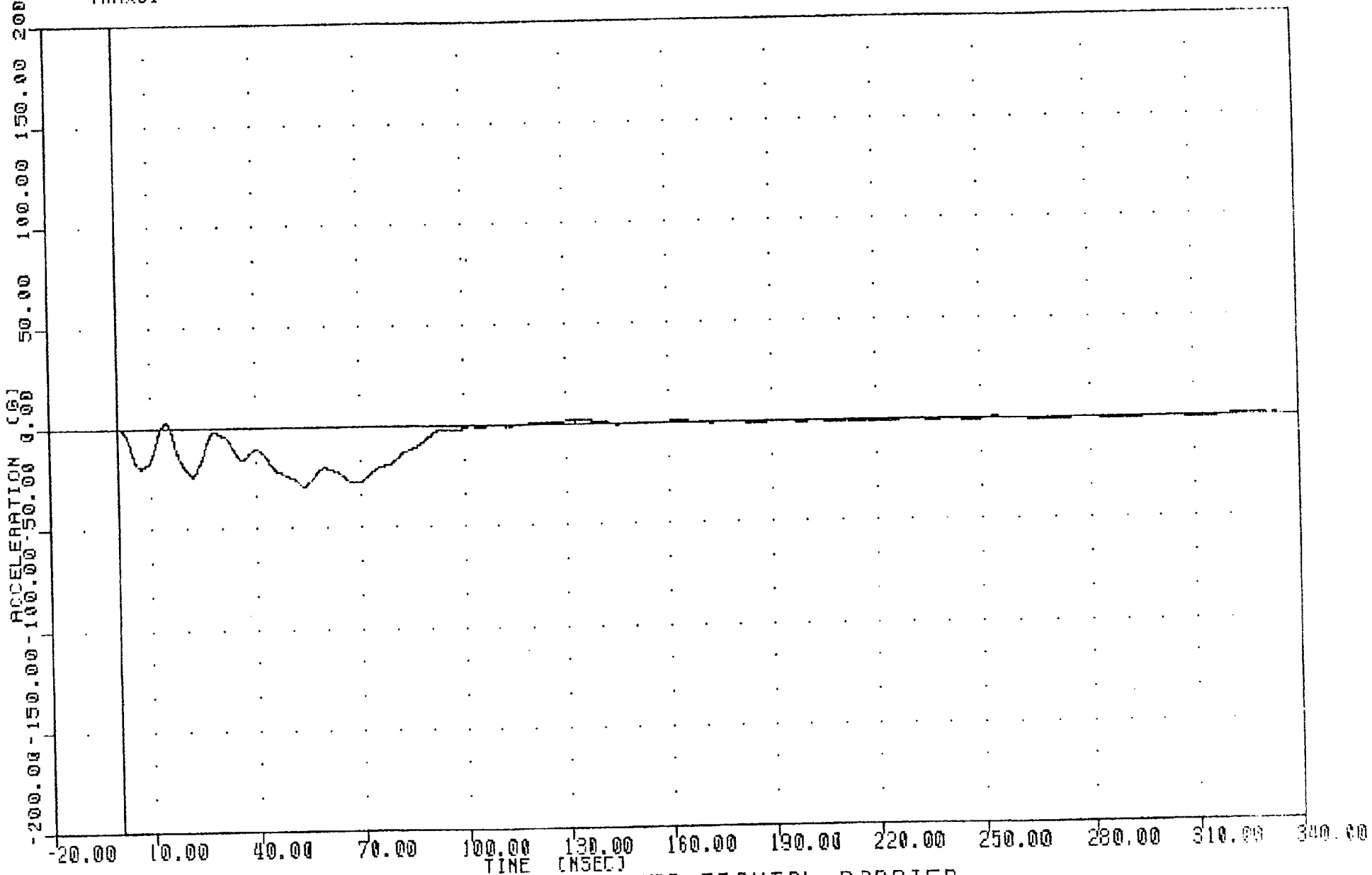
SUBARU XT INTO FRONTAL BARRIER
PASSENGER'S PASSIVE BELT INBOARD FORCE LBS



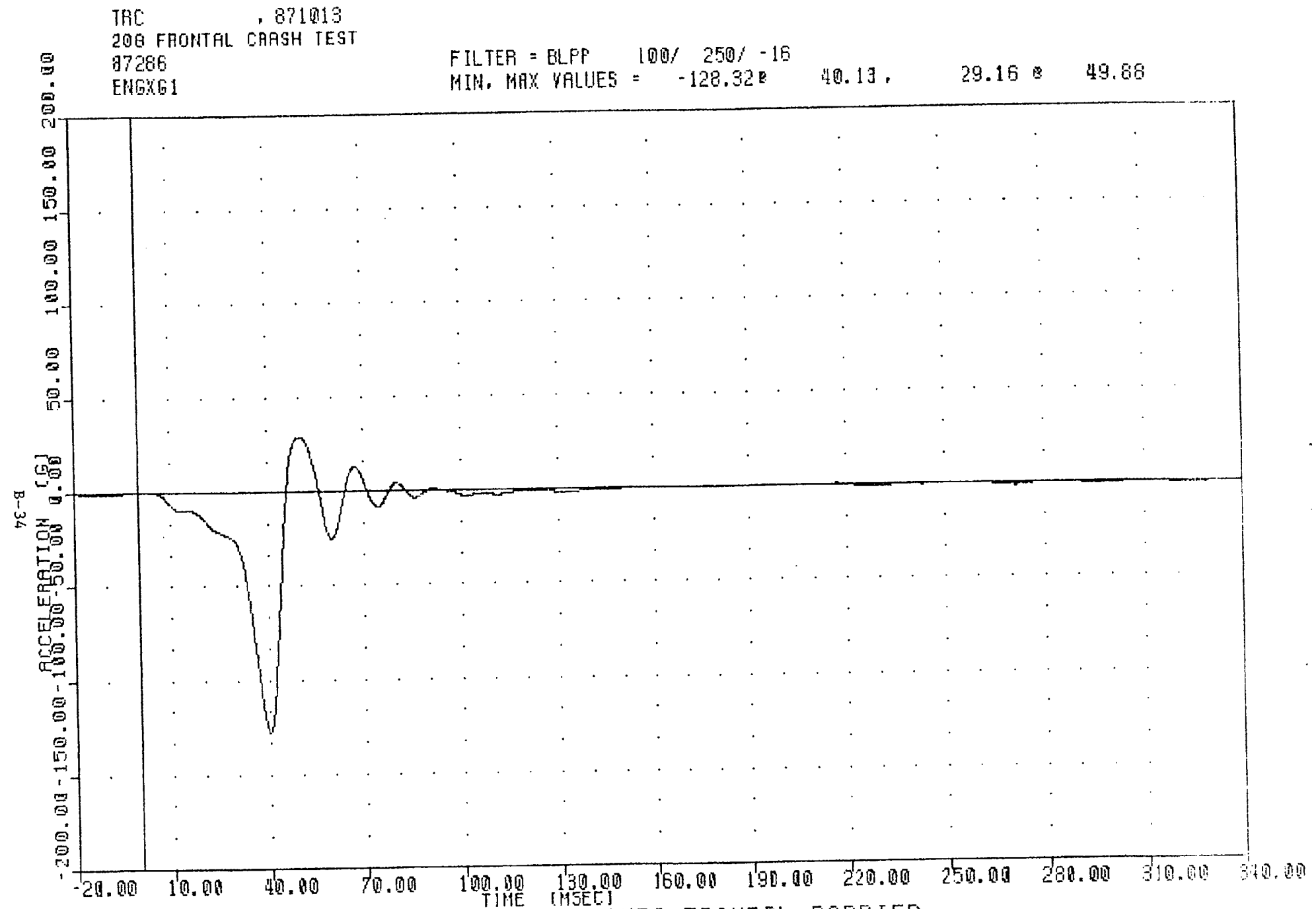
SUBARU XT INTO FRONTAL BARRIER
LEFT REAR SEAT X AXIS ACCELERATION

TRC , 871013
208 FRONTAL CRASH TEST
87286
TARX61

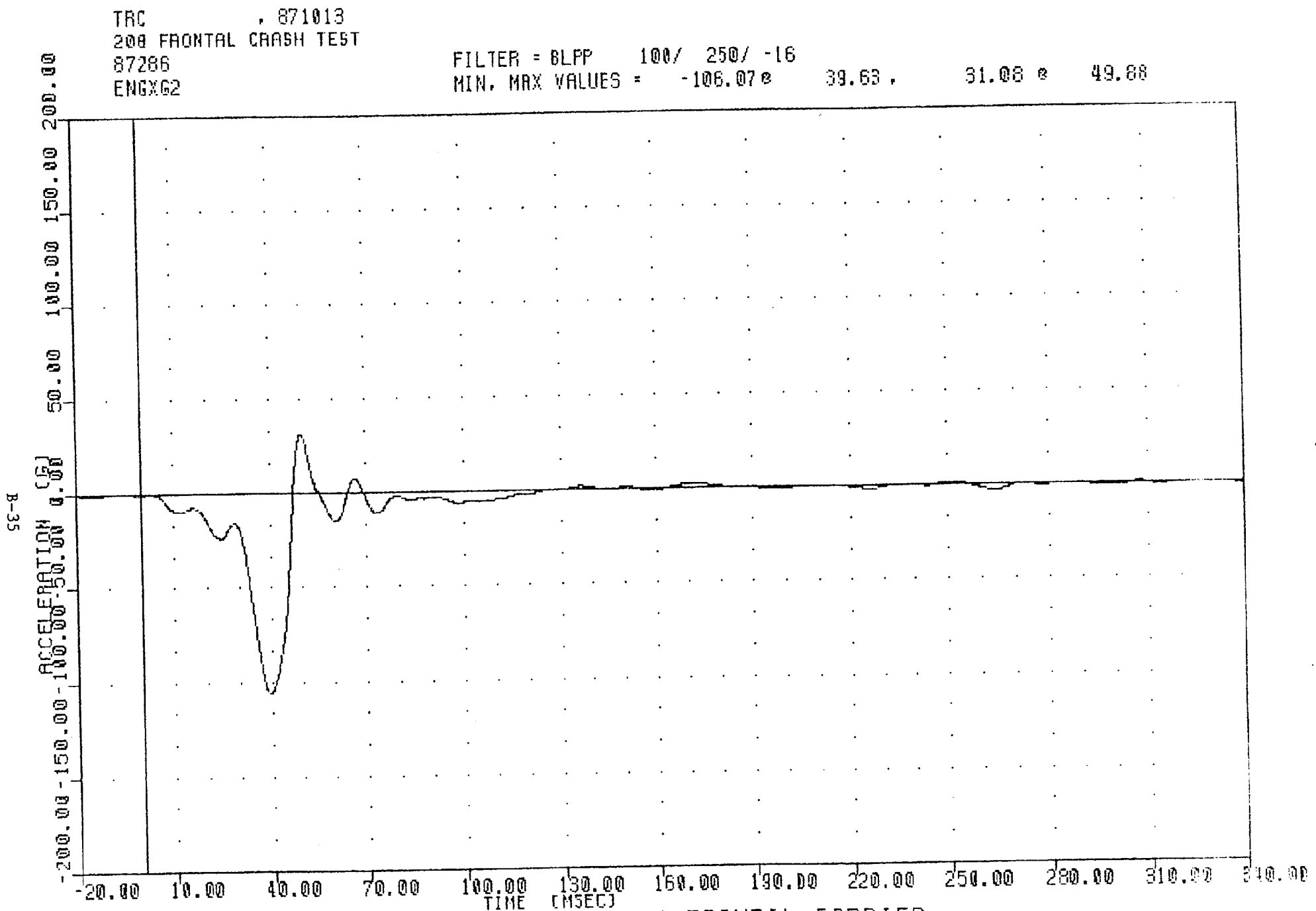
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -29.47 @ 53.63 , 3.21 @ 14.25



SUBARU XT INTO FRONTAL BARRIER
RIGHT REAR SEAT X AXIS ACCELERATION



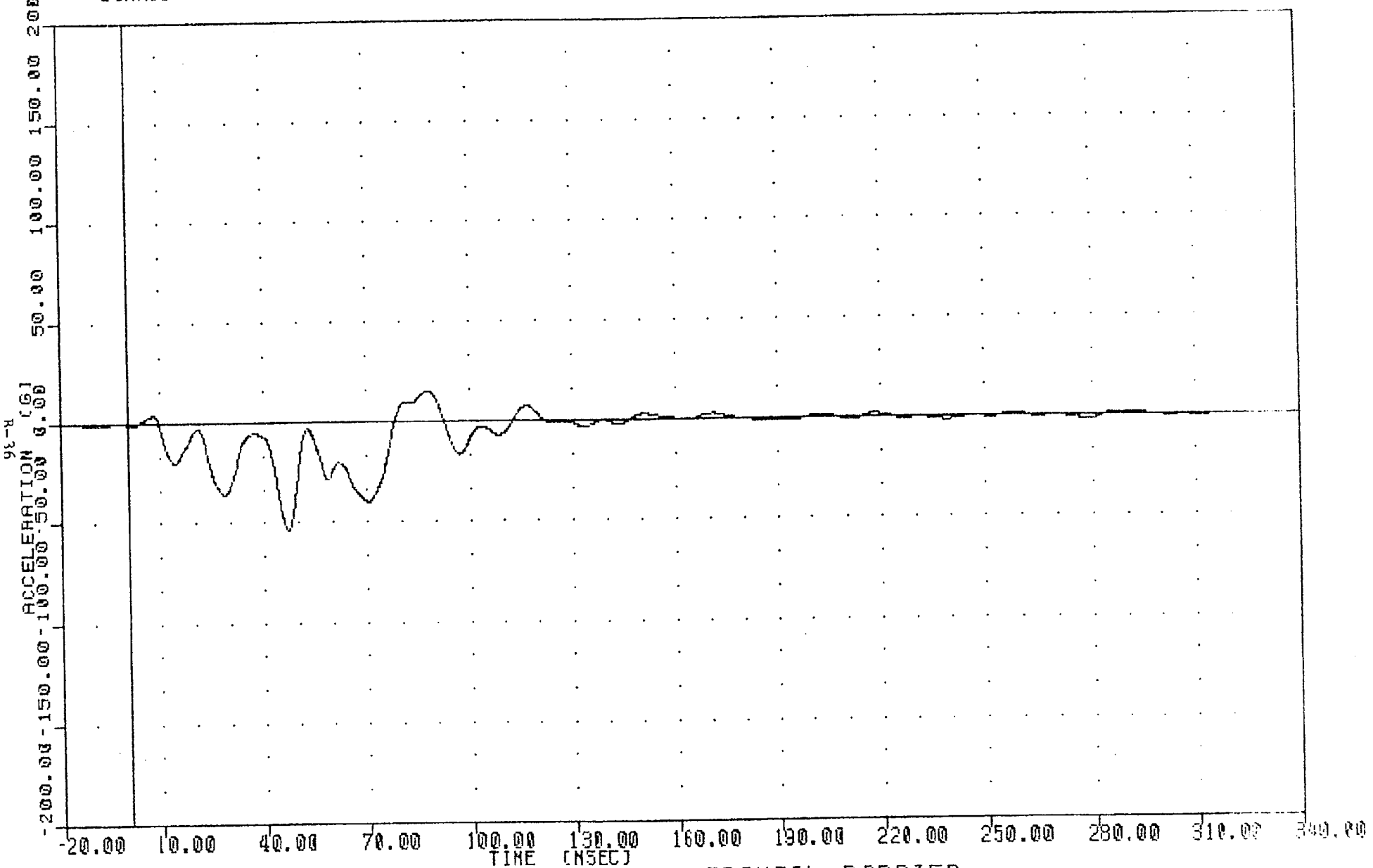
SUBARU XT INTO FRONTAL BARRIER
ENGINE UPPER BLOCK X AXIS ACCELERATION



SUBARU XT INTO FRONTAL BARRIER
ENGINE BOTTOM X AXIS ACCELERATION

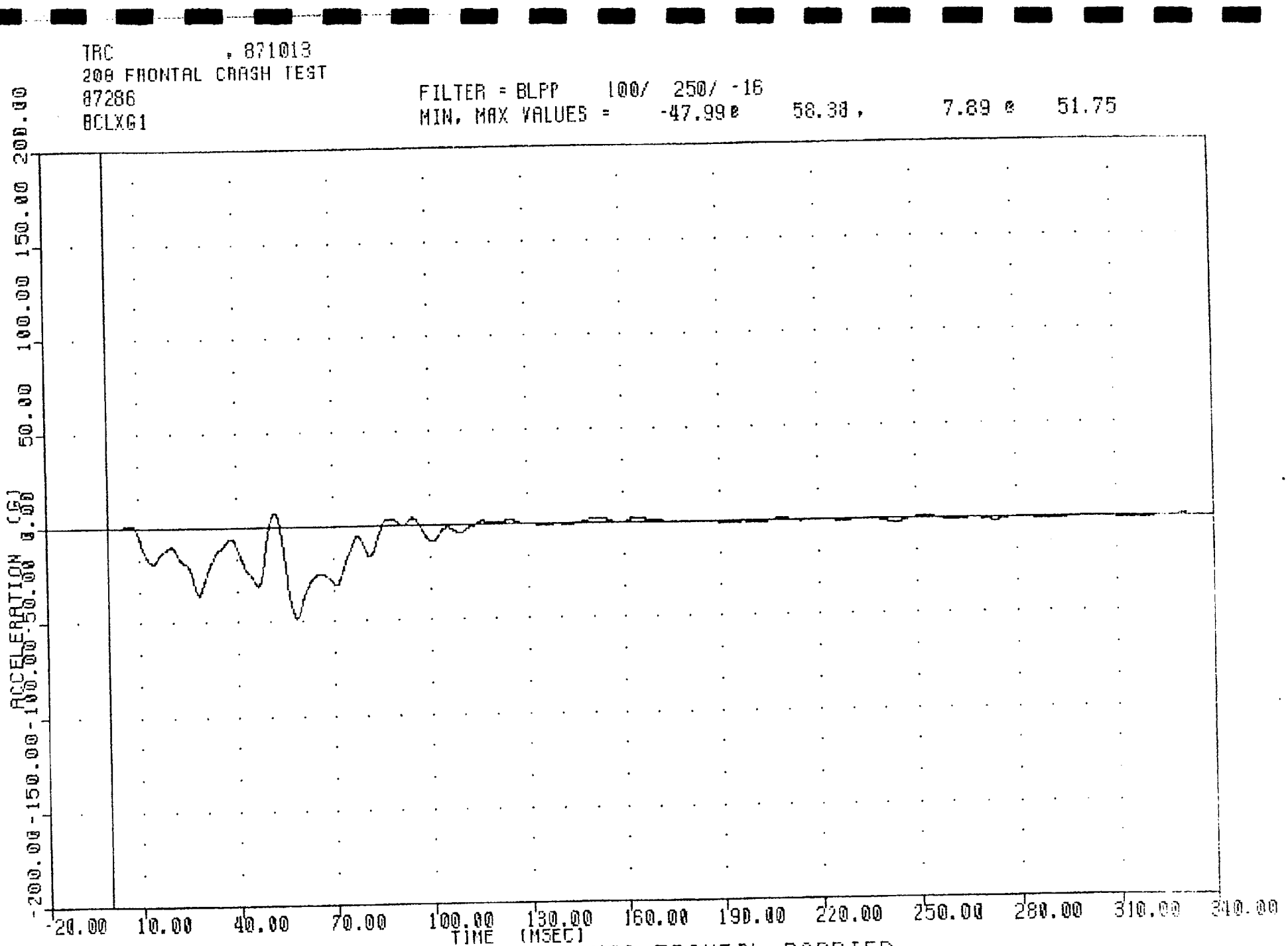
TRC , 871013
200 FRONTAL CRASH TEST
87286
BCRX61

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -53.89 @ 46.88 , 15.34 @ 88.00



R-36

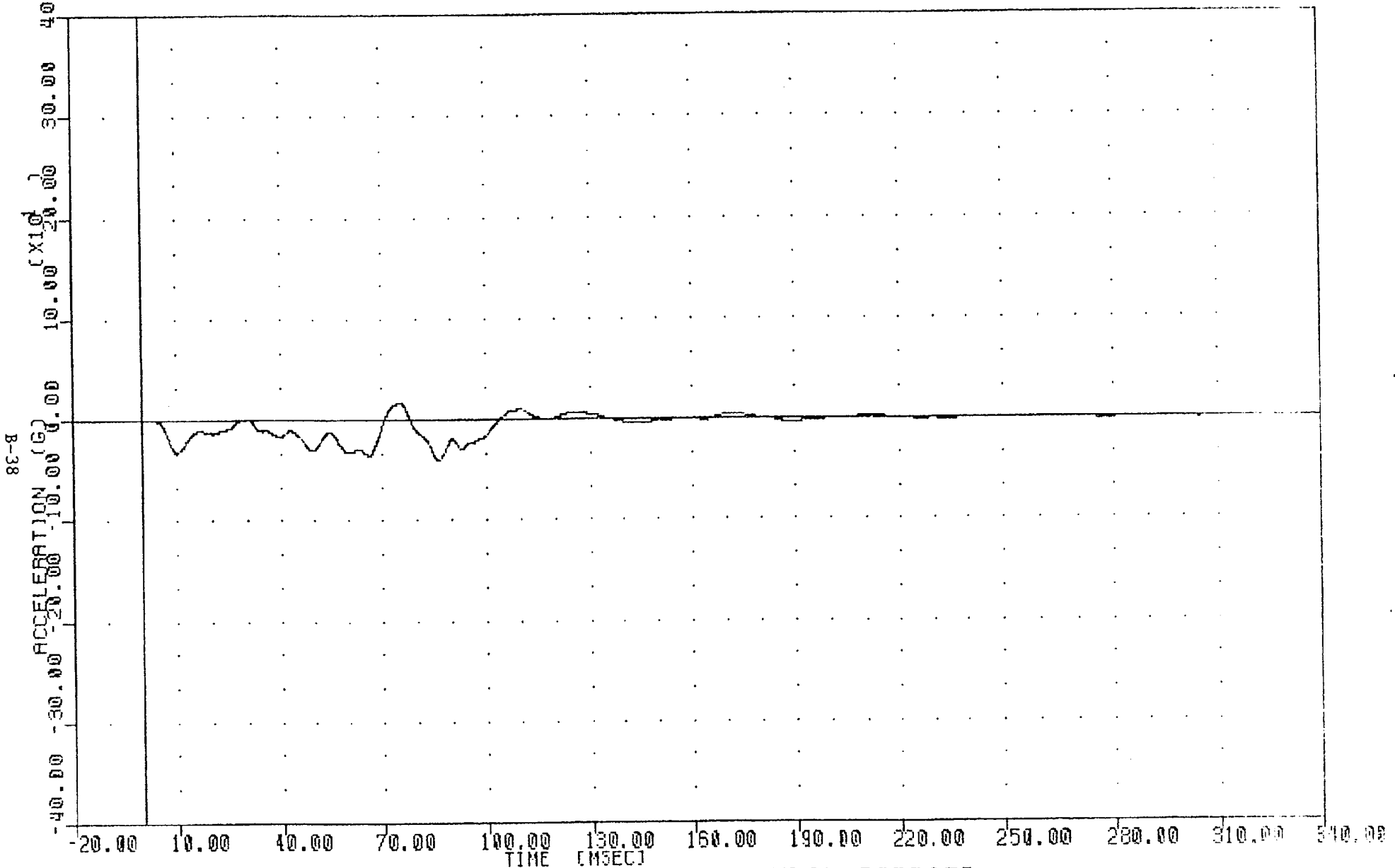
SUBARU XT INTO FRONTAL BARRIER
RIGHT BRAKE CALIPER X AXIS ACCELERATION



SUBARU XT INTO FRONTAL BARRIER
LEFT BRAKE CALIPER X AXIS ACCELERATION

TRC , 871013
20@ FRONTAL CRASH TEST
87286
DFCXG1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -39.91@ 86.36 , 16.95 @ 75.25



SUBARU XT INTO FRONTAL BARRIER
DASH PANEL CENTER X AXIS ACCELERATION

APPENDIX C

DUMMY CERTIFICATION INFORMATION

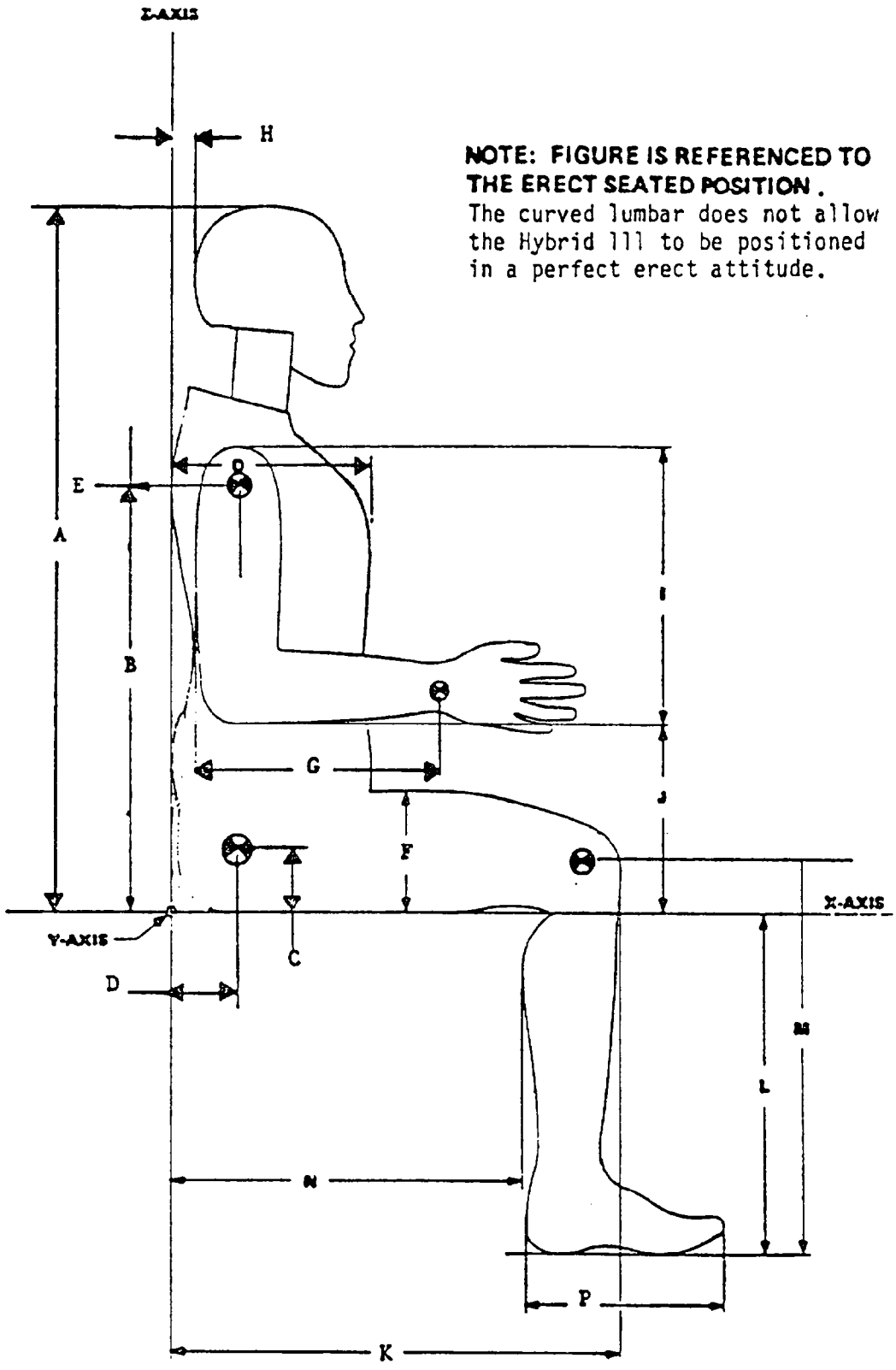
POST-TEST CALS

S/N: 45

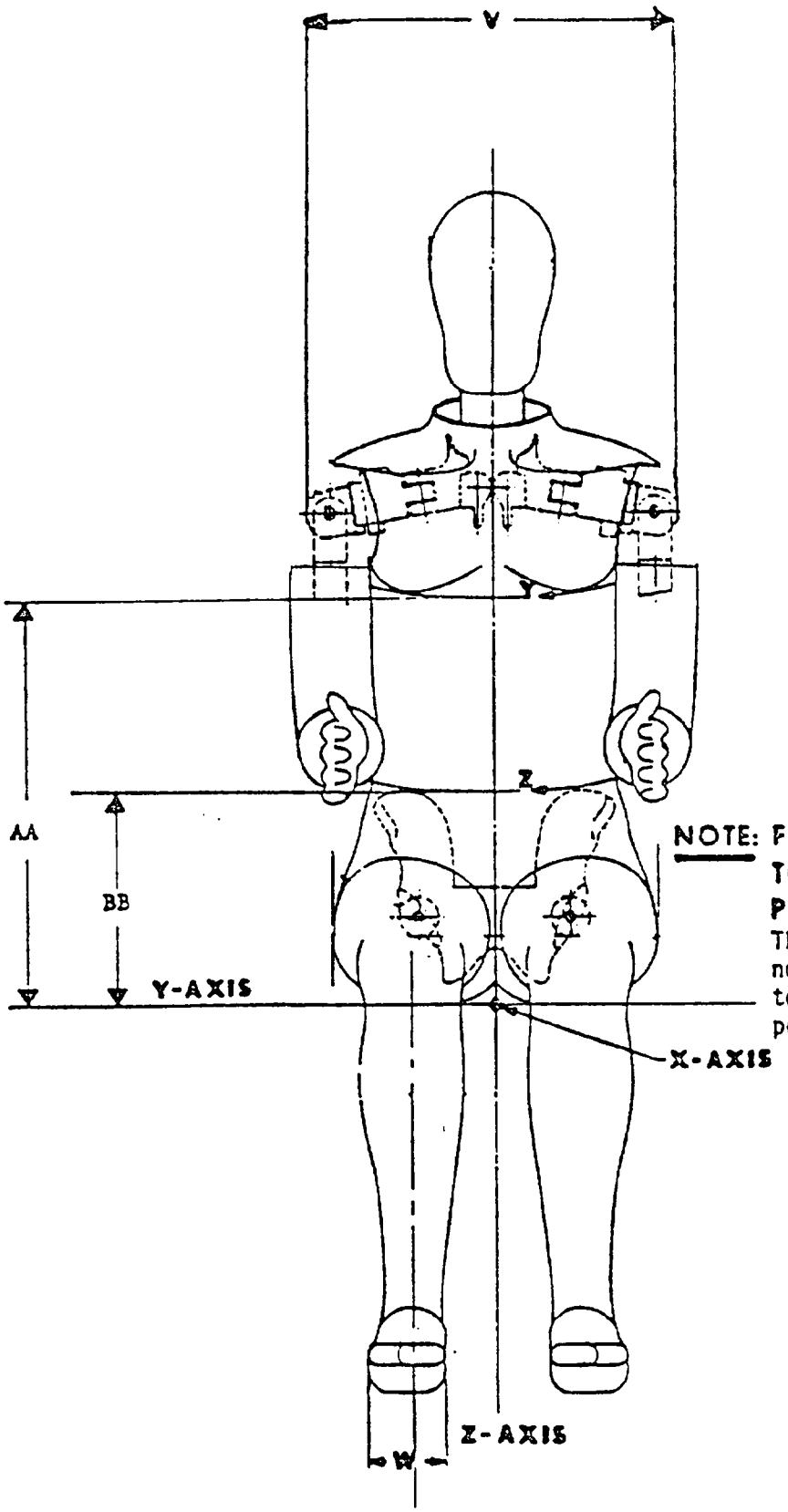
HYBRID III EXTERIOR DIMENSIONS

Dimensional Symbol	Description	Spec Dimension	Dummy Dimension SN 45
A	Sitting Height (Erect)	34.8 ±.2	34.6
B	Shoulder Pivot Height	20.2 ±.3	19.9
C	"H" Point Height	3.4 ref.	3.4
D	"H" Point Location from Back Line	5.4 ref.	5.4
E	Shoulder Pivot Location from Back Line	3.5 ±.2	3.7
F	Thigh Clearance	5.8 ±.3	5.6
G	Back of Elbow to Wrist Pivot	11.7 ±.3	11.4
H	Occiput to Z-Axis	1.7 ±.1	1.7
I	Shoulder - Elbow Length	13.3 ±.3	13.2
J	Elbow Rest Height	7.9 ±.4	7.9
K	Buttock Knee Length	23.3 ±.5	22.8
L	Popliteal Height	17.4 ±.5	17.1
M	Knee Pivot Height	19.4 ±.3	19.4
N	Buttock Popliteal Length	18.3 ±.5	18.3
O	Chest Depth	8.7 ±.3	8.7
P	Foot Length	10.2 ±.3	10.1
V	Shoulder Breadth	16.9 ±.3	16.8
W	Foot Breadth	3.9 ±.3	3.6
Y	Chest Circumference	38.8 ±.6	38.9
Z	Waist Circumference	33.5 ±.6	34.0
AA	Location for Measurement of Chest Circumference	17.0 ±.1	17.0
BB	Location for Measurement of Waist Circumference	9.0 ±.1	9.0

NOTE: The "H" point is located 1.83 inches forward and 2.57 inches down from the center of the pelvis angle reference hole.



HYBRID III Exterior Body Dimensions - Side View



NOTE: FIGURE REFERENCED TO THE ERECT SEATED POSITION.
The curved lumbar does not allow the Hybrid II to be positioned in a perfect erect attitude.

HYBRID III Exterior Body Dimensions - Front View

HEAD DROP TEST

HYBRID III

30-OCT-87

VRTC 15C26HD1 HY3 SN45 HEAD DROP CAL 26

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.60 DEG. F
RELATIVE HUMIDITY	10% - 70%	28.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	249.10 G
PEAK LATERAL ACCELERATION	15 G MAX	5.10 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas Middleton

NECK EXTENSION TEST

HYBRID III

3 AXIS NECK TRANSDUCER 30-OCT-87

VRTC 45C26NE1 HY3 SN45 CAL26 NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.70 DEG. F
RELATIVE HUMIDITY		10% - 70%	33.00 %
IMPACT VELOCITY		19.50 - 20.30 FPS	19.54 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	19.78 G
	20 MS	14.00 - 19.00 G	17.03 G
	30 MS	11.00 - 16.00 G	13.45 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	14.15 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	38.38 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	93.93 DEG.
	TIME	72 - 82 MS	80.63 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-59.0/-39.0 FT.LB	-49.70 FT.LBS
	TIME	65 - 79 MS	71.50 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	167.63 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	142.00 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

NECK FLEXION TEST

HYBRID III

3 AXIS NECK TRANSDUCER 30-OCT-87

VRTC 45C26NF1 HY3 SN45 CAL26 NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.70 DEG. F
RELATIVE HUMIDITY		10% - 70%	33.00 %
IMPACT VELOCITY		22.6 - 23.4 FPS	22.98 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	22.82 G
	20 MS	17.60 - 22.60 G	17.72 G
	30 MS	12.50 - 18.50 G	13.70 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	20.80 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	41.63 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	73.81 DEG.
	TIME	57 - 64 MS	63.38 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.LBS	76.97 FT.LBS
	TIME	47 - 58 MS	54.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	125.13 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	106.75 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

THORAX IMPACT TEST

HYBRID III

31-OCT-87

VRTC 45C26TH1 HY3 8N45 CAL 26 H.S.THORAX 01

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	71.60 DEG. F
RELATIVE HUMIDITY	10% - 70%	37.00 %
PENDULUM VELOCITY	21.6-22.4 FT/SEC	21.88 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.88 INCHES *
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1175.8 POUNDS
INTERNAL HYSTERESIS	69% - 85%	73.4%

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Chas. Middlet

KNEE IMPACT TEST

HYBRID III

30-OCT-87

LEFT KNEE
VRTC 45C26LK1

HY3 SN45 L.KNEE 11I B CAL 26

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.40 DEG. F
RELATIVE HUMIDITY	10% - 70%	28.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.90 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1403.84 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

KNEE IMPACT TEST

HYBRID III

30-OCT-87

RIGHT KNEE
VRTC 45C26RK1

HY3 SN45 R.KNEE 11LB CAL 26

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.50 DEG. F
RELATIVE HUMIDITY	10% - 70%	28.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.90 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1180.71 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

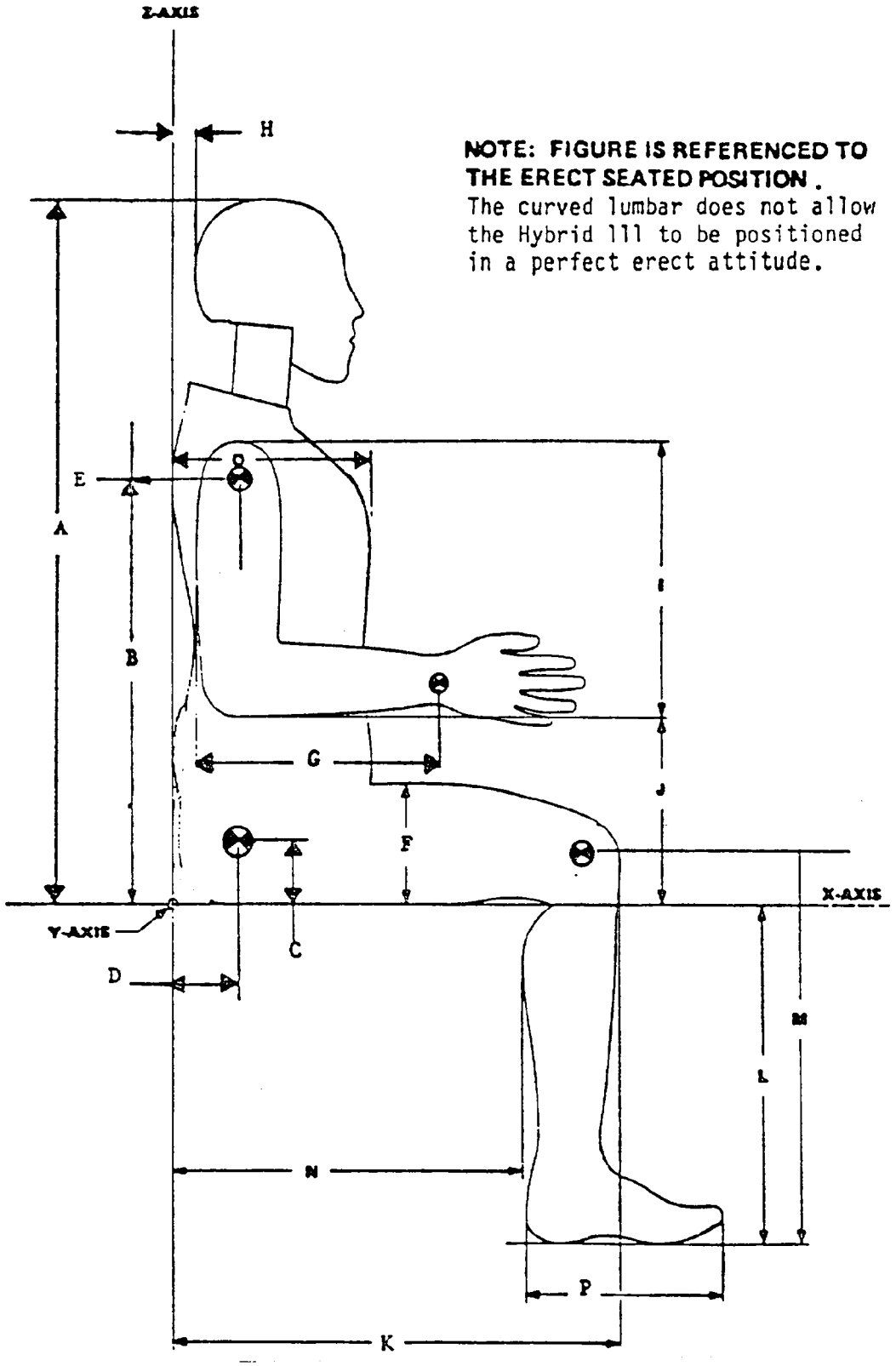
POST-TEST CALS

S/N: 143

HYBRID III EXTERIOR DIMENSIONS

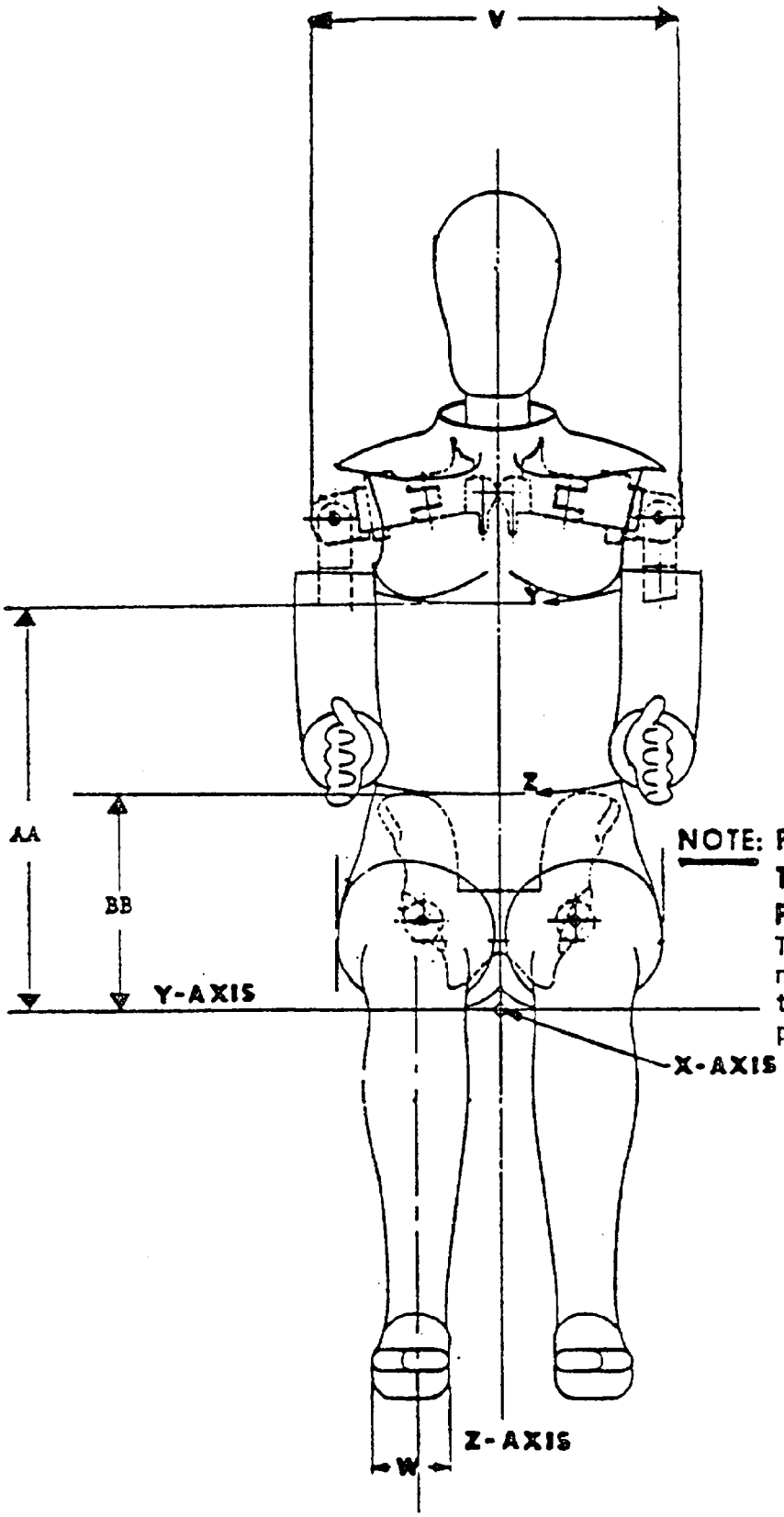
Dimensional Symbol	Description	Spec Dimension	Dummy Dimension SN 143
A	Sitting Height (Erect)	34.8 ±.2	34.7
B	Shoulder Pivot Height	20.2 ±.3	19.9
C	"H" Point Height	3.4 ref.	3.4
D	"H" Point Location from Back Line	5.4 ref.	5.4
E	Shoulder Pivot Location from Back Line	3.5 ±.2	3.7
F	Thigh Clearance	5.8 ±.3	5.9
G	Back of Elbow to Wrist Pivot	11.7 ±.3	11.5
H	Occiput to Z-Axis	1.7 ±.1	1.7
I	Shoulder - Elbow Length	13.3 ±.3	13.3
J	Elbow Rest Height	7.9 ±.4	7.8
K	Buttock Knee Length	23.3 ±.5	23.3
L	Popliteal Height	17.4 ±.5	17.0
M	Knee Pivot Height	19.4 ±.3	19.6
N	Buttock Popliteal Length	18.3 ±.5	18.3
O	Chest Depth	8.7 ±.3	8.8
P	Foot Length	10.2 ±.3	10.2
V	Shoulder Breadth	16.9 ±.3	16.8
W	Foot Breadth	3.9 ±.3	3.9
Y	Chest Circumference	38.8 ±.6	38.5
Z	Waist Circumference	33.5 ±.6	33.6
AA	Location for Measurement of Chest Circumference	17.0 ±.1	17.0
BB	Location for Measurement of Waist Circumference	9.0 ±.1	9.0

NOTE: The "H" point is located 1.83 inches forward and 2.57 inches down from the center of the pelvis angle reference hole.



NOTE: FIGURE IS REFERENCED TO THE ERECT SEATED POSITION.
The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.

HYBRID III Exterior Body Dimensions - Side View



NOTE: FIGURE REFERENCED TO THE ERECT SEATED POSITION.
The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.

HYBRID III Exterior Body Dimensions - Front View

HEAD DROP TEST

HYBRID III

30-OCT-87

VRTC 143C2HD1 HY3 SN143 HEAD DROP CAL 2

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.60 DEG. F
RELATIVE HUMIDITY	10% - 70%	28.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	253.82 G
PEAK LATERAL ACCELERATION	15 G MAX	-4.01 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

3 AXIS NECK TRANSDUCER 02-NOV-87

URTC 143C2NE1 HY3 SN143 CAL2 NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71.40 DEG. F
RELATIVE HUMIDITY		10% - 70%	48.00 %
IMPACT VELOCITY		19.50 - 20.30 FPS	19.50 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.86 G
	20 MS	14.00 - 19.00 G	15.01 G
	30 MS	11.00 - 16.00 G	13.34 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	13.30 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	40.13 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	97.58 DEG.
	TIME	72 - 82 MS	74.00 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-59.0/-39.0 FT.LB	-58.52 FT.LBS
	TIME	65 - 79 MS	74.38 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	166.50 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	148.63 MS **

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Chas. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

31-OCT-87

3 AXIS NECK TRANSDUCER

VRTC 143C2NF1 HY3 SN143 CAL2 NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.80 DEG. F
RELATIVE HUMIDITY		10% - 70%	36.00 %
IMPACT VELOCITY		22.6 - 23.4 FPS	22.87 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	26.98 G
	20 MS	17.60 - 22.60 G	20.72 G
	30 MS	12.50 - 18.50 G	16.02 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	15.93 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	35.88 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	76.15 DEG.
	TIME	57 - 64 MS	63.88 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.LBS	76.15 FT.LBS
	TIME	47 - 58 MS	51.38 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	119.75 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	104.25 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

THORAX IMPACT TEST

HYBRID III 29-OCT-87

VRTC 143C2TH1 HY3 SN143 CAL 2 H.S.THORAX 01

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	70.20 DEG. F
RELATIVE HUMIDITY	10% - 70%	36.00 %
PENDULUM VELOCITY	21.6-22.4 FT/SEC	22.01 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.65 INCHES
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1116.6 POUNDS
INTERNAL HYSTERESIS	69% - 85%	76.4%

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

KNEE IMPACT TEST

HYBRID III 30-OCT-87

LEFT KNEE
VRTC 143C2LK1 HY3 SN143 L.KNEE 11LB CAL 2

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.50 DEG. F
RELATIVE HUMIDITY	10% - 70%	28.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.96 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1243.75 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

KNEE IMPACT TEST

HYBRID III

30-OCT-87

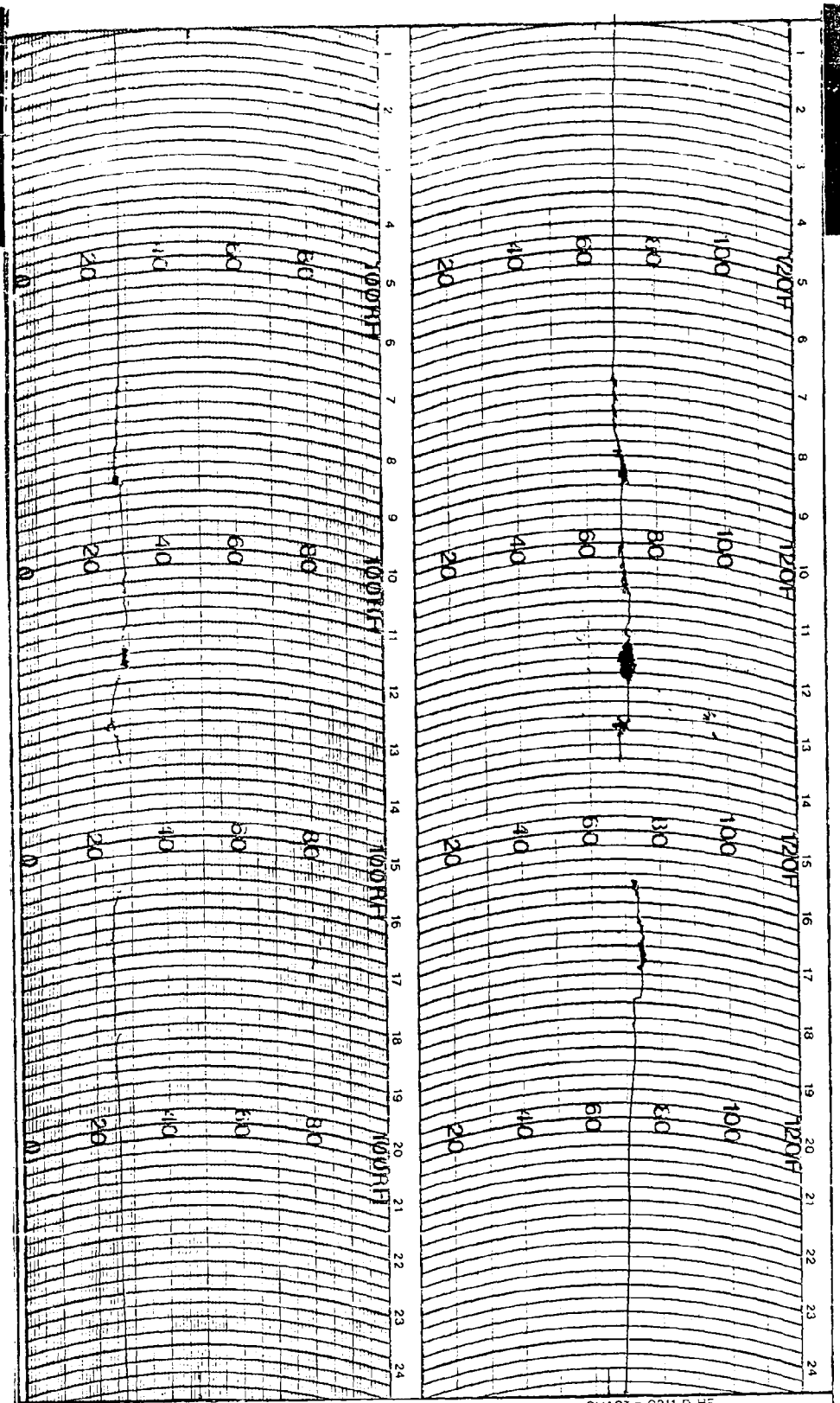
RIGHT KNEE
VRTC 143C2RK1

HY3 SN143 R.KNEE 11LB CAL 2

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	70.50 DEG. F
RELATIVE HUMIDITY	10% - 70%	28.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.95 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1271.51 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet



WEATHER MEASURE
P.O. BOX 41257
SACRAMENTO, CA. 95841
PHONE (916)481-7565

HYGROTHERMOGRAPH
1 DAY

CHART # C311 D HF
PART # 699123

STATION Subaru XT DATE ON 10/12/87 DATE OFF