

National Technical Systems Test Report for Environmental Testing of the ClearCast

Prepared For

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Prepared By

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Robert Polverari
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Revision History

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1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Environmental test program. The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements listed in Section 2.0.

2.0 References

The following references listed below form a part of this document to the extent specified herein.

- Pro V&V, Inc. Purchase Order(s) 2020-010, dated 10/26/2020
- National Technical Systems (NTS) Quote(s) OP0565143, dated 10/27/2020
- NTS Corporate Quality Policy Manual, Revision 9, dated 9/20/2018
- ISO/IEC 17025:2017(E) *General Requirements for the Competence of Testing and Calibration Laboratories*, dated 11/1/2017
- Test Specification: MIL-STD-810D

3.0 Product Selection and Description

Pro V&V, Inc. selected and provided the test sample(s) to be used as the Equipment Under Test. Details below:

Table 3.0-1: Product Identification - Equipment Under Test (EUT)

Item	Qty.	Name/Description	Part Number	Serial Number
1	1	ClearCast	BB1	CCER0401005
2	1	ClearCast	BB2	CCER0401003
3	1	ClearCast	BB3	CCER0401002
4	1	ClearCast	ClearCast	N/A

3.1 Security Classification

Non-classified

4.0 General Test Requirements

4.1 Test Equipment

NTS-provided equipment is calibrated according to ISO/IEC 17025:2017(E) and calibration is traceable to the National Institute of Standards and Technology (NIST). Calibration records are maintained on file at NTS.

4.2 Notice of Deviation

In accordance with NTS' quality procedures, when the EUT is observed to exceed or display susceptibility, a Notice of Deviation (NOD) document is generated by the technician performing the test. This NOD documents the requirement, how the EUT deviated from the requirement, and allows room for resolution of the deviation.

This document is reviewed and approved by the NTS Program Manager or Engineer and the NTS Quality Assurance Representative, and then forwarded to the customer contact. Once mitigated (or passed over), the steps taken to correct the deviation (or simply instruction from the customer to continue testing) are recorded in the NOD and a copy of the NOD is integrated into the body of the report, in the appropriate location.



5.0 Test Descriptions and Results

Table 5.0-1: Summary of Test Information & Results

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result*
5.1	Low Temperature	MIL-STD-810D	Longmont	12/14/2020 - 12/14/2020	BB2, BB3	CCER0401003, CCER0401002	N/A
5.2	High Temperature	MIL-STD-810D	Longmont	12/11/2020 - 12/14/2020	BB2, BB3	CCER0401003, CCER0401002	N/A
5.3	Humidity	MIL-STD-810D	Longmont	12/01/2020 - 12/11/2020	BB2, BB3	CCER0401003, CCER0401002	N/A
5.4	Bench Handling	MIL-STD-810D	Longmont	12/15/2020 - 12/15/2020	BB1	CCER0401005	N/A
5.5	Transportation Vibration	MIL-STD-810D	Longmont	12/17/2020 - 12/17/2020	ClearCast	N/A	N/A
5.6	Temperature/Power Variation	MIL-STD-810D	Longmont	12/14/2020 - 12/16/2020	BB2, BB3	CCER0401003, CCER0401002	N/A

*The decision rule used to state compliance is in accordance with the test specification used for testing. Unless otherwise noted, testing was performed in accordance with the latest published version of test specification at time of test.

5.1 Low Temperature

5.1.1 Test Result

N/A

5.1.2 Test Procedure

See below.

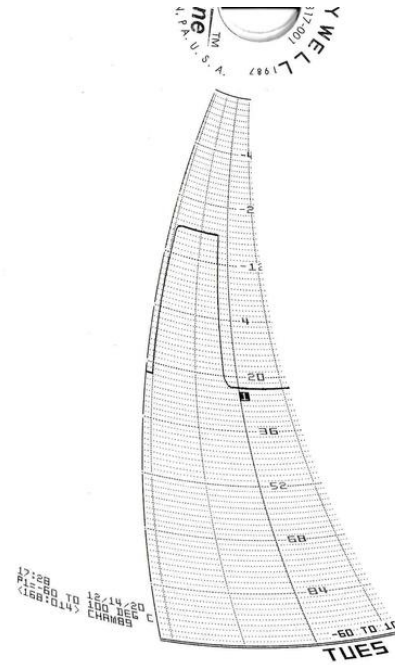
5.1.3 Test Datasheets

Start Date: 12/14/20		End Date: 12/14/20	MJO No: PR127745-00
Customer: Pro V&V/ClearVote 2.2		Test Performed: Cold Temperature Test	Test By: KM
Part Name: ClearCast		Serial No: See UUT Details	Customer Witness: N/A
Page 1 of 1		Test Specification: MIL-STD_810D	Temp: -20c Humidity: N/A
Date	Time	Remarks	Initials
12/14/20	17:40	Start the following test profile	KM
		Ramp to +23c	
		Ramp to -20c	
		Dwell at -20 for 4hrs	
		Ramp to +23c	
		Customer inspected UUT and performed post-test functional test on UUT	
12/14/20	11:00	Test complete	KM
		Note: All test pass or fail determinations decided by Pro V&V Inc.	

5.1.4 Test Photographs



5.1.5 Test Data



-20c_Graph_Data



5.1.6 Test Equipment List

Table 5.1-1: Low Temperature Test Equipment List

Asset Number	Mfct	Description	M/N	S/N	Range	Start Date	End Date	Last Cal	Cal Interval (Months)	Cal Due	Notes
WC061430	Team Corporation	Horizontal Electro Hydraulic Shaker, HYD 05	188-48-16	494		11/30/2020	12/18/2020		12	NCR	
WC061574	Honeywell	CHART RECORDER	DR4500	0220Y2 5506320 0001		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	
WC061721	Envirotronics	Solutions Plus	2173A	N/A		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.2 High Temperature

5.2.1 Test Result

N/A

5.2.2 Test Procedure

See below.

5.2.3 Test Datasheets

Start Date: 12/11/20		End Date: 12/14/20		MJO No: PR127745-00	
Customer: Pro V&V/ClearVote 2.2			Test Performed: High Temperature Test		Test By: KM
Part Name: ClearCast		Serial No: See UUT Details		Customer Witness: N/A	
Page 1 of 1		Test Specification: MIL-STD_810D		Temp: +60c Humidity: N/A	
Date	Time	Remarks			Initials
12/11/20	12:30	Start the following test profile			KM
		Ramp to +23c			
		Ramp to +60c			
		Dwell at +60 for 4hrs			
		Ramp to +23c			
		Customer inspected UUT and performed post-test functional test on UUT			
12/14/20	17:30	Test complete			KM
		Note: All test pass or fail determinations decided by Pro V&V Inc.			

5.2.4 Test Photographs





5.2.6 Test Equipment List

Table 5.2-1: High Temperature Test Equipment List

Asset Number	Mfct	Description	M/N	S/N	Range	Start Date	End Date	Last Cal	Cal Interval (Months)	Cal Due	Notes
WC061430	Team Corporation	Horizontal Electro Hydraulic Shaker, HYD 05	188-48-16	494		11/30/2020	12/18/2020		12	NCR	
WC061720	Envirotronics	Temp/Hum chamber, CH 89	EH40-1-3-RAC/M P-LN2	11087101		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	
WC061574	Honeywell	CHART RECORDER	DR4500	0220Y255063200001		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	
WC061721	Envirotronics	Solutions Plus	2173A	N/A		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.3 Humidity

5.3.1 Test Result

N/A

5.3.2 Test Procedure

See below.

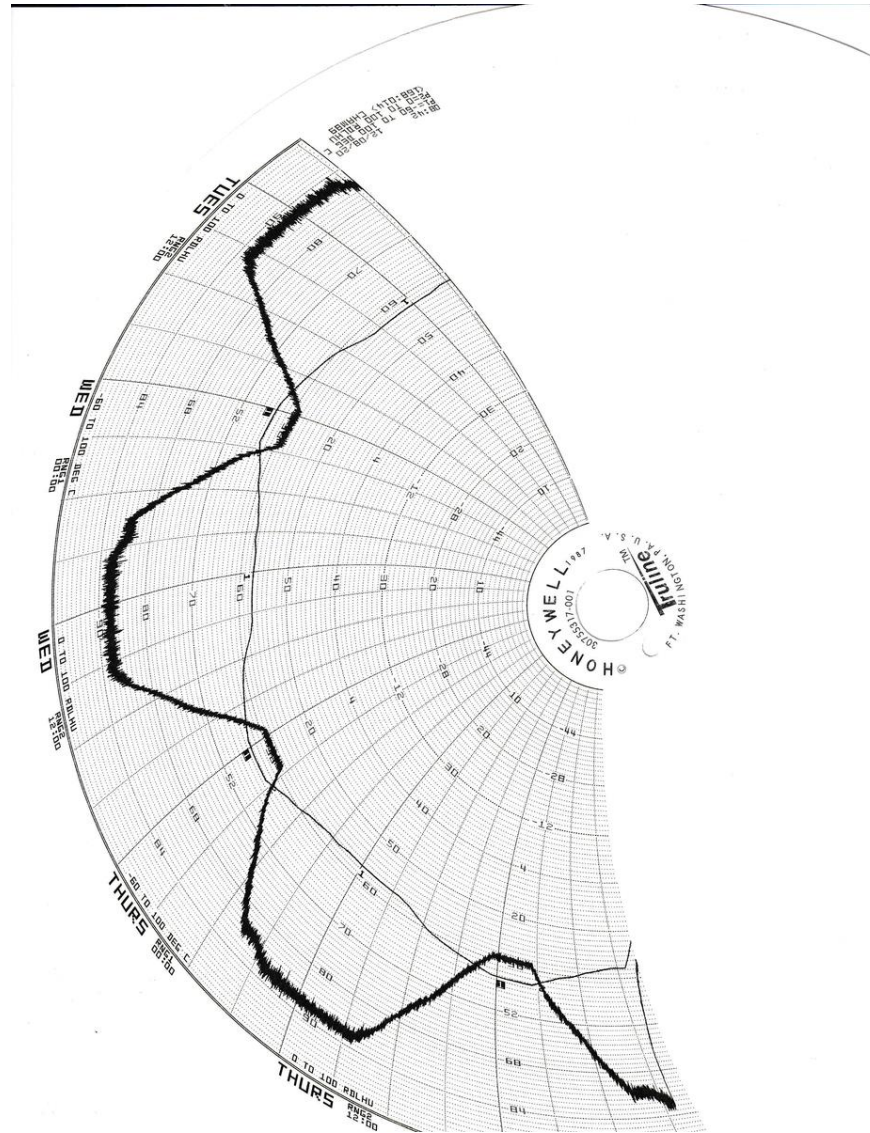
5.3.3 Test Datasheets

Start Date: 12/01/20		End Date: 12/11/20	MJO No: PR127745-00
Customer: Pro V&V/ClearVote 2.2		Test Performed: 10 Day Temperature/Humidity Test	Test By: KM
Part Name: ClearCast		Serial No: See UUT Details	Customer Witness: N/A
Page 1 of 1		Test Specification: MIL-STD_810D	Temp: +31c to +41c Humidity: 59% RH to 88% RH
Date	Time	Remarks	Initials
12/01/20	08:00	Customer performed pre-test functional test on UUT	KM
12/01/20	09:00	Install UUT in chamber	KM
12/01/20	09:35	Start test profile mil-810 hot hum 10 day test	KM
12/11/20	10:30	Test has completed mil-810 hot hum 10 day test	KM
12/11/20	10:35	Chamber at +23c ambient	KM
12/11/20	10:40	Open chambers doors	KM
12/11/20	10:45	Customer inspected UUT and performed post-test functional test on UUT	KM
12/11/20	11:00	Test complete	KM
Note: All test pass or fail determinations decided by Pro V&V Inc.			

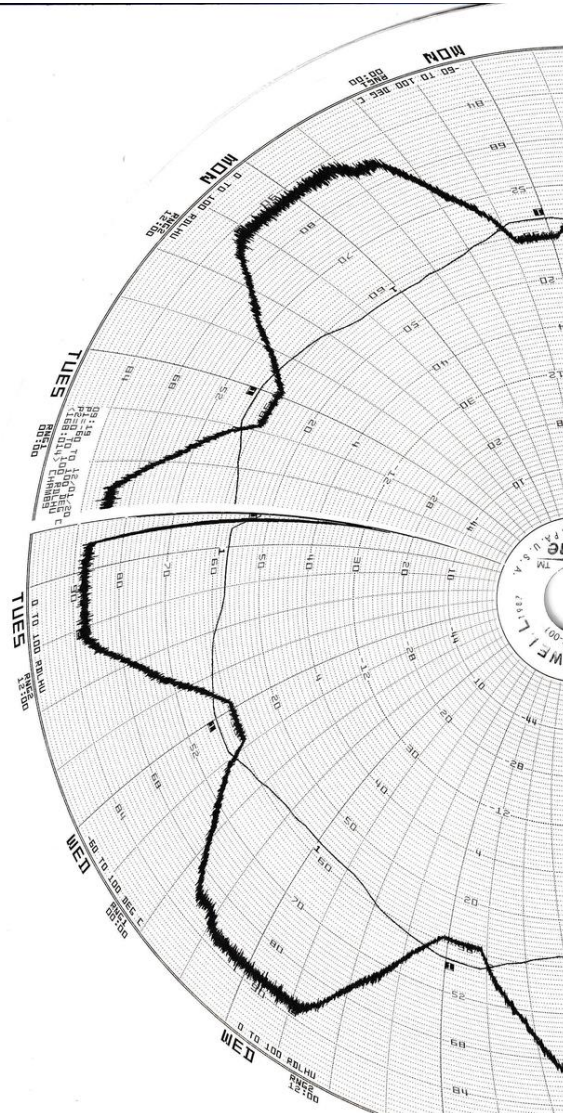
5.3.4 Test Photographs



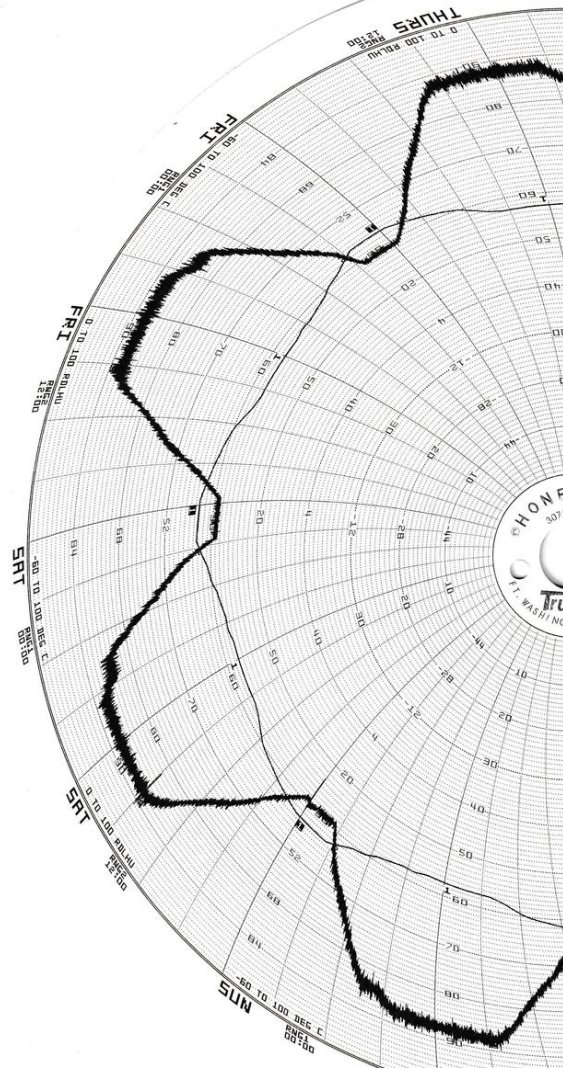
5.3.5 Test Data



Ch 89_3 Days_Humidity Test_Graph_Data



Ch 89_7 Days_Humidity Test_Graph_Data_Page_1



Ch 89_7 Days_Humidity Test_Graph_Data_Page_2



5.3.6 Test Equipment List

Table 5.3-1: Humidity Test Equipment List

Asset Number	Mfct	Description	M/N	S/N	Range	Start Date	End Date	Last Cal	Cal Interval (Months)	Cal Due	Notes
WC061430	Team Corporation	Horizontal Electro Hydraulic Shaker, HYD 05	188-48-16	494		11/30/2020	12/18/2020		12	NCR	
WC061720	Envirotronics	Temp/Hum chamber, CH 89	EH40-1-3-RAC/M P-LN2	11087101		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	
WC061574	Honeywell	CHART RECORDER	DR4500	0220Y255063200001		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	
WC061721	Envirotronics	Solutions Plus	2173A	N/A		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.4 Bench Handling

5.4.1 Test Result

N/A

5.4.2 Test Datasheets

Start Date: 12/15/20		End Date: 12/15/20	MJO No: PR127745-00
Customer: Pro V&V/ClearVote 2.2		Test Performed: Bench Test	Test By: KM
Part Name: ClearCast		Serial No: CCER0401005, BB-1	Customer Witness: Yes
Page 1 of 1		Test Specification: MIL-STD_810D	Temp: N/A Humidity: N/A
Date	Time	Remarks	Initials
12/15/20	17:30	Start 6 drops per corner of UUT from 4 inches	KM
		Total of 24 drops from 4 inches for UUT complete	
12/15/20	18:00	Test Complete and customer performed posttest	KM
		Note: All test pass or fail determinations decided by Pro V&V Inc.	

5.4.3 Test Photographs





5.4.4 Test Equipment List

Table 5.4-1: Bench Handling Test Equipment List

Asset Number	Mfct	Description	M/N	S/N	Range	Start Date	End Date	Last Cal	Cal Interval (Months)	Cal Due	Notes
WC061430	Team Corporation	Horizontal Electro Hydraulic Shaker, HYD 05	188-48-16	494		11/30/2020	12/18/2020		12	NCR	
WC061559	StorageTek	Temp/Hum chamber, CH 59	N/A			11/30/2020	12/18/2020	10/05/2020	12	10/05/2021	
WC061722	Envirotronics	Temp/Hum chamber, CH 91	EH64-2-5	08963401		11/30/2020	12/18/2020	02/11/2020	12	02/11/2021	

Calibration Abbreviations

CAL: Calibration
NCR: No Calibration Required



5.5 Transportation Vibration

5.5.1 Test Result

N/A

5.5.2 Test Procedure

See below.

5.5.3 Test Datasheets

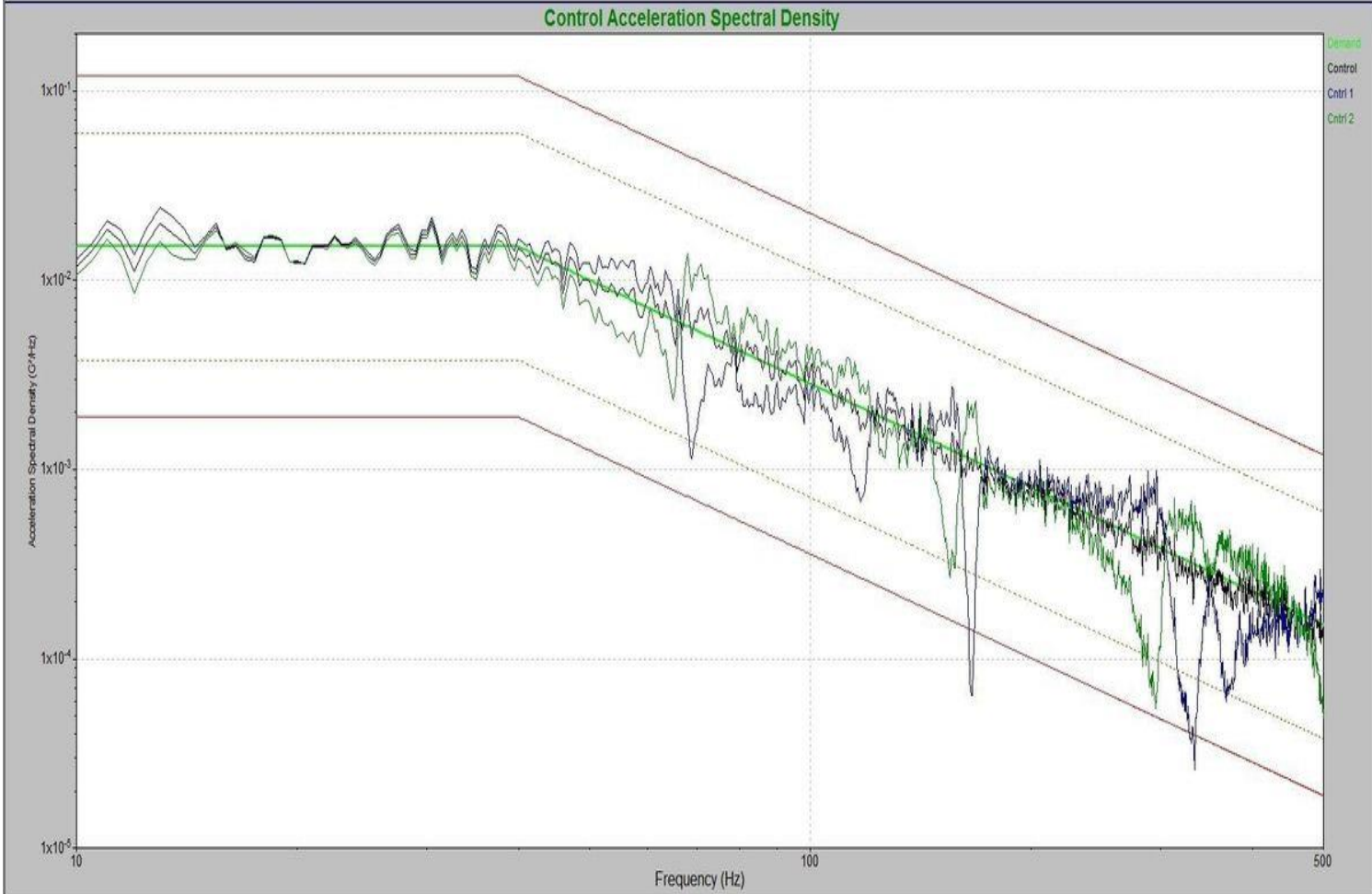
Start Date: 12/17/20		End Date: 12/17/20		MJO No: PR127745-00		
Customer: Pro V&V		Test Performed: Random Vibration		Test Engineer: Michael Nash		
Part Name: Clear Cast		Serial numbers: n/a		Customer Witness: n/a		
Page of		Test Specification: Customer SOW & MIL-STD-810D		Temp: 68° Humidity: 18%		
Date	Time	Axis	Plot No.	Serial No.	Remarks	Initials
12/17/20		Vert			Setup UUT on shaker HYD06 in the Vertical-Axis	MN
	0834		Run 1		Run 1.04 gRMS common carrier random profile on the UUT in the Vertical-Axis	MN
		Long			Setup UUT on shaker ED02 in the Longitudinal-Axis	MN
	1405		Run 2		Run 0.74 gRMS common carrier random profile on the UUT in the Longitudinal-Axis	MN
		Trans			Setup UUT on shaker ED02 in the Transverse-Axis	MN
	1513		Run 3		Run 0.2 gRMS common carrier random profile on the UUT in the Transverse-Axis	MN
					Testing complete	MN

5.5.4 Test Photographs



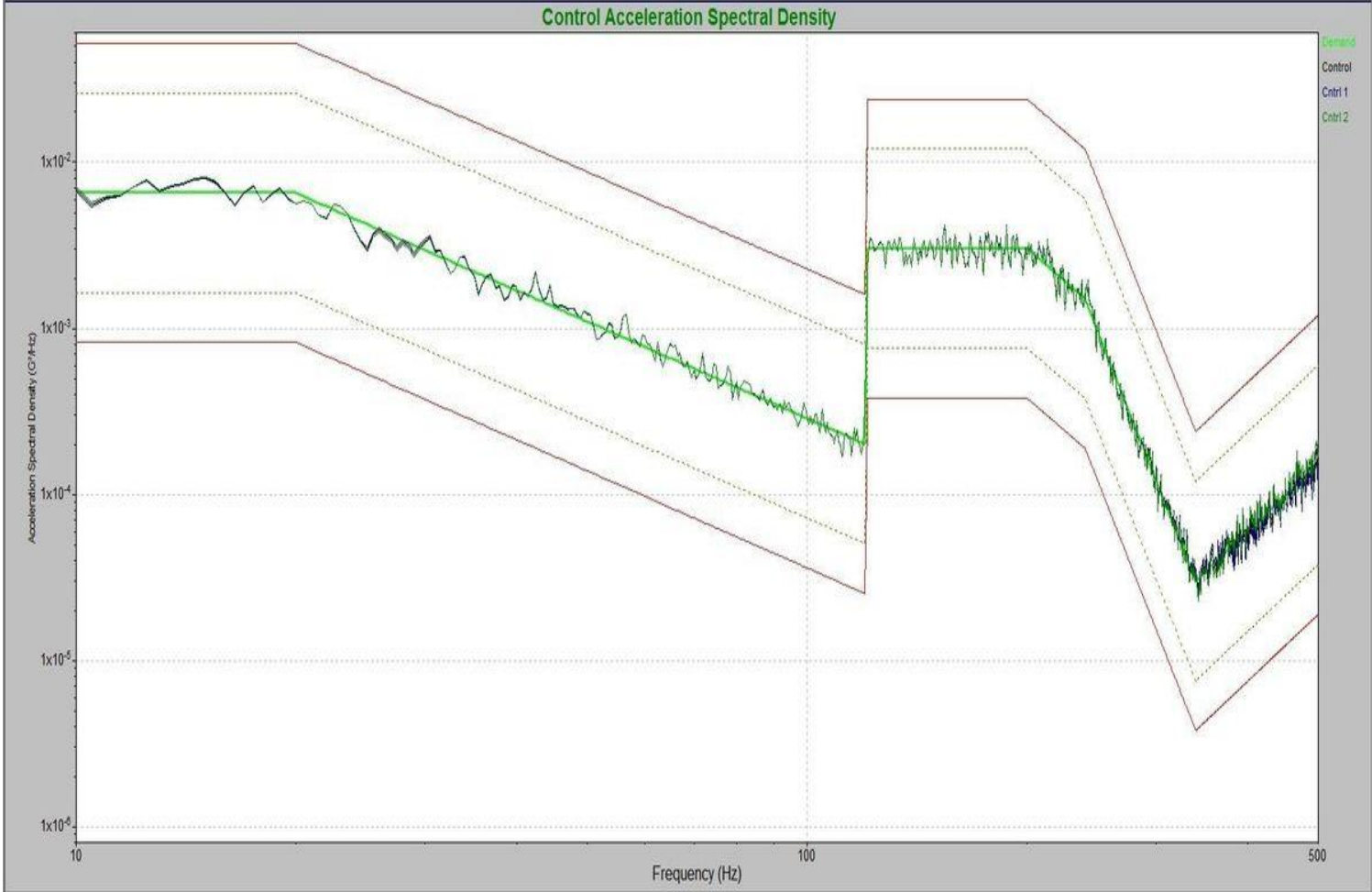
5.5.5 Test Data

NTS Longmont, CO	Level Time: 1:00:00	Demand: 1.045 G RMS	Pro V&V
Job# PR127745-00	Total Time: 1:00:16	Control: 1.053 G RMS	UUT: Clear Cast
Dec 17, 2020 08:34:54	Run 1	Test axis: Vertical	



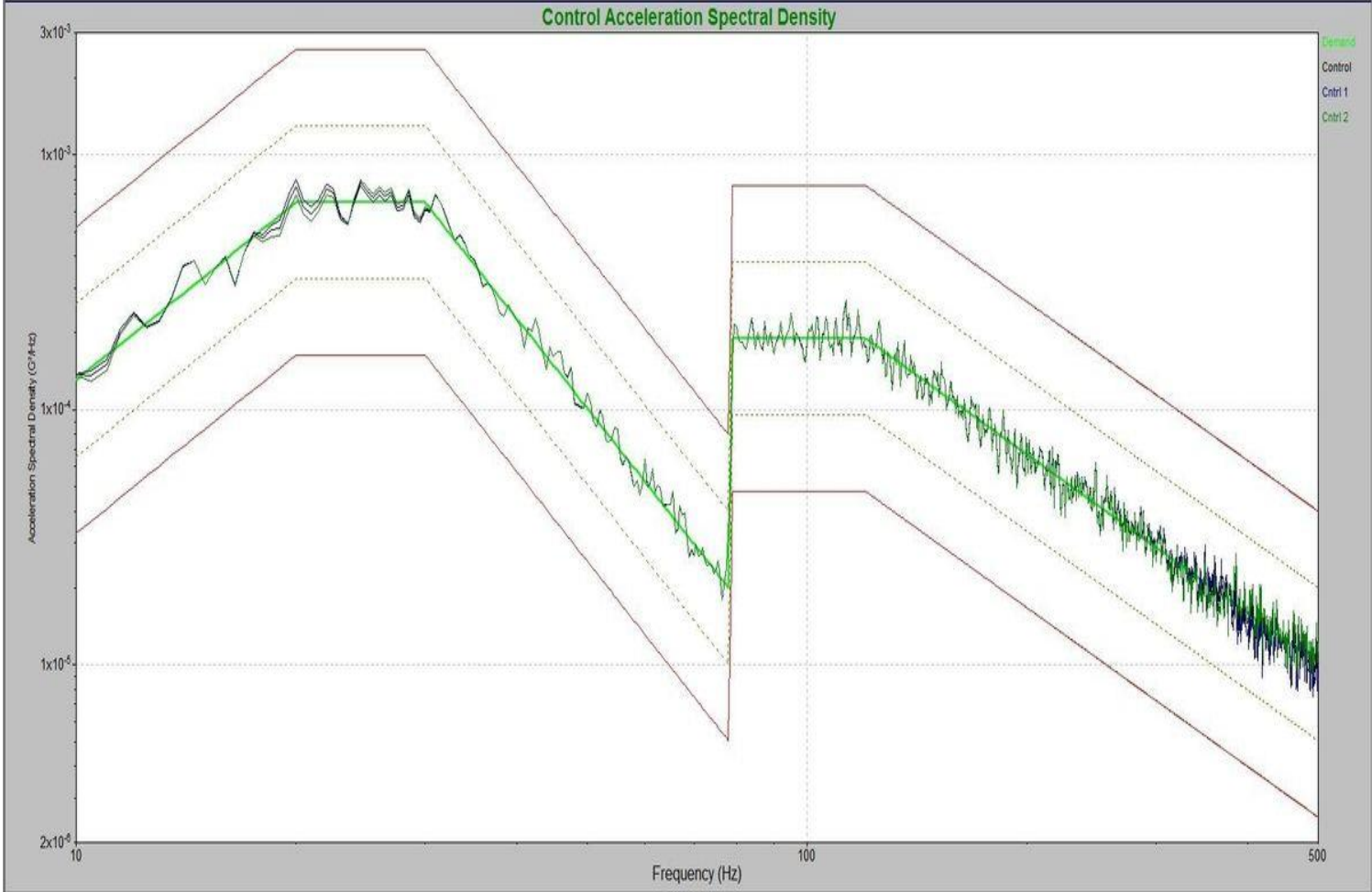
Run 1

NTS Longmont, CO	Level Time: 1:00:00	Demand: 0.7414 G RMS	Pro V&V
Job# PR127745-00	Total Time: 1:00:10	Control: 0.7445 G RMS	UUT: Clear Cast
Dec 17, 2020 14:05:43	Run 2	Test axis: Longitudinal	



Run 2

NTS Longmont, CO	Level Time: 1:00:00	Demand: 0.2036 G RMS	Pro V&V
Job# PR127745-00	Total Time: 1:00:10	Control: 0.2048 G RMS	UUT: Clear Cast
Dec 17, 2020 15:13:48	Run 3	Test axis: Transverse	



Run 3



5.5.6 Test Equipment List

Table 5.5-1: Transportation Vibration Test Equipment List

ID Number	WC Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1750	WC061429	Team	80/10.5	544	Shaker System HYD06	NCR	
1755	WC043856	Ling Electronics	DMA48/36 B335	83/338	Shaker System ED2	NCR	
1704	WC061701	VR	VR9500	9521DE37	Vibration Controller	5/15/2020	5/15/2021
1670	WC061499	PCB	333A12	30536	Accelerometer	10/7/2020	10/7/2021
1672	WC061498	PCB	333A12	30538	Accelerometer	10/7/2020	10/7/2021
1623	WC070229	PCB	J320C02	10085	Accelerometer	4/14/2020	4/30/2021
1701	WC059861	PCB	353B02	205370	Accelerometer	4/14/2020	4/30/2021
1766	WC070466	Fluke	971	3623064	Temp/Humidity Meter	4/15/2020	4/15/2021

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.6 Temperature/Power Variation

5.6.1 Test Result

N/A

5.6.2 Test Procedure

See below.

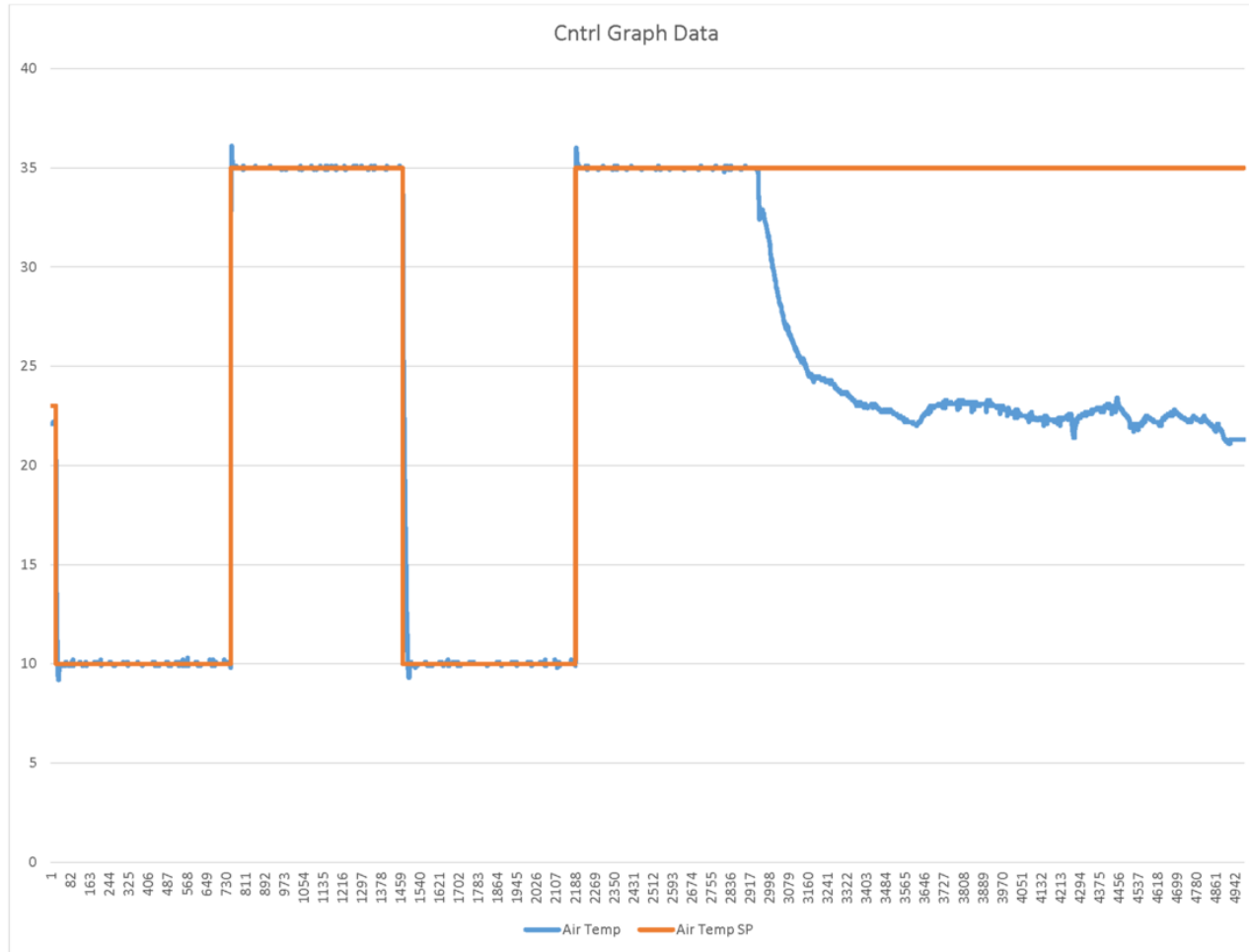
5.6.3 Test Datasheets

Start Date: 12/14/20		End Date:12/16/20	MJO No: PR127745-00
Customer: Pro V&V/ClearVote 2.2		Test Performed: Temperature Power Variation Test	Test By: KM
Part Name: ClearCast		Serial No: See UUT Details Sheet	Customer Witness: Yes
Page 1 of 1		Test Specification: MIL-STD_810D	Temp: +10c to +35c Voltage: 105vlts to 129vlts
Date	Time	Remarks	Initials
12/14/20	09:25	Set VAC to 117vlts & ramp to +10c	RSP
12/ 4/20	09:30	Start dwell at 117vlts & +10c for 4hrs	RSP
12/14/20	13:30	Lower VAC to 105vlts & dwell for 4hrs	GM
12/14/20	17:30	Raise VAC to 129vlts & dwell for 4hrs	KM
12/14/20	21:30	Lower VAC to 117vlts & Raise temperature to +35c & dwell for 4hrs	KM
12/15/20	01:30	Lower VAC to 105vlts & dwell for 4hrs	KM
12/15/20	05:30	Raise VAC to 129vlts & dwell for 4hrs	GM
12/15/20	09:30	Lower VAC to 117vlts & Lower temperature to +10c & dwell for 4hrs	GM
12/15/20	13:30	Lower VAC to 105vlts & dwell for 4hrs	GM
12/15/20	17:30	Raise VAC to 129vlts & dwell for 4hrs	KM
12/15/20	21:30	Lower VAC to 117vlts & Raise temperature to +35c & dwell for 4hrs	KM
12/16/20	01:30	Lower VAC to 105vlts & dwell for 4hrs	KM
12/16/20	05:30	Raise VAC to 129vlts & dwell for 4hrs	GM
12/16/20	09:30	Lower VAC to 117vlts & ramp to +23c ambient	GM
12/16/20	09:30	Temperature and power variation portion of test has completed	KM
12/16/20	09:30	Test will continue to run at +23c ambient for another 37hrs	KM
12/16/20	22:30	All Testing complete for a total of 85hrs	KM
Note: All test pass or fail determinations decided by Pro V&V Inc.			

5.6.4 Test Photographs



5.6.5 Test Data



Cntrl_Graph_Data



5.6.6 Test Equipment List

Table 5.6-1: Temperature/Power Variation Test Equipment List

Asset Number	Mfct	Description	M/N	S/N	Range	Start Date	End Date	Last Cal	Cal Interval (Months)	Cal Due	Notes
WC061430	Team Corporation	Horizontal Electro Hydraulic Shaker, HYD 05	188-48-16	494		11/30/2020	12/18/2020		12	NCR	
WC061603	Thermotron	Temp/Hum, Drive-in, CH 42	WS-1372-CH-(5) 25-25	23-9941		11/30/2020	12/18/2020	10/05/2020	12	10/05/2021	
WC061604	Thermotron	PROGRAM-MER/CONTROLLER	8800	23-9941	Multi / Mfg	11/30/2020	12/18/2020	10/05/2020	12	10/05/2021	

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



End of Report