

DOT# 1066

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

FUJI HEAVY IND. LTD JAPAN

1987 SUBARU GL

4 DOOR

NHTSA NO. MH5500

MOBILITY SYSTEMS AND EQUIPMENT COMPANY
6151 West Century Boulevard Suite 912
Los Angeles, California 90045



SEPTEMBER 14, 1987

FINAL REPORT

Prepared For:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
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16. Abstract A 35 mph frontal barrier impact test using a load cell barrier was conducted on a 1987 Subaru GL, 4 Door Sedan at the Mobility Systems and Equipment Company (MSE) crash test facility in Mira Loma, CA on 25 August 1987. The barrier impact velocity was 35.2 mph and the ambient temperature at the barrier face at the time of impact was 86°F. The posttest vehicle crush maximum was 22.3 in. A summary of occupant injury measure data from the test. <table border="1" data-bbox="212 1264 1279 1516"> <thead> <tr> <th>Injury Criteria</th> <th>Driver Dummy</th> <th>Passenger Dummy</th> </tr> </thead> <tbody> <tr> <td>Threshold Value</td> <td></td> <td></td> </tr> <tr> <td>Head Injury Criterion HIC = 1000</td> <td>1339</td> <td>884</td> </tr> <tr> <td>Chest Resultant Peak 60 Gs (3 ms clip)</td> <td>58</td> <td>44</td> </tr> <tr> <td>Femur Load Left</td> <td>1016</td> <td>485</td> </tr> <tr> <td>2250 pounds Right</td> <td>694</td> <td>309</td> </tr> </tbody> </table> TYPE OF RESTRAINT SYSTEM: 3-point continuous webbing system at each front outboard seating positions.				Injury Criteria	Driver Dummy	Passenger Dummy	Threshold Value			Head Injury Criterion HIC = 1000	1339	884	Chest Resultant Peak 60 Gs (3 ms clip)	58	44	Femur Load Left	1016	485	2250 pounds Right	694	309
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SECTION 1

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is a part of the FY'87 Vehicle Barrier Impact and Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-87-D-02009. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 30 mph FMVSS 208/212/219/301-75 requirements.

This 35 mph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test Procedure, dated 01 September 1986.

SECTION 2

SUMMARY OF FRONTAL BARRIER IMPACT TESTS

A load cell barrier consisting of 36 cell units was impacted by a 1987 Subaru GL, 4 Door Sedan, NHTSA No. MH5500 at a velocity of 35.2 mph. The frontal impact test was conducted by Mobility Systems and Equipment Company (MSE) on 25 August 1987. The general test and vehicle description information are presented in Tables 1 and 2. Pretest and posttest photographs of the test vehicle and dummies are shown in Appendix A.

Two (2) Part 572 50th percentile adult male Anthropomorphic Test Devices (ATD's) were placed in the driver and right front passenger designated seating positions (DSP's) according to the NHTSA test requirements.

The ATD's were instrumented with head and chest triaxial accelerometers and right/left femur load cells. In addition, load cells were placed on the driver's and passenger's lap and shoulder belts to measure dummy upper torso and pelvic section belt loading. A summary of dummy configuration and performance verification test data is presented in Appendix C.

The frontal impact event was documented by one (1) real time camera and fifteen (15) high-speed cameras. The camera location data are presented in Table 8.

Sixty-seven (67) channels of crash parameters were recorded using three (3) FM tape recorders and four (4) direct analog to digital acquisition units. Time history plots of all recorded channels are presented in Appendix B.

2.1 GENERAL COMMENTS

The 1987 Subaru GL, 4 Door Sedan was equipped with a 109 cubic inch 4 cylinder engine and 5 speed manual transmission. The test weight of the Subaru GL, 4 Door Sedan with two (2) 50th percentile male dummies, instrumentation, and cameras was 2740 pounds.

The Subaru GL was involved in a frontal load cell frontal load cell barrier crash at a velocity of 35.2 mph.

The maximum static crush for the vehicle of 22.3 inches occurred at the centerline of the front bumper. The windshield was cracked but otherwise the vehicle glazing remained intact. Both the driver's and passenger's doors were opened without the aid of tools.

The driver ATD's head hit the steering wheel rim and the center hub. The driver's left and right knees hit the dash panel. The driver ATD had a HIC value of 1339, the maximum chest acceleration (resultant clipped) was 58 and the maximum femur loads were 1016 (left) and 694 (right) pounds.

The passenger ATD's head did not contact anything. Both of his knees hit the dash panel. The HIC value for the passenger ATD was 884, the maximum chest acceleration (resultant clipped) was 44 and the maximum femur loads were 485 (left) and 309 (right) pounds.

Seat belt spoolout, measured by high speed film analysis was 2.2 inches for the driver and 2.3 inches for the passenger belts.

The inboard and outboard track latching devices of the front seats remained latched.

There were no apparent visual indications of any stoddard solvent leaks, windshield periphery separation or hood contact with the windshield.

Data Table No. 1 Test Vehicle Data

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1987/SUBARU/GL/4 DOOR SEDAN

VEHICLE NHTSA NO.: M H 5 5 0 0; VIN: J F 1 A C 4 3 B 6 H B 2 3 4 3 6 0

VEHICLE BODY COLOR: RED; MONTH & YEAR OF MANUFACTURE: 04/87

ENGINE: 4 cylinders; 109 C.I.D.; Liters; CC

X Gas; Diesel; Turbocharged

PLACEMENT-- X Longitudinal; Transverse (Lateral)

TRANSMISSION: 5 speed; X Manual; Automatic; Overdrive

FINAL DRIVE: X Front Wheel Drive; Rear Wheel Drive; Four Wheel Drive

DATE VEHICLE AVAILABLE FOR 35 MPH CRASH TESTING: 07/13/87

ODOMETER READING: 26 miles; OPTIONS: A/C; X P/S; P/Wdo.;
X Tilt Whl.; Cruise Control

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): 28 psi Front; 28 psi Rear

Recommended Tire Size: 175/70SR13

Tires On Vehicle: 175/70SR13; Manufacturer: BRIDGESTONE

Number Of Occupants: 3 Front; 2 Rear; 3rd Seat; 5 TOTAL

Type Of Front Seats: X Bucket; X Bench; Split Bench

Type of Front Seat Back: Fixed; X Adjustable With X Lever; Rotating Knob

Vehicle Maximum Capacity Loading = 860 lbs. (A)

No. Of Occupants x 150 lbs. - - - = 750 lbs. (B)

Cargo Capacity (A - B) - - - - = 110 lbs.

TEST VEHICLE DELIVERED WEIGHT WITH MAXIMUM FLUIDS:

Right Front =	642	lbs.	}	TOTAL FRONT =	1345	lbs. (60 % of TOTAL)
Left Front =	703	lbs.				
Right Rear =	454	lbs.	}	TOTAL REAR =	909	lbs. (40 % of TOTAL)
Left Rear =	455	lbs.				
TOTAL WEIGHT=	2254	lbs.				

Data Table No. 1 (Cont'd) Test Vehicle Data

CALCULATION OF TEST VEHICLE TARGET WEIGHT:

Total Test Vehicle Delivered Weight With Maximum Fluids = 2254 lbs.
 Maximum Cargo Carrying Capacity Of Test Vehicle* - - - = 110 lbs.
 Weight Of Two P.572 Dummies (2 x 164 lbs.)- - - - - = 328 lbs.
 TEST VEHICLE TARGET WEIGHT- - - - - = 2692 lbs.

*300 lbs. for light trucks and MPVs

ACTUAL WEIGHT OF TEST VEHICLE WITH 2 DUMMIES AND CARGO:

Right Front = 766 lbs.
 Left Front = 796 lbs.
 Right Rear = 596 lbs.
 Left Rear = 582 lbs.
 TOTAL FRONT = 1562 lbs. (57 % of TOTAL)
 TOTAL REAR = 1178 lbs. (43 % of TOTAL)
 TOTAL WEIGHT = 2740 lbs. (which includes 0 lbs. of cargo ballast weight placed in the cargo/luggage area)

VEHICLE COMPONENTS REMOVED TO MEET TARGET WEIGHT:

1. ☒ Spare Tire, Jack, Jack Stand
2. ☐ Rear Bumper Assembly
3. ☒ Tail lamp hsg. ☐ Rt. Side ☒ Left Side
4. Rear Seat, Rear Rug, Speakers and Trunk Mat

TEST VEHICLE ATTITUDE:

As Delivered--Right Front = 25.4 inches; Ready For Test--Right Front = 24.6 in.
 Left Front = 25.0 inches Left Front = 24.6 in.
 Right Rear = 24.4 inches Right Rear = 22.6 in.
 Left Rear = 24.1 inches Left Rear = 22.7 in.
 Test Vehicle Wheelbase: 97.2 inches; C.C.= 41.8 inches rearward of front wheel centerline

Total Vehicle Length:

Right Side = 172.8 inches
 Left Side = 172.7 inches
 Centerline = 174.3 inches

Data Table No. 2 Post Crash Test Data

DATE OF 35 MPH FRONTAL BARRIER IMPACT RATINGS TEST: 08/25/87

TIME OF TEST: 4:20 PM; AMBIENT TEMPERATURE AT BARRIER FACE: 86 ° F.

VEHICLE'S OCCUPANT COMPARTMENT TEMPERATURE: 71 ° F. (Spec. Range = 66 to 78° F.)

VEHICLE'S WINDSHIELD MOLDING TEMPERATURE: 71 ° F.

VEHICLE IMPACT VELOCITY: Primary Speed Trap = 35.21 mph

Secondary Speed Trap = 35.24 mph

(Specified Range = 34.5 to 35.5 mph)

Distance from vehicle's front bumper forwardmost surface to barrier face when--
5 ft

(a) entering the speed trap = _____
1 ft

(b) exiting the speed trap = _____

VEHICLE STATIC CRUSH:

Vehicle Pre-test Length-- Right Side=172.8 "; C/Line=174.3 "; Left Side=172.7 "

Vehicle Post-test Length- Right Side=151.0 "; C/Line=152.0 "; Left Side=154.0 "

VEHICLE STATIC CRUSH----- Right Side=21.8 "; C/Line=22.3 ; Left Side=18.7 "

VEHICLE REBOUND FROM BARRIER FACE:

Vehicle Right Side = 30.5 inches

Vehicle Centerline = 29.7 inches

Vehicle Left Side = 30.5 inches

VISIBLE DUMMY CONTACT POINTS:

	DRIVER (I.D. No. <u>465</u>)		
	Strg. Col. Hub	Strg. Wheel	Instru. Panel
HEAD - - - - -	YES	NO	NO
RIGHT KNEE - - - - -			YES
LEFT KNEE- - - - -			YES

PASSENGER (I.D. No. <u>467</u>)		
Instru. Panel	Knee Assy.	Glove Box Door
NO	NO	NO
NO		YES
NO		YES

VEHICLE DOOR OPENING INFORMATION:

	RIGHT SIDE	
	OPENED	JAMMED
FRONT DOORS- - - - -	YES	NO
REAR DOORS - - - - -	YES	NO

LEFT SIDE	
OPENED	JAMMED
YES	NO
YES	NO

Data Table No. 2 (Cont'd) Post Crash Data

VEHICLE'S FRONT SEAT MOVEMENT DURING CRASH EVENT:

	RIGHT SIDE	LEFT SIDE
Seat Cushion Shift - - -	0.2 " forward;	0.2 " forward
Seat Adjuster Failure- -	None	None

Details Of Any Failure: N/A

OTHER NOTABLE IMPACT EFFECTS:

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

I. OMI DATA

- Dummy Injury Criteria Data Summary
- Dummy Positioning Data
- Seat Belt Positioning Data
- Seat Belt Performance Assessment Data
- Driver Dummy to Steering Column Dimensions
- Camera Locations

II. OVR DATA

- Load Cell Barrier Data
- Vehicle Accelerometer Data

Data Table No. 3 FMVSS No. 208 Occupant Crash Protection Data Sheet

VEH. YR./MAKE/MODEL/BODY STYLE: 1987/SUBARU/GL/4 DR SEDAN

VEH. NHTSA NO.: MH5500; TEST DATE: 08/25/87

MAXIMUM ACCELERATION VALUES:		DRIVER DUMMY # 465	PASSENGER DUMMY # 467
Head Channel X	HEAD X	-139.10	-38.08
Head Channel Y	Y	23.24	-13.07
Head Channel Z	Z	-74.22	-63.53
HEAD RESULTANT	R	141.93	64.99
Chest Channel X	CHEST X	-59.36	-43.88
Chest Channel Y	Y	22.35	11.20
Chest Channel Z	Z	14.65	11.98
CHEST RESULTANT (3 msec clip)	R	58.306	44.128
TIME INTERVAL (seconds)		78.5-81.5	60.5-63.5

HEAD INJURY CRITERIA (HIC) VALUES:

HIC	HIC	1339.29	883.54
t_1 (seconds)		70.12	68.25
t_2 (seconds)		81.12	104.25
Avg. Accel. t_1 to t_2		117.6	58.5

MAXIMUM FEMUR FORCES:

Right Side (lbs.)	FR	693.71	308.65
Left Side (lbs.)	FL	1015.53	485.39

MAXIMUM SEAT BELT FORCES:

Lap Belt	LAP	1247.09	1478.76
Shoulder Belt	SHLDR	1781.99	1864.80

MAXIMUM SEAT BELT WEBBING SPOOL-OUT:

Lap/Shoulder Belt Combination	2.2	2.3
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Data Table No. 4 Test Dummy Positioning Data

PRE-IMPACT DATA:

Make/Model: SUBARU/GL
 Body Style: 4 DOOR SEDAN Model Year: 1987
 NHTSA No.: MH5500 Color: RED

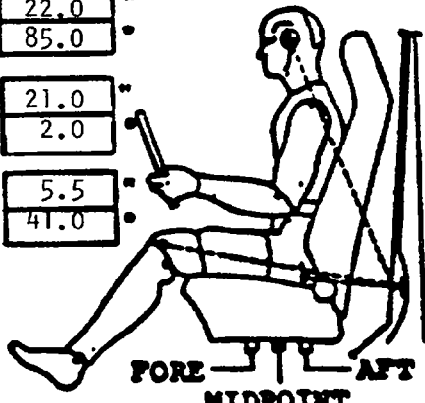
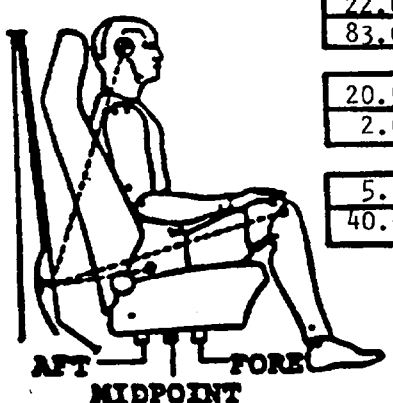
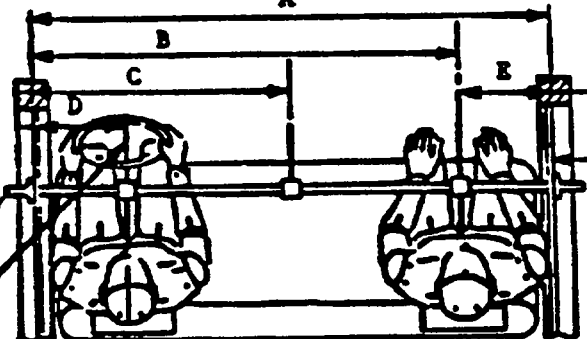
DATA FROM CERTIFICATION LABEL:

Vehicle Manufacturer: FUJI HEAVY IND. LTD JAPAN
 Date of Manufacture: 04/87 ; VIN: JF1AC43B6HB234360
 GVWR: 3430 lb; GAWR: Front = 1860 lb; Rear = 1570 lb

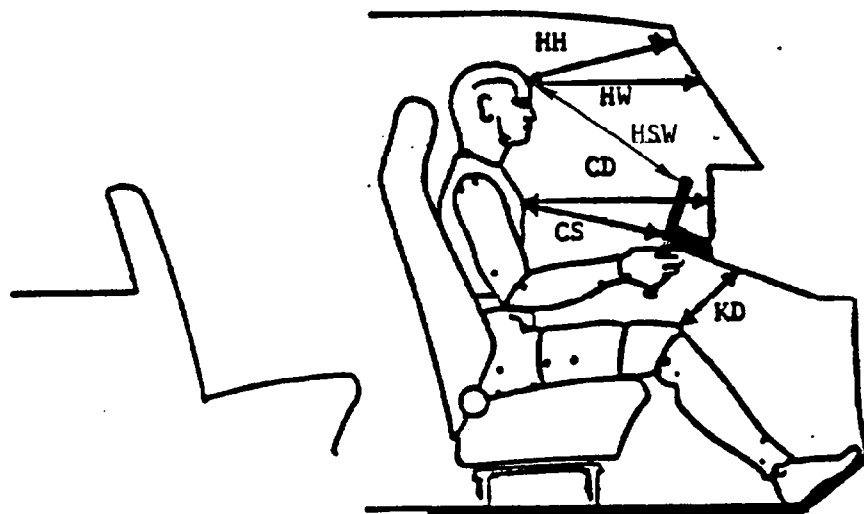
POST-IMPACT DATA:

Date of Test: 08/25/87 Time: 4:20 PM Temperature 86 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: Primary = 35.21 mph Secondary = 35.24 mph
 Seat Type: BUCKET Adjuster Type: LEVER
 Bucket Seat Back Type: ADJUSTABLE HEADREST

Technicians:

DRIVER DUMMY# 4 6 5	PASSENGER DUMMY # 4 6 7
HEAD TARGET 22.0 " 85.0 " KNEE JOINT 21.0 " 2.0 " APPROXIMATE "H" POINT 5.5 " 41.0 "	HEAD TARGET 22.0 " 83.0 " KNEE JOINT 20.5 " 2.0 " APPROXIMATE "H" POINT 5.5 " 40.0 "
 FORE MIDPOINT AFT	 AFT MIDPOINT FORE
	
A = 56.0 " B = 41.6 " C = 28.0 " D = 14.5 " E = 14.4 "	DOOR GLASS HEIGHT
LATERAL BAR ADJUSTABLE POINTER LEFT FRONT DOOR DRIVER DUMMY 4 6 5	PASSENGER DUMMY 4 6 7 RIGHT FRONT DOOR

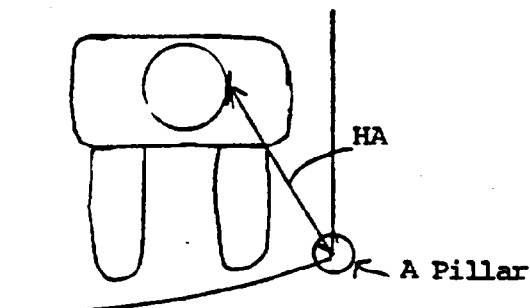
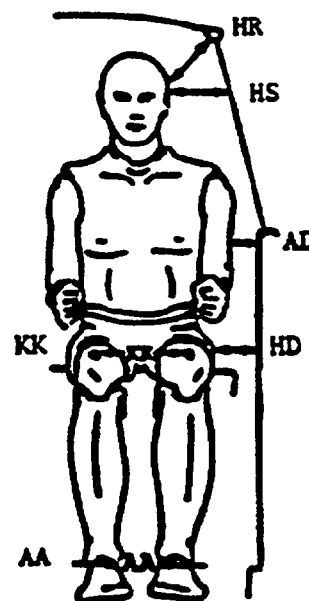
Data Table No. 4 (Cont'd) Test Dummy Positioning Data



	Driver	Passenger
HH	17.0	17.2
HW	20.6	20.7
CD	22.2	23.1
CS	14.5	N/A
KD L-	5.1	L- 5.0
KD R-	5.0	R- 5.5
Torso Angle	24.0	Torso Angle 24.0
Seat Back Angle	25.0	Seat Back Angle 25.0
HSW	22.0	-

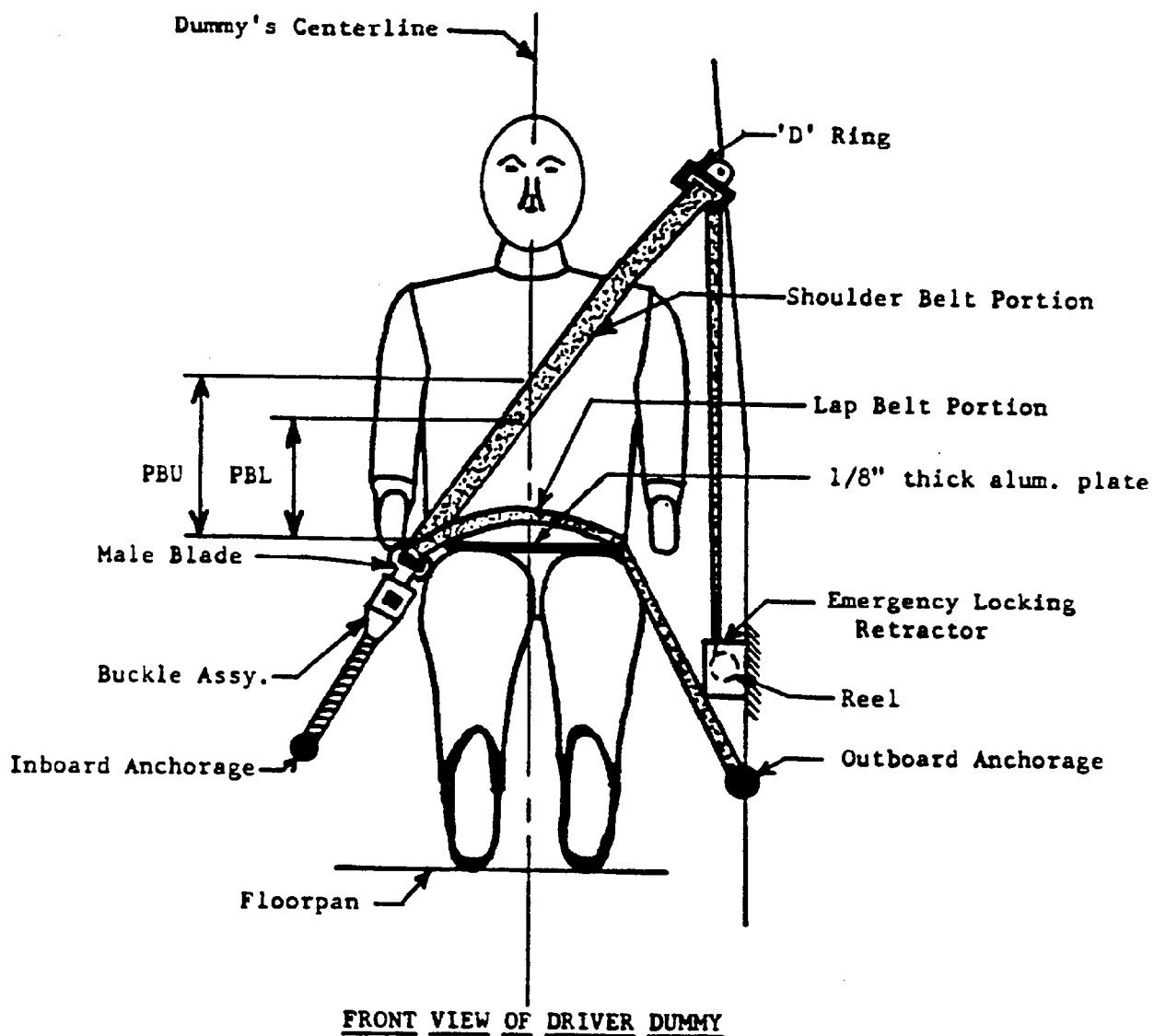
HSW = Head to Steering Wheel
 HA = Head Target to A pillar
 HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD = Knees to Dash
 HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door
 KK = Knee to Knee
 Torso and seat back angles are relative to vertical.

REMARKS:



	Driver	Passenger
HR	4.1	3.5
HS	6.6	6.2
AD	4.2	4.0
HD	8.0	6.4
KK	14.7	11.5
AA	14.0	10.5
HA	21.5	21.9

Data Table No. 5 Seat Belt Positioning Data



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> --Top surface of alum. plate to belt upper edge	14.0	14.0
<u>PBL</u> --Top surface of alum. plate to belt lower edge	10.7	10.5
<u>LAP BELT TENSION, POUNDS</u>	5.0	5.0
<u>SHOULDER BELT TENSION, POUNDS</u>	4.0	4.0

Data Table No. 6 Seat Belt Performance Assessment Test Data

BELT LENGTH DATA:

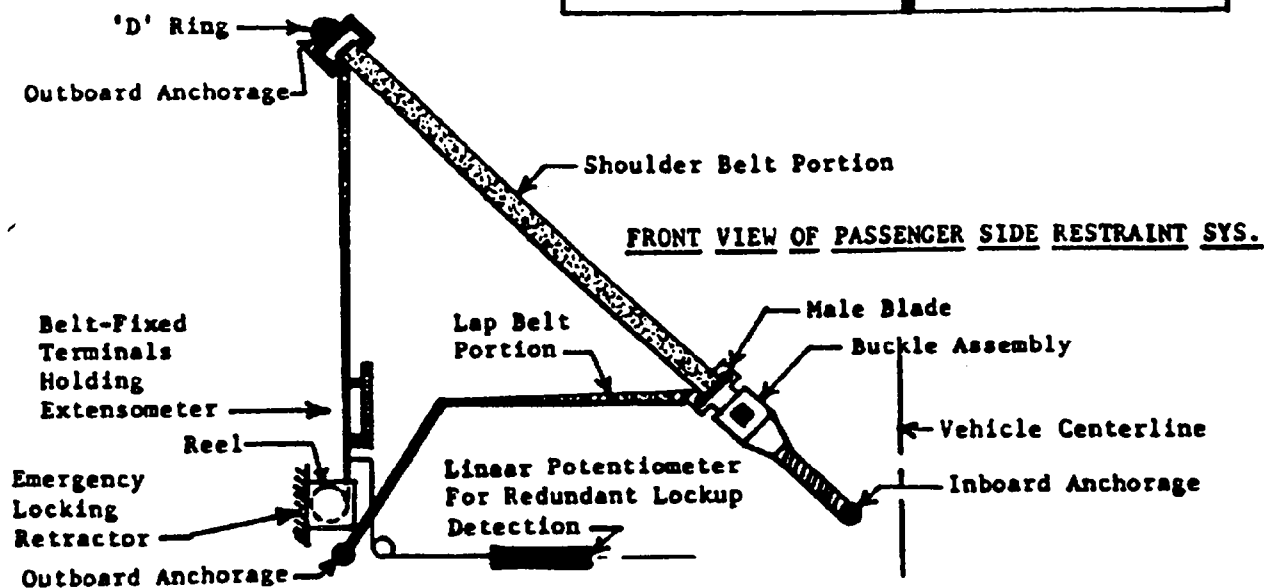
	DRIVER SIDE		PASSENGER SIDE	
	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST
Total Belt Length from retractor reel to bolt hole anchor point for continuous webbing systems	94.8	96.2	94.4	94.8
Retractor reel to 'D' ring as measured on Part 572 dummy	13.5	14.0	13.5	14.5
Shoulder belt length as measured on Part 572 dummy	30.4	28.7	30.0	29.0
Lap belt length as measured on Part 572 dummy	27.3	29.0	27.5	26.5
Remainder of belt webbing left on retractor reel	23.6	24.5	23.4	24.8

BELT SPOOL-OFF DATA:

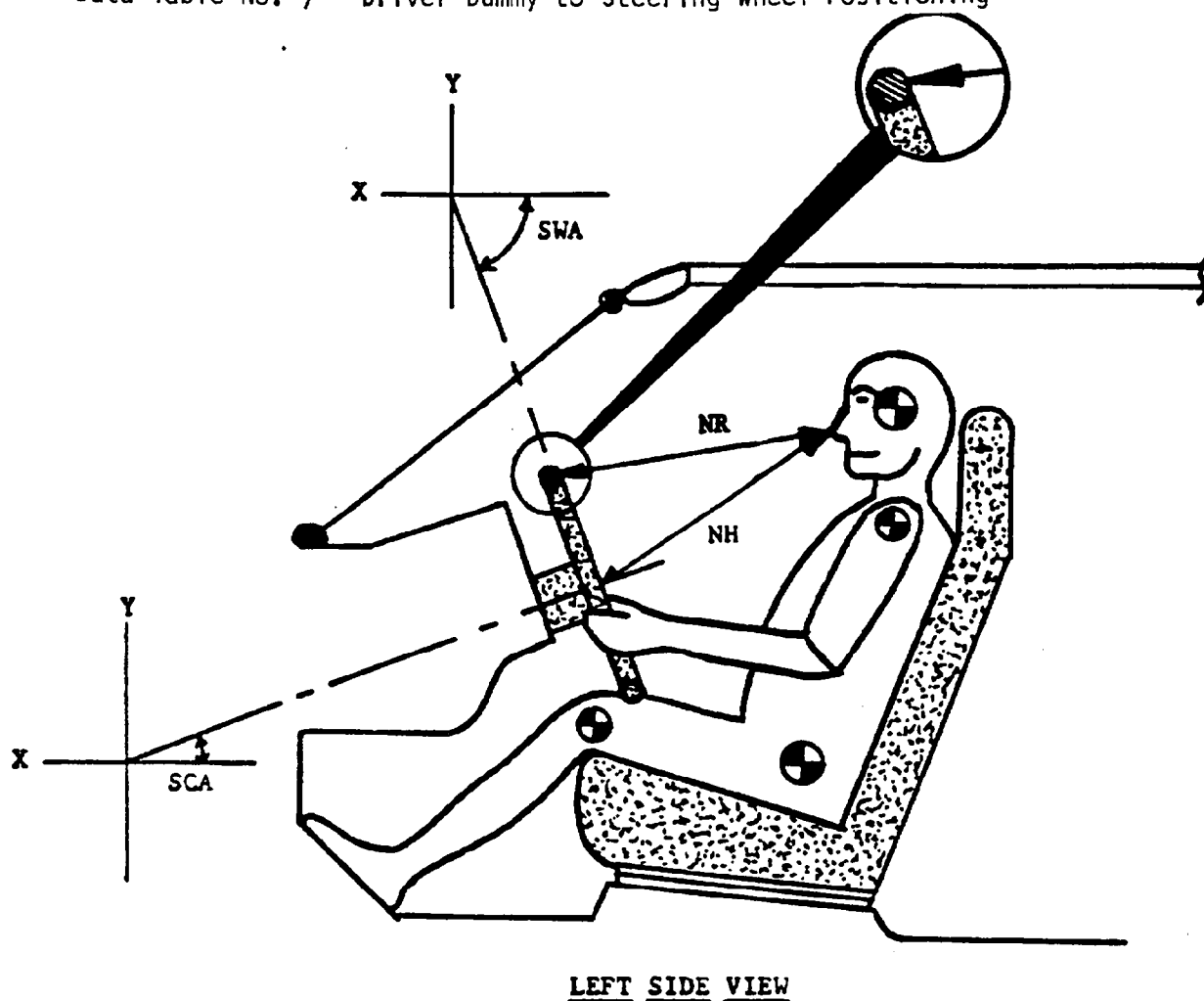
As determined by film analysis	2.2	2.3
As determined electronically	N/A	N/A
As determined mechanically	1.7	2.2

BELT STRAIN DATA:

Measured between retractor reel and 'D' ring	4 Percent	5 Percent
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Data Table No. 7 Driver Dummy to Steering Wheel Positioning



MEASUREMENTS	
<u>NR</u> --Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	17.2 Inches
<u>NH</u> --Distance from tip of dummy's nose to center of steering column hub	19.0 Inches
<u>SCA</u> --Angle of steering column relative to the horizontal X axis	26.0 Degrees
<u>SWA</u> --Angle of steering wheel relative to the horizontal X axis.	64.0 Degrees

Data Table No. 8 Camera Location Data

VEH. NHTSA NO.: MH5500; TEST DATE: 08/25/87; TIME: 4:20 PM

VEH. YEAR/MAKE/MODEL/BODY STYLE: 1987/SUBARU/GL/4 DR SEDAN

CAMERA NO.	VIEW	CAMERA POSITIONS (in.)*			ANGLE (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Left Side View	694.0	274.0	57.5	3	672.0	20-70 zoom	24
2	Right Side View	241.0	70.0	49.0	2	224.0	13	700
3	Left Side View	1190.0	53.0	41.0	0	1076.0	50	500
4	Overhead	0.0	-6.0	132.0	60	122.0	13	600
5	Pit-Engine	0.0	42.5	57.0	35**	N/A	13	500
6	Pit-Fuel Tank	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
7	Front-Passenger	14.0	-17.5	107.0	52	114.0	16	400
8	Front-Driver	12.0	-17.5	107.0	50	73.0	16	400
9	Left Side-Driver	82.0	100.0	67.5	16	60.0	16	600
10	Right Side-Passenger	84.0	99.0	72.0	20	62.0	16	600
11	Right Side-'A' Post	170.0	35.0	49.2	2	144.0	28	600
12	Left Side-'A' Post	368.0	-21.5	68.0	1	378.0	50	600
13	Onboard-Left Side	11.5	114.0	22.0	-16	30.0	13	500
14	Onboard-Right Side	11.5	114.0	22.0	-15	30.0	13	500
15	Left Side-Steering Col.	323.0	75.0	128.0	16	332.0	16	600
16	Left Side-Steering Col.	320.0	75.0	110.0	13	328.0	16	600
17	Right Side-Passenger	110.0	63.0	53.5	5	115.0	16	500

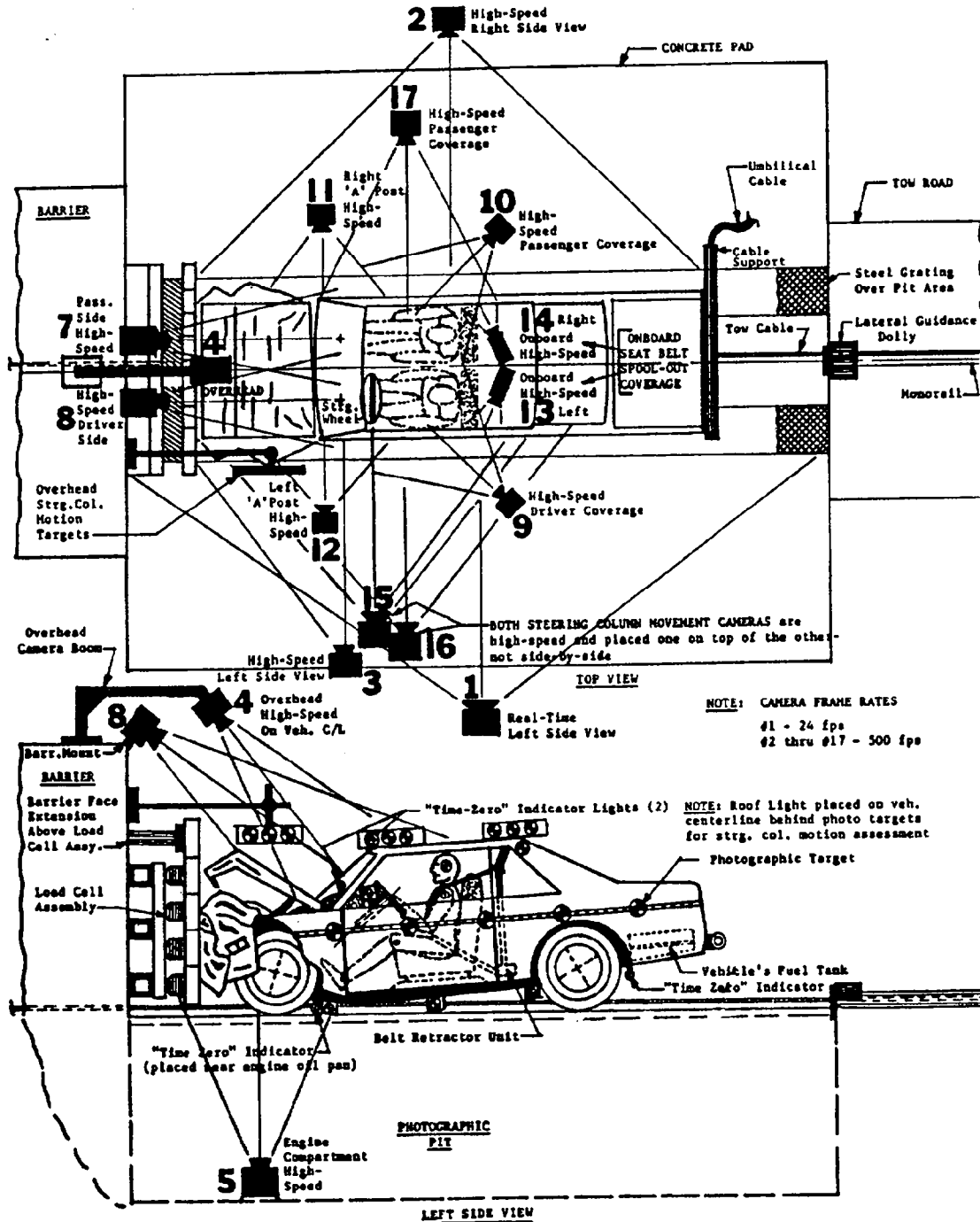
**Pit engine camera uses a refractor mirror for film imagery.

* X = film plane to monorail centerline

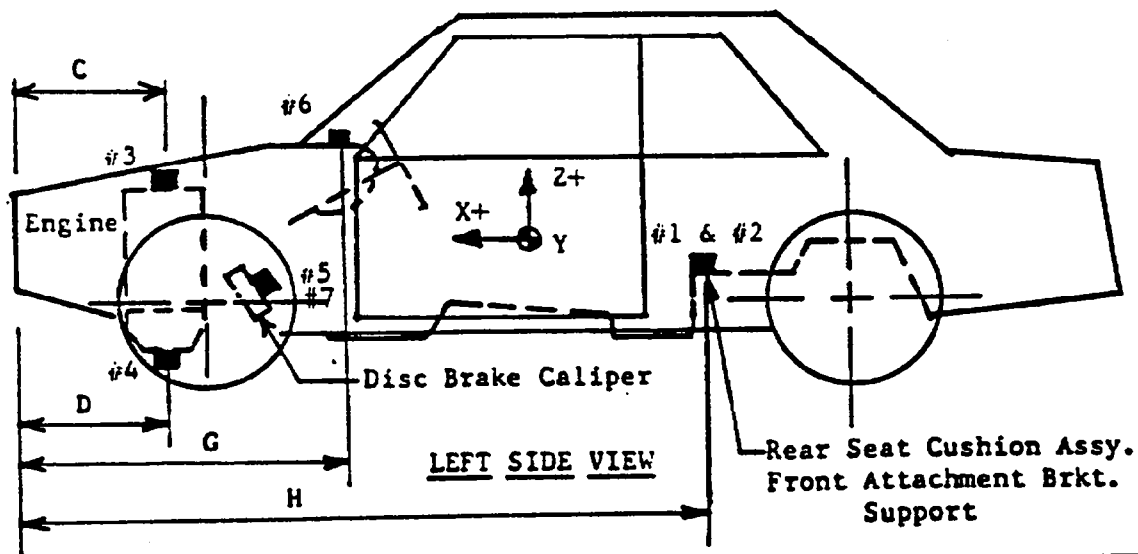
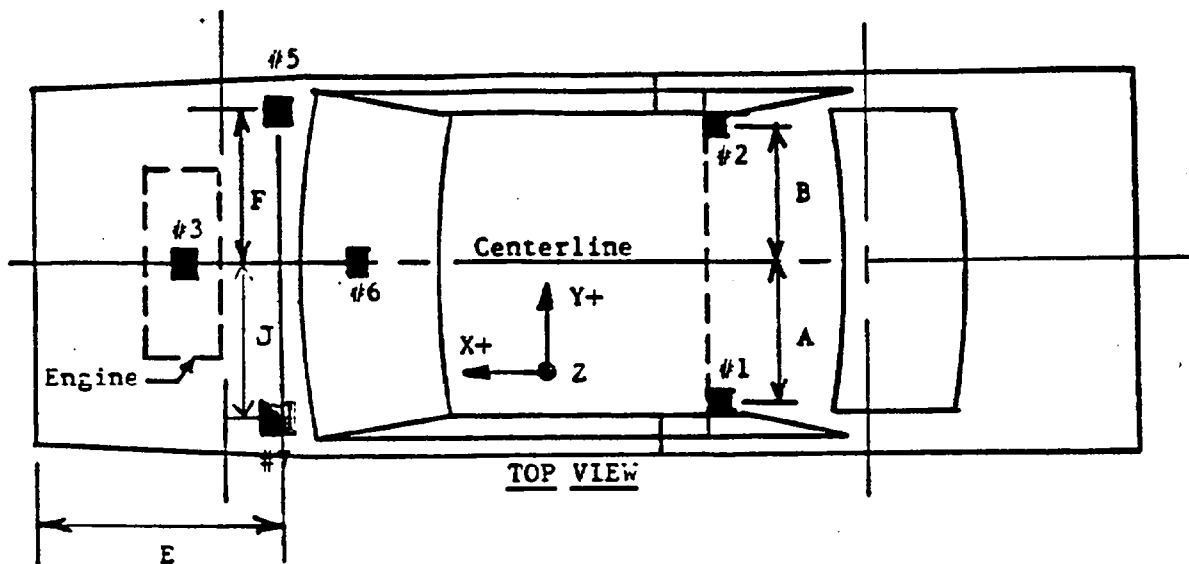
Y = film plane to barrier face

Z = film plane to ground

Data Table No. 8 (Cont'd) Camera Location Data



Data Table No. 9 Vehicle Accelerometer Location and Data Summary



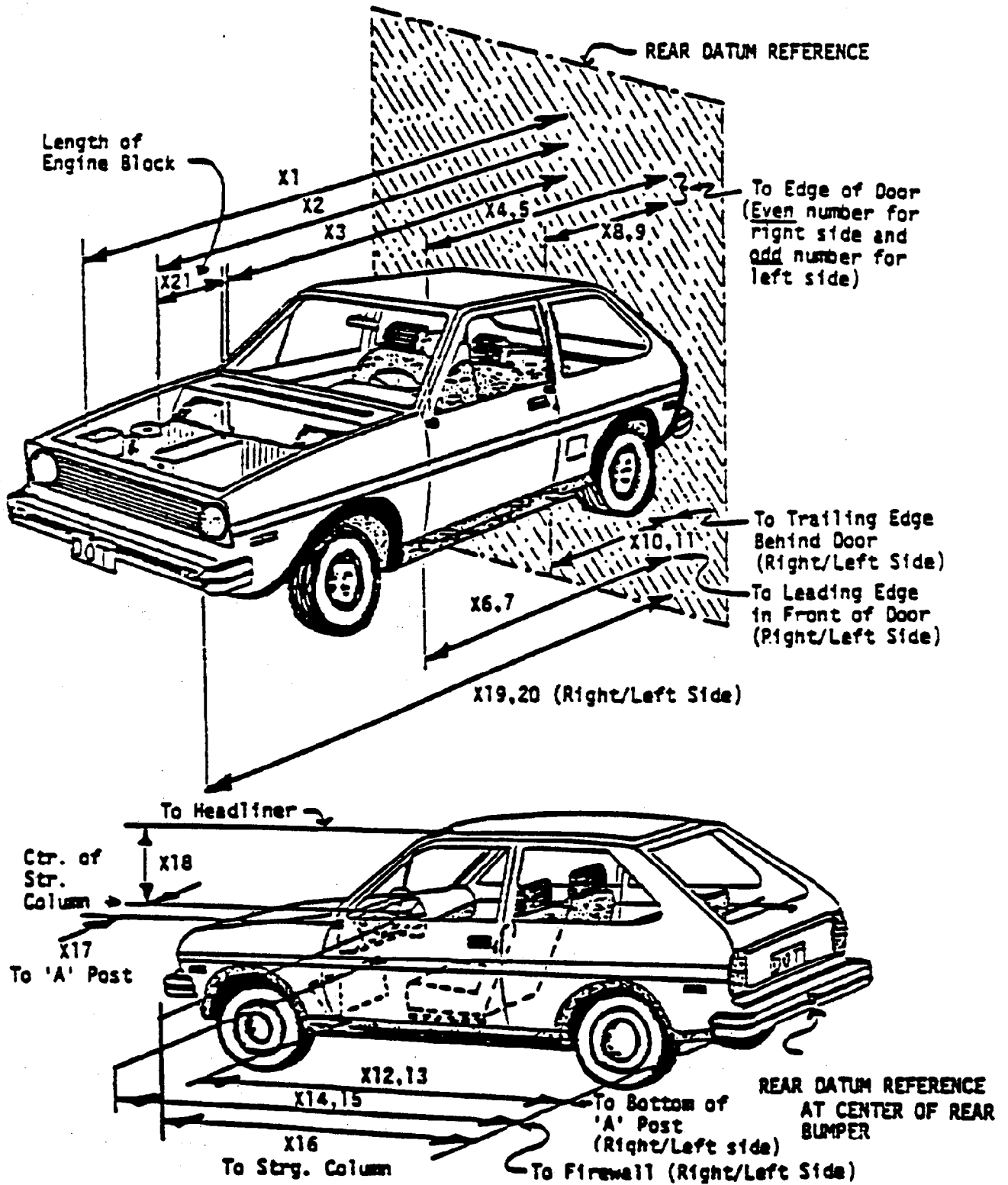
Dimension	Length (in.)
A	12.7
B	12.0
C	27.0
D	28.0
E	41.0
F	24.0
G	59.0
H	107.0
J	24.0

Loc. No.	Description	Maximum Value			
		X-	msec.	X+	msec.
1	Rear seat X-member @ Left Side	38.47	47	2.65	139
2	Rear seat X-member @ Right Side	28.56	49	3.13	134
3	Top of Engine Block	159.95	24	55.84	36
4	Bottom of Engine	163.46	27	49.98	36
5	Disc Brake Caliper @ Right Side	77.31	50	34.15	68
6	Instrument Panel	107.56	46	39.36	52
7	Disc Brake Caliper @ Left Side	63.13	34	24.74	22

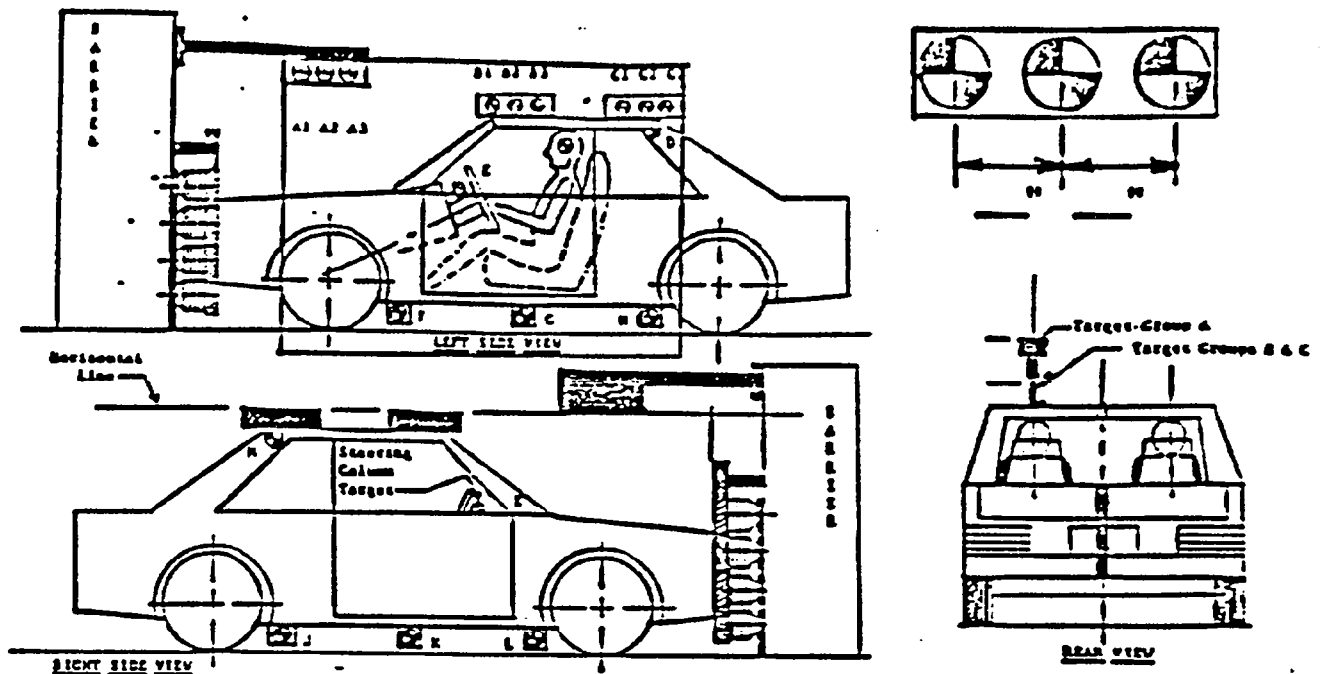
Data Table No. 10 Test Vehicle Measurements

NO.	MEASUREMENT DESCRIPTION:	Pre-Test (in.)	Post-Test (in.)	Diff. (in.)
X1	Total Length of Test Vehicle at Centerline	174.3	152.0	22.3
X2	Rear Surface of Vehicle to Front of Engine	156.5	144.0	12.5
X3	Rear Surface of Vehicle to Firewall	118.5	117.0	1.5
X4	Rear Surface to Upr. Leading Edge of Right Door	119.6	119.3	0.3
X5	Rear Surface to Upr. Leading Edge of Left Door	119.7	119.0	0.7
X6	Rear Surface to Lwr. Leading Edge of Right Door	120.7	120.5	0.2
X7	Rear Surface to Lwr. Leading Edge of Left Door	120.7	120.5	0.2
X8	Rear Surface to Upr. Trailing Edge of Right Door	81.6	81.1	0.5
X9	Rear Surface to Upr. Trailing Edge of Left Door	81.7	81.2	0.5
X10	Rear Surface to Lwr. Trailing Edge of Right Door	82.2	81.9	0.3
X11	Rear Surface to Lwr. Trailing Edge of Left Door	82.3	82.0	0.3
X12	Rear Surface to Bottom of 'A' Post on Right Side	120.0	119.7	0.3
X13	Rear Surface to Bottom of 'A' Post on Left Side	120.1	120.0	0.1
X14	Rear Surface to Firewall on Right Side	132.5	126.0	6.5
X15	Rear Surface to Firewall on Left Side	132.4	126.0	6.4
X16	Rear Surface to Steering Column	102.4	100.0	2.4
X17	Center of Steering Column to 'A' Post	15.2	14.0	1.2
X18	Center of Steering Column to Headlining	16.5	14.0	2.5
X19	Rear Surface to Right Side of Front Bumper	172.8	151.0	21.8
X20	Rear Surface to Left Side of Front Bumper	172.7	154.0	18.7
X21	Length of Engine Block	25.5	25.5	0.0

Data Table No. 10 (Cont'd) Test Vehicle Measurements



Data Table No. 11 Pretest Vehicle Target Locations



BARRIER TARGETS	'X' From Imag. Barrier Face Vertical Plane	'Y' From Monorail C/L	'Z' Above Ground
A1	23.5	20.0	81.0
A2	27.5	20.0	81.0
A3	31.5	20.0	81.0

VEHICLE TARGETS	'X' From Imag. Barrier Face Vertical Plane	'Y' From Vehicle C/L	'Z' Above Ground
B1	77.0	14.0	55.0
B2	81.0	14.0	55.0
B3	85.0	14.0	55.0
C1	110.5	14.0	55.0
C2	114.5	14.0	55.0
C3	118.5	14.0	55.0
D	116.0	21.5	51.0
E	66.0	13.0	36.5
F	52.0	26.0	5.5
G	83.8	26.0	5.3
H	115.0	26.0	5.2
J	51.5	26.0	5.9
K	83.0	26.0	5.7
L	114.5	26.0	5.5
M	114.0	21.5	51.0

NOTE: Diameter of all photo targets is 5" except for target 'E' which is 3".

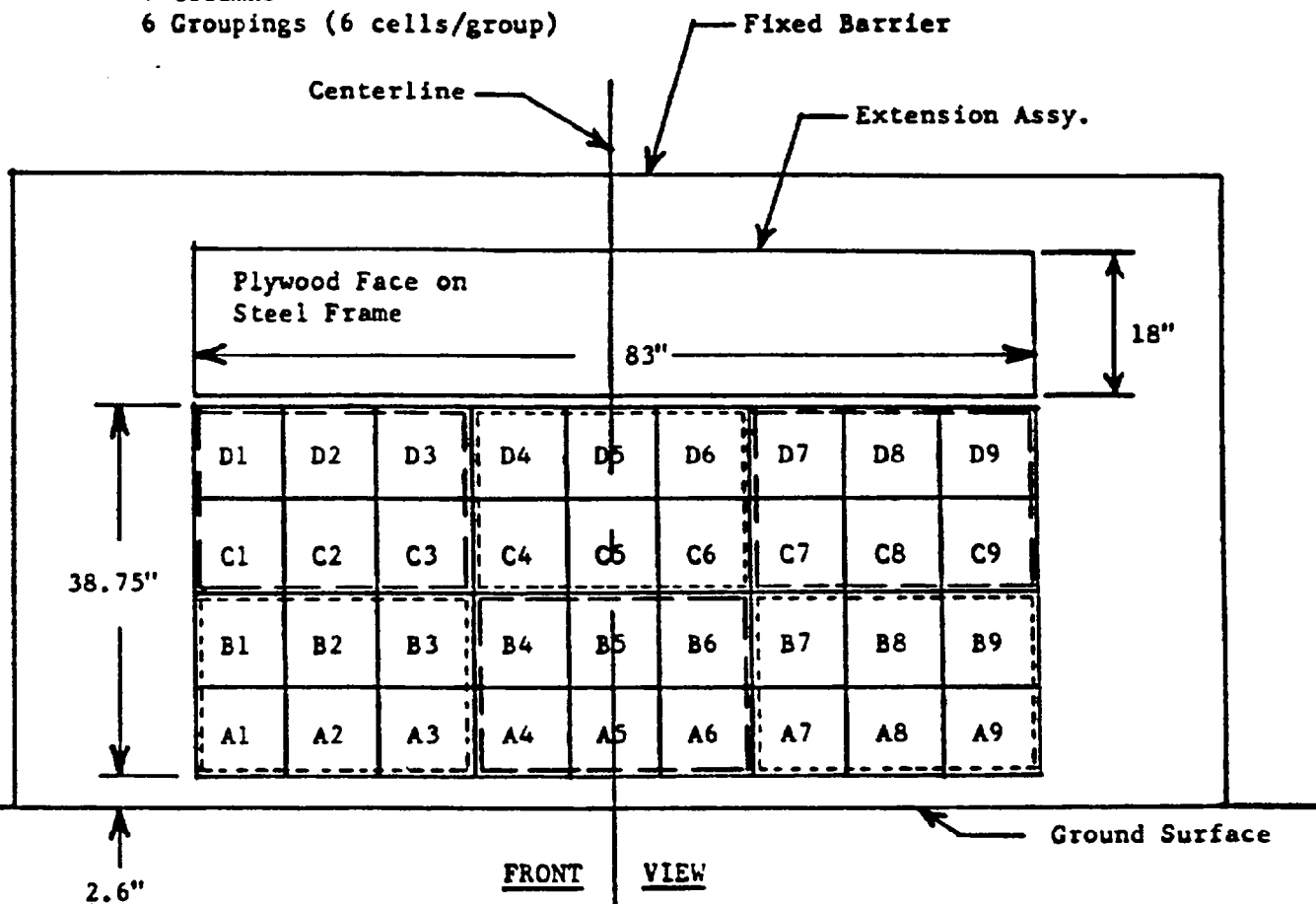
Data Table No. 12 Load Cell Locations on Fixed Barrier

36 Load Cells

4 Rows

9 Columns

6 Groupings (6 cells/group)



6 GROUPINGS OF 6 LOAD CELLS EACH

C1 thru D3	C4 thru D6	C7 thru D9
A1 thru B3	A4 thru B6	A7 thru B9

DATA REQUIREMENTS:

- (1) Data from 36 individual load cells
- (2) Total or Sum of 36 individual load cells
- (3) Data from 6 Groupings shown above (6 cells/group)

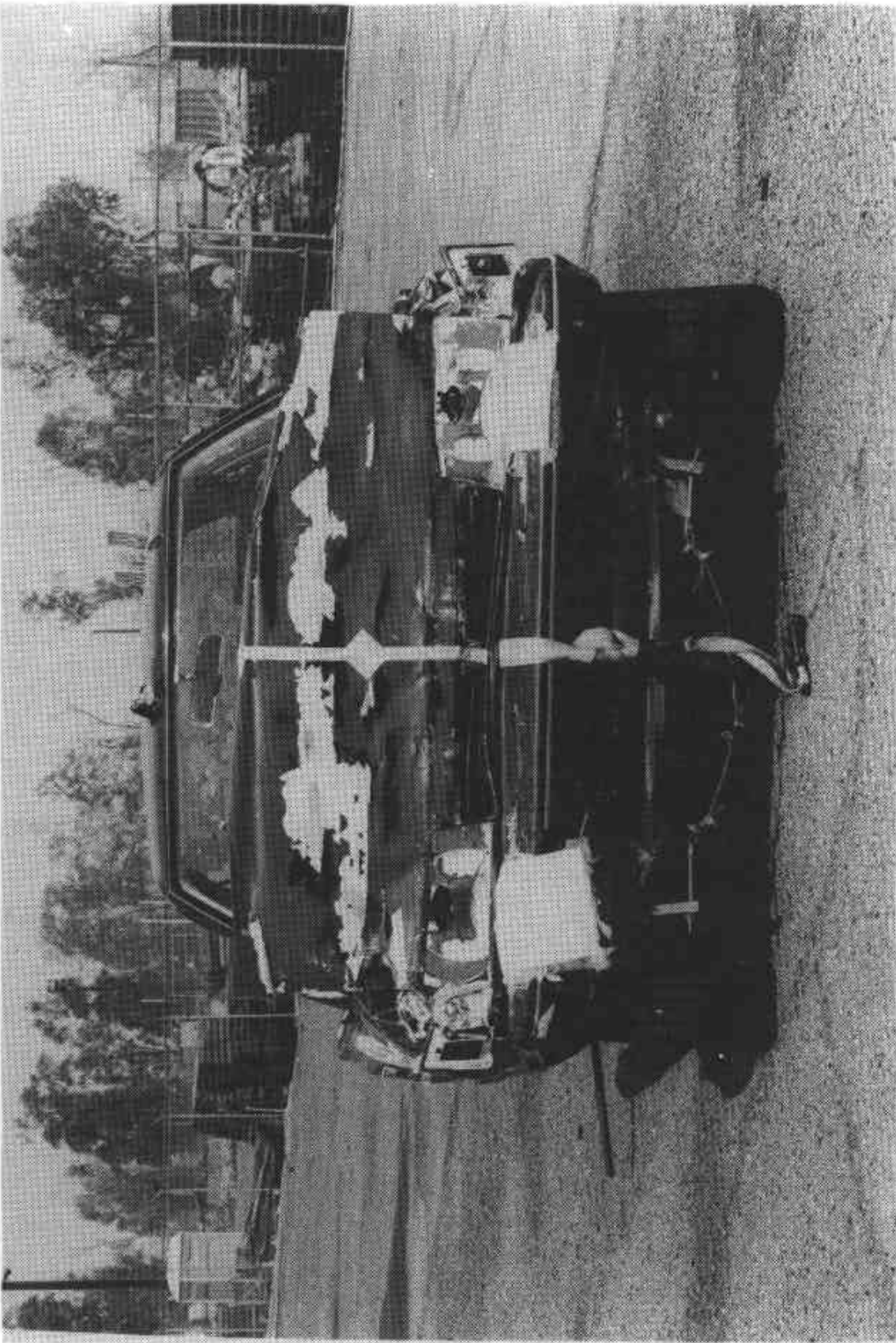
APPENDIX A

PHOTOGRAPHS

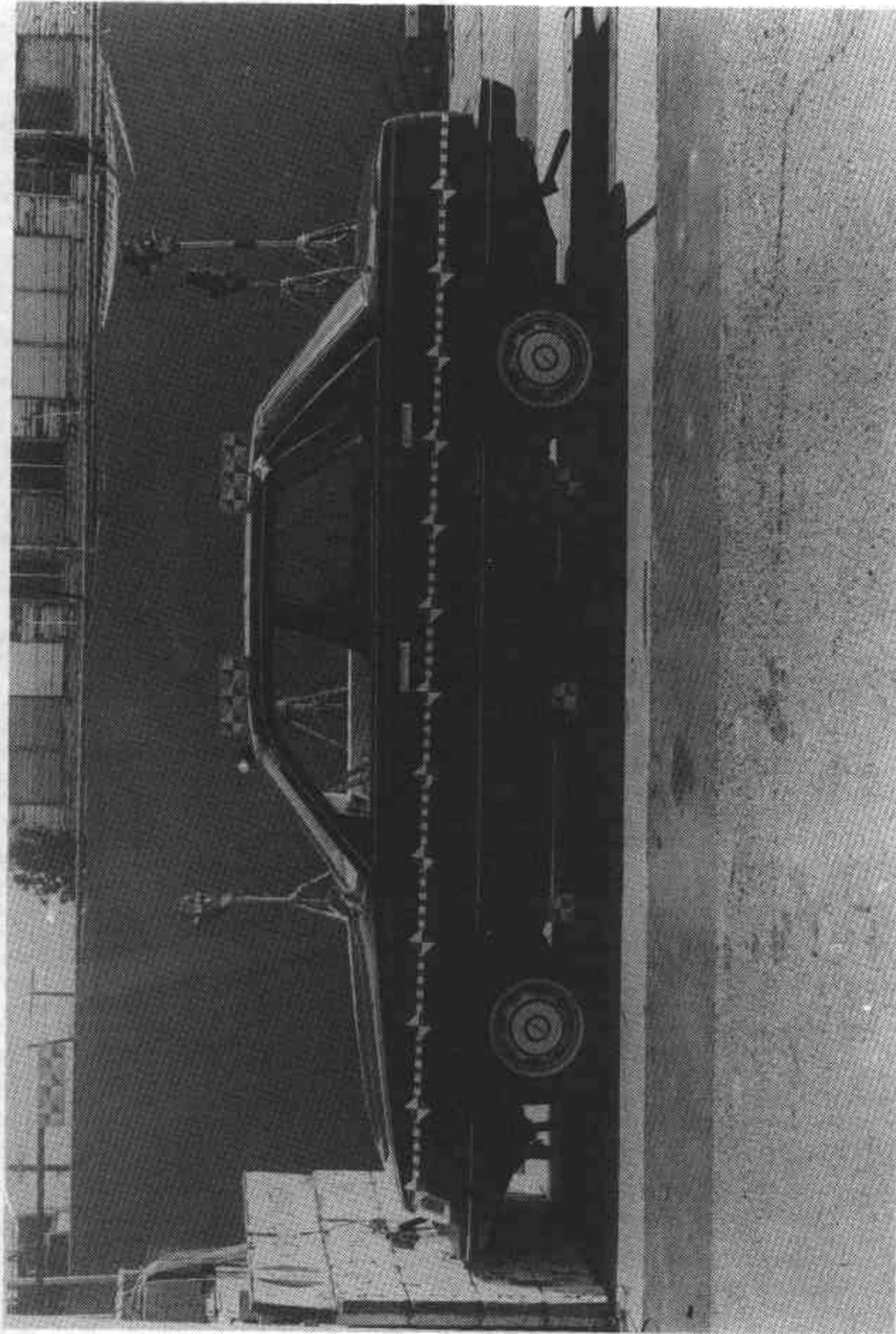
PRETEST FRONT VIEW
POSTTEST FRONT VIEW
PRETEST LEFT SIDE VIEW
POSTTEST LEFT SIDE VIEW
PRETEST RIGHT SIDE VIEW
POSTTEST RIGHT SIDE VIEW
PRETEST RIGHT FRONT 3/4 VIEW
POSTTEST RIGHT FRONT 3/4 VIEW
PRETEST LEFT REAR 3/4 VIEW
POSTTEST LEFT REAR 3/4 VIEW
PRETEST WINDSHIELD VIEW
POSTTEST WINDSHIELD VIEW
PRETEST ENGINE COMPARTMENT VIEW
POSTTEST ENGINE COMPARTMENT VIEW
PRETEST FRONT UNDERBODY VIEW
POSTTEST FRONT UNDERBODY VIEW
PRETEST REAR UNDERBODY VIEW
POSTTEST REAR UNDERBODY VIEW
PRETEST DRIVER DUMMY (ATD) POSITION VIEW
POSTTEST DRIVER DUMMY (ATD) POSITION VIEW
PRETEST PASSENGER DUMMY (ATD) POSITION VIEW
POSTTEST PASSENGER DUMMY (ATD) POSITION VIEW
PRETEST DRIVER DUMMY & VEHICLE INTERIOR VIEW (Door Open)
POSTTEST DRIVER DUMMY & VEHICLE INTERIOR VIEW (Door Open)
PRETEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW (Door Open)
POSTTEST PASSENGER DUMMY (ATD) & VEHICLE INTERIOR VIEW (Door Open)
POSTTEST DRIVER DUMMY STEERING COLUMN HUB/RIM CONTACT
POSTTEST DRIVER DUMMY KNEE CONTACT AREA
POSTTEST PASSENGER DUMMY (ATD) KNEE CONTACT



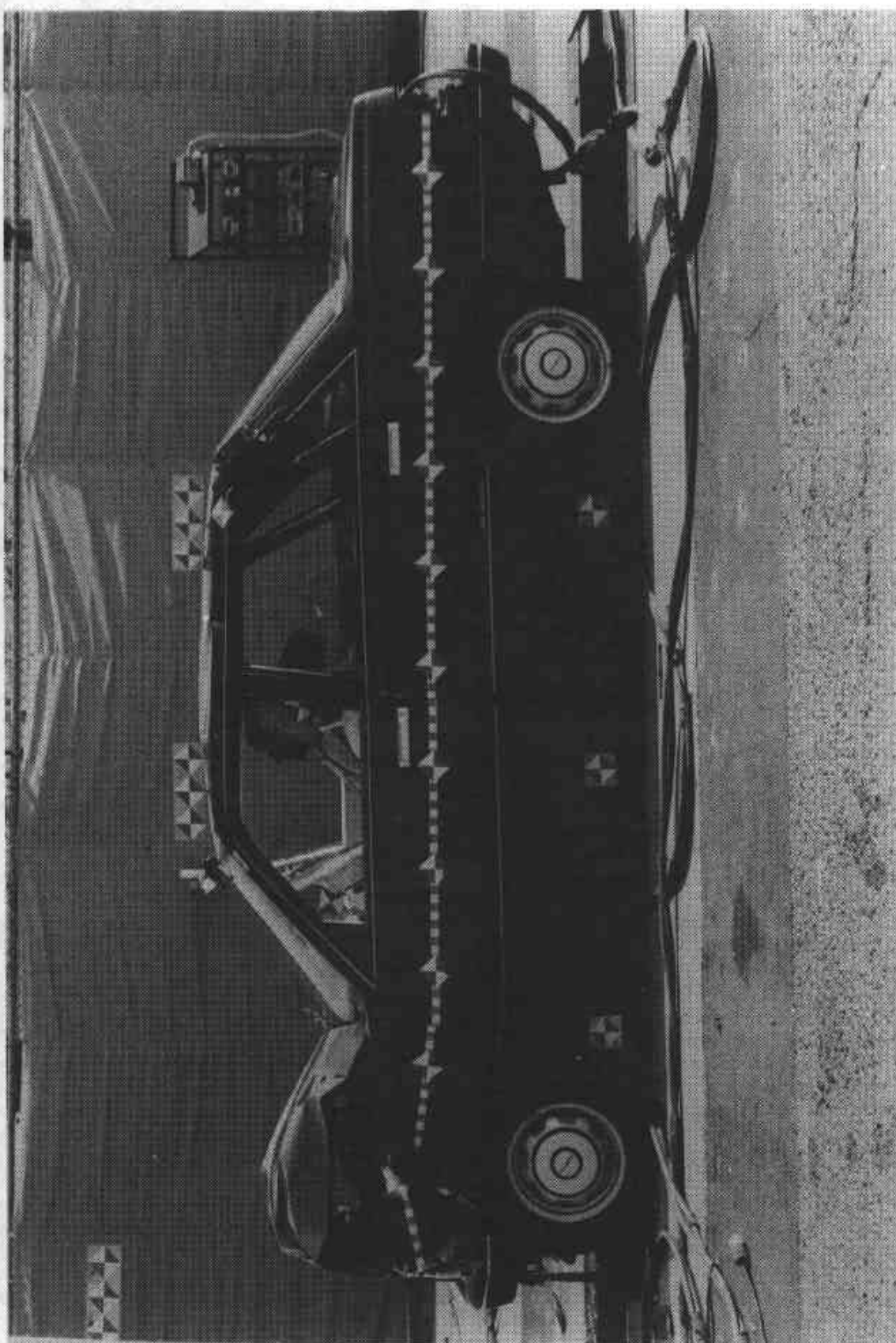
PRETEST FRONT VIEW



POSTTEST FRONT VIEW



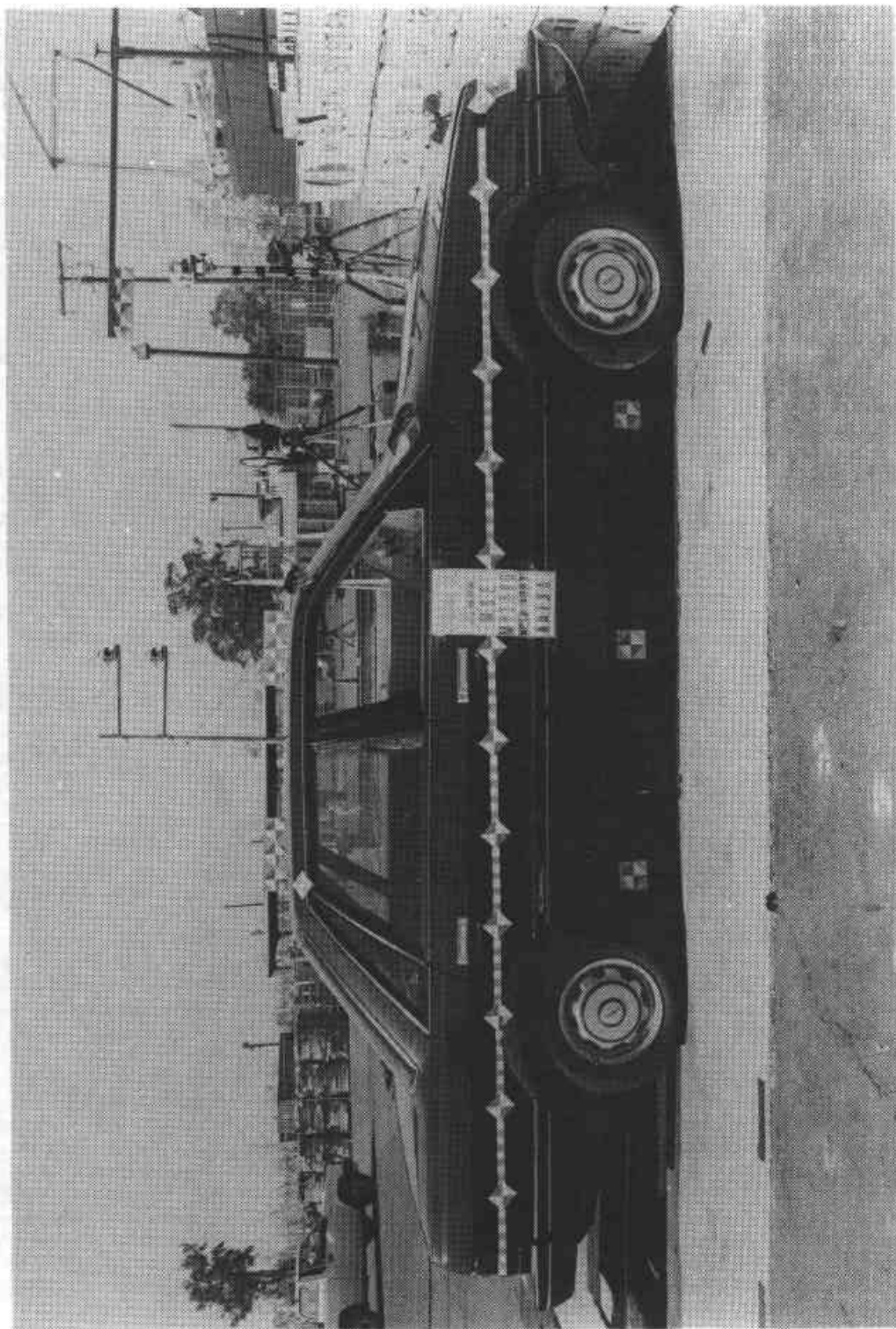
PRETEST LEFT SIDE VIEW



POSTTEST LEFT SIDE VIEW

A-4

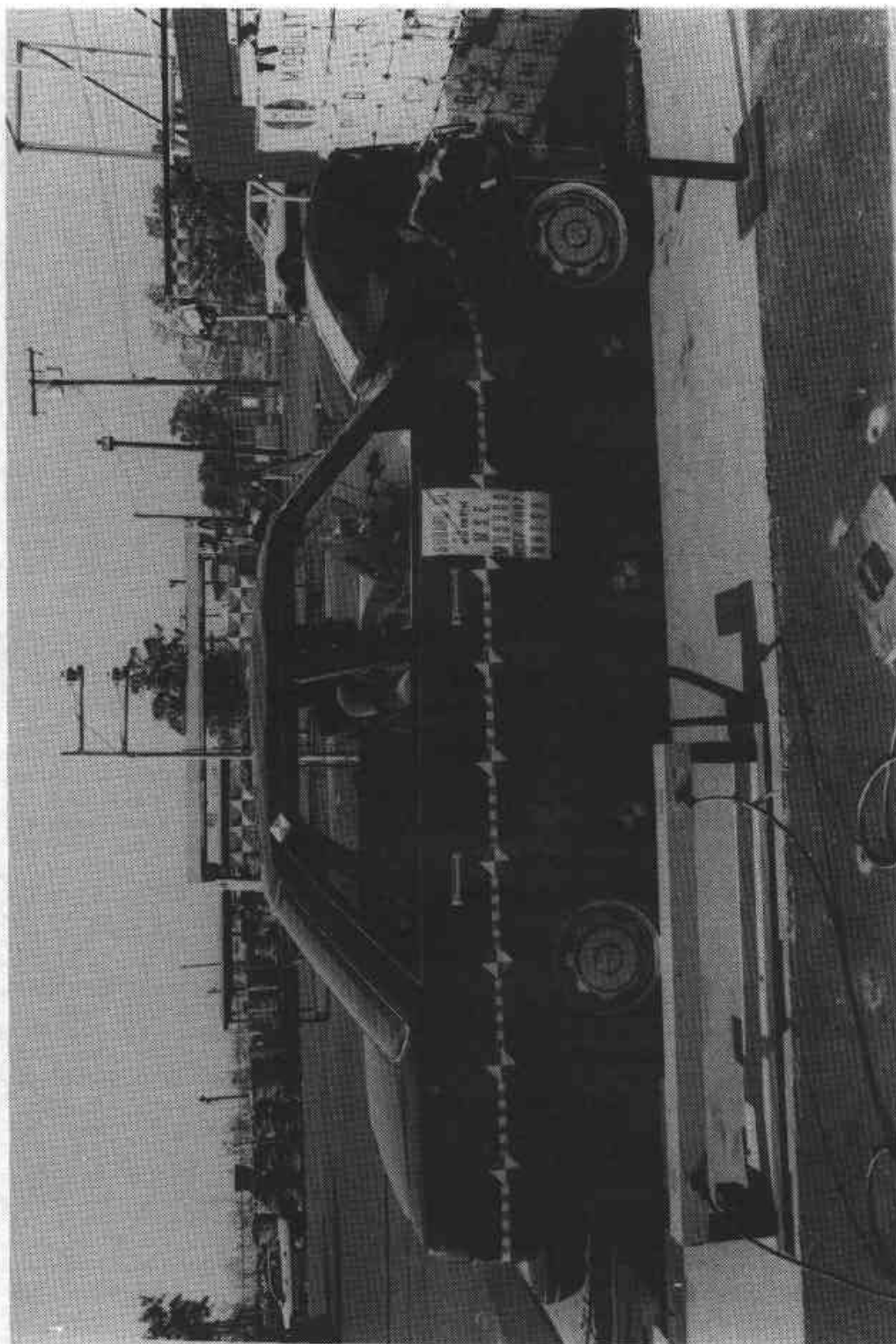
R7005-05



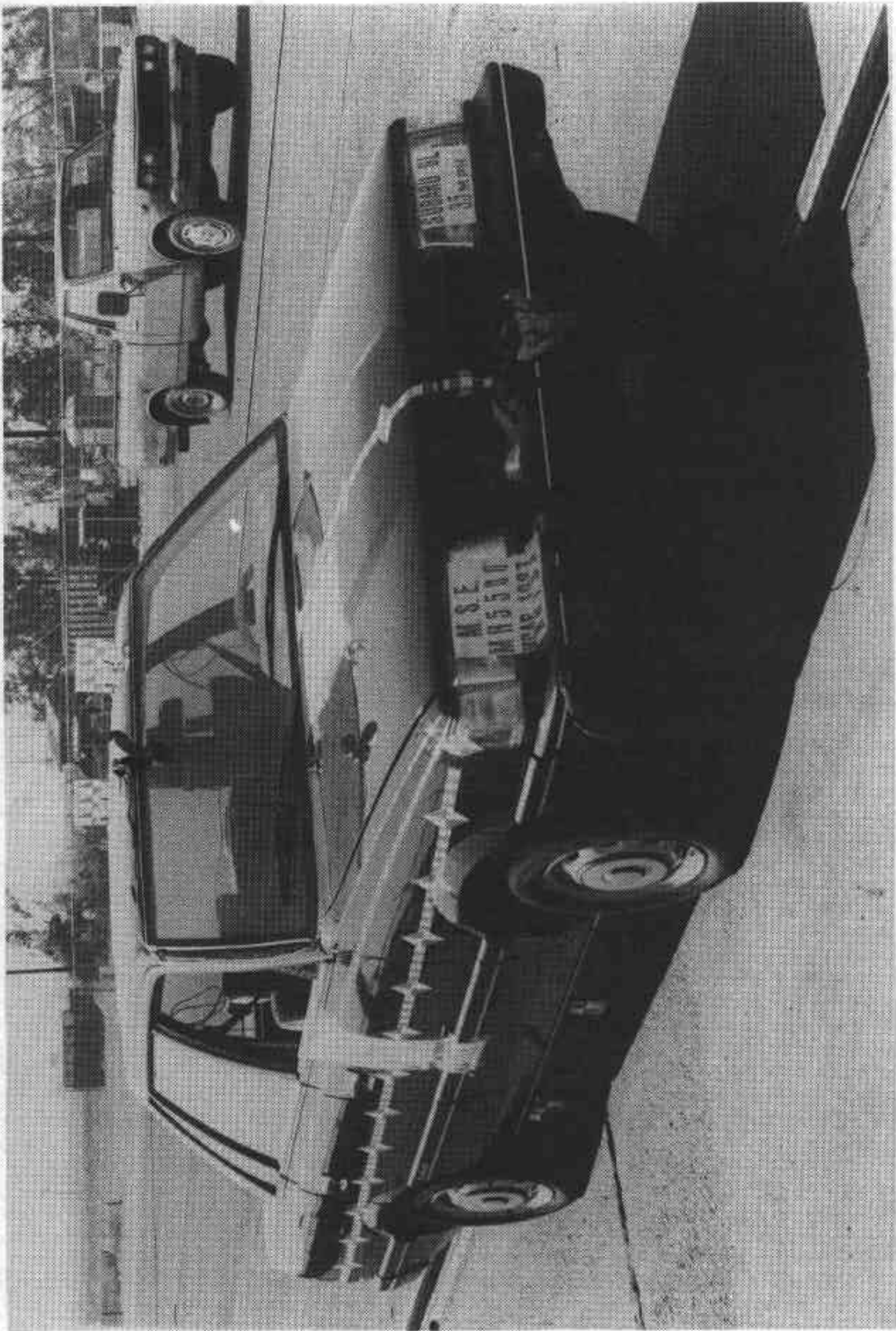
PRETEST RIGHT SIDE VIEW

A-5

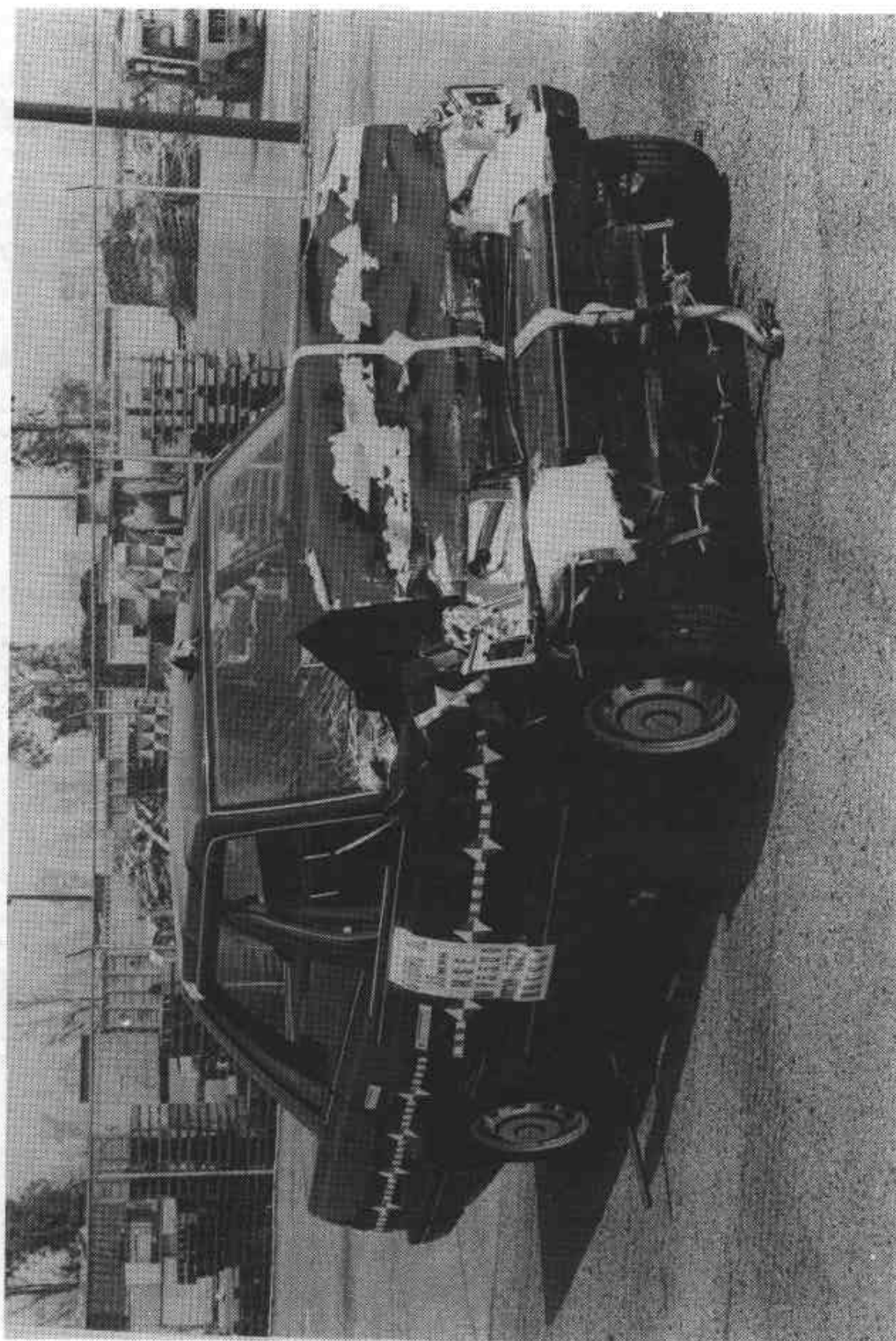
R7005-05



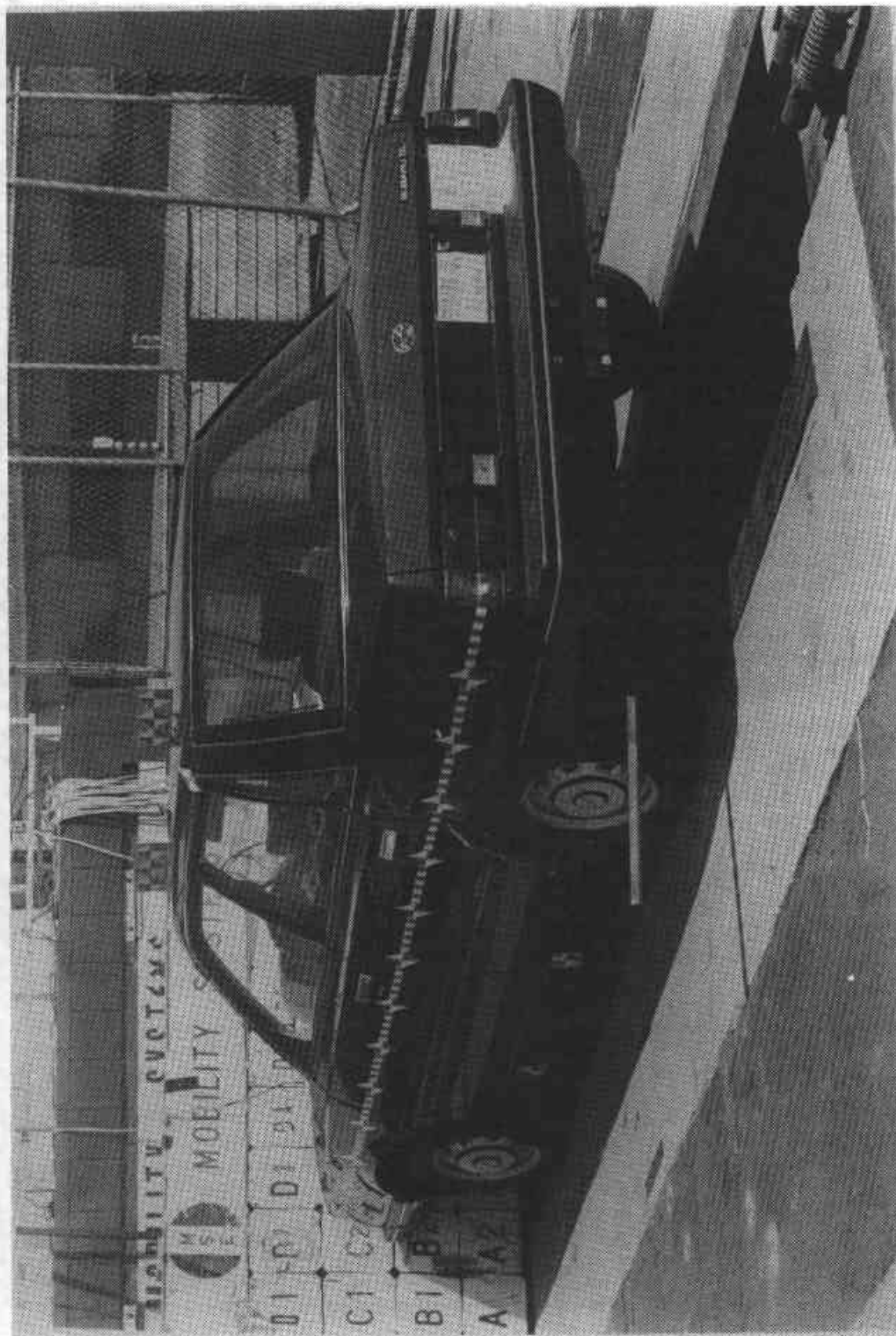
POSTTEST RIGHT SIDE VIEW



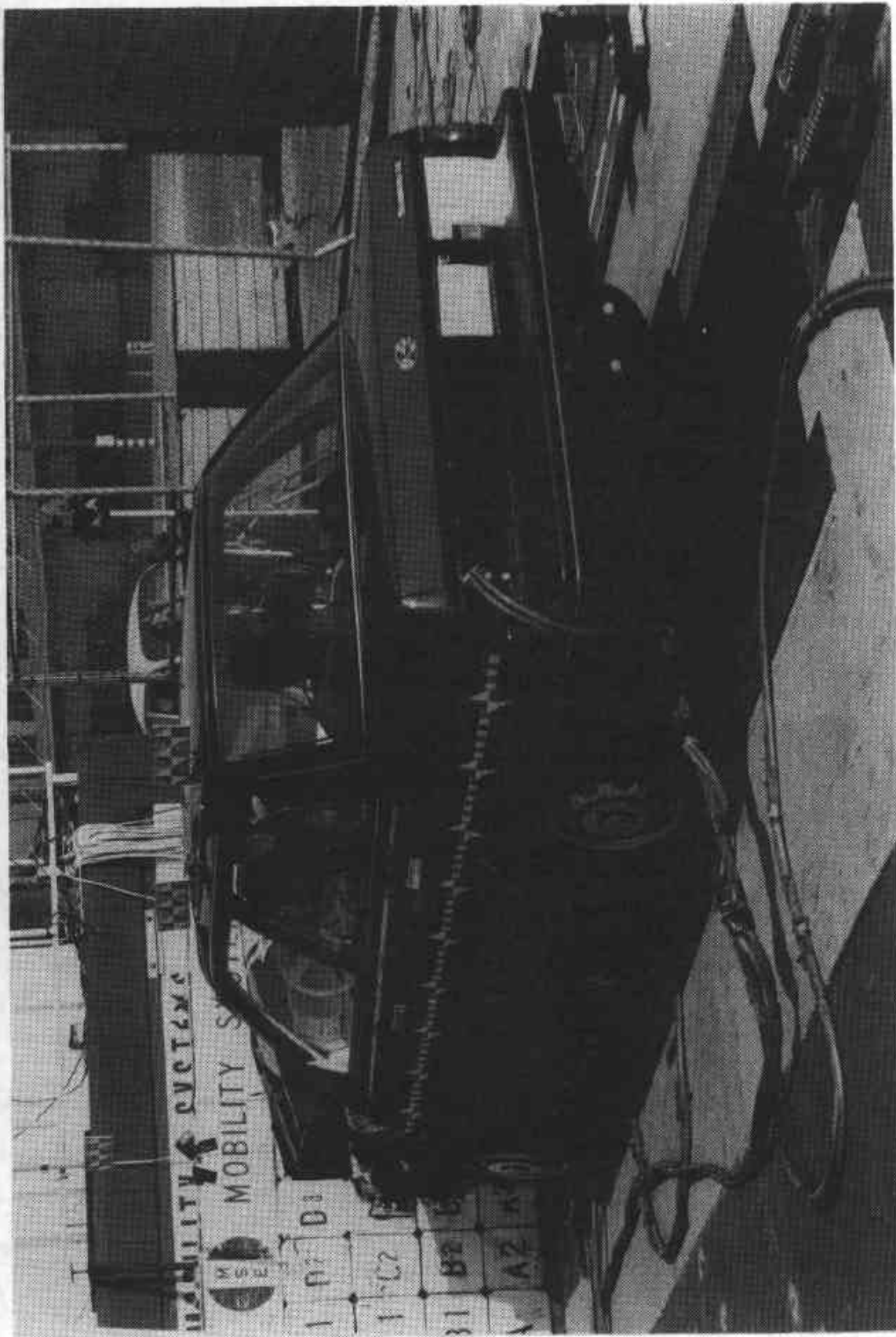
PRETEST RIGHT FRONT 3/4 VIEW



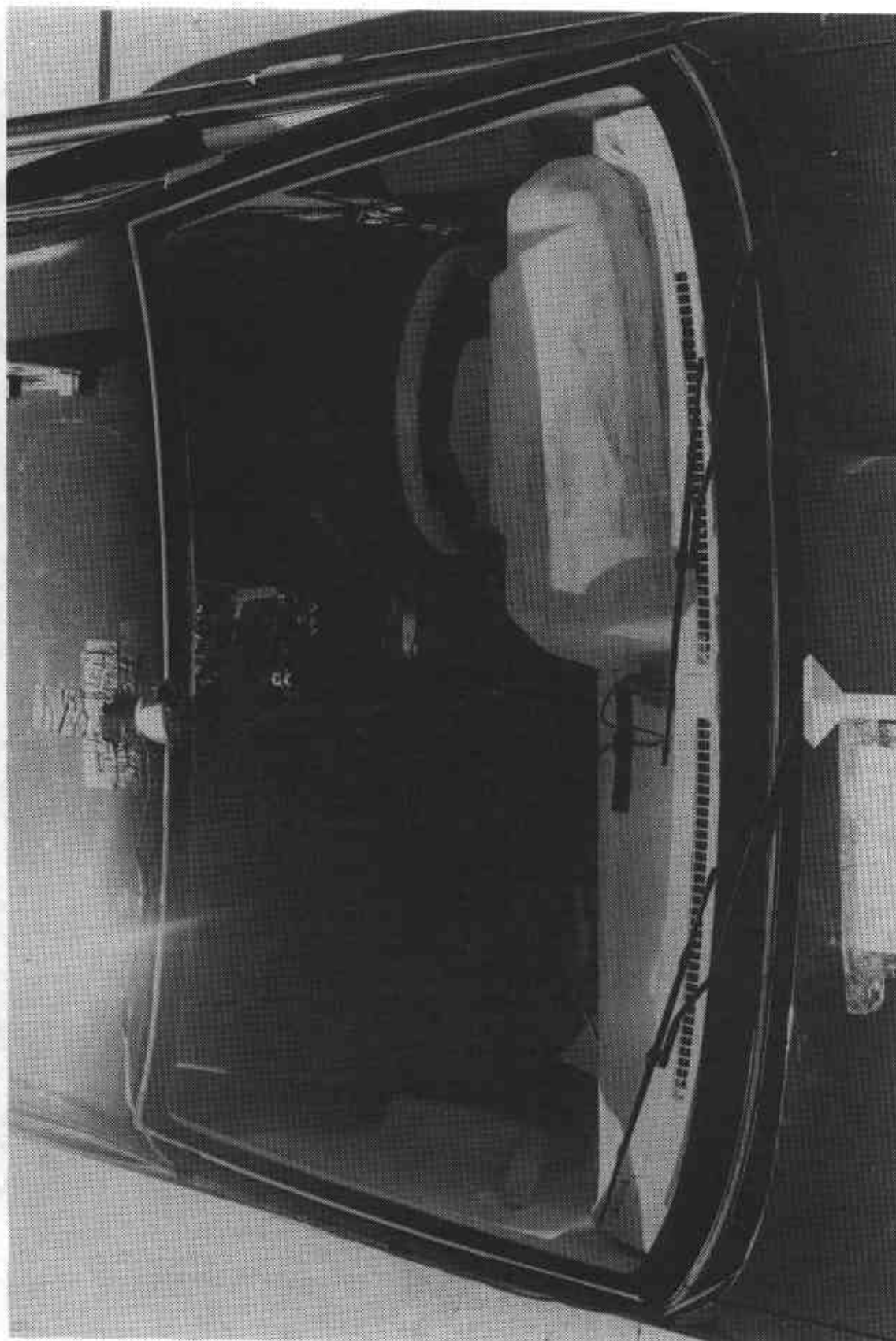
POSTTEST RIGHT FRONT 3/4 VIEW



PRETEST LEFT REAR 3/4 VIEW



POSTTEST LEFT REAR 3/4 VIEW



PRETEST WINDSHIELD VIEW

A-11

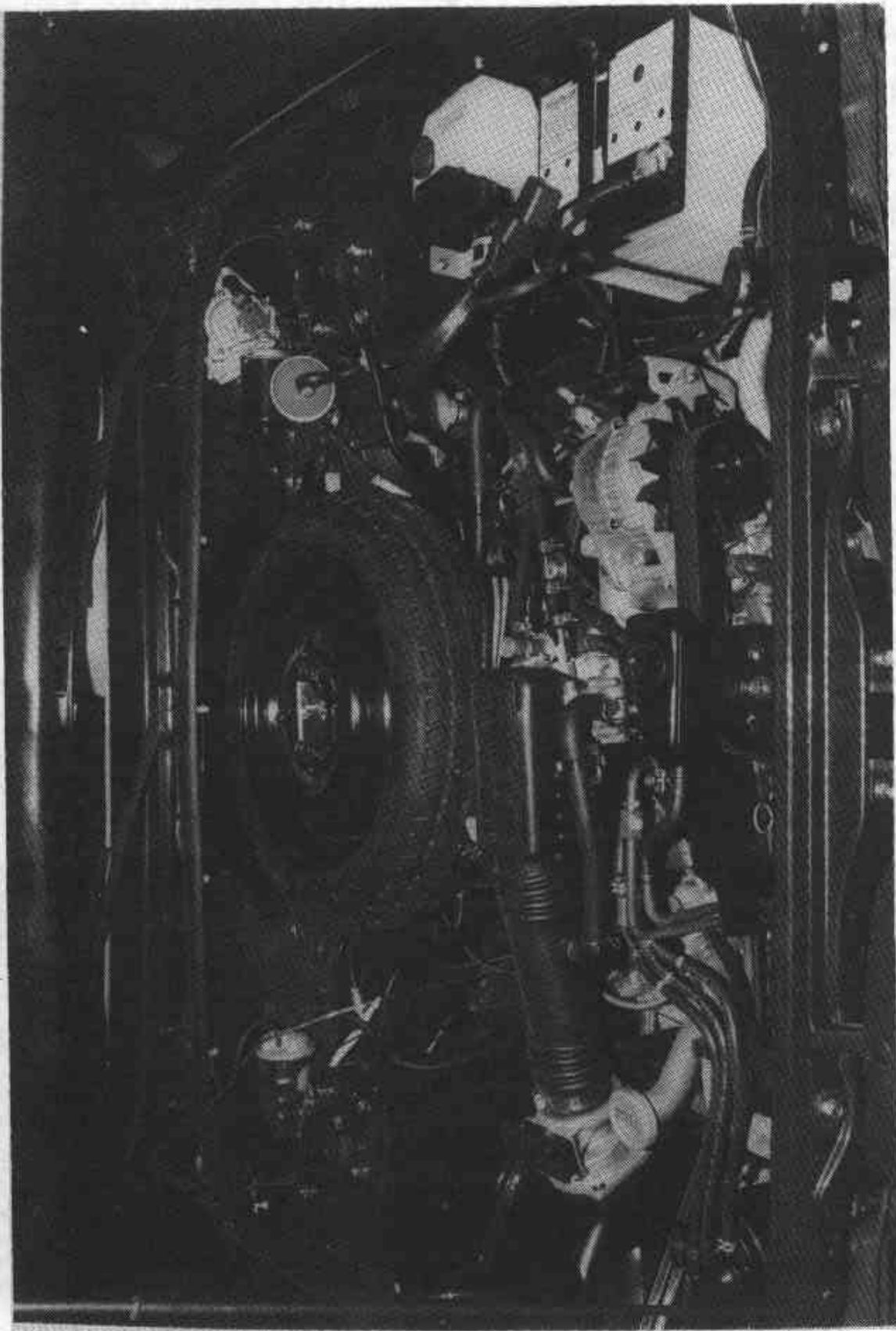
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POSTTEST WINDSHIELD VIEW

A-12

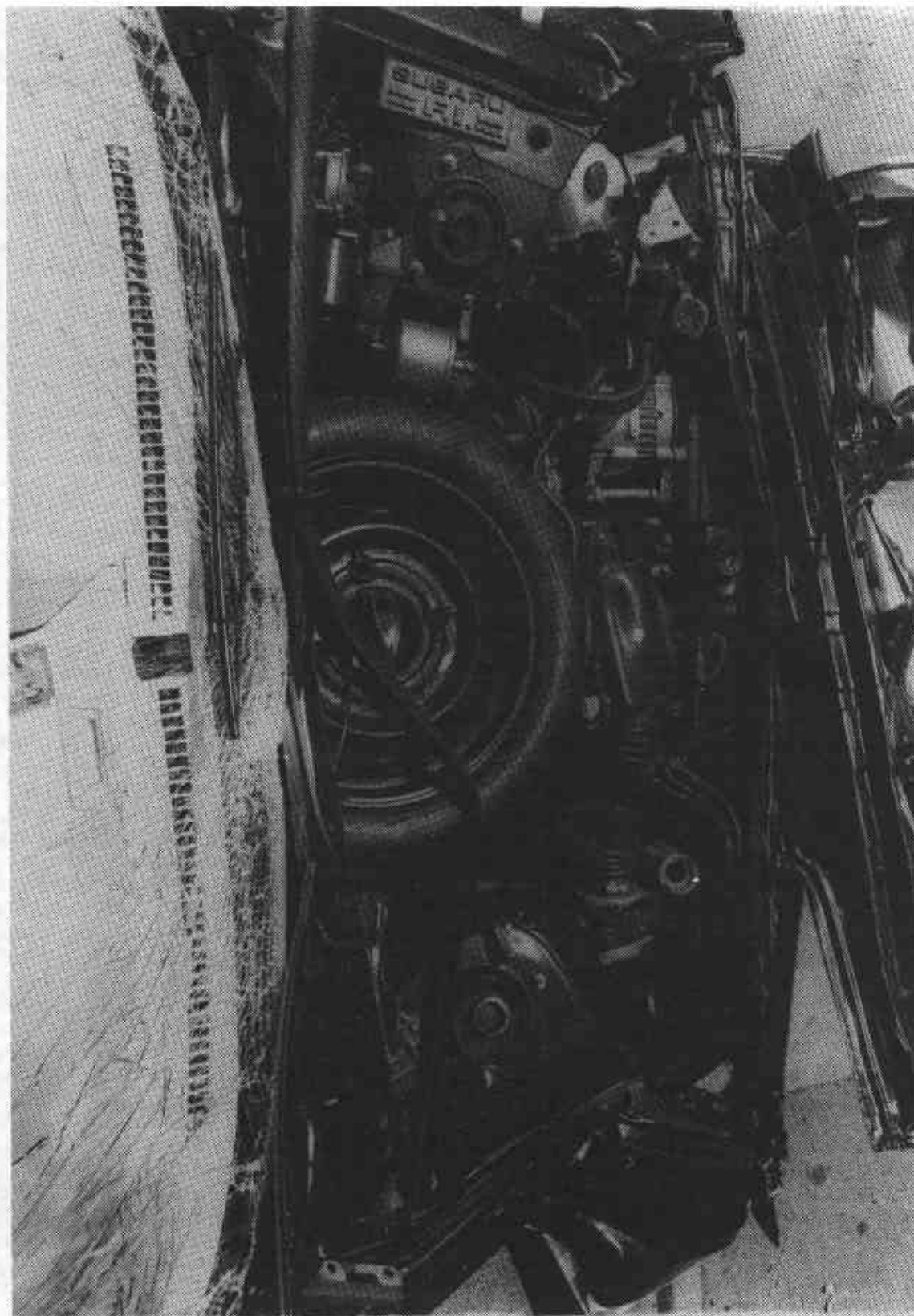
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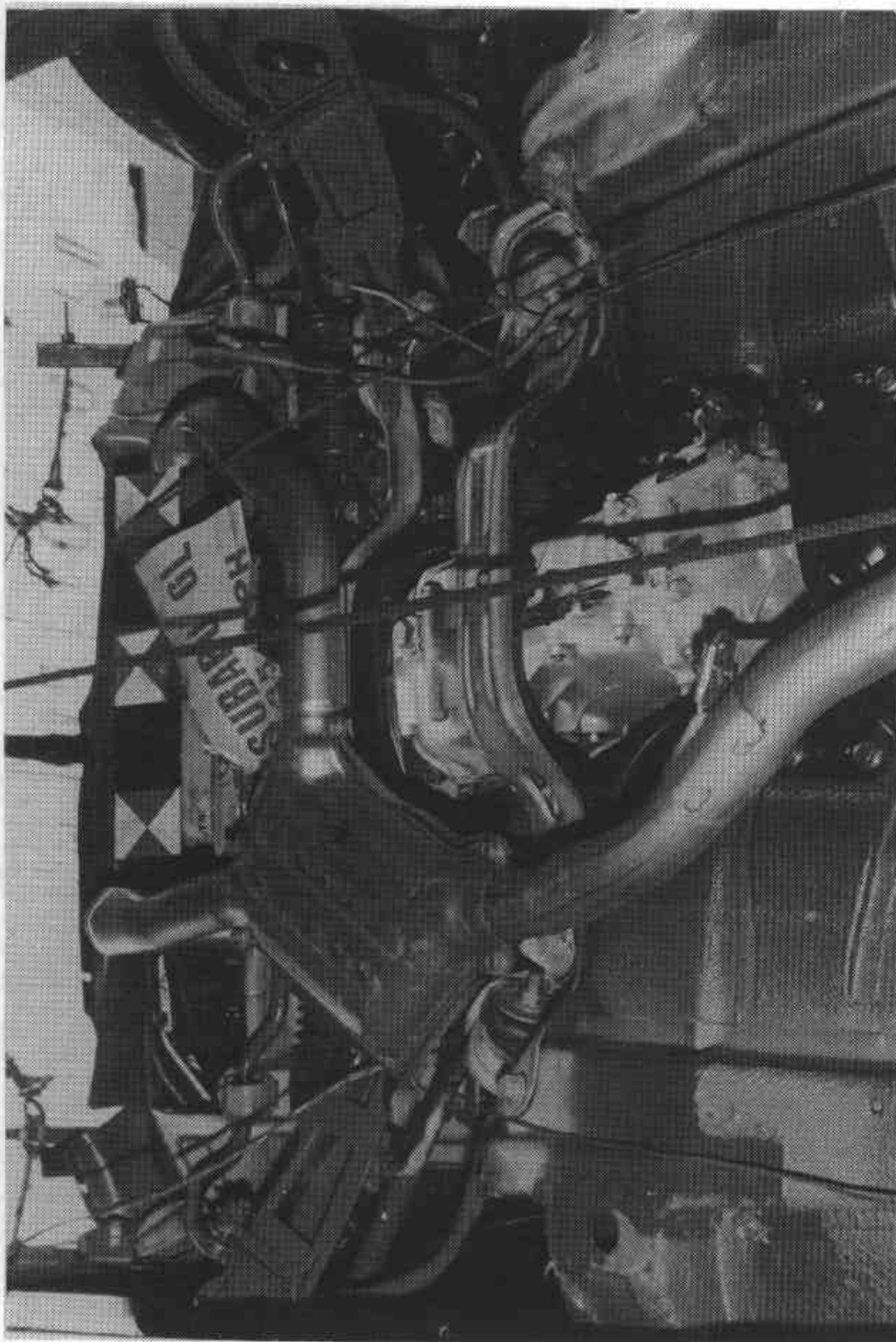
PRETEST ENGINE COMPARTMENT VIEW

A-13

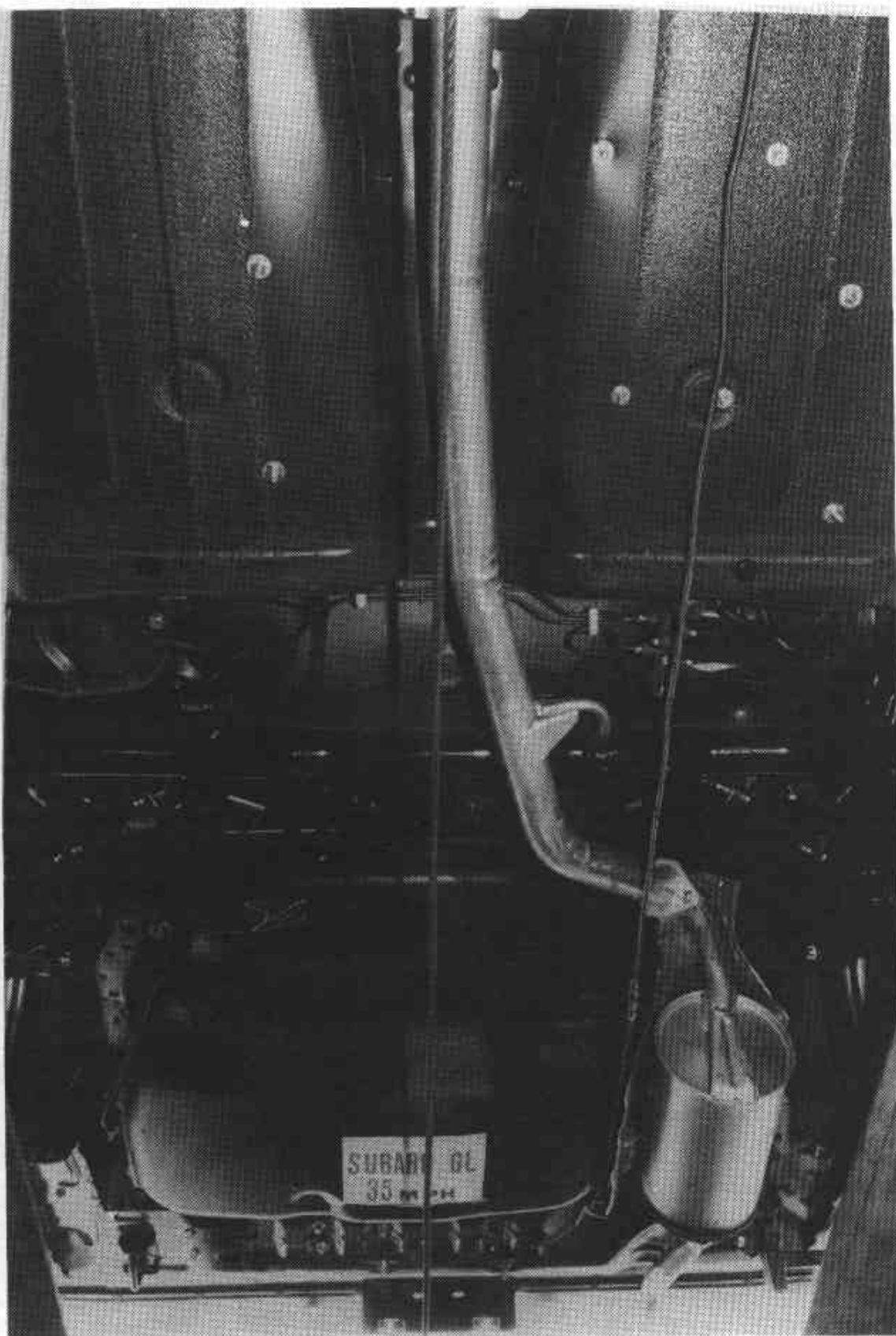
R7005-05



POSTTEST ENGINE COMPARTMENT VIEW



POSTTEST FRONT UNDERBODY VIEW



PRETEST REAR UNDERBODY VIEW
A-17

R7005-05



POSTTEST REAR UNDERBODY VIEW
A-18

R7005-05



PRETEST DRIVER DUMMY POSITION VIEW



POSTTEST DRIVER DUMMY POSITION VIEW

A-20

R7005-05



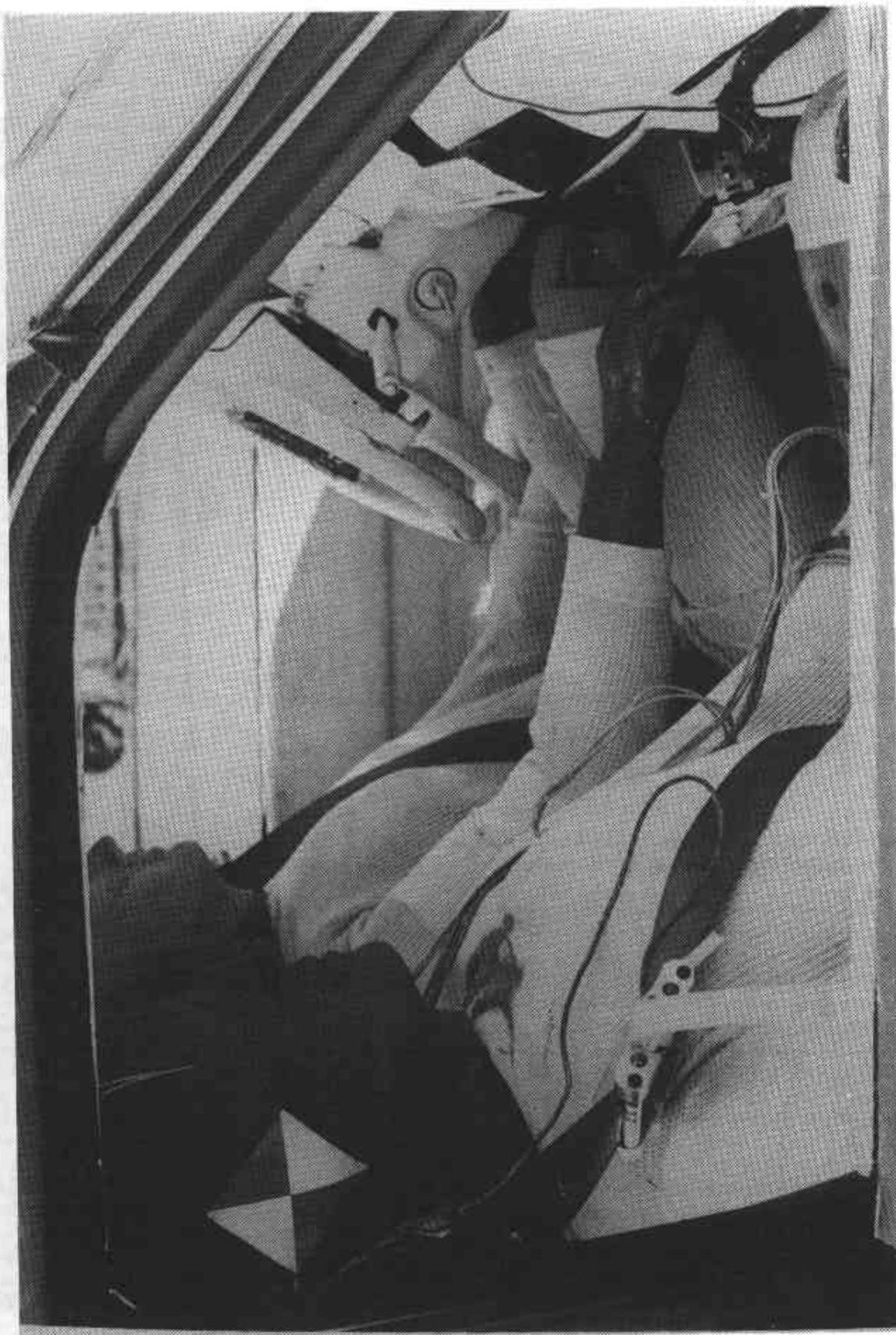
PRETEST DRIVER DUMMY & VEHICLE INTERIOR VIEW (Door Open) R7005-05
A-21



POSTTEST DRIVER DUMMY & VEHICLE INTERIOR VIEW (Door Open) R7005-05
A-22



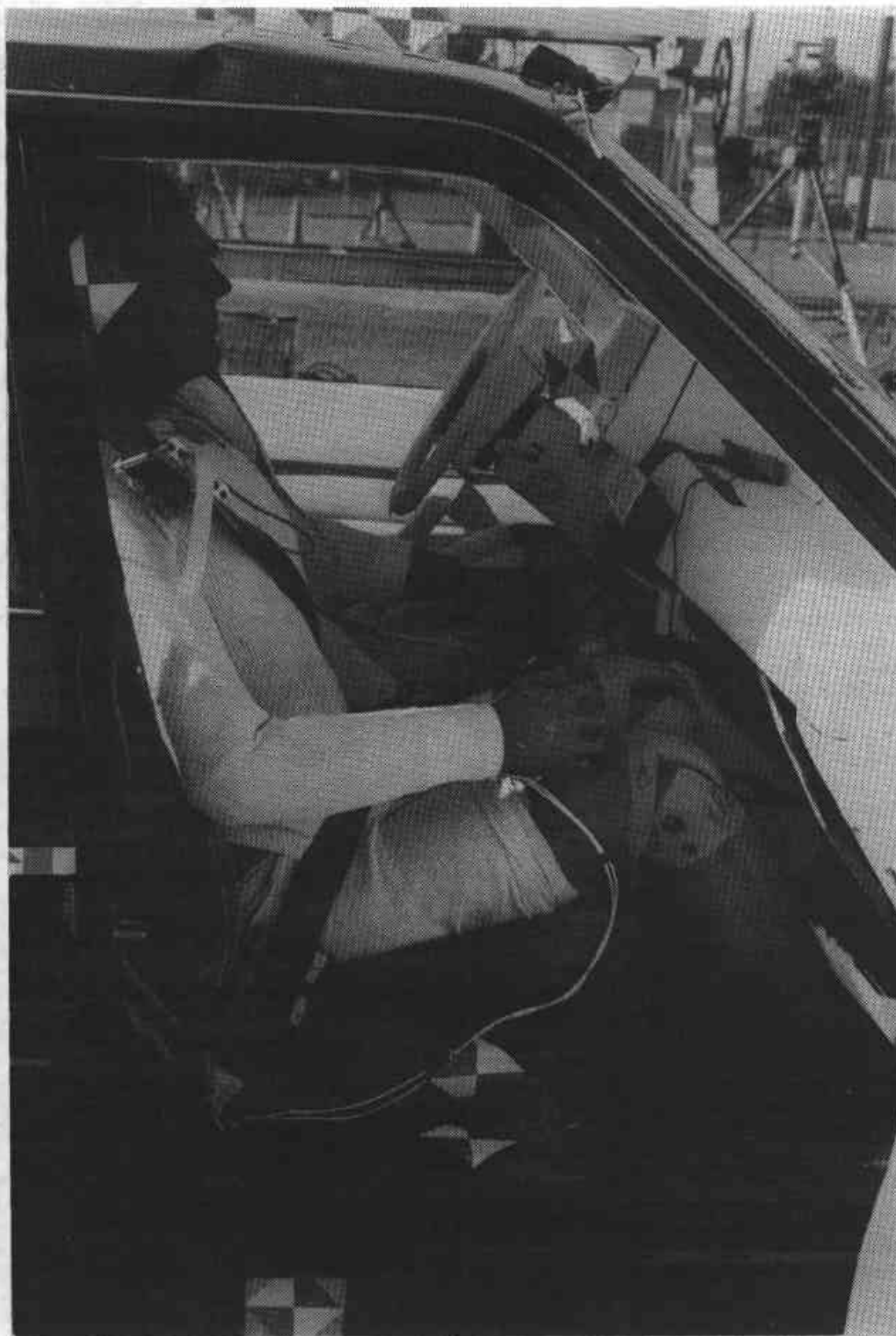
PRETEST PASSENGER DUMMY POSITION VIEW



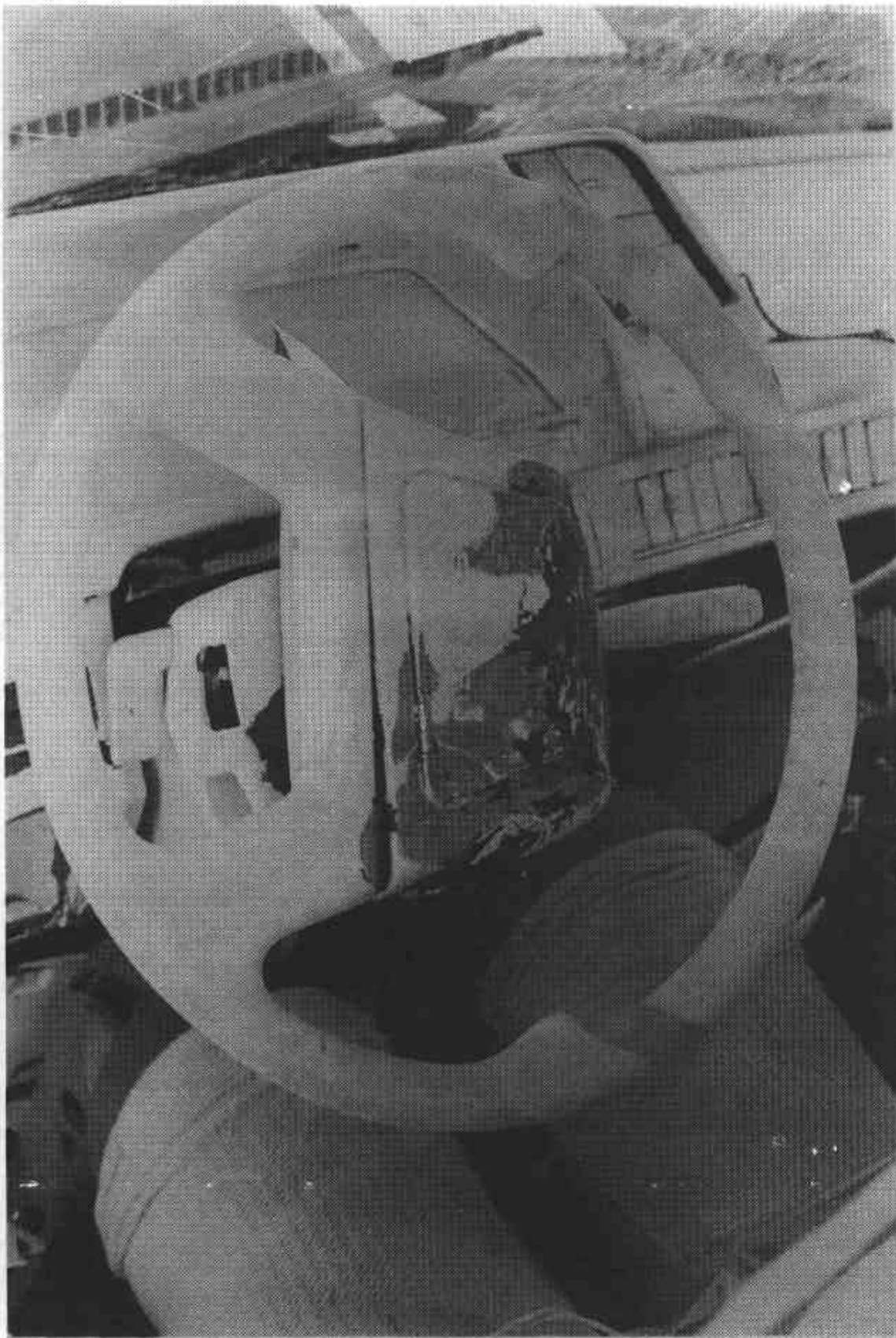
POSTTEST PASSENGER DUMMY POSITION VIEW



PRETEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW (Door Open) 7005-05
A-25

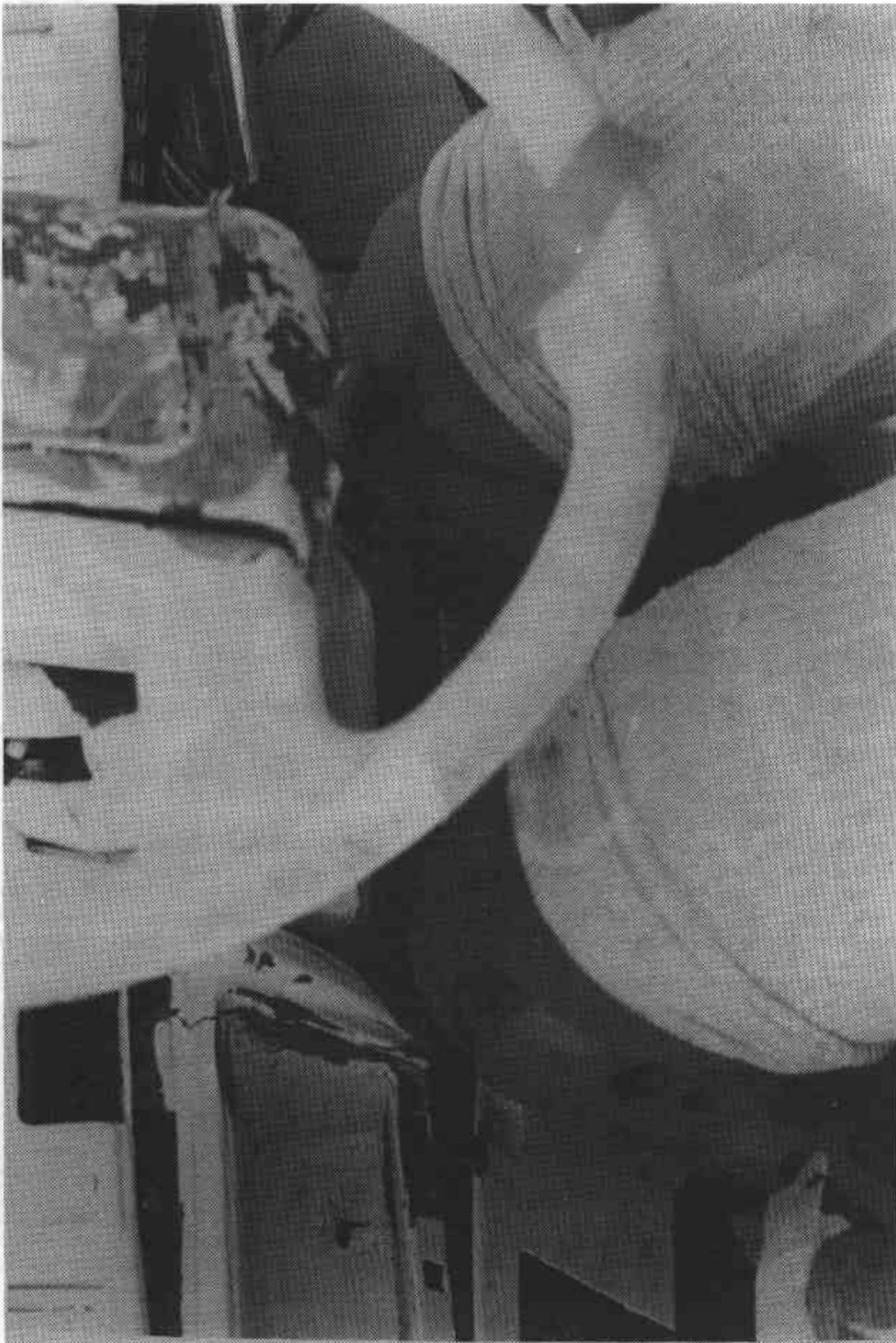


POSTTEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW (Door Open) R7005-05



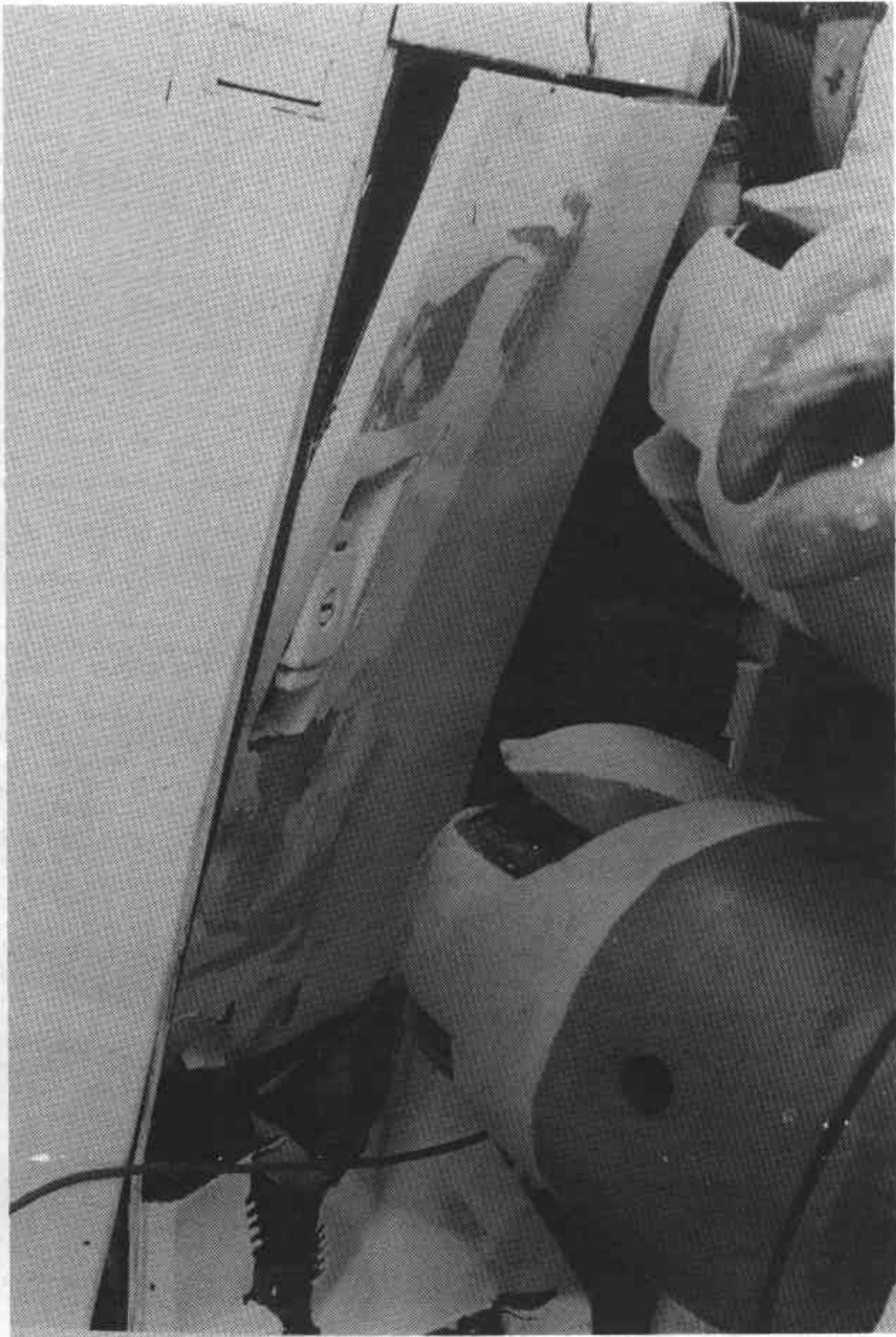
POSTTEST DRIVER DUMMY STEERING COLUMN HUB/RIM CONTACT

R7005-05



POSTTEST DRIVER DUMMY KNEE CONTACT AREA

R7005-05



POSTTEST PASSENGER DUMMY KNEE CONTACT AREA

APPENDIX B-1

VEHICLE AND DUMMY (ATD) RESPONSE DATA

DATA FILTERING:

ATD Head Channels	- Class 1000
ATD Chest Channels	- Class 180
ATD Femur Channels	- Class 600
Vehicle Channels	- Class 60

TAPE HEADER FOR THE SUBARU GL

V21 1987 35 MPH NCAP FRONTAL BARRIER IMPACT ACQUIRE NCAP DATA USING TWO INSTR. DUMMIES AND
LOAD CELL BARRIER 25/AUG/87MSDTH22-87-D-02009 N26057NCAUTBASHDRY086FMTUM835.20000000.09999.9ENG067
NO COMMENTS

212602874S JF1AC43B6HB2343604CIF 109.0 CID MF 2740 97.2 174.3 65.4 41.8SPN0NP UNMODIFIED
174.3 156.5 118.5 119.6 119.7 120.7 120.7 81.6 81.7 82.2 82.3 120.0 120.1 132.5 132.
4 102.4 15.2 16.5 172.8 172.7 25.5 35.20000000NANANA999.9999.9999.9999.9999.912FDEN5 65.4 00.0 22.3 152.0 144.0
117.0 119.3 119.0 120.5 120.5 81.1 81.2 81.9 82.0 119.7 120.0 126.0 126.0 100.0 14.0 14.0 151.0 154.0 25.5999999N
0 COMMENTS

3RLC8000999.9 36 50KLB LOAD CELLS ARRANGED IN A 9 WIDE BY 4 HIGH MATRIX.

4101P599H999999P550MFG: HUMANOID SYSTEMS, S/N 465

UNMODIFIED

NO COMMENTS

17.0 20.6

4.1 6.6 22.2 14.5 4.2 8.0 5.0999.9999.9999.9999.93PTSWEND COMMENTS

CNNASHNOSWUNDPN01339. 70.125 81.125 58.31016. 694. 351.1247.1782.NO COMMENTS

4102P599H999999P550MFG: HUMANOID SYSTEMS, S/N 467

UNMODIFIED

NO COMMENTS

17.2 20.7

3.5 6.2 23.1999.9 4.0 6.4 5.0999.9999.9999.9999.93PTDPLNO COMMENTS

CNNANONONONODPN0 884. 68.250104.250 44.1 405. 309. 379.1479.1865.NO COMMENTS

51001AC01HDCGYLG'S01650MFG: ENDEVCO, MODEL: 7264-200, S/N: BF83H

31/JUL/8700200070035.2-0360

02499 125AM

51002AC01HDCGYLG'S01650MFG: ENDEVCO, MODEL: 7264-200, S/N: BE29H

31/JUL/8700200012000.0-0360

02499 125AM

51003AC01HDCGYLG'S01650MFG: ENDEVCO, MODEL: 7264-200, S/N: BJ15H

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02499 125AM

51004AC01CHSTXLG'S01650MFG: ENDEVCO, MODEL: 7264-200, S/N: AD76

31/JUL/8700200030035.2-0360

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51005AC01CHSTYLG'S01650MFG: SETRA, MODEL: 111, S/N: 1109

31/JUL/8700250011000.0-0360

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51006AC01CHSTZLG'S01650MFG: ENDEVCO, MODEL: 7264-200, S/N: AD99

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02499 125AM

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02499 125AM

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51011AC02CHSTYLG'S01650MFG: SETRA, MODEL: 111, S/N: 1076

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51012AC02CHSTZLG'S01650MFG: ENDEVCO, MODEL: 7264-200, S/N: AE29

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51013LC01FHRLXLLBS01650MFG: GSE, MODEL: 2430, S/N: 701

05/AUG/8703000034999.9-0360

02499 125AM

51014LC01FHRLXLLBS01650MFG: GSE, MODEL: 2430, S/N: 707

05/AUG/8703000023999.9-0360

02499 125AM

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02499 125AM

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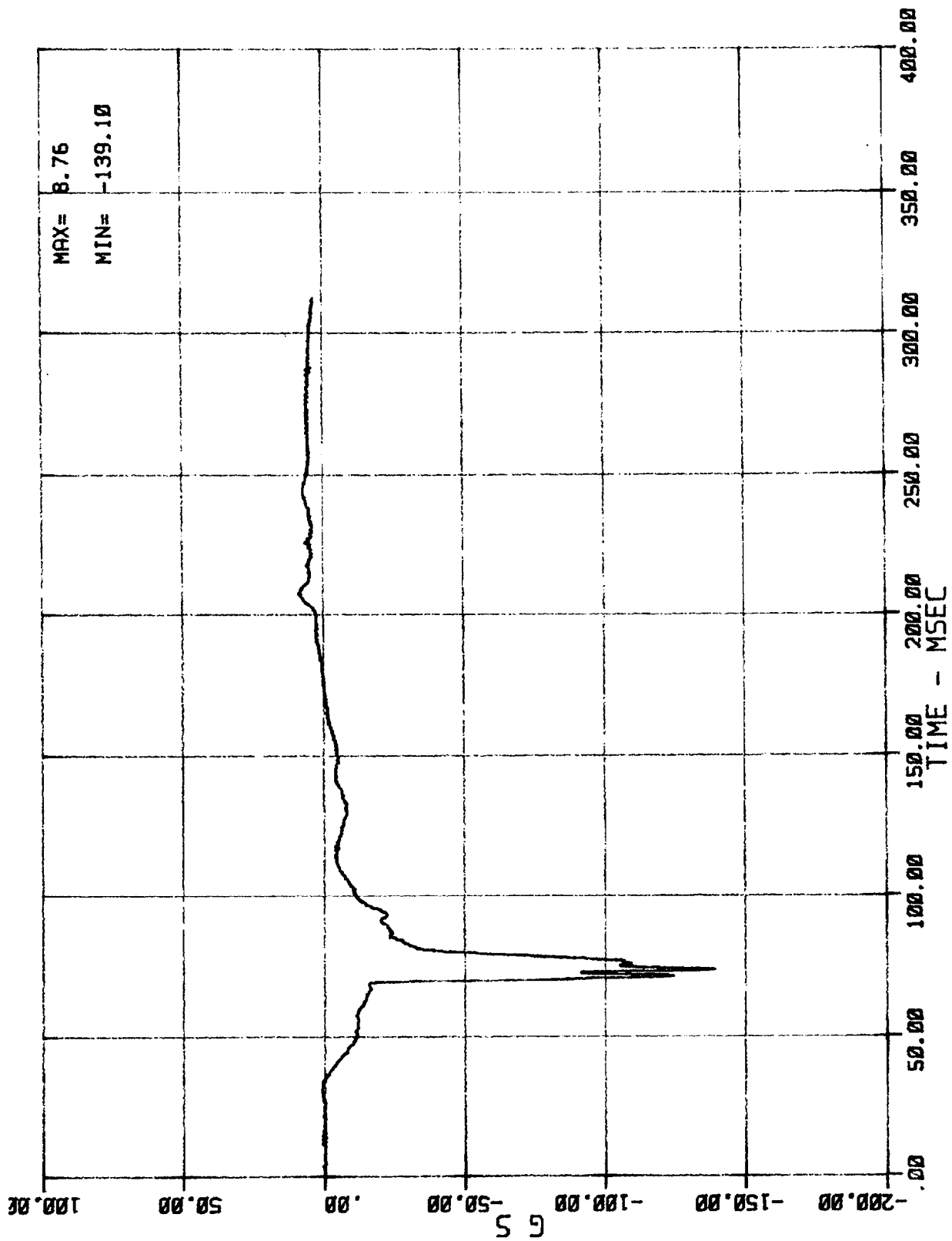
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05/AUG/8703500042999.9-0360

02499 125AM	51021DS01SHBEOTINS01650MFG: BOURNS, MODEL: 8 IN LIN S/N: NAW	12/AUG/8700000021999.9-0360
02499 125AM	51022DS02SHBEOTINS01650MFG: BOURNS, MODEL: 8 IN LIN S/N: NAW	12/AUG/8700000029999.9-0360
02499 125AM	51023DS01SHBTOTOTH01650MFG: BOURNS, MODEL: 2051414101 S/N: NAW	12/AUG/87000030012999.9-0360
02499 125AM	SEAT BELT ELONGATION, UNITS ARE INCHES/IN.(PERCENTAGE BELT STRECTH)	
02499 125AM	51024DS02SHBTOTOTH01650MFG: BOURNS, MODEL: 2051414101 S/N: NAW	12/AUG/87000030015999.9-0360
02499 125AM	SEAT BELT ELONGATION, UNITS ARE INCHES/IN.(PERCENTAGE BELT STRECTH)	
02499 125AM	51025ACNWSULFXGG/S01650MFG: SETRA, MODEL: 111 S/N: 1117	30/JUL/8700250115035.2-0360
02499 125AM	LEFT FRONT BRAKE CALIPER	
02499 125AM	51026ACNWSURFXGG/S01650MFG: SETRA, MODEL: 111 S/N: 1112	30/JUL/8700250070035.2-0360
02499 125AM	RIGHT FRONT BRAKE CALIPER	
02499 125AM	51027ACNWSGNXGG/S01650MFG: SETRA, MODEL: 111 S/N: 1111	30/JUL/8700250082035.2-0360
02499 125AM	ENGINE BOTTOM	
02499 125AM	51028ACNWSGNXGG/S01650MFG: SETRA, MODEL: 113 S/N: 1078	30/JUL/8700250135035.2-0360
02499 125AM	ENGINE TOP	
02499 125AM	51029ACNADPLCXGG/S01650MFG: SETRA, MODEL: 111 S/N: 1116	30/JUL/8700250050035.2-0360
02499 125AM	TOP OF DASH AT LATERAL C/L	
02499 125AM	51030ACNWFLLRXGG/S01650MFG: SETRA, MODEL: 111 S/N: 1121	30/JUL/8700250022035.2-0360
02499 125AM	LEFT SIDE FLOOR ON CROSS MEMBER BEHIND SEAT	
02499 125AM	51031ACNWFLLRXGG/S01650MFG: SETRA, MODEL: 111 S/N: 1123	30/JUL/8700250020035.2-0360
02499 125AM	RIGHT SIDE FLOOR ON CROSS MEMBER BEHIND SEAT	
04239 125AM	50032LCNALCAIXGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 15777	14/MAY/8550000002 0.0-0360
04239 125AM		
04239 125AM	50033LCNALCA2XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19261	14/MAY/8550000002 0.0-0360
04239 125AM		
04239 125AM	50034LCNALCA3XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19203	14/MAY/8550000003 0.0-0360
04239 125AM		
04239 125AM	50035LCNALCA4XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19263	14/MAY/8550000003 0.0-0360
04239 125AM		
04239 125AM	50036LCNALCA5XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19265	14/MAY/8550000010 0.0-0360
04239 125AM		
04239 125AM	50037LCNALCA6XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19266	14/MAY/8550000002 0.0-0360
04239 125AM		
04239 125AM	50038LCNALCA7XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19268	14/MAY/8550000004 0.0-0360
04239 125AM		
04239 125AM	50039LCNALCA8XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19270	14/MAY/8550000003 0.0-0360
04239 125AM		
04239 125AM	50040LCNALCA9XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19258	14/MAY/8550000003 0.0-0360
04239 125AM		
04239 125AM	50041LCNALCB1XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19273	14/MAY/8550000004 0.0-0360
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04239 125AM	50042LCNALCB2XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19276	14/MAY/8550000012 0.0-0360
04239 125AM		
04239 125AM	50043LCNALCB3XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19277	14/MAY/8550000026 0.0-0360
04239 125AM		
04239 125AM	50044LCNALCB4XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19278	14/MAY/8550000027 0.0-0360
04239 125AM		
04239 125AM	50045LCNALCB5XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19279	14/MAY/8550000052 0.0-0360
04239 125AM		
04239 125AM	50046LCNALCB6XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19282	14/MAY/8550000026 0.0-0360
04239 125AM		
04239 125AM	50047LCNALCB7XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19262	14/MAY/8550000028 0.0-0360
04239 125AM		
04239 125AM	50048LCNALCB8XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19285	14/MAY/8550000010 0.0-0360
04239 125AM		
04239 125AM	50049LCNALCB9XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19286	14/MAY/8550000003 0.0-0360
04239 125AM		
04239 125AM	50050LCNALCC1XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19287	14/MAY/8550000003 0.0-0360
04239 125AM		
04239 125AM	50051LCNALCC2XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19288	14/MAY/8550000014 0.0-0360
04239 125AM		
04239 125AM	50052LCNALCC3XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19289	14/MAY/8550000013 0.0-0360
04239 125AM		
04239 125AM	50053LCNALCC4XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19291	14/MAY/8550000019 0.0-0360

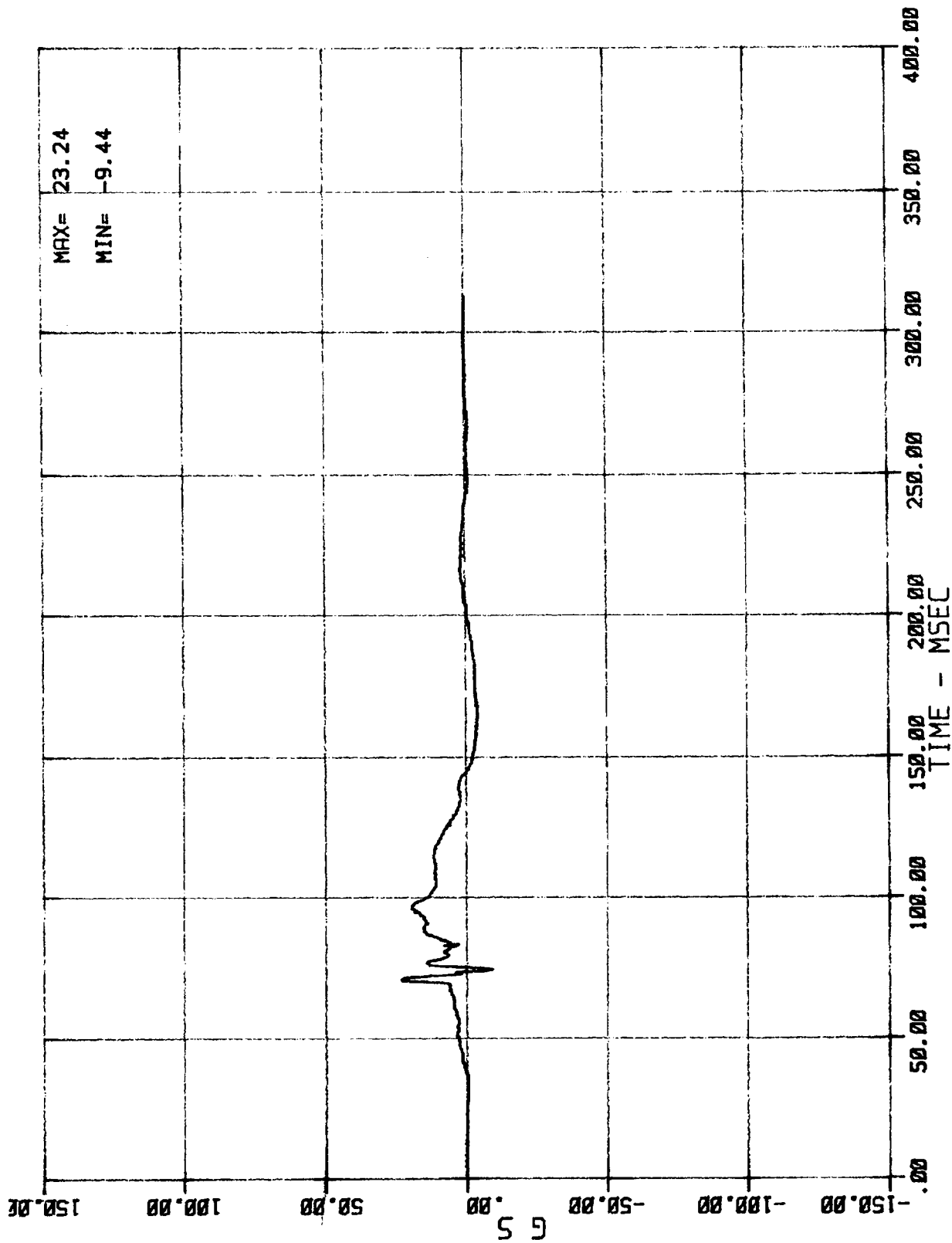
04239 125AM	50054LCNALCC5XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19324	14/MAY/8550000027 0.0-0360
04239 125AM	50055LCNALCC6XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19313	14/MAY/8550000015 0.0-0360
04239 125AM	50056LCNALCC7XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19314	14/MAY/8550000012 0.0-0360
04239 125AM	50057LCNALCC8XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19315	14/MAY/8550000002 0.0-0360
04239 125AM	50058LCNALCC9XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19316	14/MAY/8550000002 0.0-0360
04239 125AM	50059LCNALCD1XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19317	14/MAY/8550000003 0.0-0360
04239 125AM	50060LCNALCD2XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19318	14/MAY/8550000003 0.0-0360
04239 125AM	50061LCNALCD3XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19322	14/MAY/8550000002 0.0-0360
04239 125AM	50062LCNALCD4XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19323	14/MAY/8550000004 0.0-0360
04239 125AM	50063LCNALCD5XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19260	14/MAY/8550000004 0.0-0360
04239 125AM	50064LCNALCD6XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19325	14/MAY/8550000003 0.0-0360
04239 125AM	50065LCNALCD7XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19332	14/MAY/8550000001 0.0-0360
04239 125AM	50066LCNALCD8XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19333	14/MAY/8550000002 0.0-0360
04239 125AM	50067LCNALCD9XGLBS01650MFG: INTERFACE MODEL: 1220-FS S/N: 19330	14/MAY/8550000002 0.0-0360



01 AC 01 1 HED X (DRIVER HEAD ACCEL. -- X-AXIS)
MSE N26057 1987 SUBARU GL

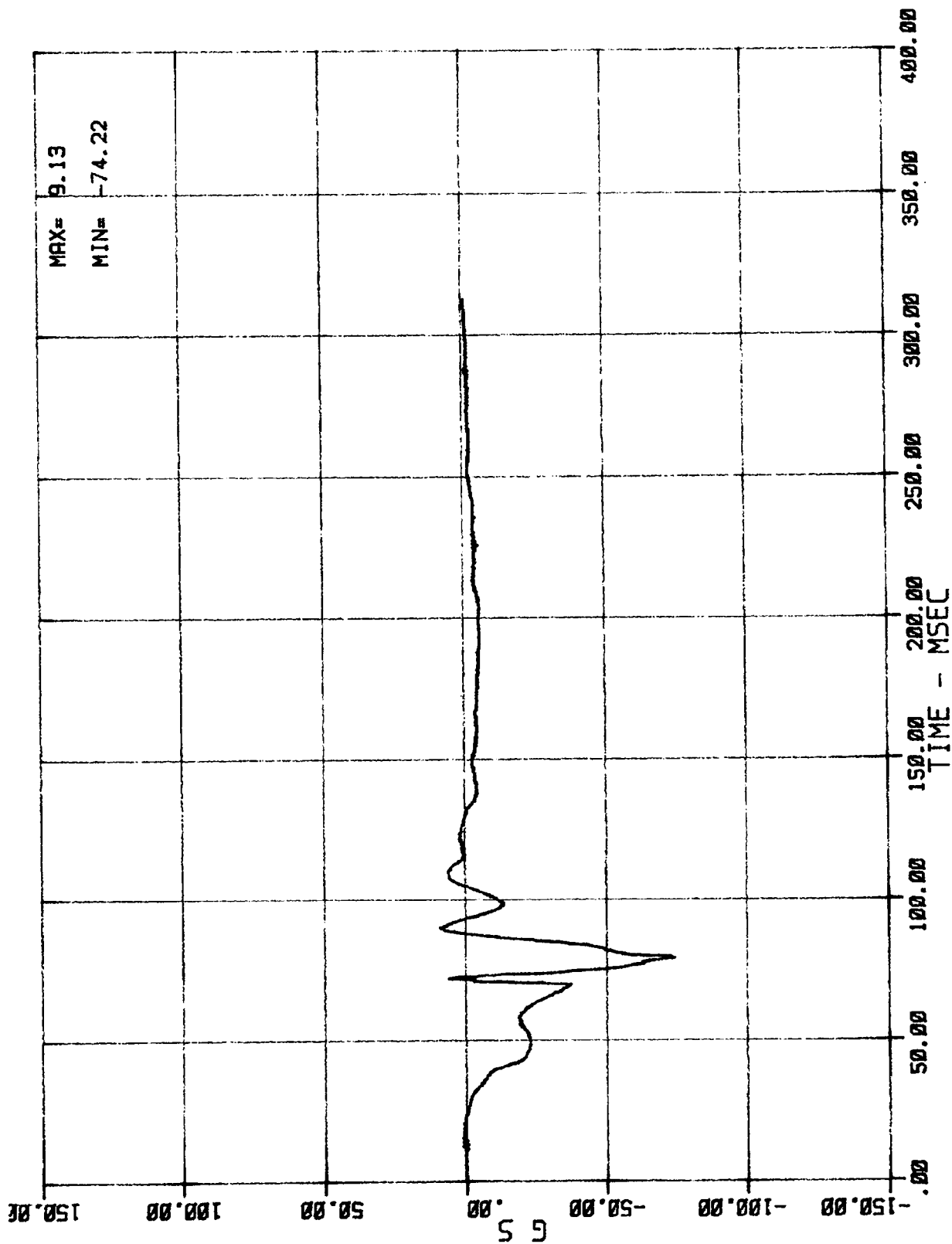
08/25/87

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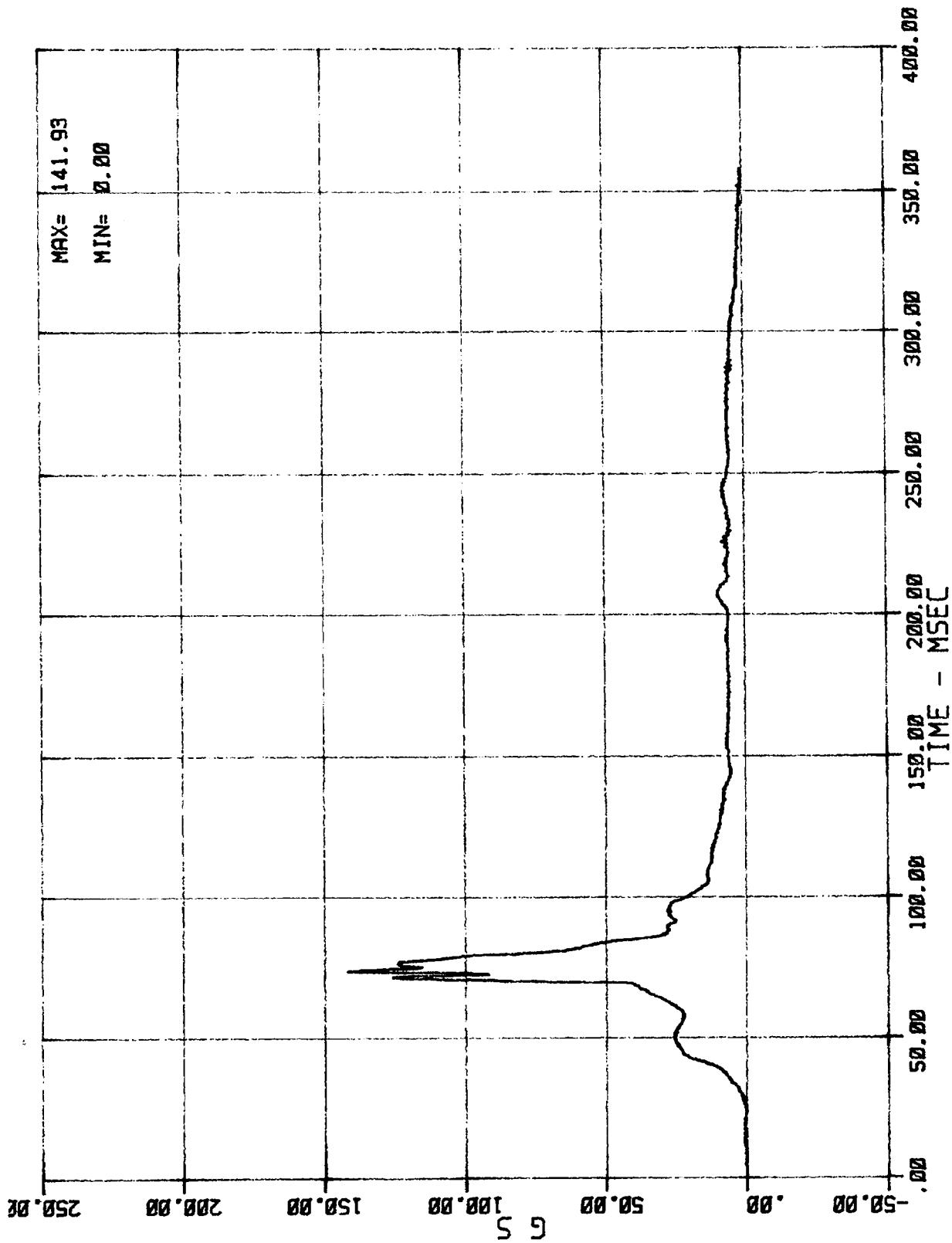
02 AC 01 1 HED Y (DRIVER HEAD ACCEL. -- Y-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



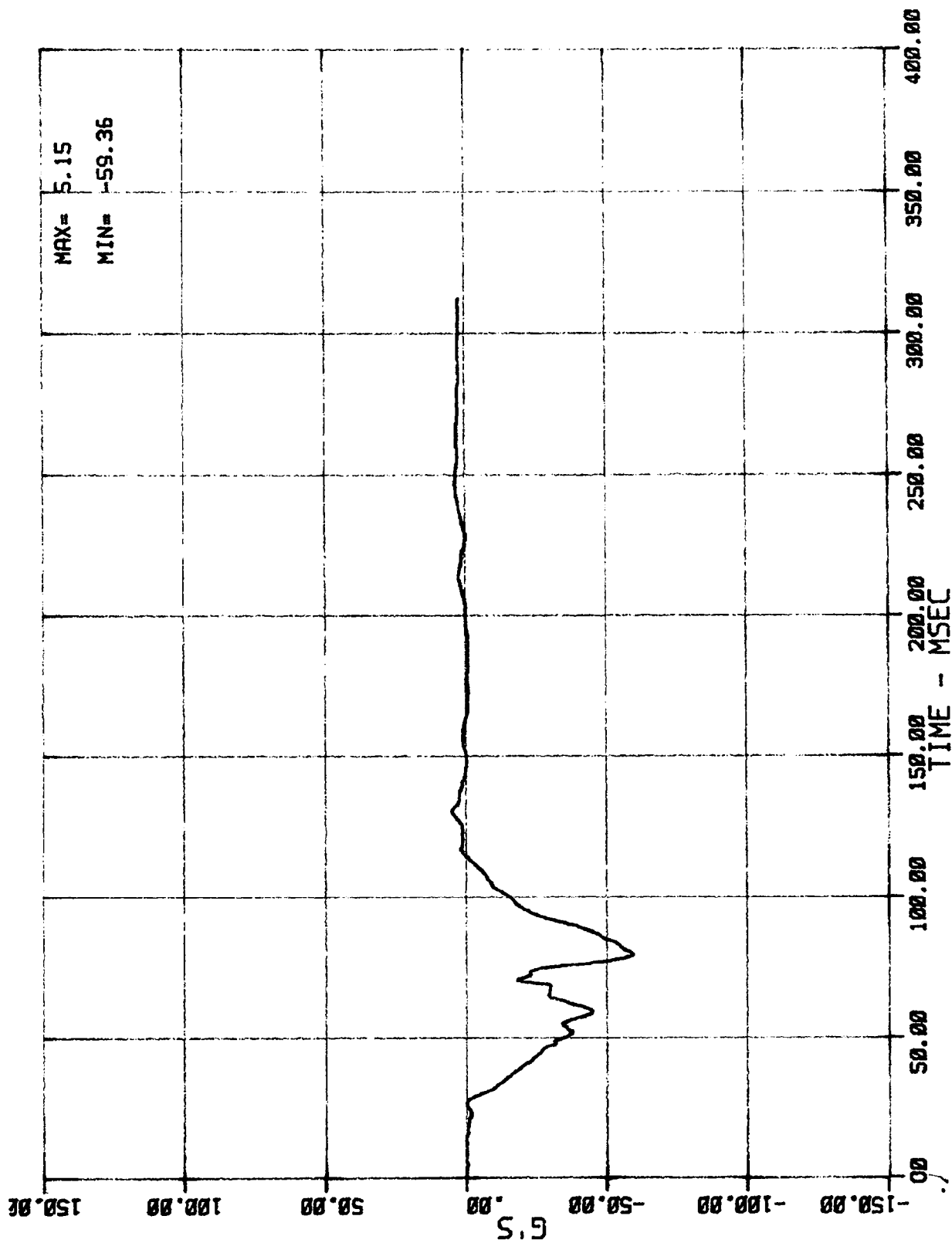
03 AC 01 1 HED Z (DRIVER HEAD ACCEL. -- Z-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



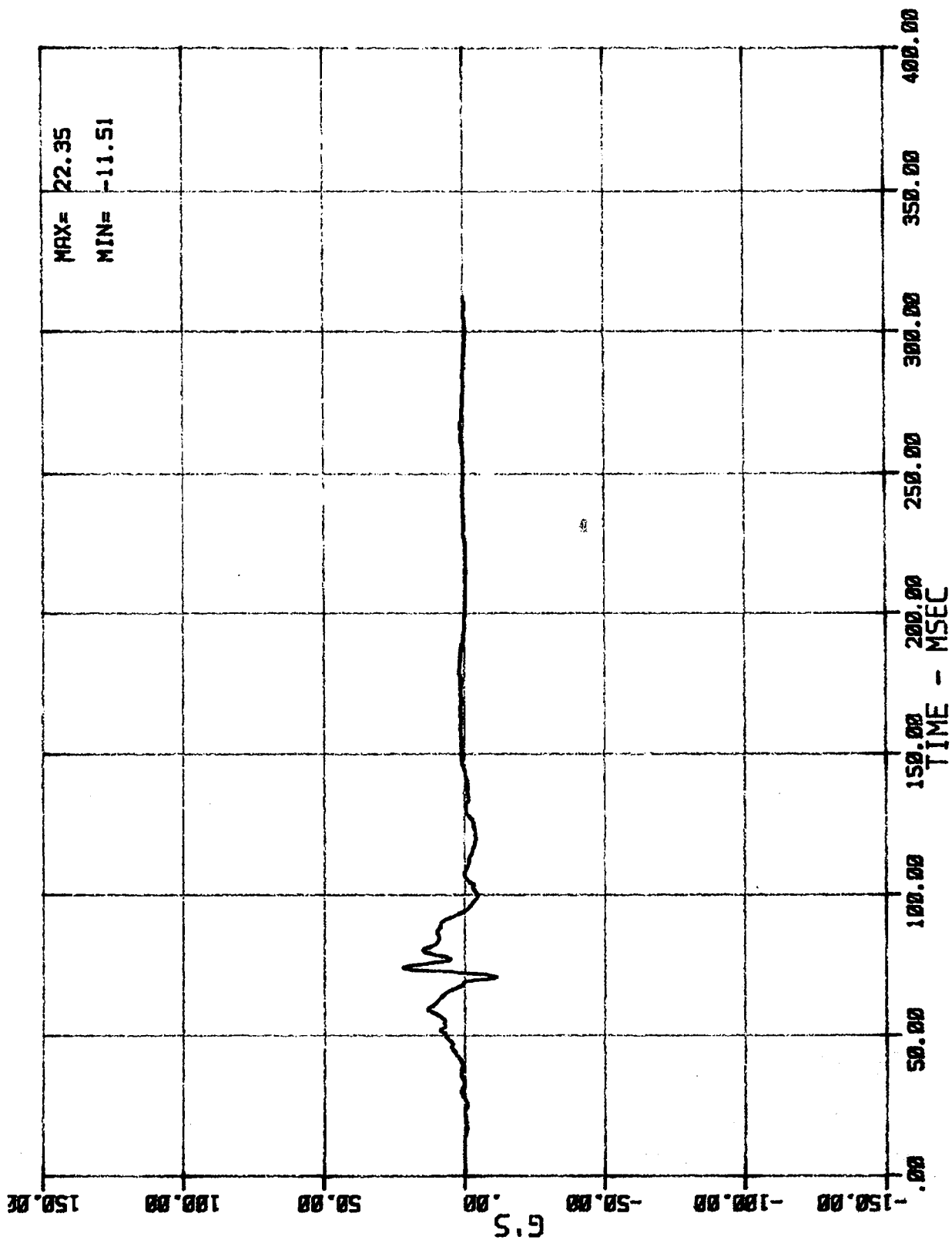
08/25/87

R7005-05



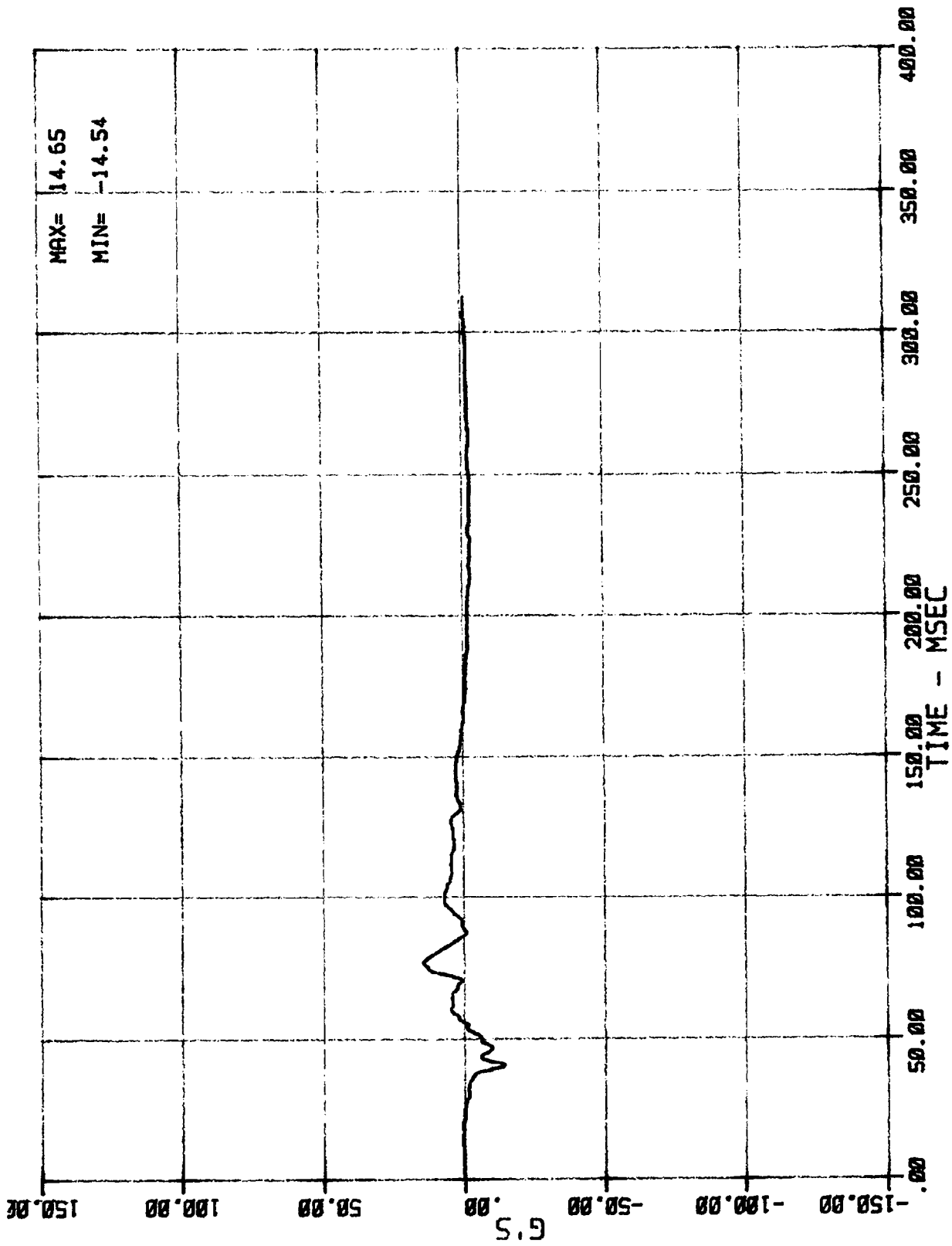
04 AC 01 1 CST X (DRIVER CHEST ACCEL. -- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



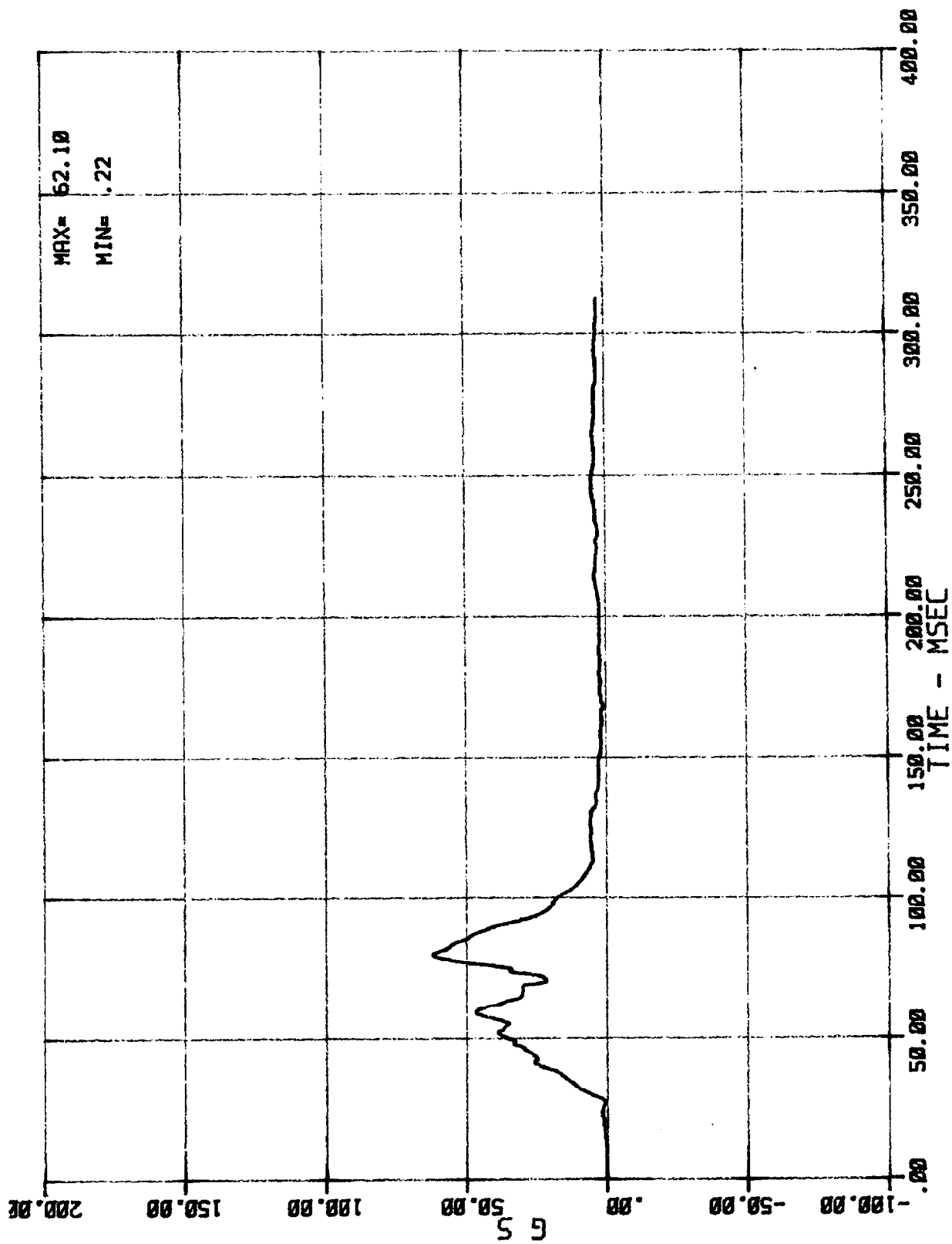
05 AC 01 1 CST Y (DRIVER CHEST ACCEL. -- Y-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



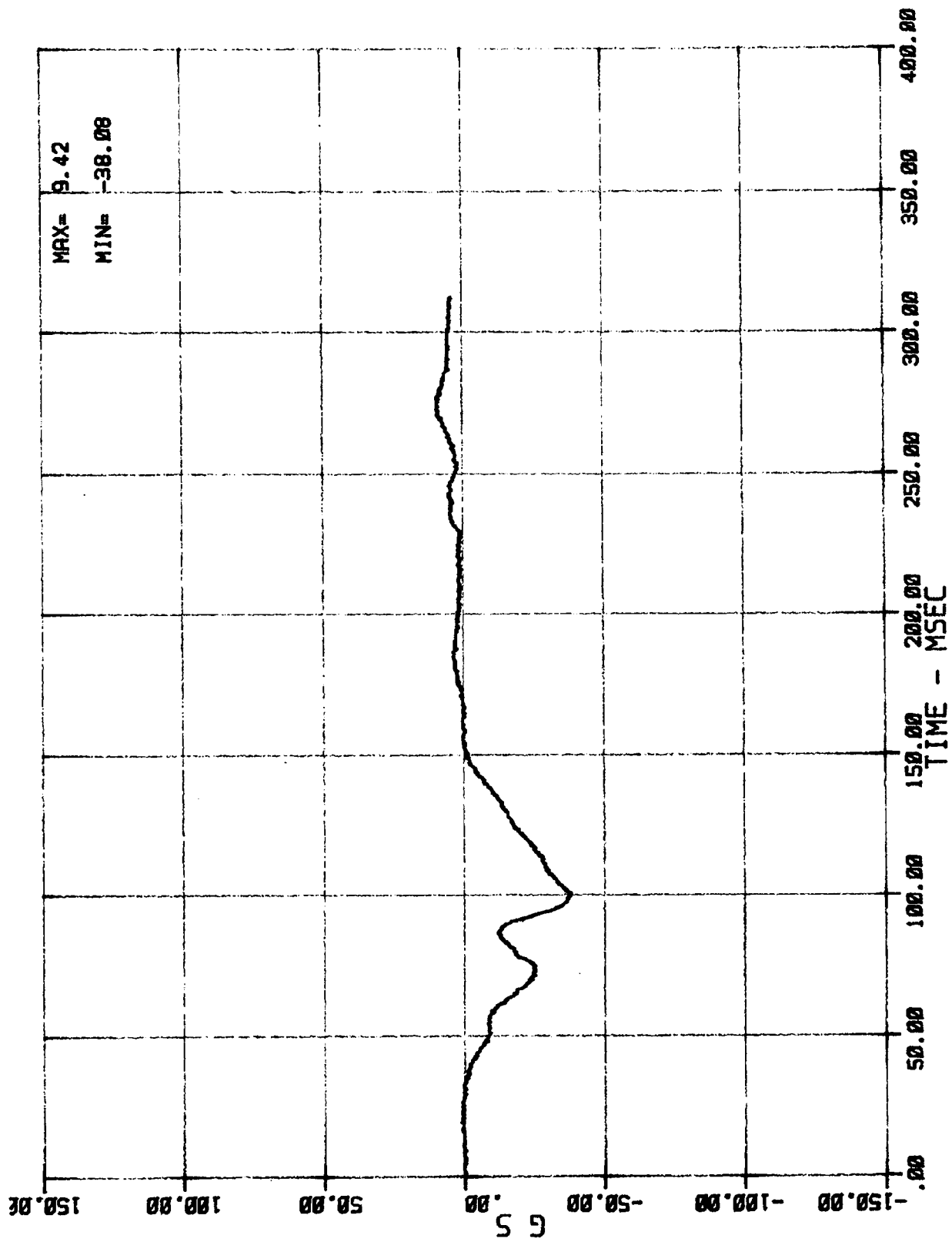
06 AC 01 1 CST 2 (DRIVER CHEST ACCEL. -- Z-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



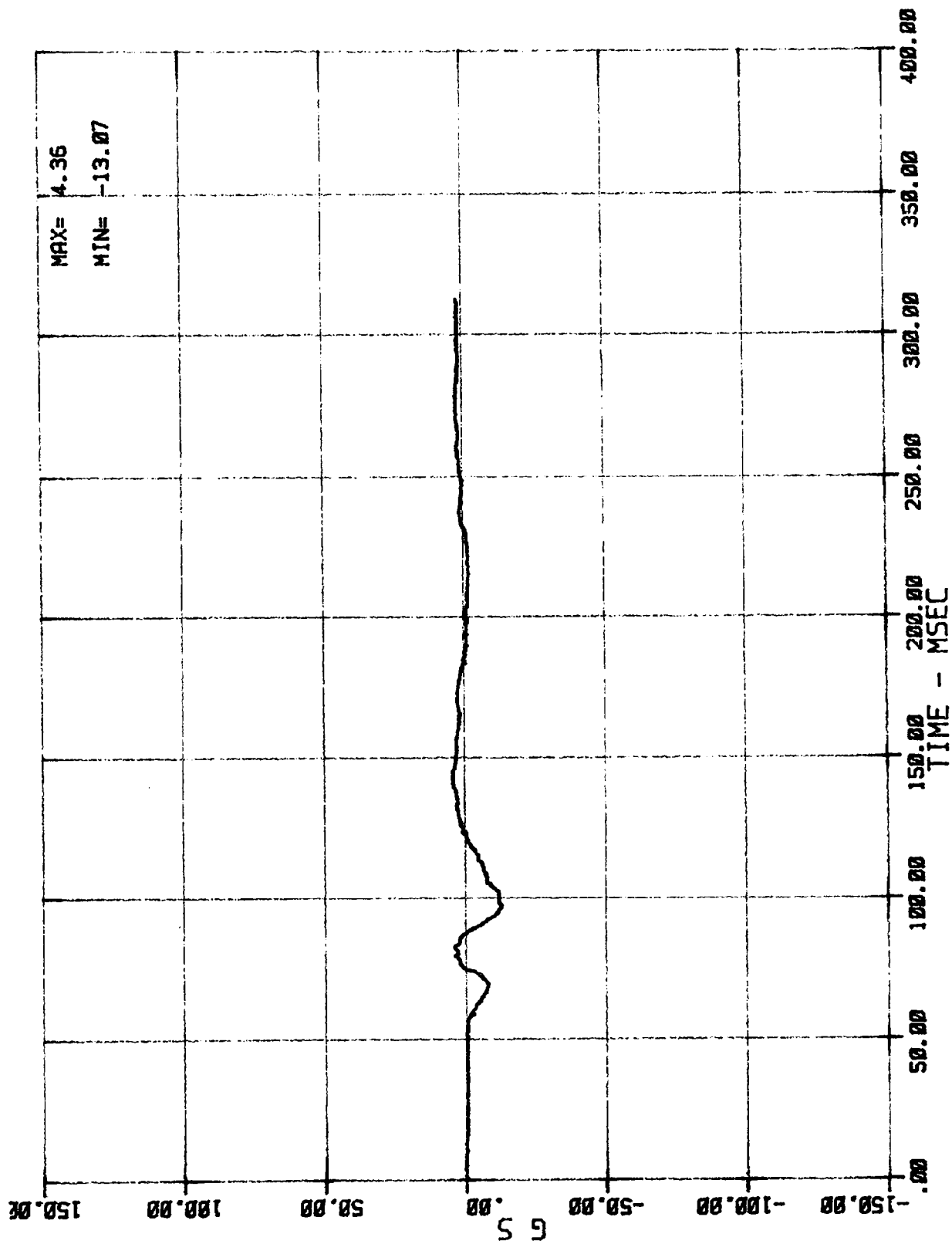
DRIVER'S CHEST RESULTANT ACCELERATION
MSE N26057 1987 SUBARU GL

08/25/87



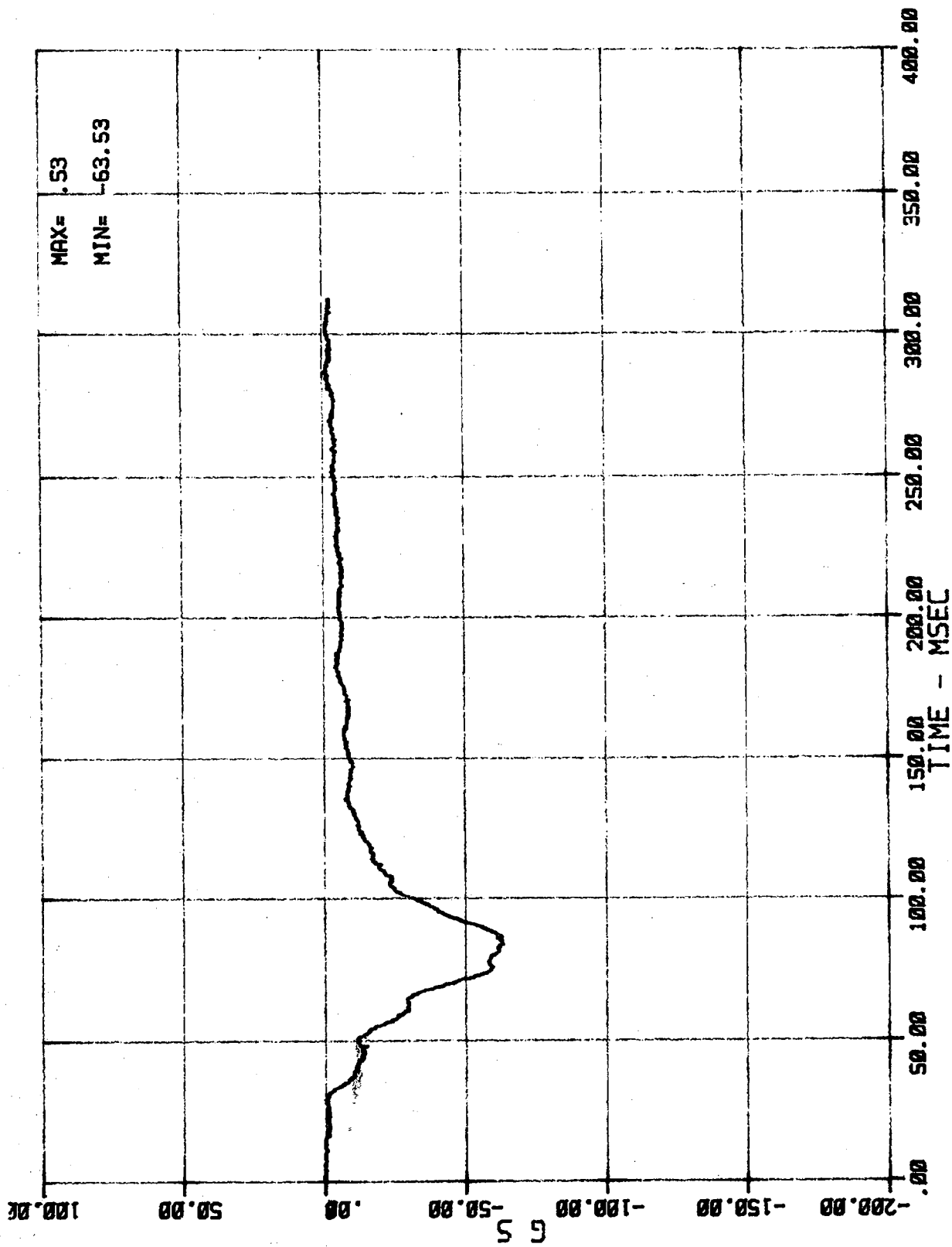
07 AC 01 2 HED X (PASSENGER HEAD ACCEL. --- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



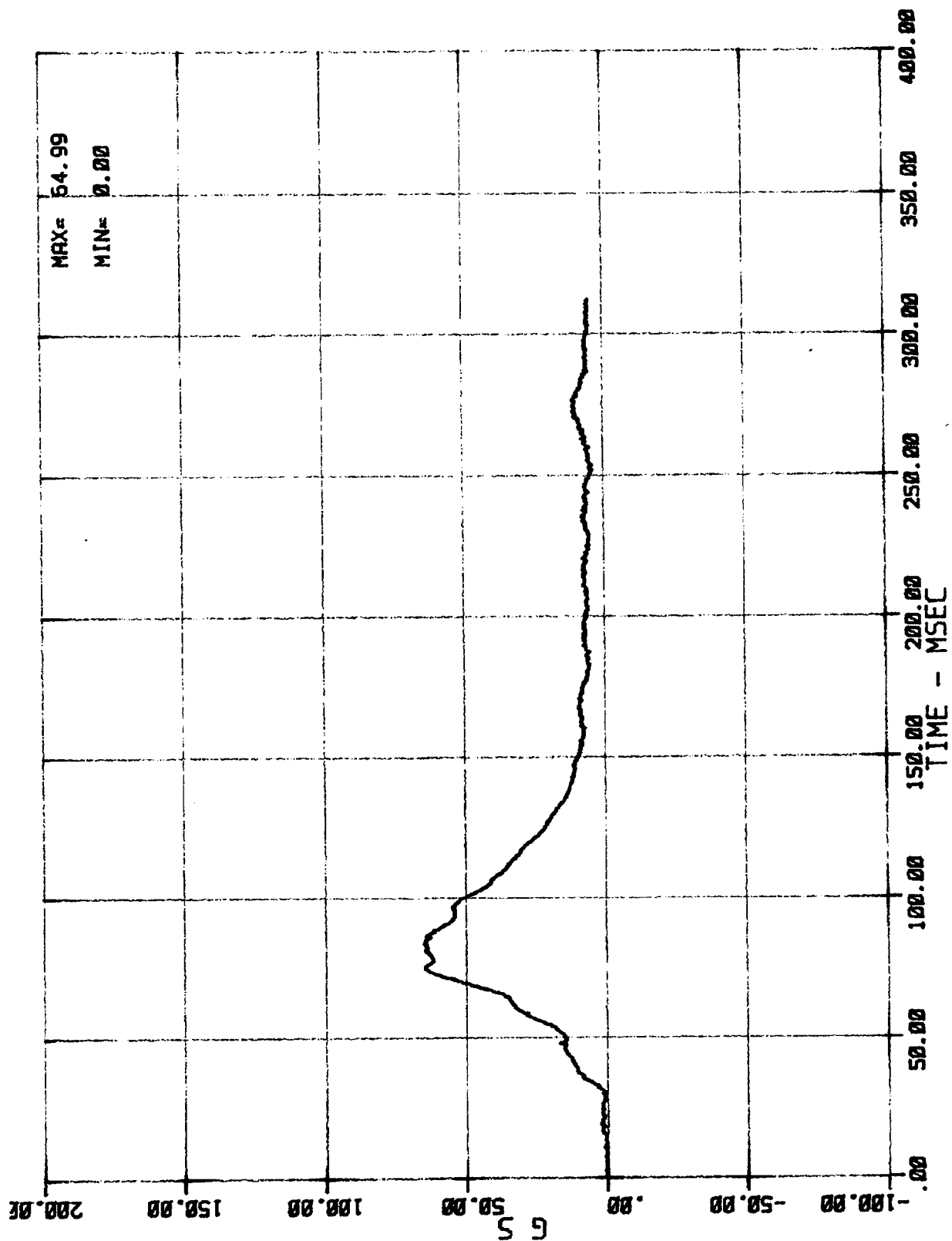
08 AC 01 2 HED Y (PASSENGER HEAD ACCEL. --- Y-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



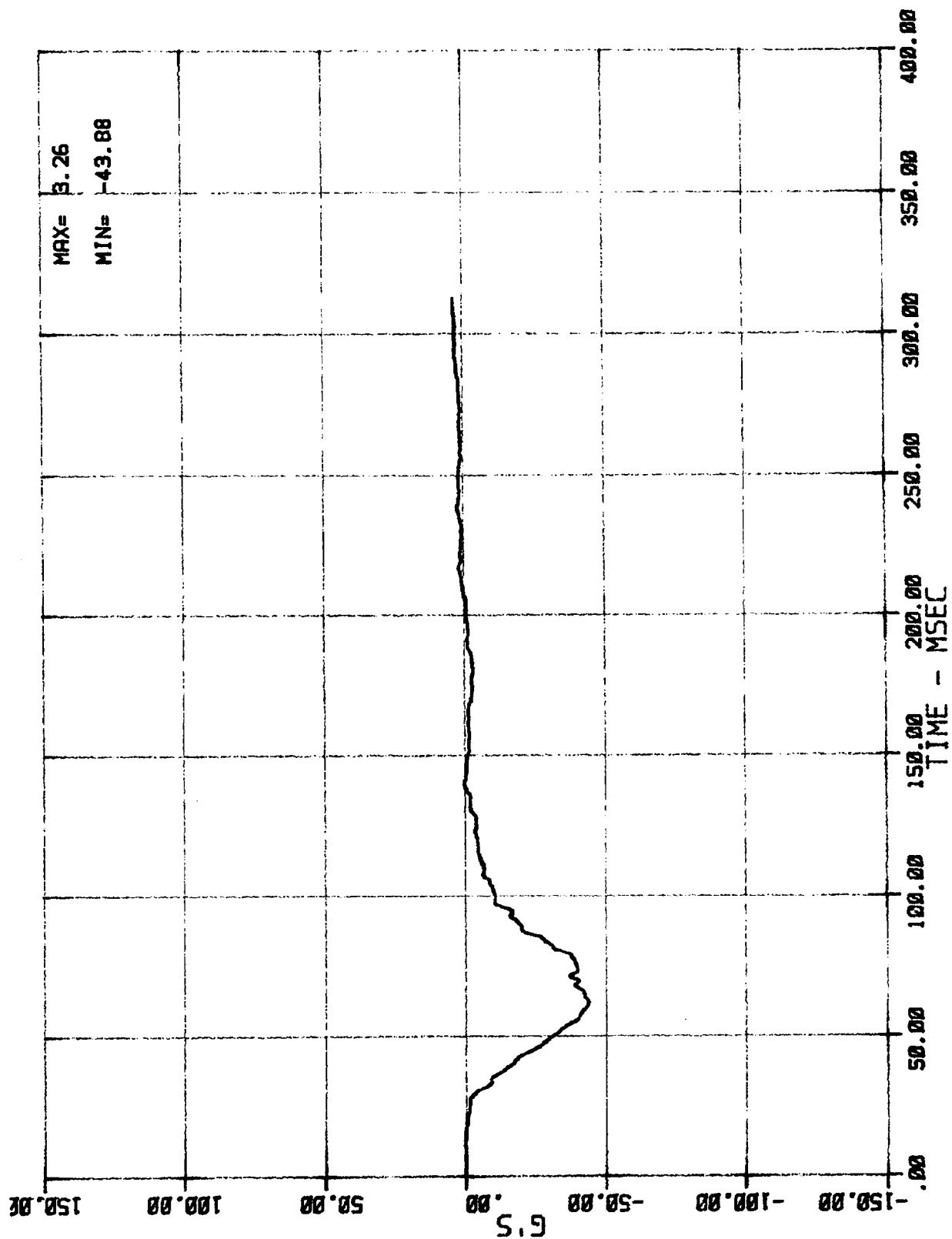
09 AC 01 2 HED Z (PASSENGER HEAD ACCEL. -- Z-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



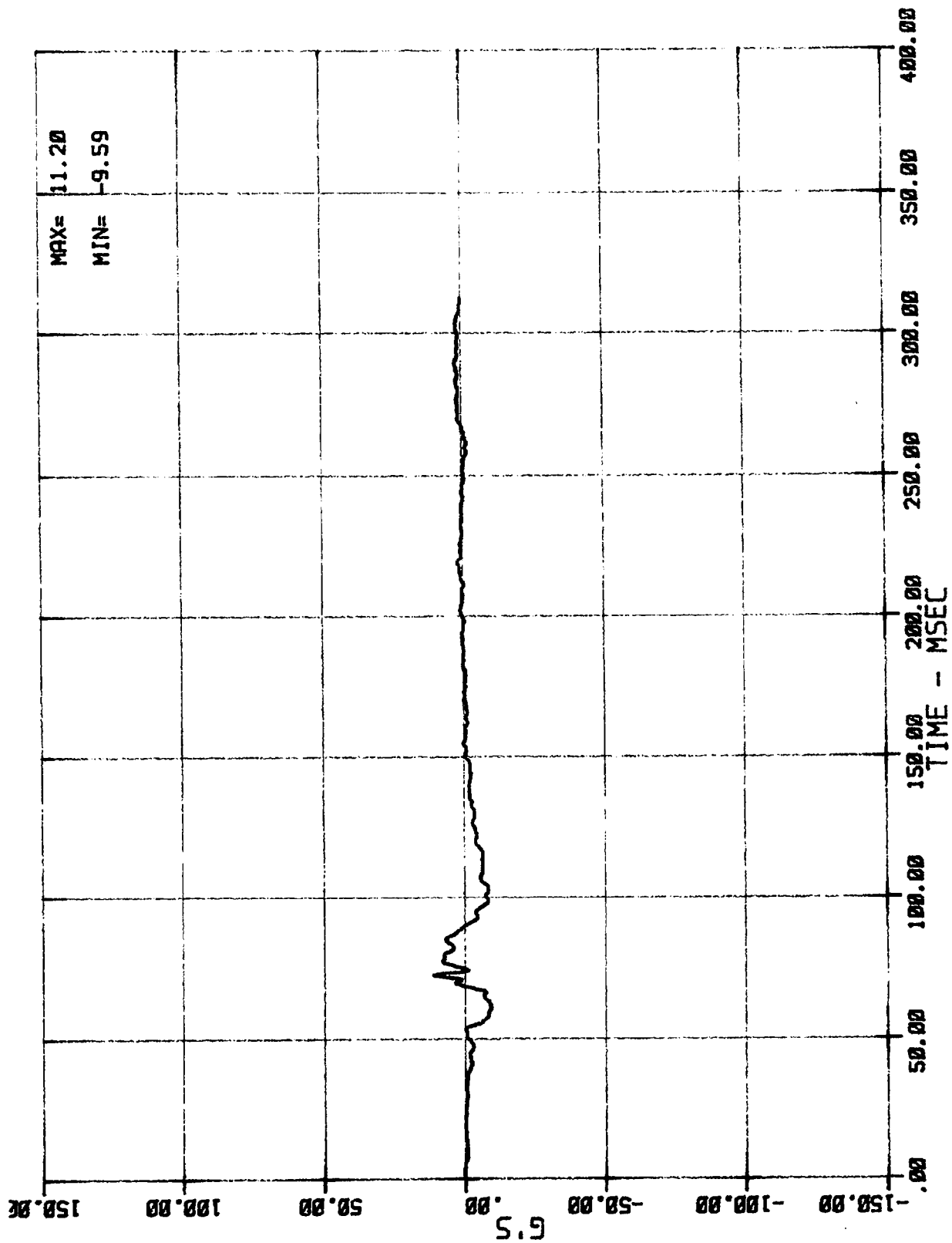
PASSENGER'S HEAD RESULTANT ACCELERATION
NSE N26057 1987 SUBARU GL

08/25/87



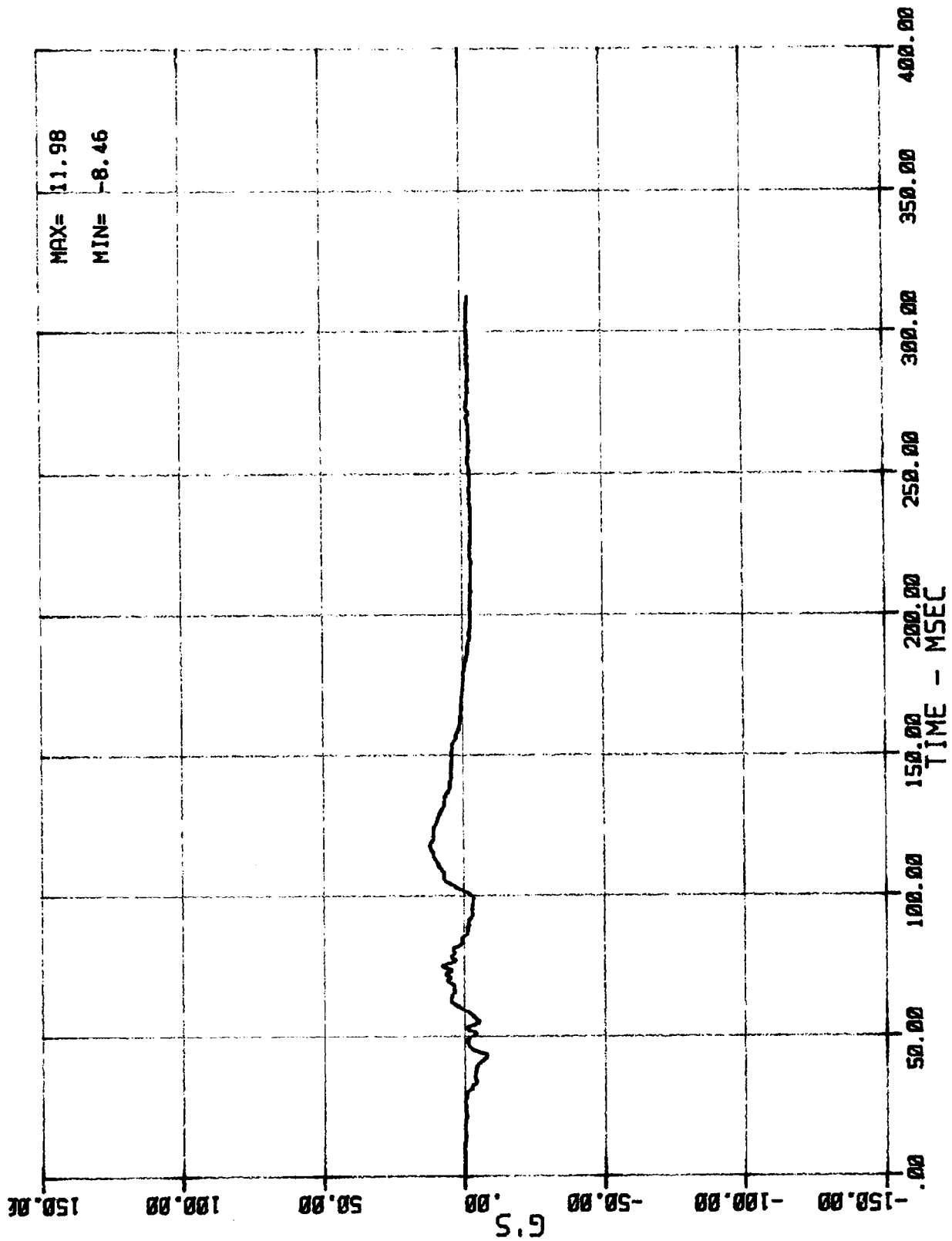
10 AC 01 2 CST X (PASSENGER CHEST ACCEL. --- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



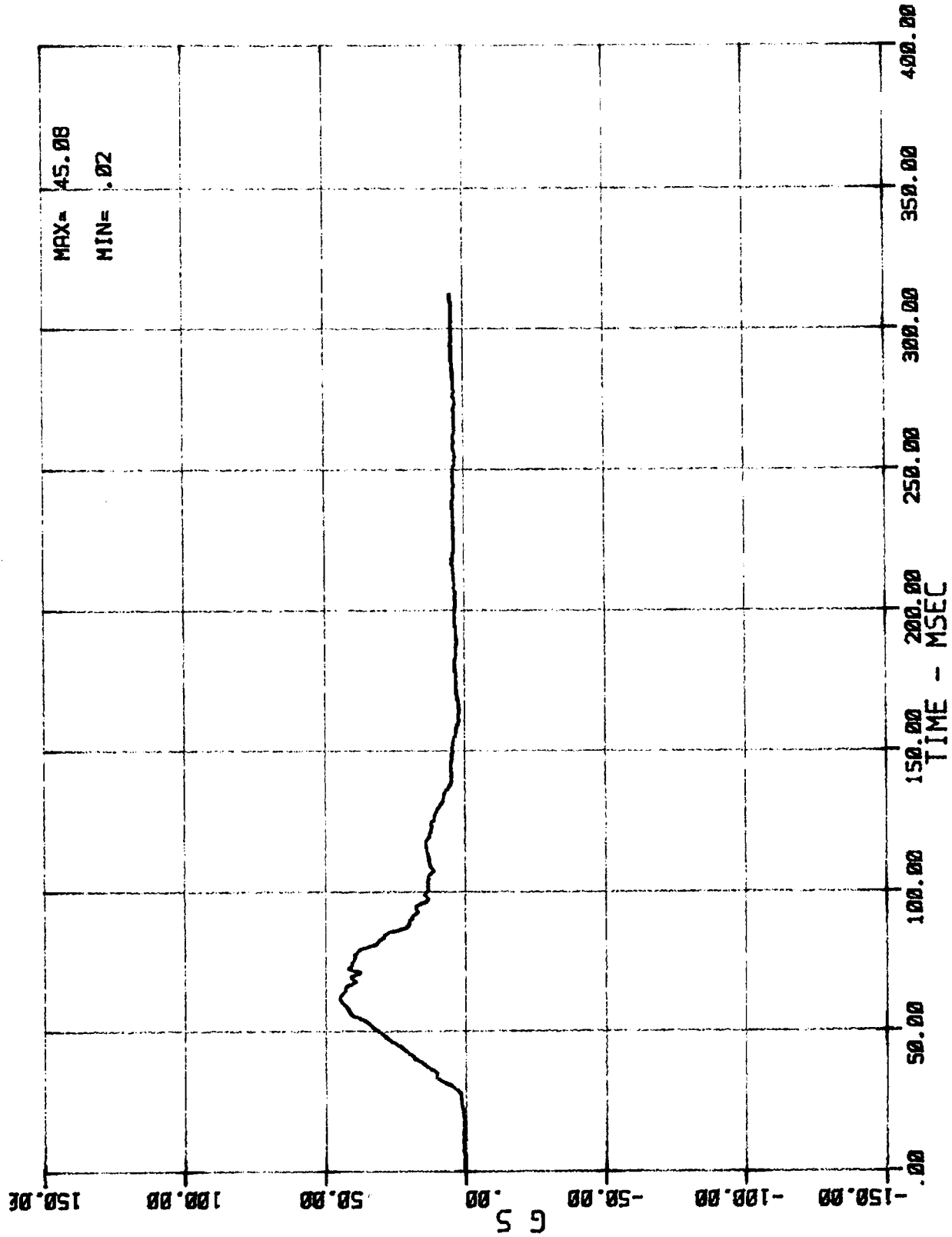
11 AC 01 2 CST Y (PASSENGER CHEST ACCEL. -- Y-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



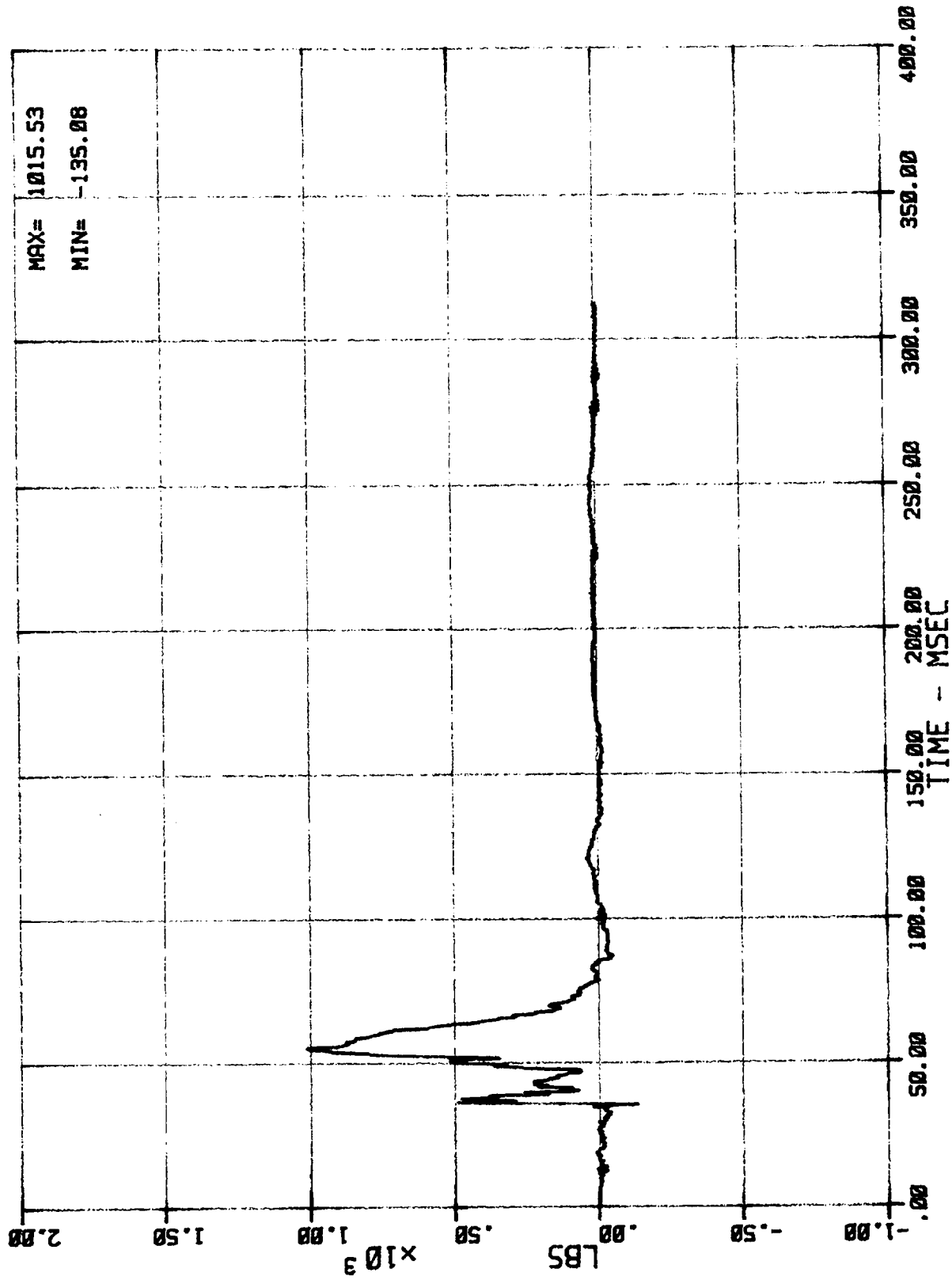
12 AC 01 2 CST 2 (PASSENGER CHEST ACCEL. -- Z-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



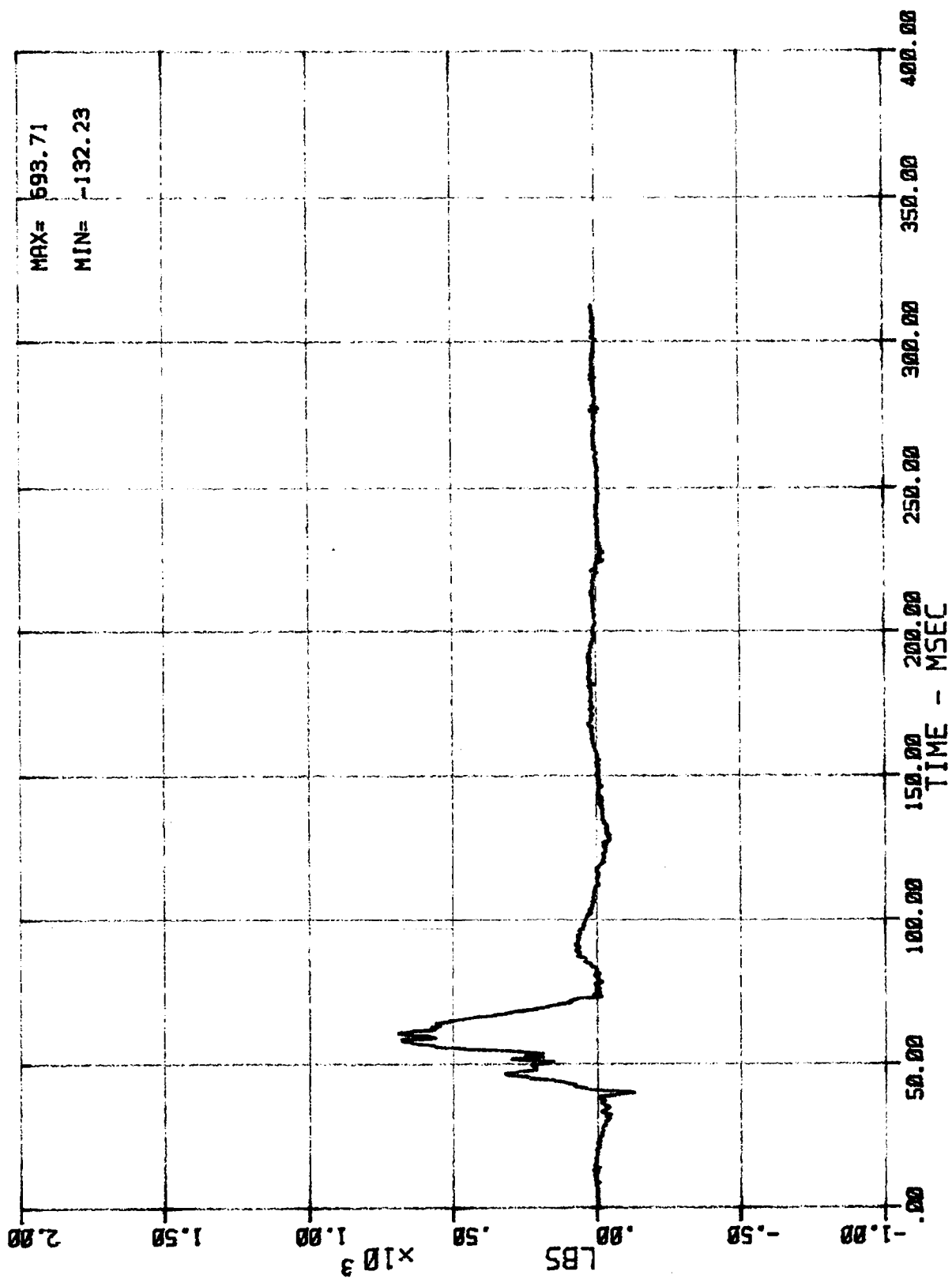
PASSENGER'S CHEST RESULTANT ACCELERATION
N5E N26057 1987 SUBARU GL

08/25/87



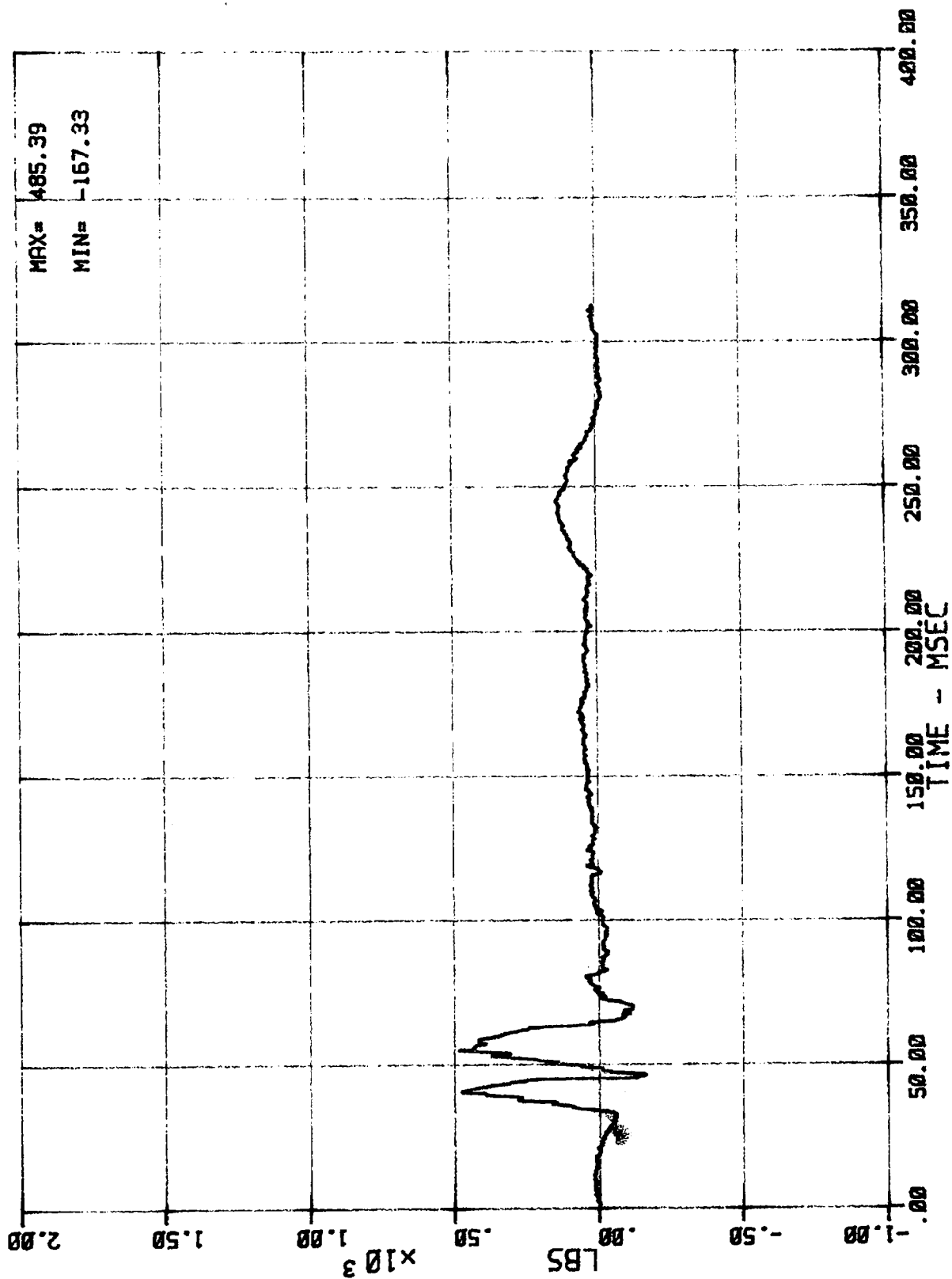
13 LC 01 1 LFM (DRIVER LEFT FEMUR FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



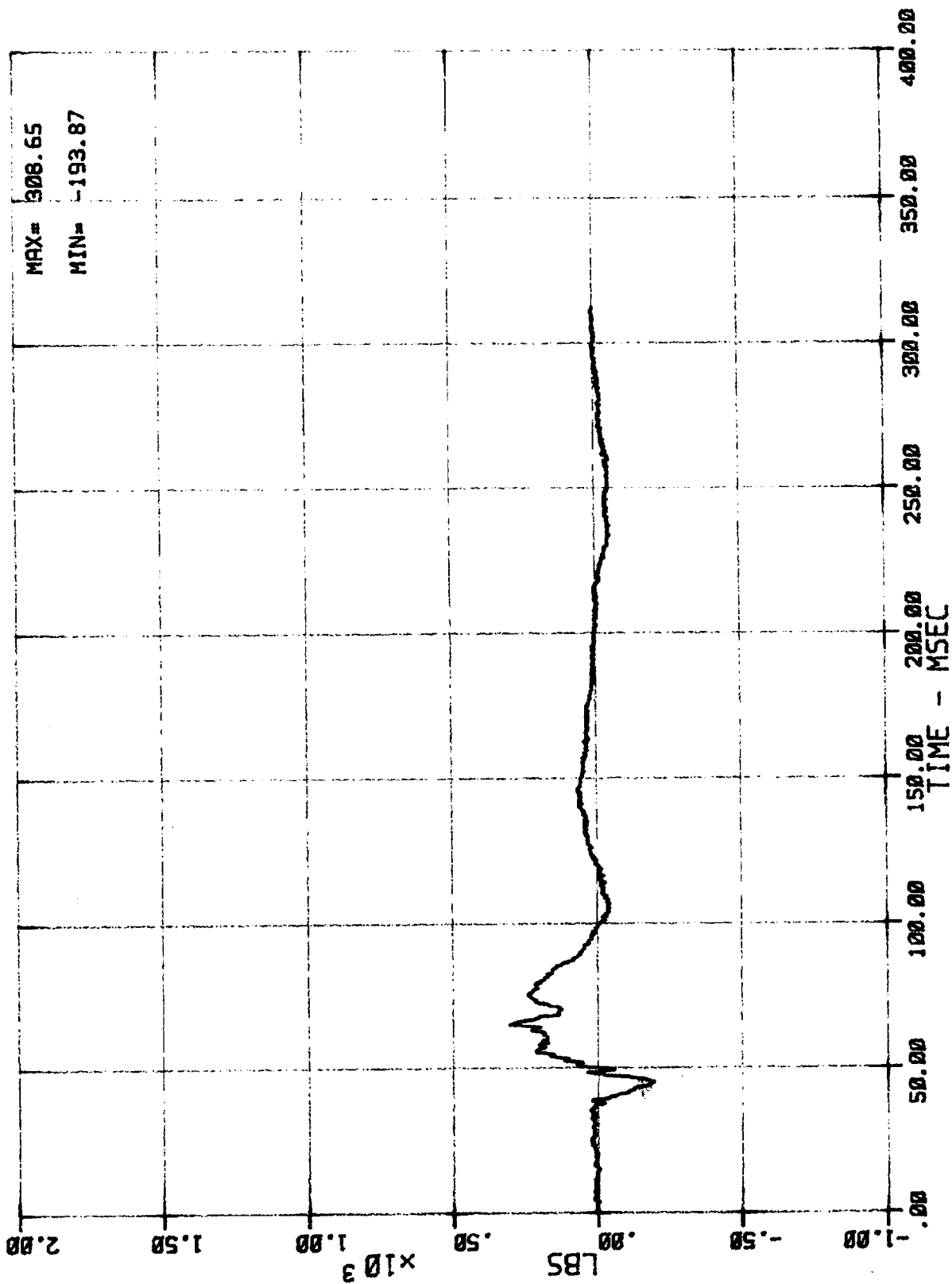
14 LC 01 1 RFM (DRIVER RIGHT FEMUR FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



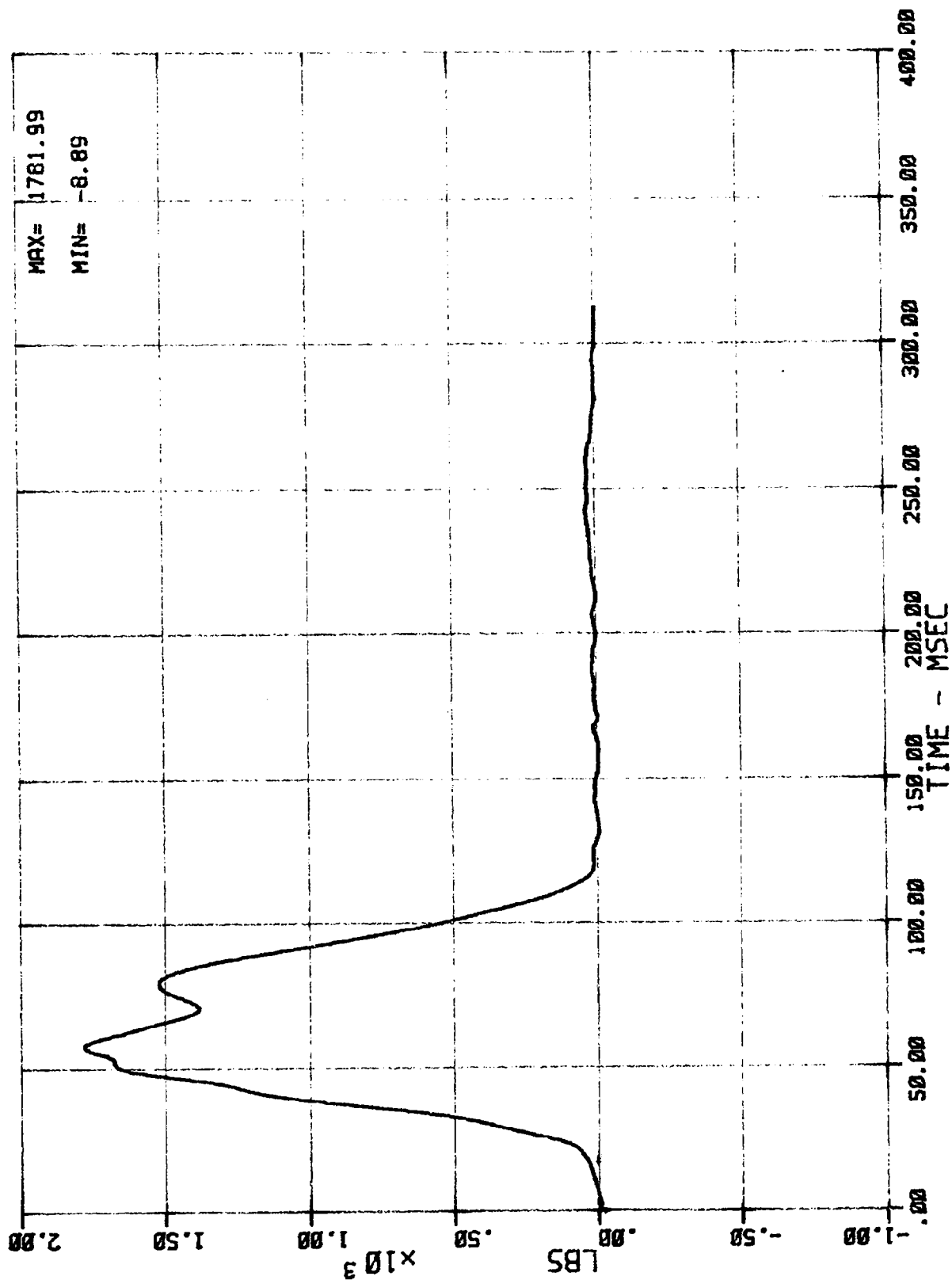
15 LC 01 2 LFM (PASSENGER LEFT FEMUR FORCE)
HSE N26057 1987 SUBARU GL

08/25/87



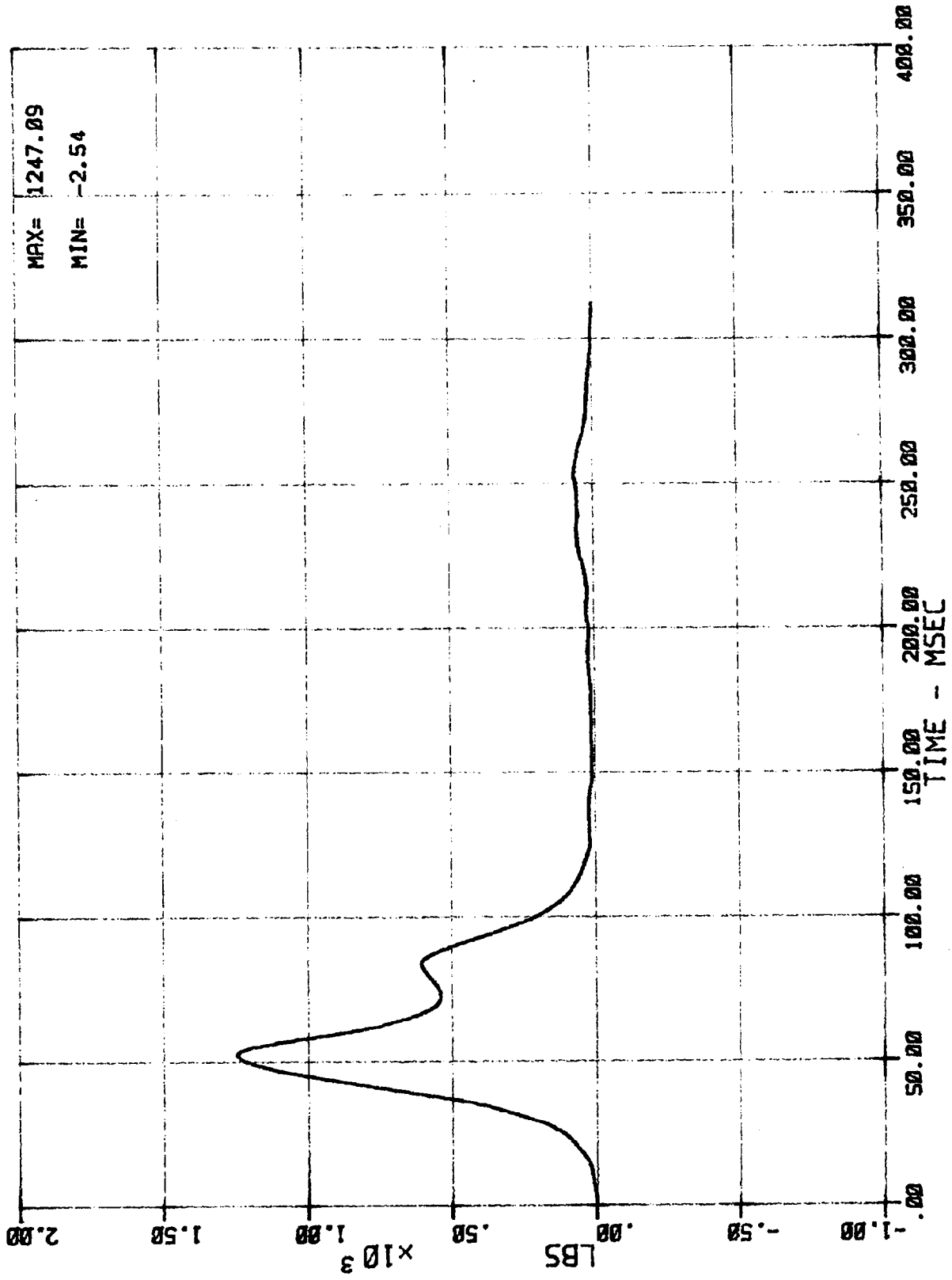
16 LC 01 2 RFM (PASSENGER RIGHT FEMUR FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



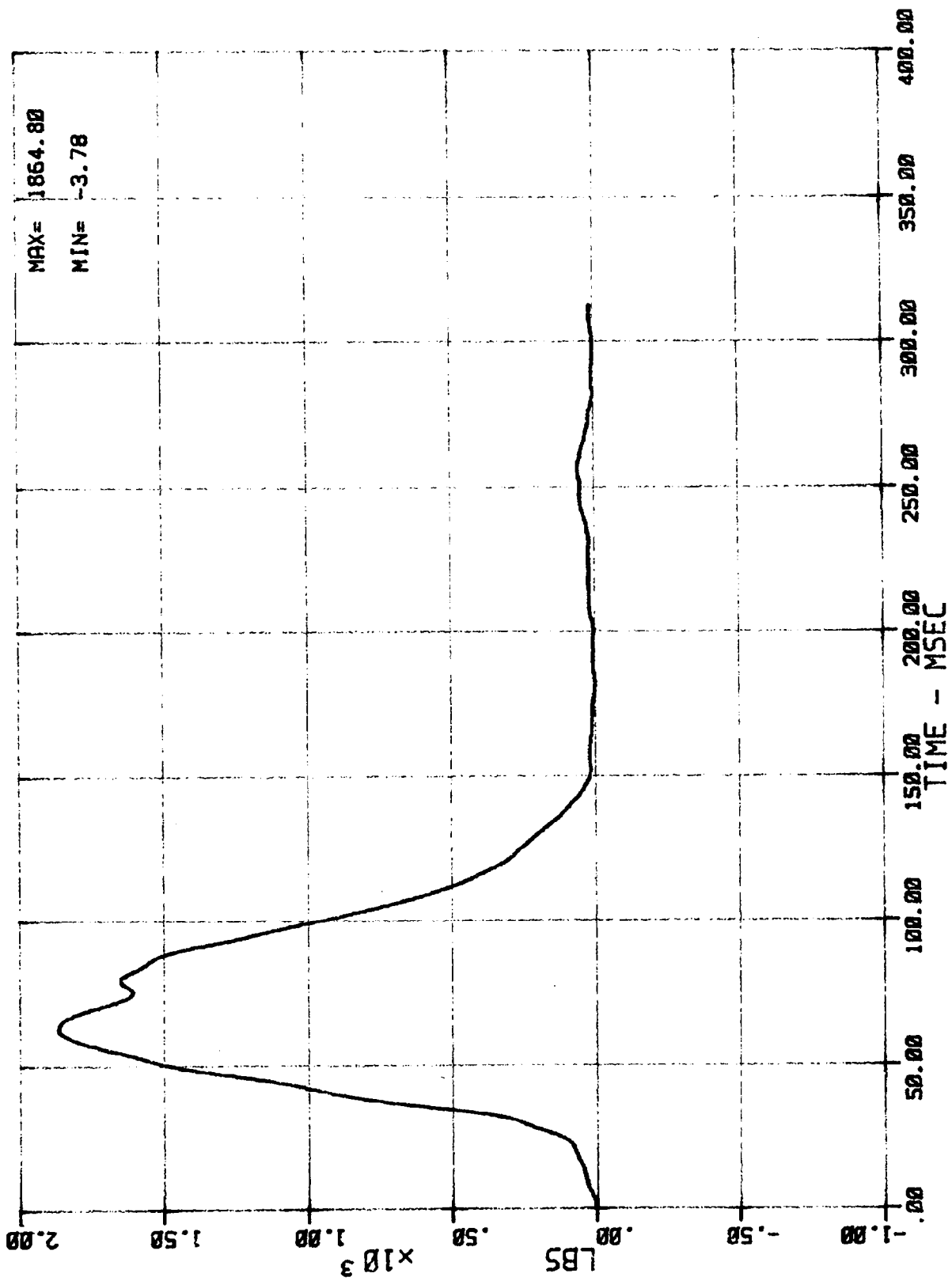
17 LC 01 1 SHB (DRIVER SHOULDER BELT FORCE)
NSE N26057 1987 SUBARU GL

08/25/87



18 LC 01 1 LBO (DRIVER LAP BELT FORCE)
MSE N26057 1987 SUBARU GL

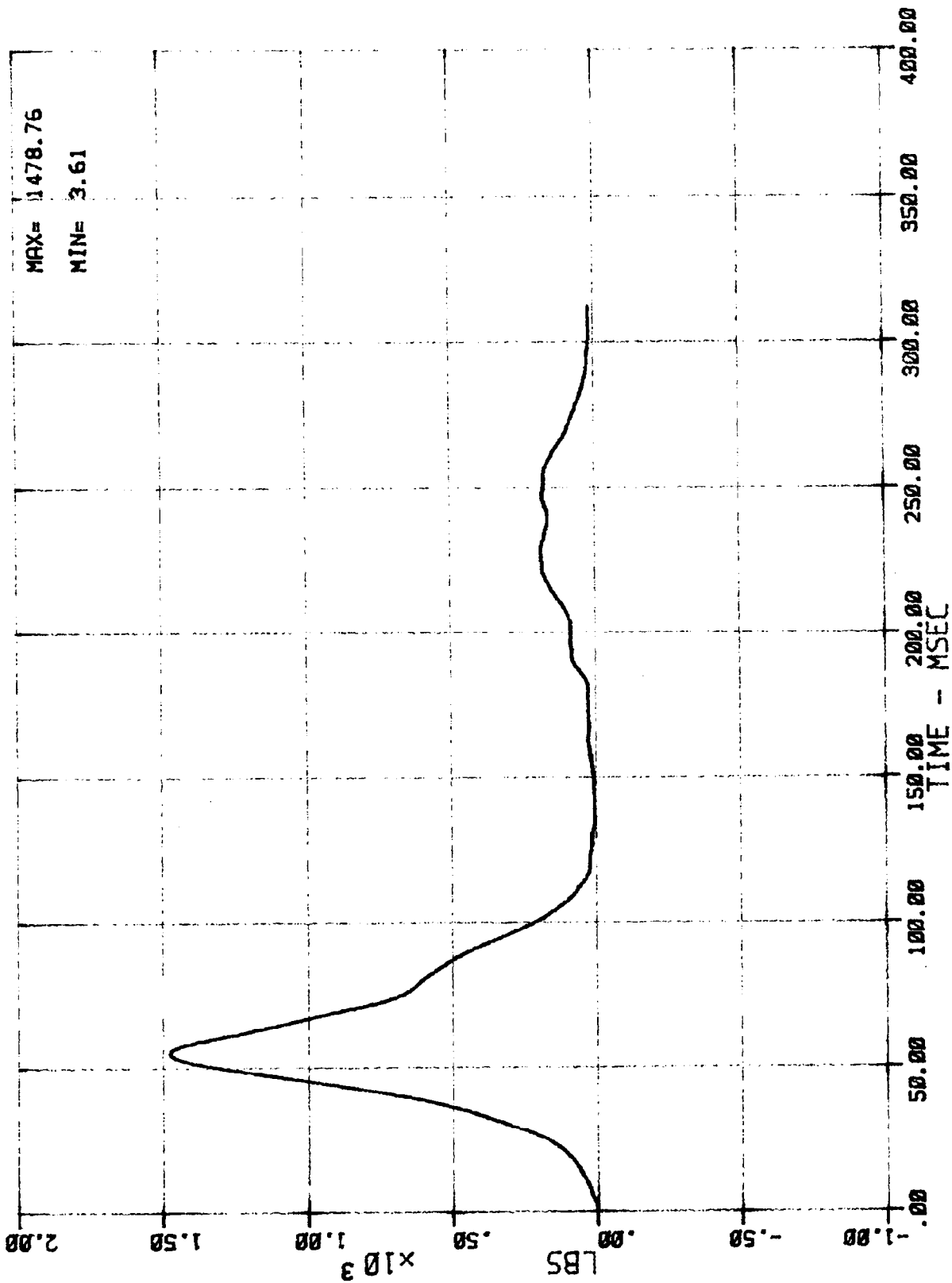
08/25/87



19 LC 2 SHB (PASSENGER SHOULDER BELT FORCE)
MSE N26057 1987 SUBARU GL

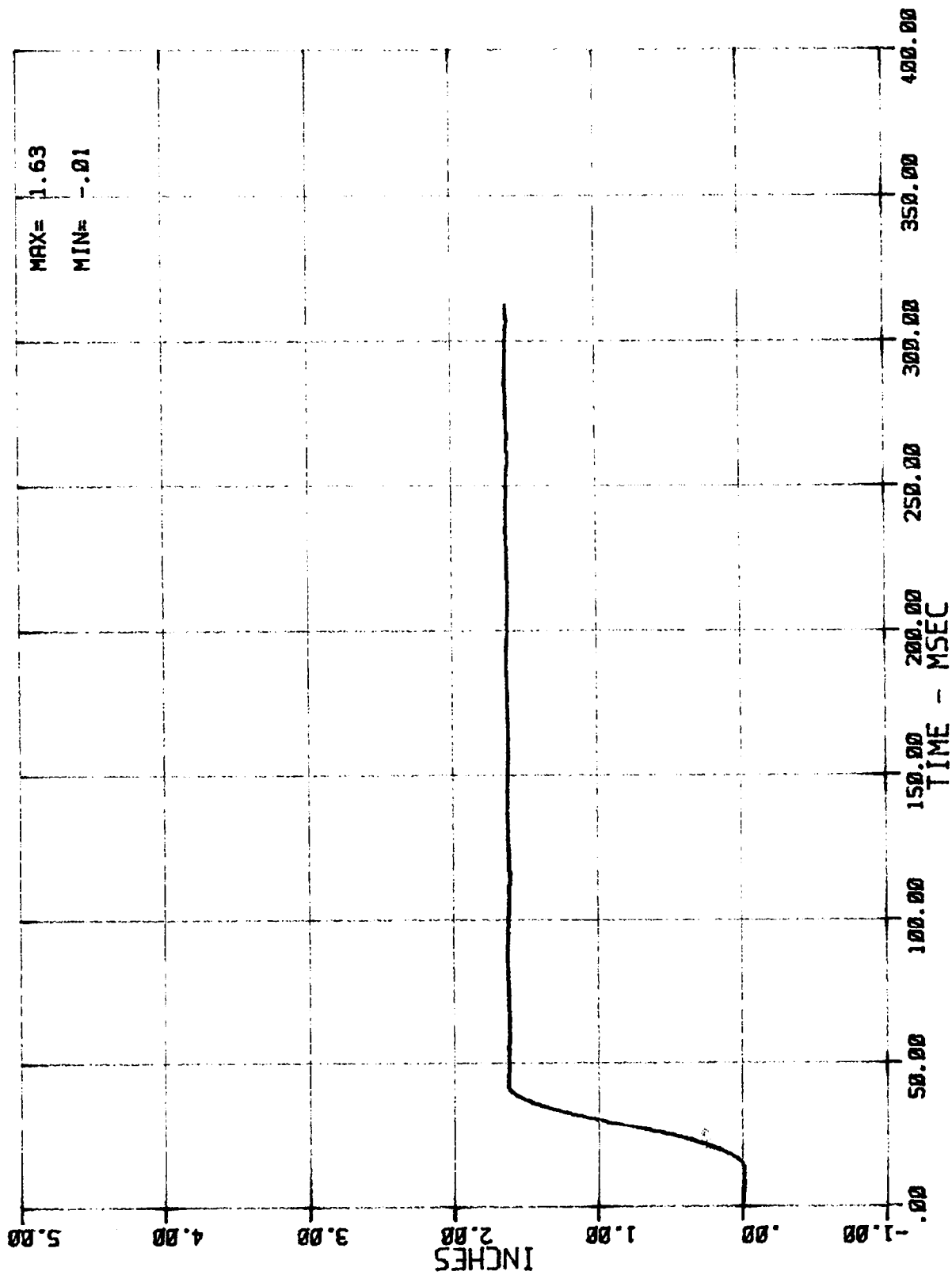
08/25/87

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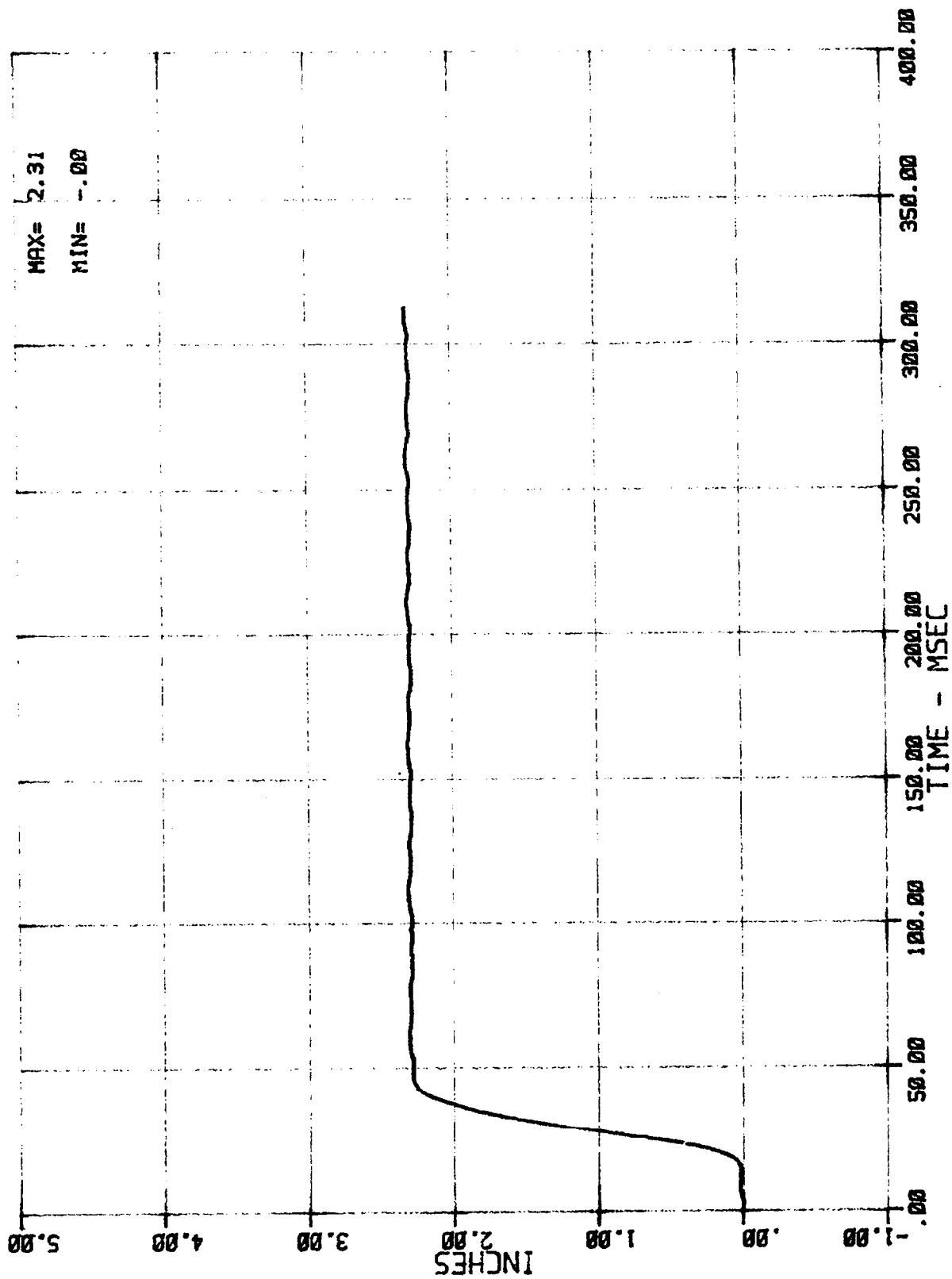
20 LC 01 2 LBO (PASSENGER LAP BELT FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



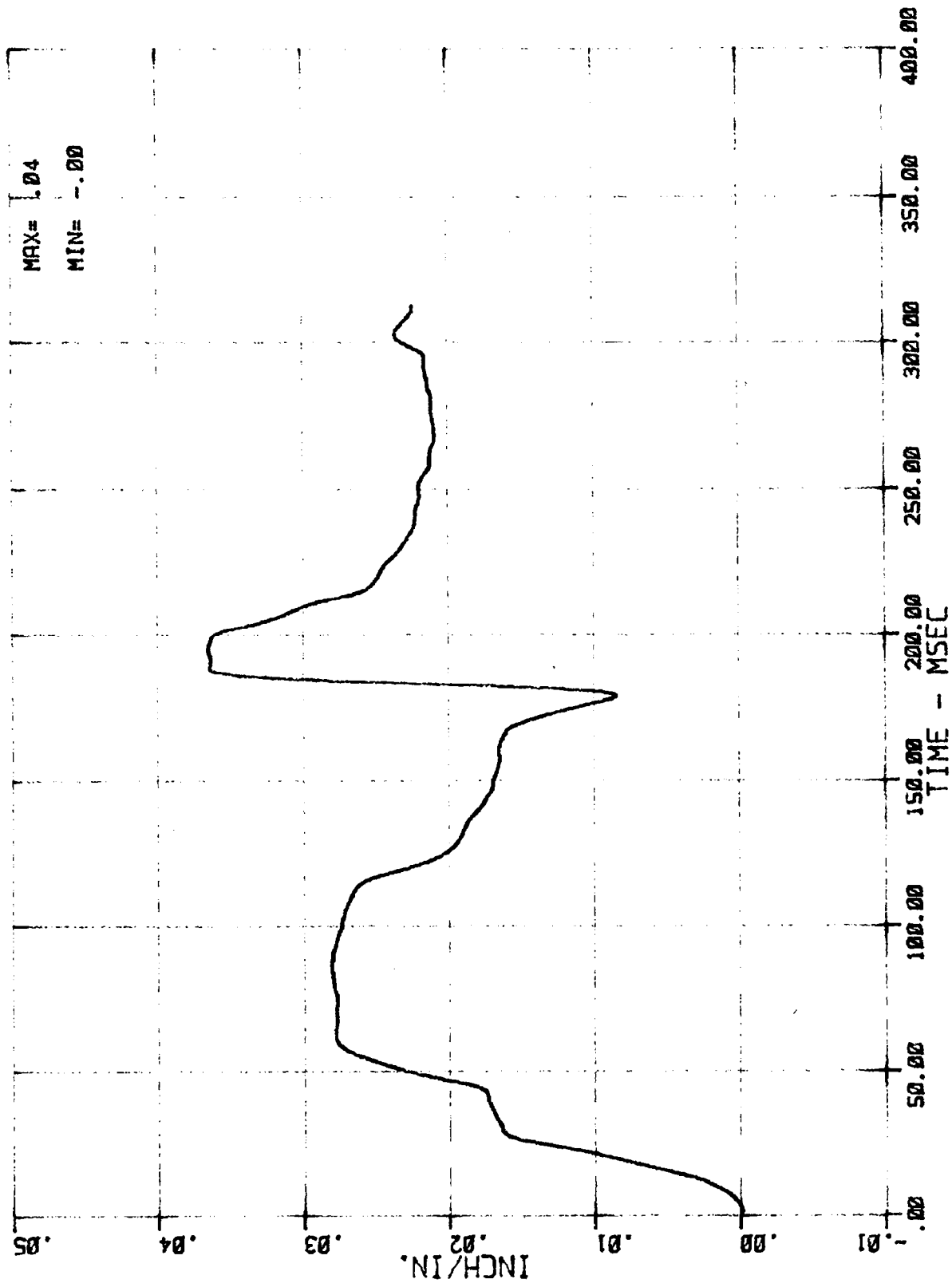
21 DT 01 1 SHB (DRIVER SHOULDER BELT PULLOUT)
MSE N26057 1987 SUBARU GL

08/25/87



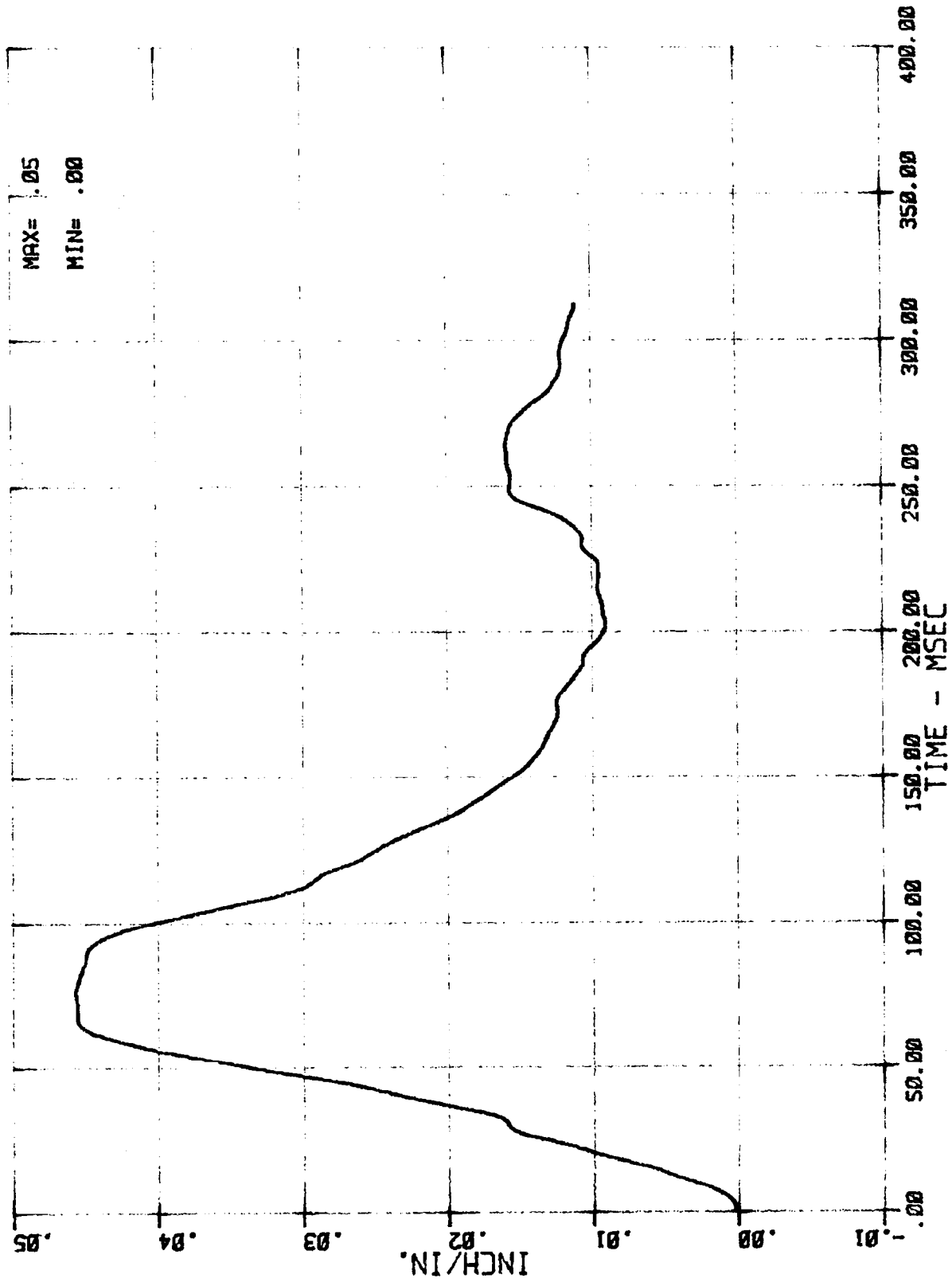
22 DT 01 2 (PASSENGER SHOULDER BELT PULLOUT)
NSE N26057 1987 SUBARU GL

08/25/87



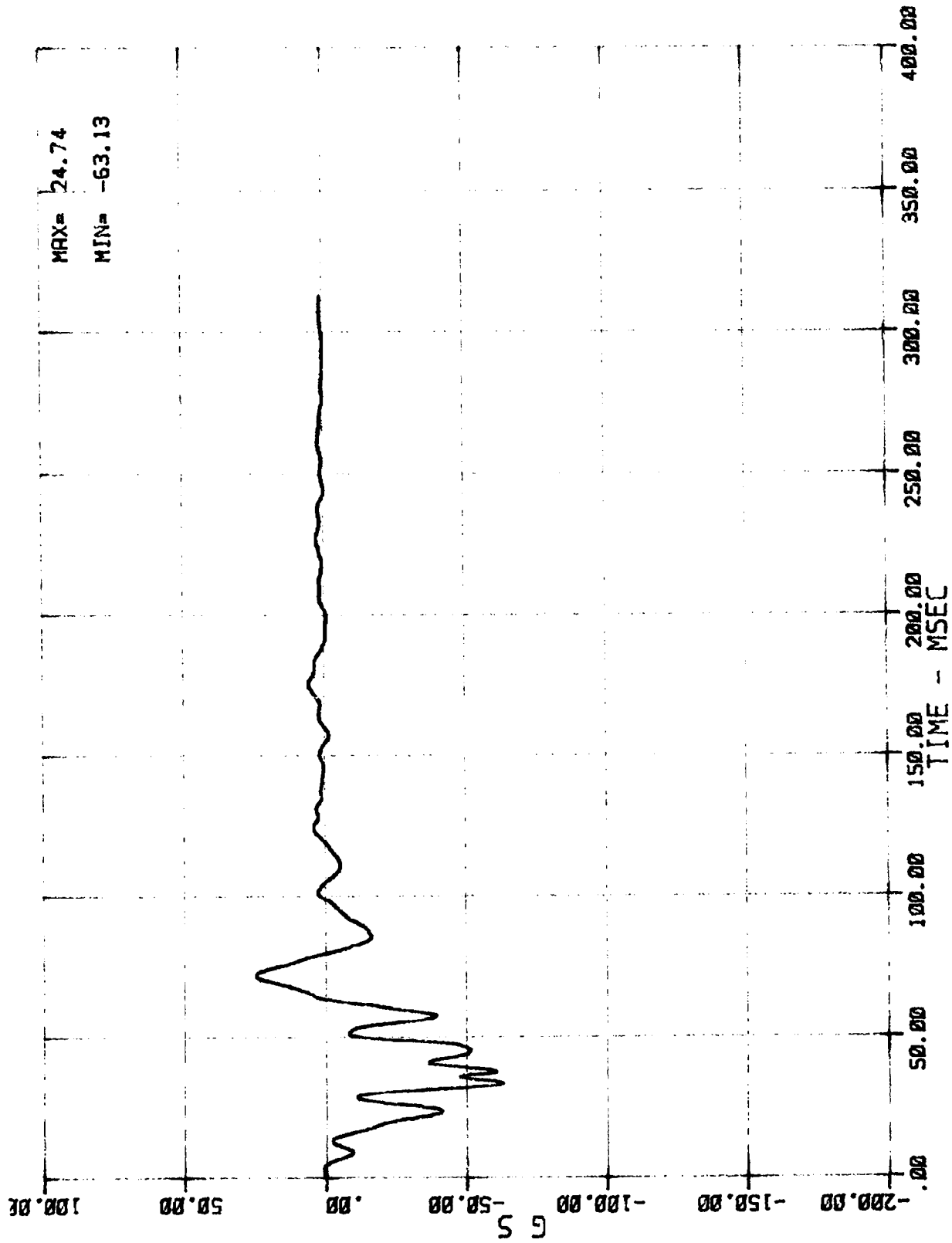
23 DT 01 1 SHB (DRIVER 'S SHOULDER BELT ELONGATION)
MSE N26057 1987 SUBARU GL

08/25/87



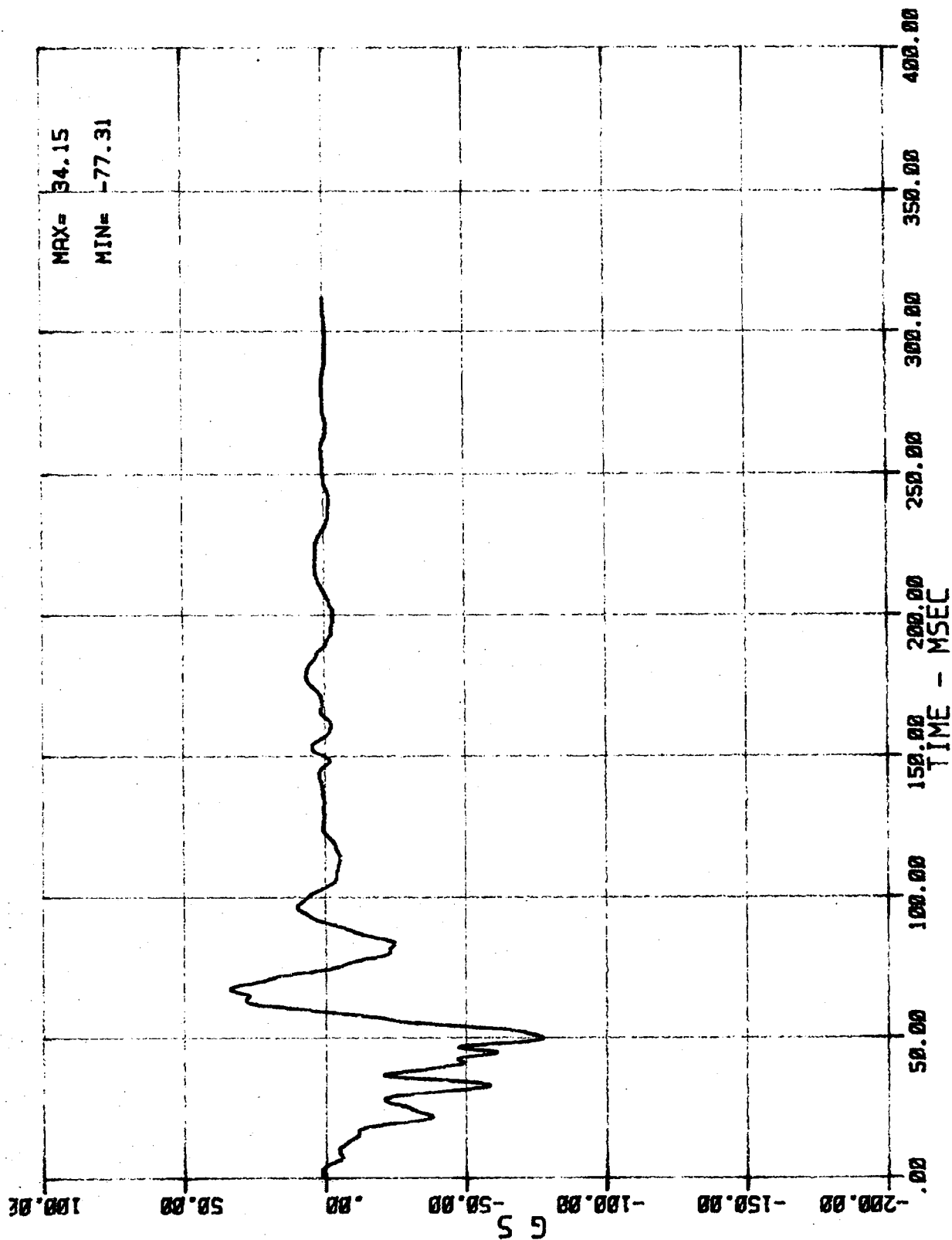
24 DT 01 2 SHB (PASSENGER'S SHOULDER BELT ELONGATION)
MSE N26057 1987 SUBARU GL

08/25/87



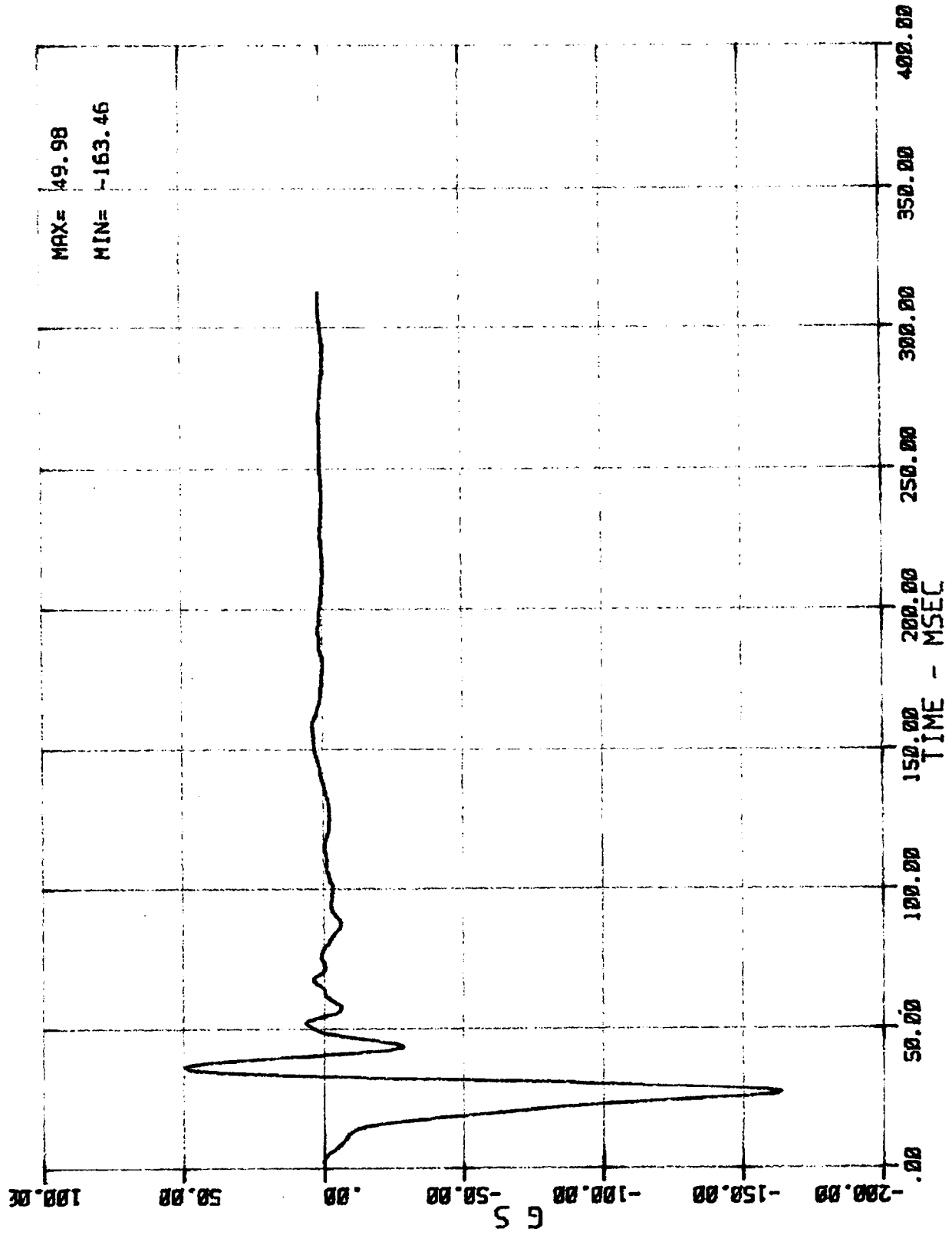
25 AC 01 N BCR X (LEFT FRONT WHEEL ACCEL. --- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



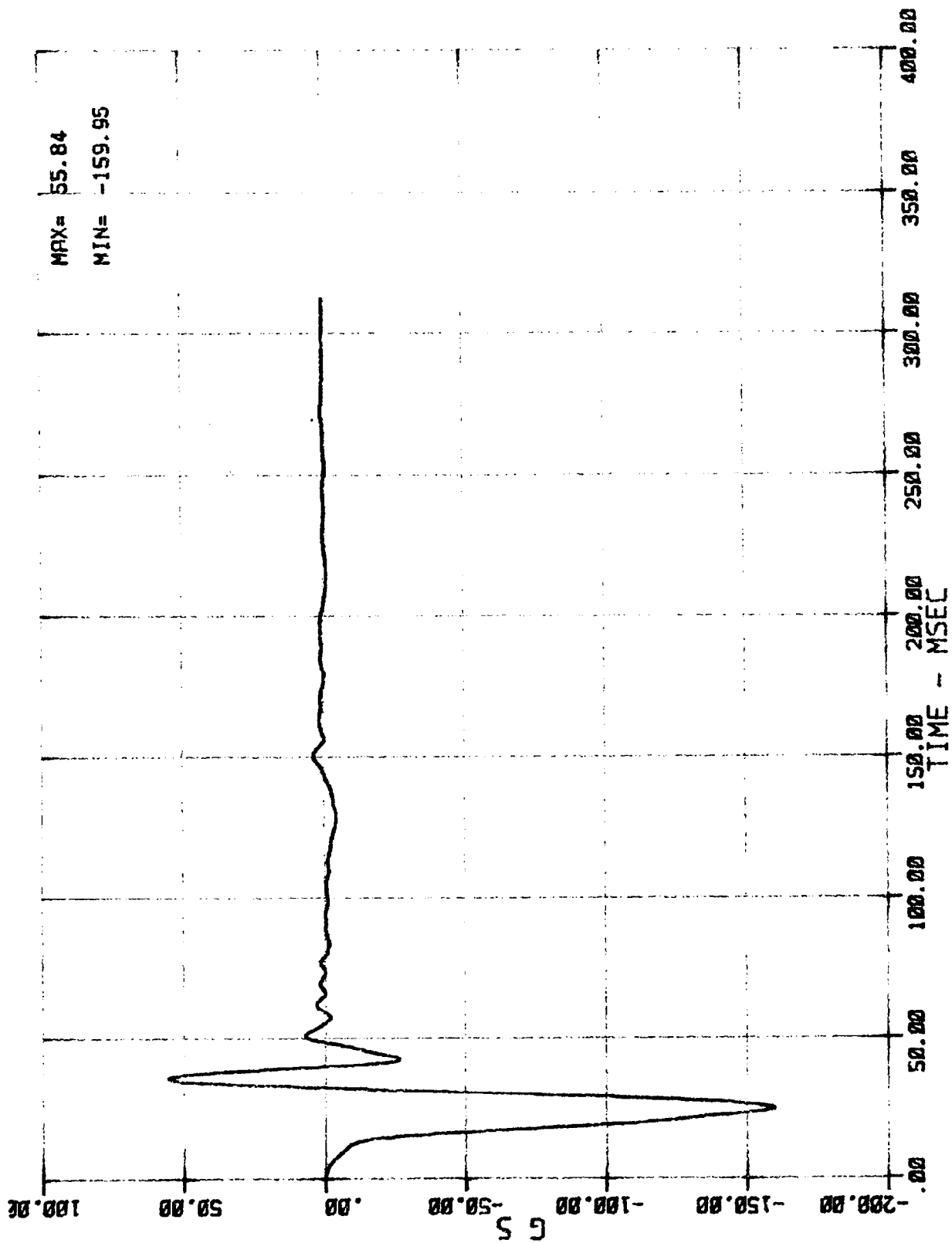
26 AC 01 N BCR X (RIGHT FRONT WHEEL ACCEL. -- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



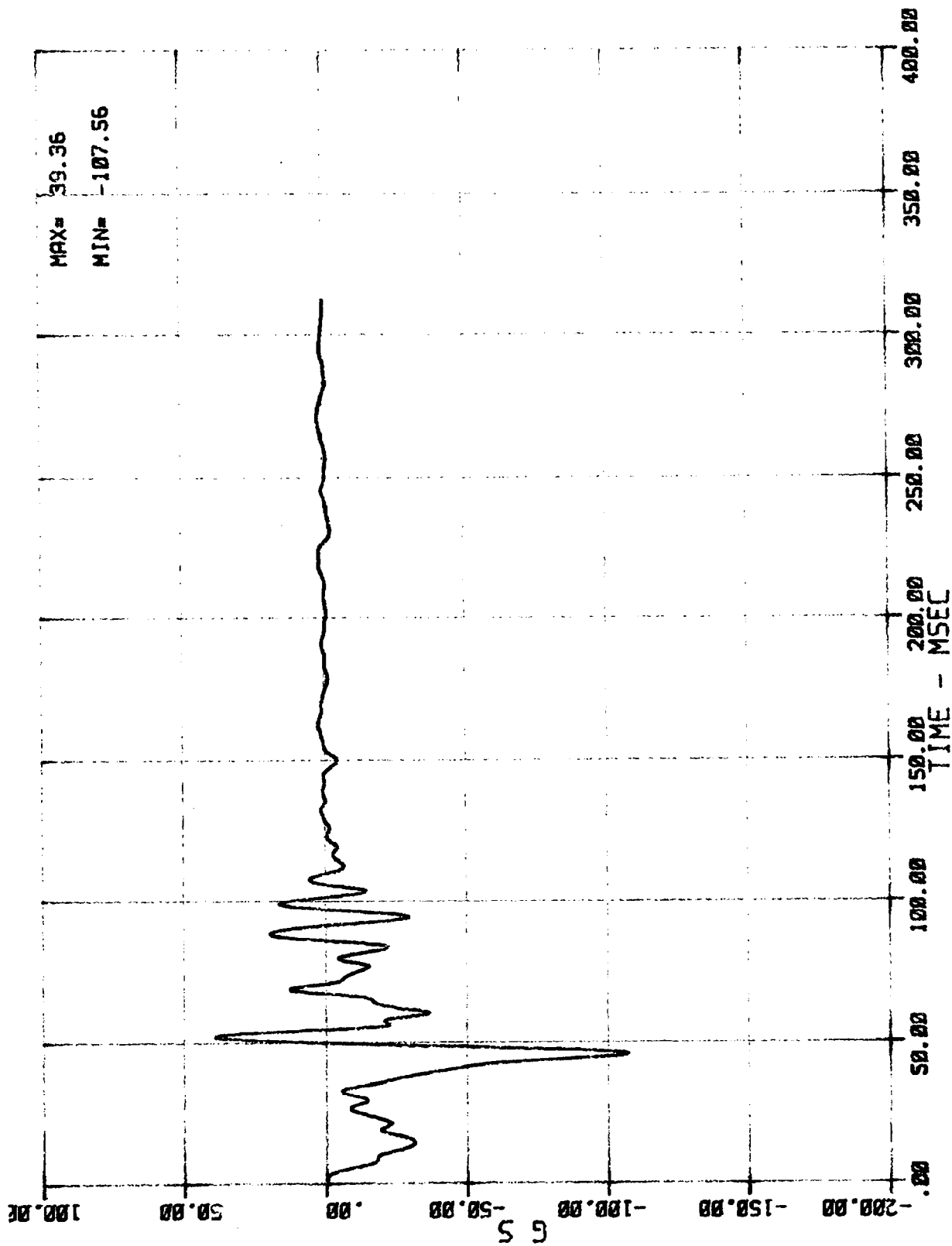
27 AC 01 N ENG X (BOTTOM OF ENGINE ACCEL. --- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87



28 AC 01 N ENG X (TOP OF ENGINE ACCEL. -- X-AXIS)
MSE N26057 1987 SUBARU GL

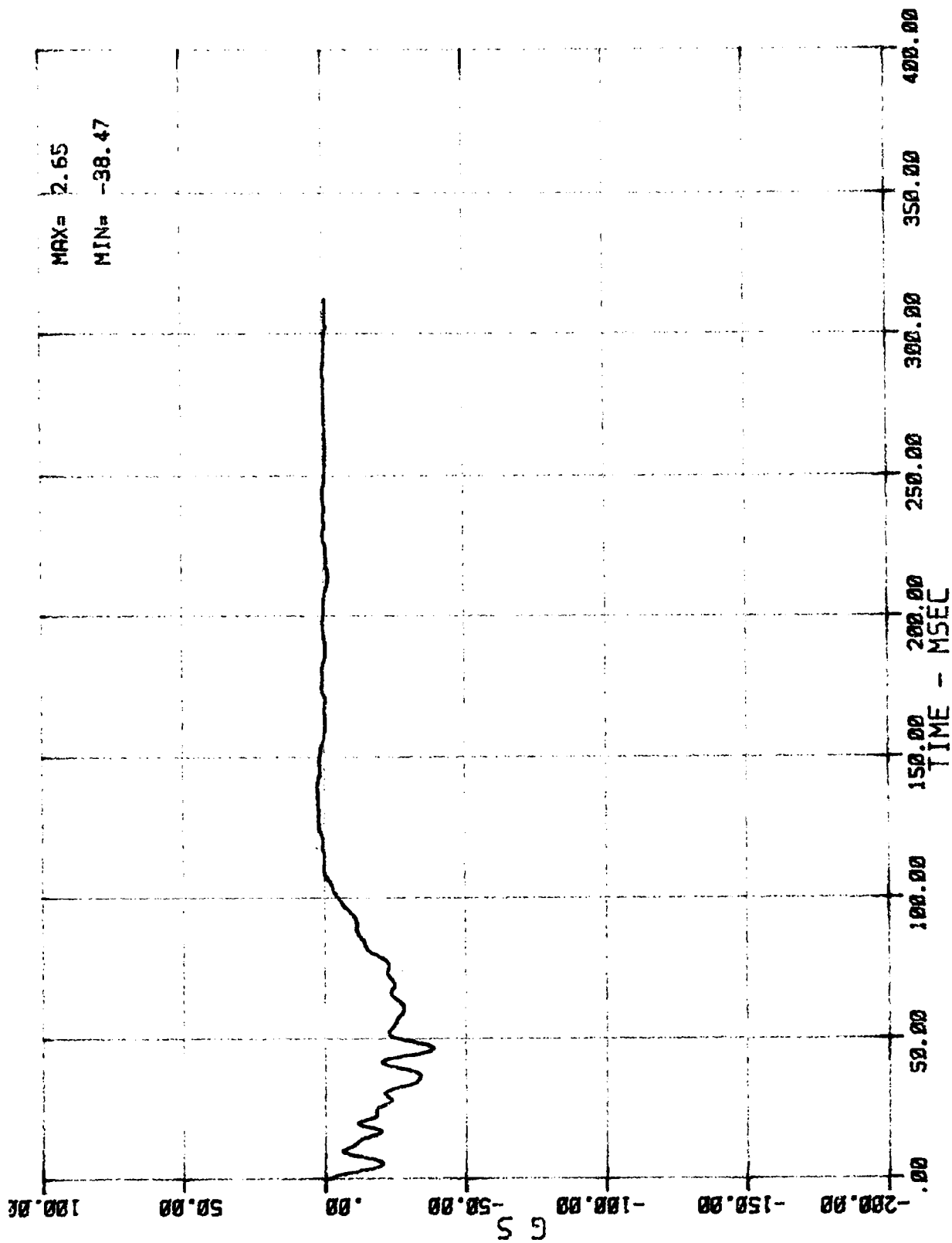
08/25/87



29 AC 01 N DPC X (CENTER OF DASH ACCEL. -- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87

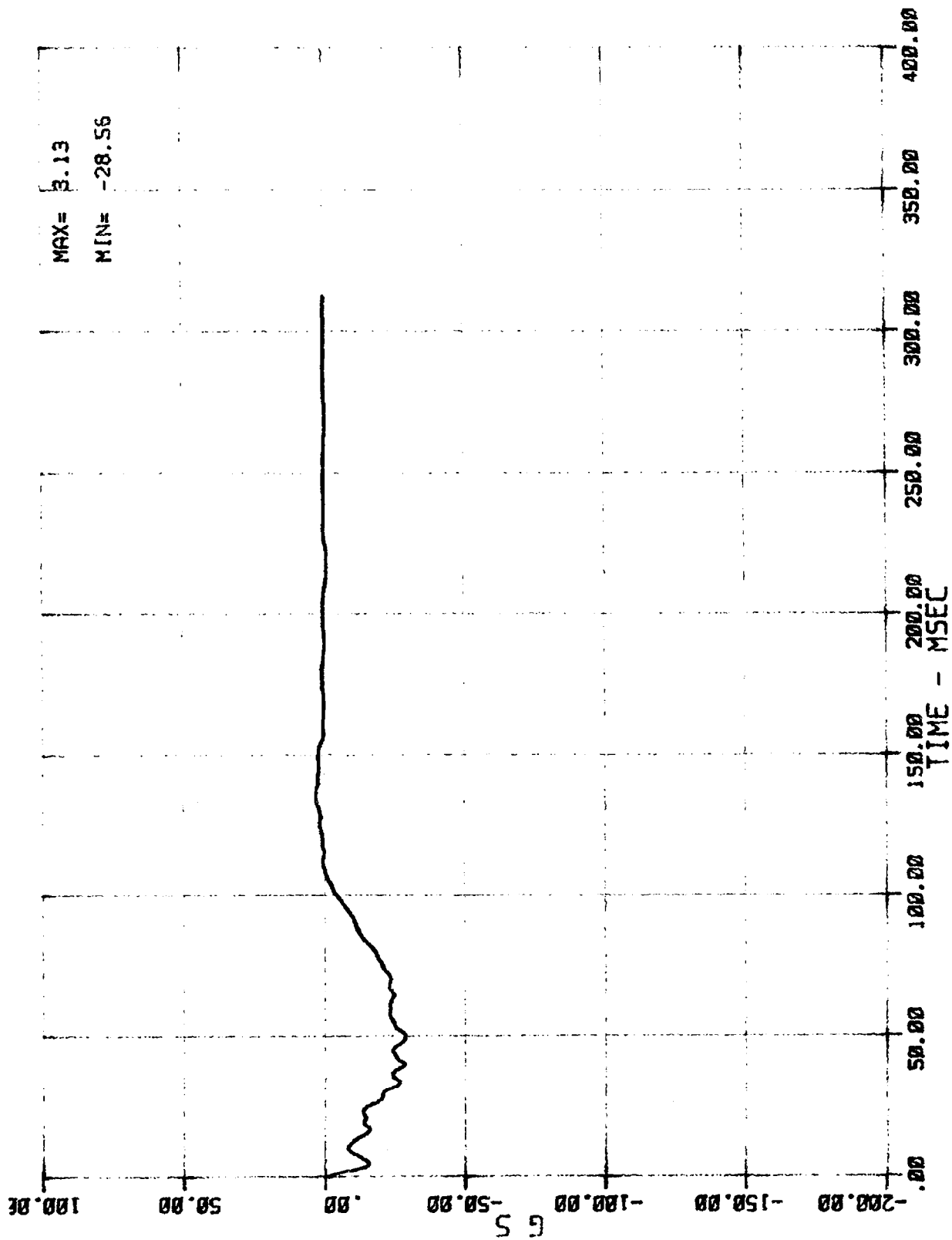
R7005-05



30 AC 01 N LRF (LEFT REAR FLOOR ACCEL. -- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87

R7005-05



31 AC 01 N RRF (RIGHT REAR FLOOR ACCEL. -- X-AXIS)
MSE N26057 1987 SUBARU GL

08/25/87

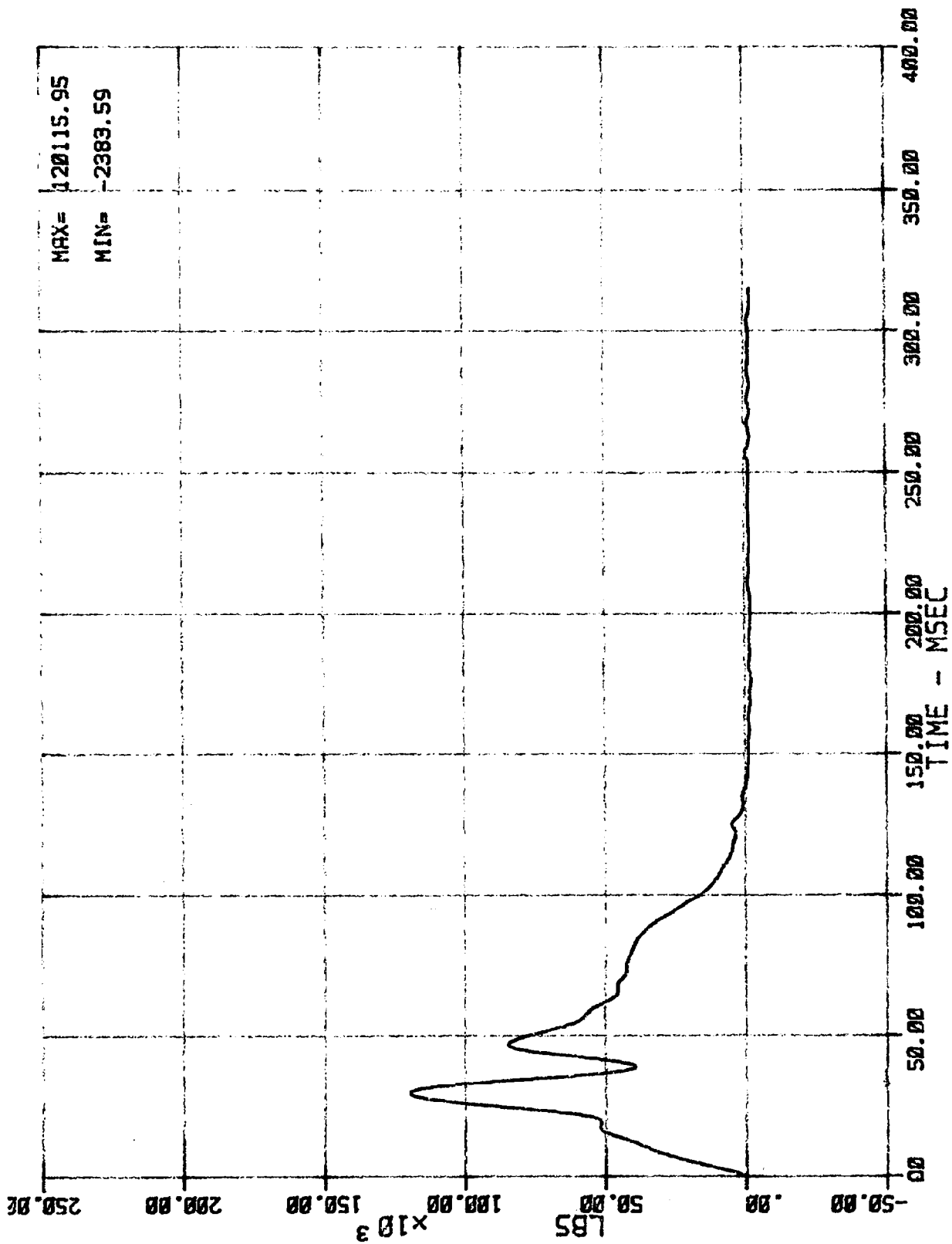
R7005-05

APPENDIX B-2

LOAD CELL BARRIER DATA

DATA FILTERING:

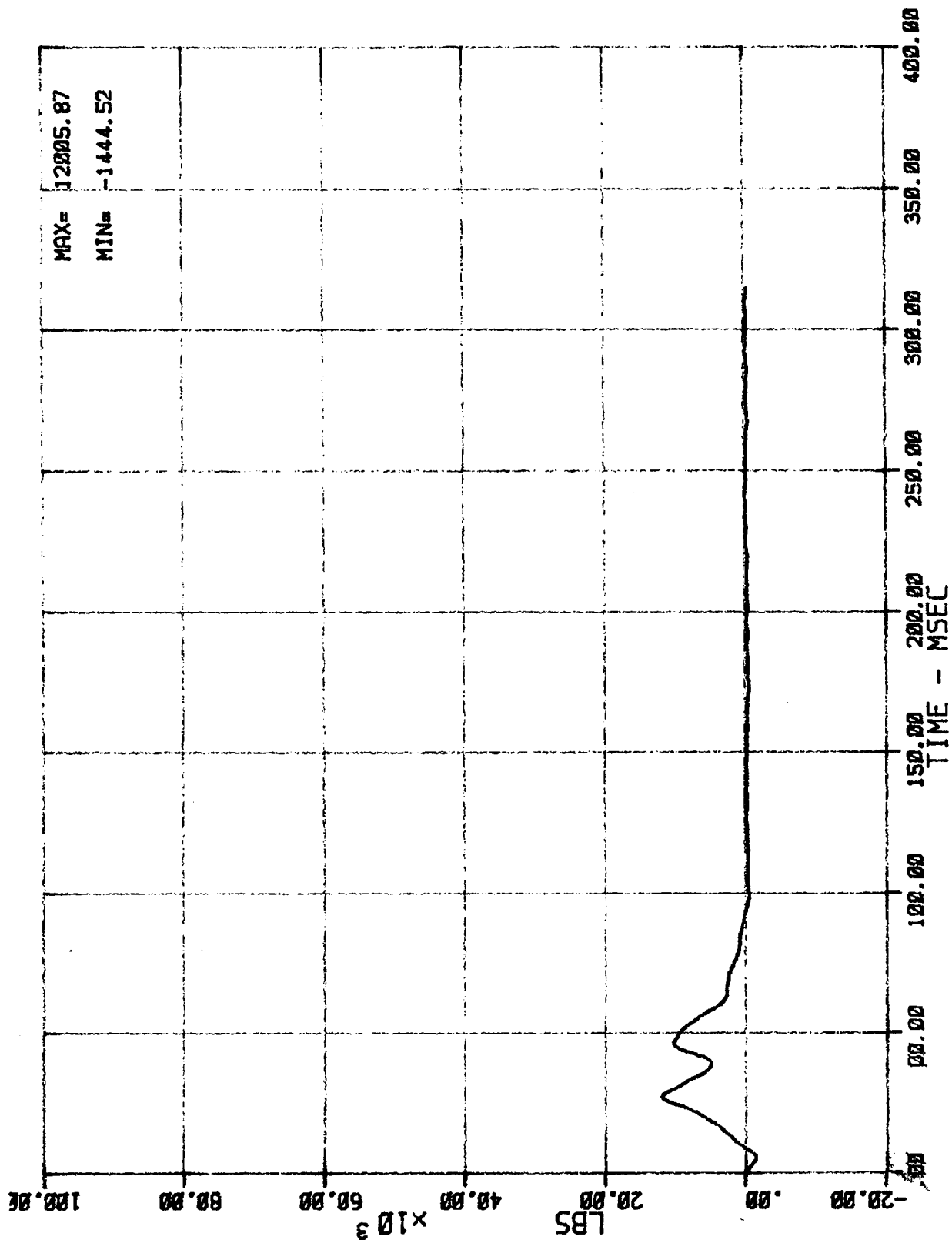
Load Cell Barrier channels - Class 60



TOTAL SUM, LOAD CELL BARRIER FORCE
MSE N26057 1987 SUBARU GL

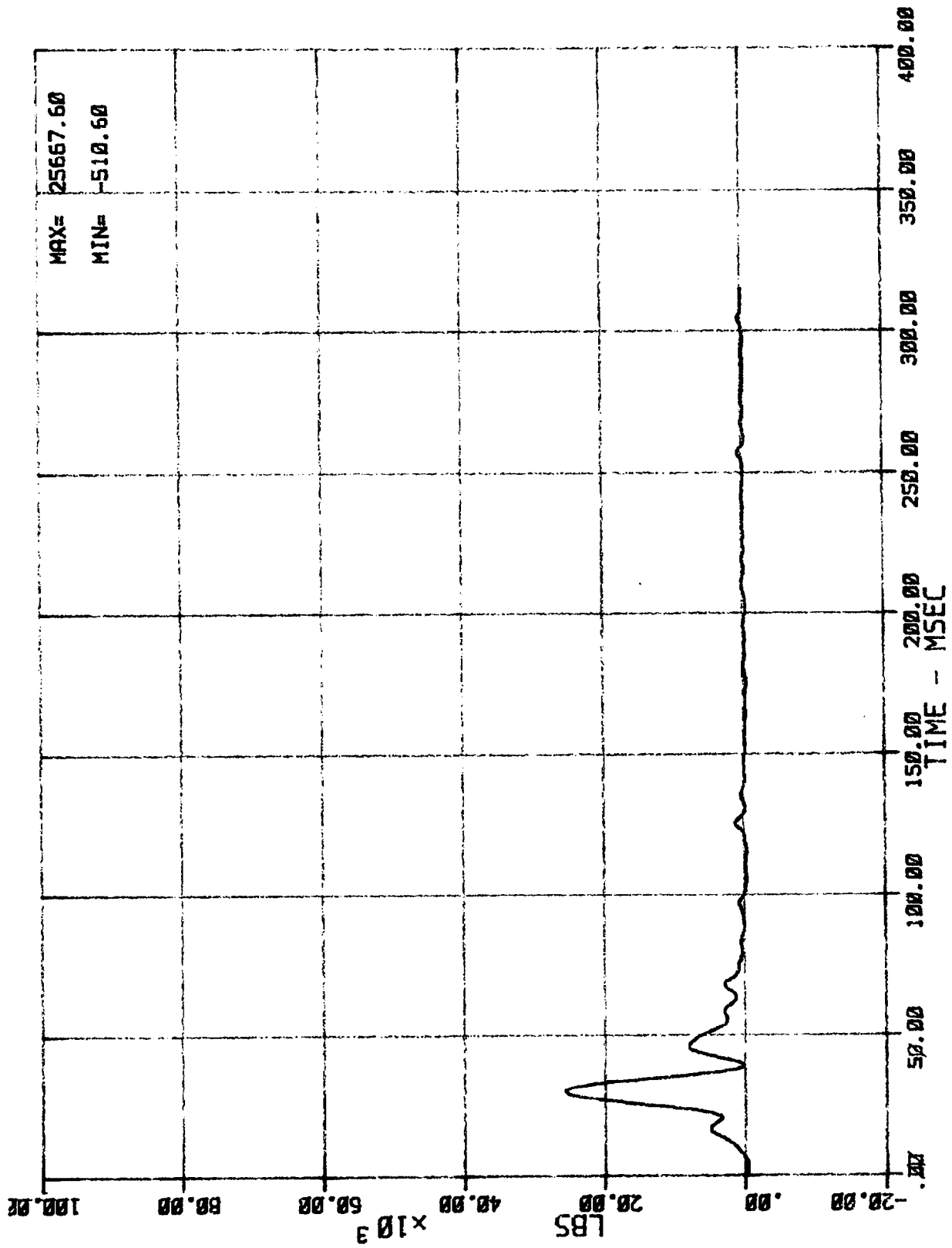
08/25/87

R7005-05



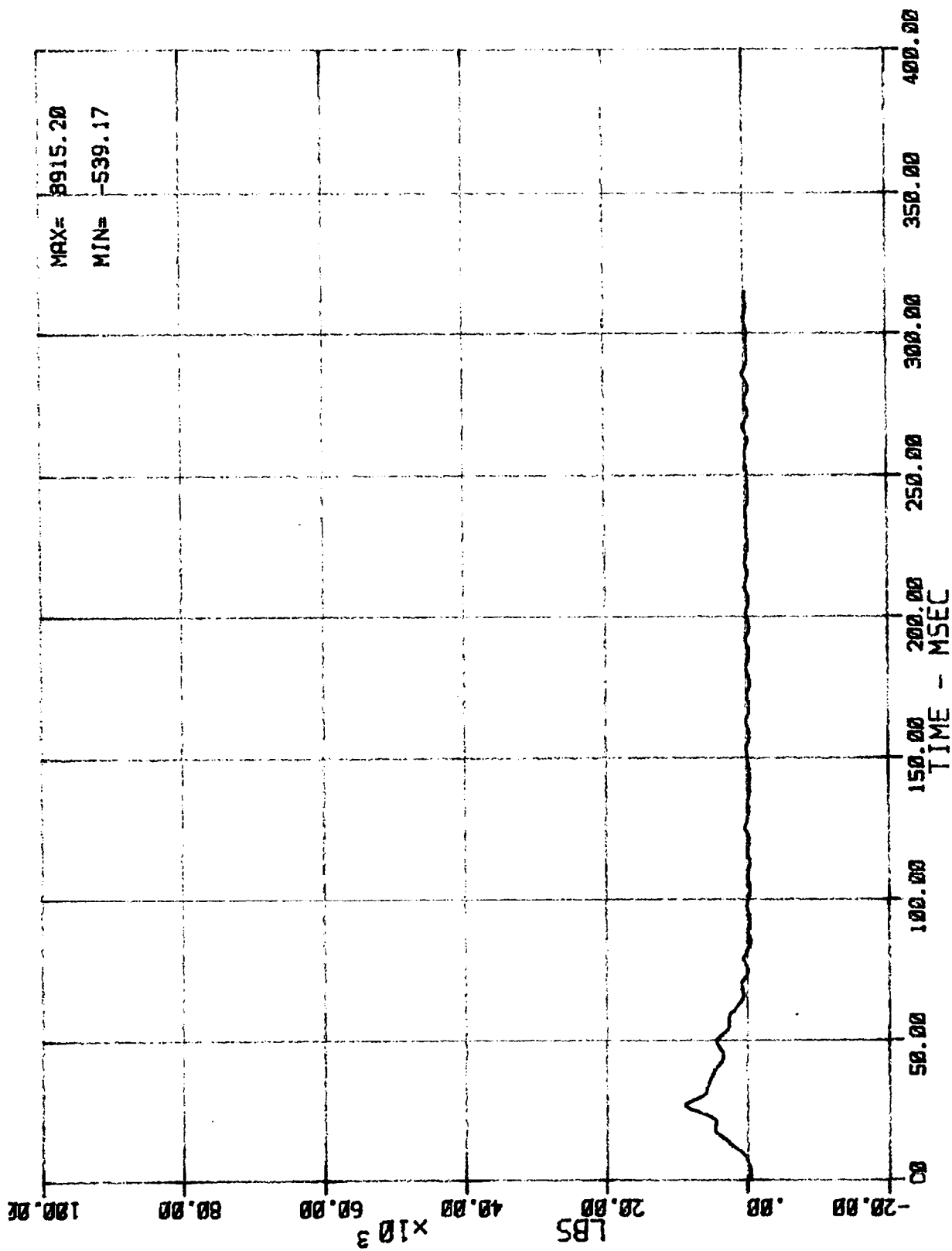
GROUP 1 SUM (C1,C2,C3,D1,D2,D3) LOAD CELL BARRIER FORCE
MSE N26057 1987 SUBARU GL

08/25/87



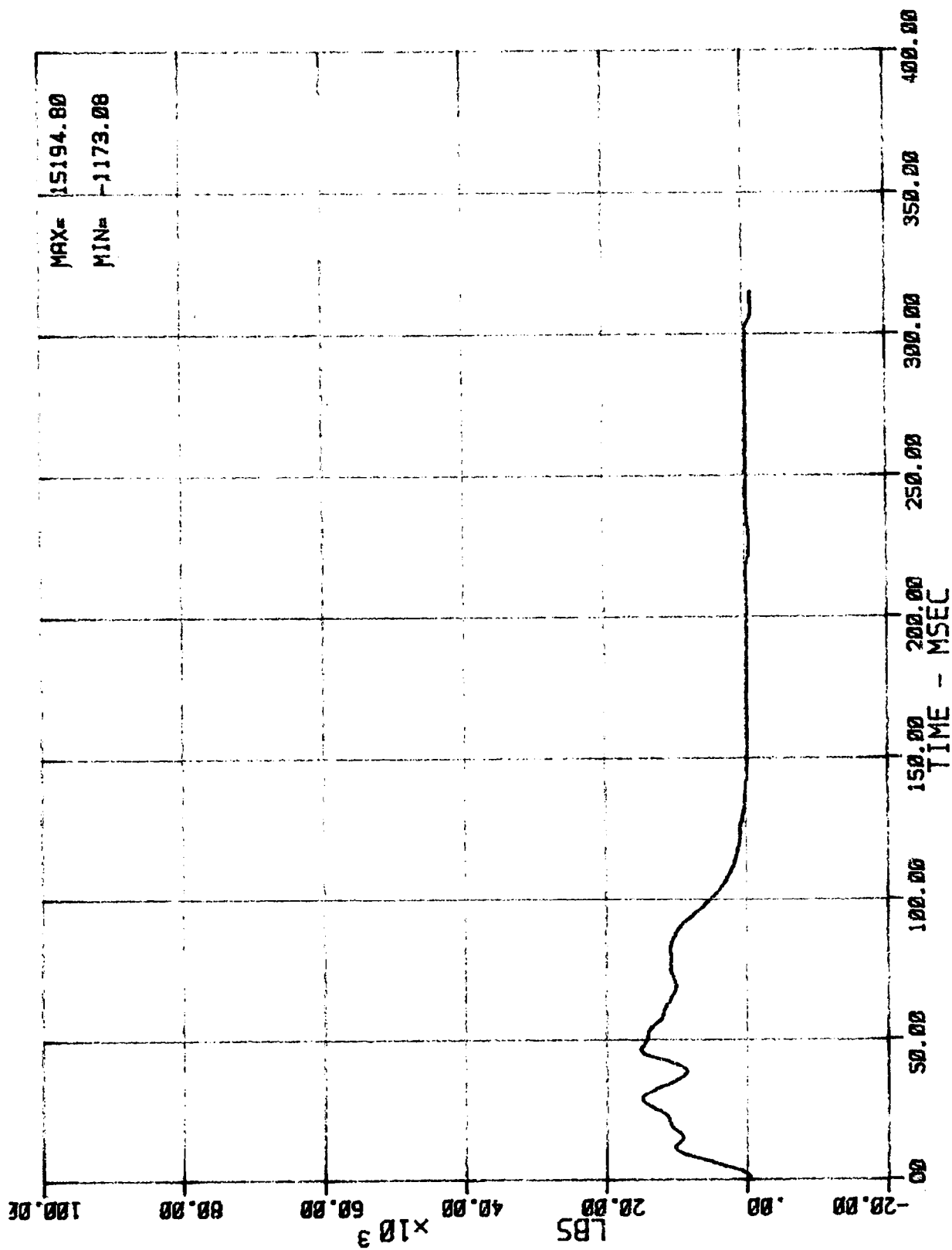
GROUP 2 SUM (C4,C5,C6,D4,D5,D6) LOAD CELL BARRIER FORCE
MSE N26057 1987 SUBARU GL

08/25/87



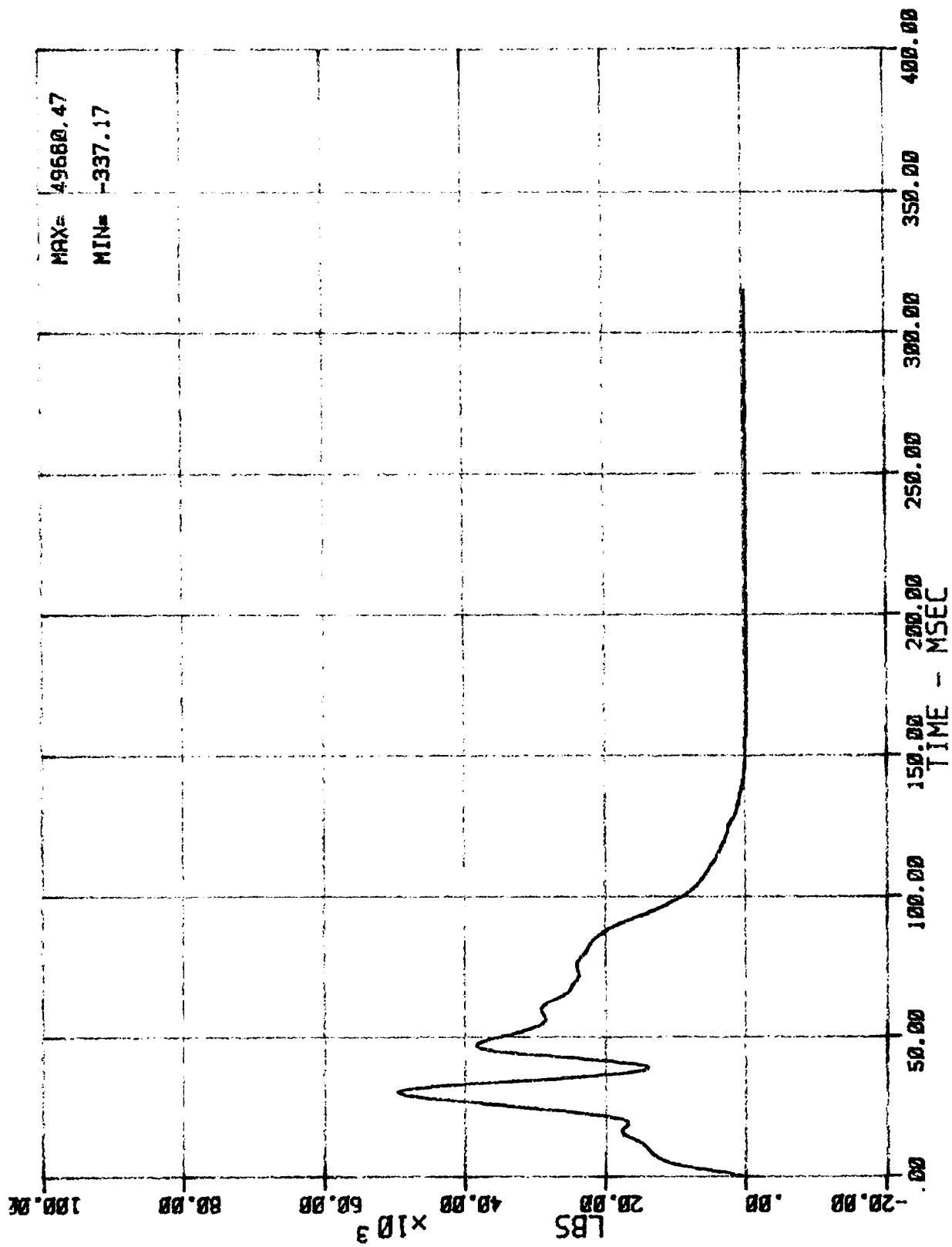
GROUP 3 SUM (C7,C8,C9,D7,D8,D9) LOAD CELL BARRIER FORCE
MSE N25057 1987 SUBARU GL

08/25/87



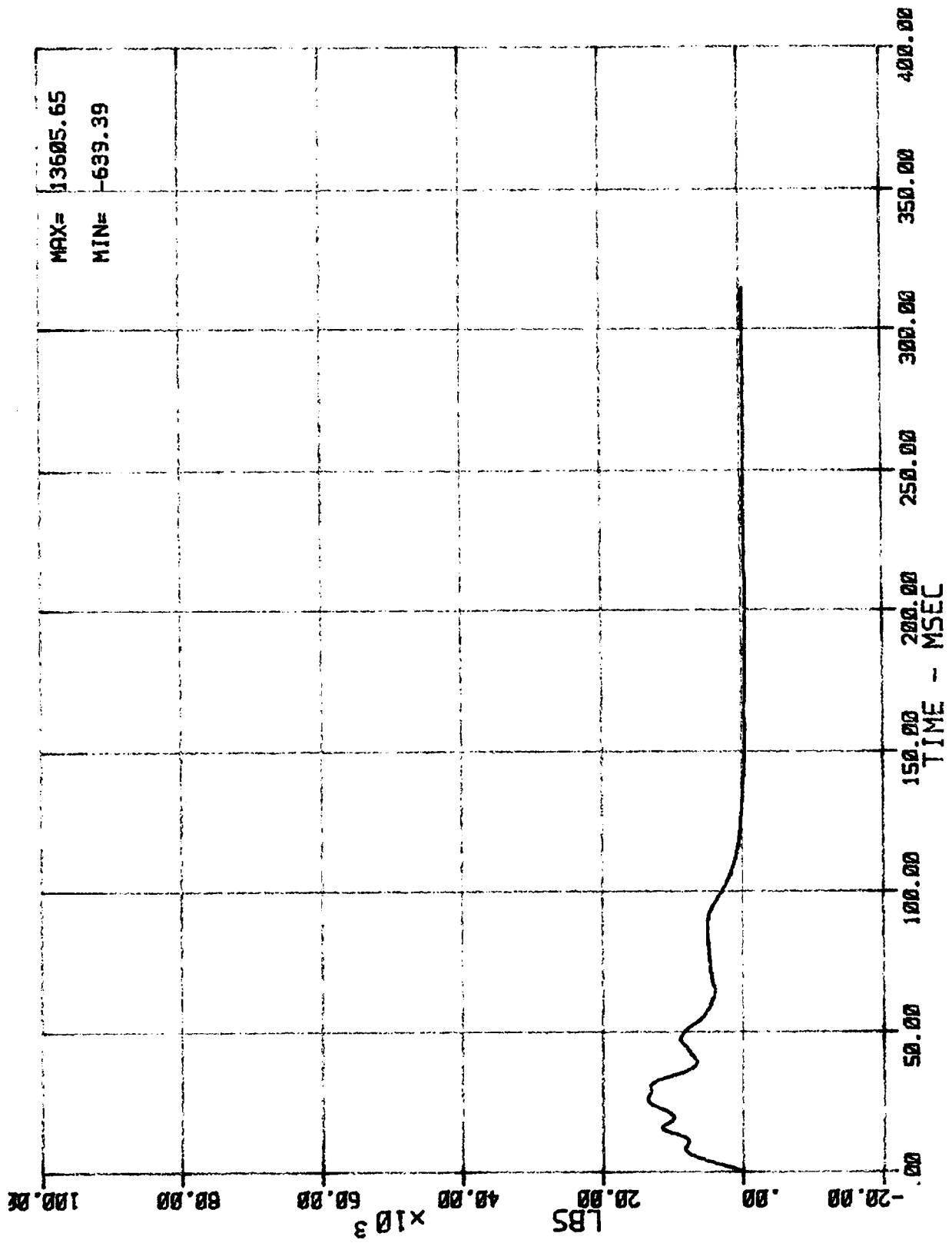
GROUP 4 SUM (A1,A2,A3,B1,B2,B3) LOAD CELL BARRIER FORCE
MSE N25057 1987 SUBARU GL

08/25/87



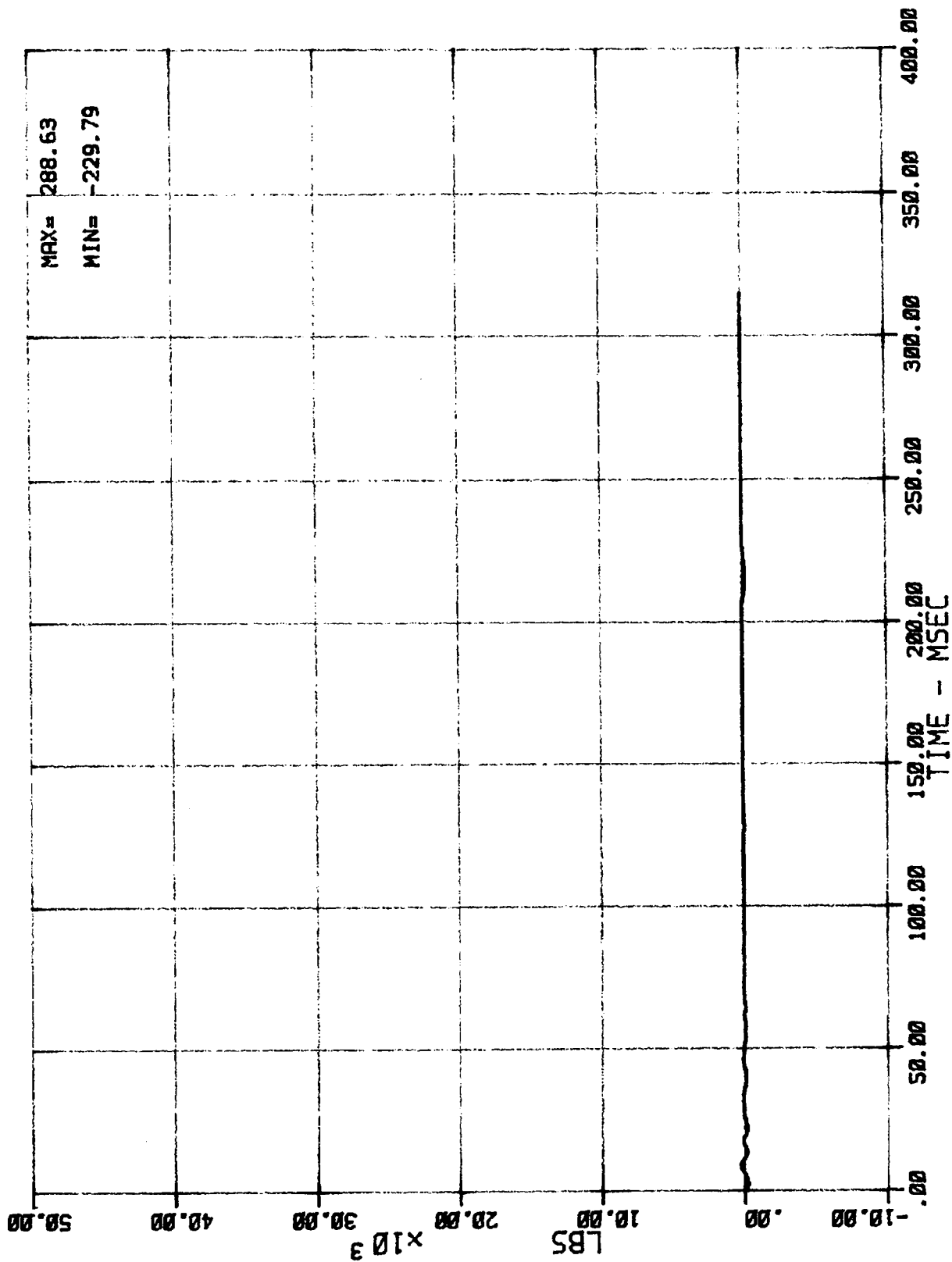
GROUP 5 SUM (A4,A5,A6,B4,B5,B6) LOAD CELL BARRIER FORCE
MSE N26057 1987 SUBARU GL

08/25/87



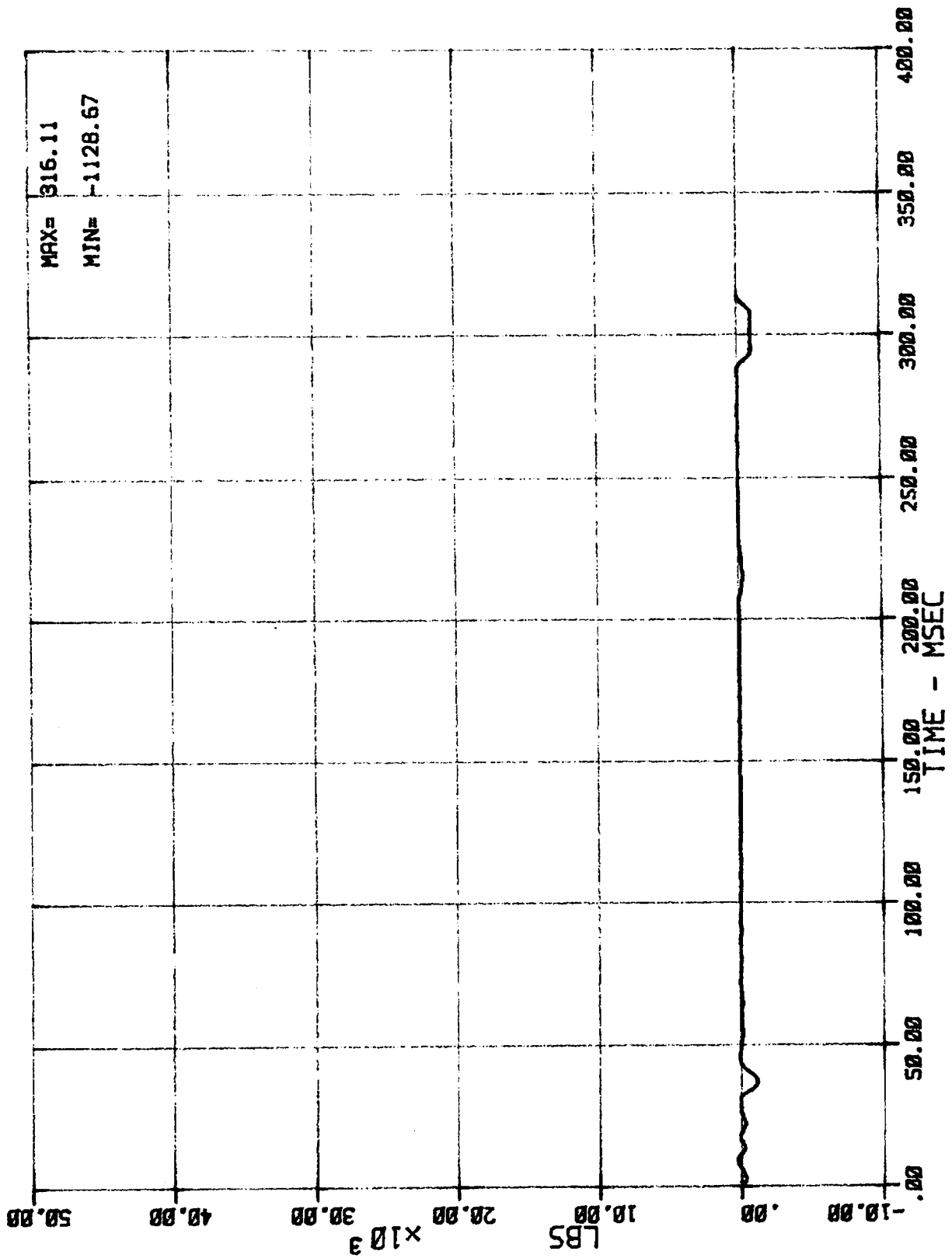
GROUP 6 SUM (A7,A8,A9,B7,B8,B9) LOAD CELL BARRIER FORCE
MSE N26057 1987 SUBARU GL

08/25/87



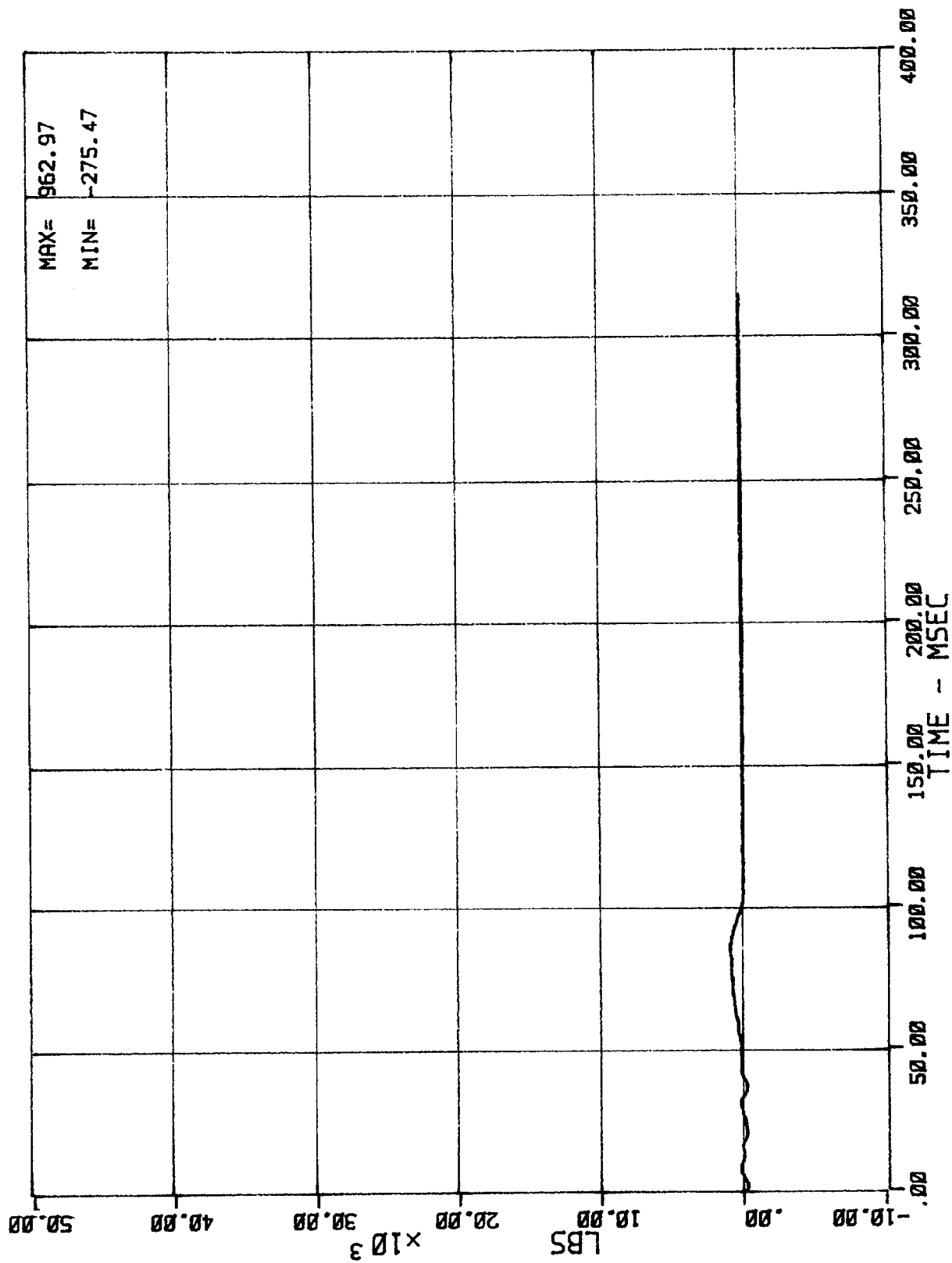
32 LC BA N BA1 (BARRIER LOAD CELL A1 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



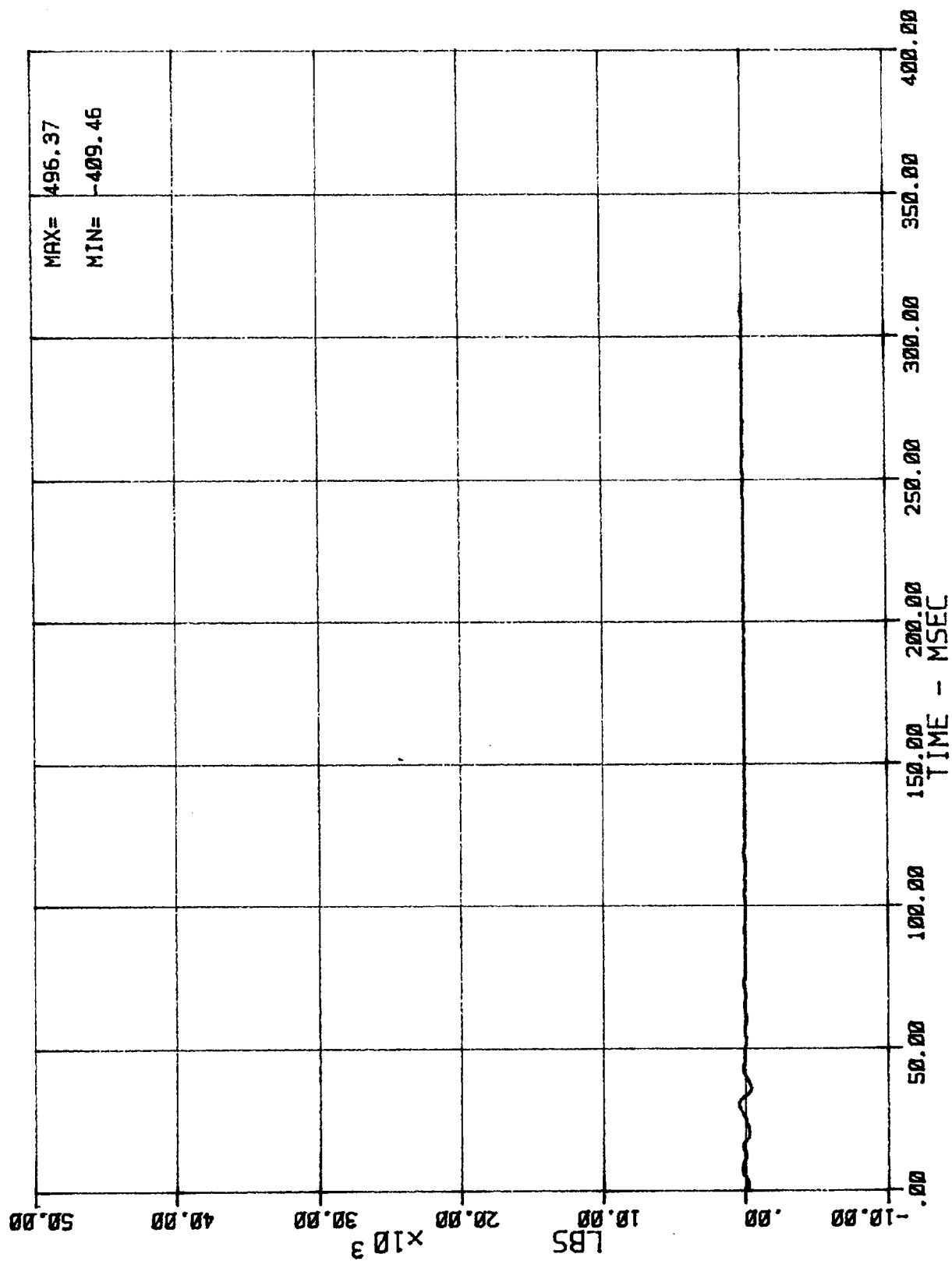
33 LC BR N BA2 (BARRIER LOAD CELL A2 - FORCE)
HSE N26057 1987 SUBARU GL

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34 LC BA N BA3 (BARRIER LOAD CELL A3 - FORCE)
MSE N26057 1987 SUBARU GL

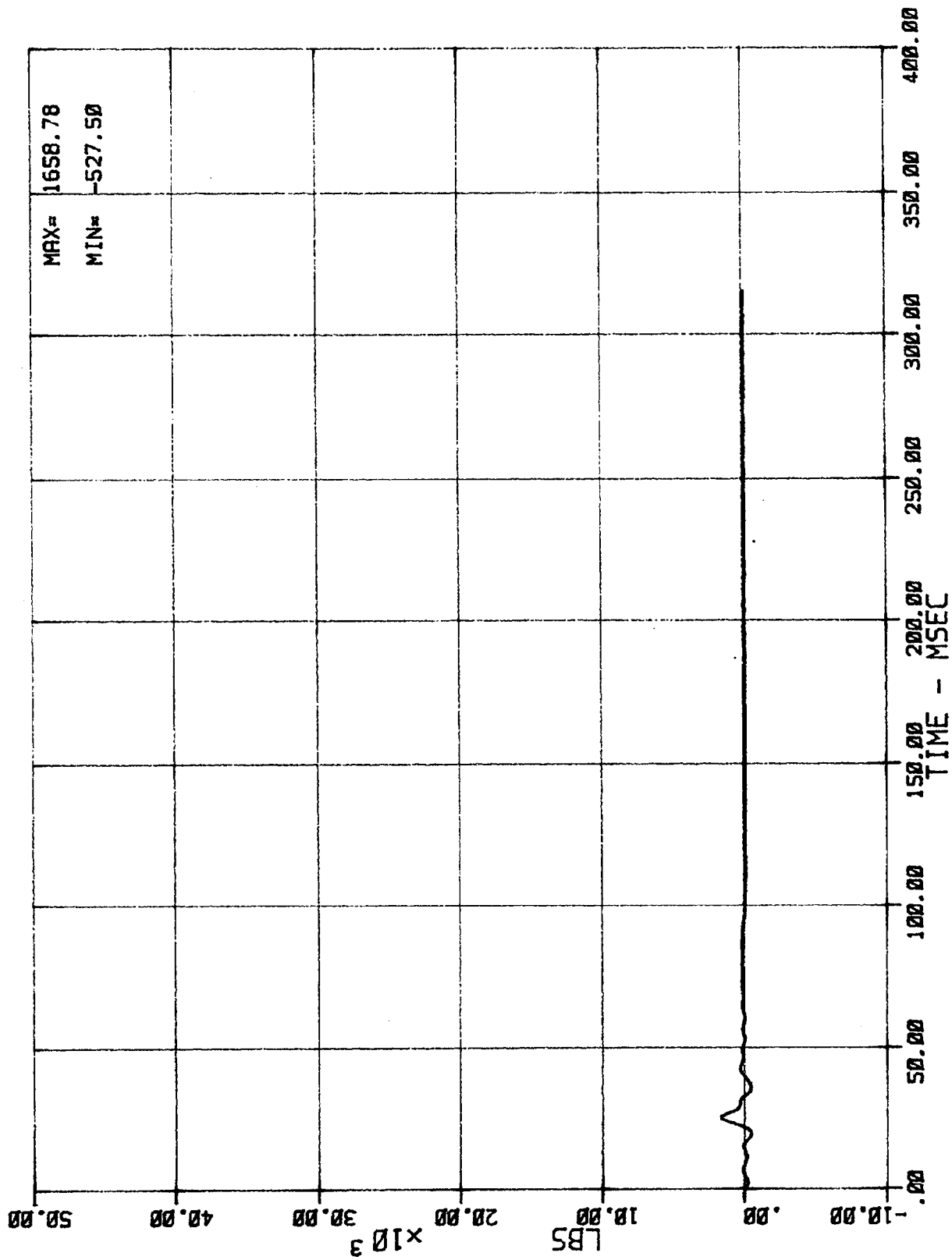
08/25/87



35 LC N BA4 (BARRIER LOAD CELL A4 - FORCE)
MSE N26057 1987 SUBARU GL

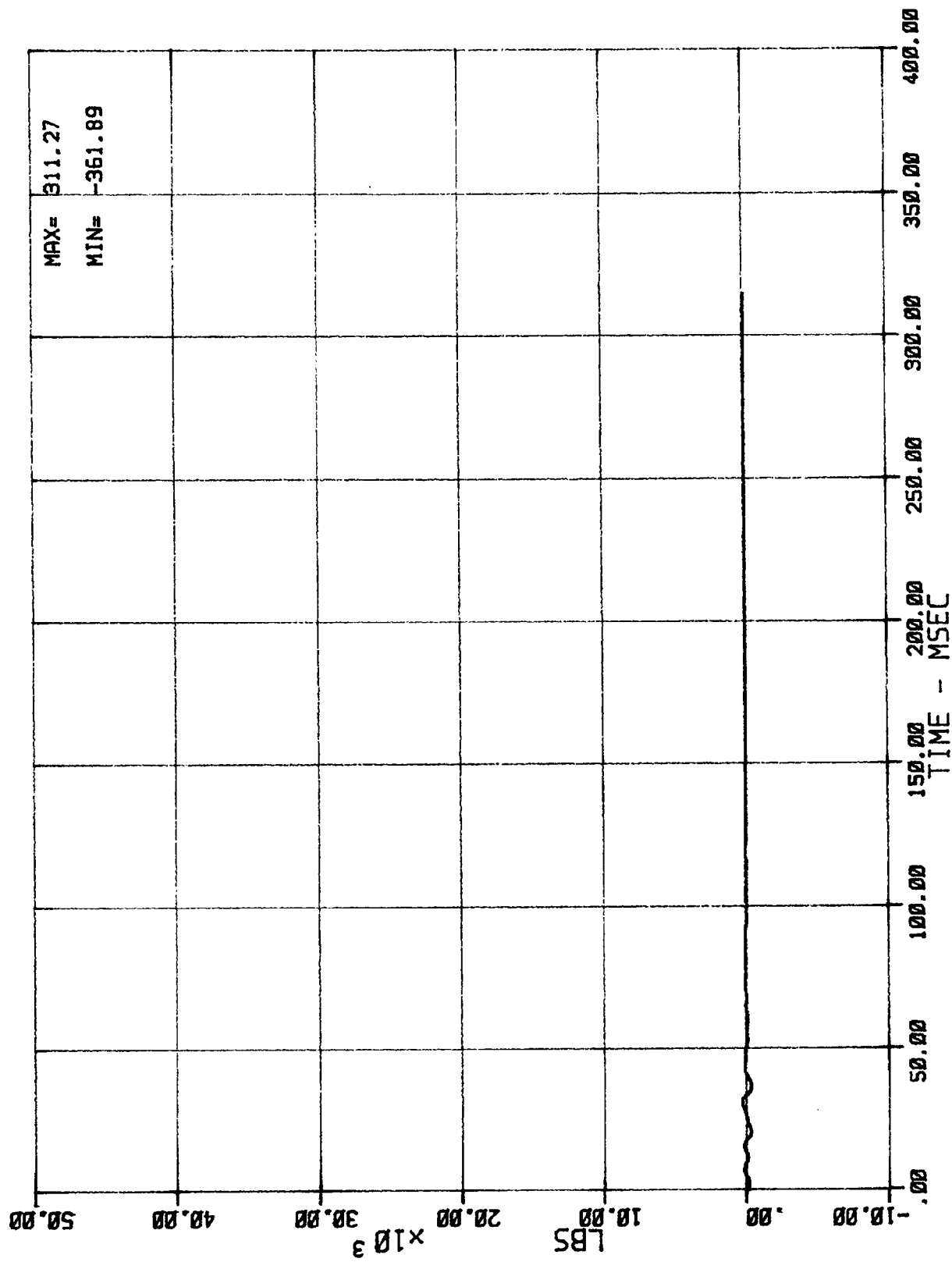
08/25/87

R7005-05



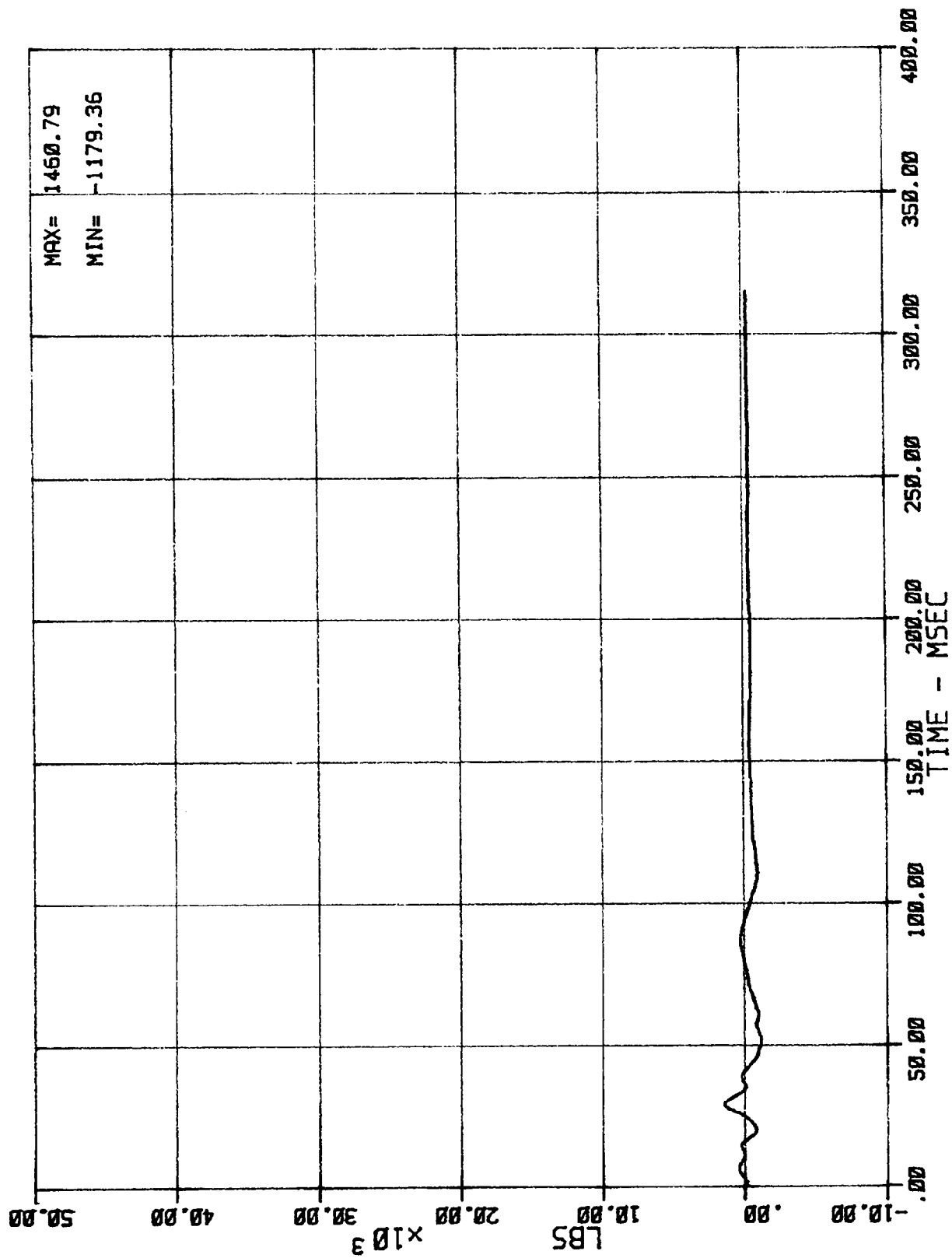
36 LC BA N BAS (BARRIER LOAD CELL A5 - FORCE)
 MSE N26057 1987 SUBARU GL

08/25/87



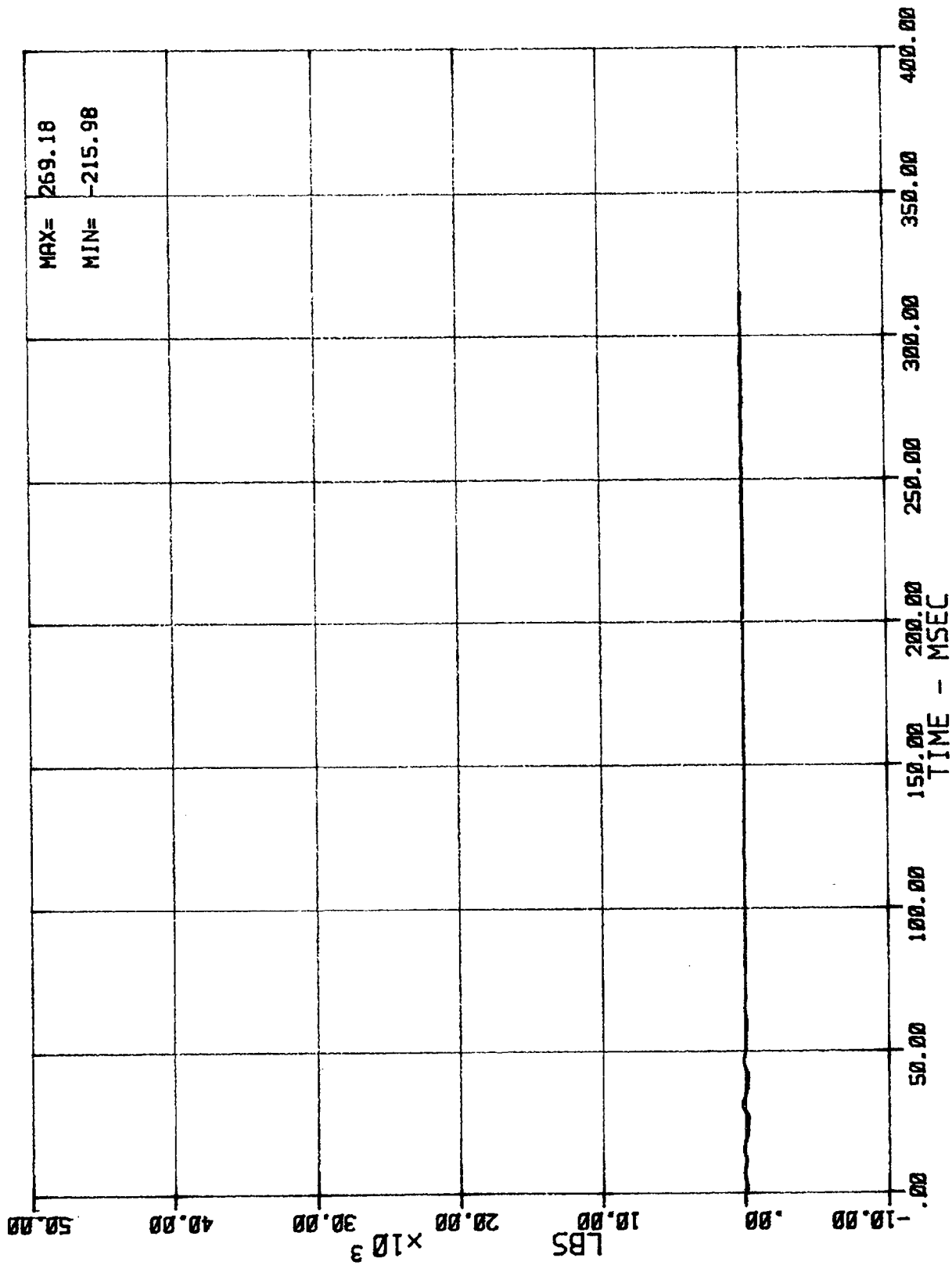
37 LC BA N BA6 (BARRIER LOAD CELL A6 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



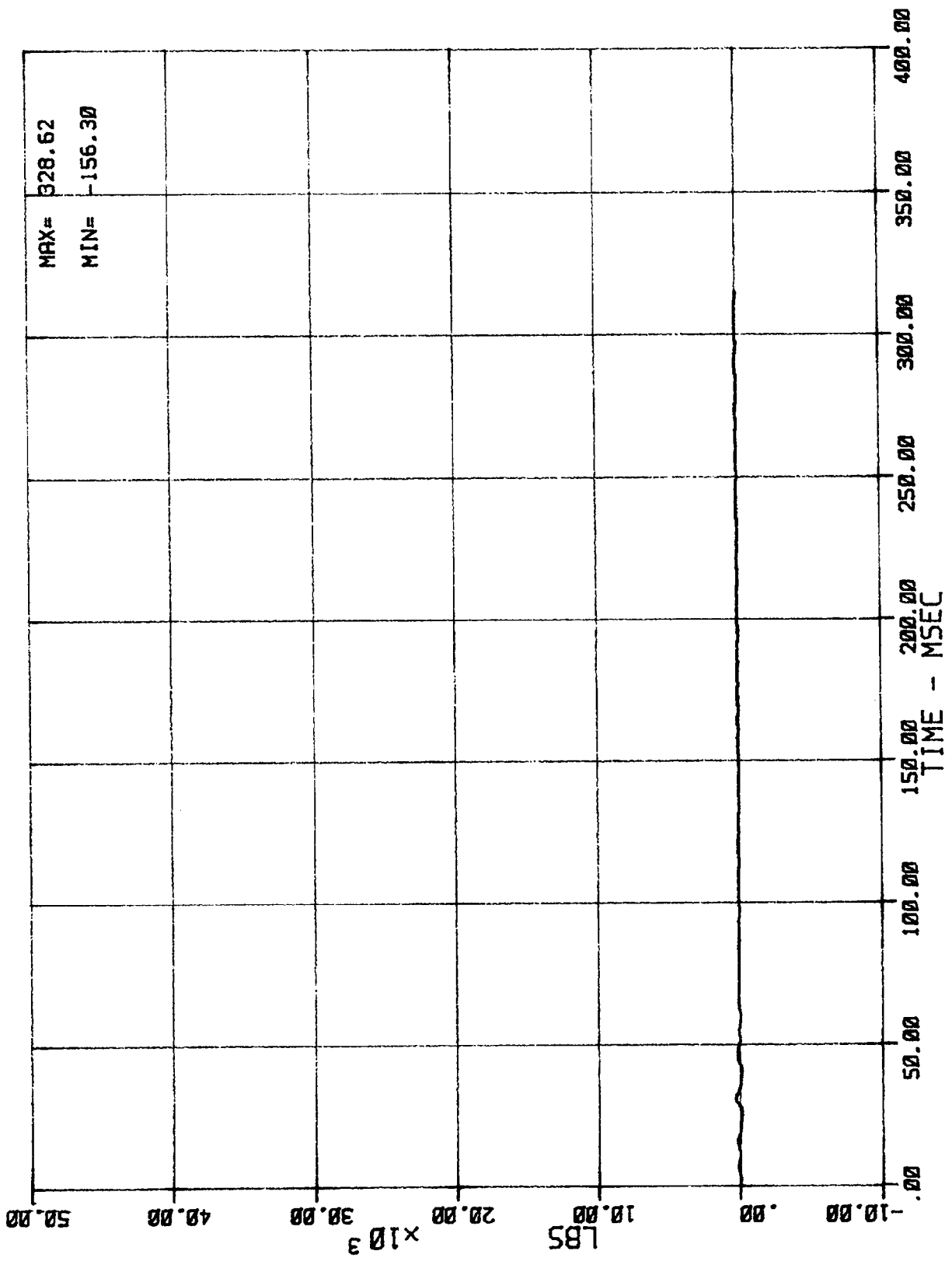
38 LC BA N BA7 (BARRIER LOAD CELL A7 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



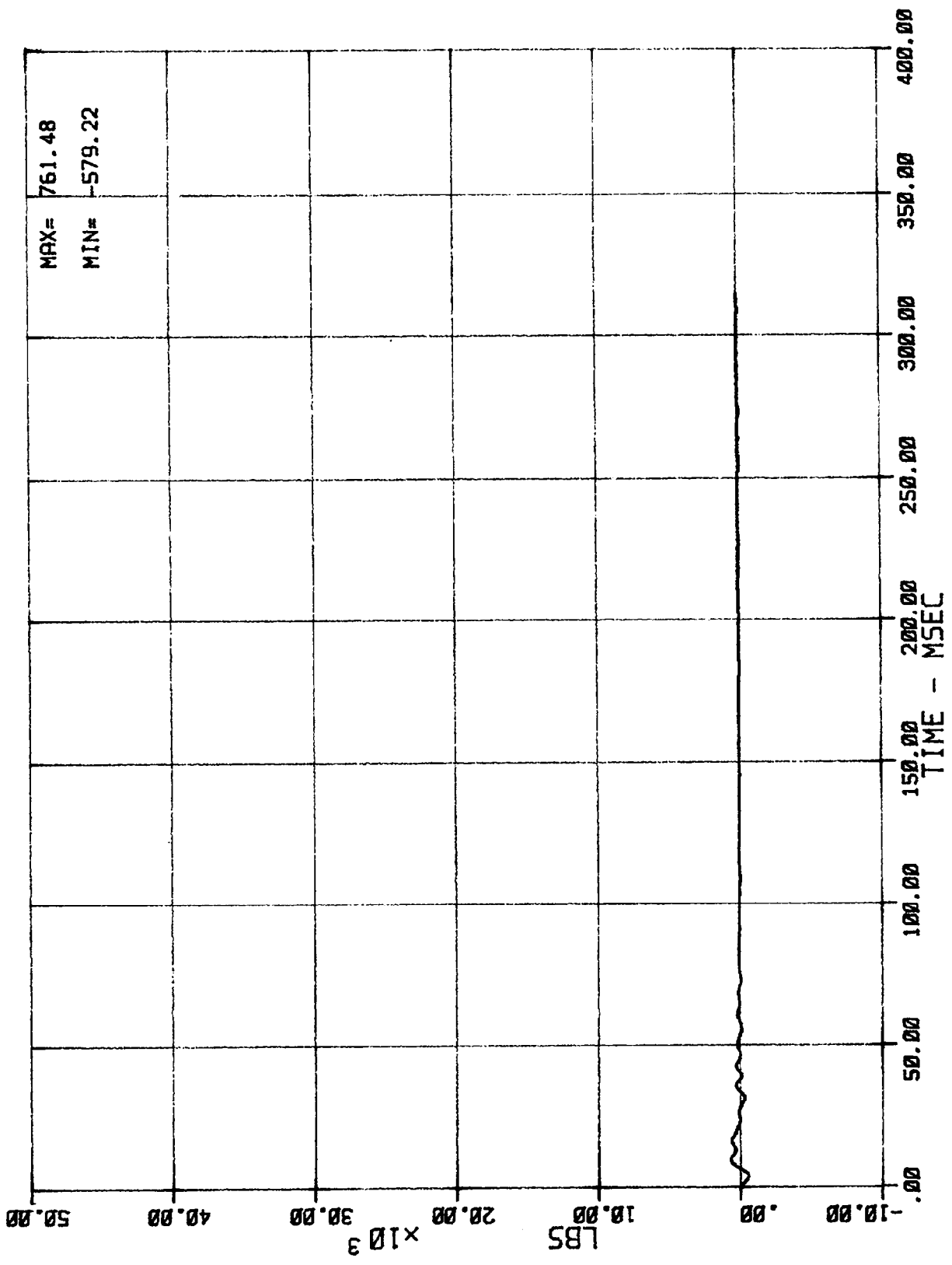
39 LC BA N BA8 (BARRIER LOAD CELL A8 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



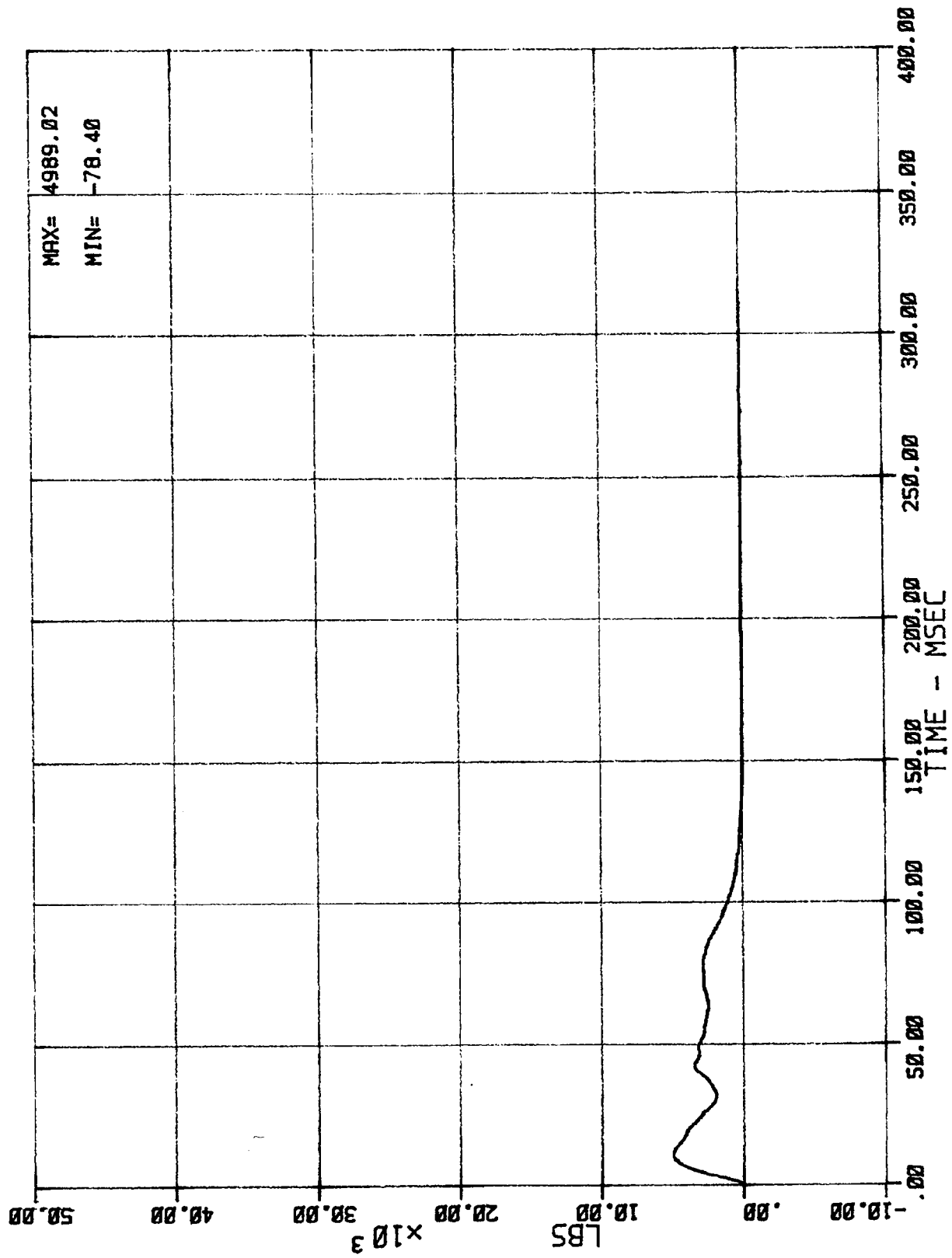
40 LC BA N BA9 (BARRIER LOAD CELL A9 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



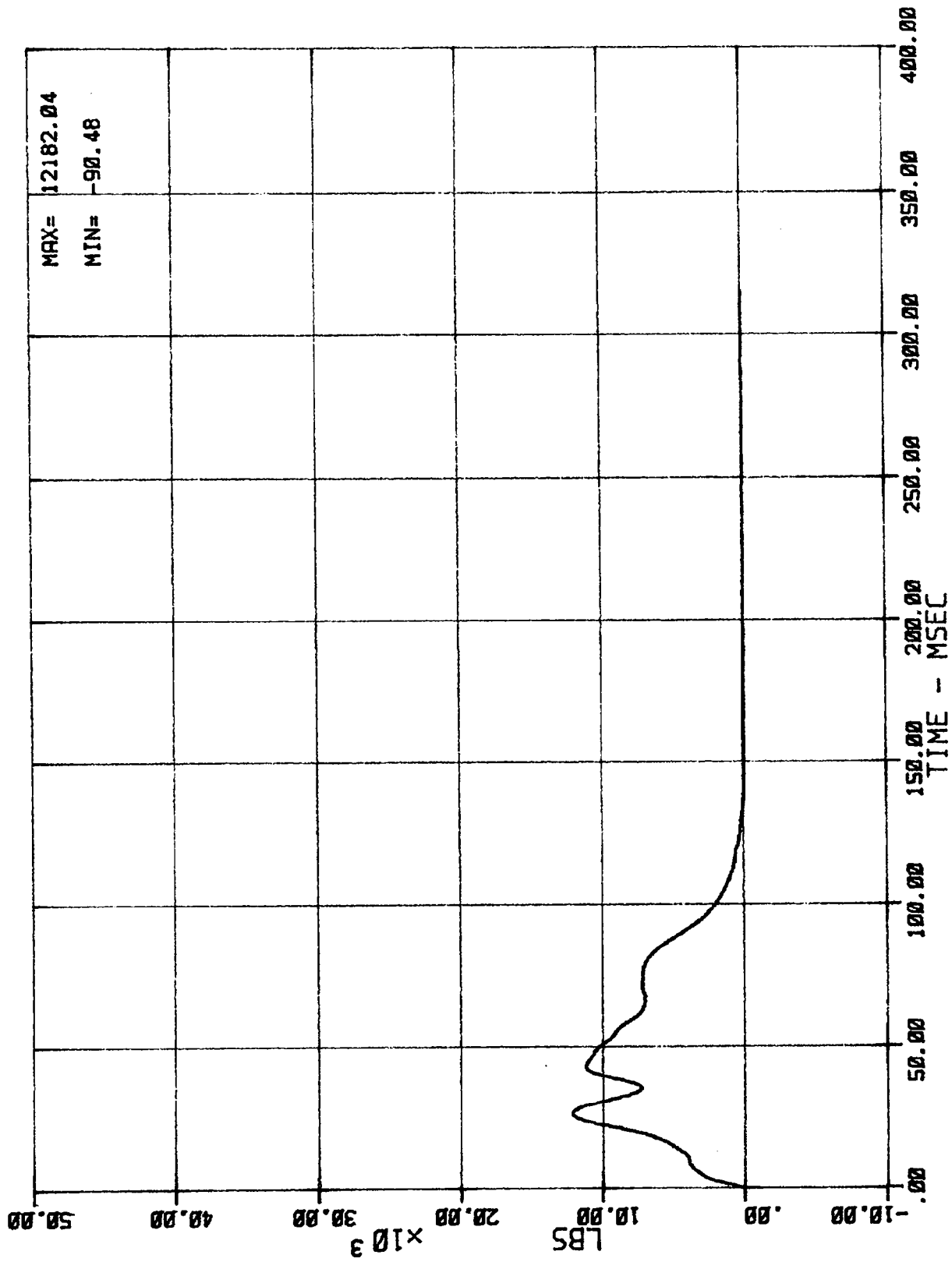
41 LC BA N BB1 (BARRIE LOAD CELL B1 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



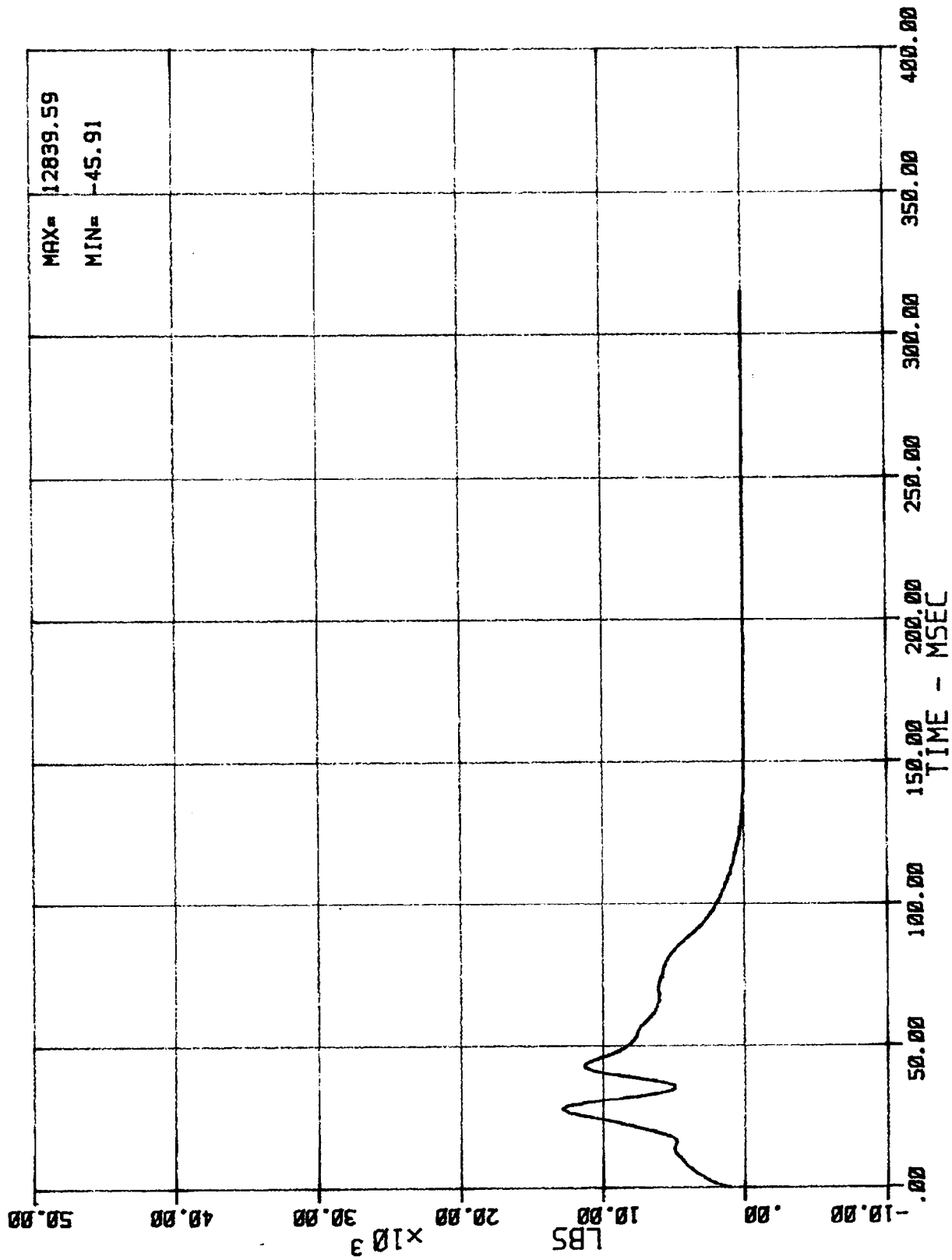
42 LC BB N BB2 (BARRIER LOAD CELL B2 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



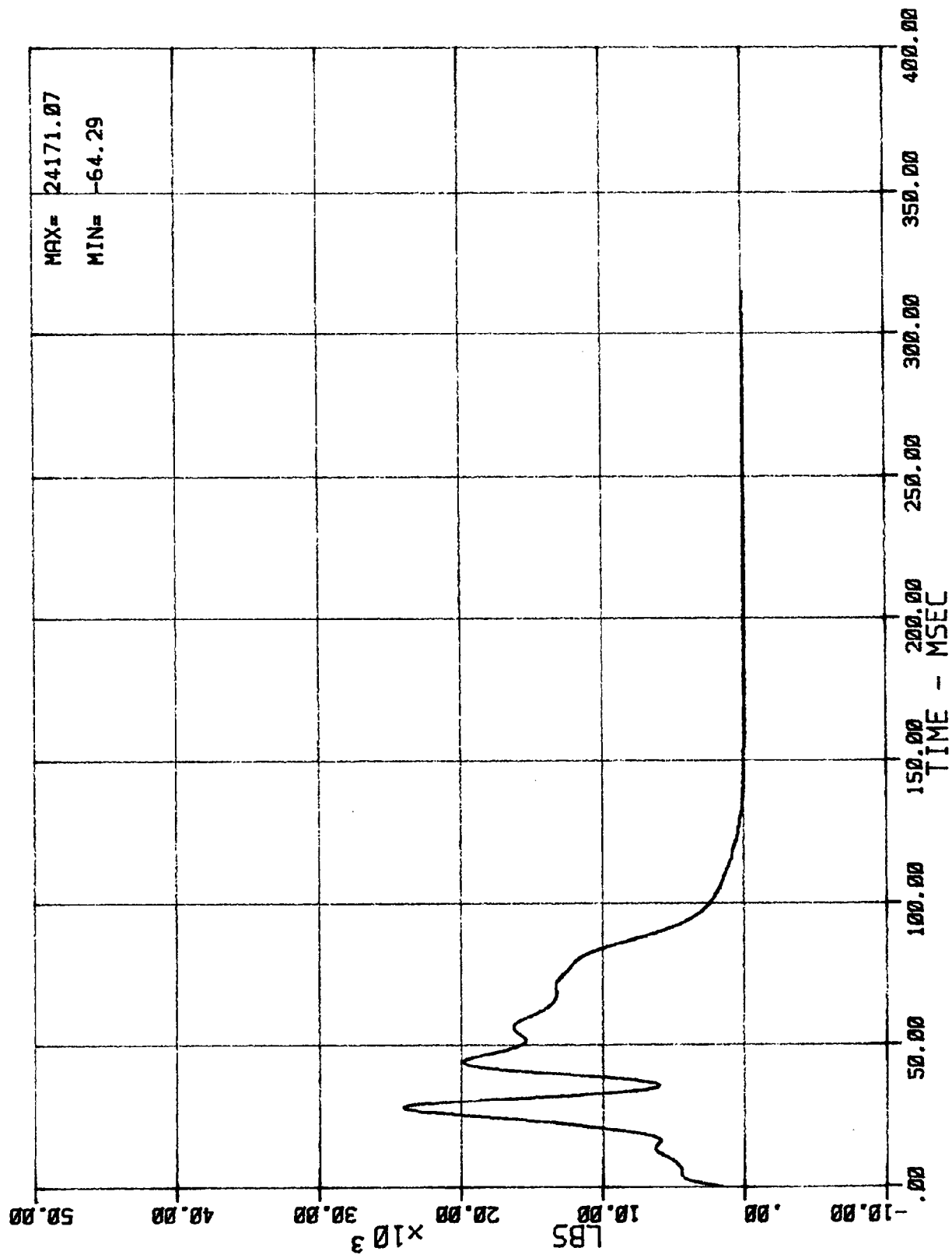
43 LC BA N BB3 (BARRIER LOAD CELL B3 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



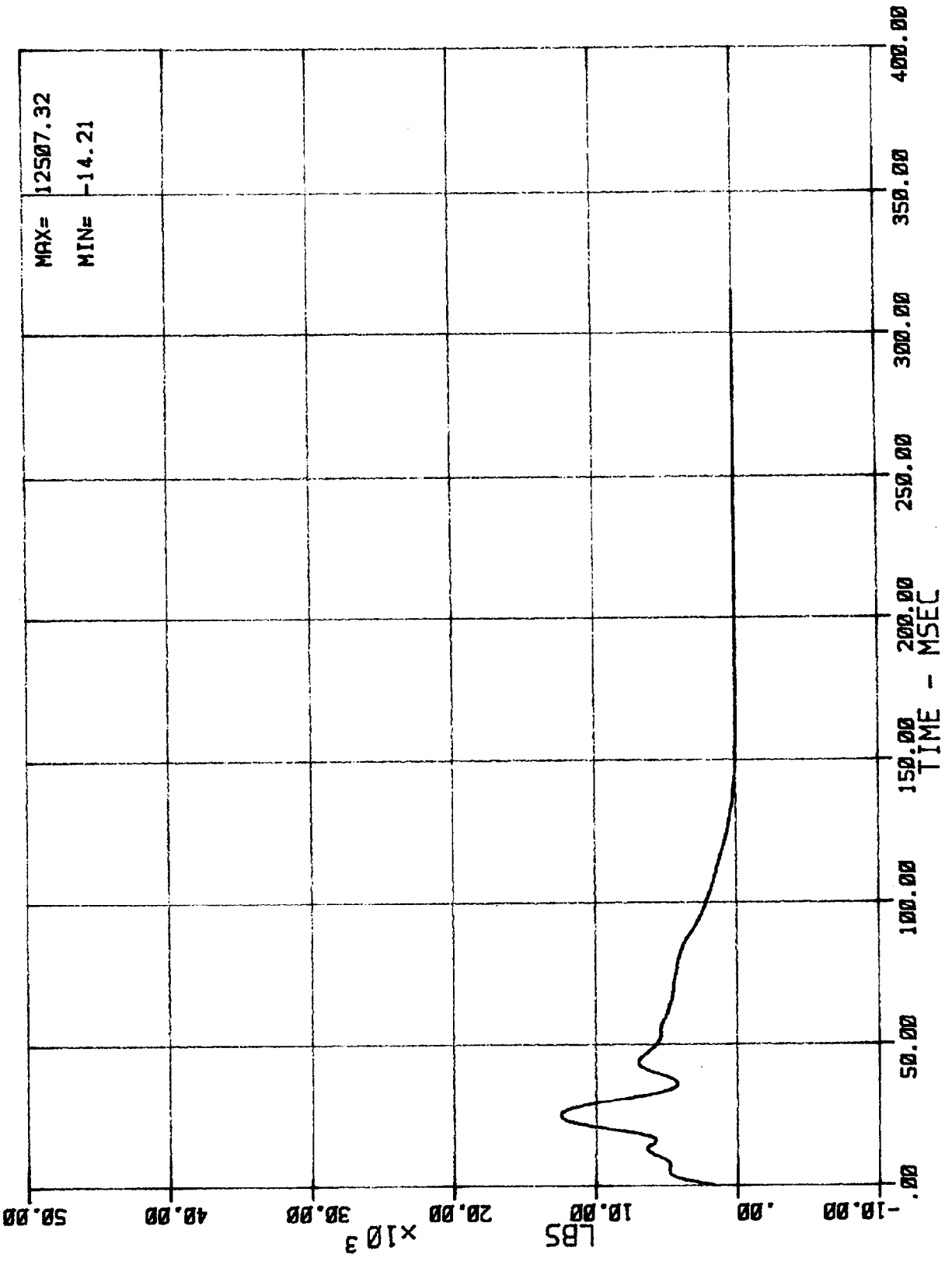
44 LC BA N BB4 (BARRIER LOAD CELL B4 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



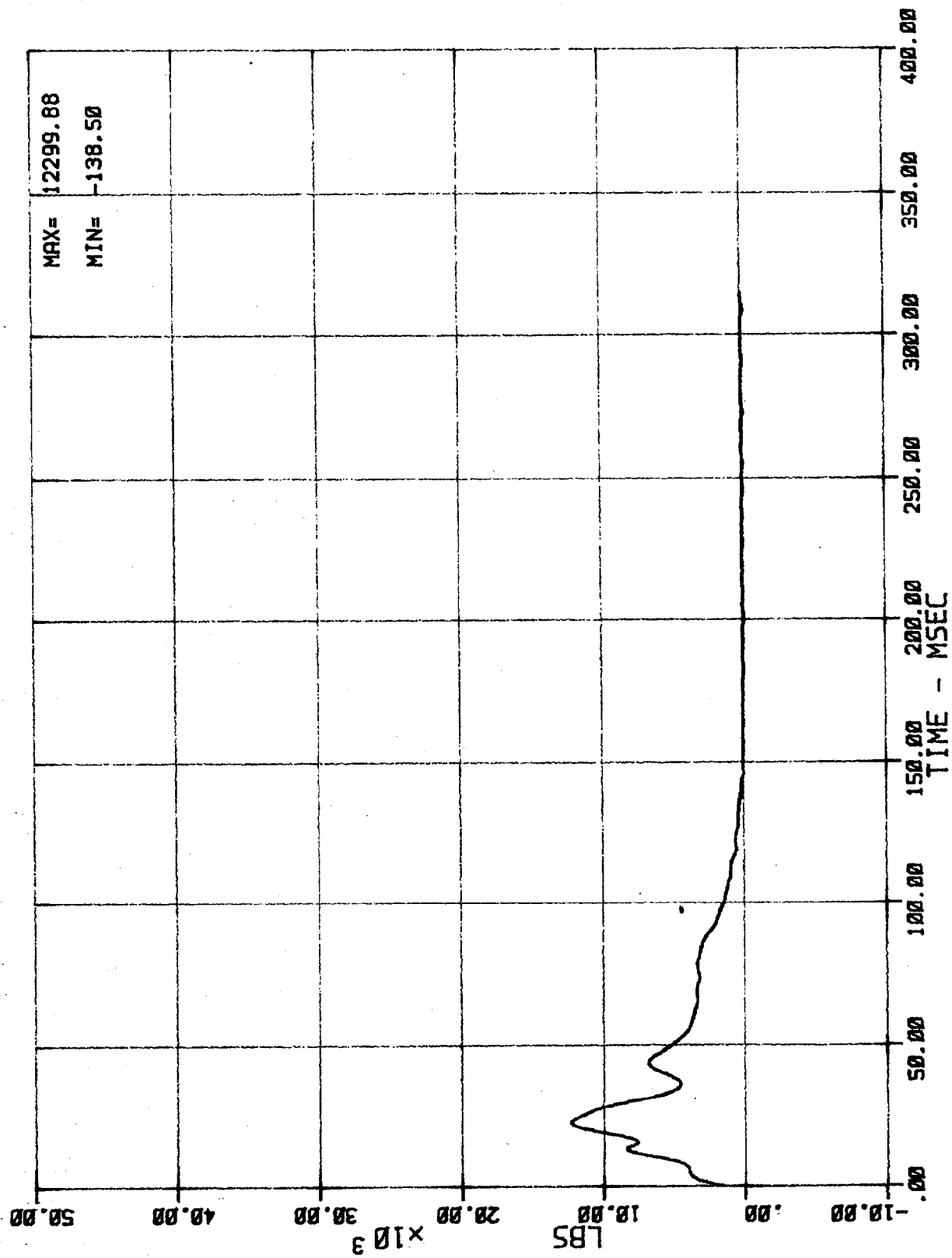
45 LC BA N BBS (BARRIER LOAD CELL B5 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



46 LC BA N 886 (BARRIER LOAD CELL 86 - FORCE)
 MSE N26057 1987 SUBARU GL

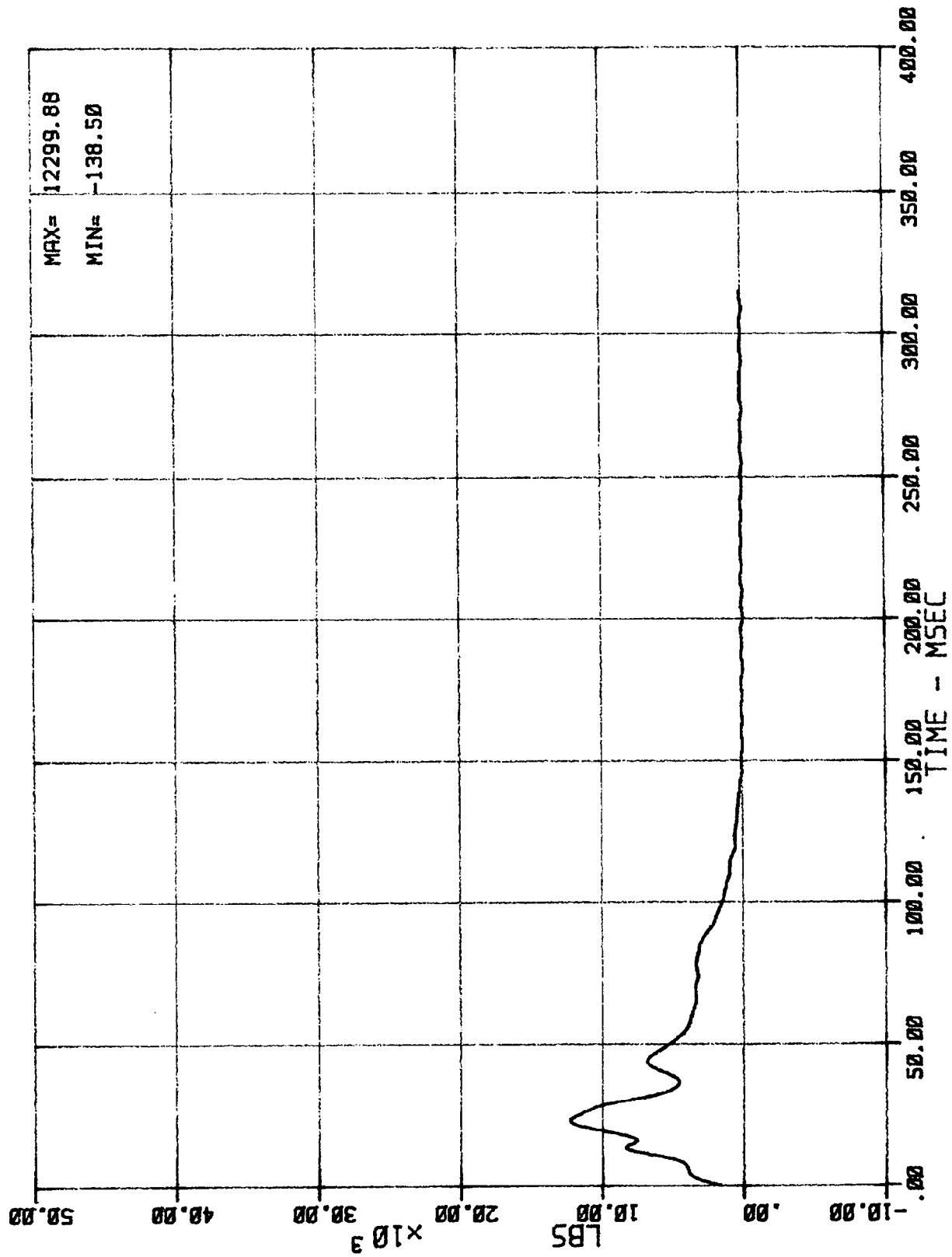
08/25/87



47 LC BA N BB7 (BARRIER LOAD CELL B7 - FORCE)
MSE N26057 1987 SUBARU GL

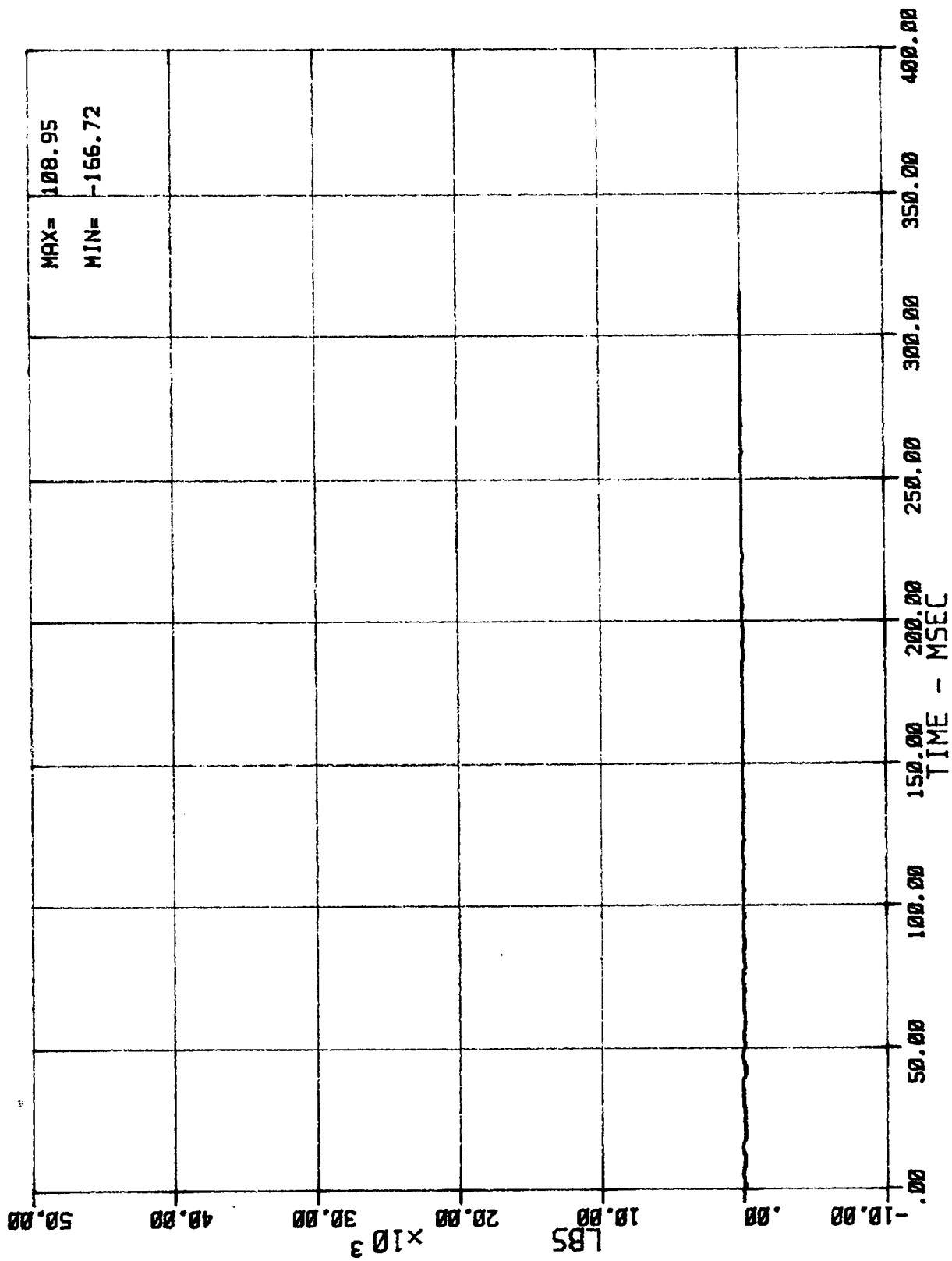
08/25/87

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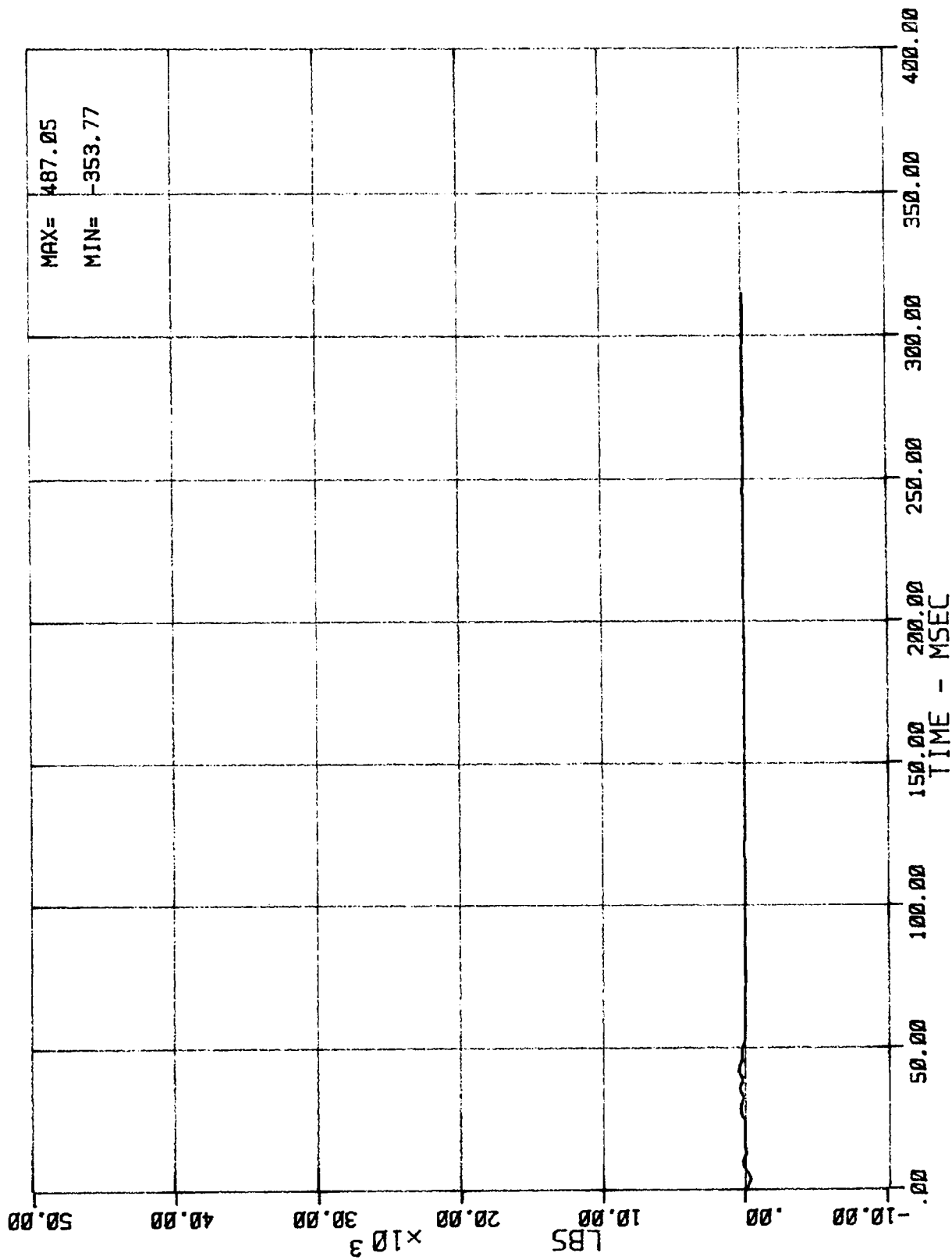
48 LC BA N BB8 (BARRIER LOAD CELL BB - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



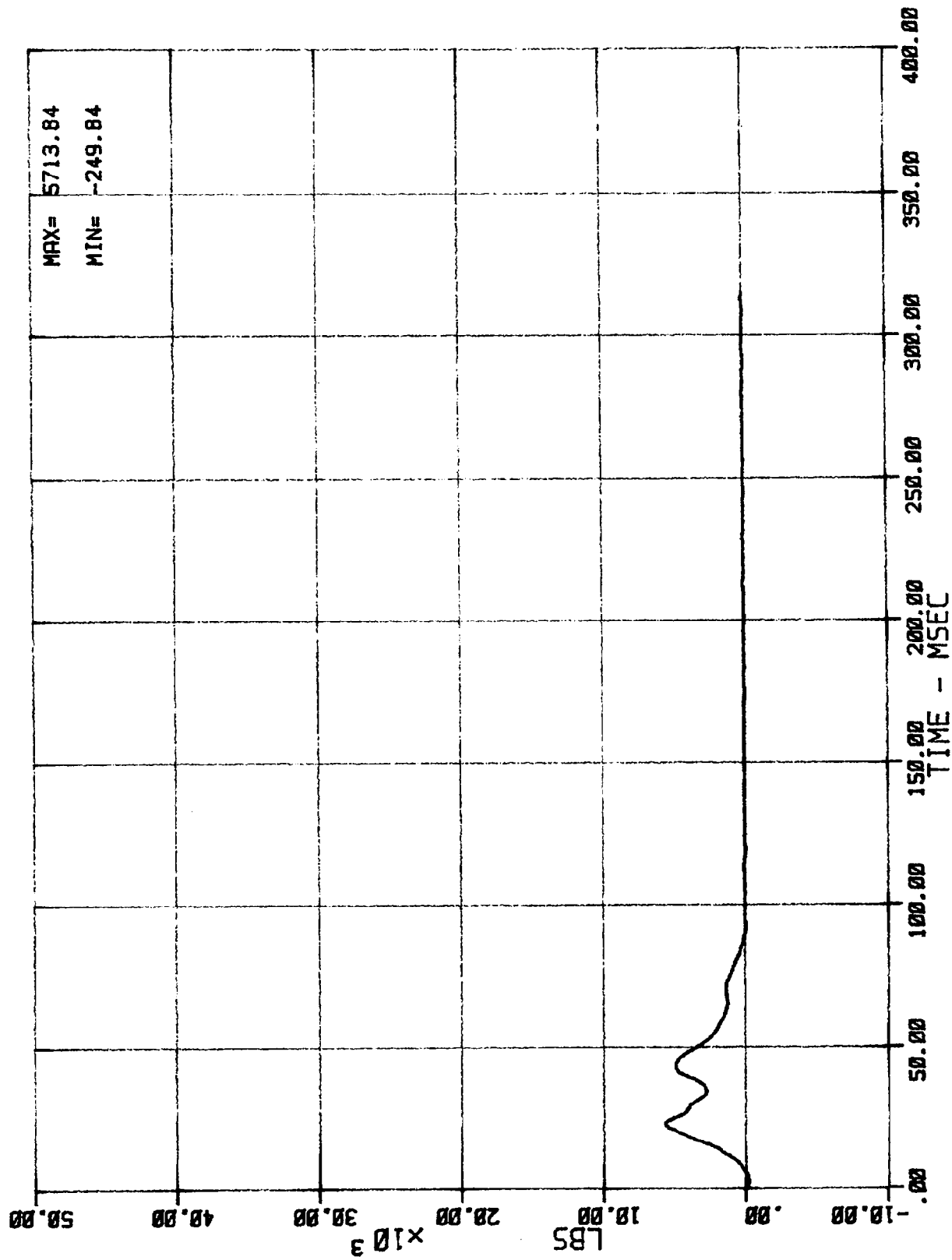
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MSE N26057 1987 SUBARU GL

08/25/87



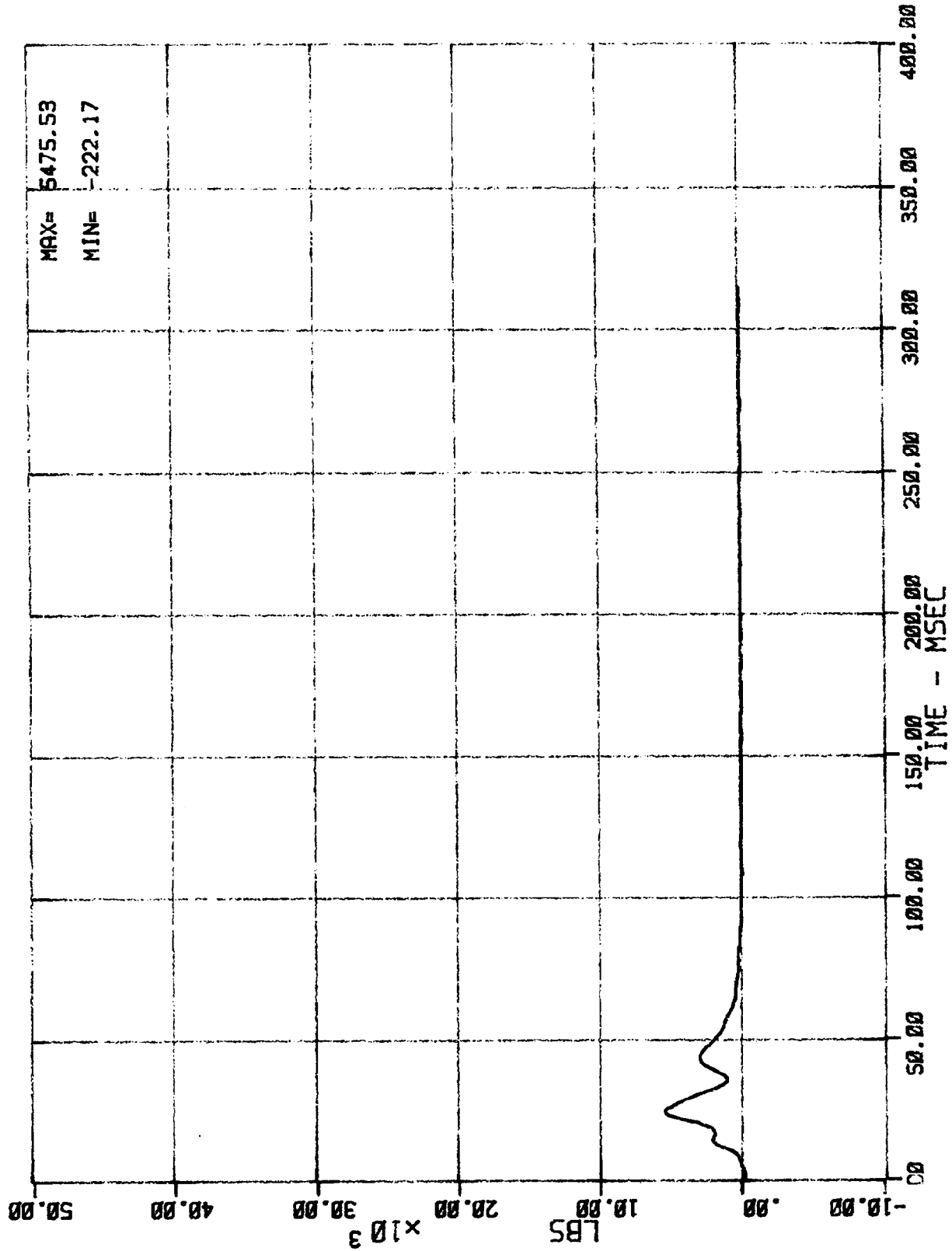
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MSE N26057 1987 SUBARU GL

08/25/87



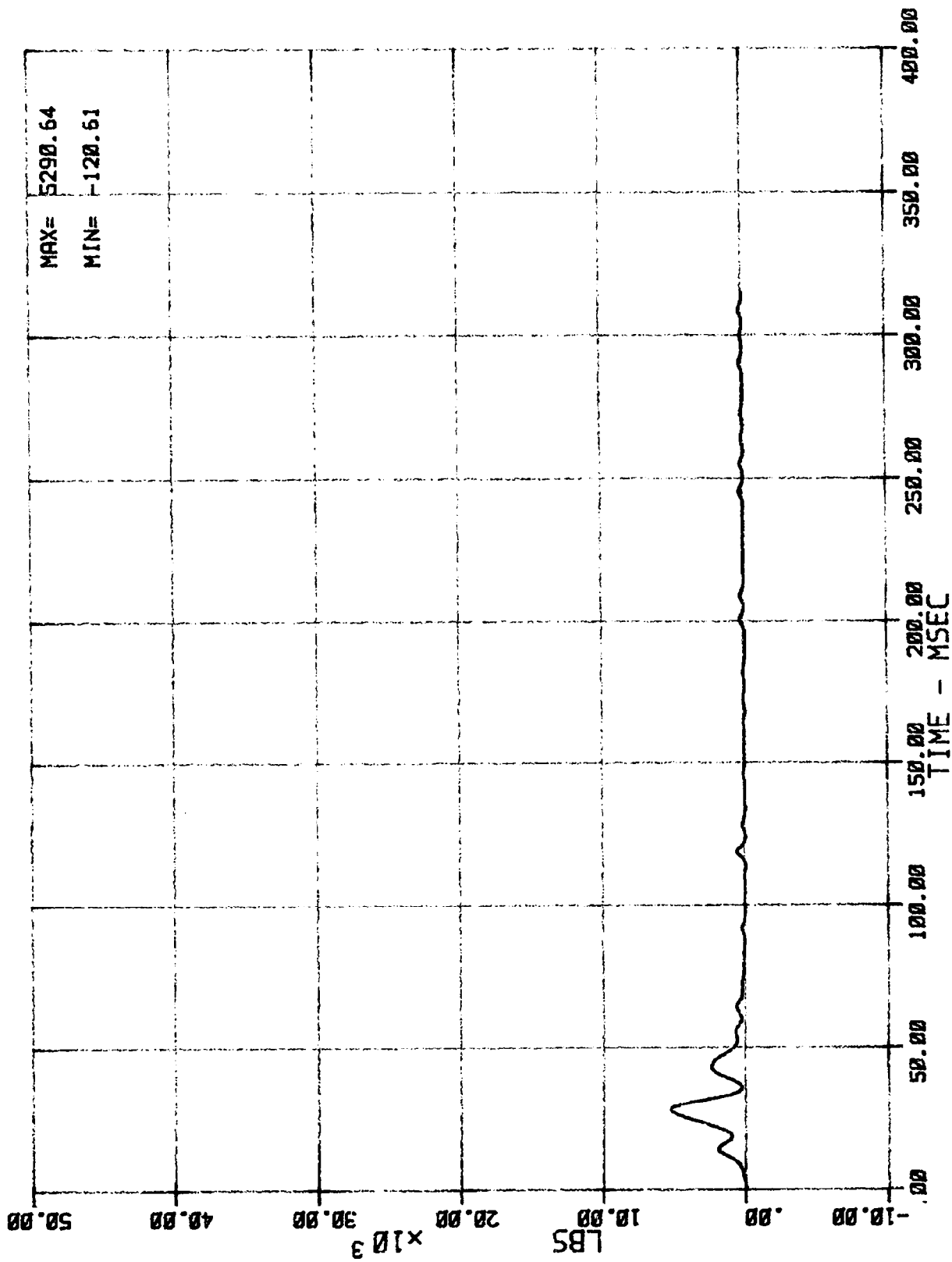
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MSE N26057 1987 SUBARU GL

08/25/87



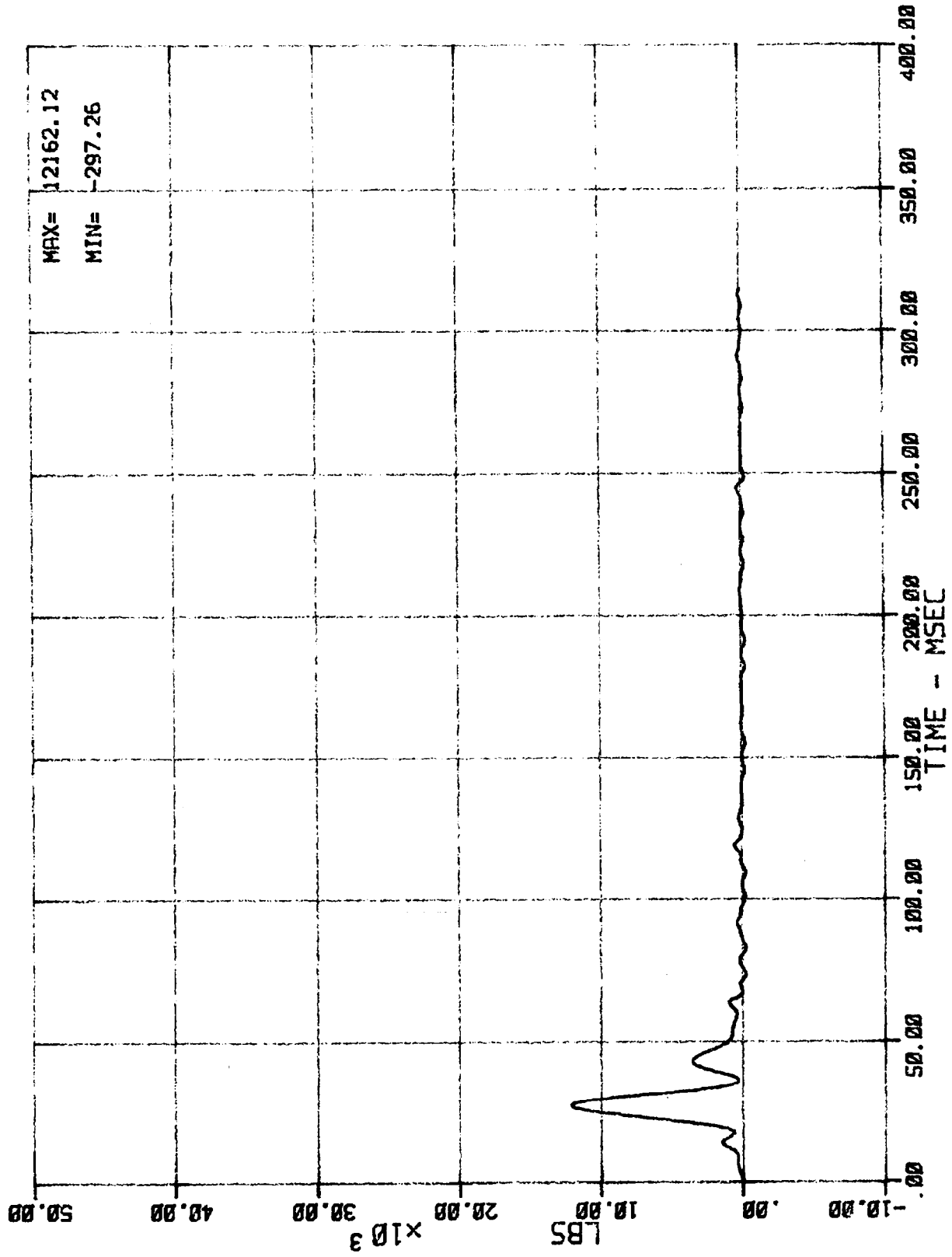
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NSE N26057 1987 SUBARU GL

08/25/87



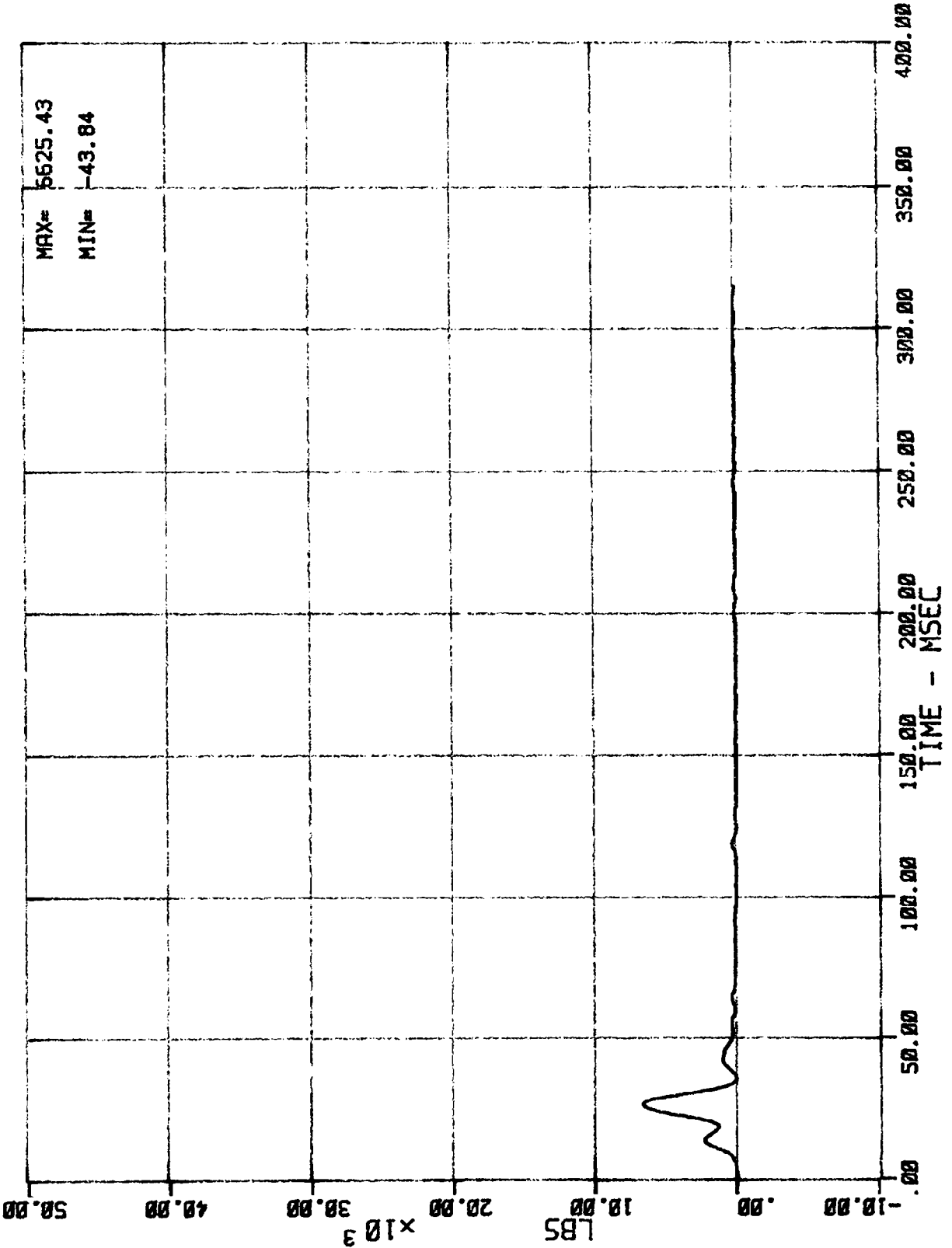
53 LC BA N BC4 (BARRIER LOAD CELL C4 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



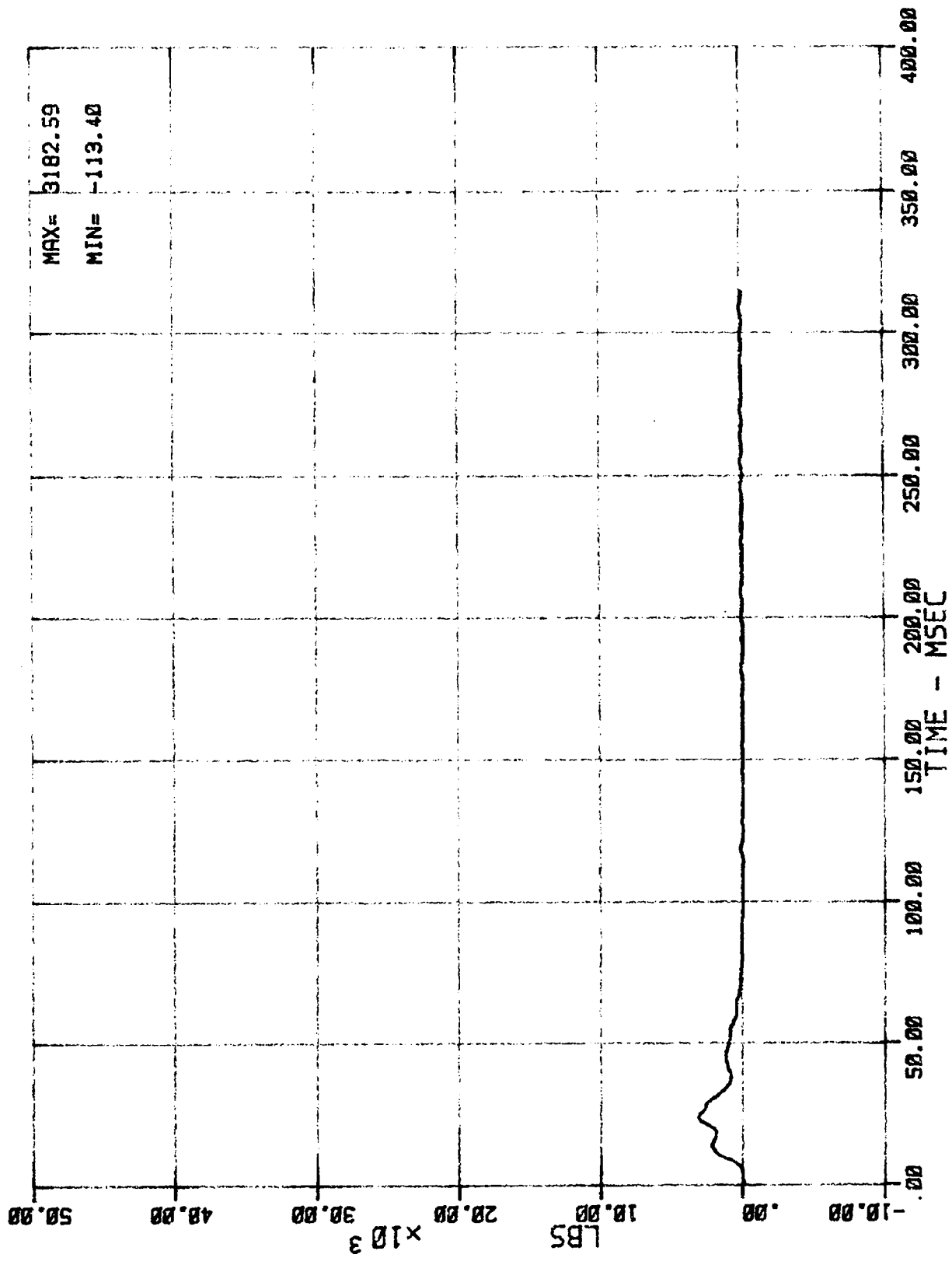
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MSE N26057 1987 SUBARU GL

08/25/87



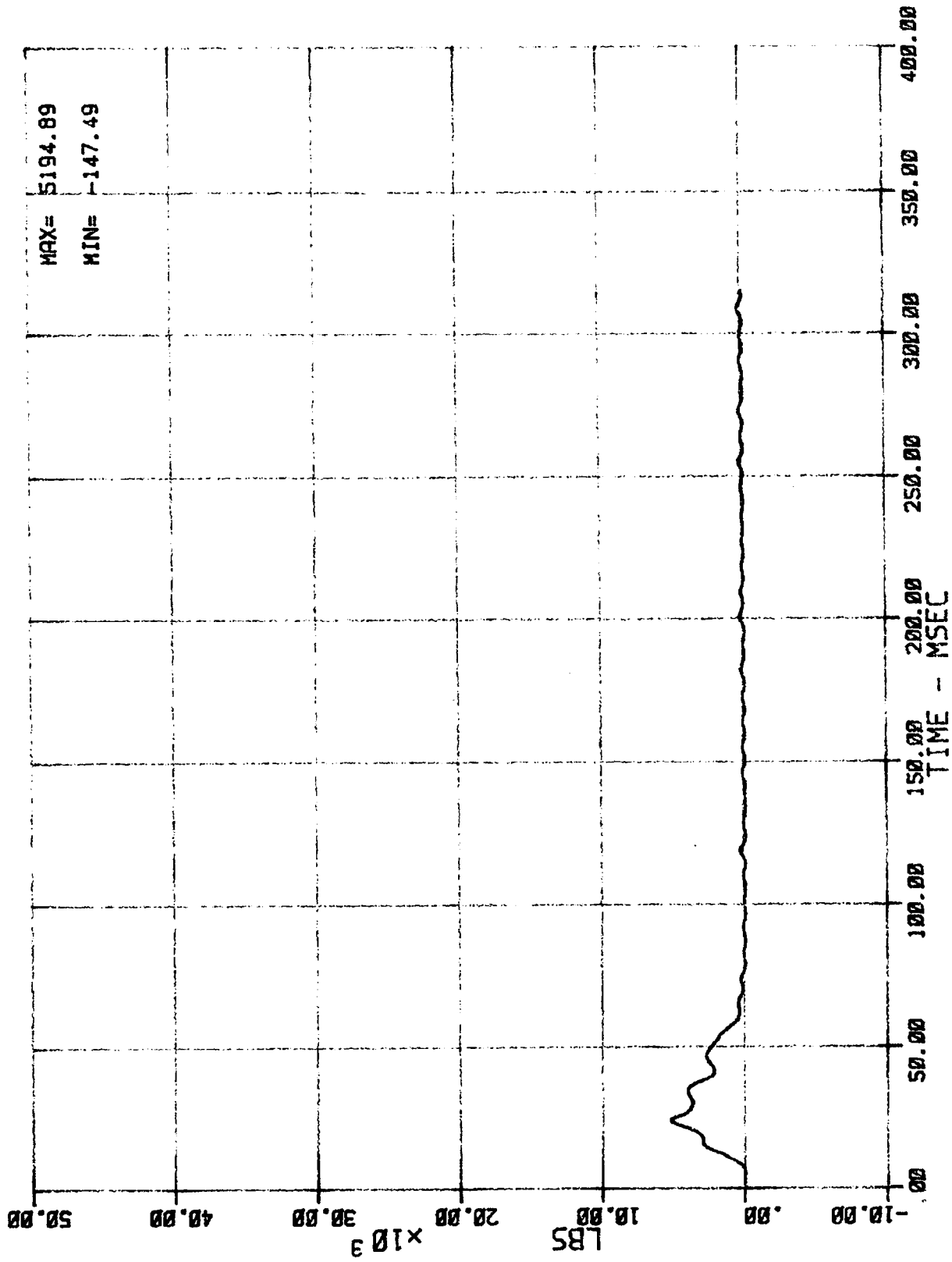
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MSE N26057 1987 SUBARU GL

08/25/87



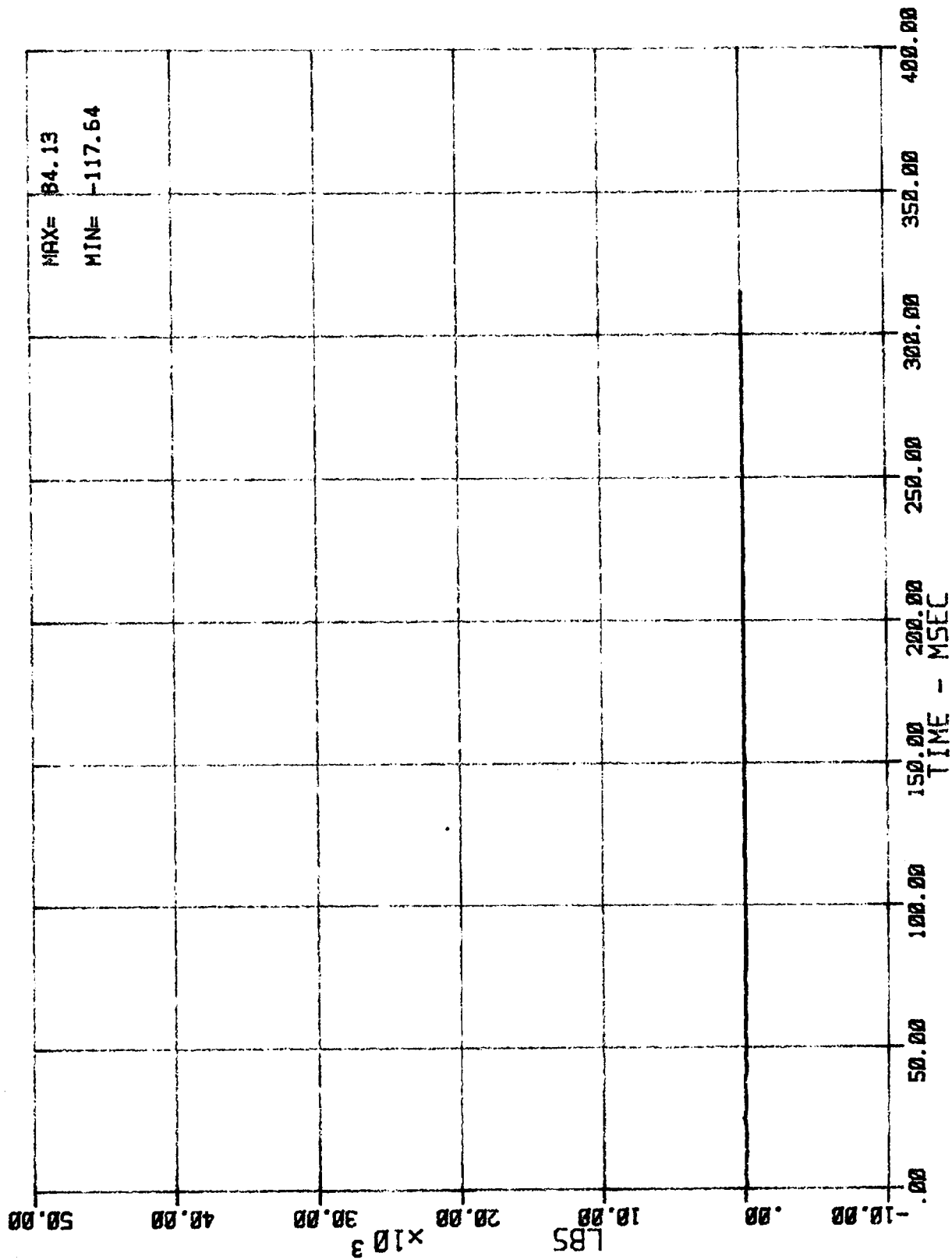
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08/25/87



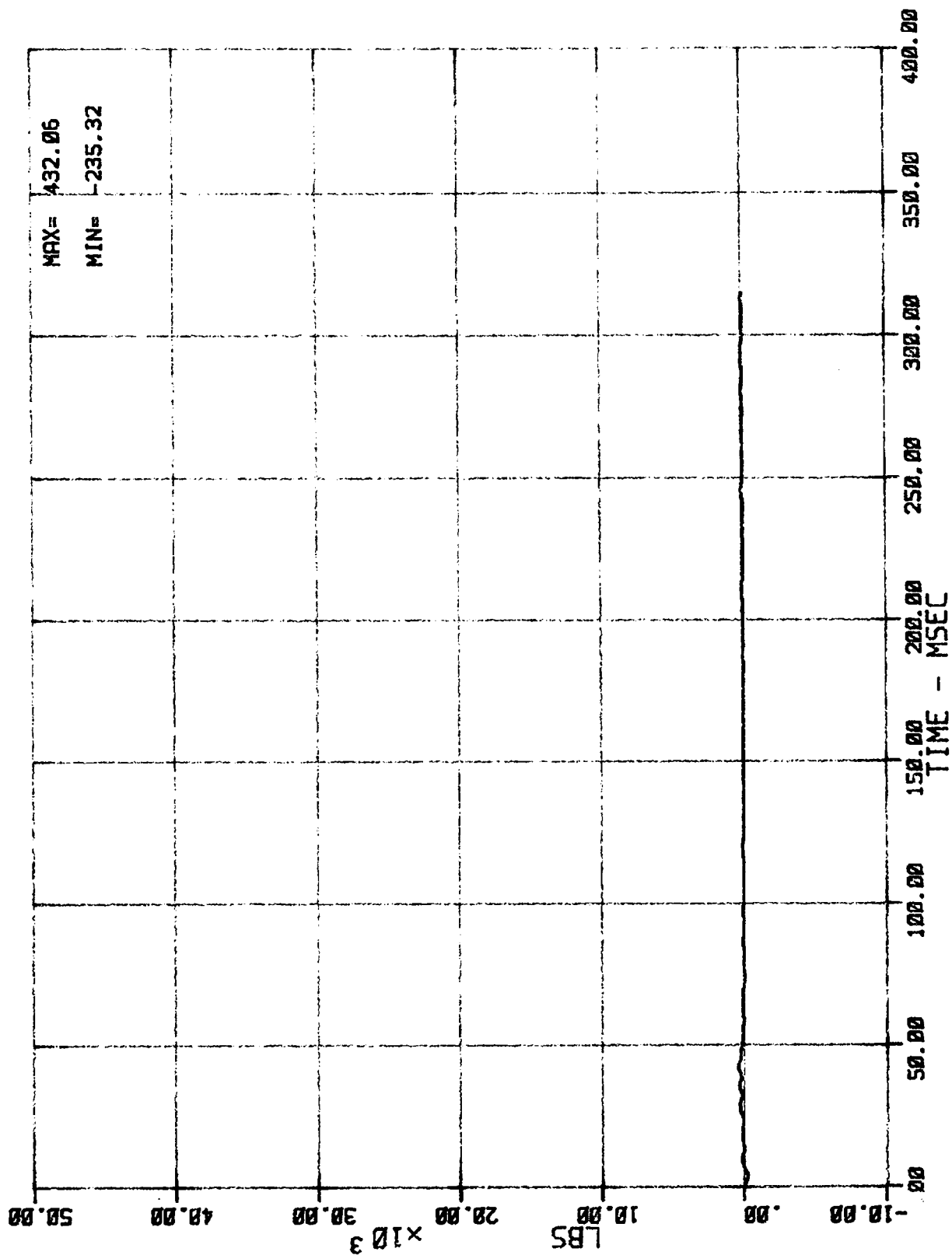
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08/25/87



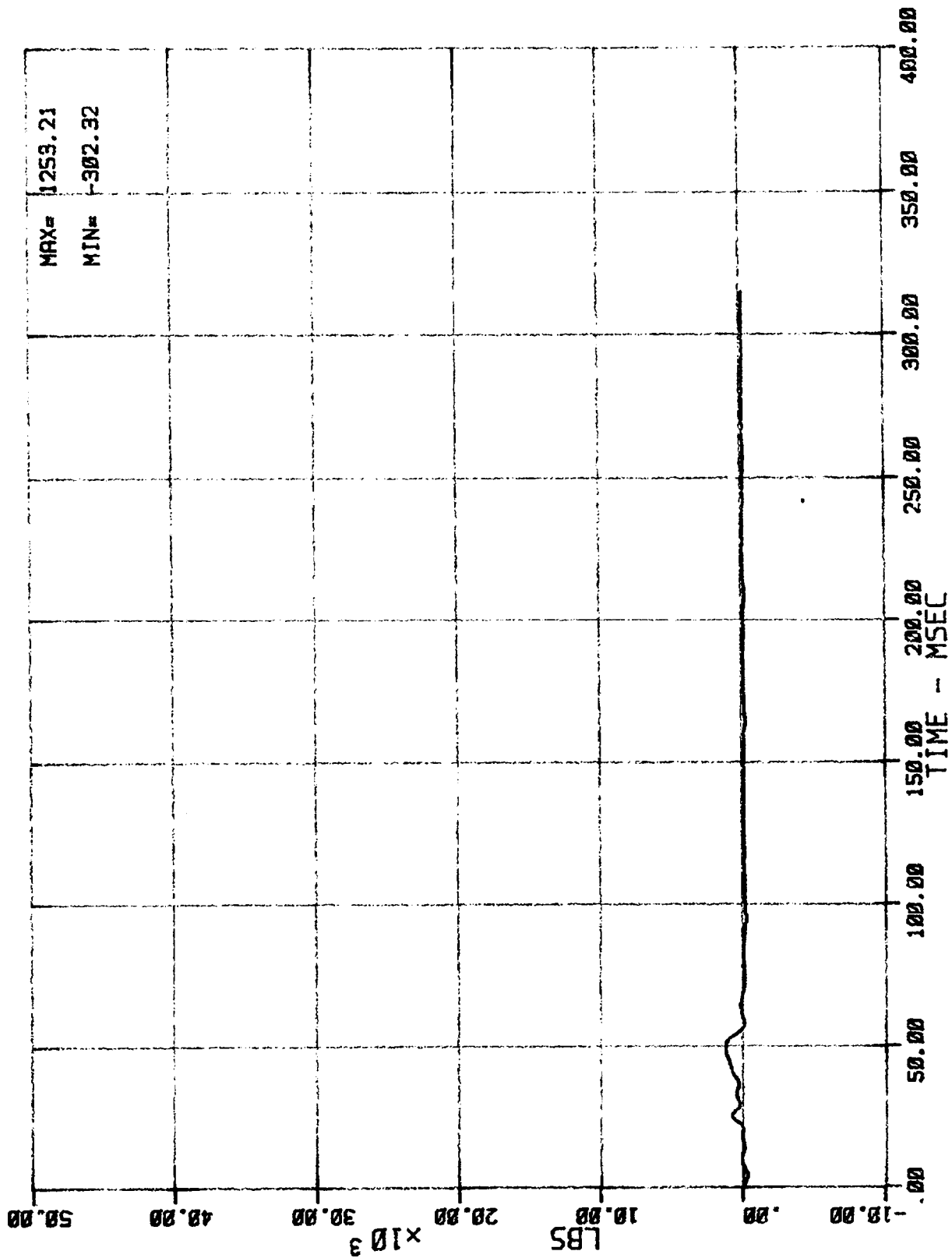
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08/25/87



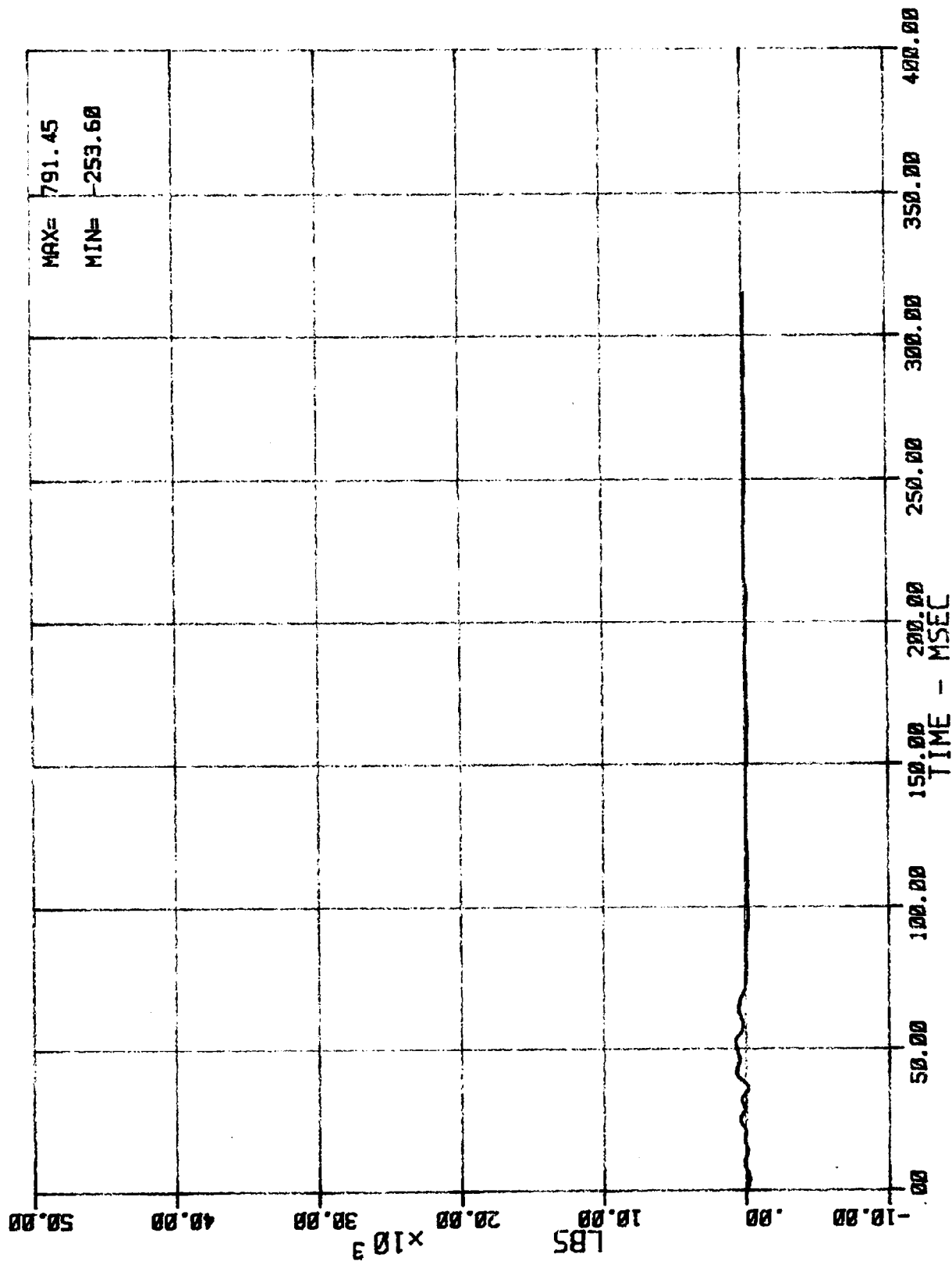
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MSE N26057 1987 SUBARU GL

08/25/87



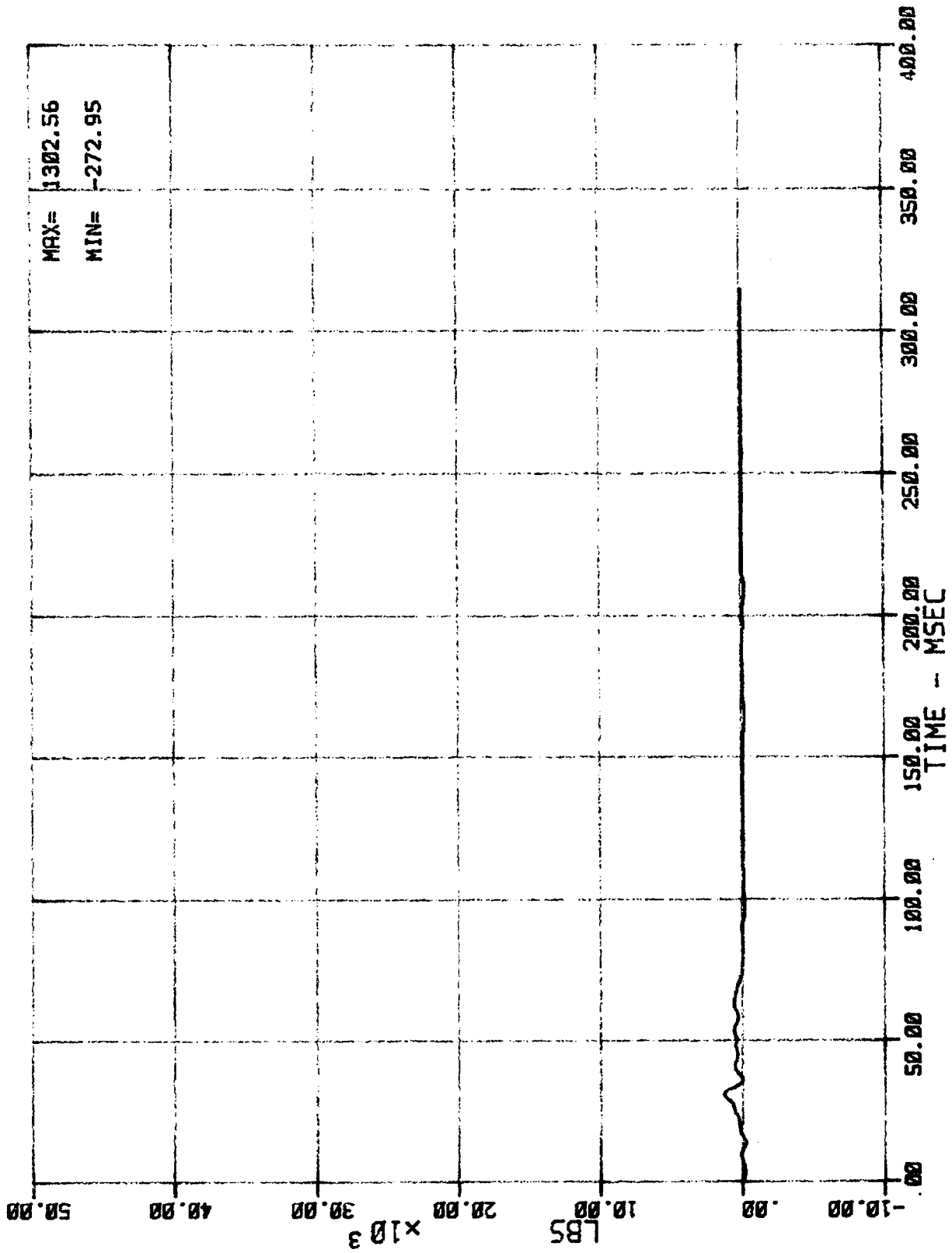
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08/25/87



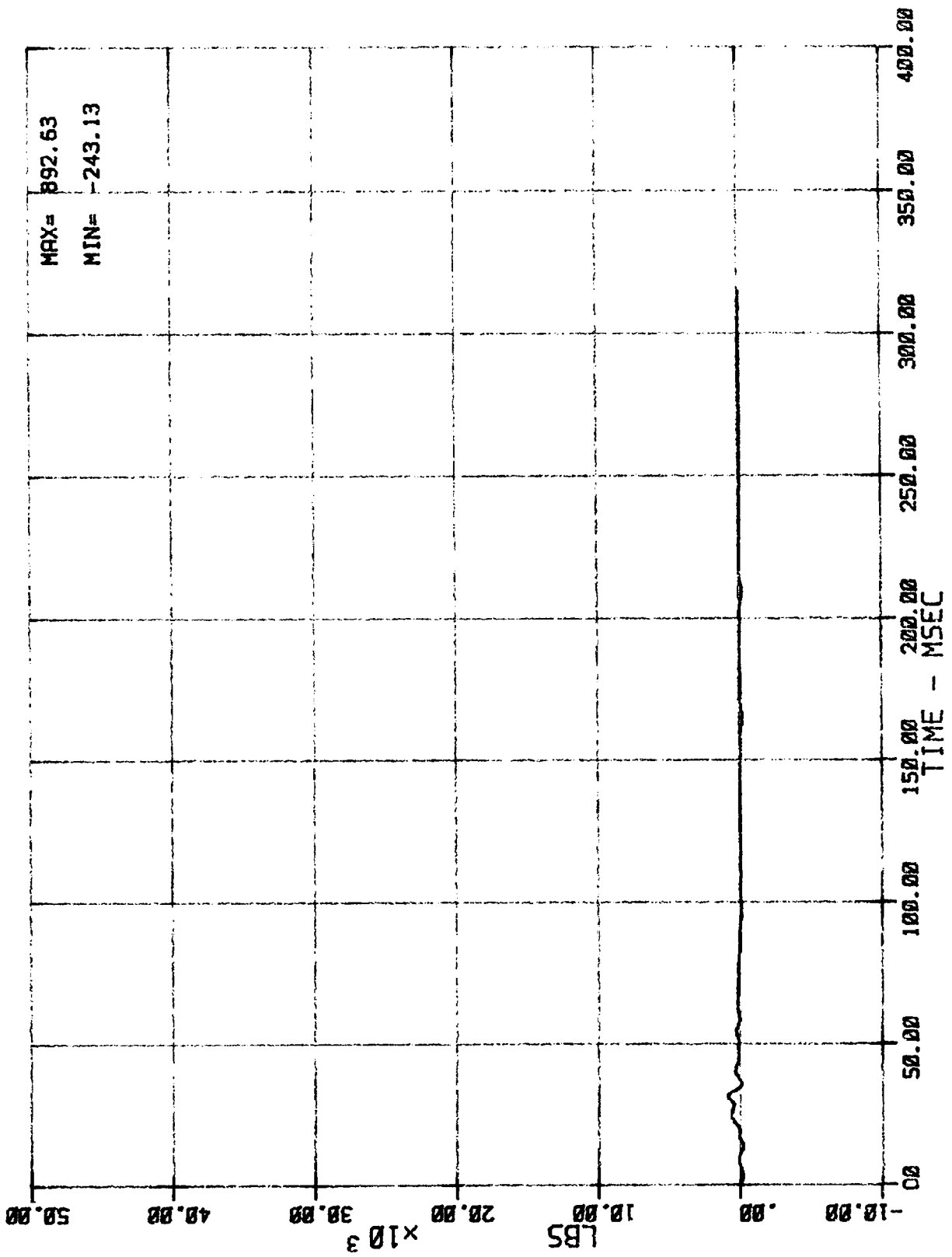
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MSE N26057 1987 SUBARU GL

08/25/87



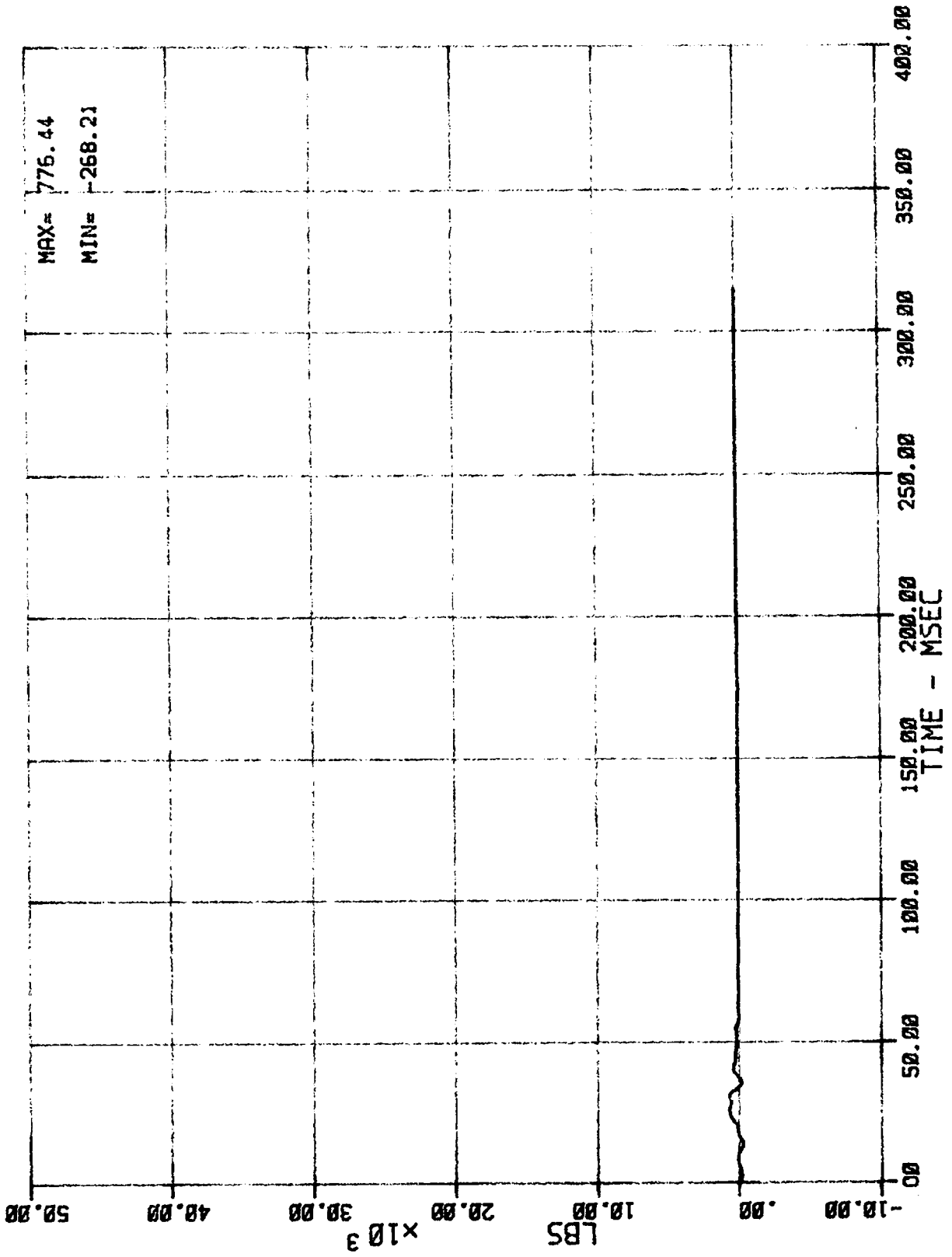
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MSE N26057 1987 SUBARU GL

08/25/87



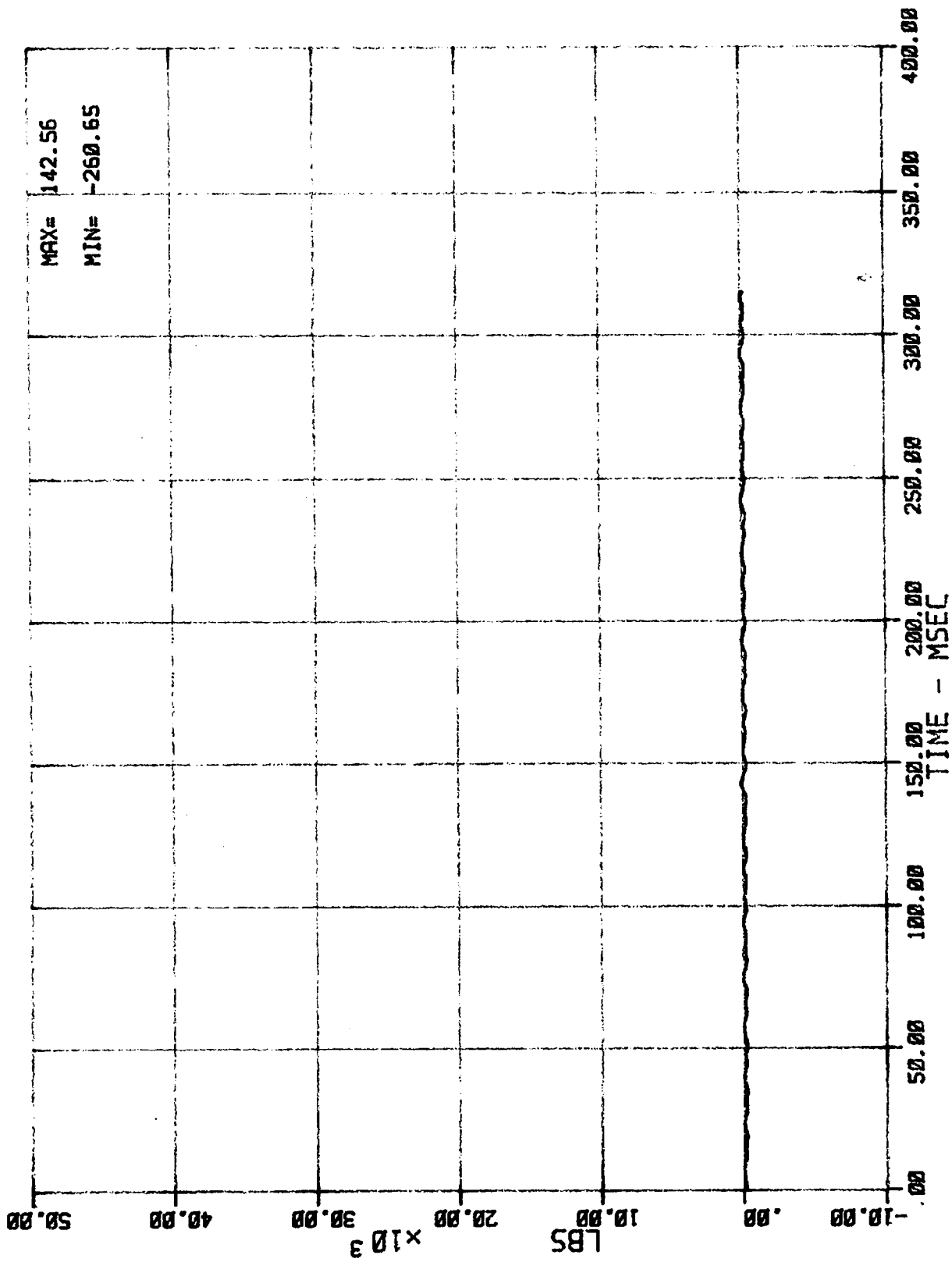
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MSE N26057 1987 SUBARU GL

08/25/87



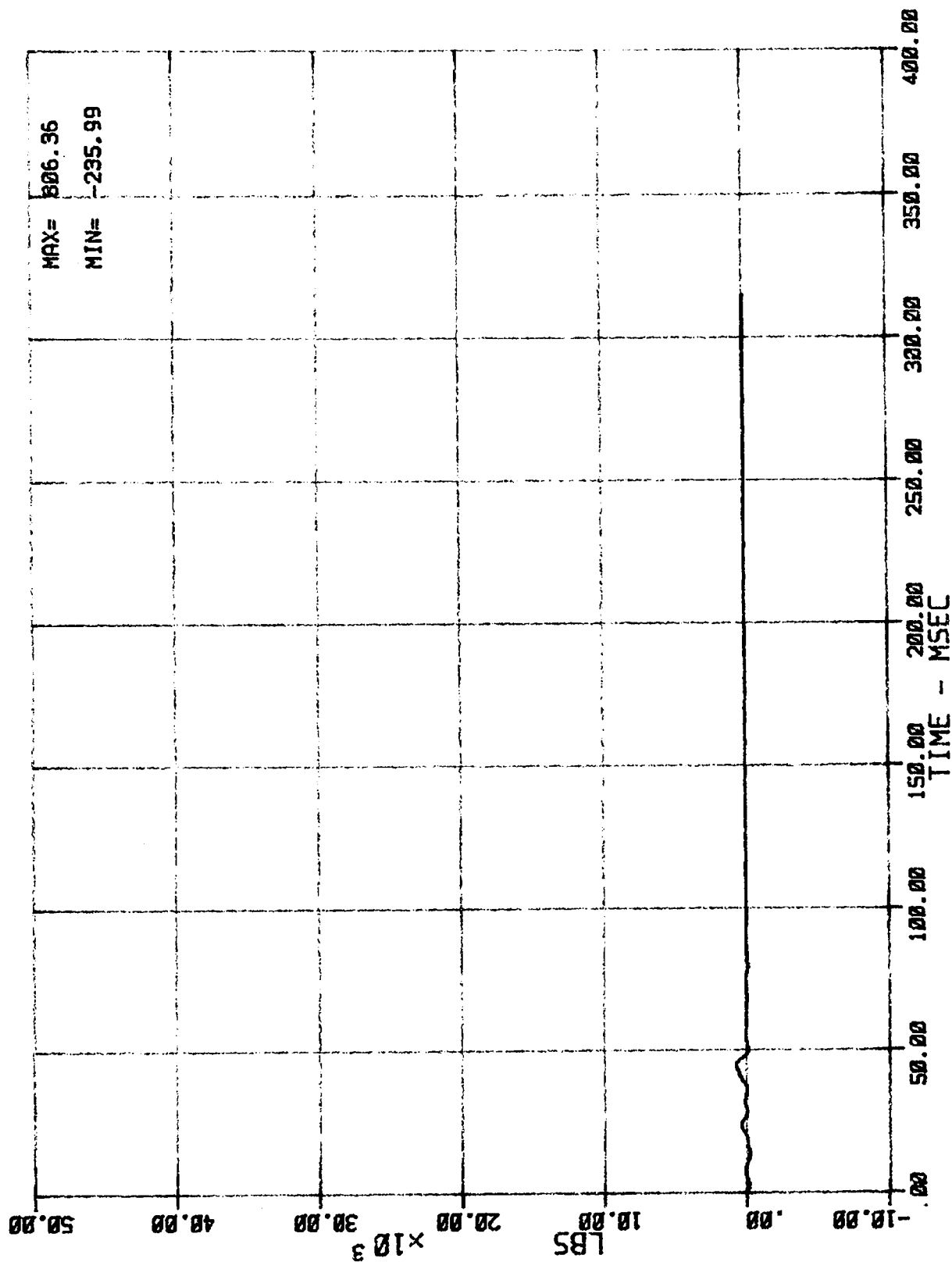
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MSE N26057 1987 SUBARU GL

08/25/87



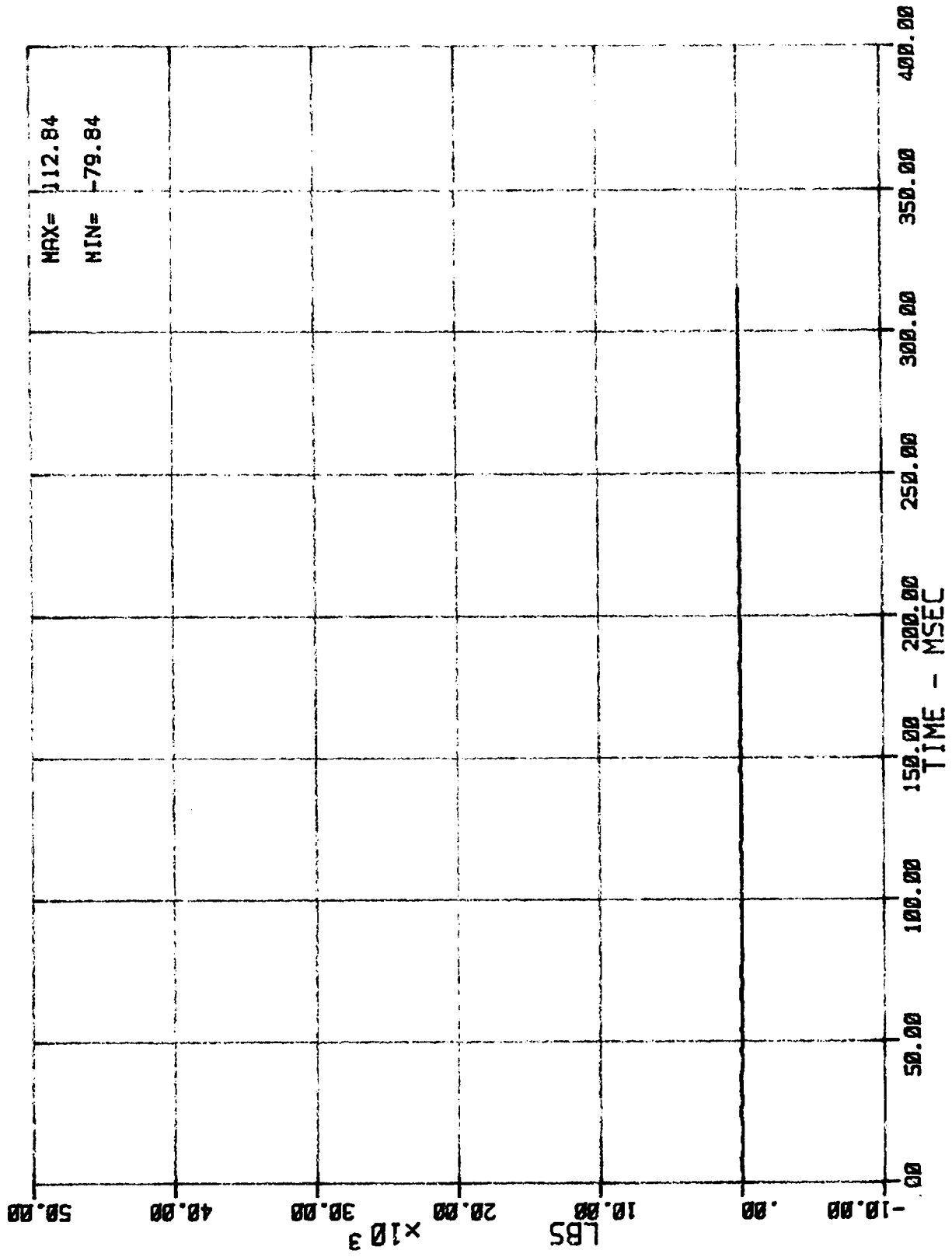
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MSE N26057 1987 SUBARU GL

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66 LC BA N B08 (BARRIER LOAD CELL 08 - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87



67 LC BA N BD9 (BARRIER LOAD CELL - FORCE)
MSE N26057 1987 SUBARU GL

08/25/87

APPENDIX C

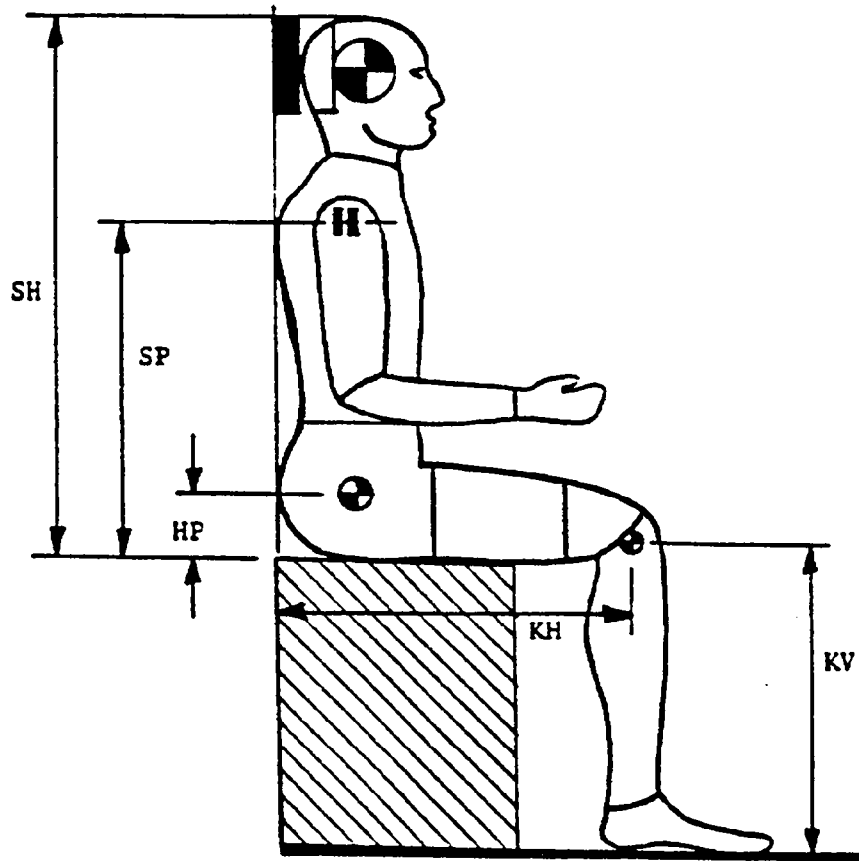
PART 572 DUMMY CONFIGURATION AND
PERFORMANCE VERIFICATION TESTS

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.:

4	6	5
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I. CONFIGURATION VERIFICATION DATA:



	P. 572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		08/14 - 08/24/87	
VERIFICATION NUMBER FOR DUMMY*		2	
SH - Seated Height- - - - -	35.6 to 35.8"	35.6	
SP - Shoulder Pivot Height- - - -	21.8 to 22.4"	22.1	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.6	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.5	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.3	
HW - Hip Width- - - - -	14.0 to 15.4"	14.3	

TECHNICIAN'S NAME: P. Leonard

* Sequential number beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.:

4	6	5
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TECHNICIAN'S NAME: P. Leonard

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		08/19 - 08/24/87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		2	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		69-75 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		54-64 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	257	
b. Peak Lateral Accel.-	≤ 10G	1.5	
c. Time above 100G- - -	0.9 to 1.5ms	1.3	
2. NECK BENDING TEST--			
a. Pendulum Speed - - -	21.5 to 25.5 fps	22.22	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	22.5	
c. Peak Resultant Head Acceleration - - - -	26G max.	25.3	
d. Pendulum Decel.(t ₂ -t ₁)	≤ 3ms	2.8	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	29.2	
f. Pendulum Decel.(t ₄ -t ₃)	≤ 10ms	8.2	
g. Max. Head Rotation - -	63 to 73°	64.0	
h. Chordal Displacement-- Head Rotation Angle-			
0°	Time- -	-2 to 2 ms	0.0
	Displ.-	-.5 to .5"	0.00
30°	Time- -	25.6 to 34.4ms	32.4
	Displ.-	2.1 to 3.1"	2.41
60°	Time- -	40.3 to 51.7ms	51.0
	Displ.-	4.3 to 5.3"	4.78
Maximum (64 °)	Time- -	53.2 to 66.8ms	60.4
	Displ.-	5.0 to 6.0"	5.13

*beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.:

4	6	5
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TECHNICIAN'S NAME: P. Leonard

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST....				
<u>Continued:</u>				
h. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	69.6	
	Displ.	4.3 to 5.3 in.	4.77	
30°	Time	85.4 to 104.6 ms	86.0	
	Displ.	2.1 to 3.1 in.	2.21	
0°	Time	101.0 to 123.0 ms	101.0	
	Displ.	-.5 to 0.5 in.	0.15	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ .5" - - - - -		23 to 36 lbs.	26.5	
b. Force @ .75" - - - - -		36 to 50 lbs.	40.5	
c. Force @ 1.0" - - - - -		50 to 63 lbs.	57.5	
d. Force @ 1.3" - - - - -		73 to 88 lbs.	88.0	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - - -		22 to 34 lbs.	29.7	
b. Force @ 30° - - - - -		34 to 46 lbs.	40.7	
c. Force @ 40° - - - - -		46 to 58 lbs.	53.9	
d. Return Angle - - - - -		12° maximum	11.0	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed- - - - -	21.78-22.22 fps	21.85		
(2) Peak Deflection- - - - -	1.7" maximum	1.67		
(3) Peak Resistive Force- - - - -	2250 lbs. maximum	1748		
(4) Internal Hysteresis - - - - -	50 to 70%	56.1		
b. Low Speed				
(1) Probe Speed- - - - -	13.86-14.14 fps	13.96		
(2) Peak Deflection- - - - -	1.1" maximum	1.02		
(3) Peak Resistive Force- - - - -	1450 lbs. maximum	1108		
(4) Internal Hyster. - - - - -	50 to 70%	57.2		

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.:

4	6	5
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TECHNICIAN'S NAME: P. Leonard

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01	
(2) Maximum Force - -	1850 to 2500 lbs.	2366	
(3) Time Above 1000g--	1.7 ms minimum	1.88	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01	
(2) Maximum Force - -	1850 to 2500 lbs.	2150	
(3) Time Above 1000g--	1.7 ms minimum	2.00	

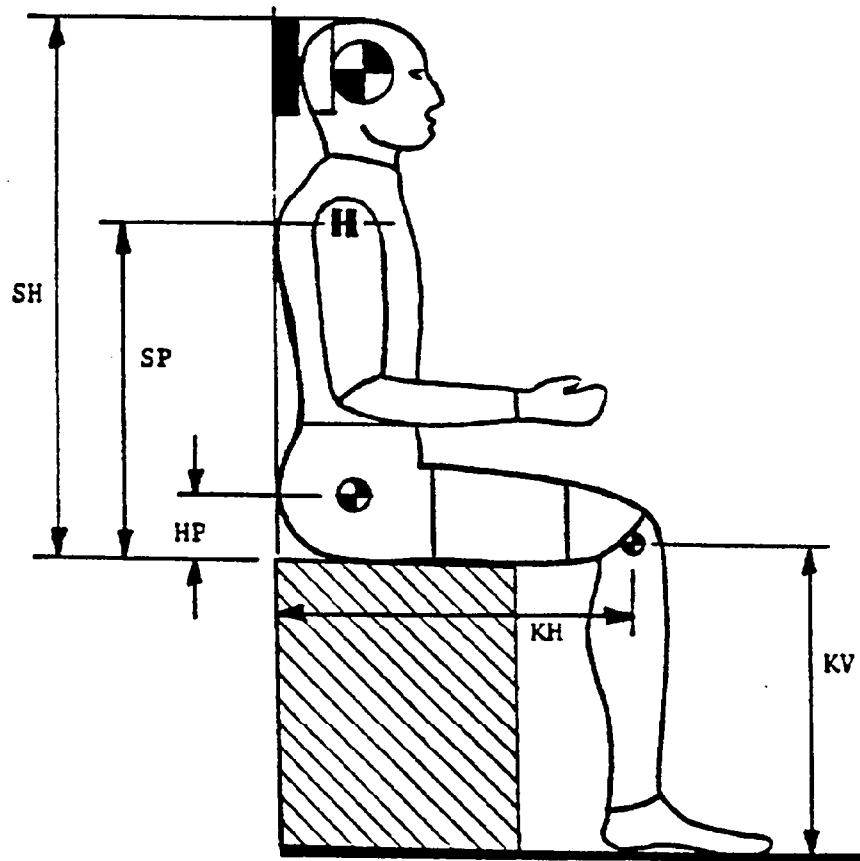
REMARKS:

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.:

4	6	7
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I. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		08/06 - 08/23/87	
VERIFICATION NUMBER FOR DUMMY*		1	
SH - Seated Height- - - - -	35.6 to 35.8"	35.6	
SP - Shoulder Pivot Height- - - -	21.8 to 22.4"	22.1	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.6	
KV - Knee Pivot from floor- - - -	19.3 to 19.9"	19.4	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.0	
HW - Hip Width- - - - -	14.0 to 15.4"	14.5	

TECHNICIAN'S NAME: P. Leonard

* Sequential number beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.:

4	6	7
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TECHNICIAN'S NAME: P. Leonard

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		08/06 - 08/23/87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		1	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		70-72 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		59-68 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	214	
b. Peak Lateral Accel.-	≤ 10G	5.2	
c. Time above 100G- - -	0.9 to 1.5ms	1.3	
2. NECK BENDING TEST--			
a. Pendulum Speed - - -	21.5 to 25.5 fps	22.14	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	24.0	
c. Peak Resultant Head Acceleration - - - -	26G max.	24.8	
d. Pendulum Decel.(t ₂ -t ₁)	≤ 3ms	2.9	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	27.4	
f. Pendulum Decel.(t ₄ -t ₃)	≤ 10ms	8.6	
g. Max. Head Rotation - -	63 to 73°	66.0	
h. Chordal Displacement-- Head Rotation Angle-			
0°	Time- - -2 to 2 ms	0.0	
	Displ.- -.5 to .5"	0.00	
30°	Time- - 25.6 to 34.4ms	33.4	
	Displ.- 2.1 to 3.1"	2.75	
60°	Time- - 40.3 to 51.7ms	49.0	
	Displ.- 4.3 to 5.3"	5.02	
Maximum (66 °)	Time- - 53.2 to 66.8ms	60.8	
	Displ.- 5.0 to 6.0"	5.43	

*beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.:

4	6	7
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TECHNICIAN'S NAME: P. Leonard

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. <u>NECK BENDING TEST</u>....				
Continued:				
h. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	71.4	
	Displ.	4.3 to 5.3 in.	4.85	
30°	Time	85.4 to 104.6 ms	88.8	
	Displ.	2.1 to 3.1 in.	2.30	
0°	Time	101.0 to 123.0 ms	101.0	
	Displ.	-.5 to 0.5 in.	0.23	
3. <u>ABDOMINAL COMPRESSION TEST:</u>				
(Preload = 10 pounds)				
a. Force @ .5" - - - - -		23 to 36 lbs.	27.0	
b. Force @ .75" - - - - -		36 to 50 lbs.	40.0	
c. Force @ 1.0" - - - - -		50 to 63 lbs.	58.0	
d. Force @ 1.3" - - - - -		73 to 88 lbs.	86.0	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20° - - - - -		22 to 34 lbs.	29.5	
b. Force @ 30° - - - - -		34 to 46 lbs.	45.0	
c. Force @ 40° - - - - -		46 to 58 lbs.	52.7	
d. Return Angle - - - - -		12° maximum	12.0	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed- - - - -	21.78-22.22 fps	21.78		
(2) Peak Deflection- - - - -	1.7" maximum	1.69		
(3) Peak Resistive Force- - - - -	2250 lbs. maximum	1721		
(4) Internal Hysteresis - - - - -	50 to 70%	60.3		
b. Low Speed				
(1) Probe Speed- - - - -	13.86-14.14 fps	13.86		
(2) Peak Deflection- - - - -	1.1" maximum	1.02		
(3) Peak Resistive Force- - - - -	1450 lbs. maximum	1141		
(4) Internal Hyster. - - - - -	50 to 70%	62.1		

R7005-05

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.:

4	6	7
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TECHNICIAN'S NAME: P. Leonard

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.81	
(2) Maximum Force - -	1850 to 2500 lbs.	1866	
(3) Time Above 1000/-	1.7 ms minimum	1.75	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.04	
(2) Maximum Force - -	1850 to 2500 lbs.	2243	
(3) Time Above 1000/-	1.7 ms minimum	1.75	

REMARKS:

APPENDIX D
VEHICLE'S OWNER MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Front seat belts

The front seat belts are the three-point type with an emergency locking retractor.

During sharp deceleration as when the vehicle suddenly stops, turns sharply, or strikes another object in an accident, the seat belt retractor automatically locks the belts. Belt operation can not be "tested" by suddenly pulling the belt from the retractor since doing so would not create the inertial forces needed to lock the belt retractor.

Before wearing a seat belt, set the seat at the desired position, then sit well back and upright in the seat.

To fasten the front seat belt, pull the belt out of the retractor, then insert the tongue into the buckle until it snaps.

To unfasten the belt, push the button on the buckle.

CAUTION:

- **Never use a belt while the belt is twisted or reversed.**
- **Never wear the shoulder belt under the arm. If an accident occurs, this can increase the risk or severity of injury.**

Rear seat belts

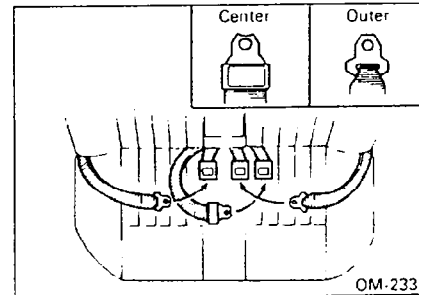
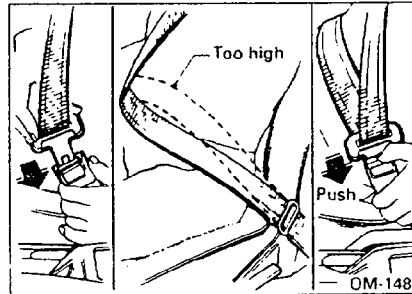
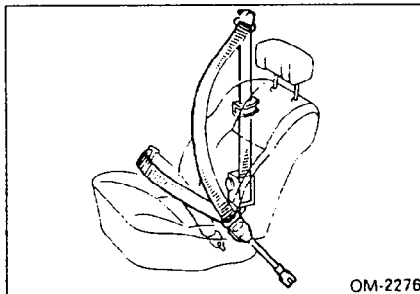
The three rear seat belts are a two-point type.

The belts for the two outside passengers have automatic locking retractors. The center belt is a manually adjusted type and belt length is adjusted at the tongue plate.

- The tongue of the center belt is different from the tongue of the outer belts and will not fit the outer belt buckles.

Ensure that the proper tongue and buckle are selected.

To fasten the rear seat belt, pull it out continuously from the retractor, then insert the tongue into the buckle until it snaps.



To unfasten the belt, push the button on the buckle

If the belt is allowed to stop and return slightly, the belt will lock. If this happens and further adjustment is required, first return the belt to the retracted position, then pull it out again

CAUTION:

Never use a belt that is twisted or reversed.

Seat belt tips

- To help reduce the risk or severity of injury in accidents or sudden stops, all persons riding in the vehicle should always protect themselves by using the seat belts provided.

- Make it a rule to have everyone, including the driver, fasten their seat belts before starting the vehicle.

- Never use one belt for more than one person at a time.

- Position the lap belt across your lap as low as possible on your hips.

This is necessary to help reduce the risk or severity of injury in an accident. This spreads the force of the lap belt over the strong hip bones instead of across the soft abdomen.

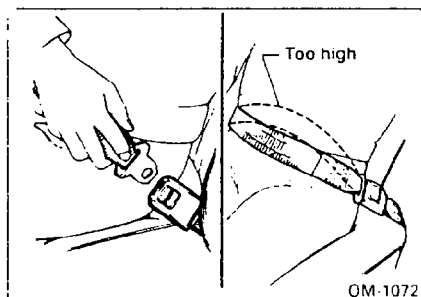
- Never let any foreign object enter the buckle or retractor. Anything inside may prevent them from working properly.

- When fastening the front seat belt, to take up the slack in the belt, pull the shoulder strap through the tongue until the belt fits snugly. Then return the shoulder belt to its retractor until the shoulder strap also fits snugly.

- **Expectant mother.** Seat belt use is recommended. Ask your doctor for specific recommendations. The lap belt should be worn securely and as low as possible over the hips and not on the waist.

- **Baby or small child.** Use a child safety seating system which fits your vehicle. Before installing, always read the manufacturer's instructions carefully.

- **Children.** It is recommended that they sit in the rear seat and be restrained with the seat belts. If sitting in front, never allow a child to stand up or kneel on the seat. Children especially should be restrained by seat belts at all times.



Seat belt maintenance

- Keep sharp edges or damaging objects away from belts and other parts of the restraint system.
- Use care to keep the webbing free of polishes, oils and chemicals, and particularly battery acid.
- Never attempt to modify or make changes that will prevent the seat belt adjustment from operating properly.
- To clean the webbing, use a mild soap solution and water. Never attempt to bleach or redye the webbing since this could seriously affect its strength.
- Inspect the seat belts and attachments periodically for cracks, damage, loose bolts or worn webbing. Replace the seat belt as necessary.
- Replace seat belt assemblies after use in any serious accident.

Fasten seat-belt warning light and chime

Your vehicle is equipped with a seat-belt warning device at the driver's seat as required by current safety standards.

This device causes the seatbelt warning light on the instrument panel to light for about six seconds when the ignition switch is turned "ON".

If the driver has not fastened his seat belt, the warning chime sounds at the same time.