Certification Test Plan

Report Number 06-V-DB-058

Premier Election Solutions, Inc.
Assure® 1.2 Voting System

Test Plan Rev 04

November 5, 2007

Prepared for:

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Accredited by the Election Assistance Commission (EAC) for Selected Voting System Test Methods or Services

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Revision History

Date	Description of Revision	Author	Revision No.
5/24/07	Initial Test Plan	K. Swift, J. Garcia, B. Barkey	Rev 01
6/27/07	Revision	D. George, B. Barkey	Rev 02
7/25/07	Revision	B. Barkey	Rev 03
11/05/07	Revision	B. Barkey	Rev 04

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1 INTRODUCTION

This Master Test Plan outlines the approach SysTest Labs will implement to perform Federal Election Commission (FEC) Voting System Standards (VSS) 2002 Certification testing of the Assure 1.2 Voting System from Premier Election Solutions, Inc. (Premier). The purpose of this document is to provide a clear and precise plan for test elements required to ensure effective certification testing.

This test plan:
- Identifies items 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 on the Assure 1.2 Voting System. This effort includes the Physical Configuration Audit, the Functional Configuration Audit, development of a thorough test plan, management of system configurations, generation of test cases according to the test requirements (in addition to the test cases and procedures furnished by Premier), test execution, and analysis of test results.

The Physical Configuration Audit includes the Technical Data Package (TDP) documentation review and source code review. The Functional Configuration Audit consists of an assessment of Premier's testing to its System Requirements Specification, as outlined in the FEC VSS Volume 1, Section 2, as well as the performance of functional and system level integration tests.

SysTest Labs' deliverable will consist of a 2002 VSS 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.

1.1 Certification Test Plan Attachments

Attachment A - Technical Data Package (TDP) Documents Delivered
Attachment B - Premier Hardware Test Matrix and Notations
Attachment C - Proprietary Source Code Reviewed
Attachment D - Trace of SysTest Labs' Test Cases to 2002 VSS and 2005 VVSG

1.1.1   Accessing Attachments
To access attachments in Adobe® Reader®:
If navigation tabs are not visible, select View > Navigation Tabs > Attachments. A tab will become available on the left side of the screen, and you can select and open attachments by clicking on the tab.
To access attachments in Adobe Acrobat®:
Select Document > File Attachments. A dialog box appears allowing you to select and open attachments.

1.2 Scope of the Assure 1.2 System

The Assure 1.2 Voting System includes the following:

Software/Firmware	Hardware
Global Election Management System (GEMS®)	PC w/ MS Windows XP/2000/2003 (COTS)
AccuVote®-OS Precinct Count (AccuVote-OS PC)	AccuVote-OS Models A, B, C, D (2002)
AccuVote-OS Central Count (AccuVote-OS CC)	AccuVote-OS Models A, B, C, D (2002) with optional AccuFeed Model A
AccuVote-OSX	AccuVote-OSX Model A (2002) with BootLoader and WinCE 500
BallotStation	AccuVote-TS R6 Model A, B (2002) with BootLoader and WinCE 300 Optional: - Optical Scan Accumulator Adapter (OSAA) Model A (2002) - Universal American Disabilities Association Interface Device (UAID™) Model A (2002)
	AccuVote-TSX Model A, B, C, D (2002) with BootLoader and WinCE 410 Optional: - AccuView Printer® Module (AVPM) Model A (2002) - Optical Scan Accumulator Adapter (OSAA) Model A (2002) - Universal American Disabilities Association Interface Device (UAID™) Model A (2002)
Election Media Processor (EMP)	EMP Model D (COTS components) with MS Windows XP
Key Card Tool (KCT)	PC w/ MS Windows 2003/XP (COTS)
VCProgrammer	PC w/ MS Windows 2003/XP (COTS)
Voter Card Encoder (VCE)	Voter Card Encoder (COTS)
ExpressPoll® CardWriter	ExpressPoll 2000 (COTS)
	ExpressPoll 4000 (COTS)
	ExpressPoll 5000 (COTS)
Premier Central Scan (PCS)	PC w/ MS Windows XP (COTS)
	AccuVote-OS Model A, B, C, D (2002)
	DRS PhotoScribe PS900 iM2 (COTS) DRS PhotoScribe PS960 (COTS)
Assure Security Manager	PC w/ MS Windows XP (COTS)
AVPM	AVPM Model A
AutoMARK Information Management System (AIMS)	PC w/ MS Windows XP
Voter Assist Terminal (VAT)	VAT A100, A200, A300

GEMS is a software application used to create the election, lay out the ballots, download the election data to the voting devices, upload the results and produce the final results reports.

AIMS imports the election data created in GEMS and then displays the appropriate ballot on the VAT, an ADA (Americans with Disabilities Act) electronic ballot marking device.

The polling place devices consist of ExpressPoll 2000, 4000, and 5000, devices that can run the EZRoster electronic poll book application and create Voter Cards for the AccuVote-TS R6/TSX.

The VCE is a small hand-held device that is used to create Voter Cards for the AccuVote-TS R6/TSX. AccuVote-OS and OSX are mark-sense precinct count scanners. With Central Count firmware installed, the AccuVote-OS can be used at the central counting location for the election. PCS is a central tally application that is supported by a variety of scanners, including the DRS PS900 iM2, DRS PS960, and AccuVote-OS with Central Count firmware installed, and AccuVote-OSX.

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Premier Election Solutions Product Overview – Assure 1.2

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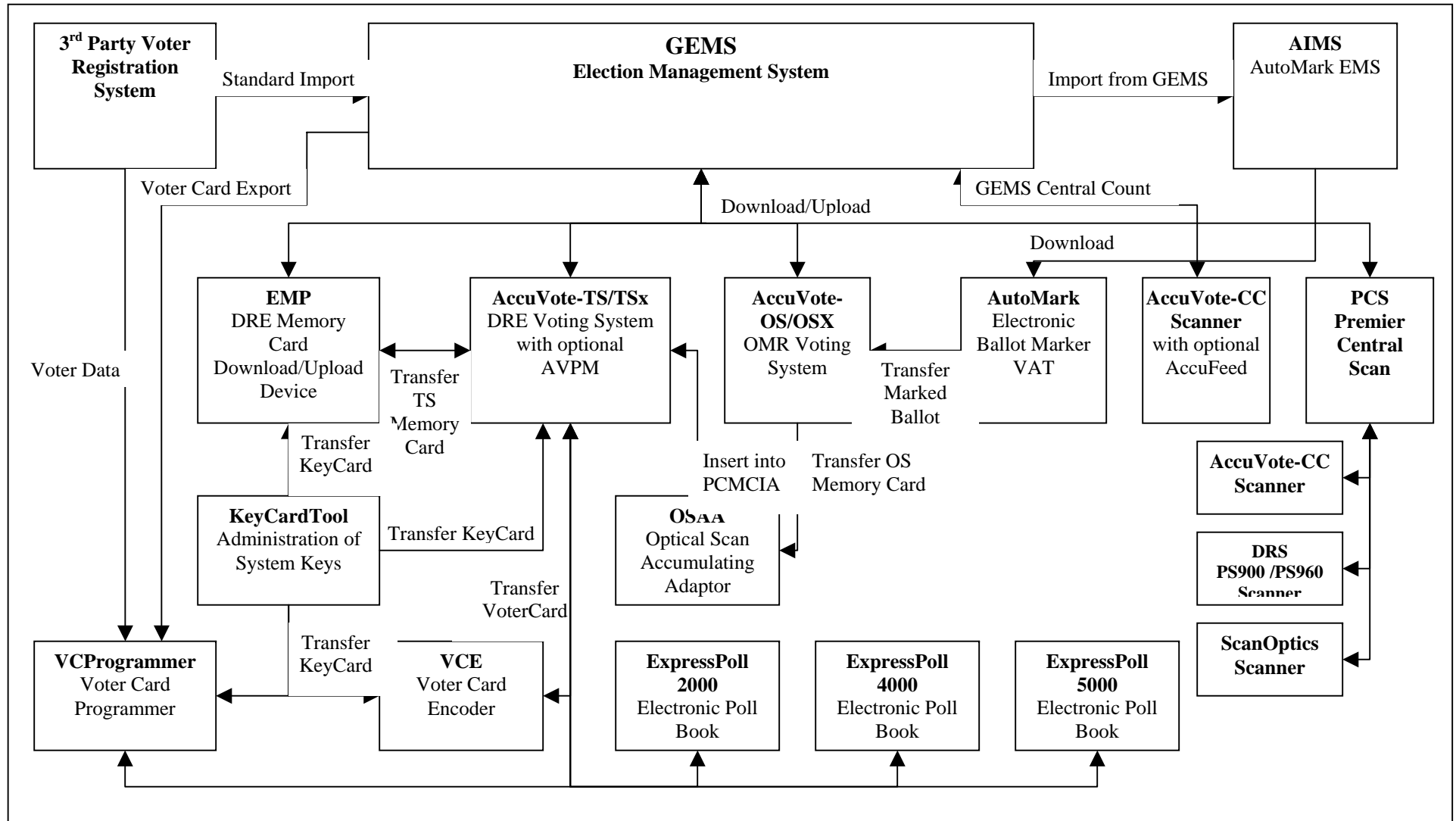
1.3 Applicable Voting System Standards

SysTest Labs will provide certification testing for Premier Election Solutions on the Assure 1.2 Voting System. The resulting certification will be to the FEC VSS 2002.

Premier Election Solutions Requirements

Certification Test component	Applicable Standard
FCA Doc Review	FEC VSS 2002
Testing of the Voting System	FEC VSS 2002
Source Code Review	FEC VSS 2002
Trusted Build	EAC Testing and Certification Program
Hardware	FEC VSS 2002
PCA Doc Review (for all documents except for Security documents)	FEC VSS 2002
PCA Doc Review (for all Security documents)	FEC VSS 2002

ATS requirements

Certification Test component	Applicable Standard
FCA Doc Review	FEC VSS 2002
Testing of the Voting System	FEC VSS 2002
Source Code Review	FEC VSS 2002
Trusted Build	EAC Testing and Certification Program
Hardware	FEC VSS 2002
PCA Doc Review	FEC VSS 2002

1.4 References

1. FEC VSS, April 2002, Volume 1, Section 6 – System Level Integration Testing
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. IEEE Standard for Software Quality Assurance Plans IEEE Std 730-1998, October 20th, 1998.
6. IEEE Standard for Software Configuration Management Plans IEEE Std 828-1998, June 25th, 1998.
7. IEEE Standard for Software Test Documentation IEEE Std 829-1998, December 16th, 1998.
8. IEEE Recommended Practice for Software Requirements Specifications IEEE Std 830-1998, October 20th, 1998.
9. IEEE Standard for Software Unit Testing IEEE Std 1008-1987, December 29th, 1986.

10. IEEE Standard for Software Verification and Validation IEEE Std 1012-1998, July 20th, 1998.
11. SysTest Labs Quality System Manual, Revision 1.0, November 3, 2006.

See also Attachment A for a list of TDP documents delivered by Premier. Note that at the time of this document drafting, not all Premier deliverables have been received by SysTest Labs.

1.5 Terms and Abbreviations

These terms and abbreviations will be used throughout this document:

Table 1 - Terms & Abbreviations

Term	Abbreviation	Description
AccuView Printer[®] Module	AVPM	The AVPM firmware is used to control the take-up motor on the AVPM device.
AccuVote Optical Scan	AccuVote-OS or AVOS	Premier's Optical Scan voting equipment
AccuVote Touch Screen	AccuVote-TS	Premier's Touch Screen Direct Recording Electronic (DRE) voting equipment
AutoMARK Information Management System	AIMS	The AIMS software is used to prepare the data for the AutoMark electronic ballot marker. The AIMS software imports election data from GEMS and allows the user to modify it as necessary for the AutoMark EBM device.
BootLoader	BL	The BootLoader (BL) is used by the AccuVote-TS/TSX/OSX to startup the system, validate the WinCE image and then start Windows CE.
Premier Central Scan	PCS	PCS downloads the election information from GEMS, scans and tallies ballots, and then uploads the results to GEMS.
Direct Recording Electronic	DRE	Touch Screen voting device.
Election Media Processor	EMP	The EMP (Election Media Processor) is a desktop PC with multiple PCMCIA card readers and a label printer. EMP is used to download and upload PCMCIA storage cards for use on the AccuVote-TS/TSX. This device is connected to GEMS via a high-speed network connection.
ExpressPoll		The ExpressPoll 2000, 4000, and 5000 are small devices that can run the EZRoster electronic poll book application. They also provide the functionality, through the CardWriter software, to be able to create Voter Cards for use by the AccuVote-TS/TSX devices.
Global Election Management System	GEMS	GEMS is Premier Election Solutions' Election Management System. This product is used to enter jurisdiction information (district, precincts, languages, etc.) as well as election specific information (races, candidates, voter groups (parties), etc. GEMS is also used to layout the ballots, download the election data to the voting devices, upload the results and produce the final results reports.
AccuVote-OS Accumulator Adapter	OSAA	OSAA (AccuVote-OS Accumulator Adapter) is used to accumulate AccuVote-OS results on an AccuVote-TS/TSX unit. The OSAA adapter is inserted into the

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Term	Abbreviation	Description
		AccuVote-TS/TSX PCMCIA slot and allows the AccuVote-OS memory cards to be read by the AccuVote-TS/TSX device.
Universal ADA Interface Device	UAID	The Universal ADA Interface Device (UAID) facilitates accessibility features to further enhance the ability of physically challenged voters to independently and privately make candidate selections and cast ballots.
Voter Assist Terminal	VAT	The AutoMark VAT device is used to allow voters to electronically mark a ballot that will be scanned by the AccuVote-OS device. The AutoMark VAT supports audio ballot as well as visual ballot marking.
Voter Card Encoder	VCE	VCE (Voter Card Encoder) is a small hand-held device that is used to create Voter Cards. The VCE is loaded with master Voter Card Images and then allows the user to create new Voter Cards from those masters.
VCProgrammer		VCProgrammer is a PC based application that is used to create vote cards for the AccuVote-TS/TSX. VCProgrammer has the ability to be integrated with 3rd party Voter Registration Systems to allow those systems to create the voter cards. The VCProgrammer uses a file that is exported from GEMS. When used with a voter registration system, it also requires the data provide by the VR system to create the Vote Card.

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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 submitted hardware and software components of the Assure 1.2 Voting System.

2.1.1 Physical Configuration Audit (PCA)

SysTest Labs conducts a PCA of the documents submitted for review in the Premier Technical Data Package, including Functional Requirements, Specifications, Procedures, System Overview, Configuration Management Plan, and Quality Assurance Program. Each component of the voting system subject to this Certification Test Plan is review against the FEC VSS 2002.

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 has conducted a Functional Configuration Audit review of the Premier test cases delivered as part of the Technical Data Package. For each component of the voting system subject to this Certification Test Plan is review against the FEC VSS 2002, Volume 1. Any required functions that were identified as not tested, or insufficiently tested, have been included in the Test Cases that SysTest will execute.

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

2.1.3 Source Code Review

The Premier Election Solutions Assure 1.2 Test Campaign is a full certification; thus, all program source code is subject to a full review. SysTest Labs has conducted a source code review of the submitted code in the following languages: C, C++.

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 resulting module names into the review work documents
- ExamDiff Pro – a commercial application used to compare revised code to previously reviewed code
- 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 Premier's internal coding

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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 the audit review, as well as the discrepancies generated, will be included in the Certification Test Report.

2.1.4 Trusted Build

A trusted build will be conducted prior to SysTest Labs' testing efforts. SysTest will use our approved standard lab procedure that details the processes for conducting the trusted build. This process includes interviews of key vendor staff to evaluate processes and process conformance in the areas of configuration management and quality assurance. Preparation for the trusted build entails obtaining and reviewing Premier's procedure for constructing the build platform, verifying the target build platform, and acquiring the necessary materials. Execution of the trusted build entails utilizing our step-by-step build procedure, with the final result being a compact disk containing the install. Finally, the conclusion of the trusted build entails the final record keeping and archiving procedures that occur at SysTest Labs, and generation of the resulting media that is submitted to the EAC approved software repository.

2.2 Pre-Certification Assessment Results

SysTest Labs has conducted a pre-certification assessment of the Premier's Technical Data Package, including end-user documentation, specifications, development test cases, Configuration Management Plan, Quality Assurance Program and test cases, and source code for each of the submitted components of the Assure 1.2 Voting System. For reference, the system components are shown in the diagram below.

SysTest Labs has determined that the Premier and ATS Test Plans, Procedures, and Scripts are consistent with the FEC Voting System Standards for Technical Data Package (TDP) documentation. Issues were noted in a discrepancy report that was provided to Premier and ATS for resolution prior to completion of testing.

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

As determined by the assessment, the following tests will be executed, as part of this Certification Test Plan:
- Operational Status Check
- Readiness Test
- Sampling of Premier's test cases
- SysTest Labs' Gen01 test case
- SysTest Labs' Gen02 test case
- SysTest Labs' Gen03 test case
- SysTest Labs' Pri01 test case
- SysTest Labs' Pri02 test case

- SysTest Labs' Pri03 test case
- SysTest Labs' Security test case
- SysTest Labs' Telecommunications test case
- System Accuracy test case.

Please see sections 4.2.1 and 4.2.2 for additional detail on the SysTest Labs test cases.

3   MATERIALS REQUIRED FOR TESTING

3.1 Software

Items identified in the table reflect all software required to perform hardware, software, security and integrated system tests. Note that the software listed with Manufacturer of Premier or ATS is software under test. Should a software version modification become necessary, an amended test plan would be produced with the new version under test listed according to Premier's revised Certification Application, which would have been submitted by Premier as appropriate.

Table 2 - Required Software and Firmware

Manufacturer	Application(s)	Version	Test Type
Premier	GEMS	1.20.2	Pre/Post Voting
Premier	AccuVote-OS PC	1.96.10	Voting
Premier	AccuVote-OS CC	2.0.13	Post Voting
Premier	AccuVote-OSX	1.0.1	Voting
Premier	BallotStation	4.7.1	Voting
Premier	EMP	4.7.1	Pre/Post Voting
Premier	Key Card Tool	4. 7.1	Full
Premier	VCProgrammer	4. 7.1	Voting
Premier	Voter Card Encoder	1.3.3	Voting
Premier	ExpressPoll CardWriter	1.1.6	Voting
Premier	PCS	2.0.1	Post Voting
Premier	ASSURE Security Manager	1.0.1	Pre/Post Voting
ATS	AutoMARK AIMS	1.3 (D)	Pre-Voting
ATS	VAT Firmware	1.3 (D)	Voting
Premier	BootLoader (BL)	1.3.8	Full
Premier	WinCE	300.3.3	Full
Premier	WinCE	410.3.8	Full
Premier	WinCE	500.3.1	Full
Premier	AVPM	3.0.3	Full
Premier	ABasic Compiler	2.2.2	Full
Premier	ABasic Report Files	2.2.2	Full
Manufacturer	**COTS Application(s)**	**Version**	**Assure 1.2 Application**
Microsoft	Windows	XP Professional	GEMS, EMP, Key Card Tool, PCS, Assure Security Manager, VCProgrammer, AIMS
Microsoft	Windows	2000 Server	GEMS
Microsoft	Windows	2003 Server	GEMS, Key Card Tool, VCProgrammer

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3.2 Equipment (Hardware)

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

Table 3 - Required Hardware

Item	Manufacturer	HW, O/S, FW, Version	Description of Use
AccuVote-TS R6 DRE – Models A, B with BL Optional: OSAA Model A, UAID Model A	Premier	O/S: WinCE 300 FW: BL 1.3.8, BallotStation 4.7.1	The AccuVote-TS R6 DRE is a direct recording electronic device, operated by voters via a touch screen interface. May be used with optional OSAA (Optical Scan Accumulator Adapter), UAID (Universal ADA Interface Device).
AccuVote-TSX DRE – Models A, B, C, D with BL Optional: OSAA Model A, UAID Model A, AVPM Model A	Premier	O/S: WinCE 410 FW: BL 1.3.8, BallotStation 4.7.1	The AccuVote TSX is a Direct Recording Electronic (DRE) touchscreen voting machine. Voting is achieved by inserting a Voter Access Card into the AccuVote-TSX card reader slot, which in turn causes display of the voter's applicable ballot. The AccuView Printer Module (AVPM) attaches to the AccuVote TSx unit for printing of ballot records, which enable voters to verify their choices before casting their ballots.
AccuVote Optical Scan Precinct Count (PC) – Models A, B, C, D	Premier	FW: 1.96.10	The AccuVote Optical Scan (OS) is a mark sense-based ballot counting device, which can be installed with the Precinct Count (PC) firmware or the Central Count (CC) firmware. The AccuVote OS, installed with the Precinct Count firmware is used on a stand-alone basis and is loaded with a memory card, which is programmed with the appropriate ballot information. The memory card also contains the tallied results of ballots scanned on the AccuVote OS.
AccuVote Optical Scan Central Count (CC) – Models A, B, C, D AccuFeed Model A – optional	Premier	FW: 2.0.13	The AccuVote-CC (Central Count) is a mark-sense device that is used to scan ballots at a central location either using the GEMS Central Count system or PCS. The AccuVote-CC is the same hardware as the AccuVote-OS but using different firmware (also see the description above). The AccuFeed Model A unit provides automated multi-sheet feeding capability.
AccuVote Optical Scan OSX – Model A with BootLoader (BL)	Premier	O/S: WinCE 500 FW: OSX 1.0.1 BL 1.3.8	The AccuVote-OSX is a mark sense-based ballot counting device (also see the AccuVote-OS description above).

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Item	Manufacturer	HW, O/S, FW, Version	Description of Use
EMP Model D (COTS)	Premier	O/S: Windows XP FW: 4.7.1	The Election Media Processor (EMP) is a bulk PCMCIA memory card download and upload device for the AccuVote-TS. It provides for simultaneous transmission of up to six memory cards.
Key Card Tool	Premier	O/S: Windows XP/2003 FW: 4.7.1	This software tool runs on a Windows PC and uses a card encoder to generate a security key card, which is used to enable the VCProgrammer, EMP, Voter Card Encoder, and AccuVote-TS/TSX and ExpressPoll units.
VCProgrammer	Premier	O/S: Windows XP/2003 FW: 4.7.1	VCProgrammer is a PC based application which, when used with an external smart card reading device, creates voter access cards for use on AccuVote-TS/TSX Ballot Station units. The application encodes voter access cards for an election using an exported file from the GEMS election database. VCProgrammer identifies the ballot information from this file and copies it onto a voter access card.
Voter Card Encoder (COTS)	Spyrus	FW: 1.3.3	The Voter Card Encoder writes the voter's precinct and party combination and desired voting options (i.e., audio or visual ballot), and encodes this information to a voter access card.
DRS PhotoScribe PS900 iM2 (COTS) PS960 (COTS)	DRS Data & Research Services, PLC	O/S: Windows XP FW: 2.0.1	Premier Central Scan (PCS) is a high-volume ballot scanning device. There are two models of the PhotoScribe (PS) units: PS900 iM2 and the PS960)
ExpressPoll (COTS) – Models 2000, 4000, 5000	2000–Gotive 4000–Advantech 5000–Advantech	FW: 1.1.6	The ExpressPoll 2000, 4000, and 5000 are small devices that can run the EZRoster electronic poll book application. They also provide the functionality, through the CardWriter software, to be able to create Voter Cards for use by the AccuVote-TS/TSX devices.
VAT Models A100, A200, A300	AutoMARK	FW: 1.3(D)	The AutoMark Voter Assist Terminal (VAT) device allows voters to electronically mark a ballot that will be scanned by the AccuVote-OS, AccuVote-OSX, and DRS PhotoScribe devices.
PC	COTS	Windows XP Professional	GEMS, EMP, Key Card Tool, VCProgrammer, PCS, ASSURE Security Manager, AIMS
PC	DELL	Windows XP Professional/ 2000 Server/ 2003 Server	XP, 2000, 2003: GEMS XP, 2OO3: Key Card Tool, VCProgrammer XP: PCS, EMP, ASSURE Security Manager

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3.3 Test Materials

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

Table 4 - Test Materials

Item
AccuView Printer Module units
AccuVote-OS ballots
AccuVote-OS control cards
AccuVote-OS keys
AccuVote-OS memory cards
AccuVote-TS audio voting equipment
AccuVote-TS keys
AccuVote-TS memory cards
Central Administrator cards
PCS scanners
Election Media Processor devices
ExpressPoll devices
ExpressPoll flash cards
OSAA units
Smart card readers
Central Administrator cards
Supervisor cards
Voter access cards
Voter Card Encoders
Voter Card Encoder battery
Voting booth

3.4 Deliverable Materials

In addition to the hardware, software and materials identified in Sections 3.1, 3.2, and 3.3, Premier delivered the Technical Data Package documents as a part of the Assure 1.2 Voting System. Please see Attachment A for a list of these documents.

3.5 Proprietary Data

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

4 TEST SPECIFICATIONS

4.1 Hardware Configuration and Design

Certification testing will occur for conformance to *Vol. 1 Sect. 3 Hardware Standards* and *Vol. 2 Sect. 4 Hardware Testing* of the FEC VSS April 2002.

The Hardware Configuration Audit will confirm that the configurations match according to Table 3 in the previous section. In order to conduct system-level integration tests, SysTest Labs may need to include minimal repetition of the operational tests to confirm that there were no changes to the systemic responses.

4.2 Software System Functions

The scope of the tests is the software certification (*Vol. 2, Sect. 5)* and system-level tests (*Vol. 2, Sect. 6)* as defined in the FEC VSS April 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 Premier'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*)

4.2.1 Functional Testing

The System Functional Testing entails assessment of the functional specification, test plans, test cases and test results. During the process, the Assure 1.2 overall system capabilities, pre-voting, voting and post-voting functions must also be demonstrated for the following functional areas (*Vol. 2, Appendix A.*).

Table 5 - 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 (Vol. 1. Section 2.2.8.2).
b.2. Accuracy Test - Ballot recording/reading accuracy	Verify with the AccuVote-OS scanner the processing of 1,549,703 consecutive ballot positions by the VAT. -Report of the initialization process

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Function	Test Methodology
	-Display the menu selections -Open polls -Zero Report -Mark ballots on the VAT, scan ballots on the AccuVote-OS, Closed polls, Run VAT Audit Log and Run totals report and Audit Log from the AccuVote-OS and reports from GEMS
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 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 Merging Copied Election Results into the Central Count
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 in Functional Tests: Print audit log all systems Audit messages must meet some minimum standards for information contained and clarity/usability of communication. Example: -Each audit message should contain a timestamp at the beginning of the audit trail. -the election identifier and software/firmware releases should be listed. -If the message pertains to results (i.e. inserted, added, deleted), the precinct(s) ID's should be listed. -the number of ballots processed should be stated whenever results are uploaded into the accumulation program.
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:

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Function	Test Methodology
	Writing election to media
Central Count Functions	
d.1. Process ballot deck or PMD for >1 precinct	Verify in Functional Tests: Process of ballot decks
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 response to all voter and poll worker commands as identified in user documentation
d.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

Other Functional Tests are used for validating functionality that does not fit well into a System Integration Level test case or may have too many options to be adequately covered in system level test cases.

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). Assure 1.2 components subject to the Accuracy Test include the Premier AccuVote-OSX, DRS PhotoScribe 900 iM2/DRS PhotoScribe 960, and the ATS VAT A300.

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 VSS Volume 1. 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.

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Table 6 - 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, 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 Premier	All System Test Cases
Recovery Tests	
Exercise system's ability to recover from hardware and data errors.	Security Test Case

4.2.2   System Level Testing

System level tests shall be performed on the Premier Assure 1.2 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.

Table 7 - System Level Testing

GEN Test Cases	
All GEN Test Cases	The object of this test case is to verify core functionality by using Premier's manual(s) to create general election ballots, vote, and tally, with the following required functionality: - 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 cast ballots, including provisional (V1:2.4.3)

GEN Test Cases	

	- DRE shall record and retain redundant copies of the original ballot image (V1:2.2.2.2)
	- 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
	- Party affiliation is identified on the ballot
	- 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)
	- Write-in voting: Voting position identified for write-ins
	- Correctly tabulate (V1:2.2.8.1)
	- Have a Ballot Counter (V1:2.2.9)
	- Provisional/Challenged ballots - Note vendor supported tabulation of these
	  ballots at Central Count
	- Overvotes
	- Undervotes
	- Blank ballots

GEN 01	Verify that ballots can be created with the following optional functionality: - Ranked Order Voting (Unsupported by GEMS) - Four Districts and Two Precincts- Split Precincts (three splits per precinct) - No Rotation - 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) - Non-Partisan contest: Proposition/Question - 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 - Slate & Group voting: one selection votes the slate - Recall Type A - Simple Yes/No question - Recall Type B - Retain is first option, followed by Replacement options for second or more
GEN 02 (Straight Party)	Verify that ballots can be created with the following optional functionality: - This is a two-page ballot election per voter - Four Districts, Seven Precincts - No Split Precincts- Ballot Rotation by Precinct - Cumulative voting ***UNSUPPORTED BY GEMS - Straight party (multi-member board) - 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) - Non-Partisan contest: Proposition/Question - 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 - Slate & Group voting: one selection votes the slate - Recall Type A - Simple Yes/No question - Recall Type B - Retain is first option, followed by Replacement options for second or more

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GEN Test Cases	
GEN 03 (Multi-language & Accessibility)	Verify that ballots can be created with the following optional functionality: - One District, One Precinct - 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 - Accessibility - Straight Party by contest, if supported (City Council)

PRI Test Cases	
All PRI Test Cases	The object of this test case is to verify core functionality by using Premier's manual(s) to create primary election ballots, vote, and tally, with the following required functionality: - 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 cast ballots, including provisional (V1:2.4.3) - DRE shall record and retain redundant copies of the original ballot image (V1:2.2.2.2) - 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 - Party affiliation is identified on the ballot - 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) - Write-in voting: Voting position identified for write-ins - Correctly tabulate (V1:2.2.8.1) - Have a Ballot Counter (V1:2.2.9) - Provisional/Challenged ballots - Note vendor supported tabulation of these ballots at Central Count - Overvotes - Undervotes - Blank ballots
PRI 01 (Open Primary)	Verify that ballots can be created with the following optional functionality: - One District, One Precinct - 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 no declared candidates and write-ins - Partisan contest: Multi-member board (N of M) - Partisan contest, one party has no candidates - Primary Presidential Nominations: List only the nominees, not the delegates.

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PRI Test Cases	
PRI 02 (Closed Primary)	Verify that ballots can be created with the following optional functionality: - Five Districts, Seven Precincts - No Rotation - 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 Type D
PRI-03 (Blanket Open Primary) Test Case	Verify that ballots can be created with the following optional functionality: - One District, One Precinct - No Rotation - 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 no declared candidates and write-ins - Partisan contest: Multi-member board (N of M) - Partisan contest, one party has no candidates - Primary Presidential Nominations: List only the nominees, not the delegates.

4.3 Test Case Design

4.3.1   Hardware Qualitative Examination Design

Some hardware testing was performed by a previous ITA/VSTL, Wyle Labs. However, some non-operating and operating environmental testing is the responsibility of SysTest Labs. Additionally, not all component equipment in the Assure 1.2 system was submitted to the previous lab for testing—specifically the AccuVote OSX, and the PCS DRS PhotoScribe PS900 iM2/PS960 product.

SysTest Labs reviewed the results provided from the previous ITA/VSTL for overall system capabilities, pre-voting, and voting, and post-voting functions. For remaining equipment and system components, SysTest Labs reviewed the overall system capabilities, pre-voting, voting, and post-voting functions. The Assure 1.2 system hardware is incorporated into the standard set of system-level test cases with the augmentation of validation steps specific to each function (*Vol. 2, Section A.4.3.1*).

Regarding the AccuVote OSX product, hardware testing will be performed at three subcontract laboratories:
- Environmental Testing will be done at Advanced Product Testing (APT) Laboratories in Longmont, Colorado,
- Emissions Testing will be performed at Criterion Laboratories in Rollinsville, Colorado.
- Safety Testing will be performed at Compliance Integrity Services (CIS) Laboratories in Longmont, Colorado.

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Maintainability testing and Accessibility and Human Engineering Evaluation testing will be performed at SysTest Labs in Denver.

4.3.2   Hardware Environmental Test Case Design

Hardware environmental certification testing for conformance to Vol. 1. Sect. 3 of the FEC VSS April 2002 is accomplished through a combination of current testing with previous testing performed by a laboratory contracted by Premier, Wyle Laboratories (Wyle Laboratories, Inc., 7800 Highway 20 West, Huntsville, Alabama 80806). Attachment B – Premier Hardware Test Matrix and Notations contains a table summarizing the equipment tested by Wyle and their subcontract laboratory, Nemko USA (802 North Kealy, Lewisville, TX 75057-3136). Attachment B indicates the equipment, testing, VSS Requirement Number, and reference to the lab which performed the test, or notes relating to the testing. Additionally, gaps on the Attachment B table indicate equipment and tests that are still needed. Maintainability testing and Accessibility and Human Engineering Evaluation testing are required, and will be performed by SysTest Labs at its Denver facility.

The ATS VAT A300 1.3 component has undergone some changes since the testing cited above. For this reason, the following hardware testing is required for those units:

Hardware Test	VSS Section
Maintainability	Volume 2, Sec. 4.7.2
Accessibility & Human Engineering	Volume 1, Sec. 3.4.9 and Sec. 2.2.7.2
Data Accuracy Test	Volume 2, Sec. 4.7.1.1

Otherwise, the testing performed by the previous labs, Wyle and Nemko, was accepted based upon review of the test results in relation to the VSS requirements, and based upon the accreditation of these labs (*Vol.2, Section A.4.3.2*).

The ATS VAT A100 and A200 component are also being included in this certification event, and they will be included with the A300 in Functional Testing. All three VAT units are software compatible, so they will operate with the VAT Firmware Version 1.3 (D) being certified with the Assure 1.2 system. The A100 and A200 have been certified previously and therefore will not require additional hardware or environmental testing. The table below illustrates similarities and compatibilities among the three VAT models.

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Table 8 - Comparison of AutoMARK VAT A100, A200, A300

#	Technical Feature	A 100	A 200	A 300	Comments
1	Compatible with VAT Firmware Version 1.3(D)	Yes	Yes	Yes	
2	Identical Paper Path & Machine Function	Yes	Yes	Yes	
3	ATS Production Phase	I	II	II	Phase II machines are manufactured after March 27, 2006. Engineering Change Order required for A200. Phase II changes were made to improve efficiency and ease of assembly and service over Phase I.
4	A100/A200 vs. A300 Differences – Brand Labeling, Inc Cartridge	Other vendor labeling	Other vendor labeling	Brand neutral ink cartridge, carry case labeling, and CF card label	A100 and A200 are marketed by a competing vendor.
5	Lock/Key Differences			Unique key and lock for power switch and CF card door for Premier	
6	Access Port	Square hole	Square hole	No hole, case solid	
7	Security Seals			Two internal added, one external added	
8	Previous NASED Certification	Yes	Yes	NA	
9	Data Accuracy Test	Tested Under Previous NASED Certification	Accepted under A100 Certification without Data Accuracy Test	To be tested under Premier Assure 1.2 certification due to changes in Firmware Version 1.3(D)	Due to the similarity between A100 and A200, the A200 was not required to undergo the Data Accuracy Test. A300 being tested due to changes in firmware.

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4.3.3   Hardware Environmental Test Case Design

4.3.4   Software Module Test Case Design and Data
SysTest Labs reviewed the test case design documents and data as provided by Premier Election Solutions. In evaluating each module with respect to flow control parameters and data on both entry and exit, SysTest Labs assesses the logical correctness, the adequacy of the code's modularity and construction, the implementation of the algorithms in assembly language (if used), 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.

4.3.5   Software Functional Test Case Design
SysTest Labs has reviewed the functional test case design documents and data as provided by Premier against a detailed matrix of system functions and the test cases that 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*).

4.3.6   System-Level Test Case Design
SysTest Labs reviewed the system-level test case design documents and data as provided by Premier. 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*).

4.3.7   Sampling Methodology
SysTest Labs reviewed the system-level and functional test case documents and data as provided by Premier Election Solutions. SysTest Labs will repeat a sampling of Premier's test cases according to the guideline below.

New System (new or never certified by the EAC):
- Review all vendor test cases and select four tests from high-risk areas for sampling, such as:
  o Security
  o Audit log
  o Tabulating
  o Transmitting (wireless, LAN, etc.)

SysTest Labs chose the following test cases:
1. Creating a Database
22. Voting on AccuVote-TS

25. Processing Ballots in Central Count
27. Audit from GEMS General Election Test Plan.pdf

These Test Cases cover secure access and data integrity in Test Cases 1 & 22, printing audit logs to show records of action taken during the election in Test Case 27, and tabulating/verifying election results in Test Case 25. All three areas of focus are considered high-risk areas appropriate for sampling.

4.4 EAC Interpretations

This test engagement utilizes <u>only</u> standard VSTL test methods that conform to the EAC Testing and Certification Program Manual and the appropriate voting system standard. No additional EAC interpretations affect the test plan and test methodology.

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5   TEST DATA

5.1 Data Recording

The FEC Voting System Standards, Volume 2 Test Standards, will be used to measure certification-testing progress against the standards defined for Electronic and paper based Voting Systems. SysTest Labs will create forms for the source code, TDP and testing reviews. They will be stored in electronic format at SysTest Labs. SysTest Labs will record all activity via status report E-mails to Premier Election Solutions.

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 1, 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 will evaluate test results against the documents and software provided by Premier. 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 Assure 1.2 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 in Colorado. All TDP and test documentation is stored in the project directory on the Voting Server.

SysTest Labs always ensures voting rooms 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.

6.2 Test Setup

Premier's Voting System test platform will be set up, as part of the Physical Configuration Audit, in the standard configuration identified in the Premier TDP documents listed in **Attachment A - TDP Documents Delivered**. The software will be installed, versions verified and made operational. The hardware will also be set up and versions verified according to the Premier TDP documents. Once the hardware and software has 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 predecessor tasks are identified in.

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; this number, along with critical test data and test procedure 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 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 Assure 1.2 Discrepancy Report. Issues that do not conform to the requirements of the FEC VSS April 2002 will be marked as **Documentation Discrepancies** or **Functional Discrepancies** (a discrepancy occurs when the software does not meet defined software requirements or specifications.). Premier must address all discrepancies prior to issuance of the Certification Report. Issues that are encountered during testing, but are not addressed by the FEC VSS April 2002 will be added to the Discrepancy report and noted as **Informational**. Premier has the option to address Informational issues. All responses by Premier are noted in the Discrepancy Report appendix to the Certification Report.

7 Approval Signatures

SysTest Labs:

James M. Nilius
Vice President, Compliance Services
November 6, 2007

Client:

Talbot Iredale
Systems Development Manager, Premier Election Solutions
November 6, 2007

End of Certification Test Plan