



★ VIRGINIA ★  
STATE BOARD *of* ELECTIONS

# BOARD MEETING

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Friday, April 17, 2015  
Washington Building  
Room B27  
2:00PM

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SBE Board Working Papers



**STATE BOARD OF ELECTIONS  
AGENDA**

**DATE: April 17, 2015**  
**LOCATION: Washington Building, Room B27**  
**TIME: 2:00 p.m.**

**I. CALL TO ORDER**

*James B. Alcorn  
Chair*

**II. COMMISSIONER'S REPORT**

*Edgardo Cortés  
ELECT Commissioner*

**III. REPORT FROM LEGAL COUNSEL**

*Anna Birkenheier  
SBE & ELECT  
Legal Counsel*

**IV. NEW BUSINESS**

**A. Hart Intercivic Verity 1.1 Voting Equipment Certification**

*Gary Fox  
ELECT Supervisor*

**V. OTHER BUSINESS & PUBLIC COMMENT**

**VI. GOOD OF THE ORDER**

**VII. ADJOURNMENT**



★ VIRGINIA ★  
STATE BOARD *of* ELECTIONS

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# Call to Order

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BOARD WORKING PAPERS



★ VIRGINIA ★  
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# Commissioner's Report

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BOARD WORKING PAPERS  
Edgardo Cortés  
Commissioner  
Department of Elections



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STATE BOARD *of* ELECTIONS

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# Legal Report

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BOARD WORKING PAPERS  
Anna Birkenheier  
Assistant Attorney General



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# New Business

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BOARD WORKING PAPERS



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# Hart Intercivic Verity 1.1 Voting Equipment Certification

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BOARD WORKING PAPERS  
Gary Fox  
Elections Administration Supervisor



★ VIRGINIA ★  
DEPARTMENT *of* ELECTIONS

## Memorandum

To: Members of the State Board of Elections  
From: Gary W. Fox, Supervisor, Election Administration  
Date: April 17, 2015  
Re: Certification of Hart Verity 1.1 Voting Systems

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### **Suggested motion for a Board member to make:**

I move that the Board certify Hart Verity 1.1 voting systems for use in elections in the Commonwealth of Virginia, pursuant to the *State Certification of Voting Systems: Requirements and Procedures*.

**Applicable Code Section:** § 24.2-629.

### **Attachments:**

Your Board materials include the following:

- SLI Global Labs Test report of Hart Verity 1.1 voting system.
- Virginia State Certification Testing Test Report for Hart Verity 1.1 voting systems.
- Product sheets for Hart Verity 1.1 voting systems.

### **Background:**

Following the steps prescribed in the Virginia *State Certification of Voting Systems: Requirements and Procedures*, Hart initiated the certification evaluation to the Department of Elections on February 20, 2015. Hart provided their Technical Data Package and Corporate Information (required under step 2 of the *Requirements and Procedures*). Both of these submissions were deemed complete and in sufficient detail to warrant Step 3, the Preliminary Review. During the preliminary review, the state-designated evaluation agent conducted a preliminary analysis of the TDP, Corporate Information, and other materials provided and prepared an Evaluation Proposal (i.e. Test Plan). Upon Hart's agreement with the test plan, the evaluation was conducted on March 23, 2015 through March 24, 2015, in the Department of Elections offices in Richmond, Virginia. In addition the system was successfully piloted in an election in Prince William County on April 14, 2015. The Hart 1.1 voting system successfully completed Virginia State Certification.

# Certification Test Report

Report Number *HRT-3026-CTR-01*

## Hart InterCivic and Verity Voting 1.0

Certification Test Report Rev 01

February 20<sup>th</sup> 2015

Prepared for:

<b>Vendor Name</b>	<i>Hart InterCivic Inc.</i>
<b>Vendor System</b>	<i>Verity Voting 1.0</i>
<b>EAC Application No.</b>	HRT-Verity-1.0
<b>Vendor Address</b>	<i>15500 Wells Port Drive Austin, TX 78728</i>

Prepared by:



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NVLAP LAB CODE 200733-0

Accredited by the National Institute of Standards and Technology (NIST) National Voluntary Lab Accreditation Program (NVLAP), and accredited by the Election Assistance Commission (EAC) for VSTL status.



## Revision History

Release	Author	Revisions
Rev 01	M. Santos	Initial Release; submitted to EAC for approval

### Disclaimer

The Certification Test results 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. Results herein relate only to the items tested.

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### **Trademarks**

- SLI is a registered trademark of SLI Global Solutions, Inc.
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- Verity is a trademark of Hart InterCivic Inc.
- All other products and company names are used for identification purposes only and may be trademarks of their respective owners.

The tests referenced in this document were performed in a controlled environment using specific systems and data sets, and results are related to the specific items tested. Actual results in other environments may vary.

### Opinions and Interpretations

There are no opinions or interpretations included in this report.

### Other Labs Performing Hardware Testing

SLI Global Solutions is responsible for all core voting system tests as identified in NIST NVLAP Handbook 150-22 (2008). Regarding non-core hardware testing for this certification test campaign, this report contains data that were produced under subcontract by the following lab(s):

**Table 1 – Labs Performing Hardware Testing**

Laboratory	Address	Test(s)	Date(s)
EMC Integrity, Inc. (NVLAP certified for electromagnetic compatibility and telecommunications)	1736 Vista View Drive Longmont, CO 80504	<b><u>EMC / EMI Tests:</u></b> Radiated Emissions, Conducted Emissions, ESD, Electromagnetic Susceptibility, Electrical Fast Transient, Lightning Surge, Conducted RF Immunity, Magnetic Fields Immunity, Electrical	<b>10/1/14 - 11/4/14</b>

Certification Test Report  
Report Number *HRT-3026-CTR-01*  
Template Rev 05-09, Doc Rev 01



Laboratory	Address	Test(s)	Date(s)
		Power Disturbance	
PTI Professional Testing (EMI), Inc.	1601 N. A. W. Grimes, Suite B  Round Rock, TX 78665, USA	<b><u>Information technology equipment Safety Test:</u></b>  EN 60950-1:2006 + A12:2011	<b>11/4/14 - 11/17/14</b>
Cascade TEK – Front Range  (A2LA certified for mechanical including MIL STD 810)	1530 Vista View Drive Longmont, CO 80504	<b><u>MIL-STD-810D Tests:</u></b>  Bench Handling, Vibration, Low Temperature, High Temperature, Humidity, Temperature/Power Variation, and Reliability	<b>10/13/14 - 11/17/14</b>



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# 1 Introduction

SLI Global Solutions is submitting this report as a summary of the certification testing efforts for the **Hart InterCivic Verity 1.0** voting system, as detailed in the section System Identification. The purpose of this document is to provide an overview of the certification testing effort and the findings of the testing effort for **Hart InterCivic Verity 1.0** voting system.

This effort included documentation review of the Technical Data Package, source code review, and testing of the **Hart InterCivic Verity 1.0** voting system. Testing consisted of the development of a test plan, managing system configurations, executing a subset of test cases based on the Hart testing performed, component and system level tests prepared by SLI, and analysis of results. The review and testing was performed at SLI's Denver, Colorado facility.

## 1.1 References

1. Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG), 2005 Version 1.0. Volumes I and II
2. NIST NVLAP Handbook 150: 2006.
3. NIST NVLAP Handbook and 150-22: 2008.
4. EAC Voting System Testing and Certification Program Manual, United States Election Assistance Commission, v 1.0, June 1, 2011
5. SLI VSTL Quality System Manual, 1.16, prepared by SLI, dated December 3, 2013

## 1.2 Document Overview

This document contains:

- The Introduction which discusses the application tested/reviewed
- The Certification Test Background which discusses the testing process
- The System Identification which identifies hardware and software for the Hart InterCivic Verity 1.0 voting system
- The System Overview which discusses the functionality of Hart InterCivic Verity 1.0 voting system software and firmware
- The Certification Tests which are a summary of the testing effort
- The Recommendations section which contains the final analysis of the testing effort
- EAC Certification & Voting System Configuration summarizes the voting system configuration
- Appendices:
  - Appendix A – Test Plan – incorporated by reference
- Attachments which contain:
  - Attachment A – Warrant of Change Control for Verity 1.0
  - Attachment B – Trusted Build records



- Attachment C – List of Source Code Reviewed and Results
- Attachment D1-5 – Accredited Hardware Test Lab Certification
- Attachment E1-11 – PCA Summary
- Attachment F1-3 – Hardware Test Plans
- Attachment G1-6 – Hardware Testing Results from Hardware Test Laboratories

## 2 Certification Test Background

This section provides a brief overview of the EAC Certification Program and the activities involved in order for a voting system to be considered for certification against the 2005 VVSG and the EAC program manual.

### 2.1 PCA - Document and Source Code Reviews

The Physical Configuration Audit (PCA) review of the Hart InterCivic Verity 1.0 documentation, submitted in the requisite Technical Data Package (TDP), was performed in order to verify conformance with the Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG) 2005. Source code was reviewed for each software and firmware application declared within the Verity 1.0 voting system.

All PCA reviews were conducted in accordance with *Volume 2 Section 2* of the EAC VVSG 2005, to demonstrate that the system meets the requirements. Results of the PCA documentation review can be found in section 5.2 of this Certification Test Report. Inconsistencies or errors in documentation were identified to Hart for resolution or comment. Additional details of the PCA documentation review can be found in “Attachment E – PCA Summary”.

All PCA source code reviews were conducted in accordance with *Volume 1 Section 5.2 and Volume 2 Section 5* of the EAC VVSG 2005, to demonstrate that the system meets the requirements. Results of the PCA source code reviews can be found in “Attachment C – List of Source Code Reviewed and Results”. Inconsistencies or errors in the source code were identified to Hart for resolution or comment.

### 2.2 FCA - Functional & System Testing and Sampling

The Functional Configuration Audit (FCA) review of the test documentation submitted by Hart in the TDP was executed in order to verify testing of the voting system requirements defined in *Volume 1 Sections 2, 6, 7, and 9* of the EAC VVSG 2005.

SLI’s standard Test Suites were customized for the **Hart InterCivic Verity 1.0** voting system and conducted in accordance with *Volume 2 Section 6*, in conjunction with the functional testing. Simulations of elections were conducted to demonstrate a beginning-to-end business use case process for the **Hart InterCivic Verity 1.0** voting system.



## 2.2.1 Test Methods

All test methods employed are within the scope of SLI's VSTL accreditation.

The following validated test methods were employed during this test campaign:

**Table 2 – Test Methods**

SLI VSTL Test Method Name	Version Date
TM_Accessibility v1.0.doc	1/14/2014
TM_Accuracy v1.1.doc	12/16/2014
TM_Audit_Record_Data v1.0.doc	1/13/2014
TM_Ballot_and_Program_Installation_and_Control v1.0.doc	1/13/2014
TM_Ballot_Box v1.1.doc	3/28/2014
TM_Ballot_Counter v1.0.doc	1/13/2014
TM_Ballot_Formatting_and_Production v1.0.doc	1/13/2014
TM_Ballot_Rotation v 1.0.doc	1/13/2014
TM_Basic_Election_Components v1.0.doc	1/13/2014
TM_Blanket_Open_Primary_Creation v 1.0.doc	1/13/2014
TM_Closed_Primary_Election_Creation v 1.0.doc	1/13/2014
TM_Closing_the_Polls v 1.0.doc	2/19/2014
TM_Error Message and Recovery v1.2.doc	12/16/2014
TM_HW_Integrity v1.0.doc	1/13/2014
TM_Maintainability v1.0.doc	1/13/2014
TM_Non-Partisan v1.0.doc	1/13/2014
TM_Partisan Offices v1.0.doc	1/13/2014
TM_Performance v1.0.doc	2/21/2014
TM_Pre-Voting_Capabilities v1.0.doc	1/13/2014
TM_Provisional or Challenged Ballots v1.0.doc	1/13/2014
TM_Ranked_Order_Voting v1.0.doc	2/7/2014
TM_Readiness v1.0.doc	1/13/2014
TM_Security_Access_Control v1.0.doc	2/19/2014
TM_Security_Access_Control_Measures v1.0.doc	2/19/2014
TM_Security_Physical_Security_Measures v1.0.doc	2/19/2014
TM_Security_Software_Security v1.0.doc	2/19/2014
TM_Split_Precincts v1.0.doc	1/13/2014
TM_Standard Open Primary Creation v1.0.doc	1/13/2014
TM_Straight_Party_Voting v1.0.doc	1/13/2014
TM_Stress v1.0.doc	2/7/2014



SLI VSTL Test Method Name	Version Date
TM_System_Audit v1.0.doc	2/7/2014
TM_Tally_and_Reporting v1.0.doc	2/7/2014
TM_Usability v1.1.doc	12/16/2014
TM_Volume v1.0.doc	2/7/2014
TM_Vote_for_N_of_M v1.0.doc	2/7/2014
TM_Voting_Ballot_Rotation v1.0.doc	2/7/2014
TM_Voting_Capabilities v1 1.doc	12/16/2014
TM_Voting_Non-Partisan v1.0.doc	2/10/2014
TM_Voting_Partisan_Offices v1.0.doc	2/10/2014
TM_Voting_Precincts_and_Districts v1.0.doc	2/10/2014
TM_Voting_Straight_Party v1.0.doc	2/10/2014
TM_Voting_Vote_for_N_of_M v1.0.doc	2/19/2014
TM_Voting_Write-In v1.0.doc	2/10/2014
TM_Write-In v1.0.doc	2/10/2014

The above listed test methods are implemented in a complementary fashion: modules are employed from various methods to form suites. Suites include a logical sequence of functionality that is used to validate the requirement addressed by each module within the suite.

#### Deviations from, additions to, or exclusions from the test methods

There were no deviations from, additions to, or exclusions from any of the test methods used in this certification test campaign.

### 2.2.2 Sampling of Manufacturer tests

SLI selected a subset of the **Hart InterCivic Verity 1.0** functionality for functional test execution. SLI performed a sampling of the vendor's test cases based on the following guideline:

- Review **Hart InterCivic Verity 1.0** test cases and selected tests from high-risk areas for sampling, including:
  - Security
  - Error and Recovery
  - Audit log
  - Tabulating



### 2.2.3 Terms and Abbreviations

This section details pertinent terms applicable within this report.

**Table 3 – Terms and Abbreviations**

Term	Abbreviation	Description
American Association for Laboratory Accreditation	A2LA	A nonprofit, non-governmental, public service, membership society whose mission is to provide comprehensive services in laboratory accreditation and laboratory-related training.
Ballot Marking Device	BMD	An accessible computer-based voting system that produces a marked ballot (usually paper) that is the result of voter interaction with visual or audio prompts.
Central Count Scanner	CCS	High Speed Digital Scanner is a ballot scanning device typically located at a central count facility and is operated by an automated multi-sheet feeding capability.
Compact Flash card	CF	This is a type of flash memory card in a standardized enclosure often used in voting systems to store ballot and/or vote results data.
Compact Flash AST	CFAST	A compact flash media based on the Serial ATA bus rather than the Parallel ATA bus, used by the original CompactFlash
Commercial Off the Shelf	COTS	Commercial, readily available hardware devices (such as card readers, printers or personal computers) or software products (such as operating systems, programming language compilers, or database management systems)
Election Assistance Commission	EAC	An independent, bipartisan commission created by the Help America Vote Act (HAVA) of 2002 that operates the federal government's voting system certification program.
Election Management System	EMS	Typically a database management system used to enter jurisdiction information (district, precincts, languages, etc.) as well as election specific information (races, candidates, voter groups (parties), etc.). In addition, the EMS is also used to layout the ballots, download the election data to the voting devices, upload the results and produce the final results reports.
Electromagnetic Compatibility	EMC	The goal of EMC is to validate the correct functioning of different equipment in the same environment and the avoidance of any interference effects between them.



Term	Abbreviation	Description
Functional Configuration Audit	FCA	Exhaustive verification of every system function and combination of functions cited in the vendor's documentation. The FCA verifies the accuracy and completeness of the system's Voter Manual, Operations Procedures, Maintenance Procedures, and Diagnostic Testing Procedures.
Independent Test Authority	ITA	This is a test lab that is not connected with the vendor or manufacturer of the voting system.
Chevron	No Abbreviation	<b>Verity</b> components use workflow chevrons. Workflow chevrons, arranged along the top of the screen, identify the function the user is currently viewing.
Institute of Electrical and Electronics Engineers	IEEE	A non-profit organization, IEEE is the world's leading professional association for the advancement of technology.
National Institute of Standards and Technology	NIST	A non-regulatory federal agency within the U.S. Dept. of Commerce. Its mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.
National Voluntary Laboratory Accreditation Program	NVLAP	A division of NIST that provides third-party accreditation to testing and calibration laboratories.
Physical Configuration Audit	PCA	The testing activities associated with the physical aspects of the system (hardware, documentation, builds, source code, etc.).
Primary – Blanket		The Blanket Primary election combines all candidates for a given contest, regardless of political affiliation, into the same contest. This is done with the same presentation as in a general election with the one difference being that there may be multiple candidates from each party listed. From the <b>Verity 1.0</b> perspective, this election is treated as if it were a general election.
Primary – Closed		The Closed Primary election segregates each political party onto its own ballot, along with all pertinent non-political contests and referendums.
Primary - Open		The Open Primary election combines all political parties contests onto a single ballot, along with all pertinent non-political contests and referendums.



Term	Abbreviation	Description
Precinct Count Scanner	PCS	A precinct-count optical scanner is a mark sense-based ballot and vote counting device located at a precinct and is typically operated by scanning one ballot at a time.
Request For Information	RFI	A form used by testing laboratories to request, from the EAC, interpretation of a technical issue related to testing of voting systems.
Requirements Matrix	N/A	This is the matrix created by the EAC and maintained by SLI that traces the requirements to the various test modules and test methods.
Standard Lab Procedure	SLP	SLI's quality system documentation is made up of standard lab procedures (SLPs), which are procedures required to ensure a systematic, repeatable and accurate approach to voting systems testing and governing the actual performance of SLI's work.
Technical Data Package	TDP	This is the data package that is supplied by the vendor and includes: Functional Requirements, Specifications, End-user documentation, Procedures, System Overview, Configuration Management Plan, Quality Assurance Program, and manuals for each of the required hardware, software, firmware components of each voting system.
Test Method	TM	SLI proprietary documents which are designed to group sets of EAC VVSG requirements in a logical manner that can be utilized to more efficiently validate where and how requirements, or portions of a requirement, are met.
Validation	No Abbreviation	Confirmation by examination and through provision of objective evidence that the requirements for a specific intended use or application have been fulfilled (ISO 9000)
Verification -	No Abbreviation	Confirmation by examination and through provision of objective evidence that specified requirements have been fulfilled (ISO 9000)
Voluntary Voting Systems Guidelines Volumes 1 & 2	VVSG	A set of specifications and requirements against which voting systems can be tested to determine if the systems provide all of the basic functionality, accessibility and security capabilities required of these systems.
Voting System Test Lab	VSTL	This is the lab where the voting system is being tested.



Term	Abbreviation	Description
Voting System Under Test	VSUT	The designation for a voting system that is currently being tested.
Voting Test Specialist	VTS	An SLI employee within the Compliance division that has been qualified to perform EAC voting system certification testing.

### 3 System Identification

The **Hart InterCivic Verity 1.0** voting system was submitted for certification testing with the documentation, hardware and software listed below. No other Hart product was included in this test effort.

#### 3.1 Documentation

The TDP User/Owner manuals that would be part of the certified system delivered to a purchaser of the system are as follows:

- Verity Build Technical Reference Manual 6600-002 A05.pdf
- Verity Central Technical Reference Manual 6600-003 A04.pdf
- Verity Count Technical Reference Manual 6600-004 A04.pdf
- Verity Build Quick Reference Manual 6620-002 A05.pdf
- Verity Central Quick Reference Manual 6620-003 A04.pdf
- Verity Count Quick Reference Manual 6620-004 A04.pdf
- Verity Polling Place Operations Technical Reference Manual 6610-100-A04.pdf
- Verity Service and Maintenance Operations Technical Reference Manual 6610-001 A05.pdf
- Verity XML Guide Package.zip (this includes Verity XML Import Guide 6600-006 A06.pdf)
- Verity Operational Guide 66400001 A13.pdf

#### 3.2 Software and Firmware

Any and all software/firmware that is to be used by the declared voting system whether directly or indirectly, in a production environment, must be validated during the certification process.

The software and firmware employed by **Hart InterCivic Verity 1.0** consists of 2 types, custom and commercial off the shelf (COTS). COTS applications were verified to be pristine, or were subjected to source code review for analysis of any modifications and verification of meeting the pertinent standards.



Tables 4, 5 and 6 below detail each application employed by the Hart InterCivic Verity 1.0 voting system.

**Table 4 – Hart Verity 1.0 Software and Firmware**

Manufacturer	Application(s)	Version
Verity Build	EMS software	1.0.3
Verity Central	High speed digital scanner software	1.0.3
Verity Count	Central count location accumulation and tallying software	1.0.3
Verity Scan	Digital scanner firmware	1.0.3
Verity Touch Writer	BMD firmware	1.0.3
Verity Device Microcontroller	Firmware for Verity Devices	V17

**Table 5 – COTS Software for Workstations**

Manufacturer	Application	Version	Verity Voting 1.0 Component
Operating system			
<b>Microsoft</b>	<i>Windows Embedded Standard with Service Pack 1, 64-bit</i> Configured for Verity Kiosk Operations	6.1.7601	Build, Central, Count
Supporting Software			
<b>McAfee</b>	Application Control Configured for Verity Kiosk	6.1.2	Build, Central, Count
<b>Microsoft</b>	.NET 4.x Framework Unmodified	4.0.30319 4.5.50709	Build, Central, Count
<b>Microsoft</b>	<i>SQL Server 2012</i> <i>Unmodified</i>	11.0.2100	Build, Central, Count
<b>Microsoft</b>	Visual Studio C++ 2005 redistributables Unmodified	8.0.56336	Build, Central, Count
<b>Microsoft</b>	Visual Studio C++ 2010 redistributables/runtime/shell Unmodified	10.0.40219	Build, Central, Count



**Table 6 – COTS Software and Firmware for Devices**

Manufacturer	Application	Version	Verity Voting 1.0 Component
<b>Operating system</b>			
<b>Microsoft</b>	<i>Windows Embedded Standard 7 with Service Pack 1, 32-bit</i>  Configured for Verity Kiosk Operations	6.1.7601	Scan, Touch Writer
<b>Supporting Software</b>			
<b>McAfee</b>	Application Control  Configured for Verity Kiosk	6.1.2	Scan, Touch Writer
<b>Microsoft</b>	.NET 4.x Framework  Unmodified	4.0.30319 4.5.50709	Scan, Touch Writer
<b>Microsoft</b>	<i>SQL Server Compact</i> <i>Unmodified</i>	11.0.2100	Scan, Touch Writer
<b>Microsoft</b>	Visual Studio C++ 2005 redistributables  Unmodified	8.0.56336	Scan, Touch Writer
<b>Microsoft</b>	Visual Studio C++ 2010 redistributables/runtime/shell/tools  Unmodified	10.0.40219	Scan, Touch Writer

### 3.3 Equipment (Hardware)

The hardware employed by **Hart InterCivic Verity 1.0** consists of 2 types, custom and commercial off the shelf (COTS). COTS hardware was verified to be pristine, or was subjected to review for analysis of any modifications and verification of meeting the pertinent standards.

Tables 7 and 8 below detail each device employed by the **Hart InterCivic Verity 1.0** voting system.

**Table 7 – Hart Verity 1.0 Voting Equipment**

Hardware	Use	Model
<b>Verity Scan</b>	Precinct polling place digital scanner	Revision B



Hardware	Use	Model
Verity Touch Writer	Precinct polling place Ballot Marking Device	Revision B
Verity Key	Security key used within the voting system	N/A
Verity vDrive	Media used for transportation of voting system data	N/A

Table 8 – COTS Equipment

Manufacturer	Hardware	Model
OKIDATA (for <b>Verity Build, Verity Central, Verity Touch Writer and Verity Count</b> )	Ballot/Report Printer	B431d
OKIDATA (for <b>Verity Build</b> )	Ballot Printer	C911
OKIDATA (for <b>Verity Build</b> )	Ballot Printer	C831
Various (for <b>Verity Build, Verity Central and Verity Count</b> )	<p><b>Intel-Windows Workstation (Recommended Requirements)</b>            Processor – x86-compatible, 3.0GHz, Quad Core            Memory – 8GB            Hard Drive – 2 x 1 TB RAID-Level 1, Removable w/ key lock            Ethernet Port – 100Mb/1Gb            USB Ports – 4 ports            Video Card - Integrated Graphics            Keyboard - USB Keyboard            Mouse - USB Mouse            NO Wireless technologies allowed: WiFi, Bluetooth, Aircard, etc.</p>	
Various (for <b>Verity Build, Verity Central and Verity Count</b> )	<p><b>Monitor (Recommended Requirements)</b>            Panel Size - 50.8 cm            Aspect Ratio - Widescreen (16:9)            Optimal Resolution - 1600 x 900 at 60 Hz            Contrast Ratio - 1000: 1            Brightness - 250 cd/m<sup>2</sup> (typical)</p>	
Kodak	Ballot Scanner	i5600



Manufacturer	Hardware	Model
(for Verity Central)		
Canon (for Verity Central)	Ballot Scanner	DR-G1100
Canon (for Verity Central)	Ballot Scanner	DR-G1130

### 3.4 Materials

The following test materials are required for the performance of testing including, as applicable, test ballot layout and generation materials, test ballot sheets, and any other materials used in testing.

- Ballots & Blank Ballot grade paper
- Thumb Drives
- Ballot marking pens
- Printer paper rolls

### 3.5 TDP Documents Used to Support Testing

The vendor documents used to support Certification Testing are listed below:

#### Verity Trace - System Functionality

- Verity 1.0 Technical Data Package Overview
- Airgap Interface for Portable Electronic Media Technical Reference
- Verity XML Import Guide (plus 8 Templates and 3 Sample Elections)
- Verity Voting Verity Operational Environment
- Verity Software Architecture & Design Technical Documentation
- System Description Technical Document
- Verity Voting Performance Characteristics
- File Manifests for Validation:
  - Build-Client, BuildCount-Client, BuildCount-Server, Build-Server, Central-Client, Central-Server, Count-Client, Count-Server, Scan-Device, Touch-Device
- Voting Systems Acronyms
- Voting Systems Glossary

#### Verity Trace - System Hardware Specifications

- Test Reports
  - Verity\_Safety\_Report\_PTI-1411085-000\_TRF\_iec60950\_ALL
  - Verity\_Safety\_Report\_NRTL\_Certificate\_72101270\_CERT



- TUV audit report of TS3
- Hart InterCivic Verity Scan Environmental Test Report - Professional Testing (EMI), Inc.
- Hart InterCivic Verity Touch Writer Environmental Test Report - Professional Testing (EMI), Inc.
- Hart InterCivic Verity Scan, Verity Touch Writer, Ballot Box, Booth Standard, Booth Accessible Environmental Test Report - Professional Testing (EMI), Inc.
- Verity\_Scan\_FCCB\_Conducted\_Emissions\_16Sept2014
- Verity\_Scan\_FCCB\_Radiated\_Emissions\_15Sept2014
- Verity\_Writer\_FCCB\_Conducted\_Emissions\_16Sept2014
- Verity\_Writer\_FCCB\_Radiated\_Emissions\_17Sept2014
- Bill of Materials
  - Scan BOM - file name 3005350B-Scan\_Indented\_BOM+AVL\_Pre-EAC
  - TouchWriter BOM - file name 3005352B-TouchWriter-Indented\_BOM+AVL\_Pre-EAC
  - BallotBox BOM - file name 3005357A-Ballot-Box\_Indented\_BOM+AVL
  - Standard Booth BOM - file name 3005358A-Standard-Booth\_Indented\_BOM+AVL
  - Accessible Booth BOM - file name 3005359A-Accessible-Booth\_Indented\_BOM+AVL
  - Drawings and Schematics: 3005210 - Verity Access (2 files)
  - Drawings, Schematics, Review Dispositions: 3005350 - Verity Scan (19 files)
  - Drawings, Schematics, Review Dispositions: 3005352 - Verity Touch Writer (20 files)
  - Drawings: 3005357-BallotBox (2 files)
  - Drawings and Review Dispositions: 3005358-Standard-Booth (5 files)
  - Drawings and Review Dispositions: 3005359-Accessible-Booth (5 files)
  - Verity System Design Specification (file name Verity Base Station Microcontroller Specification 4005462)
- Verity System Design Verity Electronics Specification
- COTS Equipment
  - Verity 1.0.0 COTS Baseline and Plan
  - QuickSpecs HP Z230 Tower Workstation
  - QuickSpecs HP ProDisplay P231 23-inch LED Backlit Monitor
  - Canon imageFORMULA DR-G1130 DR-G1100 User Manual
  - Kodak i5000 Series Scanners User's Guide
  - OKI\_B411-B431\_Manual
  - OKI User's Manual Advanced C831n/dn, C841n/dn, ES8431/8441
  - OKI User's Manual Advanced C911dn, C931dn, C941dn, ES9411dn, ES9431dn, ES9541dn
  - Eaton 5P 1500 Tower UPS User Guide
  - HART 3S2P NCR18650A Battery Pack Preliminary Specification - Totex



- CERTIFICATE OF COMPLIANCE UL 20130910-MH29443 TOTEX MFG INC Rechargeable Battery Packs, Models: U80327 and 1005015
- AC-DC 85-250 Watts AHM Series Specification - filename XP\_Power\_AHM85PS24
- Certification of Conformity CE AC/DC adaptor XP Power AHM85PS12, AHM85PS24, Test Rpt # CE990712C14A
- CE EMS Test Report CE990712C14A XP Power AHM85PS12, AHM85PS24
- Hart Secure Ballot Stock Specification
- Verity Voting System Limits

#### Verity Trace - Software Design & Spec

- All-In-One Code Framework Coding Standards [Microsoft]
- Software Design and Development Procedure
- Software Verification and Validation Process
- Verity Coding Standard Standards Document
- Verity Application Programming Interface Specification Technical Document
- Pre-voting EMS Technical Requirements Document
- Verity Central Technical Requirements Document
- Verity Count Technical Requirements Document
- Election Management Technical Requirements Document
- Electronic Voting Devices Technical Requirements Document
- Polling Place Device Suite Technical Requirements Document
- Verity Precinct Scanner Technical Requirements Document
- Verity Security Requirements Document
- Verity Key Design Technical Document
- Verity Logging Design Technical Document
- Verity Logging Technical Requirements Document
- Verity vDrive Design Technical Document
- Workflow, Design and Wireframe docs:
  - Election Management UI workflow
  - ElectionOfficeUIWorkflow
  - PCApplicationSuiteWorkflow
  - PrecinctScannerUIWorkflow
  - Shared Device Wireframes
  - TouchWriterUIWorkflow
  - User Management UI workflow
  - Verity Desktop UI Workflow
  - VerityBuildUIWorkflow
  - VerityCentralUIWorkflow
  - VerityCountUIWorkflow



- Verity Database
  - Verity Desktop Database Schema
  - Verity Device Database Schema
  - Verity Workstation Datastore Filelist
  - Verity Database Attributes
- Verity Trusted\Witness Build Process
  - The Creation And Configuration Of The Trusted Build Environment
  - The Verity Access Firmware Build Procedure
  - The Verity MCU Firmware Build Procedure
  - Device WES7 Creation Process Document
  - Device OS Creation And Configuration Process Document
  - Device Configuration Process Document
  - Workstation WES7 Creation Process Document
  - Workstation Manufacturing Process Document
  - Workstation Configuration Process Document
- License
  - Microsoft Software License Terms Microsoft SQL Server 2012 Standard For Embedded Systems
  - Indirect Authorized OEM License Agreement [filename McAfee & Hart Indirect OEM License 6\_24\_14 rev 1]
  - Neodynamic End User License Agreement [filename Barcode Professional OEM License EULA-v7]

#### Verity Trace - System Security Specification

- Verity Risk Assessment
- Verity Security Requirements Document

#### Verity Trace - System Operations Procedures

- Verity Build Technical Reference Manual
- Verity Build Quick Reference Manual
- Verity Central Technical Reference Manual
- Verity Central Quick Reference Manual
- Verity Count Technical Reference Manual
- Verity Count Quick Reference Manual
- Verity Service and Maintenance Manual
- Verity Polling Place Operations Manual
- Verity Operational Guide
- Verity Trace - System Maintenance
- Verity Service and Maintenance Manual



### Verity Trace - Personnel Deployment-Training

- Assisting Persons With Disabilities Training Agenda
- Verity Build Training Agenda
- Verity Central Training Agenda
- Verity Count Training Agenda
- Management and Best Practices Training Agenda
- Polling Place Operations Training Agenda
- Support Procedures Training Agenda
- Train-the-Trainer Training Agenda
- Assisting Persons With Disabilities [Presentation]
- Verity Build [Presentation]
- Verity Central [Presentation]
- Verity Count [Presentation]
- Verity Management & Best Practices [Presentation]
- Polling Place Operations [Presentation]
- Verity Support Procedures [Presentation]
- Verity Train the Trainer [Presentation]

### Verity Trace - Configuration Management Plan

- Verity - Operations PRD Ops/Services/Supply Chain Planning Document
- Configuration Management Processes
- Document Control Procedure
- Software Versioning Procedure
- Voting System Implementation And Maintenance Process Document

### Verity Trace - Quality Assurance

- Classification & Signature Matrix for CCB PLM Process
- Continual Improvement Process
- Control of Nonconforming Product Procedure
- Hardware Design and Development Procedure
- Hardware Verification and Validation Process
- Product Requirements Procedure
- Quality Manual
- Records Retention Matrix
- Software Production Procedure
- Software Test Design and Development Procedure
- Supplier Qualification and Management Procedure
- TDP Document Control Guide



- VSTL Product Submission Procedure

Verity Trace - System Test-Verification Specification

- Hart Requirements Management Requirements Management Process
- Verity Voting Summative Usability Test Plan
- Usability Test Report of Verity Touch/Touch Writer and Verity Scan
- Security Test Cases
- Verity Voting National Certification Test Specification

**3.5.1 Excluded Requirements**

In this section we identify VVSG requirements that do not pertain to the declared system being certified. For this certification project Hart has elected to not support their **Verity Touch** (DRE) implementation, **Verity Controller** which is used for linking multiple **Verity Touch** devices in a chain, **Verity Print** which is a ballot on demand device, nor **Verity Relay** transmission capabilities. As such, the table below enumerates the requirements that are not subject to verification for this project.

DRE Related Requirements Not Under Test	Transmission Related Requirements Not Under Test
1.5.2.2	2.1.9
1.5.2.3	2.4.4
2.1.2.f	4.1.2.15
2.1.4.k,l	6.1
2.3.1.3	6.2
2.3.2	7.5
2.3.3.3	7.6
3.1.2.f,g	7.7
4.1.1.b	7.9
4.1.4.3	
4.1.6.2	
4.3.5.b	
5.4.3.b.iv	
5.5	



DRE Related Requirements Not Under Test	Transmission Related Requirements Not Under Test
6.2.5	
7.8	
7.9	
3.2.1.c	
Vol. 2 , 4.7.4.c	

### 3.5.2 Additional Functionality/Requirements

As per 2005 VVSG, volume 2 section 3.2.2, review of the Hart Technical Requirements Documentation (TRDs) resulted in SLI's determination that **Hart** has some functionality/requirements that are considered beyond the scope of the VVSG, but since they are in the declared system, will require review and verification. Additional functionality/requirements to be audited within the scope of this certification are detailed below.

#### Verity Security Requirements 4005464 A03

- 3.2.4 Verity Desktop Systems that store critical election data shall be connectable to an Uninterruptable Power Supply that will provide sufficient power to allow the use to shutdown the system gracefully.
- 3.3.3.4 Verity shall not allow simultaneous access by the same user.
- 3.3.7.1 The secure BIOS shall verify the chain of trust before allowing the system to boot.
- 3.3.7.1.1 BIOS Verification
- 3.3.7.1.1.1 The BIOS shall store a hash computed over the entire BIOS executable stored in persistent memory.
- 3.4.1 Electronic keys shall work for one and only one election
- 3.10.1 The user must not be able to open multiple Verity Voting applications at the same time on a single computer.
- 3.10.2 The following requirements shall apply to Verity Count. These requirements may be applied to other desktop applications.
  - 3.10.2.1 The user must not be able to start, open, or access any other applications on the computer while the Verity application is open.
  - 3.10.2.2 The user must not be able to access Operating System functionality while the Verity application is open.



### Verity Central TRD 4005453 A01

- 5.3.2.2.1.2.1 The application shall NOT allow two users to access an individual ballot simultaneously [VCS PRD 4.4.5.9.1].
- 5.3.2.2.2 The application shall support up to 4 simultaneous client workstations per server.
- 5.3.2.3 Each workstation connected to the server shall be required to have a unique Workstation Name [VCS PRD 4.4.2.2.4].
- 5.11.7.2.1 Before initiating scanning, the system shall verify that there is sufficient free space available to save and process all ballot images from the scan batch.
- 5.17.1.8.5 The application shall allow the user to protect a contest, which when protected does not allow manual or automatic resolution actions to be performed on the contest during the adjudication process [VCS PRD 4.4.5.6.8.2].
  - 5.17.1.8.5.1 Protected contests shall not allow manual resolution actions.
  - 5.17.1.8.5.2 Protected contests shall not be affected by the automatic resolution feature.
- 5.17.1.8.6 The application shall allow the user to remove protection from a contest.
- 5.19.2 The application shall include an interface for creating Recovery Media.

### Verity Polling Place Device Suite TRD 4005457 A03

- 3.12.3.1.1 The title of the report shall be “Configuration Readiness Report”.
- 3.12.3.1.7 The report shall include a barcode.
  - 3.12.3.1.7.1 The barcode shall contain the following data:
    - 3.12.3.1.7.1.1 The assigned polling place.
    - 3.12.3.1.7.1.2 The device serial number.
    - 3.12.3.1.7.1.3 The Election Media Device identifier.

## 4 System Overview

### 4.1 Scope of the Hart InterCivic Verity Voting 1.0 Voting System

This section provides a description of the scope of **Hart InterCivic Verity Voting 1.0** voting system components:

- The **Hart Verity Voting 1.0** voting system represents a set of software applications for pre-voting, voting and post-voting election project activities for jurisdictions of various sizes and political division complexities. **Verity Voting 1.0** functions include:
  - Defining the political divisioning of the jurisdiction and organizing the election with its hierarchical structure, attributes and associations.
  - Defining the election events with their attributes such as the election name, date and type, as well as contests, candidates, referendum questions, voting locations and their attributes.



- Preparing and producing ballot for polling place and absentee voting.
  - Preparing media for precinct voting devices and central count devices
  - Configuring and programming the Verity Scan digital scanners
  - Configuring and programming the Verity Touch Writer BMD devices
  - Producing the election definition and auditing reports.
  - Providing administrative management functions for user, database, networking and system management.
  - Import or manual data entry of the Cast Vote Records from Verity Scan devices and Verity Central.
  - Preview and validation of the election results.
  - Producing election results tally according to voting variations and election system rules.
  - Producing a variety of reports of the election results in the desired format.
  - Publishing of the official election results.
  - Auditing of election results including ballot images and log files.
- The **Verity Scan** is a digital scan ballot counter (tabulator) that is used in conjunction with an external ballot box. The unit is designed to scan marked paper ballots, interpret and record voter marks on the paper ballot and deposit the ballots into the secure ballot box.
  - The **Verity Touch Writer** is a standalone precinct level Ballot Marker Device (BMD) which also includes an Audio Tactile Interface (ATI), which allows voters who cannot complete a paper ballot to generate a machine-readable and human readable ballot, based on vote selections made, using the ATI.
  - **Verity Election Management** allows users with the Administrator role to import and manage election definitions. Imported election definitions are available through the Elections chevron in Build. Users can also delete, archive, and manage the election definitions.
  - **Verity User Manager** enables users with the correct role and permissions to create and manage user accounts within the Verity Voting system for the local workstation in a standalone configuration, or for the network in a networked configuration.
  - **Verity Election Manager** enables users, with the correct roles, to import election defining import files into the Verity voting system. This application also supports archiving, restoring and deleting elections.
  - **Verity Desktop** enables user, with the correct roles, to set the workstations date and time, gather Verity application hash codes (in order to validate the correctness of the installed applications), and access to Windows desktop.
  - **Verity Build** opens the election to proof data, view reports, print ballots, configuring and programming the **Verity Scan** digital scanners, **Verity Touch Writer** BMD devices as well as producing the election definition and auditing reports
  - **Verity Central** is a high-speed, central digital ballot scanning system used for high-volume processing of ballots (such as vote by mail).. The unit is based on COTS scanning hardware coupled with the custom **Hart** developed ballot processing application software.



- **Verity Count** is an application that tabulates election results and generates reports. **Verity Count** can be used to collect and store all election logs from every Verity component/device used in the election, allowing for complete election audit log reviews.

## 4.2 System Review

This section provides a more in-depth description of the workings of the **Hart Verity Voting 1.0** voting system and will assist the reader with understanding the flow of the voting system.

### 4.2.1 Verity Build

**Verity Voting 1.0** is initially entered through the **Verity Build** application. New election data is imported into the system, the sub-application **Election Manager**, via an XML file that is populated outside of the certified system. Existing election data (previously imported) can be re-used within the Build application.

Once the **Verity Build** application is entered, and an election is imported, via the sub-application **Election Manager**, the normal path will take the user through the chevron workflow, which includes the Proof, Configure and Create chevrons.

#### 4.2.1.1 Proof Chevron

The Proof chevron has four tab functions within it, Data Validation, Ballot Preview, Reports, and Proof Audio.

The Data Validation tab is where the imported data is validated. This allows the user to review all aspects of an election data set.

Once the data is validated, the ballots are previewed, in the Ballot Preview tab, where users can preview the details for any selected ballot. Details that can be previewed include: ballot by language, ballot by type, sorted precinct and style lists, as well as filtered precinct and style lists.

The Reports tab enables users to generate and print reports. The Reports screen contains a list of all of the reports available in **Verity Build**. From the Reports screen, users can generate, view, customize, and print selected reports.

The Proof Audio tab provides users with a way to proof audio items for their ballots. Audio items are those recordings used to create accessible audio ballots. Users proof audio items for each language in the election.

#### 4.2.1.2 Configure Chevron

The Configure chevron and its tabs of functionality follow the Proof chevron in the **Verity Voting 1.0** system of election definition creation. The Configure workflow chevron contains two tabs: Election Settings, and Accept Election.

The Election Settings tab has six sub-tabs, Printed Ballots, Voting Type Setup, Device Reports, Device Passcodes, Scan and Touch Writer.

The Printed Ballots sub-tab allows the user to set printed ballot settings.



The Voting Type Setup sub-tab allows users to set rules for specific voting, such as early voting, absentee voting as well as Election Day voting types, and associated parameters for each.

The Device Reports sub-tab allows users to control the sort order for choices on device reports, such as: Report results at the [select level] which allows users to control the level of detail on device reports; Zero report, which allows users to control whether the Zero Report shows only totals for the device or totals by precinct and precinct split; and Ballot count report, which allows users to control whether the Ballot Count Report shows only totals for the device or totals by precinct and precinct split.

The Device Passcodes sub-tab is where passcodes are defined and maintained. Passcodes are defined for **Verity** user types and for opening, suspending, and closing the polls by voting type.

The Scan sub-tab is where users can configure the ballot processing rules for scanning ballots. The four scanning exceptions are Undervote, Overvote, Invalid Vote, and Blank Ballot. In Build, each jurisdiction defines how these exceptions are to be treated.

The Touch Writer sub-tab is where the BMD can be configured to specify the number of minutes the voter access code is active.

The Accept Election tab represents the final step in the proofing process. On the Accept Election screen, users can do one of two things: accept the election, or navigate away from this screen.

Elections must be secured for security and consistency purposes. In Build, the Accept function locks election data against further edits. This step effectively defines all of the ballot styles for the election. After that, the entire formatted election definition is transferred to **Verity vDrives**. The election definition is then carried forward on **Verity vDrives** throughout the election process.

#### 4.2.1.3 Create Chevron

The Create chevron is dimmed, indicating that it is unavailable, until the election has been accepted in the **Configure** workflow. The Create chevron has three tabs: Ballots, **Verity vDrives**, and **Verity Keys**. The Ballots tab is used to configure ballots for printing.

Printing options available for each ballot include: Quantity, where users can type or use the dial to select a quantity of ballots; Type, where users can click to select either the Official, Test, or Sample ballot; Ballot serial numbers, which can be enabled; and Include ballot stub, where users can click to select the check box to include ballot stubs on printed ballots.

A **Verity vDrives** is a removable media device that carries election data throughout the election process.

The vDrives tab, which is used to create and read **Verity vDrives**, allows users to choose a Device Type, specify the quantity of **Verity vDrives** to write, write the **Verity vDrives**, print a report of **Verity vDrives** written, and then read **Verity vDrives** statistics.

The Keys tab allows the Election Official Key to be written. **Verity Keys** are made for, and utilized by, the entire system, including **Scan, Touch Writer, Central** and **Count**.



#### 4.2.1.4 Exporting Signed Elections

The final step of the **Verity Build** includes the exportation of a signed election that will be utilized within **Verity Central** and **Verity Count**.

#### 4.2.2 Verity Touch Writer

**Verity Touch Writer** is a standalone precinct level ballot marking device solution for paper ballots. It assists voters in marking their ballot and prints it out for them. Once the ballot is printed, **Verity Touch Writer** erases all memory components of that session. **Verity Touch Writer** is paired with a commercial off the shelf printer to allow the voter to mark then print their vote selections. **Verity Touch Writer** provides input via the **Verity Access (ATI)**, utilizing the wheel/button panel, paddles, or sip and puff accessories. **Verity Touch Writer** is used in conjunction with **Verity Scan** to provide the voter with a reviewable paper ballot. **Verity Touch Writer** is enabled for a given election via a **Verity Build** created **Verity vDrive** and **Verity Key**.

#### 4.2.3 Verity Scan

**Verity Scan** records Cast Vote Records (CVRs) and audit log data in redundant, secure storage locations. The storage locations include the **Verity vDrive**, CFAST and the ballot box for scanned paper ballots. Paper ballots can be scanned and transferred into digital CVRs. **Verity vDrive** storage allows for the CVRs and device logs to be transferred into the **Verity Central** ballot resolution system or the **Verity Count** tabulation system. **Verity Scan** is enabled for a given election via a **Verity Build** created **Verity vDrive** and **Verity Key**.

#### 4.2.4 Verity Central

**Verity Central** is a high volume scanning and ballot review system within the **Verity Voting 1.0** system. This application acts as a centralized compilation and processing site for ballot handling, reading and processing before tabulation.

**Verity Central** allows for ballots to be scanned in bulk for users to review during scanning and through resolution for voter intent. Each ballot has the front and back pages scanned simultaneously to capture all voter marks, supporting duplex ballots. Users with proper training can review the ballots for write-ins and ballots flagged as having voter intent issues (such as overvotes, undervotes, and write-in candidates). Once all votes have been reviewed as indicated by flagging, the ballots are then written as Cast Vote Records (CVRs) to vDrives. The final CVR records on **Verity vDrives** are then sent to a **Verity Count** workstation for official tabulation.

**Verity Central** is enabled for a given election via a **Verity Build** created exported signed election and **Verity Key**. The election is imported via the application's **Election Manager**.

Within the **Verity Central** application, the workflow follows the path of chevrons Election, Scan, Review, Write Ballots, and Reports.



#### 4.2.4.1 Elections Chevron

The Elections chevron has three tab options: Elections, Tasks and Preferences.

The Elections tab allows a user to open a loaded election. Elections are imported through the Election Management application.

The Tasks tab creates and manages tasks and the closing of polls for scanning ballots, resolving voter intent issues, and writing vDrives. Defer write-in resolution to **Verity Count** which when selected, any resolutions of voted write-ins will be handled through a **Verity Count** workstation, not through **Verity Central**. Default is to resolve in **Verity Central**.

The Preferences tab provides configuration settings for maintaining and interacting with election results within Central.

No other chevrons will become active and accessible until an election is opened from the Elections tab and at least one task is created and opened from the Tasks screen.

#### 4.2.4.2 Scan Chevron

The Scan chevron includes the tabs, Scan, Manage Batches, Search Ballots and Settings.

The Settings tab should be accessed prior to scanning. Scanner Setup opens a scanner driver setup window and sets the scanner to be used.

Test Scan is used to run a ballot through the selected scanner in order to verify proper operation.

Allow unique identifiers where, when scanning ballots, each ballot may have a unique serial number (per the election definition). This option also allows for the same serial number to be reused and not rejected during ballot scanning.

Allow incomplete multi-sheet ballots where when scanning ballots, any incomplete ballots are allowed to scan and not be rejected. Incomplete ballots do not include all pages.

The Scan tab enables users to scan large amounts of ballots, front and back at the same time, when sent through one of the supported COTS scanners. As the ballots are scanned, the ballot images are analyzed and accepted or rejected. If rejected, the system alerts the user to review the ballot for issues.

The Manage Batches tab displays all scanned and saved batches of ballots. Users can generate and view a report on a batch, delete the batch entirely, change the type, and edit the notes.

The Search Ballots tab provides a screen for searching out specific ballots within scanned batches of ballots. These ballots can be viewed or deleted from the batch. Search criteria can be a serial number, batch ID number or scan order.



#### 4.2.4.3 Review Chevron

The Review chevron has two tabs, Review Images, and Write-in Candidates.

The Review Images tab allows the user to filter and review ballots to resolve voter intent issues.

The Write-in Candidates tab allows the user to manage write-in candidate choices for contests. All possible candidate options are listed on the screen, separated by election contest.

#### 4.2.4.4 Write Ballots Chevron

The Write Ballots chevron provides an interface for writing ballots to **Verity vDrives**. All ballots must be written to **Verity vDrives** prior to closing polls for a task. If the **Verity vDrives** is damaged or is lost, the previously written batches can be rewritten to a new **Verity vDrives** as recovery media.

The Write ballots chevron contains 2 tabs, Write Ballots and Recovery vDrive tabs.

The Write Ballots tab allows the user to write ballots to **Verity vDrives**. The screen displays a list of batches available for writing to **Verity vDrives**. Every written **Verity vDrives** has a backup restoration copy saved. Once ballot batches are written to a **Verity vDrives**, the batches cannot be selected and written to other **Verity vDrives**.

The Recovery vDrive tab allows the user to create new **Verity vDrives** to replace damaged or lost **Verity vDrives**. If the **Verity vDrives** with written batches is determined to be damaged or is lost, the user can create another **Verity vDrives** of previously written data.

#### 4.2.4.5 Reports Chevron

Reports chevron is the final chevron used in **Verity Central**. The Reports chevron has 2 tabs, Reports and Exports.

The Reports tab provides detailed information on the database at the time of generation. User are allowed to generate, view, and print reports. A set of standard reports is provided to the user in order to generate and review against the loaded task and election.

The Exports tab provides export options against the database. This data is exported to CSV files.

### 4.2.5 Verity Count

**Verity Count** allows users to tabulate all voted ballots with updates of the election. Users can generate standard and custom reports for the entire election or specific precincts and polling places. Users insert and read ballots from **Verity vDrives**. As ballots are read, **Verity Count** can tabulate automatically or as manually selected, updating all reporting polling places and precincts, to give an at-a-glance view into the election.

**Verity Count** is enabled for a given election via a **Verity Build** created exported signed election and **Verity Key**. The election is imported via the application's **Election Manager**.

**Verity Count** has the following chevrons: Elections, Read, Resolve, Results, and Import/Export.



#### 4.2.5.1 Elections Chevron

The Elections chevron has 3 tabs, Elections, Tasks and Preferences.

The Elections tab allows a user to open an election.

The Tasks tab manages tabulation tasks, used to tabulate election results. A task is required to begin working with election data and generating results and reports.

The Preferences tab provides configuration settings for maintaining and interacting with election results within **Verity Count**.

#### 4.2.5.2 Read Chevron

The Read chevron has 2 tabs: Dashboard and Media Reading.

The Dashboard tab provides an overview of the entire election, options for viewing further details, reading additional **Verity vDrives**, and an option for tabulating results.

The Media Reading tab provides extensive details for **Verity vDrives** read into the system, including the amount of successful and failure reads and the current status of the **Verity vDrives** reading. If ready to insert, a new **Verity vDrives** can be inserted for CVR loading.

#### 4.2.5.3 Resolve Chevron

The Resolve chevron has 1 tab: Write-in Votes.

The Write-In Votes tab allows review and resolution of ballots with write-in votes of candidates.

#### 4.2.5.4 Results Chevron

The Results chevron has the following tabs: Options, Reports, Precincts, Polling Places, Registered Voters, Vote Recording and Auditing Dashboard.

The Options tab provides preferences and configuration settings for all generated reports.

The Reports tab provides option for generating standard and custom reports.

The Precincts tab provides details reports and information for all precincts and precinct-splits.

The Polling Places tab details reports and information for polling places as they receive and report voting data.

The Registered Voters tab provides details information regarding all registered voters for a precinct/precinct split with options to configure and update totals.

The Vote Recording tab provides options for recording manual votes, changing voting totals through adding or subtracting ballots based on reviews.

The Auditing Dashboard tab provides an interface for generating filtered reports and exports of raw CVR data.



#### 4.2.5.5 Import/Export Chevron

The Import/Export chevron has 2 tabs, Import and Export.

The Import tab provides options for importing data from CSV files.

The Export tab provides options for exporting data into CSV files.

Each of the software based portions of the **Verity Voting 1.0** voting system (**Verity Build**, **Verity Central** and **Verity Count**) provide the ability to be utilized in either a single application implementation or a networked configuration, of like components, utilizing a centralized database implementation.

#### 4.2.6 Supported Languages

The **Hart Verity Voting 1.0** voting system supports the English and Spanish languages.

#### 4.2.7 Supported Functionality

##### 4.2.7.1 Voting Variations

**Verity Voting 1.0** supports the following voting variations:

- Closed primary elections
- Blanket primary elections
- Open primary elections
- General elections
- Partisan offices
- Non-partisan offices
- Write-in voting
- Primary presidential delegation nominations
- Ballot rotation
- Straight party voting
- Split precincts
- Vote for N of M

Note that **Verity Voting 1.0** does not include Ranked Choice Voting as a fully implemented voting variation. **Verity Build** will build a ballot to Ranked Choice voting, the voting devices **Verity Scan** and **Verity Touch Writer**, as well as **Verity Central** will allow RCV selections by the voter and record them. **Verity Count** does not perform ranked choice processing, instead it will treat the 1<sup>st</sup> candidate selected as the candidate chosen. While the full functionality is not in place, SLI tested the implemented functional portions in their respective areas as listed.



## 4.2.8 Ballot Standards

Verity Build employs and supports the ballot standards as follows:

- Supports the following paper sizes:
  - 8.5" x 11"
  - 8.5" x 11" w/ 3" stub (8.5" x 14")
  - 8.5" x 14"
  - 8.5" x 14" w/ 3" stub (8.5" x 17")
  - 8.5" x 17"
  - 8.5" x 17" w/ 2" stub (8.5" x 19")
  - 11" x 17"
- Supports ballot layouts in portrait orientation.
- Supports duplex ballot layouts.
- Supports the inclusion of ballot stubs on paper ballots.
- Supports layouts for a variety of ballot types, including Test mode, Official mode, and Sample ballots.
- Compatible with the production of ballots on standard, commercially available white paper stock.

## 5 Certification Test Results Summary

### 5.1 Source Code Review Summary

SLI has reviewed the software source code for each application in the **Hart InterCivic Verity 1.0** voting system to determine the code's compliance with The EAC VVSG 2005, Volume 1 Sections 5, 9 and Volume 2 Section 5.4 and for compliance with **Hart InterCivic's** internally developed coding standards. **Verity 1.0** is implemented with the C, C++ and C# languages. Results of the source code review are detailed in "Attachment C. – List of Source Code Reviewed and Results".

The review was conducted for:

- **Software Integrity:** The module contains no self-modifying code. Software remains unchanged and retains its integrity. The module has defined array dimensions, which are positive constant integers (Pointer variables, dynamic memory allocation and management are not applicable to Visual Basic.)
- **Modularity:** The modules have a specific testable function; performing a single function; is uniquely named; follows a standard format, has a single entry point; has a single exit point (or deviates in an acceptable manner); has error handling; and acceptable module size
- **Control Constructs:** Logic flow utilizes standard constructs of the development language used; constructs are used consistently throughout the code; logic structure is not overly complex, and acceptable use of error handlers.

- **Naming Conventions:** Variable and Function names that clearly define the purpose of the variable or function. Use of standard notation for variables by type. Use of names that are unique for both global and local variables. Use of names that are unique for functions (except where it deviates in an accepted manner).
- **Coding Conventions:** Use of a standard methodology for the construction of a code module. This includes uniform calling sequences, parameter validation, a single executable statement per line, and status or error messages.
- **Comments Conventions:** Comment Header blocks for the module / function follows a standard format in its layout and content. In code comments are clearly delineated and readable.

### Evaluation of Source Code

The source code was reviewed for compliance per the guidelines defined in EAC VVSG 2002 *Volume 2, Section 5.4*. The source code was written adequately in terms of the EAC VVSG 2005. The code is modular and contains sufficient error handling. Readability is sufficient and supports maintainability.

The reviewer's assessment is based on the following observations:

- Software Integrity
  - There were no unbounded arrays. This follows the 2005 EAC VVSG requirements for software integrity.
  - No instances of self-modifying or dynamically loaded code were observed.
- Modularity
  - The code is modular and self-contained.
  - Modules perform only the specified functionality.
  - The requirement of single entry and exit points are complied with.
  - Modules are small enough to facilitate ease of reading and understanding.
- Control Constructs
  - Control Constructs used are in accordance with those allowed by the VVSG.
  - Loop control constructs have been appropriately chosen for the logical tasks to be accomplished. (There are, however, instances of loop constructs written to include early termination logic other than by the normal loop exit condition specification. The interpretation of the currently written VVSG requirement is that this early loop termination logic is not disallowed by the VVSG but it is a variation of the construct other than that described by the standard and was accepted. As the code is currently written there will be no problems caused by those loop controls however, future changes to the code should be performed with some caution to ensure that the system state is stable.)
  - Modules have fewer than 6 levels of indented scope.

- Array boundaries are checked.
- Naming Conventions
  - Function and variable names are in accordance with the requirements of the VVSG.
  - Names differ by more than a single character and have been chosen as to enhance the readability of the code.
  - There are no instances of language keywords being used as a name for procedures or variables.
- Coding Conventions
  - Coding conventions employed are in compliance with the requirements of the VVSG.
  - Code is well structured and was written appropriately to the standards.
- Comments
  - Module headers are in compliance with the requirements of the VVSG.
  - In-line comments are sufficient in number and placement to facilitate a reasonable understanding of the code.
  - Variables have appropriate comments at the point of declaration.
- On the Application level, no more than 50% of the modules can exceed 60 lines, no more than 5% can exceed 120 lines, and none can exceed 240 lines without justification.
  - Functions/modules were within the EAC VVSG tolerances;

## 5.2 Technical Data Package Review Summary

SLI reviewed the *Hart InterCivic Verity 1.0* TDP, as detailed in sections 3.1 and 3.4, for compliance with the EAC VVSG 2005 according to *Volume 2 Section 2*.

The review was conducted for the required content and format of:

- **System Overview:** System description and performance are adequately described.
- **System Functionality Description:** System functional processing capabilities, encompassing capabilities required by the Standards and any additional capabilities provided by the system, including a simple description of each capability.
- **System Hardware Specification:** System Hardware Characteristics, Design and Construction
- **Software Design and Specification:** Purpose and scope, applicable documents, software overview, software standards and conventions, software operating environment, software functional specification, programming specifications, system database, interfaces and appendices.



- **System Security Specification:** Access control policy and measures, equipment and data security, software installation, telecommunications and data transmission security, elements of an effective security program.
- **System Test and Verification Specifications:** Development and certification test specifications that Hart applied to their testing efforts
- **System Operations Procedures:** Operation environment, system installation and test specifications, operational features, operating procedures, operations support.
- **System maintenance Procedures:** Preventative and corrective maintenance procedures, maintenance equipment, facilities and support.
- **Personnel Deployment and Training Requirements:** Personnel resources and training required to operate and maintain the system
- **Configuration Management:** Configuration management policy, configuration identification, procedures for baseline, promotion, demotion and configuration control, release process, configuration audits and management resources,
- **Quality Assurance Program:** Quality assurance policy, parts and materials special testing and examination, quality conformance inspections
- **System Change Notes:** Changes to a previously certified system (N/A)

## Evaluation of TDP

Once initially identified discrepancies were resolved, the Technical Data Package for the Hart InterCivic Verity 1.0 voting system was found to sufficiently comply with the standards such that a jurisdiction would be able appropriately deploy the Hart InterCivic Verity 1.0 voting system. Results of the PCA documentation review are detailed in “Attachment E – PCA Summary”.

## 5.3 Hardware Testing

SLI and their third-party certified hardware test laboratories, EMC Integrity, and Cascade TEK, performed an analysis and review of the **Verity 1.0** voting system hardware components, namely **Verity Scan**, **Verity Touch Writer** and **Verity Central** (with the Kodak i5600, Canon DR-G1100 and Cannon DR-G1130 high speed ballot scanners)

During execution of testing performed at EMC Integrity and Cascade TEK, an SLI representative was present to oversee the testing.

The test methodologies for all tests are identified in the following hardware test plans and hardware test reports:

- Hart InterCivic Verity VVSG EMC EMI Test Plan v5 0 - SLI
- Hart InterCivic Verity VVSG Hardware ENV Test Plan v4 0 - SLI
- CTC C1303B - Cascade TEK
- ETRB41001 revA\_Verity\_Scan – EMC Integrity
- TRB41001 revA\_Verity\_Scan – EMC Integrity



- ETRB41002 revA\_Verity\_TW – EMC Integrity
- TRB41002 revA\_Verity\_TW – EMC Integrity

Additionally SLI conducted a review on Safety Report:

“ Verity\_Safety\_Report\_PTI-1411085-000\_TRF\_iec60950\_ALL from PTI.”

Conclusion:

- All critical components comply with IEC 60950-1: 2005, or relevant component standards.

Hardware testing conducted specifically for this test campaign involved the **Verity Scan** and **Verity Touch Writer**. That testing involved verification of the following requirements:

- VVSG 2005 Vol. 1, Section 4 Hardware Requirements
- VVSG 2005 Vol. 2, Section 4 Hardware Testing

Additionally hardware testing conducted specifically for this test campaign involved the **Verity Central** (COTS) systems. That testing involved verification of the following requirements:

- VVSG 2005 Vol. 2, 4.7.1 Temperature and Power Variation , 4.7.3 Reliability

### 5.3.1 Operating Mode

Prior to and during testing, proper operation of the equipment was confirmed using Hart InterCivic software. An operational status check was successfully performed prior to and after each test verifying the equipment is within acceptable performance limits. Equipment was inspected for damages after each test. No issues were found.

**Verity Scan** and **Very Touch Writer** were in a test election mode and the following **Verity** applications were executed:

- Shoe Shine test application – provides a method of exercising the integrated scanner in Verity Scan. When application runs a ballot is inserted into the scanner and the scanner continuously scan the ballot through its ballot feeder.
- Audio Test application – is used to test the Audio playback in Verity Touch Writer.
- USB Stick Test – is an application to write data to either of the USB ports that are inside Verity Scan and Touch Writers secure device compartment.
- Printer Test - is an application to print to the thermal printer integrated into Verity Scan and Touch Writers.



## 5.4 Known Vulnerabilities Testing

**Hart Verity Voting 1.0** is an un-fielded system, with all new hardware and software components. This system does not contain a DRE precinct voting device, nor does it support public transmissions.

Within the declared system, the only public facing components are the **Verity Scan** precinct optical scanner, which processes ballots marked by voters in a public polling place and **Verity Touch Writer**, a precinct place ballot marking device.

**Verity Central** is a central count location device, which is implemented in a secure environment.

Given this, there are no known vulnerabilities to this particular system at this time.

Review of the “Known Vulnerabilities” database, maintained by SLI, provided 14 known vulnerabilities to previous Hart systems already accounted for in SLI’s Test Methods.

## 5.5 Functional Testing Summary

SLI performed tests on each of the system configurations identified in Sections 3 and 4.2. The testing incorporated end-to-end election scenarios testing the functionality supported by Hart.

### 5.5.1 How each Device was tested

Functionality was tested as identified below. The following functional areas exist for Hart InterCivic Verity 1.0 voting system.

#### 5.5.1.1 Verity Touch Writer

- **Verity Touch Writer** is a standalone precinct level ballot marking device. It assists voters in marking their ballot and prints it out for them. Once the ballot is printed, **Verity Touch Writer** erases all memory components of that session.
- **Verity Touch Writer** was tested first as an individual component in order to verify that all declared functionality is present and working as documented, utilizing **Verity Build** produced media and data. All documented features were tested, and all functional features were verified to be documented.
- **Verity Touch Writer** was then tested as an integrated piece of the voting system, in several different test suites, where it accepted user input instructions, prior to producing marked ballots that mirror user intent, utilizing all HAVA related options.
- As an individual component each function contained within the **Verity Touch Writer** device was examined to determine that it functioned as expected. Each screen was inspected and exercised in order to provide full coverage. All supported ballot sizes were exercised on the device as well. **Verity Touch Writer** testing also included all applicable HAVA aspects.



- **Verity Touch Writer** was also tested within the Accuracy test, Volume test, Stress test, and multiple system level tests that simulated election day activities.

#### 5.5.1.2 Verity Scan

- **Verity Scan** is a standalone precinct level scanning device. It accepts and records votes from voter hand marked ballots, as well as from **Verity Touch Writer** marked ballots. Data from the votes cast is stored in a **Verity vDrive** and transported to central count locations for accumulation and tallying in **Verity Count**.
- **Verity Scan** was tested first as an individual component in order to verify that all declared functionality is present and working as documented, with **Verity Build** produced media and data. All documented features were tested, and all functional features were verified to be documented.
- As an individual component, each function contained within the **Verity Scan** device was examined to determine that it functioned as expected. Each screen was inspected and exercised in order to provide full coverage. All supported ballot sizes were exercised on the device as well.
- **Verity Scan** was also tested as an integrated piece of the voting system in several different test suites, where it inputs **Verity Build** produced media and data, then accepts user filled out ballots as well as **Verity Touch Writer** produced ballots within the polling place, prior to producing all defined output media.
- **Verity Scan** was also tested within the Accuracy test, Volume test, Stress test, and multiple system level tests that simulated election day activities.

#### 5.5.1.3 Verity vDrive

- **Verity vDrive** is Verity memory device. It carries information from **Verity Build** to each of the components within the **Verity** system during the pre-voting phase of an election. On election day, data from the votes cast in **Verity Scan** and **Verity Central** is stored in a **Verity vDrive** and transported to central count locations for accumulation and tallying.
- **Verity vDrive** was tested first as an individual component in order to verify that all declared functionality is present and working as documented, utilizing **Verity Build** produced media and data. All documented features were tested, and all functional features were verified to be documented.
- **Verity vDrive** was also tested as an integrated piece of the voting system where it inputs **Verity Build** produced media and data, then accept and transporting cast vote record data and ballot images from the polling place to **Verity Count**.



#### 5.5.1.4 Verity Key

- **Verity Key** is Verity security device. It carries security information from **Verity Build** to each of the components within the **Verity** system.
- **Verity Key** was tested first as an individual component in order to verify that all declared functionality is present and working as documented, utilizing **Verity Build** produced data. All documented features were tested, and all functional features were verified to be documented.
- **Verity Key** was also tested as an integrated piece of the voting system where it is utilized for authorizing loading election information onto **Verity Touch Writer**, **Scan** and **Central**, as well as accumulating vote data into **Verity Count**.

### 5.5.2 How each Application was tested

#### 5.5.2.1 Verity Build

- **Verity Build** accepts imported election information and produces ballots, election information, **Verity vDrives** and **Verity Keys**.
- **Verity Build** was tested first as an individual component in order to verify that all declared functionality is present and working as documented. All documented features were tested, and all functional features were verified to be documented.
- **Verity Build** was also tested as an integrated piece of the voting system where it output **Verity Build** produced media and data (via Verity Key and vDrive), which feed into **Verity Touch Writer**, **Verity Scan**, **Verity Central** and **Verity Count**.

#### 5.5.2.2 Verity Central

- **Verity Central** is a central count location system that utilizes high speed scanners to scan large volumes of voted ballots, which are recorded onto a **Verity vDrive** for transportation to **Verity Count** for accumulation and tallying.
- **Verity Central** was tested first as an individual component in order to verify that all declared functionality is present and working as documented. All documented features were tested, and all functional features were verified to be documented.
- **Verity Central** was also tested as an integrated piece of the voting system where it inputs **Verity Build** produced media and data, then accepts user filled out ballots as well as **Verity Touch Writer** produced ballots, prior to producing all defined output medias.



### 5.5.2.3 Verity Count

- **Verity Count** is the **Verity** application used for accumulation and tallying of voted ballots, transported via **Verity vDrive**, from **Verity Scan** and **Verity Central**.
- **Verity Count** was tested first as an individual component in order to verify that all declared functionality is present and working as documented. All documented features were tested, and all functional features were verified to be documented.
- **Verity Count** was also tested as an integrated piece of the voting system where it inputs **Verity Build** produced media and data, then accepts **Verity vDrive** data from **Verity Scan** and **Verity Central**, prior to tabulating results and producing all defined output reports.

### 5.5.2.4 Verity Election Manager

- **Verity Election Manager** is the **Verity** application used for importing, exporting, archiving and restoring elections into and from **Verity Build, Central and Count**.
- **Verity Election Manager** was tested first as an individual component in order to verify that all declared functionality is present and working as documented,
- **Verity Election Manager** was also tested as an integrated piece of the larger voting applications where it resides (**Verity Build, Central and Count**), verifying that it performed the appropriate functions for the parent application.

### 5.5.2.5 Verity User Manager

- **Verity User Manager** is the **Verity** application used for creating and managing all user roles and accounts within each of the parent applications, **Verity Build, Central and Count**.
- **Verity User Manager** was tested first as an individual component in order to verify that all declared functionality is present and working as documented,
- **Verity User Manager** was also tested as an integrated piece of the larger voting applications where it resides (**Verity Build, Central and Count**), verifying that it performed the appropriate functions and managed the pertinent roles for the parent application.

### 5.5.2.6 Verity Desktop

- **Verity Desktop** is the **Verity** application used for setting workstation date/time, accessing the desktop and gathering hash codes for **Verity Build, Central and Count**.
- **Verity Desktop** was tested first as an individual component in order to verify that all declared functionality is present and working as documented,
- **Verity Desktop** was tested as an integrated piece of the larger voting applications where it resides (**Verity Build, Central and Count**), verifying that it performed the appropriate functions for the parent application.



### 5.5.3 How different System Level Configurations were tested

**Verity Build**, **Verity Central** and **Verity Count** are each capable of being run as standalone instantiations or networked with a central database. Also, **Verity Build** and **Verity Count** are able to be run on the same physical device, as **Verity Build/Count** in both a stand-alone implementation as well as in a networked configuration. Given these possible configurations, the following configurations were exercised:

- **Verity Build** was tested in standalone mode with accompanying database
- **Verity Count** was tested in standalone mode with accompanying database
- **Verity Build/Count** was tested in standalone mode with accompanying database
- **Verity Central** was tested in standalone mode with accompanying database
- **Verity Build** server was tested in a networked mode with accompanying database and 3 client workstations (total of 4 workstations).
- **Verity Count** server was tested in a networked mode with accompanying database and 3 client workstations (total of 4 workstations).
- **Verity Build/Count** server was tested in a networked mode with accompanying database and 3 client workstations (total of 4 workstations).
- **Verity Central** server was tested in a networked mode with accompanying database and 3 client workstations (total of 4 workstations).

### 5.5.4 Test Suites Utilized

The following test suites were executed:

#### 5.5.4.1 Readiness test suite

Ensuring readiness of a voting system is crucial for testing and assisting each jurisdiction in preparing for use of a voting system. Readiness Testing is different from testing very specific pieces of functionality within a system; it is broader than acceptance and functionality testing. It focuses on creating a validated baseline for testing and verifying system readiness.

The Readiness suite consisted of a full system setup. The setup included the election importation module (**Verity Election Manager**), user management module (**Verity User Manager**), workstation management module (**Verity Desktop**), election creation module (**Verity Build**), precinct location count devices (**Verity Touch Writer** and **Verity Scan**), Central Count devices (**Verity Central** with associated COTS scanner as well as an accumulation and reporting system (**Verity Count**). A basic election was created and executed, including offices with candidates, parties, referenda and multiple ballot styles.

The Readiness test is considered the gateway test which is performed prior to any other formal testing and is always performed prior to any other testing.



#### 5.5.4.2 Verity Election Manager test suite

All functionality present in **Verity Election Manager** was verified to work as documented, providing the appropriate functionality for each main application/workstation type, and that all functionality is appropriately documented.

This test covered **Verity Build, Verity Central** and **Verity Count**.

#### 5.5.4.3 Verity User Manager test suite

All functionality present in **Verity User Manager** was verified to work as documented, providing the appropriate functionality for each main application/workstation type, and that all functionality is appropriately documented.

This test covered **Verity Build, Verity Central** and **Verity Count**.

#### 5.5.4.4 Verity Desktop test suite

All functionality present in **Verity Desktop** was verified to work as documented, providing the appropriate functionality for each main application/workstation type, and that all functionality is appropriately documented.

This test covered **Verity Build, Verity Central** and **Verity Count**.

#### 5.5.4.5 Verity Build – Single workstation test suite

All functionality present in **Verity Build** was verified to work as documented, and that all functionality is appropriately documented.

This test covered **Verity Build** in a stand-alone configuration and focused on all functionality within the application.

#### 5.5.4.6 Verity Build – Client/Server configuration, Networked test suite

Testing of the client/server configuration, for **Verity Build**, was the focus of this testing, such that reliability of data consistency was verified in a networked setting. **Verity Build** networked supports a Server/Client workstation and up to 3 additional Client workstations, and was tested in its maximum configuration of 4 total workstations.

#### 5.5.4.7 Verity Central– Single workstation test suite

All functionality present in **Verity Central** was verified to work as documented, and that all functionality is appropriately documented.

This test covered **Verity Central** in a stand-alone configuration and focused on all functionality within the application.

#### 5.5.4.8 Verity Central – Client/Server configuration, Networked test suite

Testing of the client/server configuration, for **Verity Central**, was the focus of this testing, such that reliability of data consistency was verified in a networked setting. **Verity Central** networked supports a Server/Client workstation and up to 3 additional Client workstations, and was tested in its maximum configuration of 4 total workstations.



#### 5.5.4.9 Verity Count– Single workstation test suite

All functionality present in **Verity Count** was verified to work as documented, and that all functionality is appropriately documented.

This test covered **Verity Count** in a stand-alone configuration and focused on all functionality within the application.

#### 5.5.4.10 Verity Count – Client/Server configuration, Networked test suite

Testing of the client/server configuration, for **Verity Count**, was the focus of this testing, such that reliability of data consistency was verified in a networked setting. **Verity Count** networked supports a Server/Client workstation and up to 3 additional Client workstations, and was tested in its maximum configuration of 4 total workstations.

#### 5.5.4.11 Verity Build/Count– Single workstation test suite

This test covered **Verity Build/Count** in a stand-alone configuration and focused on all functionality within the two applications and verified that the applications did not interfere with each other, nor produce unexpected behavior.

#### 5.5.4.12 Verity Build/Count – Client/Server configuration, Networked test suite

Testing of the client/server configuration, for **Verity Build/Count**, was the focus of this testing, such that reliability of data consistency was verified in a networked setting. **Verity Build/Count** networked supports a Server/Client workstation and up to 3 additional Client workstations, and was tested in its maximum configuration of 4 total workstations.

#### 5.5.4.13 Verity Scan test suite

All functionality, including administrative, maintenance as well as election day poll worker functionality, present in **Verity Scan** was verified to work as documented, and that all functionality is appropriately documented.

#### 5.5.4.14 Verity Touch Writer test suite

All functionality, including administrative, maintenance as well as election day poll worker functionality, present in **Verity Touch Writer** was verified to work as documented, and that all functionality is appropriately documented.

#### 5.5.4.15 GenVariation1 test suite

The focus of this suite was validating N of M voting, Partisan offices, Non-Partisan Offices, Ranked Order Voting, Straight Party Voting, Ballot Rotations, Ballot Formatting, precincts and split precincts, as well as Tally and Reporting functionality.

This test covered **Verity User Manager, Verity Election Manager, Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**. Vote counts were accumulated from both **Verity Central** and **Verity Scan** into **Verity Build**.

This suite utilized 8.5x11 and 8.5x14 ballots, both stubbed and unstubbed. Languages implemented in the suite included English, Spanish and (English/Spanish).



#### 5.5.4.16 GenVariation2 test suite

This suite built off the GenVariation1 Test. Additional definition was added, with a focus on validating N of M voting, Partisan offices, Non-Partisan Offices, Write-Ins, ADA/HAVA, as well as Tally and Reporting functionality.

This test covered **Verity User Manager, Verity Election Manager, Verity Desktop, Verity Build** networked, **Verity Touch Writer, Verity Scan, Verity Central** networked as well as **Verity Count** networked. Vote counts were accumulated from both **Verity Central** and **Verity Scan** into **Verity Build**.

This suite utilized 8.5x14, 8.5x17, 11x17 ballots, both stubbed and unstubbed. Languages implemented in the suite included English, Spanish and (English/Spanish). ADA devices utilized included Headphones, paddles, sip and puff.

#### 5.5.4.17 PriOpen test suite

The focus of this suite was an election designed to conform to an Open Primary election with focus on validating primary presidential delegation nominations, N of M voting, Partisan offices, Non-Partisan Offices, Straight Party Voting, Ballot Rotations, Ballot Formatting, ADA/HAVA, precincts and split precincts, as well as Tally and Reporting functionality. Please see “Table 3 – Terms and Abbreviations” for additional detail of an Open Primary.

This test covered **Verity User Manager, Verity Election Manager, Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**. Vote counts were accumulated from both **Verity Central** and **Verity Scan**.

This suite utilized 8.5x11, 8.5x14, 8.5x17, 11x17 ballots, both stubbed and unstubbed. Languages implemented in the suite included English, Spanish and (English/Spanish).

#### 5.5.4.18 PriClosed Test Suite

The focus of this suite was an election designed to conform to a Closed Primary election with N of M voting, Partisan offices, Non-Partisan Offices, Ballot Formatting, ADA/HAVA, precincts and split precincts, as well as Tally and Reporting functionality. Please see “Table 3 – Terms and Abbreviations” for additional detail of a Closed Primary.

This test covered **Verity User Manager, Verity Election Manager, Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**. Vote counts were accumulated from both **Verity Central** and **Verity Scan**.

This suite utilized 8.5x14, 8.5x17, ballots, both stubbed and unstubbed. Languages implemented in the suite included English, Spanish and (English/Spanish). ADA devices utilized included Headphones, paddles, sip and puff.



#### 5.5.4.19 PriBlanket Test Suite

The focus of this suite was an election designed to conform to a Blanket Primary election with N of M voting, Partisan offices, Non-Partisan Offices Ballot, Ballot Formatting, ADA/HAVA, precincts and split precincts, as well as Tally and Reporting functionality. Please see “Table 3 – Terms and Abbreviations” for additional detail of a Blanket Primary.

This test covers **Verity User Manager, Verity Election Manager, Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**. Vote counts will be accumulated from both **Verity Central** and **Verity Scan**.

This suite utilized 8.5x11, 8.5x17, 11x17 ballots, both stubbed and unstubbed. Languages implemented in the suite included English, Spanish and (English/Spanish).

#### 5.5.4.20 Error Messaging and Recovery Test Suite

Testing in this suite focused on Error Messaging and Recovery in key areas of the system identified from researching previous testing and voting system documentation to help identify potential failure points. Voting systems can be subject to various conditions and when the system exceeds limitations errors are typically found. SLI leveraged its election experience and voting system knowledge to test the Error Messaging and Recovery of the **Verity 1.0** voting. Testing of Error messaging focused on the appropriate error messages being generated in response to specific errors, and content of the message. The testing of the voting system Error Recovery capability was also incorporated into Stress testing in order to leverage the necessary range of performance impacts needed to generate system errors and force recovery.

This test covered **Verity User Manager, Verity Election Manager, Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**.

#### 5.5.4.21 Audit Content Validations Test Suite

Audit records are used to track what system functions have been executed, what data has been modified, as well as by who and when. Additionally, audit record data content can be a key factor in identifying system anomalies and provide assistance in troubleshooting system errors. In tandem with the System Audit Validation, analysis of the **Verity 1.0** voting system was performed to determine strategic points of the system that require auditing, along with the content needed to accurately depict the machinations of the system for the given situation. The **Verity 1.0** applications utilize both an audit log and a system log to track workstation occurrences at two different levels. Tests were incorporated into Election Validation suites as well as specific Audit Validation suites, such that all related requirements were explicitly validated.

This test covered **Verity User Manager, Verity Election Manager, Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**.



#### 5.5.4.22 System Audit Test suite

Election audit trails provide the supporting documentation for verifying the accuracy of reported election results. They present a concrete, indestructible archival record of all system activity related to the vote tally, and are essential for public confidence in the accuracy of the tally, for recounts, and for evidence in the event of criminal or civil litigation. This testing focused on validating the system's ability to provide audit capability throughout the entire voting system, including availability, generation, integrity, and accuracy of the system's audit capability to ensure it meets the necessary requirements. The **Verity 1.0** applications utilize both an audit log and a system log to track workstation occurrences at two different levels. Negative testing was utilized to force the system into conditions that triggered errors and verified that the voting system captures those conditions.

This test covered **Verity User Manager, Verity Election Manager, Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**.

#### 5.5.4.23 Accuracy Test Suite

Testing the ability of the system to capture, record, store, consolidate and report the specific selections and absence of selections, made by the voter for each ballot position without error.

Required accuracy is defined in terms of an error rate that for testing purposes represents the maximum number of errors allowed while processing a specified volume of data. For the Accuracy test, the defined volume is no errors in 1.55 million ballot marking positions, or no more than 1 error in 3.1 million ballot marking positions.

Accuracy testing was conducted at both the device level and the system level.

Each device was subjected to scrutiny that verified that the requirements for accuracy are met. Additionally, the system was reviewed and exercised to validate that the accumulation, tallying and reporting mechanisms at the system level are able to accurately perform their functions.

This test covered, **Verity Scan, Verity Touch Writer, Verity Central** as well as **Verity Count**. Vote counts were accumulated from both **Verity Central** and **Verity Scan**. Note that **Verity Central** was tested with all supported scanners.

**Verity Scan** supports 3 base ballot sizes

- 8.5" x 11"
- 8.5" x 14"
- 8.5" x 17"

Each ballot size was exercised in the **Verity Scan**. Each size contained 2600 ballots with 600 ballot marking positions. This totaled 7800 ballots and 4.8 million marking positions read by **Verity Scan**.



**Verity Touch Writer** supports 3 base ballot sizes

- 8.5" x 11"
- 8.5" x 14"
- 8.5" x 17"

Each ballot size was exercised in the **Verity Touch Writer**. Each size contained 50 ballots with 600 ballot marking positions. This totaled 150 ballots and 90,000 marking positions, which were then read by **Verity Scan**.

**Verity Central** supports 3 scanner types and 4 base ballot sizes

- 8.5" x 11"
- 8.5" x 14"
- 8.5" x 17"
- 11" x 17"

Each ballot size was exercised in **Verity Central** through each scanner type. Each size contained 2600 ballots with 600 ballot marking positions. This totaled 7800 ballots and 4.8 million marking positions through each scanner type, for a total of 23,400 ballots and 14.4 million ballot marking positions.

All ballot sizes and ballots exercised as described above, were inputted into **Verity Count**. This accumulated to 31,350 ballots and 20.1 million ballot marking positions.

All Accuracy tests were completed without issue, and each device and application was considered to pass.

#### 5.5.4.24 Mark Sensitivity Test suite

The purpose of Ballot Mark Sensitivity testing was to determine that the system under test is able to accurately determine when a mark has been made within a ballot marking position. For this test, various marks were made within the ballot marking positions, using Verity supported colors of ink.

Marks include fully filled boxes, left and right oriented slashes, "X" markings, check marks, horizontal single line marks, and circles of various sizes. Marks also included vertical lines within the marking position that fill approximately five percent of the designated space. Small dots down to approximately two percent of the ballot marking position are also included.

Inks implemented included blue and black.

This test covered **Verity Scan**, **Verity Central** as well as **Verity Count**. Vote counts were accumulated from both **Verity Central** and **Verity Scan** into **Verity Count**.



#### 5.5.4.25 Volume and Stress test suite

Volume Testing consists of a system's response when subjected to large quantities of data, "more than the expected", as called out in the standards. Volume testing is typically considered a type of non-functional testing. However, as a voting system's primary function is to accumulate, tally, and pass a volume of data (votes) the VSTL approaches volume testing as a functional test. Experience has shown that large amounts of data can slow a system, or even cause failures and loss of data due to architectural limitations. Utilizing the VSTL's experience with voting systems the testing focused on not only passing large amounts of data but how the system operates and handles the data in key areas of functionality within the voting system.

This test covered **Verity Touch Writer**, **Verity Scan**, **Verity Central** as well as **Verity Count**. Vote counts were accumulated from both **Verity Central** and **Verity Scan**.

**Verity Scan** is a standalone device that processes ballots one at a time. Anticipated expected usage in an election environment is 1,000 ballots per device. The test was conducted in a 12 hour time period and processed 4,300 ballots.

**Verity Central** is designed to run either in standalone or in networked configurations of up to 4 workstations (1 Server/Client and 3 Clients). The Server/Client workstation maintains the database for all 4 workstations. This configuration was exercised in order to create a significant volume on **Verity Central**. The Kodak i5600 ballot scanner has an expected usage of 20,000 ballots in an 8 hour period. The Cannon DR-G1100 ballot scanner has an expected usage of 14,000 ballots in an 8 hour period. The Cannon DR-G1130 ballot scanner has an expected usage of 14,500 ballots in an 8 hour period. 1 Kodak i5600, 2 Cannon DR-G1100's and 1 CannonDR-G1130 were utilized in this volume/stress configuration. The expected usage was 62,500 ballots in an 8 hour period. The test was conducted in a 12 hour period and processed 94,000 ballots.

Stress testing consists of a "system's response to transient overload conditions." Experience has shown that when passing a dataset through a system that eclipses the system architectural limitations, failures can occur and result in the loss of critical data. Utilizing the VSTL's experience with voting systems, the testing focused on the system's ability to operate after the limitations have been exceeded and if failures occur, how the data is maintained or recovered in key areas of functionality within the voting system.

As this test is the "next step" from the Volume test, it was performed at the conclusion of the Volume test, utilizing the implementation setup as described for the Volume test.

**Verity Scan**. The test was conducted in an additional 8 hour time period and processed an additional 3700 ballots on the same device. The number of ballots for the device totaled 8,000.

**Verity Central**. The test was conducted in an additional 6 hour time period and processed an additional 51000 ballots on the same configuration. The number of ballots for the device totaled 145,000.

This test covered **Verity Build**, **Verity Touch Writer**, **Verity Scan**, **Verity Central** as well as **Verity Count**. Vote counts were accumulated from both **Verity Central** and **Verity Scan**.



#### 5.5.4.26 Language testing

Testing was conducted to ensure the voting system is capable of implementing and presenting the ballot, ballot selections, review screens and instructions in the required languages, English and Spanish. This testing is incorporated in the General and Primary test suites detailed within this section.

This testing covers **Verity Election Manager, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**. Vote counts were accumulated from both **Verity Central** and **Verity Scan**.

#### 5.5.4.27 Data Retention/HW Integrity testing

Testing integrity requirements ensure the physical stability and function of the vote recording and counting processes, such that the system is not prone to a single point of failure that would prevent voting at a polling place. The requirements related to this testing were incorporated into other test suites for validation. Testing verified prevention of failure of data input or storage, in terms of data retention, as well as confirming that appropriate audit records are maintained without modification.

This test covered **Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**.

#### 5.5.4.28 Import Election Data test suite

This testing was concerned with the import capabilities of the voting system as the primary means of populating the system with election data. This test verified the appropriate documentation exists for a 3<sup>rd</sup> party to create the necessary XML data file to create an election within the Verity Voting 1.0 voting system. Testing also verified that Verity Build successfully checked for appropriate data and gracefully handles negative data entries beyond the scope of the voting system's expected inputs

This test configuration covers **Verity Election Manager** and **Verity Build**.

#### 5.5.4.29 Security Access Control test suite

Access control testing verifies procedures and system capabilities that detect or limit access to system components in order to guard against loss of system integrity, availability, confidentiality, and accountability. This testing verified that system resources such as data files, application programs and computer-related facilities and equipment are protected against unauthorized operation, modification, disclosure, loss or impairment. Unauthorized operations include modification of compiled or interpreted code, run-time alteration of flow control logic or of data, and abstraction of raw or processed voting data in any form other than a standard output report by an authorized operator.

This test covered **Verity User Manager, Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**.



#### 5.5.4.30 Security Software test suite

Software security testing was conducted to verify the installation procedures and ongoing foreign software detection mitigation abilities of the voting system in order to protect against the modification of the software and/or the insertion of malicious software during the installation and during ongoing operations.

This test covered **Verity Desktop, Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**.

#### 5.5.4.31 Physical Security Measures test suite

Physical security testing verified monitoring and control of the environment of the work place and computing facilities. It also verified monitor and control access to and from such facilities. Separating the network and work place into functional areas are also physical controls. Some portions of physical security are functional while other portions are procedural. Functional portions were tested as appropriate while procedural portions were verified to be documented as prescribed by the VVSG.

This test covered **Verity Build, Verity Touch Writer, Verity Scan, Verity Central** as well as **Verity Count**.

#### 5.5.4.32 Audio test suite

Audio testing was performed in order to verify that the polling place ballot marking device, **Verity Touch Writer**, fell within the acceptable parameters of hearing as defined in the 2005 VVSG.

This test covered **Verity Touch Writer**.

#### 5.5.4.33 Maintainability and Accessibility test suite

Testing accessibility requirements for a voting system generally consist of both objective and observable requirements. In combination the two types of requirements verify that the voting system components are accessible to all eligible voters, including those that may have a type of challenge that creates a need for assistance of some type. The voting systems should be self contained such that the individual voter is able to cast their vote without assistance from another party. Accessibility calls for the voting system to take into account vision, varying degrees of vision, dexterity, mobility, aural issues, and speech and language proficiency.

Usability is defined as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. In the context of voting, the primary user is the voter, the product is the voting system, and the task is the correct recording of the voter ballot selections. Testing is conducted to ensure



voters are able to negotiate the process effectively, efficiently and comfortably according to the requirements dictated, including HAVA requirements.

This tests focus was as described above, as well as a review of the report of mandated usability study performed by Hart, as per 2005 VVSG requirements.

This test covered **Verity Touch Writer** and **Verity Scan**

#### 5.5.4.34 Maintainability and Accessibility test suite

Maintainability encompasses a range of maintenance actions that examine all scheduled and unscheduled events in place for preventing failures on all hardware devices. Testing verifies the ease with which maintenance actions can be performed based on the design characteristics of the equipment and software. Non-technical election workers are to be able to be made aware of the problem through the equipment and software's ability to correctly self-diagnose problems.

This test included review of Hart documentation for maintenance actions as well as performance of those maintenance actions for ease of use and understandability.

This test covered **Verity Touch Writer** and **Verity Scan**

#### 5.5.4.35 Data Retention and Hardware Integrity testing

Integrity requirements ensure the physical stability and function of the vote recording and counting processes, such that the system is not prone to a single point of failure that would prevent voting at a polling place. Testing will also verify prevention of failure of data input or storage, in terms of data retention, as well as confirming that appropriate audit records are maintained without modification.

The requirements related to this testing were incorporated into other test suites for validation. A review of all this testing performed and notation of any pertinent issues encountered would also factor into the requirements validation consideration.

This testing covers **Verity Build**, **Verity Touch Writer**, **Verity Scan**, **Verity Central** as well as **Verity Count**.



## 5.6 Evaluation of Testing

The above tests were successfully conducted using the executables delivered in the final Trusted Build, in association with the appropriate hardware versions as declared in this Test Report for the **Hart InterCivic Verity 1.0** voting system.

Issues were found during functional testing as described in section “5.8 – Discrepancies Found During Testing”. This resulted in a total of 4 Trusted Builds. The issues reduced in number in each Trusted Build, with the final issues being resolved in Trusted Build #4.

Significant regression testing and system level testing was performed on each Trusted Build, such that all functionality was reviewed.

## 5.7 Environmental Hardware Test Summary

Based upon an examination of the equipment listed in “Hart Verity 1.0 Voting Equipment

Hardware	Use	Model
Verity Scan	Precinct polling place digital scanner	Revision B
Verity Touch Writer	Precinct polling place Ballot Marking Device	Revision B
Verity Key	Security key used within the voting system	N/A
Verity vDrive	Media used for transportation of voting system data	N/A

Table 8 – COTS Equipment”, and **Hart’s** Hardware Specification, SLI concluded that the hardware listed is COTS (Commercial off the Shelf). As such, it is not subject to Environmental Hardware Testing.

SLI and their third-party certified hardware test laboratories, EMC Integrity, and Cascade TEK, executed Environmental Hardware testing on the non-COTS hardware listed in “Table 7 – Hart Verity 1.0 Voting Equipment”, and “**Error! Reference source not found.** – Hart Verity 1.0 Software and Firmware”.

The testing consisted of:

- Electromagnetic Emissions / Immunity Tests:
  - Radiated Emissions – FCC, Part 15 Class B ANSI C63.4.
  - Conducted Emissions – FCC, Part 15 Class B ANSI C63.4.
  - ESD – IEC 61000-4-2 (2008) Ed. 2.0.
  - Electromagnetic Susceptibility – IEC 61000-4-3 (1996).
  - Electrical Fast Transient – IEC 61000-4-4 (2004-07) Ed. 2.0.
  - Lightning Surge – IEC 61000-4-5 (1995-02).
  - Conducted RF Immunity – IEC 61000-4-6 (1996-04).
  - Magnetic Fields Immunity – IEC 61000-4-8 (1993-06).
  - Electrical Power Disturbance – IEC 61000-4-11 (1996-06).



- Non-Operating Environmental Tests:
  - Bench Handling - MIL-STD-810D, Method 516.3, Procedure VI
  - Vibration - MIL-STD-810D, Method 514.3, Category 1- Basic Transportation, Common Carrier.
  - Low Temperature - MIL-STD-810D, Methods 502.2, Procedure I- Storage.
  - High Temperature - MIL-STD-810D, Methods 501.2, Procedure I- Storage.
  - Humidity (85%) Soak - MIL-STD-810D, Method 507.2, Procedure I- Natural Hot-Humid.
  
- Operating Environmental Tests:
  - Temperature/Power Variation - similar to the low temperature and high temperature tests of MIL-STD-810-D, Method 502.2 and Method 501.2.
  - Reliability – Vol. 1, Section 4 for the acceptable Mean Time Between Failure (MTBF).

### 5.7.1 Evaluation of Environmental Hardware Testing

Any critical issues found were reported, resolved and re-tested. Attachments G contain the hardware environmental reports from SLI's EAC approved Hardware Environmental Test Subcontractor(s), EMC Integrity, and Cascade TEK. These reports detail specific information on the environmental hardware testing. As of the writing of this report, all devices subjected to hardware testing, as listed above, have successfully passed all tests.

## 5.8 Discrepancies Found During Testing

Discrepancies found fall into 4 major categories, Hardware, Documentation, Source Code, and Functional. Hardware discrepancies are issues that occur specifically in the hardware arena, and are usually found during the hardware testing phase. Documentation discrepancies are issues that occur during the PCA documentation review phase and are issues that are resolved by updates to the documentation. Source Code discrepancies are issues that occur during source code review and are issues that must be fixed in the source code prior to the Trusted Build. Functional discrepancies are issues that occur during functional testing and can be related to any software or firmware within the system. Functional discrepancies often lead to source code modifications, additional source code review and an additional Trusted Build.

### 5.8.1 Hardware Discrepancies

Ten hardware discrepancies were written during this campaign, with 7 of the issues occurring during the hardware testing. The primary issues were around electrical testing, such electrostatic discharge, electrical fast transient, lightning surge and radiated emissions. **Hart** developed appropriate remedies for each issue and eventually passed all hardware tests.



Two issues were concerned with firmware issues and were resolved during functional testing.

One issue was concerned with invalid calibration sheets and was resolved during functional testing.

### 5.8.2 Documentation Discrepancies

Seventy Eight documentation issues were written during the PCA documentation review phase. The issues centered around 2 main issues, incorrect information or missing information. In all instances the issues were addressed and resolved prior to the writing of this report.

### 5.8.3 Source Code Discrepancies

Source code review generated 5609 discrepancies during the review process.

Basic formatting and naming convention issues accounted for 4935 of the issues.

Basic construct issues were addressed in 664 of the discrepancies.

Issues of a logic nature accounted for 10 of the discrepancies.

All issues were addressed by the Trusted Build

### 5.8.4 Functional Discrepancies

Functional testing generated 30 discrepancies.

XML import issues, concerned with importing election data, accounted for 7 discrepancies.

User interface issues accounted for 4 discrepancies.

System functionality issues accounted for 11 discrepancies.

Concurrency issues in networked configurations accounted for 5 discrepancies.

Memory issues accounted for 2 discrepancies.

Data retention issues accounted for 1 discrepancy.

All issues were resolved prior to the final Trusted Build, and writing of this report.

## 5.9 Deficiencies

SLI has determined that there are no remaining unresolved deficiencies against the VVSG requirements.



## 6 Recommendations

SLI has successfully completed the testing of the Hart InterCivic Verity 1.0 voting system. It has been determined that the Verity 1.0 voting system meets the required acceptance criteria of the Election Assistance Commission Voluntary Voting System Guidelines 2005.

This recommendation reflects the opinion of SLI Global Solutions based on testing scope and results. It is SLI's recommendation based on this testing effort that the EAC grant certification of Hart InterCivic Verity 1.0 voting system.

**SLI:**

A handwritten signature in blue ink, appearing to read 'Traci Mapps'.

Traci Mapps  
VSTL Director/Sr. Director of Operations  
February 20<sup>th</sup> 2015



## **7 EAC Certification & Voting System Configuration**

This report has been submitted to the Election Assistance Commission on February 20<sup>th</sup> 2015. Upon acceptance of this report by the EAC technical committee, a certification number will be issued.

This certification is for the Hart InterCivic Verity 1.0 voting system, configured as detailed in section 3 of this document.

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## **Appendix A – Test Plan**

Please refer to the latest Test Plan for Verity 1.0 on the Election Assistance Commission website, located at: [www.eac.gov](http://www.eac.gov)

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End of Certification Test Report

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# Test Report

**Hart InterCivic  
Verity Voting System  
Version 1.1  
State Certification Testing  
March 31, 2015  
Virginia State Board of Elections  
1100 Bank Street, 1st Floor  
Richmond, VA 23219**

## 1 Authority

Section § 24.2-629 of the *Code of Virginia* authorizes the Virginia State Board of Elections, in the manner prescribed by the Board, to have examined a production model of such equipment and ballots associated with a vendor's request for State Certification.

The Virginia State Certification of Voting Systems *Requirements and Procedures* (Rev. 01/20140) prescribes the manner of which the Virginia State Board of Elections will conduct the state certification testing. According to the *Requirements and Procedures*,

Testing is performed to evaluate the system with respect to the specific practices of Virginia. Testing will evaluate all system operations and procedures which:

- a. Define ballot formats for a primary election, a general election and a recount, including all voting options defined by the Code of Virginia,
- b. Install application programs and election-specific programs and data in the ballot counting device,
- c. Verify system readiness for operation,
- d. Count ballots,
- e. Perform status tests,
- f. Obtain voting data and audit data reports,
- g. Support recount or election audits, and
- h. Address compliance with accessibility requirements

The test environment will include the preparation and operation of election and voting databases, and the validation, consolidation and reporting of administrative and voting data as required by law.

## 2 Background

Following the steps prescribed in the Virginia State Certification of Voting Systems *Requirements and Procedures* (Rev. 01/2014), Hart InterCivic ("Hart") initiated the certification of the Verity Voting System Version 1.1 ("Verity 1.1") by submitting a letter and Request for Certification Checklist to the Secretary of State Board of Elections on February 20, 2015. Additionally, Hart provided the corresponding Technical Data Package ("TDP") and Corporate Information (required under step 2 of the *Requirements and Procedures*). This submission was deemed complete and in sufficient detail to warrant Step 3, the Preliminary Review. During the preliminary review, the state-designated evaluation agent conducted a preliminary analysis of the TDP, Corporate Information, and other materials provided and prepared an Evaluation Proposal (i.e. Test Plan). Upon Hart's agreement with the Test Plan, the evaluation was conducted on March 23-25, 2015, in the State Board of Election offices located in Richmond, Virginia.

Prior to the evaluation, on February 20, 2015, a Certification Test Report documenting successful completion of conformance testing to the 2005 Voluntary Voting System Guidelines (“VVSG”) of Verity Voting 1.0 (the baseline to Version 1.1) was issued by SLI Global Solutions, Inc., to the Election Assistance Commission (EAC) for approval. As of the date of this Test Report, the EAC has yet to grant certification.

The Hart Verity Voting 1.1 represents an upgrade to the recently tested Verity Voting 1.0. Per Hart, the upgraded system is identical to the tested system except for new functionality that has been added to the precinct scanning device to specifically meet the Commonwealth of Virginia’s recount requirements.

Verity Voting 1.1 consists of the components listed below:

#### Software Applications

- Verity Build – Election definition software application
- Verity Central – Central scanning software application
- Verity Count – Tabulation and reporting software application
- Verity Election Management – Data Management software application

#### Voting Devices and Peripheral Equipment

- Verity Scan – Digital scanning voting device
- Verity Touch Writer with Access – Ballot marking device, with audio tactile interface
- Verity Access –audio tactile interface device
- Ballot Box – folding transportable ballot box for use with Verity Scan
- Voting Booth – accessible booth designed for Verity Touch Writer
- Verity vDrive – flash media memory devices that carry election definition information
- Verity Key – a two-factor authentication device used to secure critical functions

### 3 Testing Overview

The evaluation of the Verity Voting 1.1 system was designed to achieve the goals set forth in the Test Plan. The goals were constructed to verify that Verity Voting 1.1 conforms to the *Code of Virginia*. The evaluation successfully addressed each of the test goals in the following way:

---

Test Goal	Testing Response
<b>Ensure Verity Voting 1.1 provides support for all Virginia election management requirements (i.e. ballot design, results reporting, etc).</b>	This was tested by evaluating the Verity Voting Version 1.1 with 5 Virginia specific election scenarios using a combination of different ballot programming approaches, ballot designs, ballot sizes, languages, and tabulators. The programmed elections were actual elections from Virginia counties. The end-to-end scenario was directly from recent elections in Virginia.
<b>Simulate pre-election, Election Day, absentee, and post-election activities on the Verity Voting 1.1 for 5 election scenarios and 1 recount</b>	The Verity Voting 1.1 components were tested in pre-election, Election Day, absentee, post-election and recount situations and evaluated against documented behavior and expected results for all 5 scenarios.

---

### 4 Testing Setup

The evaluation consisted of 5 election scenarios utilizing one setup of the Verity Voting 1.1. The system was configured in the standalone configuration. The following election scenarios were used for the evaluation:

**Pre-programmed scenarios:**

1. Hanover 2009 Primary Election, 11-inch ballots
2. Chesterfield 2007 General Elections, 14-inch ballots
3. Chesterfield 2008 General Elections, 14-inch ballots

4. Fairfax (or equivalent size/complexity) 2010 General Election Multi-Language (English, Spanish), 14-inch ballots
5. Fairfax (or equivalent size/complexity) 2011 Primary Elections Multi-Language (English, Spanish), 11-inch ballots

**End-to-end scenario:**

6. Chesterfield 2008 General Elections, 14-inch ballots
7. Recount for scenario 3 above.

The pre-programmed scenarios were tested from the point where the election definition is completed in Verity Build. Each testing scenario began with opening the election, reviewing the election definition, and proceeding with the remaining preparations for Election Day and absentee voting.

The end-to-end scenario created a new election for an existing county, generate elections definitions for the tabulators and verified loading of the election definition on the tabulators.

More details on the testing setup are presented in the following tables:

<b>Election Scenario</b>	<b>Ballot Programming</b>	<b>Verity 1.1 Configuration</b>	<b>Equipment Used</b>	<b>Ballot Length</b>	<b>Languages</b>	<b># Ballots Run</b>
<b>Hanover 2009 Primary Election</b>	Ballot Style	Standalone workstation	Verity Scan\ Central Scan	11-inch	English	216
<b>Chesterfield 2007 General Election</b>	Ballot Style	Standalone workstation	Verity Scan\ Central Scan	14-inch	English	77
<b>Chesterfield 2008 General Election</b>	Ballot Style	Standalone workstation	Verity Scan\ Central Scan	14-inch	English	101
<b>Fairfax 2010 General</b>	Ballot	Standalone	Verity	17-inch	English,	97

<b>Election</b>	Style	workstation	Scan\ Central Scan		Spanish	
<b>Fairfax 2011 Primary Election</b>	Precinct	Standalone workstation	Verity Scan\ Central Scan	11-inch	English	125
<b>Fairfax 2012 Presidential Primary Election</b>	Precinct	Standalone workstation	Verity Scan\ Central Scan	11-inch	English	10,000
<b>Chesterfield 2008 General Election</b>	Ballot Style	Standalone workstation	Central Scan	17-inch	English	1

#### 4.1 Testing Candidate

Supporting the evaluation, Hart provided the following components of Verity Voting 1.1, which were verified by serial number, hardware version, and firmware/software version.

<b>Virginia Certification of Verity Voting 1.1</b>	<b>Software Version</b>	<b>Hardware Version</b>	<b>Serial Number(s)</b>
<b>Software Applications</b>			
Verity Build	1.0.3	HP Z230 Windows Embedded Standard 64-bit 32GB RAM intel i7 3.60Ghz processor  OKI Data Printer B431d	2UA50613WJ
Verity Central	1.0.3	HP Z230 Windows	2UA50613WL

		<p>Embedded Standard 64-bit 32GB RAM intel i7 3.60Ghz processor</p> <p>OKI Data Printer B431d</p> <p>Canon Image Formula DR-G1130 Scanner</p>	<p>AK4A045086A0</p> <p>GF302064</p>
Verity Count	1.0.3	<p>HP Z230 Windows Embedded Standard 64-bit 32GB RAM intel i73.60Ghz processor</p> <p>OKI Data Printer B431d</p>	2UA50613WJ
Verity Election Management	1.0.3	<p>HP Z230 Windows Embedded Standard 64-bit 32GB RAM intel i73.60Ghz processor</p> <p>OKI Data Printer B431d</p>	<p>2UA50613WJ</p> <p>AK4A0450981A0</p>
<b>Voting Devices and Peripherals</b>			
Verity Scan	1.1.3	Rev. B	S1500024302, S1500088802
Verity Touch Writer	1.0.3	Rev. B	<p>W1500010602 OKI Data B431d AK4A045081A0</p> <p>W1500010102 OKI Data B431d</p>

			AK4A045096A0
Verity vDrive	---	N/A	---
Verity Key	---	N/A	---
Verity Access	---	Rev. A	---
Ballot Box	---	Rev. A	---
Voting Accessible Booth	---	Rev. A	---

## 4.2 Test Decks

Test Decks for the pre-programmed scenarios were provided Hart and verified by the test team. Ballots were provided in the quantity and marked in the manner prescribed in the Test Plan.

## 5 Findings

The evaluation followed the procedure as provided in Section 6 of the Test Plan. During the procedure, the test team (including members of the State Board of Elections and the evaluation agent) made observations of general system behavior and attempted to verify specific behavior related to Virginia legal requirements. Therefore, the findings are organized below into findings related to each Virginia requirement and other findings which were reported during the evaluation.

### 5.1 Virginia Requirements

The evaluation of Verity Voting 1.1 produced the following findings for each requirement of the *Virginia Code*. For each requirement, Verity Voting 1.1 was evaluated for its ability to meet and pass the requirement and whether or not anomalies were reported.

**1. § 24.2-629. The voting system shall accurately count, register, and report votes.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ All results reports provide the correct/expected results for the test ballots inserted. This includes individual machine and aggregated results.
- ✓ Public and protected counters increment for each ballot.

The evaluation of Verity Voting 1.1 found that the tabulated results matched the expected results for each test deck of ballots inserted into each tabulator. The public counters incremented appropriately and tabulator audit logs correctly recorded ballot tabulation events. Verity Scan and Verity Central each provided a protected counter which correctly incremented with each ballot tabulated. Verity Count correctly aggregated and reported results from each of the various tabulators into pre-defined and consolidated reporting groups. Comparison of the results tapes from individual machines and the result reports generated in EMS with the test ballots for all three election scenarios was used as the basis for verifying accurate counting and reporting of votes.

**2. § 24.2-629. The voting system shall provide the ability for voting for all candidates of as many political parties as may make nominations at any election; on as many questions as may be submitted at any election; and at all general or special elections, permit the voter to vote for all of the candidates of one party or in part for the candidates of one or more parties.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Election scenarios (including primary elections) are fully supported by voting system without anomaly or burden.
- ✓ The voter is allowed to vote as intended and otherwise permissible.
- ✓ Overvotes are correctly handled and reported.
- ✓ Undervotes are correctly handled and reported.
- ✓ Blank ballots are correctly handled and reported.
- ✓ Write-Ins are correctly handled and reported.



The evaluation of Verity Voting 1.1 found that the tabulated results matched the expected results for each test deck of ballots inserted into each tabulator. The system supported statistical counters for each candidate and option on a question plus counters for write-ins, undervotes, and overvotes. Each statistical counter was verified to accurately record the tabulated results from the test deck.

**5. § 24.2-629. The voting system shall be provided with a "protective counter" whereby any operation of the device before or after the election will be detected.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each tabulator stores a life-time ballot count which can be accessed and recorded prior to and at the conclusion of an election. The protective counter must be in persistent memory.
- ✓ The counter increments correctly for each ballot tabulated.

Each of the tabulators evaluated provides a protective (lifetime) counter.

**6. § 24.2-629. The voting system shall be provided with a counter which shall show at all times during an election how many persons have voted.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each tabulator provides a public counter which corresponds to the number of ballots processed for this election.
- ✓ The counter increments correctly for each ballot tabulated.

Each tabulator evaluated provided a public, election specific counter which is publically displayed for each voter to see increment as a ballot is cast. The evaluation found that this counter correctly incremented for each ballot cast and matched the total number of ballots cast when the polls were closed.

**7. § 24.2-629. The voting system shall be provided with a model, illustrating the manner of voting and suitable for the instruction of voters.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ The method of voting is consistent with standard voting models and behavior such that voting operation is intuitive and teachable.

The method of voting employed with Verity Voting 1.1 is consistent with standard voting models and behavior such that the voting operation is teachable and understandable to voters.

- 8. § 24.2-629. The voting system shall enable each voter to vote for all the presidential electors of one party by one operation. It shall have a ballot containing the words "Electors For" preceded by the name of the party or other authorized designation and the names of its candidates for the offices of President and Vice-President and a mechanism which registers the collective vote cast for such electors.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots designed, printed, voted, and tabulated in end to end scenario must provide this language and behavior.

Each tabulator supports the ability for each voter to vote for all the presidential electors of one party by one operation. The ballot design and printing capabilities of Verity Voting 1.1 provide for ballots containing the words "Electors For" preceded by the name of the party or other authorized designation and the names of its candidates for the offices of President and Vice-President. Additionally, the results reporting capabilities provide a mechanism to register a collective vote cast for each such electors presented on the ballot.

- 9. § 24.2-629. The voting system shall ensure voting in absolute secrecy; and systems requiring the voter to vote a ballot that is inserted in an electronic counting device shall provide for secrecy of the ballot and a method to conceal the voted ballot.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Audit logs contain no record of voter's identity.
- ✓ Ballot can be kept reasonable private through the use of a privacy sleeve.
- ✓ Ballot box provides secrecy protections and access controls.
- ✓ Voter is not required to have assistance when voting.

No mechanism is available within Verity Voting 1.1 to connect a voted ballot back to the voter. The Verity Voting 1.1 system provides sufficient accessibility support to allow voters

with disabilities to vote independently. No personal identifying information is required by the voting system in order to operate and no personal identifying information is transmitted to or stored by any ballot tabulator. Each precinct-count tabulator is provided with a secure ballot box (secured with lock/key and tamper-evident seals) to conceal the tabulated ballots. Privacy sleeves and privacy booths can be used by a voter to conceal the ballot prior to insertion into the tabulator

**10. §24.2-629 & 24.2-648. The voting system shall segregate ballots containing write-in votes from all others.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each tabulator correctly report ballots with valid write-in voters in a write-in report.
- ✓ Write-in ballots are digitally separated from other ballots.

Each tabulator provided the ability to segregate ballots containing write-ins from all other ballots. The Verity Scan and Verity Central each detect write-ins on the ballots as they are tabulated and captures an image of the write-in name and creates a write-in report.

**11. § 24.2-629. The voting system shall (for systems requiring the voter to vote a ballot that is inserted in an electronic counting device) report, if possible, the number of ballots on which a voter voted for a lesser number of candidates for an office than the number he was lawfully entitled to vote and the number of ballots on which a voter voted for a greater number of candidates than the number he was lawfully entitled to vote.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each tabulator correctly records and reports the number of overvotes, undervotes, write-ins, and blank votes for each question.

Verity Voting 1.1 provides statistical counters for each question which record the number of votes cast for each candidate/option on a question, the number of undervotes cast for that question, and the number of overvotes cast for that question. The statistical counters were evaluated during the testing by casting ballots with undervotes and overvotes in each question. The results were verified to have correctly registered these undervoted and overvoted ballots.

**12. § 24.2-629. The voting system shall be programmable, if possible, to allow such undervoted and overvoted ballots to be separated when necessary.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each tabulator must demonstrate its ability to out stack (physically separate) ballots with either an undervote or overvote in one or more question.

Verity Voting 1.1 provides various mechanisms for handling overvotes and undervotes which can be enabled/disabled by the election and machine setup: the Verity Scan can be set to query the voter upon detection of an overvote on the ballot and can also be set to query the voter upon detection of an undervote on any one specific question or a number of questions. Verity Central provided the ability to adjudicate write-ins at the completion of the scan process.

**13. § 24.2-629. The voting system shall provide the voter with an opportunity to correct any error before a permanent record is preserved.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each precinct-based tabulator queried the voter when an under vote or overvote is detected on her ballot as to whether the voter intended on casting such a voter.
- ✓ The tabulator should respond appropriately to the voter’s response by either returning the ballot to the voter or casting it as is.

The evaluation of Verity Voting 1.1 found that the Verity Scan and Verity Central can be programmed to query voters upon the detection of an undervote, overvote, or blank ballot. Upon detection, the voter is prompted with a message indicated the under, blank, or over vote detection and given the option to cast the ballot as is to return the ballot for modification. The testing verified that voters are queried correctly and that the selection of the voter is followed by the tabulator.

**14. § 24.2-644. The voting system shall support the ability for any voter to vote for any person other than the listed candidates for the office by writing or hand printing the person's name on the official ballot.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Provide write-in blanks on all ballots (where appropriate in an election scenario).
- ✓ Correctly count and separate write-in ballots.

All ballots generated in Verity Voting 1.1 have the option to include write-in candidates on one or more questions. Furthermore, ballots with write-ins votes were correctly detected, reported, and tabulated.

**15. § 24.2-681. The voting system shall be able to handle general and special election types in a substantively equivalent manner.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Support all election scenarios requested without undue variations to the voting operation for the election official or voter.

Verity Voting 1.1 supported all election scenarios requested without undue variations to the voting operation for the election official or voter.

**16. § 24.2-606 -654. The voting system shall allow for the officers of election to open and close polls; and lock each voting and counting device against further voting.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Poll workers are provided a sufficient mechanism to open polls and determine the state of the device.
- ✓ Poll workers are provided a sufficient mechanism to close polls and place the device in a state such that further voting is not permitted.
- ✓ These functions are protected by sufficient access controls.

The evaluation of Verity Voting 1.1 found that officers of the election are provided a secure and access-controlled mechanism to open polls and determine the state of the each device. At the close of polls, election officers are provided a mechanism to close polls and place each device in a state such that further voting is not permitted without special authorization.

**17. § 24.2-629. The voting system shall be capable of storing and retaining existing votes in a permanent memory in the event of power failure during and after the election.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each device stores tabulated results such that a sudden power failure during and after an election will not erase the results.

Verity Scan stores and retains existing votes on removable media as soon as each ballot is cast. Therefore, the evaluation showed that power failure during and after an election does not impact the storage of the tabulated results. Verity Central also stores the cast vote records results on persistent memory, but requires the operator to Save Results in order to write results to the flash drive. If power is lost, any results tabulated but not saved to hard drive will be lost. All saved results are maintained.

**18. § 24.2-629. The voting system shall provide an audit trail.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each software module, tabulator, and supported electronic devices provides an accessible audit trail.
- ✓ Audit logs must be in human-readable form.
- ✓ Audit logs provide timestamps for all entries.
- ✓ Audit logs provide entries for all privilege escalation events.
- ✓ Audit logs provide entries for all events impacting the tabulated results.
- ✓ Audit logs do not record voter identifying information or information related to the tabulated results.
- ✓ Audit logs record system or component failures.

The evaluation of the Verity Voting 1.1 showed that each software module, tabulator, and supported device provides an accessible audit trail. Audit logs are in human-readable format and available for printing. Audit logs provide timestamps for all entries and provide entries

for all events impacting the tabulated results. The audit logs evaluated do not record voter identifying information or information related to the tabulated results. Furthermore, the evaluated audit logs provide sufficient detail to indicate system or component failures.

**19. § 24.2-629. The voting system shall prevent fraudulent use.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Each component provides physical and logical access controls.
- ✓ Each component prevents unauthorized individuals from manipulating voting system configurations, controls, or tabulated results.
- ✓ Each component provides mechanisms for detecting fraudulent use from authorized and unauthorized actors.

The Verity Voting 1.1 system was determined to provide a sufficient level of security controls to prevent fraudulent use when coupled with standard security and ballot accounting procedures. For example, each component provides physical and logical access controls with the ability to use tamper evident seals to detect access attempts. Each component further prevents unauthorized individuals from manipulating voting system firmware, configurations, controls, or tabulated results without the proper access credentials. In conclusion, each component provides mechanisms for detecting fraudulent use from authorized and unauthorized actors.

**20. § 24.2-601. The voting system shall support the inclusion and tabulation of town office elections on general election ballots.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots presented for one or more election scenarios included a town office (or equivalent).
- ✓ Town office (or equivalent) is correctly tabulated and reported with the general election.

The Verity Voting 1.1 demonstrated that it supports the inclusion and tabulation of town office elections on General Election ballots.

**21. § 24.2-612. The voting system shall generate ballots such that only the names of candidates for offices to be voted on in a particular election district are printed on the ballots for that election district.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Generated ballots include the questions and candidates for the corresponding election district and no other.

The ballot generation capability exhibited by the Verity Voting 1.1 during evaluation demonstrated the ability to correctly generate ballot styles with the appropriate offices and candidates for a specific election district.

**22. § 24.2-613. The voting system shall generate ballots that comply with the guidelines for managing paper ballots found in the Virginia State Board of Elections guidance documents.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Generated ballots follow the guidance provided in the Virginia SBE guidance document (15. Managing Paper Ballots).

The ballot design capabilities provided by the Verity Voting 1.1 are sufficient to allow election officers to comply with the guidelines for managing paper ballots found in the Virginia State Board of Elections guidance documents.

**23. § 24.2-613. The voting system shall provide ballot generation capabilities that support the ordering of the names of candidates according to § 24.2-613. Form of ballot.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Generated ballots providing the ordering of names are required.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**24. § 24.2-613. The voting system shall provide ballot generation capabilities that support the following ballot requirement:**

**Candidates for federal, statewide, and General Assembly offices only shall be identified by the name of his political party. (The name of the political party, the name of the "recognized political party," or term "Independent" may be shown by an initial or abbreviation to meet ballot requirements.)**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**25. § 24.2-613. The voting system shall provide ballot generation capabilities that support the following ballot requirement:**

**Independent candidates shall be identified by the term "Independent." The name of the political party, the name of the "recognized political party," or term "Independent" may be shown by an initial or abbreviation to meet ballot requirements.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**26. § 24.2-613. The voting system shall provide ballot generation capabilities that support the following ballot requirement:**

**No individual's name shall appear on the ballot more than once for the same office.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**27. § 24.2-613. The voting system shall provide ballot generation capabilities that support the following ballot requirement:**

**In preparing the ballots for general, special and primary elections, the electoral boards shall cause to be printed in not less than 10-point type, immediately below the title of any office, a statement of the number of candidates who may be voted for that office. The following language shall be used: "Vote for not more than ..... ".**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**28. § 24.2-614. The voting system shall (for presidential election ballots) provide ballot generation capabilities that support the following ballot requirement:**

**The ballot shall contain the name of each political party and the party group name, if any, specified by the persons naming electors by petition pursuant to § 24.2-543. Below the party name in parentheses, the ballot shall contain the words "Electors for ....., President and ....., Vice President" with the blanks filled in with the names of the candidates for President and Vice President for whom the candidates for electors are expected to vote in the Electoral College.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**29. § 24.2-640. The voting system shall provide ballot generation capabilities that support the following ballot requirement:**

**The names of the various candidates shall be printed in type not less than fourteen point.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**30. § 24.2-615. The voting system shall provide ballot generation capabilities that support the following ballot requirement:**

**Ballots generated by the voting systems shall be uniform throughout the election district in which the same candidates are running to fill the same offices and throughout the district in which a question is submitted to the voters.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**31. § 24.2-640. The voting system shall provide ballot generation capabilities that support the following ballot requirement:**

**All candidates shall be arranged on each device or other ballot to be electronically counted, either in columns or horizontal rows, and the caption of the various ballots on the devices shall be placed so that the voter knows what feature is to be used or operated to vote for his choice.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement.

**32. § 24.2-530. The voting system shall allow any qualified person to vote at the primary but shall prevent the person from voting for candidates of more than one party.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Primary Election scenarios shall have separate ballots for each party.
- ✓ Ballot tabulators tabulate each party's ballot separately.

The Verity Voting 1.1 generates separate ballots for each political party's offices and only list persons for that party. Verity Voting 1.1 also tabulates and reports results for each party separately. Therefore, once a voter receives a ballot for a specific party, he is only able to cast a vote for candidates of that party.

**33. § 24.2-529. The voting system shall provide ballot generation capabilities that support the following ballot requirement:**

**The primary ballots for the parties taking part in a primary shall be composed, arranged, printed, delivered, and provided in the same manner as the general election ballots except that at the top of each official primary ballot shall be printed in plain black type the name of the political party and the words "Primary Election." The names of the candidates for various offices shall appear on the ballot in an order determined by the priority of the time of filing for the office. In the event two or more candidates file simultaneously, the order of filing shall then be determined by lot by the electoral board or the State Board as in the case of a tie vote for the office. No write-in shall be permitted on ballots in primary elections.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Ballots generated for one or more of the election scenarios meet this description.

The ballot design and generation capabilities provided by the Verity Voting 1.1 provide election officials the ability to comply with this Virginia ballot design requirement for primary elections.

**34. § 24.2-623. The voting system shall have a lock and key and an opening of sufficient size to admit a single folded or unfolded ballot and no more.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:



**37. § 24.2-640. The voting system shall not utilize a knob, key lever or other device to vote for any candidate other than on an individual basis except for presidential electors. (i.e. the voting system must not use straight party voting function, or have mechanism disable it and continue to perform all other functions as required)**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 met the following condition(s) of satisfactions:

- ✓ Straight party voting can be disabled in the election configuration.
- ✓ When disabled, the voter is unable to cast a vote for more than one candidate at a time (with the exception of presidential electors).
- ✓ Tabulation logic records only one vote per voter mark.

The Verity Voting 1.1 has an option in the election setup to disable straight party voting. When disabled, straight party voting is not supported by any component of the voting system and the voting system complies with this requirement.

**38. § 24.2-626. The voting system shall provide accessible voting capability if the voting system submitted is a Direct Recording Electronic (DRE). Otherwise, DREs are not permitted for use in Virginia.**

**Passed:** Not Applicable                      **Anomalies Reported:** None

The Verity Voting 1.1 system does not include a Direct Recording Electronic (DRE) device.

**39. § 24.2-626.1. The voting system shall include provisions which allow individuals with disabilities at each polling place, including non-visual accessibility for the blind and visually impaired, to vote in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Provides correct non-visual presentation of ballot to voter.
- ✓ Provides mechanism for non-visual marking of the ballot.
- ✓ Preserves the integrity of the ballot.

- ✓ Correctly transcribes the voter’s intent onto the ballot.
- ✓ Ballots are correctly read by each precinct-count tabulator.
- ✓ Various contrast ratios for visually impaired voters.
- ✓ Various font sizes for visually impaired voters.
- ✓ Does not require the voter to have assistance during the voting process.
- ✓ Provides adjustable volume control.
- ✓ Provides assistance for voters with dexterity and mobility impairments.

**40. § 24.2-626.1. The voting system shall provide alternative language accessibility.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Multi-lingual election scenarios provide all voter facing instructions, warnings, and other presented language in Spanish.
- ✓ Accessibility provisions are supported in Spanish.

The Verity Voting 1.1 system was evaluated for its alternative language accessibility with election scenarios from Fairfax County with English and Spanish translations on the ballot. All ballot styles were generated with both translations and were used to verify that each tabulator correctly tabulated multi-lingual ballots.

**41. § 24.2-657. The voting system shall provide printed return sheets to display the tabulation results, which include the votes recorded for each office on the write in ballots and the vote on every question.**

**Passed:** Yes                      **Anomalies Reported:** None

The Verity Voting 1.1 system met the following condition(s) of satisfactions:

- ✓ Results reporting from individual machines and in aggregate provide the tabulated results for each candidate and option for each question for each precinct (or division of the election scenario).



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# Verity Scan

## Digital Ballot Scanning



The modern and innovative paper ballot solution.

As the leader in digital ballot scanning, Hart continues to expand its technology footprint. Introducing the only new voting system on the market. With easy deployment on a compact hardware platform, Verity Scan makes paper ballot voting easy, affordable, and adaptable.

12.1  
inch display

28.3  
pounds



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# Verity Scan: Features & Benefits

<p>▶ <b>The most intuitive voting experience ever</b> Design for Democracy templates and plain language voter instructions support “second chance” voting for mismarked ballots.</p>	<p>▶ <b>Accurate, fast scanning</b> Process duplex ballots in seconds. Insert with any orientation style. Images capture voter intent.</p>
<p>▶ <b>Cost effective</b> Accommodates commercial off-the-shelf paper stock.</p>	<p>▶ <b>Security &amp; Transparency</b> Record ballots and audit log data in redundant, secure storage locations.</p>
<p>▶ <b>On-site results</b> Prints ballot count totals or unofficial tally results in the polling place, if desired.</p>	<p>▶ <b>Auditability</b> Post-election access to full images of scanned ballots for complete transparency and auditability.</p>



Collapsible ballot box folds to 5" thin for light, easy portability and storage.



Easy transport, set-up, and storage. Scan is completely self-contained in a secure case.



Advancing Democracy

800.223.4278

Hart InterCivic is a full service election solutions innovator, partnering with state and local governments to deliver the most secure, accurate and reliable elections.

[www.hartintercivic.com](http://www.hartintercivic.com)

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# Verity Touch Writer

## Ballot Marking Device

### Equality of access for all voters.

Hart's Touch Writer is a ballot marking device that allows all voters to have the same paper ballots for an equal, private voting experience. With easy deployment on a compact hardware platform and a commercial off-the-shelf printer, Verity Touch Writer makes paper ballot voting easy, affordable, and adaptable.



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# Verity Touch Writer: Features & Benefits

<p>▶ <b>The most intuitive voting experience ever</b> The Touch Writer interface, based on EAC/AIGA "Design for Democracy" templates, is modern, fresh, and intuitive. The 12.1" touchscreen interface offers clarity and confidence for voters, with fewer keystrokes, higher voter satisfaction, and reduced residual votes.</p>	<p>▶ <b>Flexibility, physical access and privacy</b> Supports frontal and parallel wheelchair access, many choices for voter personalization and comfort (video-only; audio-only; adaptive devices), and flexibility for placement in the polling place, so there are no bottlenecks and maximum quiet and privacy.</p>
<p>▶ <b>Cost effective</b> Compatible with commercial off-the-shelf printers</p>	<p>▶ <b>ADA/Accessible, True equality of access</b> Touch Writer prints a full-size marked ballot from blank stock, providing equality of access for all voters.</p>
<p>▶ <b>Print from blank stock and save</b> Eliminate the need to pre-print ballots. Reduce costs by only printing the ballots that voters need.</p>	<p>▶ <b>Never wait for ballots to load</b> No ballots to load, and no waiting – after the electronic ballot is activated, voters can begin marking selections right away.</p>



Ease of access with complete privacy for all voters.



Easy transport, set-up, and storage. Touch Writer is completely self-contained in a secure case.



Advancing Democracy

800.223.4278

Hart InterCivic is a full service election solutions innovator, partnering with state and local governments to deliver the most secure, accurate and reliable elections.

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# The Verity Election Management Lifecycle

Verity sets a new standard in election technology, delivering unique benefits at each stage:

Faster, more intuitive ballot definition and production that saves time and reduces cost

An advanced software platform to streamline end-to-end election management tasks

Flexible election applications to complement certified voting systems

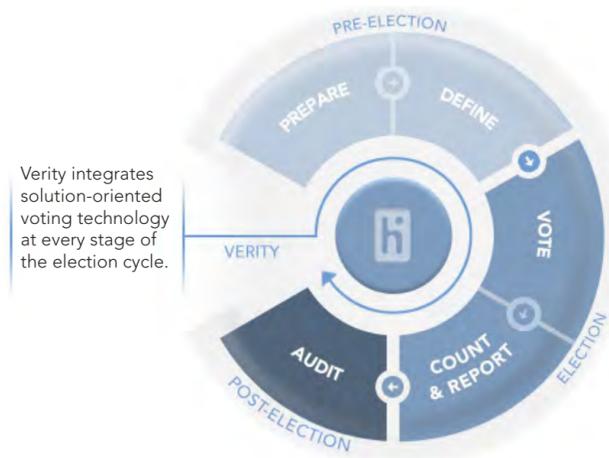
Compact, portable, lightest weight hardware means easy equipment storage, transportation, set-up, and use

Intuitive plain-language ballots result in a more efficient voting process and shorter lines

Up-to to-date adjudication technology results in streamlined ballot resolution

Speedy tabulation software supports fast reporting of results on Election Night, while user friendly dashboards display real-time progress toward completion

Plain-language audit reporting provides transparency into all election operations and results



The Future of Elections

Usable | Adaptable | Transparent



The Future of Elections™



Advancing Democracy

800.223.4278

Hart InterCivic is a full service election solutions innovator, partnering with state and local governments to deliver the most secure, accurate and reliable elections.

[www.hartintercivic.com](http://www.hartintercivic.com)

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# Verity is the future of elections.

Verity is Hart's brand-new family of election technology. It's the only fully integrated solution designed to exceed the requirements of modern elections.

**Verity supports any kind of election:** precinct paper ballot voting with accessible ballot marking device options; all electronic DRE for vote centers; by-mail; central scanning, and more. Designed to be flexible as your needs change, Verity is the only system on the market using paper-based and electronic voting options on a common 'convertible' hardware platform that lowers overall total cost of ownership.



## What makes Verity the world's most advanced family of election technology?

**It's the attention to detail.**  
**The innovation.**  
**The complete election experience.**

Verity is uniquely designed to exceed the expectations of the people who will use it, both voters and election officials. Verity showcases new productivity, security, and adaptable device management features.

Every detail of the Verity family of software and hardware ensures long-term performance and reliability – at every stage of the election process – making Verity a smart investment for the future.

Verity uses advanced technology to boldly integrate usability, adaptability, and transparency.

Verity instills the utmost confidence that each vote is captured securely and counted accurately, while also ensuring equality of access and privacy for all.



**Scan**  
digital ballot scanning



**Universal Platform, Many Devices**  
adaptable design protects your investment



**Touch**  
touch-screen DRE



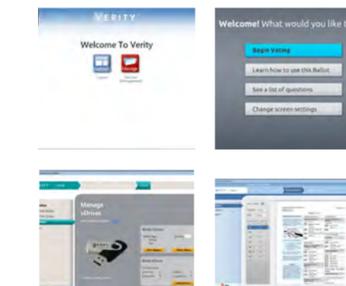
**Touch Writer with Access**  
accessible ballot marking device



**Print**  
on-demand ballot printing



**Central**  
high-speed digital ballot scanning



Election management software

Verity makes election administration and voting easier by providing user-friendly tools that reduce complexity, and streamline productivity.



Collapsible ballot box folds to 5" thin for light, easy portability and storage



Lightweight hardware is easy to store, transport, set-up, and operate



The Future of Elections

Usable | Adaptable | Transparent

## New Election Technology Solutions for Virginia

Hart InterCivic, the experienced leader in forward thinking voting technology, offers the only modern, easy to use, cost effective solution that unifies the needs of the voter and election officials – it's called Verity. Built with an all-new design, Verity is the only voting system that uses advanced technology to boldly integrate usability, adaptability and transparency.



Hart offers collapsible ballot boxes and durable, lightweight, integrated cases to protect voting units and make them easy to store, carry, setup and use.

For more information contact:

Bob Heisner  
618.521.9733  
bheisner@hartic.com

Shawn Phillips  
800.223.4278 ext.6415  
sPhillips@hartic.com



As the leader in digital ballot scanning, Hart continues to expand its technology footprint with innovations to the only new paper ballot voting system on the market. Built with usability, adaptability and transparency, Hart's paper ballot solution answers the call for an efficient, affordable, and easy to use system for voters and election officials.

## Verity Scan™

### Digital ballot imaging

- Images capture voter intent
- Completely self-contained in secure case, approx. 28 lbs.
- Accommodates commercial-off-the-shelf paper stock
- Design for Democracy, intuitive voting experience
- Prints ballot count totals or unofficial tally results in the polling place
- Post-election access to scanned images for transparency & auditability



## Verity Touch Writer™

### Accessible ballot marking

- Compatible with commercial-off-the-shelf printers
- Prints a full marked ballot from blank stock, providing equality of access for all voters
- No pre-printing required
- Approximately 28 pounds



## Verity Central™

### High-speed digital scanning

- Compatible with commercial-off-the-shelf scanners
- Scalable to meet the needs of small, medium, or large jurisdictions
- Easy to use on-screen adjudication
- Powerful, plain-language process tracking for full transparency
- Scan-only system (no tabulation) means you can begin scanning sooner and finish early



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# Other Business & Public Comment

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BOARD WORKING PAPERS



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# Good of the Order

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# Adjournment

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BOARD WORKING PAPERS



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# BOARD MEETING

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Friday, April 17, 2015  
Washington Building  
Room B27  
2:00 PM

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Master Copy  
Prepared by Rose Mansfield  
SBE Clerk