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July 1994

Final Report

Final Report of a Non-Deformable Crabbed Impactor into a 1990 Honda Civic SI in Support of Crash3 Damage Algorithm Reformulation

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16. Abstract

One 214-type non-deformable crabbed impactor side impact test was conducted for research and development in support of the CRASH3 damage algorithm reformulation. This test was conducted at Transportation Research Center Inc. on June 1, 1994.

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214-Type Non-Deformable Crabbed Impactor Side Impact Test 1990 Honda Civic SI CRASH3 Damage Algorithm Reformulation	Document is available to the public from the National Technical Information Service, Springfield, VA 22161

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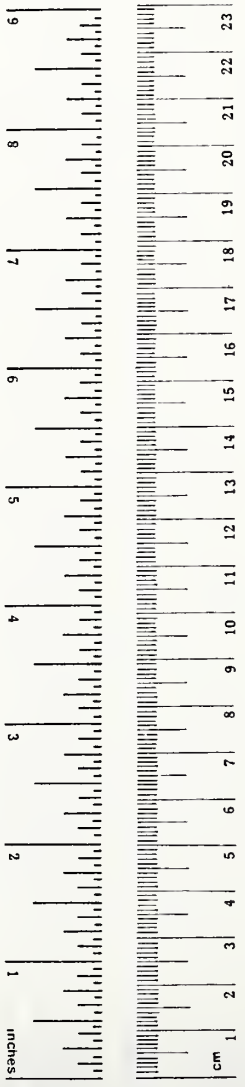
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

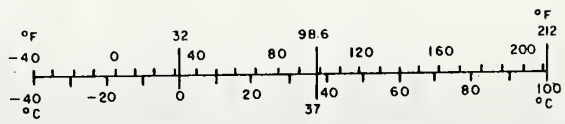
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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Section 1.0

Purpose And Test Procedure

The purpose of this non-deformable crabbed impactor side impact test was for research and development in support of the CRASH3 damage algorithm reformulation.

The 1990 Honda Civic SI was equipped with a 1.6-liter, 4-cylinder, transverse, gasoline engine with a 5-speed manual transmission. The test weight of the vehicle was 1028 killograms.

The vehicle was instrumented with seven (7) accelerometers to measure vehicle X-axis, Y-axis, and Z-axis acceleration.

The impactor was crabbed 27° counterclockwise from the direction of impactor motion. The test weight of the impactor was 1334 kg.

The impactor was instrumented to record data from three (3) accelerometers to measure X-axis, Y-axis, and Z-axis acceleration.

The crash test event was recorded by three (3) high-speed motion picture cameras operating at approximately 1000 frames per second.

Section 2.0

Vehicle And Test Data

Table 1 Test Vehicle Information

Vehicle Manufacturer: Honda of Canada Mfg., Inc. Model Year: 1990

Make/Model: Honda/Civic SI VIN: 2HGED7366LH519414

Body Style: 3-door hatchback Color: Black

Engine Data: Type: Transverse Cylinders: 4 Displacement: 1.6-liter

Transmission Data: 5 Speed, X Manual, _ Automatic, X Fwd, _ Rwd, _4wd

Date Vehicle Received: 05/26/94 Odometer Reading: 62,630

Dealer's Name And Address: NA

Accessories:

Power Steering	Yes	Automatic Transmission	No
Power Brakes	Yes	Automatic Speed Control	No
Power Seats	No	Tilting Steering Wheel	Yes
Power Windows	No	Telescoping Steering Wheel	No
Tinted Glass	Yes	Air Conditioning	Yes
Radio	No	Anti-Skid Brake	No
Clock	Yes	Rear Window Defroster	Yes
Other	None		

Remarks:

1. Is the vehicle stock throughout? Yes
2. Does vehicle show evidence of prior accident history? No
3. Does vehicle show any significant corrosion? No
4. Condition of the front/rear bumper and frame: Good

Certification Data From Vehicle's Label:

Vehicle Manufactured By: Honda of Canada Mfg., Inc.
Date Of Manufacture: 11/89 VIN: 2HGED7366LH519414
GVWR: Na lbs.
GAWR: Front: Na lbs., Rear: Na lbs.

Table 1 Test Vehicle Information, Cont'd.

Tires On Vehicle (Mfr., Line, Size): Bridgestone, Potenza, P185/60R14

Tire Pressure With Maximum Capacity Vehicle Load: Front: 241 kPa

Rear: 241 kPa

Spare Tire (Mfr., Line, Size): Goodyear, T-105/80D13

Type Of Seats: Front: Bucket

Rear: Bench

Type Of Front Seat Backs: Manually-adjustable

Maximum Width: 1665 mm

Wheelbase: 2500 mm

Location Of Label Stating Tire Data:

The label was located inside of the glove compartment.

Tire & Capacity Data From Vehicle's Label:

Recommended Tire Size: P185/60R14

Recommended Cold Tire Pressure: Front: 28 psi; Rear: 28 psi

Designated Seating Capacity: 2 Front 3 Rear 5 Total

Vehicle Capacity Weight: 850 lbs.

Test Vehicle Attitude (All Measurements Are In Millimeters):

Delivered Attitude:	LF 630;	RF 638;	LR 659;	RR 661
Pre-Test Attitude:	LF 620;	RF 624;	LR 662;	RR 666
Post-Test Attitude:	LF 585;	RF 585;	LR 650;	RR 664

Table 1 Vehicle Information, Cont'd.

Weight Of Test Vehicle As Received (With Maximum Fluids):

Right Front	308	KG	Right Rear	188	KG
Left Front	333	KG	Left Rear	188	KG
Total Front Weight	641	KG	(63.0% Of Total Vehicle Weight)		
Total Rear Weight	376	KG	(27.0% Of Total Vehicle Weight)		
Total Delivered Weight	1017	KG			

Weight Of Test Vehicle:

Right Front	332	KG	Right Rear	176	KG
Left Front	351	KG	Left Rear	169	KG
Total Front Weight	683	KG	(66.4% Of Total Vehicle Weight)		
Total Rear Weight	345	KG	(23.6% Of Total Vehicle Weight)		
Total Test Weight	1028	KG			

Weight Of Ballast Secured In Vehicle Cargo Area: 0 KG

Components Removed To Meet Target Test Weight: None

CG = 839 MM Rearward Of Front Wheel Centerline

Table 2

Profile Measurements At Vehicle Axle Height 272 mm

Location	0		1		2		3		4		5		6		7	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	489	1316	490	1238	494	1165	499	1088	503	1012	512	936	523	862	538	789
Post-Test	514	1278	517	1198	521	1124	527	1048	536	970	546	893	559	820	573	748

Location	8		9		10		11		12		13		14		15	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	553	729	570	667	601	610	650	581	700	566	771	550	850	533	1547	542
Post-Test	591	690	611	628	641	573	688	544	740	530	816	517	892	502	1584	746

Location	16		17		18		19		20		21		22		23	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	1613	546	1690	546	1767	546	1845	544	1916	545	1995	545	2067	544	2147	544
Post-Test	1630	766	1700	808	1772	815	1841	882	1898	842	1977	812	2046	810	2122	810

Location	24		25		26		27		28		29		30		31	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2220	544	2298	543	2373	538	2450	538	2525	538	2603	539	2676	540	2754	541
Post-Test	2196	800	2294	794	2352	791	2427	786	2497	786	2572	786	2638	791	2710	794

Location	32		33		34		35		36		37		38		39	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2828	543	2908	541	2985	541	3060	542	3135	543	3215	543	3290	544	NA	NA
Post-Test	2812	789	2911	790	2955	781	3080	772	3156	762	3221	742	3288	708	NA	NA

All meausrements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Table 3

Profile Measurements At Vehicle H-Point Height 460 mm

Location	0		1		2		3		4		5		6		7	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	419	1322	420	1244	423	1169	427	1093	434	1017	443	941	453	866	468	790
Post-Test	457	1288	459	1212	463	1134	470	1058	478	980	488	904	500	832	519	755

Location	8		9		10		11		12		13		14		15	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	486	717	509	646	555	582	626	557	698	540	775	528	851	518	1517	502
Post-Test	537	682	562	610	607	550	680	525	754	515	832	505	907	501	1500	793

Location	16		17		18		19		20		21		22		23	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	1595	502	1672	500	1746	500	1823	500	1899	500	1956	500	2052	494	2131	495
Post-Test	1587	824	1680	865	1749	871	1825	880	1897	885	1972	892	2047	893	2122	895

Location	24		25		26		27		28		29		30		31	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2206	495	2282	495	2355	495	2435	496	2509	498	2585	498	2658	499	2738	500
Post-Test	2195	895	2270	895	2340	897	2413	897	2483	898	2560	893	2630	885	2706	879

Location	32		33		34		35		36		37		38		39	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2814	500	2891	501	2970	503	3043	504	3122	504	3197	505	3270	505	3347	505
Post-Test	2780	876	2850	876	2980	893	3050	886	3140	879	3215	860	3240	790	3288	720

All meausrements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Table 3, Cont'd.

Profile Measurements At Vehicle H-Point Height 460 mm

Location	40		41		42		43		44		45		46		47	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Location	48		49		50		51		52		53		54		55	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	4030	510	4110	518	4186	526	4256	540	4311	590	4331	662	4345	739	4356	813
Post-Test	4018	473	4097	480	4170	485	4248	496	4302	542	4323	682	4336	692	4347	770

Location	56		57		58		59		60		61		62		63	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	4363	892	4367	968	4371	1042	4374	1117	4331	1191	4327	1217	4331	1346	NA	NA
Post-Test	4355	846	4361	926	4366	998	4370	1076	4328	1152	4324	1222	4330	1296	NA	NA

All meausrements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Table 4

Profile Measurements At Vehicle Mid Door Height 567mm

Location	0		1		2		3		4		5		6		7	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	4430	1324	4427	1252	4426	1175	4420	1102	4415	1023	4399	946	4387	871	4372	808
Post-Test	4390	1291	4383	1222	4378	1142	4371	1072	4361	996	4350	916	4334	838	4317	777

Location	8		9		10		11		12		13		14		15	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	4356	750	4343	705	4331	666	4312	644	4276	606	4223	585	4152	569	1517	513
Post-Test	4298	714	4287	670	4270	638	4240	604	4202	577	4149	561	4072	560	1533	729

Location	16		17		18		19		20		21		22		23	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	1588	513	1668	513	1745	511	1825	509	1898	509	1976	509	2047	507	2127	506
Post-Test	1590	763	1682	823	1760	823	1839	829	1910	823	1985	825	2060	820	2137	825

Location	24		25		26		27		28		29		30		31	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2200	506	2280	506	2352	505	2431	505	2505	505	2582	505	2658	505	2735	505
Post-Test	2208	829	2287	829	2379	836	2449	838	2580	837	2650	838	2697	840	2810	850

Location	32		33		34		35		36		37		38		39	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2809	505	2889	505	2966	507	3042	508	3116	509	3192	509	3267	509	3345	510
Post-Test	2884	849	2928	842	3035	883	3091	872	3165	869	3220	837	3298	788	3322	749

All meausrements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Table 4, Cont'd.

Profile Measurements At Vehicle Mid Door Height 567mm

Location	40		41		42		43		44		45		46		47	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3955	505
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3930	466

Location	48		49		50		51		52		53		54		55	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	4029	509	4107	515	4176	522	4256	533	4317	590	4335	661	4349	740	4352	811
Post-Test	4010	469	4090	474	4161	475	4239	490	4302	544	4323	616	4336	695	4344	764

Location	56		57		58		59		60		61		62		63	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	4360	888	4364	966	4369	1041	4371	1119	4376	1192	4377	1270	4379	1345	NA	NA
Post-Test	4350	837	4358	917	4364	987	4368	1068	4372	1145	4374	1217	4378	1292	NA	NA

All meausrements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Table 5

Profile Measurements At Vehicle Window Sill Height 796 mm

Location	0		1		2		3		4		5		6		7	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Location	8		9		10		11		12		13		14		15	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1519	585
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1567	672

Location	16		17		18		19		20		21		22		23	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	1593	579	1671	572	1745	568	1822	566	1896	560	1978	556	2053	552	2130	552
Post-Test	1630	709	1705	760	1775	780	1850	779	1925	778	2006	778	2080	779	2155	780

Location	24		25		26		27		28		29		30		31	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2202	550	2280	547	2356	546	2436	544	2510	541	2586	538	2662	538	2742	538
Post-Test	2226	780	2303	784	2375	784	2453	783	2527	783	2602	782	2676	783	2753	783

Location	32		33		34		35		36		37		38		39	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2815	537	2892	537	2967	536	3046	537	3120	537	3195	536	3270	535	3348	535
Post-Test	2843	787	2913	791	2999	793	3040	813	3112	800	3185	788	3262	750	3310	694

All meausrements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Table 5, Cont'd.

Profile Measurements At Vehicle Window Sill Height 796mm

Location	40		41		42		43		44		45		46		47	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	3421	535	3500	533	3575	536	3655	536	3732	536	3805	539	3882	540	3959	544
Post-Test	3380	665	3458	643	3545	622	3615	598	3696	575	3770	555	3845	539	3920	526

Location	48		49		50		51		52		53		54		55	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	4035	552	4111	558	4152	568	4191	597	4211	635	4222	689	4234	755	4244	833
Post-Test	3997	520	4070	523	4111	545	4158	543	4210	557	4224	609	4238	673	4250	748

Location	56		57		58		59		60		61		62		63	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	4251	905	4257	985	4261	1060	4265	1133	4267	1215	4268	1289	4267	1364	NA	NA
Post-Test	4260	824	4267	902	4273	980	4278	1055	4280	1133	4284	1207	4286	1282	NA	NA

All meausrements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Table 6

Profile Measurements At Vehicle Window Top Height 1265 mm

Location	0		1		2		3		4		5		6		7	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Location	8		9		10		11		12		13		14		15	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3481	585
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3433	672

Location	16		17		18		19		20		21		22		23	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Location	24		25		26		27		28		29		30		31	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	2292	809	2370	807	2448	802	2525	790	2604	793	2676	797	2754	797
Post-Test	NA	NA	2263	787	2340	779	2420	773	2493	773	2575	770	2647	765	2710	65

Location	32		33		34		35		36		37		38		39	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	2830	798	2907	798	2982	800	3060	795	3133	796	3212	796	3292	797	3367	800
Post-Test	2802	762	2878	761	2953	760	3030	757	3102	751	3182	749	3267	749	3336	749

All meausrements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Table 6, Cont'd.

Profile Measurements At Vehicle Window Top Height 1265 mm

Location	40		41		42		43		44		45		46		47	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	3440	802	3519	804	3591	805	3670	808	3742	812	3821	817	3895	827	3959	544
Post-Test	3408	747	3488	748	3560	751	3638	752	3710	755	3788	757	3860	766	3920	526

Location	48		49		50		51		52		53		54		55	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

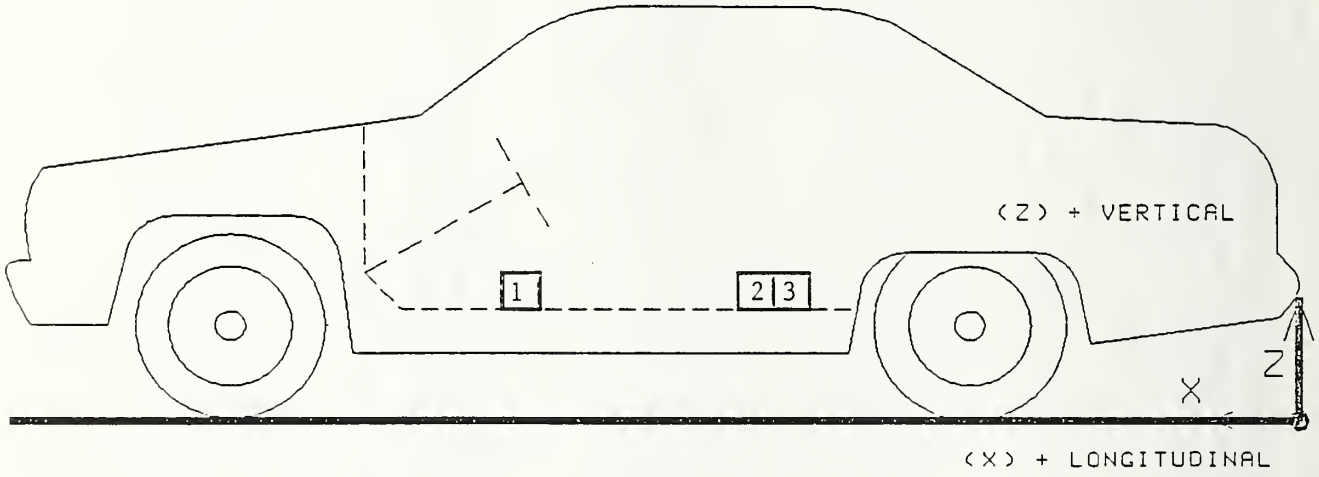
Location	56		57		58		59		60		61		62		63	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Pre-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Post-Test	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

All measurements are in millimeters. Column readings are 75 millimeters apart starting on the left side of the vehicle.

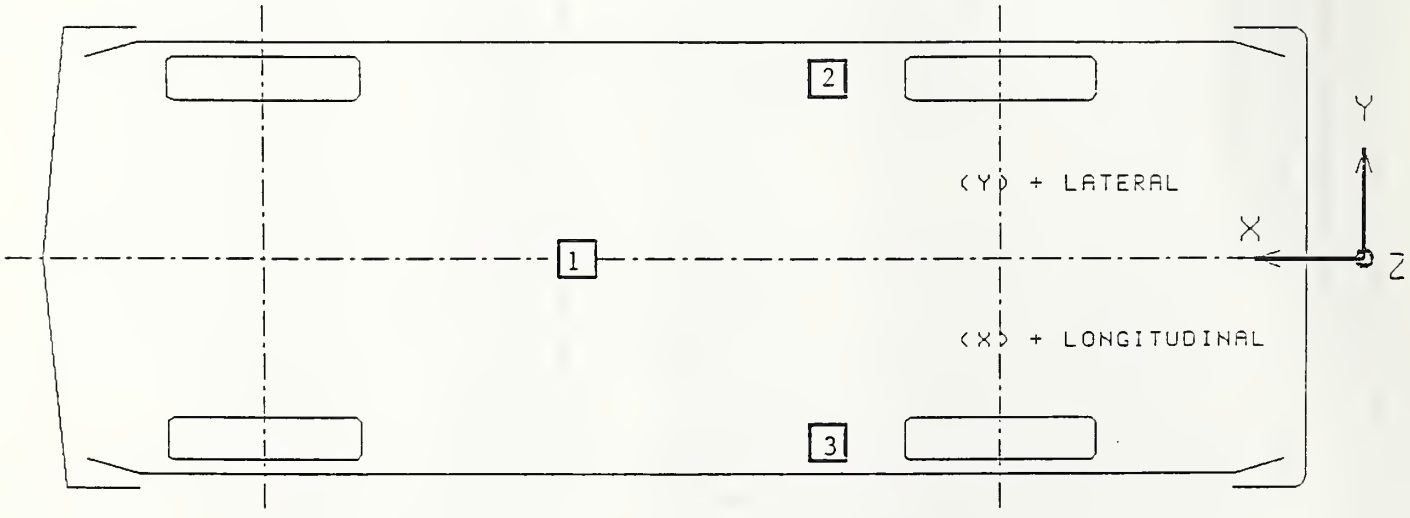
All X-axis measurements taken from a reference plane 500 millimeters from and parallel to the rear bumper.

All Y-axis measurements taken from a reference plane 1200 millimeters from and parallel to the vehicle's longitudinal centerline

Figure 1 Vehicle Accelerometer Placement

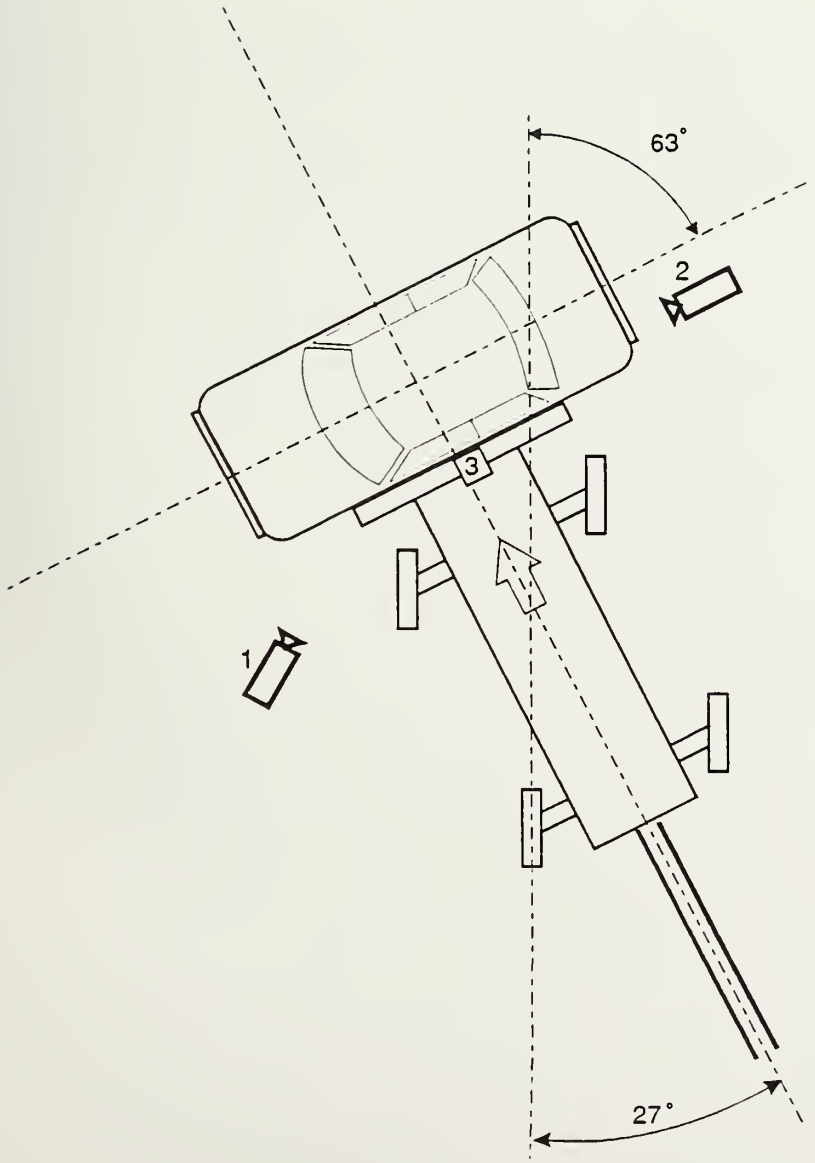


SIDE VIEW



BOTTOM VIEW

Figure 2 Camera Positions



Section 3.0

Test Summary

Table 7 Test Conditions

Test No. 940601

Date Of Test: 06/01/94

Time Of Test: 13:57

Ambient Temperature At Impact Area: 23° C

Intended Impact Velocity: 53.9 kph

Actual Impact Velocity: Primary = 53.9 kph
Secondary = 53.9 kph

Subject Vehicle Data

Length Of Direct Contact Damage: 1689 mm

Maximum Cumulative Crush

At Vehicle Axle Height:	338	mm
At Vehicle H-Point Height:	402	mm
At Vehicle Mid Door Height:	376	mm
At Vehicle Window Sill Height:	276	mm
At Vehicle Window Top Height:	-61	mm

All distance measurements are in millimeters.

Table 8 Vehicle Crush At Axle Height

Test No. 940601

FL =	2440
C1 =	-31
C2 =	120
C3 =	323
C4 =	252
C5 =	247
C6 =	164

NOTE: FL is the post-test length of the damaged surface.

Measurements C1 - C6 were spaced equally apart over the post-impact length of the damaged surface. This distance is defined as length "FL" on the vehicle crush profile plot.

All measurements are in millimeters.

Figure 3
Vehicle Crush Profile At Axle Height

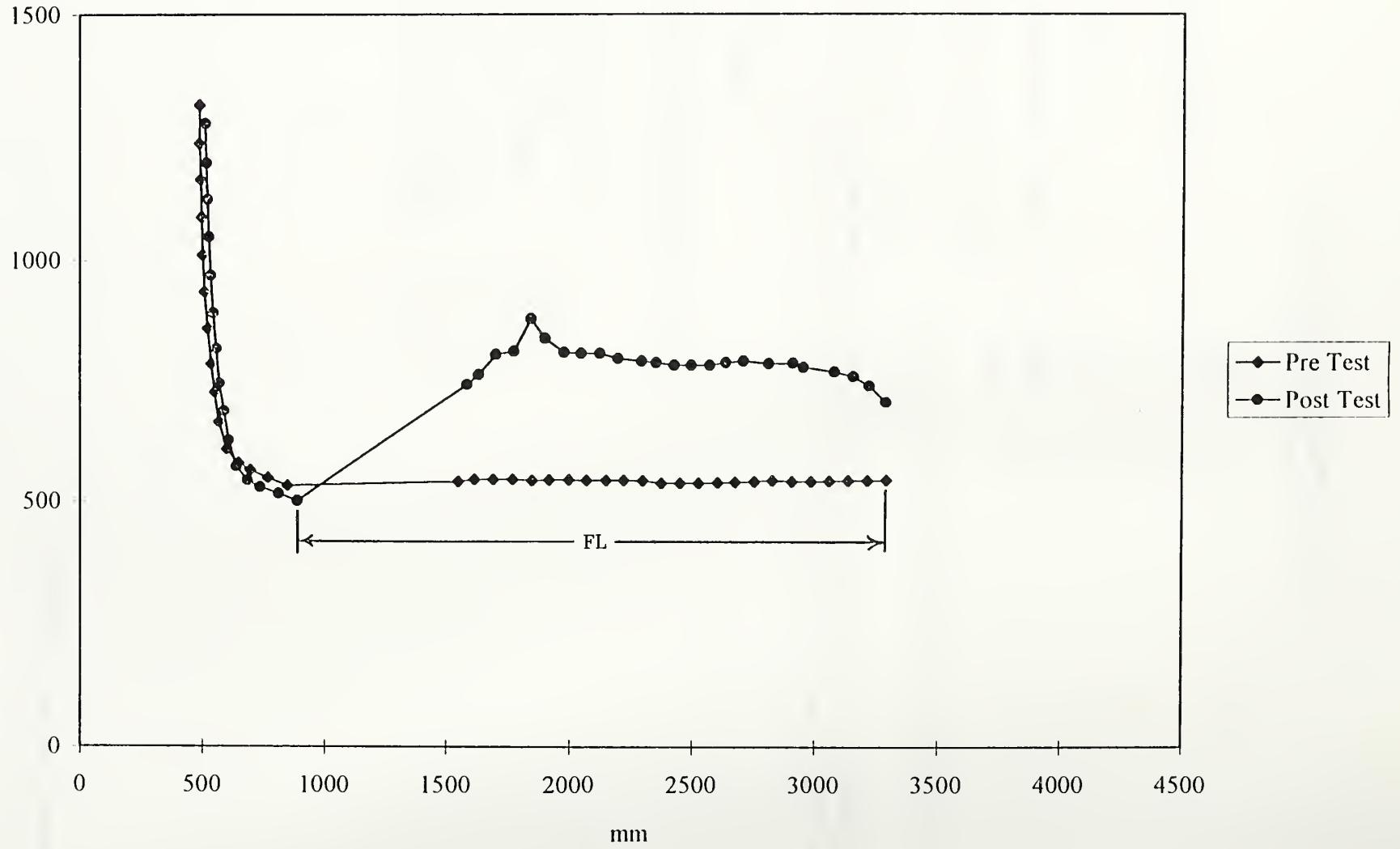


Table 9 Vehicle Crush At H-Point Height

Test No. 940601

FL =	2518
C1 =	291
C2 =	395
C3 =	398
C4 =	386
C5 =	137
C6 =	-37

NOTE: FL is the post-test length of the damaged surface.

Measurements C1 - C6 were spaced equally apart over the post-impact length of the damaged surface. This distance is defined as length "FL" on the vehicle crush profile plot.

All measurements are in millimeters.

Figure 4
Vehicle Crush Profile At H-Point Height

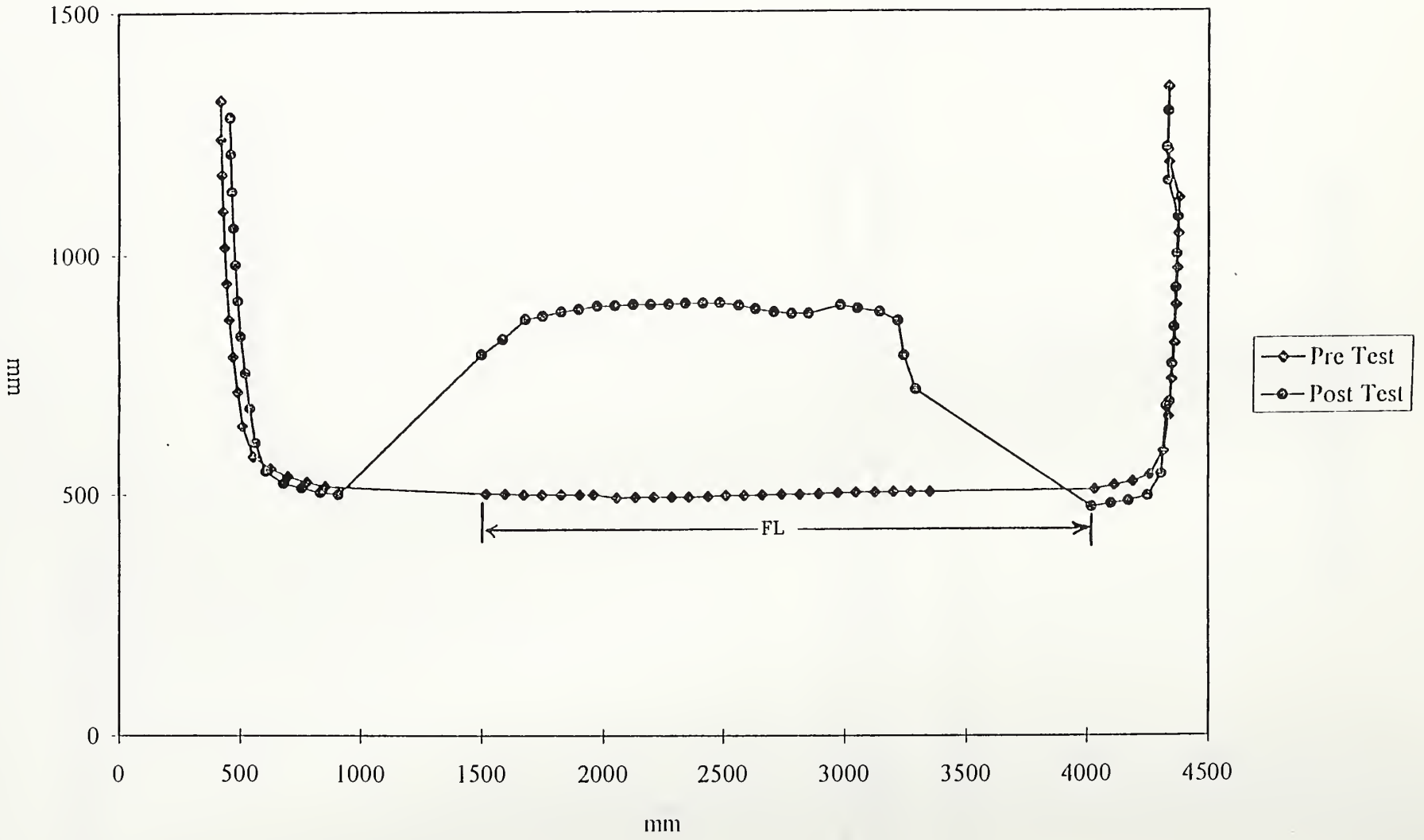


Table 10 Vehicle Crush At Mid Door Height

Test No. 940601

FL =	2397
C1 =	216
C2 =	315
C3 =	333
C4 =	353
C5 =	180
C6 =	-39

NOTE: FL is the post-test length of the damaged surface.

Measurements C1 - C6 were spaced equally apart over the post-impact length of the damaged surface. This distance is defined as length "FL" on the vehicle crush profile plot.

All measurements are in millimeters.

Figure 5
Vehicle Crush Profile At Mid-Door Height

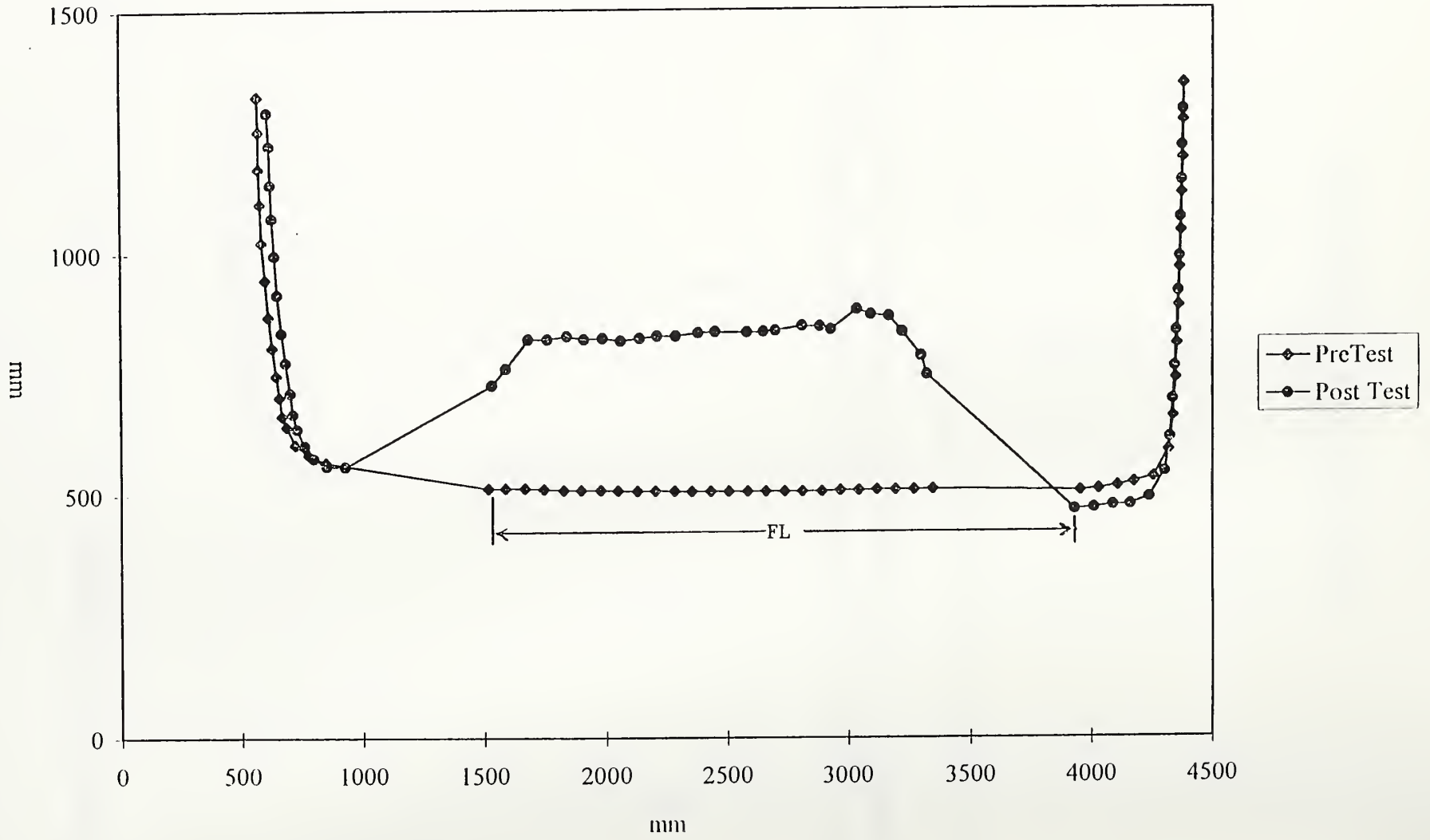


Table 11 Vehicle Crush At Window Sill Height

Test No. 940601

FL =	2278
C1 =	87
C2 =	223
C3 =	240
C4 =	255
C5 =	128
C6 =	-1

NOTE: FL is the post-test length of the damaged surface.

Measurements C1 - C6 were spaced equally apart over the post-impact length of the damaged surface. This distance is defined as length "FL" on the vehicle crush profile plot.

All measurements are in millimeters.

Figure 6
Vehicle Crush Profile At Window Sill Height

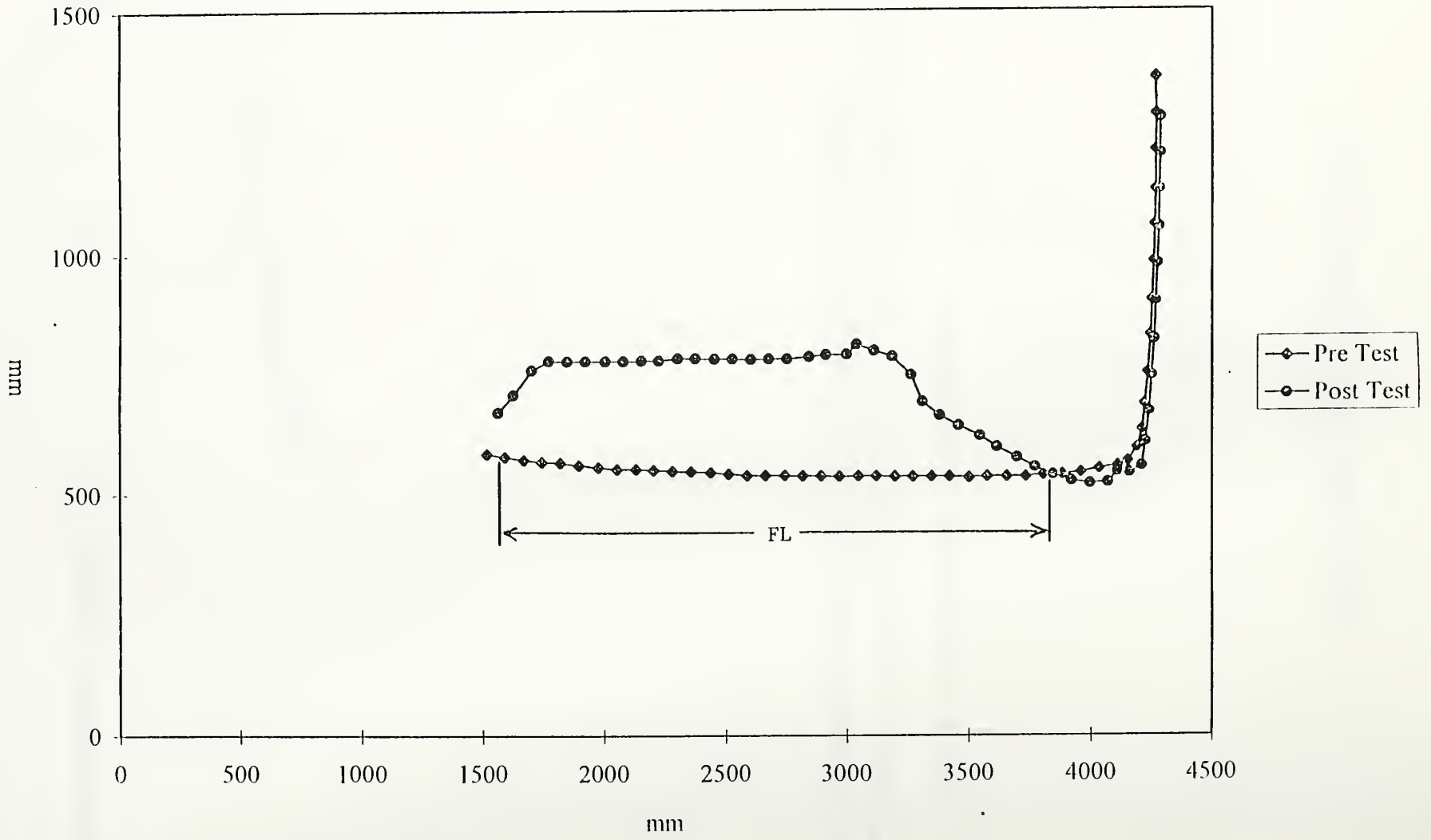


Table 12 Vehicle Crush At Window Top Height

Test No. 940601

FL =	1597
C1 =	-22
C2 =	-24
C3 =	-38
C4 =	-47
C5 =	-55
C6 =	-61

NOTE: FL is the post-test length of the damaged surface.

Measurements C1 - C6 were spaced equally apart over the post-impact length of the damaged surface. This distance is defined as length "FL" on the vehicle crush profile plot.

All measurements are in millimeters.

Figure 7
Vehicle Crush Profile At Window Top Height

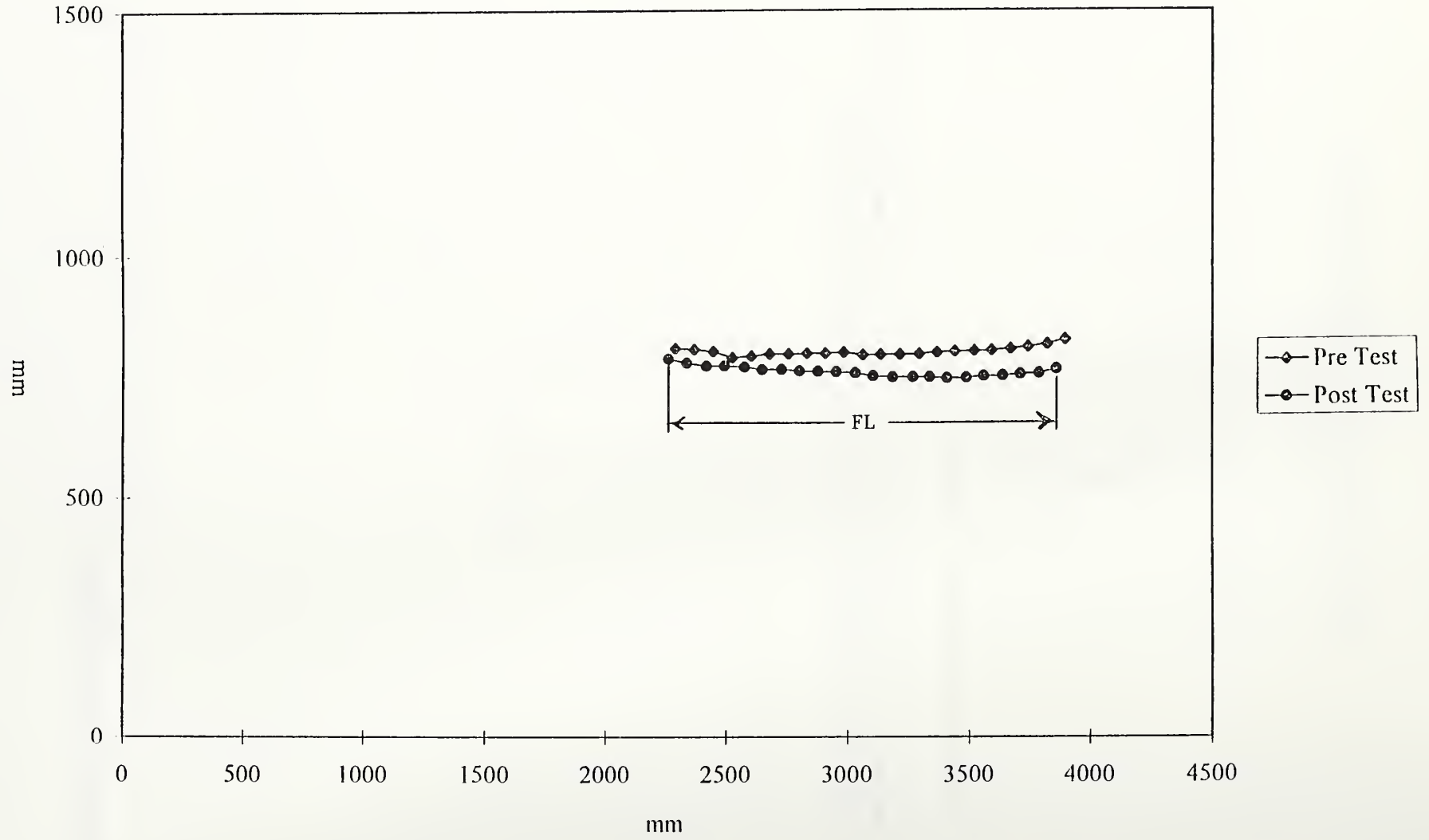


Table 13 Vehicle Accelerometer Locations And Data Summary

Test No. 940601

TEST NUMBER: 940601 No. LOCATION	X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
1 VEHICLE CENTER OF GRAVITY	1461 mm	0 mm	248 mm				
LONGITUDINAL				5.5 g	@ 64.5 ms	10.2 g	@ 39.0 ms
LATERAL				2.2 g	@ 168.2 ms	24.1 g	@ 12.4 ms
VERTICAL				16.4 g	@ 23.2 ms	17.3 g	@ 36.2 ms
RESULTANT				29.5 g	@ 12.3 ms		
2 LEFT REAR SILL	1438 mm	560 mm	308 mm				
LONGITUDINAL[1]				---- g	@ ---- ms	---- g	@ ---- ms
LATERAL[1]				---- g	@ ---- ms	---- g	@ ---- ms
3 RIGHT REAR SILL	1438 mm	-560 mm	308 mm				
LONGITUDINAL				7.0 g	@ 26.6 ms	10.9 g	@ 12.0 ms
LATERAL				2.1 g	@ 163.0 ms	27.7 g	@ 37.9 ms

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

[1] See DATA ACQUISITION EXPLANATIONS

Table 14 Crabbed Impactor Accelerometer Locations And Data Summary

Test No. 940601

TEST NUMBER: 940601 No. LOCATION	X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
1 IMPACTOR	1895	0	315				
CENTER OF GRAVITY							
LONGITUDINAL				1.5 g	@ 199.8 ms	33.5 g	@ 205.9 ms
LATERAL				6.1 g	@ 35.3 ms	15.2 g	@ 201.5 ms
VERTICAL				23.1 g	@ 205.8 ms	4.5 g	@ 74.7 ms
RESULTANT				41.7 g	@ 205.8 ms		

REFERENCE: X: + FORWARD FROM IMPACTOR'S REAR SURFACE
Y: + LEFTWARD FROM IMPACTOR'S LONGITUDINAL CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

Table 15 Camera Information

Test No. 940601

Camera Number	Location	Type	Lens (mm)	Speed (fps)	Purpose Of Camera Data
1	Left wide	Photosonic	13	998	Impact overall
2	Right wide	Photosonic	13	995	Impact overall
3	Overhead	Photosonic	8.5	995	Impact overall

Data Acquisition Explanations

The vehicle's left rear sill X- and Y-axis acceleration data channels, LRSXG1 and LRSYG1, stopped recording data after approximately 50 milliseconds because the device's cables were cut by vehicle crush.

Appendix A

Photographs

List Of Photographs

Test No. 940601

Figure A-1 Pre-Test Front View

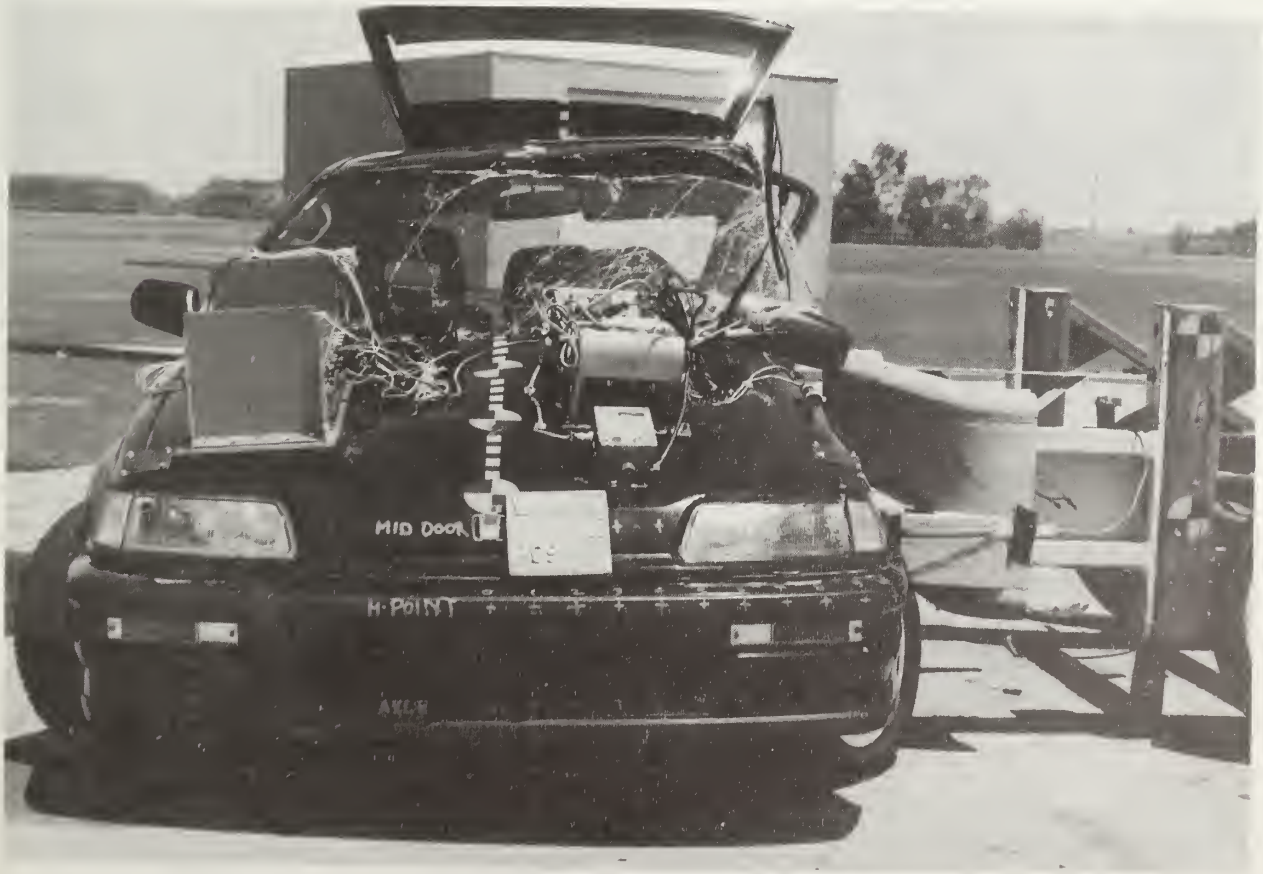


Figure A-2 Post-Test Front View

Figure A-3 Pre-Test Left Front View

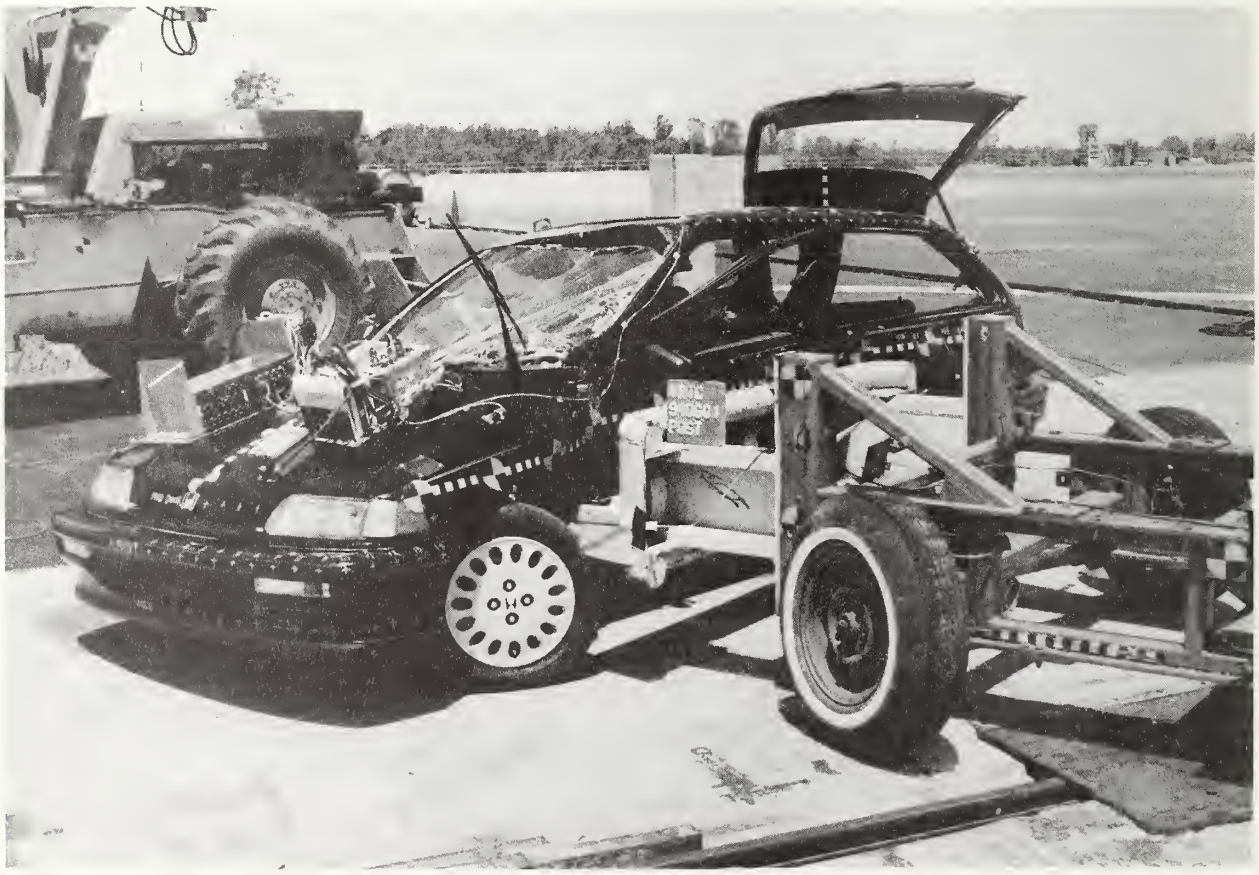


Figure A-4 Post-Test Left Front View

Figure A-5 Pre-Test Left Side View

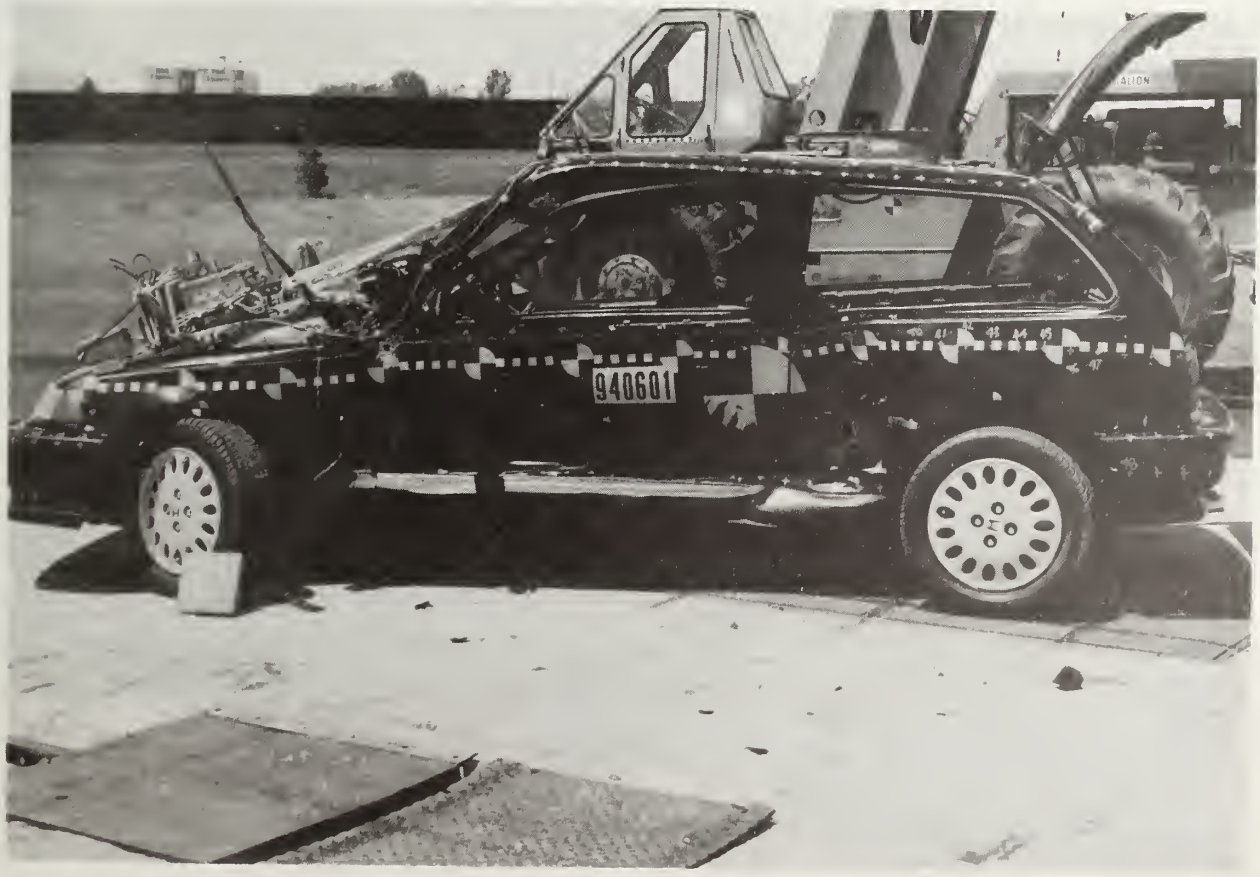


Figure A-6 Post-Test Left Side - View 1

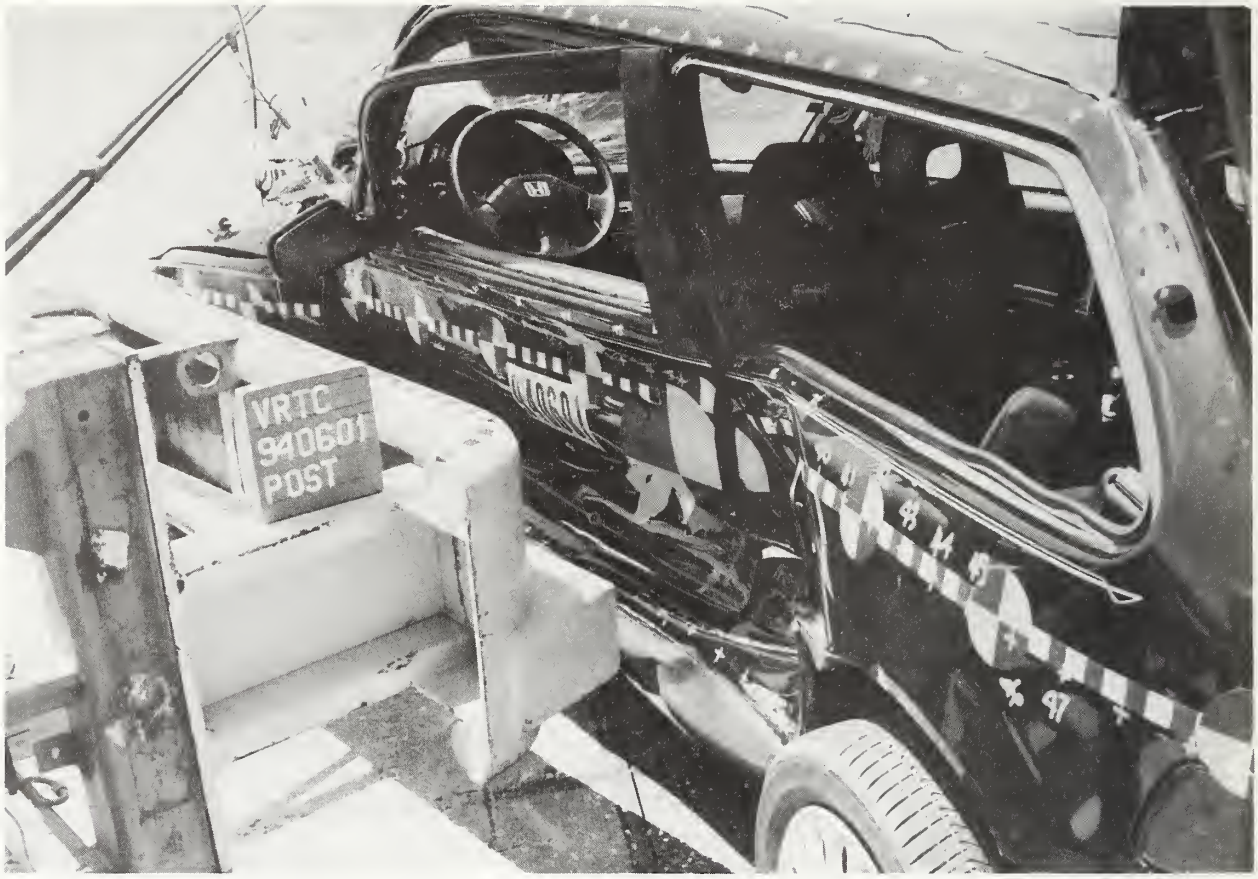


Figure A-7 Post-Test Left Side - View 2

Figure A-8 Pre-Test Left Rear View

Figure A-9 Post-Test Left Rear View

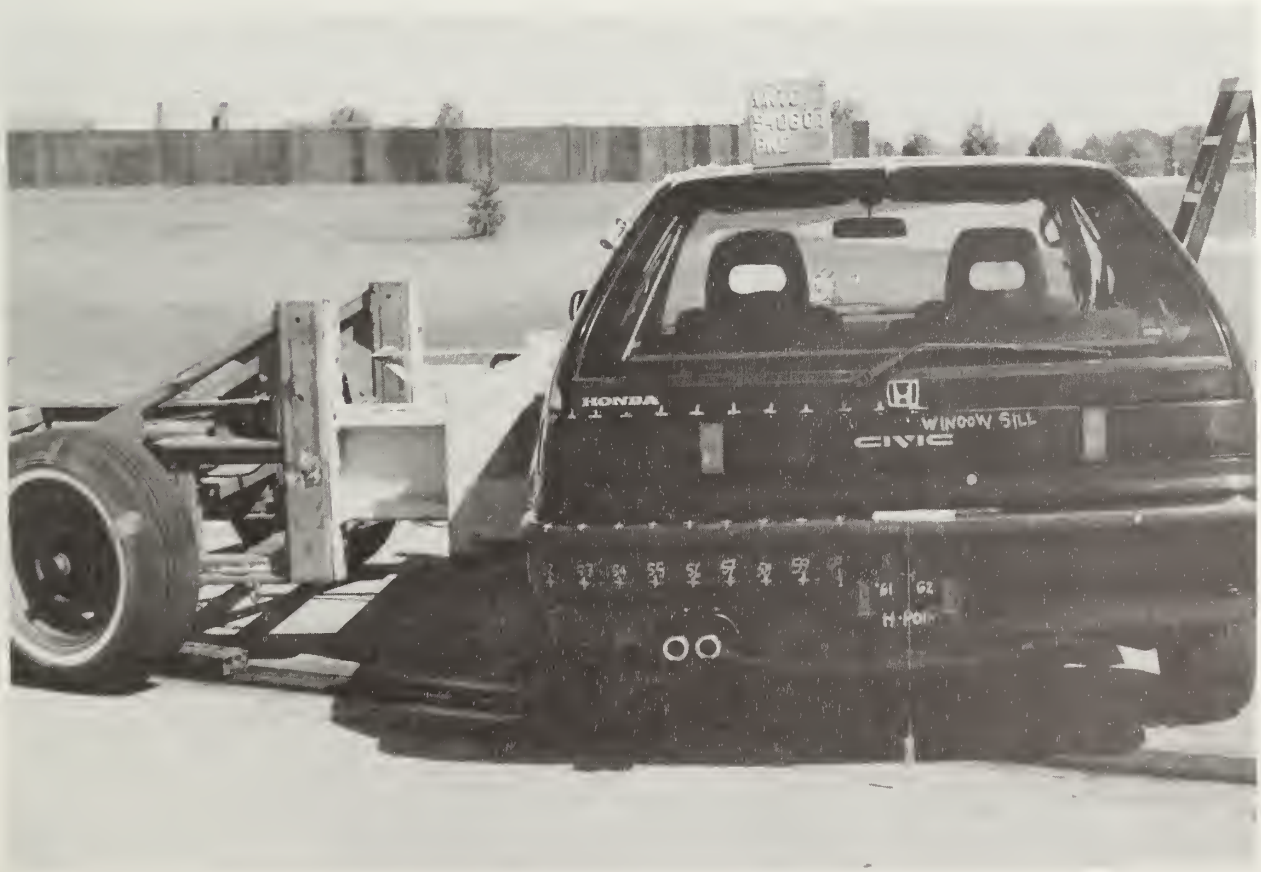


Figure A-10 Pre-Test Rear View

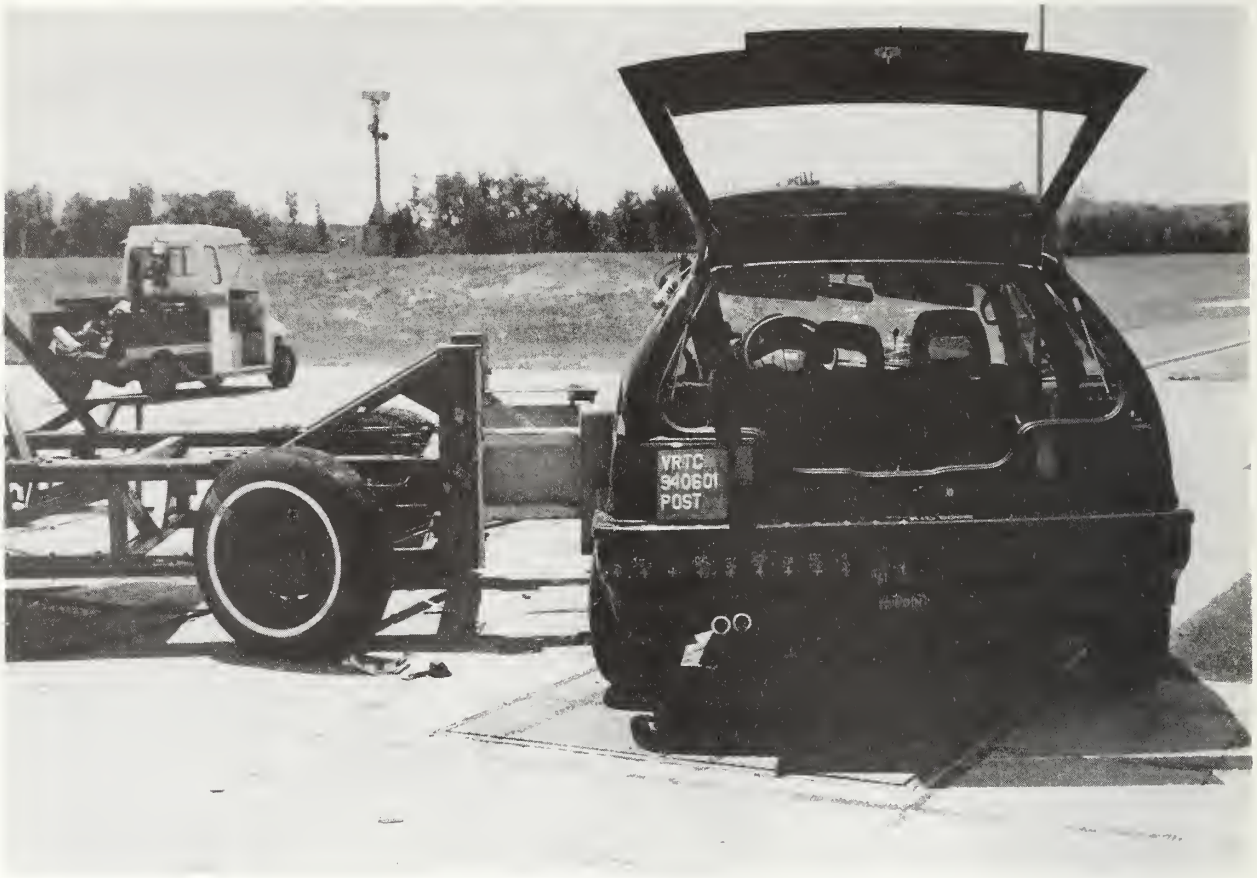


Figure A-11 Post-Test Rear View

Figure A-12 Pre-Test Right Side View

Figure A-13 Post-Test Right Side View

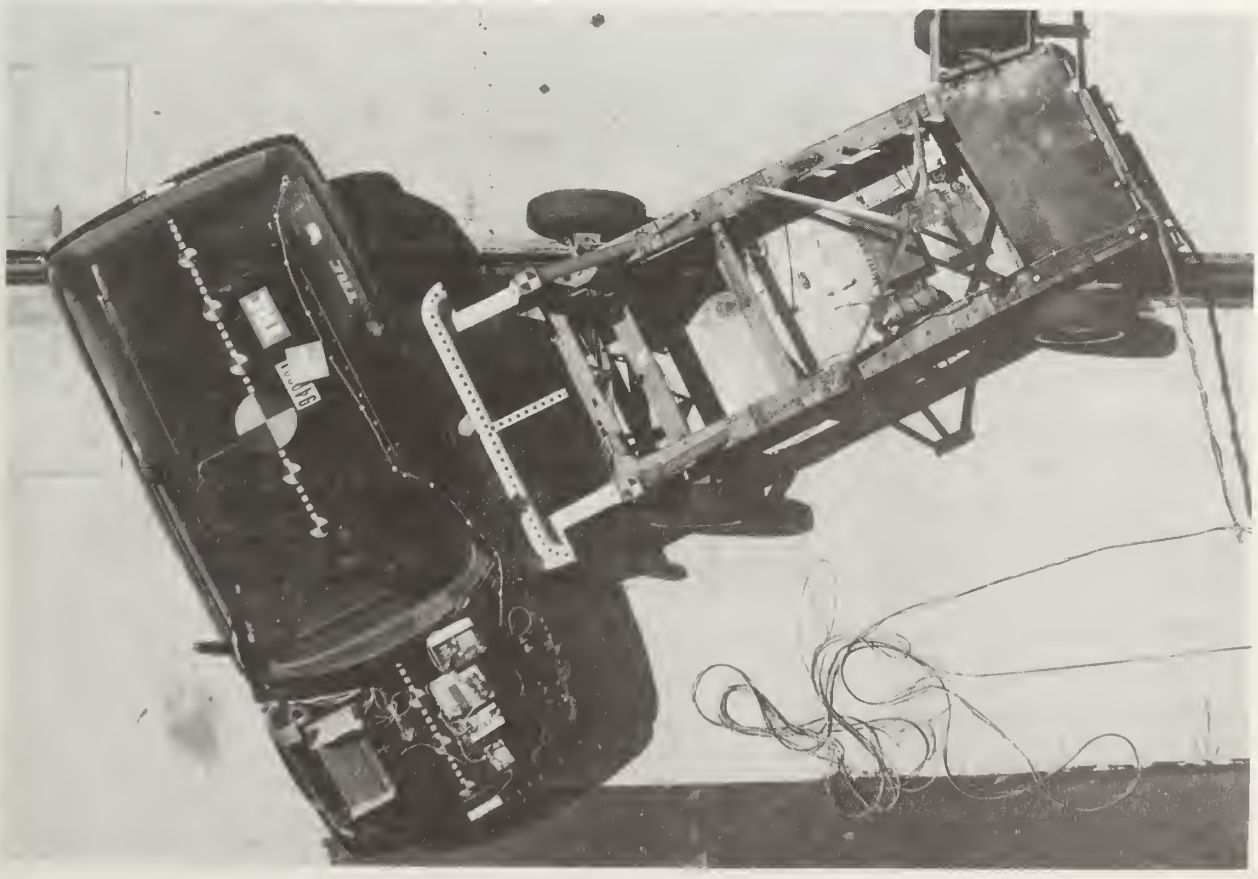


Figure A-14 Pre-Test Overhead Alignment - View 1

Figure A-15 Pre-Test Overhead Alignment - View 2

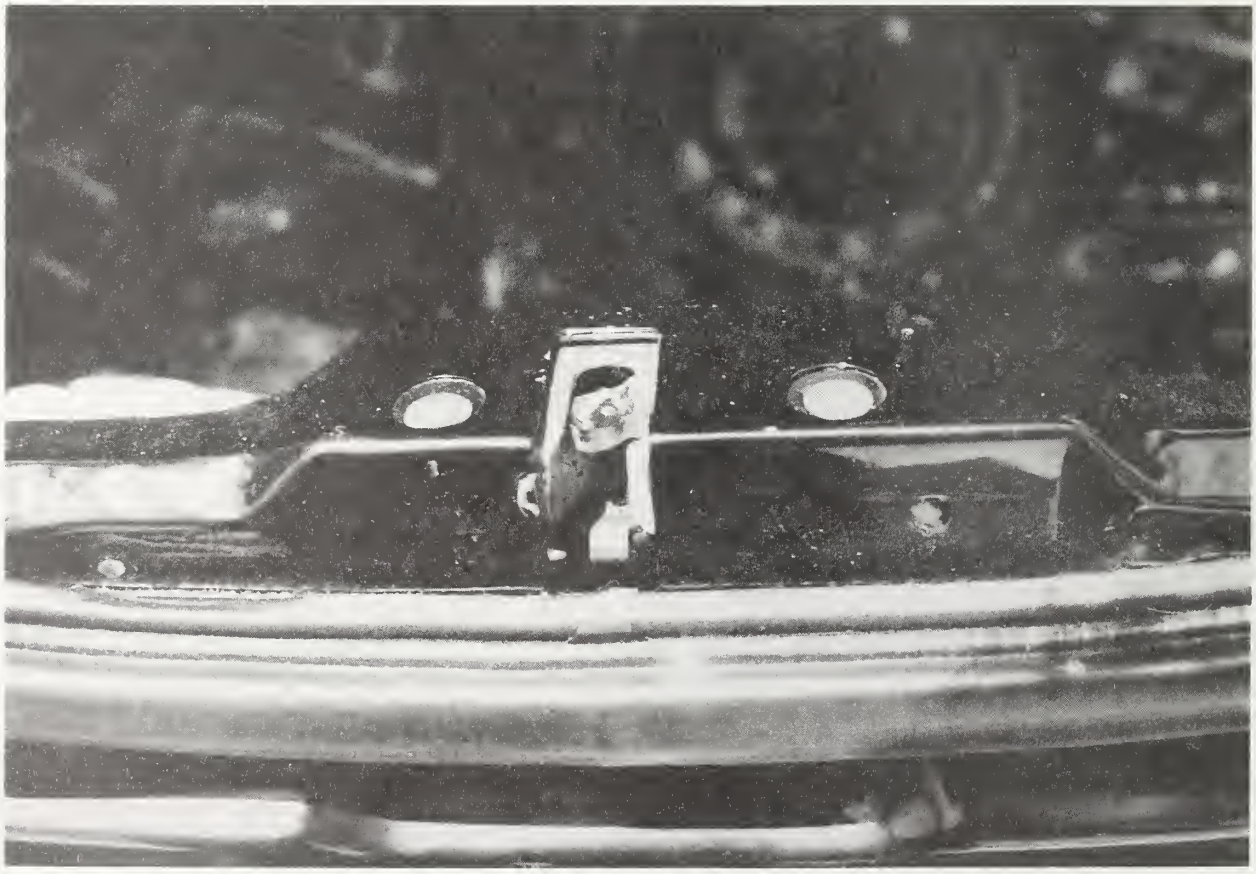


Figure A-16 Post-Test Rear Hatch Latch - View 1

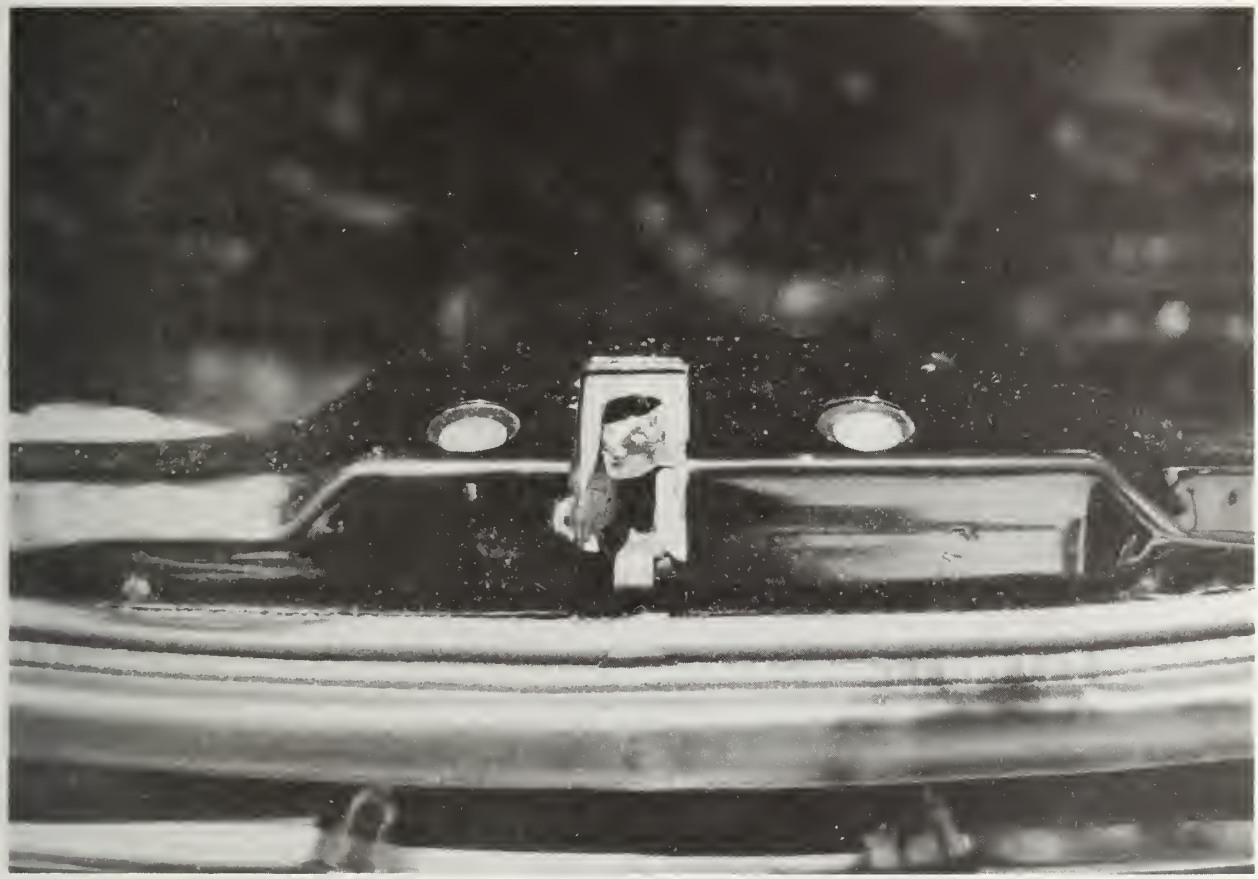


Figure A-17 Post-Test Rear Hatch Latch - View 2

Figure A-18 Post-Test Rear Hatch Striker - View 1

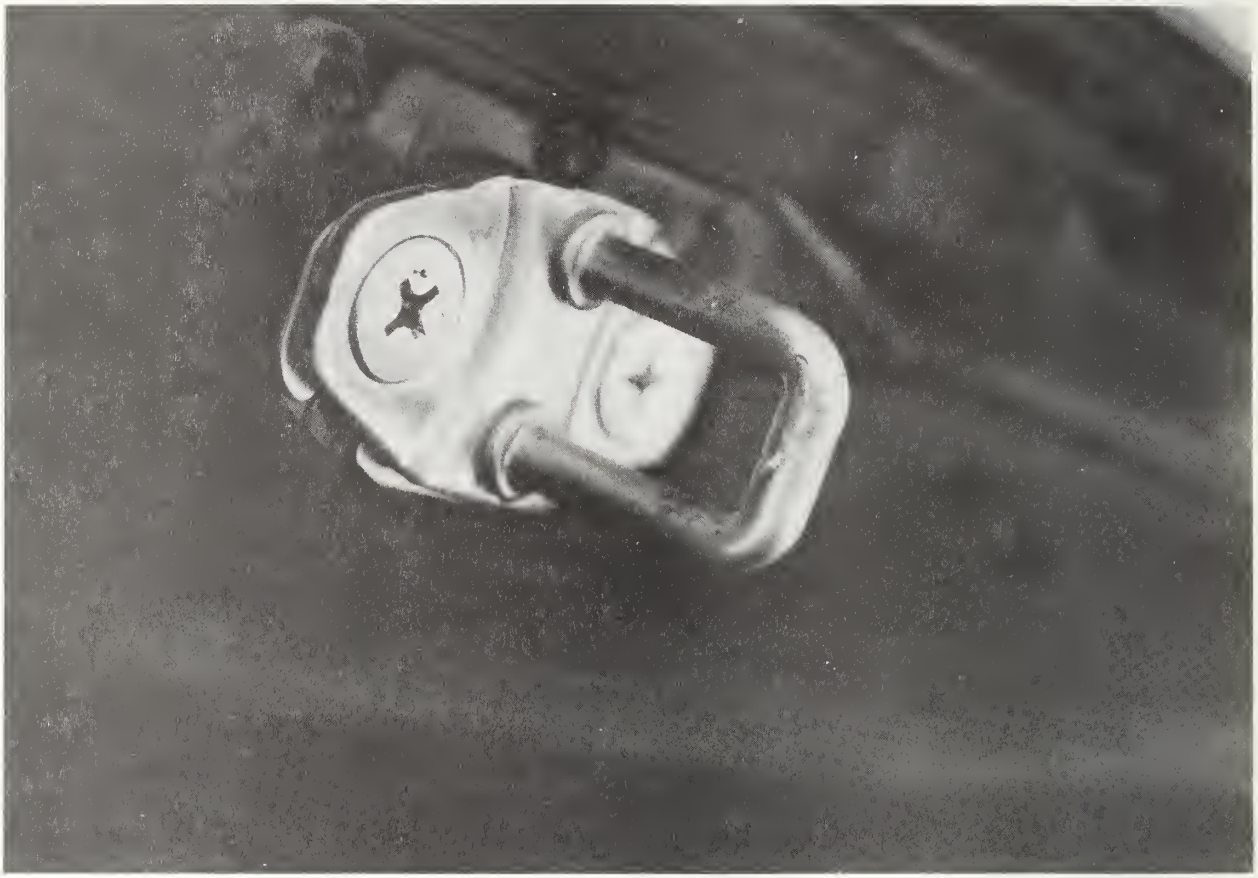


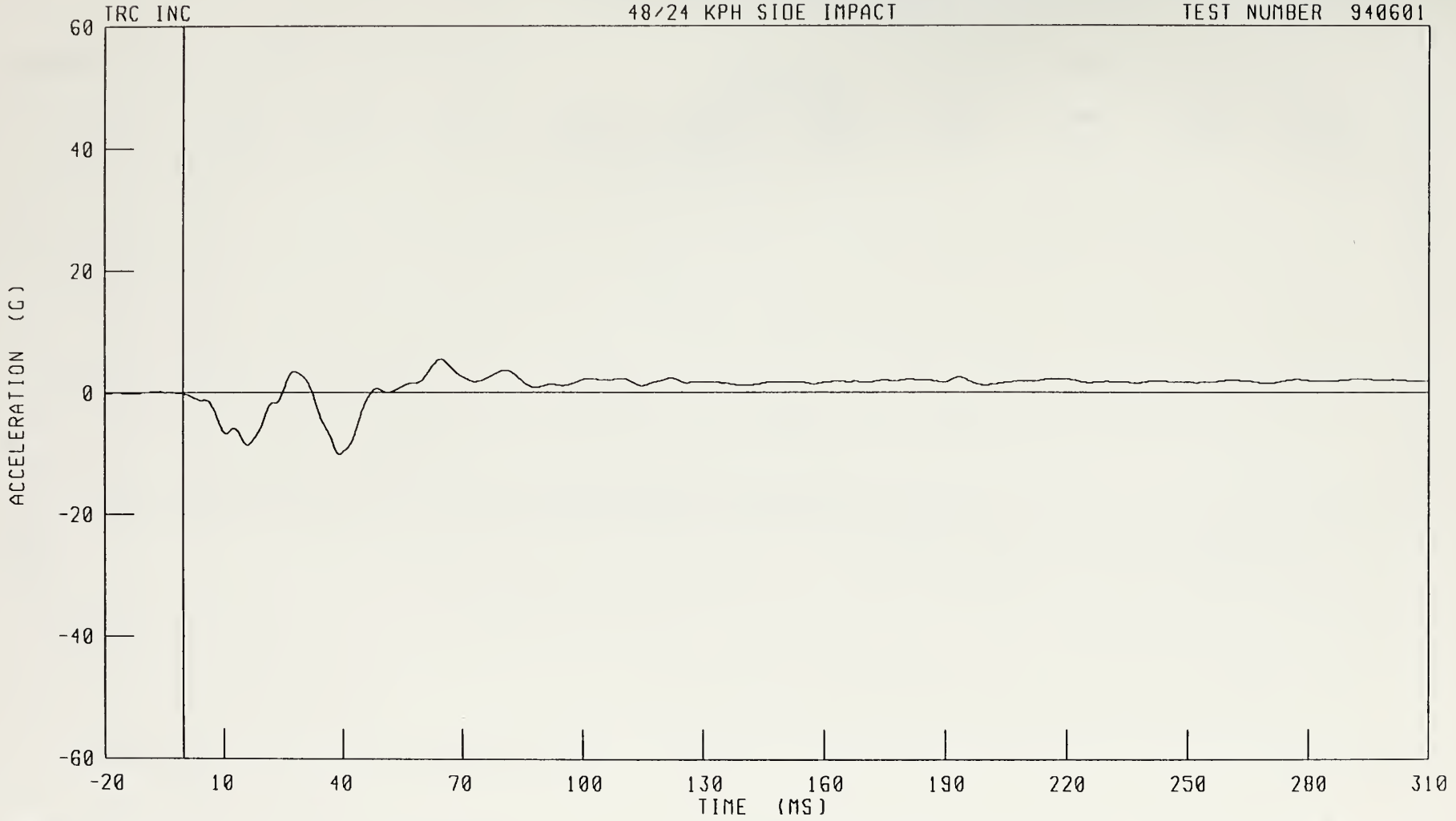
Figure A-19 Post-Test Rear Hatch Striker - View 2

Appendix B

Data Plots

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

VEHICLE CG X-AXIS ACCELERATION

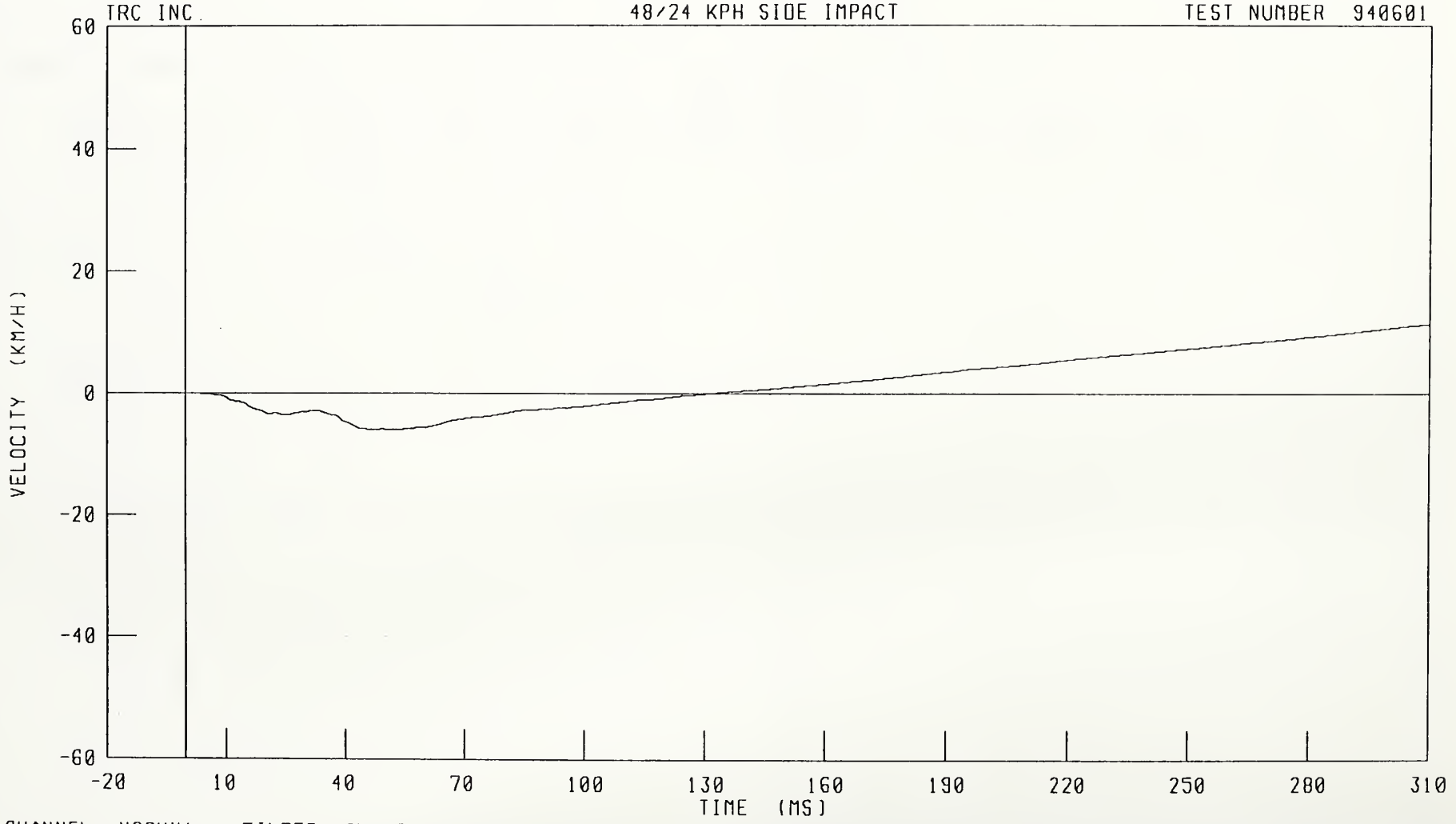


CHANNEL VCGXG1 FILTER CH CLASS 60

PEAK DATA 5 45 G @ 64 48 MS, -10 23 G @ 39 04 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

VEHICLE CG X-AXIS VELOCITY

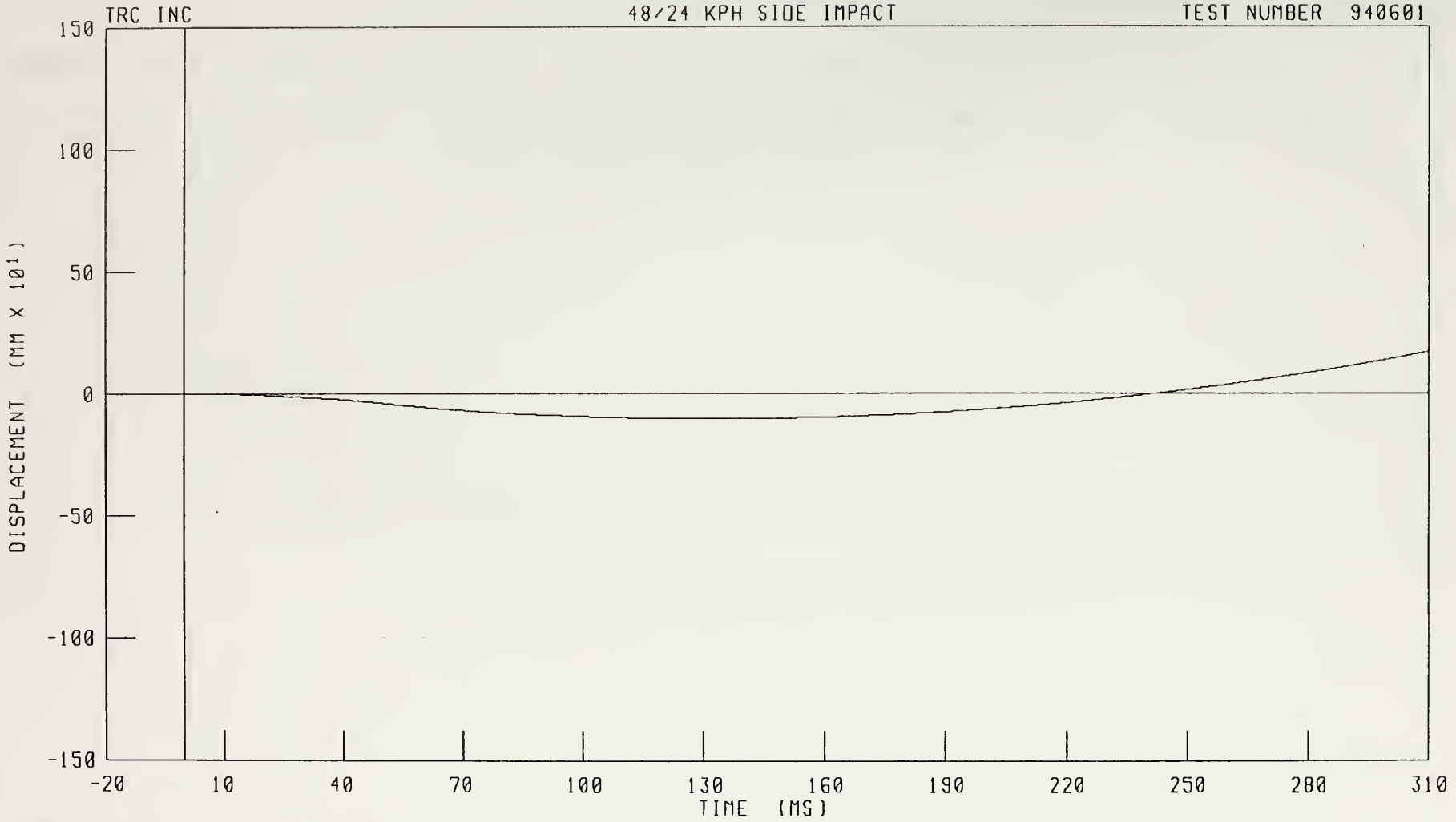


CHANNEL VCGXV1 FILTER CH CLASS 180

PEAK DATA 11 45 KM/H @ 310 00 MS, -5 95 KM/H @ 47 12 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

VEHICLE CG X-AXIS DISPLACEMENT

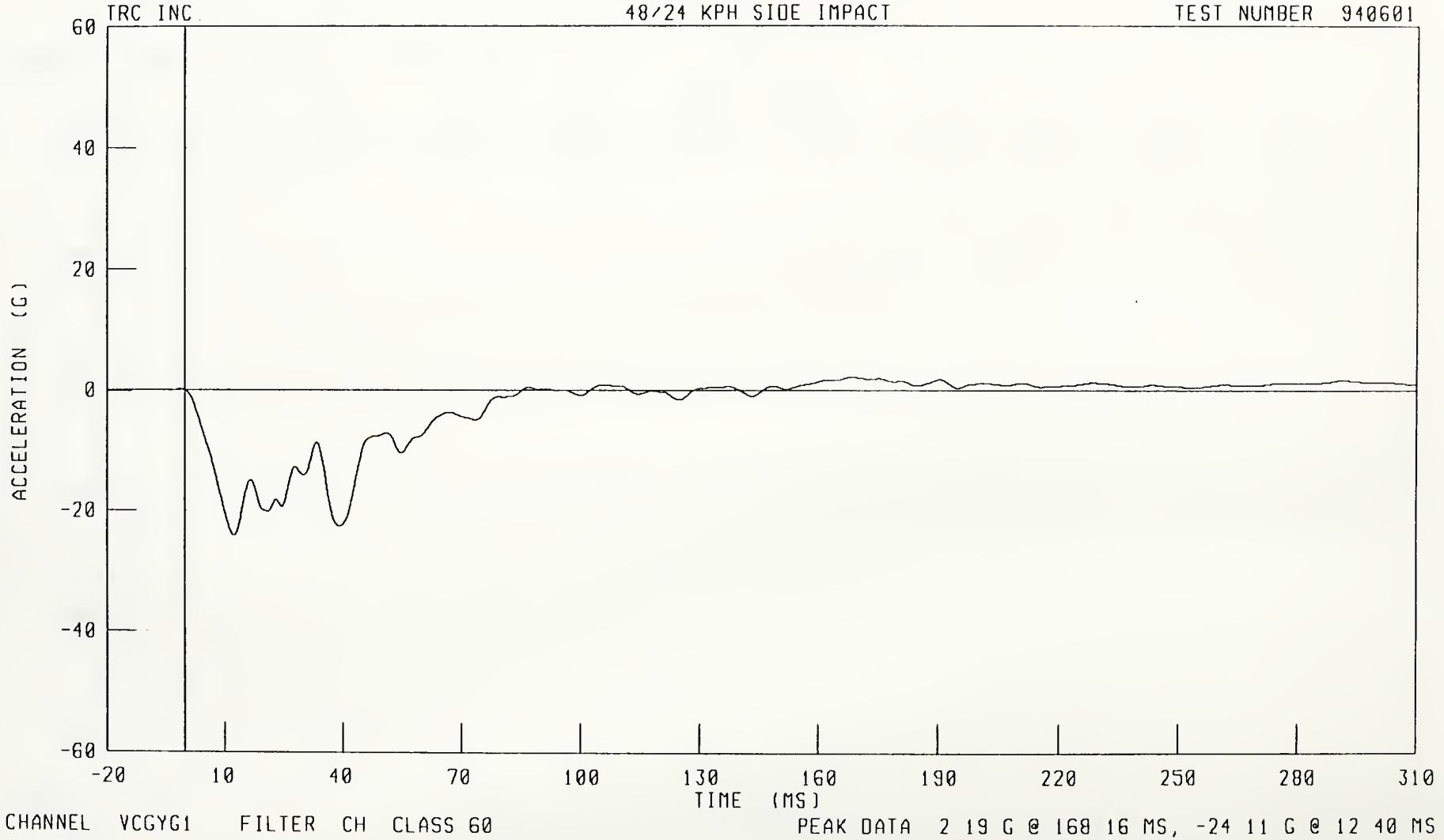


CHANNEL VCGXD1 FILTER CH CLASS 180

PEAK DATA 172 22 MM @ 310 00 MS, -102 67 MM @ 131 04 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

VEHICLE CG Y-AXIS ACCELERATION



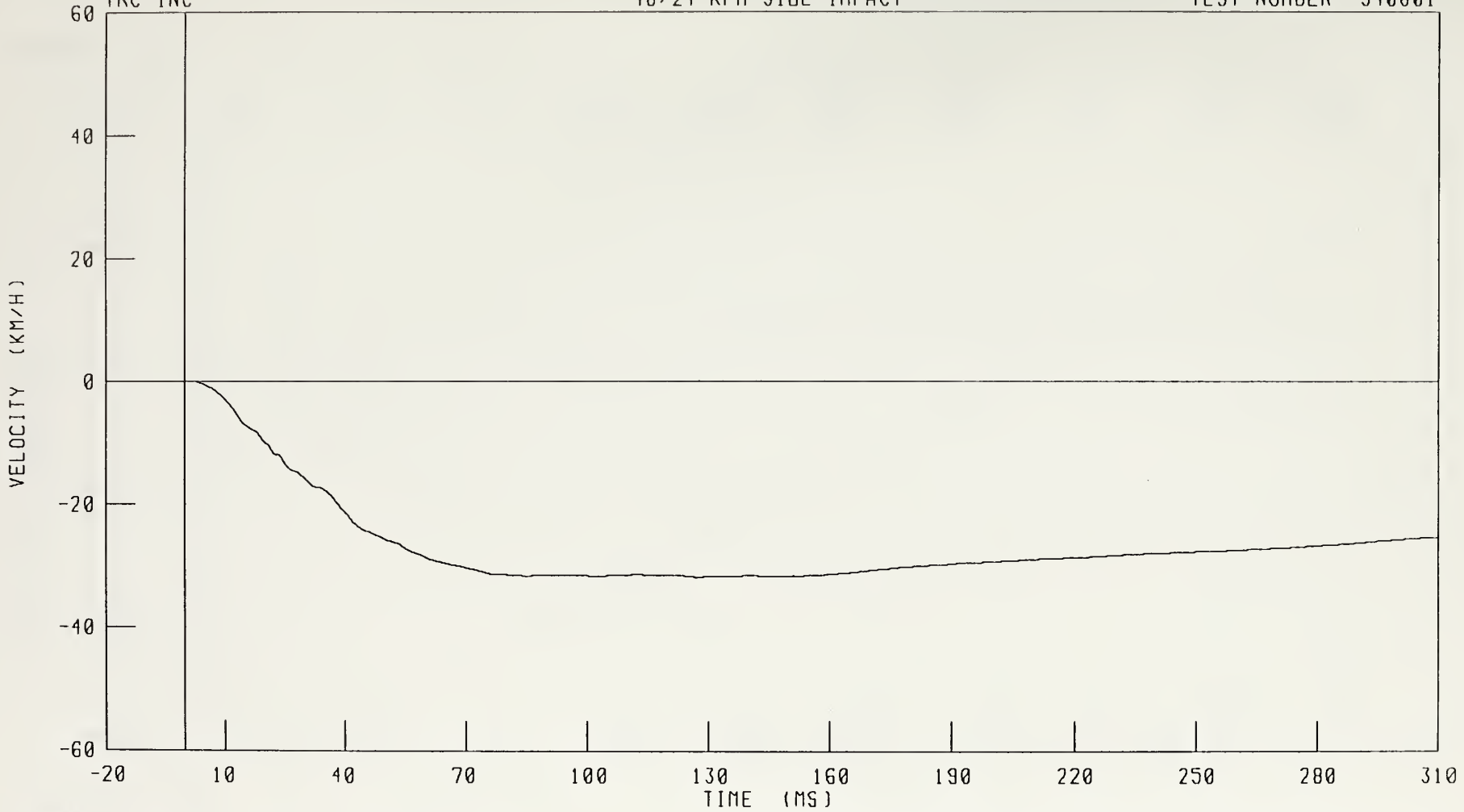
CHANNEL VCGYG1 FILTER CH CLASS 60

PEAK DATA 2 19 G @ 168 16 MS, -24 11 G @ 12 40 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

VEHICLE CG Y-AXIS VELOCITY

TRC INC 48/24 KPH SIDE IMPACT TEST NUMBER 940601

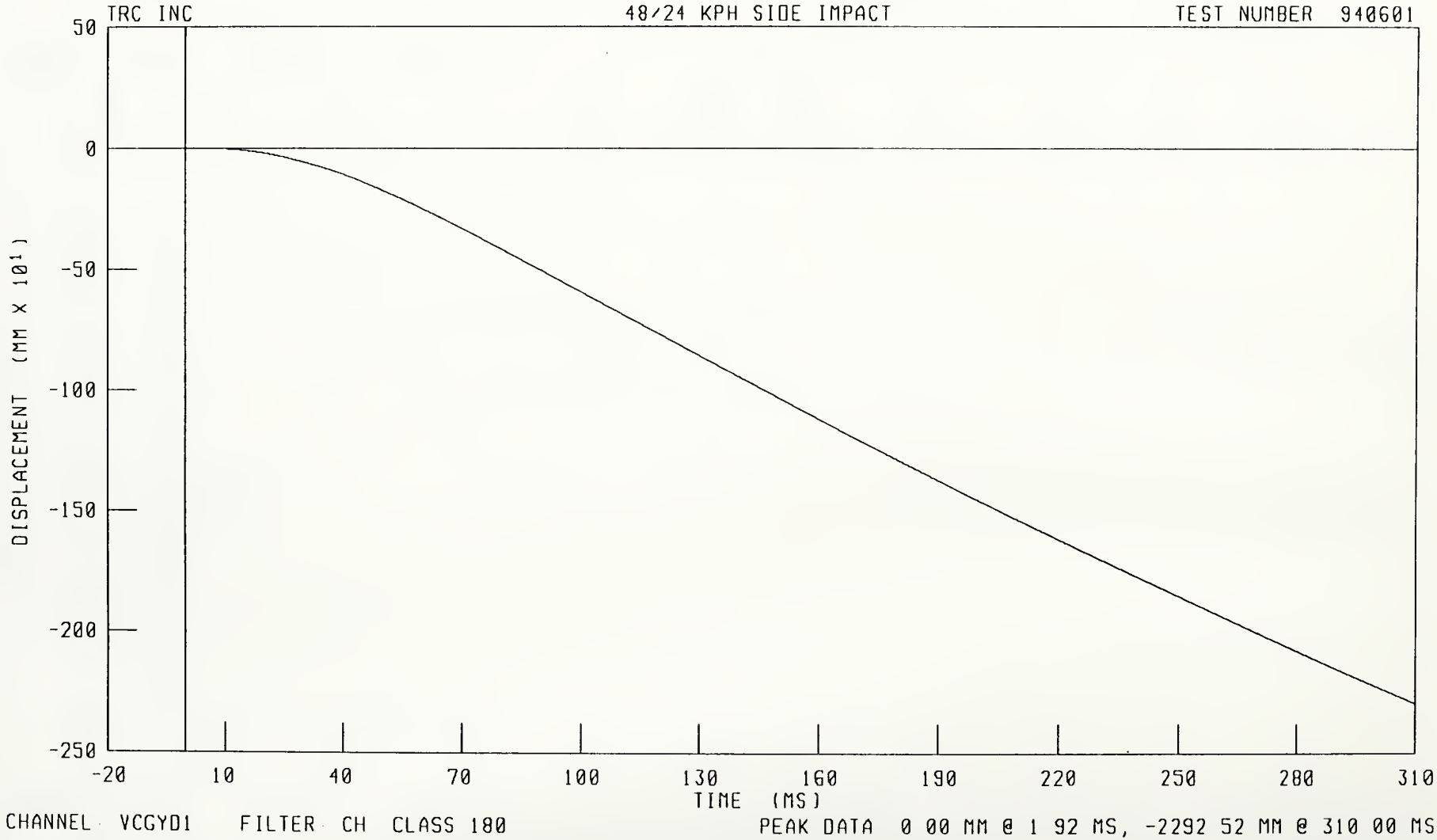


CHANNEL VCGYV1 FILTER CH CLASS 180

PEAK DATA 0 01 KM/H @ 1 44 MS, -31 75 KM/H @ 127 20 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

VEHICLE CG Y-AXIS DISPLACEMENT



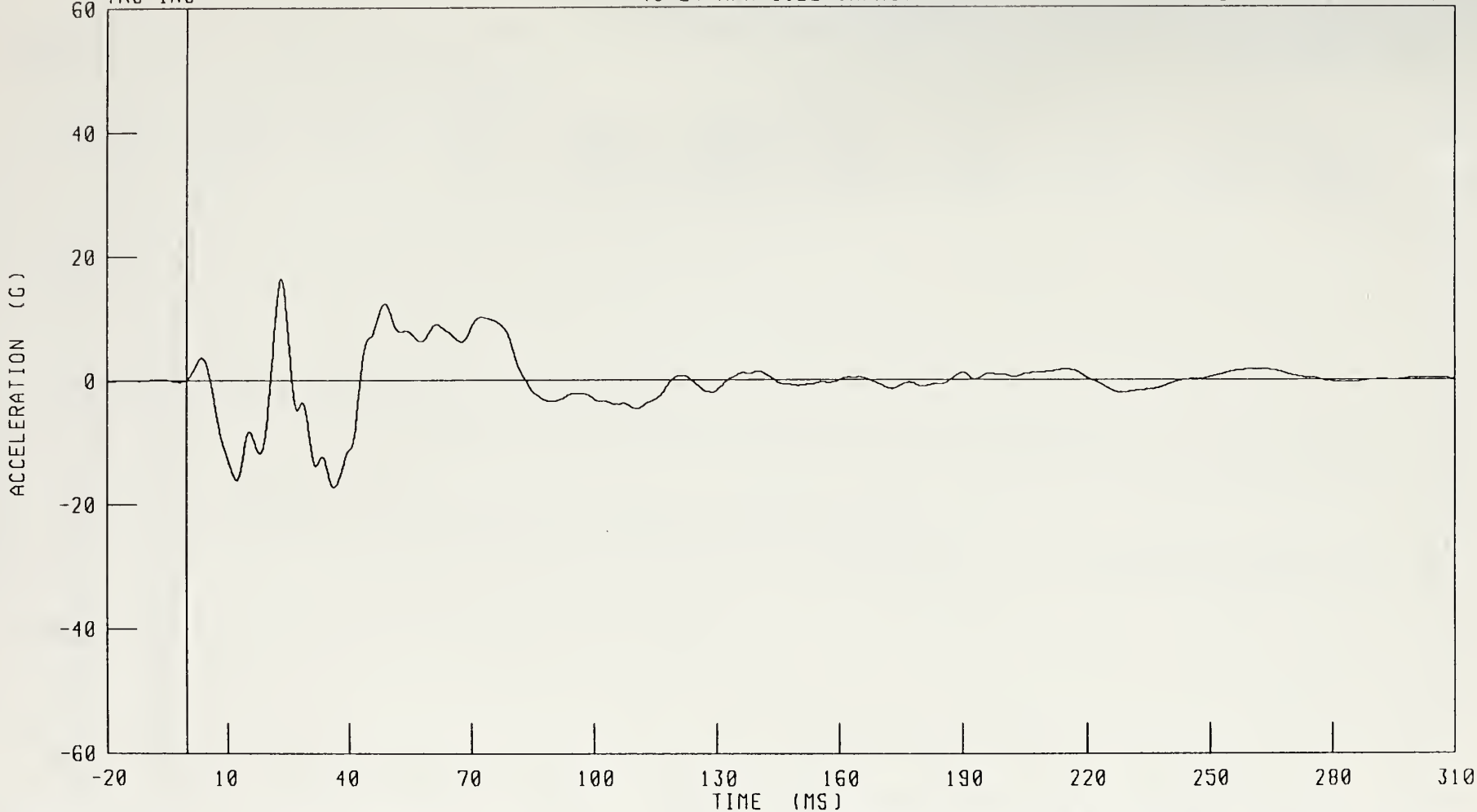
CHANNEL VCGYD1 FILTER CH CLASS 180

PEAK DATA 0 00 MM @ 1 92 MS, -2292 52 MM @ 310 00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

VEHICLE CG Z-AXIS ACCELERATION

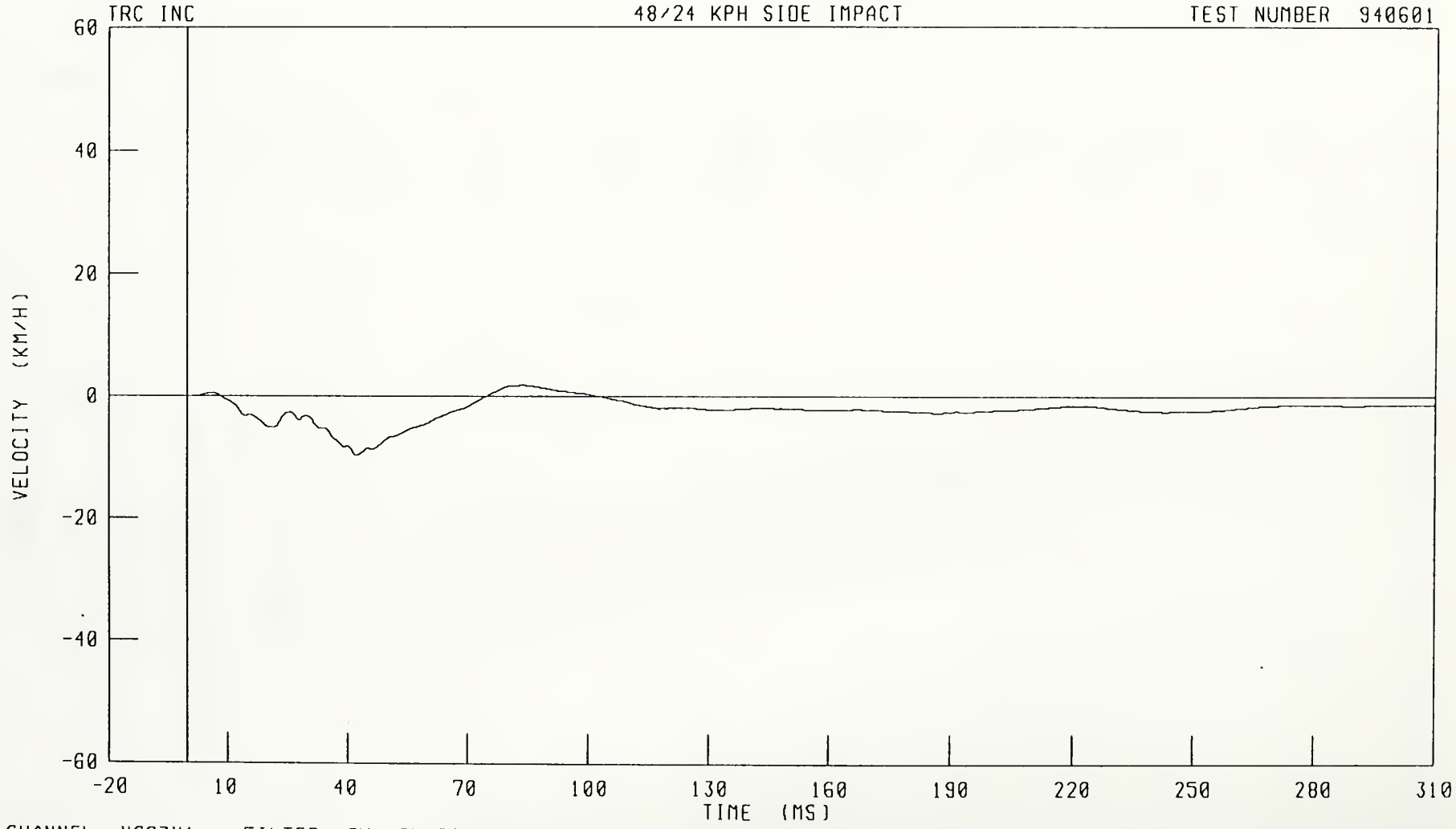
TRC INC 48/24 KPH SIDE IMPACT TEST NUMBER 940601



CHANNEL VCGZG1 FILTER CH CLASS 60 PEAK DATA 16 45 G @ 23 20 MS, -17 28 G @ 36 24 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

VEHICLE CG Z-AXIS VELOCITY

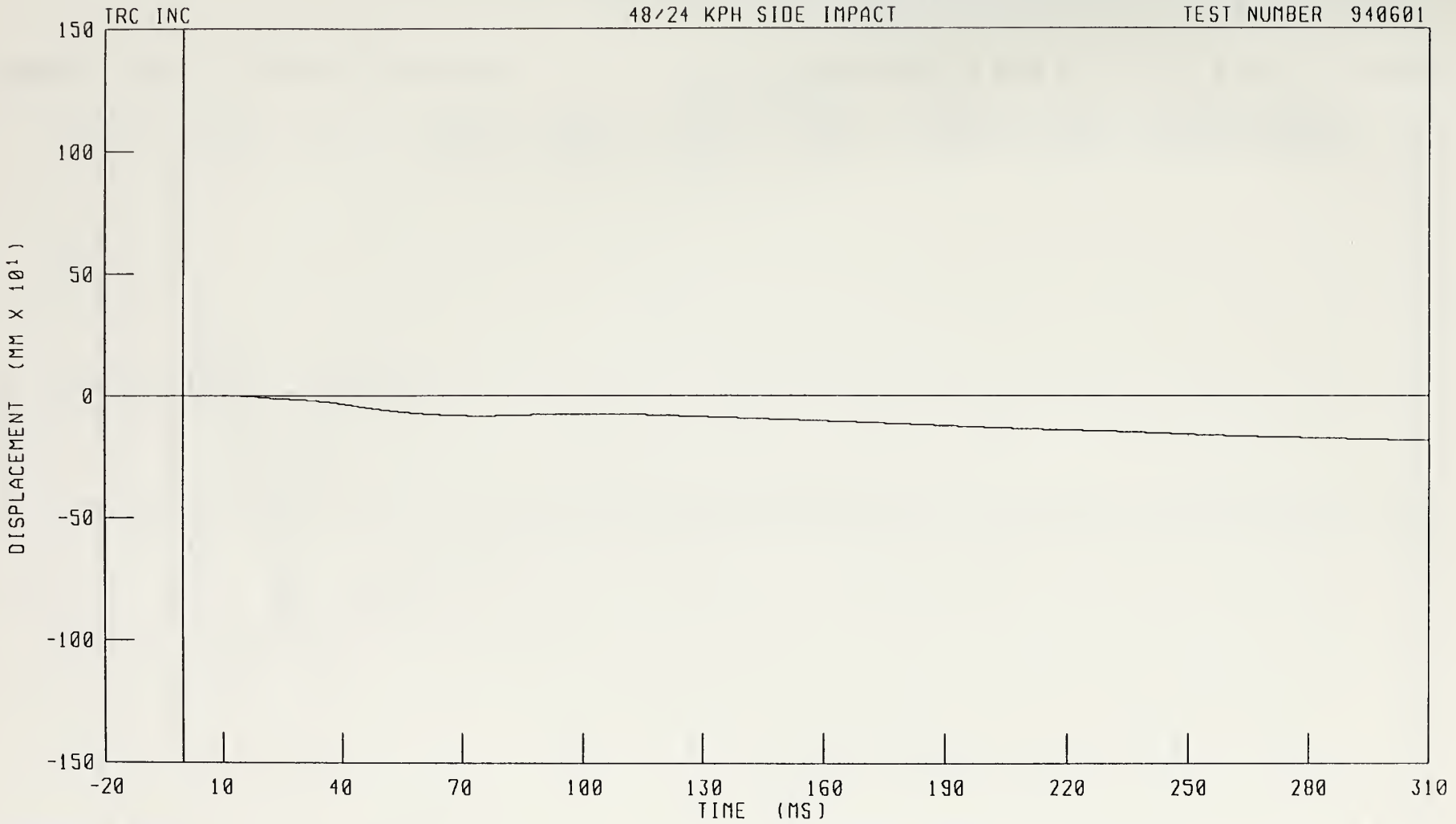


CHANNEL VCGZV1 FILTER CH CLASS 180

PEAK DATA 1 83 KM/H @ 83 84 MS, -9 62 KM/H @ 42 08 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

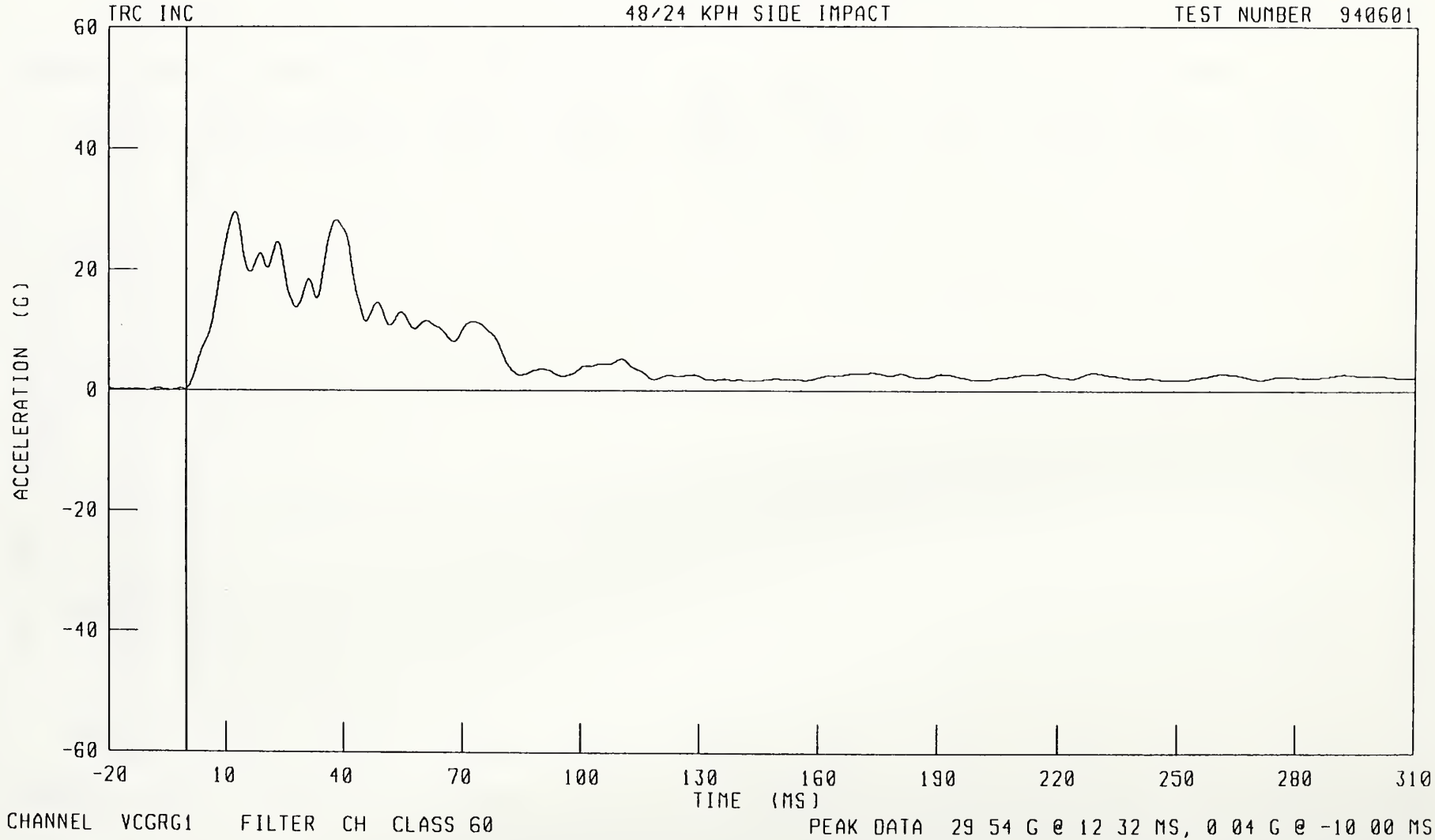
VEHICLE CG Z-AXIS DISPLACEMENT



CHANNEL VCGZD1 FILTER CH CLASS 180

PEAK DATA 0 50 MM @ 8 32 MS; -183 40 MM @ 310 00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
VEHICLE CG RESULTANT ACCELERATION

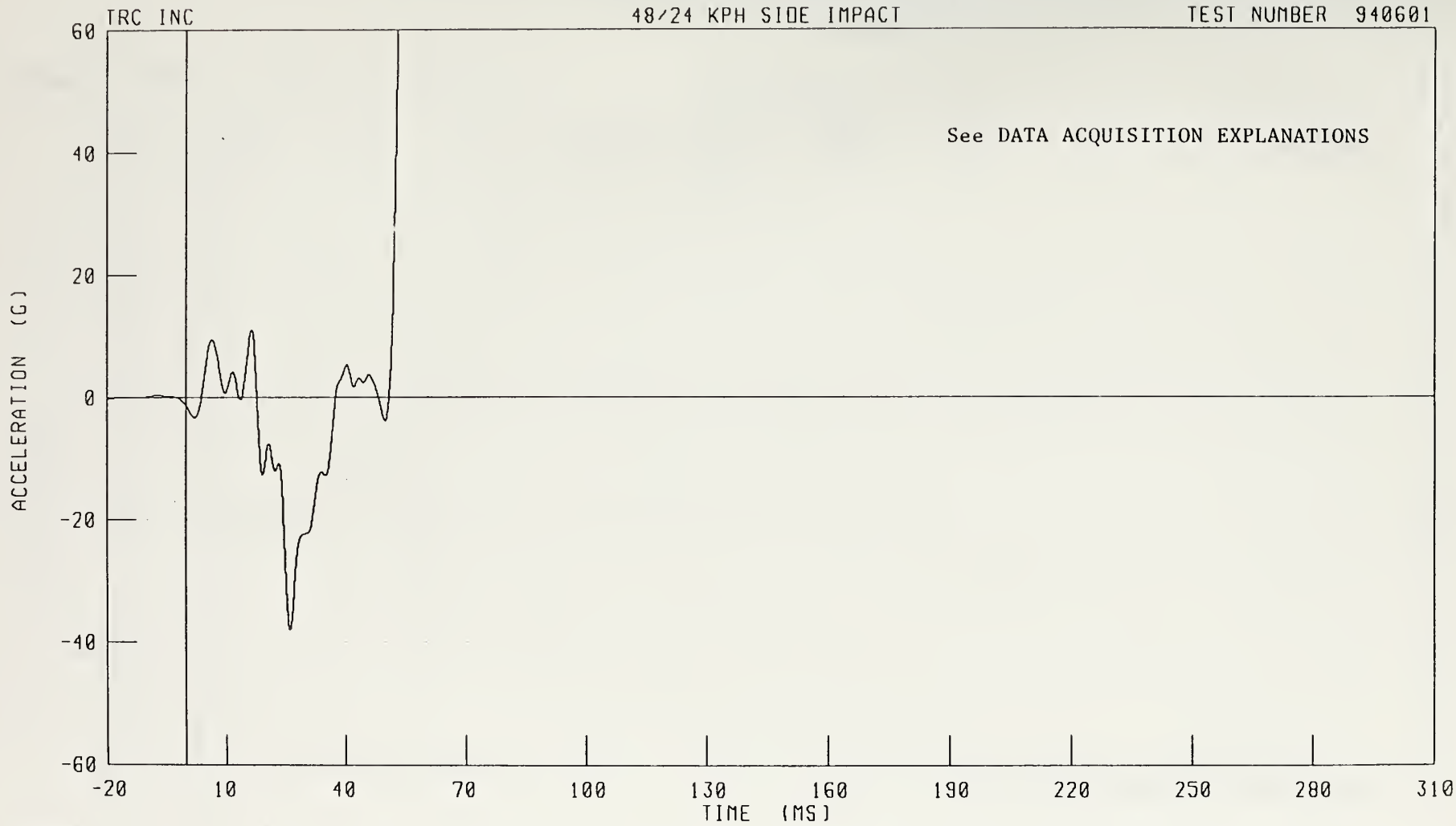


CHANNEL VCGRG1 FILTER CH CLASS 60

PEAK DATA 29 54 G @ 12 32 MS, 0 04 G @ -10 00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

LEFT REAR SILL X-AXIS ACCELERATION

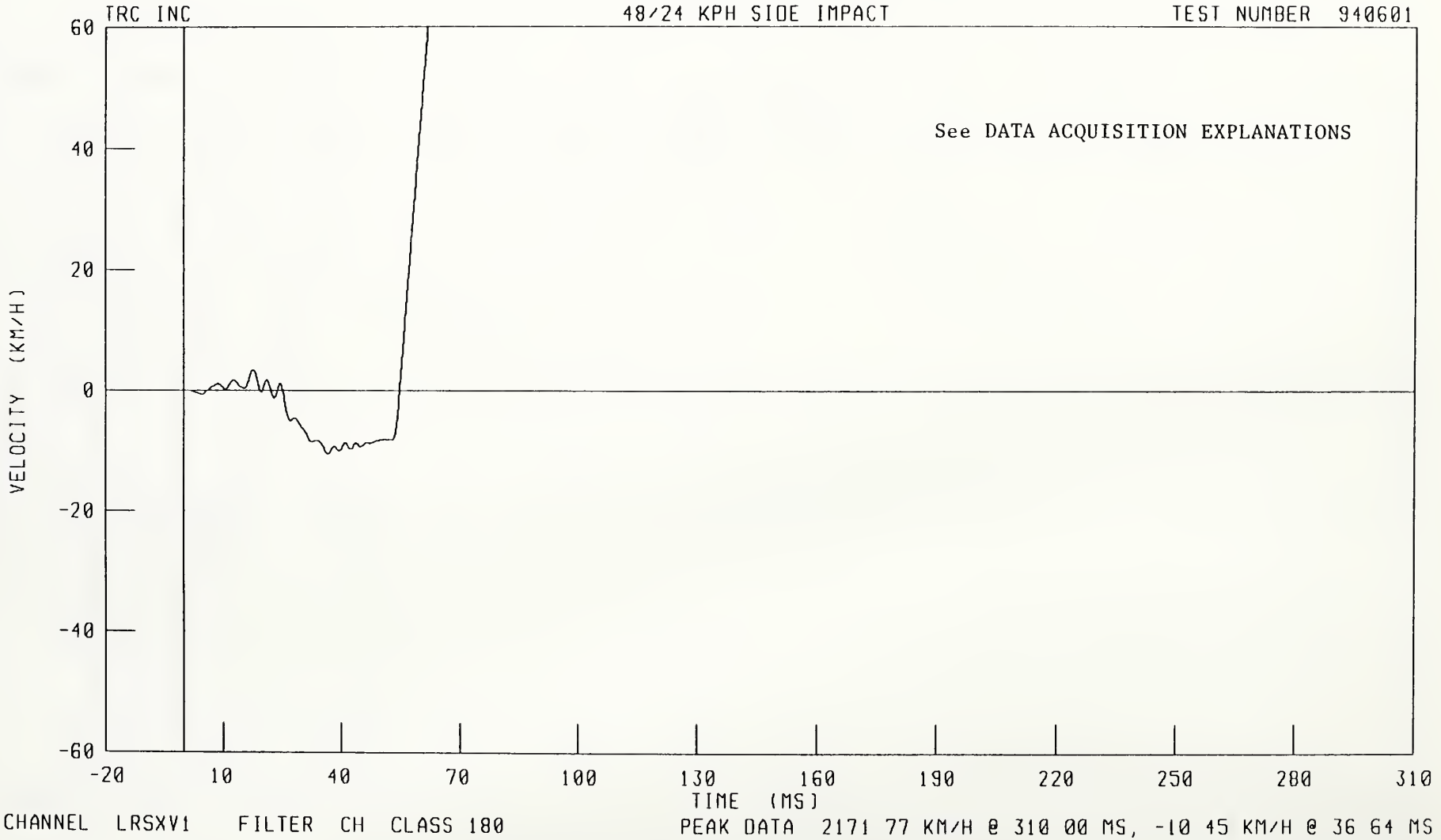


CHANNEL LRSXG1 FILTER CH CLASS 60

PEAK DATA 248 80 G @ 58 00 MS, -37 97 G @ 26 00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

LEFT REAR SILL X-AXIS VELOCITY

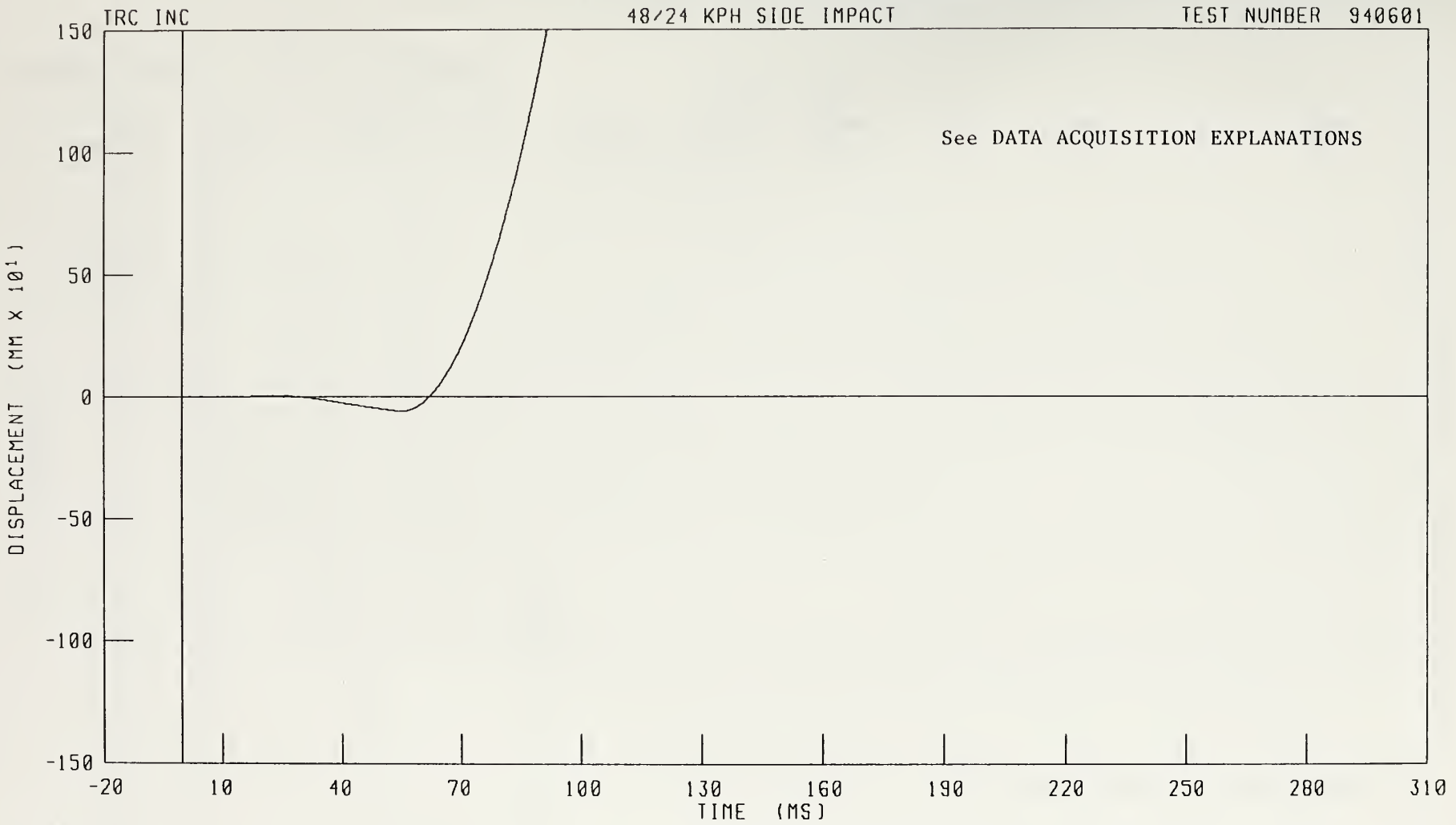


CHANNEL LRSXV1 FILTER CH CLASS 180

PEAK DATA 2171 77 KM/H @ 310 00 MS, -10 45 KM/H @ 36 64 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

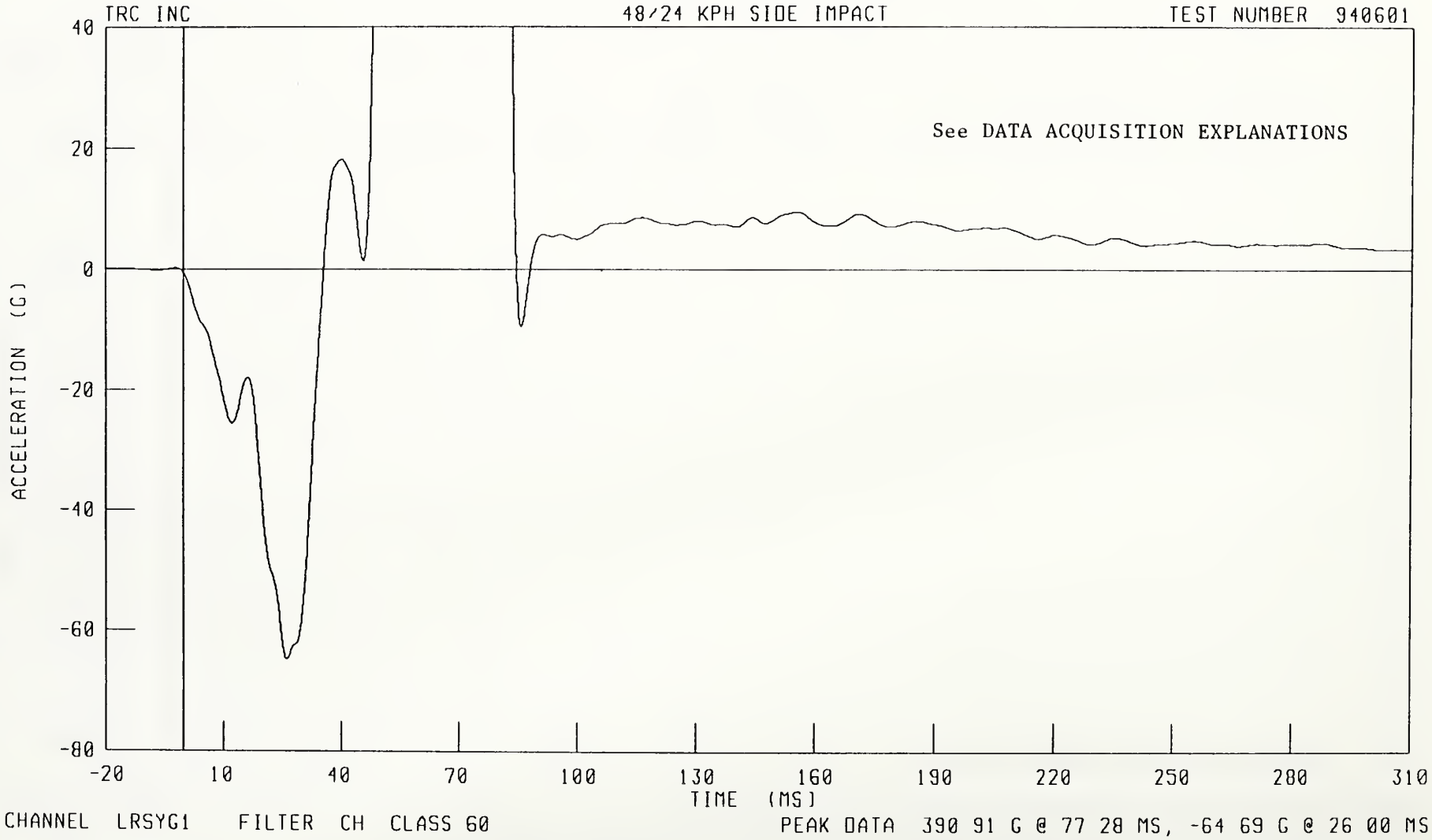
LEFT REAR SILL X-AXIS DISPLACEMENT



CHANNEL LRSX01 FILTER CH CLASS 180

PEAK DATA 76948 86 MM @ 310 00 MS, -59 65 MM @ 54 72 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
LEFT REAR SILL Y-AXIS ACCELERATION

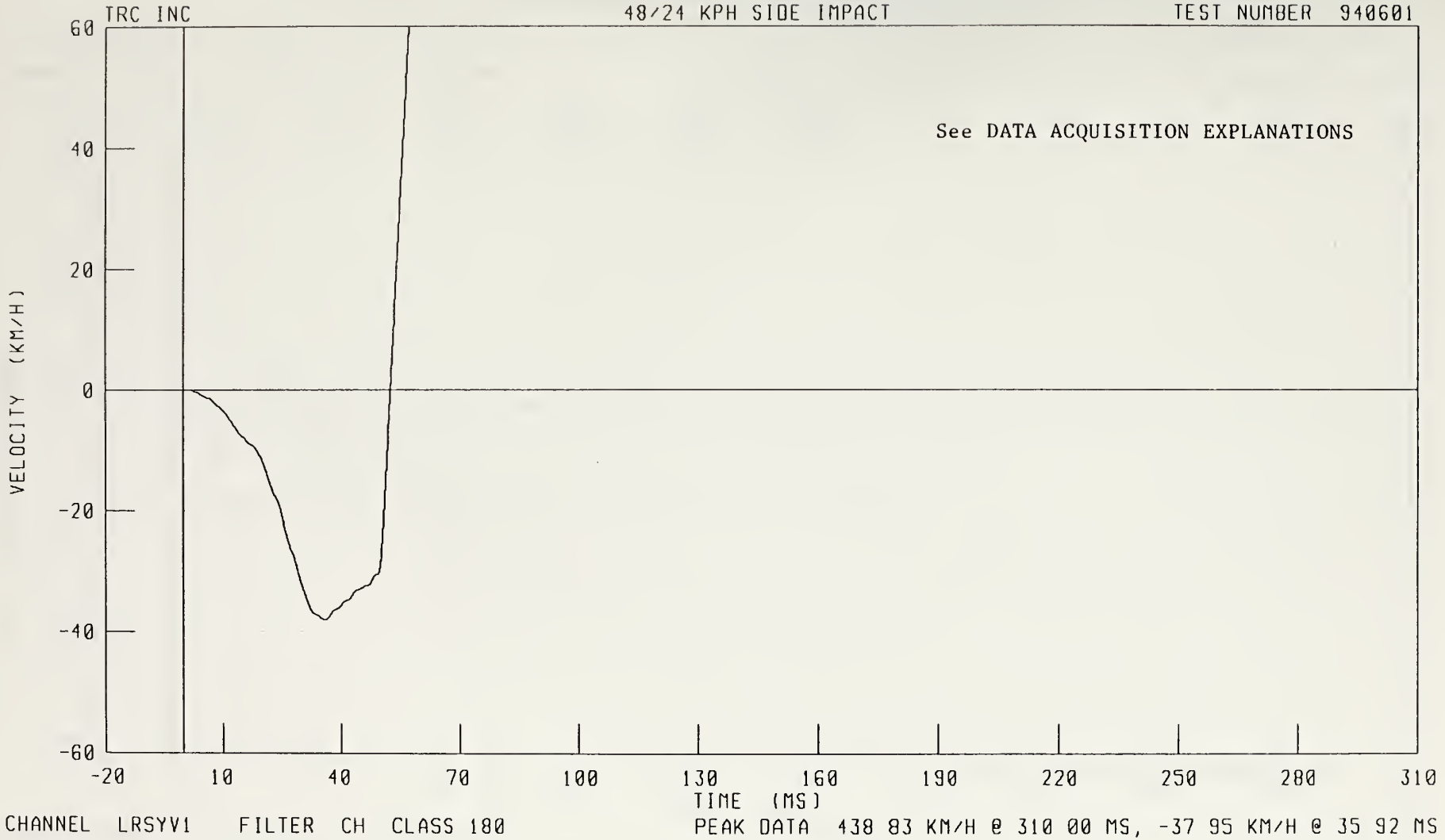


CHANNEL LRSYG1 FILTER CH CLASS 60

PEAK DATA 390 91 G @ 77 28 MS, -64 69 G @ 26 00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

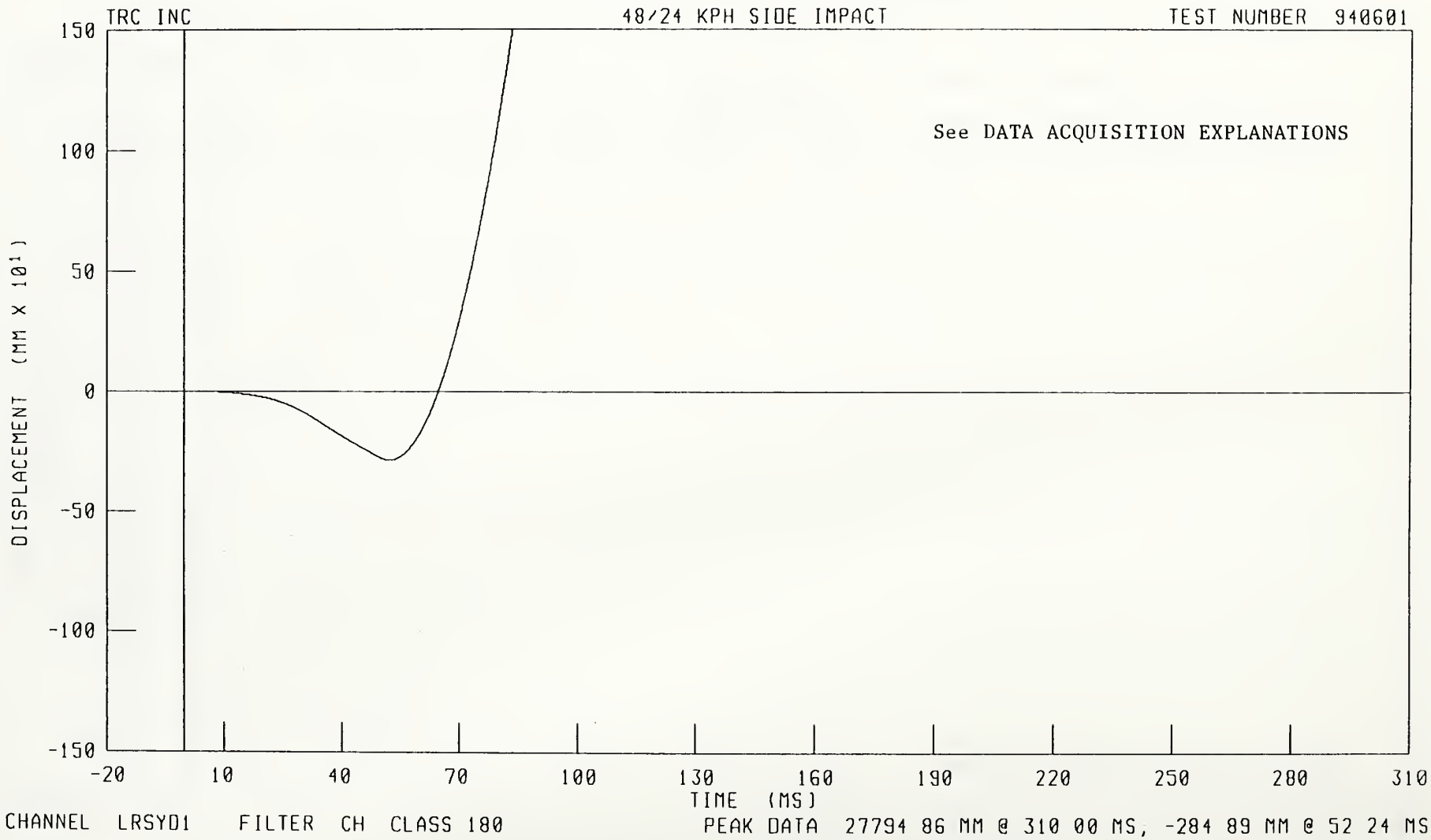
LEFT REAR SILL Y-AXIS VELOCITY



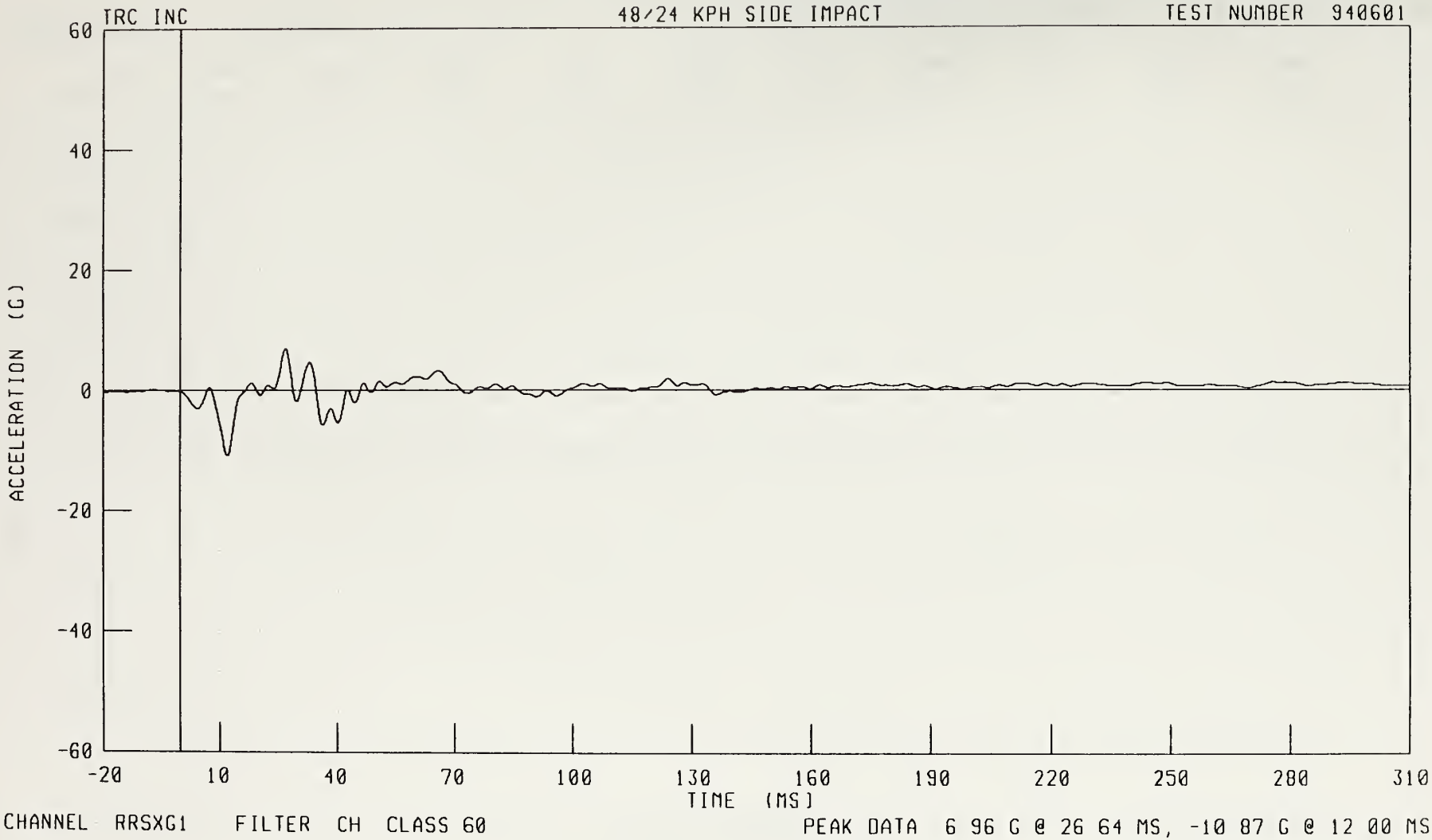
CHANNEL LRSYV1 FILTER CH CLASS 180

PEAK DATA 438 83 KM/H @ 310 00 MS, -37 95 KM/H @ 35 92 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
LEFT REAR SILL Y-AXIS DISPLACEMENT



NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
RIGHT REAR SILL X-AXIS ACCELERATION

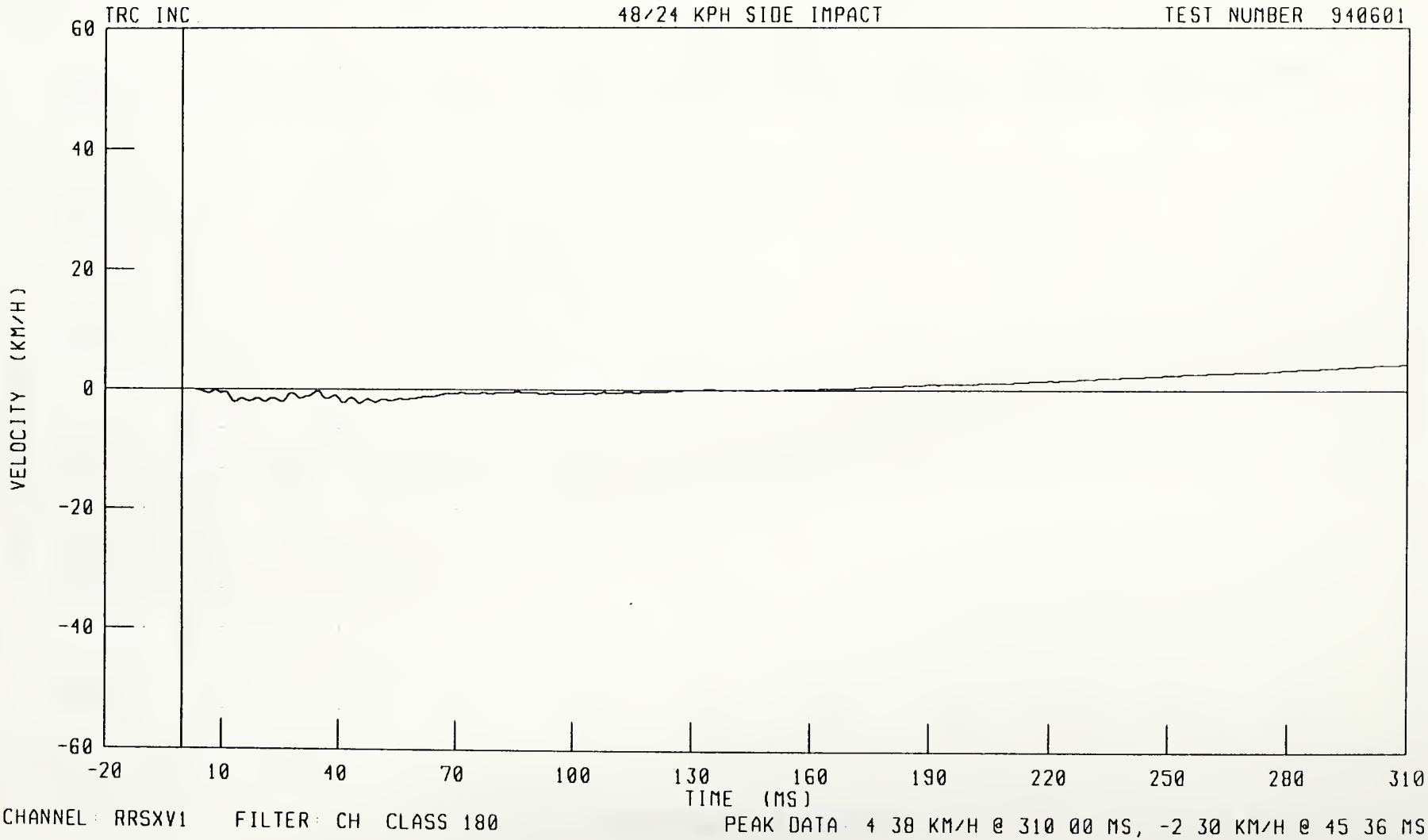


CHANNEL RRSXG1 FILTER CH CLASS 60

PEAK DATA 6 96 G @ 26 64 MS, -10 87 G @ 12 00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

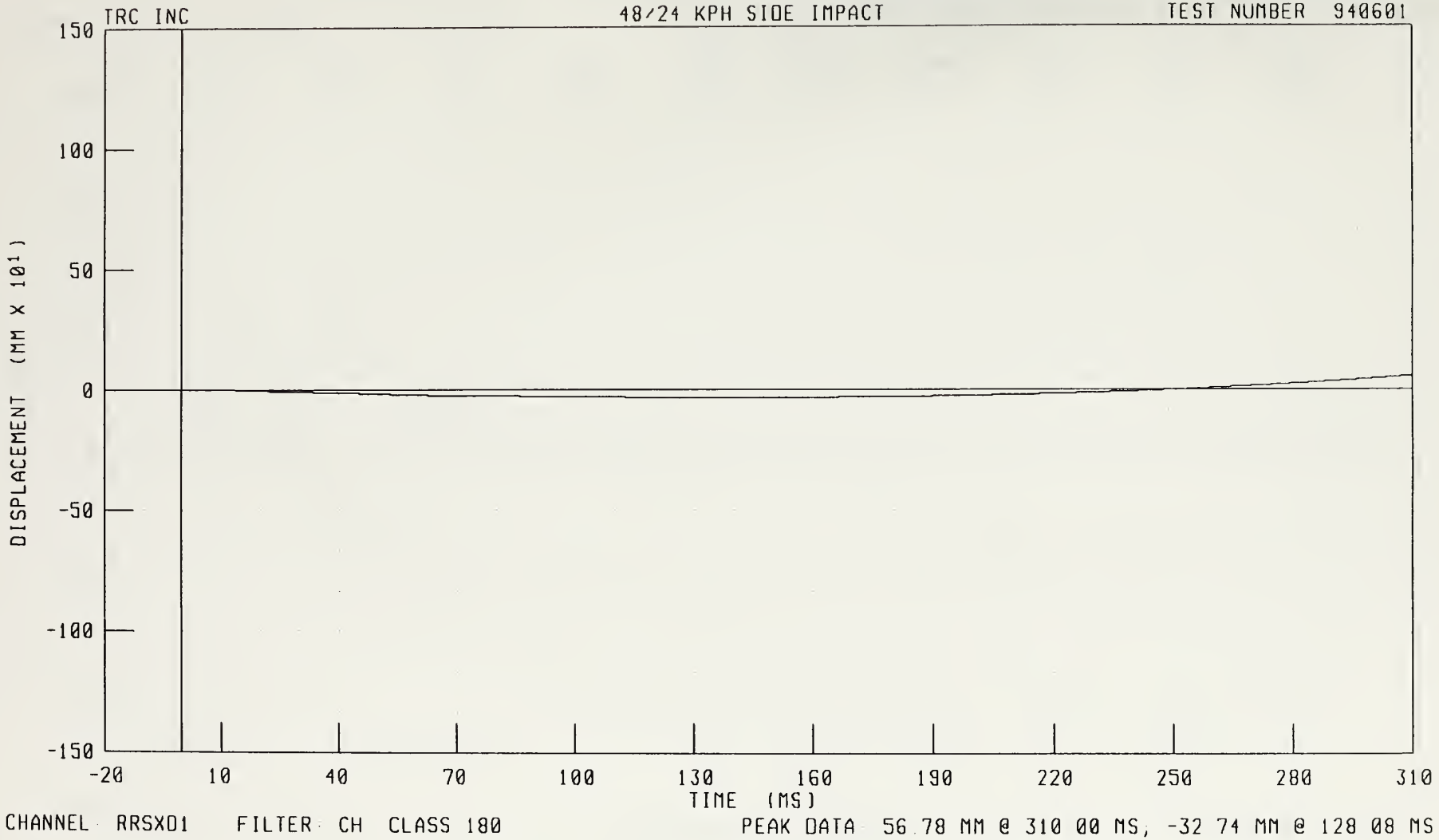
RIGHT REAR SILL X-AXIS VELOCITY



CHANNEL RRSXV1 FILTER CH CLASS 180

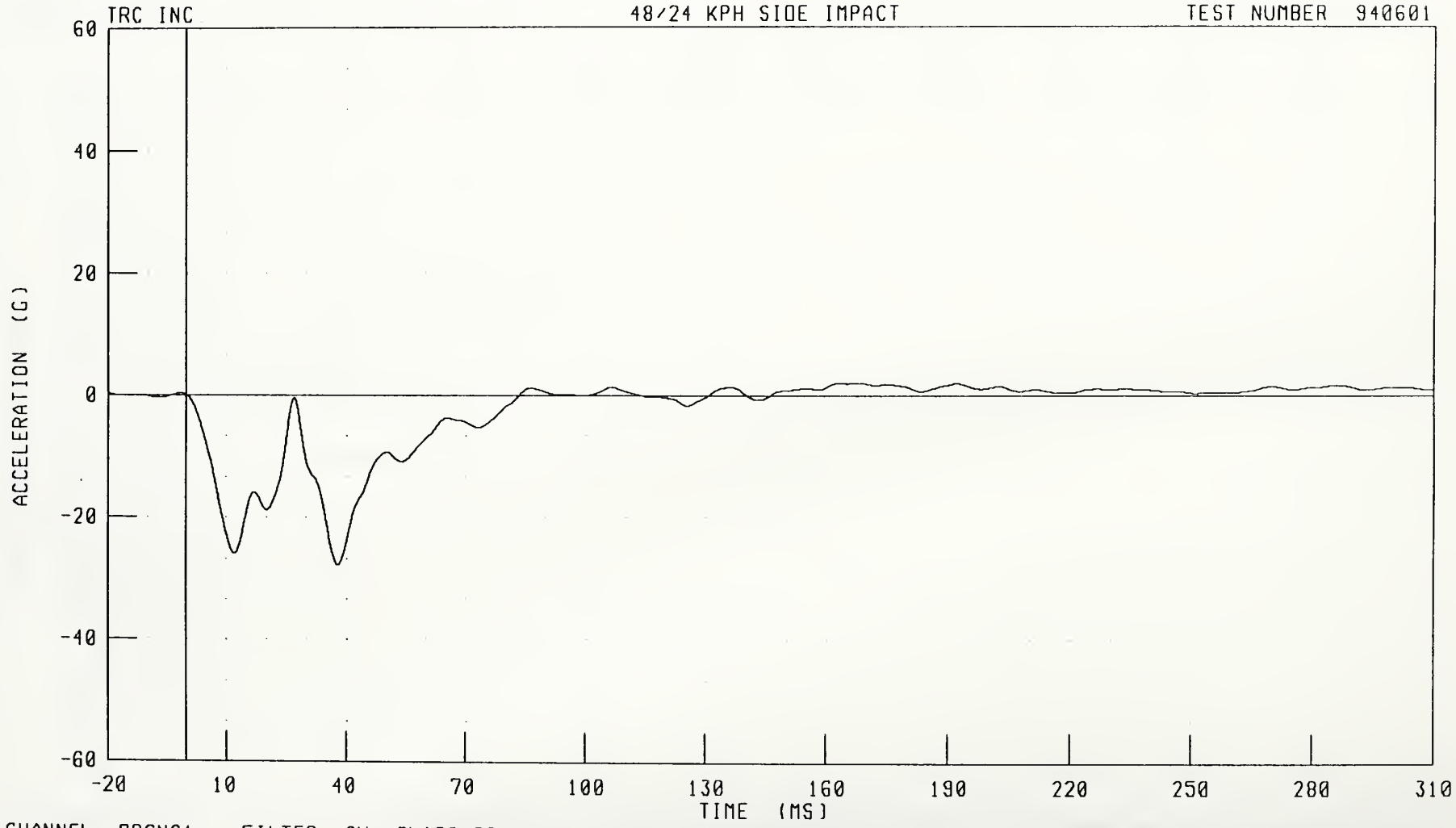
PEAK DATA 4 38 KM/H @ 310 00 MS, -2 30 KM/H @ 45 36 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
RIGHT REAR SILL X-AXIS DISPLACEMENT



CHANNEL RRSXD1 FILTER CH CLASS 180 PEAK DATA 56.78 MM @ 310.00 MS, -32.74 MM @ 128.08 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
RIGHT REAR SILL Y-AXIS ACCELERATION

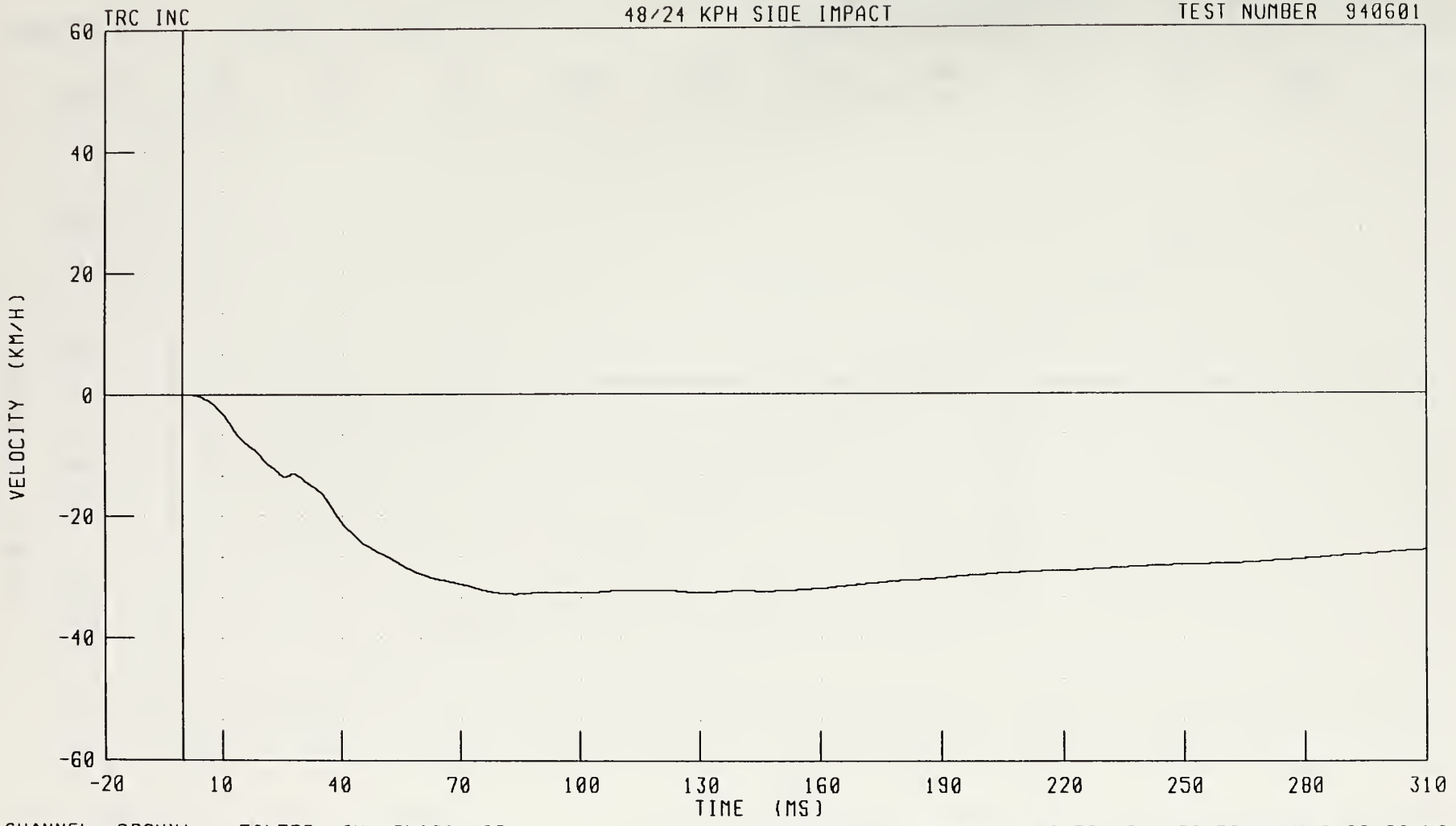


CHANNEL: RRSYG1 FILTER: CH CLASS 60

PEAK DATA: 2 07 G @ 163 04 MS, -27 70 G @ 37 92 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

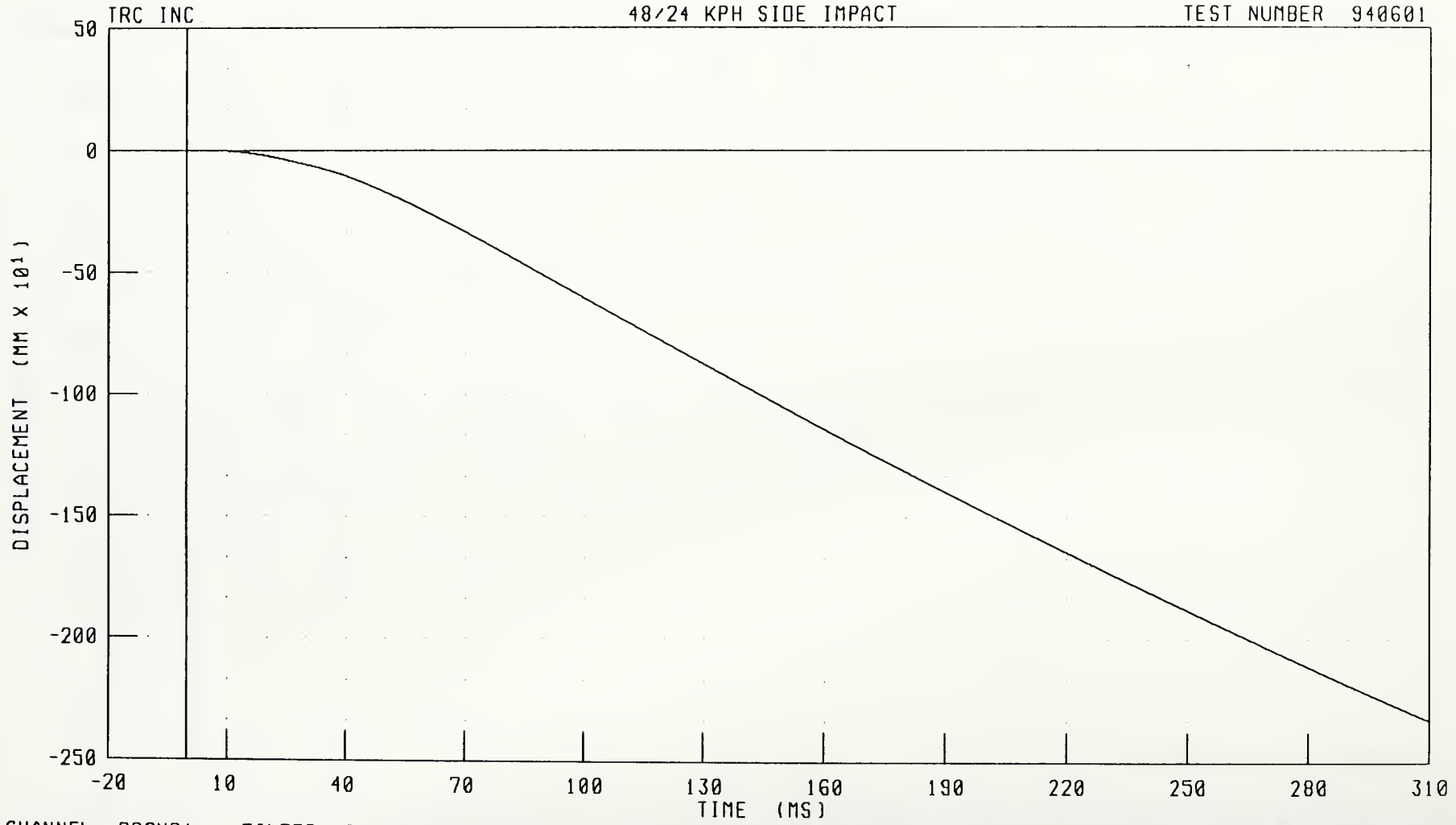
RIGHT REAR SILL Y-AXIS VELOCITY



CHANNEL: RRSYV1 FILTER: CH CLASS 180 PEAK DATA: 0 01 KM/H @ 0 56 MS, -32 76 KM/H @ 83 68 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

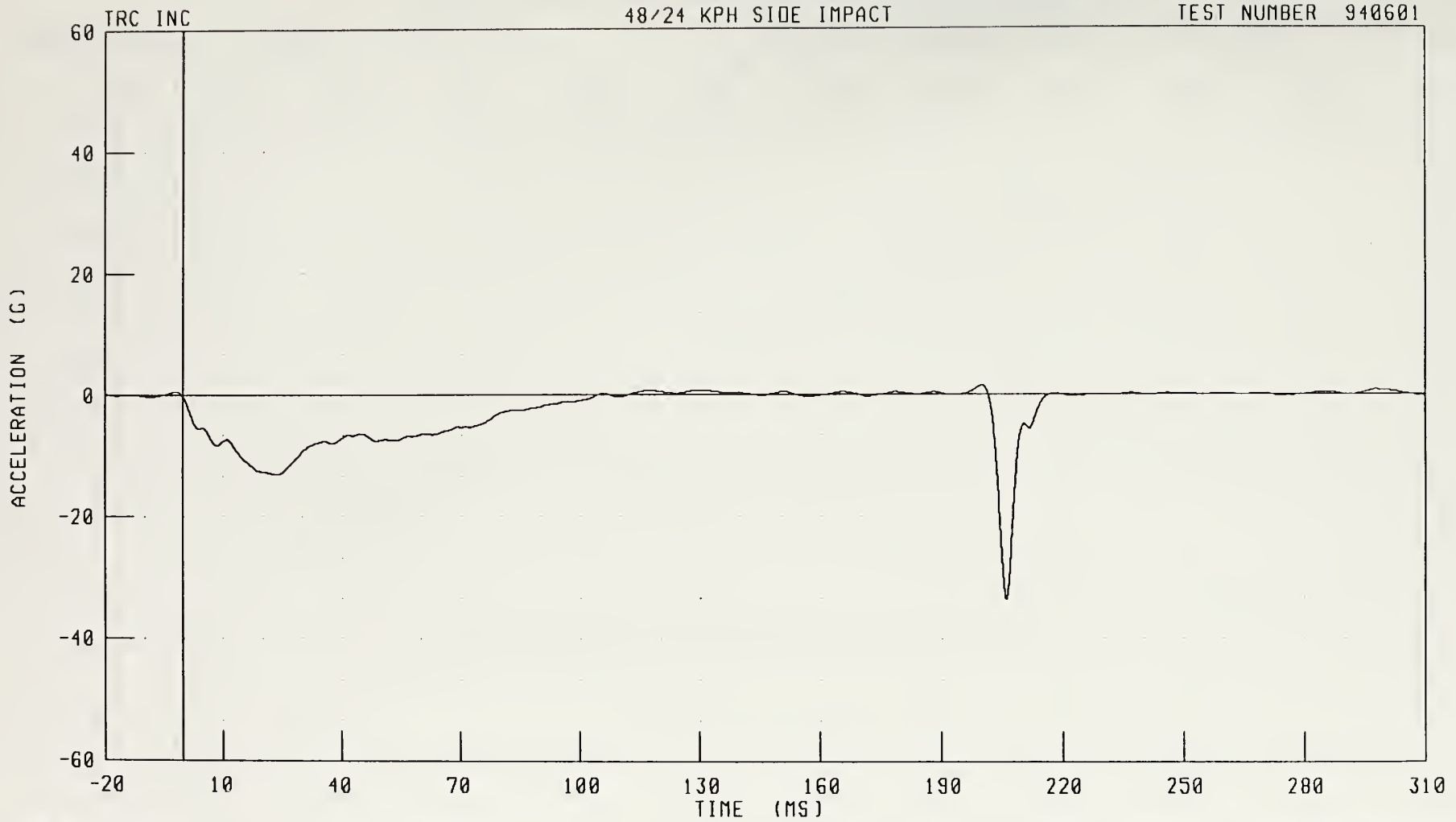
RIGHT REAR SILL Y-AXIS DISPLACEMENT



CHANNEL: RRSYD1 FILTER CH CLASS 180

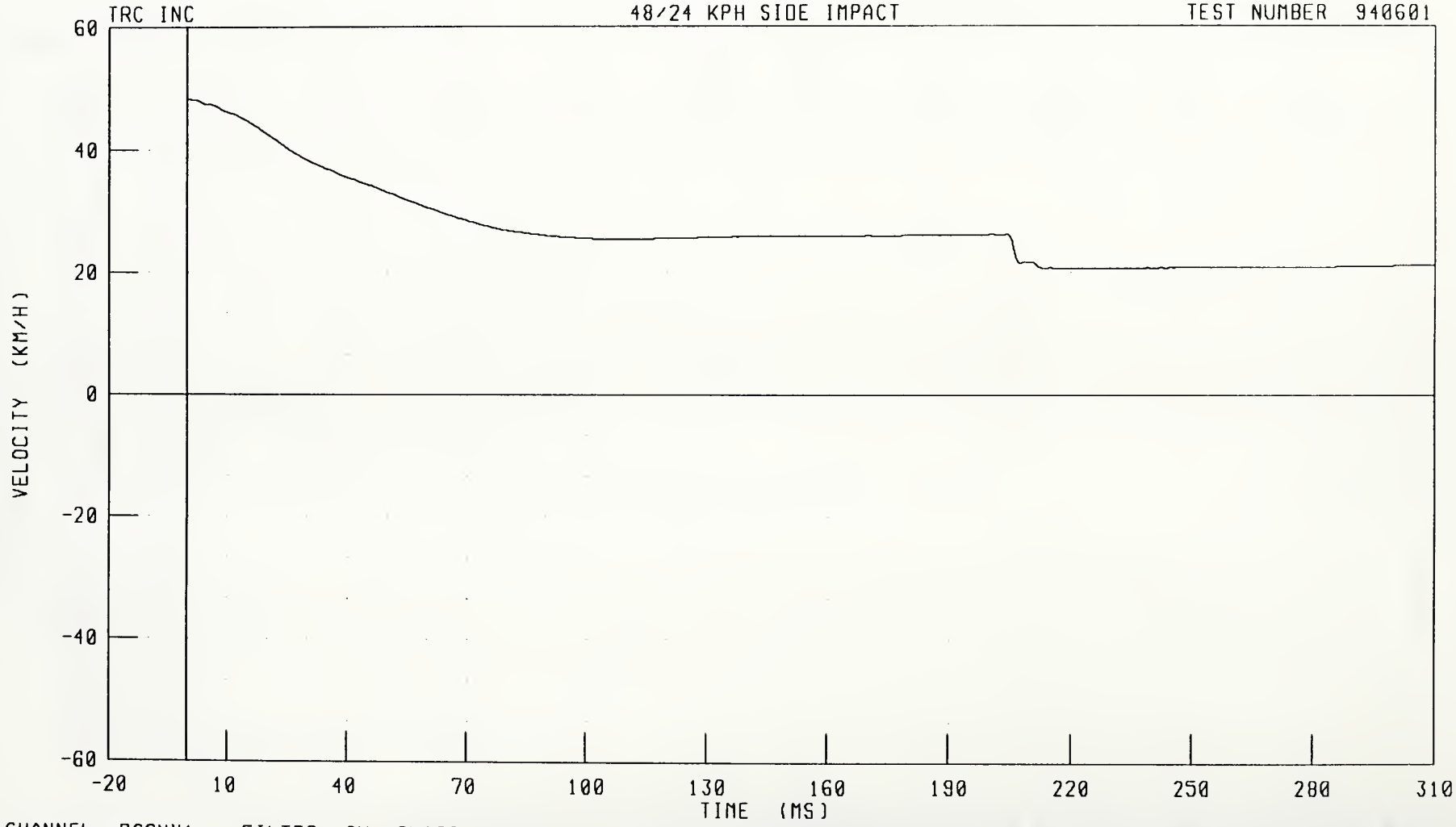
PEAK DATA 0.00 MM @ 1.12 MS, -2327.10 MM @ 310.00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY X-AXIS ACCELERATION



CHANNEL: BCGXG1 FILTER CH CLASS 60 PEAK DATA: 1 50 G @ 199 84 MS, -33 54 G @ 205 92 MS

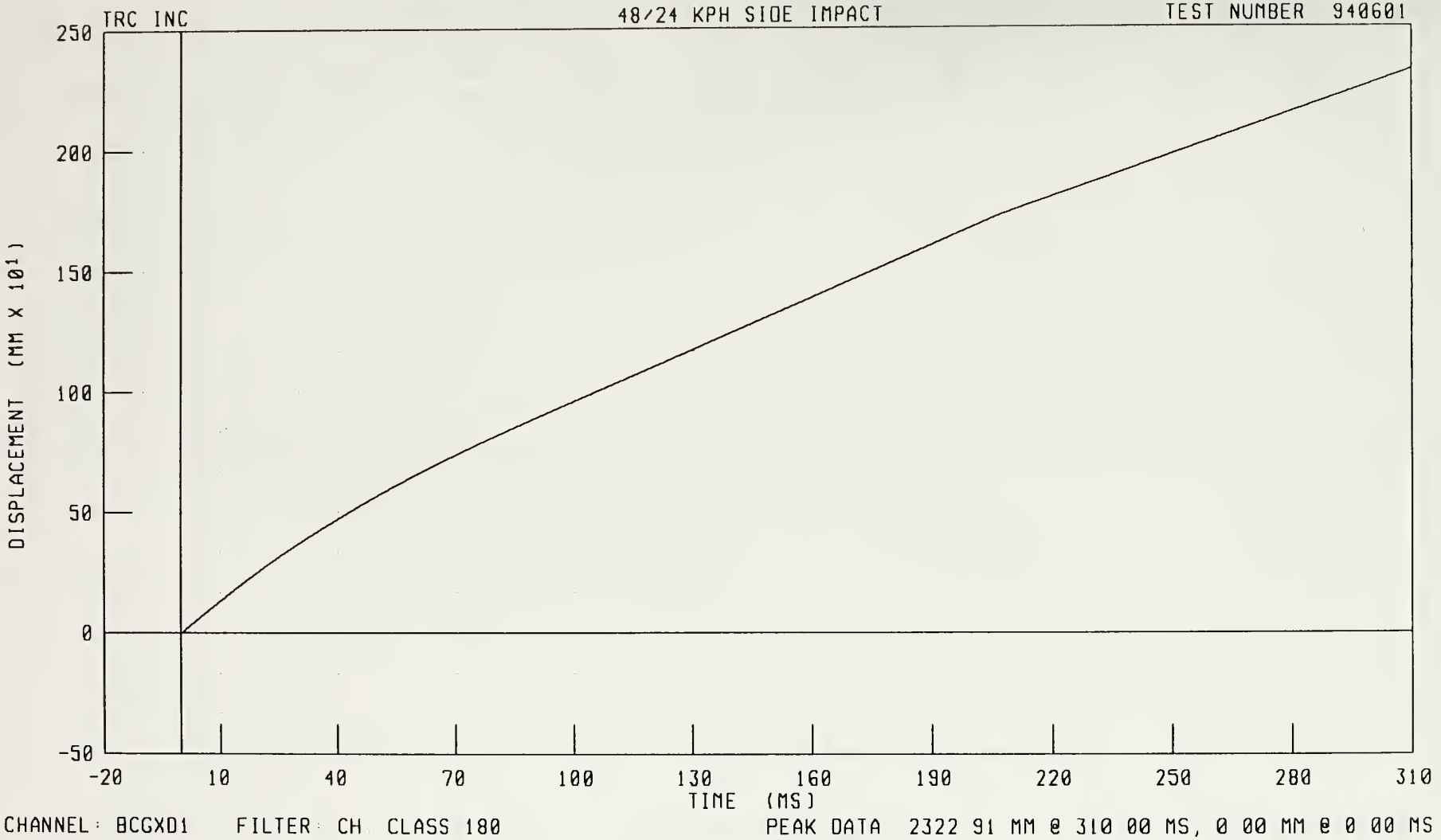
NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY X-AXIS VELOCITY



CHANNEL BCGXV1 FILTER CH CLASS 180

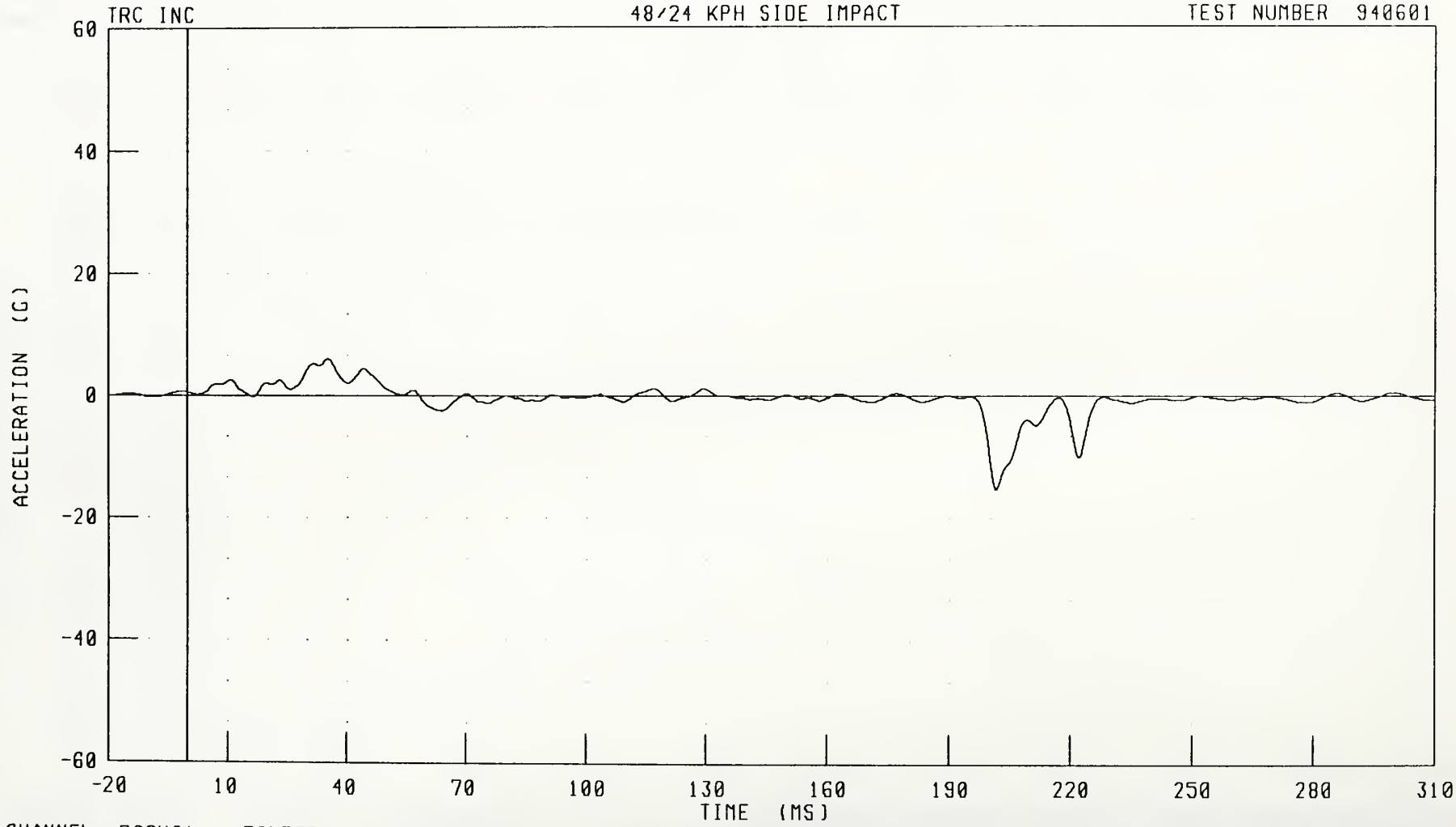
PEAK DATA 48 20 KM/H @ 0 16 MS, 20 68 KM/H @ 224 96 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY X-AXIS DISPLACEMENT



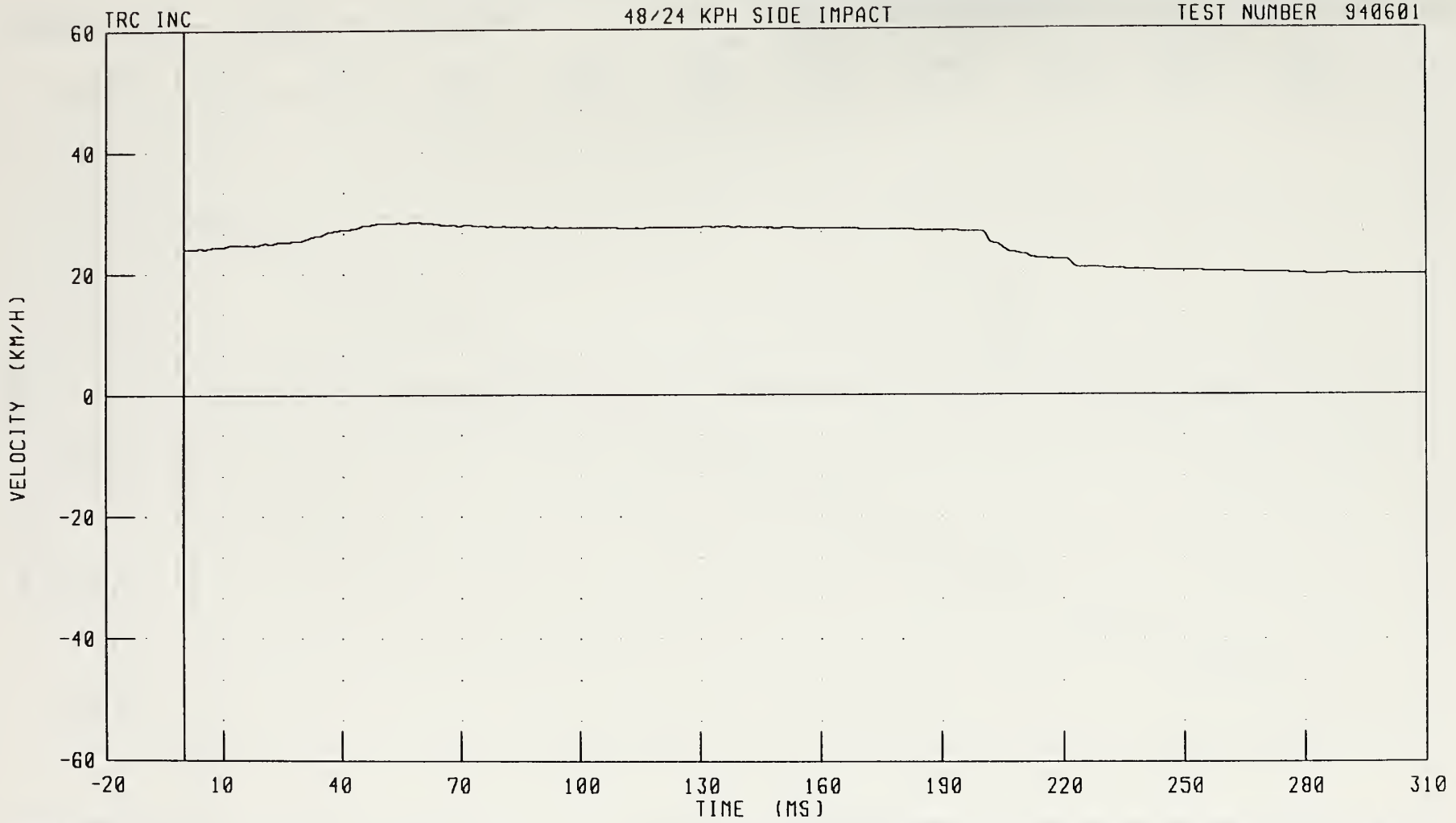
CHANNEL: BCGXD1 FILTER: CH CLASS 180 PEAK DATA 2322 91 MM @ 310 00 MS, 0 00 MM @ 0 00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY Y-AXIS ACCELERATION



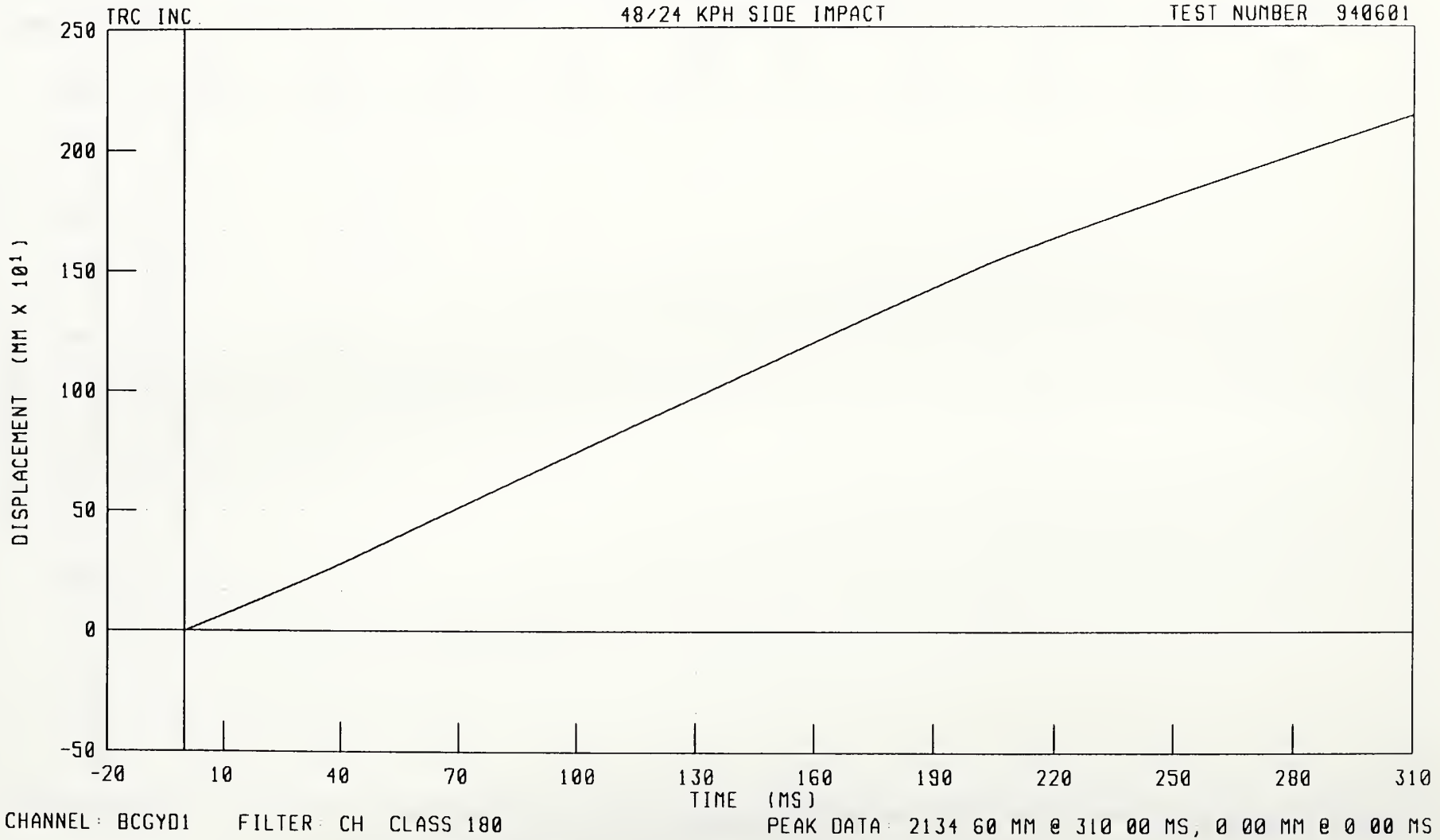
CHANNEL: BCGYG1 FILTER: CH CLASS 60 PEAK DATA: 6.05 G @ 35.28 MS, -15.20 G @ 201.52 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY Y-AXIS VELOCITY



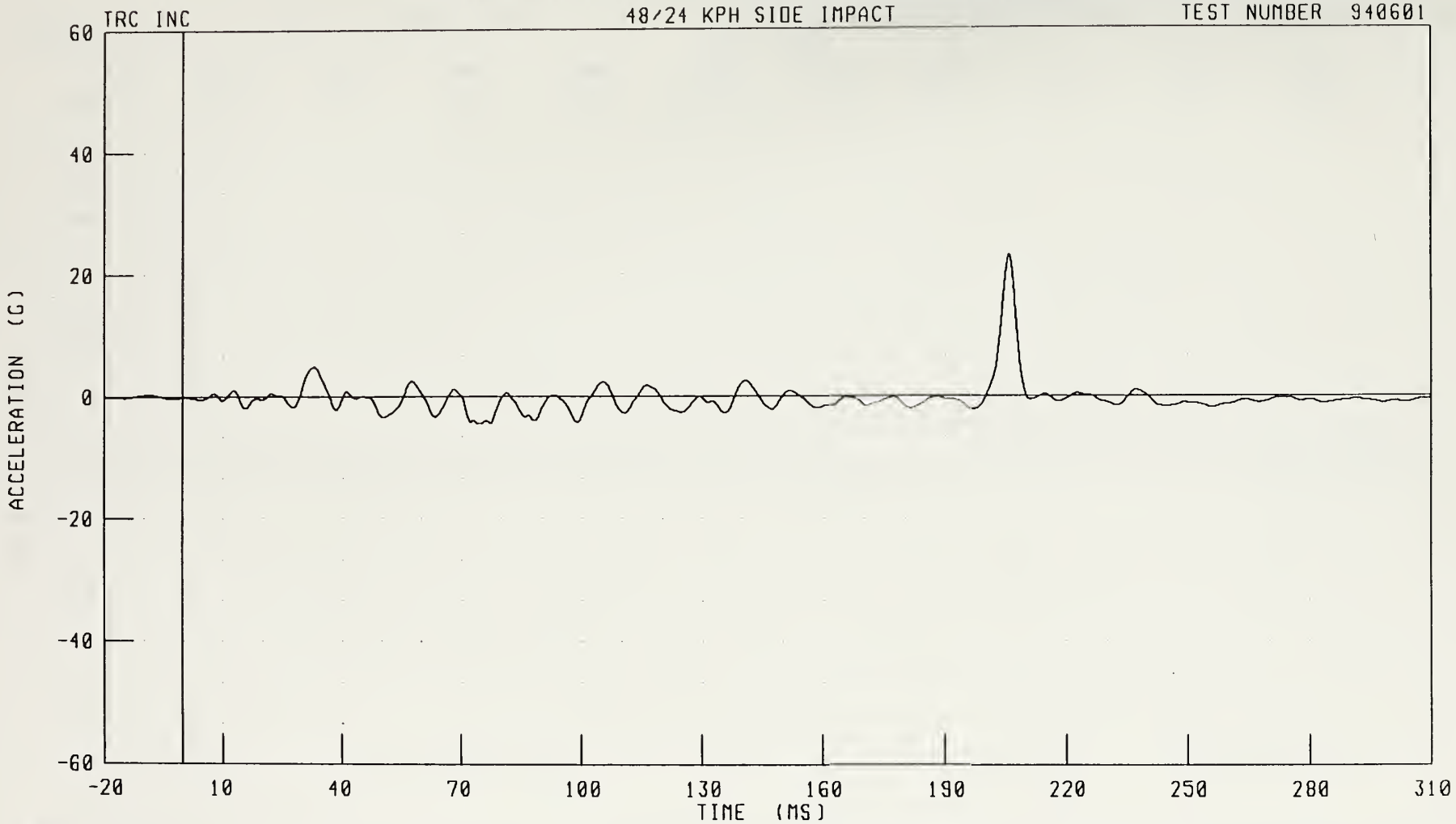
CHANNEL: BCGYV1 FILTER: CH. CLASS 180 PEAK DATA: 28.50 KM/H @ 58.40 MS, 19.60 KM/H @ 310.00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY Y-AXIS DISPLACEMENT



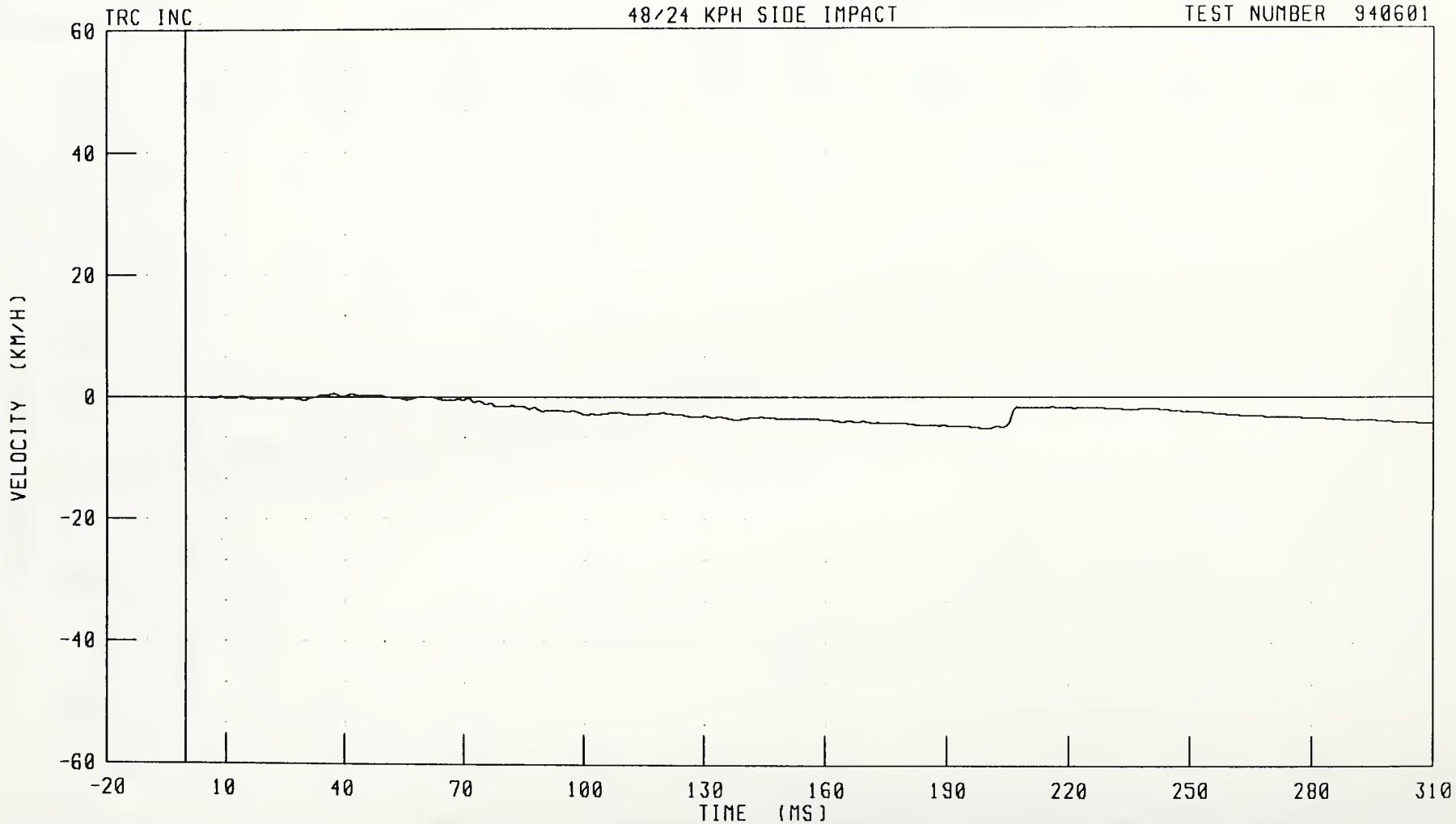
CHANNEL: BCGYD1 FILTER: CH CLASS 180 PEAK DATA: 2134.60 MM @ 310.00 MS, 0.00 MM @ 0.00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY Z-AXIS ACCELERATION



CHANNEL: BCGZG1 FILTER CH CLASS 60 PEAK DATA 23 09 G @ 205 84 MS, -4 47 G @ 74 72 MS

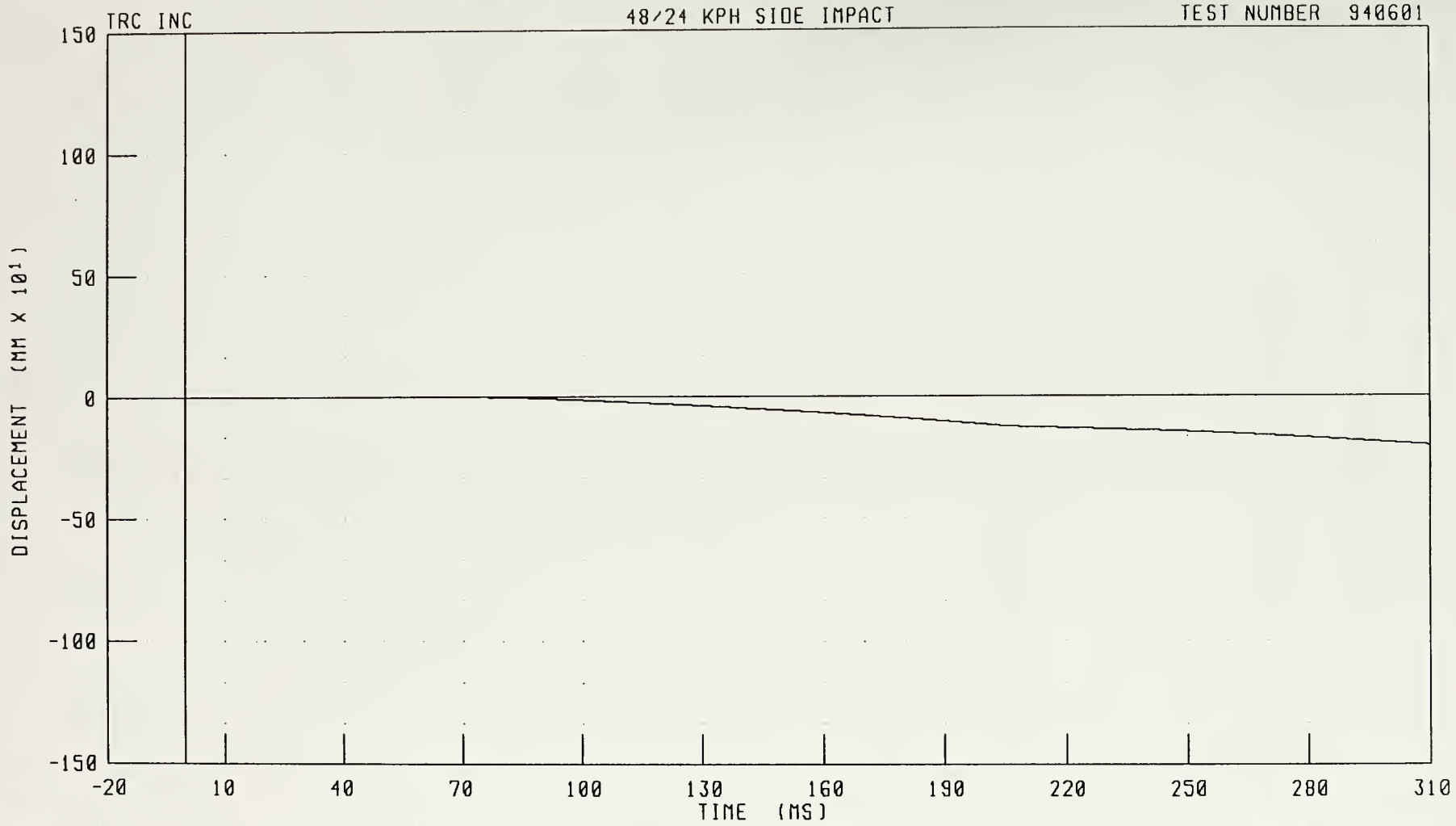
NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY Z-AXIS VELOCITY



CHANNEL: BCGZV1 FILTER: CH CLASS 180

PEAK DATA: 0.62 KM/H @ 37.28 MS, -5.12 KM/H @ 199.92 MS

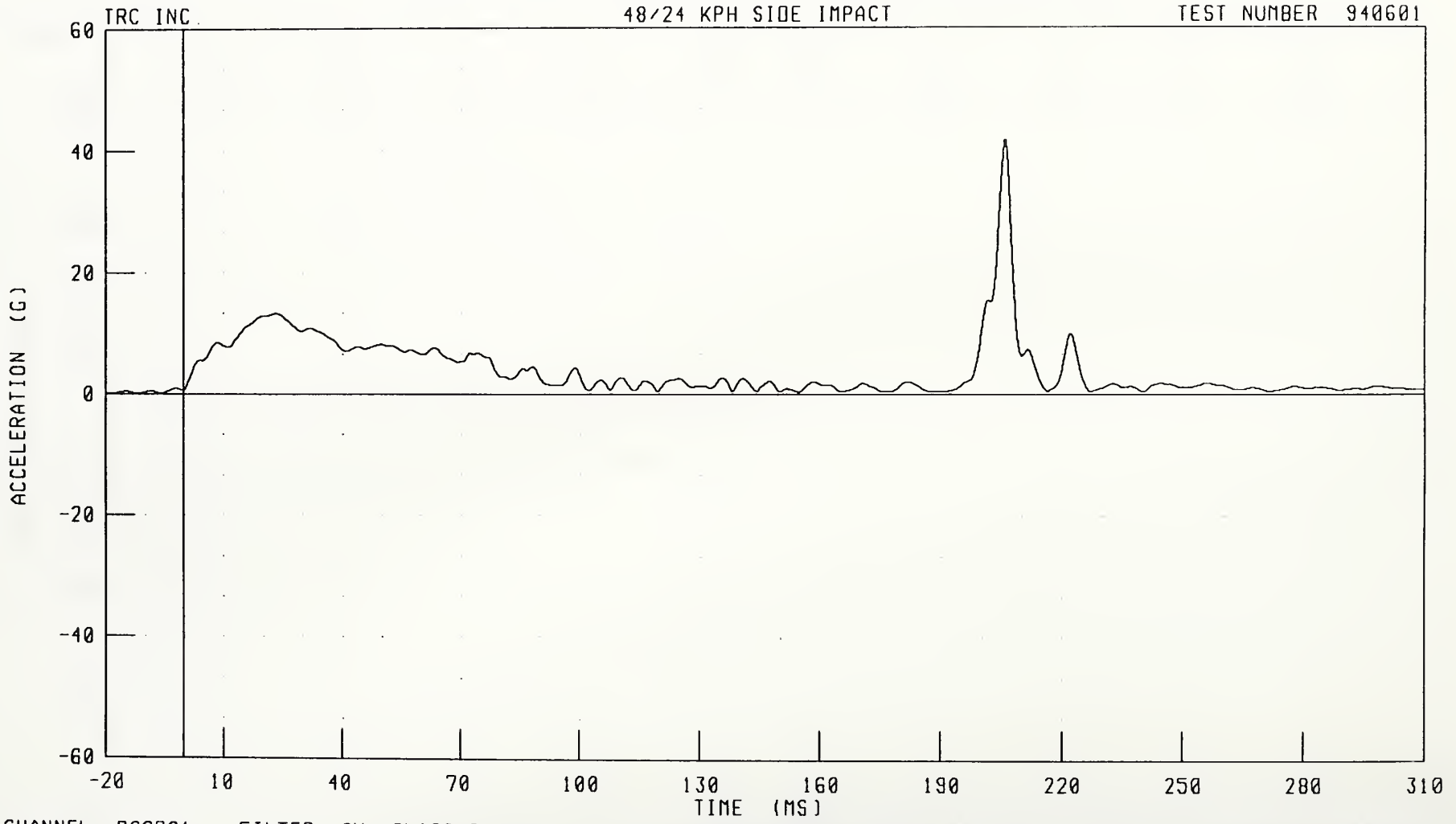
NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK
MOVING BARRIER CENTER OF GRAVITY Z-AXIS DISPLACEMENT



CHANNEL: BCGZD1 FILTER: CH. CLASS 180 PEAK DATA: 0.49 MM @ 50.56 MS; -201.93 MM @ 310.00 MS

NON-DEFORMABLE CRABBED IMPACTOR INTO 1990 HONDA CIVIC 3-DOOR HATCHBACK

MOVING BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION



CHANNEL: BCGRG1 FILTER: CH CLASS 60

PEAK DATA: 41 73 G @ 205 84 MS, 0 10 G @ -11 76 MS

Appendix C

Miscellaneous Test Information

Vehicle Accelerometer Information

No.	Location	Axis	Manufacturer	Model	Serial Number	Orientation (+ Sensing)
1	Vehicle Center Of	X	Endevco	7264	CJ21H	Front
	Gravity	Y	Endevco	7264	CP29H	Left
		Z	Endevco	7264	DT83J	Up
2	Left Rear Sill	X	Endevco	7264	CY78H	Front
	Left Rear Sill	Y	Endevco	7264	CP90H	Right
3	Right Rear Sill	X	Endevco	7264	AGRGH	Front
	Right Rear Sill	Y	Endevco	7264	CJ75H	Right

Crabbed Impactor Accelerometer Information

No.	Location	Axis	Manufacturer	Model	Serial Number	Orientation (+ Sensing)
1	Impactor Center Of	X	Endevco	7264	CM28H	Rear
	Gravity	Y	Endevco	7264	DA15H	Right
		Z	Endevco	7264	DK26JT	Up

Sign Convention

All Dummy, Barrier And Vehicle Channels:

+X: Forward

+Y: Leftward

+Z: Upward

+Force: Tension