

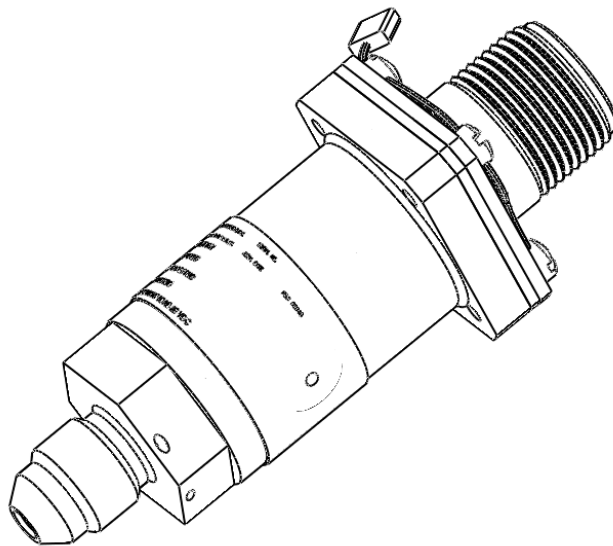


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# QUALIFICATION TEST REPORT

CUSTOMER: BELL HELICOPTER  
CCS P/N: 7G1191



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05/02/14

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Letter	Description	Date	Approved
N/C	Released	05/05/14	J. JORGENSEN
A	Updated per comments from Tim Fletcher provided via email from JP Paradis (05/22/14)	05/23/14	J. JORGENSEN

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# 1 INTRODUCTION

## 1.1 Purpose

This document contains the results of qualification tests, analyses, and examinations performed on Custom Control Sensors (CCS) Gage Pressure Switch part number 7G1191.

## 1.2 Background

The Qualification Test was performed in order to verify that CCS model 7G1191 will meet or exceed the Bell Helicopter performance requirements for this application. This model has a redesigned electrical assembly (refer to 7G1191 Similarity Statement for a detailed design comparison) and is intended to rectify issues with its predecessor, CCS model 7G1147.

## 1.3 Applicable Documents

- CCS Envelope Drawing, 7G1191, rev. A
- CCS Section Drawing, 7G1191, rev. B
- CCS 7G1191 Qualification Test Procedure (QTP), rev. H
- CCS 7G1191 Acceptance Test Procedure (ATP), rev. A
- RTCA/DO-160G: Environmental Conditions and Test Procedures for Airborne Equipment
- MIL-STD-810G: Environmental Engineering Considerations and Laboratory Tests

## 1.4 Product Overview

The product tested is a Gauge Pressure Switch that switches it's electrical signal when a certain media pressure is achieved and reverts back to the original electrical state when the pressure falls below a certain value.

Media enters the pressure port and is sealed by a diaphragm under the pressure plate. The media pressure is transferred to the pressure plate which transfers force to the disc spring. The disc spring is custom made to "snap" when a specific force is applied. The linear motion of the pressure plate, upon the disc spring "snap", hits the button of the internal switch element ("micro switch") causing an electrical signal change. The electrical chamber is sealed and safe from contamination.

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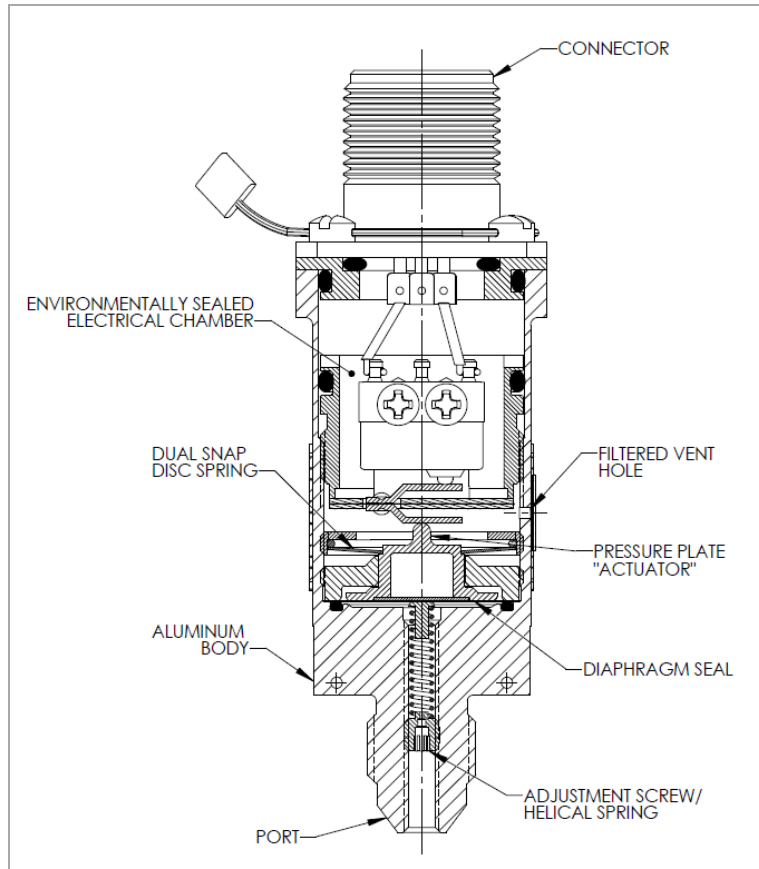


Figure 1: Design Overview

### 1.5 Qualification Test Summary

The qualifications test articles were built through standard production with no anomalies. A Bell MMUM witnessed the assembly and conformed the units. The [Acceptance Test Procedure \(ATP\)](#) was completed and the units passed all the requirements.

During the [Ground Survival Low Temperature Test & Operating Low Temperature Test](#) on S/N 005 and 006, the de-actuation point of S/N 005 for the first calibration reading at low temperature (-49°F), *prior to any cycling*, was out of specification (de-act. point approx. 5.3 PSIG). Note, calibration was performed by increasing the applied pressure until actuation and then proceeding to decrease the pressure. When the applied pressure was increased to 50 PSIG after actuation, prior to decreasing the pressure, the switch performed in accordance with the performance requirements. Cycling at low temperature began and calibration was checked in accordance with the QTP. The test was completed and there were no further deviations. At this point, CCS and the Bell Helicopter EFUMs agreed to 3 changes to the QTP: a) for all calibration checks, the applied pressure would be increased to 12 PSIG after actuation prior to decreasing the pressure, b) during the low/high temperature tests, the switch would be cycled for 15-30 minutes prior to the first calibration check at temperature, and c) all cycling would be from 0 to 20 PSIG to 0 rather than going to 100 PSIG.

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Qualification Testing was continued and the [Ground Survival High Temperature Test & Operating High Temperature Test](#) was performed on S/N 005 and 006. During this test, the de-actuation point of S/N 005 shifted lower and out of specification (de-act. point approx. 3.80 PSIG) and it remained that way throughout the duration of this test. It was concluded that S/N 005 had problems and a failure analysis was necessary. From the failure analysis investigation it was determined that an excessive amount of lubrication was used during the installation of the o-ring into the body, which became very viscous when exposed to cold temperatures, and affected the performance of the switch. It was decided, as a result of the teardown analysis, to not use any lubricant when installing this o-ring. See [APPENDIX U](#) for the full test article teardown report.

At this point, CCS/Bell decided that the unit that passed the low and high temperature tests, S/N 006, would move forward to the outside lab testing, and S/N 007 and 008 would experience the low and high temperature tests to determine if the failure of S/N 005 was an anomaly.

The [Ground Survival Low Temperature Test & Operating Low Temperature Test \(Alternate Units\)](#) and [Ground Survival High Temperature Test & Operating High Temperature Test \(Alternate Units\)](#) were completed successfully on S/N 007 and 008. S/N 005 was rebuilt using its original components without any lubricating oil and it successfully went through the [Ground Survival Low Temperature Test & Operating Low Temperature Test \(S/N 005 Re-Test\)](#) and [Ground Survival High Temperature Test & Operating High Temperature Test \(S/N 005 Re-Test\)](#).

Around this time, the [Humidity Test](#) was started on S/N 006. This test was completed successfully.

The [Temperature Variation Test](#) and [Vibration & Operational Shock Test](#) were completed successfully on S/N 007 and 008.

The [Endurance Cycling Test](#) was started on S/N 007 and 008. At the 60,000 cycle calibration check, the actuation point of S/N 007 went out of specification. The actuation point hovered under 8.50 PSIG until 95,000 cycles where it increased to nearly 10.00 PSIG. The de-actuation point of S/N 007 remained stable and S/N 008 successfully passed endurance cycling. It was decided to continue testing on S/N 007 to monitor its performance.

The [Salt Fog Test](#) was completed successfully on S/N 006.

The [Altitude Test](#) and [Explosion Proofness Test](#) were completed successfully on S/N 007 and 008. The actuation point of S/N 007 varied from 7.50 to 10.00 PSIG.

The [Dust Test](#) and [Sand Test](#) were completed successfully on S/N 006. The [Acceptance Test Procedure \(ATP\) and Insulation Resistance](#) Test was performed and qualification testing was completed successfully on S/N 006.

The [Acceptance Test Procedure \(ATP\) and Insulation Resistance](#) Test was performed on S/N 007 and 008. It was decided by Bell/CCS that no further testing would be performed on S/N 007 and it

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would be taken apart for failure analysis. S/N 008 successfully completed the [Crash Safety \(Impulse\) Test](#) and [Crash Safety \(Sustained\) Test](#).

Qualification testing was completed.

S/N 007 was disassembled for failure analysis. S/N 008 was also disassembled in order to compare the two parts. The only significant sign of failure was excessive signs of wear on the "tip" of the pressure plate, which is in contact with the "arm" of the electrical assembly. CCS determined this wear pushed S/N 007 out of sync (due to the limited movement of the pressure plate, a few thousands of an inch has a significant impact on the switch's performance). S/N 008 did exhibit signs of wear and was potentially headed in the same direction. See [APPENDIX U](#) for the full test article teardown report.

Following further review of test data and a determination of cyclic endurance requirements, Bell determined the qualification to be successful.

## 2 TEST CONDITIONS

### 2.1 Standard Conditions

Unless otherwise stated, testing was conducted in accordance with the following standard conditions:

Temperature: 59°F to 95°F

Relative Humidity: Not greater than 90%

Ambient Pressure: 12 to 15.5 PSI

### 2.2 Tolerances

The maximum allowable tolerances on non-standard test conditions, inclusive of measuring instrumentation accuracy was as follows:

Temperature:  $\pm 2.5^\circ\text{F}$

Pressure:  $\pm 5\%$

Altitude:  $\pm 5\%$

Relative Humidity:  $\pm 5\%$

Acceleration (G):  $\pm 10\%$

Vibration (amplitude):  $\pm 10\%$

Shock (Peak G, seconds):  $\pm 10\%$

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Air Velocity:  $\pm 10\%$

Voltage:  $\pm 2\%$

Current:  $\pm 2\%$

Frequency:  $\pm 2\%$

Time: 1% (less than 8 hour testing), 5 mins (more than 8 hours of testing)

### 2.3 Test Fluid

Air was used as a test media for all testing.

## 3 QUALIFICATION TEST ARTICLE

### 3.1 Description of Test Switches

The Gage Pressure Switch, CCS P/N 7G1191, was tested to the Bell Helicopter approved Qualification Procedure QTP-7G1191, Rev. H.

All of the units were completely representative of production units including design, materials, fabrication methods, finish, and assembly techniques. Furthermore, the units went through conformity inspection with witness by a representative of Bell Helicopter and FAA Form 8130-3, Airworthiness Approval Tag, were granted to CCS ("Prototype" Status).

### 3.2 Disposition of Test Switches

Unless otherwise specified, the test switches shall be retained at CCS for not less than 3 years and shall be available for examination by any authorized person.

However, note that S/N 007 and S/N 008 were torn down for a failure analysis on S/N 007 (S/N 008 did not fail and was torn down only for a comparison). The components for these items will remain at CCS.

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4 TEST OVERVIEW

Qualification Test	QTR Section	QTP Section	Test Article			
			S/N 005	S/N 006	S/N 007	S/N 008
<a href="#">Acceptance Test Procedure (ATP)</a>	<a href="#">5.1</a>	5.4	X	X	X	X
<a href="#">Ground Survival Low Temperature Test &amp; Operating Low Temperature Test</a>	<a href="#">5.2</a>	5.5	X	X		
<a href="#">Ground Survival High Temperature Test &amp; Operating High Temperature Test</a>	<a href="#">5.3</a>	5.7	X	X		
<a href="#">Ground Survival Low Temperature Test &amp; Operating Low Temperature Test (Alternate Units)</a>	<a href="#">5.4</a>	5.5			X	X
<a href="#">Ground Survival High Temperature Test &amp; Operating High Temperature Test (Alternate Units)</a>	<a href="#">5.5</a>	5.7			X	X
<a href="#">Humidity Test</a>	<a href="#">5.6</a>	5.16		X		
<a href="#">Ground Survival Low Temperature Test &amp; Operating Low Temperature Test (S/N 005 Re-Test)</a>	<a href="#">5.7</a>	5.5	X			
<a href="#">Ground Survival High Temperature Test &amp; Operating High Temperature Test (S/N 005 Re-Test)</a>	<a href="#">5.8</a>	5.7	X			
<a href="#">Temperature Variation Test</a>	<a href="#">5.9</a>	5.9			X	X
<a href="#">Vibration &amp; Operational Shock Test</a>	<a href="#">5.10</a>	5.10/5.11			X	X
<a href="#">Endurance Cycling Test</a>	<a href="#">5.11</a>	5.12			X	X
<a href="#">Salt Fog Test</a>	<a href="#">5.12</a>	5.15		X		
<a href="#">Altitude Test</a>	<a href="#">5.13</a>	5.13			X	X
<a href="#">Dust Test</a>	<a href="#">5.14</a>	5.17		X		
<a href="#">Explosion Proofness Test</a>	<a href="#">5.15</a>	5.14			X	X
<a href="#">Sand Test</a>	<a href="#">5.16</a>	5.17		X		
<a href="#">Acceptance Test Procedure (ATP) and Insulation Resistance Test</a>	<a href="#">5.17</a>	5.18/5.2		X	X	X
<a href="#">Crash Safety (Impulse)</a>	<a href="#">5.18</a>	5.19				X
<a href="#">Crash Safety (Sustained) Test</a>	<a href="#">5.19</a>	5.20				X

Table 1: Qualification Test Overview

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## 5 RESULTS AND DISCUSSION

### 5.1 Acceptance Test Procedure (ATP)

Test Article(s): S/N 005 - 008

Acceptance Testing was performed in accordance with the Bell Helicopter approved CCS Acceptance Test Procedure (ATP), rev. A.

The results for this test can be found in [APPENDIX B](#).

The units were subject to a thorough examination and were subjected to the Proof Pressure, Operational, and Dielectric Tests. All units passed acceptance testing.

### 5.2 Ground Survival Low Temperature Test & Operating Low Temperature Test

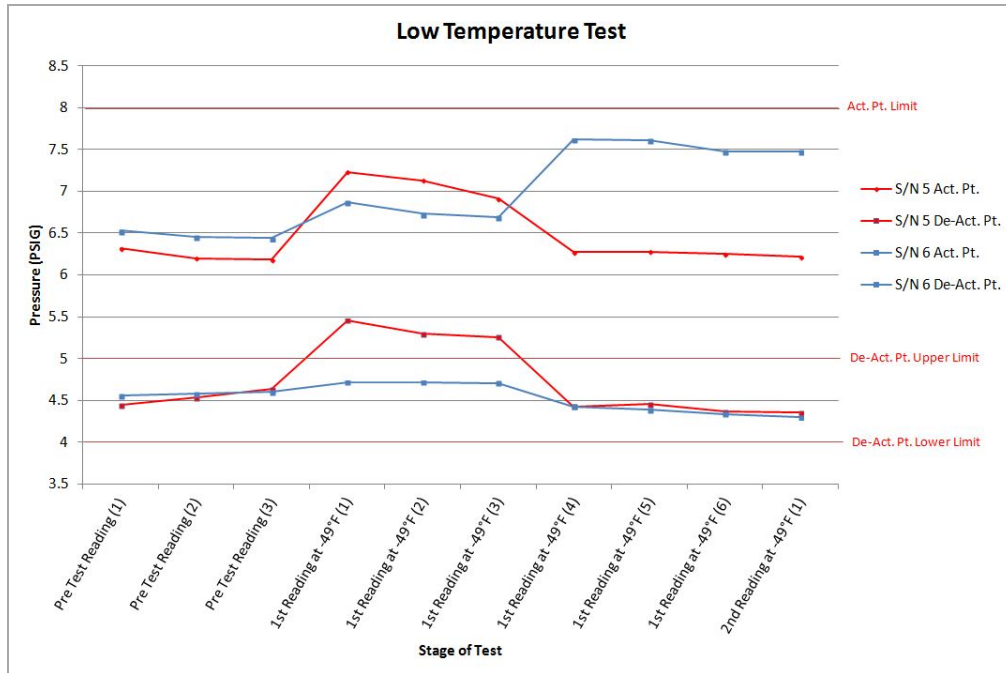
Test Article(s): S/N 005 - 006

The Ground Survival Low Temperature Test & Operating Low Temperature Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The updated test setup diagram, test setup picture(s), and the data sheet(s) for this test can be found in [APPENDIX C](#).

Below is a plot of the results.

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**Figure 2: Ground Survival Low Temperature Test and Operating Low Temperature Test (S/N 005/006)**

**NOTE:** This plot displays abnormal results because of inconsistencies in the test procedure (e.g., increasing the applied pressure to 50 PSIG after actuation, see the data sheets in [APPENDIX C](#) for clarification). Once changes were made to the test procedure results were more consistent.

During this test, the de-actuation point of S/N 005 at low temperature, -49°F, prior to any cycling, was out of tolerance (approx. 5.4 PSIG). At this stage, the calibration test was performed by increasing the applied pressure until actuation and then proceeding to decrease the pressure. When the applied pressure was increased to 50 PSIG after actuation, prior to decreasing the pressure, the actuation point returned to being within tolerance. Cycling at low temperature began and calibration was checked in accordance with the QTP. The test was completed and there were no further deviations. From CCS' experience, it is not abnormal for the first reading at low temperature, prior to any cycling, to act differently than following readings.

At this point, CCS/Bell Helicopter decided to make 3 changes to the QTP: a) for all calibration checks, the applied pressure would be increased to 12 PSIG (system pressure for this application) after actuation prior to decreasing the pressure, b) during the low/high temperature tests, the switch would be cycled for 15-30 minutes prior to the first calibration check at temperature, and c) all cycling would be from 0 to 20 PSIG to 0 rather than going to 100 PSIG.

**NOTE:** All low and high temperature testing that followed was tested as detailed by the above changes.

Testing continued with S/N 005 and 006.

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### 5.3 Ground Survival High Temperature Test & Operating High Temperature Test

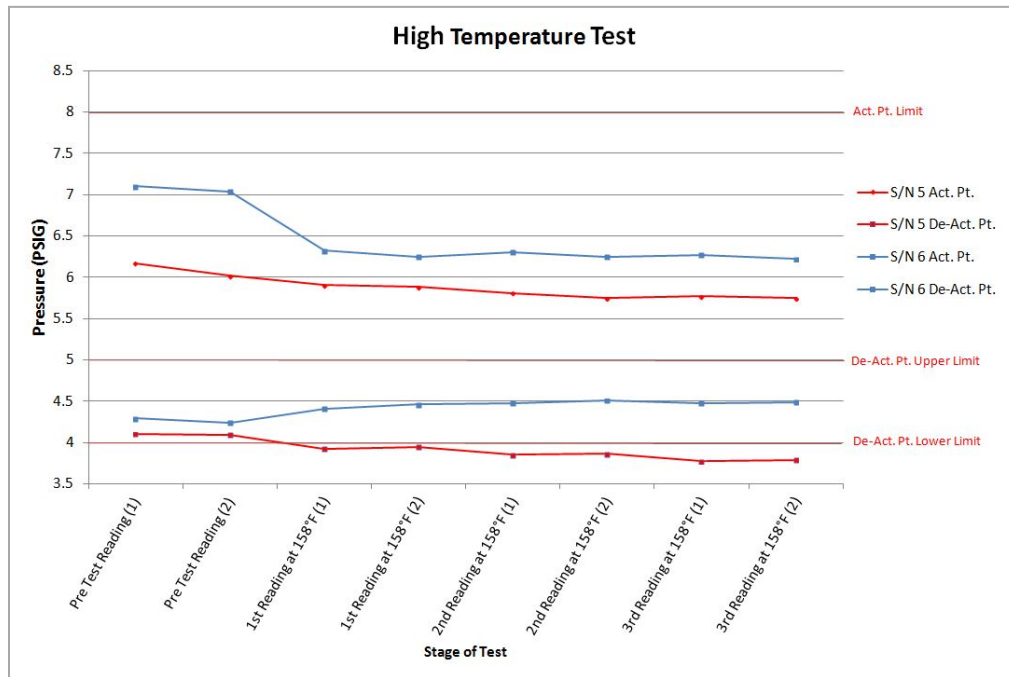
Test Article(s): S/N 005 - 006

The Ground Survival High Temperature Test & Operating High Temperature Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The updated test setup diagram and the data sheet(s) for this test can be found in [APPENDIX D](#).

**NOTE:** The test setup diagram and pictures for all low and high temperature tests are the same and are only shown in [APPENDIX C](#).

Below is a plot of the results.



**Figure 3: Ground Survival High Temperature Test and Operating High Temperature Test (S/N 005/006)**

During this test, the de-actuation point of S/N 005 shifted lower and out of tolerance (approx. 3.80 PSIG) and it remained that way throughout the test. It was concluded that S/N 005 had problems and a failure analysis was necessary. S/N 005 was disassembled and no significant issues were found. The only conclusion that CCS arrived at was that there was excessive oil used for lubrication around the o-ring/diaphragm area, which could have affected the switch's performance. At this point, results were discussed between CCS/Bell, and it was decided that the unit that passed the low and high temperature tests, S/N 006, would move forward to the outside lab testing (i.e., the [Humidity Test](#)), and S/N 007 and 008 would experience the low and high temperature tests to determine if the failure of S/N 005 was an anomaly.

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#### 5.4 Ground Survival Low Temperature Test & Operating Low Temperature Test (Alternate Units)

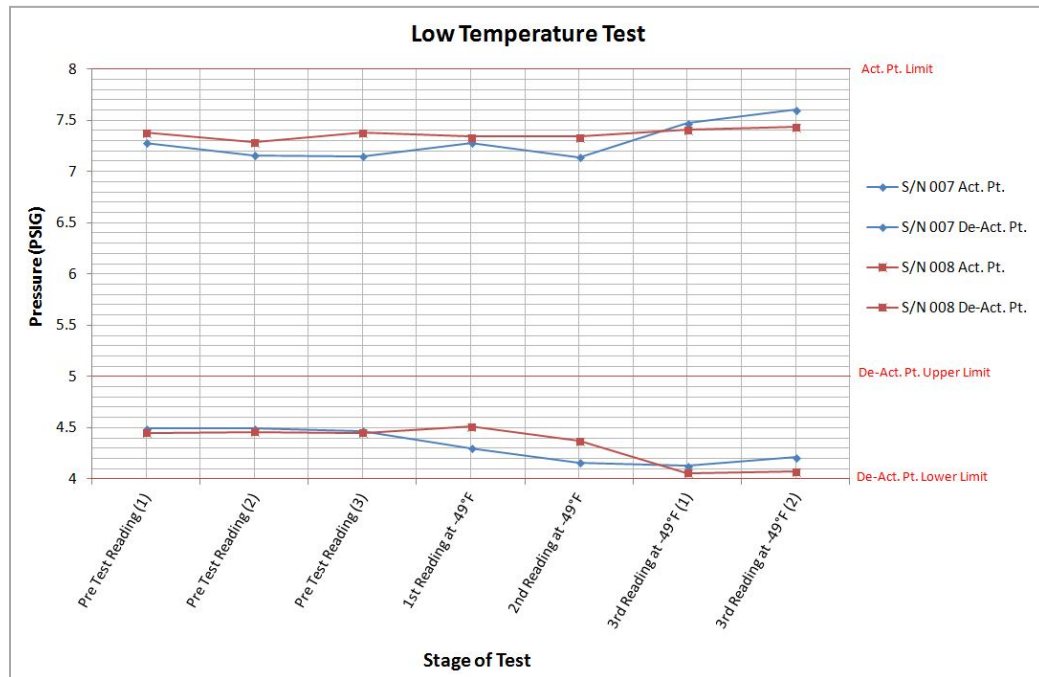
Test Article(s): S/N 007 - 008

The Ground Survival Low Temperature Test & Operating Low Temperature Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The updated test setup diagram and the data sheet(s) for this test can be found in [APPENDIX E](#).

**NOTE:** The test setup diagram and pictures for all low and high temperature tests are the same and are only shown in [APPENDIX C](#).

Below is a plot of the results.



**Figure 4: Ground Survival Low Temperature Test and Operating Low Temperature Test (S/N 007/008)**

As shown in the above data, S/N 007 and 008 both passed the Low Temperature Test. Furthermore, they both exhibited similar results, the deadband increased for both pressure switches at low temperature.

#### 5.5 Ground Survival High Temperature Test & Operating High Temperature Test (Alternate Units)

Test Article(s): S/N 007 - 008

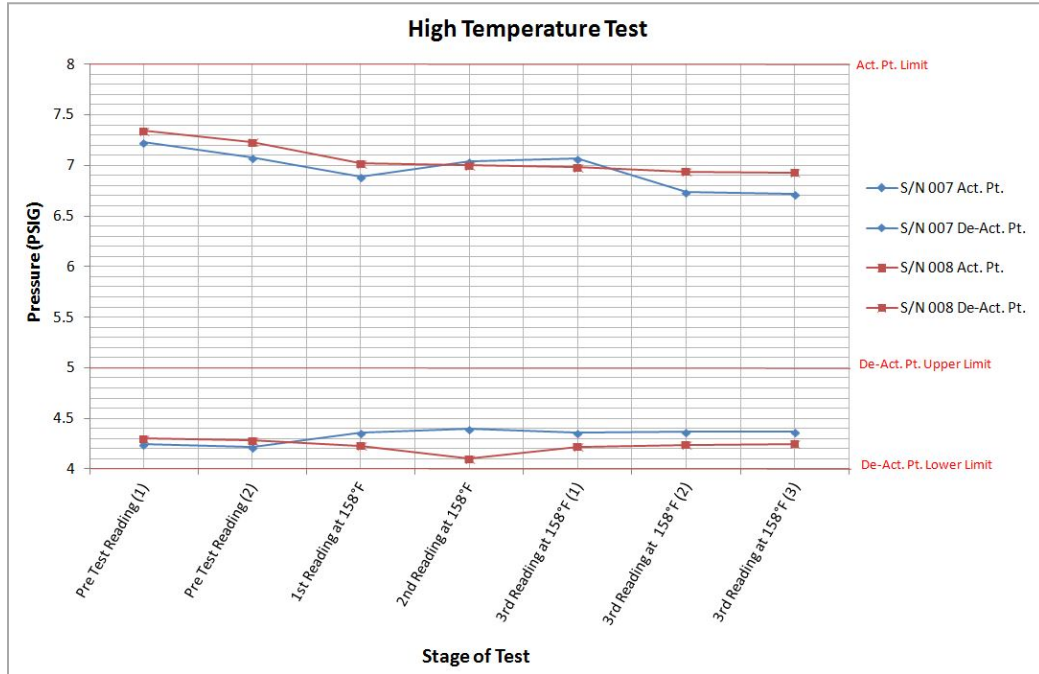
The Ground Survival High Temperature Test & Operating High Temperature Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

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The updated test setup diagram and the data sheets for this test can be found in [APPENDIX F](#).

**NOTE:** The test setup diagram and pictures for all low and high temperature tests are the same and are only shown in [APPENDIX C](#).

Below is a plot of the results.



**Figure 5: Ground Survival High Temperature Test and Operating High Temperature Test (S/N 007/008)**

S/N 007 and 008 both passed the High Temperature Test and performed similarly, that is, their deadband decreased.

Therefore, S/N 007 and 008 both passed the Low and High Temperature Tests, and it was concluded that the problem that occurred with S/N 005 was an anomaly. Bell/CCS decided to rebuild S/N 005 without using lubrication oil to further validate that the original issue that occurred would not repeat itself.

### 5.6 Humidity Test

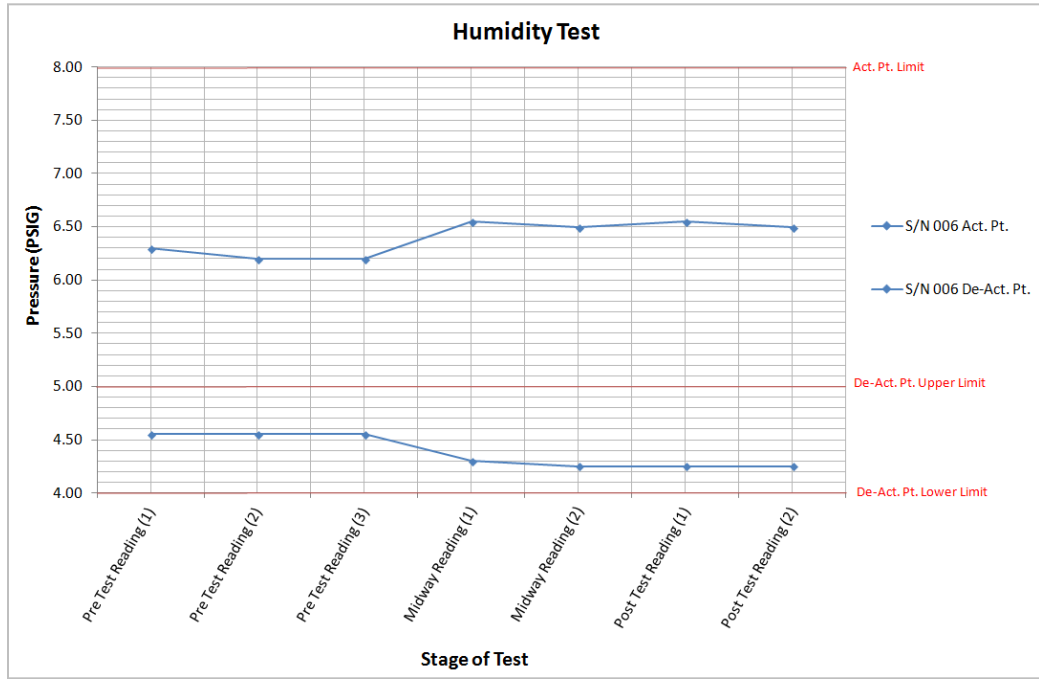
Test Article(s): S/N 006

The Humidity Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The CCS data sheet(s) for this test can be found in [APPENDIX G](#) while the test report from the outside test lab, which includes data sheet(s), equipment list(s), and test setup picture(s), can be found in [APPENDIX R](#).

Below is a plot of the results.

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**Figure 6: Humidity Test**

The Humidity Test was successfully completed on S/N 006. There was some shift in the actuation and de-actuation point, likely induced by temperature, but it was not significant.

Additionally, the Insulation Resistance and Dielectric Tests were also completed successfully on this unit.

**5.7 Ground Survival Low Temperature Test & Operating Low Temperature Test (S/N 005 Re-Test)**

Test Article(s): S/N 005

NOTE: S/N 005 was rebuilt with the same components originally used during assembly. No lubrication oil was used as it was determined that this was the cause for the out of tolerance condition which occurred. CCS/Bell decided to re-test this unit to determine if the original failure during low and high temperature testing was an anomaly. However, this unit was not re-conformed so this test data was not considered in the final determination of acceptable qualification.

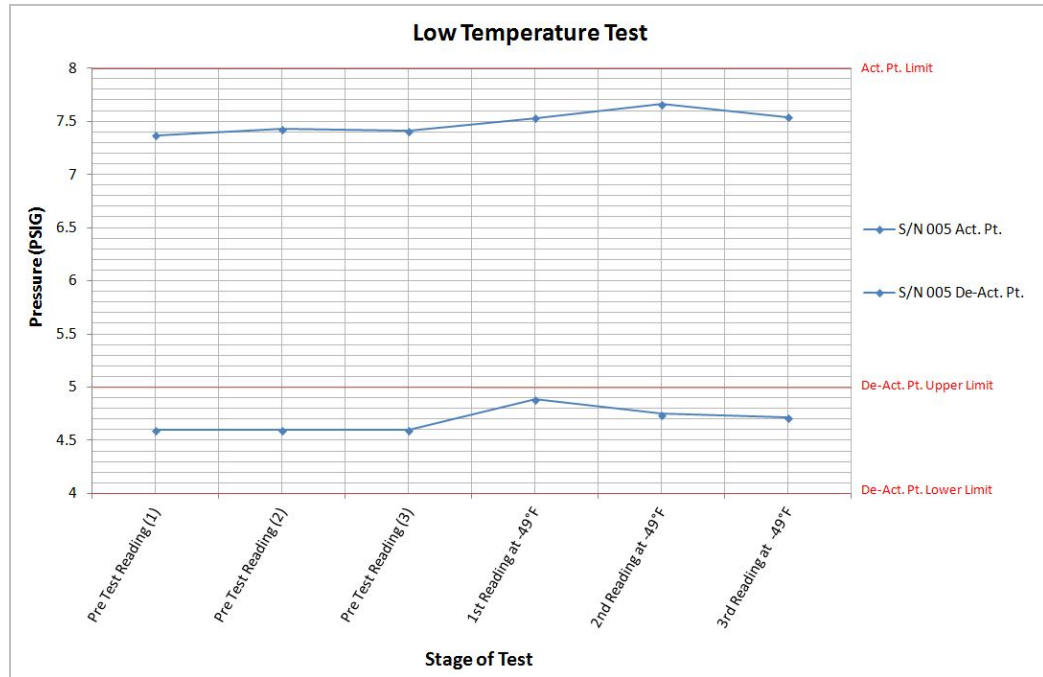
The Ground Survival Low Temperature Test & Operating Low Temperature Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The updated test setup diagram and the data sheet(s) for this test can be found in [APPENDIX H](#).

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NOTE: The test setup diagram and pictures for all low and high temperature tests are the same and are only shown in [APPENDIX C](#).

Below is a plot of the results.



**Figure 7: Ground Survival Low Temperature Test and Operating Low Temperature Test (S/N 005)**

As shown in the above plot, the low temperature re-test was successful. S/N 005 performed in accordance with its performance standards. S/N 005 acted similar to the results exhibited by S/N 007 and S/N 008 shown in [Figure 4](#), i.e., the deadband increased.

5.8 Ground Survival High Temperature Test & Operating High Temperature Test (S/N 005 Re-Test)

Test Article(s): S/N 005

NOTE: S/N 005 was rebuilt with the same components originally used during assembly. No lubrication oil was used as it was determined that this was the cause for the out of tolerance condition which occurred. CCS/Bell decided to re-test this unit to determine if the original failure during low and high temperature testing was an anomaly. However, this unit was not re-conformed so this test data was not considered in the final determination of acceptable qualification.

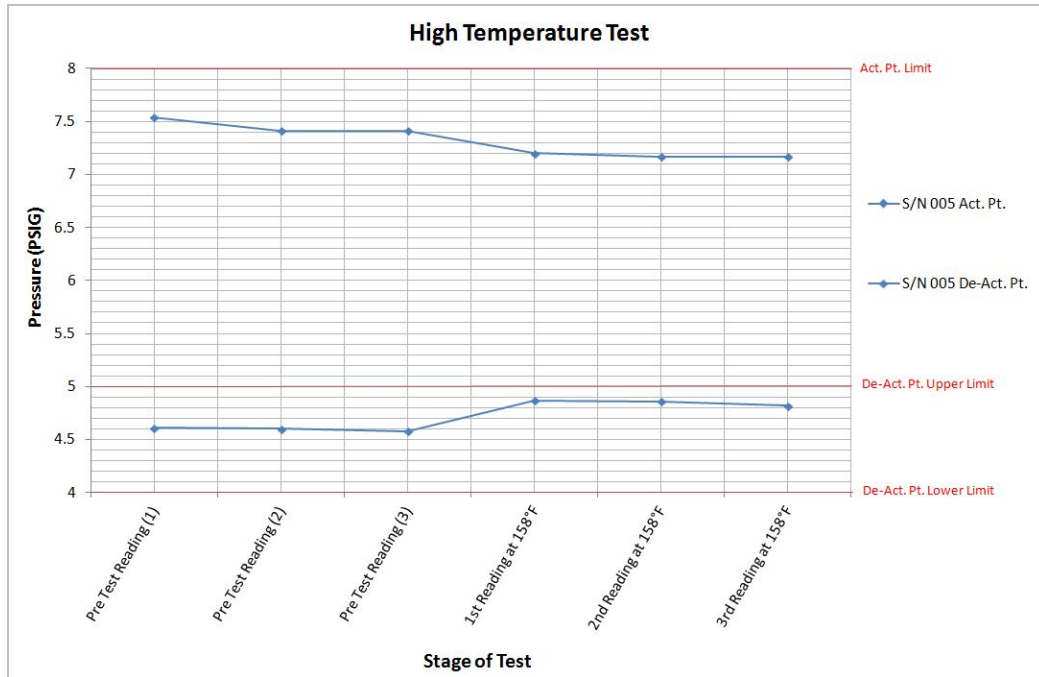
The Ground Survival High Temperature Test & Operating High Temperature Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The updated test setup diagram and the data sheet(s) for this test can be found in [APPENDIX I](#).

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NOTE: The test setup diagram and pictures for all low and high temperature tests are the same and are only shown in [APPENDIX C](#).

Below is a plot of the results.



**Figure 8: Ground Survival High Temperature Test and Operating High Temperature Test (S/N 005)**

The high temperature re-test was successful on S/N 005. This unit performed in accordance with its performance standards. S/N 005 acted similar to the results exhibited by S/N 007 and S/N 008 shown in [Figure 5](#), i.e., the deadband decreased.

Overall, the rebuilt S/N 005 successfully passed the low and high temperature tests that it originally did not. CCS/Bell were satisfied with these results and Qualification Testing continued. However, since S/N 005 was rebuilt and the conformity was no longer valid, it was decided to not continue testing on this unit.

### 5.9 Temperature Variation Test

Test Article(s): S/N 007 - 008

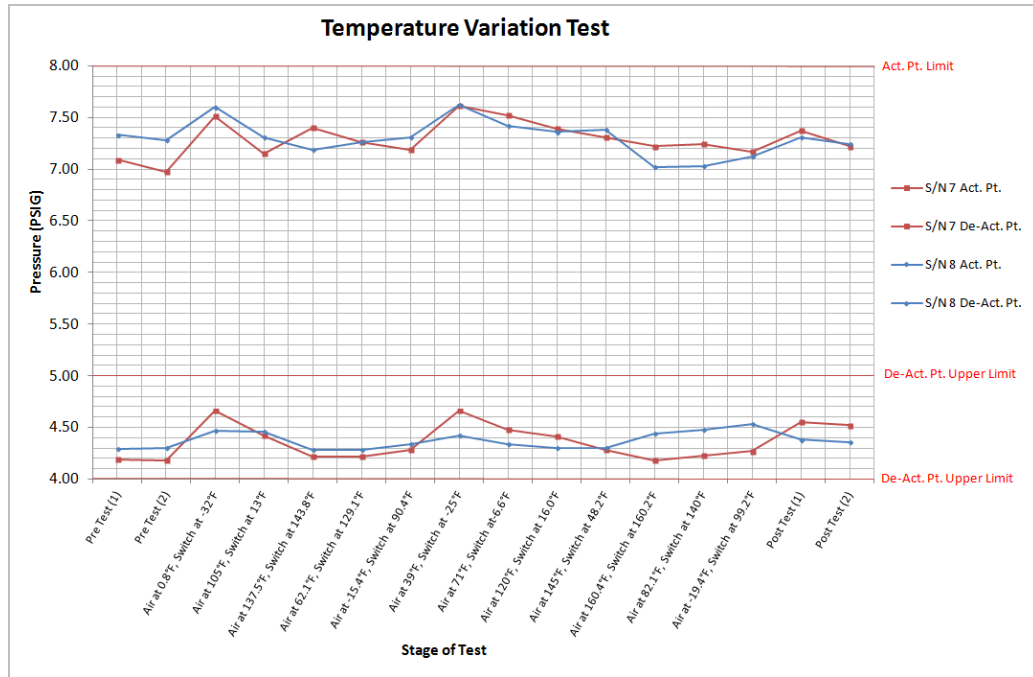
The Temperature Variation Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The test setup picture(s) and data sheet(s) for this test can be found in [APPENDIX J](#).

NOTE: Test Setup diagram is the same for all temperature testing. This diagram can be found in [APPENDIX C](#).

Below is a plot of the results.

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**Figure 9: Temperature Variation Test**

As shown in the above plot, S/N 007 and 008 both acted similarly during the Temperature Variation Test. Note, calibration is required to be checked during the temperature transitions but not at specific intervals. For this reason, the calibration readings vary but both pressure switches behaved alike. Moreover, both test articles passed the Temperature Variation Test.

Additionally, the Insulation Resistance and Dielectric Tests were also completed successfully on these unit.

**5.10 Vibration & Operational Shock Test**

Test Article(s): S/N 007 - 008

The Vibration and Operational Shock Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H.

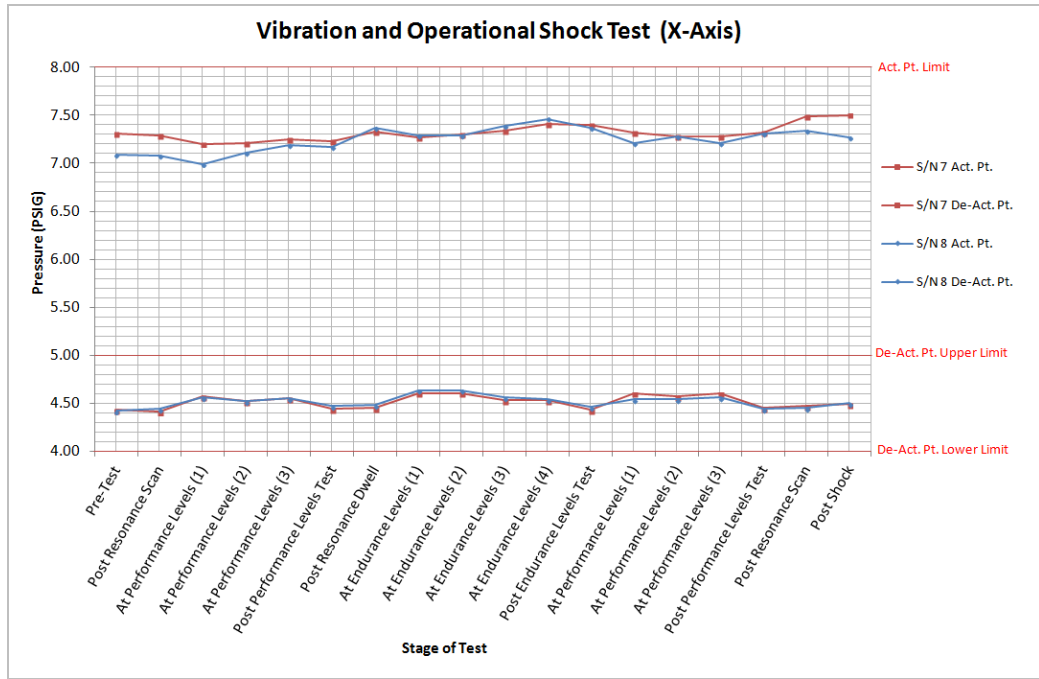
For each axis, the Vibration Test was performed followed by the Operational Shock Test. The orientation of the test article was changed and both Vibration and Operational Shock were repeated until both tests had been completed on all three axes.

The updated test setup diagram, test setup picture(s), data sheet(s), vibration plots for this test can be found in [APPENDIX K](#).

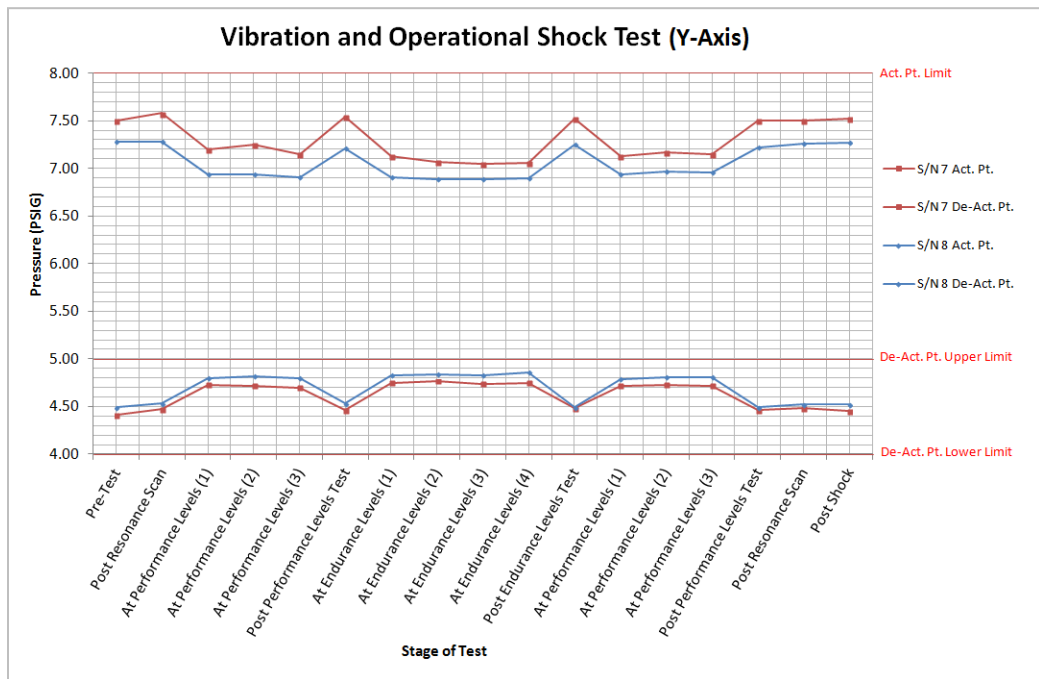
**NOTE:** For all vibration plots, Channel 2 is S/N 007 and Channel 4 is S/N 008.

Below is a plot of the results for each axis.

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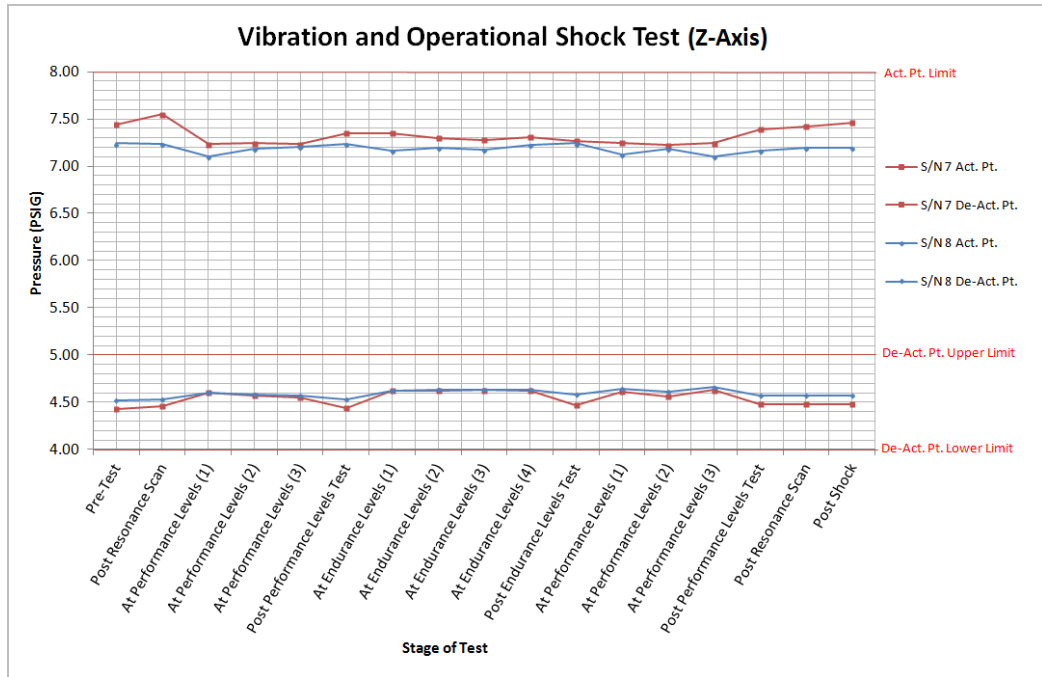


**Figure 10: Vibration and Operational Test (X-Axis)**



**Figure 11: Vibration and Operational Test (Y-Axis)**

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**Figure 12: Vibration and Operational Test (Z-Axis)**

The X and Z axis both responded similarly to the vibration and operational shock tests. The Y-axis, where the pressure switch is mounted vertically, experienced more significant shift in settings. This is not uncommon for vibration testing on this type of design. This is because the applied load from the testing is in the same direction of the loads the switch operates with (e.g., in line with the pressure plate), and thus can have some affect on actuation.

A resonance dwell was performed during testing on the X-axis but not on the Y-axis and Z-axis because the resonances were outside of the test frequency range. Transfer function amplitude ratios and relative phases were evaluated to determine actual resonant frequencies.

Below is a summary of the resonance frequencies before and after the vibration profiles were performed on each axis. As shown, there were very small changes in resonance frequencies.

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Serial No.	Resonance Frequencies (Hz.)		Change in Resonance Frequency
	Pre Test	Post Test	
<b>X-Axis</b>			
007 (CH. 2)	818	789	3.5%
008 (CH. 4)	768	752	2.1%
<b>Y-Axis</b>			
<i>No resonance frequencies</i>			
<b>Z-Axis</b>			
007 (CH. 2)	760	772	1.6%
	802	804	0.2%
008 (CH. 4)	765	772	0.9%
	852	884	3.6%

**Table 2: Resonance Frequency Summary**

During the endurance level test on the x-axis, some contact chatter (< 250 ms) was observed. Vibration was stopped and the setup was examined. It was determined that the mating connector was not fully torqued. The connector was re-tightened and testing continued. There were no further instances of contact chatter.

The Operational Shock Test was completed successfully on all axes. As shown in the above plots (last data point), [Figure 10](#), [Figure 11](#), and [Figure 12](#), very little change in performance, if any, was experienced. The Operational Shock Test typically does not have much of an effect on the design of CCS pressure switches.

Overall, both units passed all vibration and operational shock testing successfully as well as the Insulation Resistance and Dielectric Tests.

### 5.11 Endurance Cycling Test

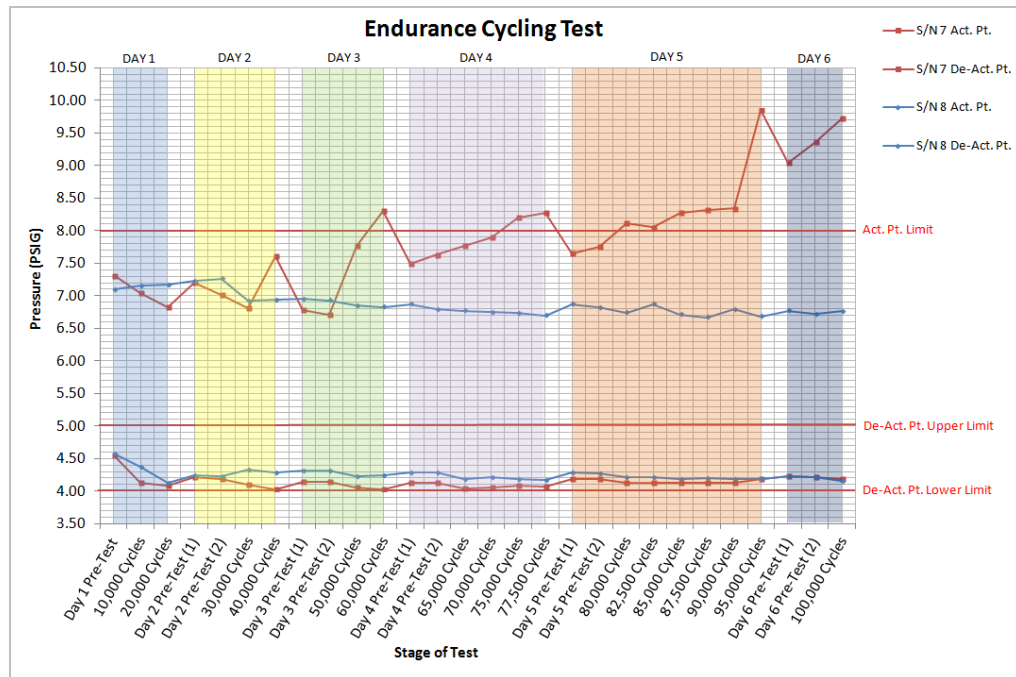
Test Article(s): S/N 007 - 008

The Temperature Variation Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The updated test setup diagram, test setup picture(s), data sheet(s), and recording of the pressure pulse for this test can be found in [APPENDIX L](#).

Below is a plot of the results.

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**Figure 13: Endurance Cycling Test**

As shown in the plot, the actuation point of S/N 007 gradually increased and went out of tolerance at the calibration reading at 60,000 cycles. CCS/Bell decided to continue with testing to observe the switch's performance for the remainder of the test. The actuation point tended to increase with more cycling. Post qualification testing, S/N 007 was disassembled and it was determined that wear on the pressure plate was the source of this issue. CCS' pressure switches operate with limited movement of the pressure plate, .008" - .011". If a few thousandths of an inch is worn off the pressure plate, a sync issue can result which would then require higher pressure to complete electrical actuation.

The de-actuation point of S/N 007 and S/N 008 was stable throughout the test and performed within its operating requirements.

Post qualification testing, Bell decided that the 100,000 cycle requirement was arbitrary and 50,000 cycles was more than adequate for the life of this item. The pressure switches successfully passed the 50,000 cycle endurance requirement.

Additionally, the Insulation Resistance and Dielectric Tests were also completed successfully on these units.

### 5.12 Salt Fog Test

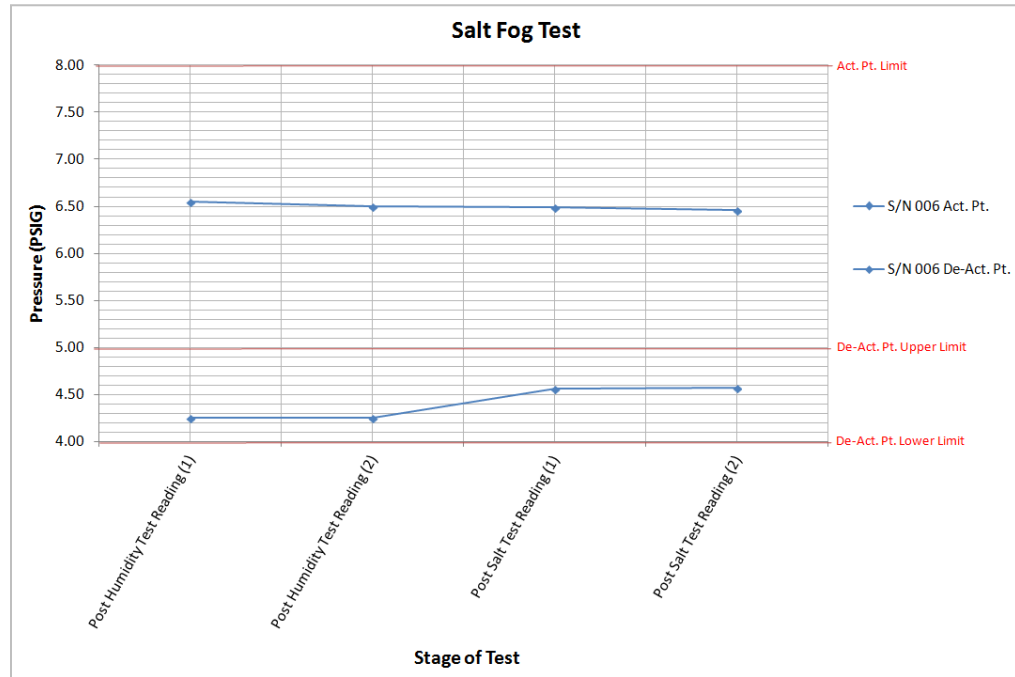
Test Article(s): S/N 006

The Salt Fog Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

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The CCS data sheet(s) for this test can be found in [APPENDIX M](#) (Post Salt Fog, Dust, Sand, and ATP Test on same data sheet) while the test report from the outside test lab, which includes data sheet(s), equipment list(s), and test setup picture(s), can be found in [APPENDIX R](#).

Below is a plot of the results.



**Figure 14: Salt Test**

As shown in the above data, the Salt Fog Test had little impact on the calibration results of the pressure switch and the unit successfully passed the test.

Additionally, the Insulation Resistance and Dielectric Tests were also completed successfully on this unit.

### 5.13 Altitude Test

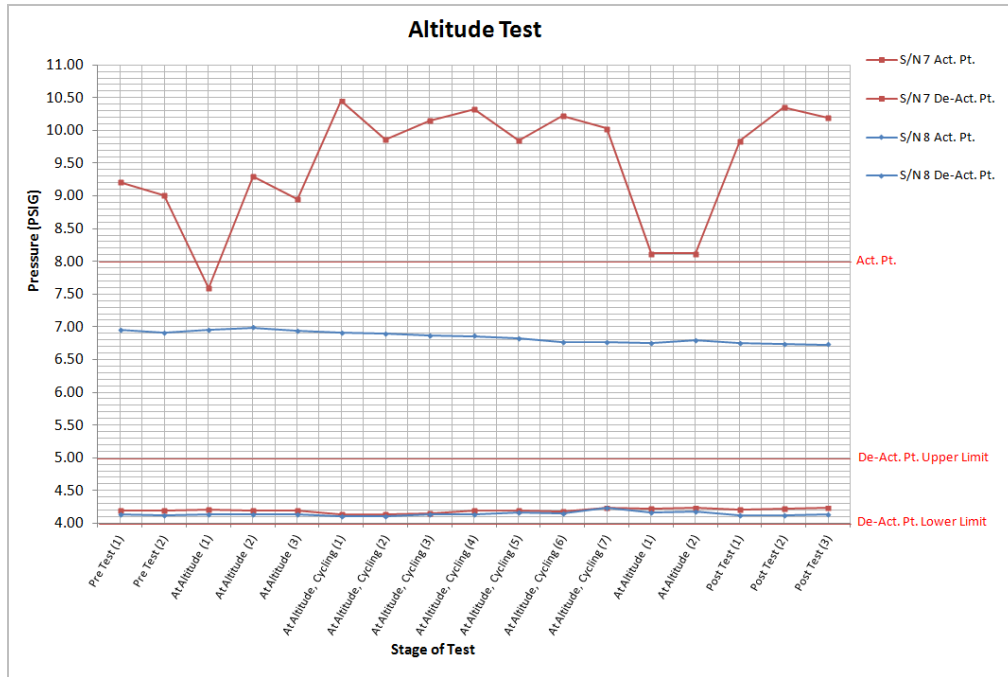
Test Article(s): S/N 007 - 008

The Altitude Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The updated test setup diagram, test setup picture(s) and the data sheet(s) for this test can be found in [APPENDIX N](#).

Below is a plot of the results.

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**Figure 15: Altitude Test**

Altitude was continued with both S/N 007 and 008 although following the [Endurance Cycling Test](#) the actuation point of S/N 007 was no longer within its operating limits and was acting quite unpredictable. Additionally, the light change of S/N 007 was observed to flicker (or possibly dim) near actuation further indicating an electrical sync issue. The data on S/N 007 was for extra information while S/N 008 was the critical qual. unit.

Aside from the behavior of the actuation point of S/N 007, the Altitude Test has little impact on the performance of the pressure switches. S/N 008 successfully passed the Altitude Test.

Additionally, the Insulation Resistance and Dielectric Tests were also completed successfully on this unit.

#### 5.14 Dust Test

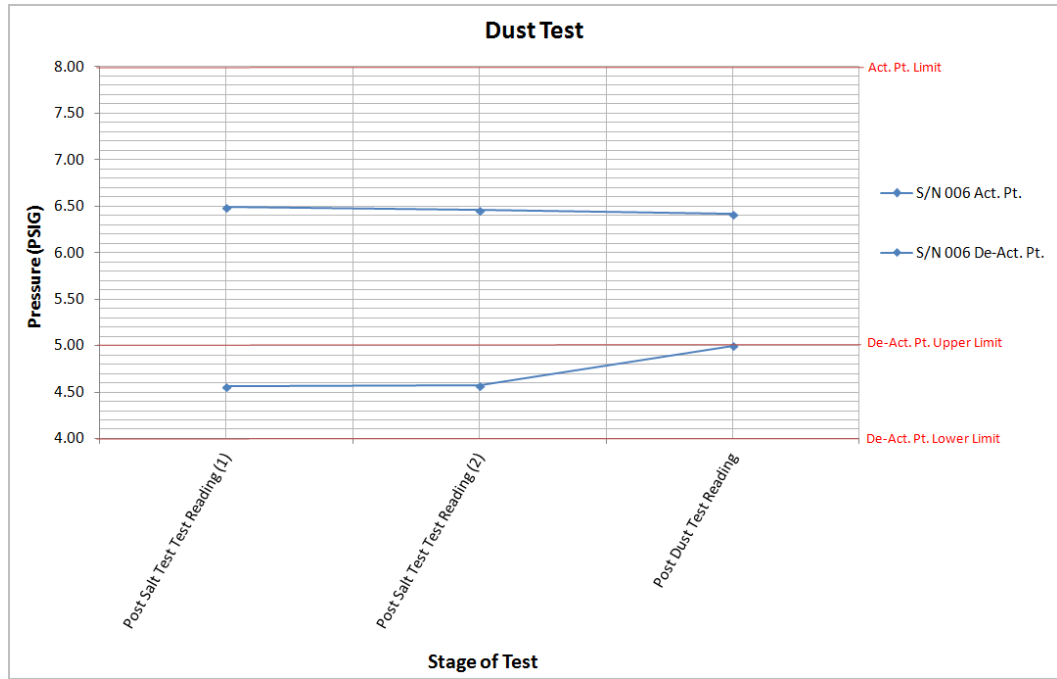
Test Article(s): S/N 006

The Dust Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The CCS data sheet(s) for this test can be found in [APPENDIX M](#) (Post Salt Fog, Dust, Sand, and ATP Test on same data sheet) while the test report from the outside test lab, which includes data sheet(s), equipment list(s), and test setup picture(s), can be found in [APPENDIX R](#).

Below is a plot of the results.

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**Figure 16: Dust Test**

The Dust Test had very little affect on the actuation point of the test article. However, the de-actuation point shifted up to its specification limit, 5.00 PSIG. CCS does not believe this change was induced by the dust itself as it is unlikely that the dust particles penetrated the pressure switch. Rather, it is believed that the test temperature, 158°F, caused this change as similar changes were observed during the temperature testing.

Overall, the unit successfully passed the Dust Test.

Additionally, the Insulation Resistance and Dielectric Tests were also completed successfully on this unit.

### 5.15 Explosion Proofness Test

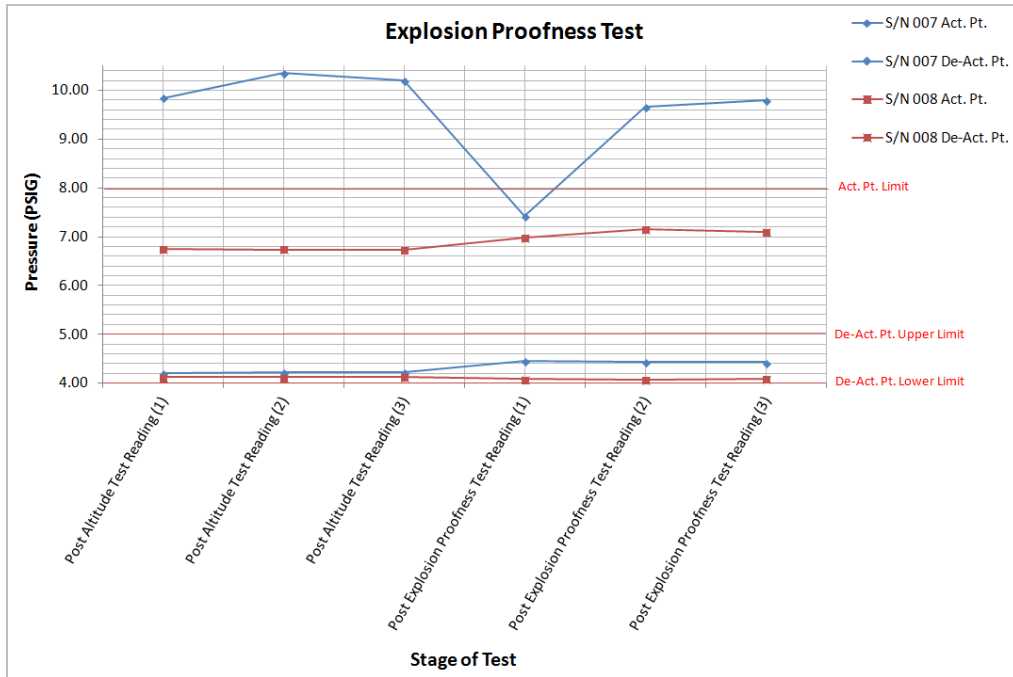
Test Article(s): S/N 007 - 008

The Explosion Proofness Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The updated test setup diagram, test setup picture(s) and the data sheet(s) for this test can be found in [APPENDIX O](#).

Below is a plot of the results.

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**Figure 17: Explosion Proofness Test**

As was the case for the [Altitude Test](#), testing was continued with both S/N 007 and 008 although the actuation point of S/N 007 was no longer within its operating limits and was acting quite unpredictable.

Otherwise, the Explosion Proofness Test was completed successfully on the pressure switches. That is, an explosion did not occur as a result of operating the units and the chamber was then verified as containing an explosive mixture.

**NOTE:** Oxygen was required to be added to the chamber to create an explosive mixture at altitude.

Additionally, the Insulation Resistance and Dielectric Tests were also completed successfully on this unit.

### 5.16 Sand Test

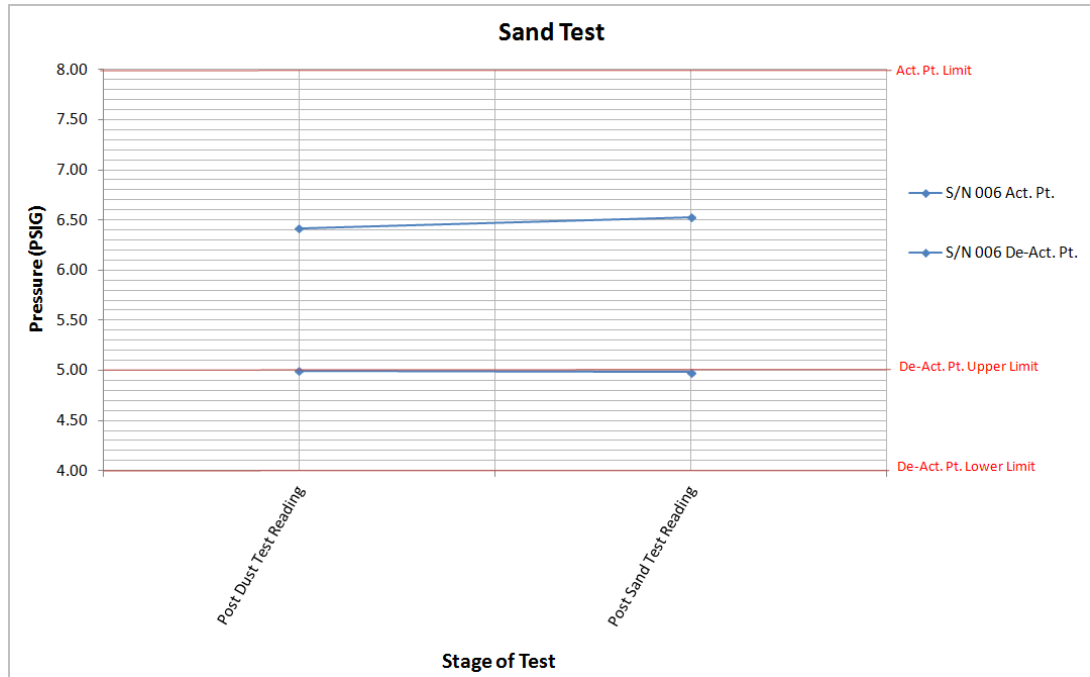
Test Article(s): S/N 006

The Dust Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H (with deviations detailed in [APPENDIX T](#)).

The CCS data sheet(s) for this test can be found in [APPENDIX M](#) (Post Salt Fog, Dust, Sand, and ATP Test on same data sheet) while the test report from the outside test lab, which includes data sheet(s), equipment list(s), and test setup picture(s), can be found in [APPENDIX R](#).

Below is a plot of the results.

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
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**Figure 18: Sand Test**

The Sand Test had little effect on the pressure switch's performance characteristics. The de-actuation point was near its limit but stayed within tolerance.

Overall, S/N 008 successfully passed the Sand Test.

Additionally, the Insulation Resistance and Dielectric Tests were also completed successfully on this unit.

**5.17 Acceptance Test Procedure (ATP) and Insulation Resistance Test**

The CCS data sheet(s) for this test for S/N 006 can be found in [APPENDIX M](#) (Post Salt Fog, Dust, Sand, and ATP Test on same data sheet).

The CCS data sheet(s) for this test for S/N 007 and 008 can be found in [APPENDIX P](#).

**5.18 Crash Safety (Impulse) Test**

Test Article(s): 008

The Crash Safety (Impulse) Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H.

The updated test setup diagram, test setup picture(s) and the data sheet(s) for this test can be found in [APPENDIX Q](#).

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The Crash Safety (Impulse) Test was completed successfully on S/N 008. There were no signs of damage to the pressure switch.

#### 5.19 Crash Safety (Sustained) Test

Test Article(s): 008

The Crash Safety (Sustained) Test was performed in accordance with the Bell Helicopter approved CCS Qualification Test Procedure (QTP), rev. H.

The updated test setup diagram, test setup picture(s) and the data sheet(s) for this test can be found in [APPENDIX Q](#).

The Crash Safety (Sustained) Test was completed successfully on S/N 008. There were no signs of damage to the pressure switch.

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## 6 CONCLUSION

The Qualification Testing on the pressure switch, CCS P/N 7G1191, was completed successfully and approved by Bell Helicopter.

The anomaly that occurred with S/N 005, caused by excessive use of lubricant on the o-ring installed the body, was caused by improper assembly methods and CCS decided to prohibit using lubricant in this location as a preventative action (without comprising design integrity).

The issue which occurred on S/N 007 was determined to be caused by wear on the pressure plate which ultimately arose due to the arbitrary 100,000 cycle requirement. Post Qualification Testing, Bell Helicopter decided 50,000 cycles was sufficient for the life of this product. It is not believed that this is a life limit on this component because it is not expected to ever see 100,000 cycles.

These issues were viewed as observations and not failures of Qualification Testing.

Overall, the Qualification Test results were accepted by Bell Helicopter.

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APPENDIX A ENVELOPE AND SECTION DRAWING

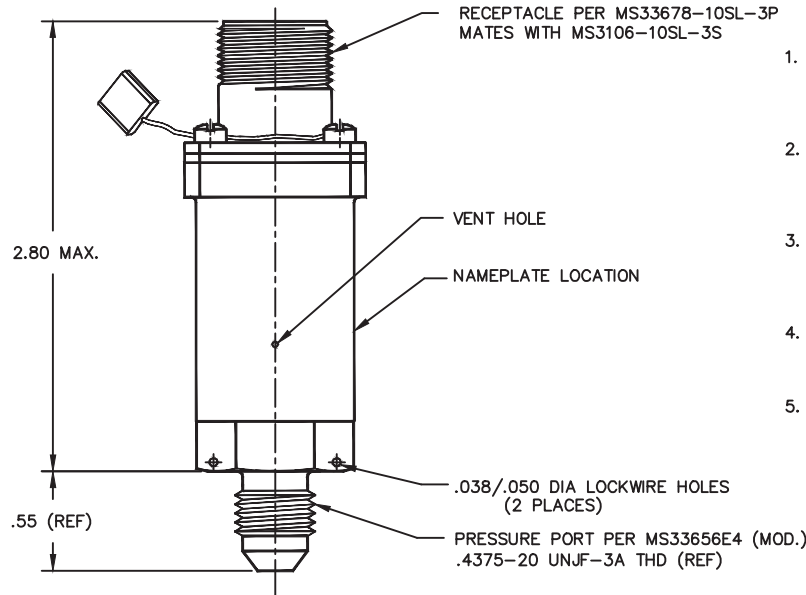
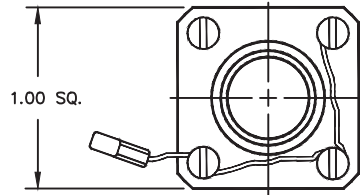
<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
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NAMEPLATE DATA

CUSTOM CONTROL SENSORS, INC.  
 21111 PLUMMER ST. CHATSWORTH. CA.  
 MODEL: 7G1191  
 INCR: BY 8 PSIG  
 DECR.: 4.5 ± 0.5 PSIG  
 PROOF: 180 PSIG  
 ELEC.: 0.5 A LAMP LOAD, 28 VDC  
 ASSY:  
 S/N:

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED
A	REVISED PER ECO #31052	04/11/2014	J.JORGENSEN



SPECIFICATIONS

1. ACTUATION POINTS

INCREASING PRESSURE: BY 8 PSIG  
 DECREASING PRESSURE: AT 4.5 ± 0.5 PSIG

2. AMBIENT TEMPERATURE

OPERATING: -65°F TO +250°F  
 NON-OPERATING: -65°F TO +250°F

MEDIA TEMPERATURE

-65°F TO +260°F

3. PROOF PRESSURE

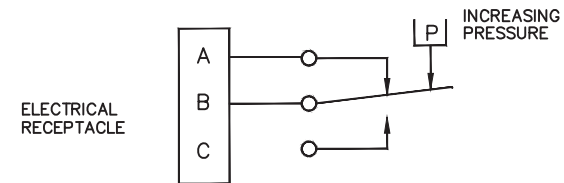
180 PSIG APPLIED TO PRESSURE PORT

4. ELECTRICAL RATING

0.5 AMP LAMP LOAD AT 28 VOLTS D.C.

5. WIRING DIAGRAM

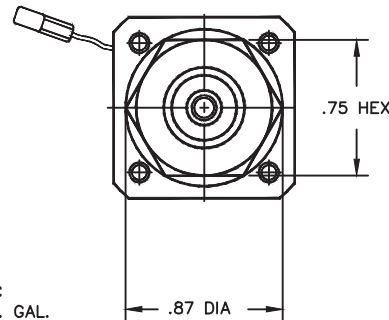
THE WIRING DIAGRAM IS DEPICTED WITH THE PRESSURE PORT AT STANDARD SEA LEVEL PRESSURE



- 6. PRESSURE PORT CONTAINS A .013/.015 RESTRICTOR.
- 5. RADIAL LOCATION OF SAFETY SEAL OPTIONAL.
- 4. LOCKWIRE PER MS33540.
- 3. WEIGHT: 2.3 OZ.
- 2. MEDIA: FUEL

-ASTM D-1655, TYPE A (JET A).  
 -ASTM D-1655, TYPE B (JET B).  
 -MIL-T-5624 GRADE JP-4.  
 -MIL-T-5624 GRADE JP-5.  
 -ANTI-ICING FUEL ADDITIVE USED, MIL-I-27686 OR LATER.  
 -FUEL MIXTURES THAT MAY BE USED.  
 1 PART BY VOLUME AVGAS PER MIL-G-5572C GRADE 80/87 OR GRADE 100/130 (2.0ml/U.S. GAL. MAX. LEAD CONTENT) AND 2 PARTS BY VOLUME JET A OR JP-5.

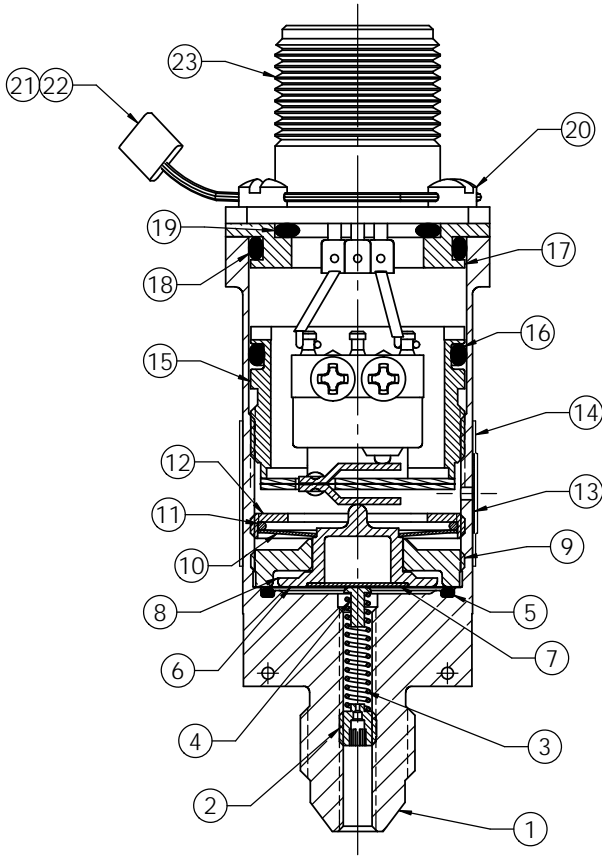
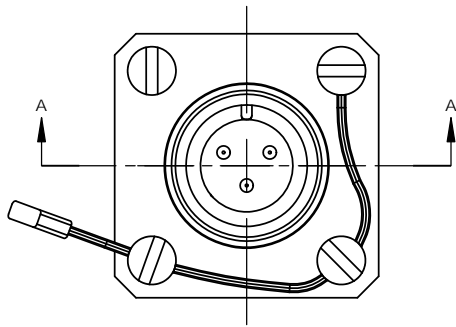
1. CUSTOMER: BELL HELICOPTER  
 NOTES:



UNLESS OTHERWISE SPECIFIED		DR: M.MENDOZA	01/29/13	 <b>Custom Control Sensors Inc.</b> <small>21111 Plummer Street, Chatsworth, California 91313 - 2818</small>
ALL DIMENSIONS ARE IN INCHES		CHK:		
TOLERANCES ON:		PROJ: M.HAROUTUNIAN		GAGE PRESSURE SWITCH
FRACTIONS	DECIMALS	ANGLES		
± 1/32	.X .XX .XXX	± 5°	MFG: J.JORGENSEN	SIZE C
± .1	± .05 ± .007		APPD: J.JORGENSEN	FSCM NO. 09049
		CAD 9218		7G1191
				SCALE: NONE
				SHEET:

7G1191 | A

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SECTION A-A

**NOTES:**

1. CUSTOMER: BELL HELICOPTER
2. MEDIA: FUEL

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED
B	REVISED PER ECO #31052	04/11/14	J. JORGENSEN

ITEM	QTY REQD	PART NUMBER	DESCRIPTION
1	1	12-1276	BODY
2	1	29-208	ADJUSTMENT SCREW
3	1	1-7	HELICAL SPRING
4	1	30-8	ADJUSTMENT SHOE
5	1	64-59-15	O-RING
6	1	31-372	DIAPHRAGM
7	1	67-137	PLATE
8	1	32-524	PRESSURE PLATE
9	1	54-194	REGISTER
10	1	2-1-7G1191	DISC SPRING
11	1	54-195	REGISTER RING
12	1	8-88	RETAINER
13	1	61-12	FILTER
14	1	131-331	NAMEPLATE
15	1	46-1361-1	ELECTRICAL ASSEMBLY
	1	18-129	SWITCH ACTUATOR ASSEMBLY
	1	24-37	SWITCH HOLDER ASSEMBLY
	1	67-133	PLATE
	2	25-134	SWITCH HOLDER
	1	31-329	DIAPHRAGM
	1	67-130	PLATE
	2	20-250	SWITCH ACTUATOR ARM
	1	15-285	ELECTRICAL CAP
	1	79-369	SWITCH ELEMENT
	2	56-86	SCREW
	2	47-29	NUT
	1	41-22-2	ELECTRICAL WIRE
	1	41-22-9	ELECTRICAL WIRE
16	1	80-017-15	O-RING
17	1	37-76	FLANGE
18	1	80-017-15	O-RING
19	1	80-014-15	O-RING
20	4	56-256	SCREW
21	1	116-56	LOCKWIRE
22	1	57-11	SAFETY SEAL
23	1	74-88	RECEPTACLE

UNLESS OTHERWISE SPECIFIED	DIAMETERS NOT MARKED TO BE CONCENTRIC WITHIN .005 TIR	DR: M. HAROUTUNIAN 01/29/13	<p>21111 Plummer Street, Chatsworth, California 91313 - 2516</p>												
ALL DIMENSIONS ARE IN INCHES	ALL DIMENSIONS ARE AFTER PLATING	CHK:													
TOLERANCES ON:	CYLINDRICAL SURFACES & FACES TO BE SQUARE WITHIN .005 IN. PER IN.	PROJ: J. JORGENSEN 01/29/13													
FRACTIONS DECIMALS ANGLES	STD SCREW THREADS PER MIL-STD-7742	MFG:													
± 1/32 .X .XX .XXX ± 5°	DRILLED HOLE TOLERANCES PER AND10387	APPR: J. JORGENSEN 01/29/13													
± .1 ± .015 ± .007	BREAK ALL SHARP EDGES .005	CAD 9232	<table border="1"> <tr> <td>TITLE:</td> <td colspan="2">GAGE PRESSURE SWITCH</td> </tr> <tr> <td>SIZE</td> <td>FSCM NO.</td> <td>S7G1191</td> </tr> <tr> <td>C</td> <td>09049</td> <td></td> </tr> <tr> <td colspan="2">SCALE: DO NOT SCALE</td> <td>SHEET 1 OF 1</td> </tr> </table>	TITLE:	GAGE PRESSURE SWITCH		SIZE	FSCM NO.	S7G1191	C	09049		SCALE: DO NOT SCALE		SHEET 1 OF 1
TITLE:	GAGE PRESSURE SWITCH														
SIZE	FSCM NO.	S7G1191													
C	09049														
SCALE: DO NOT SCALE		SHEET 1 OF 1													

APPENDIX B ACCEPTANCE TEST PROCEDURE (ATP) DATA SHEET(S) (PRE-QUALIFICATION TESTING)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
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CUSTOM CONTROL SENSORS INC.

ACCEPTANCE TEST PROCEDURE

MODEL NO. 7G1191  
ATP REV "A"

TEST DATA

P.O. NO.

CUSTOMER: BELL HELICOPTER		SPEC:		PART NO: 7G1191	
S/N	EXAMINATION	PROOF PRESSURE 180 PSIG	INCREASING PRESSURE BY 8.0 PSIG	DECREASING PRESSURE AT 4.5+/- .5 PSIG	
005	<i>CONFORMS</i>	<i>CONFORMS</i>	6.294	4.629	
006			6.451	4.611	
007			7.171	4.466	
008	✓	✓	7.135	4.399	
S/N	DIELECTRIC TEST 1000 VRMS				
005	<i>CONFORMS</i>				
006					
007					
008	✓				
INSPECTOR <i>M</i>		STAMP 	DATE <i>02-20-11</i>		

APPENDIX C GROUND SURVIVAL LOW TEMPERATURE TEST & OPERATING LOW TEMPERATURE TEST SETUP AND DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 38

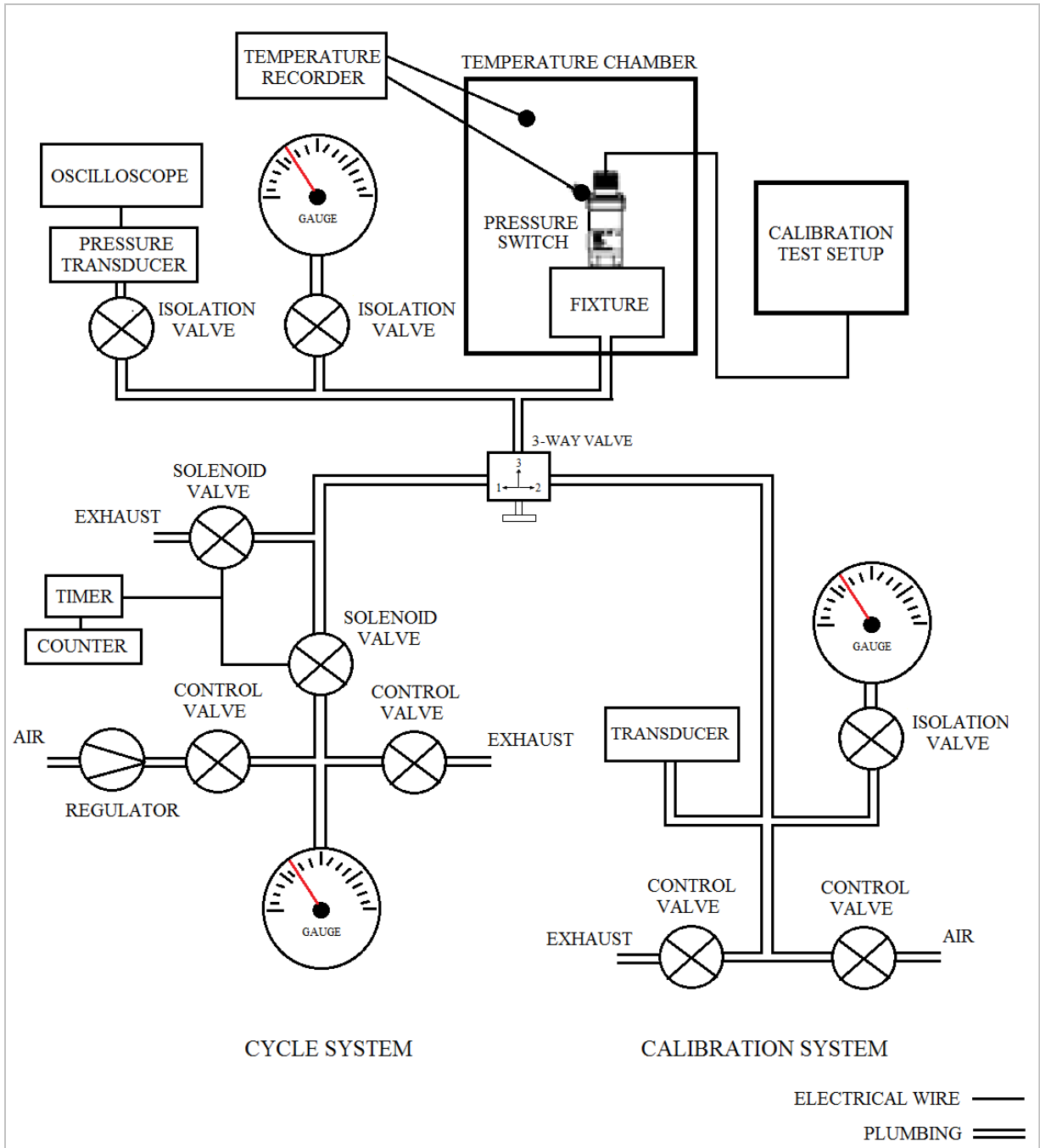


Figure 19: Temperature Testing Setup Diagram

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
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**Figure 20: Temperature Test Setup**



**Figure 21: Temperature Test Setup (Close-Up)**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
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CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:  
1035

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SNOOS	TEMP SNOOB	761191 SNOOS	761191 SN 006
2-25-2014	0750	73.3°	73.3°	73.3°	6.32	6.53
					4.45	4.56
					6.20	6.46
					4.54	4.58
					6.18	6.44
					4.64	4.60
	0800	73.0°	TEMPERATURE NOW DECREASING			
	0801	69.0°				
	0802	62.7°				
	0815	18.6°				
	0900	-65.7°	-61.0°	-60.8°		
BEGIN TEMP STAB.	0915	-68.2°	-65.2°	-65.3°	(AIR -65.2° TO -68.6°)	
	0920	-68.4°	-65.6°	-65.7°	(AIR -65.0° TO -68.9°)	
	0955	-65.5°	-66.1°	-66.3°	(AIR -65.2° TO -69.2°)	
	1100	-69.0°	-66.3°	-66.4°	(AIR -64.9° TO -69.0°)	
	1200	-67.1°	-65.7°	-65.8°	(AIR -64.5° TO -68.8°)	
	1300	-68.4°	-66.1°	-66.2°	(AIR -65.2° TO -69.2°)	
	1315	-68.8°	-66.6°	-66.6°	(AIR -65.5° TO -69.3°)	
	1335	-67.9°	TEMPERATURE INCREASING			
	1337	-49.0°	-58.9°	-58.8°	(AIR -46.8° TO -51.6°)	
BEGIN TEMP STAB.	1345	-49.2°				
	1400	-48.8°	-48.9°	-49.1°	(AIR -47.6° TO -52.0°)	
		-49.3°	-48.5°	-48.6°	(AIR -46.5° TO -49.9°)	
	1445	-50.2°	-48.4°	-48.6°	(AIR -46.8° TO -50.2°)	

Test Performed by: \_\_\_\_\_

DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:  
1035

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SN005	TEMP SN006	761191 SN005	761191 SN006
2-25-2014	1447	-49.8	-48.4	-48.6	7.23	6.87
		SN 005	DECR	OUT OF TOL.	5.46	4.72
					7.13	6.73
					5.30	4.72
					6.91	6.69
					5.26	4.71
					6.90	6.78
					50	50
					4.78	4.65
					6.44	6.74
					50	50
	1507				4.69	4.58
					6.38	6.70
					4.88	4.64
	1512	BEGW	0-100-0 PRESSURE CYCLING			
	1612	STOP	FOR CALIBRATION TEST.			
	1615	-50.0°	-46.8°	-46.8°	6.27	7.62
					4.43	4.43
					6.28	7.61
					4.46	4.39
	1620	RESUME	PRESSURE CYCLING			

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



APPENDIX D GROUND SURVIVAL HIGH TEMPERATURE TEST & OPERATING HIGH  
TEMPERATURE TEST DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 44



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SNOOS	TEMP SNOOB	761191 SNOOS	761191 SNOOB	
2-26-2014	0710	70.9°	71.2°	71.2°	6.17	7.10	
					4.10	4.29	
					6.02	7.04	
					4.09	4.24	
	0715	71.5°	TEMPERATURE NOW INCREASING				
	0720	126.3°					
	0725	163.1°	133.4°	133.0°			
	0728	185.0°	151.0	150.5°			
BEGIN TEMP STAB.	0747	186.4°	183.9°	184.2°			
	0847	186.1°	186.4°	186.4°	(AIR 185.8° TO 187.4°)		
	0947	186.3°	186.0°	185.9°	(AIR 185.3° TO 186.2°)		
	1150	185.9°	185.9°	185.9°	(AIR 185.3° TO 186.8°)		
	1153	184.4°	TEMPERATURE NOW DECREASING				
	1156	158.0°					
	1206	158.1°	162.6°	162.7°			
BEGIN TEMP STAB.	1214	158.2	159.6	159.6°			
	1320	157.0°	157.4°	157.4°	(AIR 157.0° TO 158.2°)		
	1343	158.2°	BEGIN 0-20-0 PRESSURE CYCLING				
	1358	STOP FOR CALIBRATION				TEST AT 279 CYC	
	1359	157.2°	157.3	157.3°	5.91	6.32	
					3.92	4.41	
					5.88	6.25	
					3.95	4.46	
	1408	RESUME PRESSURE CYCLING					

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SNOO5	TEMP SNOO6	761191 SNOO5	761191 SNOO6
2-26-2014	1453	STOP FOR CALIBRATION TEST AT 1131 CYCLES				
	1454	157.6°	157.3°	157.3°	5.81	6.30
					3.85	4.48
					5.75	6.25
					3.86	4.51
	1500	RESUME PRESSURE CYCLING				
	1600	STOP CYCLING AT 2275 CYCLES				
	1602	157.0°	157.3°	157.3°	5.77	6.27
					3.77	4.48
					5.75	6.22
	1606				3.79	4.49
	1621				5.77	6.22
					12	12
					3.83	4.52
					5.76	6.20
					20	20
					3.81	4.50
					5.74	6.19
					50	50
	1630	157.0°	157.2	157.2°	3.77	4.48

Test Performed by:

DATE:

APPENDIX E GROUND SURVIVAL LOW TEMPERATURE TEST & OPERATING LOW TEMPERATURE TEST (ALTERNATE UNITS) DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 47



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SNOOT7	TEMP SNOOT8	761191 SNOOT7	761191 SNOOT8
2-27-2014	0855	73.0°	73.5°	73.7°	7.28	7.38
					4.49	4.45
					7.16	7.29
					4.49	4.46
					7.15	7.38
					4.47	4.45
	0904	72.1°	TEMPERATURE NOW DECREASING			
	0906	65.6°				
	0946	-40.0°	-33.2°	-32.5°		
	1004	-65.1°	-59.2°	-59.0°		
	1006	-67.0°				
BEGIN TEMP STAB	1015	-69.0°	-66.0°	-66.0°	(-65.0° TO -68.6°)	
	1115	-67.2°	-65.8°	-65.8°	(-65.0° TO -68.6°)	
	1217	-67.3°	-66.1°	-66.1°		
	1430	-66.8°	-65.8°	-66.0°	(-64.8° TO -68.7°)	
	1431	-67.9°	TEMPERATURES INCREASING			
	1433	-49.5°				
BEGIN TEMP STAB	1441	-49.2°	-49.8	-49.8		
	1521	-47.9°	-47.7°	-47.9°		
	1530	-50.2°	-48.6°	-48.6°	(-46.6° TO -51.7°)	
	1545	-47.7°	-48.4°	-48.5°	(-47.0° TO -52.4°)	
	1550	-48.5°	BEGIN 0-20 PSI PRESSURE CYCLING			
	1605	STOP CYCLING AT 20 PSI			7.28	7.34
					4.30	4.51

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



APPENDIX F GROUND SURVIVAL HIGH TEMPERATURE TEST & OPERATING HIGH TEMPERATURE TEST (ALTERNATE UNITS) DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 50



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SNOO7	TEMP SNOO8	761191 SNOO7	761191 SNOO8
2-28-2014	0658	70.1°	69.8°	69.8°	7.23	7.34
					4.25	4.35
					7.08	7.23
					4.22	4.28
	0704	71.0°	TEMPERATURE INCREASING			
	0705	88.0°				
	0718	185.0°	150.5°	151.3°		
BEGIN TEMP STAB	0745	186.3°	184.3°	184.8°		
	0945	186.5°	186.2°	186.3°	(AIR 185.5 TO 187.2)	
	1045	186.2°	186.2°	186.2°	(AIR 185.5 TO 187.1)	
	1150	186.2°	186.2°	186.2°		
	1151	184.6°	TEMPERATURE DECREASING			
	1155	158.0°				
BEGIN TEMP STAB	1215	157.6°	159.3°	159.2°		
	1317	157.2°	157.3°	157.3°		
	1325	157.8°	157.4°	157.3°		
	1330	157.2°	BEGIN 0-20-0 CYCLING			
	1345	STOP AT	277 CYCLES		6.89	7.02
					4.36	4.23
	1350	RESUME PRESSURE CYCLING				
	1442	STOP AT	1250 CYCLES		7.04	7.00
					4.40	4.10
	1445	RESUME PRESSURE CYCLING				
	1500	157.4°	157.2°	157.2°	(AIR 156.7 TO 157.7)	

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



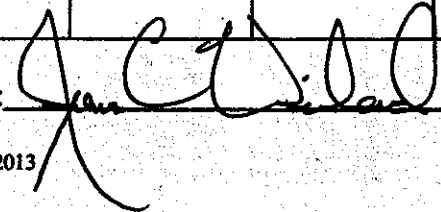
CustomControlSensors Inc.

### CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SNOO7	TEMP SNOO8	761191 SNOO7	761191 SNOO8
2-28-2014	1538	STOP AT	2224 CYCLES FOR CALIBRATION			
	1540	157.8°	157.3°	157.4°	7.07 4.36	6.98 4.22
					6.74 4.37	6.94 4.24
					6.72 4.37	6.93 4.25
3-3-2014	0720	66.7°	66.9°	66.8°	7.05 4.49	7.48 4.43
					6.96 4.47	7.35 4.43
					6.94 4.46	7.35 4.45

Test Performed by:  DATE: \_\_\_\_\_

APPENDIX G HUMIDITY TEST DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 53



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP	RH	DIELECTRIC	INSULATION	761191 SN006
2-27-2014	0923	23.4°C	57.6%			6.30
HUMIDITY						4.55
						6.20
						4.55
						6.20
						4.55
3-4-2014	1300	29.4°C	94.6%			6.55
						4.30
						6.50
						4.25
3-10-2014	1420	29.6°C	94.5%			6.55
						4.25
						6.50
						4.25
	1500	25.0°C	26.0%	.05mA	>550M <sub>r</sub>	—

Test Performed by: [Signature]

DATE: \_\_\_\_\_

APPENDIX H GROUND SURVIVAL LOW TEMPERATURE TEST & OPERATING LOW TEMPERATURE  
TEST (RE-TEST) DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 55



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SNOOS		761191 SNOOS
3-3-2014	0915	71.1°	70.8°		7.37
					4.60
					7.43
					4.60
					7.41
					4.60
	0917	69.1°	TEMPERATURE DECREASING		
	0921	25.7°			
	1025	-67.0°	-66.1°		
BEGIN TEMP STAB.	1030	-67.6°	-67.4°		
	1100	-68.8°	-66.5°	(AIR -65.2° TO -69.0°)	
	1300	-68.2°	-66.0°	(AIR -64.8° TO -69.4°)	
	1430	-69.4°			
	1431	-68.4°	TEMPERATURE INCREASING		
BEGIN TEMP STAB.	1445	-50.6°	-49.4°		
	1546	-48.0°	-48.0°	BEGIN 0-20-0 CYCLING	
	1601	STOP CYCLING FOR CALIBRATION AT 279 CYCLES.			
	1603				7.53
					4.89
	1607	-51.2°	-48.5°	RESUME CYCLING	
	1652	-47.9°	STOP AT 1111 CYCLES		
	1654	-49.0°			7.66
					4.75

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



APPENDIX I GROUND SURVIVAL HIGH TEMPERATURE TEST & OPERATING HIGH TEMPERATURE TEST (RE-TEST) DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 58



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

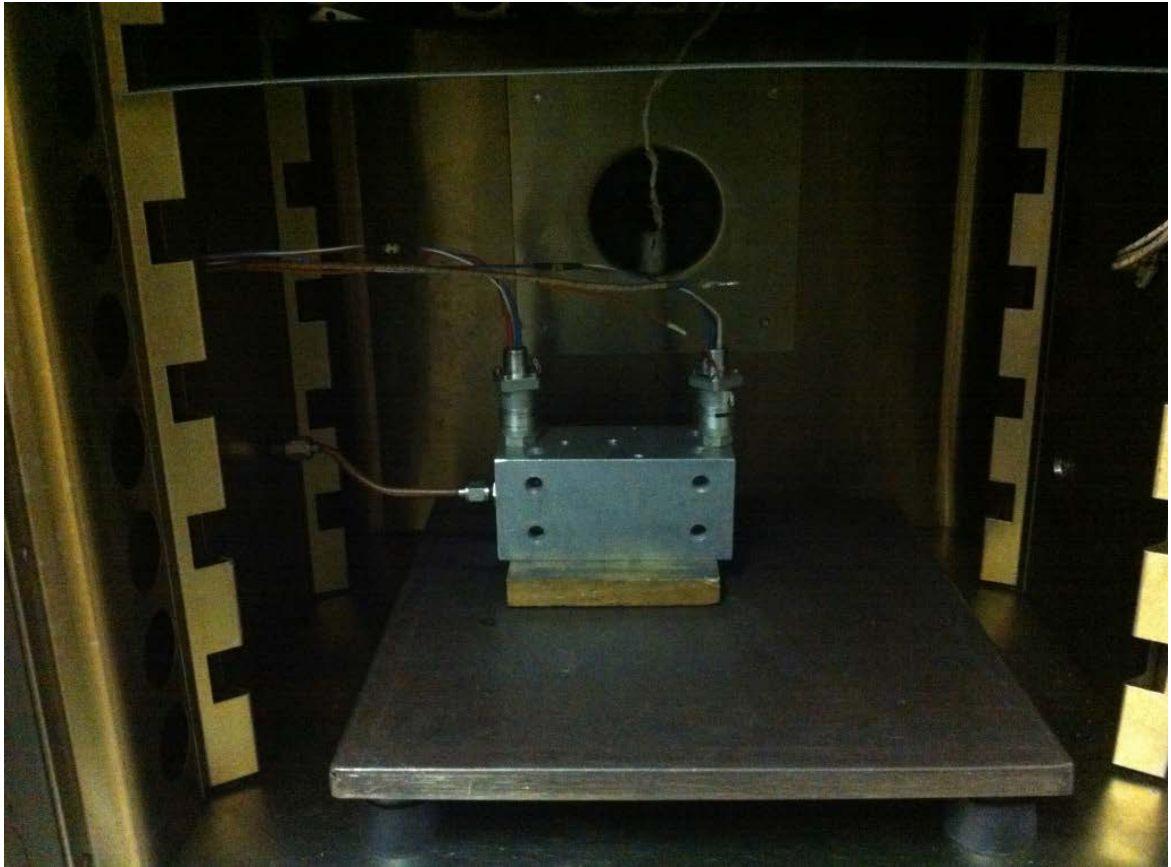
DATE	TIME	TEMP AIR	TEMP SNOOS		761191 SNOOS
3-4-2014	0714	67.5°	66.6°		7.54
					4.61
					7.41
					4.60
					7.41
					4.58
	0720	68.0°	TEMPERATURE INCREASES		
	0748	185.7°	182.3°		
BEGIN TEMP STAB	0800	186.2°	184.8°		
	0900	187.2°	186.4°		
	1015		185.0°		
	1229	186.3°	185.4°		
	1230	184.8°	TEMPERATURE INCREASING		
	1235	158.0°	168.9°		
	1240	158.8°	165.2°		
BEGIN TEMP STAB	1245	159.4°	162.0°		
	1330		156.8°		
	1355		156.7°	BEGIN PRESSURE CYCLING	
	1415	STOP AT 359 CYCLES FOR CALIBRATION			
	1416		155.8°		7.20
					4.87
	1420	RESUME 0-20-0 PRESSURE CYCLING			
	1505	STOP AT 1217 CYCLES FOR CALIBRATION			
	1506		152.0°		7.17
					4.86

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



APPENDIX J TEMPERATURE VARIATION TEST SETUP AND DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 61



**Figure 22: Temperature Variation Test Setup**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 62



CustomControlSensors Inc.

### CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SN007	TEMP SN008	761191 SN007	761191 SN008
3-4-2014	1037	72.4°	71.4°		7.09	7.33
TEMP VARIATION					4.19	4.29
					6.97	7.28
					4.18	4.30
	1122	70.2°	72.5°	TEMP. NOW DECREASING		
	1133	-50°				
	1250	-47°	-45.5°	BEGIN TEMP STAB.		
	1400	-40°	-45.0°	TEMP. NOW INCREASING		
	1402	+8°	-32.0°		7.51	7.60
					4.66	4.47
	1406	+105°	+13°		7.15	7.31
					4.42	4.46
	1413	158°	78°			
	1508	159.8°	156.8°	BEGIN TEMP STAB.		
	1615			POWER OFF		
	1617			POWER ON		
	1618	155°		TEMP NOW DECREASING		
	1622	137.5°	153.8°		7.40	7.19
					4.22	4.28
	1626	62.1°	129.1°		7.26	7.26
					4.22	4.28
	1630	-15.4°	+90.4°		7.19	7.31
					4.28	4.34
	1633	-48°	+67°			

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SN007	TEMP SN008	761191 SN007	761191 SN008
3-4-2014	1751	-48.2°	-47.7°	BEGIN	TEMP. STAB.	
	1856	-47.4°	-46.8°	BEGIN	0-20-0 CYCLING	
	2000	-52.2°	-47.5°	STOP AT 1523 CYCLES		
				POWER OFF		
	2030	-50.8°	-49.3°	POWER ON		
	2031			TEMP NOW INCREASING		
	2034	+75°		ROOM	AMB. TEMP.	
	2035	+79°	-2°			
3-5-2014	0715	68.3°	67.8°		7.44	7.47
					4.27	4.16
					7.29	7.31
					4.18	4.20
					7.21	7.30
					4.12	4.14
	0740	67.5°	66.5°	TEMP NOW DECREASING		
	0748	-49.0°				
	0751	-49.2°	+20.5°			
	0906	-48.3°	-47.0°	BEGIN	TEMP. STAB.	
	1015	-48.5°	-46.7°	TEMP. NOW INCREASING		
	1018	+39.0°	-25.0°		7.61	7.62
					4.66	4.42
		21.0°	-6.6°		7.52	7.42
					4.48	4.34

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

### CCS LABORATORY DATA SHEET

SAR/ENG NO:

#### RECORDED TEST DATA:

DATE	TIME	TEMP AIR	TEMP SNOO7	TEMP SNOO8	761191 SNOO7	761191 SNOO8
3-5-2014		120°	+16°		7.39	7.36
					4.41	4.30
		145°	48.2°		7.31	7.38
					4.38	4.30
	1028	158°	54°			
	1215	159.5°	160°	BEGIN TEMP. STAB.		
	1328		158°	POWER OFF		
	1330			POWER ON		
	1331	160.4°	160.2°	TEMP NOW DECREASING		
	1332	159.6°			7.22	7.02
					4.18	4.44
	1336	82.1°	140°		7.24	7.03
					4.23	4.48
	1340	-19.4°	99.7°		7.17	7.12
					4.27	4.53
	1341	-49°	82.5°			
	1510	-80.2°	-47.0°	BEGIN TEMP. STAB.		
	1615	-49°	-46.8°	BEGIN 0-20-0 CYCLING		
	1720	-54°	-48°	STOP AT 3,067 CYCLES		
				POWER OFF		
	1751	-52.6°	-48.8°	POWER ON		
	1754	-49.2°		TEMP. NOW INCREASING		
	1759	+76°	-16.6°	ROOM AMBI. TEMP.		
	1824	76°	+73.4°	POWER OFF		

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



APPENDIX K VIBRATION AND OPERATIONAL SHOCK TEST SETUP, DATA SHEET(S), AND PLOTS

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 67

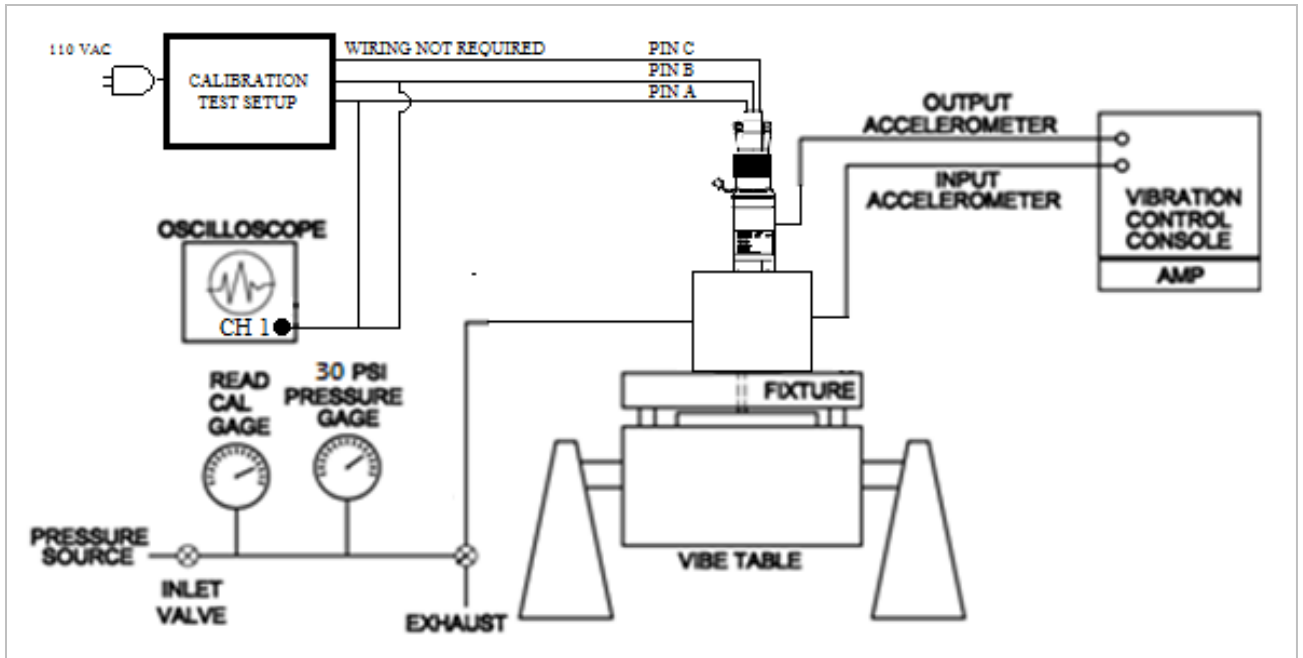
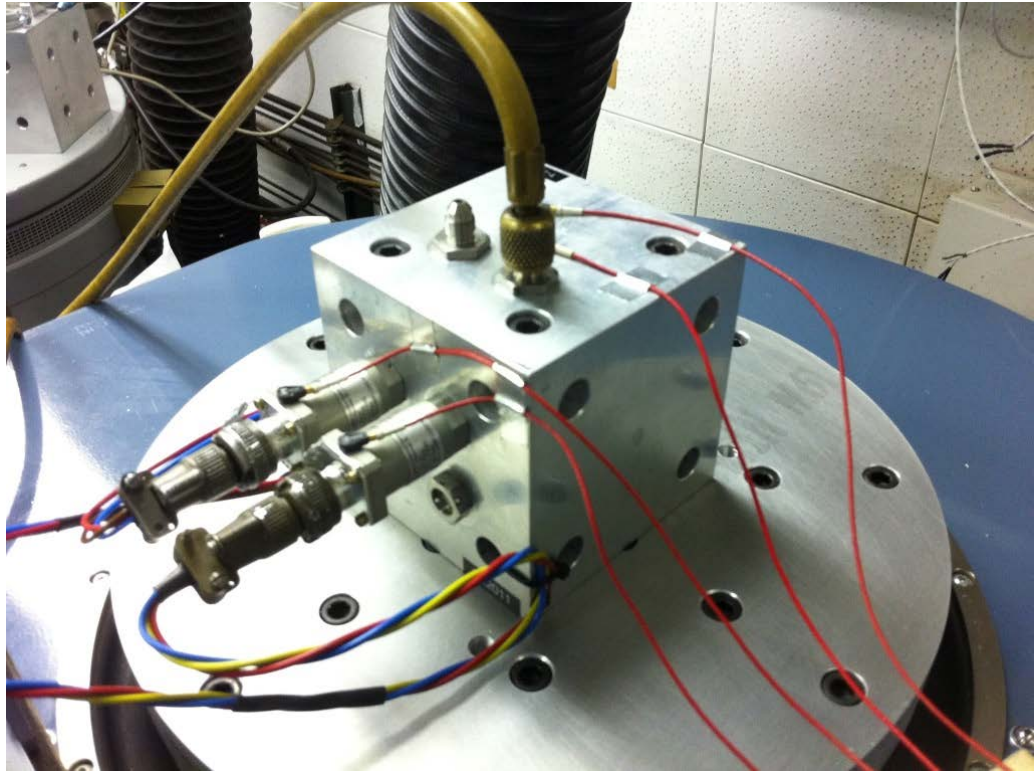


Figure 23: Vibration Test Setup Diagram

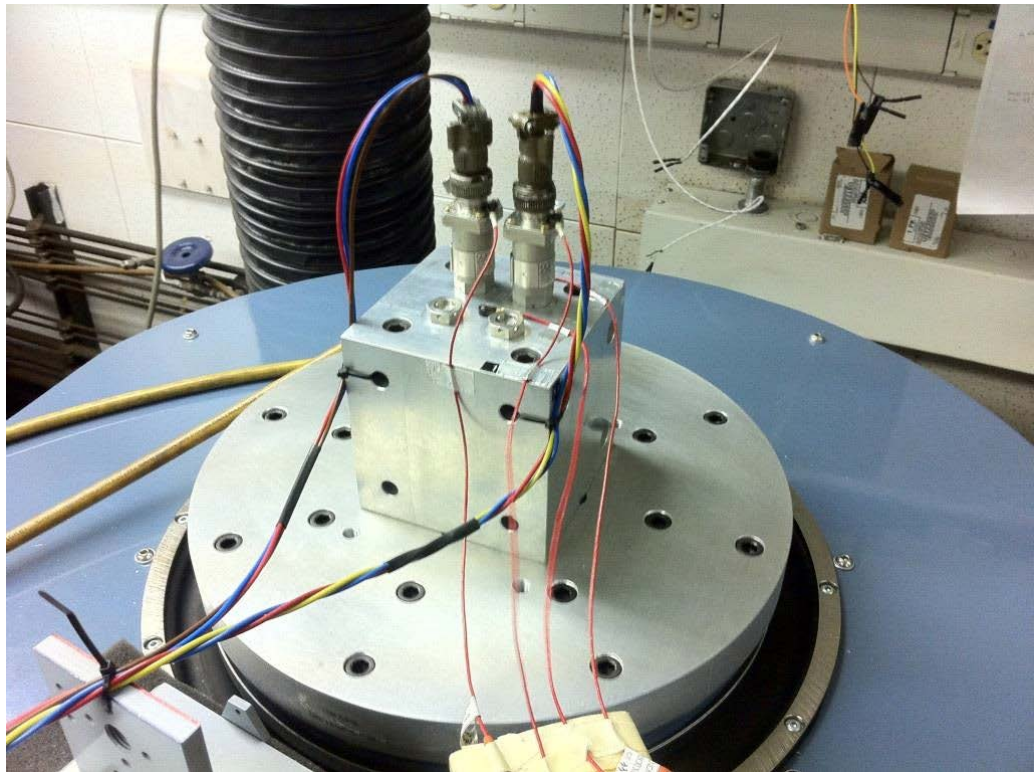


Figure 24: Vibration Test Setup

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 68

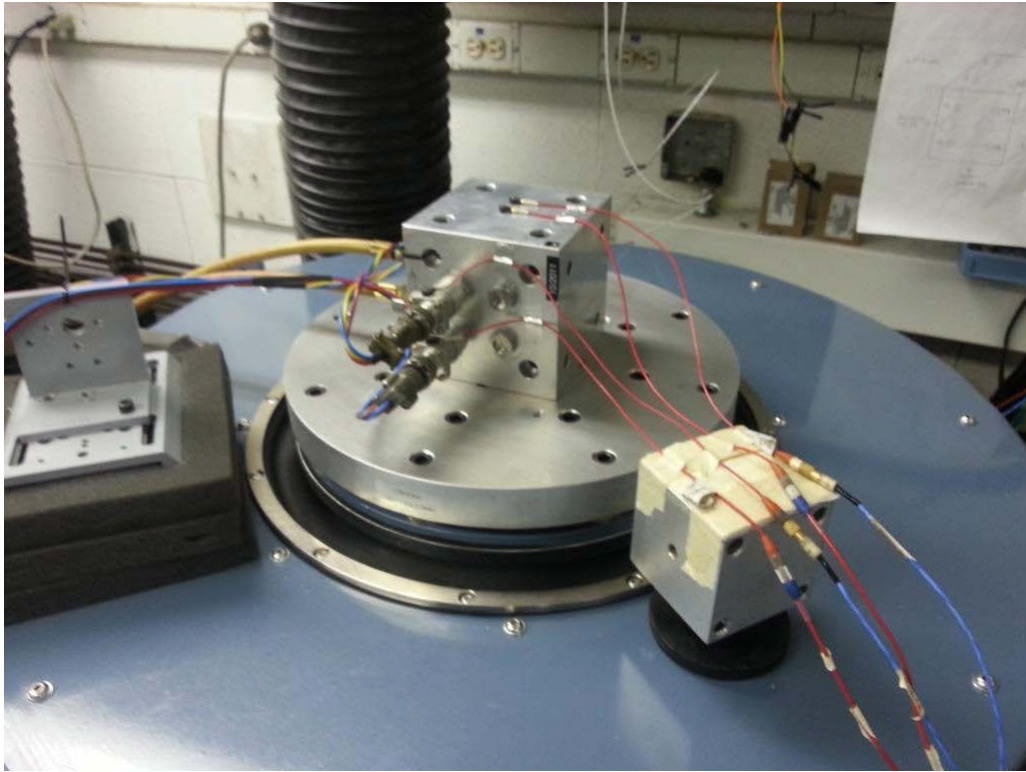


**Figure 25: Vibration Test Setup (X-Axis)**



**Figure 26: Vibration Test Setup (Y-Axis)**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 69



**Figure 27: Vibration Test Setup (Z-Axis)**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 70

Vibration and Operational Shock Data Sheets and Plots  
X-AXIS

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 71



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP/RH		761191 SN007	761191 SN008
3-6-2014	1303	77° 44%		7.31	7.09
				4.43	4.42
X-AXIS:	1313	BEGIN RESONANCE SWEEP			
	1330	SWEEP COMPLETE			
	1353			7.29	7.08
				4.41	4.44
	1406	BEGIN RANDOM W/ SINE (PERFORMANCE)			
	1407	BEGIN FREQ SWEEP			
	1412	79° 43% NO CHATTER		7.20	6.99
	1413			4.57	4.56
	1418	NO CHATTER		7.21	7.11
	1419			4.52	4.52
	1424	NO CHATTER		7.25	7.19
	1425			4.55	4.55
	1427	STOP VIBRATION		7.23	7.17
				4.44	4.47
	1501	RESONANCE DWELL SN008 (CH4)			
		AT 717 HZ / 16.99gs, RESPONSE IS 88.9gs			

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

### CCS LABORATORY DATA SHEET

SAR/ENG NO:

#### RECORDED TEST DATA:

DATE	TIME	TEMP/RH			SN007	SN008	
3-6-2014	1531	DWELL	COMPLETE,	RESPONSE IS		74.0g <sup>s</sup>	
X-AXIS							
	1609	81° 40%			7.33	7.37	
					4.45	4.48	
	1620	BEGIN RANDOM W/ SINE (ENDURANCE)					
	1650	80° 45%	NO CHATTER		7.27	7.27	
					4.60	4.60	
	1720	80° 45%	NO CHATTER		7.30	7.29	
					4.60	4.63	
	1750	80° 46%	130		7.34	7.39	
					4.53	4.56	
			222				
	1820	80° 46%	140		7.41	7.46	
					4.53	4.54	
		RETORQUE SN008 BACKSHELL (AMC)					
	1830	RESUME VIBRATION					

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

### CCS LABORATORY DATA SHEET

SAR/ENG NO:

#### RECORDED TEST DATA:

DATE	TIME	TEMP/RH			SM007	SM008	
3-6-2014	1841	STOP	NO ADDITIONAL	CHATTER			
X-AXIS							
	1846	81° 43%			7.40	7.37	
					4.43	4.46	
	1858	BEGIN RANDOM W/SINE (PERFORMANCE)					
	1903	80° 44%	NO CHATTER		7.32	7.21	
					4.60	4.54	
	1908	80° 44%	NO CHATTER		7.28	7.28	
					4.57	4.54	
	1913	80° 44%	NO CHATTER		7.28	7.21	
					4.60	4.56	
		STOP VIBRATION					
	1918	80° 44%			7.32	7.31	
					4.45	4.44	
	1921	BEGIN RESONANCE SWEEP					
	1937	SWEEP COMPLETE					
	1943	79° 44%			7.49	7.34	
					4.47	4.45	

Test Performed by:

DATE: \_\_\_\_\_



List of Resonances: Sweeping UP

SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION:

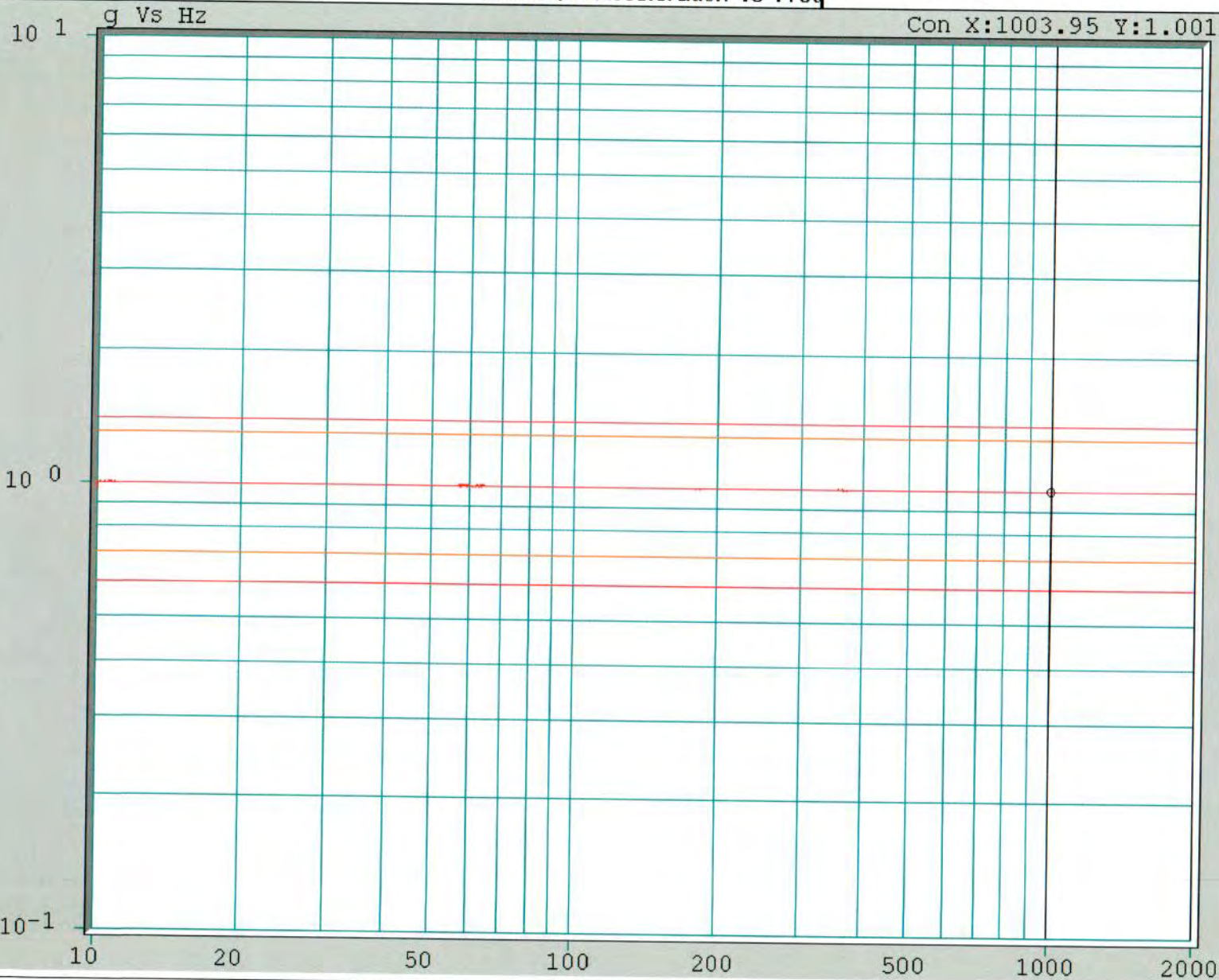
RUN NAME: run2

RUN DESC:

Ratio Limit Entered(g/g): 2.00

Chan	Freq(Hz)	g/g	CON (g)	CH (g)	Q	Phase
1	Not found					
2	817.938	9.50	1.0	9.5	28.87	39.30
3	Not found					
4	767.618	10.46	1.00	10.5	23.00	34.37

Control,1 - Acceleration vs Freq



Save 2 of 2

3/6/2014  
1:29:10 PM

Total: 0:15:34

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq 2000.00  
Hz

Ref 1.00  
g-pk

Acc 1.001  
g-pk

Vel 0.03  
in/s-pk

Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION: X-Axis

RUN NAME: run2

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

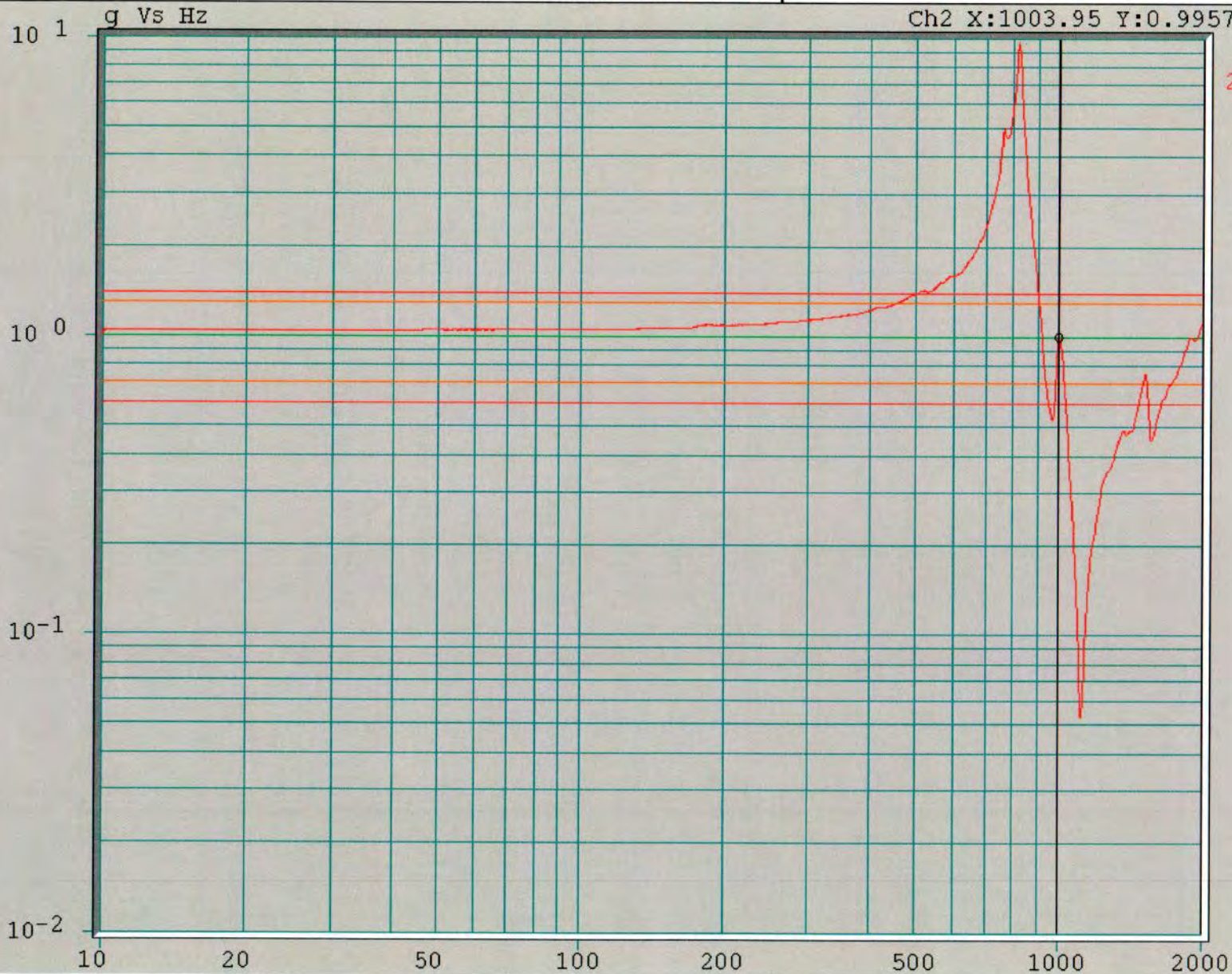
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

2 - Acceleration vs Freq



g-pk  
2:1.13

Save 2 of 2

3/6/2014  
1:29:10 PM

Total: 0:15:34

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq Hz 2000.00

Ref g-pk 1.00

Acc g-pk 1.001

Vel in/s-pk 0.03

Disp mils pk-pk 0.00

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION: X-113

RUN NAME: run2

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

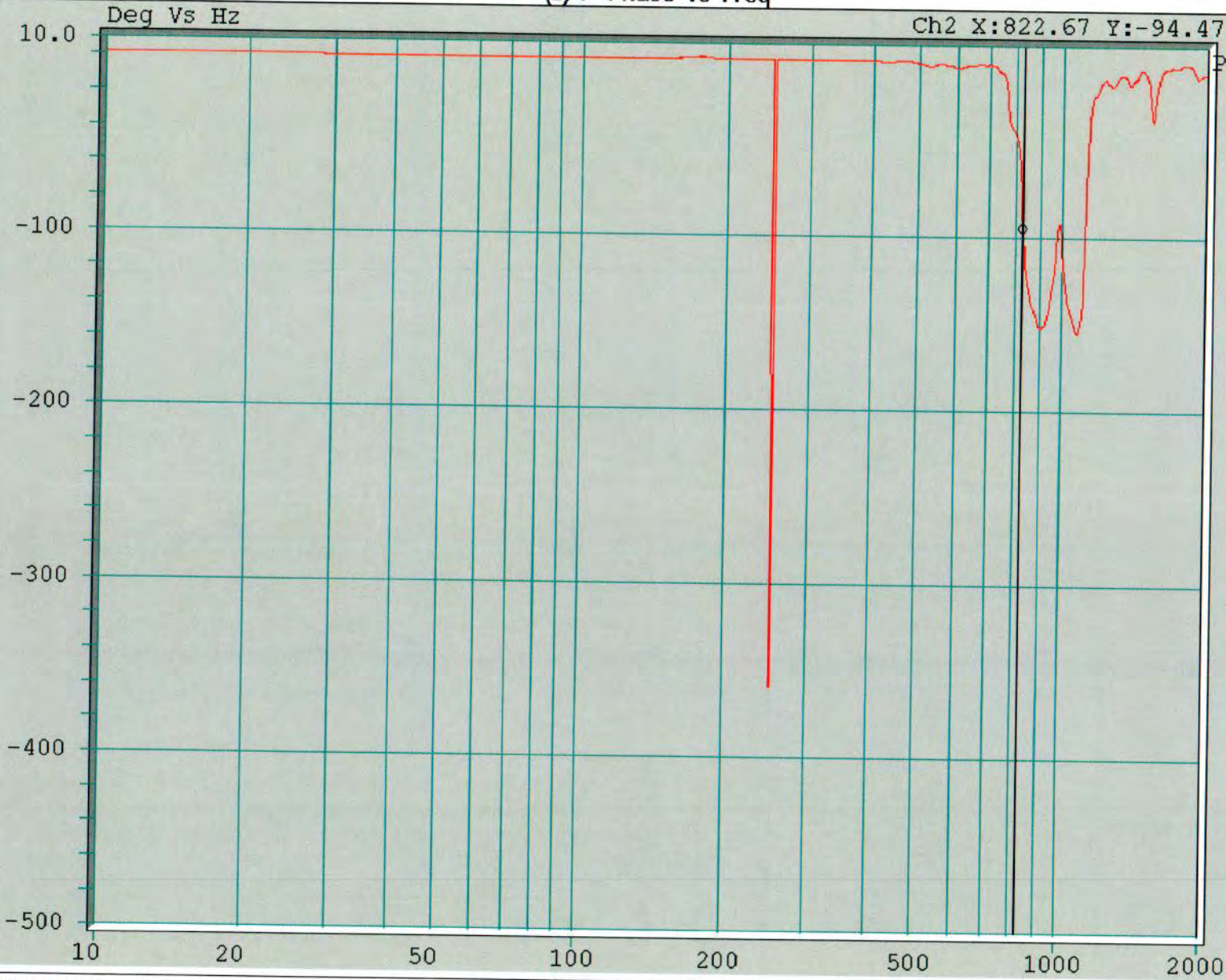
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

(2)-1 - Phase vs Freq

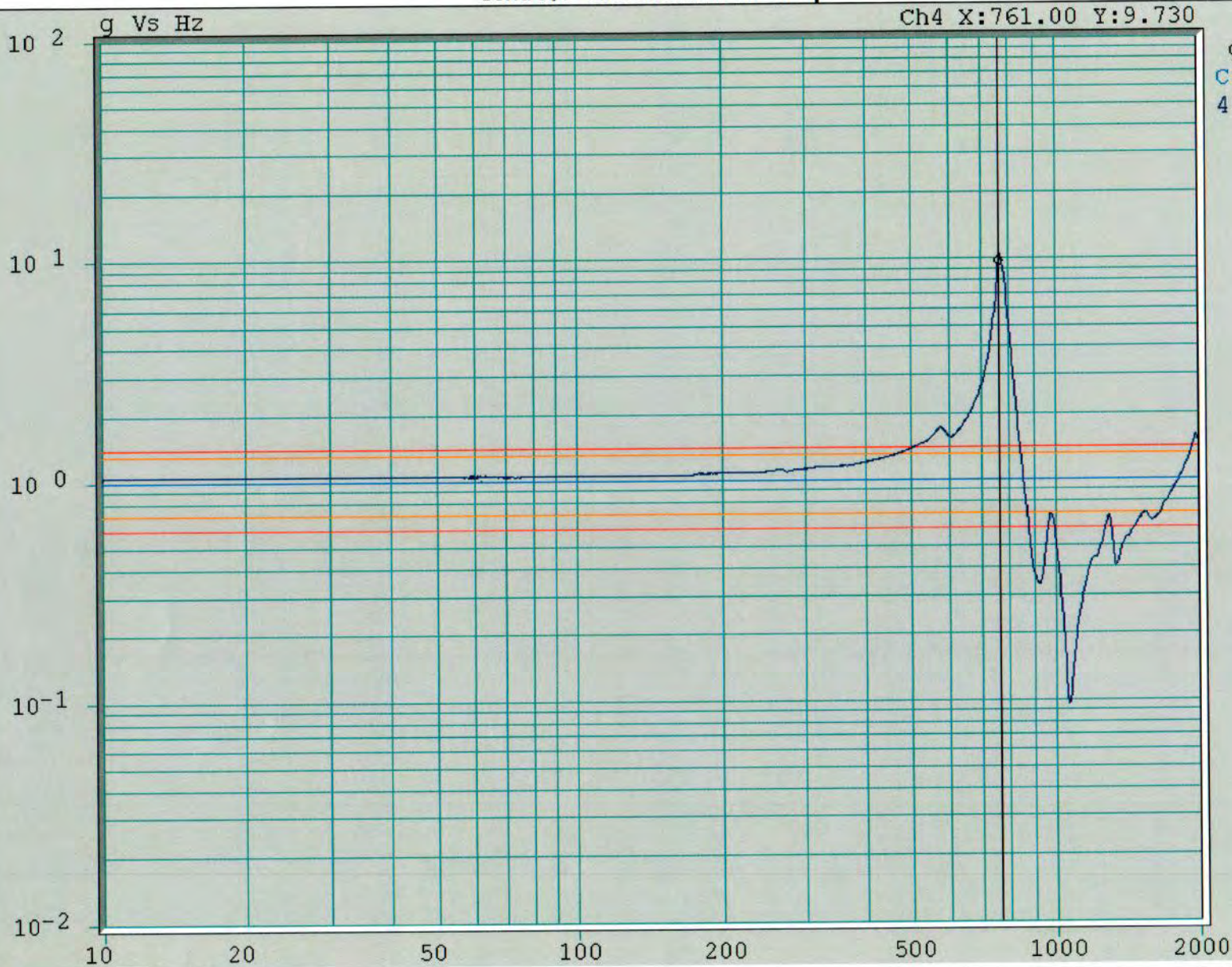


3/6/2014  
1:41:54 PM  
Total: 0:15:34  
Auto: 0:15:18  
Swp 1 of 1  
Status: Auto  
**FINISHED**  
Freq 2000.00 Hz  
Ref 1.00 g-pk  
Acc 1.001 g-pk  
Vel 0.03 in/s-pk  
Disp 0.00 mils pk-pk  
Swp : 15 min 18 sec  
Servo(dB/s): 1K  
Freq : Log  
Type:Single  
C:1  
AutoSave  
S:1,2



SINE SETUP ID: Bell 1 g resonance search  
SETUP DESCRIPTION: X-AXIS  
RUN NAME: run2  
CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      RUN DESC:      CH-4: 10.00 mV/g  
Vwin II

Control,4 - Acceleration vs Freq



g-pk  
C:1.00  
4:1.41

3/6/2014  
1:30:18 PM

Total: 0:15:34  
Auto: 0:15:18  
Swp 1 of 1

Status: Auto  
**FINISHED**

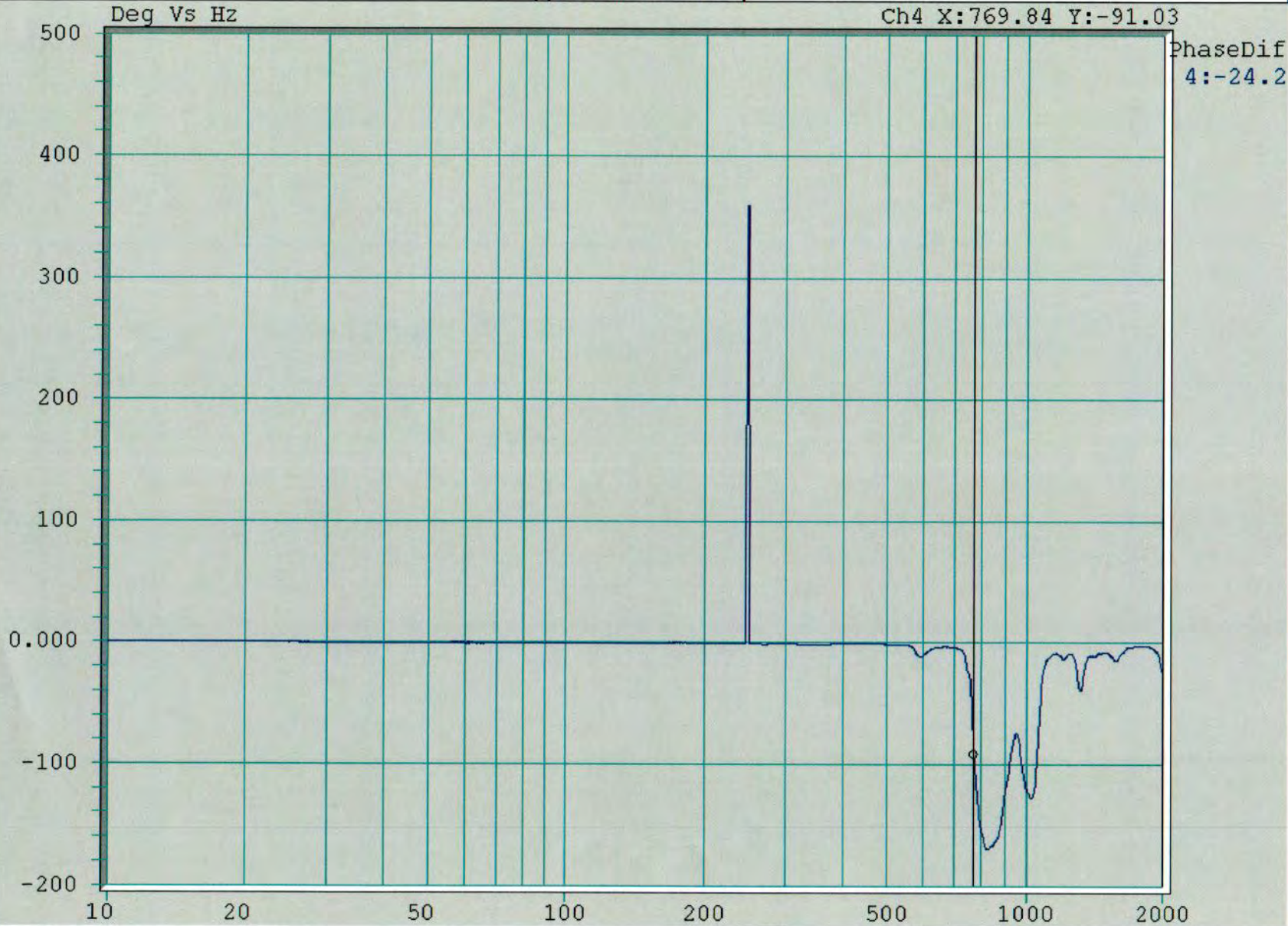
Freq Hz: 2000.00  
Ref g-pk: 1.00  
Acc g-pk: 1.001  
Vel in/s-pk: 0.03  
Disp mils pk-pk: 0.00

Swp : 15 min 18 sec  
Servo(dB/s): 1K  
Freq : Log  
Type:Single  
C:1  
AutoSave  
S:1,2



SINE SETUP ID: Bell 1 g resonance search  
 SETUP DESCRIPTION: X-AYS  
 RUN NAME: run2  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      CH-4: 10.00 mV/g  
 RUN DESC: Vwin II

(4)-1 - Phase vs Freq



3/6/2014  
1:42:2 PM

Total: 0:15:34

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq 2000.00  
Hz

Ref 1.00  
g-pk

Acc 1.001  
g-pk

Vel 0.03  
in/s-pk

Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION: X-AXIS

RUN NAME: run2

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq

3/6/2014 2:29:13 PM

TOTAL : 0:19:28

0:18:29 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
20.37	2.00	2.00	g pk
52.29	5.00	5.00	g pk
103.9	10.00	10.02	g pk
430.1	16.70	16.55	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

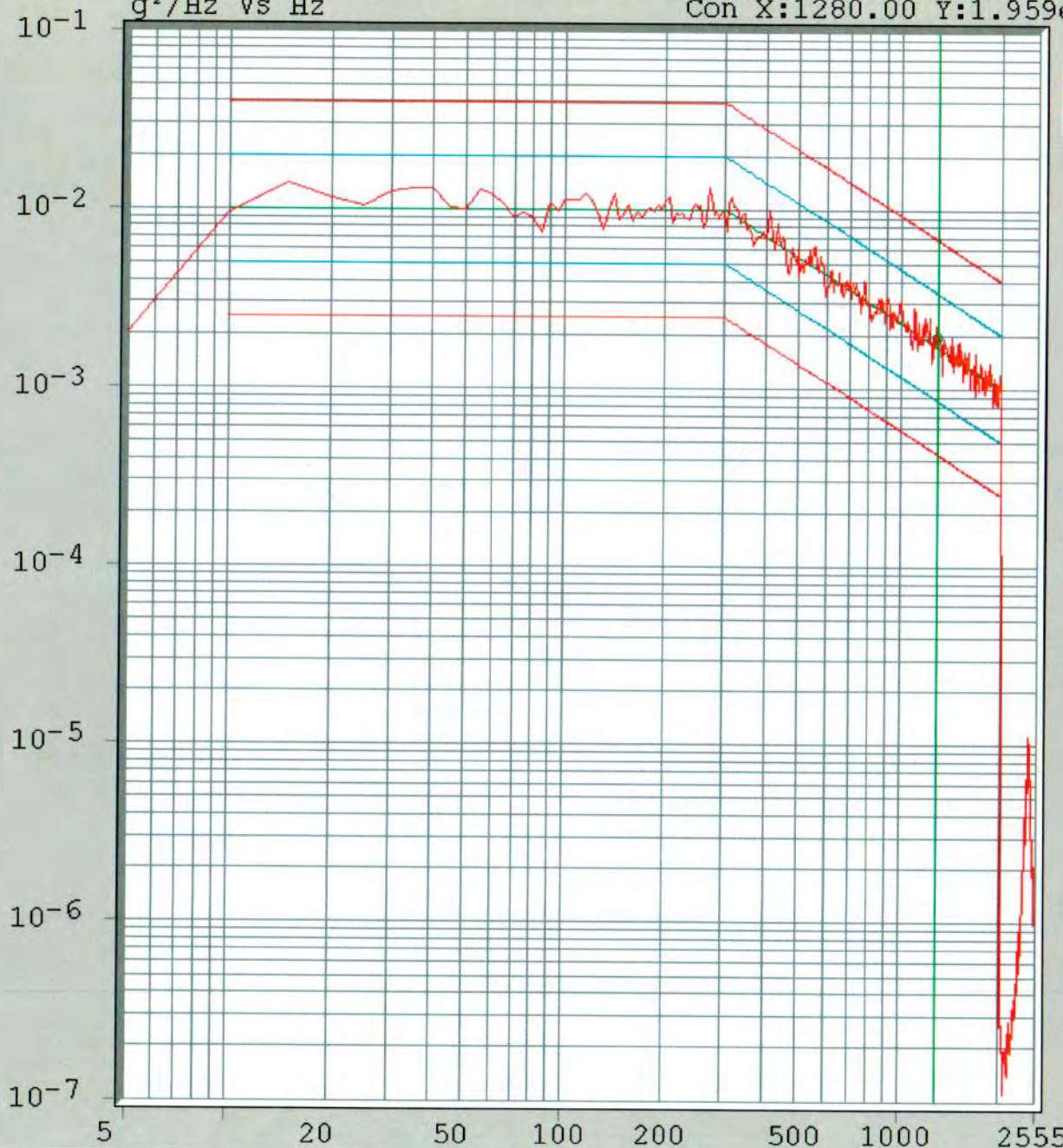
DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4

grms  
C:2.80  
1:2.80



SOR SETUP ID: 7G1191  
 SETUP DESCRIPTION:  
 RUN NAME: run11  
 CH-1: 10.00 mV/g

*X-AXIS PERFORMANCE*

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g



Vwin II

Control,1 (Tones) - Acceleration vs Freq

3/6/2014 2:29:27 PM

TOTAL : 0:19:28

0:18:29 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
20.37	2.00	2.00	g pk
52.29	5.00	5.00	g pk
103.9	10.00	10.02	g pk
430.1	16.70	16.55	g pk

Log Sweep: 5.00 Min

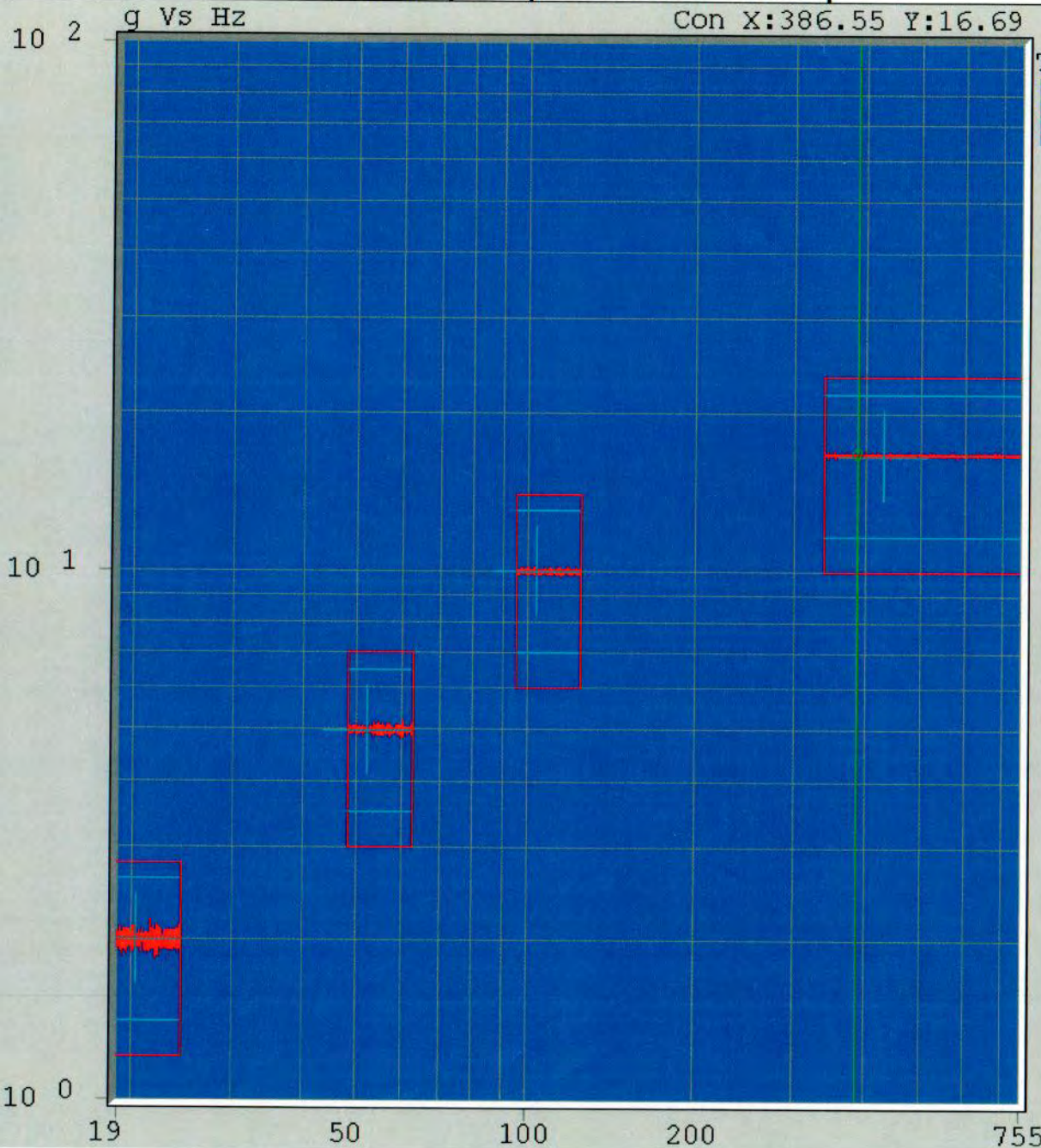
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



T1 g-pk

C:2.00

I:2.00

Con X:386.55 Y:16.69

SOR SETUP ID: 7G1191

SETUP DESCRIPTION: X-AXIS, Performance levels

RUN NAME: run11

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

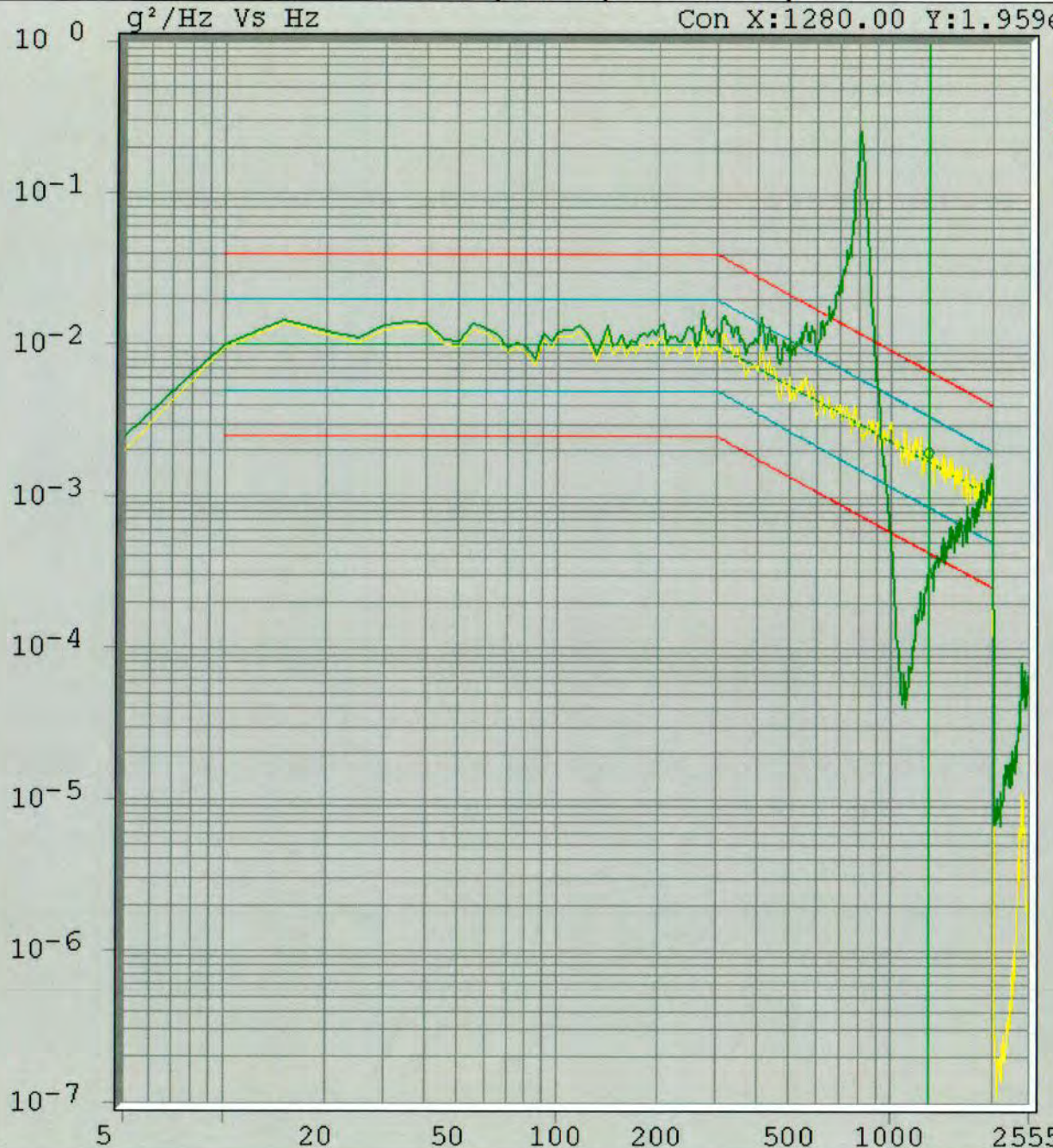
RUN DESC:

CH-4: 10.00 mV/g



Vwin II

Control,2 (Random) - PSD vs Freq



grms  
C:2.80  
2:4.92

3/6/2014 2:29:37 PM

TOTAL : 0:19:28

0:18:29 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	
20.37	2.00	2.00	g pk
52.29	5.00	5.00	g pk
103.9	10.00	10.02	g pk
430.1	16.70	16.55	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: X-AXIS, PERFORMANCE LEVELS

RUN NAME: run11

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

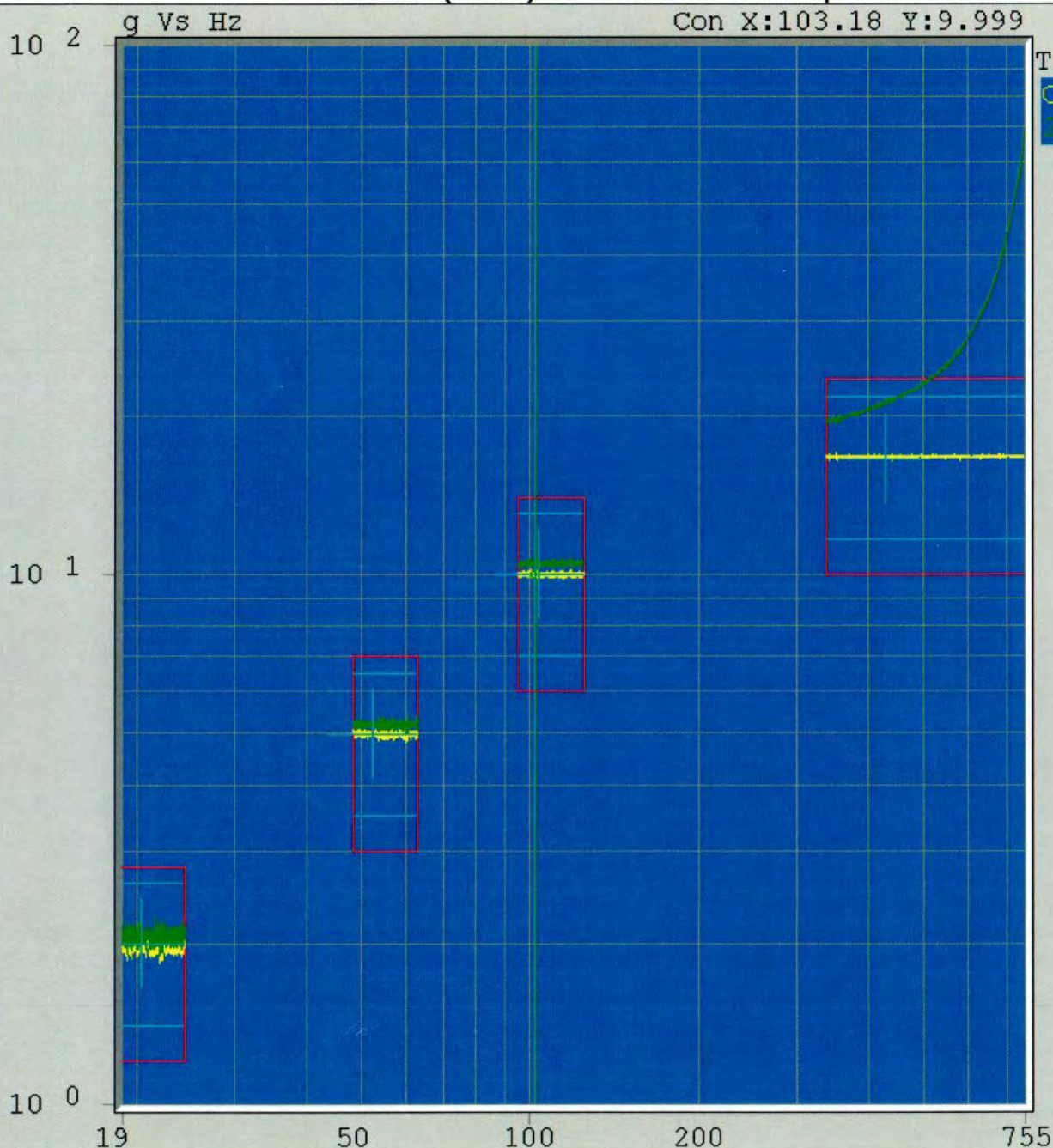
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

vwin II

Control,2 (Tones) - Acceleration vs Freq



T1 g-pk  
C:2.00  
Z:2.07

3/6/2014 2:29:46 PM

TOTAL : 0:19:28

0:18:29 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
20.37	2.00	2.00	g pk
52.29	5.00	5.00	g pk
103.9	10.00	10.02	g pk
430.1	16.70	16.55	g pk

Log Sweep: 5.00 Min  
Servo(dB/s): 100  
DOF: 100  
Lines/Res: 500/ 5.00 Hz  
C:1  
S:1,2,3,4



SOR SETUP ID: 7G1191  
SETUP DESCRIPTION: X-AXIS, PERF. LEVELS  
RUN NAME: run11  
CH-1: 10.00 mV/g

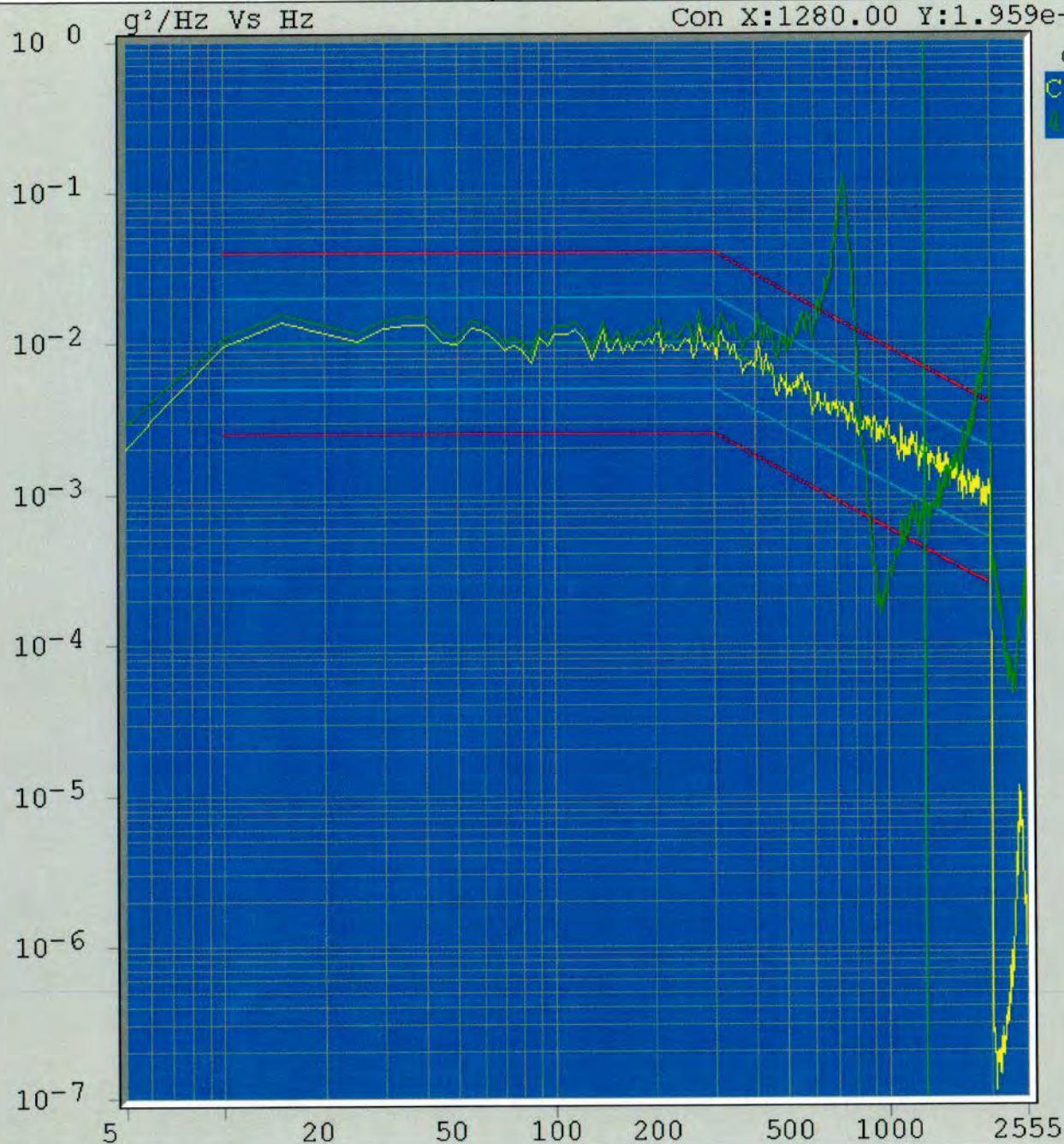
CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: CH-4: 10.00 mV/g

vwin II

Control,4 (Random) - PSD vs Freq



3/6/2014 2:30:10 PM

TOTAL : 0:19:28

0:18:29 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
20.37	2.00	2.00	g pk
52.29	5.00	5.00	g pk
103.9	10.00	10.02	g pk
430.1	16.70	16.55	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: X-AXIS, PERF. LEVELS

RUN NAME: run11

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

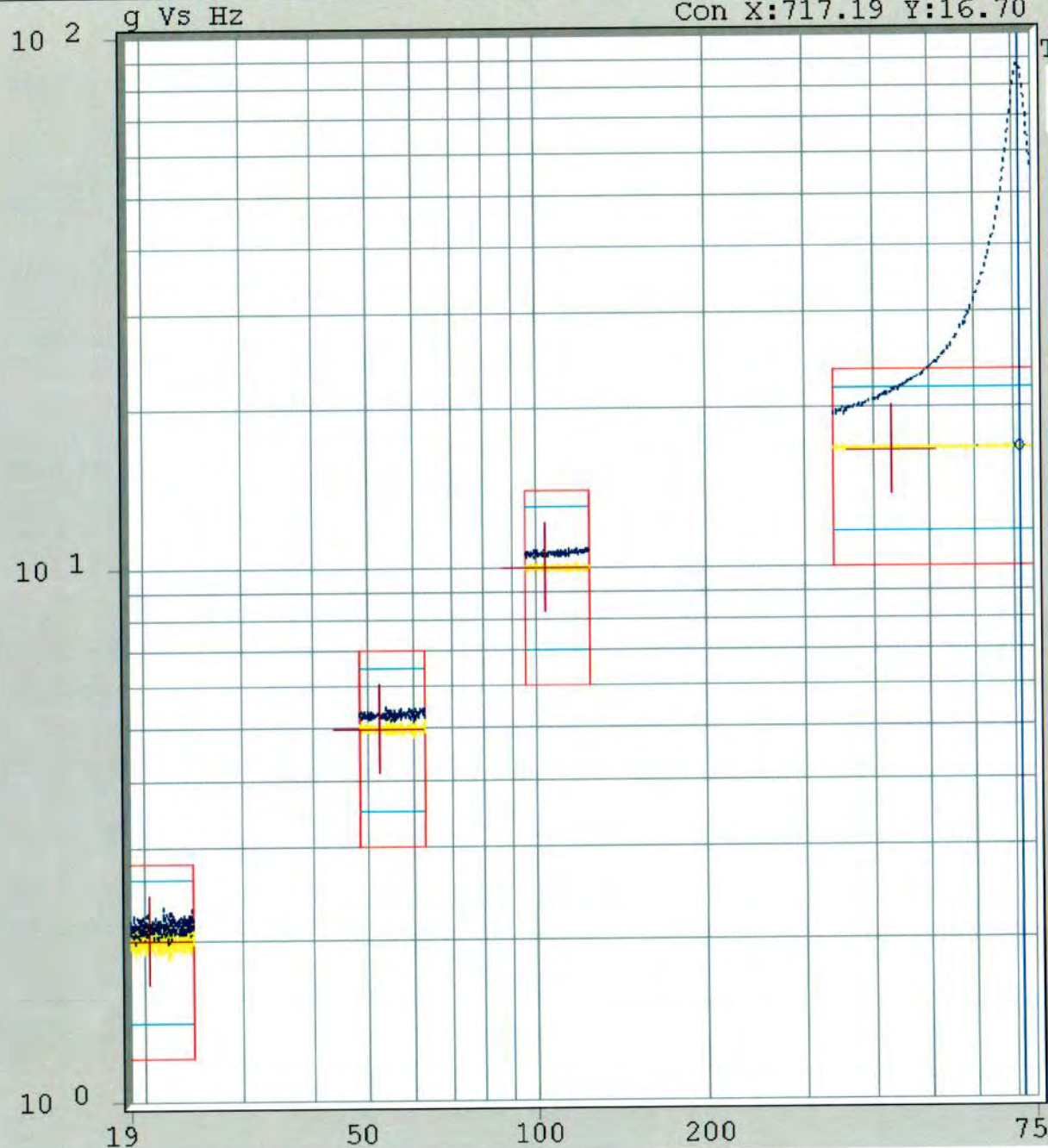
RUN DESC:

CH-4: 10.00 mV/g

vwin II

Control,4 (Tones) - Acceleration vs Freq

Con X:717.19 Y:16.70



T1 g-pk  
C:2.00  
4:2.12

3/6/2014 2:33:58 PM

TOTAL : 0:19:28

0:18:29 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.54	2.75	2.80

TONES

Freq	Ref	Con
20.37	2.00	2.00
52.29	5.00	5.00
103.9	10.00	10.02
430.1	16.70	16.55

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: X-AXIS, PERF. LEVELS

RUN NAME: run11

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

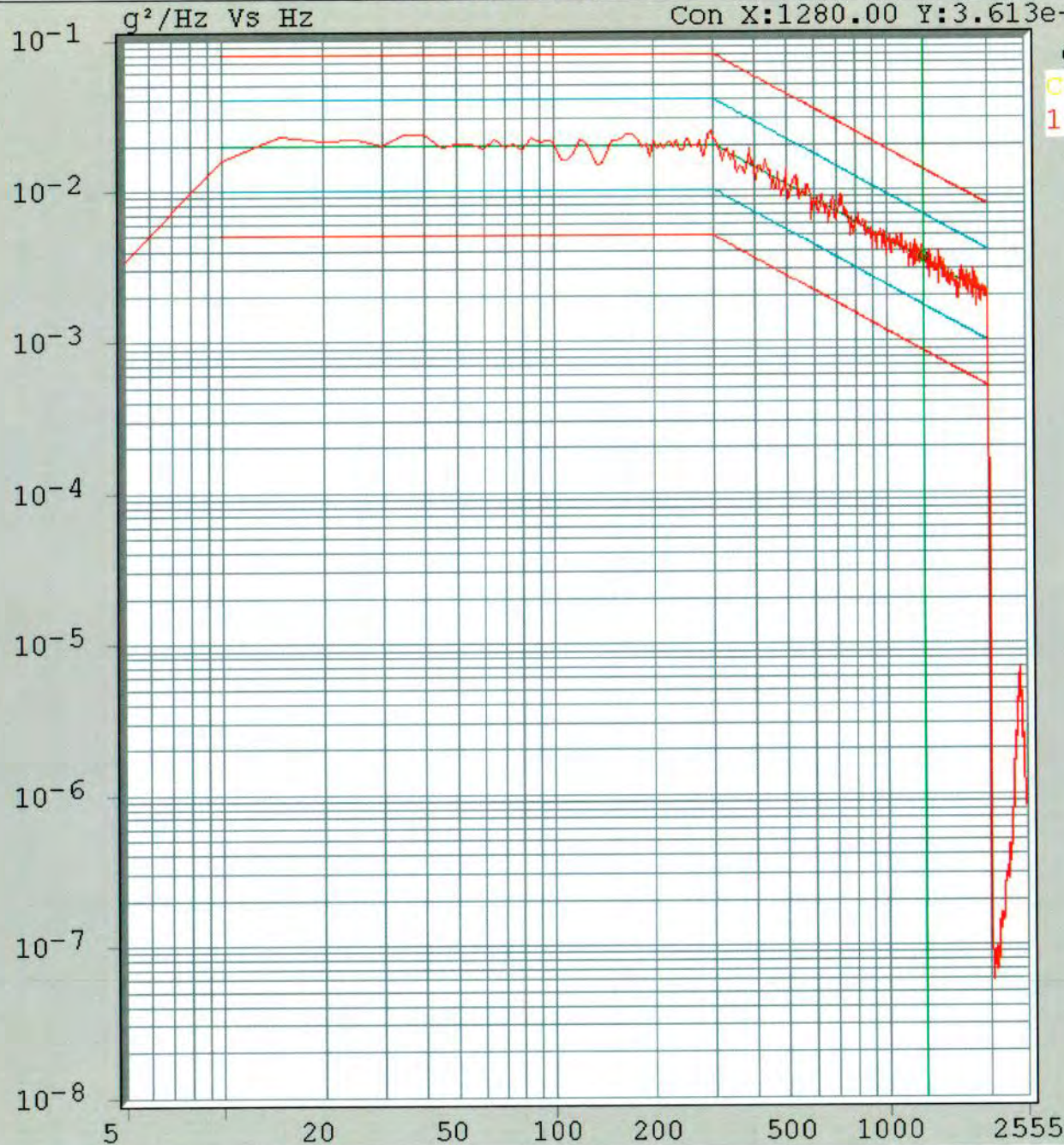
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq



grms  
C:3.91  
1:3.91

3/6/2014 4:20:43 PM

TOTAL : 0:1:35

0:0:30 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
17.91	3.89	3.91

TONES

Freq	Ref	Con	g pk
19.30	4.00	3.92	g pk
49.58	6.30	6.31	g pk
98.48	12.50	12.51	g pk
365.3	20.00	19.99	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

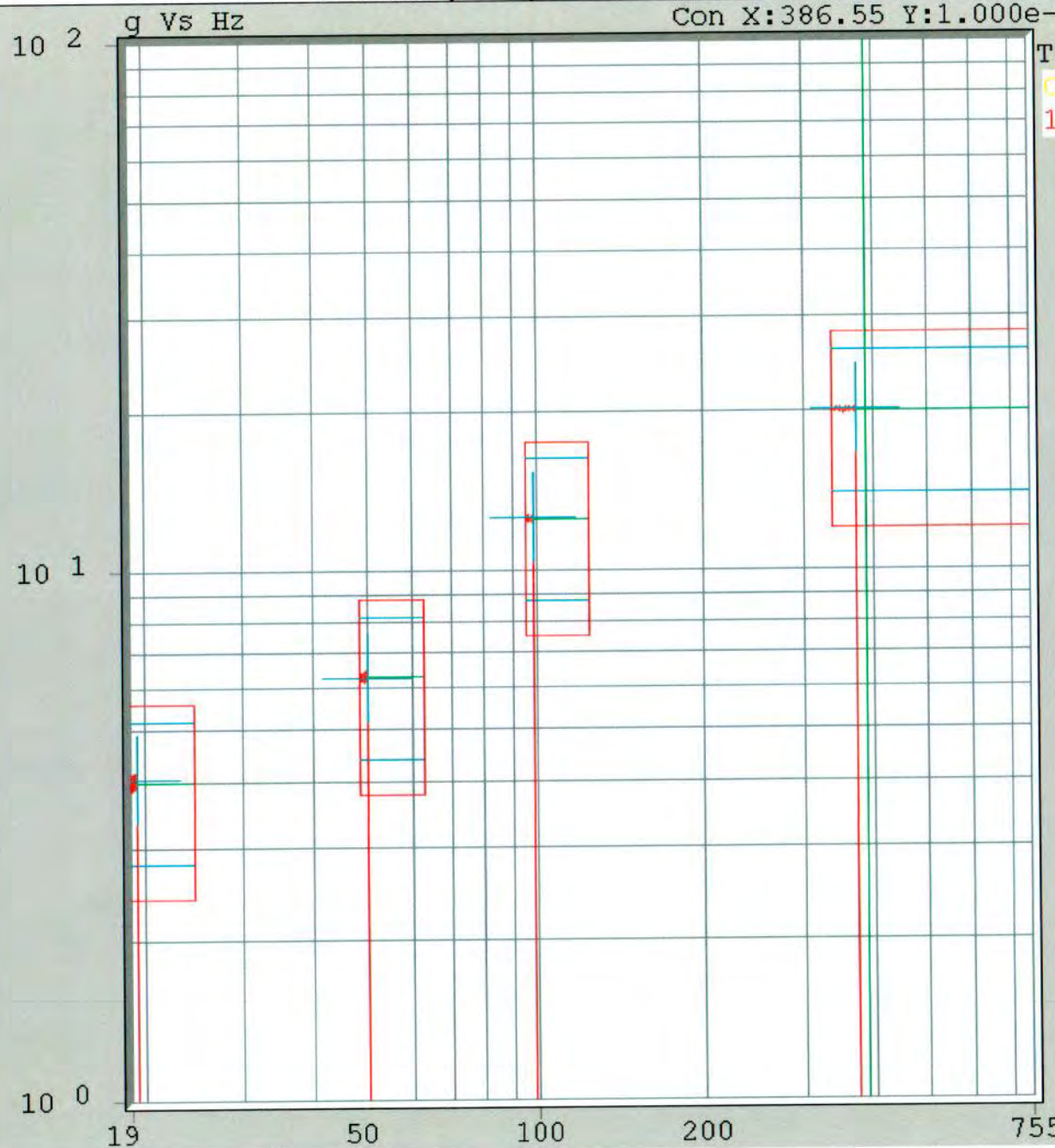
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones) - Acceleration vs Freq



3/6/2014 4:20:50 PM

TOTAL : 0:1:42

0:0:36 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.95

TONES

Freq	Ref	Con
19.41	4.00	4.04
49.85	6.30	6.26
99.00	12.50	12.56
371.3	20.00	20.09

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

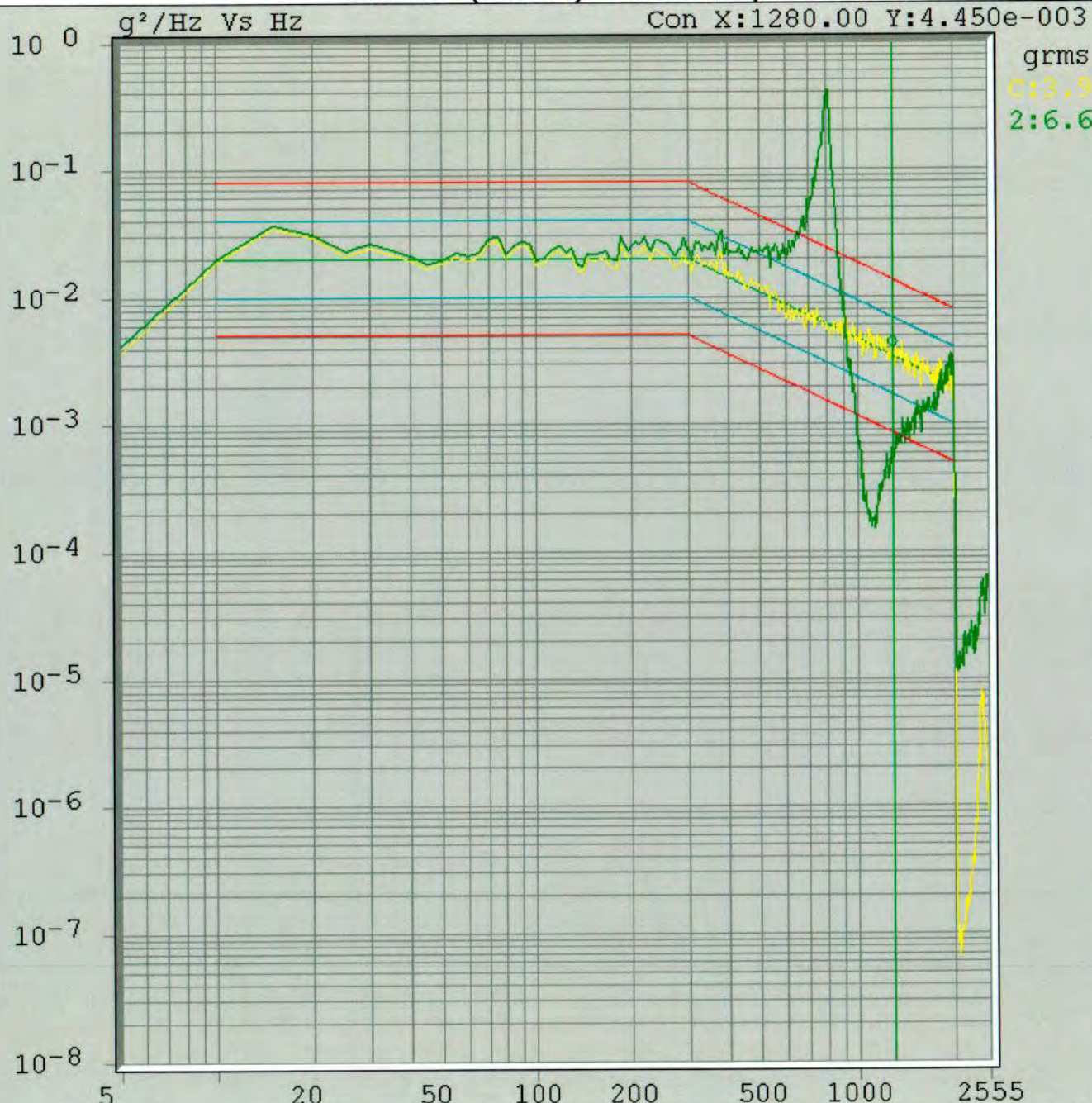
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,2 (Random) - PSD vs Freq



3/6/2014 4:21:0 PM

TOTAL : 0:1:52

0:0:46 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.98

TONES

Freq	Ref	Con	gr pk
19.58	4.00	3.93	gr pk
50.29	6.30	6.34	gr pk
99.89	12.50	12.40	gr pk
381.6	20.00	20.06	gr pk

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels X-AXIS  
 RUN NAME: run7  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

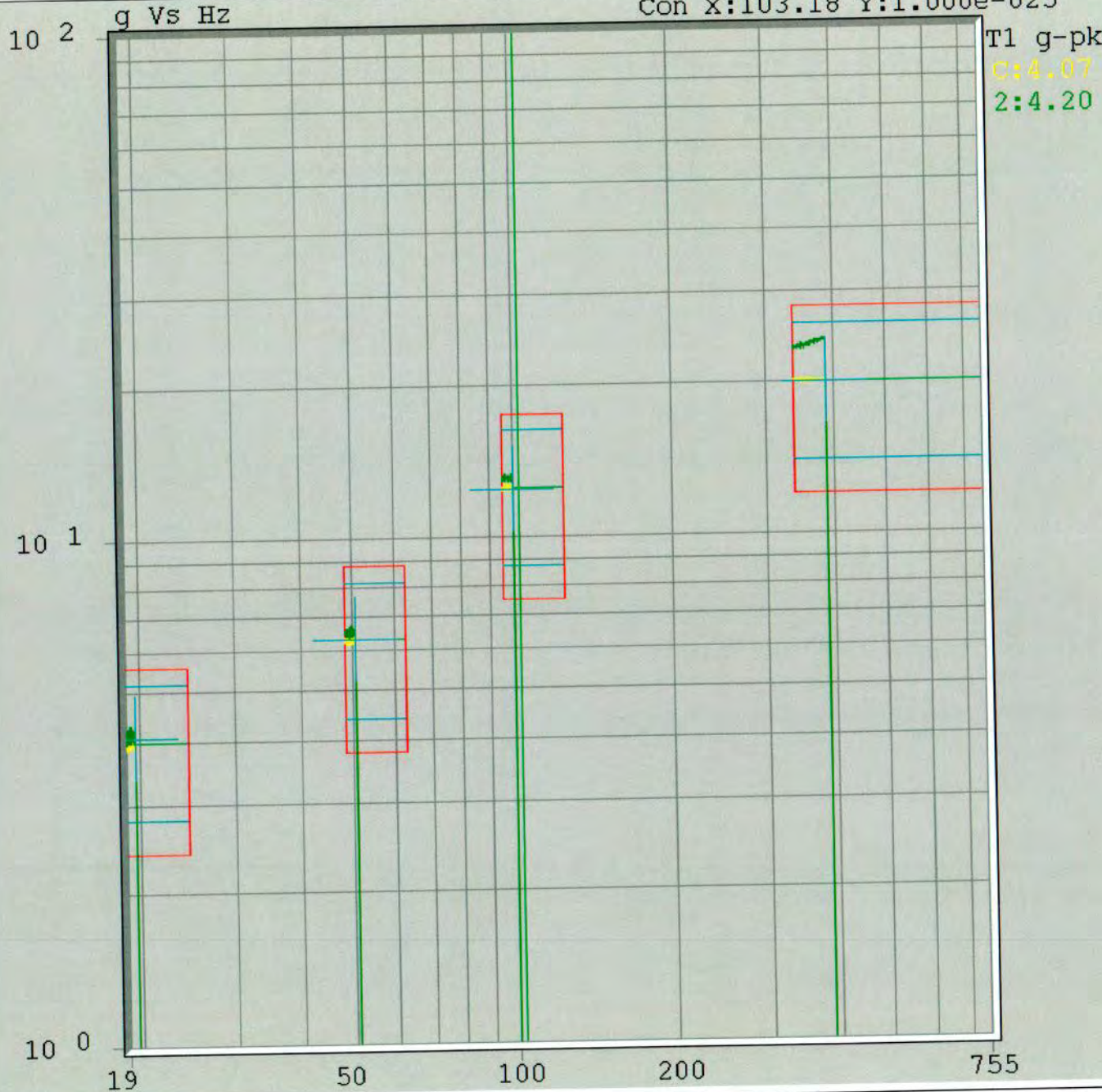
CH-3: 10.00 mV/g

RUN DESC: CH-4: 10.00 mV/g

vwin II

# Control,2 (Tones) - Acceleration vs Freq

Con X:103.18 Y:1.000e-025



3/6/2014 4:21:5 PM

TOTAL : 0:1:57

0:0:52 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
17.90	3.89	3.94

TONES

Freq	Ref	Con
19.68	4.00	4.07
50.53	6.30	6.31
100.4	12.50	12.43
387.2	20.00	19.90

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

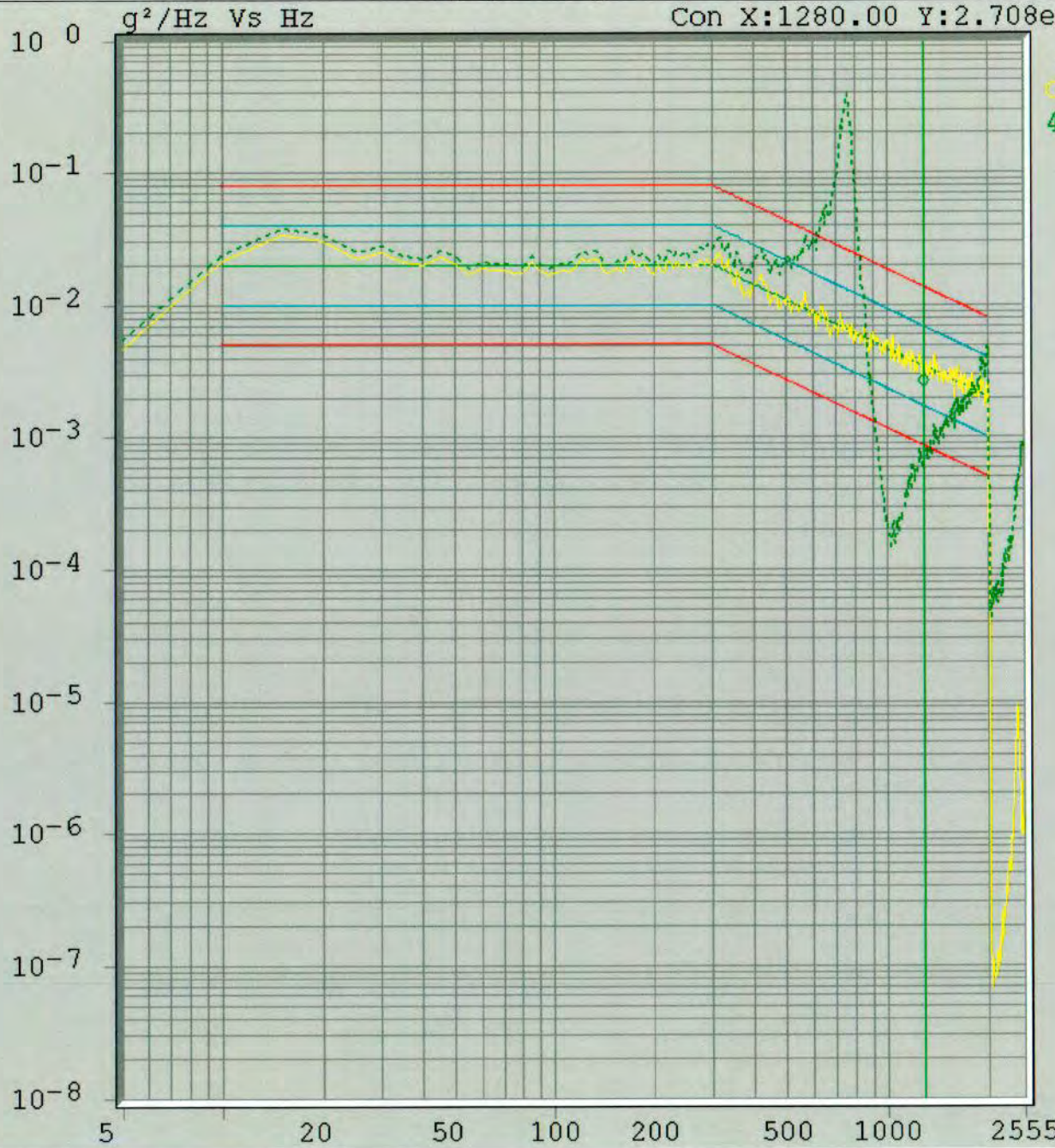
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Random) - PSD vs Freq



3/6/2014 4:21:22 PM

TOTAL : 0:2:14

0:1:8 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.90	3.89	3.91

TONES

Freq	Ref	Con	
19.97	4.00	3.98	g pk
51.28	6.30	6.27	g pk
101.9	12.50	12.39	g pk
405.0	20.00	19.98	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

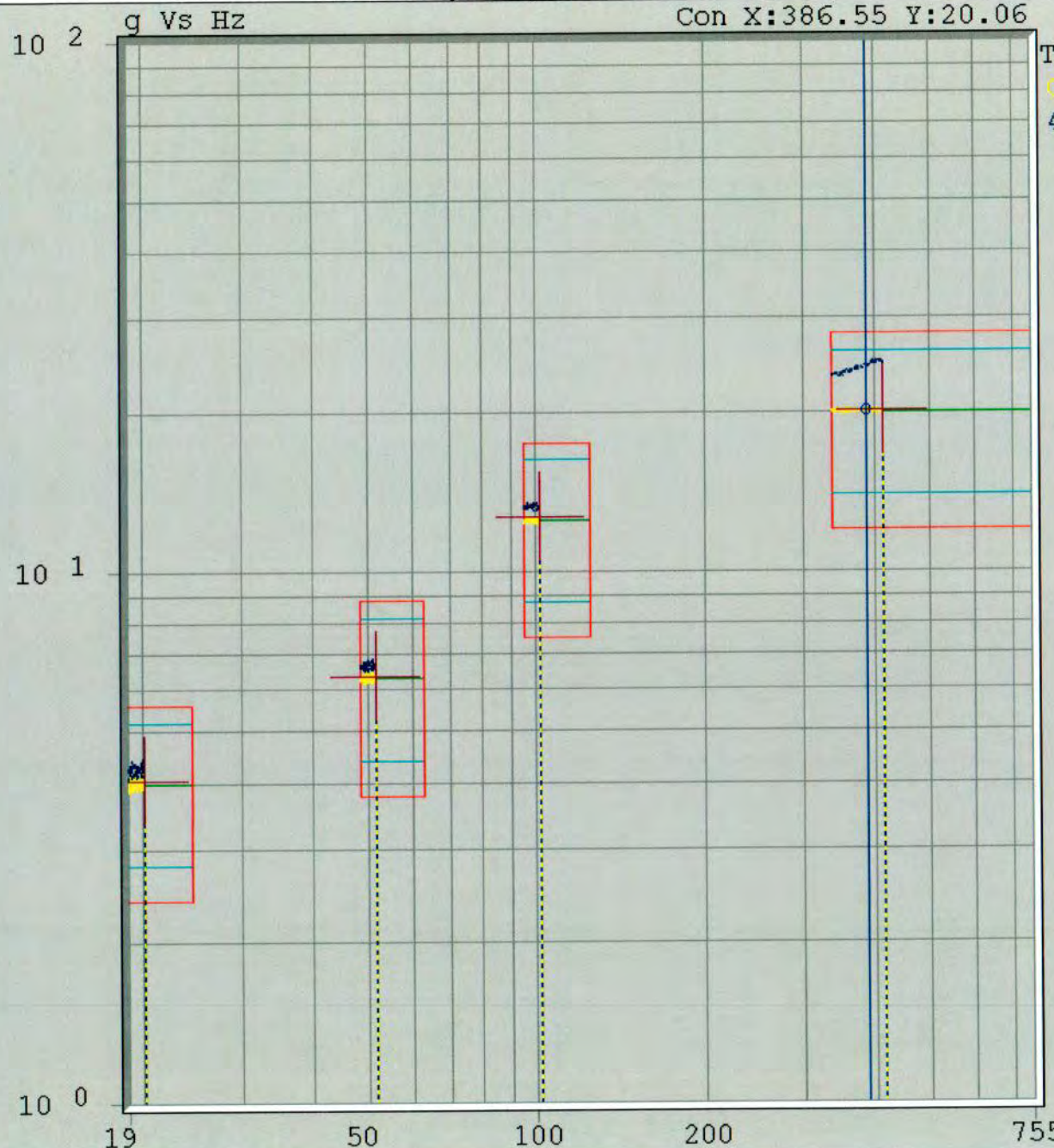
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Tones) - Acceleration vs Freq



T1 g-pk  
C:4.04  
4:4.29

3/6/2014 4:21:28 PM

TOTAL : 0:2:20

0:1:14 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
17.90	3.89	3.95

TONES

Freq	Ref	Con	g pk
20.08	4.00	4.04	g pk
51.55	6.30	6.36	g pk
102.4	12.50	12.65	g pk
411.6	20.00	20.05	g pk

Log Sweep: 5.00 Min  
Servo(dB/s): 100  
DOF: 100  
Lines/Res: 500/ 5.00 Hz  
C:1  
S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
SETUP DESCRIPTION: endurance levels, X-AXIS  
RUN NAME: run7  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

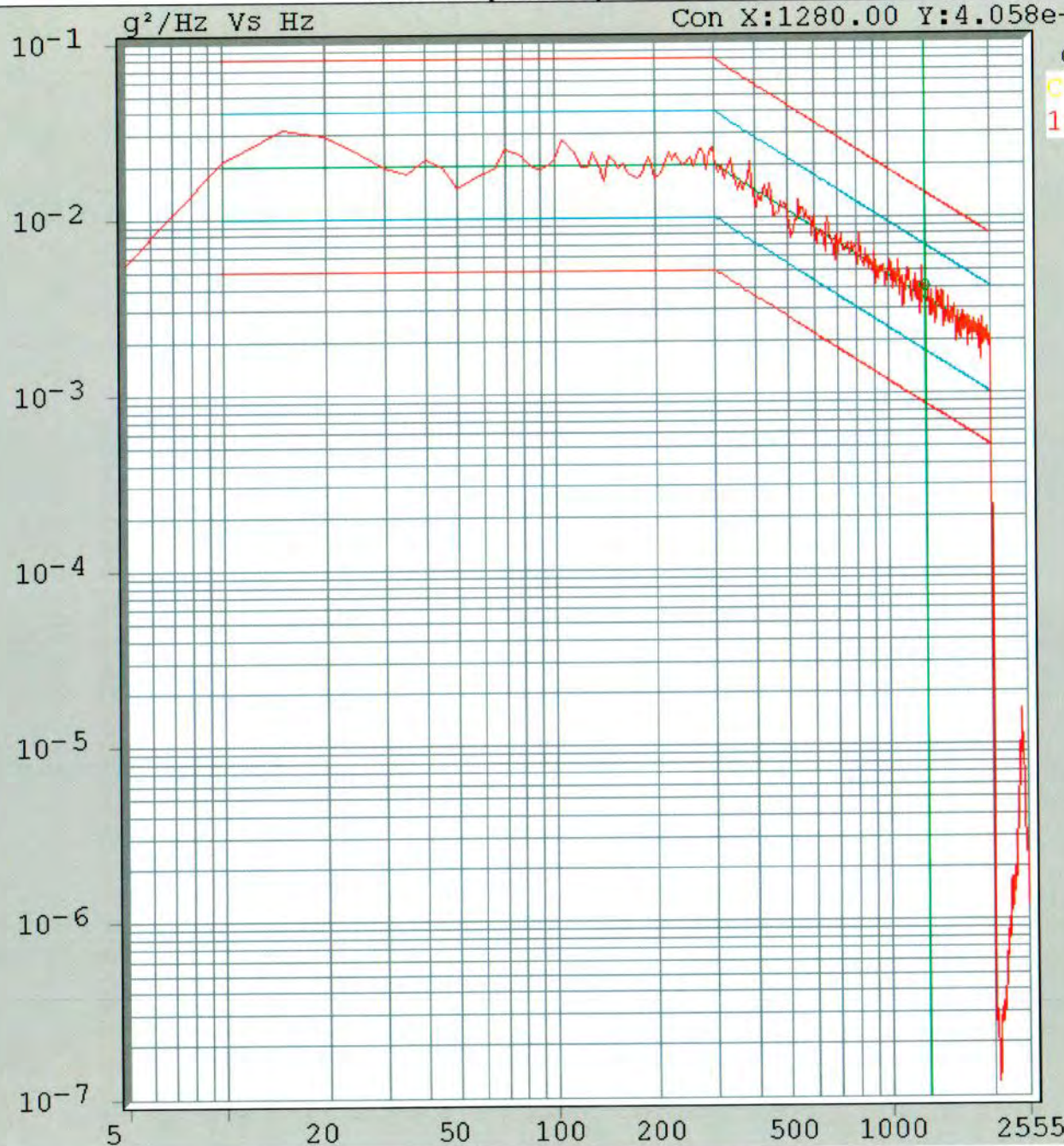
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq



grms  
C:3.95  
1:3.95

Save 1 of 2

3/6/2014 6:22:26 PM

TOTAL : 2:3:17

2:2:13 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
17.92	3.89	3.95

TONES

Freq	Ref	Con	g pk
21.18	4.00	4.03	g pk
54.36	6.30	6.29	g pk
108.1	12.50	12.42	g pk
484.6	20.00	20.13	g pk

Log Sweep: 5.00 Min  
Servo(dB/s): 100  
DOF: 100  
Lines/Res: 500/ 5.00 Hz  
C:1  
S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
SETUP DESCRIPTION: endurance levels, X-AXIS  
RUN NAME: run7  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

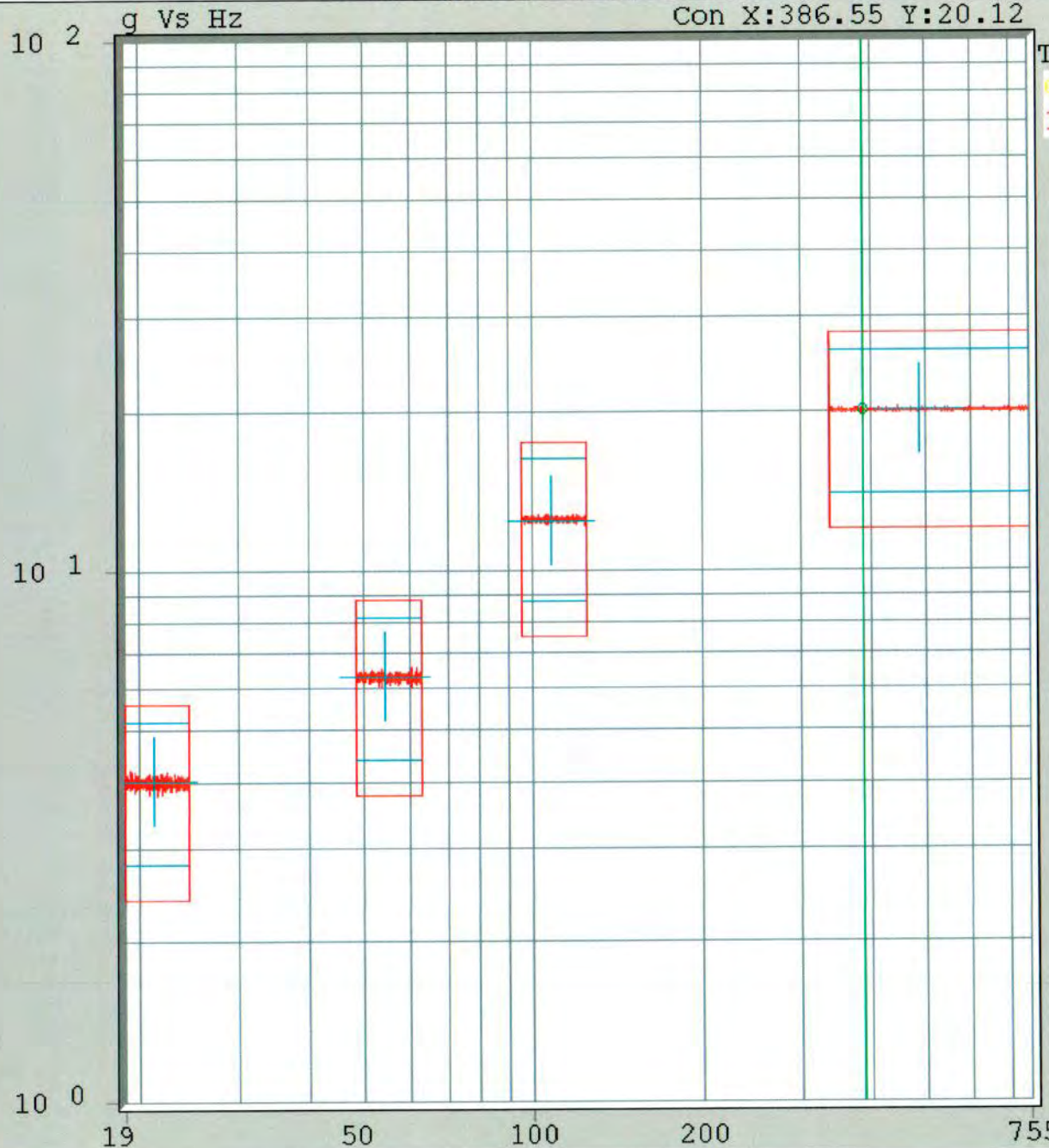
RUN DESC:

CH-4: 10.00 mV/g

Twin II

STOP TO RE-TAKE CONTROL

Control,1 (Tones) - Acceleration vs Freq



T1 g-pk  
C:4.03  
1:4.03

**Save 1 of 2**

3/6/2014 6:22:26 PM

**TOTAL : 2:3:17**

2:2:13 of 6:30:0

**Swp 25**

Status: Auto

**STOPPED**

**Level 0.0dB:100%**

**GRMS**

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.95

**TONES**

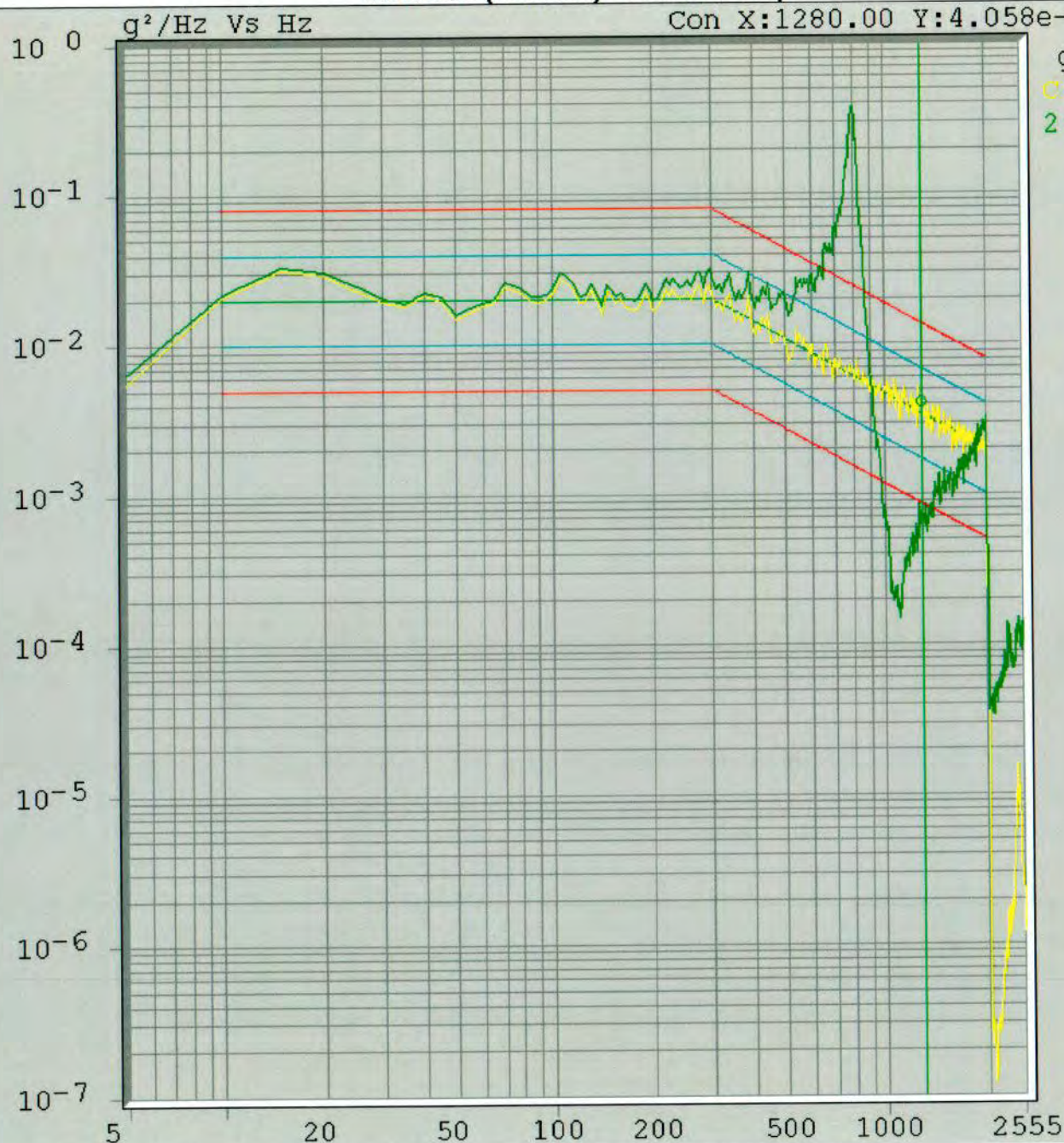
Freq	Ref	Con	g pk
21.18	4.00	4.03	g pk
54.36	6.30	6.29	g pk
108.1	12.50	12.42	g pk
484.6	20.00	20.13	g pk

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels, X-AXIS  
 RUN NAME: run7  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      CH-4: 10.00 mV/g  
 RUN DESC:  
 vwin II

Control,2 (Random) - PSD vs Freq



grms  
C:3.95  
2:6.56

Save 1 of 2

3/6/2014 6:22:26 PM

TOTAL : 2:3:17

2:2:13 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
17.92	3.89	3.95

TONES

Freq	Ref	Con	g pk
21.18	4.00	4.03	g pk
54.36	6.30	6.29	g pk
108.1	12.50	12.42	g pk
484.6	20.00	20.13	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels, X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

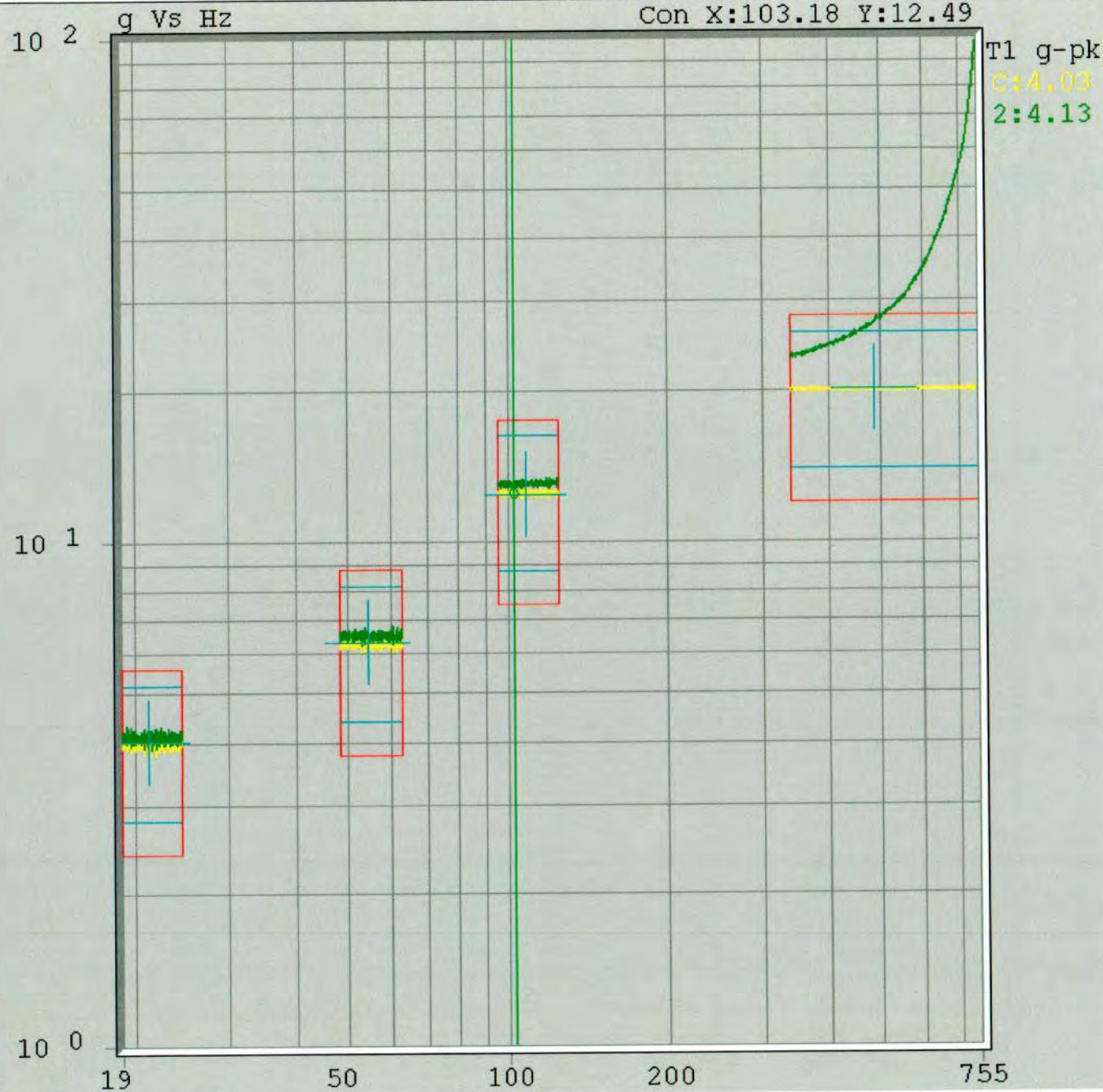
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

vwin II

Control,2 (Tones) - Acceleration vs Freq



Save 1 of 2

3/6/2014 6:22:26 PM

TOTAL : 2:3:17

2:2:13 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.95

TONES

Freq	Ref	Con	g pk
21.18	4.00	4.03	g pk
54.36	6.30	6.29	g pk
108.1	12.50	12.42	g pk
484.6	20.00	20.13	g pk

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels, X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

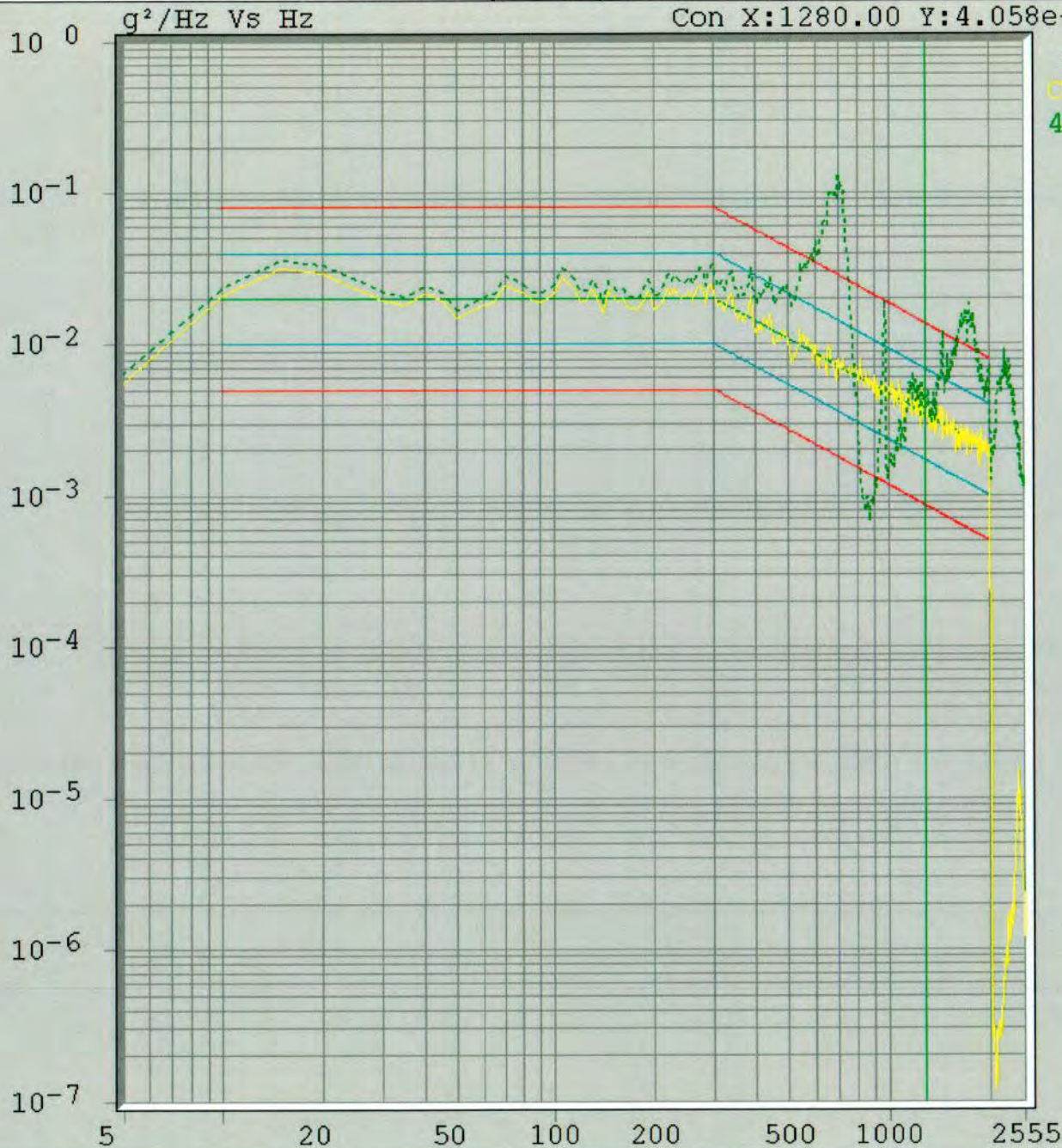
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Random) - PSD vs Freq



Con X:1280.00 Y:4.058e-003

grms  
C:3.95  
4:6.11

Save 1 of 2

3/6/2014 6:22:26 PM

TOTAL : 2:3:17

2:2:13 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.95

TONES

Freq	Ref	Con	g pk
21.18	4.00	4.03	g pk
54.36	6.30	6.29	g pk
108.1	12.50	12.42	g pk
484.6	20.00	20.13	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels, X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

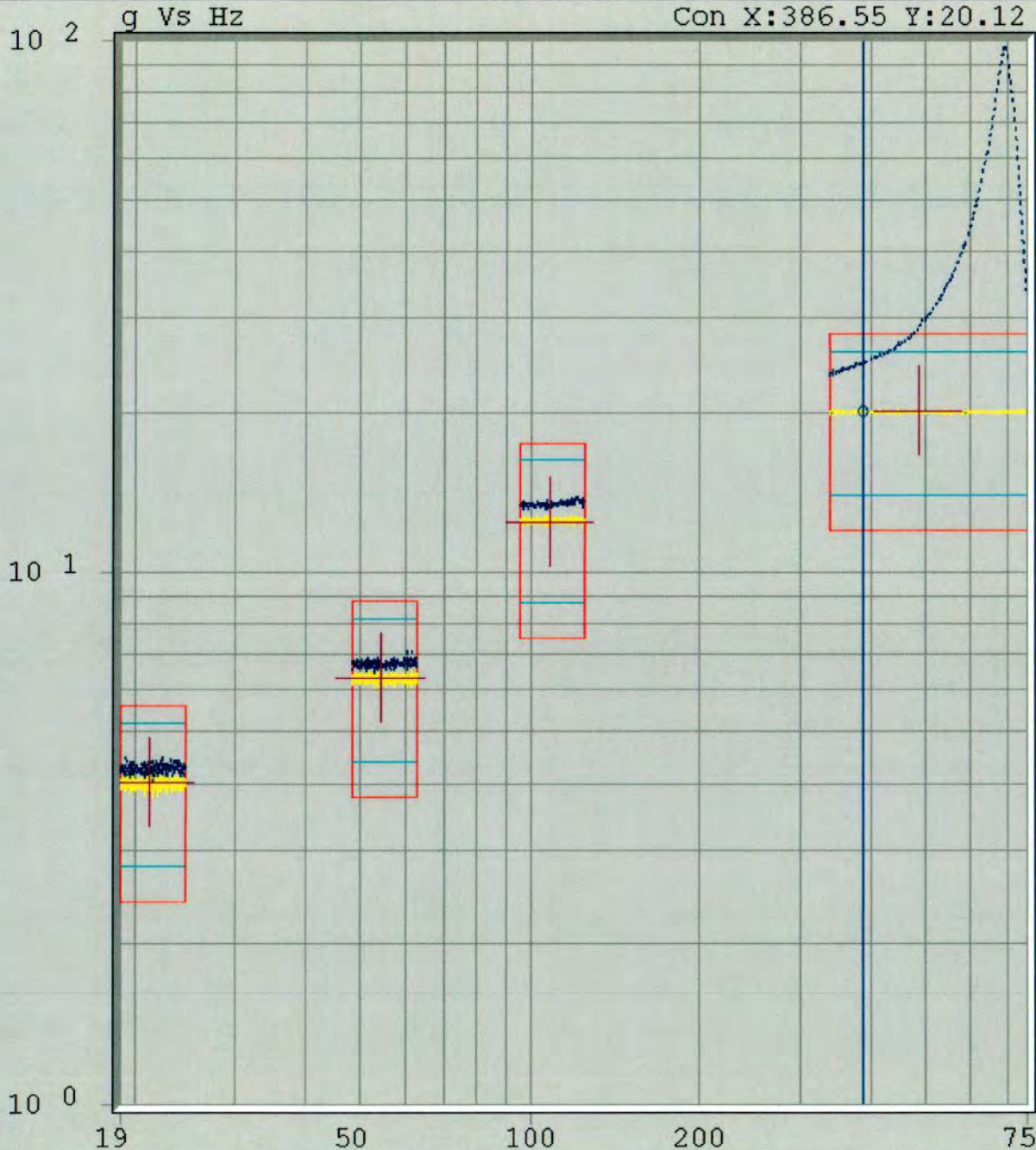
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Tones) - Acceleration vs Freq



T1 g-pk  
C:4.03  
4:4.29

Save 1 of 2  
3/6/2014 6:22:26 PM  
TOTAL : 2:3:17  
2:2:13 of 6:30:0  
Swp 25  
Status: Auto  
STOPPED  
Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
17.92	3.89	3.95

TONES

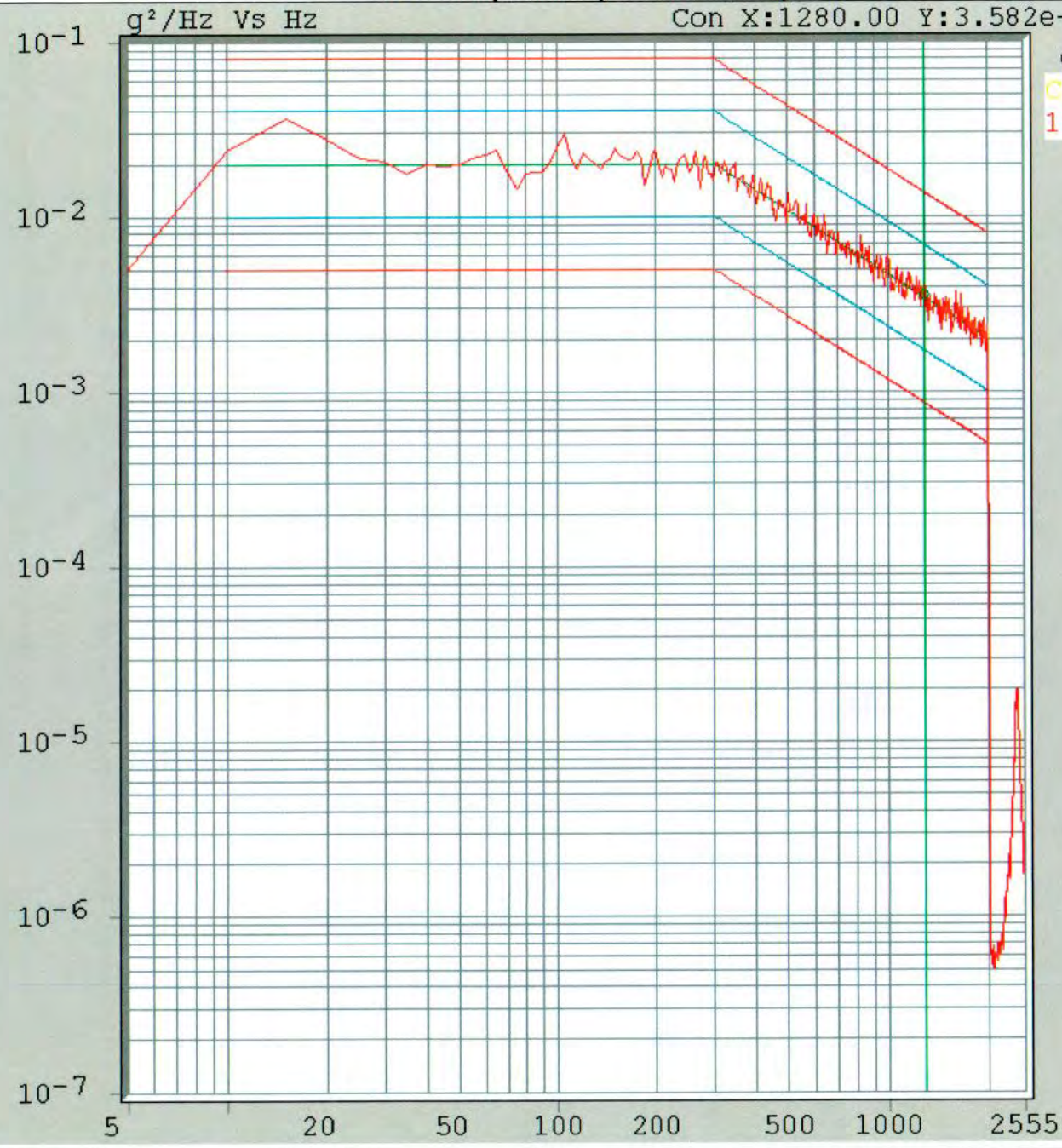
Freq	Ref	Con	g pk
21.18	4.00	4.03	g pk
54.36	6.30	6.29	g pk
108.1	12.50	12.42	g pk
484.6	20.00	20.13	g pk

Log Sweep: 5.00 Min  
Servo(dB/s): 100  
DOF: 100  
Lines/Res: 500/ 5.00 Hz  
C:1  
S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels, X-AMS  
 RUN NAME: run7  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      CH-4: 10.00 mV/g  
 RUN DESC:  
 Vwin II

### Control.1 (Random) - PSD vs Freq



grms  
**C:3.95**  
**1:3.95**

3/6/2014 6:49:37 PM

TOTAL : 2:11:47

2:10:8 of 6:30:0

Swp 27

Status: Auto

STOPPED

Level 0.0dB:100%

#### GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
17.88	3.89	3.95

#### TONES

Freq	Ref	Con	pk
18.98	4.00	3.94	g
48.75	6.30	6.41	g
96.80	12.50	12.36	g
346.7	20.00	19.89	g

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels, *x-Axis*  
 RUN NAME: run7  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

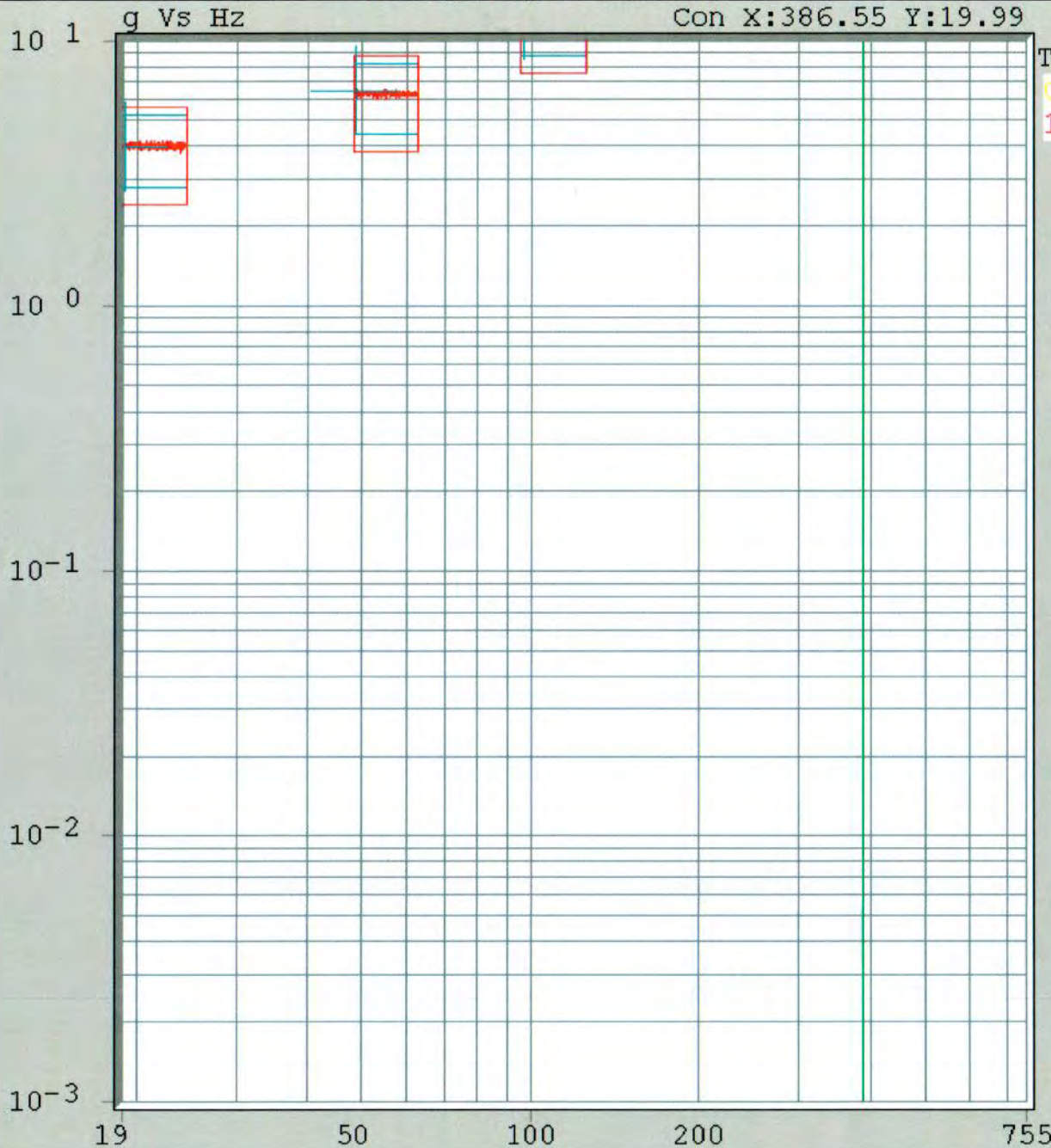
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones) - Acceleration vs Freq



T1 g-pk  
C:3.94  
1:3.94

3/6/2014 6:49:42 PM

TOTAL : 2:11:47

2:10:8 of 6:30:0

Swp 27

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.88	3.89	3.95

TONES

Freq	Ref	Con	g pk
18.98	4.00	3.94	g pk
48.75	6.30	6.41	g pk
96.80	12.50	12.36	g pk
346.7	20.00	19.89	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels, X-ABS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

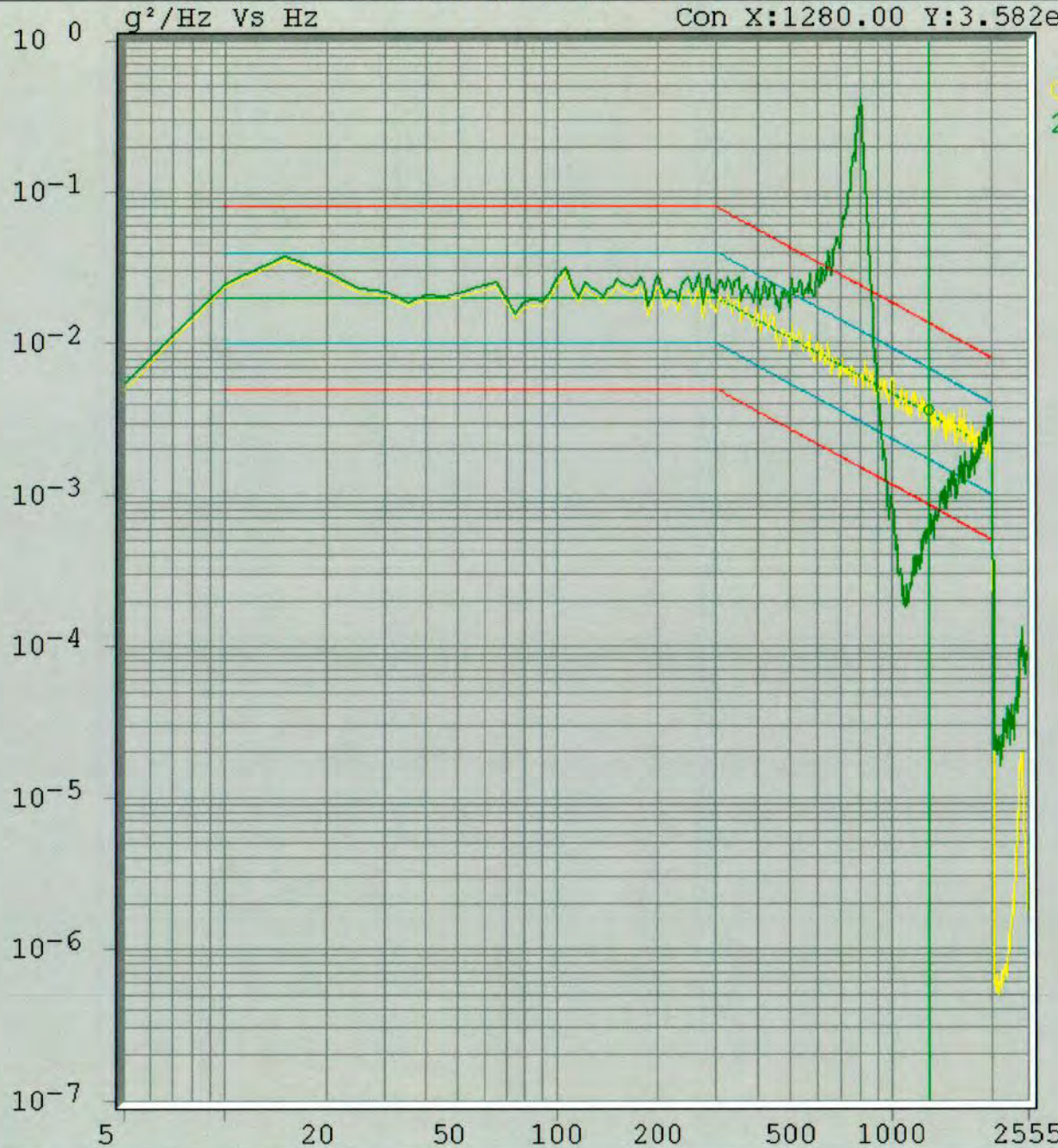
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

POST GRAVE

### Control,2 (Random) - PSD vs Freq



grms  
C:3.35  
2:6.61

3/6/2014 6:49:5 PM

TOTAL : 2:11:47

2:10:8 of 6:30:0

Swp 27

Status: Auto

STOPPED

Level 0.0dB:100%

#### GRMS

TOTAL Con	RANDOM Ref	Con
17.88	3.89	3.95

#### TONES

Freq	Ref	Con	g pk
18.98	4.00	3.94	g pk
48.75	6.30	6.41	g pk
96.80	12.50	12.36	g pk
346.7	20.00	19.89	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels, X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,2 (Tones) - Acceleration vs Freq

3/6/2014 6:49:8 PM

TOTAL : 2:11:47

2:10:8 of 6:30:0

Swp 27

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.88	3.89	3.95

TONES

Freq	Ref	Con	
18.98	4.00	3.94	g pk
48.75	6.30	6.41	g pk
96.80	12.50	12.36	g pk
346.7	20.00	19.89	g pk

Log Sweep: 5.00 Min

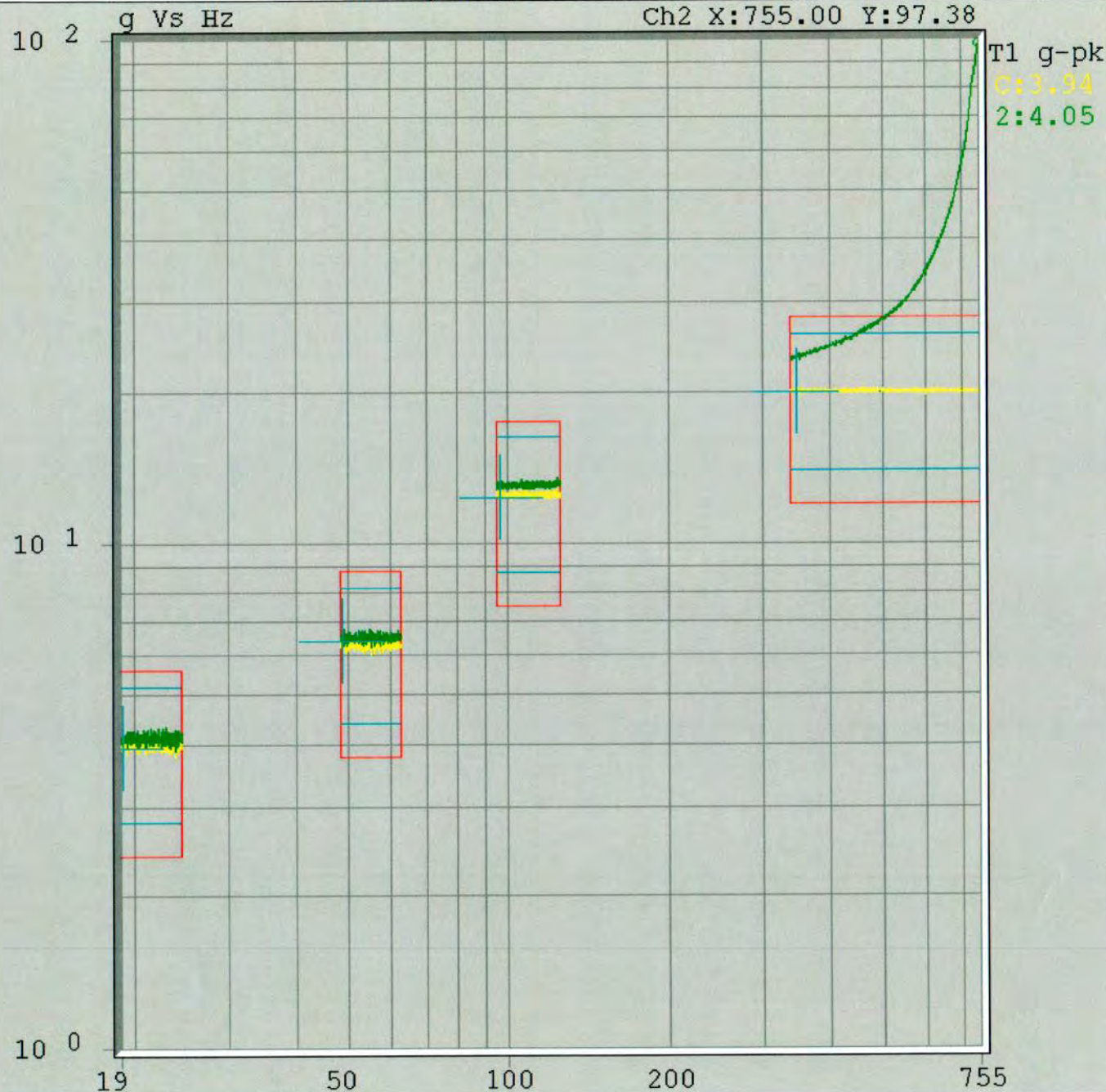
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels, *y-AXIS*

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

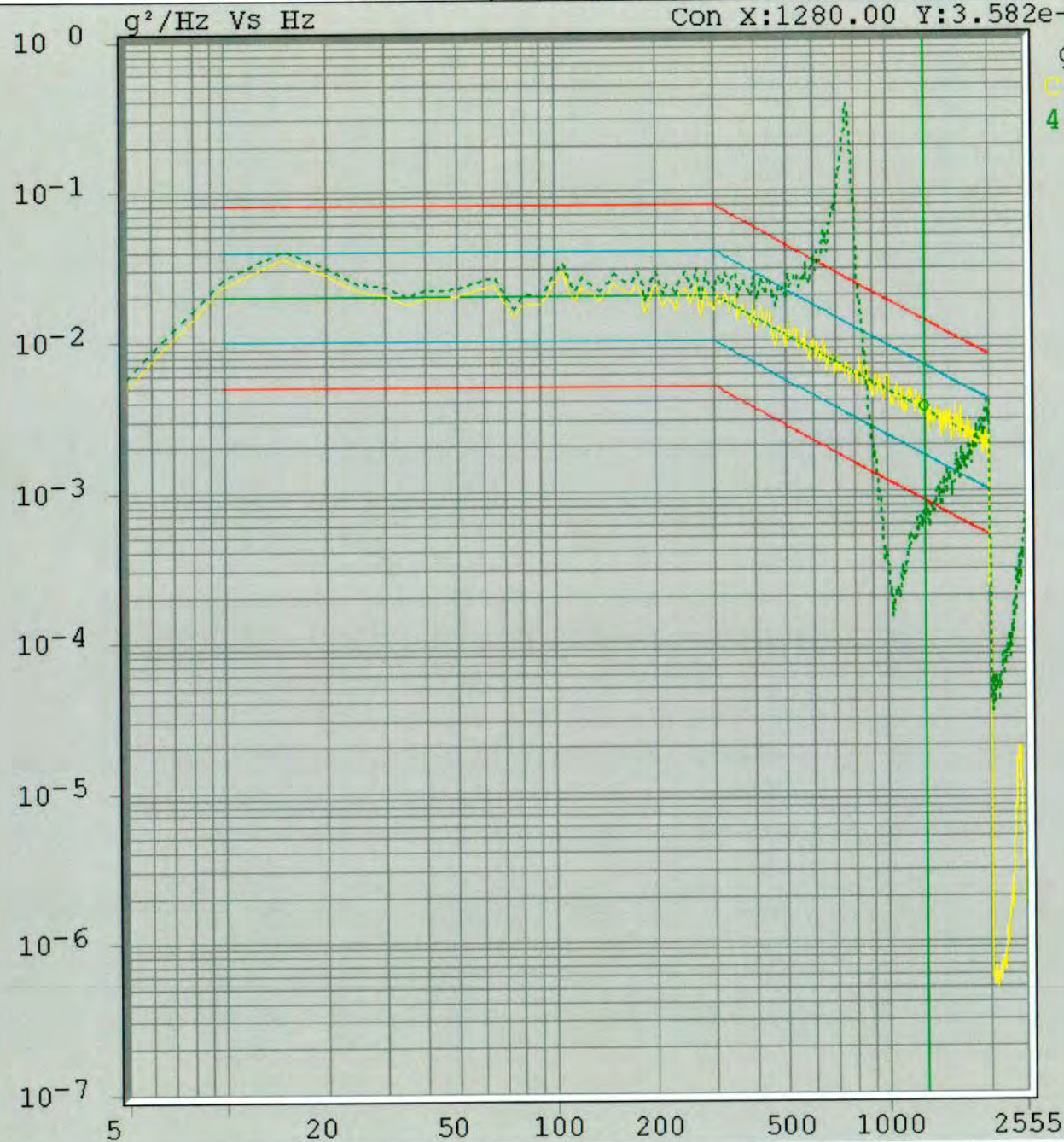
RUN DESC:

CH-4: 10.00 mV/g

Vwin II



Control,4 (Random) - PSD vs Freq



grms  
C:3.95  
4:6.45

3/6/2014 6:49:22 PM

TOTAL : 2:11:47

2:10:8 of 6:30:0

Swp 27

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL	RANDOM	
Con	Ref	Con
17.88	3.89	3.95

TONES

Freq	Ref	Con	
18.98	4.00	3.94	pk
48.75	6.30	6.41	pk
96.80	12.50	12.36	pk
346.7	20.00	19.89	pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels, X-ABS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

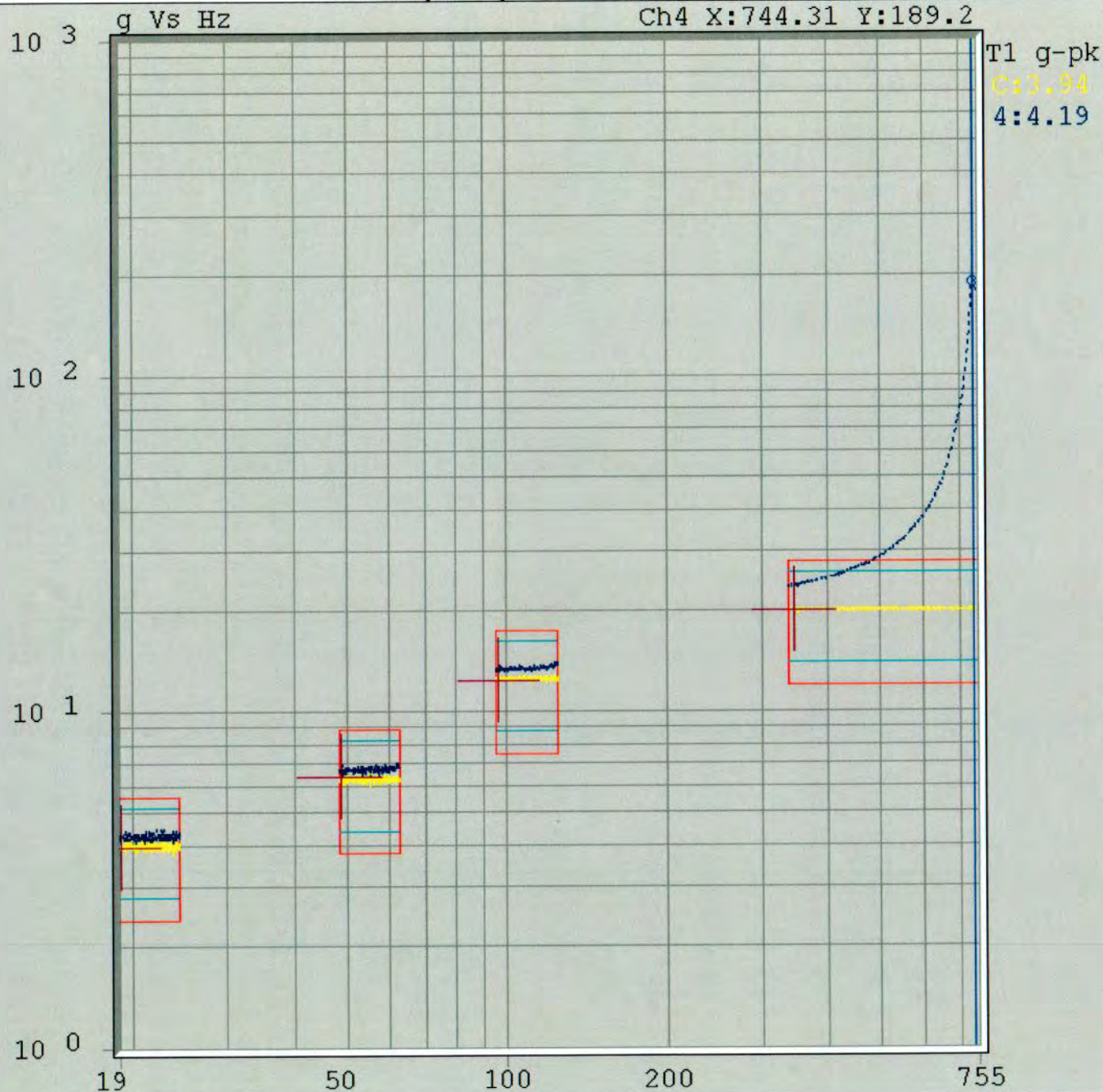
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Tones) - Acceleration vs Freq



3/6/2014 6:49:27 PM

TOTAL : 2:11:47

2:10:8 of 6:30:0

Swp 27

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.88	3.89	3.95

TONES

Freq	Ref	Con	g pk
18.98	4.00	3.94	g pk
48.75	6.30	6.41	g pk
96.80	12.50	12.36	g pk
346.7	20.00	19.89	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels, X-AXIS

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq

3/6/2014 7:15:16 PM

TOTAL : 0:17:11

0:16:12 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
22.98	2.00	1.92	g pk
58.94	5.00	4.83	g pk
117.2	10.00	9.88	g pk
621.3	16.70	16.53	g pk

Log Sweep: 5.00 Min

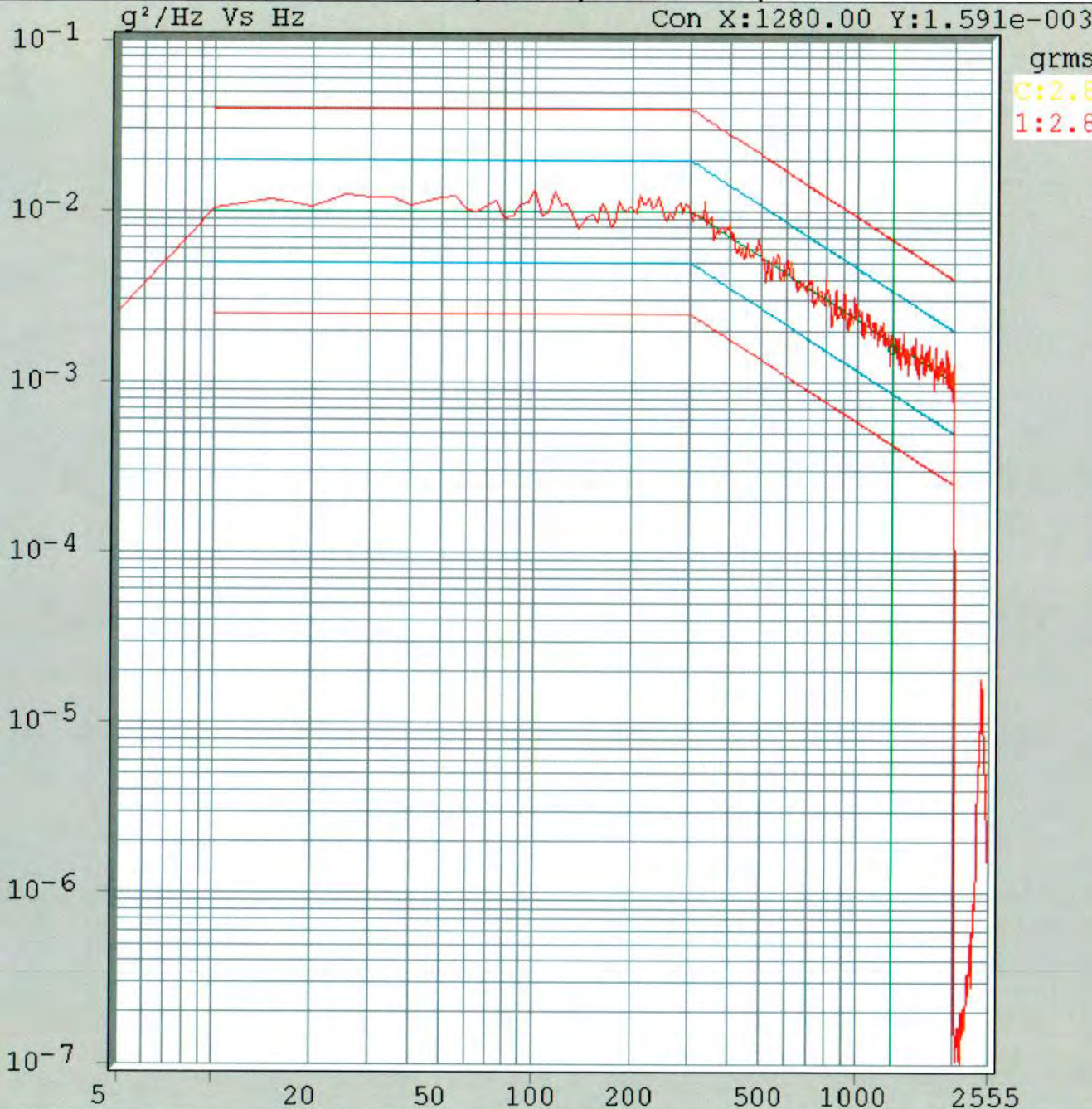
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: PERFORMANCE, X-ABS

RUN NAME: run12

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones) - Acceleration vs Freq

3/6/2014 7:15:23 PM

TOTAL : 0:17:11

0:16:12 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
22.98	2.00	1.92	g pk
58.94	5.00	4.83	g pk
117.2	10.00	9.88	g pk
621.3	16.70	16.53	g pk

Log Sweep: 5.00 Min

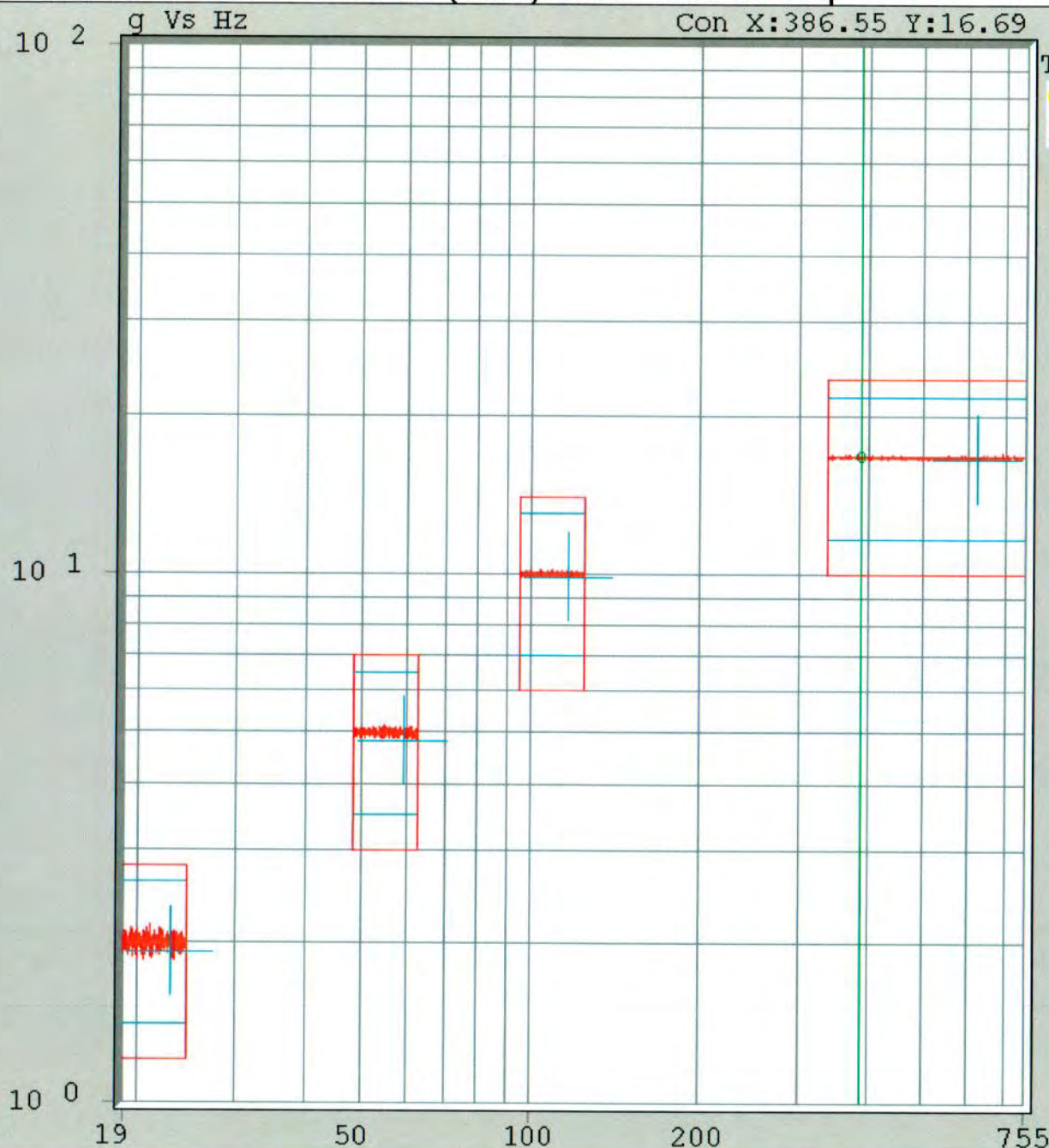
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191  
 SETUP DESCRIPTION: *PERF., X-AXIS*  
 RUN NAME: run12  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,2 (Random) - PSD vs Freq

3/6/2014 7:15:29 PM

TOTAL : 0:17:11

0:16:12 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL	RANDOM	
Con	Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	
22.98	2.00	1.92	g pk
58.94	5.00	4.83	g pk
117.2	10.00	9.88	g pk
621.3	16.70	16.53	g pk

Log Sweep: 5.00 Min

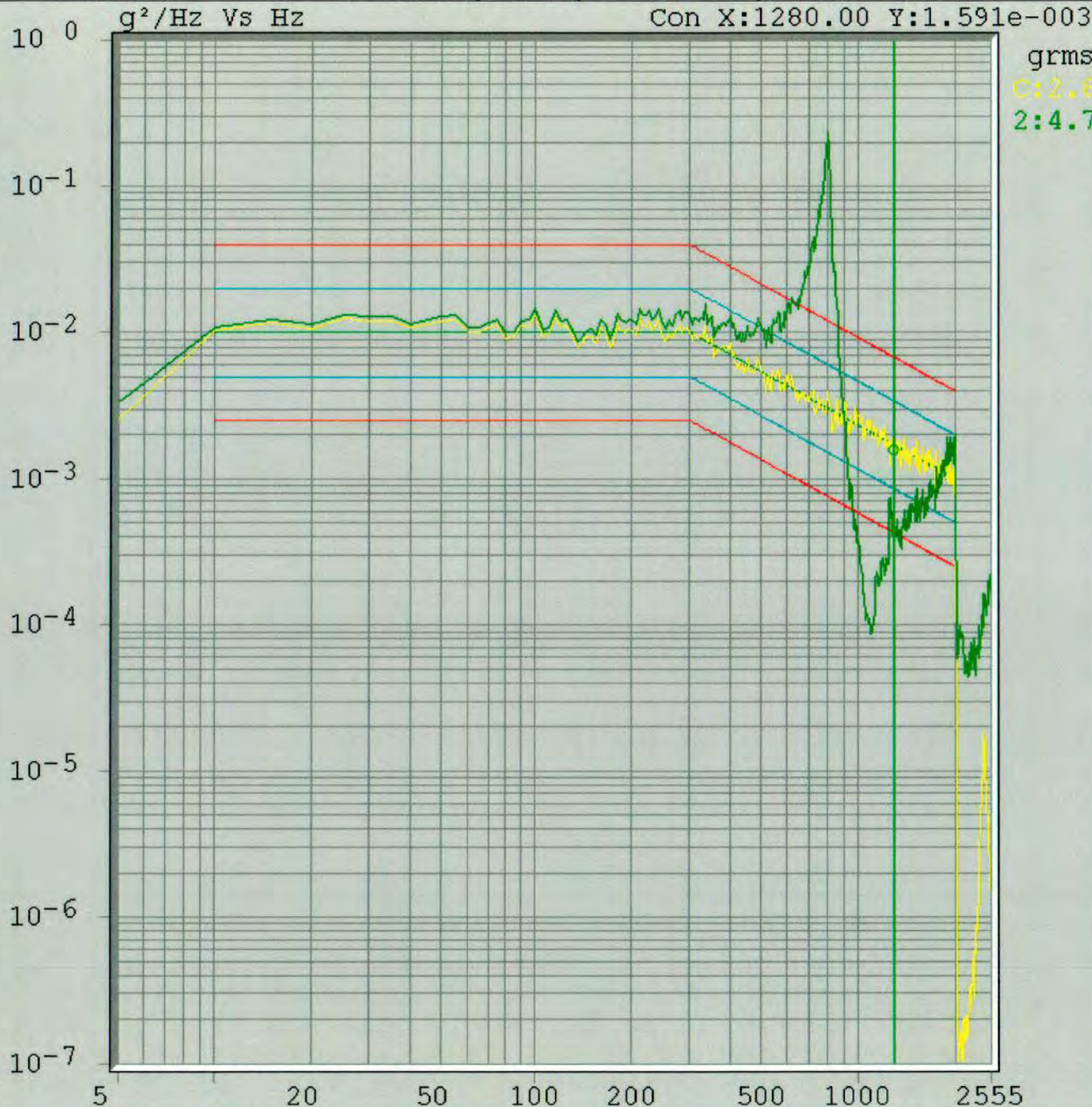
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191  
 SETUP DESCRIPTION: *PERF, X-AXIS*  
 RUN NAME: run12  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

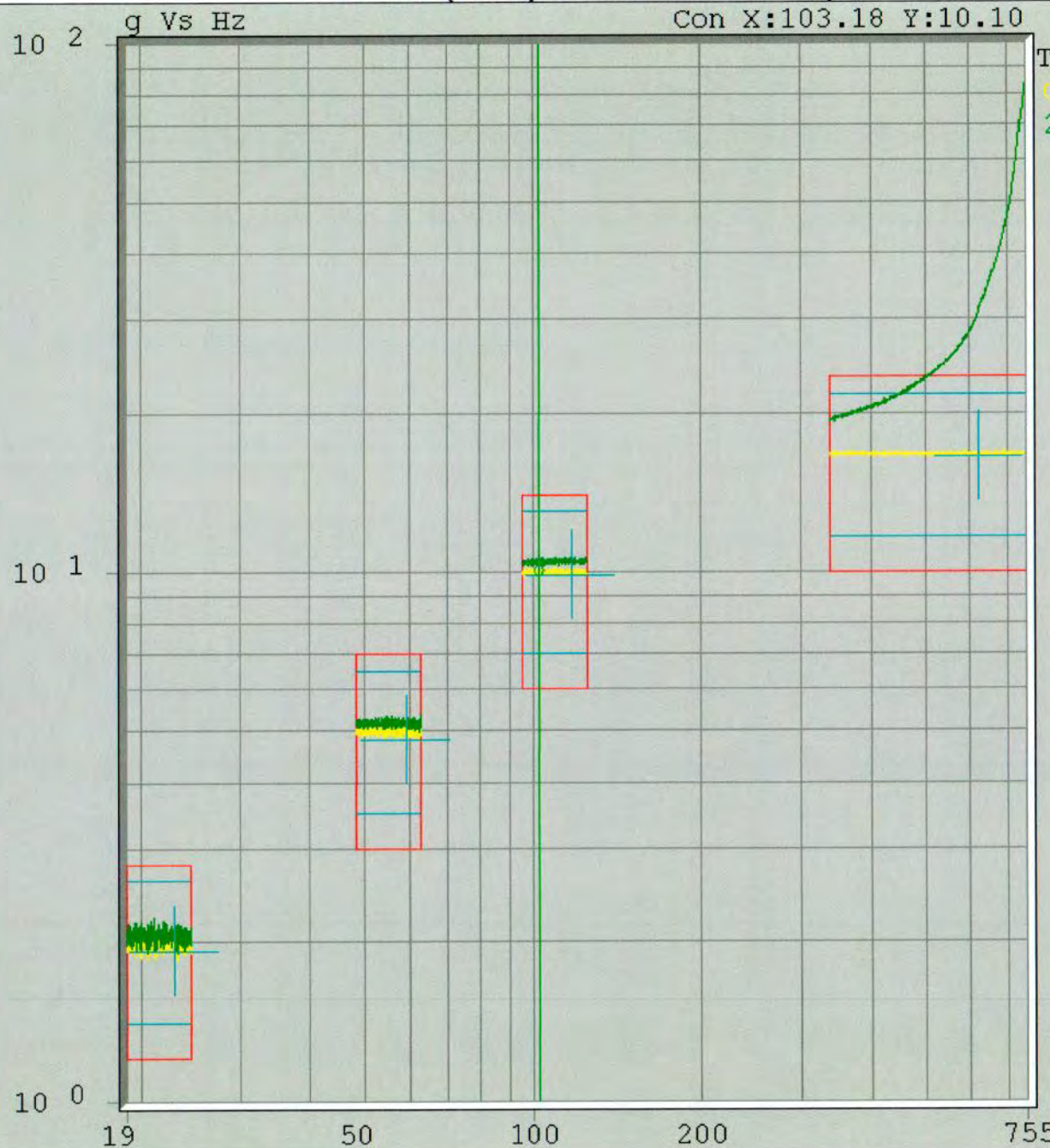
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,2 (Tones) - Acceleration vs Freq



T1 g-pk  
 C:1.92  
 2:1.98

Save 1 of 1

3/6/2014 7:14:59 PM

TOTAL : 0:17:11

0:16:12 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
22.98	2.00	1.92	g pk
58.94	5.00	4.83	g pk
117.2	10.00	9.88	g pk
621.3	16.70	16.53	g pk

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S:1,2,3,4



SOR SETUP ID: 7G1191  
 SETUP DESCRIPTION: PERF, X-AXIS  
 RUN NAME: run12  
 CH-1: 10.00 mV/g

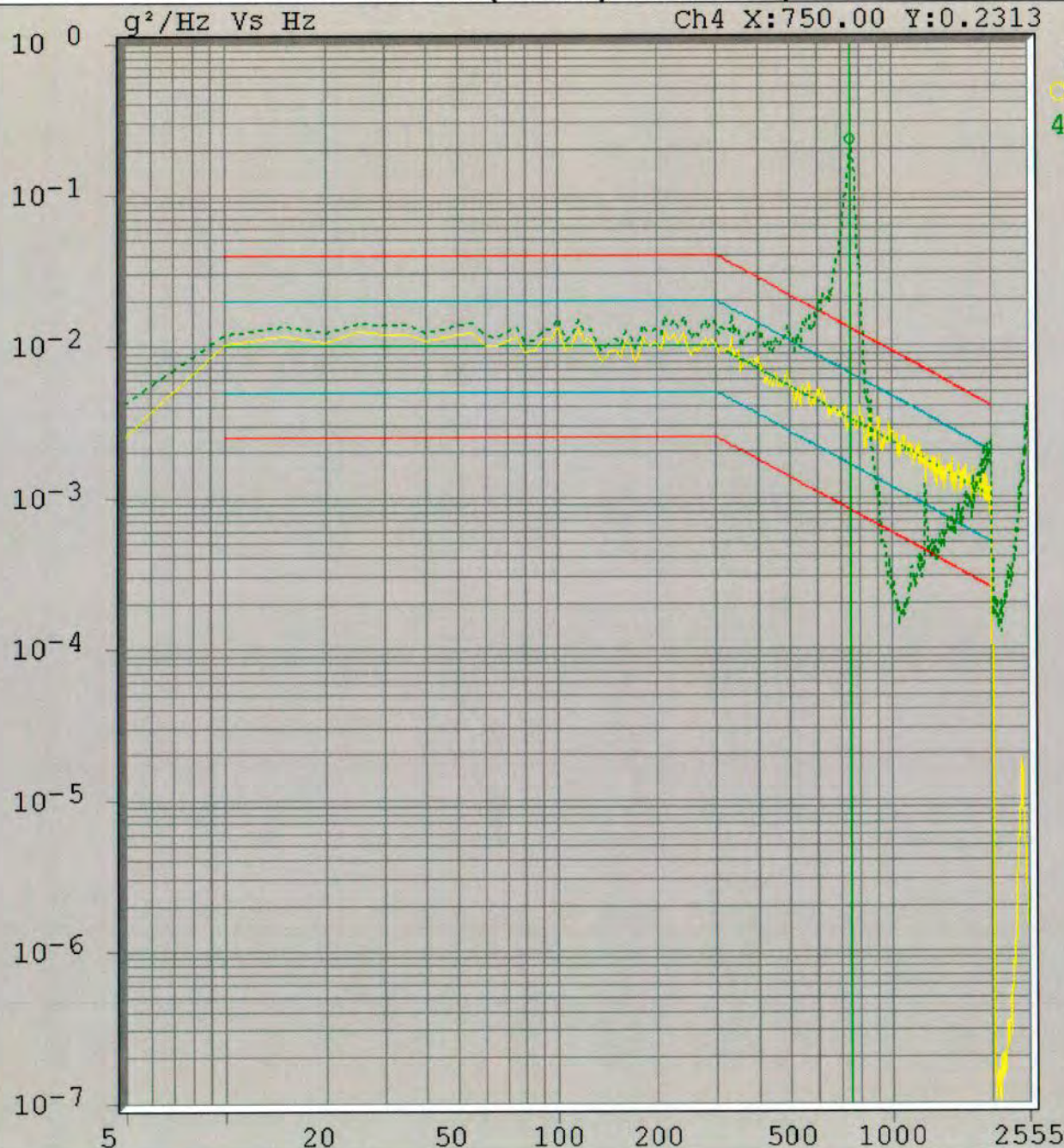
CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:  
 CH-4: 10.00 mV/g

Vwin II

Control,4 (Random) - PSD vs Freq



3/6/2014 7:15:37 PM

TOTAL : 0:17:11

0:16:12 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	pk
22.98	2.00	1.92	pk
58.94	5.00	4.83	pk
117.2	10.00	9.88	pk
621.3	16.70	16.53	pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION:

RUN NAME: run12

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

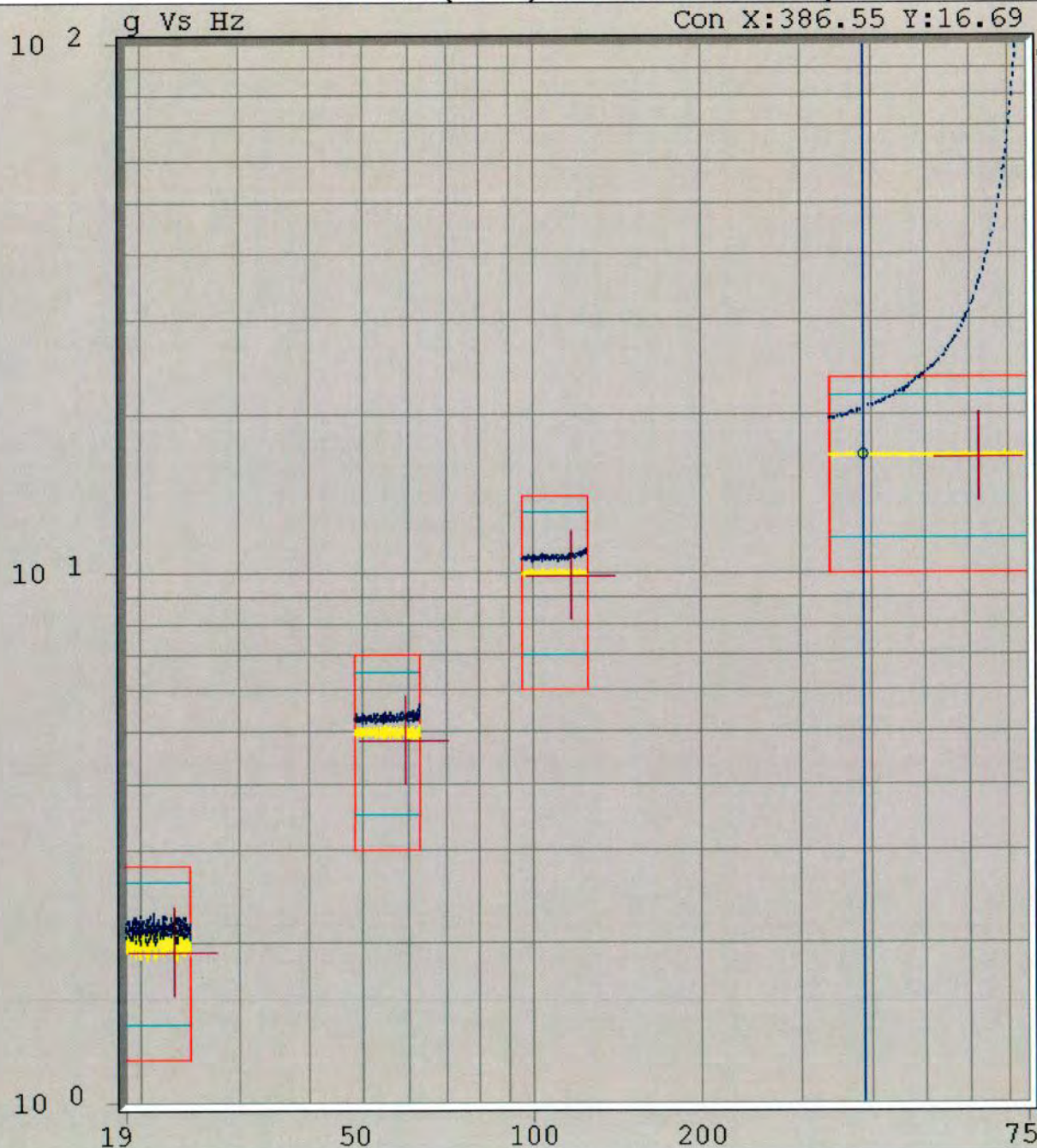
RUN DESC:

CH-4: 10.00 mV/g

*PERFORMANCE, X-AXIS*

Vwin II

Control,4 (Tones) - Acceleration vs Freq



3/6/2014 7:15:39 PM

TOTAL : 0:17:11

0:16:12 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g-pk
22.98	2.00	1.92	g-pk
58.94	5.00	4.83	g-pk
117.2	10.00	9.88	g-pk
621.3	16.70	16.53	g-pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191  
 SETUP DESCRIPTION: *PERM., X-MS*

RUN NAME: run12

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

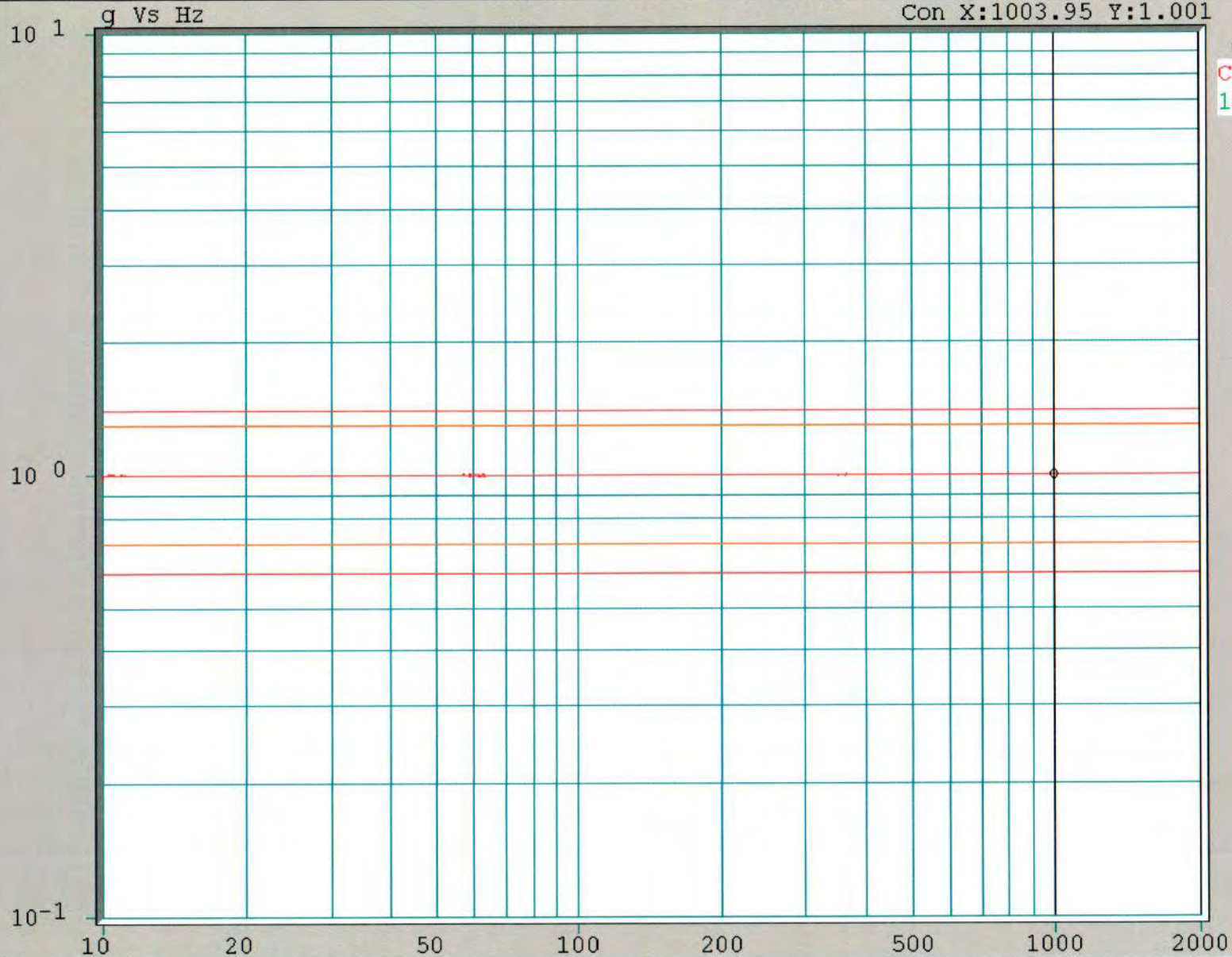
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 - Acceleration vs Freq

Con X:1003.95 Y:1.001



g-pk  
C:1.00  
1:1.00

3/6/2014  
7:37:18 PM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq 2000.00  
Hz

Ref 1.00  
g-pk

Acc 1.002  
g-pk

Vel 0.03  
in/s-pk

Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION:

RUN NAME: run4

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

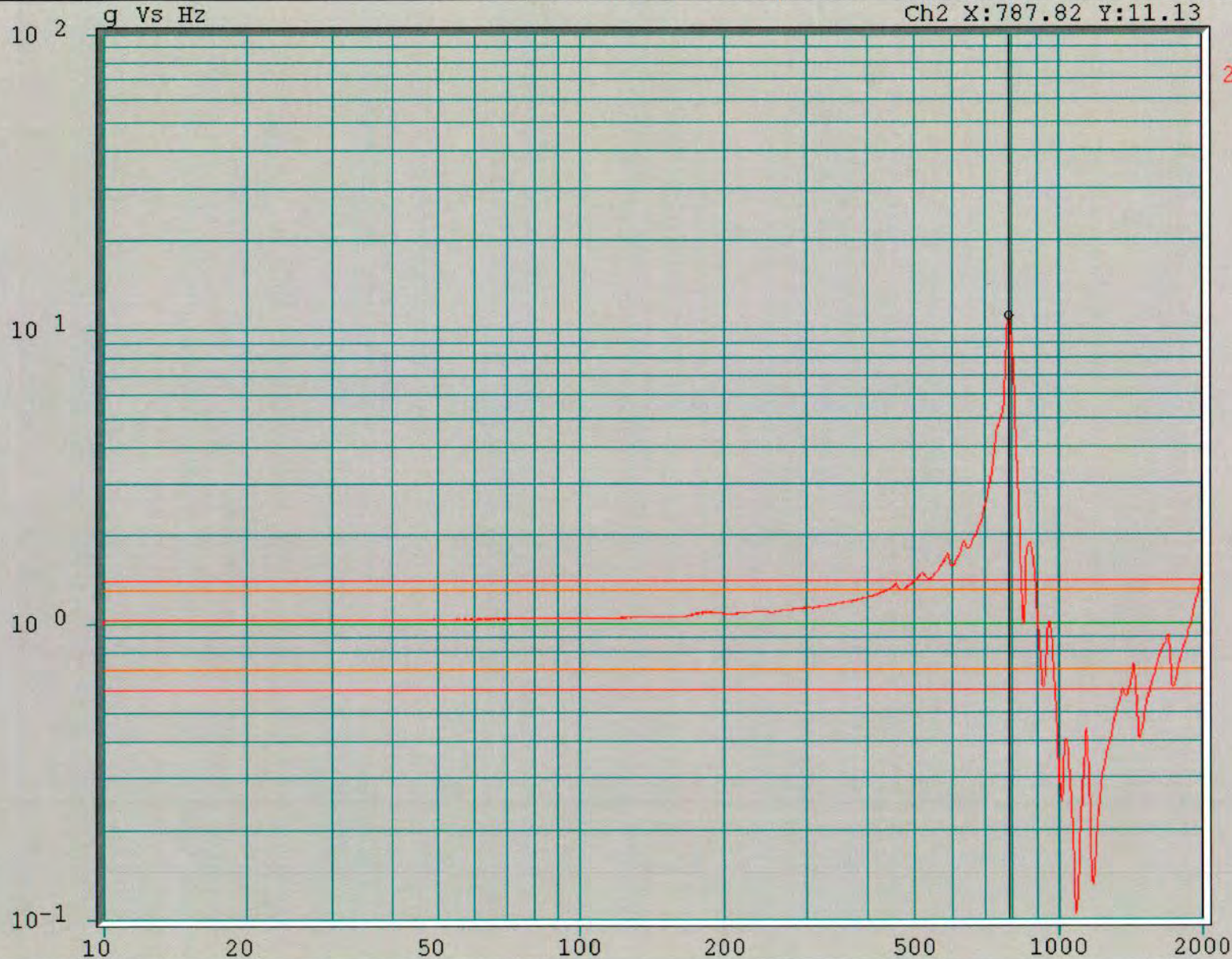
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

2 - Acceleration vs Freq



g-pk  
2:1.52

Ch2 X:787.82 Y:11.13

3/6/2014  
7:37:39 PM

Total: 0:15:28  
Auto: 0:15:18  
Swp 1 of 1

Status: Auto  
**FINISHED**

Freq Hz	2000.00
Ref g-pk	1.00
Acc g-pk	1.002
Vel in/s-pk	0.03
Disp mils pk-pk	0.00

Swp : 15 min 18 sec  
Servo(dB/s): 1K  
Freq : Log  
Type:Single  
C:1  
AutoSave  
S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION: X-AXIS

RUN NAME: run4

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

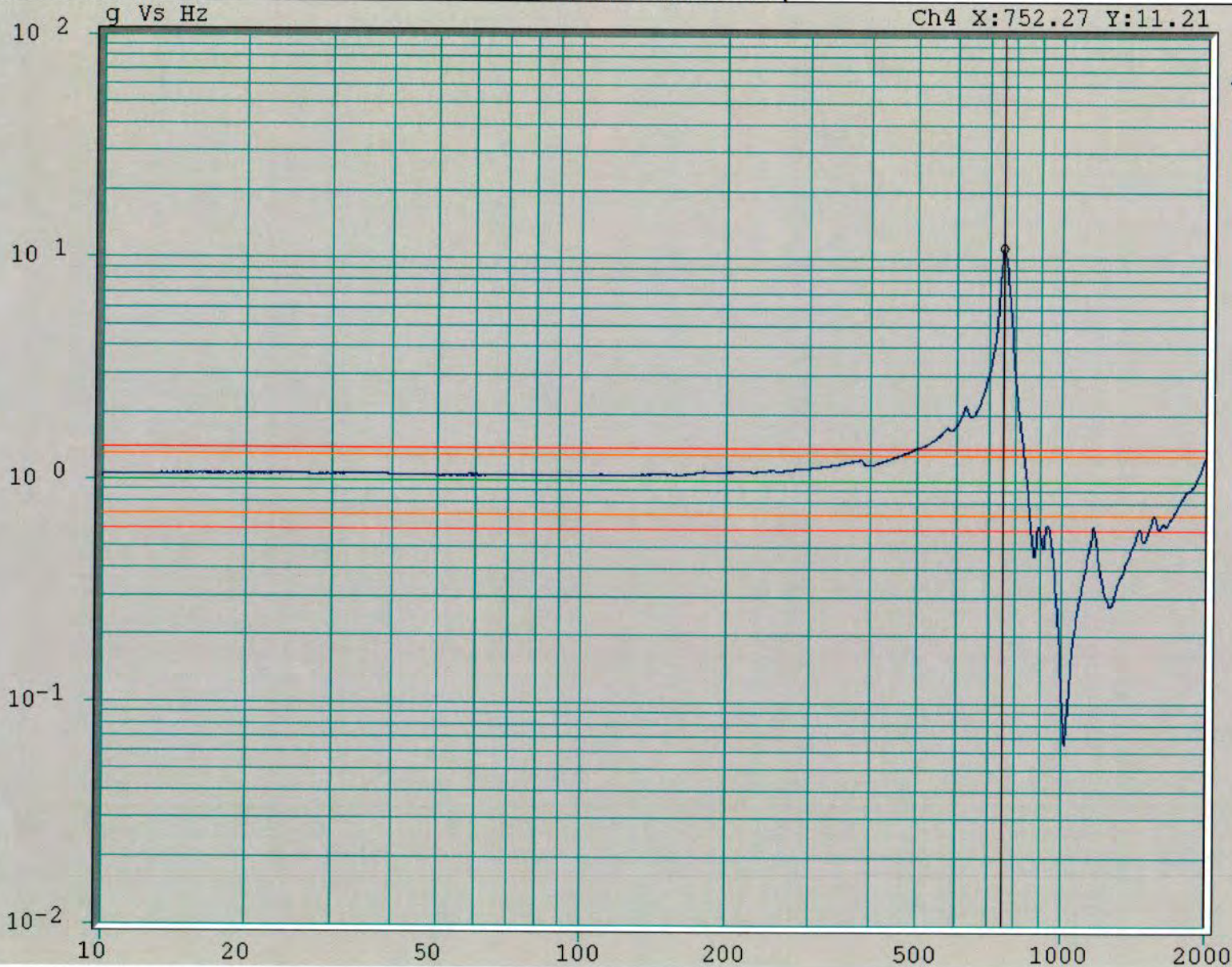
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

4 - Acceleration vs Freq



3/6/2014  
7:37:33 PM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq  
Hz 2000.00

Ref  
g-pk 1.00

Acc  
g-pk 1.002

Vel  
in/s-pk 0.03

Disp  
mils pk-pk 0.00

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION: X-AXIS

RUN NAME: run4

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

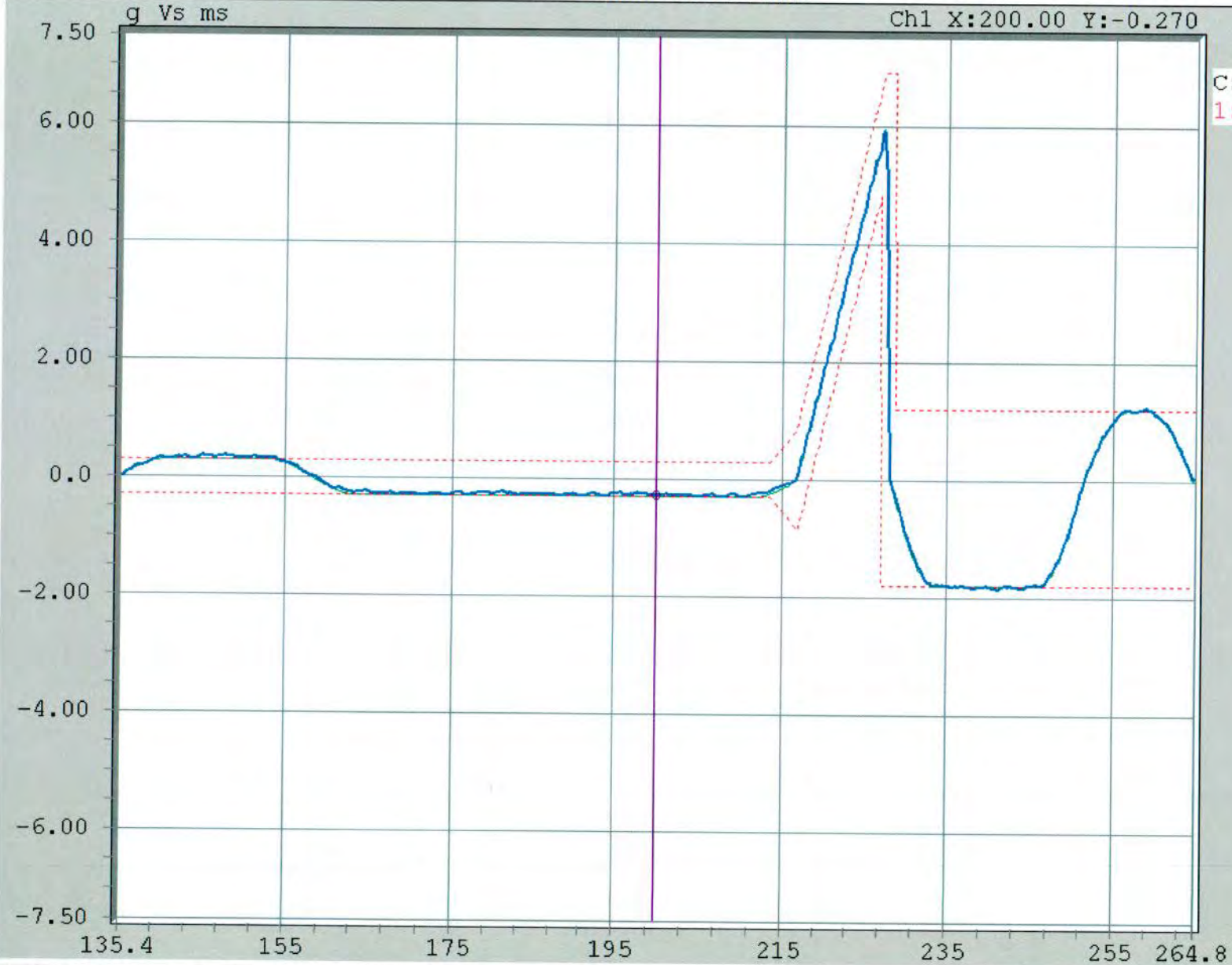
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C.1 - Acceleration vs Time



g-pk  
C: 5.92  
1: 5.92

Save 1 of 6

3/7/2014  
7:59:21 AM

Auto Pulses

1 of 6

Pulse # 6

Status: Auto-CL

RUNNING

Level 0.0dB:100%

Ref g-pk 6.00

Con g-pk +5.92

Type:SAWTOOTH-TPk

Width(ms): 11.00

Peak(g): 6.000

Rate(Hz):5120

Points: 2048

Res(Hz):2.50

Control : 1

AutoSave

S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run7  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

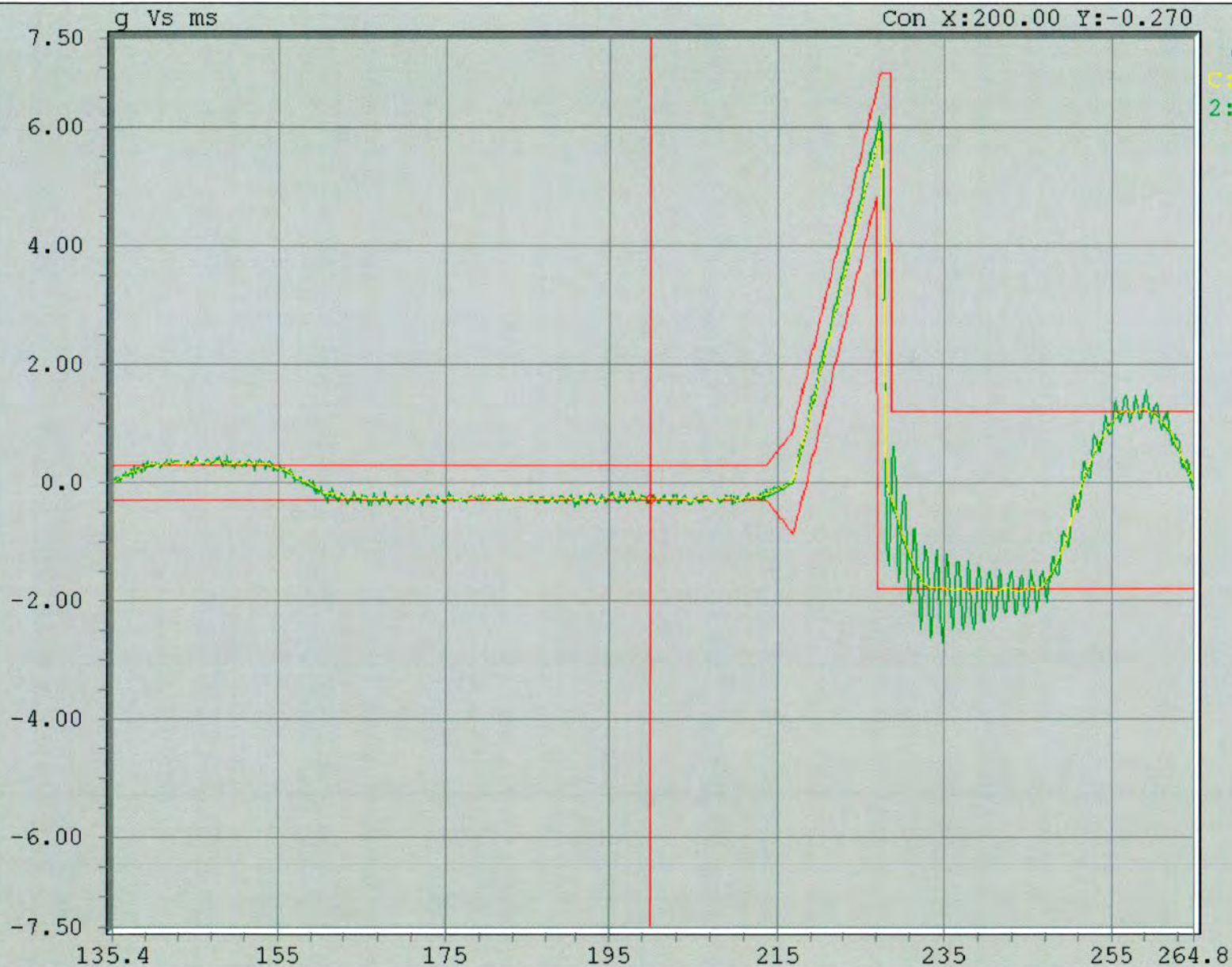
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C,2 - Acceleration vs Time



**Save 1 of 6**

3/7/2014  
7:59:21 AM

**Auto Pulses**

1 of 6

**Pulse # 6**

Status: Auto-CL  
**RUNNING**

Level 0.0dB:100%

Ref g-pk **6.00**

Con g-pk **+5.92**

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191  
SETUP DESCRIPTION: Operational shock  
RUN NAME: run7  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

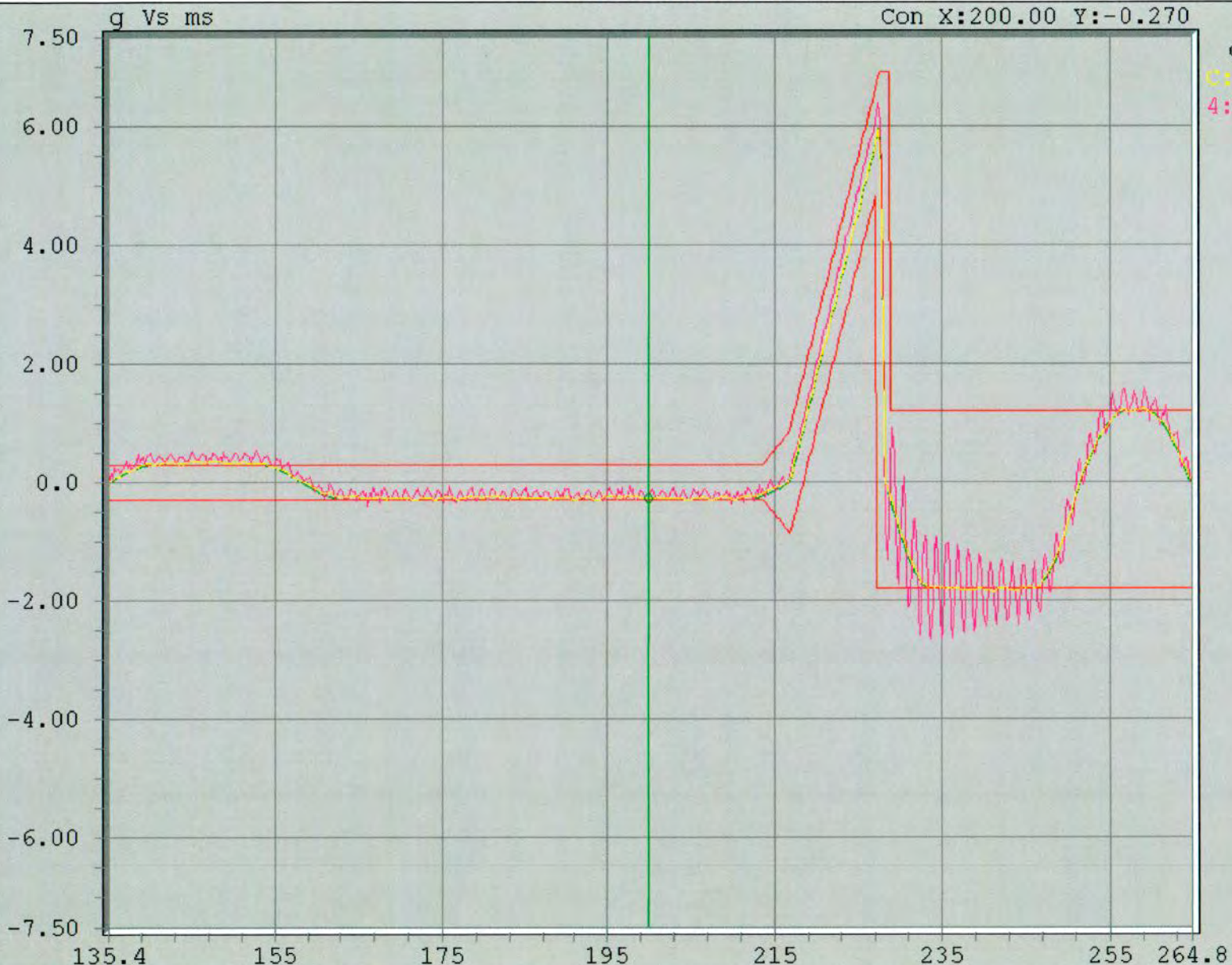
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C,4 - Acceleration vs Time



**Save 1 of 6**

3/7/2014  
7:59:21 AM

**Auto Pulses**  
1 of 6  
Pulse # 6

Status: Auto-CL  
**RUNNING**  
Level 0.0dB:100%

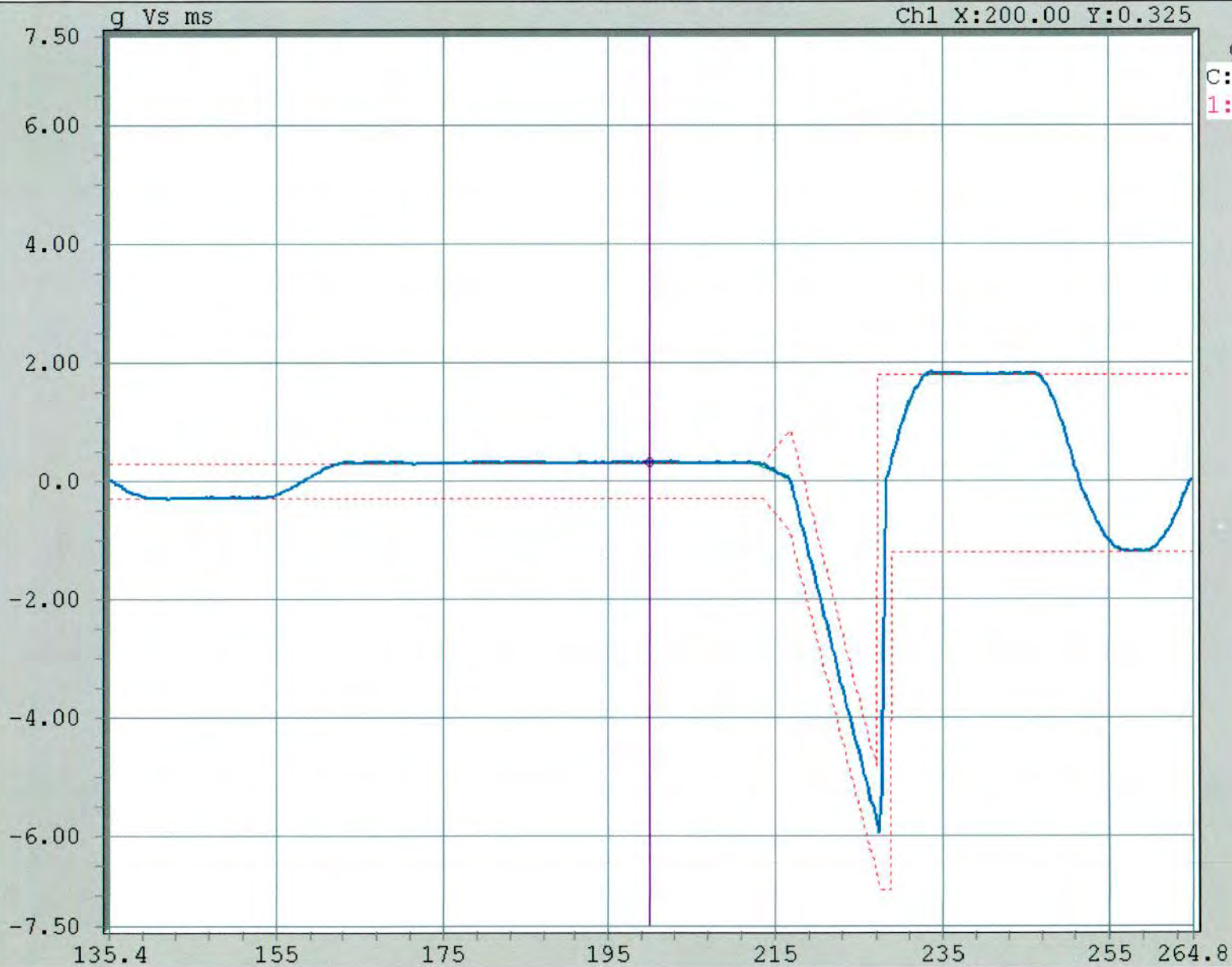
Ref g-pk **6.00**  
Con g-pk **+5.92**

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run7  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      RUN DESC:      CH-4: 10.00 mV/g

### C,1 - Acceleration vs Time



g-pk  
C:-5.95  
1:-5.95

Save 6 of 6

3/7/2014  
7:59:48 AM

Auto Pulses

6 of 6

Pulse # 11

Status: Auto-CL

FINISHED

Level 0.0dB:100%

Ref

g-pk

-6.00

Con

g-pk

-5.95

Type:SAWTOOTH-TPk

Width(ms): 11.00

Peak(g): 6.000

Rate(Hz):5120

Points: 2048

Res(Hz):2.50

Control : 1

AutoSave

S:1,2,3,4



SHOCK SETUP ID: 7G1191

SETUP DESCRIPTION: Operational shock

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

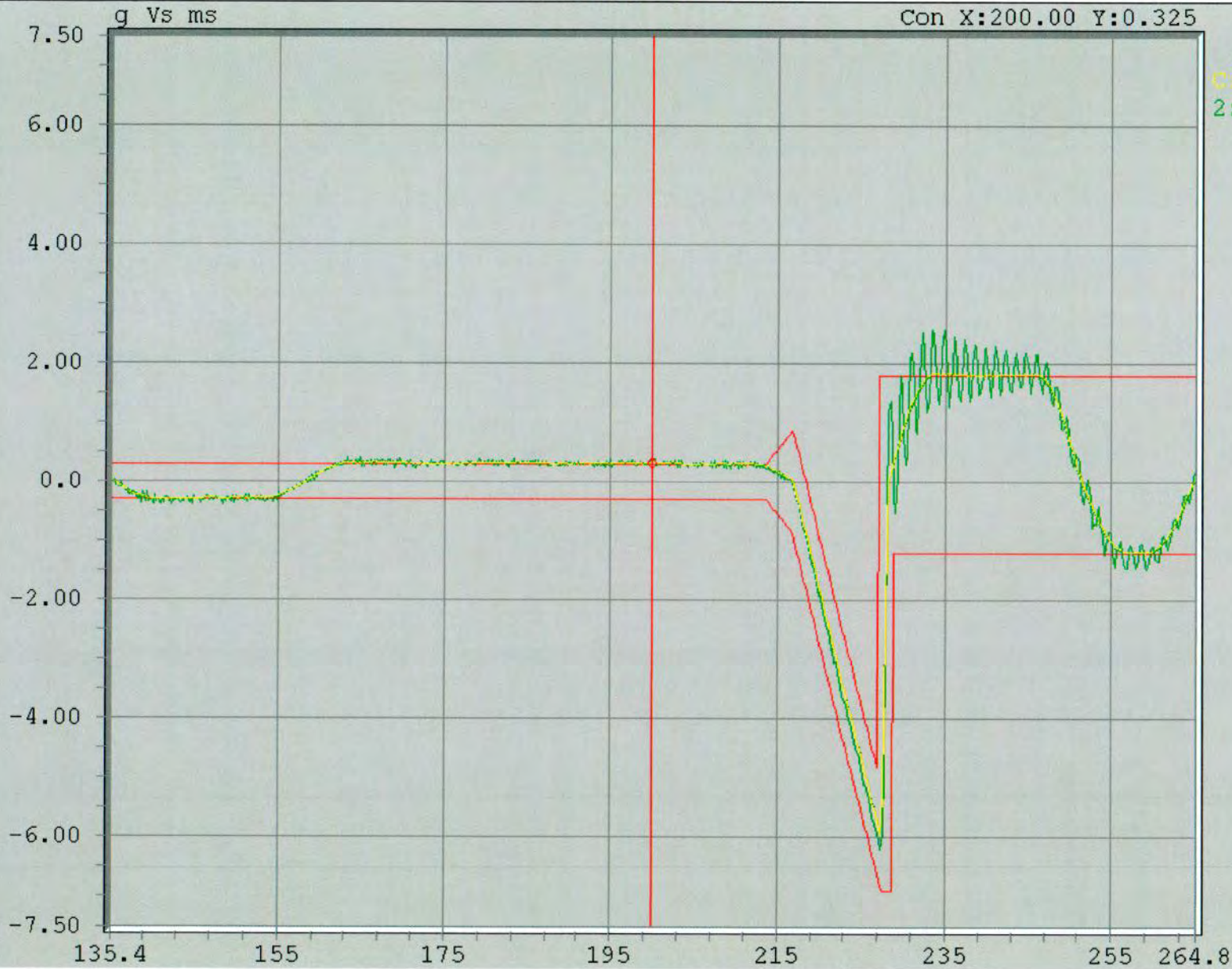
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C.2 - Acceleration vs Time



g-pk  
 1:-5.95  
 2:-6.20

Save 6 of 6

3/7/2014  
 7:59:48 AM

Auto Pulses  
 6 of 6

Pulse # 11

Status: Auto-CL  
 FINISHED

Level 0.0dB:100%

Ref g-pk -6.00

Con g-pk -5.95

Type:SAWTOOTH-TPk  
 Width(ms): 11.00  
 Peak(g): 6.000  
 Rate(Hz):5120  
 Points: 2048  
 Res(Hz):2.50  
 Control : 1  
 AutoSave  
 S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run7  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

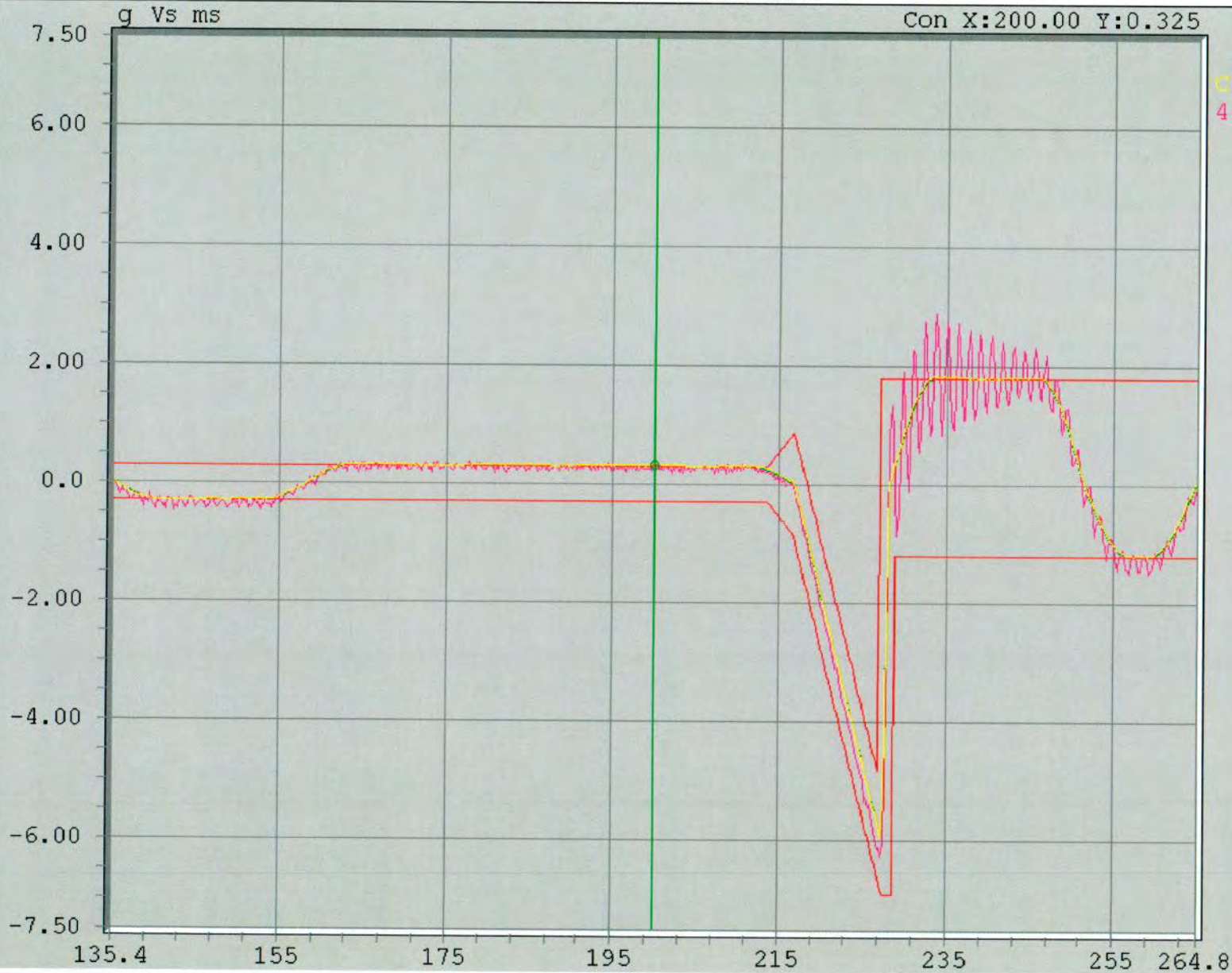
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C,4 - Acceleration vs Time



**Save 6 of 6**

3/7/2014  
7:59:48 AM

**Auto Pulses**  
6 of 6  
Pulse # 11

Status: Auto-CL  
**FINISHED**  
Level 0.0dB:100%

Ref g-pk **-6.00**  
Con g-pk **-5.95**

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run7  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Vibration and Operational Shock Data Sheets and Plots  
Y-AXIS

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 121



CustomControlSensors Inc.

### CCS LABORATORY DATA SHEET

SAR/ENG NO:

#### RECORDED TEST DATA:

DATE	TIME	TEMP/RH		761191 SN007	761191 SN008
3-7-2014	0938	78° 27%		7.50	2.28
				4.41	4.49
Y-AXIS:	0945	BEGIN RESONANCE SWEEP			
CH 2 PLOT ONLY	1000	SWEEP COMPLETE			
	1003	78° 25%		7.58	2.28
				4.47	4.53
	1013	BEGIN RANDOM W/SINE (PERFORMANCE)			
	1018	77° 28%	NO CHATTER	7.20	6.94
	1019			4.73	4.80
	1024	76° 29%	NO CHATTER	7.25	6.94
	1025			4.72	4.82
	1030	76° 28%	NO CHATTER	7.15	6.91
	1031			4.70	4.80
	1032		STOP VIBRATION	7.54	2.21
				4.46	4.53

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP/RH		761191 SNOOZ	761191 SNOO8
3-7-2014	1043	BEGIN	RANDOM W/SINE (ENDURANCE)		
Y-AXIS					
	1113	77° 27%	NO CHATTER	7.13	6.91
				4.75	4.83
	1143	77° 26%	NO CHATTER	7.07	6.89
				4.77	4.84
	1213	77° 25%	NO CHATTER	7.05	6.89
				4.74	4.83
	1243	77° 23%	NO CHATTER	7.06	6.90
				4.75	4.86
	1246	STOP VIBRATION		7.52	7.25
				4.48	4.49
	1257	BEGIN	RANDOM W/SINE (PERFORMANCE)		
	1303	78° 24%	NO CHATTER	7.13	6.94
	1304			4.72	4.79
	1309	78° 24%	NO CHATTER	7.17	6.97
	1310			4.73	4.81

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

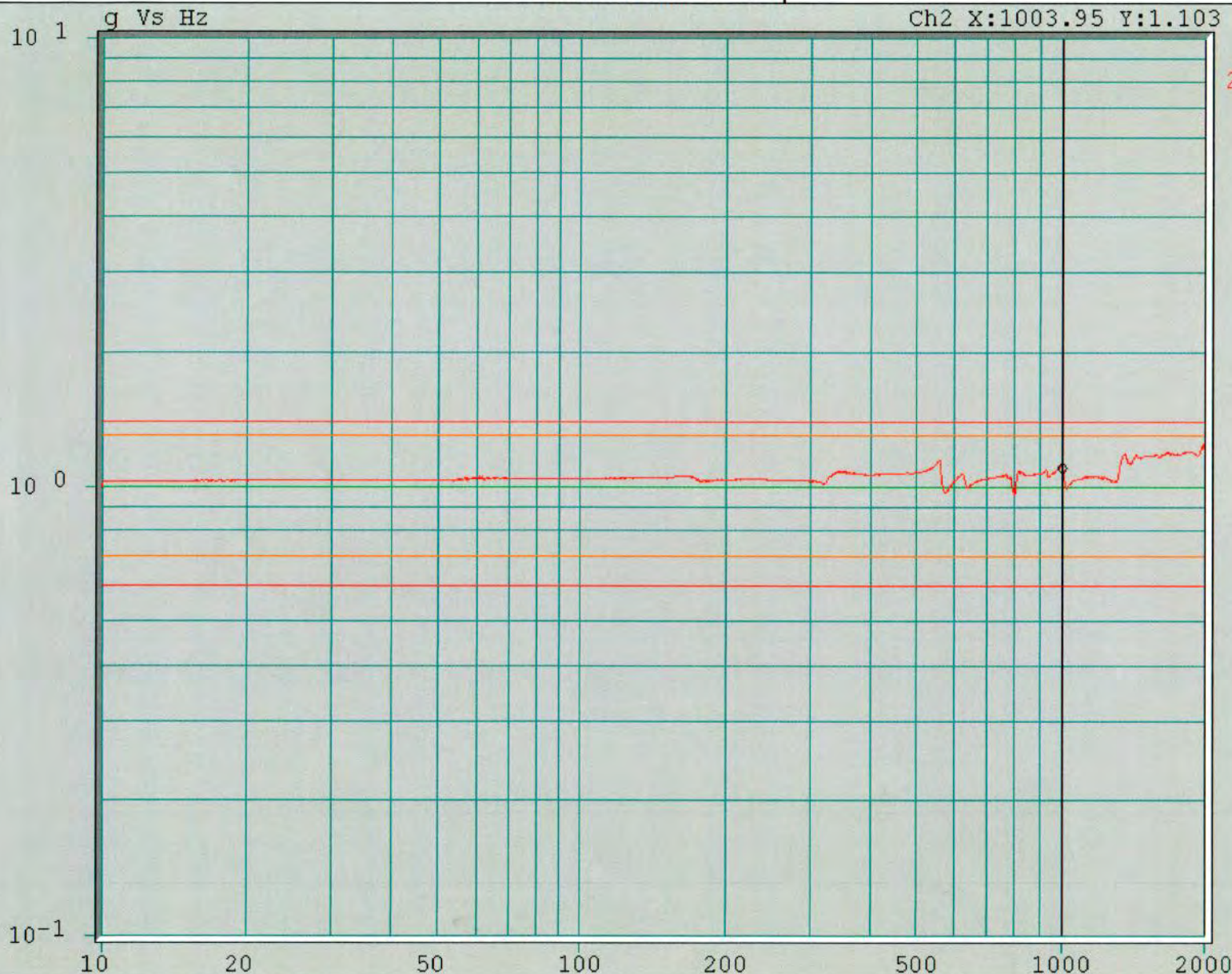
RECORDED TEST DATA:

DATE	TIME	TEMP/RH			761191 SN007	761191 SN008
3-7-2014	1315	78° 24%	NO CHATTER		7.15	6.96
Y-AXIS	1316				4.72	4.81
	1317		STOP VIBRATION		7.50	7.22
					4.46	4.49
	1322		BEGIN RESONANCE SWEEP			
	1337		SWEEP COMPLETE			
	1340	80° 21%			7.50	7.26
					4.48	4.52
	1351		RUN SHOCK PROFILE			
		81° 21%			7.52	7.27
					4.45	4.52
			Y-AXIS VIBRATION AND SHOCK TESTING COMPLETE			

Test Performed by:

DATE: \_\_\_\_\_

2 - Acceleration vs Freq



g-pk  
2:1.26

Save 1 of 1

3/7/2014

10:0:17 AM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq 2000.00  
Hz

Ref 1.00  
g-pk

Acc 0.999  
g-pk

Vel 0.03  
in/s-pk

Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION: Y-AXIS

RUN NAME: run5

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

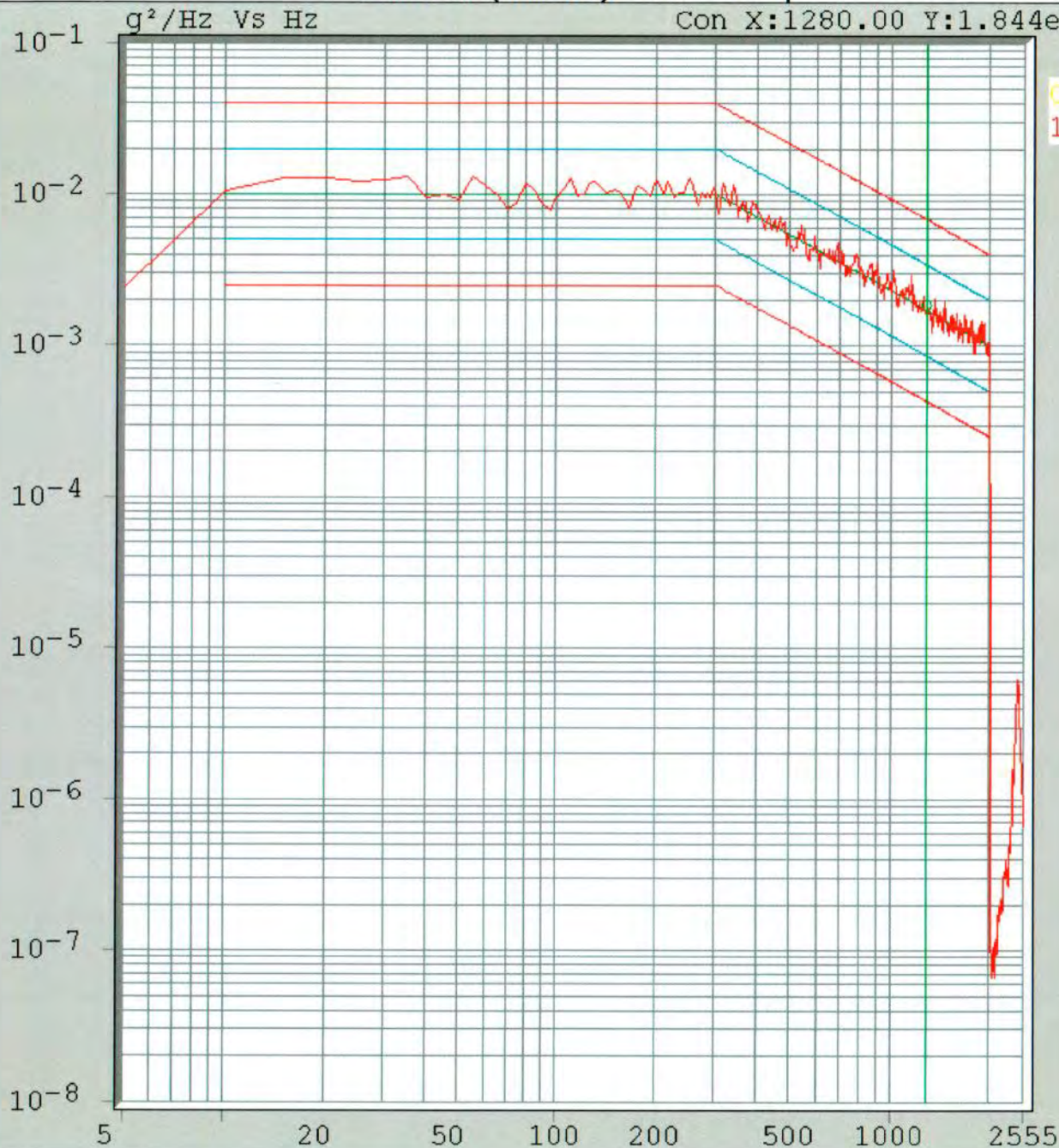
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq



Con X:1280.00 Y:1.844e-003

grms  
C:2.82  
1:2.82

Save 1 of 1

3/7/2014 10:32:7 AM

TOTAL : 0:19:16

0:18:16 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.82

TONES

Freq	Ref	Con	pk
20.59	2.00	1.97	g
52.86	5.00	4.97	g
105.1	10.00	10.00	g
444.8	16.70	16.56	g

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run13

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones) - Acceleration vs Freq

Save 1 of 1

3/7/2014 10:32:7 AM

TOTAL : 0:19:16

0:18:16 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.54	2.75	2.82

TONES

Freq	Ref	Con	
20.59	2.00	1.97	g pk
52.86	5.00	4.97	g pk
105.1	10.00	10.00	g pk
444.8	16.70	16.56	g pk

Log Sweep: 5.00 Min

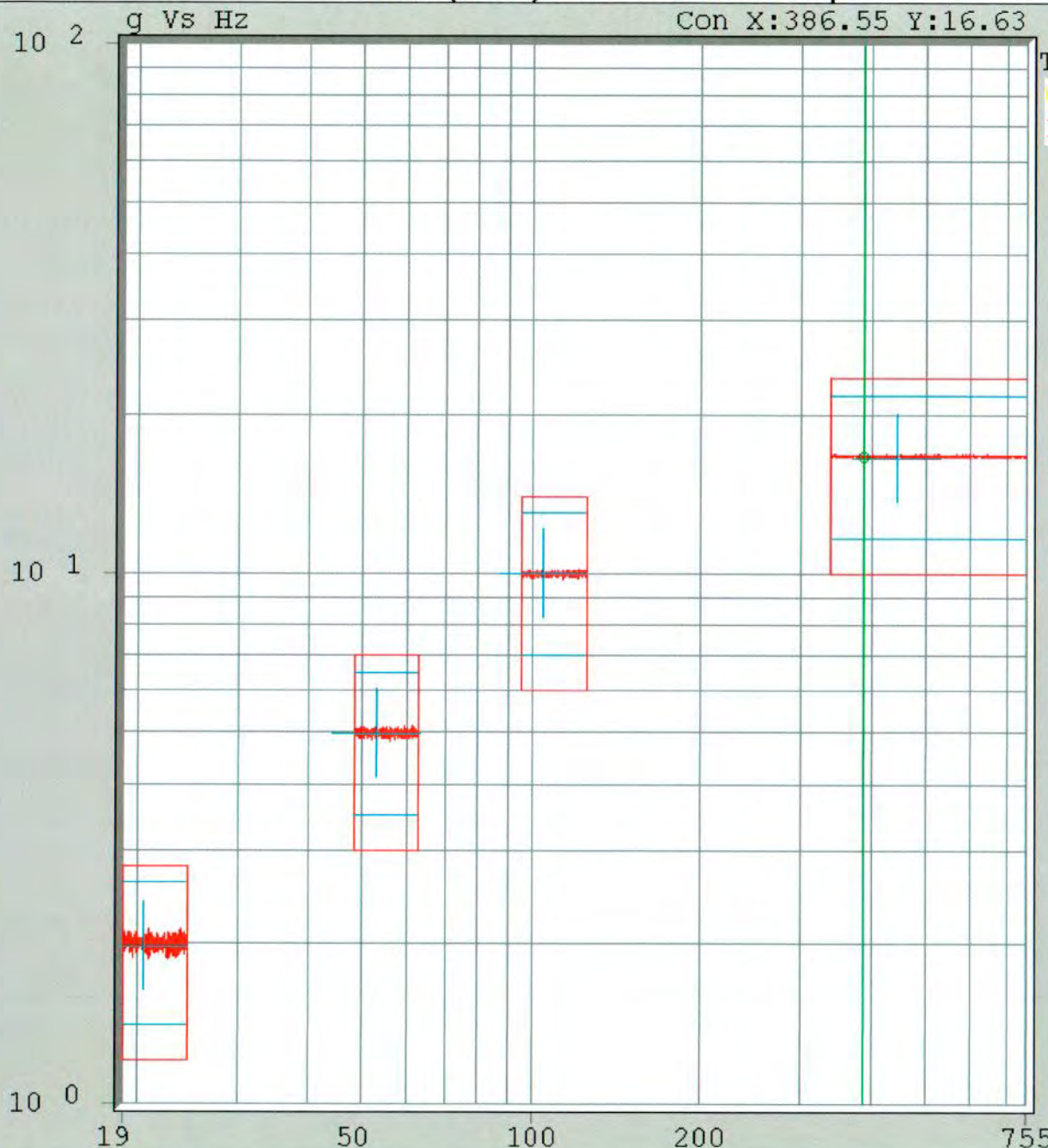
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



T1 g-pk  
C:1.97  
1:1.97



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run13

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

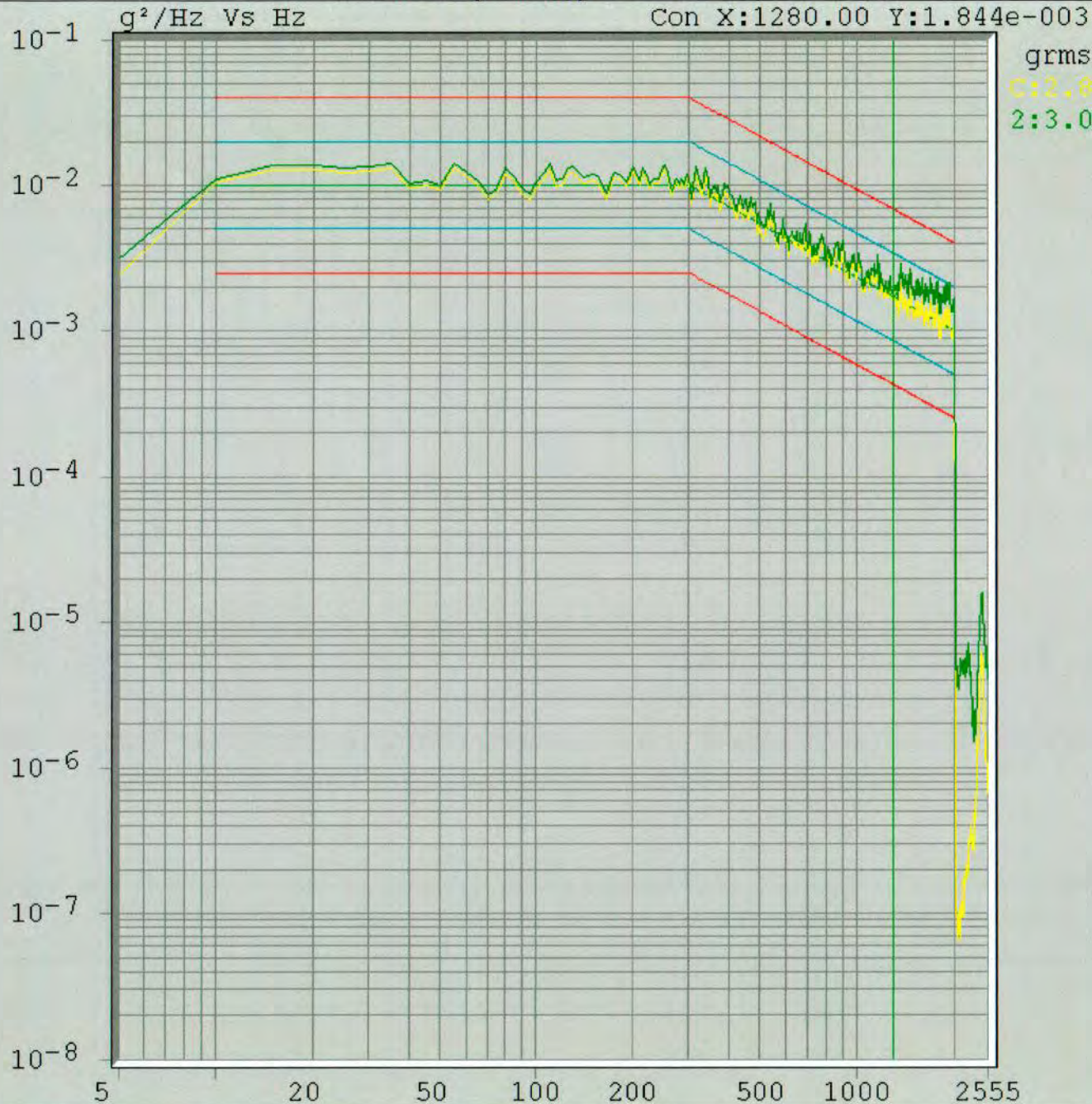
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

vwin II

Control,2 (Random) - PSD vs Freq



Save 1 of 1

3/7/2014 10:32:7 AM

TOTAL : 0:19:16

0:18:16 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.82

TONES

Freq	Ref	Con	g pk
20.59	2.00	1.97	g pk
52.86	5.00	4.97	g pk
105.1	10.00	10.00	g pk
444.8	16.70	16.56	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run13

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

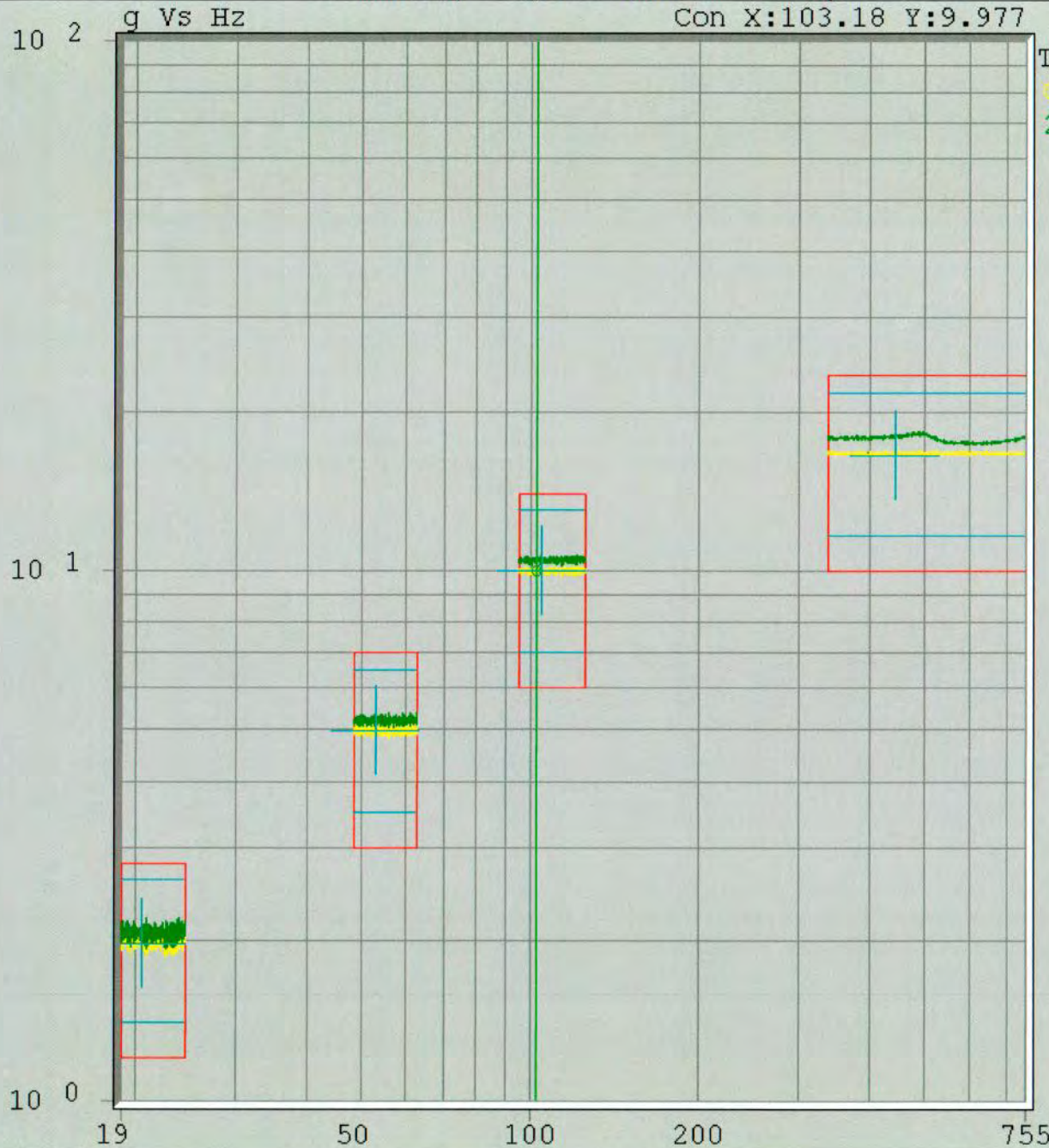
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,2 (Tones) - Acceleration vs Freq



T1 g-pk  
 C:1.97  
 2:2.03

Save 1 of 1

3/7/2014 10:32:7 AM

TOTAL : 0:19:16

0:18:16 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.54	2.75	2.82

TONES

Freq	Ref	Con	g pk
20.59	2.00	1.97	g pk
52.86	5.00	4.97	g pk
105.1	10.00	10.00	g pk
444.8	16.70	16.56	g pk

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run13

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

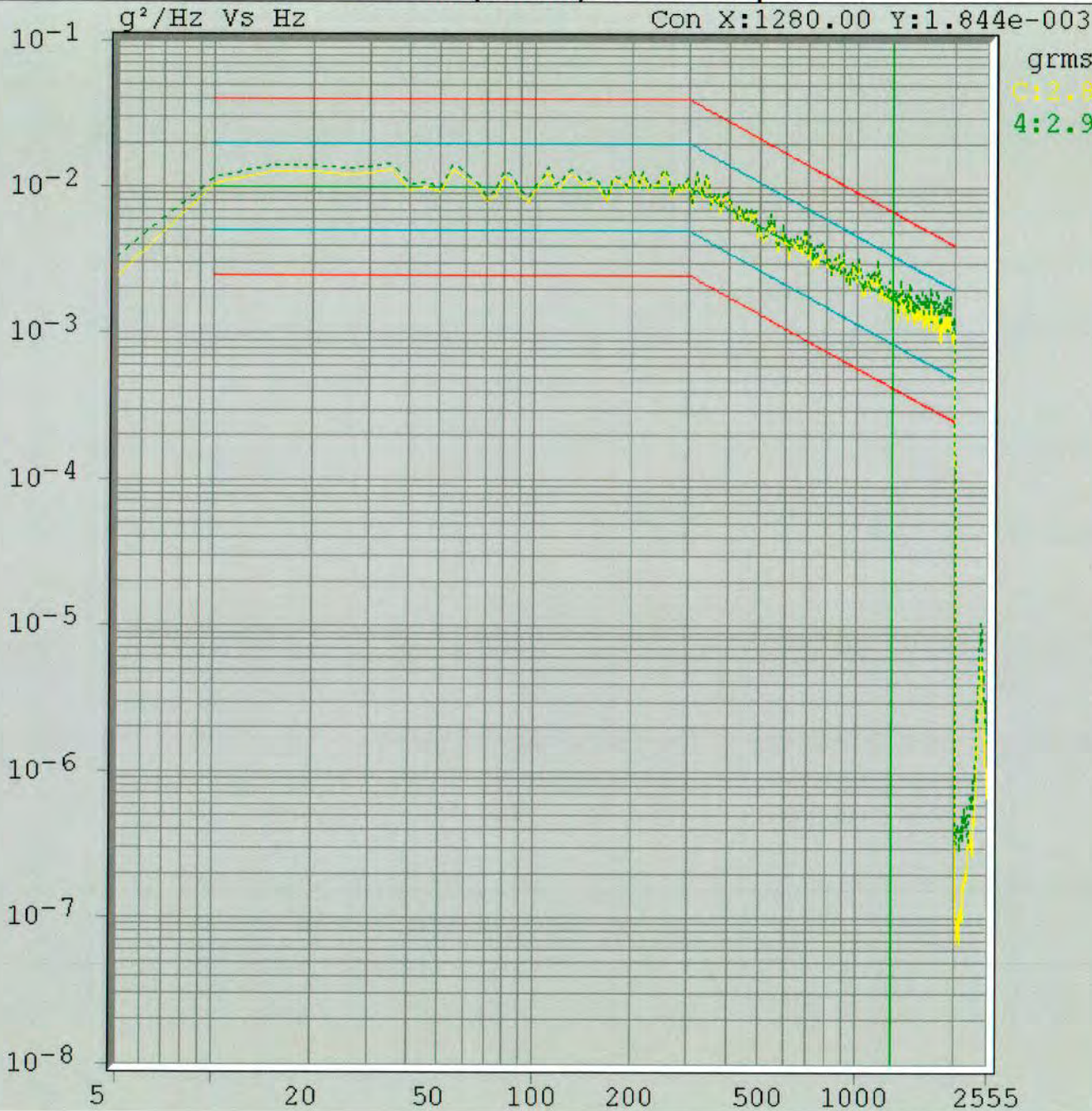
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

vwin II

Control,4 (Random) - PSD vs Freq



Save 1 of 1

3/7/2014 10:32:7 AM

TOTAL : 0:19:16

0:18:16 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.82

TONES

Freq	Ref	Con	g pk
20.59	2.00	1.97	g pk
52.86	5.00	4.97	g pk
105.1	10.00	10.00	g pk
444.8	16.70	16.56	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run13

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Tones) - Acceleration vs Freq

Save 1 of 1

3/7/2014 10:32:7 AM

TOTAL : 0:19:16

0:18:16 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.82

TONES

Freq	Ref	Con	
20.59	2.00	1.97	g pk
52.86	5.00	4.97	g pk
105.1	10.00	10.00	g pk
444.8	16.70	16.56	g pk

Log Sweep: 5.00 Min

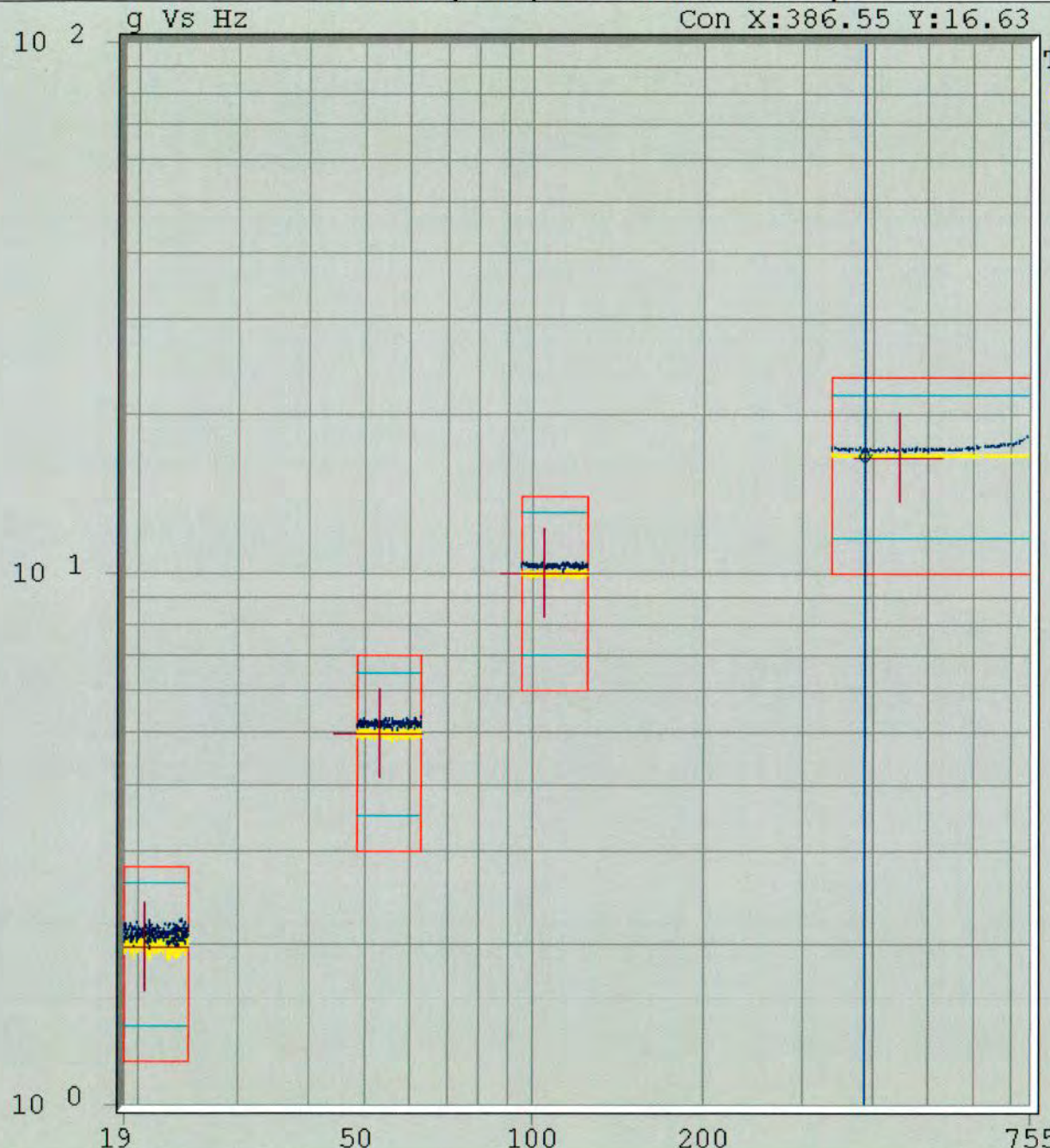
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



T1 g-pk  
C:1.97  
4:2.06

SOR SETUP ID: 7G1191  
 SETUP DESCRIPTION: performance levels y axis  
 RUN NAME: run13  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g

RUN DESC:  
 CH-3: 10.00 mV/g      CH-4: 10.00 mV/g



Vwin II

Control,1 (Random) - PSD vs Freq

3/7/2014 11:18:22 AM

TOTAL : 0:36:19

0:34:27 of 6:30:0

Swp 7

Status: Auto

SWEEEPING->

Level 0.0dB:100%

GRMS

TOTAL	RANDOM	
Con	Ref	Con
17.92	3.89	3.91

TONES

Freq	Ref	Con	
23.81	4.00	3.97	g pk
61.04	6.30	6.30	g pk
121.5	12.50	12.59	g pk
692.0	20.00	20.01	g pk

Log Sweep: 5.00 Min

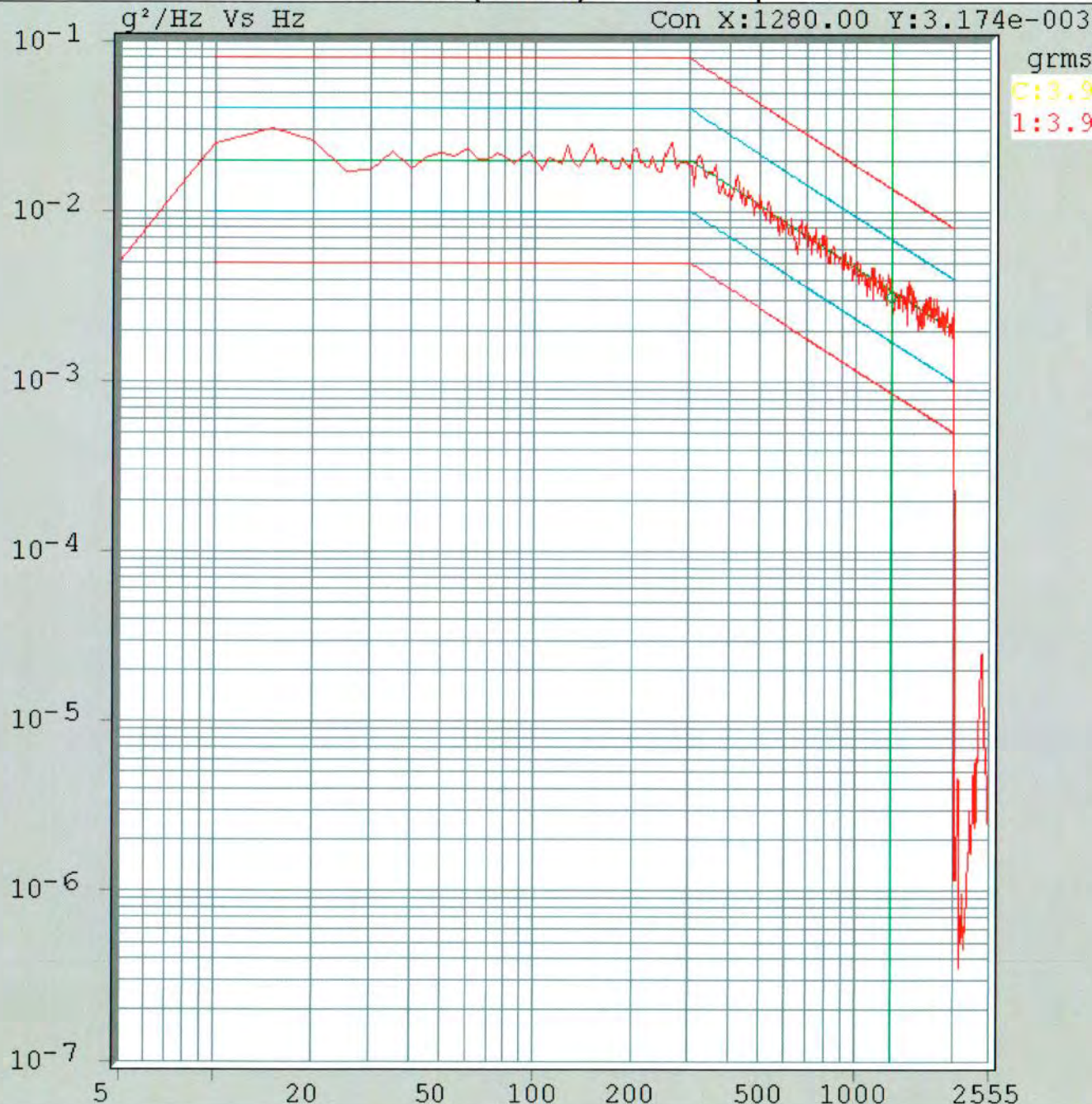
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones) - Acceleration vs Freq

3/7/2014 11:18:42 AM

TOTAL : 0:36:39

0:34:47 of 6:30:0

Swp 7

Status: Auto

SWEEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.89	3.89	3.95

TONES

Freq	Ref	Con
24.24	4.00	4.18
62.14	6.30	6.29
123.7	12.50	12.45
731.0	20.00	20.02

Log Sweep: 5.00 Min

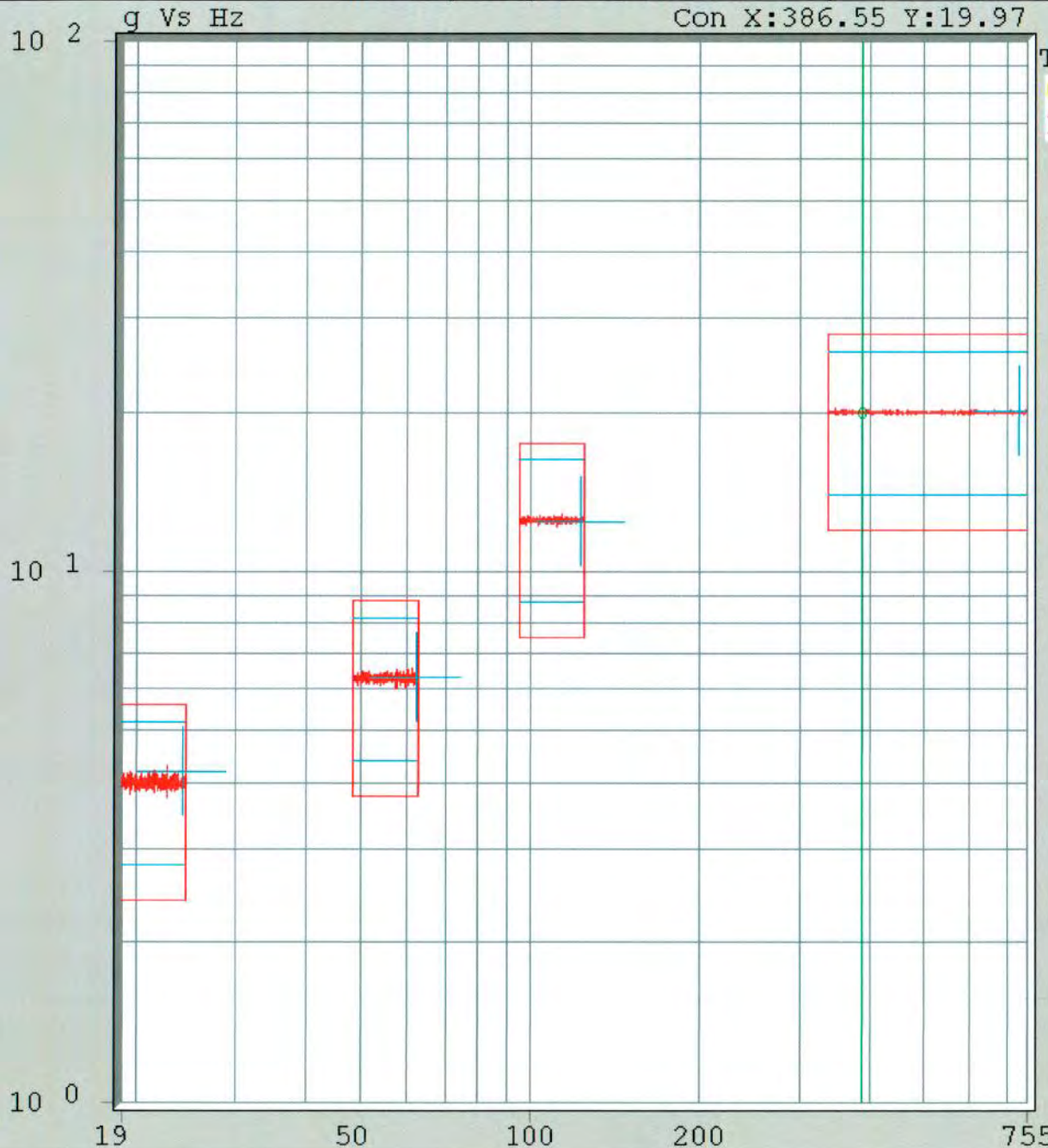
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



T1 g-pk  
C:4.18  
1:4.18

SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

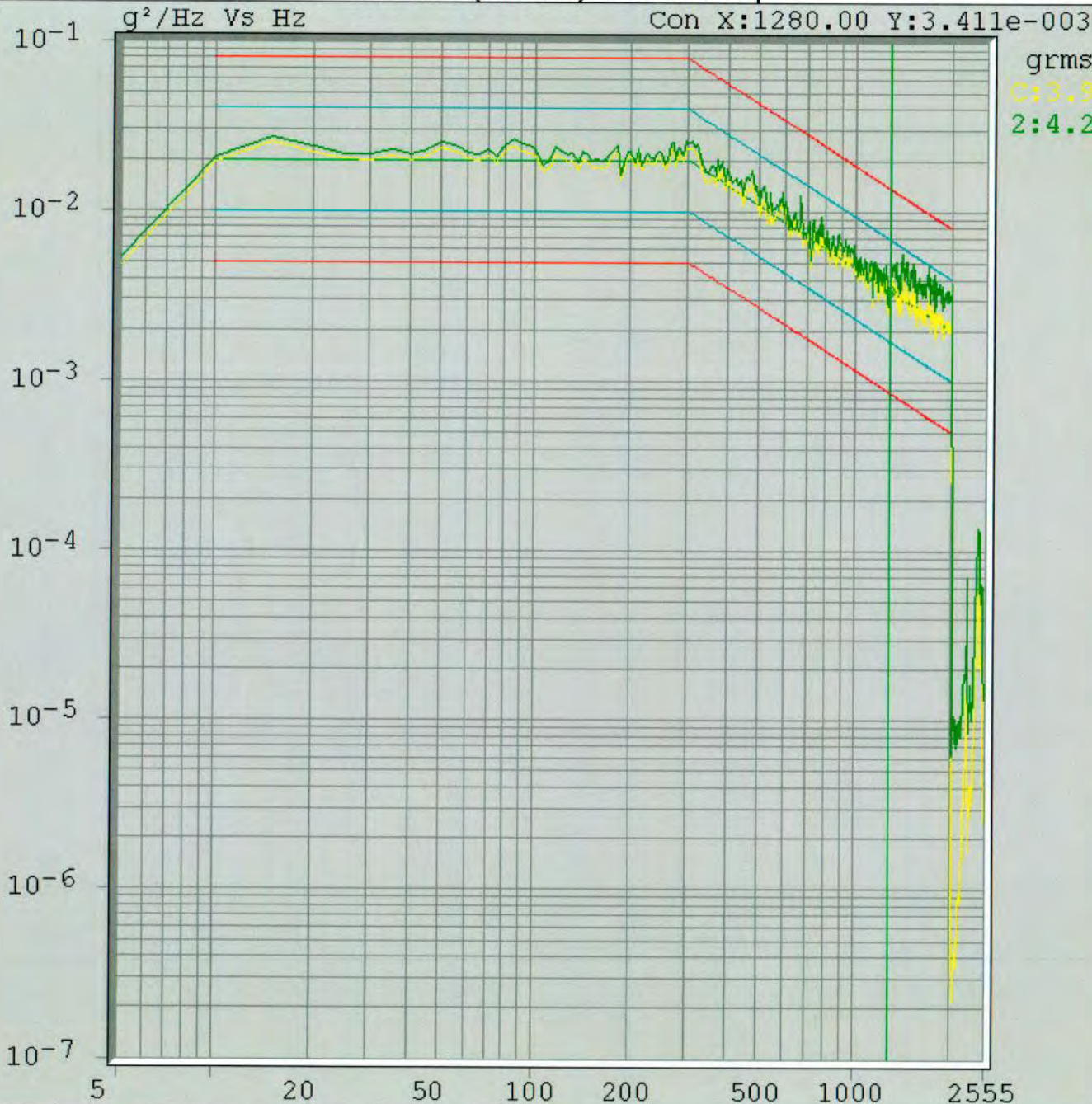
RUN DESC:

CH-4: 10.00 mV/g

Vwin II



Control,2 (Random) - PSD vs Freq



grms  
C:3.95  
2:4.23

3/7/2014 11:18:53 AM

TOTAL : 0:36:50

0:34:58 of 6:30:0

Swp 7

Status: Auto

SWEEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.95

TONES

Freq	Ref	Con	g pk
24.47	4.00	4.02	g pk
62.73	6.30	6.32	g pk
124.9	12.50	12.65	g pk
752.6	20.00	20.12	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

# Control,2 (Tones) - Acceleration vs Freq



T1 g-pk  
C:4.09  
2:4.25

3/7/2014 11:18:58 AM

TOTAL : 0:36:55

0:35:4 of 6:30:0

Swp 8

Status: Auto

<-SWEEPING

Level 0.0dB:100%

GRMS		
TOTAL	RANDOM	
Con	Ref	Con
17.92	3.89	3.99

TONES			
Freq	Ref	Con	
24.40	4.00	4.09	g pk
62.54	6.30	6.34	g pk
124.5	12.50	12.47	g pk
745.3	20.00	20.12	g pk

Log Sweep: 5.00 Min  
Servo(dB/s): 100  
DOF: 100  
Lines/Res: 500/ 5.00 Hz  
C:1  
S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels y axis  
 RUN NAME: run8  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      CH-4: 10.00 mV/g  
 RUN DESC:  
 Vwin II

Control,4 (Random) - PSD vs Freq

3/7/2014 11:19:10 AM

TOTAL : 0:37:7

0:35:15 of 6:30:0

Swp 8

Status: Auto

<SWEEPING

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.96

TONES

Freq	Ref	Con	g pk
24.15	4.00	4.04	g pk
61.92	6.30	6.37	g pk
123.2	12.50	12.57	g pk
722.8	20.00	20.01	g pk

Log Sweep: 5.00 Min

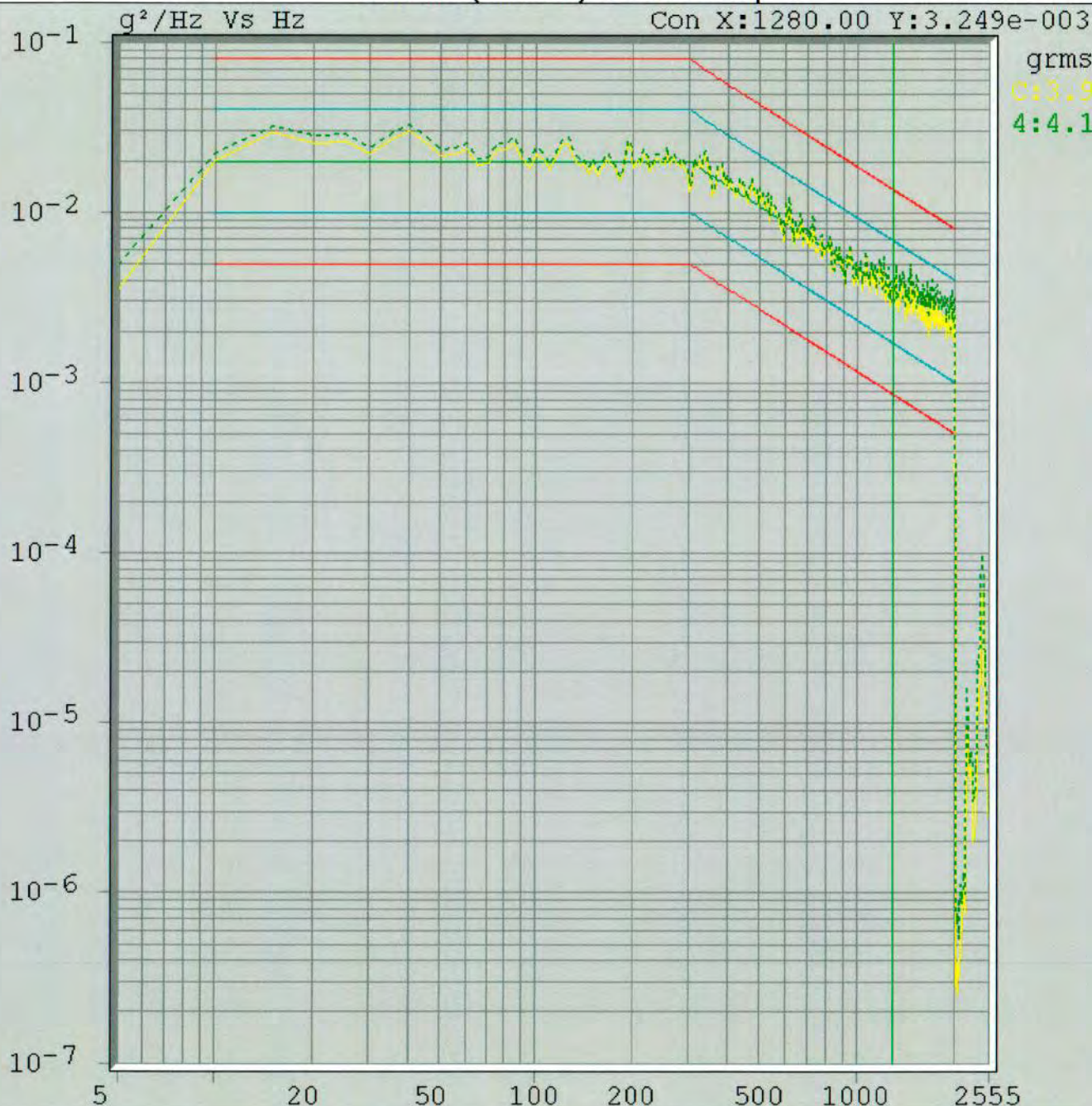
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Tones) - Acceleration vs Freq

3/7/2014 11:19:18 AM

TOTAL : 0:37:15

0:35:23 of 6:30:0

Swp 8

Status: Auto

<-SWEEPING

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.94	3.89	3.95

TONES

Freq	Ref	Con	g pk
23.99	4.00	4.01	g pk
61.49	6.30	6.34	g pk
122.4	12.50	12.70	g pk
707.8	20.00	20.09	g pk

Log Sweep: 5.00 Min

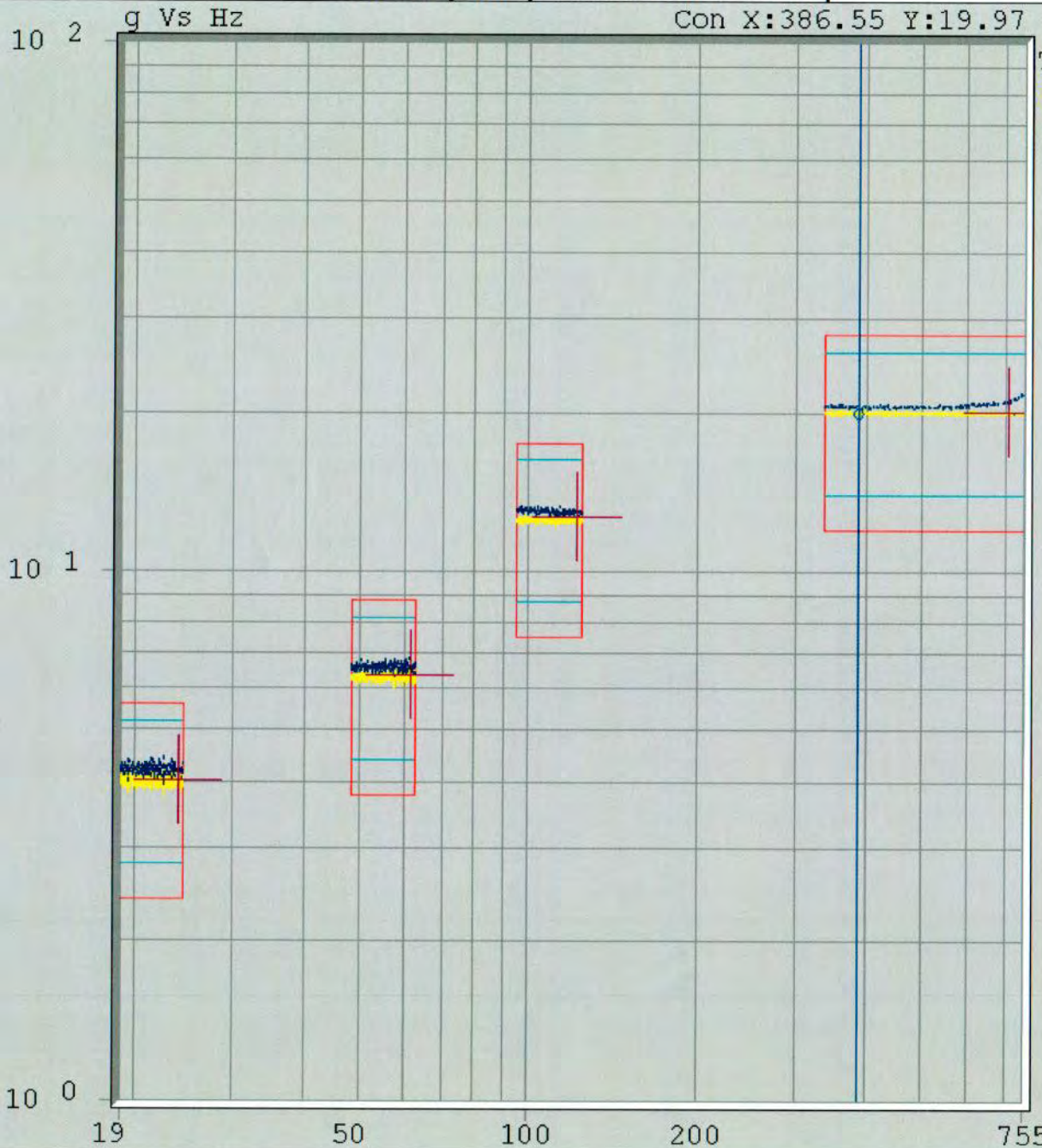
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



T1 g-pk  
C:4.01  
4:4.21



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

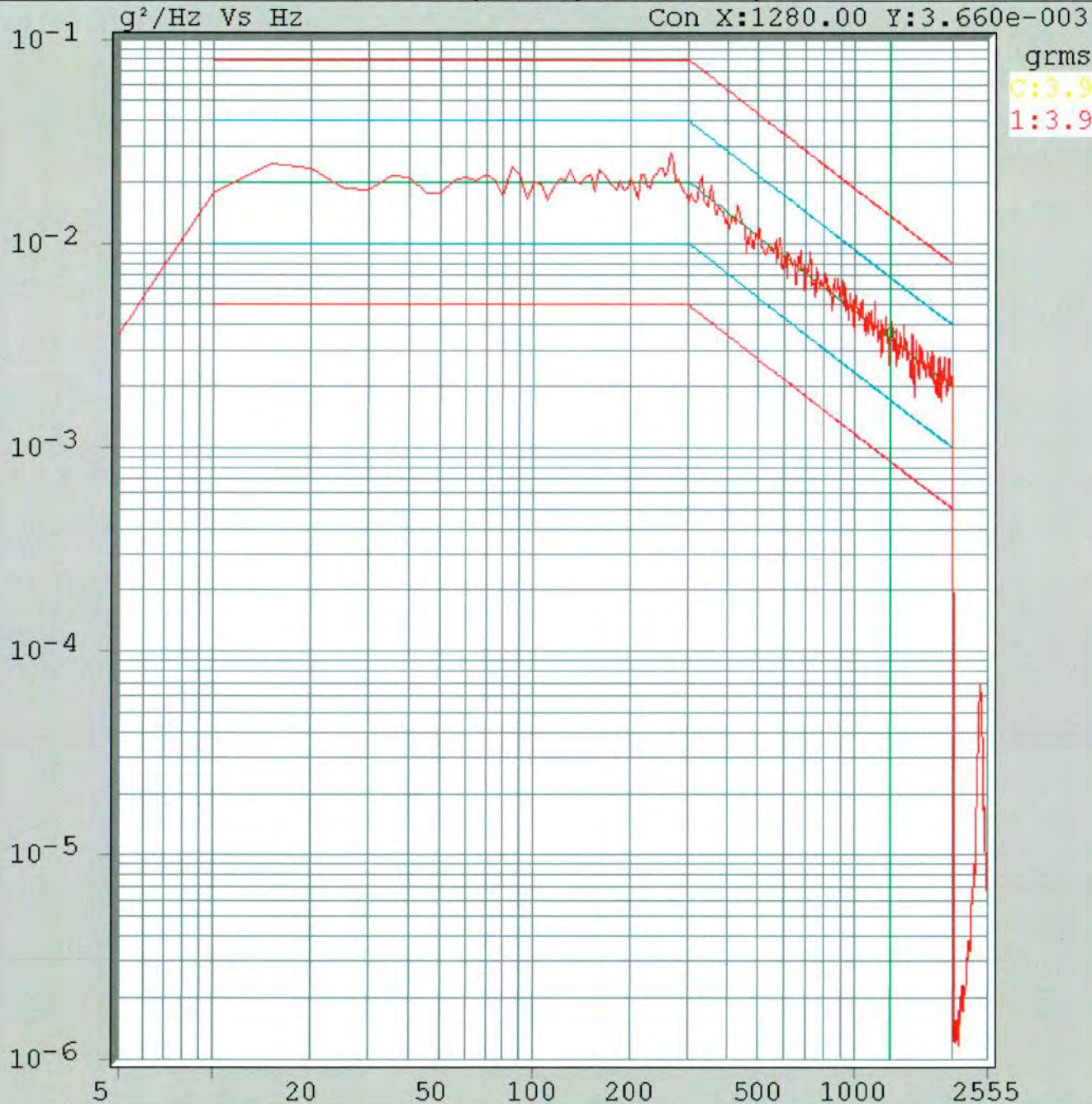
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq



3/7/2014 12:52:24 PM

TOTAL : 2:4:10

2:2:19 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
17.89	3.89	3.91

TONES

Freq	Ref	Con	g pk
21.30	4.00	4.10	g pk
54.65	6.30	6.35	g pk
108.6	12.50	12.46	g pk
492.6	20.00	20.01	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

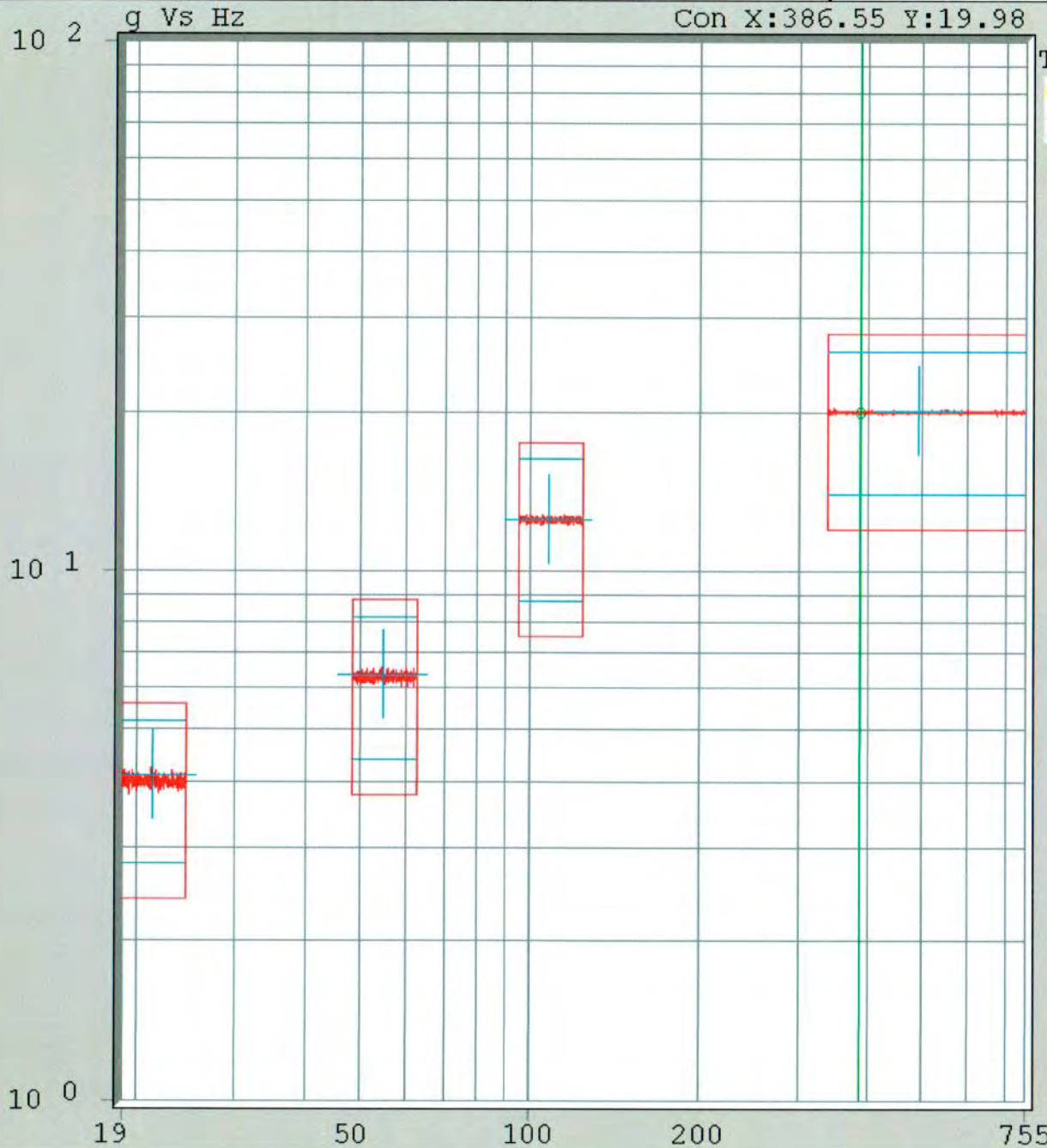
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones) - Acceleration vs Freq



T1 g-pk  
C:4.10  
1:4.10

3/7/2014 12:52:30 PM

TOTAL : 2:4:10

2:2:19 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
17.89	3.89	3.91

TONES

Freq	Ref	Con	g pk
21.30	4.00	4.10	g pk
54.65	6.30	6.35	g pk
108.6	12.50	12.46	g pk
492.6	20.00	20.01	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

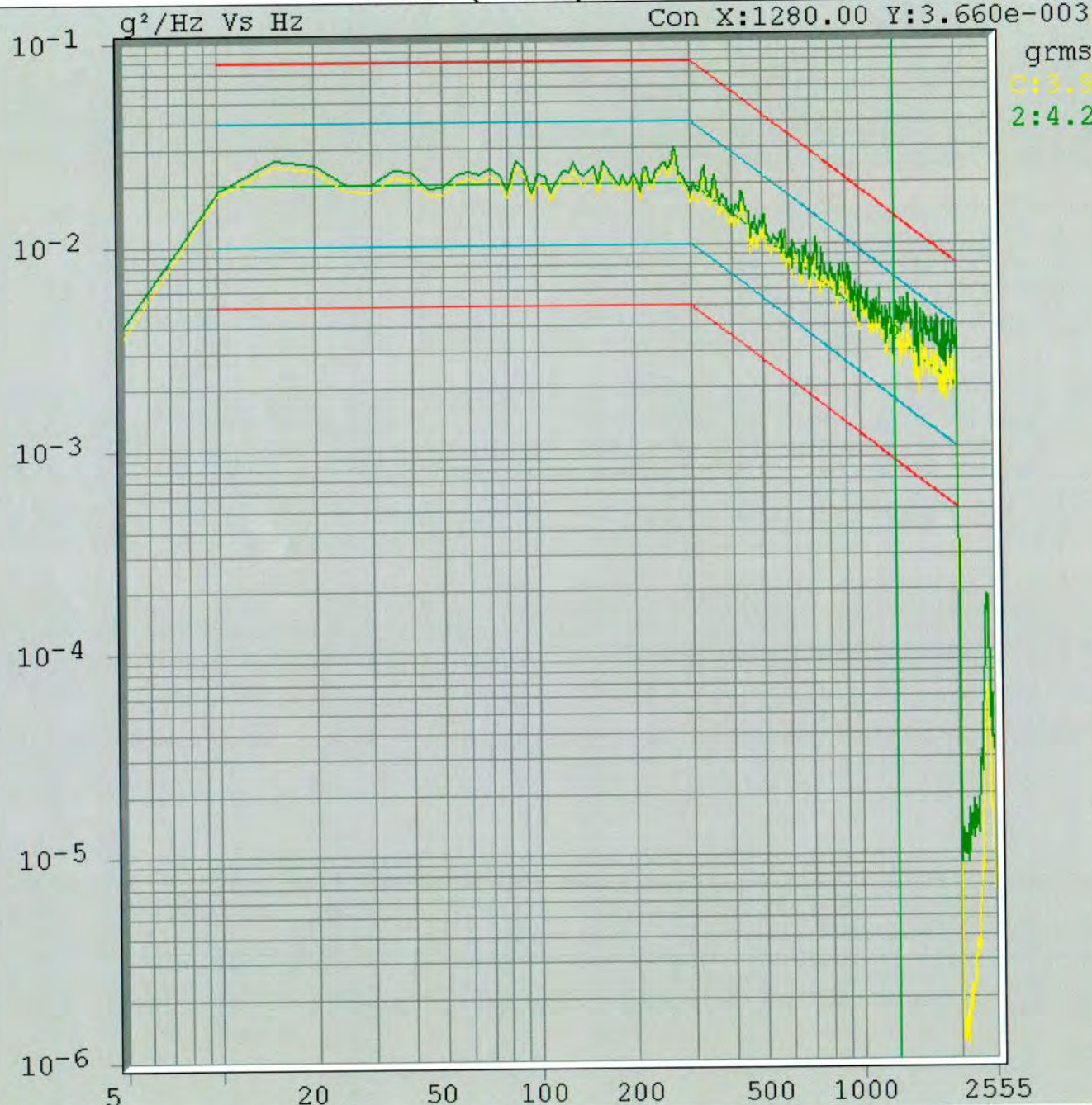
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,2 (Random) - PSD vs Freq



3/7/2014 12:52:36 PM

TOTAL : 2:4:10

2:2:19 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.89	3.89	3.91

TONES

Freq	Ref	Con	pk
21.30	4.00	4.10	g
54.65	6.30	6.35	g
108.6	12.50	12.46	g
492.6	20.00	20.01	g

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,2 (Tones) - Acceleration vs Freq



T1 g-pk  
C:4.10  
2:4.24

3/7/2014 12:52:40 PM

TOTAL : 2:4:10

2:2:19 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.89	3.89	3.91

TONES

Freq	Ref	Con	
21.30	4.00	4.10	g pk
54.65	6.30	6.35	g pk
108.6	12.50	12.46	g pk
492.6	20.00	20.01	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

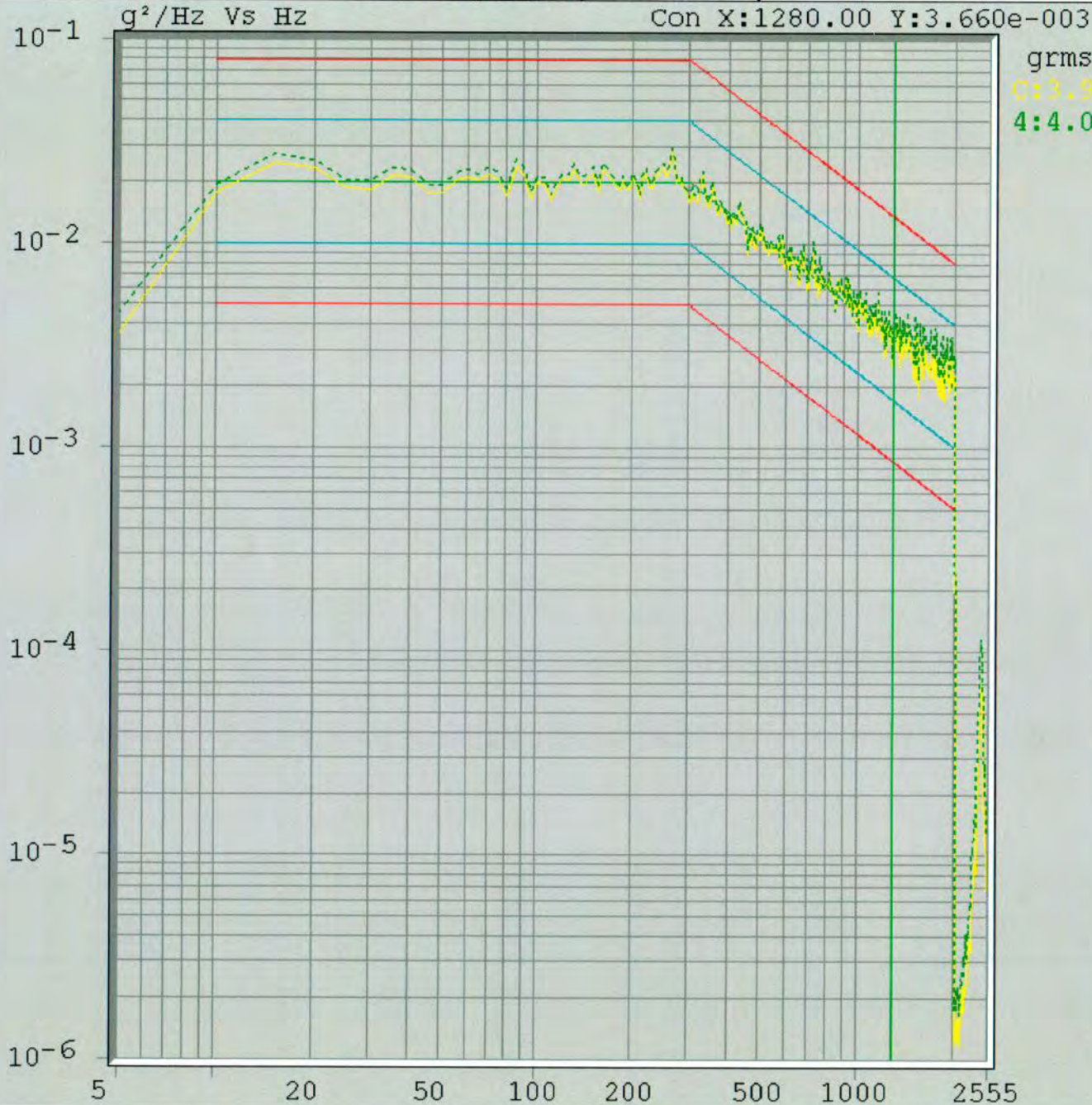
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Random) - PSD vs Freq



3/7/2014 12:52:48 PM

TOTAL : 2:4:10

2:2:19 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
17.89	3.89	3.91

TONES

Freq	Ref	Con	g pk
21.30	4.00	4.10	g pk
54.65	6.30	6.35	g pk
108.6	12.50	12.46	g pk
492.6	20.00	20.01	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels y axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

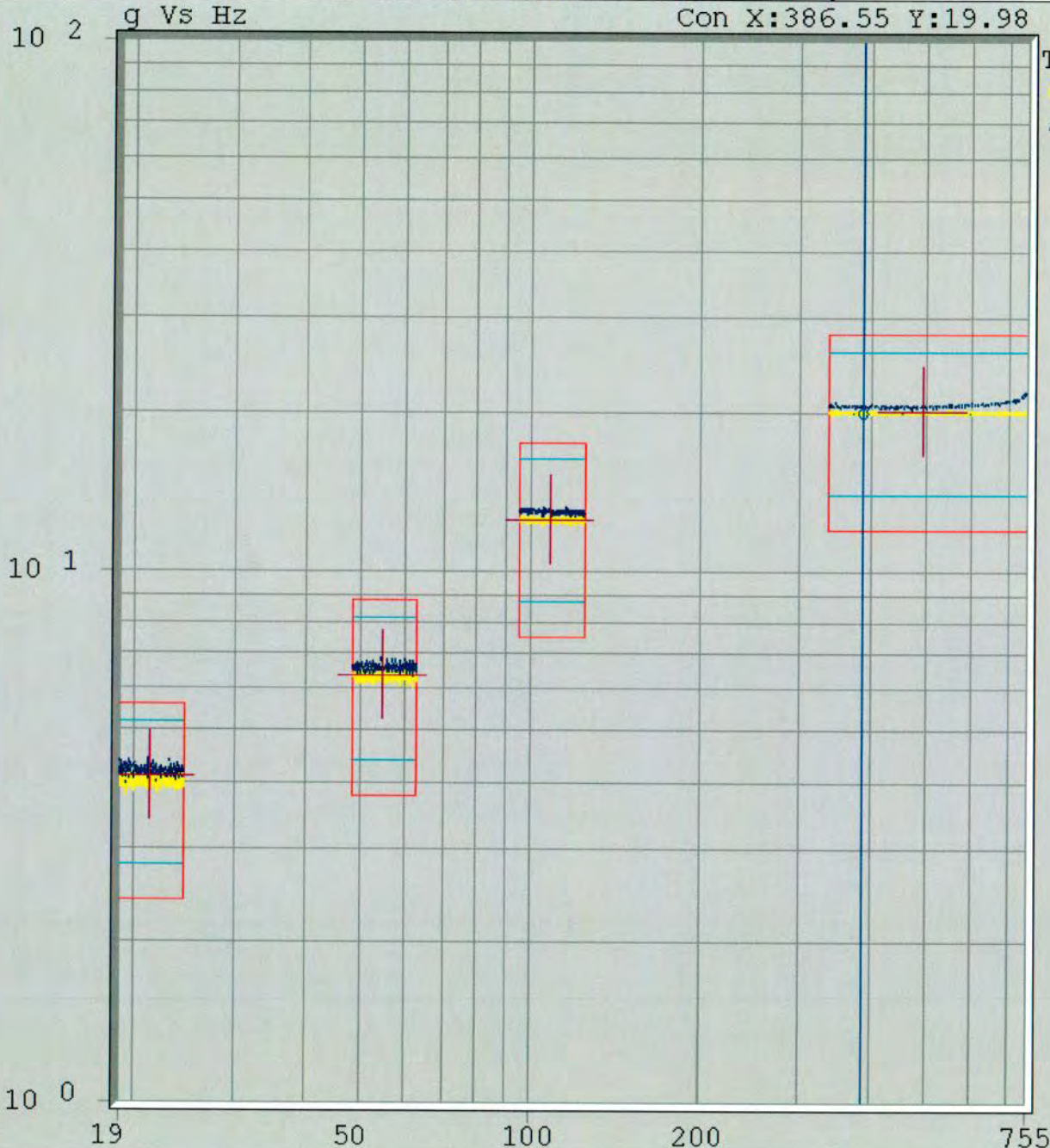
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Tones) - Acceleration vs Freq



T1 g-pk  
C:4.10  
4:4.30

3/7/2014 12:52:51 PM

TOTAL : 2:4:10

2:2:19 of 6:30:0

Swp 25

Status: Auto  
**STOPPED**

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.89	3.89	3.91

TONES

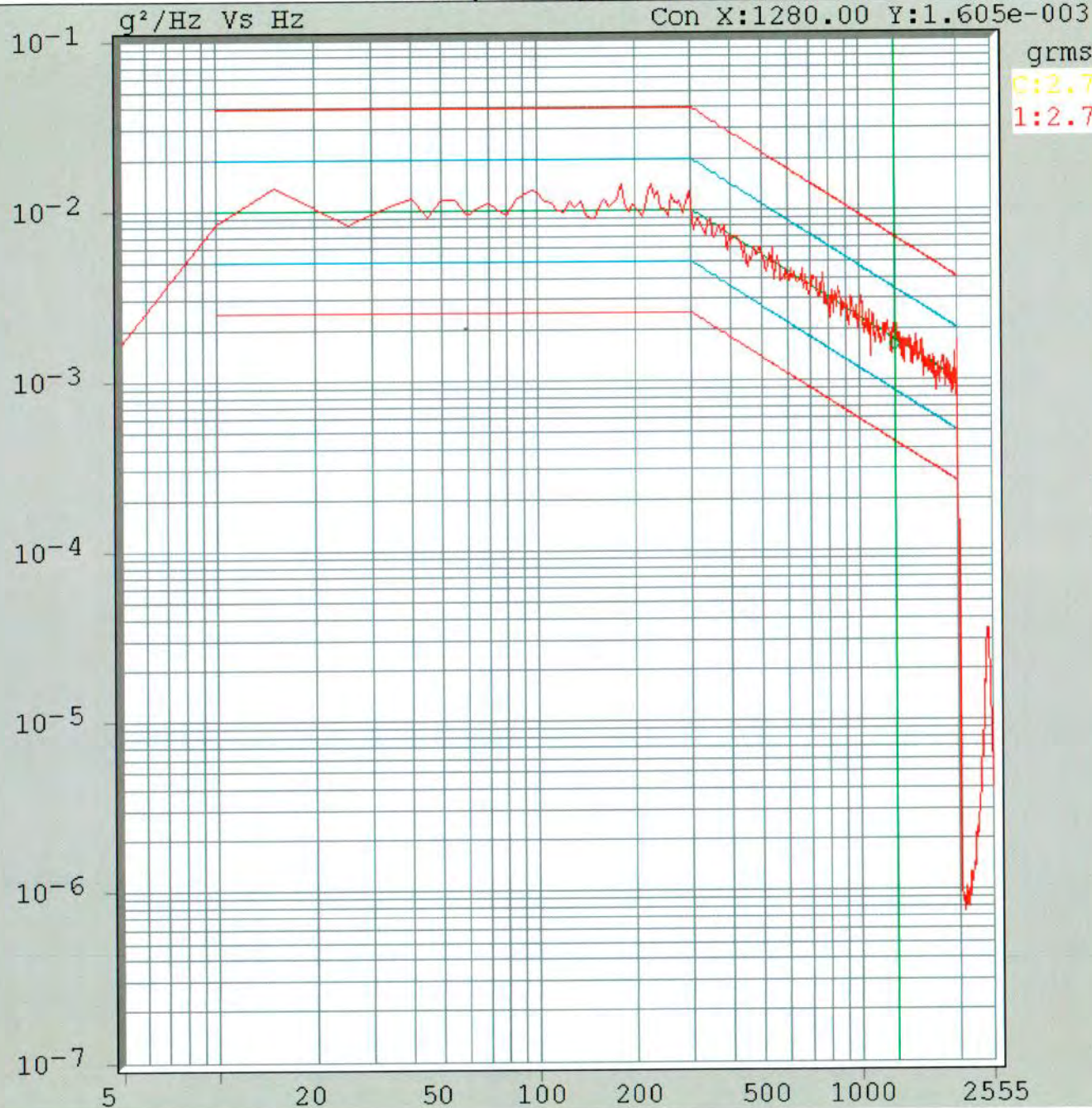
Freq	Ref	Con	g pk
21.30	4.00	4.10	g pk
54.65	6.30	6.35	g pk
108.6	12.50	12.46	g pk
492.6	20.00	20.01	g pk

Log Sweep: 5.00 Min  
Servo(dB/s): 100  
DOF: 100  
Lines/Res: 500/ 5.00 Hz  
C:1  
S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels y axis  
 RUN NAME: run8  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      CH-4: 10.00 mV/g  
 RUN DESC:  
 Vwin II

Control.1 (Random) - PSD vs Freq



Save 1 of 1

3/7/2014 1:16:34 PM

TOTAL : 0:20:1

0:18:43 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.53	2.75	2.79

TONES

Freq	Ref	Con	pk
20.11	2.00	2.06	pk
51.64	5.00	4.94	pk
102.6	10.00	9.85	pk
414.0	16.70	16.70	pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run14

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

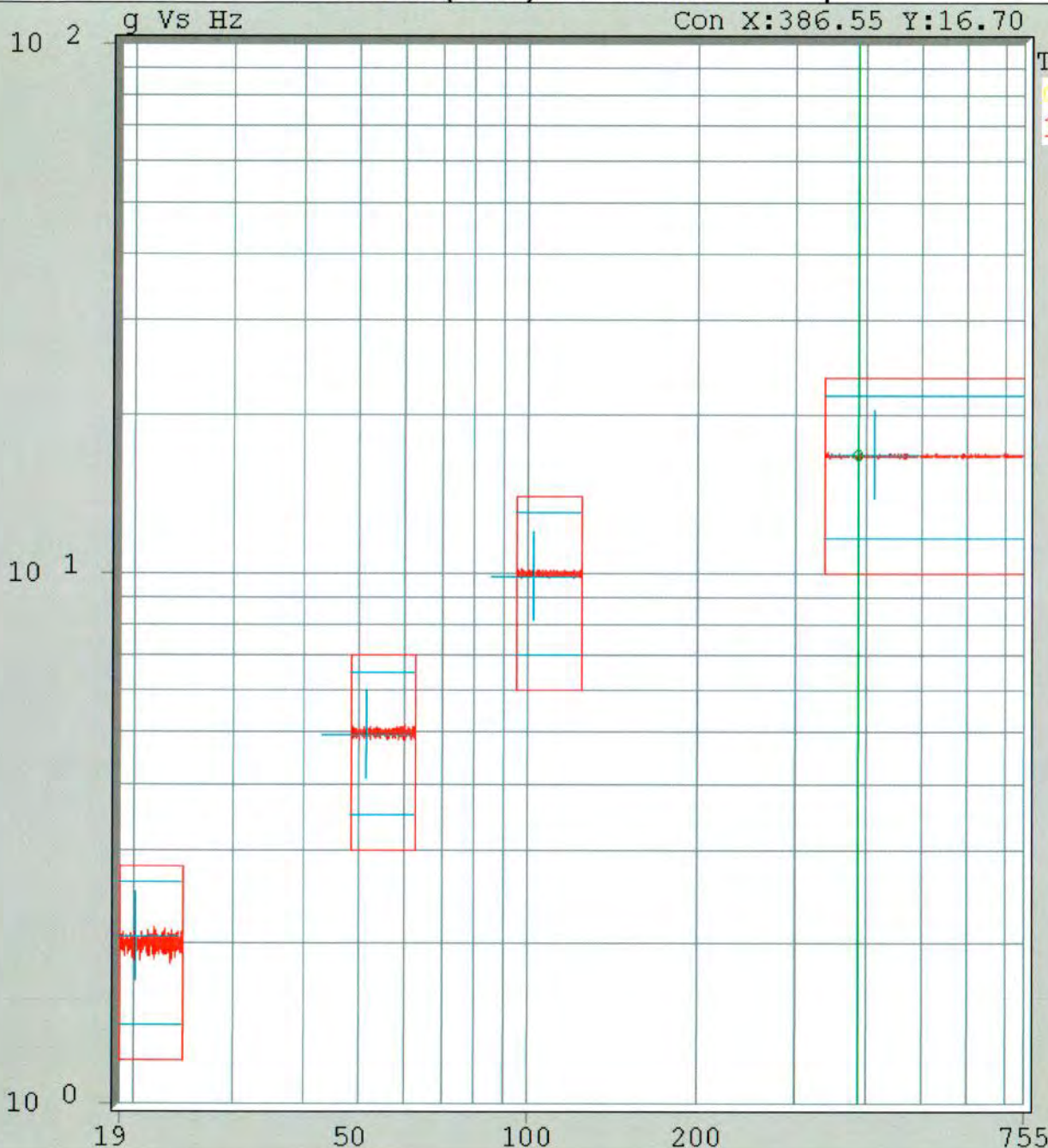
CH-3: 10.00 mV/g

RUN DESC: perform levels y axis

CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones) - Acceleration vs Freq



T1 g-pk  
C:2.06  
1:2.06

Save 1 of 1

3/7/2014 1:16:34 PM

TOTAL : 0:20:1

0:18:43 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.53	2.75	2.79

TONES

Freq	Ref	Con	g pk
20.11	2.00	2.06	g pk
51.64	5.00	4.94	g pk
102.6	10.00	9.85	g pk
414.0	16.70	16.70	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run14

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

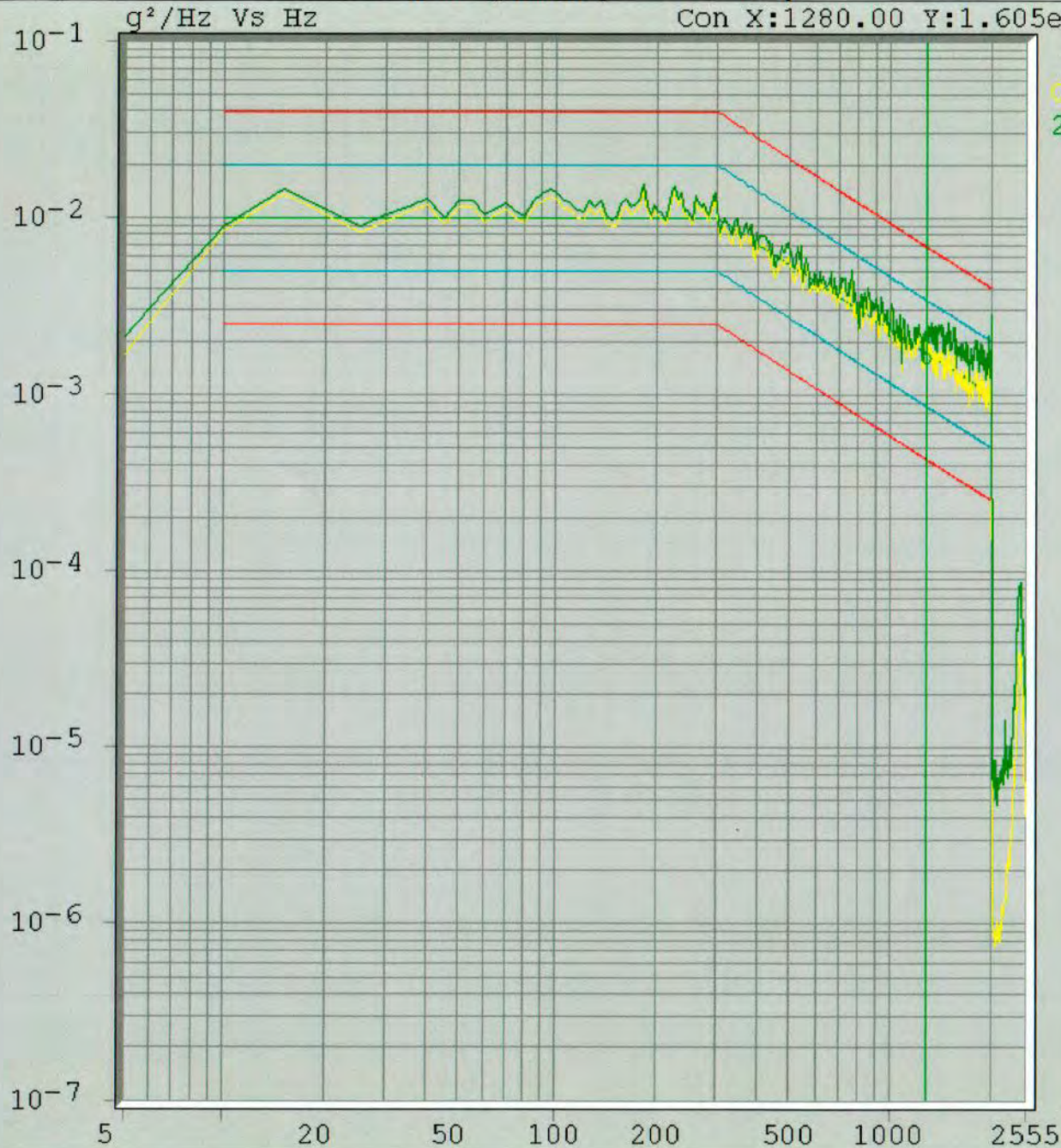
CH-3: 10.00 mV/g

RUN DESC: perform levels y axis

CH-4: 10.00 mV/g

Vwin II

Control,2 (Random) - PSD vs Freq



Save 1 of 1

3/7/2014 1:16:34 PM

TOTAL : 0:20:1

0:18:43 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.53	2.75	2.79

TONES

Freq	Ref	Con	g pk
20.11	2.00	2.06	g pk
51.64	5.00	4.94	g pk
102.6	10.00	9.85	g pk
414.0	16.70	16.70	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run14

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: perform levels y axis

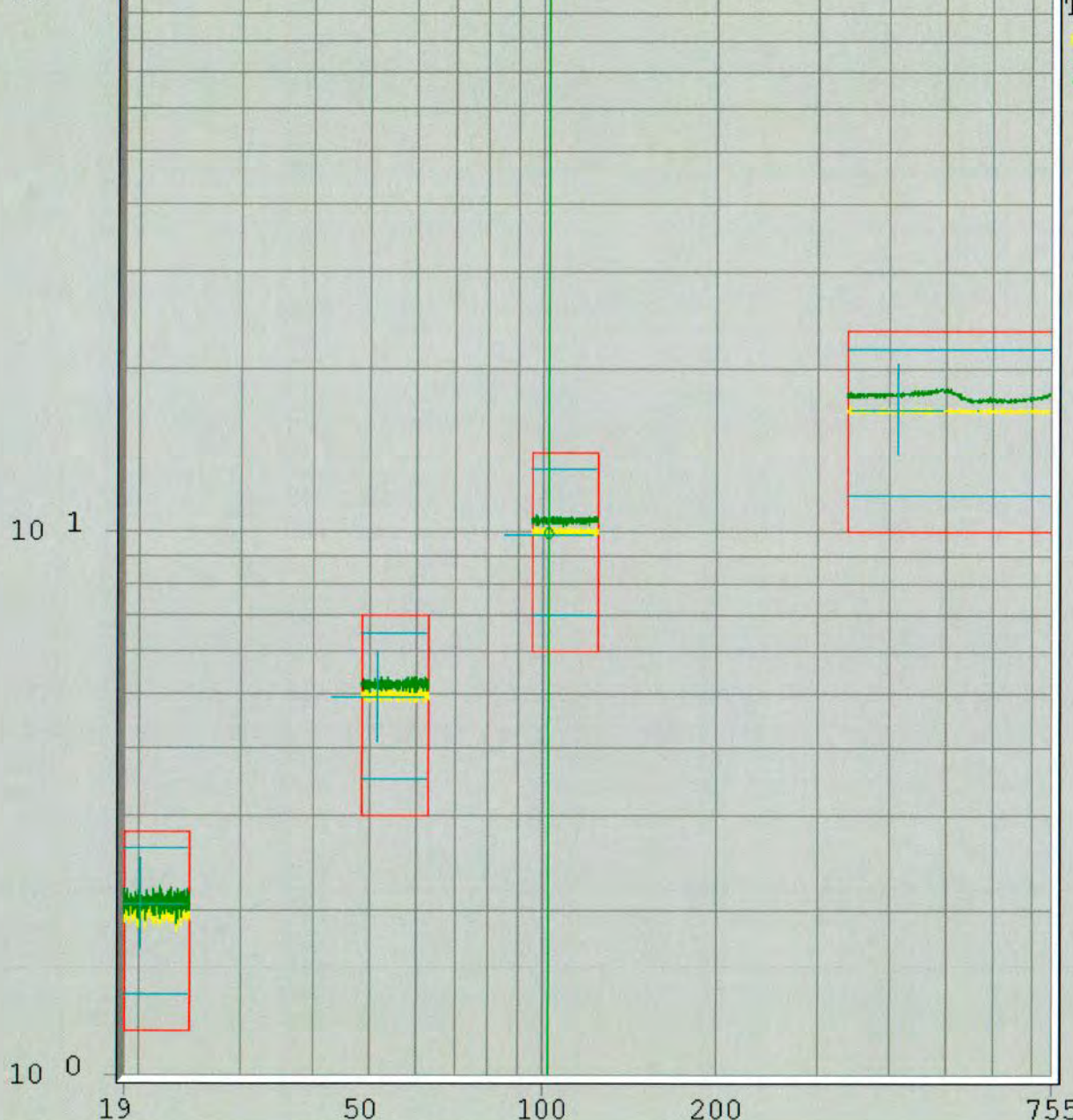
CH-4: 10.00 mV/g

Vwin II

# Control,2 (Tones) - Acceleration vs Freq

Con X:103.18 Y:9.951

10 2 g Vs Hz



T1 g-pk  
 1:2.06  
 2:2.14

Save 1 of 1

3/7/2014 1:16:34 PM

TOTAL : 0:20:1

0:18:43 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS		
TOTAL Con	RANDOM Ref	Con
14.53	2.75	2.79

TONES		
Freq	Ref	Con
20.11	2.00	2.06
51.64	5.00	4.94
102.6	10.00	9.85
414.0	16.70	16.70

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run14

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

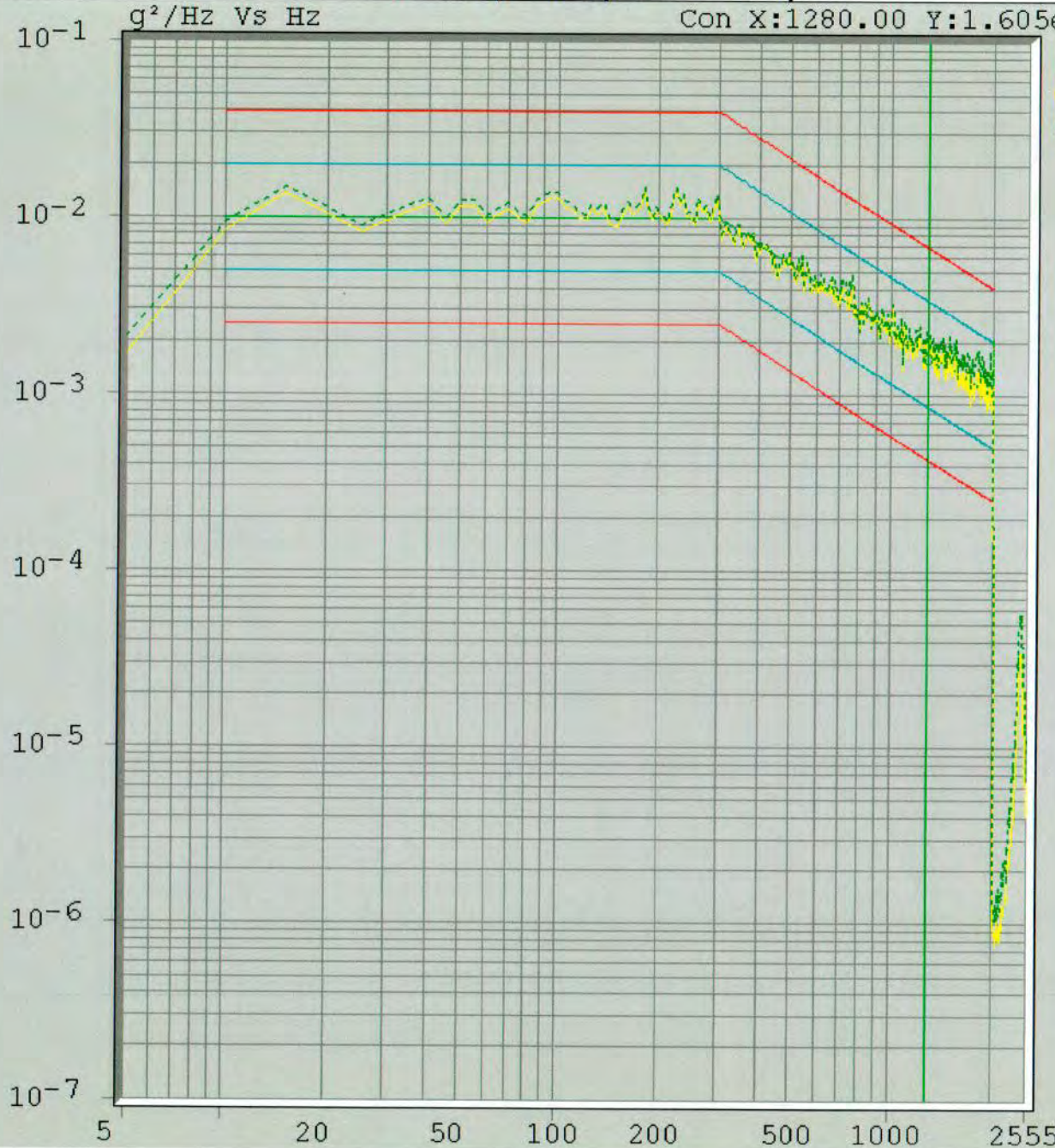
CH-3: 10.00 mV/g

RUN DESC: perform levels y axis

CH-4: 10.00 mV/g

vwin II

Control,4 (Random) - PSD vs Freq



grms  
C:2.79  
4:2.91

Save 1 of 1

3/7/2014 1:16:34 PM

TOTAL : 0:20:1

0:18:43 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS		
TOTAL Con	RANDOM Ref	Con
14.53	2.75	2.79

TONES		
Freq	Ref	Con
20.11	2.00	2.06
51.64	5.00	4.94
102.6	10.00	9.85
414.0	16.70	16.70

Log Sweep: 5.00 Min  
Servo(dB/s): 100  
DOF: 100  
Lines/Res: 500/ 5.00 Hz  
C:1  
S:1,2,3,4



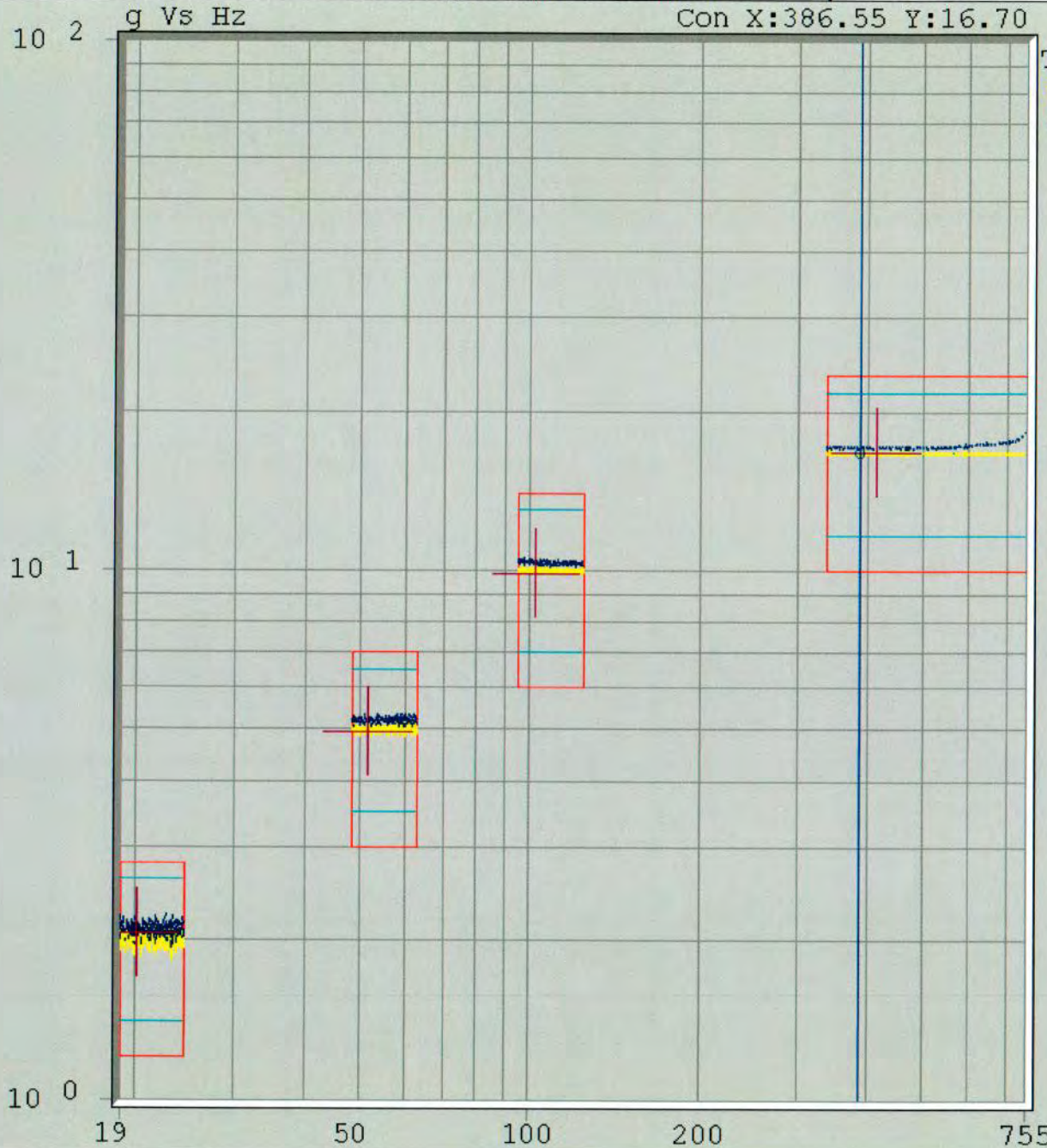
SOR SETUP ID: 7G1191  
SETUP DESCRIPTION: performance levels y axis  
RUN NAME: run14  
CH-1: 10.00 mV/g      CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: perform levels y axis  
CH-4: 10.00 mV/g

vwin II

# Control,4 (Tones) - Acceleration vs Freq



Save 1 of 1

3/7/2014 1:16:34 PM

TOTAL : 0:20:1

0:18:43 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
14.53	2.75	2.79

TONES

Freq	Ref	Con	g pk
20.11	2.00	2.06	g pk
51.64	5.00	4.94	g pk
102.6	10.00	9.85	g pk
414.0	16.70	16.70	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S:1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run14

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

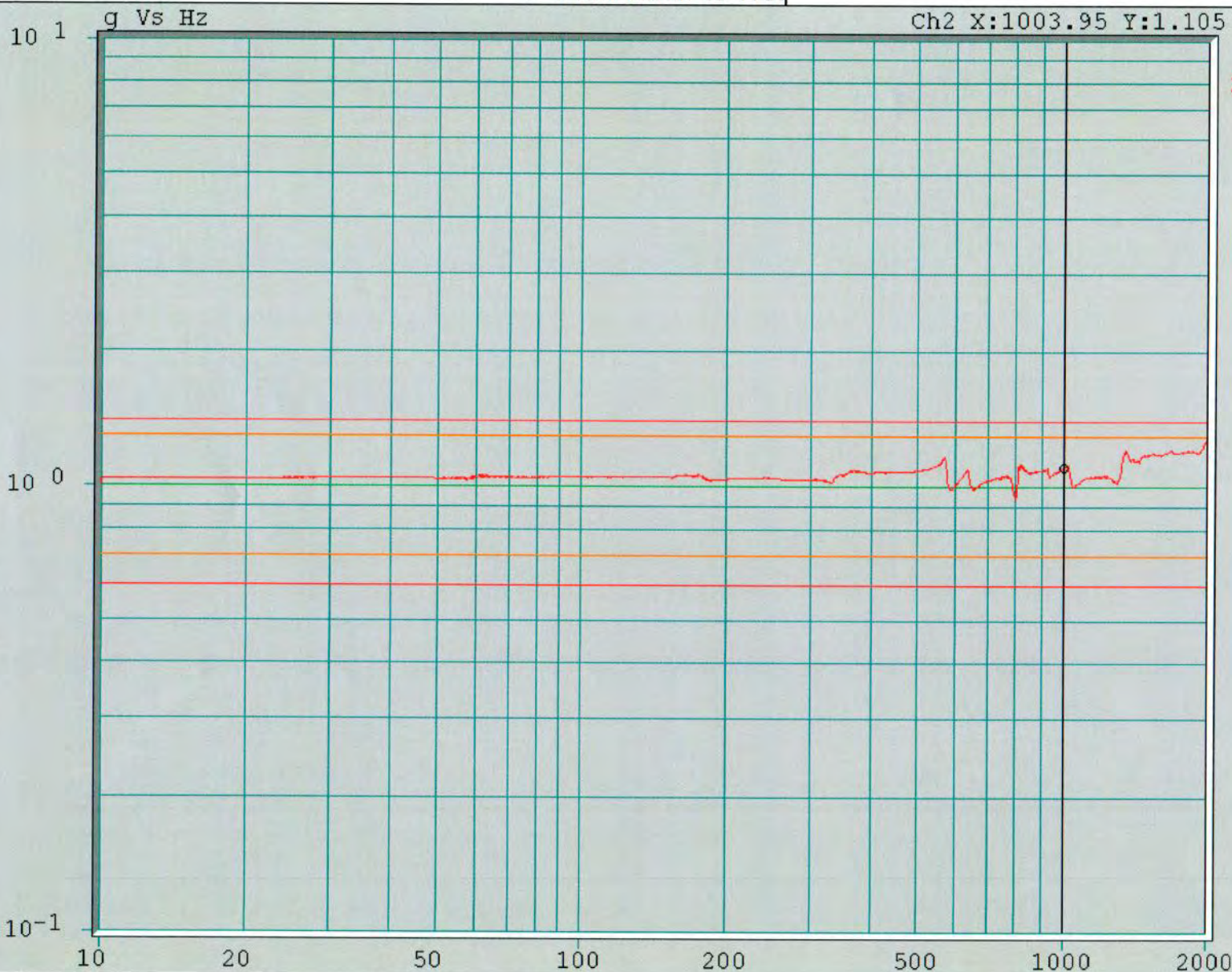
CH-3: 10.00 mV/g

RUN DESC: perform levels y axis

CH-4: 10.00 mV/g

Vwin II

2 - Acceleration vs Freq



g-pk  
2:1.29

3/7/2014  
1:37:50 PM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq 2000.00  
Hz

Ref 1.00  
g-pk

Acc 1.000  
g-pk

Vel 0.03  
in/s-pk

Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION:

RUN NAME: run6

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

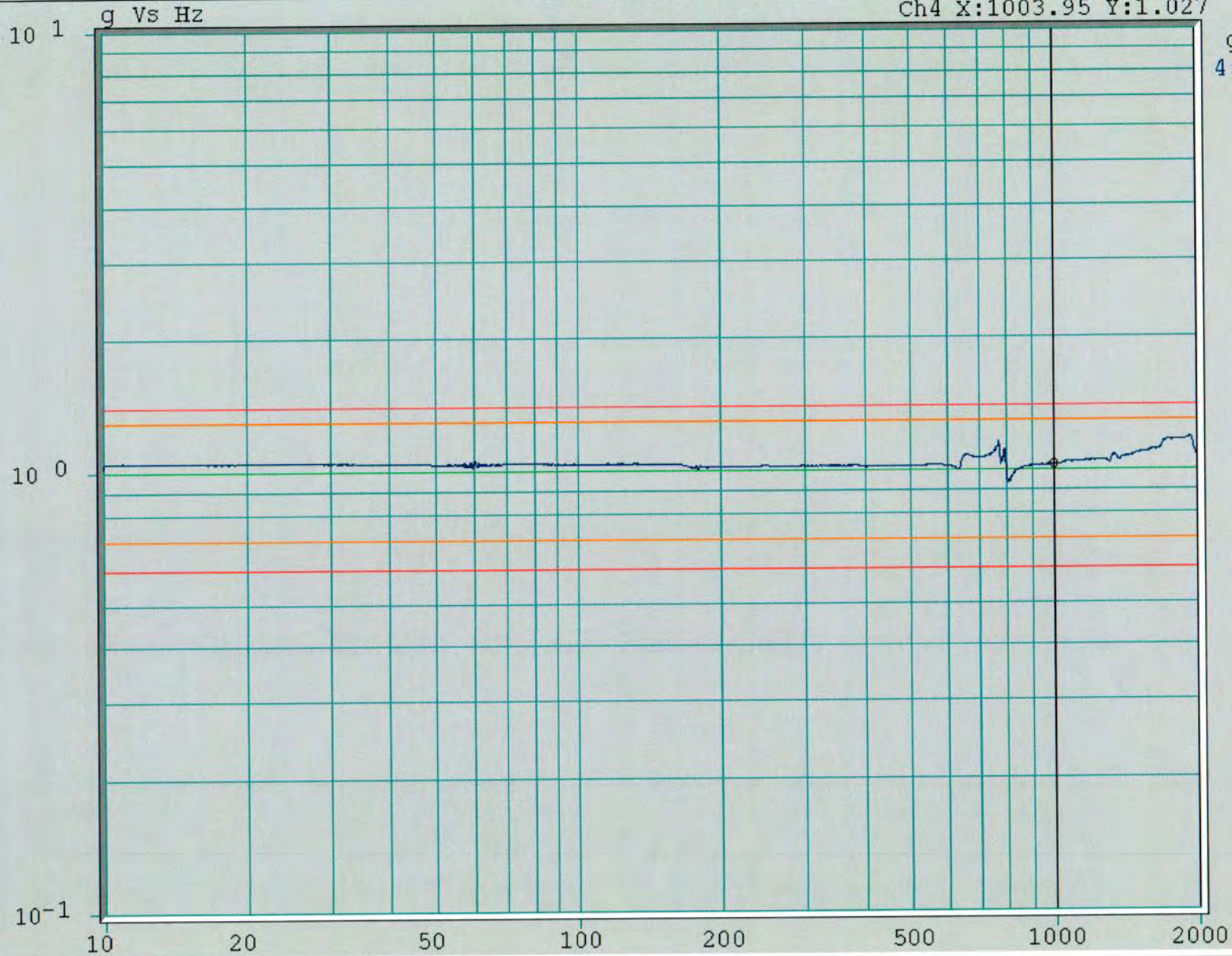
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

### 4 - Acceleration vs Freq

Ch4 X:1003.95 Y:1.027



3/7/2014  
1:37:46 PM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq  
Hz 2000.00

Ref  
g-pk 1.00

Acc  
g-pk 1.000

Vel  
in/s-pk 0.03

Disp  
mils pk-pk 0.00

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION:

RUN NAME: run6

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

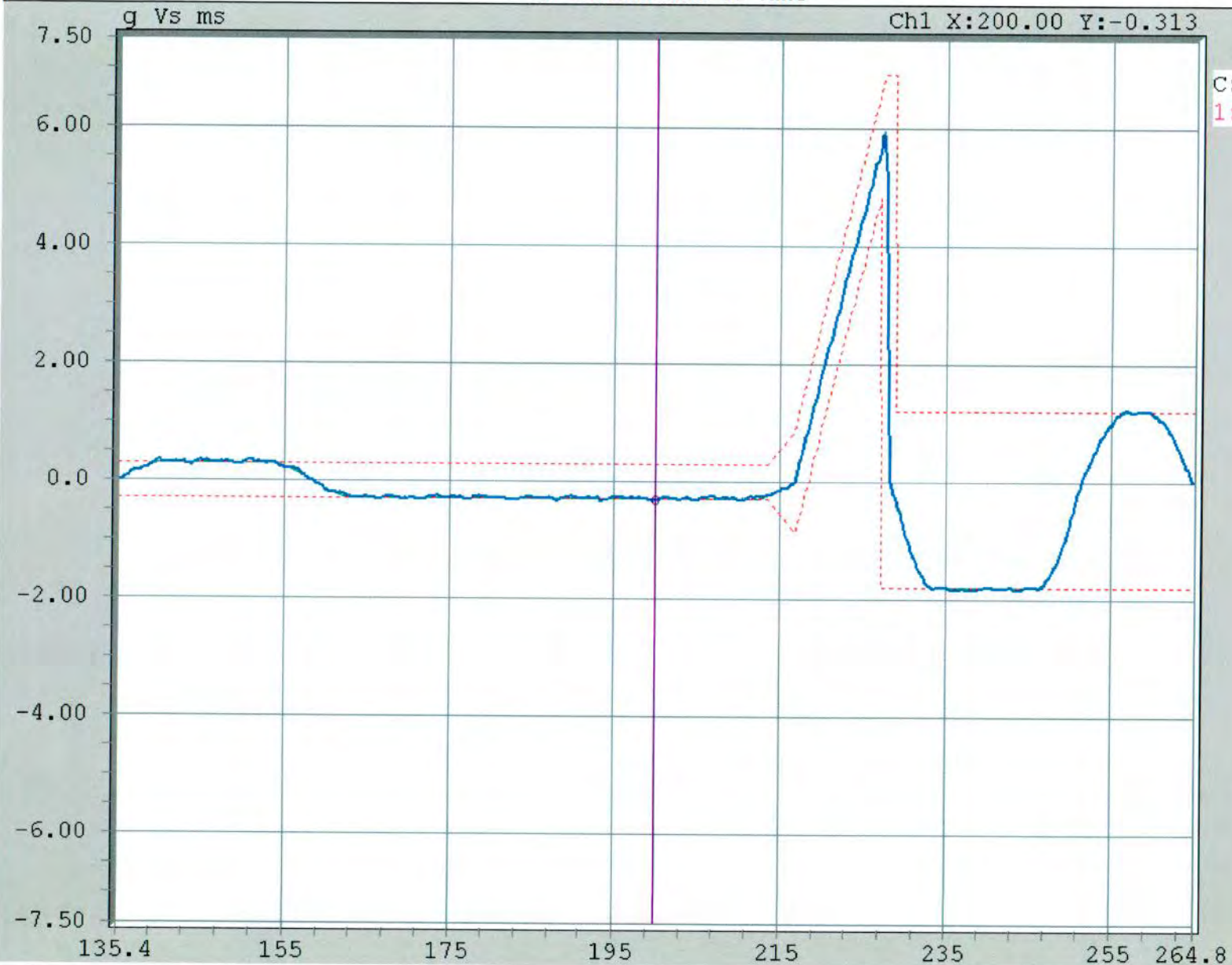
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C.1 - Acceleration vs Time



g-pk  
C: 5.89  
1: 5.89

**Save 1 of 6**

3/7/2014  
1:51:10 PM

**Auto Pulses**  
1 of 6  
Pulse # 6

Status: Auto-CL  
**RUNNING**  
Level 0.0dB:100%

Ref g-pk **6.00**  
Con g-pk **+5.89**

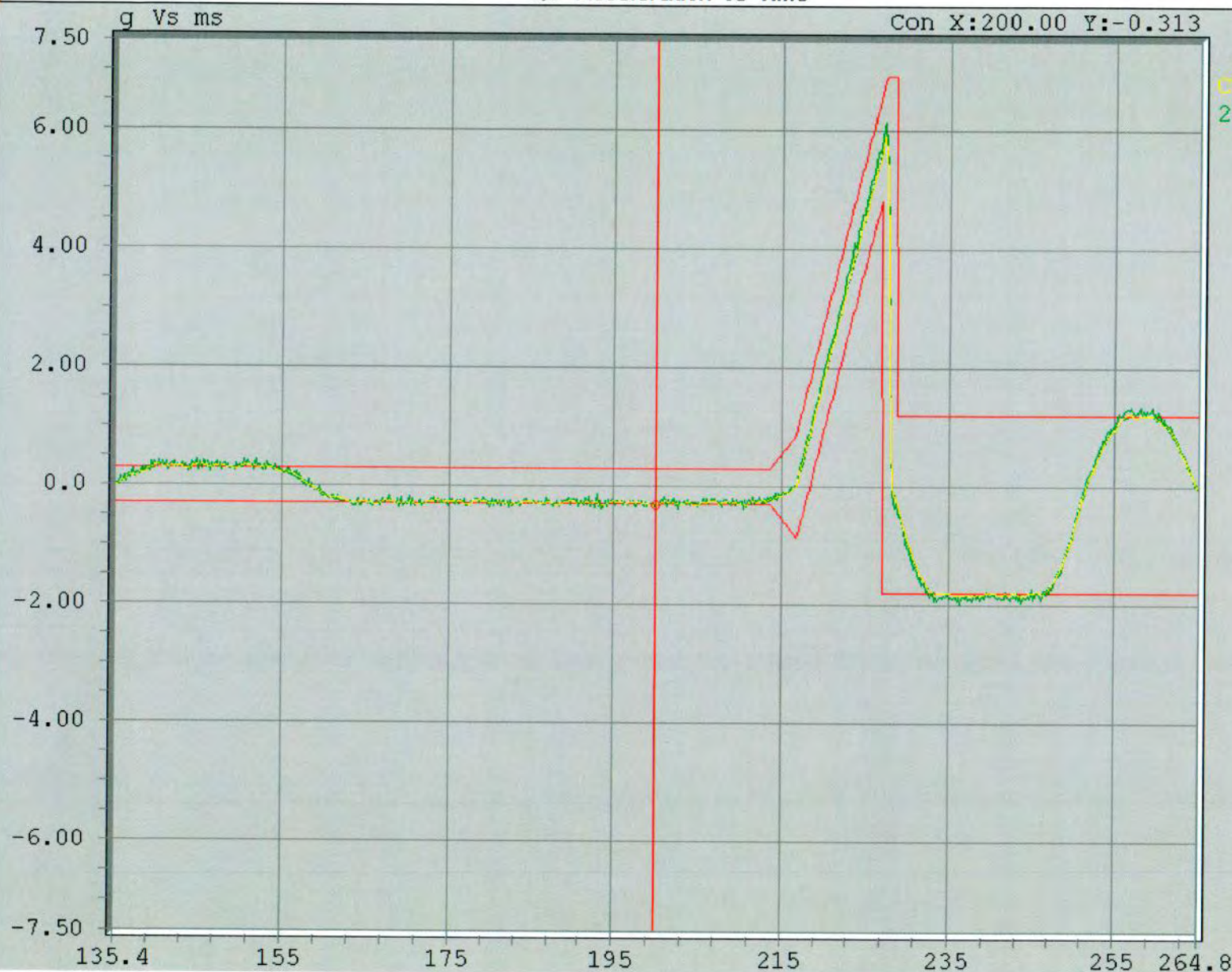
Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run8  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      RUN DESC: y axis      CH-4: 10.00 mV/g

Vwin II

C,2 - Acceleration vs Time



g-pk  
 1:5.89  
 2:6.13

Con X:200.00 Y:-0.313

**Save 1 of 6**

3/7/2014  
 1:51:10 PM

**Auto Pulses**  
 1 of 6  
 Pulse # 6

Status: Auto-CL  
 RUNNING  
 Level 0.0dB:100%

Ref g-pk 6.00  
 Con g-pk +5.89

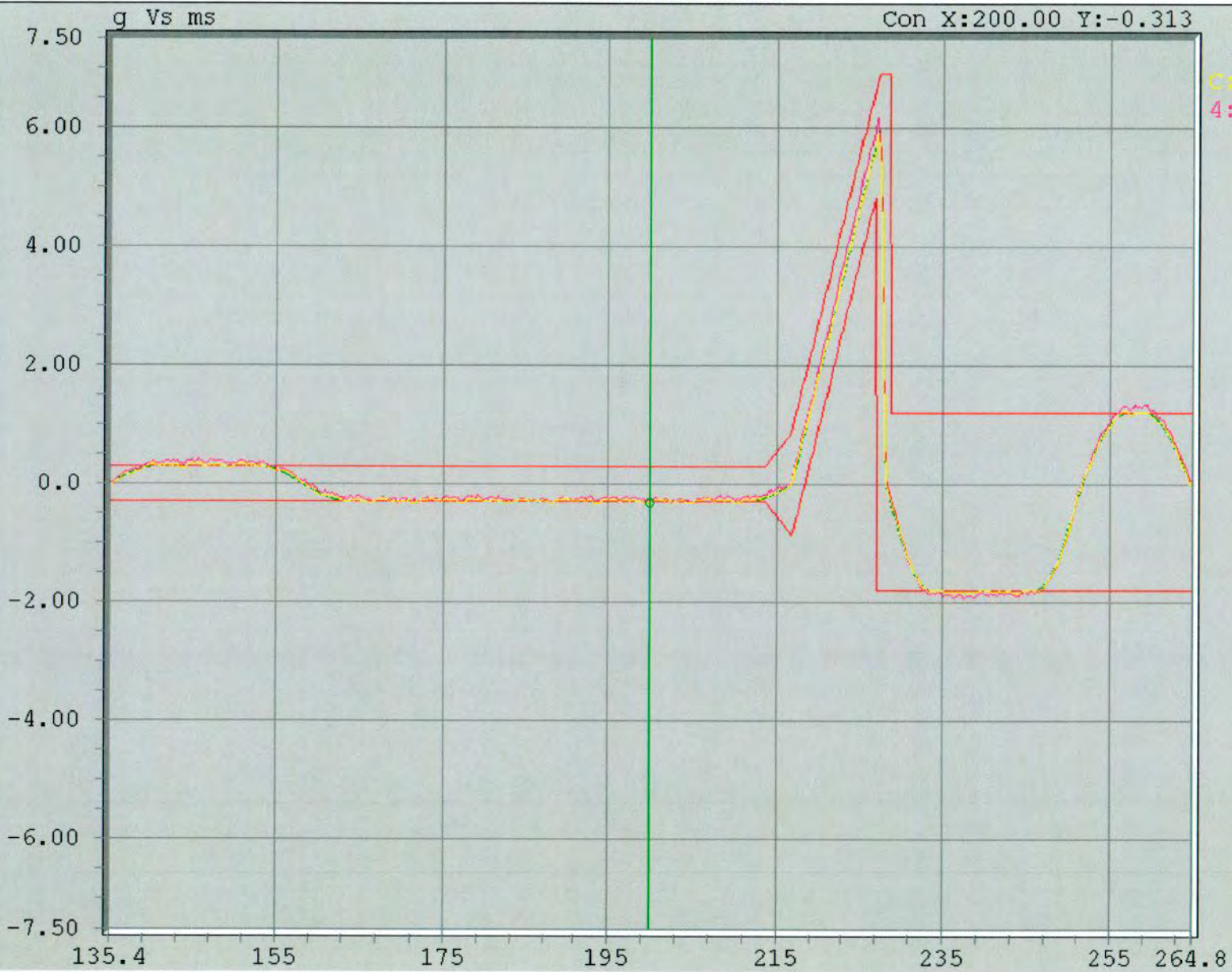
Type:SAWTOOTH-TPk  
 Width(ms): 11.00  
 Peak(g): 6.000  
 Rate(Hz):5120  
 Points: 2048  
 Res(Hz):2.50  
 Control : 1  
 AutoSave  
 S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run8  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      RUN DESC: y axis      CH-4: 10.00 mV/g

Vwin II

C,4- Acceleration vs Time



**Save 1 of 6**

3/7/2014  
1:51:10 PM

**Auto Pulses**  
1 of 6  
Pulse # 6

**Status: Auto-CL**  
**RUNNING**  
Level 0.0dB:100%

Ref g-pk **6.00**  
Con g-pk **+5.89**

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run8  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

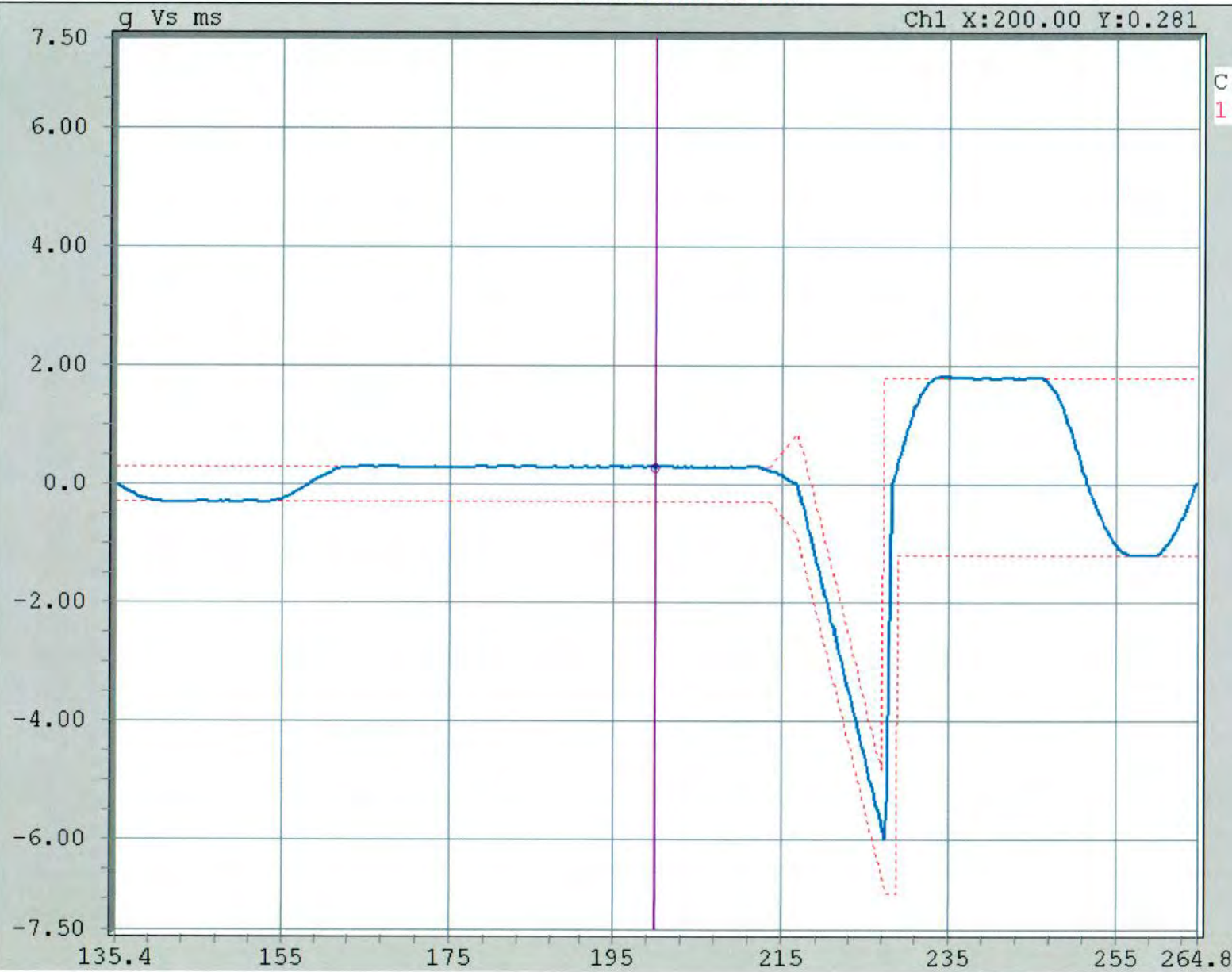
CH-3: 10.00 mV/g

RUN DESC: y axis

CH-4: 10.00 mV/g

Vwin II

### C,1-Acceleration vs Time



g-pk  
C:-5.99  
1:-5.99

Save 6 of 6

3/7/2014  
1:51:37 PM

Auto Pulses  
6 of 6

Pulse # 11

Status: Auto-CL  
FINISHED

Level 0.0dB:100%

Ref g-pk -6.00

Con g-pk -5.99

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191  
SETUP DESCRIPTION: Operational shock  
RUN NAME: run8  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: y axis

CH-4: 10.00 mV/g

Vwin II

C.2 - Acceleration vs Time



g-pk  
 1:-5.99  
 2:-6.21

**Save 6 of 6**

3/7/2014  
 1:51:37 PM

**Auto Pulses**  
 6 of 6  
 Pulse # 11

Status: Auto-CL  
**FINISHED**  
 Level 0.0dB:100%

Ref g-pk **-6.00**  
 Con g-pk **-5.99**

Type:SAWTOOTH-TPk  
 Width(ms): 11.00  
 Peak(g): 6.000  
 Rate(Hz):5120  
 Points: 2048  
 Res(Hz):2.50  
 Control : 1  
 AutoSave  
 S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

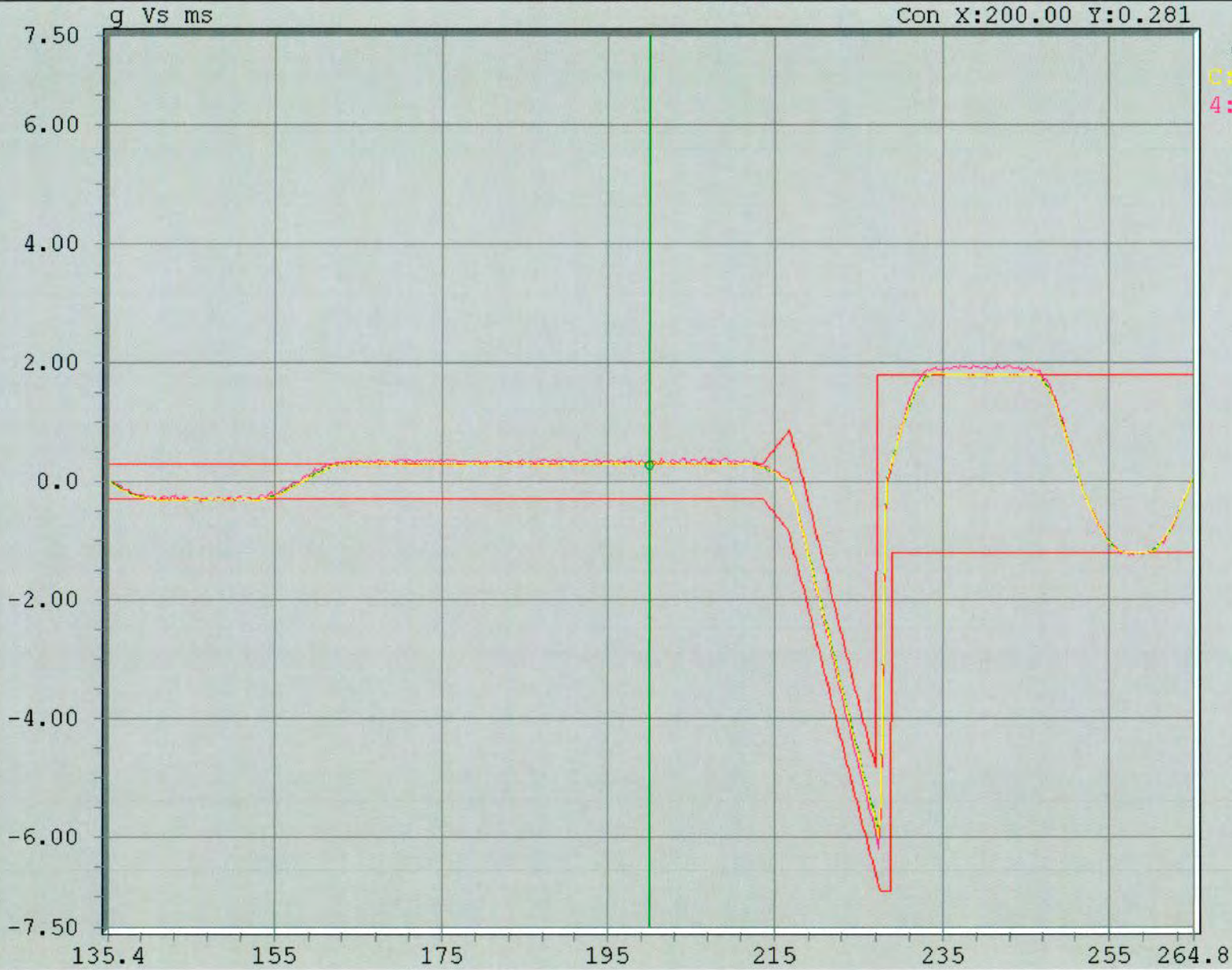
CH-3: 10.00 mV/g

CH-4: 10.00 mV/g

RUN DESC: y axis

Vwin II

C,4 - Acceleration vs Time



**Save 6 of 6**

3/7/2014  
 1:51:37 PM

**Auto Pulses**  
 6 of 6

**Pulse # 11**

Status: Auto-CL  
**FINISHED**

Level 0.0dB:100%

Ref g-pk **-6.00**  
 Con g-pk **-5.99**

Type:SAWTOOTH-TPk  
 Width(ms): 11.00  
 Peak(g): 6.000  
 Rate(Hz):5120  
 Points: 2048  
 Res(Hz):2.50  
 Control : 1  
 AutoSave  
 S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock  
 RUN NAME: run8  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      CH-4: 10.00 mV/g

RUN DESC: y axis

Vwin II

Vibration and Operational Shock Data Sheets and Plots  
Z-AXIS

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 158



CustomControlSensors Inc.

SAR/ENG NO:

CCS LABORATORY DATA SHEET

RECORDED TEST DATA:

DATE	TIME	TEMP/RH		761191 SN007	761191 SN008
3-7-2014	1448	81° 21%		7.44	7.24
				4.43	4.52
Z-AXIS:	1450	BEGIN RESONANCE SWEEP			
	1505	SWEEP COMPLETE			
	1509	81° 20%		7.55	7.23
				4.46	4.53
	1513	BEGIN RANDOM W/SINE (PERFORMANCE)			
	1518	80° 22%	NO CHATTER	7.23	7.10
				4.60	4.60
	1525	79° 22%	NO CHATTER	7.24	7.18
				4.57	4.58
	1531	79° 22%	NO CHATTER	7.23	7.20
				4.55	4.57
	1533	STOP VIBRATION			
	1550	79° 20%		7.35	7.23
				4.44	4.53

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

SAR/ENG NO:

CCS LABORATORY DATA SHEET

RECORDED TEST DATA:

DATE	TIME	TEMP/RH			761191 SN007	761191 SN008
3-10-2014	0800	74° 27%				
Z-AXIS		BEGIN	RANDOM W/SINE (ENDURANCE)			
	0830	74° 28%	NO CHATTER		7.35 4.62	7.16 4.62
	0900	74° 28%	NO CHATTER		7.30 4.62	7.19 4.63
	0930	74° 27%	NO CHATTER		7.28 4.63	7.17 4.63
	1002	74° 25%	NO CHATTER		7.31 4.62	7.22 4.63
	1005		STOP VIBRATION		7.27 4.47	7.24 4.58
	1015	BEGIN	RANDOM W/SINE (PERFORMANCE)			
	1020	74° 25%	NO CHATTER		7.25 4.61	7.12 4.64
	1025	74° 24%	NO CHATTER		7.22 4.56	7.18 4.61

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

SAR/ENG NO:

CCS LABORATORY DATA SHEET

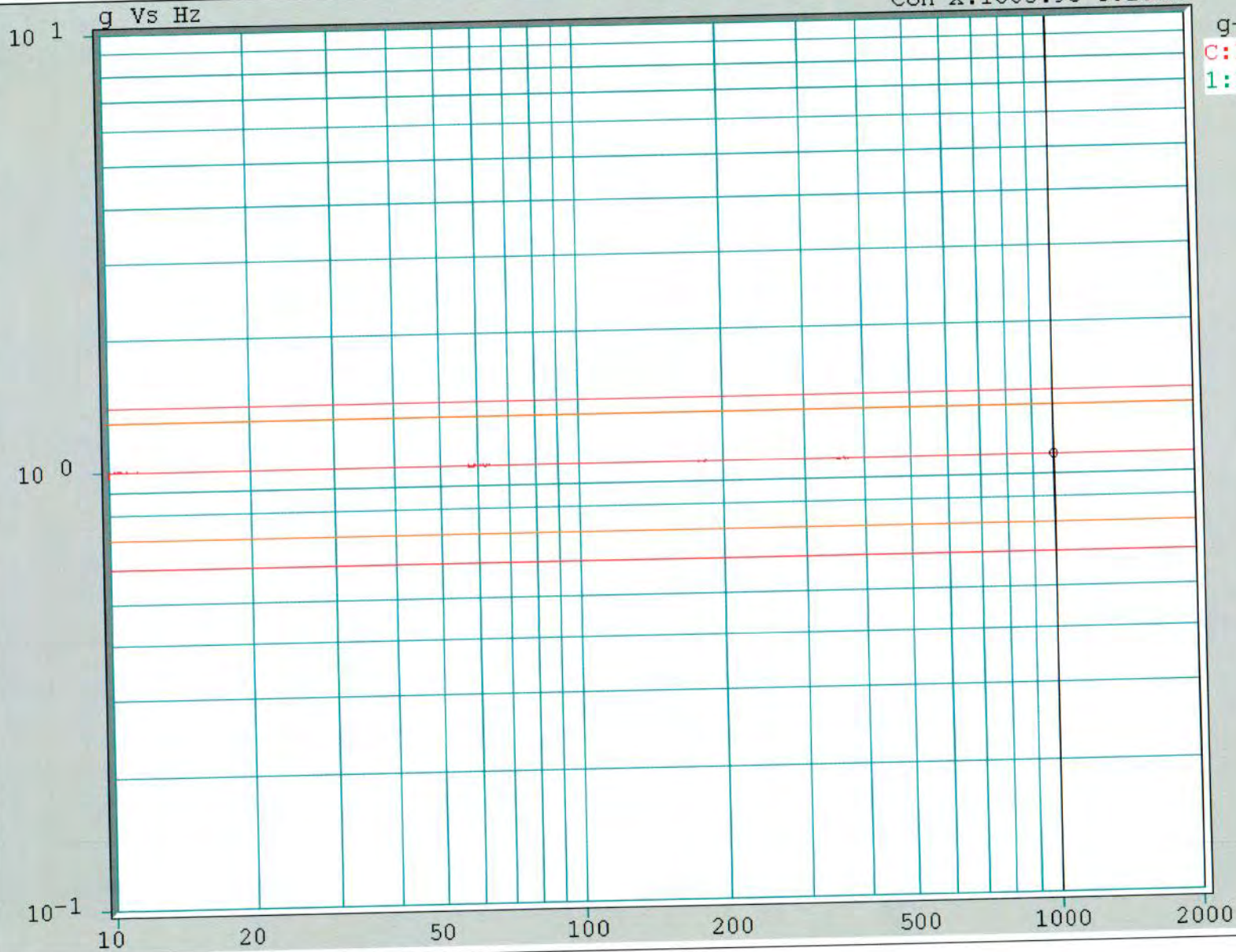
RECORDED TEST DATA:

DATE	TIME	TEMP/RH		761191 SN007	761191 SN008
3-10-2014	1030	75° 24%	NO CHATTER	7.24	7.10
Z-AXIS				4.63	4.66
	1035	75° 22%	STOP VIBRATION	7.39	7.16
				4.48	4.57
	1045		BEGIN RESONANCE SWEEP		
	1100		SWEEP COMPLETE		
	1103	76° 21%		7.42	7.19
				4.48	4.57
	1120		RUN SHOCK PROFILE		
		76° 19%		7.46	7.18
				4.48	4.56
			Z-AXIS VIBRATION AND SHOCK TESTING COMPLETE.		
			ALL VIBRATION AND SHOCK TESTING COMPLETE.		
	1200	77° 17%	DIELECTRIC:	.04mA	.04mA
			INSULATION:	>550M $\Omega$	>550M $\Omega$

Test Performed by: [Signature] DATE: \_\_\_\_\_

Control,1 - Acceleration vs Freq

Con X:1003.95 Y:1.000



g-pk  
C:1.00  
1:1.00

3/7/2014  
3:6:16 PM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq 2000.00  
Hz

Ref 1.00  
g-pk

Acc 1.001  
g-pk

Vel 0.03  
in/s-pk

Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION:

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

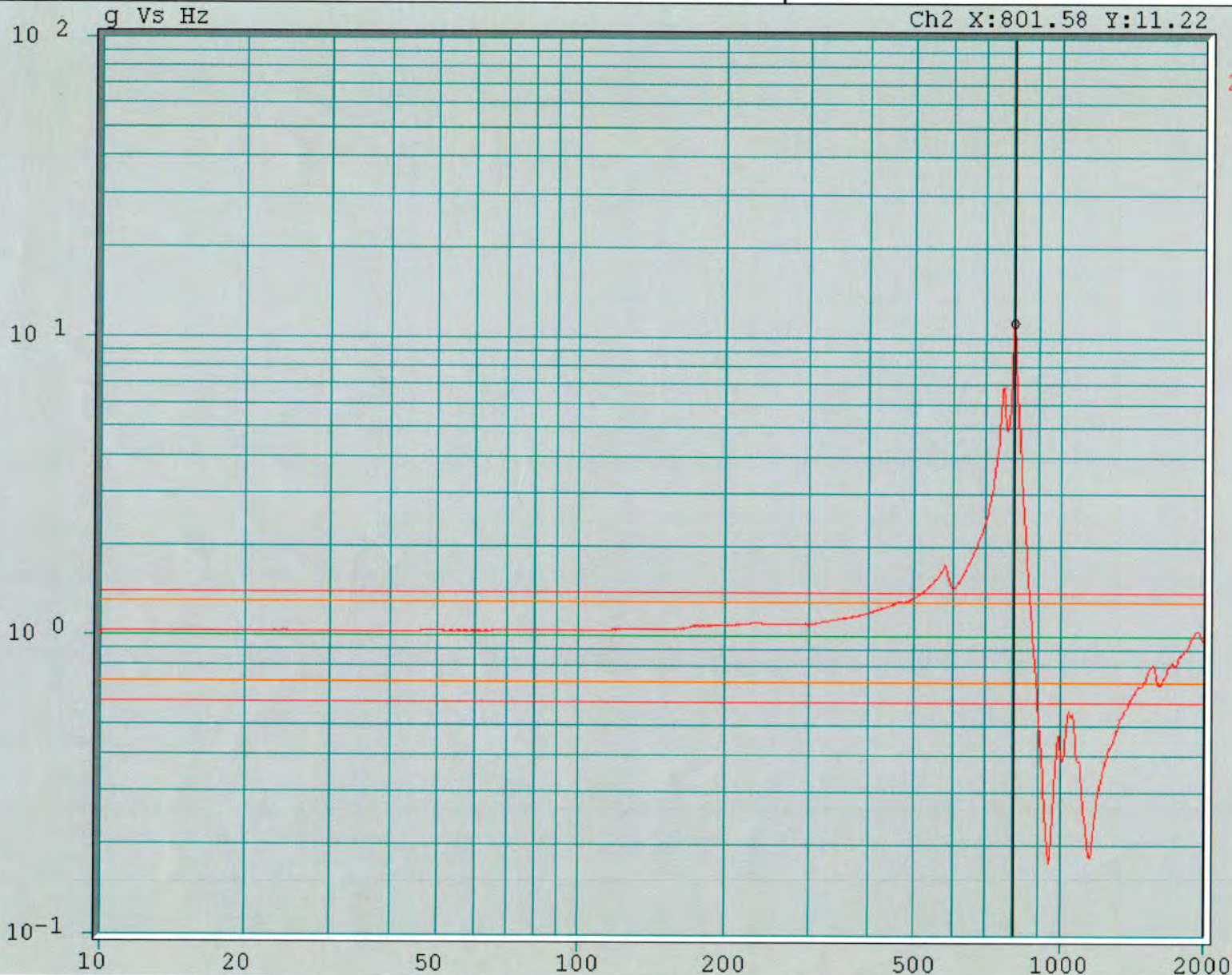
CH-3: 10.00 mV/g

RUN DESC: z axis

CH-4: 10.00 mV/g

Vwin II

2 - Acceleration vs Freq



g-pk  
2:1.00

**Save 1 of 1**  
 3/7/2014  
 3:54:18 PM  
**Total: 0:15:28**  
**Auto: 0:15:18**  
**Swp 1 of 1**

Status: Auto  
**FINISHED**

Freq Hz	2000.00
Ref g-pk	1.00
Acc g-pk	1.001
Vel in/s-pk	0.03
Disp mils pk-pk	0.00

Swp : 15 min 18 sec  
 Servo(dB/s): 1K  
 Freq : Log  
 Type:Single  
 C:1  
 AutoSave  
 S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search  
 SETUP DESCRIPTION:  
 RUN NAME: run7  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

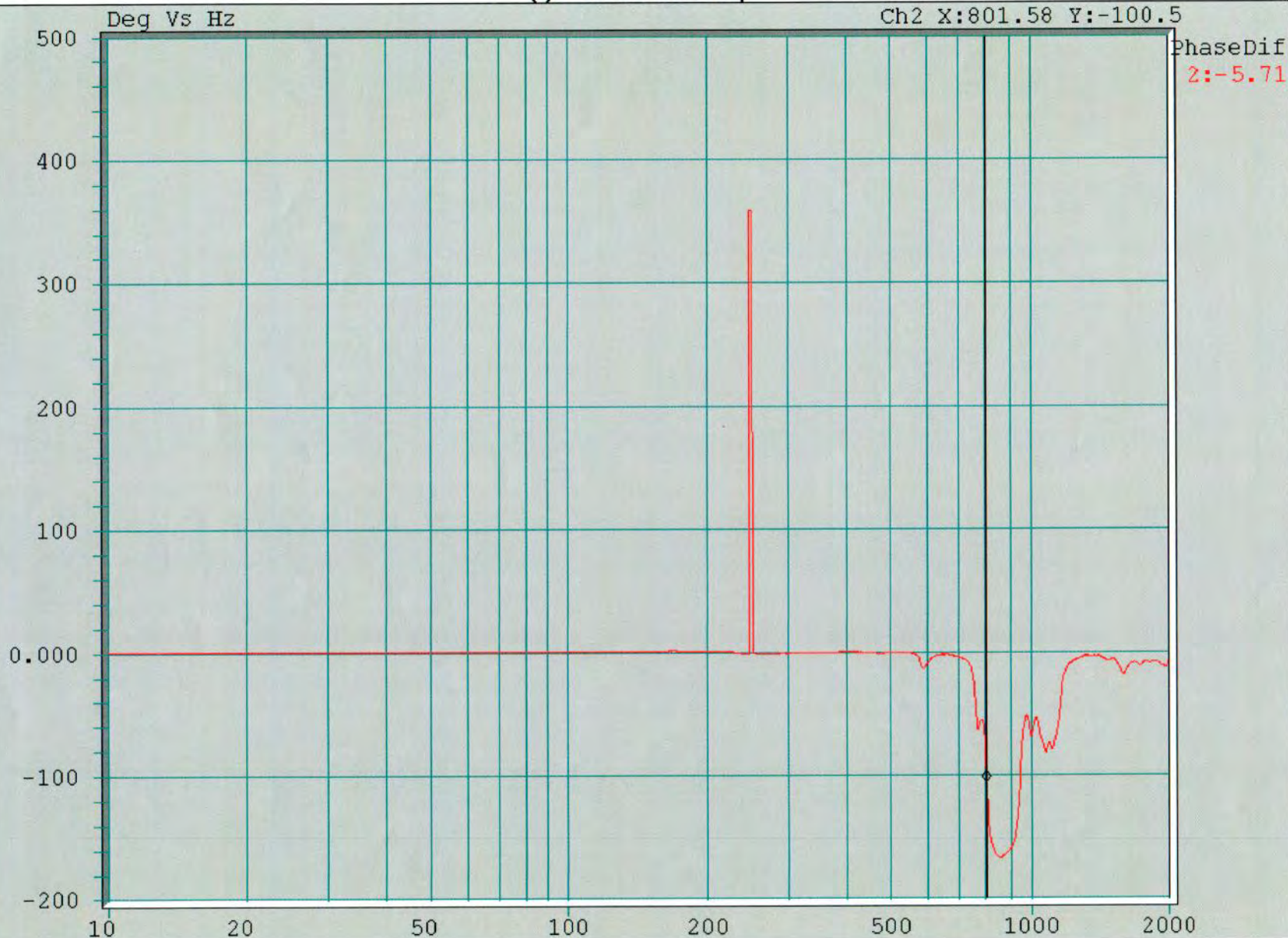
CH-3: 10.00 mV/g

RUN DESC: z axis

CH-4: 10.00 mV/g

Vwin II

(2)-1 - Phase vs Freq



**Save 1 of 1**

3/7/2014  
3:54:18 PM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

**FINISHED**

Freq 2000.00  
Hz

Ref 1.00  
g-pk

Acc 1.001  
g-pk

Vel 0.03  
in/s-pk

Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec  
Servo(dB/s): 1K  
Freq : Log  
Type:Single  
C:1  
AutoSave  
S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION:

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

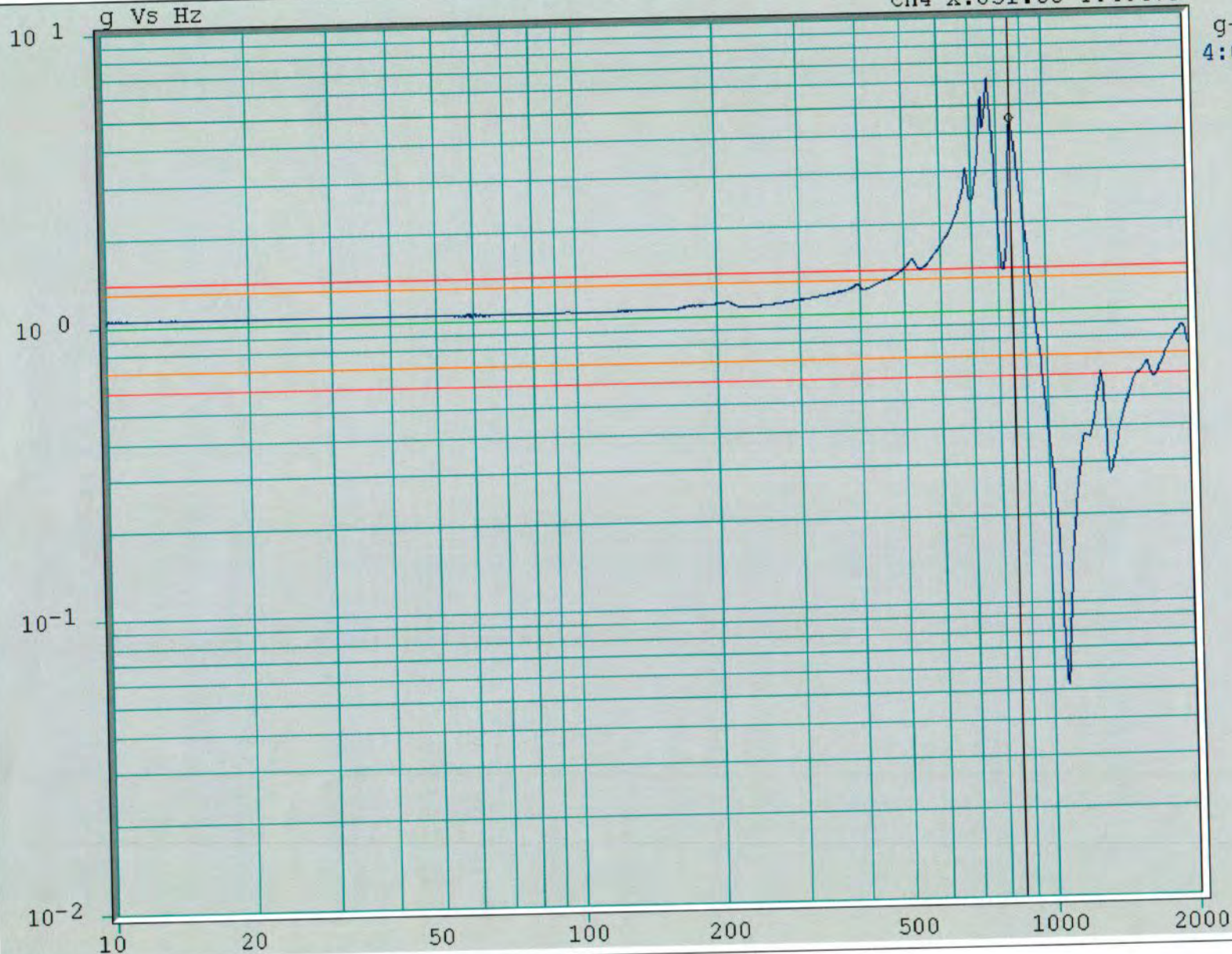
RUN DESC: z axis

CH-4: 10.00 mV/g

Vwin II

4 - Acceleration vs Freq

Ch4 X:851.66 Y:4.473



g-pk  
4:0.781

Save 1 of 1

3/7/2014  
3:54:41 PM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq Hz 2000.00

Ref g-pk 1.00

Acc g-pk 1.001

Vel in/s-pk 0.03

Disp mils pk-pk 0.00

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION:

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: z axis

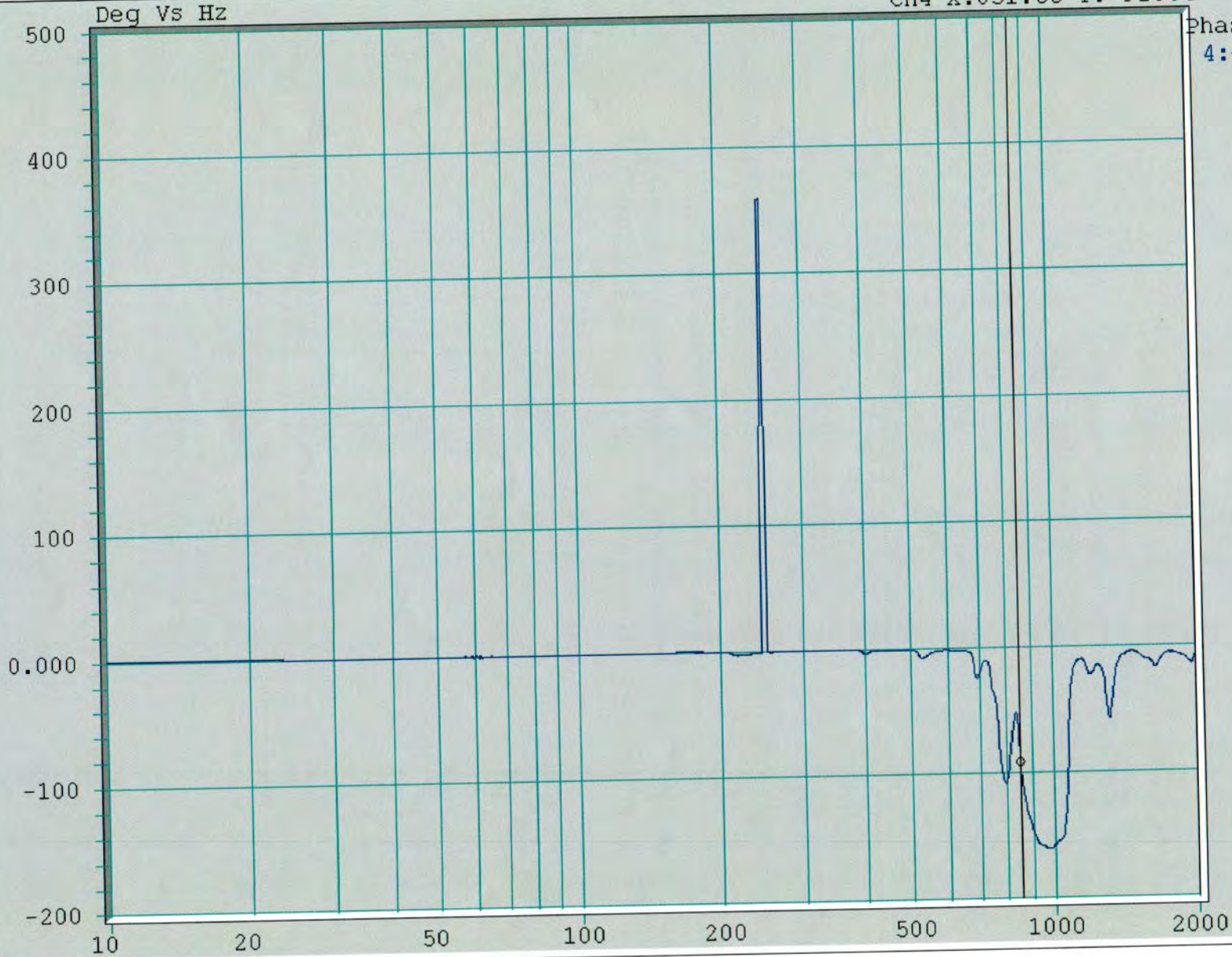
CH-4: 10.00 mV/g

Vwin II

(4)-1 - Phase vs Freq

Ch4 X:851.66 Y:-91.84

PhaseDif  
4:-5.43



Save 1 of 1

3/7/2014

3:54:18 PM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq 2000.00

Ref 1.00

Acc 1.001

Vel 0.03

Disp 0.00

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION:

RUN NAME: run7

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: z axis

CH-4: 10.00 mV/g

Vwin II

List of Resonances: Sweeping UP  
 SINE SETUP ID: Bell 1 g resonance search  
 SETUP DESCRIPTION:  
 RUN NAME: run7  
 RUN DESC: z axis  
 Ratio Limit Entered(g/g): 2.00

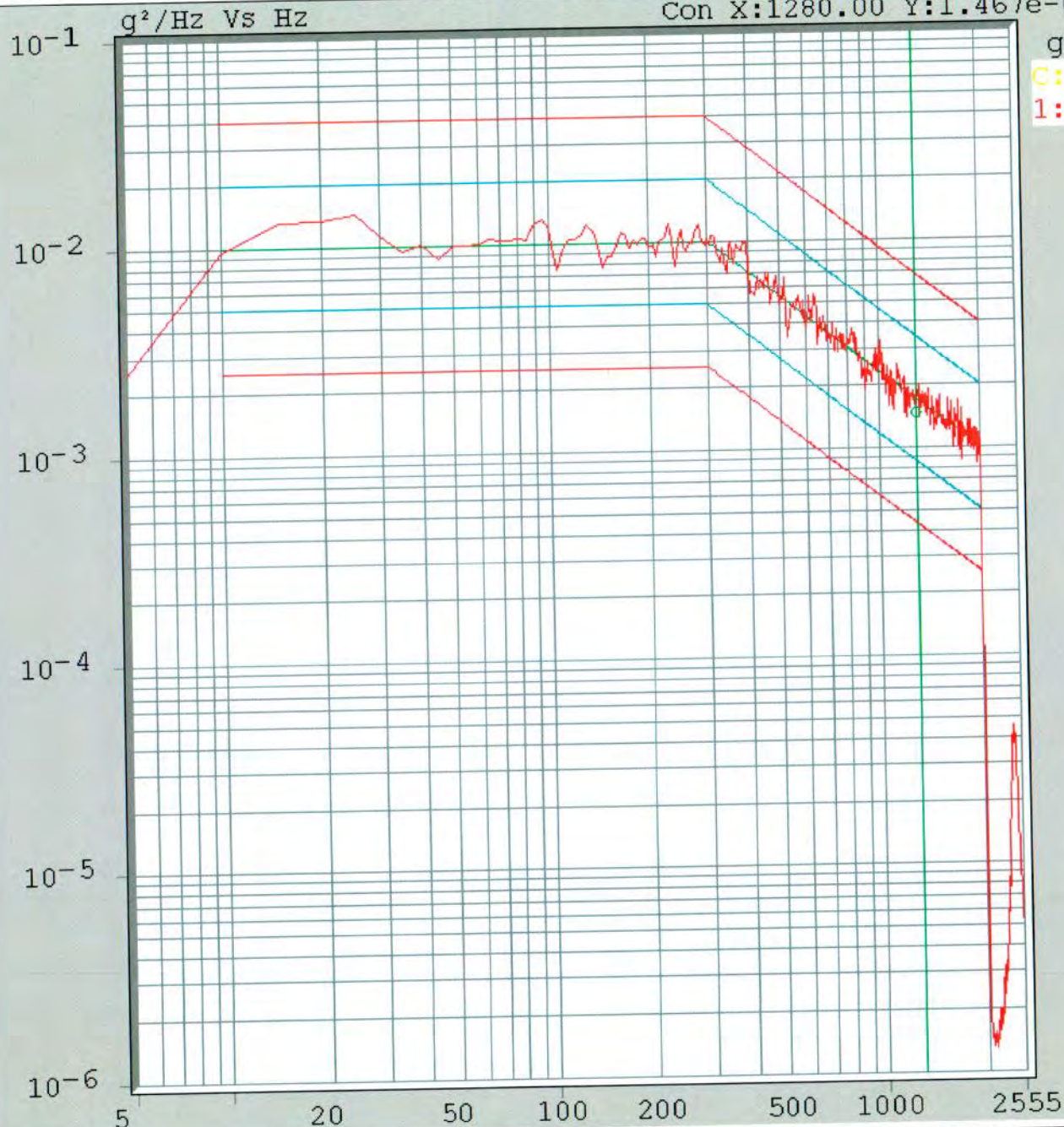
Chan	Freq(Hz)	g/g	CON (g)	CH (g)	Q	Phase
1	Not found					
2	801.579	11.21	1.0	11.2	38.44	13.29
3	Not found					
4	765.405	6.14	1.0	6.1	24.82	54.51
4	851.664	4.47	1.0	4.5	22.93	18.70



755

Control,1 (Random) - PSD vs Freq

Con X:1280.00 Y:1.467e-003



grms  
C:2.80  
1:2.80

3/7/2014 3:33:20 PM

TOTAL : 0:20:17

0:19:9 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
19.67	2.00	1.98	g pk
50.50	5.00	5.00	g pk
100.3	10.00	9.98	g pk
386.5	16.70	16.72	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run15

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

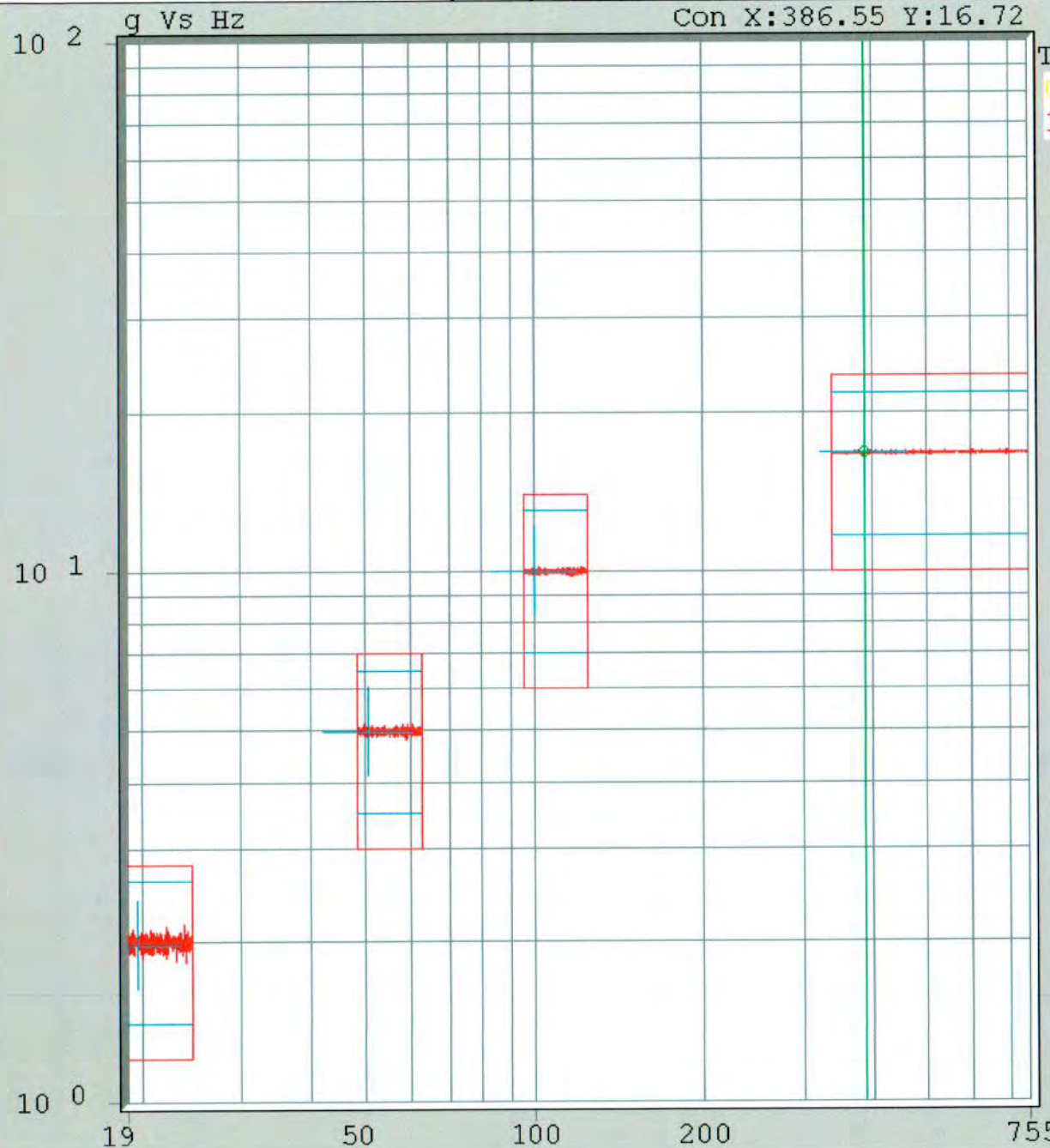
CH-3: 10.00 mV/g

RUN DESC: performance z axis

CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones)- Acceleration vs Freq



T1 g-pk  
C:1.98  
1:1.98

3/7/2014 3:33:24 PM

TOTAL : 0:20:17

0:19:9 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
19.67	2.00	1.98	g pk
50.50	5.00	5.00	g pk
100.3	10.00	9.98	g pk
386.5	16.70	16.72	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run15

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: performance z axis

CH-4: 10.00 mV/g

Vwin II

Control,2 (Random) - PSD vs Freq

3/7/2014 3:33:30 PM

TOTAL : 0:20:17

0:19:9 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
19.67	2.00	1.98	g pk
50.50	5.00	5.00	g pk
100.3	10.00	9.98	g pk
386.5	16.70	16.72	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

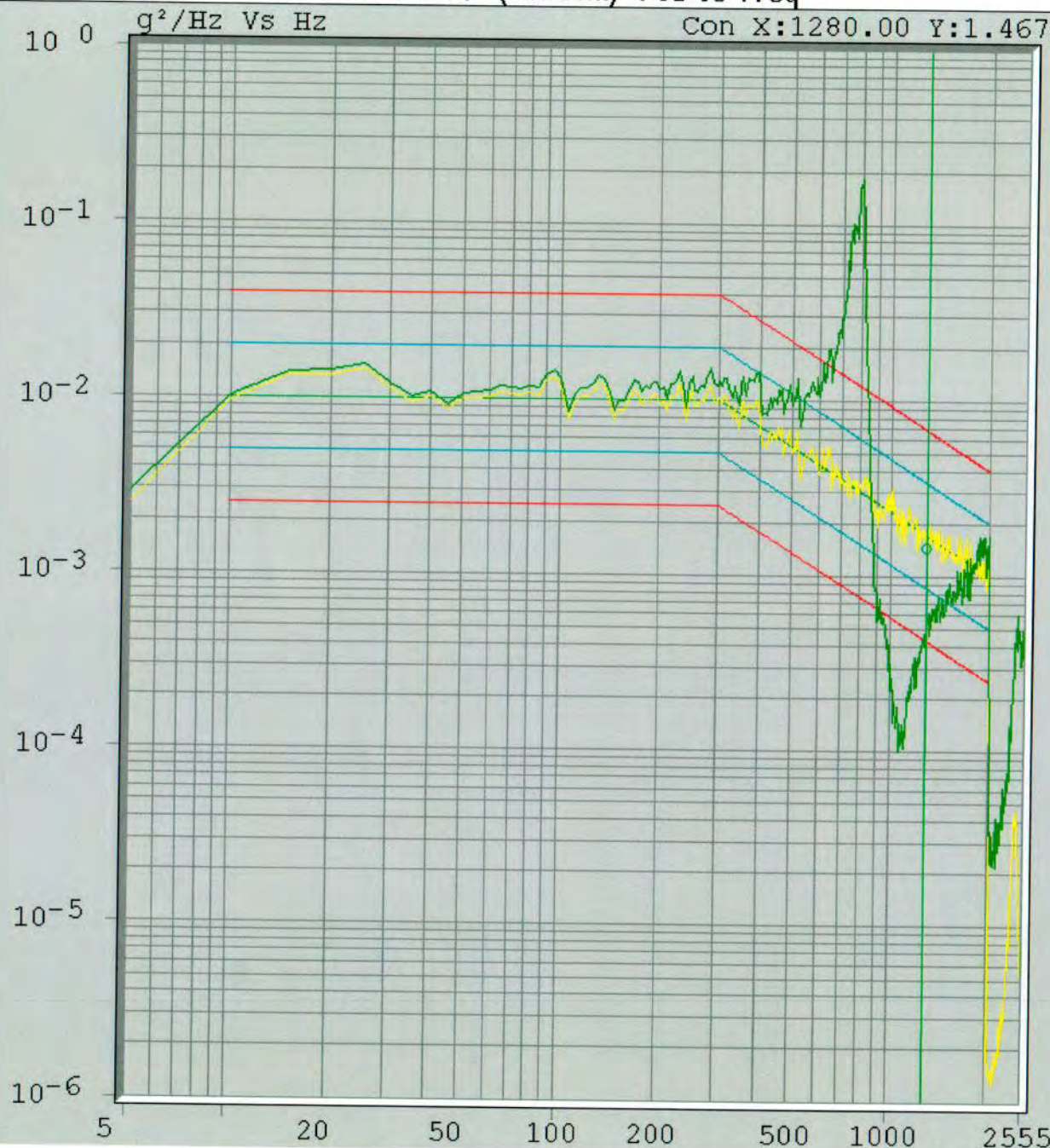
DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4

grms  
C:2.80  
2:4.56



SOR SETUP ID: 7G1191

Z

SETUP DESCRIPTION: performance levels y axis

RUN NAME: run15

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

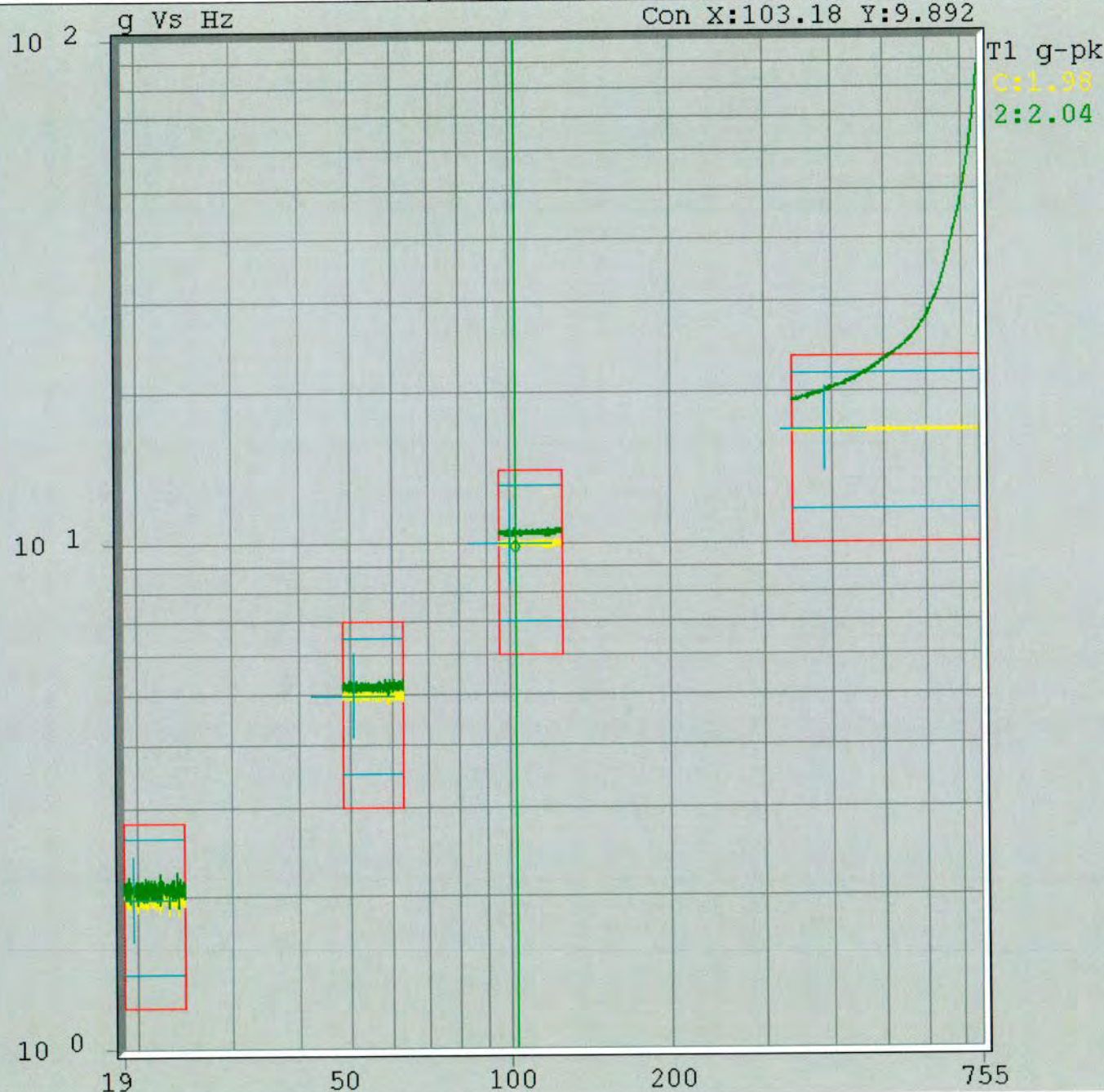
RUN DESC: performance z axis

CH-4: 10.00 mV/g



Vwin II

Control,2 (Tones) - Acceleration vs Freq



Save 3 of 3

3/7/2014 3:33:6 PM

TOTAL : 0:20:17

0:19:9 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
19.67	2.00	1.98	g pk
50.50	5.00	5.00	g pk
100.3	10.00	9.98	g pk
386.5	16.70	16.72	g pk

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191  
 SETUP DESCRIPTION: performance levels z axis  
 RUN NAME: run15  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g

RUN DESC: performance z axis  
 CH-3: 10.00 mV/g      CH-4: 10.00 mV/g

Wwin II

Control,4 (Random) - PSD vs Freq

3/7/2014 3:33:39 PM

TOTAL : 0:20:17

0:19:9 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	pk
19.67	2.00	1.98	g
50.50	5.00	5.00	g
100.3	10.00	9.98	g
386.5	16.70	16.72	g

Log Sweep: 5.00 Min

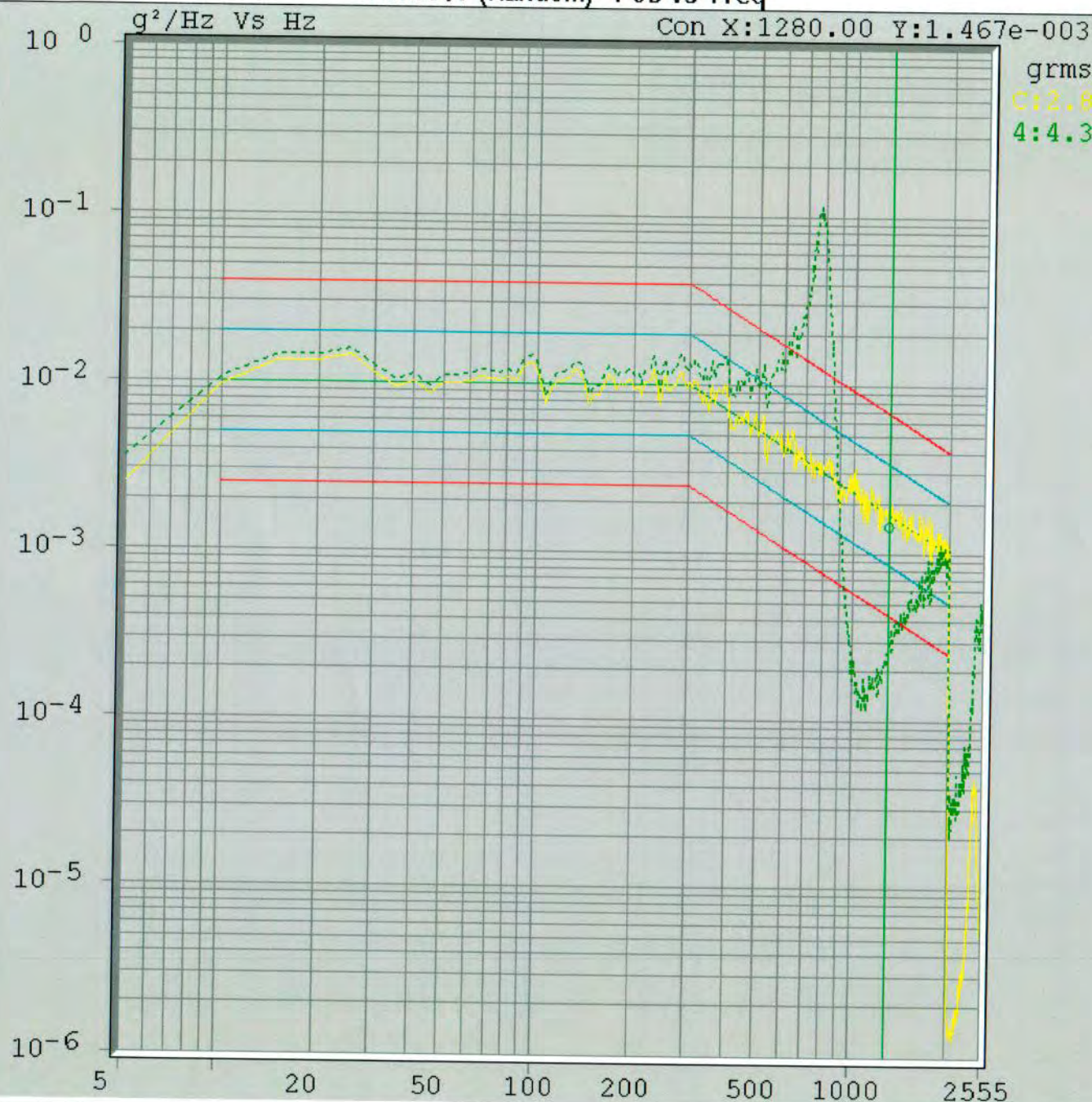
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run15

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

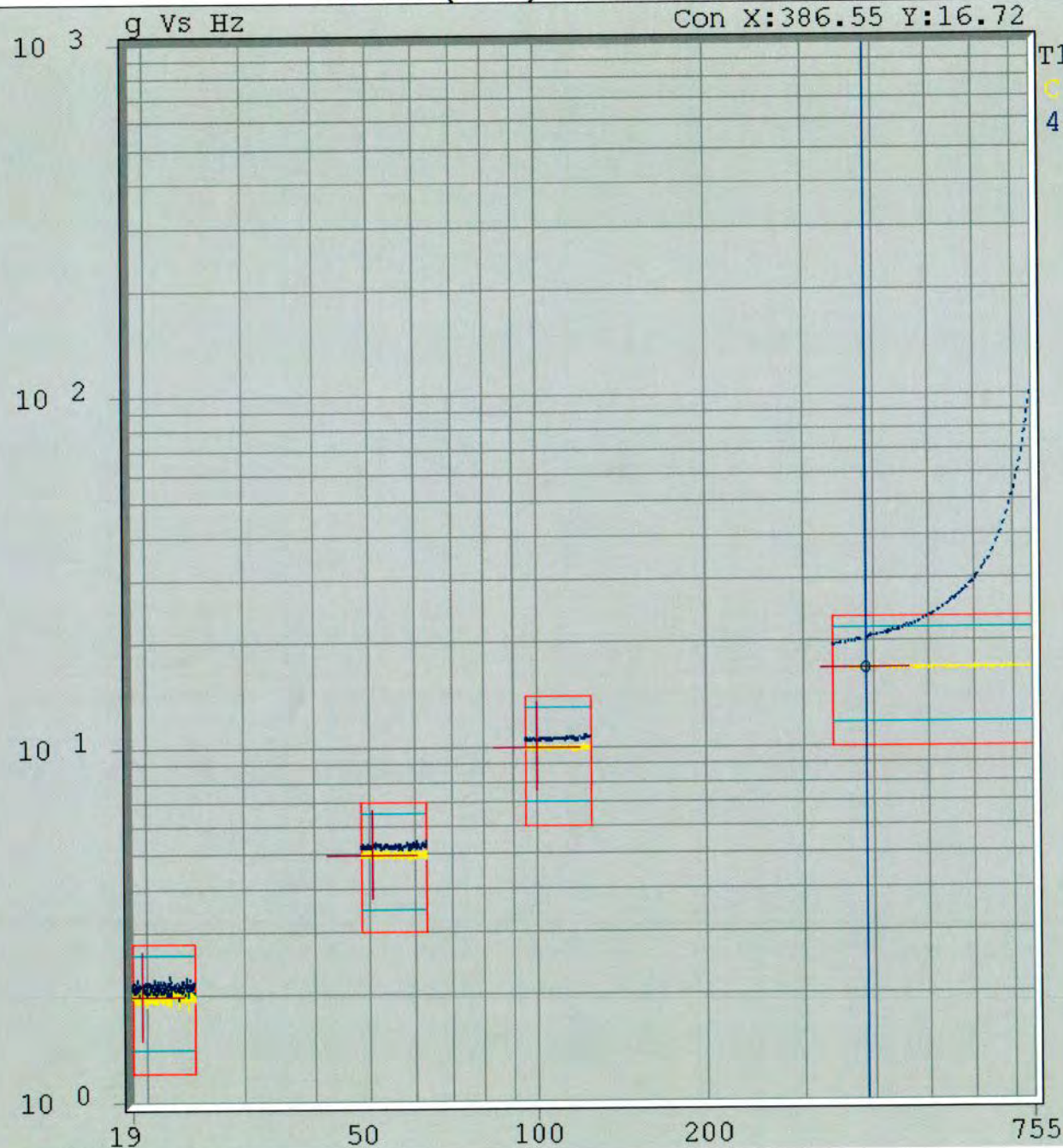
RUN DESC: performance z axis

CH-4: 10.00 mV/g

Vwin II



Control,4 (Tones) - Acceleration vs Freq



T1 g-pk  
C:1.98  
4:2.08

Save 3 of 3

3/7/2014 3:33:6 PM

TOTAL : 0:20:17

0:19:9 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.54	2.75	2.80

TONES

Freq	Ref	Con	g pk
19.67	2.00	1.98	g pk
50.50	5.00	5.00	g pk
100.3	10.00	9.98	g pk
386.5	16.70	16.72	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run15

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

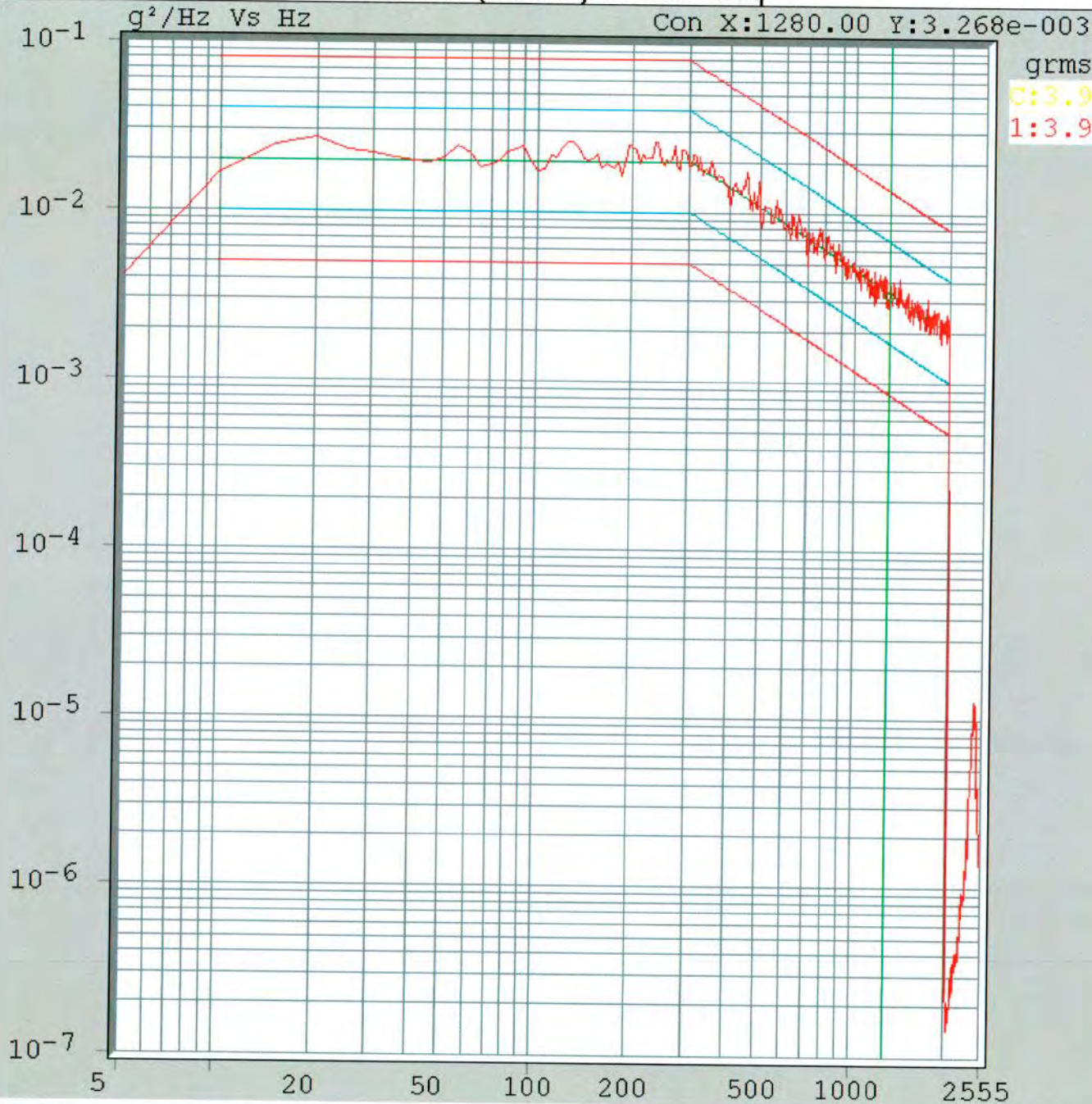
CH-3: 10.00 mV/g

RUN DESC: performance z axis

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq



grms  
**C:3.98**  
 1:3.98

3/10/2014 8:1:59 AM

TOTAL : 0:2:39

0:1:34 of 6:30:0

Swp 1

Status: Auto

**SWEeping->**

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
<b>17.90</b>	<b>3.89</b>	<b>3.98</b>

TONES

Freq	Ref	Con	g pk
<b>20.43</b>	<b>4.00</b>	<b>3.99</b>	g pk
<b>52.45</b>	<b>6.30</b>	<b>6.14</b>	g pk
<b>104.2</b>	<b>12.50</b>	<b>12.48</b>	g pk
<b>434.1</b>	<b>20.00</b>	<b>19.93</b>	g pk

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels  $\hat{z}$  axis  
 RUN NAME: run9  
 CH-1: 10.00 mV/g

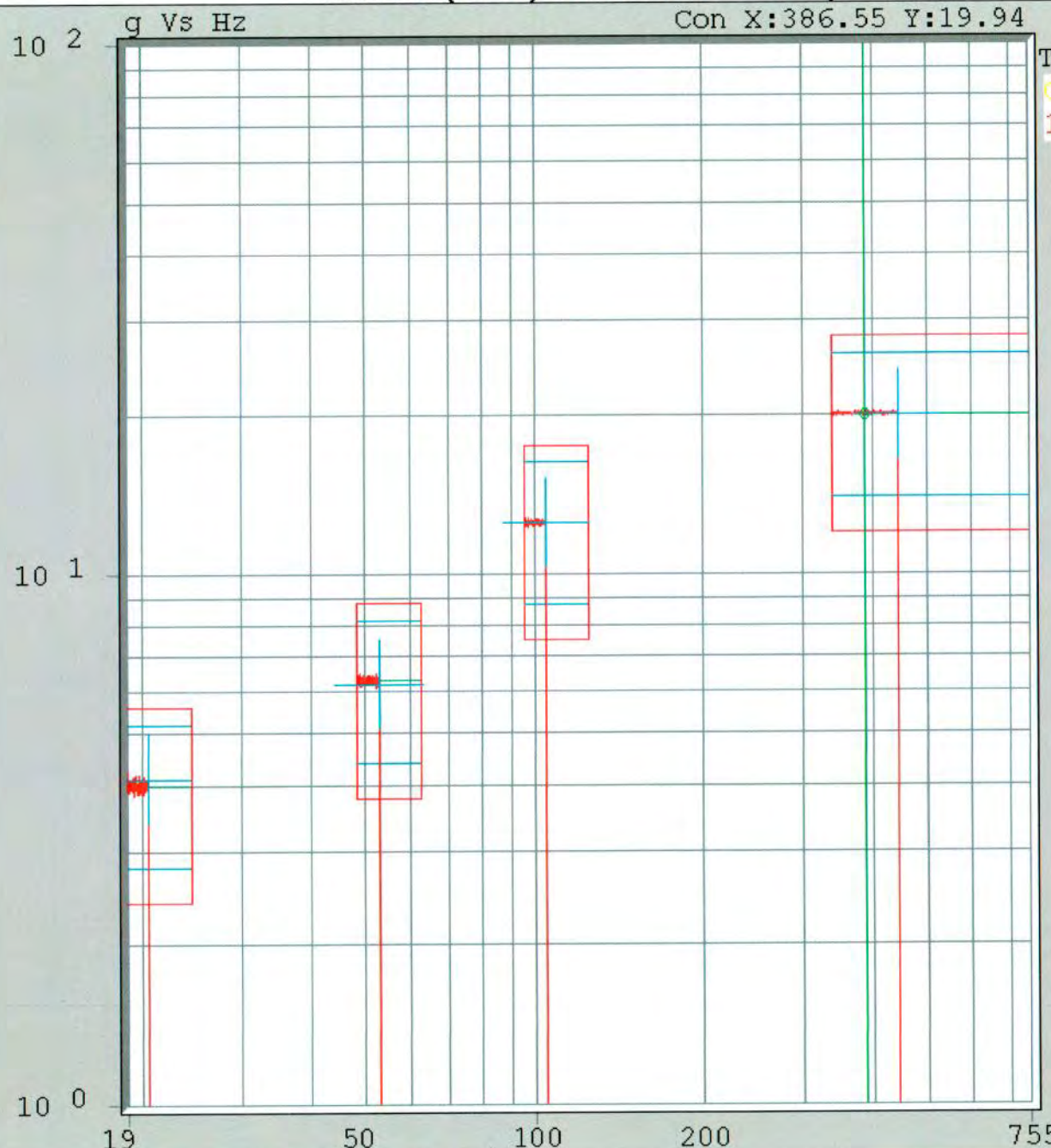
CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: endurance z axis  
 CH-4: 10.00 mV/g

Vwin II

Control,1 (Tones) - Acceleration vs Freq



3/10/2014 8:2:8 AM

TOTAL : 0:2:48

0:1:43 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
17.90	3.89	3.97

TONES

Freq	Ref	Con	g pk
20.59	4.00	4.11	g pk
52.86	6.30	6.20	g pk
105.1	12.50	12.48	g pk
444.8	20.00	19.99	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

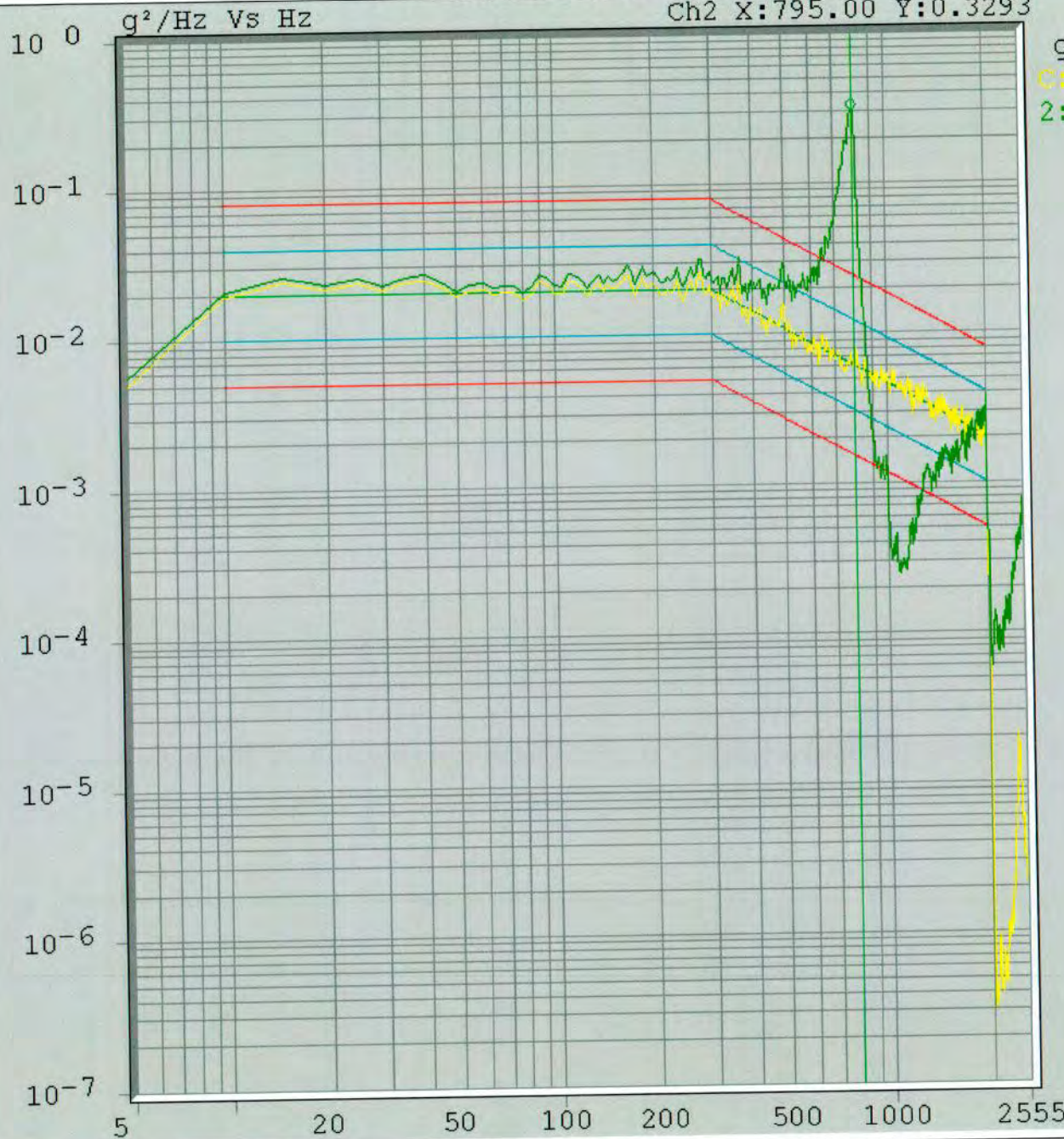
RUN DESC: endurance z axis

CH-4: 10.00 mV/g

Vwin II

Control,2 (Random) - PSD vs Freq

Ch2 X:795.00 Y:0.3293



grms  
C:3.96  
2:6.45

3/10/2014 8:2:50 AM

TOTAL : 0:3:30

0:2:26 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.91	3.89	3.96

TONES

Freq	Ref	Con	g pk
21.38	4.00	4.02	g pk
54.87	6.30	6.30	g pk
109.1	12.50	12.35	g pk
498.8	20.00	19.90	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

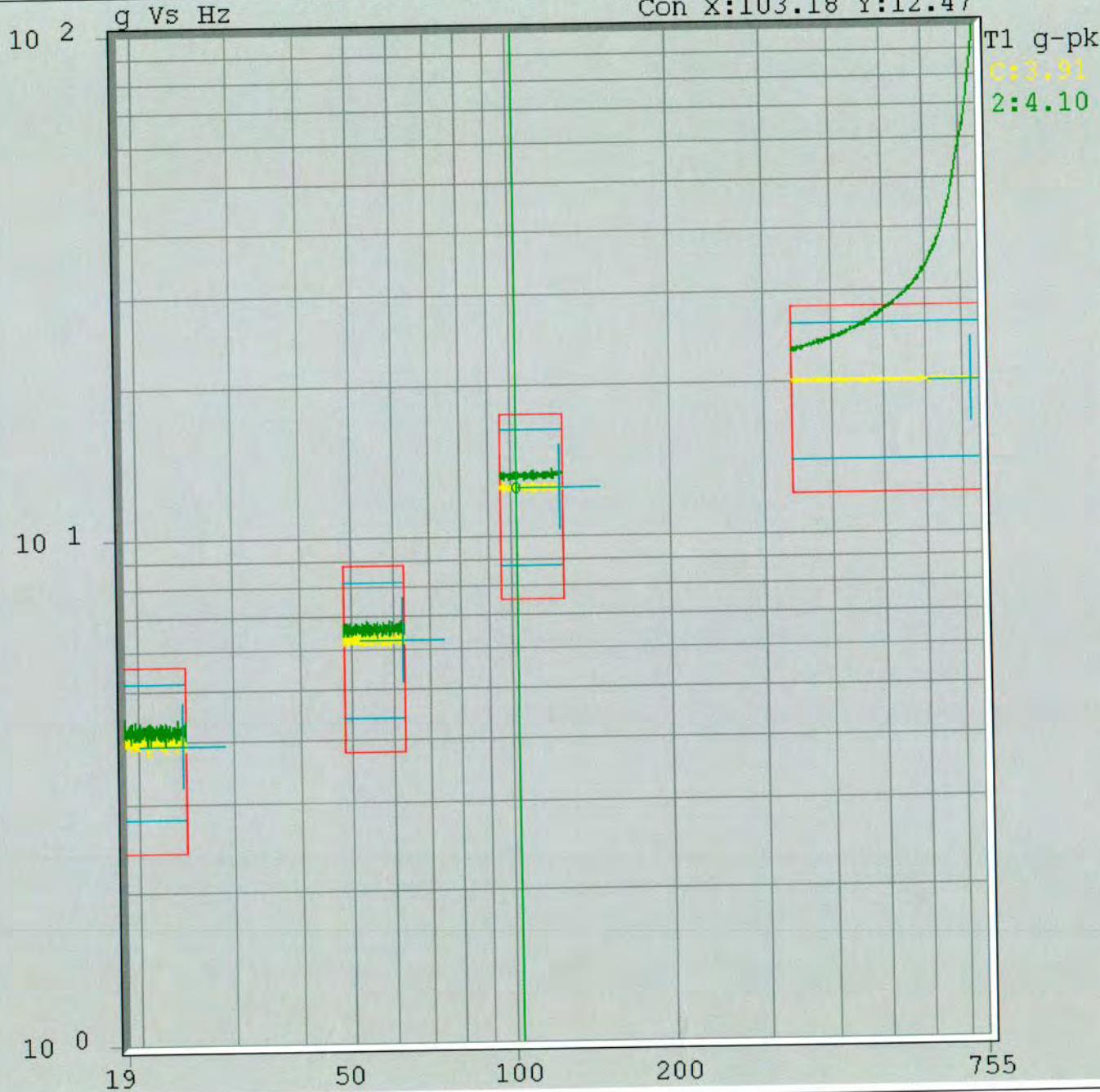
RUN DESC: endurance z axis

CH-4: 10.00 mV/g

Vwin II

Control,2 (Tones) - Acceleration vs Freq

Con X:103.18 Y:12.47



3/10/2014 8:5:38 AM

TOTAL : 0:6:18

0:5:14 of 6:30:0

Swp 2

Status: Auto

< SWEEPING

Level 0.0dB:100%

GRMS		
TOTAL Con	RANDOM Ref	CON Con
17.89	3.89	3.96

TONES		
Freq	Ref	Con
24.20	4.00	3.91
62.05	6.30	6.27
123.5	12.50	12.50
727.5	20.00	19.87

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels z axis  
 RUN NAME: run9  
 CH-1: 10.00 mV/g

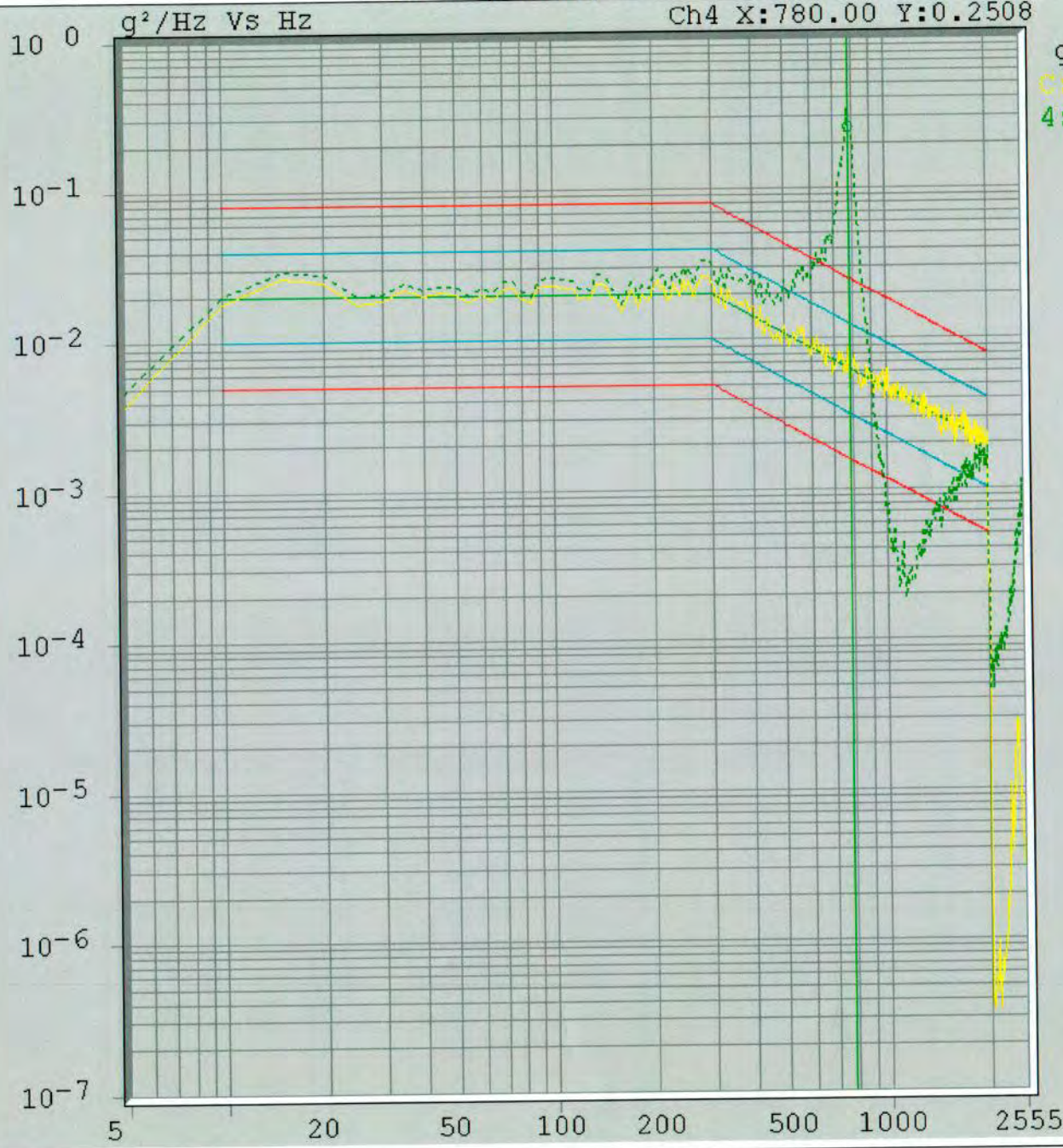
CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: endurance z axis  
 CH-4: 10.00 mV/g

Vwin II

Control,4 (Random) - PSD vs Freq



grms  
C:3.98  
4:6.39

3/10/2014 8:3:31 AM

TOTAL : 0:4:11

0:3:7 of 6:30:0

Swp 1

Status: Auto

SWEEPING->

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.90	3.89	3.98

TONES

Freq	Ref	Con	g pk
22.17	4.00	4.03	g pk
56.87	6.30	6.29	g pk
113.1	12.50	12.57	g pk
556.6	20.00	20.08	g pk

Log Sweep: 5.00 Min  
Servo(dB/s): 100  
DOF: 100  
Lines/Res: 500/ 5.00 Hz  
C:1  
S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E Z  
SETUP DESCRIPTION: endurance levels z axis  
RUN NAME: run9  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

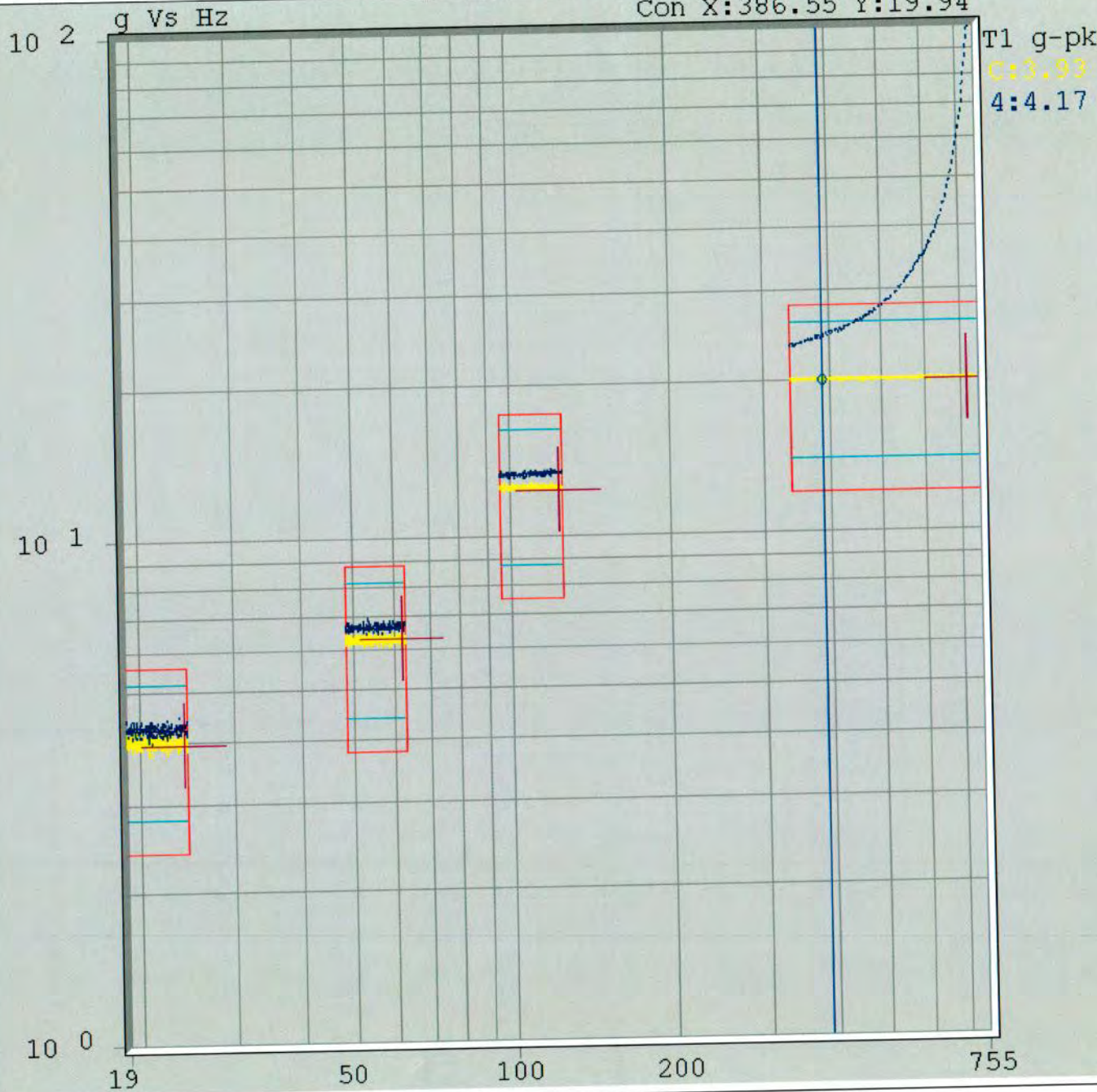
CH-3: 10.00 mV/g

RUN DESC: endurance z axis  
CH-4: 10.00 mV/g

Vwin II

Control,4 (Tones) - Acceleration vs Freq

Con X:386.55 Y:19.94



3/10/2014 8:5:42 AM

TOTAL : 0:6:22

0:5:17 of 6:30:0

Swp 2

Status: Auto

<-SWEEPING

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.91	3.89	3.99

TONES

Freq	Ref	Con	pk
24.13	4.00	3.93	pk
61.85	6.30	6.32	pk
123.1	12.50	12.36	pk
720.5	20.00	19.97	pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels Z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

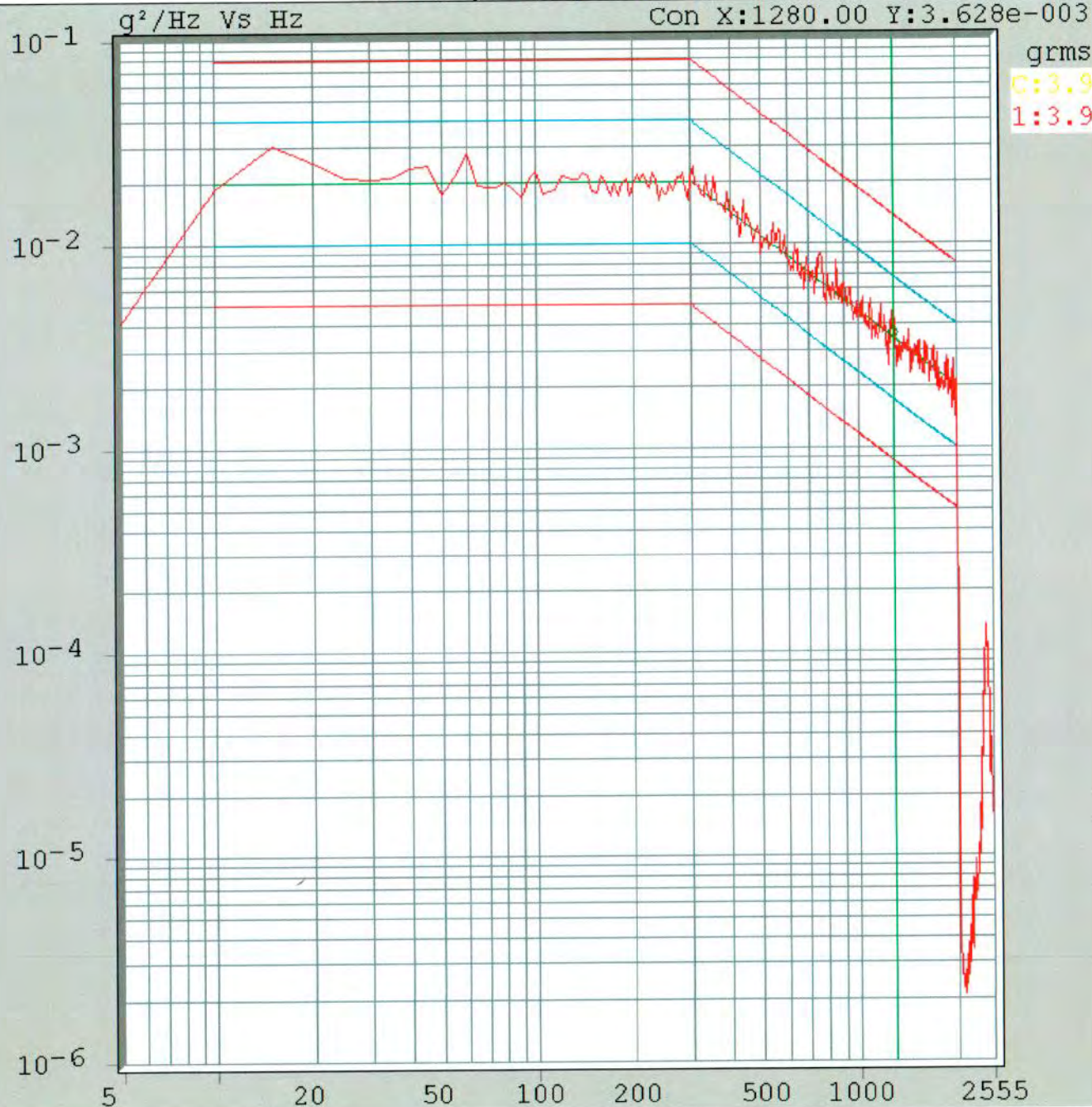
CH-3: 10.00 mV/g

RUN DESC: endurance z axis

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq



3/10/2014 10:54:28 AM

TOTAL : 2:5:17

2:4:14 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.94

TONES

Freq	Ref	Con	
23.56	4.00	4.03	g pk
60.42	6.30	6.57	g pk
120.2	12.50	12.46	g pk
670.6	20.00	20.16	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

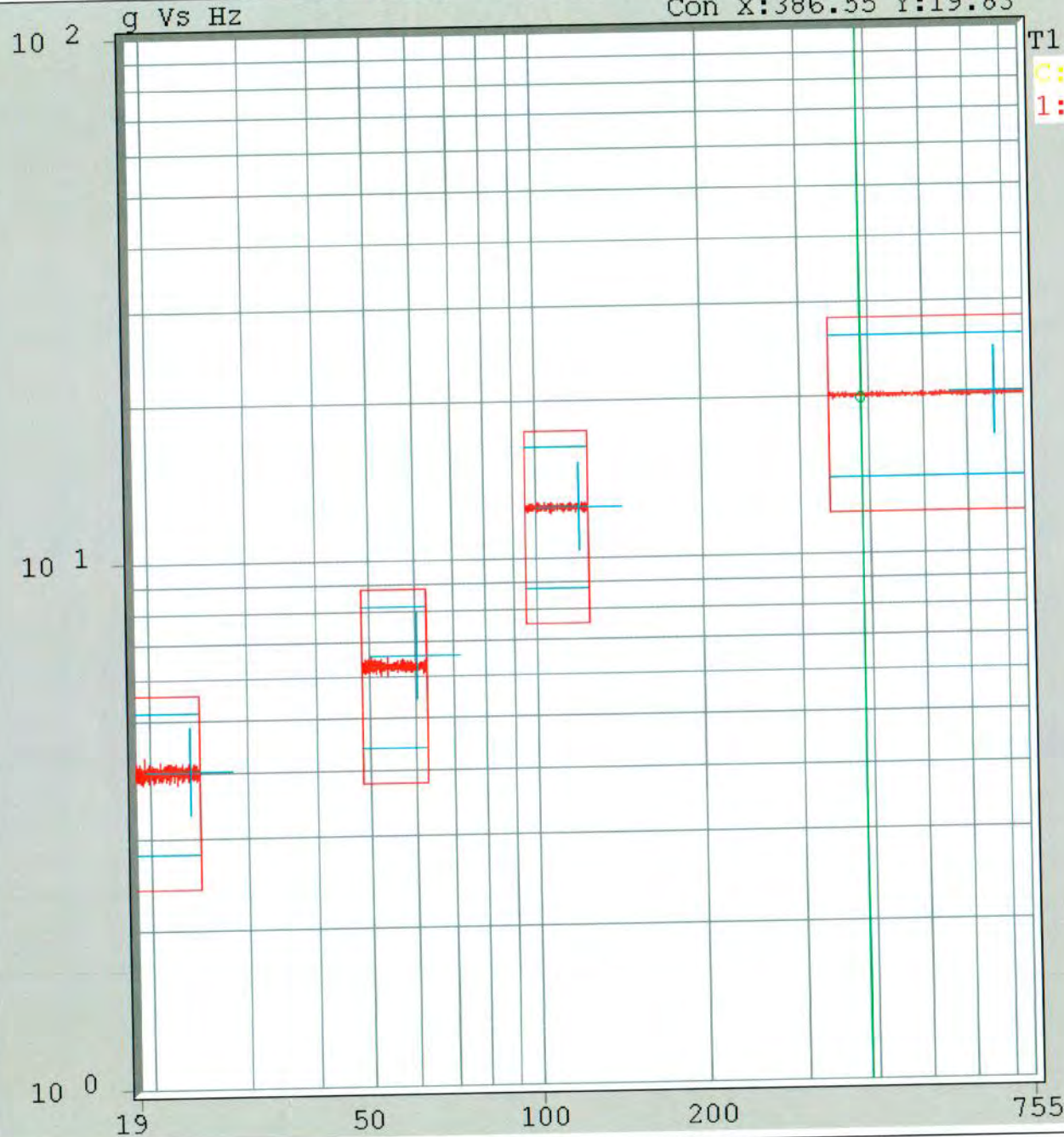
RUN DESC: endurance z axis

CH-4: 10.00 mV/g

Vwin II

# Control,1 (Tones) - Acceleration vs Freq

Con X:386.55 Y:19.83



T1 g-pk  
C:4.03  
1:4.03

3/10/2014 10:5:47 AM

TOTAL : 2:5:17

2:4:14 of 6:30:0

Swp 25

Status: Auto

**STOPPED**

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
17.92	3.89	3.94

TONES

Freq	Ref	Con	
23.56	4.00	4.03	g pk
60.42	6.30	6.57	g pk
120.2	12.50	12.46	g pk
670.6	20.00	20.16	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

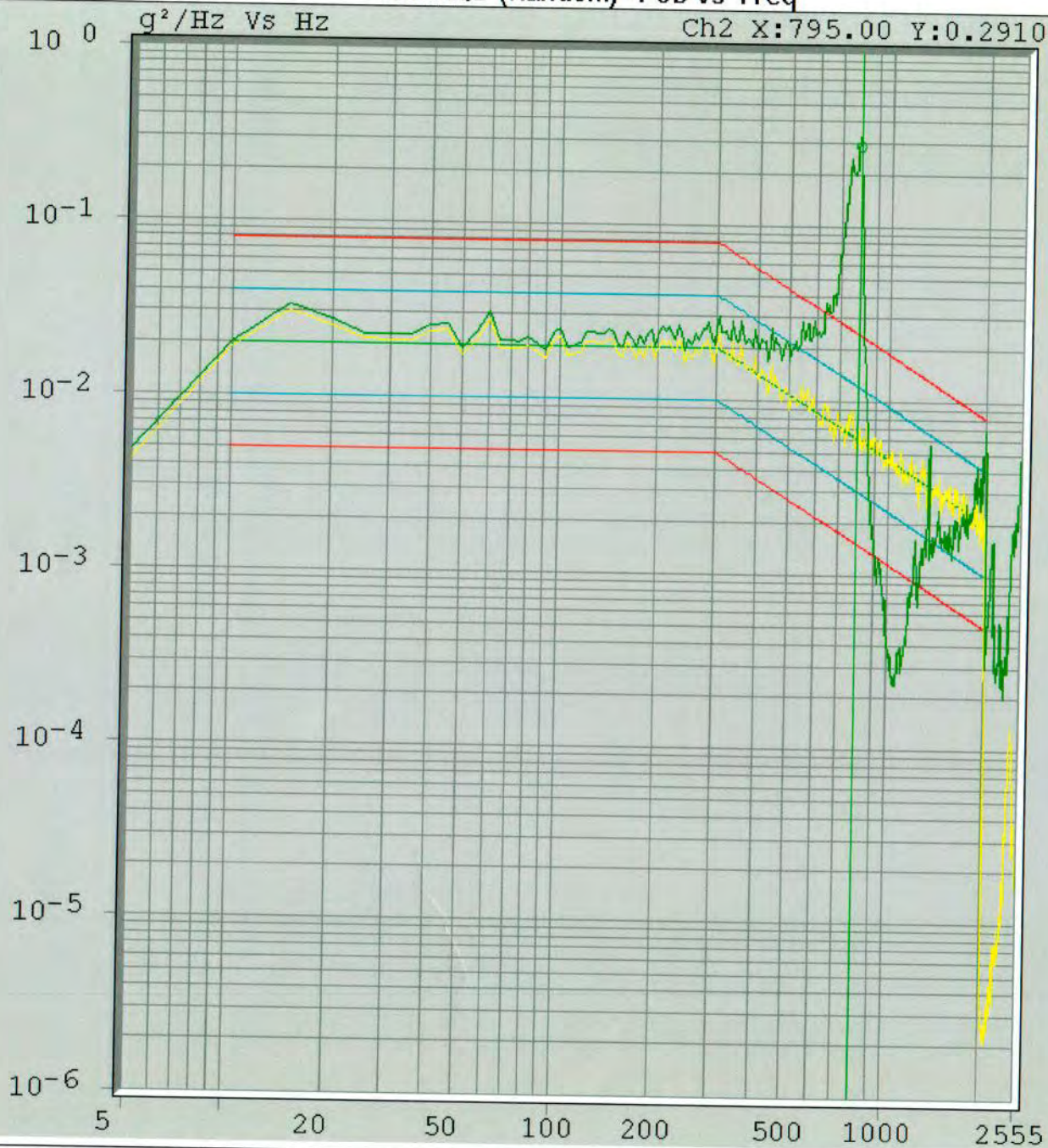
CH-3: 10.00 mV/g

RUN DESC: endurance z axis

CH-4: 10.00 mV/g

Vwin II

Control,2 (Random) - PSD vs Freq



3/10/2014 10:5:51 AM

TOTAL : 2:5:17

2:4:14 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS		
TOTAL	RANDOM	
Con	Ref	Con
17.92	3.89	3.94

TONES		
Freq	Ref	Con
23.56	4.00	4.03
60.42	6.30	6.57
120.2	12.50	12.46
670.6	20.00	20.16

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels Z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

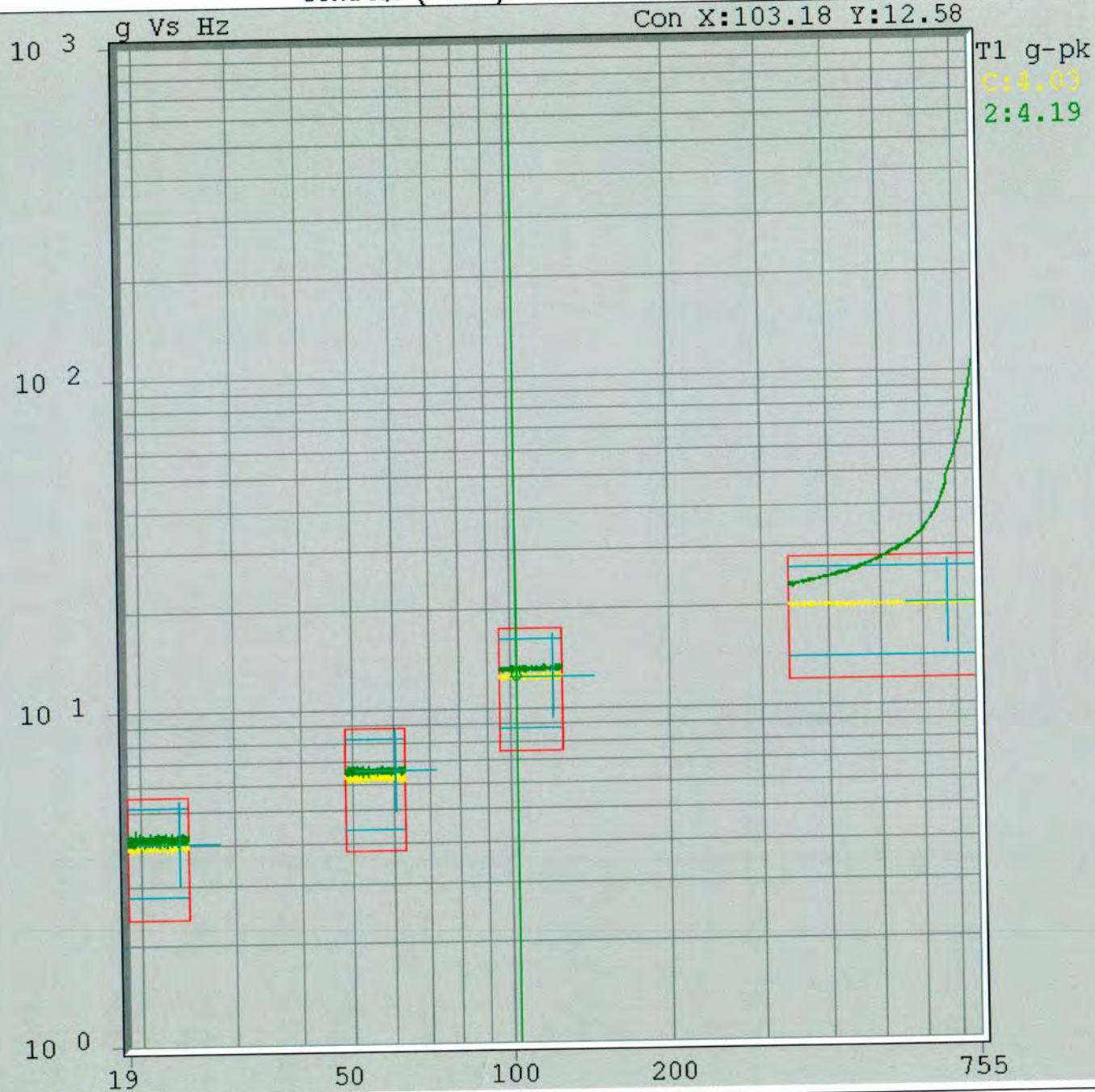
CH-3: 10.00 mV/g

RUN DESC: endurance z axis

CH-4: 10.00 mV/g

Vwin II

Control,2 (Tones) - Acceleration vs Freq



Save 10 of 10

3/10/2014 10:4:37 AM

TOTAL : 2:5:17

2:4:14 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
17.92	3.89	3.94

TONES

Freq	Ref	Con	g pk
23.56	4.00	4.03	g pk
60.42	6.30	6.57	g pk
120.2	12.50	12.46	g pk
670.6	20.00	20.16	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

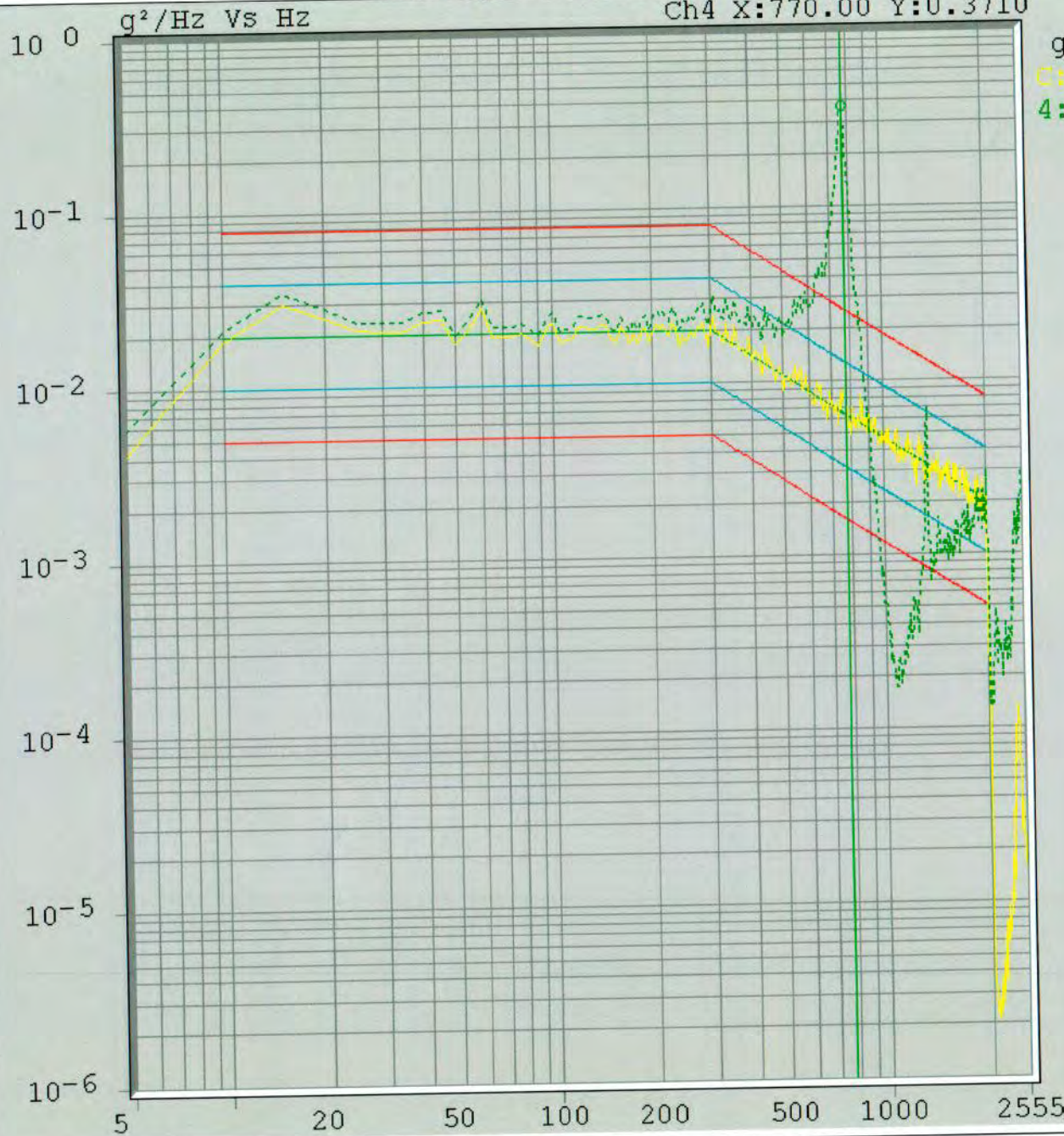
RUN DESC: endurance z axis

CH-4: 10.00 mV/g

Vwin II

Control,4 (Random) - PSD vs Freq

Ch4 X:770.00 Y:0.3710



grms  
3:3.94  
4:6.50

3/10/2014 10:5:59 AM

TOTAL : 2:5:17

2:4:14 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
17.92	3.89	3.94

TONES

Freq	Ref	Con	pk
23.56	4.00	4.03	g
60.42	6.30	6.57	g
120.2	12.50	12.46	g
670.6	20.00	20.16	g

Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E  
 SETUP DESCRIPTION: endurance levels z axis  
 RUN NAME: run9  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

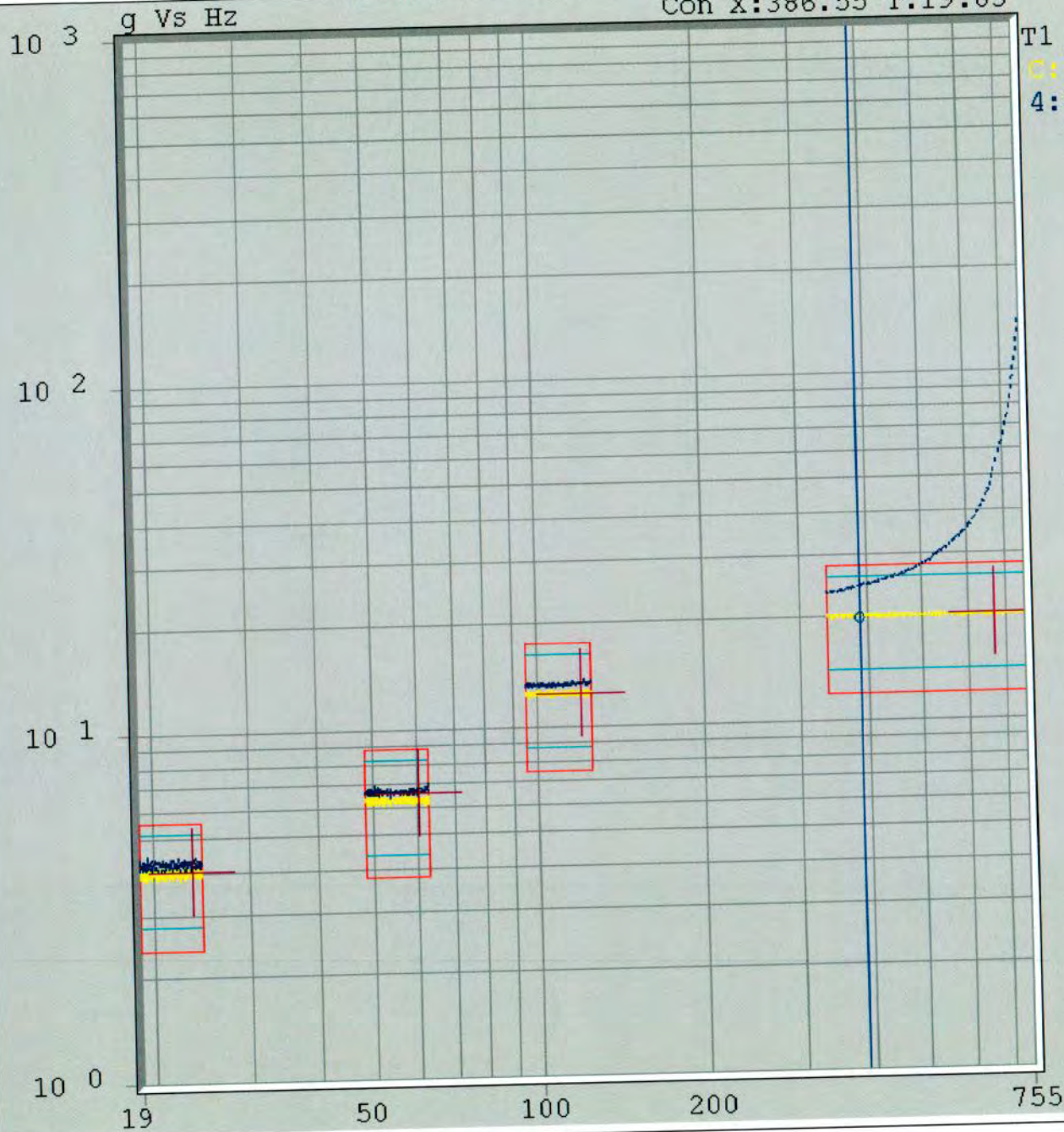
CH-3: 10.00 mV/g

RUN DESC: endurance z axis  
 CH-4: 10.00 mV/g

Vwin II

# Control,4 (Tones) - Acceleration vs Freq

Con X:386.55 Y:19.83



T1 g-pk  
C:4.03  
4:4.27

Save 10 of 10

3/10/2014 10:4:37 AM

TOTAL : 2:5:17

2:4:14 of 6:30:0

Swp 25

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
17.92	3.89	3.94

TONES

Freq	Ref	Con	g pk
23.56	4.00	4.03	g pk
60.42	6.30	6.57	g pk
120.2	12.50	12.46	g pk
670.6	20.00	20.16	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191 E

SETUP DESCRIPTION: endurance levels z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

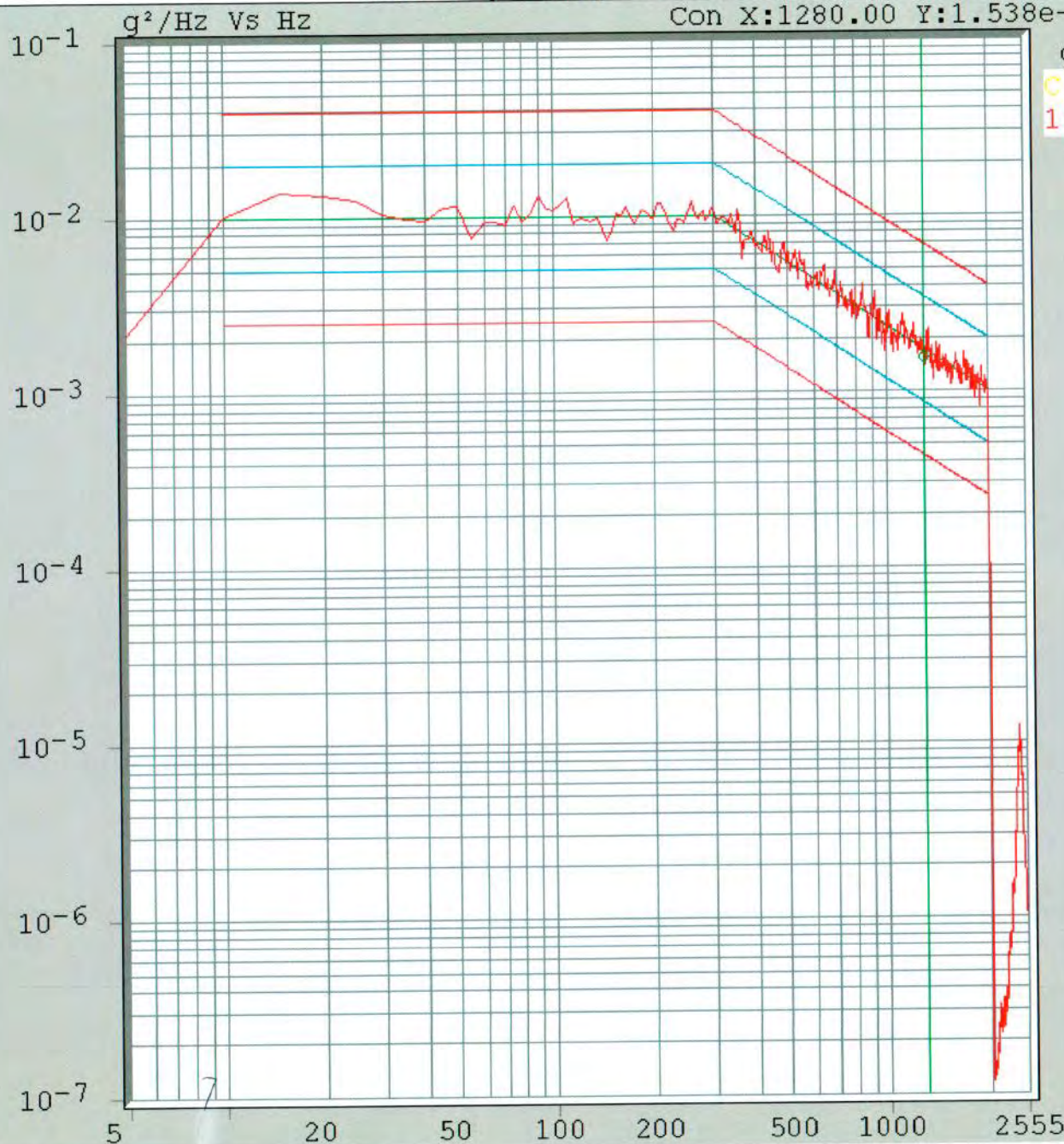
CH-3: 10.00 mV/g

RUN DESC: endurance z axis

CH-4: 10.00 mV/g

Vwin II

Control,1 (Random) - PSD vs Freq



grms  
C:2.80  
1:2.80

3/10/2014 10:35:15 AM

TOTAL : 0:18:3

0:16:59 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.55	2.75	2.80

TONES

Freq	Ref	Con	g pk
22.06	2.00	1.97	g pk
56.58	5.00	5.06	g pk
112.5	10.00	10.00	g pk
548.1	16.70	16.67	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run16

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vvin II

Control,1 (Tones) - Acceleration vs Freq

3/10/2014 10:35:23 AM

TOTAL : 0:18:3

0:16:59 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.55	2.75	2.80

TONES

Freq	Ref	Con	g pk
22.06	2.00	1.97	g pk
56.58	5.00	5.06	g pk
112.5	10.00	10.00	g pk
548.1	16.70	16.67	g pk

Log Sweep: 5.00 Min

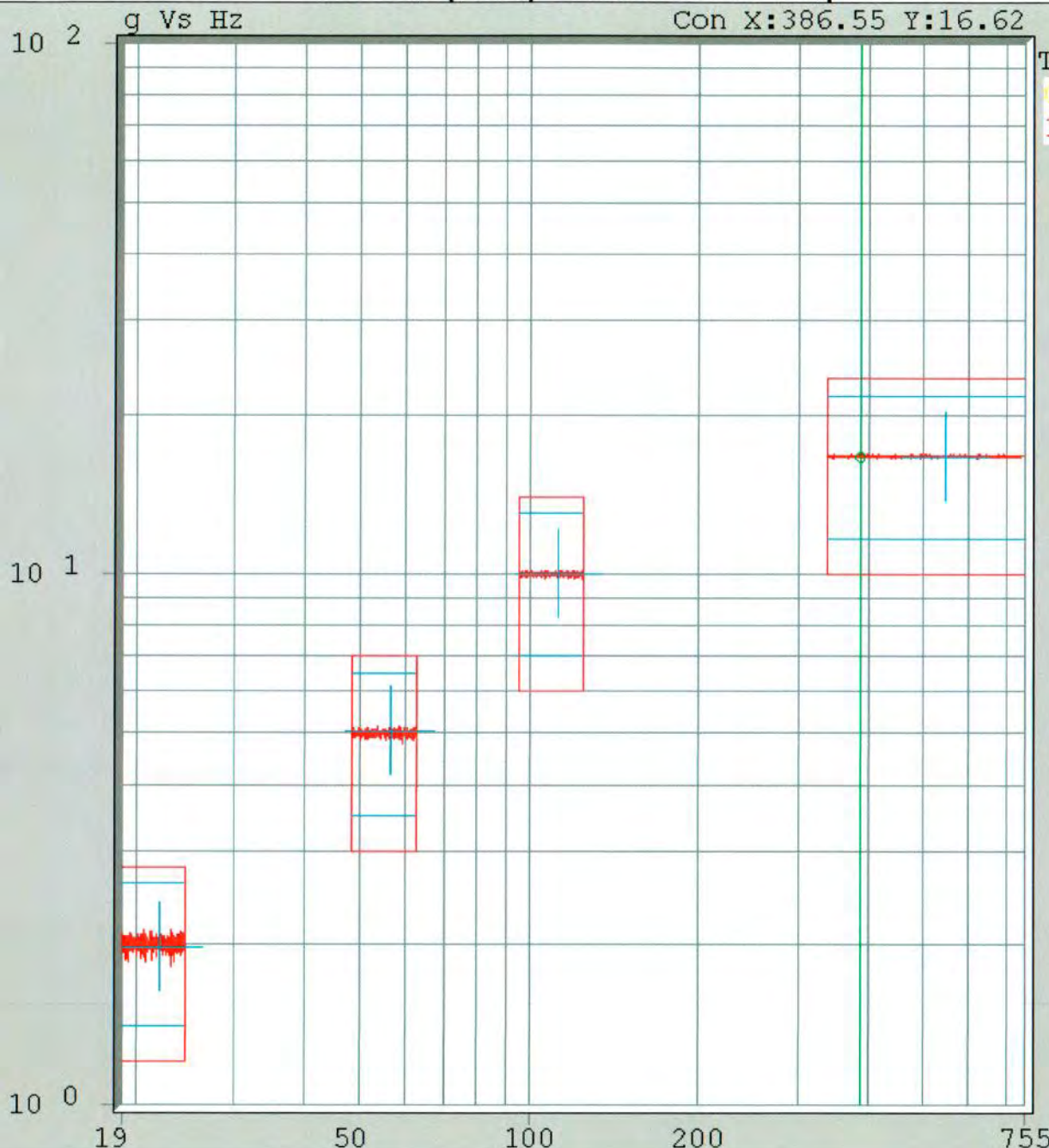
Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run16

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

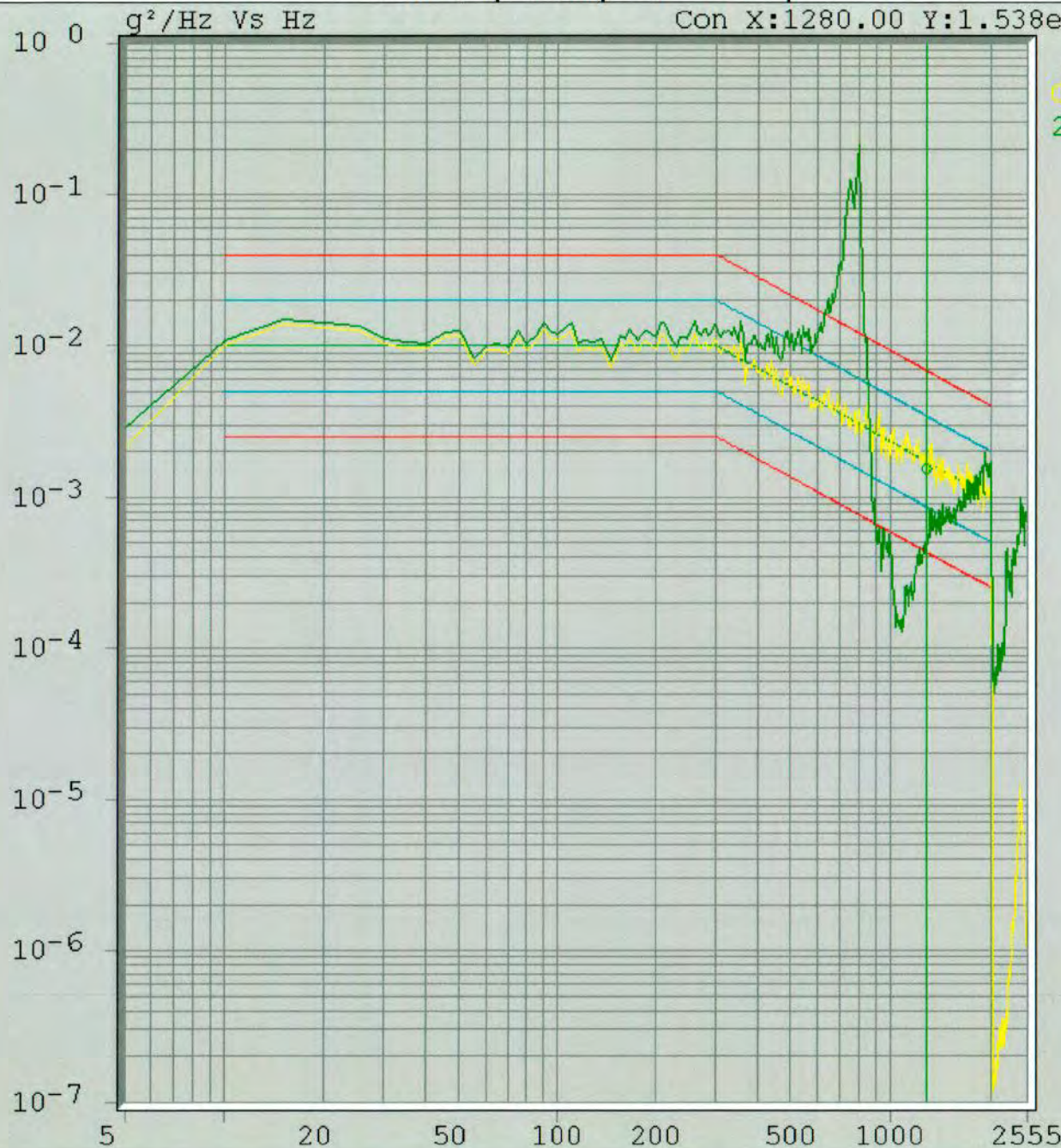
RUN DESC:

CH-4: 10.00 mV/g

Vwin II



Control,2 (Random) - PSD vs Freq



3/10/2014 10:35:30 AM

TOTAL : 0:18:3

0:16:59 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	RANDOM Con
14.55	2.75	2.80

TONES

Freq	Ref	Con	
22.06	2.00	1.97	g pk
56.58	5.00	5.06	g pk
112.5	10.00	10.00	g pk
548.1	16.70	16.67	g pk

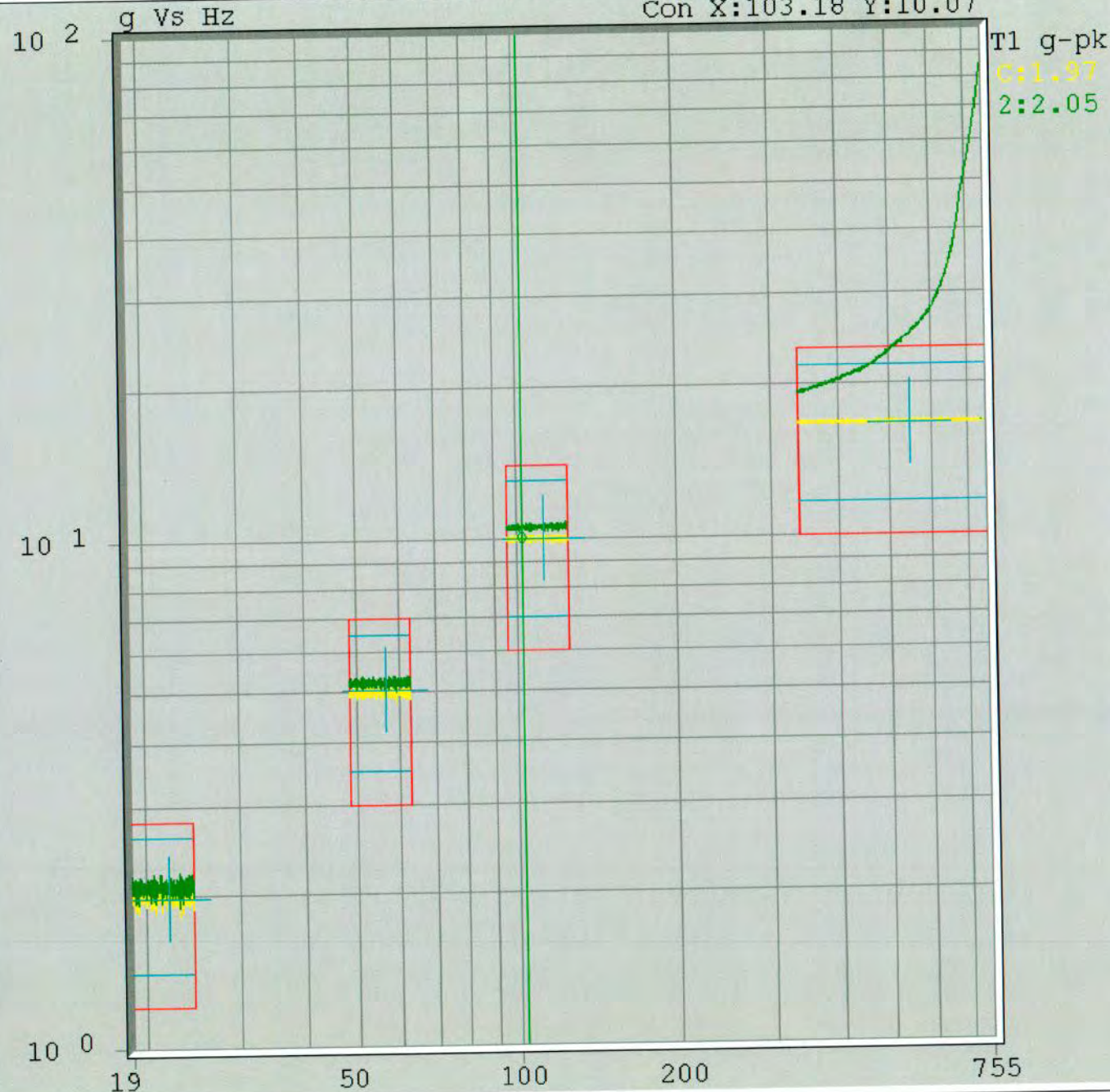
Log Sweep: 5.00 Min  
 Servo(dB/s): 100  
 DOF: 100  
 Lines/Res: 500/ 5.00 Hz  
 C:1  
 S(Auto):1,2,3,4



SOR SETUP ID: 7G1191  
 SETUP DESCRIPTION: performance levels z axis  
 RUN NAME: run16  
 CH-1: 10.00 mV/g      CH-2: 10.00 mV/g      CH-3: 10.00 mV/g      CH-4: 10.00 mV/g  
 RUN DESC:  
 Wwin II

# Control,2 (Tones) - Acceleration vs Freq

Con X:103.18 Y:10.07



3/10/2014 10:35:33 AM

TOTAL : 0:18:3

0:16:59 of 6:30:0

Swp 4

Status: Auto

**STOPPED**

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	Con
14.55	2.75	2.80

TONES

Freq	Ref	Con	g pk
22.06	2.00	1.97	g pk
56.58	5.00	5.06	g pk
112.5	10.00	10.00	g pk
548.1	16.70	16.67	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run16

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

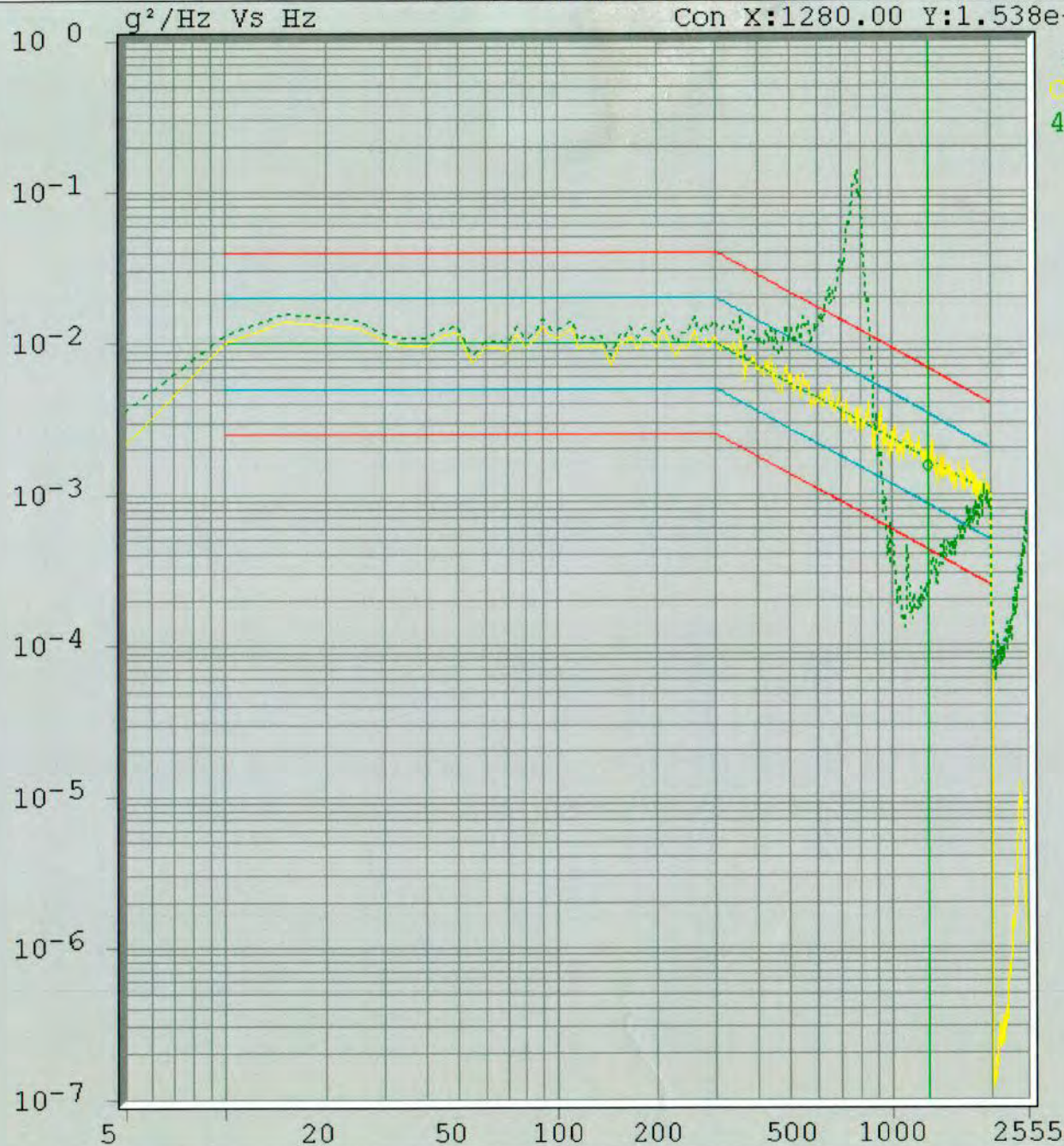
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,4 (Random) - PSD vs Freq



3/10/2014 10:35:38 AM

TOTAL : 0:18:3

0:16:59 of 6:30:0

Swp 4

Status: Auto

STOPPED

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
14.55	2.75	2.80

TONES

Freq	Ref	Con	pk
22.06	2.00	1.97	g
56.58	5.00	5.06	g
112.5	10.00	10.00	g
548.1	16.70	16.67	g

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run16

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

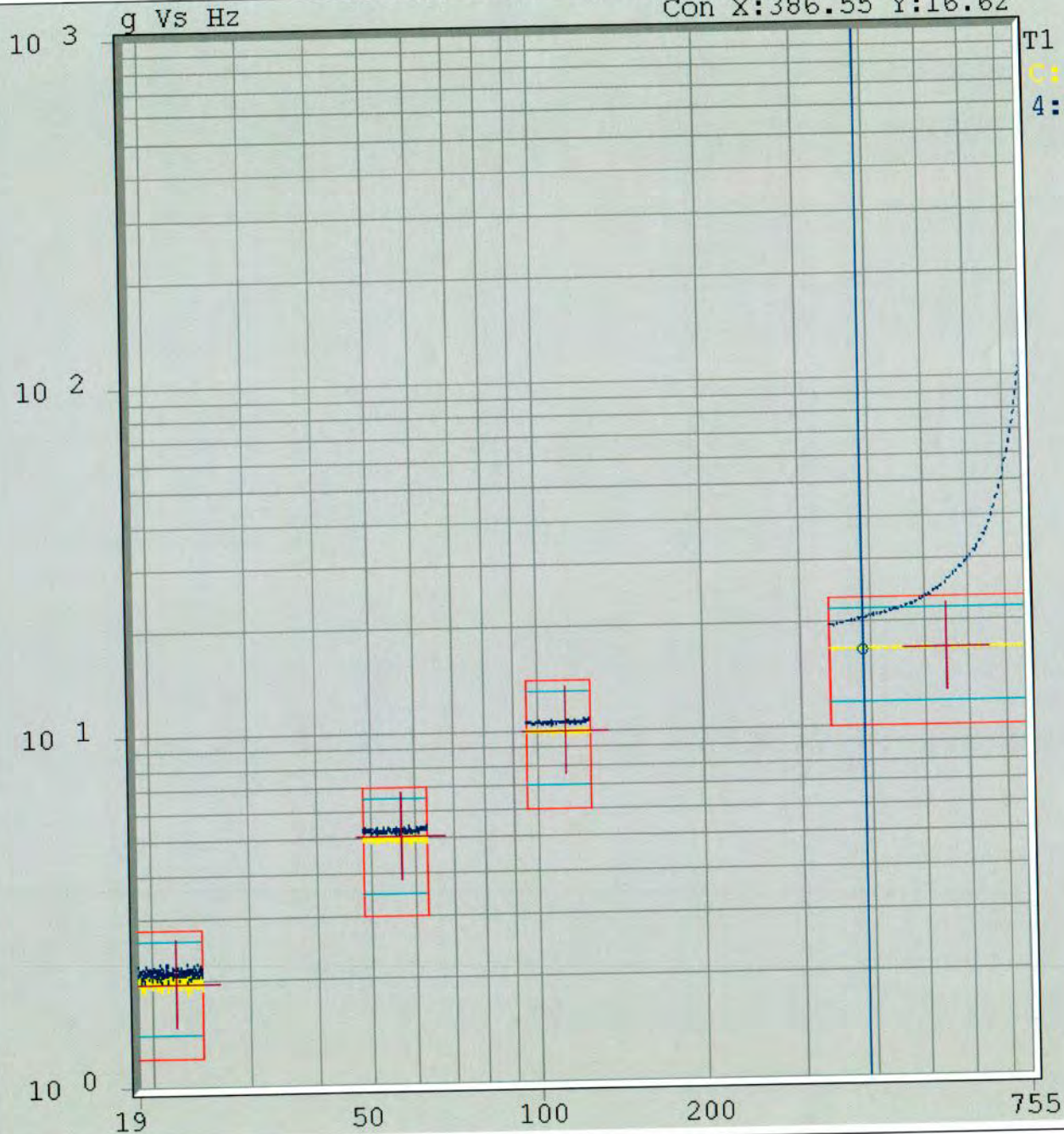
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

# Control,4 (Tones) - Acceleration vs Freq

Con X:386.55 Y:16.62



T1 g-pk  
C:1.97  
4:2.08

3/10/2014 10:35:41 AM

TOTAL : 0:18:3

0:16:59 of 6:30:0

Swp 4

Status: Auto

**STOPPED**

Level 0.0dB:100%

GRMS

TOTAL Con	RANDOM Ref	CON Con
14.55	2.75	2.80

TONES

Freq	Ref	Con	g pk
22.06	2.00	1.97	g pk
56.58	5.00	5.06	g pk
112.5	10.00	10.00	g pk
548.1	16.70	16.67	g pk

Log Sweep: 5.00 Min

Servo(dB/s): 100

DOF: 100

Lines/Res: 500/ 5.00 Hz

C:1

S(Auto):1,2,3,4



SOR SETUP ID: 7G1191

SETUP DESCRIPTION: performance levels z axis

RUN NAME: run16

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

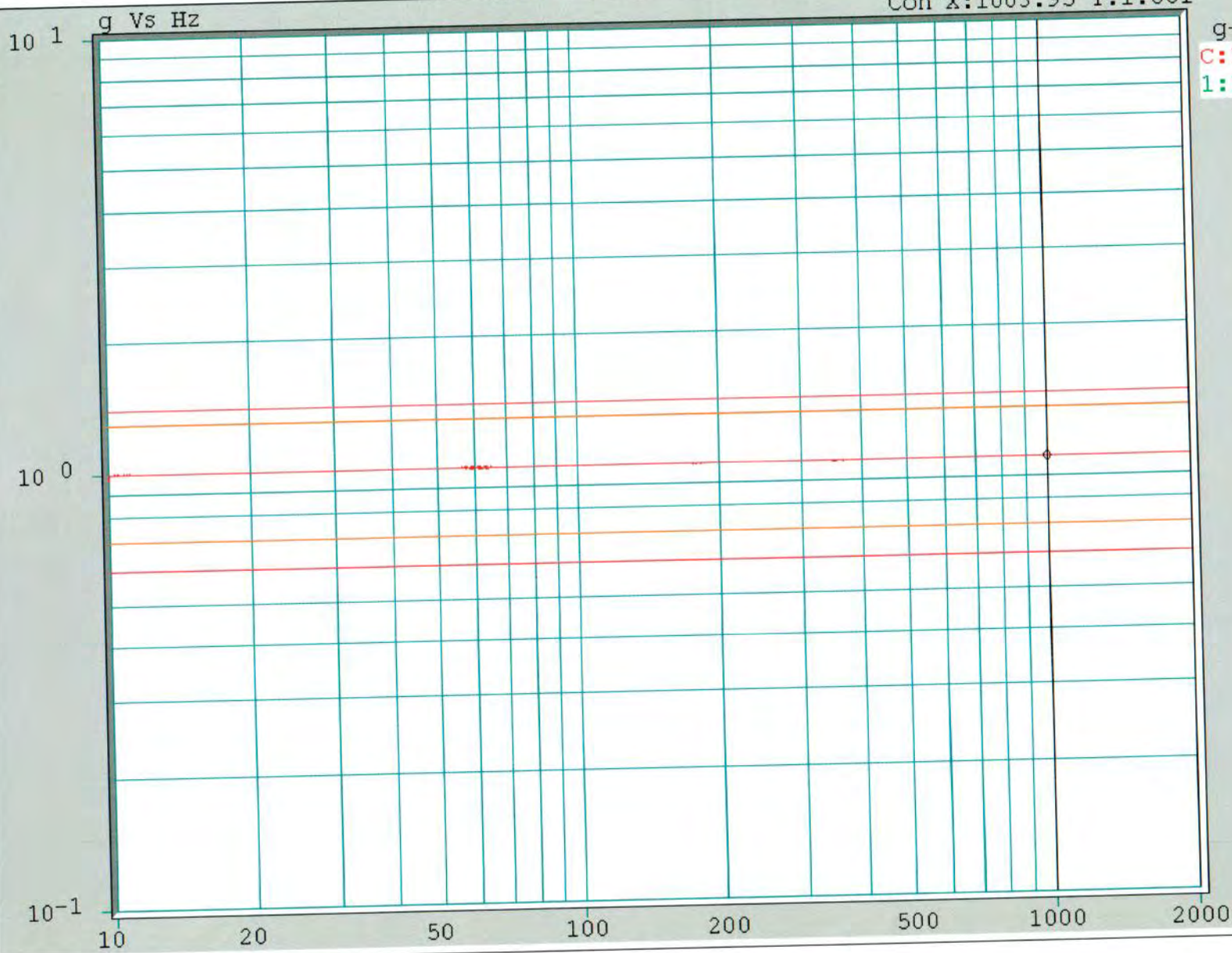
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

Control,1 - Acceleration vs Freq

Con X:1003.95 Y:1.001



g-pk  
C:1.00  
I:1.00

3/10/2014  
11:8:38 AM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

**FINISHED**

Freq Hz **2000.00**

Ref g-pk **1.00**

Acc g-pk **1.000**

Vel in/s-pk **0.03**

Disp mils pk-pk **0.00**

Swp : 15 min 18 sec  
Servo(dB/s): 1K  
Freq : Log  
Type:Single  
C:1  
AutoSave  
S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search  
SETUP DESCRIPTION: z axis  
RUN NAME: run8  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

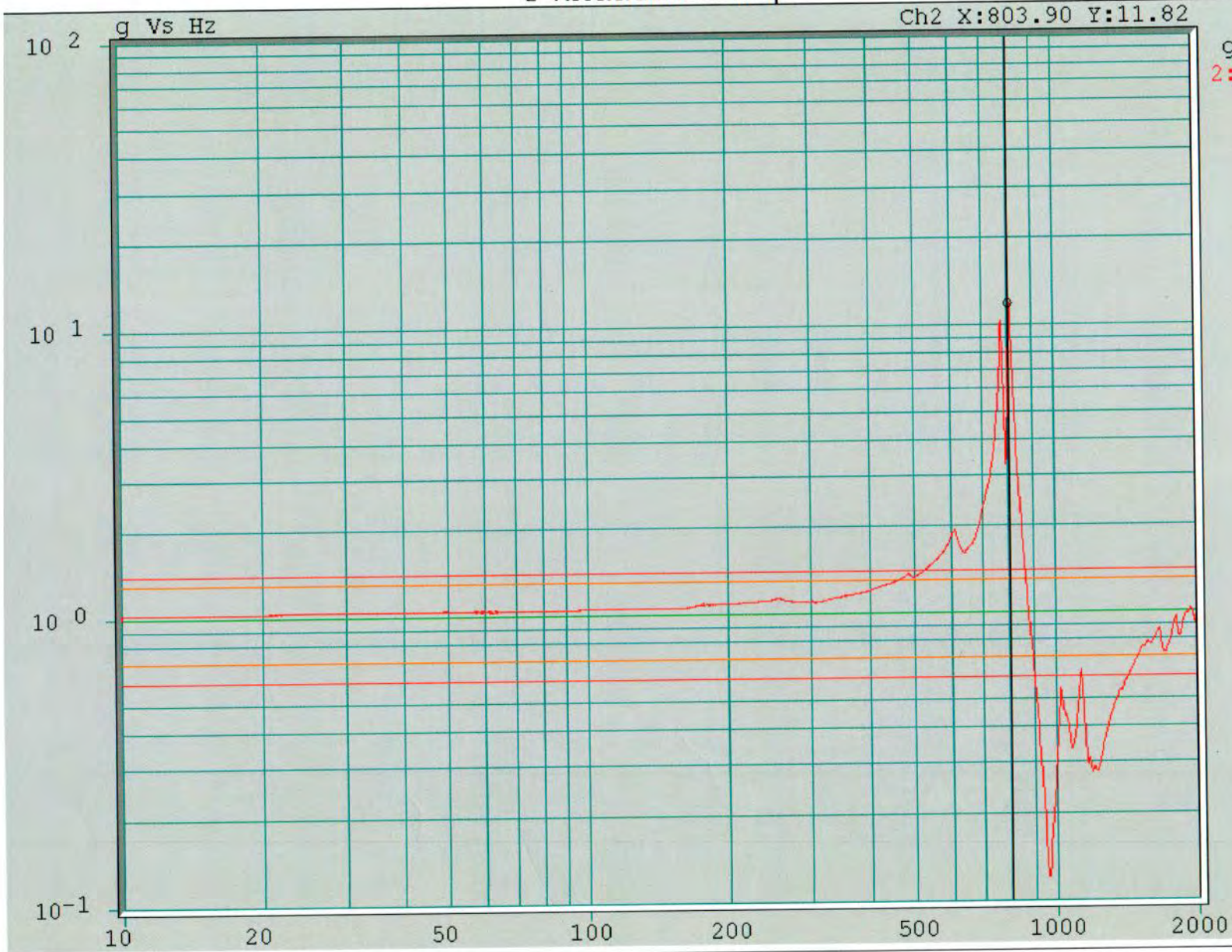
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

2 - Acceleration vs Freq



Ch2 X:803.90 Y:11.82

g-pk  
2:0.975

3/10/2014  
11:8:47 AM

Total: 0:15:28  
Auto: 0:15:18  
Swp 1 of 1

Status: Auto  
**FINISHED**

Freq Hz: 2000.00  
Ref g-pk: 1.00  
Acc g-pk: 1.000  
Vel in/s-pk: 0.03  
Disp mils pk-pk: 0.00

Swp : 15 min 18 sec  
Servo(dB/s): 1K  
Freq : Log  
Type:Single  
C:1  
AutoSave  
S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search  
SETUP DESCRIPTION: z axis  
RUN NAME: run8  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

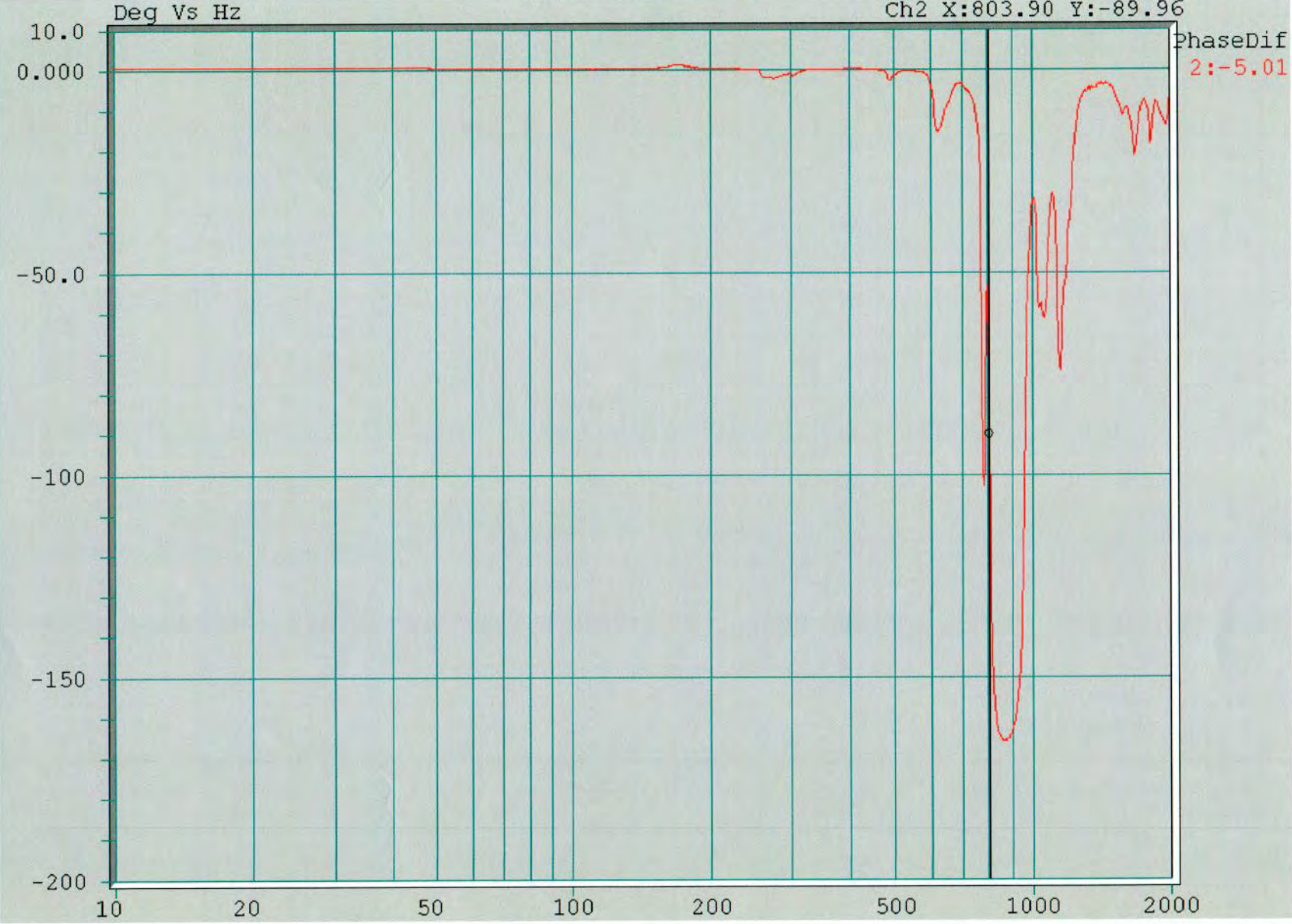
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

(2)-1 - Phase vs Freq



3/10/2014  
11:13:26 AM

Total: 0:15:28

Auto: 0:15:18

Swp 1 of 1

Status: Auto

FINISHED

Freq 2000.00  
Hz

Ref 1.00  
g-pk

Acc 1.000  
g-pk

Vel 0.03  
in/s-pk

Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec

Servo(dB/s): 1K

Freq : Log

Type:Single

C:1

AutoSave

S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search

SETUP DESCRIPTION: z axis

RUN NAME: run8

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

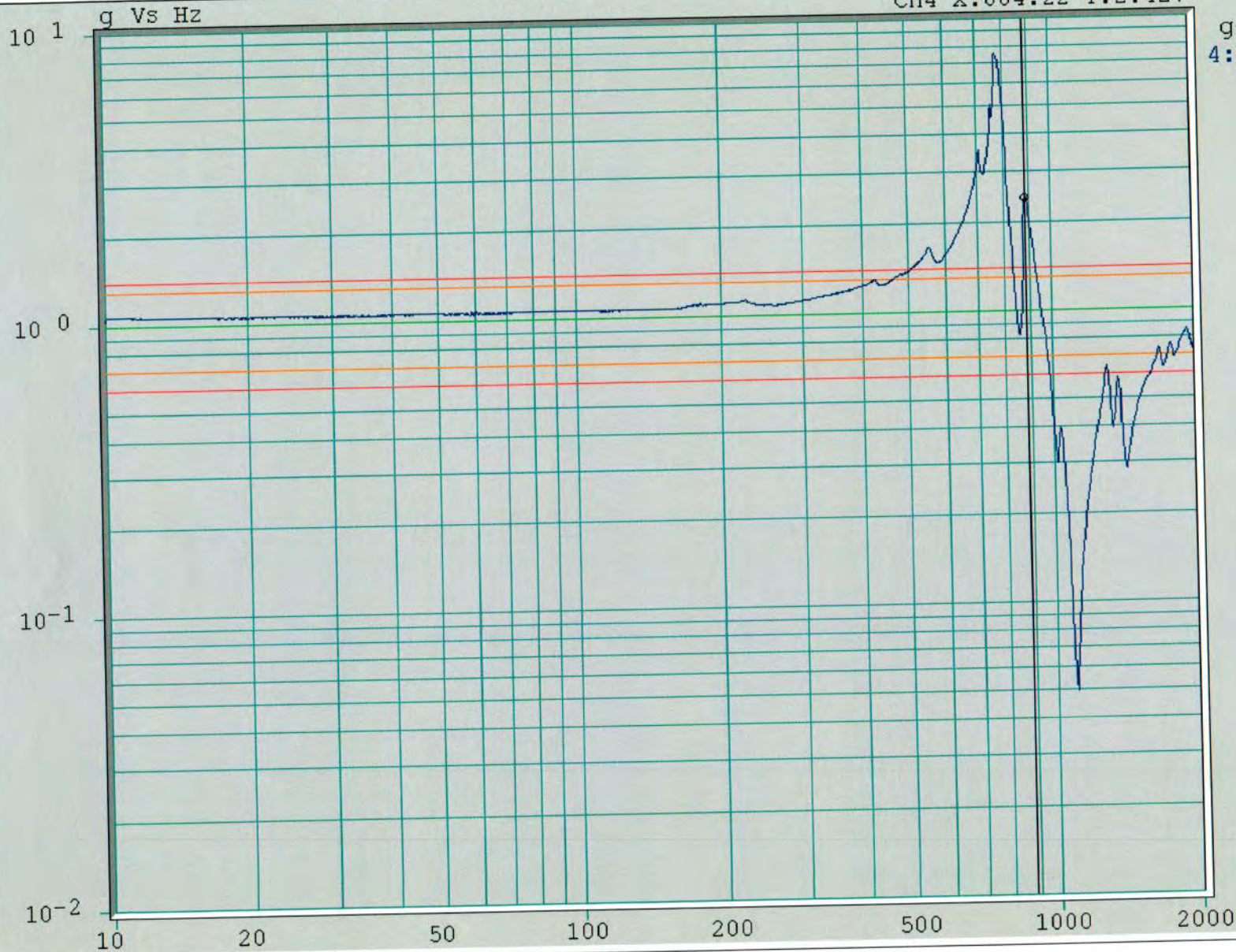
RUN DESC:

CH-4: 10.00 mV/g

vwin II

4 - Acceleration vs Freq

Ch4 X:884.22 Y:2.427



g-pk  
4:0.782

3/10/2014  
11:8:55 AM

Total: 0:15:28  
Auto: 0:15:18  
Swp 1 of 1

Status: Auto  
**FINISHED**

Freq 2000.00  
Hz  
Ref 1.00  
g-pk  
Acc 1.000  
g-pk  
Vel 0.03  
in/s-pk  
Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec  
Servo(dB/s): 1K  
Freq : Log  
Type:Single  
C:1  
AutoSave  
S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search  
SETUP DESCRIPTION: z axis  
RUN NAME: run8  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

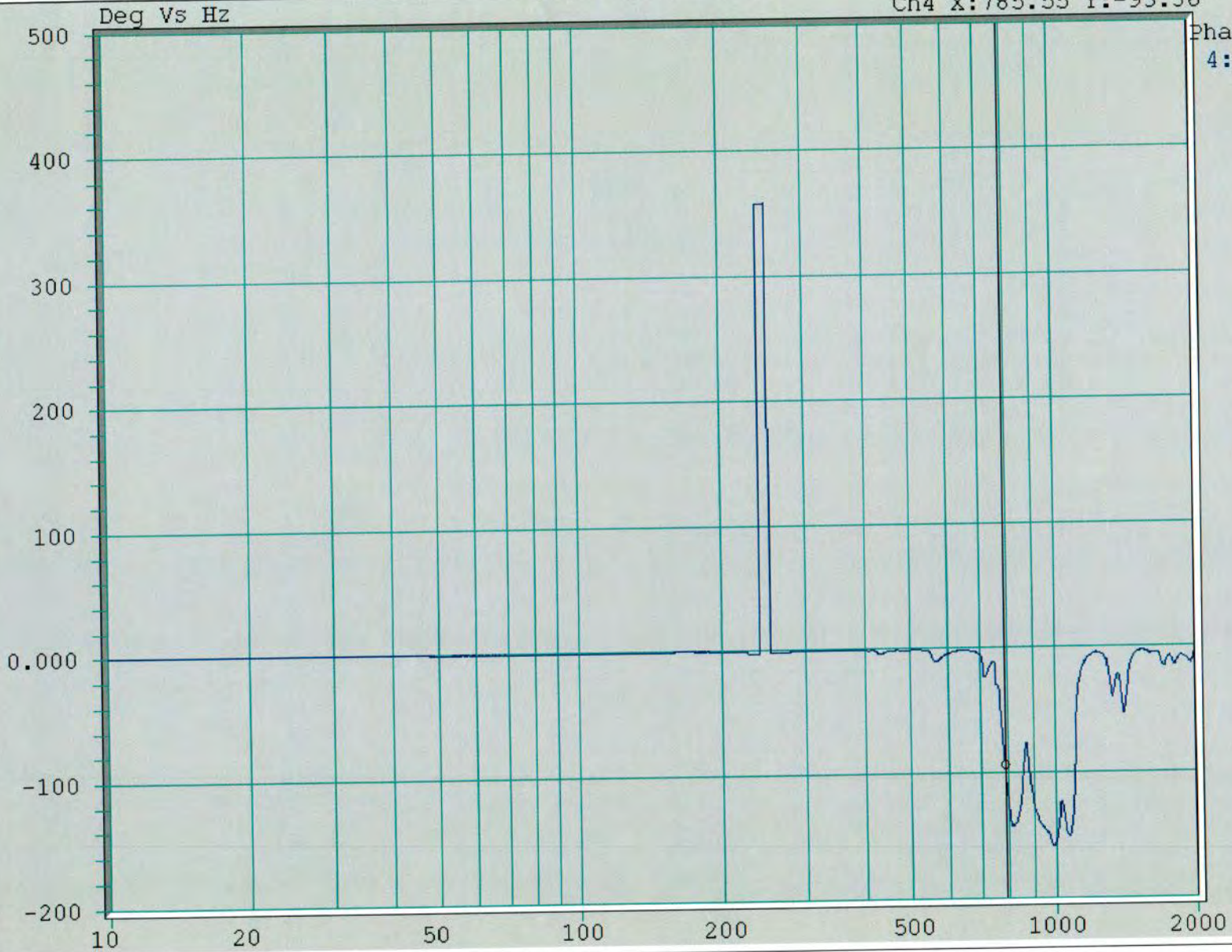
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

(4)-1 - Phase vs Freq

Ch4 X:785.55 Y:-93.36



PhaseDif  
4:-3.02

3/10/2014  
11:13:29 AM

Total: 0:15:28  
Auto: 0:15:18  
Swp 1 of 1

Status: Auto  
**FINISHED**

Freq 2000.00  
Hz  
Ref 1.00  
g-pk  
Acc 1.000  
g-pk  
Vel 0.03  
in/s-pk  
Disp 0.00  
mils pk-pk

Swp : 15 min 18 sec  
Servo(dB/s): 1K  
Freq : Log  
Type:Single  
C:1  
AutoSave  
S:1,2,3,4



SINE SETUP ID: Bell 1 g resonance search  
SETUP DESCRIPTION: z axis  
RUN NAME: run8  
CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

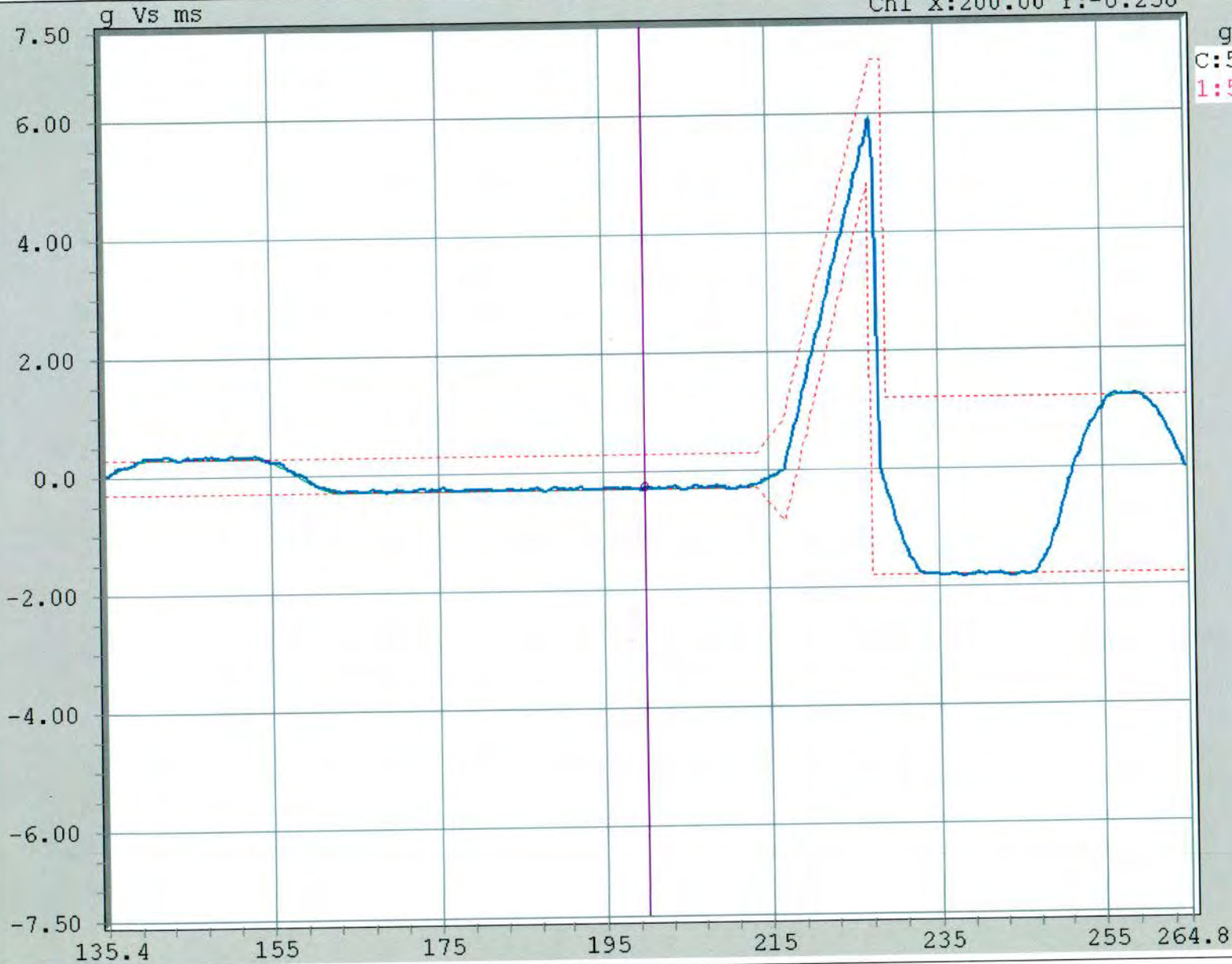
Vwin II

List of Resonances: Sweeping UP  
 SINE SETUP ID: Bell 1 g resonance search  
 SETUP DESCRIPTION: z axis  
 RUN NAME: run8  
 RUN DESC:  
 Ratio Limit Entered(g/g): 2.00

Chan	Freq(Hz)	g/g	CON (g)	CH (g)	Q	Phase
1	Not found					
2	772.061	10.29	1.0	10.3	49.57	51.08
2	803.896	11.80	1.0	11.8	49.28	23.89
3	Not found					
4	772.061	7.55	1.0	7.6	22.93	61.10
4	884.225	2.43	1.0	2.4	21.40	5.30

C,1 - Acceleration vs Time

Ch1 X:200.00 Y:-0.258



g-pk  
C:5.90  
1:5.90

**Save 1 of 6**

3/10/2014  
11:20:18 AM

**Auto Pulses**  
1 of 6  
Pulse # 6

Status: Auto-CL  
**RUNNING**  
Level 0.0dB:100%

Ref g-pk **6.00**  
Con g-pk **+5.90**

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4

SHOCK SETUP ID: 7G1191

SETUP DESCRIPTION: Operational shock z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

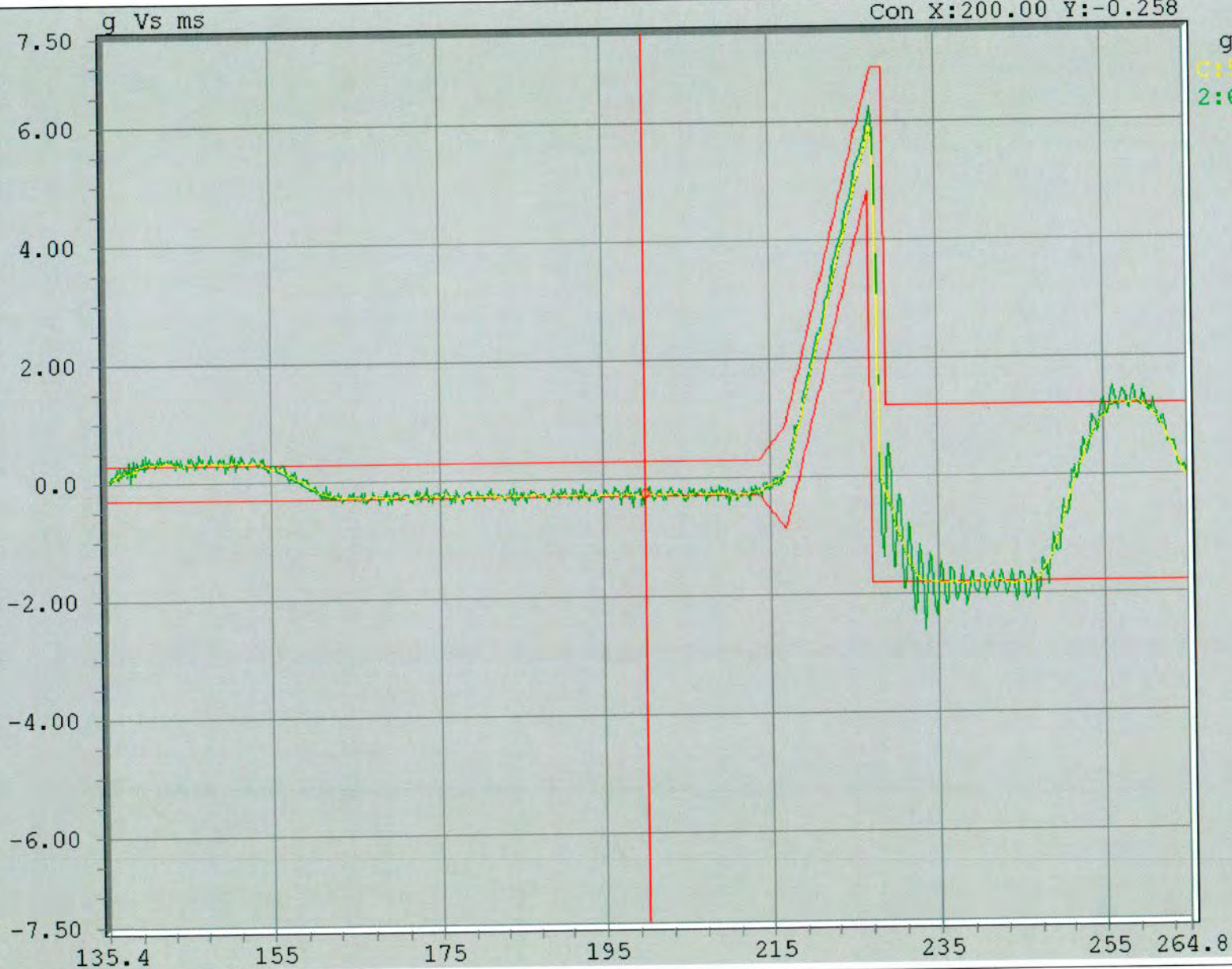
CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C.2 - Acceleration vs Time



Save 1 of 6

3/10/2014  
11:20:18 AM

Auto Pulses

1 of 6

Pulse # 6

Status: Auto-CL

RUNNING

Level 0.0dB:100%

Ref g-pk 6.00

Con g-pk +5.90

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191  
SETUP DESCRIPTION: Operational shock z axis  
RUN NAME: run9  
CH-1: 10.00 mV/g

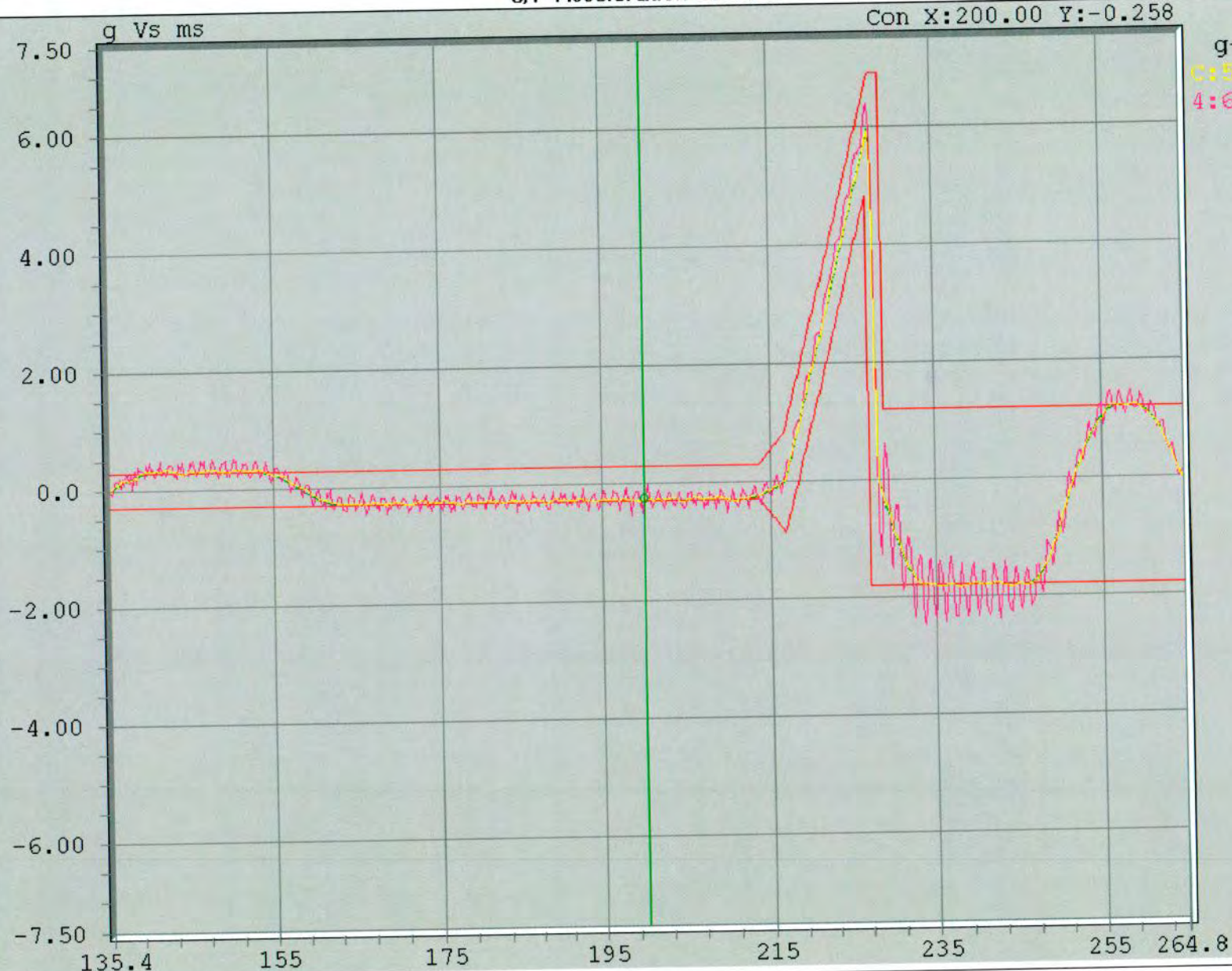
CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC: CH-4: 10.00 mV/g

Vwin II

C,4 - Acceleration vs Time



g-pk  
 C:5.90  
 4:6.38

Save 1 of 6

3/10/2014  
 11:20:18 AM

Auto Pulses

1 of 6

Pulse # 6

Status: Auto-CL

RUNNING

Level 0.0dB:100%

Ref g-pk 6.00

Con g-pk +5.90

Type:SAWTOOTH-TPK  
 Width(ms): 11.00  
 Peak(g): 6.000  
 Rate(Hz):5120  
 Points: 2048  
 Res(Hz):2.50  
 Control : 1  
 AutoSave  
 S:1,2,3,4



SHOCK SETUP ID: 7G1191  
 SETUP DESCRIPTION: Operational shock z axis  
 RUN NAME: run9  
 CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

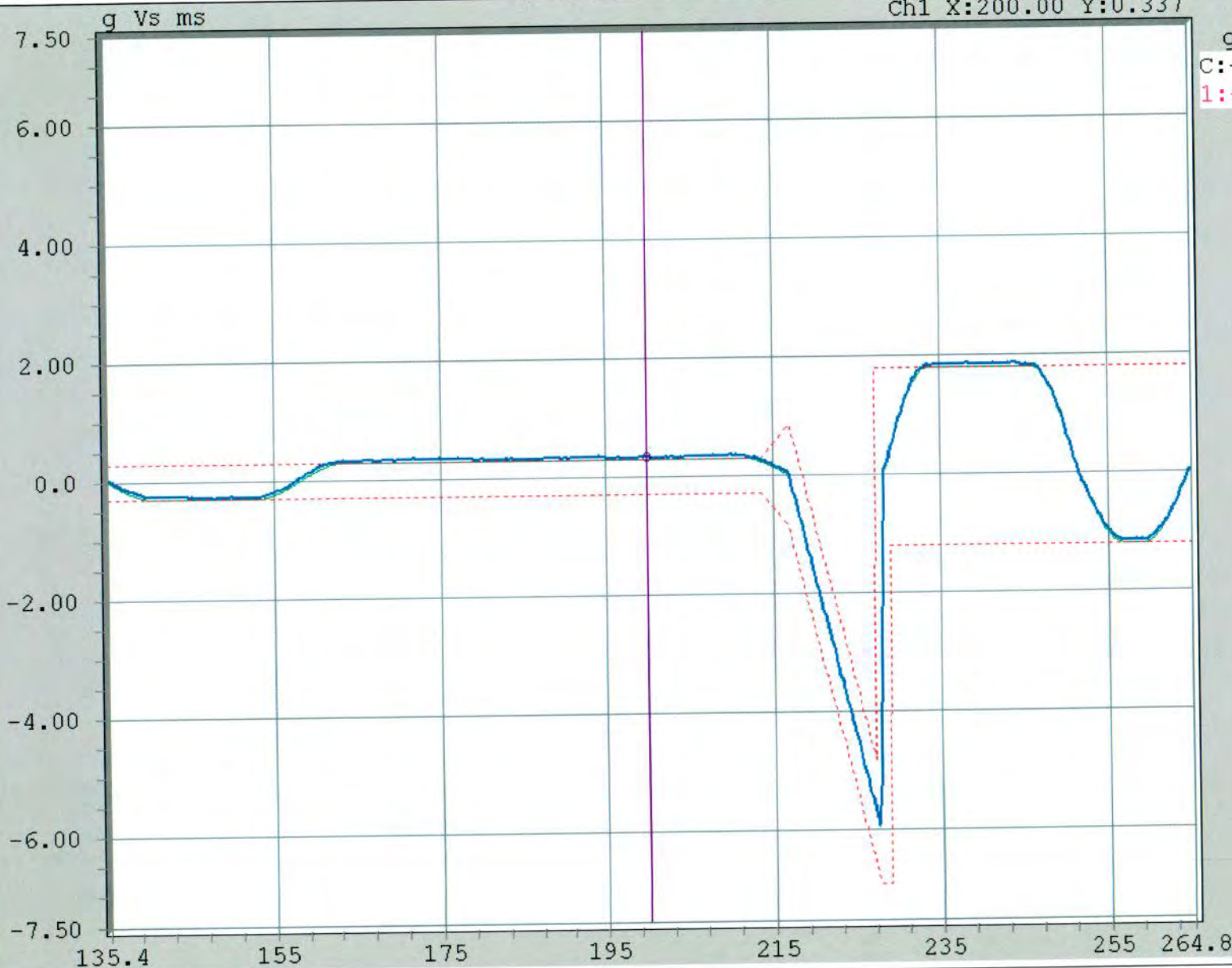
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C,1 - Acceleration vs Time

Ch1 X:200.00 Y:0.337



g-pk  
C: -5.91  
1: -5.91

Save 6 of 6

3/10/2014  
11:20:45 AM

Auto Pulses

6 of 6

Pulse # 11

Status: Auto-CL

FINISHED

Level 0.0dB:100%

Ref g-pk -6.00

Con g-pk -5.91

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191

SETUP DESCRIPTION: Operational shock z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

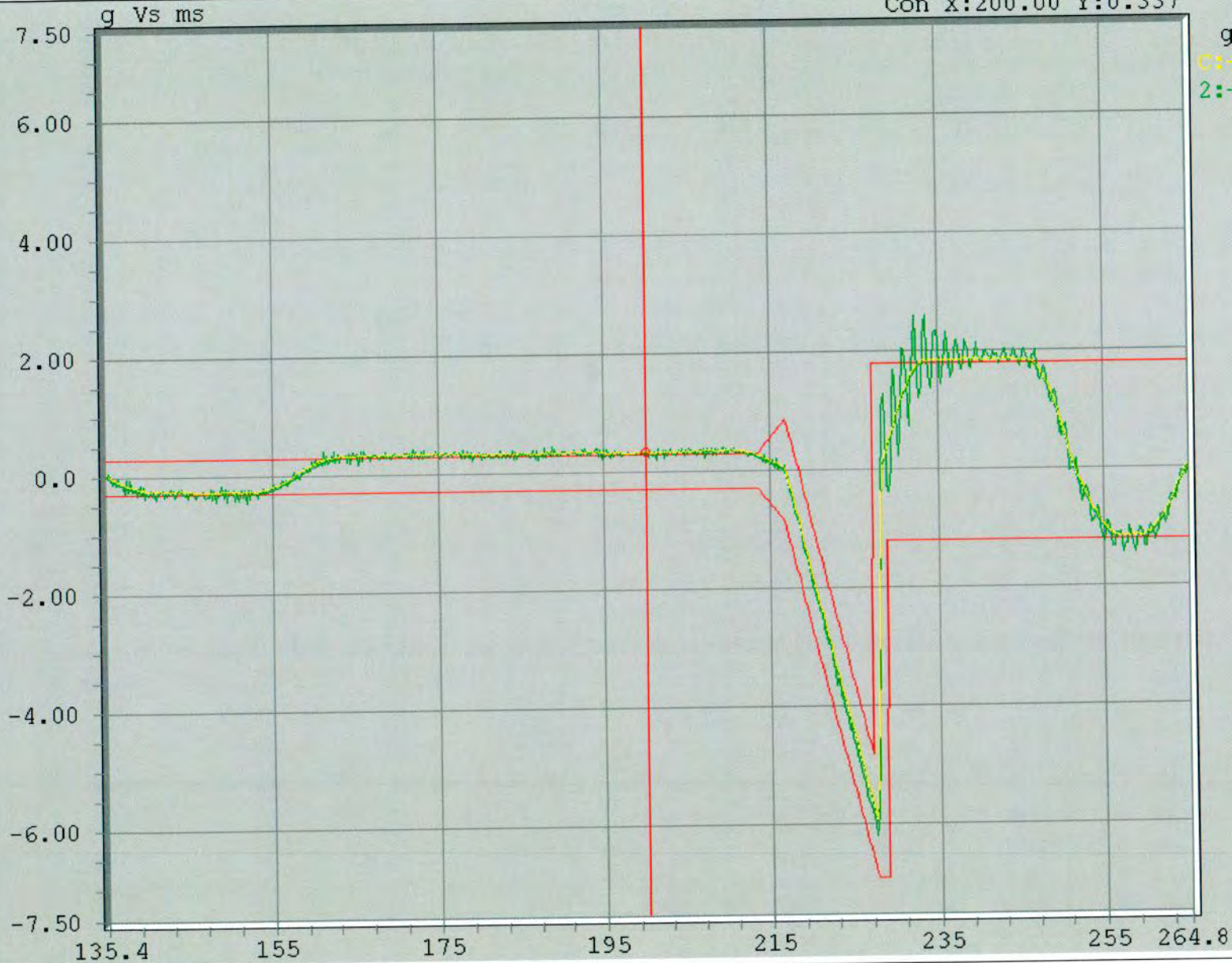
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C,2 - Acceleration vs Time

Con X:200.00 Y:0.337



Save 6 of 6

3/10/2014  
11:20:45 AM

Auto Pulses  
6 of 6

Pulse # 11

Status: Auto-CL  
FINISHED

Level 0.0dB:100%

Ref g-pk -6.00

Con g-pk -5.91

Type:SAWTOOTH-TPk  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191

SETUP DESCRIPTION: Operational shock z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

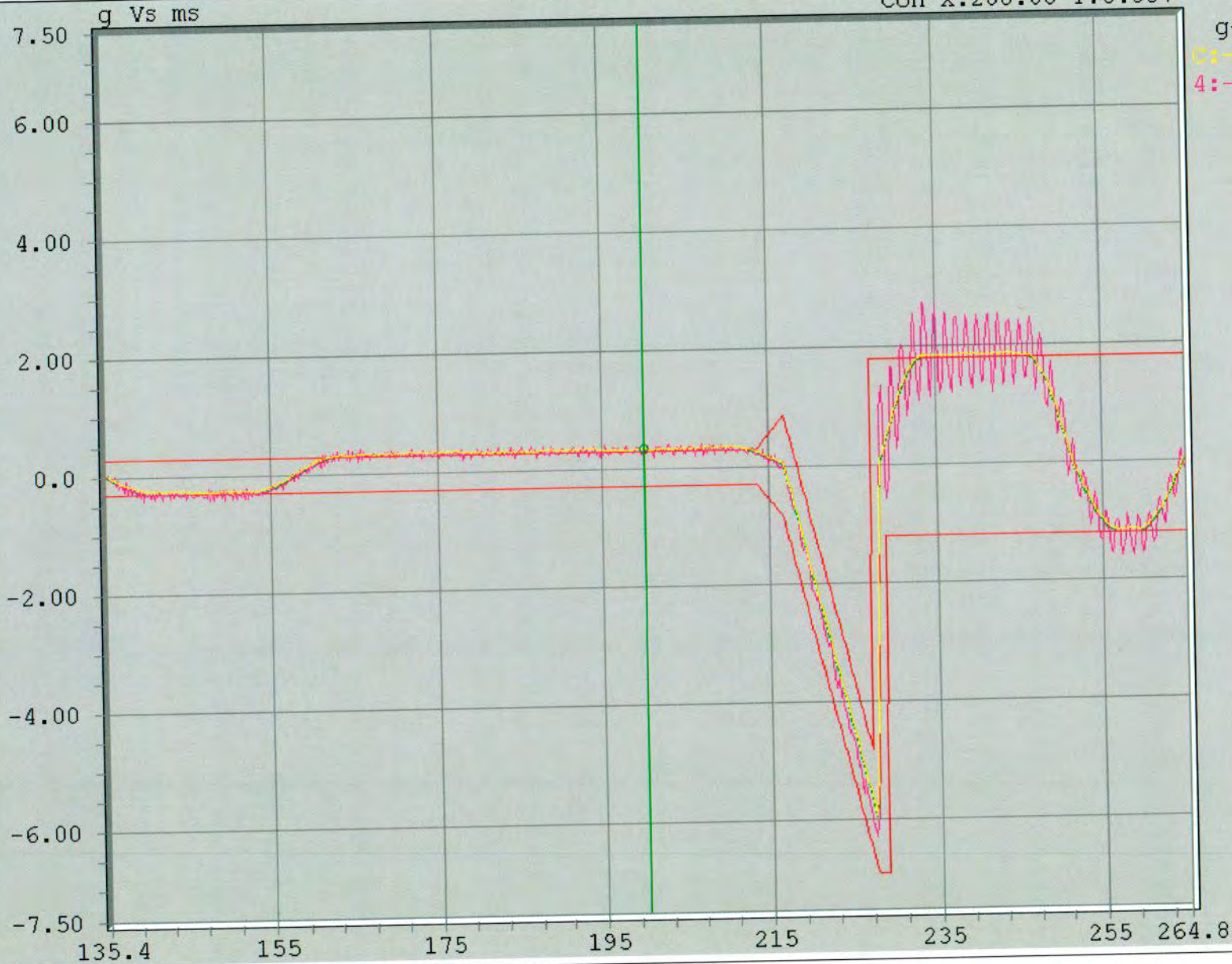
RUN DESC:

CH-4: 10.00 mV/g

Vwin II

C,4 - Acceleration vs Time

Con X:200.00 Y:0.337



g-pk  
3: -5.91  
4: -6.29

Save 6 of 6

3/10/2014  
11:20:45 AM

Auto Pulses

6 of 6

Pulse # 11

Status: Auto-CL

FINISHED

Level 0.0dB:100%

Ref g-pk -6.00

Con g-pk -5.91

Type:SAWTOOTH-TPK  
Width(ms): 11.00  
Peak(g): 6.000  
Rate(Hz):5120  
Points: 2048  
Res(Hz):2.50  
Control : 1  
AutoSave  
S:1,2,3,4



SHOCK SETUP ID: 7G1191

SETUP DESCRIPTION: Operational shock z axis

RUN NAME: run9

CH-1: 10.00 mV/g

CH-2: 10.00 mV/g

CH-3: 10.00 mV/g

RUN DESC:

CH-4: 10.00 mV/g

Vwin II

APPENDIX L ENDURANCE CYCLING TEST SETUP AND DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 204

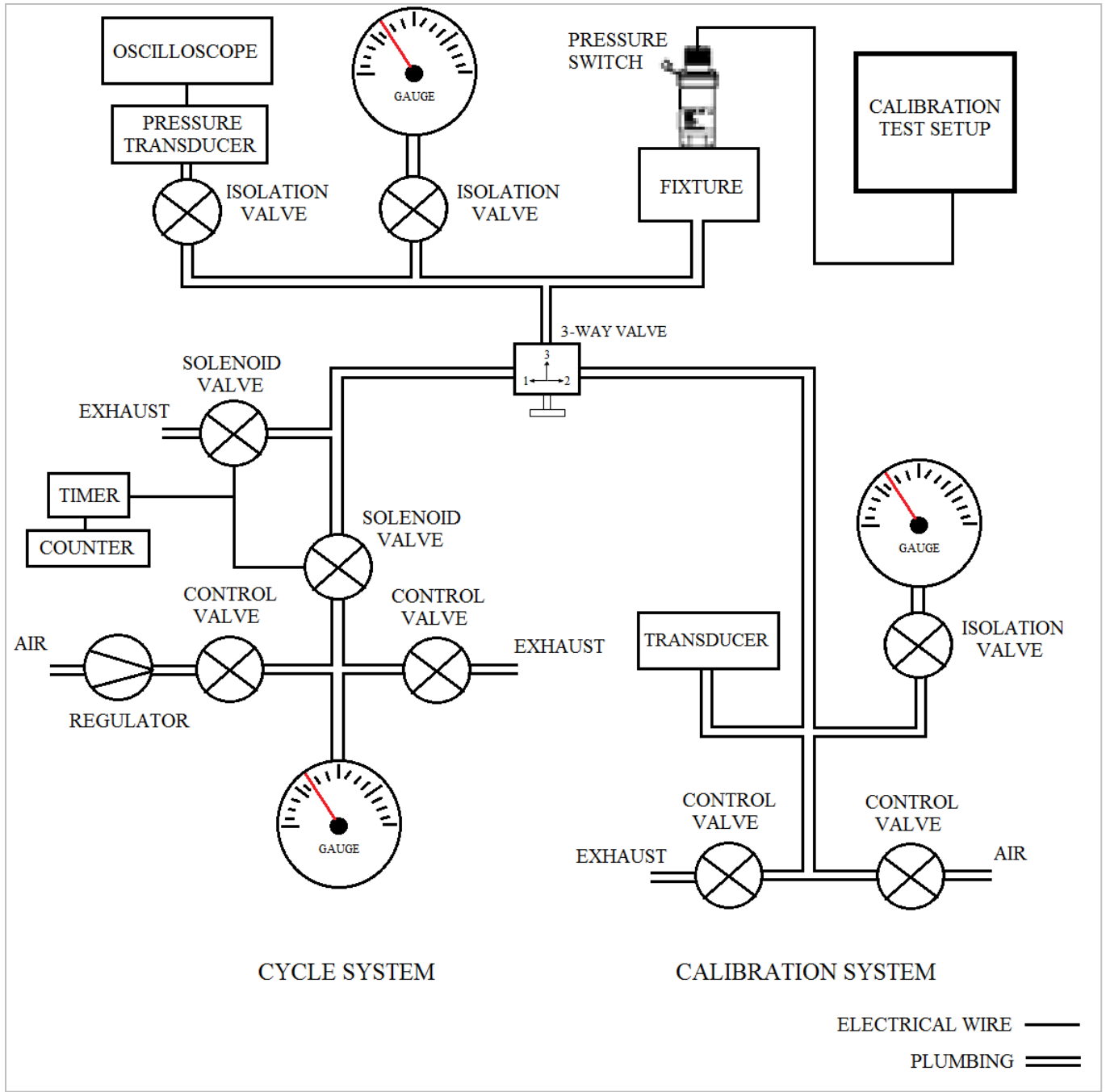
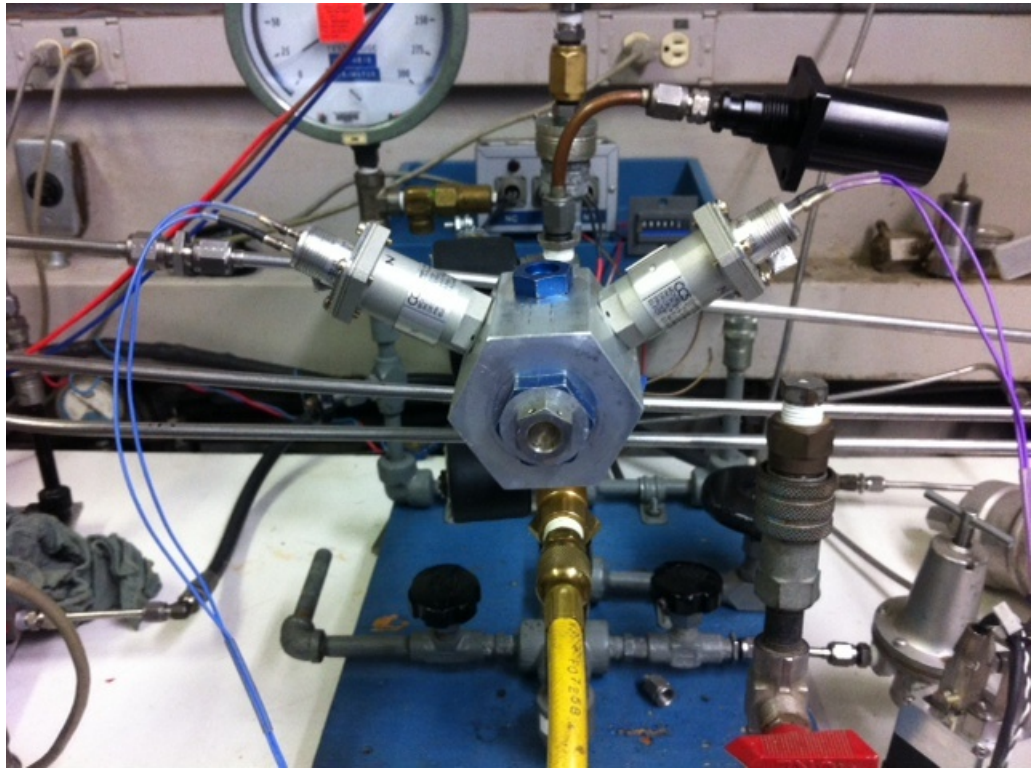


Figure 28: Endurance Cycling Test Setup Diagram

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 205



**Figure 29: Endurance Cycling Test Setup**



**Figure 30: Endurance Cycling Test Setup (Close-Up)**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 206

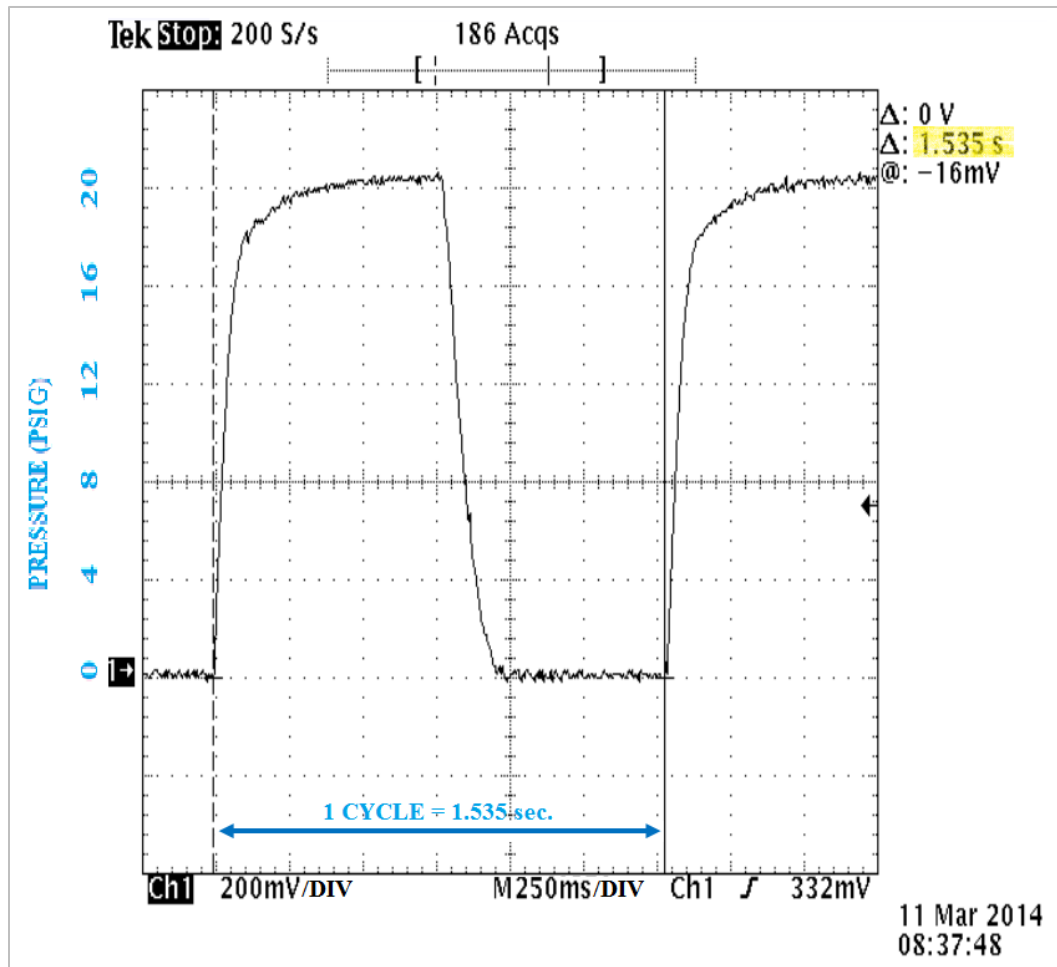


Figure 31: Endurance Cycling Pressure Pulse

Custom Control Sensors, Inc.	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 207



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP/RH			761191 SN007	761191 SN008
3-11-2014	0837	68° 27%			7.31	7.10
					4.54	4.57
	0840	BEGIN 0-20-0 PSI PRESS. CYCLING				
		RECORD PULSE				
	1018	RESET COUNTER TO 0 FROM 3822				
	1254	RECORD PULSE				
	1255	STOP AT 10,000 CYCLES				
	1258	CALIBRATION TEST			7.04	7.15
					4.12	4.37
	1300	RESUME CYCLING, RECORD PULSE				
	1713	RECORD PULSE				
	1715	STOP AT 20,000 CYCLES				
	1716	CALIBRATION TEST				
		76° 21%			6.83	7.17
					4.08	4.13
3-12-2014	0722	71° 21%			7.20	7.23
					4.21	4.24
					7.01	7.26
					4.18	4.23
	0730	RESUME CYCLING				
	0731	RECORD PULSE				

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

### CCS LABORATORY DATA SHEET

SAR/ENG NO:

#### RECORDED TEST DATA:

DATE	TIME	TEMP/RH		761191 SN007	761191 SN008
3-12-2014	1145		STOP AT 30,013 CYCLES, RECORD PULSE		
	1149		CALIBRATION TEST		
		74° 20%		6.81	6.92
				4.10	4.33
	1153		RESUME CYCLING, RECORD PULSE		
	1607		RECORD PRESSURE PULSE		
			STOP AT 40,000 CYCLES		
	1609	77° 21%		7.61	6.94
				4.03	4.28
3-13-2014	0730	71° 35%		6.78	6.95
				4.14	4.32
				6.71	6.93
				4.14	4.32
	0745		RESUME CYCLING		
	0745		RECORD PRESSURE PULSE		
	1208		STOP AT 50,000 CYCLES, RECORDED PULSE PRIOR TO STOP		
	1238	73° 30%	CALIBRATION:	7.77	6.85
				4.06	4.23
	1240		RESUME CYCLING		
	1244		RECORD PRESSURE PULSE		

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP/RH			761191 SN007	761191 SN008
3-13-2014	1701		STOP AT 60,025 CYCLES			
			CALIBRATION TEST			
	1716	77° 27%			8.30	6.83
					4.03	4.24
	1723				8.14	6.81
					4.03	4.26
	1726				8.02	6.79
					4.06	4.26
	1729				8.12	6.77
					4.04	4.26
3-14-2014	0712	72° 32%			7.49	6.87
					4.12	4.29
					7.63	6.79
					4.12	4.29
	0733		RESUME CYCLING, RECORDED PULSE			
	0942		STOP AT 65,000 CYCLES			
	0952	73° 32%			7.77	6.77
					4.04	4.19
					7.77	6.77
					4.05	4.20
	0958		RESUME CYCLING, RECORDED PULSE			

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP/RH			761191 SN007	761191 SN008
3-14-2014	1206		RECORD PRESSURE PULSE			
	1207		STOP AT 70,000 CYCLES			
	1223	74° 31%			7.96	6.79
					4.06	4.21
					7.83	6.72
					4.05	4.22
	1248		RESUME CYCLING, RECORD PULSE			
	1458		STOP AT 75,000 CYCLES, RECORD LAST PULSE			
	1500	77° 30%			8.20	6.73
					4.08	4.18
	1502		RESUME CYCLING, RECORD PULSE			
	1605		RECORD PULSE			
	1606		STOP AT 77,500 CYCLES			
	1607	77° 29%			8.27	6.70
					4.07	4.17
3-17-2014	0730	72° 25%			7.65	6.87
					4.18	4.28
					7.75	6.82
					4.18	4.27
					7.74	6.81
					4.18	4.27

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP/RH		761191 SN007	761191 SN008
3-17-2014	0745	72° 25%	RESUME CYCLING		
	0746		RECORD PULSE		
	0855		STOP AT 80,183 CYCLES		
	0858	71° 24%		8.12	6.74
				4.12	4.21
	0900		RESUME CYCLING		
	1000		STOP AT 82,500 CYCLES		
	1001	73° 24%		8.05	6.87
				4.12	4.21
	1003		RESUME CYCLING		
	1119		STOP AT 85,419 CYCLES		
	1120	75° 25%		8.27	6.71
				4.13	4.19
	1122		RESUME CYCLING		
	1215		STOP AT 87,500 CYCLES		
	1216	76° 24%		8.32	6.67
				4.13	4.20
	1217		RESUME CYCLING		
	1321		STOP AT 94,000 CYCLES		
	1322	77° 23%		8.34	6.79
				4.14	4.19

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP/RH		761191 SN007	761191 SN008
3-17-2014	1324		RESUME CYCLING, RECORD PULSE		
	1532		RECORD PULSE		
	1533		STOP AT 95,000 CYCLES		
	1534	79° 22%		9.84	6.68
				4.18	4.17
				9.80	6.67
				4.18	4.19
3-18-2014	0716	73° 33%		9.04	6.77
				4.23	4.23
				9.36	6.72
				4.21	4.22
	0721		RESUME CYCLING, RECORD PULSE		
	0927		RECORD PULSE		
	0931		STOP AT 100,000 CYCLES		
	0934	75° 33%		9.81	6.78
				4.18	4.16
				9.63	6.73
				4.18	4.16
	1018	74° 34%	DIELECTRIC @	.04mA	.04mA
			INSULATION @	>550M	>550M

Test Performed by:

*[Signature]*

DATE: 3-18-2014

APPENDIX M SALT FOG, DUST, SAND, AND POST QUALIFICATION ATP TEST DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 214



**Figure 32: Post Salt Fog Test**



**Figure 33: Post Sand Test**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 215



**Figure 34: Post Sand Test (Alternate View)**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 216



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP	RH	DIELECTRIC	INSULATION	SN 006
3-20-2014	0820	73.6°	25%	.03mA	>550M	6.49
POST SALT						4.56
						6.46
						4.57
3-21-2014	1440	77°	36%	.04mA	>550M	6.42
POST DUST						5.00
3-27-2014	1051	75°	30%	.04mA	>550M	6.53
POST SAND						4.98
A.T.P.	1105	74°	30%			
			PROOF	DIELECTRIC	INSULATION	FUNCT.
			180	.04mA	>550M	6.41
						4.91

Test Performed by:

*[Handwritten Signature]*

DATE: 3-27-2014

APPENDIX N ALTITUDE TEST SETUP AND DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 218

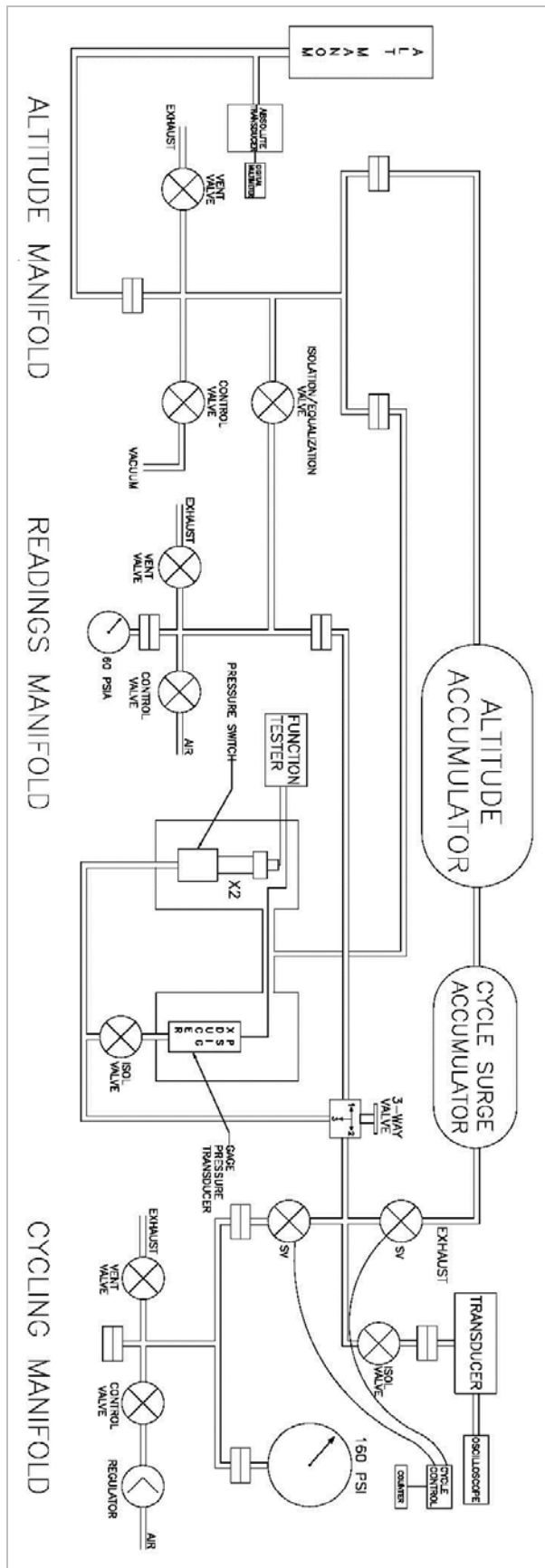


Figure 35: Altitude Test Setup Diagram

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 219



**Figure 36: Altitude Test Setup**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 220

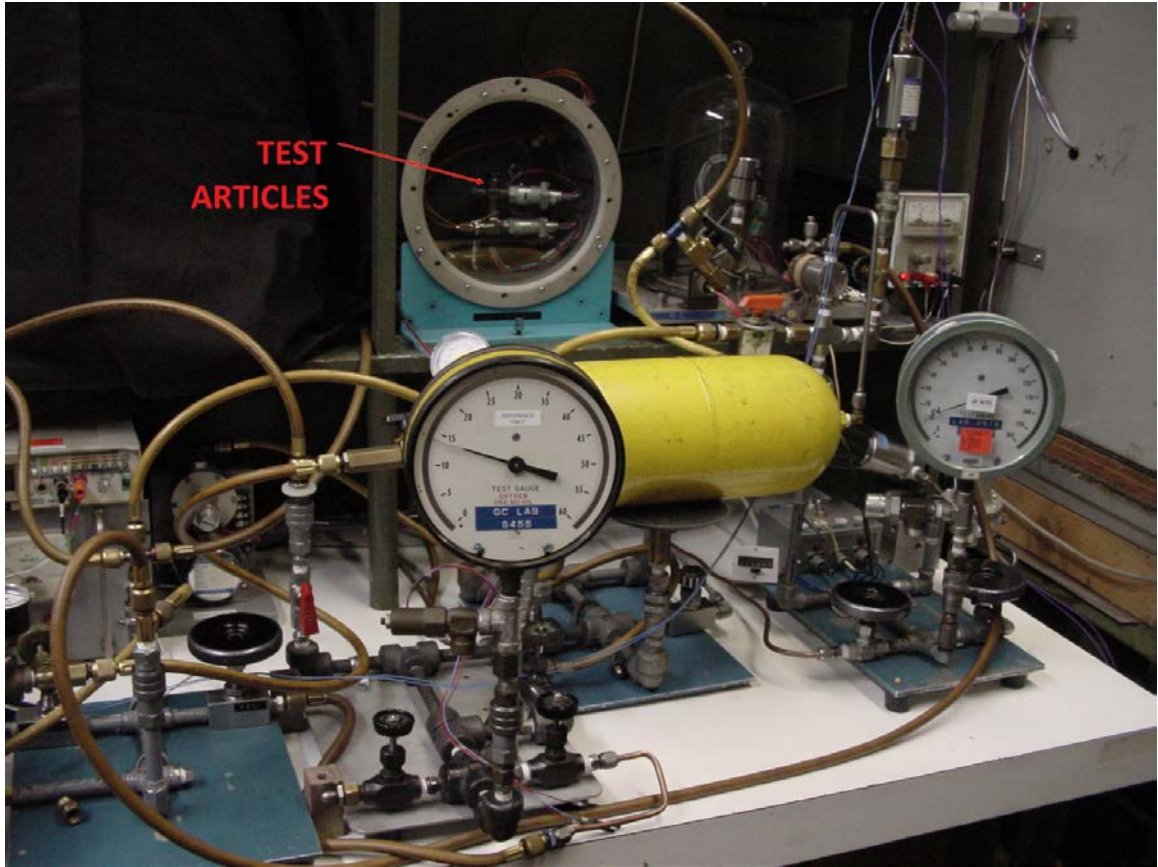


Figure 37: Altitude Test Setup (Close-Up)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 221



CustomControlSensors Inc.

CCS LABORATORY DATA SHEET

SAR/ENG NO:

RECORDED TEST DATA:

DATE	TIME	TEMP	ALT		SN007	SN008
3-20-2014	1300	76°	14.18		9.21	6.96
					4.20	4.13
					9.01	6.91
					4.20	4.12
			6.75		7.59	6.96
					4.21	4.14
					9.30	6.99
					4.20	4.13
					8.95	6.94
					4.20	4.14
	1327	BEGIN CYCLING, RECORD PULSE				
	1342	STOP AT 379 CYCLES				
	1348	77°			10.45	6.91
					4.13	4.10
	1349	RESUME CYCLING, RECORD PULSE				
	1404	STOP AT 748 CYCLES				
	1410	77°			9.86	6.89
					4.14	4.11

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

SAR/ENG NO:

CCS LABORATORY DATA SHEET

RECORDED TEST DATA:

DATE	TIME	TEMP	ALT	761191 SN007	761191 SN008
3-20-2014	1414	RESUME CYCLING, RECORD PULSE			
	1429	STOP AT 1115 CYCLES			
	1436	78°	6.75	10.15	6.87
				4.15	4.14
	1440	RESUME CYCLING, RECORD PULSE			
	1455	STOP AT 1486 CYCLES			
	1458	78°		10.33	6.86
				4.19	4.14
	1503	RESUME CYCLING, RECORD PULSE			
	1518	STOP AT 1851 CYCLES			
	1520	78°		9.85	6.82
				4.19	4.17
	1525	RESUME CYCLING, RECORD PULSE			
	1540	STOP AT 2222 CYCLES			
	1542	78°		10.22	6.76
				4.18	4.15
	1545	RESUME CYCLING, RECORD PULSE			
	1600	STOP AT 2589 CYCLES			
	1605	78°		10.03	6.77
				4.23	4.18

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_



CustomControlSensors Inc.

SAR/ENG NO:

CCS LABORATORY DATA SHEET

RECORDED TEST DATA:

DATE	TIME	TEMP	ALT	761191 SN007	761191 SN008
3-20-2014	1610	RESUME CYCLING,	RECORD PULSE		
	1625	STOP AT 2957 CYCLES			
	1628	79°		8.12	6.75
				4.22	4.17
				8.12	6.79
				4.23	4.18
	1634	DECREASE ALTITUDE TO ROOM	AMBIENT PRESSURE		
	1638	78°	14,15'	*9.84	6.75
				4.21	4.12
				*10.35	6.74
				4.22	4.12
				*10.20	6.73
				4.23	4.13
		* N.C. INDICATOR LIGHT DIMS AND FLICKERS PRIOR TO SWITCH ACTIVATION			
	1700	DIELECTRIC INSULATION		.05mA	.05mA
				>550M	>550M <sub>Ω</sub>

Test Performed by:

*[Signature]*

DATE:

3-20-2014

APPENDIX O EXPLOSION PROOFNESS TEST SETUP AND DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 225

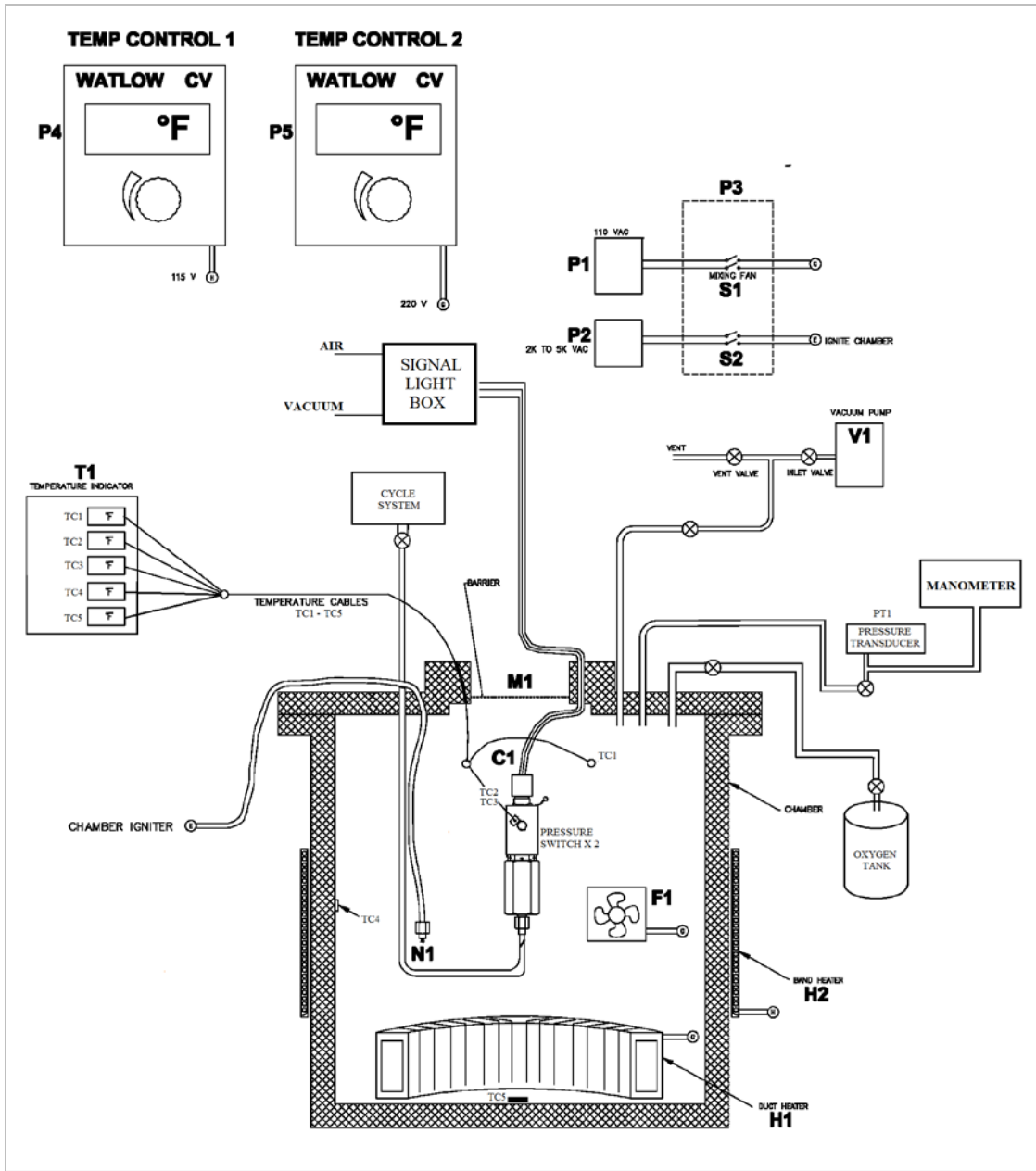
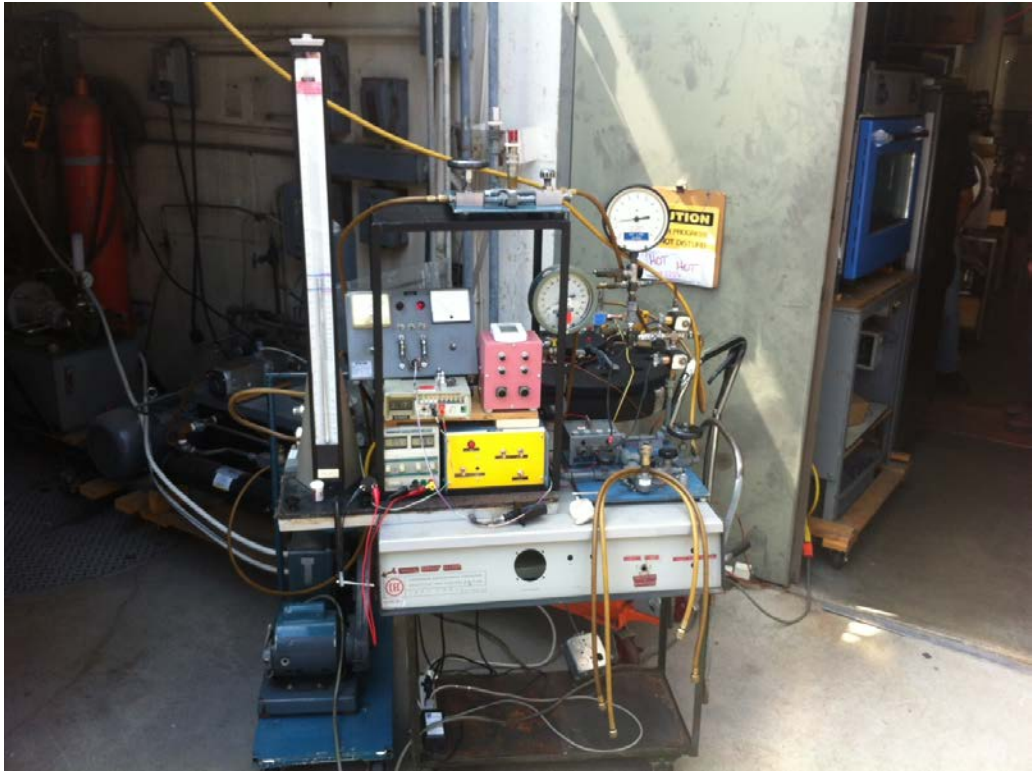


Figure 38: Explosion Proofness Test Setup Diagram

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 226

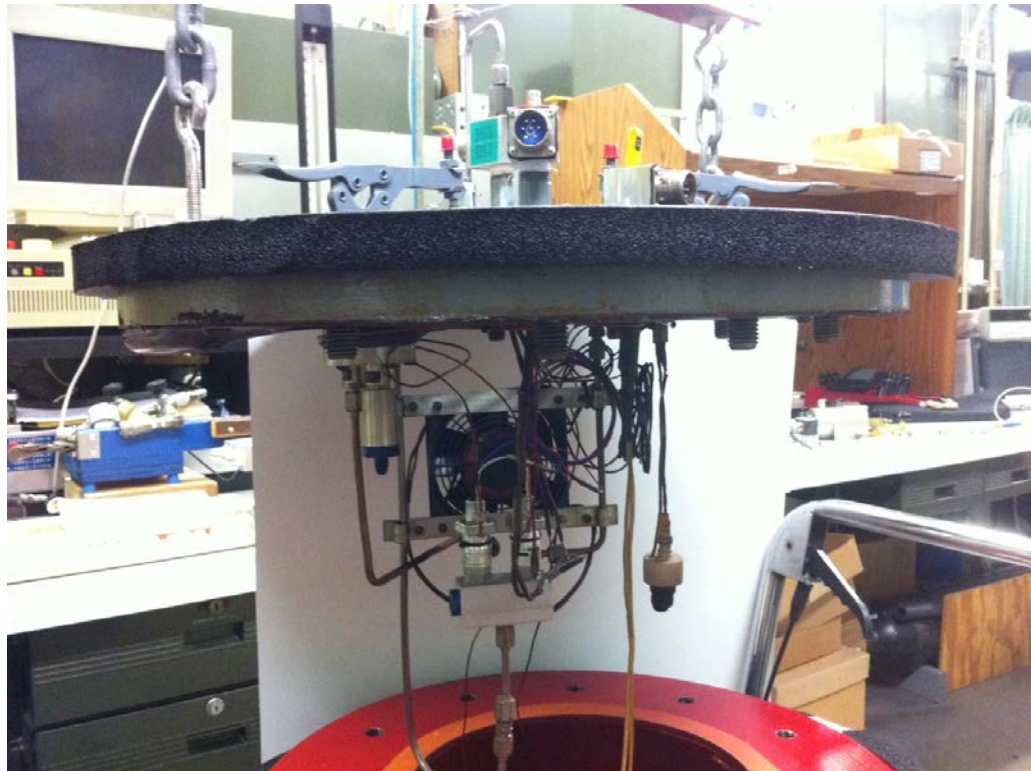


**Figure 39: Explosion Proofness Test Setup**



**Figure 40: Explosion Proofness - Test Chamber**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 227



**Figure 41: Explosion Proofness - Inside of Test Chamber**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 228



CustomControlSensors Inc.

SAR/ENG NO:

CCS LABORATORY DATA SHEET

RECORDED TEST DATA:

	PSIA	TEMP AIR	TEMP SWITCH			
EXPLOSION:						
TEST ALTITUDE						
20,000 FT	6.70	235°	228°			
	2.65ml HEXANE ALLOWED TO MIX FOR 10 MINUTES.					
	PRESSURE CYCLED SWITCHES FROM APPX. 20,000 FT VACUUM TO 20 PSIG AT A RATE OF APPX 13 CYCLES PER MINUTE FOR 10 MINUTES. SWITCH LOAD 28V. SA EACH. NO EXPLOSION OCCURED.					
	ATTEMPTED TO IGNITE CHAMBER, FOUND NOT TO BE EXPLOSIVE.					
	PURGED CHAMBER AT LOCAL AMBIENT PRESSURE FOR RE-TEST.					
920 FT	14.20	229°	232°			
	5.70ml HEXANE ALLOWED TO MIX FOR 10 MINUTES.					
	PRESSURE CYCLED SWITCHES FROM 0 PSIG TO 20 PSIG FOR 10 MINUTES. NO EXPLOSION OCCURED.					
	IGNITED CHAMBER.					

Test Performed by: \_\_\_\_\_ DATE: \_\_\_\_\_





APPENDIX P POST QUALIFICATION ATP (S/N 007 AND 008)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 232



APPENDIX Q CRASH SAFETY (IMPULSE AND SUSTAINED) TEST SETUP AND DATA SHEET(S)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
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**Figure 42: Sustained Crash Safety (Cantilever)**



**Figure 43: Sustained Crash Safety (Vertical)**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 235



**Figure 44: Sustained Crash Safety (Inverted)**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
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CustomControlSensors Inc.

### CCS LABORATORY DATA SHEET

SAR/ENG NO:

#### RECORDED TEST DATA:

DATE	TIME	TEMP/RH			76191 SN008
3-26-2014	1424	80° 32%	RUN 20g/11ms	SHOCK PULSES	
CRASH SAFETY (IMPULSE)			OF Y-AXIS (VERTICAL)		
			3 POS., 3 NEG.		
	1442	79° 32%	RUN 20g/11ms	SHOCK PULSES	
			OF Z-AXIS (HORIZONTAL)		
			3 POS., 3 NEG.		
	1515	80° 32%	RUN 20g/11ms	SHOCK PULSES	
			OF X-AXIS (HORIZONTAL)		
			3 POS., 3 NEG.		
CRASH SAFETY (SUSTAINED)	1550	78° 29%	Z-AXIS (POS.)		1 MIN 9 SEC
	1554		Z-AXIS (NEG.)		1 MIN 9 SEC
Z & X: 500Z WT.	1558		X-AXIS (POS.)		1 MIN 9 SEC
	1602		X-AXIS (NEG.)		1 MIN 9 SEC
Y: 520Z WT.	1609		Y-AXIS (POS.)		1 MIN 9 SEC
	1616		Y-AXIS (NEG.)		1 MIN 9 SEC
NO DEFORMITIES RESULTED					

Test Performed by:

DATE: 3-26-2014

APPENDIX R HUMIDITY, SALT FOG, DUST, AND SAND TEST REPORT (FROM OUTSIDE LAB)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 238

April 3, 2014

Report No. 35522-0221693 Rev. A

Custom Control Sensors  
2111 Plummer Street  
Chatsworth, CA 91311

Attention: Matthew Haroutunian

Reference: (1) Custom Control, Purchase Order No.P000007280  
(2) Environment Associates Shipper NO. 43143  
(3) Specification No. MIL-STD-810G, Method 501.5  
QTP-7G1191 Rev. H Paragraph 5.15, 5.16, 5.17



**ENVIRONMENT  
ASSOCIATES, Inc.**

9604 Variel Avenue  
Chatsworth, CA 91311

Phone: (818) 709-0568

Fax: (818) 709-8914

[www.eatest.com](http://www.eatest.com)

### CERTIFICATION

Environment Associates, Inc hereby certifies that One (1) Pressure Switch P/N 7G1191, S/N 006 was subjected to Humidity, Salt Fog, Dust and Sand testing with the above references as evidenced by and reported in the accompanying data.

The original of this report is on file at Environment Associates, Inc. under the above referenced job number for review by authorized persons. The results of the testing reported herein relate only to the actual items tested.

Respectfully submitted,

ENVIRONMENT ASSOCIATES, INC.

George Frie,  
Laboratory Manager

GF/dl

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maintains laboratory accreditation to ISO/IEC 17025 and ISO 9001

**TEST DATA**

DATE STARTED <b>2-27-14</b>	CUSTOMER <b>CUSTOM CONTROL SENSORS</b>	TECHNICIAN (SIGNATURE)
DATE COMPLETED <b>3-10-14</b>	SPECIMEN DESCRIPTION <b>PRESSURE SWITCH</b>	ENGINEER (SIGNATURE) <i>Martin R. Batten</i>
TEMPERATURE (LAB) <b>+24 °C</b>	TYPE OF TEST <b>HUMIDITY</b>	ENGINEER <i>George Eric</i>
HUMIDITY (LAB) <b>43 %</b>	TEST SPECIFICATION <b>MIL-STD-810G, METHOD 501.5, PROC. II</b>	JOB NUMBER <b>35522-0221693</b>
SPECIMEN NUMBER <b>P/N 761191 S/N's 006 QTP-761191 REV.H PARA. 5.16</b>		PHOTO TAKEN BY <b>M. BAXTER</b>

**MRB 1000** SAMPLE PLACED INTO THE CHAMBER WITH CABLE AND AIR LINE ATTACHED, BASELINE TEST COMPLETED BY THE CUSTOMER, PHOTOGRAPH TAKEN, CHAMBER CLOSED, BEGINNING 24 HOURS OF CONDITIONING AT +23°C AND 50% RELATIVE HUMIDITY.

**2-28**

**0801** CHAMBER OK, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70°C.

**PM 1250** CHAMBER OPERATION OK AT +60°C / 95% R.H., OVERTE MP2 VERIFIED AT +70°C.

**3/1**

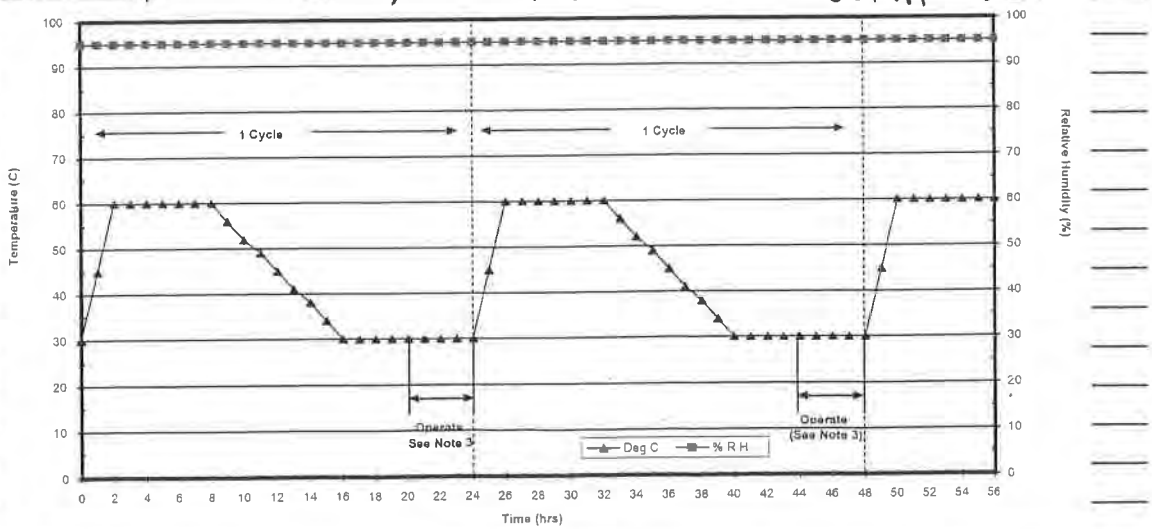
**0745** CYCLING PROPERLY AT +29.5°C / 95% HUMIDITY  
CHART CHANGED, TEMP PROTECTION AT +70°C

**3-02**

**MRB 0757** CYCLING OK, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70°C.

**3-03**

**0757** CYCLING OK, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70°C.

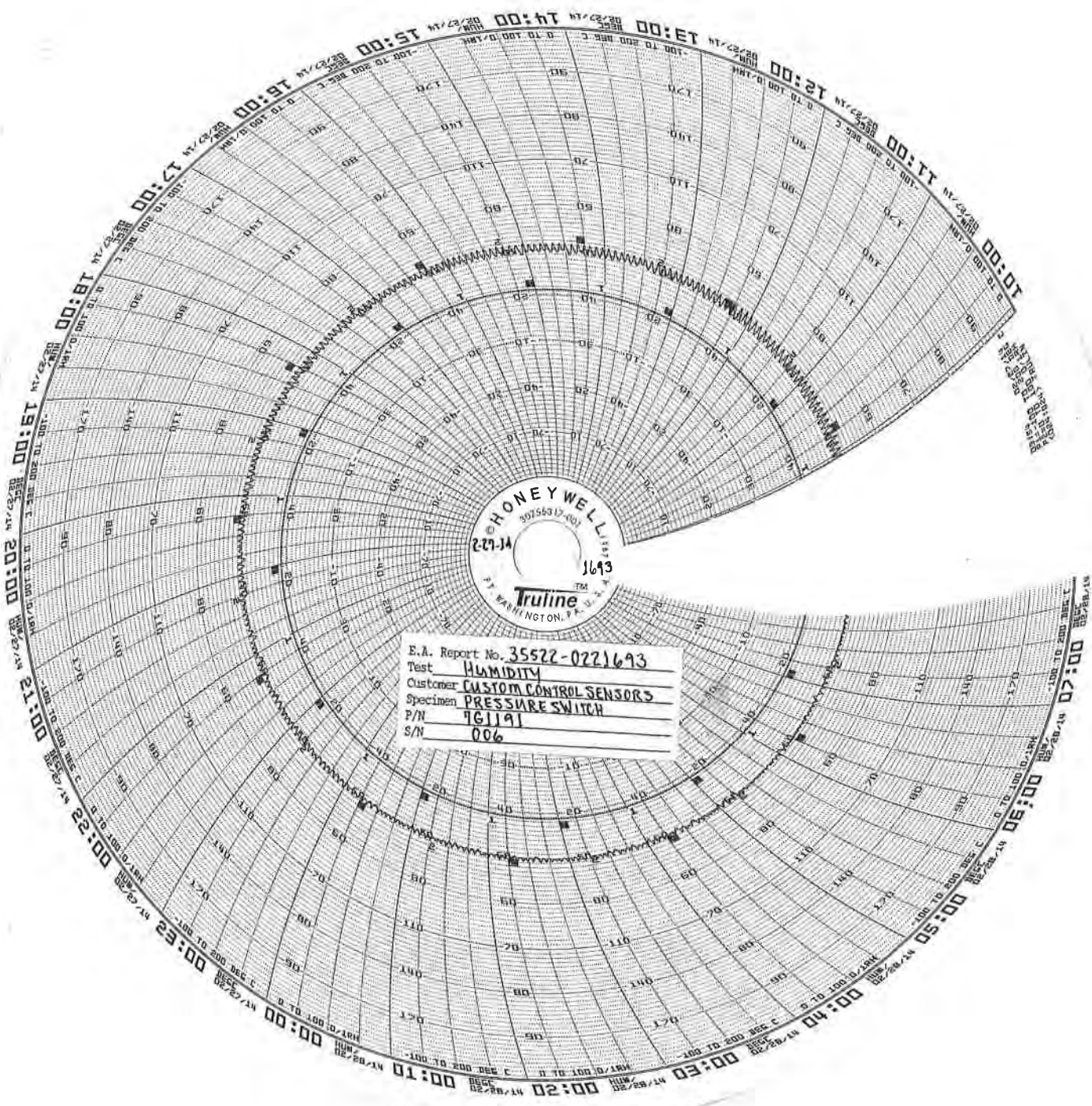


**TEST DATA**

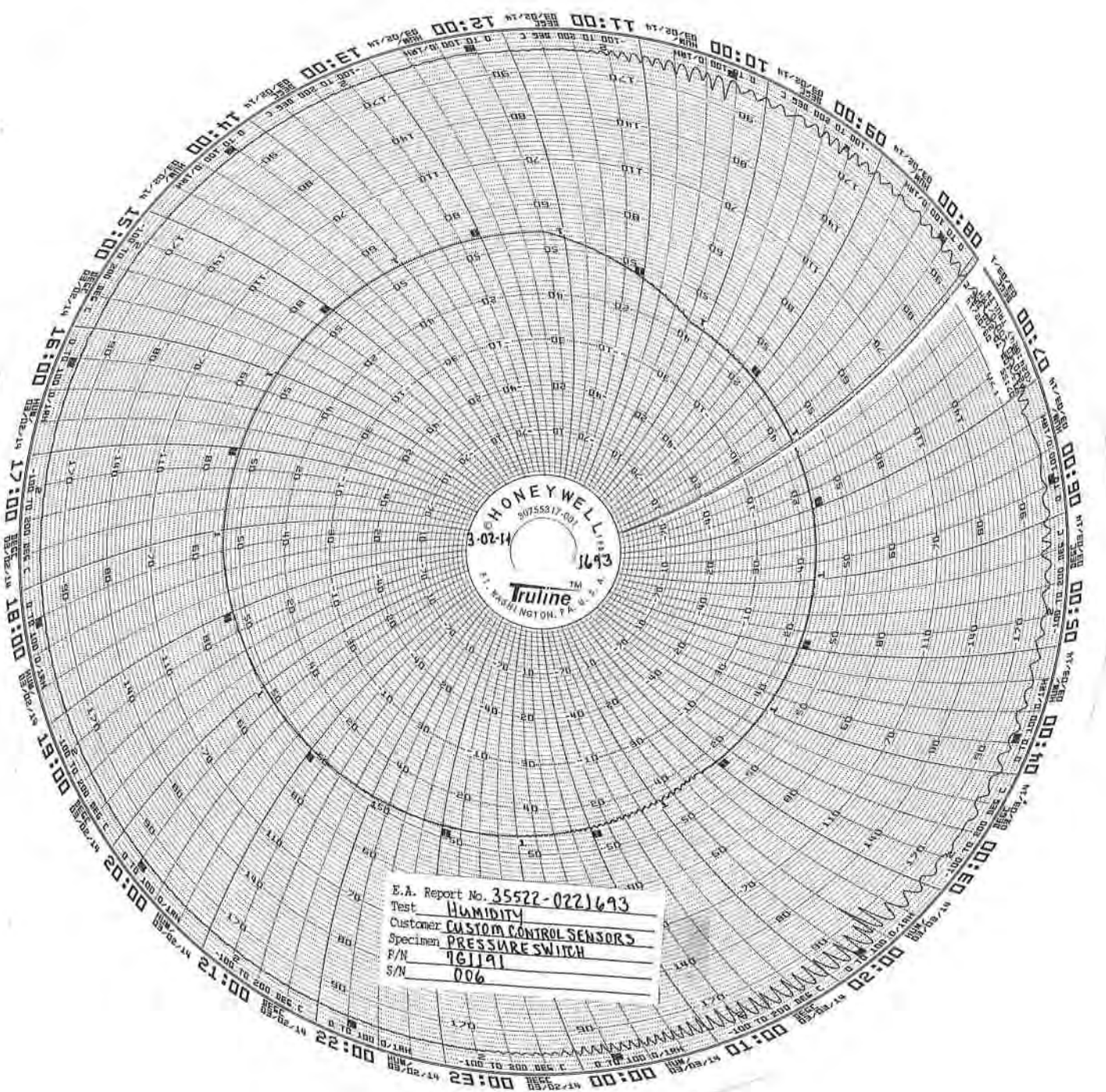
DATE STARTED <b>2-27-14</b>	CUSTOMER <b>CUSTOM CONTROL SENSORS</b>	TECHNICIAN (SIGNATURE)
DATE COMPLETED <b>3-10-14</b>	SPECIMEN DESCRIPTION <b>PRESSURE SWITCH</b>	ENGINEER (SIGNATURE) <i>Martin R. Batten</i>
TEMPERATURE (LAB) <b>+21 °C</b>	TYPE OF TEST <b>HUMIDITY</b>	ENGINEER <i>George Frie</i>
HUMIDITY (LAB) <b>34 %</b>	TEST SPECIFICATION <b>MIL-STD-810G, METHOD 507.5, PROC. II</b>	JOB NUMBER <b>35522-0221693</b>
SPECIMEN NUMBER <b>P/N 7G1191 S/N 006</b>	PARAGRAPH NO. <b>QTP-7G1191 REV. H PARA 5.16</b>	

PHOTO TAKEN BY

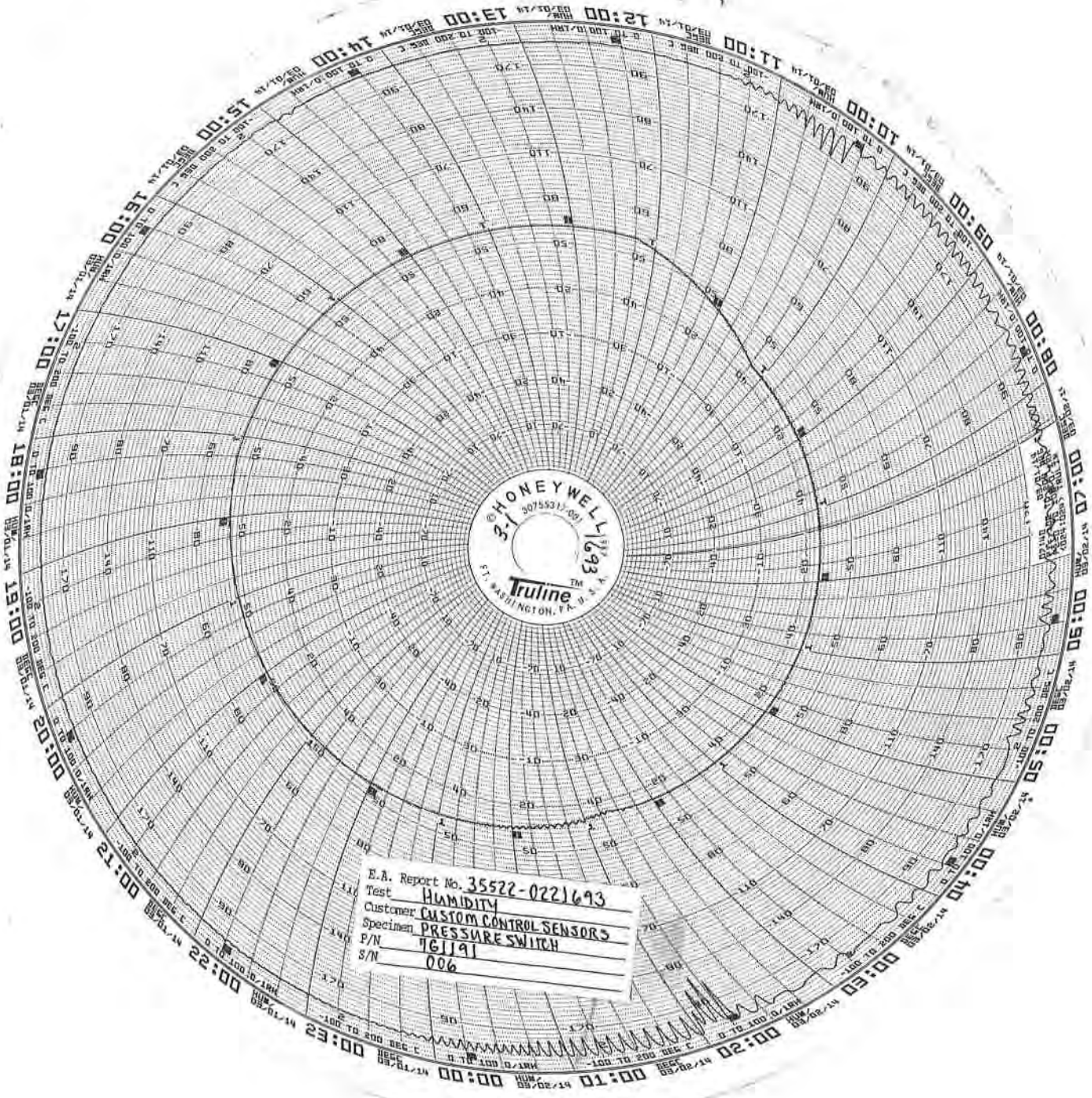
<b>3-04</b>	
<b>0758</b>	<b>CYCLING OK, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70 °C.</b>
<b>1015</b>	<b>CONTROLLER PUT ON HOLD PER CUSTOMER REQUEST.</b>
<i>PM 1236</i>	<i>CHAMBER MAINTAINING +30 °C / 95% R.H.</i>
<b>1258</b>	<b>CUSTOMER AND BELL HELICOPTER REPRESENTATIVES ON SITE FOR FUNCTIONAL TESTING.</b>
<b>1309</b>	<b>TESTING COMPLETED, SAMPLE OPERATION OK, RESUMING CYCLING.</b>
<b>3-05</b>	
<b>0806</b>	<b>CYCLING OK, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70 °C.</b>
<b>3-06</b>	
<b>0801</b>	<b>CHAMBER COMPLETING CYCLE 6, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70 °C.</b>
<b>3-07</b>	
<b>0800</b>	<b>CHAMBER CYCLING OK, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70 °C.</b>
<b>3-08</b>	
<b>0800</b>	<b>CYCLING OK, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70 °C.</b>
<b>3-09</b>	
<i>REF 0837</i>	<i>DAYLIGHT SAVINGS TIME, CLOCKS MOVED FORWARD 1 HOUR. CHANGED CHART. CHAMBER CYCLING PROPERLY. TEMPERATURE PROTECTION SET AT +70 °C. CYCLING CONTINUES.</i>
<b>3-10</b>	
<i>MRB 0730</i>	<i>CHAMBER COMPLETING THE FINAL CYCLE, CHANGED CHART, TEMPERATURE PROTECTION SET AT +70 °C.</i>
<i>1409 1309</i>	<i>CHAMBER PUT ON HOLD, AWAITING CUSTOMER ARRIVAL ON SITE.</i>
<b>1417</b>	<b>CUSTOMER ON SITE FOR FUNCTIONAL TESTING.</b>
<b>1434</b>	<b>TESTING SUCCESSFULLY COMPLETED, RETURNING THE CHAMBER TO +23 °C &amp; 50% RH.</b>



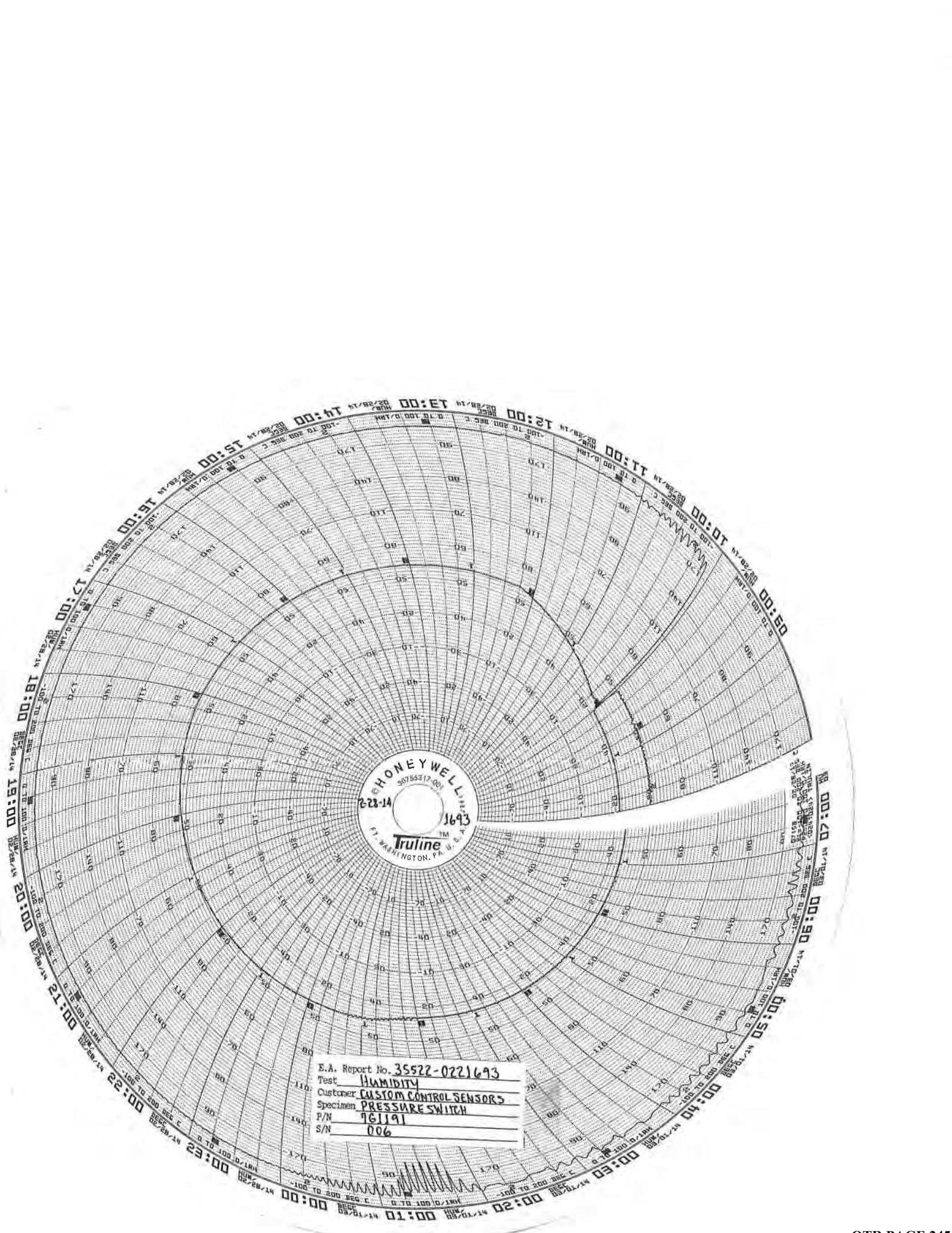
E.A. Report No. 35522-0221693  
 Test HUMIDITY  
 Customer CUSTOM CONTROL SENSORS  
 Specimen PRESSURE SWITCH  
 P/N 761191  
 S/N 006



E.A. Report No. 35522-0221693  
 Test HUMIDITY  
 Customer CUSTOM CONTROL SENSORS  
 Specimen PRESSURE SWITCH  
 F/N 761191  
 S/N 006

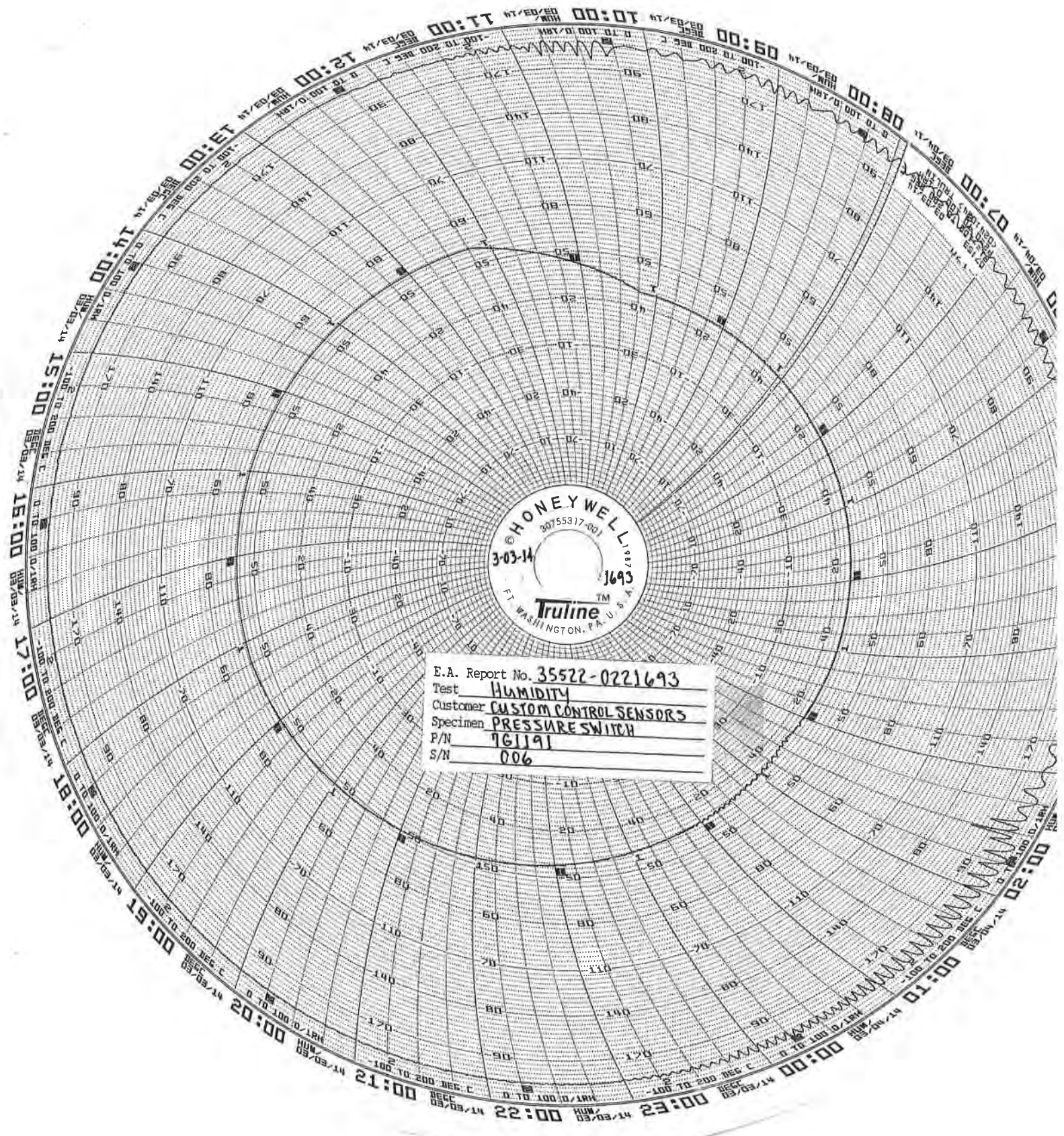


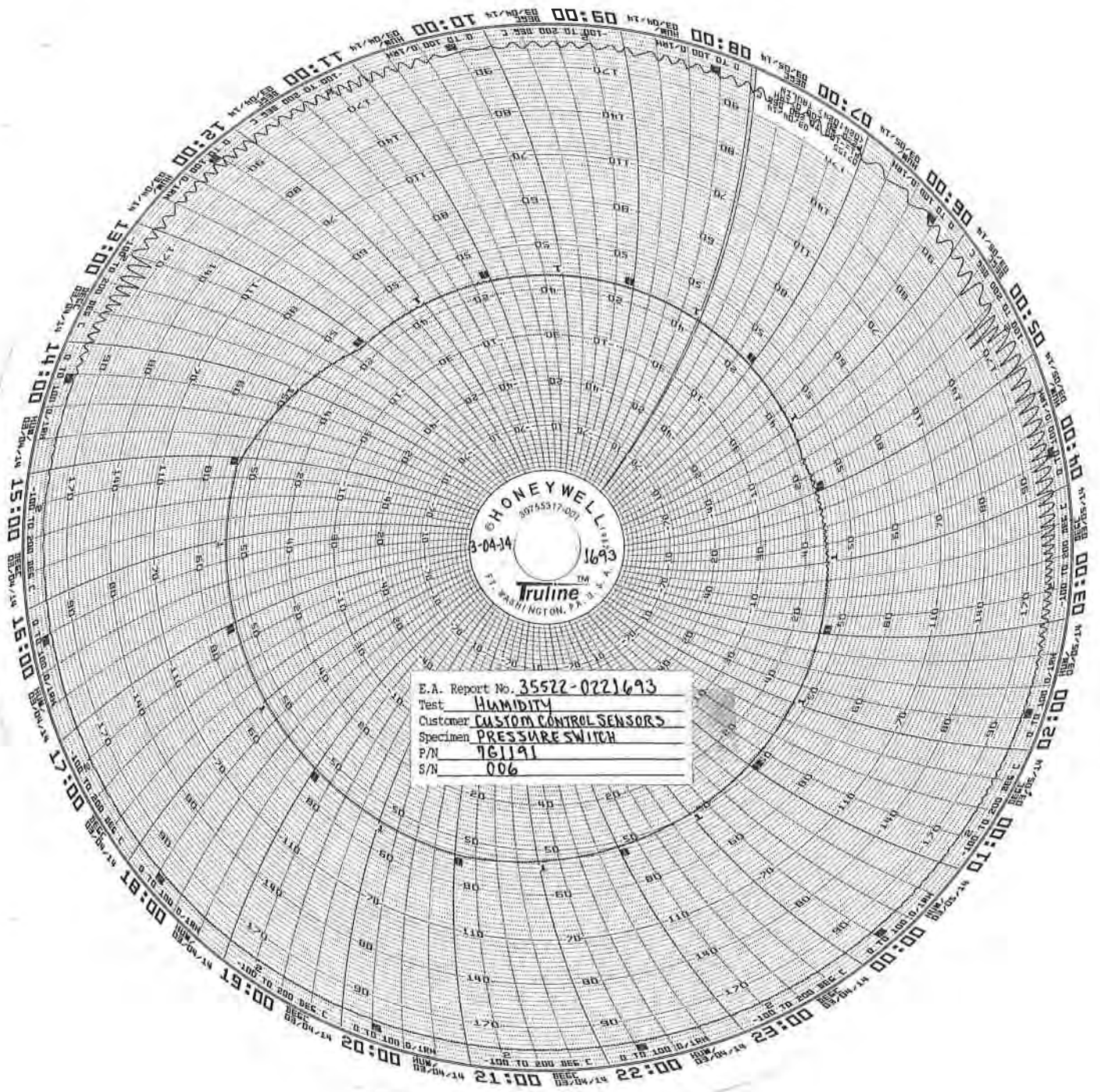
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 Specimen PRESSURE SWITCH  
 P/N 161191  
 S/N 006



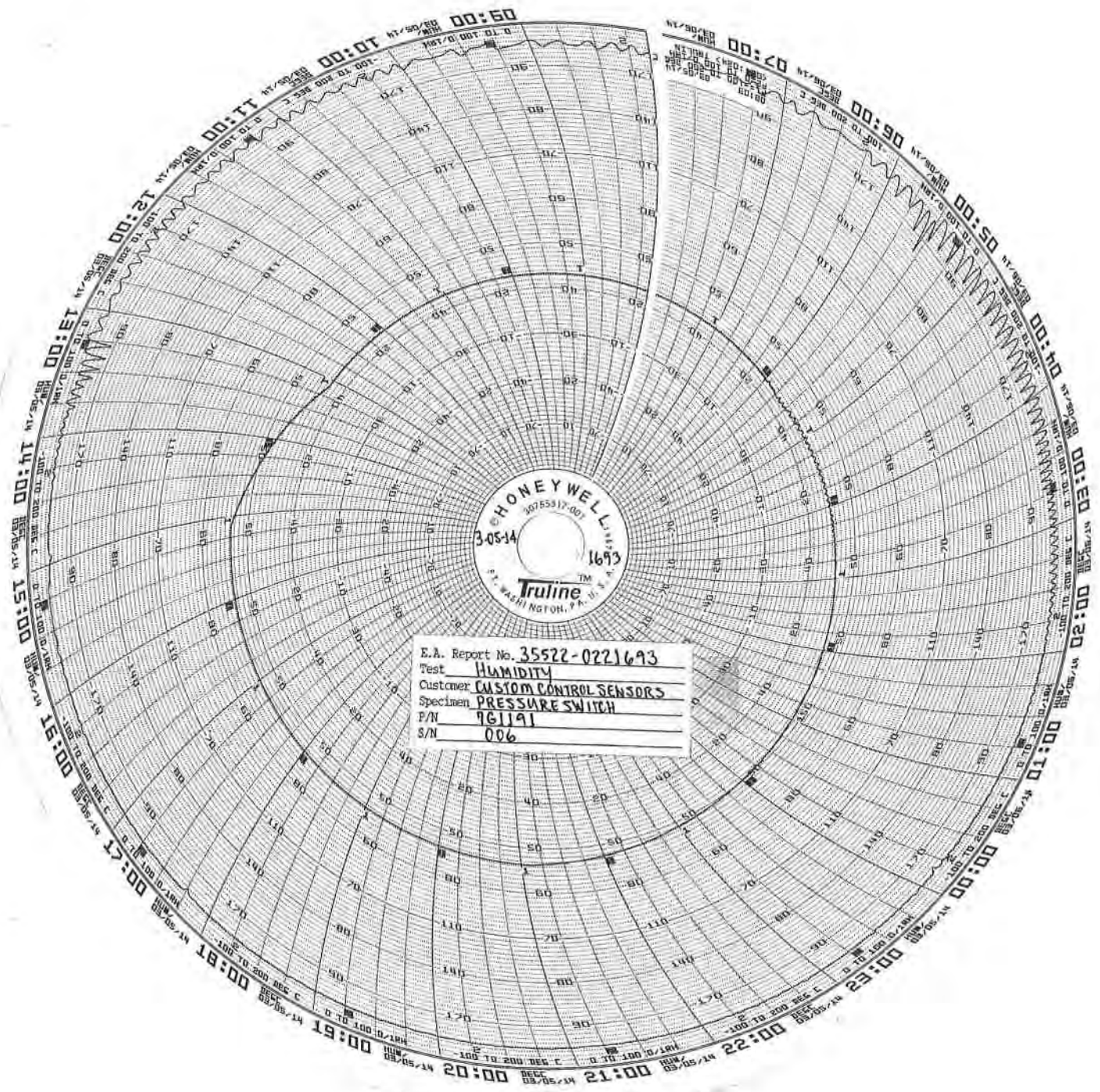
HONEYWELL  
 39755317 001  
 2-23-14  
 1693  
 Truline  
 WASHINGTON, PA U.S.A.

E.A. Report No. 35522-0221693  
 Test HUMIDITY  
 Customer CUSTOM CONTROL SENSORS  
 Specimen PRESSURE SWITCH  
 P/N 761191  
 S/N 006

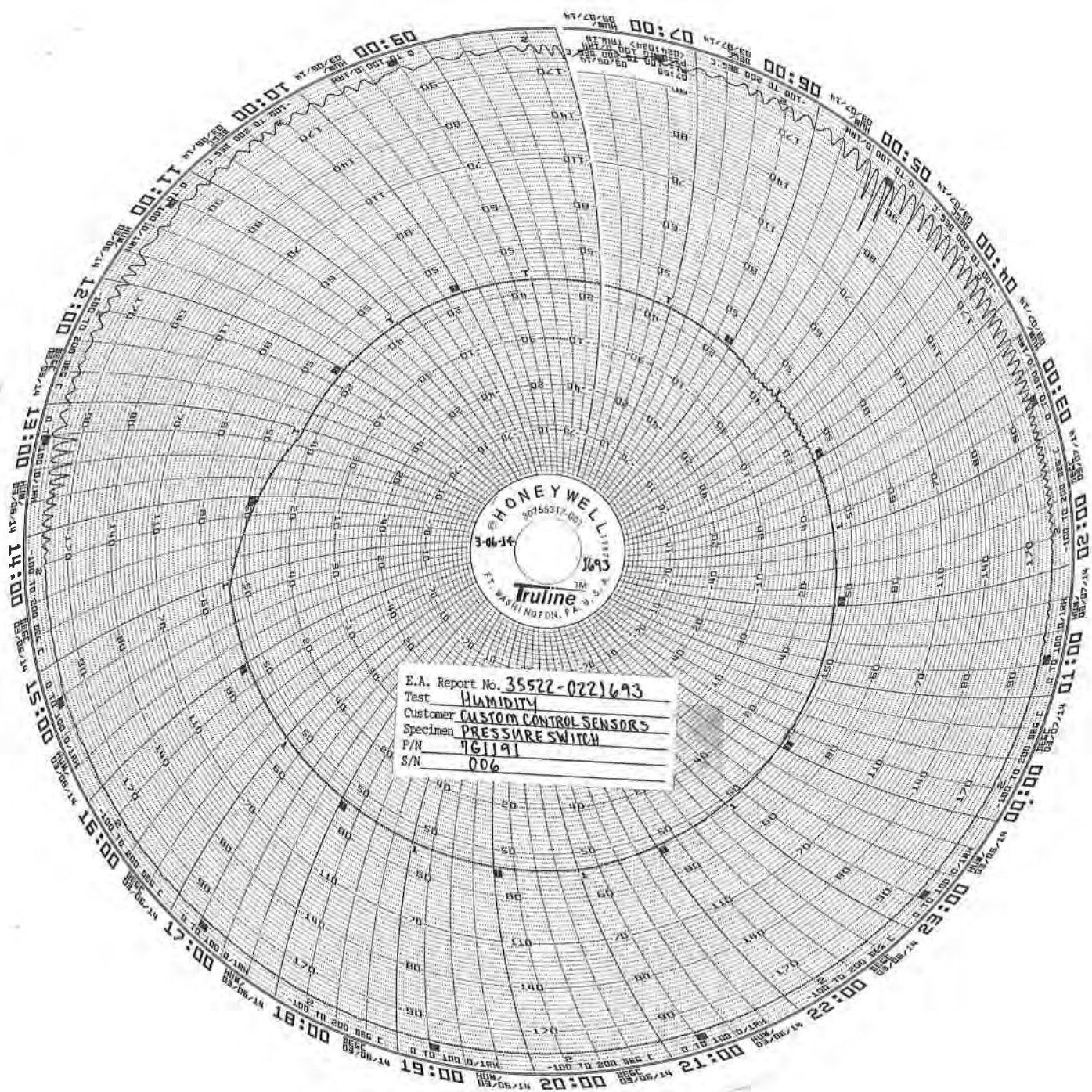


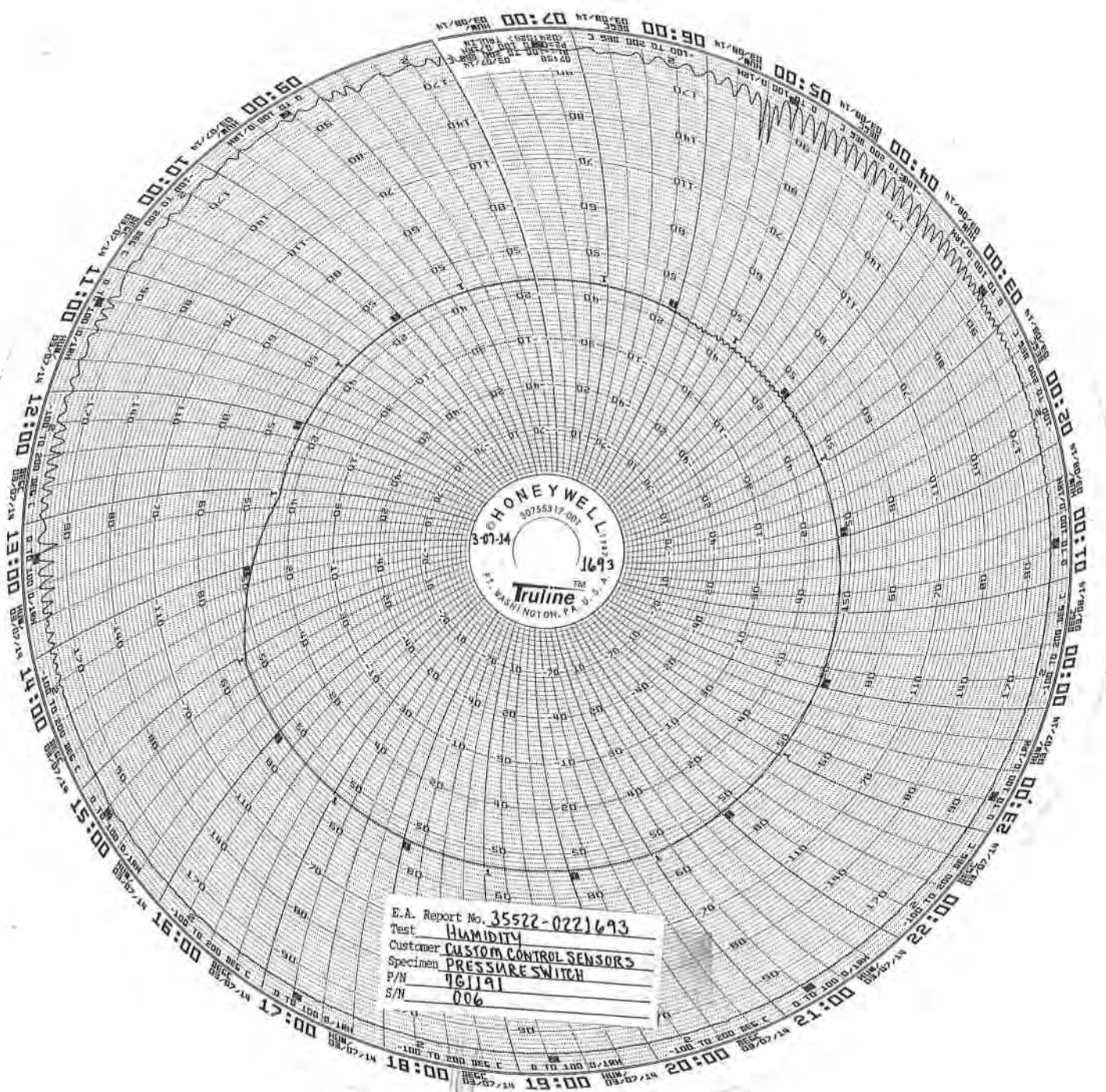


E.A. Report No. 35522-0221693  
 Test HUMIDITY  
 Customer CUSTOM CONTROL SENSORS  
 Specimen PRESSURE SWITCH  
 P/N 761191  
 S/N 006

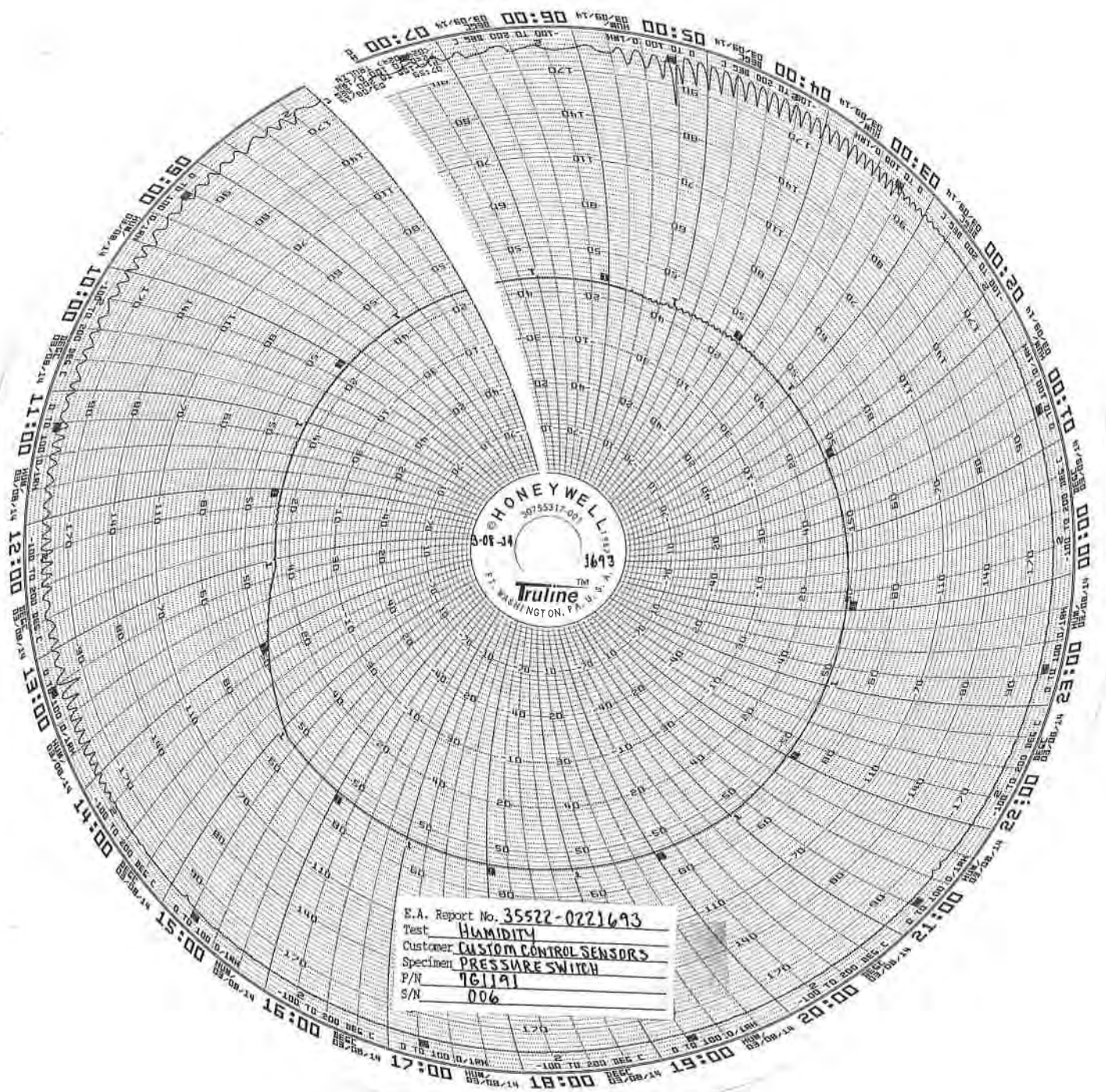


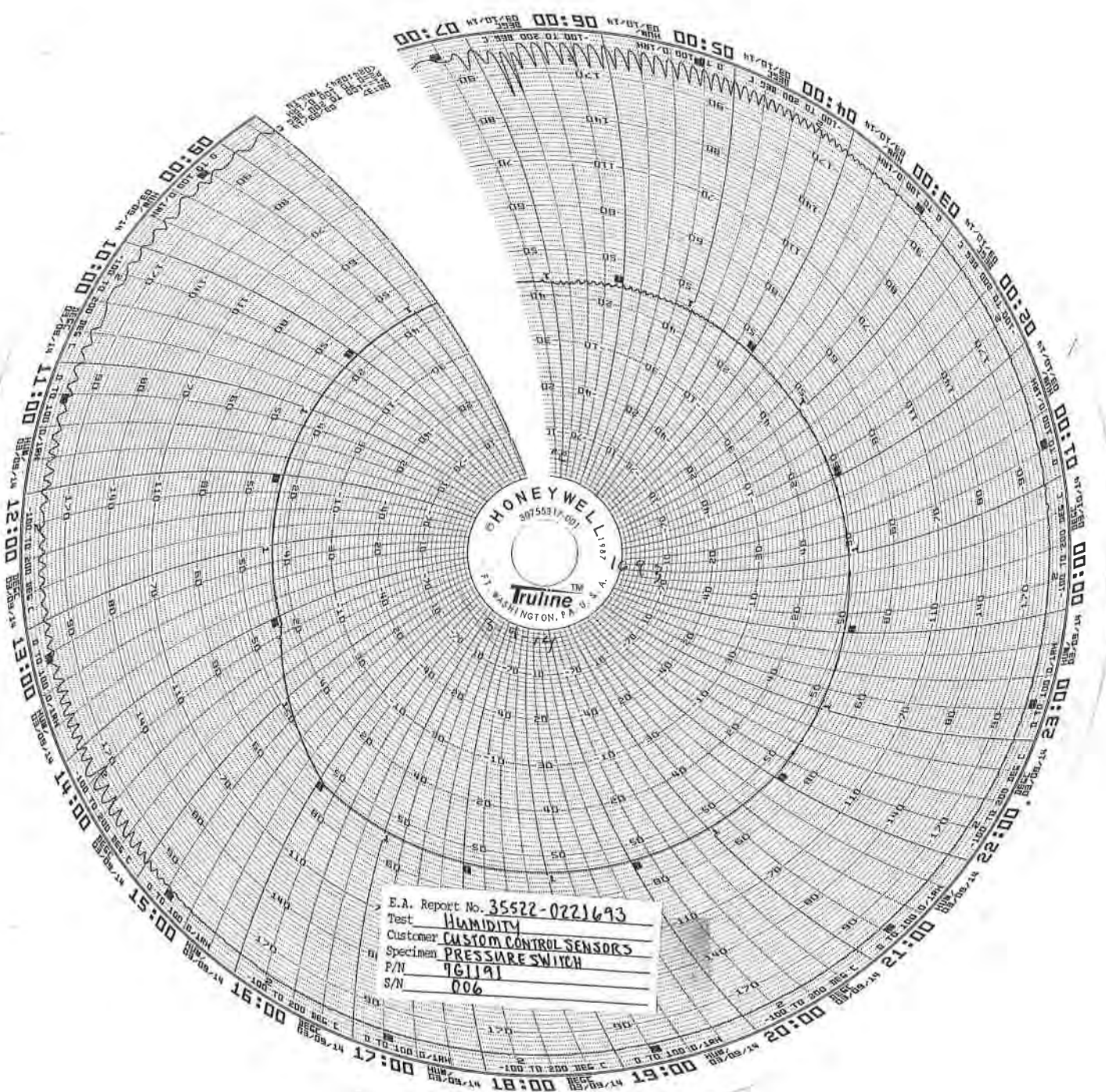
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 Customer CUSTOM CONTROL SENSORS  
 Specimen PRESSURE SWITCH  
 P/N 961191  
 S/N 006



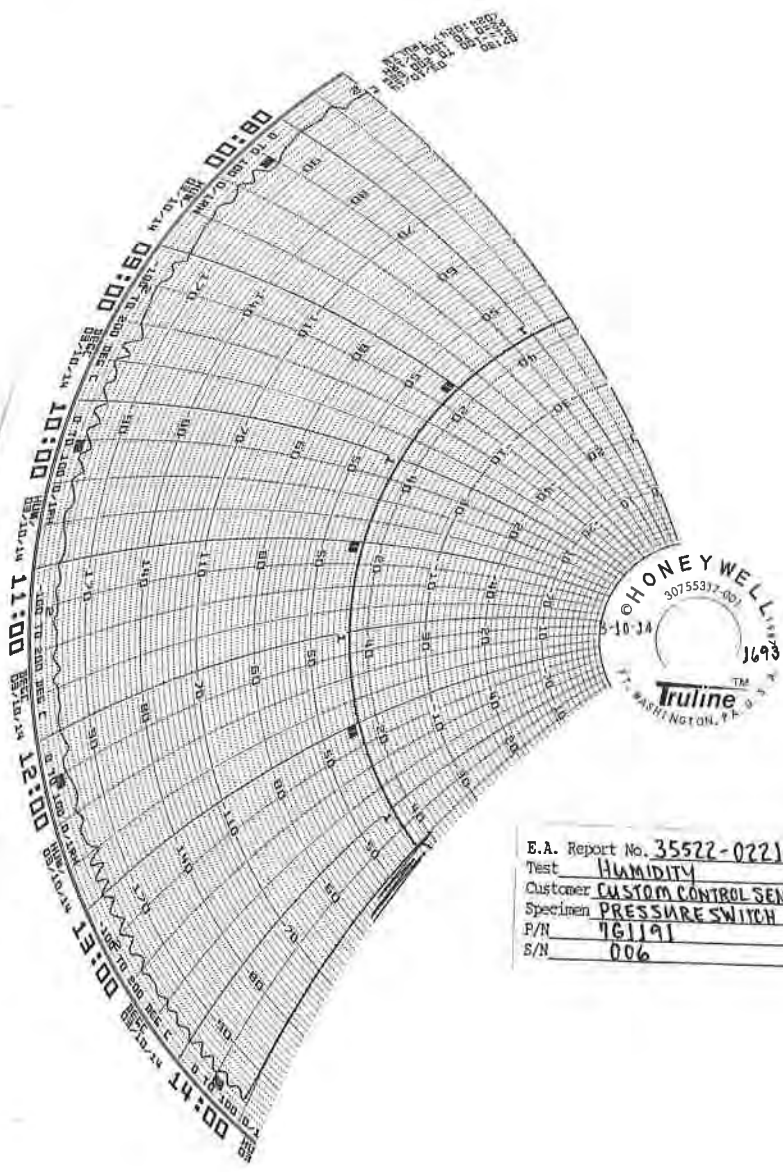


E.A. Report No. 35522-0221693  
 Test HUMIDITY  
 Customer CUSTOM CONTROL SENSORS  
 Specimen PRESSURE SWITCH  
 P/N 761191  
 S/N 006





E.A. Report No. 35522-0221693  
 Test HUMIDITY  
 Customer CUSTOM CONTROL SENSORS  
 Specimen PRESSURE SWITCH  
 P/N 961191  
 S/N 006

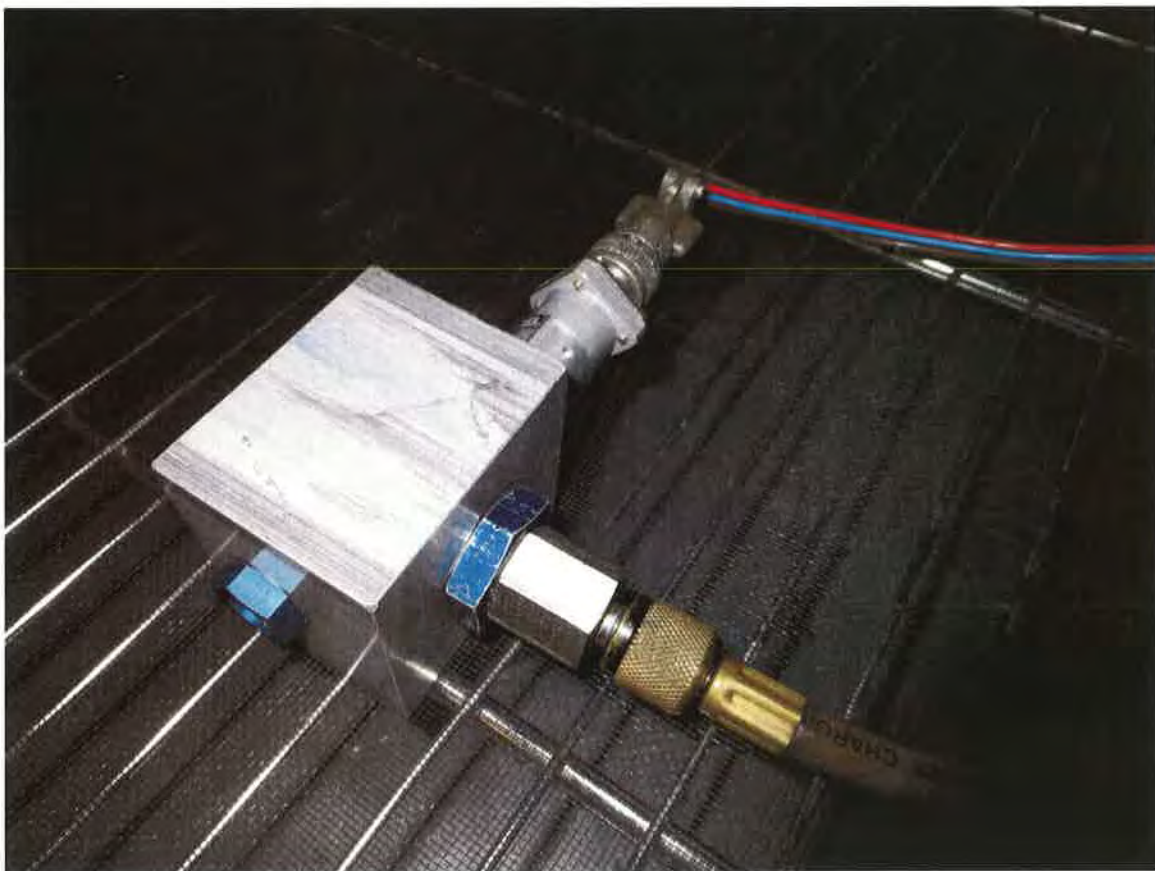


E.A. Report No.	35522-0221693
Test	HUMIDITY
Customer	CUSTOM CONTROL SENSORS
Specimen	PRESSURE SWITCH
P/N	761191
S/N	006





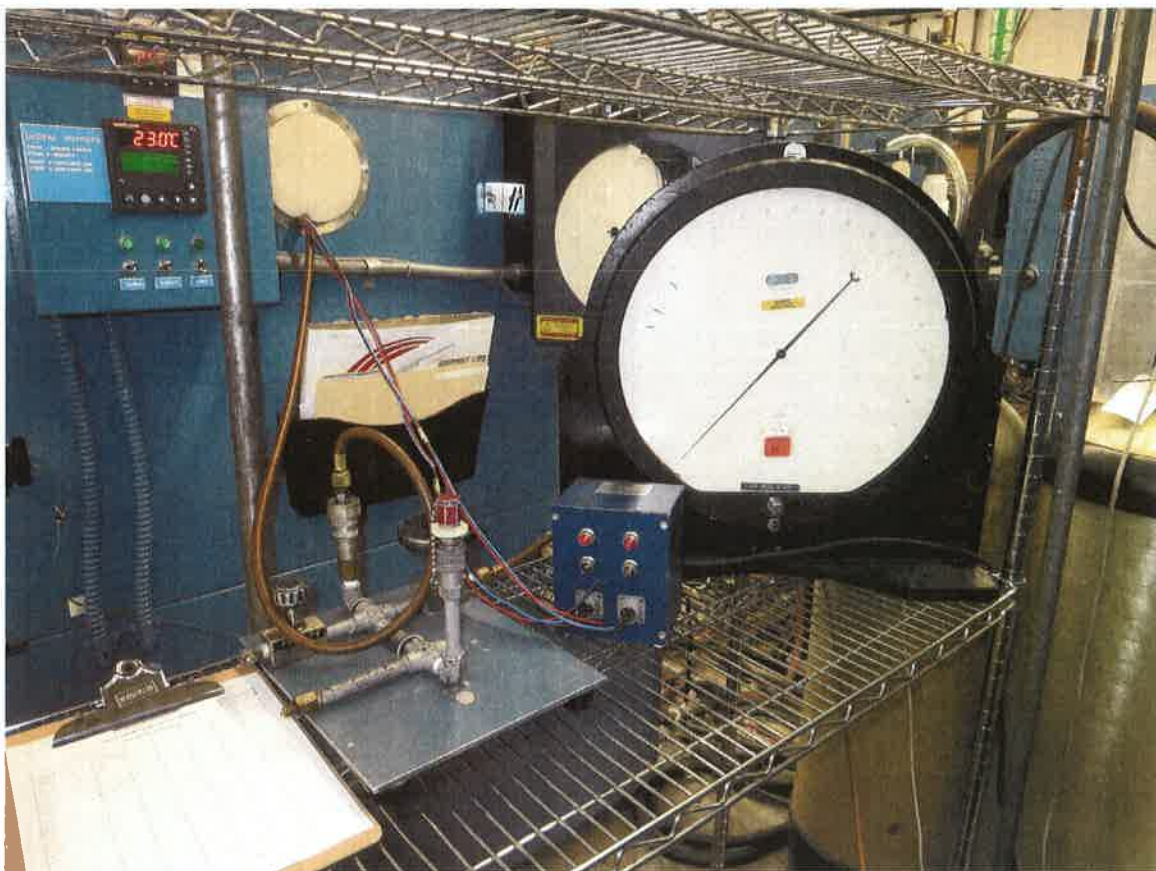
TEST SET UP



2-27-14 Humidity – Pressure Switch, P/N 7G1191, S/N 006 in the chamber

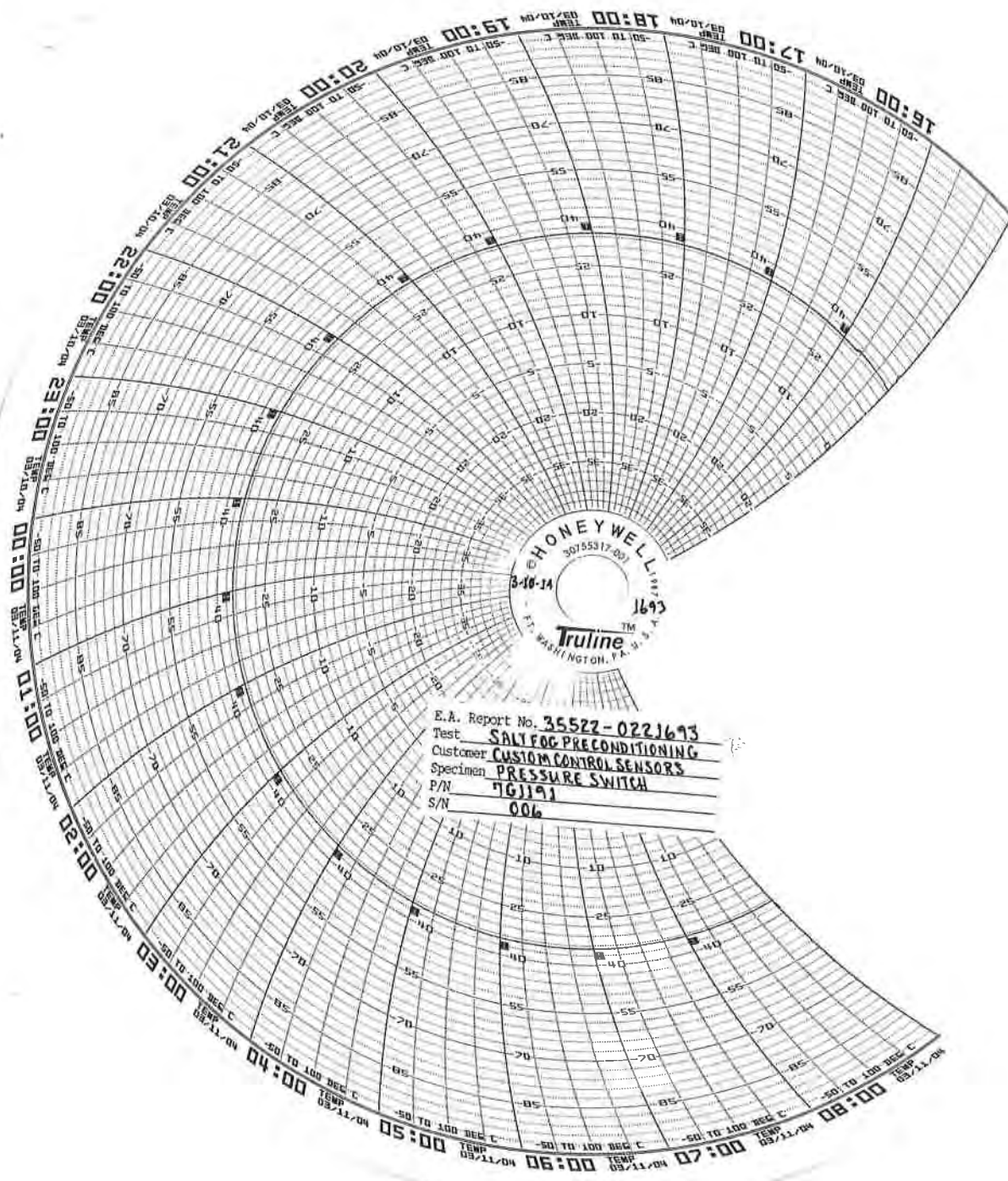


TEST SET UP



2-27-14 Humidity – Test equipment outside of the chamber





3-10-14  
1693

E.A. Report No. 35522-0221693  
 Test SALT FOG PRECONDITIONING  
 Customer CUSTOM CONTROL SENSORS  
 Specimen PRESSURE SWITCH  
 P/N 761191  
 S/N 006

ENVIRONMENT ASSOCIATES – QUALITY ASSURANCE

SALT SPRAY DATA SHEET

TEST SETUP									
CUSTOMER: CUSTOM CONTROL SENSORS		JOB NUMBER: 35522-0221693			DATE: 3-11-14				
SPECIMEN: PRESSURE SWITCH		PART NO: 761191			SERIAL NUMBER: 006				
SPECIFICATION NO: MIL-STD-883C		REVISION: G			PARAGRAPH: METHOD 509.5				
PREPARATION OF SPECIMENS: BY CUSTOMER									
PROTECTION FOR NON-TESTED PARTS: NONE									
VENTS, PORTS, CONNECTORS CAPPED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO COMMENT:									
SUPPORT METHOD: PLASTIC RACK									
ORIENTATION OF SPECIMENS: ACROSS THE CENTER OF THE CHAMBER									
SOLUTION: SALT 5 % H <sub>2</sub> O 95 % (BY MRB)		pH 7.0 at +74 °F		CHAMBER TEMPERATURE: +95 °F		SPECIFIC GRAVITY: 1.025 AT +74 °F			
WATER COLUMN TEMPERATURE: +118 °F				NOZZLE PRESSURE: J6		PSIG			
TEST RECORD									
(1), (2), (3), (4) Check the Specification and Revision for the number and location of collection receptacles. Describe on the log sheet.									
ELAPSED TIME HOURS AND DATE	CHAMBER TEMPERATURE (°F)	SOLUTION VOLUME PER 80 CM <sup>2</sup> AREA(1) (ml/Hr)	SOLUTION VOLUME PER 80 CM <sup>2</sup> AREA(2) (ml/Hr)	SOLUTION VOLUME PER 80 CM <sup>2</sup> AREA(3) (ml/Hr)	SOLUTION VOLUME PER 80 CM <sup>2</sup> AREA(4) (ml/Hr)	COLLECTED SOLUTION			COLLECTED SOLUTION TEMP (°F)
						PH VALUE	SPECIFIC GRAVITY	PH VALUE	
24 3-12-14	+95	1.25	2.67	1.96	1.38	MEAS: 1.025	7.0	7.0	+92
						CORR: .0061			
						ACTUAL: 1.031			
48 3-14-14	+95	1.67	2.45	1.83	1.25	MEAS: 1.025	7.0	7.0	+92
						CORR: .006			
						ACTUAL: 1.031			
						MEAS:			
						CORR:			
						ACTUAL:			

ENVIRONMENT ASSOCIATES – QUALITY ASSURANCE

SALT SPRAY DATA SHEET

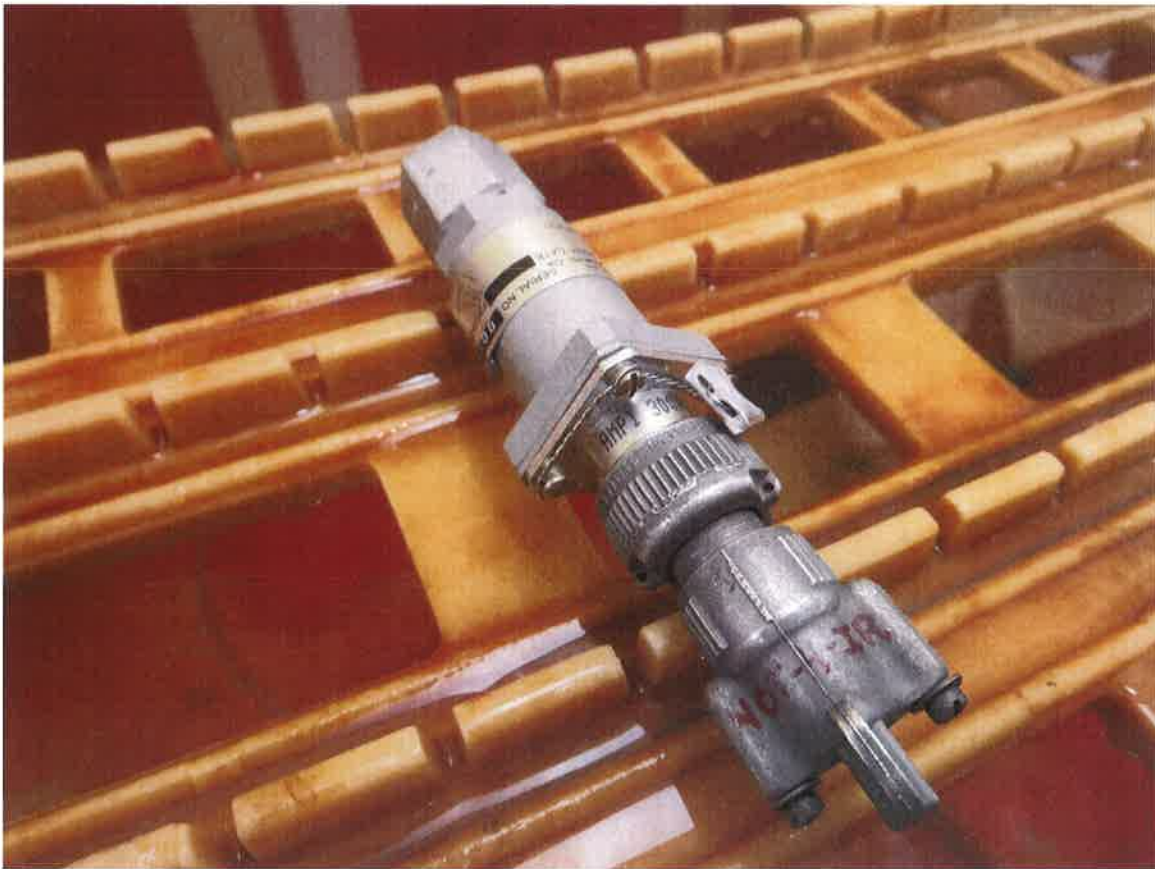
ELAPSED TIME HOURS AND DATE	CHAMBER TEMPERATURE (°F)	SOLUTION VOLUME PER 80 CM² AREA(1) (ml/Hr)	SOLUTION VOLUME PER 80 CM² AREA(2) (ml/Hr)	SOLUTION VOLUME PER 80 CM² AREA(3)	SOLUTION VOLUME PER 80 CM² AREA(4) (ml/Hr)	COLLECTED SOLUTION SPECIFIC GRAVITY	COLLECTED SOLUTION pH VALUE	COLLECTED SOLUTION TEMP (°F)
(1), (2), (3), (4) Check the Specification and Revision for the number and location of collection receptacles. Describe on the log sheet.								
						MEAS:		
						CORR:		
						ACTUAL:		
						MEAS:		
						CORR:		
						ACTUAL:		
						MEAS:		
						CORR:		
						ACTUAL:		
						MEAS:		
						CORR:		
						ACTUAL:		
STOP DATE AND TIME: 3-14-14 0900						TEST DURATION: 48 HOURS		
COMMENTS: NO ANOMALIES OCCURRED DURING THE EXPOSURE						PHOTOGRAPHS TAKEN: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
RESULTS OF TEST: SAMPLE WILL BE INSPECTED AND TESTED AT CUSTOMER FACILITY AFTER DRYING IS COMPLETED.								
TEST TECHNICIAN:						TEST ENGINEER: Martin R. Butler / M. Butler 3/17/14		







**TEST SET UP**

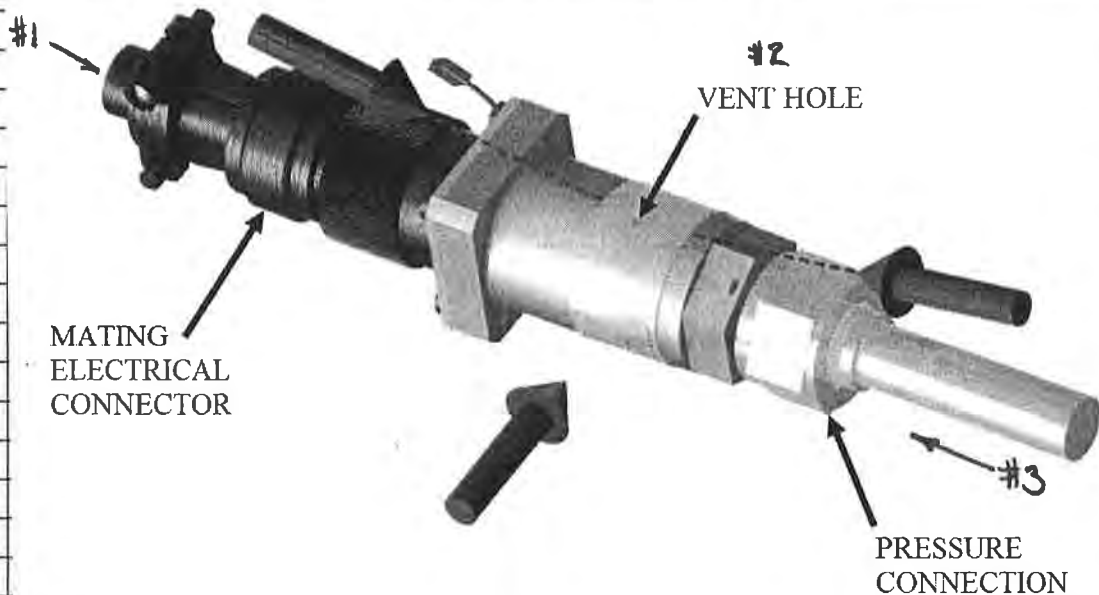


3-11-14 Salt Fog – Pressure Switch, P/N 7G1191, S/N 006 in the chamber

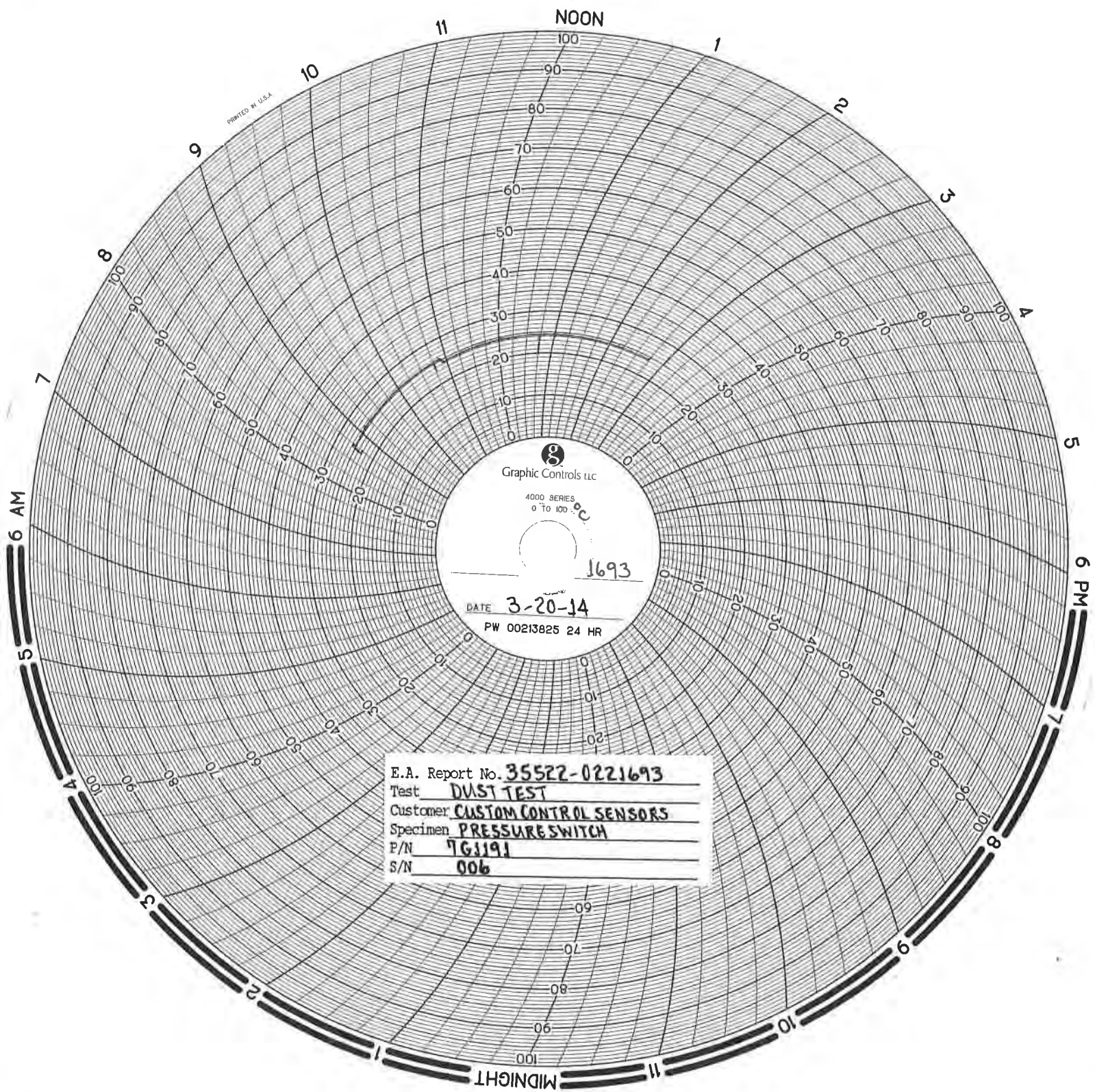
**TEST DATA**

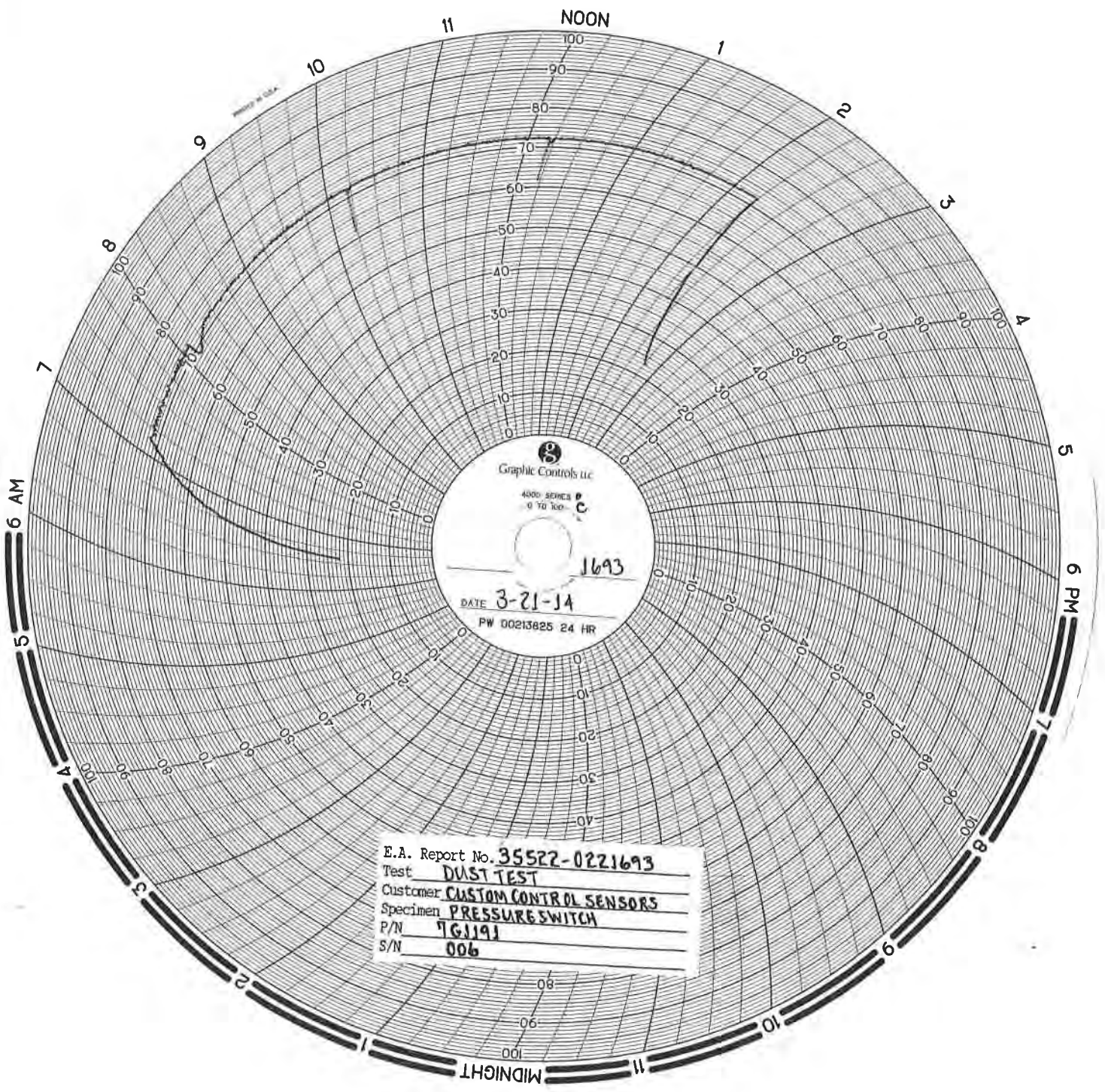
DATE STARTED <b>3-20-14</b>	CUSTOMER <b>CUSTOM CONTROL SENSORS</b>	TECHNICIAN (SIGNATURE)
DATE COMPLETED <b>3-21-14</b>	SPECIMEN DESCRIPTION <b>PRESSURE SWITCH</b>	ENGINEER (SIGNATURE) <i>Martin R. Baxter</i>
TEMPERATURE (LAB) <b>+20 °C</b>	TYPE OF TEST <b>DUST TEST</b>	ENGINEER <i>George Feie</i>
HUMIDITY (LAB) <b>34 %</b>	TEST SPECIFICATION <b>MIL-STD-883C, METHOD 510.5/</b>	PARAGRAPH NO. <b>QTP-761191 REV. H 5.16</b>
SPECIMEN NUMBER <b>P/N 761191 S/N 006</b>		JOB NUMBER <b>35522-0221693</b>
		PHOTO TAKEN BY <b>M. BAXTER</b>

<b>0845</b>	<b>SAMPLE PLACED INTO THE CHAMBER SECURED TO A FRAME TO ALLOW FOR EASY REORIENTATION IN THREE DIRECTIONS DURING THE EXPOSURE, PHOTOGRAPH TAKEN, CHAMBER CLOSED, BLOWER TURNED ON AND ADJUSTED TO HIGH VELOCITY, DUST FEED TURNED ON, BEGINNING TWO HOUR EXPOSURE IN DIRECTION #1. SEE BELOW FOR ORIENTATION</b>
<b>1045</b>	<b>SAMPLE CHANGED TO DIRECTION #2, PHOTOGRAPH TAKEN.</b>
<b>1245</b>	<b>SAMPLE CHANGED TO DIRECTION #3, PHOTOGRAPH TAKEN.</b>
<b>1445</b>	<b>TESTING COMPLETED FOR TODAY, CHAMBER SHUT OFF</b>
<b>3-21</b>	
<b>0637</b>	<b>CHAMBER TURNED ON, BLOWER ADJUSTED TO LOW VELOCITY, DUST FEED TURNED OFF, RAISING CHAMBER TO +71°C, TEMPERATURE PROTECTION SET AT +80°C.</b>
<b>0708</b>	<b>CHAMBER AT +71°C, BEGINNING ONE HOUR STABILIZATION PERIOD.</b>









E.A. Report No. **35522-0221693**  
 Test **DUST TEST**  
 Customer **CUSTOM CONTROL SENSORS**  
 Specimen **PRESSURE SWITCH**  
 P/N **761191**  
 S/N **006**

ENVIRONMENT ASSOCIATES - QUALITY ASSURANCE

STANDARD PRE-TEST - EQUIPMENT LIST

JOB NUMBER	35522-0221693	CUSTOMER	CUSTOM CONTROL SENSORS	DATE	3-20-14
TEST DESCRIPTION / SPECIFICATION & (REVISION):	DUST TEST MIL-STD-810G, METHOD 510.5 / QTP-761191 REV.H				
<b>PRE-TEST EQUIPMENT VERIFICATION:</b>					
On date:	3-20-14	Immediately prior to this test the following instrumentation was checked to insure that calibration was current and the instrumentation was in good working order:			
Technician & Signature: <i>Martin R. Bayler</i>					

INSTRUMENT	MANUFACTURER	MODEL NUMBER	E.A. ASSET NUMBER	CALIBRATION DUE DATE REFERENCE
CHAMBER	HOOVER	EA-010	0205	2-12-15
CHART RECORDER	PARTLOW	4440-000-011-00	0205A	11-04-14
TEMP SENSOR	THERMOMETRICS	100- Ohm RTD	1463	
<b>DUST SYSTEM CERTIFICATION</b>	EA TEST (Marty)	<b>DONE 10-21-13</b>	6-MONTH INTEVRAL	<b>DUE 4-21-14</b>
HUMIDITY INDICATOR	VAISALA	HM-141	1329	1-16-14
VELOCITY ANEMOMETER	EXTEXH	407113	5045	9-16-14
CONCENTRATION				
AIR SAMPLER	STAPLEX	TFIA (S/N 22690R)	1282	REFERENCE
SCALE	A&D	HR-200 (2.10g X 0.0001g)	9078	12-12-13
<b>INSERT VALUES FROM LAST DUST SYSTEM VERIFICATION BELOW:</b>		<b>LAST VERIFICATION PERFORMED: 10-21-13</b>		
HUMIDITY:				
AT:	+ 23	°C	12.2	%
AT:	+ 71	°C	3.8	%
AT:		°C		%
AT:		°C		%
AT:		°C		%
VELOCITY LOW:		447 *		FT/MIN
VELOCITY HIGH:		1772 **		FT/MIN
DUST CONCENTRATION:		0.201		GRAM/CU.FT.
		7.10		GRAM/CU.M
		* 2.27 METERS/SECOND		
		** 9.00 METERS/SECOND		



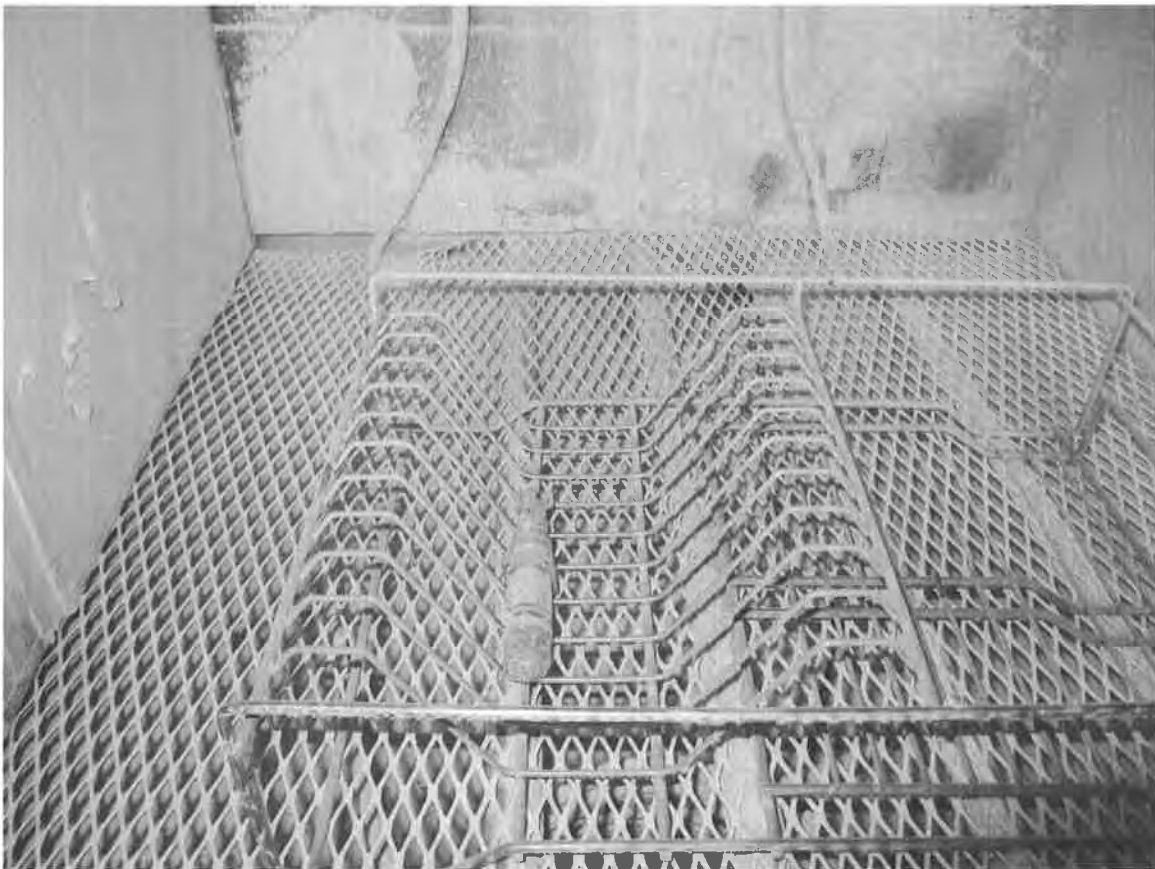
TEST SET UP



3-20-14 Dust Test – Pressure Switch – P/N 7G1191, S/N 006 in the chamber in direction  
# 1



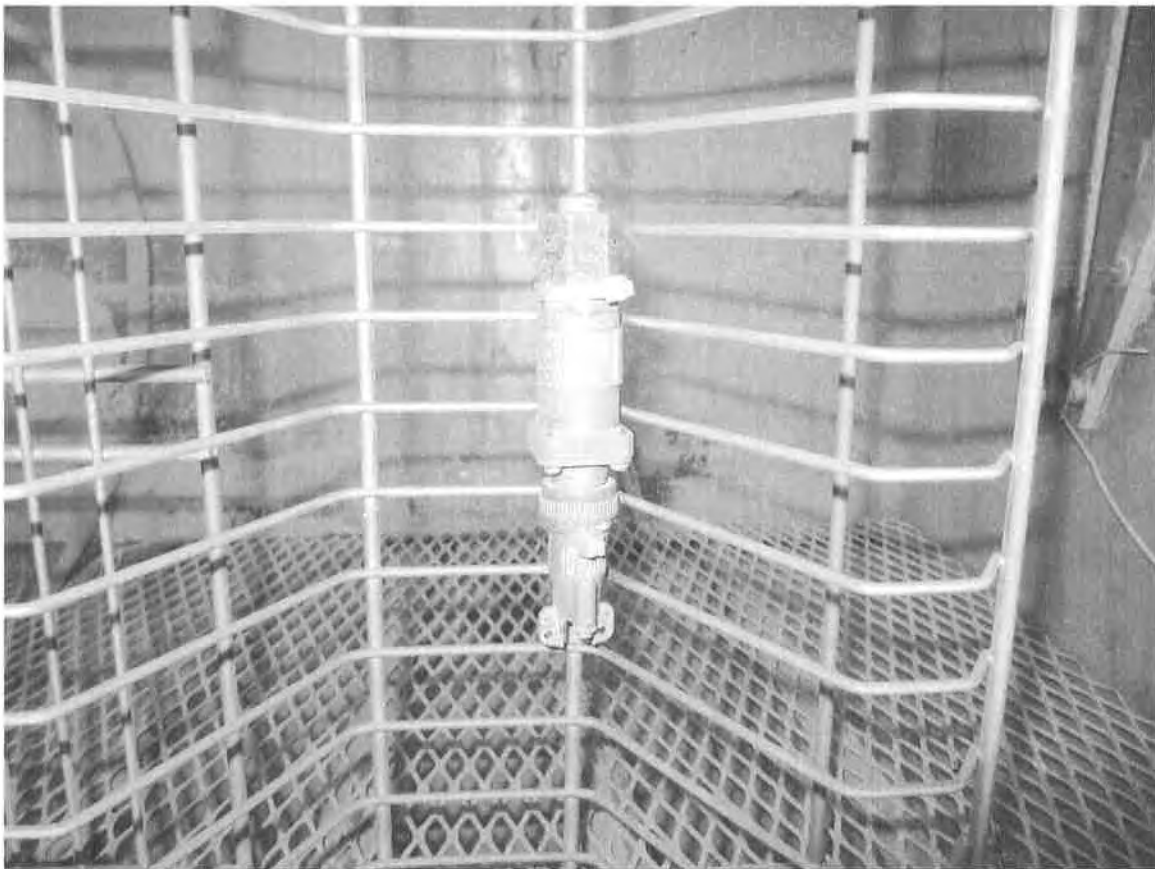
TEST SET UP



3-20-14 Dust Test – Pressure Switch, P/N 7G1191, S/N 006 in the chamber in direction # 2



TEST SET UP



3-20-14 Dust Test – Pressure Switch, P/N 7G1191, S/N 006 in the chamber in direction # 3



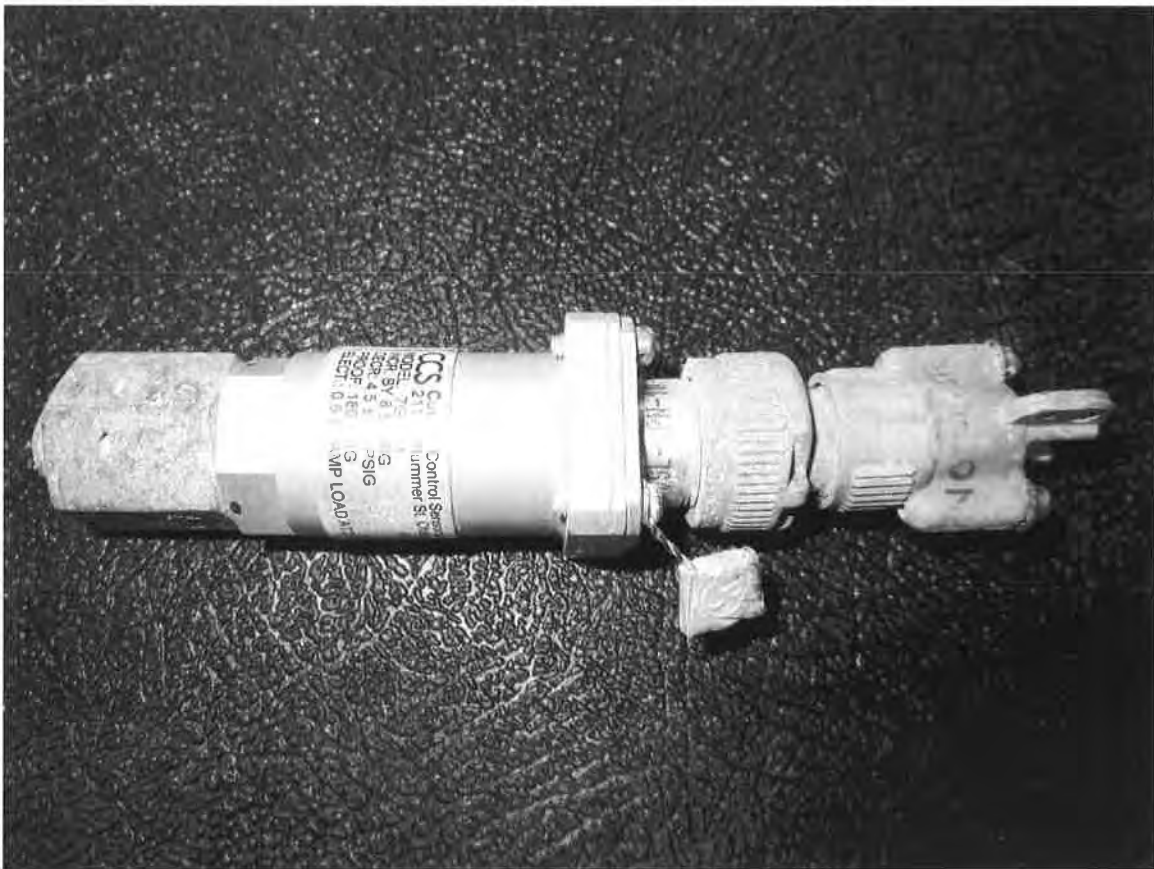
**TEST SET UP**



3-21-14 Dust Test – Pressure Switch P/N 7G1191, S/N 006 post exposure, prior to removal and cleaning.



TEST SET UP



3-21-14 Dust Test – Pressure Switch P/N 7G1191, S/N 006 post exposure, after cleaning.



CERTIFICATION

April 2, 2014

ENVIRONMENTAL ASSOCIATES
9604 Variel Avenue
Chatsworth, CA 91311

Purchase Order Number: 35522-0221693 Part Number: 7G1191
ITL Job Number: 14640 Serial Number: 006

Sand Test:

One (1) Switch, Part Number 7G1191, Serial Number 006, was subjected to a Sand Test in accordance with QTP-7G1191 Rev. H, Redlined.

Sand Test Procedure:

With the test unit non-operating inside the test chamber and its temperature stabilized at 158 ±10°F (+70 ±5.5°C), the air velocity was adjusted to 19 meters/sec. The sand feeder was then adjusted to obtain a sand mass flow rate of 2.2 g/m². This condition was maintained for 90 minutes in one axis only. Upon completion of the test, removed the test unit from the chamber and allowed to cool to ambient temperature.

Results:

The test unit showed no signs of visible abrasion or sand penetration. The test unit was sent back to Environmental Associates for further evaluation.

EQUIPMENT LIST

Table with 3 columns: ITL Control #, Equipment Description, Calibration Dates. Rows include Sand Chamber, Humidity Probe, Timer, Scale, Chart Recorder, Air Velocity Meter, and Digital Multimeter.

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INDEPENDENT TESTING LABORATORIES, INC.

ITL  
13

Kristian DiSanzo, Quality Assurance Manager

KSD/aa

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**Sand Test  
Axis 1**

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**Sand Test  
Axis 2**

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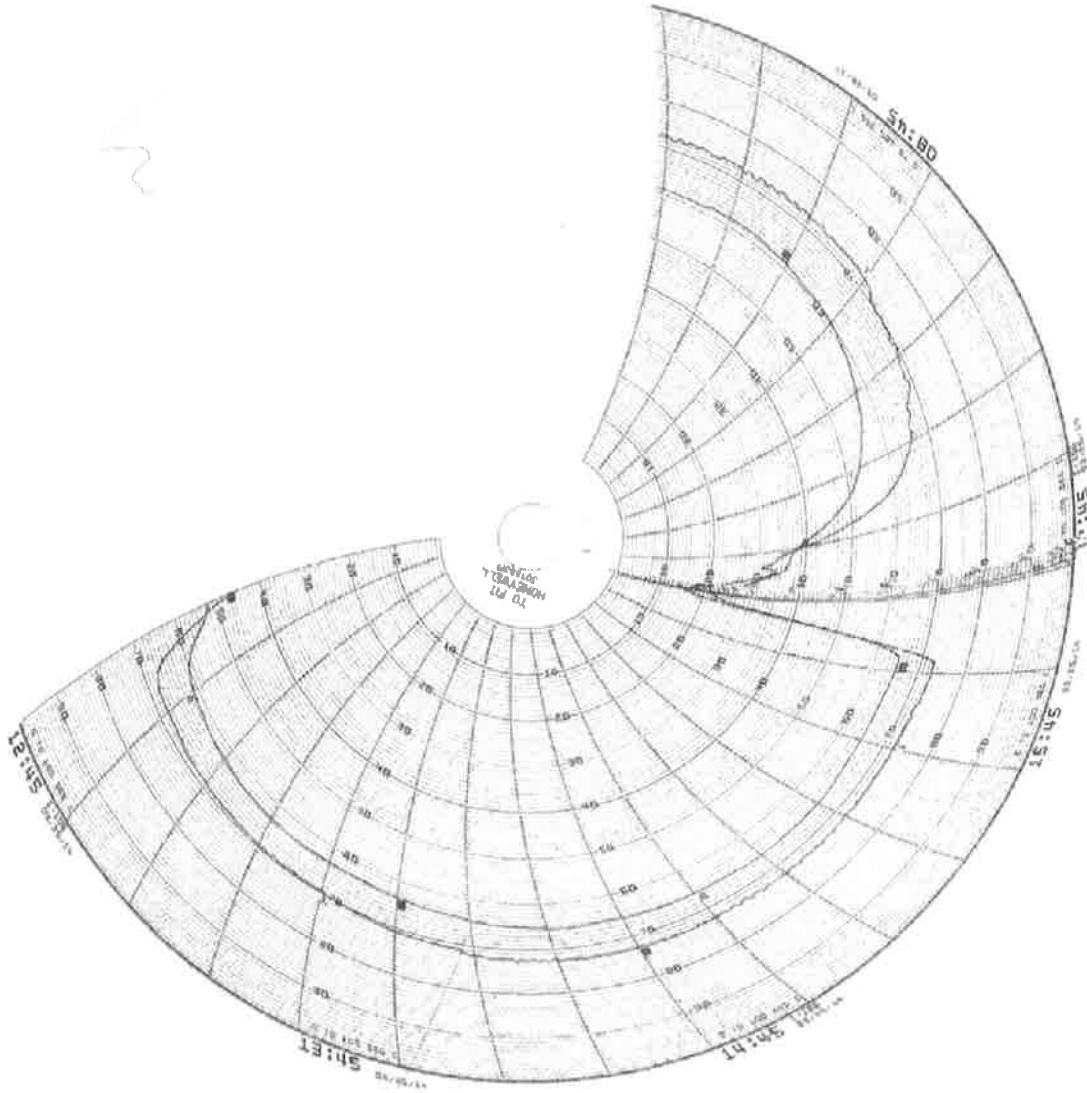


**Sand Test  
Axis 3**

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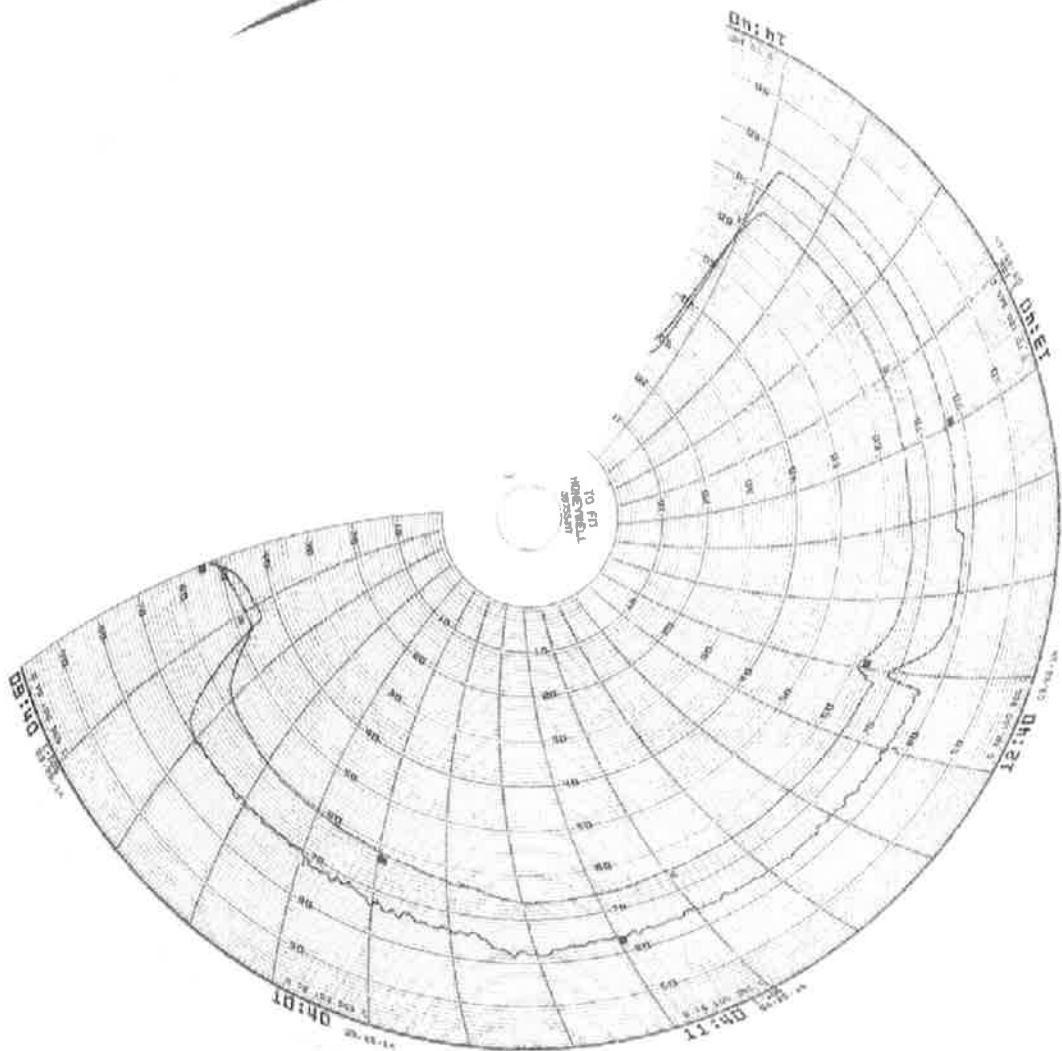


**Sand Test  
Axis 1**

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**Sand Test  
Axes 2 & 3**

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APPENDIX S TEST EQUIPMENT LIST

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 281

Equipment Description	Manufacturer	Model No.	Range/Accuracy	Calibration
<i>Acceptance Tests</i>				
Insulation Resistance Tester	Fluke	1507	50 - 1000 VDC	1001
Hypot Tester	Associated Research	404	0 - 4000 V	17-208R-39
Pressure Gauge	Ashcroft	1082	0 - 200 PSI .25% FS	33K6-4-427-1
Signal Light Box	CCS			Upon Use
<i>Vibration/Shock Tests</i>				
Control	Unholtz-Dickie	VWIN 2	120 Gs 5000 Hz	per MFG.
Charge Amp	Unholtz-Dickie			per MFG.
Accelerometers	Endenco	2222C	± 1.5% 10,000 Gs 20- 10,000 Hz	ANSI S2.2
<i>Endurance Cycling</i>				
Oscilloscope	Tektronix	TDS 340A	2% DC .01% Frequency	17-20AW-256
<i>Temperature Tests</i>				
Thermocouple Interface	TCIC	TCI-10014	-300°F to 1500°F ±1°F	CWI-12
Digital Indicator	Omega	Digicator	-300°F to 1500°F ±1°F	CWI-12
<i>Altitude Tests</i>				
Pressure Transducer	Setra	270	0 - 50 PSIA .03% Full Scale	33K6-4-427-1
Pressure Transducer	Setra	280E	0 - 50 PSIA .03% Full Scale	CWI-1
Manometer	Dynatech	500	0 - 100,000 ft.	Upon Use
<i>Multiple Tests</i>				
Digital Multimeter	Keithly OR Fluke	2000 8050A	10 V ± .0025%	17-20AQ-184
Pressure Transducer	Setra	280E	0 - 100 PSIG .11% Full Scale	CWI-1
Pressure Transducer	Setra	280E	0 - 25 PSIG .11% Full Scale	CWI-1
Transducer Monitor	CCS		.11% Full Scale	CWI-1
Pressure Gauge	Ashcroft	1082	0 - 300 PSI .25% FS	33K6-4-427-1

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 282

Pressure Gauge	Ashcroft	1082	0 - 60 PSI .25% FS	33K6-4-427-1
Pressure Gauge	Ashcroft	1082	0 - 60 PSI .25% FS	Upon Use
Pressure Gauge	Ashcroft	1082	0 - 160 PSI .25% FS	33K6-4-427-1

**Table 3: Equipment List**

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 283

APPENDIX T CCS MEMO DETAILING QTP DEVIATIONS

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 284

**Engineering Coordination Memo**

Program 412 Helicopter	Ref No. ECM-412-CCS-Bell-001	Revision A	Date 04/25/14	Page 1 of 3
------------------------------	---------------------------------	---------------	------------------	----------------

<b>Author:</b> Matthew Haroutunian	<b>To:</b> Bell Helicopter
<b>Email:</b> mharoutunian@ccsdualsnap.com	<b>Email:</b>
<b>Phone:</b> +1 818.341.4610	<b>Phone:</b>

**Subject: Qualification Test Procedure (QTP), rev. H, Deviations**

Reply Required: <input checked="" type="checkbox"/> NO ; YES	Reply To:	Reply By (Date):
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**1.0 REFERENCES**

[1] CCS Qualification Test Procedure (QTP), rev. H

**2.0 INTRODUCTION**

REF. [1] describes the test procedure to qualify the Bell Helicopter Model 412 fuel pressure switch. This coordination memo is to clarify the deviations that were made from the QTP.

**3.0 DEVIATION SUMMARY**

Change No.	Applicable Section	Description	Reason
1	4.0	Changes were made in regards to which S/N experienced which test	When S/N 005 experienced issues with low temperature testing, the test plan was altered to stay on schedule - the QTR reflects the accurate test sequence

Distribution Information			
CCS:		CCS Additional Distribution:	Bell Helicopter Distribution:
ORIGINATOR:	Matthew Haroutunian	Jeff Jorgensen	Paradis, Jean-Pierre
		Raul Dijamco	Shaheen, Edward
			Tjandra, Albertus
			Weeks, Eugene
			Halverson, Aaron
			Fletcher, Tim D
			Madej, Paul
THIS MEMO IS NOT A CONTRACT CHANGE AUTHORIZATION, IF IMPLEMENTATION OF THIS MEMO IMPACTS COST/SCHEDULE, NOTIFY THE BUYER WITHIN 48 HOURS OF RECEIPT FOR APPROPRIATE DIRECTION. CHANGES IN CONTRACT TASKS, SCHEDULE, PRICES, OR SPECIFICATION THAT MAY RESULT FROM THIS MEMO REQUIRE AUTHORIZATION FROM BUYER PRIOR TO INITIATION OF THE CHANGE.			

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## Engineering Coordination Memo

Program 412 Helicopter	Ref No. ECM-412-CCS-Bell-001	Revision A	Date 04/25/14	Page 2 of 3
------------------------------	---------------------------------	---------------	------------------	----------------

2	4.0	"Short-Time" removed from Ground Survival Low/High Temperature Test and <i>Short-Time</i> Operating Low/High Temperature Test; Operating Low/High Temperature Test removed	Short-time (30 mins) not needed to be performed because full duration (2 hrs.) operating performed at temperature
3	5.1.2	Calibration Test procedure changed to increase applied pressure to 12 PSIG then back to 0 PSIG rather than only increasing pressure to actuation	12 PSIG is the approx. system pressure for this system in which this pressure switch is installed and it is more customary to increase the pressure to system pressure during calibration
4	5.5, 5.7	Remove "Short-Time" from "Ground Survival Low/High Temperature Test and <i>Short-Time</i> Operating Low/High Temperature Test"	Short-time (30 mins.) operating not performed; regular duration (2 hrs.) of operation performed <i>(reference change no. 1)</i>
5	5.5.1, 5.7.1	Add note: "Oscilloscope not required" to Test Setup reference	Oscilloscope not required for temperature testing
6	5.5.2c 5.7.2c 5.9.2f 5.12.2 5.13.2b	Change pressure cycling to 20 PSIG rather than 100 PSIG	Cycling to 20 PSIG is more realistic as the system pressure for this application is approx. 12 PSIG.
7	5.5.2c 5.7.2c	Change operational period to 2 hours minimum from 30 minutes minimum	Eliminates the need to perform short-time operating portion of test <i>(reference change no. 1, 3)</i>
8	5.5.2d 5.7.2d	Change to "Perform the Calibration Test per section 5.1 3 times during the cycling period: 15-30 minutes in to cycling, midway through, and at the end of this 2 hour cycling period" from "Perform the Calibration Test per section 5.1 at the beginning, middle, and end of this 30 minute cycling period"	Specify that it is not required to perform the calibration procedure prior to any cycling at temperature due to anomaly that occurred during testing.
9	5.6, 5.8	Remove Operating Low/High Temperature Test	Merged with "Ground Survival Low/High Temperature Test and Operating Low/High Temperature Test" <i>(reference change no. 1, 3, 6)</i>
10	5.13.2a 5.14.2a	Remove "Beginning at ambient temperature with electrical power applied through the signal light box turned ON, lower the chamber temperature to the operating low temperature, -49°F"	Not intended for this procedure (mistakenly copied from other test procedure)
11	5.15.2c	Add "NOTE: Two (2) 24 hour wet/24 hour dry cycles are also acceptable per MIL-STD-810G"	MIL-STD-810 allows a single 48 hour wet/48 hour dry cycle or two 24 hour wet/24 hour dry cycles. Lab planned on the latter.
12	5.16.2c	Change end of 5th cycle to end of 4th cycle for operational check	Changed for convenience of performing check with ODA witness (ODA not available for 5th day operational check)



## Engineering Coordination Memo

Program 412 Helicopter	Ref No. ECM-412-CCS-Bell-001	Revision A	Date 04/25/14	Page 3 of 3
------------------------------	---------------------------------	---------------	------------------	----------------

13	5.17.2e (Dust Test)	Change dust test chamber temperature to 158°F (was 250°F)	Test lab not able to go above 160°F for dust test. 158°F is the operating high temperature used in prior testing.
14	5.17.2b 5.17.2f (Sand Test)	Change temperature change rate to 5°C/min. (9°F/min.) from 3°C/min. (5°F/min.)	Expedite temperature transitions to shorten overall test time
15	5.17.2b (Sand Test)	Change sand test chamber temperature to 158°F (was 250°F)	Test lab not able to go above 160°F for sand test. 158°F is the operating high temperature used in prior testing.
16	5.17.2d (Sand Test)	Add "Sand Concentration = $2.2 \pm 0.5 \text{ g/m}^3$ "	Concentration wasn't specified. This category applies to helicopters (most severe).
17	Figure 15 (Appendix A)	Endurance Cycling Test Setup: remove isolation valve/gauge	Items not required for test setup
18	Figure 18 (Appendix A)	Explosion Proofness Setup Diagram: add thermocouples, add oxygen tank, change "Calibration Test Setup" to "Signal Light Box"	More thermocouples required. Some oxygen required for explosion at altitude.

### 4.0 CONCLUSION

This document is deemed approved with approval of the qualification test report.

APPENDIX U TEST ARTICLE TEARDOWN REPORT (S/N 005 AND 007)

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 288

## Product Failure Analysis Investigation Report

Customer Info: (Service Department)						
Customer: Bell Helicopter			Address:			
Customer Contact: Jean-Pierre Paradis			Phone:		E-mail:	
Retuned Switch Information: (Service Department)						
Part Number: 7G1191			Part Description: Gauge Pressure Switch			
RSR / RMA N/A		Qty Of Switches 1	Serial Number: 005			Assembly Date: 02/2014
Reason for Return: <b>NOTE:</b> This unit was not returned from the customer. It is a qualification test unit.						
Incoming Switch Evaluation: (Service Department)						
Visual Examination: No external signs of damage			Incoming Pictures:			
Functional Test		Electrical Test			Mechanical Movement Test	
ATP # 7G1191		Dielectric	Did not test		Total Movement: .0097	
Increase      5.89		Contact Check	Did not test		Pre Creep .0030	
Decrease      3.95		Ground Test	Did not test		Post Creep .0017	
Dead Band      1.94		Insulation Resistance	Did not test		Snap .0068	
Proof		Contact Resistance	Did not test		Increase Sync	
					Decrease Sync	
Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/>					Diff Movement      .0008	
Comments: Settings based on average of last readings at room temperature on 02/27/14 after both low and high temperature tests						
Service Technician:		Matthew Haroutunian			Date:	02/27/14
Returned Switch History "RSR" (QA)						
RSR	P/N	S/N	Assy Date	Customer Reason for Return	Service Analysis	Date Received

No return history. Qualification test unit.

**Failure Analysis (MFG, ENG, QA)**

**Teardown Examination**

Diaphragm	Some minor signs of wear	Connector	Acceptable
O-Ring	Acceptable	Wiring	Acceptable
Arm Assembly	Acceptable	Switch Element	Acceptable
Seals	No observed issue	Actuator	Acceptable
Torque Screw	Acceptable	Leakage	None observed
Body	Acceptable	Electrical	Acceptable - no issues

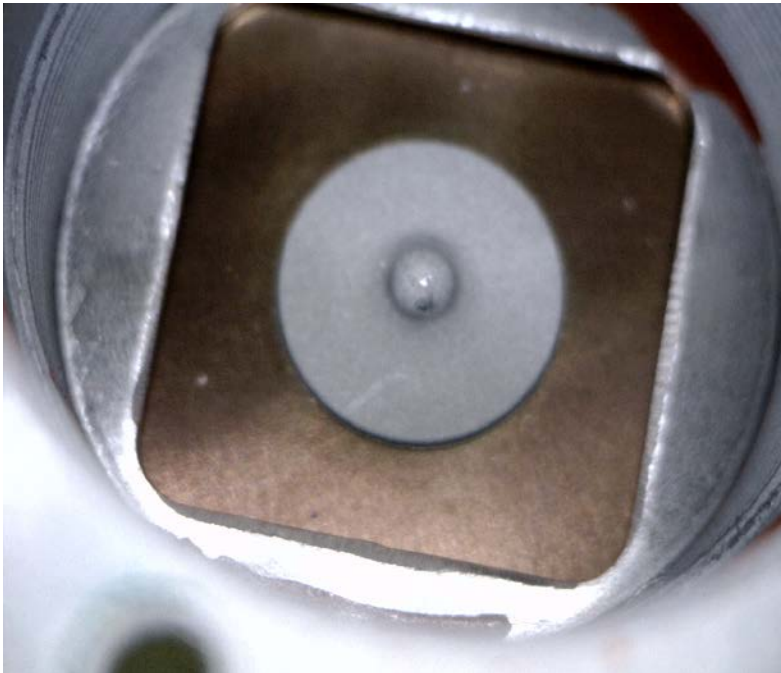
**Teardown Conclusion:**

There was excessive lubrication oil used around the o-ring which overflowed into the diaphragm area of the switch. This area is sensitive to contamination and any foreign substances can impact the switch's performance. CCS believes the viscosity of this oil, when exposed to low temperature, increases. Therefore, the excessive oil around the diaphragm thickened and caused the switch to perform incorrectly.

Teardown Pictures



Electrical Assembly - Functional; good condition



Actuator (Pressure Plate) - acceptable; minor signs of wear



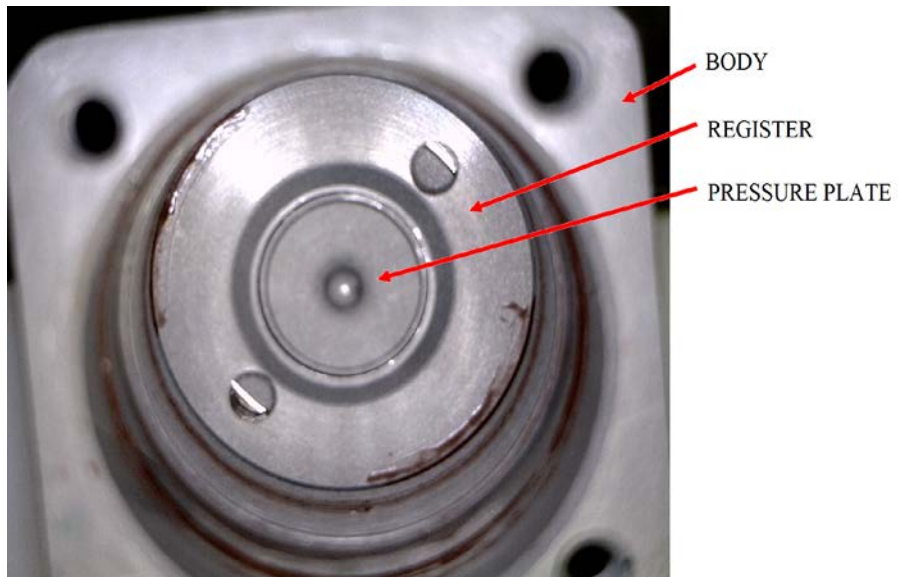
Switch Actuator Assembly - Functional



Retainer/Register Ring - Acceptable; good condition



Disc Spring - Acceptable; minor signs of normal wear from cycling



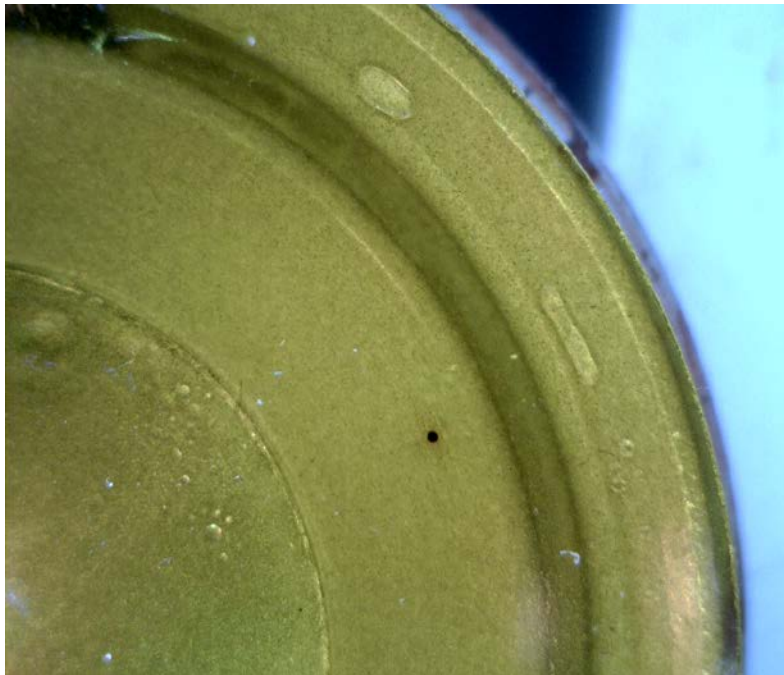
Body, Register Pressure Plate - no visible issues



Pressure Plate/Plate - Acceptable; no signs of wear



Body/O-Ring/Diaphragm - no significant areas of concern




Diaphragm - displaying excessive use of lubricating oil



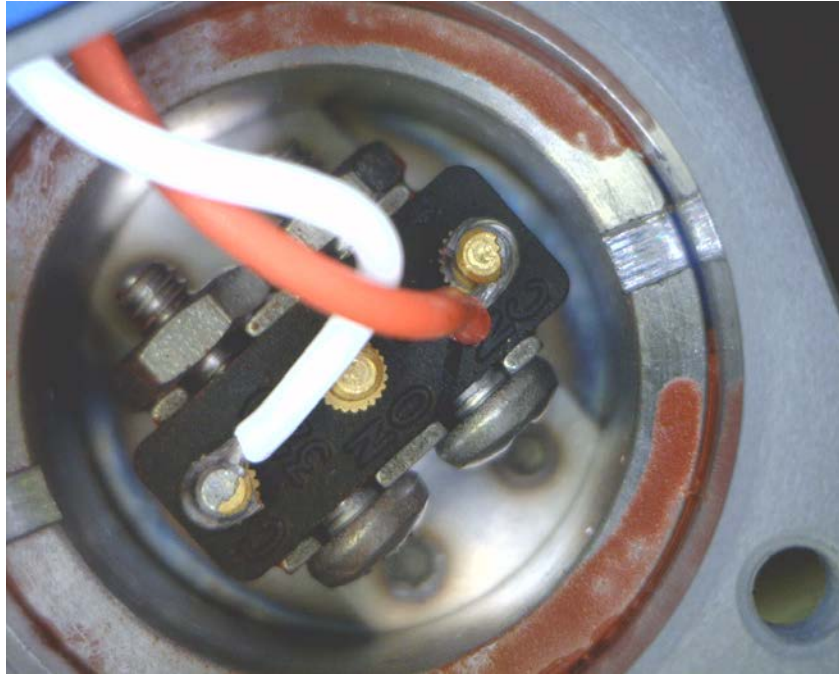
Body/O-Ring - some possible FOD; oily surface of body

Teardown Performed by:	Matthew Haroutunian	Date:	02/27/14
<b>Root Cause Analysis (MFG, ENG, QA)</b>			
Root Cause fish bone			
<b>Problem</b> Excessive/improper use of lubricant	<b>Machine/Policy</b>	<input type="text"/>	<b>Method/ Procedures</b> Prohibit use of lubricant during assembly
	<b>Manpower/People</b>	<input type="text"/>	<b>Physical Environment</b> <input type="text"/>
		<b>Materials/ Process</b>	<input type="text"/>
Root Cause Conclusion:			
Follow up testing was performed on 04/14/14 on the lubricant. CCS used Perfluoroether Lubricating Oil (Brayco 1625, CCS P/N 116-164) to build the test articles. As an alternative, CCS discussed using a grease version of this lubricant (Braycote 806, CCS P/N 116-165). Both of these lubricants were exposed to -67°F for 2 hours. The viscosity of both of these substances increased dramatically. It was concluded that the improper application of either lubricant, can have a negative impact on the switch's performance, and it would be better if lubricant is not used in this location (o-ring installed in the body) for this application.			
Containment Action: Not required - only used for qualification test units.			
Corrective Action: Remove use of lubricant for o-ring installed in body.			
Estimated C/A Completion Date:	04/30/14		
<b>Corrective Action Approvals (MFG, ENG, QA)</b>			
Engineering	J.Jorgensen		Date: 04/15/14
Manufacturing	B. Johnson		Date: 04/15/14
Quality Assurance	A. Perez		Date: 04/15/14
<b>Corrective Action Follow up (MFG, ENG, QA)</b>			
Follow up notes:			
<input type="text"/>			
Follow Up Status? Open <input type="checkbox"/> Closed <input type="checkbox"/> Performed by:			

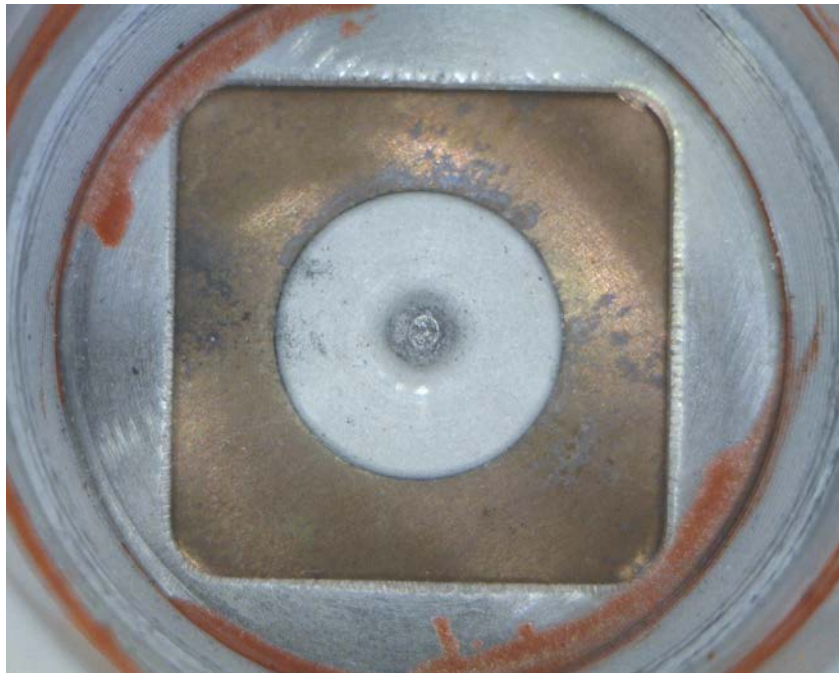
## Product Failure Analysis Investigation Report

<b>Customer Info: (Service Department)</b>			
Customer: Bell Helicopter		Address:	
Customer Contact: Jean-Pierre Paradis		Phone:	E-mail:
<b>Retuned Switch Information: (Service Department)</b>			
Part Number: 7G1191		Part Description: Gauge Pressure Switch	
RSR / RMA N/A	Qty Of Switches 1	Serial Number: 007	Assembly Date: 02/2014
Reason for Return:			
<b>NOTE:</b> This unit was not returned from the customer. It is a qualification test unit.			
<b>Incoming Switch Evaluation: (Service Department)</b>			
Visual Examination: No external signs of damage		Incoming Pictures:  	
Functional Test	Electrical Test		Mechanical Movement Test
ATP # 7G1191	Dielectric	Pass	Total Movement: .0081
Increase      10.17	Contact Check	Did not test	Pre Creep .0005
Decrease      4.40	Ground Test	Did not test	Post Creep .0000
Dead Band      5.77	Insulation Resistance	Pass	Snap .0076

Proof	Contact Resistance		Acceptable	Increase Sync		
				Decrease Sync		
Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/>				Diff Movement		
Comments: Actuation point out of tolerance. Could not check electrical sync with Tandy ("sync too low"). Manually checked.						
Service Technician:	Matthew Haroutunian		Date:	03/27/14		
<b>Returned Switch History "RSR" (QA)</b>						
RSR	P/N	S/N	Assy Date	Customer Reason for Return	Service Analysis	Date Received
No return history. Qualification test unit.						
<b>Failure Analysis (MFG, ENG, QA)</b>						
<b>Teardown Examination</b>						
Diaphragm	Some minor signs of wear			Connector	Acceptable	
O-Ring	Acceptable			Wiring	Acceptable	
Arm Assembly	Acceptable			Switch Element	Acceptable	
Seals	No observed issue			Pressure Plate	<b>Significant signs of wear</b>	
Screw	Acceptable			Leakage	None observed	
Body	Acceptable			Electrical	Acceptable - no issues	
<p><b>Teardown Conclusion:</b>  From the teardown, significant signs of wear were seen on the tip of the pressure plate and there was a buildup of debris in the surrounding area (see pictures below). CCS believes the wear was caused by the 100,000 cycles (requirement of Endurance Cycling Qualification Test) this switch experienced (possibly some contribution from vibration testing as well).</p> <p>About .002" - .004" of material was removed from the pressure plate. As CCS products operate with .008" - .011" of travel/movement, any reduction of the pressure plate can impact the switch's performance. It appears some extra movement/pressure was required to electrically actuate the switch.</p> <p><b>NOTE:</b> S/N 008, which passed all qualification testing, was also torn down and had some similar wear on the pressure plate. CCS believes this unit would have displayed similar results if cycling continued.</p>						
Teardown Pictures						



Electrical Assembly - good condition



Partially Disassembled Switch - wear on pressure plate and debris built up



Switch Actuator Assembly - functional; minor wear on arm at point of pressure plate contact



Pressure Plate - worn down to a flat (should be a full radius)



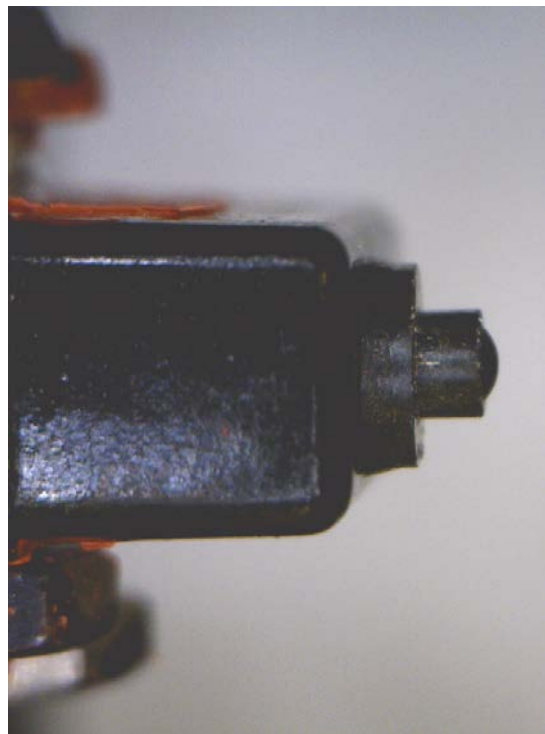
Pressure Plate - worn down to a flat (should be a full radius)



Register - good condition; no signs of wear



Diaphragm - good condition

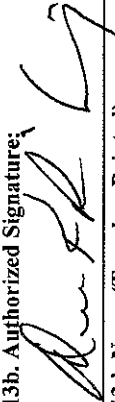


Switch Element - acceptable; button in fair condition

Teardown Performed by:	Matthew Haroutunian	Date:	03/27/14
<b>Root Cause Analysis (MFG, ENG, QA)</b>			
Root Cause fish bone			
<b>Problem</b> Wear on pressure plate	<b>Machine/Policy</b>	<input type="text"/>	<b>Method/Procedures</b>
	<b>Manpower/People</b>	<input type="text"/>	<b>Physical Environment</b> 100,000 cycles (excessive for design)
			<b>Materials/Process</b> Material of pressure plate (aluminum)
Root Cause Conclusion: CCS is confident this out of tolerance condition was caused by the 100,000 cycles the switch experienced as part of Endurance Cycling Qualification Test.			
Containment Action: Not required - result of qualification testing, not actual in-flight usage.			
Corrective Action: Not required - Bell accepted test results. If required, CCS would consider a) hard anodizing the pressure plate, or b) considering making the pressure plate out of stainless steel.			
Estimated C/A Completion Date:	N/A		
<b>Corrective Action Approvals (MFG, ENG, QA)</b>			
Engineering	N/A		Date:
Manufacturing	N/A		Date:
Quality Assurance	N/A		Date:
<b>Corrective Action Follow up (MFG, ENG, QA)</b>			
Follow up notes: Not required - Bell accepted test results.			
Follow Up Status?	Open <input type="checkbox"/>	Closed <input checked="" type="checkbox"/>	Performed by:
Not required - Bell accepted test results.			

APPENDIX V 8130-3 - AIRWORTHINESS APPROVAL TAGS

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 304

1. Approving Civil Aviation Authority/Country: <b>FAA/UNITED STATES</b>		2. Form Tracking Number: <b>TD0057.01-1</b>	
4. Organization Name and Address: <b>Bell Helicopter</b>			
6. Item: 7. Description:		9. Quantity:	10. Serial Number:
1	Gauge Pressure Switch	1	5
11. Status/Work: <b>Prototype</b>			
5. Work Order/Contract/Invoice Number:			
12. Remarks: Conformity Inspection. FAA ODA Project TD0057RC-R 8120-10 Tracking number TD0057.01. 1. CCS Envelope Drawing, Drawing No. 7G1191 Rev. Basic, Dated 01/13/2014 2. CCS Section Drawing, Drawing No. S7G1191 Rev. A, Dated 01/29/2014. No Deviations.			
13a. Certifies the items identified above were manufactured in conformity to: <input type="checkbox"/> Approved design data and are in a condition for safe operation. <input checked="" type="checkbox"/> Non-approved design data specified in Block 12.		14a. <input type="checkbox"/> 14 CFR 43.9 Return to Service <input type="checkbox"/> Other regulation specified in Block 12 Certifies that unless otherwise specified in block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.	
13b. Authorized Signature: 		14b. Authorized Signature:	
13c. Approval/Authorization No.: <b>ODA-710621-SW</b>		14c. Approval/Certificate No.:	
13d. Name (Typed or Printed): <b>Warren K. Pickering</b>		14d. Name (Typed or Printed):	
13e. Date (dd/mm/yyyy): <b>19/FEB/2014</b>		14e. Date (dd/mm/yyyy):	
User/Installer Responsibilities			
It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article. Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/articles(s) from the airworthiness authority of the country specified in Block 1. Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.			

NSN: 0052-00-012-9005

FAA Form 8130-3 (02-14)

1. Approving Civil Aviation Authority/Country: **FAA/UNITED STATES**  
 2. Form Tracking Number: **TD0057.01-2**

3. Organization Name and Address: **Bell Helicopter**  
 4. Organization Name and Address: **FAA Form 8130-3, AIRWORTHINESS APPROVAL TAG**  
 5. Work Order/Contract/Invoice Number:  
 6. Item: **1** 7. Description: **Gauge Pressure Switch** 8. Part Number: **7G1191** 9. Quantity: **1** 10. Serial Number: **6** 11. Status/Work: **Prototype**

12. Remarks:  
 Conformity Inspection. FAA ODA Project TD0057RC-R 8120-10 Tracking number TD0057.01.  
 1. CCS Envelope Drawing, Drawing No. 7G1191 Rev. Basic, Dated 01/13/2014  
 2. CCS Section Drawing, Drawing No. S7G1191 Rev. A, Dated 01/29/2014.  
 No Deviations.

13a. Certifies the items identified above were manufactured in conformity to:  
 Approved design data and are in a condition for safe operation.  
 Non-approved design data specified in Block 12.

13b. Authorized Signature: *Warren K. Pickering*  
 13c. Approval/Authorization No.: **ODA-710621-SW**  
 13d. Name (Typed or Printed): **Warren K. Pickering**  
 13e. Date (dd/mm/yyyy): **19/FEB/2014**

14a.  14 CFR 43.9 Return to Service  Other regulation specified in Block 12  
 Certifies that unless otherwise specified in block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.  
 14b. Authorized Signature:  
 14c. Approval/Certificate No.:  
 14d. Name (Typed or Printed):  
 14e. Date (dd/mm/yyyy):

It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article.  
 Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/articles(s) from the airworthiness authority of the country specified in Block 1.  
 Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.

1. Approving Civil Aviation Authority/Country: **FAA/UNITED STATES**

3. Form Tracking Number: **TD0057.01-3**

2. **AUTHORIZED RELEASE CERTIFICATE**  
 FAA Form 8130-3, AIRWORTHINESS APPROVAL TAG

4. Organization Name and Address: **Bell Helicopter**


5. Work Order/Contract/Invoice Number:

6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:
1	Gauge Pressure Switch	7G1191	1	7	Prototype

12. Remarks:  
 Conformity Inspection. FAA ODA Project TD0057RC-R 8120-10 Tracking number TD0057.01.  
 1. CCS Envelope Drawing, Drawing No. 7G1191 Rev. Basic, Dated 01/13/2014  
 2. CCS Section Drawing, Drawing No. S7G1191 Rev. A, Dated 01/29/2014.  
 No Deviations.

13a. Certifies the items identified above were manufactured in conformity to:

Approved design data and are in a condition for safe operation.  
 Non-approved design data specified in Block 12.

13b. Authorized Signature: 

13c. Approval/Authorization No.: **ODA-710621-SW**

13d. Name (Typed or Printed): **Warren K. Pickering**

13e. Date (dd/mm/yyyy): **19/FEB/2014**

14a.  14 CFR 43.9 Return to Service  Other regulation specified in Block 12

Certifies that unless otherwise specified in block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.

14b. Authorized Signature:

14c. Approval/Certificate No.:

14d. Name (Typed or Printed):

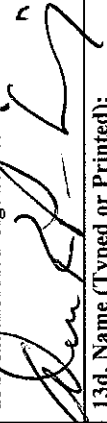
14e. Date (dd/mm/yyyy):

It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article.

**User/Installer Responsibilities**

Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/articles(s) from the airworthiness authority of the country specified in Block 1.

Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.

1. Approving Civil Aviation Authority/Country: <b>FAA/UNITED STATES</b>		2. <b>AUTHORIZED RELEASE CERTIFICATE</b> FAA Form 8130-3, AIRWORTHINESS APPROVAL TAG		3. Form Tracking Number: <b>TD0057.01-4</b>	
4. Organization Name and Address: <b>Bell Helicopter</b>				5. Work Order/Contract/Invoice Number:	
6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:
1	Gauge Pressure Switch	7G1191	1	8	Prototype
12. Remarks: Conformity Inspection. FAA ODA Project TD0057RC-R 8120-10 Tracking number TD0057.01. 1. CCS Envelope Drawing, Drawing No. 7G1191 Rev. Basic, Dated 01/13/2014 2. CCS Section Drawing, Drawing No. S7G1191 Rev. A, Dated 01/29/2014. No Deviations.					
13a. Certifies the items identified above were manufactured in conformity to: <input type="checkbox"/> Approved design data and are in a condition for safe operation. <input checked="" type="checkbox"/> Non-approved design data specified in Block 12.			14a. <input type="checkbox"/> 14 CFR 43.9 Return to Service <input type="checkbox"/> Other regulation specified in Block 12 Certifies that unless otherwise specified in block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.		
13b. Authorized Signature: 		13c. Approval/Authorization No.: <b>ODA-710621-SW</b>		14c. Approval/Certificate No.:	
13d. Name (Typed or Printed): <b>Warren K. Pickering</b>		13e. Date (dd/mm/yyyy): <b>19/FEB/2014</b>		14e. Date (dd/mm/yyyy):	
<b>User/Installer Responsibilities</b>					
It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article. Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/articles(s) from the airworthiness authority of the country specified in Block 1. Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.					

NSN: 0052-00-012-9005

FAA Form 8130-3 (02-14)

APPENDIX W TEST WITNESS SIGNATURE SHEETS

<b>Custom Control Sensors, Inc.</b>	CAGE CODE	CCS P/N	DOCUMENT TITLE
	09049	7G1191	QUALIFICATION TEST REPORT (QTR)
	DATE 05/23/14	REVISION A	PAGE 309



**ORGANIZATION DESIGNATION AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

<b>Unit Member Name:</b> Weeks, Eugene	<b>Designation:</b> Systems & Equipment (Electrical)
<b>Unit Member Number:</b> UM067	<b>Phone:</b> 602 418-9753
	<b>Unit Member Category:</b> BHTI

<b>ODA Project Number:</b> TD0057RC-R	<b>ODA Project Name:</b> Fuel Pressure Switch	<b>Model:</b> 412
--	--	----------------------

**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No  Yes (EFUM cannot witness this test)

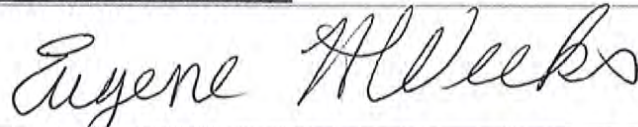
<b>Test Plan Number:</b> QTP-7G1191 Rev H	<b>Test Plan Title:</b> Qualification Test Procedure
--	---

**Description of ODA-Approved Test Article Deviations:**  
None

**Additional Information (vendor/location/duration/schedule, etc.):**  
Tests will be performed at CCS facility in Chatsworth, CA weeks of 2/24/2014 thru 3/10,2014

<b>Certification Test Checklist</b>	<b>Verify:</b>	<b>Verification Date:</b>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	2/24/2014
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	2/24/2014
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	2/24/2014
The Test Set-Up has been conformed	<input checked="" type="radio"/> Yes <input type="radio"/> No	2/24/2014
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	2/24/2014
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	3/4/2014

**Test Witness Participation Period:** Start 2/24/2014 End 3/4/2014

**Signature of the Test Witness:**  **Date:** 4/8/2014

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

This form is only required for Certification Tests other than Flight Tests



**ORGANIZATION DESIGNATION  
AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

**Unit Member Name:** Fletcher, Timothy      **Designation:** Systems & Equipment (Mechanical)  
**Unit Member Number:** UM060      **Phone:** 817-280-4997      **Unit Member Category:** BHTI

**ODA Project Number:** TD0057RC-R      **ODA Project Name:** 412 Fuel Pressure Switch Improvement      **Model:** 412

**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No     Yes (EFUM cannot witness this test)

**Test Plan Number:** QTP-7G1191, Rev. H      **Test Plan Title:** Qualification Test Procedure (QTP) CCS p/n 7G1191

**Description of ODA-Approved Test Article Deviations:**  
 N/A

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS) / Chatsworth, CA  
 I witnessed the Vibration and Shock tests at CCS' in-house test lab.  
 \* I performed verification of the test set-up rather than have conformity performed by a MMUM.

<u>Certification Test Checklist</u>	<u>Verify:</u>	<u>Verification Date</u>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	2/24/2014
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	2/19/2014
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No *	
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	

**Test Witness Participation Period:** Start 3/6/2014      End 3/7/2014

**Signature of the Test Witness:**       **Date:** 3/10/2014

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

This form is only required for Certification Tests other than Flight Tests



**ORGANIZATION DESIGNATION AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

**Unit Member Name:**  **Designation:**   
**Unit Member Number:**  **Phone:**  **Unit Member Category:**

**ODA Project Number:**  **ODA Project Name:**  **Model:**   
**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No  Yes (EFUM cannot witness this test)

**Test Plan Number:**  **Test Plan Title:**

**Description of ODA-Approved Test Article Deviations:**  
 None.

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS), Chatsworth CA.  
 \* I verified the test set-up for the **Altitude Test** portion of the qualification test rather than having it conformed by a MMUM.

<u>Certification Test Checklist</u>	<u>Verify:</u>	<u>Verification Date:</u>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="2/24/2014"/>
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<input type="text" value="2/19/2014"/>
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="2/19/2014"/>
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="3/20/2014"/>
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="3/20/2014"/>
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="3/20/2014"/>

**Test Witness Participation Period:** Start  End

**Signature of the Test Witness:**  **Date:**

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

**This form is only required for Certification Tests other than Flight Tests**



**ORGANIZATION DESIGNATION AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

<b>Unit Member Name:</b> Madej, Paul	<b>Designation:</b> Powerplant (Engine)
<b>Unit Member Number:</b> UM061	<b>Phone:</b> 817 280-8442
<b>Unit Member Category:</b> BHTI	

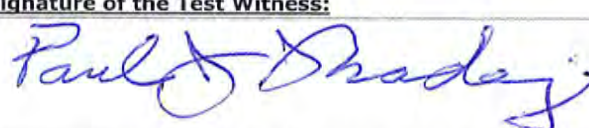
<b>ODA Project Number:</b> TD0057RC-R	<b>ODA Project Name:</b> M412 Fuel Pressure Switch Improvement	<b>Model:</b> 412
<b>Is Test Witnessing Retained by the FAA as a Specific Finding?</b> <input checked="" type="radio"/> No <input type="radio"/> Yes (EFUM cannot witness this test)		

<b>Test Plan Number:</b> QTP7G1191 Rev. H	<b>Test Plan Title:</b> Qualification Test Procedure CCS P/N 7G1191
<b>Description of ODA-Approved Test Article Deviations:</b> None.	

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS), Chatsworth CA.  
 \* I verified the test set-up for the **Crash Safety Test** portion of the qualification test rather than having it conformed by a MMUM.

<b>Certification Test Checklist</b>	<b>Verify:</b>	<b>Verification Date:</b>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	2/24/2014
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	2/19/2014
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	2/19/2014
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No ✖	3/27/2014
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	3/27/2014
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	3/27/2014

**Test Witness Participation Period:** Start 3/27/2014 End 3/27/2014

<b>Signature of the Test Witness:</b> 	<b>Date:</b> 4/9/2014
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The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

**This form is only required for Certification Tests other than Flight Tests**



**ORGANIZATION DESIGNATION AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

**Unit Member Name:**  **Designation:**   
**Unit Member Number:**  **Phone:**  **Unit Member Category:**

**ODA Project Number:**  **ODA Project Name:**  **Model:**   
**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No  Yes (EFUM cannot witness this test)

**Test Plan Number:**  **Test Plan Title:**

**Description of ODA-Approved Test Article Deviations:**  
 None.

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS) Chatsworth CA. subcontracted Environmental Associates Inc., Chatsworth CA. to perform the **Dust Test**.  
 \* I verified the **Dust Test** set-up as an EFUM rather than having it conformed by a MMUM.

<b>Certification Test Checklist</b>	<b>Verify:</b>	<b>Verification Date:</b>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="2/24/2014"/>
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<input type="text" value="2/19/2014"/>
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="2/19/2014"/>
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No <input checked="" type="radio"/> *	<input type="text" value="3/20/2014"/>
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="3/20/2014"/>
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="3/21/2014"/>

**Test Witness Participation Period:** Start  End

**Signature of the Test Witness:**  **Date:**

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

This form is only required for Certification Tests other than Flight Tests

**Test Witness Signature Sheet**  
**ODAF.16 Rev. B**


**Unit Member Name:** Madej, Paul **Designation:** Powerplant (Engine)  
**Unit Member Number:** UM061 **Phone:** 817 280-8442 **Unit Member Category:** BHTI

**ODA Project Number:** TD0057RC-R **ODA Project Name:** M412 Fuel Pressure Switch Improvement **Model:** 412  
**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No  Yes (EFUM cannot witness this test)


**Test Plan Number:** QTP7G1191 Rev. H **Test Plan Title:** Qualification Test Procedure CCS P/N 7G1191

**Description of ODA-Approved Test Article Deviations:**  
 None.

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS), Chatsworth CA.  
 \* I verified the test set-up for the **Endurance Test** portion of the qualification test rather than having it conformed by a MMUM.

<u>Certification Test Checklist</u>	<u>Verify:</u>	<u>Verification Date:</u>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<u>2/24/2014</u>
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<u>2/19/2014</u>
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<u>2/19/2014</u>
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No 	<u>3/11/2014</u>
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<u>3/11/2014</u>
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	<u>3/27/2014</u>

**Test Witness Participation Period:** **Start** 3/11/2014 **End** 3/27/2014

**Signature of the Test Witness:**  **Date:** 4/9/2014

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

This form is only required for Certification Tests other than Flight Tests



**ORGANIZATION DESIGNATION AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

**Unit Member Name:**  **Designation:**   
**Unit Member Number:**  **Phone:**  **Unit Member Category:**

**ODA Project Number:**  **ODA Project Name:**  **Model:**   
**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No  Yes (EFUM cannot witness this test)

**Test Plan Number:**  **Test Plan Title:**   
**Description of ODA-Approved Test Article Deviations:**  
 None.

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS), Chatsworth CA.  
 \* I verified the test set-up for the **Explosion Proof Test** portion of the qualification test rather than having it conformed by a MMUM.

<b>Certification Test Checklist</b>	<b>Verify:</b>	<b>Verification Date:</b>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="2/24/2014"/>
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<input type="text" value="2/19/2014"/>
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="2/19/2014"/>
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No	<input type="text" value="3/20/2014"/>
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="3/20/2014"/>
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="3/26/2014"/>

**Test Witness Participation Period:** Start  End

**Signature of the Test Witness:**  **Date:**

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

**This form is only required for Certification Tests other than Flight Tests**



**ORGANIZATION DESIGNATION AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

**Unit Member Name:**  **Designation:**   
**Unit Member Number:**  **Phone:**  **Unit Member Category:**

**ODA Project Number:**  **ODA Project Name:**  **Model:**   
**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No  Yes (EFUM cannot witness this test)

**Test Plan Number:**  **Test Plan Title:**

**Description of ODA-Approved Test Article Deviations:**

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS), Chatsworth CA.  
 \* I verified the test set-up for the **Post-Test Acceptance Test** portion of the qualification test rather than having it conformed by a MMUM.

<u>Certification Test Checklist</u>	<u>Verify:</u>	<u>Verification Date:</u>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="2/24/2014"/>
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<input type="text" value="2/19/2014"/>
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="2/19/2014"/>
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No *	<input type="text" value="3/27/2014"/>
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="3/26/2014"/>
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="3/26/2014"/>

**Test Witness Participation Period:** **Start**  **End**

**Signature of the Test Witness:**  **Date:**

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

This form is only required for Certification Tests other than Flight Tests



**ORGANIZATION DESIGNATION AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

**Unit Member Name:**  **Designation:**   
**Unit Member Number:**  **Phone:**  **Unit Member Category:**

**ODA Project Number:**  **ODA Project Name:**  **Model:**   
**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No  Yes (EFUM cannot witness this test)

**Test Plan Number:**  **Test Plan Title:**

**Description of ODA-Approved Test Article Deviations:**

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS) Chatsworth CA. subcontracted Environmental Associates Inc., Chatsworth CA. to perform the **Salt Fog** Test.  
 \* I verified the **Salt Fog** test set-up as an EFUM rather than having it conformed by a MMUM.

<b>Certification Test Checklist</b>	<b>Verify:</b>	<b>Verification Date:</b>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="2/24/2014"/>
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<input type="text" value="2/19/2014"/>
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="2/19/2014"/>
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No	<input type="text" value="3/11/2014"/>
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="3/11/2014"/>
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="3/20/2014"/>

**Test Witness Participation Period:** **Start**  **End**

**Signature of the Test Witness:**  **Date:**

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

This form is only required for Certification Tests other than Flight Tests



**ORGANIZATION DESIGNATION AUTHORIZATION**

**ODA-710621-SW**

**Test Witness Signature Sheet  
ODAF.16 Rev. B**

**Unit Member Name:**  **Designation:**   
**Unit Member Number:**  **Phone:**  **Unit Member Category:**

**ODA Project Number:**  **ODA Project Name:**  **Model:**   
**Is Test Witnessing Retained by the FAA as a Specific Finding?**  
 No  Yes (EFUM cannot witness this test)

**Test Plan Number:**  **Test Plan Title:**

**Description of ODA-Approved Test Article Deviations:**  
 None.

**Additional Information (vendor/location/duration/schedule, etc.):**  
 Custom Control Sensors Inc. (CCS) Chatsworth CA. subcontracted Environmental Associates Inc., Chatsworth CA., who subcontracted Independent Testing Laboratories Inc., Costa Mesa CA. to perform the **Sand Test**.  
 \* I verified the **Sand Test** set-up as an EFUM rather than having it conformed by a MMUM.

<b>Certification Test Checklist</b>	<b>Verify:</b>	<b>Verification Date:</b>
The Test Plan has been approved (by ODA or FAA)	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="2/24/2014"/>
The Test Article has been conformed (by MMUM)	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<input type="text" value="2/19/2014"/>
All Test Article Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="2/19/2014"/>
The Test Set-Up has been conformed	<input type="radio"/> Yes <input checked="" type="radio"/> No	<input type="text" value="3/25/2014"/>
All Test Set-Up Unsats have been acceptably dispositioned	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> N/A	<input type="text" value="3/25/2014"/>
The Test Witnessing Function is complete	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="text" value="3/27/2014"/>

**Test Witness Participation Period:** Start  End

**Signature of the Test Witness:** **Date:**

The EFUM Test Witness is responsible for including a copy of this completed form in the Test Report  
 If more than one EFUM witnesses the test, each EFUM must prepare a form for his part of the test.

**This form is only required for Certification Tests other than Flight Tests**