

National Technical Systems Test Report for Environmental Testing of the DS300

Prepared For

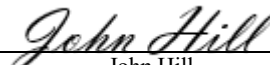
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A handwritten signature in black ink, appearing to read "Karen Norton", written over a horizontal line.

Karen Norton
Preparer

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John Hill
Program Manager

This report and the information contained herein represents the results of testing of only those articles/products identified in this document and selected by the client. The tests were performed to specifications and/or procedures approved by the client. National Technical Systems ("NTS") makes no representations expressed or implied that such testing fully demonstrates efficiency, performance, reliability, or any other characteristic of the articles being tested, or similar products. This report should not be relied upon as an endorsement or certification by NTS of the equipment tested, nor does it present any statement whatsoever as to the merchantability or fitness of the test article or similar products for a particular purpose. This document shall not be reproduced except in full without written approval from NTS.

Revision History

Rev.	Description	Issue Date
0	Initial Release	05/03/2022
1	Title Page: Updated test item name to DS300. Table 3.0-1: Corrected S/N to DS3021420008. Table 5.0-1: Corrected S/N to DS3021420008. Added Section 5.6 for Temperature/Power Variation. Changed specification for 5.7. Section 5.1.2: Replaced humidity charts. Section 5.6: Replaced all data, photographs, information, and equipment. Section 5.7.1: Corrected test specification. Section 5.7.3: Corrected test specification.	05/13/2022
2	Section 5.6.4: Added additional photograph.	05/16/2022

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1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Environmental/Dynamics 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.

- Test Specification: MIL-STD-810D (see Table 5.0-1 for Paragraph reference)
Pro V&V, Inc. Purchase Order(s) 2021-014, dated 09/08/2021
- National Technical Systems (NTS) Quote(s) OP0594524, dated 09/07/2021
- ISO/IEC 17025:2017(E) *General Requirements for the Competence of Testing and Calibration Laboratories*, dated 11/1/2017

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.

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

Item	Qty.	Name/Description	Part Number	Serial Number
3	4	DS300	N/A	DS3021420008 DS3022330003 DS3021420004 DS3021420011

3.1 Security Classification

Non-classified

4.0 General Test Requirements

4.1 Test Equipment

The instrumentation used in the performance of these tests is periodically calibrated and standardized within manufacturer's rated accuracies and are traceable to the National Institute of Standards and Technology. The calibration procedures and practices are in accordance with ISO 17025:2017. Certification of calibration is on file subject to inspection by authorized personnel.

5.0 Test Descriptions and Results

Table 5.0-1: Summary of Test Information & Results

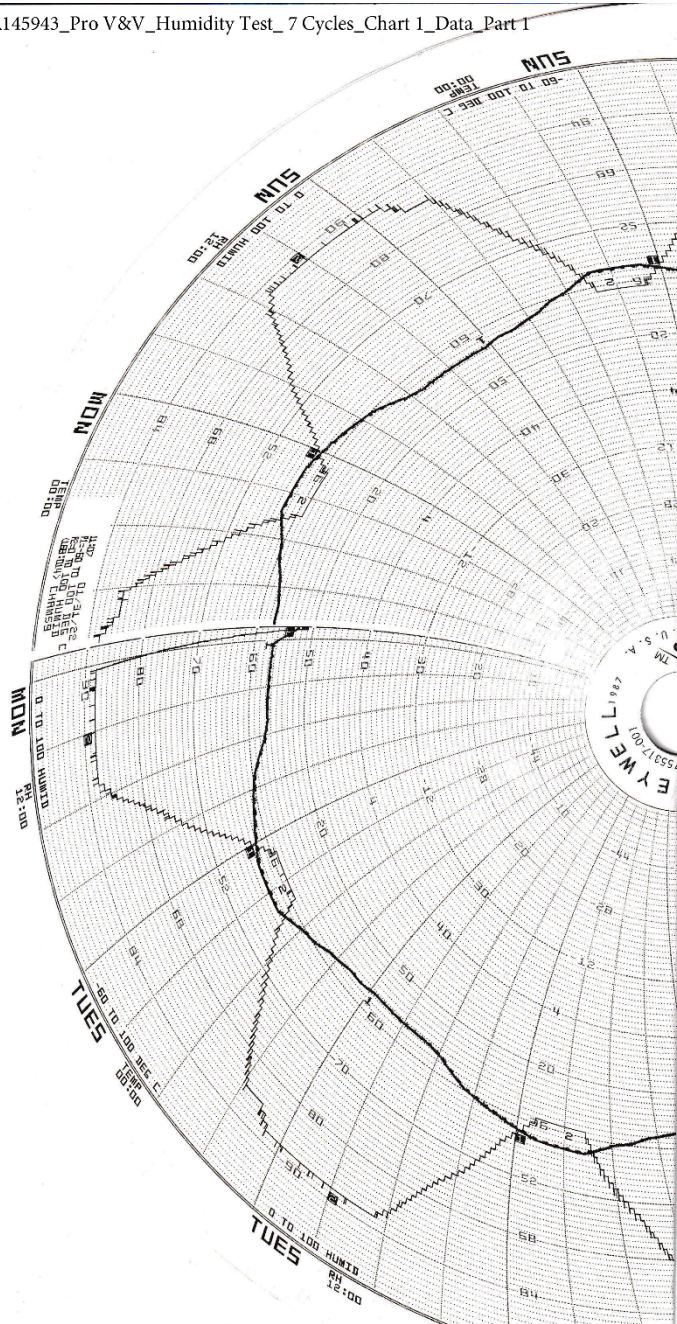
Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result
5.1	Humidity	MIL-STD-810D Method 507.2	Longmont	01/28/2022 - 02/10/2022	N/A	DS3021420008	No damage or anomalies noted.
5.2	Low Temperature	MIL-STD-810D Method 502.2	Longmont	02/14/2022 - 02/15/2022	N/A	DS3021420008	No damage or anomalies noted.
5.3	High Temperature	MIL-STD-810D 501.2	Longmont	02/15/2022 - 02/16/2022	N/A	DS3021420008	No damage or anomalies noted.
5.4	Bench Handling	MIL-810D Method 516.3	Longmont	02/16/2022 - 02/16/2022	N/A	DS3021420008	No damage or anomalies noted.
5.5	Transportation Vibration	MIL-810D Method 514.3 Category 1	Longmont	02/16/2022 - 02/16/2022	N/A	DS3021420008	No damage or anomalies noted.
5.6	Temperature/Power Variation	MIL-STD-810D, Method 502.2	Longmont	04/08/2022 1 04/15/222	N/A	DS3021420004 DS3021420011	No damage or anomalies noted.
5.7	Settling Dust	MIL-STD-810D, Method 5.10.2	Longmont	04/18/2022 - 04/22/2022	N/A	DS3022330003	No damage or anomalies noted.
5.8	Dripping Rain	MIL-STD-810D Method 506.2	Longmont	04/18/2022 - 04/22/2022	N/A	DS3022330003	No damage or anomalies noted.

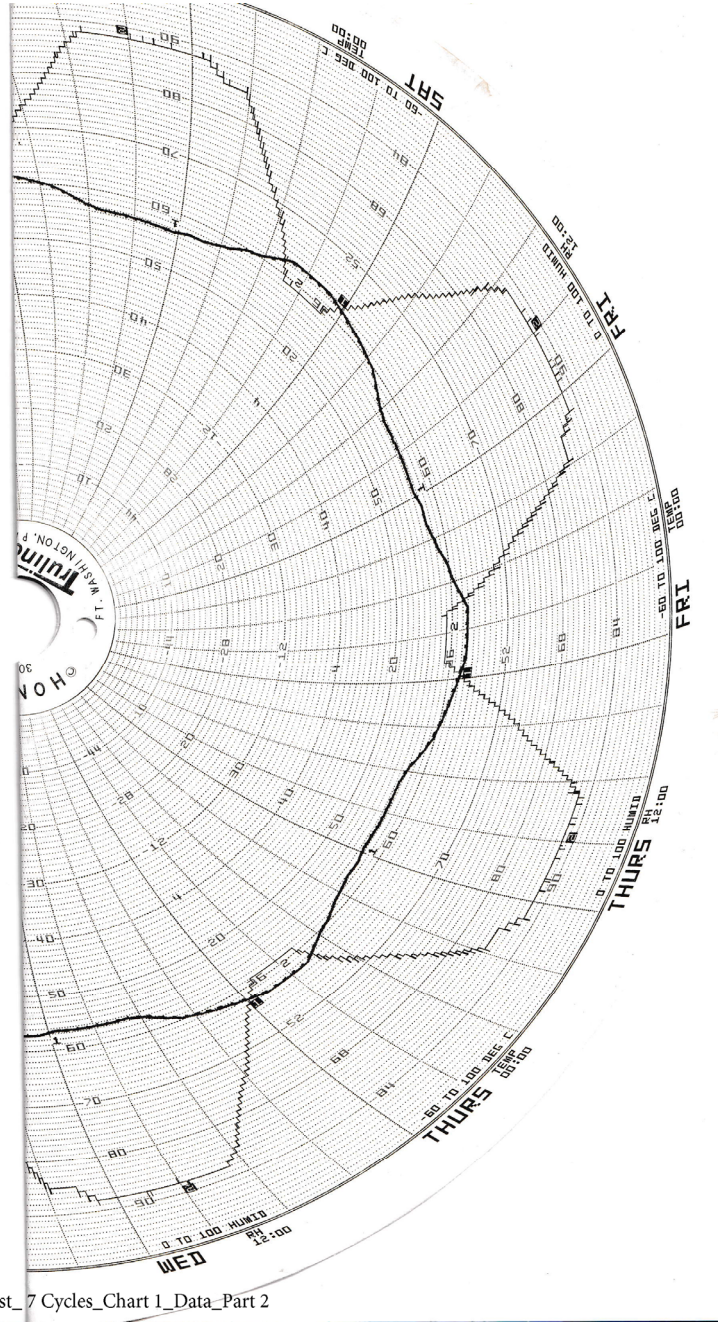
The decision rule for Test Results was based on the Test Specification used for testing.

5.1.4 Test Photographs

5.1.5 Test Data

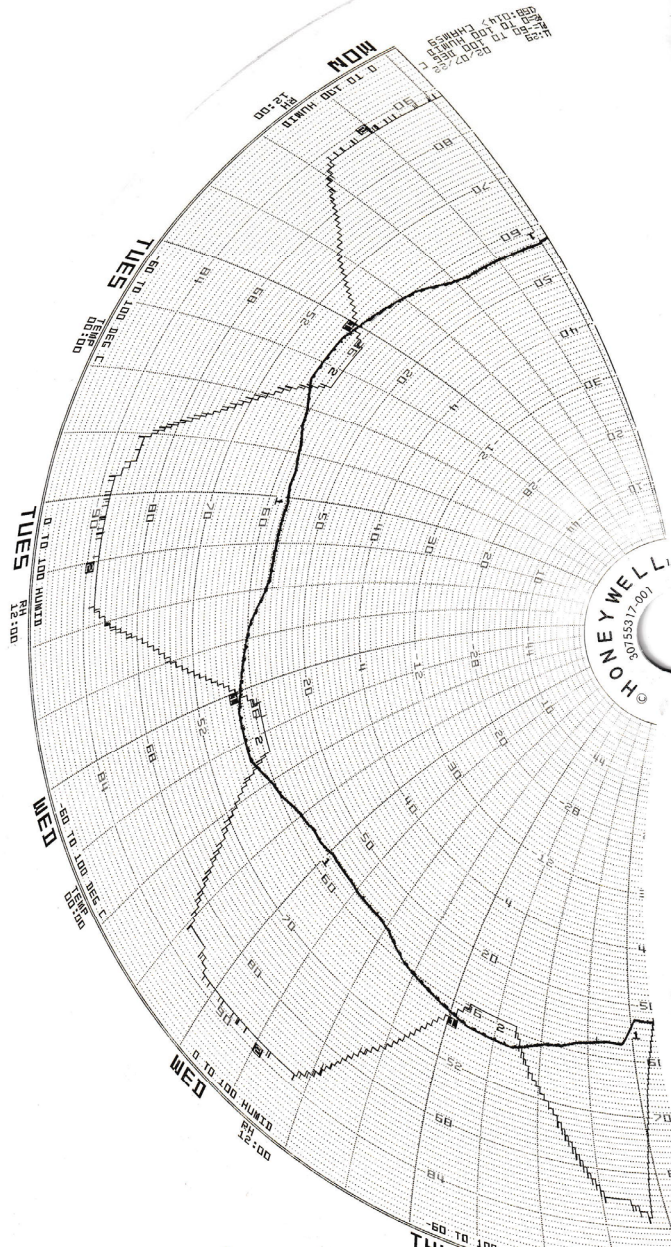
PR145943_Pro V&V_Humidity Test_7 Cycles_Chart 1_Data_Part 1





R145943_Pro V&V_Humidity Test_7 Cycles_Chart 1_Data_Part 2

PR145943_Pro V&V_Humidity Test_3 Cycles_Chart 2_Data





5.1.6 Test Equipment List

Table 5.1-1: Humidity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061559	Chamber (Temperature/Humidity)	StorageTek	Large Walk In	09/29/2021	09/29/2022
WC061560	Controller (Temperature)	Watlow	F4	09/29/2021	09/29/2022
WC061561	Recorder (Chart)	Honeywell	DR45AT	09/29/2021	09/29/2022

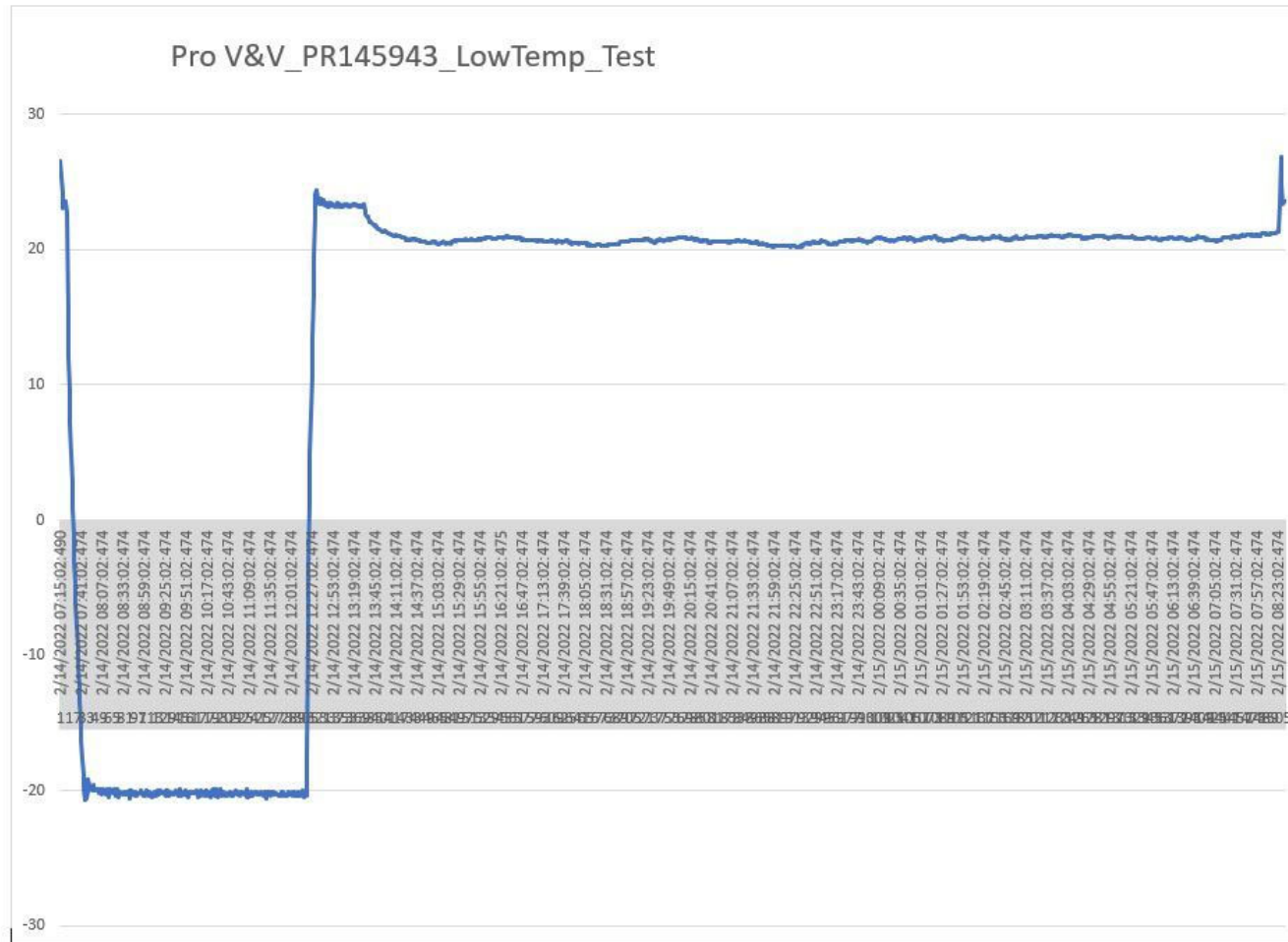
Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.2.4 Test Photographs

5.2.5 Test Data





5.2.6 Test Equipment List

Table 5.2-1: Low Temperature Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061626	Chamber (Temperature/Humidity)	Envirotronics	SH16 C	02/08/2021	03/08/2022
WC070559	Controller (Temperature)	Future Design Controls	FDC-9300	02/08/2021	03/08/2022

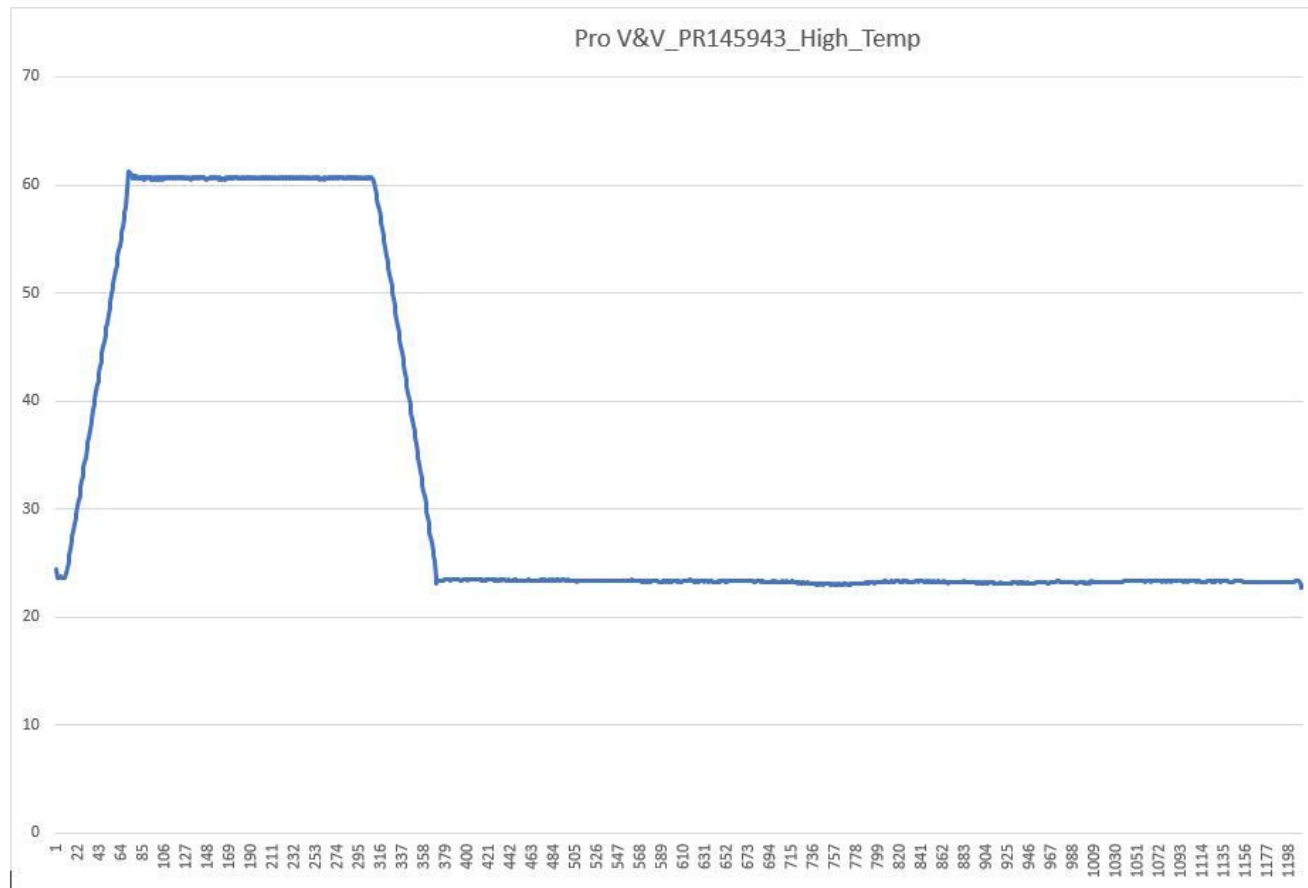
Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.3.4 Test Photographs

5.3.5 Test Data



5.3.6 Test Equipment List

Table 5.3-1: High Temperature Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061559	Chamber (Temperature/Humidity)	StorageTek	Large Walk In	09/29/2021	09/29/2022
WC070366	Data Acquisition (Board/Card)	Agilent Technologies	34901A	02/12/2021	03/12/2022
WC070522	System (Data Acquisition)	Agilent Technologies	34970A	02/09/2021	03/09/2022
WC070559	Controller (Temperature)	Future Design Controls	FDC-9300	02/08/2021	03/08/2022

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.4.4 Test Photographs





5.4.5 Test Equipment List

Table 5.4-1: Bench Handling Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061429	Shaker (Hydraulic)	Team Corporation	80/10.5	NCR	NCR

Calibration Abbreviations

CAL: Calibration

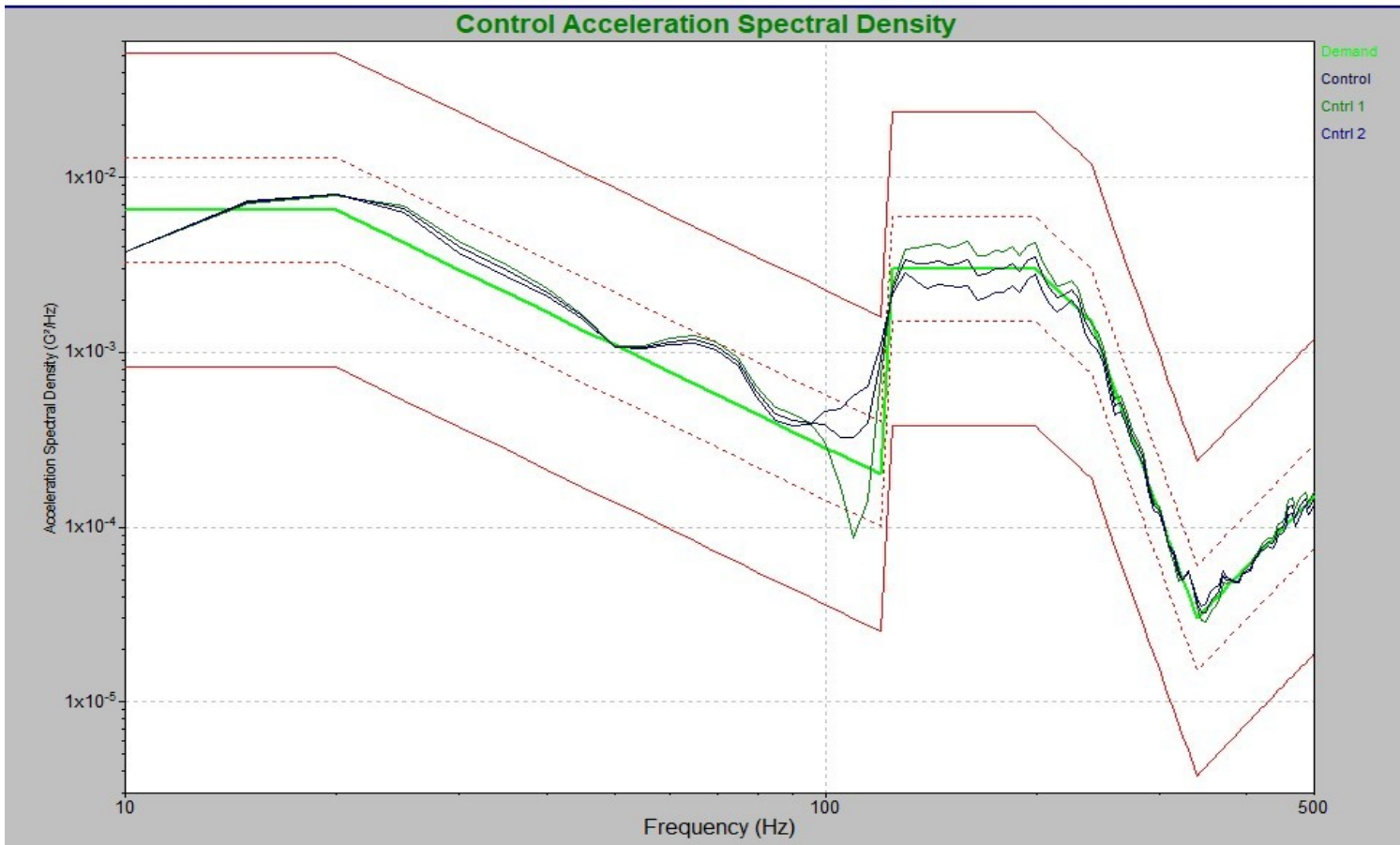
NCR: No Calibration Required

5.5.4 Test Photographs

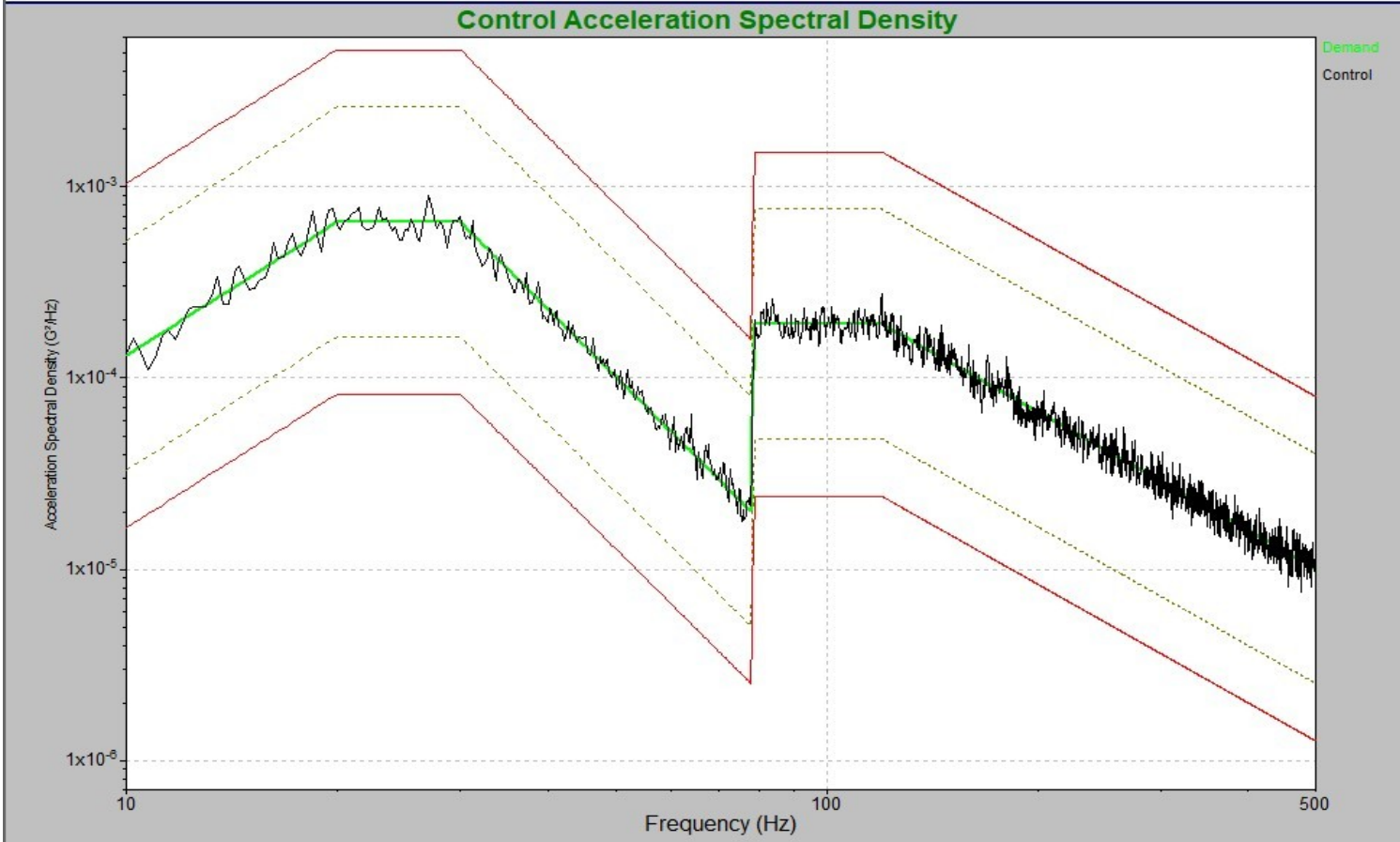


5.5.5 Test Data

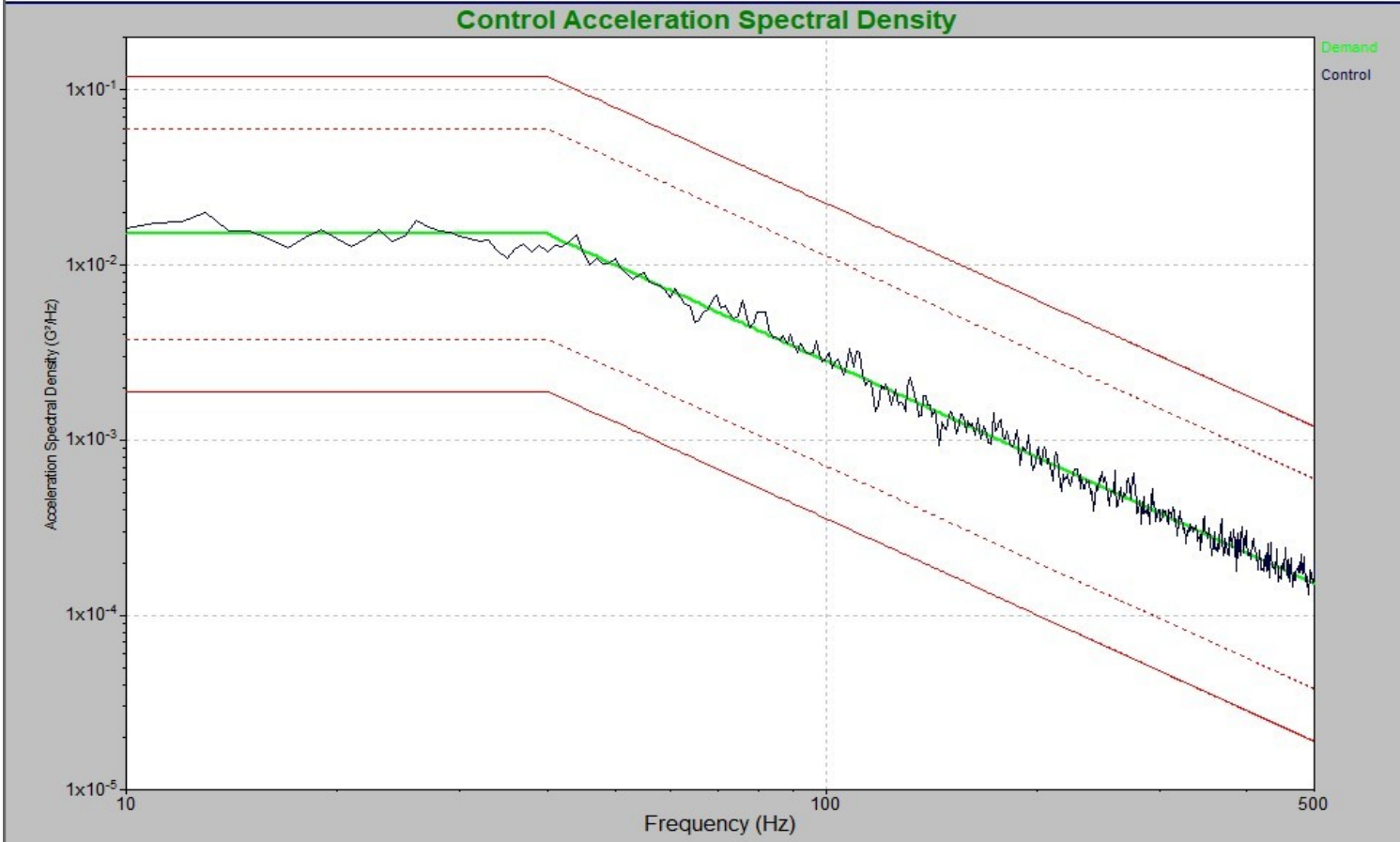
NTS Longmont, CO	Level Time: 1:00:00	Demand: 0.7489 G RMS	Pro V&V
Job# PR145943	Total Time: 1:00:23	Control: 0.78 G RMS	UUT: FL EVS 6.3.0.0
Feb 16, 2022 10:02:58	Run 1	Test axis: Longitudinal	SN: DS3021420008



NTS Longmont, CO	Level Time: 1:00:00	Demand: 0.2036 G RMS	Pro V&V
Job# PR145943	Total Time: 1:00:17	Control: 0.2037 G RMS	UUT: FL EVS 6.3.0.0
Feb 16, 2022 11:29:49	Run 2	Test axis: Transverse	SN: DS3021420008



NTS Longmont, CO	Level Time: 1:00:00	Demand: 1.047 G RMS	Pro V&V
Job#: PR145943	Total Time: 1:00:10	Control: 1.05 G RMS	UUT: FL EVS 6.3.0.0
Feb 16, 2022 12:51:25	Run 3	Test axis: Vertical	SN: DS3021420008





5.5.6 Test Equipment List

Table 5.5-1: Transportation Vibration Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061429	Shaker (Hydraulic)	Team Corporation	80/10.5	NCR	NCR
WC061505	Accelerometer (Vibration)	PCB Piezotronics	353B32	05/19/2021	05/19/2022
WC061706	Computer (Vibration Controller)	Vibration Research	VR9500	04/28/2021	04/28/2022
WC070243	Accelerometer (Vibration)	PCB Piezotronics	353B32	05/19/2021	05/19/2022
WC070466	Meter (Hygrometer)	Fluke	971	04/19/2021	04/19/2022

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.6 Temperature/Power Variation

5.6.1 Test Procedure

MIL-STD-810D, Method 502.2

5.6.2 Test Result

No visible evidence of damage or anomalies were noted as a result of the test.

5.6.3 Test Datasheets

Test Log				
MJO: PR145943		Customer: Pro V&V	MIL-STD-810D Method 502.2	Temp/Pwr/Variation Test
Date	Time	Log Entry		Tech
4/8/2022	13:00	No visible evidence of damage before testing.		KM
4/11/2022	08:45	Note: UUT S/N DS3021420004 tested with NTS01 USB 3.0		KM
		Note: UUT S/N DS3021420011 tested with NTS02 USB 2.0		KM
4/11/2022	08:50	Set VAC to 117vIts & ramp to +10c		NP
4/11/2022	09:00	Start dwell at 117vIts & +10c for 4hrs		NP
4/11/2022	13:00	Lower VAC to 105vIts & dwell for 4hrs		NP
4/11/2022	17:00	Raise VAC to 129vIts & dwell for 4hrs		KM
4/11/2022	21:00	Lower VAC to 117vIts & Raise temperature to +35c & dwell for 4hrs		KM
4/12/2022	01:00	Lower VAC to 105vIts & dwell for 4hrs		KM
4/12/2022	05:00	Raise VAC to 129vIts & dwell for 4hrs		NP
4/12/2022	09:00	Lower VAC to 117vIts & Lower temperature to +10c & dwell for 4hrs		NP
4/12/2022	13:00	Lower VAC to 105vIts & dwell for 4hrs		NP
4/12/2022	17:00	Raise VAC to 129vIts & dwell for 4hrs		KM
4/12/2022	21:00	Lower VAC to 117vIts & Raise temperature to +35c & dwell for 4hrs		KM
4/13/2022	01:00	Lower VAC to 105vIts & dwell for 4hrs		KM
4/13/2022	05:00	Raise VAC to 129vIts & dwell for 4hrs		NP
4/13/2022	09:00	Lower VAC to 117vIts & ramp to +23c ambient		NP
4/13/2022	09:00	Temperature and power variation portion of test has completed		NP
4/13/2022	09:00	Test will continue to run at +23c ambient for another 37hrs		NP
4/15/2022	22:00	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



Temperature/Power Variation



Temperature/Power Variation

PR145943_Pro V&V_Temp_Pwr_Var_Test



Note: UUT S/N DS3021420011 tested with NTS02 USB 2.0

Temperature/Power Variation

PR145943_Pro V&V_Temp_Pwr_Var_Test

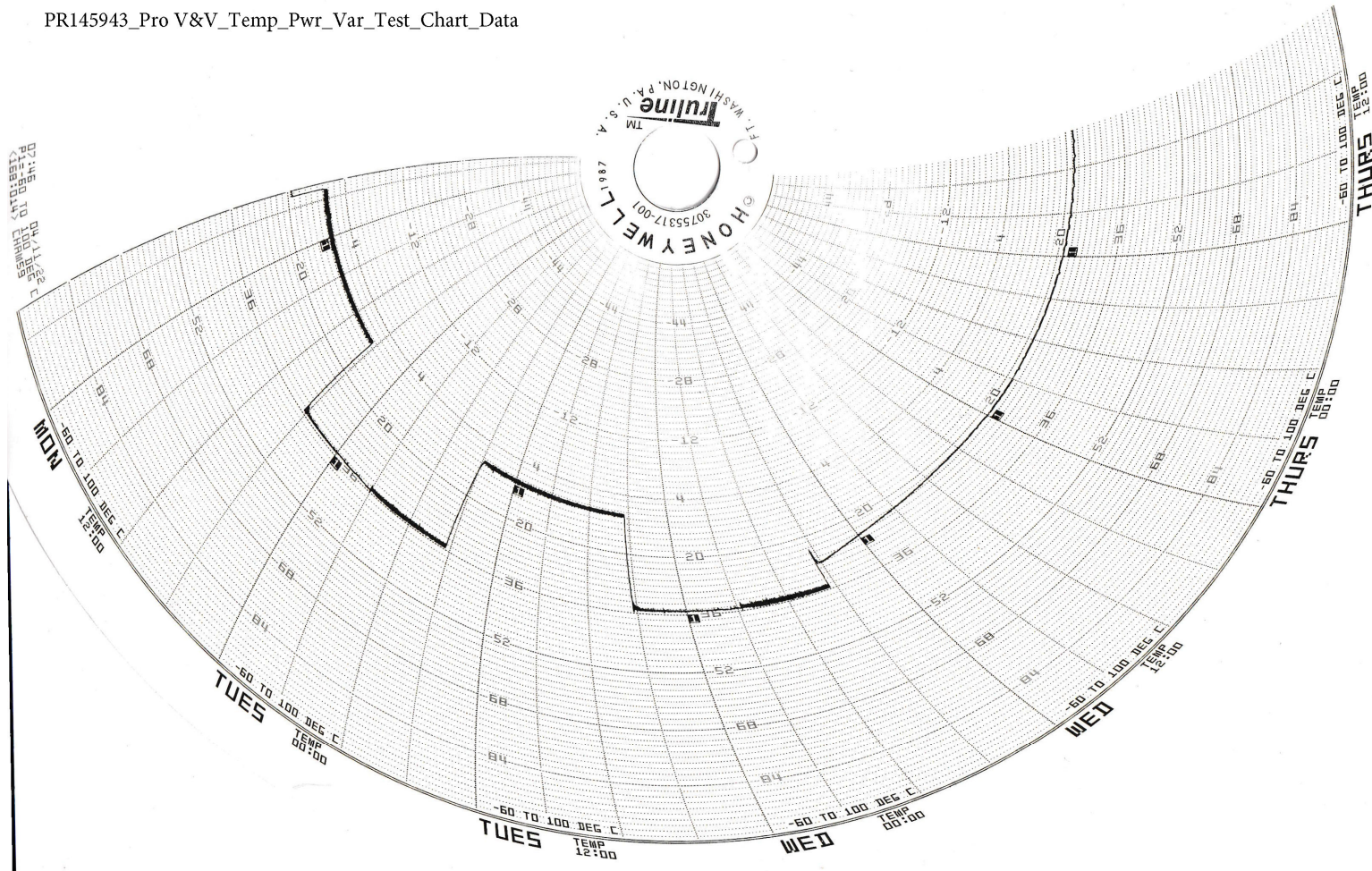


Note: UUT S/N DS3021420004 tested with NTS01 USB 3.0

Temperature/Power Variation

5.6.5 Test Data

PR145943_Pro V&V_Temp_Pwr_Var_Test_Chart_Data





5.6.6 Test Equipment List

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

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061559	Chamber (Temperature/Humidity)	StorageTek	Large Walk In	09/29/2021	09/29/2022
WC061560	Controller (Temperature)	Watlow	F4	09/29/2021	09/29/2022
WC061561	Recorder (Chart)	Honeywell	DR45AT	09/29/2021	09/29/2022
WC061603	Chamber (Temperature/Humidity)	Thermotron	WS-1372-CH-(5) 25-25	09/29/2021	09/29/2022
WC061604	Controller (Temperature)	Thermotron	8800	09/29/2021	09/29/2022
WC061559	Chamber (Temperature/Humidity)	StorageTek	Large Walk In	09/29/2021	09/29/2022

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.7 Settling Dust

5.7.1 Test Procedure

MIL-STD-810D, Method 5.10.2

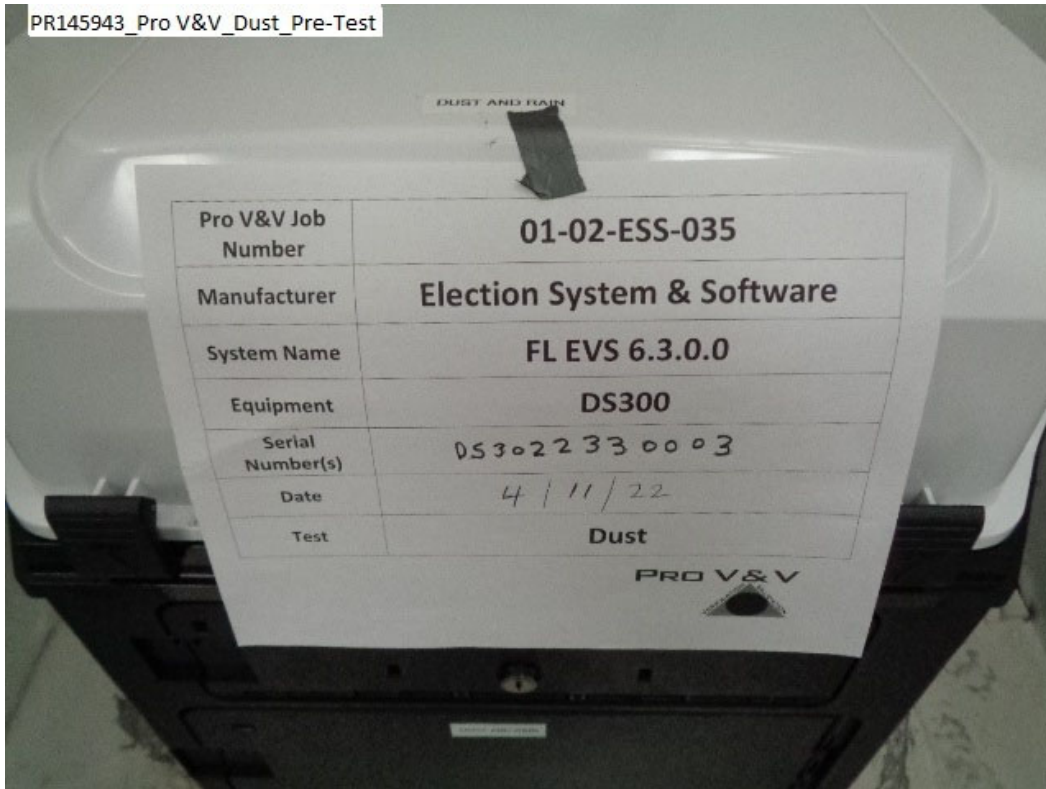
5.7.2 Test Result

There was no visible evidence of damage noted as a result of the test.

5.7.3 Test Datasheets

Test Log				
MJO No: PR145943		Customer: Pro V&V	Test Spec: MIL-STD-810D Method 5.10.2	Dust Test
Date	Time	Log Entry		Tech
4/8/2022	14:00	No visible evidence of damage before testing.		KM
4/11/2022	17:30	Customer performed functional pretest and visual inspection – No issues found		KM
4/11/2022	17:44	Install UUT into chamber		KM
4/11/2022	17:45	Start Dust Test		KM
4/11/2022	17:46	Installed dust per IP5x 1 minute		KM
4/11/2022	18:47	Let dust settle 1hr		KM
4/11/2022	18:48	Installed dust per IP5x 1 minute		KM
4/11/2022	19:49	Let dust settle 1hr		KM
4/11/2022	19:50	Installed dust per IP5x 1 minute		KM
4/11/2022	20:51	Let dust settle 1hr		KM
4/11/2022	20:52	Installed dust per IP5x 1 minute		KM
4/11/2022	21:53	Let dust settle 1hr		KM
4/11/2022	21:54	Installed dust per IP5x 1 minute		KM
4/11/2022	22:55	Let dust settle 1hr		KM
4/11/2022	22:56	Installed dust per IP5x 1 minute		KM
4/11/2022	23:57	Let dust settle 1hr		KM
4/11/2022	23:58	Installed dust per IP5x 1 minute		KM
4/12/2022	24:59	Let dust settle 1hr		KM
4/12/2022	01:00	Installed dust per IP5x 1 minute		KM
4/12/2022	02:00	Let dust settle 1hr		KM
4/12/2022	05:30	Test Complete		KM
		test – No issues found		KM
		Note: All test pass or fail determinations decided by Pro V&V Inc.		KM

5.7.4 Test Photographs



Dust Pre-Test



Dust Pre-Test



Dust Post-Test



Dust Post-Test



5.7.5 Test Equipment List

Table 5.7-1: Settling Dust Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061530	Chamber (Dust, Blowing)	Quantum Technologies	STK	NCR	NCR

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.8 Dripping Rain

5.8.1 Test Procedure

MIL-STD-810D, Method 506.2.

5.8.2 Test Result

There was no visible evidence of damage noted as a result of the test.

5.8.3 Test Datasheets

Test Log				
MJO No: PR145943		Customer: Pro V&V	Test Spec: MIL-STD_810D 506.2	Drip Test
Date	Time	Log Entry		Tech
4/12/2022	9:45	No visible evidence of damage before testing.		NP
4/12/2022	10:00	Customer performed functional pretest and visual inspection – No issues found		NP
4/12/2022	10:15	Install UUT's under Chamber 118. UUT will be exposed to 2kg of leakage with a distance of 1 meter (3 feet) from upper surface for 15 minutes		NP
4/12/2022	10:30	Start drip test		NP
4/12/2022	10:45	Drip test complete		NP
4/12/2022	11:00	Customer performed post-test inspection and functional test on UUT – No issues found		NP
		Note: All test pass or fail determinations decided by Pro V&V Inc.		

5.8.4 Test Photographs

Drip Setup



Drip Setup



5.8.5 Test Equipment List

Table 5.8-1: Dripping Rain Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061710	Machine (Rain)	StorageTek	Rain Drip	NCR	NCR

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



End of Test Report