



U.S. Department
of Transportation
Federal Railroad
Administration

VEHICLE PERFORMANCE TEST: MATERIAL HANDLING CARS IN SERVICE FROM NEW YORK CITY TO CHICAGO

Office of Research and
Development
Washington, D.C. 20590

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13. ABSTRACT Vehicle performance tests were conducted on empty 1400-series Amtrak Material Handling Cars (MHC) from Albany, New York, to Chicago, Illinois. TTCI used its 33-inch instrumented wheelsets, accelerometers, and data acquisition and analysis system to collect the vehicle performance data. In order to configure the instrumented wheelsets to the MHC, modifications were performed on the B-end truck of the 1400 MHC car. The tests started on December 6, 2002, with a scheduled completion date of December 16, 2002; however, the test procedure was shortened due to the MHC test train derailment caused by a broken rail on December 14, 2002.				
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298-102

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
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LENGTH

in	inches	*2.50	centimeters	cm
ft	feet	30.00	centimeters	cm
yd	yards	0.90	meters	m
mi	miles	1.60	kilometers	km

AREA

in ²	square inches	6.50	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.80	square meters	m ²
mi ²	square miles	2.60	square kilometers	km ²
	acres	0.40	hectares	ha

MASS (weight)

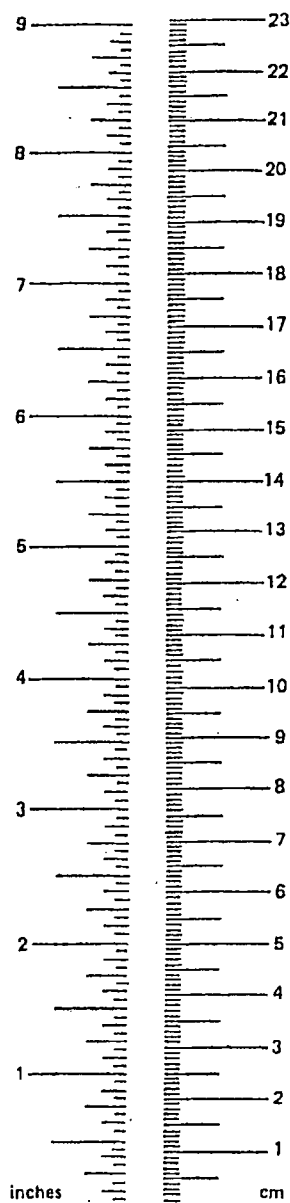
oz	ounces	28.00	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.90	tonnes	t

VOLUME

tsp	teaspoons	5.00	milliliters	ml
Tbsp	tablespoons	15.00	milliliters	ml
fl oz	fluid ounces	30.00	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.80	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 cm (exactly)

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
--------	---------------	-------------	---------	--------

LENGTH

mm	millimeters	0.04	inches	in
cm	centimeters	0.40	inches	in
m	meters	3.30	feet	ft
m	meters	1.10	yards	yd
km	kilometers	0.60	miles	mi

AREA

cm ²	square centim.	0.16	square inches	in ²
m ²	square meters	1.20	square yards	yd ²
km ²	square kilom.	0.40	square miles	mi ²
ha	hectares (10,000 m ²)	2.50	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	2.10	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	36.00	cubic feet	ft ³
m ³	cubic meters	1.30	cubic yards	yd ³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
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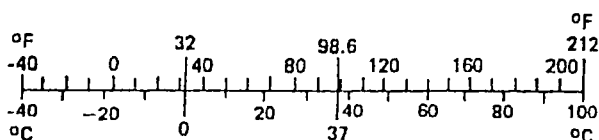


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1.0 INTRODUCTION

The Federal Railroad Administration (FRA) contracted with Transportation Technology Center, Inc. (TTCI), a subsidiary of the Association of American Railroads (AAR), to conduct vehicle performance tests on empty 1400-series Amtrak Material Handling Cars (MHC) from Albany, New York to Chicago, Illinois. TTCI used its 33-inch instrumented wheelsets (IWS), accelerometers, and data acquisition and analysis system to collect the vehicle performance data. In order to configure the instrumented wheelsets to the MHC, modifications were performed on the B-end truck of the 1400 MHC car.

The tests started on December 6, 2002, with a scheduled completion date of December 16, 2002; however, the test procedure was shortened due to the MHC test train derailment caused by a broken rail on December 14, 2002.

The FRA, CSX Transportation, and Amtrak sponsored this test in cooperation with Norfolk Southern.

2.0 OBJECTIVE

The objective of this test program was to investigate the dynamic performance of the MHC car and analyze the results using the safety criteria provided by FRA. A strong emphasis was placed on the vertical bounce movement of the car body and truck, and how the wheels were unloaded during bounce (resonance) situations.

3.0 PROCEDURE

3.1 MHC 1400 TRUCK MODIFICATIONS

The 1400 series MHC car was originally equipped with Buckeye BX trucks. This truck is typically configured with 33-inch wheels and 5.5 by 10-inch roller bearings. The 33-inch TTCI IWS are configured with 6 by 11-inch roller bearings. In order to use the TTCI IWS in this truck design, modifications were performed to the bearing boxes and pedestal liners (machine bearing boxes on wear surfaces and fabricate thinner pedestal liners). All modifications were based on recommendations from the truck designer (Buckeye) and were performed at the Amtrak vehicle maintenance facility in Ivy City, District of Columbia.

The sequence of the modifications was:

1. Obtain 6 by 11-inch bearing boxes and machine wear plates to a final longitudinal dimension of 10.00 inches. The lateral wear plate of the thrust plate was also machined to a final dimension of 1/8 inch thick.
2. Fabricate the truck pedestal wear liners using 12-gage 504L stainless steel plate.
3. Remove existing wear liners and install new wear liners using standard Amtrak welding procedures.
4. Assemble truck using TTCI 33-inch IWS and newly machined bearing housings.

Figures 1 through 4 show the wear liners used and the final assembly of the IWS in the MHC 1400 truck.

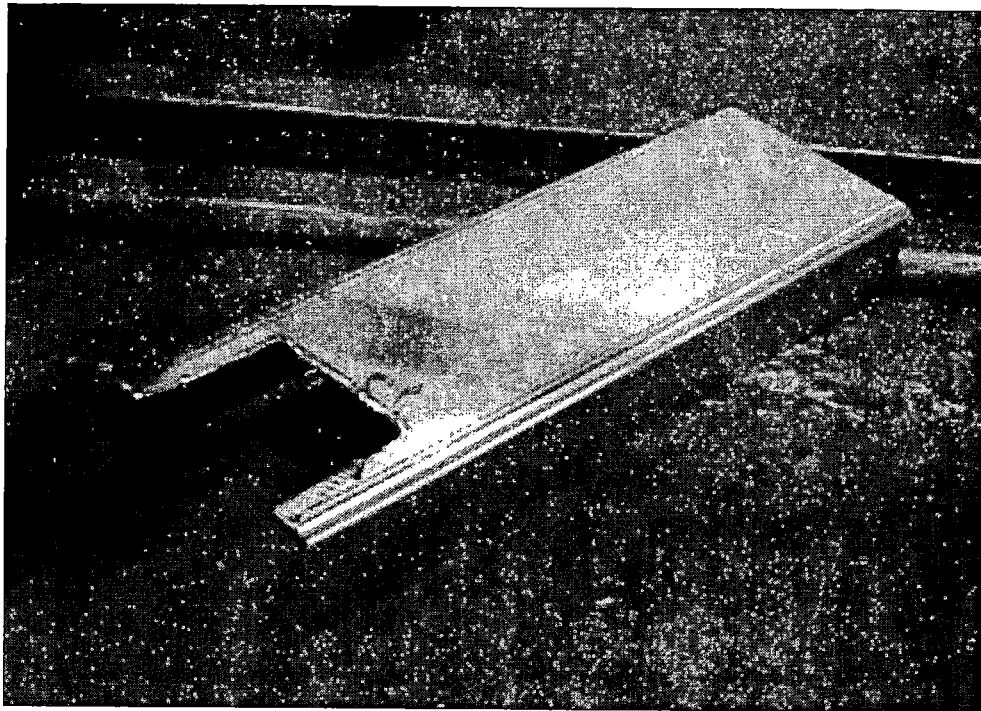


Figure 1. 12-Gage 504L Stainless Steel Wear Liners

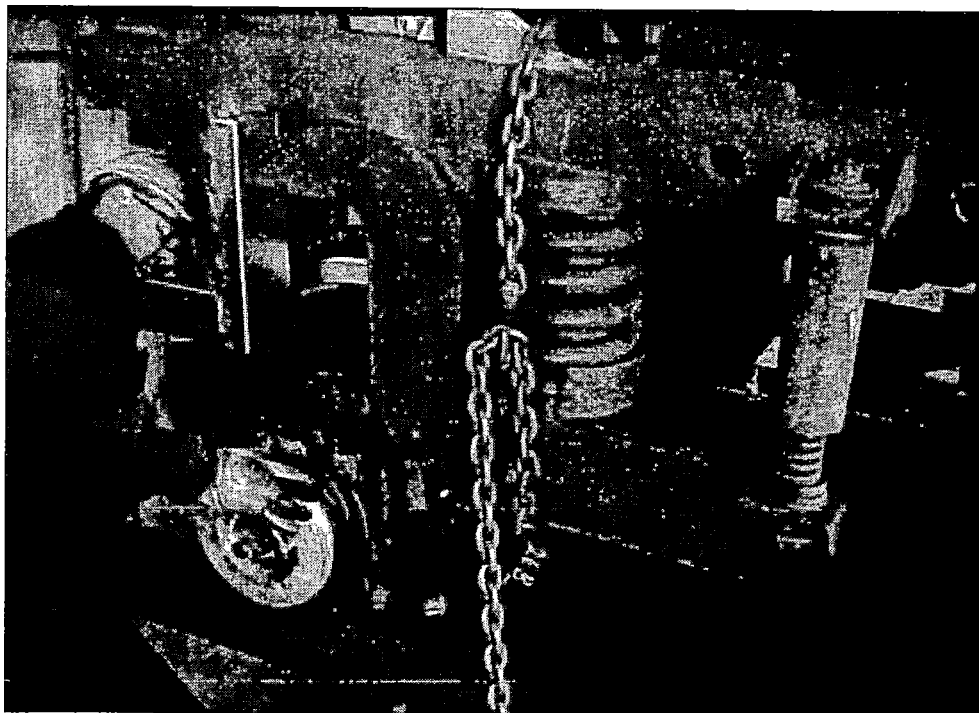


Figure 2. Installation of the Wear Liners and IWS into MHC Truck

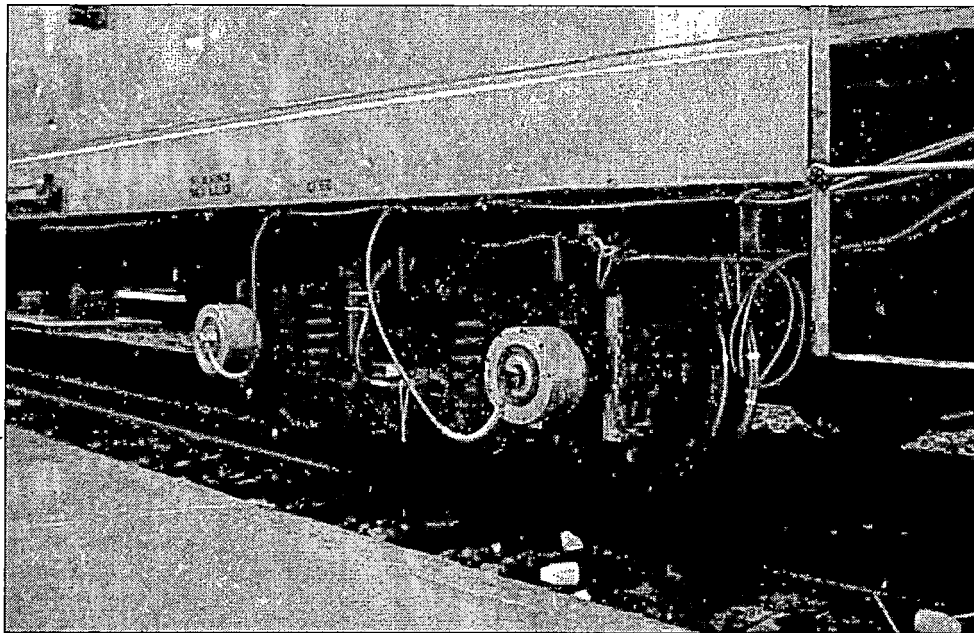


Figure 3. Final installation of TTCI IWS into MHC Car

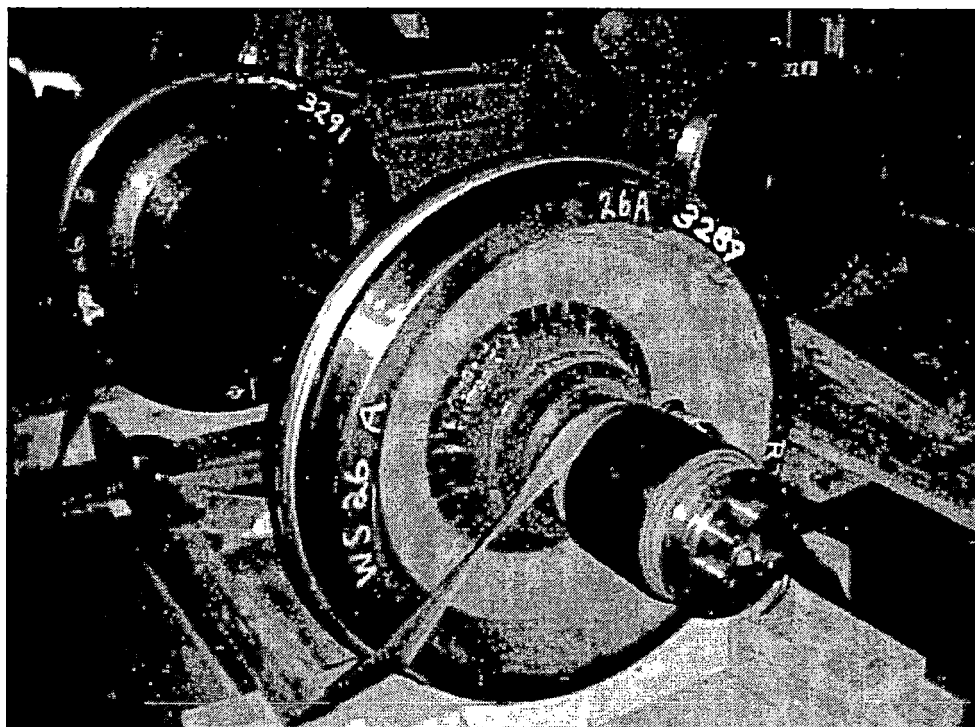


Figure 4. TTCI 33-inch IWS (Amtrak Standard 1:40 NF)

3.2 INSTRUMENTATION SETUP

Table 1 shows the instrumentation configuration. All channels were sampled at 300 samples per second. The IWS were low pass filtered at 25 Hz (4-pole Bessel), and the remaining channels were filtered at 30 Hz (4-pole Bessel). Table 1 shows a general layout of the MHC test train instrumentation. A complete description of the measurement scale factors and transducers are provided in Appendix A.

Table 1. MHC Test Train Instrumentation Setup

	T-16				Baggage Car				Each of the Two MHCs			
	Lead		Trail		Lead		Trail		Lead		Trail	
	CB	Truck	CB	Truck	CB	Truck	CB	Truck	CB	Truck	CB	Truck
Vertical Acceleration			X		X	X	X	X	X	X	X	X
Lateral Acceleration					X				X			
Displacement Transducer						X(2)				X(2)		
Instrumented Wheelset										X(2)		

Figures 5 and 6 show the location of the vertical truck acceleration and vertical spring displacement transducers. Prior to installation, Modern Machine and Tool performed a complete laboratory calibration on each IWS ensuring that the most accurate measurements possible could be provided by the IWS.

At the request of the FRA, one additional accelerometer, used to measure vertical axle acceleration, was installed on the equalizer beam next to the truck axle. The range of the accelerometer used for this measurement was a ± 5 g, thus requiring the mounting arrangement to be isolated using a foam isolation pad.

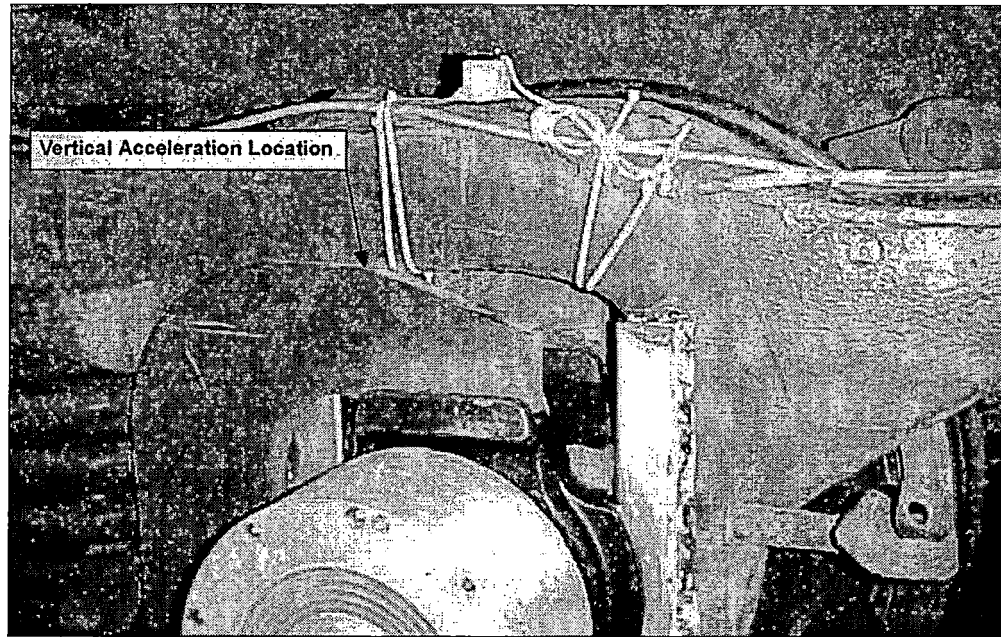


Figure 5. Vertical Truck Acceleration Location

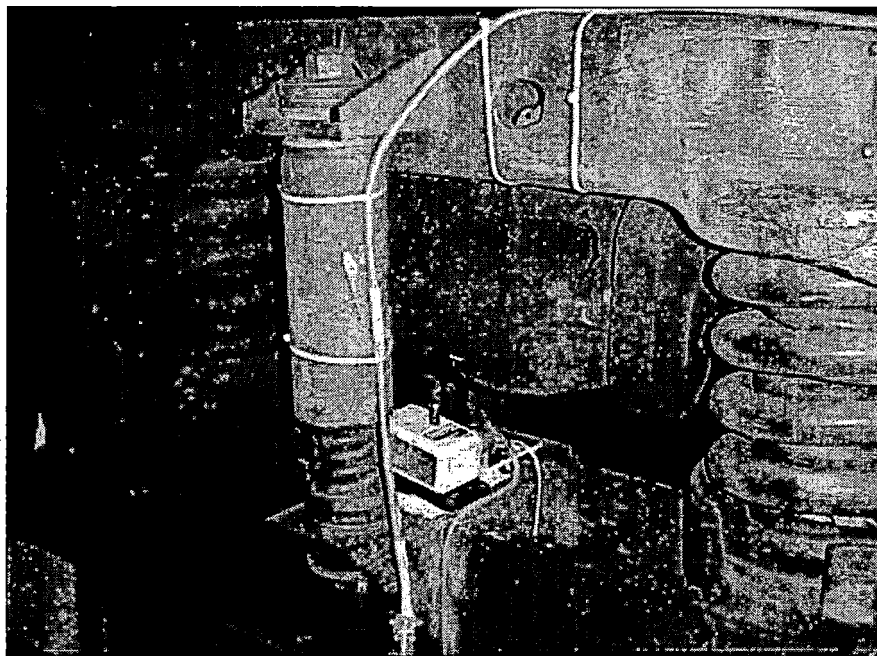


Figure 6. Vertical Spring Displacement Transducer Location

3.3 TRAIN CONFIGURATION

The test train was a special non-revenue train that operated between Albany, New York, and Cleveland, Ohio, over the route of trains 48 and 49. The only planned stops were to pick up or drop off observers and to change train crews. Figure 7 shows the train configuration.

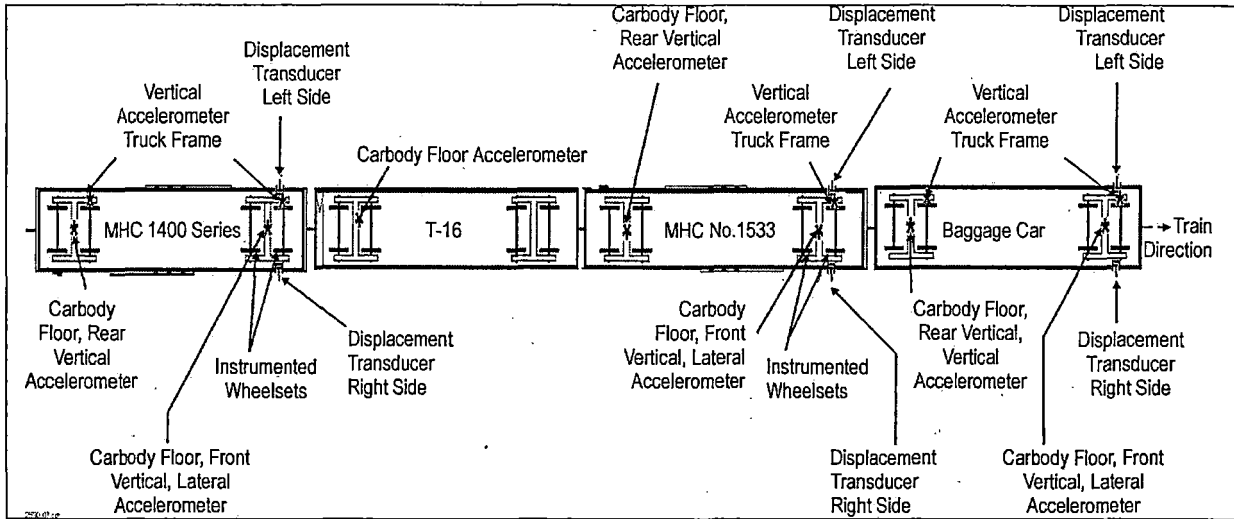


Figure 7. Test Train Configuration (Baggage, 1500, T16, 1400)

3.4 DATA ANALYSIS

All data analysis was performed per the FRA vehicle qualification criteria found in the Code of Federal Regulations, 49 CFR 213.333. The analysis reports were provided approximately every 3 minutes for determining the vehicle pass-fail criteria. The single wheel L/V limit (1.03) was determined using the design flange angle of 72.5 degrees. The static vertical wheel load used for the net axle lateral and single wheel vertical criteria was 9.38 kips; this average value was provided by Ensco based on a scale measurement.

The criteria for success are those identified in §213.345 of 49 CFR. §213 - Track Safety Standards - Subpart G, "Train Operations at Track Classes 6 and Higher." Figure 8 provides details of the FRA vehicle qualification and data analysis requirements.

Vehicle/Track Interaction Safety Limits

Parameter	Safety Limit	Filter/ Window	Requirements
Wheel/Rail Forces¹			
Single Wheel Vertical Load Ratio	≥ 0.1	5 ft	No wheel of the equipment shall be permitted to unload to less than 10% of the static vertical wheel load. The static vertical wheel load is defined as the load that the wheel would carry when stationary on level track. The vertical wheel load limit shall be increased by the amount of measurement error.
Single Wheel L/V Ratio	$\leq \frac{\tan \delta - .5}{1 + .5 \tan \delta}$	5 ft	The ratio of the lateral force that any wheel exerts on an individual rail to the vertical force exerted by the same wheel on the rail shall be less than the safety limit calculated for the wheel's flange angle (δ).
Net Axle L/V Ratio	≤ 0.5	5 ft	The net lateral force exerted by any axle on the track shall not exceed 50% of the static vertical load that the axle exerts on the track.
Truck Side L/V Ratio	≤ 0.6	5 ft	The ratio of the lateral forces that the wheels on one side of any truck exert on an individual rail to the vertical forces exerted by the same wheels on that rail shall be less than 0.6.
Accelerations			
Carbody Lateral ²	≤ 0.5 g peak-to-peak	10 Hz 1 sec window	The peak-to-peak accelerations, measured as the algebraic difference between the two extreme values of measured acceleration in a one second time period, shall not exceed 0.5 g.
Carbody Vertical ²	≤ 0.6 g peak-to-peak	10 Hz 1 sec window	The peak-to-peak accelerations, measured as the algebraic difference between the two extreme values of measured acceleration in a one-second time period, shall not exceed 0.6 g.
Truck Lateral ³	≤ 0.4 g RMS mean-removed	10 Hz 2 sec window	Truck hunting ⁴ shall not develop below the maximum authorized speed.

¹ The lateral and vertical wheel forces shall be measured with instrumented wheelsets with the measurements processed through a low pass filter with a minimum cut-off frequency of 25 Hz. The sample rate for wheel force data shall be at least 250 samples/sec.

² Carbody lateral and vertical accelerations shall be measured near the car ends at the floor level.

³ Truck accelerations in the lateral direction shall be measured on the truck frame. The measurements shall be processed through a filter having a pass band of 0.5 to 10 Hz.

⁴ Truck hunting is defined as a sustained cyclic oscillation of the truck which is evidenced by lateral accelerations in excess of 0.4 g root mean square (mean-removed) for 2 seconds.

[63 FR 34029, June 22, 1998; 63 FR 46102, Aug. 28, 1998]

Figure 8. Code of Federal Regulations 49 CFR 213.333

3.4.1 Special Vehicle Track Interaction Thresholds for MHC car

There are no federal regulations for lateral or vertical car body accelerations for FRA Track Classes 1 through 5. For reference purposes only, the "alarm" and "alert" exception levels were pre-programmed in the analysis software. The threshold values were provided by Amtrak and are listed below:

3.4.2 Peak-to-Peak Car Body Acceleration (10 Hz LP 1 sec window)

The filter characteristic used for all digital data processing consisted of a Finite Impulse Response digital filter (using a 1024 data point window). The **peak-to-peak** acceleration threshold levels were set according to the following:

	Car Body Peak-to-Peak Vertical Acceleration	Car Body Peak-to-Peak Lateral Acceleration
Alert threshold	0.40 g	0.25 g
Alarm threshold	0.80 g	0.60 g

3.4.3 Zero-to-Peak Car Body Acceleration (10 Hz LP no window)

The **zero-to-peak** acceleration threshold levels (defined to indicate potential wheel unloading) for the vertical car body channels were set according to the following:

	Car Body Zero-to-Peak Vertical Acceleration
Alert threshold	0.8 g
Alarm threshold	1.0 g

3.4.4 Single Wheel Vertical Load (5 foot / 2 foot window)

The thresholds for single wheel unloading were set according to the following:

	Single Wheel Vertical Load Ratio	Vertical Wheel Load 1404 MHC
Nominal Wheel Load	1.0	9,380 lbs
Alert threshold	0.2	1,875 lbs
Alarm threshold	0.1	940 lbs

3.5 TEST SEQUENCE OF EVENTS

The map in Figure 9 shows a general description of the test route from Albany to Chicago on the Lake Shore Limited Line.

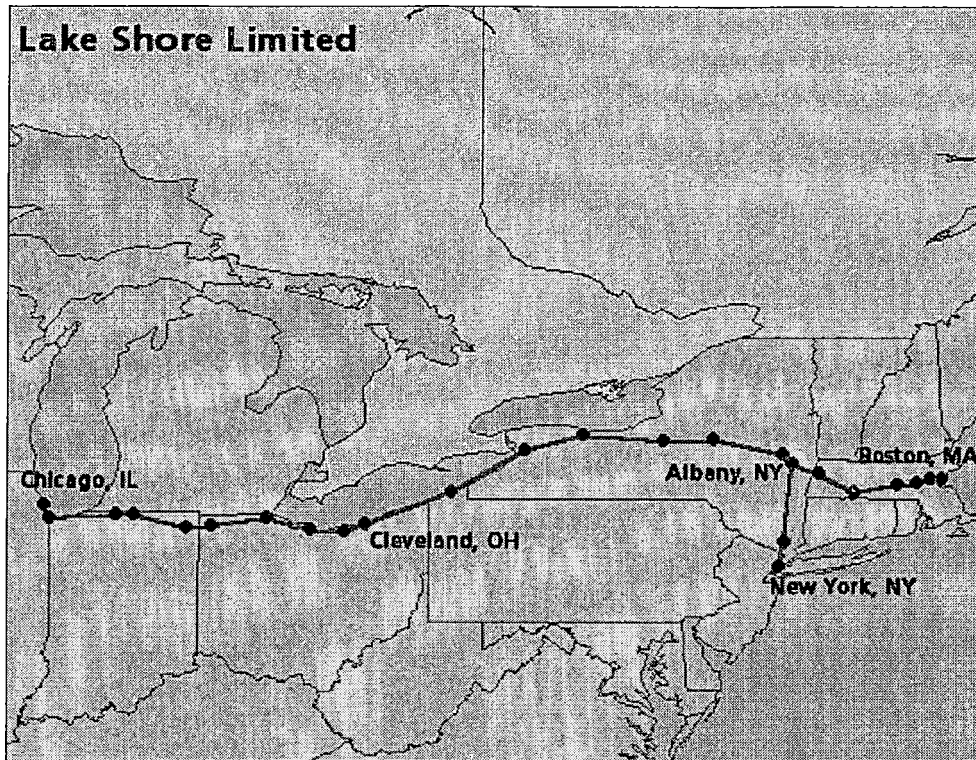


Figure 9. Test Route, Lake Shore Limited Line

Table 2 provides a sequence of the significant test events.

Table 2. Sequence of Test Events

Date	Start	End	Max Speed	Railroad	Comments
12/6/02	Washington, DC	Sunnyside		NEC	Checkout runs (changed p-p criteria)
12/7/02	Sunnyside	Albany		MNRR	Long layover in NYC
12/9/02	Albany	Cleveland	60	CSX	Repairs to right string pot at Buffalo
12/10/02	Cleveland	Chicago	79	NS	Lost 26A L1 Lateral Bridge (replace spinning amp in Toledo, repair in Chicago)
12/10/02	Chicago	Cleveland	79	NS	IWS repair successful
12/11/02	Cleveland	Albany	70	CSX	No instrumentation problems
12/12/02	Albany	Erie	75	CSX	Install vertical axle accelerometer 25A Issues at MP 324 on T16 & 1533, 1533 wheel exception at MP 403
12/14/02	Erie	Albany	75	CSX	60 mph at mp 404 and 324 1533 wheel exception at mp 72.6 Derailed at MP 338 in a 2-degree curve at 65 mph

4.0 RESULTS

4.1 FRA ANALYSIS PER 49 CFR 213.345

All vehicle test runs were combined and evaluated per criteria for wheel/rail force safety limits, truck lateral accelerations, and vertical/lateral car body accelerations. Figures 10 through 18 show the vehicle performance for each individual criterion per the CFR 213.345 criteria.

Figures 10-13 summarize the FRA criteria regarding wheel/rail forces, and Figures 14-16 summarize car body and truck accelerations. Each plot shows the worst-case criteria value for each 7-minute report. Appendix B provides the run statistics for all test runs including speed and milepost information. Exceptions are noted with bold text.

Wheel / Rail Forces (Figures 10-13)

No wheel / rail force exceptions were measured on the MHC car when using 49 CFR 213.345 as criteria.

Car body Accelerations (Figures 14 and 15)

Several car body acceleration exceptions were recorded for the vertical and lateral car body measurements. The maximum 1 second peak-to-peak lateral acceleration measured on the car body was 0.639 g from milepost 198.5 to 198.6 with a max speed of 59 mph. The maximum 1 second peak-to-peak vertical acceleration measured on the car body was 2.92 g from milepost 324.7 to 320.4 with a max speed of 75 mph.

Truck Lateral Accelerations (Figure 16)

No truck lateral acceleration exceptions were measured on the MHC car when using 49 CFR 213.345 as criteria.

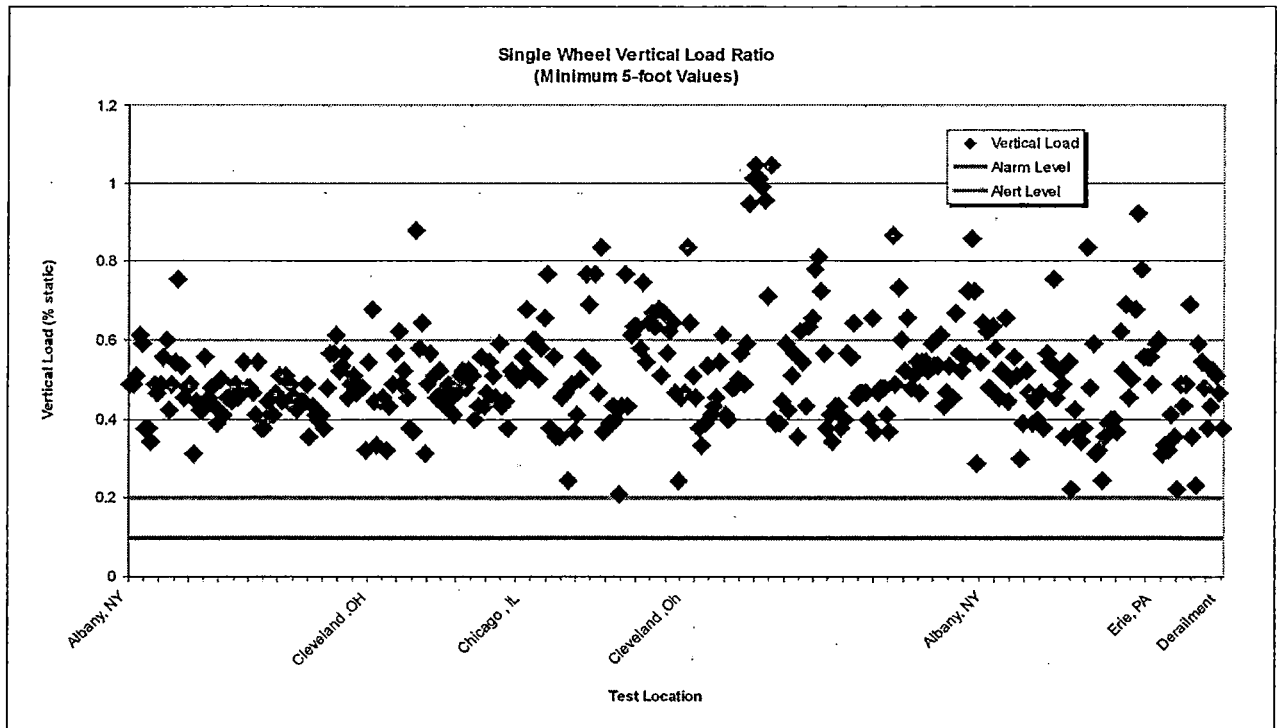


Figure 10. Single Wheel Vertical Load Ratio

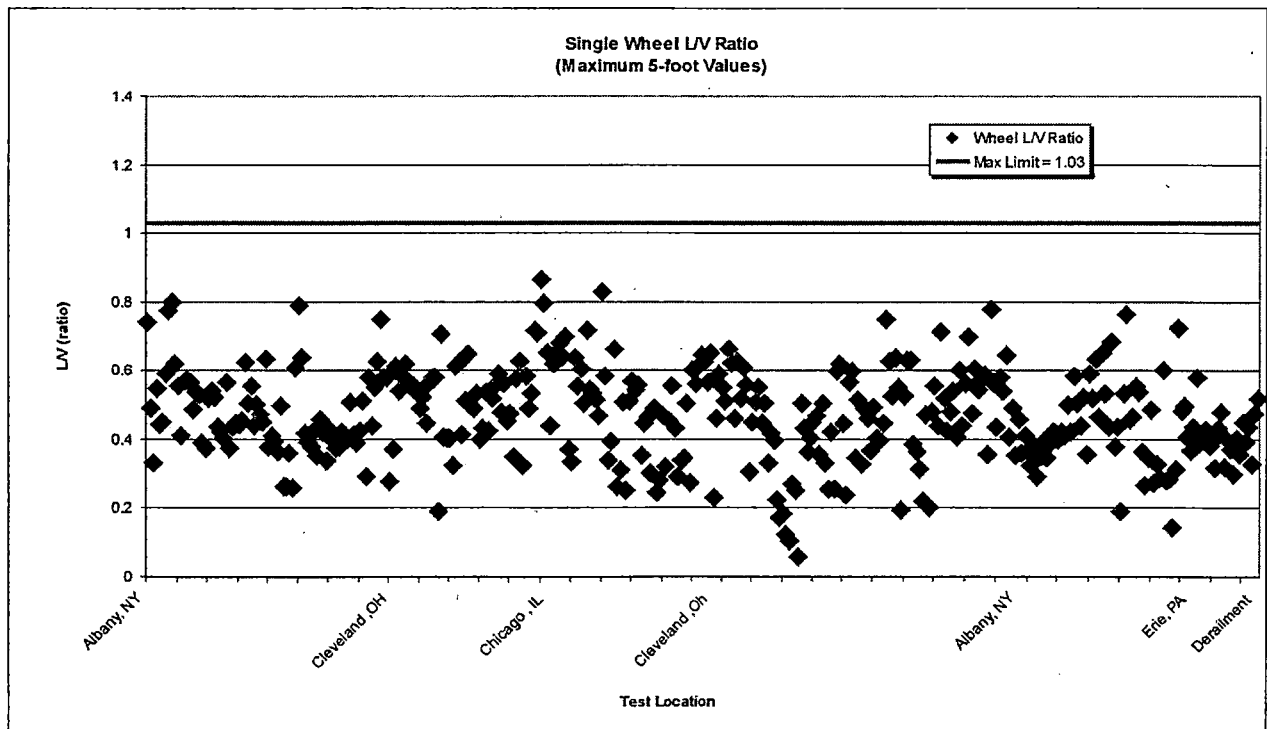


Figure 11. Single Wheel L/V Ratio

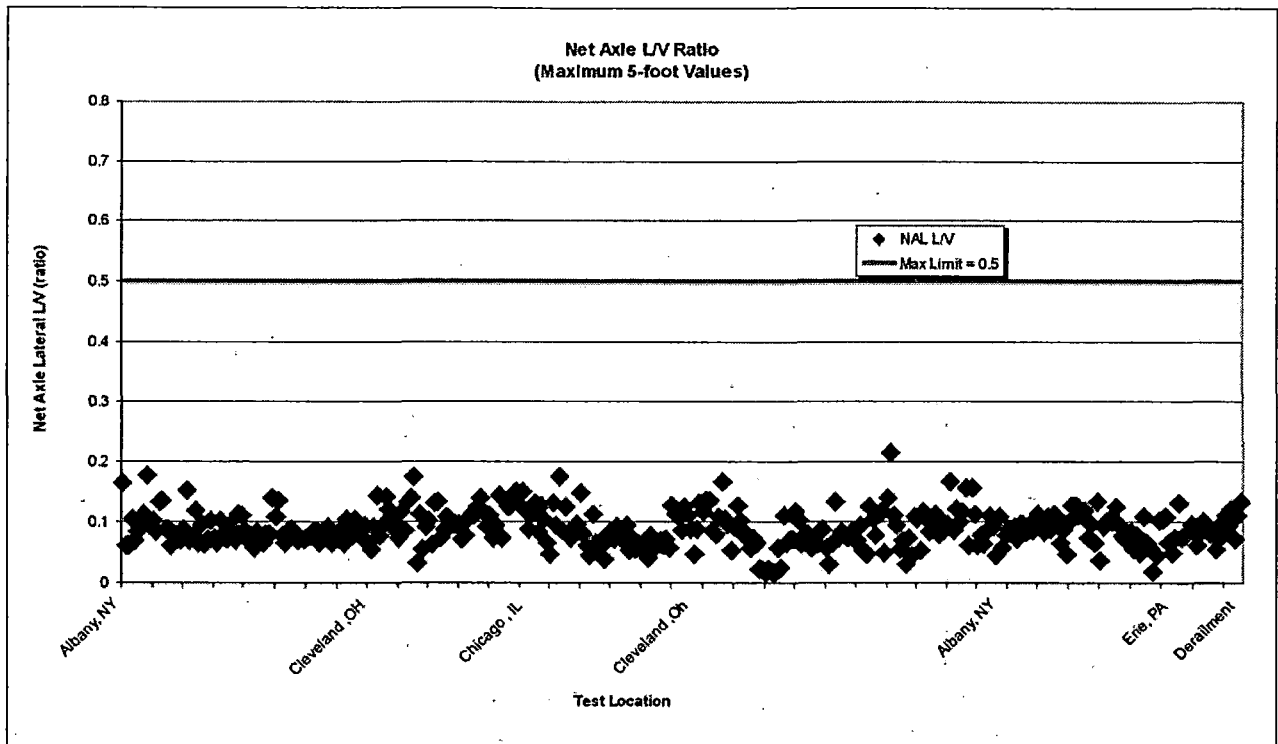


Figure 12. Net Axle L/V Ratio

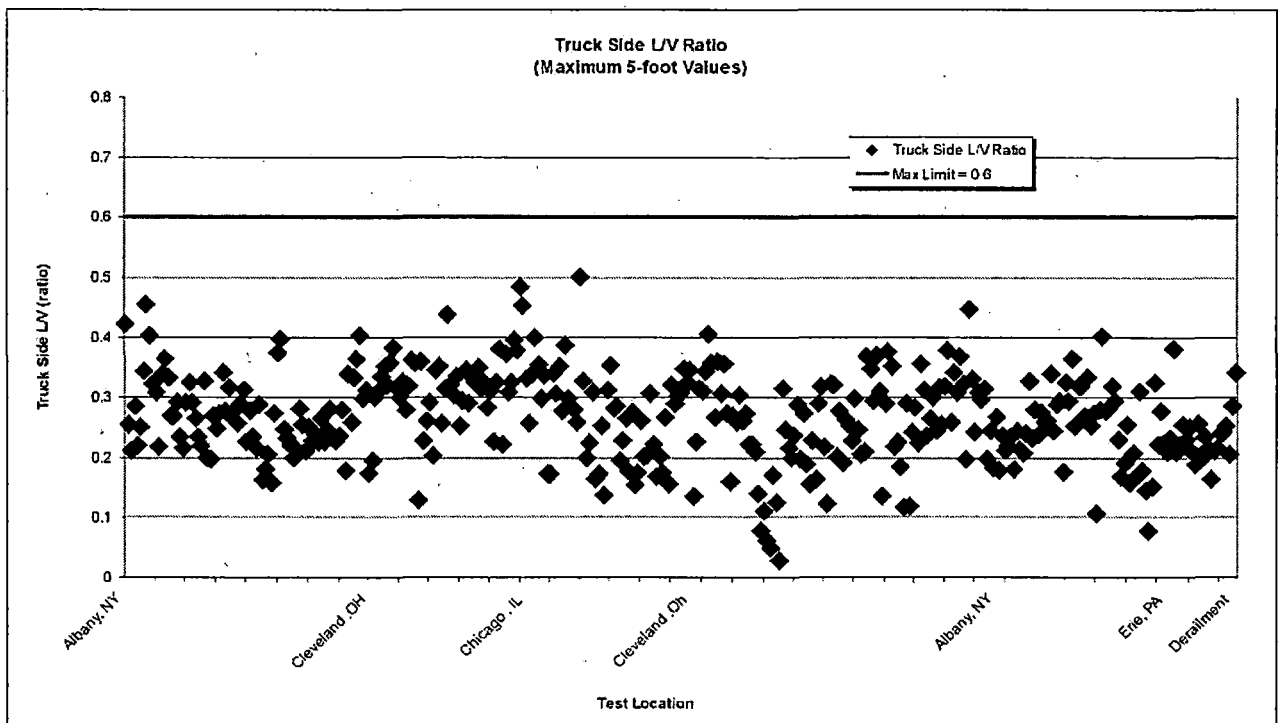


Figure 13. Truck Side L/V Ratio

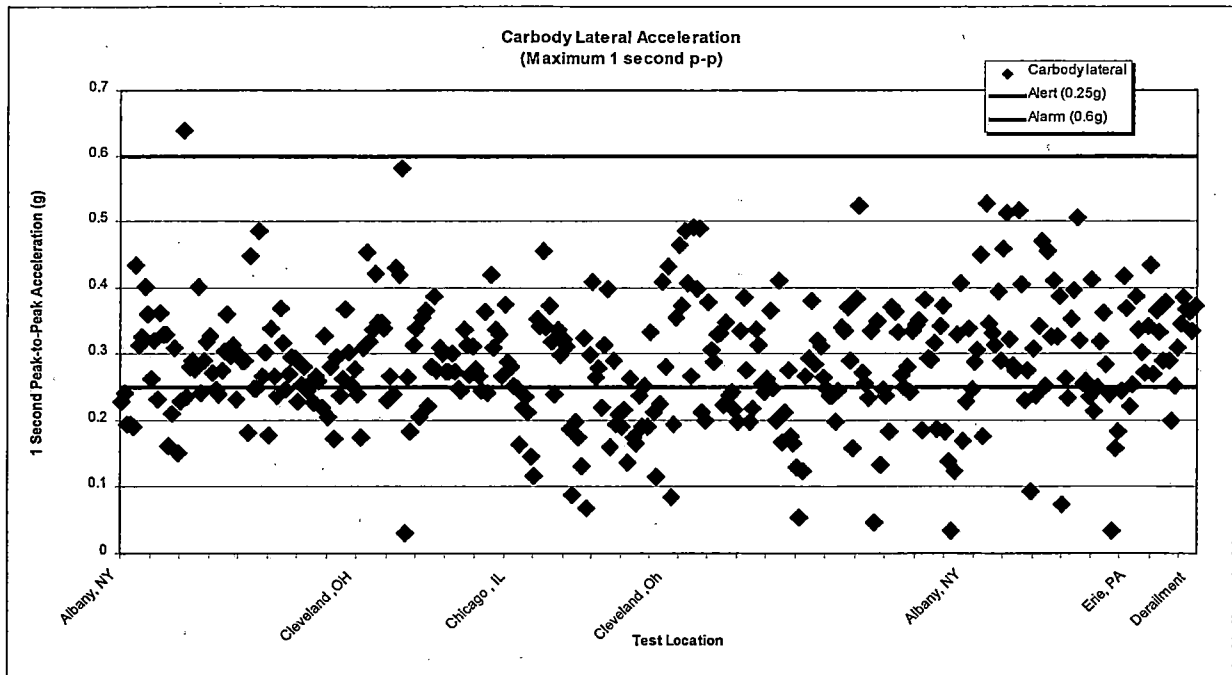


Figure 14. Car Body Lateral Accelerations (p-p)

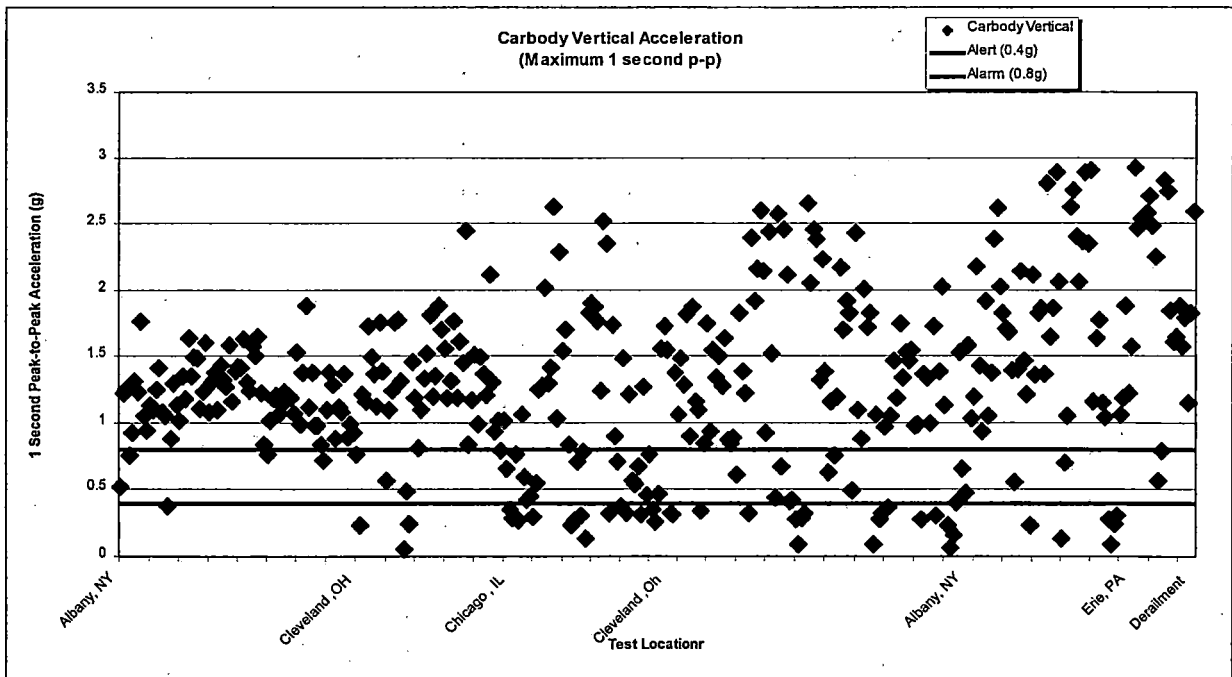


Figure 15. ZC1 and ZC2 Car Body Vertical Accelerations (p-p)

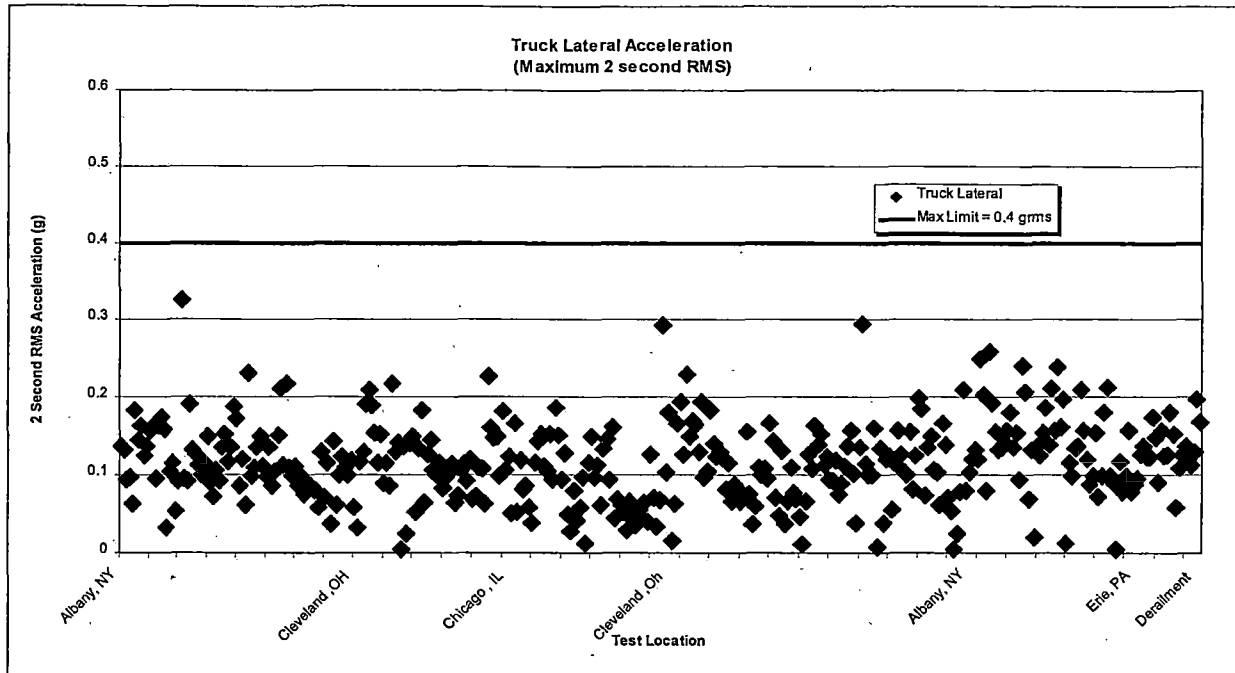


Figure 16. Truck Lateral Accelerations

4.2 CAR BODY BOUNCE UNLOADING ANALYSIS

Figure 17 shows the minimum vertical acceleration (0-peak) values measured for each data file recorded. Additional data printouts of significant vertical unloading events are provided in Appendix C.

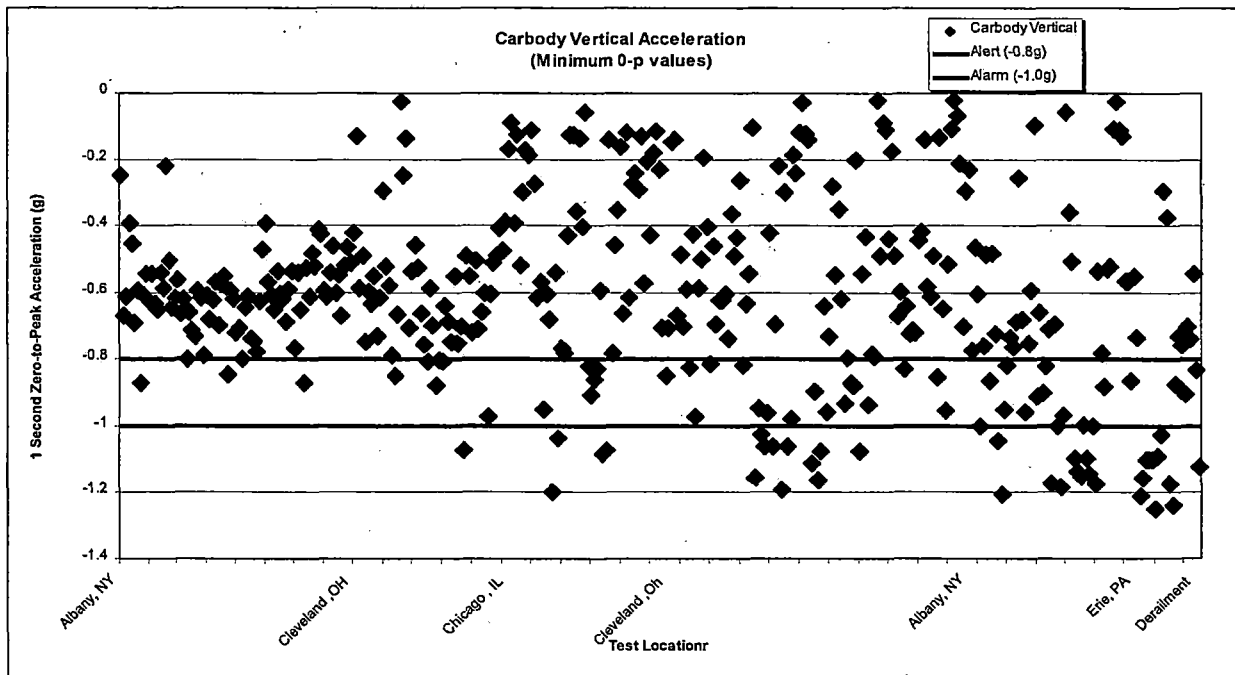


Figure 17. ZC1 and ZC2 Car Body Vertical Acceleration (0-p)

Figure 18 shows each vertical alert/alarm for the car body location configured with the IWS (ZC1). This figure also shows the minimum and average IWS wheel load (2-second window) for each car body alert/alarm. Even though the vertical wheel load fell below the 10 percent threshold, the value was not sustained for more that 5 feet; therefore, an IWS exception was not generated.

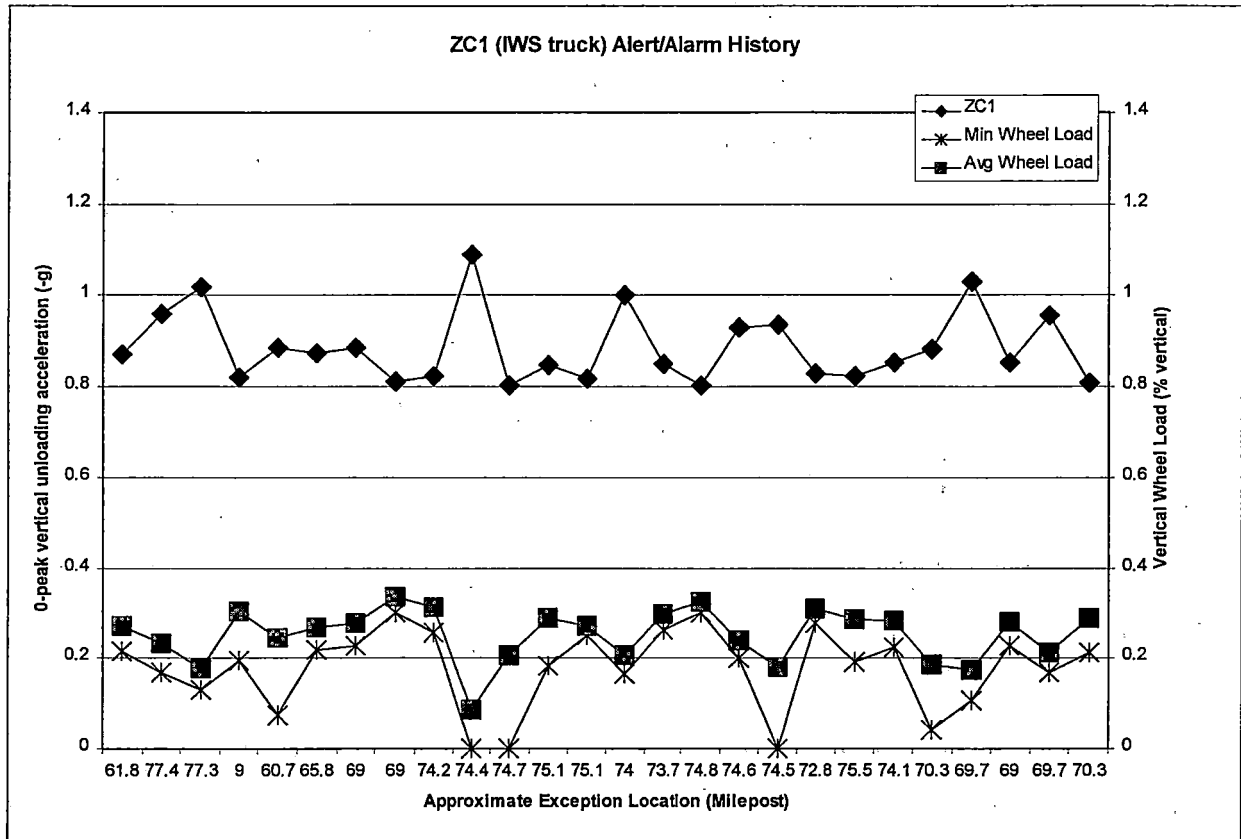


Figure 18. ZC1 Alert/Alarm Records (leading end)

Figure 19 shows each vertical alert/alarm for the car body location at the trailing end of the test car(ZC2). This end of the test car measured much higher unloading acceleration levels; however, it was not configured with instrumented wheelsets.

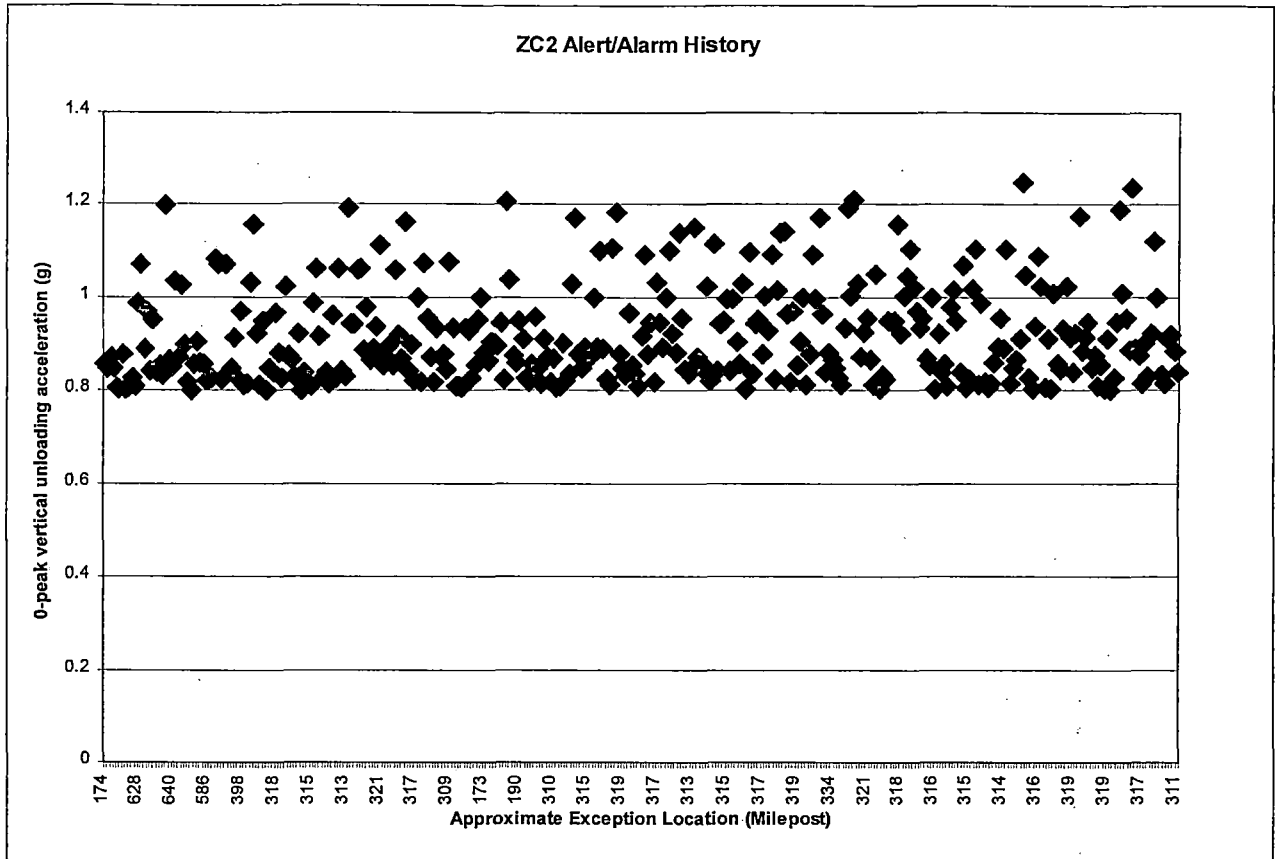


Figure 19. ZC2 Alert/Alarm Records (trailing end)

4.2.1 IWS Analysis Using 2-Foot Window Criteria

At the request of the FRA an analysis for the wheel force measurements were also performed using a 2-foot window. This analysis produced two vertical load alarms: one at MP 404.6 and one at MP 316.5. All other IWS alerts resulting from this analysis are provided in Table 3.

Table 3. 2-Foot Exceptions

FILENAME	TYPE	NAME	TIME	DIST.	MP	SPEED	VALUE	LEVEL
			sec	feet		mph		
12091953.U01	TSLV	LTSLV1	87.6	6574.2	198.6	44.6	0.707	Alert
12091953.U01	NAL	AXLAT1	87.6	6574.2	198.6	44.6	10.962	Alert
12091953.U01	WHLLV	LVA25	87.62	6575.5	198.6	44.6	1.035	Alert
12100350.U01	VLOAD	VB25	32.89	2081.4	404.6	43.6	0	Alarm
12100942.U01	WHLLV	LVB25	263.14	25637.6	678.6	66.1	2.369	Alert
12101001.U01	NAL	AXLAT1	316.34	19343.7	697.2	44.2	9.58	Alert
12110000.U01	VLOAD	VA25	264.95	30105.3	648.2	77.4	1.769	Alert
12110230.U01	VLOAD	VA26	301.43	29184.4	562.2	77.3	1.678	Alert
12111300.U01	NAL	AXLAT1	318.8	29373.4	310.4	69.1	13.515	Alert
12121705.U01	WHLLV	LVB25	41.86	3867	161.6	70.2	2.616	Alert
12122108.U01	NAL	AXLAT1	366.16	40148.9	318.2	74.4	9.394	Alert
12122108.U01	VLOAD	VB25	366.31	40165.2	318.2	74.4	1.482	Alert
12122108.U01	VLOAD	VA25	366.32	40166.3	318.2	74.4	1.434	Alert
12122108.U01	VLOAD	VB26	366.3	40164.1	318.2	74.4	1.495	Alert
12122108.U01	VLOAD	VB26	366.36	40170.7	318.2	74.4	1.787	Alert
12122127.U01	VLOAD	VA25	399.11	43692.3	316.5	74.7	0	Alarm
12122127.U01	WHLLV	LVB25	395.37	43280.3	316.5	74.8	1.302	Alert
12122306.U01	WHLLV	LVB25	54.25	5568.2	314.7	68.7	1.432	Alert
12140624.U01	VLOAD	VB26	55.09	6012.9	319.9	74.5	1.22	Alert
12140702.U01	VLOAD	VA25	462.16	44454	313.4	69.7	1.793	Alert
12140702.U01	VLOAD	VA26	462.18	44456	313.4	69.7	1.647	Alert

4.2.2 Wheel Unloading Events During Car Body Bounce

Several test files recording severe car body bounce were observed during the test route.

Specific files identifying Milepost 318.2 and 313.4 were further analyzed in detail showing the vertical wheel loads reaction to the car body vertical acceleration. Figures 20 and 21 show time history plots of each location.

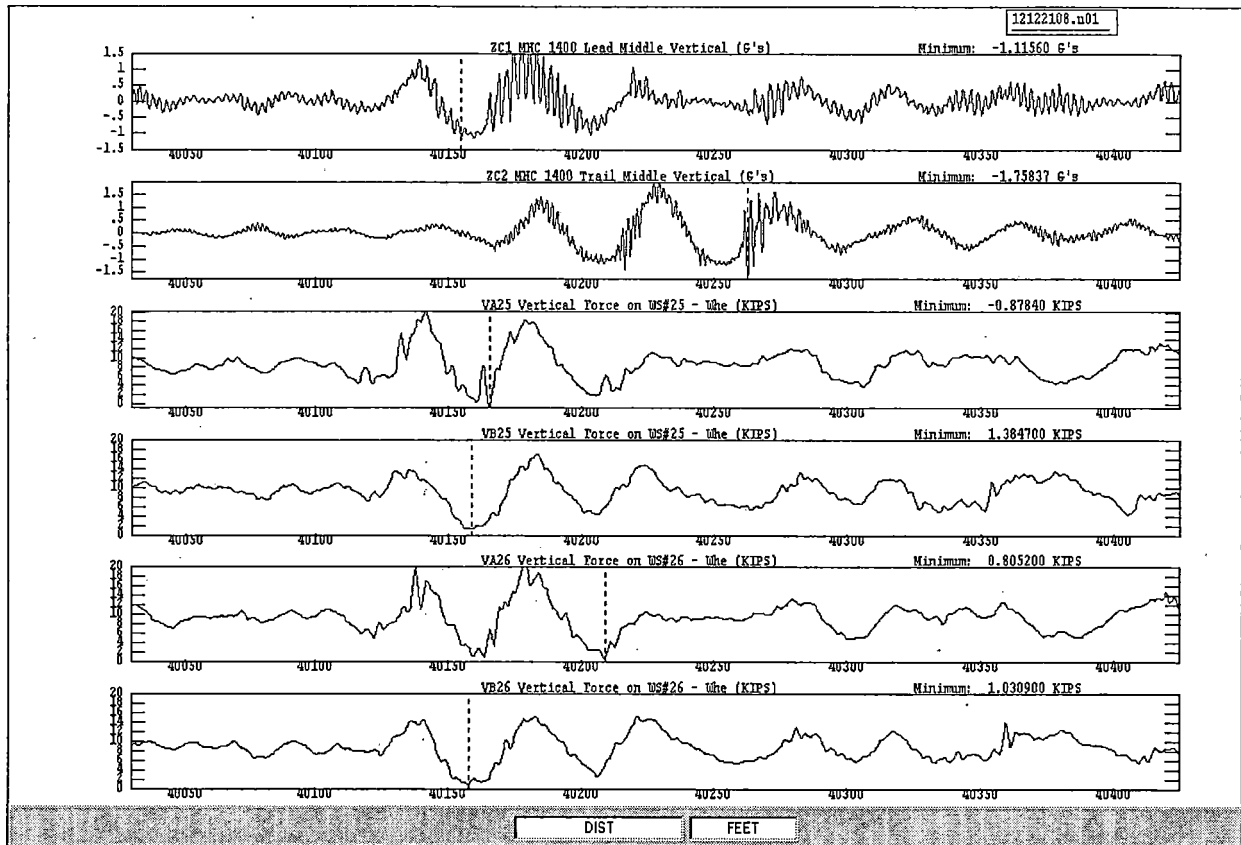


Figure 20. Milepost 318.2 – Car Body Bounce Events Showing Wheel Unloading

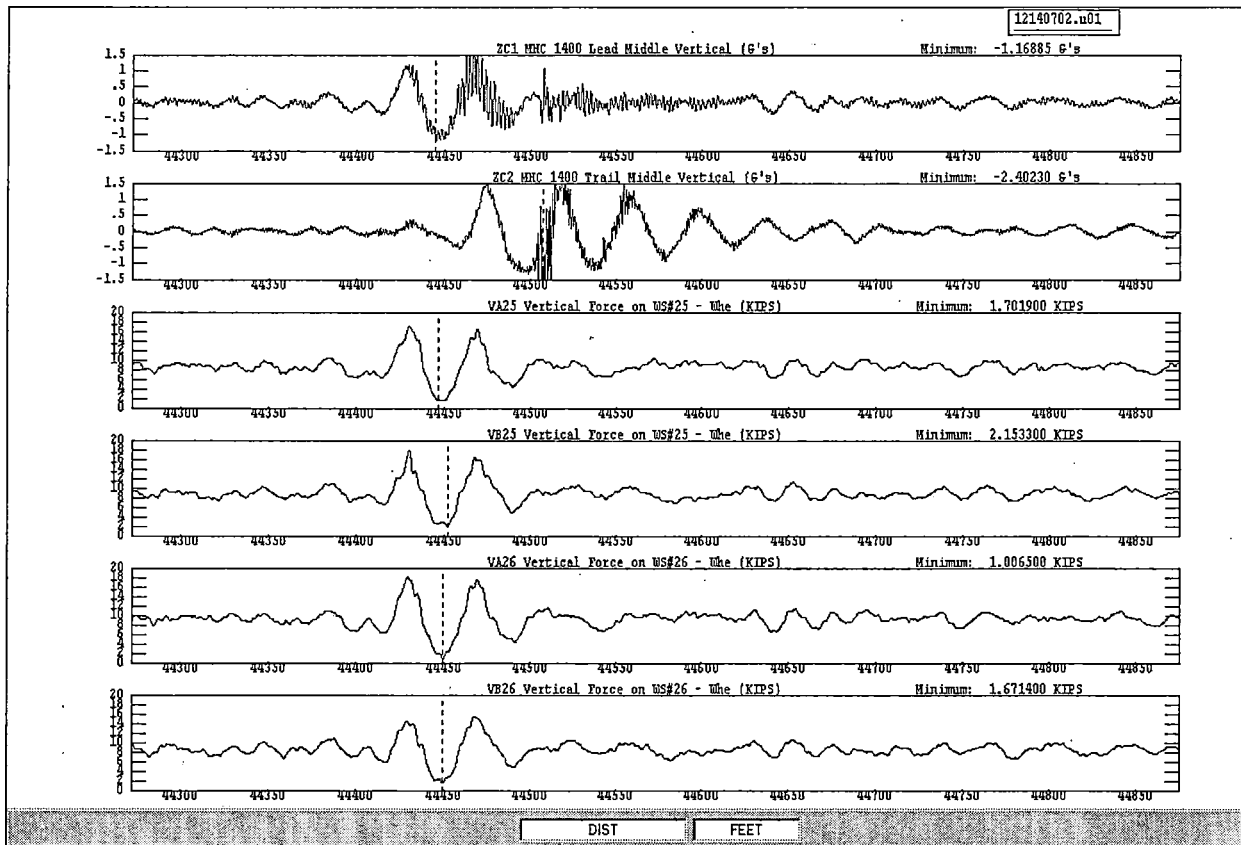


Figure 21. Milepost 313.4 – Car Body Bounce Events Showing Wheel Unloading

The remaining events were analyzed by plotting vertical car body acceleration versus the minimum vertical wheel load within a 2-second window. Results of this analysis are provided in Figure 22. This plot shows how car body unloading of up to 1 g can be achieved while maintaining up to 1,500 pounds of vertical wheel load (16 percent of the static vertical wheel load).

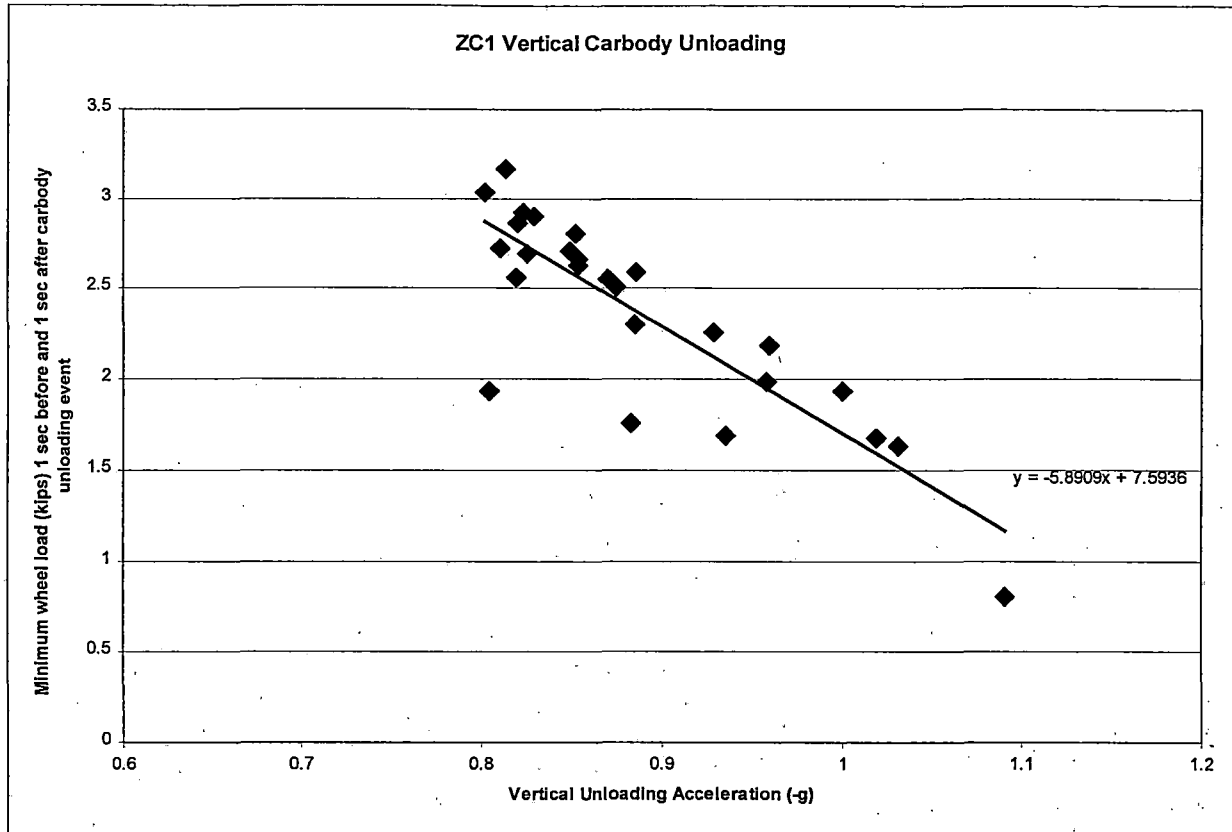


Figure 22. Vertical Car Body Acceleration versus Minimum 2-second Wheel Load

4.2.3 Car Body Bounce and Pitch Natural Frequency Plots

Bounce and pitch natural frequencies for the MHC vehicle were measured by spectral analysis of the acceleration time histories. Figures 23 and 24 show a time history and frequency domain plot of the accelerometers mounted on the leading (ZC1) and trailing (ZC2) and of the test car. Figure 23 shows a plot of the time history, and Figure 24 shows a plot of the pitch and bounce natural frequency.

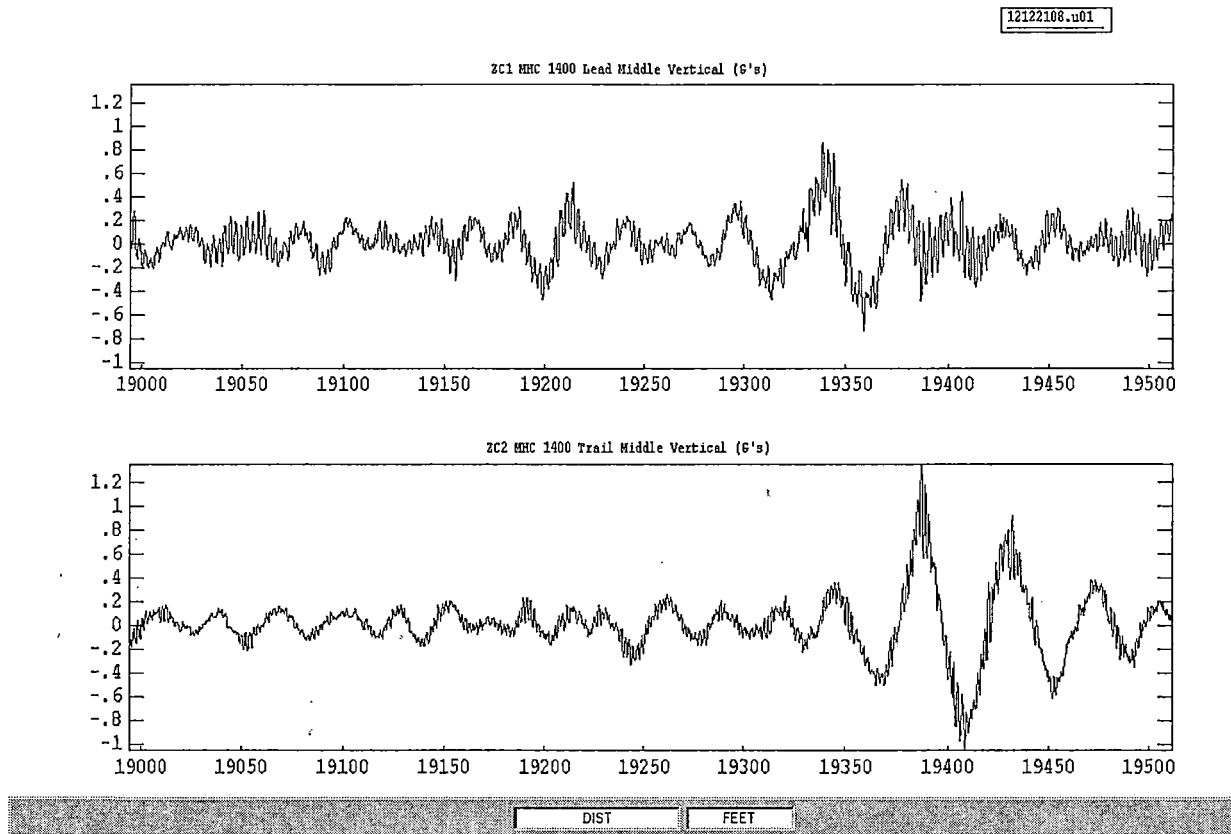


Figure 23. Car Body Vertical Acceleration Time History (ZC1 and ZC2)

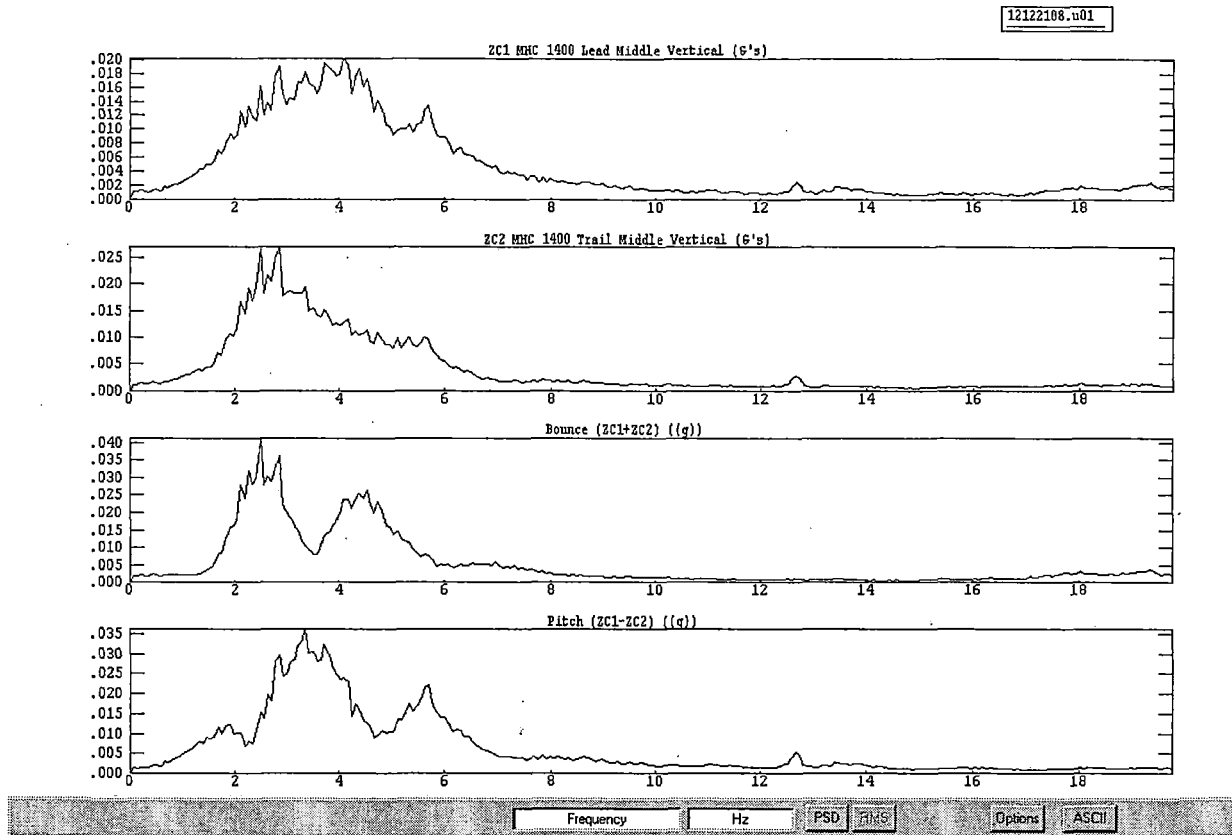


Figure 24. Car Body Vertical Acceleration FFT

4.2.4 Vertical Car Body Acceleration Histograms

Figure 25 shows a histogram of the two car body mounted accelerometers for the MHC car. This figure shows that the accelerations in general were much higher on the trailing end (ZC2) when compared to the leading end (ZC1).

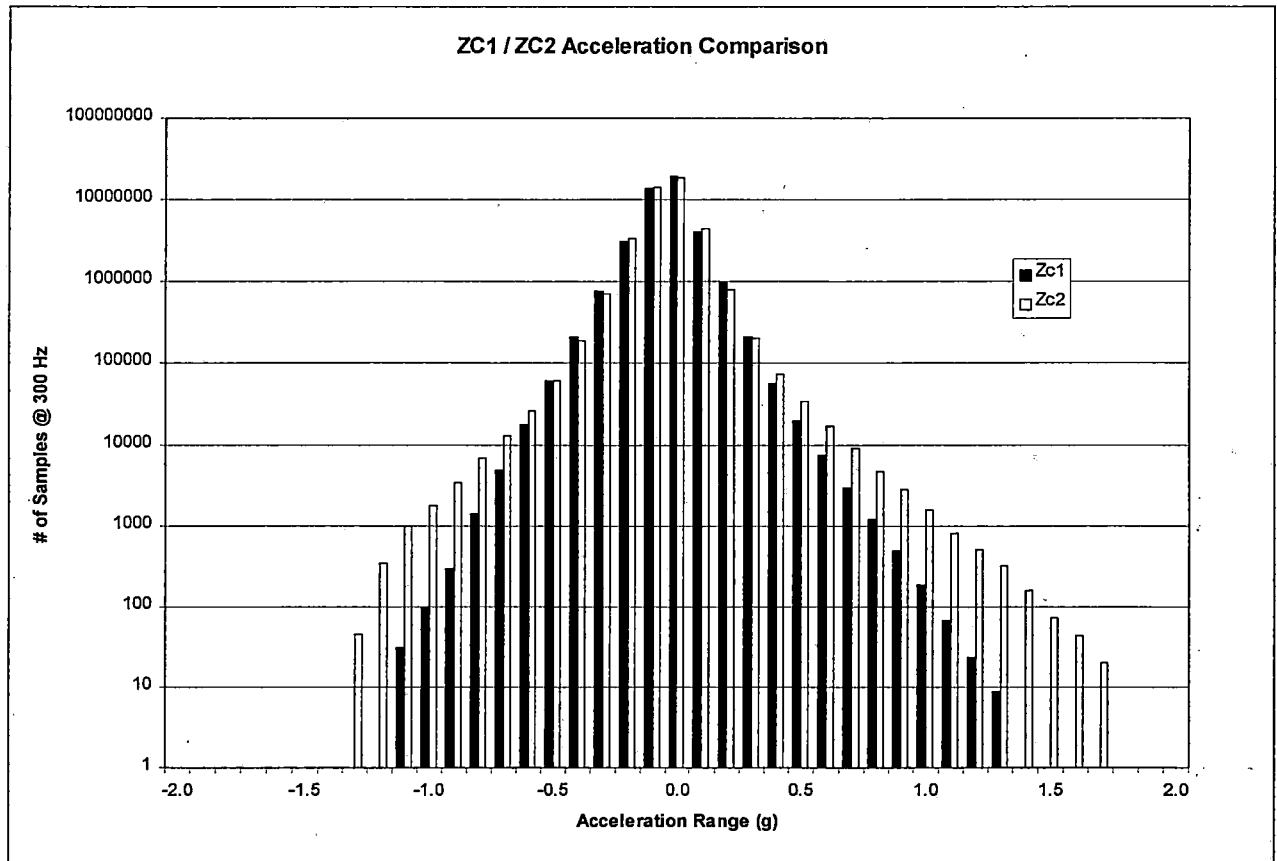


Figure 25. ZC1/ZC2 Vertical Acceleration Histogram

Appendix A

MEASUREMENT INFORMATION FILE

This table provides details on the test setup including measurement description, sensitivity, engineering units, scale factors, and sensitivities.

Measurement Information File

Ch #	Name	Units	eu/v	Description
0	TSPD	Mph	20	TrainSpeed
1	25V1A	U_strains	144.207	WS#25-VerticalChannel1-WheelA
2	25V2A	U_strains	144.207	WS#25-VerticalChannel2-WheelA
3	25V3A	U_strains	144.207	WS#25-VerticalChannel3-WheelA
4	25V4A	U_strains	144.207	WS#25-VerticalChannel4-WheelA
5	25L1A	U_strains	-432.62	WS#25-LateralChannel1-WheelA
6	25L2A	U_strains	-432.62	WS#25-LateralChannel2-WheelA
7	25TQA	Kips	1.989	WS#25-TorqueChannel-WheelA
8	25P1A	U_strains	56.002	WS#25-PositionChannel1-WheelA
9	25P2A	U_strains	56.002	WS#25-PositionChannel2-WheelA
10	25P3A	U_strains	56.002	WS#25-PositionChannel3-WheelA
11	25P4A	U_strains	56.002	WS#25-PositionChannel4-WheelA
12	25V1B	U_strains	144.207	WS#25-VerticalChannel1-WheelB
13	25V2B	U_strains	144.207	WS#25-VerticalChannel2-WheelB
14	25V3B	U_strains	144.207	WS#25-VerticalChannel3-WheelB
15	25V4B	U_strains	144.207	WS#25-VerticalChannel4-WheelB
16	25L1B	U_strains	-432.62	WS#25-LateralChannel1-WheelB
17	25L2B	U_strains	-432.62	WS#25-LateralChannel2-WheelB
18	25P1B	U_strains	56.002	WS#25-PositionChannel1-WheelB
19	25P2B	U_strains	56.002	WS#25-PositionChannel2-WheelB

Ch #	Name	Units	eu/v	Description
20	25P3B	U_strains	56.002	WS#25-PositionChannel3-WheelB
21	25P4B	U_strains	56.002	WS#25-PositionChannel4-WheelB
22	26V1A	U_strains	144.207	WS#26-VerticalChannel1-WheelA
23	26V2A	U_strains	144.207	WS#26-VerticalChannel2-WheelA
24	26V3A	U_strains	144.207	WS#26-VerticalChannel3-WheelA
25	26V4A	U_strains	144.207	WS#26-VerticalChannel4-WheelA
26	26L1A	U_strains	-432.62	WS#26-LateralChannel1-WheelA
27	26L2A	U_strains	-432.62	WS#26-LateralChannel2-WheelA
28	26TQA	Kips	1.989	WS#26-TorqueChannel-WheelA
29	26P1A	U_strains	56.002	WS#26-PositionChannel1-WheelA
30	26P2A	U_strains	56.002	WS#26-PositionChannel2-WheelA
31	26P3A	U_strains	56.002	WS#26-PositionChannel3-WheelA
32	26P4A	U_strains	56.002	WS#26-PositionChannel4-WheelA
33	26V1B	U_strains	144.207	WS#26-VerticalChannel1-WheelB
34	26V2B	U_strains	144.207	WS#26-VerticalChannel2-WheelB
35	26V3B	U_strains	144.207	WS#26-VerticalChannel3-WheelB
36	26V4B	U_strains	144.207	WS#26-VerticalChannel4-WheelB
37	26L1B	U_strains	-432.62	WS#26-LateralChannel1-WheelB
38	26L2B	U_strains	-432.62	WS#26-LateralChannel2-WheelB
39	26P1B	U_strains	56.002	WS#26-PositionChannel1-WheelB
40	26P2B	U_strains	56.002	WS#26-PositionChannel2-WheelB

Ch #	Name	Units	eu/v	Description
41	26P3B	U_strains	56.002	WS#26-PositionChannel3-WheelB
42	26P4B	U_strains	56.002	WS#26-PositionChannel4-WheelB
43	ZC1	G's	1.265	MHC1400LeadMiddleVerticalCarbodyAccel#2637
44	YC1	G's	1.258	MHC1400LeadMiddleLateralCarbodyAccel#2718
45	ZC2	G's	1.255	MHC1400TrailMiddleVerticalCarbodyAccel#2720
46	YBR1	G's	1.007	MHC1400LeadRightLateralTruckFrameAccel#12444
47	Null	Null	0	NullChannel
48	ZBL3	G's	2.512	MHC1400TrailLeftVerticalTruckFrameAccel#2610
49	ZBL1	G's	2.511	MHC1400LeadLeftVerticalTruckFrameAccel#260
50	D1LZ	Inch	1.031	MHC1400LeadLeftVerticalSpringNestDisp.#16012
51	D1RZ	Inch	1.099	MHC1400LeadRightVerticalSpringNestDisp.#18301
52	ZAL1	G's	1.258	MHC1400LeadLeftAxleVerticalAccel#2724
53	VA25	KIPS	20	VerticalForceonWS#25-WheelA
54	LA25	KIPS	10	LateralForceonWS#25-WheelA
55	POA25	INCHES	1	WS#25-WheelATread_Position
56	LVA25	RATIO	1	WS#25-WheelAL/V
57	VB25	KIPS	20	VerticalForceonWS#25-WheelB
58	LB25	KIPS	10	LateralForceonWS#25-WheelB
59	POB25	INCHES	1	WS#25-WheelBTread_Position
60	LVB25	RATIO	1	WS#25-WheelBL/V
61	ASUM25	RATIO	1	WS#25-AxlesumL/V

Ch #	Name	Units	eu/v	Description
62	LNET25	KIPS	10	WS#25-NetAxleLateralforce
63	TV25	RATIO	1	WS#25-Longitudinal/Vertical
64	VA26	KIPS	20	VerticalForceonWS#26-WheelA
65	LA26	KIPS	10	LateralForceonWS#26-WheelA
66	POA26	INCHES	1	WS#26-WheelATread_Position
67	LVA26	RATIO	1	WS#26-WheelAL/V
68	VB26	KIPS	20	VerticalForceonWS#26-WheelB
69	LB26	KIPS	10	LateralForceonWS#26-WheelB
70	POB26	INCHES	1	WS#26-WheelBTread_Position
71	LVB26	RATIO	1	WS#26-WheelBL/V
72	ASUM26	RATIO	1	WS#26-AxlesumL/V
73	LNET26	KIPS	10	WS#26-NetAxleLateralforce
74	TV26	RATIO	1	WS#26-Longitudinal/Vertical
75	latd	deg	3278.688	Latitude in degrees
76	latm	min	6.557	Latitude in minutes
77	longd	deg	3278.688	Longitude in degrees
78	longm	min	6.557	Longitude in minutes
79	uhr	hour	3278.688	UTC Time stamp Hours (24-Hour)
80	umin	minutes	3278.688	UTC Time stamp Minutes
81	usec	sec	3278.688	UTC Time stamp Seconds
82	uyear	year	3278.688	UTC Time stamp Year (2-digit)

Ch #	Name	Units	eu/v	Description
83	umonth	month	3278.688	UTCTimestampMonthNumber
84	uday	day	3278.688	UTCTimestampDayofMonth
85	GPSV	mph	32.787	GPSVelocity
86	gpshead	deg	32.787	GPSCourseOverGround(True)
87	gpsvar	deg	32.787	GPSMagneticVariation
88	gpsstat	stat	3278.688	GPSStatus
89	Time	Sec.	3278.689	
90	Distance	Feet	3278.689	

Summary of Worst Values Recorded During Each File															
Filename	StMP	EndMP	EndDist (ft)	AvSpd (mph)	MxSpd (mph)	MaxCD (in)	N.A.L (ratio)	WhL/V (ratio)	TSL/V (ratio)	Vert (ratio)	ycp-p (g)	zcp-p (g)	zc0-p (g)	y-Trk (grms)	z-Trk (g)
12091721.U01	MN-164.5	MN-167.0	18919.9	34.2	44	-3.2	0.16	0.74	0.42	0.49	0.228	0.525	-0.249	0.138	0.748
12091727.U01	MN-167.0	MN-164.5	33045.9	59.7	61.7	2.7	0.06	0.49	0.25	0.49	0.241	1.226	-0.671	0.132	1.525
12091733.U01	MN-164.5	MN-169.4	32772.3	59.2	62.4	-1.8	0.06	0.33	0.21	0.51	0.194	1.255	-0.613	0.094	1.522
12091740.U01	MN-169.4	MN-173.4	24528.8	44.3	61.2	2.3	0.11	0.55	0.29	0.61	0.194	0.76	-0.394	0.097	0.898
12091746.U01	MN-173.4	MN-171.6	33140.3	59.9	62.5	-2.6	0.07	0.44	0.22	0.59	0.19	0.923	-0.452	0.063	1.144
12091752.U01	MN-171.6	MN-175.7	33087.7	59.8	61.3	-2.1	0.08	0.45	0.25	0.38	0.433	1.313	-0.691	0.184	2.121
12091758.U01	MN-175.7	MN-172.5	32474.1	58.7	61.5	2.1	0.09	0.59	0.34	0.38	0.313	1.231	-0.595	0.145	1.978
12091805.U01	MN-172.5	MN-174.2	31648	57.2	62.4	-2.5	0.11	0.77	0.46	0.34	0.326	1.76	-0.87	0.164	2.413
12091811.U01	MN-174.2	MN-171.2	31842.3	57.5	61.5	-3.4	0.18	0.80	0.40	0.49	0.402	1.055	-0.608	0.125	1.623
12091817.U01	MN-171.2	MN-175.1	32936.9	59.5	61.1	-2.3	0.10	0.62	0.32	0.47	0.359	0.945	-0.542	0.138	1.729
12091824.U01	MN-175.1	MN-181.2	33501.4	60.5	63	-2.1	0.10	0.55	0.31	0.49	0.263	1.138	-0.625	0.157	2.396
12091830.U01	MN-181.2	MN-185.2	31242.6	56.4	63	-1.5	0.08	0.41	0.22	0.56	0.32	1.099	-0.543	0.162	1.814
12091836.U01	MN-185.2	MN-187.9	21233	38.4	61.3	3	0.13	0.57	0.34	0.60	0.232	1.249	-0.633	0.096	1.727
12091842.U01	MN-187.9	MN-186.4	33227.6	60	62.6	-2.3	0.14	0.57	0.36	0.42	0.362	1.413	-0.653	0.163	2.511
12091849.U01	MN-186.4	MN-184.1	33317.1	60.2	61.1	-2.4	0.09	0.56	0.33	0.49	0.33	1.082	-0.54	0.174	2.714
12091855.U01	MN-184.1	AN-188.7	33188.8	59.9	61.8	1.9	0.09	0.49	0.27	0.54	0.329	1.052	-0.587	0.159	1.905
12091901.U01	AN-188.7	AN-189.7	7902.4	27.4	57.6	-1.5	0.06	0.54	0.27	0.76	0.162	0.381	-0.221	0.032	0.411
12091928.U01	AN-189.8	AN-194.8	31450.6	56.8	62.1	-2.1	0.08	0.53	0.29	0.53	0.21	0.884	-0.505	0.105	1.177
12091934.U01	AN-194.8	AN-199.8	32231.1	58.2	58.8	1.8	0.08	0.39	0.24	0.46	0.31	1.295	-0.645	0.115	2.004
12091940.U01	AN-199.8	AN-200.4	32262.5	58.3	59	2.7	0.07	0.37	0.22	0.48	0.151	1.131	-0.617	0.054	1.639
12091947.U01	AN-200.4	AN-198.5	31752.2	57.4	61.4	2.1	0.09	0.52	0.29	0.49	0.228	1.014	-0.562	0.092	1.597
12091953.U01	AN-198.5	AN-198.6	30347.2	54.8	59.3	-3.5	0.15	0.54	0.33	0.31	0.639	1.351	-0.662	0.325	1.855
12091959.U01	AN-198.6	AN-201.4	32291.9	58.3	59	-2	0.07	0.52	0.29	0.44	0.236	1.182	-0.619	0.095	2.013
12092006.U01	AN-201.4	AH-205.8	32238.1	58.2	58.9	1.3	0.08	0.43	0.27	0.42	0.28	1.637	-0.798	0.092	2.444
12092012.U01	AH-205.8	AH-313.2	28508.5	51.5	58.9	-2.7	0.12	0.42	0.24	0.42	0.289	1.351	-0.66	0.191	2.712
12092018.U01	AH-313.2	AH-313.3	28812.3	52	59.8	2.6	0.07	0.40	0.22	0.56	0.277	1.495	-0.713	0.132	1.615
12092024.U01	AH-313.3	AH-312.5	31425.7	56.8	60.9	-3.8	0.10	0.57	0.33	0.46	0.402	1.483	-0.732	0.127	2.087
12092031.U01	AH-312.5	AH-311.9	32433.9	58.6	59.1	1.4	0.06	0.37	0.20	0.48	0.242	1.104	-0.595	0.113	1.584
12092037.U01	AH-311.9	AH-310.1	32337.6	58.4	59	1.2	0.07	0.44	0.20	0.43	0.289	1.235	-0.617	0.101	1.95
12092043.U01	AH-310.1	AH-308.3	32330.6	58.4	59.2	-1.9	0.10	0.45	0.27	0.39	0.318	1.602	-0.787	0.115	2.532
12092050.U01	AH-308.3	AH-308.4	29770.8	53.8	59.8	1.2	0.08	0.44	0.25	0.50	0.327	1.076	-0.607	0.149	1.661
12092056.U01	AH-308.4	AH-309.4	32971.4	59.6	60.8	1.1	0.07	0.46	0.27	0.41	0.272	1.308	-0.682	0.091	1.714
12092102.U01	AH-309.4	AH-308.6	31652.7	57.2	59.7	-2.9	0.10	0.62	0.34	0.46	0.247	1.378	-0.624	0.073	1.922
12092108.U01	AH-308.6	AH-308.2	32481.6	58.7	72.3	1.7	0.08	0.50	0.28	0.46	0.24	1.094	-0.57	0.107	1.94
12092115.U01	AH-308.2	AH-310.4	32600.6	58.9	65.4	-1.6	0.07	0.56	0.32	0.44	0.276	1.435	-0.698	0.093	2.163
12092121.U01	AH-310.4	AH-311.8	32216.9	58.2	58.9	2.3	0.09	0.44	0.27	0.49	0.305	1.32	-0.576	0.135	1.796
12092127.U01	AH-311.8	AH-312.1	32388.7	58.5	59.3	1.7	0.09	0.50	0.28	0.46	0.36	1.266	-0.552	0.152	2.332
12092134.U01	AH-312.1	AH-315.6	32675.2	59	60.9	-1.5	0.07	0.47	0.26	0.47	0.297	1.583	-0.847	0.117	2.074
12092140.U01	AH-315.6	AH-319.8	30895.7	55.8	59.9	4	0.11	0.45	0.29	0.54	0.313	1.159	-0.593	0.136	2.009
12092146.U01	AH-319.8	AH-319.0	30552.3	55.2	59.7	3.7	0.11	0.64	0.31	0.48	0.232	1.386	-0.62	0.188	2.843
12092153.U01	AH-319.0	AH-318.2	32482.5	58.7	63.4	-1.4	0.09	0.38	0.23	0.48	0.299	1.425	-0.718	0.172	2.45
12092159.U01	AH-318.2	AH-318.3	32464.5	58.6	61.9	1.7	0.07	0.41	0.28	0.47	0.29	1.411	-0.704	0.087	1.946
12092205.U01	AH-318.3	AH-317.6	32360.6	58.5	58.7	-0.7	0.08	0.39	0.24	0.41	0.289	1.628	-0.799	0.12	2.228
12092211.U01	AH-317.6	AH-315.3	32302.7	58.3	58.9	-2	0.06	0.36	0.22	0.54	0.182	1.301	-0.645	0.061	1.566
12092218.U01	AH-315.3	AH-316.6	32553.5	58.8	59.8	1.1	0.08	0.50	0.29	0.38	0.448	1.238	-0.612	0.232	2.634
12092224.U01	AH-316.6	AH-317.6	32369.4	58.5	59.3	-0.7	0.07	0.26	0.16	0.38	0.249	1.578	-0.737	0.099	1.991
12092230.U01	AH-317.6	AH-318.8	32683.5	59	60.4	-0.7	0.07	0.26	0.18	0.44	0.249	1.499	-0.746	0.109	2.287
12092237.U01	AH-318.8	AH-320.2	32576.6	58.8	59.7	0.8	0.08	0.36	0.21	0.41	0.486	1.647	-0.776	0.136	2.151
12092243.U01	AH-320.2	AH-322.0	28597.1	52.3	61.8	-0.9	0.08	0.26	0.16	0.41	0.266	1.223	-0.625	0.15	2.022
12092313.U01	AH-322.1	AH-323.5	23465.5	42.4	59.9	2.8	0.14	0.61	0.27	0.47	0.302	0.84	-0.472	0.111	1.221
12092320.U01	AH-323.5	AH-322.2	16564.5	29.9	58.7	-1.4	0.11	0.79	0.38	0.51	0.179	0.764	-0.394	0.098	1.136
12092326.U01	AH-322.2	AH-317.3	27757.4	50.1	60.3	-1.7	0.14	0.64	0.40	0.44	0.338	1.021	-0.569	0.135	1.931
12092332.U01	AH-317.3	AH-315.8	33047.8	59.7	60.7	-1.7	0.08	0.42	0.25	0.51	0.266	1.18	-0.61	0.086	2.215
12092339.U01	AH-315.8	AH-314.1	33076.1	59.7	60.9	0.9	0.07	0.39	0.23	0.44	0.237	1.202	-0.651	0.105	1.639
12092345.U01	AH-314.1	AH-312.7	33192	59.9	60.9	1.1	0.09	0.38	0.22	0.49	0.369	1.07	-0.536	0.151	1.487
12092351.U01	AH-312.7	AH-313.4	32969.4	59.5	60.3	-1.6	0.09	0.42	0.20	0.46	0.316	1.135	-0.603	0.211	1.395
12092357.U01	AH-313.4	AH-314.4	33107	59.8	60.3	1.6	0.08	0.35	0.21	0.42	0.247	1.236	-0.618	0.113	1.844
12100004.U01	AH-314.4	AH-314.6	32979.3	59.6	60.1	-2.1	0.07	0.46	0.28	0.44	0.27	1.21	-0.689	0.218	2.029
12100010.U01	AH-314.6	AH-314.6	32925.5	59.5	60.2	-1.1	0.08	0.42	0.25	0.44	0.296	1.188	-0.591	0.11	2.058
12100016.U01	AH-314.6	AH-315.8	33057.7	59.7	60.2	-0.5	0.07	0.34	0.21	0.49	0.294	1.072	-0.538	0.098	1.58
12100023.U01	AH-315.8	AH-317.2	32995.5	59.6	60.2	0.6	0.08	0.43	0.25	0.36	0.228	1.531	-0.766	0.111	2.372
12100029.U01	AH-317.2	AH-319.1	32966.9	59.6	60.1	-1	0.08	0.40	0.23	0.43	0.254	0.988	-0.54	0.086	1.814
12100035.U01	AH-319.1	AH-321.7	33113.4	59.8	60.3	-0.9	0.08	0.37	0.24	0.41	0.28	1.377	-0.652	0.098	2.921
12100041.U01	AH-321.7	AH-324.6	33018.8	59.6	60.1	0.6	0.09	0.38	0.23	0.40	0.245	1.876	-0.871	0.076	2.229
12100048.U01	AH-324.6	AH-326.3	19294.5	39.6	60.1	0.8	0.07	0.42	0.27	0.41	0.256	1.112	-0.524	0.088	1.595
12100104.U01	AH-326.3	AH-328.9	31171.9	56.3	59.8	1.8	0.07	0.41	0.23	0.38	0.226	1.374	-0.611	0.086	1.88
12100111.U01	AH-328.9	AH-330.7	22128.3	40	59.1	-0.7	0.08	0.40	0.25	0.48	0.266	0.983	-0.481	0.083	1.307
12100120.U01	AH-330.7	AH-334.4	31116.2	56.2	61	-1.6	0.09	0.51	0.28	0.57	0.26	0.984	-0.521	0.08	1.321
12100126.U01	AH-334.4	AH-337.8	33130.1	59.8	60.7	1.8	0.07	0.42	0.24	0.57	0.22	0.837	-0.41	0.059	1.48
12100132.U01	AH-337.8	AH-342.1	33088	59.8	60.6	1.3	0.07	0.39	0.23	0.61	0.327	0.718	-0.425	0.129	1.591
12100139.U01	AH-342.1	AH-346.0	33192.3	60	60.6	-1.7	0.07	0.42	0.24	0.52	0.206	1.098	-0.594	0.071	1.504
12100145.U01	AH-346.0	AH-349.9	31722.2	57.3	60.1	1.3	0.09	0.51	0.28	0.53	0.28				

Summary of Worst Values Recorded During Each File															
Filename	StMP	EndMP	EndDist	AvSpd	MxSpd	MaxCD	N.A.L	WhL/V	TSL/V	Vert	ycp-p	zcp-p	zc0-p	y-Trk	z-Trk
			(ft)	(mph)	(mph)	(in)	(ratio)	(ratio)	(ratio)	(ratio)	(g)	(g)	(g)	(grms)	(g)
12100157.U01	AH-353.5	AH-357.6	33074.1	59.7	60.5	-1	0.11	0.58	0.34	0.46	0.296	0.88	-0.462	0.144	1.551
12100204.U01	AH-357.6	AH-362.7	33129	59.8	60.6	-1.4	0.08	0.44	0.26	0.49	0.237	1.112	-0.602	0.061	1.452
12100210.U01	AH-362.7	AH-367.6	33113.5	59.8	60.3	-1.2	0.08	0.55	0.33	0.51	0.262	1.081	-0.548	0.1	1.759
12100216.U01	AH-367.6	AH-371.0	33054.8	59.7	59.9	0.6	0.11	0.63	0.36	0.47	0.367	1.371	-0.668	0.124	2.613
12100223.U01	AH-371.0	AH-375.0	32980.8	59.6	60.4	-2.4	0.08	0.75	0.40	0.48	0.303	0.895	-0.518	0.11	1.414
12100229.U01	AH-375.0	AH-378.1	26405.5	47.7	60.7	1.4	0.08	0.58	0.30	0.48	0.254	0.986	-0.465	0.1	1.825
12100235.U01	AH-378.1	AH-381.5	26170.9	47.3	60.7	2	0.09	0.58	0.31	0.32	0.277	0.93	-0.51	0.119	1.587
12100241.U01	AH-381.5	AH-384.2	21514	38.9	60.9	1.1	0.07	0.28	0.18	0.54	0.239	0.764	-0.422	0.058	1.016
Cleveland, OH															
12100248.U01	AH-384.2	AH-384.8	4651.5	22.5	30	2.1	0.06	0.37	0.20	0.68	0.174	0.238	-0.129	0.033	0.545
12100324.U01	AH-384.8	AH-388.8	32191.6	58.1	78.3	3.1	0.09	0.61	0.30	0.44	0.31	1.211	-0.588	0.117	1.531
12100331.U01	AH-388.8	AH-390.7	31665	57.2	71.8	3.5	0.14	0.54	0.31	0.33	0.453	1.158	-0.488	0.129	1.829
12100343.U01	AH-397.7	AH-404.1	33919.9	61.3	80.3	1.9	0.08	0.58	0.34	0.44	0.318	1.729	-0.747	0.192	3.079
12100350.U01	AH-404.1	AH-411.9	38816.9	70.1	78.9	3.4	0.10	0.62	0.35	0.46	0.336	1.494	-0.598	0.209	3.04
12100356.U01	AH-411.9	AH-419.1	36877	66.6	78.1	3.7	0.14	0.57	0.32	0.32	0.421	1.364	-0.633	0.19	1.848
12100402.U01	AH-419.1	AH-425.6	41201.5	74.4	78.3	-3.3	0.12	0.56	0.36	0.43	0.348	1.128	-0.55	0.155	1.771
12100408.U01	AH-425.6	AH-433.3	40128.8	72.5	79	-2.3	0.10	0.56	0.38	0.49	0.347	1.757	-0.729	0.116	2.033
12100415.U01	AH-433.3	AH-441.0	38715.4	69.9	78.8	2.9	0.09	0.54	0.32	0.57	0.339	1.387	-0.617	0.152	1.301
12100421.U01	AH-441.0	AH-443.7	16858.6	46.8	76.9	1.7	0.08	0.49	0.30	0.62	0.23	0.565	-0.296	0.09	0.887
12100426.U01	AH-444.1	AH-451.2	35828.9	64.7	79.1	-3.3	0.12	0.52	0.33	0.49	0.267	1.099	-0.521	0.116	1.553
12100432.U01	AH-451.2	AH-458.3	35895.6	64.8	79.2	1	0.09	0.45	0.28	0.52	0.24	1.243	-0.581	0.086	1.77
12100438.U01	AH-458.3	AH-466.9	43101.9	77.8	78.3	-2.7	0.13	0.56	0.32	0.46	0.43	1.752	-0.789	0.218	2.377
12100445.U01	AH-466.9	AH-475.5	43075.9	77.8	78.3	2.3	0.14	0.58	0.36	0.38	0.42	1.776	-0.849	0.13	2.545
12100451.U01	AH-475.5	AH-480.9	29530.1	53.3	78.2	-3	0.18	0.58	0.36	0.37	0.581	1.316	-0.665	0.142	1.712
12100457.U01	AH-480.9	AH-481.0	762.5	1.4	16.7	-0.2	0.03	0.19	0.13	0.88	0.03	0.051	-0.026	0.005	0.038
12100627.U01	AH-484.7	AH-488.2	18222.6	32.9	57.8	2.9	0.11	0.71	0.36	0.58	0.265	0.488	-0.247	0.138	1.081
12100633.U01	AH-488.2	AH-490.7	14150.7	25.8	35.7	0.5	0.06	0.41	0.23	0.64	0.184	0.242	-0.137	0.025	0.319
12100649.U01	AH-491.8	AH-499.7	42960.4	77.6	80	0.8	0.09	0.40	0.26	0.31	0.313	1.459	-0.704	0.14	2.157
12100655.U01	AH-499.7	AH-507.5	42739.4	77.2	77.9	0.8	0.10	0.40	0.29	0.49	0.338	1.188	-0.537	0.149	2.227
12100702.U01	AH-507.6	AH-514.6	38279	69.2	77.4	-0.4	0.06	0.32	0.20	0.57	0.205	0.809	-0.456	0.052	1.291
12100712.U01	AH-514.9	AH-521.9	37904.4	68.5	79.7	3.1	0.13	0.61	0.35	0.51	0.355	1.102	-0.524	0.134	2.243
12100719.U01	AH-521.9	AH-529.6	41224.4	74.5	77.1	-0.8	0.13	0.62	0.35	0.46	0.366	1.328	-0.661	0.183	2.073
12100725.U01	AH-529.6	AH-535.4	30824.1	55.7	76.8	0.9	0.08	0.41	0.26	0.52	0.221	1.522	-0.757	0.065	1.667
12100731.U01	AH-535.4	AH-542.8	39527.5	71.4	79.7	1.2	0.09	0.51	0.31	0.47	0.281	1.805	-0.807	0.127	2.773
12100738.U01	AH-542.8	AH-550.6	41871.3	75.6	77	0.8	0.11	0.65	0.44	0.43	0.386	1.201	-0.586	0.145	2.112
12100744.U01	AH-550.6	AH-558.4	39738.4	71.8	77.8	-2	0.09	0.50	0.32	0.49	0.276	1.346	-0.697	0.106	2.167
12100750.U01	AH-558.5	AH-566.9	42296.3	76.4	76.8	1.2	0.10	0.49	0.30	0.46	0.31	1.879	-0.879	0.1	2.054
12100756.U01	AH-566.9	AH-575.4	42326.9	76.5	77.4	-2.6	0.10	0.53	0.34	0.41	0.301	1.703	-0.803	0.116	2.285
12100803.U01	AH-575.4	AH-583.9	42344.2	76.5	77.1	0.5	0.10	0.40	0.25	0.47	0.274	1.555	-0.806	0.083	1.974
12100809.U01	AH-583.9	AH-592.4	42290	76.4	76.7	-1.6	0.07	0.43	0.30	0.51	0.273	1.191	-0.64	0.097	1.97
12100815.U01	AH-592.4	AH-600.1	42332.7	76.5	77.2	-0.5	0.08	0.54	0.35	0.52	0.301	1.31	-0.686	0.104	1.987
12100822.U01	AH-600.1	AH-605.5	29684.7	56.9	78.1	0.5	0.11	0.42	0.29	0.48	0.274	1.76	-0.749	0.114	2.77
12100834.U01	AH-606.1	AH-611.1	27892.3	50.4	77.5	-2.6	0.11	0.52	0.33	0.52	0.249	1.191	-0.551	0.065	1.505
12100840.U01	AH-611.1	AH-614.8	24483.8	44.2	72.5	1.9	0.11	0.56	0.33	0.51	0.244	1.615	-0.752	0.074	2.347
12100847.U01	AH-614.8	AH-620.7	31935	57.7	77.7	-3.3	0.13	0.59	0.35	0.40	0.337	1.448	-0.701	0.107	2.333
12100853.U01	AH-620.8	AH-629.0	42096.8	76	78.1	-3.1	0.14	0.48	0.31	0.43	0.313	2.443	-1.072	0.114	3.04
12100859.U01	AH-629.0	AH-635.1	30724.8	55.5	71.6	-2.4	0.12	0.56	0.33	0.56	0.268	0.838	-0.491	0.093	1.254
12100905.U01	AH-635.1	AH-643.4	41479.5	74.9	78.2	-1.3	0.09	0.45	0.28	0.43	0.311	1.167	-0.549	0.12	1.713
12100912.U01	AH-643.5	AH-650.4	42675.7	77.1	81.1	-2.6	0.11	0.48	0.31	0.47	0.277	1.512	-0.721	0.07	2.458
12100918.U01	AH-650.4	AH-655.0	31381.5	56.7	77.4	-1	0.08	0.35	0.23	0.54	0.267	0.986	-0.503	0.072	1.79
12100924.U01	AH-655.0	AH-661.7	35486.4	64.1	78.6	-2.6	0.09	0.58	0.33	0.51	0.244	1.494	-0.708	0.11	2.039
12100931.U01	AH-661.7	AH-669.6	40278.5	72.8	78.1	-3.3	0.14	0.63	0.38	0.46	0.363	1.367	-0.66	0.108	1.729
12100937.U01	AH-669.6	AH-673.4	18644.5	58.4	76.8	-0.7	0.08	0.32	0.22	0.59	0.241	1.21	-0.6	0.064	1.471
12100942.U01	AH-673.5	AH-680.8	36922.9	66.7	79.1	-4.2	0.13	0.58	0.37	0.43	0.419	2.111	-0.97	0.226	2.578
12100948.U01	AH-680.8	AH-688.8	40835	73.8	79.4	-1.6	0.13	0.49	0.31	0.44	0.31	1.302	-0.604	0.161	2.263
12100954.U01	AH-688.8	AH-693.9	29483.5	53.2	78.8	-3.1	0.13	0.53	0.32	0.38	0.336	0.935	-0.51	0.148	1.569
12101001.U01	AH-693.9	AH-697.9	23569.9	42.6	54.7	-2.1	0.15	0.72	0.40	0.52	0.329	1.013	-0.488	0.149	1.511
12101007.U01	AH-697.9	AH-701.9	25816.2	46.6	68.8	-3.8	0.15	0.71	0.38	0.51	0.267	0.792	-0.408	0.098	1.478
12101013.U01	AH-701.9	AH-705.6	24433	44.1	70.7	-1.2	0.13	0.86	0.48	0.50	0.374	1.018	-0.474	0.182	1.674
12101019.U01	AH-705.6	AH-706.2	22173	40	66.1	-3.3	0.15	0.80	0.45	0.50	0.288	0.			

Summary of Worst Values Recorded During Each File															
Filename	StMP	EndMP	EndDist (ft)	AvSpd (mph)	MxSpd (mph)	MaxCD (in)	N.A.L (ratio)	WhL/V (ratio)	TSL/V (ratio)	Vert (ratio)	ycc-p (g)	zcc-p (g)	zc0-p (g)	y-Trk (grms)	z-Trk (g)
12102341.U01	AH-675.5	AH-667.1	41695.6	75.3	79.1	-0.7	0.09	0.50	0.28	0.36	0.34	2.019	-0.951	0.111	2.629
12102348.U01	AH-667.1	AH-659.4	39777.5	71.8	79.1	-3.1	0.13	0.72	0.39	0.46	0.372	1.297	-0.605	0.105	2.001
12102354.U01	AH-659.4	AH-652.5	39810.8	71.9	79.2	2.4	0.08	0.54	0.30	0.47	0.318	1.417	-0.682	0.152	1.943
12110000.U01	AH-652.5	AH-646.3	42935.5	77.5	79.4	-2.6	0.08	0.53	0.29	0.24	0.24	2.629	-1.197	0.094	3.922
12110007.U01	AH-646.3	AH-642.9	17240.1	52.5	80.6	-2.7	0.09	0.52	0.28	0.49	0.337	1.031	-0.54	0.187	1.822
12110022.U01	AH-642.1	AH-633.6	42518.7	76.8	79.3	0.9	0.10	0.47	0.26	0.37	0.299	2.281	-1.035	0.151	3.858
12110028.U01	AH-633.6	AH-627.0	33587.4	60.7	78.5	3.6	0.15	0.83	0.50	0.41	0.322	1.538	-0.765	0.094	2.36
12110034.U01	AH-627.0	AH-619.0	40852.2	73.8	78.8	2.4	0.08	0.58	0.33	0.50	0.311	1.704	-0.781	0.128	2.724
12110041.U01	AH-618.9	AH-616.4	12993.2	41.9	69.4	0.7	0.06	0.34	0.20	0.56	0.187	0.833	-0.43	0.049	1.341
12110105.U01	AH-616.4	AH-615.4	6056	10.9	13.2	-1.7	0.04	0.39	0.23	0.77	0.088	0.232	-0.125	0.027	0.441
12110111.U01	AH-615.4	AH-614.3	6629.4	12	19.3	1	0.11	0.66	0.31	0.69	0.198	0.269	-0.125	0.08	0.839
12110118.U01	AH-614.3	AH-610.9	22595.4	40.8	61.6	1.3	0.07	0.26	0.17	0.53	0.174	0.709	-0.355	0.041	1.334
12110124.U01	AH-610.9	AH-609.2	9818.2	20.2	30	-0.8	0.06	0.31	0.17	0.77	0.131	0.304	-0.135	0.058	0.468
12110131.U01	AH-609.0	AH-605.9	16813.7	30.4	46.1	-2.3	0.07	0.51	0.25	0.47	0.324	0.785	-0.404	0.097	0.968
12110137.U01	AH-605.9	AH-605.3	3451.6	11.6	27.3	0.5	0.04	0.25	0.14	0.83	0.069	0.134	-0.058	0.013	0.183
12110152.U01	AH-605.3	AH-598.2	38771.6	70	79	0.4	0.07	0.51	0.31	0.37	0.299	1.824	-0.82	0.115	3.349
12110158.U01	AH-598.2	AH-590.2	43123.2	77.9	78.5	1.8	0.08	0.57	0.35	0.38	0.409	1.897	-0.906	0.149	2.742
12110205.U01	AH-590.2	AH-581.5	43133	77.9	78.2	-0.5	0.07	0.54	0.28	0.39	0.264	1.875	-0.859	0.097	2.947
12110211.U01	AH-581.5	AH-572.9	43152.2	77.9	78.6	2.9	0.09	0.56	0.29	0.43	0.279	1.761	-0.828	0.112	2.859
12110217.U01	AH-572.8	AH-568.1	23573	63.9	79.3	2.4	0.09	0.35	0.20	0.40	0.219	1.246	-0.593	0.062	2.358
12110230.U01	AH-568.1	AH-560.5	37829.9	68.3	79.2	0.8	0.07	0.45	0.23	0.21	0.314	2.521	-1.082	0.134	3.572
12110236.U01	AH-560.5	AH-554.0	32198.5	58.1	77.6	-0.7	0.09	0.46	0.27	0.43	0.397	2.345	-1.072	0.147	3.56
12110243.U01	AH-554.0	AH-551.0	16020.9	28.9	31.9	-1.3	0.05	0.30	0.18	0.77	0.16	0.328	-0.141	0.094	1.056
12110249.U01	AH-551.0	AH-544.3	35366.2	63.9	79	-0.7	0.07	0.49	0.28	0.43	0.289	1.735	-0.781	0.162	2.918
12110255.U01	AH-544.3	AH-540.5	20336.1	36.7	73.1	0.6	0.06	0.25	0.15	0.61	0.194	0.902	-0.456	0.045	1.524
12110302.U01	AH-540.5	AH-536.2	22879.8	41.3	54	-0.9	0.07	0.28	0.18	0.63	0.209	0.711	-0.352	0.069	0.841
12110308.U01	AH-536.2	AH-532.6	19661.5	35.5	49.3	1	0.06	0.47	0.26	0.63	0.191	0.377	-0.163	0.062	0.931
12110314.U01	AH-532.5	AH-526.8	31053.7	56.1	77.5	-0.7	0.06	0.32	0.20	0.58	0.216	1.486	-0.664	0.052	2.153
12110320.U01	AH-526.8	AH-523.7	16575.3	29.9	31.6	1	0.04	0.45	0.21	0.74	0.136	0.324	-0.117	0.029	0.444
12110327.U01	AH-523.7	AH-518.8	26495.9	47.9	64.8	1.8	0.08	0.55	0.31	0.54	0.263	1.214	-0.615	0.067	1.695
12110333.U01	AH-518.8	AH-514.2	24705.7	44.6	65	0.8	0.06	0.43	0.22	0.64	0.175	0.563	-0.273	0.042	0.82
12110339.U01	AH-514.2	AH-510.0	22607.8	40.8	61.8	0.3	0.06	0.29	0.17	0.67	0.166	0.542	-0.241	0.036	0.519
12110346.U01	AH-510.0	AH-504.1	31965.4	57.7	68.9	0.4	0.07	0.34	0.20	0.63	0.238	0.674	-0.292	0.056	0.812
12110352.U01	AH-504.1	AH-500.9	17601	31.8	44	0.7	0.06	0.35	0.17	0.68	0.191	0.314	-0.129	0.045	0.786
12110358.U01	AH-500.9	AH-495.4	29350.9	53	65	-1.4	0.07	0.51	0.27	0.51	0.252	1.273	-0.571	0.065	2.576
12110405.U01	AH-495.4	AH-493.4	11371.4	20.9	41	-0.7	0.06	0.28	0.16	0.67	0.19	0.456	-0.206	0.04	0.579
12110420.U01	AH-490.8	AH-486.2	25104	45.3	70.5	3.3	0.13	0.60	0.32	0.57	0.333	0.765	-0.429	0.127	1.285
12110426.U01	AH-486.2	AH-484.6	8359.4	15.1	26	-1.1	0.11	0.56	0.29	0.62	0.213	0.35	-0.181	0.071	0.849
12110432.U01	AH-484.6	AH-484.4	832.8	5.6	8.6	-1.7	0.11	0.61	0.30	0.64	0.115	0.261	-0.114	0.034	0.396
12110502.U01	AH-484.2	AH-482.4	10138.8	18.3	34.8	1.6	0.09	0.64	0.31	0.47	0.225	0.464	-0.229	0.068	1.253
12110508.U01	AH-482.4	AH-475.7	37561.3	67.9	78.6	3.1	0.13	0.63	0.35	0.24	0.409	1.556	-0.707	0.293	3.033
12110514.U01	AH-475.6	AH-467.1	42803.4	77.3	77.8	-2.6	0.11	0.57	0.33	0.46	0.28	1.73	-0.848	0.103	2.41
12110520.U01	AH-467.1	AH-459.4	38694.1	69.9	77.7	2.6	0.09	0.65	0.35	0.47	0.431	1.55	-0.706	0.18	1.938
Cleveland, Oh															
12110527.U01	AH-459.3	AH-458.1	6191.5	25.7	31	-0.3	0.05	0.23	0.14	0.83	0.085	0.324	-0.147	0.016	0.376
12110615.U01	AH-451.6	AH-448.8	13977.3	25.2	45.9	-1.5	0.09	0.46	0.23	0.64	0.194	0.315	-0.139	0.063	0.529
12110621.U01	AH-448.8	AH-443.5	28525.1	51.5	68.3	3.1	0.13	0.59	0.31	0.51	0.355	1.378	-0.67	0.166	1.903
12110628.U01	AH-443.4	AH-436.8	36328.2	65.6	77.4	3.1	0.12	0.55	0.31	0.46	0.464	1.065	-0.486	0.195	1.903
12110640.U01	AH-428.7	AH-421.4	39949.1	72.1	78.1	3.5	0.14	0.51	0.34	0.38	0.372	1.489	-0.702	0.126	2.486
12110646.U01	AH-421.4	AH-414.6	41308.4	74.6	78.9	-2.2	0.14	0.66	0.41	0.33	0.486	1.287	-0.592	0.23	2.765
12110653.U01	AH-414.6	AH-406.1	42302.3	76.4	79.4	0.9	0.09	0.62	0.36	0.39	0.406	1.817	-0.825	0.15	2.777
12110659.U01	AH-406.1	AH-400.0	31912.1	57.6	76.4	-2.7	0.08	0.46	0.27	0.53	0.266	0.902	-0.425	0.17	1.462
12110705.U01	AH-399.9	AH-392.1	40141.5	72.5	77.5	0.6	0.11	0.63	0.36	0.41	0.497	1.875	-0.97	0.165	3.553
12110712.U01	AH-392.1	AH-389.5	29421.3	53.1	67.4	3.2	0.17	0.52	0.31	0.43	0.397	1.163	-0.585	0.13	1.984
12110718.U01	AH-389.5	AH-385.8	36358	65.7	78.3	-2.7	0.11	0.61	0.36	0.46	0.489	1.102	-0.501	0.194	2.204
12110724.U01	AH-385.8	AH-384.8	6993.2	12.6	34.8	1.5	0.10	0.56	0.27	0.54	0.212	0.343	-0.193	0.097	0.589
12110730.U01	AH-384.8	AH-383.1	13623.3	24.6	69.5	-1.1	0.05	0.31	0.16	0.61	0.199	0.843	-0.402	0.105	1.12
12110737.U01	AH-383.1	AH-378.9	32569.2	58.8	70.1	-2.2	0.09	0.45	0.27	0.41	0.377	1.748	-0.813	0.184	2.136
12110743.U01	AH-378.9	AH-375.3	30136.2	54.4	70.2	-2.3	0.13	0.51	0.26	0.40	0.306	0.932	-0.46	0.14	1.773
12110749.U01	AH-375.3	AH-370.8	37926.9	68.5	70.8	3.5	0.10	0.55	0.30	0.48	0.288	1.546	-0.693	0.124	1.786
12110756.U01	AH-370.8	AH-367.7	30313.8	54.8	72.3	0.7	0.08	0.45	0.26	0.48	0.329	1.337	-0.622	0.129	2.321
12110802.U01	AH-367.7	AH-361.9	38598.4	69.7	70.4	-2.9	0.08	0.50	0.27	0.50	0.331	1.499	-0.623	0.122	2.484
12110808.U01	AH-361.9	AH-356.1	38755.7	70	71	1.8	0.06	0.33	0.22	0.57	0.224	1.281	-0.605	0.082	2.345
12110821.U01	AH-351.7	AH-347.9	34271.9	61.9	70	-1.5	0.08	0.42	0.22	0.49	0.348	1.639	-0.737	0.116	2.347
12110827.U01	AH-347.9	AH-345.2	23100.8	52.9	69.8	2.6	0.07	0.40	0.21	0.59	0.237	0.874	-0.362	0.067	1.876
12110832.U01	AH-345.1	AH-340.3	30820.7	9	9	-2.6	0.02	0.22	0.14	0.94	0.243	0.844	-0.491	0.088	1.822
12110839.U01	AH-339.5	AH-335.7	33850.5	9	9	-2.4	0.02	0.17	0.08	1.01	0.216	0.894	-0.436	0.075	1.489
12110846.U01	AH-335.7	AH-335.2	4250.5	9	9	-2.7	0.02	0.19	0.11	1.05	0.198	0.608	-0.262	0.067	0.716
12110847.U01	AH-334.8	AH-333.5	7264.8	9	9	1.9	0.02	0.12	0.06	1.01	0.334	1.823	-0.817	0.075	2.801
12110851.U01	AH-331.3	AH-329.6	16896.1	9	9	1.6	0.02	0.11	0.05	0.99	0.385	1.386	-0.635	0.156	1.494
12110855.U01	AH-329.3	AH-326.7	29306.3	9	9	1.4	0.02	0.27	0.17	0.96	0.275	1.224	-0.544	0.075	1.928
12110901.U01	AH-326.7	AH-326.3	2620.1	9	9	-0.9	0.06	0.25	0.13	0.71	0.198	0.328	-0.105	0.037	0.638
12110912.U01	A														

Summary of Worst Values Recorded During Each File															
Filename	StMP	EndMP	EndDist	AvSpd	MxSpd	MaxCD	N.A.L	WhL/V	TSL/V	Vert	ycc-p	zcp-p	zc0-p	y-Trk	z-Trk
			(ft)	(mph)	(mph)	(in)	(ratio)	(ratio)	(ratio)	(ratio)	(g)	(g)	(g)	(grms)	(g)
12110914.U01	AH-321.3	AH-318.5	33697.4	60.9	61.6	1.7	0.11	0.51	0.31	0.40	0.336	1.912	-0.948	0.109	2.974
12110921.U01	AH-318.5	AH-316.5	33723	60.9	61.4	-1.4	0.07	0.43	0.25	0.39	0.314	2.163	-1.024	0.101	3.601
12110927.U01	AH-316.4	AH-315.0	33639.9	60.8	61	0.6	0.07	0.36	0.22	0.39	0.256	2.602	-1.063	0.108	4.591
12110933.U01	AH-315.0	AH-314.3	31665.8	57.2	61.7	-2.1	0.07	0.40	0.20	0.44	0.243	2.138	-0.962	0.096	3.22
12110939.U01	AH-314.3	AH-315.3	26235.7	47.4	61.5	-3.5	0.12	0.45	0.24	0.59	0.263	0.93	-0.422	0.167	1.089
12110946.U01	AH-315.3	AH-313.8	33826.8	61.1	62.2	-3.7	0.10	0.47	0.29	0.42	0.366	2.437	-1.062	0.143	2.879
12110952.U01	AH-313.8	AH-313.0	13550.9	38.4	58.6	0.8	0.06	0.36	0.20	0.51	0.249	1.525	-0.694	0.071	1.596
12110956.U01	AH-312.9	AH-312.6	19207.7	34.7	50.2	2.7	0.08	0.51	0.27	0.57	0.199	0.444	-0.221	0.048	1.112
12111003.U01	AH-312.6	AH-313.8	32336.7	58.4	70.6	-1.4	0.08	0.33	0.19	0.36	0.411	2.572	-1.191	0.131	2.794
12111009.U01	AH-313.8	AH-315.1	25019.8	45.2	47.5	1	0.06	0.26	0.16	0.62	0.168	0.675	-0.298	0.037	1.052
12111015.U01	AH-315.1	AH-316.5	30081.8	54.3	70.1	-0.6	0.06	0.42	0.23	0.54	0.212	2.458	-1.062	0.067	3.526
12111022.U01	AH-316.5	AH-319.3	28536.5	51.5	69.7	2.5	0.06	0.26	0.16	0.43	0.276	2.111	-0.978	0.109	2.511
12111028.U01	AH-319.3	AH-322.0	14087	25.4	55.8	0.9	0.09	0.60	0.29	0.63	0.176	0.411	-0.186	0.077	0.915
12111034.U01	AH-322.1	AH-323.4	9778.2	17.7	21.2	-1.7	0.09	0.62	0.32	0.66	0.166	0.423	-0.24	0.07	1.084
12111041.U01	AH-323.4	AH-323.5	7757.1	14	21	-0.9	0.06	0.45	0.22	0.78	0.13	0.281	-0.12	0.047	0.828
12111047.U01	AH-323.5	AH-323.5	2368.5	7.8	13.5	-0.4	0.03	0.24	0.12	0.81	0.054	0.093	-0.027	0.011	0.121
12111055.U01	AH-323.5	AH-323.0	7834.8	14.2	19.6	-0.9	0.07	0.57	0.32	0.72	0.125	0.286	-0.121	0.067	0.748
12111102.U01	AH-323.0	AH-322.1	14265.4	26.5	36.9	2.8	0.13	0.60	0.32	0.57	0.267	0.322	-0.142	0.127	0.754
12111115.U01	AH-322.0	AH-320.0	33100.2	59.8	69.9	1	0.08	0.34	0.20	0.38	0.293	2.651	-1.111	0.108	3.821
12111121.U01	AH-320.0	AH-318.4	37816.5	68.3	69	-0.7	0.08	0.51	0.28	0.41	0.379	2.049	-0.897	0.164	3.059
12111127.U01	AH-318.4	AH-317.1	37389.9	67.5	69.9	0.8	0.08	0.33	0.19	0.34	0.285	2.46	-1.162	0.139	3.169
12111134.U01	AH-317.1	AH-315.3	38170.7	69	70.8	-1.9	0.08	0.49	0.26	0.43	0.321	2.38	-1.075	0.153	4.171
12111140.U01	AH-315.3	AH-317.5	33328.2	60.2	70	2.5	0.08	0.46	0.25	0.43	0.311	1.321	-0.639	0.113	1.973
12111146.U01	AH-317.5	AH-318.2	32574.1	58.8	69.9	2.9	0.07	0.37	0.23	0.38	0.264	2.234	-0.956	0.123	2.617
12111152.U01	AH-318.2	AH-318.4	28681.6	51.8	60.1	-1.5	0.07	0.49	0.30	0.40	0.249	1.389	-0.732	0.094	1.862
12111159.U01	AH-318.4	AH-317.9	21955.4	39.7	58.4	-1.8	0.09	0.40	0.25	0.57	0.238	0.634	-0.281	0.093	1.356
12111205.U01	AH-317.9	AH-319.1	27818.3	50.2	60.3	0.7	0.05	0.40	0.21	0.56	0.237	1.164	-0.546	0.119	1.743
12111211.U01	AH-319.1	AH-319.3	13720.8	41.2	53.6	0.7	0.05	0.45	0.21	0.64	0.198	0.76	-0.348	0.076	1.424
12111219.U01	AH-319.3	AH-318.9	21230.6	38.3	50.3	-3.2	0.13	0.75	0.37	0.46	0.244	1.199	-0.618	0.089	1.678
12111225.U01	AH-318.9	AH-314.3	37085.1	67	70.3	-3.5	0.11	0.63	0.35	0.47	0.341	2.167	-0.933	0.111	2.799
12111231.U01	AH-314.3	AH-311.3	36719.4	66.3	69.9	2.8	0.08	0.52	0.29	0.47	0.334	1.705	-0.795	0.137	2.77
12111237.U01	AH-311.3	AH-309.8	33686.5	60.8	70.9	3.4	0.11	0.64	0.37	0.47	0.371	1.919	-0.871	0.158	2.323
12111244.U01	AH-309.8	AH-309.5	33531.3	60.6	70.4	3.3	0.12	0.55	0.31	0.40	0.289	1.827	-0.879	0.102	2.201
12111250.U01	AH-309.5	AH-309.2	2428.8	24.3	38.9	-0.5	0.05	0.20	0.14	0.66	0.159	0.498	-0.201	0.038	0.625
12111254.U01	AH-309.2	AH-308.2	32638.5	59	70	3.8	0.14	0.53	0.29	0.37	0.384	2.428	-1.077	0.136	2.666
12111300.U01	AH-308.2	AH-310.0	35299.2	63.8	70.1	-4.6	0.21	0.63	0.38	0.47	0.523	1.095	-0.542	0.295	1.967
12111306.U01	AH-310.0	AH-308.4	38133.2	68.9	70.3	-4.1	0.11	0.63	0.35	0.48	0.271	0.882	-0.433	0.114	1.533
12111313.U01	AH-308.4	AH-308.2	34147.8	61.7	70.2	3	0.09	0.38	0.22	0.48	0.256	2.003	-0.934	0.1	2.44
12111319.U01	AH-308.2	AH-310.7	38041.7	68.7	69.7	2.3	0.06	0.37	0.23	0.41	0.234	1.717	-0.786	0.1	2.723
12111325.U01	AH-310.7	AH-312.1	29678.6	53.6	70.3	-1.7	0.07	0.31	0.19	0.37	0.335	1.828	-0.791	0.16	3.092
12111332.U01	AH-312.1	AH-312.2	3484.3	12.4	19.4	0.2	0.03	0.22	0.12	0.87	0.046	0.089	-0.023	0.008	0.11
12111336.U01	AH-312.2	AH-312.2	31130.3	56.2	67.6	-1.9	0.08	0.47	0.29	0.49	0.35	1.061	-0.489	0.134	1.876
12111342.U01	AH-312.2	AH-312.0	6618.5	23.8	36.5	0.3	0.04	0.20	0.12	0.73	0.133	0.279	-0.089	0.038	0.625
12111349.U01	AH-312.0	AH-313.1	13428.9	29.5	43.2	2.5	0.11	0.48	0.24	0.60	0.247	0.323	-0.111	0.121	0.838
12111405.U01	AH-313.7	AH-313.3	22283.7	40.2	59.7	-2.6	0.11	0.56	0.28	0.52	0.238	0.97	-0.44	0.125	1.379
12111411.U01	AH-313.3	AH-313.2	3525	21.5	26.1	0.9	0.05	0.44	0.23	0.66	0.183	0.371	-0.177	0.056	1.037
12111420.U01	AH-313.2	AH-205.8	28792.3	52	69.9	-2.2	0.12	0.71	0.36	0.48	0.37	1.052	-0.488	0.115	1.538
12111427.U01	AH-205.8	AN-200.8	38002.1	68.6	69.9	-2.5	0.11	0.52	0.31	0.51	0.363	1.468	-0.67	0.158	2.531
12111433.U01	AN-200.8	AN-198.7	38091.8	68.8	70.1	3.2	0.08	0.42	0.24	0.54	0.333	1.187	-0.598	0.126	1.92
12111439.U01	AN-198.7	AN-199.7	38132.1	68.9	70	3.7	0.10	0.48	0.27	0.47	0.269	1.746	-0.827	0.104	2.476
12111446.U01	AN-199.7	AN-200.3	37929	68.5	69.8	-4.1	0.11	0.54	0.30	0.54	0.251	1.34	-0.64	0.1	1.844
12111452.U01	AN-200.3	AN-194.9	38037	68.7	71.7	-3.1	0.08	0.41	0.24	0.54	0.28	1.533	-0.722	0.156	2.391
12111458.U01	AN-194.9	AN-189.2	36795.7	66.5	70.2	3.5	0.10	0.60	0.32	0.52	0.243	1.467	-0.713	0.082	1.756
12111504.U01	AN-189.2	MN-190.3	38087.7	68.8	70.1	-3	0.09	0.44	0.25	0.59	0.335	1.55	-0.721	0.125	3.458
12111511.U01	MN-190.3	MN-186.3	38256.5	69.1	70	4.4	0.10	0.56	0.32	0.53	0.343	0.978	-0.443	0.199	2.442
12111517.U01	MN-186.3	MN-187.6	32474.2	58.7	69.9	-3.6	0.17	0.70	0.38	0.53	0.351	0.992	-0.419	0.185	1.671
12111523.U01	MN-187.6	MN-185.3	15669.1	28.3	39.7	-1.6	0.09	0.47	0.26	0.61	0.186	0.278	-0.14	0.074	0.826
12111530.U01	MN-185.3	MN-181.1	32625.6	58.9	70.1	-3.8	0.12	0.60	0.34	0.43	0.381	1.371	-0.582	0.135	1.482
12111536.U01	MN-181.1	MN-174.1	37767.6	68.2	70.4	-3.5	0.10	0.54	0.31	0.47	0.293	1.343	-0.612	0.15	2.319
12111542.U01	MN-174.1	MN-171.6	35427.6	64	69.3	-3.3	0.12	0.57	0.37	0.53	0.291	0.998	-0.489	0.107	1.475
12111548.U01	MN-171.6	MN-174.3	35591.6	64.3	70	-3	0.16	0.59	0.32	0.46	0.316	1.731	-0.854	0.104	2.914
12111555.U01	MN-174.3	MN-172.9	11020.5	28.9	44.8	1.1	0.06	0.36	0.20	0.67	0.188	0.308	-0.134	0.061	1.07
12111610.U01	MN-172.3	MN-176.2	32827	59.3	70	-3.1	0.16	0.78	0.45	0.57	0.342	1.39	-0.647	0.167	1.542
12111616.U01	MN-176.2	MN-171.2	38203.7	69	70.6	3	0.11	0.56	0.33	0.52	0.373	2.025	-0.952	0.139	2.711
12111623.U01	MN-171.2	MN-172.3	37837.7	68.3	69.7	1.3	0.06	0.44	0.24	0.56	0.183	1.134	-0.515	0.071	2.312
12111629.U01	MN-172.3	MN-171.6	7065.1	12.8	50.1	-2.6	0.08	0.58	0.31	0.72	0.139	0.232	-0.109	0.054	0.602
12111635.U01	MN-171.6	MN-171.5	636.5	3.4	5.7	-2.3	0.06	0.54	0.30	0.86	0.035	0.06	-0.02	0.005	0.084
12111639.U01	MN-171.4	MN-170.7	788.8	5.8	7.6	-1.5	0.09	0.64	0.31	0.72	0.124	0.159	-0.067	0.025	0.451
12111651.U01	MN-170.6	MN-168.5	16276.1	29.4	51.3	-3.1	0.11	0.41	0.20	0.29	0.33	0.404	-0.213	0.078	1.273
12111657.U01	MN-168.5	MN-163.2	32932.5	59.5	70	3.5	0.09	0.49	0.24	0.54	0.406	1.529	-0.703	0.21	2.418
12111703.U01	MN-163.2	MN-168.0	19264.7	54.1	69.2	-1.7	0.04	0.35	0.18	0.64	0.17	0.66	-0.294	0.08	0.942
Albany, NY															
12121659.U01	MN-164.8	MN-167.4	17002	31	54.9	-3.1	0.11	0.46	0.27	0.62	0.228	0.48	-0.232	0.104	0.748

Summary of Worst Values Recorded During Each File															
Filename	StMP	EndMP	EndDist (ft)	AvSpd (mph)	MxSpd (mph)	MaxCD (in)	N.A.L. (ratio)	WhL/V (ratio)	TSL/V (ratio)	Vert (ratio)	ycp-p (g)	zcp-p (g)	zc0-p (g)	y-Trk (grms)	z-Trk (g)
12121705.U01	MN-167.4	MN-166.3	39954.5	73	75.7	-0.8	0.06	0.36	0.18	0.48	0.339	1.584	-0.774	0.121	1.983
12121711.U01	MN-166.3	MN-170.7	31873.5	58.2	75.7	3.1	0.08	0.41	0.24	0.63	0.247	1.037	-0.464	0.133	2.089
12121717.U01	MN-170.7	MN-176.2	34412.5	62.8	76.2	3.6	0.09	0.36	0.21	0.58	0.288	1.195	-0.605	0.121	1.912
12121723.U01	MN-176.2	MN-174.6	39095	71.4	76.1	2.9	0.09	0.32	0.22	0.46	0.306	2.174	-0.999	0.25	2.698
12121730.U01	MN-174.6	MN-178.2	37310.3	68.1	70.2	3.4	0.09	0.38	0.24	0.52	0.45	1.435	-0.759	0.204	2.264
12121736.U01	MN-178.2	MN-172.3	4818.3	49.7	50.4	-2.9	0.07	0.29	0.18	0.66	0.177	0.937	-0.486	0.08	1.2
12121737.U01	MN-172.3	MN-171.6	53899.6	65.6	75.6	3.9	0.10	0.35	0.25	0.44	0.528	1.92	-0.862	0.259	2.443
12121747.U01	MN-171.6	MN-177.0	50230.7	61.1	70.5	-4.5	0.10	0.39	0.21	0.50	0.345	1.049	-0.482	0.193	1.537
12121756.U01	MN-177.0	MN-185.8	58492.9	71.2	75.1	3.7	0.08	0.35	0.21	0.56	0.332	1.374	-0.722	0.156	2.6
12121805.U01	MN-185.8	MN-186.6	55100.1	67	71.1	3.9	0.09	0.39	0.24	0.51	0.313	2.383	-1.042	0.133	2.902
12121815.U01	MN-186.6	AN-188.5	60787.5	73.9	75.5	-3.4	0.09	0.42	0.33	0.30	0.394	2.618	-1.207	0.136	3.546
12121824.U01	AN-188.6	AN-197.7	58424.5	71.1	75.8	4.2	0.10	0.42	0.23	0.39	0.29	2.028	-0.949	0.142	2.301
12121833.U01	AN-197.7	AN-199.7	60163.1	73.2	76.1	4.4	0.11	0.40	0.28	0.52	0.458	1.825	-0.818	0.158	2.669
12121843.U01	AN-199.7	AN-199.3	61327.1	74.6	75.9	-3.7	0.10	0.42	0.24	0.47	0.513	1.706	-0.734	0.181	3.709
12121852.U01	AN-199.3	AH-314.9	61443.5	74.7	78.6	3.7	0.08	0.41	0.28	0.39	0.322	1.684	-0.764	0.135	2.717
12121901.U01	AH-314.9	AH-314.0	31916.7	38.8	75.4	3.3	0.11	0.50	0.26	0.44	0.283	1.392	-0.686	0.155	1.945
12121911.U01	AH-314.0	AH-313.2	17898.5	27.5	30.2	1.6	0.09	0.42	0.26	0.40	0.276	0.561	-0.256	0.094	1.238
12121925.U01	AH-312.7	AH-312.2	49384.7	60.1	74.9	3.9	0.11	0.58	0.34	0.47	0.516	1.404	-0.681	0.24	2.27
12121934.U01	AH-312.2	AH-308.8	57832.1	70.3	77.5	2.6	0.11	0.50	0.25	0.38	0.404	2.139	-0.957	0.206	2.696
12121943.U01	AH-308.8	AH-308.3	33400	40.6	82	-2.2	0.07	0.44	0.29	0.57	0.231	1.47	-0.753	0.07	2.594
12121953.U01	AH-308.3	AH-309.0	35683.2	43.4	74.3	2.3	0.09	0.52	0.29	0.54	0.275	1.215	-0.595	0.132	1.311
12122002.U01	AH-309.0	AH-308.8	4960.5	21.2	47.2	1.9	0.05	0.36	0.18	0.76	0.093	0.236	-0.096	0.02	0.36
12122021.U01	AH-308.9	AH-308.4	49871.5	60.7	75	4.2	0.10	0.59	0.32	0.46	0.307	2.113	-0.912	0.137	3.453
12122031.U01	AH-308.4	AH-309.5	57918.7	70.5	74.9	4.8	0.13	0.52	0.29	0.52	0.238	1.357	-0.657	0.125	1.967
12122040.U01	AH-309.5	AH-312.4	59188.2	72	75.1	4.1	0.13	0.63	0.36	0.49	0.342	1.828	-0.901	0.154	3.165
12122049.U01	AH-312.4	AH-319.0	54063.9	65.8	75.8	3.9	0.11	0.47	0.25	0.36	0.47	1.859	-0.821	0.186	3.074
12122059.U01	AH-319.0	AH-319.2	29411.7	35.8	74.8	3.8	0.11	0.65	0.32	0.54	0.252	1.367	-0.709	0.139	2.497
12122108.U01	AH-319.2	AH-318.5	61375.2	74.7	75.6	-3.6	0.12	0.53	0.32	0.22	0.456	2.81	-1.172	0.211	3.795
12122117.U01	AH-318.5	AH-317.0	61146.7	74.4	75.2	2.7	0.08	0.43	0.27	0.42	0.325	1.646	-0.694	0.157	3.009
12122127.U01	AH-317.0	AH-317.0	61346.9	74.6	75.2	3.4	0.10	0.68	0.33	0.37	0.411	1.858	-1.001	0.239	3.461
12122136.U01	AH-317.0	AH-319.1	58844.1	71.6	75.4	0.7	0.07	0.38	0.25	0.34	0.325	2.892	-1.184	0.162	5.128
12122145.U01	AH-319.1	AH-321.7	47958.8	58.3	79.1	3	0.13	0.43	0.27	0.38	0.387	2.063	-0.968	0.198	3.431
12122155.U01	AH-321.7	AH-322.0	4752.9	12.2	24.9	0.5	0.04	0.19	0.11	0.83	0.073	0.133	-0.057	0.013	0.239
12122219.U01	AH-322.1	AH-323.5	26754.2	32.5	57	3.3	0.09	0.53	0.28	0.48	0.262	0.698	-0.359	0.116	0.931
12122228.U01	AH-323.5	AH-319.4	26965.9	32.8	76.7	-2.1	0.10	0.76	0.40	0.59	0.234	1.052	-0.509	0.099	1.356
12122238.U01	AH-319.4	AH-315.0	60889.2	74.1	75.7	-2.6	0.11	0.46	0.28	0.31	0.353	2.627	-1.099	0.134	4.094
12122247.U01	AH-315.0	AH-312.5	58551	71.2	75.5	-1.7	0.10	0.47	0.28	0.32	0.395	2.754	-1.139	0.137	4.102
12122256.U01	AH-312.5	AH-314.4	58972.1	71.8	75.4	3.7	0.13	0.56	0.32	0.24	0.505	2.406	-1.152	0.21	3.605
12122306.U01	AH-314.4	AH-314.5	60526.5	73.6	75.3	4.5	0.10	0.54	0.30	0.36	0.321	2.062	-0.997	0.158	3.247
12122315.U01	AH-314.5	AH-316.4	54654.8	66.5	75.2	-0.8	0.08	0.36	0.23	0.39	0.256	2.362	-1.097	0.121	3.95
12122324.U01	AH-316.4	AH-317.8	26673	32.4	74	-1.4	0.07	0.27	0.17	0.40	0.259	2.885	-1.143	0.088	4.026
12122334.U01	AH-317.8	AH-320.0	35163.7	42.8	75	-2.1	0.07	0.35	0.19	0.40	0.236	2.344	-0.999	0.099	3.442
12122343.U01	AH-320.0	AH-324.5	53321.5	64.8	74.7	0.8	0.08	0.49	0.26	0.37	0.412	2.903	-1.172	0.155	4.017
12122352.U01	AH-324.5	AH-326.3	19341.7	23.5	42.7	0.9	0.06	0.27	0.16	0.62	0.214	1.161	-0.535	0.072	1.057
12130005.U01	AH-326.3	AH-330.5	50913.8	61.9	74.9	2.1	0.08	0.33	0.21	0.52	0.251	1.641	-0.781	0.099	2.302
12130014.U01	AH-330.5	AH-333.9	31525.2	38.4	70.8	-2	0.05	0.29	0.17	0.69	0.318	1.773	-0.881	0.18	2.891
12130023.U01	AH-333.9	AH-340.5	57218.9	69.6	70.9	3	0.11	0.60	0.31	0.46	0.362	1.155	-0.529	0.213	1.973
12130033.U01	AH-340.5	AH-347.0	52254.9	63.6	70.4	-2.7	0.07	0.28	0.18	0.50	0.284	1.045	-0.523	0.099	2.047
12130042.U01	AH-347.0	AH-349.6	20853.5	25.4	38.9	-1.3	0.06	0.28	0.15	0.68	0.239	0.276	-0.107	0.089	0.644
12130051.U01	AH-349.6	AH-349.6	252.4	3.4	6.4	0.4	0.02	0.14	0.08	0.92	0.035	0.087	-0.025	0.005	0.177
12130101.U01	AH-349.6	AH-349.9	2474.2	9.4	12.4	1.4	0.04	0.31	0.15	0.78	0.158	0.241	-0.113	0.117	0.689
12130136.U01	AH-349.6	AH-347.9	15004.1	23.5	29	2.1	0.10	0.73	0.33	0.56	0.184	0.302	-0.13	0.078	0.421
12130147.U01	AH-347.8	AH-341.5	51031	62.1	70.7	2.7	0.11	0.48	0.22	0.56	0.244	1.059	-0.566	0.098	2.227
12130156.U01	AH-341.5	AH-335.3	56221.3	68.4	70.8	-2.8	0.11	0.50	0.28	0.56	0.417	1.19	-0.564	0.158	2.258
12130205.U01	AH-335.3	AH-330.7	36988.4	45	70	-2.6	0.07	0.41	0.22	0.49	0.368	1.883	-0.865	0.079	2.398
12130215.U01	AH-330.7	AH-327.9	33498.5	40.7	79.3	-1	0.05	0.37	0.21	0.59	0.222	1.224	-0.551	0.088	1.999
Erie, PA															
12130224.U01	AH-327.9	AH-326.3	20496.6	41.2	60.3	1	0.08	0.44	0.23	0.60	0.254	1.572	-0.735	0.096	1.9
12140615.U01	AH-324.7	AH-320.4	50646.8	61.7	75.2	-1.4	0.13	0.58	0.38	0.31	0.387	2.92	-1.21	0.127	3.374
12140624.U01	AH-320.4	AH-317.2	48488.9	66.7	75.4	2.3	0.08	0.39	0.21	0.33	0.336	2.465	-1.157	0.138	3.553
12140634.U01	AH-317.2	AH-315.0	55436.8	67.4	75.6	0.9	0.08	0.41	0.22	0.32	0.302	2.537	-1.103	0.124	4.487
12140644.U01	AH-315.0	AH-315.1	59356.8	72.2	78.6	2.3	0.08	0.43	0.25	0.41	0.272	2.551	-1.102	0.124	3.139
12140653.U01	AH-315.1	AH-313.1	56905.1	69.2	70.4	-3.5	0.10	0.38	0.23	0.36	0.342	2.581	-1.103	0.175	3.204
12140702.U01	AH-313.1	AH-313.8	54538.4	66.4	72.2	1.7	0.09	0.40	0.25	0.22	0.433	2.709	-1.249	0.148	3.582
12140712.U01	AH-313.8	AH-316.5	56489.9	68.7	72	-1	0.06	0.32	0.21	0.49	0.27	2.479	-1.089	0.091	3.145
12140721.U01	AH-316.5	AH-322.3	44405	54	72.3	2.4	0.08	0.43	0.19	0.43	0.366	2.25	-1.024	0.158	3.088
12140730.U01	AH-322.3	AH-322.8	28401.7	34.5	62.9	2.7	0.10	0.48	0.26	0.49	0.333	0.571	-0.294	0.125	0.977
12140740.U01	AH-322.8	AH-322.1	11296.6	46.5	65.2	-0.4	0.09	0.32	0.20	0.69	0.289	0.793	-0.373	0.126	1.786
12140803.U01	AH-322.0	AH-319.0	54799.8	66.6	74.3	0.7	0.08	0.40	0.24	0.36	0.378	2.824	-1.174	0.181	3.674
12140812.U01	AH-319.0	AH-317.0	55954.1	68.1	71.1	0.8	0.08	0.37	0.22	0.23	0.29	2.745	-1.237	0.153	4.033
12140821.U01	AH-317.0	AH-316.5	17384.6	39.1	69.5	0.5	0.06	0.30	0.17	0.59	0.199	1.84	-0.876	0.059	2.068
12140835.U01	AH-316.5	AH-317.5	50170.4	61	70.9	-2.9	0.09	0.40	0.21	0.54	0.252	1.609	-0.731	0.109	1.9

Summary of Worst Values Recorded During Each File															
Filename	StMP	EndMP	EndDist	AvSpd	MxSpd	MaxCD	N.A.L	WhL/V	TSL/V	Vert	ycp-p	zcp-p	zc0-p	y-Trk	z-Trk
			(ft)	(mph)	(mph)	(in)	(ratio)	(ratio)	(ratio)	(ratio)	(g)	(g)	(g)	(grms)	(g)
12140854.U01	AH-318.6	AH-319.0	50840.1	61.9	70.7	3.4	0.11	0.45	0.24	0.38	0.346	1.878	-0.902	0.137	2.363
12140903.U01	AH-319.0	AH-319.7	29308.5	55.1	69.8	-4.2	0.09	0.39	0.24	0.43	0.385	1.577	-0.702	0.12	2.451
12140910.U01	AH-319.7	AH-314.9	39902.3	48.5	71.5	-4.7	0.12	0.43	0.25	0.52	0.367	1.786	-0.739	0.113	2.137
12140920.U01	AH-314.9	AH-312.4	23148.8	30	69.2	3.4	0.07	0.33	0.21	0.51	0.364	1.153	-0.544	0.13	1.874
12140929.U01	AH-312.4	AH-311.2	25419.6	30.9	69.2	2.5	0.11	0.48	0.29	0.47	0.335	1.829	-0.83	0.197	2.121
12140938.U01	AH-311.2	AH-310.4	55864.2	67.9	70.7	3.8	0.13	0.52	0.34	0.38	0.373	2.589	-1.122	0.168	3.408
Derailment															

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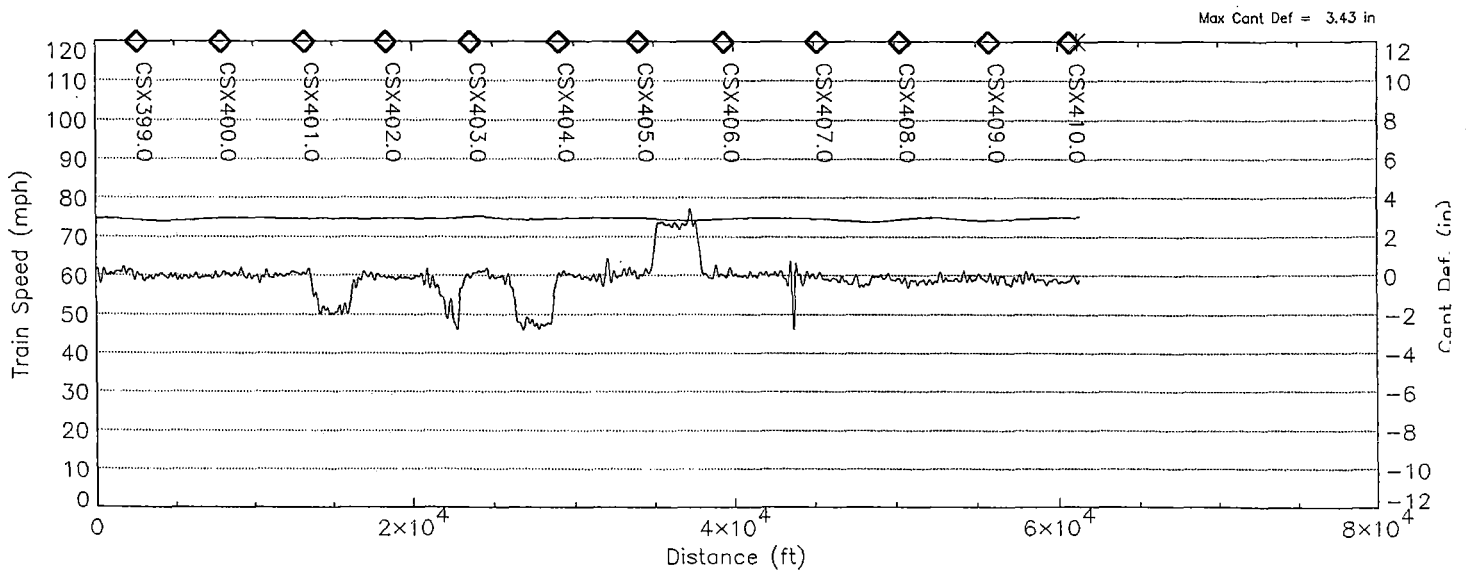
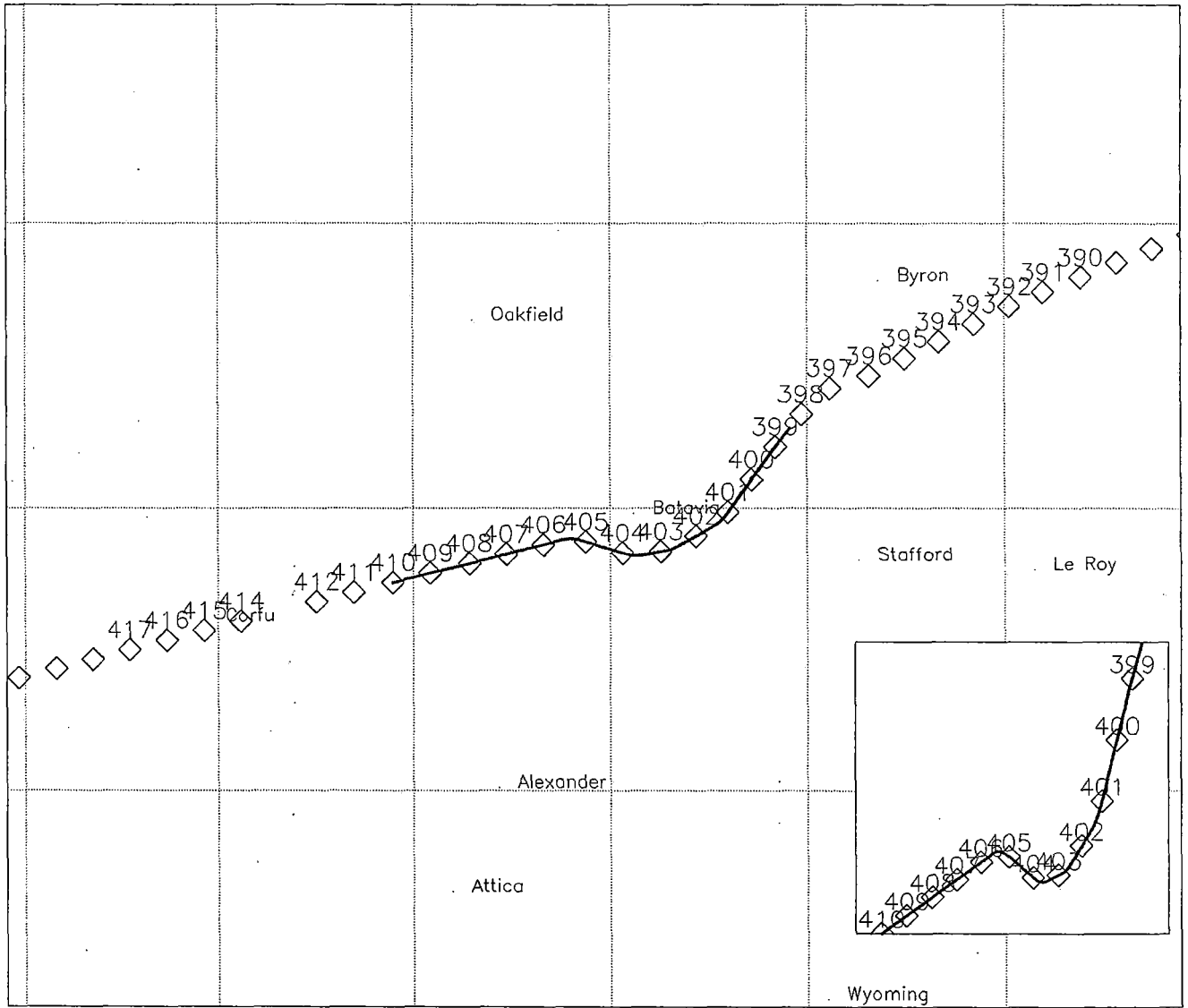
Appendix C

Data Reports with Vertical Load Alarms

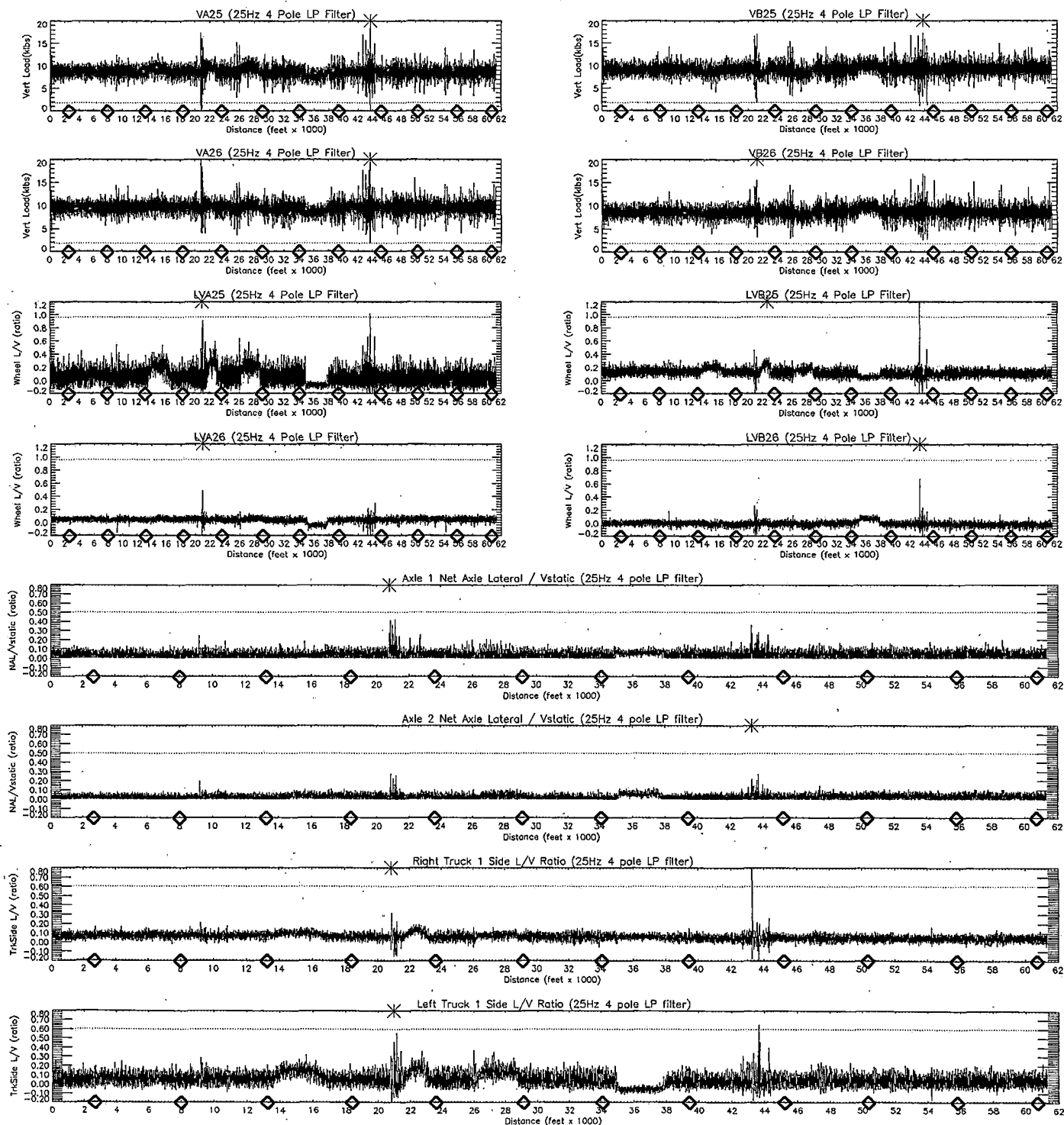
12122127.U01

AvgSpd: 74.6 mph MaxSpd: 75.2 mph

Total Distance Travelled: 12.37 miles



Amtrak MHC 1404



-- TEST ZONE -- From MP CSX398.4 To MP CSX410.0 -- TEST ZONE --

All Results Below Are Calculated Using A 5 Foot Window

Single Whl Vert. Load
(> 1.799)
0 exceptions

AX1 R V = 3.7 (9.2)
AX1 L V = 3.3 (8.6)
AX2 R V = 3.7 (8.6)
AX2 L V = 3.8 (9.5)

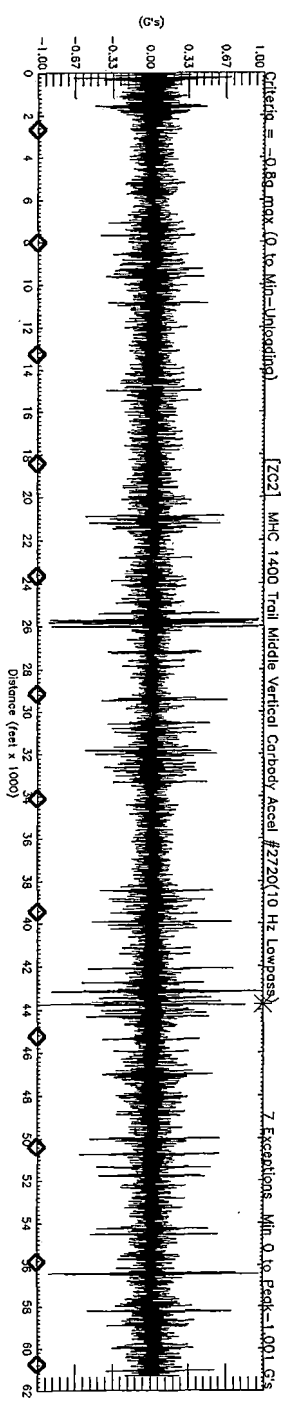
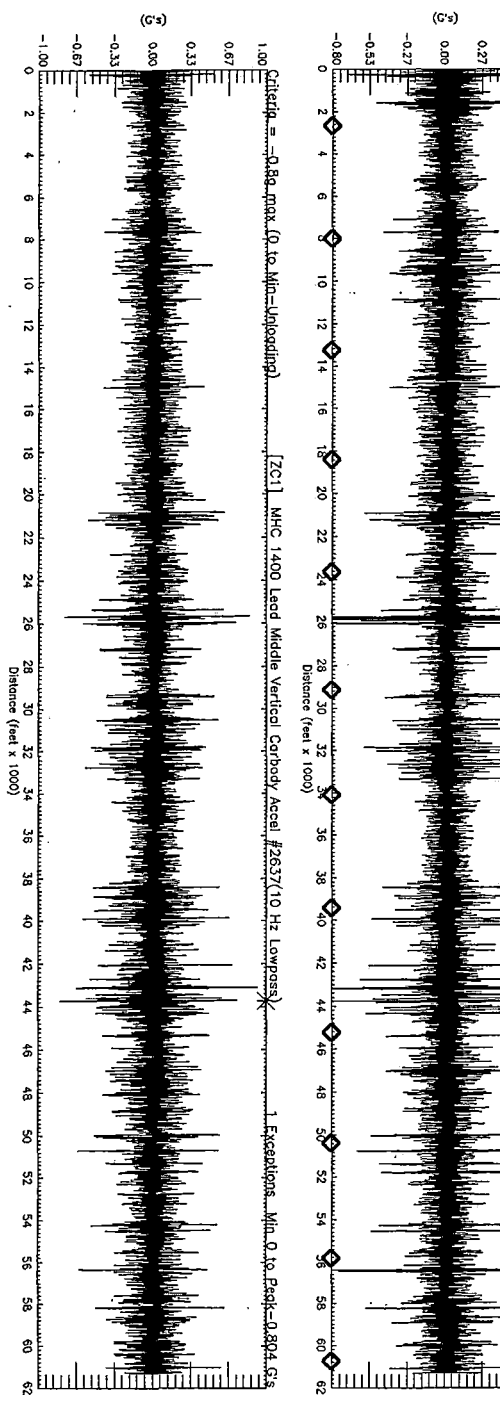
Single Wheel L/V
(L/V < 0.963)
(Flange Ang = 70.5, mu = 0.5)
0 exceptions
AX1 R L/V = 0.312 (0.094)
AX1 L L/V = 0.684 (0.056)
AX2 R L/V = 0.197 (-0.005)
AX2 L L/V = 0.216 (0.039)

Net Axle Lateral Force
(< 8.995)
0 exceptions

AX1 Lat Sum = 3.5 (0.8)
AX2 Lat Sum = 2.9 (0.6)

Truck Side L/V Ratio
(< 0.6)
0 exceptions

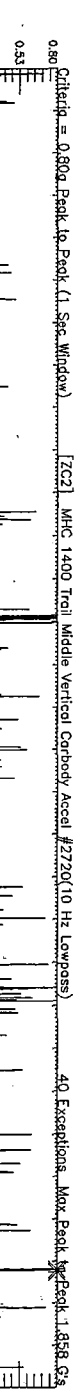
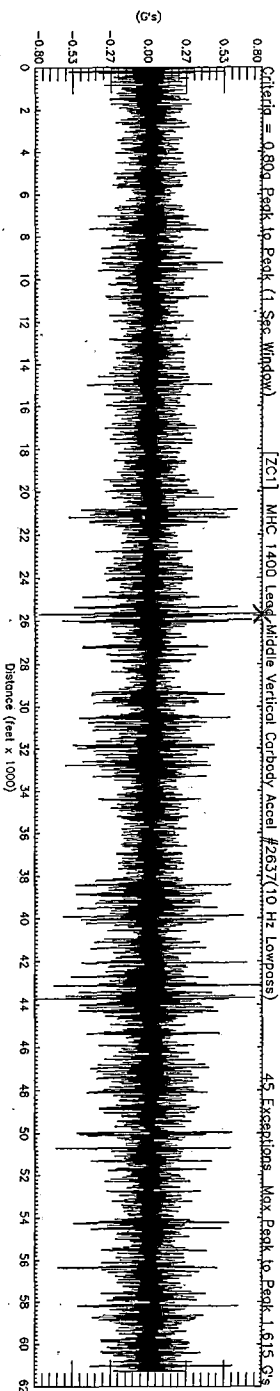
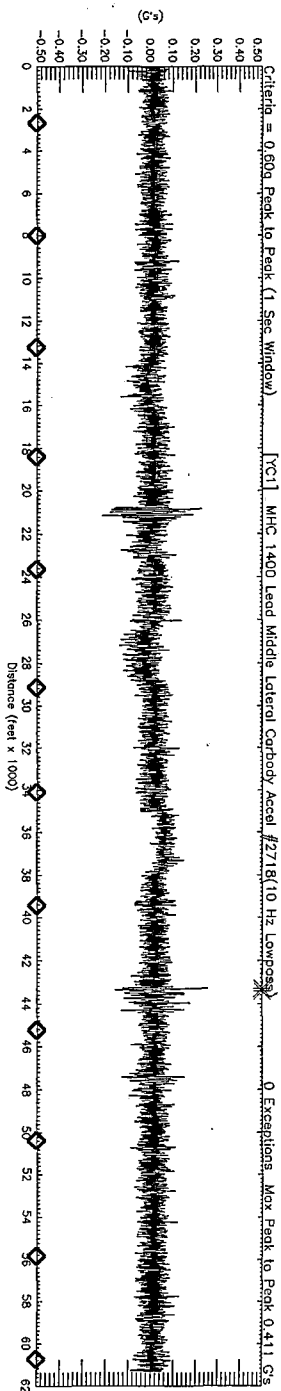
R Truck 1 Side L/V = 0.186 (0.058)
L Truck 1 Side L/V = 0.333 (0.048)



Acceleration Criteria 12122127.U01 - 74.6 mph

Accelerations

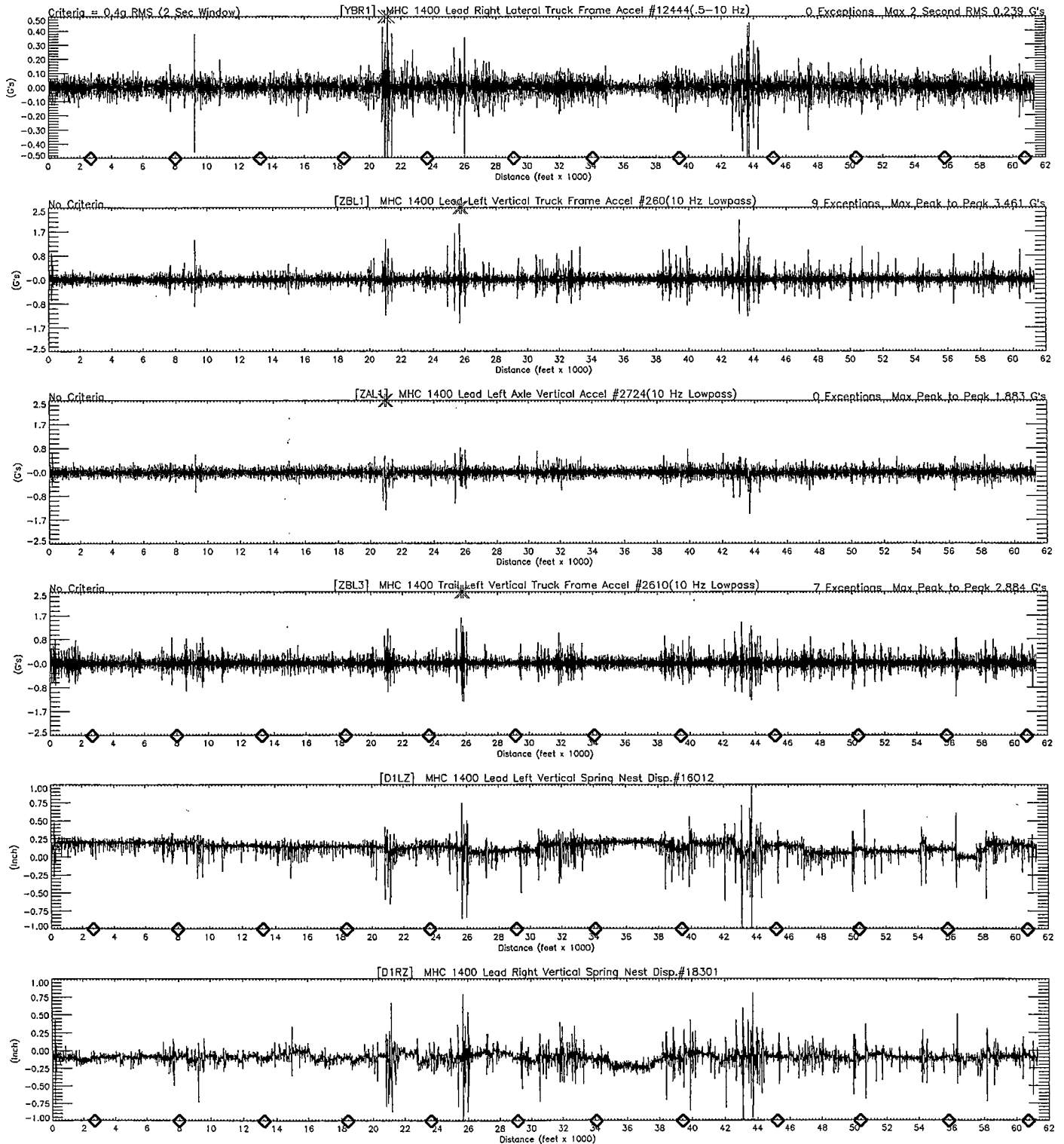
-- TEST ZONE -- From MP CSX398.4 To MP CSX410.0 -- TEST ZONE --



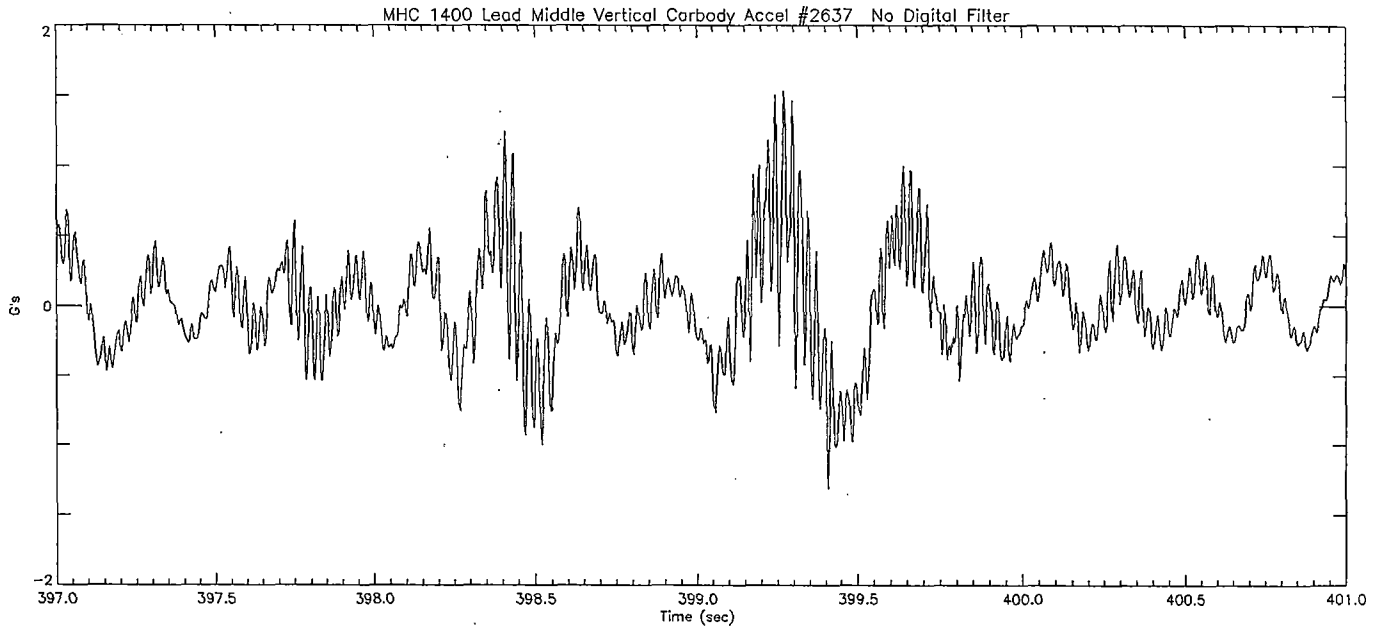
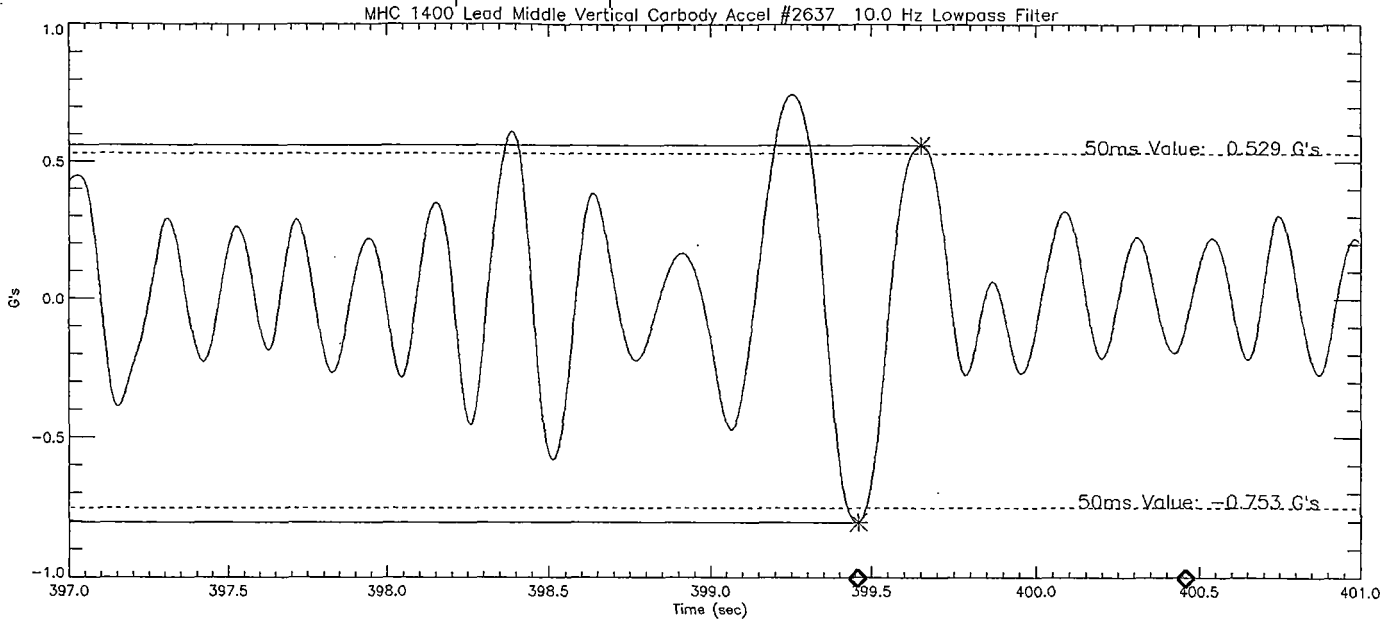
Acceleration Criteria 12122127.U01 -- 74.6 mph

Accelerations

-- TEST ZONE -- From MP CSX398.4 To MP CSX410.0 -- TEST ZONE --



Exception Report - 12122127.U01



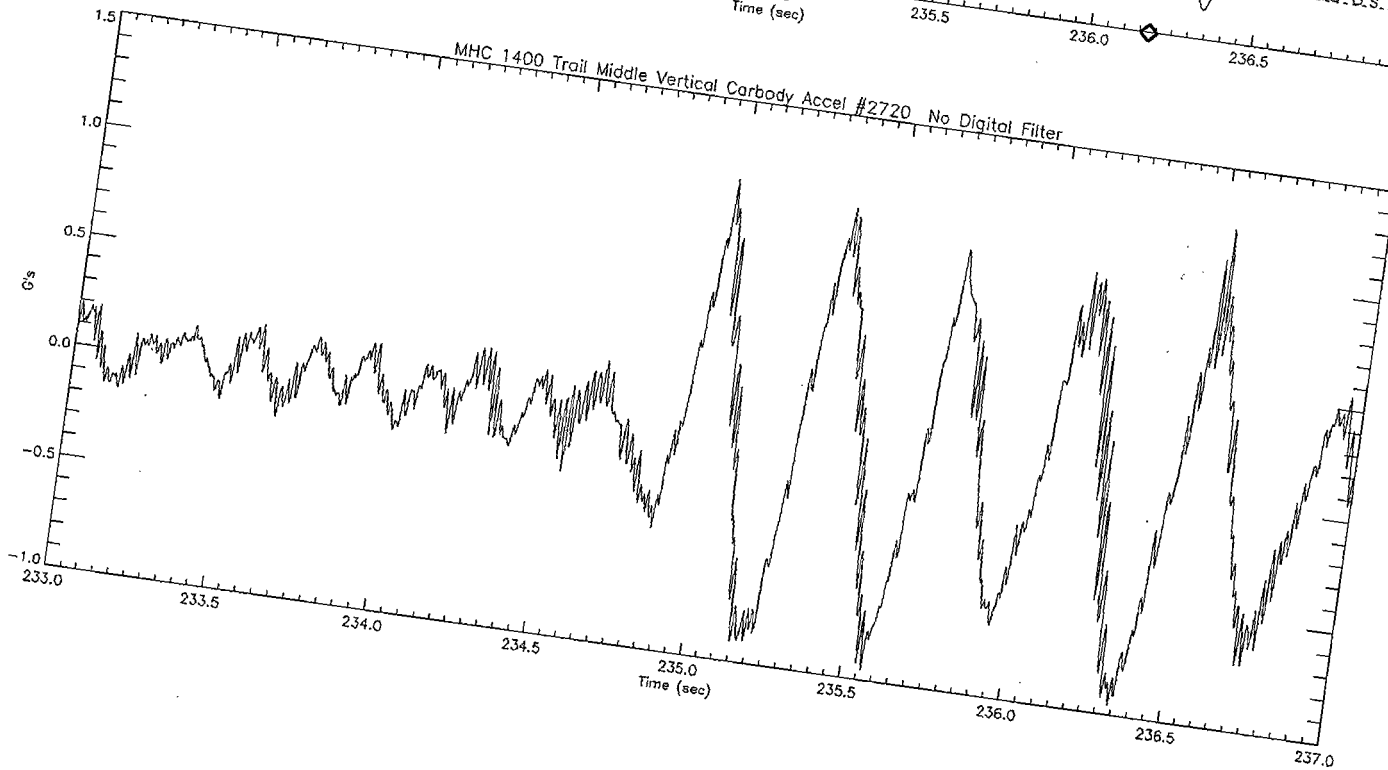
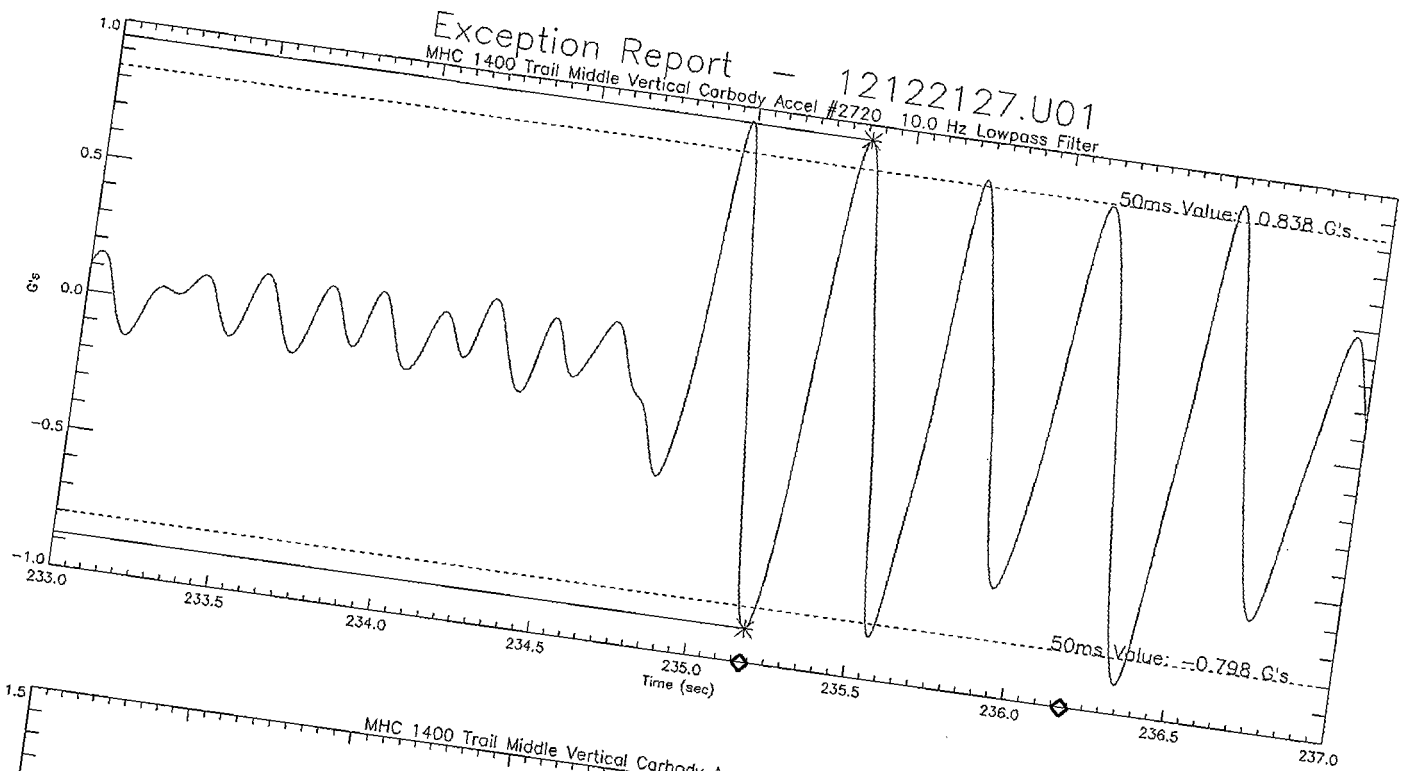
CB VRT MIN Exception

Criteria = 1.0g min from 0.0

Reported Value: -0.804 G's 50ms Value: 1.282 G's

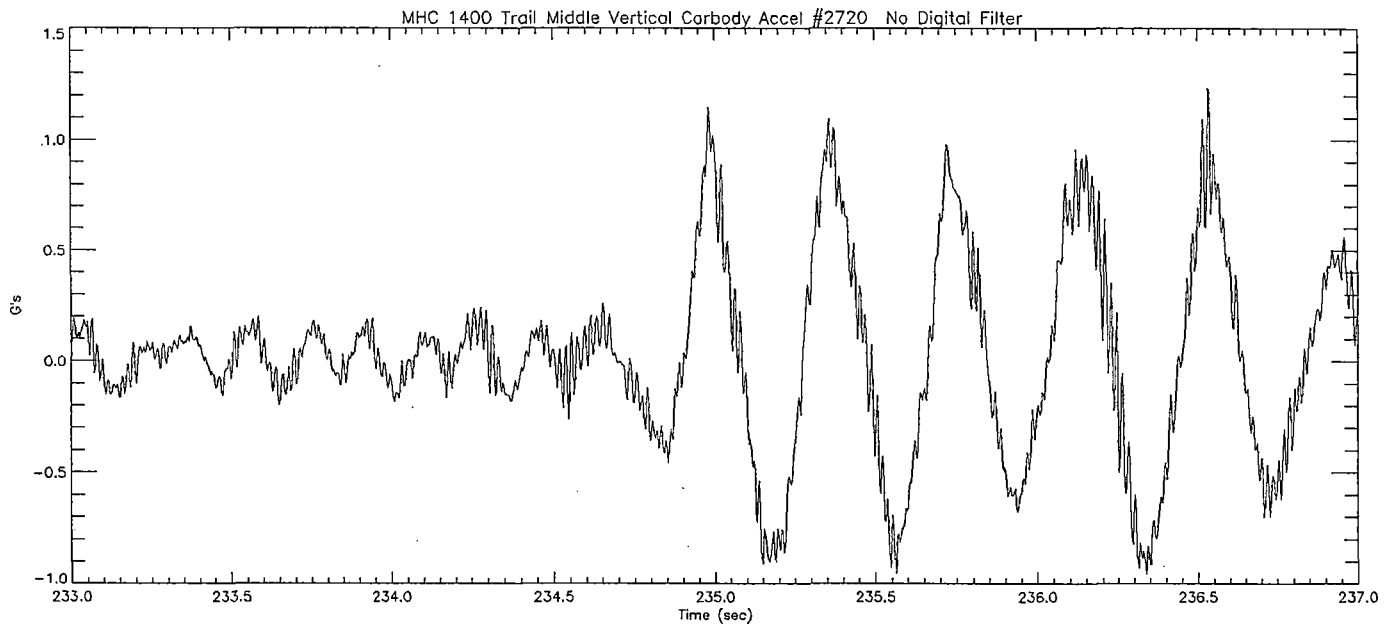
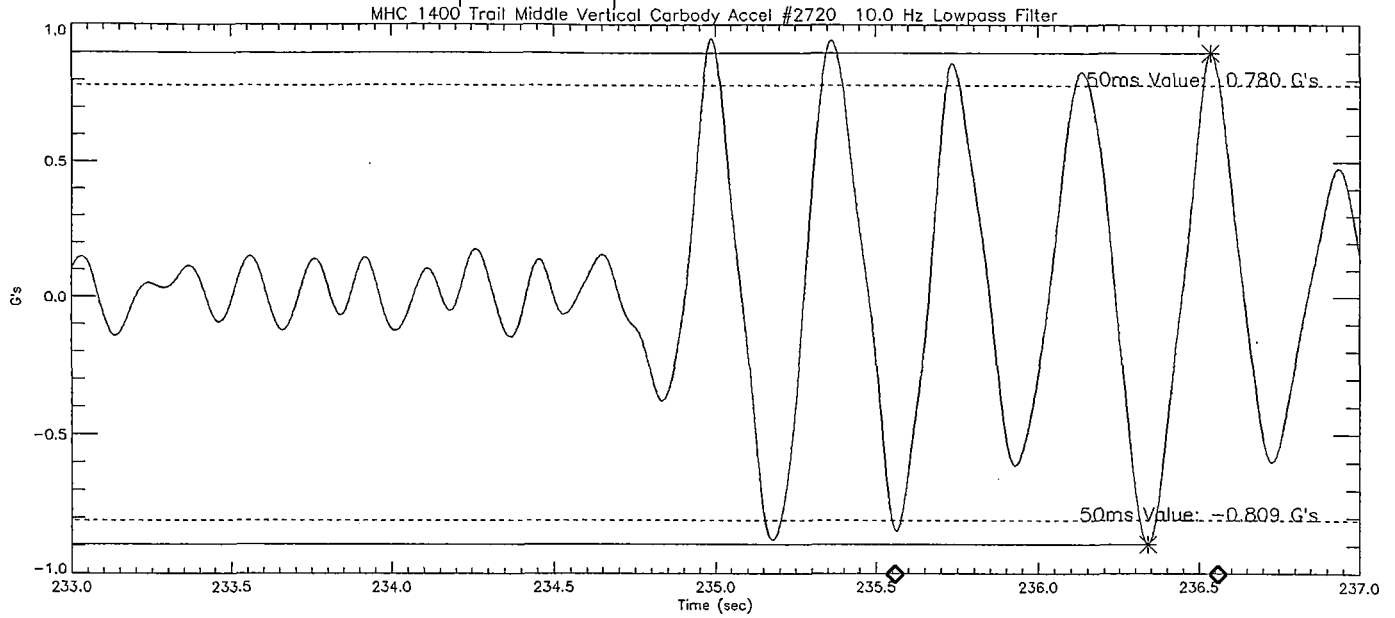
Channel #: 43 (ZC1) MHC 1400 Lead Middle Vertical Corbody Accel #2637

Milepost: 406.7 Speed: 74.7 mph



CB VRT MIN Exception
 Criteria = 1.0g min from 0.0
 Reported Value: -0.879 G's 50ms Value: 1.636 G's
 Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720
 Milepost: 403.4 Speed: 74.7 mph

Exception Report - 12122127.U01



CB VRT MIN Exception

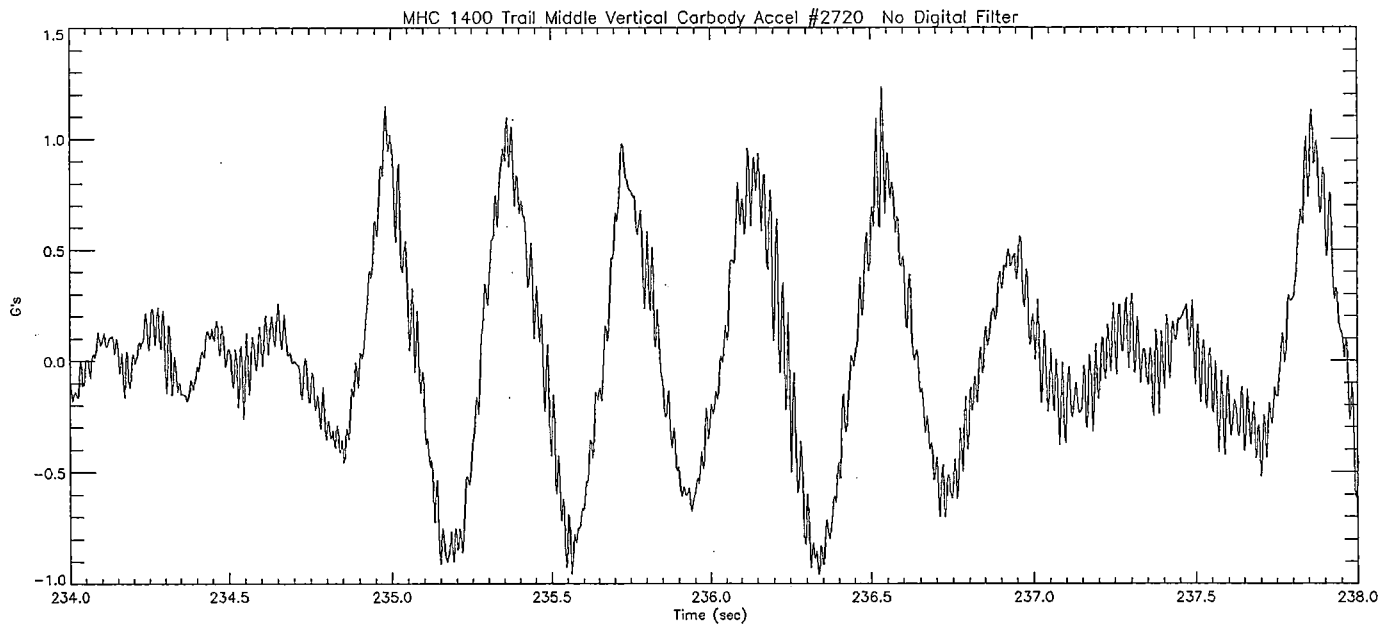
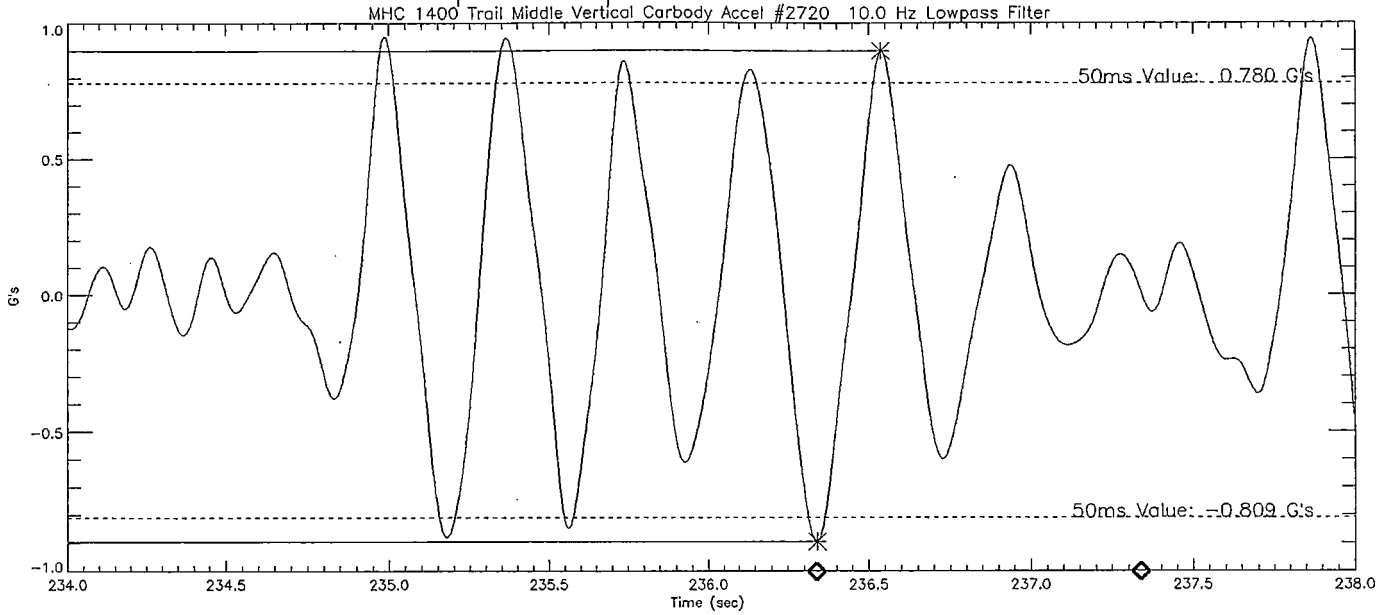
Criteria = 1.0g min from 0.0

Reported Value: -0.847 G's 50ms Value: 1.589 G's

Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

Milepost: 403.4 Speed: 74.6 mph

Exception Report - 12122127.U01



CB VRT MIN Exception

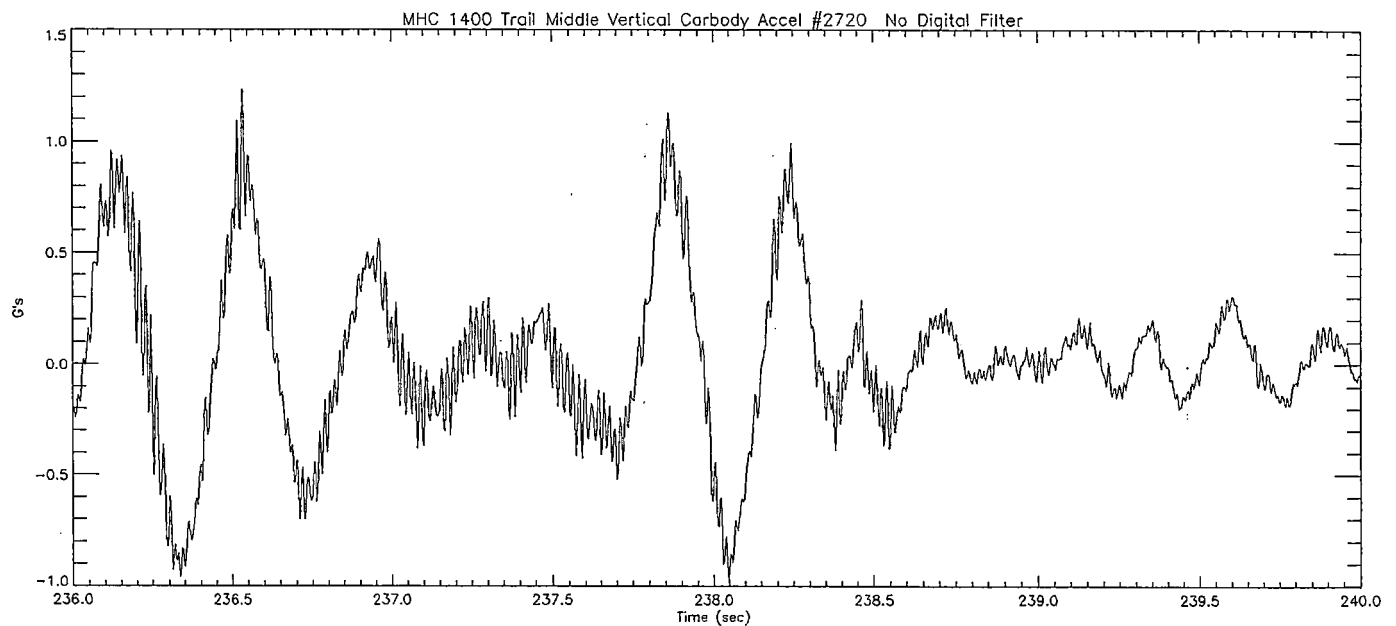
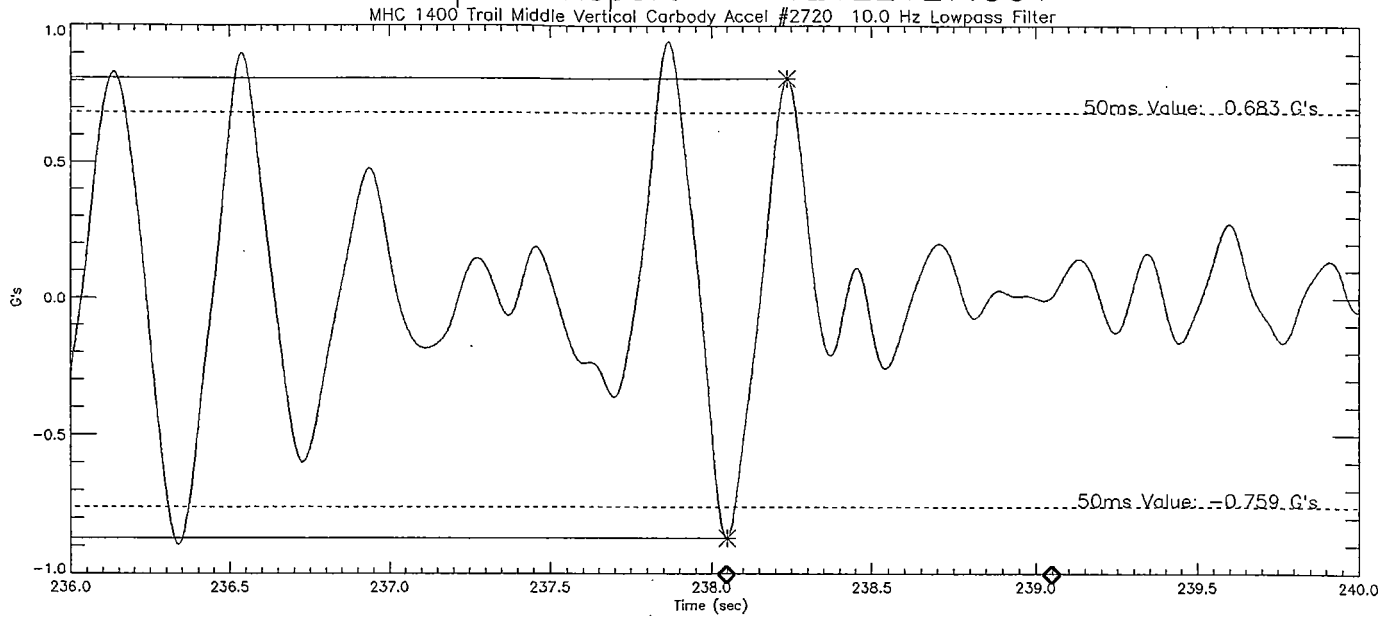
Criteria = 1.0g min from 0.0

Reported Value: -0.893 G's 50ms Value: 1.589 G's

Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

Milepost: 403.4 Speed: 74.6 mph

Exception Report — 12122127.U01



CB VRT MIN Exception

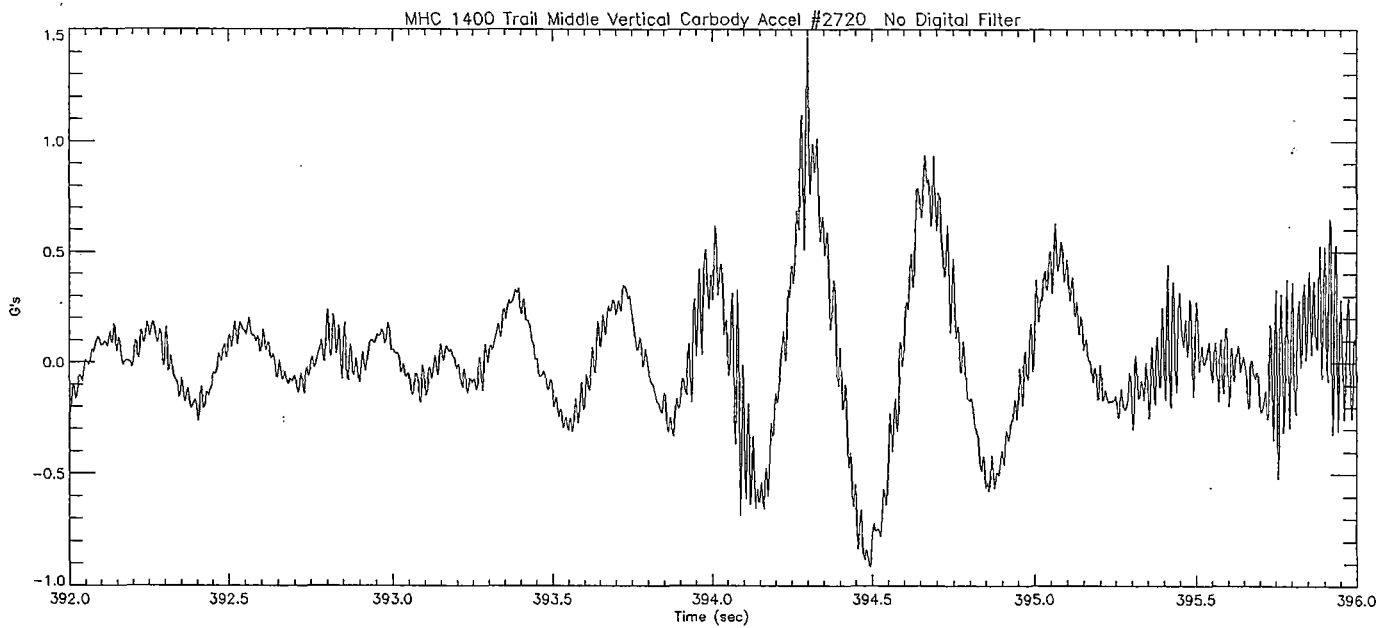
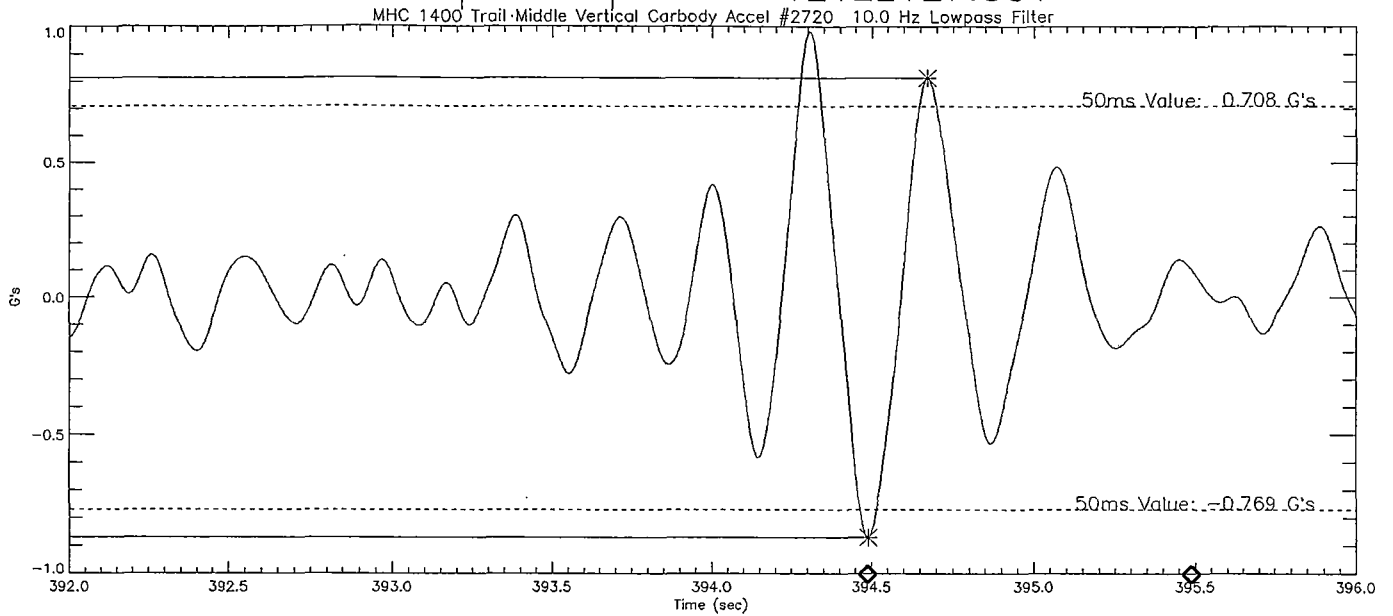
Criteria = 1.0g min from 0.0

Reported Value: -0.873 G's 50ms Value: 1.442 G's

Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

Milepost: 403.4 Speed: 74.6 mph

Exception Report - 12122127.U01



CB VRT MIN Exception

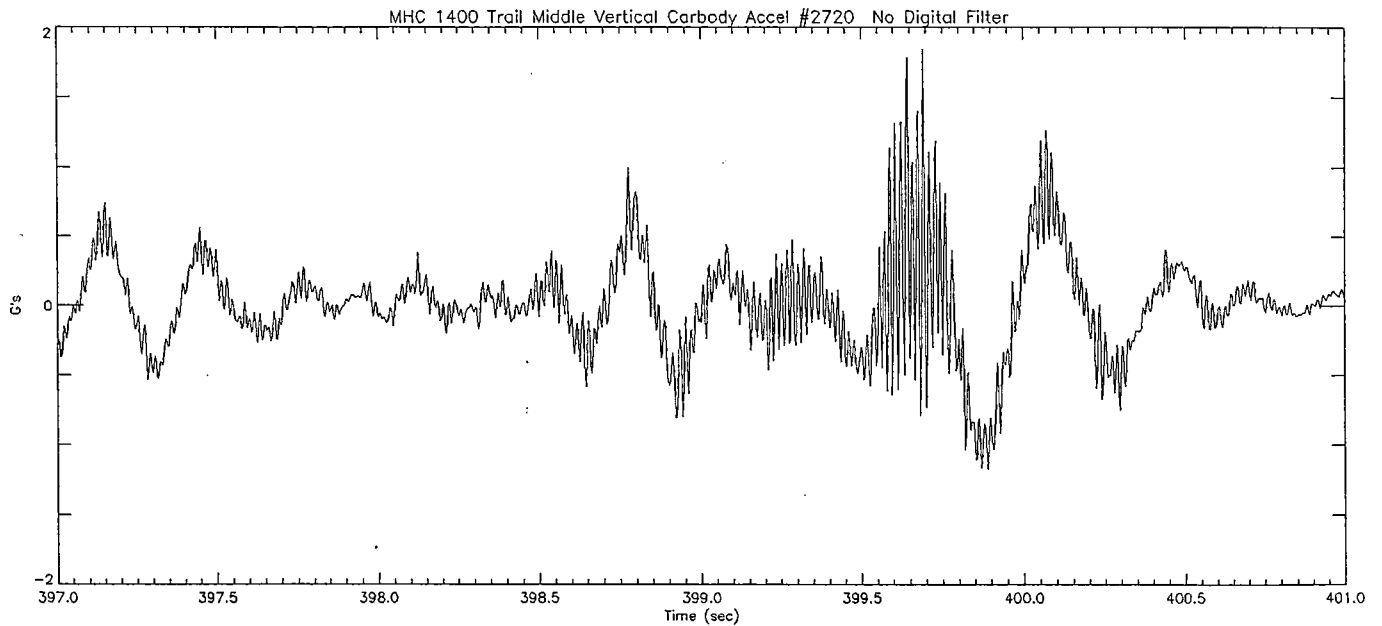
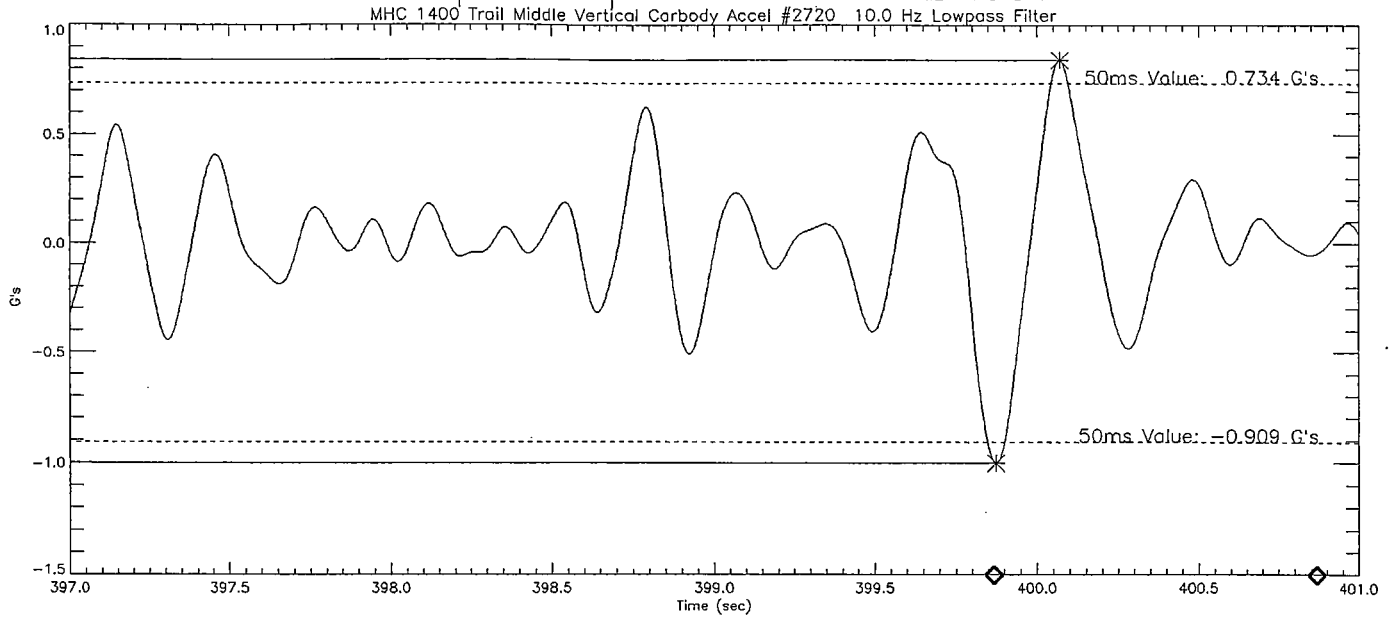
Criteria = 1.0g min from 0.0

Reported Value: -0.872 G's 50ms Value: 1.478 G's

Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

Milepost: 406.6 Speed: 74.7 mph

Exception Report — 12122127.U01



CB VRT MIN Exception

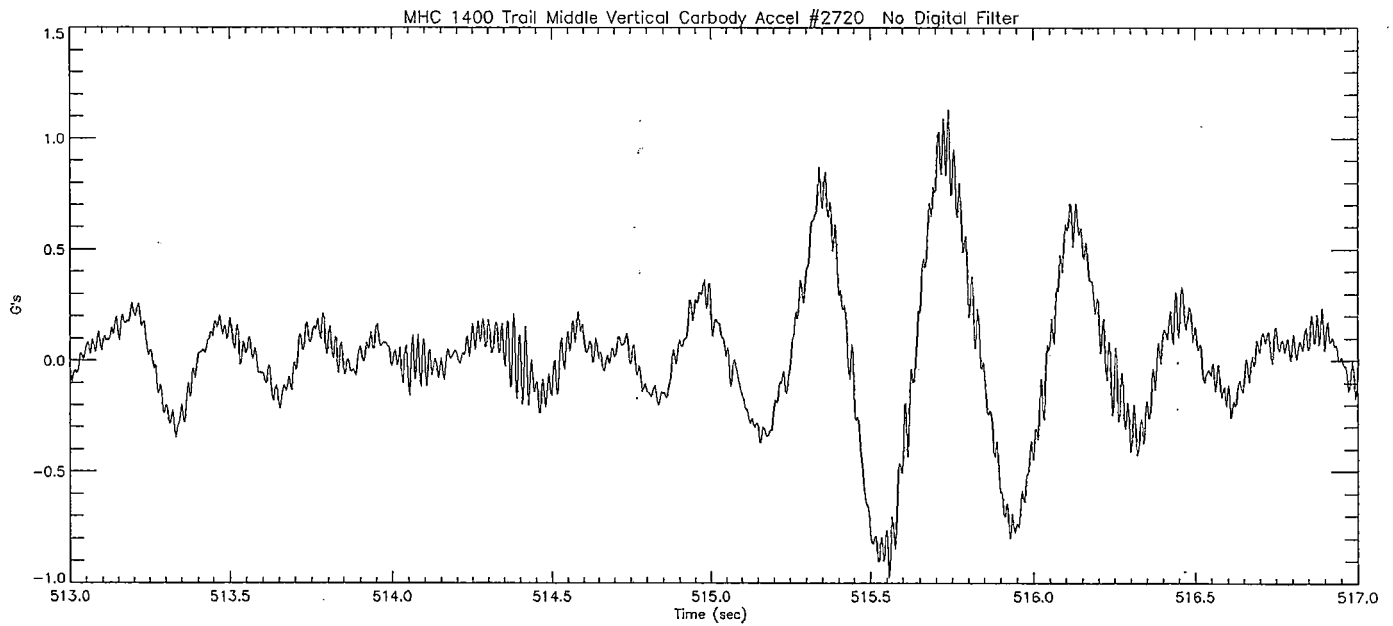
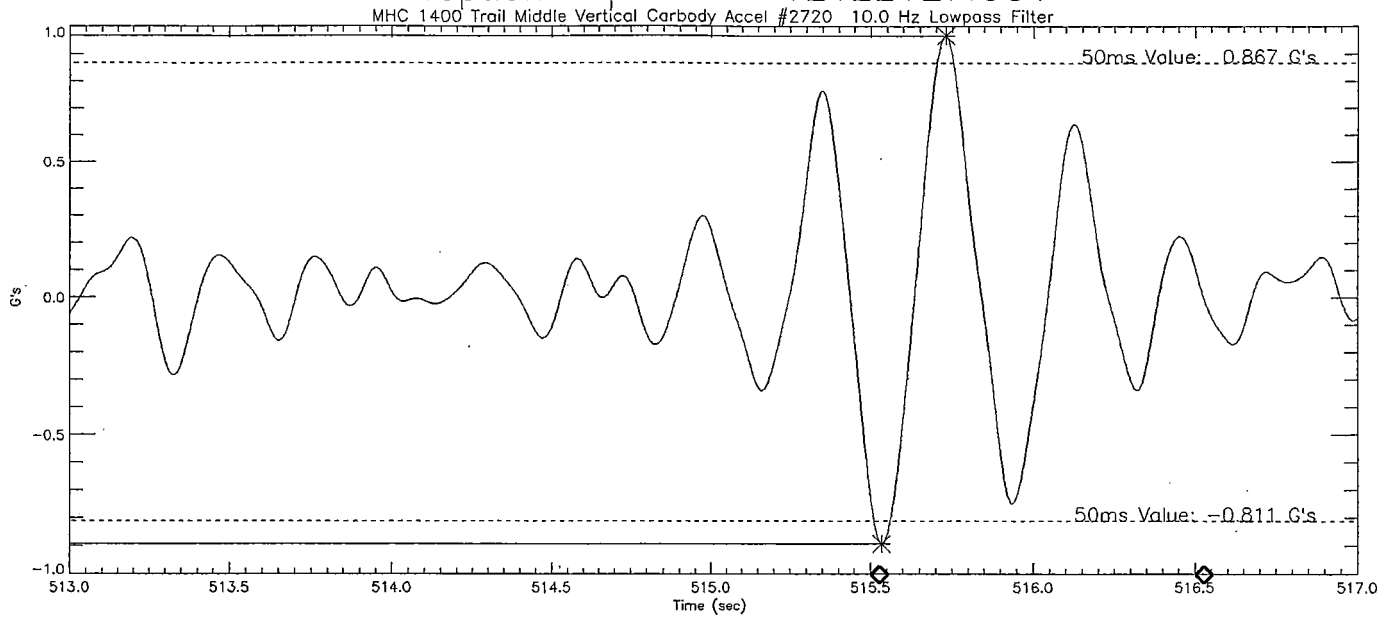
Criteria = 1.0g min from 0.0

Reported Value: -1.001 G's 50ms Value: 1.644 G's

Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

Milepost: 406.7 Speed: 74.7 mph

Exception Report - 12122127.U01



CB VRT MIN Exception

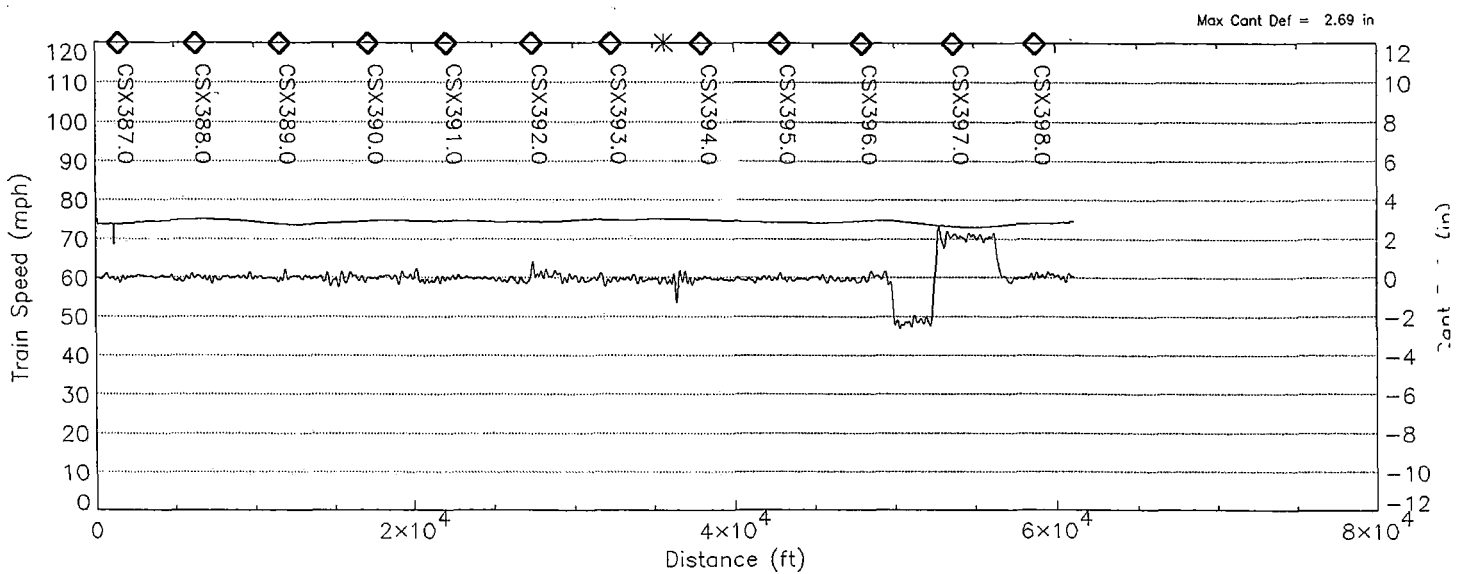
Criteria = 1.0g min from 0.0

Reported Value: -0.893 G's 50ms Value: 1.677 G's

Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

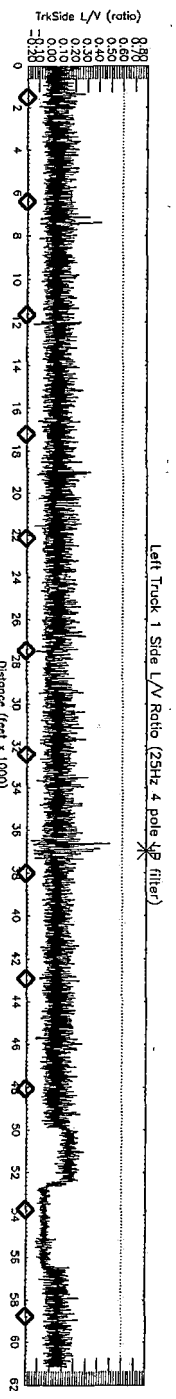
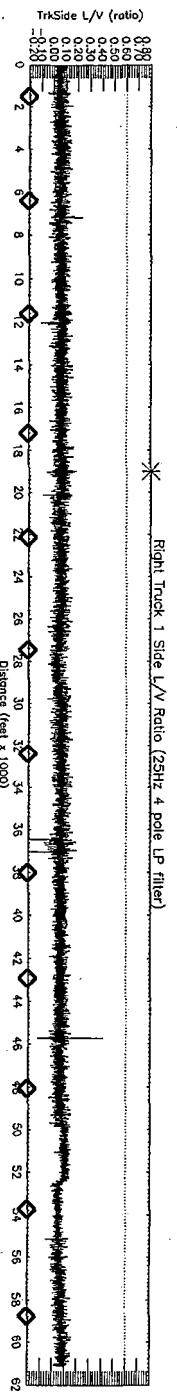
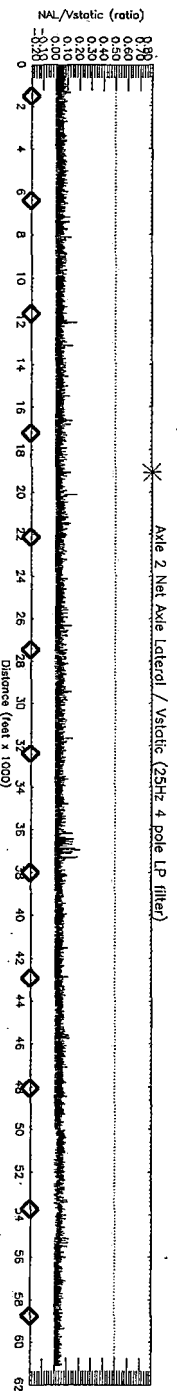
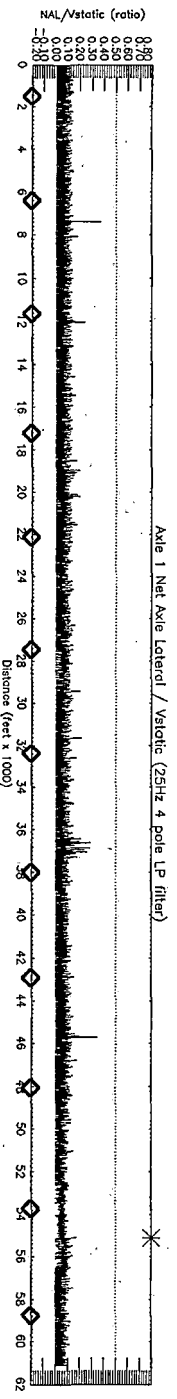
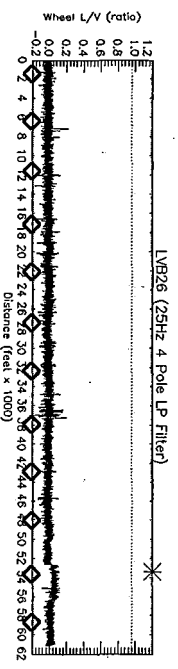
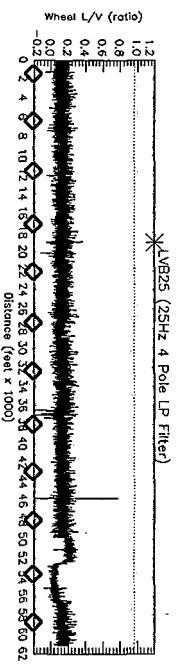
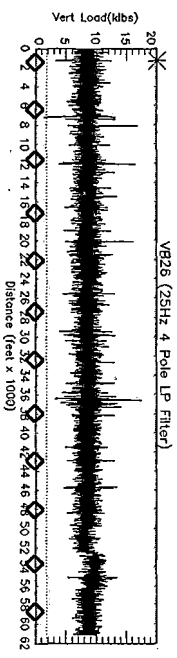
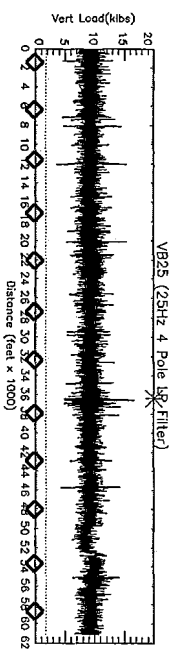
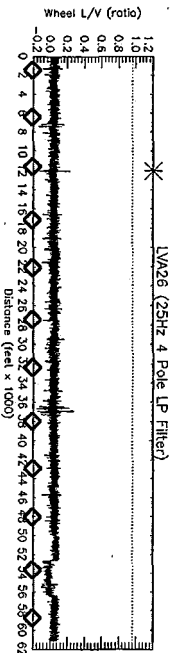
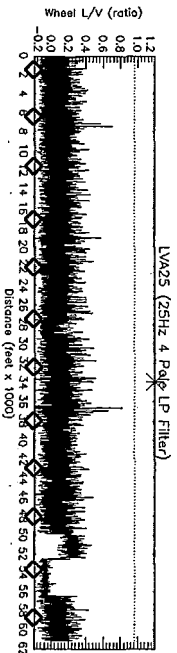
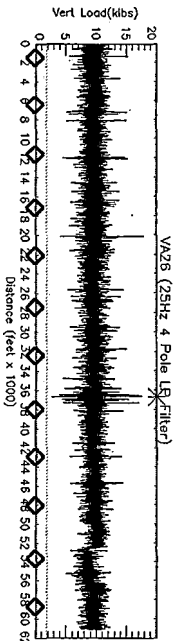
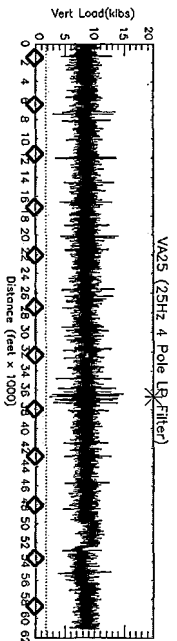
Milepost: 409.1 Speed: 74.3 mph

AvgSpd: 74.4 mph MaxSpd: 75.2 mph
Total Distance Travelled: 12.33 miles



FRA 213.333 Safety Criteria 12122117.U01 - 74.4 mph

Amtrak MHC 1404



-- TEST ZONE -- From MP CSX386.7 To MP CSX398.4 -- TEST ZONE --
All Results Below Are Calculated Using A 5 Foot Window

Single Wht Vert. Load
(> 1.759)
0 exceptions

AX1 R V = 5.6 (9.2)
AX1 L V = 4.2 (8.5)
AX2 R V = 4.6 (8.6)
AX2 L V = 3.8 (9.5)

Single Wheel L/V
($L/V < 0.963$)
(Flange Ang = 70.5, $\mu u = 0.5$)
0 exceptions

AX1 R L/V = 0.296 (0.099)
AX1 L L/V = 0.434 (-0.057)
AX2 R L/V = 0.105 (-0.008)
AX2 L L/V = 0.134 (0.039)

Net Axle Lateral Force
(< 8.995)
0 exceptions

AX1 Lat Sum = 2.7 (0.8)
AX2 Lat Sum = 1.9 (0.6)

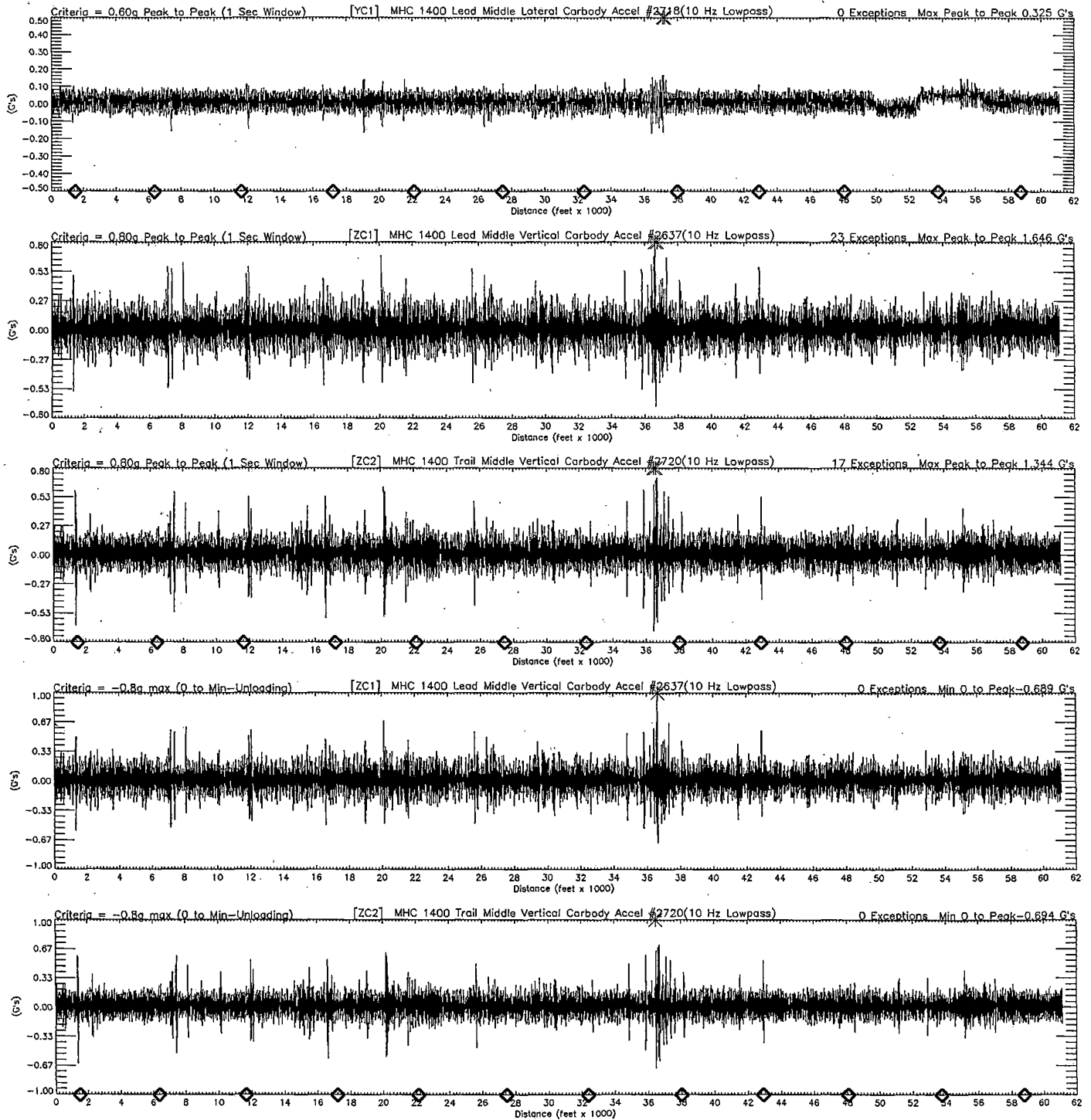
Truck Side L/V Ratio
(< 0.6)
0 exceptions

R Truck 1 Side L/V = 0.160 (0.061)
L Truck 1 Side L/V = 0.270 (0.049)

Acceleration Criteria 12122117.U01 -- 74.4 mph

Accelerations

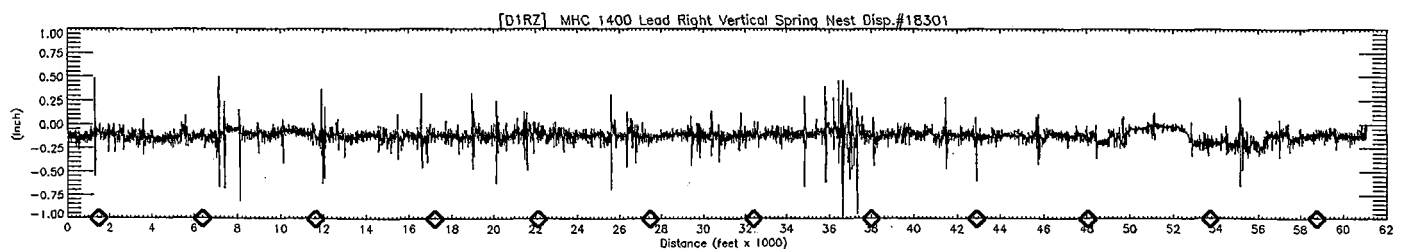
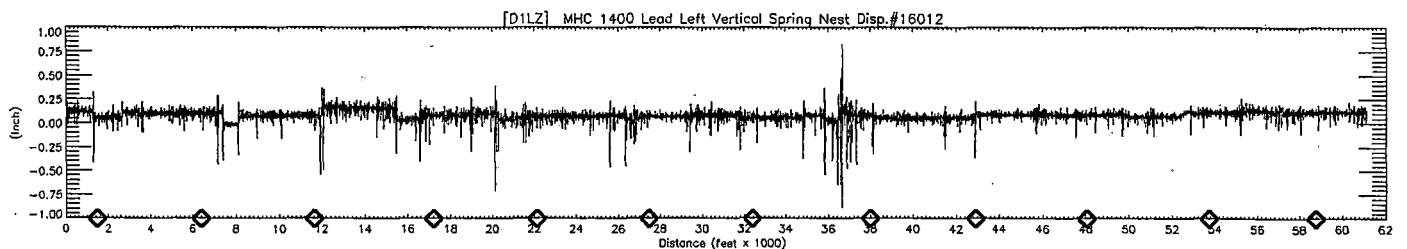
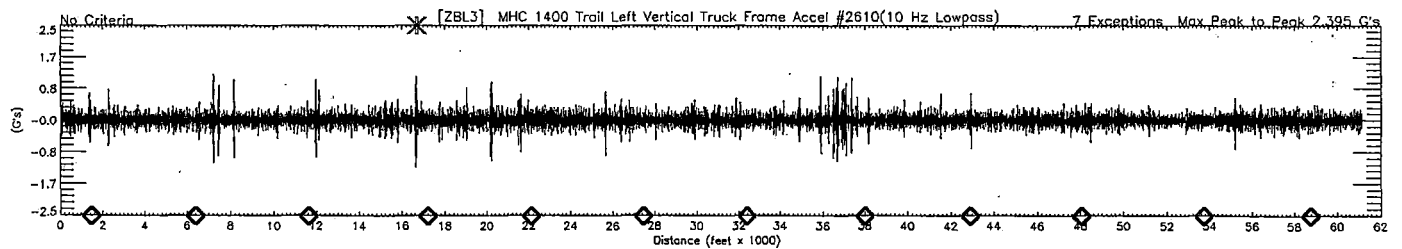
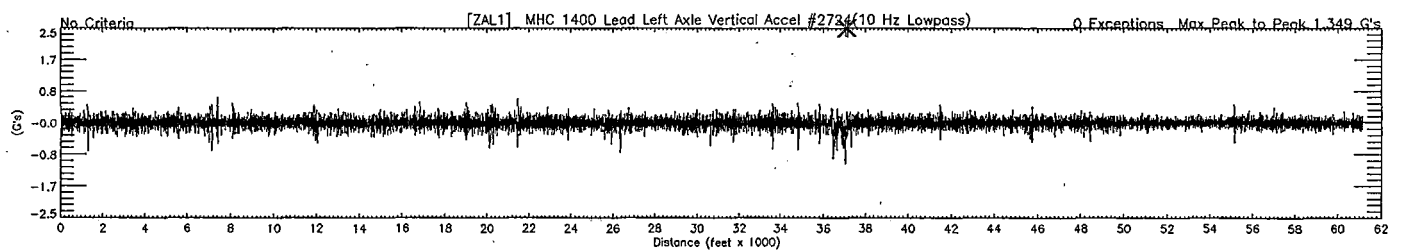
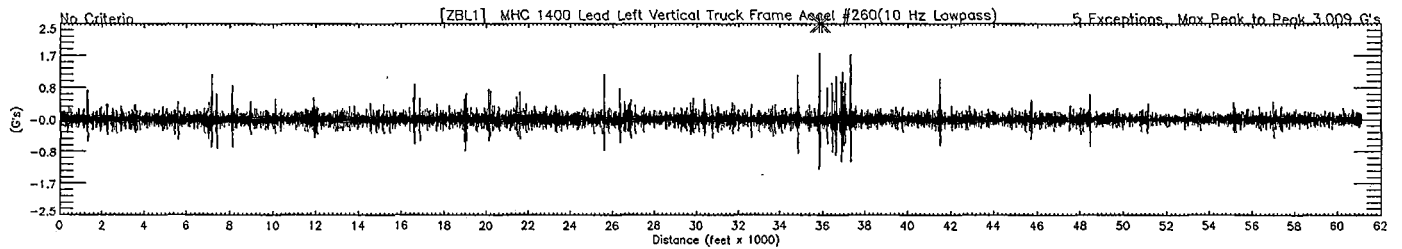
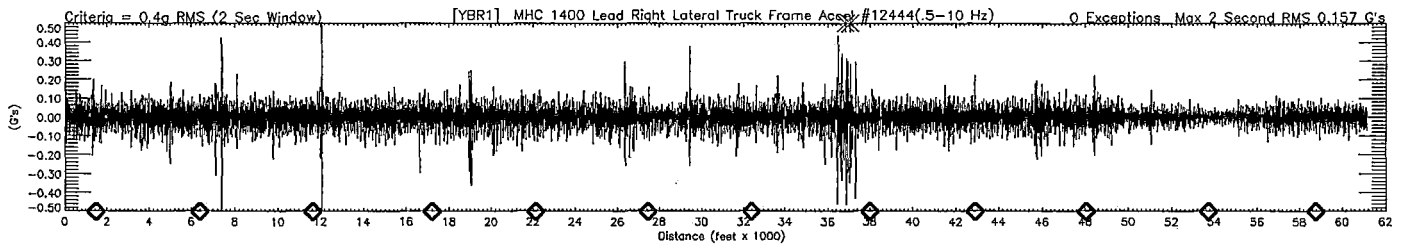
-- TEST ZONE -- From MP CSX386.7 To MP CSX398.4 -- TEST ZONE --



Acceleration Criteria 12122117.U01 -- 74.4 mph

Accelerations

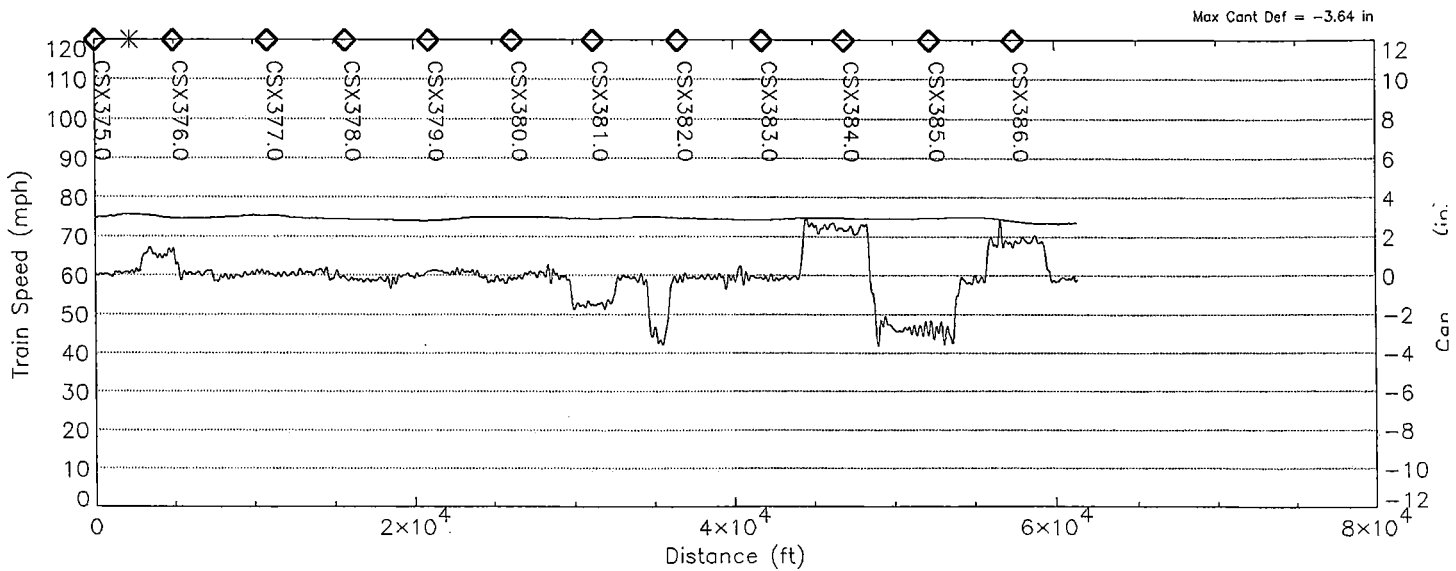
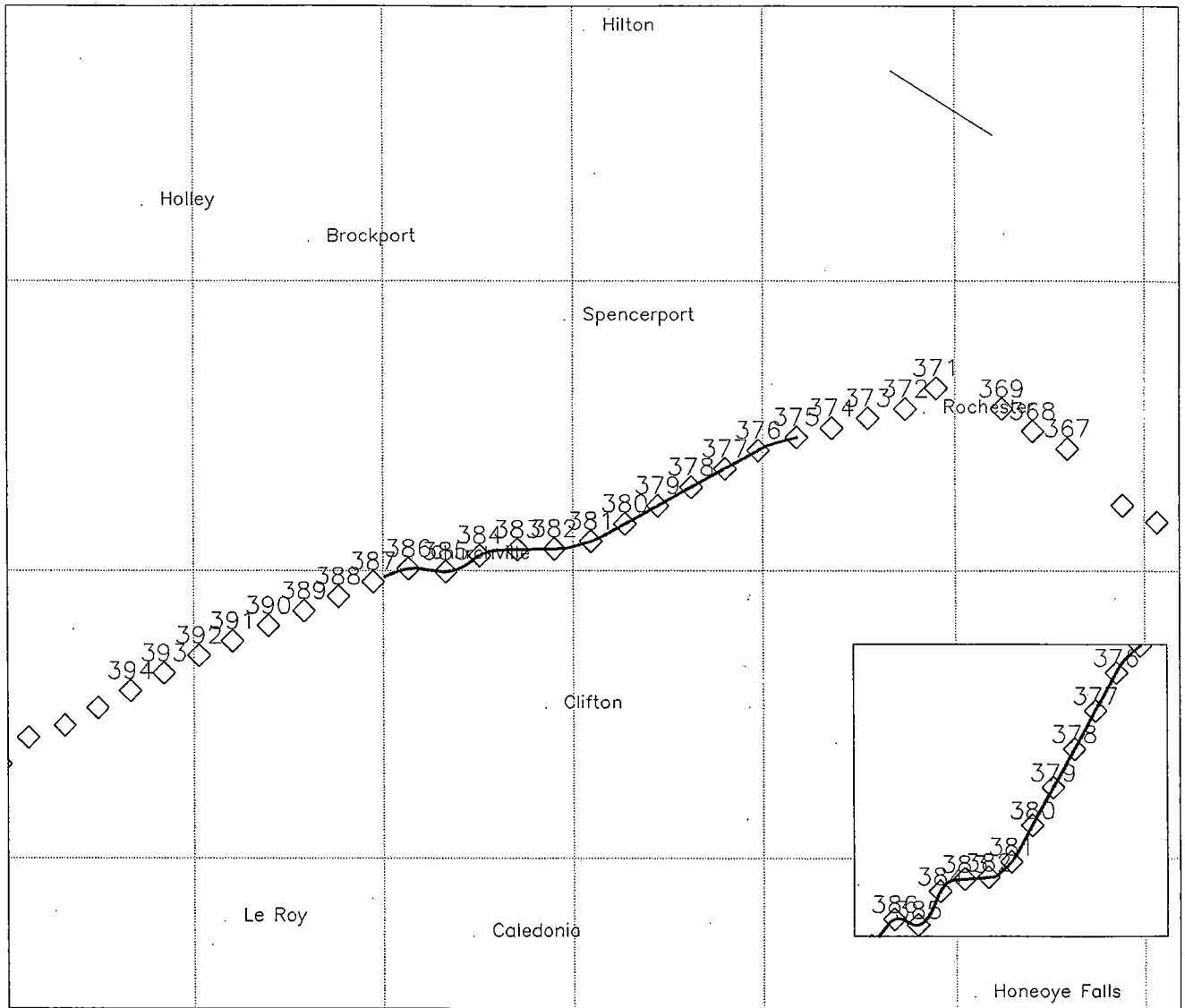
-- TEST ZONE -- From MP CSX386.7 To MP CSX398.4 -- TEST ZONE --



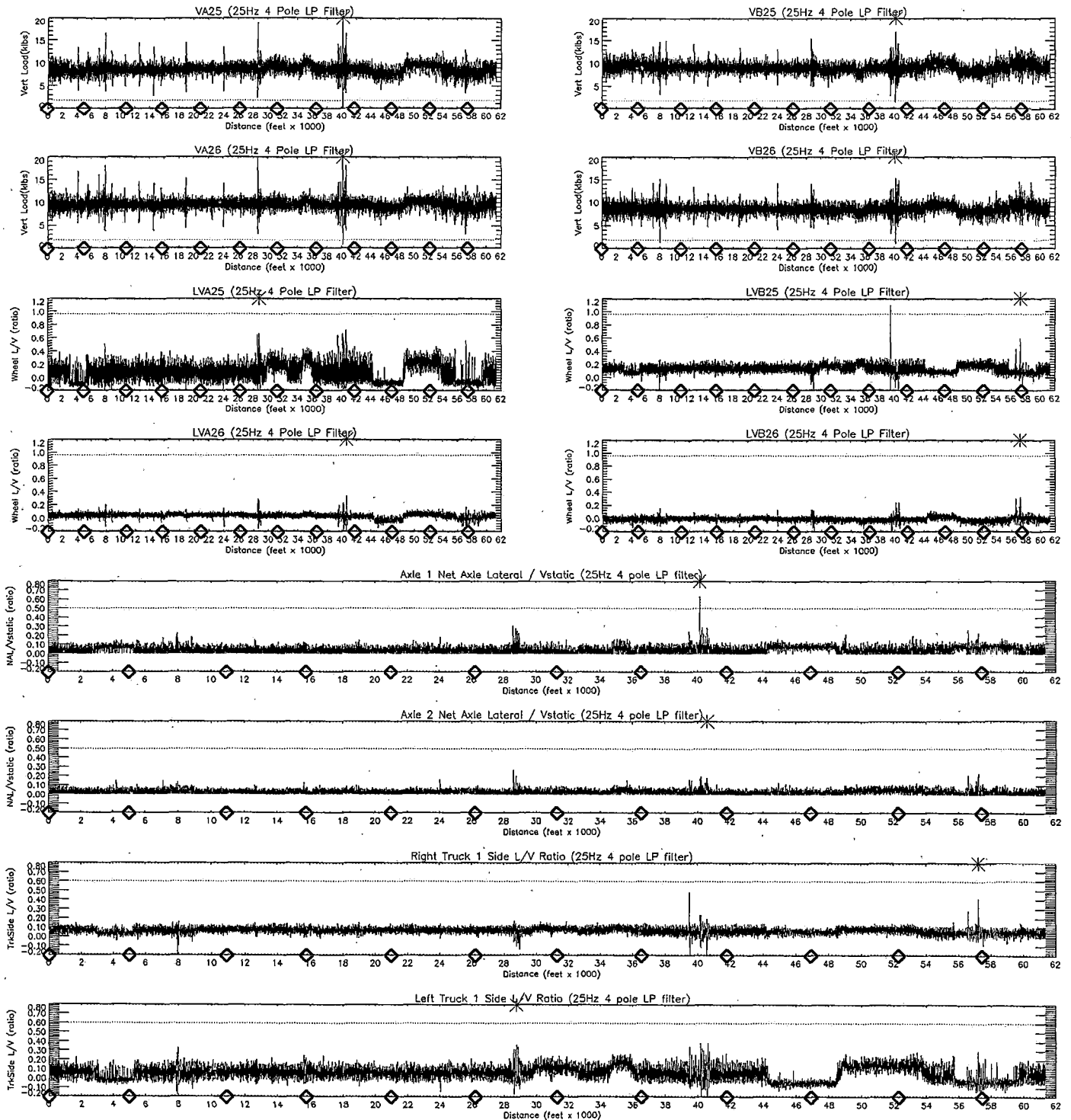
12122108.U01

AvgSpd: 74.6 mph MaxSpd: 75.6 mph

Total Distance Travelled: 12.36 miles



Amtrak MHC 1404



-- TEST ZONE -- From MP CSX375.0 To MP CSX386.7 -- TEST ZONE --
All Results Below Are Calculated Using A 5 Foot Window

Single Whl Vert. Load
(> 1.799)
0 exceptions

AX1 R V = 2.0 (9.1)
AX1 L V = 2.9 (8.6)
AX2 R V = 2.1 (8.6)
AX2 L V = 2.5 (9.5)

Single Wheel L/V
(L/V < 0.963)
(Flange Ang = 70.5, mu = 0.5)
0 exceptions
AX1 R L/V = 0.402 (0.110)
AX1 L L/V = 0.532 (0.071)
AX2 R L/V = 0.257 (-0.009)
AX2 L L/V = 0.172 (0.034)

Net Axle Lateral Force
(< 8.995)
0 exceptions

AX1 Lat Sum = 4.3 (0.8)
AX2 Lat Sum = 3.0 (0.6)

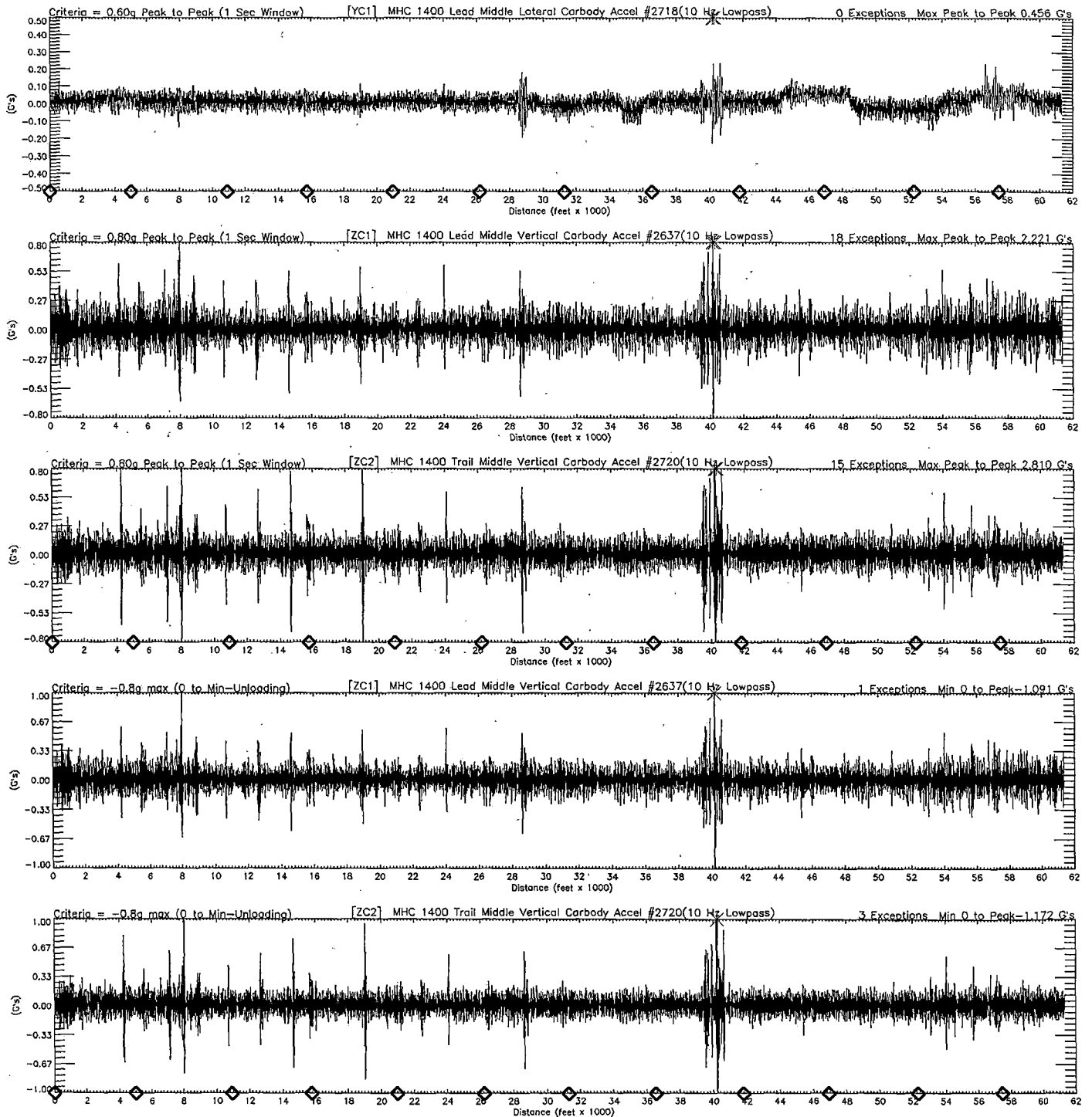
Truck Side L/V Ratio
(< 0.6)
0 exceptions

R Truck 1 Side L/V = 0.299 (0.064)
L Truck 1 Side L/V = 0.319 (0.053)

Acceleration Criteria 12122108.U01 - 74.6 mph

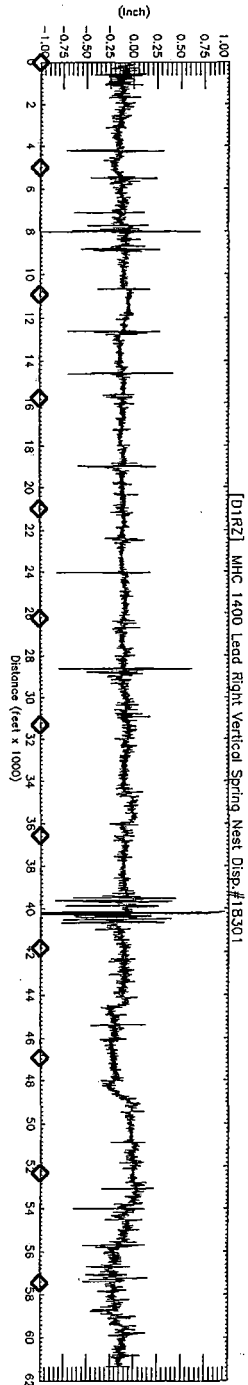
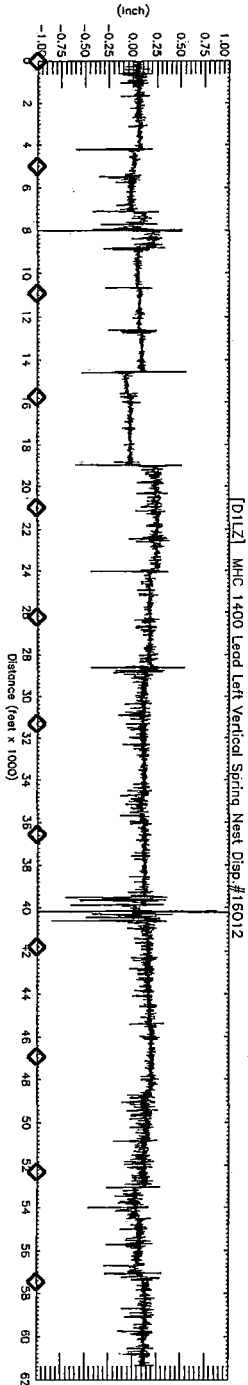
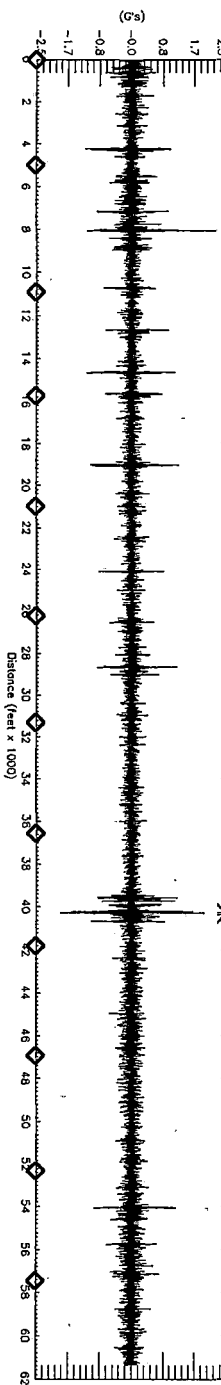
Accelerations

-- TEST ZONE -- From MP CSX375.0 To MP CSX386.7 -- TEST ZONE --



2.5 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62
Distance (feet x 1000)

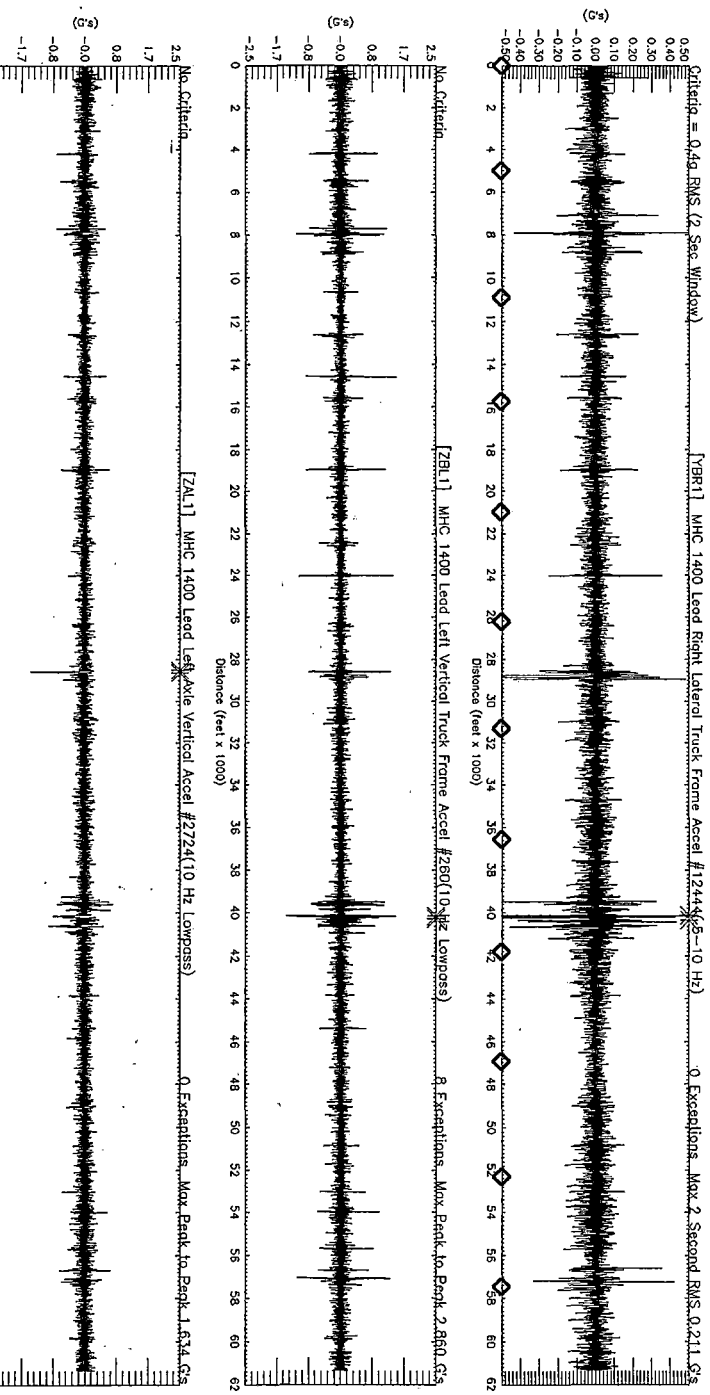
No. Caledon [781.3] MHC 1400 Trail Left Vertical Truck Frame Accel #2610(10) * Lowpass) R. Exemption, Mox. Park to Park 3.795 G's



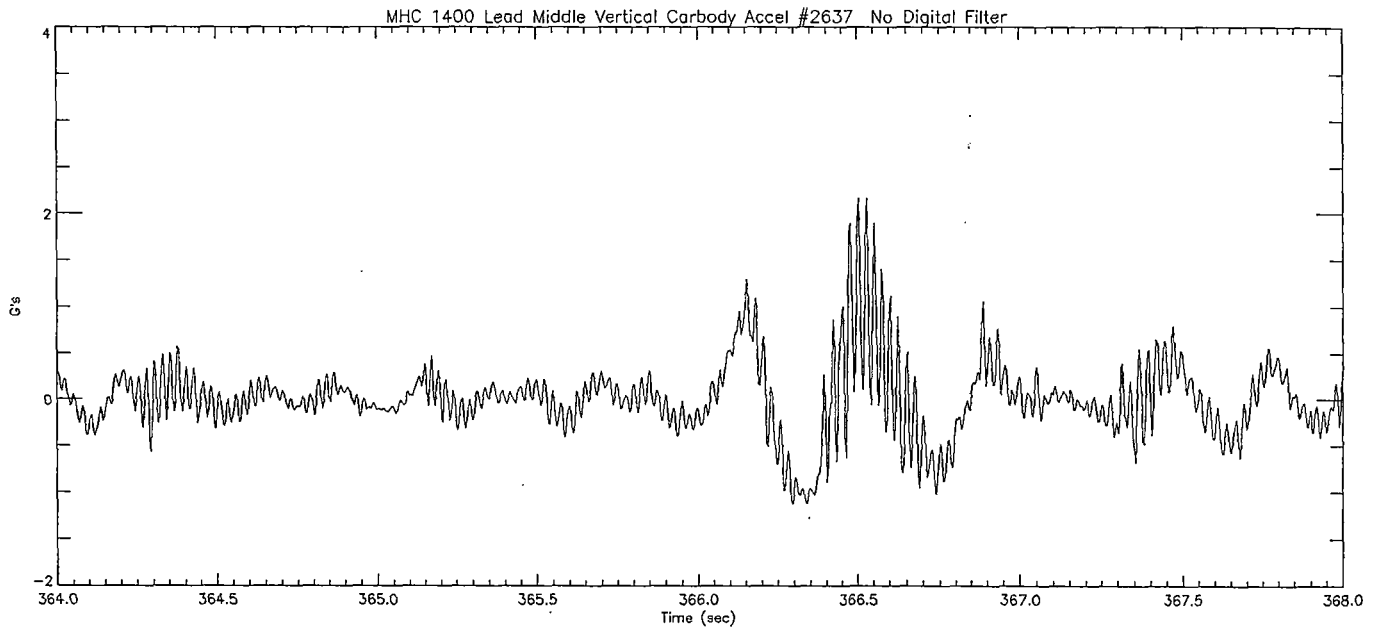
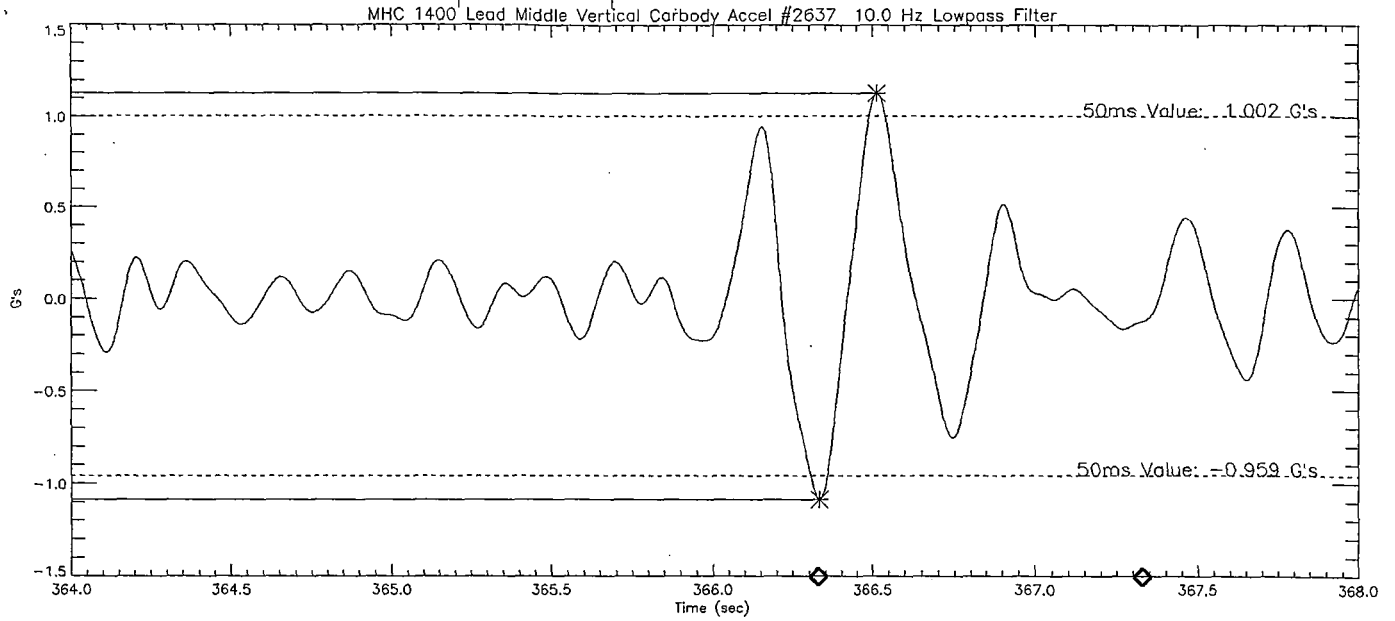
Acceleration Criteria 12122108.U01 -- 74.6 mph

Accelerations

-- TEST ZONE -- From MP CSX375.0 To MP CSX386.7 -- TEST ZONE --



Exception Report - 12122108.U01



CB VRT MIN Exception

Criteria = 1.0g min from 0.0

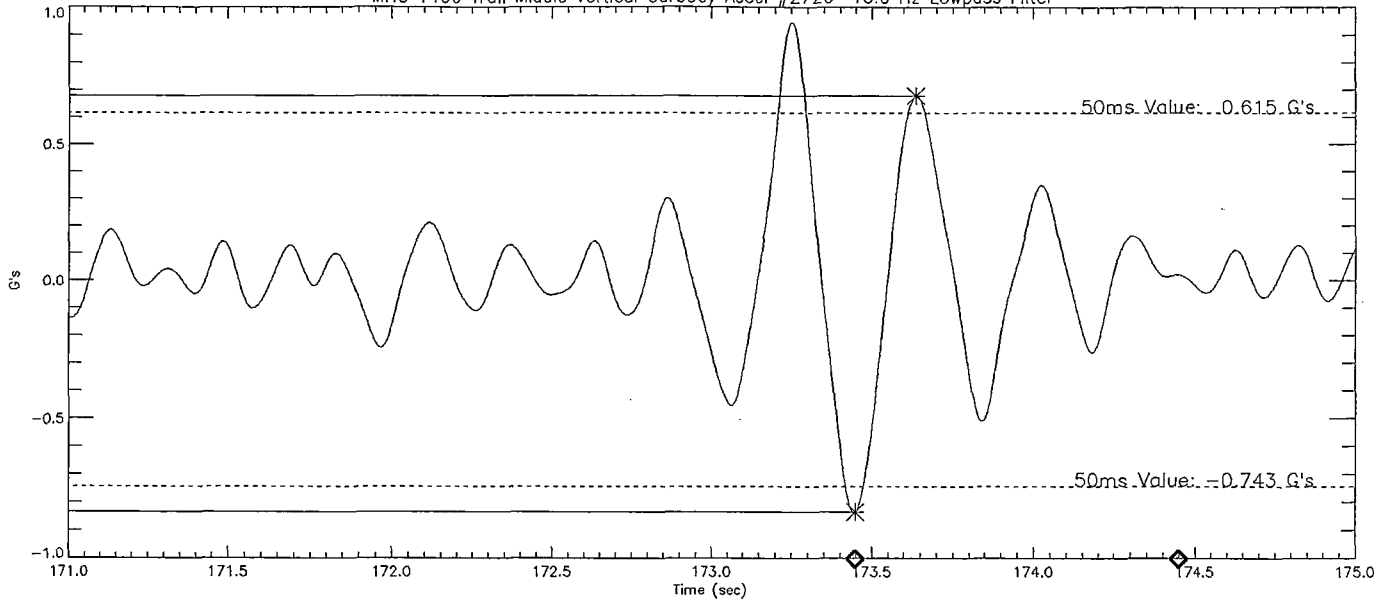
Reported Value: -1.084 G's 50ms Value: 1.961 G's

Channel #: 43 (ZC1) MHC 1400 Lead Middle Vertical Carbody Accel #2637

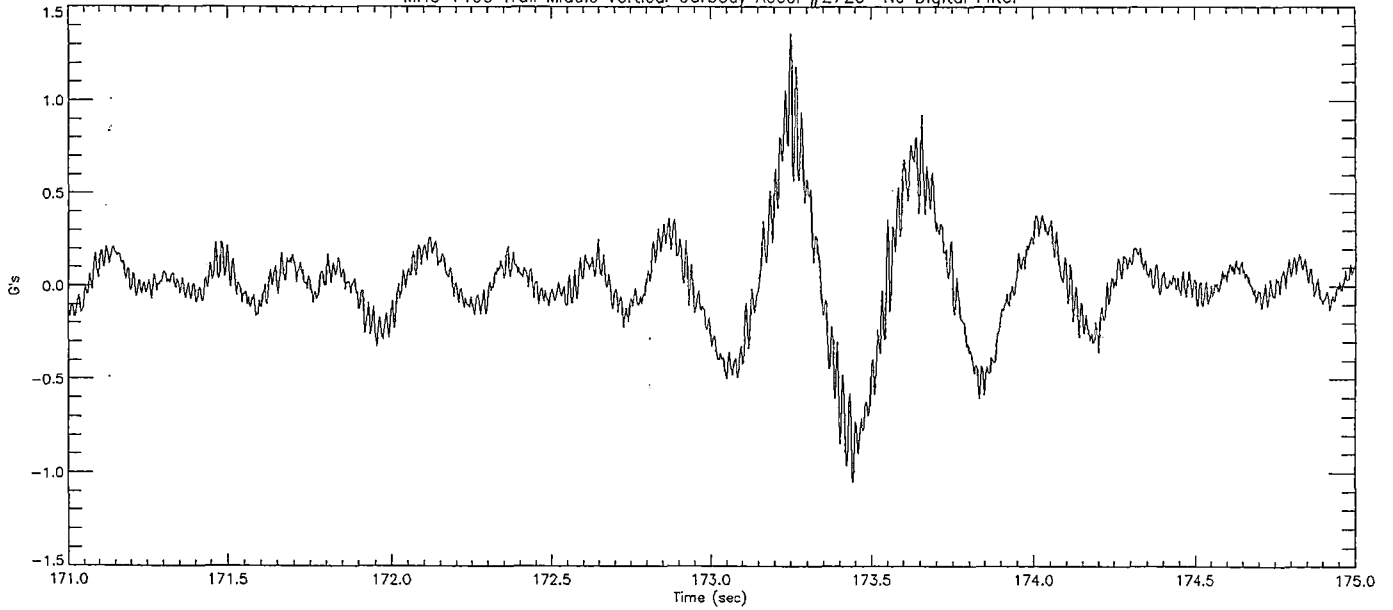
Milepost: 382.7 Speed: 74.3 mph

Exception Report - 12122108.U01

MHC 1400 Trail Middle Vertical Carbody Accel #2720 10.0 Hz Lowpass Filter



MHC 1400 Trail Middle Vertical Carbody Accel #2720 No Digital Filter



CB VRT MIN Exception

Criteria = 1.0g min from 0.0

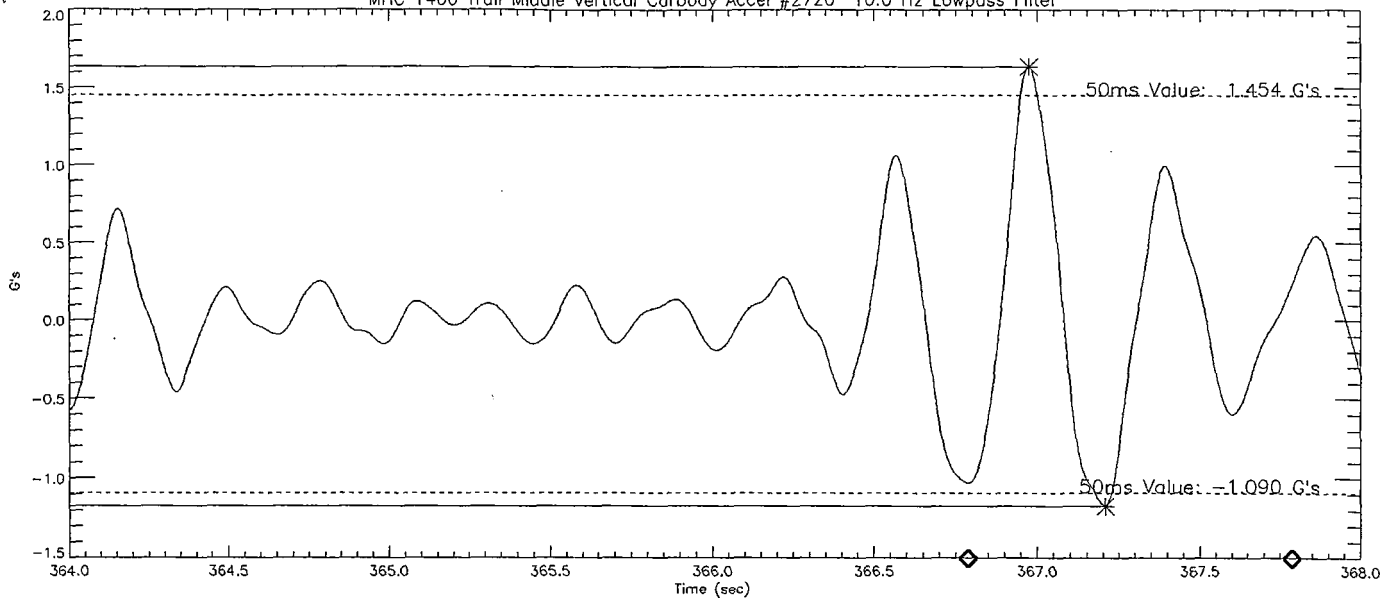
Reported Value: -0.837 G's 50ms Value: 1.358 G's

Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

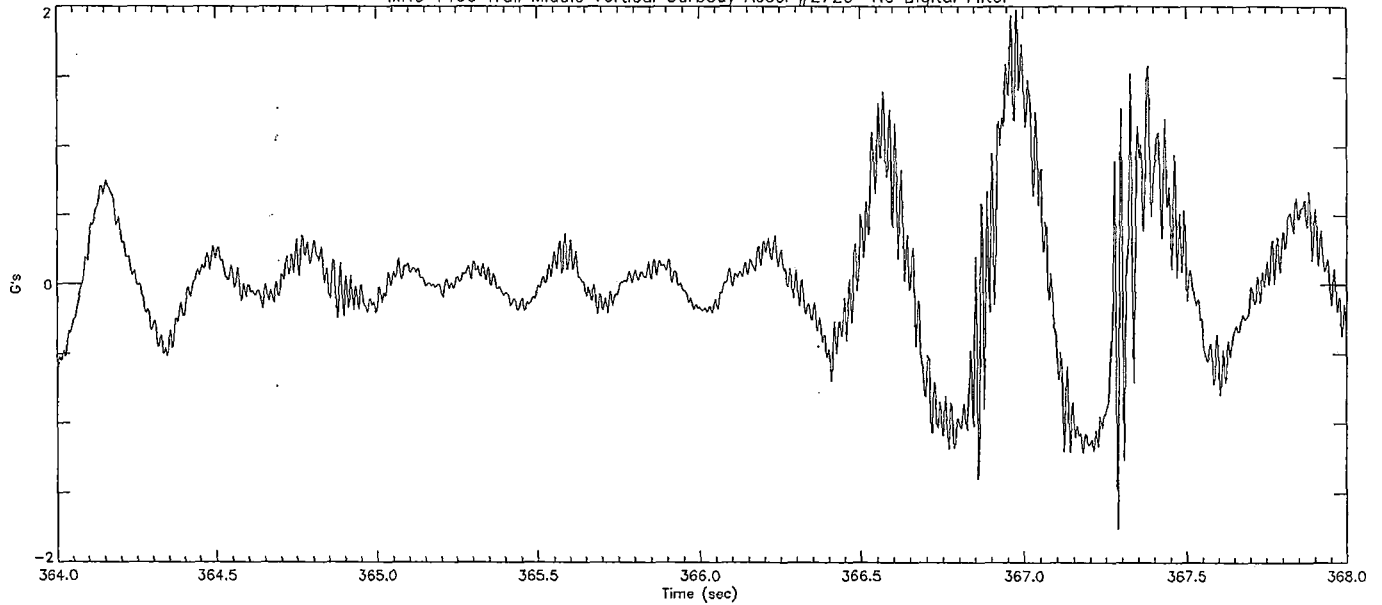
Milepost: 378.6 Speed: 74.2 mph

Exception Report - 12122108.U01

MHC 1400 Trail Middle Vertical Carbody Accel #2720 10.0 Hz Lowpass Filter



MHC 1400 Trail Middle Vertical Carbody Accel #2720 No Digital Filter



CB VRT MIN Exception

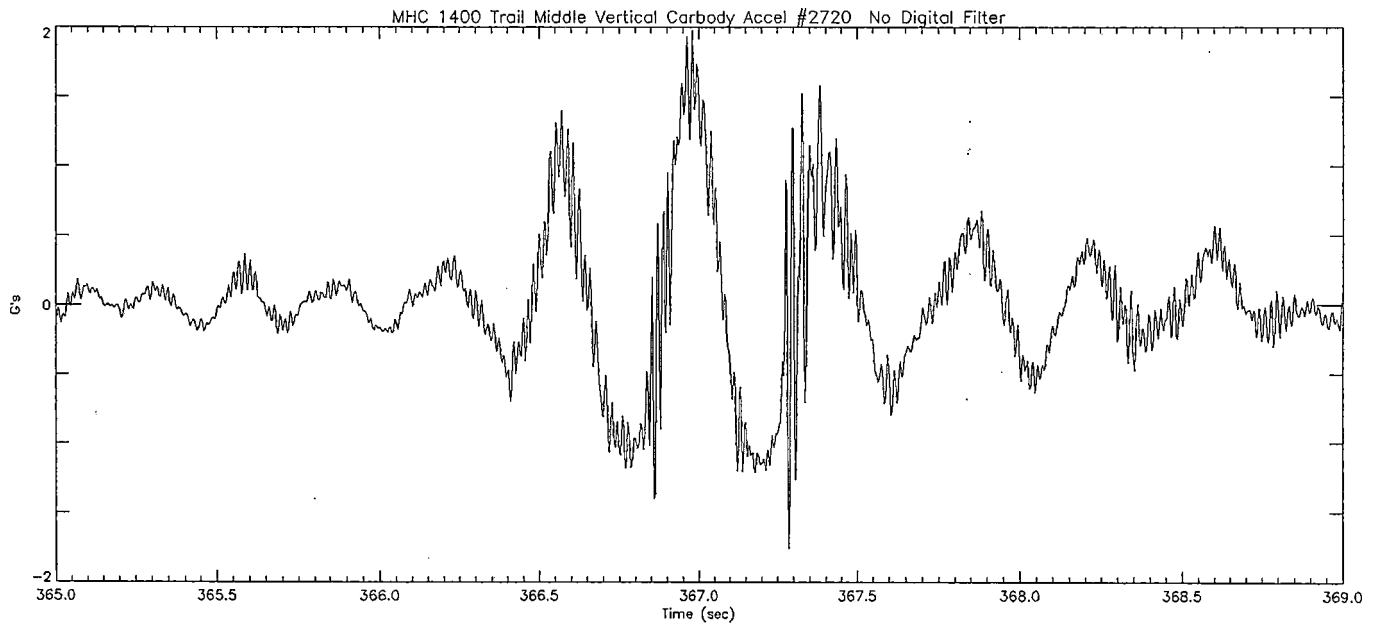
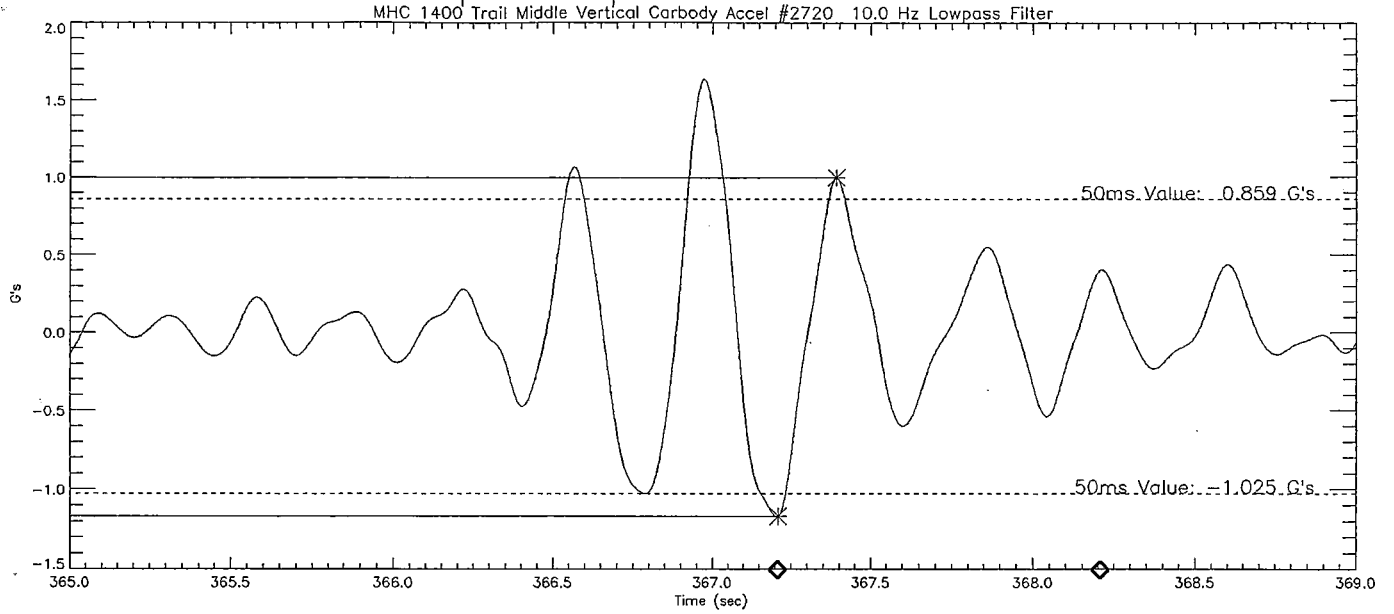
Criteria = 1.0g min from 0.0

Reported Value: -1.028 G's 50ms Value: 2.544 G's

Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

Milepost: 382.7 Speed: 74.3 mph

Exception Report - 12122108.U01



CB VRT MIN Exception

Criteria = 1.0g min from 0.0

Reported Value: -1.172 G's 50ms Value: 1.884 G's

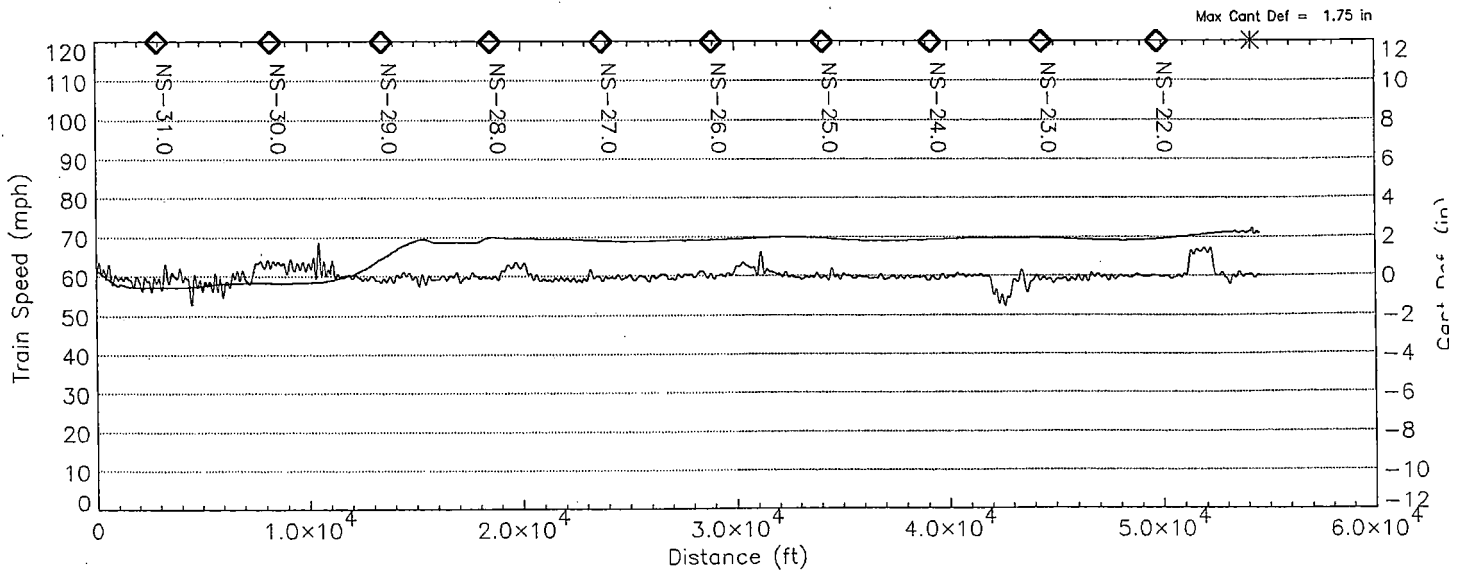
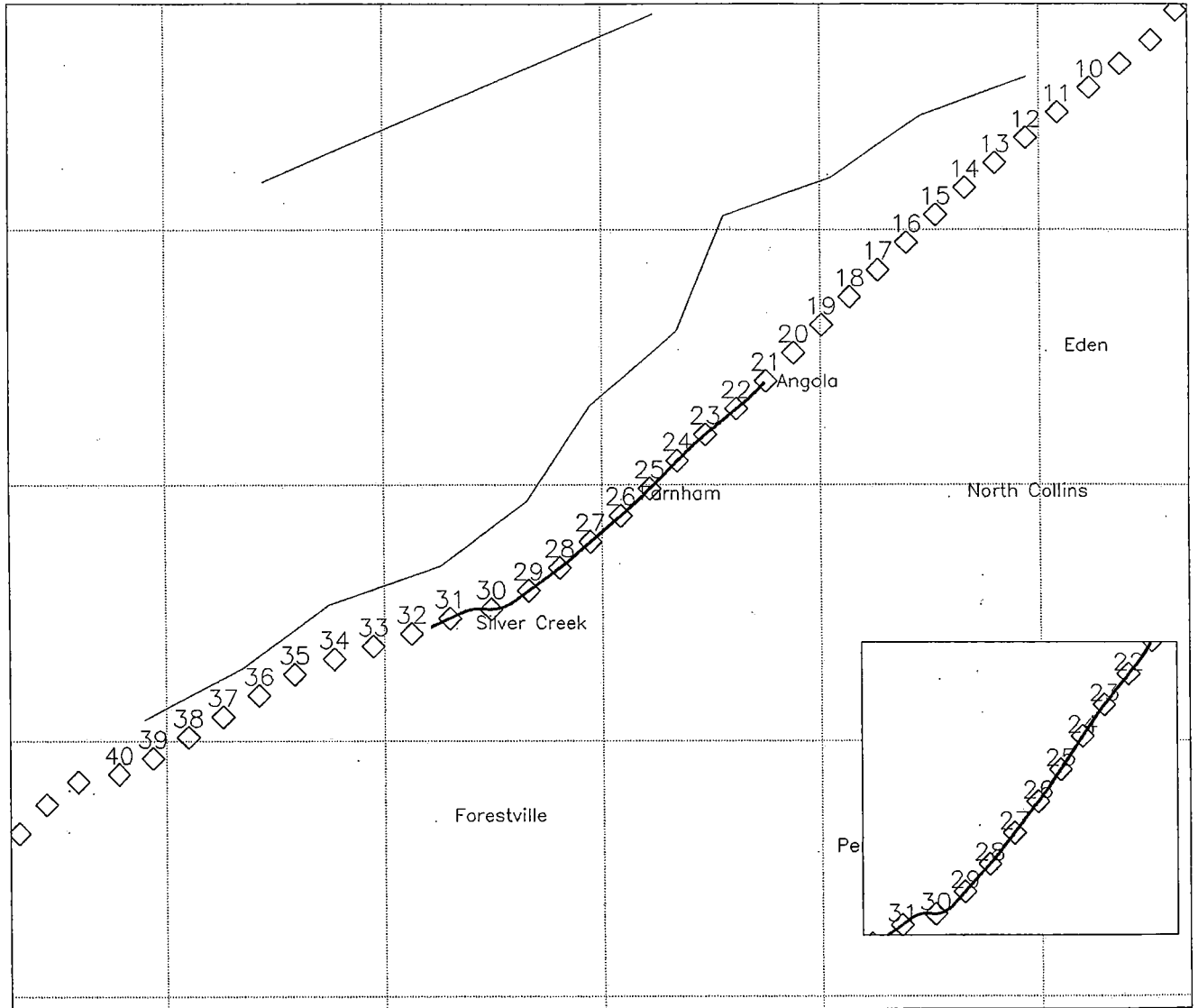
Channel #: 45 (ZC2) MHC 1400 Trail Middle Vertical Carbody Accel #2720

Milepost: 382.7 Speed: 74.3 mph

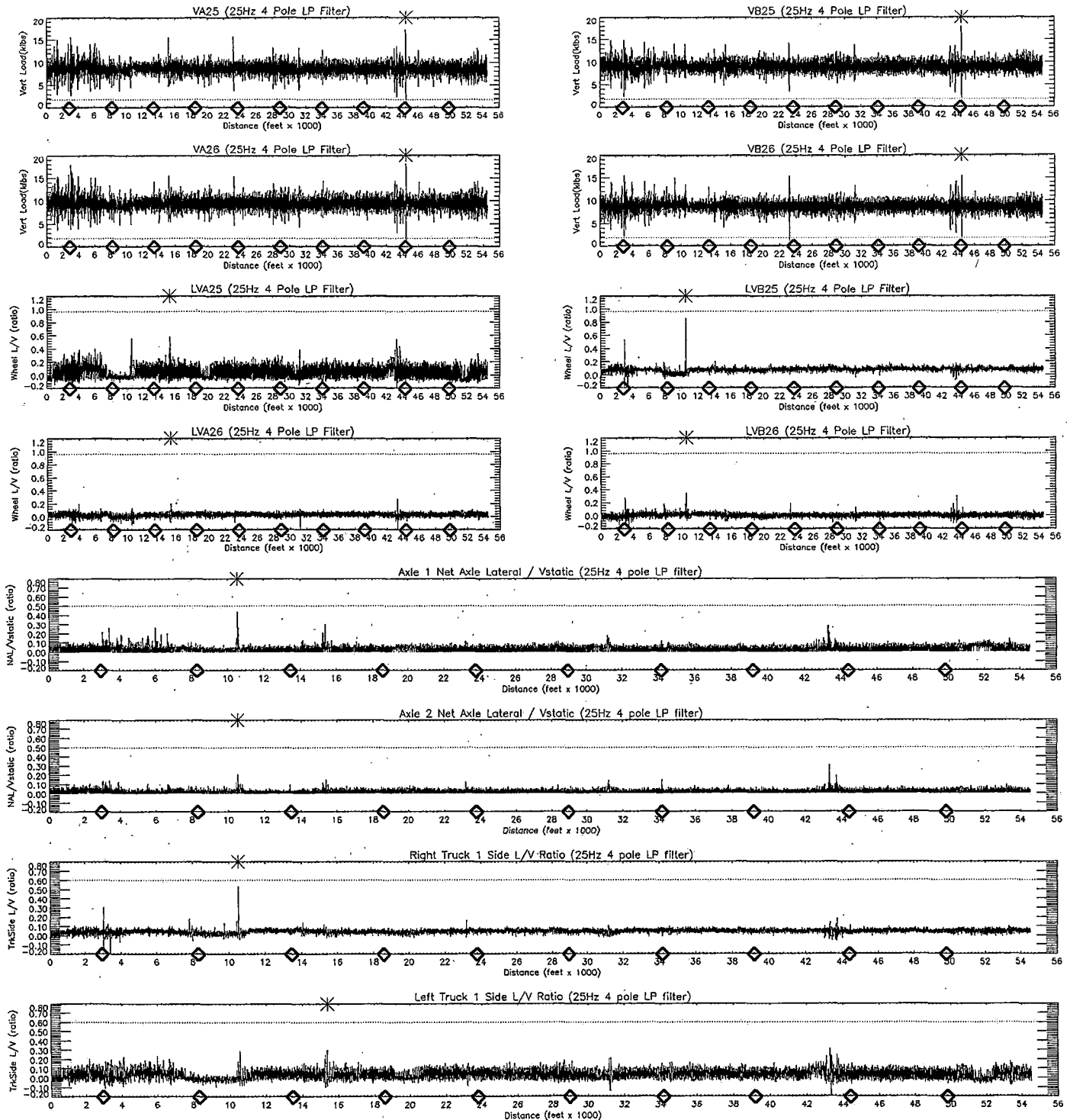
12140702.u01

AvgSpd: 66.4 mph MaxSpd: 72.2 mph

Total Distance Travelled: 11.02 miles



Amtrak MHC 1404



--- TEST ZONE --- From MP NS-31.5 To MP NS-21.1 --- TEST ZONE ---
 All Results Below Are Calculated Using A 5 Foot Window

Single Whl Vert. Load
 (> 1.799)
 0 exceptions

AX1 R V = 3.1 (9.0)
 AX1 L V = 2.0 (8.6)
 AX2 R V = 2.5 (8.7)
 AX2 L V = 2.3 (9.3)

Single Wheel L/V
 (L/V < 0.963)
 (Flange Ang = 70.5, mu = 0.5)
 0 exceptions
 AX1 R L/V = 0.395 (0.068)
 AX1 L L/V = 0.350 (0.039)
 AX2 R L/V = 0.275 (0.005)
 AX2 L L/V = 0.104 (0.026)

Net Axle Lateral Force
 (< 8.995)
 0 exceptions

AX1 Lat Sum = 3.1 (0.6)
 AX2 Lat Sum = 3.1 (0.4)

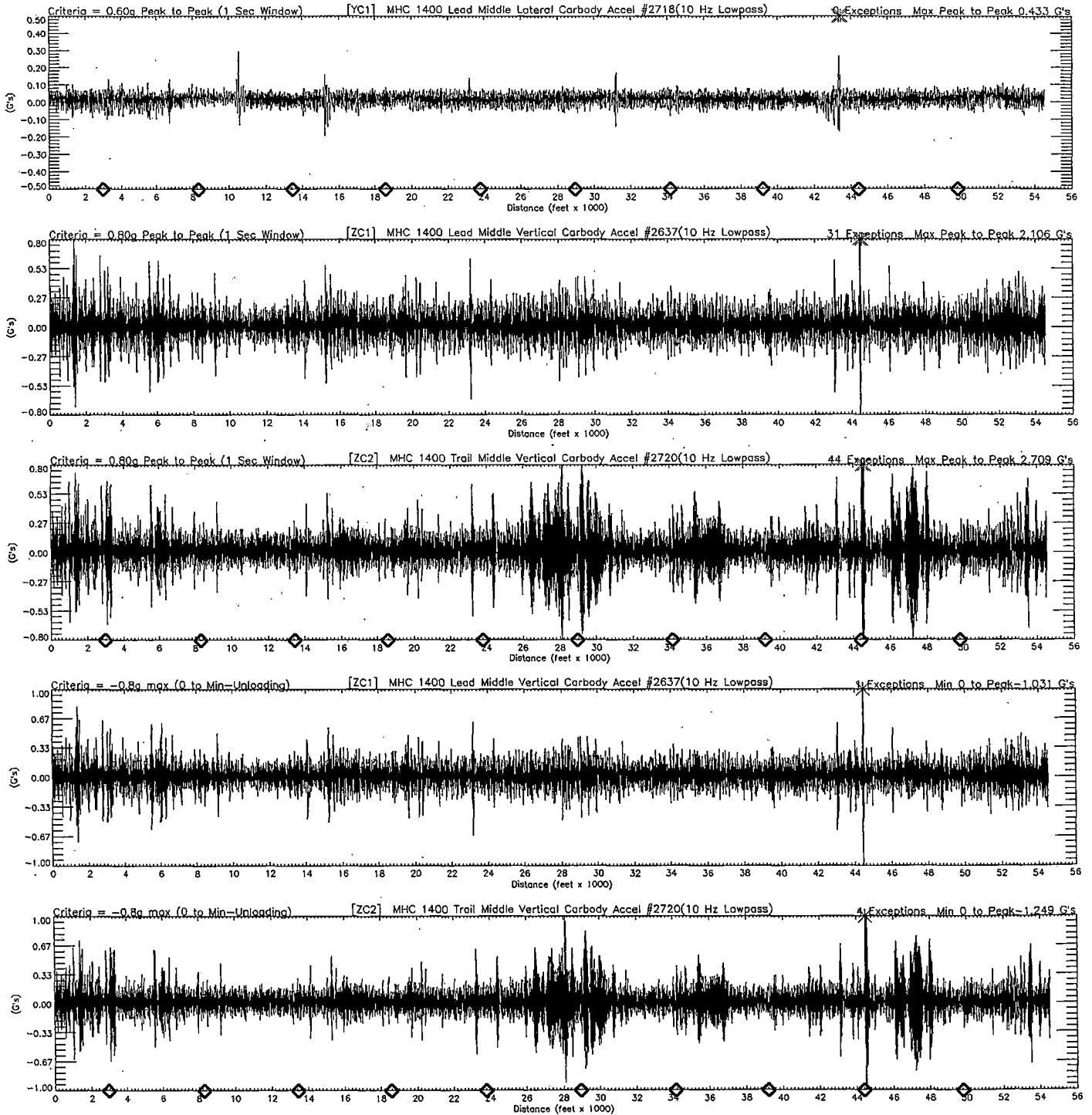
Truck Side L/V Ratio
 (< 0.6)
 0 exceptions

R Truck 1 Side L/V = 0.250 (0.043)
 L Truck 1 Side L/V = 0.215 (0.033)

Acceleration Criteria 12140702.u01 — 66.4 mph

Accelerations

-- TEST ZONE -- From MP NS-31.5 To MP NS-21.1 -- TEST ZONE --



Acceleration Criteria 12140702.u01 — 66.4 mph

Accelerations

-- TEST ZONE -- From MP NS-31.5 To MP NS-21.1 -- TEST ZONE --

