Election Assistance Commission
Voting System Certification Testing

Certification Test Plan

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Prepared for:

Vendor Name	Election Systems & Software
Vendor System	Election Systems and Software (ES&S) Unity 4.0 Voting System
EAC Application No.	ESS0702
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Accredited by the Election Assistance Commission (EAC) for Selected Voting System Test Methods or Services

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1 INTRODUCTION

This Certification Test Plan outlines the approach SysTest Labs will implement to perform Election Assistance Commission (EAC) certification testing of the Election Systems and Software (ES&S) Unity 4.0 voting system to the approved voting system Standards (VSS), version 2002. The purpose of this document is to provide a clear and precise plan for test elements required to ensure effective Certification testing as outlined in section 1.2 of this Certification Test Plan.

This test plan:

- Identifies items that need to be tested;
- Defines the test approach;
- Identifies required hardware, support software, and tools to be used for testing; and
- Identifies the types of tests to be performed.

SysTest Labs will provide certification testing on the ES&S Unity 4.0 voting system based on the guidelines established for voting system certification testing as defined by the EAC. This effort includes all required levels of software, firmware, system and hardware environmental testing required to demonstrate that the ES&S Unity 4.0 voting system meets the requirements of the VSS, the appropriate portions of the Help America Vote Act (HAVA), and associated Vendor specific requirements. SysTest Labs' major task categories for voting system certification testing, as defined by SysTest Labs' National Voluntary Lab Accreditation Program (NVLAP) audited and approved Quality System Manual and associated SysTest Labs Procedures (SLP), include:

- Physical Configuration Audit (PCA)
  - Verification of software and hardware functional and physical configurations
  - Iterative documentation review and assessment
  - Iterative source code review

- Functional Configuration Audit (FCA)
  - Iterative review of ES&S System Test & Verification Specification and all of ES&S's completed testing to ES&S System Requirements Specification, as outlined in the FEC VSS Volume 1, Section 2
  - Iterative hardware is environmentally testing
  - Iterative software and firmware testing to validate logic
  - Iterative testing of voting systems to validate functionality, accuracy, performance, security, and system level integration

- Management of Vendor supplied deliverables, SysTest Labs' test artifacts, and software, firmware, hardware and system test configurations

- Generation of test cases that ensure that the voting system meets all applicable VSS requirements, appropriate portions of HAVA, and associated Vendor specific requirements

- Traceability and tracking of test cases to VSS requirements, appropriate portions of HAVA, requirements established by the EAC and associated Vendor specific requirements

- Software, Firmware, System, and Hardware test execution

- Reporting of all test results

SysTest Labs' will develop and submit to the EAC a certification test report deliverable that details all test results and findings as a result of this certification test effort, as well as a recommendation to certify or not to certify based on the test results.

1.1 Certification Test Plan Attachments

The following attachments apply to this Certification Test Plan:

1. Attachment A: List of Technical Data Package (TDP) Deliverables
2. Attachment B: Supported Functionality Declaration
3. Attachment C: List of Source Code Reviewed - **PROPRIETARY**
4. Attachment D: Hardware Test Plans
5. Attachment E: Unity 4.0 Test Case Matrix
6. Attachment F: Security and Telecom Test Case
7. Attachment G1: Documentation and Functional Discrepancy Report
8. Attachment G2: Source Code Discrepancy Report - **PROPRIETARY**
9. Attachment H: Hardware Testing Results from Hardware Test Laboratories
10. Attachment I: Accredited Hardware Test Lab Certifications

1.2 Scope of the ES&S Unity 4.0 Voting System

This section provides a brief overview of the scope of the ES&S Unity 4.0 voting system components.

Please note that each of the items listed in Table 1 - Summary of Unity 4.0 Voting System Components, Figure 1 Overview of Unity 4.0 Election Support Process and Figure 2 Overview of the Unity 4.0 Components are explicitly defined in Table 1, Table 4 and Table 5. The list of software, firmware, and hardware components, their model numbers and versions, and their configurations included in this certification testing effort are defined solely by ES&S in the TDP items delivered to both SysTest Labs and the EAC.

Table 1 - Summary of Unity 4.0 Voting System Components

Software/Firmware	Hardware
Election Management System (EMS) • Audit Manager	• Compact Flash Multi-Card Reader/Writer

Software/Firmware	Hardware
• Election Data Manager • AutoMARK Information Management System (AIMS) • ES&S Ballot Image Manager (includes Ballot on Demand) • iVotronic Image Manager • Hardware Programming Manager • Data Acquisition Manager • Election Reporting Manager	• Automatic Bar Code Reader • Hand held bar code scanner (Voyager) • iVotronic DRE with a 4-inch Real-Time Audit Log printer • iVotronic DRE with a 9.5-inch Real-Time Audit Log printer • iVotronic DRE without a 4-inch Real-Time Audit Log printer • iVotronic DRE without a 9.5-inch Real-Time Audit Log printer • iVotronic DRE with stand-alone printer • iVotronic DRE with the communication pack • AutoMARK Voter Assist Terminals • Model 100 precinct scanner with steel ballot box • intElect DS200 precinct/central count scanner with steel ballot box • Model 650 central count scanners with green light optical sensor to read ovals on the left and right • Model 650 central count scanners with green and red light optical sensors to read ovals on the left

Figure 1 Overview of Unity 4.0 Election Support Process

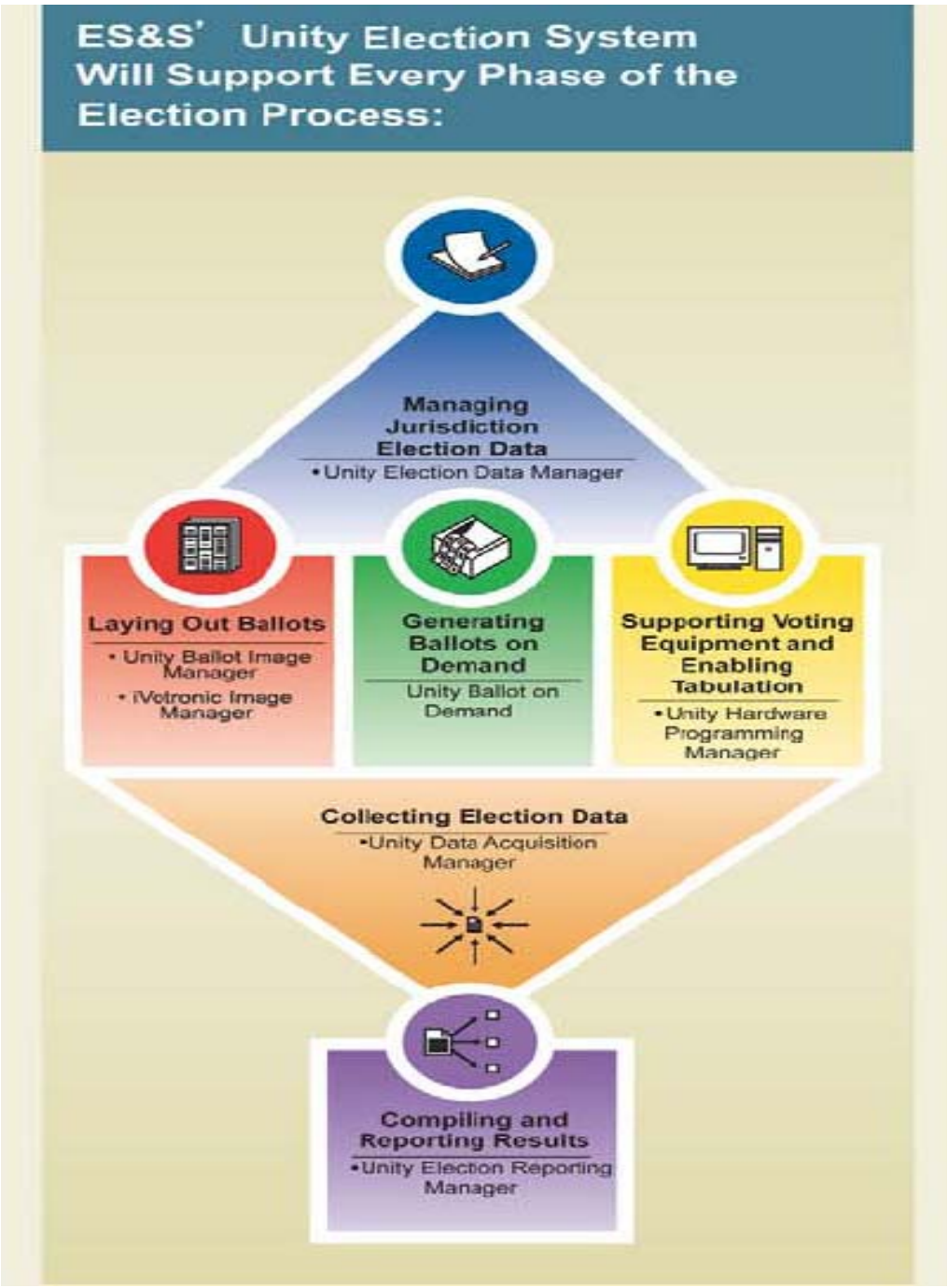
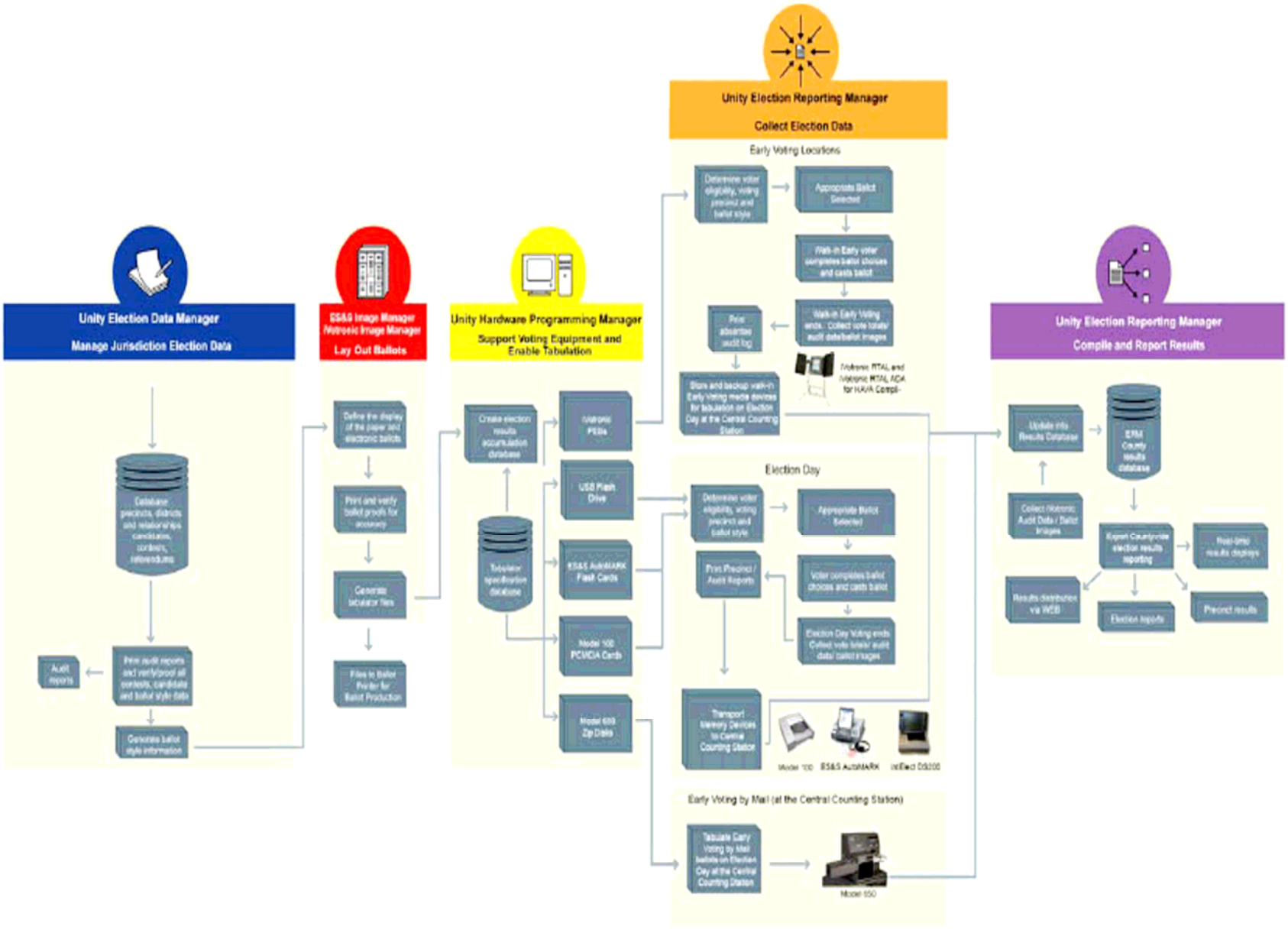


Figure 2 Overview of the Unity 4.0 Components



1.3 Applicable Standards

1.3.1 Applicable Voting System Standards

All testing will determine whether or not the Election Systems and Software (ES&S) Unity 4.0 voting system meets the requirements from the following voting system Standards:

1. VSS, version 2002[1]
2. Help America Vote Act (HAVA) – Section 301

1.3.2 Applicable Testing Standards

All testing will be conducted based on the following testing standards and guidelines[2]:

1. NIST NVLAP Handbook 150: 2006
2. NIST NVLAP Handbook and 150-22: 2005[3]
3. NIST NVLAP Handbook and 150-22: 2007
4. EAC Testing and Certification Program Manual, United States Election Assistance Commission, 2006
5. DRAFT – VSTL Accreditation Program Manual DRAFT

1.4 References

1. IEEE Standard for Software Quality Assurance Plans IEEE Std 730-1998, October 20th, 1998.
2. IEEE Standard for Software Configuration Management Plans IEEE Std 828-1998, June 25th, 1998.
3. IEEE Standard for Software Test Documentation IEEE Std 829-1998, December 16th, 1998.
4. IEEE Recommended Practice for Software Requirements Specifications IEEE Std 830-1998, October 20th, 1998.
5. IEEE Standard for Software Unit Testing IEEE Std 1008-1987, December 29th, 1986.
6. IEEE Standard for Software Verification and Validation IEEE Std 1012-1998, July 20th, 1998.
7. SysTest Labs Quality System Manual, Revision 1.0, November 3, 2006.
8. ISO 17025

[1] Please note that in addition to the VSS, version 2002 requirements, SysTest Labs must interpret and apply similar requirements from the VSS, version 2002 for Voter Verifiable Paper Audit Trail capabilities, Ballot Marking Devices, and Bar Code Readers.

[2] Where conflicts in the testing standards exist, the EAC Guidelines take precedence.

[3] SysTest Labs was accredited as a VSTL under the 150-22: 2005 NIST Handbook but the EAC has requested that where conflicts exist, testing adhere to the guidelines defined in the 150-22: 2007 NIST Handbook.

1.5 Terms, Abbreviations and Definitions

The following terms and definitions

Table 2 - Matrix of Terms & Abbreviations provided by the vendor.

Term	Abbrevi-ation	Definition
Audit Manager	AM	Audit Manager is ES&S' tracking program for the Unity software suite. AM tracks user activity in AM, EDM and ESSIM.
Automatic Bar Code Reader	ABCR	The ABCR is a device that audits and recounts the printout generated by the iVotronic RTAL printer. The ABCR device interfaces with ABCR software installed on a PC to generate reports based upon the scanned barcodes from the RTAL printout.
AutoMARK Information Management System	AIMS	Software that facilitates creation of the election database, or conversion of a 3rd party election database, for installation on the VAT.
AutoMARK Voter Assist Terminal	VAT	AutoMARK Technical Systems optical paper ballot marking device for disabled voters and alternative languages
Ballot On Demand	BOD	Election officials use Ballot on Demand to print test ballots, early voting ballots and ballots for polling places that run short of ballot stock on Election Day.
Binary Logic Input Device		Alternative accessible appliance that is connected to the AutoMARK Voter Assist Terminal through a stereo jack, enabling the voter to issue either a yes or no command. These devices may include foot pedals and Sip/Puff tubes.
Compact Flash Multi-Card Reader/Writer		The ES&S Compact Flash Multi-Card Reader/Writer reads and writes data to multiple flash cards. A multi-card reader/writer may also be called a gang burner. Use the multi-card reader before an election to transfer ballot data to compact flash cards for the iVotronic. Election coders prepare each election using Election Data Manager, and then prepare compact flash cards and PEBs (personalized electronic ballots) using Hardware Programming Manager. Use the multi-card reader to quickly create additional compact flash cards for iVotronic terminals. The other use for the Compact Flash Multi-Card Reader/Writer is to read in audit data from the iVotronic.
Data Acquisition Manager	DAM	The ES&S Data Acquisition Manager software is used to transmit election results over a network connection from ES&S ballot counting equipment to a central count location.
Delkin USB		A USB flash drive to store the DS200 scanner's election definition, audit log and other election-specific information.
Election Data Manager	EDM	Election Data Manager is a database system that stores all of a jurisdiction's precinct, office, and candidate information. It is used in conjunction with other Unity software to format and print ballots, program ballot scanning equipment, and produce Election Day reports.
Election Reporting Manager	ERM	The Election Reporting Manager is an election results reporting program, used to generate paper and electronic reports for poll workers, candidates, and the media. ERM can display updated election totals on a monitor as ballot data is tabulated and can send result reports directly to media outlets over the Internet. ERM is designed to support a wide range of ES&S ballot scanning equipment and can produce reports for both

Term	Abbrevi-ation	Definition
		central count systems and precinct count systems.
ES&S Ballot Image Manager	ESSIM	ES&S Ballot Image Manager is a publishing tool used to design and print ballots with the election information stored in EDM.
Flash Memory Card	FMC	The FMC supplies ballot content information to the VAT.
iVotronic		The iVotronic is a DRE (direct recording electronic) touch screen that displays ballots and records votes. The iVotronic addresses accessibility requirements through the use of voice files, font type and size, and color combinations. There are two sizes of iVotronics: 12 inch and 15 inch. There are two types of iVotronics: ADA and Non-ADA. The ADA iVotronics are manufactured with either a 3-key, 4-key, or 6-key configuration. The 6-key allows the use of the sip and puff. The Non-ADA iVotronics are manufactured without keys.
iVotronic Image Manager	iVIM	The iVotronic Image Manager enables the user to create and format graphic ballot screens for the iVotronic voting device.
Hardware Programming Manager	HPM	Hardware Programming Manager enables the user to import, format, and convert the election definition files for ballot scanning equipment and DREs.
intElect DS200	DS200	The intElect DS200 precinct or central count ballot scanner is part of a jurisdiction-wide election tabulating system. Voters make selections and then insert their ballots directly into the DS200 at the polling place. The scanner tabulates votes and sorts a ballot as soon as a voter inserts it and then feeds the ballot into the attached ballot storage bin accepting ballots inserted in any direction and reads both sides of the ballot simultaneously.
Model 100	M100	The Model 100 precinct ballot scanner is part of a jurisdiction-wide election tabulating system. Voters make selections and then insert their ballots directly into the Model 100 at the polling place. The scanner tabulates votes and sorts a ballot as soon as a voter inserts it and then feeds the ballot into the attached ballot storage bin accepting ballots inserted in any direction and reads both sides of the ballot simultaneously.
Model 650	M650	The Model 650 is an optical scan central count counter that is used to scan ballots at a central count location. The M650 scans up to 350 ballots per minute, counts different sizes (11, 14,17, 19) of ballots and can read voting marks on the right or left of the ballot column. The M650 prints results reports and saves results to a zip disk.
PCMCIA		PCMCIA card stores the M100 election definition, as well as voter results, exactly mirroring the ballot contents and issues as defined by election officials.
Personalized Electronic Ballots	PEB	An electronic ballot that a jurisdiction defines for use with the iVotronic to open polls, load ballots and collect votes from each terminal at the end of an election day.
Real-Time Audit Log Printer	RTAL	The Real-Time Audit Log Printer records each voter's actions on a paper audit log in real time, including all selections and de-selections. The paper audit log can be viewed but not touched by the voter as the paper is behind a clear plastic cover. Prior to casting a vote. Under-voted contests and a two-dimension bar code of the votes are appended to the audit entries and the paper advances out of the view window in either a 9-inch or 4.5-inch window.
Unity Release	N/A	The system configuration(s) of ES&S hardware and software voting system(s).

2 PRE-CERTIFICATION TESTS

2.1 Pre-Certification Test Activity

SysTest Labs has conducted an assessment of the Technical Data Package, including 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 the ES&S Unity 4.0 voting system. For a complete list of all items included in the TDP, please refer to Attachment A.

2.1.1 Physical Configuration Audit

2.1.1.1 Document Review

SysTest Labs conducted a PCA review of the documents submitted for review in the ES&S Unity 4.0 TDP. These included:

- Functional Requirements
- Design and Security Specifications
- Test and verification specifications
- Operations and Maintenance Procedures
- System Overview
- Configuration Management Plan
- Quality Assurance Program

Each document included in the Unity 4.0 voting system TDP was reviewed for compliance to the 2002 VSS, Volume 2, Sections 2.2 Through 2.13 and Volume 2, Section 6.6.

2.1.1.2 Source Code Review

The ES&S Unity 4.0 test campaign is a full certification as defined by the EAC. A full certification requires that all program source code undergo a full source code review. SysTest Labs has conducted a source code review of all source code submitted as a part of the TDP. The coding languages for the Unity 4.0 voting system include the following:

- C
- C++
- JAVA
- VB
- Assembler
- Cobol

Source Code Review Tools utilized by SysTest Labs includes

- Practiline Line Counter: a commercial application used to determine the counts of executable and comment lines;
- Module Finder: a SysTest Labs 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; and
- KEdit: a commercial text editor application running a SysTest Labs proprietary macro used to parse module names from Cobol code and populate the identified module names into the review document.

SysTest Labs utilizes a team approach in reviewing and managing the tasks of receiving the code to be reviewed, determining the volume of code to be reviewed, reviewing the vendor's internal coding standards and determining if there are any variances from the prescribed Standards, creating the review work documents, distributing the code to be reviewed along with the created work documents to the project code reviewers, reviewing the code, performing peer reviews, creating discrepancy reports, and receiving modified code and other vendor responses.

2.1.1.3 Trusted Build

Prior to testing, SysTest Labs will conduct a trusted build according to the detailed trusted build procedure provided by the vendor in the TDP and the EAC Testing and Certification Program Manual. The process includes interviews of key vendor staff to evaluate vendor processes and process conformance in the areas of configuration management and quality assurance. The following staff positions were interviewed: Developer and Senior Software Engineer. Preparation for the trusted build includes obtaining and reviewing the vendor-defined procedure for constructing the build platform, verifying the target build platform, and acquiring the installation material and VSTL reviewed source code.

COTS Tools:

- Acronis Software – Performs hard drive wiping and imaging.
- SLAX Linux boot CD – Performs hash values with sha1deep command to produce SHA hashes.

The source code is provided by the vendor and hash values are compared to the hash values of the code from the VSTL to assure that reviewed code is being built. The hash values are generated with the sha1deep command line command to produce SHA hashes. A build machine is wiped by the VSTL in preparation for the build with a clean machine. Execution of the trusted build complies with the vendor’s detailed build procedure for constructing the build environment and only the items listed in those procedures will be placed on the machine. A hash is taken of the build environment after this process is complete. The VSTL approved source code is placed on the machine for the build and another hash and image is obtained. The next image and hash is taken after following the vendor’s build procedure to compile the source code and produce the executable code. Additional hashes are taken of any installation CDs that are made during the build. All hashes, images, and copies of the VSTL approved source code are kept on a VSTL

repository during the entire build procedure and all build results are copied over as well after the build is complete.

Finally, the conclusion of the trusted build consists of record-keeping and archiving procedures that occur at SysTest Labs. The report contains any unique identifiers, results of the build with version numbers and dates and descriptions of all hashes and images in the repository. VSTL backup procedures are performed on all Trusted Build media and records to have an accessible and safe copy. A copy of the resulting media and records are submitted to the EAC-approved software repository as part of finalizing the Certification Test Report.

2.1.2 Functional Configuration Audit

2.1.2.1 Review of Vendor's Completed Test Cases and Results

SysTest Labs conducted an FCA review of the Unity 4.0 test cases delivered as part of the initial delivery of the Unity 4.0 voting system TDP. These test cases are designed and executed by ES&S for QA and testing of the Unity 4.0 voting system. The Unity 4.0 test cases were reviewed to determine the scope of testing and conformance to the VSS, version 2002, Volume 1, Sections 2, 3, 4, 5 & 6 and Volume 2, Section 6.7.

The results of these audit reviews, as well as the discrepancies generated, will be included in the Certification Report.

2.1.2.2 Review of Ohio and Colorado Voting System Reviews

SysTest Labs will conduct an FCA review of the Ohio and Colorado Voting System Reviews as directed in the EAC memorandum to the VSTLs dated December 19, 2007 (please refer to item 1, in Section 1.3.2). The directive specifically states that "…any VSTL currently testing a system from one of the manufacturers listed in these reports to review the State reports to see what, if any, items might require a closer look during Federal certification testing". SysTest Labs will review the findings against the VSS, version 2002 requirements, appropriate portions of HAVA, and associated Vendor specific requirements.

2.1.3 Hardware Environmental Testing Assessment

The acceptance and use of previous hardware environmental testing and certification is based on the following criteria:

- The configuration of the equipment being presented for testing is substantially identical to the equipment that was previously tested and certified and that all changes made to the hardware configuration of the equipment being presented for testing, from the hardware that was previously tested and certified were confirmed to be de minimis changes

- The standards and associated requirements under which the previous testing and certification was performed are equal to or more demanding than the current requirements.

- There have been no significant changes to the test methods.

- The lab that completed the hardware environmental testing and certification meets the EAC's requirements for accreditation as defined in NIST HANDBOOK 150-22: 2005 and NIST HANDBOOK 150-22: 2007.

2.2 Pre-Certification Assessment Results

2.2.1 Physical Configuration Audit

2.2.1.1 Document Review

SysTest Labs is in the process of completing the PCA Documentation Review to ensure that the ES&S TDP documentation is in compliance with the VSS, version 2002, Volume 2, Sections 2.2 Through 2.13. All discrepancies that were encountered during the PCA Document Review to date, were provided to ES&S in a series of iterative discrepancy reports for resolution. All PCA Document Review discrepancies must be corrected by ES&S and re-reviewed to ensure that each was fixed per the requirements of the VSS, version 2002, Volume 2, Sections 2.2 Through 2.13.

All discrepancies generated to date are included in Attachment G as a part of this Certification Test Plan. In addition, all detailed results from the Document Review and all discrepancies will be included in the Certification Test Report.

2.2.1.2 Source Code Review

Source Code Review for the ES&S Unity 4.0 certification began in April 2007, and is planned to be completed in January of 2008. All discrepancies that were encountered during the PCA Source Code Review to date were provided to ES&S in a series of iterative discrepancy reports for resolution. All PCA Source Code Review discrepancies must be corrected by ES&S and re-reviewed to ensure that each was fixed per the requirements of the VSS, version 2002

All discrepancies generated to date are included in Attachment G as a part of this Certification Test Plan. In addition, all detailed results from the source code review and all discrepancies will be included in the Certification Test Report.

If errors are encountered during Functional Testing, then additional source code submissions would be expected, and additional source code review would be necessary, as well as closure of any new discrepancies which may result in those reviews.

2.2.1.3 Trusted Build

Trusted Builds were performed at both the Omaha, NE offices of ES&S, and at the SysTest Labs office in Denver. The first Trusted Build was completed July 30, 2007 in Omaha, NE, and it resulted in the Trusted Build platform PC, which was used for Trusted Builds of ES&S products. Subsequently a separate Trusted Build platform PC will be built at the SysTest site for Trusted Builds of the ATS products.

Trusted Builds were performed with ES&S, and will be performed for ATS products, as described under Section 2.1.1 above, on the respective build platform PCs in order to provide the compiled software and firmware installation packages to be used in the certification testing.

2.2.2 Functional Configuration Audit

2.2.2.1 Review of Vendor's Completed Test Cases and Results

SysTest Labs has determined that the initial delivery of the ES&S Unity 4.0 voting system TDP test cases and subsequent test results are consistent with the VSS, version 2002. All discrepancies in the test cases and test results that were encountered during the FCA were provided to ES&S in a series of iterative discrepancy reports for resolution. All discrepancies were corrected by ES&S and re-reviewed to ensure that each was fixed per the requirements of the VSS, version 2002. All discrepancies that were encountered during the FCA will be included in the Certification Test Report.

For all required functions that were identified as not tested or insufficiently tested, SysTest Labs will design and develop tests cases, test data, and test procedures and will add these to SysTest Labs' list of VSTL Test Cases for Unity 4.0 certification test execution.

As determined by the FCA, the following tests will be executed, as part of this Certification Test Plan:

- Operational Status Check
- Readiness Test
- Sampling of ES&S's Unity 4.0 test cases as described below in Section 4 under Sampling Methodology
- SysTest Labs' Gen01 test case
- SysTest Labs' Gen02 rotation and straight party test case
- SysTest Labs' Gen02 PA straight party with Cross party endorsement test case
- SysTest Labs' Gen03 Usability & Accessibility test case
- SysTest Labs' Pri01 Open Primary test case
- SysTest Labs' Pri01Open Primary with Pick a Party test case
- SysTest Labs' Pri02 Close Primary test case
- SysTest Labs' Security test case
- SysTest Labs' Telecommunications test case
- System Accuracy test case.

Please see Tables 5, 6 and 7, and Appendix A – Test Cases for additional detail on the SysTest Labs test cases.

All discrepancies generated are included in Attachment G as a part of this Certification Test Plan. In addition, all detailed results from the review of the Vendor completed test cases and results and all discrepancies will be included in the Certification Test Report.

2.2.2.2 Review of Ohio and Colorado Voting System Reviews

SysTest Labs has not completed the FCA review of the Ohio and Colorado voting system Reviews. However, as a result of the FCA review of the Ohio and Colorado voting system Reviews, SysTest Labs will develop an addendum to the Certification Test Report that will include the following:

- A summary of the state findings for each system
- How SysTest Labs incorporated (if appropriate) these findings into the test campaign for the Unity 4.0 voting system
- The outcome of any additional testing deemed necessary

2.2.3 Hardware Environmental Analysis of Testing Results

Test reports from previous hardware testing were analyzed to determine if the results could be accepted for certification. If the testing met the criteria as defined in 2.1.3 above, it was considered to satisfy the requirements. The equipment is then exempted from specific tests as reflected in the testing matrix in the EMC and Environmental test plans attached to this document.

3 MATERIALS REQUIRED FOR TESTING

3.1 Software/Firmware

Items identified in the table reflect all software and firmware used to perform hardware, software, telecommunications, security and integrated system tests. Not all items listed below are required to run the Unity 4.0 voting system. However, all items listed were part of the certification test effort. Should a software version modification become necessary, an amended test plan would be produced with the new version under test listed according to ES&S revised Certification Application, which will be submitted by ES&S as appropriate.

Table 3 - Matrix of Required Software/Firmware

Application(s)	Mfgr.	Version	Description
Audit Manager	ES&S	7.5.0.0	Audit Manager provides security and user tracking for Election Data Manager and Ballot Image Manager. Audit Manager runs in the background of the other Unity programs and provides password security and a real-time audit log of all user inputs and system outputs. Election coders use Audit Manager to set Unity system passwords and track user activity.
Election Data Manager	ES&S	7.8.0.0	Election Data Manager is a single-entry database that stores all of a jurisdiction's precinct, office, and candidate information. Election Data Manager is used in conjunction with other Unity software to format and print ballots, program ballot scanning equipment, and produce Election Day reports.
ES&S Ballot Image Manager	ES&S	7.7.0.0	ESSIM is a desktop publishing tool that allows users to design and print ES&S paper ballots. ESSIM uses ballot style information created by Unity Election Data Manager to display the WYSIWYG ballots. Ballot On Demand (BOD) is an accessory program that you can use to print individual, Election Day ballots directly from ESSIM.
iVotronic Image Manager	ES&S	3.1.0.0	iVotronic Image Manager (iVIM) is a desktop publishing tool that allows user to design and generate graphic ballots for the iVotronic precinct voting system. iVIM uses ballot style information created by Unity Election Data Manager to display the WYSIWYG ballots. iVotronic Image Manager also allows the user to view the ballot in different languages, and create multiple displays for the same ballot. Ballots generated by iVotronic Image Manager comply with ADA (Americans with Disabilities Act) requirements using voice files, specific font type and size, and color combinations.
Hardware Programming Manager	ES&S	5.6.2.0	Hardware Programming Manager (HPM) is a complete election package that enables the user to import, format, and convert the election file; define districts; specify election contests and candidates; create election definitions for ballot scanning equipment; burn PC Cards, DS200 USB memory sticks, M650 zip disks, or PEBs; and create the Data Acquisition Manager Precinct List. The Hardware Programming Manager is primarily used for converting the election IFC file for use with the Election Reporting Manager and for creating and loading election parameters; however, it may also be used for coding the election. The Unity Hardware Programming Manager seamlessly programs the ES&S election tabulation hardware with election-specific information retrieved from the Unity

Application(s)	Mfgr.	Version	Description
			Election Data Manager (EDM). **NOTE: Creating an election definition from scratch in HPM is not supported in the Unity 4.0 certification.**
Data Acquisition Manager	ES&S	6.1.2.0	The Unity Data Acquisition Manager (DAM) is a client-server application that collects election data from ES&S voting systems and transmits the data directly from the polls or regional sites via modem transmission to the host election server for the purpose of results accumulation, reporting, and display. The Data Acquisition Manager allows users to transfer election results from remote polling sites to a jurisdiction's election headquarters. Data Acquisition Manager has two software configurations: Data Acquisition Manager Remote and Acquisition Manager Host. Poll workers use the remote configuration to transfer election results to the central collection location. Officials at the central site use the host configuration to receive election data from polling places. Workers at the central location load collected results into Election Reporting Manager™ to format, print, and display final election reports.
Election Reporting Manager	ES&S	7.4.0.0	Election Reporting Manager (ERM) is ES&S' election results reporting program. ERM generates paper and electronic reports for election workers, candidates, and the media. ERM can also display updated election totals on a monitor as ballot data is tabulated, and it can send results reports directly to media outlets. Election Reporting Manager is designed to support a wide range of ES&S ballot scanning equipment and can produce reports for both central-count systems and precinct-count systems.
AIMS	AutoMARK	1.4	The AutoMARK Management Information System (AIMS) is software that manages all of the information required by the AutoMARK Voter Assist Terminal (VAT) for an election. The AIMS process starts with a printed optical scan ballot. In addition to the printed ballot, files produced by ES&S Unity Systems may be imported into AIMS, for ease in loading data into the AutoMARK election database. In lieu of the import procedure, election specific data may be manually entered into AIMS. AIMS writes the election database to a compact flash memory card (FMC). This FMC supplies ballot content information to the VAT.

Table 4 - Matrix of Required COTS Software/Firmware

COTS Application(s)	Mfgr.	Version	Description
Required COTS software for the Unity 4.0 voting system			
Windows XP Professional	Microsoft Corporation	2002 Service Pack 2	COTS software for all Applications listed above.
RM COBOL RUNTIME System	RM/COBOL	11.01	COTS software for the ERM, HPM
Adobe Type Manager (includes Adobe Type Basics and Adobe Type Manager Light)	Adobe	4.1	COTS software for ESSIM, BOD
OmniDrive USB Professional	Omni	No version	COTS software for the HPM, ERM

COTS Application(s)	Mfgr.	Version	Description
PEB Reader	Pivot/ES&S	1.1.0.0	COTS software for HPM, ERM
Non required COTS software for the Unity 4.0 voting system			
Broadcom Gigabit Integrated Controller	Broadcom	9.02.06	COTS software Voyager Hand scanner, and Desktop PCs.
C-Major Audio	SigmaTel	42.xx	COTS software Voyager Hand scanner, and Desktop PCs.
Conexant D110 MDC	Unknown	92 Modem	COTS software Voyager Hand scanner
Graphics Media Accelerator Driver for Mobile	Intel	No version	COTS software Voyager Hand scanner
MS Office Professional Edition 2003 (MS Word and Excel installed in the setup)	Microsoft Corporation	11.0.7969.0	COTS software Voyager Hand scanner
O2Micro Smartcard Driver	O2Micro	2.26.0000	COTS software Voyager Hand scanner, and Desktop PCs.
ATI Display Driver	ATI	No version	COTS software for the Server
Dell OpenManage Array Manager	Dell	No version	COTS software for the Server
DirectX Hotfix – KB839643	Microsoft Corporation	No version	COTS software for the Server
HP Laser Jet 2300 Uninstaller	HP	No version	COTS software for the Server
Intel® PRO Intelligent Installer Intel® PRO Network Adapters and Drivers	Intel	2.01.1000	COTS software for the Server
Internet Explorer Q867801	Microsoft Corporation	No version	COTS software for the Server
LiveUpdate	Symantec Corporation	1.7	COTS software for the Server
Symantec AntiVirus Client	Symantec Corporation	8.0.0.374	COTS software for the Server
Outlook Express Q823353	Microsoft Corporation	No version	COTS software for the Server
Windows 2000	Microsoft Corporation	Service Pack 4	COTS software for the Server
Windows 2000 Administration Tools	Microsoft Corporation	5.0.0.0000	COTS software for the Server
Microsoft Health Monitor 2.1	Microsoft Corporation	2.10.1850.0000	COTS software for the Server
Microsoft Internet Security and Acceleration Server	Microsoft Corporation	3.0.1200	COTS software for the Server
Microsoft Shared Fax	Microsoft Corporation	1.0000	COTS software for the Server
Microsoft Small Business	Microsoft Corporation	Server 2000	COTS software for the Server
Microsoft Data Access Components KB870669	Microsoft Corporation	No version	COTS software for the Server
Microsoft.NET Framework	Microsoft Corporation	1.1.4322	COTS software for the Server
Windows 2000 Hotfix: - KB819696, - KB820888, - KB822831, - KB823182, - KB823559, - KB82410, - KB824141, - KB824146,	Microsoft Corporation	- 20030703.183130 - 20030604.152521 - 20030611.114034 - 20030618.121409 - 20030627.135515 - 20030716.151320 - 20030805.151423 - 20030823.144456	COTS software for the Server

COTS Application(s)	Mfgr.	Version	Description
- KB825119, - KB826232, - KB828028, - KB828035, - KB828741, - KB828749, - KB835732, - KB837001 - KB839643, - KB839645, - KB840315, - KB841872, - KB841873, - KB842526,		- 20030827.151123 - 20031007.160553 - 20040122.114409 - 20031023.142138 - 20040311.130332 - 20031023.124056 - 20040323.171849 - - 20040506.120130 - 0040519.160457 - 20040622.153749 - 20040520.90850 - 20040610.95344 - 20040521.202909	
Intel ProEthernet Adapter and Software	Intel	No version	COTS Software on the Desktop PCs
SeaCOM	Unknown	No version	COTS Software on the Desktop PCs
SoundMAX	Unknown	No version	COTS Software on the Desktop PCs
ATI Software Uninstall Utility	ATI	6.14.10.10.14	COTS Software on the Desktop PCs
ATI Control Panel	ATI	6.14.10.5173	COTS Software on the Desktop PCs
ATI Display Driver	ATI	8.20-051110A1-028793C-Dell	COTS Software on the Desktop PCs
Conexant D480mdc	Unknown	92 modem	COTS Software on the Desktop PCs

3.2 Equipment (Hardware)

Equipment identified in the table reflects all hardware used to perform hardware, software, security and integrated system tests. Not all items listed below are required to run the Unity 4.0 voting system. However, all items listed were part of this certification test effort. All equipment was provided by ES&S, SysTest Labs staff uploaded all executables and installs on the equipment, while the equipment and Trusted Build executable and installs were under the control of SysTest Labs.

Table 5 - Matrix of Required Hardware

Item	Mfgr	Model #	Version/Rev	Description
intElect DS200 (Scanner) – **3 Received**	ES&S	DS200	Hardware v. 1.2.0 DS200 Firmware 1.2.0.0 Power Management Firmware 1.0.0.0 Scanner Firmware 2.7.0.0.0	A precinct/central count ballot scanner. The scanner accepts ballots, tabulates votes, and sorts the ballots (if attached to a ballot box containing a diverter).
Steel ballot box without diverter **1 Received**	ES&S	N/A	N/A	A storage receptacle to store scanned ballots. (Used with M100 and DS200)
Model 100 (Scanner) –	ES&S	M100	Hardware v. 1.3.0	A precinct ballot scanner. The scanner accepts ballots,

Item	Mfgr	Model #	Version/Rev	Description
3 Received			Firmware v. 5.4.0.0	tabulates votes, and sorts the ballots (if attached to a ballot box containing a diverter).
Model 100 (Scanner) – **1 Received**	ES&S	M100	Hardware v. 1.3.0 Firmware v. 5.4.0.0	A precinct ballot scanner. The scanner accepts ballots, tabulates votes, and sorts the ballots (if attached to a ballot box containing a diverter).
Steel ballot box w/ diverter) **1 Received**	ES&S	N/A	N/A	A storage receptacle to sort and store scanned ballots. (Used with M100 and DS200)
Model 650 – Red – Left (Scanner) **1 Received**	ES&S	M650	Hardware v. 1.2 Firmware v. 2.2.1.0	An optical scan central counter that is used to scan ballots at a central count location. The M650 prints results reports and saves results to a zip disk.
Model 650 – Green – Right (Scanner) **1 Received**	ES&S	M650	Hardware v. 1.1 Firmware v. 2.2.1.0	An optical scan counter that is used to scan ballots at a central count location. The M650 prints results reports and saves results to a zip disk.
Model 650 – Green – Left (Scanner) **1 Received**	ES&S	M650	Hardware v. 1.2 Firmware v. 2.2.1.0	An optical scan central counter that is used to scan ballots at a central count location. The M650 prints results reports and saves results to a zip disk.
12inch, 3 key iVotronic (DRE) – **2 Received**	ES&S	0105-096-90659	Hardware v. 1.1 Firmware v. 9.2.0.0	A DRE (direct recording electronic) touch screen that displays ballots and records votes. This is 12 inches with 3 keys ADA buttons.
12inch, Non-ADA iVotronic (DRE) – **2 Received**	ES&S	0105-096-90659	Hardware v. 1.1 Firmware v. 9.2.0.0	A DRE (direct recording electronic) touch screen that displays ballots and records votes. This is 12 inches with no ADA buttons
15inch, 3 key iVotronic (DRE) **1 Received**	ES&S	9VDC 2770mA	Hardware v. 1.1 Firmware v. 9.2.0.0	A DRE (direct recording electronic) touch screen that displays ballots and records votes. This is 15 inches with 3 keys ADA buttons.
15inch, 4 Key iVotronic (DRE) – **2 Received**	ES&S	9VDC 2770mA	Hardware v. 1.1 Firmware v. 9.2.0.0	A DRE (direct recording electronic) touch screen that displays ballots and records votes. This is 15 inches with 4 keys ADA buttons.
15inch, 6 key iVotronic (DRE) – **2 Received**	ES&S	15" 9VDC 2770mA	Hardware v. 1.1 Firmware v. 9.2.0.0	A DRE (direct recording electronic) touch screen that displays ballots and records votes. This is a 15 inches with 6 key ADA buttons. The iVotronic 6 keys allows the use of the sip and puff.

Item	Mfgr	Model #	Version/Rev	Description
15 inch, Non-ADA iVotronic (DRE) – **15 Received**	ES&S	0105-096-90659	Hardware v. 1.1 Firmware v. 9.2.0.0	A DRE (direct recording electronic) touch screen that displays ballots and records votes. This is 15 inches with no ADA buttons
15 inch Supervisor iVotronic (RED) – **2 Received**	ES&S	9VDC 2770mA 0150-096-90659	Hardware v. 1.1 Firmware v. 9.2.0.0	Poll workers use supervisor equipment to open polls, load ballots onto voter PEBs or voting terminals, close the polls, and print results for the polling place.
iVotronic RTAL Booth 4.5 inch window **1 Received**	Booth: Pivot, Printer: Xten	N/A	Hardware v. N/A Firmware v. V012	The Real-Time Audit Log Printer records each voter's actions on a paper audit log in real time on a 4.5-inch window. This printer is attached to a private voting booth
iVotronic RTAL Booth 9 inch window **1 Received**	Booth: Pivot, Printer: Xten	N/A	Hardware v. N/A Firmware v. V012	The Real-Time Audit Log Printer records each voter's actions on a paper audit log in real time on a 9-inch window. This printer is attached to a private voting booth
ABCR (Automatic Bar Code Reader) – **2 Received**	JADAK	N/A	Hardware v. B Firmware v. 29	The ABCR is a device that audits and recounts the barcode printout generated by the iVotronic RTAL printer
Supervisor PEB – **15 Received**	Pivot	N/A	Hardware v. N/A Firmware v. 1.7.1.0	A portable cartridge fitted with an infrared communications window and a flash memory chip. Supervisor PEBs contain specific ballot data for each election. They open the polls, load the ballot onto a voter terminal and enable the service mode for administrative functions.
Election SecurityKey PEB – **8 Received**	ES&S	N/A	Hardware v. N/A Firmware v. 1.7.1.0	The iVotronic utilizes a "Key" PEB which requires that a key be passed to each iVotronic during set up in order to validate that the EQC (election qualification code) is correct for the election being conducted. This "Key" also requires that the correct election key be resident on each terminal before the election data is allowed to be unencrypted.
Voter Activated PEB – **3 Received**	Pivot	N/A	Hardware v. N/A Firmware v. 1.7.1.0	The Voter Activated PEB allows the voter to activate a ballot on the terminal in complete privacy.

Item	Mfgr	Model #	Version/Rev	Description
Communication Pack with Seiko printer **1 Received**	Pivot Seiko	N/A DPU 3445	Hardware v. 1.1	A case that contains special communications hardware, a serial thermal printer, and an optional modem for the iVotronic. The printer generates paper results, and the modem is used to transfer results to a central count location.
Printer (standalone for iVotronic) **1 Received**	Seiko	DPU-3445	N/A	Standalone printer for the iVotronic
BOD Printer **1 Received**	OkiData	9600		Printer used to print ballots
Printer (M650 Red Left Printer) – **2 Received**	520 OkiData	GE5258A	N/A	Printer for audit logs and reports for the M650
Printer (M650 Green Right Printer) – **2 Received**	520 OkiData	GE5258A	N/A	Printer for audit logs and reports for the M650
Printer (M650 Green Left Printer) – **2 Received**	Epson Model # LQ-590	P363A	N/A	Printer for audit logs and reports for the M650
LaserJet Printer **1 Received**	HP	2300N	N/A	Printer for reports created within Unity
Router **2 Received**	Dlink	1 @ DSH-16, 1 with no identification	1 @ V. B2, 1 with no identification	Directs and controls the flow of data
Modem **1 Received**	US Robotics	56K Sportster	N/A	A device that allows computer information to be sent over a telephone line.
Multi-Modem Adapters (Used in DAM PC) **2 Received (1 each)**	Equinox	N/A	N/A	4 and 8 port
Multi-Modem Adapters (Used in DAM PC) **2 Received (1 each)**	Digi	N/A	N/A	4 and 8 Port
Multi-Modem Adapters (Used in DAM PC) **2 Received (1 each)**	Perle	N/A	N/A	4 and 8 Port
Multi-Port Adapter (Used in DAM	SeaLevel	N/A	N/A	7801 & 7803 – 8 Port 7406 – 4 Port

Item	Mfgr	Model #	Version/Rev	Description
PC) **3 Received** **(1 each)**				
USB PEB Reader/Writer **1 Received**	Pivot	M1706	Hardware v. 1.1	A device with a USB connection used to upload election results from a PEB to a PC
Hand Bar Code Reader **1 Received**	Voyager	MS9544	N/A	A device that reads the barcode printout generated by the iVotronic RTAL printer
Omni Drive **1 Received**	Omni	D707-94	Rev. C1 USB 1.1	A device used to read/write data to the PCMCIA card.
Omni Drive Professional USB2 **1 Received**	Omni	D707-94	Rev. A USB 2.0	A device used to read/write data to the PCMCIA card.
SanDisk Reader **1 Received**	SanDisk	SDDR-91	N/A	Used to read data off of a SanDisk
SanDisk ImageMate CF Reader **1 Received**	SanDisk	SDDR-92	N/A	Used to read data off of a SanDisk
Zip Disk **1 Received**	Iomega	Z250USBPCMBP	N/A	Used to store data
Headphones **3 Received** **(2 for ES&S, 1 for AutoMARK)**	ADID - (ESS) N/A - (AutoMARK)	N/A	N/A (ESS) AKG-K-44 (AutoMARK)	A pair of listening devices joined by a band across the top of the head and worn in or over the ears
Multi Compact Flash Reader/Writer (gangburner) **1 Received**	ES&S	N/A	Hardware v. 1.2 iVotronic Compact Flash Get Audit Data Software v. 9.2.0.0 CF Duplicator Software v. 9.2.1.0	A device used to read/write multiple compact flash cards of the same election definition for the iVotronic
External Volume Control Button **1 Received**	ES&S	N/A	Hardware v. N/A	Used for controlling the volume on the 12 inch 3-Key and 15 inch 3-Key iVotronics
Serial PEB Reader **1 Received**	Pivot	N/A	Hardware Rev. 1.1 Software: N/A	A device with a serial connection used to upload election results from a PEB to a PC. The reader can also connect to a M100 to combine results at the polling place.
UPS **4 Received**	Belkin	N/A	N/A	Backup uninterrupted power source for the M650 and Multi Compact Flash Reader/Writer (gangburner)
Sip n Puff **1 Received**	Pivot	N/A		Device used on the iVotronic 6-key by physically disabled

Item	Mfgr	Model #	Version/Rev	Description
				voters
iVotronic booth **3 Received (2 with RTAL space, 1 without RTAL space)**	Pivot	N/A	N/A	A booth that holds an iVotronic terminal and optionally an RTAL printer, to ensure voter privacy
Dell Laptop D600 Latitude **1 Received**	Dell	N/A	Windows XP Professional, SP2 Rev A00	Intel® Pentium® M processor 1.60GHz 1.60 GHz, 1.00 GB of RAM (Laptop for Remote modeming only) Post Voting (DAM Client Regional Site remote only)
Dell PC Pentium® **1 Received**	Dell	N/A	Windows XP Professional, SP2	4 CPU 2.00GHz, 512MB of RAM (PC System 1) (Pre and Post Voting)
Dell PC Pentium® **1 Received**	Dell	N/A	Windows XP, SP2	4 CPU 2.80GHz, 2.79 GHz, 1.00 GB of RAM (PC System 2) Pre and Post Voting
Dell PC Pentium® **1 Received**	Dell	N/A	Windows XP Professional, SP2	4 CPU 2.80GHz, 2.79 GHz, 5.12 MB of RAM (PC System 3) (Post Voting DAM Host only)
Server (PC) PE600SC **1 Received**	Dell	N/A		Intel Pentium 4 CPU 1.80 GHz AT/AT compatible 523,763 KB RAM
Dell Laptop D610 Latitude **1 Received**	Dell	N/A	Windows XP Professional, SP2 Rev A06	Intel® Pentium® M processor 1.73GHz 795MHz, 0.99GB of RAM, (Physical Address Extension - laptop) (Hand Bar Code Reader and ABCR)
Multi Compact Flash Reader/Writer (Gang Programmer PC) **1 Received**	Dell	N/A	Windows XP Professional, SP2 Rev A00	Pentium 4 CPU 2.80GHz, 2.79 GHz, 512 MB of RAM (Pre & Post voting)
VAT **1 Received**	ATS	Model # A100	Hardware v 1.0 Firmware v. 1.4	AutoMARK Voter Assist Terminal (VAT) is an electronic ballot marking device that allows voters to electronically mark a ballot, by using the touch screen Braille keypad or an AT (Assistive Technology (Sip and Puff) device
VAT **1 Received**	ATS	Model # A200	Hardware v 1.0, and 1.1 Firmware v. 1.4	AutoMARK Voter Assist Terminal (VAT) is an electronic ballot marking device that allows voters to electronically mark a ballot, by using the touch screen

Item	Mfgr	Model #	Version/Rev	Description
				Braille keypad or an AT (Assistive Technology (Sip and Puff) device

3.3 Test Materials

Items identified in the table reflect all test materials required to perform hardware, software, telecommunications, security and integrated system tests not identified in section 3.1 or 3.2 above. The items noted in this section are primarily consumables required for the testing effort. Some of these may be reused for other testing after being properly prepared, for example, various forms of flash memory such as USB or compact flash memory devices that have been erased and/or formatted prior to each use.

Table 6 - Matrix of Test Materials

Item	Provided by	Manufacturer	Details
Printer paper rolls	ES&S	RTAL: Future Logic & Nashua, M100 & DS200: NCR Communication Pack & Seiko Printer: Nakagawa	RTAL, Communication Pack, M100, DS200 and Seiko Printer
Zip disks	ES&S	Iomega	M650 program media
USB SanDisk (CF)	ES&S	SanDisk & Kingston	Compact Flash card 128, 256 & 512MB
Blank paper ballot stock	ES&S	Weyerhaeuser	Inches/ballot positions: 11x36, 14x36, 14x48, 17x45, 17x60, 19x51, 19x68
PCMCIA	ES&S	Vikant	PC Cards M100 program media
USB Memory Stick	ES&S	Delkin	DS200
Head sets	ES&S	ADID (ES&S) N/A (AutoMark)	For the VAT and iVotronic

3.4 Deliverable Materials

Deliverable Materials consist of all of the documents submitted as part of the TDP supplied by the vendor.

In addition to the hardware, software and materials identified in sections 3.1, 3.2, and 3.3, ES&S delivered the Technical Data Package documents as part of the ES&S Unity 4.0 voting system:

- Hardware Specifications;
- Software Specifications;
- Voter, operator, and hardware/software maintenance manuals;
- Program listings, facsimile ballots, tapes; and

- Sample output report formats.

Please see Attachment A for a complete list of TDP documents.

3.5 Proprietary Data

SysTest Labs will indicate which portions of reports are considered proprietary information. We understand material that is not classified as proprietary, including test plans and test reports, will become publicly available. Proprietary information will be submitted in a separate attachment to the EAC, and marked "Proprietary".

4 TEST SPECIFICATIONS

Testing for compliance to the VSS 2002 will be conducted as listed below. The Test Methods for all system level tests are provided in Appendix A – Test Cases.

4.1 Hardware Configuration and Design

SysTest Labs' FCA Hardware Environmental Test Assessment established the baseline for hardware configuration required for testing the Unity 4.0 voting system. This baseline is shown in Table 5 – Required Hardware and Table 6 – Test Materials. Should any changes to the hardware configuration be required as a result of any testing, SysTest Labs will assess the changes and determine what regression tests are required to ensure compliance to the VSS, version 2002 and HAVA.

4.2 Software System Functions

The scope of the tests in the software certification (*Vol. 2, Sect. 5)* and system-level tests (*Vol. 2, Sect. 6)* as defined in the VSS, version 2002, which include:

- Pre-Certification Test Assessment (*Vol. 2, Section A.2*), reflecting the Technical Data Package (*Vol. 2, Sect. 2*) document examination portions of the Physical Configuration Audit and the Functional Configuration Audit

- Physical Configuration Audit (*Vol. 2, Sect. 6.6*)

  - Establish the software/hardware configuration baseline used in testing
  - Perform a full Source Code Review (*Vol.2 Sect. 5.4*)
  - Review ES&S's functional specification for adequacy or discrepancy
  - Conduct Trusted Build and comparison to the code tested

- Functional Configuration Audit (*Vol. 2, Sect. 6.7*)

  - Create and issue a Master Certification Test Plan (*Vol. 2, Section A*)
  - Review, evaluate, create, and execute Functional Tests (*Vol.2. Section A*)
  - Initiate System-Level Integration Tests (*Vol. 2, Sect. 6*)

4.3 Test Case Design

4.3.1 Hardware Environmental Test Case Design

Hardware environmental certification testing is performed to verify conformance to Vol. 1. Section 3 of the FEC VSS April 2002. Certification testing is accomplished through a combination of testing performed by SysTest Labs and previous testing performed by subcontractor labs. Specific test plans and test reports from the subcontractor labs are included as Attachments to this document.

The hardware testing will be performed at four subcontract laboratories:

- Emissions Testing will be performed at Criterion Laboratories in Rollinsville, Colorado (intElect DS200)

- Environmental Testing will be done at Advanced Product Testing (APT) Laboratories in Longmont, Colorado (ABCR and intElect DS200)
- Emissions Testing will be performed at National Center for Excellence in Electronics (NCEE) in Lincoln, Nebraska. (ABCR)
- Safety Testing will be performed at Compliance Integrity Services (CIS) Laboratories in Longmont, Colorado. (ABCR and intElect DS200)

4.3.2 Acceptance of Previous Hardware Test Results

Hardware testing requirements as specified in Vol. 1 Section 3 of the VSS, version 2002 are satisfied through a combination of testing by SysTest Labs and previous testing performed by Wyle Laboratories, (Wyle Laboratories, Inc., 7800 Highway 20 West, Huntsville, Alabama 80806) and Percept Technology Labs (Percept, 4888 Pearl East Cir #110, Boulder, CO 80302).

The previous testing performed by the aforementioned labs was accepted based upon the results documented in test reports provided. The testing by product is defined in Attachment D1H.

4.3.3 Software Module Test Case Design and Data

SysTest Labs reviewed the test case design documents and data as provided by ES&S. In evaluating each module, with respect to flow control parameters and data on both entry and exit, SysTest Labs assesses for discrepancies between the Software Specifications and the test case design. Discrepancies are issued to the vendor for correction, if determined necessary *(Vol. 2, Section A.4.3.3)*.

SysTest Labs designs additional module test cases, as required, to provide coverage of modules containing untested paths with potential for un-trapped errors. SysTest Labs also reviews the vendor's module test data in order to verify that the requirements of the Software Specifications have been demonstrated by the data. In the event that the vendor's module test data are insufficient, SysTest Labs provides a description of additional module tests prerequisite to the initiation of functional tests.

The data is also checked during source code review in conformance with other sections of the standard relating to unbound arrays, parameter type and range validation, pointer controls, vote counter overflow, etc.

If it is determined during source code review that potential risks exist at module entry/exit points, then functional test cases are designed to test these areas, and the results of these tests will be included in the Certification Test Report. If during source code review an issue is identified with entry/exit points of the module, then discrepancies are written and submitted to the Vendor.

SysTest Labs will include in the Certification Test Report a listing of all COTS application files as well as all operating system files in a pre-election configuration, including related hash codes and file signatures.

4.3.4 Software Functional Test Case Design

SysTest Labs has reviewed the ES&S test cases against the 2002 VSS requirements matrix, in conducting the FCA Document Review, and has evaluated the test cases in light of the vendor's system functionality documents. SysTest Labs has prepared Functional Test cases using the operator/user procedures, and the data content of output reports.

Software Functional Testing will demonstrate that the ES&S Unity 4.0 voting system overall capabilities meet the requirements for pre-voting, voting and post-voting functional areas (*Vol. 2, Appendix A.*). These include the functions defined in Table 7 – Matrix of System Functional Testing.

Table 7 - Matrix of System Functional Testing

Function	Test Methodology
Ballot Preparation Functions	
a. Ballot preparation subsystem	Verify the election is defined for election day, and one more precinct/polling place can be defined.
Before, During & After Processing of Ballots	
b.1. Logic Test – Interpretation of Ballot Styles & recognition of precincts	Verify in Functional Tests: Verify voting variation functionality identified by ES&S for the ES&S Unity 4.0 voting system (Vol. 1. Section 2.2.8.2).
b.2. Accuracy Tests- Ballot recording/reading accuracy	Verify with the processing of 1,549,703 consecutive ballot positions with no errors, or 3,126,404 with one error (Vol. 2 Section 4.7.1.1).
b.3. Status Tests- Equipment statement &memory contents	Verify in Functional Tests: Equipment statement & memory contents at the corresponding intervals outlined in user documentation for the functions a. b.4, c 1-7 and d. 1-8
b.4. Report Generation – Produce test output data	Verify in Functional Tests: Clearing Election Totals Manual data entry Generating a Zero Report Testing an Election Creating Test Reports Clearing Totals for Election Day Selecting Reporting Groups Loading Scanner Totals Producing Election Reports Displaying Election Information ERM Election Results
b 5. Report Generation- Produce audit data	Verify in Functional Tests: System audit reports voting
Polling Place Functions	
c.1. Opening the polls, accepting & counting ballots	Verify in Functional Tests: Zero Reports Scan paper ballots Alerts for over votes and under votes
c.2. Monitoring equipment status	Verify in Functional Tests: Equipment status as identified in user documentation
c.3. Equipment response to commands	Verify in Functional Tests: Equipment response to all voter and poll worker commands as identified in user documentation
c.4. Generating real-time audit messages	Verify Verified in Functional Tests: Print audit log Each audit message contains a timestamp. Election name, software, and firmware are listed at the

Function	Test Methodology
	beginning of each audit log. Count of ballots processed is included in log of uploaded results. Error messages. Precinct ID is identified for all results pertaining to insertions, additions, and deletions.
c.5: Closing polls and disabling ballot acceptance	Verify in Functional Tests: Inability to cast additional ballots Close of polls Inability to scan additional ballots
c.6. Generating election data reports.	Verify in Functional Tests: Generation of precinct reports
c.7. Transfer ballot count to central counting location	Verify in Functional Tests: Reading media into ERM (DS200 – USB, M100 – PCMCIA, iVotronic – PEB) Telecommunication
c.8. Electronic transmission of election data to central count locations	Verify in Functional Tests: Confirming transmission, receipt, and validity of data interactively and with reports
Central Count Functions	
*d.1.*Process ballot deck for > 2 precincts with 3 split precincts per precinct for a total of 6 ballot styles	Verify in Functional Tests: Process of ballot decks on the
d.2. Monitoring equipment status	Verify in Functional Tests: Equipment status as identified in user documentation
d.3. Equipment response to commands	Verify in Functional Tests: Equipment responds to all voter and poll worker commands as identified in user documentation (Messages generated by the equipment that require an action by the voter or poll worker before operation continues--as in blank ballots, overvotes, undervotes as defined in election setup)
.4. Integration with peripherals equipment or other data processing systems	See b.3
d.5. Generating real-time audit messages.	See b.4
d.6. Generating precinct-level election data reports	See b.3
d.7. Generating summary election data reports	See b.3
d.8. Transfer of detachable memory module to the processing equipment	See b.3
d.9. Electronic transmission of data to other processing equipment	Verify in Functional Tests: Confirming transmission, receipt, and validity of data interactively and with reports
d.10. Producing output data for interrogation by external display devices	Verify in Functional Tests: Confirming transmission, receipt, and validity of data interactively and with reports where possible

4.3.5 Accuracy Test

The Accuracy Test is SysTest Labs' test case for validating a systems ability to accurately read/tally a large number of ballot positions (a minimum of 1,549,703 ballot positions, or 3,126,404 with one error, per Volume 2, Section 4.7.1.1). Unity 4.0 components subject to the Accuracy Test include:

- intElect DS200 scanners – hardware vers. 1.2.0, firmware vers. 1.2.0.0

- Model 100 scanners - hardware vers. 1.3.0, firmware vers. 5.4.0.0
- Model 650 scanners - hardware vers. 1.1 and 1.2, firmware vers. 2.2.1.0
- iVotronic DRE - hardware vers. 1.1, firmware vers. 9.2.0.0
- Communication pack with Seiko printer - hardware vers. 1.1, firmware vers. N/A
- ATS VAT Models A100 and A200 - hardware vers. 1.0 and 1.1, firmware vers. 1.4

The following steps are utilized in the execution of the Accuracy Test:

- Election/ballot definition is created in EDM, and additionally imported into AIMS.
- Ballot definition data and scanner media is created and loaded onto the device being tested.
- Report of the initialization process
- Display the function selections
- Open polls
- Zero Report
- Execute votes (if a touchscreen or VAT device is being tested), Scan ballots (if an optical scanner or VAT is being tested), Close polls, Run Totals report and Audit Log
- Transfer data to ERM for reporting
- Validate test results

4.3.6 Security Test

The Security Test Case is SysTest Labs' test case for verifying that a voting system will correspond correctly with security tests based on VSS Volume 1, Section 6. It incorporates systems security provisions, unauthorized access, deletion or modification of data, audit trail data, and modification or elimination of security mechanisms. The vendor documentation will be reviewed to ensure sufficient detail is present to operate the voting system in a secured implementation. Where the vendor statements assert the voting system is secured via mechanisms and seals, procedures will test the presence and effectiveness of such controls.

In its security testing SysTest identifies the specific threats that are tested for and the associated risk if a flaw or exception is identified in a voting system. The tests used by SysTest Labs are designed to insure that the voting system meets or exceeds the requirements in the VSS and any instance where an anomaly or possible security flaw is identified; the potential risk is reported and evaluated.

For additional detail, please also refer to the Security Test Case in Appendix A.

4.3.7 System Level Test Case Design

System level tests shall be performed on the ES&S Unity 4.0 voting system for the purpose of assessing the response of the software to a range of conditions. Paper ballots will be used in several of these test cases, and samples of those ballots will be included with the Certification Reports.

The customized test cases for all system level tests are listed in Tables 5, 6, 7 and Appendix A.

In addition, other Functional Tests are used for validating functionality that does not fit well into a system level test cases, e.g., may have too many options to be adequately covered in system level test cases. Tables 8 and 9 provide information that delineates both the system level and the other software functions to be tested and how they will be tested.

Table 8 - Matrix of System Level and Other Functional Testing

Other Functional Testing	Test Methodology
Volume Test	
System's response to processing more than the expected number of ballots/voters per precinct, to processing more than the expected number of precincts, or to any other similar conditions that tend to overload the system's capacity to process, store, and report data.	Accuracy Test Case (described previously in this section)
Stress Tests	
System's responses to transient overload conditions. Subject polling place devices to ballot processing at the high volume rates, evaluate software response to hardware-generated interrupts and wait states.	Hardware is tested to limits outside the range of 'normal' but within specifications for the units.
Usability Tests	
Responses to input, text syntax, error message content, and audit message input	All System-Level Test Cases
Accessibility Test	
Exercises system capabilities of voters with disability features	System-Level Test Case GEN 03
Security Test	
Exercises systems security provisions, unauthorized access, deletion or modification of data, audit trail data, and modification or elimination of security mechanisms.	Security Test case for each component (described previously in this section)
Telecommunications Test	
Exercises telecommunications, maintaining data integrity, protection against external threats, monitoring and responding to external threats, shared operating environment, incomplete election returns, and use of public communications networks.	Telecommunications Test case for each component
Performance Tests	
Tests accuracy, processing rate, ballot format, handling capability and other performance attributes claimed by vendor	All System Test Cases
Recovery Tests	
Exercise system's ability to recover from hardware and data errors.	Security Test Case

4.3.8 Sampling Methodology

SysTest Labs reviewed the ES&S test case documents as provided in the TDP against the 2002 VSS requirements matrix, in conducting the FCA Document Review. SysTest Labs took a sampling of ES&S' test cases according to the guideline below.

New System (new or never certified by the EAC):

- Review all vendor test cases and select tests from high-risk areas for sampling, such as:
  - Security
  - Audit log
  - Tabulating
  - Transmitting (telecomm, LAN, etc.)
  - Accuracy

SysTest Labs chose the following test cases:

- AM - 3.0 View Log
- DS200 - 3.2 Opening Polls Functions: Open Polls with more than one Precinct
- ERM - Expanded Precincts (M100)
- ERM - Expanded Precincts (DS200)
- Maximum Candidates
- L&A Vote Selected Ballot Test
- L&A Multi-Vote Test
- L&A Vote for One Test
- M100 with Plastic Ballot Box

(For more information on the sample tests, see Table 7)

4.3.9 Additional Functional Testing

SysTest Labs' deemed it necessary to execute additional functional test cases. These test cases are detailed below, along with more information on the Sampling test cases chosen. Also, see Attachment E - Unity 4.0 Test Case Matrix, for an outline of functionality being tested in each test case.

Table 9 - Matrix of Additional Testing

Test Case No.	Test Case	Execution
N/A	Hi Capacity Ballot Test, 11X36 ballot	Using an all fill ballot definition (all left and right ballot positions utilized) vote the first and last ballot position in all contests on the 11X36 ballot (6 contest w/ 35 candidates). Scan the ballot on the scanners (M100, DS200, M650), utilizing random orientations to test all orientations.

Test Case No.	Test Case	Execution
N/A	Hi Capacity Ballot Test, 14X36 ballot	Using an all fill ballot definition (all left and right ballot positions utilized) vote the first and last ballot position in all contests on the 14X36 ballot (6 contest w/ 35 candidates). Scan the ballot on the scanners (M100, DS200, M650), utilizing random orientations to test all orientations.
N/A	Hi Capacity Ballot Test, 14X48 ballot	Using an all fill ballot definition (all left and right ballot positions utilized) vote the first and last ballot position in all contests on the 14X48 ballot (6 contest w/ 47 candidates). Scan the ballot on the scanners (M100, DS200, M650), utilizing random orientations to test all orientations.
N/A	Hi Capacity Ballot Test, 17X45 ballot	Using an all fill ballot definition (all left and right ballot positions utilized) vote the first and last ballot position in all contests on the 17X45 ballot (6 contest w/ 44 candidates). Scan the ballot on the scanners (M100, DS200, M650), utilizing random orientations to test all orientations.
N/A	Hi Capacity Ballot Test, 17X60 ballot	Using an all fill ballot definition (all left and right ballot positions utilized) vote the first and last ballot position in all contests on the 17X60 ballot (6 contest w/ 59 candidates). Scan the ballot on the scanners (M100, DS200, M650), utilizing random orientations to test all orientations.
N/A	Hi Capacity Ballot Test, 19X51 ballot	Using an all fill ballot definition (all left and right ballot positions utilized) vote the first and last ballot position in all contests on the 19X51 ballot (6 contest w/ 50 candidates). Scan the ballot on the scanners (M100, DS200, M650), utilizing random orientations to test all orientations.
N/A	Hi Capacity Ballot Test, 19X68 ballot	Using an all fill ballot definition (all left and right ballot positions utilized) vote the first and last ballot position in all contests on the 19X68 ballot (6 contest w/ 67 candidates). Scan the ballot on the scanners (M100, DS200, M650), utilizing random orientations to test all orientations.
N/A	Expanded Precincts (M100)	Using M100 firmware, create PCMCIA card for early voting containing 494 precincts on one card. Verify the card can be created and read into ERM.
N/A	Expanded Precincts	Using DS200 firmware, create DS200 USB

Test Case No.	Test Case	Execution
	(DS200)	drive for early voting containing 494 precincts on one USB drive. Verify the card can be created and read into ERM.
N/A	Auto Recovery	Using the iVotronic Auto Recovery procedure v 9.2.0.0, vote an election and recover the results from the U2-D chip. (U2-D chip is a SanDisk). Manual provided and steps were completed, as only a trained ES&S technician completes this procedure.
B6225	Maximum Candidates	In ERM load election database "02PNELAN" with more than 1000 candidates in a precinct. ERM limits 1000 counters in a single precinct. Verify that an attempt to load over 1000 counters gives an error messages stating "Aborted-over 1000 candidate in precinct: 211 ERM create results database failed. Connect election definition HPM and then retry."
N/A	L&A Vote Selected Ballot Test	Using ES&S test case, for the iVotronic, "L&A Vote Selected Ballot Test" to verify the logic and accuracy vote selected ballot test. The voter selects a particular ballot to vote and that vote logic is applied to a select number of ballots designated for the voter to cast.
N/A	L&A Multi-Vote Test	Using ES&S test case, for the iVotronic, "L&A Vote Multi-Vote Test" to verify the logic and accuracy of the multi vote test. Votes for each candidate will increase from one to the next, as in 1, 2, 3, 4, 5, etc.
N/A	L&A Vote for One Test	Using ES&S test case, for the iVotronic, "L&A Vote For One Test" to verify the logic and accuracy of the vote for one test. Each candidate within a contest will receive one vote. There will be an additional undervote assigned in each contest.
AM 3.0	View Log	Using an existing election (GEN01), select a user and verify Audit Manager has captured all activity(ies) carried out in all applicable applications (EDM, AM, and ESSIM).
DS200 3.2	Opening the Polls Functions	Use this test case to determine if the DS200 can open polls with an election definition that has more than one precinct. The HPM Report Level option must be ‘Precinct’.
N/A	M100 with Plastic Ballot Box	Using ES&S test case "Model 100 with Plastic Ballot Box" to verify that the M100 can process ballots accurately when seated in

Test Case No.	Test Case	Execution
		the plastic ballot box. **Note: Testing was completed with the Plastic Ballot Box; however, the box has not been subject to environmental testing.**

4.4 EAC Interpretations

The test engagement described in this Certification Test Plan utilizes only standard VSTL test methods that conform to the EAC Testing and Certification Program Manual and the appropriate voting system standard. Additional EAC interpretations affect the test plan and test methodology and if used are noted below.

The Certification Test Plan and the execution of tests for the ES&S Unity 4.0 voting system identified in this plan do not include any EAC interpretations.

5 TEST DATA

5.1 Data Recording

The FEC VSS, Vol. 2, Test Standards, will be used to measure certification-testing progress against the standards defined for all systems. SysTest Labs will create forms for the source code, TDP, and testing reviews. They will be stored in electronic format at SysTest Labs for the life of the voting system as defined by the vendor plus an additional seven years. SysTest Labs will record all activity via status report E-mails to ES&S.

The testing process involves the assessment of:

- Operational accuracy in the recording and processing of voting data, as measured by the error rate articulated in Volume I, Section 3.

- Operational failure or the number of unrecoverable failures under conditions simulating the intended storage, operation, transportation, and maintenance environments for voting systems, using an actual time-based period of processing test ballots.

- System performance and function under normal and abnormal conditions.

- Completeness and accuracy of the system documentation and configuration management records to enable purchasing jurisdictions to effectively install, test, and operate the system.

5.2 Test Data Criteria

SysTest Labs evaluates test results against the documents and software provided by the vendor. These documents shall be used to customize a standard set of system level tests. Testing will be conducted as an independent verification and validation across the entire voting system. A greater depth of testing will be given to places where there are code changes and changes to documentation. In the standard system level tests, elections are customized to the functionality supported by the voting system as identified by the vendor. System performance shall be measured against a predicted result.

5.3 Test Data Reduction

SysTest Labs processes the test data by manually recording data in the Test Case records and SysTest Labs templates.

6 TEST PROCEDURE AND CONDITIONS

6.1 Facility Requirements

Testing of the ES&S Unity 4.0 voting system will be performed at SysTest Labs' facilities in Denver, Colorado. All TDP and test documentation is stored on site at SysTest Labs' facility in a secure project directory on SysTest Labs' secure Voting server.

SysTest Labs always ensures voting room doors are kept locked at all times, unless the current activity requires that the door be opened. Vendors are never left unattended in a voting room at any time.

Environmental hardware testing for hardware components of the Unity 4.0 voting system was executed at the NVLAP or A2LA accredited environmental hardware testing facilities shown in Attachment I: Accredited Hardware Test Lab Certifications.

6.2 Test Setup

The ES&S voting system test platform will be set up, as part of the Physical Configuration Audit, in the standard configuration identified in the vendor TDP documents listed in **Attachment A - TDP Documents.** The software will be installed, versions verified, and made operational. The hardware will also be set up and versions verified according to the vendor TDP documents. Once the hardware and software have been set up, SysTest Labs will proceed with testing the system.

6.3 Test Sequence

While there is no required sequence for performing voting system software certification testing and audits, there are prerequisite tasks for some testing. Tasks and any applicable predecessor tasks are identified in the table below.

Table 10 - Matrix of Testing Tasks

Certification Task	Prerequisite Task
Scope Definition	Ascertain previous certification Information for the voting system, if applicable
PCA – Review of Source Code and Document TDPs	Receipt of TDPs
FCA – Testing Requirements Determined	Submissions of TDPs by vendor (including QA and testing specifics)
EAC Certification Test Plan	Review of TDPs and vendor testing
FCA – Test Case Development	Documentation TDP review; mapping of test requirements to VSS and vendor testing (or identified risk areas where additional testing is needed)
PCA – System Configuration Audit	Equipment received at SysTest, staff trained on system, and documentation available
Trusted Build	Completion of PCA source code review
FCA Hardware Environmental Testing	Completion of FCA test case preparation and PCA system configuration audit

Certification Task	Prerequisite Task
FCA Accuracy Testing	Completion of FCA test case preparation, PCA system configuration audit, and environmental testing
FCA Functional Testing	Completion of FCA test case preparation and PCA system configuration audit
FCA System Level Testing	Completion of FCA test case preparation and PCA system configuration audit
FCA Security Testing	Completion of FCA test case preparation and PCA system configuration audit
Reporting Discrepancies	Completion of initial PCA source code and documentation reviews, and system level testing
Regression and Discrepancy Testing	Receipt of applicable discrepancy fix (source code, documentation, hardware, firmware) or vendor response
EAC Certification Test Report	Successful completion of all certification tasks

6.4 Test Operations Procedures

The SysTest Labs VSTL Test Team provides step-by-step procedures for each test case to be conducted. Each step is assigned a test step number and this number, along with critical test data and test procedures information, is tabulated onto a test report form for test control and the recording of test results.

An inventory will be performed to verify the voting equipment received contains hardware and software elements as defined in the TDP prior to commencement of Functional or System Level testing.

The PCA will include verification that the system can be configured using the system operations manuals.

Throughout the testing effort, test procedures will be marked as follows:

- **Accept –** Test is accepted as successful.
- **Reject** – Test is rejected as unsuccessful.
- **NT –** Not Testable is used for test procedures that cannot be followed. For example, if failure of one test procedure failure precludes attempting subsequent test procedures, the latter will be marked as **NT**. Also, for expected functionality that is not implemented the test procedure will be marked as **NT**.
- **NS** – Not Supported is used for requirements not supported in the tested configuration.
- **NA** – Not Applicable - If a test procedure is not applicable to the current certification test effort it will be marked as NA. The NA designation would also be entered for any subsequent step that is not applicable.

Test results Reject, NT, and NA will include comments by the Tester explaining the reason for the result.

Issues encountered during review and testing will be documented on the Discrepancy Report. Issues that do not conform to the requirements of the applicable standards as identified in section 1.2 are marked as **Documentation Discrepancies** or **Functional Discrepancies** (a discrepancy occurs when the voting system component does not meet defined requirements or specifications). The vendor must address all discrepancies prior to issuance of the Certification Report. Issues that are encountered during testing, but are not addressed by the applicable standard will be added to the Discrepancy report and noted as **Informational**. The vendor has the option to address Informational issues. All responses provided by the vendor are noted in the Discrepancy Report attachment to the Certification Report.

7 Approval Signatures

SysTest Labs:

James M Nilius
Vice President, Compliance Services
January 25, 2008

Client:

Sue Munguia
Director of Certification
January 25, 2008

8 Appendix A – Test Cases

Test Detail	Test Methodology
Test Case Name	**GEN01**
Scope	A system level test that uses The 2002 Voting System Standards (VSS) guidelines to validate required functionality and performance. Testing includes accuracy, ballot format handling capability, reporting, and usability of the hardware, software and procedures in the entire voting system.
Objective	The object of this test case is to verify core functionality and performance by using vendor manual(s) to create election ballots, vote, and tally, for a General Election.
Results	
Findings	

Variables: Voting Variations	* 2 Precincts * Split Precincts (3 splits per precinct) * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Non-Partisan contest: Proposition/Question (Proposition X) * Partisan contest: Vote for 1 of N (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with a single candidate and a write-in (Attorney General) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board includes declared candidates with write-in voting (City Council) * Partisan contest: “Vote for 1 of M” race where one party does not declare candidates (Secretary of State) * Partisan contest: Slate & Group voting: one selection votes the slate (Governor/Lt. Governor) * Recall Type A: Simple Yes/No question (Recall Judge) * Recall Type B: Retain/Replace (Replace Judge) * Rotation = Standard (Rotates with every new Precinct) (Governor/Lt. Governor) * Volatile Flush Header * M650 Network to create 10 node folders * M650 Early Voting Group * Coded Ballots * Onscreen Vote (iVotronic) * Reject (M100/DS200 option only) * On Screen Vote
Variables: Election Variations	*** Governor/Lt. Governor**: 4 candidates * **Sheriff**: no candidate/write-in * **Superintendent of Schools**: 1 candidate/1 write-in * **County Commissioner**: 4 candidates * **Proposition X:** Y/N * **Secretary of State**: 3 candidates (no DEM candidate) * **City Council**: 6 candidates/write-in * **Attorney General**: 1 candidate/write-in * **County Treasurer:** no candidate/write-in * **Recall Judge (District A):** Y/N * **Replace Judge (District B):** Retain = first option, Replace = second and third options

A description of the voting system type and the operational environment	* **EDM** - Election Data Manager * **iVIM** – iVotronic Image Manager * **HPM** - Hardware Programming Manager * **AIMS** - AutoMARK Information Management System * **VAT** - AutoMARK Voter Assist Terminal (A200) * **M100** - Model 100 Ballot Scanner * **DS200** - intElect DS200 Ballot Scanner * **iVotronic** - iVotronic DRE * **M650** - Model 650 Optical Scan Central Count Counter * **AM** - Audit Manager * **DAM** - Data Acquisition Manager * **ERM** - Election Reporting Manager * **ESSIM** - ES&S Ballot Image Manager Refer to the following tables for complete descriptions: ➢ Matrix of Required Software/Firmware ➢ Matrix of Required Hardware
Standards Documents	Voting System Standards 2002, vol. 1 Voting System Standards 2002, vol. 2 Specific standards are noted in following steps
Pre-requisites and initialization of the test case	* Document the date and tester(s) * System, including the trusted build, is installed and set up as defined in the user documentation * Define election contests, candidates, issues etc. (V1: 2.2.6) * Party affiliation is identified on the ballot where applicable * Create a supervisory level access 'user' and password' * Testers are informed that the test environment must remain static, if not, no changes shall occur without documentation in the test record and the authorization of the project manager * Have a Ballot Counter (V1: 2.2.9, 3.2.4.2.6) * Retrieve all supplies necessary for testing * Complete Readiness check list
Documentation of Test Data & Test Results	* Capture all voting steps in order to maintain repeatability of the test * Record election, ballot, and vote data fields on the corresponding worksheet tabs * Save all worksheet tabs for all iterations of the test case * Record results of test run by entering 'Accept/Reject' on the Test Results Matrix * Provide comments when observing deviations, discrepancies or notable observations * Log discrepancies on the Discrepancy Report

Pre-vote: Ballot Preparation procedures verifications	* Installation and Election databases can be accurately/securely defined and formatted * A ballot can be accurately/securely defined and formatted (V1: 3.2.4.2) * A ballot can be accurately/securely programmed and installed into the appropriate media (V1: 3.2.4.2.4, 3.2.4.2.5)
Pre-vote: Preparation - Security	System Preparation - Security: * System username/password authentication and other access controls are set up according to system documentation guidelines for all devices being tested. * Any/all unnecessary processes are disabled and/or required process control measures noted in the documentation are followed. * All COTS and vendor subsystems used for system security are configured and active as recommended by the system documentation. This includes all connection, port, virus, and data or authorized process restriction systems. * Any other pre-election system security measures listed in the documentation are followed including setup of additional hardware or software not covered above. Please also see the Documentation section of the Security Test Case within Appendix A.
Readiness Testing and Poll Verification	* The election is correctly installed * Status and data reports are generated * Test data is separate from voting data without impact to the testing * Zero count report * A list of all ballot fields is created (V1: 3.2.4.2.1) * No hardware/software failures * The voting device is ready to accept votes (V1: 3.2.4.2.2, 3.2.4.3.1) * All functionality is available/accessible per Vendor documentation
Pre-vote: Opening the Polls Verification	* Completed Readiness check list * Perform proper sequence of functions to open the polls * Identify any issues, failures, or unexpected results and their required corrective action(s)

Voting: Required functionality verifications	* Maintain accurate and complete audit records (V1: 2.2.5.2.1, 3.2.7) * Maintain accurate and complete error and status messages (V1: 2.2.5.2.2, 2.2.5.2.3,3.2.1) * All paper-based systems shall: Protect the secrecy of the vote throughout the process. (V1: 2.4.3.2.1) * Accurately record cast ballots, including provisional (V1: 2.4.3,3.2.3.1, 3.2.5.2,3.2.6.2.2) * DRE shall record and retain redundant copies of the original ballot image (V1: 2.2.2.2, 3.2.4.3.2, 3.2.4.3.3) * Ensure undervotes are counted as cast votes * Separate accumulation of Undervotes and Paper Overvotes * Ensure Overvotes are counted on paper ballots and tally correctly * Maintain integrity of Vote and Audit data * Accurate Definition, Count, Reporting for Election Day, Absentee - paper and DRE, with the results tallied, excluding and including provisional ballots (V1: 2.2.2.1, 3.2.8.2) * Write-in voting: Voting position identified for write-ins (V1: 3.2.5.1.3) * Correctly tabulate (V1:2.2.8.1) * Provisional/Challenged ballots - Note vendor supported tabulation of these ballots at Central Count * Overvotes (V1: 3.2.5.1.3) * Undervotes (V1: 3.2.5.1.3) * Blank ballots (V1: 3.2.5.1.3)

Voting: Optional functionality verifications	* 2 Precincts * Split Precincts (3 splits per precinct) * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Non-Partisan contest: Proposition/Question (Proposition X) * Partisan contest: Vote for 1 of N (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with a single candidate and a write-in (Attorney General) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board includes declared candidates with write-in voting (City Council) * Partisan contest: “Vote for 1 of M” race where one party does not declare candidates (Secretary of State) * Partisan contest: Slate & Group voting: one selection votes the slate (Governor/Lt. Governor) * Recall Type A: Simple Yes/No question (Recall Judge) * Recall Type B: Retain/Replace (Replace Judge) * Rotation = Standard (Rotates with every new Precinct) (Governor/Lt. Governor) * Volatile Flush Header * M650 Network to create 10 node folders * M650 Early Voting Group * Coded Ballots * Onscreen Vote (iVotronic) * Reject (M100/DS200 option only) * On Screen Vote
Post-Vote: Closing the Polls	* Polls are properly closed * Further casting of ballots and reopening of the polls is prohibited * Device status is normal * Identify any issues, failures, or unexpected results and their required corrective action(s) * Create a test record that verifies the sequence of test events
Post-Vote: Central Count	Capture, document, and verify all counts

Post-Vote: Security	Post-Vote - Security: * System username/password authentication and other access controls are set up according to system documentation guidelines for all devices being tested. * Any/all unnecessary processes are disabled and/or required process control measures noted in the documentation are followed. * All COTS and vendor subsystems used for system security are configured and active as recommended by the system documentation. This includes all connection, port, virus, data or authorized process restriction systems. * Any other pre-election system security measures listed in the documentation are followed including setup of additional hardware or software not covered above. Please also see the Documentation section of the Security Test Case within Appendix A.
Post-Vote: System Audit	* Produce and verify available system reports
Results are Observed	Review the outcome of the test(s) against the expected result(s): * Accept: expected results is observed * Reject: expected result is NOT observed * Not Testable (NT): rejection of a previous test step prevents validation of this step or this was tested in another test case * Not Applicable (NA): not applicable to the current test scope or to the component under review * Not Supported (NS): not supported in the current test scope
Record Observations and all input/outputs for each election	*All information used in processing the test case is captured. This includes: inputs, outputs, deviations and any other item that may impact the validation of the test case. * Any failure of the test against the EAC guidelines is reported and implies failure of the system * Failures are reported as Defect Issues in the Discrepancy Report and are provided to the manufacturer * Before the final Certification report is issued, manufacturers are given the opportunity to correct all discrepancies * If corrections are submitted, by the manufacturer, retests are performed * Issues that do not impact the failure of the requirements but could be considered defects are logged as Informational Issues on the Discrepancy Report. It is the manufacturer's option to address these issues.

Test Detail	Test Methodology
Test Case Name	**GEN02 Straight Party**
Scope	A system level test that uses The 2002 Voting System Standards (VSS) guidelines to validate required functionality and performance. Testing includes accuracy, ballot format handling capability, reporting, and usability of the hardware, software and procedures in the entire voting system.
Objective	The object of this test case is to verify core functionality and performance by using vendor manual(s) to create election ballots, vote, and tally, for a General Election: Straight Party.
Variables: Voting Variations	* Single page ballot election per voter * 7 precincts and no split precincts * Straight party (multi-member board) * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Non-Partisan contest: Proposition/Question (Proposition X) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with a single candidate and a write-in (Attorney General) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board includes declared candidates with write-in voting (City Council) * Partisan contest: “Vote for 1 of M” race where one party does not declare candidates (Secretary of State) * Partisan contest: Slate & Group voting: one selection votes the slate (Governor/Lt. Governor) * Recall Type A: Simple Yes/No question (Recall Judge) * Recall Type B: Retain/Replace (Replace Judge) * Recall Type C: Retain/Recall Conditional contest (Judge recall) * Networked M650
Variables: Election Variations	SEE GEN01
A description of the voting system type and the operational environment	* **EDM** - Election Data Manager * **iVIM** – iVotronic Image Manager * **HPM** - Hardware Programming Manager * **AIMS** - AutoMARK Information Management System * **VAT** - AutoMARK Voter Assist Terminal (A100) * **M100** - Model 100 Ballot Scanner (with PEB merge)

	* **iVotronic** - iVotronic DRE * **M650** - Model 650 Optical Scan central Count Counter * **AM** - Audit Manager * **DAM** - Data Acquisition Manager * **ERM** - Election Reporting Manager * **ESSIM** - ES&S Ballot Image Manager Refer to the following tables for complete descriptions: ➢ Matrix of Required Software/Firmware ➢ Matrix of Required Hardware
Standards Documents	SEE GEN01
Pre-requisites and initialization of the test case	SEE GEN01
Documentation of Test Data & Test Results	SEE GEN01
Pre-vote: Ballot Preparation procedures verifications	SEE GEN01
Pre-vote: Preparation - Security	SEE GEN01
Readiness Testing and Poll Verification	SEE GEN01
Pre-vote: Opening the Polls Verification	SEE GEN01
Voting: Required functionality verifications	SEE GEN01 * Using the iVotronic Auto Recovery procedure v.9.2.0.0, vote an election and recover the results from the ScanDisk and not the PEB.

Voting: Optional functionality verifications	* Single page ballot election per voter * 7 precincts and no split precincts * Straight party (multi-member board) * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Non-Partisan contest: Proposition/Question (Proposition X) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with a single candidate and a write-in (Attorney General) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board includes declared candidates with write-in voting (City Council) * Partisan contest: “Vote for 1 of M” race where one party does not declare candidates (Secretary of State) * Partisan contest: Slate & Group voting: one selection votes the slate (Governor/Lt. Governor) * Recall Type A: Simple Yes/No question (Recall Judge) * Recall Type B: Retain/Replace (Replace Judge) * Recall Type C: Retain/Recall Conditional contest (Judge recall) * Networked M650
Post-Vote: Closing the Polls	SEE GEN01
Post-Vote: Central Count	SEE GEN01
Post-Vote: Security	SEE GEN01
Post-Vote: System Audit	SEE GEN01
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

Test Detail	Test Methodology
Test Case Name	**GEN02 PA Straight Party**
Scope	A system level test that uses The 2002 Voting System Standards (VSS) guidelines to validate required functionality and performance. Testing includes accuracy, ballot format handling capability, reporting, and usability of the hardware, software and procedures in the entire voting system.
Objective	The object of this test case is to verify core functionality and performance by using vendor manual(s) to create election ballots, vote, and tally, for a General Election: Straight Party for PA.
Variables: Voting Variations	* Two page ballot election per voter * 7 precincts and no split precincts * Straight party (multi-member board) * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Non-Partisan contest: Proposition/Question (Proposition X) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with a single candidate and a write-in (Attorney General) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board and cross-endorsed candidates (City Council) * Partisan contest: “Vote for 1 of M” race where one party does not declare candidates (Secretary of State) * Partisan contest: Slate & Group voting: one selection votes the slate (Governor/Lt. Governor) * Recall Type A: Simple Yes/No question (Recall Judge) * Recall Type B: Retain/Replace (Replace Judge) * Recall Type C: Retain/Recall Conditional contest (Judge recall) * Rotation: iVotronic Auto Rotate (iVo rotates with each new voter)
Variables: Election Variations	SEE GEN01
A description of the voting system type and the operational environment	* **EDM** - Election Data Manager * **iVIM** – iVotronic Image Manager * **HPM** - Hardware Programming Manager * **AIMS** - AutoMARK Information Management System * **VAT** - AutoMARK Voter Assist Terminal (A200) * **M100** - Model 100 Ballot Scanner

	* **iVotronic** - iVotronic DRE * **M650** - Model 650 Optical Scan central Count Counter * **AM** - Audit Manager * **DAM** - Data Acquisition Manager * **ERM** - Election Reporting Manager * **ESSIM** - ES&S Ballot Image Manager Refer to the following tables for complete descriptions: ➢ Matrix of Required Software/Firmware ➢ Matrix of Required Hardware
Standards Documents	SEE GEN01
Pre-requisites and initialization of the test case	SEE GEN01
Documentation of Test Data & Test Results	SEE GEN01
Pre-vote: Ballot Preparation procedures verifications	SEE GEN01
Pre-vote: Preparation - Security	SEE GEN01
Readiness Testing and Poll Verification	SEE GEN01
Pre-vote: Opening the Polls Verification	SEE GEN01
Voting: Required functionality verifications	SEE GEN01 Note: Blank ballots (Not applicable on the iVotronic)

Voting: Optional functionality verifications	* Two page ballot election per voter * 7 precincts and no split precincts * Straight party (multi-member board) * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Non-Partisan contest: Proposition/Question (Proposition X) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with a single candidate and a write-in (Attorney General) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board and cross-endorsed candidates (City Council) * Partisan contest: “Vote for 1 of M” race where one party does not declare candidates (Secretary of State) * Partisan contest: Slate & Group voting: one selection votes the slate (Governor/Lt. Governor) * Recall Type A: Simple Yes/No question (Recall Judge) * Recall Type B: Retain/Replace (Replace Judge) * Recall Type C: Retain/Recall Conditional contest (Judge recall) * Rotation: iVotronic Auto Rotate (iVo rotates with each new voter)
Post-Vote: Closing the Polls	SEE GEN01
Post-Vote: Central Count	SEE GEN01
Post-Vote: Security	SEE GEN01
Post-Vote: System Audit	SEE GEN01
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

Test Detail	Test Methodology
Test Case Name	**PRI01 Open Primary**
Scope	A system level test that uses The 2002 Voting System Standards (VSS) guidelines to validate required functionality and performance. Testing includes accuracy, ballot format handling capability, reporting, and usability of the hardware, software and procedures in the entire voting system.
Objective	The object of this test case is to verify core functionality and performance by using vendor manual(s) to create election ballots, vote, and tally, for an Open Primary Election.
Variables: Voting Variations	* 5 precincts * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board (City Council) * Primary Presidential Nominations List only the nominees, not the delegates * Rotation: Districts by Registered Voters (Non-Partisan) (Rotates based on the precincts registered voters)
Variables: Election Variations	SEE GEN01
A description of the voting system type and the operational environment	* **EDM** - Election Data Manager * **iVIM** – iVotronic Image Manager * **HPM** - Hardware Programming Manager * **AIMS** - AutoMARK Information Management System * **VAT** - AutoMARK Voter Assist Terminal (A100) * **M100** - Model 100 Ballot Scanner * **iVotronic** - iVotronic DRE * **M650** - Model 650 Optical Scan central Count Counter * **AM** - Audit Manager * **DAM** - Data Acquisition Manager * **ERM** - Election Reporting Manager * **ESSIM** - ES&S Ballot Image Manager

	Refer to the following tables for complete descriptions: ➢ Matrix of Required Software/Firmware ➢ Matrix of Required Hardware
Standards Documents	SEE GEN01
Pre-requisites and initialization of the test case	SEE GEN01
Documentation of Test Data & Test Results	SEE GEN01
Pre-vote: Ballot Preparation procedures verifications	SEE GEN01
Pre-vote: Preparation - Security	SEE GEN01
Readiness Testing and Poll Verification	SEE GEN01
Pre-vote: Opening the Polls Verification	SEE GEN01
Voting: Required functionality verifications	SEE GEN01 * Party affiliation is identified on the ballots *where appropriate*
Voting: Optional functionality verifications	* 5 precincts * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board (City Council) * Primary Presidential Nominations List only the nominees, not the delegates * Rotation: Districts by Registered Voters (Non-Partisan) (Rotates based on the precincts registered voters)
Post-Vote: Closing the Polls	SEE GEN01
Post-Vote: Central Count	SEE GEN01
Post-Vote: Security	SEE GEN01

Post-Vote: System Audit	SEE GEN01
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

Test Detail	Test Methodology
Test Case Name	**PRI01 Pick-a-Party/Party Preference**
Scope	A system level test that uses The 2002 Voting System Standards (VSS) guidelines to validate required functionality and performance. Testing includes accuracy, ballot format handling capability, reporting, and usability of the hardware, software and procedures in the entire voting system.
Objective	The object of this test case is to verify core functionality and performance by using vendor manual(s) to create election ballots, vote, and tally, for an Open Primary Election, Party selection.
Variables: Voting Variations	* 5 precincts * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board (City Council) * Primary Presidential Nominations List only the nominees, not the delegates * Rotation: Standard (Candidate > Vote for)
Variables: Election Variations	SEE GEN01
A description of the voting system type and the operational environment	* **EDM** - Election Data Manager * **iVIM** – iVotronic Image Manager * **HPM** - Hardware Programming Manager * **AIMS** - AutoMARK Information Management System * **VAT** - AutoMARK Voter Assist Terminal (A200) * **M100** - Model 100 Ballot Scanner * **iVotronic** - iVotronic DRE * **M650** - Model 650 Optical Scan central Count Counter * **AM** - Audit Manager

	* **DAM** - Data Acquisition Manager * **ERM** - Election Reporting Manager * **ESSIM** - ES&S Ballot Image Manager Refer to the following tables for complete descriptions: ➢ Matrix of Required Software/Firmware ➢ Matrix of Required Hardware
Standards Documents	SEE GEN01
Pre-requisites and initialization of the test case	SEE GEN01
Documentation of Test Data & Test Results	SEE GEN01
Pre-vote: Ballot Preparation procedures verifications	SEE GEN01
Pre-vote: Preparation - Security	SEE GEN01
Readiness Testing and Poll Verification	SEE GEN01
Pre-vote: Opening the Polls Verification	SEE GEN01
Voting: Required functionality verifications	SEE GEN01 * Party affiliation is identified on the ballots *where appropriate*
Voting: Optional functionality verifications	* 5 precincts * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in (Superintendent of Schools) * Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins (Sheriff) * Non-Partisan contest: Multi-member board (N of M) (County Commissioner) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: "Vote for 1" race with no declared candidates and write-ins (County Treasurer) * Partisan contest: Multi-member board (City Council) * Primary Presidential Nominations List only the nominees, not the delegates * Rotation: Standard (Candidate < Vote for)
Post-Vote: Closing the Polls	SEE GEN01
Post-Vote: Central Count	SEE GEN01

Post-Vote: Security	SEE GEN01
Post-Vote: System Audit	SEE GEN01
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

Test Detail	**Test Methodology**
Test Case Name	**PRI02 Closed Primary**
Scope	A system level test that uses The 2002 Voting System Standards (VSS) guidelines to validate required functionality and performance. Testing includes accuracy, ballot format handling capability, reporting, and usability of the hardware, software and procedures in the entire voting system.
Objective	The object of this test case is to verify core functionality and performance by using vendor manual(s) to create election ballots, vote, and tally, for a Closed Primary Election.
Variables: Voting Variations	* 7 precincts * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: Multi-member board (City Council) * Partisan contest: “Vote for 1 of M” race where one party does not declare candidates (Secretary of State) * Primary Presidential Delegates: a delegate slate, display of delegates with nominees * Recall Type D: Retain/Recall Conditional contest (Judge recall) * Query Undervote enabled on Precinct Paper Tabulators (100/200) * Rotation: District by Registered Voters (Rotates based on party’s registered voters by Party)
Variables: Election Variations	SEE GEN01
A description of the voting system type and the operational environment	* **EDM** - Election Data Manager * **iVIM** – iVotronic Image Manager * **HPM** - Hardware Programming Manager * **AIMS** - AutoMARK Information Management System * **VAT** - AutoMARK Voter Assist Terminal (A100) * **M100** - Model 100 Ballot Scanner * **DS200** - intElect DS200 Ballot Scanner

	* **iVotronic** - iVotronic DRE * **M650** - Model 650 Optical Scan central Count Counter * **AM** - Audit Manager * **DAM** - Data Acquisition Manager * **ERM** - Election Reporting Manager * **ESSIM** - ES&S Ballot Image Manager Refer to the following tables for complete descriptions: ➢ Matrix of Required Software/Firmware ➢ Matrix of Required Hardware
Standards Documents	SEE GEN01
Pre-requisites and initialization of the test case	SEE GEN01
Documentation of Test Data & Test Results	SEE GEN01
Pre-vote: Ballot Preparation procedures verifications	SEE GEN01
Pre-vote: Preparation - Security	SEE GEN01
Readiness Testing and Poll Verification	SEE GEN01
Pre-vote: Opening the Polls Verification	SEE GEN01
Voting: Required functionality verifications	SEE GEN01 * Party affiliation is identified on the ballots *where appropriate*

Voting: Optional functionality verifications	* 7 precincts * Non-Partisan contest: Vote for 1 of N (Sheriff) (Superintendent of Schools) * Partisan contest: Vote for 1 of N (Governor/Lt. Governor) (Secretary of State) (City Council) (Attorney General) (County Treasurer) * Partisan contest: Multi-member board (City Council) * Partisan contest: "Vote for 1 of M" race where one party does not declare candidates (Secretary of State) * Primary Presidential Delegates: a delegate slate, display of delegates with nominees * Recall Type D: Retain/Recall Conditional contest (Judge recall) * Query Undervote enabled on Precinct Paper Tabulators (100/200) * Rotation: District by Registered Voters (Rotates based on party's registered voters by Party)
Post-Vote: Closing the Polls	SEE GEN01
Post-Vote: Central Count	SEE GEN01
Post-Vote: Security	SEE GEN01
Post-Vote: System Audit	SEE GEN01
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

Test Detail	**Test Methodology**
Test Case Name	**GEN03 (Usability and Accessibility)**
Scope	A system level test that uses the 2002 Voting System Standards (VSS) guidelines to validate required functionality and performance. Testing includes accuracy, ballot format handling capability, reporting, and usability of the hardware, software and procedures in the entire voting system.
Objective	The object of this test case is to verify core functionality and performance by using vendor manual(s) to create election ballots, vote, and tally, for a General Election while also testing Usability and Accessibility.

Variables: Voting Variations	* 1 precinct * Provisional/Challenged ballots * Non-Partisan contest: Vote for 1 of M (Sheriff) * Non-Partisan contest: Proposition/Question (Proposition X) * Partisan contest: Multi-member board, “Vote for 3 of M” race with declared candidates with a voting position defined for write-in (City Council) * Type D: Recall/Retain contest (12” 3-Key only) * Multi-language ballots (English and Spanish) * Audio/Visual/Combo ballots, 15 “ iVotronics with 3-key, 4-Key, 6-Key (6-Key supports sip and puff), 12” iVotronic 3-Key * VVPAT printer
Variables: Election Variations	SEE GEN01
A description of the voting system type and the operational environment	* **EDM** - Election Data Manager * **iVIM** – iVotronic Image Manager * **HPM** - Hardware Programming Manager * **AIMS** - AutoMARK Information Management System * **VAT** - AutoMARK Voter Assist Terminal (A100) & (A200) * **iVotronic** - iVotronic DRE (12” & 15”) * **ABCR Scanner** – Automatic Bar Code Reader * **Voyager Hand-held scanner** – hand held device * **AM** - Audit Manager * **ERM** - Election Reporting Manager * **ESSIM** - ES&S Ballot Image Manager Refer to the following tables for complete descriptions: ➢ Matrix of Required Software/Firmware ➢ Matrix of Required Hardware
Standards Documents	SEE GEN01
Pre-requisites and initialization of the test case	SEE GEN01
Documentation of Test Data & Test Results	SEE GEN01

Pre-vote: Ballot Preparation procedures verifications	SEE GEN01
Pre-vote: Preparation - Security	SEE GEN01
Readiness Testing and Poll Verification	SEE GEN01
Pre-vote: Opening the Polls Verification	SEE GEN01
Voting: Required functionality verifications	SEE GEN01
Voting: Optional functionality verifications	* 1 precinct * Provisional/Challenged ballots * Non-Partisan contest: Vote for 1 of M (Sheriff) * Non-Partisan contest: Proposition/Question (Proposition X) * Partisan contest: Multi-member board, “Vote for 3 of M” race with declared candidates with a voting position defined for write-in (City Council) * Type D: Recall/Retain contest (12” 3-Key only) * Multi-language ballots (English and Spanish) * Audio/Visual/Combo ballots, 15 “ iVotronics with 3-key, 4-Key, 6-Key (6-Key supports sip and puff), 12” iVotronic 3-Key * VVPAT printer
Accessibility verifications	* Privacy, secrecy, and integrity demands of the FEC VSS (V1: 2.2.7) * Common standards - reach, obstruction, protrusion, operable controls, ADA standards (V1: 2.2.7.1) * DRE standards - Audio, headsets, FCC Part 68, ANSI C63.19-2001 Category 4, Settings (contrast, color, size, volume), touch screen, sound cues, biometrics, dexterity (V1: 2.2.7.2, NASED Technical Guide #1, #2)
Usability verifications	* General Principles (V1: Appendix C.2) * Overall Design and Layout of the Voter Workspace (V1: Appendix C.3) * Ballot Legibility and Understandability (V1: Appendix C.4) * Information Grouping (V1: Appendix C.5) * Voting Input Fields (V1: Appendix C.6) * Navigation and Manipulation of Ballots (V1: Appendix C.7) * Preventing and Minimizing Voter Errors (V1: Appendix C.8) * Help and System Failure (V1: Appendix C.9) * Voter Familiarization and Training (V1: Appendix C.10)

Post-Vote: Closing the Polls	SEE GEN01
Post-Vote: Central Count	SEE GEN01
Post-Vote: Security	SEE GEN01
Post-Vote: System Audit	SEE GEN01
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

Test Detail	**Test Methodology**
Test Case Name	**Readiness Test**
Scope	A system level test that uses The 2002 Voting System Standards (VSS) guidelines to validate Readiness throughout the entire voting system. (V1: 3.4.1)
Objective	The object of this test case is to verify equipment and system readiness to ensure that the voting system functions properly, to confirm that the system equipment has been properly intergraded, and to obtain equipment status reports. (V1: 3.4.1)
A listing of the applicable voting system machines	* **EDM** - Election Data Manager * **iVIM** – iVotronic Image Manager * **HPM** - Hardware Programming Manager * **AIMS** - AutoMARK Information Management System (Create & Import) * **VAT** - AutoMARK Voter Assist Terminal (A100 & A200) * **M100** - Model 100 Ballot Scanner * **DS200** - intElect DS200 Ballot Scanner * **iVotronic** - iVotronic DRE (12 & 15) * **M650** - Model 650 Optical Scan central Count Counter * **AM** - Audit Manager * **DAM** - Data Acquisition Manager * **ERM** - Election Reporting Manager * **ESSIM** - ES&S Ballot Image Manager Refer to the following tables for complete descriptions: ➢ Matrix of Required Software/Firmware ➢ Matrix of Required Hardware

Standards Documents	SEE GEN01
Pre-requisites and initialization of the test case	This testing is to be executed on initial testing and each time the system is to be shut down and restarted.
Documentation of Test Data & Test Results	SEE GEN01
System Preparation - Security	SEE GEN01
Readiness Testing Verification	* Voting machines or vote recording and data processing equipment, precinct count equipment, and central count equipment are properly configured for an election, and collect data that verifies equipment readiness * Obtain status and data reports from each set of equipment * Correct installation and interface of all system equipment * Hardware and software function correctly * Version verification
Summary of Instructions followed per Product	The following list of documentation is used to perform system readiness: **Election Data manager (EDM) Checklist** **Election Day Training manual** Unity Version 4.0 Release Date: August 2007 **Audit Manager Checklist** **Election Day Training manual** Unity Version 4.0 Release Date: August 2007 **Hardware Programming Manager (HPM) Checklist** **Election Day Training manual** Unity Version 4.0 Release Date: August 2007 **iVotronic Voting System** **Election Day Training manual** Unity Version 4.0 Release Date: August 2007 **Model 100 Precinct Scanner**

	Pre-Election Day Checklist Unity Version 4.0 Release Date: August 2007 **Model 650 Central Scanner** **Pre-Election Day Checklist** Unity Version 4.0 Release Date: August 2007 **Windows XP on Dell Optiplex** **Installation Guide** Version 5.1 Release Date: August 20, 2007 **ESS Image Manager (ESSIM) Checklist** **Election Day Training manual** Unity Version 4.0 Release Date: August 2007 **DS200 Precinct Scanner** **Election Day Checklist** Unity Version 4.0 Release Date: September 2007 **DAM/ERM Checklist** **Election Day Training manual** Unity Version 4.0 Release Date: September 2007 **iVotronic Image Manager (iVIM) Checklist** **Election Day Training manual** Unity Version 4.0 Release Date: August 2007
Readiness Audit	* Produce and verify available system reports
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

Test Detail	Test Methodology
Test Case Name	**Operational Status Check**
Scope	SysTest Labs requires the vendor to provide a comprehensive end-to-end test case(s) that they supply to their customers, such as state election officials. The Vendor may provide SysTest Labs a comprehensive checklist of test case(s) for particular states' functionality. This test may be based on the vendor's certification configuration. SysTest Labs will perform the operational status check once upon acceptance of the equipment, and once after all other testing, prior to checkout. (V2: 4.6.1.5)
Objective	The object of this test case is to verify that when all tests, inspections, repairs, and adjustments have been completed, normal operation can be verified by conducting an operational status check.
Standards Documents	SEE GEN01
Documentation of Test Data & Test Results	SEE GEN01
Operational Status Check Verification	During this process, all equipment will be operated in a manner and environmental conditions that simulate election use to verify the functional status of the system. Prior to the conduct of each of the environmental hardware non-operating tests, a supplemental test will be made to determine that the operational state of the equipment is within acceptable performance limits. The following procedures will be followed to verify the equipment status: Step 1: Arrange the system for normal operation. Step 2: Turn on power, and allow the system to reach recommended operating temperature. Step 3: Perform any servicing, and make any adjustments necessary, to achieve operational status. Step 4: Operate the equipment in all modes, demonstrating all functions and features that would be used during election operations. Step 5: Verify that all system functions have been correctly executed.
Readiness Audit	SEE GEN01
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

Test Detail	Test Methodology
Test Case Name	**Security**
Scope	Security Testing Overview Security testing is related to four activities. * **Documentation Review** - Documentation Review verifies that the system has documented policies and procedures that mitigate or eliminate security threats outlined in the VSS and/or VSSG guidelines. It also describes Access controls * **Source Code Review** - Source Code Review insures source code meets VSS and/or VVSG guidelines and provides additional protection against security flaws into the system. Potential security issues may include default passwords or backdoors in the source code, encryption keys in the source code, encryption flaws, unencrypted data transmissions, encryption algorithms that are not NIST certified, etc. * **Hardware Testing** - Hardware Testing insures that that equipment will stand up to environment conditions, machines are accurate, physical access to machine components is restricted, machine hardware is reliable and attempts to compromise machine security is detectable. A hardware malfunction could impact the accuracy of voting data or provide unauthorized access to secure information. Specific hardware limitations or restrictions impact the test procedures needed to validate security of the system. * **System Testing** - System Testing verifies that voting systems have sufficient system and data protection mechanisms that when combined with other review processes, provide a secure voting environment. This section of the document relates to System Testing but depends on the other three activities that are covered in their own specific section.
Objective	Security testing attempts to identify flaws in voting systems where undesired or unauthorized human or machine activity may compromise an election through system failure, data manipulation, data interception or other means.
Variables: Voting Variations	Prevent and/or detect undesired system activities including: * Unauthorized access through accidental or intentional bypass or circumvention of authorization controls. * Alteration, deletion, replacement or theft of voter, election, audit and/or vote data. * Hardware and/or software tampering * Interruption of voting activities
A description of the voting system type and the operational environment	SEE Readiness Test
Standards Documents	SEE GEN01

Role	Privileges are not allowed to be: * Exceeded (V1-6.2.1.2c) * Changed to Run Reports Voters are inhibited from: * Accessing Equipment Before Polls Open * Running Reports Changes to Privileges are Prohibited for ID's and Passwords Thus Preventing Unauthorized Report Printing, Results Transmission, Results Downloading and Resetting of Elections Voter equipment access or keys are limited to ensure: * Only the User interface is accessible * Only a single vote may be cast * Closed Polls are secure * Counts are not available to voters * Unauthorized Accounts from System Functions Fraudulent Ballots are not accepted by the system ensuring only valid ballots are counted (V1-4.2.1c)
Access	Access validation to the system ensures that only applicable system entry is allowed. This includes: * Seals and/or Password are Required to Open Polls (1.2.4.1.3) * Security Seal and/or Password Prevent Unauthorized Opening of Polls * Incorrect or Blank Password Cannot be Used to Open Polls (1-6.2.2) * System Provides Access Controls that Limit or Detect Access to Critical System Components (1.2.3.1.1.1.a)
System Security	System security ensures that executables can only be run in their intended manner and order so that any other type of attempt to run the system is prohibited. (1.2.2.1) Additionally, executable preconditions are verified. Safeguards During Repair, Interventions or Failure are validated to ensure that tampering is not possible. Security Provision Compatibility With Procedures and Admin Tasks Incorporate a means of implementing a capability if access to a system function is to be restricted or controlled.
System Log	Verification of System Log Activity is performed to ensure: * Error Activity provided by the system is complete, applicable, and appropriate (1.4.4.3) * Voting Activity is captured correctly (1.4.4.3.d) * Log(s) have the needed protection to validate that the information is secure (1.4.4.3)
Audit Records	Audit Record verification is performed to verify that the generation of records cannot be turned off (1.2.2) This ensures that all audit data is maintained.
Software Security	Software security validation ensures that the accessibility to firmware is appropriately prohibited. This includes verifying that access from ports or through an open case is restricted. (6.4.1.c) Verify the Separation of Election Specific Firmware and Operating System are stored (6.4.1.d)

Data Integrity	Transmission of Cast Ballots During Voting Employs Receipt (6.5.2) Transmission of Cast Ballots During Voting Error Detection, Recovery and Retransmission Transmission of Cast Ballots During Voting Integrity Checks Transmission Verification Checks
Telecommunications & Data Transmission	Encrypted Transmissions (V1, 7.5.1.b) Encryption Specification Verification Session Hijacking (6.5.3.a) Protection Against External Threats (V1, 7.5.2.a & 7.5.3.f.) COTS Security Update Validation (6.5.4.1) COTS Zero Day Exploit Protection (6.5.4.1.a) COTS Exploit Resistance (6.5.4.3.f.1)
Telecommunications	Threat Vulnerability (1-6.5.4.1) Unauthorized Tool Virus Threat Reception and Storage Prevention (1-6.5.4.2) Remote Access Disabled User Account Restriction From Remote Access Settings Routers and/or Firewalls
Threat Protection	Memory Threat & Virus Scanning Mechanisms (1-6.5.4.2 END) Rootkit Scanning Mechanisms
Audit Log	Audit logs and data files cannot be altered through the use of an alternate boot sequence without detection, and the test will consist of attempting to boot the devices using alternative media during boot sequences. Audit logs and data files cannot be altered through the use of editing tools without detection. The test will consist of attempting to edit the audit log to confirm that the system either: * Does not allow edits of the audit log or data files, or * Detects and reports all attempts at editing the audit log or data files
Data Protection	Logical Isolation of Voting System Software & Data (1-6.5.5.b)
Vote Count Integrity	Layered Protection In Shared Environment 30 (V1-7.5.4)
Role	* Password Required for Each System Software Component (1-6.5.5.c) * Password Required for Each System Data Component * Password Required for Each System Data Component * Hardware Key Required for Each System Hardware Component * Each Type of User Account Can Only Perform Intended Functions
Data Protection	Access Control Lists Preclude Data Leakage (1-6.5.5.d) Routers and Firewalls Preclude Data Leakage Electronic Policies Prevent Copy of Data Voting System Access to Incomplete Election Returns (1-6.5.6)

Documentation	All vendor documentation is reviewed to validate all Vendor Access Control Policies pertaining to: * General, Software, Hardware Access controls * Communications * Effective Password management * Protection abilities of a particular operating system * General characteristics of supervisory access privileges * Segregation of duties * Vendor's access privileges * Access control measures * Physical security measures * Polling place security * Central count location security * Software security * Software and firmware installation * Protection against malicious software * Telecommunications and data transmission * Data integrity * Data interception prevention * Protection against external threats * Identification of COTS Products * Use of protective software * Monitoring and responding to external threats * Shared operating environment * Access to incomplete election returns and interactive queries * Security for transmission of official data over public communications networks * General security requirements for systems transmitting data over public networks * Voting process security for casting individual ballots over a public telecommunications networks * Documentation of mandatory security activities * Capabilities to operate during interruption of telecommunications capabilities * Any other relevant characteristics
External Access	Blocked Central Count Environment Access to Incomplete Election Returns (1-6.5.6.a)

Test Detail	Test Methodology
Test Case Name	**Telecommunications**
Scope	A system level test that uses the 2002 Voting System Standards (VSS) guidelines to validate required functionality. Testing includes Telecommunications capability of the vendor's voting system.
Objective	The object of this test case is to verify that the physical, technical, and procedural (documentation) controls correspond correctly for Telecommunication features.
Variables: Voting Variations	* Select type of components on the components tab using the vendor documentation. (V1: 5.1.1) * Voting-related transmission over a public network. (V1: 5.1.2) * Data / Vote Transmission (V1: 5.1.3) * Capabilities (5.2 - 5.2.5): considered basic to all data transmissions. (V1: 5.2, 5.2.1, 5.2.6) * Confirmation, the system notifies the user of the successful or unsuccessful completion of the data transmission. (V1: 5.2.7) * Voting systems that use telecommunications to communicate between system components and locations are subject to the same security requirements governing access to any other system hardware, software, and data function. (V1: 6.5.1 - 6.5.2) * Voting systems that use public telecommunications networks shall protect against threats. (V1: 6.5.4 - 6.5.4.3) * Systems that use a shared operating environment (V1: 6.5.5) * Access to Incomplete Election Returns and Interactive Queries (V1: 6.5.6) * Security for Transmission of Official Data Over Public Communications Networks. Transmitting Data Over Public Network (V1: 6.6, 6.6.1) * Security for Casting Individual Ballots over a Public Telecommunications Network (V1: 6.6.2, 6.6.2.1) * Operate During Interruption of Telecommunications Capabilities (V1: 6.6.2.2)
A description of the voting system type and the operational environment	SEE Readiness Test
Standards Documents	SEE GEN01
Pre-requisites and initialization of the test case	SEE GEN01 * Prepare device & test specific option setting * Prepare computer and device peripheral hardware options * Load firmware/data media * Validate basic device communication functionality, usability * Load voter registration - Electronic Poll Book at precincts
Documentation of Test Data & Test Results	SEE GEN01

Pre-vote: Ballot Preparation procedures verifications	SEE GEN01
Pre-vote: System Preparation - Security	SEE GEN01
Readiness Testing and Poll Verification	SEE GEN01 * The election is correctly installed and Electronic Poll Book is in use
Pre-vote: Opening the Polls Verification	SEE GEN01
Voting: Required functionality verifications	SEE GEN01
Voting: Optional functionality verifications	* Components are set up as described in the vendor documentation (V1: 5.1.1) * Voting-related transmission over a public network. (V1: 5.1.2) * Data / Vote Transmission (V1: 5.1.3) * Capabilities (5.2 - 5.2.5): considered basic to all data transmissions. (V1: 5.2, 5.2.1, 5.2.6) * Confirmation, the system notified the user of the successful or unsuccessful completion of the data transmission. (V1: 5.2.7) * Voting systems that use telecommunications to communicate between system components and locations are subject to the same security requirements governing access to any other system hardware, software, and data function. (V1: 6.5.1 - 6.5.2) * Voting systems that use public telecommunications networks protect against threats. (V1: 6.5.4 - 6.5.4.3) * Systems that used a shared operating environment (V1: 6.5.5) * Access to Incomplete Election Returns and Interactive Queries (V1:6.5.6) * Security for Transmission of Official Data Over Public Communications Networks. Transmitting Data Over Public Network (V1: 6.6, 6.6.1) * Security for Casting Individual Ballots over a Public Telecommunications Network (V1: 6.6.2, 6.6.2.1) * Operate During Interruption of Telecommunications Capabilities (V1: 6.6.2.2)
Post-Vote: Closing the Polls	SEE GEN01
Post-Vote: Central Count	SEE GEN01
Post-Vote: Security	SEE GEN01
Post-Vote: System Audit	SEE GEN01
Results are Observed	SEE GEN01
Record Observations and all input/outputs for each election	SEE GEN01

End of Certification Test Plan