

Certification Test Plan – Modification AS RUN

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Prepared for:

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





Revision History

Date	Release	Author	Revision Summary
February 8, 2022	1.0	M. Santos	Initial Version
March 3, 2022	2.0	M. Santos	Updates for EAC comments
March 9, 2022	3.0	B. Watters	Updates for EAC comments
March 21, 2022	4.0	M. Santos	Updates for EAC comments
May 2, 2022	As-Run	M. Santos	Added Regression testing done

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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, except as noted under Recommendations.



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1 INTRODUCTION

This Modification Test Plan outlines the test approach SLI Compliance will follow when performing system modification testing on the **Hart Verity Voting 2.7** voting system against the Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG) version 1.0. **Verity Voting 2.7** is a modification of **Verity Voting 2.6**, certified by the EAC on April 20th, 2021, with limited changes.

The votingsystem will be tested based on the “modified system” requirements, as set forth in section 4.6.2.3 of the “EAC Voting System Testing and Certification Program Manual, version 2.0”. The purpose of this document is to provide a clear understanding of the work SLI Compliance will conduct and a detailed plan outlining the test effort.

When the testing is complete, SLI Compliance will submit a Certification Test Report that details all test results and findings from the Certification Test effort, as well as a recommendation to the EAC.

1.1 Attachments

- Hart Verity 2.7 EAC Electrical Hardware Test Plan v3v4.0 [Track Changes](#)
- Hart Verity 2.7 EAC Environmental Hardware Test Plan v2.0 [Track Changes](#)
- Hart Verity 2.7 EAC Temp and Power Var Test Plan v4v2.0 [Track Changes](#)

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1.2 Description and Overview of the Certified System

This section contains a description of the previously certified **Verity Voting 2.6** voting system, the specific modifications to the current system version, and the impact of those modifications on the system and certification testing.

1.2.1 Definition of the Baseline Verity Voting 2.6 Certified System

This modification project builds upon the foundation established in **Verity Voting 2.6**, which contains the applications for **Verity Data**, **Verity Build**, **Verity Central**, **Verity Count**, and **Verity Relay Receiving Station**, as well as the polling place devices **Verity Controller**, **Verity Scan**, **Verity Scan with Relay**, **Verity Print**, **Verity Touch Writer**, **Verity Touch Writer Duo**, and **Verity Touch Writer Duo Standalone**.

1.2.2 Modifications

Verity Voting 2.7 is a modification of the EAC certified **Verity Voting 2.6** system. The modifications to **Verity Voting 2.7** address multiple aspects of the system, including features for all devices and workstations, modifications to Verity Data, Verity Count and Verity Central, as well as associated documentation updates.

Note, the **Verity Voting 2.7** system does not contain the **Verity Touch**, **Verity Touch with Access**, **Z230 Workstation model**, or the **32GB** workstation configurations. The following modifications are implemented in this release: **Features for all devices and workstations:**

- When using the **System Validation Tool** on devices or workstations, the system



exports hashes for all Verity-related system files, as well as the files themselves.

- Verity supports adding new languages to devices and workstations via the “Language Pack” functionality.
- Verity supports the following additional languages:
 - Gujarati
 - Hmong
 - Lao
 - Hawaiian
 - Cantonese
 - Punjabi
 - Bengali

COTS Updates

- Added support for the Brother HL-L6400DWVS laser printer. This printer now replaces the OKI Data B432 printer for use on Verity Touch Writer, Verity Printer, Verity Build, and for report printing on all Verity workstation software.
- Added the Duracell DR660PSS UPS for battery backup for the new Brother HL-L6400DWVS printer when used with the Verity Touch Writer laser printer.
- Added support for the Into Print SP1360 laser printer, which is a brand of the OKI Data C931 printer that it replaces on Verity Build.
- Added additional CFast card vendor.
- Added magnifying devices for use with ballots in the polling place.

Hawaii-specific Features

- Supports General and Open Primary elections only.

Verity Count Reporting

- Now allows users to set a custom order for contests on results reports across all Tasks in an election.
- Includes the following new reports and exports:
 - Three-Column Summary Results Report
 - Three-Column Precinct Results Report (export only)
 - Statement of Vote Report
 - Precinct Detail Export
 - Summary Export
- Adds support for adding a Run ID to the report header of the following reports:
 - Three-Column Summary Results Report
 - Three-Column Precinct Results Report



- Adds support for identifying the following reports as “zero reports”
 - Three-Column Summary Results Report
 - Three-Column Precinct Results Report
- Added support for calculating ballots cast in a multi-sheet election using the highest recorded sheet count for the following reports:
 - Three-Column Summary Results
 - Three-Column Precinct Results
 - Statement of Vote Report
 - Precincts Reporting
 - Summary Export
 - Precinct Detail Export
- Added an Election Preference to “Enable Hawaii results reports and exports”.
- Manual vote recording now allows users to enter sheet counts for each sheet that exists in the ballot for the precinct-split/party being adjusted.

Paper Ballot Features

- Paper ballots support a maximum paper size of 8.5”x22”, without stub capability.
- Paper ballot stubs support adding a customizable prefix to the stub number display.
- Verity now supports 80lb Text paper weight for ballots.
- Added targeting landmarks to ballot corners for option box triangulation.

Grid Ballot Features

- Verity now supports grid-based paper ballots, where office contests appear in columns and parties in rows on odd-numbered pages, and propositions appear in a column-based layout on even-numbered pages.
 - Proposition-only ballots can utilize both sides of a sheet.
- Grid-based paper ballots support all paper sizes in a landscape orientation (short edge on left):
- Grid-based paper ballots support the same stub sizes and options as column-based paper ballots.
 - 8.5” x 22” ballots do not support a stub
- Grid-based paper ballots support all paper ballot election definition elements EXCEPT:
 - Party Selector contests
 - Open Primary Party Selector contests
 - “Ranked Choice”, “Cumulative”, or “Fractional Cumulative” contests



- Ballot Additional Text
- Rotation
- Column or page forcing on Office type contests
 - Column or page forcing is allowed for contests appearing on the Proposition side of the ballot.
- Contest images
- Dependent contests
- Two-line write-ins
- Uncommitted choices
- Grid-based ballots support candidate cross-filing, where if a voter marks multiple boxes for across-filed choice, it will be recorded as a single vote for the choice.
- Added support for Slate Choices, where two choice names can be treated as a single votable option.

Additional Features for Verity Devices Features for all devices

- Updated model for each Verity device
 - A single standardized circuit board replaces baseboard and I/O board combinations found in all Verity devices, with no change to functionality. Electronic components from the existing Tally Tape Thermal Printer are added directly to the baseboard.
 - Tally Tape thermal printer for report printing now uses Hart built plastics and firmware.
 - Rear panel connectors now recessed to increase rugged ability and reduce cable strain if a device is handled while cables are installed.
 - Power input connector no longer contains a slide to release cable retention feature.
 - Tamper evident seal now serialized
- All Verity devices now show the first three sections (XX.XX.XX) of the system version number in the user interface, without needing to reboot the device.
- All Verity devices now follow these optional VVSG 1.0 user-interface conventions:
 - If an unrecoverable error occurs on a polling place device, the device suspends voting operations and presents a clear indication to the user of the malfunction.
 - Warnings and alerts issued to a voter on a device shall state the nature of the problem; the set of responses available to the voter; and whether the voter has performed or attempted an invalid operation, or the voting equipment itself has malfunctioned in some way.



- When color is used to indicate status in the system, the user interface uses green, white, or blue for normal status; amber or yellow for marginal status; and red for an error status.
- When color is used to indicate the type of information displayed, the user interface uses green, white, or blue for general information; amber or yellow for warnings; and red to indicate problems that require immediate attention.

Features for Verity Scan

- Added support for Write-in Mark Detection, where Scan will return the ballot for second-chance voting input if a mark is detected in the write-in area, but the option box is not marked.
 - If the ballot is accepted as-is, unmarked write-ins will count only if the Build setting for default counting behavior is enabled, except for ranked-choice or cumulative contests.
- Performance improvements that reduce ballot processing time. This change is applicable to all Verity Scan models.

Features for Verity Scan with Relay

- Device startup reports are now labeled "Verity Scan with Relay," not "Verity Scan."
- Voter-facing screens now do not display the product name "Verity Scan with Relay."

Features for Verity Transmit

- Transmit supports transmitting vDrives written by:
 - Verity Central
 - Verity Scan
 - Verity Scan with Relay
- For Central vDrives, Transmit now displays "Central vDrive" in lieu of the vDrive polling place.

Additional Features for Verity Workstations

- Secure Boot now enabled on workstations.
- Full Disk Encryption now required for all deployments.

Features for Election Management

- Added new feature "Configuration Control", which supports limiting election variations based on what equipment and ballot types are used by a jurisdiction, eliminating unnecessary work for the user.

Features for Verity Data

- The Contest Title field limit is increased to 250 characters.
- Verity Data now supports entering separate contest instructions for devices and



paper ballots.

- Verity Data proofing reports containing contest instructions display both electronic instructions and paper instructions.
- Added support for defining Candidate Slate choices on grid-based ballots.
- Added additional rich-text formatting options for Ballot Additional Text.
- The Ballot Additional Text field limit increased to 3000 characters.
- Verity Data validates that fold lines do not intersect ballot landmarks, in addition to barcodes and option boxes
- The default PVR paper size changed to 8.5" x 11".

Features for Verity Build

- Verity Build includes a new setting to print single language ballots on Touch Writer.
- Added support for Write-in Mark Detection, including:
 - New options to control second-chance voting behavior for unmarked write-ins on Scan devices.
 - New option to control the default counting behavior for unmarked write-ins on Scan devices.
- Added a note that "Setting the default Voting Method will also apply to Verity Reader".

Features for Verity Central

- Added support for Write-in Mark Detection, including:
 - A new adjudication condition called "Unmarked Write-in".
 - An Election Preference to count unmarked write-ins as if they were marked; off by default.
 - An election setting to count unmarked write-ins as if they were marked.
 - An election preference and setting to allow automatic acceptance of unmarked write-ins during scan, or when accepting at the batch, ballot, or page level.
 - Allowing the user to filter voter intent issues by "Unmarked Write-ins".

Features for Verity Relay Receiving Station

- Renamed Verity Relay application for clarity; now called Verity Relay Receiving Station.
- Features for Verity Transmit support added to a new "Verity Transmit Receiving Station" with the following modifications from the "Verity Receiving Station":
 - Application now supports receiving vDrives written by:
 - Verity Central
 - Verity Scan



- Verity Scan with Relay
 - vDrives written from Verity Transmit Receiving Station support at least the same number of ballots as vDrives written from Verity Central, Scan, or Scan with Relay.
 - The Receiving Dashboard displays the status of Central vDrive data separately from the status of device vDrive data.
 - The vDrives Written Report displays, after the “ID of the transfer vDrive” field, the type of device that wrote the CVR data (“Central” or polling place device type) for each child vDrive written to a transfer vDrive.
 - The Received vDrives Report displays, before the “Polling place name” field, the type of device that wrote the CVR data (“Central” or polling place device type) for each received vDrive.

Features for Verity Count

- Count results reports containing contest instructions display electronic instructions only.
- Slate Choices: On results reports, both choice names are displayed next to a single vote counter.
- Count now includes a digital signature for any exported collection of CVRs.
 - The digital signature is user-verifiable using a separate utility.
- Improved Alias functionality:
 - Aliases Groups and Sets (collections of Alias Groups) can be exported or imported to/from removable media.
 - Alias Groups can be imported into any elections containing the same strings.
 - Alias Sets can only be imported into the election with the same Election ID from which they were generated.
 - Alias Sets can be used for reports and results exports, including the Detailed Vote Total export.
- Visually updated the Verity Count dashboard.

Corrected Defects

The following defects found in previous **Verity** releases are corrected in the **Verity Voting 2.7** release:



Product	Description of Verity Voting 2.6 Defect	Resolution/Results in Verity Voting 2.7
Data/Build	Help screen for: "Shared Device Behaviors" is inaccurate. The help screen states, "Require users to view all choices in each contest" however what is displayed is "Require voters to view all choices in each contest."	Corrected and verified
Scan	Scanner multi-feed calibration can get stuck on a spinner and not show the results screen, requiring a lock and unlock of the tablet to exit the screen.	Corrected and verified
Devices	Physical keyboard input of "Alt-ESC" returns to the user to the Verity launcher splash screen.	Corrected and verified
Count	If the number of columns in contest are less than or equal to 14 in the Canvass Results Report, then a blank page will follow the contest on the PDF export.	Corrected and verified

1.2.3 Initial Assessment of Impact of the Modifications

Review of the modifications listed in section "1.1.2 Modifications", indicates the need for limited Physical and Functional Configuration Audits to verify that the system continues to meet VVSG 1.0 requirements. All software and firmware modifications will be verified by execution of elections that incorporate steps to verify the modifications, or via test suites designed to specifically focus on the functional changes made to the applicable devices and applications.

1.2.4 Regression Testing

The limited FCA will consider functions that have not changed but may be impacted by the modifications. Each modified component of the system will require a new build. This will be subjected to FCA review at an appropriate level of scrutiny.

All modified components of **Verity Voting 2.7** will be regression tested in order to verify continued compliance to VVSG 1.0. Additionally, end-to-end system level general and open primary elections will be performed to verify proper system operation.

1.3 References

The following key documents were used in preparing this test plan.

1. Election Assistance Commission Voluntary Voting System Guidelines (EACVVSG 1.0), Version 1.0, 2005.
2. NIST Handbook 150: 2020.
3. NIST Handbook 150-22: 2017.



4. EAC Voting System Testing and Certification Program Manual, United States Election Assistance Commission, v 2.0, May 2015
5. SLI Compliance VSTL Quality System Manual, Rev. 3.3, December 17th, 2020.

1.4 Terms and Abbreviation

The following terms and abbreviations will be used throughout this document:

Table 1 – 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 Optical Scanner is a mark sense-based ballot and vote counting 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.
Commercial Off the Shelf	COTS	Term used to designate computer software, hardware or accessories that are ready-made and available for sale, lease, or license to the general public
Direct Recording Electronic	DRE	Voting systems that, using Touch Screen or other user interfaces, directly record the voter's selections in each race or contest on the ballot in electronic form.
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



Term	Abbreviation	Description
		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/EMI	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.
Functional Configuration Audit	FCA	The testing activities associated with the functional testing of the system.
Institute of Electrical and Electronics Engineers	IEEE	A non-profit 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.).
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 means used by testing laboratories and manufacturers to request that the EAC provide an interpretation of a technical issue related to testing of voting systems.
Requirements Matrix	N/A	A matrix that traces the VVSG requirements to the various test modules and test methods.



Term	Abbreviation	Description
Technical DataPackage	TDP	The data package supplied by the vendor, which 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 a voting system.
Voluntary Voting System Guidelines	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 for EAC certification.
Voting System Test Lab	VSTL	An independent testing organization accredited by NVLAP and the EAC to conduct voting system testing for EAC certification.



1.5 Testing Responsibilities

The following project schedule contains owner assignments and identifies test procedure (module) development, test case (suite) development, 3rd party tests, and EAC and Manufacturer dependencies.

1.5.1 Project Schedule

The subsections below describe the project schedule.

1.5.1.1 Project Timeline

The following schedule outlines the expected timeline for this project

Task Name Start Finish	Start	Finish
Task Name Start Finish	Mon 11/15/21	Fri 5/20/22
Review - Source Code (EAC)	Mon 11/15/21	Mon 12/20/21
Trusted Build	Mon 1/24/22	Fri 1/28/22
Test Readiness Review (TRR)	Wed 1/26/22	Fri 1/28/22
Initiation of EAC Certification Project	Wed 2/2/22	Wed 2/2/22
Project Initiation	Wed 2/2/22	Wed 2/2/22
TDP Deliver/Receive Vendor Package	Wed 2/2/22	Wed 2/2/22
FCA Assessment	Thu 2/10/22	Tue 2/15/22
Hardware	Mon 2/7/22	Thu 4/21/22
Test Plan Development	Thu 2/3/22	Thu 3/24/22
Preparation	Mon 2/7/22	Mon 2/7/22
Training	Mon 2/7/22	Mon 2/7/22
Test Suite Development	Mon 1/31/22	Wed 3/16/22
Determine content of Election Validation Suites	Mon 2/7/22	Wed 2/9/22
Create/Validate	Mon 1/31/22	Wed 3/16/22
Vendor Specific Module and Suite Creation/Validation	Mon 1/31/22	Wed 3/16/22
Modifications	Mon 1/31/22	Wed 3/16/22
Regression Testing	Wed 2/9/22	Fri 3/11/22
TDP Review	Fri 2/4/22	Thu 2/17/22



Official Execution	Mon 11/15/21	Fri 5/20/22
Official Test Execution of Test Suites	Wed 3/16/22	Mon 4/25/22
Prep Test Environment	Wed 3/16/22	Thu 3/17/22
Execute Test Suites	Thu 3/17/22	Fri 4/22/22
Final Documentation Updates	Fri 4/22/22	Mon 4/25/22
Reporting to EAC	Tue 4/19/22	Thu 5/19/22
Certification Test Report and Final Test Plan	Tue 4/19/22	Wed 5/18/22
Delivery of Artifacts to EAC Repository	Wed 5/18/22	Thu 5/19/22
Project Management	Mon 11/15/21	Wed 5/4/22
Project Close Out	Wed 5/18/22	Fri 5/20/22

1.5.1.2 Owner Assignments

- System Analysis and Review will be conducted by Source Code Review, Security and Voting Test Engineers, with oversight by the Test Manager.
- Source code review will be conducted by Voting Test Engineers (Source Code Review Specialists), with oversight by the Test Manager.
- Documentation review will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.
- Hardware testing will be conducted by NTS Engineers, with oversight by the SLI Hardware Engineer.
- Test Module Development will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.
- Test Suite Development will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.
- Formal Test Execution will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.

1.5.1.3 Test Module Development

Test Modules will be developed and/or modified to provide repeatable detailed test steps. The Modules are defined at a basic level in SLI Compliance's formal Test Methods and are designed for use in any suite that employs their functionality. This reusability reduces the development time associated with creating Modules.

The Modules will be validated prior to formal test execution to ensure accurate testing of the voting system.



Additionally, the Test Modules will provide traceability to SLI Compliance's formal Test Methods, as well as the VVSG 1.0 requirements.

1.5.1.4 Test Suite Development

Test Suites will be developed to help group and focus testing around key areas of the voting system. The Test Suites will contain multiple test modules providing clear and traceable test scripts and information. Various configurations will be identified within the suites. Potentially, variations of the same suite may be run multiple times to verify different configurations.

1.5.1.5 Trusted Build

Prior to formal test execution, a Trusted Build will be performed, producing software and firmware components for **Verity Data, Verity Build, Verity Central, Verity Count, Verity Print, Verity Controller, Verity Touch Writer, Verity Touch Writer Duo, Verity Touch Writer Duo Standalone, Verity Scan, Verity Transmission** and **Verity Relay Receiving Station** in order to include modifications made to those applications.

1.5.1.6 Formal Test Execution

Formal execution of the approved Test Suites and modules will be conducted against the declared voting system to verify the system's compliance with the VVSG requirements.

1.5.1.7 Third Party Hardware Testing

Hardware testing will be conducted by third party, certified hardware test laboratories to verify the voting system hardware devices comply with the VVSG hardware requirements. Under the 2005 VVSG 1.0, this portion of the certification is considered to be part of the FCA.

Other Labs Performing Hardware Testing

SLI Compliance is responsible for all core voting system tests as identified in NIST NVLAP Handbook 150-22 (2017). The labs listed below will perform non-core hardware testing for this certification test campaign. Complete details for the hardware testing campaign can be found in the following documentation:

- *Hart Verity 2.7 EAC Electrical Hardware Test Plan v3.0 docx*
- *Hart Verity 2.7 EAC Environmental Hardware Test Plan v2.0 docx*
- *Hart Verity 2.7 EAC Temp and Power Var Test Plan v1.0.docx*

Labs Performing Hardware Testing

Environmental testing will be conducted at NTS Environmental/Dynamic, 1601 Dry Creek Drive, Suite 2000, Longmont, Colorado 80503.

Please see attached "Hart Verity 2.7 EAC Environmental Hardware Test Plan v2.0" for complete details.

Temperature and Power testing will be conducted at NTS Environmental/Dynamic, 1601 Dry Creek Drive, Suite 2000, Longmont, Colorado 80503.



Please see attached “Hart Verity 2.7 EAC Temp and Power Var Test Plan v1.0” for complete details.

Electrical testing will be conducted at NTS, EMI / EMC Test Lab, 1736 Vista View Drive, Longmont, Colorado 80504.

Please see attached “Hart Verity 2.7 EAC Electrical Hardware Test Plan v3.0” for complete details.

Three configurations will be involved in the hardware testing listed in Table 2, above:

Configuration	Components	Dates
1	Verity Controller w/ 2 Verity Touch Writer DUO's	March 9-17
2	Verity Touch Writer w/ Brother HL-L6400DWVS Laser Printer	March 17-23
3	Verity Scan	March 23-April 1

1.5.1.8 EAC & Manufacturer Dependencies

The Test Plan will require EAC approval prior to finalization.

Hart will be required to provide all source code, documentation, equipment and supporting materials identified as part of the voting system.

The source code must have all discrepancies resolved, be built and installed successfully, and complete operational status checks prior to formal test execution.

In addition, **Hart** is required to provide training on the voting system and support throughout the life of the project.



1.6 Scope of Testing

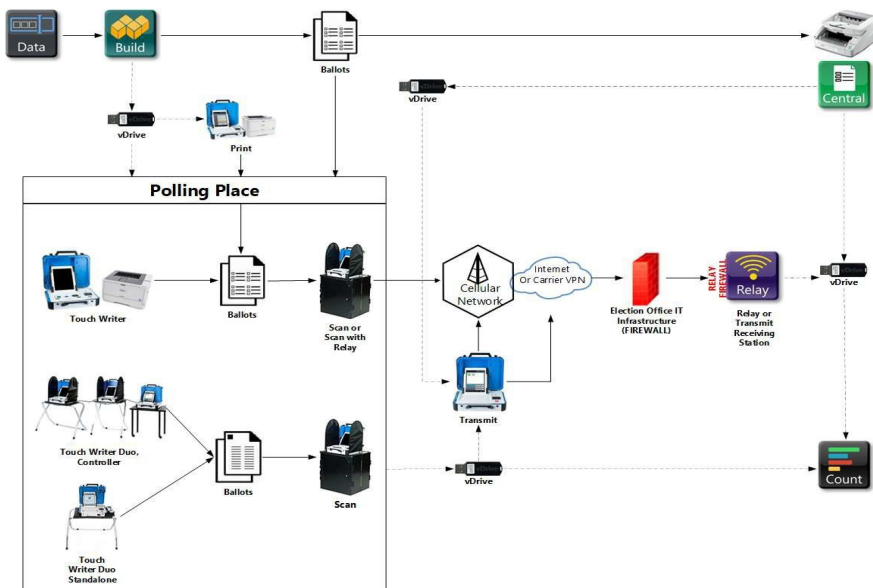
1.6.1 EAC Interpretations – RFI

This Certification Test Plan and the execution of tests for the voting system identified in this plan do not include any additional EAC interpretations.

1.6.2 EAC Notices of Clarification

This Certification Test Plan and the execution of tests for the voting system identified in this plan do not include any additional EAC Notices of Clarification (NOC).

1.6.3 Block Diagram





Overview of the diagram:

- The components are displayed as touch points of data access, transfers, and verification.
- Dotted lines show the flow of data and air gaps using vDrives.
- Verity Print is a ballot production device that provides unmarked printed ballots.
- Verity Touch Writer and Scan may be installed in polling places to support paper-based voting.
- Verity Controller, Touch Writer Duo, Touch Writer Duo Standalone, and Scan may be installed in polling places to support paper-based voting. Verity Scan maybe used with the Scan with Relay kit to remotely transmit vDrive data from that device only to a Relay Receiving Station.
- Verity Transmit is used to remotely transmit vDrive data from polling place devices or VerityCentral to a Transmit receiving station.
- Verity Key (not shown) is required for user access into components to load elections, to use critical features, and to generate reports. Feature access depends on the roles applied to user accounts.

2 PRE-CERTIFICATION TESTING AND ISSUES

2.1 Evaluation of Prior VSTL Testing

Prior VSTL testing has been performed on predecessor versions of the **Hart Verity Voting 2.7** voting system. A full test campaign was conducted by SLI Compliance during the **Verity Voting 2.0** EAC certification project. The **Verity Voting 2.6** release, which was VSTL tested and EAC certified, constitutes the main code base used for the **Verity Voting 2.7** release.

2.2 Evaluation of prior non-VSTL Testing

No prior state or non-VSTL lab testing has been performed on the **Hart Verity Voting 2.7** voting system. Review of Hart's internal testing will be performed during the FCA review.

2.3 Known Field Issues

Review of the "Known Vulnerabilities" database, maintained by SLI Compliance, has provided no known vulnerabilities that relate to the modifications implemented in **Verity Voting 2.7**.

3 MATERIALS REQUIRED FOR TESTING

Any materials that are used in an election cycle must be provided to SLI Compliance to facilitate testing of the voting system. This section outlines these materials that are required.

3.1 Software/Firmware

All software and firmware used by the declared **Verity Voting 2.7** voting system,



whether directly or indirectly, in a production environment must be validated during the certification process.

The following software/firmware is required for the execution of hardware, software, telecommunications, and security tests. This includes all supporting software such as operating systems, compilers, assemblers, application software, firmware, any applications used for burning of media, transmission of data or creation/management of databases.

3.1.1 Verity Voting Custom Software/Firmware

The **Hart Verity Voting 2.7** voting system consists of the following software and firmware components:

Table 2 – Manufacturer Software/Firmware

Manufacturer	Application	Version
Verity Data	EMS Software	2.7.0
Verity Build	EMS Software	2.7.0
Verity Central	High-Speed Optical Scanner Software	2.7.0
Verity Count	Central Count Location Tabulation and Report Software	2.7.0
Verity Relay Receiving Station	Data Transmission Software	2.7.0
Verity Scan	Optical Scanner Firmware	2.7.0
Verity Touch Writer	BMD Firmware	2.7.0
Verity Touch Writer Duo	BMD Firmware	2.7.0
Verity Touch Writer Duo Standalone	BMD Firmware	2.7.0
Verity Controller	Firmware	2.7.0
Verity Print	BMD Firmware	2.7.0
Verity Transmit	Data Transmission Software	2.7.0
Verity Transmit Receiving Station	Data Transmission Software	2.7.0



3.1.2 COTS Software/Firmware

This section details the Commercial Off the Shelf software and firmware utilized within the **Verity Voting 2.7** voting system.

Table 3 – COTS Software/Firmware

Manufacturer	Application	Version
Microsoft	Windows 10 Enterprise 2019 LTSC	10.0.17763
Microsoft	Microsoft SQL Server Standard 2019	15.0.4153.1
Microsoft	SQLite	3.36.0
McAfee	McAfee Application Control for Devices("Solidifier")	8.2.1-143
Nuance Communications	Nuance Western OCR, Desktop, OEM	V20

3.1.3 Additional Supporting Test Software

This section outlines all test specific software that will be used in the certification campaign.

Table 4 – Additional Supporting Test Software

Manufacturer	Application
CLOC	<u>Count Lines of Code</u> : an open source application used to determinethe counts of executable and comment lines.
SLI Compliance	<u>Module Finder</u> : an SLI Compliance proprietary application used to parsemodule names from source code.
SciTools	<u>Understand</u> : a customizable integrated development environment used forstatic code analysis.

3.2 Equipment

The following equipment is required for the execution of the hardware, software, telecommunications, and security tests. This includes system hardware, general purpose data processing and communications equipment, and any test instrumentation required.

3.2.1 Verity Voting 2.7 Custom Equipment

The following **Hart Verity Voting 2.7** equipment will be used in testing:



Table 5 – Hart Verity Voting Equipment

Hardware	Model
Verity Controller	3005825 / 3006085
Verity Print	3005356 / 3005856 / 3006095
Verity Scan (digital scanner)	3005350 / 3005800 / 3006080
Verity Touch Writer (BMD)	3005352 / 3005852 / 3006090
Verity Touch Writer Duo (BMD)	3005700 / 3006070
Verity Touch Writer Duo Standalone (BMD)	3005730 / 3006075
Verity Transmit	3006065
Relay Accessory kit	3005251

3.2.2 COTS Equipment

The following Commercial Off-the-Shelf equipment will be used in testing:

Table 6 – COTS Equipment

Manufacturer	Hardware	Model
OKIDATA (for Verity Data, Verity Build, Verity Central, Verity Count, Verity Relay Receiving Station, Verity Print, Verity Transmit Receiving Station and Verity TouchWriter)	Ballot and Report Printer	B432dn
Brother HL-L6400 Series (for Verity Data, Verity Build, Verity Central, Verity Count, Verity Relay Receiving Station, Verity Print, Verity Transmit Receiving Station and Verity Touch Writer)	Ballot and Report Printer	HLL6400DWVS
OKIDATA (for Verity Data, Verity Build, and Verity Print)	Ballot Printer	C844dn
OKIDATA (for Verity Data, Verity Build)	Ballot Printer	C931e
Into Print SP1360 (for Verity Data and Verity Build)	Ballot Printer	SP1360



<p>Hewlett-Packard Z4 G4 (For Verity Data, Verity Build, Verity Central, Verity Count, Verity Relay Receiving Station)</p>	<p>Verity Workstation (Minimum Requirements) Processor – x86-compatible,3.0GHz, Quad Core Memory – 64GB 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 functionality</p>	
<p>Hewlett-Packard Z240 (For Verity Data, Verity Build, Verity Central, Verity Count)</p>	<p>Verity Workstation (Minimum Requirements) Processor – x86-compatible,3.0GHz, Quad Core Memory – 64GB 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</p>	
	<p>Keyboard - USB Keyboard Mouse - USB Mouse No wireless functionality</p>	
<p>Hewlett-Packard P244 Monitor (for Z4 G4 workstations)</p>	<p>Verity Display Panel Active Area – 52.7x29.64 cm Aspect Ratio - 16:9 Optimal Resolution – FHD 1920x1080 @ 60 Hz Contrast Ratio - 1000:1 static, 10000000:1 dynamic Brightness - 250 cd/m²</p>	



Hewlett-Packard P24 G4 24Monitor (For Z4 G4 workstations)	Verity Display Panel ActiveArea – 52.7x29.4 cm Aspect Ratio - 16:9 Optimal Resolution – FHD 1920x1080 @ 60 Hz Contrast Ratio - 1000:1 static, 8000000:1 dynamic Brightness - 250 cd/m ²	
Hewlett-Packard P232 Monitor (for Z240 workstations)	Verity Display Panel ActiveArea – 52.92x28.64 cm Aspect Ratio - 16:9 Optimal Resolution – 1920x1080 @ 60 Hz Contrast Ratio - 1000:1 static, 5000000:1 dynamic Brightness - 250 cd/m ²	
Canon (for Verity Central)	Ballot Scanner	DR-G1100 DR-G1130 DR-G2110 DR-G2140
OKIDATA (for Verity Data, VerityBuild and Verity Print)	Ballot and Report Printer	C831dn (for existing customers only)
OKIDATA (for Verity Data and Verity Build)	Ballot and Report Printer	C911dn (for existing customers only)
OKIDATA (for Verity Data, Verity Build, Verity Central, Verity Count, Verity Relay Receiving Station, Verity Print, Verity Transmit Receiving Station and Verity Touch Writer)	Ballot and Report Printer	B431d (for existing customers only)



3.3 Test Materials

The following test materials are required for the performance of testing including, as applicable, test ballot layout and generation materials, test ballot sheets, test ballot cards and control cards, standard and optional output data report formats, and any other materials used in testing.

- Ballots & blank ballot grade paper
- Thumb drives
- USB dongle
- Ballot marking pens
- Printer paper rolls

3.4 Deliverable Documents

See “Appendix A – TDP Listing”, for documents to be delivered as a part of the **Hart Verity Voting 2.7** system.

4 TEST SPECIFICATIONS

The following are the specifications for testing to be conducted on the **Hart Verity Voting 2.7** system. The specifications contain details on the focus of testing, configuration(s), and the functions to be tested.

4.1 Requirements

The **Verity Voting 2.7** modified voting system will be tested to requirements as listed below:

2.1.1	2.1.7.2.e	3.1.3	4.1.2.13	4.3.3	7.3.1	7.9.4
2.1.1.abcfg	2.1.9	3.1.4.b	4.1.2.14	4.3.4.ad	7.4	7.9.4.efkl
2.1.2	2.2.1	3.1.4.b	4.1.2.15	4.3.6	7.4.3	7.9.5
2.1.4.bcd	2.2.1.3	3.1.4.d	4.1.2.4	4.8	7.4.5	7.9.6
2.1.4.hj	2.2.2	3.1.4.e	4.1.2.5-12	5.1.1	7.4.6.b.i d	9.6.c,d
2.1.6	2.2.4.d	3.1.5	4.1.5.2	5.1.2	7.4.6.e	vii, 4.6.2-6
2.1.7.1.d	2.2.e	3.2.2.2	4.1.7.1	5.4.4	7.5	vii, 4.7.1
2.1.7.2	2.3.3.1	3.2.7	4.1.7.1	6	7.6	vii, 4.8
2.1.7.2.b	2.4.3	4.1.1	4.1.7.2	7.2	7.7	
2.1.7.2.e	2.4.3.gk	4.1.2	4.1.8	7.3	7.9.3.de.ii	

Please see “Appendix B – Requirements to Components” for additional information.



4.2 Hardware Configuration and Design

The **Hart Verity Voting 2.7** system, as declared in the application for certification submitted to the EAC, consists of:

- A **Verity Data/Build** workstation to create all election information and election media.
- **Verity Print** is a pre-voting ballot production device that is paired with a COTS printer to produce unmarked paper ballots.
- At the precinct level, **Verity Scan** optical scanners, **Verity Touch Writer BMD**, **Verity Touch Writer Duo BMD**, and **Verity Touch Writer DuoStandalone BMD** configurations are employed. Additionally, **Verity Scan** may be equipped with an optional accessory modem for wireless transmission. **Verity Transmit** is used to remotely transmit vDrive data.
- The central count location employs a workstation that utilizes the **Verity Central** software in combination with a high-speed COTS scanner, for tabulation of paper ballots.
- The consolidation, tally and reporting location employs a workstation with **Verity Count** software as well as a printer.
- **Verity Relay Receiving Station** is a remote transmission software application that receive selection data transmissions sent by Verity Scan devices equipped with an optional Relay modem accessory.
- **Verity Transmit Receiving Station** is a remote transmission software application that receives election data transmissions sent by Verity Transmit devices.

4.3 Test Suite Design

4.3.1 Software Functional Test Design and Data

SLI Compliance will prepare functional test modules using the operator/user procedures specified in the TDP. Functionality provided by the **Verity Voting 2.7** voting system is exercised in order to verify that each functional component performs as expected. Accept/reject criteria are based on requirements of the VVSG, and the system specification documents provided within the TDP. As many of the individual functional components rely on preceding functionality within the system, SLI Compliance incorporates system level suites that employ modules that exercise the individual functional components of the system.

The following test suites will be implemented:

General Election – The full **Verity Voting 2.7** voting system will be reviewed in order to verify proper integration of the voting system and that all components continue to work as expected.

Primary Election – The full **Verity Voting 2.7** voting system will be reviewed in



order to verify proper integration of the voting system and that all components continue to work as expected.

Modifications – The modifications to each component and software application will be given focused testing in order to verify that the modifications implemented do not adversely affect operations. Elections will be designed and utilized, in some instances repeated, in order to test functionality related to contests where no candidates have been filed as well as the new voting types that are now supported.

Security – A general security review of the system will be performed to ensure no new security threat has been introduced to the system as a result of the modifications implemented. In any instance where an anomaly or possible security flaw is identified, the potential risk will be evaluated and reported.

Verity Data/Build – The functionality of the **Verity Data/Build** application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Verity Central – The functionality of the **Verity Central** application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Verity Count – The functionality of the **Verity Count** application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Verity Relay Receiving Station – The functionality of the **Verity Relay Receiving Station** application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Verity Transmit – The functionality of the **Verity Transmit** application will be given focused testing in order to verify that the component performs as expected.

Verity Transmit Receiving Station – The functionality of the **Verity Relay Receiving Station** application will be given focused testing in order to verify that the component performs as expected.

Verity Scan – The functionality of the **Verity Scan** application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Verity Print – The functionality of the **Verity Print** application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Verity Touch Writer – The functionality of the **Verity Touch Writer** application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Verity Touch Writer Duo – The functionality of the **Verity Touch Writer Duo** application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Verity Touch Writer Duo Standalone – The functionality of the **Verity Touch Writer**



Duo Standalone application will be given focused testing in order to verify that the modifications implemented do not produce any adverse effects.

Security Testing– Security Testing of telecommunications, access control and software/firmware will be performed in order to verify that the modifications implemented do not produce any adverse security concerns.

4.4 TDP Evaluation

SLI Compliance is completing an assessment of the deliveries in the Technical Data Package for **Verity Voting 2.7** against the **Verity Voting 2.6** TDP. Any modification to previously reviewed documentation will be evaluated.

SLI Compliance will conduct a PCA review of all new or modified vendor traced documents submitted for review in the delivery of the **Verity Voting 2.7** TDP. Documents are verified for compliance to the VVSG 1.0, Volume 2, Sections 2.2 through 2.13 and Volume 2, Section 6.6.

Any subsequent re-deliveries of the TDP items will be solely the result of fixes to discrepancies identified in the remaining FCA or PCA activities.

4.5 Source Code Review

The certification campaign for the **Hart Verity Voting 2.7** voting system includes modified software and firmware that have been created as proprietary to **Hart**, as well as review of any commercial off the shelf products. SLI Compliance has conducted a source code review of all modified proprietary source code, and modified COTS products, submitted in the delivery of the voting system TDP for compliance to the EAC VVSG v 1.0, Volume 2, Section 6.6.

The coding languages involved in the vendor's applications include:

- C
- C++
- C#

Source code review Tools utilized by SLI Compliance include:

- LocMetrics Line Counter: a commercial application used to determine the counts of executable and comment lines.
- Module Finder: an SLI Compliance proprietary application used to parse module names from C/C++ and VB code and populate the identified module names into the review documents.
- Understand: a customizable integrated development environment used for static code analysis.

Any subsequent re-reviews of source code will be the result of fixes to discrepancies identified in the FCA activities.

COTS operating systems and software used in the voting system have been verified as authentic and unmodified in the **Verity Voting 2.7** test campaign.



4.6 Trusted Build

The Trusted Build process for **Hart Verity Voting 2.7** was devised to allow for the build to be performed by and under the supervision of an SLI Compliance Voting System Test Engineer, to preserve the security of the Hart Trusted Build process, and to maintain SLI Compliance's chain of custody. The steps for this process included the following:

- Preparation for the Trusted Build – Obtaining and reviewing Hart's procedure for constructing the build platform, verifying the target build platform, and verifying the proper contents of the source code package were extracted to the target build platform via hash codes.
- Execution of the Trusted Build – SLI Compliance performed the Trusted Build by using the step-by-step build procedure, as provided by Hart to create a pristine build environment. SLI Compliance observed the following items throughout the build process:
 - Build environment images at various key points
 - Build environment and file hashes at various key points
 - Build environment hardware characteristics
 - Build results from code compilation and file hashes
 - Final software installs files and file hashes
 - Build virtual machine files
- Deliverables to Testing – Upon completion of the Trusted Build, the product installs were created and installed on equipment at Hart's facility. Each device had a unique serialized security seal applied that was verified by SLI Compliance upon receipt. In addition, certain items were sent to the SLI Compliance test group:
 - Final software installs files
 - Workstation base OS images
 - Workstation product images
 - Build output hash values to validate install files
 - Workstation and device hash files
 - Tamper seal application evidence
 - Build server artifacts
- Final Record Keeping and Archiving Procedures – At the conclusion of the Trusted Build process, SLI Compliance completed all final record keeping and archiving procedures at SLI Compliance's facility. This record keeping includes any unique identifiers, results of the build with version numbers and dates, and descriptions of all hashes and images in the repository.



- Hash files of the build outputs were verified against the hash files obtained from the devices to ensure the contents of the installed images. Tamper seals codes were verified and confirmed to be intact.

4.7 Standard VSTL Test Methods and Uncertainty of Test Data Measurement

This test campaign utilizes Standard VSTL test methods and nominal type testdata only.

4.8 Regression Testing to Address Discrepancies

A second Trusted Build will be performed to address any Functional Discrepancies, after updated source code is received and reviewed for continued VVSG compliance. Appropriate Regression testing will be performed to verify that each discrepancy is successfully resolved and that no new issues have been introduced. This will include execution of a General Election and an Open Primary Election, in addition to the Discrepancy Specific testing.

5 TEST DATA

Test data for the **Hart Verity Voting 2.7** voting system will be compiled such that all modified functionality declared will be tested to determine conformance to the standards.

5.1 Data Recording

SLI Compliance will evaluate the modified system functionality, as described by **Hart** technical documentation, as well as requirements as listed in the EAC VVSG v 1.0, and make determinations as to expected results of all data inputs into the **Hart Verity Voting 2.7** voting system. This includes:

- Election type
- Precincts of all types
- Districts
- Offices
- Contests
- Candidates
- Parties
- Devices used
- Voting variations employed
- Issues/Referendums
- Votes cast for each candidate/issue/referendum
- Vote consolidation data from one device/level to the next



The data is contained in master data records, including each input and each expected output. This data is incorporated into the appropriate test suite, populating test modules with exact expected data for the function being tested.

Testing information is recorded in the test suites and test notebooks, which are utilized according to SLI Compliance's relevant standard lab procedures.

6 TEST PROCEDURE AND CONDITIONS

This section describes the test conditions and procedures for execution of test suites. If a particular sequence is mandatory for the execution of suites, a rationale will be given. Additionally, this section describes procedures for setting up equipment to be utilized in the execution of the test suites.

6.1 Facility Requirements

Testing will be performed on site at SLI Compliance in Colorado.

Secure labs are available with appropriate power supply and space to accommodate the various configurations defined within this test plan. Temperature/humidity gauges will be employed to determine whether the appropriate conditions exist during testing.

Unless otherwise specified herein, all remaining tests, including system level functional testing, shall be performed at standard ambient conditions:

- Temperature: 64°F - 79°F (17.7°C - 26.1°C)
- Relative Humidity: 20 to 90%
- Atmospheric Pressure: Local Site Pressure

All TDP and test documentation is stored on site at SLI Compliance's facility in a secure project directory on SLI Compliance's secure Voting server.

6.2 Test Setup

Configurations of **Verity Voting 2.7** will be deployed that conform to each specific test suite's needs. In all instances **Verity Voting 2.7** documentation will be followed in the setup of the configurations.

6.3 Test Sequence

While there is no required sequence for performing voting system certification testing and audits, there are prerequisite tasks for some testing. Tasks and any applicable predecessor tasks are identified within each suite for the test cases.

6.4 Test Operations Procedures

An inventory has been performed to verify the voting equipment received contains hardware and software elements as defined in the TDP prior to commencement of testing.

Throughout the testing effort, test suites and modules will be marked as follows:

- **Passed** – Test is accepted as successful.



- **Failed** – Test is rejected as unsuccessful.
- **NT** – Not Testable is used for test modules that cannot be completed. For example, if failure of one test module precludes attempting subsequent test modules, the latter will be marked as NT.

Test results **Failed** and **NT** will include comments by the test engineer explaining the reason for the result.

Issues encountered during review and testing will be documented on the Discrepancy Report. Test findings showing that an aspect of the voting system does not conform to the requirements of the identified test standard will be marked as Documentation Discrepancies, Source Code Review Discrepancies, Hardware Discrepancies, or Functional Discrepancies.

Issues that are encountered during testing or documentation review but are not addressed by the applicable standard will be added to the Discrepancy Report and noted as Informational. The vendor has the option whether to address Informational issues. All responses provided by the vendor are noted in the Discrepancy Report attachment to the Certification Test Report.

Approval Signature

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

Traci Mapps
VP, SLI Compliance
May 2, 2022



Appendix A – TDP Listing

- o 6641-056 A01_Verity_2.7_Administrators Guide_Data.pdf
- o 6641-057 A00_Verity_2.7_Administrators Guide_Build.pdf
- o 6641-058 A00_Verity_2.7_Administrators Guide_Central.pdf
- o 6641-059 A00_Verity_2.7_Administrators Guide_Count.pdf
- o 6641-060 A00_Verity_2.7_Remote Transmission Administrators Guide.pdf
- o 6641-061 A01_Verity_2.7_System Administrators Guide.pdf
- o 6643-062 A01_Verity_2.7_Support Procedures Guide.pdf
- o 6651-053 A00_Verity_2.7_Polling Place Field Guide - CDS.pdf
- o 6651-054 A00_Verity_2.7_Polling Place Field Guide - DS.pdf
- o 6651-055 A00_Verity_2.7_Polling Place Field Guide - SW.pdf
- o 6651-056 A00_Verity_2.7_Polling Place Field Guide - SRW.pdf
- o 6651-058 A00_Verity_2.7_Verity Print Field Guide.pdf
- o 6651-061 A01_Verity_2.7_Verity Transmit Field Guide.pdf
- o 6653-011 A00_Verity_2.7_Device Troubleshooting Field Guide.pdf
- o 6673-010 E_Verity_Relay Implementation Process.pdf
- o 6675-011 A_Verity_OKI B432 Tray Extension Kit Installation.pdf
- o 6675-042 A_Verity_HL-L6400DWVS Tray Extension Kit.pdf
- o 462785-1.1 Hart InterCivic CofC.pdf
- o All-In-One Code Framework Coding Standards.pdf
- o Change Notes Verity Voting 2.7.0 to 2.7.1 4005724 A00.pdf
- o Configuration Management Process 1001074 D01.pdf
- o Continual Improvement Process 1000550 E02.pdf
- o Control of Nonconforming Product Procedure 1000657 B02.pdf
- o Device Configuration Process Document 4005523 B00.pdf
- o Device OS Creation and Configuration Process Document Verity 2.7 4005696A01.pdf
- o Document Control Procedure 1000538 E06.pdf
- o Factory TUV SUD inspection 2021 December report.pdf
- o Hardware 2005713-CFAST Door Security Kit Design.pdf
- o Hardware 3005018-ATI Kit Design.pdf
- o Hardware 3005174-AutoBallot Kit Design.pdf
- o Hardware 3005350-Scan Design.pdf
- o Hardware 3005352-Touch Writer Design.pdf
- o Hardware 3005356-Print Design.pdf
- o Hardware 3005357-Ballot Box Design.pdf



- Hardware 3005358-Standard Booth Design.pdf
- Hardware 3005359-Accessible Booth Design.pdf
- Hardware 3005700-Touch Writer Duo Design.pdf
- Hardware 3005730-Touch Writer Duo Standalone Design.pdf
- Hardware 3005800-Scan Design.pdf
- Hardware 3005801-Accessible Booth with ATI Tray Design.pdf
- Hardware 3005825-Controller Design.pdf
- Hardware 3005852-Touch Writer Design.pdf
- Hardware 3005856-Print Design.pdf
- Hardware 3005905-Duo Go Design.pdf
- Hardware 3006065-Transmit Design.pdf
- Hardware 3006070-Touch Writer Duo Design.pdf
- Hardware 3006075-Touch Writer Duo Standalone Design.pdf
- Hardware 3006080-Scan Design.pdf
- Hardware 3006085-Controller Design.pdf
- Hardware 3006090-Touch Writer Design.pdf
- Hardware 3006095-Print Design.pdf
- Hardware Design Development Procedure 1000513 D01.pdf
- Hardware PCB Photos.pdf
- Hardware Verification and Validation Process 1000514 D01.pdf
- Hart Safety Certificate U8 090917 0006.pdf
- Hart Safety Certificate U8 090917 0008 Rev. 00.pdf
- Hart Safety Certificate U8 17 10 90917 004.pdf
- Hart Secure Ballot Stock Specification 4005526 A01.pdf
- HartLogo.jpg
- HP Z240 Verity Win10 Workstation Manufacturing 4005673 A03.pdf
- HP Z4 G4 Verity Win10 Workstation Manufacturing 4005670 A03.pdf
- HPQC Test Cases.pdf
- Quality Manual 1000490 D04.pdf
- Record Retention Matrix 1000510 E02.pdf
- Sinatra Modifications Electronics Specification 4005701 A00.pdf
- Software Design Development Procedure 1000566 D02.pdf
- Software Production 1000551 E01.pdf
- Software Test Design Development 1000508 D02.pdf
- Software Verification and Validation Process 1000560 D02.pdf
- Software Versioning Procedure 1001070 C05.pdf
- SQA Requirements Management Process 1000540 A02.pdf
- Supplier Qualification and Management 1000563 C02.pdf



- Tally Tape Thermal Printer Controller Firmware Build and Flash Procedure 4005719A00.pdf
- The Creation and Configuration of the Access Build Environment 4005517 A01.pdf
- The Creation and Configuration of the Automated Deployment Environment 4005723A01.pdf
- The Creation and Configuration of the MCU Build Environment 4005519 A02.pdf
- The Creation and Configuration of the Trusted Build Environment 4005518 A06.pdf
- Verity 2.7 (Sinatra) Modification TRD 4005691 A01.pdf
- Verity 2.7 Implementation Statement 4005699 A01.pdf
- Verity 2.7 Notice of Protected Information 1000786 A01.pdf
- Verity 2.7 TDP Abstract 1000785 A01.pdf
- Verity 2.7 Test Cases.pdf
- Verity 2.7.X COTS List.pdf
- Verity Airgap Interface Technical Reference 4005512 A02.pdf
- Verity Application Framework TRD 4005634 A00.pdf
- Verity Application Installer Build Process Document Verity 2.7 4005695 A00.pdf
- Verity Application Programming Interface Specification 4005604 A04.pdf
- Verity Ballot Creation TRD 4005636 A00.pdf
- Verity Base Station Microcontroller Specification 4005462 A01.pdf
- Verity Build TRD 4005628 A00.pdf
- Verity Central TRD 4005632 A00.pdf
- Verity Coding Standard 4005498 A14.pdf
- Verity Controller TRD 4005624 A01.pdf
- Verity Count TRD 4005629 A01.pdf
- Verity Cuyahoga (Verity 2.6) Modification TRD 4005683 A00.pdf
- Verity Data TRD 4005627 A00.pdf
- Verity Database Attributes 4005543 C06.pdf
- Verity Device Suite TRD 4005621 A00.pdf
- Verity Election Definition Data TRD 4005639 A01.pdf
- Verity Election Management TRD 4005631 A00.pdf
- Verity Electronics Specification 4005461 A21.pdf
- Verity Entity Relationship Diagram Database - Devices.pdf
- Verity Entity Relationship Diagram Database - Servers (Count Only).pdf
- Verity Entity Relationship Diagram Database - Servers (No Count).pdf
- Verity Key Design 4005514 A02.pdf



- o Verity Logging TRD 4005635 A00.pdf
- o Verity Omni Modification TRD 4005655 A01.pdf
- o Verity Operational Environment 4005515 C17.pdf
- o Verity PC Application Framework User Interface Design Document.pdf
- o Verity Performance Characteristics 4005497 C05.pdf
- o Verity Print TRD 4005626 A00.pdf
- o Verity Redstone Modification TRD 4005671 A01.pdf
- o Verity Relay Theory of Operations 4005571 A06.pdf
- o Verity Risk and Threat Assessment 4005513 C05.pdf
- o Verity Scan TRD 4005623 A00.pdf
- o Verity Security Requirements 4005464 A07.pdf
- o Verity Shared Device User Interface Design Document.pdf
- o Verity Software Architecture-Design 4005463 B02.pdf
- o Verity Summative Usability Report 4005496 A00.pdf
- o Verity Summative Usability Test Plan 4005495 A01.pdf
- o Verity Supply Chain PRD 4005302 C01.pdf
- o Verity Touch Writer Duo Base Station Microcontroller Specification 4005638 A00.pdf
- o Verity Touch Writer Duo TRD 4005625 A00.pdf
- o Verity Touch Writer TRD 4005622 A00.pdf
- o Verity User Management TRD 4005630 A00.pdf
- o Verity Vote Counting and Cast Vote Records TRD 4005640 A00.pdf
- o Verity Voting 2.7 Change Notes 4005722 A01.pdf
- o Verity Voting 2.7 Usability Impact Statement.pdf
- o Verity Voting 2.7.0 Source Documentation.zip
- o Verity Voting National Certification Test Specification 4005527 B06.pdf
- o VerityLogo.jpg
- o VirTex Q01 Quality Manual Rev R.pdf
- o Voting System Implementation and Maintenance 1000745 C02.pdf
- o VSTL Product Submission Procedure 1000565 D02.pdf
- o Workstation OS Creation and Configuration Process Document Verity 2.7 4005697A01.pdf
- o _TDPindex.html



Appendix B – Requirements to Components

Requirement	Item
	Features for all devices and workstations
7.4.5,	<ul style="list-style-type: none"> When using the System Validation Tool on devices or workstations, the system exports hashes for all Verity-related system files, as well as the files themselves.
2.2.1.3, 3.1.3, 3.1.7.2, 3.2.2.2, 3.2.7, 7.9.5, 7.9.6	<ul style="list-style-type: none"> Verity supports adding new languages to devices and workstations via the "Language Pack" functionality.
	<ul style="list-style-type: none"> Verity supports the following additional languages: <ul style="list-style-type: none"> Gujarati Hmong Lao Hawaiian Cantonese Punjabi Bengali
	COTS updates
4.1.7.2, 5.1.2, 7.9.4.e,f,k,l	<ul style="list-style-type: none"> Added support for the Brother HL-L6400DWVS laser printer. This printer now replaces the OKI Data B432 printer for use on Verity Touch Writer, VerityPrinter, Verity Build, and for report printing on all Verity workstation software.
4.1.2.4	<ul style="list-style-type: none"> Added the Duracell DR660PSS UPS for battery backup for the new Brother HL-L6400DWVS printer when used with the Verity Touch Writer laser printer.
4.1.7.2, 5.1.2, 7.9.4.e,f,k,l	<ul style="list-style-type: none"> Added support for the IntoPrint SP1360 laser printer, which is a brand of the OKI Data C931 printer that it replaces on Verity Build.
2.1.2, 4.1.7.1, 7.3	<ul style="list-style-type: none"> Added additional CFast card vendor.
2.3.3.1, 3.1.5	<ul style="list-style-type: none"> Added magnifying devices for use with ballots in the polling place.
	Hawaii-specific Features



2.1.7.1.d, 2.1.7.2.b	<ul style="list-style-type: none"> Supports General and Open Primary elections only.
2.4.3, 4.1.1, 4.1.8, 5.4.4,	<p>Verity Count Reporting</p> <ul style="list-style-type: none"> Now allows users to set a custom order for contests on results reports across all Tasks in an election. Includes the following new reports and exports: <ul style="list-style-type: none"> Three-Column Summary Results Report Three-Column Precinct Results Report (export only) Statement of Vote Report Precinct Detail Export Summary Export Adds support for adding a Run ID to the report header of the following reports: <ul style="list-style-type: none"> Three-Column Summary Results Report Three-Column Precinct Results Report Adds support for identifying the following reports as “zero reports” <ul style="list-style-type: none"> Three-Column Summary Results Report Three-Column Precinct Results Report Added support for calculating ballots cast in a multi-sheet election using the highest recorded sheet count for the following reports: <ul style="list-style-type: none"> Three-Column Summary Results Three-Column Precinct Results Statement of Vote Report Precincts Reporting Summary Export Precinct Detail Export Added an Election Preference to “Enable Hawaii results reports and exports”. Manual vote recording now allows users to enter sheet counts for each sheet that exists in the ballot for the precinct-split/party being adjusted.
2.1.6, 2.1.7.1.d, 2.1.7.2, 2.2.2	<p>All Ballot Features</p> <ul style="list-style-type: none"> Added support for Slate Choices, where two choice names can be treated as a single votable option.
2.1.6, 2.2.1	<p>Paper Ballot Features</p> <ul style="list-style-type: none"> Paper ballots support a maximum paper size of 8.5”x22”, without stub capability. Paper ballot stubs support adding a customizable prefix to the stub number display.



	<ul style="list-style-type: none"> • Verity now supports 80lb Text paper weight for ballots.
	<ul style="list-style-type: none"> • Added targeting landmarks to ballot corners for option box triangulation.
2.1.6, 2.1.7.1.d, 2.1.7.2, 2.2.2	Grid Ballot Features
	<ul style="list-style-type: none"> • Verity now supports grid-based paper ballots, where office contests appear in columns and parties in rows on odd-numbered pages, and propositions appear in a column-based layout on even-numbered pages.
	<ul style="list-style-type: none"> o Proposition-only ballots can utilize both sides of a sheet.
	<ul style="list-style-type: none"> o Select office-type contests can appear on the proposition side of the ballot.
	<ul style="list-style-type: none"> • Grid-based paper ballots support all paper sizes in a landscape orientation (short edge on left):
	<ul style="list-style-type: none"> • Grid-based paper ballots support the same stub sizes and options as column-based paper ballots.
	<ul style="list-style-type: none"> o 8.5" x 22" ballots do not support a stub
	<ul style="list-style-type: none"> • Grid-based paper ballots support all paper ballot election definition elements EXCEPT:
	<ul style="list-style-type: none"> o Party Selector contests
	<ul style="list-style-type: none"> o Open Primary Party Selector contests
	<ul style="list-style-type: none"> o "Ranked Choice", "Cumulative", or "Fractional Cumulative" contests
	<ul style="list-style-type: none"> o Ballot Additional Text
	<ul style="list-style-type: none"> o Rotation
	<ul style="list-style-type: none"> o Column or page forcing on Office type contests
	<ul style="list-style-type: none"> ▪ Column or page forcing is allowed for contests appearing on the Proposition side of the ballot.
	<ul style="list-style-type: none"> o Contest images
	<ul style="list-style-type: none"> o Dependent contests
	<ul style="list-style-type: none"> o Two-line write-ins
	<ul style="list-style-type: none"> o Uncommitted choices
	<ul style="list-style-type: none"> • Grid-based ballots support candidate cross-filing, where if a voter marks multiple boxes for a cross-filed choice, it will be recorded as a single vote for the choice.
	Additional Features for Verity Devices
	Features for all devices
	<ul style="list-style-type: none"> • Updated model for each Verity device
Volume I: 2.1.4 (b,c,d), 4.1.2.5-12, 4.1.2.13, 4.1.2.14, 4.1.7.1 4.3.3 Volume II:	<ul style="list-style-type: none"> o A single standardized circuit board replaces baseboard and I/O board combinations found in all Verity devices, with no change to functionality. Electronic components from the existing Tally Tape Thermal Printer are added directly to the baseboard.



4.6.2-6 4.7.1, 4.8	
	<ul style="list-style-type: none"> o Tally Tape thermal printer for report printing now uses Hart built plastics and firmware.
	<ul style="list-style-type: none"> o Rear panel connectors now recessed to increase ruggedability and reduce cable strain if a device is handled while cables are installed.
	<ul style="list-style-type: none"> o Power input connector no longer contains to slide to release cable retention feature.
2.1.1, 7.3.1, 7.4.6.e, 7.9.4	<ul style="list-style-type: none"> o Tamper evident seal now serialized
9.6.c,d	<ul style="list-style-type: none"> • All Verity devices now show the first three sections (XX.XX.XX) of the system version number in the user interface, without needing to reboot the device.
	<ul style="list-style-type: none"> • All Verity devices now follow these optional VVSG 1.0 user-interface conventions:
3.1.4.d	<ul style="list-style-type: none"> o If an unrecoverable error occurs on a polling place device, the device suspends voting operations and presents a clear indication to the user of the malfunction.
3.1.4.d	<ul style="list-style-type: none"> o Warnings and alerts issued to a voter on a device shall state the nature of the problem; the set of responses available to the voter; and whether the voter has performed or attempted an invalid operation, or the voting equipment itself has malfunctioned in some way.
3.1.4.e	<ul style="list-style-type: none"> o When color is used to indicate status in the system, the user interface uses green, white, or blue for normal status; amber or yellow for marginal status; and red for an error status.
3.1.4.e	<ul style="list-style-type: none"> o When color is used to indicate the type of information displayed, the user interface uses green, white, or blue for general information; amber or yellow for warnings; and red to indicate problems that require immediate attention.
	Features for Verity Scan
2.1.7.2.e, 2.2.4.d, 3.1.4.b	<ul style="list-style-type: none"> • Added support for Write-in Mark Detection, where Scan will return the ballot for second-chance voting input if a mark is detected in the write-in area, but the option box is not marked.
2.1.7.2.e, 2.2.4.d, 3.1.4.b	<ul style="list-style-type: none"> o If the ballot is accepted as-is, unmarked write-ins will count only if the Build setting for default counting behavior is enabled, except for ranked-choice or cumulative contests.
	Features for Verity Scan with Relay
2.2.4.d, 4.3.6	<ul style="list-style-type: none"> • Device startup reports are now labeled "Verity Scan with Relay," not "Verity Scan."
2.2.4.d, 4.3.6	<ul style="list-style-type: none"> • Voter-facing screens now do not display the product name "Verity Scan with Relay."



2.1.1.a,b,c,f,g, 2.1.4.h,j, 2.1.9, 2.2.4.d, 2.4.3.g,k, 4.1.2, 4.1.2.15, section 6, 7.3, 7.5, 7.6, 7.7	<p>Features for Verity Transmit</p> <ul style="list-style-type: none"> • Transmit supports transmitting vDrives written by: <ul style="list-style-type: none"> o Verity Central o Verity Scan o Verity Scan with Relay • For Central vDrives, transmit now displays “Central vDrive” in lieu of the vDrive polling place.
	<p>Additional Features for Verity Workstations</p> <p>Features for all Workstations</p> <ul style="list-style-type: none"> • Secure Boot now enabled on workstations. • Full Disk Encryption now required for all deployments.
2.1.1, 7.2, 7.4	
2.1.1, 7.2, 7.4	
	<p>Features for Election Management</p> <ul style="list-style-type: none"> • Added new feature “Configuration Control”, which supports limiting election variations based on what equipment and ballot types are used by a jurisdiction, eliminating unnecessary work for the user.
2.2.4.d, 5.1.1, 7.4.3	
2.1.2, 2.1.6, 2.2.1, 2.2.2, 2.2.4.d	<p>Features for Verity Data</p> <ul style="list-style-type: none"> • The Contest Title field limit is increased to 250 characters. • Verity Data now supports entering separate contest instructions for devices and paper ballots. <ul style="list-style-type: none"> o Verity Data proofing reports containing contest instructions display both electronic instructions and paper instructions. • Added support for defining Candidate Slate choices on grid-based ballots. • Added additional rich-text formatting options for Ballot Additional Text. • The Ballot Additional Text field limit increased to 3000 characters.
4.1.5.2	<ul style="list-style-type: none"> • Verity Data validates that fold lines do not intersect ballot landmarks, in addition to barcodes and option boxes • The default PVR paper size changed to 8.5" x 11".
	<p>Features for Verity Build</p> <ul style="list-style-type: none"> • Verity Build includes a new setting to print single language ballots on Touch Writer. • Added support for Write-in Mark Detection, including: <ul style="list-style-type: none"> o New options to control second-chance voting behavior for unmarked write-ins on Scan devices.
2.2.4.d	
2.1.7.2.e, 2.2.4.d, 3.1.4.b	
2.1.7.2.e, 2.2.4.d, 3.1.4.b	



2.1.7.2.e, 2.2.4.d, 3.1.4.b	<ul style="list-style-type: none"> o New option to control the default counting behavior for unmarked write-ins on Scan devices.
2.2.4.d	<ul style="list-style-type: none"> • Added a note that "Setting the default Voting Method will also apply to Verity Reader".
Features for Verity Central	
2.1.7.2.e, 2.2.4.d, 3.1.4.b	<ul style="list-style-type: none"> • Added support for Write-in Mark Detection, including: <ul style="list-style-type: none"> o A new adjudication condition called "Unmarked Write-in".
2.2.4.d	<ul style="list-style-type: none"> o An Election Preference to count unmarked write-ins as if they were marked; off by default.
2.2.4.d	<ul style="list-style-type: none"> o An election setting to count unmarked write-ins as if they were marked.
2.2.4.d	<ul style="list-style-type: none"> o An election setting to allow automatic acceptance of unmarked write-ins during scan, or when accepting at the batch, ballot, or page level.
2.2.4.d	<ul style="list-style-type: none"> o Allowing the user to filter voter intent issues by "Unmarked Write-ins".
Features for Verity Relay Receiving Station	
2.2.4.d	<ul style="list-style-type: none"> • Renamed Verity Relay application for clarity; now called Verity Relay Receiving Station.
2.2.4.d	<ul style="list-style-type: none"> • Application now supports receiving vDrives written by: <ul style="list-style-type: none"> o Verity Central o Verity Scan o Verity Scan with Relay
2.2.4.d	<ul style="list-style-type: none"> • vDrives written from Verity Relay Receiving Station support at least the same number of ballots as vDrives written from Verity Central, Scan, or Scan with Relay.
2.2.4.d	<ul style="list-style-type: none"> • The Receiving Dashboard now displays the status of Central vDrive data separately from the status of device vDrive data.
2.2.4.d	<ul style="list-style-type: none"> • The vDrives Written Report displays, after the "ID of the transfer vDrive" field, the type of device that wrote the CVR data ("Central" or polling place device type) for each child vDrive written to a transfer vDrive.
2.2.4.d	<ul style="list-style-type: none"> • The Received vDrives Report displays, before the "Polling place name" field, the type of device that wrote the CVR data ("Central" or polling place device type) for each received vDrive.
Features for Verity Count	
2.2.4.d, 2.4.3, 4.1.8	<ul style="list-style-type: none"> • Count results reports containing contest instructions display electronic instructions only.
2.2.4.d, 2.4.3, 4.1.8	<ul style="list-style-type: none"> • Slate Choices: On results reports, both choice names are displayed next to a single vote counter.
7.9.3.d,e,ii	<ul style="list-style-type: none"> • Count now includes a digital signature for any exported collection of CVRs.
7.4.6.b,i, d	<ul style="list-style-type: none"> o The digital signature is user-verifiable using a separate utility.
2.2.4.d	<ul style="list-style-type: none"> • Improved Alias functionality:



2.2.4.d	<ul style="list-style-type: none">Aliases Groups and Sets (collections of Alias Groups) can be exported or imported to/from removable media.
2.2.4.d	<ul style="list-style-type: none">Alias Groups can be imported into any elections containing the same strings.
2.2.4.d	<ul style="list-style-type: none">Alias Sets can only be imported into the election with the same Election ID from which they were generated.
2.2.4.d	<ul style="list-style-type: none">Alias Sets can be used for reports and results exports, including the Detailed Vote Total export.
2.2.4.d	<ul style="list-style-type: none">Visually updated the Verity Count dashboard.
	Corrected Defects
2.2.e, 2.2.4.d	Data/Build Help screen for: "Shared Device Behaviors" is inaccurate. The help screen states, "Require user to view all choices in each contest" however what is displayed is "Require voters to view all choices in each contest."
2.2.4.d, 4.3.4.a,d	Scan Scanner multi-feed calibration can get stuck on a spinner and not show the results screen, requiring a lock and unlock of the tablet to exit the screen.
2.2.4.d	Devices Physical keyboard input of "Alt-ESC" returns to the user to the Verity launcher splash screen.
2.2.4.d	Count If the number of columns in contest are less than or equal to 14 in the Canvass Results Report, then a blank page will follow the contest on the PDF export.

End of Modification Test Plan
