V3124

1999 Ford Expedition XLT
into a Flat Frontal Barrier
TRC Test Number: 990315-1

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Section 1.0

Purpose and Test Procedure

Purpose and Test Summary

This 30 mph flat frontal barrier impact test has as the main objective to investigate both vehicle and occupant dynamics during a flat frontal barrier test. A secondary objective is to gather information on de-powered airbags.

This test was conducted with a 1999 Ford Expedition XLT that impacted a flat frontal barrier. The test vehicle contained two instrumented Hybrid III 50th percentile adult male dummies.

Section 2.0

Frontal Barrier Impact Test Summary

Test Procedure

This test was conducted per VRTC personnel's instructions. Data was obtained relative to FMVSS 208, "Occupant Crash Protection," performance.

The test vehicle was instrumented with eight (8) accelerometers to measure longitudinal, lateral, and vertical axis accelerations. The vehicle's specified impact velocity range was 47.5 to 49.1 kph. The vehicle impacted a flat frontal barrier.

The test vehicle contained two (2) Hybrid III 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the FMVSS 208 laboratory seating procedure.

Both dummies were instrumented with head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations; chest deflection potentiometers; left and right femur load cells to measure axial forces; and upper neck load cells to measure forces and moments.

The thirty-eight (38) data channels were digitally sampled at 12,500 samples per second and processed per Sections 11.13 through 11.15 of the Laboratory Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and fourteen (14) high-speed motion picture cameras. The pre-test and post-test conditions were recorded by one (1) real-time motion picture camera.

The vehicle and occupant data are summarized in Section 2.0. The FMVSS 208 data are presented in Section 3.0. The vehicle, occupant, and camera measurements are presented in Section 4.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the dummy calibration information.

Test Results Summary

This flat frontal barrier test was conducted at TRC on March 15, 1999.

The test vehicle, a 1999 Ford Expedition XLT, was equipped with airbags at the driver's and right front passenger's seating positions. The vehicle's test weight was 2459.9 kilograms. The vehicle's impact speed was 48.5 kph. The vehicle's maximum static crush was 655 millimeters.

The driver's 15-millisecond HIC was 178 and the 36-millisecond HIC was 377. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 46.7 g. The driver's chest deflection was 28.1 millimeters. The driver's left and right femur maximum compressive forces were 5953 N and 6612 N, respectively.

The right front passenger's 15-millisecond HIC was 132 and the 36-millisecond HIC was 147. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 50.9 g. The passenger's chest deflection was 19.6 millimeters. The right front passenger's left and right femur maximum compressive forces were 6730 N and 6975 N, respectively.

Data Acquisition Explanations

The vehicle's engine top X-axis acceleration data channel, ENGXG1, lost data after approximately 41 milliseconds.

Table 1 Crash Test Summary

Test type:	Frontal barrier impact
Test date:	03/15/99
Test time:	1249
Ambient temperature at impact area:	22° C
Vehicle year/make/ model/body style:	1999/Ford/Expedition/XLT
Vehicle test weight:	2459.9 kg
Impact angle[1]:	0°
Impact velocity[2]:	
Primary:	48.5 kph
Secondary:	48.5 kph
Maximum static crush:	655 mm
Average rebound:	423 mm
Number of cameras:	
Real-time:	1
High-speed:	14
Door opening data:	
Left-front:	Easy
Right-front:	Easy

[1] With respect to tow track centerline.
[2] Speed trap measurement (± .08 km/h accuracy)

Table 1 Crash Test Summary, Cont'd.

Dummies:	Driver #168	Passenger #169
Type:	Hybrid III 50th percentile adult male	Hybrid III 50th percentile adult male
Location:	Left front	Right front
Restraint:	Airbag	Airbag
Number of data channels:	15	15
Front seat data:		
Seat track failure:	None	None
Seat back failure:	None	None
Visible dummy contact points:		
Head:	Airbag	Airbag/Sun Visor
Chest:	Airbag	Airbag
Abdomen:	None	None
Left knee:	Instrument panel	Instrument panel
Right knee:	Instrument panel	Instrument panel

Table 2 Test Vehicle Information

Vehicle year/make/ model/body style:	1999/Ford/Expedition/XLT			
Color:	Green			
VIN:	1FMRU176XXLA81900			
Engine data:				
Placement:	Longitudinal/Inline			
Cylinders:	8			
Displacement:	4.6 liters			
Transmission data:	_4_speed,	___manual,	_X_automatic,	_X_overdrive
Final drive:	__fwd,	_X_rwd,	___4wd	
Date vehicle received:	03/12/99			
Odometer reading:	48			
Dealer's name and address:	Bob Kiem Ford 5300 N. High Street. Columbus, OH			

Accessories:

Power steering	Yes	Automatic transmission	Yes
Power brakes	Yes	Automatic speed control	Yes
Power seats	Yes	Tilting steering wheel	Yes
Power windows	Yes	Telescoping steering wheel	No
Tinted glass	Yes	Air conditioning	Yes
Radio	Yes	Anti-skid brake	Yes
Clock	Yes	Rear window defroster	Yes
Power door locks	Yes	Other:	None

Certification data from vehicle's label:

Vehicle manufactured by:		Ford Motor Company
Date of manufacture:		12/98
VIN:		1FMRU176XXLA81900
GVWR:		3039 kg
GAWR:	Front:	1383 kg
	Rear:	1769 kg

Table 2 Test Vehicle Information, Cont'd.

Size of tires on vehicle:	P235/70R16
Spare tire:	P235/70R16
Type of front seats:	Split Bench, Driver -power; Passenger -manual

Tire & capacity data from vehicle's label:

Recommended tire size:	P235/70R16SL
Recommended cold tire pressure:	
Front:	207 kPa
Rear:	241 kPa
Designated Seating Capacity:	
Front	3
Rear	3
Back	3
Total	9
Vehicle Cargo Weight:	136.1 kg

Test vehicle attitudes:

Delivered attitude:	LF:	873 mm	RF:	874 mm	LR:	886 mm	RR:	887mm
Fully loaded attitude:	LF:	860 mm	RF:	862 mm	LR:	850 mm	RR:	855 mm
Pre-test attitude:	LF:	858 mm	RF:	857 mm	LR:	849 mm	RR:	848 mm
Post-test attitude:	LF:	902 mm	RF:	882 mm	LR:	882 mm	RR:	850 mm

Table 2 Test Vehicle Information, Cont'd.

Weight of test vehicle as received (with maximum fluids):

Right front	570.2 kg	Right rear	543.4 kg
Left front	536.1 kg	Left rear	527.5 kg
Total front weight	1106.3 kg	(50.8% of total vehicle weight)	
Total rear weight	1070.9 kg	(49.2% of total vehicle weight)	
Total delivered weight	2177.2 kg		

Calculation of test vehicle's target test weight:

RCLW[1] = Rated Cargo and Luggage Weight (136.1 kg)

UDW = Unloaded Delivered Weight (2177.2 kg)

VCW = Vehicle Capacity Weight (N\A)

DSC[2] = Designated Seating Capacity (9)

RCLW[1] = 136.1 kg

Target test weight = UDW + RCLW + (number of Hybrid III Dummies x 75.7 kg per dummy)

Target test weight = 2177.2 + 136.1 + 151.4 = 2464.7 kg

Weight of test vehicle with required dummies and 136.1 kg of cargo weight:

Right front	614.6 kg	Right rear	649.1 kg
Left front	562.5 kg	Left rear	633.7 kg
Total front weight	1177.1 kg	(47.9% of total vehicle weight)	
Total rear weight	1282.8 kg	(52.1% of total vehicle weight)	
Total test weight	2459.9 kg	(0.2% under target test weight)	

Weight of ballast secured in vehicle: 79.4 kg steel plate in rear

Components removed to meet target test weight: None

CG rearward of front wheel centerline: 1580.1 mm

Vehicle Wheelbase: 3030 mm

[1] Cargo weight for multi-purpose passenger vehicles, trucks, and buses is the vehicle's calculated cargo and luggage weight or 136.1 kg, whichever is less.

[2] The designated seating capacity is determined by counting the number of seat belts installed in the vehicle.

Table 3 Post-Impact Data

Test number:	990315-1
Test date:	03/15/99
Test time:	1249
Test type:	Frontal barrier impact
Impact angle:	0°
Ambient temperature at impact area:	22° C
Temperature in occupant compartment:	21° C

Impact velocity:

Primary:	48.5 kph
Secondary	48.5 kph
Specified range:	47.5 to 49.1 kph

Distance from vehicle to barrier:

Entering velocity trap:	356 mm
Exiting velocity trap:	51 mm

Test vehicle static crush:

Overall length of test vehicle:

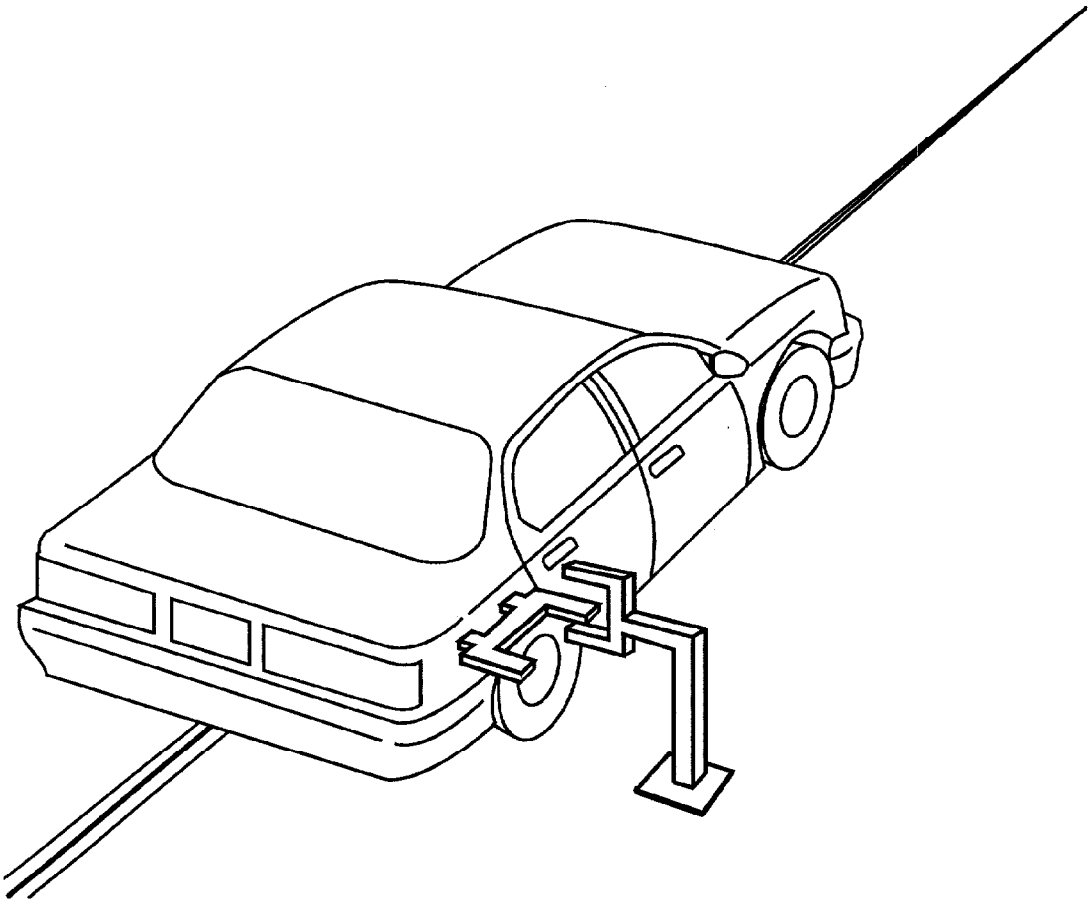
Pre-test:	L:	5285 mm	C: 5461 mm	R:	5298 mm
Post-test:	L:	4790 mm	C: 4806 mm	R:	4806 mm
Total crush:	L:	495 mm	C 655 mm	R:	492 mm
Average crush:	547 mm				

Test vehicle rebound from flat barrier:

Distance from test vehicle to barrier:

Post-test:	L:	442 mm	C: 390 mm	R:	438 mm
Average rebound:	423 mm				

Figure 1 Impact Velocity Measurement System

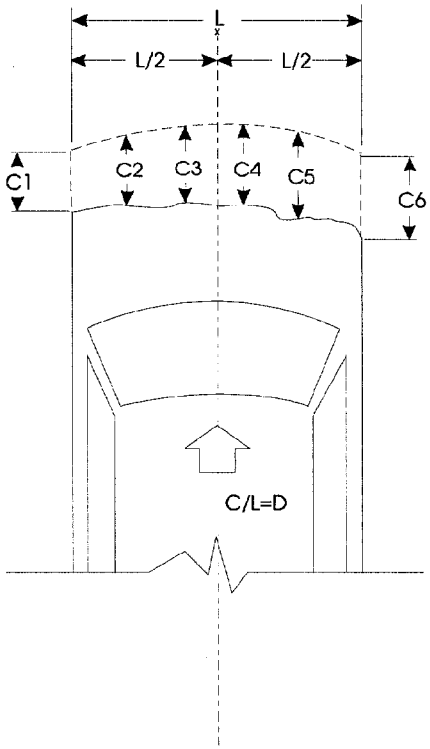


The final vane clears the final emitter/receiver pair 51 millimeters before impact.

The vanes have 305-millimeter spacing.

Figure 2 Accident Investigation Division Data for 30 mph Frontal Barrier Impact

Test date:	03/15/99
Vehicle year/make/ model/body style:	1999/Ford/Expedition/XLT
VIN:	1FMRU176XXLA81900
Build date:	12/98
Test weight:	2459.9 kg
Vehicle wheelbase:	3030 mm
Maximum width:	1989 mm
Front overhang:	991 mm



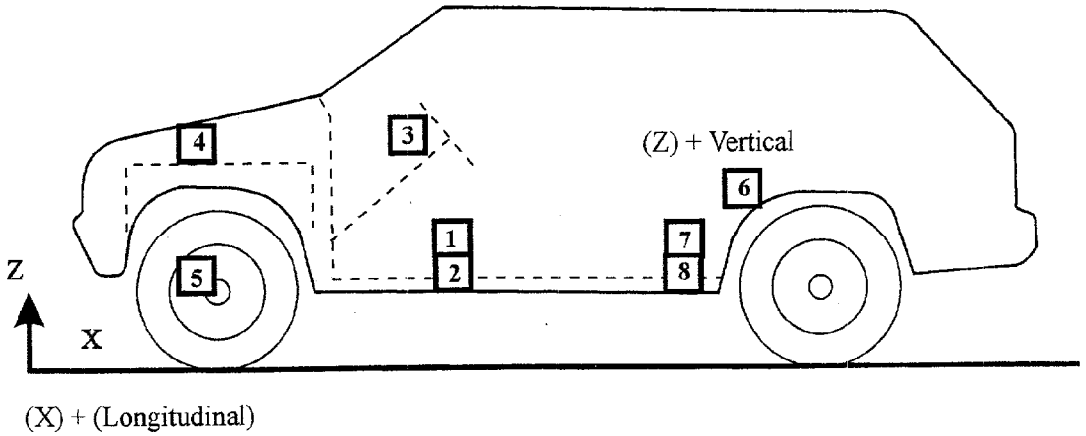
Collision Deformation Classification (CDC) Code: 12FDEW3

Crush depth measurements:	C1: 495 mm
	C2: 577 mm
	C3: 628 mm
	C4: 603 mm
	C5: 562 mm
	C6: 492 mm

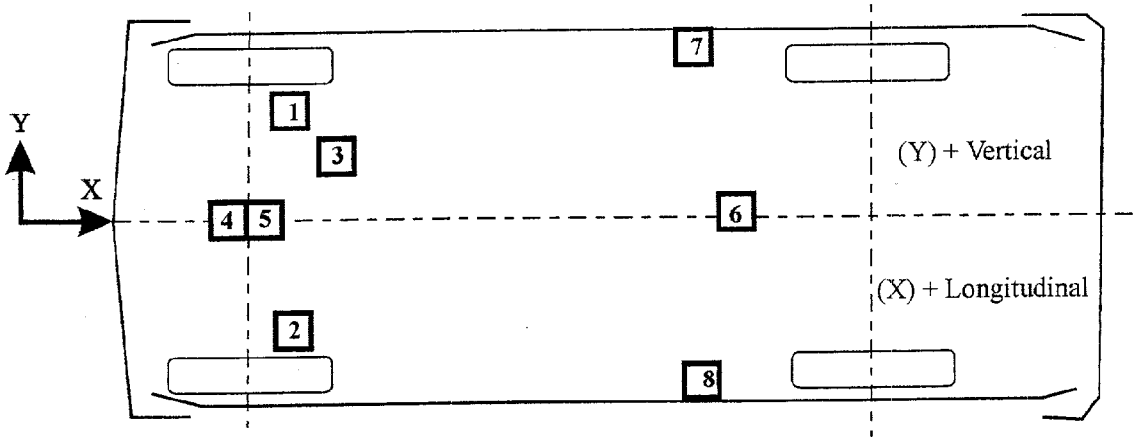
Midpoint of damage: D: Vehicle Longitudinal Centerline

Length of damaged region: L: 1525 mm

Figure 3 Vehicle Accelerometer Placement



Side View



Bottom View

Table 4 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 990315-1 No. LOCATION		X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
1 LEFT BRAKE CALIPER	PRE	4080 mm	705 mm	309 mm				
	POST	3890 mm	760 mm	271 mm				
LONGITUDINAL					35.6 g	@ 71.4 ms	78.9 g	@ 41.8 ms
2 RIGHT BRAKE CALIPER	PRE	4080 mm	-705 mm	304 mm				
	POST	3960 mm	-720 mm	290 mm				
LONGITUDINAL					58.0 g	@ 32.8 ms	97.7 g	@ 47.7 ms
3 INSTRUMENT PANEL CENTER	PRE	3444 mm	0 mm	1337 mm				
	POST	3425 mm	25 mm	1285 mm				
LONGITUDINAL					35.4 g	@ 120.2 ms	50.5 g	@ 36.2 ms
4 ENGINE TOP	PRE	4531 mm	174 mm	1020 mm				
	POST	4475 mm	178 mm	1142 mm				
LONGITUDINAL[1]					0.2 g	@ 2.3 ms	808.5 g	@ 46.1 ms
5 ENGINE BOTTOM	PRE	3915 mm	-45 mm	269 mm				
	POST	3859 mm	-41 mm	250 mm				
LONGITUDINAL					15.8 g	@ 81.4 ms	36.2 g	@ 49.3 ms

Table 4 Vehicle Accelerometer Locations and Data Summary, Cont'd.

TEST NUMBER: 990315-1 No. LOCATION		X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
6 REAR VEHICLE CENTERLINE VERTICAL	PRE	310 mm	0 mm	794 mm				
	POST	310 mm	0 mm	835 mm	12.2 g	@ 23.8 ms	28.9 g	@ 27.7 ms
7 LEFT REAR SEAT LONGITUDINAL	PRE	2000 mm	700 mm	577 mm				
	POST	2000 mm	700 mm	527 mm	1.6 g	@ 173.4 ms	27.2 g	@ 46.2 ms
8 RIGHT REAR SEAT LONGITUDINAL	PRE	2000 mm	-700 mm	578 mm				
	POST	2000 mm	-700 mm	535 mm	1.5 g	@ 156.1 ms	29.2 g	@ 46.1 ms

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

[1]See DATA ACQUISITION EXPLANATIONS

Section 3.0

FMVSS 208 Data

Table 5 Dummy Injury Criteria

Maximum Acceleration

	Head				Chest		
	X	Y	Z	R	X	Y	Z
Driver	-46.9 g	10.2 g	-27.8 g	47.8 g	-45.9 g	2.7 g	-12.7 g
Passenger	-57.2 g	14.8 g	-23.9 g	60.7 g	-47.3 g	-2.4 g	-21.7 g

Maximum Femur Compressive Force

	Left Femur	Right Femur
Driver	5953 N	6612 N
Passenger	6730 N	6975 N

15-Millisecond Head Injury Criteria[1]

	HIC	Time t_1	Time t_2
Driver	178	98.6 ms	113.6 ms
Passenger	132	79.0 ms	94.0 ms

36-Millisecond Head Injury Criteria[1]

	HIC	Time t_1	Time t_2
Driver	377	93.7 ms	129.7 ms
Passenger	147	80.6 ms	116.6 ms

Chest Maximum Resultant Acceleration[2]

	Acceleration	Time t_1	Time t_2
Driver	46.7 g	87.2 ms	90.3 ms
Passenger	50.9 g	98.0 ms	101.0 ms

Maximum Chest Deflection

Driver	28.1 mm
Passenger	19.6 mm

[1] As defined in FMVSS No. 208
[2] Defined as equal to or exceeding 0.003 sec. duration

Dummy Kinematic Summary

Driver Dummy

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head and chest impacted the airbag. The dummy continued forward and up, and the top of the dummy's head impacted the windshield.. The dummy's head and upper torso rotated rearward as the dummy rebounded into the seat back. The driver dummy came to rest seated in the driver's seat.

Right Front Passenger Dummy

Upon impact, the passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head and chest impacted the airbag. The dummy continued forward and up, and the dummy's head impacted the sun visor. The dummy's head and upper torso rotated to the right as the dummy rebounded into the seat back. The passenger dummy came to rest seated in the passenger's seat.

Section 4.0

Vehicle, Occupant, and Camera Measurements

Figure 4 Pre-test and Post-test Measurement Points

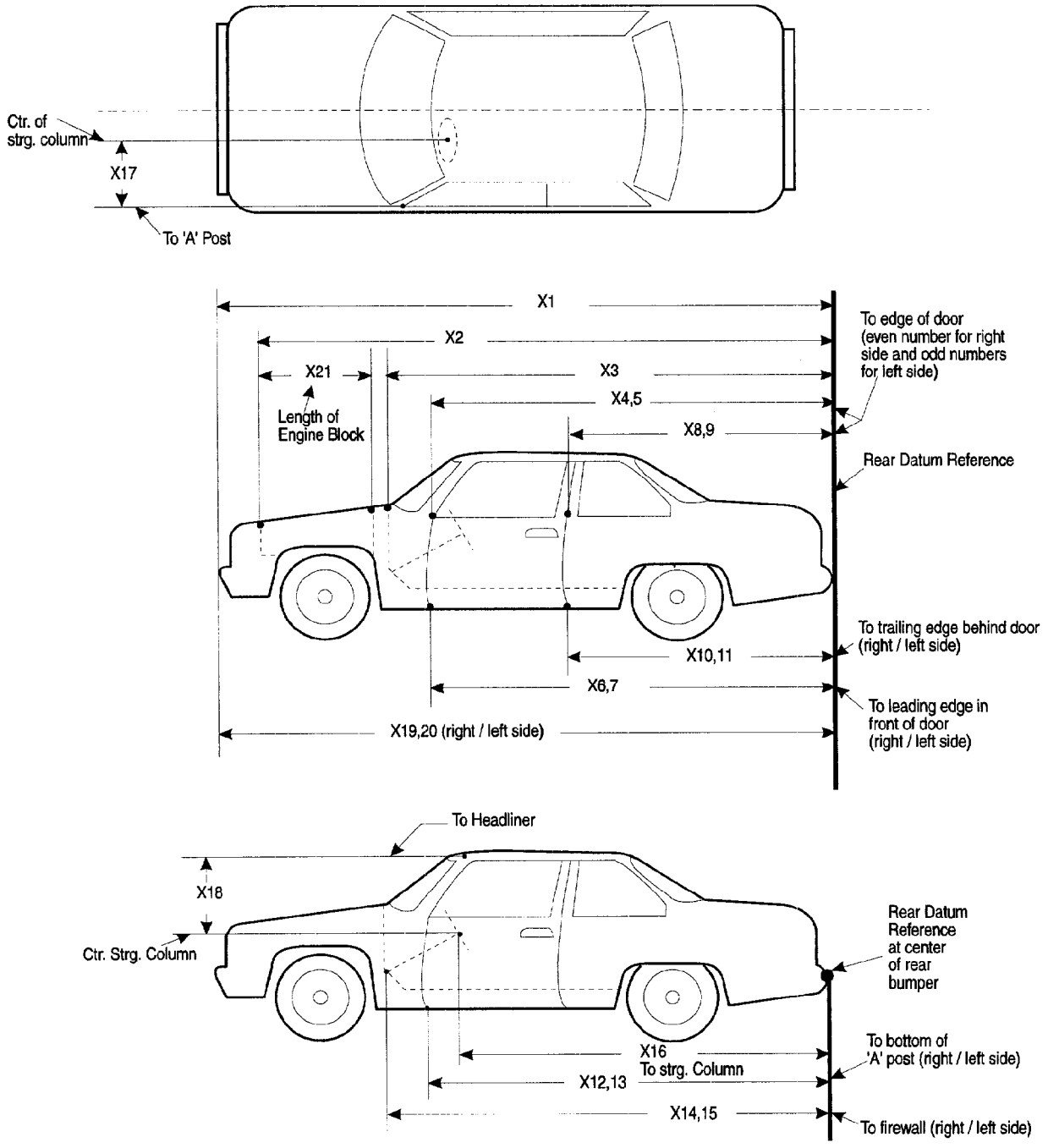


Table 6 Impacted Vehicle Measurements

Vehicle year/make/model/body style: 1999/Ford/Expedition/XLT

Test Number: 990315-1

No.	Type of measurement	Pre-test	Post-test	Difference
X1	Total length of vehicle at centerline	5461 mm	4806 mm	655 mm
X2	Rear surface of vehicle to front of engine block	4461 mm	4405 mm	56 mm
X3	Rear surface of vehicle to firewall	4259 mm	4240 mm	19 mm
X4	Rear surface of vehicle to upper leading edge of right door	3854 mm	3851 mm	3 mm
X5	Rear surface of vehicle to upper leading edge of left door	3853 mm	3844 mm	9 mm
X6	Rear surface of vehicle to lower leading edge of right door	3769 mm	3745 mm	24 mm
X7	Rear surface of vehicle to lower leading edge of left door	3771 mm	3737 mm	34 mm
X8	Rear surface of vehicle to upper trailing edge of right door	2770 mm	2768 mm	2 mm
X9	Rear surface of vehicle to upper trailing edge of left door	2770 mm	2759 mm	11 mm
X10	Rear surface of vehicle to lower trailing edge of right door	2754 mm	2728 mm	26 mm
X11	Rear surface of vehicle to lower trailing edge of left door	2750 mm	2719 mm	31 mm
X12	Rear surface of vehicle to bottom of "A" post on right side	3797 mm	3795 mm	2 mm
X13	Rear surface of vehicle to bottom of "A" post on left side	3791 mm	3780 mm	11 mm
X14	Rear surface of vehicle to firewall - right side	4260 mm	4213 mm	47 mm
X15	Rear surface of vehicle to firewall - left side	4235 mm	4120 mm	115 mm
X16	Rear surface of vehicle to steering wheel center	3392 mm	3400 mm	-8 mm
X17	Center of steering column to "A" post	270 mm	255 mm	15 mm
X18	Center of steering column to headliner	460 mm	470 mm	-10 mm
X19	Rear surface of vehicle to right side of front bumper	5298 mm	4806 mm	492 mm
X20	Rear surface of vehicle to left side of front bumper	5285 mm	4790 mm	495 mm
X21	Length of engine block	500 mm	500 mm	0 mm

Figure 5 Vehicle Target Locations

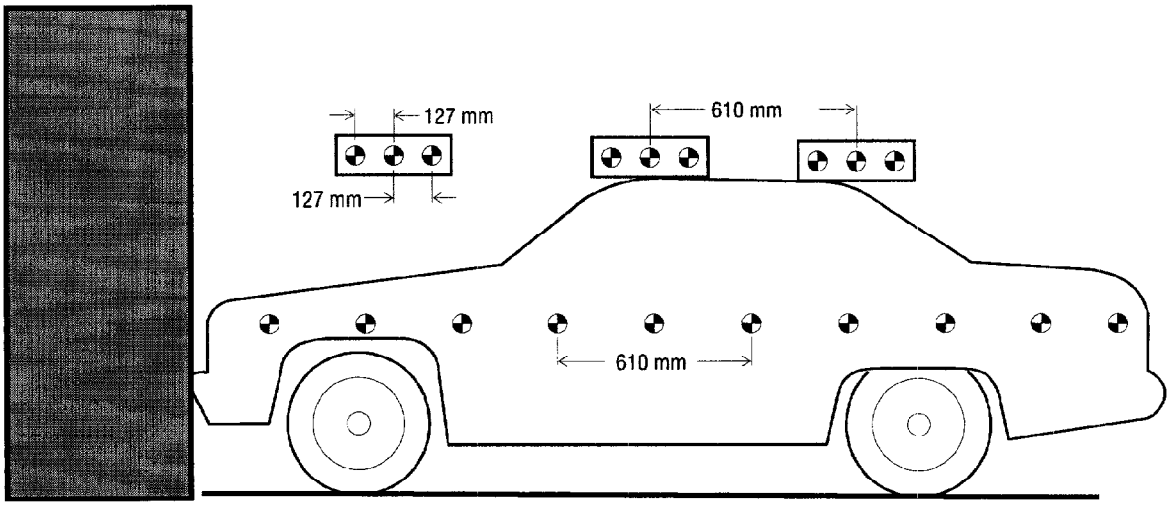


Figure 6 Dummy Measurement Locations for Front Seat Occupants

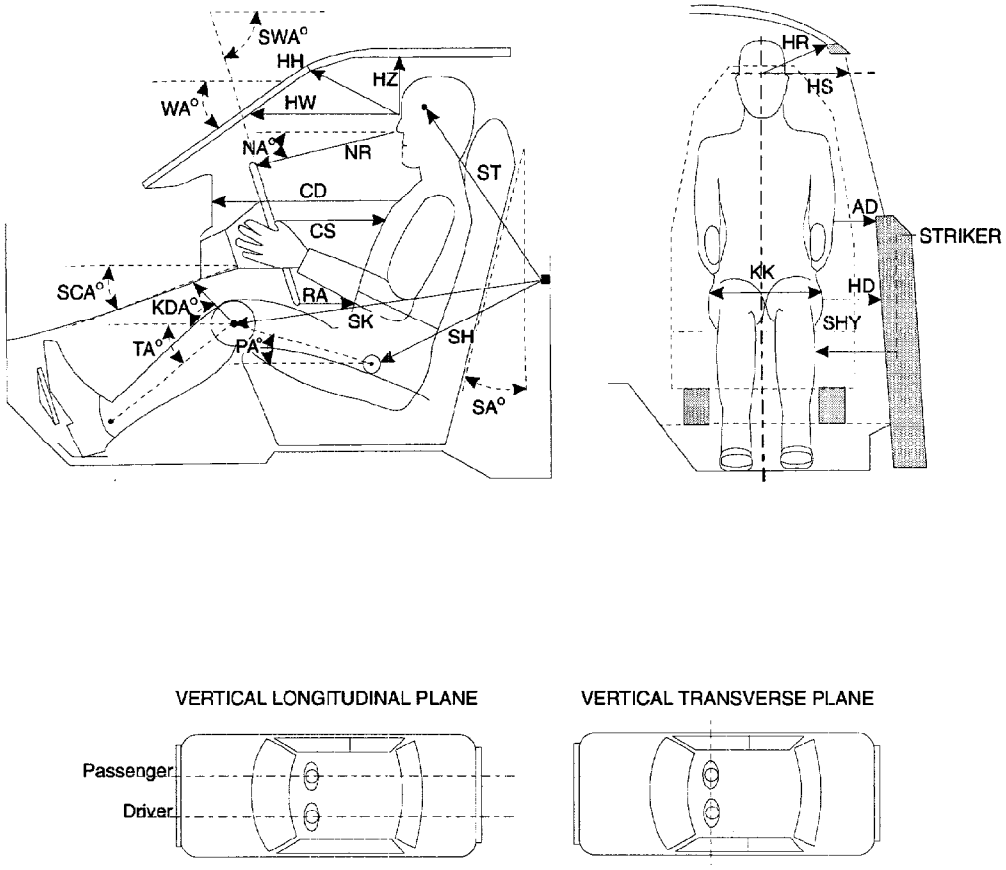


Table 7 Dummy Measurement Data For Front Seat Occupants

Designation	Type of Measurement	Driver (Serial #168)	Passenger (Serial #169)
WA	Windshield angle	33°	33°
SWA	Steering wheel angle	68°	N/A
SCA	Steering column angle	22°	N/A
SA	Seat back angle	21°	21°
HZ	Head to roof	230 mm	225 mm
HH	Head to header	455 mm	461 mm
HW	Head to windshield	653 mm	637 mm
HR	Head to side header	265 mm	245 mm
NR	Nose to rim	436 mm	N/A
NA	Nose to rim angle	11°	N/A
CD	Chest to dash	598 mm	605 mm
CS	Steering wheel to chest	325 mm	N/A
RA	Rim to abdomen	220 mm	N/A
KDL	Left knee to dash	148 mm	183 mm
KDR	Right knee to dash	145 mm	177 mm
KDA	Outboard knee to dash angle	26°	27°
PA	Pelvic angle	23°	23°
TA	Tibial angle	52°	58°
KK	Knee to knee	270 mm	272 mm
ST[1]	Striker to head	641 mm	652 mm
	Striker to head angle	-85°	-83°
SK	Striker to knee	605 mm	617 mm
	Striker to knee angle	-11°	-13°
SH[1]	Striker to H-point	216 mm	232 mm
	Striker to H-point angle	3°	-7°
SHY	Striker to H-point (Y dir.)	231 mm	247 mm
HS	Head to side window	332 mm	320 mm
HD	H-point to door	176 mm	150 mm
AD	Arm to door	132 mm	119 mm

The seat back angle (SA°) is measured relative to vertical, all other angles are measured relative to horizontal.

[1] A negative angle indicates the measurement point was above the striker.

Figure 7 Camera Positions

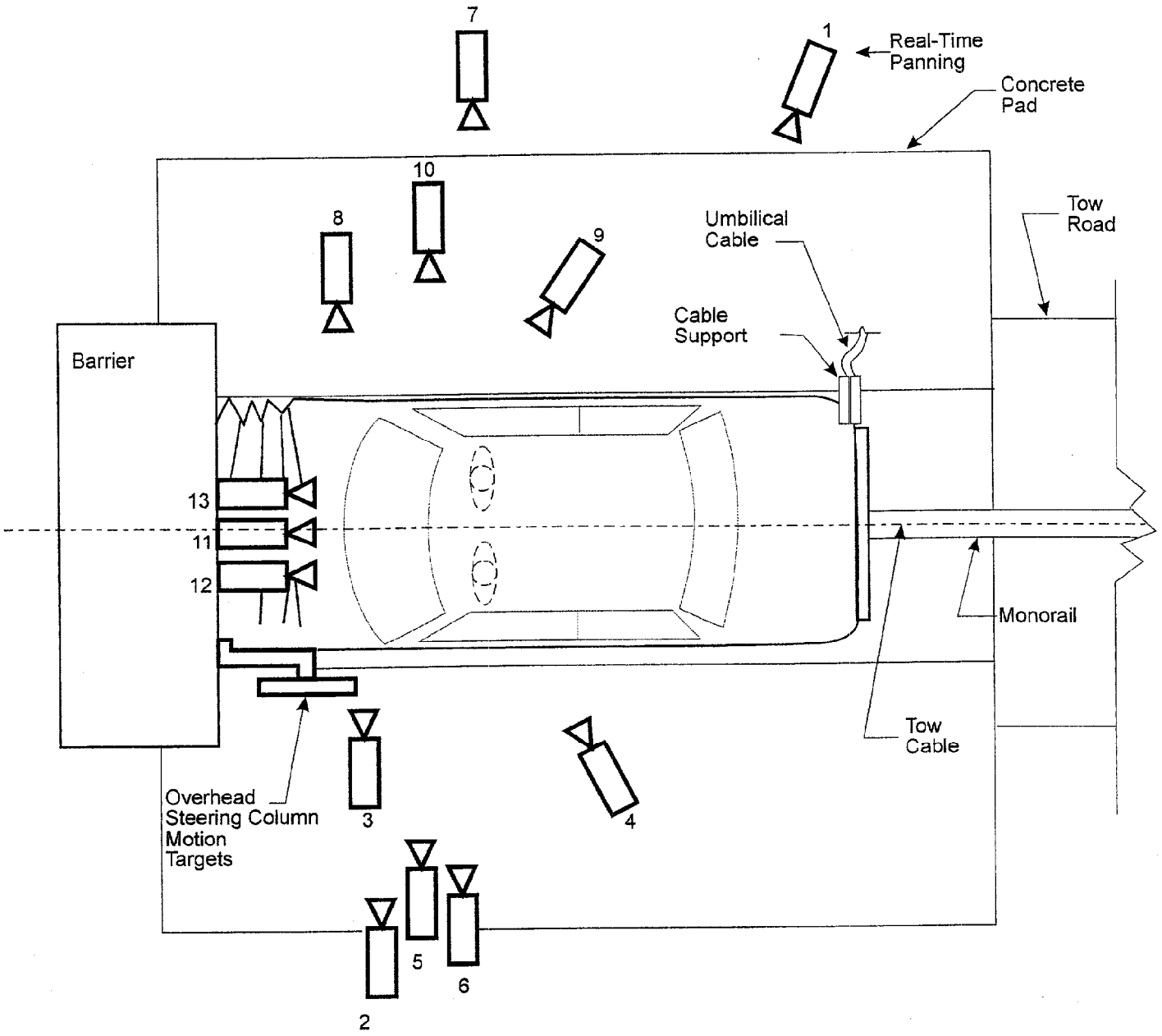


Figure 7 Camera Positions, Cont'd.

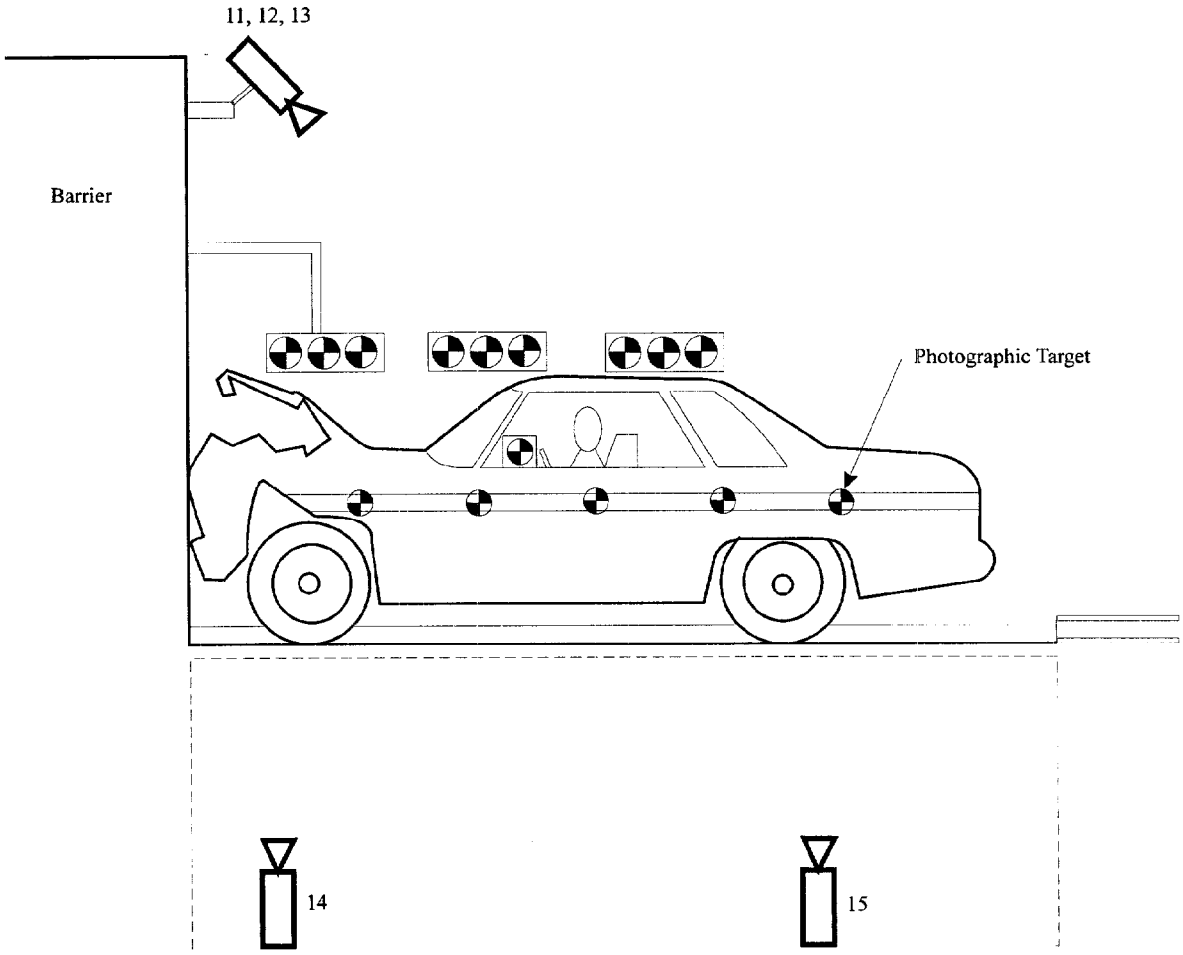


Table 8 Motion Picture Camera Locations

Vehicle year/make/model/body style: 1999/Ford/Expedition/XLT

Test number: 990315-1

Camera Number	View	Camera Positions[1] X	Y	Z	Camera Angle[2]	Film Plane to Head Target	Camera Lens	Film Speed
1	Real-time panning	NA	NA	NA	NA	NA	16 mm	24 frames/s
2	Left vehicle crush	-1054 mm	7493 mm	1118 mm	0°	6920 mm	25 mm	1005 frames/s
3	Left windshield intrusion	-906 mm	7984 mm	1530 mm	0°	7115 mm	50 mm	1000 frames/s
4	Driver kinematics	-3995 mm	2946 mm	2210 mm	6°	3060 mm	25 mm	998 frames/s
5	Steering column motion	-3560 mm	7264 mm	2930 mm	11°	6890 mm	25 mm	1000 frames/s
6	Steering column motion	-3560 mm	7264 mm	1908 mm	4°	6710 mm	25 mm	995 frames/s
7	Right overall	-2065 mm	-6767 mm	1120 mm	0°	6730 mm	13 mm	1012 frames/s
8	Right windshield intrusion	-906 mm	-7984 mm	1530 mm	0°	6960 mm	50 mm	1005 frames/s
9	Passenger kinematics	-3863 mm	-2946 mm	2210 mm	8°	3090 mm	25 mm	990 frames/s
10	Passenger kinematics	-986 mm	-7442 mm	1340 mm	0°	6874 mm	25 mm	995 frames/s
11	Windshield front view	-440 mm	0 mm	2350 mm	69°	NA	8.5 mm	1000 frames/s
12	Driver - front view	-440 mm	375 mm	2350 mm	53°	NA	13 mm	965 frames/s
13	Passenger - front view	-440 mm	-325 mm	2350 mm	60°	NA	13 mm	992 frames/s
14	Pit - front position	-340 mm	0 mm	-3320 mm	90°	NA	13 mm	1002 frames/s
15	Pit - rear position	-1260 mm	0 mm	-3320 mm	90°	NA	13 mm	1005 frames/s
	Real-time documentation	NA	NA	NA	NA	NA	12-120 mm	24 frames/s

[1] +X: Film plane forward of barrier face
+Y: Film plane to left of monorail centerline
+Z: Film plane above ground level

[2] +Angle: Film plane angled upward from horizontal plane

Appendix A

Photographs

Figure A-1 Pre-Test Front View

Figure A-2 Post-Test Front View

Figure A-3 Pre-Test Left Side View

Figure A-4 Post-Test Left Side View

Figure A-5 Pre-Test Left Rear Three-Quarter View

Figure A-6 Post-Test Left Rear Three-Quarter View

Figure A-7 Pre-Test Rear View

Figure A-8 Post-Test Rear View

Figure A-9 Pre-Test Right Side View

Figure A-10 Post-Test Right Side View

Figure A-11 Pre-Test Right Front Three-Quarter View

Figure A-12 Post-Test Right Front Three-Quarter View

Figure A-13 Pre-Test Front Underbody View

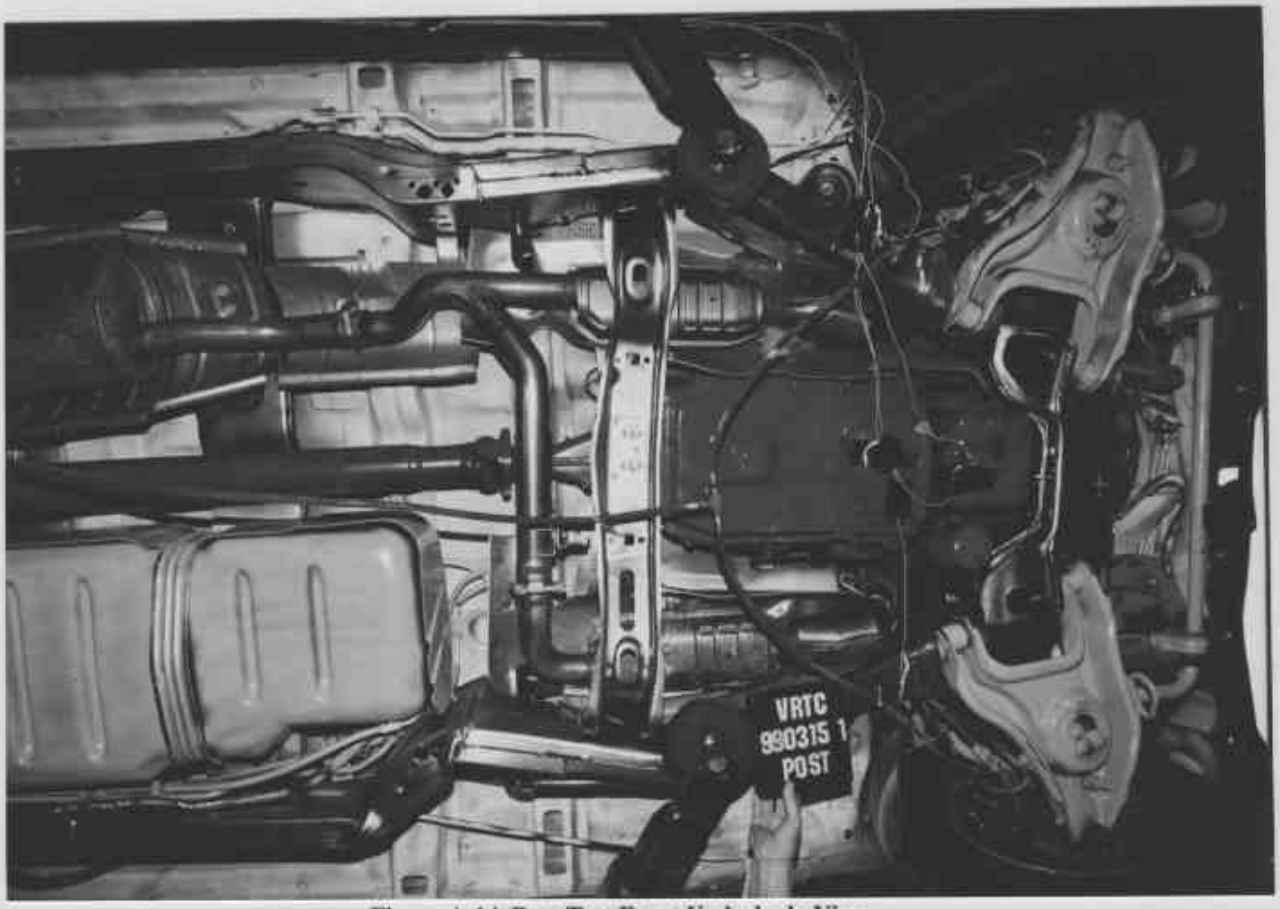


Figure A-14 Post-Test Front Underbody View

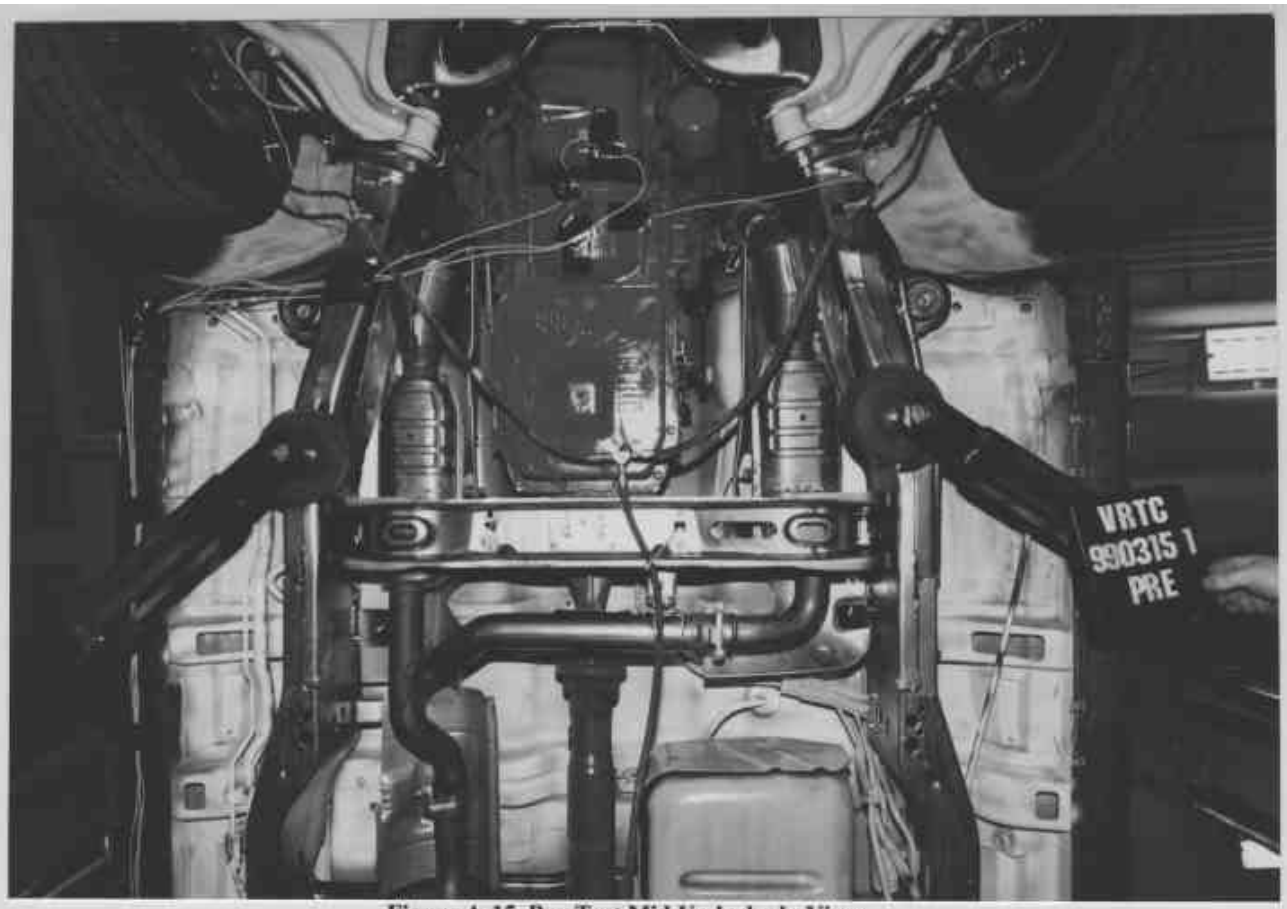


Figure A-15 Pre-Test Mid Underbody View

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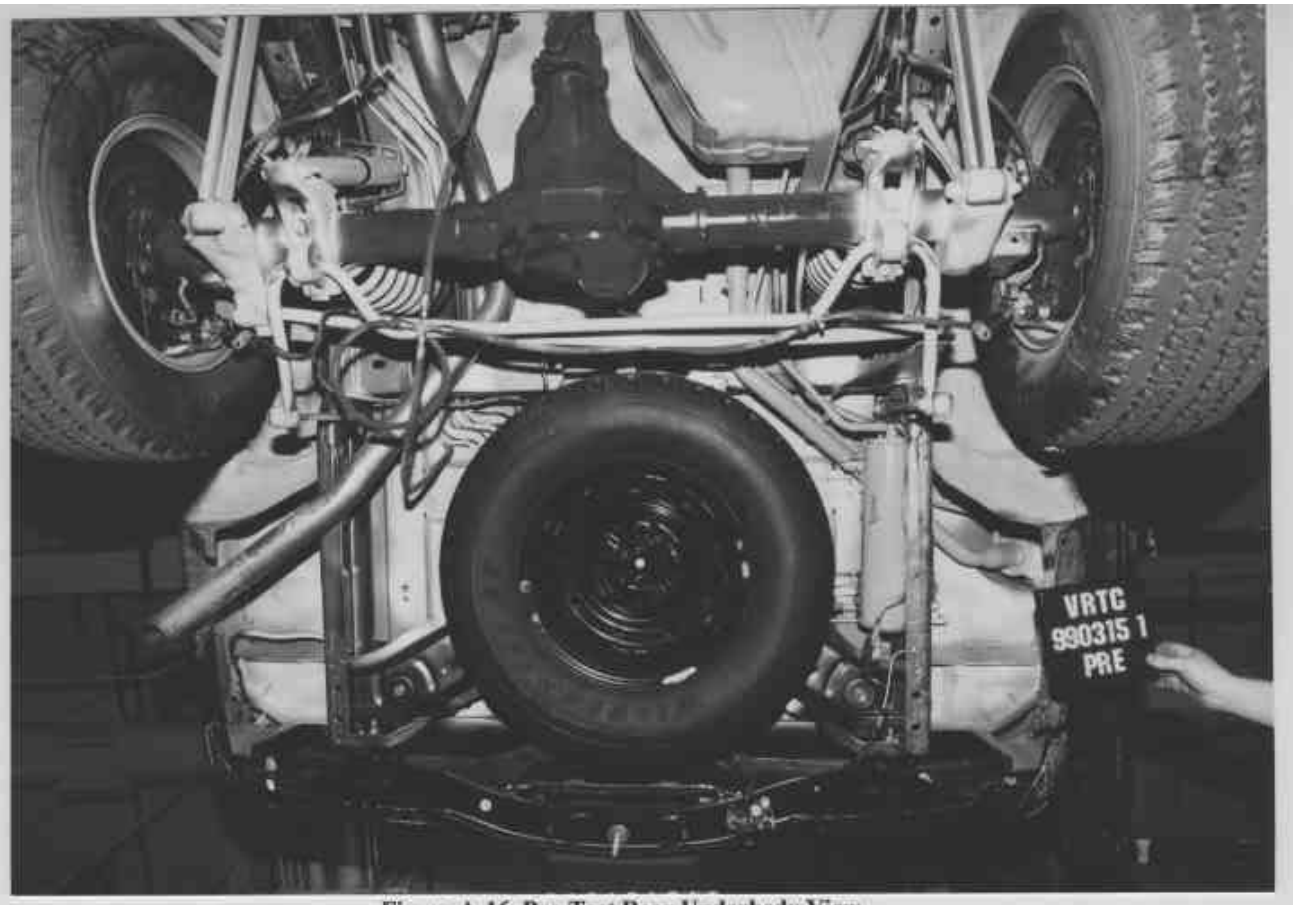


Figure A-16 Pre-Test Rear Underbody View

Figure A-17 Post-Test Rear Underbody View

Figure A-18 Pre-Test Engine Compartment View

Figure A-19 Post-Test Engine Compartment View

Figure A-20 Pre-Test Windshield View

Figure A-21 Post-Test Windshield View

Figure A-22 Pre-Test Driver Dummy Windshield View

Figure A-23 Post-Test Driver Dummy Windshield View

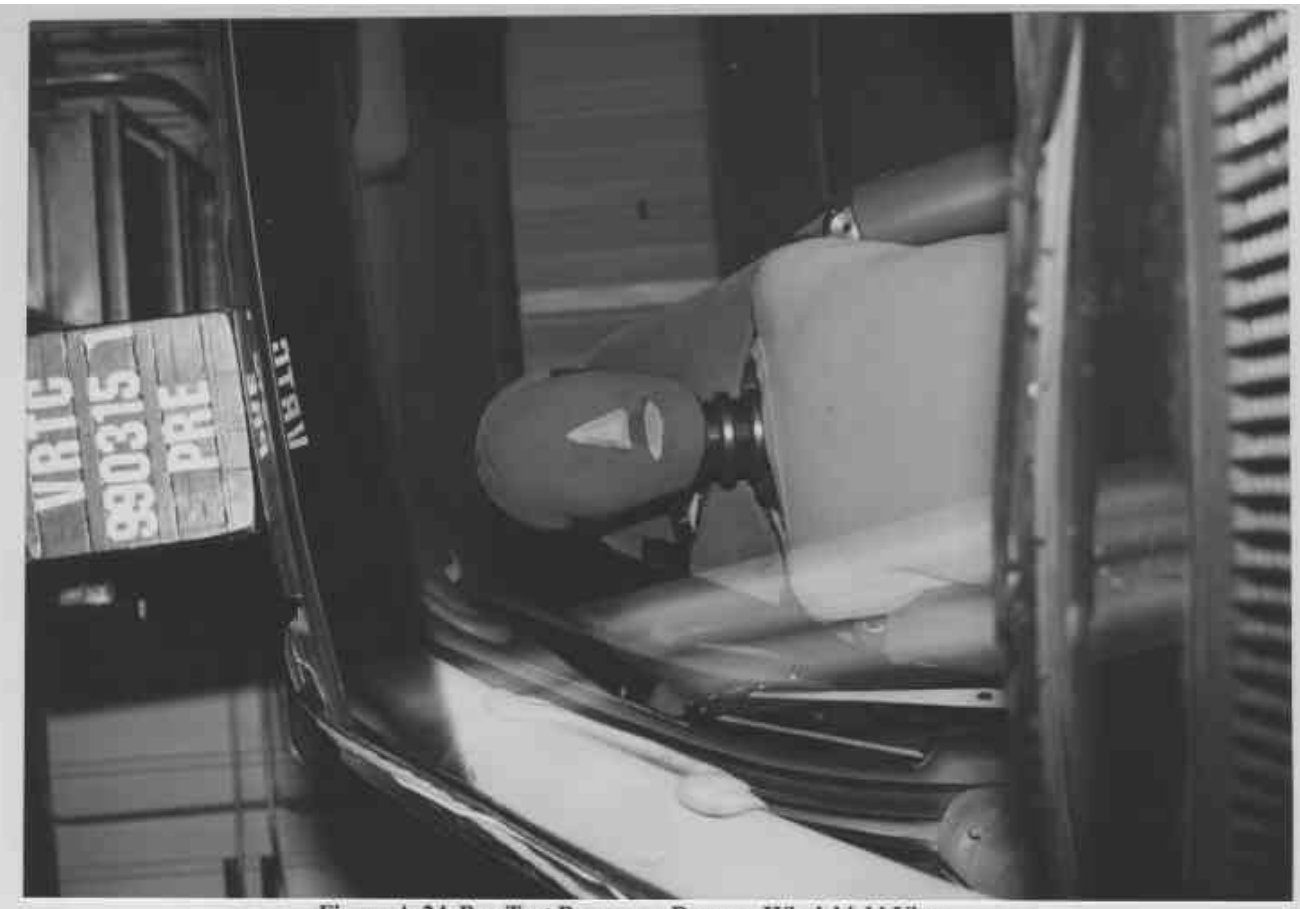


Figure A-24 Pre-Test Passenger Dummy Windshield View

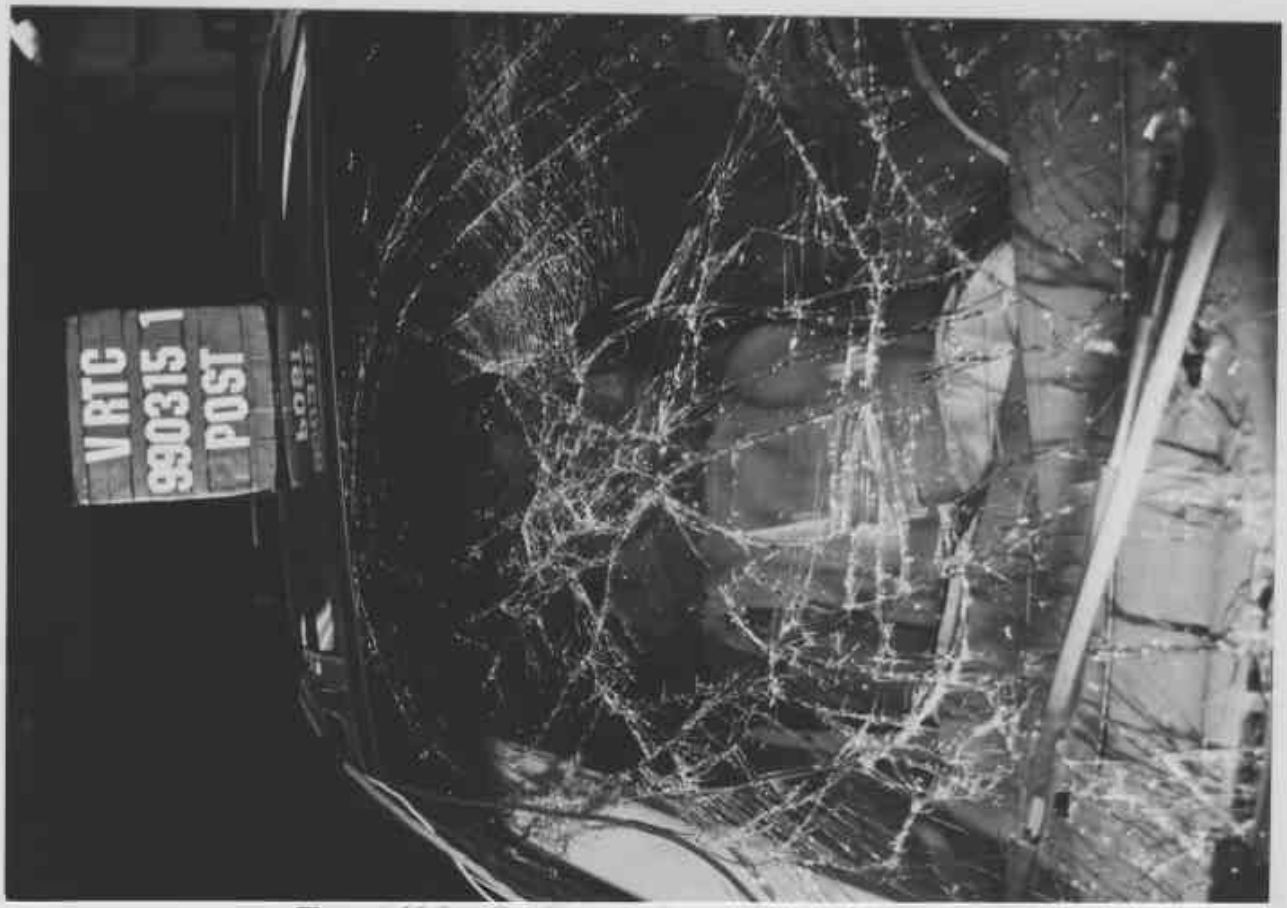


Figure A-25 Post-Test Passenger Dummy Windshield View

Figure A-26 Pre-Test Driver Dummy Position - View 1

Figure A-27 Post-Test Driver Dummy Position - View 1

Figure A-28 Pre-Test Driver Dummy Position -View 2

Figure A-29 Post-Test Driver Dummy Position - View 2

Figure A-30 Pre-Test Driver Dummy Position -View 3

Figure A-31 Post-Test Driver Dummy Position - View 3

Figure A-32 Pre-Test Passenger Dummy Position - View 1

Figure A-33 Post-Test Passenger Dummy Position - View 1

Figure A-34 Pre-Test Passenger Dummy Position - View 2

Figure A-35 Post-Test Passenger Dummy Position - View 2

Figure A-36 Pre-Test Passenger Dummy Position - View 3

Figure A-37 Post-Test Passenger Dummy Position - View 3

Figure A-38 Post-Test Driver Dummy View

Figure A-39 Post-Test Driver Dummy Head Contact - View 1

Figure A-40 Post-Test Driver Dummy Head Contact - View 2

Figure A-41 Post-Test Driver Dummy Knee Contact - View 1

Figure A-42 Post-Test Driver Dummy Knee Contact - View 2

Figure A-43 Post-Test Driver Footwell Deformation View

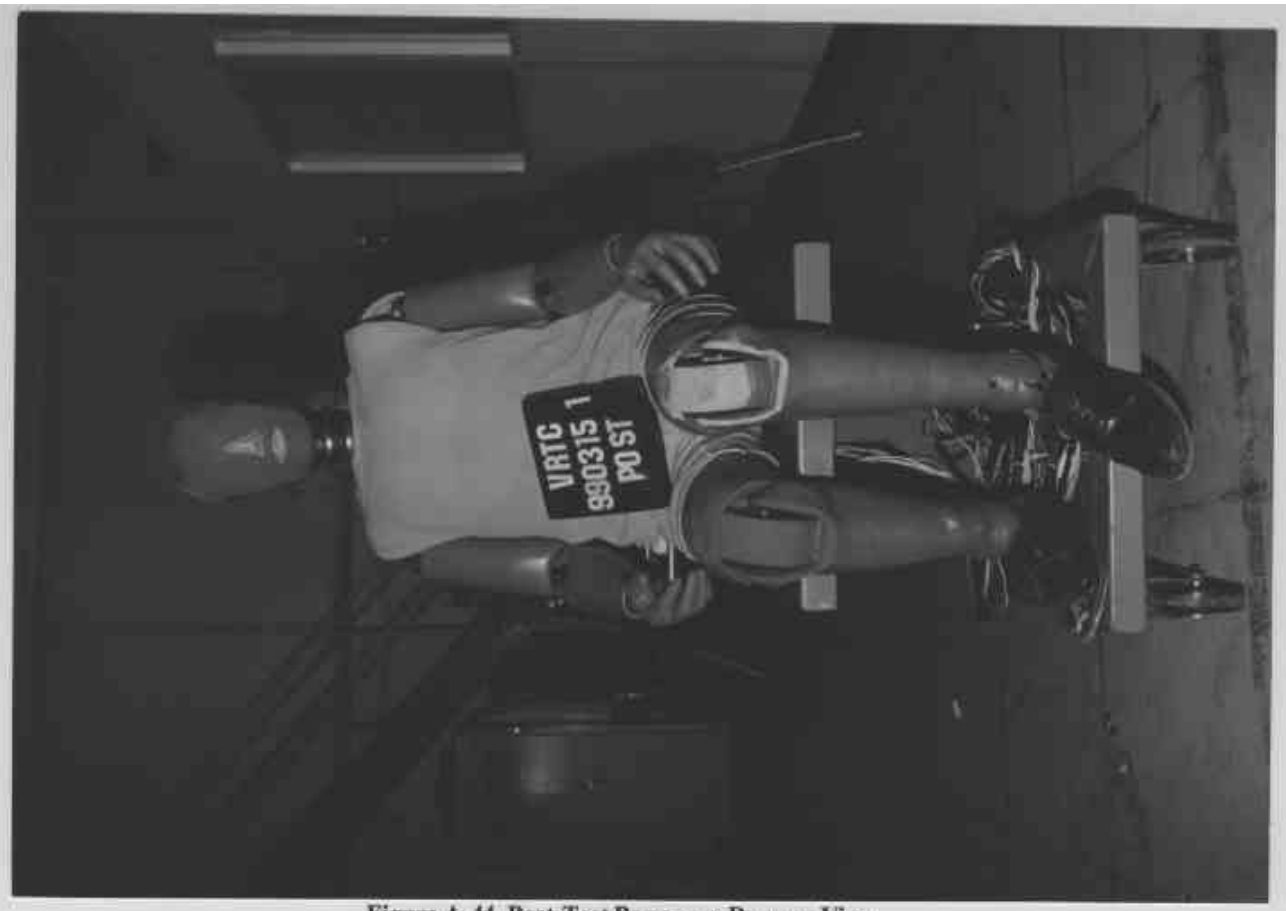


Figure A-44 Post-Test Passenger Dummy View

Figure A-45 Post-Test Passenger Dummy Head Contact - View 1

Figure A-46 Post-Test Passenger Dummy Head Contact - View 2

Figure A-47 Post-Test Passenger Dummy Head Contact - View 3

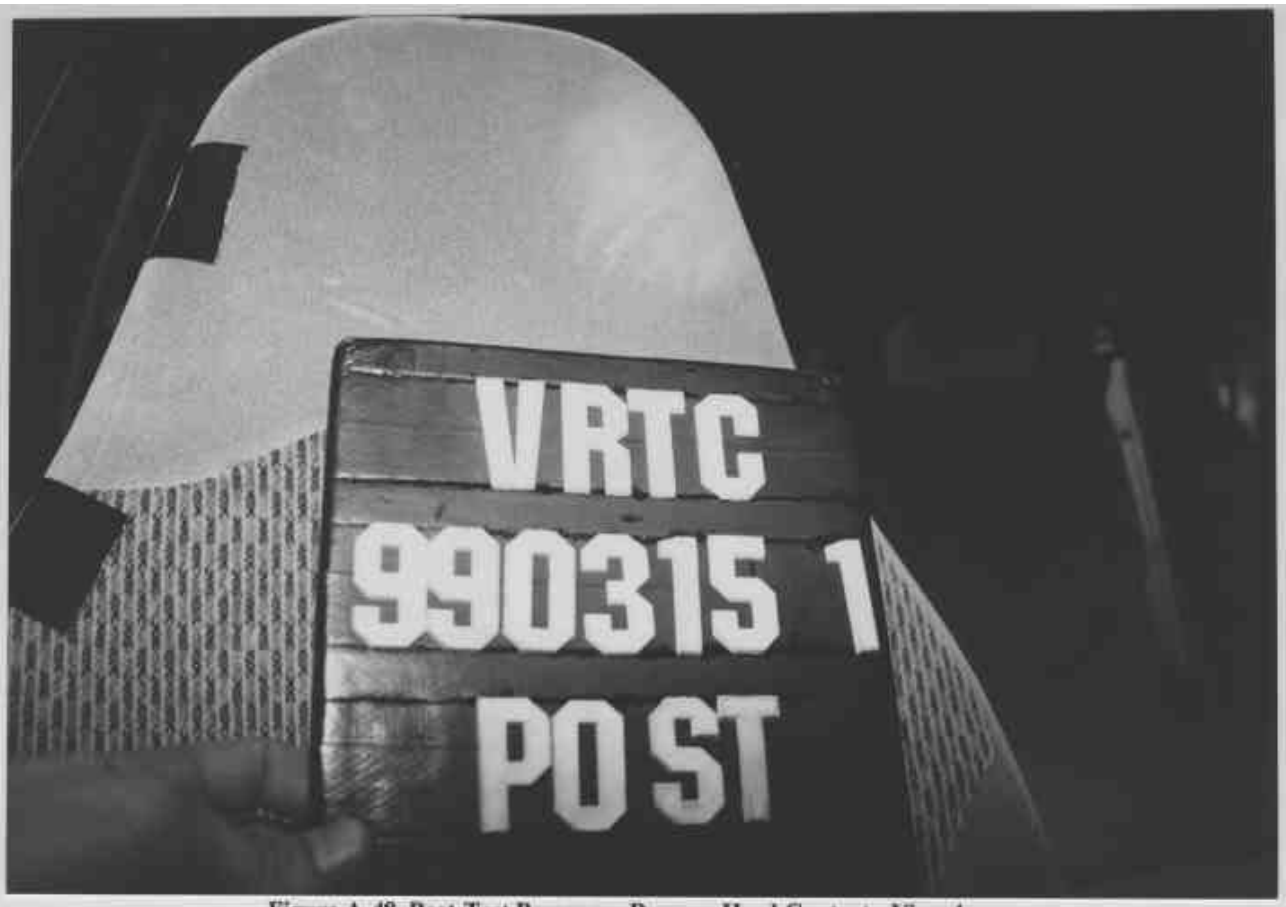


Figure A-48 Post-Test Passenger Dummy Head Contact - View 4

Figure A-49 Post-Test Passenger Dummy Knee Contact - View 1

Figure A-50 Post-Test Passenger Dummy Knee Contact - View 2

Figure A-51 Post-Test Passenger Footwell Deformation View

Figure A-52 Pre-Test Ballast Location View

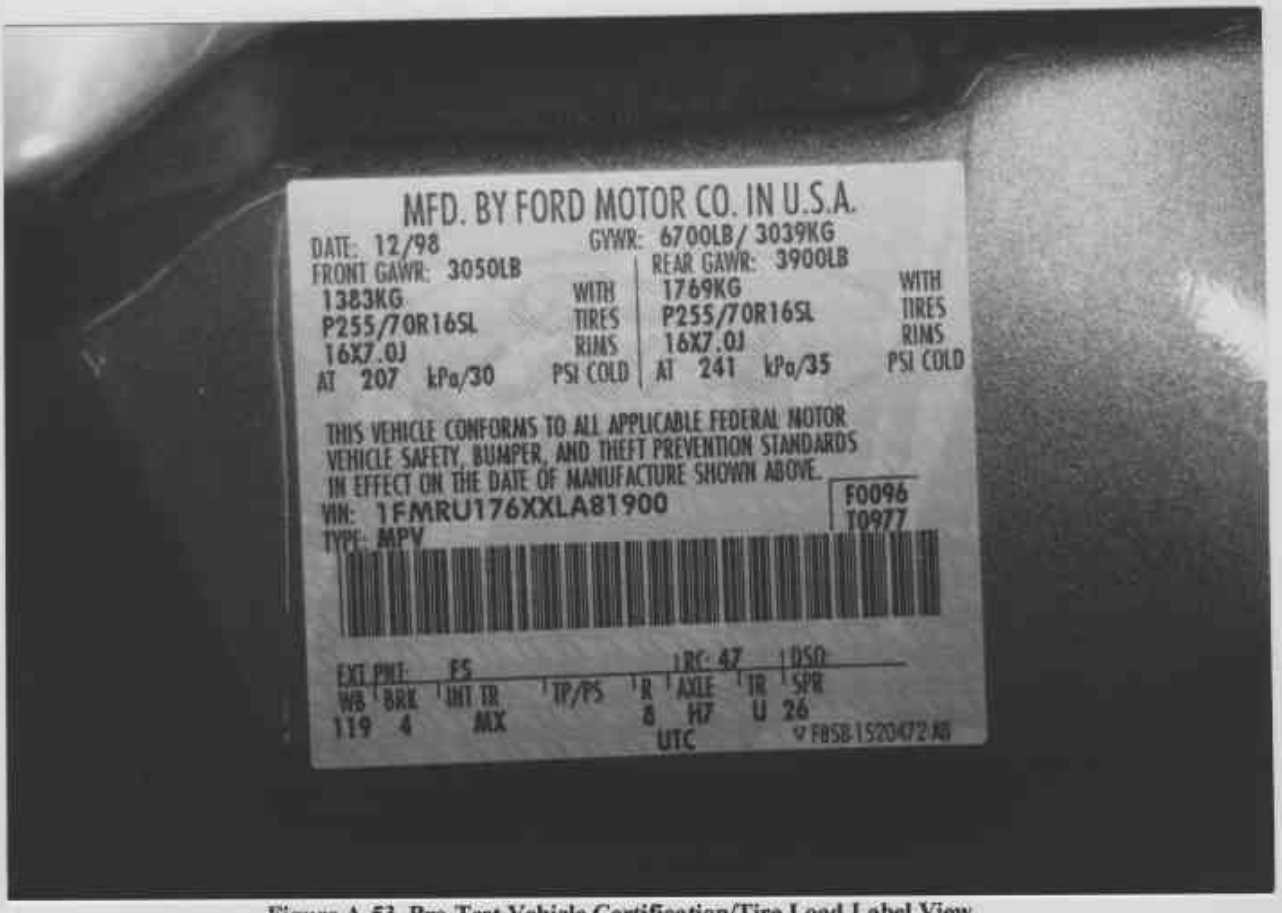


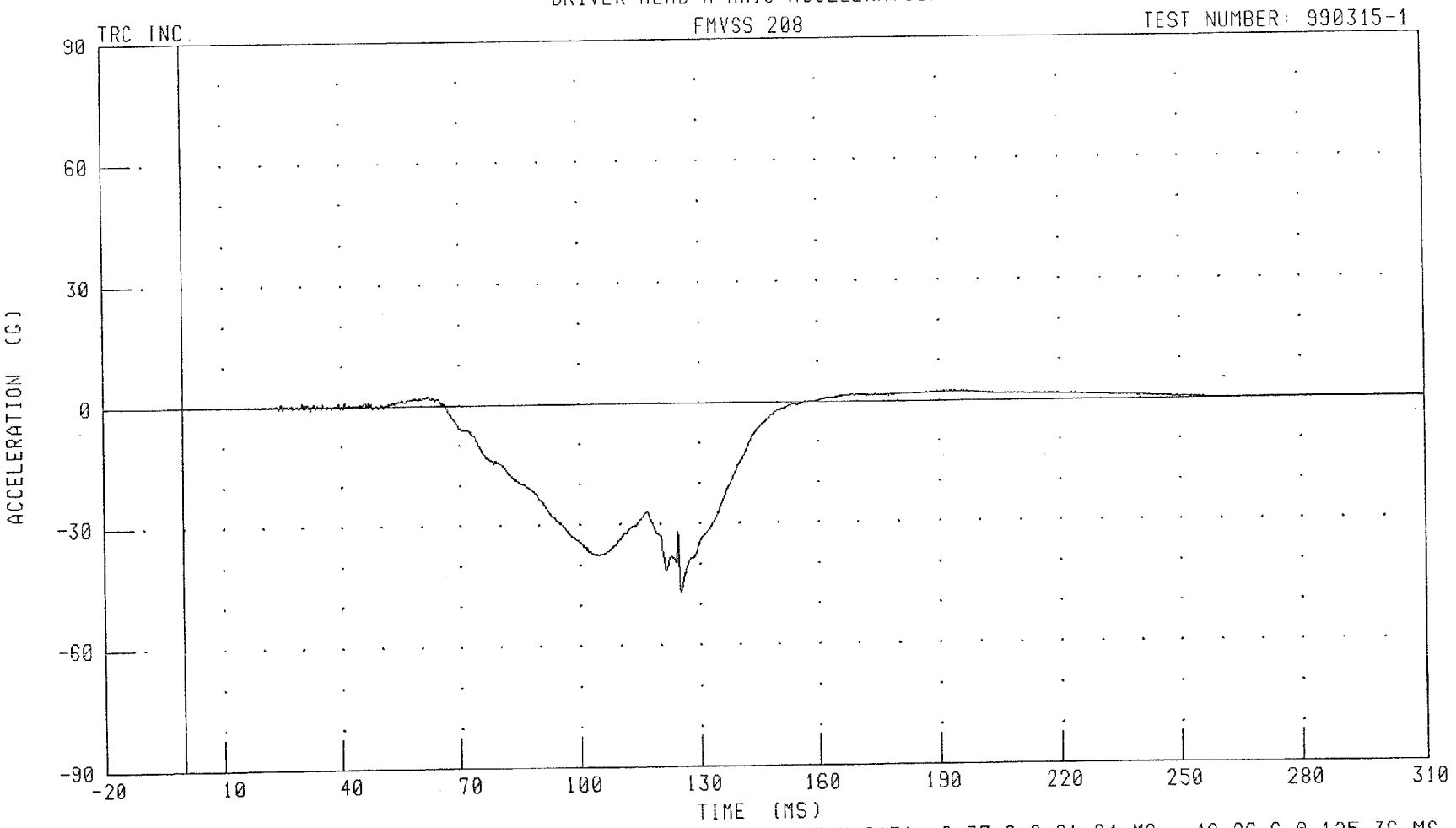
Figure A-53 Pre-Test Vehicle Certification/Tire Load Label View

Figure A-54 Impact Event

Appendix B

Data Plots

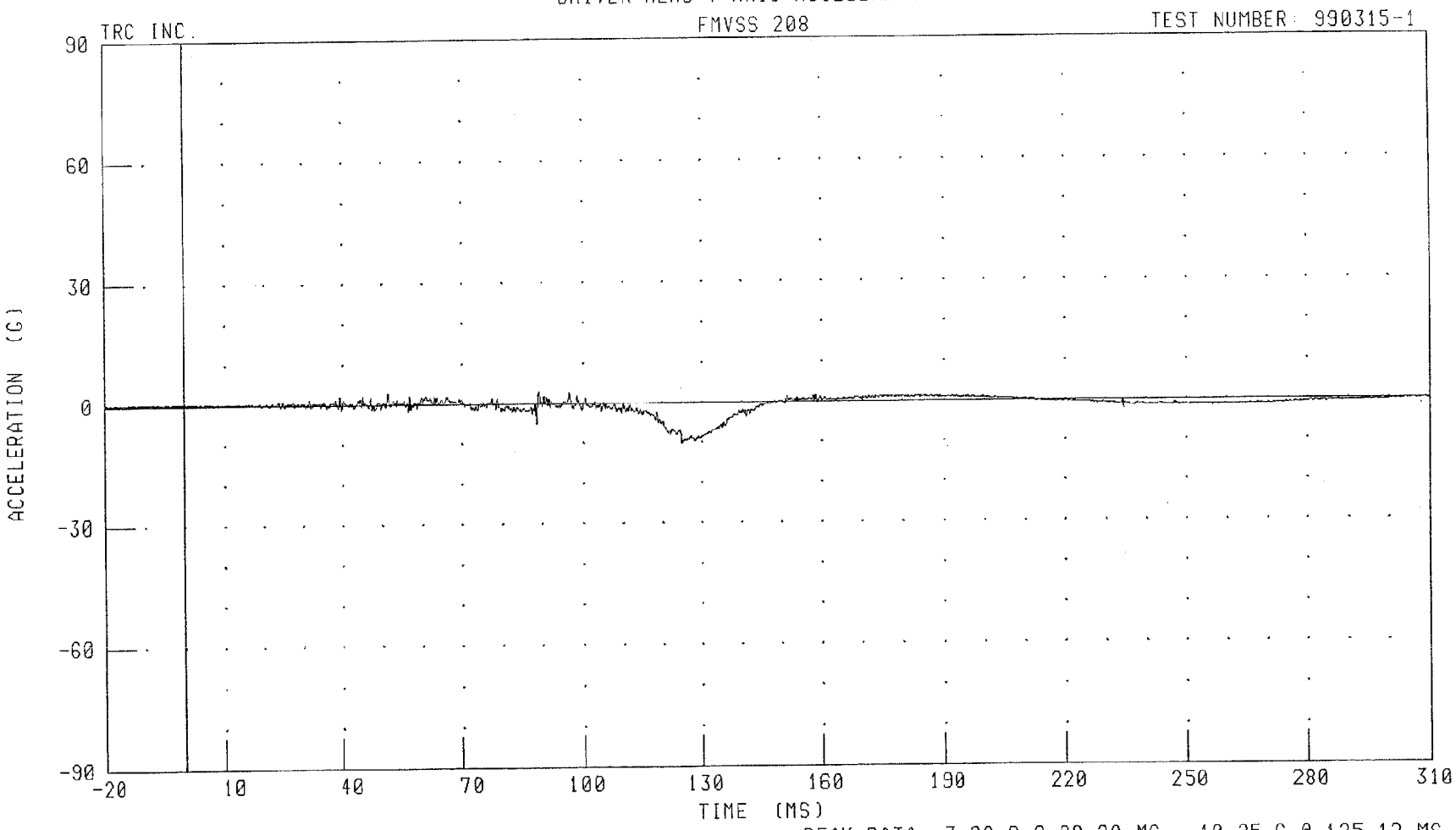
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
DRIVER HEAD X-AXIS ACCELERATION
FMVSS 208



CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

PEAK DATA: 2.37 G @ 61.84 MS; -46.86 G @ 125.36 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
DRIVER HEAD Y-AXIS ACCELERATION

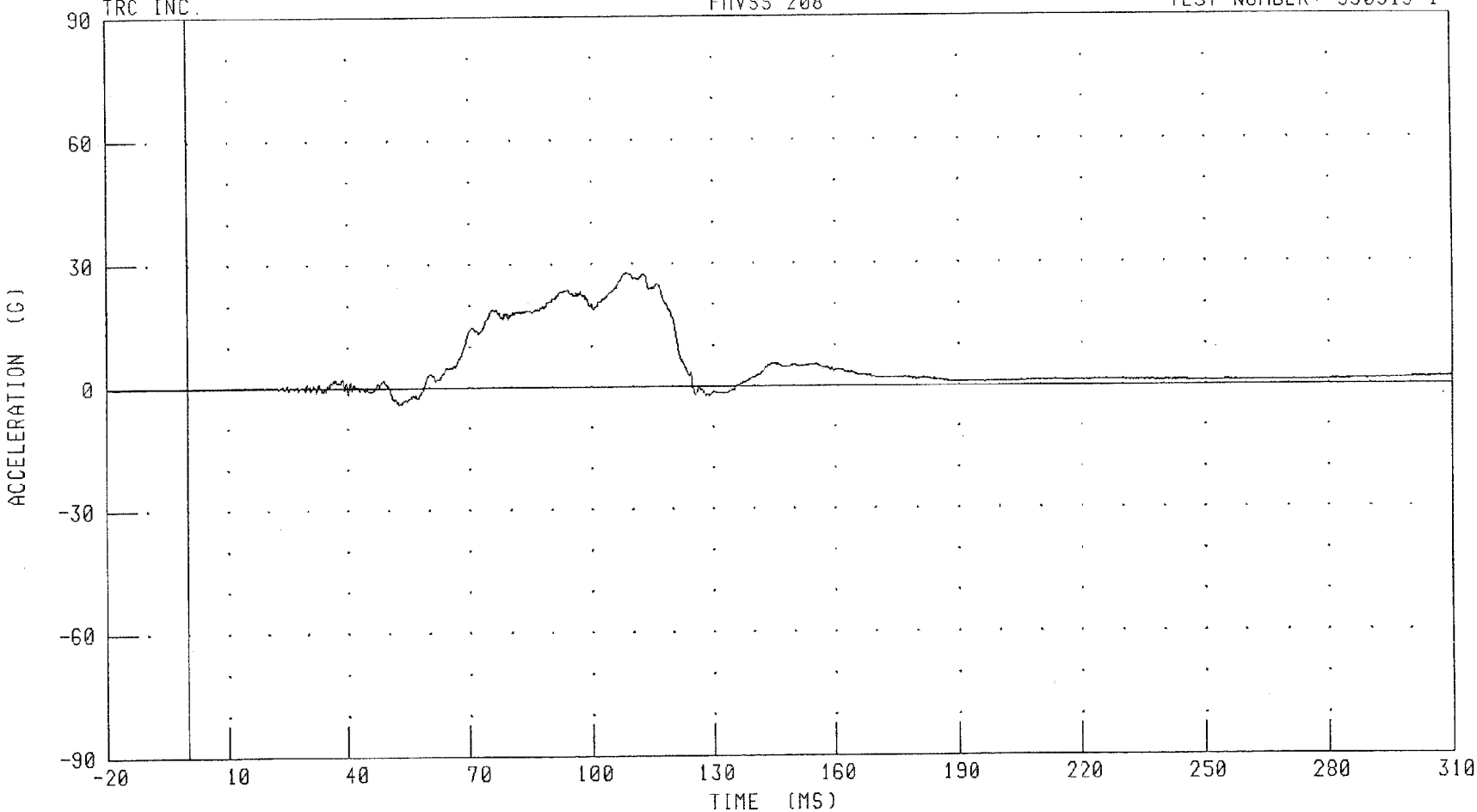


CHANNEL: HEDYG1 FILTER: CH. CLASS 1000 PEAK DATA: 3.00 G @ 89.20 MS, -10.25 G @ 125.12 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

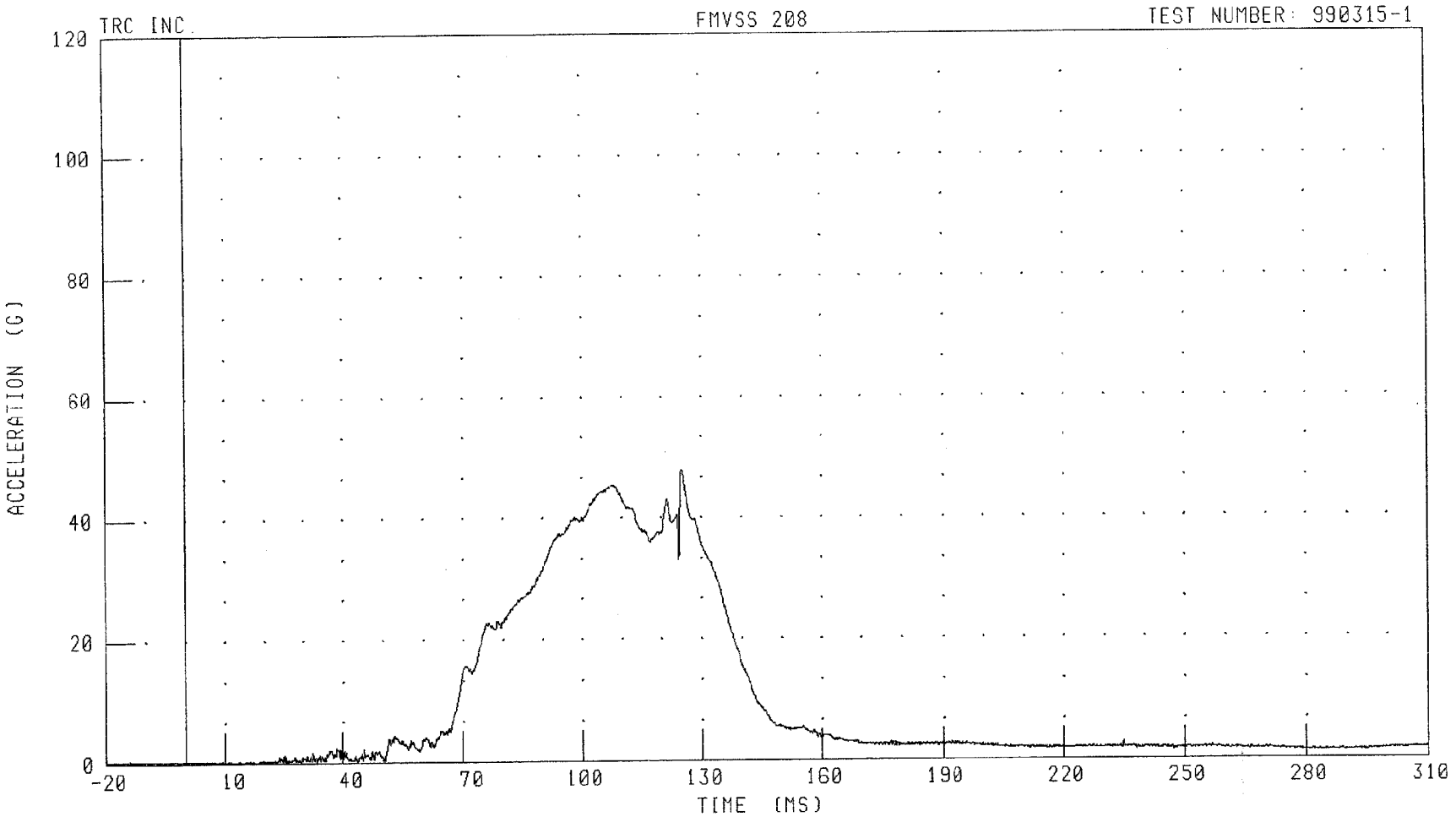
DRIVER HEAD Z-AXIS ACCELERATION

TRC INC. FMVSS 208 TEST NUMBER: 990315-1



CHANNEL: HEDZG1 FILTER: CH. CLASS 1000 PEAK DATA: 27.84 G @ 108.48 MS; -4.28 G @ 52.80 MS

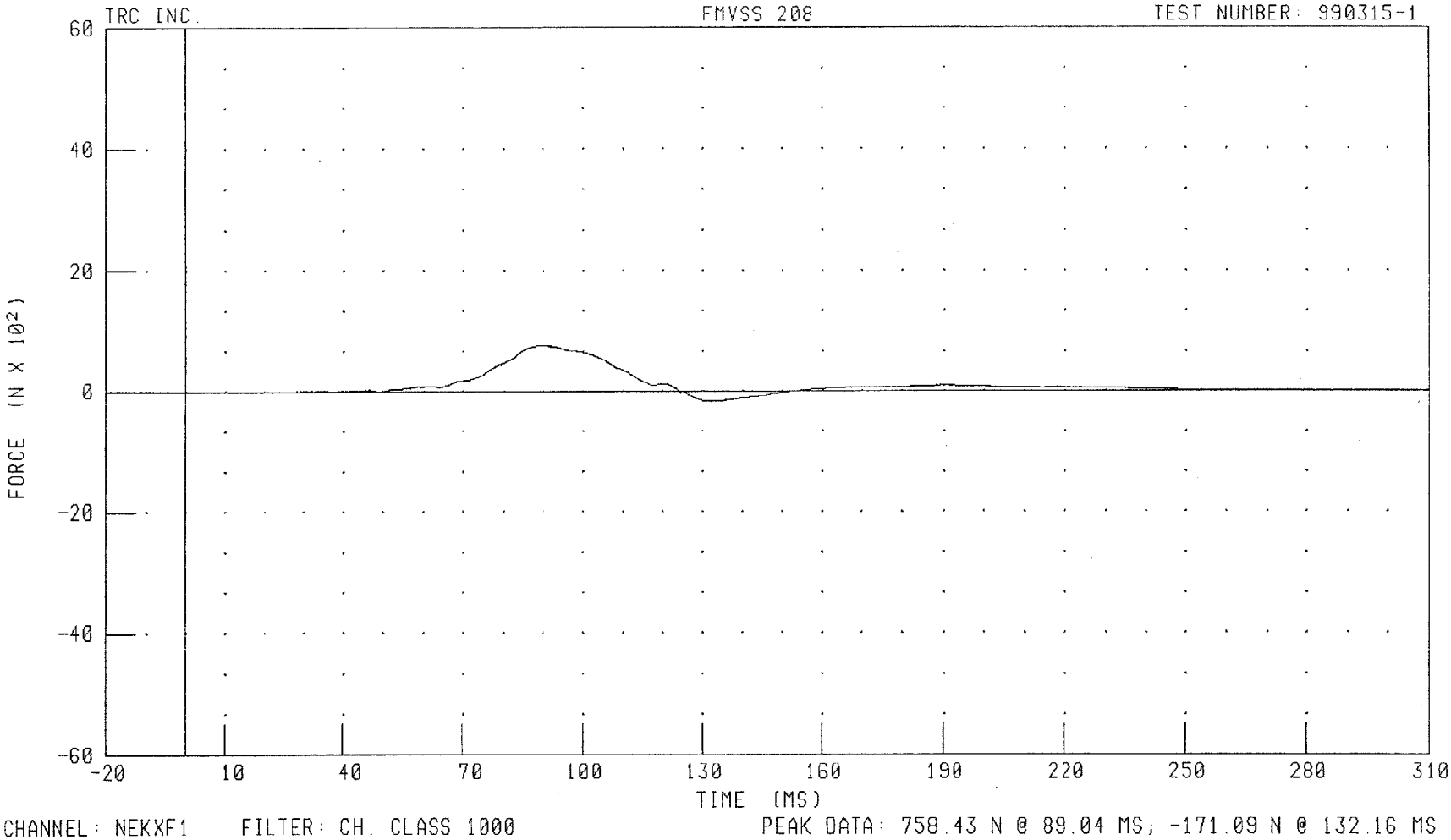
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
DRIVER HEAD RESULTANT ACCELERATION



CHANNEL: HEDRG1 FILTER: CH. CLASS 1000 PEAK DATA: 47.85 G @ 125.36 MS; 0.09 G @ -20.00 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

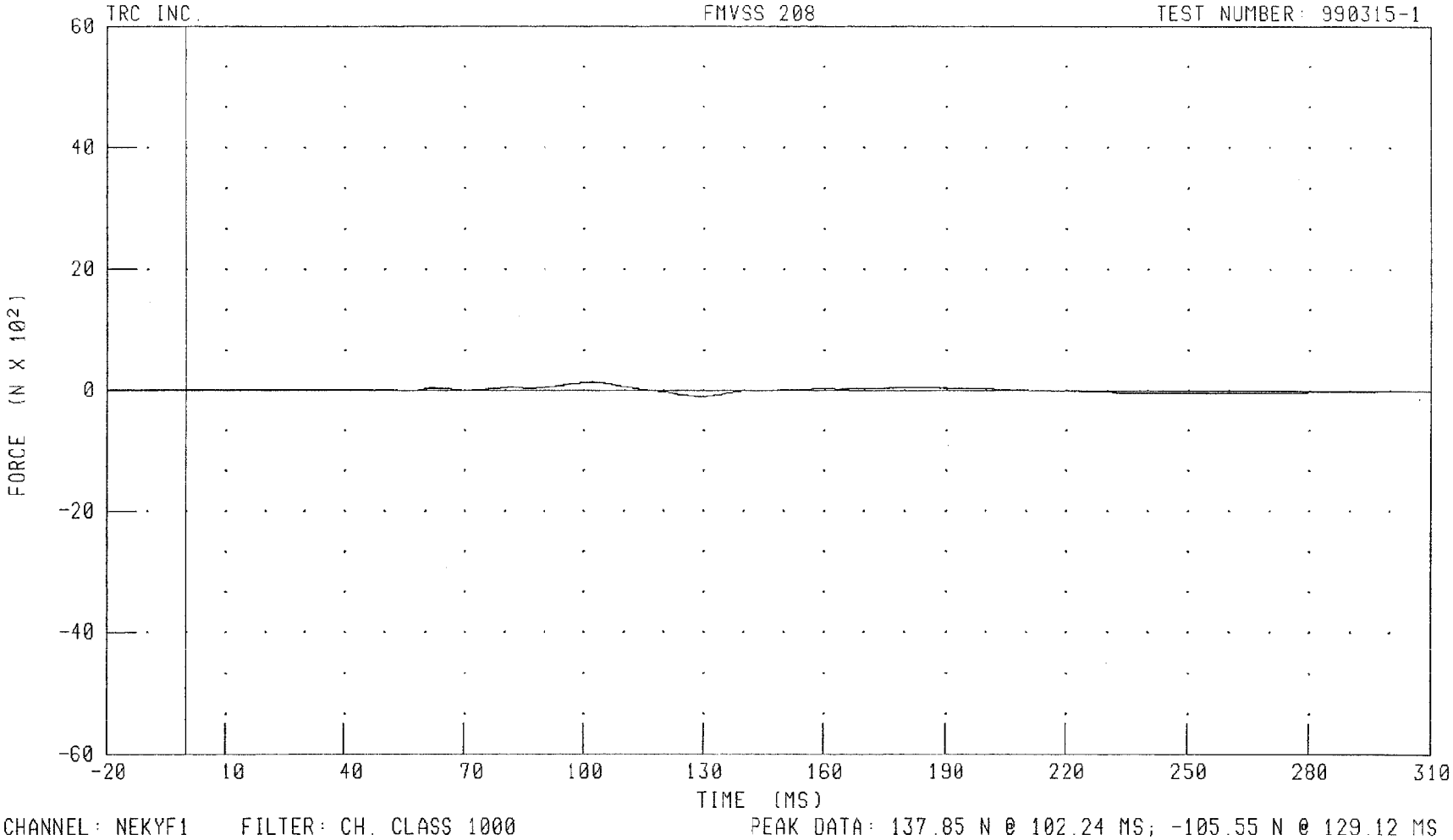
DRIVER NECK X-AXIS SHEAR FORCE



CHANNEL: NEKXF1 FILTER: CH. CLASS 1000 PEAK DATA: 758.43 N @ 89.04 MS; -171.09 N @ 132.16 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

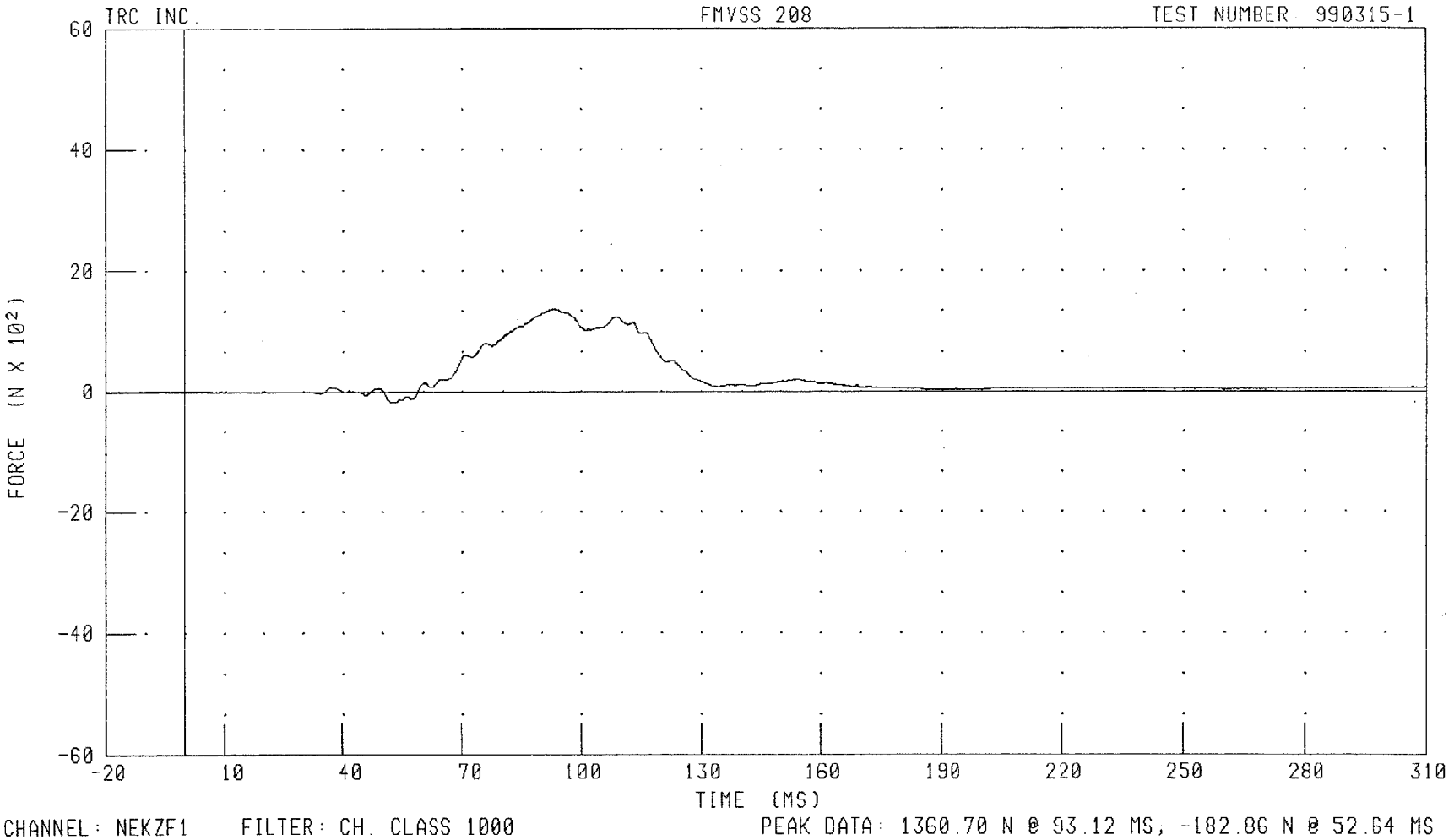
DRIVER NECK Y-AXIS SHEAR FORCE



CHANNEL: NEKYF1 FILTER: CH. CLASS 1000 PEAK DATA: 137.85 N @ 102.24 MS; -105.55 N @ 129.12 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

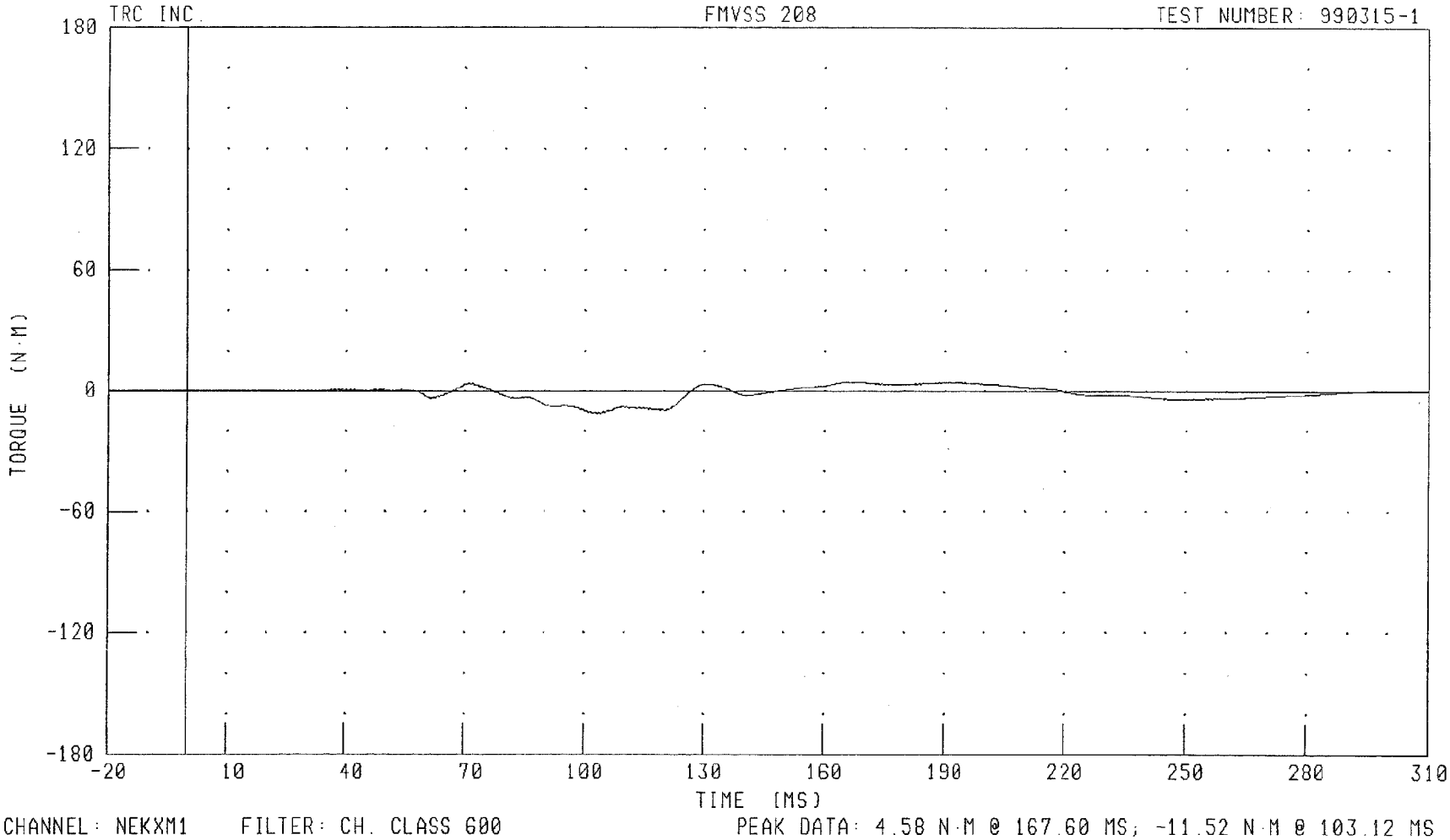
DRIVER NECK Z-AXIS AXIAL FORCE



CHANNEL: NEKZF1 FILTER: CH. CLASS 1000 PEAK DATA: 1360.70 N @ 93.12 MS; -182.86 N @ 52.64 MS

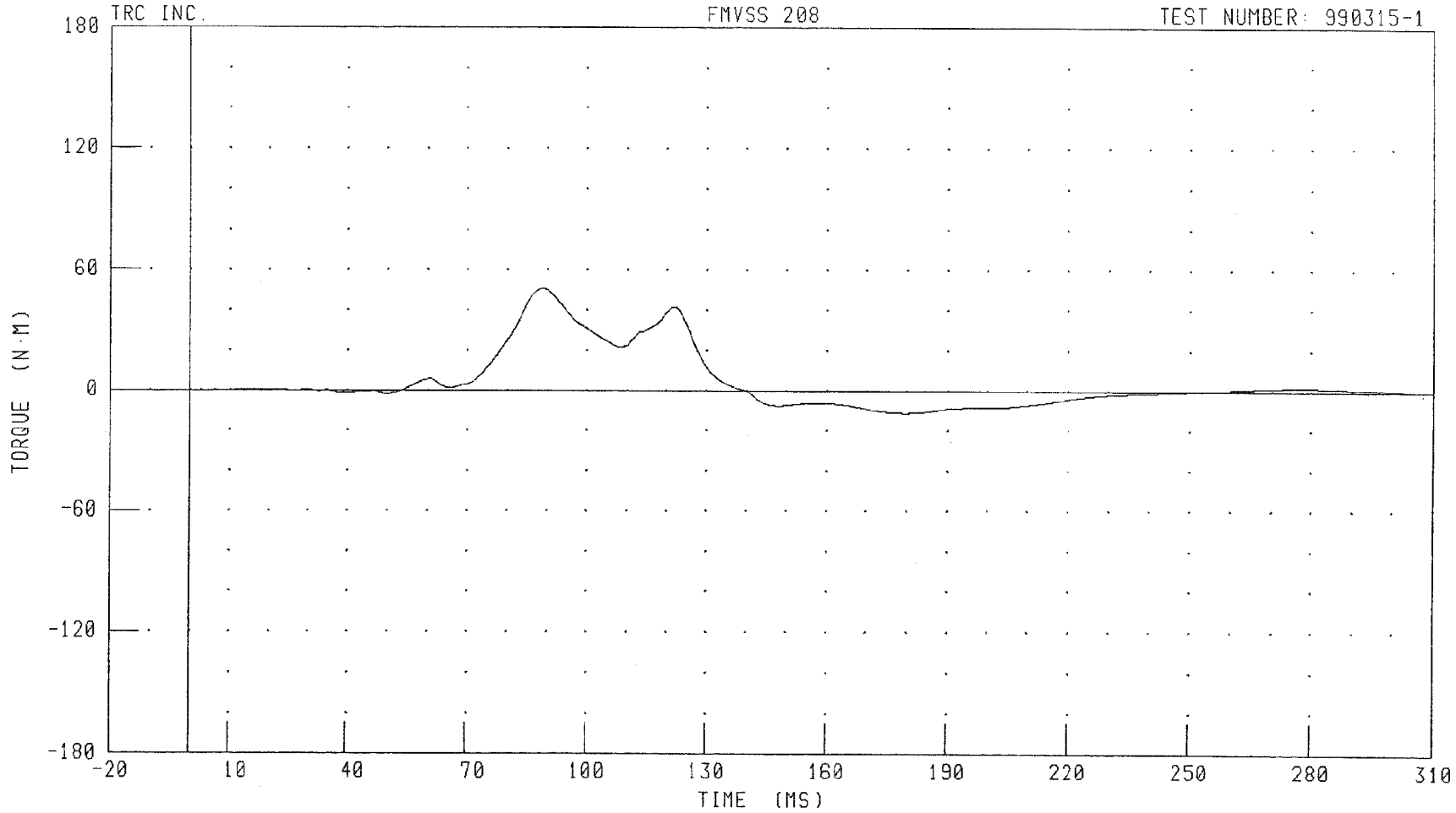
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

DRIVER NECK MOMENT ABOUT X AXIS



CHANNEL: NEKXM1 FILTER: CH. CLASS 600 PEAK DATA: 4.58 N-M @ 167.60 MS; -11.52 N-M @ 103.12 MS

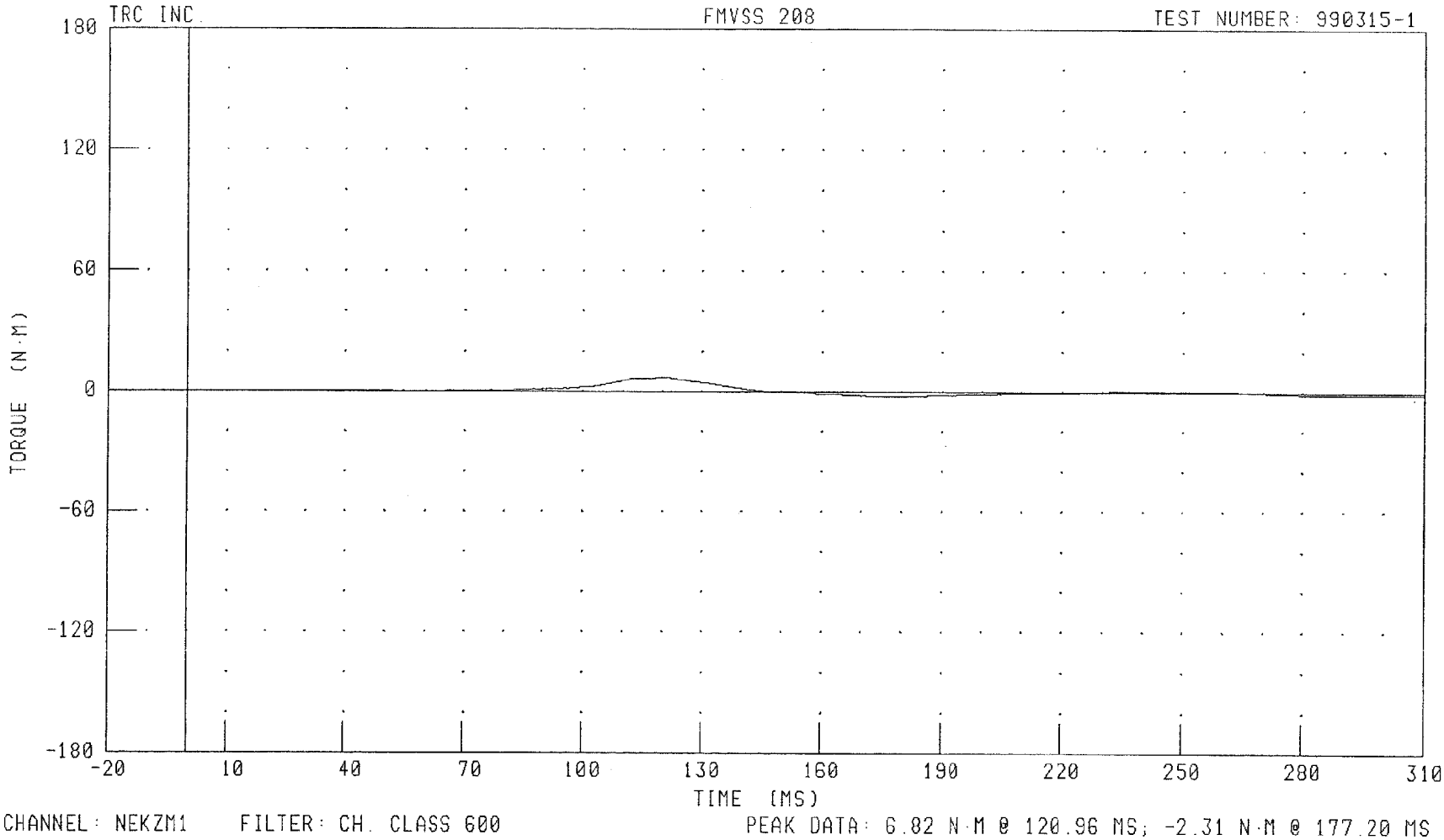
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
DRIVER NECK MOMENT ABOUT Y AXIS



CHANNEL: NEKYM1 FILTER: CH. CLASS 600 PEAK DATA: 50.62 N-M @ 88.88 MS; -11.18 N-M @ 180.40 MS

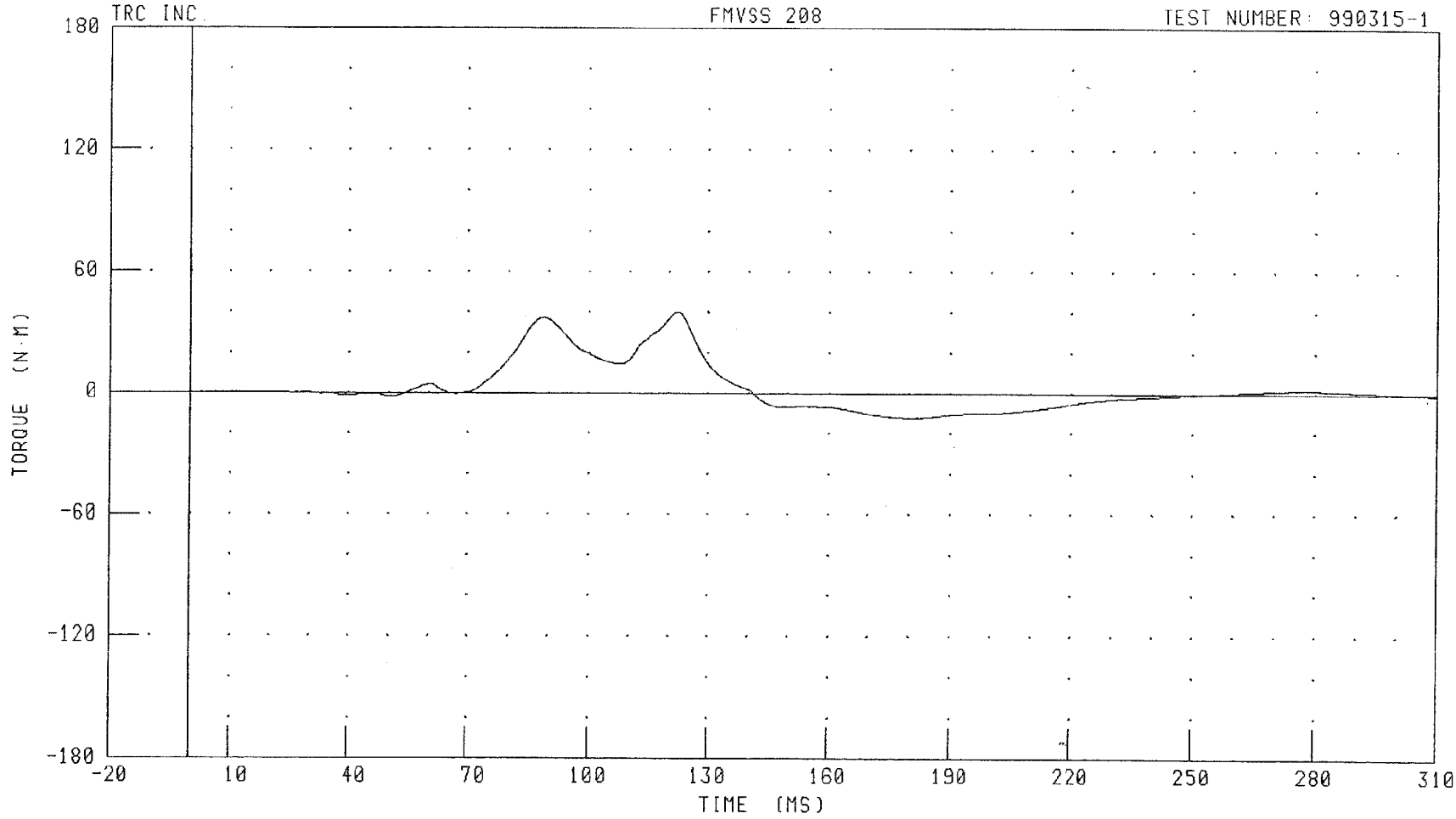
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

DRIVER NECK MOMENT ABOUT Z AXIS



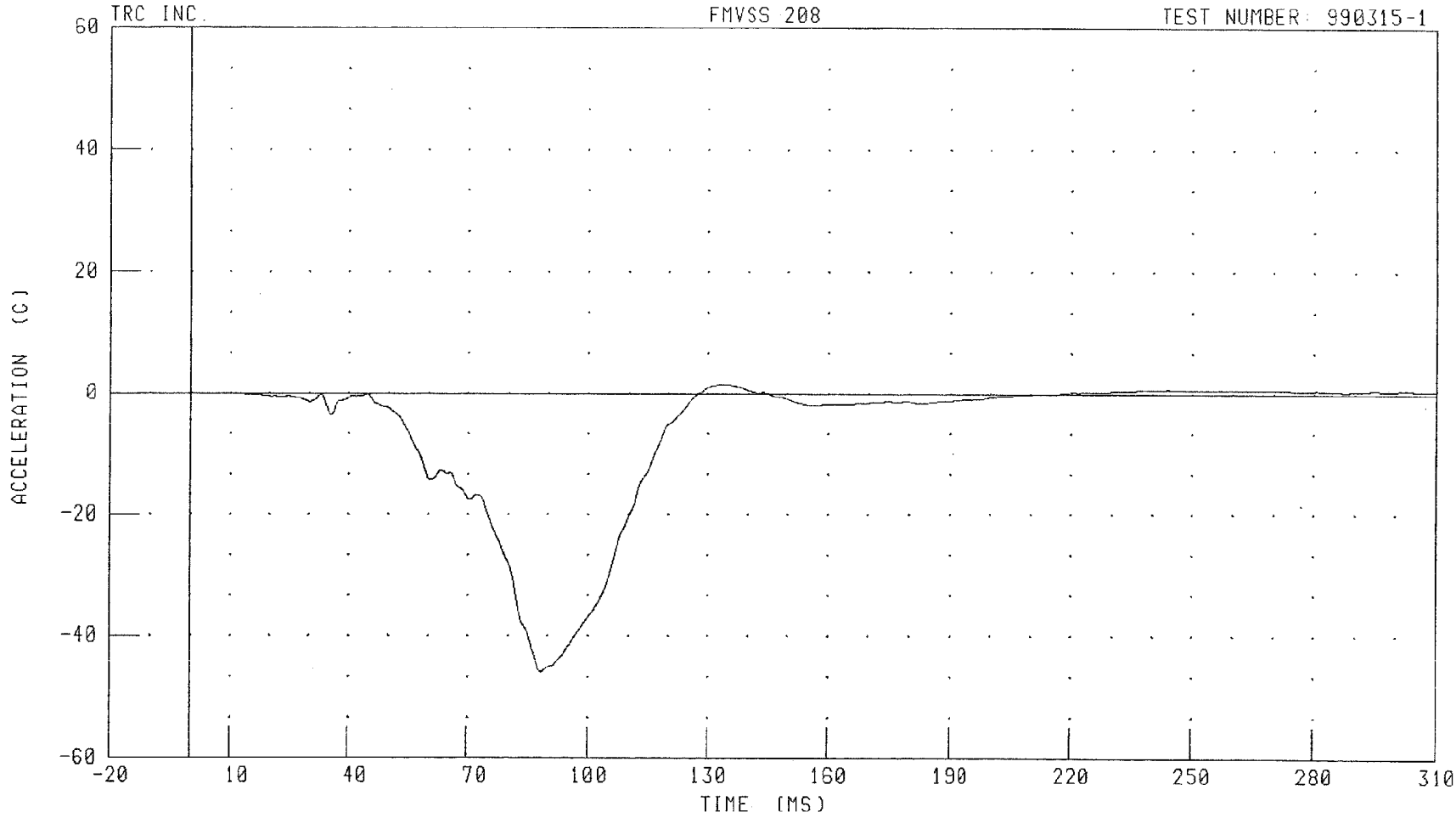
CHANNEL: NEKZM1 FILTER: CH. CLASS 600 PEAK DATA: 6.82 N-M @ 120.96 MS; -2.31 N-M @ 177.20 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
DRIVER NECK OCCIPITAL CONDYLE



CHANNEL: NEKOM1 FILTER: CH. CLASS 600 PEAK DATA: 40.13 N-M @ 122.32 MS; -12.31 N-M @ 180.48 MS

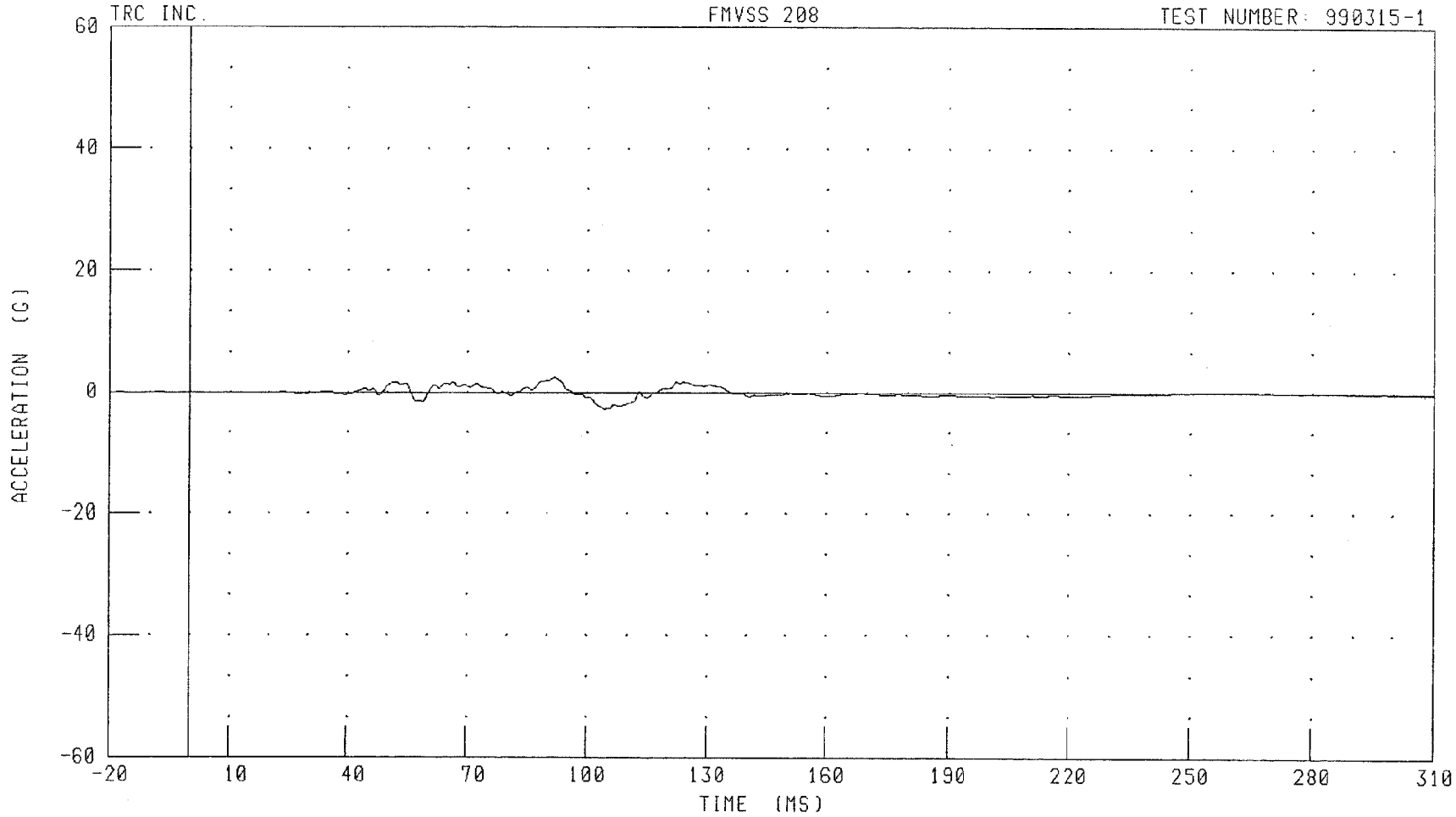
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
DRIVER CHEST X-AXIS ACCELERATION



CHANNEL: CSTXG1 FILTER: CH. CLASS 180 PEAK DATA: 1.46 G @ 133.76 MS; -45.89 G @ 88.24 MS

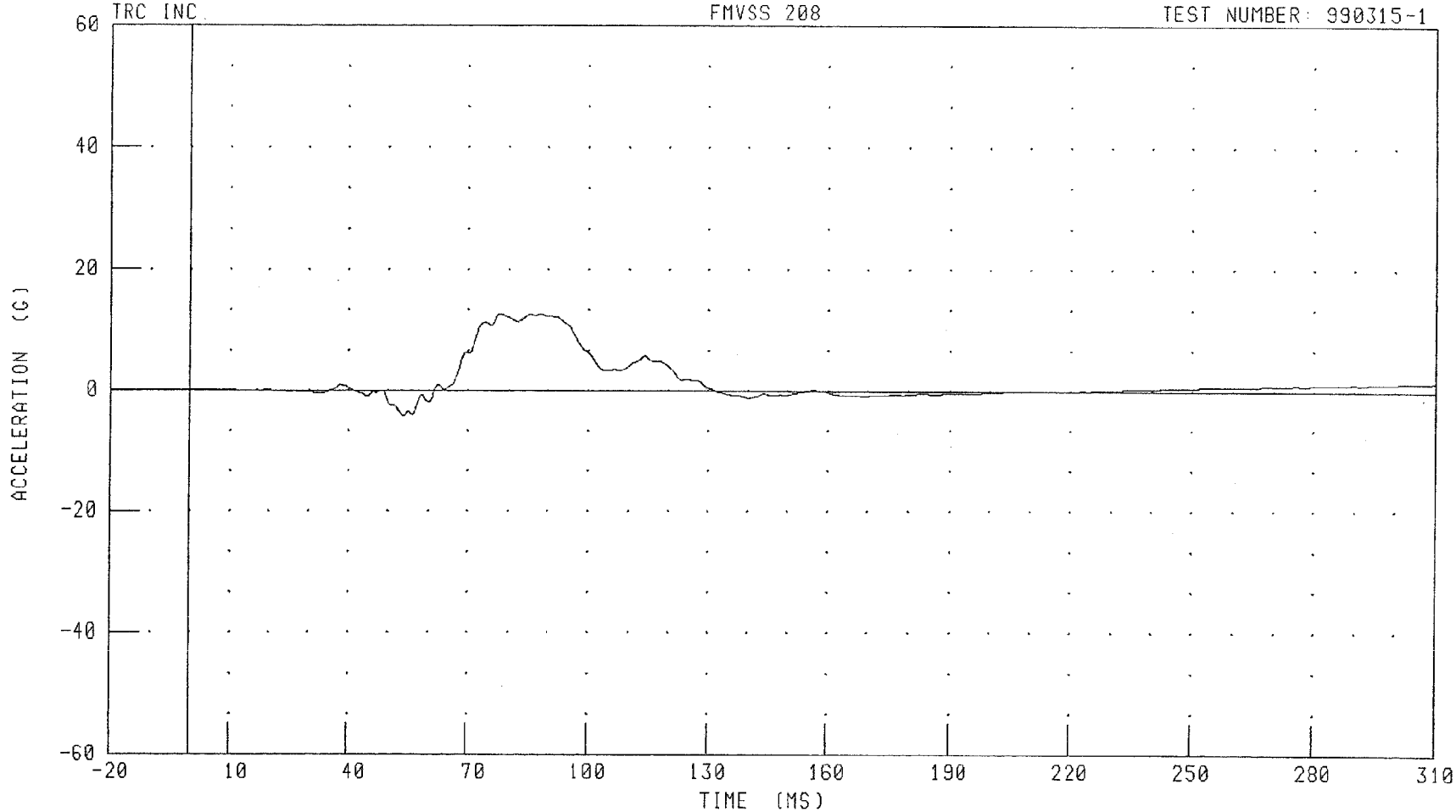
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

DRIVER CHEST Y-AXIS ACCELERATION



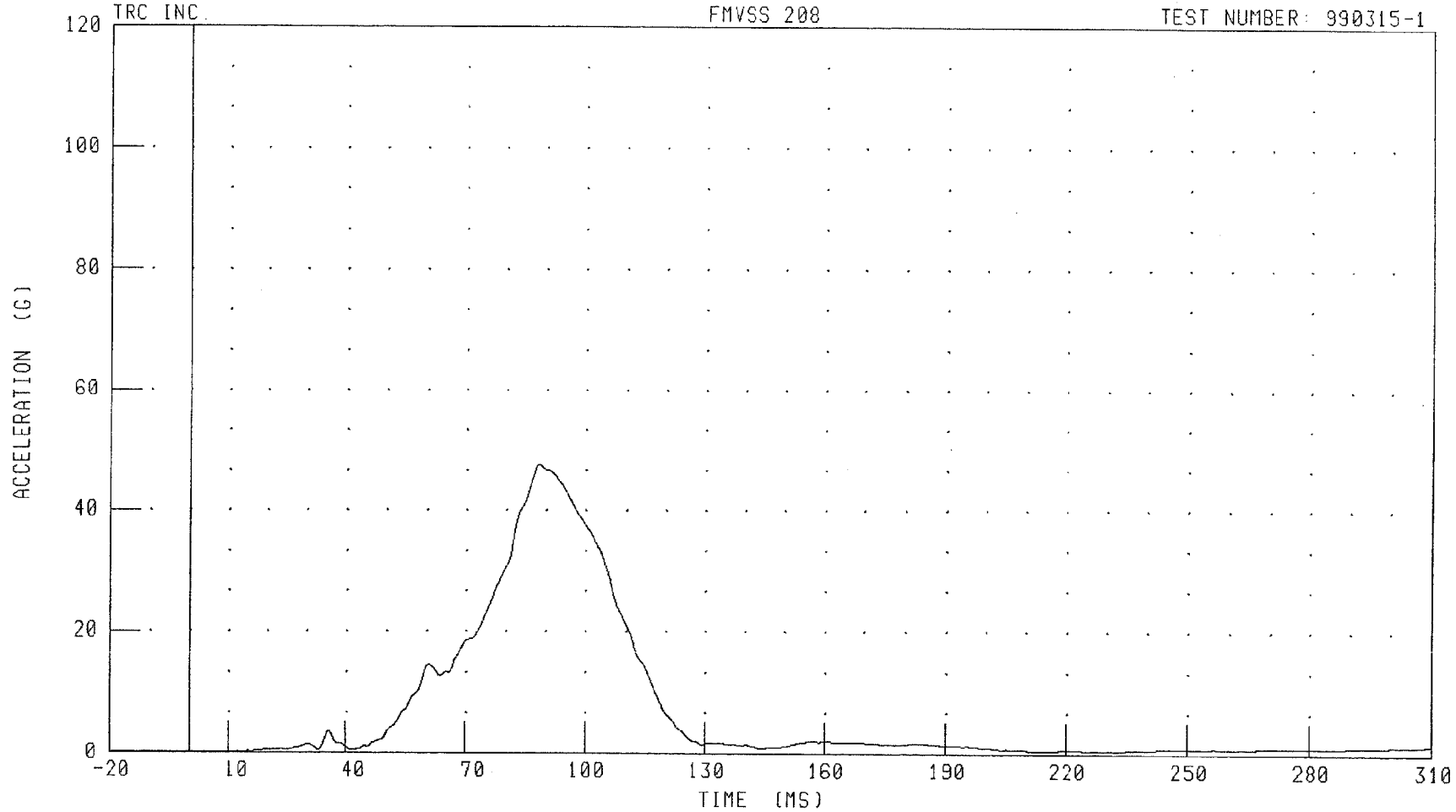
CHANNEL: CSTYG1 FILTER: CH. CLASS 180 PEAK DATA: 2.43 G @ 91.92 MS; -2.75 G @ 104.40 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
DRIVER CHEST Z-AXIS ACCELERATION



CHANNEL: CSTZG1 FILTER: CH. CLASS 180 PEAK DATA: 12.70 G @ 87.92 MS, -4.32 G @ 53.92 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
DRIVER CHEST RESULTANT ACCELERATION

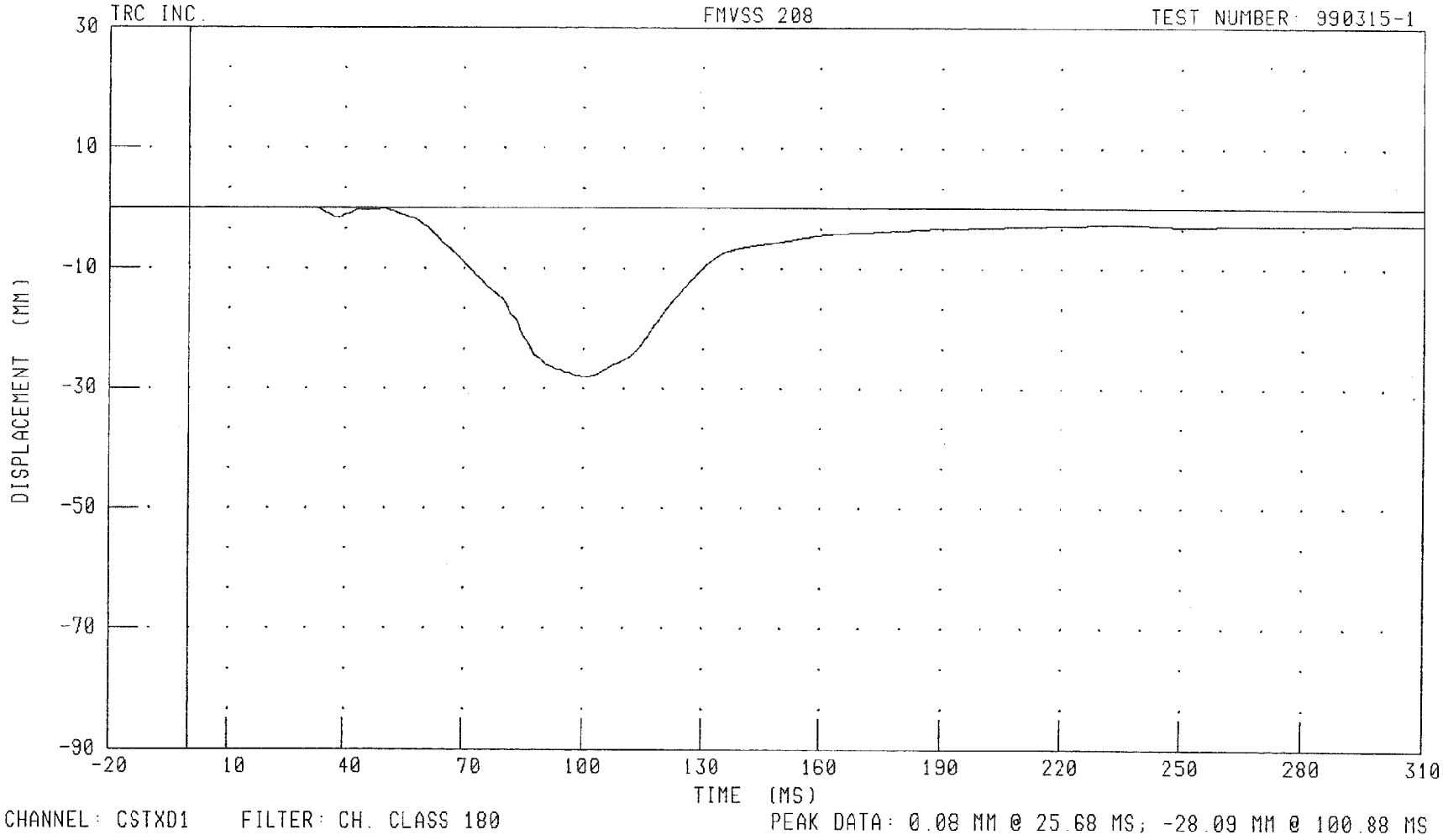


CHANNEL: CSTRG1 FILTER: CH. CLASS 180

PEAK DATA: 47.64 G @ 88.24 MS; 0.01 G @ -20.00 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

DRIVER CHEST DEFLECTION

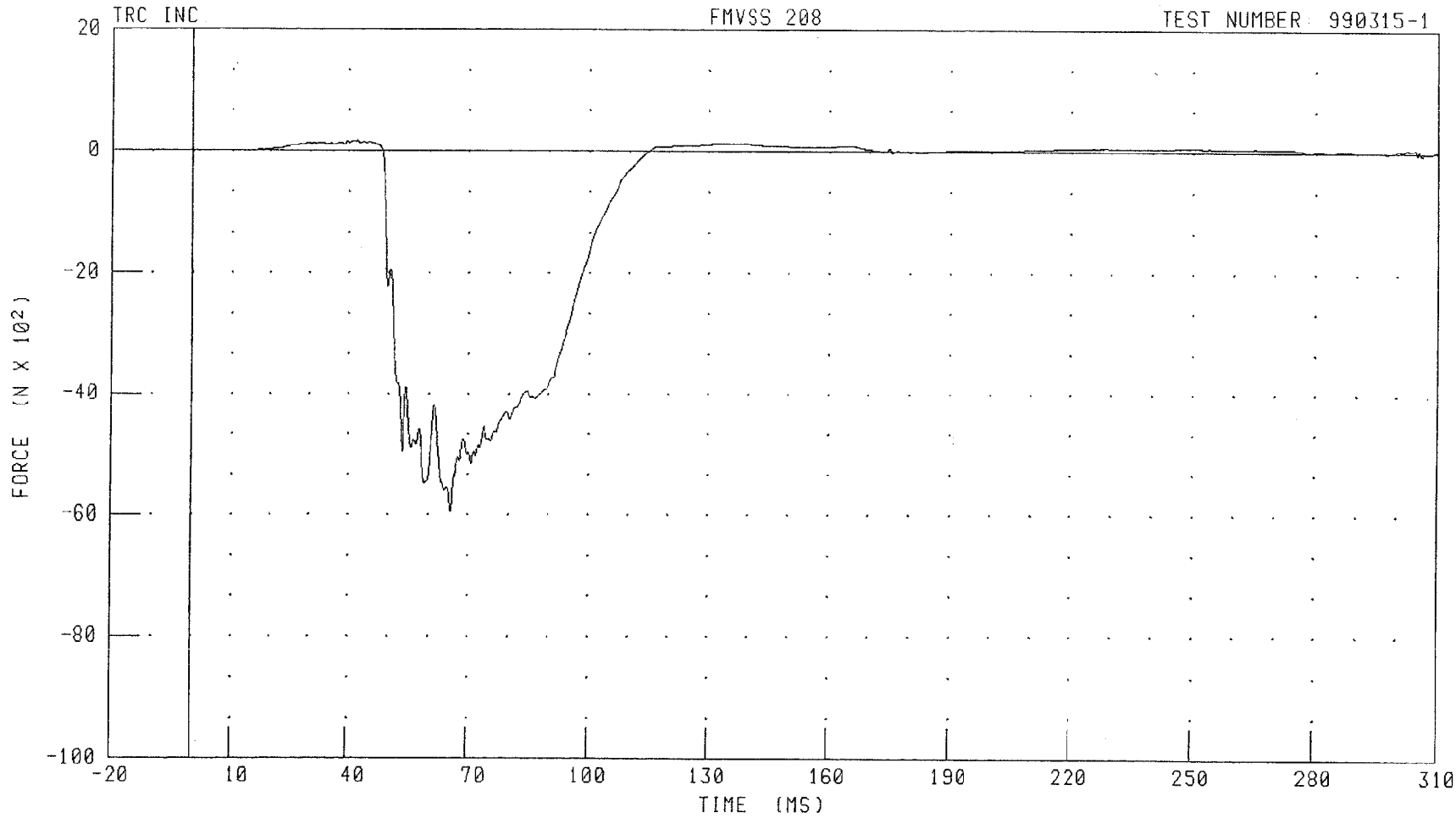


CHANNEL: CSTXD1 FILTER: CH. CLASS 180

PEAK DATA: 0.08 MM @ 25.68 MS; -28.09 MM @ 100.88 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

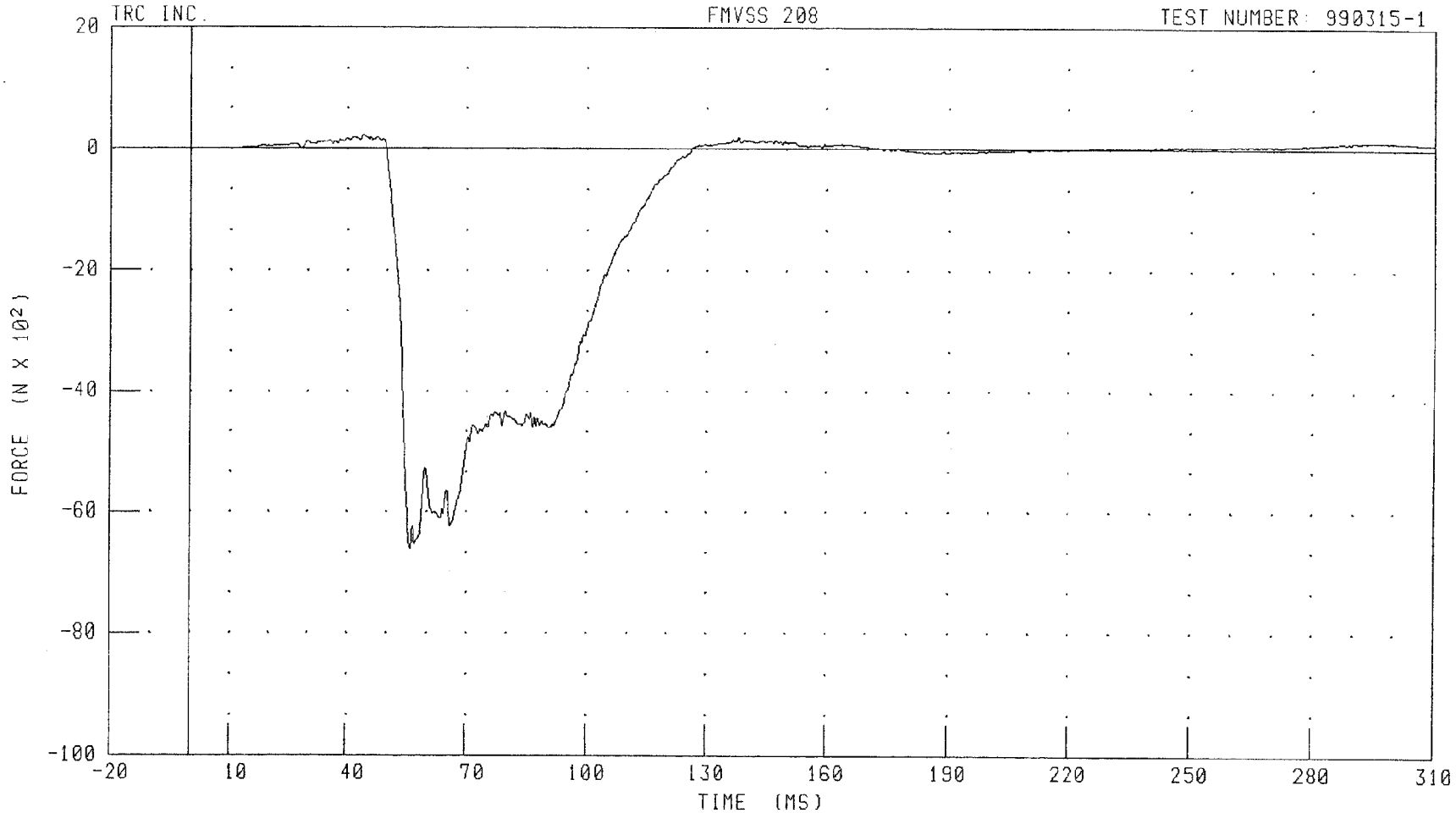
DRIVER LEFT FEMUR FORCE



CHANNEL: LFMF1 FILTER: CH. CLASS 600 PEAK DATA: 168.69 N @ 42.32 MS; -5952.53 N @ 66.00 MS

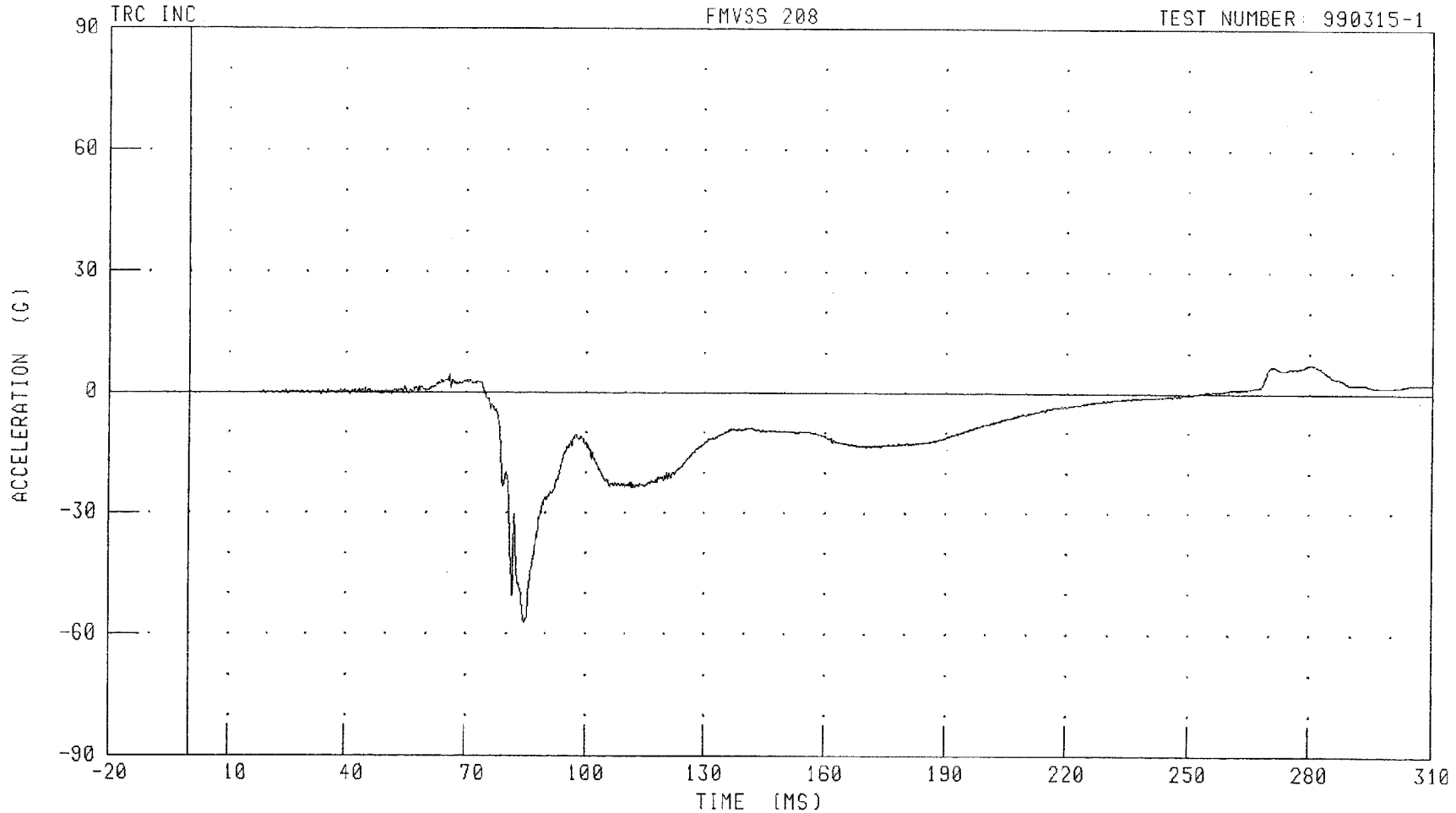
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

DRIVER RIGHT FEMUR FORCE



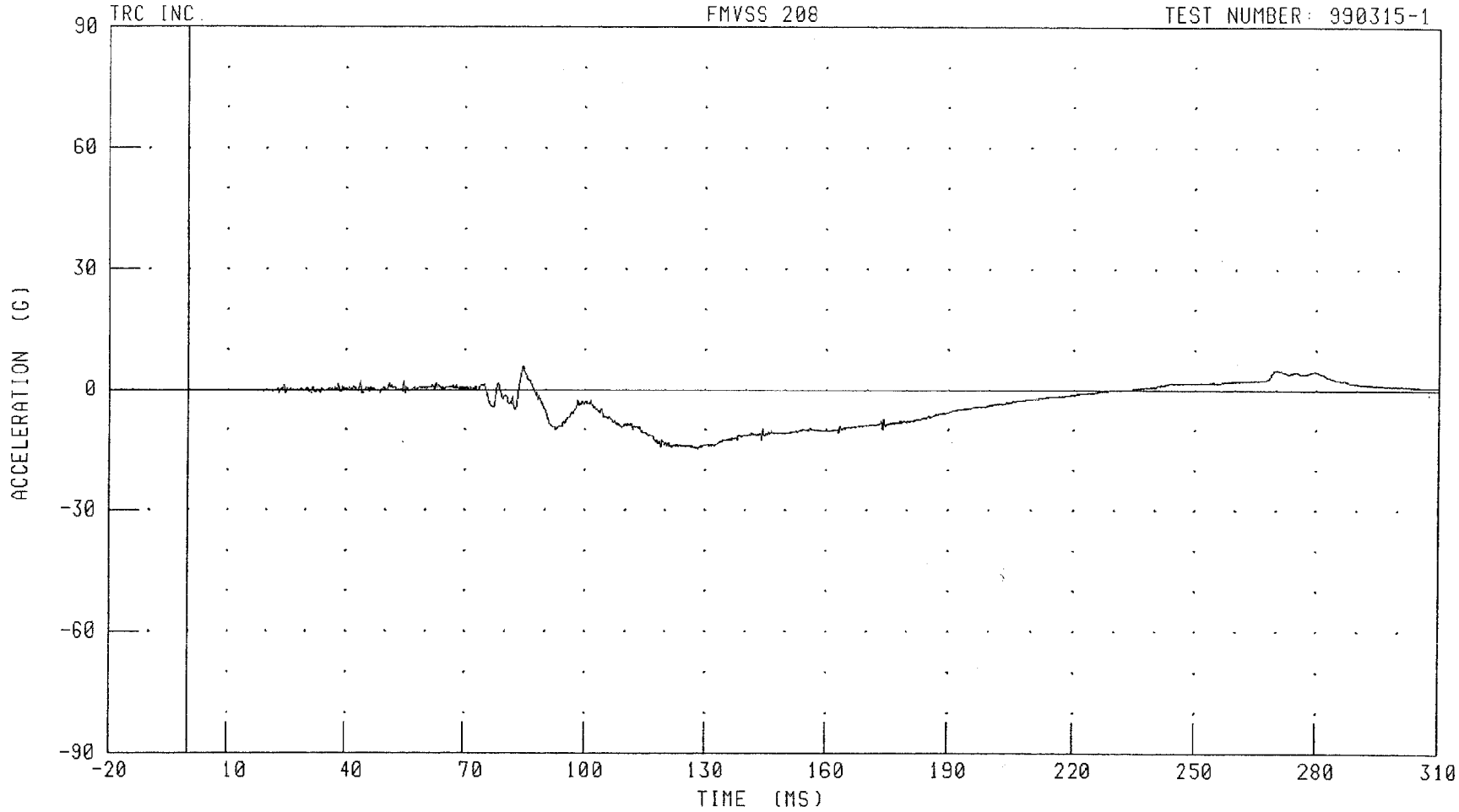
CHANNEL: RFMF1 FILTER: CH. CLASS 600 PEAK DATA: 228.91 N @ 44.08 MS, -6612.49 N @ 56.08 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION



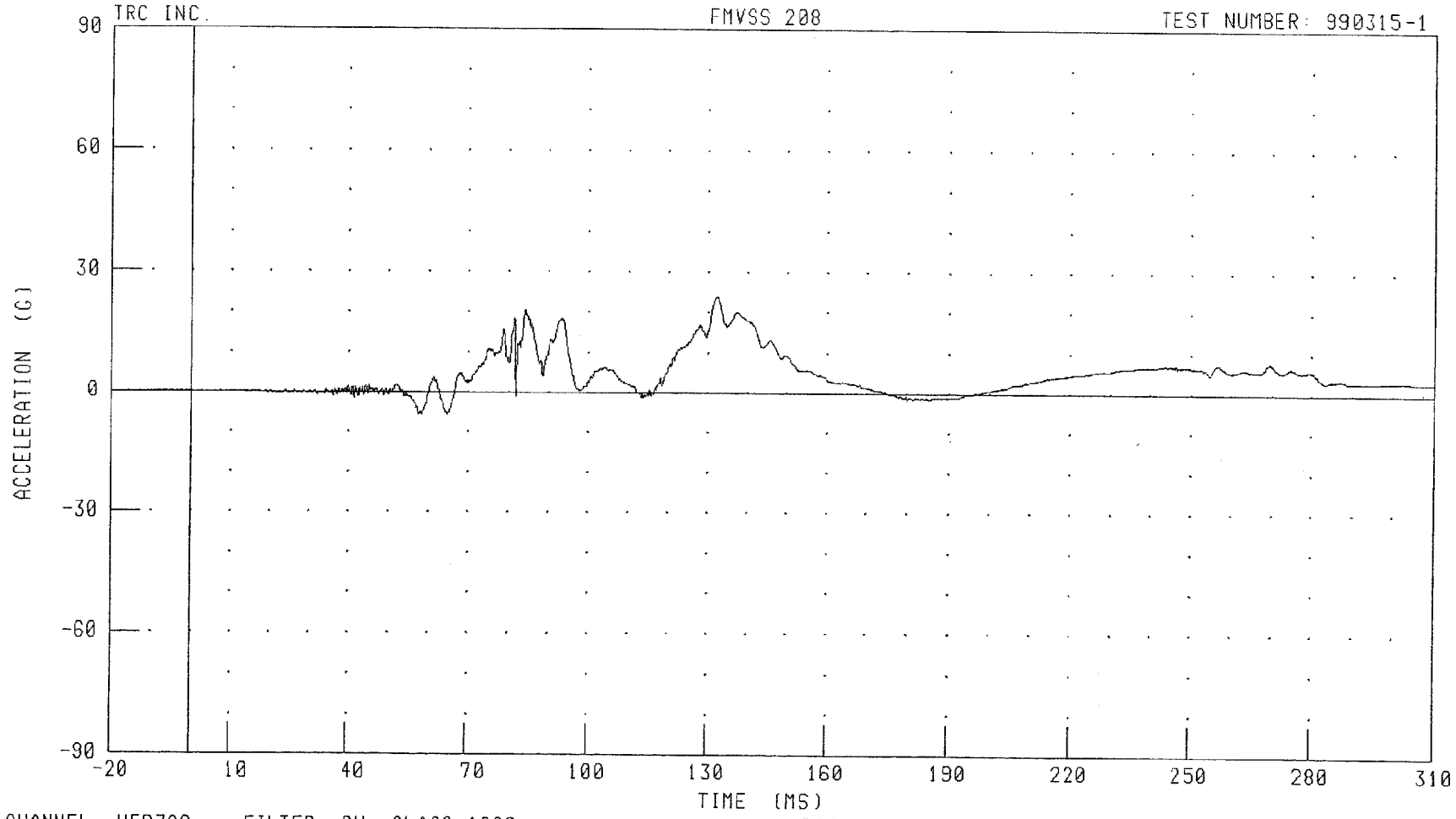
CHANNEL: HEDXG2 FILTER: CH. CLASS 1000 PEAK DATA: 7.37 G @ 280.16 MS; -57.24 G @ 84.56 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION



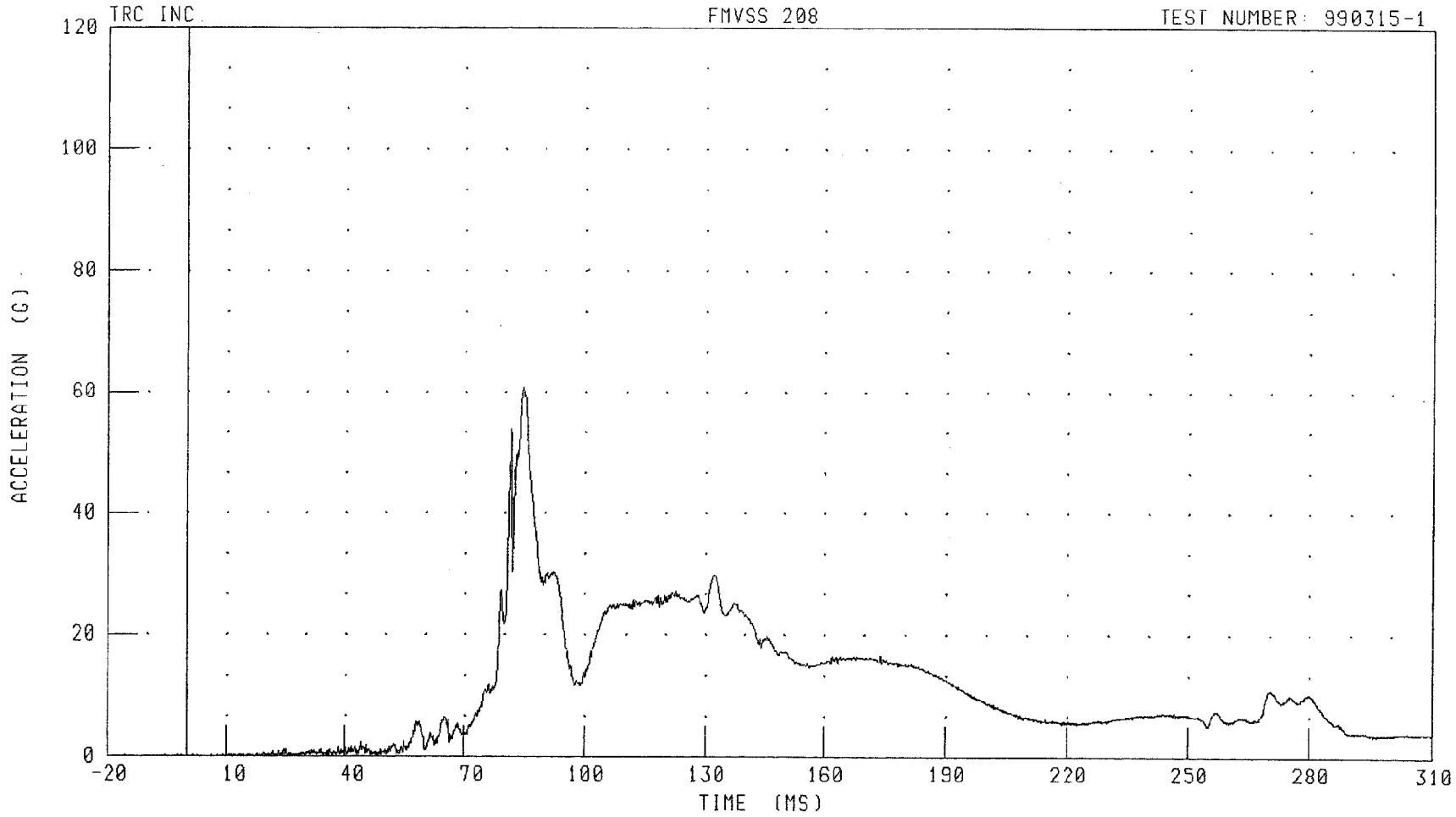
CHANNEL: HEDYG2 FILTER: CH. CLASS 1000 PEAK DATA: 5.82 G @ 84.56 MS; -14.78 G @ 128.24 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION



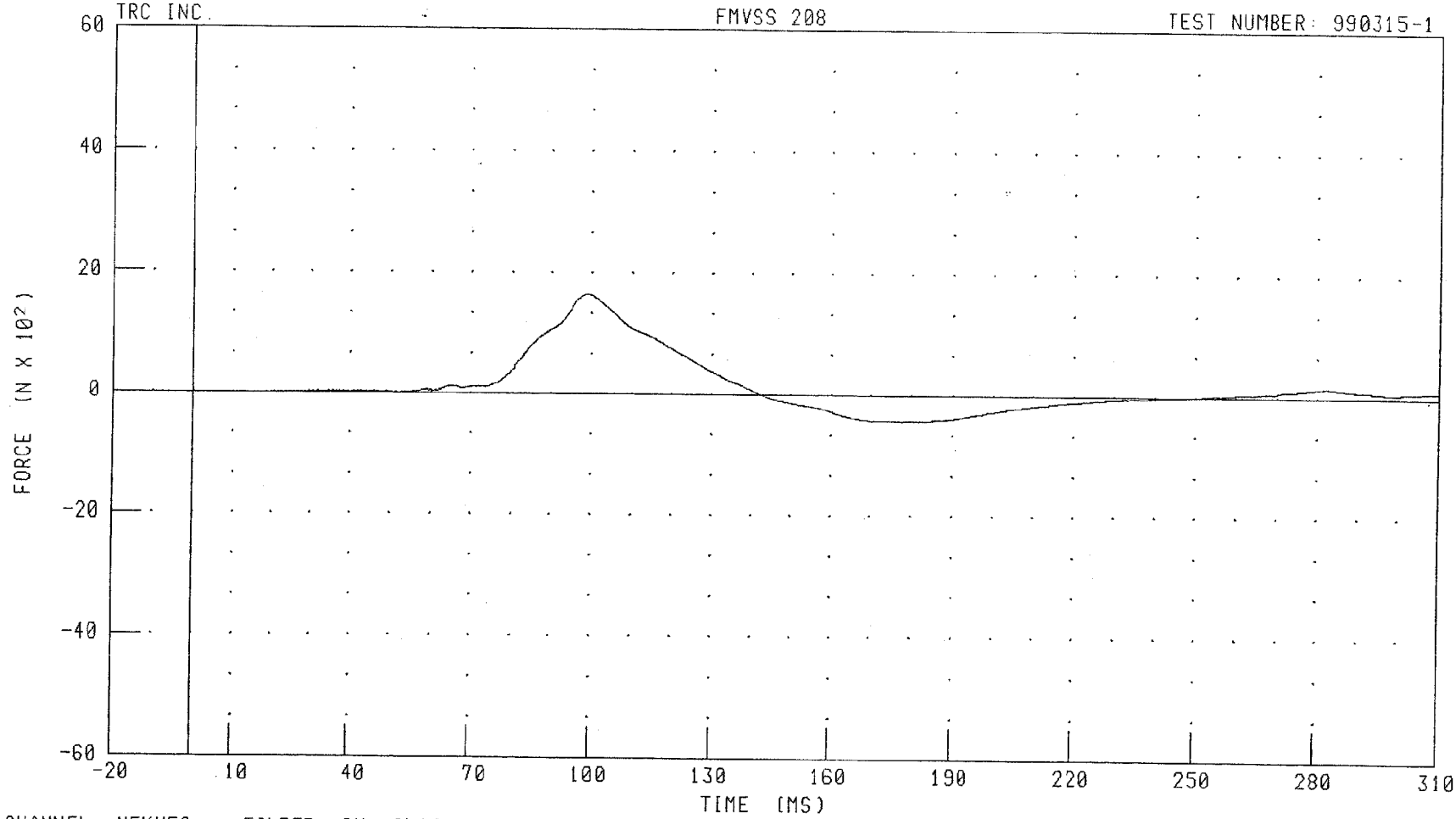
CHANNEL: HEDZG2 FILTER: CH. CLASS 1000 PEAK DATA: 23.86 G @ 132.08 MS; -5.69 G @ 57.68 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION



CHANNEL: HEDRG2 FILTER: CH. CLASS 1000 PEAK DATA: 60.72 G @ 84.64 MS; 0.08 G @ -19.92 MS

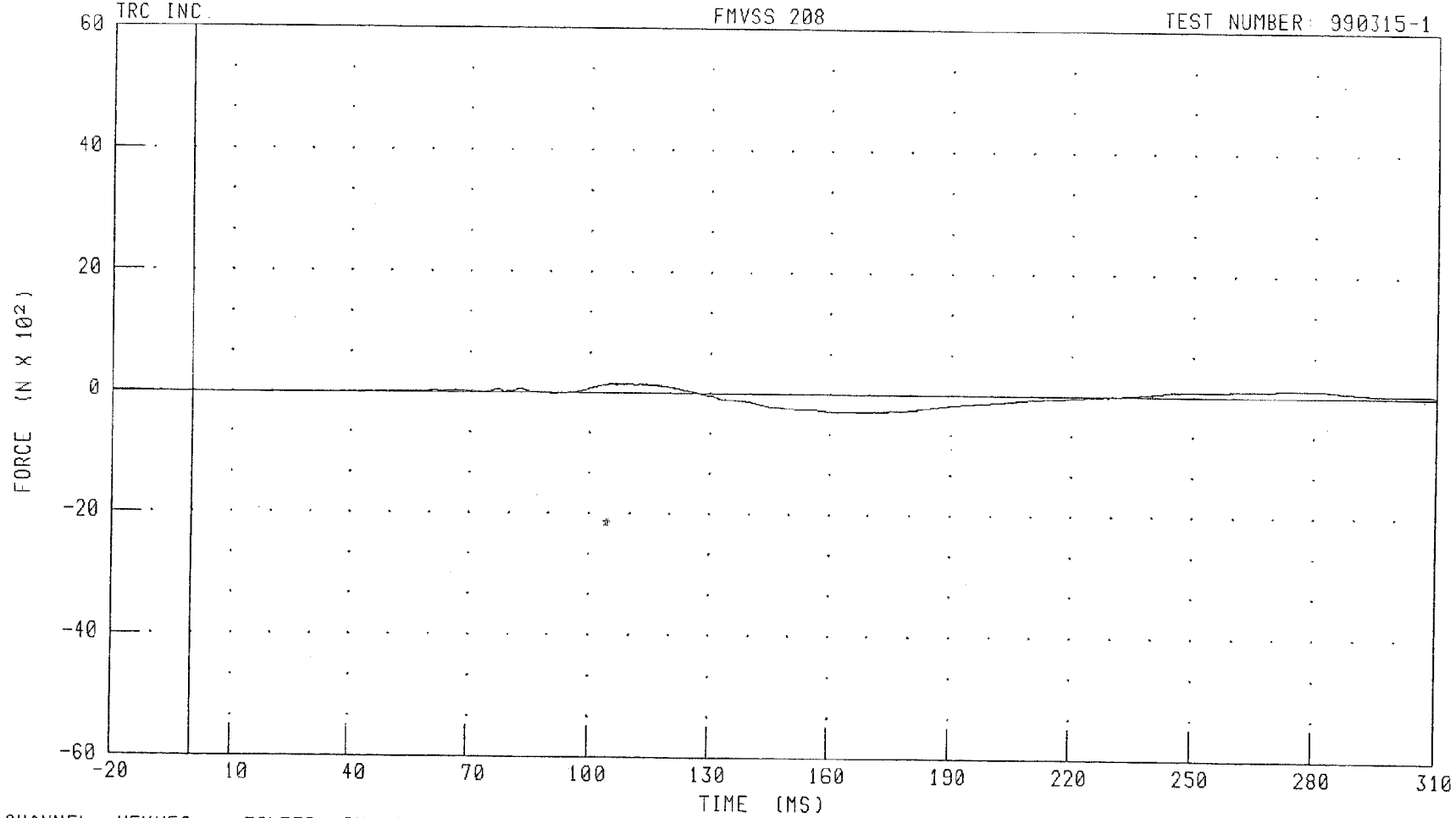
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER NECK X-AXIS SHEAR FORCE



CHANNEL: NEKXF2 FILTER: CH. CLASS 1000

PEAK DATA: 1636.64 N @ 98.88 MS; -442.80 N @ 177.84 MS

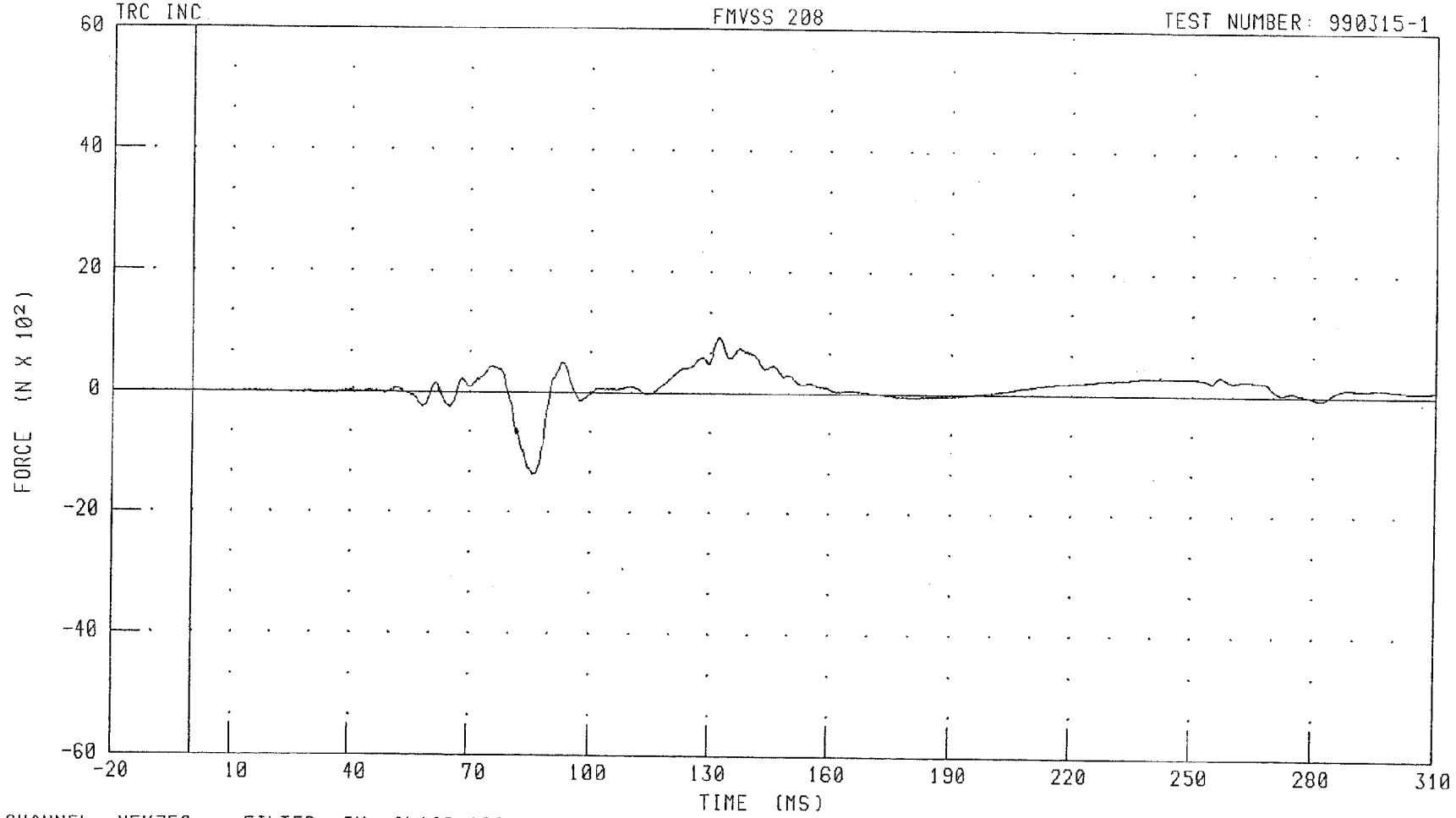
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER NECK Y-AXIS SHEAR FORCE



CHANNEL: NEKYF2 FILTER: CH. CLASS 1000

PEAK DATA: 146.80 N @ 108.00 MS; -300.96 N @ 160.88 MS

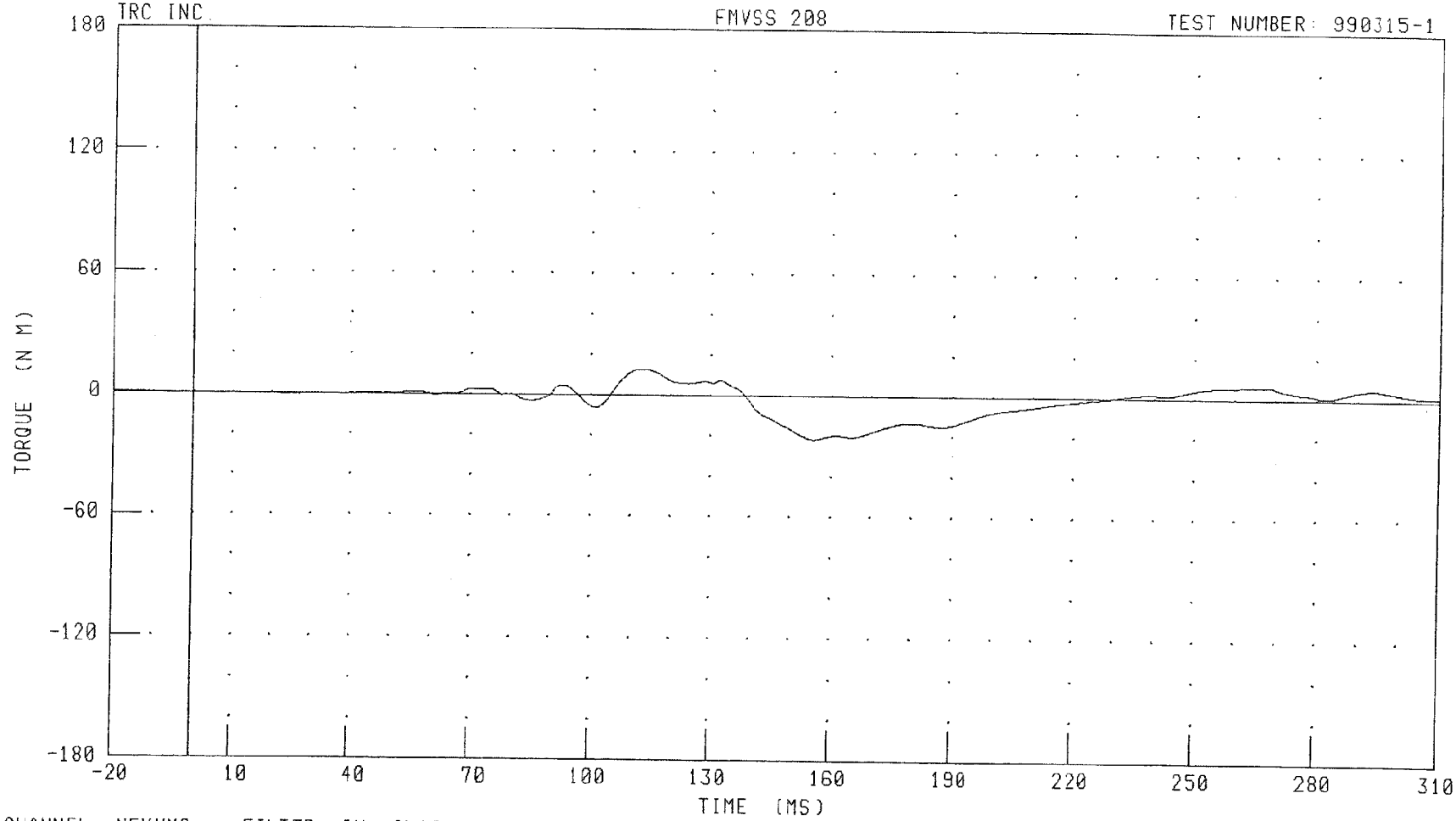
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER NECK Z-AXIS AXIAL FORCE



CHANNEL: NEKZF2 FILTER: CH. CLASS 1000

PEAK DATA: 925.61 N @ 132.32 MS; -1374.99 N @ 85.84 MS

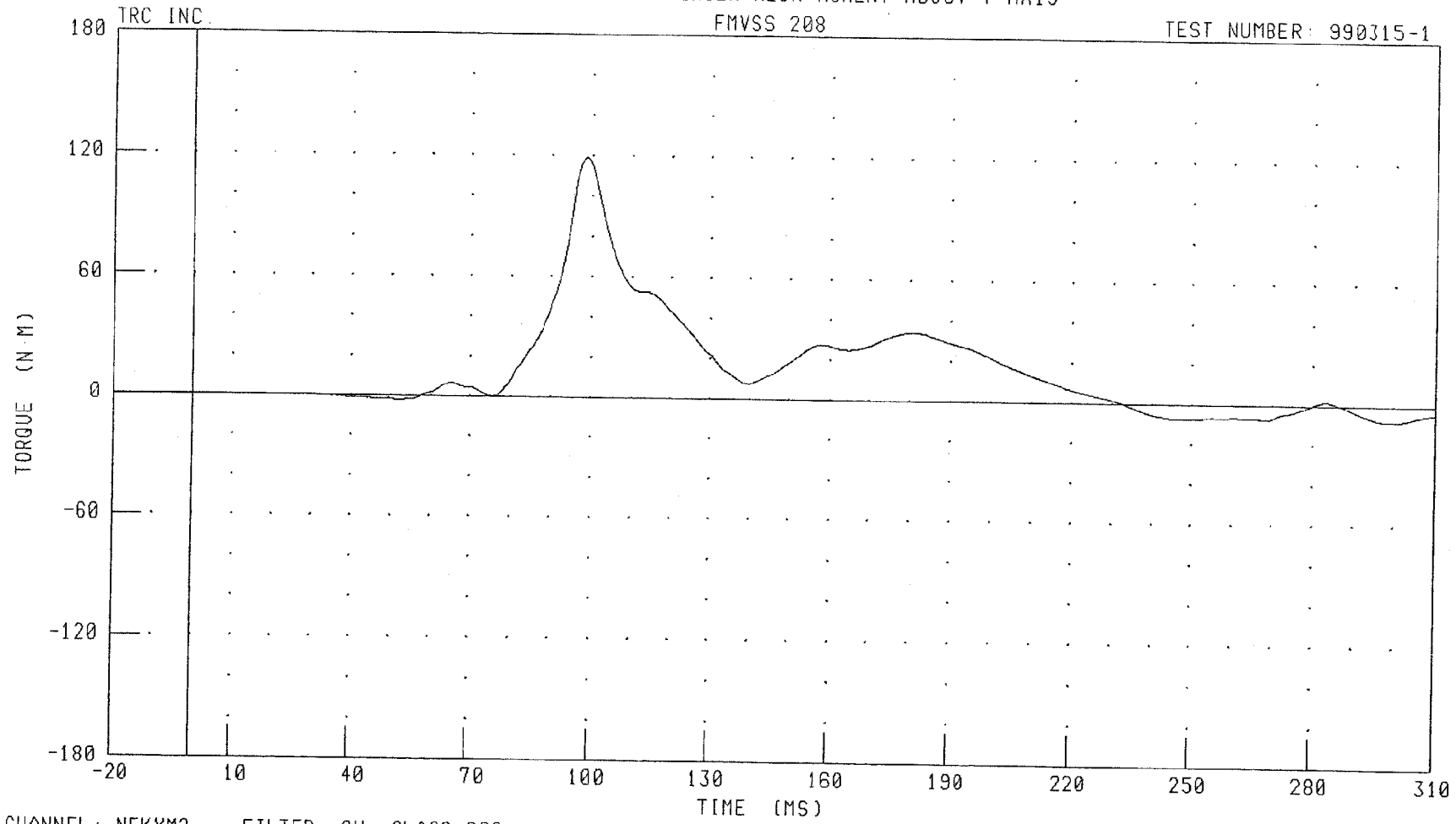
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER NECK MOMENT ABOUT X AXIS



CHANNEL: NEKXM2 FILTER: CH. CLASS 600

PEAK DATA: 12.68 N-M @ 113.60 MS; -21.90 N-M @ 155.92 MS

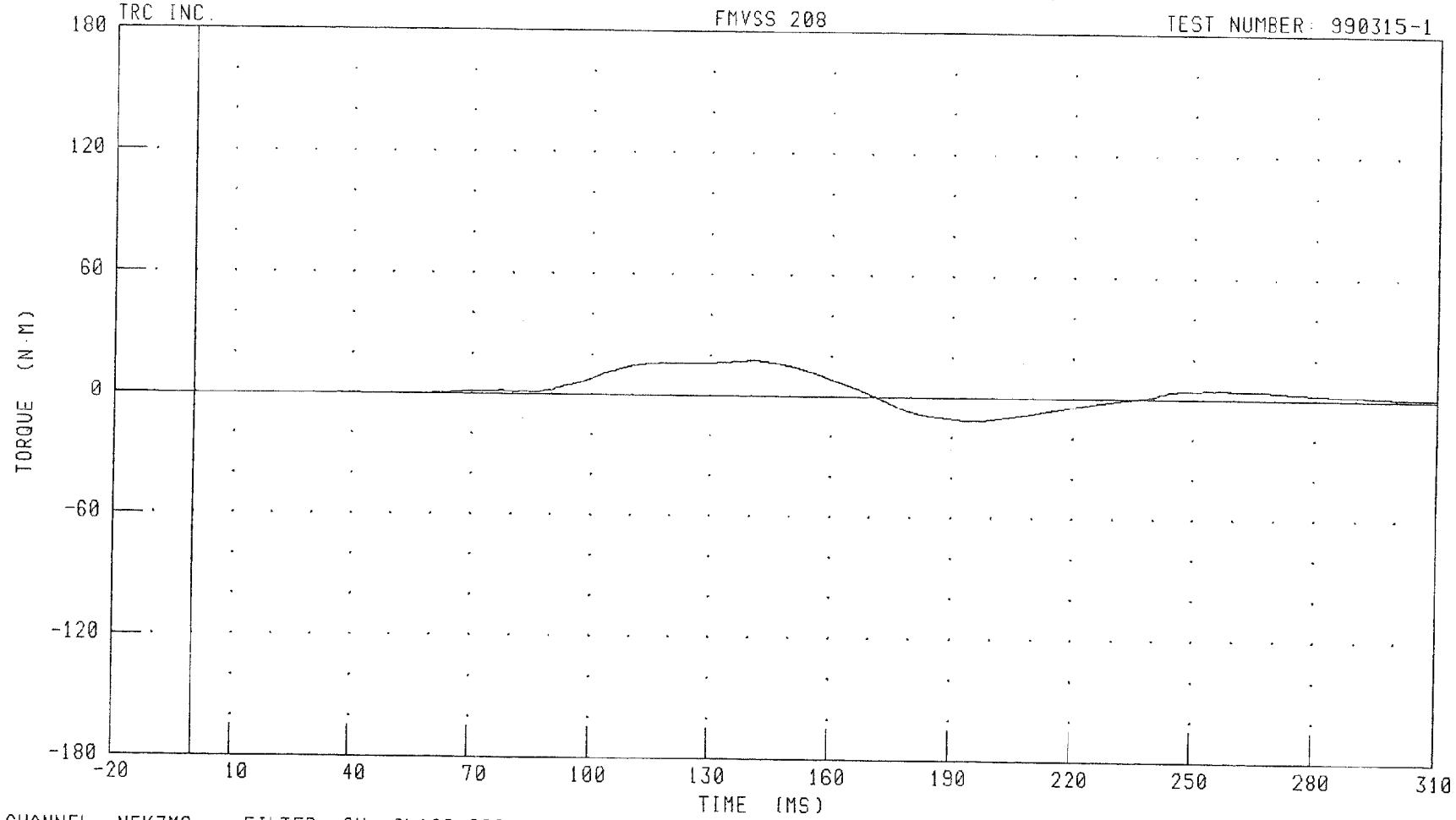
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER NECK MOMENT ABOUT Y AXIS



CHANNEL: NEKYM2 FILTER: CH. CLASS 600

PEAK DATA: 118.95 N-M @ 98.72 MS; -8.04 N-M @ 299.20 MS

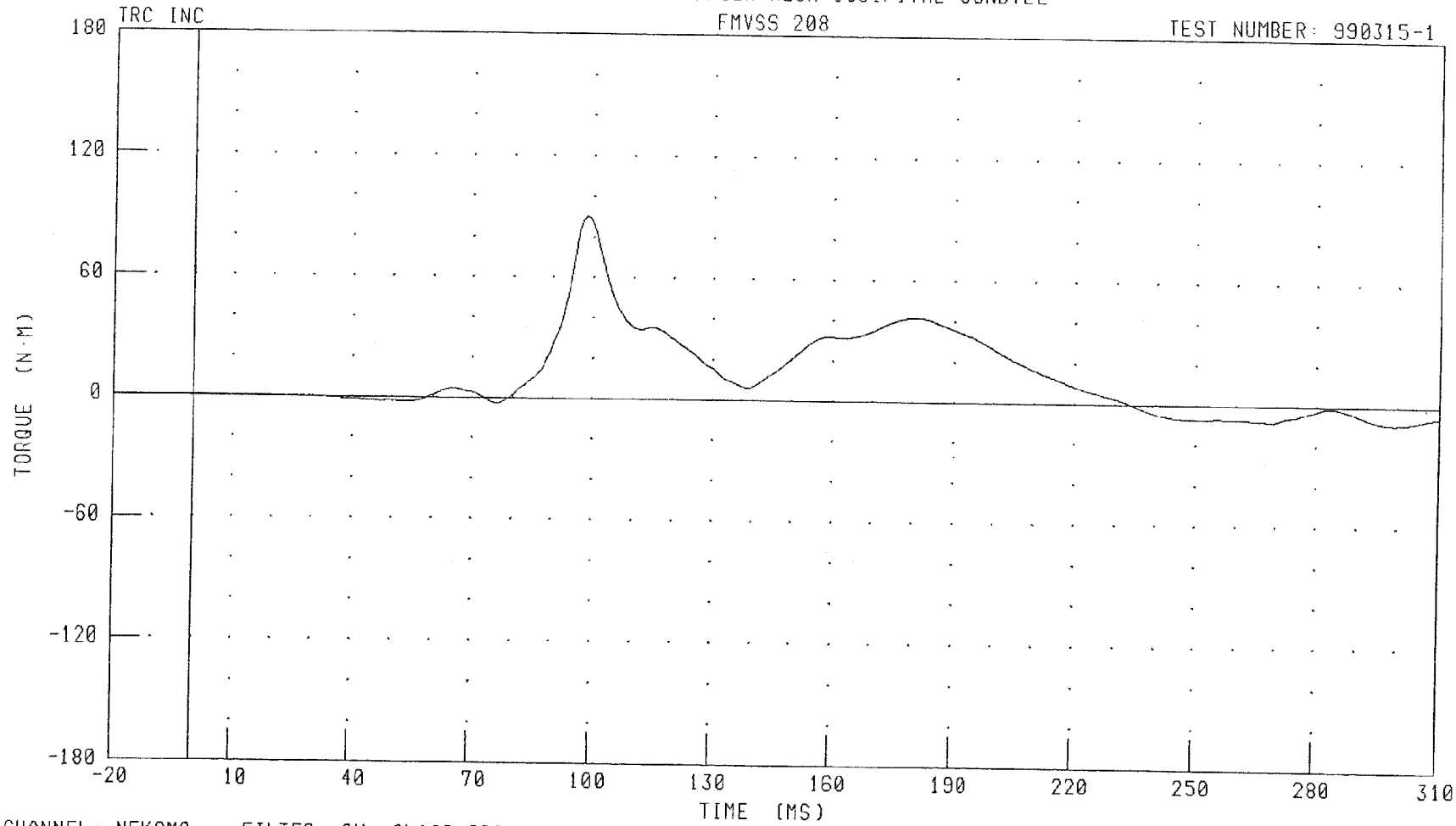
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER NECK MOMENT ABOUT Z AXIS



CHANNEL: NEKZM2 FILTER: CH. CLASS 600

PEAK DATA: 17.47 N-M @ 141.28 MS; -11.36 N-M @ 195.12 MS

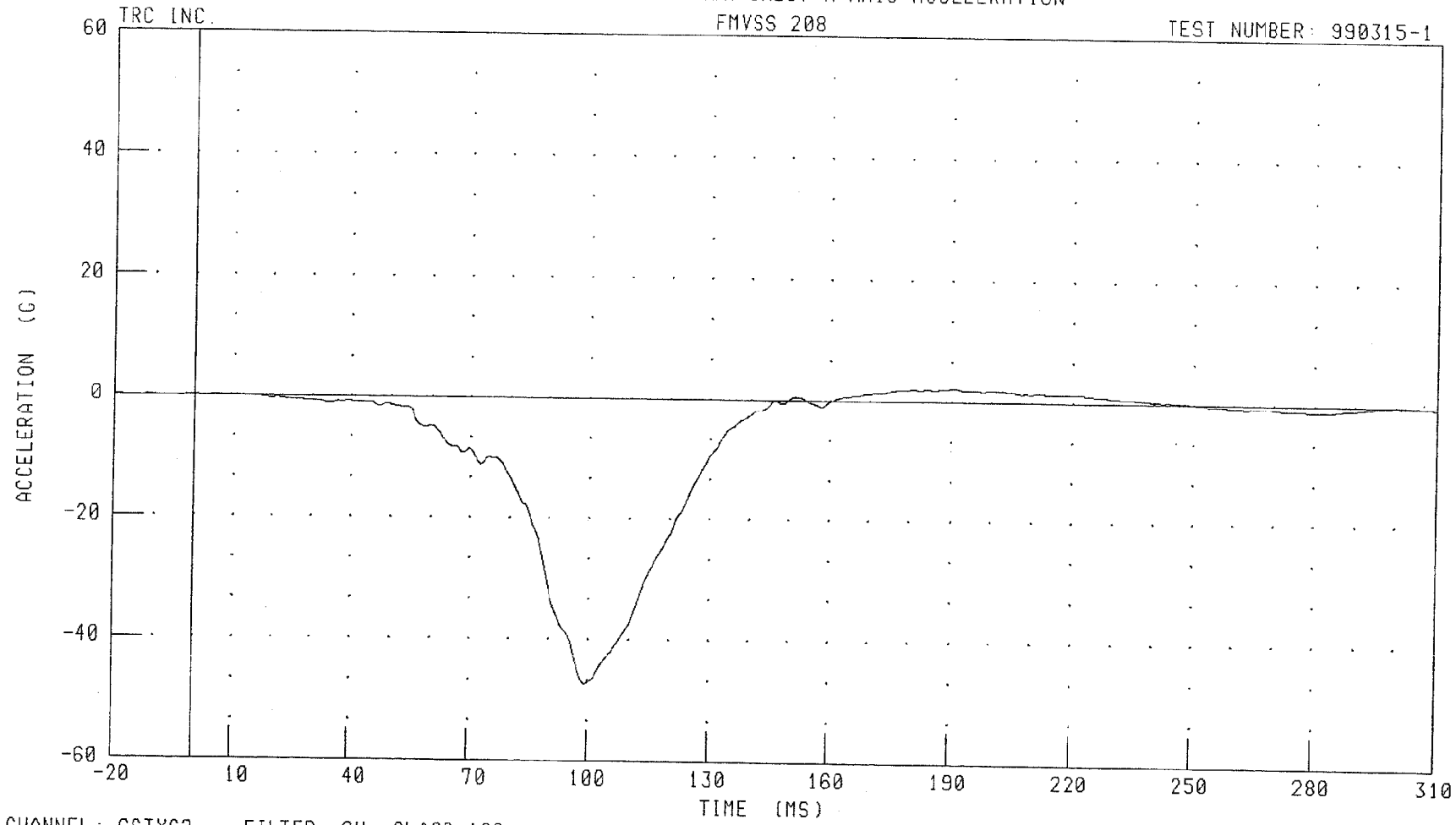
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER NECK OCCIPITAL CONDYLE



CHANNEL: NEKOM2 FILTER: CH. CLASS 600

PEAK DATA: 89.95 N-M @ 98.64 MS; -9.19 N-M @ 299.20 MS

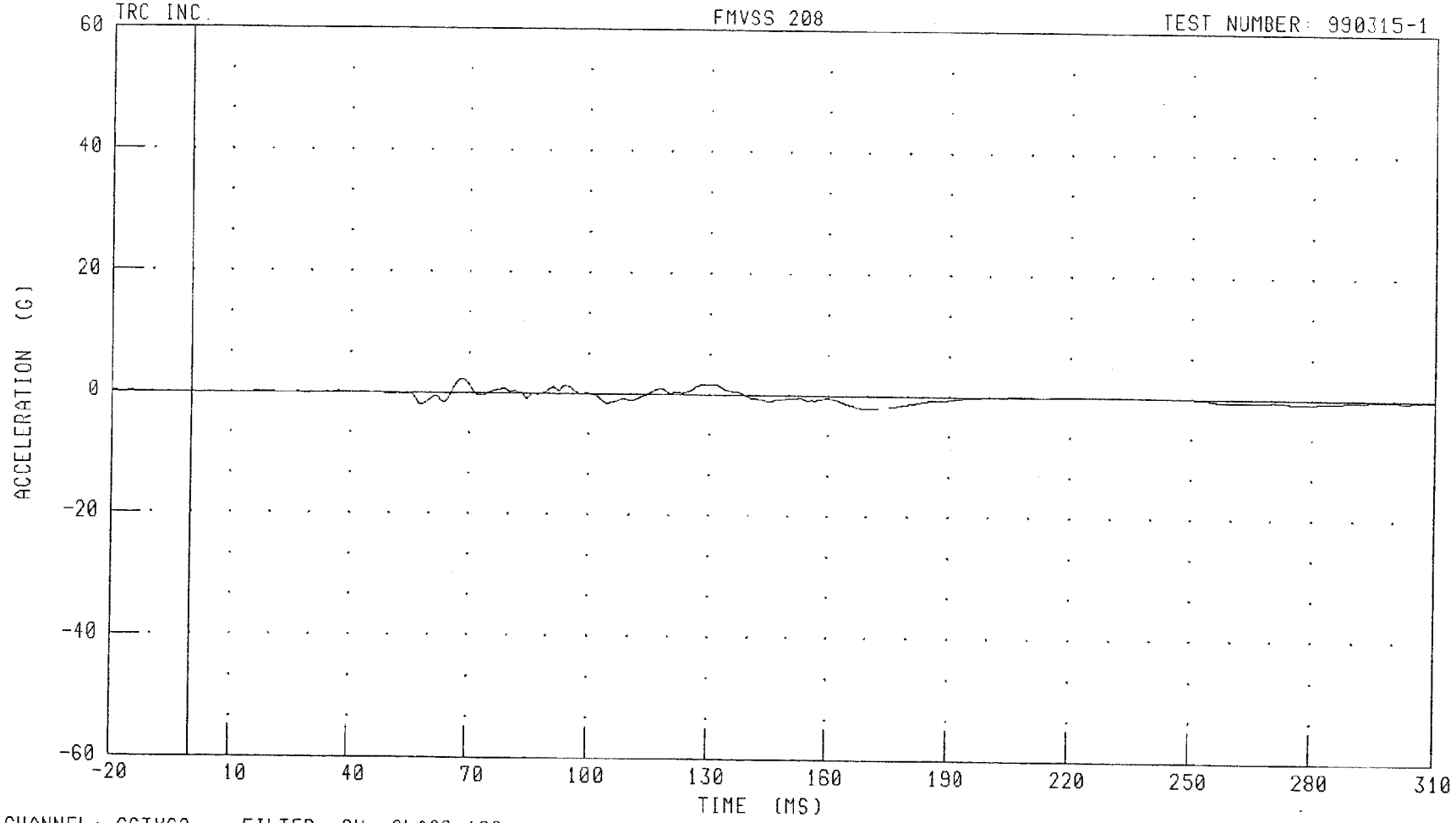
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION



CHANNEL: CSTXG2 FILTER: CH. CLASS 180

PEAK DATA: 2.15 G @ 190.88 MS; -47.28 G @ 99.36 MS

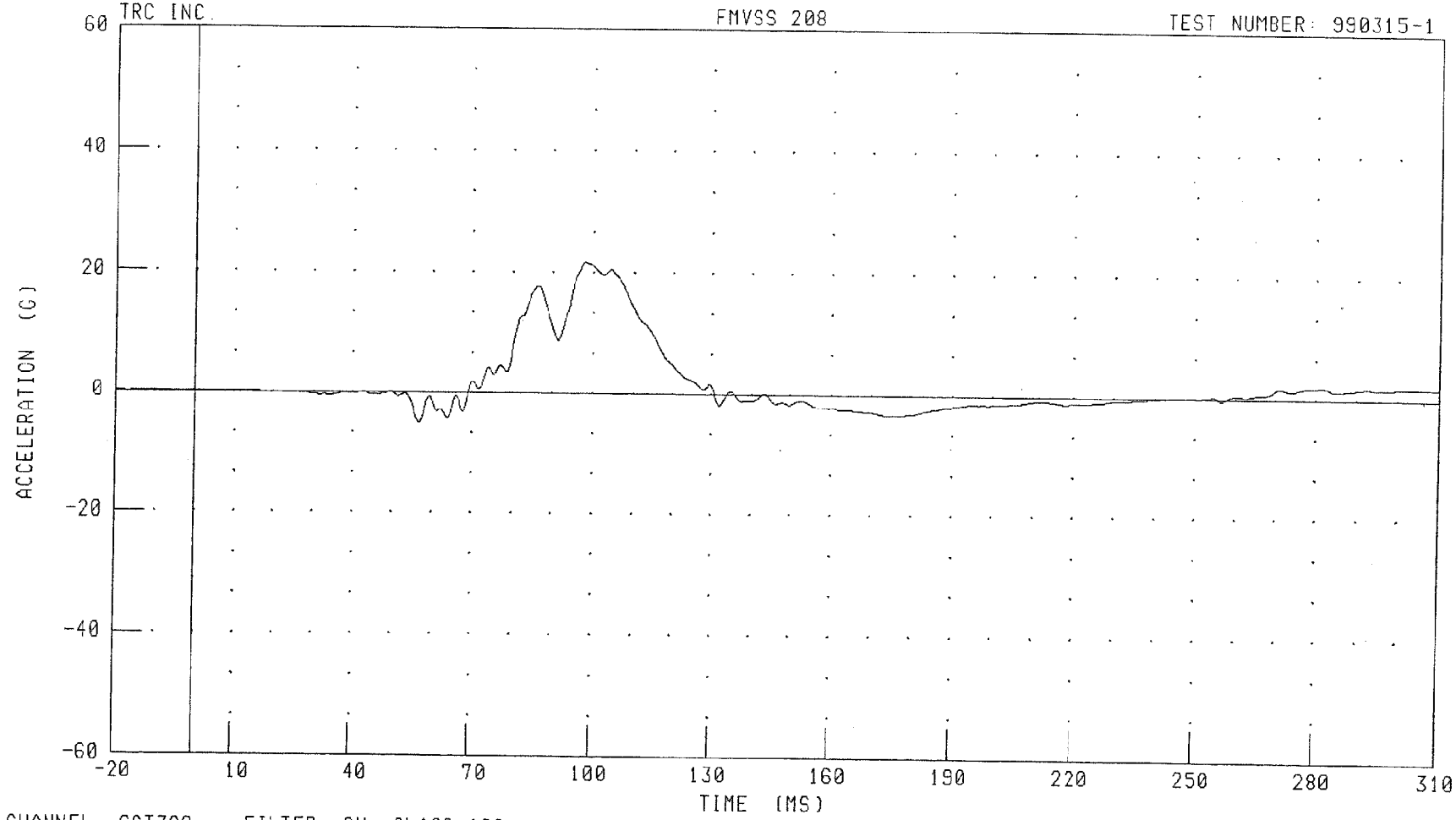
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION



CHANNEL: CSTYG2 FILTER: CH. CLASS 180

PEAK DATA: 2.37 G @ 68.40 MS, -2.12 G @ 170.80 MS

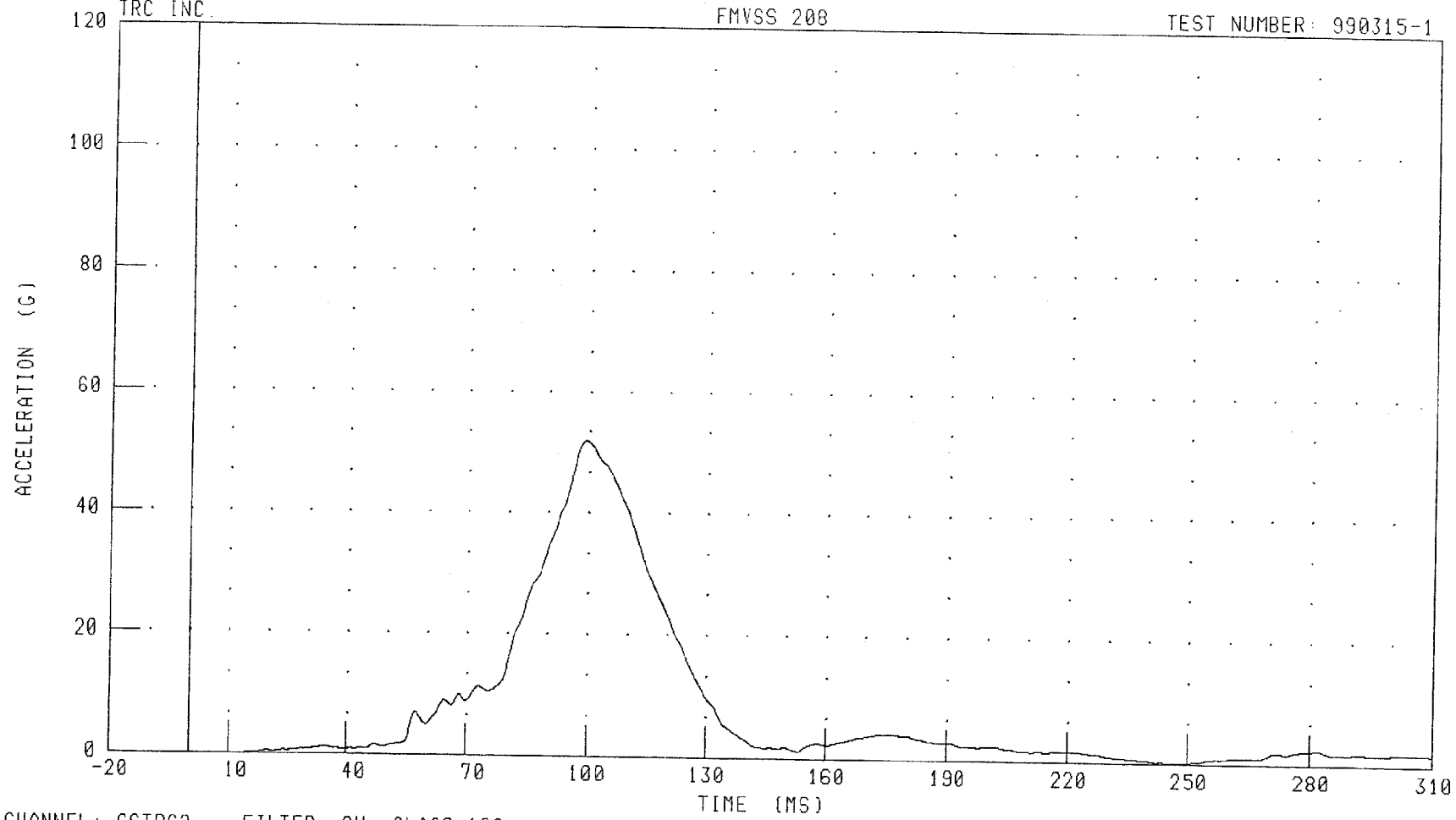
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION



CHANNEL: CSTZG2 FILTER: CH. CLASS 180

PEAK DATA: 21.69 G @ 98.08 MS; -5.06 G @ 56.80 MS

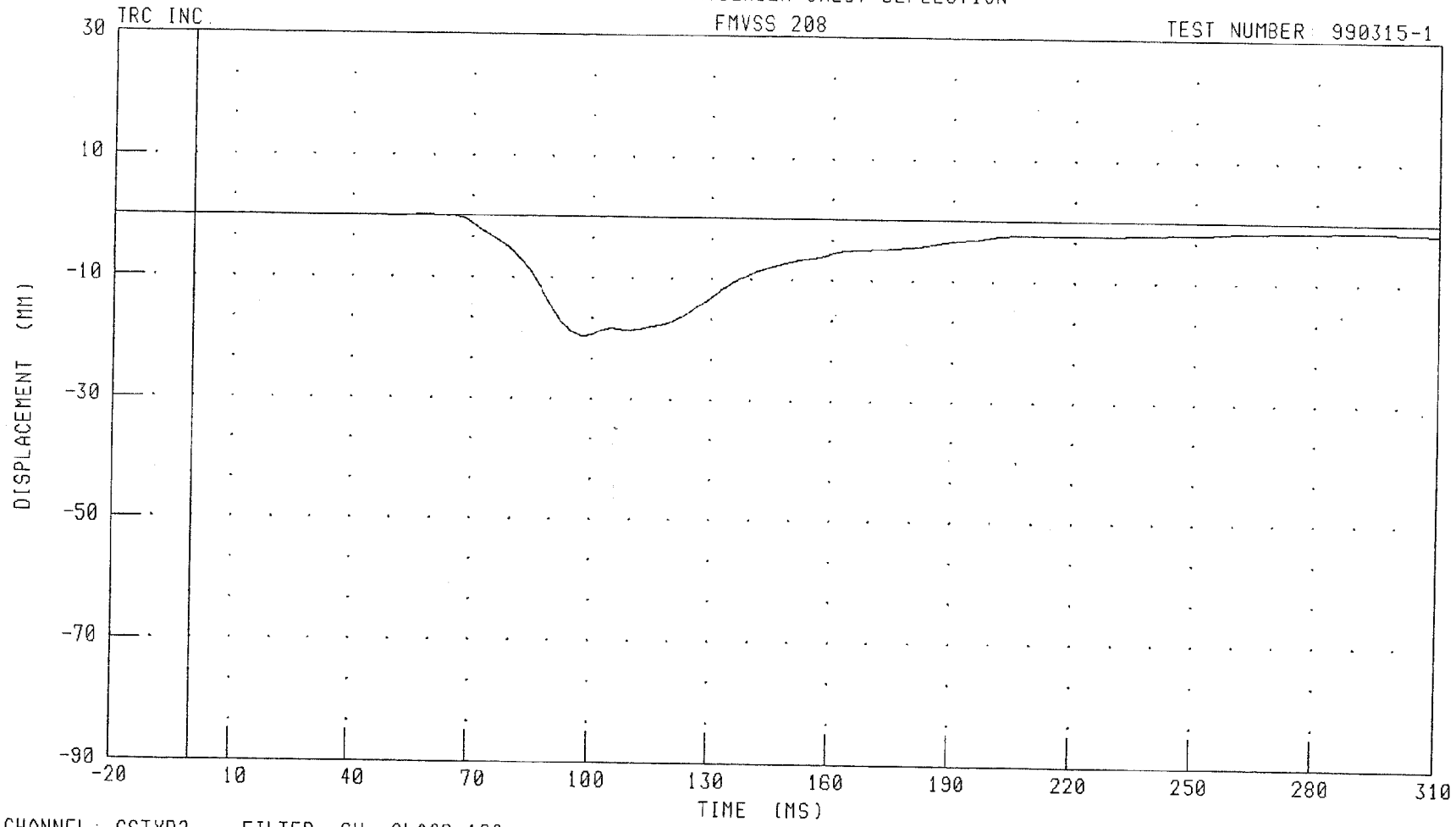
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION



CHANNEL: CSTRG2 FILTER: CH. CLASS 180

PEAK DATA: 51.89 G @ 99.28 MS; 0.01 G @ -20.00 MS

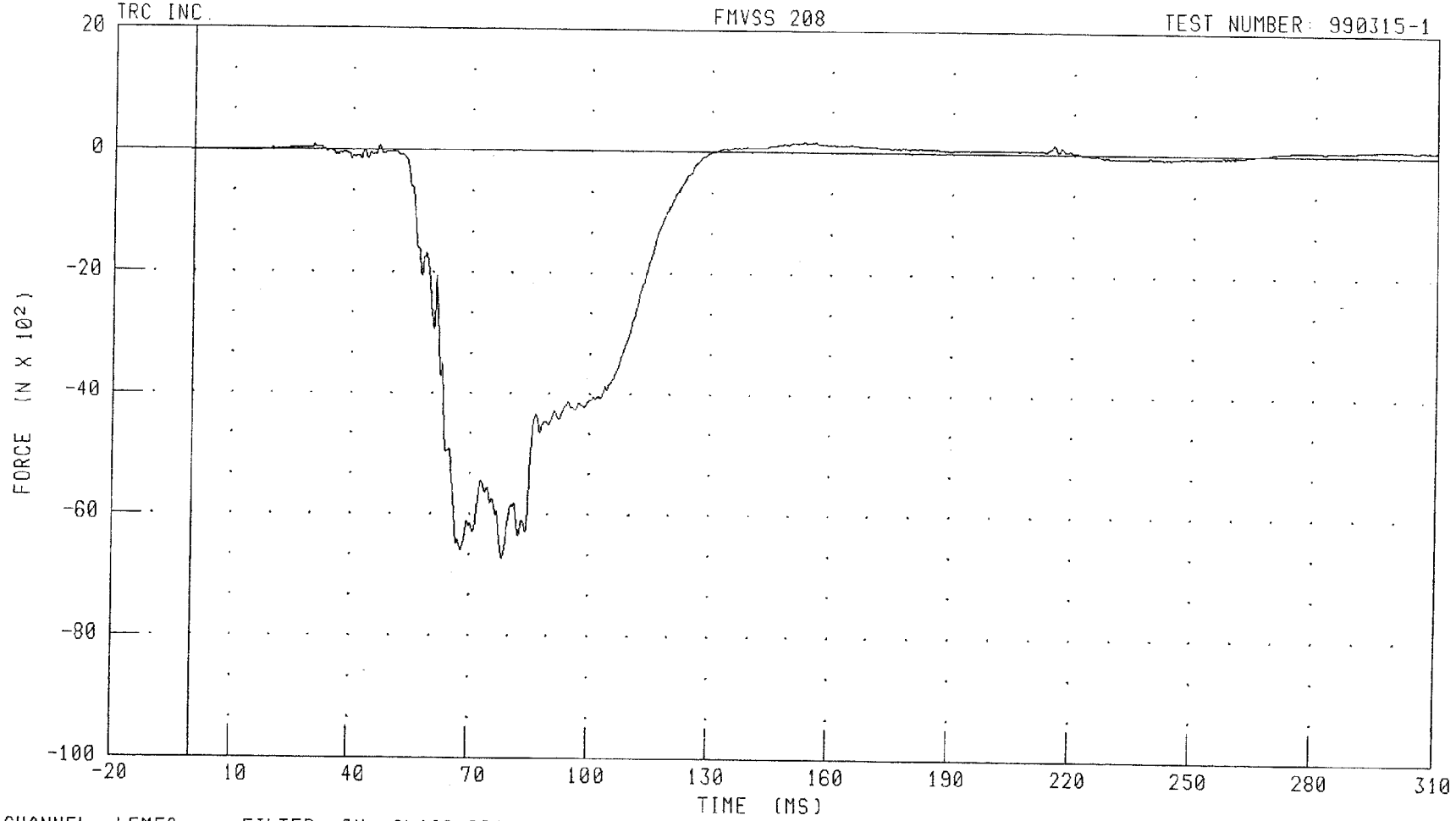
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER CHEST DEFLECTION



CHANNEL: CSTXD2 FILTER: CH. CLASS 180

PEAK DATA: 0.30 MM @ 57.28 MS; -19.57 MM @ 98.16 MS

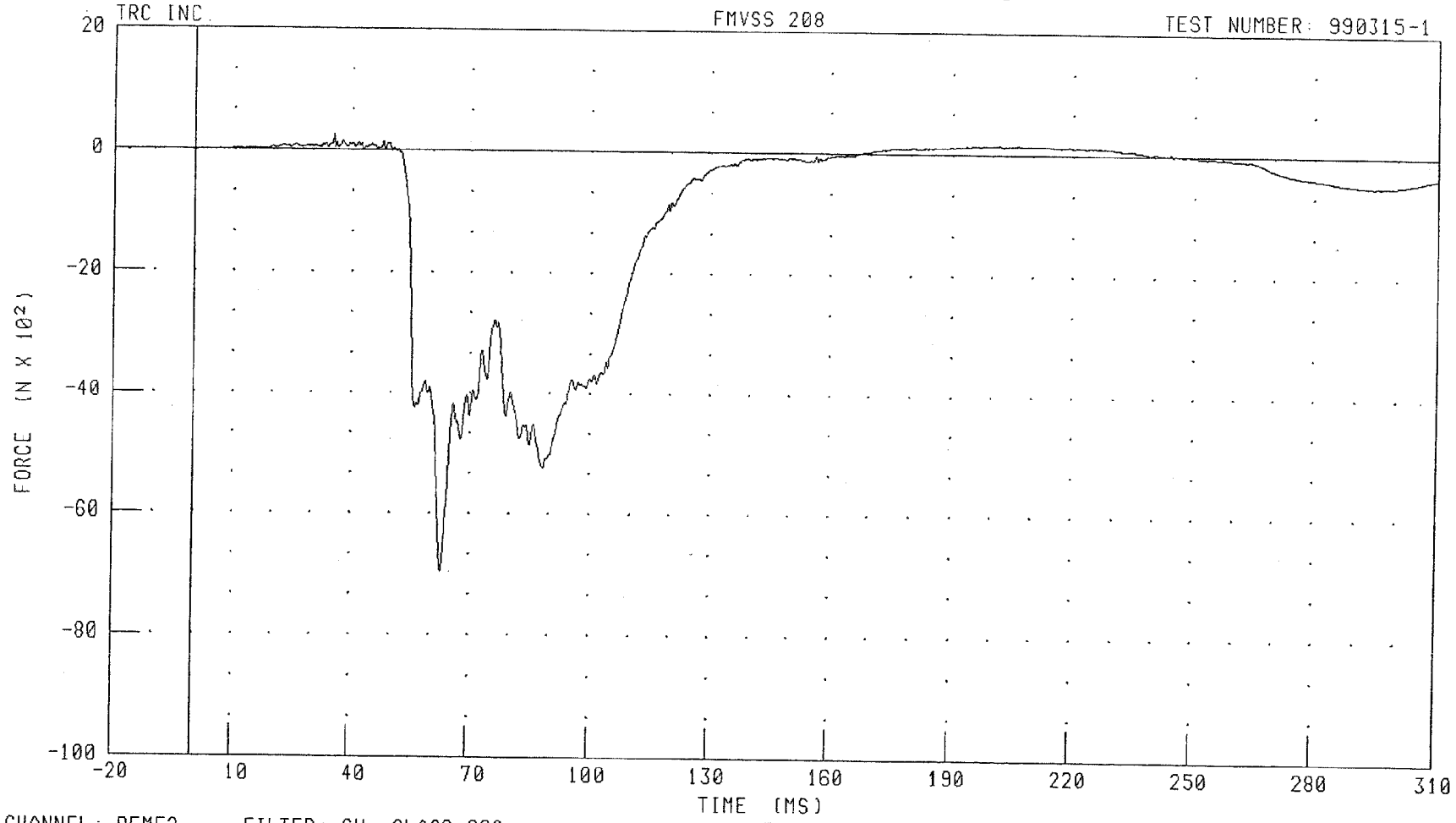
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER LEFT FEMUR FORCE



CHANNEL: LFMF2 FILTER: CH. CLASS 600

PEAK DATA: 172.20 N @ 153.44 MS; -6729.65 N @ 78.48 MS

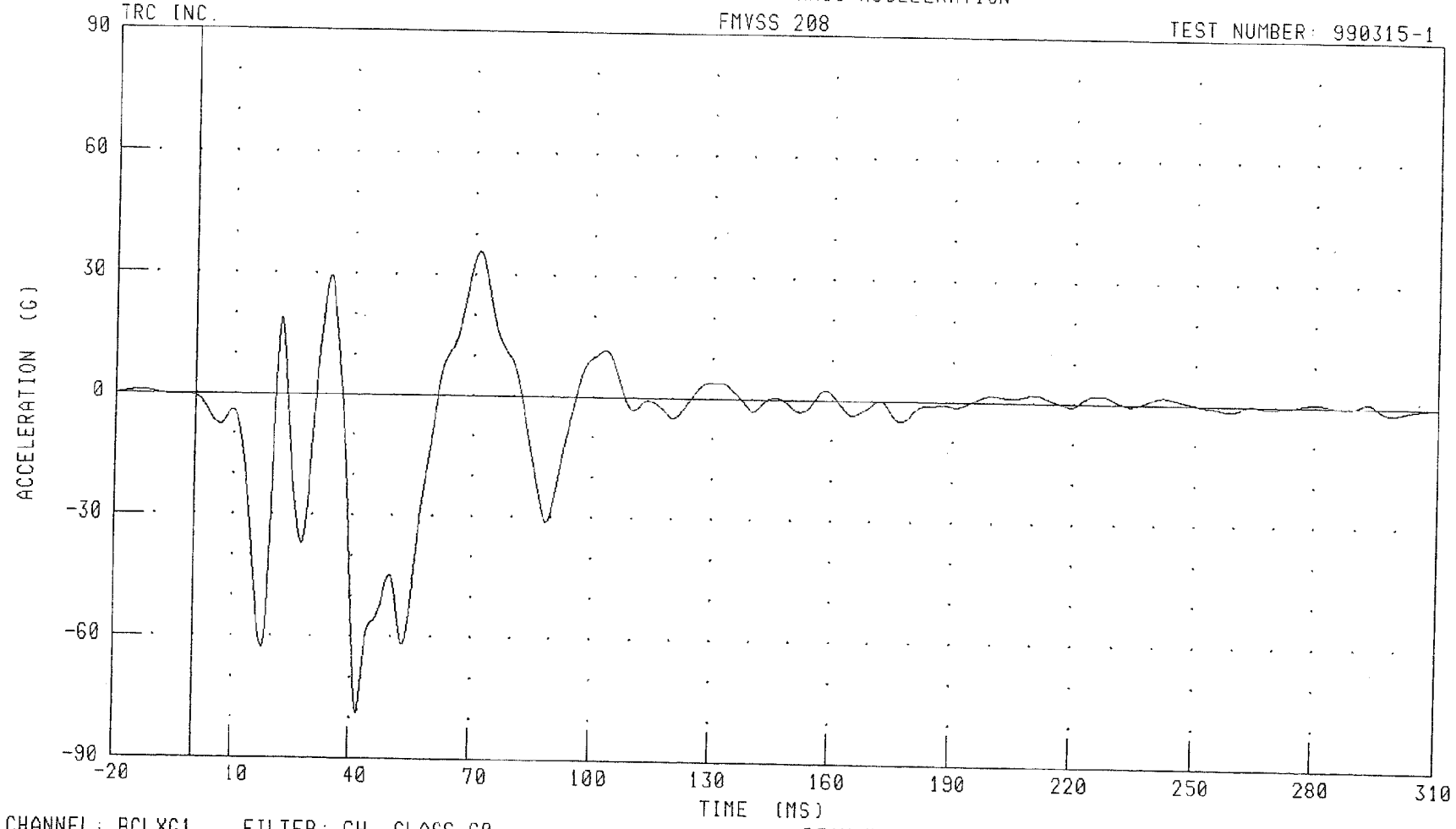
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE



CHANNEL: RFMF2 FILTER: CH. CLASS 600 PEAK DATA: 256.73 N @ 35.44 MS, -6975.24 N @ 63.04 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

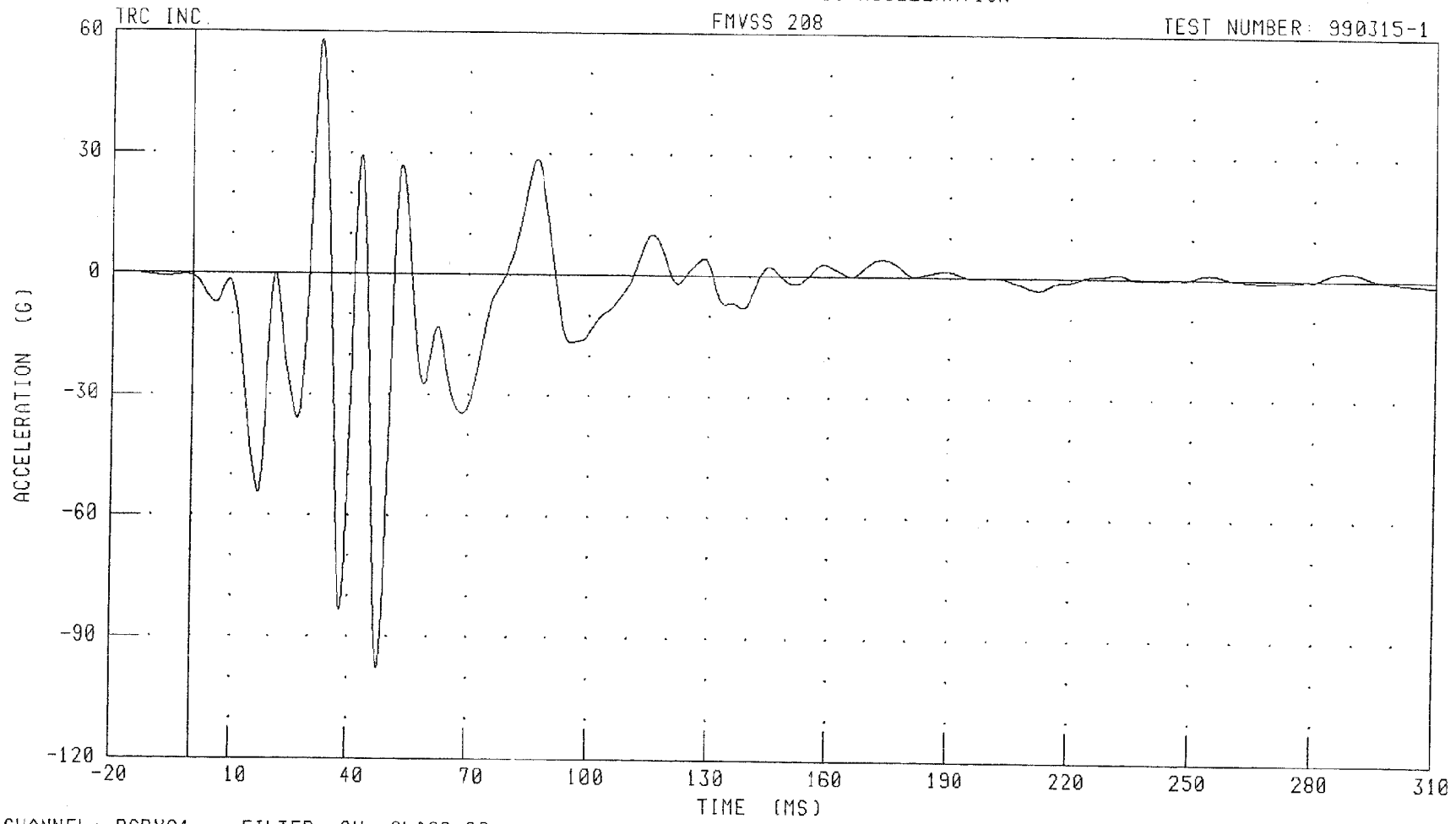
LEFT BRAKE CALIPER X-AXIS ACCELERATION



CHANNEL: BCLXG1 FILTER: CH. CLASS 60

PEAK DATA: 35.59 G @ 71.44 MS; -78.90 G @ 41.84 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

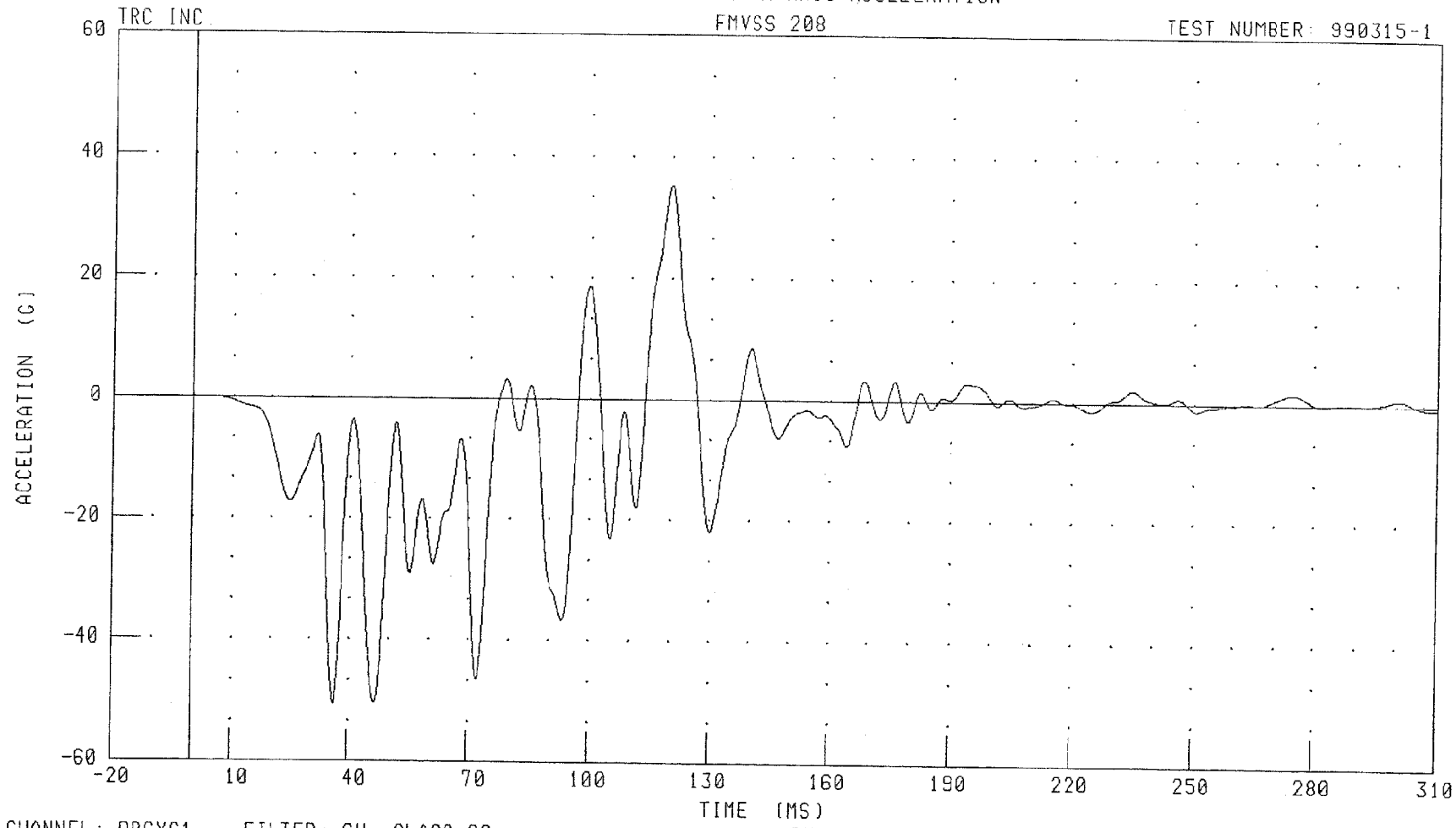


CHANNEL: BCRXG1 FILTER: CH. CLASS 60

PEAK DATA: 57.97 G @ 32.80 MS; -97.73 G @ 47.68 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

DASH PANEL CENTER X-AXIS ACCELERATION

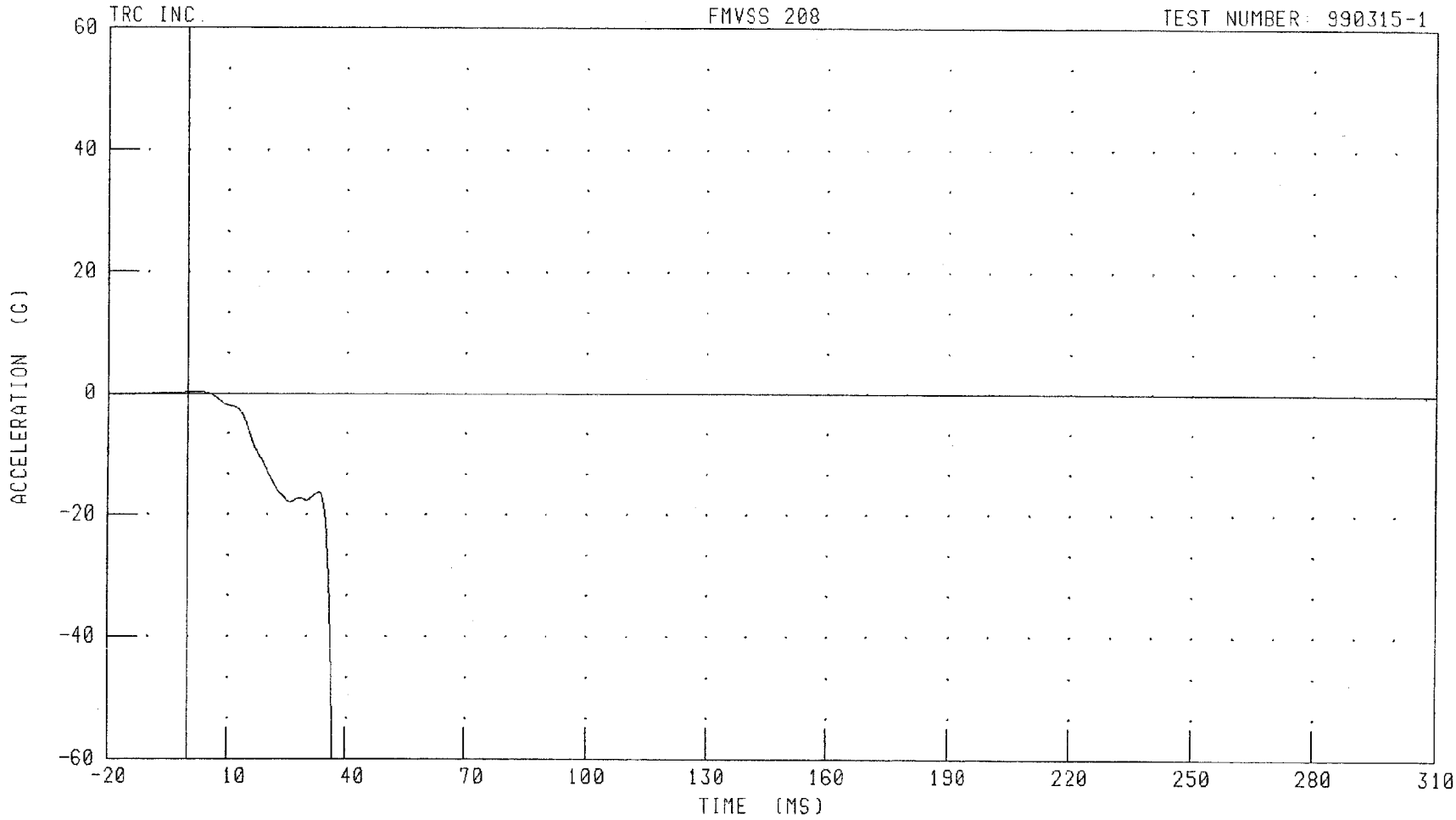


CHANNEL: DPCXG1 FILTER: CH. CLASS 60

PEAK DATA: 35.39 G @ 120.16 MS; -50.51 G @ 36.24 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

ENGINE TOP X-AXIS ACCELERATION

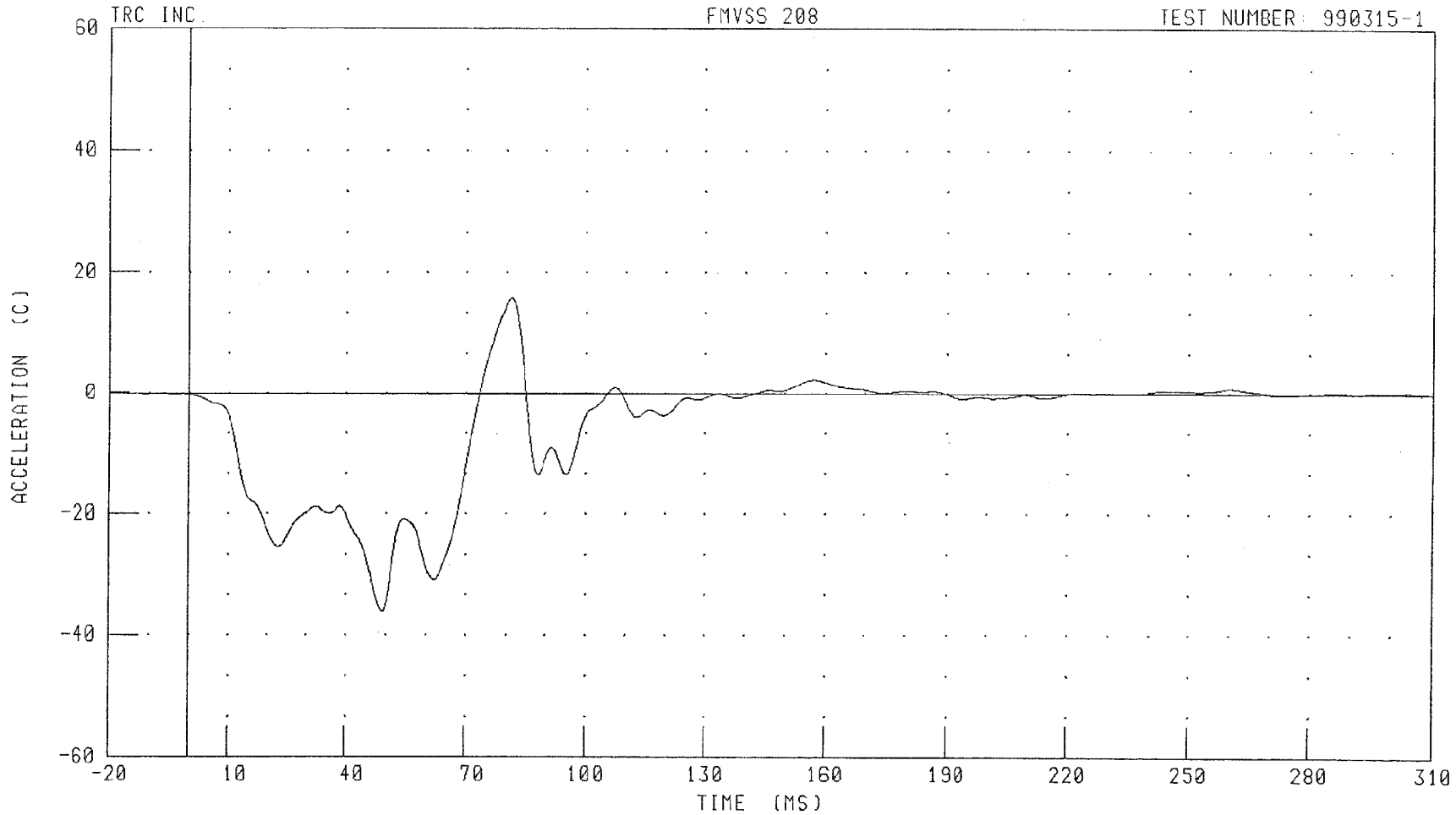


CHANNEL: ENGXG1 FILTER: CH. CLASS 60

PEAK DATA: 0.25 G @ 2.32 MS; -808.48 G @ 46.08 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

ENGINE BOTTOM X-AXIS ACCELERATION

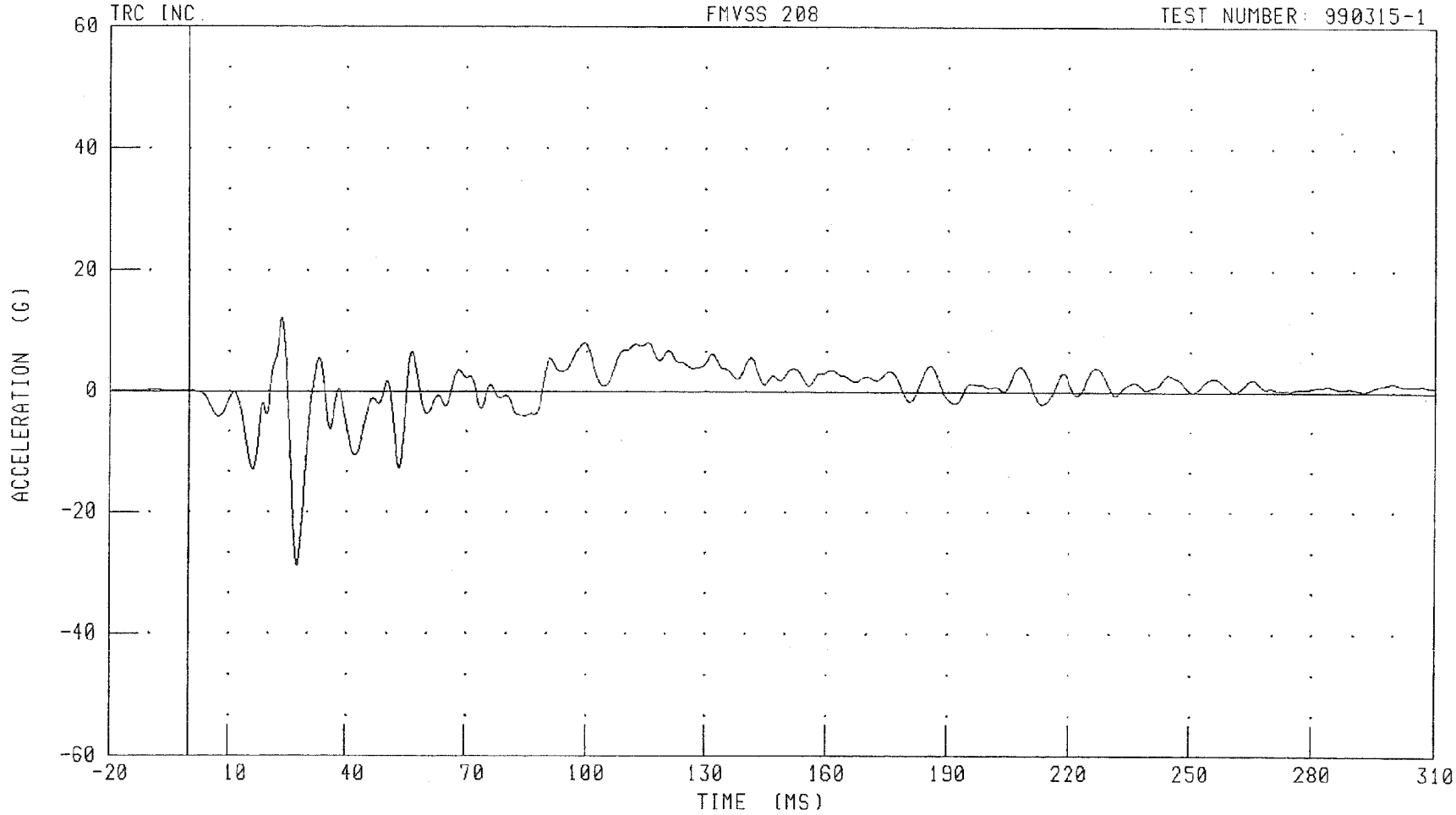


CHANNEL: ENGXG2 FILTER: CH. CLASS 60

PEAK DATA: 15.79 G @ 81.36 MS; -36.18 G @ 49.28 MS

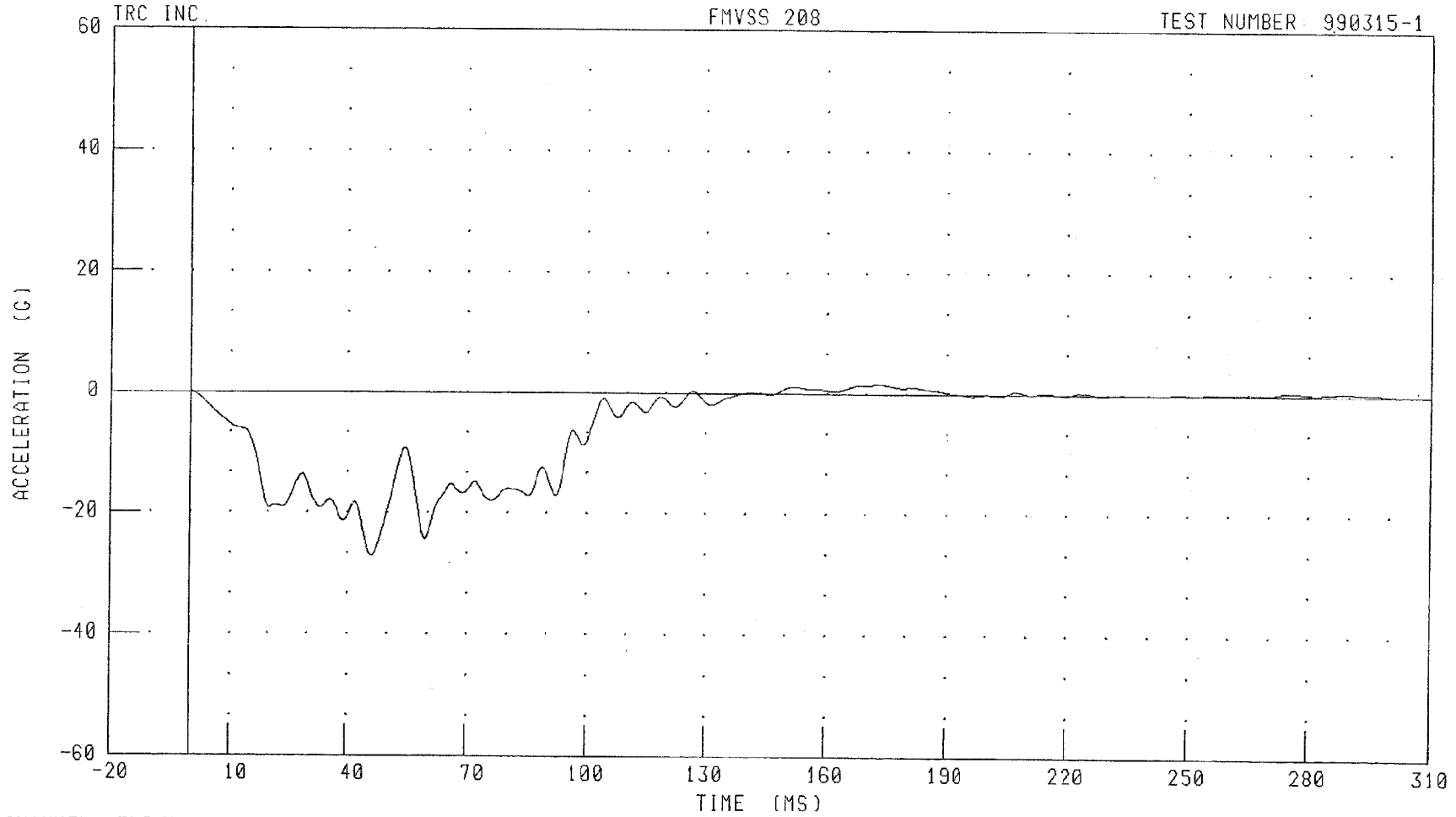
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH

VEHICLE REAR CENTER Z-AXIS ACCELERATION



CHANNEL: RDKZG1 FILTER: CH. CLASS 60 PEAK DATA: 12.18 G @ 23.76 MS; -28.89 G @ 27.68 MS

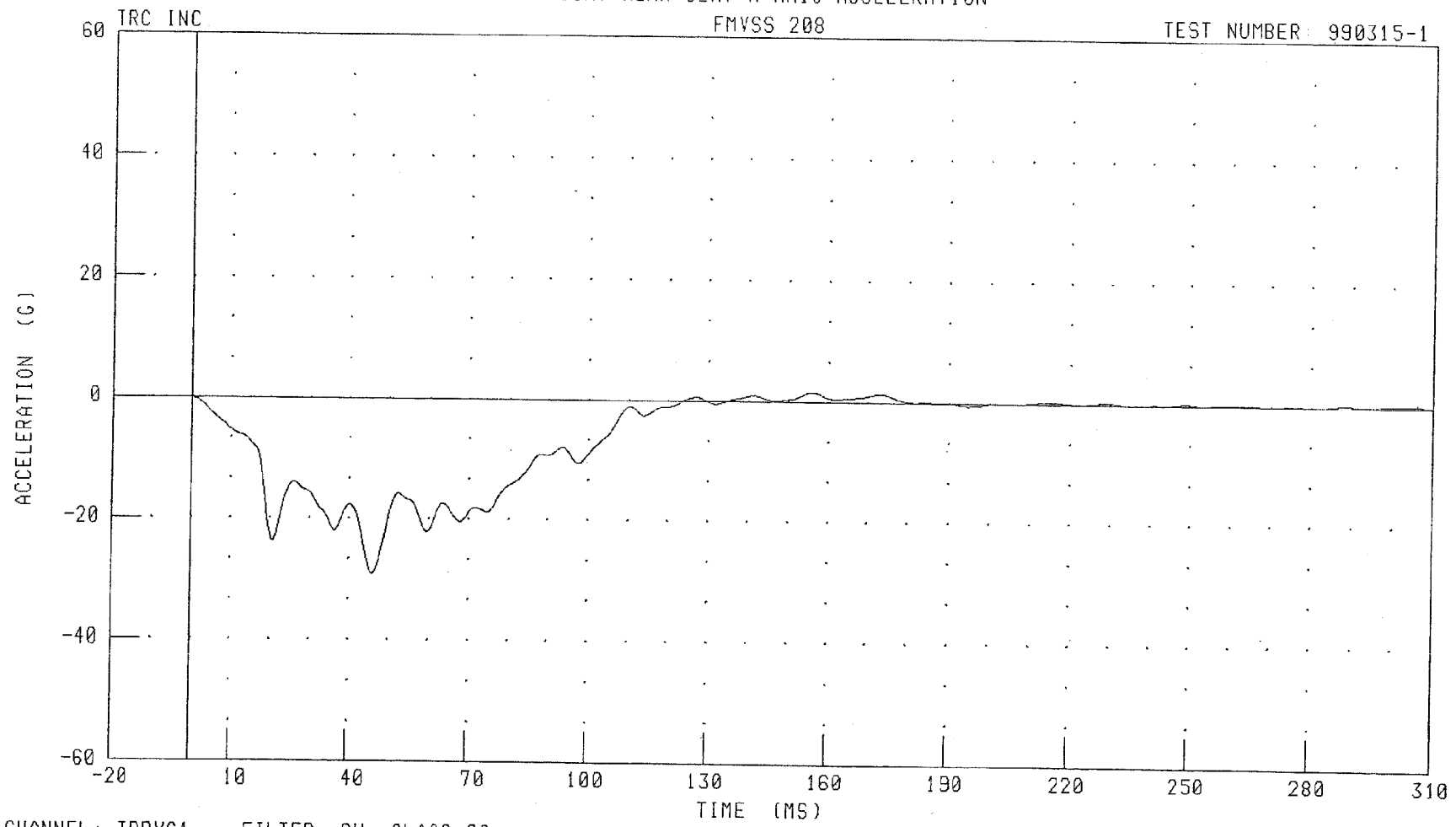
1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
LEFT REAR SEAT X-AXIS ACCELERATION



CHANNEL: TLRXG1 FILTER: CH. CLASS 60

PEAK DATA: 1.65 G @ 173.36 MS; -27.15 G @ 46.16 MS

1999 FORD EXPEDITION SUV INTO A FLAT FRONTAL BARRIER AT 30 MPH
RIGHT REAR SEAT X-AXIS ACCELERATION
FMVSS 208



CHANNEL: TRRXG1 FILTER: CH. CLASS 60

PEAK DATA: 1.53 G @ 156.08 MS; -29.15 G @ 46.08 MS

Appendix C

Dummy Certification

Pre-Test Dummy Certification

Driver Dummy S/N 168

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III 50th 12-MAR-99

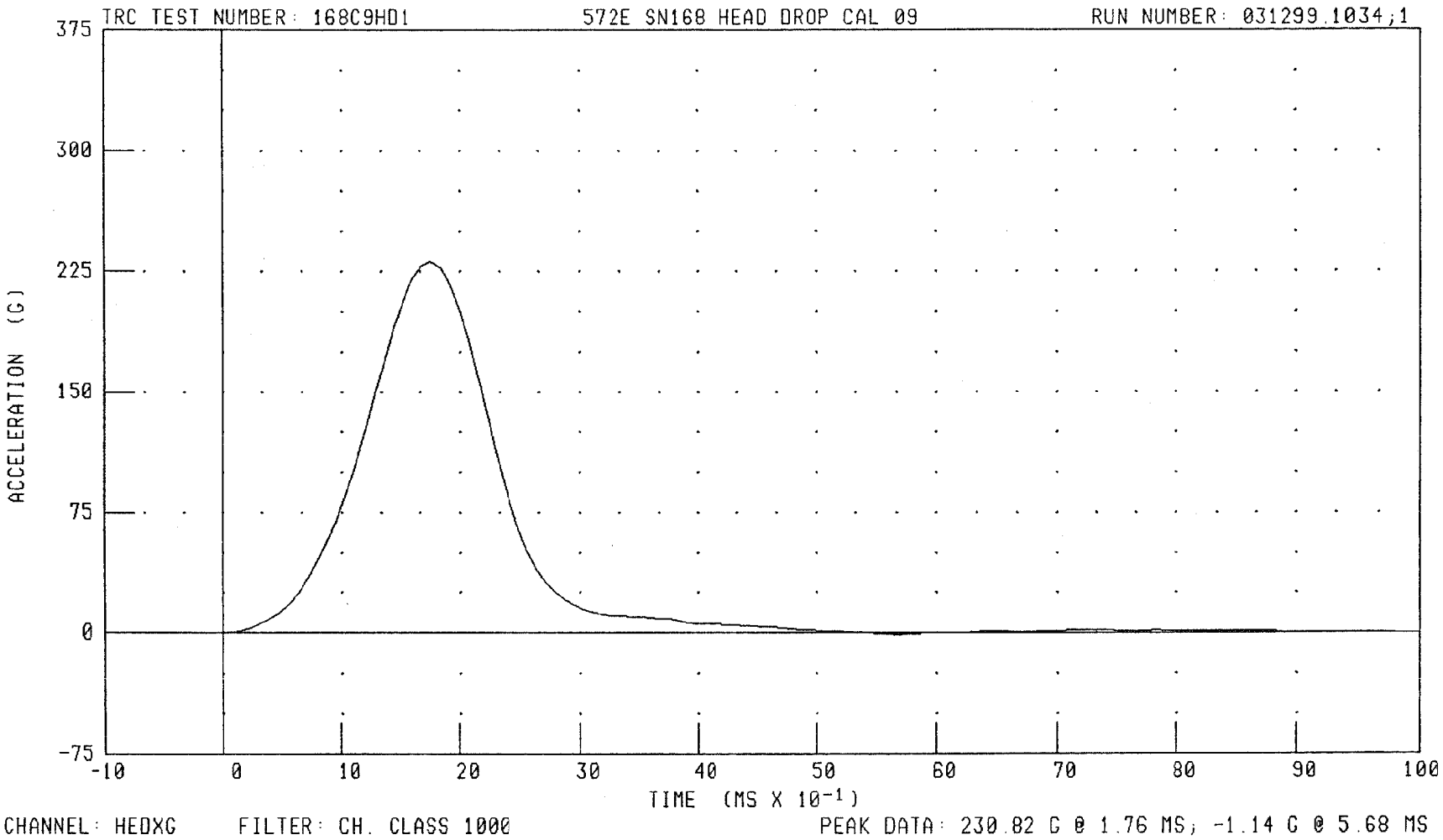
TRC INC. TEST NO: 168C9HD1 572E SN168 HEAD DROP CAL 09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	264.25 G
PEAK LATERAL ACCELERATION	15 G MAX	-3.02 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

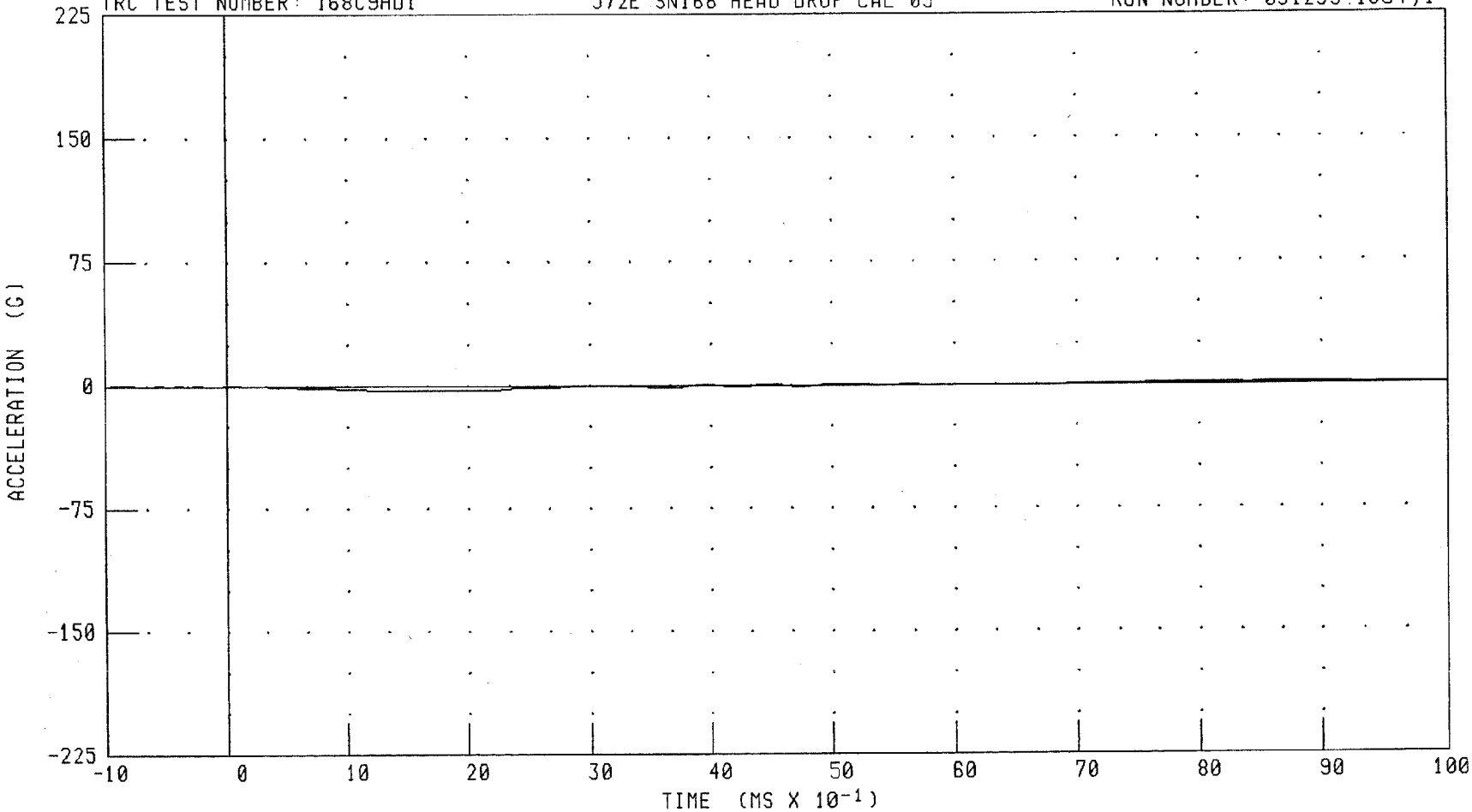
TECHNICIAN _____ RUN NUMBER: 031299.1034;1

PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS



PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

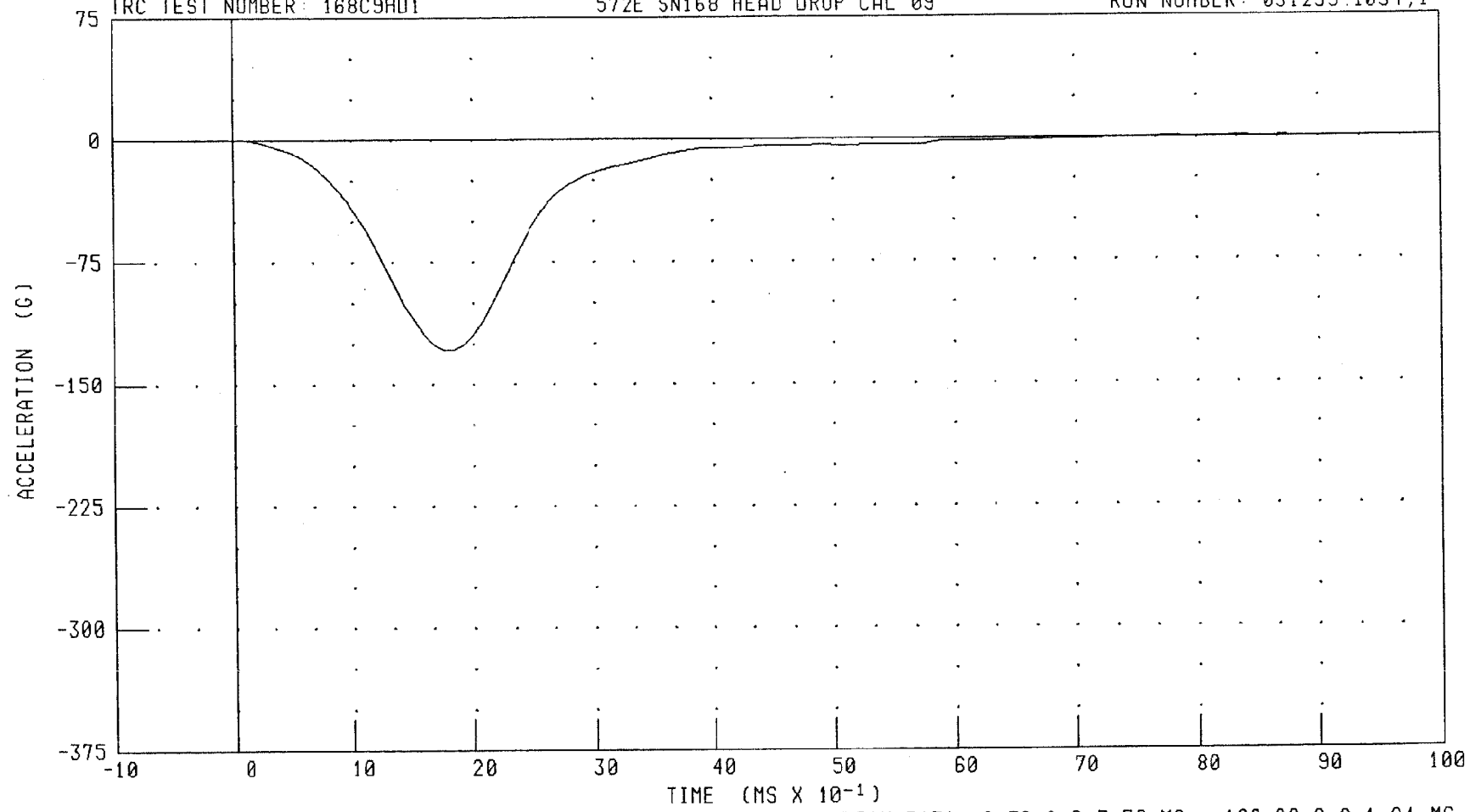
TRC TEST NUMBER: 168C9HD1 572E SN168 HEAD DROP CAL 09 RUN NUMBER: 031299.1034;1



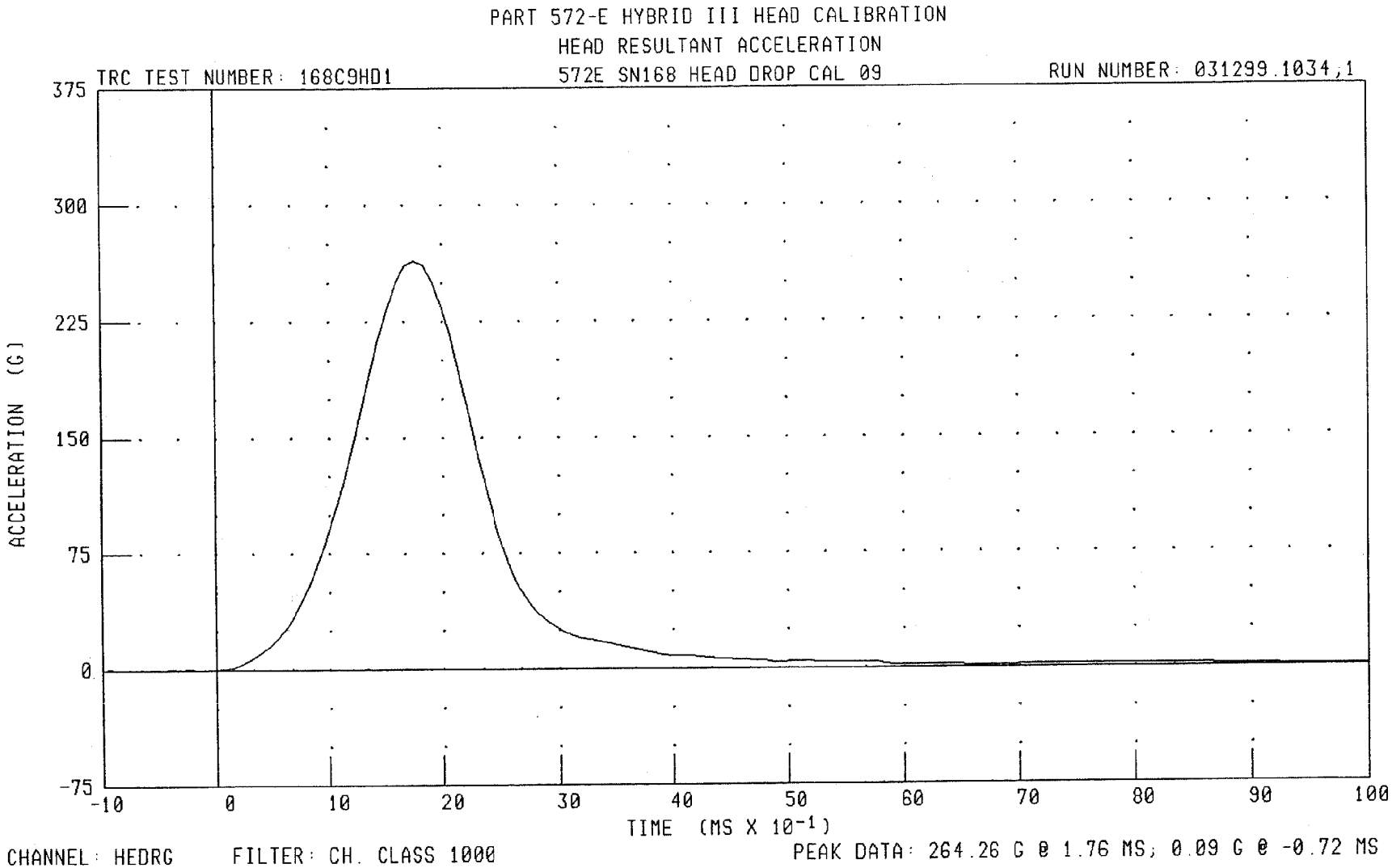
CHANNEL: HEDYG FILTER: CH. CLASS 1000 PEAK DATA: 0.89 G @ 7.92 MS; -3.02 G @ 1.44 MS

PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Z AXIS

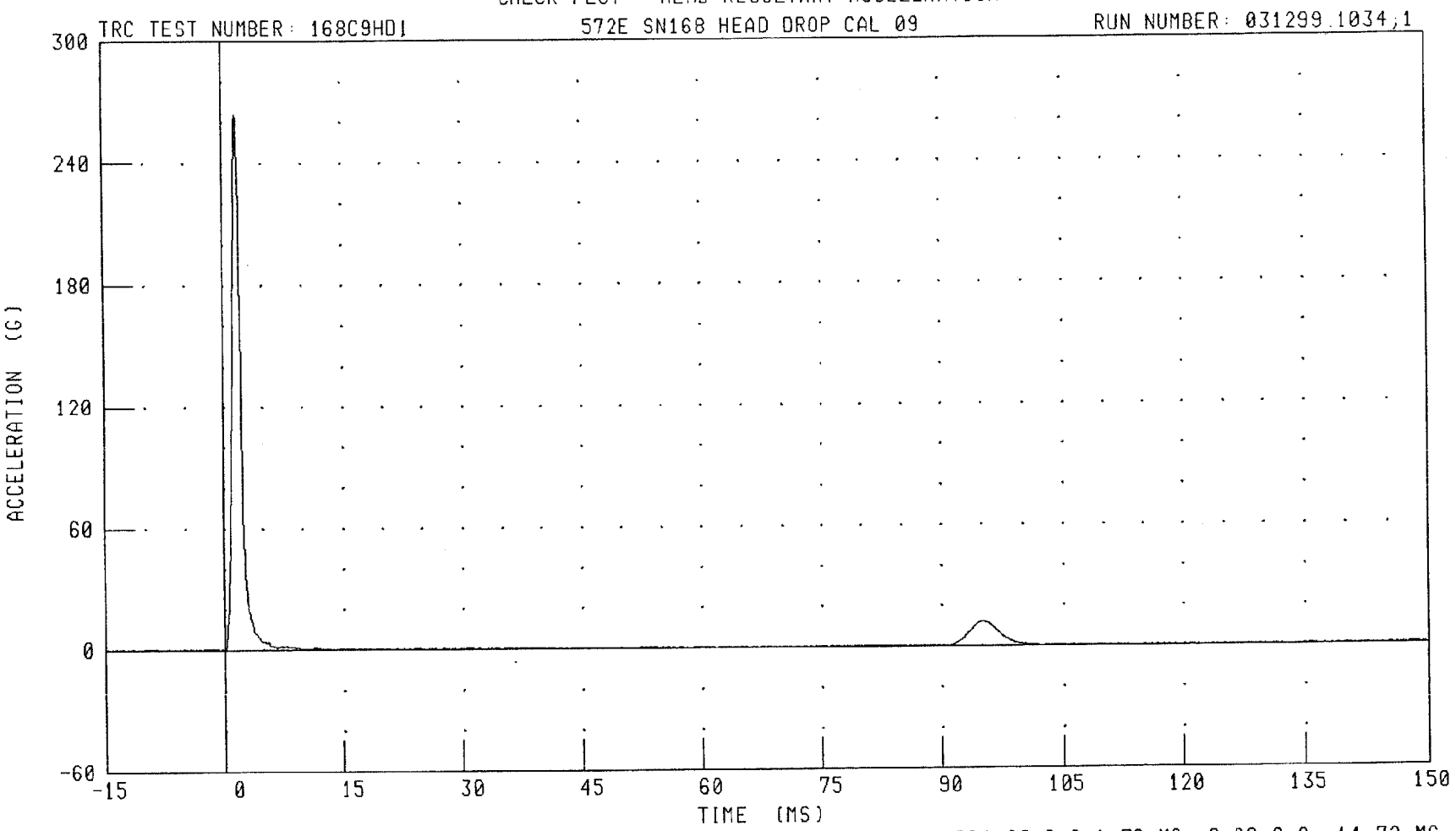
TRC TEST NUMBER: 168C9HD1 572E SN168 HEAD DROP CAL 09 RUN NUMBER: 031299.1034;1



CHANNEL: HEDZG FILTER: CH. CLASS 1000 PEAK DATA: 0.59 G @ 7.76 MS; -128.82 G @ 1.84 MS


PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION
TRC TEST NUMBER: 168C9HD1
572E SN168 HEAD DROP CAL 09
RUN NUMBER: 031299.1034,1
375
300
225
150
75
0
-75
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10-1)
CHANNEL: HEDRG
FILTER: CH. CLASS 1000
PEAK DATA: 264.26 G @ 1.76 MS; 0.09 G @ -0.72 MS

PART 572-E HYBRID III HEAD CALIBRATION
CHECK PLOT - HEAD RESULTANT ACCELERATION



CHANNEL: HEDRG FILTER: CH. CLASS 1000

PEAK DATA: 264.26 G @ 1.76 MS; 0.09 G @ -14.72 MS

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III 50th 12-MAR-99

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 168C9NF1 572E SN168 NECK FLEXION CAL09

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	22.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	6.93 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.57 G
	20 MS	17.60 - 22.60 G	21.45 G
	30 MS	12.50 - 18.50 G	17.60 G
MAX PENDULUM G		29 G MAX	24.05 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	17.54 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	37.68 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	71.00 DEG.
	TIME	57 - 64 MS	59.52 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	95.96 NM
	TIME	47 - 58 MS	50.32 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	115.36 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	103.04 MS

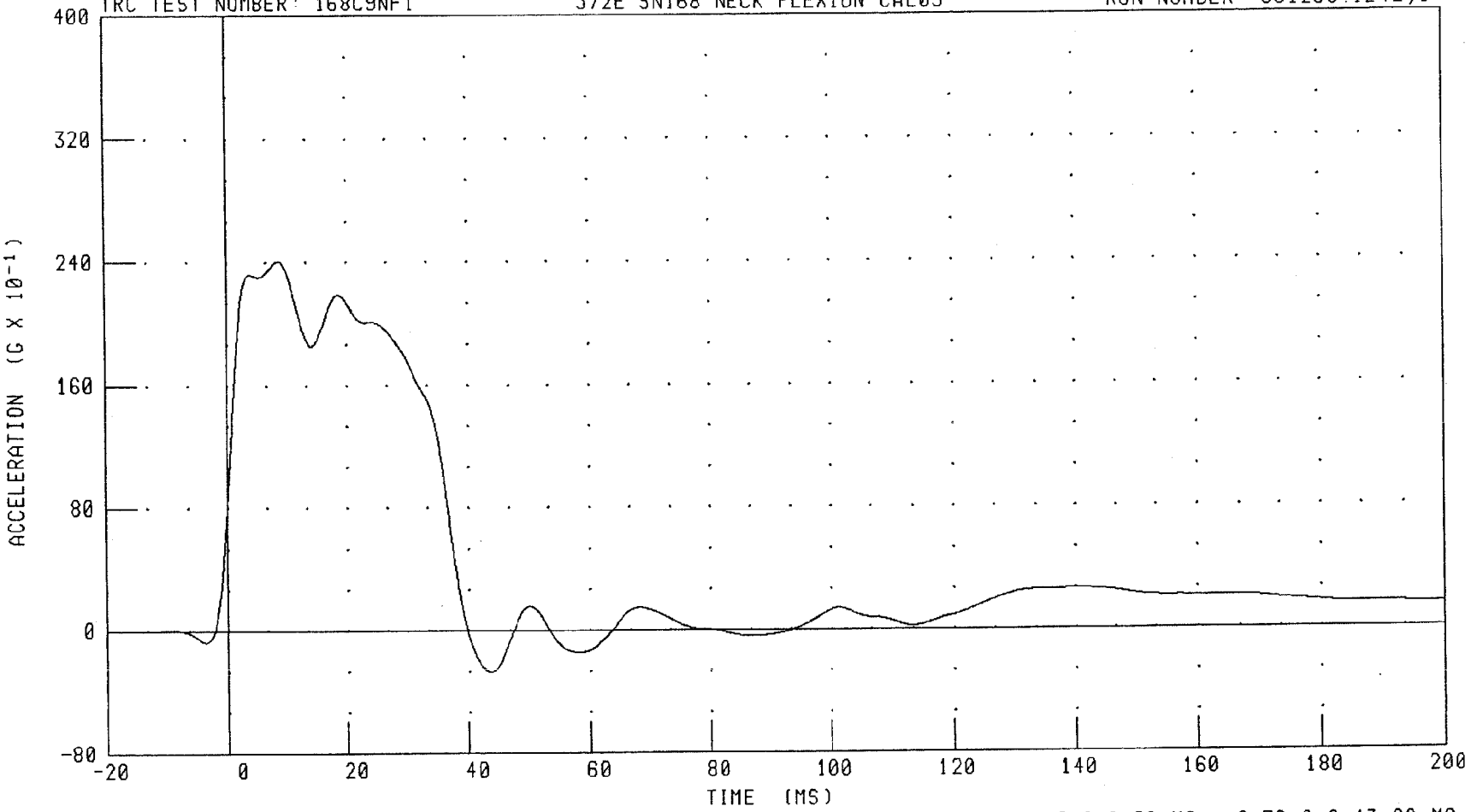
TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031299.1242;1

PART 572-E HYBRID III NECK FLEXION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 168C9NF1 572E SN168 NECK FLEXION CAL09 RUN NUMBER: 031299.1242;1



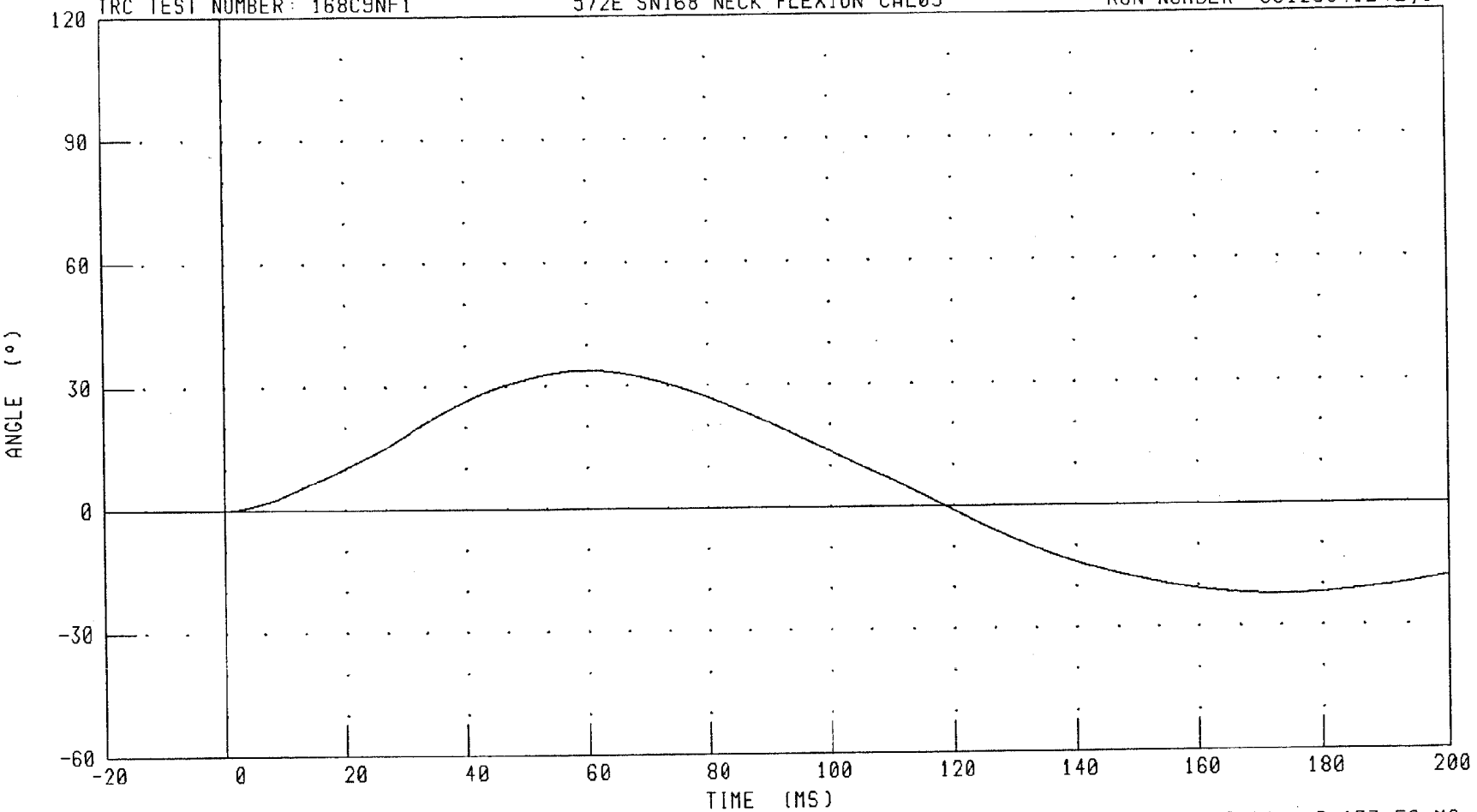
CHANNEL: PENXG FILTER: CH. CLASS 60

PEAK DATA: 24.06 G @ 8.88 MS; -2.72 G @ 43.68 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 168C9NF1 572E SN168 NECK FLEXION CAL09 RUN NUMBER: 031299.1242,1

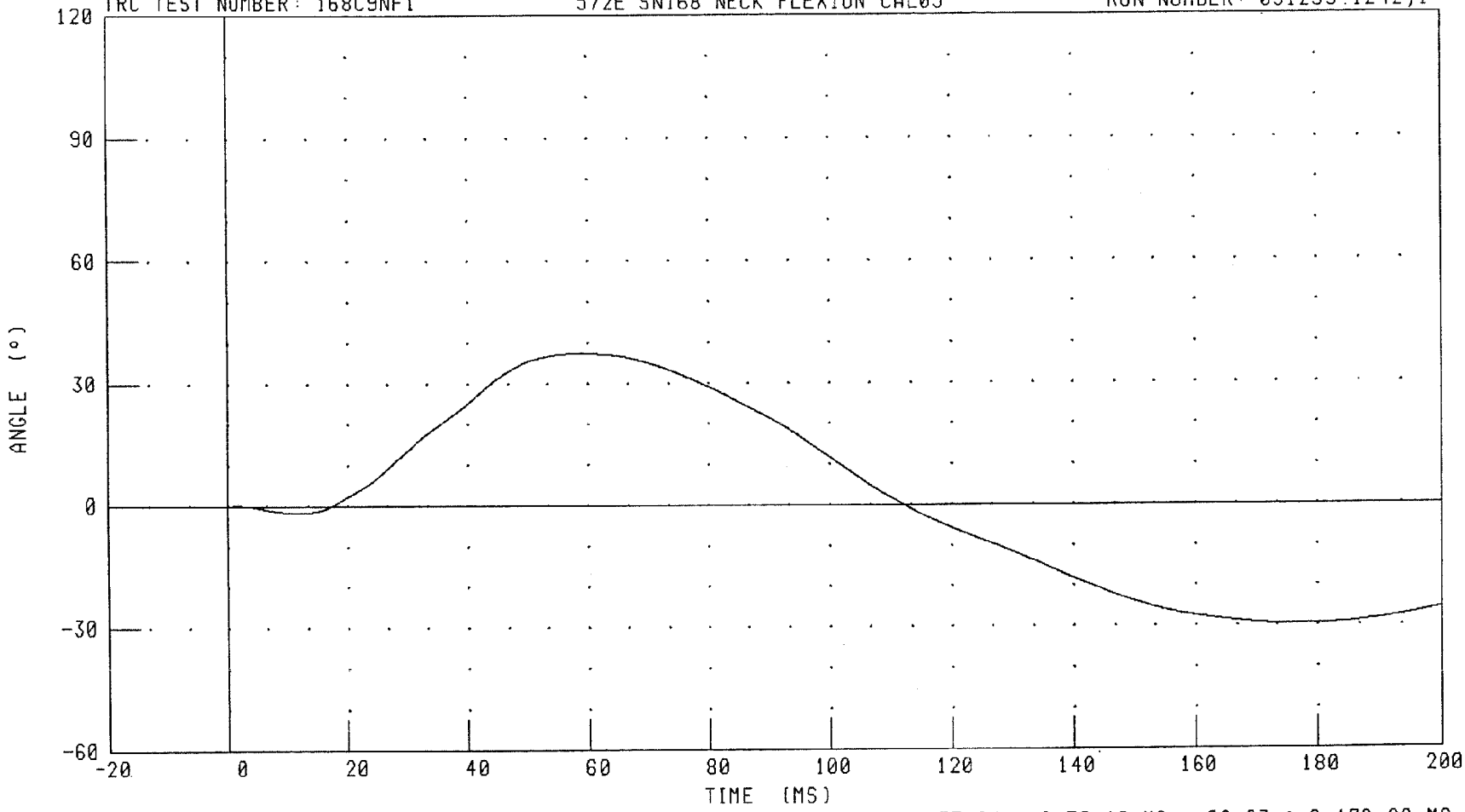


CHANNEL: BETA FILTER: CH. CLASS 60

PEAK DATA: 33.77 ° @ 59.92 MS; -22.14 ° @ 173.52 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 168C9NF1 572E SN168 NECK FLEXION CAL09 RUN NUMBER: 031299.1242;1

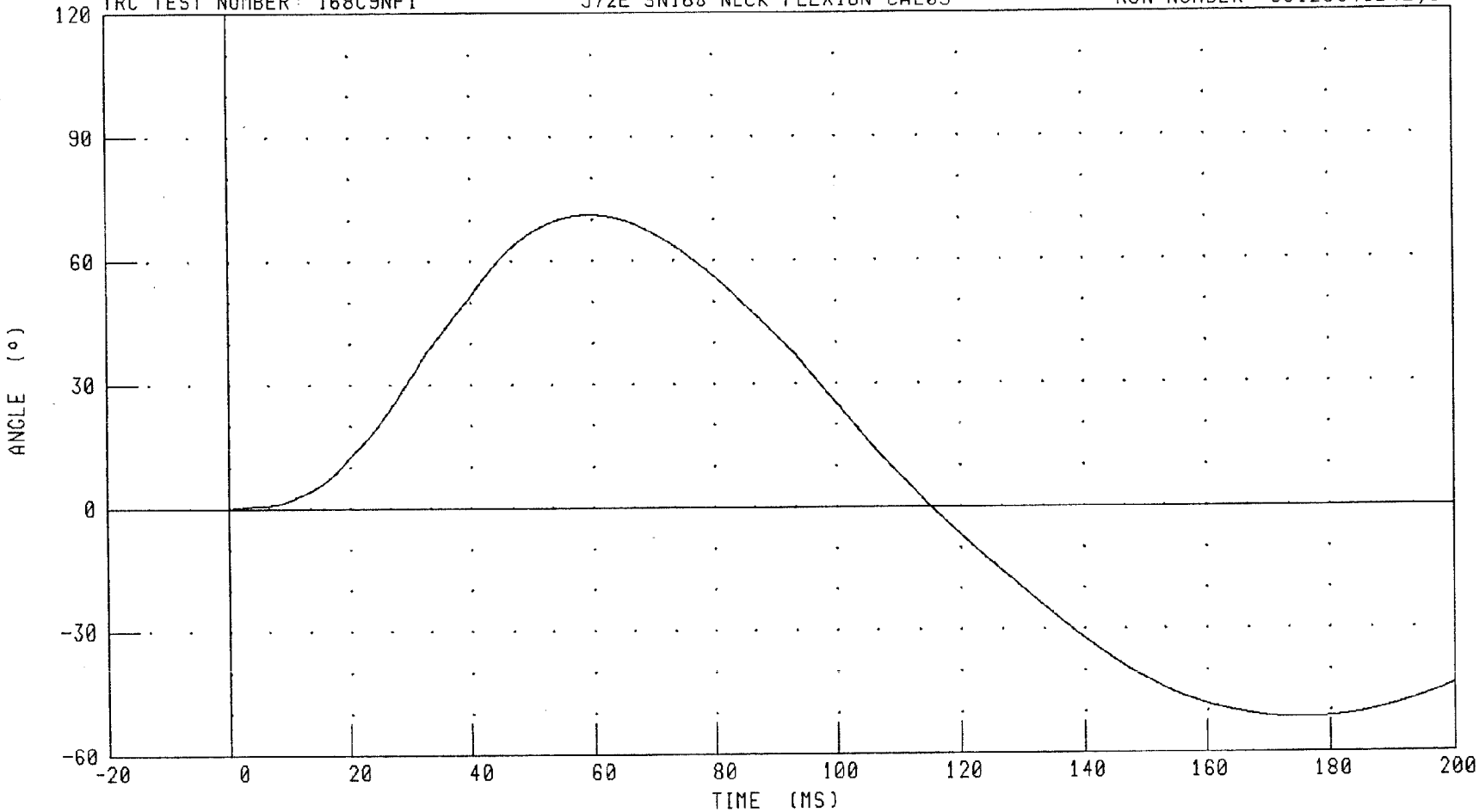


CHANNEL: THETA FILTER: CH. CLASS 60 PEAK DATA: 37.24 ° @ 59.12 MS; -29.63 ° @ 176.96 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 168C9NF1 572E SN168 NECK FLEXION CAL09 RUN NUMBER: 031299.1242;1

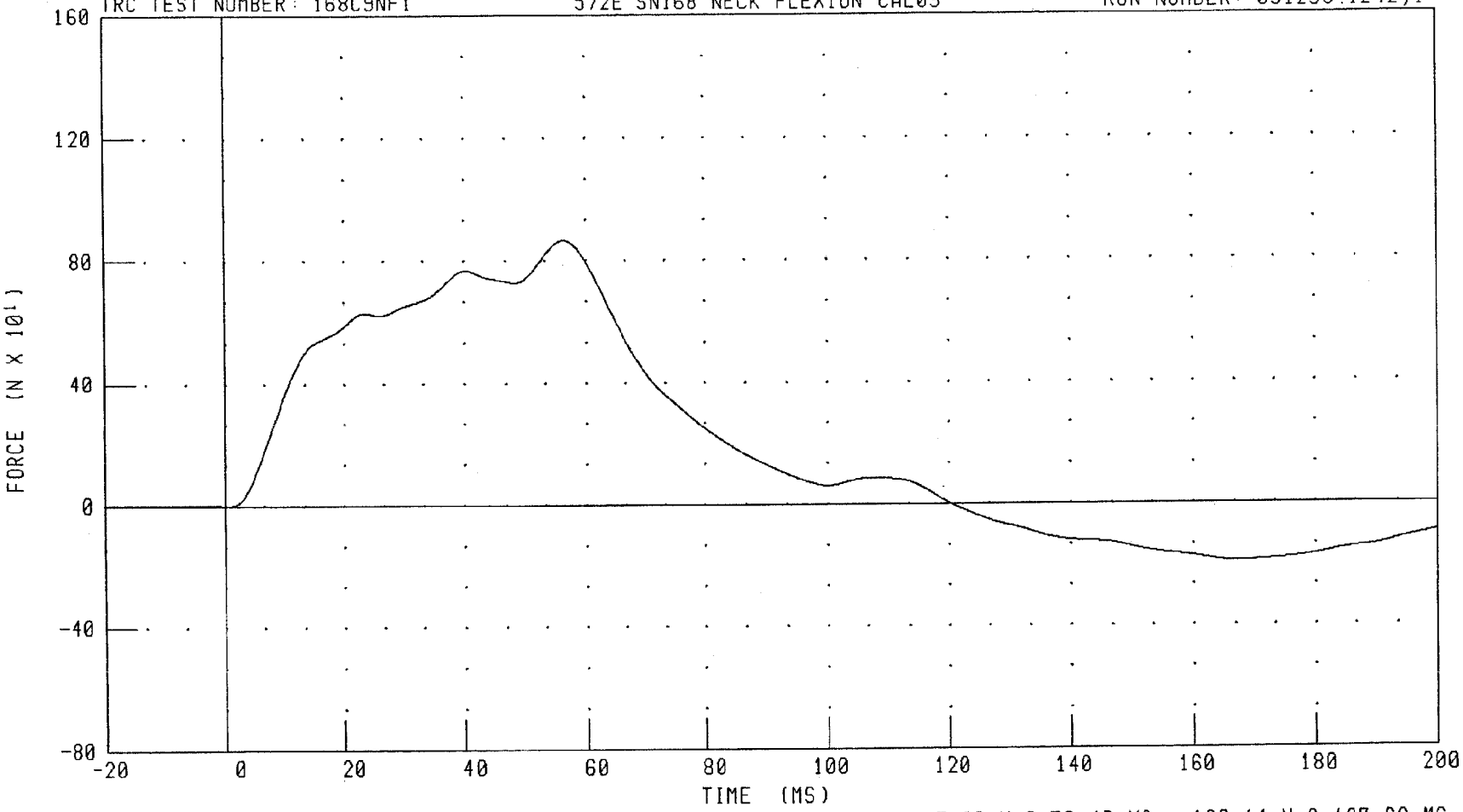


CHANNEL: TOTAN FILTER: CH. CLASS 60 PEAK DATA: 71.00 ° @ 59.52 MS, -51.73 ° @ 175.84 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 168C9NF1 572E SN168 NECK FLEXION CAL09 RUN NUMBER: 031299.1242;1



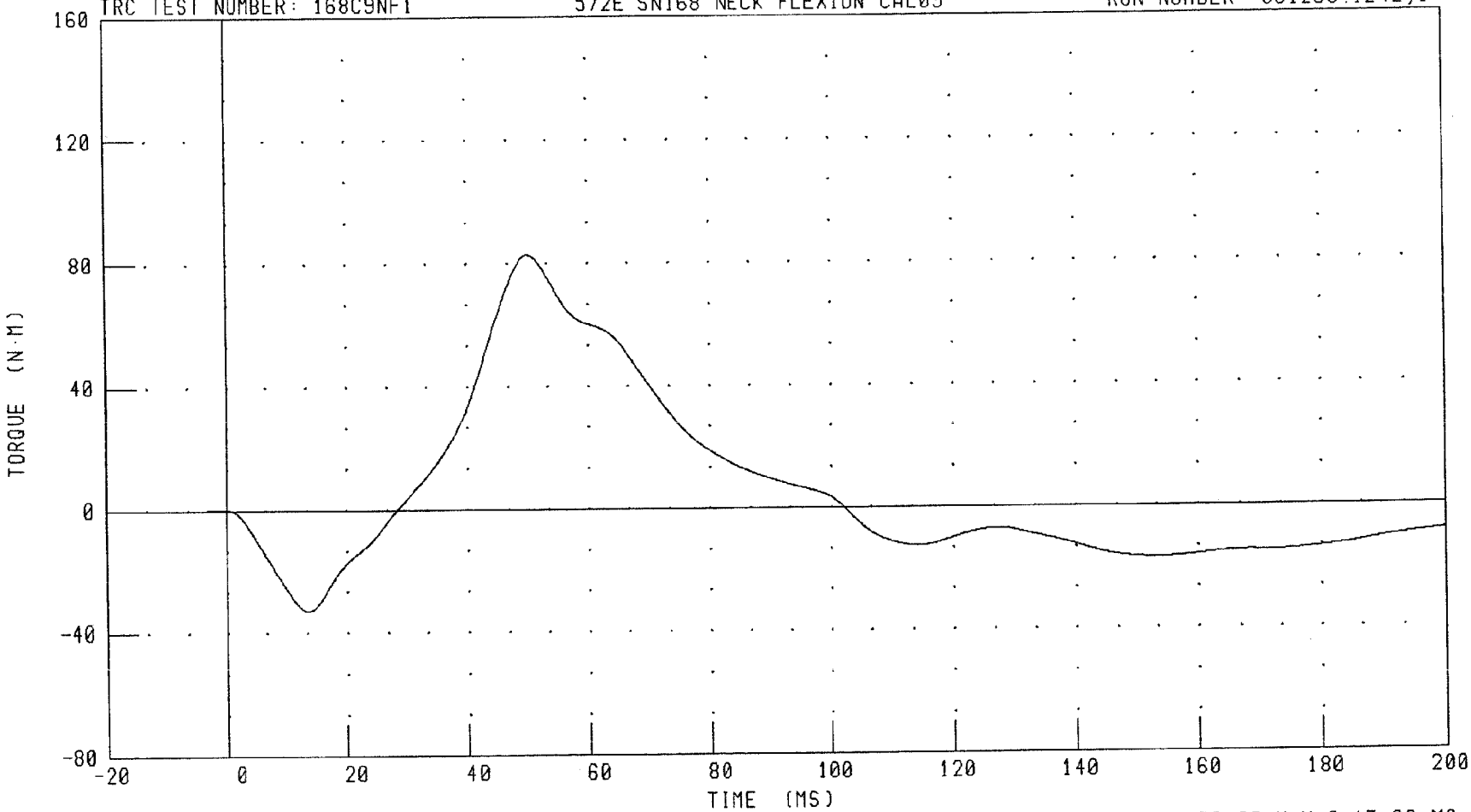
CHANNEL: NEKXF FILTER: CH. CLASS 60

PEAK DATA: 865.08 N @ 56.48 MS; -192.14 N @ 167.68 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

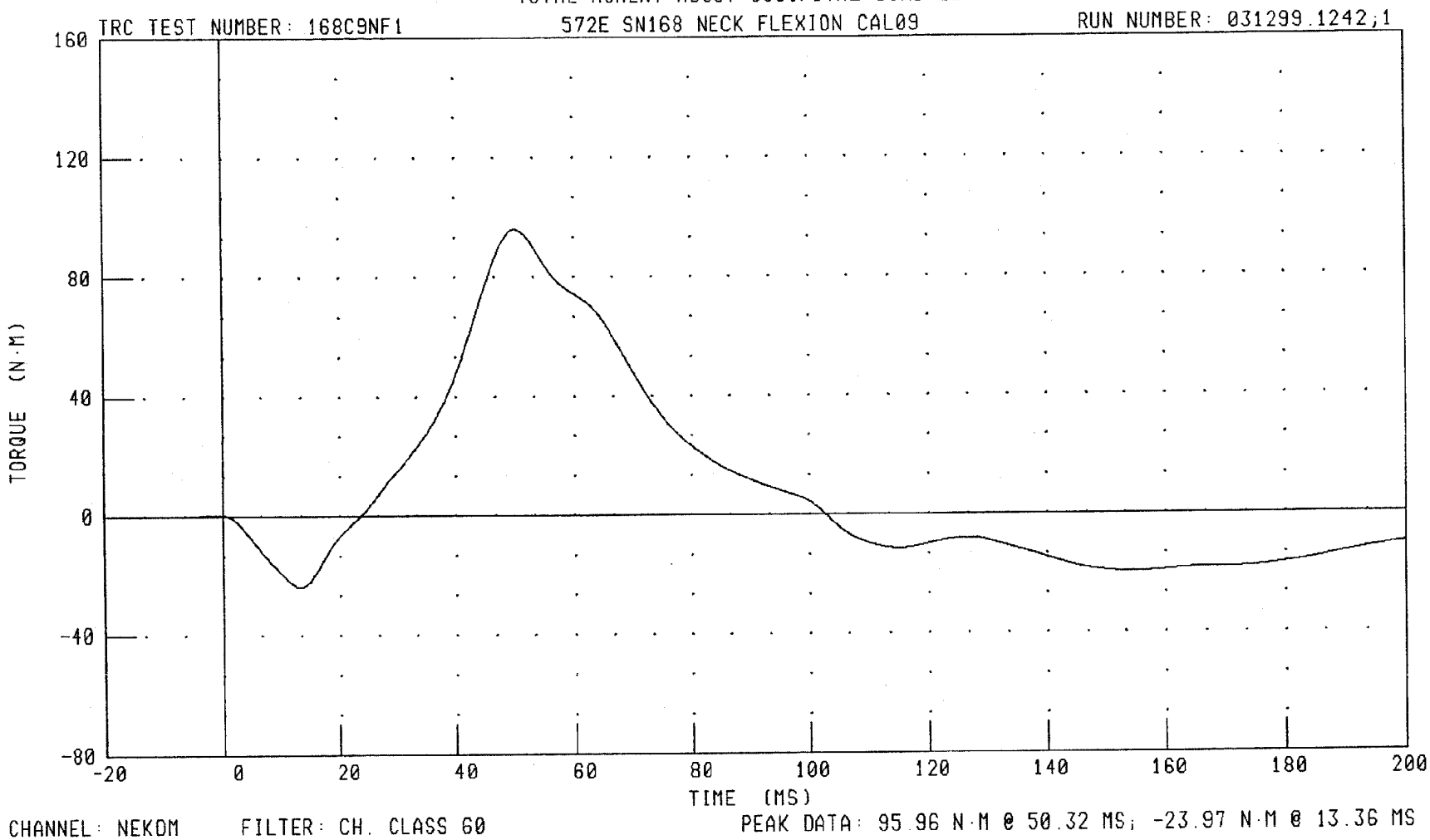
TRC TEST NUMBER: 168C9NF1 572E SN168 NECK FLEXION CAL09 RUN NUMBER: 031299.1242;1



CHANNEL: NEKYM FILTER: CH. CLASS 60

PEAK DATA: 82.79 N-M @ 50.16 MS; -32.93 N-M @ 13.68 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 95.96 N·M @ 50.32 MS; -23.97 N·M @ 13.36 MS

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III 50th 12-MAR-99

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 168C9NE1 572E SN168 NECK EXT CAL09

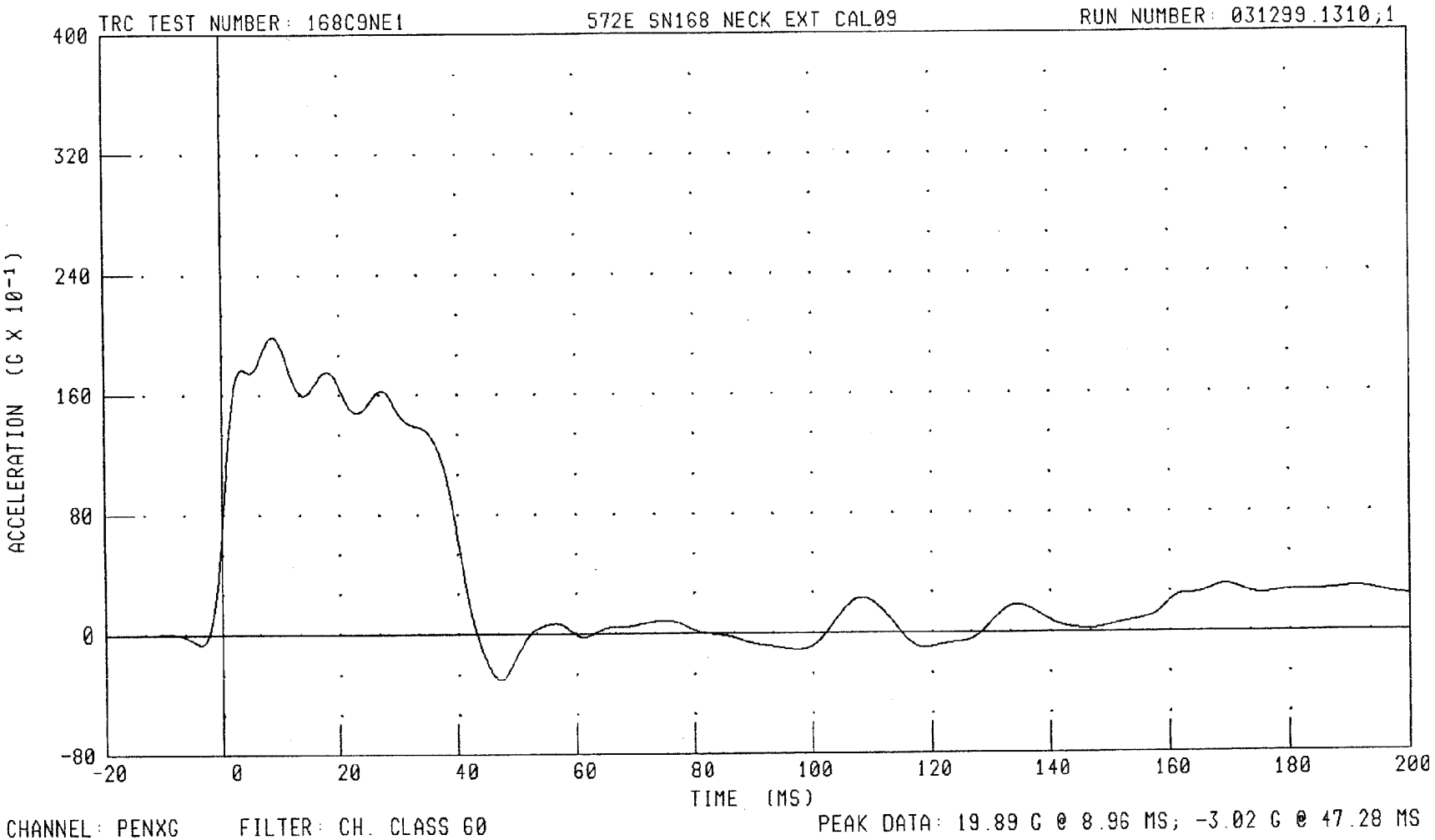
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	22.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.00 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	19.46 G
	20 MS	14.00 - 19.00 G	16.63 G
	30 MS	11.00 - 16.00 G	14.76 G
MAX PENDULUM G		22 G MAX	19.89 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	14.72 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	40.72 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	98.72 DEG.
	TIME	72 - 82 MS	77.04 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-66.28 NM
	TIME	65 - 79 MS	71.60 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	156.80 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	144.40 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031299.1310;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

PENDULUM DECELERATION

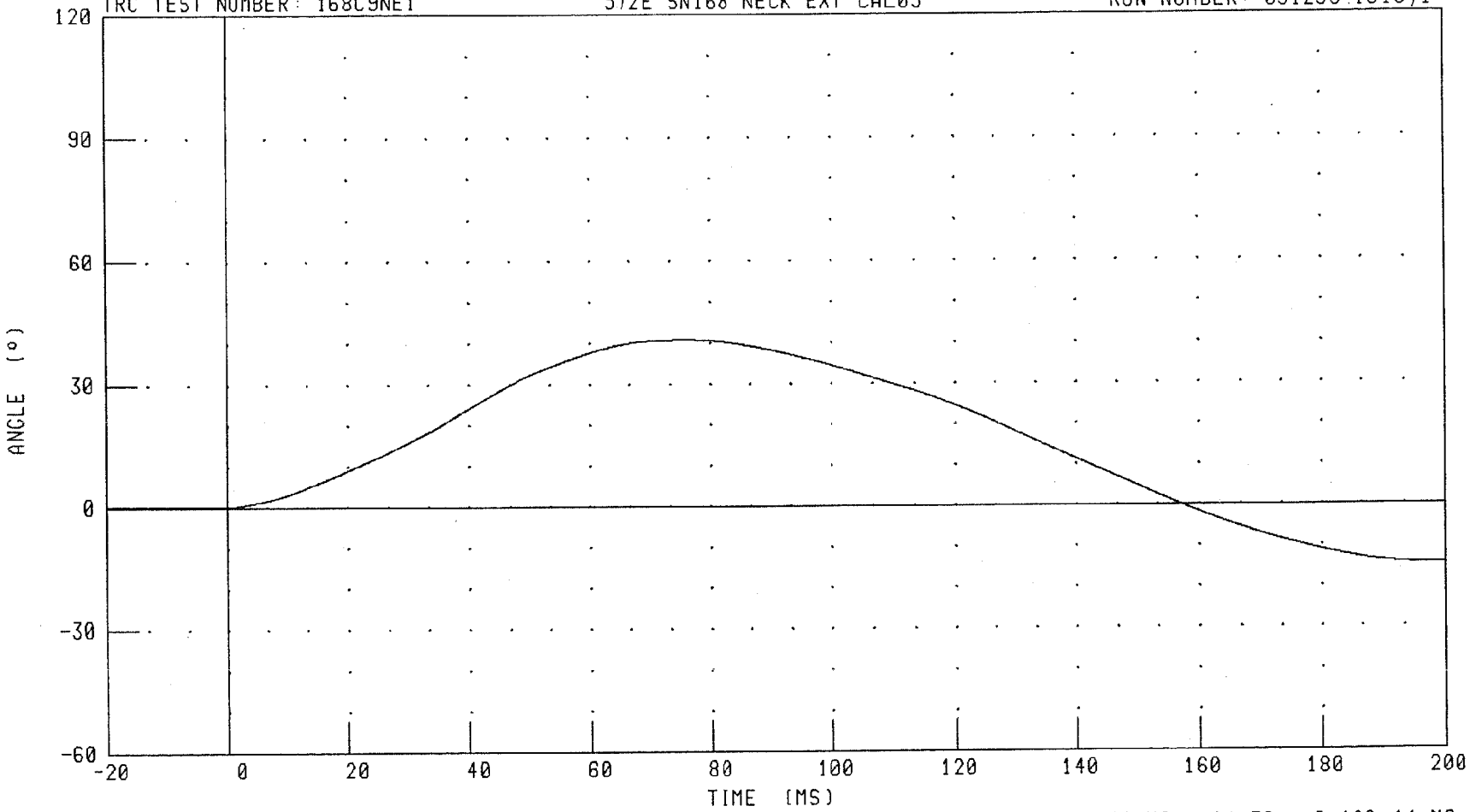


CHANNEL: PENXG FILTER: CH. CLASS 60

PEAK DATA: 19.89 G @ 8.96 MS; -3.02 G @ 47.28 MS

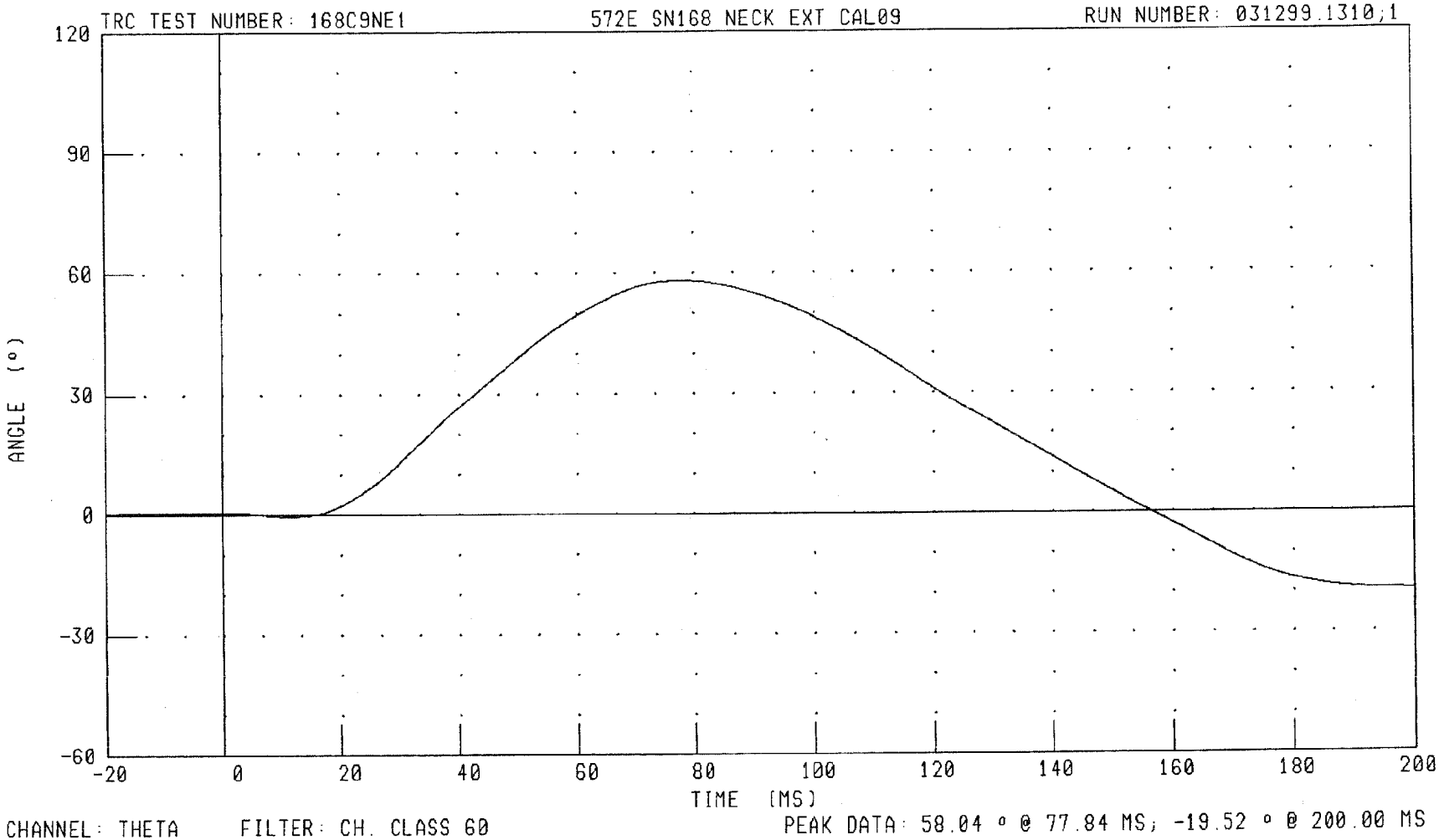
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 168C9NE1 572E SN168 NECK EXT CAL09 RUN NUMBER: 031299.1310;1



CHANNEL: BETA FILTER: CH. CLASS 60 PEAK DATA: 40.71 ° @ 75.76 MS; -14.58 ° @ 199.44 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE



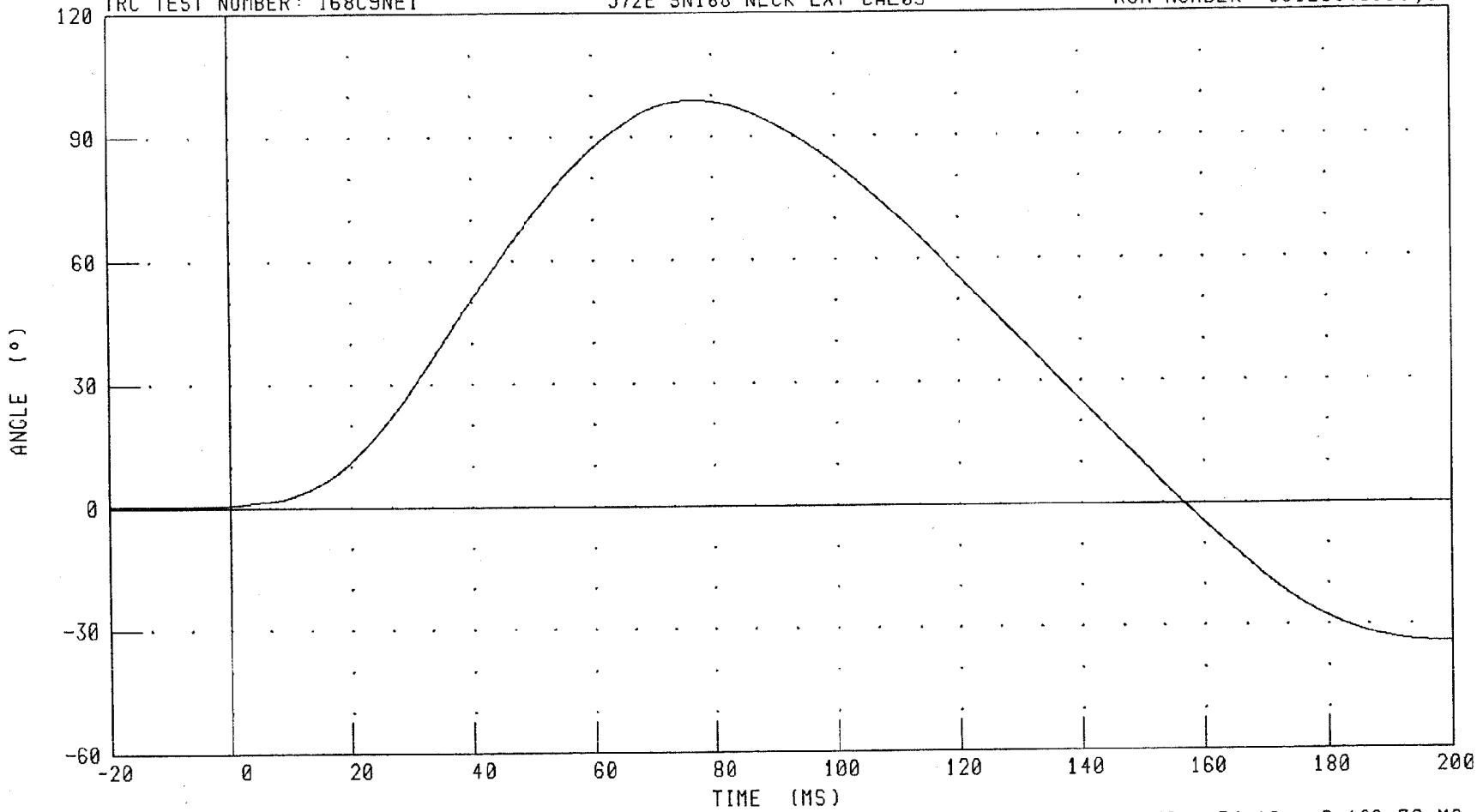
CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 58.04 ° @ 77.84 MS; -19.52 ° @ 200.00 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 168C9NE1 572E SN168 NECK EXT CAL09 RUN NUMBER: 031299.1310;1



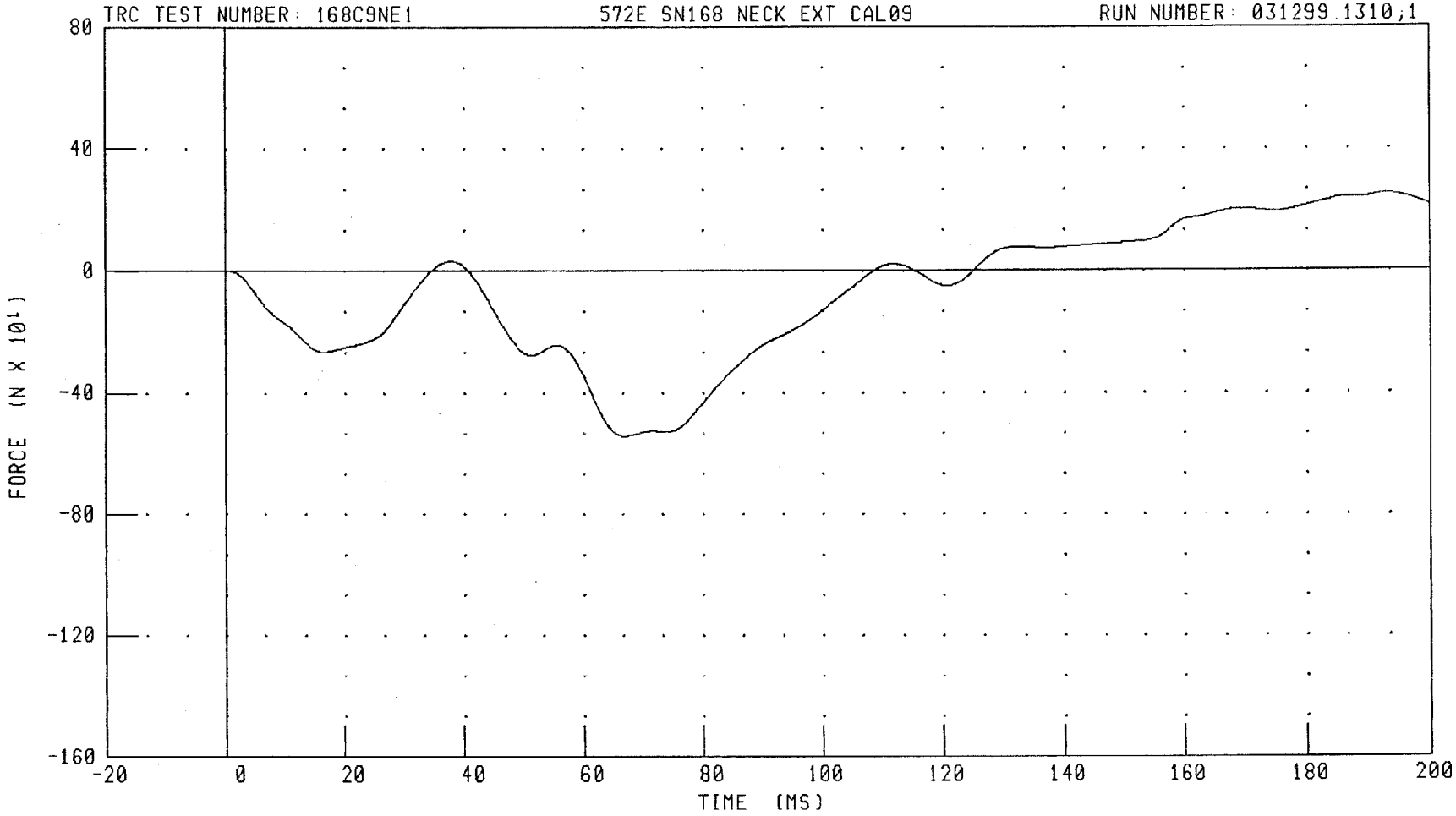
CHANNEL: TOTAN FILTER: CH. CLASS 60

PEAK DATA: 98.72 ° @ 77.04 MS; -34.10 ° @ 199.76 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 168C9NE1 572E SN168 NECK EXT CAL09 RUN NUMBER: 031299.1310;1

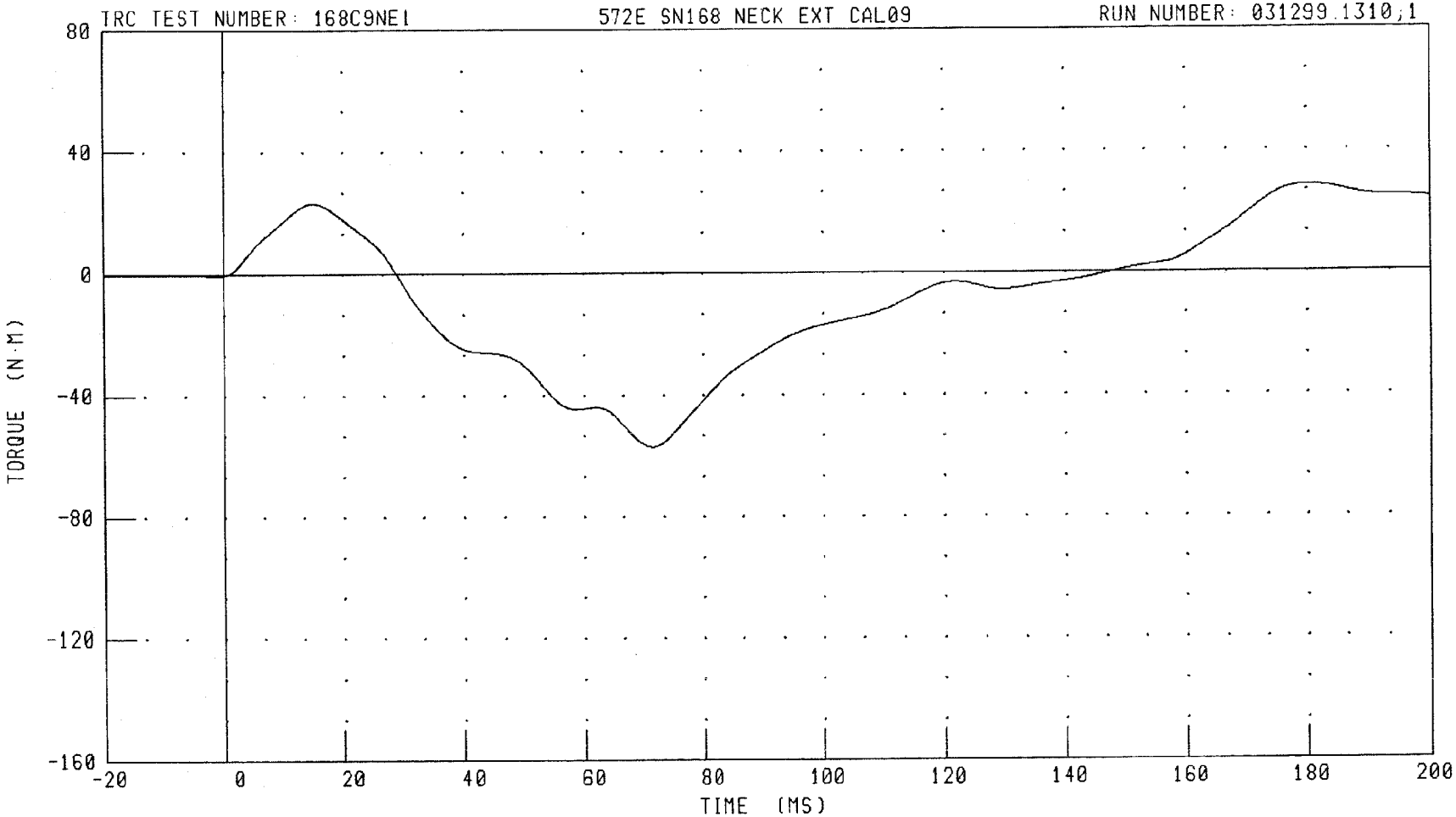


CHANNEL: NEKXF FILTER: CH. CLASS 60 PEAK DATA: 252.04 N @ 192.96 MS; -543.10 N @ 67.04 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

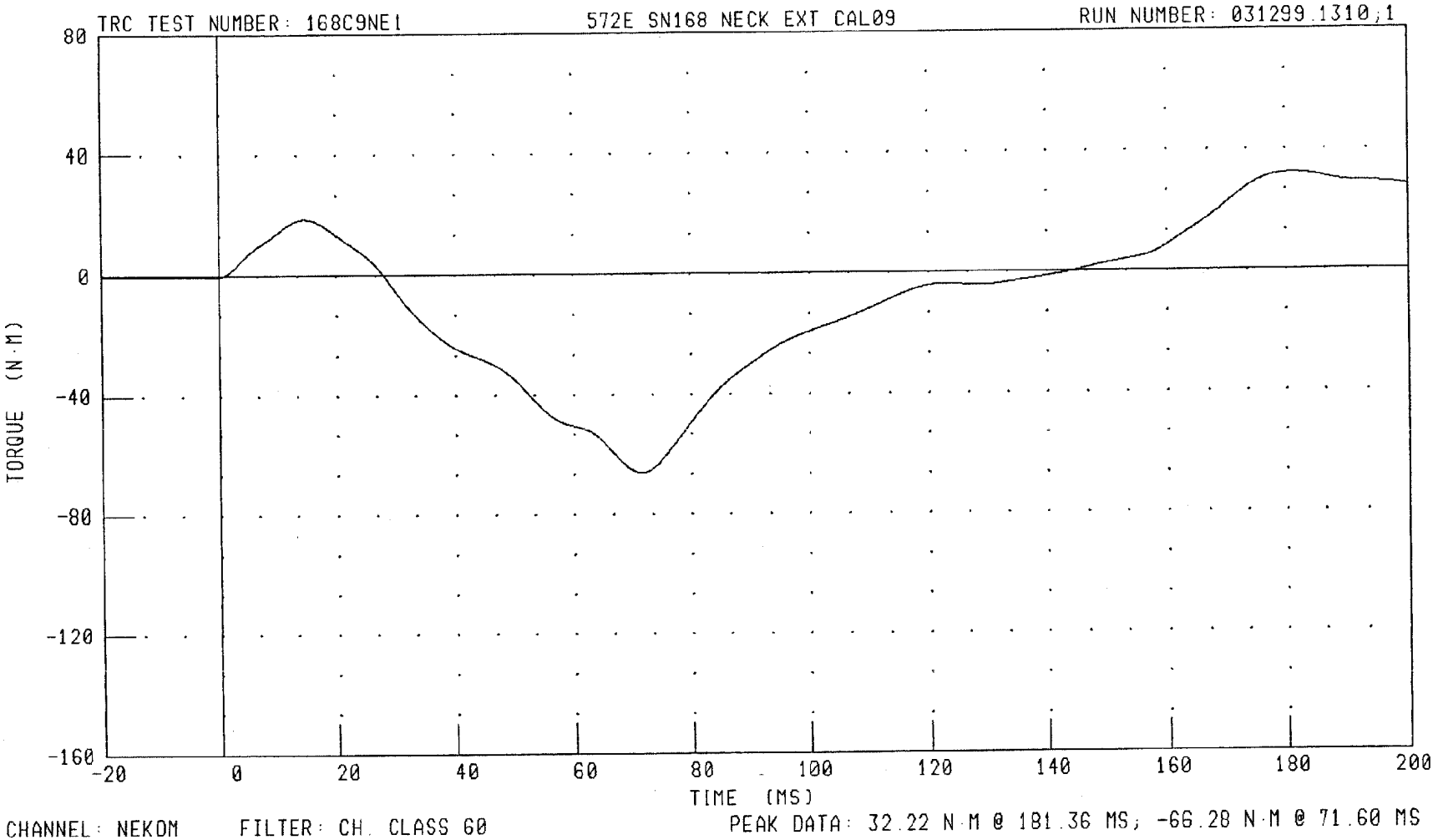
NECK MOMENT Y AXIS

TRC TEST NUMBER: 168C9NEI 572E SN168 NECK EXT CAL09 RUN NUMBER: 031299.1310;1



CHANNEL: NEKYM FILTER: CH. CLASS 60 PEAK DATA: 28.34 N-M @ 180.56 MS; -56.95 N-M @ 71.60 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 32.22 N·M @ 181.36 MS; -66.28 N·M @ 71.60 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III 50th 12-MAR-99

TRC INC. TEST NO: 168C9TH1 572E SN168 H.S.THORAX CAL09

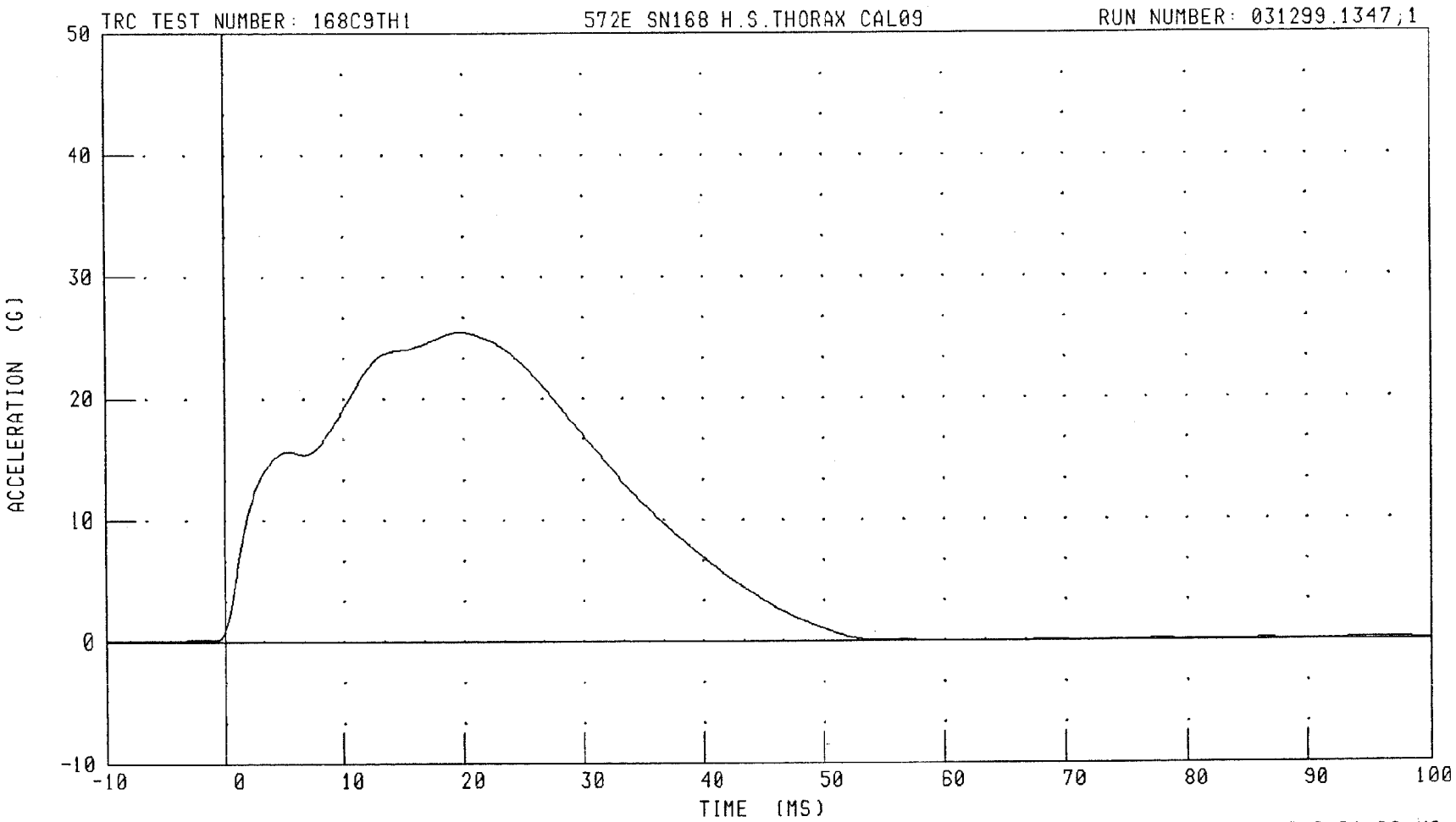
TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.62 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	68.9 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5831. N
INTERNAL HYSTERESIS	69% - 85%	69.3%

TEST MEETS SPECIFICATIONS

TECHNICIAN By Colt

RUN NUMBER: 031299.1347;1

PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION

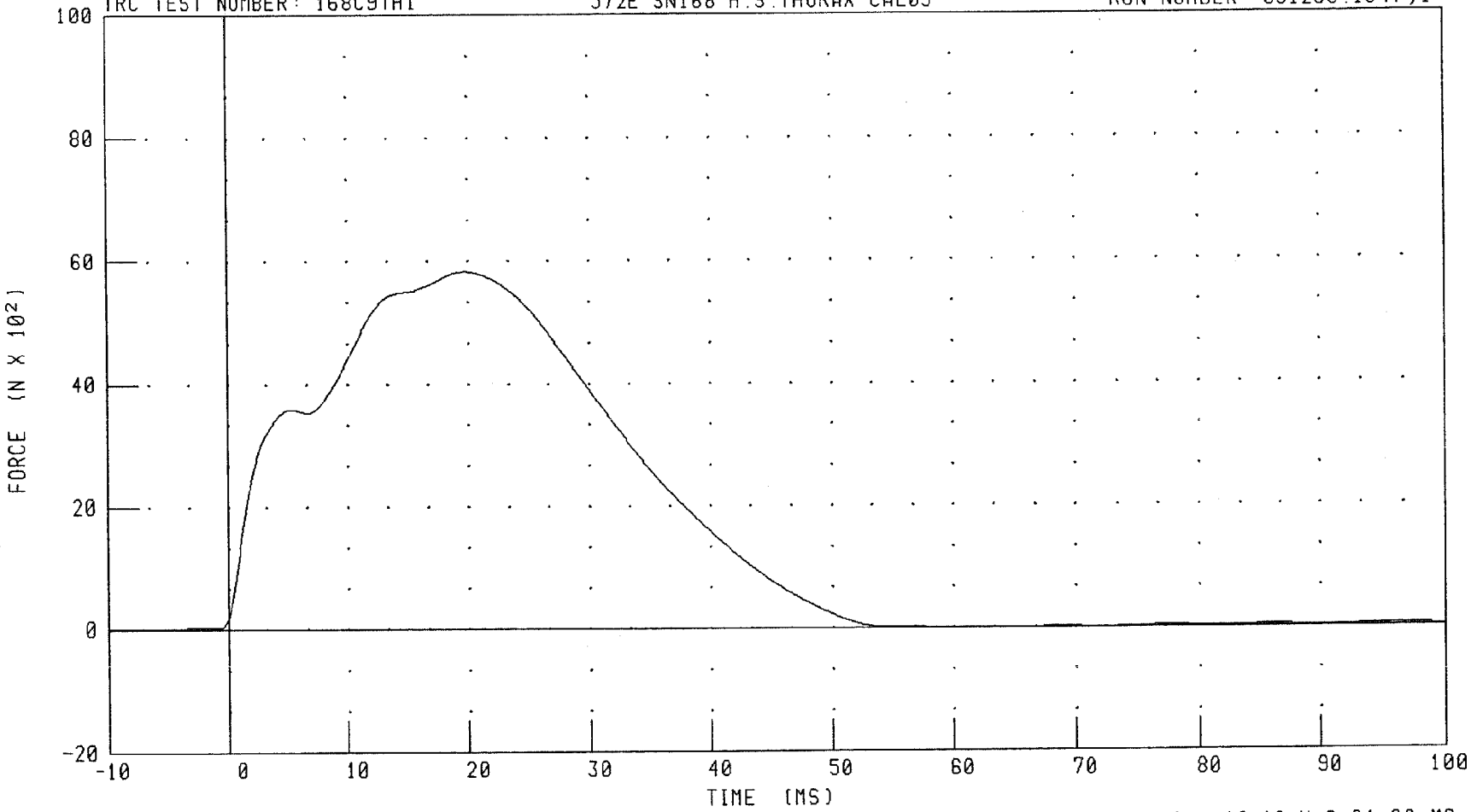


CHANNEL: PENXG FILTER: CH. CLASS 180 PEAK DATA: 25.45 G @ 19.84 MS; -0.04 G @ 64.80 MS

PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM FORCE

TRC TEST NUMBER: 168C9TH1 572E SN168 H.S.THORAX CAL09 RUN NUMBER: 031299.1347;1



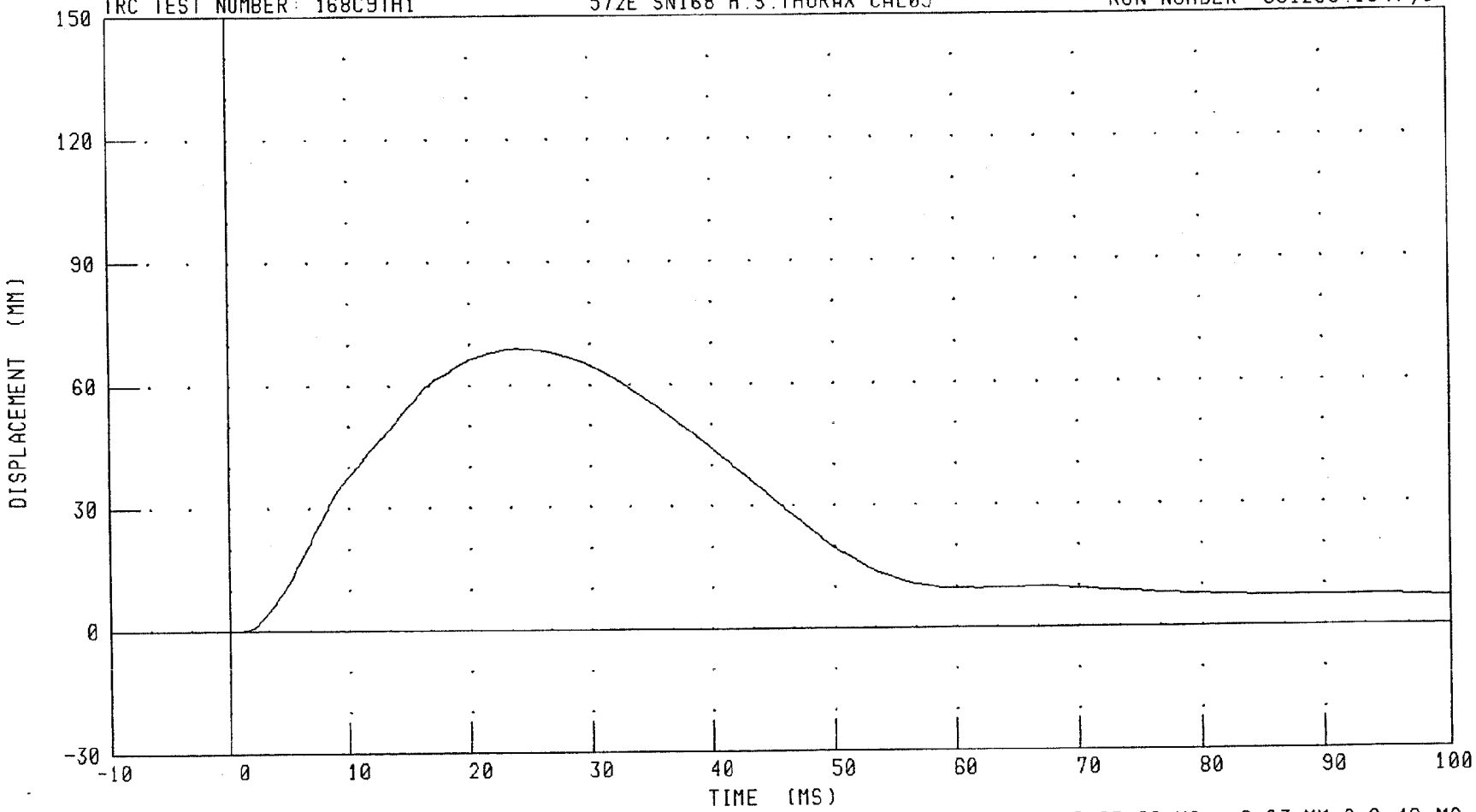
CHANNEL: PENXF FILTER: CH. CLASS 180

PEAK DATA: 5831.05 N @ 19.84 MS; -10.19 N @ 64.80 MS

PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

TRC TEST NUMBER: 168C9TH1 572E SN168 H.S.THORAX CAL09 RUN NUMBER: 031299.1347;1

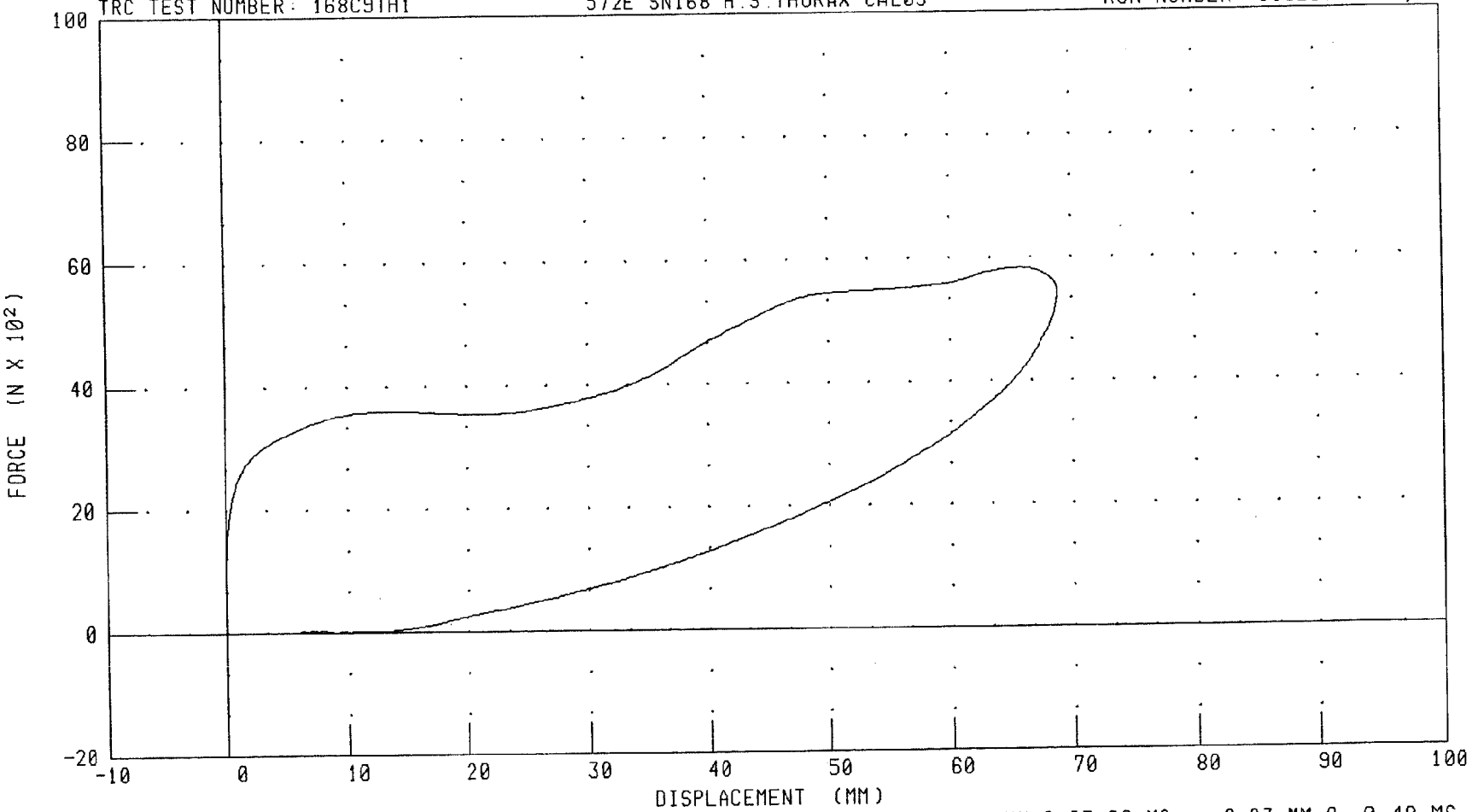


CHANNEL: CSTXD FILTER: CH. CLASS 180

PEAK DATA: 68.91 MM @ 23.92 MS; -0.03 MM @ 0.48 MS

PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

TRC TEST NUMBER: 168C9TH1
572E SN168 H.S.THORAX CAL09
RUN NUMBER: 031299.1347;1



CHANNEL: CSTXD
PENXF

FILTER: CH. CLASS 180
CH. CLASS 180

PEAK DATA: 68.91 MM @ 23.92 MS; -0.03 MM @ 0.48 MS
5831.05 N @ 19.84 MS; -10.19 N @ 64.80 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E 12-MAR-99

TRC INC. TEST NO: 168C9HR1 572E SN 168 HIPFLEX CAL 09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	65.4 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	46.8 deg.

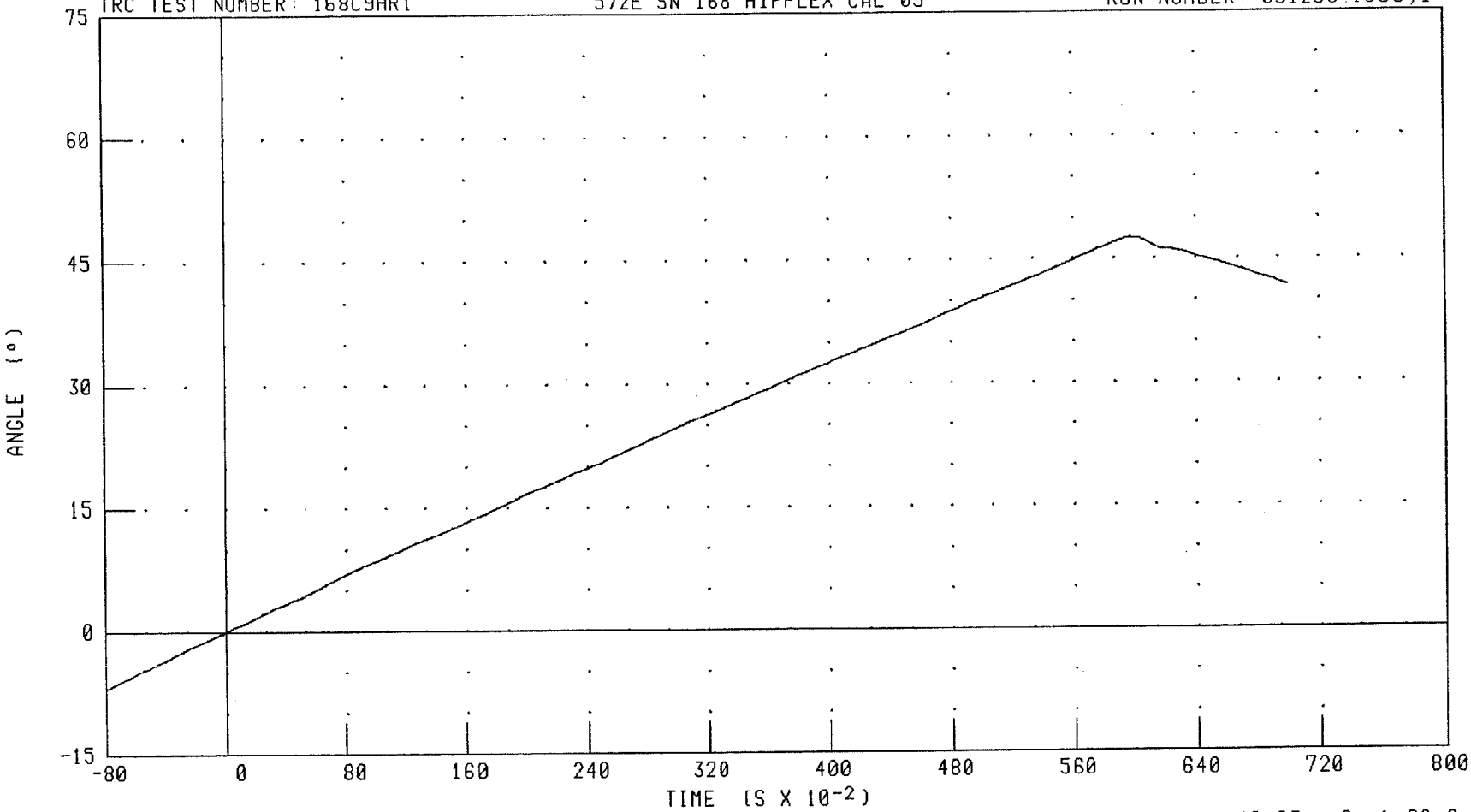
TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031299.1039;1

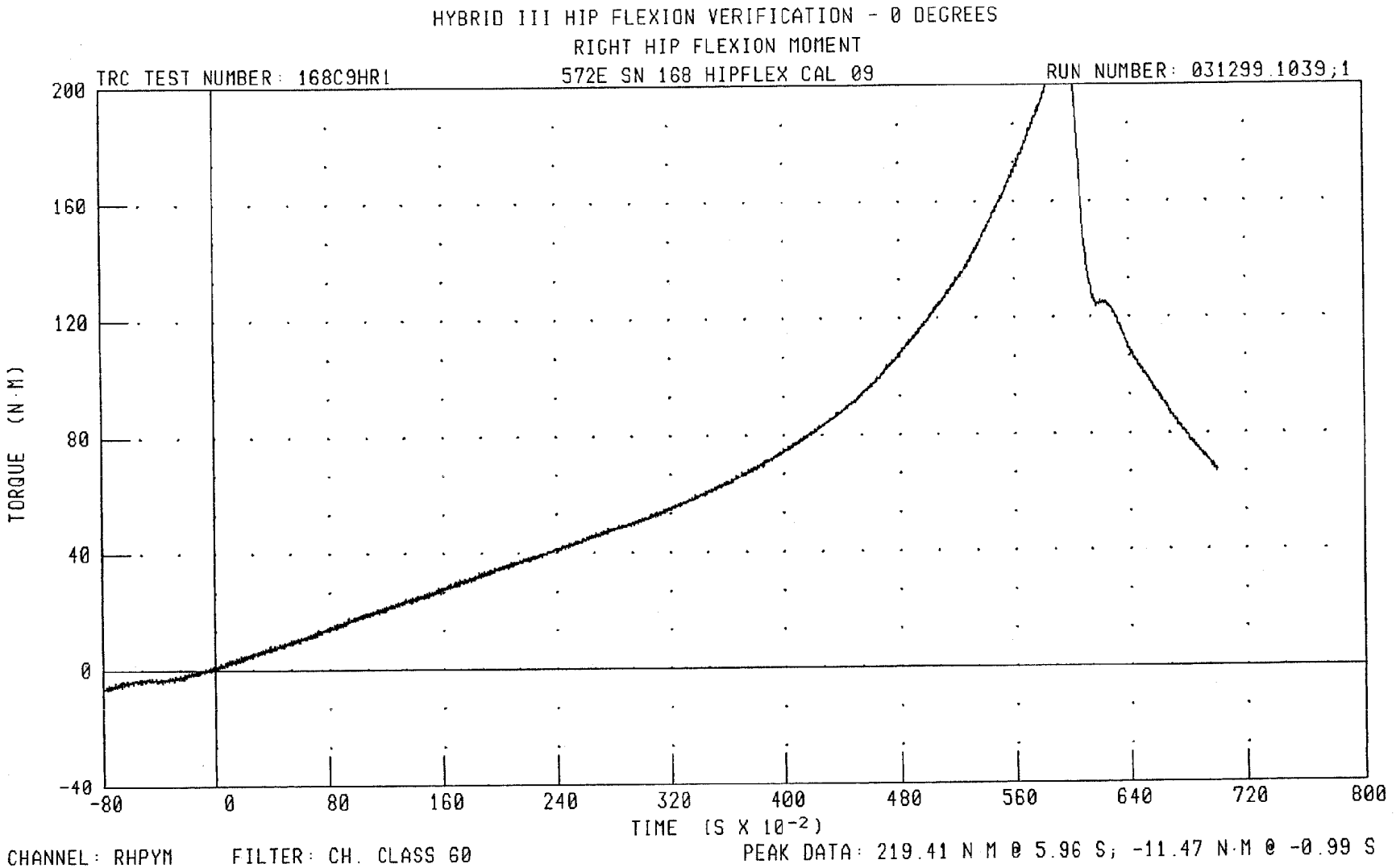
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION ROTATION

TRC TEST NUMBER: 168C9HR1 572E SN 168 HIPFLEX CAL 09 RUN NUMBER: 031299 1039;1



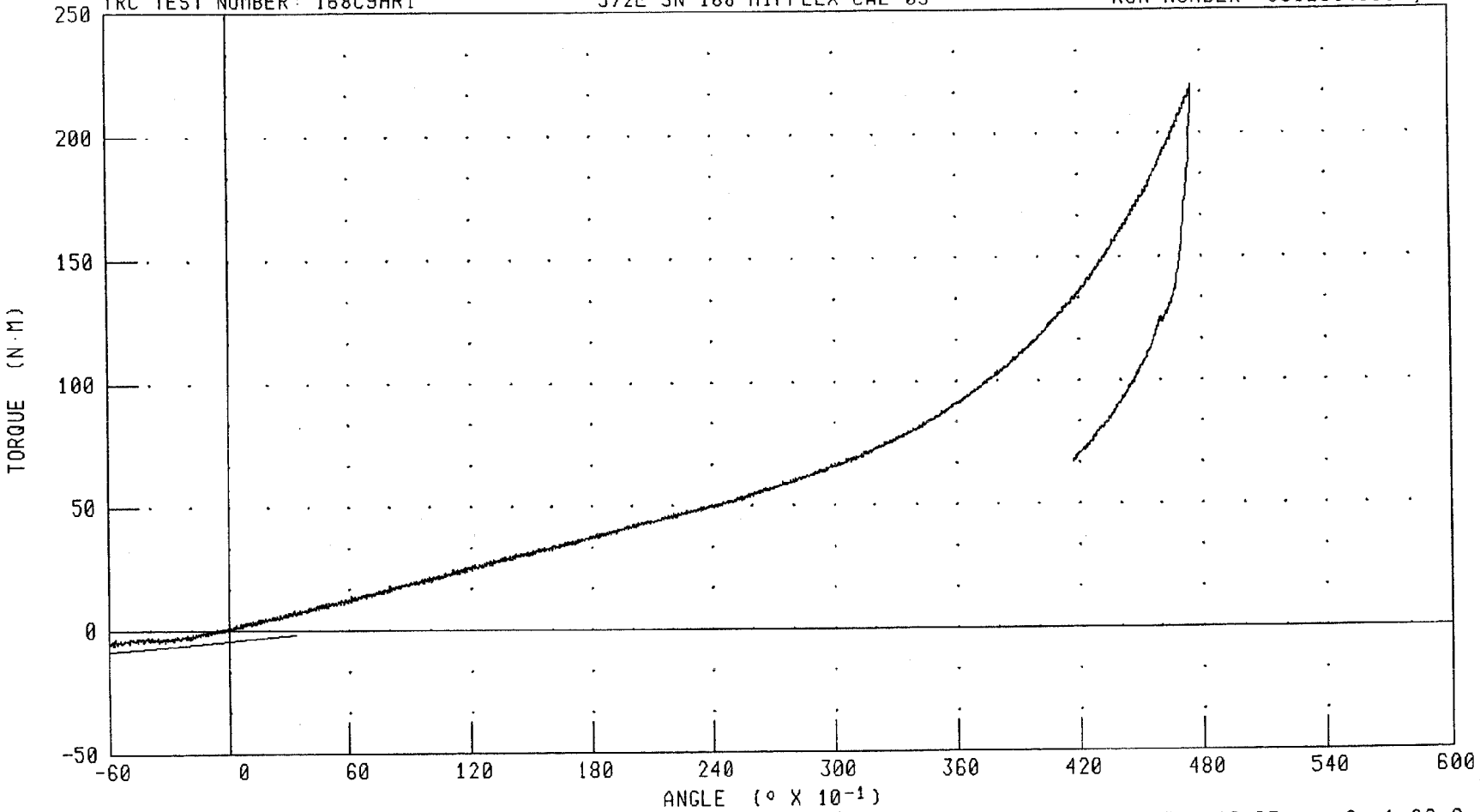
CHANNEL: RHPXD FILTER: CH. CLASS 60 PEAK DATA: 47.56 ° @ 5.98 S; -10.03 ° @ -1.00 S


HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
RIGHT HIP FLEXION MOMENT
TRC TEST NUMBER: 168C9HR1
572E SN 168 HIPFLEX CAL 09
RUN NUMBER: 031299.1039;1
TORQUE (N·M)
200
160
120
80
40
0
-40
-80
0
80
160
240
320
400
480
560
640
720
800
TIME (S X 10-2)
CHANNEL: RHPYM
FILTER: CH. CLASS 60
PEAK DATA: 219.41 N·M @ 5.96 S; -11.47 N·M @ -0.99 S

HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION MOMENT VS ROTATION ANGLE

TRC TEST NUMBER: 168C9HR1 572E SN 168 HIPFLEX CAL 09 RUN NUMBER: 031299.1039;1



CHANNEL: RHPXD FILTER: CH. CLASS 60

RHPYM CH. CLASS 60

PEAK DATA: 47.56 ° @ 5.98 S; -10.03 ° @ -1.00 S

219.41 N·M @ 5.96 S; -11.47 N·M @ -0.99 S

TRANSPORTATION RESEARCH CENTER INC.

LEFT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E 12-MAR-99

TRC INC. TEST NO: 168C9HL1 572E SN 168 HIPFLEX CAL 09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	66.5 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	45.2 deg.

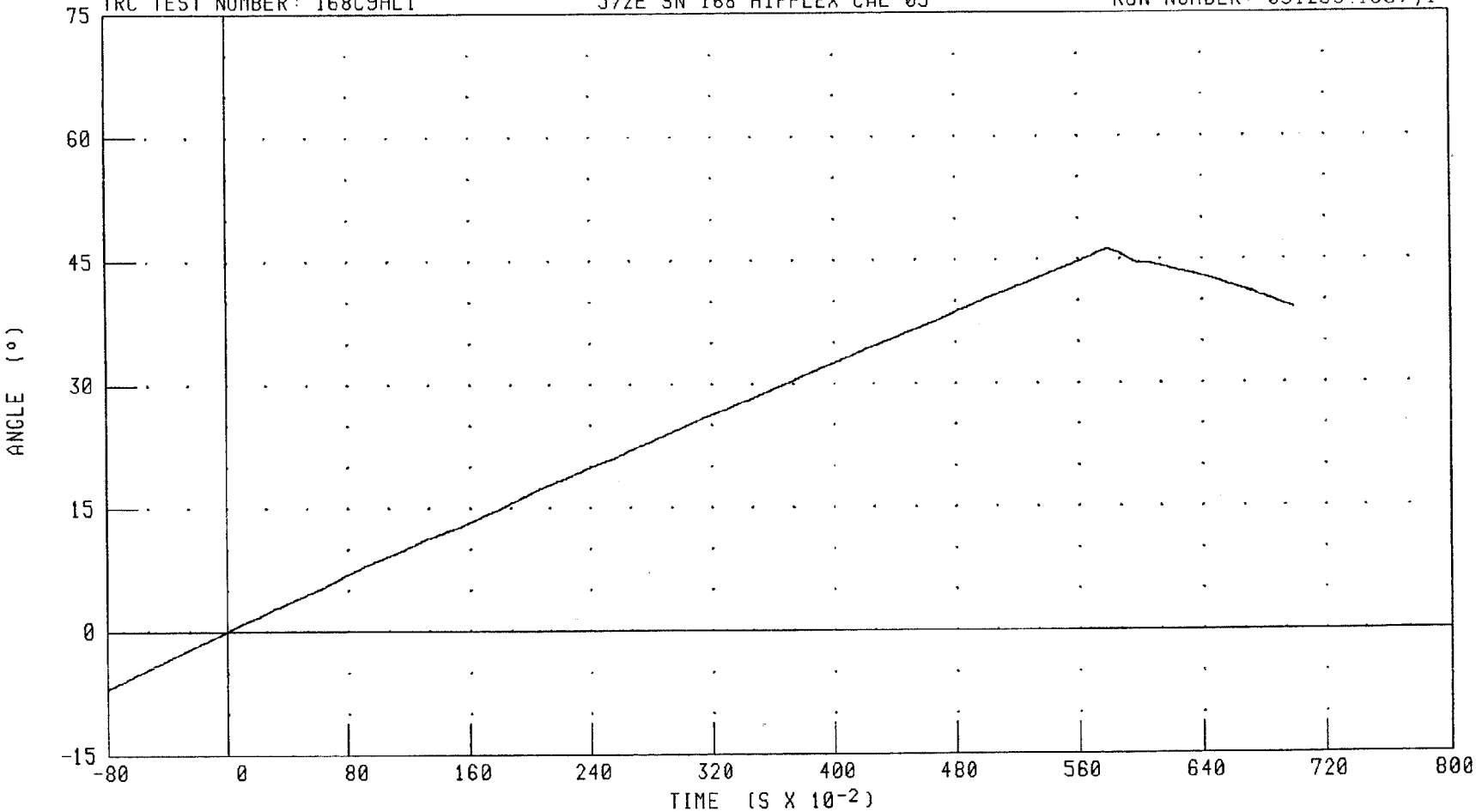
TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031299.1036;1

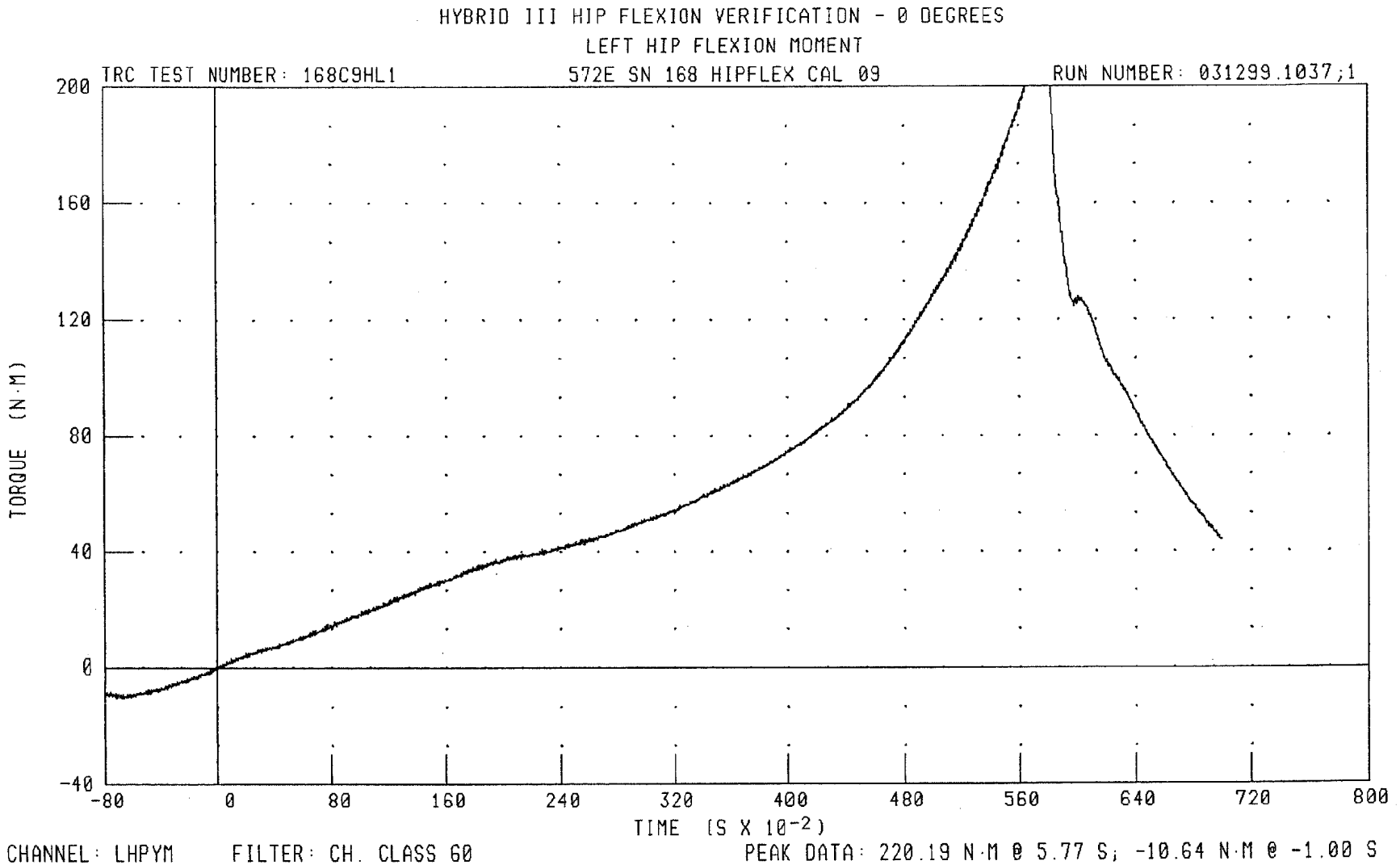
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION ROTATION

TRC TEST NUMBER: 168C9HL1 572E SN 168 HIPFLEX CAL 09 RUN NUMBER: 031299.1037;1



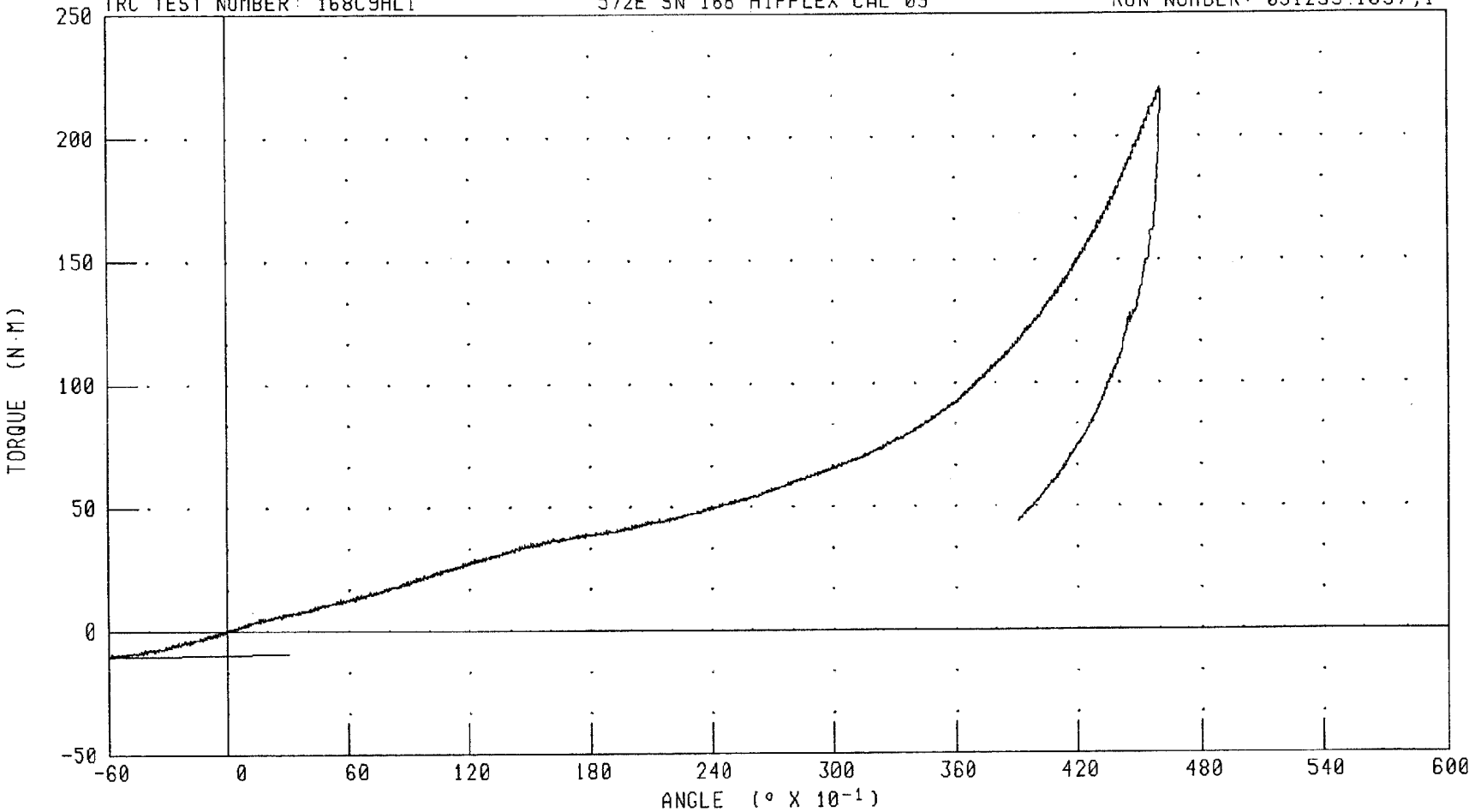
CHANNEL: LHPXD FILTER: CH. CLASS 60 PEAK DATA: 46.15 ° @ 5.81 S; -10.09 ° @ -1.00 S


HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
LEFT HIP FLEXION MOMENT
TRC TEST NUMBER: 168C9HL1
572E SN 168 HIPFLEX CAL 09
RUN NUMBER: 031299.1037;1
TORQUE (N·M)
200
160
120
80
40
0
-40
-80
0
80
160
240
320
400
480
560
640
720
800
TIME (S X 10-2)
CHANNEL: LHPYM
FILTER: CH. CLASS 60
PEAK DATA: 220.19 N·M @ 5.77 S; -10.64 N·M @ -1.00 S

HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION MOMENT VS ROTATION ANGLE

TRC TEST NUMBER: 168C9HL1 572E SN 168 HIPFLEX CAL 09 RUN NUMBER: 031299.1037;1



CHANNEL: LHPXD FILTER: CH. CLASS 60

LHPYM CH. CLASS 60

PEAK DATA: 46.15 ° @ 5.81 S; -10.09 ° @ -1.00 S

220.19 N·M @ 5.77 S; -10.64 N·M @ -1.00 S

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III 50th 12-MAR-99

TRC INC. TEST NO: 168C9RK1 572E SN168 RIGHT KNEE CAL 09

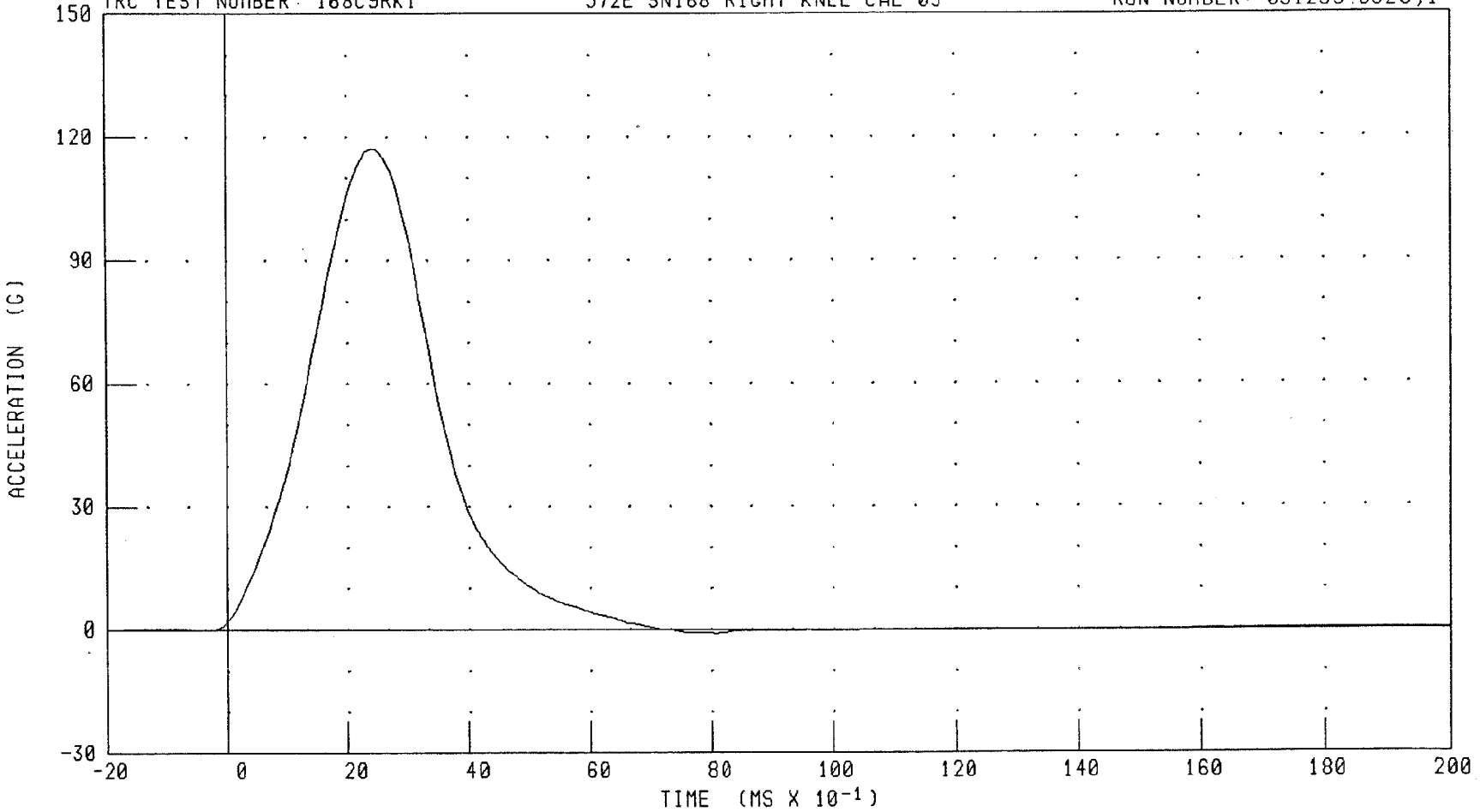
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5724.3 N

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031299.0925;1

PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 168C9RK1
572E SN168 RIGHT KNEE CAL 09
RUN NUMBER: 031299.0925;1

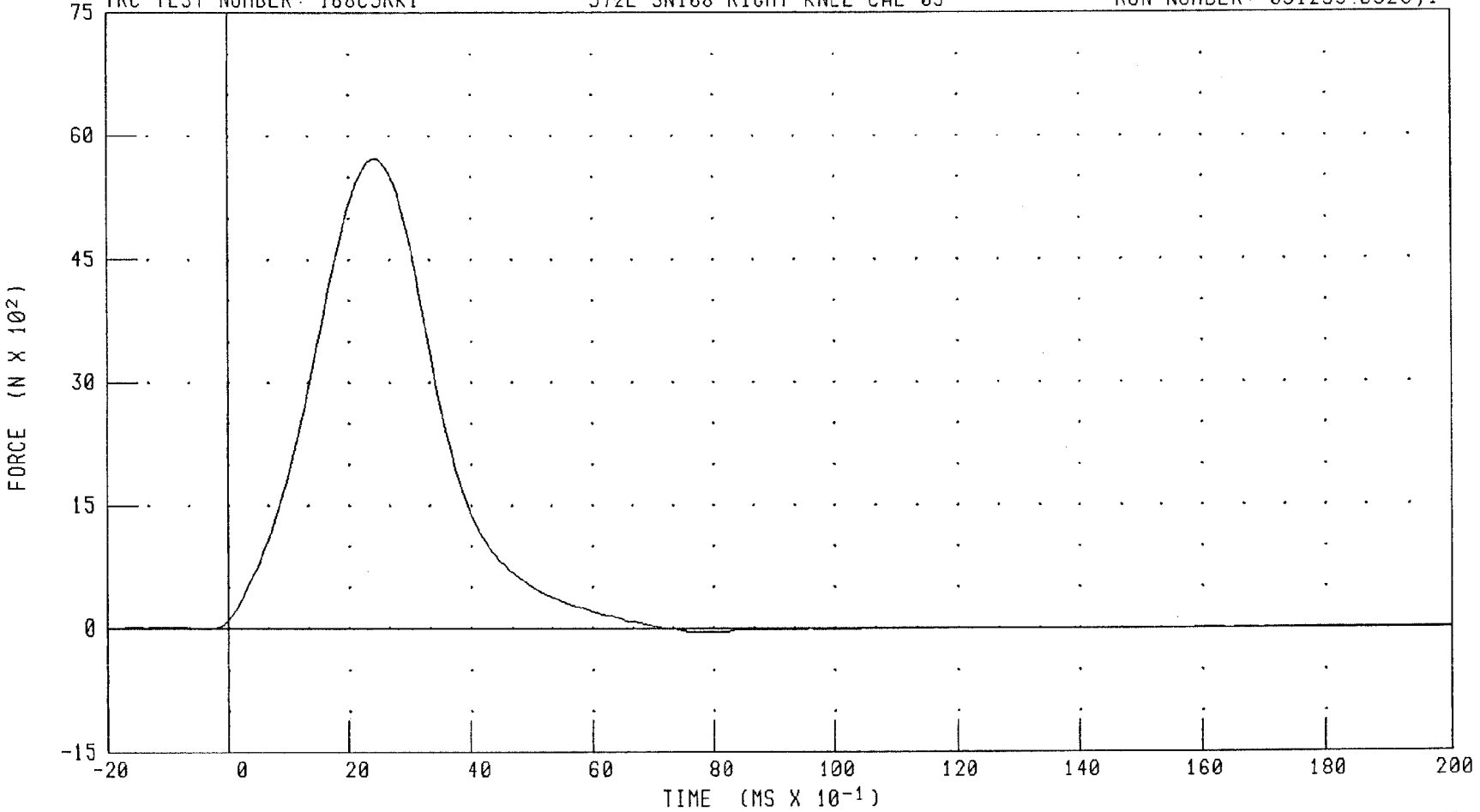


CHANNEL: PENXG FILTER: CH. CLASS 600
PEAK DATA: 117.00 G @ 2.40 MS; -0.95 G @ 8.08 MS

PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 168C9RK1 572E SN168 RIGHT KNEE CAL 09 RUN NUMBER: 031299.0925;1



CHANNEL: PENXF FILTER: CH. CLASS 600 PEAK DATA: 5724.35 N @ 2.40 MS; -46.59 N @ 8.08 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III 50th 12-MAR-99

TRC INC. TEST NO: 168C9LK1 572E SN168 LEFT KNEE CAL 09

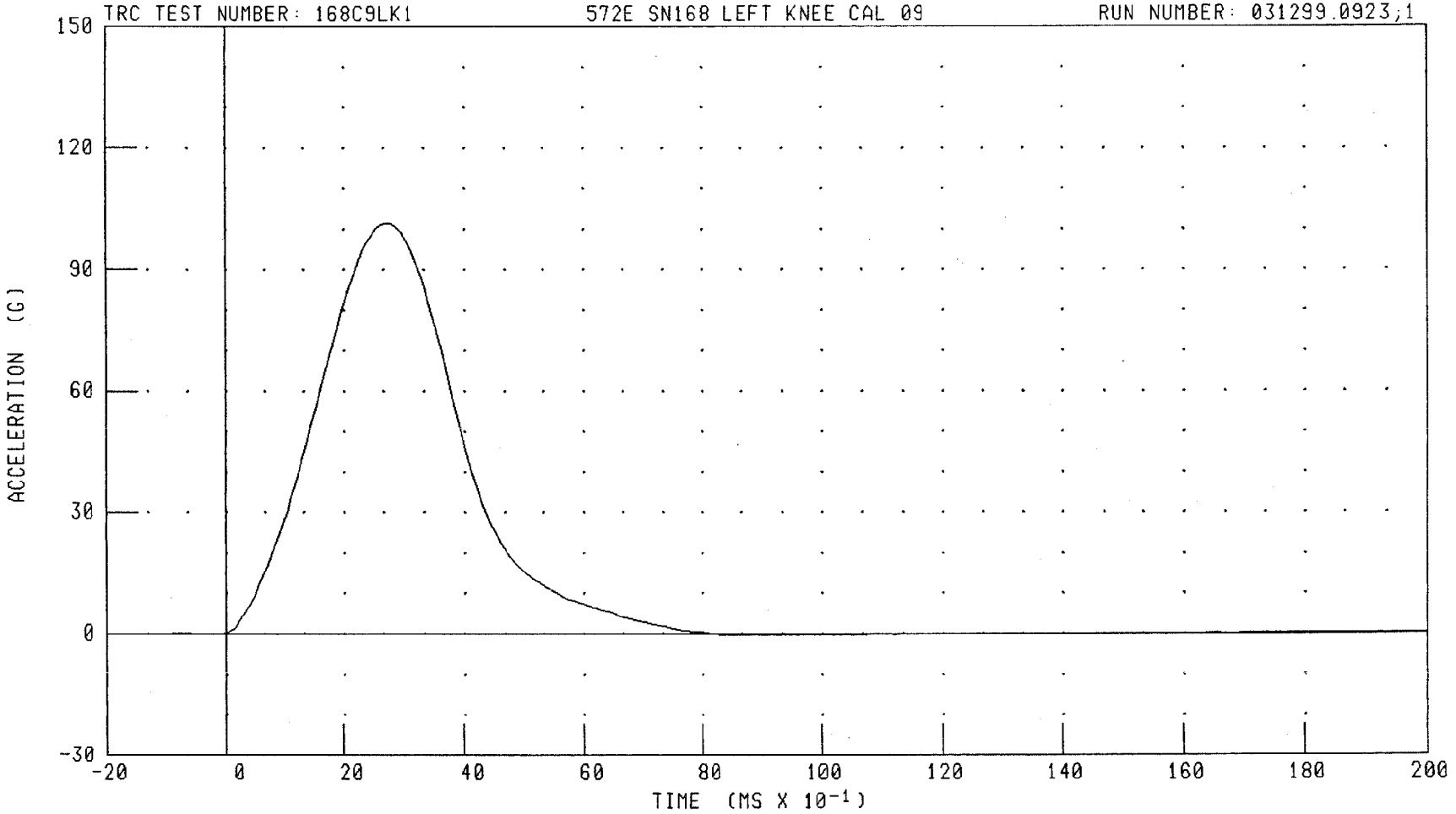
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.10 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	4962.2 N

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031299.0923;1

PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 168C9LK1
572E SN168 LEFT KNEE CAL 09
RUN NUMBER: 031299.0923;1

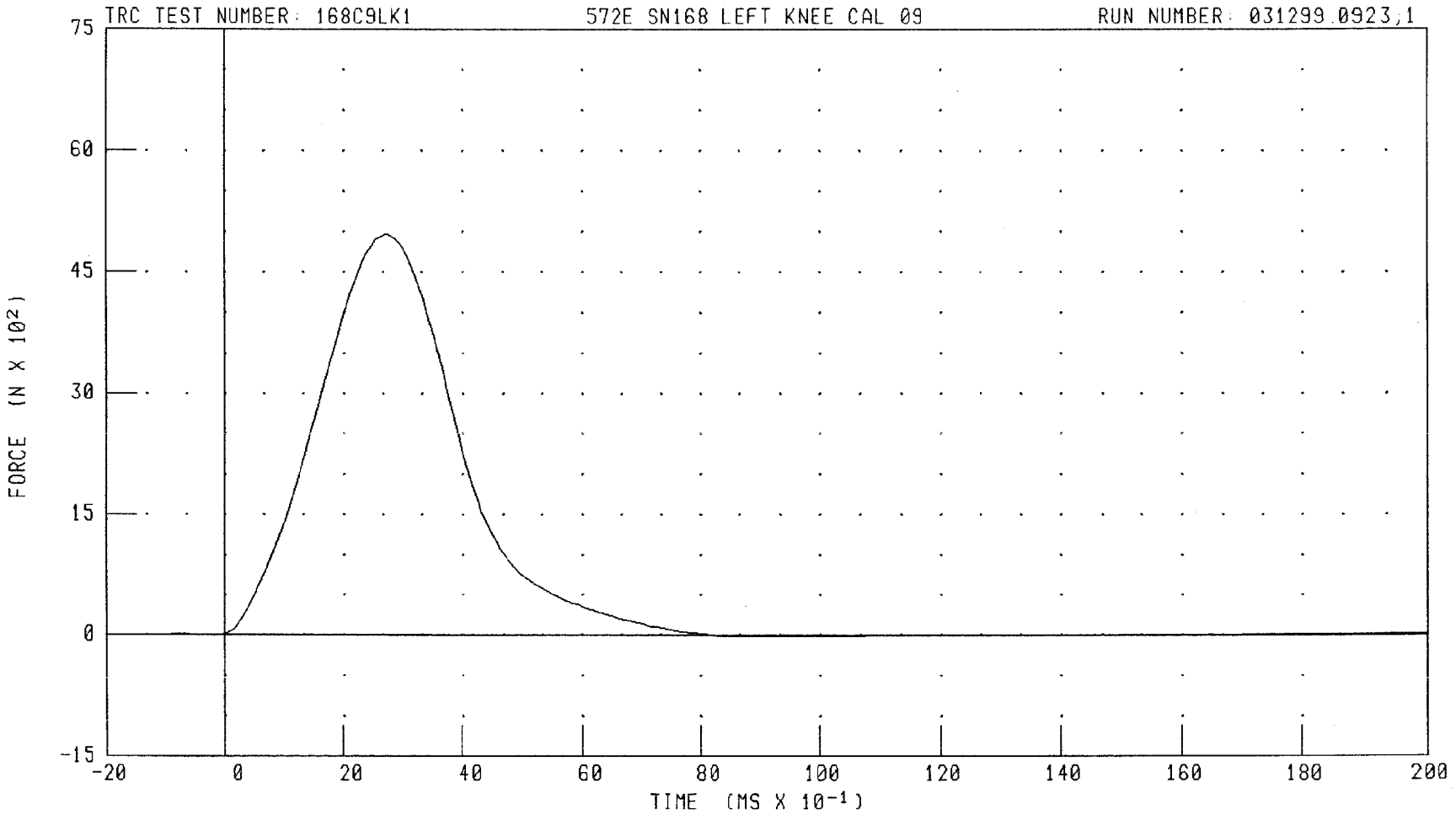


CHANNEL: PENXC FILTER: CH. CLASS 600
PEAK DATA: 101.42 G @ 2.72 MS; -0.43 G @ 9.04 MS

PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 168C9LK1 572E SN168 LEFT KNEE CAL 09 RUN NUMBER: 031299.0923;1



CHANNEL: PENXF FILTER: CH. CLASS 600 PEAK DATA: 4962.30 N @ 2.72 MS; -21.09 N @ 9.04 MS

Post-Test Dummy Certification

Driver Dummy S/N 168

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III 50th 17-MAR-99

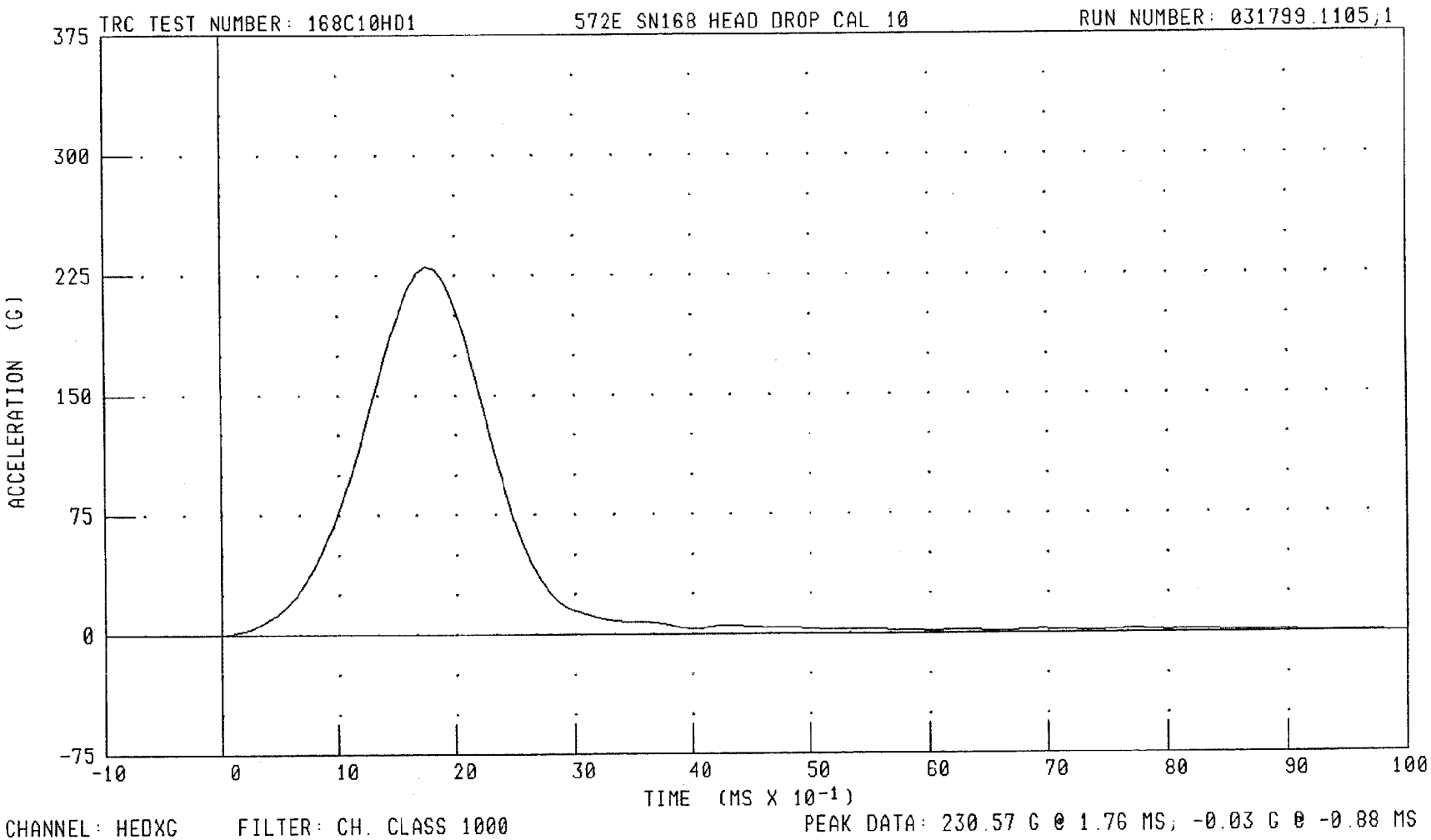
TRC INC. TEST NO: 168C10HD1 572E SN168 HEAD DROP CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	263.82 G
PEAK LATERAL ACCELERATION	15 G MAX	-2.53 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1105;1

PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS

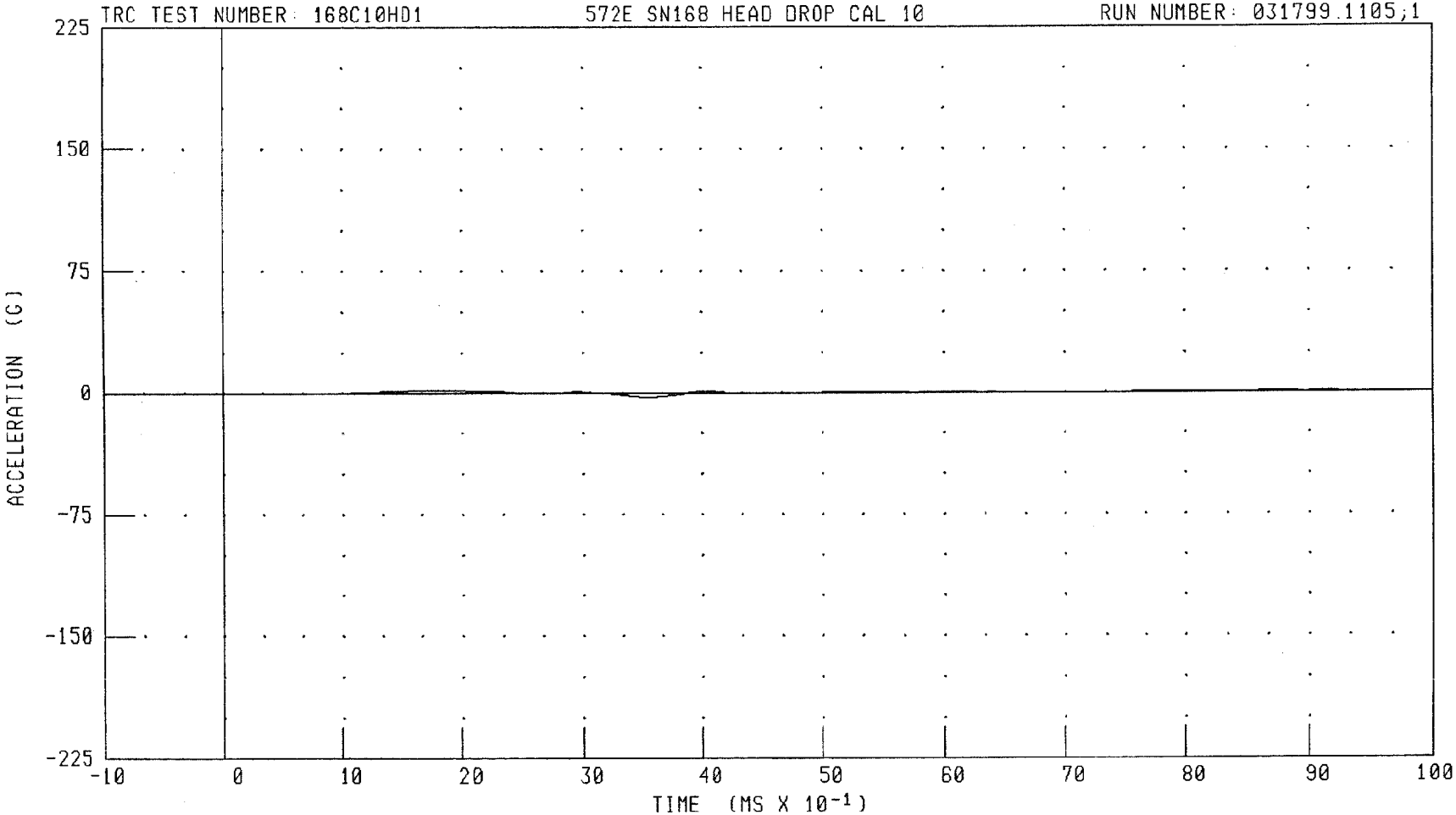


CHANNEL: HEDXG FILTER: CH. CLASS 1000

PEAK DATA: 230.57 G @ 1.76 MS; -0.03 G @ -0.88 MS

PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

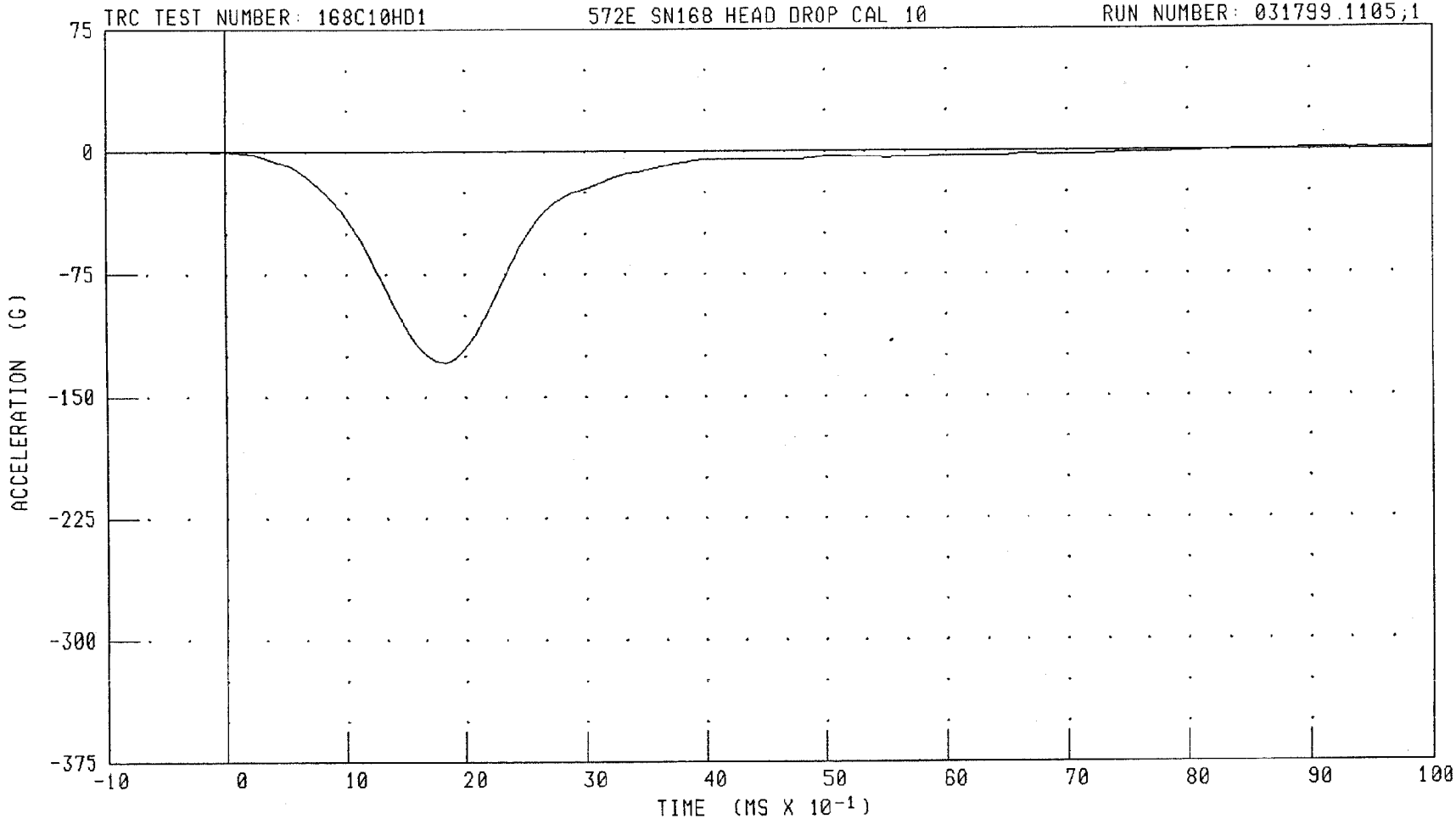
TRC TEST NUMBER: 168C10HD1 572E SN168 HEAD DROP CAL 10 RUN NUMBER: 031799.1105;1



CHANNEL: HEDYG FILTER: CH. CLASS 1000 PEAK DATA: 1.77 G @ 1.84 MS, -2.54 G @ 3.52 MS

PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Z AXIS

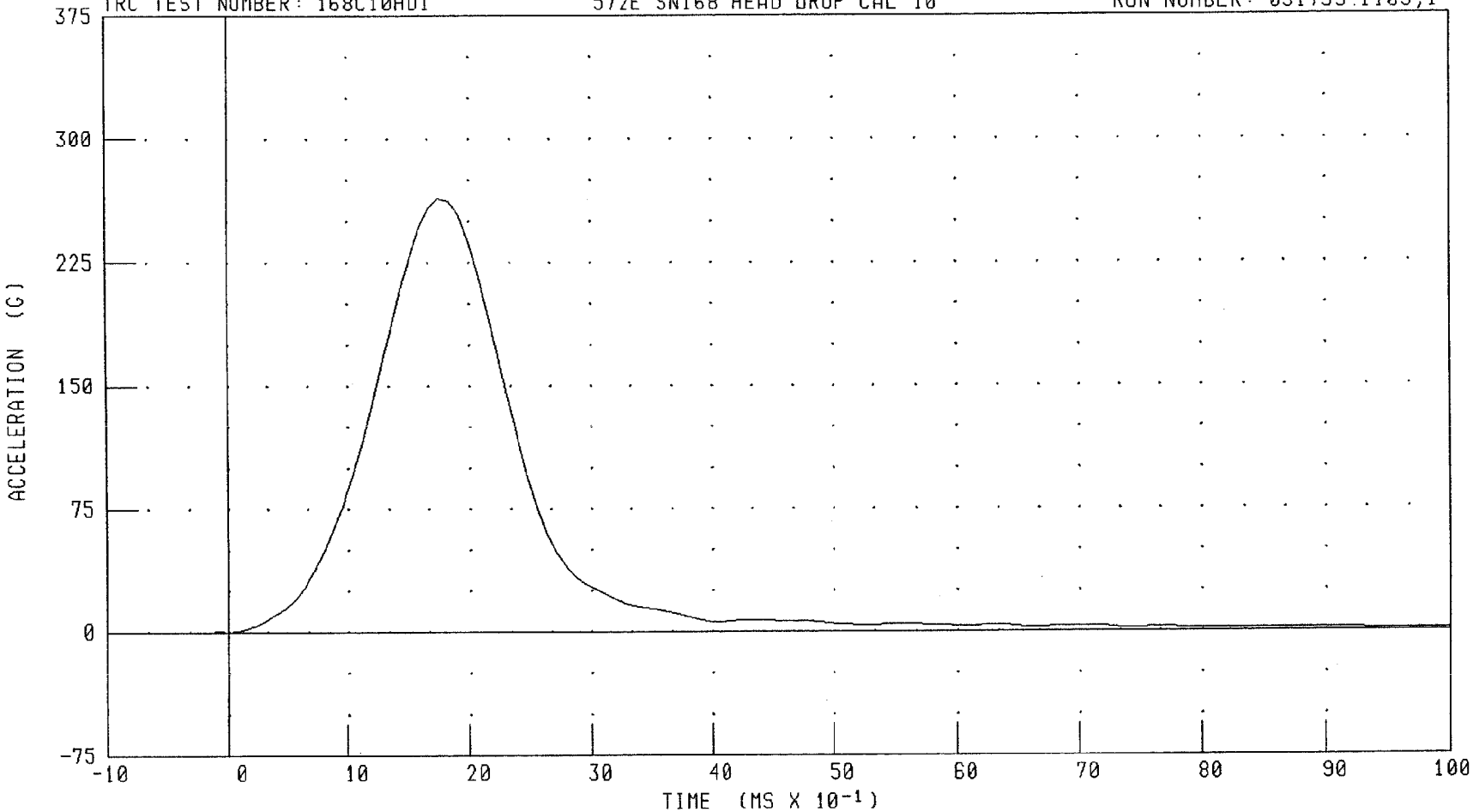
TRC TEST NUMBER: 168C10HD1 572E SN168 HEAD DROP CAL 10 RUN NUMBER: 031799.1105;1



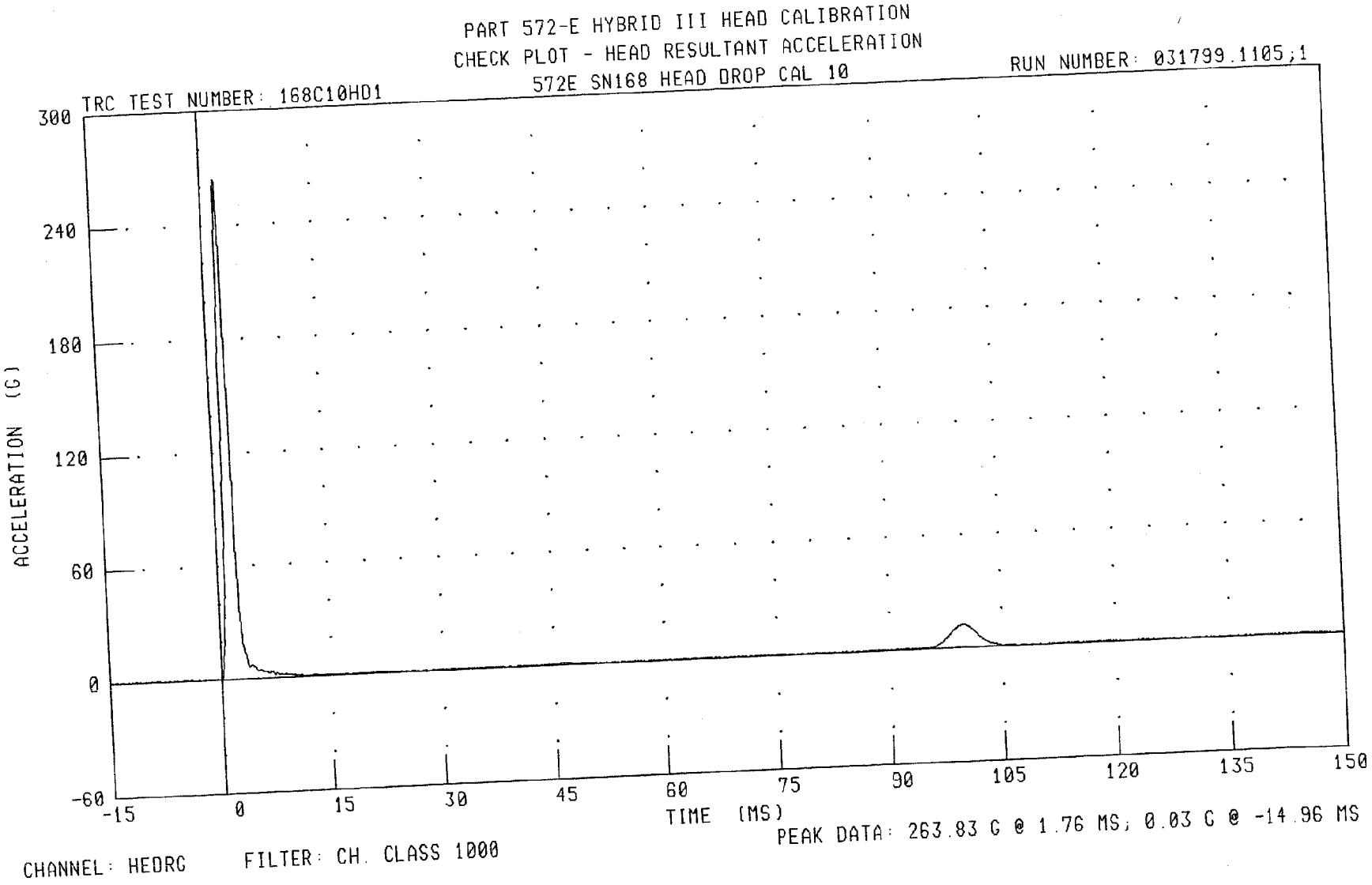
CHANNEL: HEDZG FILTER: CH. CLASS 1000 PEAK DATA: 1.18 G @ 10.00 MS; -129.01 G @ 1.84 MS

PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION

TRC TEST NUMBER: 168C10HD1
572E SN168 HEAD DROP CAL 10
RUN NUMBER: 031799.1105;1



CHANNEL: HEDRG FILTER: CH. CLASS 1000
PEAK DATA: 263.83 G @ 1.76 MS; 0.03 G @ -0.88 MS


PART 572-E HYBRID III HEAD CALIBRATION
CHECK PLOT - HEAD RESULTANT ACCELERATION
572E SN168 HEAD DROP CAL 10
TRC TEST NUMBER: 168C10HD1
RUN NUMBER: 031799.1105;1
ACCELERATION (G)
300
240
180
120
60
0
-60
-15
0
15
30
45
60
75
90
105
120
135
150
TIME (MS)
CHANNEL: HEDRC
FILTER: CH. CLASS 1000
PEAK DATA: 263.83 G @ 1.76 MS; 0.03 G @ -14.96 MS

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III 50th 17-MAR-99

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 168C10NF2 572E SN168 NECK FLEXION CAL10

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY		10 - 70 %	22.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	6.99 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.75 G
	20 MS	17.60 - 22.60 G	20.69 G
	30 MS	12.50 - 18.50 G	16.75 G
MAX PENDULUM G		29 G MAX	24.54 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	16.69 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	38.08 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	71.68 DEG.
	TIME	57 - 64 MS	57.68 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	98.93 NM
	TIME	47 - 58 MS	50.88 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	114.88 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	103.20 MS

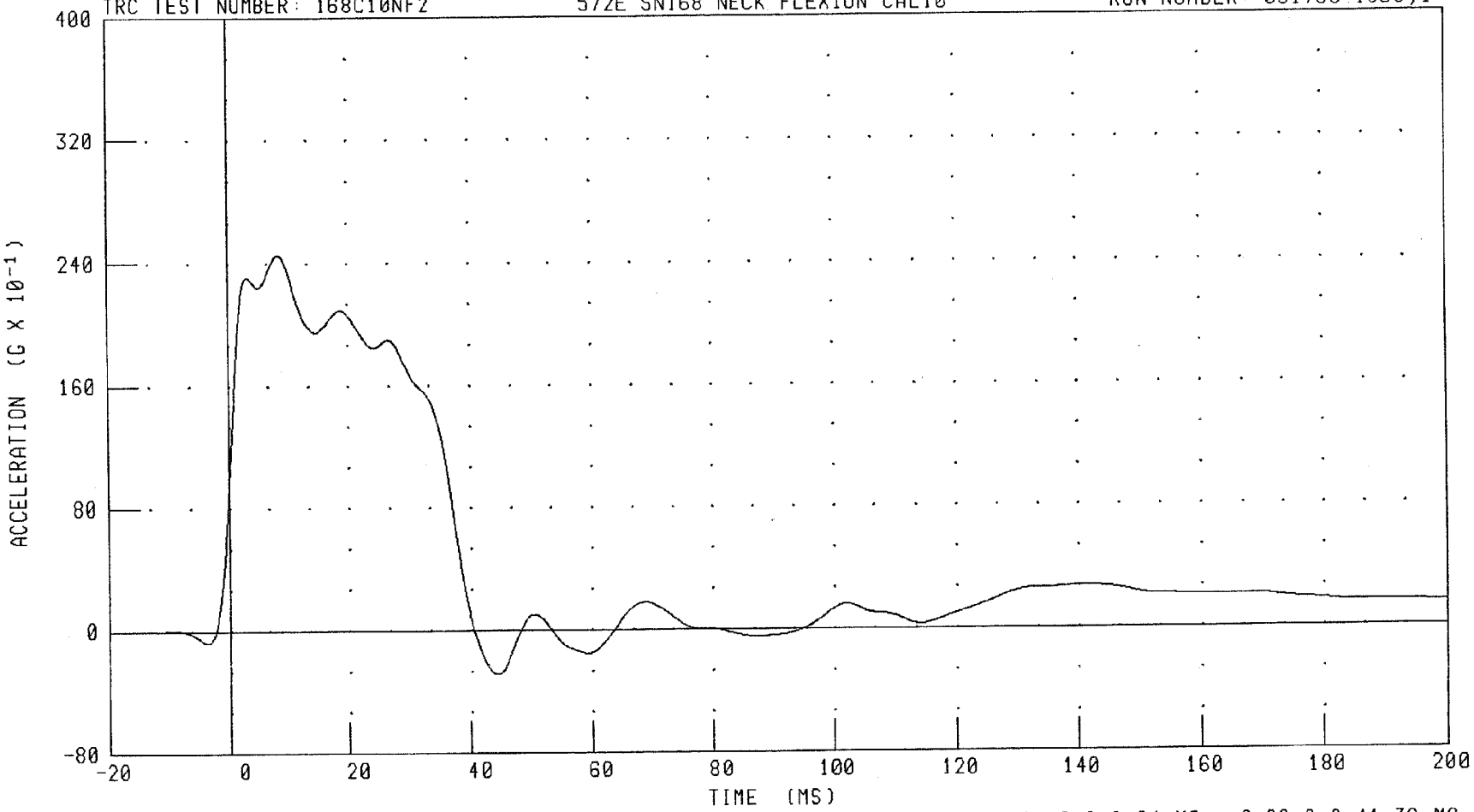
TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1359;1

PART 572-E HYBRID III NECK FLEXION CALIBRATION

PENDULUM DECELERATION

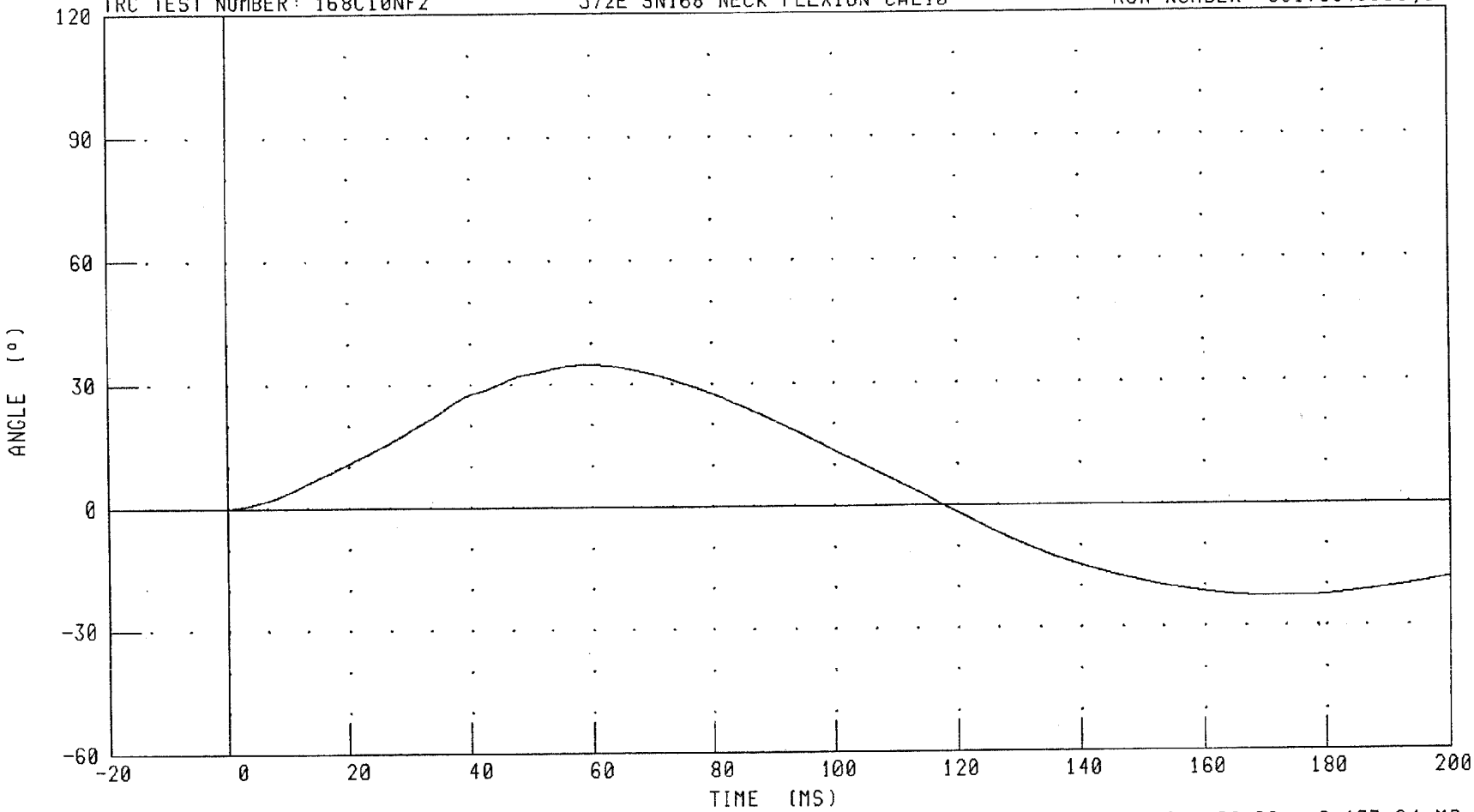
TRC TEST NUMBER: 168C10NF2 572E SN168 NECK FLEXION CAL10 RUN NUMBER: 031799 1359;1



CHANNEL: PENXG FILTER: CH. CLASS 60 PEAK DATA: 24.54 G @ 8.64 MS; -2.89 G @ 44.32 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK

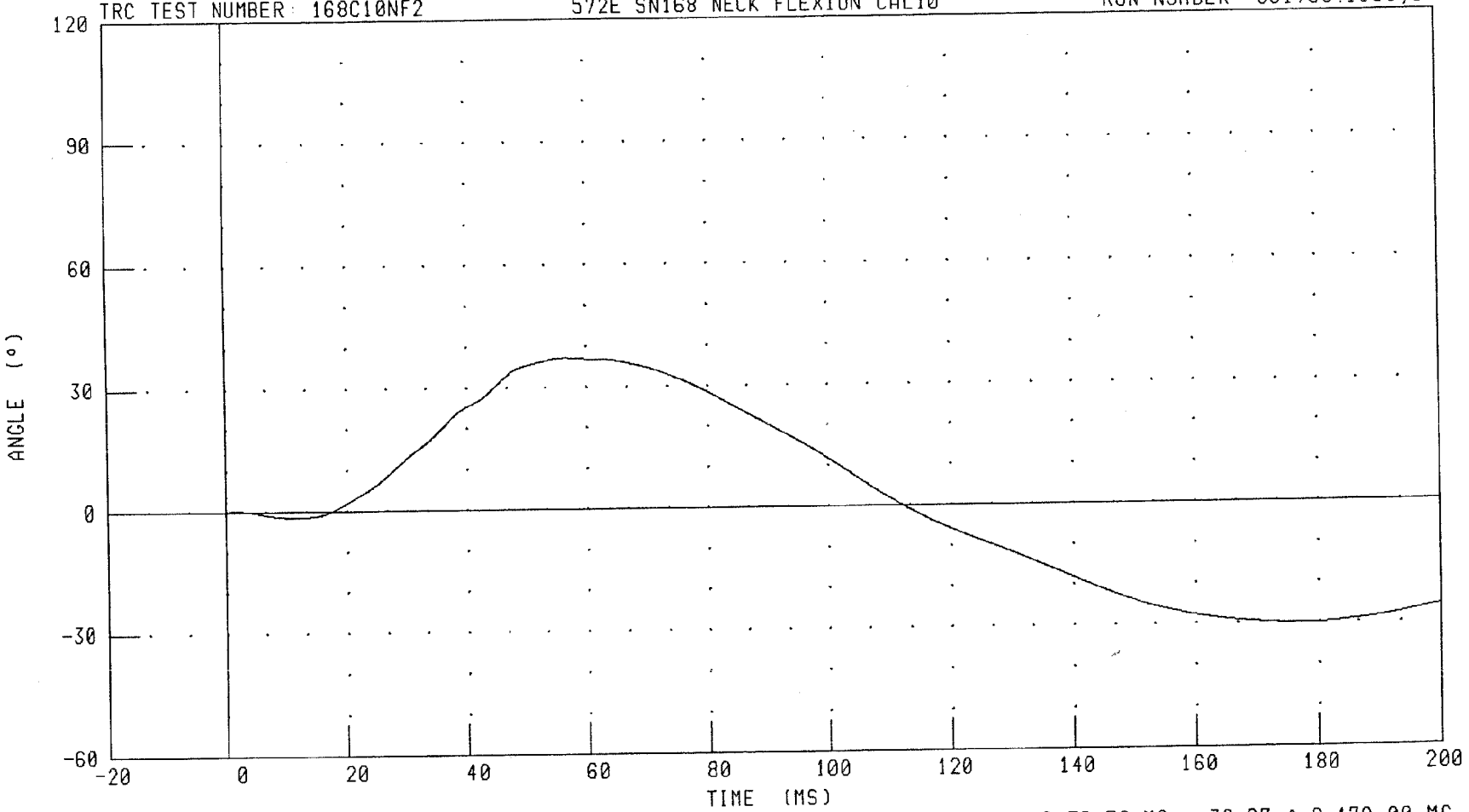
TRC TEST NUMBER: 168C10NF2
572E SN168 NECK FLEXION CAL10
RUN NUMBER: 031799.1359;1



CHANNEL: BETA
FILTER: CH. CLASS 60
PEAK DATA: 34.67 ° @ 59.52 MS; -22.80 ° @ 173.04 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 168C10NF2 572E SN168 NECK FLEXION CAL10 RUN NUMBER: 031799.1359;1

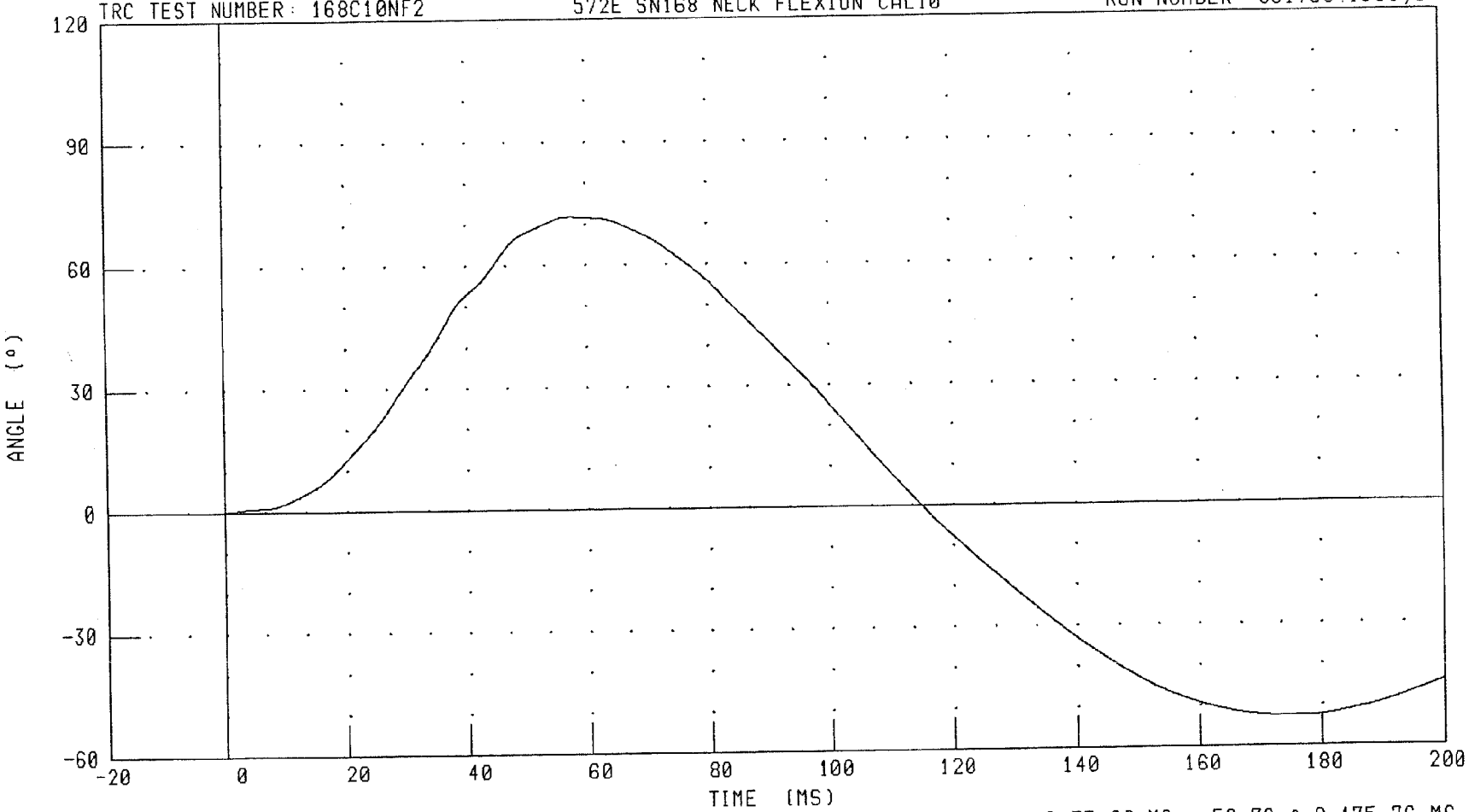


CHANNEL: THETA FILTER: CH. CLASS 60 PEAK DATA: 37.14 ° @ 56.72 MS; -30.07 ° @ 178.00 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 168C10NF2 572E SN168 NECK FLEXION CAL10 RUN NUMBER: 031799.1359;1



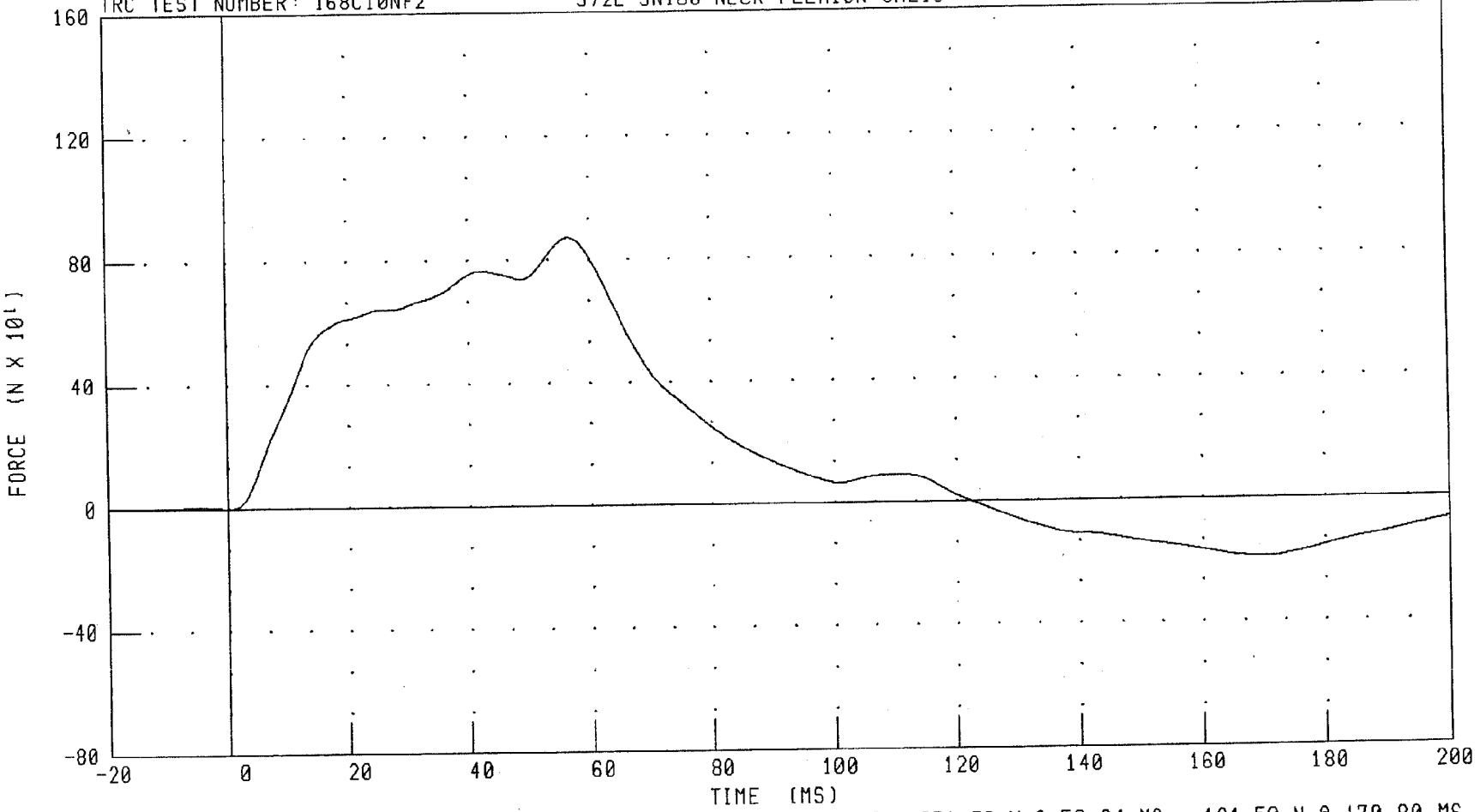
CHANNEL: TOTAN FILTER: CH. CLASS 60

PEAK DATA: 71.69 ° @ 57.68 MS; -52.78 ° @ 175.76 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 168C10NF2 572E SN168 NECK FLEXION CAL10 RUN NUMBER: 031799.1359,1



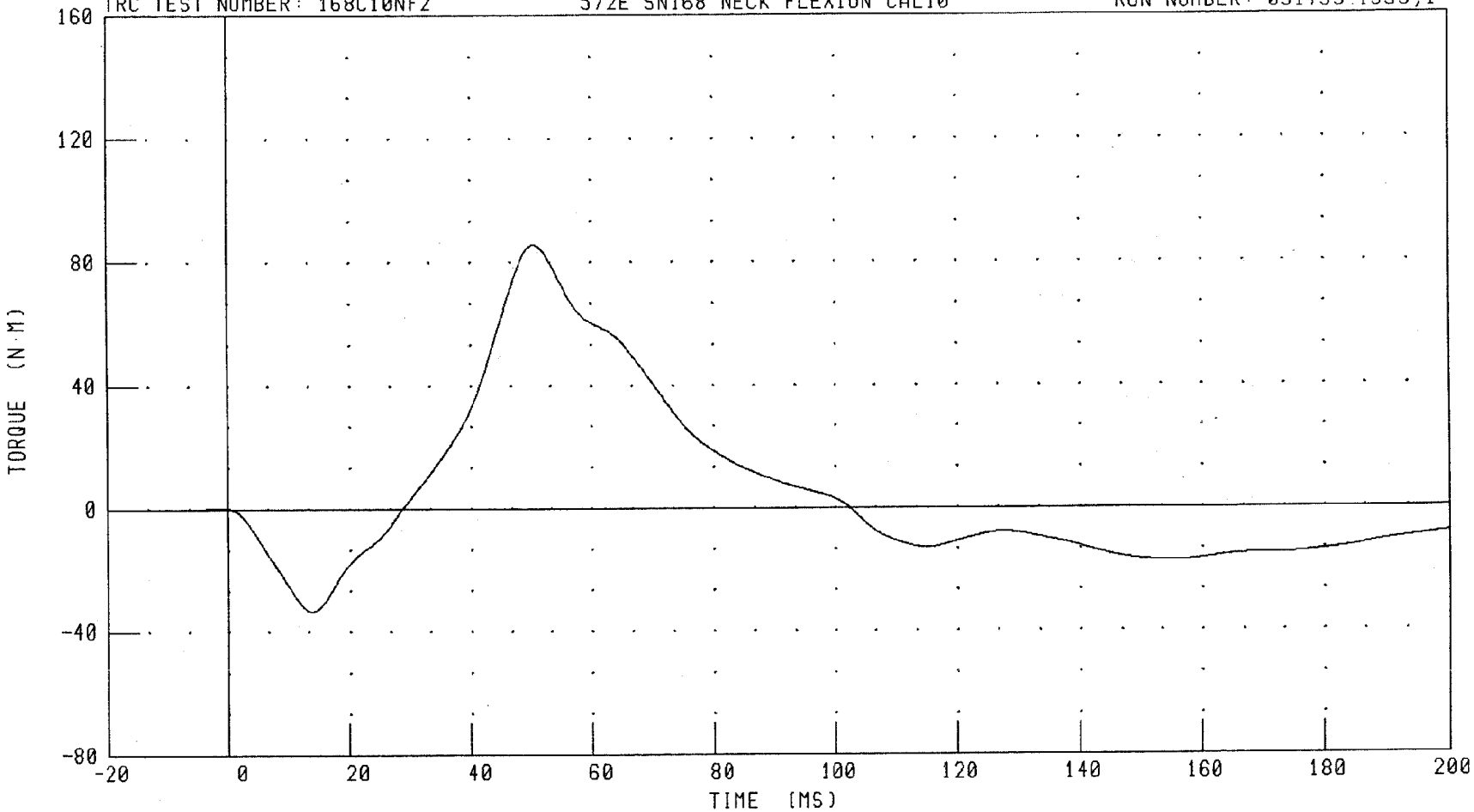
CHANNEL: NEKXF FILTER: CH. CLASS 60

PEAK DATA: 871.38 N @ 56.64 MS; -191.50 N @ 170.80 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

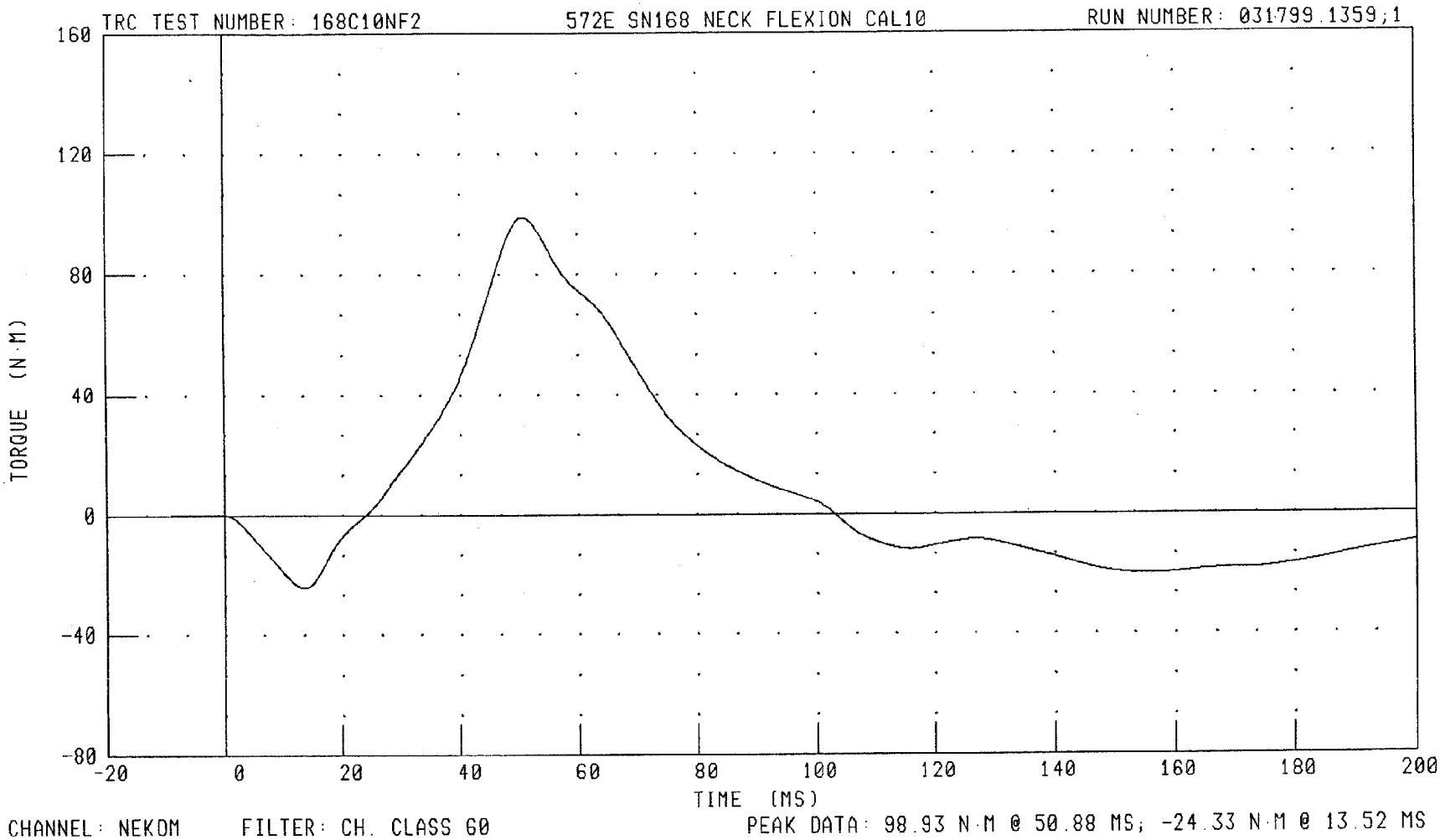
NECK MOMENT Y AXIS

TRC TEST NUMBER: 168C10NF2 572E SN168 NECK FLEXION CAL10 RUN NUMBER: 031799.1359;1



CHANNEL: NEKYM FILTER: CH. CLASS 60 PEAK DATA: 85.54 N-M @ 50.72 MS; -33.61 N-M @ 14.00 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



CHANNEL: NEKOM FILTER: CH. CLASS 60 PEAK DATA: 98.93 N-M @ 50.88 MS; -24.33 N-M @ 13.52 MS

TRANSPORTATION RESEARCH CENTER INC.

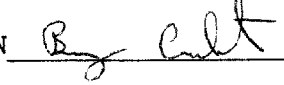
HYBRID III 50th 17-MAR-99

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 168C10NE1 572E SN168 NECK EXT CAL10

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY		10 - 70 %	22.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.05 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.69 G
	20 MS	14.00 - 19.00 G	17.07 G
	30 MS	11.00 - 16.00 G	15.56 G
MAX PENDULUM G		22 G MAX	19.14 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	15.52 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	40.00 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	98.11 DEG.
	TIME	72 - 82 MS	76.40 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-67.88 NM
	TIME	65 - 79 MS	70.88 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	156.16 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	142.96 MS

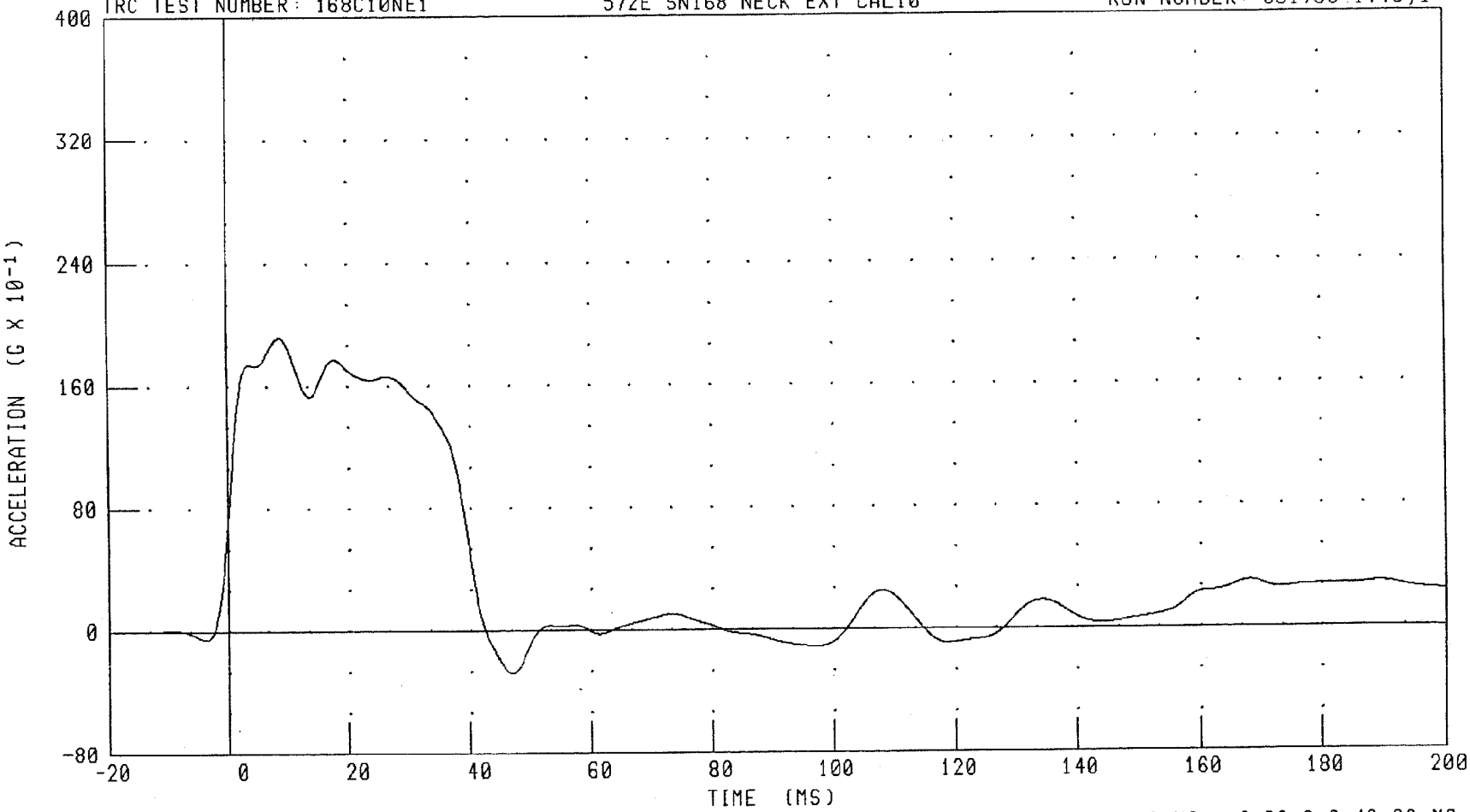
TEST MEETS SPECIFICATIONS

TECHNICIAN  RUN NUMBER: 031799.1442;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 168C10NE1 572E SN168 NECK EXT CAL10 RUN NUMBER: 031799.1443,1

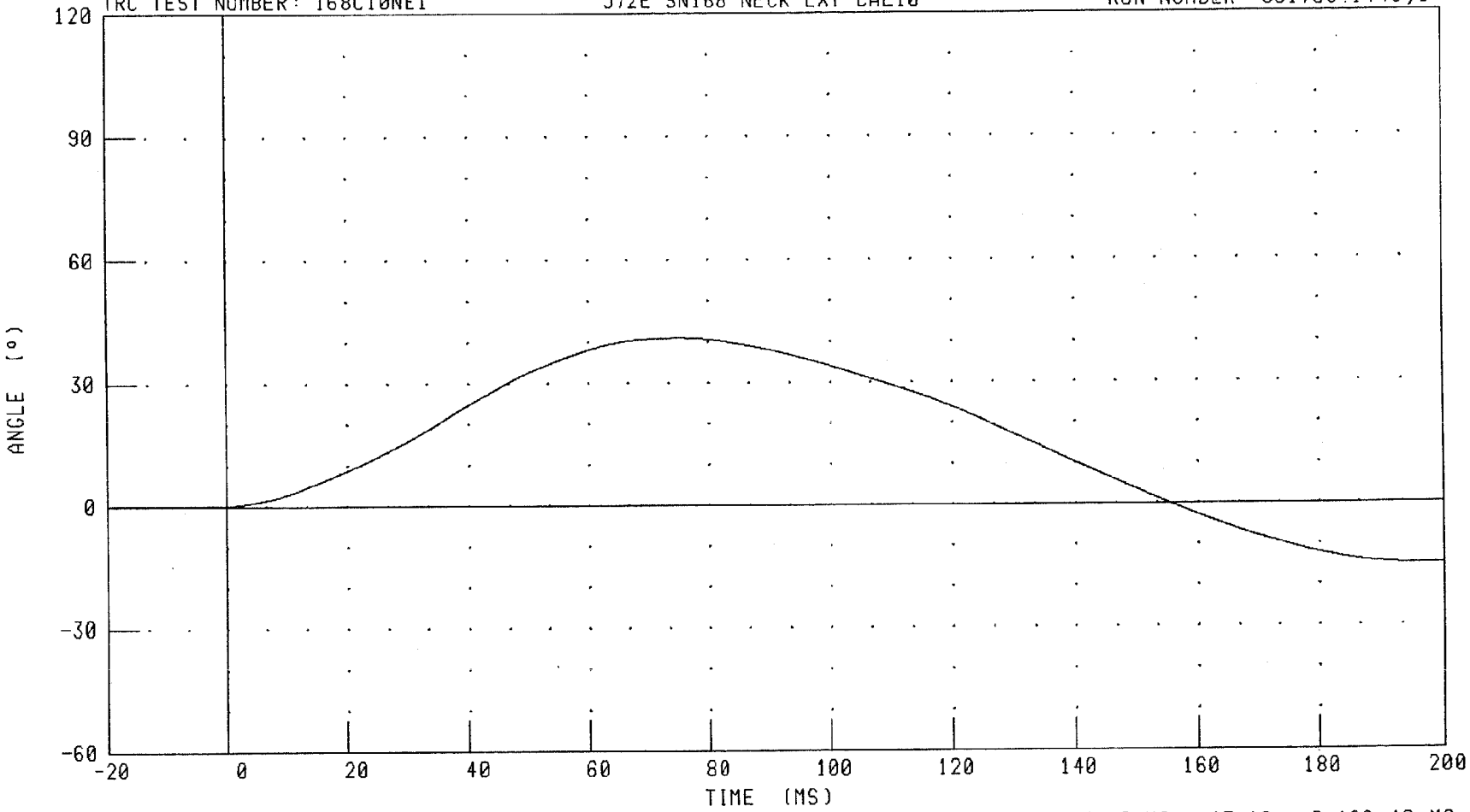


CHANNEL: PENXC FILTER: CH. CLASS 60

PEAK DATA: 19.14 G @ 8.88 MS; -2.80 G @ 46.96 MS

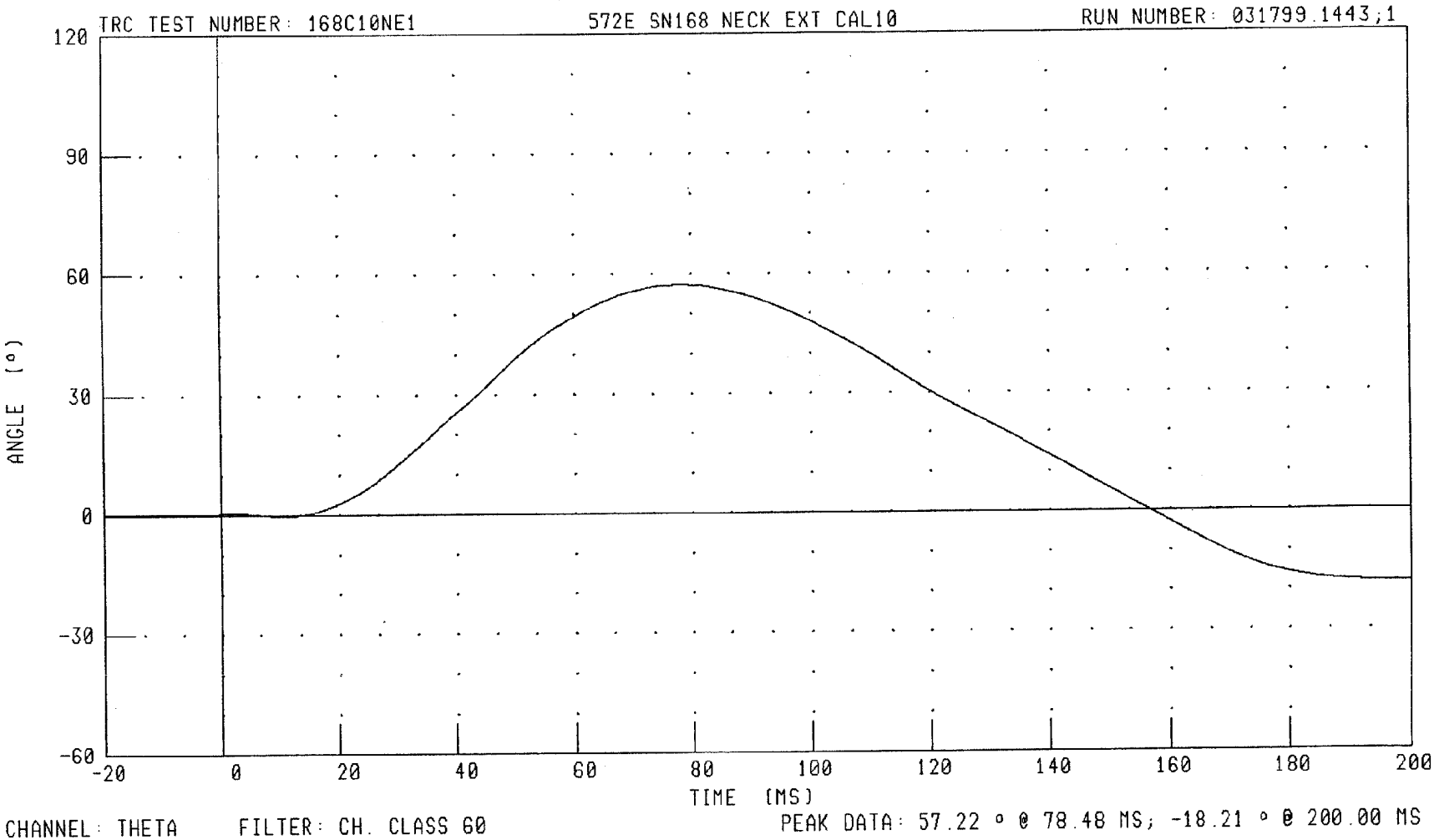
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 168C10NE1 572E SN168 NECK EXT CAL10 RUN NUMBER: 031799.1443;1



CHANNEL: BETA FILTER: CH. CLASS 60 PEAK DATA: 40.97 ° @ 75.12 MS; -15.19 ° @ 198.40 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE



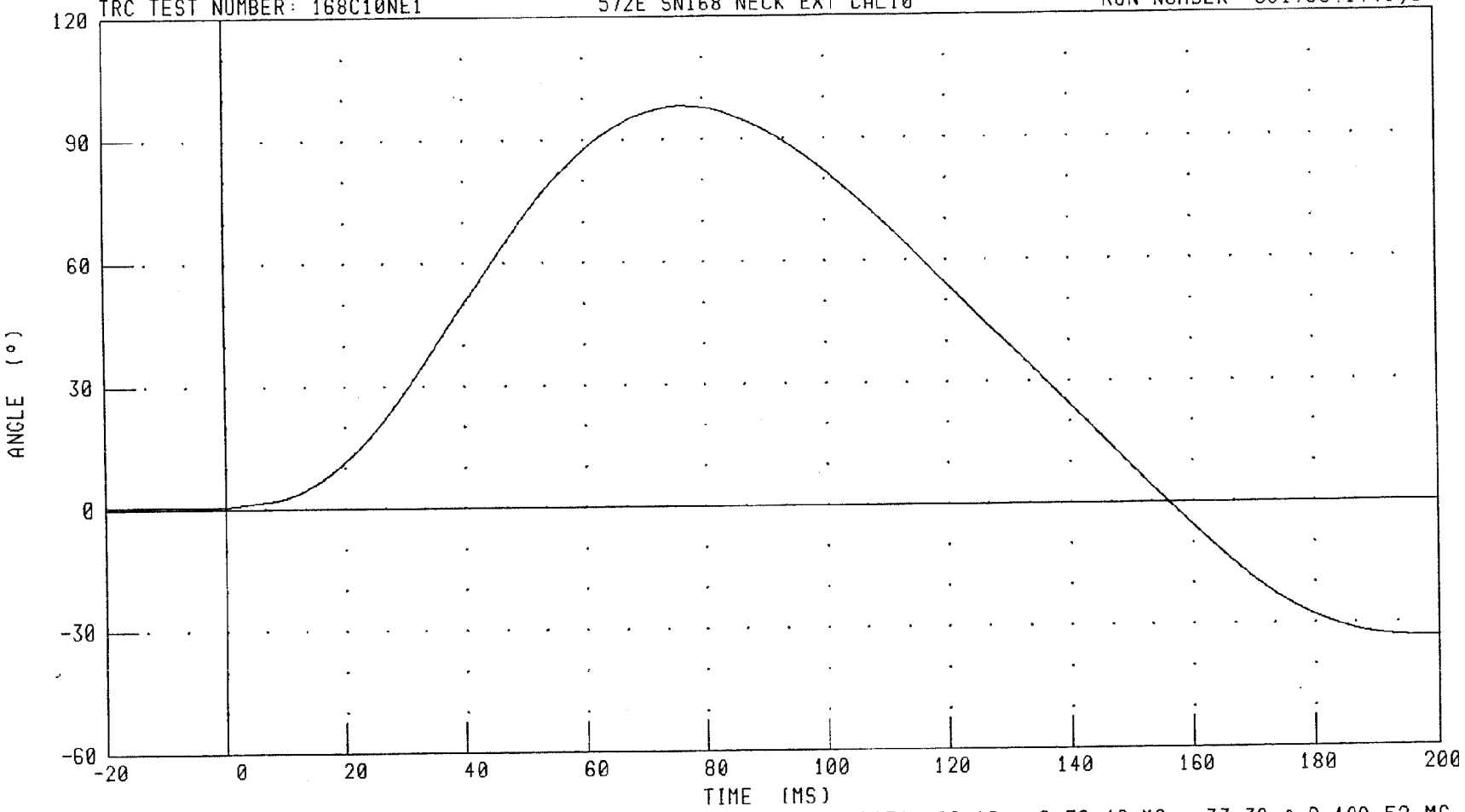
CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 57.22 ° @ 78.48 MS; -18.21 ° @ 200.00 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 168C10NE1 572E SN168 NECK EXT CAL10 RUN NUMBER: 031799.1443;1



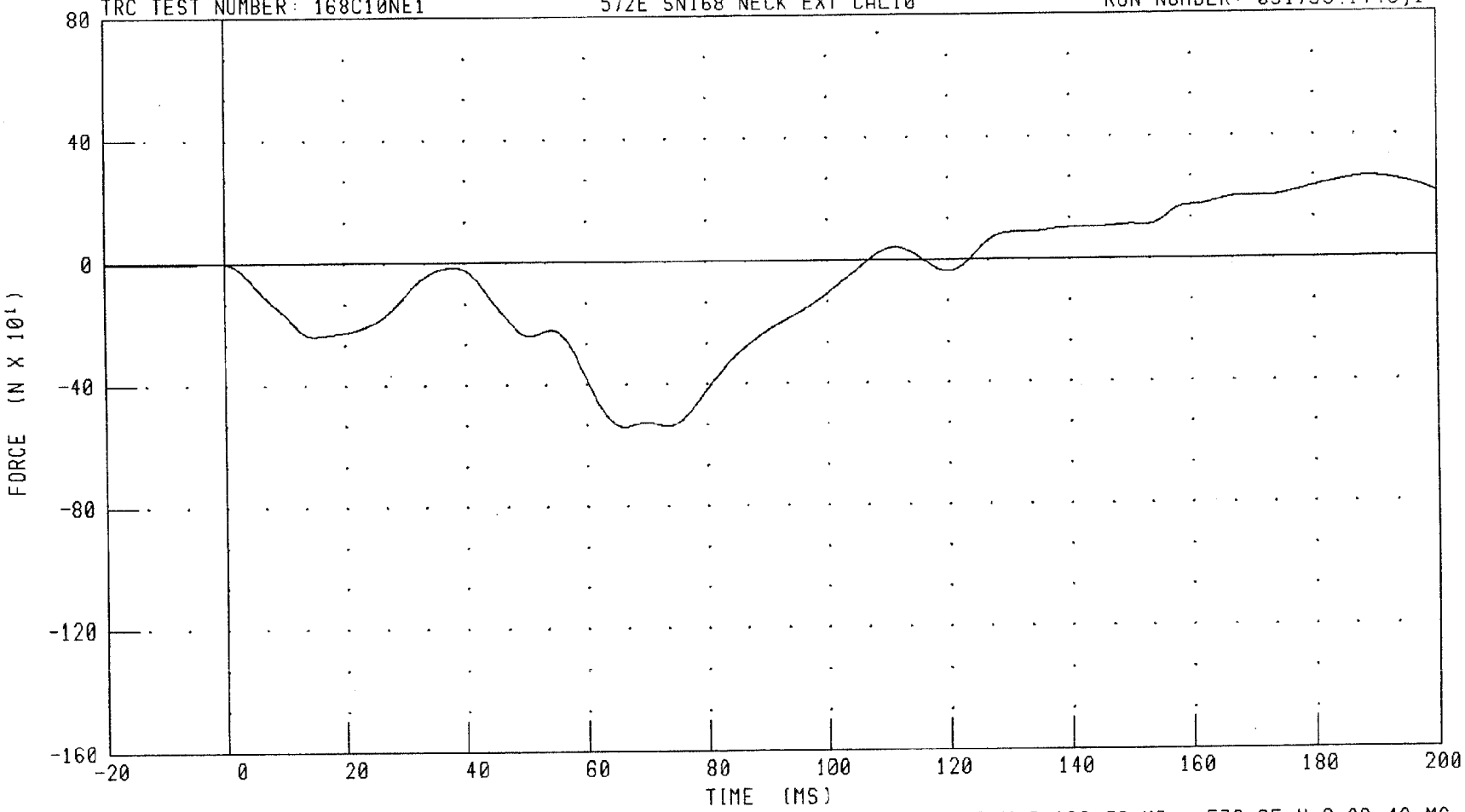
CHANNEL: TOTAN FILTER: CH. CLASS 60

PEAK DATA: 98.12 ° @ 76.40 MS; -33.39 ° @ 199.52 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 168C10NE1 572E SN168 NECK EXT CAL10 RUN NUMBER: 031799.1443;1



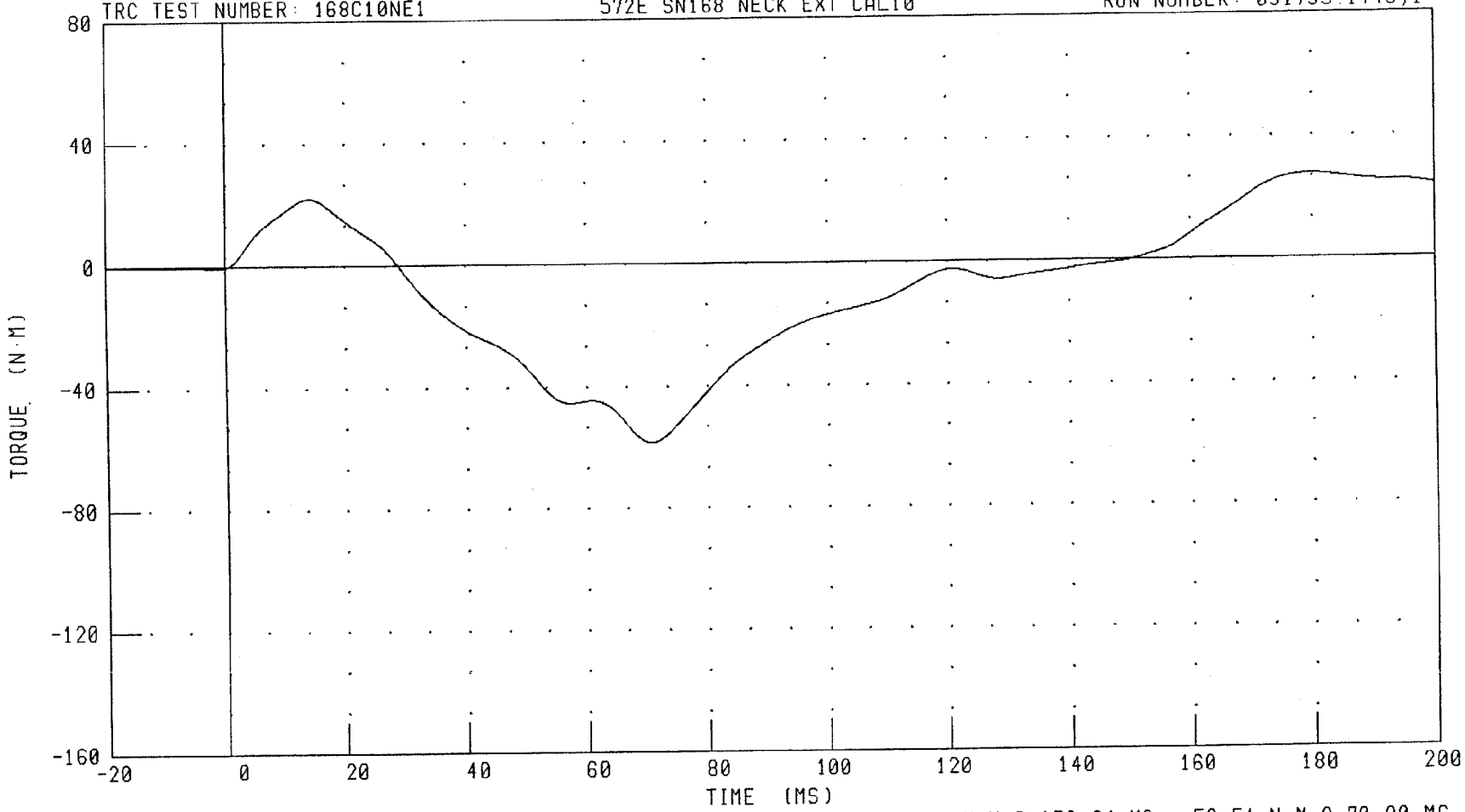
CHANNEL: NEKXF FILTER: CH. CLASS 60

PEAK DATA: 261.42 N @ 189.36 MS; -539.85 N @ 66.40 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

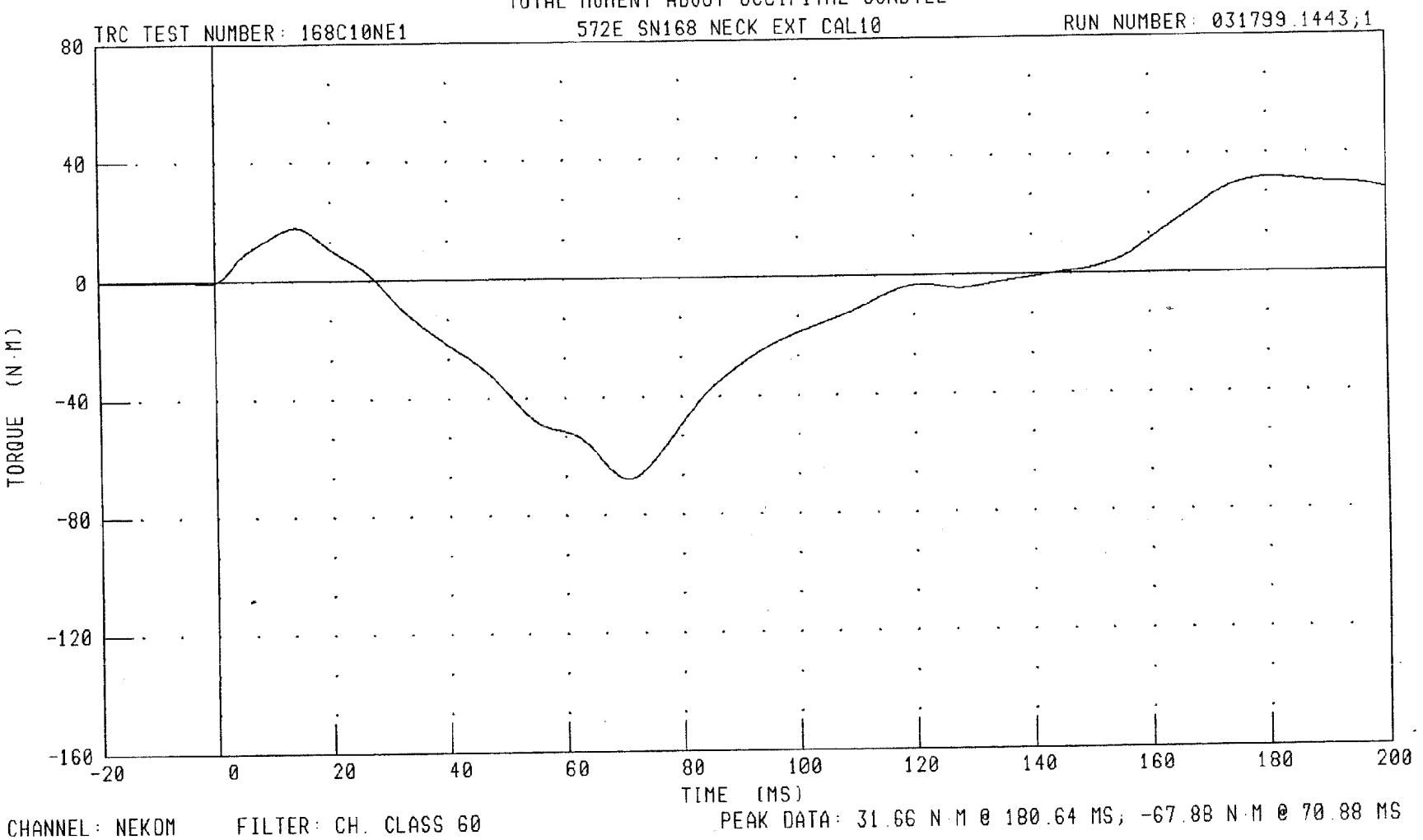
TRC TEST NUMBER: 168C10NE1 572E SN168 NECK EXT CAL10 RUN NUMBER: 031799.1443;1



CHANNEL: NEKYM FILTER: CH. CLASS 60

PEAK DATA: 27.54 N-M @ 179.84 MS; -58.51 N-M @ 70.80 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 31.66 N.M @ 180.64 MS; -67.88 N.M @ 70.88 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III 50th 18-MAR-99

TRC INC. TEST NO: 168C10TH1 572E SN168 H.S.THORAX CAL10

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.59 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	67.0 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5767. N
INTERNAL HYSTERESIS	69% - 85%	70.0%

TEST MEETS SPECIFICATIONS

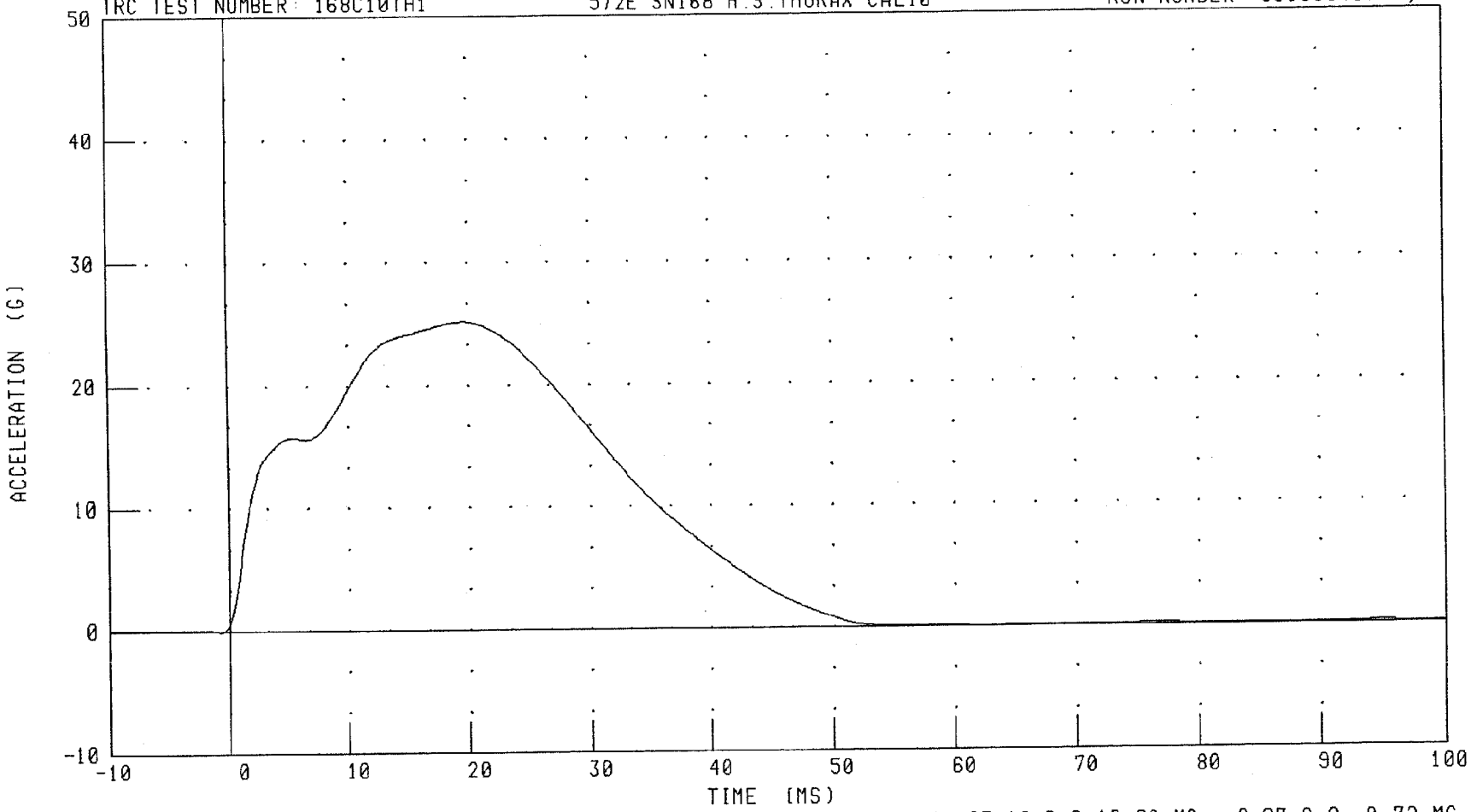
TECHNICIAN B. Cobb

RUN NUMBER: 031899.0734;1

PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 168C10TH1 572E SN168 H.S.THORAX CAL10 RUN NUMBER: 031899.0735;1



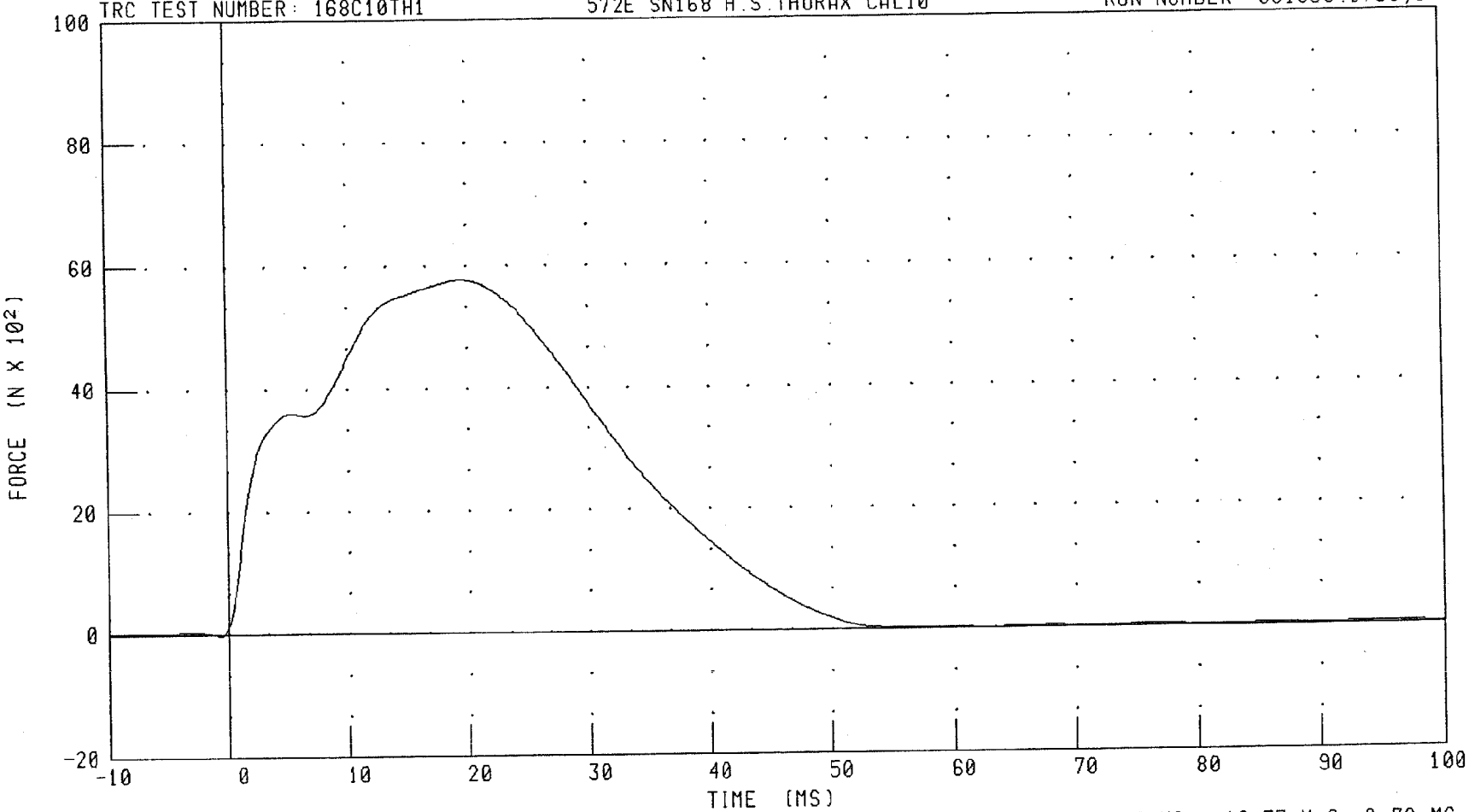
CHANNEL: PENXG FILTER: CH. CLASS 180

PEAK DATA: 25.18 G @ 19.68 MS; -0.07 G @ -0.72 MS

PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM FORCE

TRC TEST NUMBER: 168C10TH1 572E SN168 H.S.THORAX CAL10 RUN NUMBER: 031899.0735;1



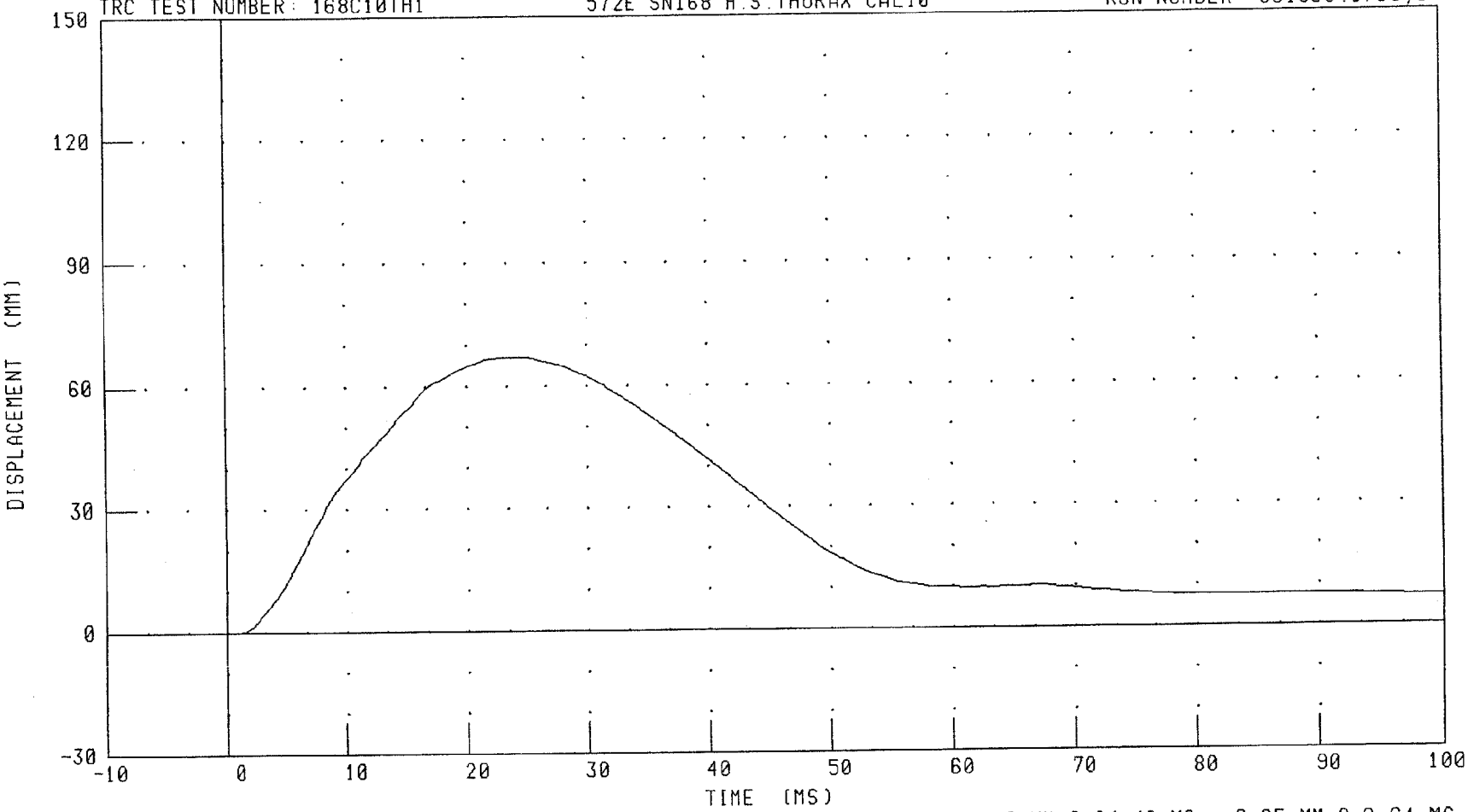
CHANNEL: PENXF FILTER: CH. CLASS 180

PEAK DATA: 5767.39 N @ 19.68 MS; -16.77 N @ -0.72 MS

PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

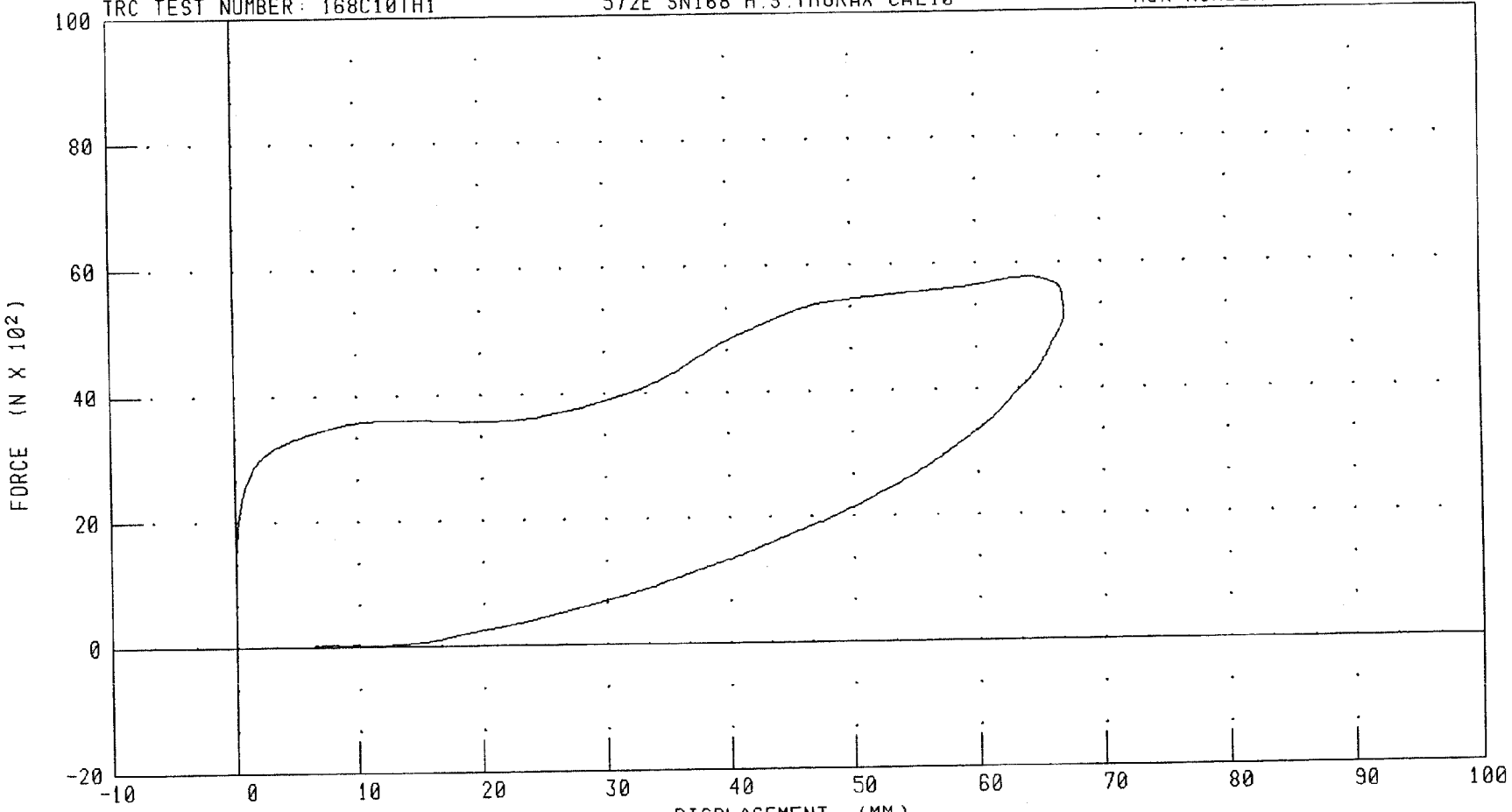
TRC TEST NUMBER: 168C10TH1 572E SN168 H.S.THORAX CAL10 RUN NUMBER: 031899.0735,1



CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 67.06 MM @ 24.48 MS; -0.05 MM @ 0.64 MS

PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

TRC TEST NUMBER: 168C10TH1
572E SN168 H.S.THORAX CAL10
RUN NUMBER: 031899.0735;1



CHANNEL: CSTXD
PENXF

FILTER: CH. CLASS 180
CH. CLASS 180

PEAK DATA: 67.06 MM @ 24.48 MS; -0.05 MM @ 0.64 MS
5767.39 N @ 19.68 MS; -16.77 N @ -0.72 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E 17-MAR-99

TRC INC. TEST NO: 168C10HR1 572E SN 168 HIPFLEX CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	61.3 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	49.6 deg.

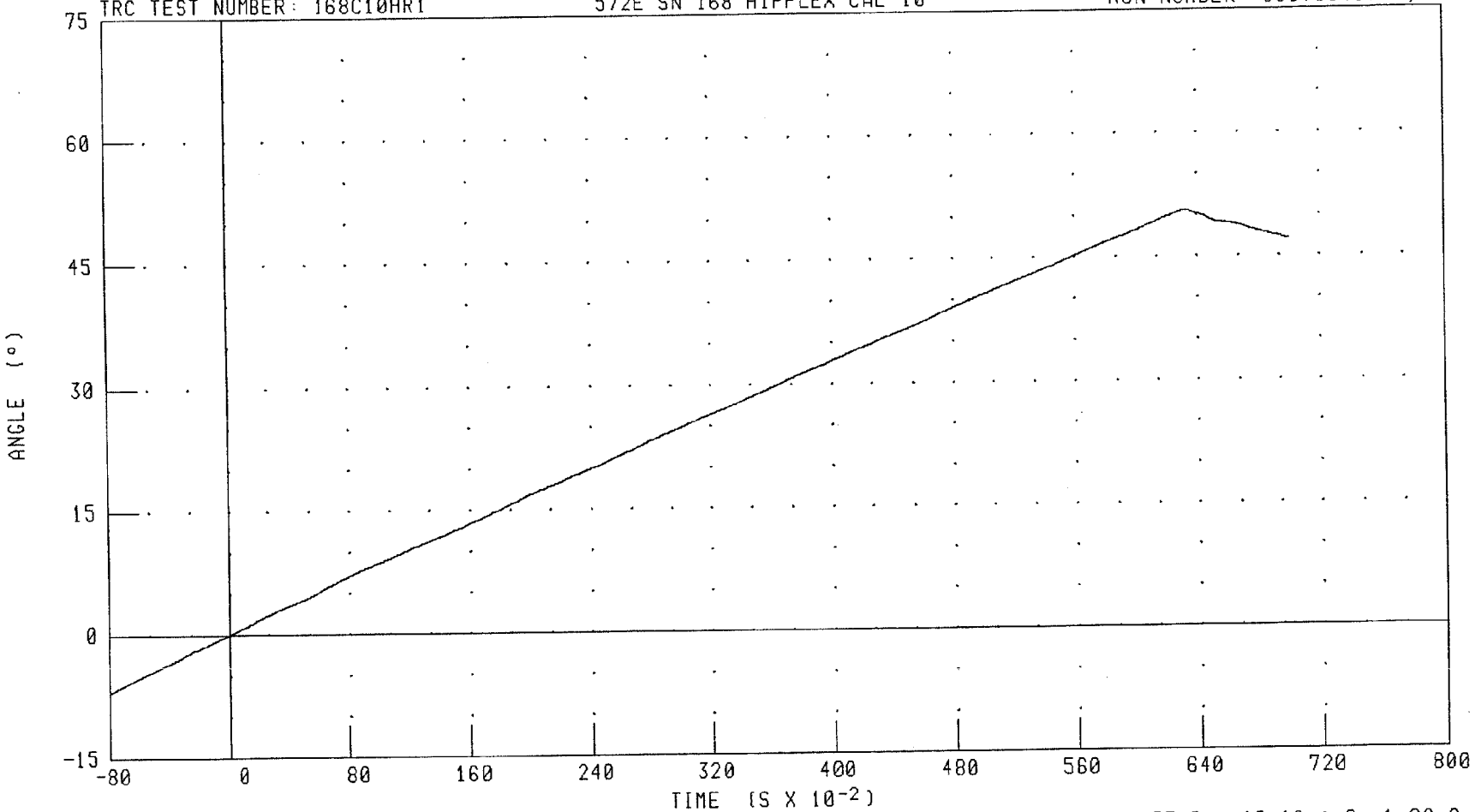
TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1355;1

HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
RIGHT HIP FLEXION ROTATION
572E SN 168 HIPFLEX CAL 10

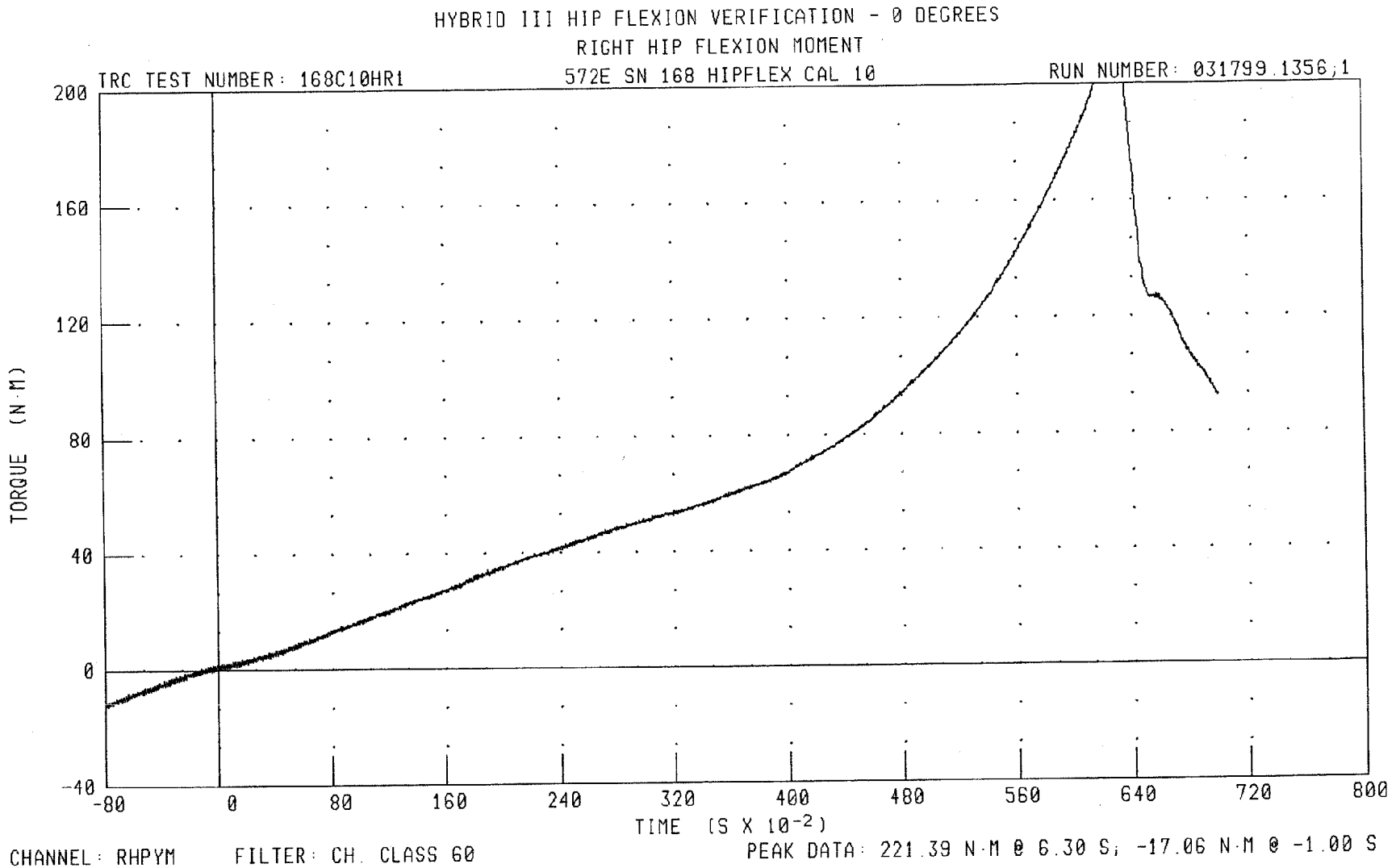
TRC TEST NUMBER: 168C10HR1

RUN NUMBER: 031799.1356,1



CHANNEL: RHPXD FILTER: CH. CLASS 60

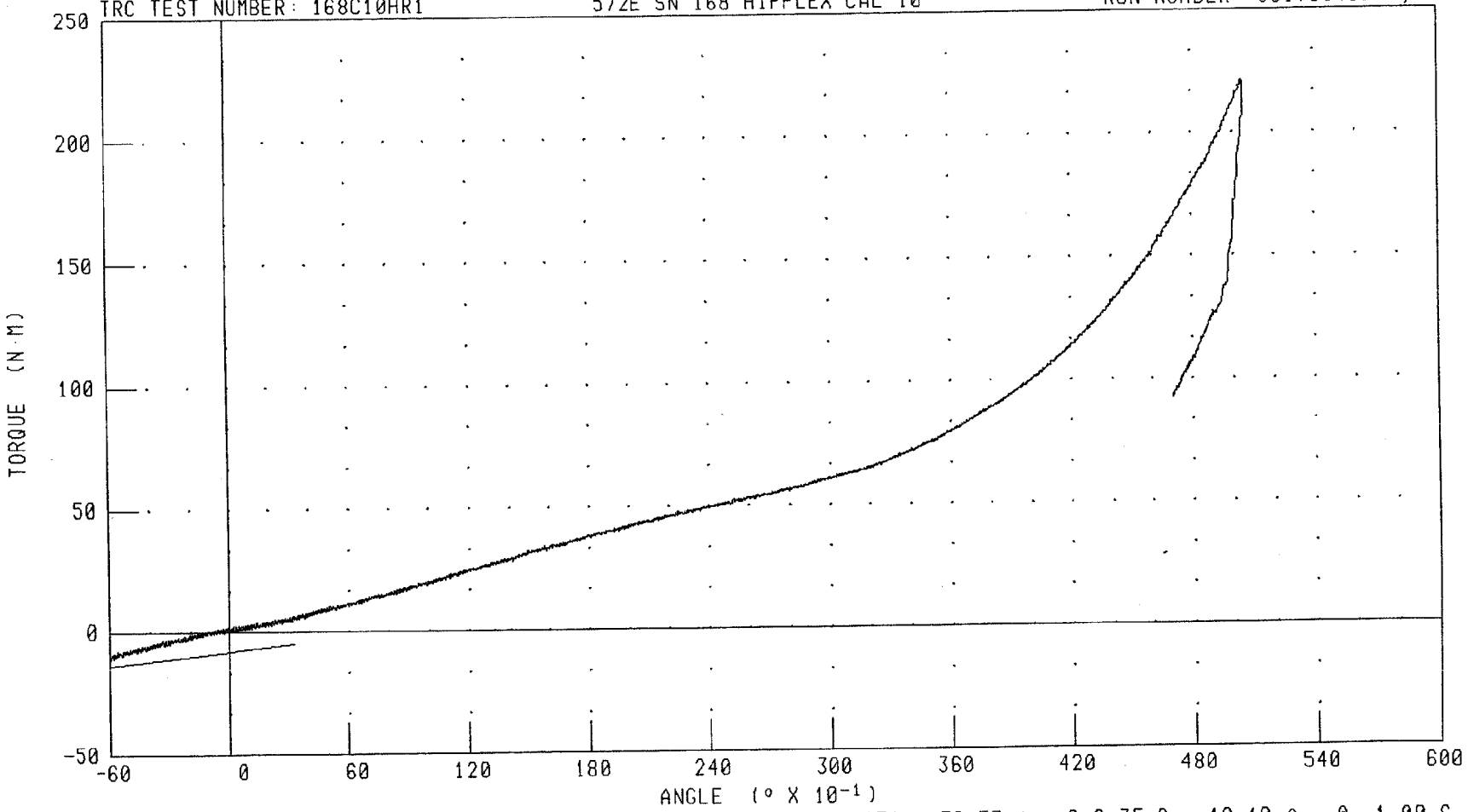
PEAK DATA: 50.53 ° @ 6.35 S; -10.10 ° @ -1.00 S


HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
RIGHT HIP FLEXION MOMENT
TRC TEST NUMBER: 168C10HR1
572E SN 168 HIPFLEX CAL 10
RUN NUMBER: 031799.1356;1
TORQUE (N·M)
200
160
120
80
40
0
-40
-80
0
80
160
240
320
400
480
560
640
720
800
TIME (S X 10-2)
CHANNEL: RHPYM
FILTER: CH. CLASS 60
PEAK DATA: 221.39 N·M @ 6.30 S; -17.06 N·M @ -1.00 S

HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION MOMENT VS ROTATION ANGLE

TRC TEST NUMBER: 168C10HR1 572E SN 168 HIPFLEX CAL 10 RUN NUMBER: 031799.1356;1



CHANNEL: RHPXD FILTER: CH. CLASS 60

RHPYM CH. CLASS 60

PEAK DATA: 50.53 ° @ 6.35 S; -10.10 ° @ -1.00 S

221.39 N·M @ 6.30 S; -17.06 N·M @ -1.00 S

TRANSPORTATION RESEARCH CENTER INC.

LEFT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E 17-MAR-99

TRC INC. TEST NO: 168C10HL1 572E SN 168 HIPFLEX CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	64.6 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	44.8 deg.

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1352;1

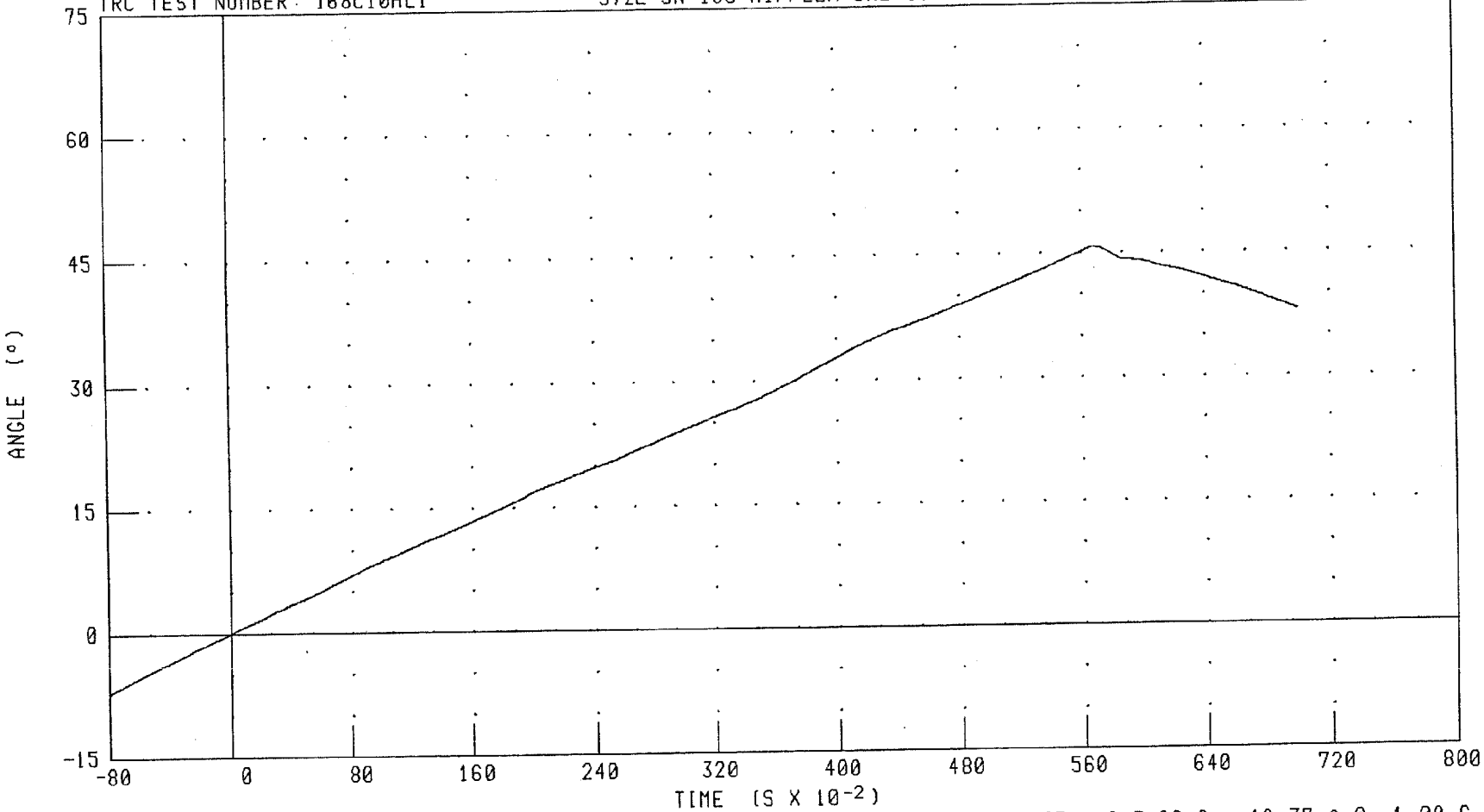
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION ROTATION

TRC TEST NUMBER: 168C10HL1

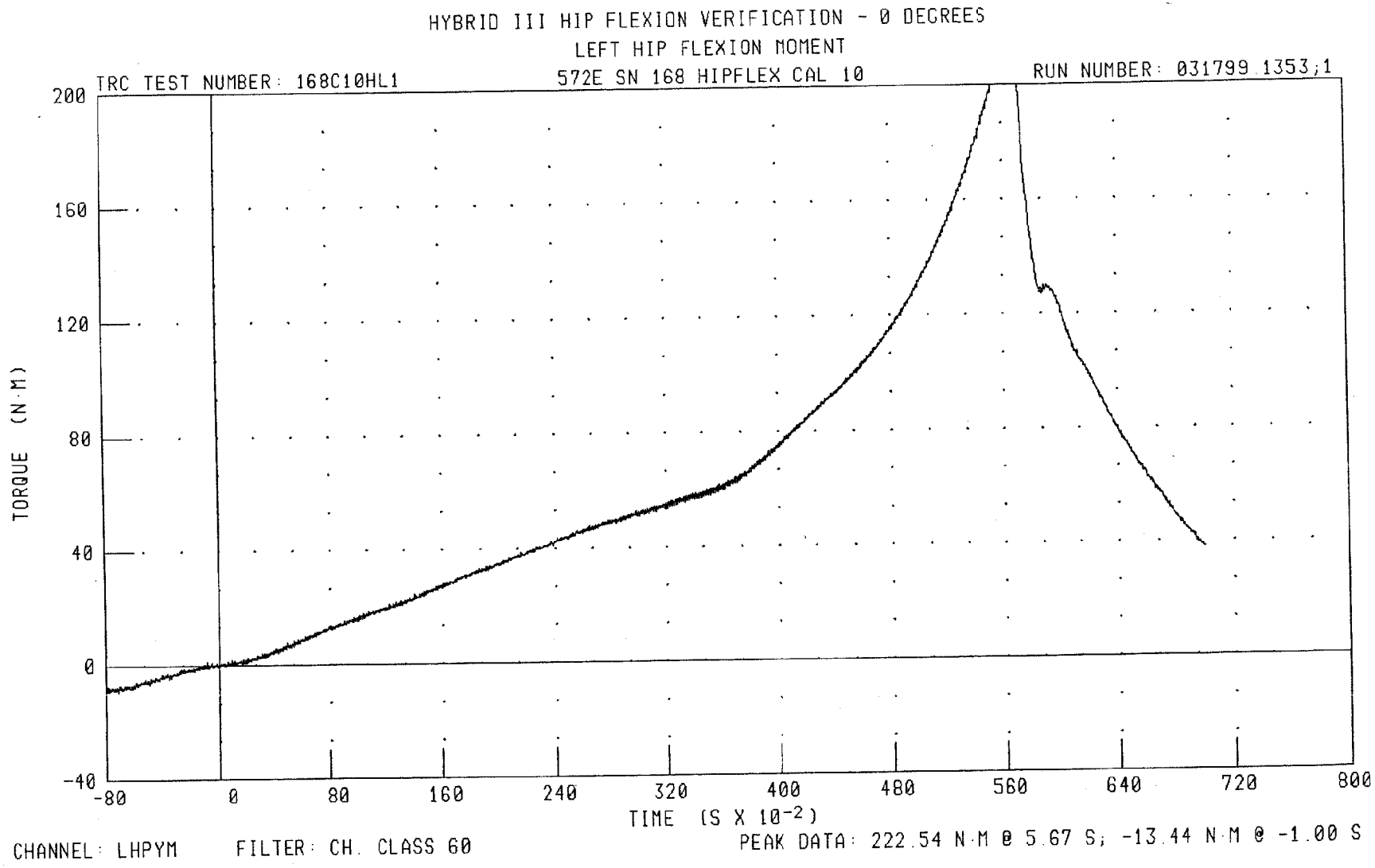
572E SN 168 HIPFLEX CAL 10

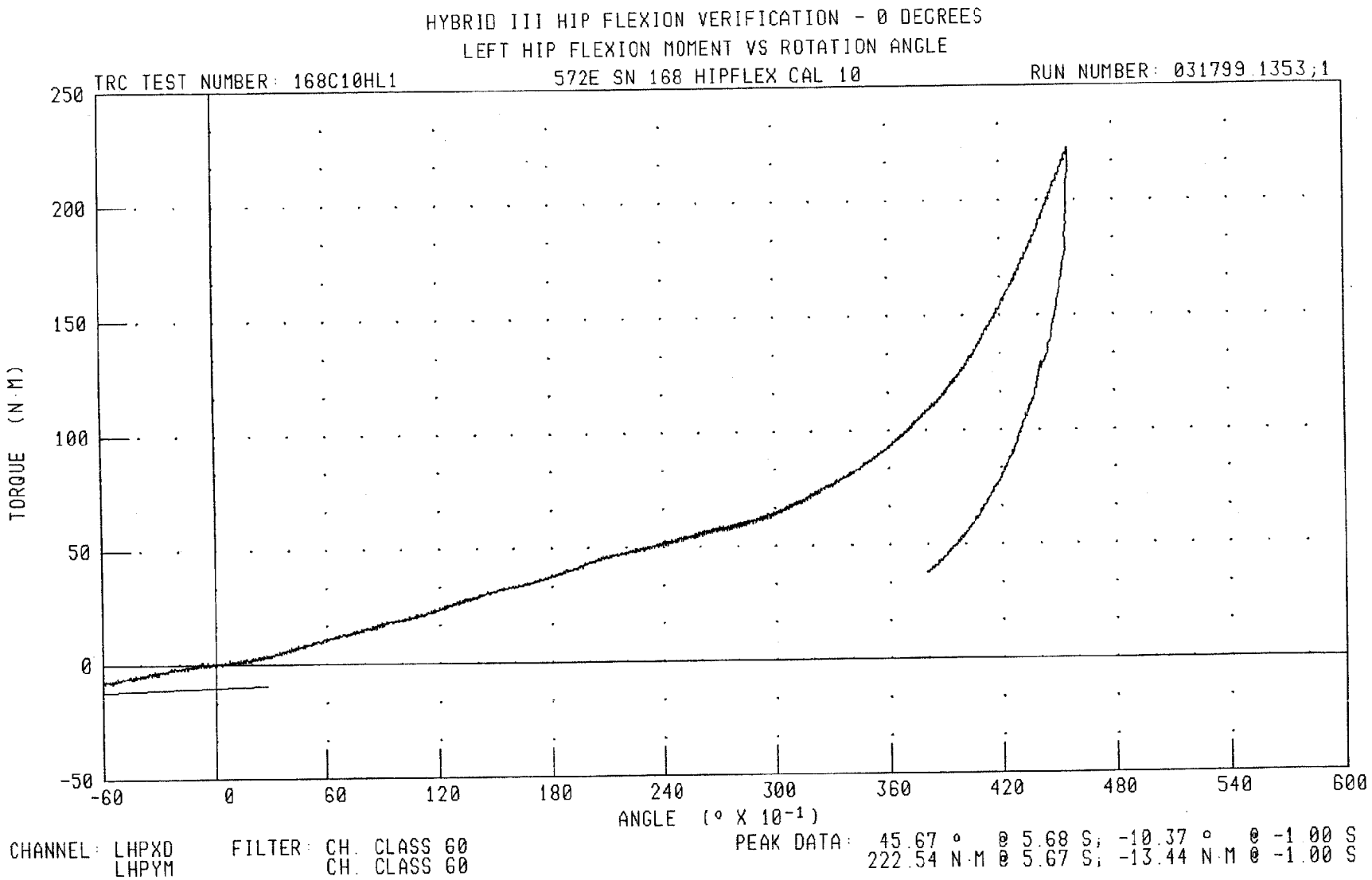
RUN NUMBER: 031799.1353;1



CHANNEL: LHPXD FILTER: CH. CLASS 60

PEAK DATA: 45.67 ° @ 5.68 S; -10.37 ° @ -1.00 S


HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
LEFT HIP FLEXION MOMENT
TRC TEST NUMBER: 168C10HL1
572E SN 168 HIPFLEX CAL 10
RUN NUMBER: 031799.1353;1
TORQUE (N·M)
200
160
120
80
40
0
-40
-80
0
80
160
240
320
400
480
560
640
720
800
TIME (S X 10-2)
CHANNEL: LHPYM
FILTER: CH. CLASS 60
PEAK DATA: 222.54 N·M @ 5.67 S; -13.44 N·M @ -1.00 S


HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
LEFT HIP FLEXION MOMENT VS ROTATION ANGLE
TRC TEST NUMBER: 168C10HL1
572E SN 168 HIPFLEX CAL 10
RUN NUMBER: 031799.1353;1
TORQUE (N-M)
250
200
150
100
50
0
-50
-60
0
60
120
180
240
300
360
420
480
540
600
ANGLE (° X 10⁻¹)
CHANNEL: LHPXD
LHPYM
FILTER: CH. CLASS 60
CH. CLASS 60
PEAK DATA: 45.67 ° @ 5.68 S; -10.37 ° @ -1.00 S
222.54 N-M @ 5.67 S; -13.44 N-M @ -1.00 S

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III 50th 17-MAR-99

TRC INC. TEST NO: 168C10RK1 572E SN168 RIGHT KNEE CAL 10

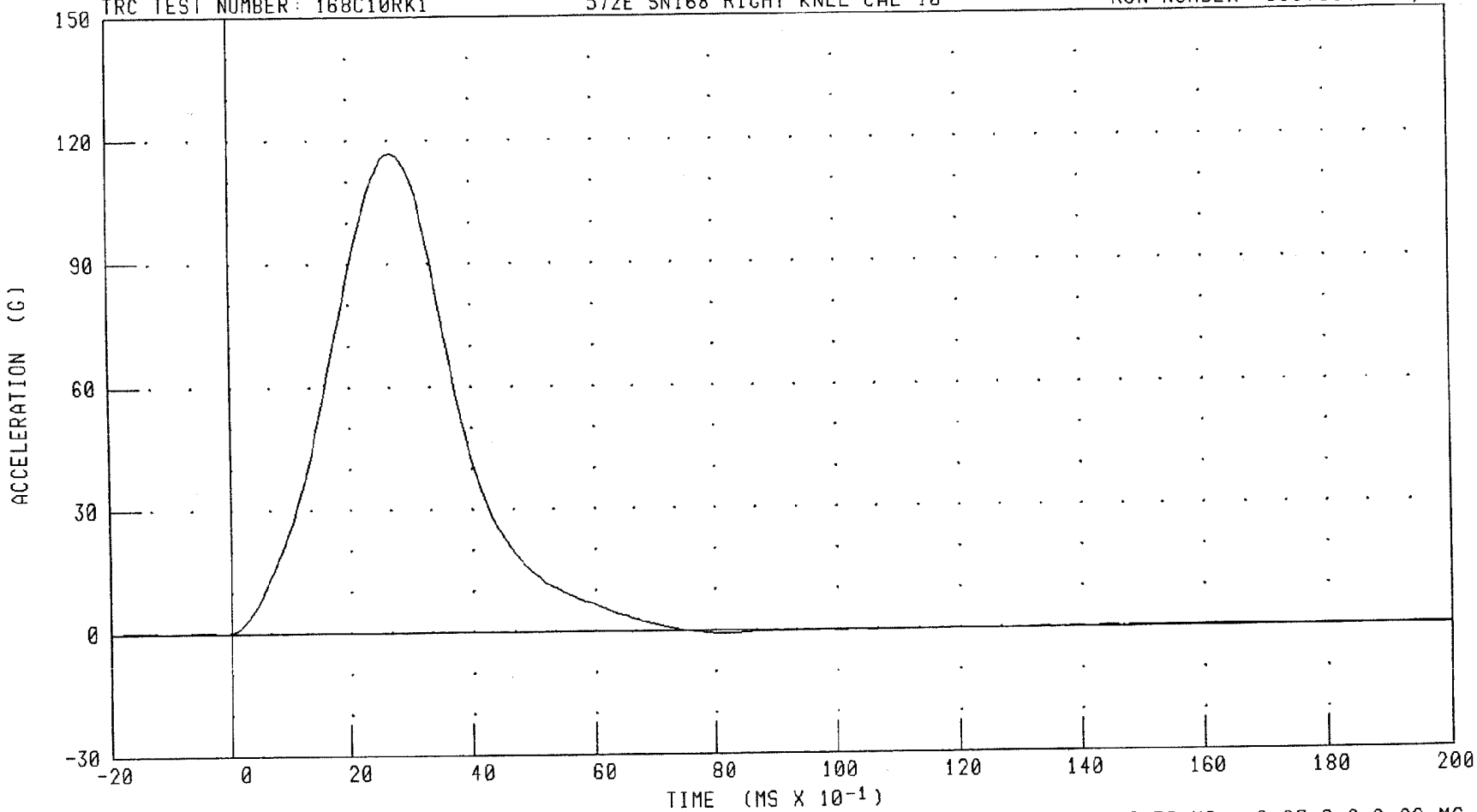
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.10 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5714.9 N

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1111;1

PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 168C10RK1
572E SN168 RIGHT KNEE CAL 10
RUN NUMBER: 031799.1111;1



CHANNEL: PENXG FILTER: CH. CLASS 600

PEAK DATA: 116.80 G @ 2.72 MS; -0.87 G @ 8.08 MS

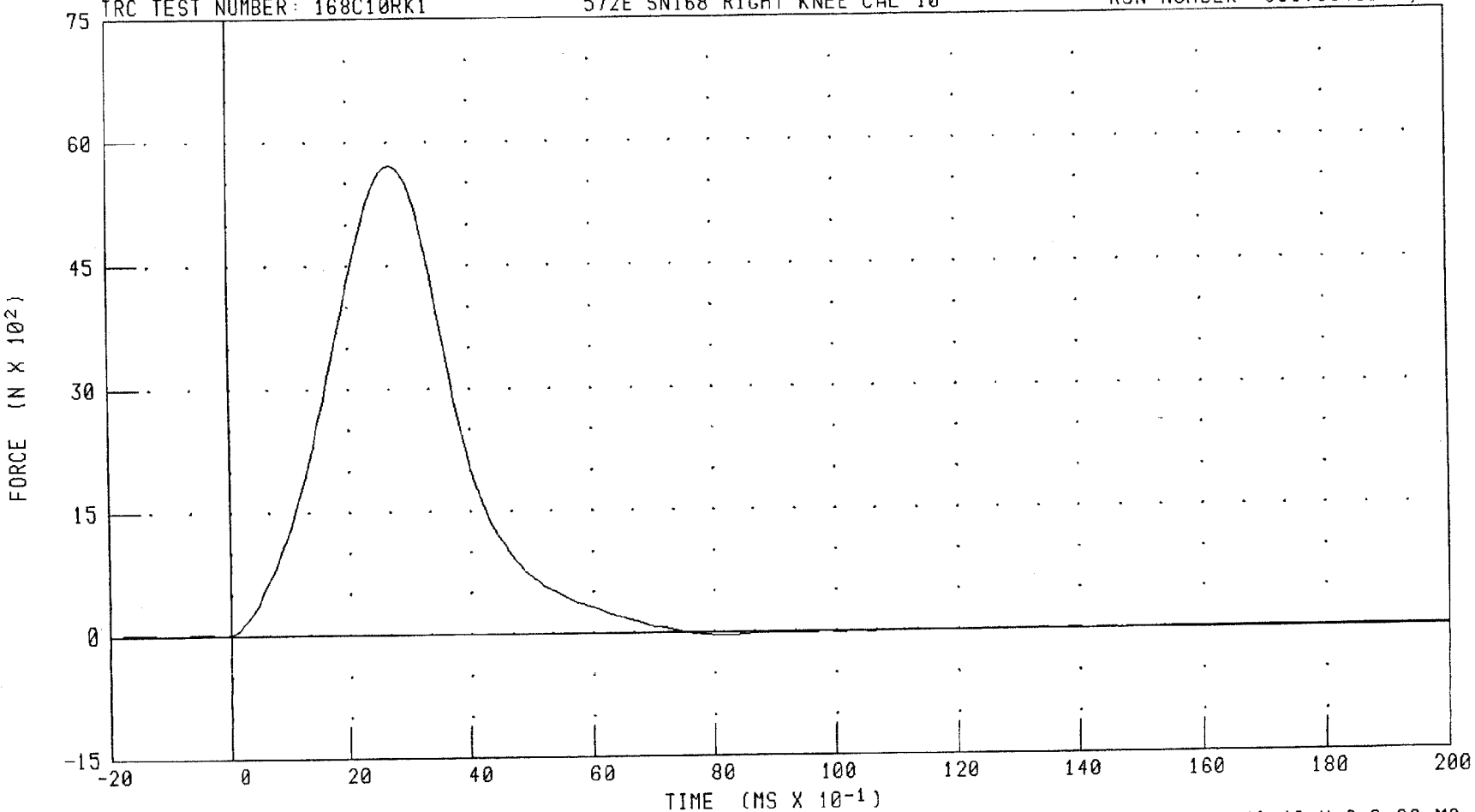
PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 168C10RK1

572E SN168 RIGHT KNEE CAL 10

RUN NUMBER: 031799.1111;1



CHANNEL: PENXF FILTER: CH. CLASS 600

PEAK DATA: 5714.93 N @ 2.72 MS; -42.48 N @ 8.08 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III 50th 17-MAR-99

TRC INC. TEST NO: 168C10LK1 572E SN168 LEFT KNEE CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.09 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	4861.6 N

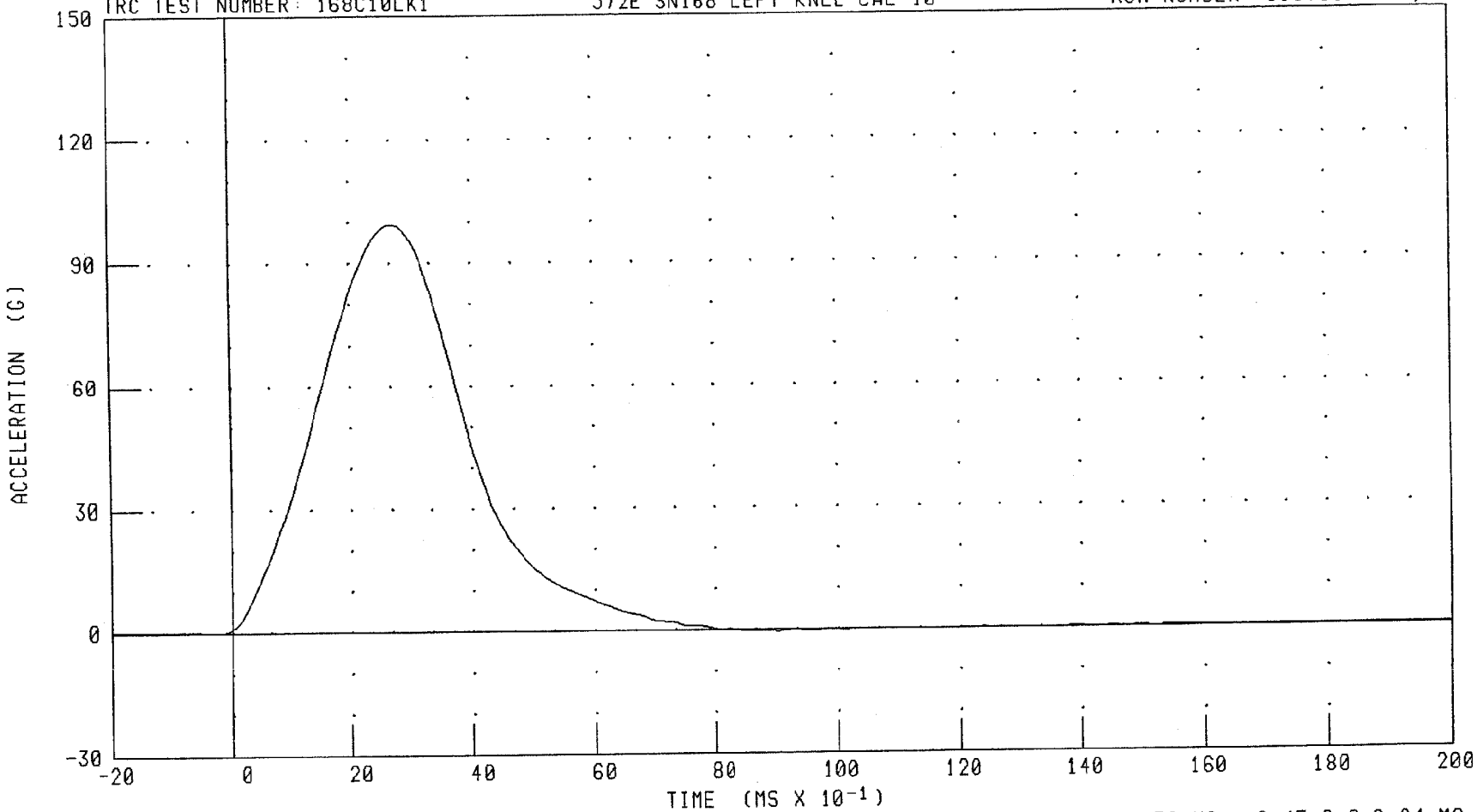
TEST MEETS SPECIFICATIONS

TECHNICIAN By Colt

RUN NUMBER: 031799.1108;1

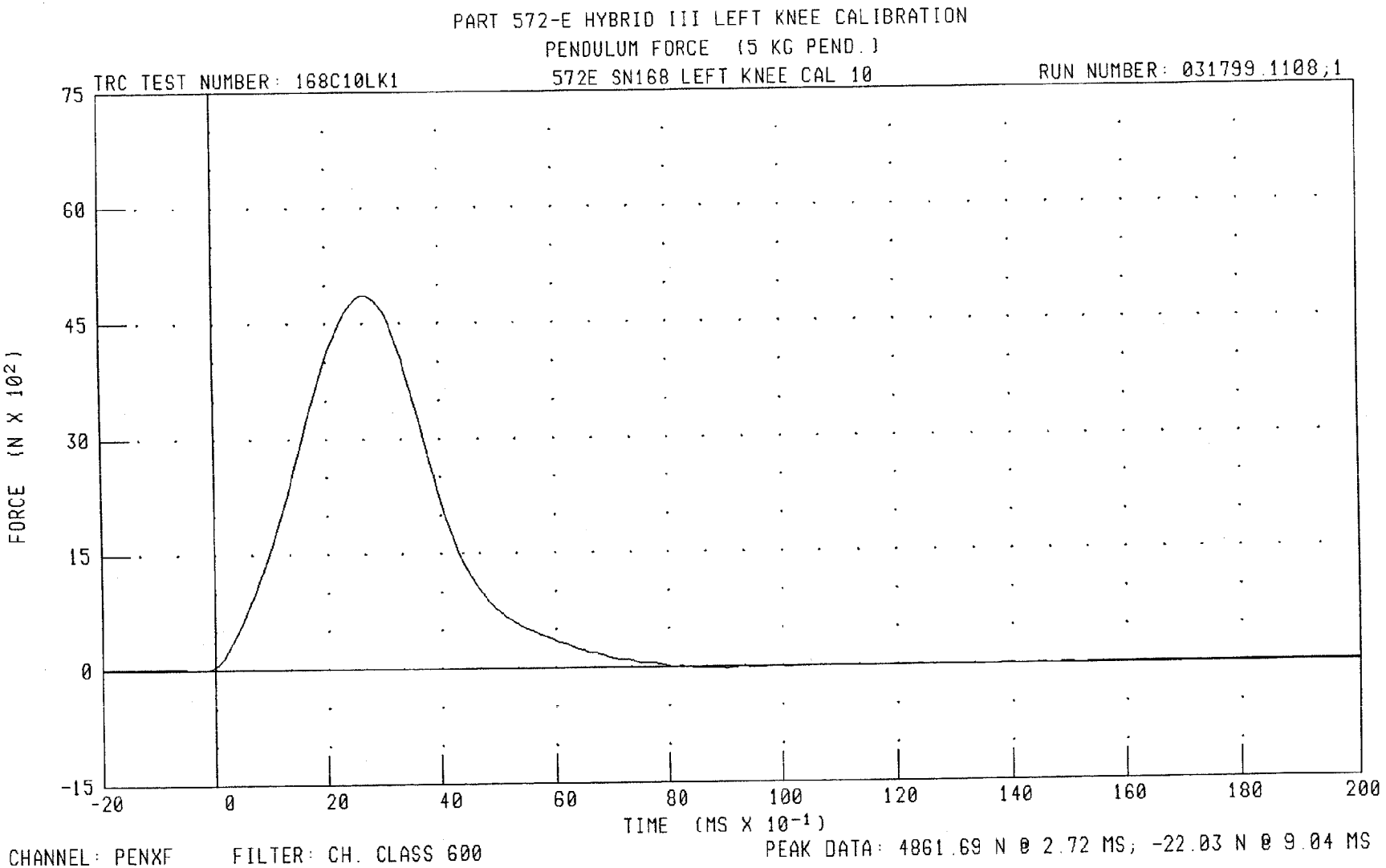
PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 168C10LK1
572E SN168 LEFT KNEE CAL 10
RUN NUMBER: 031799.1108;1



CHANNEL: PENXG FILTER: CH. CLASS 600

PEAK DATA: 99.36 G @ 2.72 MS; -0.45 G @ 9.04 MS


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE (5 KG PEND.)
TRC TEST NUMBER: 168C10LK1
572E SN168 LEFT KNEE CAL 10
RUN NUMBER: 031799.1108;1
FORCE (N X 10²)
75
60
45
30
15
0
-15
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXF
FILTER: CH. CLASS 600
PEAK DATA: 4861.69 N @ 2.72 MS; -22.03 N @ 9.04 MS

Post-Test Dummy Certification

Passenger Dummy S/N 169

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III 50th 17-MAR-99

TRC INC. TEST NO: 169C8HD1 572E SN169 HEAD DROP CAL 08

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	252.85 G
PEAK LATERAL ACCELERATION	15 G MAX	-3.18 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

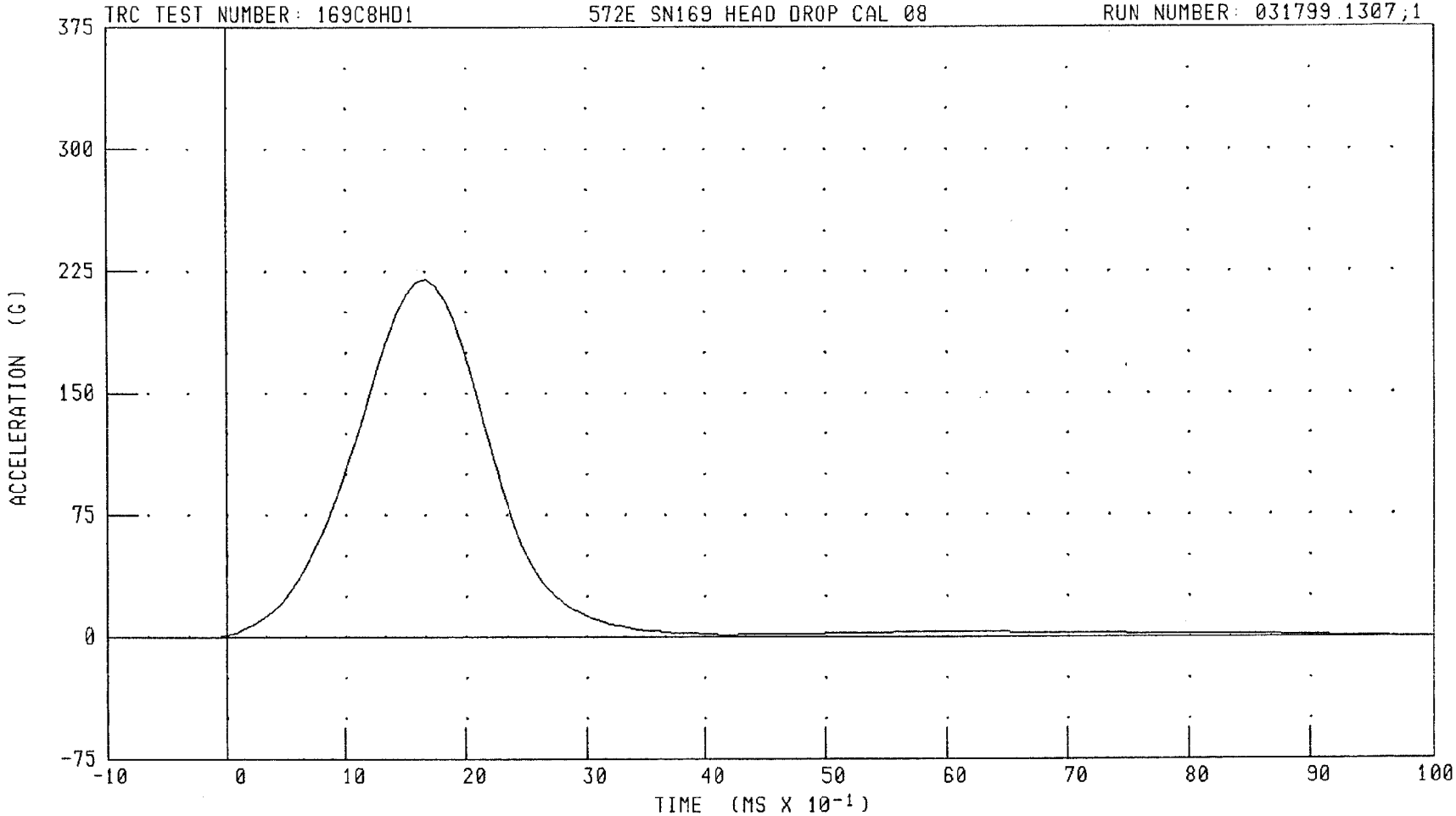
TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1307;1

PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION X AXIS

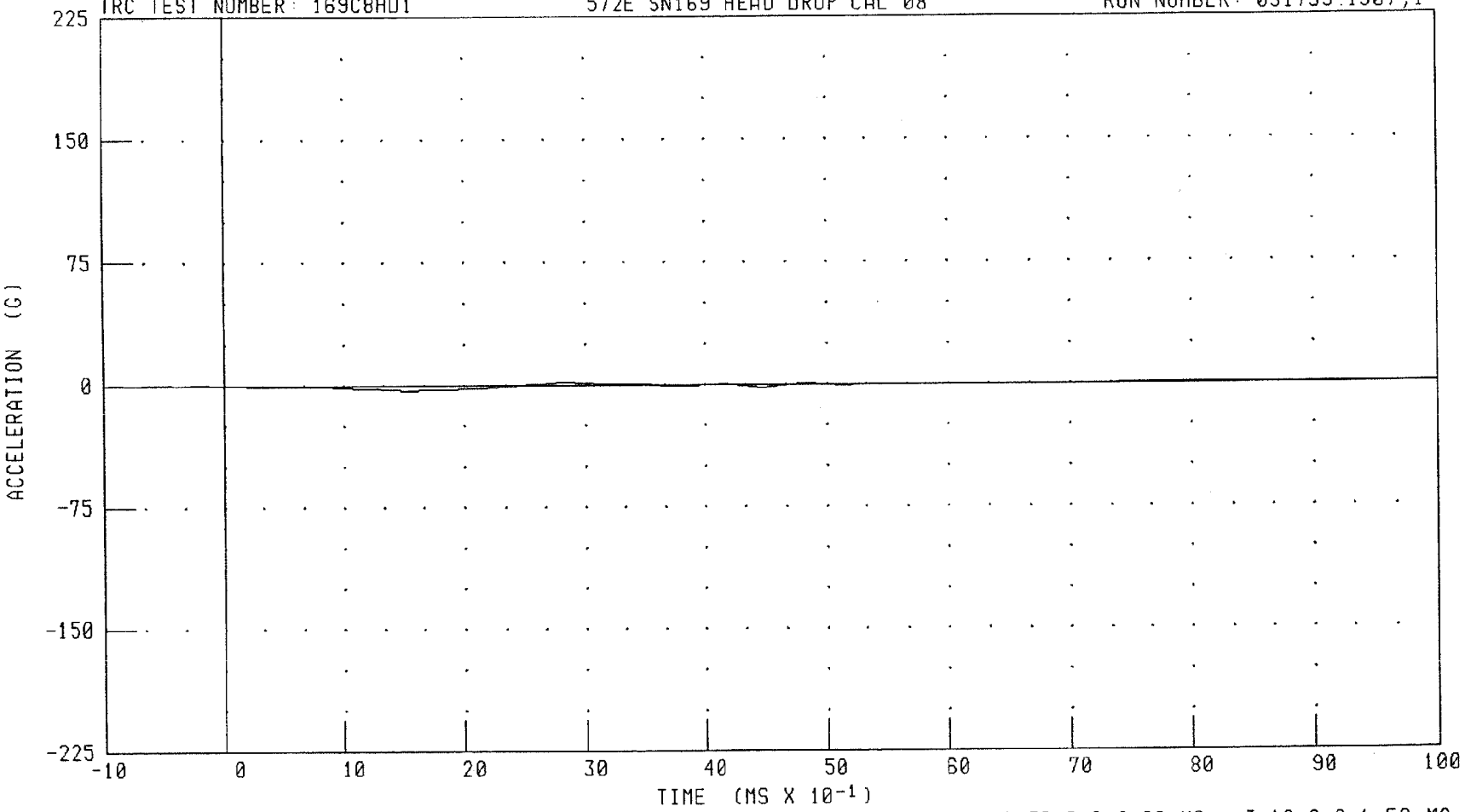
TRC TEST NUMBER: 169C8HD1 572E SN169 HEAD DROP CAL 08 RUN NUMBER: 031799.1307;1



CHANNEL: HEDXG FILTER: CH. CLASS 1000 PEAK DATA: 219.95 G @ 1.68 MS; -0.29 G @ 9.92 MS

PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

TRC TEST NUMBER: 169C8HD1 572E SN169 HEAD DROP CAL 08 RUN NUMBER: 031799.1307;1

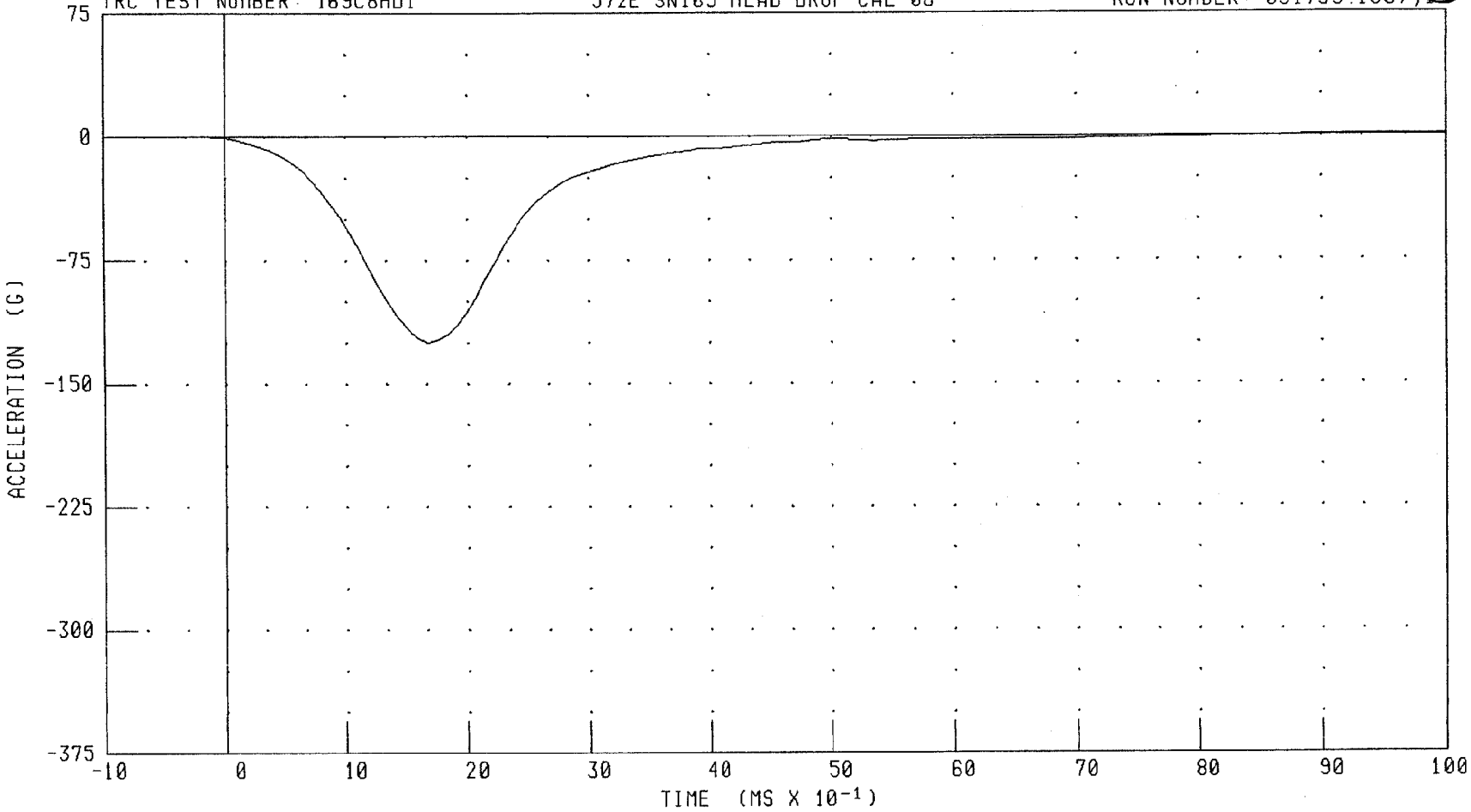


CHANNEL: HEDYG FILTER: CH. CLASS 1000 PEAK DATA: 1.32 G @ 2.80 MS; -3.18 G @ 1.52 MS

PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

TRC TEST NUMBER: 169C8HD1 572E SN169 HEAD DROP CAL 08 RUN NUMBER: 031799.1307;1

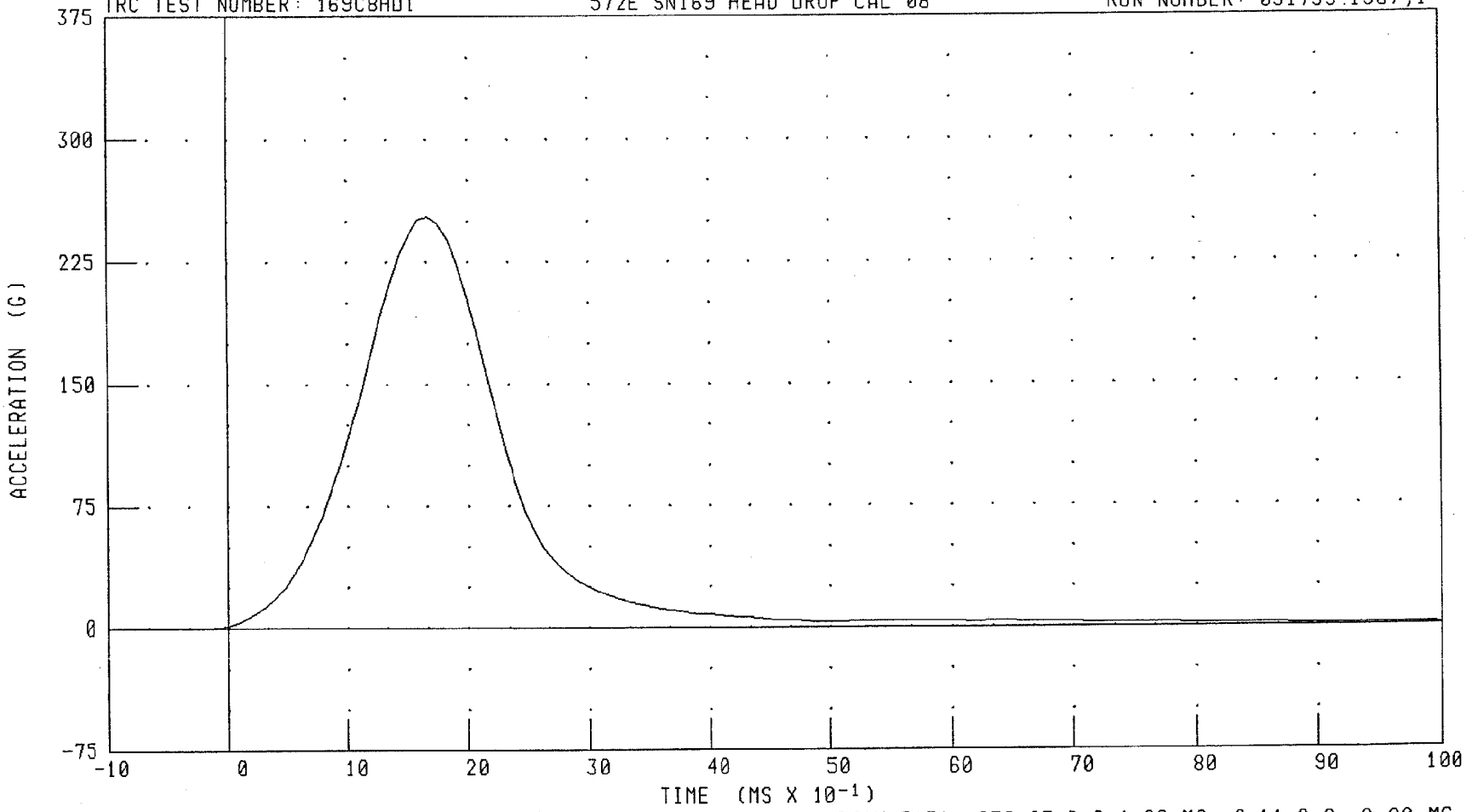


CHANNEL: HEDZG FILTER: CH. CLASS 1000 PEAK DATA: 0.79 G @ 9.44 MS; -124.69 G @ 1.68 MS

PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION
572E SN169 HEAD DROP CAL 08

TRC TEST NUMBER: 169C8HD1

RUN NUMBER: 031799.1307;1

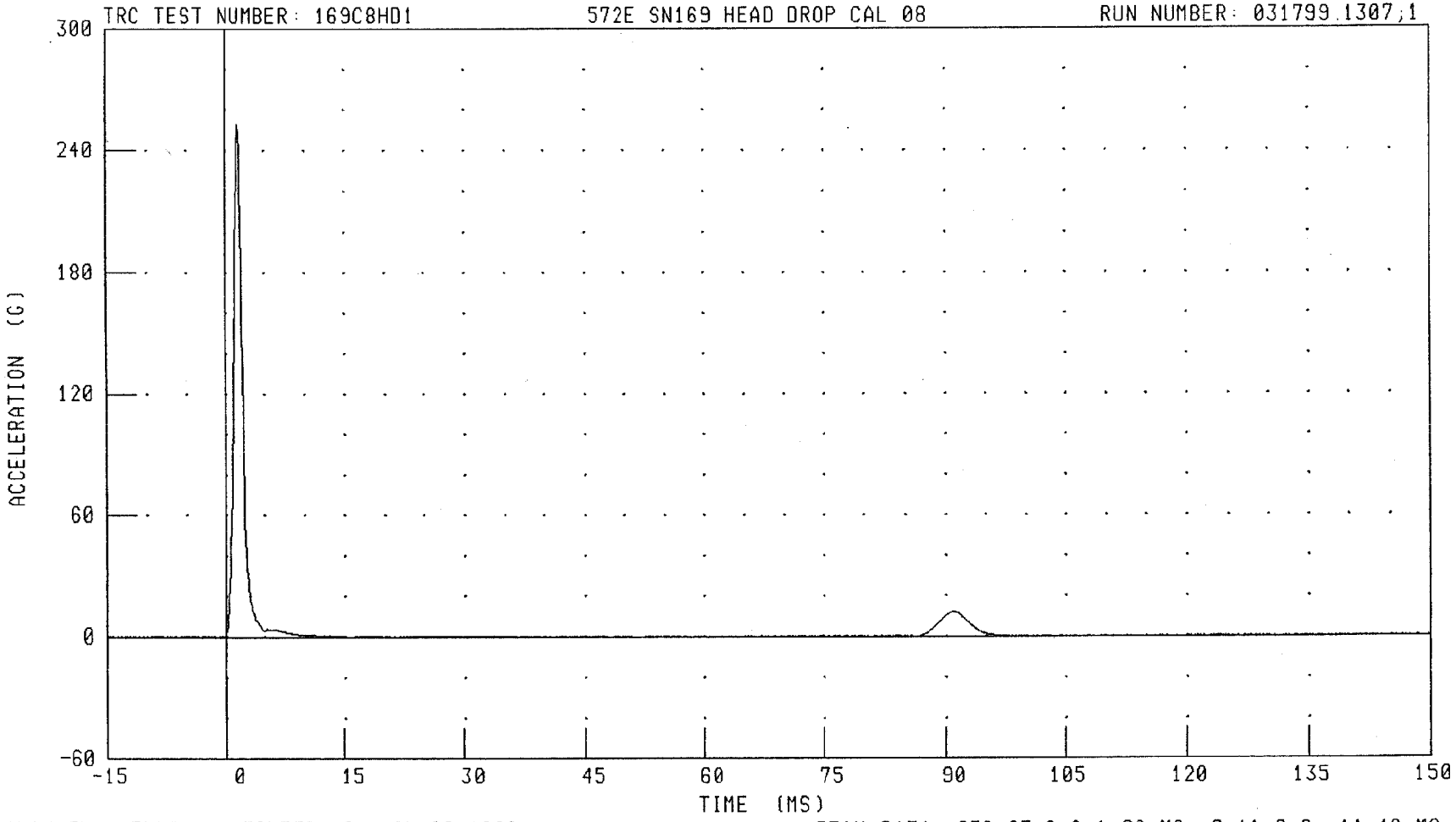


CHANNEL: HEDRG FILTER: CH. CLASS 1000

PEAK DATA: 252.85 G @ 1.68 MS; 0.11 G @ -0.80 MS

PART 572-E HYBRID III HEAD CALIBRATION
CHECK PLOT - HEAD RESULTANT ACCELERATION

TRC TEST NUMBER: 169C8HD1 572E SN169 HEAD DROP CAL 08 RUN NUMBER: 031799.1307;1



CHANNEL: HEDRG FILTER: CH. CLASS 1000 PEAK DATA: 252.85 G @ 1.68 MS; 0.11 G @ -14.48 MS

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III 50th 17-MAR-99

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 169C8NF1 572E SN169 NECK FLEXION CAL8

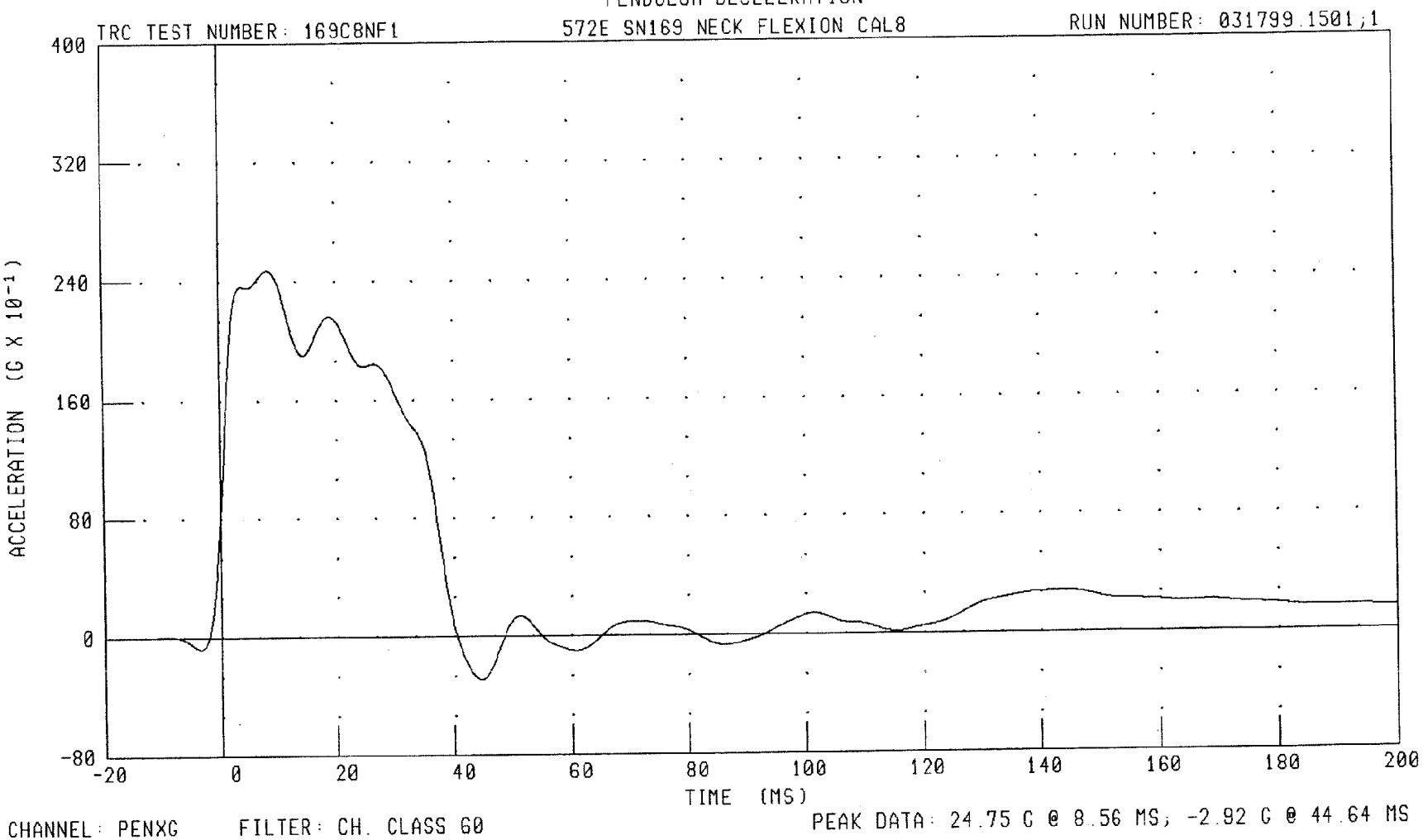
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY		10 - 70 %	22.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	6.93 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	24.13 G
	20 MS	17.60 - 22.60 G	21.44 G
	30 MS	12.50 - 18.50 G	16.53 G
MAX PENDULUM G		29 G MAX	24.75 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	16.45 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	38.16 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	76.09 DEG.
	TIME	57 - 64 MS	62.56 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	92.24 NM
	TIME	47 - 58 MS	51.20 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	119.92 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	104.72 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN By calt

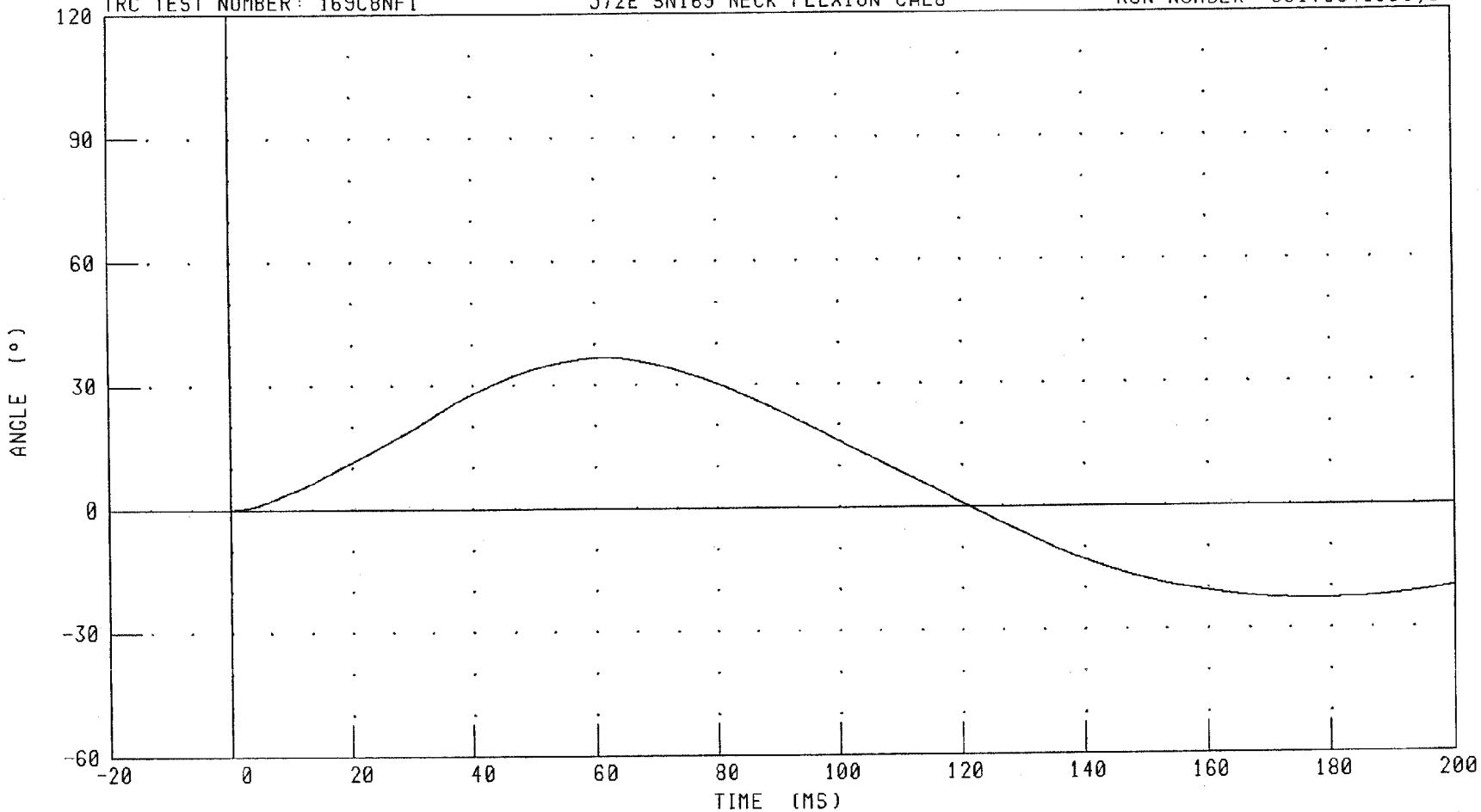
RUN NUMBER: 031799.1500;1

PART 572-E HYBRID III NECK FLEXION CALIBRATION
PENDULUM DECELERATION



PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK

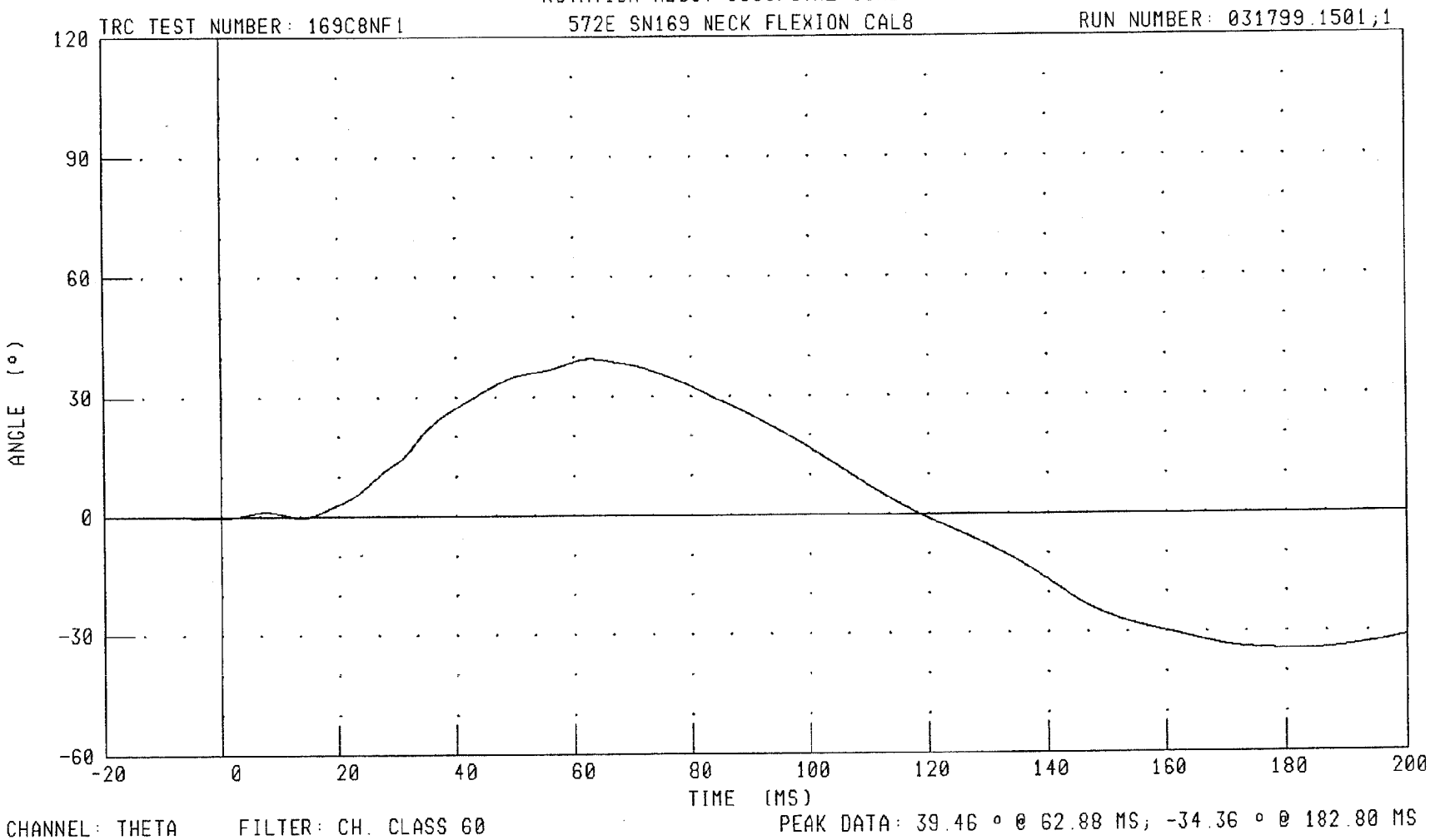
TRC TEST NUMBER: 169C8NF1
572E SN169 NECK FLEXION CAL8
RUN NUMBER: 031799.1501,1



CHANNEL: BETA FILTER: CH. CLASS 60

PEAK DATA: 36.67 ° @ 61.84 MS; -22.96 ° @ 176.88 MS

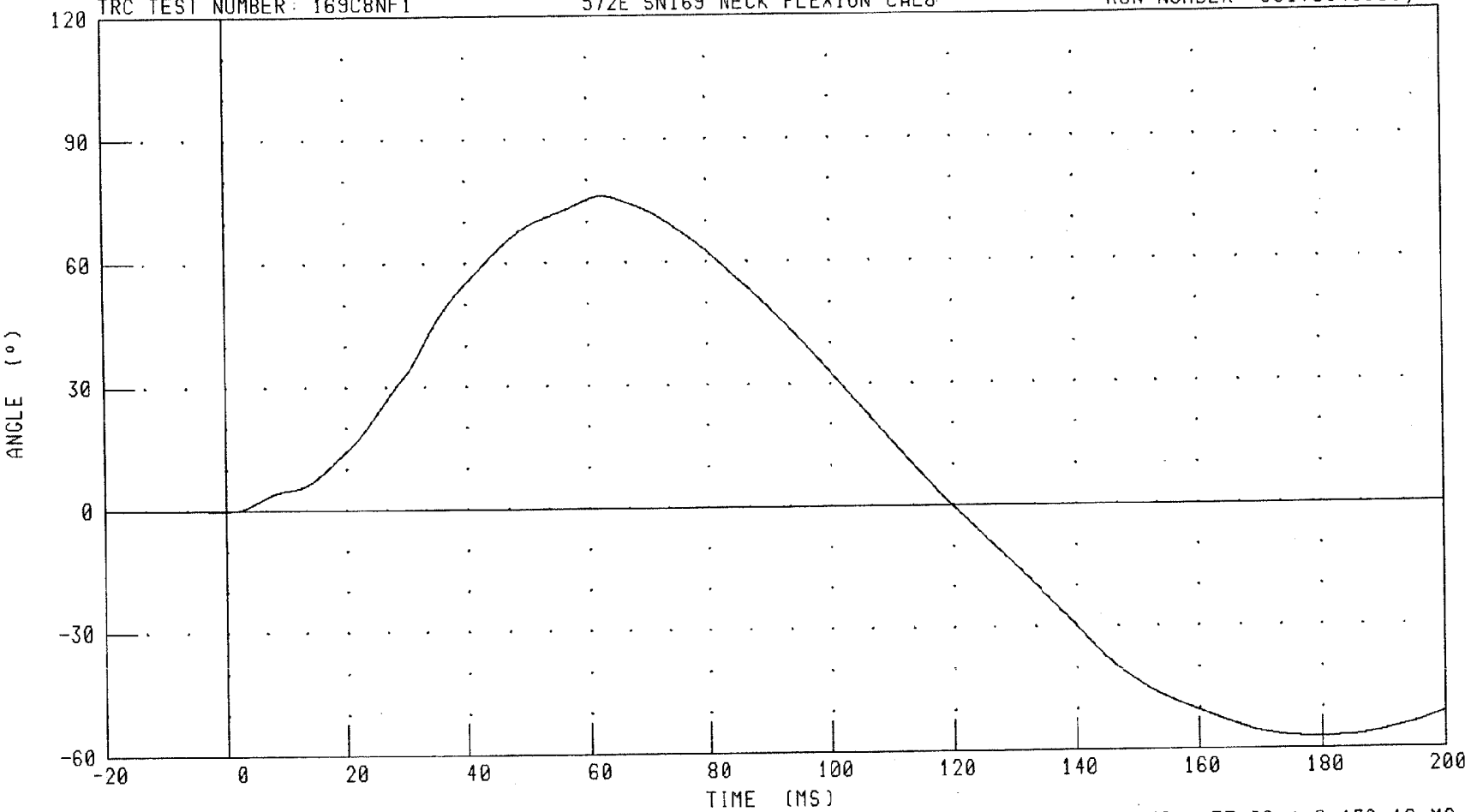
PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE



PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 169C8NF1 572E SN169 NECK FLEXION CAL8 RUN NUMBER: 031799.1501;1



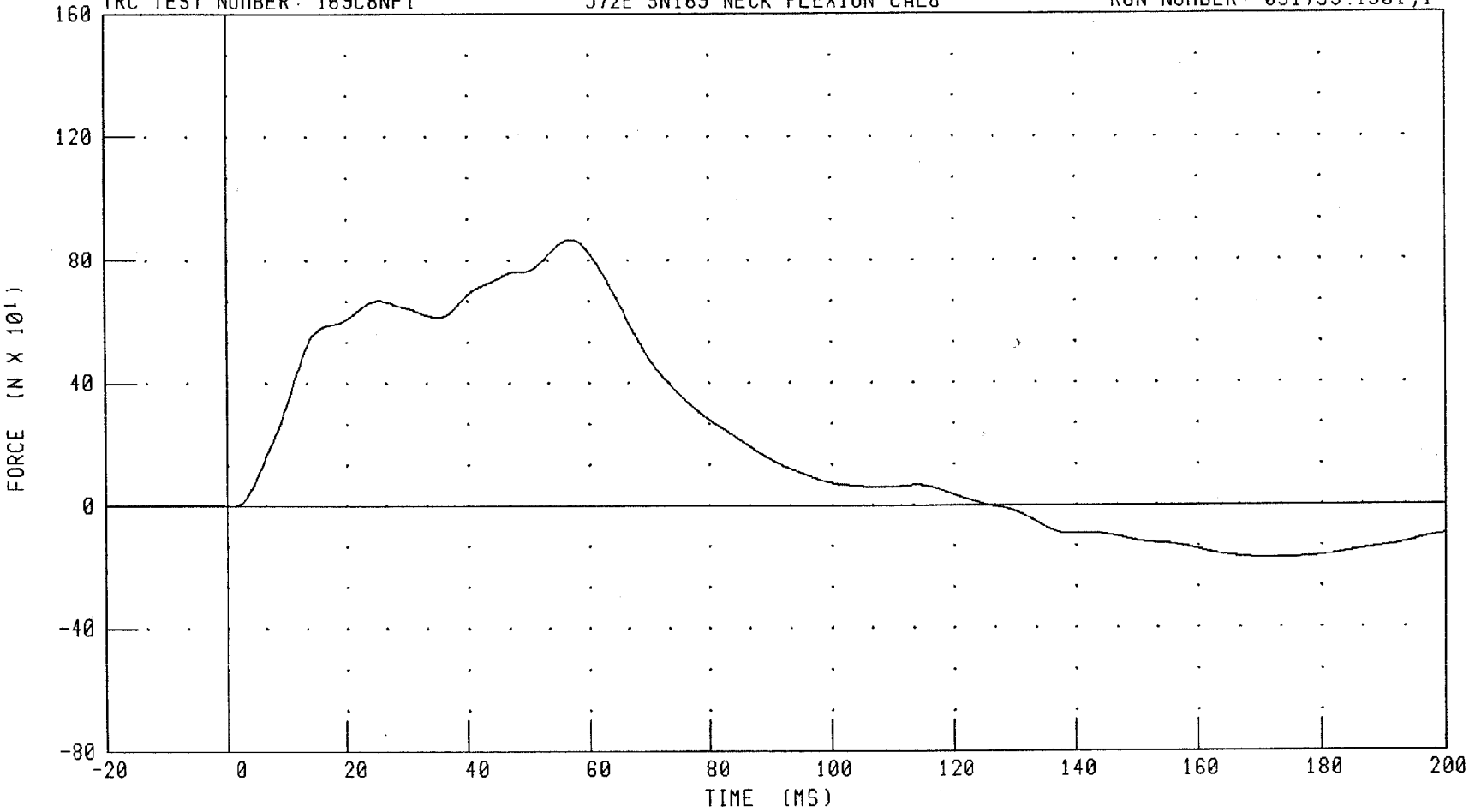
CHANNEL: TOTAN FILTER: CH. CLASS 60

PEAK DATA: 76.09 ° @ 62.56 MS; -57.20 ° @ 179.12 MS

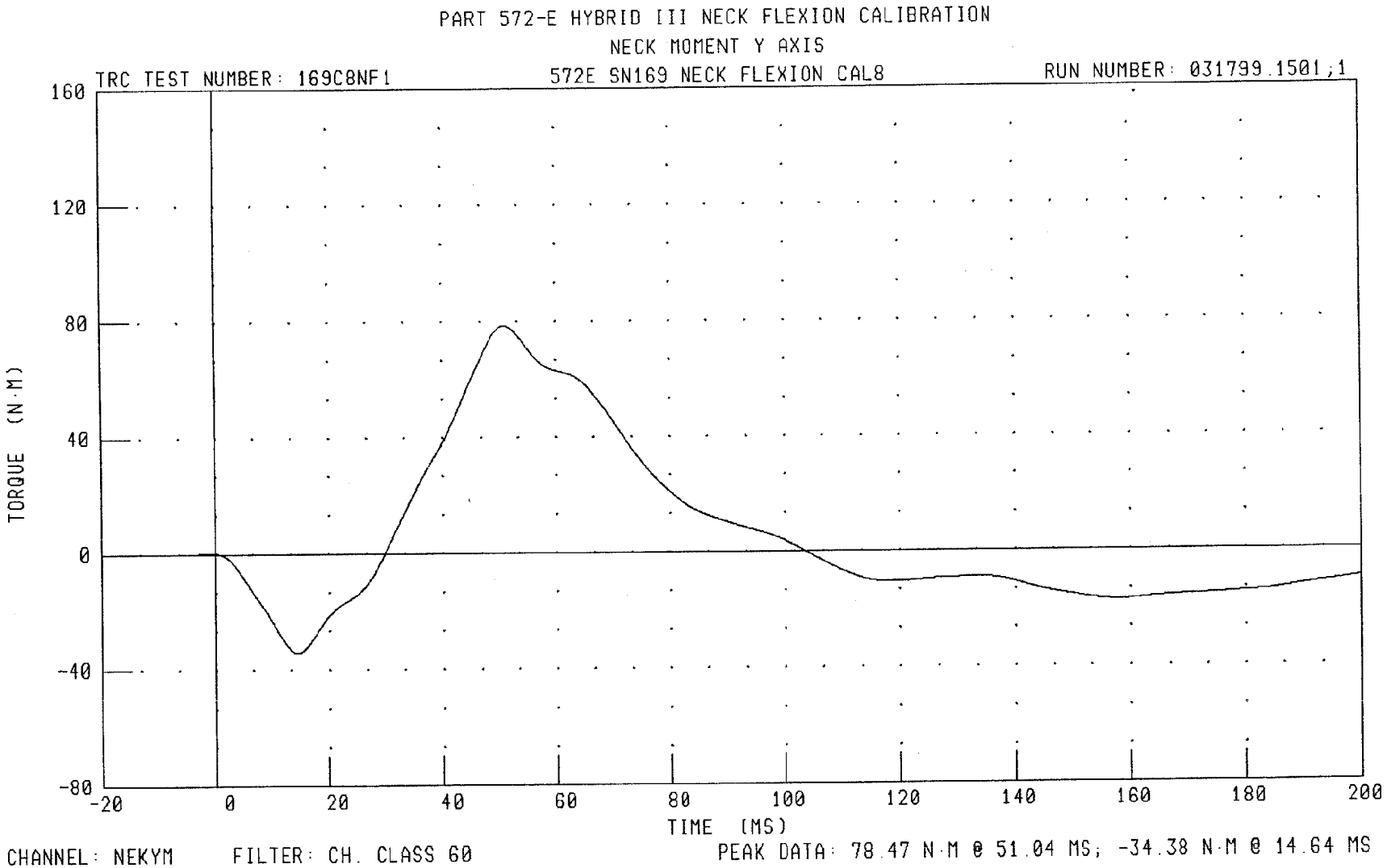
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 169C8NF1 572E SN169 NECK FLEXION CAL8 RUN NUMBER: 031799.1501;1

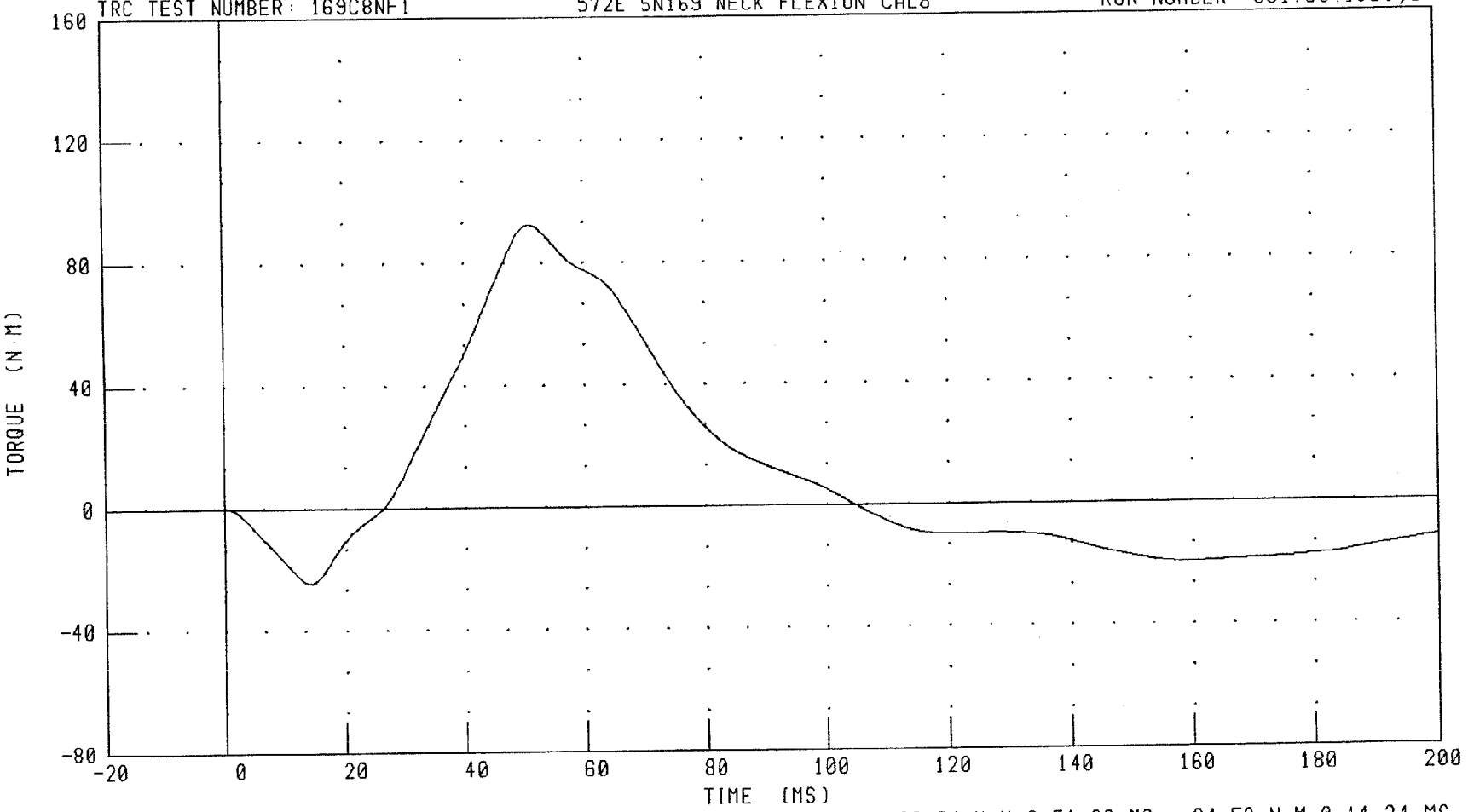


CHANNEL: NEKXF FILTER: CH. CLASS 60 PEAK DATA: 867.16 N @ 57.04 MS; -173.03 N @ 171.44 MS


PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK MOMENT Y AXIS
TRC TEST NUMBER: 169C8NF1
572E SN169 NECK FLEXION CAL8
RUN NUMBER: 031799.1501;1
TORQUE (N-M)
160
120
80
40
0
-40
-80
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKYM
FILTER: CH. CLASS 60
PEAK DATA: 78.47 N-M @ 51.04 MS; -34.38 N-M @ 14.64 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 169C8NF1 572E SN169 NECK FLEXION CAL8 RUN NUMBER: 031799.1501;1



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 92.24 N-M @ 51.20 MS; -24.52 N-M @ 14.24 MS

TRANSPORTATION RESEARCH CENTER INC.

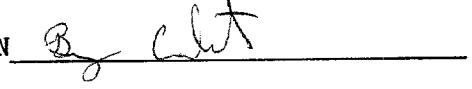
HYBRID III 50th 18-MAR-99

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 169C8NE1 572E SN 169 NECK EXT CAL8

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY		10 - 70 %	22.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.05 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.00 G
	20 MS	14.00 - 19.00 G	16.99 G
	30 MS	11.00 - 16.00 G	13.63 G
MAX PENDULUM G		22 G MAX	18.95 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	13.57 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	40.64 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	101.92 DEG.
	TIME	72 - 82 MS	76.96 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-67.82 NM
	TIME	65 - 79 MS	71.60 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	158.56 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	148.00 MS

TEST MEETS SPECIFICATIONS

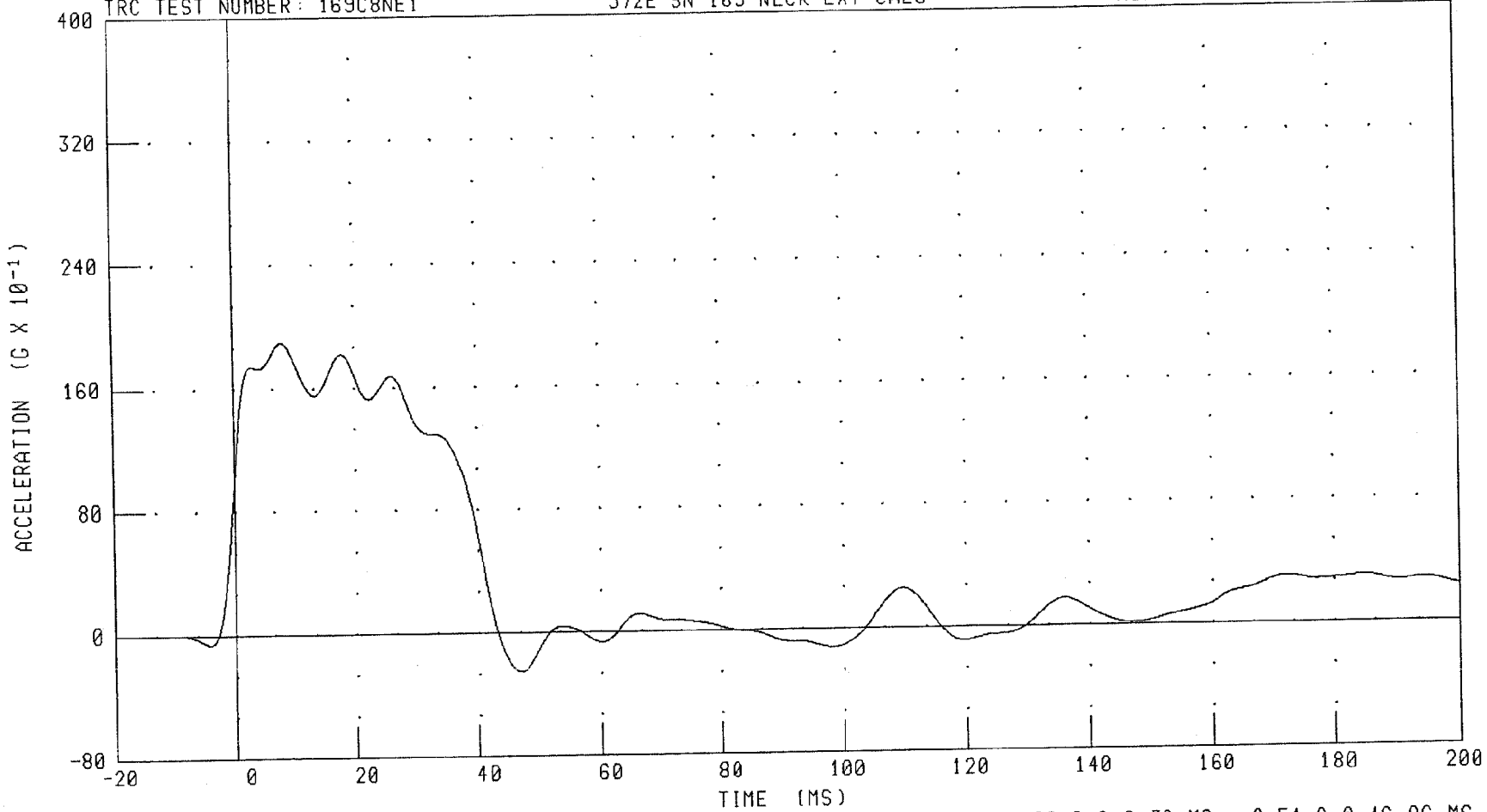
TECHNICIAN 

RUN NUMBER: 031899.0716;3

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 169C8NE1 572E SN 169 NECK EXT CAL8 RUN NUMBER: 031899.0717;3

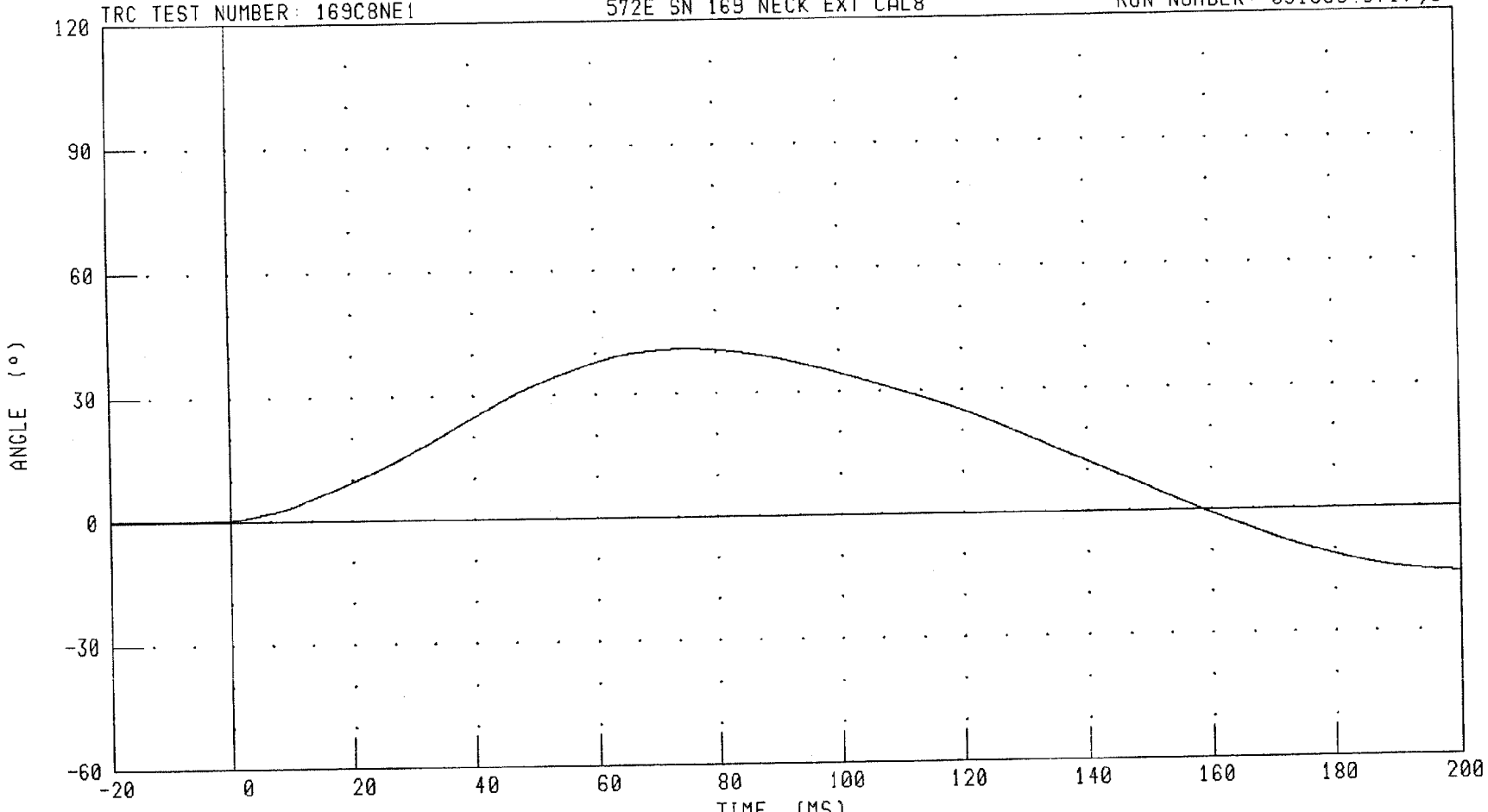


CHANNEL: PENXG FILTER: CH CLASS 60

PEAK DATA: 18.96 G @ 8.32 MS; -2.54 G @ 46.96 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 169C8NE1
572E SN 169 NECK EXT CAL8
RUN NUMBER: 031899.0717;3

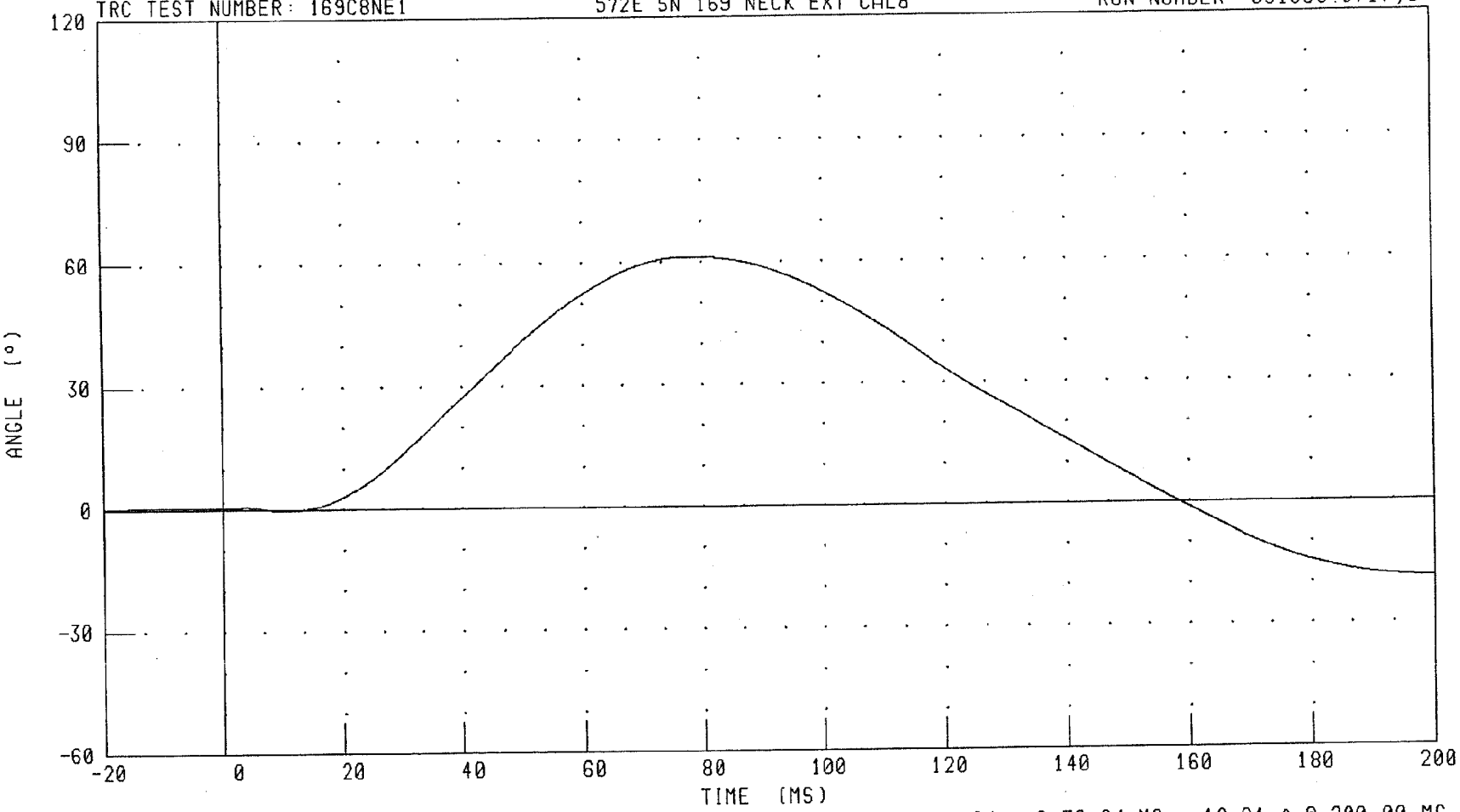


CHANNEL: BETA FILTER: CH. CLASS 60

PEAK DATA: 40.77 ° @ 75.04 MS; -15.78 ° @ 200.00 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 169C8NE1 572E SN 169 NECK EXT CAL8 RUN NUMBER: 031899.0717;3



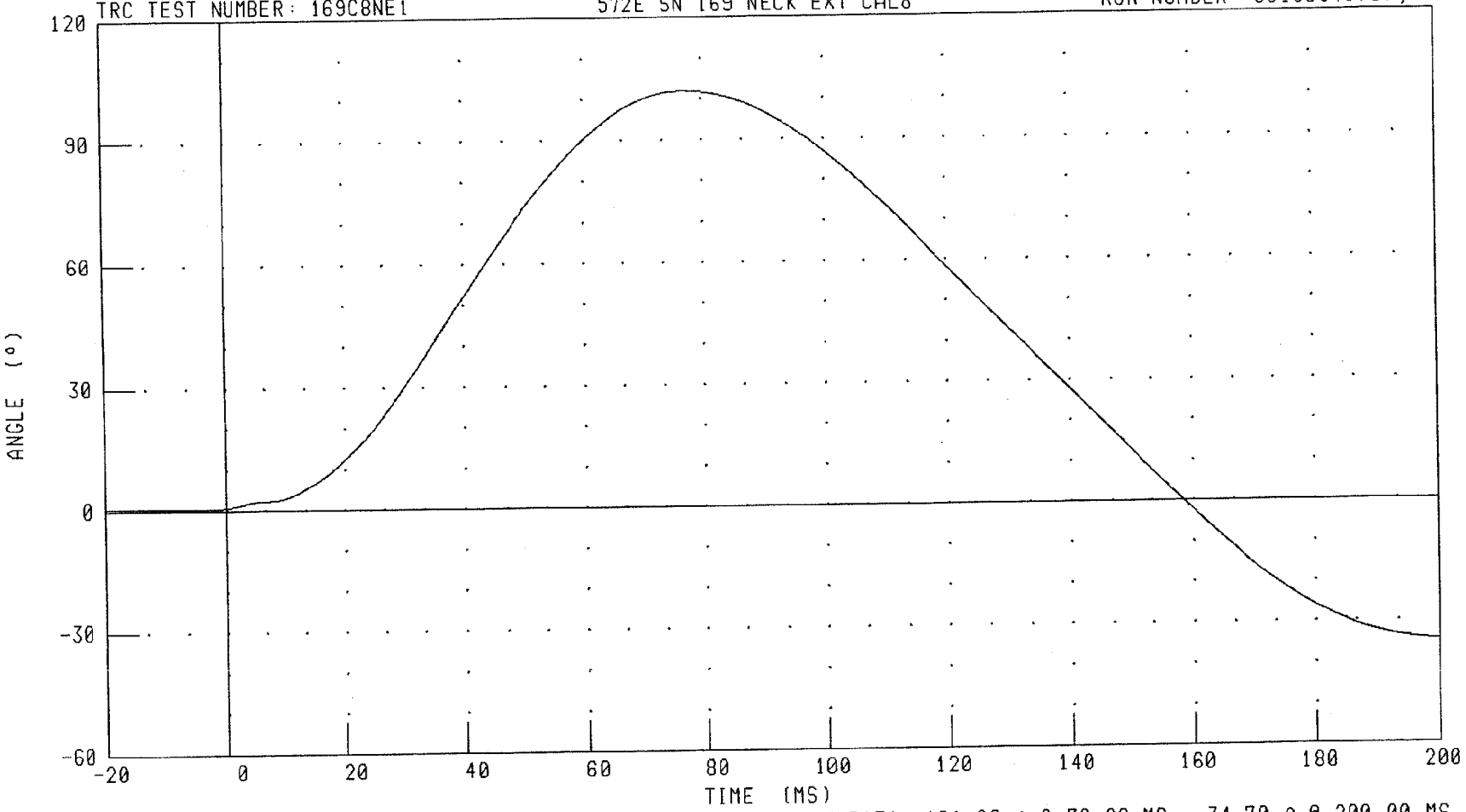
CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 61.24 ° @ 78.64 MS; -18.91 ° @ 200.00 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 169C8NE1 572E SN 169 NECK EXT CAL8 RUN NUMBER: 031899.0717;3

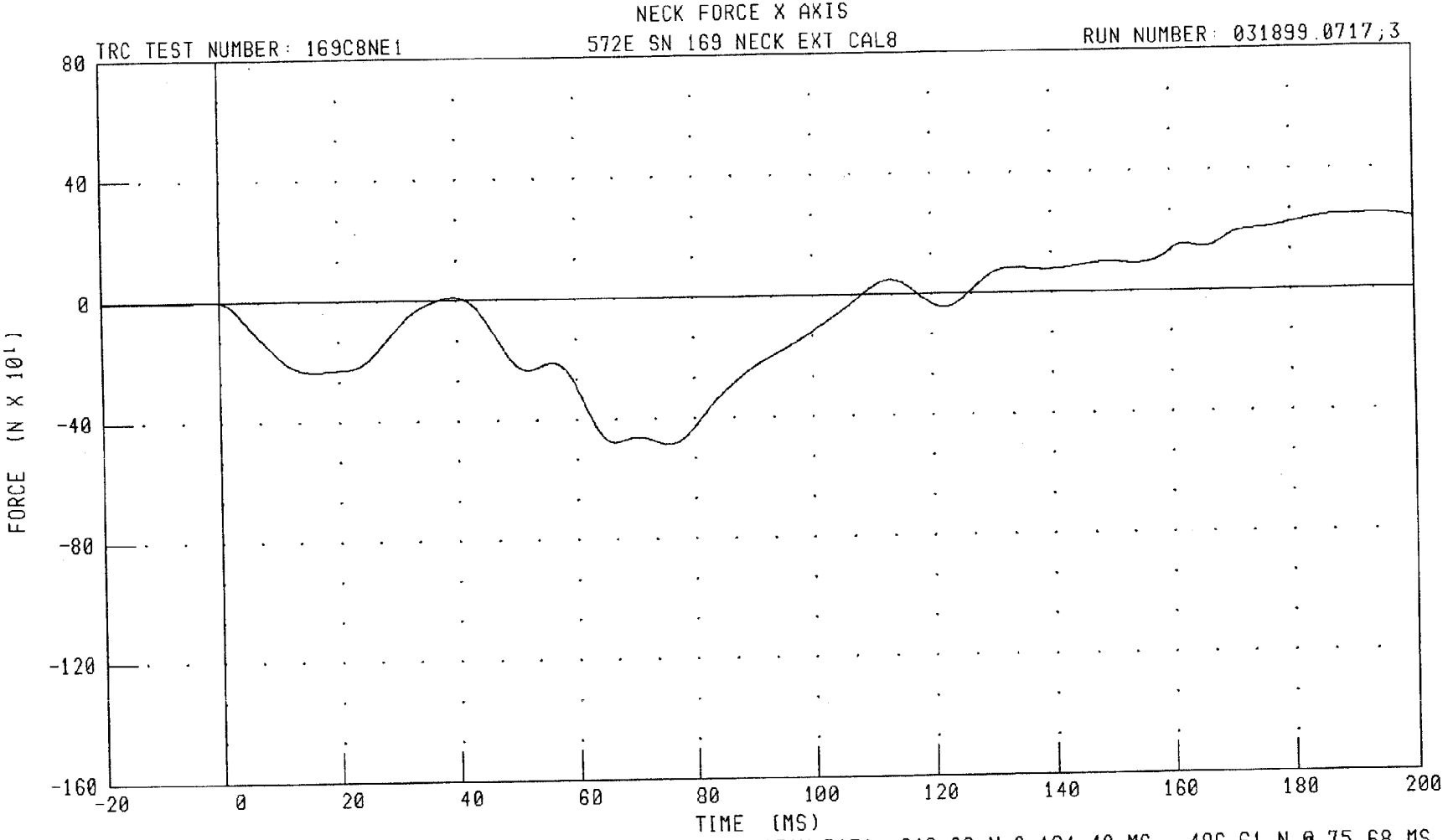


CHANNEL: TOTAN FILTER: CH. CLASS 60

PEAK DATA: 101.92 ° @ 76.96 MS; -34.70 ° @ 200.00 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS



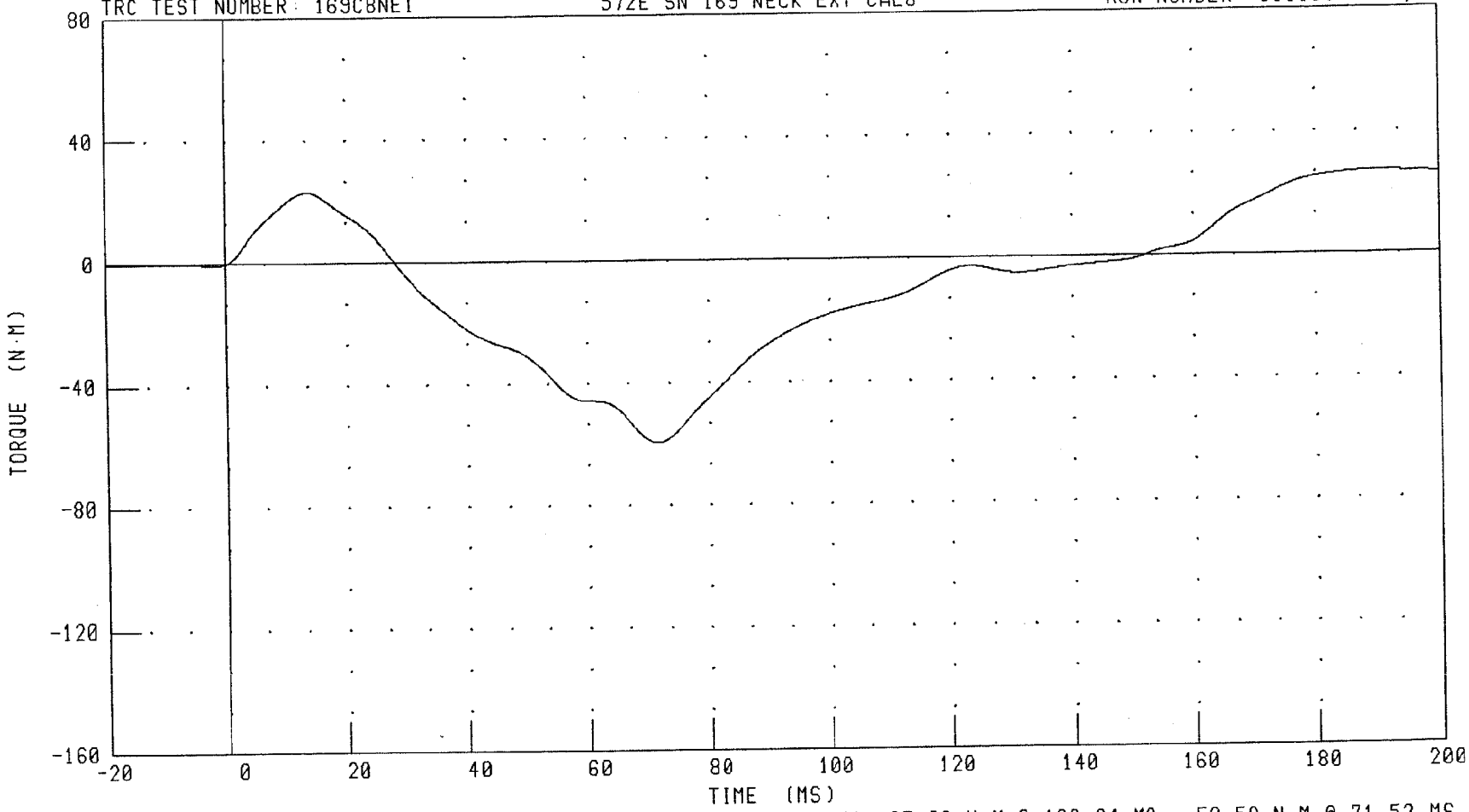
CHANNEL: NEKXF FILTER: CH. CLASS 60

PEAK DATA: 248.60 N @ 194.48 MS; -486.61 N @ 75.68 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

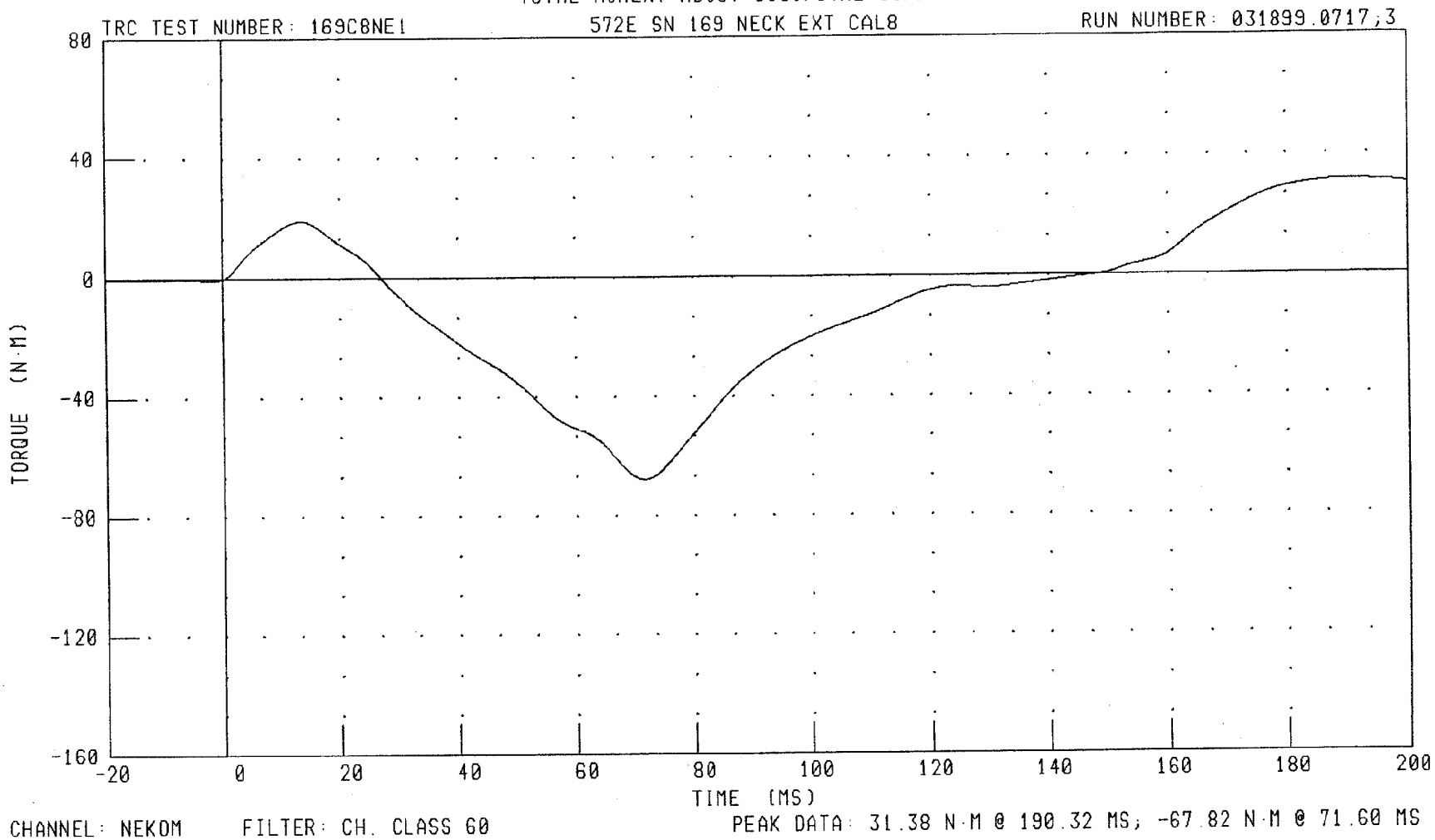
TRC TEST NUMBER: 169C8NE1 572E SN 169 NECK EXT CAL8 RUN NUMBER: 031899.0717;3



CHANNEL: NEKYM FILTER: CH. CLASS 60

PEAK DATA: 27.00 N-M @ 190.24 MS; -59.58 N-M @ 71.52 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 31.38 N·M @ 190.32 MS; -67.82 N·M @ 71.60 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III 50th 18-MAR-99

TRC INC. TEST NO: 169C8TH1 572E SN169 H.S.THORAX CAL08

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.59 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	68.8 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5434. N
INTERNAL HYSTERESIS	69% - 85%	72.9%

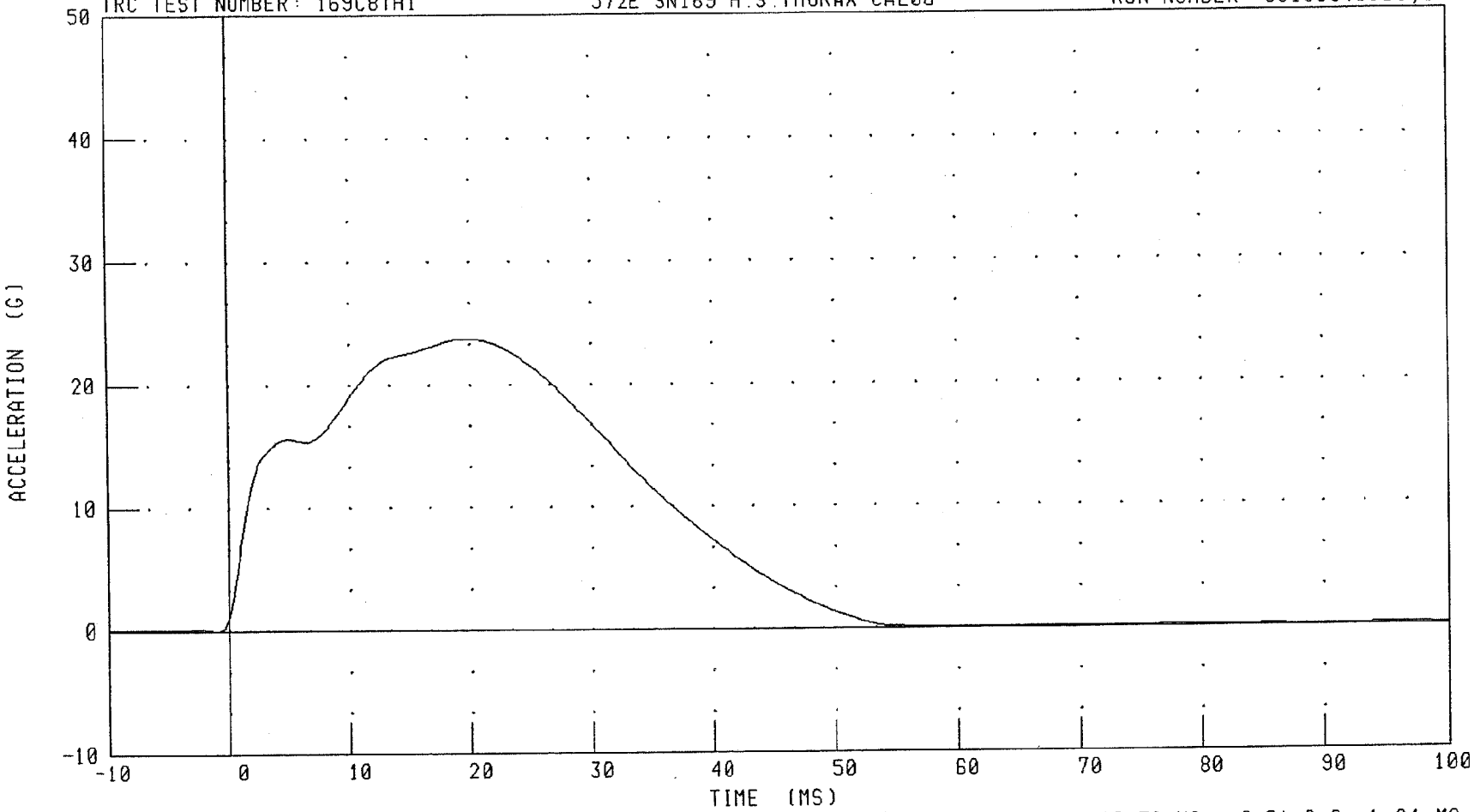
TEST MEETS SPECIFICATIONS

TECHNICIAN By Calt

RUN NUMBER: 031899.0805;1

PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION

TRC TEST NUMBER: 169C8TH1
572E SN169 H.S.THORAX CAL08
RUN NUMBER: 031899.0805;1



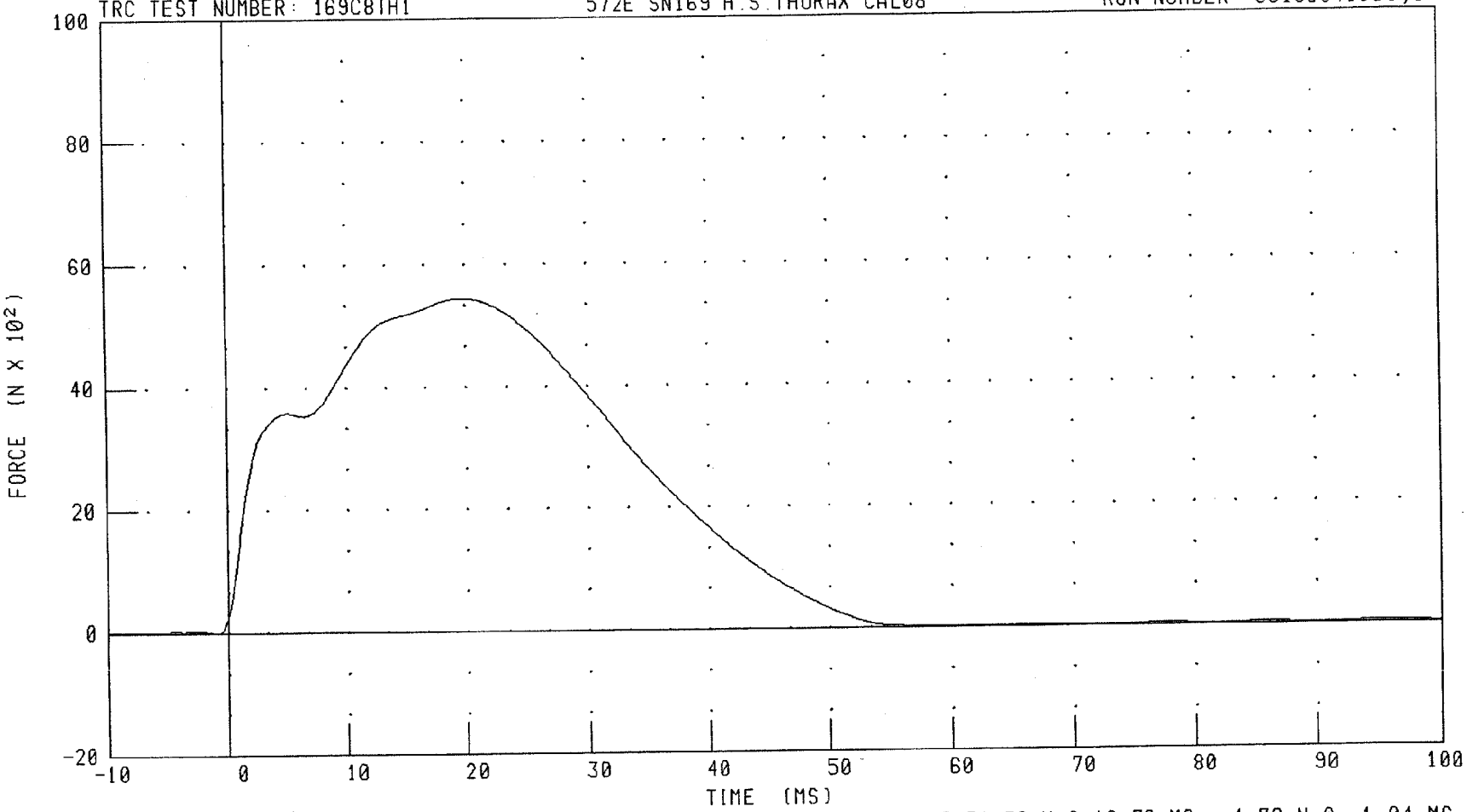
CHANNEL: PENXG FILTER: CH. CLASS 180

PEAK DATA: 23.72 G @ 19.76 MS; -0.01 G @ -1.04 MS

PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM FORCE

TRC TEST NUMBER: 169C8TH1 572E SN169 H.S.THORAX CAL08 RUN NUMBER: 031899.0805;1



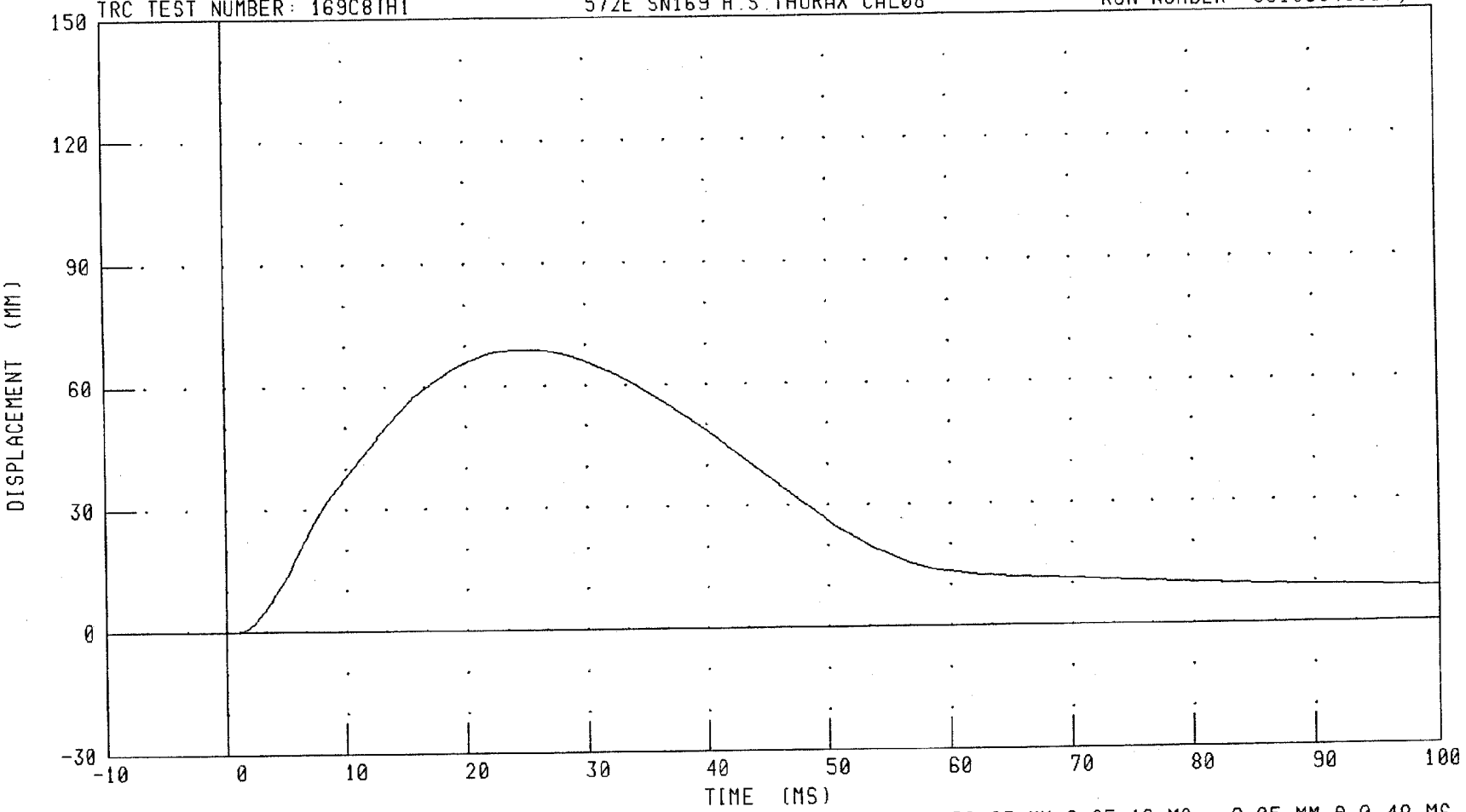
CHANNEL: PENXF FILTER: CH. CLASS 180

PEAK DATA: 5434.38 N @ 19.76 MS; -1.79 N @ -1.04 MS

PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

TRC TEST NUMBER: 169C8TH1 572E SN169 H.S.THORAX CAL08 RUN NUMBER: 031899.0805;1

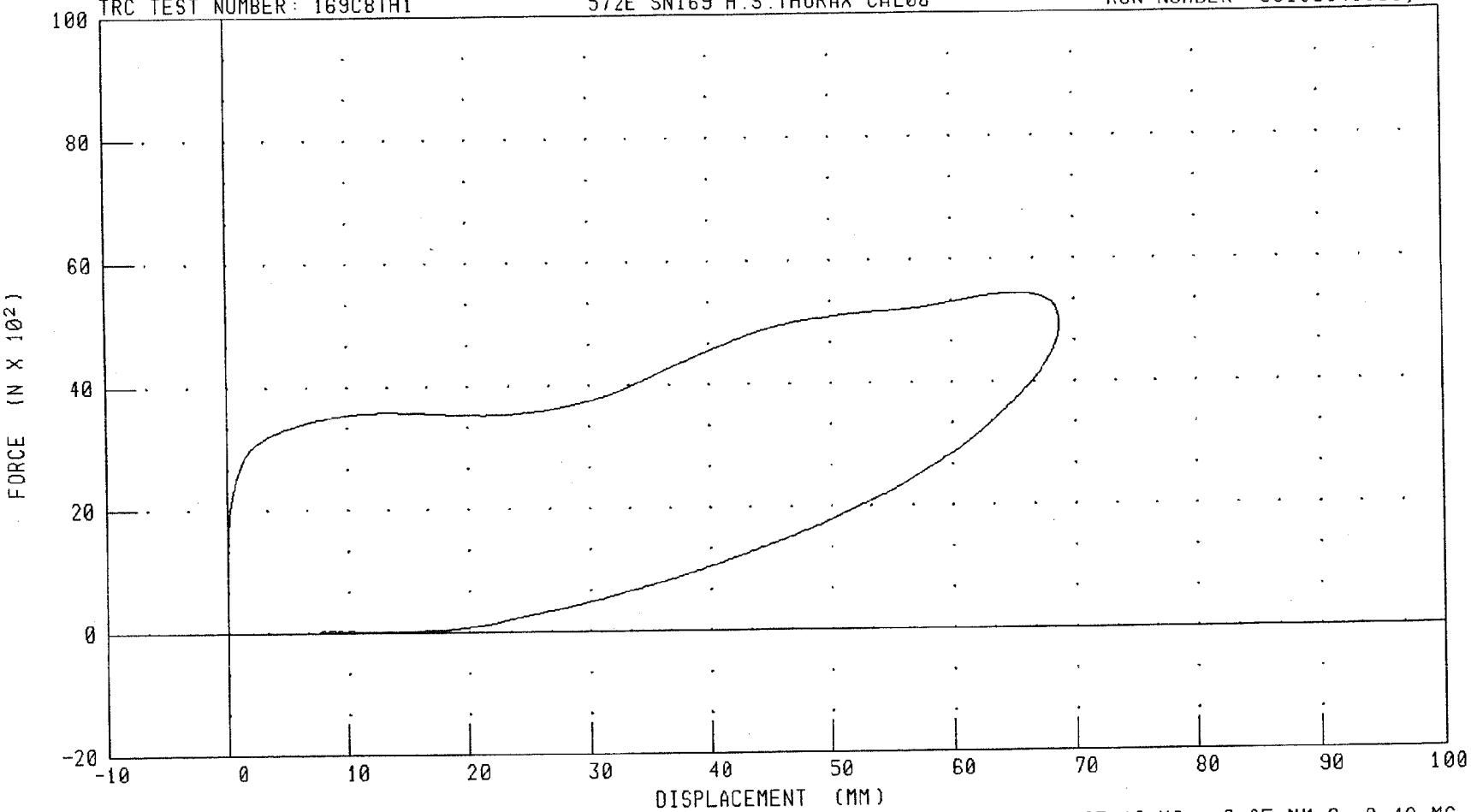


CHANNEL: CSTXD FILTER: CH. CLASS 180

PEAK DATA: 68.83 MM @ 25.12 MS; -0.05 MM @ 0.48 MS

PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

TRC TEST NUMBER: 169C8TH1
572E SN169 H.S.THORAX CAL08
RUN NUMBER: 031899.0805;1



CHANNEL: CSTXD
PENXF

FILTER: CH. CLASS 180
CH. CLASS 180

PEAK DATA: 68.83 MM @ 25.12 MS; -0.05 MM @ 0.48 MS
5434.38 N @ 19.76 MS; -1.79 N @ -1.04 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E 17-MAR-99

TRC INC. TEST NO: 169C8HR1 572E SN 169 HIPFLEX CAL 08

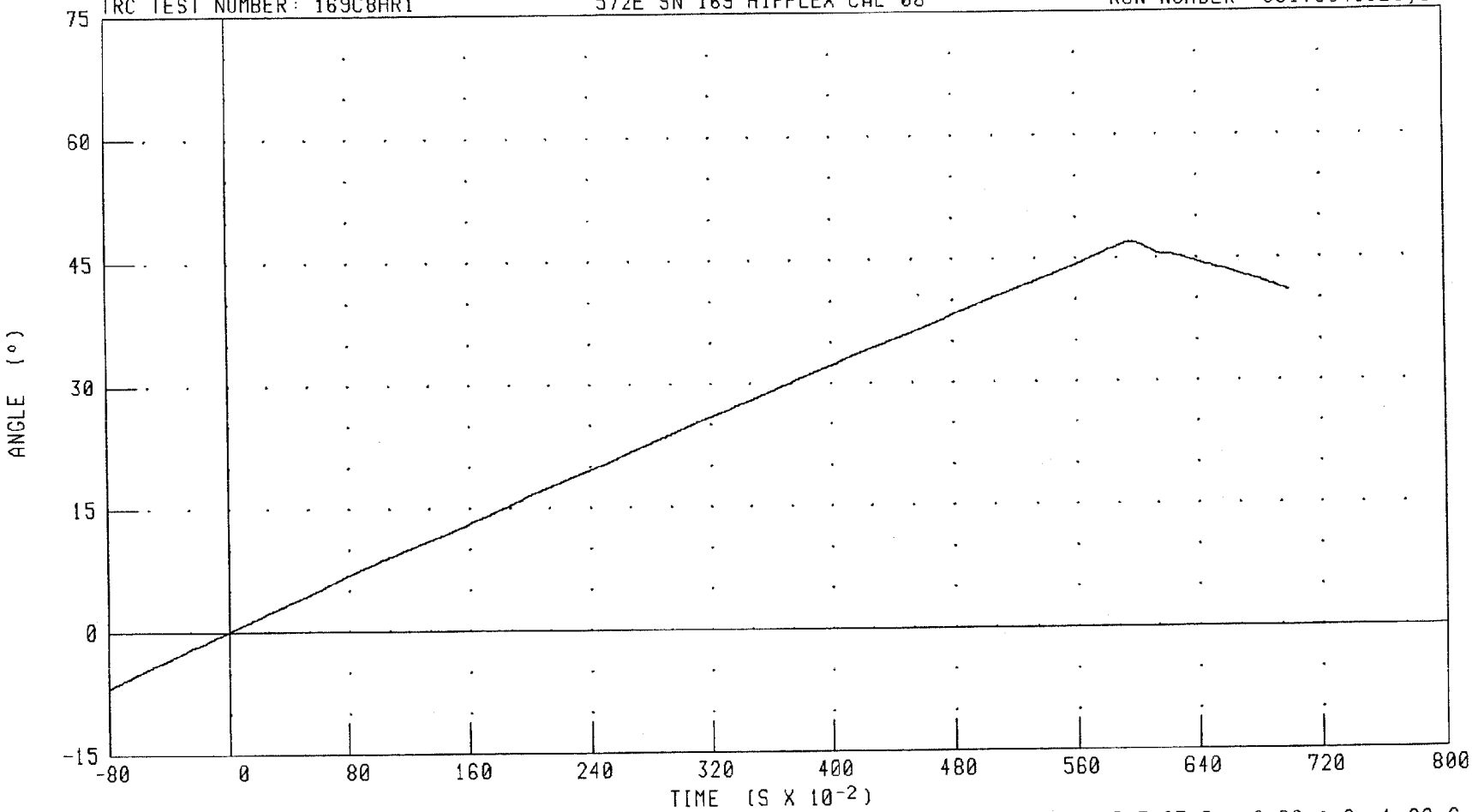
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	67.5 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	46.1 deg.

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1129;1

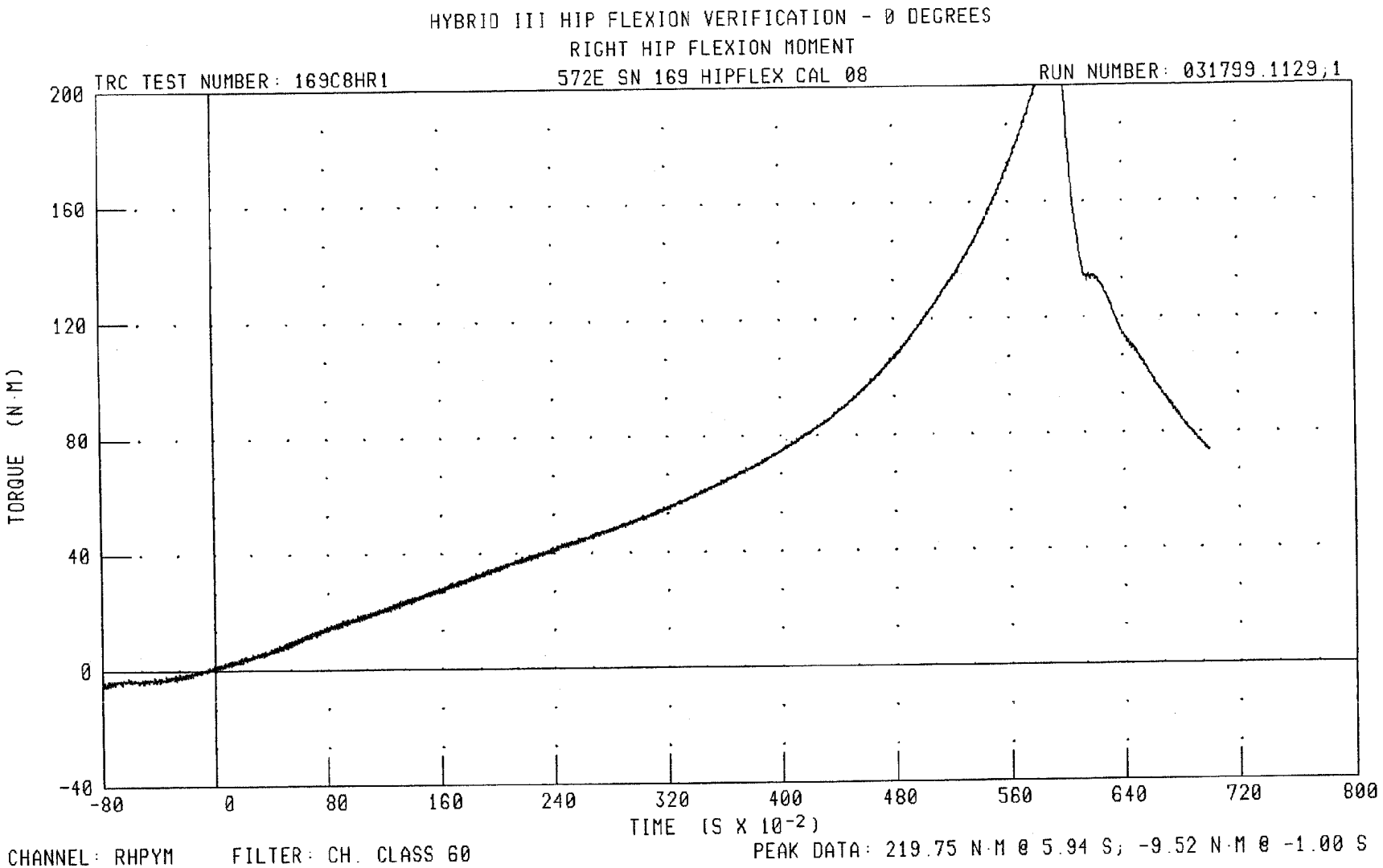
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
RIGHT HIP FLEXION ROTATION

TRC TEST NUMBER: 169C8HR1
572E SN 169 HIPFLEX CAL 08
RUN NUMBER: 031799.1129;1



CHANNEL: RHPXD FILTER: CH. CLASS 60

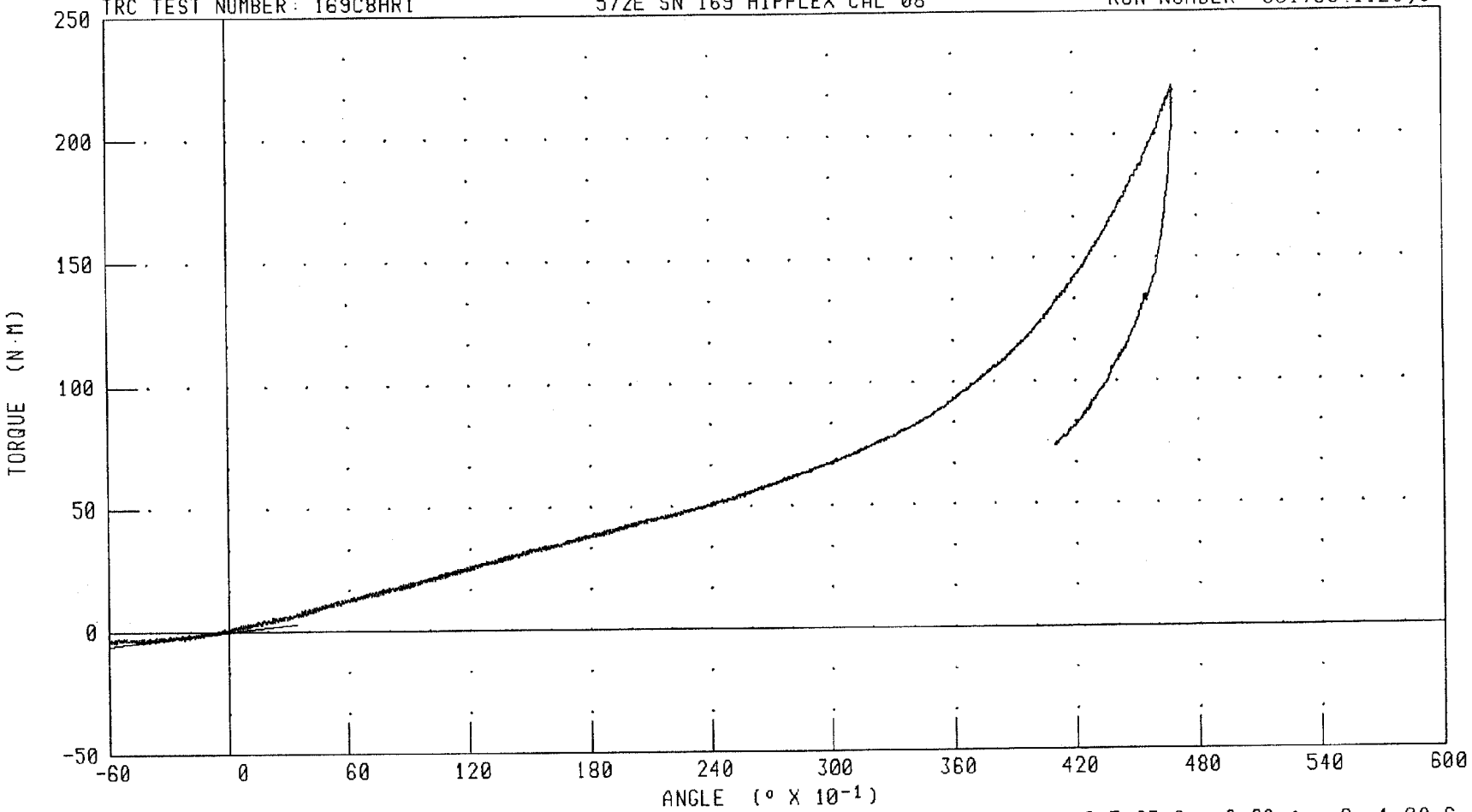
PEAK DATA: 46.94 ° @ 5.95 S; -9.89 ° @ -1.00 S


HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
RIGHT HIP FLEXION MOMENT
TRC TEST NUMBER: 169C8HR1
572E SN 169 HIPFLEX CAL 08
RUN NUMBER: 031799.1129,1
200
160
120
80
40
0
-40
TORQUE (N·M)
-80
0
80
160
240
320
400
480
560
640
720
800
TIME (S X 10-2)
CHANNEL: RHPYM
FILTER: CH. CLASS 60
PEAK DATA: 219.75 N·M @ 5.94 S; -9.52 N·M @ -1.00 S

HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION MOMENT VS ROTATION ANGLE

TRC TEST NUMBER: 169C8HR1 572E SN 169 HIPFLEX CAL 08 RUN NUMBER: 031799.1129;1



CHANNEL: RHPXD FILTER: CH. CLASS 60

RHPYM CH. CLASS 60

PEAK DATA: 46.94 ° @ 5.95 S; -9.89 ° @ -1.00 S

219.75 N·M @ 5.94 S; -9.52 N·M @ -1.00 S

TRANSPORTATION RESEARCH CENTER INC.

LEFT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E 17-MAR-99

TRC INC. TEST NO: 169C8HL1 572E SN 169 HIPFLEX CAL 08

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	50.7 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	46.6 deg.

TEST MEETS SPECIFICATIONS

TECHNICIAN By Cahl

RUN NUMBER: 031799.1125;1

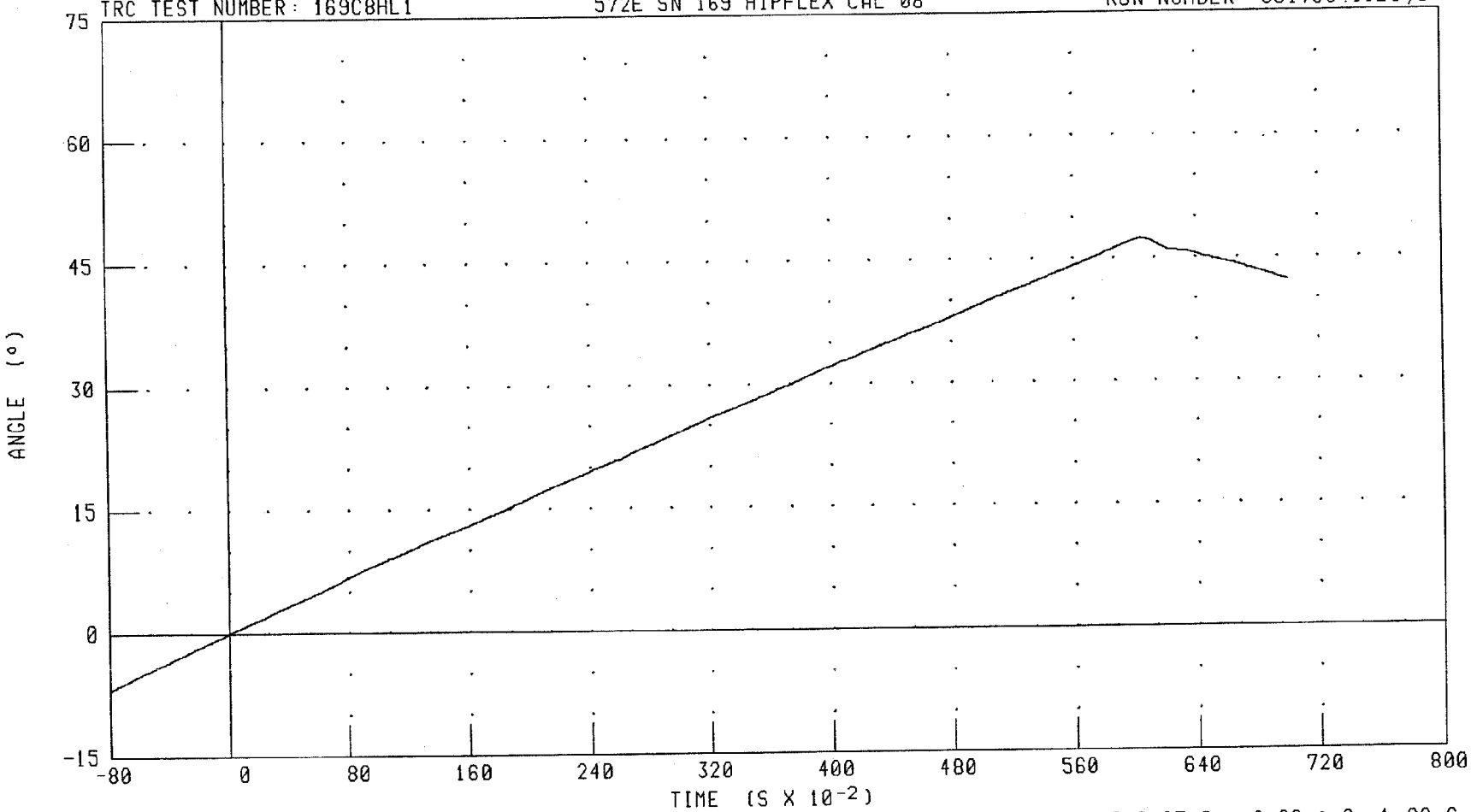
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION ROTATION

TRC TEST NUMBER: 169C8HL1

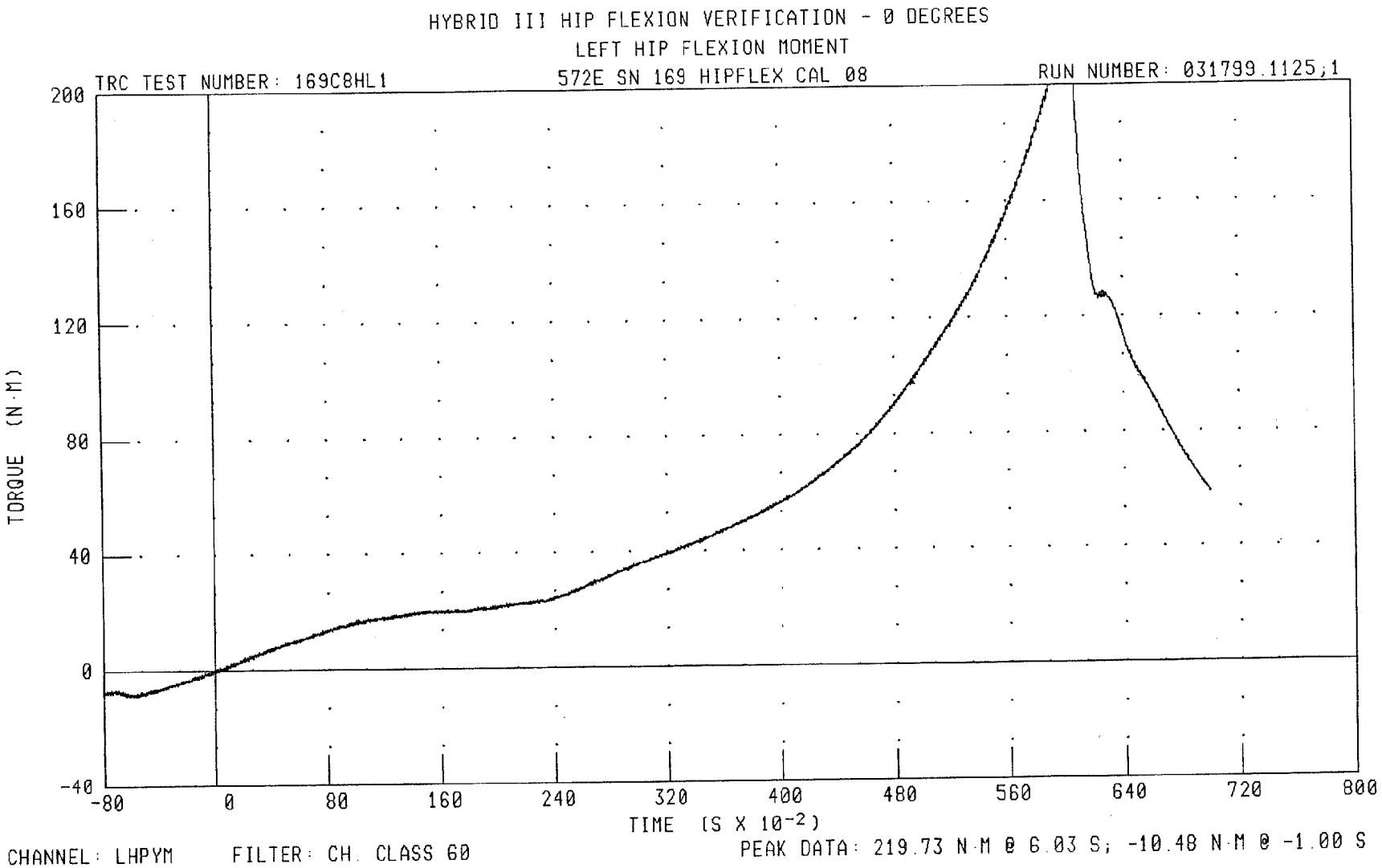
572E SN 169 HIPFLEX CAL 08

RUN NUMBER: 031799.1125;1



CHANNEL: LHPXD FILTER: CH. CLASS 60

PEAK DATA: 47.42 ° @ 6.05 S; -9.98 ° @ -1.00 S


HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
LEFT HIP FLEXION MOMENT
TRC TEST NUMBER: 169C8HL1
572E SN 169 HIPFLEX CAL 08
RUN NUMBER: 031799.1125;1
TORQUE (N·M)
200
160
120
80
40
0
-40
-80
0
80
160
240
320
400
480
560
640
720
800
TIME (S X 10⁻²)
CHANNEL: LHPYM
FILTER: CH. CLASS 60
PEAK DATA: 219.73 N·M @ 6.03 S; -10.48 N·M @ -1.00 S

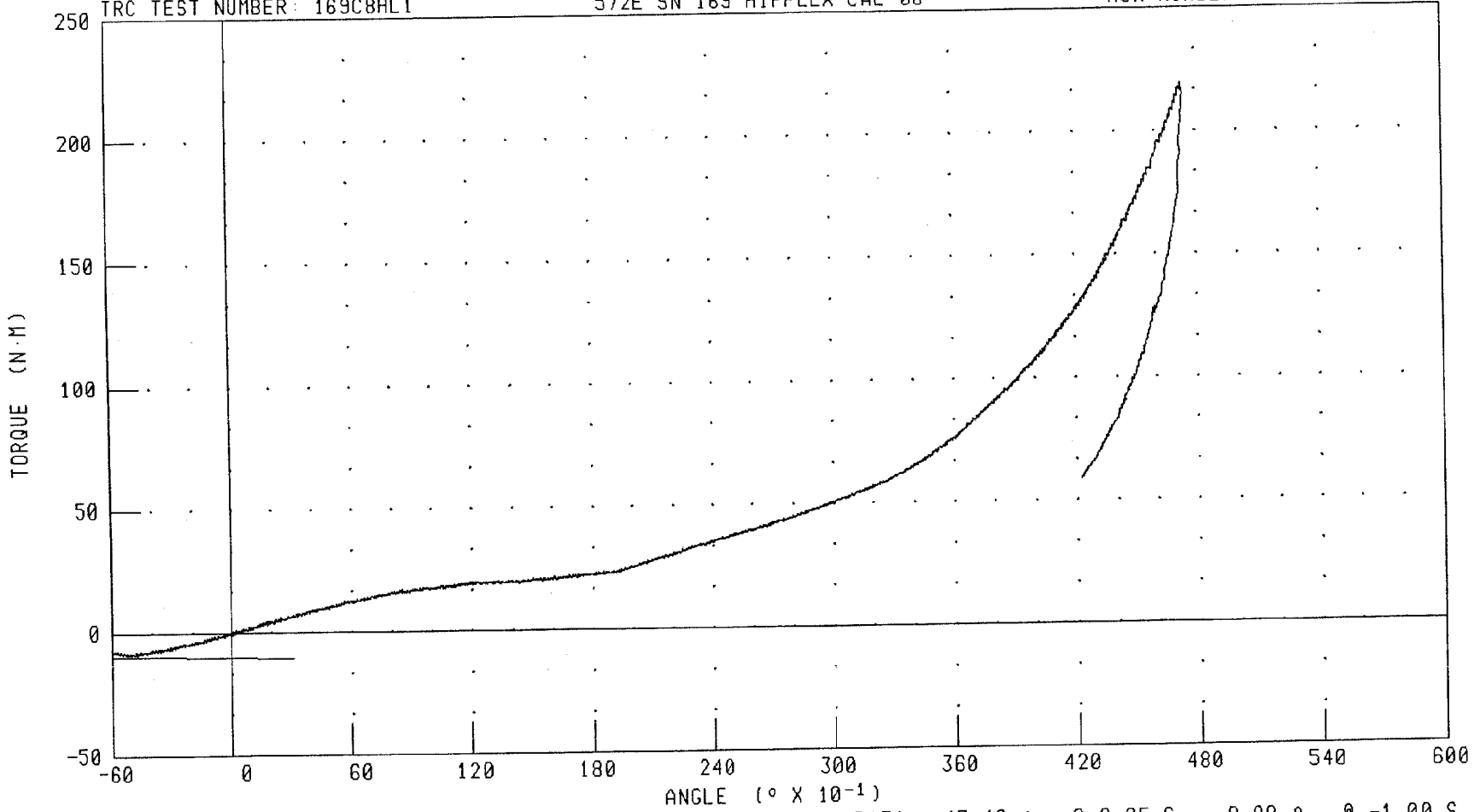
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION MOMENT VS ROTATION ANGLE

TRC TEST NUMBER: 169C8HL1

572E SN 169 HIPFLEX CAL 08

RUN NUMBER: 031799.1125;1



CHANNEL: LHPXD
LHPYM

FILTER: CH. CLASS 60
CH. CLASS 60

PEAK DATA: 47.42 ° @ 6.05 S; -9.98 ° @ -1.00 S
219.73 N·M @ 6.03 S; -10.48 N·M @ -1.00 S

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III 50th 17-MAR-99

TRC INC. TEST NO: 169C8RK1 572E SN169 RIGHT KNEE CAL 8

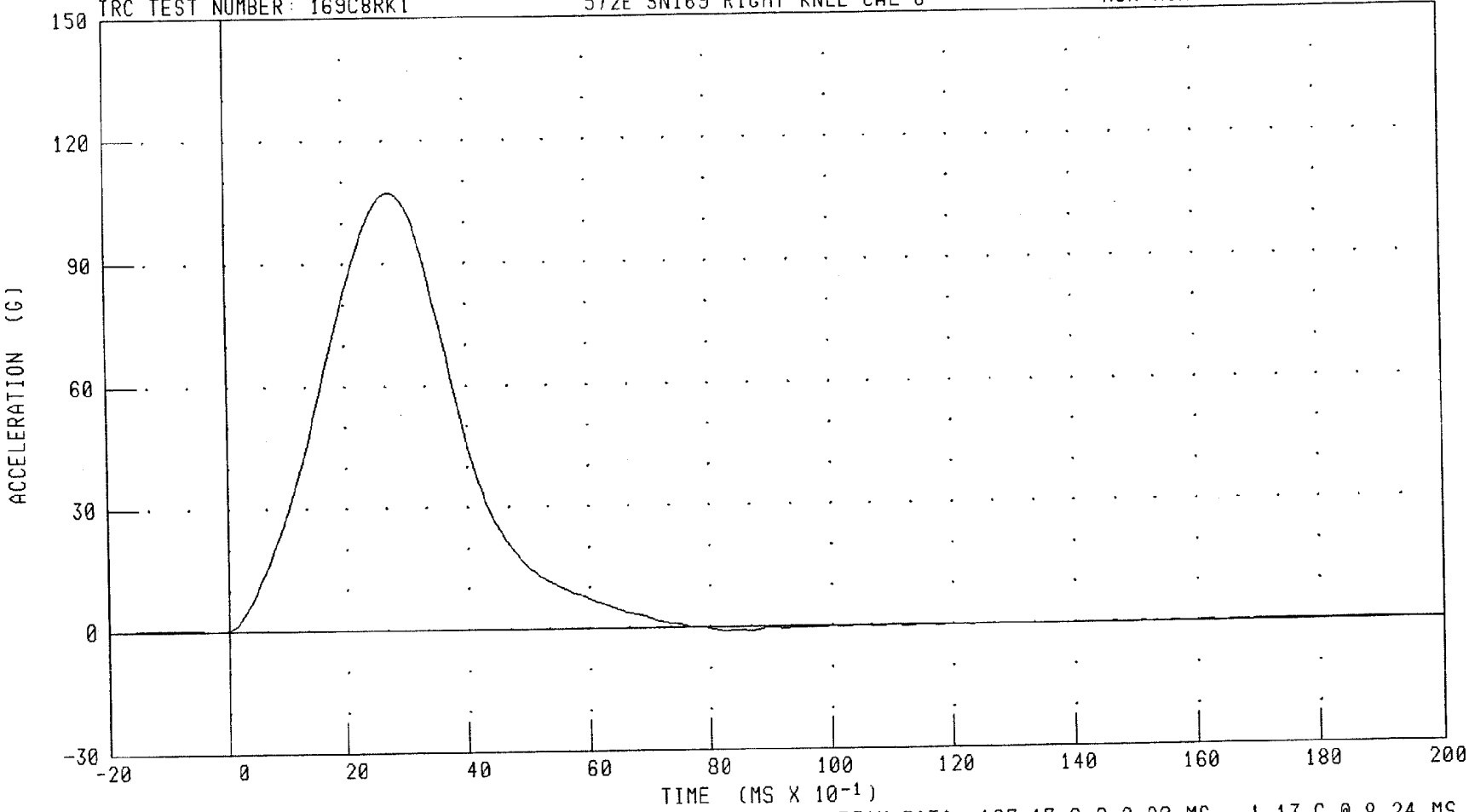
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.10 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5243.5 N

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1117;1

PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 169C8RK1
572E SN169 RIGHT KNEE CAL 8
RUN NUMBER: 031799.1118;1



CHANNEL: PENXG FILTER: CH. CLASS 600

PEAK DATA: 107.17 G @ 2.80 MS; -1.13 G @ 8.24 MS

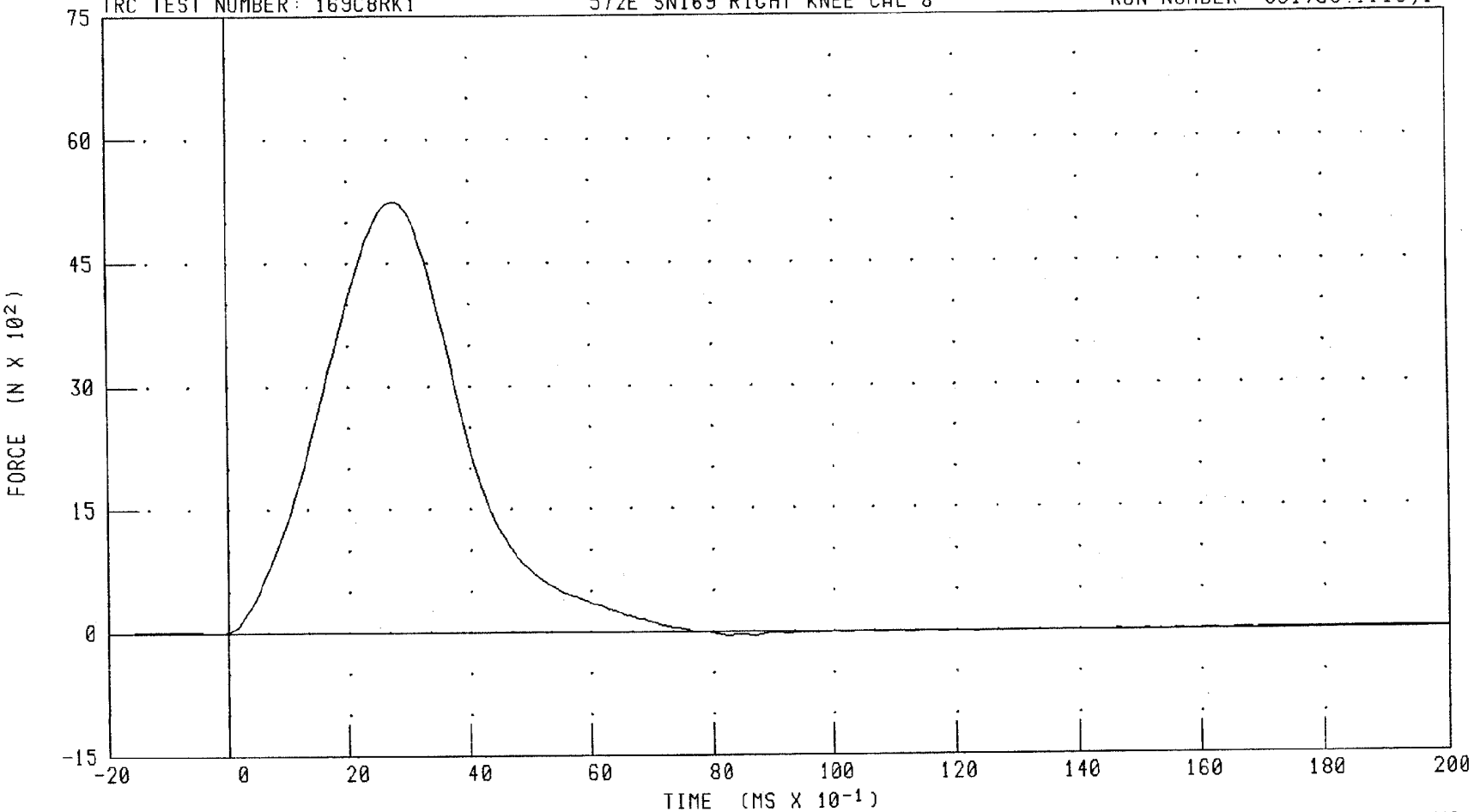
PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 169C8RK1

572E SN169 RIGHT KNEE CAL 8

RUN NUMBER: 031799.1118;1



CHANNEL: PENXF FILTER: CH. CLASS 600

PEAK DATA: 5243.51 N @ 2.80 MS; -55.36 N @ 8.24 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III 50th 17-MAR-99

TRC INC. TEST NO: 169C8LK1 572E SN169 LEFT KNEE CAL 8

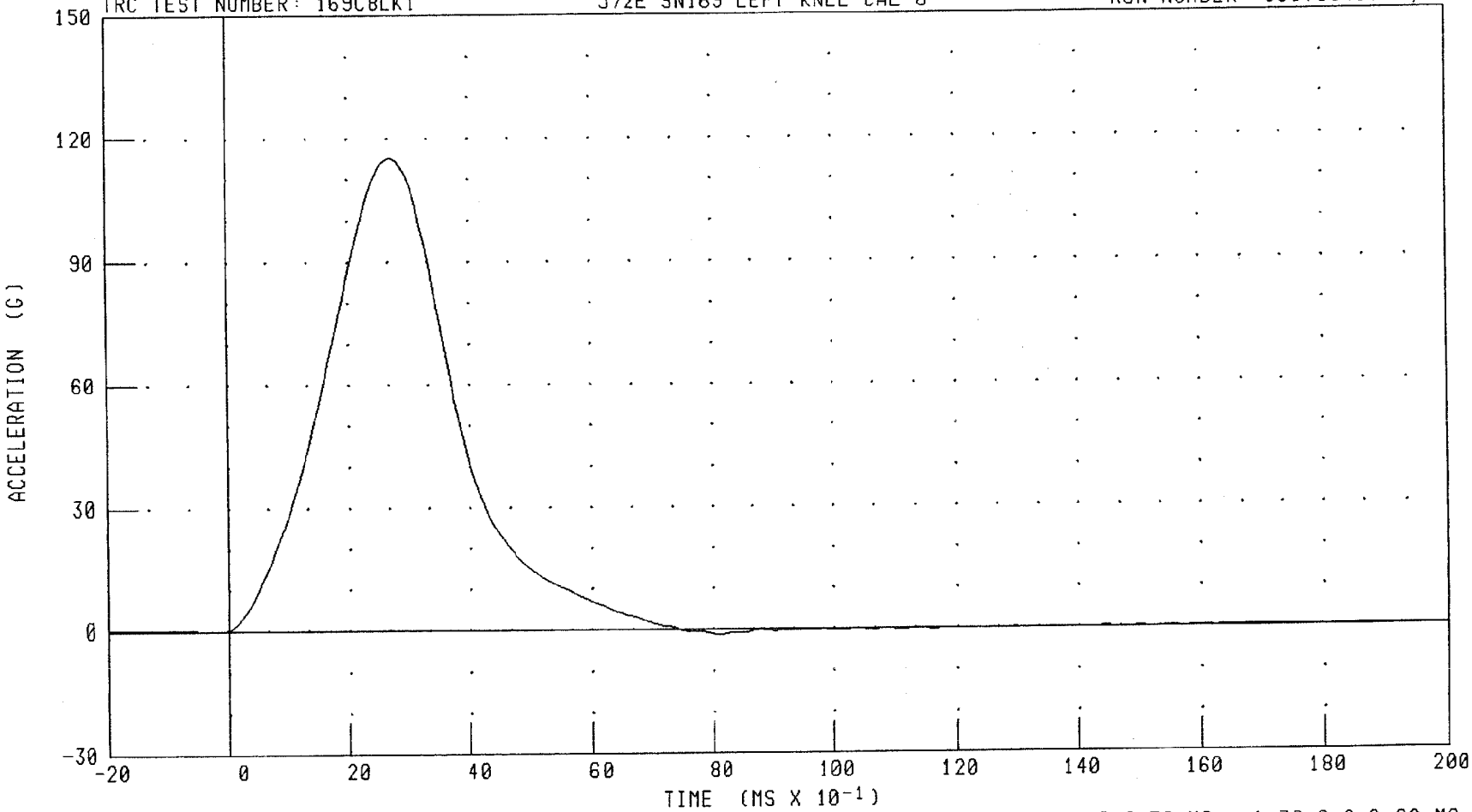
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	22.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.10 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5641.2 N

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 031799.1114;1

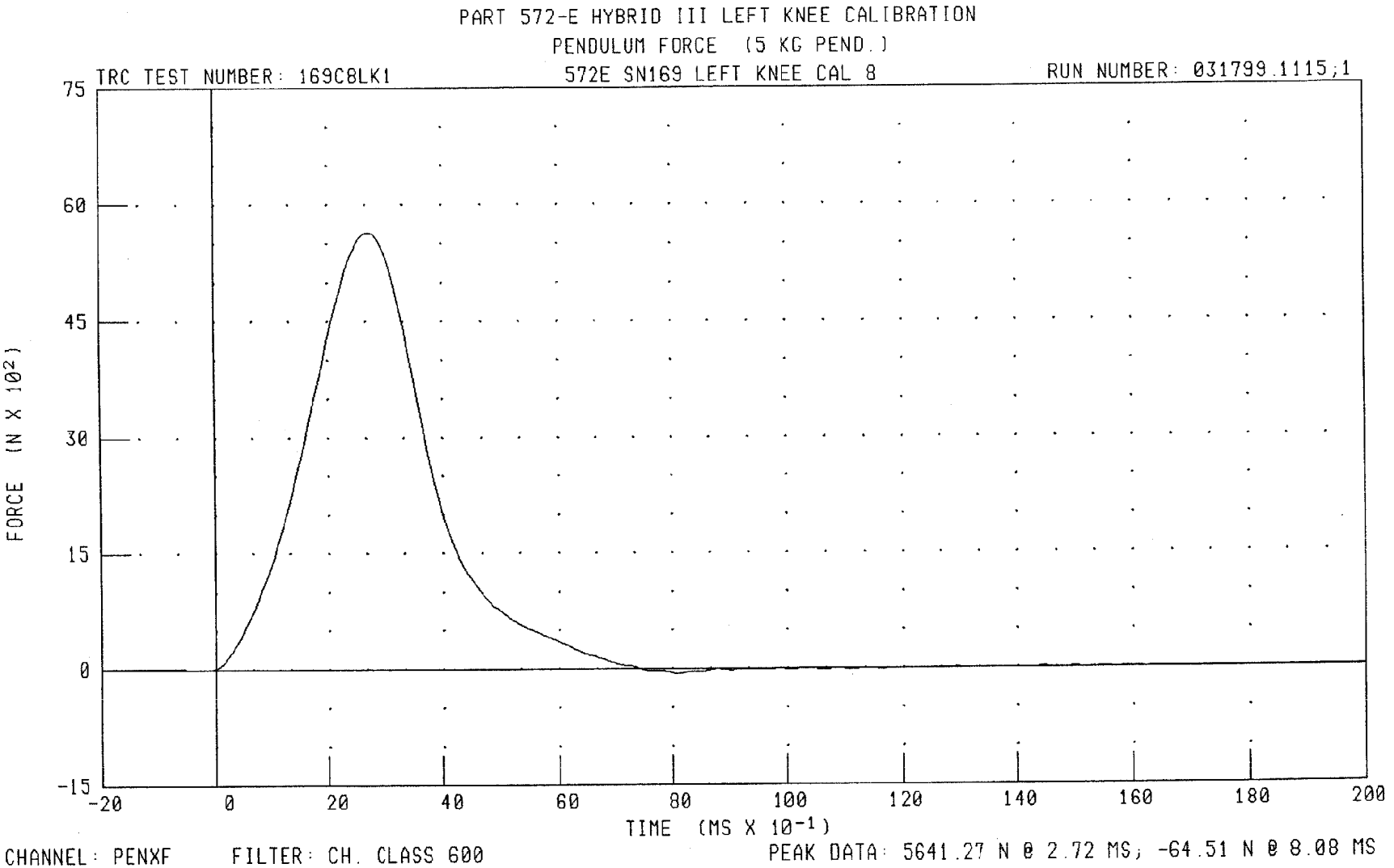
PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 169C8LK1
572E SN169 LEFT KNEE CAL 8
RUN NUMBER: 031799.1115;1



CHANNEL: PENXG FILTER: CH. CLASS 600

PEAK DATA: 115.30 G @ 2.72 MS; -1.32 G @ 8.08 MS


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE (5 KG PEND.)
TRC TEST NUMBER: 169C8LK1
572E SN169 LEFT KNEE CAL 8
RUN NUMBER: 031799.1115;1
FORCE (N X 10²)
75
60
45
30
15
0
-15
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXF
FILTER: CH. CLASS 600
PEAK DATA: 5641.27 N @ 2.72 MS; -64.51 N @ 8.08 MS

Appendix D

Miscellaneous Test Information

Dummy Sign Convention

Accelerometers:	+X: Forward	
	+Y: Rightward	
	+Z: Downward	
Potentiometers:	+Chest longitudinal deflection:	Outward
Load cells:	+Femur force:	Tension
Neck load cells:	+X force:	Head rearward
	+Y force:	Head leftward
	+Z force:	Head upward (tension on neck)
	+X moment:	Left ear rotating toward left shoulder
	+Y moment:	Chin rotating toward chest
	+Z moment:	Chin rotating toward left shoulder

Filtering Data

J211 OCT88

Load Cell Barrier Forces Class 60

Vehicle Structural Accelerations Class 60

Occupant

Head Accelerometer Class 1000

Neck Class 60

Chest Accelerometer Class 180

Chest Deflection Class 180

Femur Force Class 600

Sternum Accelerometer Class 180

Lower Leg Class 600

Vehicle Instrumentation Placement

Test Number 990315-1

Number	Location	Axis	Manufacturer	Model	S/N	Orientation (+ Sensing)
1	Left Brake Caliper	X	Endevco	7264T	J19547	Rearward
2	Right Brake Caliper	X	Endevco	7264T	DM66J	Forward
3	Instrument Panel Center	X	Endevco	7264T	J19885	Forward
4	Engine Top	X	Endevco	7264T	J20158	Forward
5	Engine Bottom	X	Endevco	7264T	J19868	Rearward
6	Vehicle Rear Center	Z	Endevco	7264T	J20582	Up
7	Left Rear Seat Crossmember	X	Endevco	7264T	J20329	Forward
8	Right Rear Seat Crossmember	X	Endevco	7264T	J20294	Forward

Transducer Information

Hybrid III Dummy Serial No.: 168v | Manufacturer: Humanoid | Seating Position: Driver

Project/Segment No.: 096017-5650 | Engineer: P. Garland | Test Date: March 15, 1999

MNEMONIC PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NO.	SERIAL NO.	MFR.	SENSITIVITY	CAL DUE DATE	FULL SCALE (ENGR. UNITS) DESIRED	ACTUAL	DIRECTION OF POSITIVE POLARITY	CABLE NO.
HEDXG HAP	HEAD X-AXIS ACCEL.	7264	J19535	End.	.2649 mv/g at 10 volts	8-3-1999	400 g		Rear	J19535
HEDYG HLR	HEAD Y-AXIS ACCEL.	"	J19548	"	.2192 mv/g at 10 volts	"	400 g		Left	J19548
HEDZG HIS	HEAD Z-AXIS ACCEL.	"	J20026	"	.2527 mv/g at 10 volts	"	400 g		Up	J20026
NEKXF NFX*	NECK X-AXIS SHEAR FORCE	1716A	0853	Dento n.	1.7387 MV/V @ 2000 LBS	"	900 Kg 2,000 lbs. 9,000 N			FX
NEKYF NFY*	NECK Y-AXIS SHEAR FORCE	"	"	"	1.6587 MV/V @2000 LBS	"	900 Kg 2,000 lbs. 9,000 N			FY
NEKZF NFZ*	NECK Z-AXIS AXIAL FORCE	"	"	"	1.2806 MV/V @3000 LBS	"	1300 Kg 3,000 lbs. 13,500 N			FZ
NEKXM NMX*	NECK MOMENT ABOUT X AXIS	"	"	"	1.6595 MV/V @2500 IN- LBS	"	30 Kgm 200 ft·lbs 275 N·m			MX
NEKYM NMY*	NECK MOMENT ABOUT Y AXIS	"	"	"	1.6596 MV/V @2500 IN-LBS	"	30 Kgm 200 ft·lbs 275 N·m			MY
NEKZM NMZ*	NECK MOMENT ABOUT Z AXIS	"	"	"	2.3663 MV/V @2500 IN-LBS	"	30 Kgm 200 ft·lbs 275 N·m			MZ

Transducer Information

Hybrid III Dummy Serial No.: 168v | Manufacturer: Humanoid | Seating Position: Driver

Project/Segment No.: 096017-5650 | Engineer: P. Garland | Test Date: March 15, 1999

MNEMONIC PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NO.	SERIAL NO.	MFR.	SENSITIVITY	CAL DUE DATE	FULL SCALE (ENGR. UNITS) DESIRED	ACTUAL	DIRECTION OF POSITIVE POLARITY	CABLE NO.
CSTXG CAP	CHEST X-AXIS ACCEL.	7264	J20011	End.	.2324 mv/g at 10 volts	8-3-1999	400 g		Forward	J20011
CSTYG CLR	CHEST Y-AXIS ACCEL.	"	J20001	"	.2709 mv/g at 10 volts	"	400 g		Left	J20001
CSTZG CIS	CHEST Z-AXIS ACCEL.	"	J20438	"	.2313 mv/g at 10 volts	"	400 g		Up	J20438
CSTXD CAPD	CHEST DEFLECTION	14CB1-2847	168	SERV	27.89 mv/v /in	8-3-1999	6 inch 150 mm			168
PEVXG PAP	PELVIS X-AXIS ACCEL.						400 g			
PEVYG PLR	PELVIS Y-AXIS ACCEL.						400 g			
PEVZG PIS	PELVIS Z-AXIS ACCEL.						400 g			
LFMF LF	LEFT FEMUR FORCE	2430	726	DENT	0.9495 mv/v at 3000 lbs.	8-3-1999	1300 Kg 3,000 lbs. 13,500 N			726
RFMF RF	RIGHT FEMUR FORCE	"	741	"	0.9030 mv/v at 3000 lbs.	"	1300 Kg 3,000 lbs. 13,500 N			741

Transducer Information

Hybrid III Dummy Serial No.: 169v | Manufacturer: Humanoid | Seating Position: Passenger

Project/Segment No.: 096017-5650 | Engineer: P. Garland | Test Date: March 15, 1999

MNEMONIC PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NO.	SERIAL NO.	MFR.	SENSITIVITY	CAL DUE DATE	FULL SCALE (ENGR. UNITS) DESIRED	ACTUAL	DIRECTION OF POSITIVE POLARITY	CABLE NO.
HEDXG HAP	HEAD X-AXIS ACCEL.	7264	J21935	End.	.2409 mv/g at 10 volts	8-3-1999	400 g		Rear	J21935
HEDYG HLR	HEAD Y-AXIS ACCEL.	"	J23912	"	.2827 mv/g at 10 volts	"	400 g		Left	J23912
HEDZG HIS	HEAD Z-AXIS ACCEL.	"	J23810	"	.2826 mv/g at 10 volts	"	400 g		Up	J23810
NEKXF NFX*	NECK X-AXIS SHEAR FORCE	1716	0106	Dento n.	1.7167 MV/V @ 2000 LBS	8-3-1999	900 Kg 2,000 lbs. 9,000 N			FX
NEKYF NFY*	NECK Y-AXIS SHEAR FORCE	"	"	"	1.6802 MV/V @2000 LBS	"	900 Kg 2,000 lbs. 9,000 N			FY
NEKZF NFZ*	NECK Z-AXIS AXIAL FORCE	"	"	"	1.2943 MV/V @3000 LBS	"	1300 Kg 3,000 lbs. 13,500 N			FZ
NEKXM NMX*	NECK MOMENT ABOUT X AXIS	"	"	"	1.6148 MV/V @2500 IN- LBS	"	30 Kgm 200 ft·lbs 275 N·m			MX
NEKYM NMY*	NECK MOMENT ABOUT Y AXIS	"	"	"	1.6205 MV/V @2500 IN-LBS	"	30 Kgm 200 ft·lbs 275 N·m			MY
NEKZM NMZ*	NECK MOMENT ABOUT Z AXIS	"	"	"	2.2982 MV/V @2500 IN-LBS	"	30 Kgm 200 ft·lbs 275 N·m			MZ

Transducer Information

Hybrid III Dummy Serial No.: 169v | Manufacturer: Humanoid | Seating Position: Passenger

Project/Segment No.: 096017-5650 | Engineer: P. Garland | Test Date: March 15, 1999

MNEMONIC PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NO.	SERIAL NO.	MFR.	SENSITIVITY	CAL DUE DATE	FULL SCALE (ENGR. UNITS) DESIRED	ACTUAL	DIRECTION OF POSITIVE POLARITY	CABLE NO.
CSTXG CAP	CHEST X-AXIS ACCEL.	7264	J23914	End.	.2528 mv/g at 10 volts	8-3-1999	400 g		Forward	J23914
CSTYG CLR	CHEST Y-AXIS ACCEL.	"	J23808	"	.2843 mv/g at 10 volts	"	400 g		Left	J23808
CSTZG CIS	CHEST Z-AXIS ACCEL.	"	J23774	"	.2405 mv/g at 10 volts	"	400 g		Up	J23774
CSTXD CAPD	CHEST DEFLECTION	14CB1-2847	169	SERV	28.26 mv/v /in	8-3-1999	6 inch 150 mm			169
PEVXG PAP	PELVIS X-AXIS ACCEL.						400 g			
PEVYG PLR	PELVIS Y-AXIS ACCEL.						400 g			
PEVZG PIS	PELVIS Z-AXIS ACCEL.						400 g			
LFMF LF	LEFT FEMUR FORCE	2430	96661	GSE	0.8816 mv/v at 3000 lbs.	8-3-1999	1300 Kg 3,000 lbs. 13,500 N			D105
RFMF RF	RIGHT FEMUR FORCE	"	96662	"	0.8605 mv/v at 3000 lbs.	"	1300 Kg 3,000 lbs. 13,500 N			709

Description Of Timing Marks On TRC High-Speed Film

All TRC high-speed cameras are equipped with red leds which put timing marks on the right edge of the film. TRC uses a single timing generator to generate the timing for all cameras. This allows the timing marks to be common to all cameras. The timing marks can be used to measure camera speed (frames per second) or to locate a point in time before or after the time-zero event.

The timing marks appear on the film as small red marks on the right edge of the film. Round marks are left by the Photo-Sonics and Stalex cameras while horizontal bars are left by the Hycam, Locam, and Fastax II cameras.

The timing generator puts out a pulse for every millisecond plus it generates additional pulses for hundredths and tenths of seconds. To explain this further, we can use an example of a camera running at 1000 frames per second.

1. Every frame will have **one** led appear in it. This indicates a *millisecond* pulse.

2. Every ten frames will have **two** leds appear in it. These indicate a *millisecond* pulse plus a *hundredth of a second* pulse.

3. Every one hundred frames will have **three** leds appear in it. These indicate a *millisecond* pulse, a *hundredth of a second* pulse, and a *tenth of a second* pulse.