

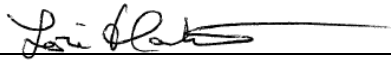
Element Materials Technology Denver-Longmont A.K.A. NTS Labs, LLC Test Report for Environmental/Dynamics Testing of the Vanguard Equipment

Prepared For


SLI Compliance | 4720 Independence Street | Wheat Ridge, CO 80033

Prepared By

Element Materials Technology Denver-Longmont | 1601 Dry Creek Drive, Suite 2000 | Longmont, CO 80503 | 303-776-7249 | www.element.com

A handwritten signature in black ink, appearing to read 'Lori Hartman', written over a horizontal line.

Lori Hartman
Preparer

A handwritten signature in black ink, appearing to read 'Michael Bosica', written over a horizontal line.

Michael Bosica
Program Manager

This report and the information contained herein represent 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. Element Materials Technology (hereafter referred to as "Element") 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 Element 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 Element.

These items are controlled by the U.S. Government and authorized for export only to the country of ultimate destination for use by the ultimate consignee or end-user(s) herein identified. They may not be resold, transferred, or otherwise disposed of, to any other country or to any person other than the authorized ultimate consignee or end-user(s), either in their original form or after being incorporated into other items, without first obtaining approval from the U.S. government or as otherwise authorized by U.S. law and regulations.

Revision History

Rev.	Description	Issue Date
0	Initial Release	03/21/2025
1	Corrected Part Numbers per customer request	04/07/2025

Table of Contents

1.0	Introduction	4
2.0	References	4
3.0	Product Selection and Description	4
3.1	Security Classification	4
4.0	General Test Requirements	4
4.1	Test Equipment	4
5.0	Test Description and Results	5
5.1	Bench Handling	6
5.1.1	Test Procedure	6
5.1.2	Test Result	6
5.1.3	Test Datasheets	6
5.1.4	Test Photographs	7
5.1.5	Test Equipment List	13
5.2	Vibration	14
5.2.1	Test Procedure	14
5.2.2	Test Result	14
5.2.3	Test Datasheets	14
5.2.4	Test Photographs	15
5.2.5	Test Data	18
5.2.6	Test Equipment List	24
5.3	Low Temperature	25
5.3.1	Test Procedure	25
5.3.2	Test Result	25
5.3.3	Test Datasheets	25
5.3.4	Test Photographs	26
5.3.5	Test Data	27
5.3.6	Test Equipment List	29
5.4	High Temperature	30
5.4.1	Test Procedure	30
5.4.2	Test Result	30
5.4.3	Test Datasheets	30
5.4.4	Test Photographs	31
5.4.5	Test Data	32
5.4.6	Test Equipment List	33
5.5	Continuous Operation	34
5.5.1	Test Procedure	34
5.5.2	Test Result	34
5.5.3	Test Datasheets	35
5.5.4	Test Photographs	37
5.5.5	Test Data	41
5.5.6	Test Equipment List	42

List of Tables

Table 3.0-1: Product Identification – Equipment Under Test (EUT)	4
Table 5.0-1: Summary of Test Information & Results	5
Table 5.1-1: Bench Handling Test Equipment List	13
Table 5.2-1: Vibration Test Equipment List	24
Table 5.3-1: Low Temperature Test Equipment List	29
Table 5.4-1: High Temperature Test Equipment List	33
Table 5.5-1: Continuous Operation Test Equipment List	42

1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Environmental/Dynamics test program at Element Materials Technology Denver-Longmont (hereafter referred to as “Element”). The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements defined in the test specification.

2.0 References

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

- Test Specification: Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0
- SLI Compliance Purchase Order 20240723-02 dated 07/23/2024.
- Element Quotation OP0648193 dated 10/10/2023.
- ISO/IEC 17025:2017(E) *General Requirements for the Competence of Testing and Calibration Laboratories*, dated 11/2017.

3.0 Product Selection and Description

SLI Compliance selected and provided the following 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
1	1	Vanguard Boost	2007020, Rev. A Reg: VV-500	B2520006601
2	1	Vanguard Flex	2007010, Rev. A Reg: VV-400	F2520001001
3	1	Vanguard Vault with Imprinter	2007030, Rev. A Reg: VV-600	V2520004401
4	1	Vanguard Adapt	2007040 Rev A Reg: VV-700	A2520009201
5	1	Vanguard Capture (Central Scan) Server	HP Z2 SFF G4	MXL401233Q
6	1	Vanguard Capture (Central Scan) Client	HP Z2 SFF G4	MXL4233CZC
7	1	P24 Monitors	None	CNC3471MLW
8	1	Canon DR-G2110 High-Speed Scanner with Imprinter (COTS)	None	JG313298
9	1	Canon DR-G2140 High Speed Scanner with Imprinter (COTS)	None	JF306475
10	2	P24 G5 Monitors (COTS)	None	CNC3471MMG, CNC3471MLW

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 Description and Results

Table 5.0-1: Summary of Test Information & Results

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result
5.1	Bench Handling	Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0	Longmont	03/16/2025 - 03/19/2025	2007020, Rev. A Reg: VV-500	B2520006601	Customer determined test pass after conducting an operational status check
					2007010, Rev. A Reg: VV-400	F2520001001	
					2007030, Rev. A Reg: VV-600	V2520004401	
5.2	Vibration	Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0	Longmont	03/03/2025 - 03/19/2025	2007020, Rev. A Reg: VV-500	B2520006601	Customer determined test pass after conducting an operational status check
					2007010, Rev. A Reg: VV-400	F2520001001	
					2007030, Rev. A Reg: VV-600	V2520004401	
					2007040 Rev A Reg: VV-700	A2520009201	
5.3	Low Temperature	Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0	Longmont	03/18/2025 - 03/19/2025	2007020, Rev. A Reg: VV-500	B2520006601	Customer determined test pass after conducting an operational status check
					2007010, Rev. A Reg: VV-400	F2520001001	
					2007030, Rev. A Reg: VV-600	V2520004401	
					2007040 Rev A Reg: VV-700	A2520009201	
5.4	High Temperature	Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0	Longmont	03/14/2025 - 03/18/2025	2007020, Rev. A Reg: VV-500	B2520006601	Customer determined test pass after conducting an operational status check
					2007010, Rev. A Reg: VV-400	F2520001001	
					2007030, Rev. A Reg: VV-600	V2520004401	
					2007040 Rev A Reg: VV-700	A2520009201	
5.5	Continuous Operation	Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0	Longmont	03/07/2025 - 03/14/2025	2007020, Rev. A Reg: VV-500	B2520006601	Customer determined test pass after conducting an operational status check
					2007010, Rev. A Reg: VV-400	F2520001001	
					2007030, Rev. A Reg: VV-600	V2520004401	
					2007040 Rev A Reg: VV-700	A2520009201	
					HP Z2 SFF G4	MXL401233Q	
					HP Z2 SFF G4	MXL4233CZC	
					None	CNC3471MLW	
					None	JG313298	
					None	JF306475	
					None	CNC3471MMG, CNC3471MLW	

5.1 Bench Handling

5.1.1 Test Procedure

Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0

5.1.2 Test Result

The EUT's results will be determined by SLI Compliance.

5.1.3 Test Datasheets

[illegible]

5.1.4 Test Photographs



SN-B2520006601_Beast_Edge 1



SN-B2520006601_Beast_Edge 2



SN-B2520006601_Boost_Edge 3



SN-B2520006601_Boost_Edge 4



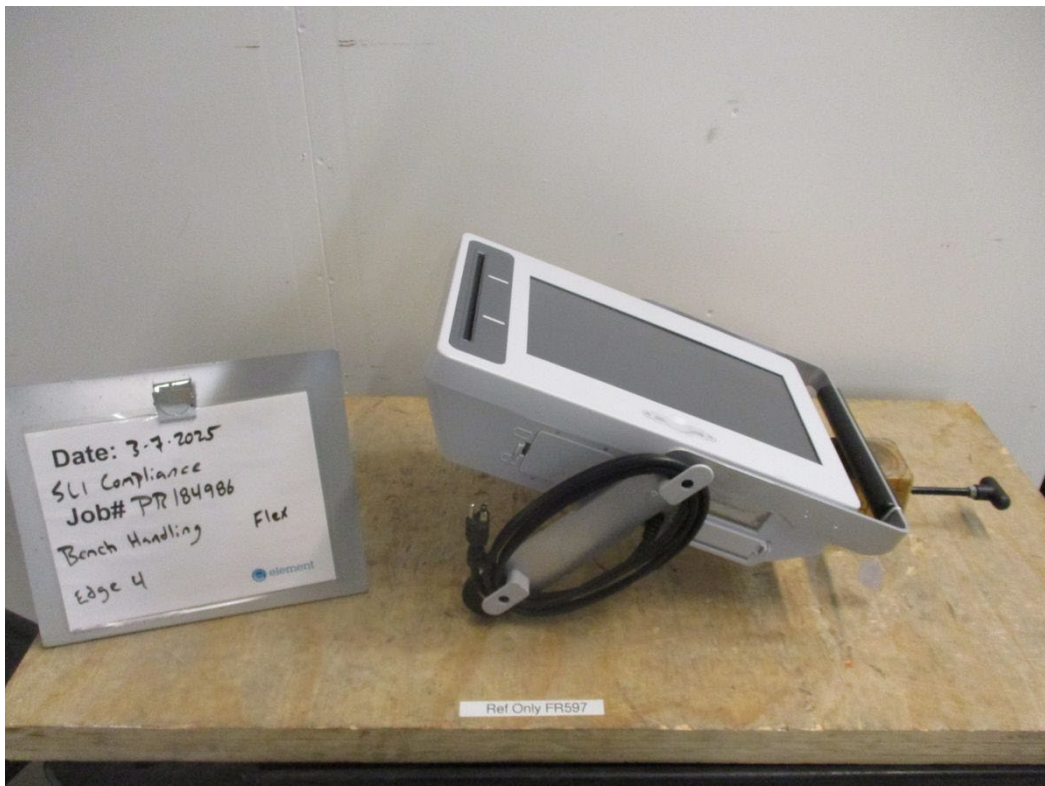
SN-V2520004401_Flex_Edge 1



SN-V2520004401_Flex_Edge 2



SN-V2520004401_Flex_Edge 3



SN-V2520004401_Flex_Edge 4



SN-V2520004401_Vault_Edge 1



SN-V2520004401_Vault_Edge 2



SN-V2520004401_Vault_Edge 3



SN-V2520004401_Vault_Edge 4

5.1.5 Test Equipment List

Table 5.1-1: Bench Handling Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC070466	Meter (Hygrometer)	Fluke	971	06/28/2024	06/28/2025
WC078513	Measurement Tools (Rule)	StorageTek	4 Inch Block	NCR	NCR
WC084235	Measurement Tools (Protractor)	Empire Devices	36	07/23/2024	07/23/2025
WC084240	Measurement Tools (Tape Measure)	Stanley	33-726	06/26/2024	06/26/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.2 Vibration

5.2.1 Test Procedure

Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0

5.2.2 Test Result

The EUT's results will be determined by SLI Compliance.

5.2.3 Test Datasheets

[illegible]

5.2.4 Test Photographs



Adapt_Vertical Axis



Adapt_Longitudinal Axis



Boost, Flex, Vault _ Vertical Axis



Boost, Flex, Vault _ Longitudinal Axis



Boost, Flex, Vault _Transverse Axis



Adapt _Transverse Axis

5.2.5 Test Data

Element - Longmont

Customer: SLI Compliance

PR184986

Remaining: 0:00:00

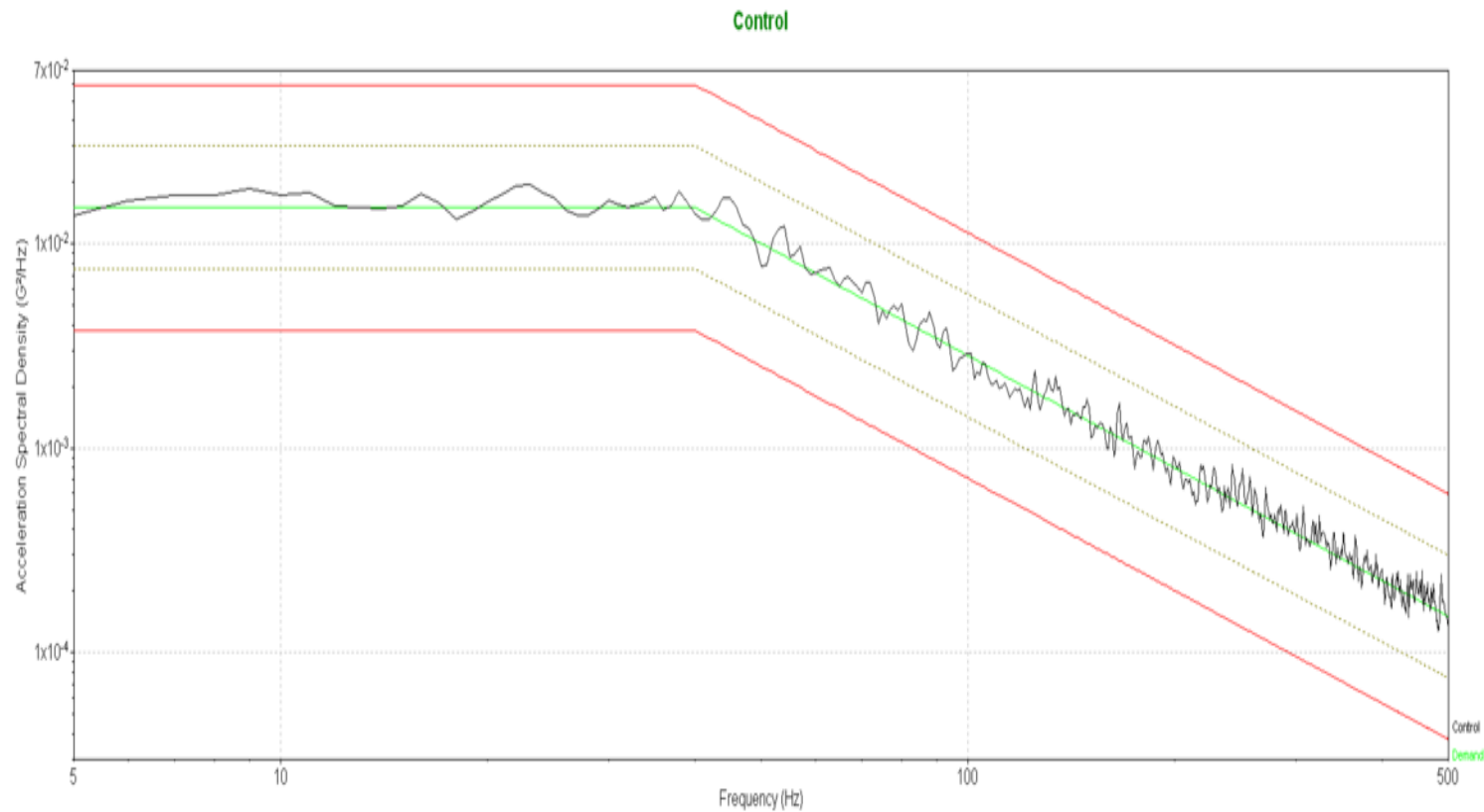
At Level: 1:00:00

Elapsed: 1:00:15

Level: 100 %

Demand: 1.082 G RMS

Control: 1.115 G RMS



Axis: Vertical

Test Item(s): Adapt

S/N(s): A2520009201

Start Time: Mar 03, 2025 10:19:37

End Time: Mar 03, 2025 11:19:52

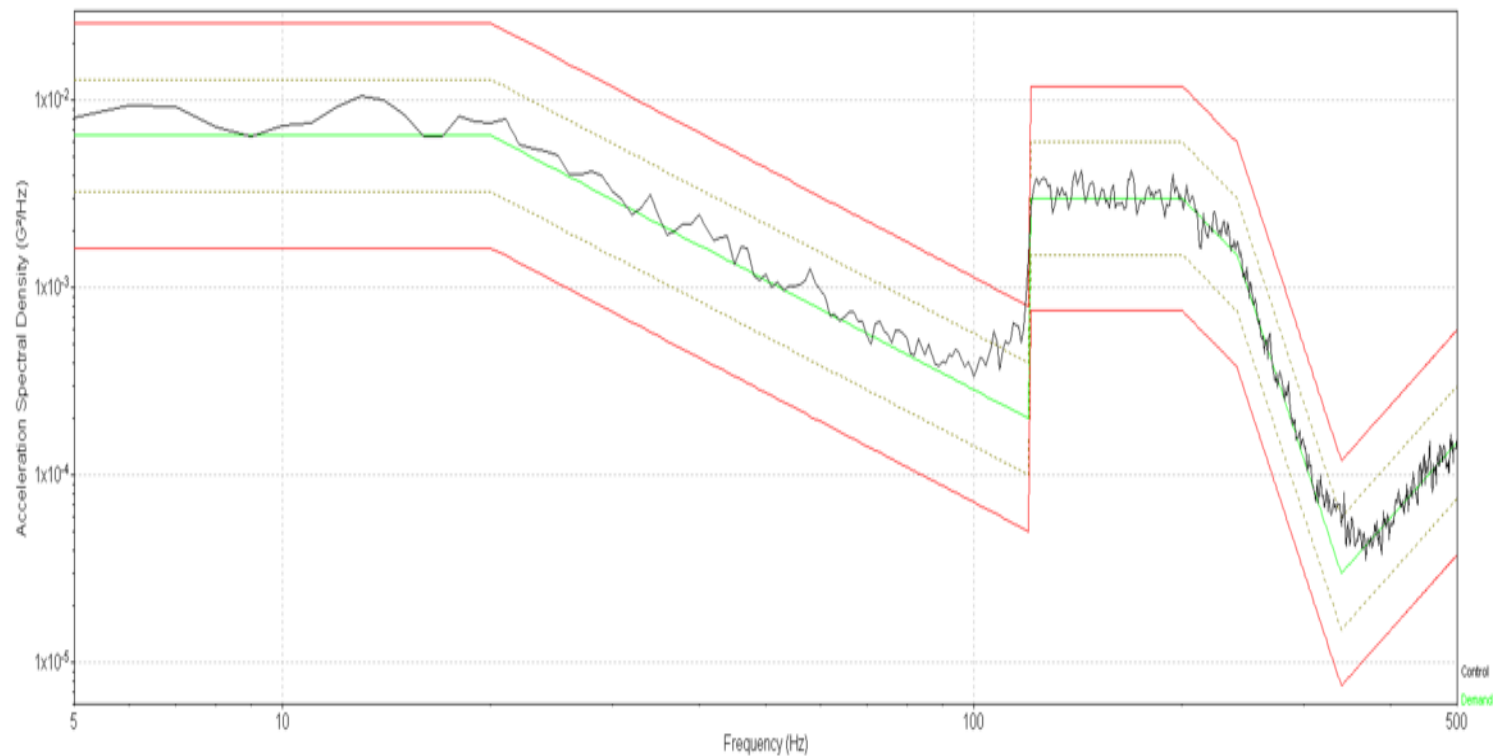
Run 1

Element - Longmont
Customer: SLI Compliance
PR184986

Remaining: 0:00:00
At Level: 1:00:00
Elapsed: 1:01:46

Level: 100 %
Demand: 0.7644 G RMS
Control: 0.8133 G RMS

Control



Axis: Longitudinal
Test Item(s): Adapt
S/N(s): A2520009201

Start Time: Mar 03, 2025 14:22:38
End Time: Mar 03, 2025 15:42:03
Run 2

Element - Longmont

Customer: SLI Compliance

PR184986

Remaining: 0:00:00

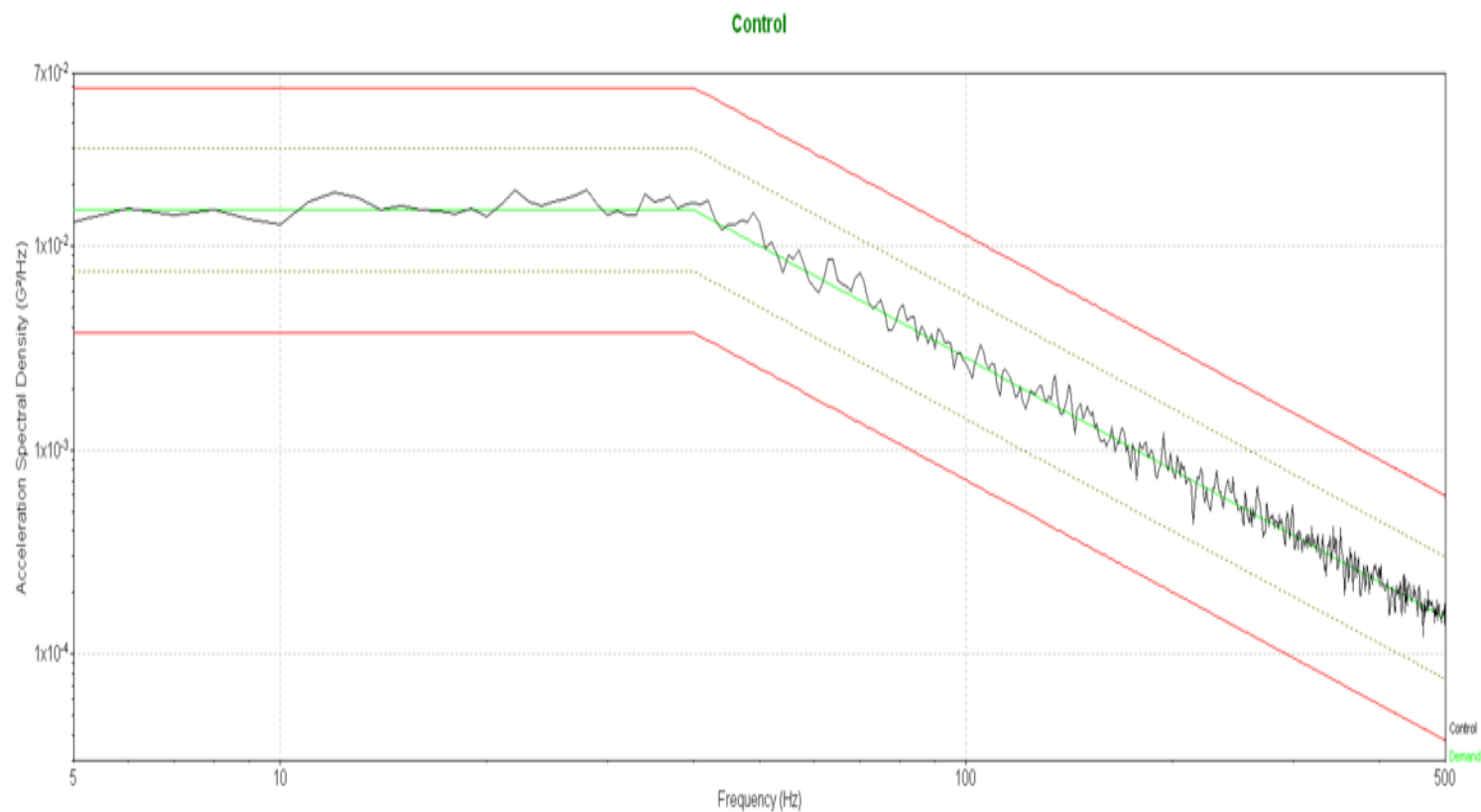
At Level: 1:00:00

Elapsed: 1:00:15

Level: 100 %

Demand: 1.082 G RMS

Control: 1.115 G RMS



Axis: Vertical

Test Item(s): Boost, Vault, Flex

S/N(s): B2520006601, V2520004401, F2520001001

Start Time: Mar 04, 2025 11:25:55

End Time: Mar 04, 2025 12:26:11

Run 3

Element - Longmont

Customer: SLI Compliance

PR184986

Remaining: 0:00:00

At Level: 1:00:00

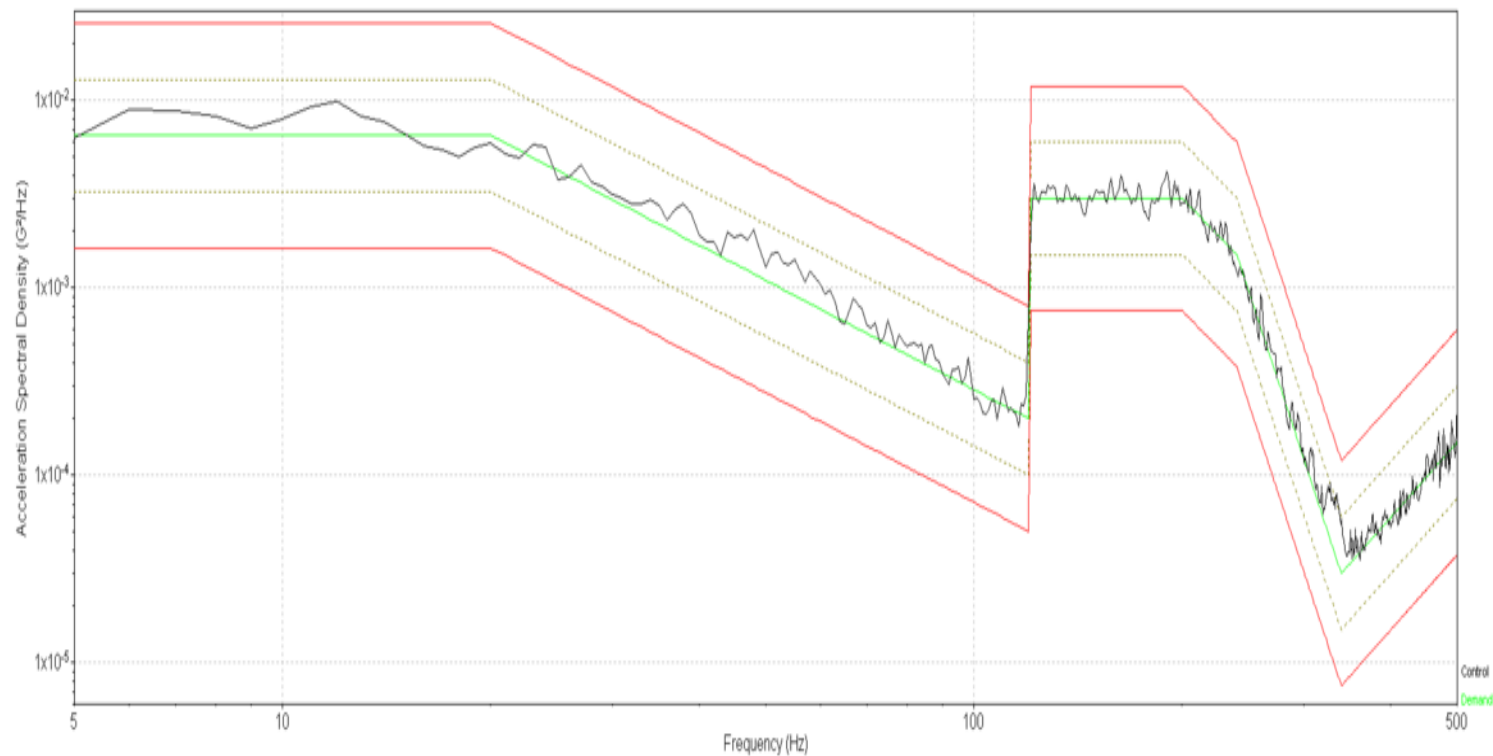
Elapsed: 1:00:14

Level: 100 %

Demand: 0.7644 G RMS

Control: 0.796 G RMS

Control



Axis: Longitudinal

Test Item(s): Boost, Vault, Flex

S/N(s): B2520006601, V2520004401, F2520001001

Start Time: Mar 04, 2025 12:33:32

End Time: Mar 04, 2025 13:33:46

Run 4

Element - Longmont

Customer: SLI Compliance

PR184986

Remaining: 0:00:00

At Level: 1:00:00

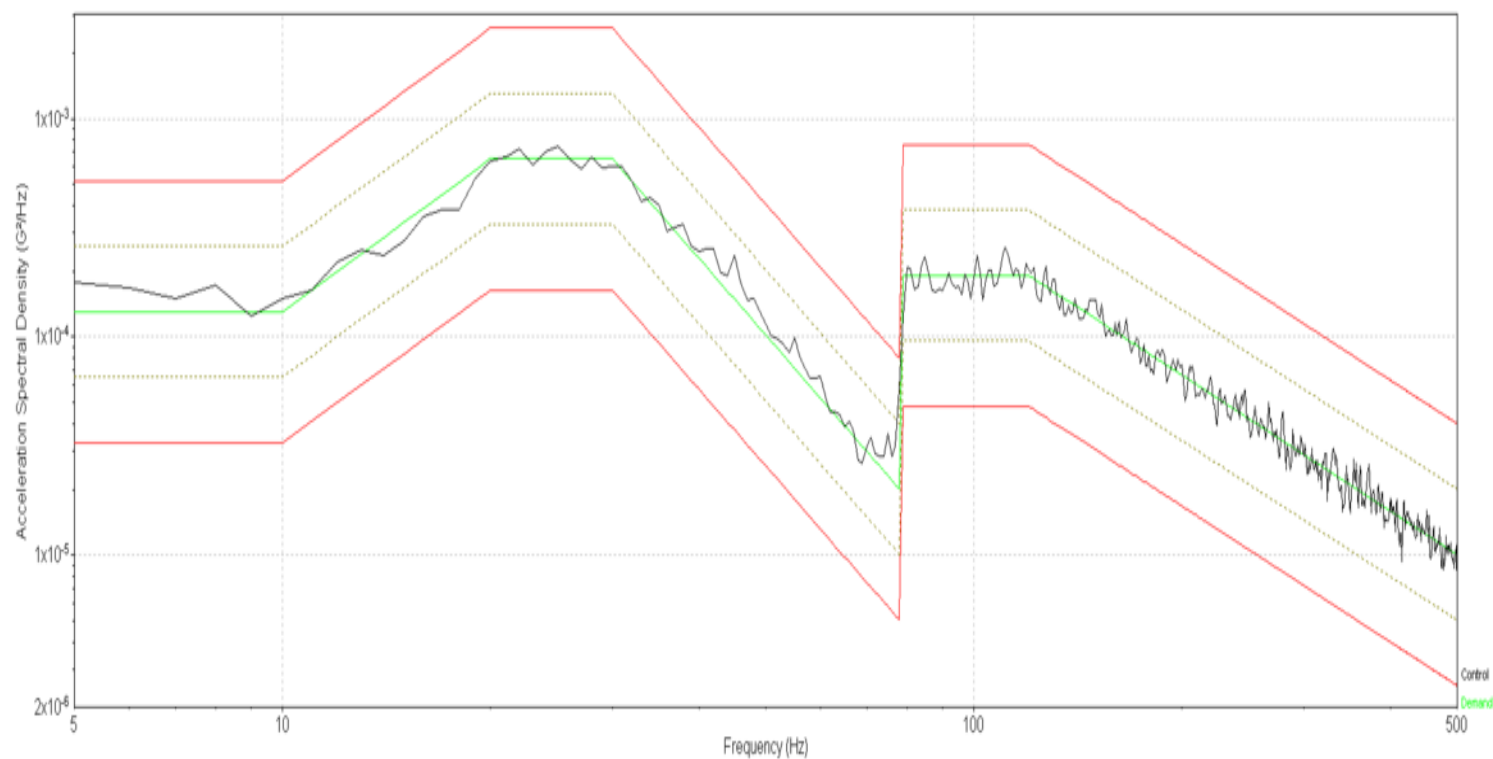
Elapsed: 1:00:14

Level: 100 %

Demand: 0.2054 G RMS

Control: 0.2068 G RMS

Control



Axis: Transverse

Test Item(s): Boost, Vault, Flex

S/N(s): B2520006601, V2520004401, F2520001001

Start Time: Mar 04, 2025 13:47:22

End Time: Mar 04, 2025 14:47:36

Run 5

Element Longmont, CO

Level Time: 1:00:00

Demand: 0.2052 G RMS

PR184986 SLI Compliance

Level 100 %

Total Time: 1:01:43

Control: 0.2078 G RMS

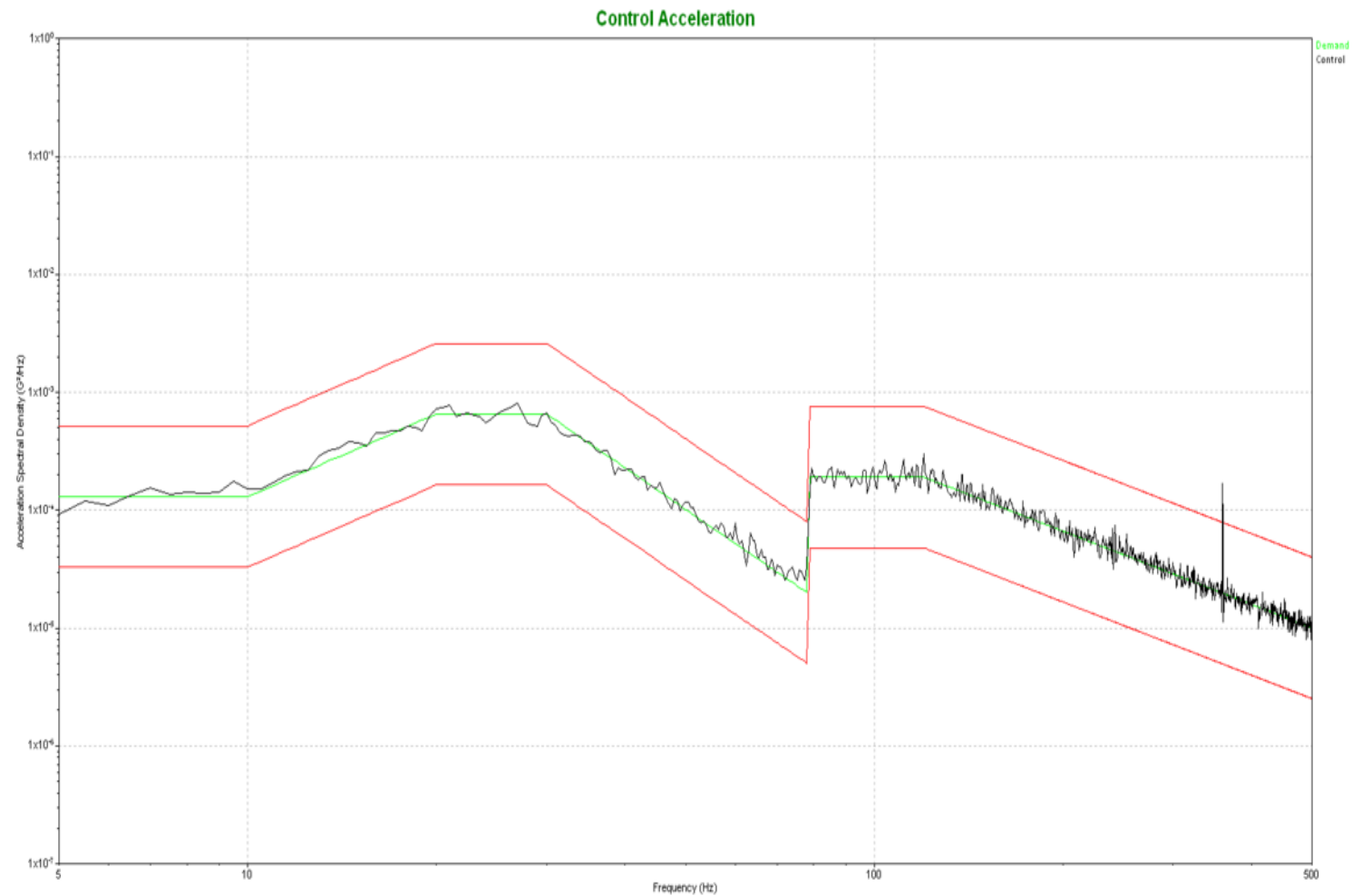
UUT: Adapt

Mar 19, 2025 10:13:32

Run 6

Test axis: Transverse

S/N: A2520009201



5.2.6 Test Equipment List

Table 5.2-1: Vibration Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061429	Shaker (Hydraulic)	Team Corporation	80/10.5	NCR	NCR
WC061430	Shaker (Hydraulic)	Team Corporation	188-48-16	NCR	NCR
WC084307	Shaker (Electro-Dynamic)	Dynamic Solution	DS-15400VHI22-70	NCR	NCR
WC061501	Accelerometer (Vibration)	PCB Piezotronics	333A12	11/18/2024	11/18/2025
WC061504	Accelerometer (Vibration)	PCB Piezotronics	353B34	06/28/2024	06/28/2025
WC061663	Accelerometer (Vibration)	PCB Piezotronics	307A21	01/13/2025	01/13/2026
WC061701	Computer (Vibration Controller)	Vibration Research	VR9500	04/04/2024	04/04/2025
WC070466	Meter (Hygrometer)	Fluke	971	06/28/2024	06/28/2025
WC080847	Controller (Vibration)	Vibration Research	VR9500	08/08/2024	08/08/2025
WC080910	Accelerometer (Vibration)	Dytran Instruments	3030B5	11/20/2024	11/20/2025
WC080917	Accelerometer (Vibration)	Dytran Instruments	3030B5	04/16/2024	04/16/2025
WC084328	Accelerometer (Shock)	PCB Piezotronics	353B33	07/23/2024	07/23/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.3.4 Test Photographs

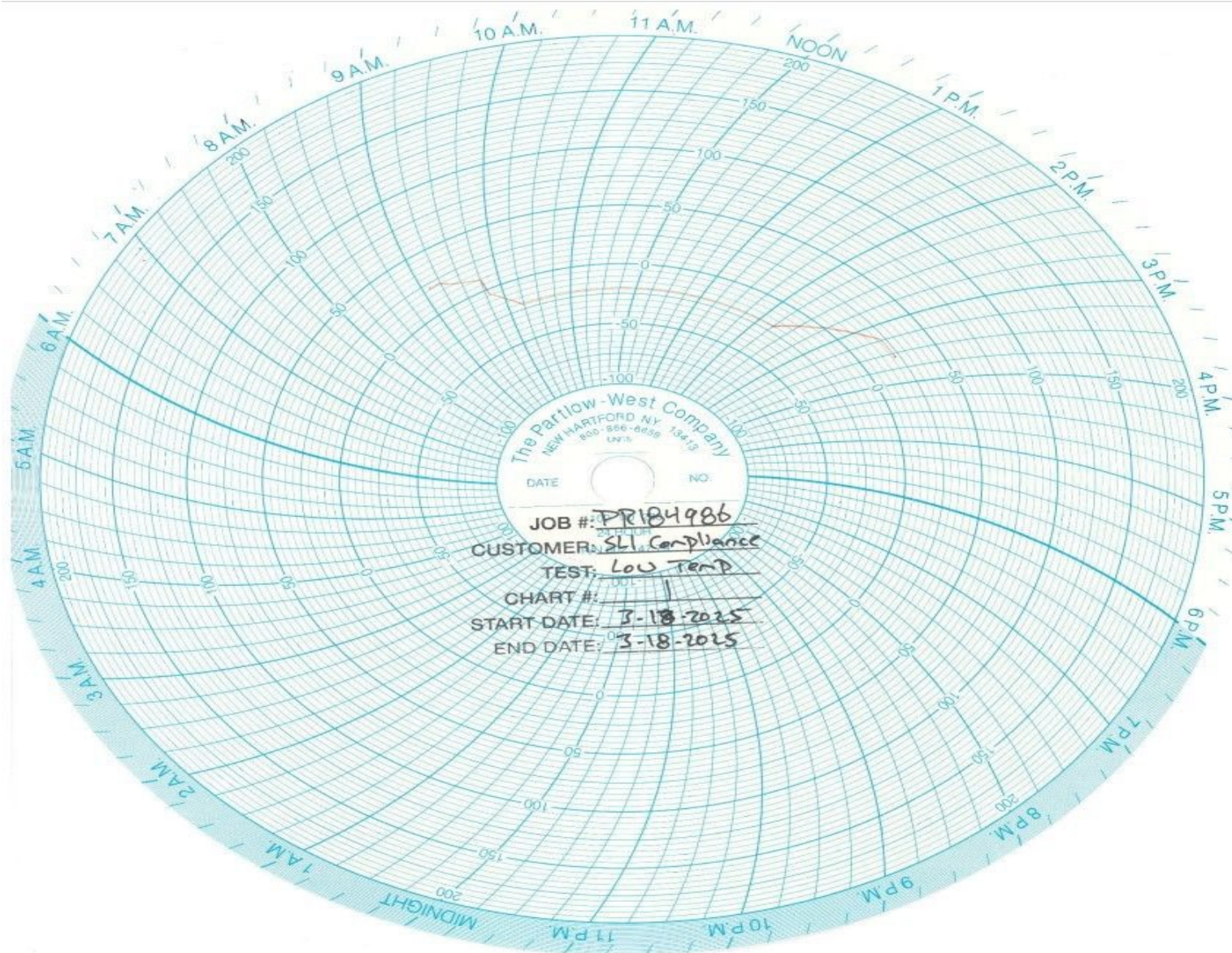


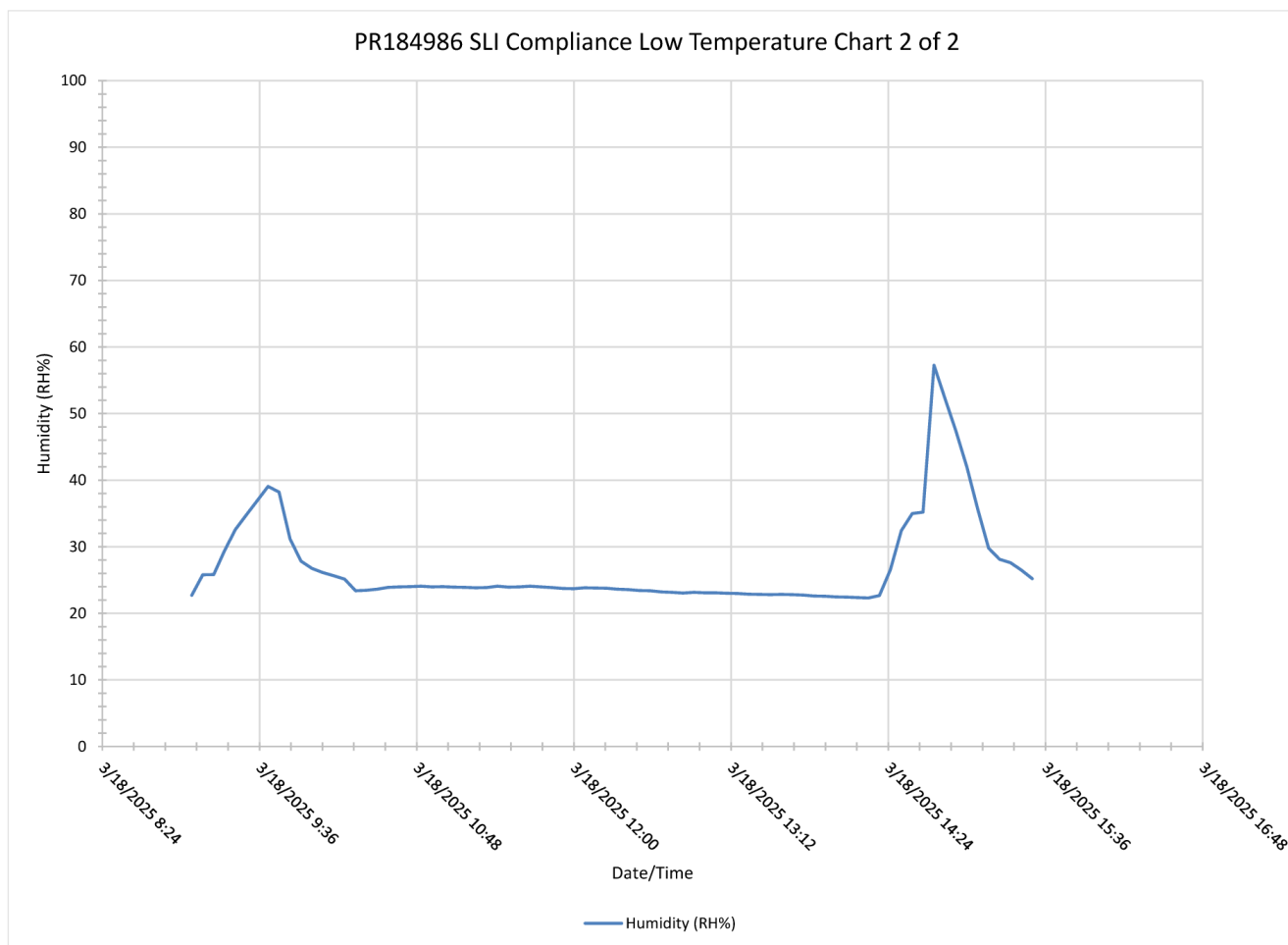
Pre-Exposure



Post Exposure

5.3.5 Test Data





5.3.6 Test Equipment List

Table 5.3-1: Low Temperature Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC084418	Chamber (Temperature/Humidity)	Espec	EWPX823-30CW	07/12/2024	07/12/2025
WC080884	Probe (Temperature/Humidity)	Vaisala	HMP77B	06/11/2024	06/11/2025
WC080885	Probe (Temperature/Humidity)	Vaisala	M170	NCR	NCR

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.4.4 Test Photographs

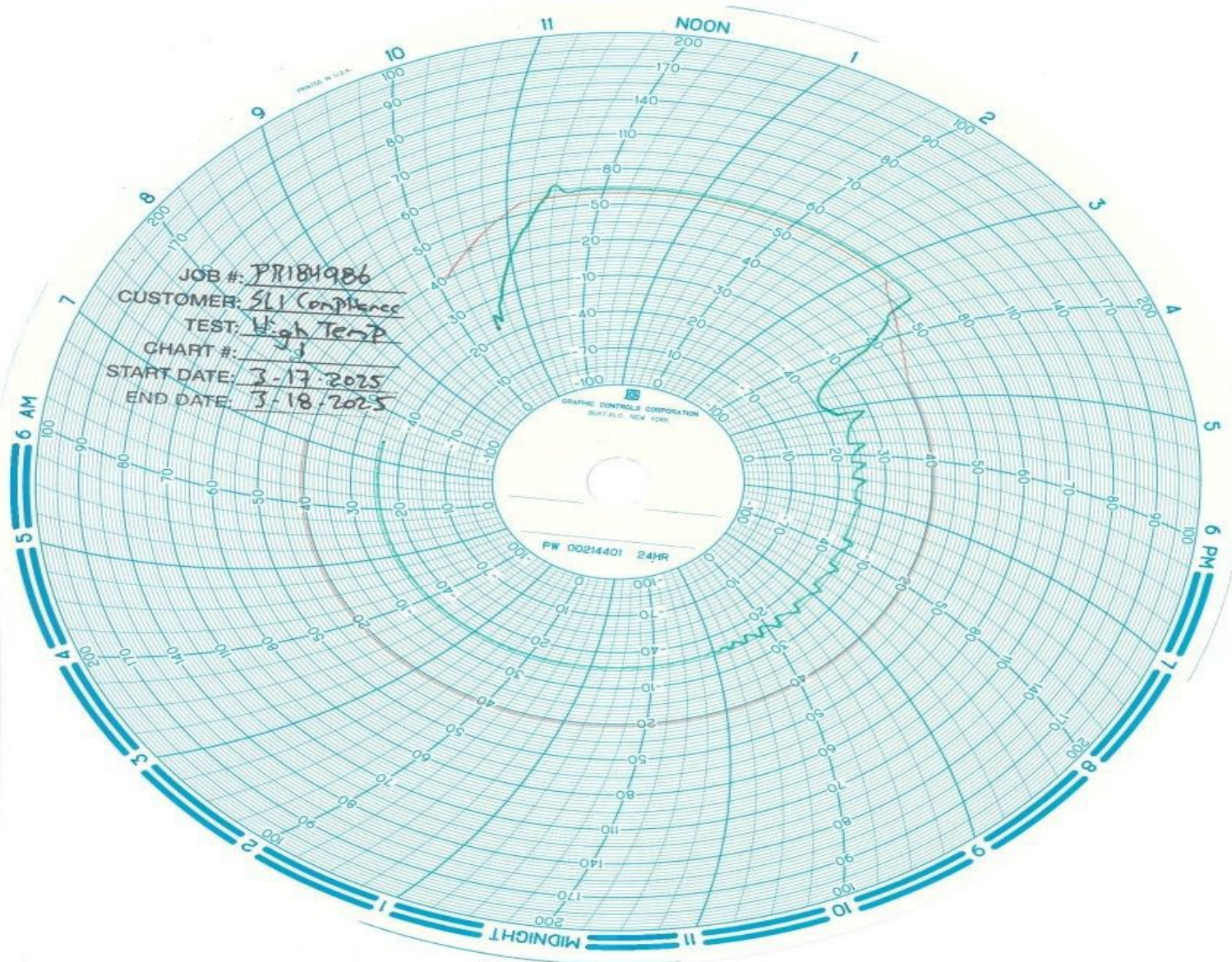


Pre-Exposure



Post Exposure

5.4.5 Test Data



5.4.6 Test Equipment List

Table 5.4-1: High Temperature Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC084418	Chamber (Temperature/Humidity)	Espec	EWPX823-30CW	07/12/2024	07/12/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.5 Continuous Operation**5.5.1 Test Procedure**

Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0

5.5.2 Test Result

The EUT's results will be determined by SLI Compliance.

5.5.3 Test Datasheets

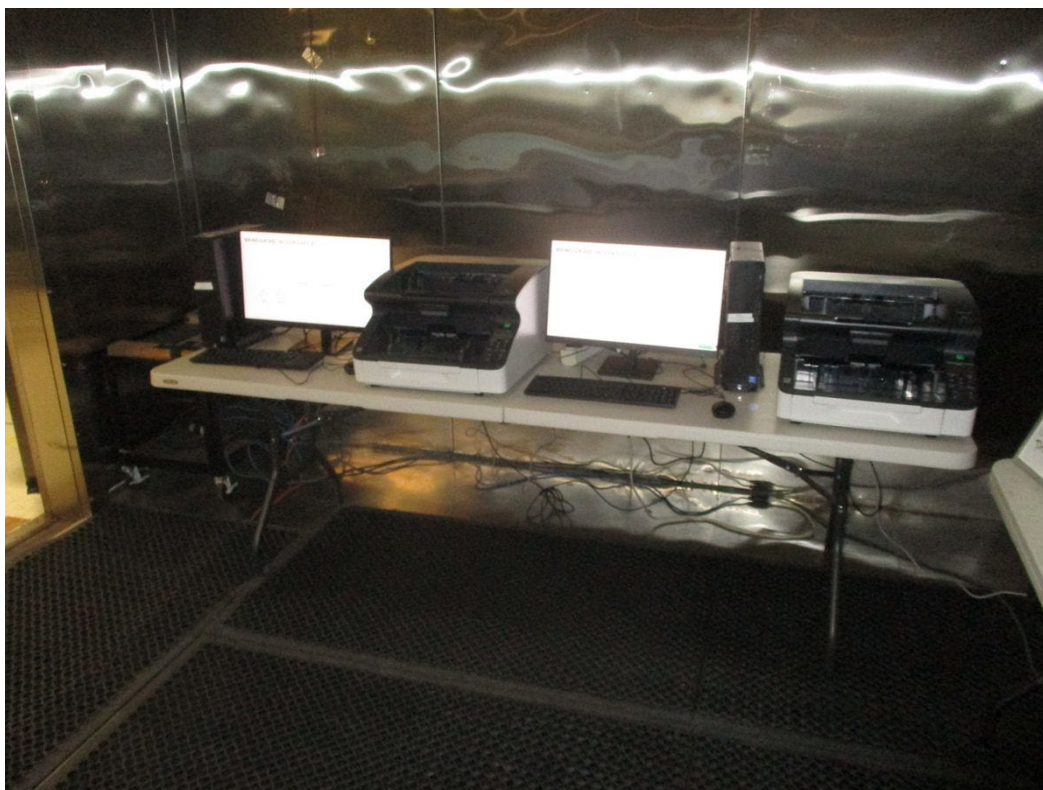
Test Log			
MJO No: PR184986		Customer: SLI Compliance	Test Specification: Hart InterCivic Verity Vanguard 1.0 EAC Environmental Hardware Test Plan v2.0 Test Performed: Continuous Operation – Varied Environmental Conditions
Date	Time	Log Entry	Tech
3/7/2025	845	No visible evidence of damage before testing.	CS
		Samples will be exposed to Continuous Operation – Varied Environmental Conditions test. The testing will be in accordance with the high and low temperature specifications of MIL-STD-810H, Methods 501.7 and 502.7, Procedure II – Operation, Cyclic Temperature and Humidity exposure. The samples will be exposed to +10C with 25% relative humidity for 12 hours and +35C with 55% RH for 12 hours. 3 cycles of exposure for a duration of 72 hours of operation. After 72 hours of exposure the chamber will return to ambient conditions for 32 hours of operation. Total test duration is 104 consecutive hours	CS
3/7/25	0900	Customers began setting up samples within the chamber	CS
3/10/25	0807	Chamber door was sealed shut. Test has begun with a ramp to +10C & 25% RH	CS
3/10/25	0830	Begin dwell at +10C & 25% RH for 12 hours	CS
3/10/25	2030	Ramp chamber to +35C & 55% RH & dwell for 12 hours	KM
3/11/25	0830	Ramp chamber to +10C & 25% RH & dwell for 12 hours	CS
3/11/25	2030	Ramp chamber to +35C & 55% RH & dwell for 12 hours	KM
3/12/25	0830	Ramp chamber to +10C & 25% RH & dwell for 12 hours	CS
3/12/25	2030	Ramp chamber to +35C & 55% RH & dwell for 12 hours	KM
3/13/25	0830	Ramp chamber to +23C ambient temperature and humidity	CS
3/13/25	0830	Temperature and humidity variation portion of test has completed	CS
3/13/25	0830	Test will continue to run at ambient temperature and humidity for another 32 hours	CS
3/14/25	1630	All Testing complete for a total duration of 104 hours	CS
3/14/25	1645	Test complete, customer to make final determination of test results	CS
		The following customer support test equipment was used during the testing:	
		Inside the Test chamber:	
		Adapt, Part No. – 2007040, Serial #: A2520009201	
		Add-on ATI kit, Part No. 3007080	
		Jelly Switch, Part No. 2007510	
		Headphones Part No. 2005230	
		23357010550274	
		Accessibility Controller (ATI), Part No. 3007080	
		Boost, Part No. 3007020, Serial #: B2520006601	
		Add-on ATI kit, Part No. 3007080	
		Jelly Switch, Part No. 2007510	
		Headphones Part No. 2005230	
		23357010550274	
		Accessibility Controller (ATI), Part No. 3007080	
		HP LaserJet Pro 4001dn series mono laser printer, s/n: VNL0714117	
		Flex, Part No. 3007010, Serial #: F252001001	
		Add-on ATI kit, Part No. 3007080	
		Jelly Switch, Part No. 2007510	
		Headphones Part No. 2005230	
		Accessibility Controller (ATI), Part No. 3007080	
		Vault, Part No. 3007030, Serial #: V2520004401	

	Add-on ATI kit, Part No. 3007080	
	Jelly Switch, Part No. 2007510	
	Headphones Part No. 2005230	
	Imprinter, Part No. 3007050, s/n: I2520012401	
	Ball Box, Model 2007060, s/n: X2520014901	
	Vanguard Capture (Central Scan) – Central Count System:	
	Test Config. 1: Verity Vanguard Capture (Server)	
	MXL401233Q	
	P24 G5 Monitors, s/n: CNC3471MMG	
	Canon DRG-2140 high speed scanner w/imprinter, s/n: JF306475	
	Test Config. 2: Verity Vanguard Capture (Client)	
	MXL4233CZC	
	P24 G5 Monitors, s/n: CNC3471MLW	
	Canon DRG-2110 high speed scanner w/imprinter, s/n: JG313298	
	Ethernet Switch: aruba instant on 1430 Switch s/n: TW45L4600J	
	Outside the test chamber:	
	Verity Vanguard Define/Deploy/Results	
	MXL4233CZW	
	P24 G5 Monitors, s/n: CNC40324T1	

5.5.4 Test Photographs



Pre-Exposure



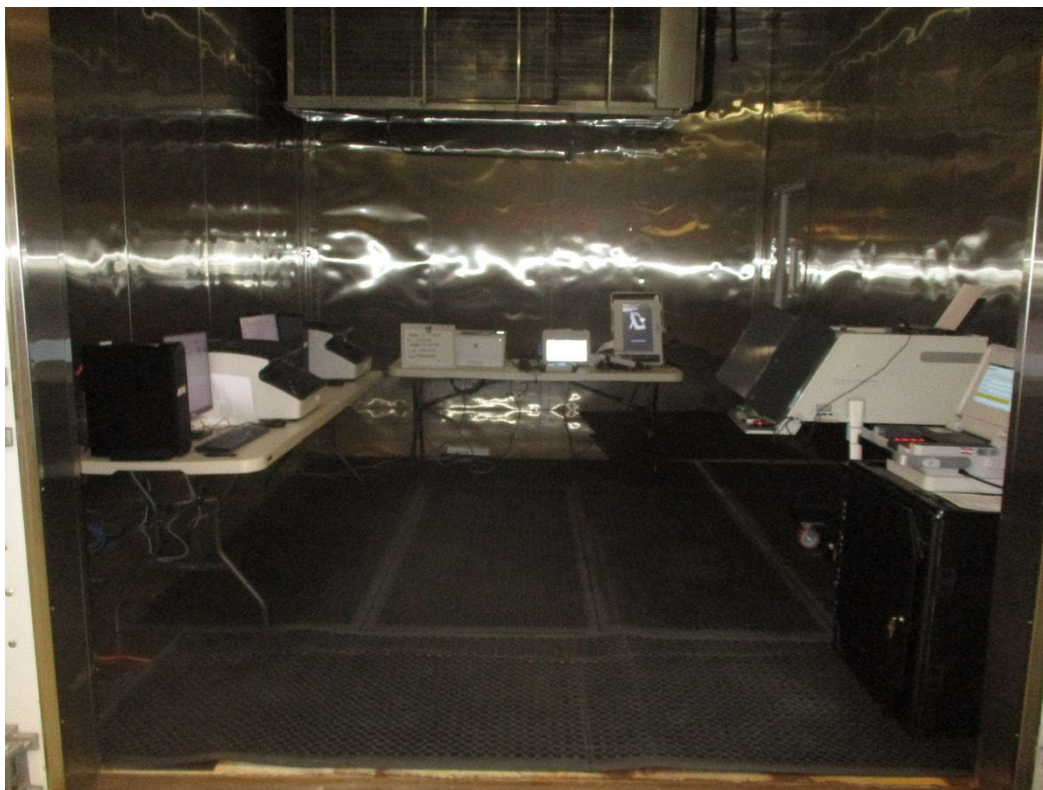
Pre-Exposure



Pre-Exposure



Pre-Exposure



Post Exposure



Post Exposure

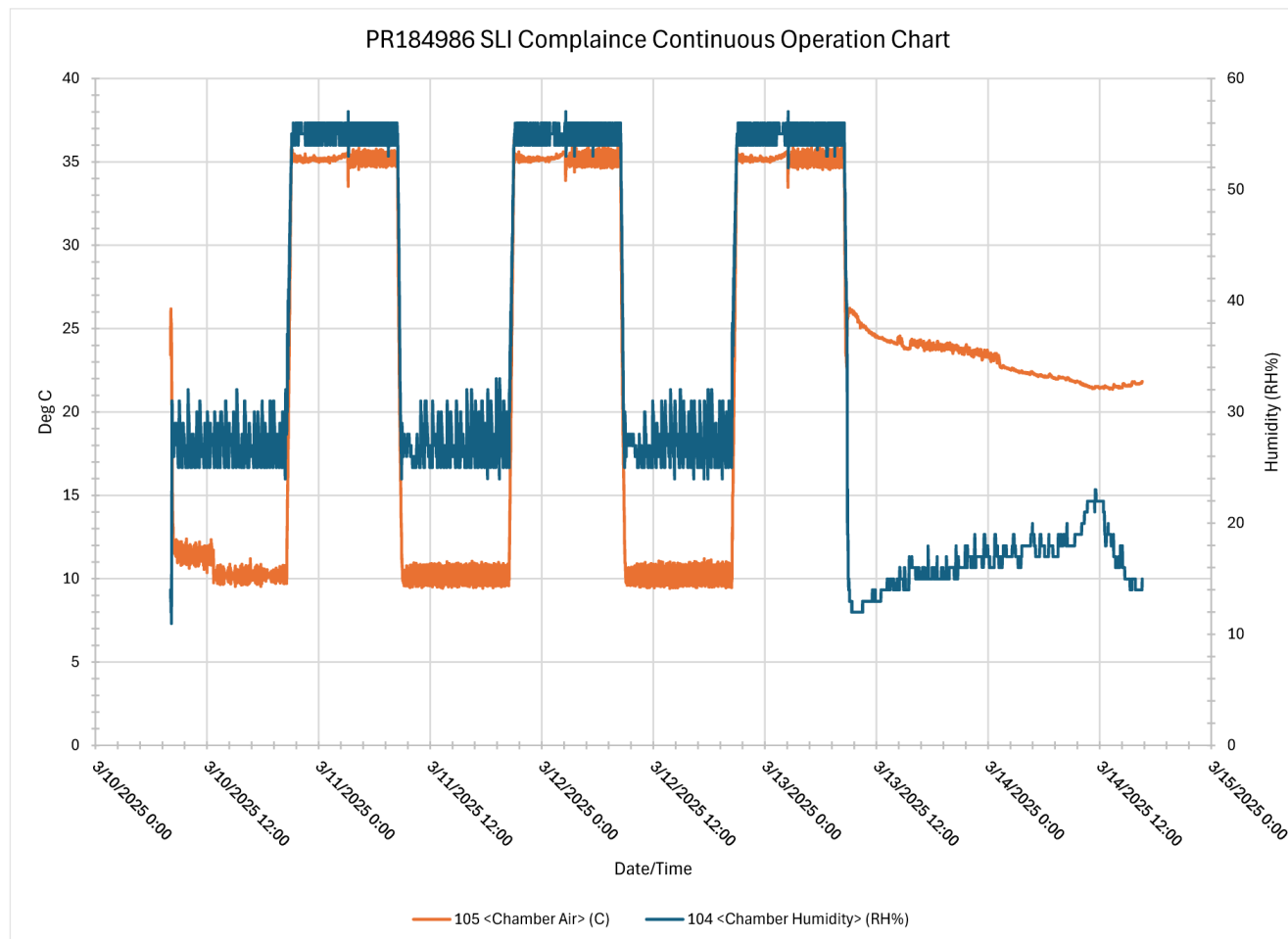


Post Exposure



Post Exposure

5.5.5 Test Data



5.5.6 Test Equipment List

Table 5.5-1: Continuous Operation Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC061559	Chamber (Temperature/Humidity)	StorageTek	Large Walk In	10/03/2024	10/03/2025
WC059836	Data Acquisition (Board/Card)	Agilent Technologies	34901A	09/10/2024	09/10/2025
WC059855	Data Acquisition (Board/Card)	Agilent Technologies	34901A	08/28/2024	08/28/2025
WC070523	System (Data Acquisition)	Agilent Technologies	34970A	08/23/2024	08/23/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

End of Test Report