

Certification Test Plan

Report Number 07-V-DOM-046-CTP-01

Dominion Voting Systems Dominion Democracy Suite 1.0.0

Consisting of:

EMS Core System, ImageCAST Precinct Ballot Imager and ImageCAST Central Ballot Imager

Test Plan Rev 01

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In addition to VSTL accreditation, SysTest Labs was accredited for and still holds accreditation as an EAC Interim Independent Test Authority (ITA)

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Revision History

Date	Description of Revision	Author	Revision No.
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1 INTRODUCTION: Certification Test Background

This Master Certification Test Plan outlines the approach SysTest Labs will implement to perform Election Assistance Commission 2005 Voluntary Voting System Guidelines Certification testing on the Democracy Suite Voting System by Dominion Voting Systems. The purpose of this document is to provide a clear and precise plan for test elements required to ensure effective Certification testing. The Dominion Voting System consists of the core Election Management System (EMS), the ImageCAST Precinct Ballot Imager and the ImageCAST Central Tabulator. The EMS has two main components, the Election Event Designer client which is used to create the initial election data, as well as the Results/Tally and Reporting client which is used for tallying of election data. The Precinct Ballot Imager, which is an optical scan paper ballot tabulator that accepts ballots inserted in any direction and reads both sides of the ballot simultaneously, is used at the precinct level. The Central Tabulator, which is a high speed optical scan paper ballot tabulator that accepts ballots inserted in any direction and reads both sides of the ballot simultaneously at a central count location.

The objective of this test plan is to outline the certification test tasks. 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;
- Identifies the types of tests to be performed;

SysTest Labs will provide certification testing for Dominion Voting Systems, on the Democracy Suite Voting System. This effort includes the

- Physical Configuration Audit,
 - Including the Technical Data Package documentation review and source code review
- Functional Configuration Audit
 - Including an assessment of Dominion Voting Systems' testing to the Dominion Voting Systems System Requirements Specification and the requirements outlined in the EAC VVSG Vol. 1 section 2 and the performance of functional and system level integration tests.
 - This includes developing a test plan, managing system configurations, generating test cases, as needed based on the set of test requirements, (in addition to the test cases and procedures furnished by Dominion Voting Systems), test execution, and analysis of results.

1.1 Certification Test Plan Attachments

The following attachments apply to this Certification Test Plan:

Attachment A: List of Technical Data Package Documents

Attachment B: Supported Functionality Declaration

Attachment C: List of Source Code Reviewed – **PROPRIETARY (separate document)**

Attachment D: 2005 Vendor Testing and TDP Trace

Attachment E: Trace of SysTest Labs' Test cases to 2005 VVSG

1.2 Scope

The following Dominion Voting System components are in the scope of the Certification Test Plan as detailed in this document.

The Dominion Democracy Suite Voting System consists of the following software packages:

- Election Management System – Election Event Designer Client
- Election Management System – Results Tally and Reporting Client
- Election Management System – Central Count Tabulator
- Election Management System – ImageCast Precinct Firmware

With the following hardware:

- ImageCAST™ Precinct Ballot Imager
- ImageCAST™ Central Ballot Imager

This effort includes the Physical Configuration Audit (including the Technical Data Package documentation review and source code review) as defined by the EAC 2005 VVSG Vol. 2, section 2. The Functional Configuration Audit will consist of an assessment of Dominion's testing to the Dominion Voting System Requirements Specification, as outlined in the EAC 2005 VVSG Vol. 1 section 2, as well as the performance of functional and system level integration tests. This includes development of this test plan, managing system configurations, generating test cases as needed based on the set of test requirements (in addition to the test cases and procedures furnished by Dominion), test execution, and analysis of test results.

SysTest Labs' deliverable will consist of a 2005 VVSG Certification Test Report, which will contain results of all software/hardware tests run, as well as a recommendation to certify or not to certify based on the test results.

1.3 Applicable Voting System Standards

SysTest Labs will conduct certification testing for Dominion on their Democracy Suite voting system. The resulting certification will be to the EAC 2005 VVSG.

Certification Test component	Applicable Standard
FCA Doc Review	EAC VVSG 2005, Vol. 1, Sec. 2
Testing of the Voting System	EAC VVSG 2005, Vol. 1 and 2
Source Code Review	EAC VVSG 2005 Vol. 1, Sec. 4 and Vol. 2, Sec 5
Trusted Build	EAC Testing and Certification Program Manual
Hardware	EAC VVSG 2005, Vol. 1, Sec. 4; Vol. 2, Sec.4
PCA Doc Review (for all documents except for Security documents)	EAC VVSG 2005, Vol. 2, Sec. 2
PCA Doc Review (for all Security documents)	EAC VVSG 2005, Vol. 2, Sec. 2

The Functional Configuration Audit will consist of an assessment of the vendor’s testing to its System Requirements Specification, as outlined in the applicable voting standard, as well as the performance of functional and system level integration tests. This includes developing a thorough test plan, managing system configurations, generating test cases as needed based on the set of test requirements (in addition to the test cases and procedures furnished by the vendor), test execution, and analysis of test results.

1.4 References

1. Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG), 2005 Version 1.0. Volumes I and II.
2. NIST NVLAP Handbook 150: 2006.
3. NIST NVLAP Handbook and 150-22: 2005.
4. EAC Testing and Certification Program Manual, United States Election Assistance Commission, 2006
5. SysTest Labs Quality System Manual, Revision 1.0, prepared by SysTest Labs, dated 11/3/2006.

See also Attachment A for a list of vendor deliverables.

1.5 Terms and Abbreviations

These terms and abbreviations will be used throughout this document:

Table 1 - Matrix of Terms & Abbreviations

Term	Abbreviation	Description
Dominion Democracy Suite EMS Core System	EMS	Suite of inter-operative software applications: Application Server, Database Server, Election Event Designer, and Results, Tally & Reporting. Election Management System is used to create, configure and report election events
Election Event Designer	EED	Election Event Designer, an application within the EMS
Results, Tally & Reporting	RTR	Results, Tally & Reporting, an application within the EMS
ImageCAST Precinct Ballot Imager	N/A	Ballot scanner, for use in precinct polling places. Both hardware and firmware for this device are proprietary.
ImageCast AudioVote Add-On	N/A	Accessibility kit, for conformance with ADA regulations. Includes: Audio Tactile Interface (ATI), External Laser Printer, Headset, Sip n puff interface, ADA Paddles, Hygienic Headset Ear Cover.
Audio Tactile Interface	ATI	Component of accessibility kit, above
ImageCast Precinct	ICP	Precinct level scanner
ImageCast Central	ICC	Central Count level scanner

2 PRE-CERTIFICATION TESTS

2.1 Pre-Certification Test Activity (Assessment)

SysTest Labs has conducted a review of the Dominion Voting Systems Technical Data Package, including:

- Functional requirements
- Software design documentation and specification
- Configuration Management Plan
- Quality Assurance Plan
- End-user documentation
- Test plan
- Test cases and procedures

for each software component of the Democracy Suite Voting System, which includes Dominion Voting Systems' EMS, ImageCast Precinct Ballot Imager and ImageCAST Central Tabulator.

These reviews were conducted in accordance with EAC VVSG 2005.

2.1.1 Physical Configuration Audit (PCA)

SysTest Labs conducts a PCA of the documents submitted for review in the Dominion Technical Data Package, including Functional Requirements, Specifications, Procedures, System Overview, Configuration Management Plan, and Quality Assurance Program. The review is based on the standard noted in section 1.3 of this test plan for each of the submitted individual components of the voting system subject to this Certification Test Plan.

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

2.1.2 Functional Configuration Audit (FCA)

SysTest Labs conducts an FCA review of the vendor test cases delivered as part of the Technical Data Package. The review was conducted against the standard as defined in section 1.3 of this test plan, for each of the submitted components. Any requirements that were identified as not being tested, or insufficiently tested, have been included in the Test Cases that SysTest Labs will execute.

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

2.1.3 Source Code Review

The Democracy Suite voting system is subject to a full certification and thus all code is subject to a full review against the standard noted in section 1.2 of this test plan. SysTest Labs has conducted a source code review of the all the code submitted by the vendor for the voting system under test. The source code submitted by the vendor and subject to review as part of this Certification Test is in the following languages: C, C++, and Assembler.

Source Code Review Tools utilized by SysTest include

- Practiline Line Counter: a commercial application used to determine the counts of executable and comment lines;
- Module Finder: a SysTest 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 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.

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

2.1.4 Trusted Build

Prior to testing, SysTest Labs will conduct a trusted build according to the detailed trusted build procedure provided by Dominion Voting Systems in the TDP, as outlined in 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.

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 necessary materials.

Execution of the trusted build entails the vendor detailed build procedure and additional steps required in the Certification Program Manual resulting in installation media containing the installation files as well as images taken of the build environment at various stages.

Finally, the conclusion of the trusted build consists of record-keeping and archiving procedures that occur at SysTest Labs, and the resulting media is submitted to the EAC-approved software repository.

2.2 Pre-Certification Assessment Results

SysTest Labs conducted an assessment of Dominion Voting Systems' Technical Data Package, including End-user Documentation, Specifications, Quality Assurance program, Configuration Management Plan, Development test cases, Quality Assurance test cases, and Source Code for each of the submitted components of the Democracy Suite Voting System.

2.2.1 Results of Pre-Certification Assessment

Based upon the findings of the pre-certification assessment for Dominion Voting Systems, SysTest Labs has determined that Dominion Voting Systems' TDP content is consistent with the EAC 2005 Voluntary Voting System Standards for TDP documentation.

Issues were noted in a discrepancy report that was provided to Dominion Voting Systems for resolution prior to completion of testing.

These reports will be included in the Certification Test Report.

Full assessment, review, and correction of the Dominion Voting Systems TDP will be completed as part of the execution of this Certification Test Plan.

As determined by the assessment, the following tests are slated to be executed, as part of this Certification Test Plan:

- Operational Status Check
- Readiness Test
- Sampling of Dominion Voting Systems' test cases
- SysTest Labs' Gen01 test case
- SysTest Labs' Gen03 test case
- SysTest Labs' Pri02 test case
- SysTest Labs' Functional test case
- SysTest Labs' Security test case
- System Accuracy test case.

Please see section 4.2.1 and 4.2.2 for additional detail of the SysTest Labs test cases.

3 SYSTEM IDENTIFICATION AND MATERIALS REQUIRED FOR TESTING

3.1 Software/Firmware

Items identified in the table reflect all software required to perform hardware, software, functional, security and integrated system tests. Note that the software listed with Manufacturer of Dominion is software under test. Should a software modification become necessary, an amended test plan would be produced with the new version under test listed and any/all previous iterations listed with a strikethrough.

Table 2 - Matrix of Required Software

Manufacturer	Application(s)	Version	Release Type	Test Type
Dominion	Democracy Suite EMS Election Event Designer	1.0.21	(Initial)	Pre- & Post-Voting
Dominion	Democracy Suite EMS Results, Tally & Reporting	1.0.21	(Initial)	Post-Voting
Dominion	Democracy Suite EMS Application Server	1.0.21	(Initial)	Pre- & Post-Voting
Dominion	Democracy Suite EMS Database Server	1.0.21	(Initial)	Pre- & Post-Voting
Dominion	ImageCast Precinct firmware	1.9.0	(Initial)	Voting
Dominion	ImageCast Central firmware	1.4.0	(Initial)	Voting
Microsoft	For Database Server PC - Microsoft Windows Server 2003 R2 Standard Edition (configured in Application Server mode)	R2	COTS	Pre- & Post-Voting
Microsoft	For EMS EED & RTR Workstations - Microsoft Windows Installer Redistributable 3.1 (version 2)	3.1.4000.2435	COTS	Pre- & Post-Voting
Microsoft	For Database Server PC - Microsoft SQL Server 2005 Standard Edition (or SQL Server 2005 Express Edition)	2005 with SP2	COTS	Pre- & Post-Voting
Microsoft	For Database Server PC - .NET Framework 2.0	2.0	COTS	Pre- & Post-Voting
Microsoft	For EMS EED & RTR Workstations - Windows Internet Explorer 7 for Windows XP SP2	7.0	COTS	Pre- & Post-Voting
Microsoft	For EMS EED & RTR Workstations - Windows Media Player 11 for Windows XP	11.0	COTS	Pre- & Post-Voting
Microsoft	For EMS EED & RTR Workstations - Microsoft Visual J# Redistributable 2.0	2.0	COTS	Pre- & Post-Voting
Microsoft	For Database Server PC - Server side digital certificate (SSL 128 bit key strength)	N/A	COTS	Pre- & Post-Voting
Microsoft	For Application Server PC -	R2	COTS	Pre- & Post-Voting

Manufacturer	Application(s)	Version	Release Type	Test Type
	Microsoft Windows Server 2003 R2 Standard Edition configured in Application Server mode with IIS 6.0			
Microsoft	For Application Server PC - .NET Framework 2.0	2.0	COTS	Pre- & Post-Voting
Microsoft	For Application Server PC - Server side digital certificate (AES 128 bit key strength)	N/A	COTS	Pre- & Post-Voting
Microsoft	For EMS EED& RTR/ ImageCAST Central PCs - Microsoft Windows XP SP2 Professional	SP2	COTS	Pre- & Post-Voting
Microsoft	For EMS EED & RTR PCs - .NET Framework 2.0	2.0	COTS	Pre- & Post-Voting
Microsoft	For EMS EED & RTR PCs - Microsoft Office 2003 Standard edition	2003	COTS	Pre- & Post-Voting
Adobe	For EMS EED & RTR Workstations - Adobe Acrobat Reader 7.0 or higher	7.0	COTS	Pre- & Post-Voting
Arcturus Networks	ucLinux	3.2.0	COTS	Voting
Maxim Integrated Products	For EMS EED & RTR Workstations - Dallas 1-Wire Device Driver version 4.0	4.0 (TMEX and optional OWCOM API and .NET support)	COTS	Voting
Symantec	For EMS EED & RTR Workstations - Symantec Anti-Virus Corporate Edition 10.2	10.2	COTS	Pre- & Post-Voting

3.2 Equipment (Hardware)

Equipment identified in the table reflects all hardware required to perform hardware, software, security and integrated system tests.

Table 3 - Matrix of Required Hardware

Item	Manufacturer	O/S Version	Type
ImageCAST Precinct Ballot Imager	Dominion Voting Systems	ucLinux 20070130	Scanner
Database and Application Server PC (COTS components) Single or Dual Intel XEON or multi-core - Pentium 4 hardware platform (32-bit or 64-bit mode) (or appropriate AMD version) - 2GB of Operating Memory - 160GB Hard Disk array with 2 disks in RAID mode - Dual 1 Gigabit Ethernet network adapters -DVD RW ROM	COTS	Microsoft Windows Server 2003 R2 Standard with SP2	Personal computer
EED & RTR PC (COTS components) Single multi-core Pentium 4 hardware platform (32-bit mode) - 1GB of Memory - 160GB Hard Disk - Single 1 Gigabit Ethernet network adapter - DVD RW ROM - Compact Flash card reader - Video adapter and monitor capable of minimum 1280x1024 resolution - Audio sound card with audio recording capabilities	COTS	Microsoft Windows XP Professional SP2	Personal computer
ImageCast AudioVote Add-On	COTS		Accessibility kit
Audio-tactile interface	ATI		Component of accessibility kit, above
ImageCast Central Tabulator	COTS		Scanner

3.3 Test Materials

Items identified in the table reflect all additional test materials required to perform hardware, software, functional, security and integrated system tests.

Table 4 - Matrix of Additional Test Materials

Item
Ballot Box
Precinct Kits / Consumables: Pens, Secrecy sleeves, Thermal printing tape, Flash Card, Lithium Ion Battery, Optical Cleaning Kits
Compact Flash card reader
Compact Flash cards
Laser printer
11-inch ballot
14-inch ballot
17-inch ballot
22-inch ballot

3.4 Deliverable Materials

In addition to the hardware, software and test materials identified in section 3.1, 3.2, and 3.3, Dominion delivered Technical Data Package documents as a part of the Democracy Suite Voting System. Please see Attachment A for a list of these documents.

3.5 Proprietary Data

SysTest Labs considers all software, equipment, hardware, test and deliverable materials as the private property of Dominion Voting Systems and shall handle them in a proprietary manner.

4 TEST SPECIFICATIONS

4.1 Hardware Configuration and Design

Certification testing will occur for conformance to Vol. 1 Sect. 4 Hardware Requirement and Vol. 2 Sect. 4 Hardware Testing of the EAC 2005 VVSG.

The Hardware Configuration Audit will confirm the configurations match.

Table 5 - Matrix of Hardware Configuration

Item	Manufacturer	O/S Version	Description of Use
Database & Application Server PC (COTS components) Single or Dual Intel XEON or multi-core - Pentium 4 hardware platform (32-bit or 64-bit mode) (or appropriate AMD version) - 2GB of Operating Memory - 160GB Hard Disk array with 2 disks in RAID mode - Dual 1 Gigabit Ethernet network adapters - DVD RW ROM	COTS	Microsoft Windows Server 2003 R2 Standard with SP2	Personal computer
EED & RTR PC (COTS components) Single multi-core Pentium 4 hardware platform (32-bit mode) - 1GB of Memory - 160GB Hard Disk - Single 1 Gigabit Ethernet network adapter - DVD RW ROM - Compact Flash card reader - Video adapter and monitor capable of minimum 1280x1024 resolution - Audio sound card with audio recording capabilities	COTS	Microsoft Windows XP Professional SP2	Personal computer
ImageCast AudioVote Add-On			Accessibility kit, for conformance with ADA regulations. Includes: Audio Tactile Interface (ATI), External Laser Printer, T-coil coupler, Headset, Sip n puff interface, ADA Paddles, Hygienic Headset Ear Cover.
Audio Tactile Interface			Component of accessibility kit, above
ImageCast Precinct Scanner	Dominion Voting Systems		Precinct Scanner
ImageCast Central Tabulator	COTS		Central Count Scanner

4.2 Software System Functions

The scope of the testing includes the software testing (*Vol. 2, Sect. 5*) and system integration testing (*Vol. 2, Sect. 6*) as defined in the EAC VVSG 2005 including:

- Conducting a Pre-Certification Test Assessment (*Vol. 2, Appendix 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
 - Full Source Code Review (*Vol. 2, Sect. 5.4*) of all non-COTS code
 - Review Dominion Voting Systems documentation technical data package in full
 - Review Dominion Voting Systems' functional specification for adequacy or discrepancy
 - Execution of the Trusted Build process
- Functional Configuration Audit: (*Vol. 2, Sect. 6.7*)
 - Creation and issuance of this Certification Test Plan (*Vol. 2, Appendix A.*)
 - Review, evaluation, creation, execution of Functional Tests (*Vol. 2, Appendix A.4.3.3 & A.4.3.4*)
 - Creation and execution System Level Integration Tests (*Vol. 2, Sect. 6*)

4.2.1 Functional Testing

Review of Dominion Voting Systems' functional specification, test plans, test cases and test results demonstrate the following functional areas are included in Democracy Suite Voting System's overall system capabilities; pre-voting, voting and post-voting functions. This functionality will be verified by the tests performed. (*Vol. 2, Appendix. A 4.3.4*)

Table 6 - Matrix of 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 voting variation functionality identified by Dominion Voting Systems' Democracy Suite, as defined in The Supported Functionality Declaration, attachment B (Vol. 1. Section 2.2.8.2).
b.2. Accuracy Tests- Ballot reading accuracy	Accuracy Test Verify recording of 1,549,703 consecutive ballot positions on the ImageCAST Precinct Imager. Accuracy Ballot definition is loaded onto ImageCast -Report of the initialization process -Display the function selections -Open polls -Zero Report -Scan ballots, Close polls, Run totals report and Audit Log
b.3. Status Tests- Equipment statement & memory contents	Equipment statement & memory contents at the corresponding intervals outlined in user documentation
b.4. Report Generation – Produce test output data	Verify: Clearing Election Totals Manual data entry Generating a Zero Report

Function	Test Methodology
	Testing an Election Creating Test Reports Clearing Totals for Election Day Selecting Reporting Groups Loading Scanner Totals Producing Election Reports Displaying Election Information Democracy Suite RTR Election Results
<i>b 5.</i> Report Generation- Produce audit data	Verify Democracy Suite RTR system is capable of generating audit reports
Polling Place Functions	
<i>c.1.</i> Opening the polls, accepting & counting ballots	Verify Zero Reports Scan paper ballots Alerts for over votes and under votes
<i>c.2.</i> Monitoring equipment status	Equipment status as identified in user documentation
<i>c.3.</i> Equipment response to commands	Equipment response to all voter and poll worker commands as identified in user documentation
<i>c.4.</i> Generating real-time audit messages	Print audit log Each audit message contains a timestamp. Election name, software, and firmware are listed at the 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.
<i>c.5:</i> Closing polls and disabling ballot acceptance	Inability to cast additional ballots Closing of polls Inability to scan additional ballots
<i>c.6.</i> Generating election data reports.	Generation of precinct reports
<i>c.7.</i> Transfer ballot count to central counting location	Reading the Compact Flash Card to the RTR
Central Count Functions	
<i>d.1.</i> 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 DS200
<i>d.2.</i> Monitoring equipment status	Equipment status as identified in user documentation
<i>d.3.</i> Equipment response to commands	Equipment (ImageCAST Precinct Ballot Imager) 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)
<i>d.4.</i> Integration with peripherals equipment or other data processing systems	See b.3
<i>d.5.</i> Generating real-time audit messages.	See b.4
<i>d.6.</i> Generating precinct-level election data reports	See b.3
<i>d.7.</i> Generating summary election data reports	See b.3
<i>d.8.</i> Transfer of detachable memory module to the processing equipment	See b.3
<i>d.9.</i> Producing output data for interrogation by external display devices	RTR to DS Election Management Results Publishing Server

A Functional Test is a SysTest Labs test case for validating a system's ability to correctly perform a given function. These test cases are used for validating functionality that does not fit well into a System Integration Level test case, or is a functionality that has enough options that are not able to be covered in their entirety in a system level test case.

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, per Volume 2, Section 4.7.1.1).

A twenty-two inch, two sided ballot will be utilized, with 312 ballot positions on the front (contest/candidates) and 30 ballot positions on the back (propositions), for a total of 342 ballot positions per ballot.

This will necessitate a minimum of 4532 ballot passes to accomplish the Accuracy Test.

Five different ballot markings sets will be utilized during the Accuracy Test. The five sets are designed to set various boundary conditions and that each scanner component is utilized by at least 2 different ballot sets.

Each ballot marking set will be utilized on three individual ballots, for a total of 15 ballots.

Each ballot will be run 306 times.

This will result in 4590 ballot passes, and 1,569,780 ballot positions being scanned.

A zero ballot positions read report will be run to validate the initial state.

Each ballot will be scanned 6 times manually, for a total of 90 manual ballot insertions.

At the end of these 90 manual ballot insertions, a report will be run.

Each ballot will be scanned an additional 300 times using an automated feed method.

After every ballot is run 300 times a report will be run.

15 reports will be generated during the automated feed method.

Seventeen reports will be generated overall (One zero, One manual feed, 15 auto feed).

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

- Accuracy ballot definition is loaded onto a Compact Flash Card
- Report of the initialization process
- Display the function selections
- Open polls
- Zero Report
- Scan ballots, Close polls, Run Totals report and Audit Log

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 VVSG Vol. 1 and Vol. 2. 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.

4.2.2 System Level Testing

System level tests shall be performed on the Dominion Democracy Suite EMS EED/ RTR /Application Server/ Database Server/ ImageCAST Precinct Imager/ ImageCAST Central Imager for the purpose of assessing the response of the software to a range of conditions (*Vol. 2, Sect. A.4.3.5*).

Table 7 - Matrix of System Level Testing:

System Tests	Test Methodology
Volume Test	
System's response to processing more than the expected number of ballots/voters per polling place	Data Accuracy test will be performed
Stress Tests	
Hardware Test Plan	Hardware test labs test the limits outside the range of 'normal' but within specifications for the units as defined in the VVSG standards Vol.1: Section 4. 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.
Usability Tests	
GEN01 Test Case GEN03 Test Case PRI02 Test Case	Responses to input, text syntax, error message content, and audit message input.
Accessibility Test	
Exercises systems capabilities for voters with disabilities	Summative and usability tests conforming to requirement defined in Volume I, Section 4, to satisfy the provisions of HAVA 301(a)(4) and 241(b)(5). Descriptions of testing, participating test subjects and test results shall be documented by the vendor and as part of the Technical Data Package, so that Test labs can review this information during the system certification documentation review.
Security Test	
Exercises systems security provisions, unauthorized access, deletion or modification of data, audit trail data, and modification or elimination of security mechanisms.	Incorporate systems security provisions, unauthorized access, deletion or modification of data, audit trail data, and modification or elimination of security mechanisms
Performance Tests	
GEN 01 Test Case and Accuracy Test (Hardware Test Plan)	Test accuracy, processing rate, ballot format, handling capability and other performance attributes claimed by the vendor. Perform End-to-End System Level Testing validating a predicted result.
Recovery Tests	
Hardware Test Plan	Exercise system's ability to recover from hardware and data errors. Validate battery backup and recovery from error conditions, incorporated into Hardware test lab tests to requirements as defined in the VVSG standards Vol.1: Section 4. (See also Hardware Tests)

GEN 01 is SysTest Labs' System level test case for a general non-straight party election. The objective of the GEN 01 test case is to test the core functionality of the voting system. This is accomplished by

using the vendor's manual(s) to create a general election, ballot creation (election definition), vote the general election, and tally the results. GEN 01 will test the following items:

- Define election contests, candidates, issues etc. (V1:2.2.6)
- Maintain accurate and complete audit records (V1:2.2.5.2.1)
- Maintain accurate and complete error and status messages (v1:2.2.5.2.2, 2.2.5.2.3)
- Accurately record scanned ballots.
- Ensure Undervotes are counted as cast votes
- Reporting separate accumulation of Undervotes and Overvotes
- Ensure Overvotes are allowed when scanned
- Maintain integrity of Vote and Audit data
- Party affiliation is identified on the ballot
- Accurate Definition, Count, Reporting for Election Day, with the results tallied (V1:2.2.2.1)
- Write-in voting: Voting position identified for write-ins
- Correctly tabulate (V1:2.2.8.1)
- Have a Ballot Counter (V1:2.2.9)
- Blank ballots
- Non-Partisan contest: Vote for 1 of N
- Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in
- Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins
- Non-Partisan contest: Multi-member board (N of M)
- Partisan contest: Vote for 1 of N
- Partisan contest: "Vote for 1" race with a single candidate and a write-in
- Partisan contest: "Vote for 1" race with no declared candidates and write-ins
- Partisan contest: Multi-member board (N of M)
- Partisan contest, one party has no candidates
- 2 precincts
- Split precincts
- Provisional/Challenged Ballots:

GEN 03 is SysTest Labs' System level test case for verifying that with the vendor's manual, all supported multi-lingual formats can be created, voted, provisionally voted, audio voted and tallied for Election Day Voting and Absentee/Early Voting.

- Define election contests, candidates, issues etc. (VVSG Vol 1: 2.1.6)
- Maintain accurate and complete audit records (VVSG Vol 1: 2.1.5.1.a)
- Maintain accurate and complete error and status messages (VVSG Vol 1-2.1.5.1.b, Vol 1: 2.1.5.1.c)
- Accurately record cast ballots, including provisional (VVSG Vol 1: 2.3.3)
- Ensure undervotes are counted as cast votes
- Separate accumulation of Undervotes and Paper Overvotes
- Ensure Overvotes are counted on paper
- Maintain integrity of Vote and Audit data
- Party affiliation is identified on the ballot
- Accurate Definition, Count, Reporting for Election Day, Absentee - paper, with the results tallied, excluding and including provisional ballots (VVSG Vol 1: 2.1.2)
- Write-in voting: Voting position identified for write-ins
- Correctly tabulate (VVSG Vol 1: 2.1.7.1)
- Have a Ballot Counter (VVSG Vol 1:2.1.8)

- Overvotes
- Undervotes
- Blank ballots

Additionally, ballots can be created with the following optional functionality:

- Non-Partisan contest: Vote for 1 of N
- Non-Partisan contest: "Vote for 1" race with a single candidate and a write-in
- Non-Partisan contest: "Vote for 1" race with no declared candidates and write-ins
- Non-Partisan contest: Multi-member board (N of M)
- Partisan contest: Vote for 1 of N
- Partisan contest: "Vote for 1" race with a single candidate and a write-in
- Partisan contest: "Vote for 1" race with no declared candidates and write-ins
- Partisan contest: Multi-member board (N of M)
- Partisan contest, one party has no candidates
- Non-Partisan contest: Proposition/Question
- Slate & Group voting: one selection votes the slate
- Multi-language ballots
- Audio Ballots
- Rotation, by precinct,
- 3 precincts

Pri 02 is SysTest Labs' System level test case for a Closed Primary Election which is created using the vendor's manual to create two partisan and one non-partisan ballots, vote, and tally, with the following required functionality:

- Define election contests, candidates, issues etc. (VVSG V1: 2.1.6)
- Maintain accurate and complete audit records (VVSG V1: 2.1.5.1.a)
- Maintain accurate and complete error and status messages (VVSG V1: 2.1.5.1.b, V1: 2.1.5.1.c)
- Accurately record cast ballots, including provisional (VVSG V1: 2.3.3)
- Ensure undervotes are counted as cast votes
- Separate accumulation of Undervotes and Paper Overvotes
- Ensure Overvotes are counted on paper
- Maintain integrity of Vote and Audit data
- Party affiliation is identified on the ballots where appropriate
- Accurate Definition, Count, Reporting for Election Day, with the results tallied. (VVSG V1: 2.1.2)
- Write-in voting: Voting position identified for write-ins.
- Correctly tabulate (VVSG V1: 2.1.7.1)
- Have a Ballot Counter (VVSG V1: 2.1.8)
- Overvotes
- Undervotes
- Blank ballots

Additionally, that ballots can be created with the following optional functionality:

- Non-Partisan contest: Vote for 1 of N
- Partisan contest: Vote for 1 of N
- Partisan contest: Cross over to another partisan ballot if no declared candidate
- Partisan contest: Multi-member board (N of M)
- Partisan contest, one party has no candidates

- Primary Presidential Delegates: a delegate slate, display of delegates with nominees
- Recall Issues with Options: Simple Yes/No
- Recall Issues with Options: Retain is the first option, Replacement candidate for the second or more options
- Rotation, by precinct
- 7 Precincts

The Security Test Case is SysTest Labs' test case for verifying that a voting system will correspond correctly with security tests based on VVSG Vol. 1 and Vol. 2. The test case will be customized as applicable to the system under test. It incorporates checks for:

- system 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.

4.3 Test Case Design

4.3.1 Hardware Qualitative Examination Design

SysTest Labs reviewed the overall system capabilities, pre-voting, voting, and post-voting functions. The Democracy Suite hardware is incorporated into the standard set of system level test cases with the augmentation of functionality-specific validation steps.

4.3.2 Hardware Environmental Test Case Design

Hardware environmental certification testing for conformance to Vol 1. Sect. 4 of the EAC VVSG 2005 will be run on the ImageCAST Precinct Ballot Imager. This will consist of all required tests:

- Non-Operating - Maintainability
- Non-Operating - Safety Evaluation
- Non-Operating Environmental - Bench Handling
- Non-Operating Environmental - Vibration
- Non-Operating Environmental - Low Temperature
- Non-Operating Environmental - High Temperature
- Non-Operating Environmental - Humidity (85%) Soak
- Other Environmental Tests (Electrical) - Usability and Accessibility
- Other Environmental Tests (Electrical) - Temperature/Power Variation and Reliability
- Other Environmental Tests (Electrical) - Data Accuracy
- Other Environmental Tests (Electrical) - Power Disturbance
- Other Environmental Tests (Electrical) - Electromagnetic Radiation
- Other Environmental Tests (Electrical) - Electrostatic Disruption
- Other Environmental Tests (Electrical) - Electromagnetic Susceptibility
- Other Environmental Tests (Electrical) - Electrical Fast Transient
- Other Environmental Tests (Electrical) - Lightning Surge
- Other Environmental Tests (Electrical) - Conducted RF Immunity

- Other Environmental Tests (Electrical) - Magnetic Fields Immunity

As of June 6, 2007, after reviewing relevant documentation, SysTest Labs determined that the Democracy Suite Voting System contains common off the shelf hardware (COTS), consisting of the ImageCAST Central Tabulator (a Bell and Howell CopiScan 8000+ scanner), as well as the ImageCAST Workstation and Data Center (Pentium 4 PC). As such there is no requirement for environmental testing of this COTS hardware.

4.3.3 Software Module Test Case Design and Data

SysTest Labs reviewed the test case design documents and data as provided by Dominion Voting Systems. In evaluating each module, with respect to flow control parameters and data on both entry and exit, SysTest Labs assessed the adequacy of the code's modularity and construction, the absence of hidden code, and the extent to which "industry standard" characteristics are incorporated (Vol. 2, Section A.4.3.3).

SysTest Labs shall design additional module test cases, as required, to provide coverage of modules containing untested paths with potential for un-trapped errors.

SysTest Labs shall also review 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 shall provide a description of additional module tests, prerequisite to the initiation of functional tests.

4.3.4 Software Functional Test Case Design

SysTest Labs has reviewed the functional test case design documents and data as provided by Dominion Voting Systems against a detailed matrix of system functions and the test cases, which exercise them. SysTest Labs has prepared a test procedure describing all test ballots, operator procedures, and the data content of output reports. SysTest Labs will design and conduct all appropriate module and integrated functional tests found necessary (Vol. 2, Section A.4.3.4).

4.3.5 System-level Test Case Design

SysTest Labs reviewed the system-level test case design documents and data as provided by Dominion Voting Systems. SysTest Labs will conduct all appropriate module and integrated functional tests found necessary, in addition to the standard set of system level tests run against all voting systems. (Vol. 2, Section A.4.3.5).

4.3.6 Sampling Methodology

SysTest Labs reviewed the system-level and functional test case documents and data as provided by Dominion Voting Systems. SysTest Labs will repeat a sample of the vendor's test cases according to the following guideline:

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

- Review all vendor test cases and select 1 or more tests from high-risk areas for sampling, such as:
 - Security
 - Audit log
 - Tabulating

SysTest Labs has selected the following test cases as sample test cases because they either represent integral parts of the voting system or they exercise essential features of the Democracy Suite system.

Security: 5.1.15. Risk Test – Operator interaction, TC # PVR 015

Test determines if Operator messages are clearly displayed and operator functions meet specifications, especially any attempts to access Administration functions without an access key. Operator messages should be self-contained. Access to results and printouts can only be granted by using the access key specifically linked to a poll.

Audit: 4.18.16. - Create Audit, TC # 0086

Test confirms whether the EMS EED client application can create all report types within the System report group (User). This test utilizes an active (open) EMS EED client and at least one existing Language Profile. Application users accounts are defined, and the test hinges on a simple date range entry – verification of results is direct.

Tabulating: 4.15. Defining Tabulators, TC # 0057

Test confirms that an active (open) EMS EED client application can define Tabulators. System is exercised as an Election Project is defined and opened. Political Divisioning and Voting Locations are also defined during the course of the test.

4.4 Standard VSTL Test Methods and Uncertainty of Test Data Measurement

This test engagement utilizes only standard VSTL test methods that conform to the EAC Testing and Certification Program Manual. As such, this test engagement will involve the generation and measurement of nominal type test data only.

For all tests conducted by SysTest Labs in this engagement, other than the Accuracy Test, the involvement of only nominal type test data means that uncertainty of measurement issues are not applicable.

For the Accuracy Test conducted during this engagement, measurement of uncertainty will pertain only to the extent of confirming that the number of actual ballot position inputs matches the projected ballot position inputs.

Other uncertainty of measurement issues may attach to hardware specific voting system equipment tests. For details on management of measurement uncertainty for those tests, please contact the subcontractors and/or test labs performing those evaluations.

4.5 EAC Interpretations

This test engagement utilizes standard VSTL test methods that conform to the EAC Testing and Certification Program Manual and the appropriate voting system standard. Additionally, EAC interpretation **EAC Decision on Request for Interpretation 2007-02** was utilized during source code review.

5 TEST DATA

5.1 Data Recording

The EAC Voluntary Voting System Guidelines 2005, Volume 2 Test Standards, will measure certification testing progress against the standards defined for Marksense devices. SysTest Labs will create forms for the source code, TDP and testing reviews. These forms will be stored in electronic format at SysTest Labs. SysTest Labs will record all activity via periodic status report emails to the voting system vendor, Dominion Voting Systems.

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 4.
- 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 will evaluate test results against the documents and software provided by Dominion Voting Systems. 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 Democracy Suite Voting System Voting System. System performance shall be measured against a predicted result.

5.3 Test Data Reduction

SysTest Labs will process 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 will be performed on site at SysTest Labs. All TDP and test documentation is stored in the project directory on the Voting server.

6.2 Test Setup

The Democracy Suite Voting System test platform will be set up, as part of the Functional Configuration Audit, in the standard configuration identified in the TDP documents listed in attachment A. The operating system will be installed and made operational and with the typical complement of accessories and preloaded programs present in the system under test. The software will be installed, versions verified, and the system 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, predecessor tasks are required for some testing. Tasks and any applicable predecessors tasks are identified in Table 7 - Matrix of System Level Testing.

6.4 Test Operations Procedures

The SysTest Labs VSTL Test Team will provide step-by-step procedures for each test case to be conducted. Each step shall be assigned a test step number and this number, along with necessary test data and test procedures information, shall be 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 by 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) - If a failure of a test procedure precludes attempting subsequent test procedures, the test procedures that cannot be executed will be marked as NT. For expected functionality that is not implemented the test procedure will be marked as NT
- **NS** (not supported) indicates requirements that apply to features that are not supported in the configuration being tested.
- **NA**, Not Applicable - If a test procedure is not applicable to the current certification test effort it will be marked as NA. NA 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 Democracy Suite Voting System Discrepancy Report. Issues that do not conform to the requirements of the EAC VVSG 2005 will be marked as Documentation Discrepancy or Functional Discrepancy (a Discrepancy occurs when the documentation or software does not meet defined requirements or specifications).

Dominion Voting Systems must address all defects prior to issuance of the Certification Report.

Issues that are encountered during testing, but are not addressed by the EAC VVSG 2005 standards will be added to the Discrepancy report and noted as Informational.

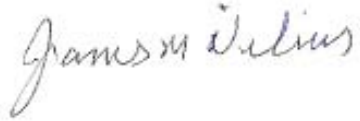
Dominion Voting Systems has the option to address Informational issues.

All responses provided by Dominion Voting Systems are noted in the Discrepancy Report appendix within the Certification Report.

The test cases and procedures are contained in a separate document.

7 Approval Signatures

SysTest Labs:



James M. Nilius
Vice President, Compliance Services, SysTest Labs
October 2, 2007

Client:

Victor Vasquez
Program Manager, Dominion Voting Systems
October 2, 2007

End of Certification Test Plan
