Voting System Examination
Hart Verity

Prepared for the
Secretary of State of Texas

James Sneeringer, PhD
Designee of the Attorney General

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

Examination Date: May 22-23, 2019
Report Date: May 31, 2019

	Component	Version	EAC Cert. Num.
1.	Verity Data	2.3.1	HRT-Verity-2.3
2.	Verity Build	2.3.1	HRT-Verity-2.3
3.	Verity Count	2.3.1	HRT-Verity-2.3
4.	Verity Central	2.3.1	HRT-Verity-2.3
5.	Verity User Management	2.3.1	HRT-Verity-2.3
6.	Verity Election Management	2.3.1	HRT-Verity-2.3
7.	Verity Desktop	2.3.1	HRT-Verity-2.3
8.	Verity Scan	2.3.1	HRT-Verity-2.3
9.	Verity Touch Writer with Access	2.3.1	HRT-Verity-2.3
10.	Verity Controller	2.3.2	HRT-Verity-2.3
11.	Verity Touch	2.3.1	HRT-Verity-2.3
12.	Verity Touch with Access	2.3.1	HRT-Verity-2.3
13.	Verity Touch Writer Duo	2.3.1	HRT-Verity-2.3

These version numbers of the equipment examined matched those above.

Verify Print was listed on the Form 100 submitted by Hart, but Texas does not require certification of ballot-printing devices, so I have not included it above.

System Summary

Overview. The Verity system comprises

(a) software components that run under Windows 7 on commercial-off-the-shelf (COTS) computer systems (1-7 above)
(b) devices for the polling place (8-13 above), and
(c) COTS components (such as computers, printers, and scanners).

Security

Chain of Custody. To verify that components we tested are the same as that certified by the Election Assistance Commission (EAC), the Secretary of State obtained the images directly from the EAC. Hart delivers its software components to customers on hard drives and its firmware components on memory cards known as CFAST. (CFAST is a newer version of Compact Flash memory, which is widely used in digital cameras. CFAST is short for Compact Fast, since CFAST is faster than Compact Flash.)

The hard drives and CFAST cards delivered by Hart require no software or firmware installation; once they have been inserted into the computer or other device, it is only necessary to switch on the power. Since the EAC sent the same kind of media Hart would give to customers, the examiners did not need to observe any installation procedures.

There is also a procedure that allows the customer to verify that the software has not been tampered with. This is done by creating a manifest containing hashes of the files that comprise the system. The hashes are compared with those on a manifest downloaded from the National Software Reference Library. If the hashes are the same, the files are also. We spot-checked the hash codes to verify again that we were examining the same products as the EAC.

Verity Keys are USB drives used to provide extra security (in addition to user IDs and passwords) to certain parts of the Verity system. They contain no election data and are used solely as tokens to restrict access to people who have the appropriate Verity Key and eight-digit passcode.

Verity Keys are not used in polling places, where only a six-digit numeric passcode is needed. Once again, the passcodes can be different for different operations, such as Open Polls, Close Polls, and spoil a ballot.

For security, Verity workstations used in the central-count office are run in *kiosk mode,* denying access to the operating system to anyone who does not have a special passcode available only from Hart support and valid for only one day.

Hart's complex ballot security system can be daunting, but it seems to be a robust system for guarding against unauthorized access. Nevertheless, there is some risk because the passcodes are the same throughout an election for all voting stations and other precinct devices.

Election Setup

The Hart Verity workstation software (Verity Data, Verity Build, etc.) can (a) create an election definition (containing races, candidates, ballot styles, etc.), (b) proof the election, (c) print ballots or create PDF files to send to a printer, (d) create Verity Keys, and (e) create *vDrives*, which convey election information to the voting devices and scanners.

vDrives are USB drives that are easily distinguishable from Verity Keys by shape and color. All vDrives contain the entire election definition and any vDrive for the election can be used to convey the election definition to any Verity device. For example, vDrives are used in polling places to initialize devices such as the Verity Touch, Verity Scan, and Verity Touch Writer Duo. vDrives for a given election all contain exactly the same data at first, for ease of creation and handling, but once a vDrive is used to initialize a device for the election, a unique ID is written on the vDrive, so every use of that vDrive can be traced in the audit logs.

When voting is over, the vDrives convey cast-vote records and logs to the counting location while the duplicate copy on the CFAST remains in the machine. All results are in clear text, but digitally signed so that their authenticity can be verified. Results are stored on vDrives in random order, to protect voter privacy. Should a vDrive have an invalid signature (or a signature from a different election), it will not be accepted.

Voting

Voting may be done (a) by hand-marking a paper ballot, (b) by voting on a Verity Touch, a direct-recording electronic (DRE) voting station, which records votes directly on both its vDrive and CFAST, or (c) by using either the Verity Touch Writer or the Verity Touch Writer Duo. The last two allow the voter to make selections on a touch screen and then print a marked ballot with those selections; they do not record the votes, except (of course) on the marked ballots that they print. The marked ballot from the Touch Writer looks like a traditional hand-marked ballot, while the ballot created by the Touch Writer Duo (called a PVR, for printed vote record) is printed in plain text that can be directly read by optical character recognition, with a hash in a QR code to detect any errors.

Voting can be done using the touch screen, but there is also support for disabled voters, such as audio, paddles, and sip-and-puff. Support for disabled voters was tested by the Secretary of State and is not covered by this report.

The voting devices seemed well-designed and easy to use, reducing the burden of both voters and poll workers. They present one race at a time to the voter, which in my opinion is the best method. I looked at the messages they presented in several situations (e.g. a ballot jam) and found them very understandable. I also spot-checked the Hart documentation for administrators and poll workers and found it understandable as well. It is still a formidable task to run an election, but good documentation and clear messages ease the burden significantly.

The Touch Writer does have the disadvantage that each voter must be authorized by a poll worker who physically walks to the Touch Writer, enters a password to gain access, and then selects the voter's precinct. In my opinion, this procedure is awkward and requires a lot of poll-worker time. However, a Touch Writer in every polling location would provide access to disabled voters.

The Touch Writer Duo does not have this disadvantage, because each voter is given a five-digit access code that controls ballot selection. Since voters on the Duo are also given a piece of thermal paper to record their choices, there is a small inconvenience, because they must enter their access code while holding both the blank "ballot" and the slip of paper containing the access code.

The Verity Controller controls voting at a group of Verity Touch or Touch Writer Duo stations. It issues the five-digit access codes that a voter must enter to begin voting.

Hart also offers Verity Scan, which can scan ballots in the polling place and store cast-vote records for later tabulation.

Tabulation, Reporting, and other Central Activities

Verity Central reads vDrives with results from the polling places and does ballot scanning, produces reports, and provides audit data. It can resolve issues and process write-ins and provisional votes, both for ballots it scanned and for those scanned in the precinct and then transported on a vDrive. Verity Central does not tabulate votes.

Verity Count tabulates the votes (stored in cast-vote records that came from a vDrive) and produces reports. It can also resolve issues and process write-ins.

Concerns

The Hart passcodes are the same for all voting stations and other precinct devices throughout the entire election. Since the same set of passcodes must be given to many people (at least one person at every voting location), it is imperative not to distribute the passcodes until just before the election.

The Hart devices share many common components, which is commendable. However, if Hart chooses to upgrade older customer devices to the newer ones, it should be done in such a way that the result is completely equivalent to the devices that have been certified.

Conclusion

I believe the Hart Verity system is one of the best we have examined. I am pleased that Hart has addressed several problems raised in previous exams.

I recommend certification of this system.