Environmental Hardware Test Plan

EAC VVSG 1.0

Document Number HIN-21005-ENHTP-01

Prepared for:

Vendor Name	Hart InterCivic
Vendor System	Verity 2.7
EAC Application No.	HRT-Verity-2.7
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NVLAP TESTING
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Accredited by the Election Assistance Commission (EAC) for Selected Voting System Test Methods or Services

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Revision History

Date	Release	Author	Revision Summary
February 14, 2022	1.0	*Darrick Forester*	Initial Release
March 9, 2022	2.0	*Darrick Forester*	Updated for EAC Comments

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TABLE OF CONTENTS

1 INTRODUCTION

This test plan covers the environmental test requirements and methods for the Hart InterCivic 2.7 voting system, Controller / Touch Writer Duo, hereafter known as the Unit Under Test (UUT), to the requirements as stated in Election Assistance Commission 2005 Voluntary Voting System Guidelines Version 1.0

1.1 Qualifications

The UUT supplied by Hart InterCivic is representative of product produced in their volume manufacturing process.

1.2 Hardware Test Lab Facility

NTS Environmental/Dynamic
1601 Dry Creek Drive, Suite 2000
Longmont, Colorado 80503

1.3 Reference Documents

- Election Assistance Commission Voluntary Voting System Guidelines version 1.0 (EAC VVSG), Volumes I & II.
- EAC Voting System Testing and Certification Program Manual, United States Election Assistance, v 2.0, May 2015.
- EAC Voting System Testing Laboratory Program Manual, United States Election Assistance, Commission v 2.0, May 2015.
- NIST Handbook 150-2020.
- NIST Handbook 150-22-~~2021~~2017.
- EAC Notice of Clarification 07-05: Voting System Test Laboratory (VSTL) responsibilities in the management and oversight of third-party testing.
- EAC Decision on Request for Interpretation 2007-05 (COTS).
- EAC Decision on Request for Interpretation 2008-01 FINAL (temp and power variation tests).
- EAC Decision on Request for Interpretation 2009-06 (Temperature Power Variation) FINAL.041610.
- SLI Compliance VSTL Quality System Manual, v 3.3, December 17, 2020

2 Product Description

2.1 Unit Under Test

Product / Model	Serial Number	Description	Qty
Controller w/ Touch Writer DUO **(Humidity Test)**	C2115161506 B1903101010	**Verity Controller** - is a poll worker device use for management of voting devices. **Verity Touch Writer Duo** - is a voting device that prints to ab 8.5"x11" or 8.5"x14" thermal paper ballot. They are networked together via a daisy-chain network cable (100Mbit Ethernet over a proprietary cable). An optional accessibility controller (ATI) may be equipped.	1 Set
Controller w/ Touch Writer DUO **(Bench, Handling, Vibration, Low Temp, High Temp)**	C2115161406 B2013730601	**Verity Controller** - is a poll worker device use for management of voting devices. **Verity Touch Writer Duo** - is a voting device that prints to ab 8.5"x11" or 8.5"x14" thermal paper ballot. They are networked together via a daisy-chain network cable (100Mbit Ethernet over a proprietary cable). An optional accessibility controller (ATI) may be equipped.	1 Set

2.2 Product Information

Description	Dimensions	Weight
Controller w/ Touch Writer DUO	Storage Dimensions (approx.) 19" wide x 18" deep x 8" high	28lbs each

2.3 Support Equipment (SE)

Product / Model	Serial Number	Description	Qty
Accessible Booth with ATI Tray	N/A	For Touch Writer Duo	2
Standard Booth	N/A	For Touch Writer Duo	2

2.4 Accessories

Type	Model	Function
Verity Key - Security Key	2005535	User authentication and configuration of election security.
Verity vDrive	2005361	Load election definitions, record CVRs and audit logs.
COTS Jelly Switches	N/A	Enable voters with limited body mobility to vote independently and privately.
COTS headphones	Hart 2005230	For visually impaired voters and voters having trouble reading the ballot.
Hart Verity ATI Module	2005018	Audio-Tactile Interface (ATI) intended for voters that cannot, or prefer not to, use the touch screen.

2.5 Software / Firmware

Type	Version	Description
Verity Software (all)	2.7.0	Election software for operational status check.
Verity Baseboard Microcontroller Firmware	1	Duo devices only.
Verity Baseboard Microcontroller Firmware	17	Verity Devices.

3 Environmental Test Requirements

3.1 Test Procedures

3.1.1 Operating Environmental

Equipment used for election management activities or vote counting (including both precinct and central count systems) shall be capable of operation in temperatures ranging from 50 to 95 degrees Fahrenheit.

3.1.2 Environmental Control – Transit and Storage

Equipment used for vote casting or for counting votes in a precinct count system, **shall** meet these specific minimum performance standards that simulate exposure to physical shock and vibration associated with handling and transportation by surface and air common carriers, and to temperature conditions associated with delivery and storage in an uncontrolled warehouse environment:

- High and low storage temperatures ranging from -4 to +140 degrees Fahrenheit, equivalent to MIL-STD-810D, Methods 501.2 and 502.2, Procedure I-Storage.
- Bench handling equivalent to the procedure of MIL-STD-810D, Method 516.3, Procedure VI.
- Vibration equivalent to the procedure of MIL-STD-810D, Method 514.3, Category 1- Basic Transportation, Common Carrier; and
- Uncontrolled humidity equivalent to the procedure of MIL-STD-810D, Method 507.2, Procedure I-Natural Hot-Humid.

3.2 Design, Construction and Maintenance

This covers voting system materials, construction workmanship, and specific design characteristics important to the successful operation and efficient maintenance of the voting system.

3.2.1 Physical Attributes

The following physical attributes will be examined to assess reliability:

a. Presence of labels and the identification of test points
b. Provision of built-in test and diagnostic circuitry or physical indicators of condition
c. Presence of labels and alarms related to failures
d. Presence of features that allow non-technicians to perform routine maintenance tasks (such as update of the system database)

3.2.2 Additional Attributes

The following additional attributes will be considered to assess system maintainability:

a. Ease of detecting that equipment has failed by a non-technician
b. Ease of diagnosing problems by a trained technician
c. Low false alarm rates (i.e., indications of problems that do not exist)
d. Ease of access to components for replacement
e. Ease with which adjustment and alignment can be performed
f. Ease with which database updates can be performed by a non-technician

g. Adjust, align, tune or service components

3.3 Non-Operating Environmental Test

3.3.1 Operational Status Check

When all tests, inspections, repairs, and adjustments have been completed, normal operation **shall** be verified by conducting an operational status check.

During this process, all equipment shall be operated in a manner and under environmental conditions that simulate election use to verify the functional status of the system. Prior to the conduct of each of the environmental hardware non-operating tests, a supplemental test shall be made to determine that the operational state of the equipment is within acceptable performance limits.

The following procedures **shall** be followed to verify the equipment status:

Step 1: Arrange the system for normal operation.

Step 2: Turn on power, and allow the system to reach recommended operating temperature.

Step 3: Perform any servicing, and make any adjustments necessary, to achieve operational status.

Step 4: Operate the equipment in all modes, demonstrating all functions and features that would be used during election operations.

Step 5: Verify that all system functions have been correctly executed.

3.3.1.1 Failure Criteria

Upon completion of each non-operating test, the system hardware shall be subject to functional testing to verify continued operability. If any portion of the voting machine or precinct counter hardware fails to remain fully functional, the testing will be suspended until the failure is identified and corrected by the manufacturer. The system will then be subject to a retest.

3.3.2 Bench Handling Test

The bench handling test simulates stresses faced during maintenance and repair of voting machines and ballot counters. All systems and components, regardless of type, **shall** meet the requirements of this test. This test is equivalent to the procedure of MIL-STD-810D, Method 516.3, and Procedure VI.

3.3.2.1 Procedure

Step 1: Place each piece of equipment on a level floor or table, as for normal operation or servicing.

Step 2: Make provision, if necessary, to restrain lateral movement of the equipment or its supports at one edge of the device. Vertical rotation about that edge shall not be restrained.

Step 3: Using that edge as a pivot, raise the opposite edge to an angle of 45 degrees, to a height of four inches above the surface, or until the point of balance has been reached, whichever occurs first.

Step 4: Release the elevated edge so that it may drop to the test surface without restraint.

Step 5: Repeat steps 3 and 4 for a total of six events.

Step 6: Repeat steps 2, 3, and 4 for the other base edges, for a total of 24 drops for each device.

Step 7: Perform an **Operational Status Check** verifying continued operability of the UUT.

3.3.3 Vibration Test

The vibration test simulates stresses faced during transport of voting machines and ballot counters between storage locations and polling places. All systems and components, regardless of type, **shall** meet the requirements of this test. This test is equivalent to the procedure of MIL-STD-810D, Method 514.3, Category 1- Basic Transportation, and Common Carrier.

3.3.3.1 Procedure

Step 1: Install the test item in its transit or combination case as prepared for transport.

Step 2: Attach instrumentation as required to measure the applied excitation.

Step 3: Mount the equipment on a vibration table with the axis of excitation along the vertical axis of the equipment.

Step 4: Apply excitation as shown in MIL-STD-810D, Method 514.3-1, “Basic transportation, common carrier, vertical axis”, with low frequency excitation cutoff at 10 Hz, for a period of 30 minutes.

Step 5: Repeat steps 2 and 3 for the transverse and longitudinal axes of the equipment with the excitation profiles shown in Figures 514.3-2 and 514.3-3, respectively. (Note: The total excitation period equals 90 minutes, with 30 minutes excitation along each axis.)

Step 6: Remove the test item from its transit or combination case and perform an **Operational Status Check** verifying continued operability of the UUT.

3.3.4 Low Temperature Test

The low temperature test simulates stresses faced during storage of voting machines and ballot counters. All systems and components, regardless of type, **shall** meet the requirements of this test. This test is equivalent to the procedure of MIL-STD-810D, Method 502.2, and Procedure I-Storage. The minimum temperature shall be -4 degrees F.

3.3.4.1 Procedure

Step 1: Arrange the equipment as for storage. Install it in the test chamber.

Step 2: Lower the internal temperature of the chamber at any convenient rate, but not so rapidly as to cause condensation in the chamber, and in any case no more rapidly than 10 degrees F per minute, until an internal temperature of -4 degrees F has been reached.

Step 3: Allow the chamber temperature to stabilize. Maintain this temperature for a period of 4 hours after stabilization.

Step 4: Allow the internal temperature of the chamber to return to standard laboratory conditions, at a rate not exceeding 10 degrees F per minute.

Step 5: Allow the internal temperature of the equipment to stabilize at laboratory conditions before removing it from the chamber.

Step 6: Remove the equipment from the chamber and from its containers, and inspect the equipment for evidence of damage.

Step 7: Perform an **Operational Status Check** verifying continued operability of the UUT.

3.3.5 High Temperature Test

The high temperature test simulates stresses faced during storage of voting machines and ballot counters. All systems and components, regardless of type, **shall** meet the requirements of this test. This test is equivalent to the procedure of MIL-STD-810D, Method 501.2, and Procedure I-Storage. The maximum temperature shall be 140 degrees F.

3.3.5.1 Procedure

Step 1: Arrange the equipment as for storage. Install it in the test chamber.

Step 2: Raise the internal temperature of the chamber at any convenient rate, but in any case, no more rapidly than 10 degrees F per minute, until an internal temperature of 140 degrees F has been reached.

Step 3: Allow the chamber temperature to stabilize. Maintain this temperature for a period of 4 hours after stabilization.

Step 4: Allow the internal temperature of the chamber to return to standard laboratory conditions, at a rate not exceeding 10 degrees F per minute.

Step 5: Allow the internal temperature of the equipment to stabilize at laboratory conditions before removing it from the chamber.

Step 6: Remove the equipment from the chamber and from its containers and inspect the equipment for evidence of damage.

Step 7: Perform an **Operational Status Check** verifying continued operability of the UUT.

3.3.6 Humidity Test

The humidity test simulates stresses faced during storage of voting machines and ballot counters. All systems and components regardless of type **shall** meet the requirements of this test. This test is similar to the procedure of MIL-STD-810D, Method 507.2, Procedure I-Natural Hot-Humid. It is intended to evaluate the ability of the equipment to survive exposure to an uncontrolled temperature and humidity environment during storage. This test lasts for ten days.

3.3.6.1 Procedure

Step 1: Arrange the equipment as for storage. Install it in the test chamber.

Step 2: Adjust the chamber conditions to those given in MIL-STD-810D Table 507.2-I, for the time 0000 of the Hot Humid cycle (Cycle 1).

Step 3: Perform a 24-hour cycle with the time and temperature-humidity values specified in Figure 507.2-1, Cycle 1.

Step 4: Repeat Step 2 until 5, 24-hour cycles have been completed.

Step 5: Continue with the test commencing with the conditions specified for time = 0000 hours.

Step 6: At any convenient time in the interval between time = 120 hours and time = 124 hours, place the equipment in an operational configuration, and perform a complete operational status check.

Step 7: If the equipment satisfactorily completes the status check, continue with the sixth 24-hour cycle.

Step 8: Perform 4 additional 24-hour cycles, terminating the test at time = 240 hours.

Step 9: Remove the equipment from the test chamber and inspect it for any evidence of damage.

Step 10: Perform an **Operational Status Check** verifying continued operability of the UUT.

4 Environmental Test Summary

The following Table shows the tests to be performed on the UUT.

Test	Test Specification	VVSG 1.0
Non-Operating Environmental Tests		
Bench Handling	MIL-STD-810D, Method 516.3, Procedure VI	**V1**: 4.1.7.1, **V2**: 4.6.2
Vibration	MIL-STD-810D, Method 514.3, Category 1-Basic Transportation, Common Carrier	**V1**: 4.1.7.1, **V2**: 4.6.3

Test	Test Specification	VVSG 1.0
Low Temperature	MIL-STD-810D, Method 502.2, Procedure I-Storage	**V1**: 4.1.7.1, **V2**: 4.6.4
High Temperature	MIL-STD-810D, Method 501.2, Procedure I-Storage	**V1**: 4.1.7.1, **V2**: 4.6.5
Humidity	MIL-STD-810D, Method 507.2, Procedure I-Natural Hot-Humid	**V1**: 4.1.7.1, **V2**: 4.6.6

End of ENV Hardware Test Plan