Certification Test Plan

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Diebold Election Systems
Assure® 1.2 Voting System

Test Plan Rev 03

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

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Revision History

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1 INTRODUCTION

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

The Assure 1.2 Voting System includes the following (Note that final version numbers have not been assigned but will be documented as part of the Certification Test Report):

Software/Firmware	Hardware
Global Election Management System (GEMS®) 1.20.1	PC w/ MS Windows XP/2000/2003 (COTS)
AccuVote®-OS Precinct Count (AccuVote-OS PC) 1.96.9	AccuVote-OS Models A, B, C, D (2002)
AccuVote-OS Central Count (AccuVote-OS CC) 2.0.13	AccuVote-OS Models A, B, C, D (2002) with optional AccuFeed Model A
AccuVote-OSX 1.0.1	AccuVote-OSX Model A (2002) with BootLoader and WinCE 500.3
BallotStation 4.6.6	AccuVote-TS R6 Model A, B (2002) with BootLoader and WinCE 300.3 - 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 410.3 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) 4.6.3	EMP Models B, C, D (COTS components) with MS Windows XP
Key Card Tool (KCT) 4.6.2	PC w/ MS Windows 2003/XP (COTS)
VCProgrammer 4.6.2	PC w/ MS Windows 2003/XP (COTS)
Voter Card Encoder (VCE) 1.3.3	Voter Card Encoder (COTS)
ExpressPoll® CardWriter 1.1.6	ExpressPoll 2000 (COTS)
	ExpressPoll 4000 (COTS)
	ExpressPoll 5000 (COTS)
Central Tally System (CTS) 2.0.1	PC w/ MS Windows XP (COTS)
	AccuVote-OS Model A, B, C, D (2002)
	DRS PS900 iM2 (COTS)
AutoMARK Information Management System (AIMS) 1.3 (D)	PC w/ MS Windows XP
Voter Assist Terminal (VAT) Firmware 1.3 (D)	VAT 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 uses it to display 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. CTS 2.0.1 is a central tally application that is supported by a variety of scanners, including the DRS PS900 iM2, AccuVote-OS with Central Count firmware installed, and AccuVote-OSX.

The objective of this test plan is to outline the certification test tasks.

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 (including the Technical Data Package documentation review and source code review), and the Functional Configuration Audit (including an assessment of the System Requirements Specification, the requirements outlined in the Federal Election Commission Voting System Standards (FEC VSS) Volume 1, Section 2, and the performance of functional and system-level integration tests). This includes developing a thorough test plan, managing system configurations, executing a sampling of vendor tests, generating test cases as needed based on the set of test requirements (in addition to the test cases and procedures furnished by Diebold), test execution, and analysis of test results.

1.1 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 the vendor. Note that at the time of this document drafting, not all vendor deliverables have been received by SysTest Labs.

1.2 Terms and Abbreviations

These terms and abbreviations will be used throughout this document:

Table 1 - Terms & Abbreviations

Term	Abbreviation	Description
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.
AccuView Printer® Module	AVPM	The AVPM firmware is used to control the take-up motor on the AVPM 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.
Central Tally System	CTS	CTS downloads the election information from GEMS, scans and tallies ballots, and then uploads the results to GEMS.
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.
Global Election Management System	GEMS	GEMS is Diebold Election Systems' 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 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

Term	Abbreviation	Description
		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.
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.

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.

SysTest Labs has conducted a Functional Configuration Audit review of the vendor test cases delivered as part of the Technical Data Package. The review was conducted against the **FEC VSS 2002, Volume 1,** 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 will execute.

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

The Diebold Election Systems 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++, and Visual Basic (VB).

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;

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.

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 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 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

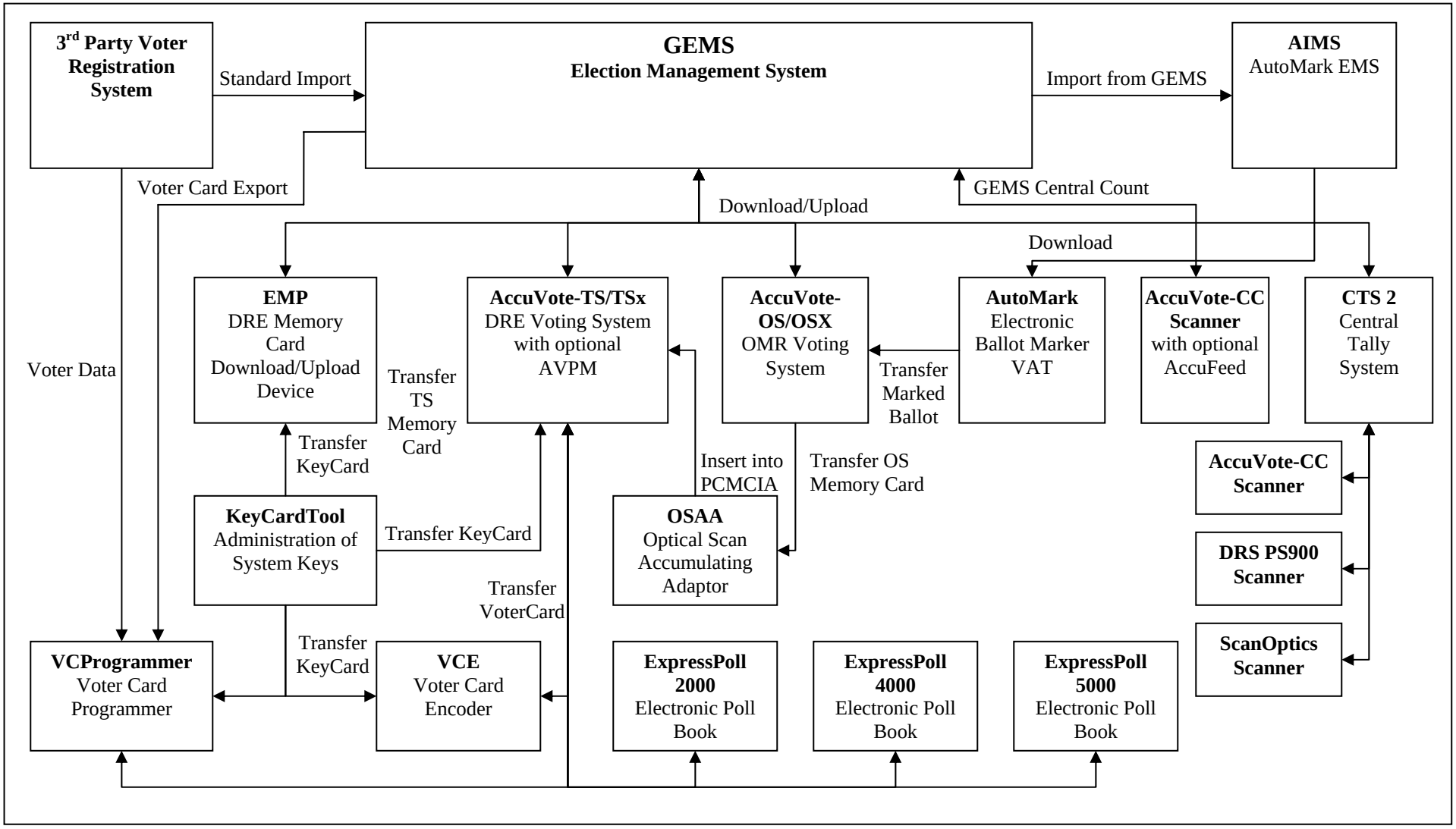
that occur at SysTest Labs, and generation of the resulting media that is submitted to the EAC approved software repository.

2.2 Pre-Certification Assessment Results

SysTest Labs has conducted a pre-certification assessment of the manufacturer's Technical Data Package, including End-user Documentation, development test cases, Quality Assurance 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 Diebold 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 Diebold and ATS for resolution prior to completion of testing.

Diebold Election Systems Product Overview – Assure 1.2



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. Final version numbers have not been assigned but will be documented as part of the Certification Test Report.

Table 2 - Required Software and Firmware

Manufacturer	Application(s)	Version	Test Type
Diebold	GEMS	1.20.1	Pre/Post Voting
Diebold	AccuVote-OS PC	1.96.10	Voting
Diebold	AccuVote-OS CC	2.0.13	Post Voting
Diebold	AccuVote-OSX	1.0.1	Voting
Diebold	BallotStation	4.6.6	Voting
Diebold	EMP	4.6.3	Pre/Post Voting
Diebold	Key Card Tool	4.6.2	Full
Diebold	VCProgrammer	4.6.2	Voting
Diebold	Voter Card Encoder	1.3.3	Voting
Diebold	ExpressPoll CardWriter	1.1.6	Voting
Diebold	CTS	2.0.1	Post Voting
ATS	AutoMARK AIMS	1.3 (D)	Pre-Voting
ATS	VAT Firmware	1.3 (D)	Voting
Diebold	BootLoader	1.3.8	Full
Diebold	WinCE	300.3.3	Full
Diebold	WinCE	410.3.8	Full
Diebold	WinCE	500.3.1	Full
Diebold	AVPM	3.0.3	Full
Diebold	ABasic Compiler	2.2.2	Full
Diebold	ABasic Report Files	2.2.2	Full
Manufacturer	**COTS Application(s)**	**Version**	**Assure 1.2 Application**
Microsoft	Windows	XP	GEMS, AIMS, Key Card Tool, VCProgrammer
Microsoft	Windows	2000	GEMS
Microsoft	Windows	2003	GEMS, Key Card Tool, VCProgrammer

3.2 Equipment (Hardware)

Equipment identified in the table reflects all hardware required to perform hardware, software, telecommunications, security and integrated system tests. Final version numbers have not been assigned but will be documented as part of the Certification Test Report.

Table 3 - Required Hardware

Item	Manufacturer	O/S Version if applicable
PC (COTS)		MS Windows XP/2000/2003 (COTS)
AccuVote-OS Model A, B, C, D (2002)AccuFeed Model A – optional	Diebold	
AccuVote-OSX Model A (2002) with BootLoader 1.3.8	Diebold	WinCE 500.3.1
AccuVote-TS R6 Model A, B (2002) OSAA Model A (2002) - optional UAID Model A (2002) – optional	Diebold	WinCE 300.3.3
AccuVote-TSX Model A,B,C, D (2002) with BootLoader 1.3.8 AVPM Model A (2002) - optional OSAA Model A (2002) - optional UAID Model A (2002) – optional	Diebold	WinCE 410.3.8
EMP Model B, C, D (COTS components)	Diebold	MS Windows XP
Voter Card Encoder (COTS)	Spyrus	
ExpressPoll 2000 (COTS)	Gotive	
ExpressPoll 4000 (COTS)	Advantech	
ExpressPoll 5000 (COTS)	Advantech	
PS900 iM2 (COTS)	DRS Data & Research Services, PLC	
VAT A300	AutoMARK	MS Windows XP

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
CTS 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, Diebold delivered the documents listed in Attachment A as a part of the Assure 1.2 Voting System.

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. 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. Final version numbers have not been assigned but will be documented as part of the Certification Test Report.

Table 5 - Hardware Configuration

Item	Manufacturer	O/S Version	Description of Use
AccuVote-TSx DRE Models A, B, C, and D with AccuView Printer Module	Diebold	WinCE 410.3.8	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.
OSAA: Diebold (Optical Scan Accumulator Adapter)	Diebold	N/A	The OSAA facilitates the accumulation of the AccuVote-OS results on an AccuVote TS terminal. The OSAA allows the memory card from the AccuVote-OS to be inserted into the AccuVote-TS terminal where the results of both terminals are accumulated.
EMP Models B, C & D	Diebold	PC with Windows XP	The Election Media Processor (EMP) is a bulk AccuVote-TS PCMCIA memory card download and upload device, which provides for simultaneous transmission of up to six memory cards.
AccuVote-TS R6 DRE Models A, B	Diebold	WinCE 300.3.3	The AccuVote-TS R6 DRE is a direct recording electronic device, operated by voters via a touch screen interface, or with optional UAID (Universal ADA Interface Device), and with optional AVPM (AccuView Printer® Module).

Item	Manufacturer	O/S Version	Description of Use
AVOS Models A, B, C, and D	Diebold	N/A	The AccuVote-OS is a mark sense-based ballot counting device, which can be run in Precinct Count (PC) mode or Central Count (CC) mode. The AccuVote-OS 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.
Key Card Tool 4.6.2	Diebold	PC with Windows XP or 2003	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 and ExpressPoll units.
AccuVote-OSX Model A	Diebold	WinCE 500.3.1	The AccuVote-OS is a mark sense-based ballot counting device, with HAVA ADA accessibility and the ability to create a paper record of ballots.
VCProgrammer 4.6.2	Diebold	PC with Windows XP or 2003	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 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	Spyrus	N/A	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.
ExpressPoll Models 2000, 4000, and 5000	Model - Manuf. 2000–Gotive 4000–Advantech 5000–Advantech	N/A	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 A300	AutoMARK	Windows XP	The AutoMark VAT device allows voters to electronically mark a ballot that will be scanned by the AccuVote-OS device.

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 Diebold'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 System 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, Section A.*)

Table 6 - System Functional Testing

Function	Test Methodology
Ballot Preparation Functions	
a. Ballot preparation subsystem	Verify the election is defined for election day, and one more precinct/polling place can be defined.
Before, During & After Processing of Ballots	
b.1. Logic Test – Interpretation of Ballot Styles & recognition of precincts	Verify in Functional Tests: Verify voting variation functionality identified (Vol. 1. Section 2.2.8.2).
b.2. Accuracy Tests- Ballot reading accuracy	Verify recording approximately 27,000 consecutive ballot positions on the VAT with the AccuVote-OS scanner. -Accuracy Ballot is loaded onto a Sand Disk -Report of the initialization process -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
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

Function	Test Methodology
	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: 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

GEN Test Cases	
All GEN Test Cases	The object of this test case is to verify core functionality by using the vendor'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) - 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	Additionally, that ballots can be created with the following optional functionality: - Ranked Order Voting (Unsupported by GEMS) - Minimum of two Precincts - Split Precincts (three splits per 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) - 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)	Additionally, that ballots can be created with the following optional functionality: - This is a two page ballot election per voter - Minimum of seven precincts - Rotational ballot 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
GEN 03 (Multi-language & Accessibility)	Additionally, that 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 - Accessibility - Straight Party by contest, if supported (City Council) - Rotation

PRI Test Cases	
All PRI Test Cases	The object of this test case is to verify core functionality by using the vendor'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)	Additionally, that 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 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.

PRI 02 (Closed Primary)	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 Type D - Rotation - Minimum of 7 Precincts
PRI-03 00 (Blanket Open Primary) Test Case	Additionally, that 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 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.

System Tests	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
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
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 the vendor	All System Test Cases

System Tests	Test Methodology
Recovery Tests	
Exercise system's ability to recover from hardware and data errors.	Security Test Case

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 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*).

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 Diebold, Wyle Laboratories (Wyle Laboratories, Inc., 7800 Highway 20 West, Huntsville, Alabama 80806). Attachment B – Diebold 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.

The ATS VAT 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*).

4.3.3 Software Module Test Case Design and Data

SysTest Labs reviewed the test case design documents and data as provided by Diebold Election Systems. 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)*.

4.3.4 Software Functional Test Case Design

SysTest Labs has reviewed the functional test case design documents and data as provided by Diebold 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*).

4.3.5 System-Level Test Case Design

SysTest Labs reviewed the system-level test case design documents and data as provided by Diebold. 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 Diebold Election Systems. SysTest Labs will repeat a sampling of the vendor's test cases according to the guideline below.

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

- Review all vendor test cases and select 3 tests from high-risk areas for sampling, such as:
    - Security
    - Audit log
    - Tabulating
    - 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, and 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 only 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.

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 Diebold Election 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 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 Diebold. 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 Diebold Elections in Vancouver, BC in a secure room and/or at SysTest Labs in Colorado. All TDP and test documentation is stored in the project directory on the Voting server.

VSTL testing at a client site must meet the conditions under which testing is performed at SysTest Labs' laboratory.

SysTest Labs performs VSTL functional and system-level testing at SysTest Labs' facility unless testing at the client site is necessitated by logistics related to the characteristics of one or more components of the voting system under test. Environmental hardware testing for voting systems may only be executed at the environmental hardware testing subcontractor's facility or their alliance lab facilities.

Prior to any VSTL test activities that occur at a client's site, both equipment and facility will be examined and analyzed to ensure that competent and up-to-date temporary facility support exists for testing of voting system technologies, in compliance with SysTest Labs' VSTL test standards and accepted practices of test engineering. If the equipment or facility is found not to be in compliance, SysTest Labs will identify, to the client, any necessary improvements in the equipment and facility. SysTest Labs assures that these improvements are made before client-site testing can begin.

When testing is performed at a Vendor facility, SysTest Labs requires that our test staff follow all protocols associated with recording, reporting, maintaining and controlling all test results. In addition, to ensure the integrity of all tests and recorded results, SysTest Labs requires that all test results be stored only on computer equipment provided and controlled by SysTest Labs, e.g., test staff laptop computers. SysTest Labs will control access to the test equipment, including hardware, software and firmware and the test room.

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

Diebold's Voting System test platform will be set up, as part of the Physical Configuration Audit, in the standard configuration identified in the vendor TDP documents listed in **Attachment A - TDP Documents Delivered**. The software will be installed, versions verified and made operational. The hardware will also be set up and versions verified according to the vendor TDP documents. Once the hardware and software 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 **Table 6 - System Functional 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; 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 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 with the test result of ***Accept*** or ***Reject***. If a failure of a test procedure precludes attempting subsequent test procedures, the test procedures that cannot be executed will be marked as ***NT***, Not Testable. ***NS*** (not supported) indicates requirements that apply to features that are not supported in the configuration being tested. For expected functionality that is not implemented, the test procedure will be marked as ***NT***, Not Testable. If a test procedure is not applicable to the current certification test effort it will be marked as ***NA***, Not Applicable. ***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 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.). Diebold 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**. Diebold has the option to address Informational issues. All responses by Diebold are noted in the Discrepancy Report appendix to the Certification Report.

7 Approval Signatures

SysTest Labs:

Electronic Signature

Name
Title
Date

Client:

Electronic Signature

Name
Title
Date

End of Certification Test Plan