

**Vehicle Research and Test Center
2006 Ford F-250 XL Super Duty Pickup into a
Override Load Cell Barrier
TRC Inc. Test Number: 060913**

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**Prepared For:
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Section 1.0

Purpose and Test Procedure

Purpose

This override load cell barrier impact test was conducted for the National Highway Traffic Safety Administration (NHTSA) and Vehicle Research and Test Center (VRTC) by Transportation Research Center Inc. (TRC Inc.).

The test mode was defined as the vehicle moving at 40.2 km/h striking the override load cell barrier at an impact angle of 0 degrees. The purpose of this test was to evaluate the vehicle response of the subject vehicle, a 2006 Ford F-250 XL Super Duty Pickup, in the override load cell barrier impact mode.

Test Procedure

This test was conducted in accordance with VRTC instructions for an override load cell barrier impact test. Data was obtained relative to FMVSS 208, "Occupant Crash Protection" (December 18, 2001) and FMVSS 301, "Fuel System Integrity".

The subject vehicle, a 2006 Ford F-250 XL Super Duty Pickup, was instrumented with seven (7) accelerometers to measure longitudinal, lateral and vertical axis accelerations. The driver's and passenger's airbag signals were monitored with inductive pickups. The vehicle's specified impact velocity range was 39.4 to 41.0 km/h.

One (1) 50th percentile adult male Hybrid III dummy and one (1) 5th percentile adult female dummy were placed in the vehicle's left front and right front designated seating positions, respectively. The driver dummy and passenger dummy were both belted and were restrained with front dual stage airbags. The dummies were not instrumented.

The 50 data channels were digitally sampled and recorded at 12,500 samples per second and processed per SAE J211 March 1995.

The crash event was recorded by one (1) real-time panning motion picture camera and eight (8) high-speed digital motion picture cameras.

The override barrier was set at a height of 510 mm for this test. All data processing was adjusted to set T-0 as the time when the vehicle passed over the override barrier. Vehicle to barrier contact occurred at approximately 2 milliseconds.

The test summary data is presented in Section 2.0. The camera and vehicle measurements are presented in Section 3.0. Appendix A contains the still photographic prints. Appendix B contains the vehicle data plots. Appendix C contains miscellaneous test information. Appendix D contains an INSIA report that was the basis for the Structural Measurements presented in Table 5 of this report.

Section 2.0

Override Load Cell Barrier Test Summary

Test Results Summary

This 40.2 km/h override load cell barrier impact test was conducted by TRC Inc. on September 13, 2006.

The subject test vehicle, a 2006 Ford F-250 XL Super Duty Pickup, was equipped 5.4-liter longitudinally-placed engine, automatic transmission, power steering, and power brakes, and dual stage front airbags. The vehicle's test weight was 2906.9 kg. The vehicle's impact speed was 40.2 km/h.

Data Acquisition Explanations

There were no data anomalies for this test.

Table 1 Crash Test Summary

Test mode:	Override Barrier	
Test date:	09/13/06	
Test time:	14:18	
Ambient temperature:	21° C	
Year/make/model/body style:	2006/Ford/F-250 XL Super Duty/Pickup	
Test weight:	2906.9 kg	
Impact angle ¹ :	0°	
Impact velocity ² :	Primary = 40.2 km/h Secondary = 40.2 km/h	
Total number of data channels:	50	
Number of cameras:		
High-speed digital:	8	
Real-time:	1	
<u>Dummies:</u>		
	<u>Driver</u>	<u>Right Front Passenger</u>
Type:	HIII 50 th	HIII 5 th
Location:	Left front	Right front
Restraint:	Seat belt, airbag	Seat belt, airbag
Data channels:	Ballast	Ballast

¹ With respect to tow track centerline.

² Speed trap measurement ($\pm$.08 km/h accuracy)

Table 2 General Test and Vehicle Parameter Data

Year/make/model/body style:	2006/Ford/F-250 XL Super Duty/Pickup
VIN:	1FTSX21566ED94254
Model year:	2006
Body style:	Pickup
Color:	White
Engine data:	
Cylinders:	8
Displacement	5.4 liters
Type:	V
Placement:	longitudinally-placed
Transmission data:	<u>4</u> speed, <u> </u> manual, <u> X </u> automatic, <u> </u> overdrive
Final drive:	<u> </u> FWD, <u> </u> RWD, <u> X </u> 4WD
Date vehicle received:	09/11/2006
Odometer reading:	67 miles
Dealer's name and address:	Vehicle supplied by VRTC

Accessories:

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

Certification data from vehicle's label:

Vehicle manufactured by:	Ford Motor Company
Date of manufacture:	05/06
VIN:	1FTSX21566ED94254
GVWR:	9200 lbs. (4173 kg)
GAWR: Front:	5200 lbs. (2359 kg)
Rear:	6100 lbs. (2767 kg)

Table 2 General Test and Vehicle Parameter Data, Continued

Tires on vehicle (mfr., line, size): Goodrich, Rugged Trail, LT265/70R17

Tire pressure with maximum capacity vehicle load:

 Front: psi (kPa)

 Rear: psi (kPa)

Spare tire (mfr., line, size): Goodrich, Rugged Trail, LT265/70R17

Type of seats:

 Front Split bench

 Rear Bench

Maximum width: 2030 mm

Wheelbase: 3600 mm

Location of "Recommended Tire Pressure" label:

Driver B-Pillar

Data from vehicle's "Recommended Tire Pressure" label:

Recommended tire size: LT265/70R17

Recommended cold tire pressure: Front: 75 psi (515 kPa)

 Rear: 75 psi (515 kPa)

Seating capacity: Front: 3

 Rear: 3

 Total: 6

Vehicle capacity weight: 2673 lbs. (1212 kg)

Rated cargo/luggage weight: N/A

Test vehicle attitude:

Delivered attitude: LF 1015 mm; RF 1018 mm; LR 1057 mm; RR 1060 mm

Fully loaded attitude: LF 1010 mm; RF 1010 mm; LR 1037 mm; RR 1041 mm

Pre-test attitude: LF 1013 mm; RF 1020 mm; LR 1064 mm; RR 1062 mm

Post-test attitude: LF 1035 mm; RF 980 mm; LR 1069 mm; RR 1063 mm

Table 2 General Test and Vehicle Parameter Data Continued

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

Right front	804.5 kg	Right rear	626.5 kg
Left front	855.0 kg	Left rear	624.5 kg
Total front weight	1659.5 kg	(57.0 % of total vehicle weight)	
Total rear weight	1251.0 kg	(43.0 % of total vehicle weight)	
Total delivered weight	2910.5 kg		

Weight of test vehicle with required dummies and cargo weight:¹

Right front	834.2 kg	Right rear	609.4 kg
Left front	875.8 kg	Left rear	587.5 kg
Total front weight	1710.0 kg	(58.8% of total vehicle weight)	
Total rear weight	1196.9 kg	(41.2% of total vehicle weight)	
Total test weight	2906.9 kg		

Weight of ballast secured in vehicle: 10.4 kg

Components removed to meet target test weight: Tailgate, spare tire, and hitch

Location of Vehicle's CG: 1482 mm rearward of front wheel centerline

Fuel System Data:

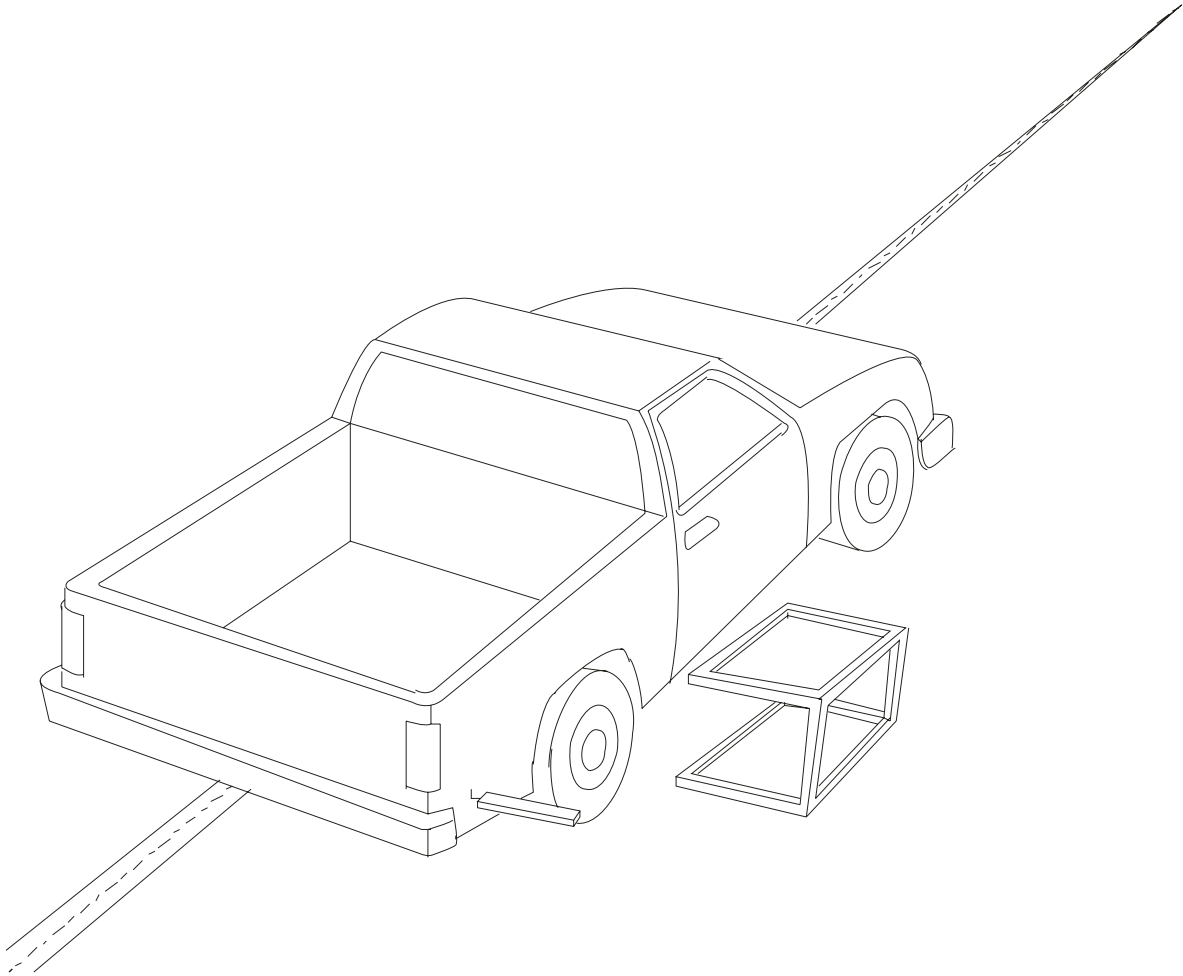
Usable fuel system capacity	143.8 liters (provided by customer)
Actual test volume:	133.6 liters (93% of usable)

¹ Test weight set by customer to match previous testing.

Table 3 Post-Impact Data

Test number:	060913
Test date:	09/13/06
Test time:	14:18
Test type:	Override load cell barrier
Impact angle:	0°
Ambient temperature at impact area: 21° C	
Impact velocity:	
Primary:	40.2 km/h
Secondary	40.2 km/h
Required impact velocity range:	39.4 to 41.0 km/h
Impact accuracy:	
Vertical:	Vehicle 0 mm - from intended impact point
Horizontal:	Vehicle 9 mm left from intended impact point
Distance from vehicle to barrier:	
Entering velocity trap:	660 mm
Exiting velocity trap:	50 mm, approximately

Figure 1 Impact Velocity Measurement System



The vane clears the final emitter/receiver pair approximately 50 millimeters before impact.

The emitter/receiver pairs have 610-millimeter spacing.

Table 4 Accelerometer Data Summary

Accel. No.	Location		Positive Direction		Negative Direction	
			Max. (g)	Time (ms)	Max. (g)	Time (ms)
1	Vehicle Center of Gravity	X	2.9	98.1	48.0	67.7
		Y	9.0	75.3	6.4	98.2
		Z	39.8	78.1	23.8	95.9
2	Vehicle Dash	X	27.1	120.6	49.1	86.4
3	Vehicle Rear Deck	X	6.7	30.3	79.8	66.2
		Y	10.6	80.6	9.8	101.9
		Z	33.4	69.9	49.7	65.0

Reference: X: + Forward From Rear Bumper
 Y: + Rightward From Vehicle Centerline
 Z: + Downward From Ground Level

For acceleration data sign convention see Report Sign Convention in Appendix C.

Section 3.0

Camera and Vehicle Information

Table 5 Structural Measurements¹

	Elements	Pre-Test
1	Total Length ²	5750
2	Total Width	2040
3	Bumper Top Height	764
4	Bumper Bottom Height	454
5	Longitudinal Member Top Height	744
6	Longitudinal Member Bottom Height	619
7	Distance Between Longitudinal Members	1065
7'	Longitudinal Member Width	100
8	Engine Top Height	1193
9	Engine Bottom Height	425
10	Engine and Gearbox Width	775
11	Front Bumper - Engine Distance	730
12	Front Shock Absorber Fixing Height	878
13	Bonnet Leading Edge Height	1254
14	Front Shock Absorber Fixing Width	1017
15	Front Bumper - Front Axle Distance	945
16	Front Axle - A Pillar Distance	800
17	A Pillar - B Pillar Distance	1080
18	B Pillar - Rear Axle Distance	1770
19	B Pillar - C Pillar Distance	620
20	Roof Sill Bottom Height	1922
21	Roof Sill Top Height	1957
22	Floor Sill Bottom Height	637
23	Floor Sill Top Height	674

All distance measurements are in millimeters.

¹ Taken from INSIA report, “Structural Survey of Cars, Methodology of the Main Resistant Elements in the Car Body”, March 1999. This report is included in Appendix D.

² Length measured with vehicle tailgate removed.

Figure 2 Pre-Test And Post-Test Measurement Points

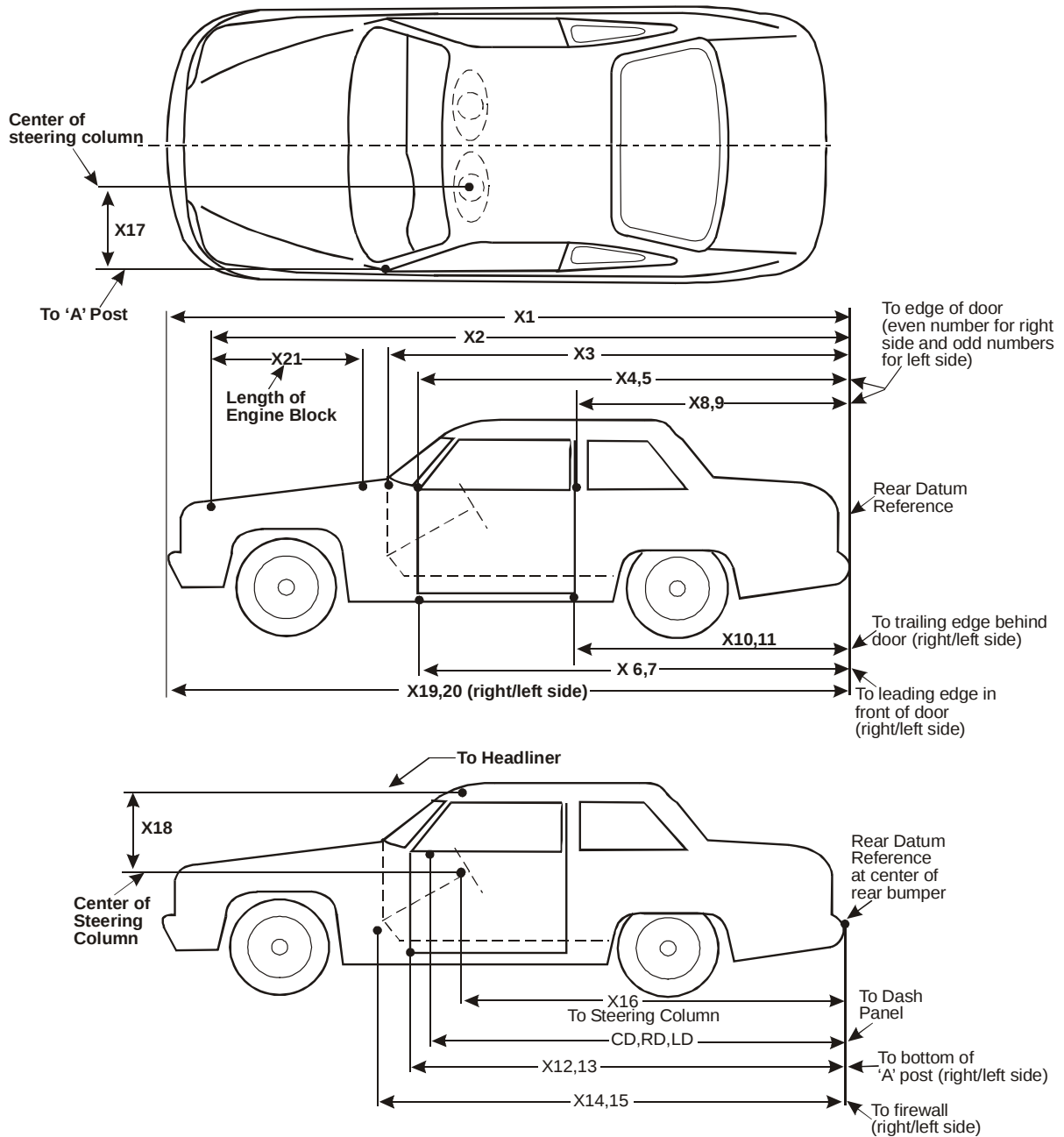


Table 6 Impacted Vehicle Measurements

Test number: 060913

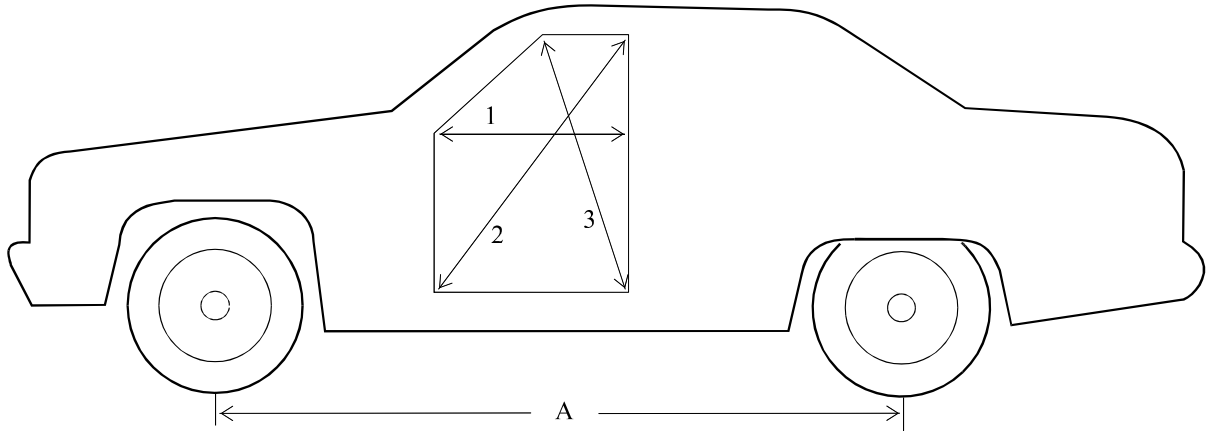
Vehicle year/make/model/body style: 2006/Ford/F-250 XL Super Duty/Pickup

No.	Type of measurement	Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	5750	5542	-208
X2	Rear Surface of Vehicle to Front of Engine Block	4990	5077	-87
X3	Rear Surface of Vehicle to Firewall	4704	4929	-225
X4	Rear Surface of Veh. to Upper Leading Edge of Right Door	4276	4337	-61
X5	Rear Surface of Veh. to Upper Leading Edge of Left Door	4290	4359	-69
X6	Rear Surface of Veh. to Lower Leading Edge of Right Door	4153	4200	-47
X7	Rear Surface of Veh. to Lower Leading Edge of Left Door	4171	4224	-53
X8	Rear Surface of Veh. to Upper Trailing Edge of Right Door	3044	3108	-64
X9	Rear Surface of Veh. to Upper Trailing Edge of Left Door	3056	3120	-64
X10	Rear Surface of Veh. to Lower Trailing Edge of Right Door	3033	3070	-37
X11	Rear Surface of Veh. to Lower Trailing Edge of Left Door	3055	3105	-50
X12	Rear Surface of Veh. to Bottom of " A " Post on Right Side	4207	4287	-80
X13	Rear Surface of Veh. to Bottom of " A " Post on Left Side	4225	4294	-69
X14	Rear Surface of Vehicle to Firewall - Right Side	4590	4720	-130
X15	Rear Surface of Vehicle to Firewall - Left Side	4625	4737	-112
X16	Rear Surface of Vehicle to Steering Wheel Center	3777	3777	0
X17	Center of Steering Column to " A " Post	300	300	0
X18	Center of Steering Column to Headliner	470	465	5
X19	Rear Surface of Vehicle to Right Side of Front Bumper	5528	5414	-114
X20	Rear Surface of Vehicle to Left Side of Front Bumper	5514	5388	-126
X21	Length of Engine Block	540	540	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	4104	4178	-74
CD	Rear Surface of Vehicle to Center of Dash Panel	4002	3997	5
LD	Rear Surface of Vehicle to Left Side of Dash Panel	4012	4095	-83

All distance measurements are in millimeters.

Figure 3 Vehicle Intrusion Measurements

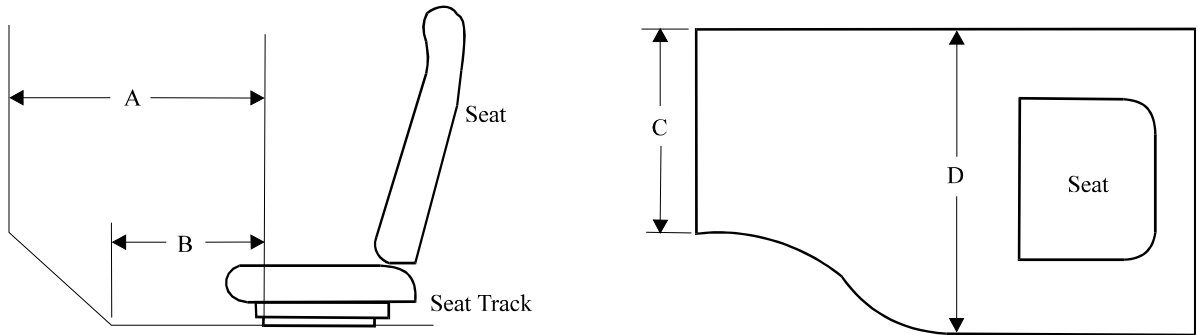
Door Opening Width



Units (mm)	Left			Right		
Measurement	1	2	3	1	2	3
Before Test	1135	1595	1435	1135	1605	1405
After Test	1136	1594	1429	1138	1601	1413
Difference	-1	1	6	-3	4	-8

Units (mm)	A = Wheelbase Left	A = Wheelbase Right
Pre-Test	3600 mm	3600 mm
Post-Test	3591 mm	3597 mm
Difference	9 mm	3 mm

Figure 4 Vehicle Intrusion Measurements
Static Footwell Deformation



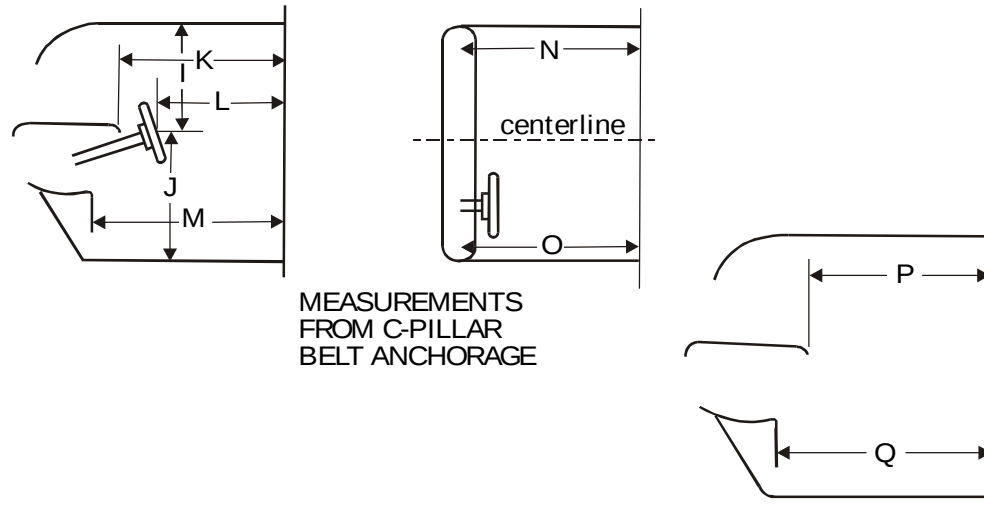
Driver's Side

Measurement	Pre-Test	Post-Test	Difference
A	730 mm	706 mm	24 mm
B	520 mm	496 mm	24 mm
C	500 mm	503 mm	-3 mm
D	455 mm	460 mm	-5 mm

Passenger's Side

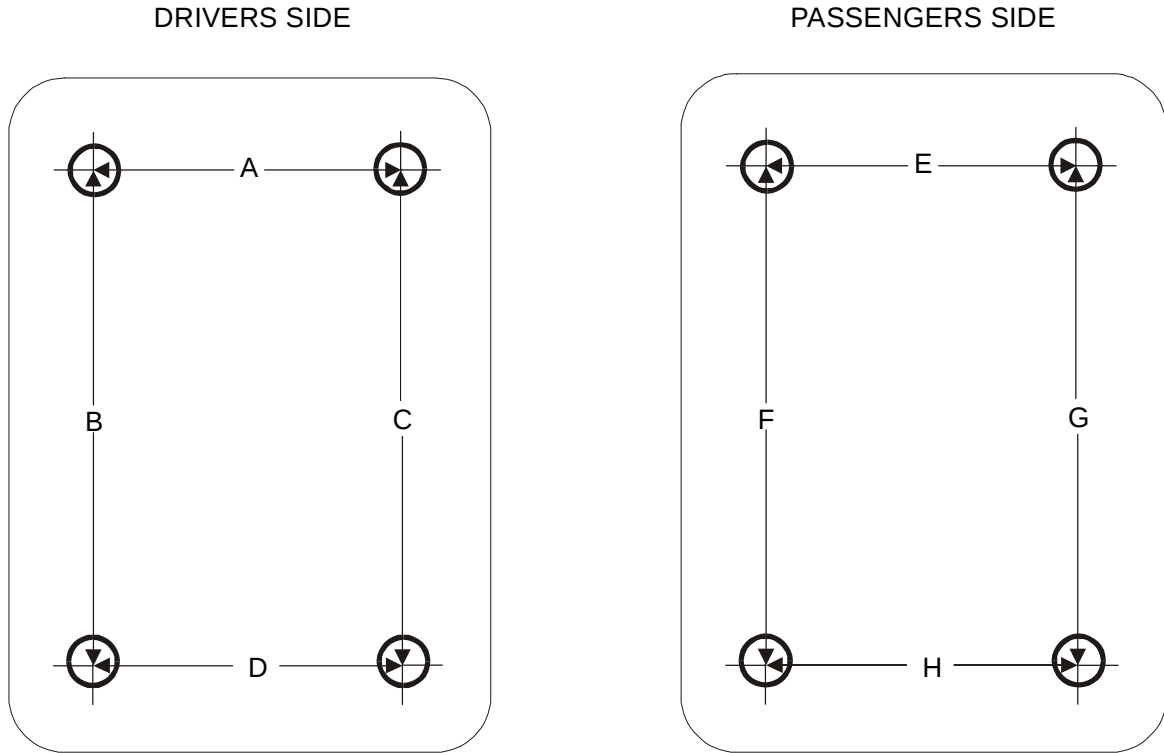
Measurement	Pre-Test	Post-Test	Difference
A	725 mm	723 mm	2 mm
B	520 mm	525 mm	-5 mm
C	375 mm	375 mm	0 mm
D	380 mm	383 mm	-3 mm

Figure 5 Vehicle Intrusion Measurements
Static Passenger Compartment Intrusion



Measurement	Pre-Test	Post-Test	Difference
I	467 mm	460 mm	7 mm
J	730 mm	740 mm	-10 mm
K (driver's side)	1555 mm	1570 mm	-15 mm
L	1340 mm	1345 mm	-5 mm
M (driver's side)	1720 mm	1740 mm	-20 mm
N (passenger's side)	1640 mm	1663 mm	-23 mm
O (driver's side)	1565 mm	1575 mm	-10 mm
P (passenger's side)	1635 mm	1640 mm	-5 mm
Q (passenger's side)	1742 mm	1745 mm	-3 mm

Figure 6 Vehicle Floorboard Deformation



Measurement	Pre-Test	Post-Test	Difference
A	500 mm	503 mm	-3 mm
B	400 mm	400 mm	0 mm
C	410 mm	410 mm	0 mm
D	455 mm	460 mm	-5 mm
E	375 mm	375 mm	0 mm
F	410 mm	413 mm	-3 mm
G	412 mm	415 mm	-3 mm
H	380 mm	383 mm	-3 mm

Table 7 Frontal Profile Measurements

Bottom of Front Bumper

Pre-Test				Post-Test			Difference		
Index	X, mm	Y, mm	Z, mm	X, mm	Y, mm	Z, mm	X, mm	Y, mm	Z, mm
1	5469	-915	256	5402	-920	257	-67	-5	1
2	5662	-569	258	5589	-574	211	-73	-5	-47
3	5715	-192	269	5609	-192	209	-106	0	-60
4	5712	186	272	5602	177	233	-110	-9	-39
5	5659	575	257	5575	567	259	-84	-8	2
6	5507	903	217	5427	900	267	-80	-3	50

Top of Front Bumper

Pre-Test				Post-Test			Difference ¹		
Index	X, mm	Y, mm	Z, mm	X, mm	Y, mm	Z, mm	X, mm	Y, mm	Z, mm
1	5514	-920	45	5388	-921	42	-126	-1	-3
2	5692	-569	51	5548	-564	10	-144	5	-41
3	5750	-192	50	5542	-186	12	-208	6	-38
4	5750	185	48	5543	184	28	-207	-1	-20
5	5689	576	44	5544	576	49	-145	0	5
6	5528	905	41	5414	913	93	-114	8	52

Center of Grill

Pre-Test				Post-Test			Difference		
Index	X, mm	Y, mm	Z, mm	X, mm	Y, mm	Z, mm	X, mm	Y, mm	Z, mm
1	5410	-912	-205	5476	-914	-244	66	-2	-39
2	5562	-569	-202	5490	-570	-268	-72	-1	-66
3	5684	-192	-204	5598	-187	-257	-86	5	-53
4	5684	186	-205	5596	191	-244	-88	5	-39
5	5559	579	-207	5488	596	-228	-71	17	-21
6	5417	904	-204	5478	931	-184	61	27	20

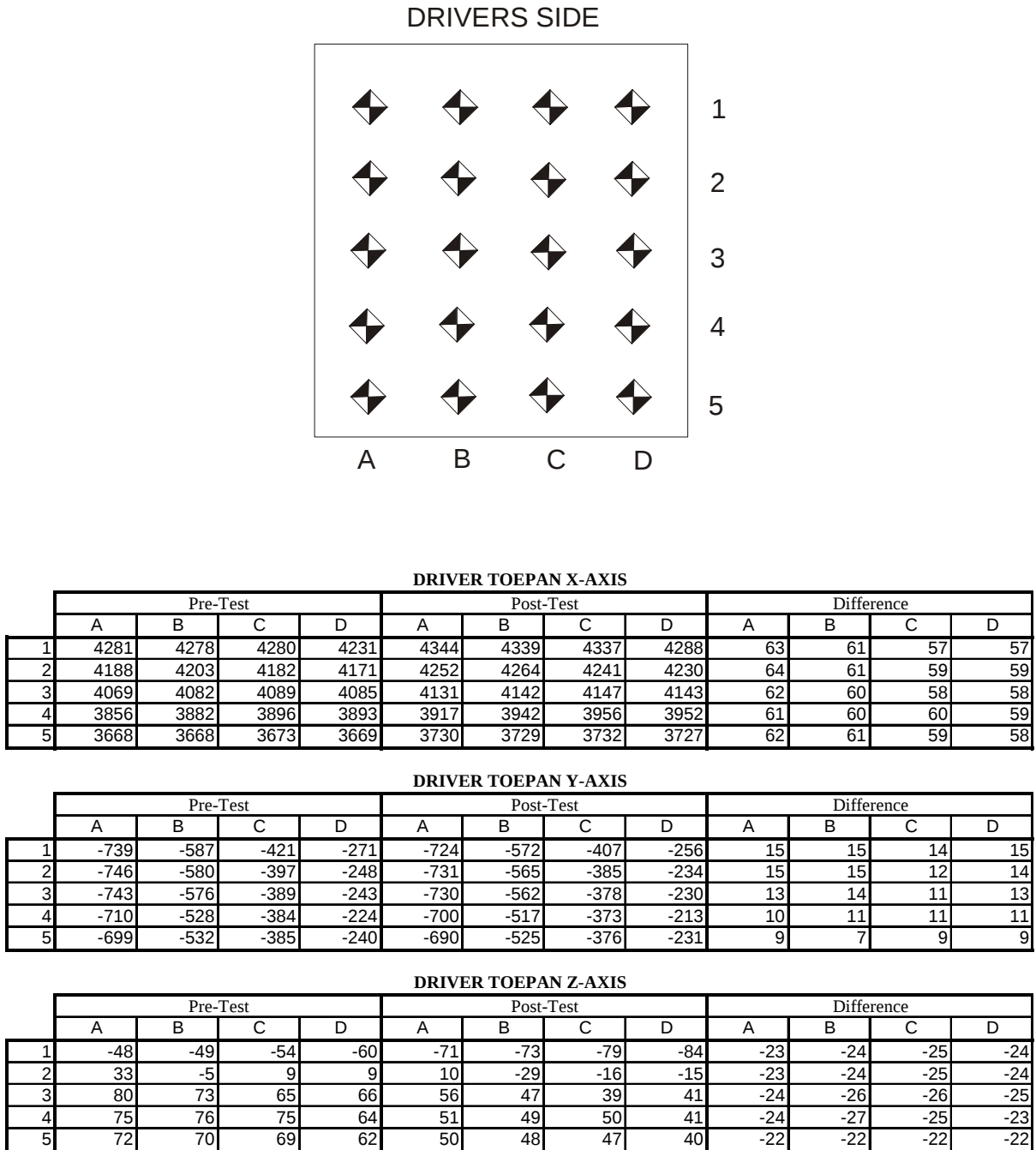
Front of Hood

Pre-Test				Post-Test			Difference		
Index	X, mm	Y, mm	Z, mm	X, mm	Y, mm	Z, mm	X, mm	Y, mm	Z, mm
1	5414	-848	-398	5378	-839	-592	-36	9	-194
2	5567	-568	-483	5495	-538	-568	-72	30	-85
3	5631	-192	-504	5491	-165	-551	-140	27	-47
4	5631	185	-505	5479	191	-552	-152	6	-47
5	5567	576	-489	5500	586	-559	-67	10	-70
6	5411	858	-407	5390	889	-582	-21	31	-175

Pre-test and post-test measurement reference: +X forward; +Y right; +Z down.
0, 0, 0 origin is center of rear bumper.

¹ Measurements 1-6, Top of Front Bumper, are included in the NHTSA Entrée database submission as Damage Profile Distances 1-6.

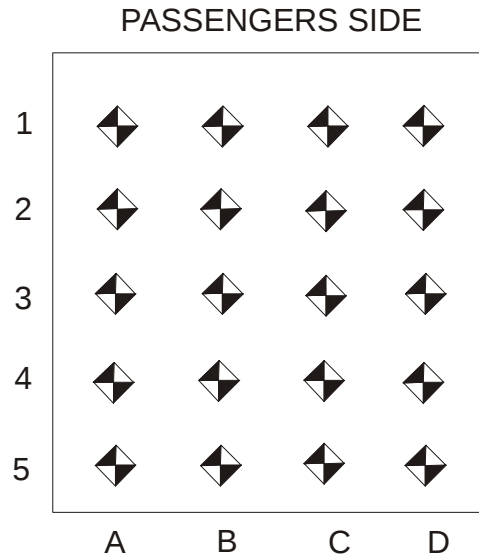
Figure 7 Vehicle Toeboard Measurements



Pre-test and post-test measurement reference: +X forward; +Y right; +Z down.

0, 0, 0 origin is center of rear bumper.

Figure 7 Vehicle Toeboard Measurements, Continued



PASSENGER TOEPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	4256	4256	4265	4269	4314	4314	4323	4327	58	58	58	58
2	4163	4166	4159	4160	4221	4222	4216	4216	58	56	57	56
3	4071	4065	4063	4067	4128	4122	4121	4123	57	57	58	56
4	3870	3866	3856	3864	3927	3923	3914	3920	57	57	58	56
5	3666	3666	3663	3656	3723	3723	3721	3713	57	57	58	57

PASSENGER TOEPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	485	567	655	742	492	575	662	747	7	8	7	5
2	454	537	657	740	458	541	662	744	4	4	5	4
3	360	472	614	737	364	475	617	739	4	3	3	2
4	296	423	548	705	299	426	552	708	3	3	4	3
5	300	427	550	682	304	431	552	684	4	4	2	2

PASSENGER TOEPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-106	-103	-109	-112	-115	-111	-115	-115	-9	-8	-6	-3
2	-21	-17	-20	-20	-32	-27	-27	-24	-11	-10	-7	-4
3	57	62	63	60	44	50	56	55	-13	-12	-7	-5
4	72	73	73	70	57	57	58	64	-15	-16	-15	-6
5	61	68	67	65	48	58	60	62	-13	-10	-7	-3

Pre-test and post-test measurement reference: +X forward; +Y right; +Z down.

0, 0, 0 origin is center of rear bumper.

Table 8 IIHS Measurements

IIHS MEASUREMENTS											
		Pre-Test			Post-Test			Difference			
Index	Description	Xmm	Ymm	Zmm	Xmm	Ymm	Zmm	Xmm	Ymm	Zmm	
1	Center of Steering Wheel on the Airbag Door	3647	-472	-654	3721	-446	-692	74	26	-38	
2	Driver's Lower Left Instrument Panel	3897	-622	-393	3965	-605	-418	68	17	-25	
3	Driver's Lower Right Instrument Panel	3899	-323	-393	3966	-305	-416	67	18	-23	
4	Brake Pedal Center	4091	-462	-127	4153	-441	-151	62	21	-24	
9	Left Front Driver's Seat Mounting Bolt	3568	-612	-6	3628	-605	-24	60	7	-18	

Figure 8 Camera Positions

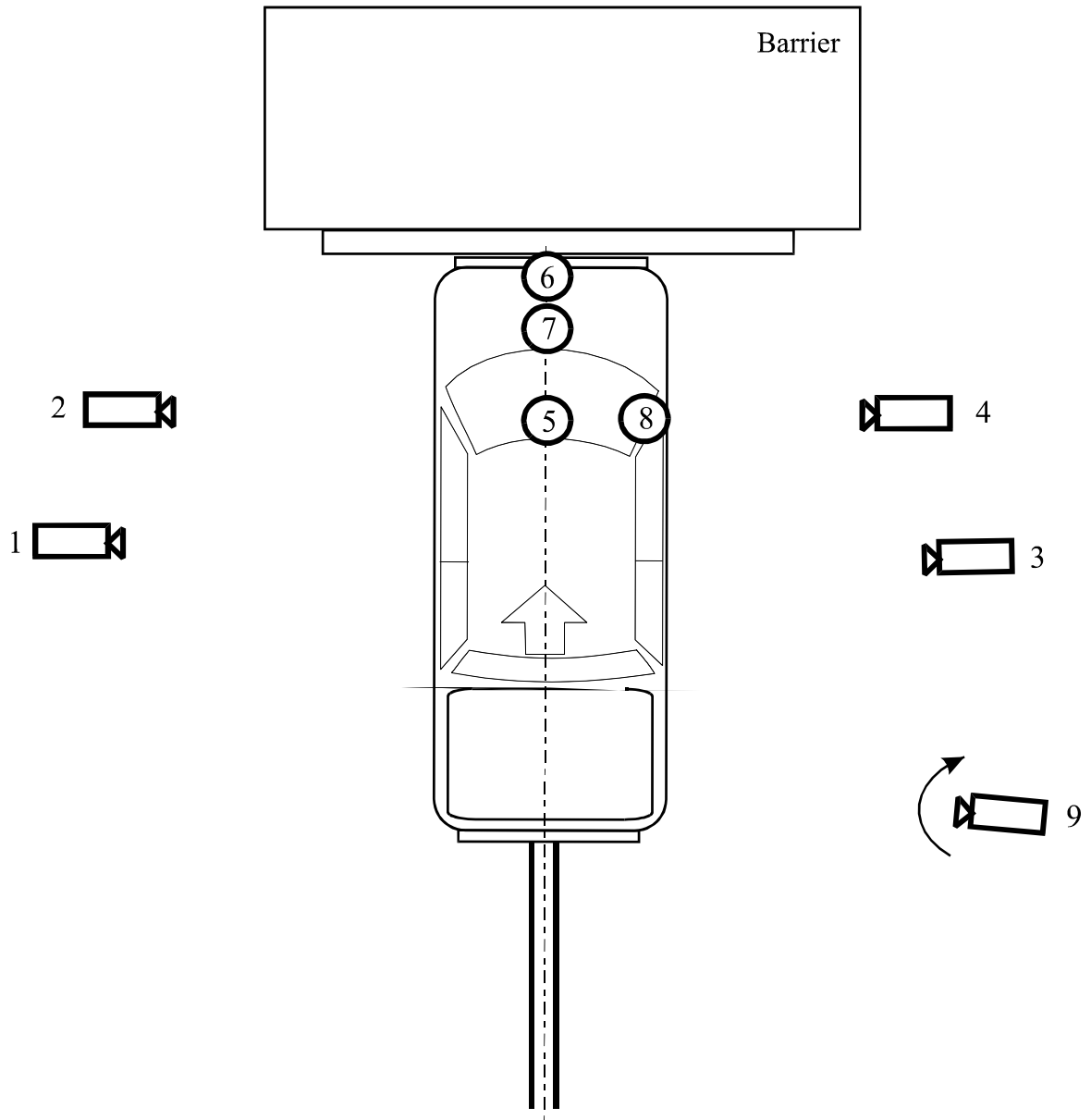
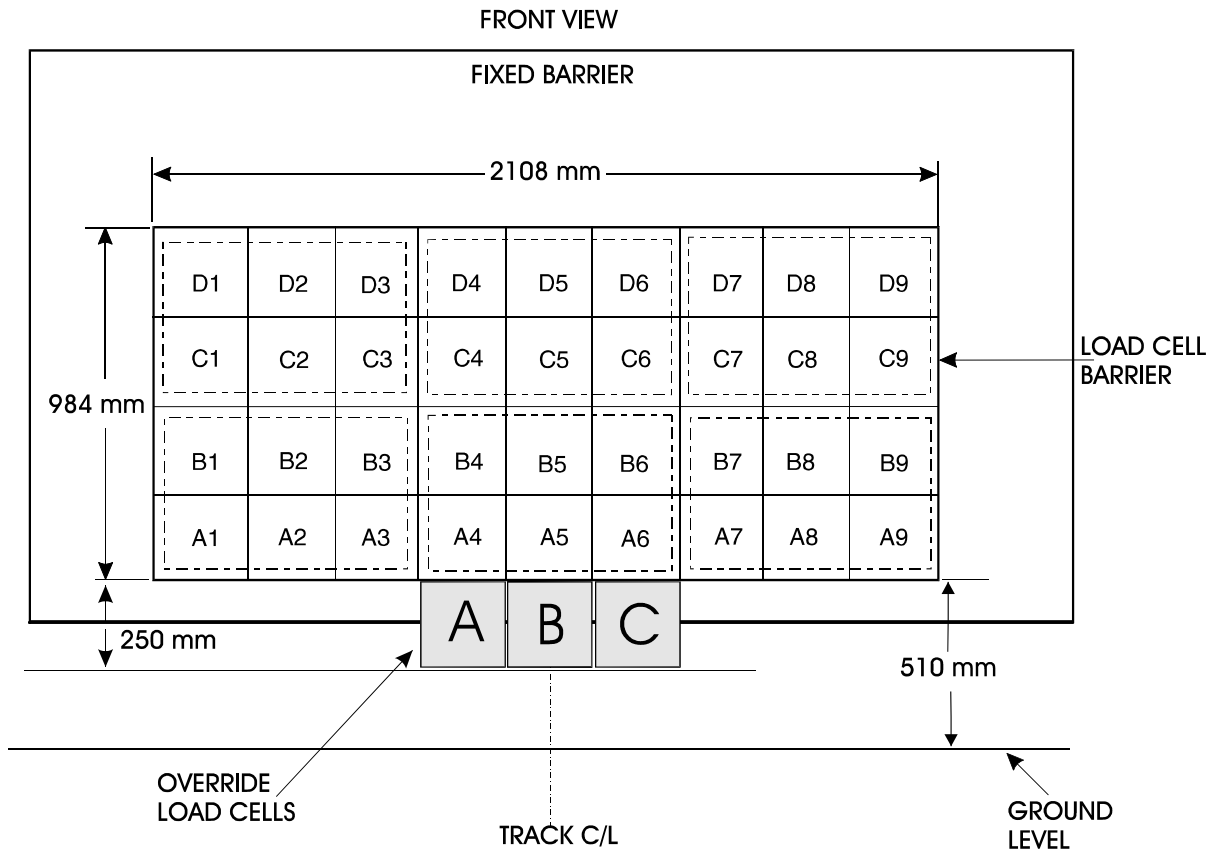


Table 9 Camera Information

Camera Number	Location	Location, mm			Angle (deg.)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Left wide	-1250	7500	-1040	-1.9°	12.5	1000
2	Left tight	0	6900	-420	0.0°	25	1000
3	Right wide	1200	7650	-1000	-1.0°	12.5	1000
4	Right tight	0	680	-420	0.0°	25	1000
5	Overhead wide	650	0	-5650	90.0°	12.5	1000
6	Overhead tight	200	0	-5650	90.0°	25	1000
7	Underbody	0	0	-450	90.0°	25	1000
8	Underbody angled	2800	0	-450	90.0°	12.5	1000
9	Panning/documentary	N/A	N/A	N/A	N/A	zoom	30

+X: Forward from impact point
 +Y: Rightward from impact point
 +Z: Downward from ground level

Figure 9 Override Load Cell Locations



Appendix A

Photographs



Figure A-1 Pre-Test Front View



Figure A-2 Post-Test Front View



Figure A-3 Pre-Test Left Front View



Figure A-4 Post-Test Left Front View



Figure A-5 Pre-Test Left Side View



Figure A-6 Post-Test Left Side View



Figure A-7 Pre-Test Left Rear View



Figure A-8 Post-Test Left Rear View



Figure A-9 Pre-Test Rear View



Figure A-10 Post-Test Rear View



Figure A-11 Pre-Test Right Rear View



Figure A-12 Post-Test Right Rear View



Figure A-13 Pre-Test Right Side View



Figure A-14 Post-Test Right Side View



Figure A-15 Pre-Test Right Front View



Figure A-16 Post-Test Right Front View



Figure A-17 Pre-Test Overhead View

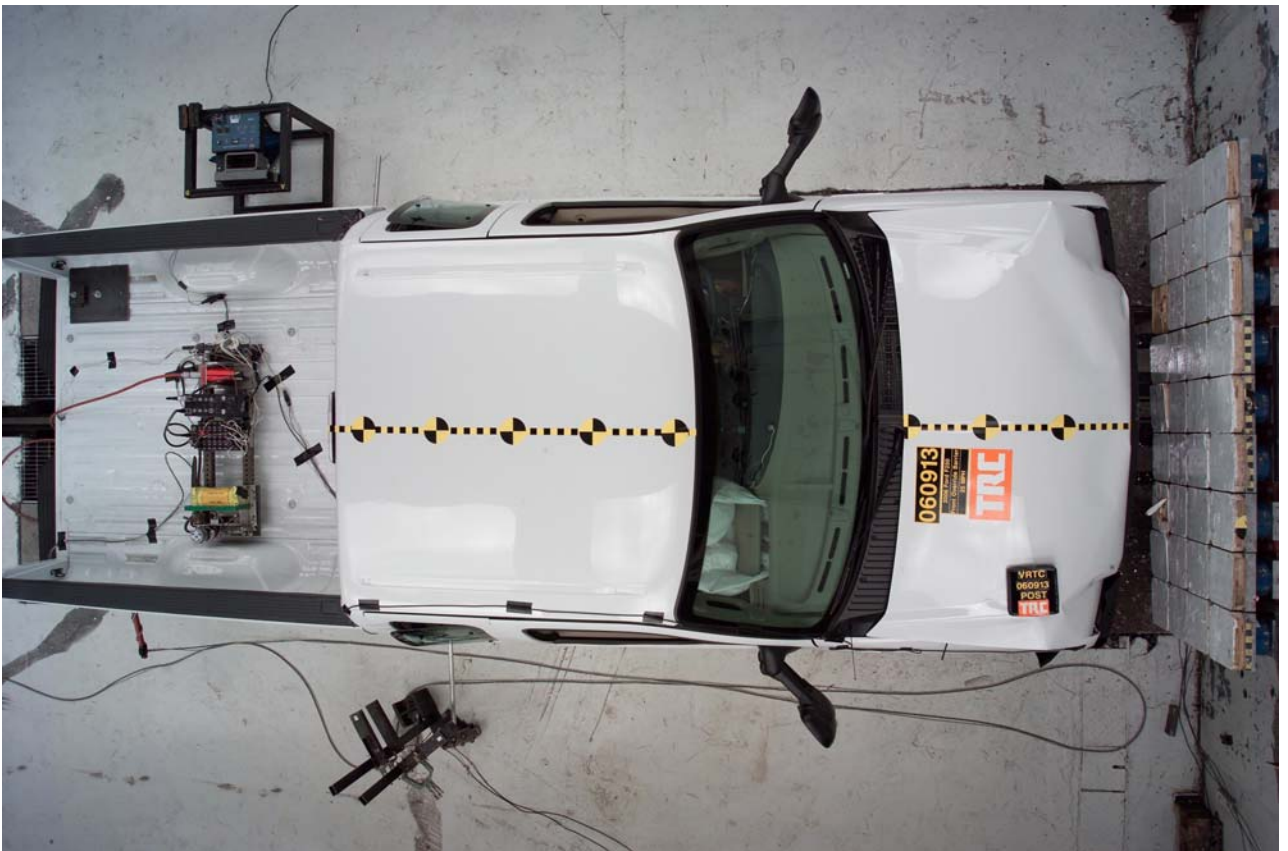


Figure A-18 Post-Test Overhead View



Figure A-19 Pre-Test Overhead Close-up View



Figure A-20 Post-Test Overhead Close-up View



Figure A-21 Pre-Test Engine Compartment View



Figure A-22 Post-Test Engine Compartment View

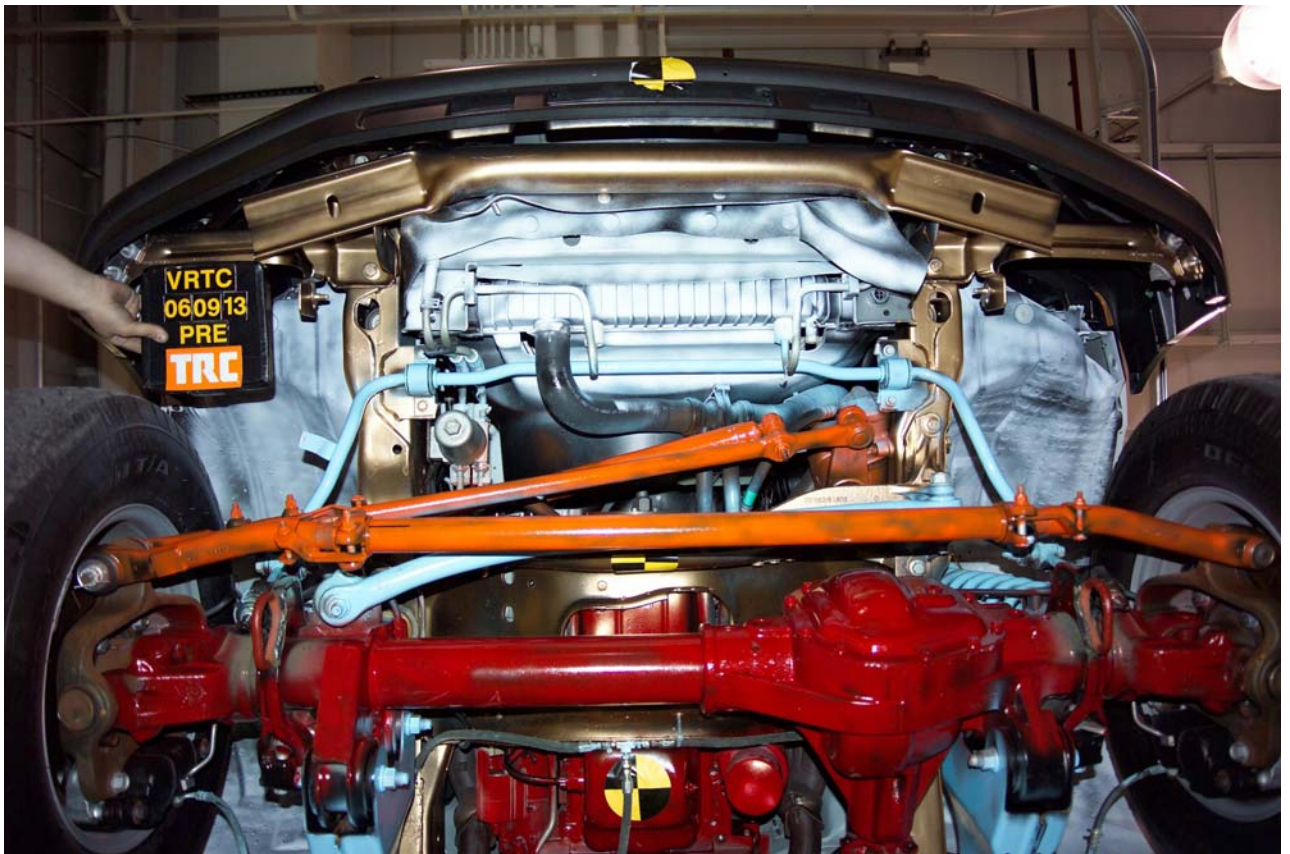


Figure A-23 Pre-Test Front Underbody View

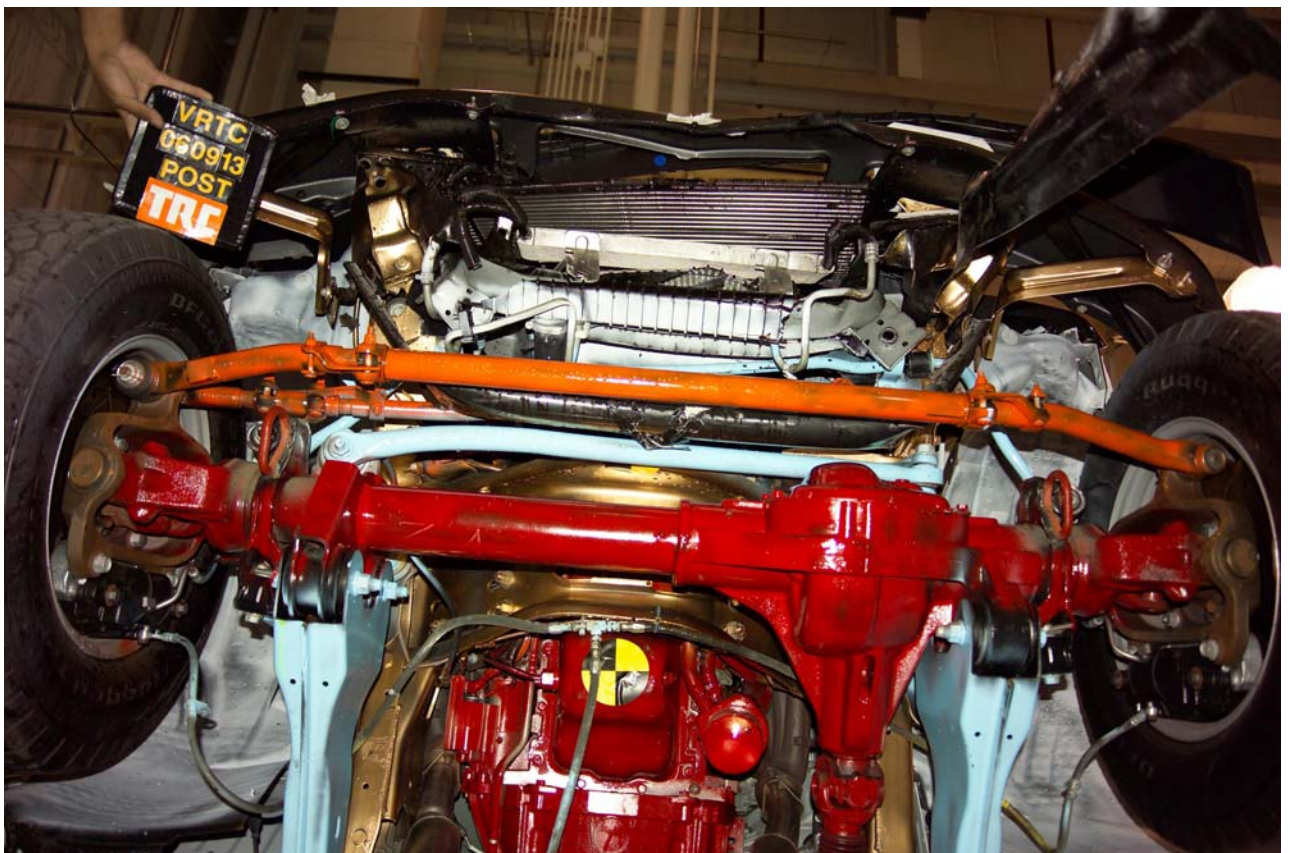


Figure A-24 Post-Test Front Underbody View

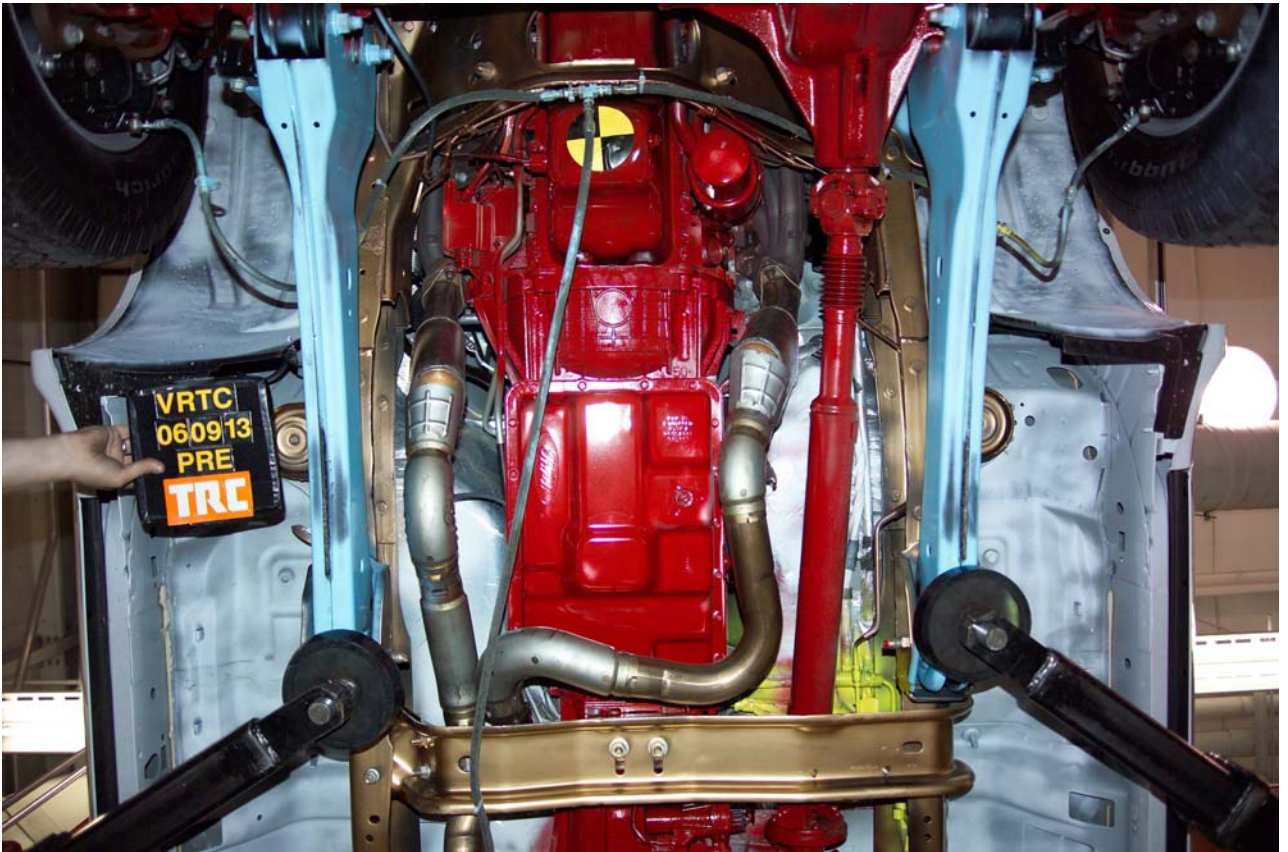


Figure A-25 Pre-Test Mid Front Underbody View

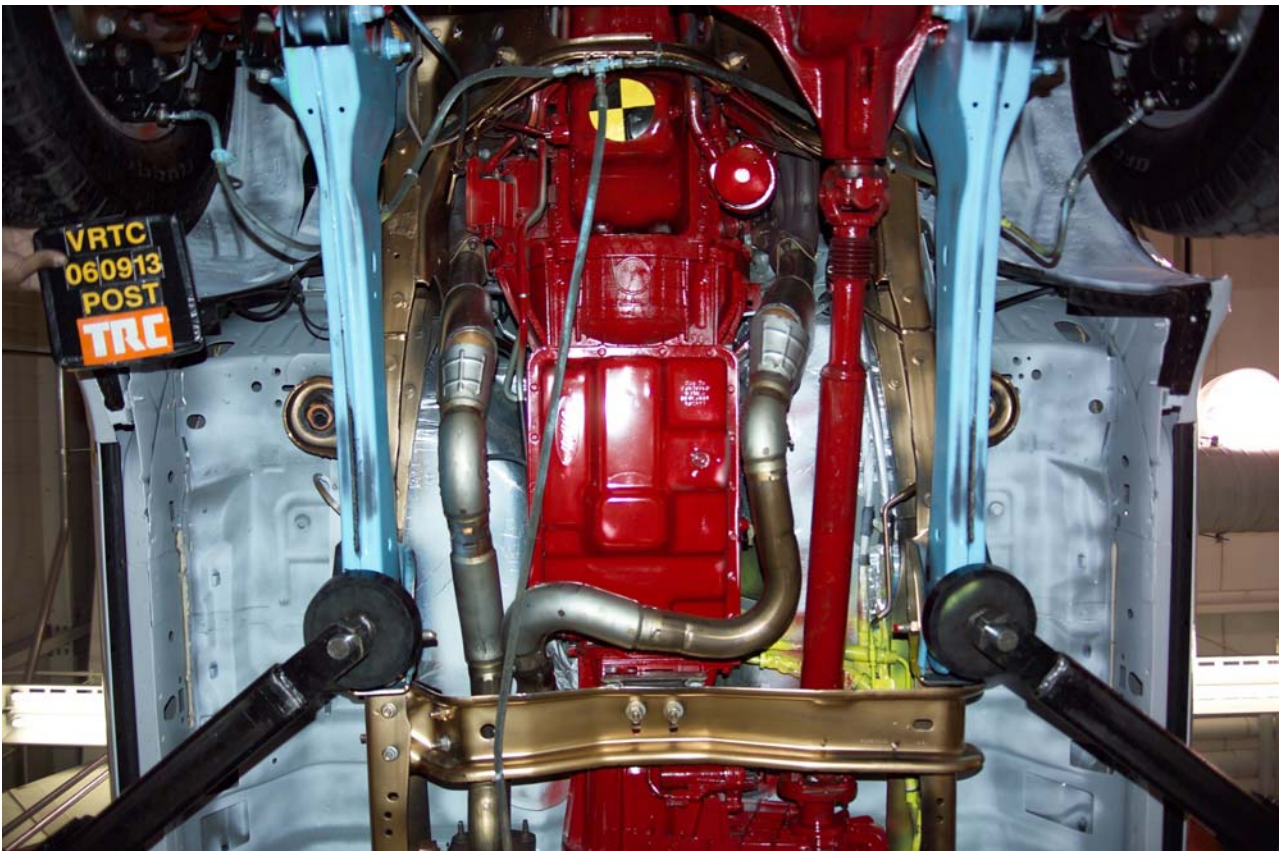


Figure A-26 Post-Test Mid Front Underbody View

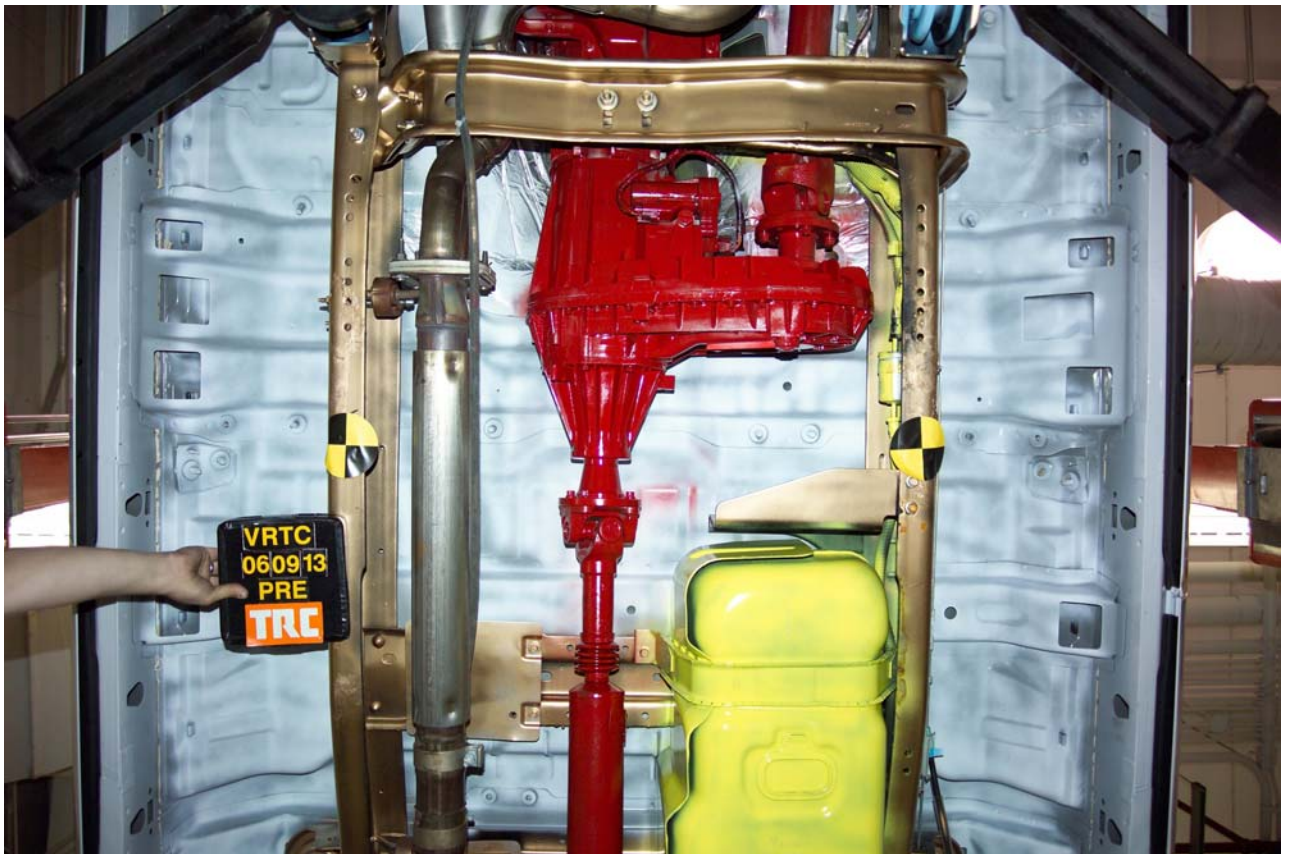


Figure A-27 Pre-Test Mid Underbody View

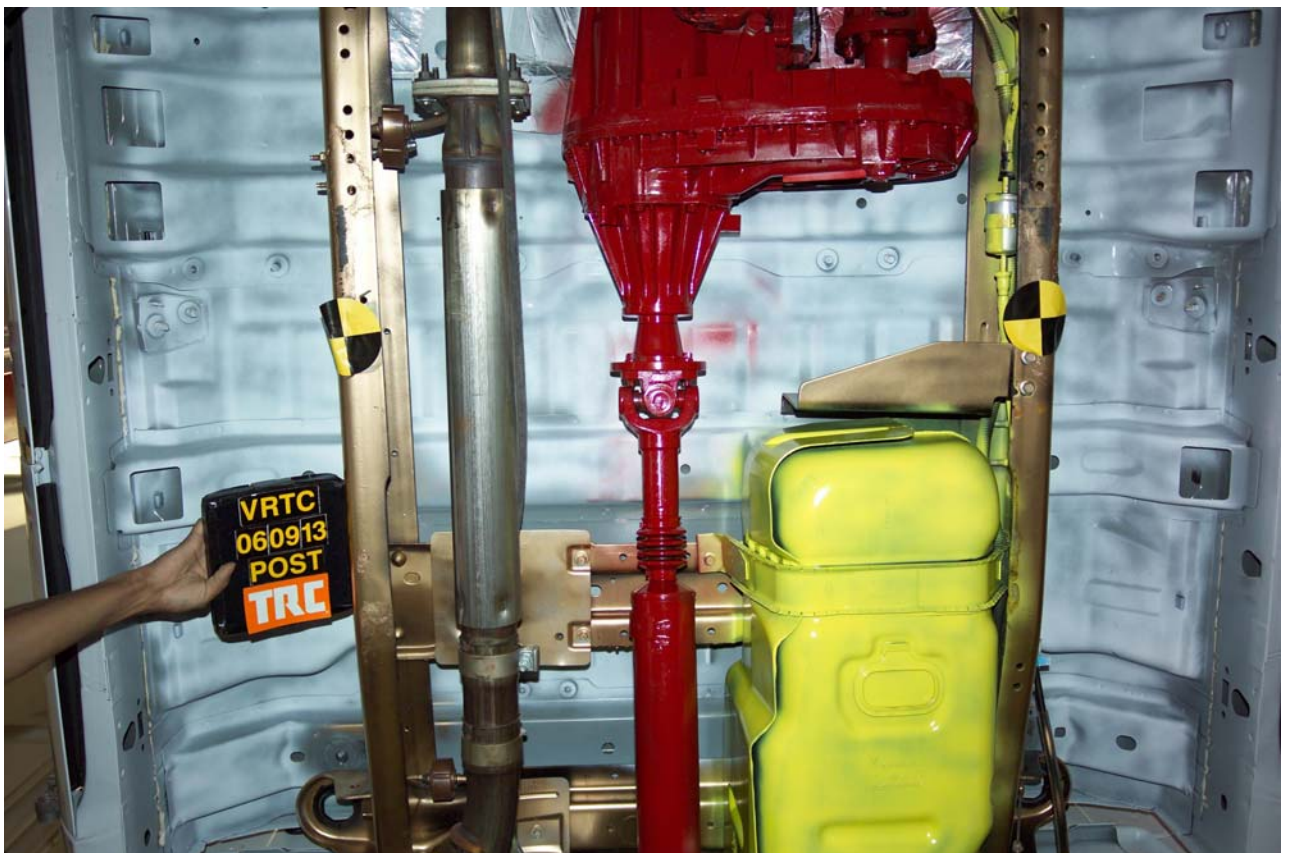


Figure A-28 Post-Test Mid Underbody View



Figure A-29 Pre-Test Mid Rear Underbody View



Figure A-30 Post-Test Mid Rear Underbody View



Figure A-31 Pre-Test Rear Underbody View



Figure A-32 Post-Test Rear Underbody View



Figure A-33 Pre-Test Fuel Tank View

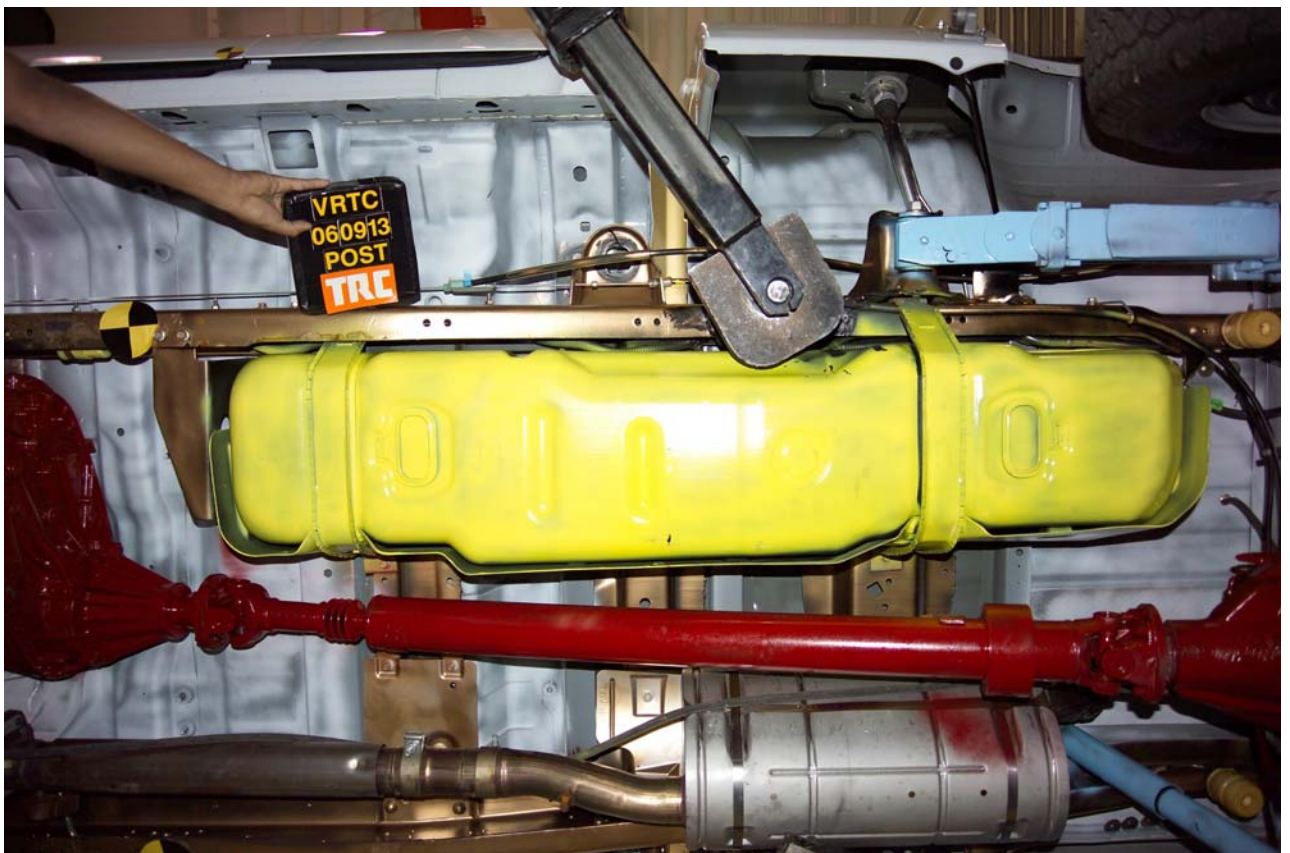


Figure A-34 Post-Test Fuel Tank View



Figure A-35 Post-Test Fuel Filler Neck View

Intentionally Left Blank



Figure A-36 Pre-Test Barrier Front View



Figure A-37 Post-Test Barrier Front View



Figure A-38 Pre-Test Barrier Right Side View

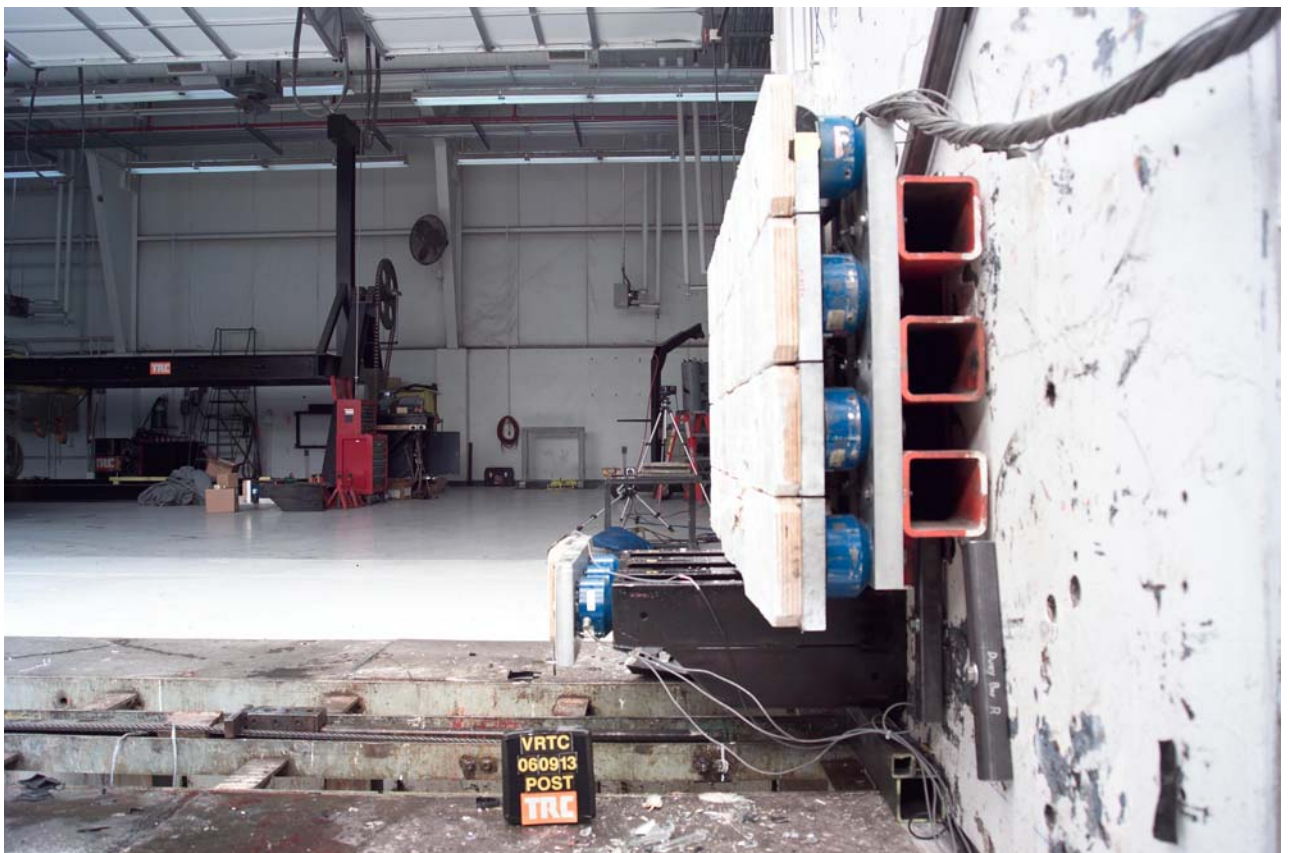


Figure A-39 Post-Test Barrier Right Side View



Figure A-40 Pre-Test Barrier Left Side View



Figure A-41 Post-Test Barrier Left Side View

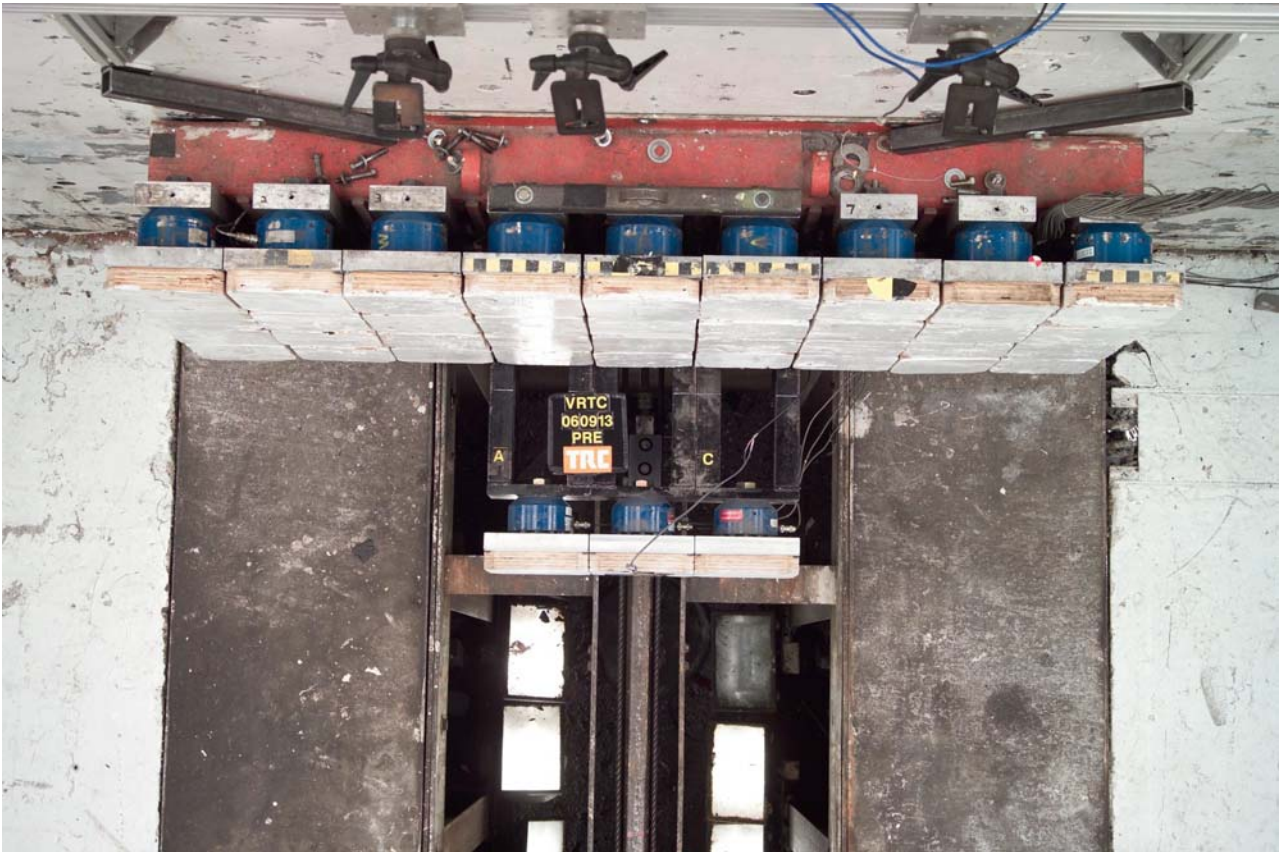


Figure A-42 Pre-Test Barrier Overhead View

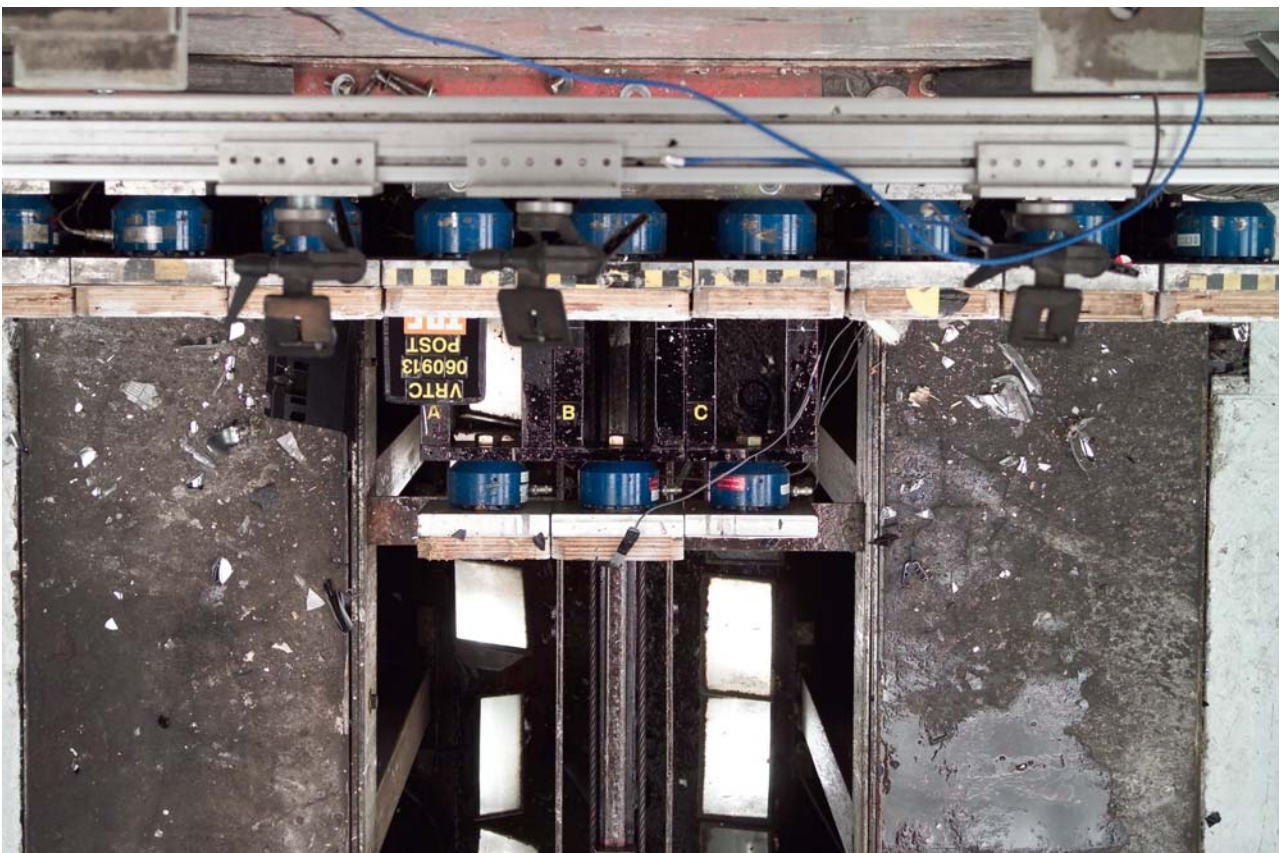


Figure A-43 Post-Test Barrier Overhead View



Figure A-44 Post-Test Digital Light Trap Read-Out - View 1

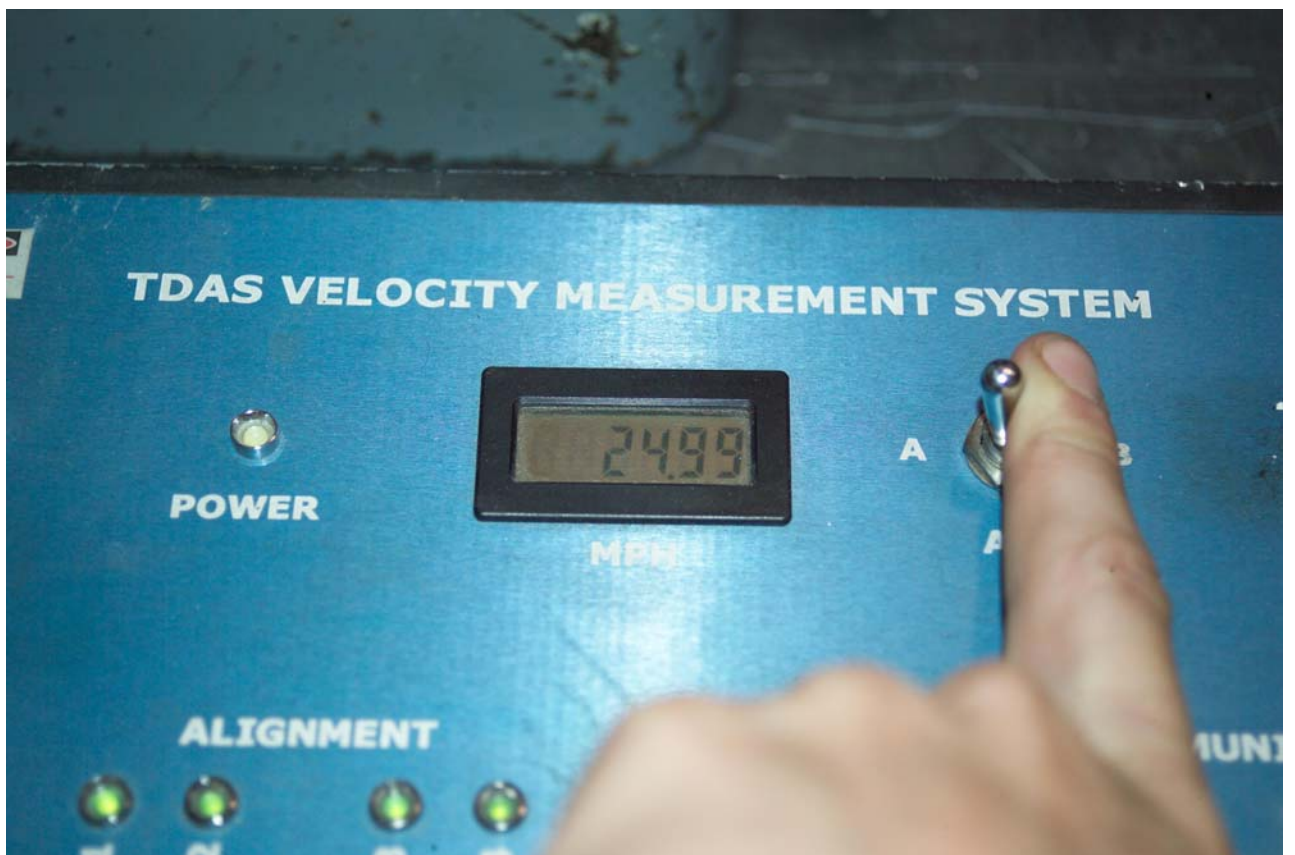


Figure A-45 Post-Test Digital Light Trap Read-Out - View 2

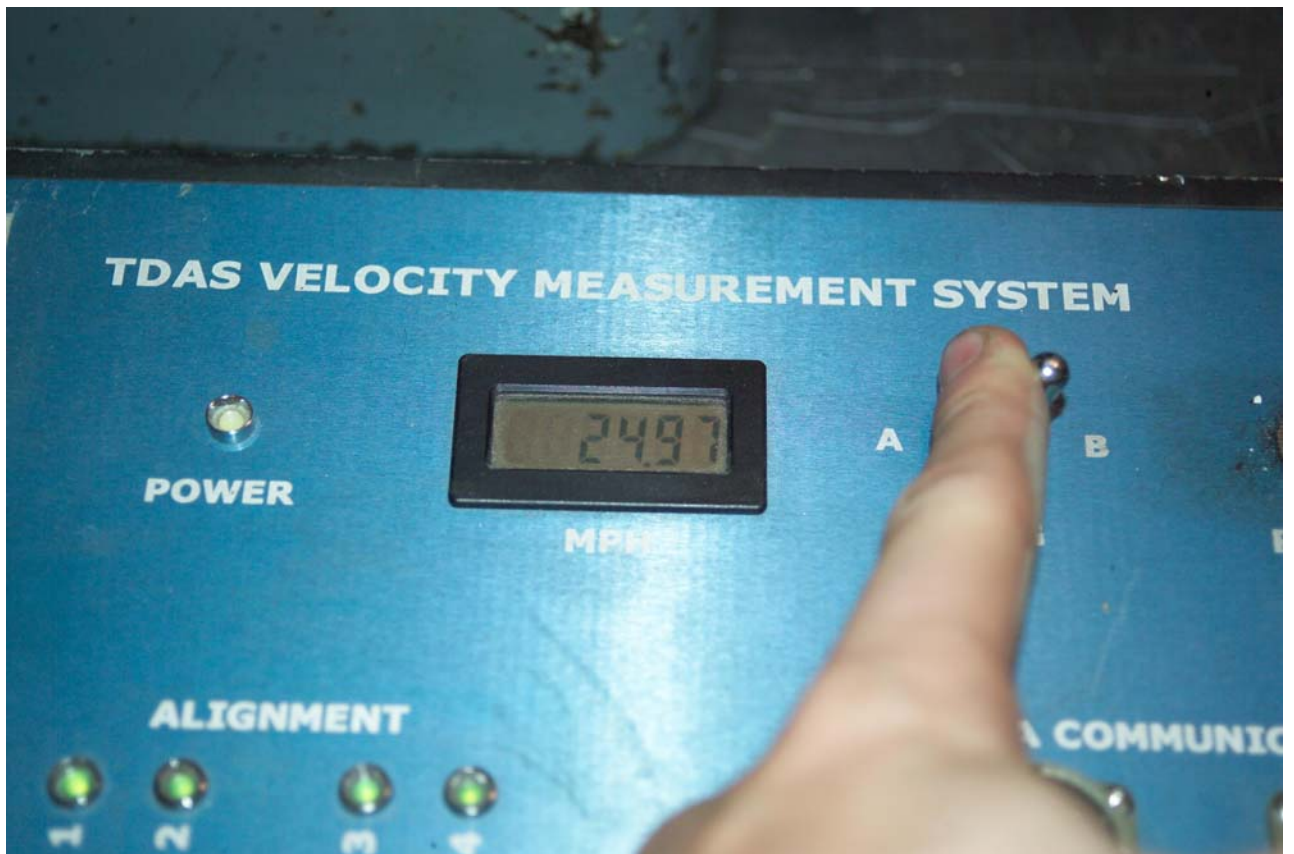


Figure A-46 Post-Test Digital Light Trap Read-Out - View 3

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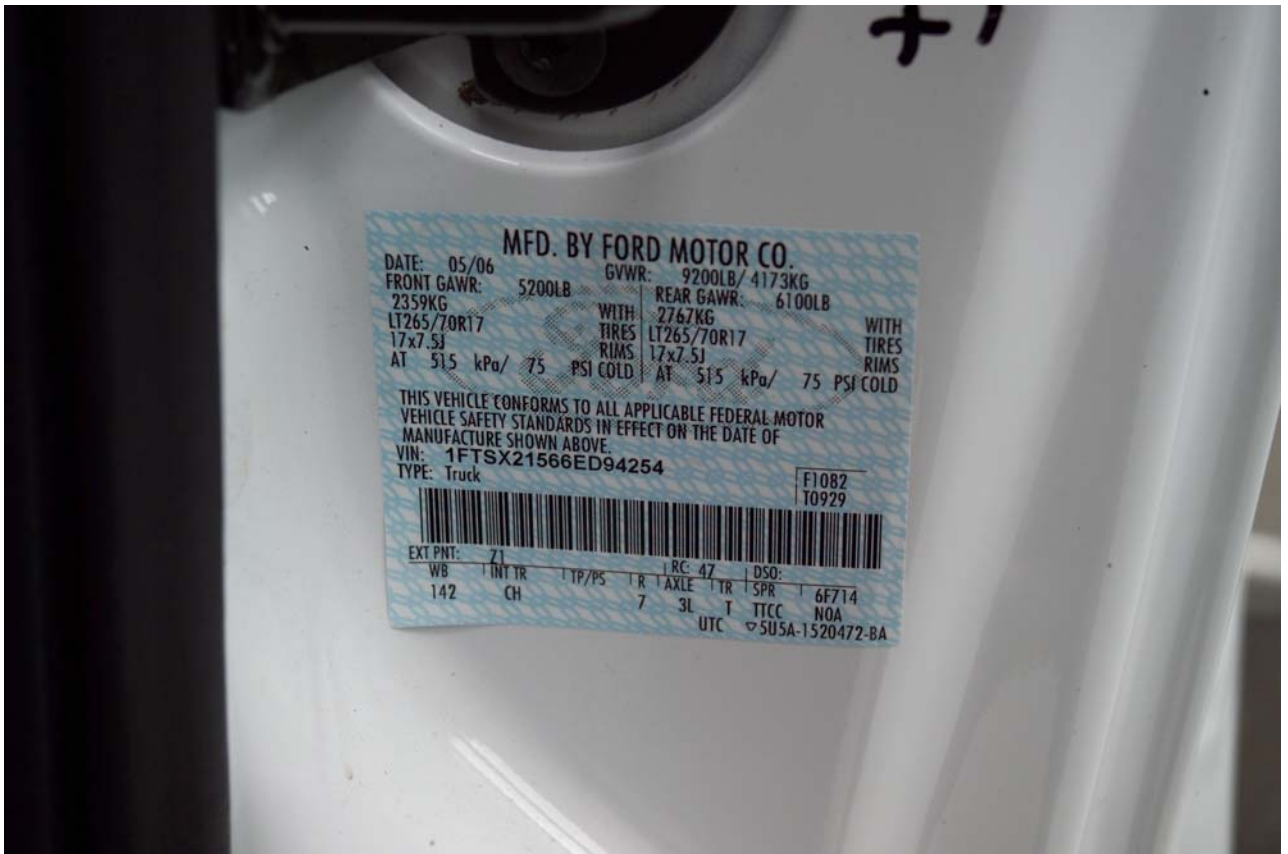


Figure A-47 Certification Label View



Figure A-48 Recommended Tire Pressure Label View



Figure A-49 Pre-Test Ballast View

Appendix B

Data Plots



2006 Ford F250 into Override Barrier at 25 mph
VEHICLE CENTER OF GRAVITY X-AXIS ACCELERATION

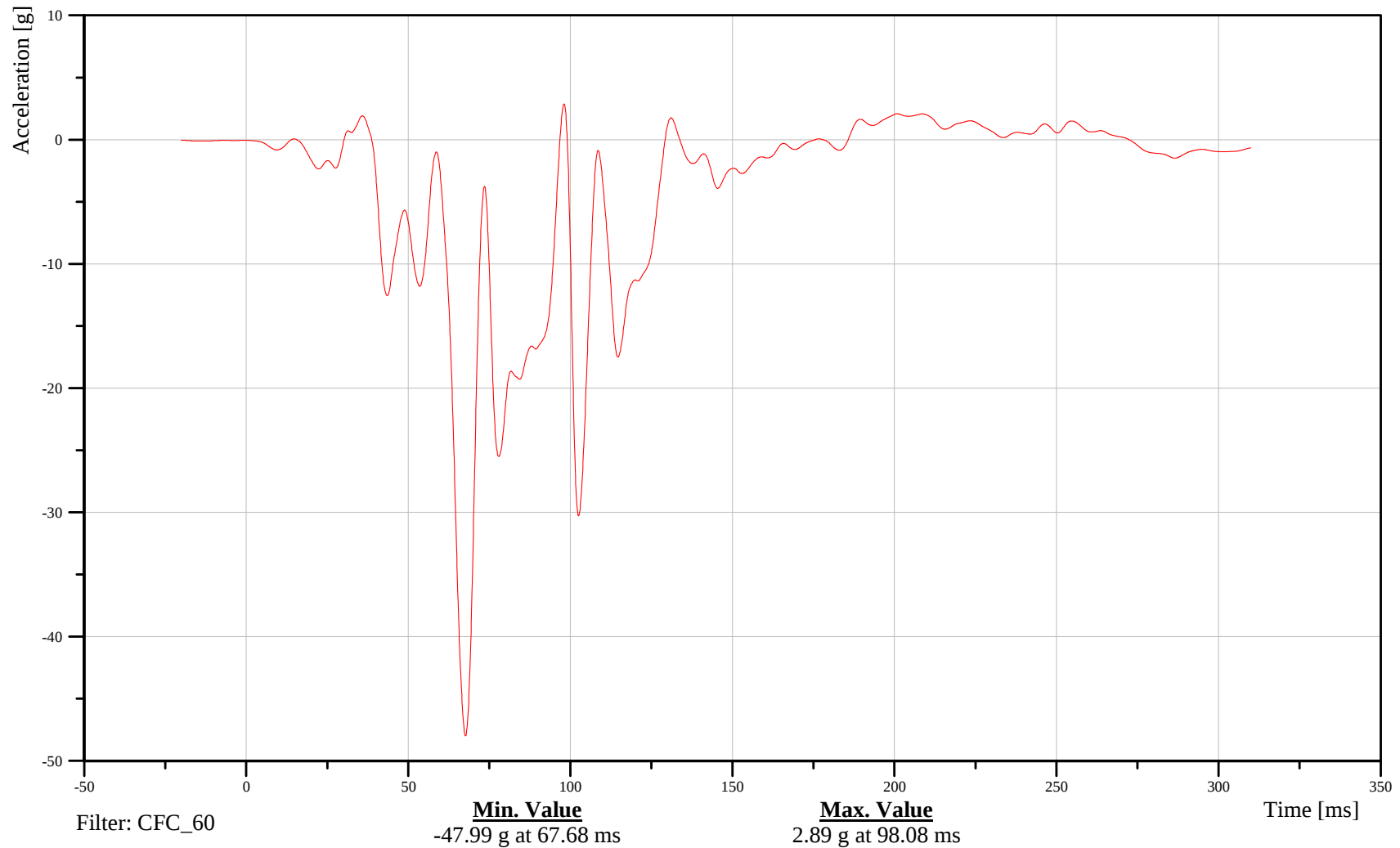
Date: 09/13/2006
Time: 14:23

Customer: VRTC

10VEHCCG0000ACXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-2

060913



2006 Ford F250 into Override Barrier at 25 mph
VEHICLE CENTER OF GRAVITY Y-AXIS ACCELERATION

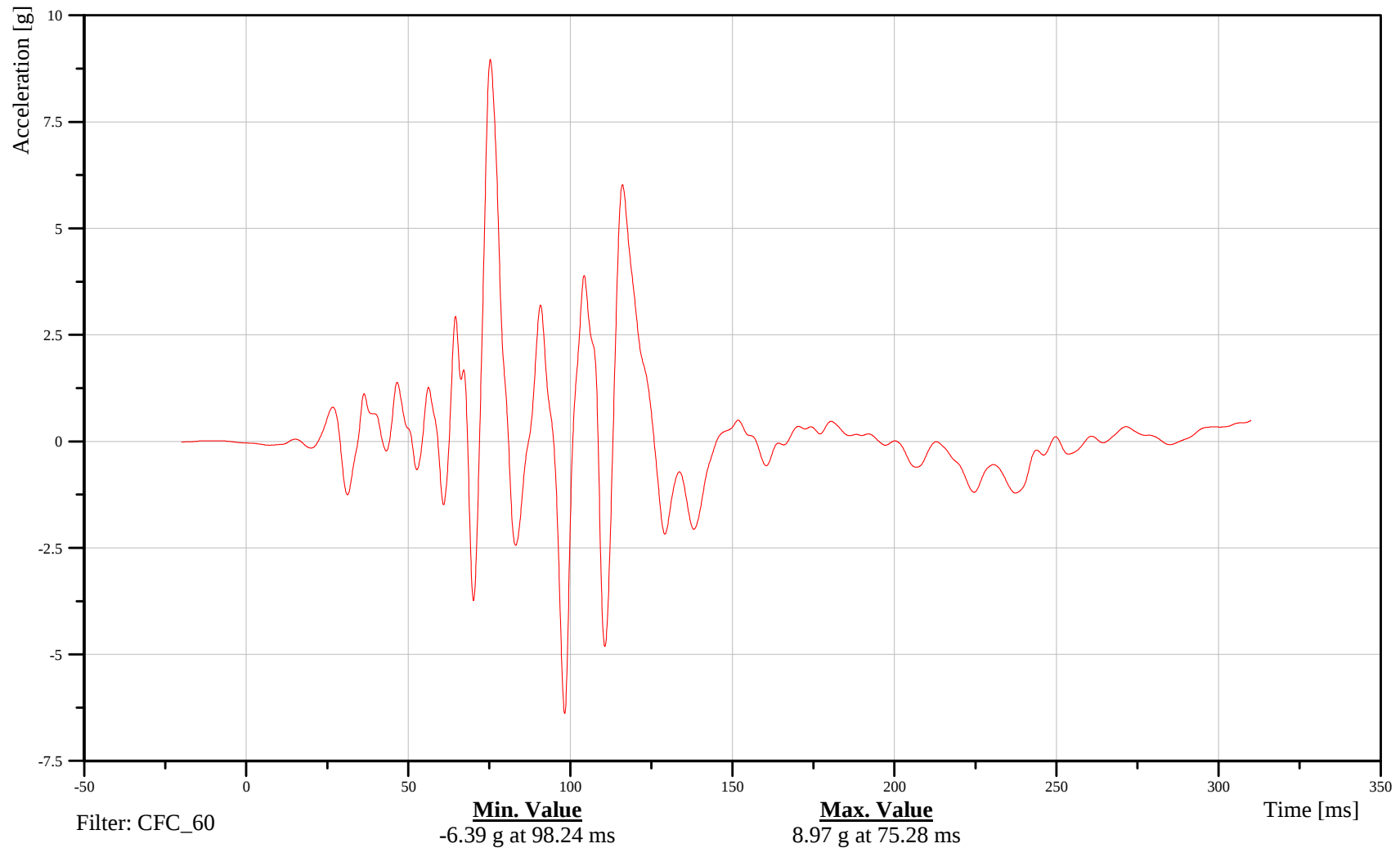
Date: 09/13/2006
Time: 14:23

Customer: VRTC

10VEHCCG0000ACYD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-3

060913



2006 Ford F250 into Override Barrier at 25 mph
VEHICLE CENTER OF GRAVITY Z-AXIS ACCELERATION

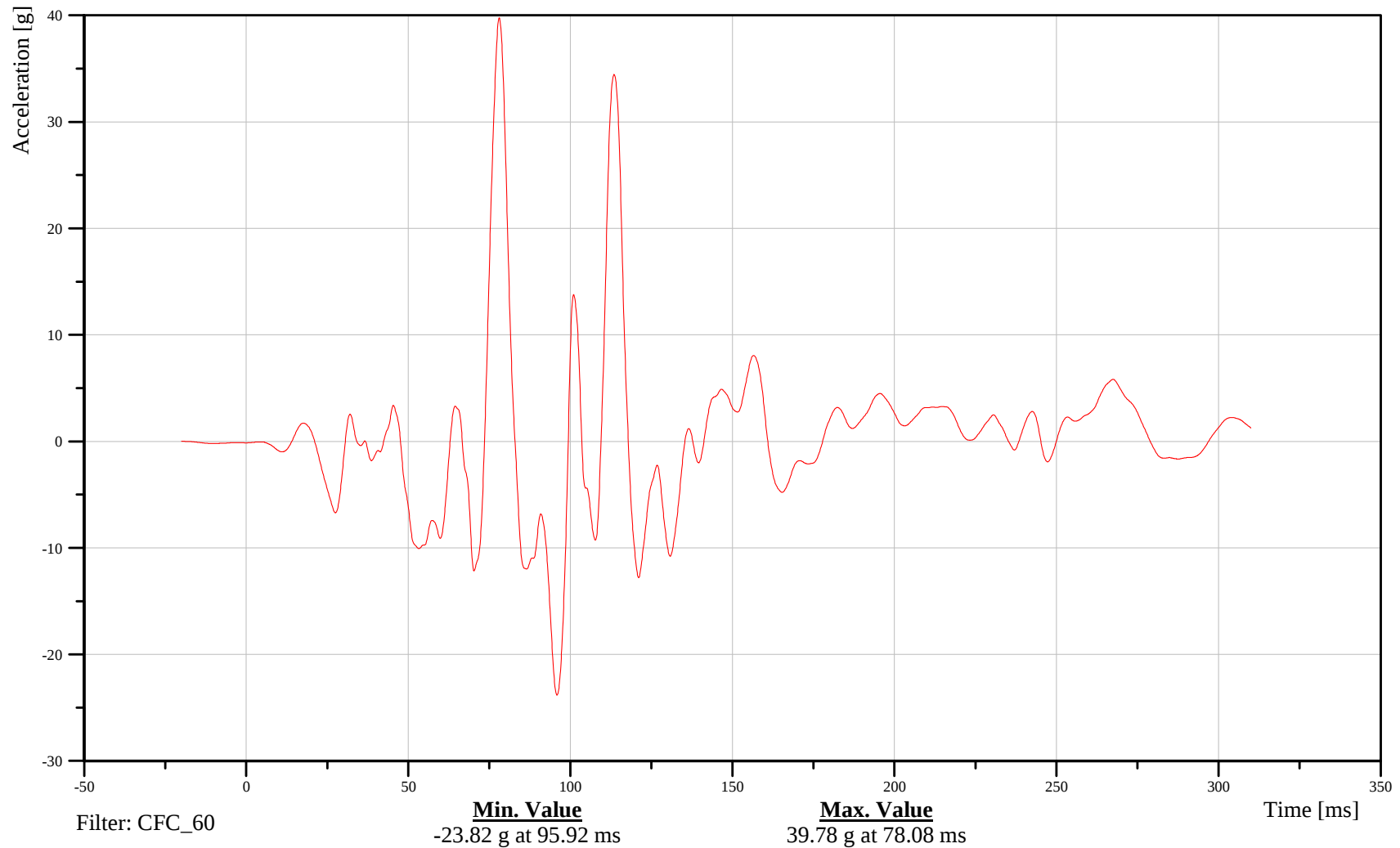
Date: 09/13/2006
Time: 14:23

Customer: VRTC

10VEHCCG0000ACZD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-4

060913



2006 Ford F250 into Override Barrier at 25 mph

Date: 09/13/2006
Time: 14:23

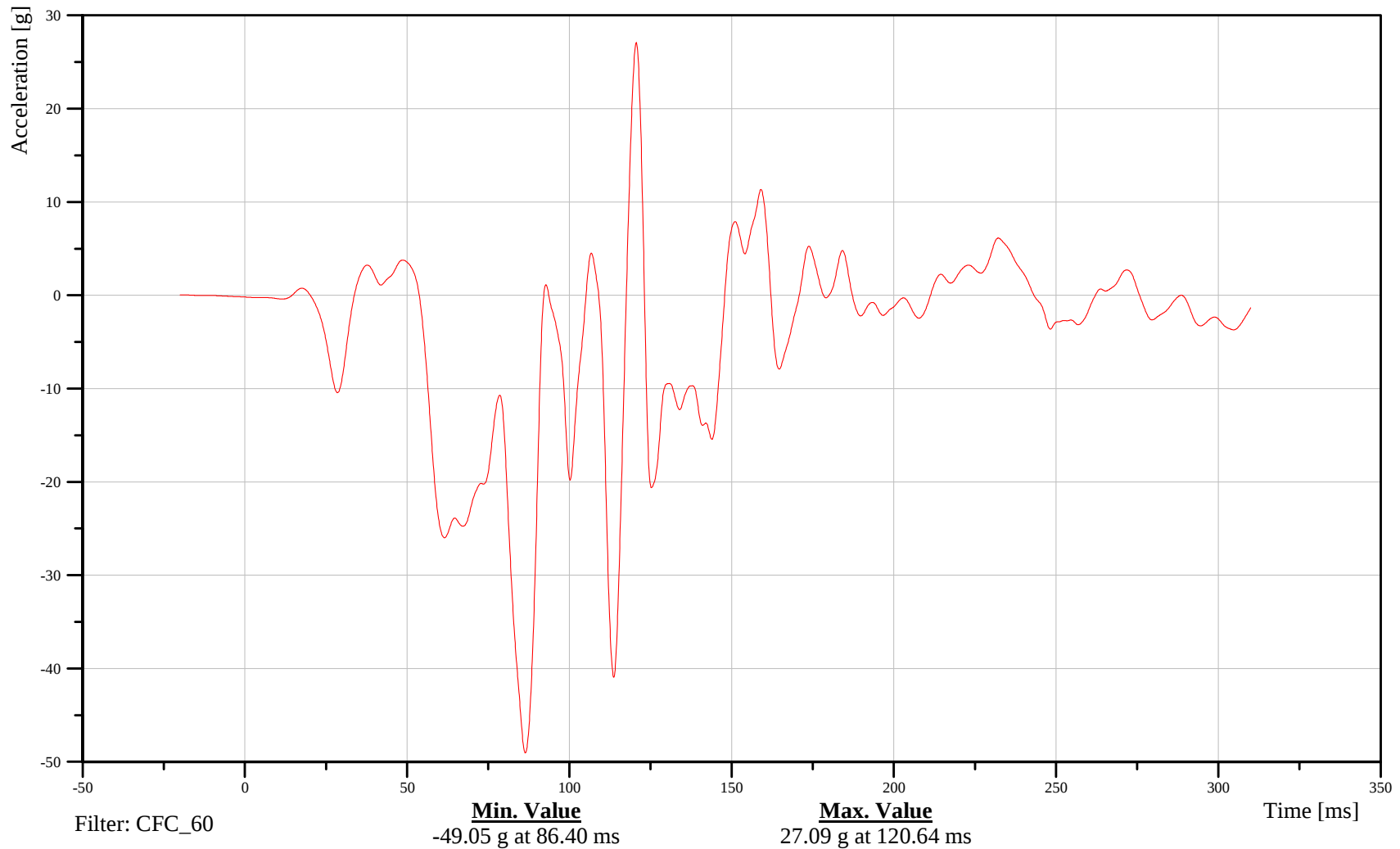
VEHICLE DASH X-AXIS ACCELERATION

Customer: VRTC

12DASH000000ACXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-5

060913



2006 Ford F250 into Override Barrier at 25 mph

VEHICLE REAR DECK X-AXIS ACCELERATION

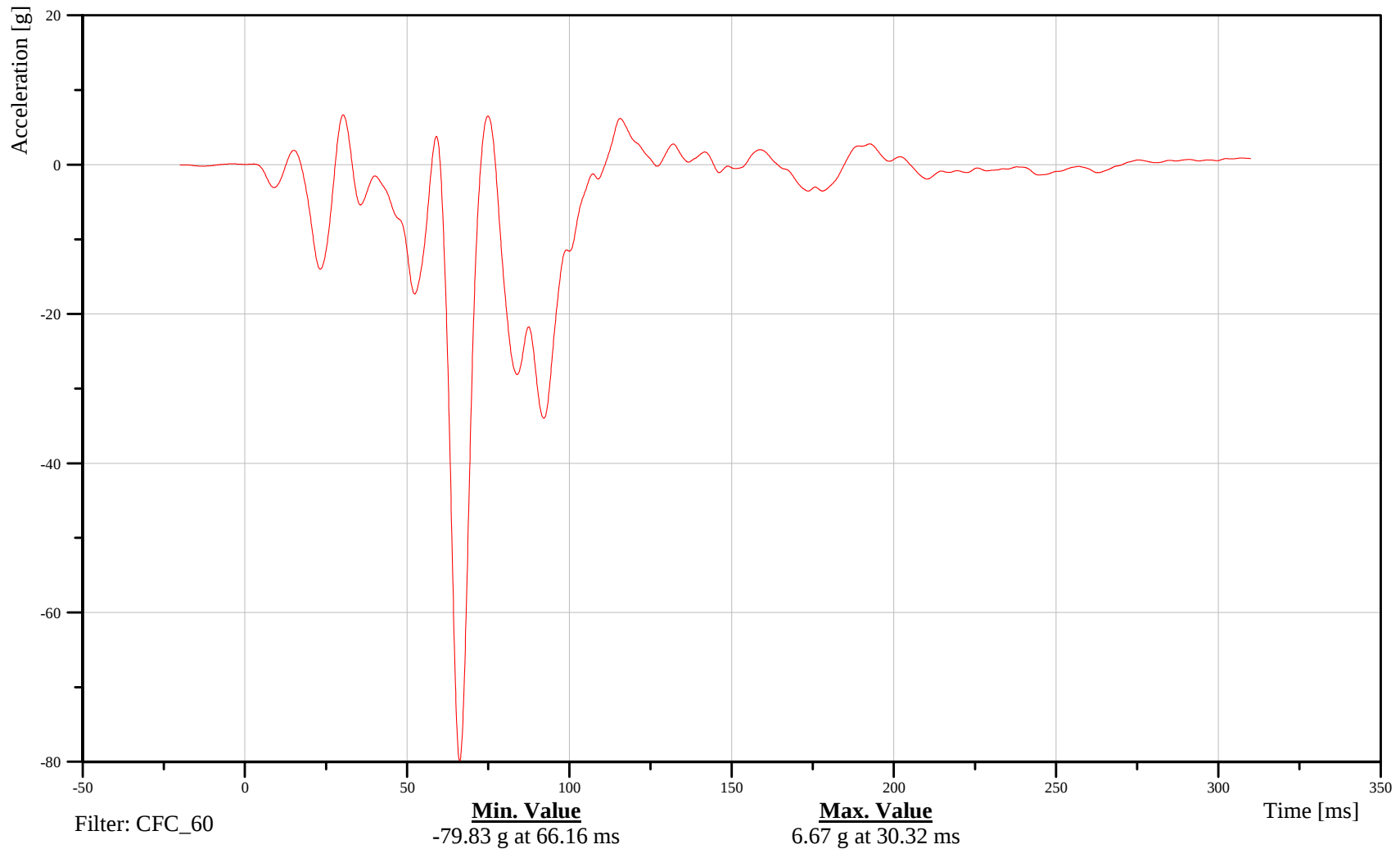
Date: 09/13/2006
Time: 14:23

Customer: VRTC

10VEHC000000ACXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-6

060913



2006 Ford F250 into Override Barrier at 25 mph

VEHICLE REAR DECK Y-AXIS ACCELERATION

Date: 09/13/2006

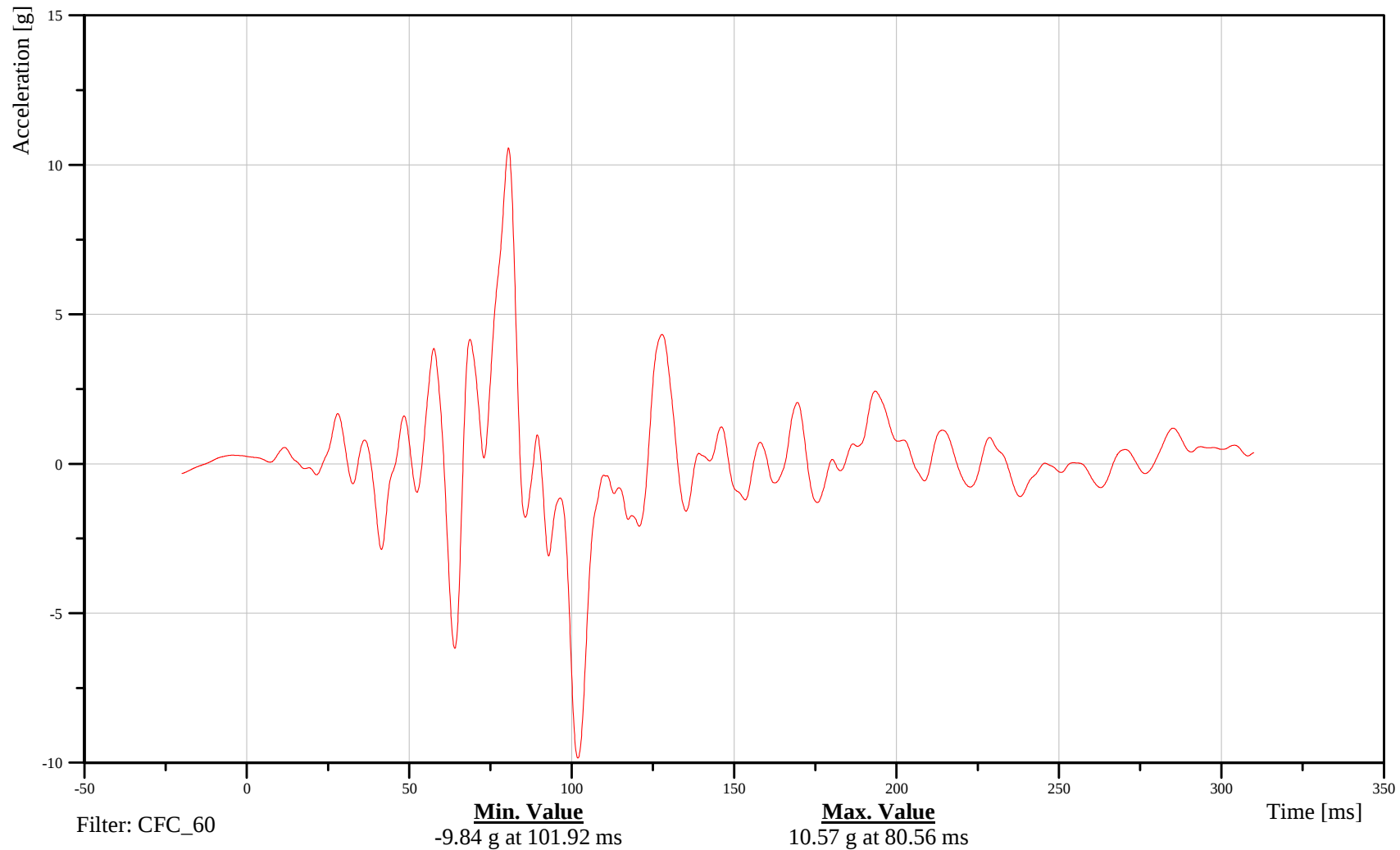
Time: 14:23

Customer: VRTC

10VEHC000000ACYD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-7

060913



2006 Ford F250 into Override Barrier at 25 mph

VEHICLE REAR DECK Z-AXIS ACCELERATION

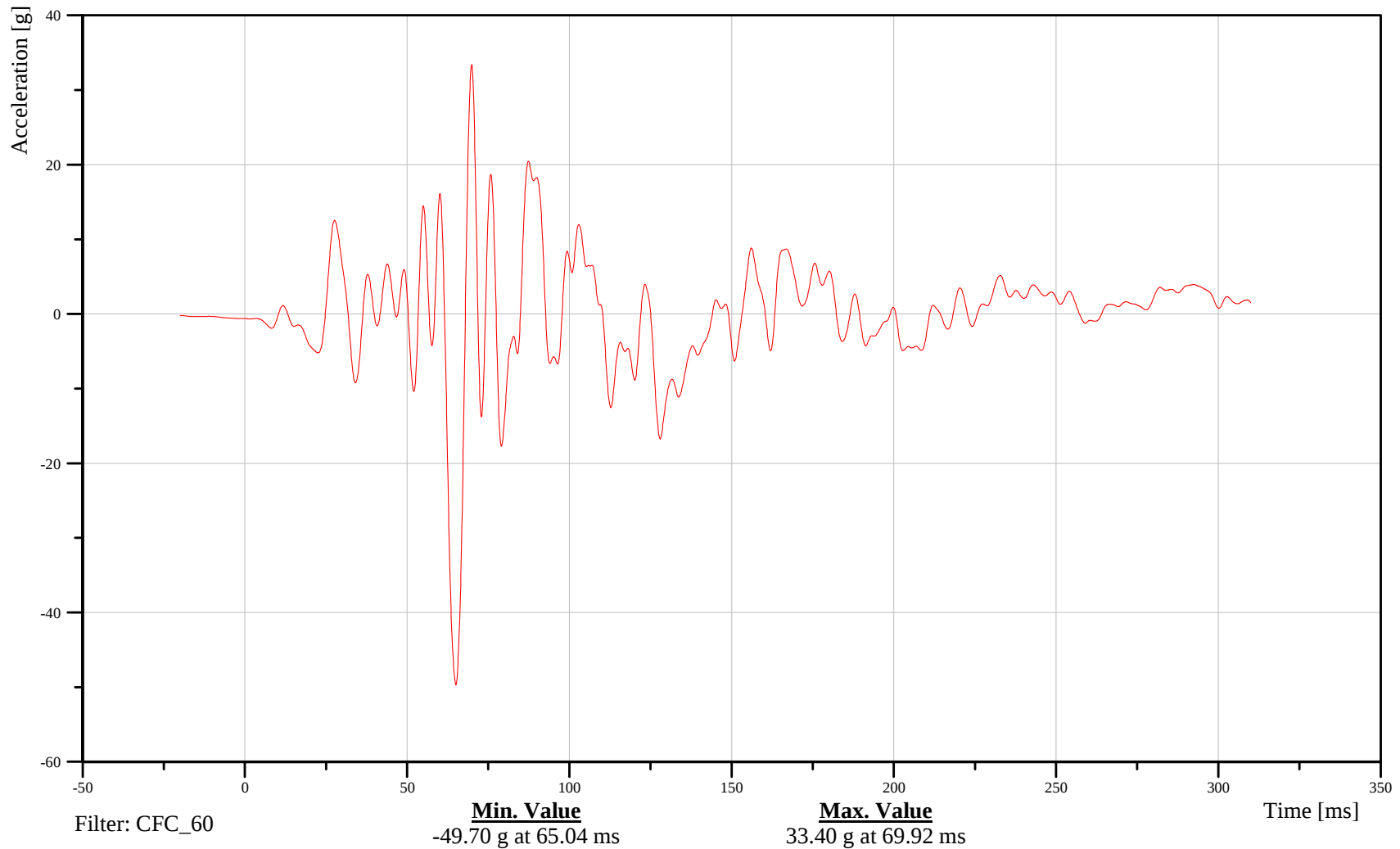
Date: 09/13/2006
Time: 14:23

Customer: VRTC

10VEHC000000ACZD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-8

060913



2006 Ford F250 into Override Barrier at 25 mph

DRIV. FRONT AIRBAG1 INDUCTOR

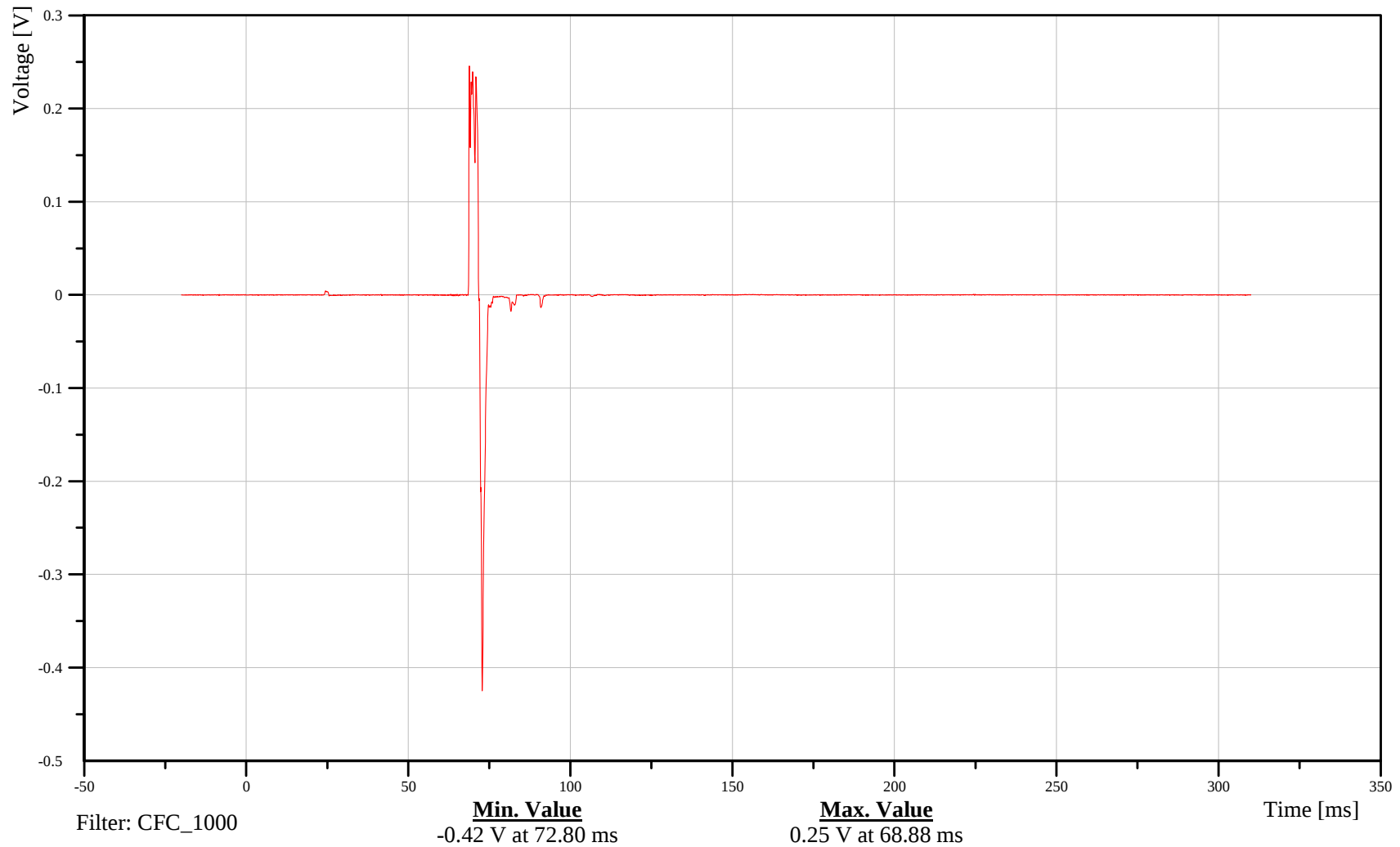
Date: 09/13/2006
Time: 14:23

Customer: VRTC

11AIRBFR0100EV0A

TRC Inc. Test Lab: CTF

Test Number: 060913



B-9

060913



2006 Ford F250 into Override Barrier at 25 mph

PASS. FRONT AIRBAG1 INDUCTOR

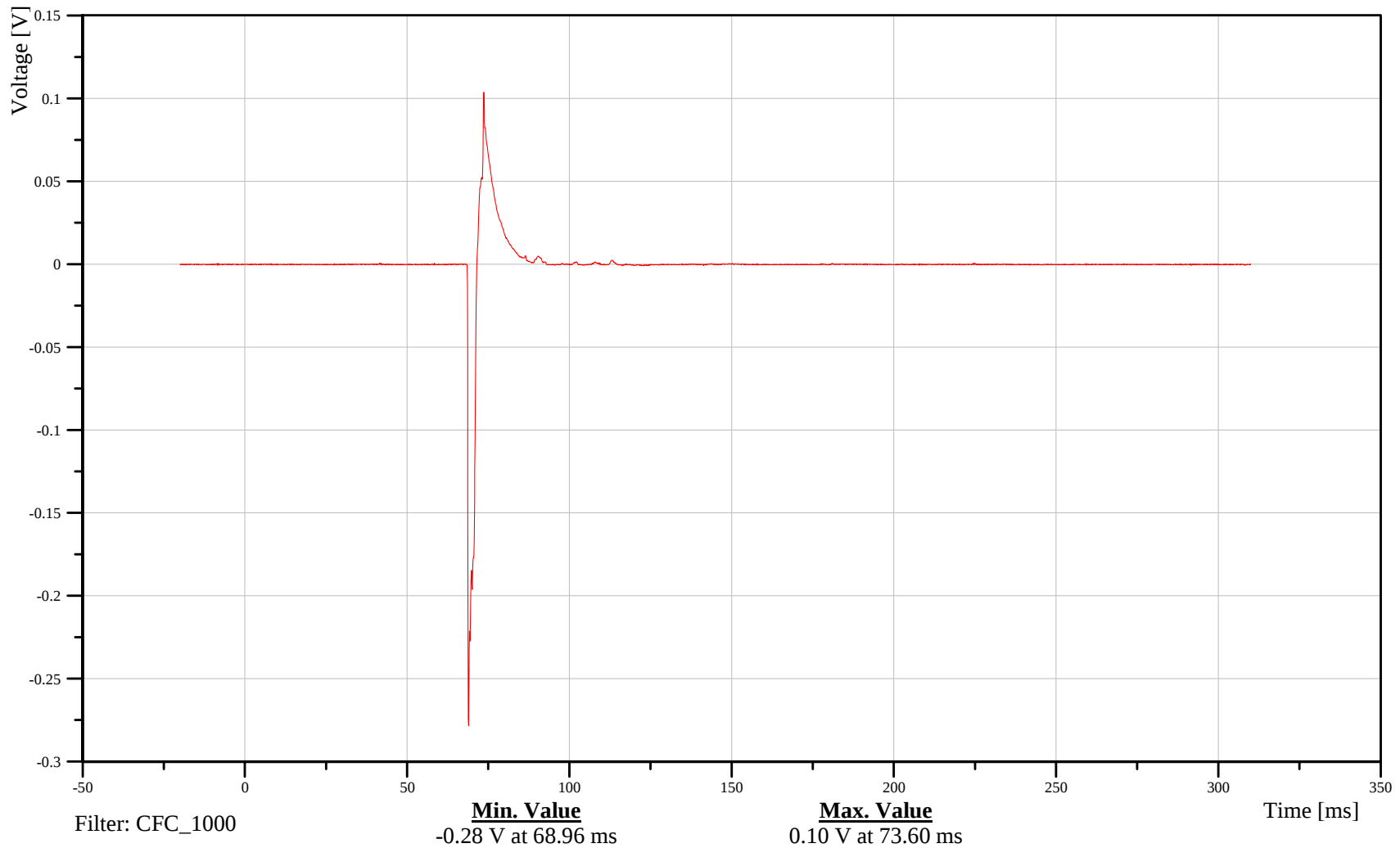
Date: 09/13/2006
Time: 14:23

Customer: VRTC

13AIRBFR0100EV0A

TRC Inc. Test Lab: CTF

Test Number: 060913



B-10

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A1

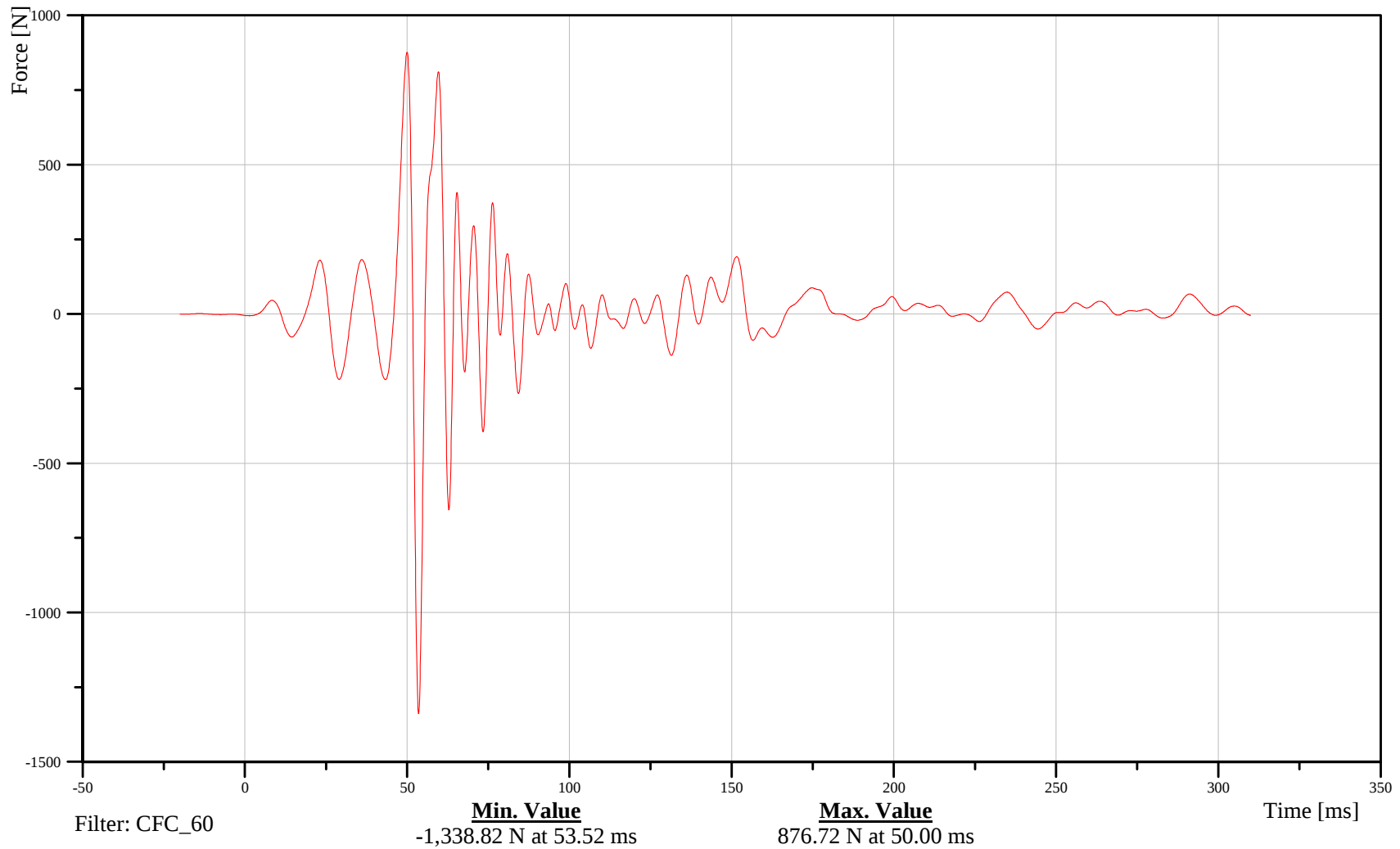
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR010000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-11

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A2

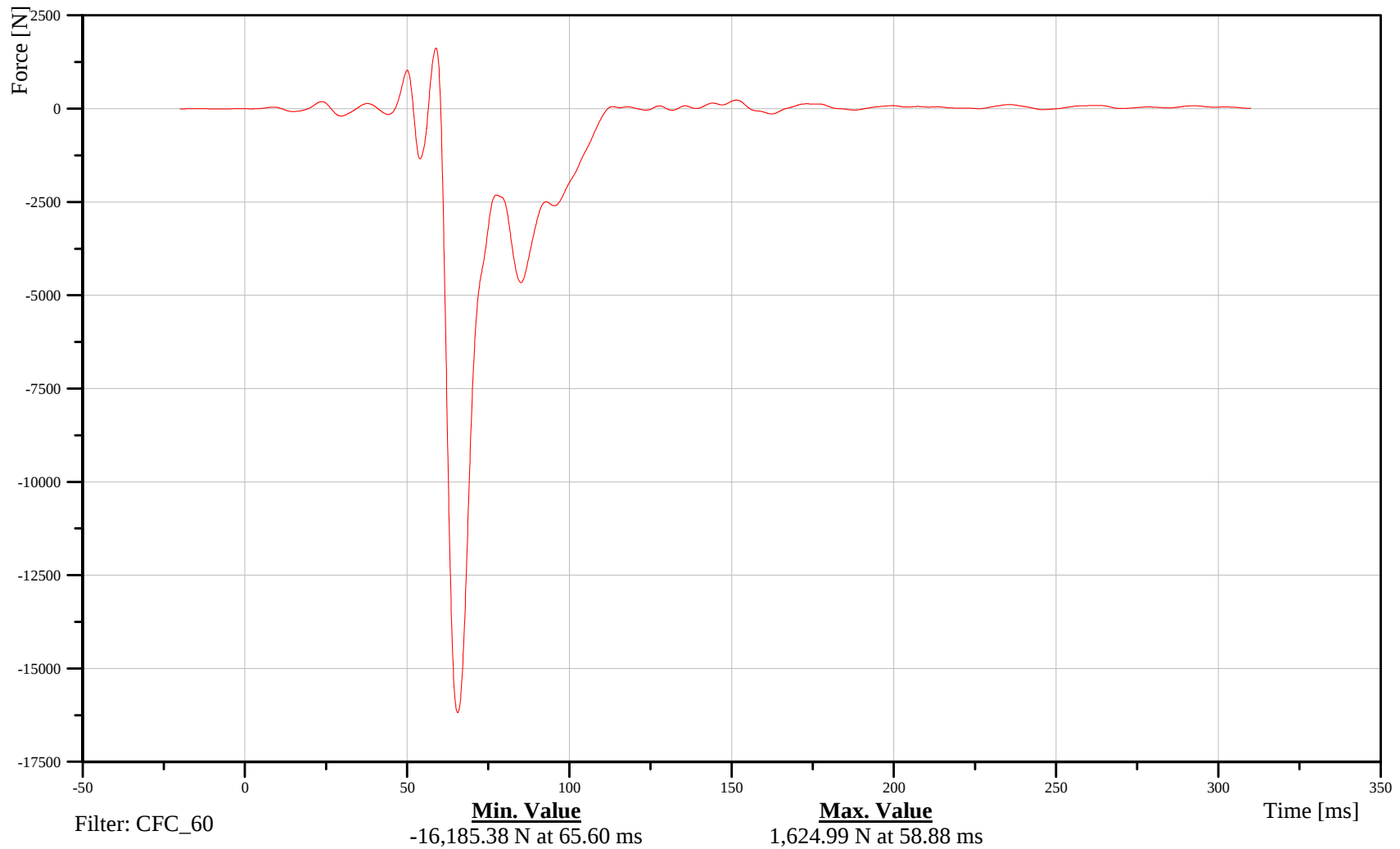
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR020000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-12

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A3

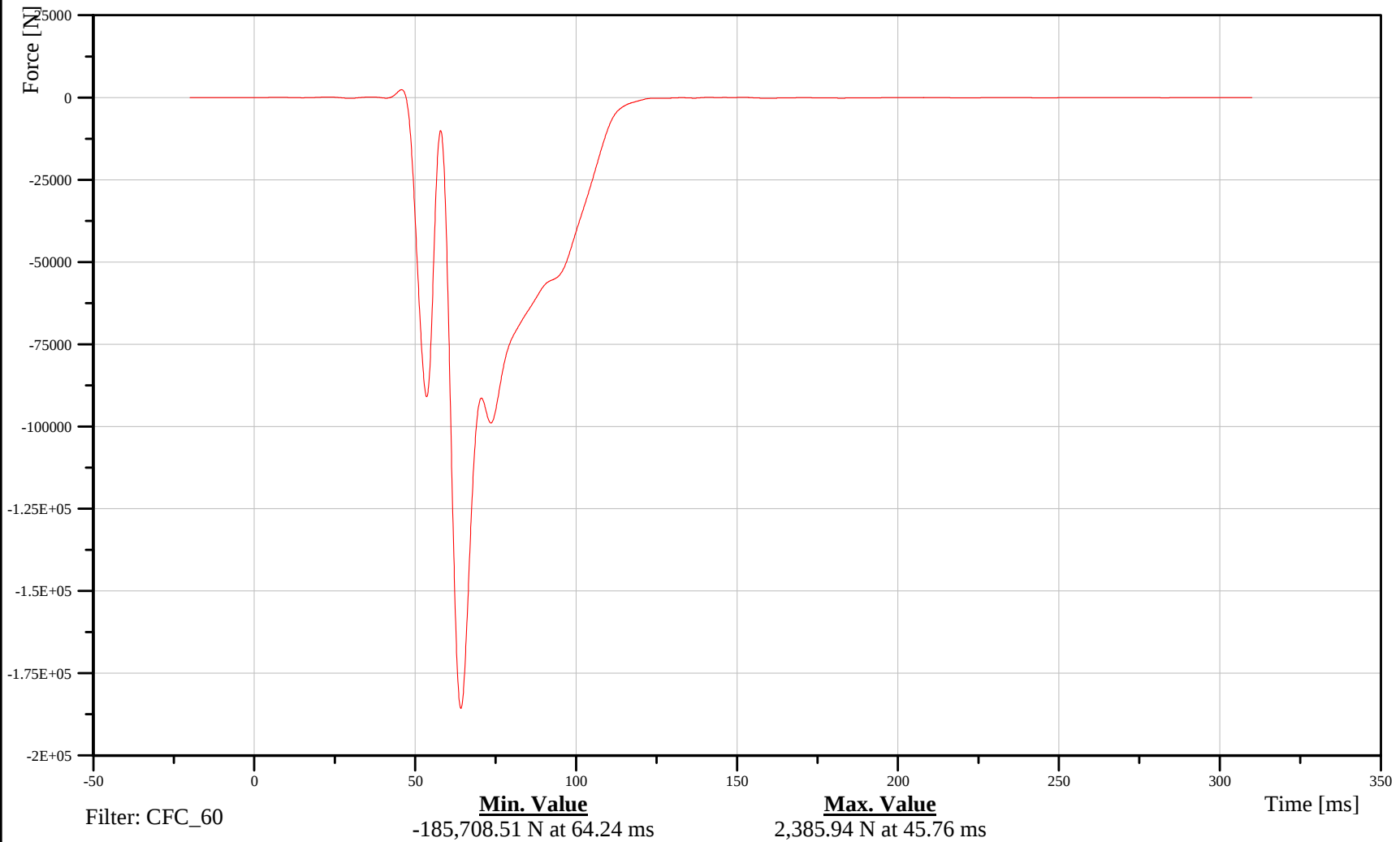
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR030000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-13

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A4

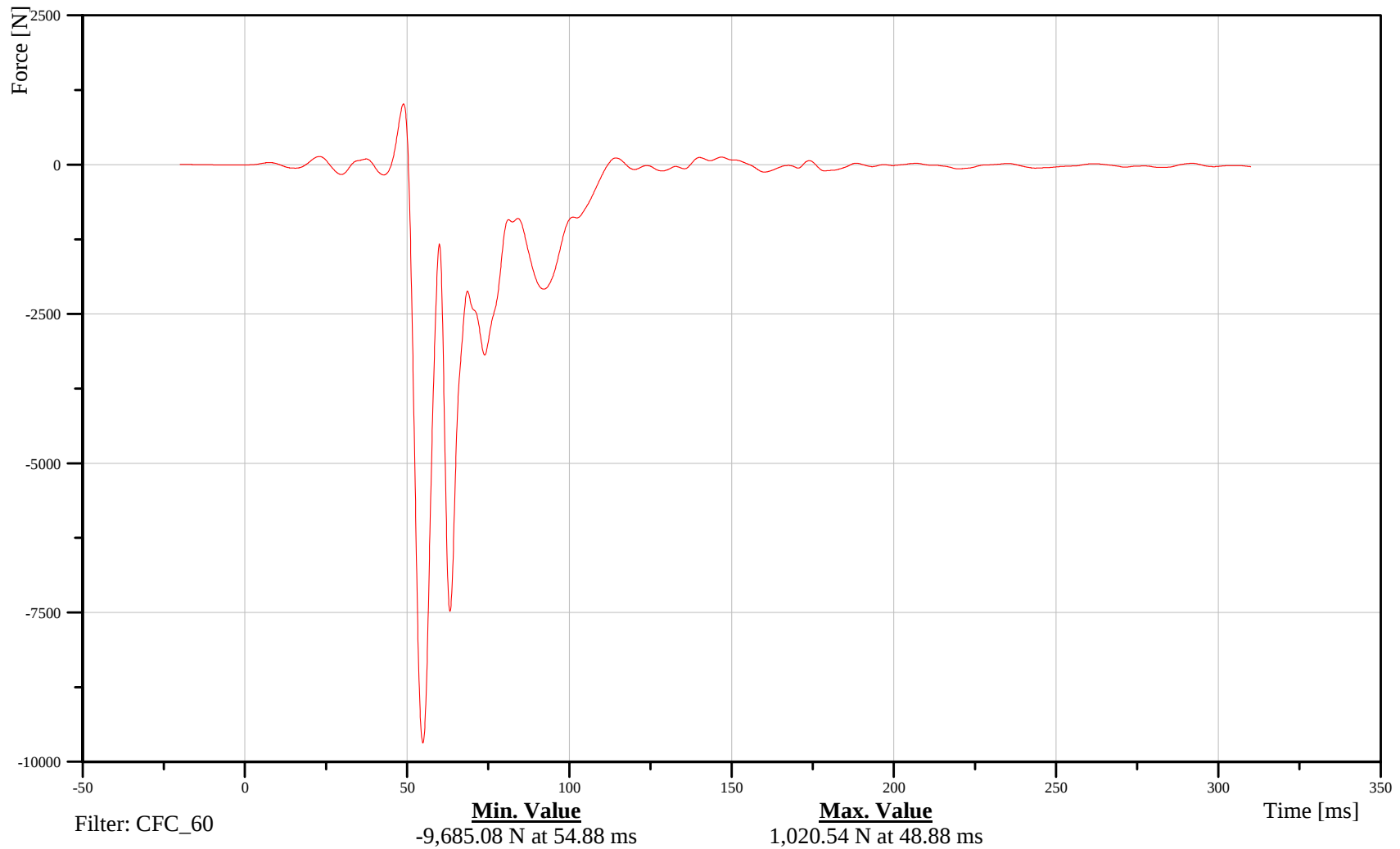
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR040000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-14

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A5

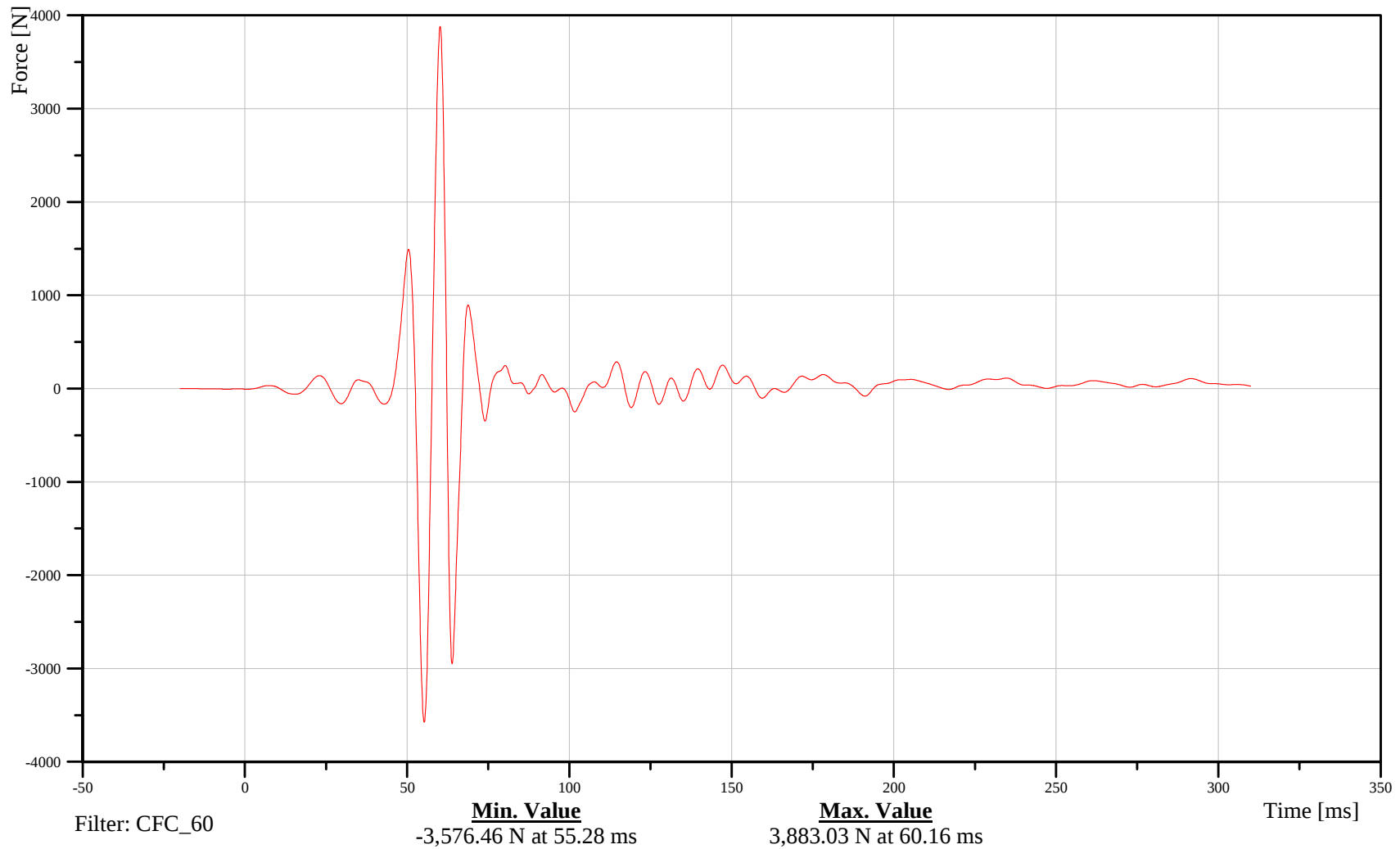
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR050000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-15

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A6

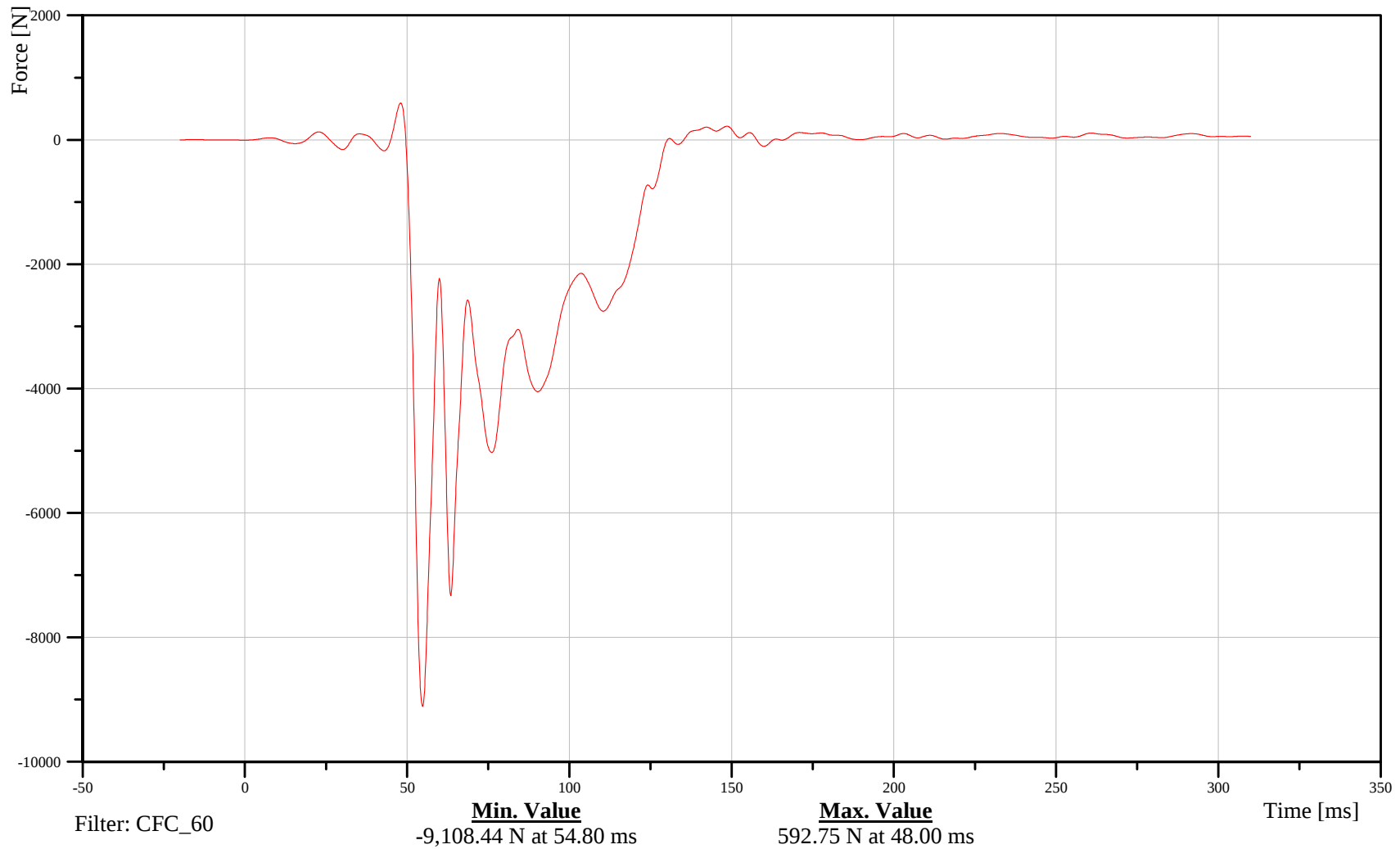
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR060000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-16

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A7

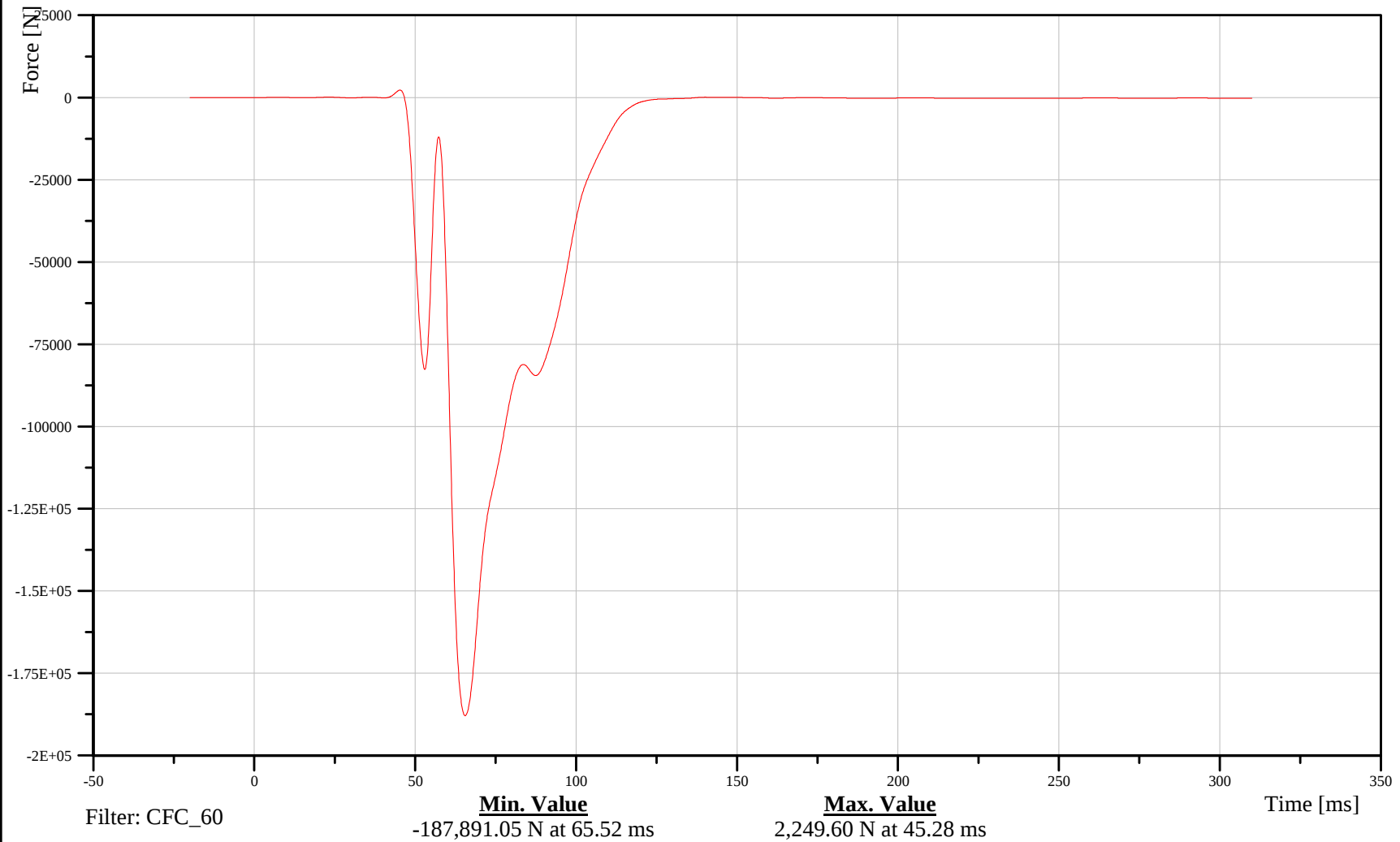
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR070000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-17

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A8

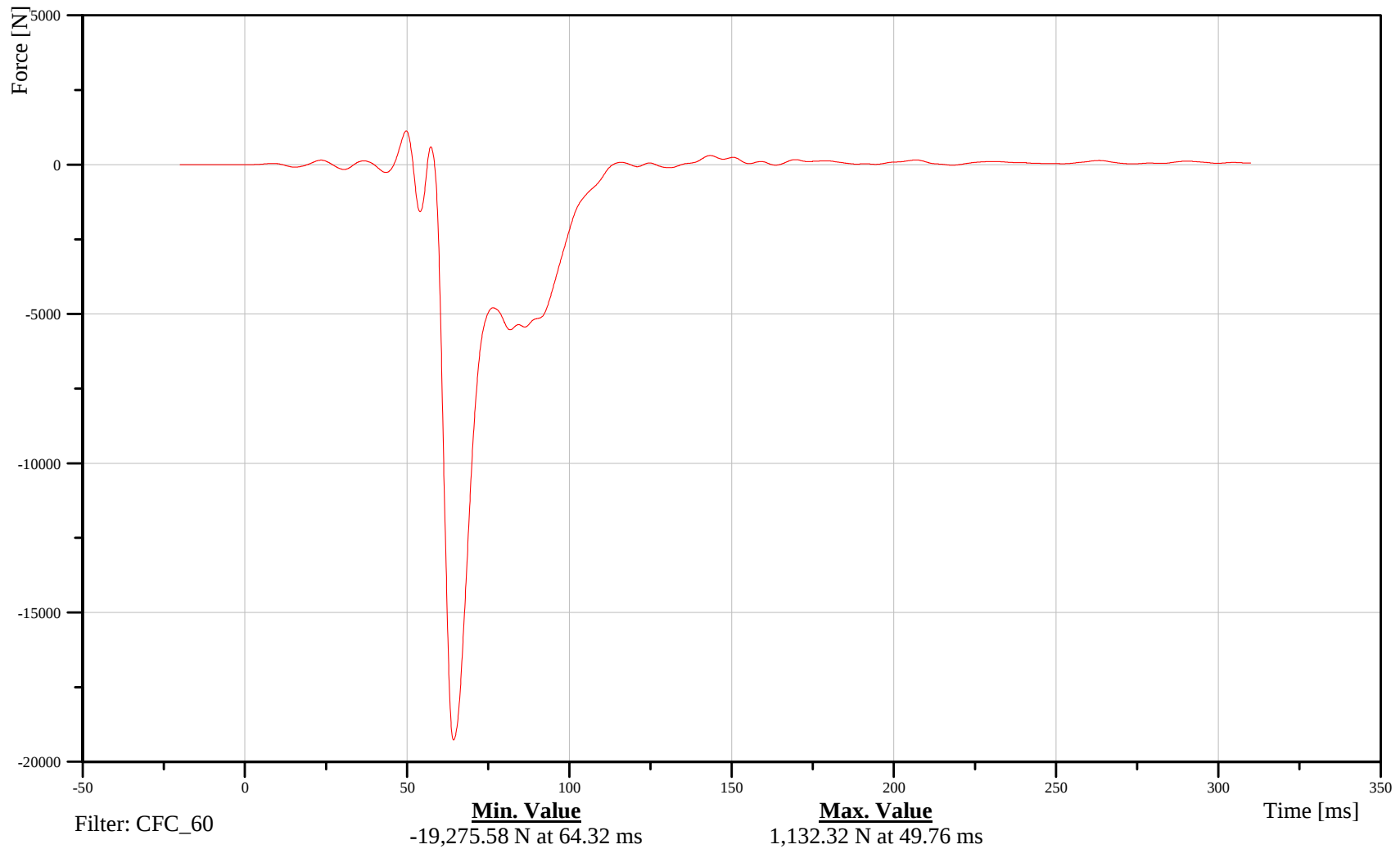
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR080000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-18

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD A9

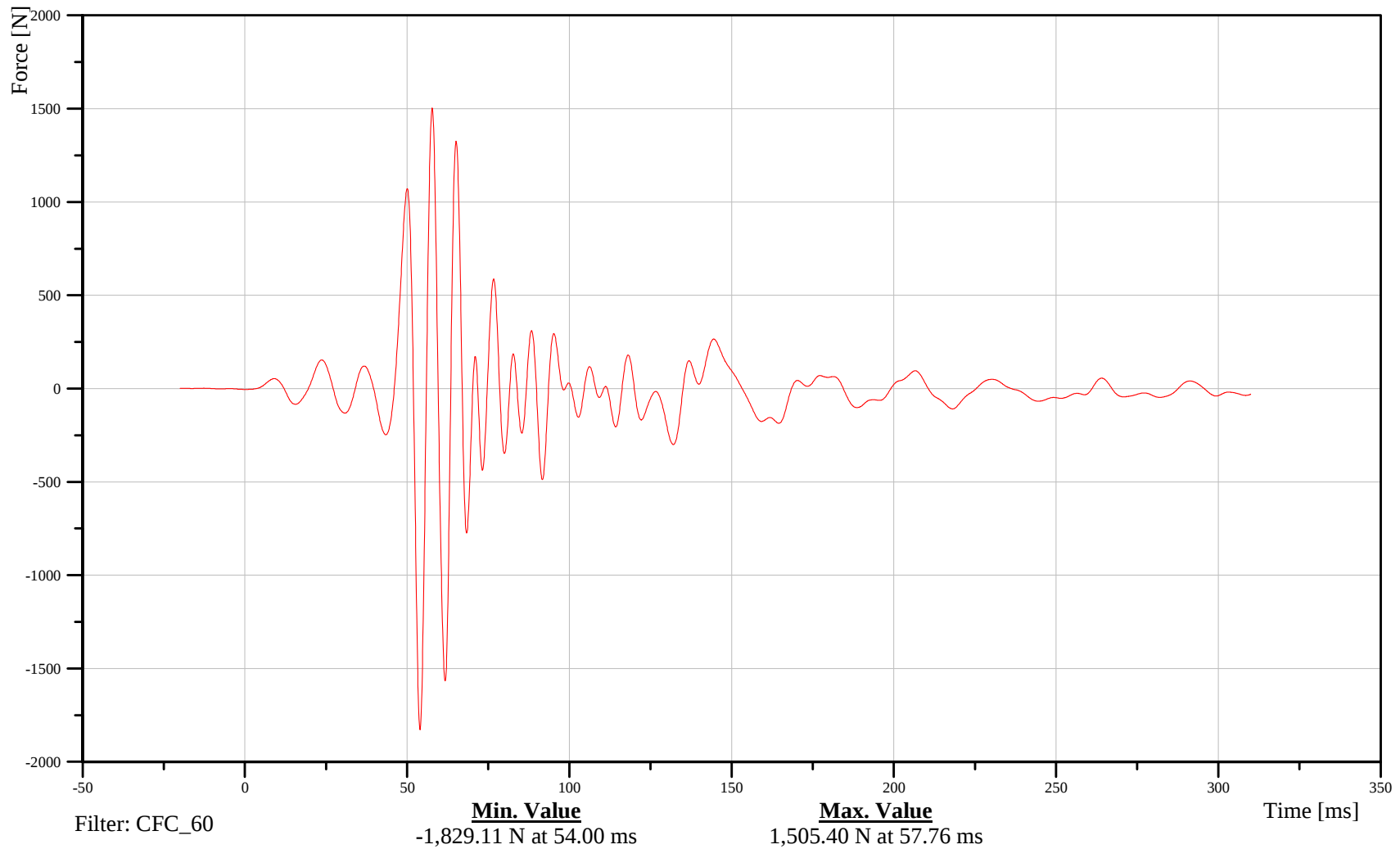
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR090000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-19

060913



2006 Ford F250 into Override Barrier at 25 mph

Date: 09/13/2006
Time: 14:23

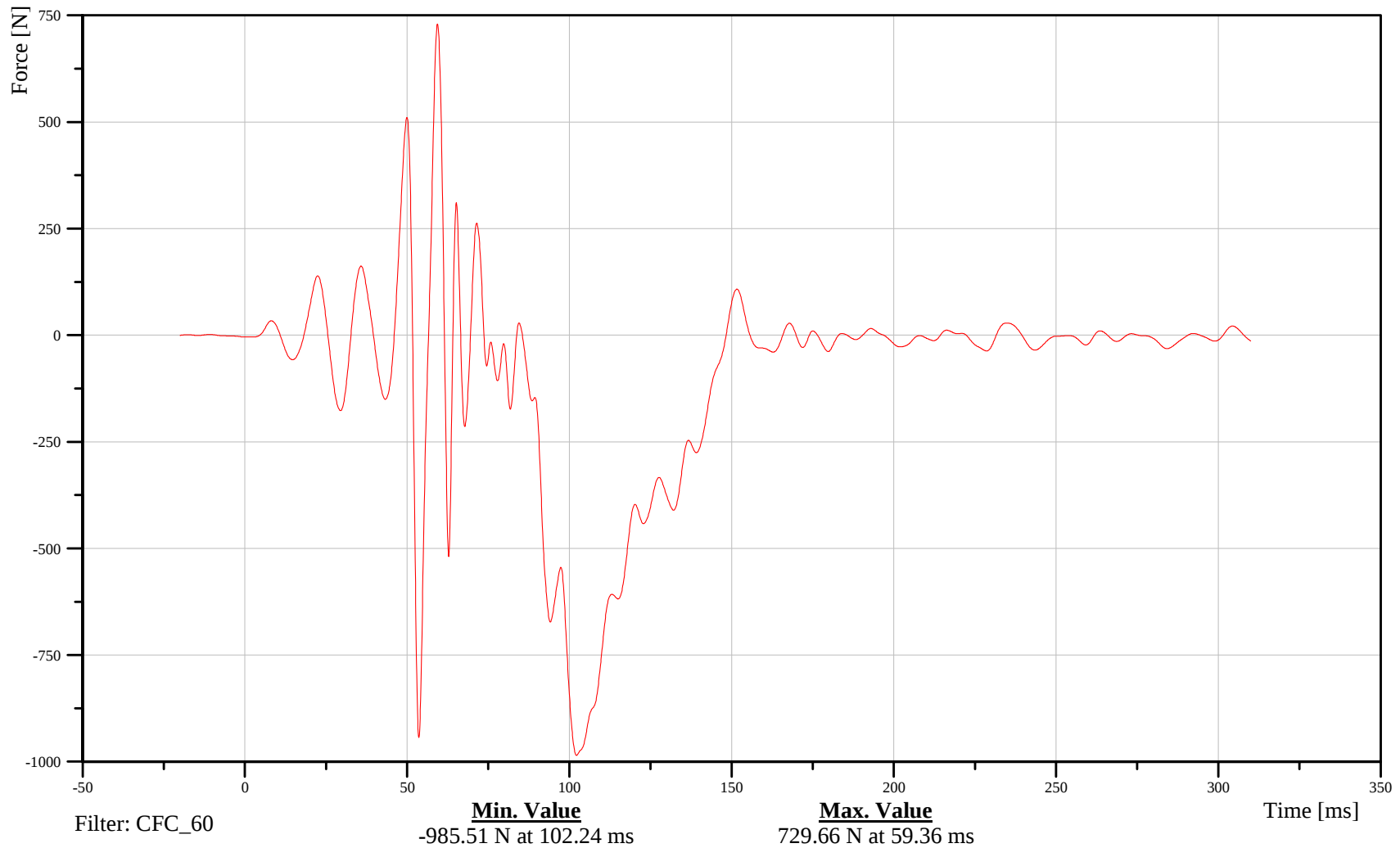
BARRIER LOAD B1

Customer: VRTC

L0FBAR100000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-20

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD B2

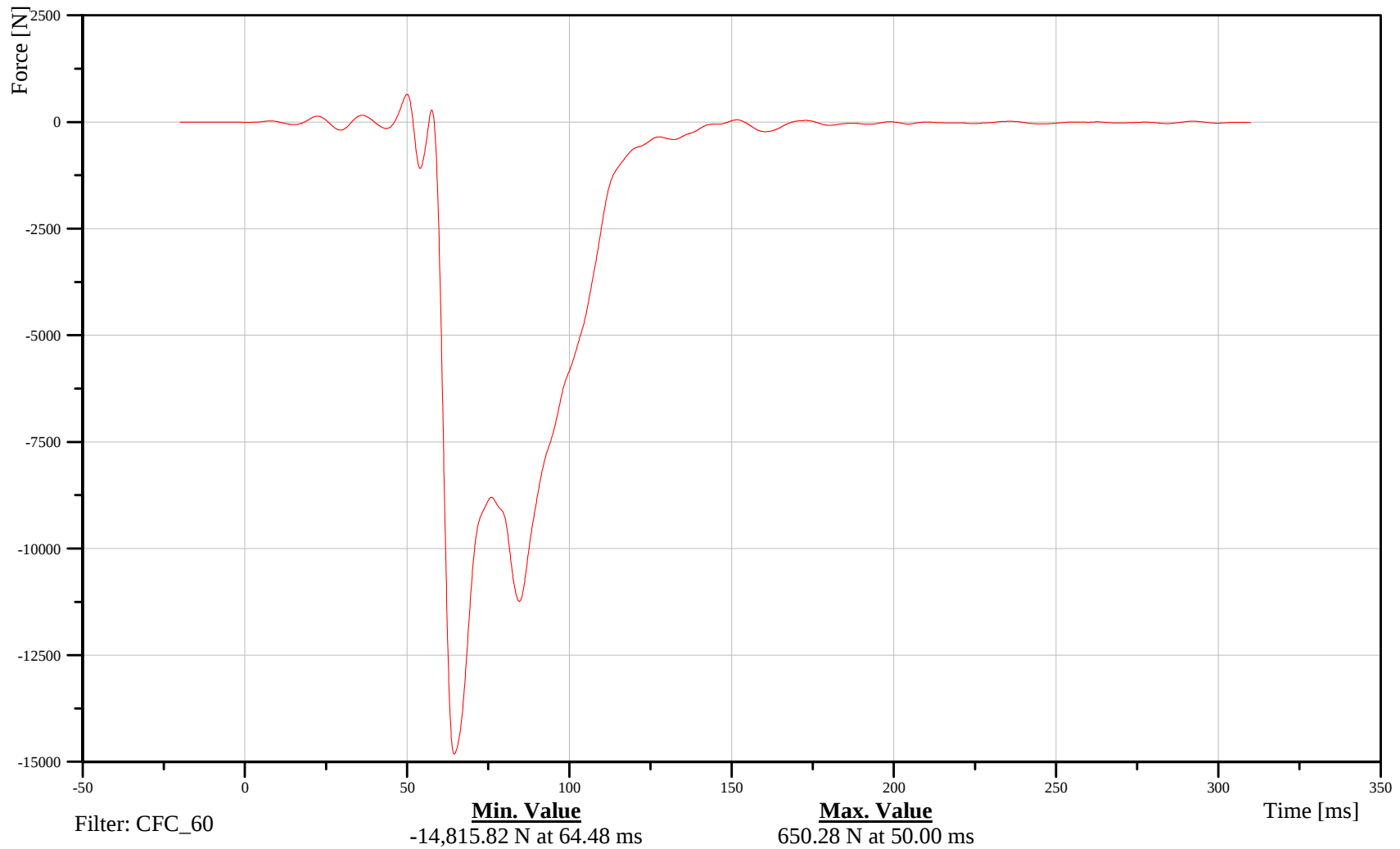
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR110000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-21

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD B3

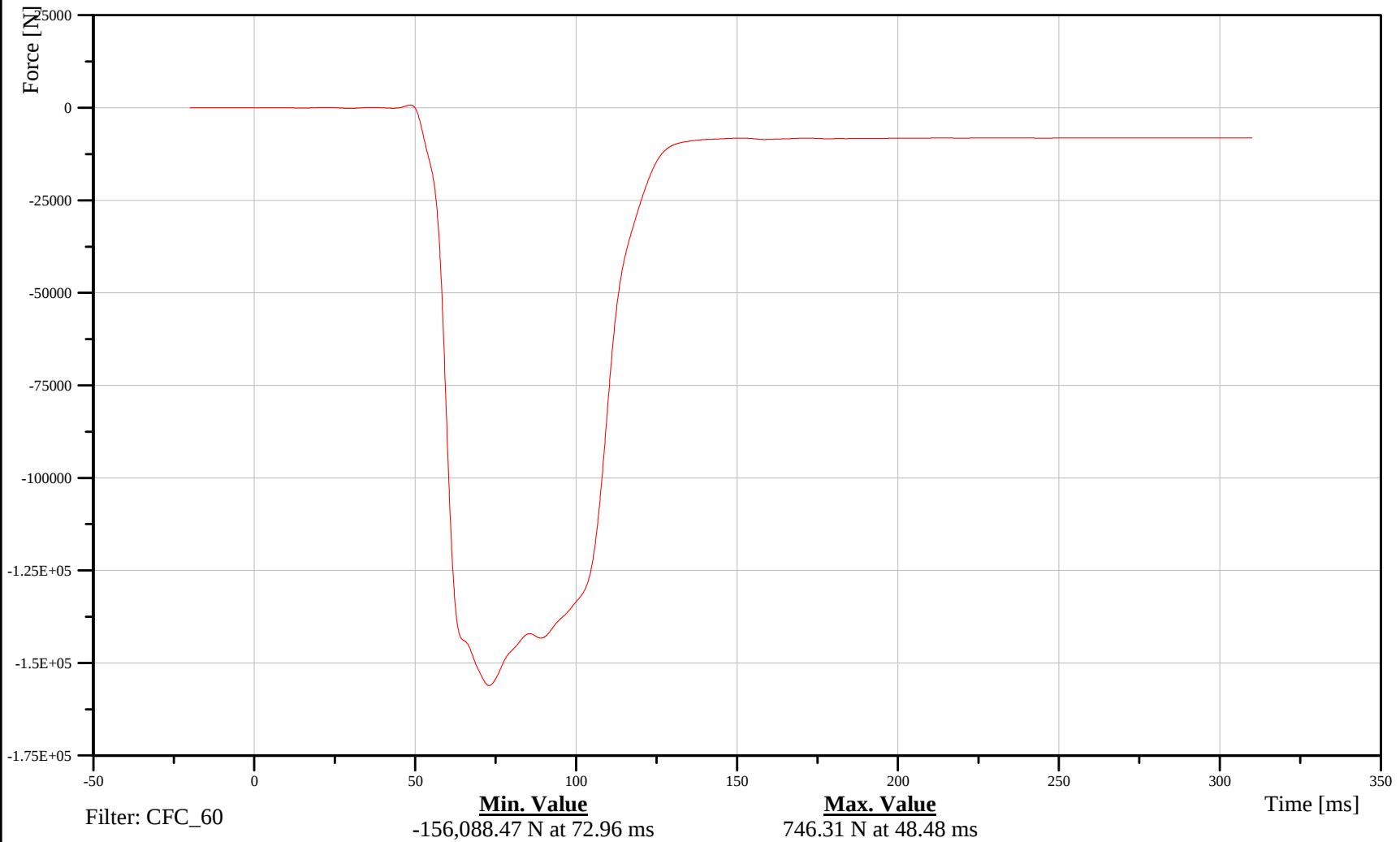
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR120000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-22

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD B4

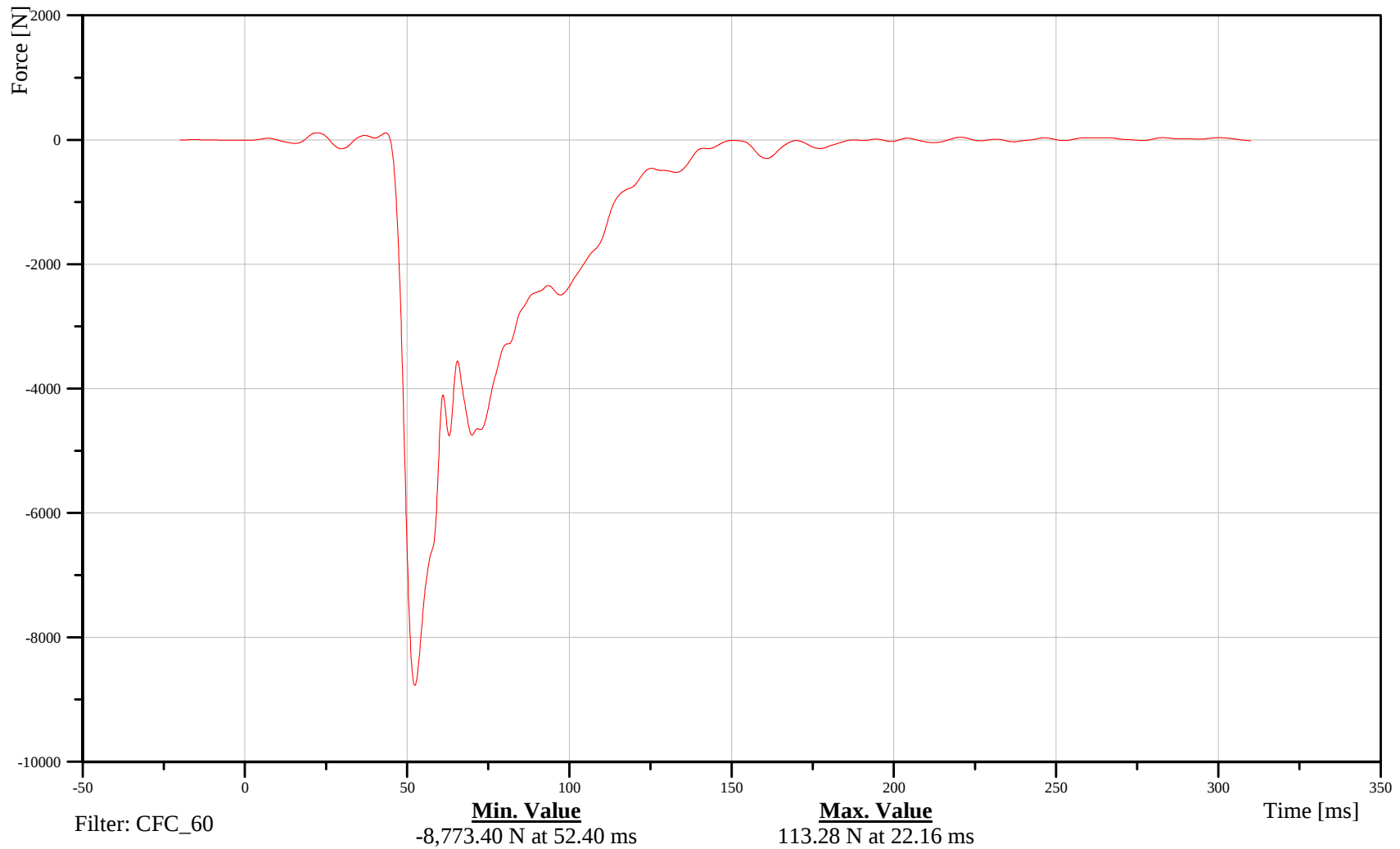
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR130000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-23

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD B5

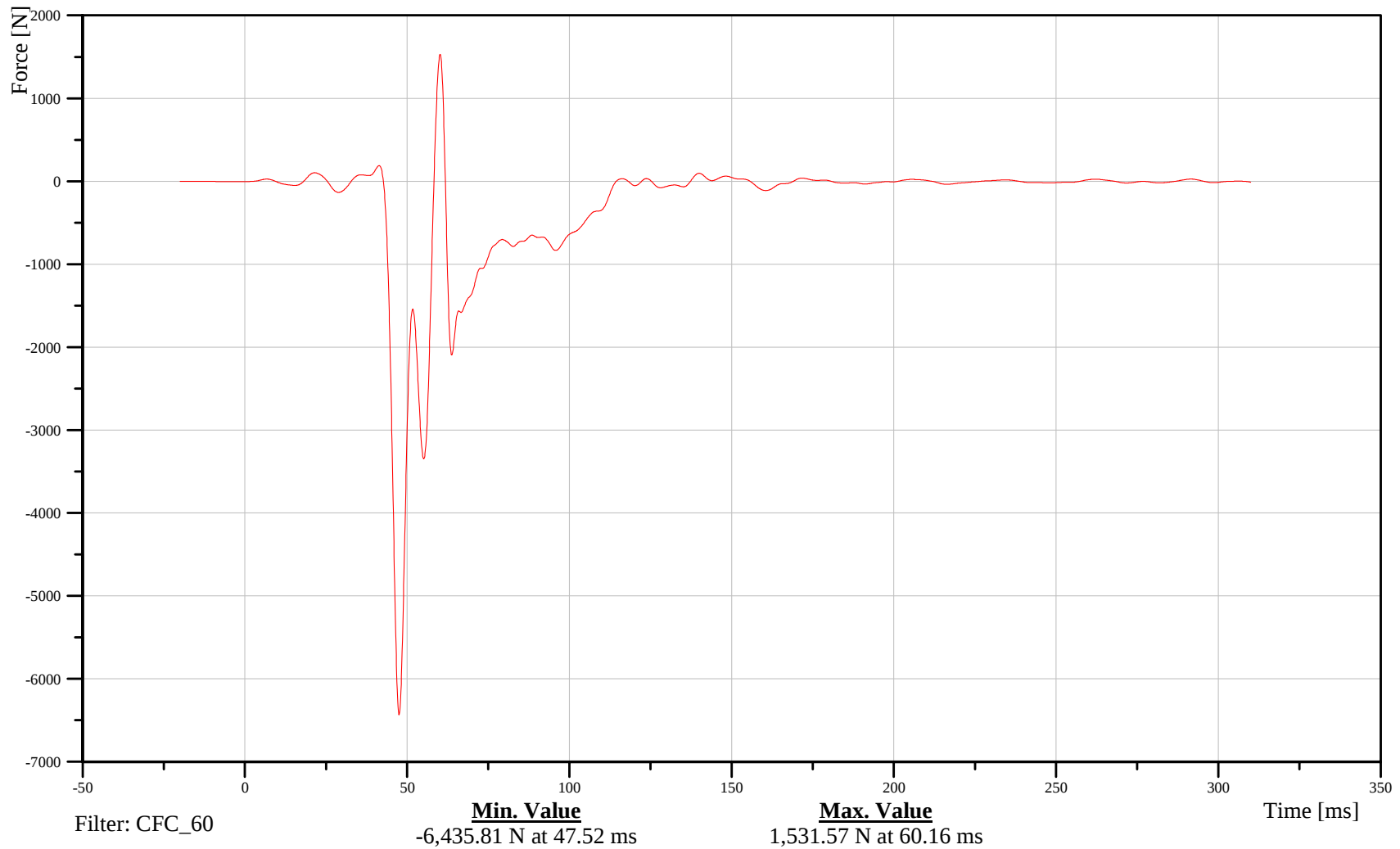
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Time: 14:23

Customer: VRTC

L0FBAR140000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-24

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD B6

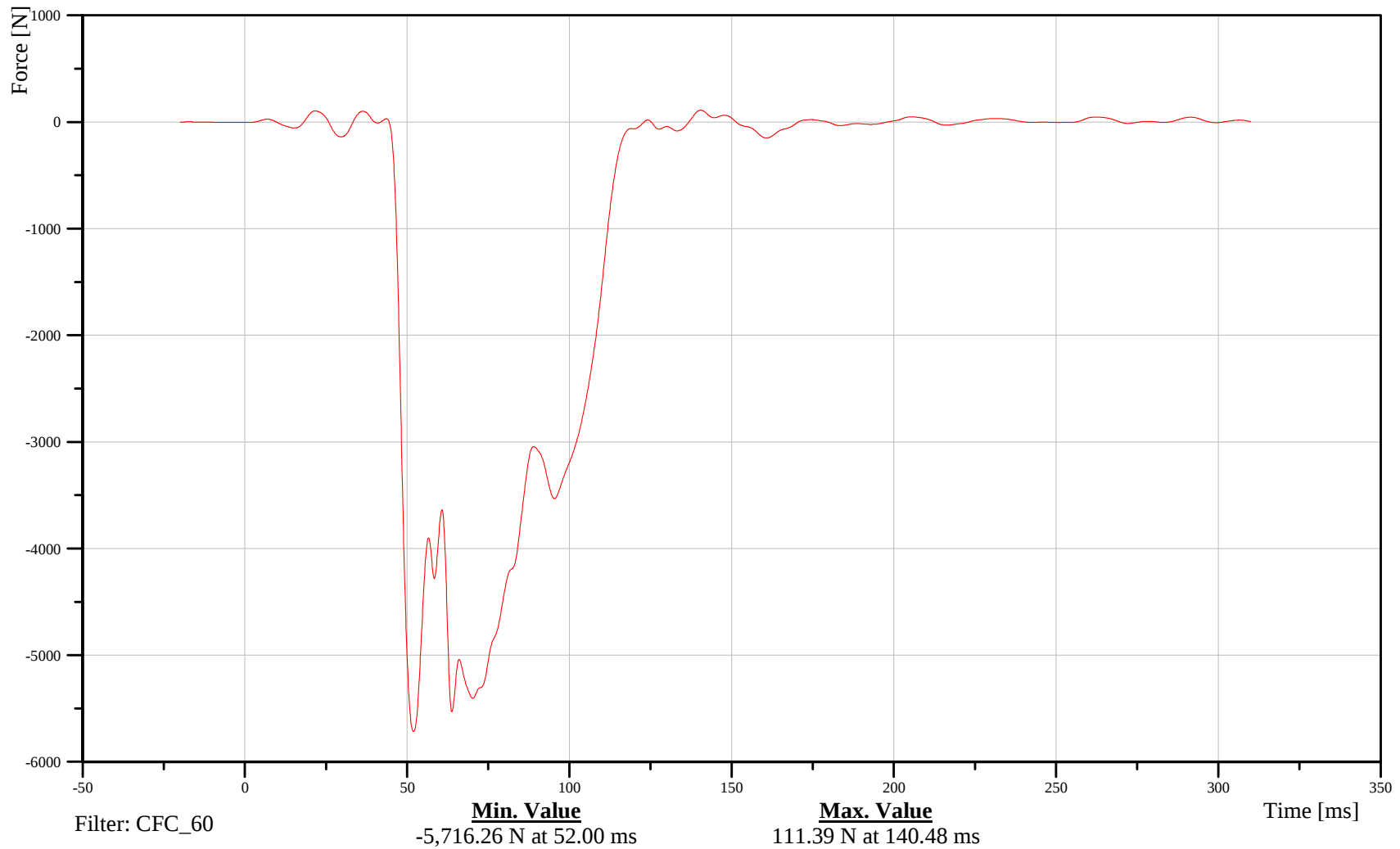
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR150000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-25

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD B7

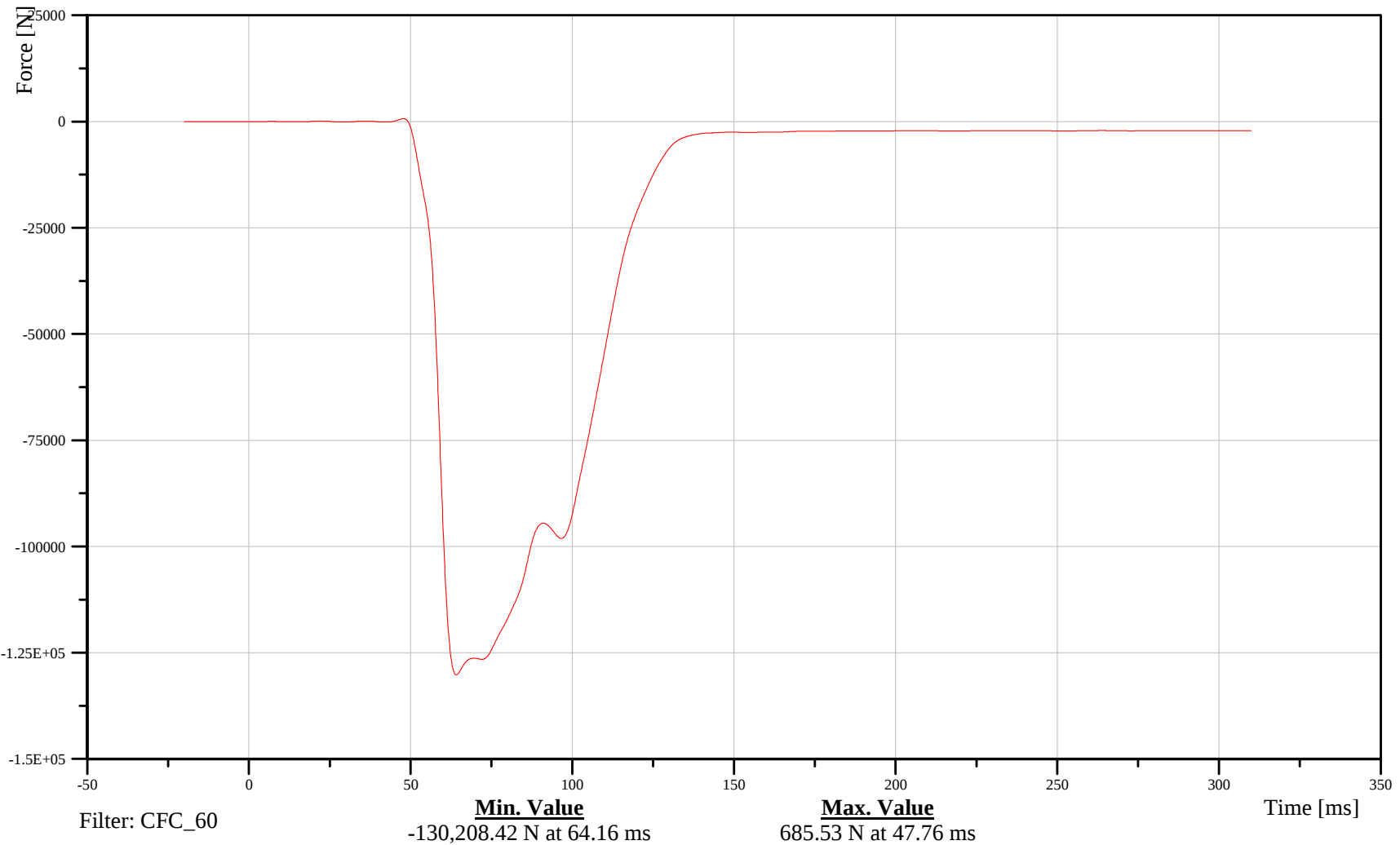
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR160000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-26

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD B8

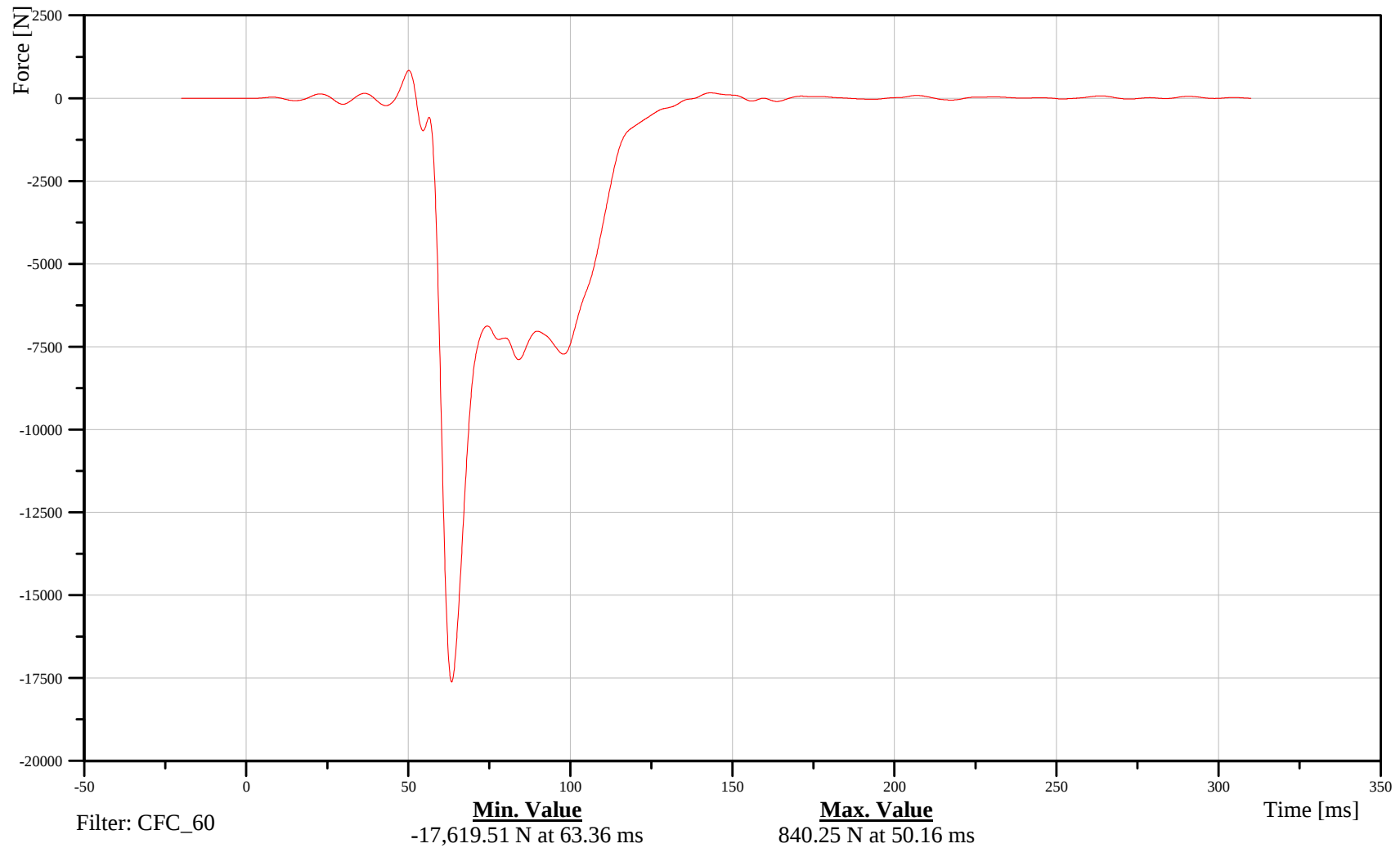
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR170000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-27

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD B9

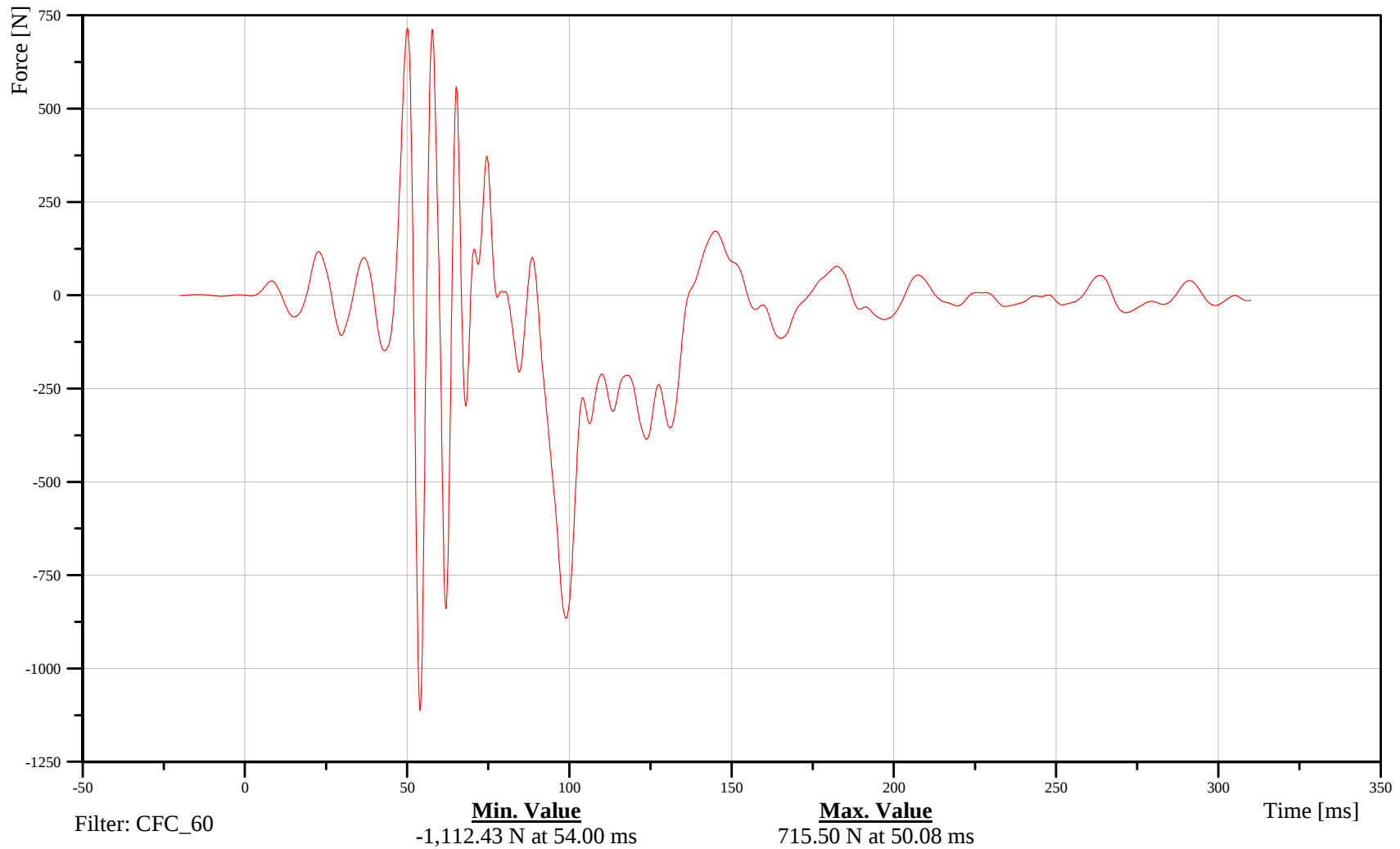
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR180000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-28

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C1

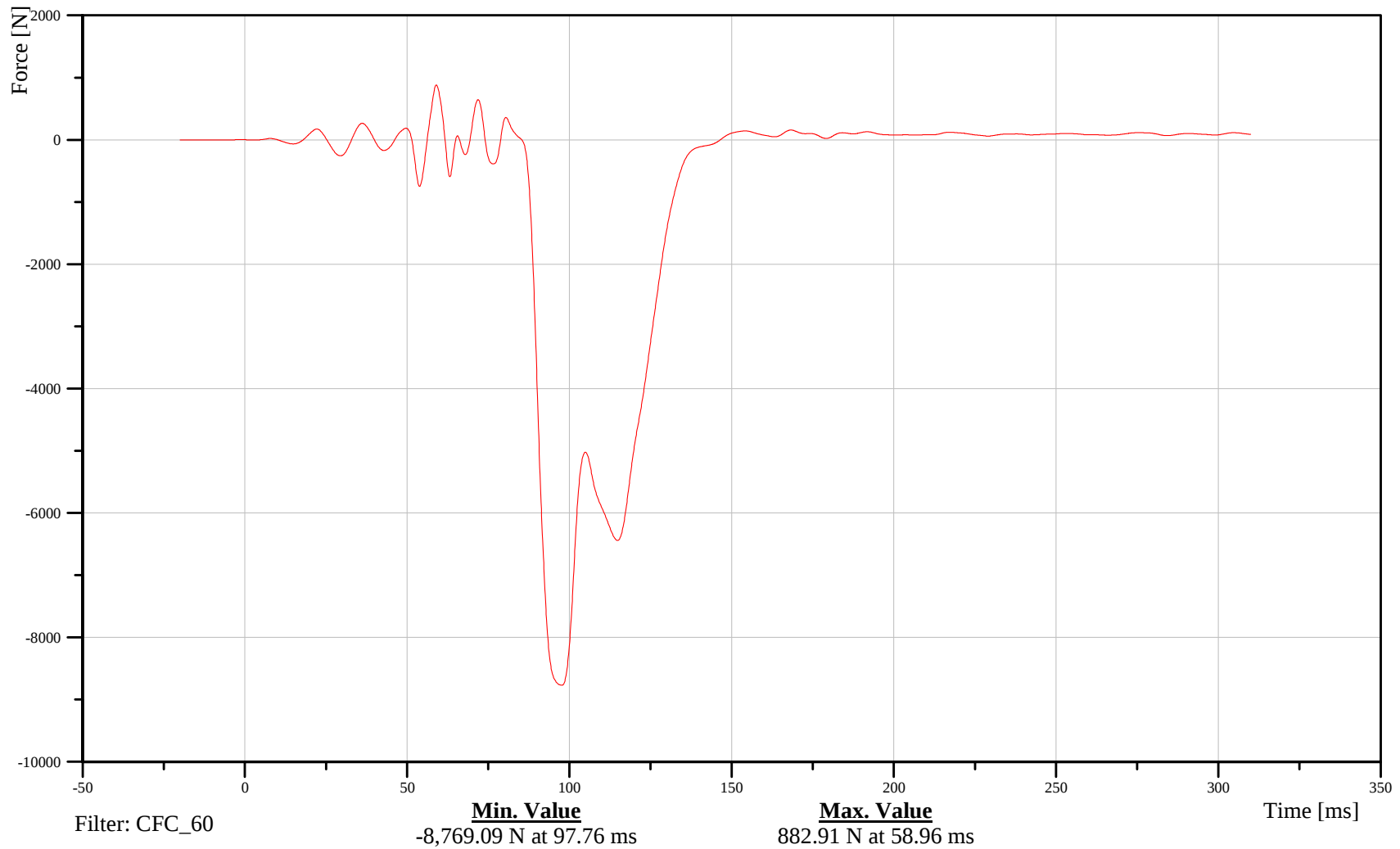
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR190000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-29

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C2

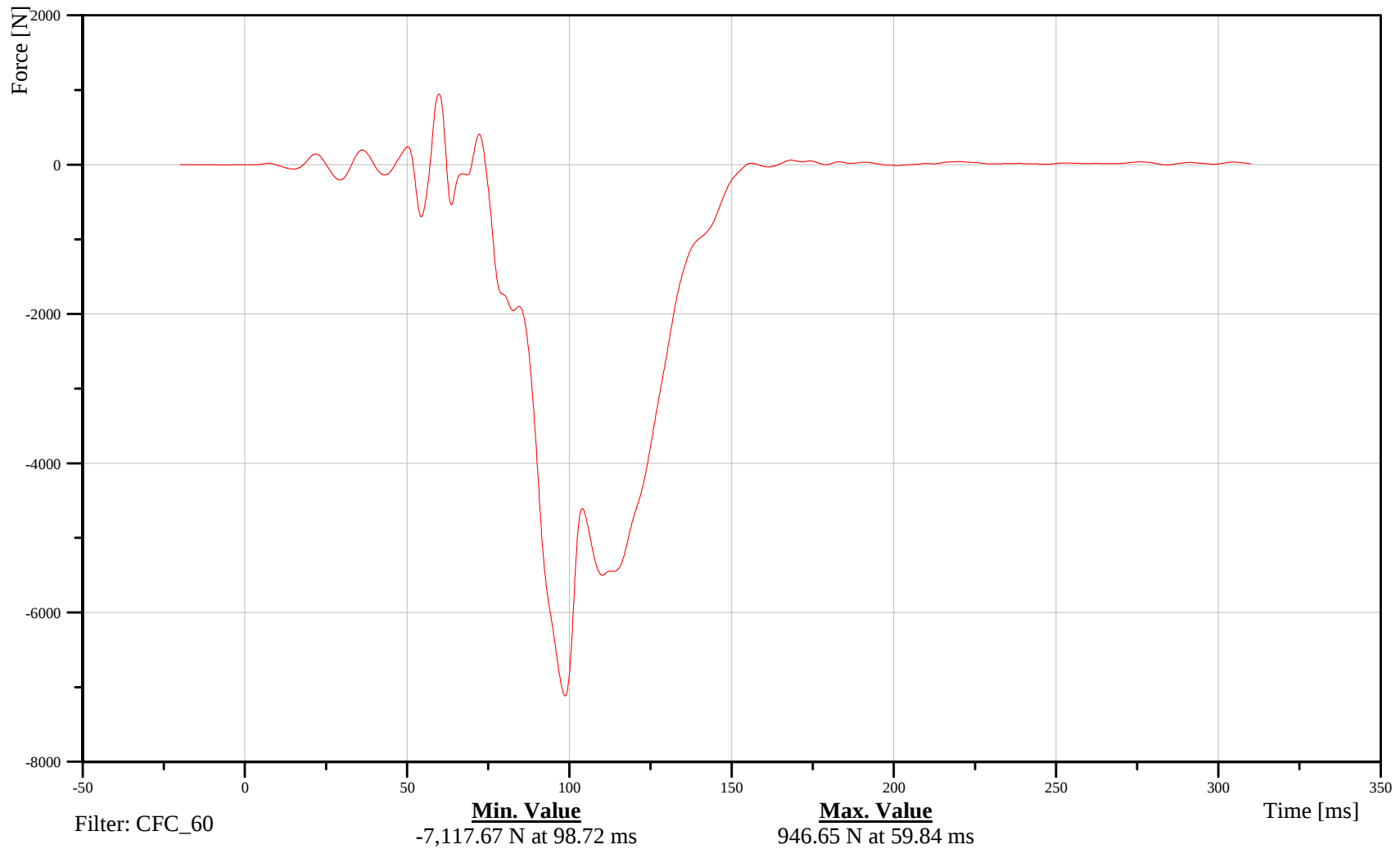
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR200000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-30

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C3

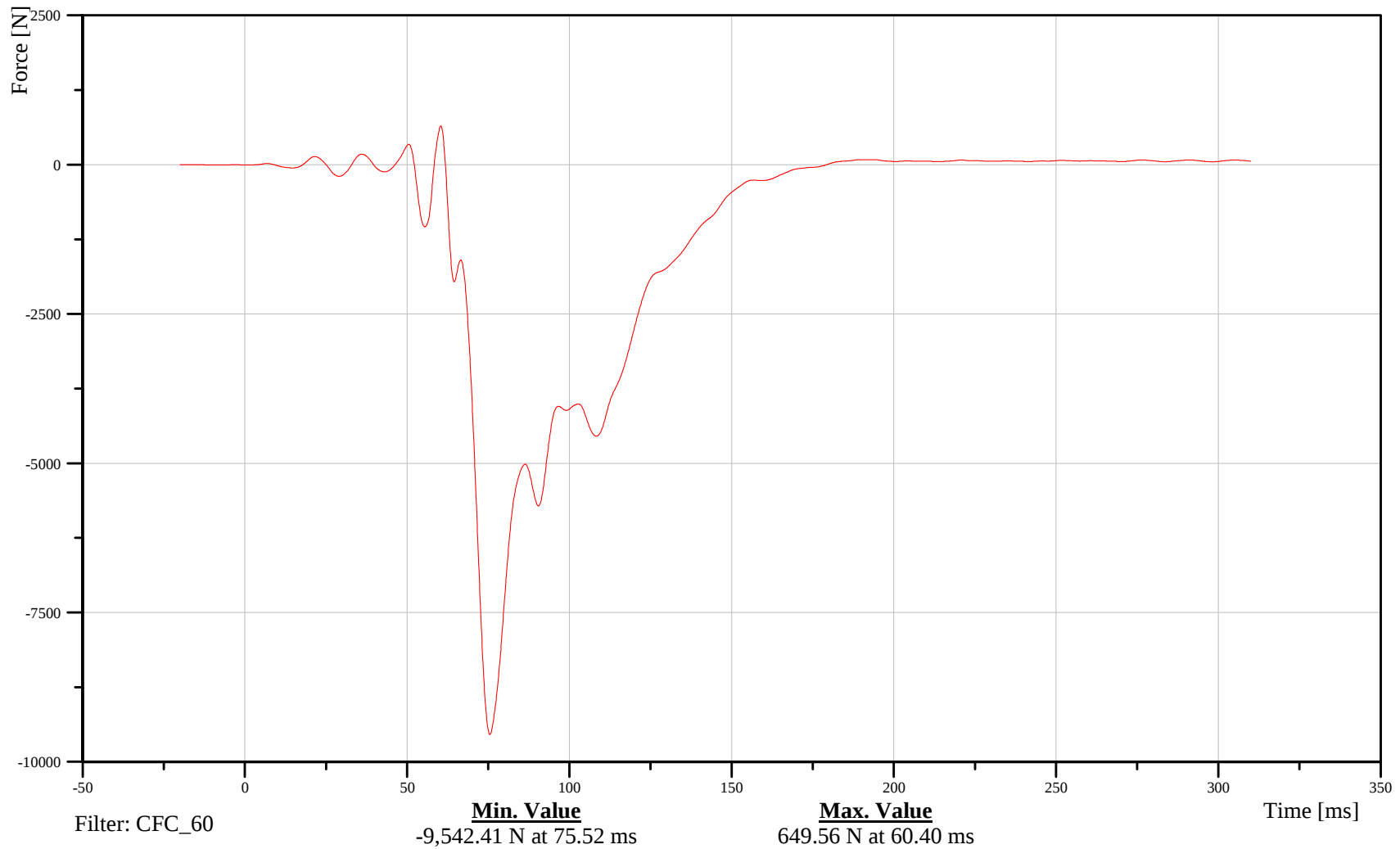
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR210000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-31

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C4

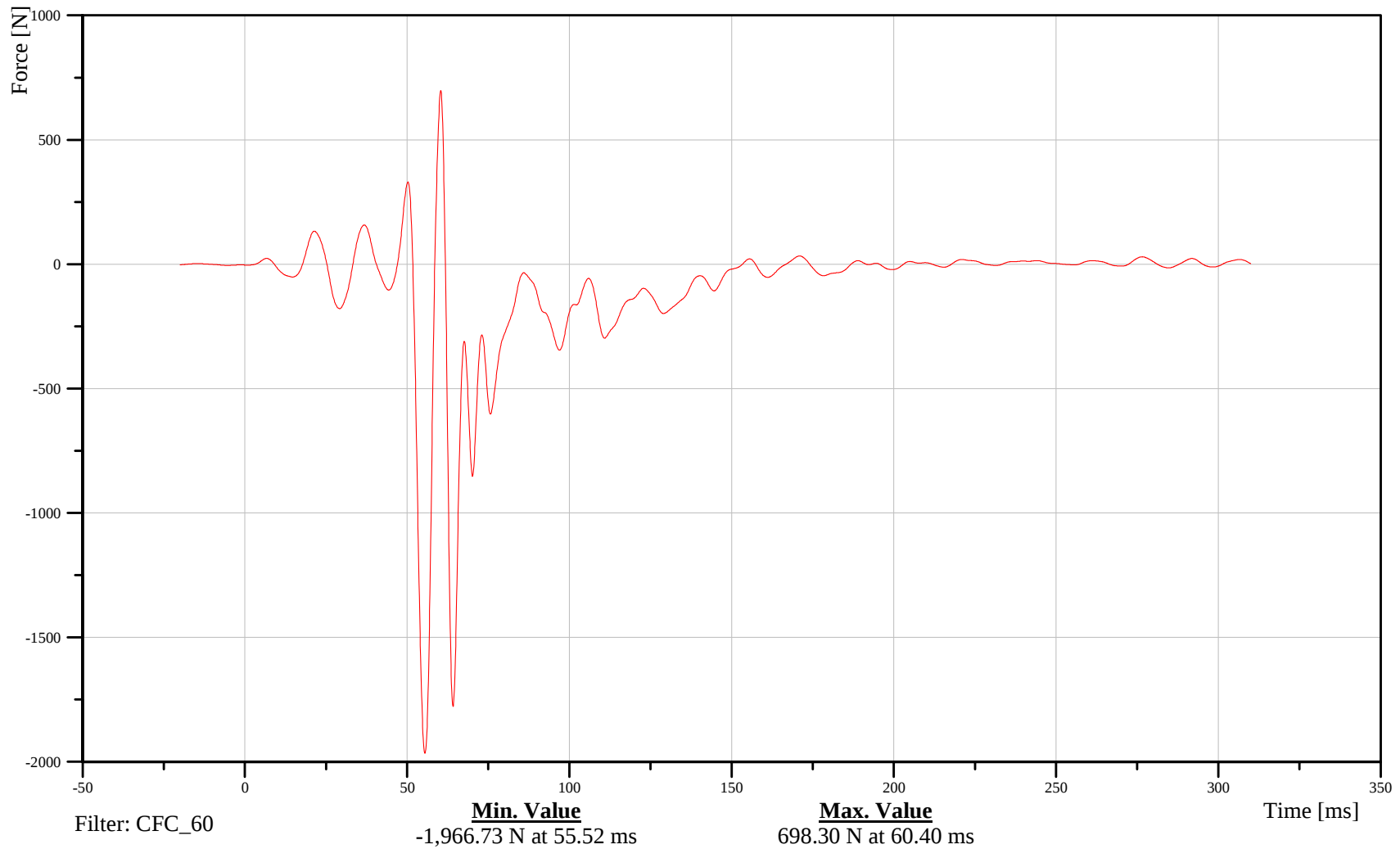
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR220000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-32

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C5

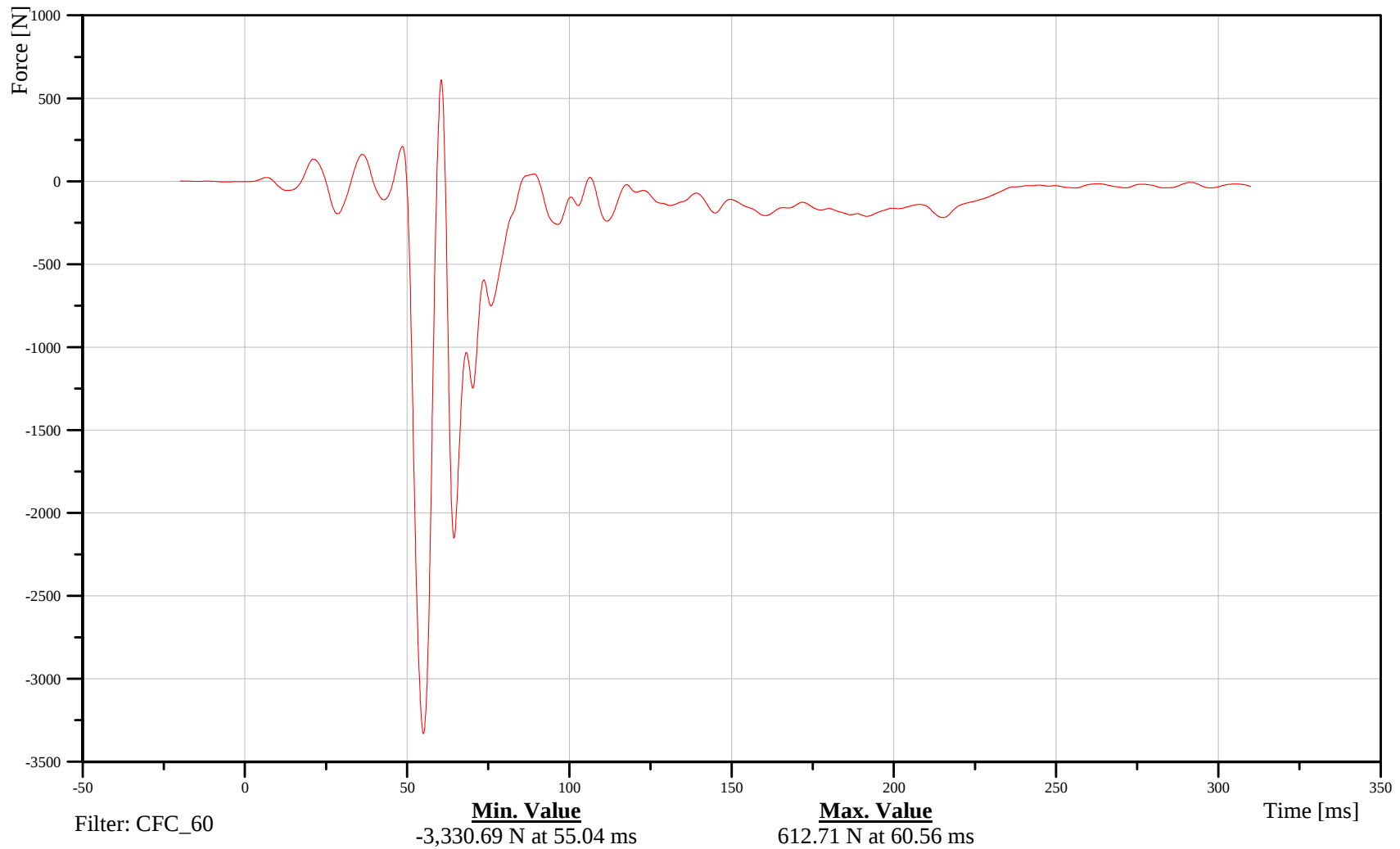
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR230000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-33

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C6

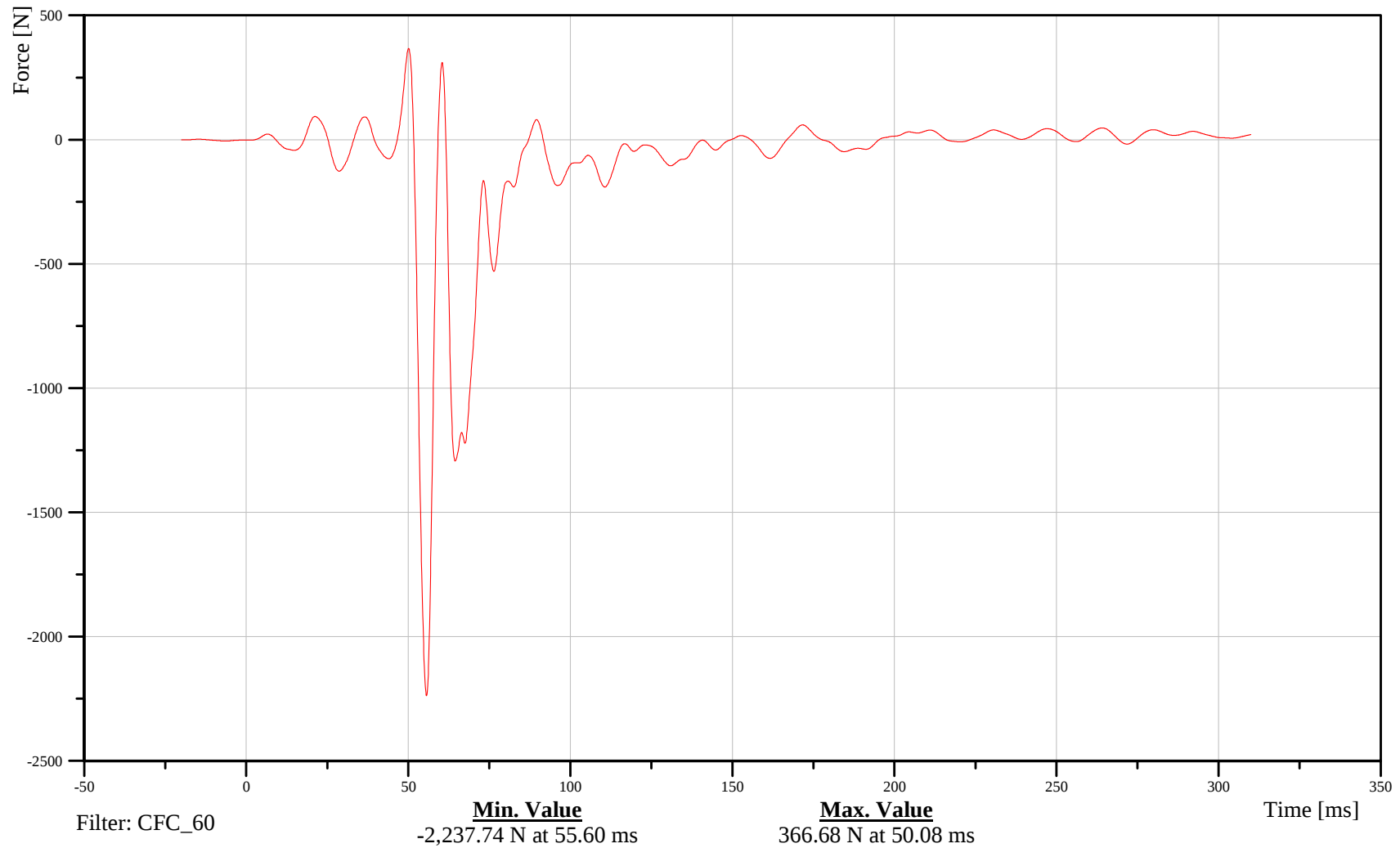
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR240000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C7

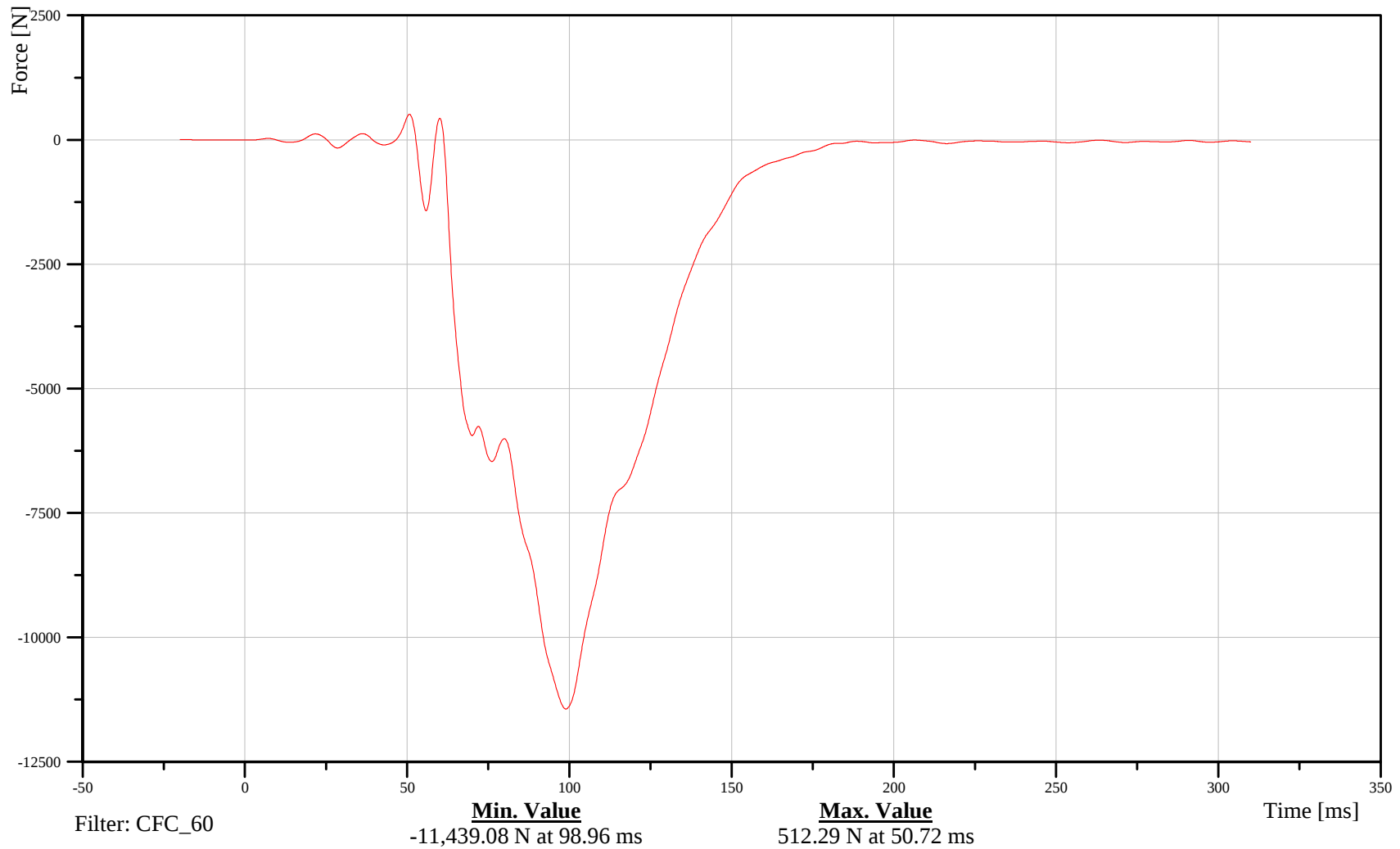
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR250000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-35

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C8

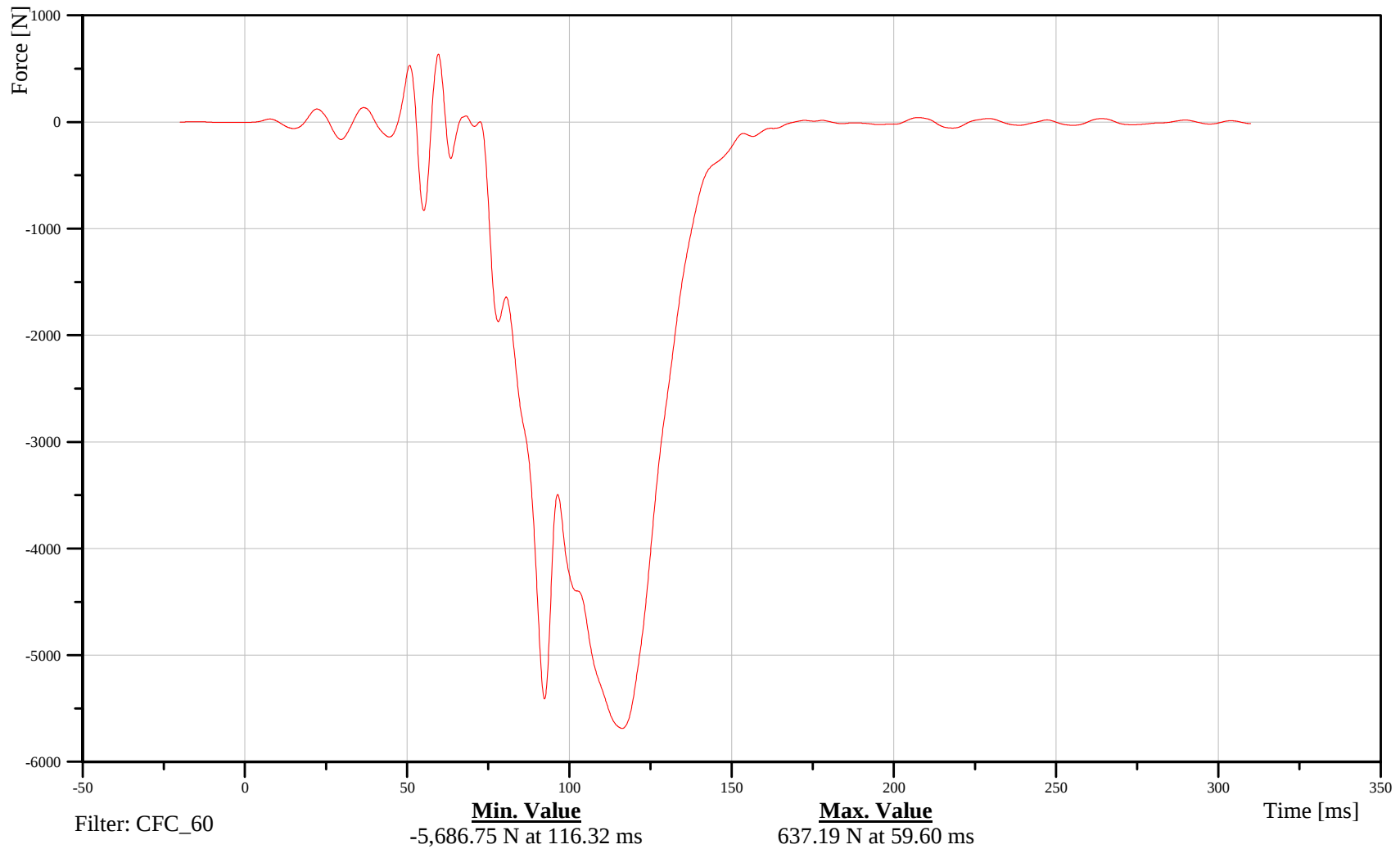
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR260000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-36

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD C9

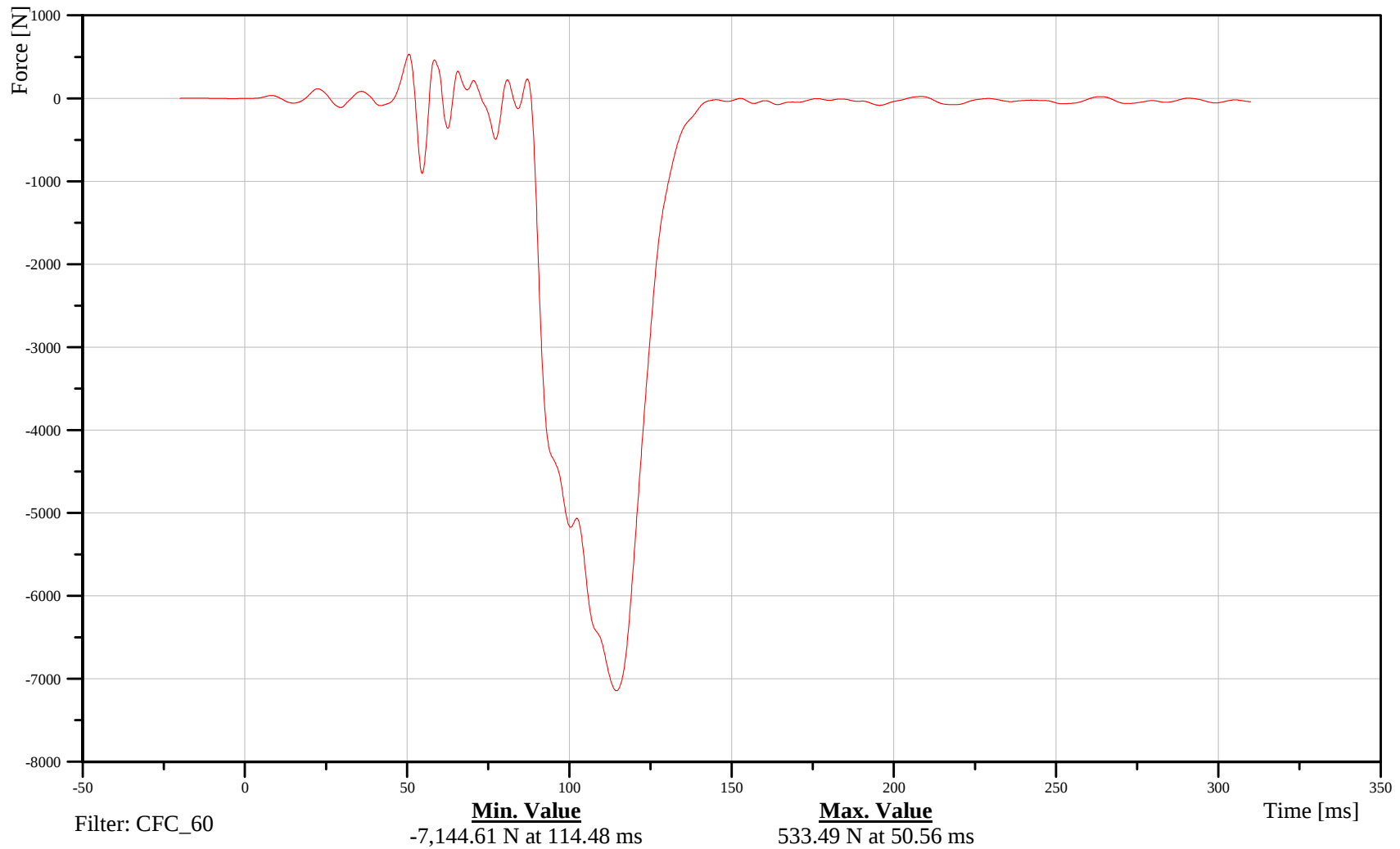
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR270000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-37

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D1

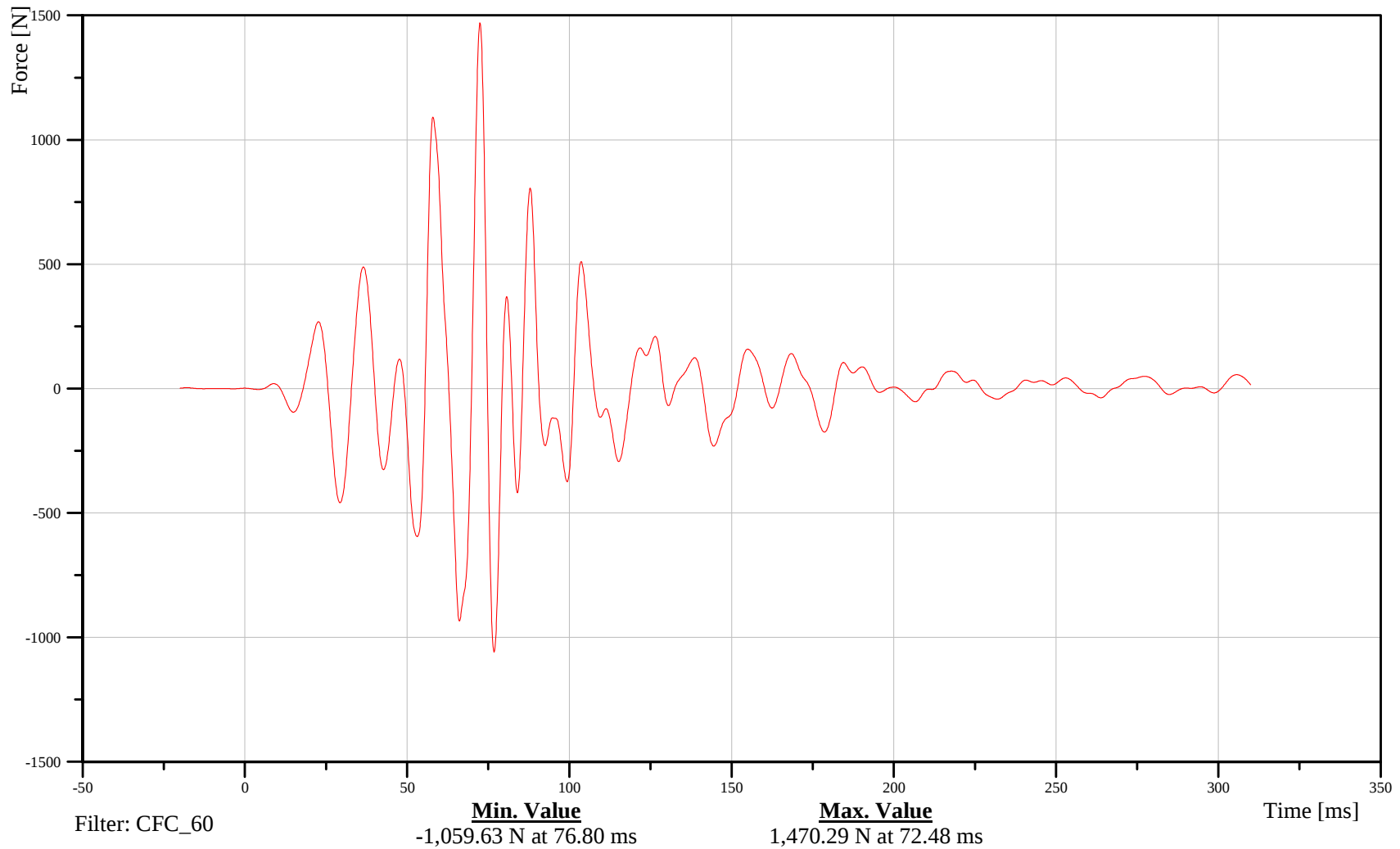
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR280000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-38

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D2

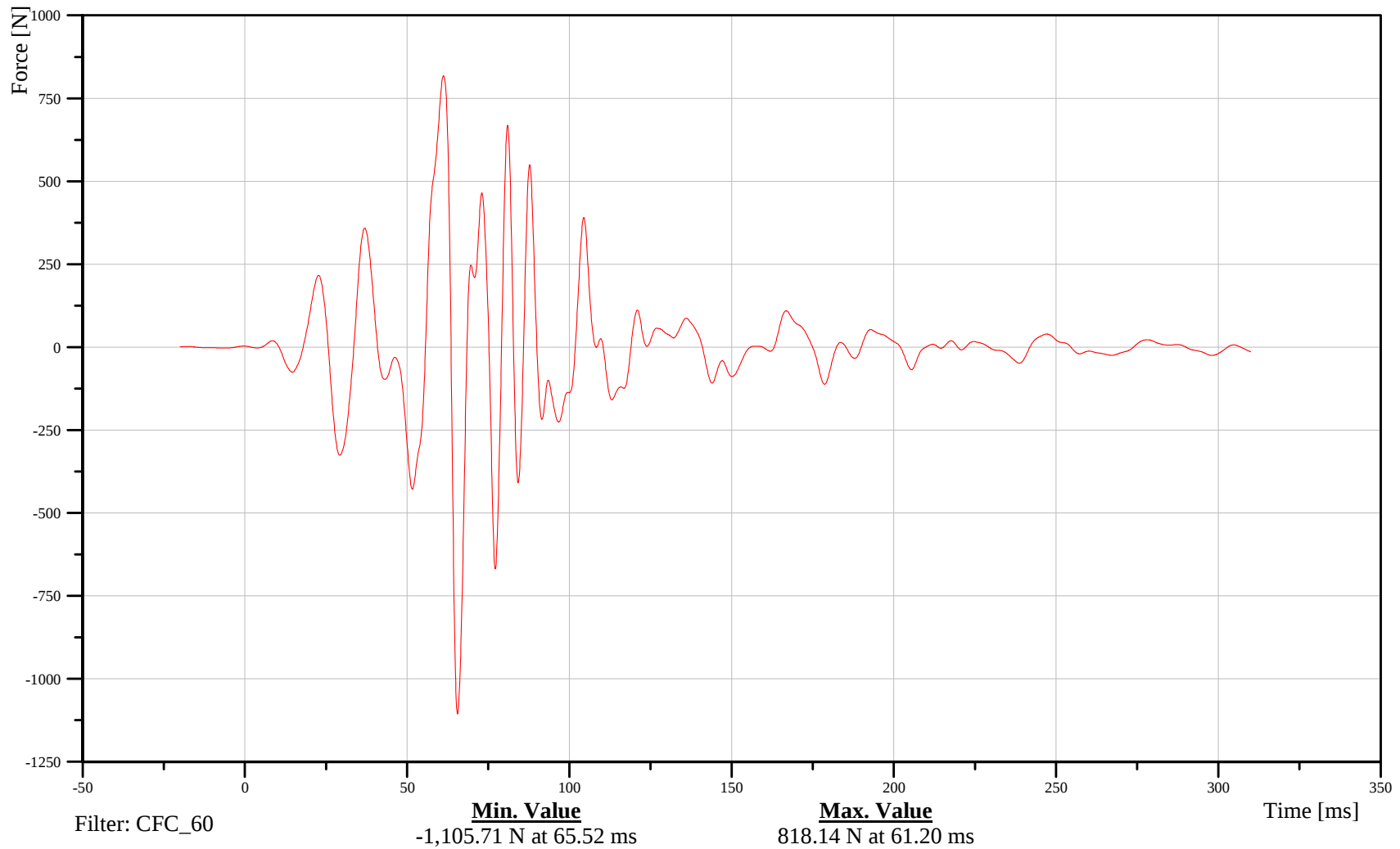
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR290000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-39

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D3

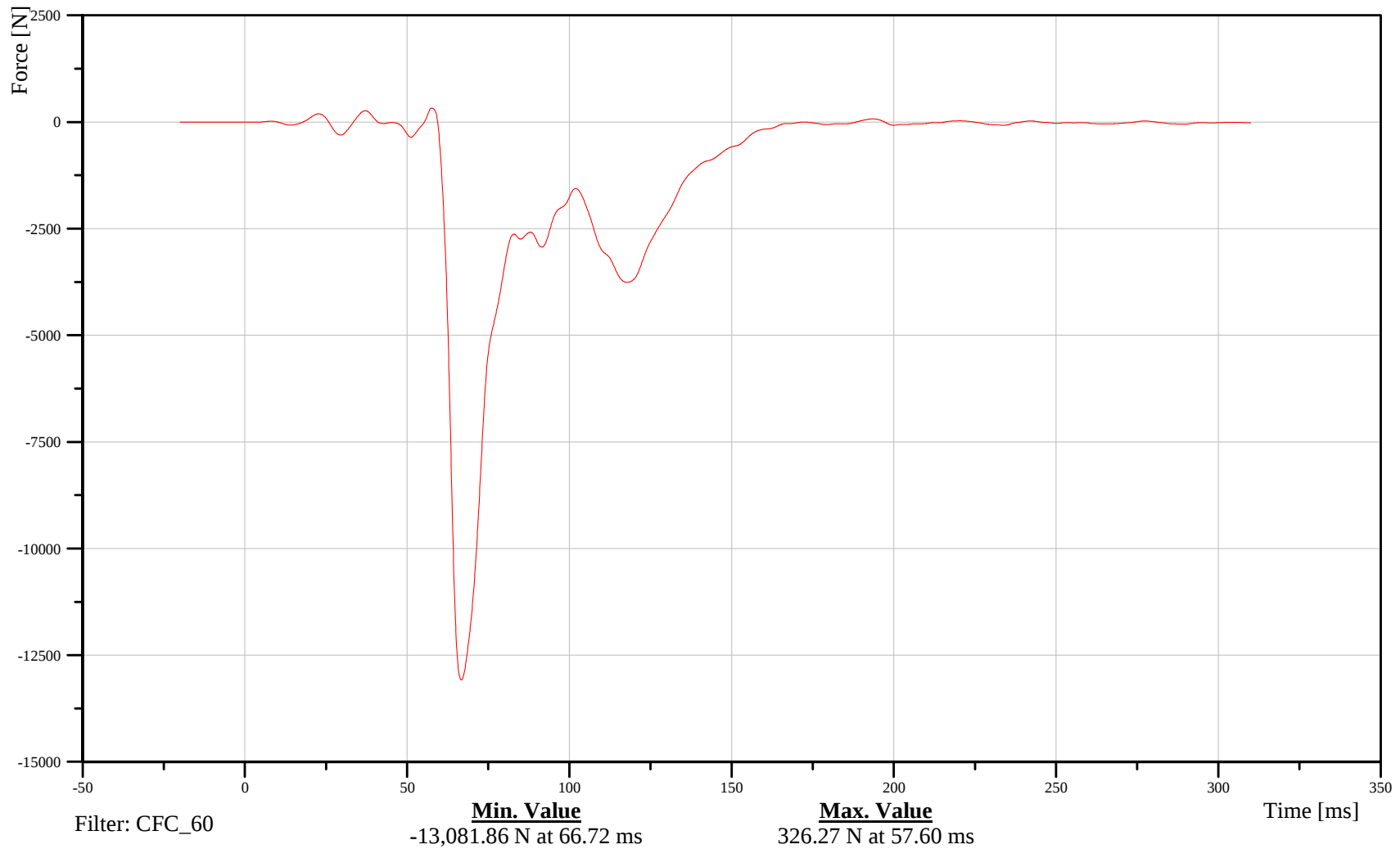
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR300000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-40

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D4

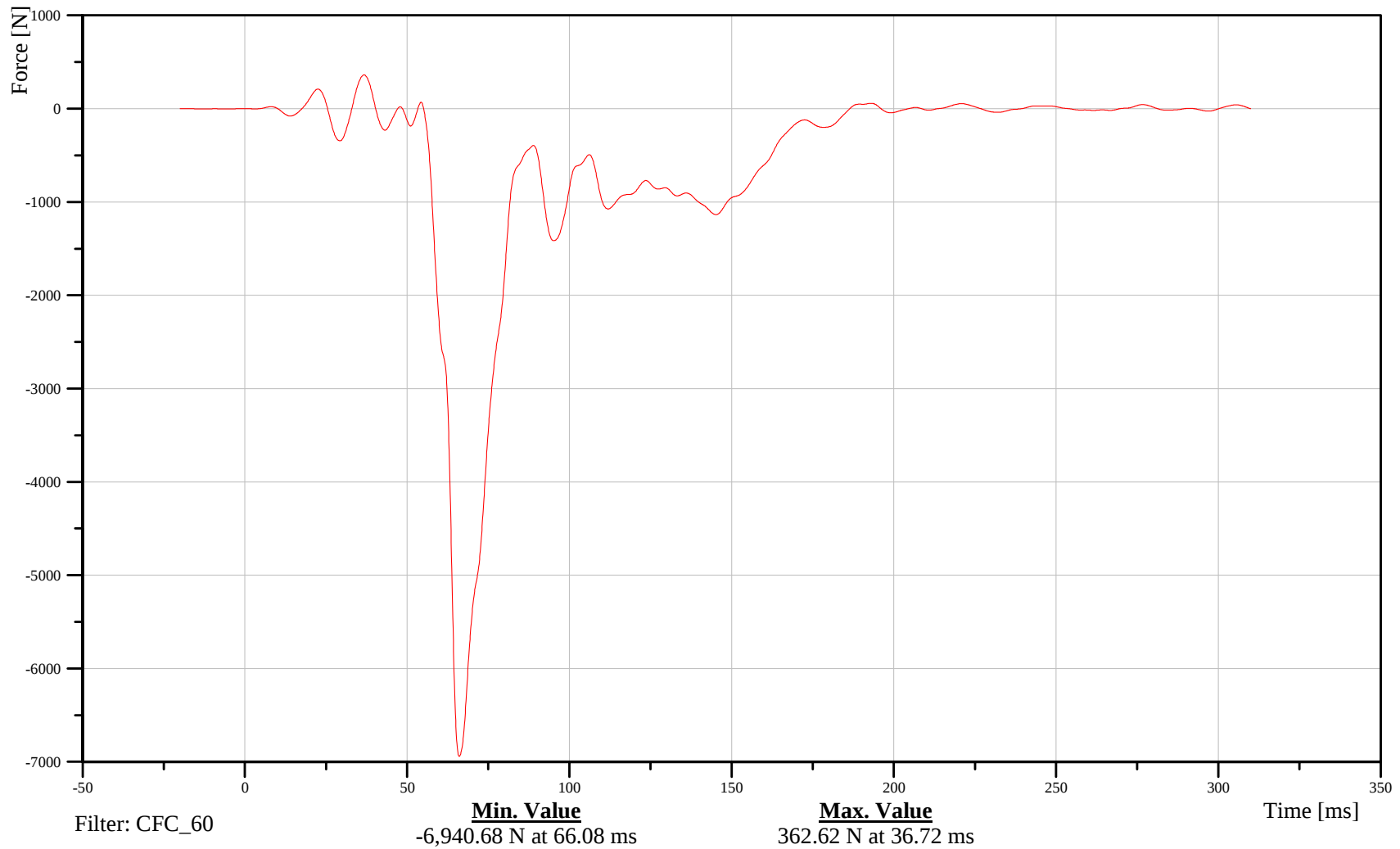
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR310000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D5

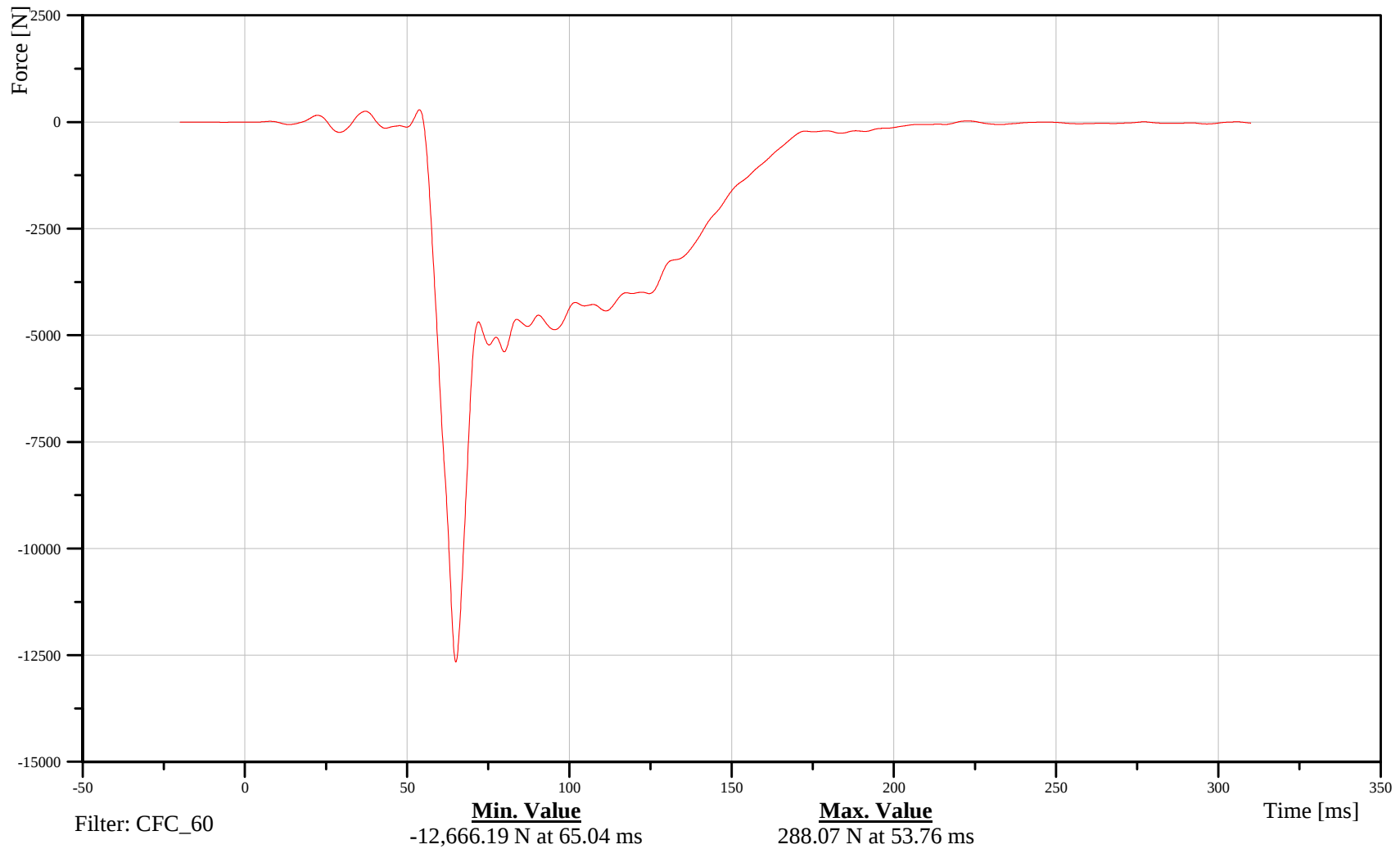
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR320000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D6

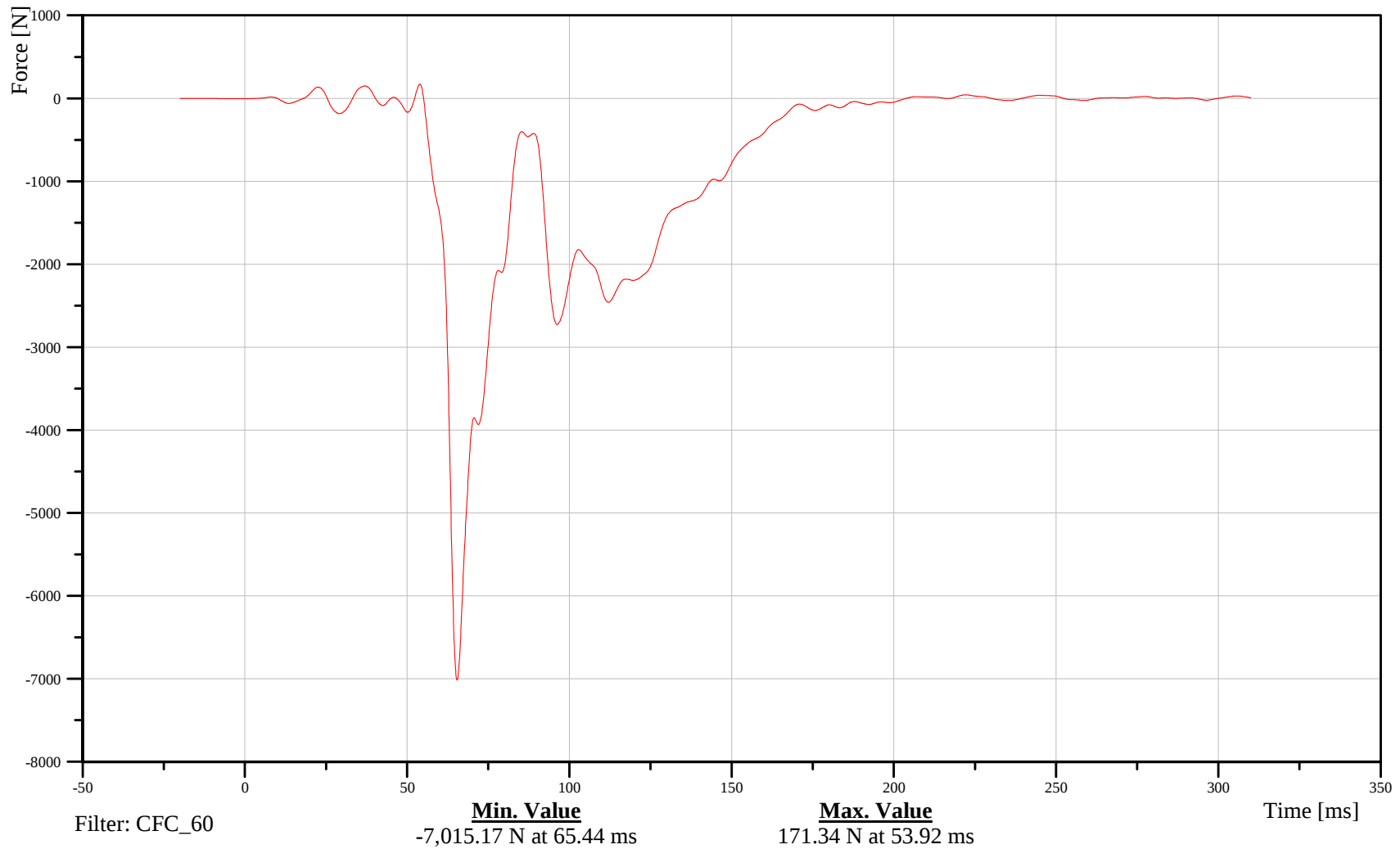
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR330000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D7

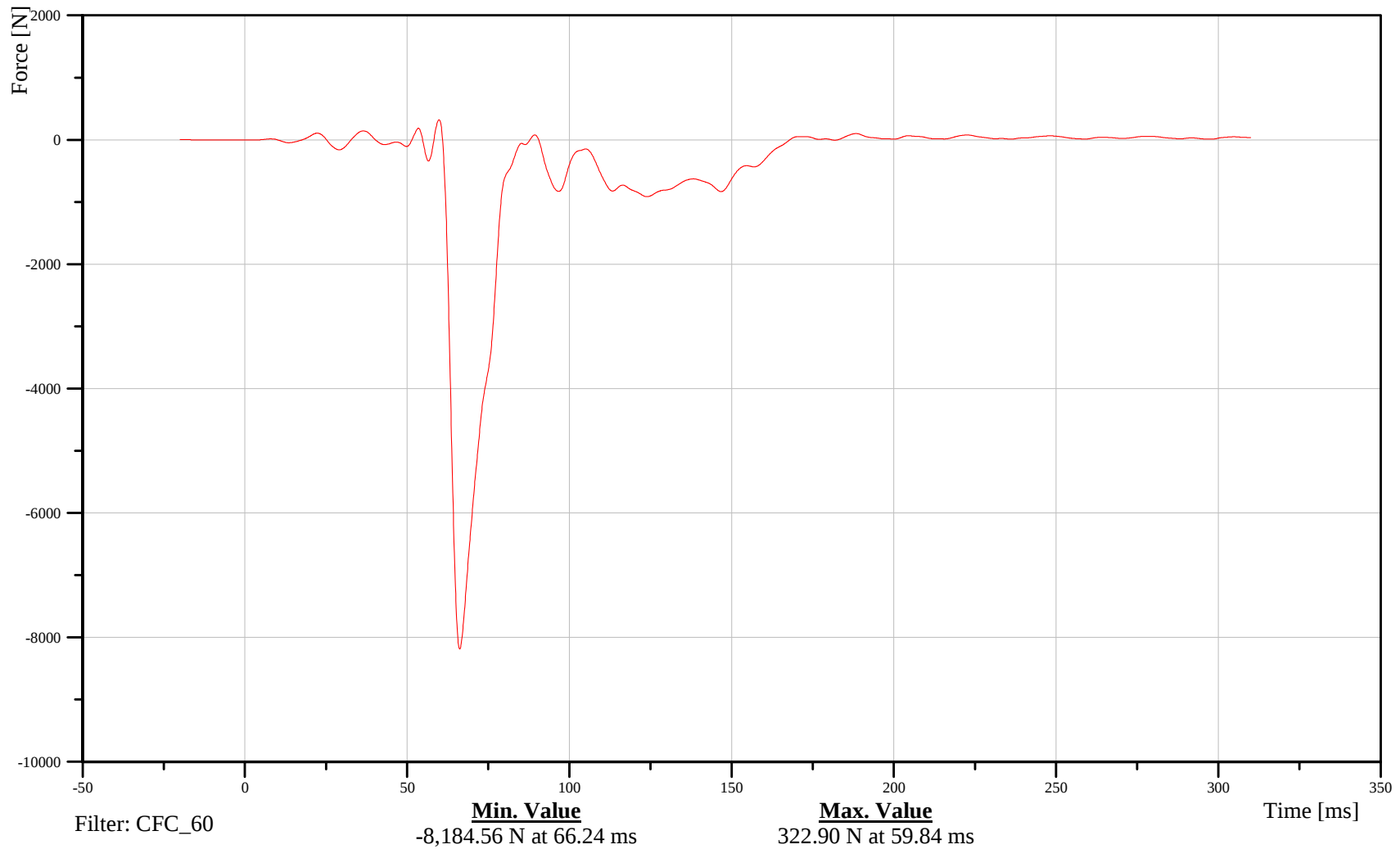
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR340000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D8

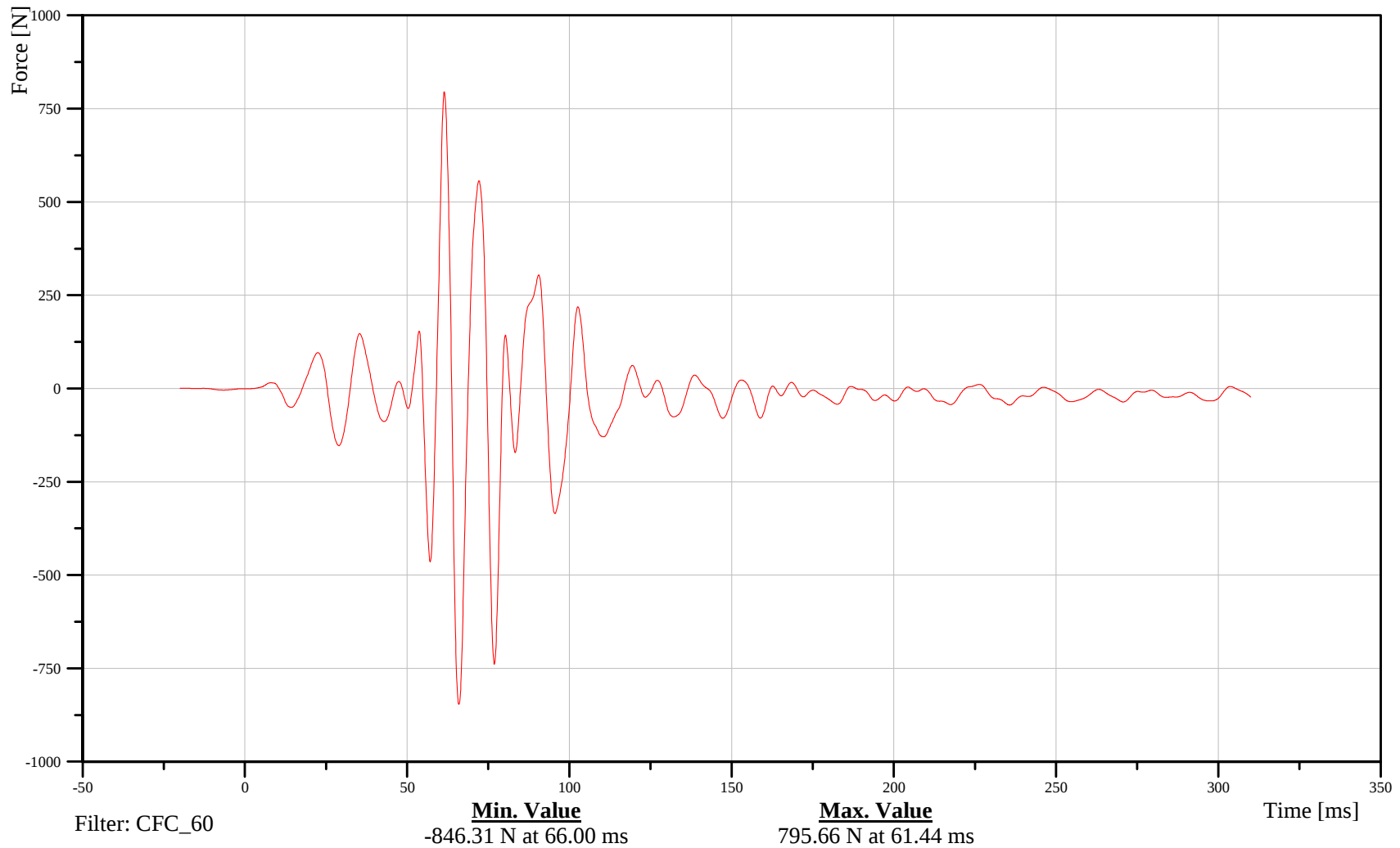
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR350000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-45

060913



2006 Ford F250 into Override Barrier at 25 mph

BARRIER LOAD D9

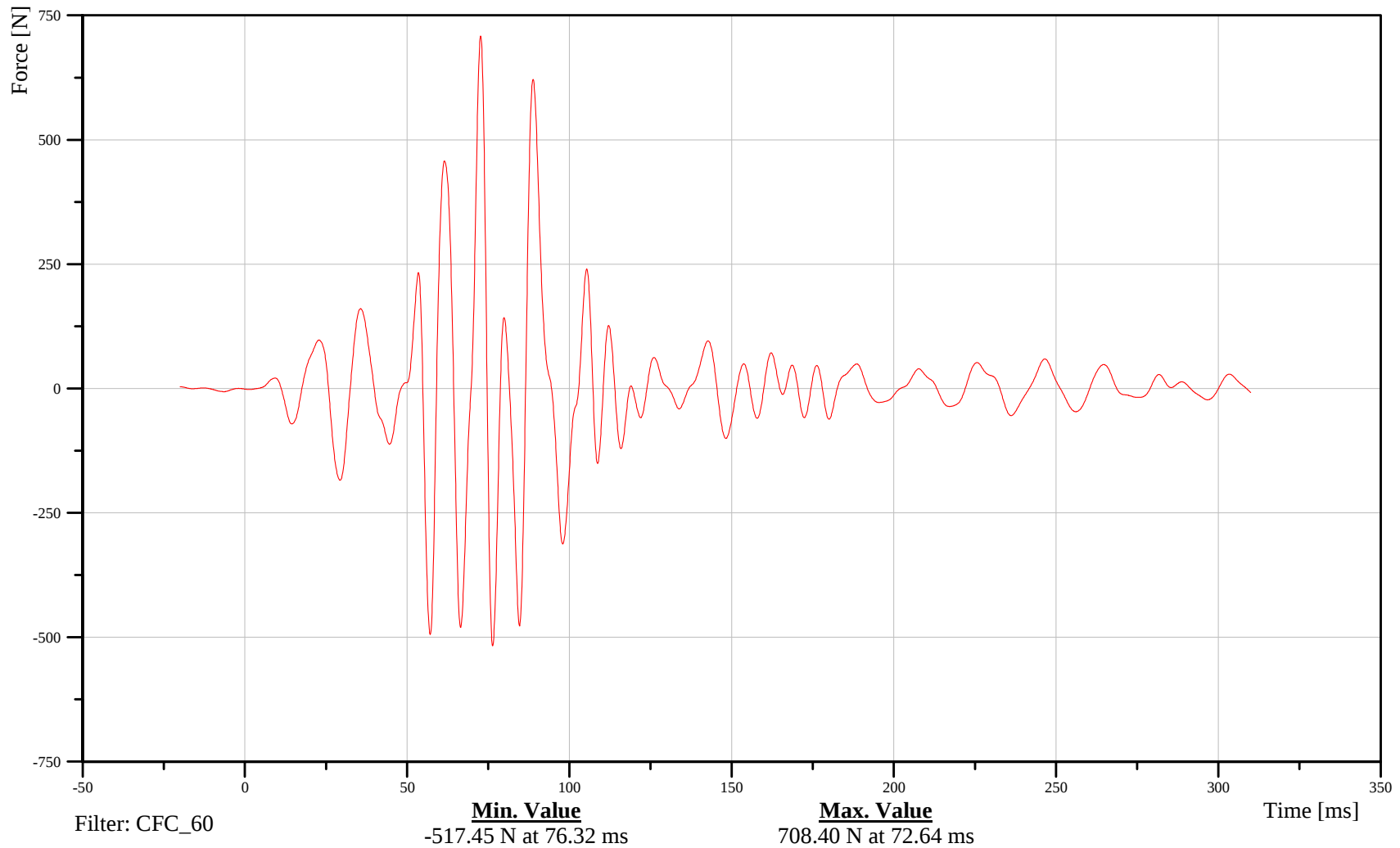
Date: 09/13/2006
Time: 14:23

Customer: VRTC

L0FBAR360000FOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



B-46

060913



2006 Ford F250 into Override Barrier at 25 mph

Date: 09/13/2006
Time: 14:23

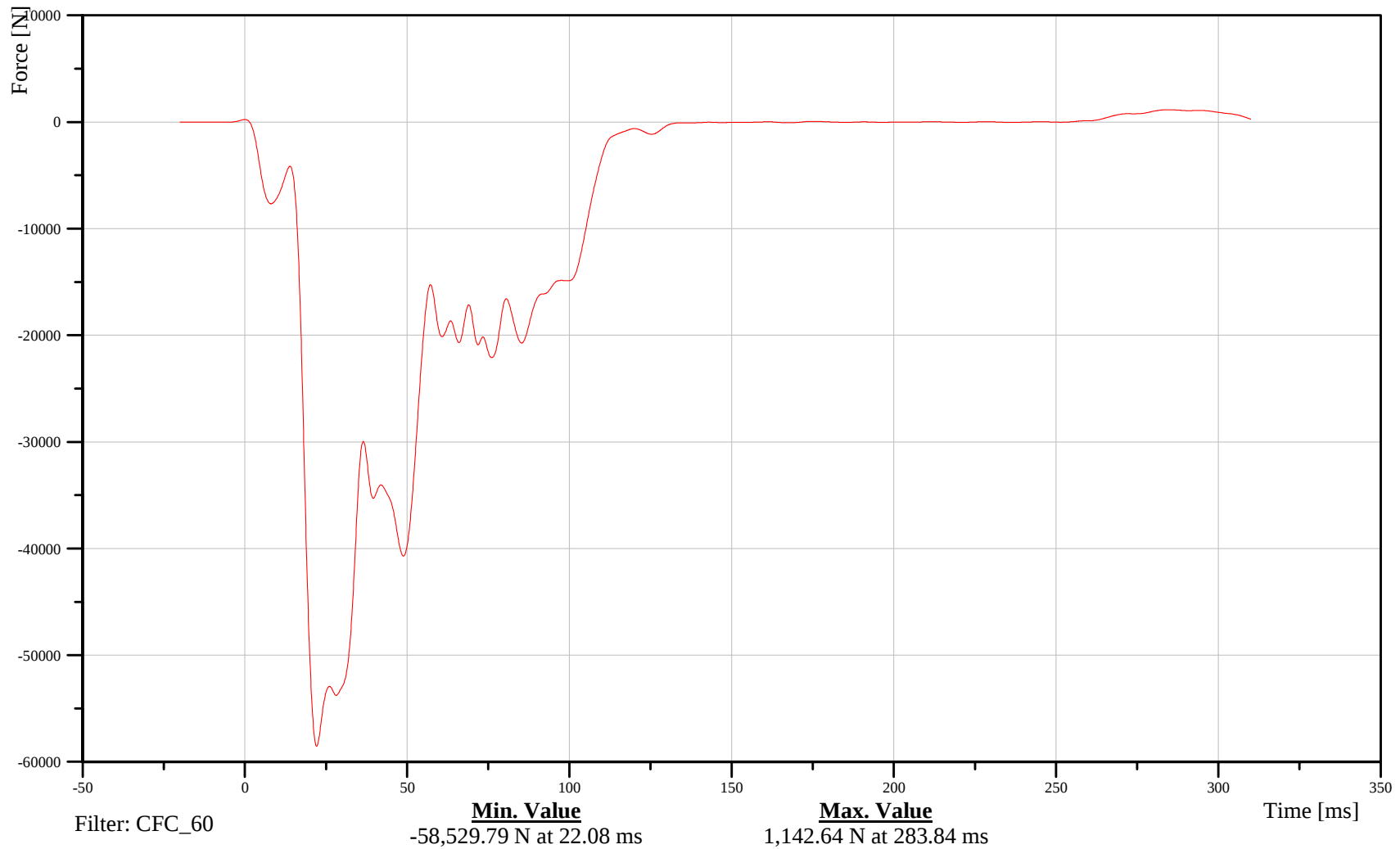
BARRIER LOAD A

Customer: VRTC

L0FBAR00000AFOX

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

Date: 09/13/2006
Time: 14:23

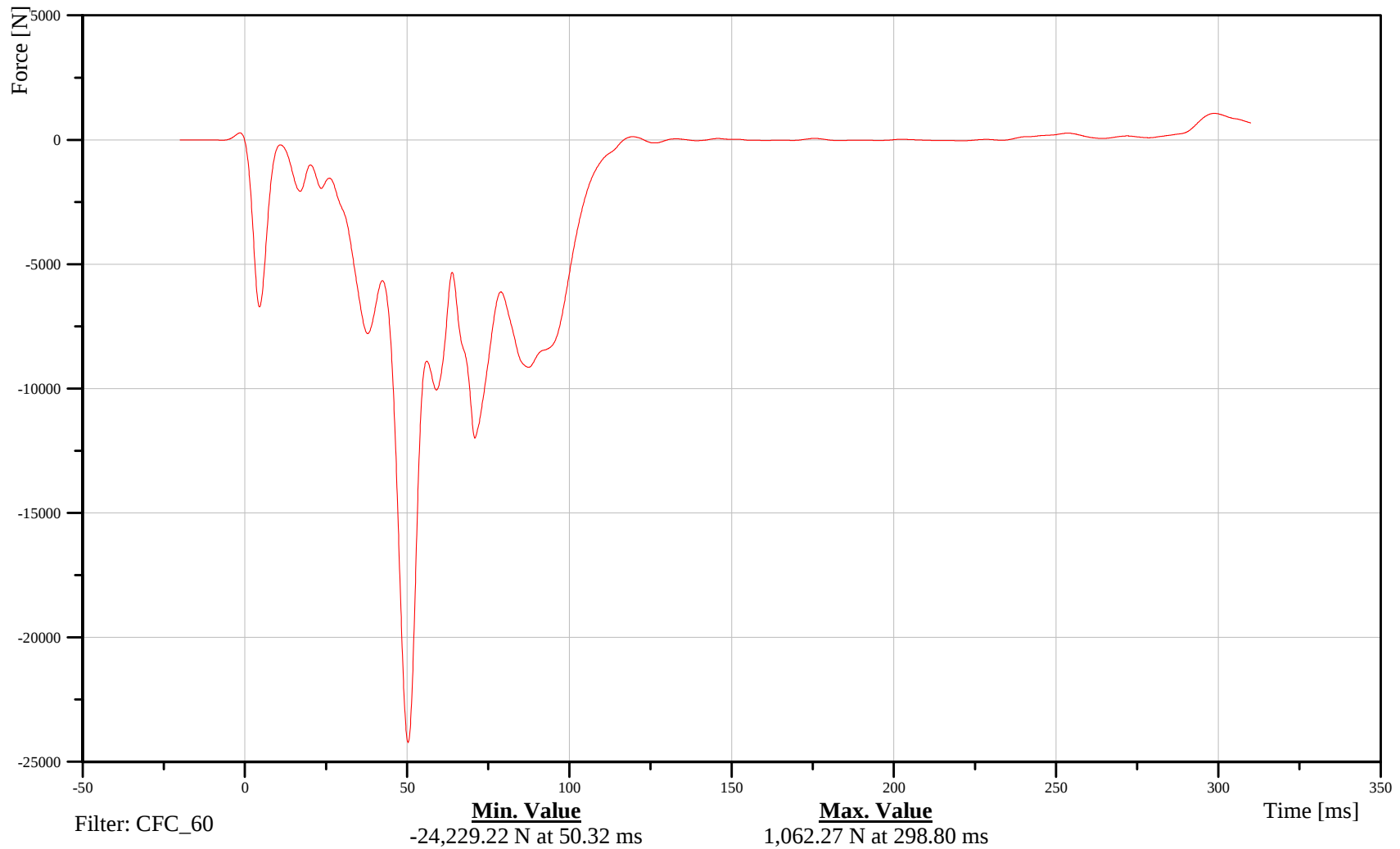
BARRIER LOAD B

Customer: VRTC

L0FBAR00000BFOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

Date: 09/13/2006
Time: 14:23

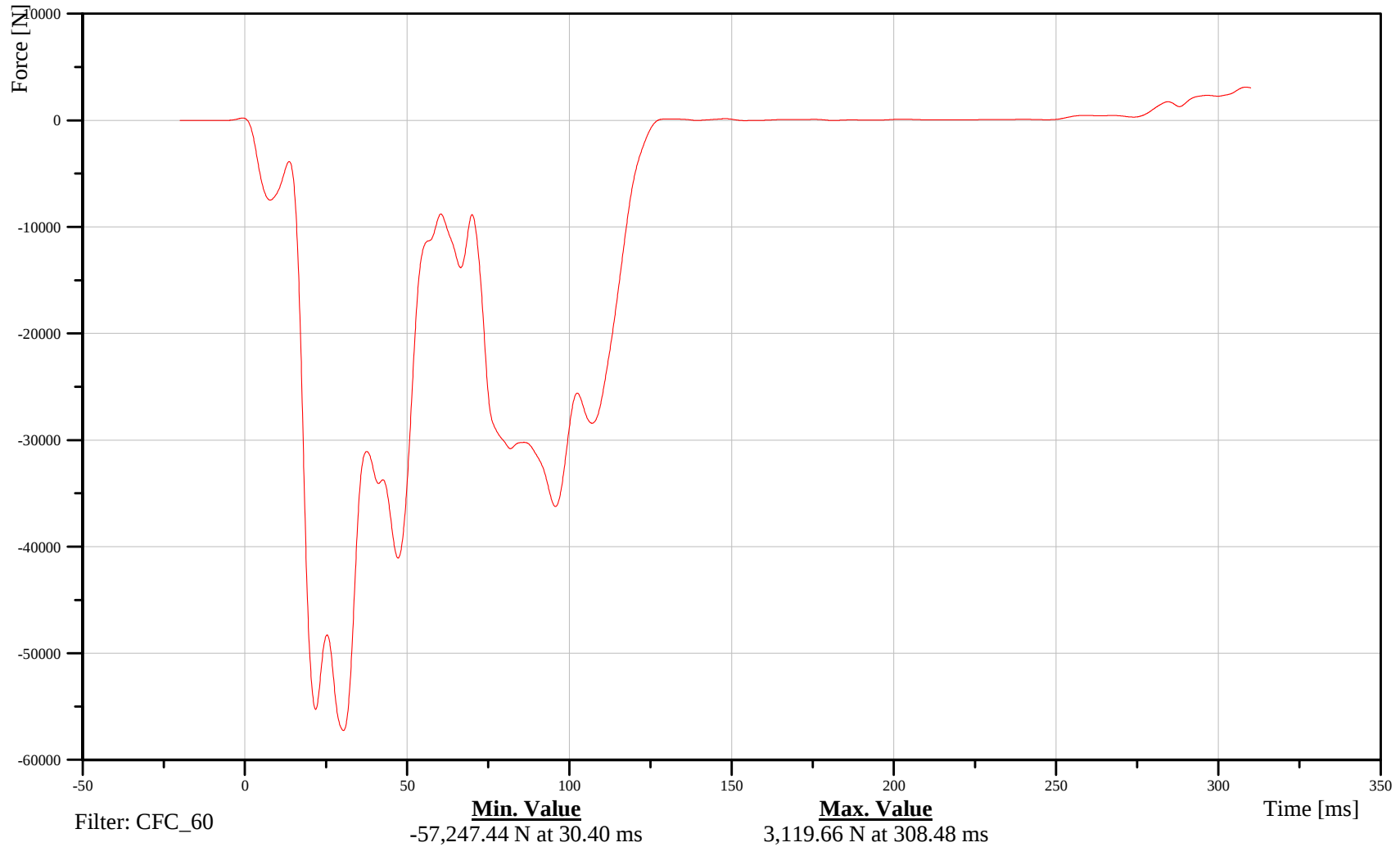
BARRIER LOAD C

Customer: VRTC

L0FBAR00000CFOXD

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

Date: 09/13/2006
Time: 14:23

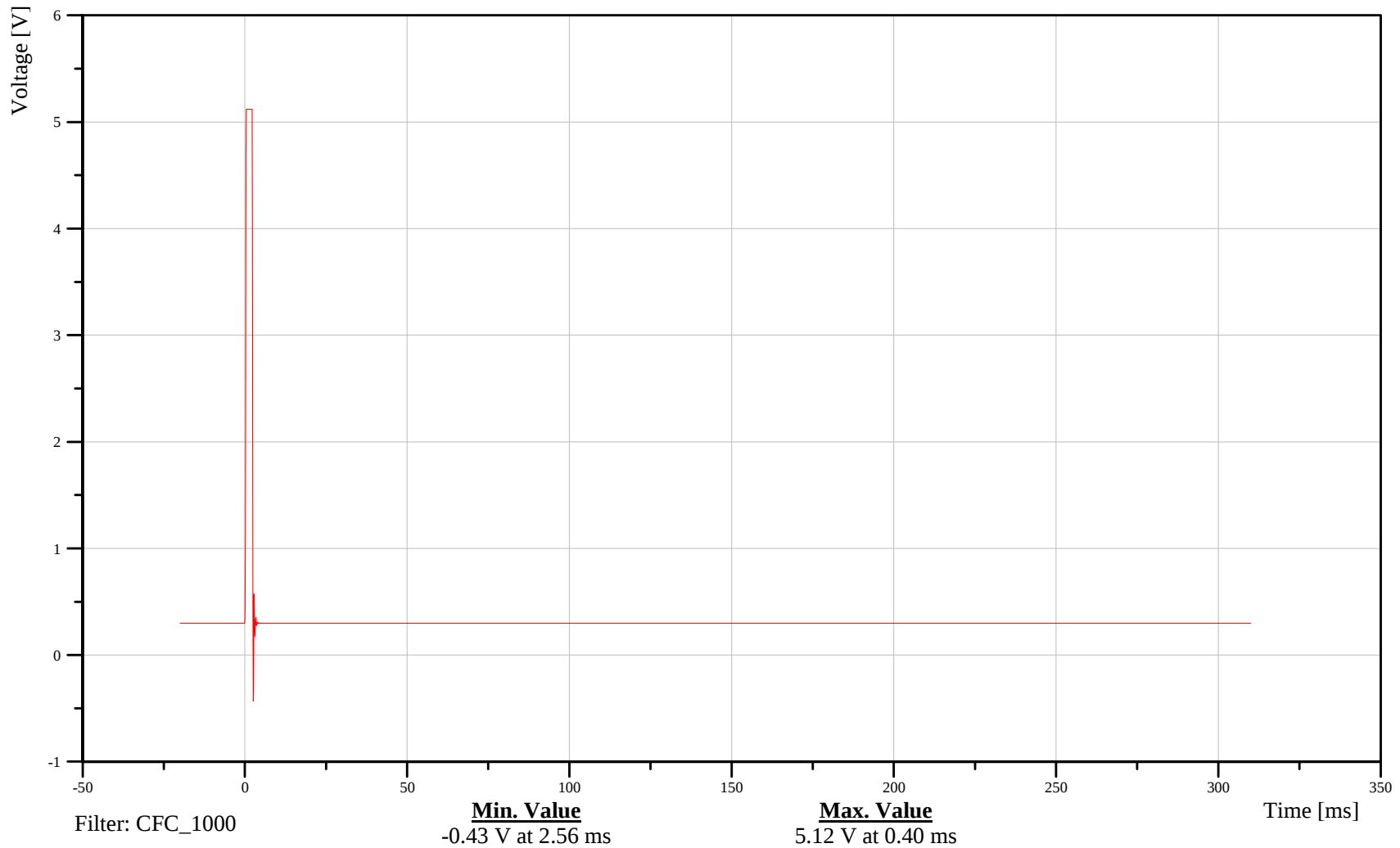
VERRIDE LIGHT TRAP 1

Customer: VRTC

10ZERO000001VO0A

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913



2006 Ford F250 into Override Barrier at 25 mph

Date: 09/13/2006
Time: 14:23

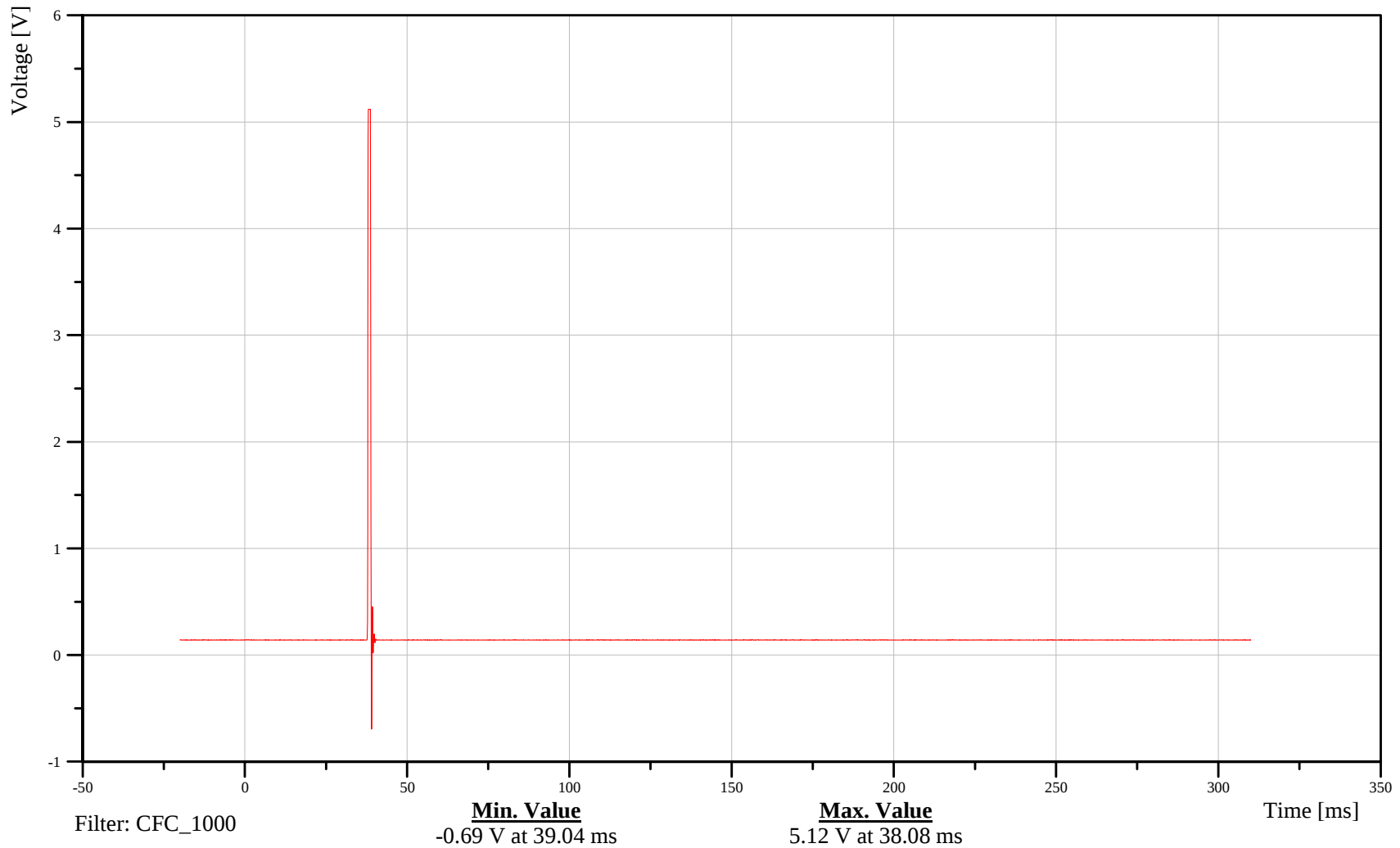
VERRIDE LIGHT TRAP 2

Customer: VRTC

10ZERO000002VO0A

TRC Inc. Test Lab: CTF

Test Number: 060913



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060913

Appendix C

Test Equipment and Instrumentation Calibration Information

Sign Convention
SAE J211 MAR95

Accelerometers:

+X: Forward
+Y: Rightward
+Z: Downward

Potentiometers:

+Chest longitudinal deflection: Outward
+Chest lateral deflection: Rightward
+Seat belt displacement: Outward
+Seat belt extension: Elongation
+Knee slider displacement: Distance between femur and tibia increased (in relation to a seated dummy)

Rotation potentiometers:

+About the X-axis: Left foot-eversion
Right foot-inversion
+About the Y-axis: Left/right foot-dorsiflexion
+About the Z-axis: Left foot-internal
Right foot-external

Load cells:

+Femur force: Tension
+Seat belt force: Tension
+Barrier force: Tension

Neck load cells:

+X force: Head pushed rearward
+Y force: Head pushed leftward
+Z force: Head pulled 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

Tibia load cells:

+X force: Ankle forward, knee rearward
+Y force: Ankle rightward, knee leftward
+Z force: Tension
+X moment: Bottom of tibia moving leftward
+Y moment: Bottom of tibia moving rearward

Frequency Response Classes
SAE J211 MAR95

<u>Typical Test Measurements</u>	<u>Channel Class</u>
Vehicle Structural Accelerations for use in:	
Total vehicle comparison	60
Collision simulation input	60
Component analysis	600
Integration for velocity or displacement	180
Barrier Face Forces	60
Belt Restraint System Loads	60
Anthropomorphic Test Device	
Head accelerations (linear and angular)	1000
Neck	
Forces	1000
Moments	600
Thorax	
Spine accelerations	180
Rib accelerations	1000
Sternum accelerations	1000
Deflections	600
Lumbar	
Forces	1000
Moments	1000
Pelvis	
Accelerations	1000
Forces	1000
Moments	1000
Femur/Knee/Tibia/Ankle	
Forces	600
Moments	600
Displacements	180
Sled Accelerations	60
Steering Column Loads	600
Head Form Accelerations	1000

The direction column on the following sheets describes the transducer output as mounted and wired in the test location. The polarity column indicates whether a polarity change occurred during data acquisition to conform to J211 MAR95. See Report Sign Convention sheet for description of data output as presented in the report: occasionally channels have been adjusted in post-acquisition processing to conform to J211 MAR95.

Channel Report Test Number 060913

Ref	Transducer ID	ISO Signal Identifier	Description	FScale	Units	DAS		Assembly
						Flip	Positive Polarity	
1	Trig D1	10ZERO000000VO0A	Event		1 Logic	+	Bipolar	
2	P47477	10VEHCCG0000ACXA	VEHICLE CENTER OF GRAVITY (X) ACCELERATION VS TIME	1000	g	+	Forward	
3	P50569	10VEHCCG0000ACYA	VEHICLE CENTER OF GRAVITY (Y) ACCELERATION VS TIME	1000	g	-	Leftward	
4	P38180	10VEHCCG0000ACZA	VEHICLE CENTER OF GRAVITY (Z) ACCELERATION VS TIME	1000	g	-	Upward	
5	P50811	12DASH000000ACXA	VEHICLE DASH (X) ACCELERATION VS TIME	1000	g	+	Forward	
6	P49793	10VEHC000000ACXA	VEHICLE rear deck (X) ACCELERATION VS TIME	1000	g	+	Forward	
7	P49959	10VEHC000000ACYA	VEHICLE rear deck (Y) ACCELERATION VS TIME	1000	g	+	Rightward	
8	P50961	10VEHC000000ACZA	VEHICLE rear deck (Z) ACCELERATION VS TIME	1000	g	-	Upward	
9	ABFire1	11AIRBFR0100EV0A	DRIV. FRONT AIRBAG1 IND (IP 40) (610)	5	V	+	Bipolar	
10	ABFire2	13AIRBFR0100EV0A	PASS. FRONT AIRBAG1 IND (IP 15) (A4)	5	V	+	Bipolar	
11	volts	00TIMENING100V0A	Timing channel 1	5	V	+	Bipolar	
12	volts	00TIMENING200V0A	Timing channel 2	5	V	+	Bipolar	
13	68050A	L0FBAR010000FOXA	BARRIER LOAD A1	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.001
14	68055	L0FBAR020000FOXA	BARRIER LOAD A2	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.002
15	62456	L0FBAR030000FOXA	BARRIER LOAD A3	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.003
16	68015	L0FBAR040000FOXA	BARRIER LOAD A4	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.004
17	68047	L0FBAR050000FOXA	BARRIER LOAD A5	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.005
18	122051A	L0FBAR060000FOXA	BARRIER LOAD A6	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.006
19	62467	L0FBAR070000FOXA	BARRIER LOAD A7	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.007
20	68024	L0FBAR080000FOXA	BARRIER LOAD A8	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.008
21	68027	L0FBAR090000FOXA	BARRIER LOAD A9	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.009
22	68058	L0FBAR100000FOXA	BARRIER LOAD B1	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.010
23	68012	L0FBAR110000FOXA	BARRIER LOAD B2	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.011
24	68014	L0FBAR120000FOXA	BARRIER LOAD B3	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.012
25	62466	L0FBAR130000FOXA	BARRIER LOAD B4	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.013
26	68039	L0FBAR140000FOXA	BARRIER LOAD B5	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.014
27	68051	L0FBAR150000FOXA	BARRIER LOAD B6	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.015
28	68061	L0FBAR160000FOXA	BARRIER LOAD B7	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.016
29	68032	L0FBAR170000FOXA	BARRIER LOAD B8	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.017
30	68026	L0FBAR180000FOXA	BARRIER LOAD B9	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.018
31	68064	L0FBAR190000FOXA	BARRIER LOAD C1	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.019
32	62453	L0FBAR200000FOXA	BARRIER LOAD C2	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.020
33	68028	L0FBAR210000FOXA	BARRIER LOAD C3	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.021
34	62510	L0FBAR220000FOXA	BARRIER LOAD C4	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.022
35	68033A	L0FBAR230000FOXA	BARRIER LOAD C5	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.023
36	122055A	L0FBAR240000FOXA	BARRIER LOAD C6	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.024
37	68018	L0FBAR250000FOXA	BARRIER LOAD C7	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.025
38	68067	L0FBAR260000FOXA	BARRIER LOAD C8	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.026
39	68021	L0FBAR270000FOXA	BARRIER LOAD C9	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.027
40	68034	L0FBAR280000FOXA	BARRIER LOAD D1	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.028
41	68045A	L0FBAR290000FOXA	BARRIER LOAD D2	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.029
42	68069	L0FBAR300000FOXA	BARRIER LOAD D3	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.030
43	68068A	L0FBAR310000FOXA	BARRIER LOAD D4	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.031
44	68054	L0FBAR320000FOXA	BARRIER LOAD D5	222400	N	+	Tension force	0-Barrier Flat 36 Load Cell.032

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060913

Channel Report Test Number 060913

Ref	Transducer ID	ISO Signal Identifier	Description	DAS			
				FScale	Units	Flip	Positive Polarity Assembly
45	68063	L0FBAR330000FOXA	BARRIER LOAD D6	222400	N	+	Tension force 0-Barrier Flat 36 Load Cell.033
46	68042	L0FBAR340000FOXA	BARRIER LOAD D7	222400	N	+	Tension force 0-Barrier Flat 36 Load Cell.034
47	68052	L0FBAR350000FOXA	BARRIER LOAD D8	222400	N	+	Tension force 0-Barrier Flat 36 Load Cell.035
48	122065A	L0FBAR360000FOXA	BARRIER LOAD D9	222400	N	+	Tension force 0-Barrier Flat 36 Load Cell.036
49	15763	L0FBAR00000AFOXA	BARRIER LOAD A	222411	N	+	Tension force 0-Barrier VRTC ORB Loadcell.001
50	73431	L0FBAR00000BFOXA	BARRIER LOAD B	222411	N	+	Tension force 0-Barrier VRTC ORB Loadcell.002
51	19472	L0FBAR00000CFOXA	BARRIER LOAD C	222411	N	+	Tension force 0-Barrier VRTC ORB Loadcell.003

Command File Test Number 060913

Channel	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
1	10VEHCCG0000ACXA	VEHICLE CENTER OF GRAVITY X-AXIS ACCELERATION	60	+	yes	1000
2	10VEHCCG0000ACYA	VEHICLE CENTER OF GRAVITY Y-AXIS ACCELERATION	60	+	yes	1000
3	10VEHCCG0000ACZA	VEHICLE CENTER OF GRAVITY Z-AXIS ACCELERATION	60	+	yes	1000
4	12DASH000000ACXA	VEHICLE DASH X-AXIS ACCELERATION	60	+	yes	1000
5	10VEHC000000ACXA	VEHICLE REAR DECK X-AXIS ACCELERATION	60	+	yes	1000
6	10VEHC000000ACYA	VEHICLE REAR DECK Y-AXIS ACCELERATION	60	+	yes	1000
7	10VEHC000000ACZA	VEHICLE REAR DECK Z-AXIS ACCELERATION	60	+	yes	1000
8	11AIRBFR0100EV0A	DRIV. FRONT AIRBAG1 INDUCTOR	1000	+	no	5
9	13AIRBFR0100EV0A	PASS. FRONT AIRBAG1 INDUCTOR	1000	+	no	5
10	L0FBAR010000FOXA	BARRIER LOAD A1	60	+	yes	222400
11	L0FBAR020000FOXA	BARRIER LOAD A2	60	+	yes	222400
12	L0FBAR030000FOXA	BARRIER LOAD A3	60	+	yes	222400
13	L0FBAR040000FOXA	BARRIER LOAD A4	60	+	yes	222400
14	L0FBAR050000FOXA	BARRIER LOAD A5	60	+	yes	222400
15	L0FBAR060000FOXA	BARRIER LOAD A6	60	+	yes	222400
16	L0FBAR070000FOXA	BARRIER LOAD A7	60	+	yes	222400
17	L0FBAR080000FOXA	BARRIER LOAD A8	60	+	yes	222400
18	L0FBAR090000FOXA	BARRIER LOAD A9	60	+	yes	222400
19	L0FBAR100000FOXA	BARRIER LOAD B1	60	+	yes	222400
20	L0FBAR110000FOXA	BARRIER LOAD B2	60	+	yes	222400
21	L0FBAR120000FOXA	BARRIER LOAD B3	60	+	yes	222400
22	L0FBAR130000FOXA	BARRIER LOAD B4	60	+	yes	222400
23	L0FBAR140000FOXA	BARRIER LOAD B5	60	+	yes	222400
24	L0FBAR150000FOXA	BARRIER LOAD B6	60	+	yes	222400
25	L0FBAR160000FOXA	BARRIER LOAD B7	60	+	yes	222400
26	L0FBAR170000FOXA	BARRIER LOAD B8	60	+	yes	222400
27	L0FBAR180000FOXA	BARRIER LOAD B9	60	+	yes	222400
28	L0FBAR190000FOXA	BARRIER LOAD C1	60	+	yes	222400
29	L0FBAR200000FOXA	BARRIER LOAD C2	60	+	yes	222400
30	L0FBAR210000FOXA	BARRIER LOAD C3	60	+	yes	222400
31	L0FBAR220000FOXA	BARRIER LOAD C4	60	+	yes	222400
32	L0FBAR230000FOXA	BARRIER LOAD C5	60	+	yes	222400
33	L0FBAR240000FOXA	BARRIER LOAD C6	60	+	yes	222400
34	L0FBAR250000FOXA	BARRIER LOAD C7	60	+	yes	222400
35	L0FBAR260000FOXA	BARRIER LOAD C8	60	+	yes	222400
36	L0FBAR270000FOXA	BARRIER LOAD C9	60	+	yes	222400
37	L0FBAR280000FOXA	BARRIER LOAD D1	60	+	yes	222400

Command File Test Number 060913

Channel	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
38	L0FBAR290000FOXA	BARRIER LOAD D2	60	+	yes	222400
39	L0FBAR300000FOXA	BARRIER LOAD D3	60	+	yes	222400
40	L0FBAR310000FOXA	BARRIER LOAD D4	60	+	yes	222400
41	L0FBAR320000FOXA	BARRIER LOAD D5	60	+	yes	222400
42	L0FBAR330000FOXA	BARRIER LOAD D6	60	+	yes	222400
43	L0FBAR340000FOXA	BARRIER LOAD D7	60	+	yes	222400
44	L0FBAR350000FOXA	BARRIER LOAD D8	60	+	yes	222400
45	L0FBAR360000FOXA	BARRIER LOAD D9	60	+	yes	222400
46	L0FBAR000000AFOXA	BARRIER LOAD A	60	+	yes	222411
47	L0FBAR000000BFOXA	BARRIER LOAD B	60	+	yes	222411
48	L0FBAR000000CFOXA	BARRIER LOAD C	60	+	yes	222411
49	10ZERO000000VO0A	TIMING 1 EVENT CHANNEL	1000	+	no	5

Appendix D

INSIA Report on Structural Measurements



STRUCTURAL SURVEY OF CARS. MEASUREMENT METHODOLOGY OF THE MAIN RESISTANT ELEMENTS IN THE CAR BODY

**APARICIO IZQUIERDO, FRANCISCO
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March, 1999

REPORT DOCUMENTATION PAGE	
Title:	<i>STRUCTURAL SURVEY OF CARS. MEASUREMENT METHODOLOGY OF THE MAIN RESISTANT ELEMENTS IN THE CAR BODY</i>
Author(s):	Aparicio Izquierdo, Francisco Páez Ayuso, Francisco Javier
Performing Organisation name and address:	INSIA – University Institute for Automobile Research Carretera de Valencia, Km. 7 – Campus Sur de la Universidad Politécnica de Madrid 28031 – Madrid – Spain
Supplementary notes:	Under contract to: THE EUROPEAN COMMUNITY Project: “Improvement of Crash Compatibility between Cars” Contract N°: RO – 97 – SC.1064
Abstract:	The main aim of this working package -<i>Structural Survey of Cars</i>- is the reduction of incompatibilities, both structural and geometric, between passenger vehicles and their potential collision partners. The understanding of these incompatibilities needs a previous step for the knowledge of the existing car fleet. Firstly, it is necessary to select the main resistant elements in the car body. These elements have to be chosen from the point of view of the sort of collision that we want to study, that is to say, frontal and side impacts. Detailed measurements have been taken from exterior and interior elements, spread to a total number of 74 models selected from the main vehicle manufacturers at Spain. All of them are being sold this year. Using the information available from the previous measurements in vehicles, the geometric characteristics of the main resistant elements involved in the geometric compatibility between cars will be defined. This report shows the methodology followed to get these measurements.
Subject terms:	Crash compatibility, geometric compatibility, resistant elements, measure methodology
Date:	March, 1999

1.- METHODOLOGY.

Detailed measurements have been taken from exterior and interior elements. Using the information available from the previous measurements in vehicles, the geometric characteristics of the main resistant elements involved in the geometric compatibility between cars have been defined. These elements are presented in the following figures, and have been divided in two main groups according to the vehicle zones studied in this project.

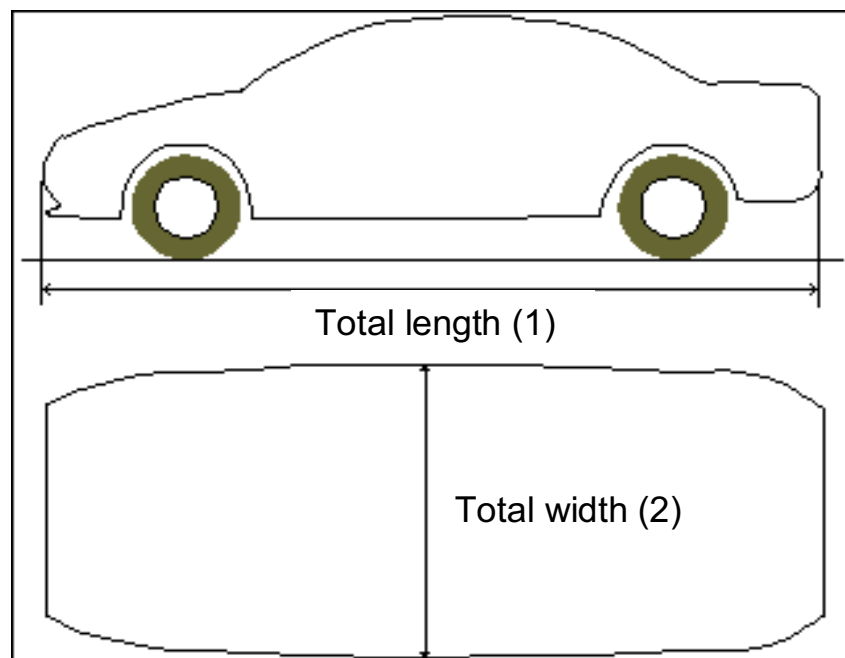


Figure 1.- Definition of the main resistant elements. General dimensions.

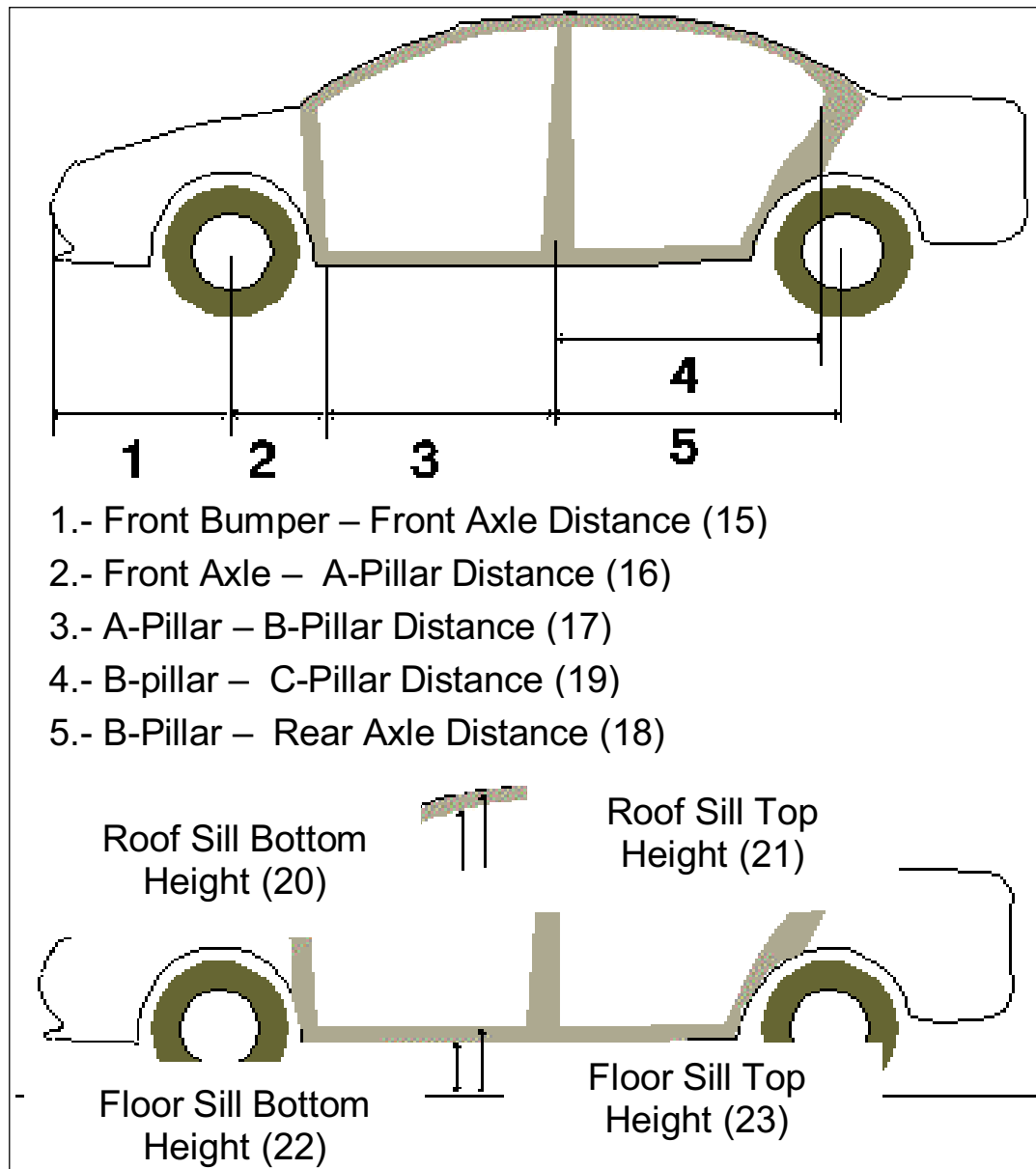


Figure 2.- Definition of the main resistant elements. Side elements.

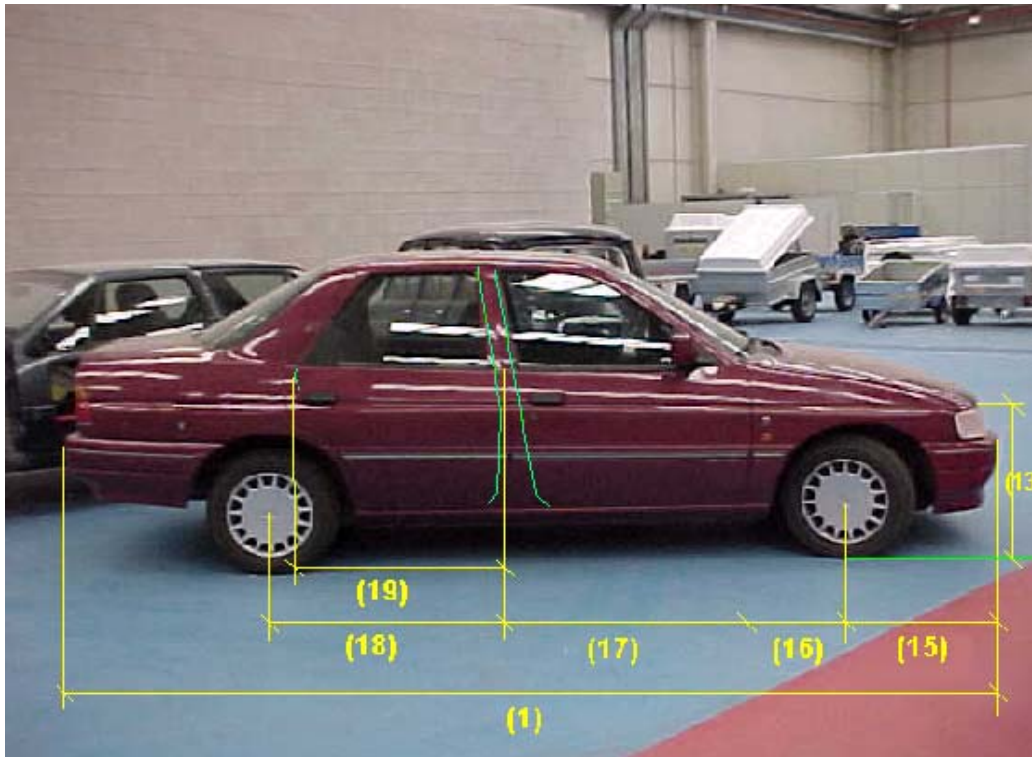
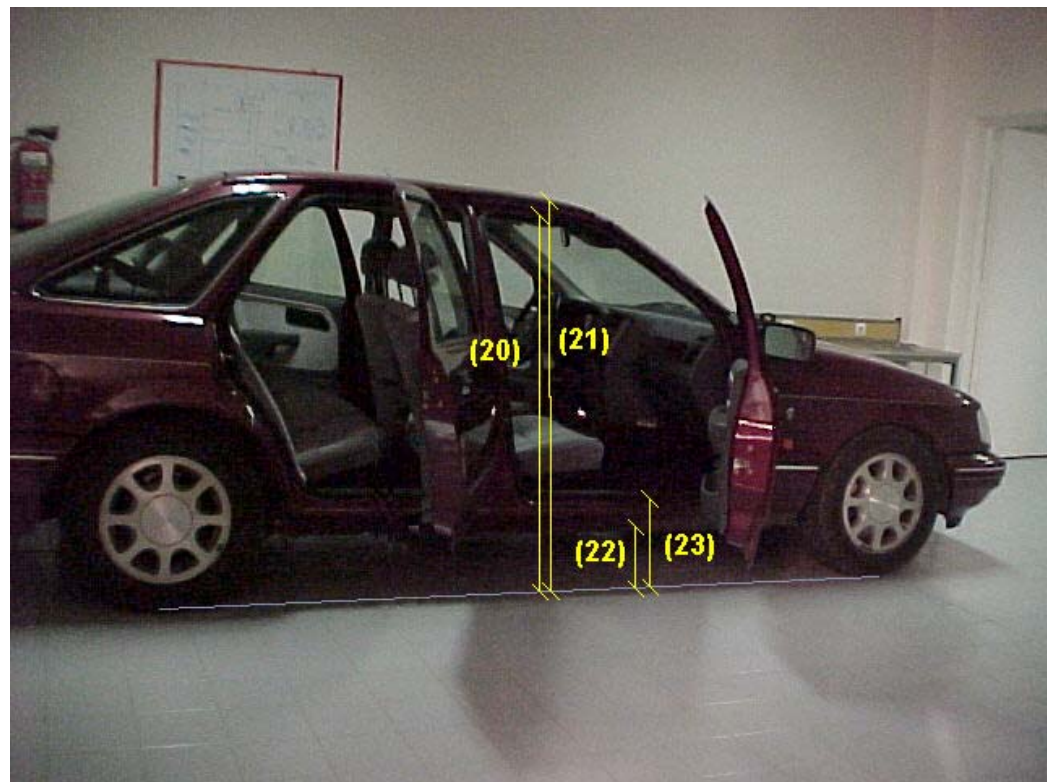


Figure 3.-
Measurements of
the side resistant
elements (outer).

Figure 4.- Measurements
of the side resistant
elements (inner).



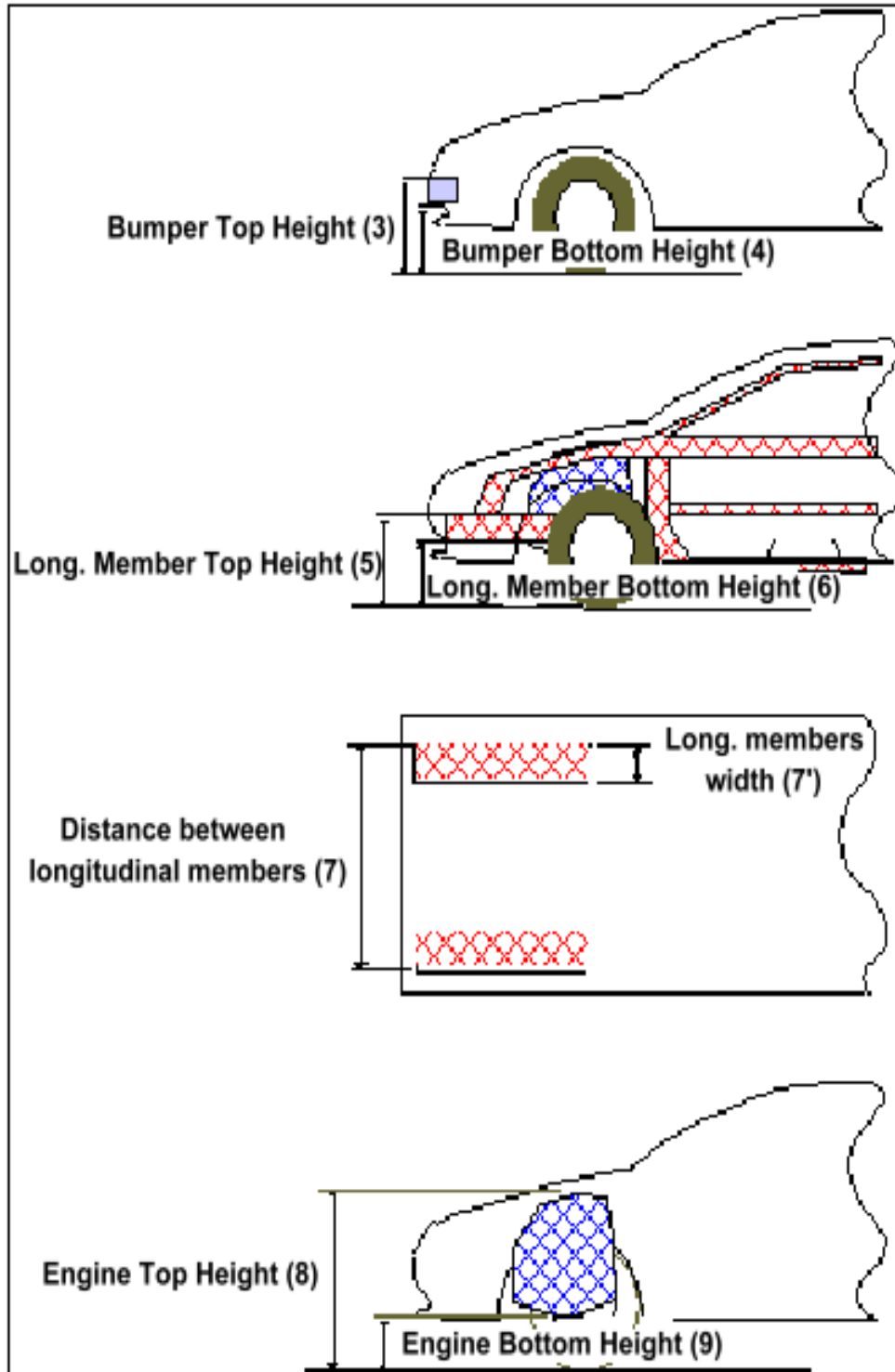


Figure 5.- Definition of the main resistant elements. Front elements.

Figure 6.-
Measurements of the
main resistant elements.
Front elements 1.

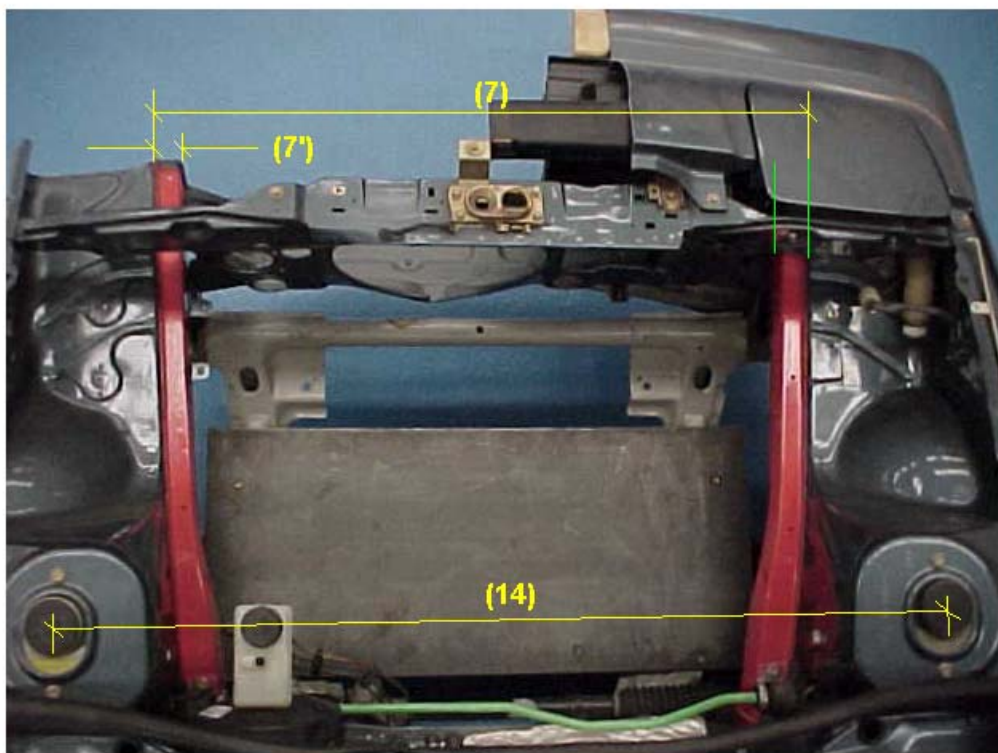
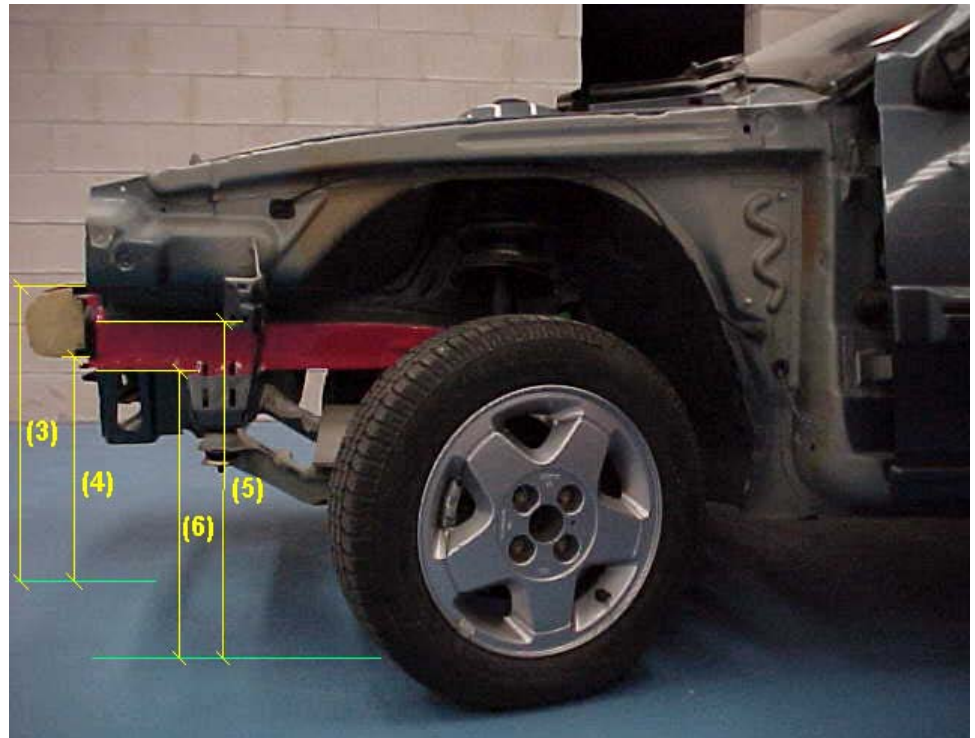


Figure 7.-
Measurements
of the main
resistant
elements. Front
elements 2.

Figure 8.-
Measurements of
the main resistant
elements. Front
elements 3.

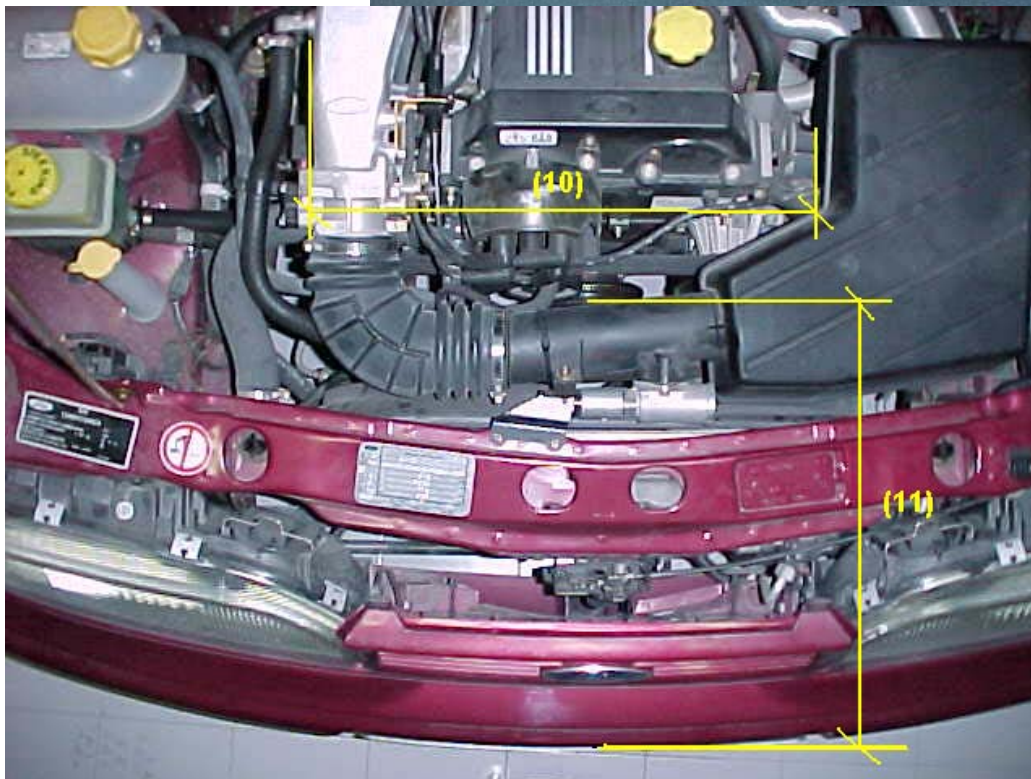
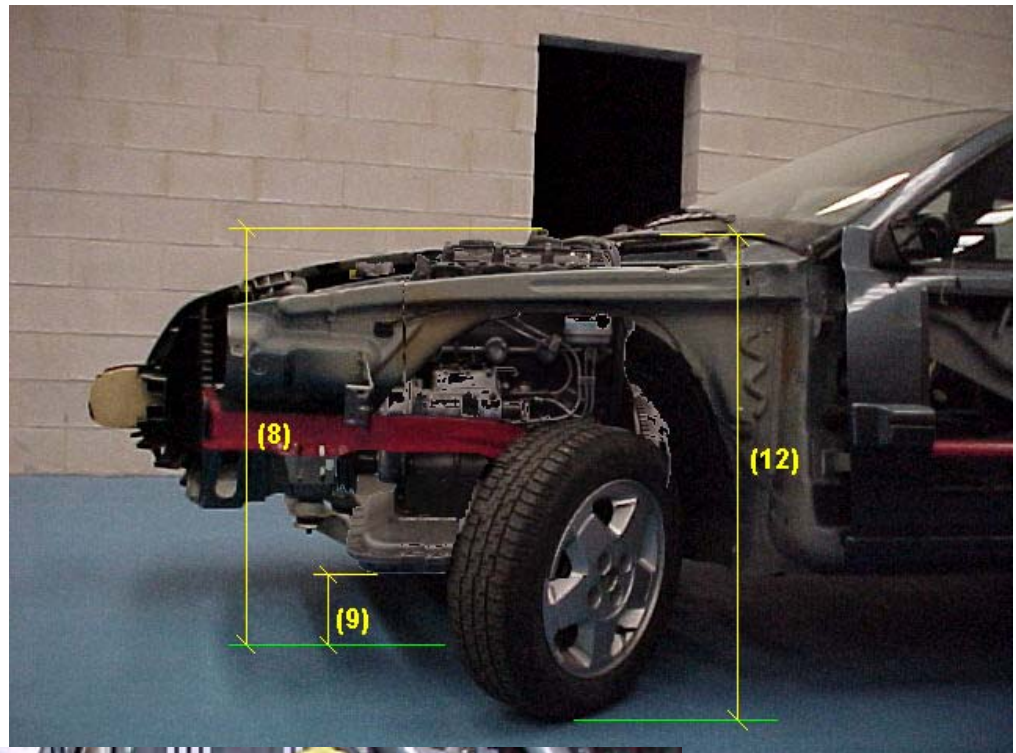


Figure 9.-
Definition of
the main
resistant
elements. Front
elements
(Longitudinal
engine).



The procedure considered to measure these elements is described as follows, where it is indicated the location of these ones in the Excel Sheet (SURVEY.XLS) into brackets:

FRONT ELEMENTS

- **Total Length –(1)- (Side & Front Sheets - C column):** distance between the point in the front bumper further on and the point in the rear bumper further back.
- **Weight (Side & Front Sheets - D column):** mass, including an average driver weight (70 kg), and the fuel tank mass (at half-capacity).
- **Total Width –(2)- (Side & Front Sheets - E column):** distance between the outer side points in a transverse plane of the vehicle (middle plane between the front and rear axles).
- **Bumper bottom height –(4)- (Front Sheet G column):** distance between the ground and the lowest point on the front bumper, being a resistant member (aerodynamic elements under the front bumper are not considered).
- **Bumper top height –(3)- (Front Sheet H column):** distance between the ground and the highest point on the front bumper, being a resistant member (aerodynamic elements are not considered).
- **Longitudinal member top height –(5)- (Front Sheet I column):** distance between the ground and the highest point on the longitudinal members, measured approximately in the front bumper-longitudinal member joint (when accessible).
- **Longitudinal member bottom height –(6)- (Front Sheet J column):** distance between the ground and the lowest point on the longitudinal members, measured approximately in the front bumper-longitudinal member joint.
- **Distance between longitudinal members (Front Sheet K column):** transverse distance between extreme points in longitudinal members, measured approximately in the front bumper-longitudinal member joint.

Depending on the accessibility of these members, the extreme points are the inner points (I) or the outer points (O).

- **Longitudinal member width -7'- (Front Sheet L column):** width of one of the longitudinal members, measured approximately in the front bumper-longitudinal member joint.



- **Engine top height (8) (Front Sheet N column):** distance between the ground and the highest point on the engine that can be a resistant member in case of accident (usually, the highest point on the head, or the highest point of the inlet or exhaust manifolds).
- **Engine bottom height (9) (Front Sheet M column):** distance between the ground and the lowest point on the engine (usually, the lowest point on the crankcase).
- **Engine and Gearbox width (10) (Front Sheet O & P columns):**
 - *Transverse configuration engine:* distance between extreme points in the gearbox-cylinder block unit or others resistant members attached to the cylinder block unit, i.e. fan belts (from a front point of view).
 - *Longitudinal configuration engine:* distance between extreme points in the cylinder block unit (from a front point of view).
- **Front bumper - Engine distance (11) (Front Sheet Q column):** distance between the point in the front bumper further on and the point in the engine further on that is a resistant element, i.e. the further on point of the exhaust manifold placed in the front of the engine.
- **Front shock absorber fixing width (14) (Front Sheet R column):** transverse distance between the front shock absorber - body car joints.
- **Front shock absorber fixing height (12) (Front Sheet S column):** distance between the ground and the front shock absorber-body car joint.
- **Bonnet leading edge height (Front Sheet T column):** distance between the ground and the bonnet edge further on.

SIDE ELEMENTS

- **Front bumper - Front axle distance (15) (Side Sheet G column):** distance between the point in the front bumper further on and the middle point in the front tyre-road contact patch.
- **Front axle - A Pillar distance (16) (Side Sheet H column):** distance between the middle point in the front tyre-road contact patch and the point in the A-pillar further back.
- **A Pillar - B Pillar distance (17) (Side Sheet I column):** distance between the point in the A-pillar further back and the middle point in the B-pillar.
- **B Pillar - C Pillar distance (19) (Side Sheet J column):** distance between the middle point in the B-pillar and the point in the C-pillar further back (only 4/5-door vehicles).
- **B Pillar - Rear axle distance (18) (Side Sheet K column):** distance between the middle point in the B-pillar and the middle point in the rear tyre-road contact patch.
- **Roof sill bottom height (20) (Side Sheet L column):** distance between the ground and the lowest point on the roof sill, measured in the front door middle point.
- **Roof sill top height (21) (Side Sheet M column):** distance between the ground and the highest point on the roof sill (usually located in the sill-roof joint), measured in the front door middle point.
- **Floor sill bottom height (22) (Side Sheet N column):** distance between the ground and the lowest point on the floor sill, measured in the front door middle point.
- **Floor sill top height (23) (Side Sheet O column):** distance between the ground and the highest point on the floor sill, measured in the front door middle point.

NOTE

- N/A: dimension not available.