

# Environmental Hardware Test Plan

Temperature and Power Variation

EAC VVSG 1.0

Document Number HIN-21005-ENHTP-02

Prepared for:

<b>Vendor Name</b>	Hart InterCivic
<b>Vendor System</b>	Verity 2.7
<b>EAC Application No.</b>	HRT-Verity-2.7
<b>Vendor Address</b>	15500 Wells Port Drive

Prepared by:



4720 Independence St.  
Wheat Ridge, CO 80033  
303-422-1566  
[www.SLICompliance.com](http://www.SLICompliance.com)



**Accredited by the Election  
Assistance Commission (EAC)  
for Selected Voting System Test  
Methods or Services**



Copyright © 2022 by SLI Compliance®, a Division of Gaming Laboratories International LLC

## Revision History

Date	Release	Author	Revision Summary
March 10, 2022	1.0	Darrick Forester	Initial Release
April 13, 2022	2.0	Darrick Forester	Added Verity Reader

### Disclaimer

The information reported herein must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

#### **Trademarks**

- SLI is a registered trademark of SLI Compliance.
- All products and company names are used for identification purposes only and may be trademarks of their respective owners.

**This document shall not be reproduced outside of SLI Compliance without written consent.**



## TABLE OF CONTENTS

<b>ENVIRONMENTAL HARDWARE TEST PLAN .....</b>	<b>1</b>
<b>1 INTRODUCTION.....</b>	<b>4</b>
1.1 QUALIFICATIONS .....	4
1.2 HARDWARE TEST LAB FACILITY .....	4
1.3 REFERENCE DOCUMENTS .....	4
<b>2 PRODUCT DESCRIPTION.....</b>	<b>5</b>
2.1 UNIT UNDER TEST .....	5
2.2 PRODUCT INFORMATION .....	5
2.3 SUPPORT EQUIPMENT (SE).....	6
2.4 AC POWER ADAPTER .....	6
2.5 ACCESSORIES .....	7
2.6 SOFTWARE / FIRMWARE .....	7
<b>3 OPERATING ENVIRONMENTAL TESTS.....</b>	<b>7</b>
3.1 SIMULATED OPERATION DIAGNOSTIC.....	<b>ERROR! BOOKMARK NOT DEFINED.</b>
3.2 INTEGRITY .....	7
3.3 TEMPERATURE AND POWER VARIATION .....	7
3.3.1 <i>Test Approach</i> .....	9
3.3.2 <i>Reliability</i> .....	10
<b>4 ENVIRONMENTAL TEST SUMMARY.....</b>	<b>11</b>



## 1 INTRODUCTION

This test plan covers the environmental test requirements and methods for the Hart InterCivic 2.7 voting system, Verity Touch Writer, Verity Scan and 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 150-22-2017.
- 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
Verity Controller (3006085) w/ Verity Touch Writer Duo (3006070) <b>2 Daisy Chain configurations used for Temp / Power Testing</b>	Daisy Chain 1: C2115161506 B1903101010  Daisy Chain 2: C2115161406 B2013730601	<b>Verity Controller</b> – is a poll worker device use for management of voting devices. <b>Verity Touch Writer Duo</b> – 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.	2 sets
Verity Scan (3006080) <b>2 devices used for Temp / Power Testing</b>	S2115228806 S2115227906	Polling Place Ballot Marking Device for voters that require an accessible way to mark a paper ballot.	2
Verity Touch Writer (3006090) w / Brother Laser Printer attached <b>2 config. used for Temp / Power Testing</b>	W2014374311 W2014395311	Polling Place Ballot Marking Device for voters that require an accessible way to mark a paper ballot.	2
Verity Reader	R2115230606 R2115230806	Accessible ballot verification device. Verity Reader is a paper-ballot review device only. Reader does not store or tabulate votes.	2

Formatted: Font: (Default) Arial, 11 pt

### 2.2 Product Information

Description	Dimensions	Weight
Verity Scan	Device Closed 18.8 x 17.4 x 7.7 Device Open 18.8 x 21.4 x 20.9	28lbs
Verity Controller Touch Writer Duo	Device Closed 18.8 x 17.4 x 7.7 Device Open 18.8 x 21.4 x 20.9	28lbs
Verity Touch Writer	Device Closed 18.8 x 17.4 x 7.7 Device Open 18.8 x 21.4 x 20.9	28lbs



Verity Reader	Device Closed 18.8 x 17.4 x 7.7	28lbs
	Device Open 18.8 x 21.4 x 20.9	

### 2.3 Support Equipment (SE)

Product / Model	Serial Number	Description	Qty
Accessible Booth with ATI Tray	TBD	For Touch Writer Duo and Touch Writer	24
Standard Booth	TBD	For Touch Writer Duo	24
AutoBallot (barcode scanner) Hart P/N 3005174 Motorola/Zebra DS4308-SR7U2100AZW	TBD	Optional COTs barcode scanner. This is an option for and does not ship with the unit as a default configuration.	46
Red/Green Jelly Switches	N/A	Red/Green jelly switches for disabled use. These are COTS switches that do not ship with the unit and are typically provided by an accessible user	46
Headphones Hart: P/N 2005230 v7 brand HA300-2NP	N/A	Optional COTS Headphones for listening to audio.	46
Brother Laser Printer HL-L6400DWVS (COTS)	U64185J1N427136 U64185J1N427134	Print Marked Ballots use with Verify Touch Writer	2
Hart Verity ATI Module	TBD	Audio-Tactile Interface (ATI) intended for voters that cannot, or prefer not to, use the touch screen.	4
Ballot Box	N/A	For Scan	23

### 2.4 AC Power Adapter

Manufacturer	Model	Input	Output and Type
SL Power Electronics	TE60 Series	N/A	24VDC, 2.7A



## 2.5 Accessories

Type	Model	Function
Test Ballots	N/A	Mark / View Ballots
Verity Key - Security Key	N/A	User authentication and configuration of election security.
Verity vDrive	N/A	Load election definitions, record CVRs and audit logs.

## 2.6 Software / Firmware

Type	Version	Description
Test Software	2.7.0	Election software
Verity Baseboard Microcontroller Firmware	1	Duo devices only.
Verity Baseboard Microcontroller Firmware	17	Verity Devices.

## 3 Operating Environmental Tests

This section addresses a range of tests for all voting system equipment, including equipment for both precinct count systems.

### 3.1 Integrity

The UUT is subject to integrity verification based on the provisions of Volume I, Section 2.1.4 (d) to ensure system integrity, all system shall protect against ambient temperature and humidity fluctuations. The ambient temperature fluctuations are verified during the temperature and power variation test. The MILSTD-810D, Method 507.2, Procedure I-Natural Hot-Humid is considered to be industry standard and is selected to verify humidity fluctuations.

### 3.2 Temperature and Power Variation

This test is similar to the low temperature and high temperature tests of MIL-STD-810-D, Method 502.2 and Method 501.2, with test conditions that correspond to the requirements of the performance standards. This procedure tests system operation under various environmental conditions for 85 hours. During 48 hours of this operating time, the device shall be in a test chamber. For the remaining hours, the equipment shall be operated at room temperature. The system shall be powered for the entire period of this test; the power may be disconnected only if necessary for removal of the system from the test chamber.



Operation shall consist of ballot-counting cycles, which vary with system type. An output report need not be generated after each counting cycle. The interval between reports, however, should be no more than 4 hours to keep to a practical minimum the time between the occurrence of a failure or data error and its detection.

The recommended pattern of votes is one chosen to facilitate visual recognition of the reported totals; this pattern shall exercise all possible voting locations. System features such as data quality tests, error logging, and audit reports shall be enabled during the test. Each operating cycle shall consist of processing the number of ballots indicated above.

**Step 1:** Arrange the equipment in the test chamber. Connect as required and provide for power, control, and data service through enclosure wall.

**Step 2:** Set the supply voltage at 117 voltage alternating current.

**Step 3:** Power the equipment and perform an operational status check as in Section 4.6.1.5.

**Step 4:** Set the chamber temperature to 50 degrees F, observing precautions against thermal shock and condensation.

**Step 5:** Begin 24 hour cycle.

**Step 6:** At T=4 hrs., lower the supply voltage to 105 vac.

**Step 7:** At T=8 hrs., raise the supply voltage to 129 vac.

**Step 8:** At T=11:30 hrs., return the supply voltage to 117 vac and return the chamber temperature to lab ambient, observing precautions against thermal shock and condensation.

**Step 9:** At T=12:00 hrs., raise the chamber temperature to 95 degrees Fahrenheit.

**Step 10:** Repeat Steps 5 through 8, with temperature at 95 degrees Fahrenheit, complete at T=24 hrs.

**Step 11:** Set the chamber temperature at 50 degrees Fahrenheit as in Step 4.

**Step 12:** Repeat the 24 hour cycle as in Steps 5-10, complete at T=48 hrs.

**Step 13:** After completing the second 24 hour cycle, disconnect power from the system and remove it from the chamber if needed.

**Step 14:** Reconnect the system as in Step 2 and continue testing for the remaining period of operating time.

*Note: Requires 24-hr continuous coverage / support from the hardware test lab for the duration of Temperature / Power Variation Test. Support from the hardware test lab includes monitoring and setting voltage meter when required base off test plan requirements.*





### 3.2.1 Test Approach

The test election with two contests with four candidates each, and two propositions ~~with~~ will be used.

Verity Controller + Touch Writer Duo daisy chain configuration = 85 hours for each configuration under test. Per test ballots counting cycle requirement, test will be conducted as such:

- Each Verity Controller will issue 8 Access Codes every hour.
  - 8 voting and printing cycles will be performed on each Touch Writer Duo every hour, for a total of 8 voting and printing cycles on each daisy chain every hour.
  - 16 voted ballots will be scan by Verity Scan located outside of the chamber. Polls will close every 4 hours to get the tally reports.

Test configuration:

- Config A – Controller+Duo 1
- Config B – Controller+Duo 2

Verity Scan with Touch Writer = 85 hours for each configuration under test. Per test ballots counting cycle requirement, test will be conducted as such:

- Each Verity Scan will scan 100 pre-marked ballots every hour which Includes 1 ballot generated from each Touch Writer every hour.
- The marking pattern will be the same for 4 hours, after which the pre-marked ballots will be retired. The Touch Writer ballot will be scanned only once per hour.
- Each Verity Reader will visually verify five marked paper ballots every hour prior to being scan.

Test configuration:

- Config A – Scan 1 w/ Touch Writer 1, accepting all Touch Writer ballots, and Reader
- Config B – Scan 2 w/ Touch Writer 2, accepting all Touch Writer ballots, and Reader

Prevented maintenance will be performed every 16 hours for configurations under test.

The test will be conducted to run in 4-hour cycles, such that each cycle is concluded with the generation of a report that details the vote data cast during that period. When required SLI personnel will audit ballots once per hour until testing is completed.



### 3.2.2 Reliability

The accredited test lab shall test for reliability based on the provisions of Volume I, Section 4 for the acceptable Mean Time Between Failure (MTBF). The MTBF shall be measured during the conduct of other system performance tests specified in this section and shall be at least 163 hours. Appendix C of VVSG Vol. II provides further details of the calculation for this testing period.

The “cause for failure” is only limited by the functions being performed by the scanner while in use, as partially denoted by the criterion “Loss of one or more functions”. While this list attempts to cover all potential points of failure, if an issue occurs outside of this list it will still be reviewed. For this test, the criteria will be defined as any function observed to have failed from its intended purpose, during the conduction of the test. E.g., for the scanner, scanning ballots (physically moving them in and out of the scanner), the screen remains on and active, counters are active, printer continues to function.

A failure is defined as any event which results in either:

1. **Criterion A:** Loss of one or more functions.
  - Scanner not scanning ballots, ballot jam etc.
  - Scanner sensors read inconsistently.
  - USB ports not writing to the vDrive.
  - Thermal printer not printing.
  - Tablet display goes away.
  - Tablet display does not function.
  - USB printer not printing.
  - USB printer not functioning.
  - Static Audio not playing.
  - Device does not power on or off properly.
  - Loss of ADA functionality.
  - Loss of guide lights for feeding ballots.
  - vDrive fails.
  - Audit / Error logging is incorrect.
  - Battery becomes damaged.
  - Loss of ATI functionality.
  - Loss of LED functionality.
2. **Criterion B:** Degradation of performance such that the device is unable to perform its intended function for longer than 10 seconds; will look for degradation of performance of the device, as opposed to actual functionality failure covered under the first failure criterion.
3. **Criterion C:** COTS and support equipment may have temporary loss of function or degradation of performance, the correction of which requires operator intervention or system reset.



## 4 Environmental Test Summary

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

Test	Test Specification	VVSG 1.0
<b>Operating Environmental Tests</b>		
Temp / Power Variation	This test is similar to the low temperature and high temperature tests of MIL-STD-810-D, Method 502.2 and Method 501.2. See RFI 2009-06; See note below.	<b>V1:</b> 4.1.7.1, <b>V2:</b> 4.7.1
Reliability Assessment	See V1 4.3.3 for additional information.	<b>V1:</b> 4.3.3, <b>V2:</b> 4.7.2
Integrity	Protect against ambient temperature and humidity fluctuations.	<b>V1:</b> 2.1.4 (d)

**Note:** V1 4.1.7.1 Removable Storage Media: In voting systems that use storage media that can be removed from the system and transported to another location for readout and report generation, these media **shall** use devices with demonstrated error-free retention for a period of 22 months under the environmental conditions for operation and non-operation contained in Subsection 4.1.2. Examples of removable storage media include programmable read-only memory (PROM), random access memory (RAM) with battery backup, magnetic media, or optical media.

---

End of Temp / Power Variation Hardware Test Plan

---