

Bruce McDannold  
Election Specialist – Voting Systems  
Office of the Secretary of State  
1500 11th Street  
Sacramento CA 95814

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Subject: Certification Test for the Diebold Election Systems, Inc. (DESI)  
GEMS 1.18.22/AV-TSX 4.6.1 Voting System Including the AccuView Printer  
Module

### ***Executive Summary***

State certification testing was conducted 28 Mar to 1 Apr, 2004, at the California Secretary of State Election Division offices in Sacramento, CA, to certify the Diebold Election Systems, Inc. (DESI) Voting System consisting of:

1. The GEMS Version 1.18.22 (GEMS 1.18.22) election management system,
2. The AccuVote-TSx (AV-TSx) Revision 7 touch screen voting device with Ballot Station Firmware Release 4.6.1 (AVTSX 4.61 with the AccuView Printer Module (AVPM))
3. Various components previously certified with earlier versions of GEMS.

The AV-TSx is being re-certified under the criteria for new DREs with an accessible voter verifiable paper audit trail (AVVPAT) device, the AVPM.

The take up reel security canister, which is the AVVPAT-S component of the AVPM, used in the testing had repeated problems and was identified as a pre-production version which was expected to be changed in the final version.

The paper audit record carries a unique identifier which appears to violate the California Election Code, Chapter 3, Semifinal Official Canvass, Section 15208. A paper ballot with type of marking would be required to be declared void and ineligible for counting. The same unique identifier may also be used to retrieve and print out the electronic ballot image.

As configured and presented for testing, this version is not ready for use in an election.

### ***References:***

1. [SVF0624] Freeman, *Certification of the Diebold Election Systems Global Election Management Systems (GEMS) Version 1.18.19, Key Card Tool Rev 1.0.1, Voter Card Encoders (VCE) Rev 1.3.2, and AccuVote Touch Screen DRE (AV-TS R6), Firmware 4.3.15D*, 24 Jun 2004
2. [Conditions] Secretary of State-California, *Decertification and Withdrawal of Approval of Certain DRE Voting Systems and Conditional Approval of the Use of Certain DRE Voting Systems*, 30 Apr 2004
3. [AVVPAT] Secretary of State-California, *State of California Standards For Accessible Voter Verified Paper Audit Trail Systems In Direct Recording Electronic (DRE) Voting Systems*, 21 Jan 2004
4. [SOSPROC] Diebold Election Systems, Inc., *State of California PROCEDURES Required for Use of the Diebold Election Systems AccuVote-TSx Electronic Ballot Station [Draft]*, 28 Mar 2005

### ***Introduction***

In compliance with California Elections Code 19200 and 19205, Diebold Election Systems applied for certification for the following:

1. GEMS, Version Release 1.18.22
2. AV-TSx with AccuView Printer Module (Pre-production)
3. Ballot Station Firmware Release 4.6.1 (tested as 4.6.0.20). This firmware is used on the AV-TSx with AVPM.

These components are supported and test with previously the following previously certified components of the Diebold Election System:

4. Key Card Tool Version 1.0.1
5. Voter Card Encoder (VCE) (Spyrus) Version 1.3.2
6. VC Programmer Version 4.1.11
7. AV-OS Precinct Firmware Release 1.96.4
8. AV-OS Central Count 2.0.12 Firmware Release 2.0.12

The AV-TSx was decertified in Apr 2004 by the California Secretary of State with a condition that it could not be recertified unless it was with a voter verified paper audit trail [AVVPAT] feature. The AVPM is intended to satisfy that requirement. The AV-TSx is an improved model from the currently used AV-TR6 and takes advantage of more advanced options of the Key Card Tool used to change and install encryption and pass codes.

The AVPM is a printer modification that support printing ballot receipts showing the voter's choices after the ballot is cast. The vote tally is not changed until the voter reviews and verifies the receipt. Once the receipts are verified by the voter, AVPM prints a bar-code on the bottom of the receipt and advances the receipt into a sealed canister containing a take-up reel. (The bar-code was not evaluated in this test). Provisional ballots are labeled with a Voter Id which can be used in GEMS in the Challenge Board option to locate, accept, and review the ballot. Rejected ballots are marked and advanced into the secure take-up reel canisters.

#### Additional Significant Changes

1. The addition of Secure Socket Layer (SSL) encryption to the GEMS-Ballot Station connection. The option for an encrypted link is enabled or disabled in the AccuVote TS Options dialog. The change was actually made to earlier versions, which were not used in California but had problems which this version attempted to address.
2. Ability to print out unaccepted, un-reviewed challenge (provisional) ballots. This feature is potentially useful in meeting the requirement to handle provisional ballot submitted in the wrong precinct.
3. Corrections on numerous problems with Statement of Vote Count (SOVC) reports.

#### **NASED Qualifications/State Certifications**

<u>Component</u>	<u>NASED #</u>	<u>State Certification</u>
1. GEMS 1.18.22	N-1-06-12-12-003	none
2&3. AV-TSx/AVPM, BS 4.6.1	(in review)	none
4. Key Card Tool 1.0.1	N-1-06-12-12-002	(1.18.19) 08/10/2004
	N-1-06-12-12-003	(1.18.22)
5. VCE 1.3.2 (Spyrus)	N-1-06-12-12-002	(1.18.19) 08/10/2004
	N-1-06-12-12-003	(1.18.22)
6. VC Programmer 4.1.11	N-1-06-12-12-004	(1.18.19) 10/04/2004
	N-1-06-12-12-005	(1.18.22)
7. AV-OS Precinct 1.96.4	N-1-06-12-12-002	(1.18.19) 08/10/2004
	N-1-06-12-12-003	(1.18.22)
8. AV-OS CC 2.0.12	N-1-06-12-12-004	(1.18.19) 09/28/2004
	N-1-06-12-12-005	(1.18.22)

The final test reports have been submitted to the Election Administration Commission for review by the NASED Voting System Board Technical Committee. The reports are through the technical review and have been presented to the NASED Voting System Board for a final decision.

The Key Card Tool, VCE (Spyrus), VC Programmer, AV-OS Precinct Counter, and AV-OS Central Counter were previously certified in California [SVF0624] in conjunction with GEMS 1.18.19 and the AV-TR6 with Ballot Station Firmware Release 4.3.15D. These versions have not changed but were tested at this time to confirm valid operation with the GEMS 1.18.22 and AV-TSx DRE.

This test did not include an AV-TR6 although NASED Certification N-1-06-12-12-003 qualified the AV-TR6 with BS Firmware Release 4.5.2.

### ***Test Report Results***

The tests were conducted with three test elections based on sample contests from the 2004 Presidential elections and the 2003 Special Recall election. The exercised full election logic options under California election code including:

1. AB 190 provisions for the recording, tallying, and reporting of non-partisan voters in partisan primary contests,
2. The use of seven political parties in the primary and general election.
3. Rotation of races based on Assembly District.
4. Multiple levels of voting districts for contests and measures covering federal, state-wide, state districts including Assembly Districts, and local contests.
5. Contests with Presidential slate (Pres/Vice Pres), single declared candidates, multiple declared candidates, and a contest where voters may vote for more than one candidate.
6. Write-ins.
7. Provisional ballots and the resolution of write-ins in provisional ballot including issues with provisional ballots submitted in the wrong precinct.
8. Multiple languages (directly tested English, Spanish, and Vietnamese representations in written and audio ballots; Chinese, Japanese, Korean, and Taglog were tested in the Voting Systems Standards qualification testing by a NASED certified test laboratory).
9. Accessibility features on the DRE (font size changes, color changes, and audio ballots).
10. Accessible voter verified paper audit trail production of records of each test ballot.
11. Production of precinct/polling place level reports.
12. Consolidation of voting results from multiple precincts and voting devices.
13. Production of canvassing reports, status reports, and audit logs.

In additions, the test was conducted using Windows operating system security profiles to restrict access to limited functions by administrative and subordinate workers in conjunction with changes in the GEMS and AV-TSx access and data exchange controls. The test was not scaled for a full-scale security review but did provide some oversight of functional availability and impact of security controls and options on the operation of the system.

Overall, the system tested favorably with improvements in basic operations and performance as compared with the existing certified DESI system in California, but minor problems noted in earlier releases are still present and the new AVPM needs further work. The following issues were noted:

1. GEMS Security Procedures. We attempted to exercise GEMS using the procedures recommended under the [SOSPROC] Security of GEMS Server, section 11.1.3, 11.1.4, and 11.1.10. These sections require the set up and creation of logon accounts with accesses restricted to needed functions at the administrator and user levels (11.1.3), limited use of the administrator logon (11.1.4) and the use of an anti-virus programs (11.1.10). The administrator logon is a super-user needed to support installation of programs and setting critical system security values such as the logon accounts. Limiting this functionality to administrator accounts

also supports section 11.1.7, 11.1.8, and 11.1.9 concerning controls to restrict undesirable installation of or changes to software programs and files. All other operations are expected to be performed by one or more classes of user accounts with fewer privileges which can not install or change software or unauthorized files. The logon accounts were managed through the Windows 2000 security policies managers. The anti-virus program used was a McAfee package.

The Windows security profile management defaults to three levels of logon account profiles: "administrators", "power-user", and "user"; other custom levels may be also defined. "User" level profile accounts effectively could not be used without tweaking to the "power-user" level (Microsoft has said in their own guidance that third-party products such as GEMS will usually not be usable with this profile level without modification), "power-user" account profiles were generally effective and provided some restriction to access of some undesirable operations outside the GEMS application but tended to run into routine operations in GEMS (such changing or deleting records and files) which required the system to be exited, rebooted, and re-entered under an administrator level user. Logon accounts at these levels may be tweaked to be more useful and provide improved security.



No problems were experienced with the anti-virus program.

2. AVPM Proto-type reliability. The AVPM unit provided for testing was identified in testing as a proto-type unit. During initial setup and installation, we had several persistent problems with the paper feed. The take up roll was not drawing the paper ballot or blank tape into the ballot security canister. With the loss of tension, the paper folds up prior to entering the ballot security canister. In this jam condition, the audit records are visible to the poll worker clearing the jam. We also experienced minor incidents of paper skewing to the side and not printing correctly. The initial incidents were consistent enough that the cover of the AVPM and sometimes the cover to the take up security canister were left open during the test so we could respond and correct the problem. Part of the problem was that the take up canister was popping out of its mount and not being fully engaged with the drive gears. Attempts were made to tape the canister down but failures still occurred and someone had to hold the canister in place. Closing and locking the cover down may have reduced the seriousness of the problem but it failed even with the cover down.

In a later message from DESI through the Wyle test laboratory, they claim the test unit was probably out of specification. The test needs to be repeated with a unit matching meeting the production specification.

3. AVPM Ballot Serial Number. The AVPM audit report displayed to the voter contains a ballot serial number that uniquely identifies the ballot in both the AVVPAT records and in the internally stored electronic ballot image. The California Election Code, Chapter 3. Semifinal Official Canvass states:

**"15208 Preparation of ballots for counting**

. . . . Any ballot that is marked in a manner so as to identify the voter shall be marked 'Void and shall be placed in the container for void ballots."

Under this code requirement, the paper ballots would not be useable for a recount. Furthermore, because the same number is used to identify and access the electronic ballot images, the internal electronic ballot images may also not be useable in a recount. The problem disappears if the

number is assigned after the voter has verified the ballot and the printed audit record is no longer visible to the user or other observers.



4. Provisional Ballots. Voter Access cards can include the information that a voter is a provisional voter. The provisional ballot is processed just like a standard ballot including a ballot image record but the ballot is not added to the vote tally results at the AV-TSx DRE. The electronic ballot image and the voter verified audit record include the voter id number assigned when the Voter Access card is created. When the results, including the ballot images, are uploaded to the Vote Center in GEMS, an option exists called the Challenge Board to resolve the provisional ballots. The feature allows the ballots to be identified and accepted based on the verification of the provisional voter. The Challenge Board also includes the ability to review the provisional ballot and to print a 'copy' of the ballot which may be used as a paper ballot to transcribe the ballot into a paper ballot giving only the authorized races in voter's legal precinct.

The Challenge Board does not provide a method to modify the ballot images online to submit in place of a corrected paper ballot; the provisional ballots revised to place them into the correct precinct still have to be processed as paper ballots. However, for provisional ballots that are in the correct precinct, the ballots may be accepted and consolidated in the canvass result totals without the paper ballot handling. Currently, under the conditions for certifying a DRE [Condition], all the provisional ballots are to be recorded and processed as paper ballots and this feature would not be used.

The use of the Challenge Board (and the Ballot View option which works for any ballot) allows a user with access to GEMS and the election database to pull up and see any ballot for which they have a voter id, in the case of the provisional ballots, or a ballot serial number for any ballot. The Challenge Board provides a record that the ballot was viewed as a provisional ballot. The earlier version only allowed the ballot to be viewed if the ballot was accepted; this version allows a ballot to be viewed and not accepted. There is no audit trail record that identifies a ballot was pulled up on the system and viewed other than this window which may be changed.

Allowing the voting of provisional ballots on the DRE is an attractive and potentially efficient method of handling the provisional versus requiring the physical handling of paper ballots. Voters out of precinct will still need the ballots to be transcribed and counted as paper (absentee style) ballots but in precinct voters could be handled with substantial less ballot handling and errors.

However, two problems exist:

- a. Avoiding duplication of voting (or the recording of the wrong precinct ballot) between the online version and the paper version.
- b. The lack of an audit trail showing these ballots were opened and viewed even though they may not have been accepted as provisional ballots. (This also applies to non-provisional ballots where the ballot serial number may be acquired).

5. In the reports, several reports or options on the report were identified that resulted in minor errors or problems with the reports such as the Statement of Vote Count (SOVC). In all cases, alternate reports, or simply avoiding certain options, is sufficient to avoid the problems. Several of these have been identified in early reports or are listed in DESI's own list of known problems and are scheduled for correction or modification in later releases. DESI should provide in the instructions and manuals an errata type sheet identifying which reports and options should be

avoided or at least guidance on interpreting the misleading information. The following is an example:

The export feature converts GEMS database voting results into a format that can be used by other applications such as California's CalVoter. It is known, and was verified in testing, that some sets of options result in a system failure that halts production of the export file. Although we were able to find a set of options that allowed an export file to be produced, it did not include options that were desired for CalVoter. DESI did not know which options or combinations of options results in the system failure.

### **Conclusion**

The take up reel security canister, which is the AVVPAT-S component of the AVPM, used in the testing had repeated problems and was identified as a pre-production version which was expected to be changed in the final version.

The paper audit record carries a unique identifier which appears to violate the California Election Code, Chapter 3, Semifinal Official Canvass, Section 15208. A paper ballot with type of marking would be required to be declared void and ineligible for counting. The same unique identifier may also be used to retrieve and print out the electronic ballot image.

As configured and presented for testing, this version is not ready for use in an election.

Sincerely,



Steven V. Freeman

Attachment:s:

- A. List of the test configuration components
- B. AVPM photos

## Attachment A

**Test Configuration Inventory**

1. Dell Power Edge 600SC, HH18021 Chassis S/N
  - a. 1.8 gigahertz, Pentium 4 processor
  - b. 1 GByte RAM
  - c. 20 GByte IDE Internal Hard Drive
  - d. ViewSonic VE 155, 905035200089
  - e. PLEXTOR CD-R PX-W1210S SCSI CdRom Drive
  - f. 3.5 Diskette Drive
  - g. ARCHIVE Python 06408-XXX SCSI Sequential Tape Drive (not used)
  - h. Digi AccelePort Xem-PCI bus card
2. Digi Portserver – 16port, S/N: (S) V10300256
3. DigiPorts 8/EM, PC/8em DB25, S/N: (S) V 21488435. Port 1 (COM3) and 2 (COM4)
4. Hewitt Packard Laser 1200 Printer S/N: CNFL007164
5. Epson Color Printer, S/N C8EFa11779
6. ST 100 USB Memory Card Reader, S/N 10077001740 (for VC Programmer)
7. Vote Access Encoders (VCE) - Spyrus
  - a. VCE Firmware Ver. 1.3.2, P3001 35621 (defective)
  - b. VCE Firmware Ver. 1.3.2, P3001 35603 (defective)
  - c. VCE Firmware Ver. 1.3.2, P3001 26713
  - d. VCE Firmware Ver. 1.3.2, P3001 26718
8. Commercial-Off-The-Shelf Software
  - a. MS Windows 2000 Server, Service Pack 4 (Build 2195) w additional patches for SP5.
    - i. Window Internet Explorer 6.00.2800.1106
  - b. Adobe Acrobat Version 6.0.0.2003051900
  - c. Adobe Audition Version 1.0
  - d. Nero CD/DVD Rom Burning Suite, Version 6,
  - e. WinZip 8.1, SR1
  - f. McAfee SecurityCenter Version 5.0.0.0
  - g. McAfee VirusScan Version 9.0.0.0
  - h. SEIKO Epson Driver
9. Diebold Election Systems, Inc. Software:
  - a. GEMS 1-18-22
  - b. Key Card Tool 1.0.1
  - c. VC Programmer 4.1.11
10. Voting Machine Unit(s)
  - a. AV-TSx, Firmware Ver. 4.6.0.20 (to be released as 4.6.1), 207636
  - b. AV-TSx, Firmware Ver. 4.6.0.20 (to be released as 4.6.1), 207636
  - c. AV-TSx, Firmware Ver. 4.6.0.20 (to be released as 4.6.1), 206421
  - d. AV-OS 79811-04 S/N 30682, PC Firmware Ver. 1.96.4
  - e. AV-OS 79811-04 S/N 30697, PC Firmware Ver. 1.96.4
  - f. AV-OS 79811-04 S/N 30681, CC Firmware Ver. 2.0.1.2
  - g. AccuFeed 1.0 (supports AV-OS CC operation), S/N 30681
11. Documentation
  - a. GEMS 1.18 Users Guide, revision 11.0
  - b. GEMS 1.18 Reference Guide, revision 7.0
  - c. GEMS 1.18 Election Administrators Guide, revision 7.0
  - d. GEMS 1.18 System Administrators Guide, revision 5.0
  - e. AccuVote-TSX Hardware Guide, revision 8.0
  - f. AccuVote-TSX Pollworkers Guide, revision 4.0

- g. Key Card Tool 1.0 Users Guide, revision 2.0
- h. Voter Card Encoder 1.3, Users Guide 2.0
- i. VCProgrammer 4.1 Users Guide, revision 4.0
- j. AccuVote-OS Hardware Guide, revision 6.0
- k. AccuVote-OS Pollworkers Guide, revision 3.0
- l. AccuVote-OS 1.96 Precinct Count Users Guide, revision 3.0
- m. AccuFeed 1.0 Hardware Guide, revision 1.0