

# Certification Test Plan – Modification

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Prepared for:

<b>Vendor Name</b>	<i>Election Systems and Software (ES&amp;S)</i>
<b>Vendor System</b>	<i>EVS 5.2.3.0</i>
<b>EAC Application No.</b>	<i>EVS5230</i>
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***Accredited by the Election  
Assistance Commission (EAC)  
for Selected Voting System Test  
Methods or Services***



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## Revision History

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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 **ES&S EVS 5.2.3.0** against the 2005 Voluntary Voting System Guidelines (VVSG). **ES&S EVS 5.2.3.0** is a modification of **ES&S EVS 5.2.2.0** voting system, certified by the EAC on February 27<sup>th</sup>, 2017, with limited changes. The system 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”.

When the testing is complete, SLI 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 Description and Overview of the Certified System

This system contains a description of the previously certified system, the specific modifications to the current system version, and the impact of those modifications on the system and certification testing.

#### 1.1.1 Definition of the Baseline Certified System

This modification project builds upon the foundation established in **ES&S EVS 5.2.2.0**, which contained the applications **Electionware**, **Removable Media Service**, **Event Logging Service**, and **Election Reporting Manager**, the polling place devices **AutoMARK**, **ExpressVote 1.0**, **DS200**, as well as the central count location devices **DS450**, and **DS850**.

The table below details each application employed by the **ES&S EVS 5.2.2.0** voting system.

**Table 1 – ES&S EVS 5.2.2.0 Software and Firmware**

Application	Version
Electionware	4.7.1.1
Removable Media Service	1.4.5.0
ExpressVote Previewer	1.4.1.2
VAT Previewer	1.8.6.1
Event Log Service	1.5.5.0
Election Reporting Manager (ERM)	8.12.1.1
ExpressVote 1.0	1.4.1.2
DS200	2.12.2.0
DS450	3.0.0.0
DS850	2.10.2.0
AutoMARK	1.8.6.1



## 1.1.2 Modifications

**ES&S EVS 5.2.3.0** is a modification of the EAC-certified **ES&S EVS 5.2.2.0** system. The following modifications are implemented in this release with updates to the **ExpressVote 1.0** only:

- Remove background compensation algorithm that was implemented to deal with colored stock to allow for improved reading of the activation barcode.
- Optimize imaging of activation barcode by slightly increasing the illumination to compensate for the ExpressVote and barcode scanner hardware behavior.
- Optimize EEPROM management to resolve rare issue whereby the unit serial number is incorrectly thought to be invalid and is cleared.
- Update copyright date on startup screen.

## 1.1.3 Initial Assessment of Impact of the Modifications

**ES&S EVS 5.2.3.0's** modifications listed in section 1.1.2 affects the **ExpressVote 1.0** only.

Review of the modifications implemented and source code modified indicates the need for only a limited Functional Configuration Audit (FCA) to verify that the system continues to meet 2005 VVSG 1.0 requirements. The limited FCA will consider not only the implemented modifications, but also functions that have not changed but may be impacted by the modifications.

Updates made to this system only apply to the **ExpressVote 1.0** which has modified source code and will require a new build. This will be subjected to FCA review at an appropriate level of scrutiny.

## 1.1.4 Regression Testing

This section describes what system elements will be regression tested to establish assurance that the modifications have no adverse impact on the compliance, integrity or performance of the system.

Regression testing will focus around the **ExpressVote 1.0** modification for optimization of the bar code imaging. This will be achieved through a series of accuracy test modules utilizing different voting card sizes, a test module that demonstrates improved clarity of a degraded barcode image as a result of the firmware update, as well as general and primary elections, to ensure the **ExpressVote 1.0** is accurately marking ballots. Ballots will be run through a central scanner device then read into the Election Reporting Manager to compare against machine operations logs and audit reports.



## 1.2 References

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

1. Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG), 2005 Version 1.0 Volumes I and II.
2. NIST Handbook 150: 2016.
3. NIST Handbook 150-22: 2008.
4. EAC Voting System Testing and Certification Program Manual, United States Election Assistance Commission, v 2.0, May 2015
5. SLI VSTL Quality System Manual, 2.4, prepared by SLI, dated October 20, 2017.

## 1.3 Terms and Abbreviations

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

**Table 2 – 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.



Term	Abbreviation	Description
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.
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 Data Package	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.
Voter Verifiable Paper Audit Trail	VVPAT	An independent verification system for voting machines designed to allow voters to verify that their vote was cast correctly, to detect possible election fraud or malfunction, and to provide a means to audit the stored electronic results.
Voting System Test Lab	VSTL	An independent testing organization accredited by NVLAP and the EAC to conduct voting system testing for EAC certification.
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 who has been qualified to perform EAC voting system certification testing.

## 1.4 Testing Responsibilities

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

### 1.4.1 Project Schedule

The subsections below describe the project schedule.

#### 1.4.1.1 Owner Assignments

- System Analysis and Review will be conducted by Source Code Review Specialists, and Voting Test Specialists, with oversight by the Test Manager
- Source code review will be conducted by Source Code Review Specialists, with oversight by the Test Manager



- Documentation review will be conducted by Voting Test Specialists, with oversight by the Test Manager
- Test Module Development will be conducted by Voting Test Specialists, with oversight by the Test Manager
- Test Suite Development will be conducted by Voting Test Specialists, utilizing SLI's formal Test Methods, with oversight by the Test Manager
- Formal Test Execution will be conducted by Voting Test Specialists, with oversight by the Test Manager

#### 1.4.1.2 Test Module Development

Test Modules will be developed and/or modified to provide repeatable detailed test steps. The Test Modules will be validated prior to Formal Test Execution to ensure accurate testing of the voting system modifications. Additionally, the Test Modules will provide traceability to the 2005 VVSG 1.0 requirements by referencing each VVSG requirement addressed within the Test Module.

#### 1.4.1.3 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. Potentially, variations of the same suite may be run multiple times to verify different configurations.

#### 1.4.1.4 Trusted Build

A Trusted Build was performed for the **ExpressVote 1.0** firmware version 1.4.1.6 which was used for Formal Test Execution on **ES&S EVS 5.2.3.0**. All other components of the **ES&S EVS 5.2.3.0** voting system are previously certified under the EAC certified **ES&S EVS 5.2.2.0** voting system.

#### 1.4.1.5 Formal Test Execution

Formal execution of the approved Test Suites and modules will be conducted to verify the system's compliance with the 2005 VVSG 1.0 requirements.

#### 1.4.1.6 Third Party Hardware Testing

No hardware testing is scheduled for this certification project.

#### 1.4.1.7 Project Timeline

The following schedule outlines the expected timeline for this project.

Task Name	Start	Finish
<b>5230 EAC Certification</b>	<b>Thu 10/12/17</b>	<b>Tue 1/16/18</b>
<b>Phase 1</b>	<b>Thu 10/12/17</b>	<b>Thu 1/4/18</b>
<b>Project Initiation</b>	<b>Thu 10/12/17</b>	<b>Wed 10/25/17</b>
<b>TDP Deliver/Receive Vendor Package</b>	<b>Fri 10/20/17</b>	<b>Mon 11/6/17</b>
<b>Submission - Document Check-in</b>	<b>Fri 10/20/17</b>	<b>Fri 10/20/17</b>



Task Name	Start	Finish
<b>TDP Review</b>	<b>Mon 10/30/17</b>	<b>Thu 11/2/17</b>
<b>Hardware</b>	<b>Mon 11/6/17</b>	<b>Mon 11/6/17</b>
<b>Test Plan Development</b>	<b>Thu 10/12/17</b>	<b>Thu 1/4/18</b>
<b>Phase 2</b>	<b>Tue 10/24/17</b>	<b>Fri 11/10/17</b>
<b>Source Code Review</b>	<b>Tue 10/24/17</b>	<b>Thu 10/26/17</b>
<b>Vendor Specific Module Creation/Validation</b>	<b>Mon 11/6/17</b>	<b>Tue 11/7/17</b>
<b>Trusted Build</b>	<b>Thu 11/9/17</b>	<b>Mon 11/13/17</b>
<b>Notify EAC of Test Suites Ready for their review</b>	<b>Tue 11/14/17</b>	<b>Tue 11/14/17</b>
<b>Phase 3</b>	<b>Tue 11/14/17</b>	<b>Fri 11/17/17</b>
<b>Official Test Execution of Test Suites</b>	<b>Tue 11/14/17</b>	<b>Fri 11/17/17</b>
<b>Phase 4</b>	<b>Wed 10/25/17</b>	<b>Wed 1/31/18</b>
<b>Create Certification Report</b>	<b>Mon 12/4/17</b>	<b>Tue 12/5/17</b>
<b>Final updates to Test Plan</b>	<b>Tue 12/5/17</b>	<b>Tue 12/5/17</b>
<b>EAC Review</b>	<b>Tue 12/5/17</b>	<b>Tue 1/9/18</b>
<b>Final updates to Test Report</b>	<b>Tue 1/9/18</b>	<b>Wed 1/10/18</b>
<b>EAC Acceptance</b>	<b>Wed 1/10/18</b>	<b>Wed 1/31/18</b>
<b>Report Complete</b>	<b>Wed 1/31/18</b>	<b>Wed 1/31/18</b>
<b>Project Management</b>	<b>Wed 10/25/17</b>	<b>Tue 12/19/17</b>
<b>EAC Repository and Manufacturer</b>	<b>Wed 1/31/18</b>	<b>Thu 2/1/18</b>
<b>Phase 5</b>	<b>Wed 1/31/18</b>	<b>Fri 2/2/18</b>
<b>Manufacturer Deposit</b>	<b>Wed 1/31/18</b>	<b>Wed 1/31/18</b>
<b>Return Equipment to Vendor</b>	<b>Wed 1/31/18</b>	<b>Fri 2/2/18</b>
<b>Archive Test Materials</b>	<b>Wed 1/31/18</b>	<b>Thu 2/1/18</b>

### 1.4.1.8 EAC & Manufacturer Dependencies

The Test Plan will require EAC approval prior to finalization.

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

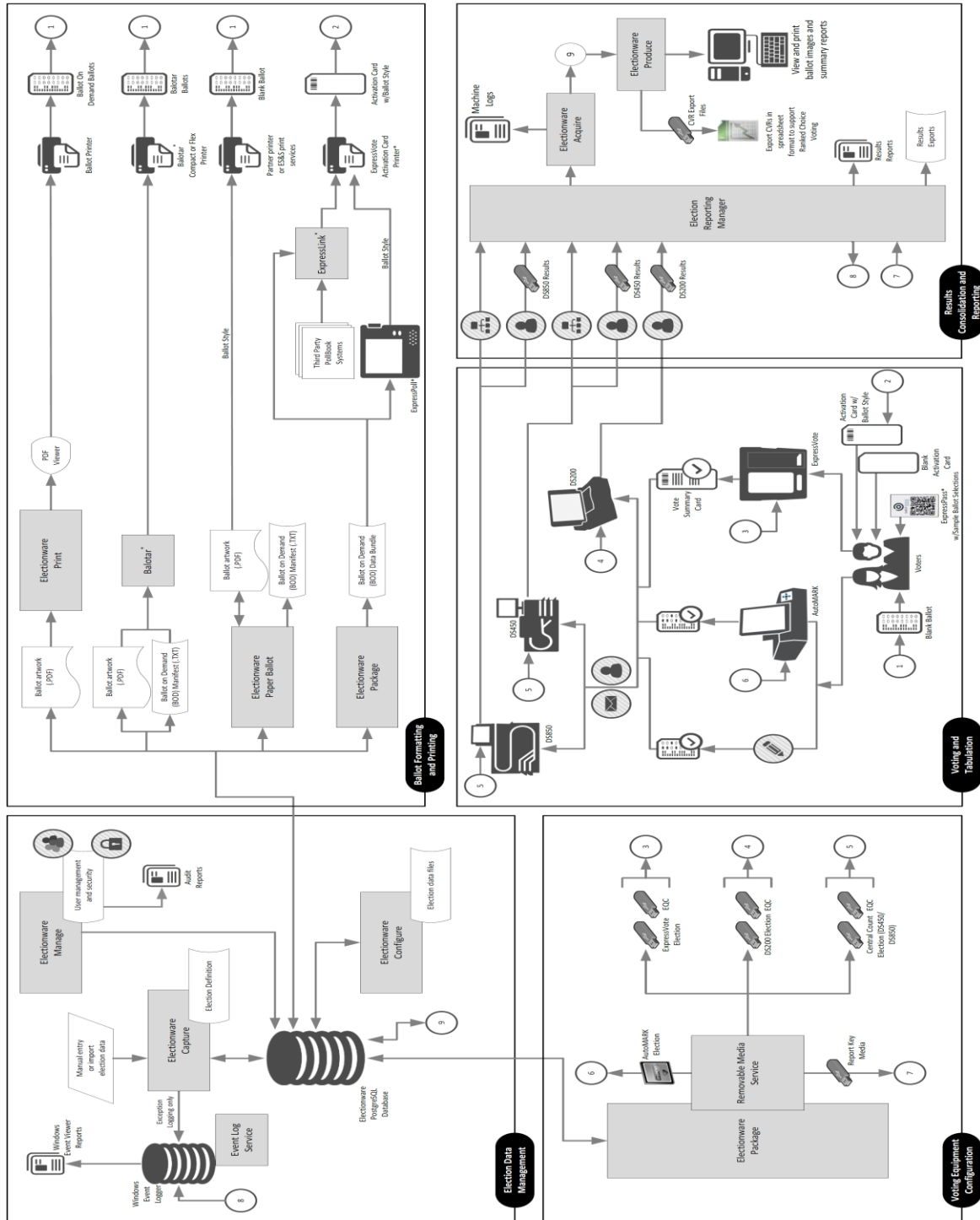
The source code must have all discrepancies resolved, be able to be built successfully, installed, as well as successfully complete operational status checks prior to Formal Test Execution.

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

Please see the Project Plan for a detailed listing of all activities within the scope of this test campaign.

## 1.5 Scope of Testing

### 1.5.1 Block Diagram





### 1.5.2 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.

### 1.5.3 EAC Notices of Clarification

This Certification Test Plan and the execution of tests for the voting system identified in this plan account for the following NOC's:

- NOC 13-02: Detailed Description of Changes for Modifications
- NOC 09-005: Development and Submission of Test Plans for Modifications to EAC Certified Systems.
- NOC 09-002: Clarification of EAC Laboratory Independence Requirement
- NOC 09-001: Clarification of the Requirements for Voting System Test Laboratories (VSTLs) Development and Submission of Test Plans
- NOC 08-003: Clarification of EAC Conformance Testing Requirements for Voting System Test Laboratories (VSTLs)

## 2 PRE-CERTIFICATION TESTING AND ISSUES

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### 2.1 Evaluation of prior VSTL testing

VSTL testing has been performed on the version previous to the **ES&S EVS 5.2.3.0** voting system. The previous version of this system, **ES&S EVS 5.2.2.0**, is EAC certified and will serve as the source code base for this evaluation.

### 2.2 Evaluation of prior non-VSTL testing

No prior state or non-VSTL lab testing has been performed on the **ES&S EVS 5.2.3.0** voting system. Review of ES&S's internal testing is performed during the FCA review.

### 2.3 Known Field Issues

Review of the "Known Vulnerabilities" database, maintained by SLI, has provided 49 known vulnerabilities to previous **ES&S** systems, which are already accounted for in SLI's Testing. At this time, there are no known field issues or vulnerabilities specific to this system.



## 3 MATERIALS REQUIRED FOR TESTING

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

### 3.1 Software/Firmware

All software and 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 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 Manufacturer Software/Firmware

The **ES&S EVS 5.2.3.0** voting system consists of the following software and firmware components:

- **ExpressVote 1.0** Universal Voting System firmware
- **DS450** Central Tabulator firmware, Central Count scanner and tabulator
- **DS850** Central Tabulator firmware, Central Count scanner and tabulator
- **DS200** Precinct Tabulator firmware, Precinct scanner and tabulator
- **AutoMARK** BMD firmware
- **Electionware** Election database creation, media programming and tally/reporting software
- **Event Log Service (ELS)** software service monitoring user's interactions with the Election Management System
- **Removable Media Service (RMS)** software service supporting election media programming
- **Election Reporting Manager (ERM)** software service supporting election results reporting

The table below details each application employed by the **ES&S EVS 5.2.3.0** voting system.



**Table 3 – ES&S EVS 5.2.3.0 Software and Firmware**

Application	Version
Electionware	4.7.1.1
Removable Media Service	1.4.5.0
ExpressVote Previewer	1.4.1.6
VAT Previewer	1.8.6.1
Event Log Service	1.5.5.0
Election Reporting Manager (ERM)	8.12.1.1
ExpressVote 1.0	1.4.1.6
DS200	2.12.2.0
DS450	3.0.0.0
DS850	2.10.2.0
AutoMARK	1.8.6.1

### 3.1.2 COTS Software/Firmware

This section details the Commercial Off The Shelf software and firmware utilized within the **ES&S EVS 5.2.3.0** system.

**Table 4 – COTS Software/Firmware**

Manufacturer	Application	Version
Microsoft Corporation	Window 7 Professional	SP-1 (64-bit)
Microsoft Corporation	Windows Server 2008	R2, SP-1 (64-bit)
Microsoft Corporation	WSUS Microsoft Windows Offline Update Utility	10.7.4
Symantec	Symantec Endpoint Protection	12.1.6
Symantec	Symantec Endpoint Protection Intelligent Updater	20160829-002-v5i64.exe
Adobe	Adobe Acrobat Standard	v. 11
Cerberus	Cerberus FTP Server - Enterprise	8.0.6(64-bit)
RMCOBOL	Microfocus	v. 12.06

### 3.1.3 Additional Supporting Test Software

This section outlines all test specific supporting software that will be used by SLI to conduct testing in this certification campaign.

**Table 5 – Additional Supporting Test Software**

Manufacturer	Application	Version
LocMetrics	LocMetrics Line Counter	2007



Manufacturer	Application	Version
SLI Compliance	Module Finder	1.0
Prestosoft	ExamDiff Pro	3.0
Scitools	Understand	4.0
gurock	TestRail	5.4.0.3660

## 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 ES&S EVS 5.2.3.0 Equipment

The following manufacturer equipment will be used in testing:

**Table 6 – ES&S EVS 5.2.3.0 Equipment**

Hardware	Model
ExpressVote Universal Voting System	1.0
DS200	1.2, 1.2.3, 1.3
DS450	1.0
DS850	1.0
AutoMARK	1.3
ExpressVote Rolling Kiosk	98-00049
ExpressVote Voting Booth	87001
ExpressVote ADA Table	87031
DS200 Plastic Ballot Box	57521
DS200 Metal Ballot Box	N/A
DS200 Tote Bin	00074
DS450 Cart	3002
DS850 Cart	6823

### 3.2.2 COTS Equipment

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





**Table 7 – COTS Equipment**

Manufacturer	Hardware	Model	Operating System
INNO Disk	USB (1GB)	DEUF-01GI21C1/DEUH1-01GI72AC1SB-B190	N/A
MEGA -POWER WIN	Power Supply	MDS160T-P240-0618	N/A
POWER-WIN	Power Supply	PW-080A2-1Y24AP	N/A
WALL INDUSTRIES	Power Supply	DTA8021Y24ESS	N/A
Seiko	Thermal Printer	LTP9447A-S832-E	N/A
Symbol Technologies	Scanner (External)	DS9208	N/A
Zebra Technologies	Scanner (Integrated)	DS457-SR20009	N/A
OKI	Audit Printer	Microline 420	N/A
Dell	Report Printer	S2810dn	N/A
OKI	Report Printer	B431D, B431DN	N/A
SanDisk	Compact Flash Memory Card: 512 MB, 1 GB, 2 GB	N/A	N/A
SanDisk	Compact Flash Memory Card Reader/Writer	N/A	N/A
APC	Backup power supply (Uninterruptible Power Supply)	Back-UPS Pro 1500 or RS 1500	N/A
Tripp Lite	Spike Cube	SPIKECUBE	N/A
Delkin	USB Flash Drive: 1 GB, 2 GB, 4 GB, 8 GB	N/A	N/A
Delkin	Validation USB Flash Drive: 16 GB	N/A	N/A
Delkin	Compact Flash Memory Card: 1 GB max	N/A	N/A
Delkin	Compact Flash Memory Card Reader/Writer	6381	N/A
Seiko Instruments	Thermal Printer	LTPD-347B	N/A
NCR / Nashua	Paper Roll	2320	N/A
HP Inkjet	Print Cartridge	87002	N/A
AVID	Headphones	86002	N/A



Manufacturer	Hardware	Model	Operating System
Various (EMS Networked or Standalone configuration)	<ul style="list-style-type: none"><li>Processor: Dual Core</li><li>RAM: 4 GB, 8 GB recommended</li><li>Hard Disk: 150 GB</li><li>Keyboard</li><li>Mouse</li><li>Monitor: 1280x800 resolution</li><li>CD/DVD reader: 16x min</li><li>2 USB ports: 2.0 min</li><li>Report Printer: w/printer control language driver</li></ul>	N/A	Windows 7 Professional, SP-1 (64-bit)
Various (EMS Networked server configuration)	<ul style="list-style-type: none"><li>Processor: Quad Core</li><li>RAM: 4 GB</li><li>Hard Disk: 320 GB</li><li>Keyboard</li><li>Mouse</li><li>Monitor: 1280x800 resolution</li><li>CD/DVD reader: 16x min</li><li>2 USB ports: 2.0 min</li><li>Report Printer: Network printer w/printer control language driver</li><li>Ethernet Port</li><li>Back-up power supply: 865 Watts / 1500 VA output capacity</li><li>Network Switch: 1 GB throughput</li></ul>	N/A	Windows Server 2008 R2, SP-1 (64-bit)

### 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.

- Activation cards



- Ballot pens
- Compact Flash memory cards
- USB flash drives
- Printer paper rolls

### 3.4 Deliverable Materials

The following are documents and materials to be delivered as a part of the **ES&S EVS 5.2.3.0** system.

**Table 7 – ES&S Technical Data Package**

Document	Version
System Overview	1.2
System Functionality Description	1.0
DS200 Operator's Guide	1.1
DS450 Operator's Guide	1.1
DS850 Operator's Guide	1.1
EVS Event Log Service User's Guide	1.0
Election Reporting Manager User's Guide	1.0
Electionware Vol. I: Administrator Guide	1.0
Electionware Vol. II: Define User Guide	1.0
Electionware Vol. III: Design User Guide	1.0
Electionware Vol. IV: Deliver User Guide	1.0
Electionware Vol. V: Results User Guide	1.0
Electionware Vol. VI: Appendices	1.0
ExpressVote Operator's Guide (HW1.0)	1.0
AutoMARK System Hardware Specification	6
AutoMARK System Overview	9
Requirements of the 2005 VVSG Trace to Technical Data Package	1.0
DS200 Hardware Specification HW 1.2	3.4
DS200 Hardware Specification HW 1.3	4.5
DS450 Hardware Specification	1.6
DS850 Hardware Specification	1.6
ExpressVote Hardware Specification HW1.0	3.6
Approved Parts List - DS200 v1.2	1.2
Approved Parts List - DS200 v1.3	1.1
Approved Parts List - DS450	1.1
Approved Parts List - DS850	1.1
Approved Parts List - ExpressVote v1.0	1.1
Approved Parts List – A100	2.0
Approved Parts List – A200	2.0
Approved Parts List – A300	2.0
System Development Program	1.5



Document	Version
ES&S Coding Standards	1.2
License Agreements for Procured Software	1.3
DS200 – Software Design Specification	1.0
DS450 – Software Design Specification	1.0
DS850 – Software Design Specification	1.0
Electionware – Software Design Specification	1.0
Electionware – PostGreSQL Entity Descriptions	N/A
Event Log Service – Software Design Specification	1.0
ExpressVote (HW1.0) Software Design Specification	1.0
Election Reporting Manager Software Design Specification	1.0
Usability Test Report: DS200 Precinct-Based Scanner and Tabulator	N/A
Certification Test Cases - Accuracy	N/A
Certification Test Cases - Core Elections	N/A
Certification Test Cases – Optimization	N/A
Usability Test Report: ExpressVote Universal Voting System (HW1.0)	N/A
EMS Client Workstation Secure Setup & Configuration Guide	1.0
EMS Server Secure Setup & Configuration Guide	1.0
Standalone EMS Workstation Secure Setup & Configuration Guide	1.0
Voting System Security Specification	1.0
Security Script Description	1.0
Verification Procedure: DS200 Precinct Scanner and Tabulator	1.0
Verification Procedure: DS450 High-Throughput Scanner & Tabulator	1.0
Verification Procedure: DS850 High-Speed Scanner & Tabulator	1.0
Verification Procedure: Election Management System Workstation and Server	1.0
Verification Procedure: ExpressVote Hardware 1.0	1.0
Verification Procedure: AutoMARK	1.0
Validation File List: DS200	1.0
Validation File List: DS450	1.0
Validation File List: DS850	1.0
Validation File List: Event Log Service	1.0
Validation File List: ExpressVote HW1.0	1.0
Validation File List: ExpressVote HW1.0 Previewer	1.0
Validation File List: Electionware	1.0
Validation File List: Removable Media Service	1.0
Validation File List: ERM	1.0
Validation File List: AutoMARK	1.0
Validation File List: VAT Previewer	1.0
DS200 Maintenance Manual	1.0



Document	Version
DS450 Maintenance Manual	1.0
DS850 Maintenance Manual	1.0
ExpressVote Maintenance Manual (HW1.0)	1.0
AutoMARK Maintenance Manual	1.0
Personnel Deployment and Training Program	1.1
Configuration Management Program	2.1
Technical Documentation Program	1.0
Manufacturing Quality Assurance Program	1.1
Software Quality Assurance Program	1.2
Ballot Production Guide for EVS	2.9
Conformity Statement: 2005 VVSG	N/A
COTS Production Implementation Plan	1.0
EAC Application Requirements Trace	N/A

## 4 TEST SPECIFICATIONS

The following are the specifications for testing to be conducted on the **ES&S EVS 5.2.3.0** system. The specifications contain details on the focus of testing, configuration(s), and the functions to be tested. Additional information is provided in the associated appendices.

### 4.1 Requirements

The **ES&S EVS 5.2.3.0** system will be tested to the approved 2005 VVSG 1.0 requirements.

**ExpressVote 1.0's** firmware modification to optimize imaging of activation barcodes by slightly increasing the illumination to compensate for hardware behavior as detailed in section "1.1.2 Modifications". Pertinent VVSG requirements are:

- 2.1.2.c Accuracy
- 6.2.3 Testing Volume

### 4.2 Hardware Configuration and Design

The **ES&S EVS 5.2.3.0** system, as declared in the application for certification submitted to the EAC, consists of:

- An **Electionware** standalone workstation with minimum requirements of 150 GB hard disk, 8 GB of recommended memory and Dual Core processing speed.
- For network configuration, a networked workstation with minimum requirements of 150 GB hard disk, 8 GB of recommended memory and



Dual Core processing speed. Additionally, the network configuration includes a server with minimum requirements of 320 GB hard disk, 4 GB of memory and Quad Core processing speed.

- The precinct level employs the **ExpressVote 1.0**, the **AutoMARK BMD**, and the **DS200** tabulator.
- The central count location employs the **DS450** and **DS850** tabulators.
- The consolidation, tally and reporting process employs the workstation with either a direct connect or a network printer.

## 4.3 Test Suite Design

### 4.3.1 Software Functional Test Design and Data

SLI has prepared functional test modules using the operator/user procedures contained within **ES&S's** TDP. Functionality provided by **ES&S EVS 5.2.3.0** 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.

After analysis of the changes incorporated into the **ES&S EVS 5.2.3.0** voting system, the following tests are implemented:

**ExpressVote 1.0** Accuracy test modules – The modification to the **ExpressVote 1.0** device will be given focused testing to verify that the modification implemented, and the subsequent Trusted Build of the firmware, does not adversely affect operations.

**ExpressVote 1.0** Barcode Optimization – The modification to the **ExpressVote 1.0** device will be tested with a direct demonstration of a degraded barcode image that is significantly more clear following an update to the **ExpressVote 1.0** firmware.

General Election test module – The **ExpressVote 1.0** will be reviewed in order to verify continued integration of the voting system and that all components continue to work as expected.

Primary Election test module – The **ExpressVote 1.0** will be reviewed in order to verify continued integration of the voting system and that all components continue to work as expected.

## 4.4 TDP Evaluation

SLI is completing an assessment of the deliveries of the Technical Data Package for **ES&S EVS 5.2.3.0** against the **ES&S EVS 5.2.2.0** TDP. Any modification to previously reviewed documentation is being reviewed. 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.



#### 4.4.1 Document Review

SLI conducted a PCA review of all vendor traced documents submitted for review in the delivery of the **ES&S EVS 5.2.3.0** TDP. These included:

- System configuration overview
- System functionality description
- System hardware specifications
- Software design and specifications
- System test and verification specifications
- System security specifications
- User/system operations procedures
- System maintenance procedures
- Personnel deployment and training requirements
- Configuration management plan
- Quality assurance program
- System change notes

Documents are verified for compliance to the 2005 VVSG 1.0, Volume 2, Sections 2.2 through 2.13 and Volume 2, Section 6.6. Unless noted otherwise, all requirements are successfully met within the pertinent areas of the TDP.

### 4.5 Source Code Review

#### 4.5.1.1 Source Code Review

The certification campaign for the **ES&S EVS 5.2.3.0** voting system includes software and firmware from **ES&S EVS 5.2.2.0** that have been modified by and are proprietary to **ES&S**. SLI has conducted a source code review of all modified source code for the **ExpressVote 1.0** submitted in the delivery of the voting system TDP for **ES&S EVS 5.2.3.0** for compliance to the VVSG, version 2005 1.0, Volume 2, Section 6.6. No COTS products were modified for this voting system version.

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

- C
- C++
- C#
- COBOL
- SQL
- Assembler
- VB.Net
- Java





Source Code Review Tools utilized by SLI include

- Module Finder: an SLI proprietary application used to parse module names from C/C++ and VB code and populate the identified module names into the review documents;
- ExamDiff Pro: a commercial application used to compare revised code to previously reviewed code

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

COTS operating systems and software used in the voting system have been verified as authentic and unmodified in the **ES&S EVS 5.2.3.0** test campaign.

## 4.6 Trusted Build

The Trusted Build for the **ExpressVote 1.0** firmware version 1.4.1.6, which was used for Formal Test Execution on **ES&S EVS 5.2.3.0**, will be conducted prior to SLI's final testing and will be completed on site at SLI's facility. SLI will use its approved standard lab procedure that details the processes for controlling, managing, and conducting the Trusted Build. This process includes the following:

- Preparation for the Trusted Build - Obtaining and reviewing **ES&S's** procedure for constructing the build platform, verifying the target build platform, and acquiring and verifying the necessary materials.
- Execution of the Trusted Build – SLI will perform the Trusted Build by using the step-by-step build procedure, as provided by **ES&S**, to create a pristine build environment. SLI records and ascertains 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 install files and file hashes
- Deliverables to Testing – Upon completion of the Trusted Build, certain items are sent to the SLI test group. The final result will be a media containing the following:
  - Final software install files
  - Hash values to validate install files
- Final Record Keeping and Archiving Procedures – At the conclusion of the Trusted Build process, SLI completes all final record keeping and archiving procedures at SLI'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.

## 4.7 Standard VSTL Test Methods and Uncertainty of Test Data Measurement

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

## 5 TEST DATA

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Test data for the **ES&S EVS 5.2.3.0** voting system has been compiled such that all functionality declared will be tested to determine conformance to the standards.

### 5.1 Data Recording

SLI has evaluated the system functionality, as described by **ES&S's** technical documentation, as well as requirements as listed in the EAC 2005 VVSG 1.0, and made determinations as to expected results of all data inputs into the **ES&S EVS 5.2.3.0** voting system. This includes:

- Offices
- Contests
- Candidates
- Votes cast for each candidate/issue/referendum

The data is contained in one master data record, including each input and each expected output. This data is incorporated into the appropriate test suite.

Testing information is recorded in the test suites, as well as in test notebooks, which are utilized according to SLI's standard lab procedure *SLP-VC-30 - Test Notebooks*.

### 5.2 Test Data Criteria

SLI has evaluated the system functionality as described by manufacturer technical documentation, as well as requirements as listed in the EAC 2005 VVSG 1.0, and made determinations as to expected output of all data inputs into the **ES&S EVS 5.2.3.0** voting system. A data matrix has been recorded into one master data record that couples data inputs to their expected output, as determined above. The system's execution shall be measured against the expected results.

## 6 TEST PROCEDURE AND CONDITIONS

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This section describes the test conditions and procedures for execution of test suites. Additionally, this section is used to describe procedures for setting up equipment that will be utilized in the execution of the test suites.

## 6.1 Facility Requirements

Testing will be performed on site at SLI in Wheat Ridge, Colorado.

Two 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 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: 68 to 75°F ± 4°F
- Relative Humidity: 20 to 90%
- Atmospheric Pressure: Local Site Pressure

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

## 6.2 Test Setup

Configurations of **ES&S EVS 5.2.3.0** will be deployed that conform to each specific test suite's needs. In all instances **ES&S EVS 5.2.3.0** documentation will be followed in the setup of the configurations.

Successful completion of operational status checks will indicate that the system is ready for test execution.

## 6.3 Test Sequence

There is no required sequence for performing **ES&S EVS 5.2.3.0** voting system certification testing and audits.

## 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:

- **Accept** – Test is accepted as successful.
- **Reject** – Test is rejected as unsuccessful.



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

Test results **Reject** and **NT** will include comments by the VTS 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 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.

## 7 Approval Signatures

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SLI:

Traci Mapps  
Director of Operations, SLI Compliance  
January 4<sup>th</sup>, 2018

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End of Certification Test Plan

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