

Voting System Examination

Hart InterCivic

Prepared for the
Secretary of State of Texas

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Designee of the Attorney General

This report conveys the findings of the Attorney General's designee from an examination of the equipment listed, pursuant to Title 9, Chapter 122 of the Texas Election Code, section 122.036(b).

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Report Date	June 16, 2006

Component	Version	NASED Number
Ballot Origination Software System (BOSS)	4.2.13	N-1-04-22-22-005
Ballot Now: Paper Ballots	3.2.4	N-1-04-22-22-005
Tally (Vote Tabulation System)	4.2.8	N-1-04-22-22-005
Rally (Vote Transfers to Tally)	2.2.4	N-1-04-22-22-005
Servo (Warehouse Software)	4.1.6	N-1-04-22-22-005
Electronic Crypto Module (eCM)	1.1.7	N-1-04-22-22-005
eSlate Voting Station	4.1.3	N-1-04-22-22-005
Judges Booth Controller (JBC)	4.1.3	N-1-04-22-22-005
eScan Precinct Scanner	1.2.0	N-1-04-22-22-005

Improvements

- Hart has changed their system to disable the ResetPVS, their device that can clear all the votes on a JBC, MBB and eSlates. Starting with System 6.0, ResetPVS no longer works, but can still be used to clear votes on older versions. Because of this, it is desirable to update all Texas jurisdictions to System 6.1 as soon as practical.
- A unique code (called a GUID) has been added for each eCM key. This allows the system to more quickly verify that the right eCM key is in use. This is a convenience to users who might insert the wrong key.
- Tally now supports on-screen resolution of write-ins from the eScan. It displays an image of the relevant part of the ballot and allows the election worker to choose the corresponding name from a list.

Notes

- The overall system is referred to as System 6.1, even though the version numbers of the individual components do not contain 6.1.
- Hart is ISO 9000 certified, so their engineering processes are certified by an external agency. This is a very positive factor.

DRE System: eSlate Precinct Voting System (PVS), eScan Precinct Scanner, and Judges Booth Controller (JBC)

Election Setup	PCMCIA card (Mobile Ballot Box, or MBB) created with BOSS election setup software
Zero-total report	On a thermal printer, which is found on both the Judge's Booth Controller (JBC) and on the eScan.
Authorization to vote / Ballot selection	For the eSlate, a four-digit authorization code is issued to each voter on a tape printed at the election judge's controller.
Provisional Ballots	<p>The system allows ballots to be designated as provisional, automatically assigns a recall number to each one, and prints it out. Each eSlate provisional ballot can later be included in the tally or can remain excluded. Recall numbers are automatically assigned to provisional eSlate ballots and the recall numbers are printed, so transcription errors are avoided; this is preferable to manually assigning them, as some systems require.</p> <p>With the eScan, provisional ballots must be handled with a manual envelope system, where ballots are not scanned until they are accepted.</p>
View / Vote	For the eSlate, LCD display / selection wheel and keys
Vote Storage	Flash memory (called a Mobile Ballot Box, or MBB)
Precinct Consolidation	Not applicable when only eSlates are used, because precinct results are all accumulated together in the Judge's Booth Controller (JBC). If both eSlates and eScans are used in the same precinct, consolidation is done on one of the eScans, but only for the purpose of creating the precinct report. All the MBBs from both eSlates and eScans are carried to election central.
Transfer Results	Flash memory (MBB) used to send to Tally software. Protected by a hash on each vote record. The Electronic Crypto Module (or eCM, a USB dongle) must be present for Tally, BOSS, Rally, Ballot Now or Servo (warehouse software) to create or use a Mobile Ballot Box (MBB).
Print precinct results	On thermal printer. There is a thermal printer on the JBC and on the eScan. If both are used in the precinct, the precinct report is printed on the eScan.
Straight party / crossover	Yes. Also, a warning is given if a straight party vote cancels a crossover vote that has already been selected. This prevents straight-party voting from having an effect the voter did not intend.
Precinct Scanning	The eScan precinct scanner integrates with the precinct system. Results from the JBC can be placed on an MBB and plugged into the eScan, which then produces the precinct report with totals from both the DREs connected to the JBC and the eSlate precinct scanner.

Voter-Verified Paper Audit Trail (VVPAT)	Yes, there is an optional VVPAT. For privacy, the VVPAT is maintained on a paper tape that is automatically wound onto a spool with a one-way clutch that does not permit viewing after verification by the voter. However, privacy can be compromised if someone at the polling place keeps a record of the order in which people vote on a particular machine, since the VVPAT records the ballots in order. For easier counting, each paper vote record is followed by a bar code containing its votes. The voter can only reject the printout twice. Note: Although Hart demonstrated their VVPAT, VVPATS are not required in Texas, and there are no standards for their use in Texas.
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Tabulation and Transmission Software: Tally and Rally

Results Storage	Sybase SQL Anywhere
OS access	Not permitted during tabulation. You can restart the system, but it is logged.
Real-Time Audit Log	Yes.
Data Integrity	Sybase SQL Anywhere implements transaction protection (using a log file), so that either all the data in a transaction is posted, or none of it is.
Transmission	The Rally system can be placed in a regional center to collect results and forward them to the central counting location. No tabulation is done. It merely accepts precinct data and forwards it. All transactions are logged.

Ballot Printing Software & Ballot Scanning: Ballot Now & BOSS

Election Setup	PCMCIA card (MBB) created with BOSS election setup software
Ballot Scanning	<ul style="list-style-type: none"> • BOSS can scan ballots, allow manual interpretation of any undervotes or overvotes, and create Cast Vote Records (CVRs) that can be input into Tally.
Notes	<ul style="list-style-type: none"> • Ballots are produced on demand • Each ballot has a serial number and a bar code, which prevents ballots from being counted twice by the Tally software. • Especially good for absentee ballots

Concerns

1. Jurisdictions using Hart software before System 6.0 are still vulnerable to attack using ResetPVS, which clears all the votes on a JBC, MBB and eSlates. (See above under “Improvements.”) Although the ResetPVS is presumably only available to Hart personnel, the risk is too great to ignore. One person working alone could obtain a copy of this program (for example by theft or bribery) and completely erase the data of entire polling locations quickly and without leaving a trace.
Recommendation: Hart software before System 6.0 should be decertified, effectively requiring jurisdictions to upgrade.

2. If the same ballot is scanned by an eScan and by Ballot Now, it will be counted twice. This is not a big enough problem to prevent certification, since many systems will count ballots twice if they are scanned twice. However, since the Hart system normally refuses to count the same ballot twice, election officials may become somewhat lax about enforcing procedures to prevent this.

Recommendation: Hart should warn counties of the importance of keeping eScan ballots separate from Ballot Now ballots, so they are not scanned twice.

3. Hart's VVPAT system has one inherent weakness. There is a possible compromise of privacy, because the paper records for each voting station are stored in the order that people vote. For example, if everyone in a precinct votes on a single DRE, comparing the VVPAT tape to the voter sign-in log would reveal how people voted. Even with multiple machines, a poll watcher could record the order in which people vote on a given machine. If the VVPAT tape is an open record under Texas law, then the Hart VVPAT appears to violate Texas law.

Recommendation. This problem needs to be considered and addressed by the Secretary of State and the Legislature. This type of VVPAT is only acceptable if the VVPAT tape is not an open record, and procedures are in place to protect the privacy of the tape. Possibly the tape would only be opened in the event of a contest, and only under controlled circumstances. Also, standards and procedures should be developed for VVPAT use in Texas.

4. Erroneous tallies were produced in Tarrant County using an uncertified program called Fusion, which was described as a "glorified spreadsheet utility" that was used to create unofficial totals from two different systems on election night. The error was discovered the next morning. The error reportedly occurred because election workers used the same filenames over and over. I understand that Fusion is not subject to certification by the Secretary of State.

Recommendation A (For Hart). Although Fusion was not examined and I have never seen it, from the description, it appears that the problem could have been prevented by good software design, and that Fusion was not designed to Hart's normal standard of quality and error resistance. I recommend that Hart review the Fusion product for ease of use and resistance to human error. Obviously this has no effect on certification, since Fusion is not subject to certification.

Recommendation B (For SOS). As Hart representatives pointed out, this type of problem and many others would be avoided if there were a standard, industry-wide export format for election results. I recommend that the Secretary of State lobby national decision-makers for such an export format.

5. Some JBCs in Tom Green Country were accidentally cleared before they were backed up. Clearly this was a human error, but election systems should do everything they can to prevent human error. For example, since the JBCs presumably knew that they had not been backed up, it might be possible for them to refuse to reset or at least give a stronger warning when results have not been backed up.

Recommendation. I recommend that Hart investigate and determine if a software change could reasonably prevent this error in the future, and I request that they report their findings to us. This has no effect on certification at this time.

6. Hart reports that users occasionally open the polls and then practice closing them. Since the polls cannot be re-opened once closed, this requires that the equipment be reset using

Servo.

Recommendation. I recommend that Hart investigate and determine if a software change could reasonably prevent or reduce the frequency of this error, and I request that they report their findings to us. For example, perhaps the poll-closing message could make it very clear that the polls cannot be re-opened, or an extra warning could be given and an extra confirmation required if the user requests to close the pools before the scheduled time. This has no effect on certification at this time.