Wisconsin Elections Commission

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MEMORANDUM

DATE: For the September 24, 2019 Commission Meeting

TO: Members, Wisconsin Elections Commission

FROM: Meagan Wolfe
Administrator

Prepared and Presented by:
Robert Williams, Elections Specialist
Cody Davies, Elections Specialist

SUBJECT: Election Systems and Software (ES&S)
Petition for Approval of Electronic Voting Systems
EVS 6.0.4.0 and EVS 6.0.5.0

I. Introduction

Election Systems and Software (ES&S) is requesting the Wisconsin Elections Commission ("WEC" or "Commission") approve the EVS 6.0.4.0 and EVS 6.0.5.0 voting systems for sale and use in the State of Wisconsin. The Government Accountability Board originally approved the EVS system, with EVS 5.2.0.0 and EVS 5.3.0.0, on September 4, 2014. No electronic voting equipment may be offered for sale or utilized in Wisconsin unless first approved by the WEC based upon the requirements of Wis. Stat. § 5.91 (Appendix A). The WEC has also adopted administrative rules detailing the approval process in Wis. Admin. Code Ch. EL 7 (Appendix B).

A. EVS 6.0.4.0

EVS 6.0.4.0 is a federally tested and certified paper based, digital scan voting system powered by the ElectionWare software platform. It consists of eight major components: an election management system (EMS) server; an EMS client (desktop and/or laptop computer); the ExpressVote, an Americans with Disabilities Act ("ADA") compliant vote capture device for a polling place; the ExpressVote Tabulator, which combines the vote capture component of the base ExpressVote with an incorporated tabulator; ExpressLink, a ballot activation code application and barcode printer combination for ExpressVote ballots; the DS200, a polling place scanner and tabulator; the DS450, a mid-range scanner

and tabulator for a central count location; and the DS850, a high-speed scanner and tabulator for a central count location.

Updates introduced in this system include:

- Multiple DS200 components were updated to address end-of-life issues. These components include the motherboard, the display, and the touch screen controller and drivers.

- Support for the Windows 7 Enterprise operating system (OS) to be used for the EMS. This support also allows the option to employ dual-factor authentication and supports the use of BitLocker, which is Microsoft's proprietary hard drive encryption utility.

- Support for multi-language audio playback of the write-in keyboards featured on the ExpressVote.

- Modifications to the DS450 and DS850 firmware to support an alternative uninterruptible power supply (UPS) and report printer.

- Slight revisions were made to the collapsible ballot box for the DS200.

A full list of the updates to the system can be found in the U.S. Election Assistance Commission's Scope of Certification document found in Appendix C.

B. EVS 6.0.5.0

EVS 6.0.5.0 is a federally tested modification to the EVS 6.0.4.0 voting system. The modification provides support for modeming of unofficial election results from a DS200 to a Secure File Transfer Protocol (SFTP) server through wireless telecommunications networks after the polls close on Election Day. The modeming components of EVS 6.0.5.0 cannot meet federal certification standards, but the underlying voting system (EVS 6.0.4.0) is federally certified.

At its May 21, 2013, meeting, pursuant to authority granted in Wis. Stat. § 5.91 and Wis. Admin. Code EL 7, the Government Accountability Board adopted testing procedures and standards pertaining to the modeming and communication functionality of voting systems that have not received EAC certification. The standards were based upon the analysis and findings outlined in a staff memorandum and detailed in the *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin*, which are attached as Appendix D. These rules apply to non-EAC certified voting systems, where the underlying voting system received EAC certification to either the 2002 Voting System Standards (VSS) or 2005 VVSG, but any additional modeming component does not meet the 2005 VVSG.

Updates introduced in this system include:

- Upgrade to modems with 4G capabilities

- Support for write-in review to be sorted by precinct or to not display contests in which no write-in votes were recorded.

- Ancillary antenna added to 4G configuration.
- The ability to automatically modem DS200 results into Electionware at the close of polls and user interface (UI) changes to support this process.

C. Recommendation

WEC staff is recommending approval of both the EVS 6.0.4.0 and EVS 6.0.5.0 for sale and use in Wisconsin. Staff is not recommending the approval of of the tabulation component of the ExpressVote ballot marking device. This component is a hybrid ballot marking device and tabulator that does not meet Wisconsin law that requires the voting machine to generate a complete, permanent paper record showing all votes cast by the elector, that is verifiable by the elector before the elector leaves the voting area. Detailed recommendations are listed on pages 25 and 26 following the analysis of functional testing performed by WEC staff.

D. Ongoing Windows 7 Support

EVS 6.0.4.0 and 6.0.5.0 include two different versions of the Windows 7 operating system for purchasing entities to choose. On August 16, 2019 WEC Staff forwarded a communication to Steve Pearson, Senior Vice President of Certification at ES&S, requesting clarification regarding the vendor's plans for supporting their clients who will potentially be purchasing this system and for those using previously certified systems which include Windows 7 during 2020 and beyond. The goal of this communication was to obtain information on which ES&S systems will still operate on Windows 7, how many jurisdictions currently operate those systems, and how the vendor will both communicate with these jurisdictions and ensure that the pertinent systems are kept secure and up to date. On August 30, 2019, a response was received that addressed all questions posed in the original communication. While a brief summary of information provided appears below, the detailed responses provided by the vendor can be found in Appendix H.

ES&S confirmed that only the client workstation laptop that houses the Election Management System utilizes the Windows 7 operating system and that none of the optical scan tabulators or accessible voting devices included in this system run on Windows 7.

At this time, 30 counties in Wisconsin operate system versions from ES&S that run on the Windows 7 platform. ES&S has reached out to each of these counties to provide additional information on Windows 7 support and how that support will continue to be provided when the platform reaches its projected end-of-life date on January 14, 2020. Microsoft will be offering Extended Security Updates (ESUs) to Windows 7 customers throughout 2023, which will address any critical vulnerabilities and provide security updates accordingly. Any critical security updates would be applied after undergoing further testing and submission to a federal test lab and Commission approval through the ECO process.

ES&S stated each county operating a system version that uses Windows 7 will be required to enter into a support contract with Microsoft and will be responsible for any fees associated with the ESU contract. Pricing details for these support contracts have not yet been publicly shared by Microsoft, but the vendor's current understanding is that 12-month contracts will be offered incrementally from 2020 through 2023 with price increases upon each annual renewal. ES&S has also stated that it will make every effort to migrate all users to systems that run on Windows 10 prior to the final discontinuation of

support for Windows 7 in January of 2023. ES&S has also indicated there will be costs associated with these upgrades, but those costs are unknown at this time.

E. Application Background

On July 17, 2019, WEC staff received an Application for Approval of EVS 6.0.4.0. ES&S submitted complete specifications for hardware, firmware, and software related to the voting system. In addition, ES&S submitted technical manuals, documentation, and instruction materials necessary for the operation of EVS 6.0.4.0. At the same time, ES&S requested WEC staff approve the EVS 6.0.5.0 voting system. ES&S submitted technical manuals, documentation, and instruction materials necessary for the operation of EVS 6.0.5.0.

A. EVS 6.0.4.0 (base voting system)

The Voting System Test Laboratory (VSTL) responsible for testing EVS 6.0.4.0, SLI Compliance, recommended on April 26, 2019 that the U.S. Election Assistance Commission (EAC) certify ES&S EVS 6.0.4.0. ES&S provided the SLI Compliance report to WEC staff along with the Application for Approval of EVS 6.0.4.0. Voting systems submitted to the EAC for testing after December 13, 2007, are tested using the 2005 Voluntary Voting System Guidelines (2005 VVSG). The EAC certified ES&S EVS 6.0.4.0 on May 3, 2019 and issued certification number **ESSEVS6040**.

WEC staff conducted the voting system testing campaign for EVS 6.0.4.0 on August 26-30, 2019 in the WEC office. The campaign consisted of functional testing using three different mock election configurations, a meeting of the Wisconsin Voting Equipment Review Panel (a body that consists of local election officials and voting and disability advocates), and a public demonstration of the system.

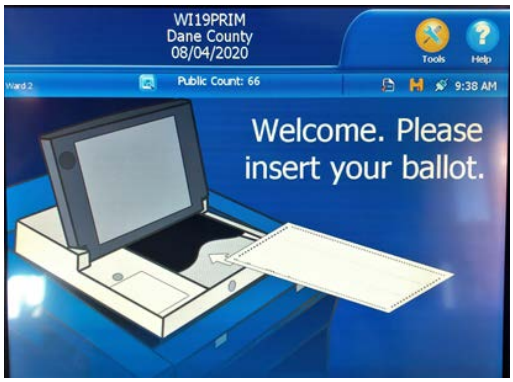
i. Hardware Components

ES&S submitted the following equipment for testing as part of EVS 6.0.4.0:

Equipment	***Hardware Version(s)***	***Firmware Version***	***Type***
DS200	1.2.1 1.2.3 1.3, 1.3.11	2.17 4.0	Polling Place Digital Scanner and Tabulator
DS450	1.0	3.1.1.0	Mid-range Digital Scanner and Tabulator
DS850	1.0	3.1.1.0	High-speed Digital Scanner and Tabulator
ExpressVote HW 1.0	1.0	1.5.2.0	Universal Voting System
ExpressVote HW 2.1	2.1.0.0 2.1.2.0	2.4.5.0	Hybrid Universal Voting System and precinct count tabulator

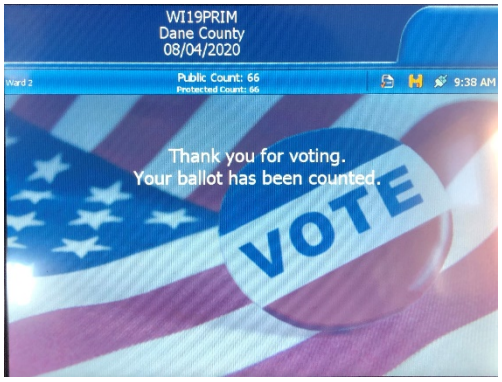
The following paragraphs describe the design of the EVS 6.0.4.0 hardware taken in part from ES&S technical documentation.

1. DS200



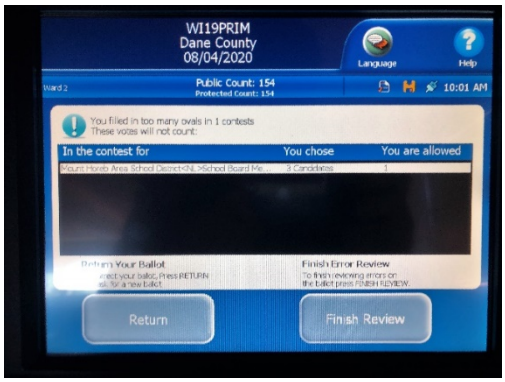
The DS200 is a digital scan paper ballot tabulator designed for use at the polling place. After the voter marks a paper ballot, their ballot is inserted into the unit for processing. The tabulator uses a high-resolution image-scanning device to simultaneously image the front and back of the ballot. The resulting ballot images are then processed by proprietary mark recognition software, which identifies and evaluates marks made by the voter. The system then tabulates any votes cast on each ballot before depositing the ballot into an integrated secured storage bin. The ballot images and election results are stored on a removable USB flash drive. This USB flash drive may be taken to the municipal clerk's office or county clerk's office where the ballot images and election results may be uploaded into an election results management program or transferred to another memory device or machine to facilitate storage. The DS200 does not store any images or data in its internal memory.

Voter Information Screens: The DS200 features a 12-inch touchscreen display to provide feedback to the voter regarding the disposition of any ballot inserted into the machine. The screens are designed to alert voters to errors on their ballot. The DS200 will, depending on the situation, provide details about the error, identify the specific contests where the errors occurred, allow the ballot to be returned to the voter, and provide the option for the voter to cast the ballot with errors on it. In two scenarios, the machine will not let the voter cast a ballot and will only return the ballot to the voter. A ballot that has unreadable marks on it will not be accepted by the machine and the DS200 will automatically return ballots if a voter attempts to insert multiple ballots into the machine at the same time.



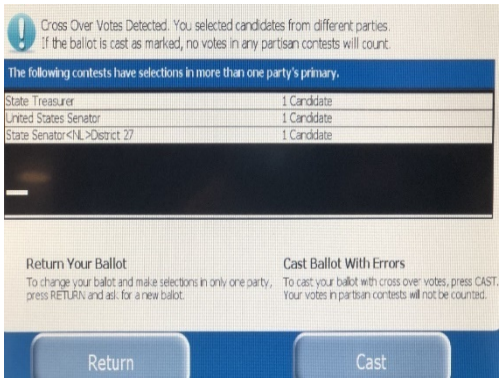
- **Ballot Counted:** If the ballot is scanned and accepted by the machine, a message appears that states the ballot has been counted.

- **Overvote Notification:** If the ballot contains an overvote, a message appears that identifies the contest or contests with overvotes. The message also tells the voter that these votes will not count. The language displayed in this notification reflects the requirements as approved by the Commission.



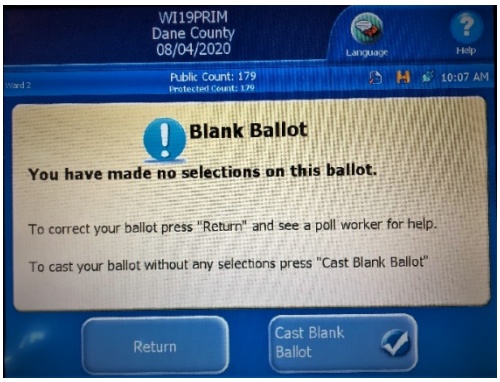
The voter has the option to return the ballot for review or cast the ballot. If there are multiple errors the voter is given an option to review the next error. Instructions above the "Return" button direct the voter to press "Return" if they wish to correct their ballot. The voter is also instructed to ask for a new ballot. Instructions above the "Cast" button direct the voter to press "Cast" if they wish to submit their ballot with votes that will not count. Instructions above the "Next" button direct the voter to press "Next" if they wish to review additional errors on their ballot. Once all the errors have been reviewed, the voter will have the option to cast the ballot.

- **Crossover Vote Notification:** If a ballot is inserted with votes in more than one party's primary, a message appears that identifies the contests with crossover votes. As in the notification for an overvote, the language displayed in this notification reflects the requirements as approved by the Commission.

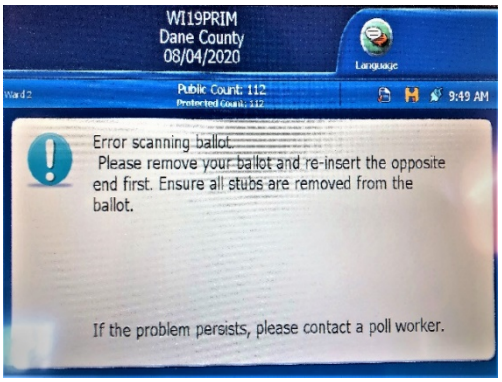


The voter has the ability to return the ballot for review or cast the ballot. If there are multiple errors the voter is given an option to review the next error. Instructions above the "Return" button direct the voter to press "Return" if they wish to correct their ballot to reflect their party preference. The voter is instructed to ask for a new ballot. Instructions above the "Next" button direct the voter to press the "Next" button if they wish to review additional errors on their ballot. Once all errors have been reviewed, the voter will have the option to cast the crossover-voted ballot.

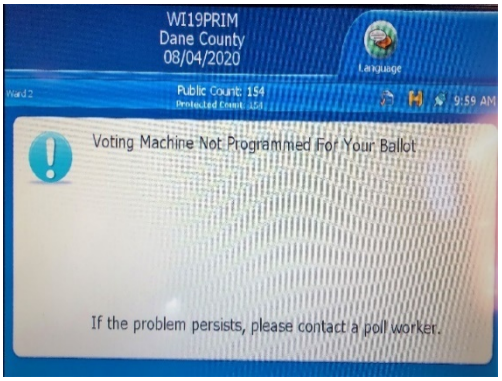
- **Blank Ballot Notification:** If the ballot contains no votes, a message appears that states the ballot is blank. The voter is instructed to press "Return" to correct their ballot and see a poll worker for help. The voter is instructed to press "Cast Blank Ballot" to submit their ballot without any selections.



- **Error Scanning Ballot:** If a ballot is inserted incorrectly, the DS200 will return the ballot to the voter and advise that the voter reinsert the ballot into the tabulator. The DS200 does not allow the voter to cast the ballot without resolving the issue and, if the issue persists, the voter is instructed to contact a poll worker for assistance.

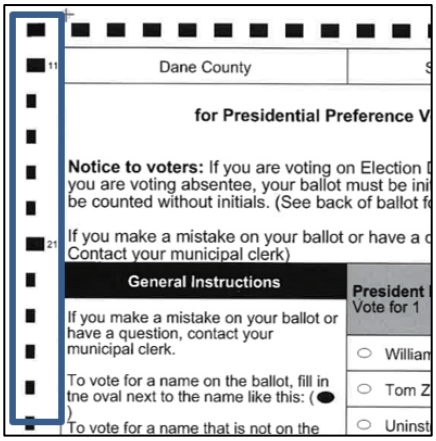


- **Voting Machine Not Programmed For Your Ballot:** This error will be displayed if a voter attempts to insert a ballot that is for a separate reporting unit or ward other than those programmed on the tabulator. This error message is especially useful in instances of polling places that have multiple or several different reporting units voting in the same location.



The screen shots above illustrate the manufacturer's default configuration. This system may also be programmed, at the request of the municipality, to automatically reject all ballots with overvotes or crossover votes without the option for override, which requires the voter to correct the error by remaking his or her ballot. This ensures that voters do not mistakenly process a ballot on which a vote for one candidate or all candidates will not count. The automatic rejection configuration of the DS200, however, creates issues for processing absentee ballots because no voter is present to correct the error. These ballots would have to be remade without the improperly voted contests before they could be processed by the DS200.

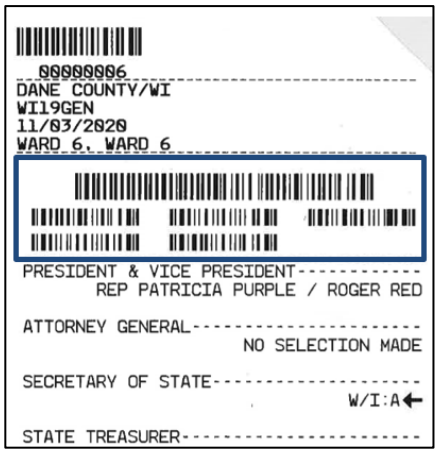
Reading Ballots: The DS200 uses proprietary software called Intelligent Mark Recognition to identify properly marked votes on a hand-marked ballot. Ballots used in conjunction with this system are designed with an oval next to the candidate name or ballot choice that a voter would fill in to indicate their choice. The machine uses coordinates determined by the timing marks laid out and printed on the border of the optical scan ballot to determine which contest and candidate each filled-in oval corresponds with. It does not read the actual candidate name printed next to the oval to determine voter intent as the voting equipment programming is responsible for determining the correlation between the filled-in oval and the candidate name.



A digital image of both sides of the ballot is captured by the machine when the ballot is inserted and the DS200 scans the ballot images to determine and record the voter's choices. ES&S recommends

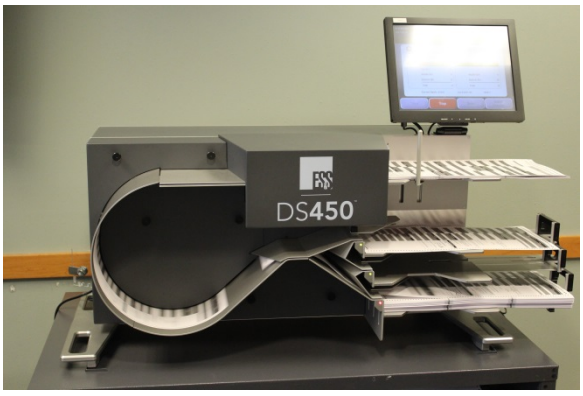
that voters use a specific marking device (BIC Grip Roller Ball pen) to mark ballots processed on the DS200. Per the supporting documentation provided by ES&S as part of its application, an improper mark is defined as being "smaller than .005 square inches as a marked response on a pixel count basis." Marks that do not have a greater pixel count than this standard will be read by the equipment as an unmarked oval.

Ballots marked using the ExpressVote are tabulated by the DS200 based on the barcodes that print on the top sections of the ballot card after the voter has made their selections. The barcode at the top of the ballot represents the ballot style for that ballot and indicates to the tabulator which contests and candidates are contained on that style. Each barcode listed in the highlighted section in the image provided to the right represents the same coordinates used by the DS200 to identify contest and candidate information found on the hand-marked optical scan ballot. The DS200 reads those barcodes and uses that information to determine voter intent.



Printing Reports: The DS200 includes an internal thermal printer for the printing of the zero reports, log reports, and polling place totals upon the official closing of the polls. An additional update in this system version provides the ability to choose between two font sizes on the report tape, depending on preference. The default font size is still available, but the DS200 may also be configured to print in a much larger font that is clearer and easier to read.

2. <u>DS450</u>



The DS450 is a mid-range digital scan ballot tabulator designed for use by election officials at a central count facility. This machine can accommodate a variety of different length ballots and can process between 60 and 90 ballots per minute, depending on the size of the ballot. The DS450 uses technology similar to the DS200 to image both sides of the ballot and identify properly marked votes. Three sorting trays are available that can be configured to set apart specific types of ballots for further review. For example, an election official can use the touchscreen interface to program the machine to sort all ballots containing write-in votes or all overvoted ballots into separate trays for hand tabulation or review. While processing ballots, the DS450 prints a continuous audit log to a dedicated audit log printer. Reports are printed from a second printer. The DS450 saves voter selections and ballot images to an internal hard disk and exports results to a USB flash drive for processing with the Election Management System.

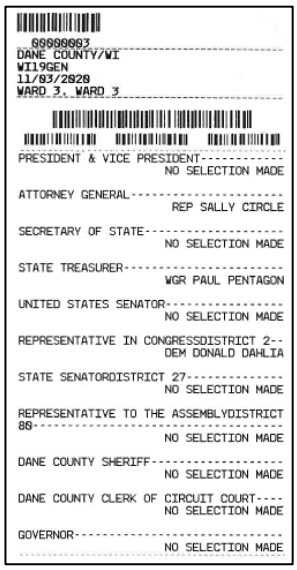
3. DS850

The DS850 is a high-speed, digital scan ballot tabulator designed for use by election officials at a central count facility. The DS850 can scan and count up to 300 ballots per minute. It uses digital cameras and imaging systems to read the front and back of each ballot, evaluate the result, and sort each ballot into trays based on the result to maintain continuous scanning and tabulating. Multiple criteria can be used to segregate ballots for review, including overvotes, crossover votes and blank ballots. Depending on the situation, ballots segregated in this fashion may not be counted and may need to be remade by the election inspectors. Election officials use a 14-inch touchscreen display to program these features of the DS850. While processing ballots, the DS850 prints a continuous audit log to a dedicated audit log printer. Reports are printed from a second connected printer. The DS850 saves voter selections and ballot images to an internal hard disk and exports results to a USB flash drive for processing with the Election Management System.

4. ExpressVote

The ExpressVote is an electronic vote capture device designed for use by all voters. It features a touchscreen display and integrated thermal printer.

Voters insert a blank ballot card in the machine to begin the voting process. Ballot instructions, contests and candidates are displayed on the screen and they have the option to use the touchscreen or the keypad to navigate the ballot and make selections. The voter may adjust the text contrast and size of the display, if needed. Each button on the tactile keypad has both Braille and printed text labels designed to indicate function and use to the voter. In addition, voters may also use headphones to access the audio ballot function that provides a recording of the ballot instructions and lists candidates and options for each contest. The volume and tempo of the audio can be adjusted by the voter and they can use the touchscreen, tactile keypad, or other assistive technology to make their selections.


99999993
DANE COUNTY/WI
WI19GEN
11/03/2020
WARD 3, WARD 3

PRESIDENT & VICE PRESIDENT----------
NO SELECTION MADE

ATTORNEY GENERAL----------
REP SALLY CIRCLE

SECRETARY OF STATE----------
NO SELECTION MADE

STATE TREASURER----------
WGR PAUL PENTAGON

UNITED STATES SENATOR----------
NO SELECTION MADE

REPRESENTATIVE IN CONGRESSDISTRICT 2--
DEM DONALD DAHLIA

STATE SENATORDISTRICT 27----------
NO SELECTION MADE

REPRESENTATIVE TO THE ASSEMBLYDISTRICT 80----------
NO SELECTION MADE

DANE COUNTY SHERIFF----------
NO SELECTION MADE

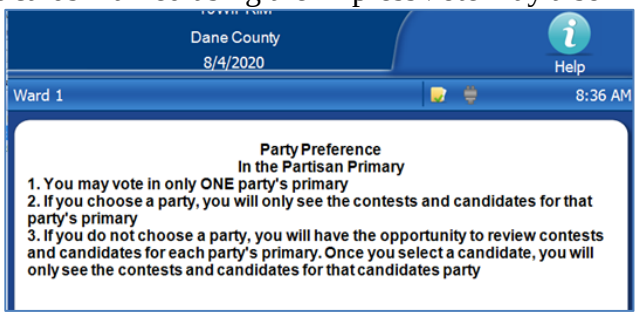
DANE COUNTY CLERK OF CIRCUIT COURT----
NO SELECTION MADE

GOVERNOR----------
NO SELECTION MADE

The ExpressVote provides a ballot summary screen for the voter to review their selections before the ballot is marked by the built-in printer. Overvotes and crossover votes cannot occur on this equipment and a voter is warned about undervotes on the ballot summary screen. Once the voter confirms their selections, those selections are printed on ballot and the machine returns the ballot to the voter. The ExpressVote ballot cards do not employ the oval format but utilize an unambiguous ballot format where the names of candidates and referendum choices are printed directly on the

ballot card along with the names of the contest. The phrase "No Selection" appears under any contest in which the elector did not vote.

After the voter completes the process, the ExpressVote clears its internal memory and the paper ballot is the only record of the voting selections made. Ballot cards marked using the ExpressVote can be processed by the DS200 or deposited into a secured ballot box to be hand tabulated by election inspectors after the polls have closed. Ballot cards marked using the ExpressVote may also be tabulated using the DS450 and DS850.



For Partisan Primary elections, the ExpressVote displays language similar to the verbiage on the DS200. This language further clarifies the unique instructions for voting in such an election and reflects previous Commission recommendations.

5. ExpressVote Tabulator (EVT)

In addition to the base functions of the ExpressVote, this system version also introduces a variant of the ExpressVote which incorporates the printing of the voter's ballot selections as a cast vote record and tabulation into the same unit. The process for marking a ballot is largely the same as it would be on the base ExpressVote system, but at the end of the process a voter would have the option to cast their voted ballot card without confirming how the machine interpreted their selections. The voter begins by inserting a blank voting card, making their selections using the touchscreen, and then reviews their selections on a ballot summary screen at which point they may make any requisite changes.

After the voter has confirmed their selections, they will be given the option to either have the ballot card returned to them to physically review their selections again or to automatically cast their ballot, at which point the ballot card will be deposited into the affixed ballot bin and tabulated accordingly. The ExpressVote tabulator can operate in the same polling place as a separate tabulator, e.g., a DS200, but it is not able to transmit results when polls close.

While an ExpressVote equipped with a tabulator does allow the voter the option of physically reviewing the ballot prior to reinserting and casting it, this function is not automatic. The voter must either choose between having the ballot returned or having it cast and tabulated without further review. If the voter has chosen to review their ballot, the ballot card will be marked and returned to them. Following the review and confirmation of the voter's choices, the voter will then reinsert the ballot card and confirm that they wish to cast the ballot, at which time it will be tabulated and deposited into the ballot bin.

6. ExpressLink

ExpressLink is an application software used to pre-print ballot cards for the ExpressVote so that ballot style information is automatically loaded when the ballot card is put into the ExpressVote. Ballot style information, in the form of a barcode for Ward 1 ballots and a different code for Ward 2 ballots, are printed at the top of the blank ExpressVote ballot card using an ExpressLink associated printer. If blank ballot cards are used in these situations, a poll worker or voter will be prompted to

select the correct ballot style upon inserting the activation card. WEC staff pre-printed activation cards for this test campaign using this application and the ExpressLink printer. WEC staff incorporated these preprinted activation cards into the in-office equipment testing by including 100 ballot cards in 10 reporting units as part of the ExpressVote ballot test deck. A more detailed explanation of the ExpressLink testing on page 16 of this report.

As in previous testing campaigns, this feature worked as designed. However, neither the ExpressLink application nor ExpressLink printer are federally certified by the EAC. SLI, a Voting System Test Laboratory, determined it to be outside of the scope of certification but SLI did review the source code for 2005 VVSG compliance. SLI tested the equipment and found that it functions as stated in the technical data package for this voting system. No other federal testing was performed on this equipment. ES&S states that these products do not require federal certification. These products are described as ancillary products available to a jurisdiction who may purchase the system. These products are not required for the ExpressVote to function and, in their absence, election inspectors will need to activate each ballot on the ExpressVote if more than one ballot style is available on the machine.

i. Software

EVS 6.0.4.0 offers an update to the ElectionWare software suite previously approved for use in Wisconsin under EVS 5.2.0.0. ElectionWare integrates election administration functions into a unified application and is used to create the programming definitions for an election and to create the files used by the DS200, DS450, DS850, ExpressVote, and EMS.

The software components used during this test campaign were as follows:

Software	***Version***
ElectionWare	5.0.4.0
ES&S Event Logging Service (ELS)	1.6.0.0
ExpressVote Previewer (HW 1.0)	1.5.2.0
ExpressVote Previewer (HW 2.1)	2.4.5.0
ExpressLink*	1.5.0.0
Removable Media Service (RMS)	1.5.1.0

WEC staff visually verified the software version numbers for each component of the EVS 6.0.4.0 by checking the component's configuration display.

In addition to the verification of software version numbers, WEC staff also had the opportunity to interact with several functionalities of the software components of EVS 6.0.4.0. The functionality of the three tabulators that capture digital ballot images increases the ability of groups requesting to conduct post-election audits of the vote. The images could be provided or made publicly available via a county or municipal website, in lieu of copies of paper ballots.

These ballot images can be exported to the Election Management System and a report listing the disposition of each vote on a ballot can be viewed. This feature can be used to verify how a tabulator treated a vote or ballot if questions arise as to how the machine counted votes for a contest or on a specific ballot, or ballots. The ballot image files serve as a reliable backup in the event that original ballot images are lost or damaged.

A. EVS 6.0.5.0 (base voting system with modeming functionality)

EVS 6.0.5.0 is a modification to EVS 6.0.4.0 that provides support for modeming of unofficial election results from a DS200 to a Secure File Transfer Protocol (SFTP) server through public wireless telecommunications networks. All modifications of the system were tested to the 2005 VVSG by SLI Compliance.

At its May 21, 2013, meeting, pursuant to authority granted in Wis. Stat. § 5.91 and Wis. Admin. Code EL 7, the Government Accountability Board adopted testing procedures and standards pertaining to the modeming and communication functionality of voting systems that have not received EAC certification. The standards were based upon the analysis and findings outlined in a staff memorandum and detailed in the *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin*, which are attached as Appendix D. These rules apply to non-EAC certified voting systems, where the underlying voting system received EAC certification to either the 2002 Voting System Standards (VSS) or 2005 VVSG, but any additional modeming component does not meet the 2005 VVSG.

WEC staff conducted testing of EVS 6.0.5.0 in three counties: Waukesha, St. Croix, and Outagamie, between September 3 and 5, 2019. In consultation with each county clerk, WEC staff selected three municipalities in each county to serve as locations for testing.[1] The municipalities were selected in part because of the strength of the wireless networks in the community, or lack thereof, and the municipal clerk's willingness to host the test team.

The modem in the DS200 communicates with the jurisdiction's wireless carrier or to transmit unofficial election night results to a secure server at a central office location, such as the county clerk's office. Wireless transmissions rely on networks maintained by Verizon Wireless. The server hosts a secure file transfer commercial off the shelf software package. A firewall provides a buffer between the network segment, where the server is located, and other internal virtual networks. The data that is transmitted is encrypted and it is digitally signed. The modem function may only be used after an election inspector has closed the polls and entered a password to access the control panel. The network is configured to only allow valid connections with the correct encryption key to connect to the SFTP server. The firewall further restricts the flow and connectivity of traffic.

The EMS is required to be deployed on a "hardened system," meaning that all software that is not essential to the proper functioning of the EMS is removed from the computer where the EMS is installed. This procedure is designed to increase the security of the system through the elimination of applications that may provide "back door" access to the system. Access to the internet is also restricted and the EMS provides an audit log of all system actions and connection attempts that can be used to

[1] Waukesha County: Village of Oconomowoc Lake, City of Pewaukee, Town of Brookfield
St. Croix County: City of New Richmond, Village of Roberts, Town of Star Prairie
Outagamie County: City of Seymour, Village of Black Creek, Town of Freedom

verify unauthorized access to the system while unofficial election results are being transmitted after the close of polls.

While previous versions of the EMS supported modeming through a number of service providers, e.g., Sprint, AT&T, and Verizon, this version of the EMS only supports the transmission of results via Verizon modems. During this test campaign, WEC staff successfully transmitted results in each county using Verizon modems in each municipality. During this test campaign, the strength of service ranged from two bars (lowest indicator level is zero) to five bars (highest indicator level). Election results packets were sent successfully at all service levels.

EVS 6.0.5.0 also features a Regional Results program. This stand-alone application allows for the transmission of unofficial election results from a regional location to a central office utilizing a wireless network provided Verizon. The Regional Results application allows election media containing results from different polling places to be read and then securely transferred to a server at a central office location such as the county clerk's office.

Neither the modem function of the DS200 nor the Regional Results program impacts the tabulation of official election results.

i. Hardware

ES&S submitted the following equipment for testing as part of EVS 6.0.5.0:

Equipment	***Hardware Version(s)***	***Firmware Version***	***Type***
DS200	1.2.0.0 1.3.0.0 1.3.1.1	2.17.5.0	Polling Place Digital Scanner and Tabulator
DS450	1.0	3.1.1.0	Mid-range Central Count Digital Scanner and Tabulator
DS850	1.0	3.1.1.0	Central Count Digital Scanner and Tabulator
ExpressVote HW 1.0	1.0	1.5.3.0	Universal Voting System
ExpressVote HW 2.1	2.1.0.0 2.1.2.0	2.4.6.0	Hybrid Universal Voting System and precinct count tabulator

ii. Software

The software components used during this test campaign were as follows:

Software	***Version***
ElectionWare	5.0.5.0
ES&S Event Logging Service (ELS)	1.6.0.0

ExpressVote Previewer (HW 1.0)	1.5.3.0
ExpressVote Previewer (HW 2.1)	2.4.6.0
ExpressLink	1.5.0.0
Removable Media Service (RMS)	1.5.1.0
Regional Results	1.3.0.0

A. Functional Testing

A. EVS 6.0.4.0 (base voting system)

As required by Wis. Admin. Code EL § 7.02(1), WEC staff conducted three mock elections with each component of EVS 6.0.4.0 to ensure the voting system conforms to all Wisconsin requirements. These mock elections included: A partisan primary with a special nonpartisan school board election, a general election with both a presidential and special gubernatorial contest, and a presidential preference vote combined with a partisan Assembly Representative special election.

WEC staff designed a test deck of nearly 1,500 ballots using various configurations of votes over the three mock elections to verify the accuracy and functional capabilities of EVS 6.0.4.0. Using blank test ballots supplied by ES&S, WEC staff appropriately marked votes for contests and candidates as designated on a test deck spreadsheet. For each mock election, 300 paper ballots were marked to be fed through the DS200, DS450 and DS850. An additional 80 paper ballots were marked to test the write-in report function of the DS200. The functionality of the ExpressVote was tested by marking 550 ballots with the equipment across the three mock elections. This total includes 100 ballots for each mock election, plus 100 ExpressVote ballots that were marked as part of ExpressLink testing. Staff also marked a further 150 ballots on the ExpressVote to test the ExpressVote tabulation unit as it would be used on Election Day.

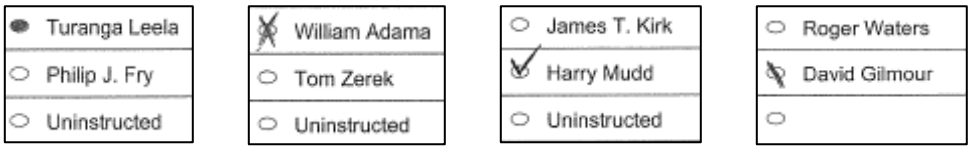
The paper ballots marked, as well as the votes captured by the ExpressVote, were verified by WEC staff before being scanned and counted by the DS200, DS450, and DS850 and ExpressVote tabulator. WEC staff ensured that the results produced by the three pieces of equipment were accurate and reconciled with the test deck script prior to transitioning to test the next mock election type. A small number of results anomalies, explained below, were investigated and resolved in real time.

Votes were recorded on test ballots in a variety of configurations in all contests to ensure that the programming of the tabulation equipment was compatible with Wisconsin election law, and that the equipment processed ballot markings in accordance with statutory requirements. Ballots were purposefully marked with overvoted contests and the equipment was able to consistently identify those scenarios and inform the voter about the specific contest, or contests, that were problematic. Ballots for both the Partisan Primary and Presidential Preference mock elections were also marked with votes that crossed party lines and, in each instance, the machines were able to identify those crossover votes and display the warning screen to the voter. Two different ballot styles were used for each mock election and one ballot style in each election had a special election contest included on the ballot. This inclusion was used to determine if the equipment could be programmed to accommodate multiple election definitions on the same ballot style and produce accurate results. In all instances, the equipment was

found to have accurately tabulated votes and correctly reflected Wisconsin election law in the programming.

The test decks used for this campaign were also designed to determine what constitutes a readable mark by each piece of tabulation equipment included in this system. A subset of ballots in the test deck were marked using "special marks." The ballots with special marks were processed by the tabulation equipment. WEC staff reviewed the results to determine which of the special marks were read by the tabulation machines. The chart below illustrates actual marks from test deck ballots that were successfully read and counted as "good marks" by the DS200, DS450 and DS850.

Examples of Marks Read by the EVS 6.0.4.0 Components during Testing



All three pieces of equipment were able to correctly read marks in pencil, black pen, blue pen, red pen, and green pen as well as using ballot markers provided by ES&S. The test decks also included ballots folded to simulate absentee ballots and ballots with slight tears in them. Folded ballots were able to be processed on the DS200, DS450 and DS850. It is possible, however, for ballots with folds directly through the oval to create what is best described as a false positive. While all three pieces of equipment processed slightly torn ballots without incident, anything other than a slight tear was only able to be processed by the DS200. Ballots with large tears resulted in jams in both the DS450 and the DS850.

Blank ballots were also included to determine how each of the three different tabulators would treat these ballots. The DS200 was able to identify blank ballots and provide a warning message to the voter that indicated the ballot was blank and provide options to return the ballot or cast it as is. This functionality was also tested on the DS450 or DS850, with the blank ballots diverted to a separate tray for election inspector review.

Ballots with write-in votes tabulated by the DS200 are marked by the tabulator with a small pink circle on one end of the ballot. Depending on the ballot box used, these ballots may or may not be diverted into a separate write-in bin. This voting system can also be configured to capture ballot images of ballots with write-ins and store them on the external USB flash drive, which would permit write-in votes to be easily verified within the ElectionWare EMS. For a more detailed review of the testing staff conducted to review the DS200's write-in report functionality, please see Appendix F.

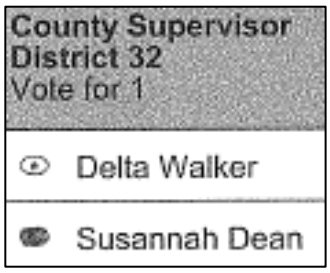
Staff also conducted testing on the ExpressLink application and ballot style printer. The ExpressLink printer places a barcode on an ExpressVote ballot that, when inserted, automatically loads a voter's correct ballot style. To ensure that the ExpressLink printer functions appropriately, staff placed ballot style activation codes on 100 ExpressVote ballot cards, representing 10 ballot styles. These 100 ballot cards were then placed in the ExpressVote and marked according to a pre-set test script. Each of the 100 ExpressVote ballot cards that had been pre-printed with the ExpressLink ballot style activation codes loaded the corresponding ballot style correctly. Further detail on the testing protocol employed to test the ExpressLink functionality can be found in Appendix E.

The final piece of equipment tested as part of EVS 6.0.4.0 was the ExpressVote tabulator (EVT). As discussed above, the EVT functions quite similarly to the standard ExpressVote ballot marking device. Voters insert a blank ballot card and make their selections on a touch screen display. Following their selections, and an on-screen ballot review section, voters are given the opportunity to review their physical ballot or to directly cast the ballot, through the tabulation unit into the attached ballot bin.

The addition of the tabulation component required separate testing to be conducted on the EVT. During initial rounds of testing, staff subjected the EVT to the same test requirements as the three other tabulation devices released as part of EVS 6.0.4.0. For each mock election 100 ExpressVote ballot cards were cast on the EVT. All ballot cards used as part of the ExpressLink test were also cast on the EVT, a further 100. To replicate an Election Day scenario, staff marked an additional 150 ballots directly on the EVT, with the ballot cards cast directly into the attached ballot bin. The results were then reconciled against the pre-set test matrix for each election type. In each mock election, the EVT accurately tabulated all votes cast.

Despite the EVT's accurate tabulation, staff considers the direct cast option problematic and in conflict with Wis. Stat. § 5.91(15) and (18). There is no way to set the EVT to automatically return a voter's ballot card for physical review. A voter has to choose that their card be returned for review. Staff does not believe that this meets Wisconsin statutory requirements regarding voters having the opportunity to physically verify their choices before leaving the voting area.

The majority of ballots in the test deck were processed without incident during the test campaign, but there were minimal anomalies identified. There was a single instance in which a ballot with an erasure mark that was not captured by the DS850 or DS200 triggered an overvote on the DS450. An investigation of the cast vote record showed that the oval containing the erasure appeared much darker when scanned by the DS450 tabulator than to the naked eye. Other test ballots that contained lighter erasure marks were treated uniformly by all three tabulators.



In addition, ballots that were purposefully marked with slight resting marks were not treated consistently across all three machines. As shown in the example to the right, on ballots where there were heavy, or especially dark resting marks, the DS850, in several instances, did not read the resting mark in the oval as an overvote and counted the ballot correctly. However, the DS450 and DS200 both read the mark as unclear, or an overvote, and would not accept the ballot as marked. Additional test ballots that were marked with lighter resting marks within an oval, or with resting marks touching the edge or outside of the oval were all treated the same by the three machines and these marks did not negatively impact the counting of votes on those ballots.

Anomalies such as these are common during a testing campaign and are identified by the purposeful inclusion of ambiguous marks on test deck ballots. In both instances, voter behavior in marking the ballot (erasure smudge and resting mark within an oval) played a significant role in the disposition of those ballots by the voting equipment. No anomalies that presented during testing affected the outcome in any way. All elections reconciled, as required. Testing results and staff observation of the system indicate that EVS 6.0.4.0 consistently identifies and tabulates correctly marked votes in a uniform fashion. The system is also flexible enough to correctly interpret special marks made within an oval while not considering resting or stray marks made outside of an oval.

B. EVS 6.0.5.0 (base voting system with modeming functionality)

WEC staff conducted functional testing of EVS 6.0.5.0 in Waukesha, St. Croix, and Outagamie counties based on the *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin.* A four-person team of WEC staff conducted this testing campaign between September 3 to 5, 2019. Two representatives from ES&S were on hand in each county to provide technical support. ES&S provided three (3) DS200s in each county, each equipped with a Verizon wireless modem. Also provided by ES&S as part of testing was a portable EMS environment, which included an SFTP client, firewall, and Electionware software. In each location, ES&S set up the portable environment in the county office to receive test election results from each municipal testing location. In each municipal location, WEC staff inserted a pre-marked package of 10 test ballots through the DS200 to create an election results packet to transmit to the county office. A WEC staff member was present at the county office to observe how the portable EMS environment handled the transmissions.

In previous test campaigns, staff tested both wireless and analog (wired) modems. Testing for EVS 6.0.5.0, however, was performed only with wireless modems, as there was no analog component submitted for certification. An additional change to EVS 6.0.5.0 is the method of wireless transmission, referred to as a "Zero Tunnel" by ES&S. As part of EVS 6.0.5.0, the unofficial results data continues to be encrypted and digitally signed but is transmitted via a further encrypted virtual private network (VPN) hosted by Verizon Wireless. Without the correct encryption key, the incoming data is prevented from reaching the EMS workstation.

i. Waukesha County

On September 3, 2019, WEC staff conducted tests on the EVS 6.0.5.0 modem component in three municipalities: City of Pewaukee, Village of Oconomowoc Lake, and Town of Brookfield. ES&S conducted pre-testing of the EVS 6.0.5.0 wireless modem component in Waukesha County prior to WEC testing. A DS200 equipped with Verizon wireless modem was tested in all three municipalities. A test script was used to ensure that each machine conforms to the communications device standards and was able to transmit accurate election results data from the DS200 to the Election Management System.

Municipality	**Type of Modem**	**Signal Strength**
City of Pewaukee	Wireless	5 bars
Village of Oconomowoc Lake	Wireless	3-4 bars
Town of Brookfield	Wireless	3 bars

WEC staff successfully transmitted election results from each of the three municipalities. The test script calls for the verification of several certification standards and then requires 10 results sets to be transmitted from each DS200. The machines were able to successfully transmit multiple results with a 100% success rate during this portion of testing. The functional testing concluded with a load test during which WEC staff attempted to transmit results simultaneously from all the machines for a set period of time. Each machine was able to transmit multiple results sets with 100% success during the 15-minute load test in Waukesha County.

Location	Modem Type	Initial Transmission	Load Test Results
City of Pewaukee	Wireless	10 of 10	14 of 14
Village of Oconomowoc Lake	Wireless	10 of 10	17 of 17
Town of Brookfield	Wireless	10 of 10	15 of 15
Totals		**30 of 30**	**46 of 46**

ii. St. Croix County

On September 4, 2019, WEC staff conducted tests on the EVS 6.0.5.0 modem component in three municipalities: City of New Richmond, Village of Roberts, and Town of Star Prairie. ES&S conducted pre-testing of the EVS 6.0.5.0 modem component in St. Croix County prior to WEC testing. A DS200 equipped with a Verizon wireless modem was tested in all three municipalities. The same test script that was used in Waukesha County was again used during this portion of the test campaign.

Municipality	Type of Modem	Signal Strength
City of New Richmond	Wireless	2-3 bars
Village of Roberts	Wireless	3 bars
Town of Star Prairie	Wireless	4 bars

WEC staff successfully transmitted election results from each of the three municipalities. The test script calls for the verification of several certification standards and then requires 10 results sets to be transmitted from the DS200. The three machines each were able to successfully transmit results with an 87% success rate during this portion of testing. The functional testing concluded with a load test where WEC staff attempted to transmit results simultaneously from all the machines for a set period of time and each machine was able to transmit at least 16 results set during the stress test with zero overall transmission failures.

Location	Modem Type	Initial Transmission	Load Test Results
City of New Richmond	Wireless	10 of 10	16 of 16
Village of Roberts	Wireless	6 of 10	16 of 16
Town of Star Prairie	Wireless	10 of 10	18 of 18
Totals		**26 of 30**	**50 of 50**

iii. Outagamie County

On April 18, 2019, WEC staff conducted tests on the EVS 6.0.5.0 modem component in three municipalities: City of Seymour, Village of Black Creek, and Town of Freedom. ES&S conducted pre-testing of the EVS 6.0.5.0 modem component in Outagamie County prior to WEC testing. A DS200 equipped with a Verizon wireless modem was tested in all three municipalities. The same test script that was used in Waukesha and St. Croix Counties was again used during this portion of the test campaign.

Municipality	Type of Modem	Signal Strength
City of Seymour	Wireless	3-4 bars
Village of Black Creek	Wireless	0-2 bars
Town of Freedom	Wireless	4 bars

WEC staff successfully transmitted election results from each of the three municipalities using wireless modems. The test script calls for the verification of several certification standards and then requires 10 results sets to be transmitted from the DS200. The three machines each were able to transmit results sets during this portion of testing with a 97% rate of success. The functional testing concluded with a load test during which WEC staff attempted to transmit results simultaneously from all of the machines for a set period of time and each machine was able to transmit at least 15 results set during the stress test with zero overall transmission failures.

Location	Modem Type	Initial Transmission	Load Test Results
City of Seymour	Wireless	10 of 10	19 of 19
Village of Black Creek	Wireless	9 of 10	16 of 16
Town of Freedom	Wireless	10 of 10	15 of 15
Totals		**29 of 30**	**50 of 50**

B. Public Demonstration

A public demonstration of EVS 6.0.4.0 was held August 29, 2019, from 4:00 p.m. to 5:30 p.m. in Madison at the WEC office. The public meeting is designed to allow members of the public the opportunity to use the voting system and provide comment. There were two attendees at the public demonstration.

Feedback routed to WEC via the League of Women Voters from one attendee addressed that attendee's concern after having difficulty determining how to print their ballot for review when the font size was increased on the ExpressVote Tabulator. This attendee is visually impaired and wished to mark their ballot sans headphones. During the demonstration, staff was also able to assist the attendee with questions related to printing their ballot for review. However, the attendee remained curious as to why a voter would be required to choose to physically review their ballot.

C. Wisconsin Elections Commission Voting Equipment Review Panel Meeting

In an effort to continue to receive valuable feedback from local election officials and community advocates during the voting equipment approval process, the Wisconsin Elections Commission formed a Voting Equipment Review Panel. Wis. Admin. Code EL §7.02(2), permits the agency to use a panel of local election officials and electors to assist in the review of voting systems.

Nine of the 25 invited participants attended the Voting Equipment Review Panel Meeting, which is composed of municipal and county clerks, representatives of the disability community, and advocates for the interests of the voting public. The meeting took place at the WEC office in Madison on August 29, 2019, from 2:00 p.m. to 3:30 p.m. ES&S provided a demonstration of EVS 6.0.4.0 with attendees encouraged to test the equipment. The modeming component of EVS 6.0.5.0 was discussed but not

demonstrated during the meeting. Comments and feedback from the Voting Equipment Review Panel meeting are included in Appendix G.

D. Statutory Compliance

Wis. Stat. §5.91 provides the following requirements voting systems must meet to be approved for use in Wisconsin. Please see the text below of each requirement and staff's analysis of the EVS 6.0.4.0 and EVS 6.0.5.0's compliance with the standards.

§ 5.91 (1)
The voting system enables an elector to vote in secret.
Staff Analysis
The ES&S voting systems meet this requirement by allowing a voter to vote a paper ballot in the privacy of a voting booth or at the accessible voting station without assistance.

§ 5.91 (3)
The voting system enables the elector, for all elections, except primary elections, to vote for a ticket selected in part from the nominees of one party, and in part from nominees from other parties and write-in candidates
Staff Analysis
The ES&S voting systems allow voter to split their ballot among as many parties as they wish during any election that is not a partisan primary.

§ 5.91 (4)
The voting system enables an elector to vote for a ticket of his or her own selection for any person for any office for whom he or she may desire to vote whenever write-in votes are permitted.
Staff Analysis
The ES&S voting systems allow write-ins where permitted.

§ 5.91 (5)
The voting systems accommodate all referenda to be submitted to electors in the form provided by law.
Staff Analysis
The ES&S voting systems meet this requirement. Referenda included as part of testing were accurately tabulated by all EVS 6.0.4.0 components.

§ 5.91 (6)
The voting system permits an elector in a primary election to vote for the candidates of the recognized political party of his or her choice, and the system rejects any ballot on which votes are cast in the primary of more than one recognized political party, except where a party designation is made or where

an elector casts write-in votes for candidates of more than one party on a ballot that is distributed to the elector.
Staff Analysis
The ES&S voting systems can be configured to always reject crossover votes without providing an opportunity for the voter to override. The system can also be programmed to provide a warning screen to the voter that identifies any crossover voted contest. Either one of these programming options allows these systems to meet this requirement. The warning screen provides options where the voter can choose to have their ballot returned to them or they can cast the ballot without correcting the crossover vote. The use of the override function was previously prohibited by statute, but Wis. Stats. §5.85(2)(b) expressly allows for the optional use of the override function in event of an overvote and the WEC has applied the same standard to the use of the override function in the event of crossover vote.

§ 5.91 (7)
The voting system enables the elector to vote at an election for all persons and offices for whom and for which the elector is lawfully entitled to vote; to vote for as many persons for an office as the elector is entitled to vote for; to vote for or against any question upon which the elector is entitled to vote; and it rejects all choices recorded on a ballot for an office or a measure if the number of choices exceeds the number which an elector is entitled to vote for on such office or on such measure, except where an elector casts excess write-in votes upon a ballot that is distributed to the elector.
Staff Analysis
The ES&S voting systems can be configured to always reject overvotes without providing an opportunity for the voter to override. The system can also be programmed to provide a warning screen to the voter that identifies any overvoted contest. Either one of these programming options allows these systems to meet this requirement. The warning screen provides options where the voter can choose to have their ballot returned to them or they can cast the ballot without correcting the overvote. The use of the override function was previously prohibited by statute, but Wis. Stats. §5.85(2)(b) expressly allows for the optional use of the override function in event of an overvote.

§ 5.91 (8)
The voting system permits an elector at a General Election by one action to vote for the candidates of a party for President and Vice President or for Governor and Lieutenant Governor.
Staff Analysis
The ES&S voting systems meet this requirement. Traditional paper ballots utilized by the DS200, as well as the ExpressVote candidate screens, present the two candidates in these contests as a single choice.

§ 5.91 (9)
The voting system prevents an elector from voting for the same person more than once, except for excess write-in votes upon a ballot that is distributed to the elector.
Staff Analysis
The ES&S voting systems meet this requirement.

§ 5.91 (10)
The voting system is suitably designed for the purpose used, of durable construction, and is usable safely, securely, efficiently and accurately in the conduct of elections and counting of ballots.
Staff Analysis
The ES&S voting systems meet this requirement.

§ 5.91 (11)
The voting system records and counts accurately every vote and maintains a cumulative tally of the total votes cast that is retrievable in the event of a power outage, evacuation or malfunction so that the records of votes cast prior to the time that the problem occurs is preserved.
Staff Analysis
The ES&S voting systems meet this requirement.

§ 5.91 (12)
The voting system minimizes the possibility of disenfranchisement of electors as the result of failure to understand the method of operation or utilization or malfunction of the ballot, voting system, or other related equipment or materials.
Staff Analysis
The ES&S voting systems can be programmed to provide warning screens to the voter that identifies any problem with their ballot. The warning screens provide an explanation of the problem and allow the voter to have their ballot returned to them to review and correct the error. The systems can be configured to always reject overvotes and crossover votes without providing an opportunity for the voter to override.

§ 5.91 (13)
The automatic tabulating equipment authorized for use in connection with the system includes a mechanism which makes the operator aware of whether the equipment is malfunctioning in such a way that an inaccurate tabulation of the votes could be obtained.
Staff Analysis
The ES&S voting systems meet this requirement.

§ 5.91 (14)
The voting system does not use any mechanism by which a ballot is punched or punctured to record the votes cast by an elector.
Staff Analysis
The ES&S voting systems do not use any such mechanism to record votes.

§ 5.91 (15)
The voting system permits an elector to privately verify the votes selected by the elector before casting his or her ballot.
Staff Analysis
The ES&S voting systems meet this requirement through the use of hand-marked paper ballots and accessible voting equipment that provides both an electronic ballot review screen and a marked paper ballot that can be reviewed before tabulation. However, due to its direct cast feature and the lack of automatic ballot return for voter review on the ExpressVote Tabulator, that specific piece of equipment does not meet this requirement.

§ 5.91 (16)
The voting system provides an elector the opportunity to change his or her votes and to correct any error or to obtain a replacement for a spoiled ballot prior to casting his or her ballot.
Staff Analysis
The ES&S voting systems meet this requirement. Traditional paper ballots can be changed and/or spoiled at any point up to being placed in the tabulator. ExpressVote ballots are printed for the voter to review prior to casting in a tabulator and can be spoiled at will by the voter.

§ 5.91 (17)
Unless the ballot is counted at a central counting location, the voting system includes a mechanism for notifying an elector who attempts to cast an excess number of votes for a single office the ballot will not be counted, and provides the elector with an opportunity to correct his or her ballot or to receive a replacement ballot.
Staff Analysis
The ES&S voting systems can be programmed to provide warning screens to the voter that identifies any problem with their ballot. The warning screens provide an explanation of the problem and allow the voter to have their ballot returned to them to review and correct the error. The systems can be configured to always reject overvotes and crossover votes without providing an opportunity for the voter to override.

§ 5.91 (18)
If the voting system consists of an electronic voting machine, the voting system generates a complete, permanent paper record showing all votes cast by the elector, that is verifiable by the elector, by either visual or nonvisual means as appropriate, before the elector leaves the voting area, and that enables a manual count or recount of each vote cast by the elector.
Staff Analysis
Since the ES&S voting systems presented for approval require paper ballots to be used to cast votes, this requirement is satisfied. However, due to its direct cast feature and the lack of automatic ballot return for voter review on the ExpressVote Tabulator, that specific piece of equipment does not meet this requirement.

The Help America Vote Act of 2002 (HAVA) also provides the following applicable requirements that voting systems must meet:

HAVA § 301(a)(1)(A)
The voting system shall: (i) permit the voter to verify (in a private an independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted; (ii) provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error); and (iii) if the voter selects votes for more than one candidate for a single office – (I) notify the voter than the voter has selected more than one candidate for a single office on the ballot; (II) notify the voter before the ballot is cast and counted of the effect of casting multiple votes for the office; and, (III) provide the voter with the opportunity to correct the ballot before the ballot is cast and counted
HAVA § 301(a)(1)(C)
The voting system shall ensure than any notification required under this paragraph preserves the privacy of the voter and the confidentiality of the ballot.
HAVA § 301(a)(3)(A)
The voting system shall— (A) be accessible for individuals with disabilities, including nonvisual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as other voters

Staff Analysis
The ES&S voting system components, with the exception of the ExpressVote Tabulator, meet these requirements through the inclusion of options for ADA-compliant voting machines municipalities can choose to employ.

E. Recommendations

Staff has reviewed the application materials, including the technical data package and testing lab report, and examined the results from the functional and modeming test campaigns to determine if these systems are compliant with both state and federal certification laws. EVS 6.0.4.0, with the exception of the ExpressVote tabulator, complies with all applicable state and federal requirements. As EVS 6.0.4.0 is the base voting system for EVS 6.0.5.0, EVS 6.0.5.0 also meets this standard. The remaining voting system components met all standards over three mock elections and staff determined they can successfully run a transparent, fair, and secure election in compliance with Wisconsin Statutes. The systems also enhance access to the electoral process for individuals with disabilities with the inclusion of the ExpressVote vote capture system.

1. WEC staff recommends approval of ES&S voting system EVS 6.0.4.0 and components set forth in the tables on pages 4 and 11 above, with the exception of the ExpressVote tabulator, as described below in item 3. This voting system accurately completed the three mock elections and was able to accommodate the voting requirements of the Wisconsin election process.

2. WEC staff recommends approval of ES&S voting system EVS 6.0.5.0, with the exception of the ExpressVote tabulator, and components set forth in the tables on pages 13 and 14 above. The analog modem functionality of this system was not submitted for testing by ES&S and that functionality is not recommended for approval as part of this system version. This recommendation is based on the VSTL report provided by SLI Compliance and on this voting system successfully completing a functional test according to the *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin*.

3. WEC staff recommends approval of the ExpressLink application software and ballot style printer as part of the WEC's approval. While this product lacks EAC certification, the component performed successfully when evaluated under a Commission approved test protocol.

4. WEC staff does not recommend approval of the ExpressVote Tabulator. With its direct cast feature, and no way to be programmed for automatic ballot return for voter review, staff believes that this specific piece of equipment does not meet the requirements laid out in Wis. Stat. §5.91(15),(18). These statutes state that equipment must permit an elector to privately verify the votes selected by the elector before casting his or her ballot, and that it must generate a complete, permanent paper record showing all votes cast by each elector, that is verifiable by the elector, by visual or non-visual means, before the elector leaves the voting area.

5. WEC staff recommends that as a continuing condition of the WEC's approval, ES&S may not impose customer deadlines contrary to requirements provided in Wisconsin Statutes, as determined by the WEC. In order to enforce this provision, local jurisdictions purchasing ES&S equipment

shall also include such a provision in their respective purchase contract or amend their contract if such a provision does not currently exist.

6. WEC staff recommends that as a continuing condition of the WEC's approval, that voting systems purchased and installed as part of EVS 6.0.4.0 or EVS 6.0.5.0 be configured in the same manner in which they were tested, subject to verification by the Commission or its designee. Once installed, the configuration must remain the same and may not be altered by ES&S nor by state, county, or municipal officials except as approved by the Commission.

7. WEC staff recommends that as a continuing condition of the WEC's approval, that this system must always be configured to include the following options:

   a. Automatic rejection of crossover and overvoted ballots with or without the option to override.
   b. Automatic rejection of all improper ballots except blank ballots.
   c. Digital ballot images to be captured for all ballots tabulated by the system.

8. As part of US EAC certificate: ESSEVS6040, only equipment included in this certificate can be used together to conduct an election in Wisconsin. Previous versions that were approved for use by the former Elections Board and the G.A.B. are not compatible with the new ES&S voting system and are not to be used together with the equipment seeking approval by the WEC, as this would void the US EAC certificate. If a jurisdiction upgrades to EVS 6.0.4.0, it needs to upgrade each and every component of the voting system to the requirements of what is approved herein. Likewise, if a jurisdiction upgrades to EVS 6.0.5.0, it needs to upgrade each and every component of the voting system to the requirements of what is approved herein.

9. WEC staff recommends that as a condition of approval, ES&S shall abide by applicable Wisconsin public records laws. If, pursuant to a proper public records request, the customer receives a request for matters that might be proprietary or confidential, customer will notify ES&S, providing the same with the opportunity to either provide customer with the record that is requested for release to the requestor, or shall advise customer that ES&S objects to the release of the information, and provide the legal and factual basis of the objection. If for any reason, the customer concludes that customer is obligated to provide such records, ES&S shall provide such records immediately upon customer's request. ES&S shall negotiate and specify retention and public records production costs in writing with customers prior to charging said fees. In absence of meeting such conditions of approval, ES&S shall not charge customer for work performed pursuant to a proper public records request, except for the "actual, necessary, and direct" charge of responding to the records request, as that is defined and interpreted in Wisconsin law, plus shipping, handling, and chain of custody.

10. The Wisconsin application for approval contains a condition that requires the vendor to reimburse the WEC for all costs associated with the testing campaign and certification process. ES&S agreed to this requirement on the applications submitted to WEC on July 17, 2019 requesting the approval of EVS 6.0.4.0 and 6.0.5.0.

F. Proposed Motion

MOTION: The Wisconsin Elections Commission adopts the staff's recommendations for approval, with the exception of the ExpressVote Tabulator, of the ES&S voting system's Application for

Approval of EVS 6.0.4.0 in compliance with US EAC certificate ESSEVS6040 including the conditions described above, and the ES&S voting system's Application for Approval of EVS 6.0.5.0 including the conditions described above.

Appendices

- Appendix A: Wisconsin Statutes § 5.91
- Appendix B: Wisconsin Administrative Code Ch. EL 7
- Appendix C: US-EAC Certificate of Conformance / Scope of Certification
- Appendix D: *Voting Systems Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices in Wisconsin*
- Appendix E: ExpressLink Testing Protocol
- Appendix F: DS200 Write-In Report Pilot Test Protocol
- Appendix G: Wisconsin Voting Equipment Review Panel Feedback
- Appendix H: ES&S Ongoing Support for Windows 7

Appendix A: Wis. Stat. § 5.91

5.91 Requisites for approval of ballots, devices and equipment. No ballot, voting device, automatic tabulating equipment, or related equipment and materials to be used in an electronic voting system may be utilized in this state unless it is certified by the commission. The commission may revoke its certification of any ballot, device, equipment, or materials at any time for cause. The commission may certify any such voting device, automatic tabulating equipment, or related equipment or materials regardless of whether any such item is approved by the federal election assistance commission, but the commission may not certify any ballot, device, equipment, or material to be used in an electronic voting system unless it fulfills the following requirements:

(1) It enables an elector to vote in secrecy and to select the party for which an elector will vote in secrecy at a partisan primary election.

(3) Except in primary elections, it enables an elector to vote for a ticket selected in part from the nominees of one party, and in part from the nominees of other parties, and in part from independent candidates and in part of candidates whose names are written in by the elector.

(4) It enables an elector to vote for a ticket of his or her own selection for any person for any office for whom he or she may desire to vote whenever write-in votes are permitted.

(5) It accommodates all referenda to be submitted to the electors in the form provided by law.

(6) The voting device or machine permits an elector in a primary election to vote for the candidates of the recognized political party of his or her choice, and the automatic tabulating equipment or machine rejects any ballot on which votes are cast in the primary of more than one recognized political party, except where a party designation is made or where an elector casts write-in votes for candidates of more than one party on a ballot that is distributed to the elector.

(7) It permits an elector to vote at an election for all persons and offices for whom and for which the elector is lawfully entitled to vote; to vote for as many persons for an office as the elector is entitled to vote for; to vote for or against any question upon which the elector is entitled to vote; and it rejects all choices recorded on a ballot for an office or a measure if the number of choices exceeds the number which an elector is entitled to vote for on such office or on such measure, except where an elector casts excess write-in votes upon a ballot that is distributed to the elector.

(8) It permits an elector, at a presidential or gubernatorial election, by one action to vote for the candidates of a party for president and vice president or for governor and lieutenant governor, respectively.

(9) It prevents an elector from voting for the same person more than once for the same office, except where an elector casts excess write-in votes upon a ballot that is distributed to the elector.

(10) It is suitably designed for the purpose used, of durable construction, and is usable safely, securely, efficiently and accurately in the conduct of elections and counting of ballots.

(11) It records correctly and counts accurately every vote properly cast and maintains a cumulative tally of the total votes cast that is retrievable in the event of a power outage, evacuation or malfunction so that the records of votes cast prior to the time that the problem occurs is preserved.

(12) It minimizes the possibility of disenfranchisement of electors as the result of failure to understand the method of operation or utilization or malfunction of the ballot, voting device, automatic tabulating equipment or related equipment or materials.

(13) The automatic tabulating equipment authorized for use in connection with the system includes a mechanism which makes the operator aware of whether the equipment is malfunctioning in such a way that an inaccurate tabulation of the votes could be obtained.

(14) It does not employ any mechanism by which a ballot is punched or punctured to record the votes cast by an elector.

(15) It permits an elector to privately verify the votes selected by the elector before casting his or her ballot.

(16) It provides an elector with the opportunity to change his or her votes and to correct any error or to obtain a replacement for a spoiled ballot prior to casting his or her ballot.

(17) Unless the ballot is counted at a central counting location, it includes a mechanism for notifying an elector who attempts to cast an excess number of votes for a single office that his or her votes for that office will not be counted, and provides the elector with an opportunity to correct his or her ballot or to receive and cast a replacement ballot.

(18) If the device consists of an electronic voting machine, it generates a complete, permanent paper record showing all votes cast by each elector, that is verifiable by the elector, by either visual or nonvisual means as appropriate, before the elector leaves the voting area, and that enables a manual count or recount of each vote cast by the elector.

History: 1979 c. 311; 1983 a. 484; 1985 a. 304; 2001 a. 16; 2003 a. 265; 2005 a. 92; 2011 a. 23, 32; 2015 a. 118 s. 266 (10); 2015 a. 261; 2017 a. 365 s. 111.

Cross-reference: See also ch. EL 7, Wis. adm. code.

Appendix B: Wis. Admin. Code Ch. EL 7

Chapter EL 7

APPROVAL OF ELECTRONIC VOTING EQUIPMENT

Note: Chapter ElBd 7 was renumbered chapter GAB 7 under s. 13.92 (4) (b) 1., Stats., and corrections made under s. 13.92 (4) (b) 7., Stats., Register April 2008 No. 628. **Chapter GAB 7 was renumbered Chapter EL 7 under s. 13.92 (4) (b) 1., Stats., Register June 2016 No. 726.**

EL 7.01 Application for approval of electronic voting system.

(1) An application for approval of an electronic voting system shall be accompanied by all of the following:

(a) A signed agreement that the vendor shall pay all costs, related to approval of the system, incurred by the elections commission, its designees and the vendor.

(b) Complete specifications for all hardware, firmware and software.

(c) All technical manuals and documentation related to the system.

(d) Complete instruction materials necessary for the operation of the equipment and a description of training available to users and purchasers.

(e) Reports from an independent testing authority accredited by the national association of state election directors (NASED) demonstrating that the voting system conforms to all the standards recommended by the federal elections commission.

(f) A signed agreement requiring that the vendor shall immediately notify the elections commission of any modification to the voting system and requiring that the vendor will not offer, for use, sale or lease, any modified voting system, if the elections commission notifies the vendor that the modifications require that the system be approved again.

(g) A list showing all the states and municipalities in which the system has been approved for use and the length of time that the equipment has been in use in those jurisdictions.

(2) The commission shall determine if the application is complete and, if it is, shall so notify the vendor in writing. If it is not complete, the elections commission shall so notify the vendor and shall detail any insufficiencies.

(3) If the application is complete, the vendor shall prepare the voting system for three mock elections, using offices, referenda questions and candidates provided by the elections commission.

History: Cr. Register, June, 2000, No. 534, eff. 7−1−00; **correction in (1) (a), (f), (2), (3) made under s. 13.92 (4) (b) 6., Stats., Register June 2016 No. 726.**

EL 7.02 Agency testing of electronic voting system.
(1) The elections commission shall conduct a test of a voting system, submitted for approval under s. EL 7.01, to ensure that it meets the criteria set out in s. 5.91, Stats. The test shall be conducted using a mock election for the partisan primary, a mock general election with both a presidential and gubernatorial vote, and a mock nonpartisan election combined with a presidential preference vote.
(2) The elections commission may use a panel of local election officials and electors to assist in its review of the voting system.
(3) The elections commission may require that the voting system be used in an actual election as a condition of approval.
History: Cr. Register, June, 2000, No. 534, eff. 7−1−00; **correction in (1) to (3) made under s. 13.92 (4) (b) 6., Stats., and correction in (1) made under s. 13.92 (4) (b) 7., Stats., Register June 2016 No. 726.**

EL 7.03 Continuing approval of electronic voting system.

(1) The elections commission may revoke the approval of any existing electronic voting system if it does not comply with the provisions of this chapter. As a condition of maintaining the elections commission's approval for the use of the voting system, the vendor shall inform the elections commission of all changes in the hardware, firmware and software and all jurisdictions using the voting system.
(2) The vendor shall, at its own expense, furnish, to an agent approved by the elections commission, for placement in escrow, a copy of the programs, documentation and source code used for any election in the state.
(3) The electronic voting system must be capable of transferring the data contained in the system to an electronic recording medium, pursuant to the provisions of s. 7.23, Stats.
(4) The vendor shall ensure that election results can be exported on election night into a statewide database developed by the elections commission.
(5) For good cause shown, the elections commission may exempt any electronic voting system from strict compliance with this chapter.

History: Cr. Register, June, 2000, No. 534, eff. 7−1−00; **correction in (1), (4), (5) made under s. 13.92 (4) (b) 6., Stats. and corrections in (5) made under s. 13.92 (4) (b) 7., Stats., and s. 35.17, Stats., Register June 2016 No. 726.**

Appendix C: US-EAC Certificate of Conformance / Scope of Certification

Manufacturer:	*Election Systems & Software*	**Laboratory:**	*SLI Compliance*
System Name:	*EVS 6.0.4.0*	**Standard:**	*VVSG 1.0 (2005)*
Certificate:	*ESSEVS6040*	**Date:**	*May 3, 2019*

Scope of Certification

This document describes the scope of the validation and certification of the system defined above. Any use, configuration changes, revision changes, additions or subtractions from the described system are not included in this evaluation.

Significance of EAC Certification

An EAC certification is an official recognition that a voting system (in a specific configuration or configurations) has been tested to and has met an identified set of Federal voting system standards. An EAC certification is **not**:

- An endorsement of a Manufacturer, voting system, or any of the system's components.
- A Federal warranty of the voting system or any of its components.
- A determination that a voting system, when fielded, will be operated in a manner that meets all HAVA requirements.
- A substitute for State or local certification and testing.
- A determination that the system is ready for use in an election.
- A determination that any particular component of a certified system is itself certified for use outside the certified configuration.

Representation of EAC Certification

Manufacturers may not represent or imply that a voting system is certified unless it has received a Certificate of Conformance for that system. Statements regarding EAC certification in brochures, on Web sites, on displays, and in advertising/sales literature must be made solely in reference to specific systems. Any action by a Manufacturer to suggest EAC endorsement of its product or organization is strictly prohibited and may result in a Manufacturer's suspension or other action pursuant to Federal civil and criminal law.

System Overview

The ES&S EVS 6.0.4.0 voting system is a modification of the ES&S EVS 6.0.2.0 voting system, certified on October 4, 2018, which contains changes in hardware, software, as well as an upgrade in the election management system's COTS operating system. The ES&S EVS 6.0.4.0 voting system is composed of software applications, central count location devices and polling place devices with accompanying firmware, and COTS hardware and software.

Electionware election management software is an end-to-end election management software application that provides election definition creation, ballot formation, equipment configuration, result consolidation, adjudication and report creation. Electionware is composed of five software groups: Define, Design, Deliver, Results and Manage.

ExpressVote XL™

ExpressVote XL is a hybrid paper-based polling place voting device that provides a full-face touchscreen vote capture that incorporates the printing of the voter's selections as a cast vote record, and tabulation scanning into a single unit.

ExpressTouch®

ExpressTouch Electronic Universal Voting System (ExpressTouch) is a DRE voting system which supports electronic vote capture for all individuals at the polling place.

ExpressVote® Hardware 1.0

ExpressVote Universal Voting System Hardware 1.0 (ExpressVote HW1.0) is a hybrid paper- based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, to be scanned for tabulation in any one of the ES&S precinct or central scanners.

ExpressVote® Hardware 2.1

ExpressVote Universal Voting System Hardware 2.1 (ExpressVote HW2.1) is a hybrid paper- based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, and tabulation scanning into a single unit. ExpressVote HW2.1 is capable of operating in either marker or tabulator mode, depending on the configurable mode that is selected in Electionware.

There are two separate versions of the ExpressVote hardware version 2.1: 2.1.0.0 and version 2.1.2.0 (6.4 & 6.8). Please note that all future references to ExpressVote HW 2.1 as used throughout the document refers to both hardware versions.

DS200®

DS200 is a polling place paper-based voting system, specifically a digital scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

DS450®

DS450 is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

DS850®

DS850 is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

Event Log Service (ELS)

ELS monitors and logs users' interactions with the Election Management System. Events that happen when a connection to the database is not available are logged to the Windows Operating System log through the ELS.

Removable Media Service (RMS)

RMS is a utility that runs in the background of the Windows operating system. RMS reads specific information from any attached USB devices so that ES&S applications such as Electionware can use that information for media validation purposes.

Configurations

Within the scope of the ES&S EVS 6.0.4.0 voting system, three unique configurations are supported, in order to accommodate limitations of components with the ES&S EVS 6.0.4.0 voting system.

Configuration A

ES&S EVS 6.0.4.0: Test Configuration A is comprised of the entire suite of voting system products.

- Electionware
- ExpressVote Marker (HW 1.0)
- ExpressVote Marker/Tabulator (HW 2.1)
- ExpressVote XL
- ExpressTouch
- DS200
- DS450
- DS850

Configuration B

- Electionware
- ExpressVote Marker (HW 1.0)
- ExpressVote Marker/Tabulator (HW 2.1)
- DS200
- DS450
- DS850

Configuration C

- Electionware
- ExpressVote XL

Mark Definition

ES&S' declared level mark recognition for the DS200, DS450 and DS850 is a mark across the oval that is 0.02" long x 0.03" wide at any direction.

Tested Marking Devices

Bic Grip Roller Pen

Language Capability

EVS 6.0.4.0 supports English, Spanish, Chinese (Cantonese), Korean, Japanese, Hindi, Bengali, Vietnamese, Tagalog, Creole, Russian, and French. Configuration C also supports Punjabi and Gujarati.

Proprietary Components Included

This section provides information describing the components and revision level of the primary components included in this Certification.

System Component	Software or Firmware Version	Hardware Version	Model	Comments
Electionware	5.0.4.0			
ES&S Event Log Service	1.6.0.0			
Removable Media Service	1.5.1.0			
ExpressVote HW 1.0	1.5.2.0	1.0		Paper-based vote capture and selection device
ExpressVote Previewer (1.0)	1.5.2.0			
ExpressVote HW 2.1	2.4.5.0	2.1.0.0 2.1.2.0		Hybrid paper-based vote capture and selection device and precinct count tabulator
ExpressVote Previewer (2.1)	2.4.5.0			
DS200	2.17.4.0	1.2.1, 1.2.3, 1.3, 1.3.11		Precinct Count Tabulator
DS450	3.1.1.0	1.0		Central Count Scanner and Tabulator
DS850	3.1.1.0	1.0		Central Count Scanner and Tabulator
ExpressVote XL	1.0.3.0	1.0		Hybrid full-faced paper-based vote capture and selection device and precinct count tabulator
ExpressTouch	1.0.3.0	1.0		DRE
Delkin USB Flash Drive		USB Flash Drive	Bitlocker 32.2MB	BitLocker USB Flash Drive
ExpressVote Rolling Kiosk		1.0	98-00049	Portable Voting Booth
Voting Booth		N/A	98-00051	Stationary Voting Booth
Quad Express Cart		N/A	41404	Portable Voting Booth

MXB ExpressVote Voting Booth		N/A	95000	Sitting and Standing Voting Booth
System Component	Software or Firmware Version	Hardware Version	Model	Comments
ExpressVote Single Table		N/A	87033	Voting Table for One Unit
ExpressVote Double Table		N/A	87032	Voting Table for Two Units
ADA Table		N/A	87031	Voting Table for One Unit
DS200 Ballot Box		1.0, 1.1	98-00009	Collapsible Ballot Box
DS200 Ballot Box		1.2, 1.3, 1.4, 1.5	57521	Plastic ballot box
DS200 Tote Bin		1.0	00074	Tote Bin Ballot Box
DS450 Cart		N/A	3002	
DS850 Cart		N/A	6823	
Universal Voting Console		1.0	98-00077	Detachable ADA support peripheral
Tabletop Easel		N/A	14040	
ExpressTouch Voting Booth		N/A	98-00081	Stationary Voting Booth
SecureSetup	2.1.0.3			Proprietary Hardening Script

COTS Software

Manufacturer	Application	Version
Microsoft Corporation	Server 2008	R2 w/ SP1 (64-bit)
Microsoft Corporation	Windows 7 Professional	SP1 (64-bit)
Microsoft Corporation	Windows 7 Enterprise	SP1 (64-bit)
Microsoft Corporation	WSUS Microsoft Windows Offline Update Utility	11.5
Symantec	Endpoint Protection	14.2.0_MP1 (64-bit)
Symantec	Symantec Endpoint Protection Intelligent Updater (File-Based Protection)	20190122-001-core15sdsv5i64.exe
Symantec	Symantec Endpoint Protection Intelligent Updater (Network-Based Protection)	20190121-062-IPS_IU_SEP_14RU1.exe
Symantec	Symantec Endpoint Protection Intelligent Updater (Behavior-Based Protection)	20190115-001-SONAR_IU_SEP.exe
Gigabyte	WindowsImageTool	B17.1116.01
Cerberus	CerberusFTP Server – Enterprise	10.0.5 (64-bit)
Adobe	Acrobat	XI
Microsoft Corporation	Visual C++ Redistributable	en_visual_cpp_2015_redistributable_x86_8487157.exe (32-bit)
RSA Security	RSA BSAFE Crypto-C ME for Windows 32-bit	4.1
OpenSSL	OpenSSL	2.0.12
OpenSSL	OpenSSL	2.0.16
OpenSSL	OpenSSL	1.02d

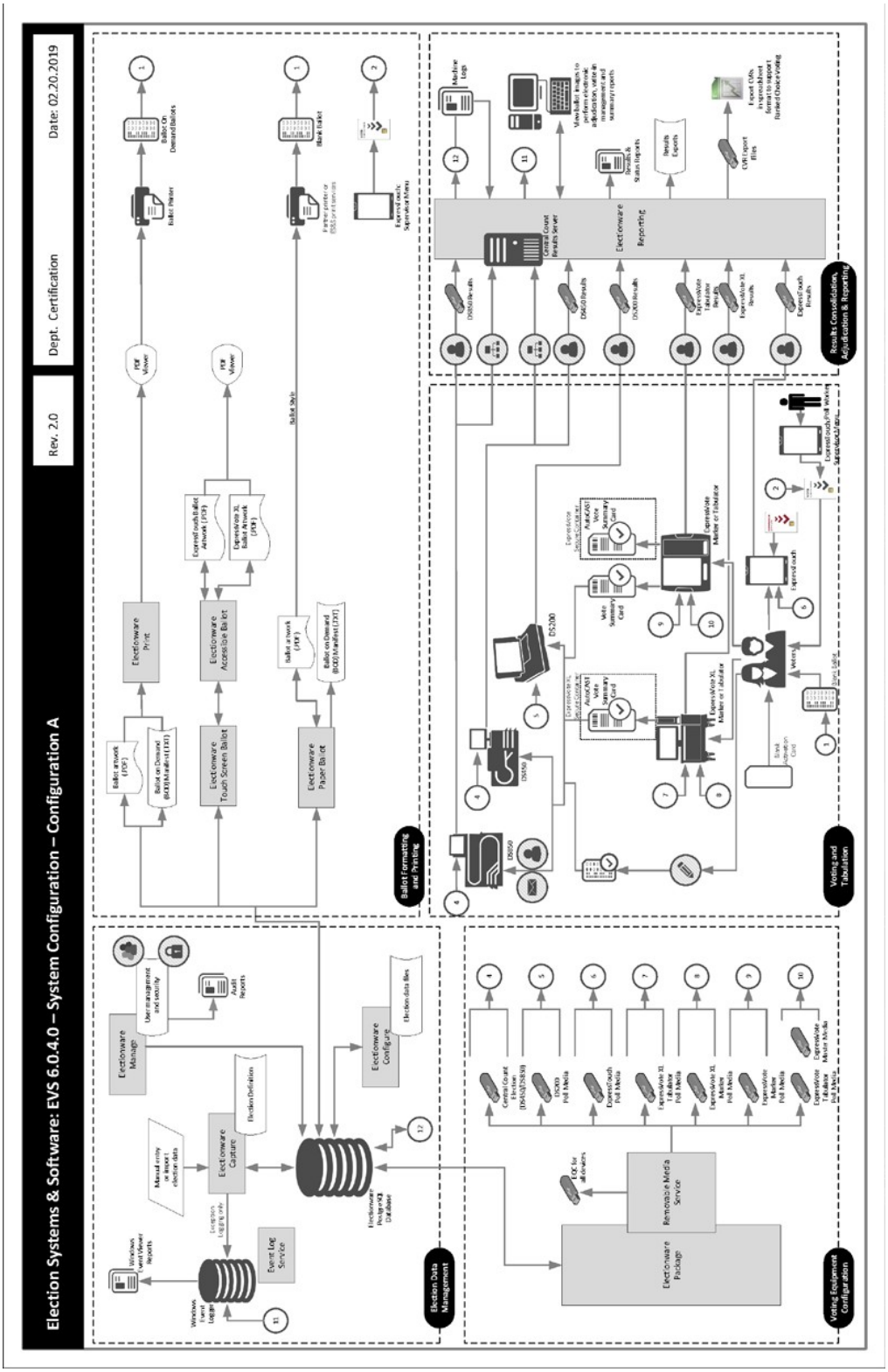
OpenSSL	OpenSSL	1.02h
OpenSSL	OpenSSL	1.02k

COTS Hardware

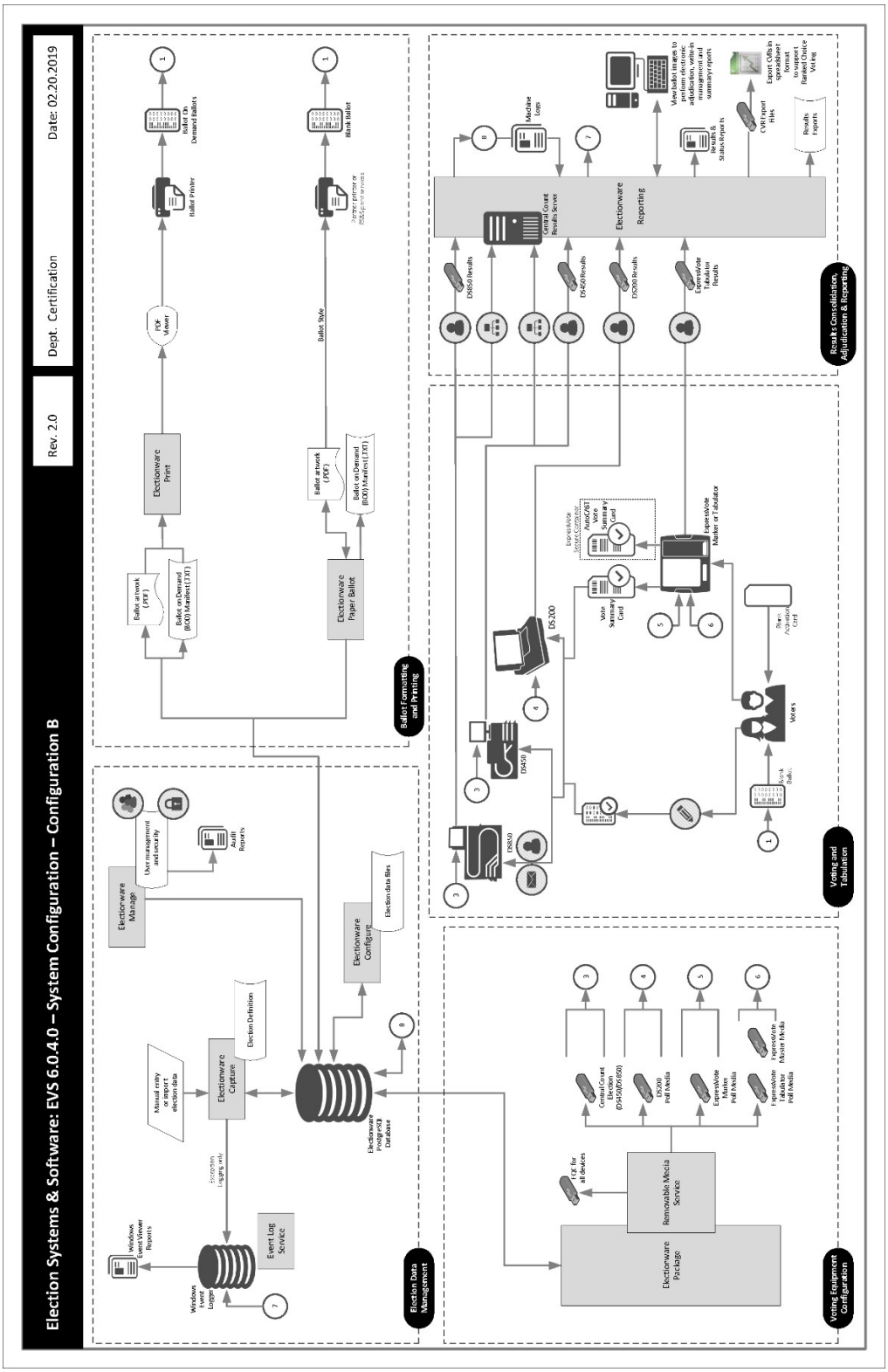
Manufacturer	Hardware	Model/Version
Dell	EMS Server	PowerEdge T420, T630
Dell	EMS Client or Standalone Workstation	Latitude 5580, E6430 OptiPlex 5040, 5050, 7020
Dell	Trusted Platform Module (TPM) Chip version 1.2	R9X21
Innodisk	USB EDC H2SE (1GB) for ExpressVote 1.0	DEEUH1-01GI72AC1SB
Innodisk	USB EDC H2SE (16GB) for ExpressVote 2.1	DEEUH1-16GI72AC1SB
Delkin	USB Flash Drive (512MB, 1GB, 2GB, 4GB, 8GB)	N/A
Delkin	Validation USB Flash Drive (16 GB)	N/A
Delkin	USB Embedded 2.0 Module Flash Drive	MY16TNK7A-RA042-D/ 16 GB
Delkin	Compact Flash Memory Card (1GB)	CE0GTFHHK-FD038-D
Delkin	Compact Flash Memory Card Reader/Writer	6381
Delkin	CFAST Card (2GB, 4GB)	N/A
Lexar	CFAST Card Reader/Writer	LRWCR1TBNA
CardLogix	Smart Card	CLXSU128kC7/ AED C7
SCM Microsystems	Smart Card Writer	SCR3310
Avid	Headphones	86002
Zebra Technologies	QR code scanner (Integrated)	DS457-SR20009, DS457-SR20004ZZWW
Symbol	QR Code scanner (External)	DS9208
Dell	DS450 Report Printer	S2810dn
OKI	DS450 and DS850 Report Printer	B431dn, B431d, B432DN
OKI	DS450 and DS850 Audit Printer	Microline 420
APC	DS450 UPS	Back-UPS Pro 1500, Smart-UPS 1500
APC	DS850 UPS	Back-UPS RS 1500, Pro 1500
Tripp Lite	DS450 and DS850 Surge Protector	Spike Cube
Seiko Instruments	Thermal Printer	LTPD-347B
NCR/Nashua	Paper Roll	2320
Fujitsu	Thermal Printer	FTP-62GDSL001, FTP-63GMCL153

Configuration Diagrams

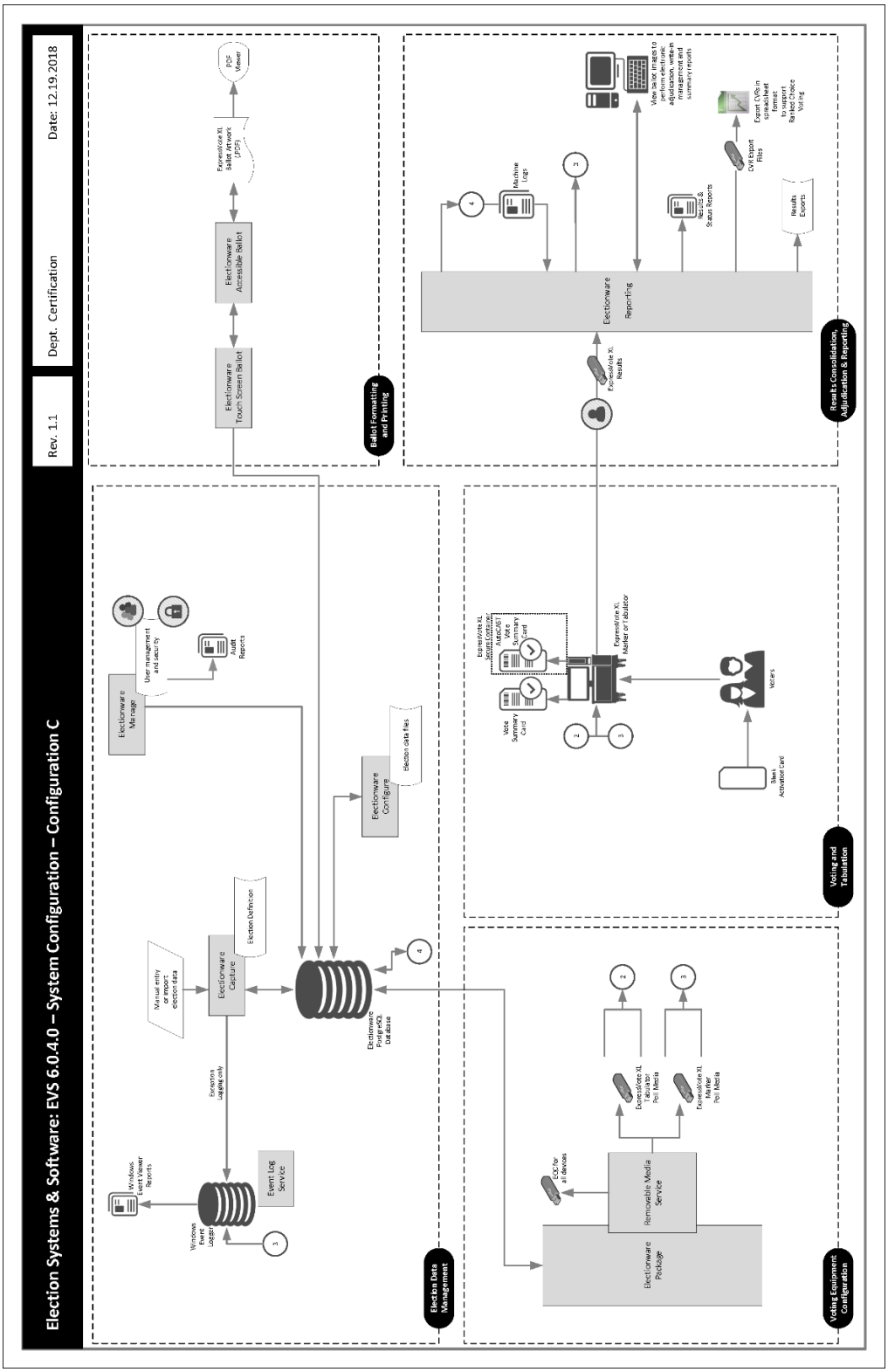
Configuration A



Configuration B



Configuration C



System Limitations

This table depicts the limits the system has been tested and certified to meet.

System Characteristic	Boundary or Limitation	Limiting Component
Max. precincts allowed in an election	9,900	Electionware
Max. ballot styles in an election	15,000	Electionware
Max. candidates allowed per election	10,000	Electionware
Max. contests allowed in an election	10,000	Electionware
Max. number of parties allowed	General election: 75 Primary election: 30	Electionware
Max. District Types/Groups	25	Electionware
Max. districts of a given type	250	
Max. Contests allowed per ballot style	500	
Max. Reporting Groups in an election	14	Electionware
Max. candidates allowed per contest	230	Electionware
Max. “Vote For” per contest	230	Electionware
Max. ballots per batch	1,500	DS45/DS850

Component Limitations:

Electionware

1. Electionware software field limits were calculated based on an average character width for ballot and report elements. Some uses and conditions, such as magnified ballot views or combining elements on printed media or ballot displays, may result in field limits (and associated warnings) lower than those listed. Check printed media and displays before finalizing the election.
2. The Electionware Export Ballot Images function is limited to 250 districts per export.
3. Electionware supports the language special characters listed in the System Overview, Attachment 1. Language special characters other than those listed may not appear properly when viewed on equipment displays or reports.
4. The Straight Party feature must not be used in conjunction with the Single or Multiple Target Cross Endorsement features.

5. The 'MasterFile.txt' and the 'Votes File.txt' do not support results for elections that contain multiple sheets or multiple ExpressVote cards per voter. These files can be produced using the Electionware > Reporting > Tools > Export Results menu option. This menu option is available when the Rules Profile is set to "Illinois".

Paper Ballot Limitations

1. The paper ballot code channel, which is the series of black boxes that appear between the timing track and ballot contents, limits the number of available ballot variations depending on how a jurisdiction uses this code to differentiate ballots. The code can be used to differentiate ballots using three different fields defined as: Sequence (available codes 1-16,300), Type (available codes 1-30) or Split (available codes 1-18).
2. If Sequence is used as a ballot style ID, it must be unique election-wide and the Split code will always be 1. In this case the practical style limit would be 16,300.
3. The ExpressVote activation card has a limited ballot ID based on the three different fields defined as: Sequence (available codes 1-16,300), Type (available codes 1-30) or Split (available codes 1-18).
4. Grid Portrait and Grid Landscape ballot types are New York specific and not for general use.

ExpressVote

1. ExpressVote capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting system. For this reason, Election Management System and ballot tabulator limitations define the boundaries and capabilities of the ExpressVote system as the maximum capacities of the ES&S ExpressVote are never approached during testing.

ExpressVote XL

1. ExpressVote XL capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting system. For this reason, Election Management System and ballot tabulator limitations define the boundaries and capabilities of the ExpressVote XL system as the maximum capacities of the ES&S ExpressVote XL are never approached during testing.
2. ExpressVote XL does not offer open primary support based on the ES&S definition of Open Primary, which is the ability to select a party and vote based on that party.
3. ExpressVote XL does not support Massachusetts Group Vote.
4. ExpressVote XL does not support Universal Primary Contest.
5. ExpressVote XL does not support Multiple Target Cross Endorsement.
6. ExpressVote XL does not support Reviewer or Judges Initials boxes.
7. ExpressVote XL does not support multi-card ballots.
8. In a General election, one ExpressVote XL screen can hold 32 party columns if set up as columns or 16 party rows if set up as rows.
9. ExpressVote XL does not support Team Write-In.

ExpressTouch

1. ExpressTouch capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting system. For this reason, Election Management System limitations define the boundaries and capabilities of the ExpressTouch system as the maximum capacities of the ES&S ExpressTouch are never approached during testing.

2. ExpressTouch does not offer open primary support, which is the ability to select a party and vote based on that party.
3. ExpressTouch does not support Massachusetts Group Vote.
4. ExpressTouch does not support Universal Primary Contest.
5. ExpressTouch does not support Multiple Target Cross Endorsement.
6. ExpressTouch does not support Team Write-In.

DS200

1. The ES&S DS200 configured for an early vote station does not support precinct level results reporting. An election summary report of tabulated vote totals is supported.
2. The DS200 storage limitation for write-in ballot images is 3,600 images. Each ballot image includes a single ballot face, or one side of one page.
3. Write-in image review requires a minimum 1GB of onboard RAM.
4. To successfully use the Write-In Report, ballots must span at least three vertical columns. If the column is greater than 1/3 of the ballot width (two columns or less), the write-in image will be too wide to print on the tabulator report tape.

Functionality

VVSG 1.0 Supported Functionality Declaration

Feature/Characteristic	Yes/No	Comment
Voter Verified Paper Audit Trails		
VVPAT	No	
Accessibility		
Forward Approach	Yes	
Parallel (Side) Approach	Yes	
Closed Primary		
Primary: Closed	Yes	
Open Primary		
Primary: Open Standard (provide definition of how supported)	Yes	Configuration B only
Primary: Open Blanket (provide definition of how supported)	No	
Partisan & Non-Partisan:		
Partisan & Non-Partisan: Vote for 1 of N race	Yes	
Partisan & Non-Partisan: Multi-member (“vote for N of M”) board races	Yes	
Partisan & Non-Partisan: “vote for 1” race with a single candidate and write-in voting	Yes	
Partisan & Non-Partisan “vote for 1” race with no declared candidates and write-in voting	Yes	
Write-In Voting:		
Write-in Voting: System default is a voting position identified for write-ins.	Yes	
Write-in Voting: Without selecting a write in position.	Yes	
Write-in: With No Declared Candidates	Yes	
Write-in: Identification of write-ins for resolution at central count	Yes	
Primary Presidential Delegation Nominations & Slates:		
Primary Presidential Delegation Nominations: Displayed delegate slates for each presidential party	No	

Feature/Characteristic	Yes/No	Comment
Slate & Group Voting: one selection votes the slate.	No	
Ballot Rotation:		
Rotation of Names within an Office; define all supported rotation methods for location on the ballot and vote tabulation/reporting	Yes	
Straight Party Voting:		
Straight Party: A single selection for partisan races in a general election	Yes	
Straight Party: Vote for each candidate individually	Yes	
Straight Party: Modify straight party selections with crossover votes	Yes	
Straight Party: A race without a candidate for one party	Yes	
Straight Party: N of M race (where "N">1)	Yes	
Straight Party: Excludes a partisan contest from the straight party selection	Yes	
Cross-Party Endorsement:		
Cross party endorsements, multiple parties endorse one candidate.	Yes	
Split Precincts:		
Split Precincts: Multiple ballot styles	Yes	
Split Precincts: P & M system support splits with correct contests and ballot identification of each split	Yes	
Split Precincts: DRE matches voter to all applicable races.	Yes	
Split Precincts: Reporting of voter counts (# of voters) to the precinct split level; Reporting of vote totals is to the precinct level	Yes	It is possible to list the number of voters.
Vote N of M:		
Vote for N of M: Counts each selected candidate, if the maximum is not exceeded.	Yes	
Vote for N of M: Invalidates all candidates in an overvote (paper)	Yes	
Recall Issues, with options:		
Recall Issues with Options: Simple Yes/No with separate race/election. (Vote Yes or No Question)	No	
Recall Issues with Options: Retain is the first option, Replacement candidate for the second or more options (Vote 1 of M)	No	
Recall Issues with Options: Two contests with access to a second contest conditional upon a specific vote in contest one. (Must vote Yes to vote in 2nd contest.)	No	
Recall Issues with Options: Two contests with access to a second contest conditional upon any vote in contest one. (Must vote Yes to vote in 2nd contest.)	No	
Cumulative Voting		
Cumulative Voting: Voters are permitted to cast, as many votes as there are seats to be filled for one or more candidates. Voters are not limited to giving only one vote to a candidate. Instead, they can put multiple votes on one or more candidate.	No	
Ranked Order Voting		
Ranked Order Voting: Voters can write in a ranked vote.	No	
Ranked Order Voting: A ballot stops being counting when all ranked choices have been eliminated	No	

Feature/Characteristic	Yes/No	Comment
Ranked Order Voting: A ballot with a skipped rank counts the vote for the next rank.	No	
Ranked Order Voting: Voters rank candidates in a contest in order of choice. A candidate receiving a majority of the first choice votes wins. If no candidate receives a majority of first choice votes, the last place candidate is deleted, each ballot cast for the deleted candidate counts for the second choice candidate listed on the ballot. The process of eliminating the last place candidate and recounting the ballots continues until one candidate receives a majority of the vote	No	
Ranked Order Voting: A ballot with two choices ranked the same, stops being counted at the point of two similarly ranked choices.	No	
Ranked Order Voting: The total number of votes for two or more candidates with the least votes is less than the votes of the candidate with the next highest number of votes, the candidates with the least votes are eliminated simultaneously and their votes transferred to the next-ranked continuing candidate.	No	
Provisional or Challenged Ballots		
Provisional/Challenged Ballots: A voted provisional ballots is identified but not included in the tabulation but can be added in the central count.	Yes	
Provisional/Challenged Ballots: A voted provisional ballots is included in the tabulation, but is identified and can be subtracted in the central count	Yes	
Provisional/Challenged Ballots: Provisional ballots maintain the secrecy of the ballot.	Yes	
Overvotes (must support for specific type of voting system)		
Overvotes: P & M: Overvote invalidates the vote. Define how overvotes are counted.	Yes	
Overvotes: DRE: Prevented from or requires correction of overvoting.	Yes	
Overvotes: If a system does not prevent overvotes, it must count them. Define how overvotes are counted.	Yes	
Overvotes: DRE systems that provide a method to data enter absentee votes must account for overvotes.	Yes	
Undervotes		
Undervotes: System counts undervotes cast for accounting purposes	Yes	
Blank Ballots		
Totally Blank Ballots: Any blank ballot alert is tested.	Yes	
Totally Blank Ballots: If blank ballots are not immediately processed, there must be a provision to recognize and accept them	Yes	
Totally Blank Ballots: If operators can access a blank ballot, there must be a provision for resolution.	Yes	
Networking		
Wide Area Network – Use of Modems	No	
Wide Area Network – Use of Wireless	No	
Local Area Network – Use of TCP/IP	No	
Local Area Network – Use of Infrared	No	

Feature/Characteristic	Yes/No	Comment
Local Area Network – Use of Wireless	No	
FIPS 140-2 validated cryptographic module	Yes	
Used as (if applicable):		
Precinct counting device	Yes	DS200, ExpressTouch, ExpressVote HW2.1, ExpressVote XL
Central counting device	Yes	DS450 and/or DS850

Baseline Certification Engineering Change Order's (ECO)

This table depicts the ECO's certified with the voting system:

Change ID	Date	Component	Description	Inclusion
ECO 938	12/14/18	DS200	Texture Free Surface for Security Seals	DeMinimis Optional
ECO 982	2/20/19	ExpressVote XL	Add Cord Wrap Hooks, Filler for Card Bin and Shipping Bracket	DeMinimis Optional
ECO 988	4/29/19	ExpressVote	Add End of Life Zebra Scanner	DeMinimis Optional
ECO 989	4/29/19	ExpressVote	Adds Updated USB Thumb Drive Cover	DeMinimis Optional
ECO 991	4/29/19	DS200	Add Hardware Rev 1.3.11	Non-DeMinimis Optional
ECO 993	4/29/19	DS450	Adds Oki 432 Report Printer and APC Smart-UPS 1500	Non-DeMinimis Optional
ECO 1000	2/13/19	DS200 Collapsible Ballot Box	Adds Hardware Rev 1.1	De Minimis Optional
ECO 1004	12/14/18	DS450	Add Oki 432 Report Printer Due to End of Life	De Minimis Optional
ECO 1005	12/14/18	DS850	Add Oki 432 Report Printer Due to End of Life	De Minimis Optional
ECO 1016	2/13/19	ExpressVote Voting Booth	Added Enhanced Doors	De Minimis Optional
ECO 2160	4/29/19	ExpressVote	Lengthen Detachable Key Pad Cord	De Minimis Optional

Appendix D: Voting System Standards, Testing Protocols and Procedures Pertaining to the Use of Communication Devices

PART I: PROPOSED TESTING STANDARDS

Applicable VVSG Standard

The modem component of the voting system or equipment must be tested to the requirements contained in the most recent version or versions of the Voluntary Voting System Guidelines (VVSG) currently accepted for testing and certification by the U.S. Election Assistance Commission (EAC). Compliance with the applicable VVSG may be substantiated through federal certification by the EAC, through certification by another state that requires compliance with the applicable VVSG, or through testing conducted by a federally certified voting system test laboratory (VSTL) to the standards contained in the applicable VVSG. Meeting the requirements contained in the VVSG may substantiate compliance with the voting system requirements contained in Section 301 of the Help America Vote Act of 2002 (HAVA).

Access to Election Data

Provisions shall be made for authorized access to election results after closing of the polls and prior to the publication of the official canvass of the vote. Therefore, all systems must be capable of generating an export file to communicate results from the election jurisdiction to the Central processing location on election night after all results have been accumulated. The system may be designed so that results may be transferred to an alternate database or device. Access to the alternate file shall in no way affect the control, processing, and integrity of the primary file or allow the primary file to be affected in any way.

Security

All voting system functions shall prevent unauthorized access to them and preclude the execution of authorized functions in an improper sequence. System functions shall be executable only in the intended manner and order of events and under the intended conditions. Preconditions to a system function shall be logically related to the function so as to preclude its execution if the preconditions have not been met.

Accuracy

A voting system must be capable of accurately recording and reporting votes cast. Accuracy provisions shall be evidenced by the inclusion of control logic and data processing methods, which incorporate parity, and checksums, or other equivalent error detection and correction methods.

Data Integrity

A voting system shall contain provisions for maintaining the integrity of voting and audit data during an election and for a period of at least 22 months thereafter. These provisions shall include protection against:

- the interruption of electrical power, generated or induced electromagnetic radiation.
- ambient temperature and humidity.

- the failure of any data input or storage device.
- any attempt at an improper data entry or retrieval procedure.

Reliability

Successful Completion of the Logic and Accuracy test shall be determined by two criteria

- The number of failures in transmission
- and the accuracy of vote counting

The failure or connectivity rate will be determined by observing the number of relevant failures that occur during equipment operation. The accuracy is to be measured by verifying the completeness of the totals received.

PART II: TEST PROCEDURES AND PROTOCOLS

Overview of Telecommunication Test

The telecommunication test focuses on system hardware and software function and performance for the transmission of data that is used to operate the system and report election results. This test applies to the requirements for Volume I, Section 6 of the EAC 2005 VVSG. This testing is intended to complement the network security requirements found in Volume I, Section 7 of the EAC 2005 VVSG, which include requirements for voter and administrator access, availability of network service, data confidentiality, and data integrity. Most importantly, security services must restrict access to local election system components from public resources, and these services must also restrict access to voting system data while it is in transit through public networks. Compliance with Section 7, EAC 2005 VVSG shall be evidenced by a VSTL report submitted with the vendor's application for approval of a voting system.

In an effort to achieve these standards and to verify the proper functionality of the units under test, the following methods will be used to test each component of the voting system:

Wired Modem Capability Test Plan

Test Objective: To transfer the results from the tabulator to the Election Management System via a wired network correctly.

Test Plan:

1. Attempt to transmit results prior to the closing of the polls and printing of results tape

2. Set up a telephone line simulator that contains as many as eight phone lines

3. Perform communication suite for election night reporting using a bank with as many as seven analog modems:
    a. Connect the central site election management system to the telephone line simulator and connect the modems to the remaining telephone line ports

b. Setup the phone line numbers in the telephone line simulator
c. Use the simulated election to upload the election results
    i. Use at least eight tabulators in different reporting units
    ii. Use as many as two tabulators within the same reporting units
d. Simulate the following transmission anomalies
    i. Attempt to upload results from a tabulating device to a computer which is not part of the voting system
    ii. Attempt to upload results from a non-tabulating device to the central site connected to the modem bank
    iii. Attempt to load stress by simulating a denial of service (DOS) attack or attempt to upload more than one polling location results (e.g., ten or more polling locations)

Wireless Capability Test Plan

Test Objective: To transfer the results from the tabulator to EMS via a wireless network correctly.

Test Plan:

1. Attempt to transmit results prior to the closing of the polls and printing of results tape.

2. Perform wireless communication suite for election night reporting:
    a. Use the simulated election to upload the election results using wireless transfer to the secure FTP server (SFTP)
    b. Use at least eight tabulators in different reporting units
    c. Use as many as two tabulators within the same reporting unit

3. Simulate the following transmission anomalies
    a. Attempt to upload results from a tabulating device to a computer which is not part of the voting system
    b. Attempt to upload results from a non-tabulating device to the SFTP server
    c. Attempt to load stress by simulating a denial of service (DOS) attack or attempt to upload more than one polling location results (e.g., ten or more polling locations)
    d. If possible, simulate a weak signal
    e. If possible, simulate an intrusion

Test Conclusions for Wired and Wireless Transmission

- System must be capable of transferring 100% of the contents of results test packs without error for each successful transmission.

- Furthermore, system must demonstrate secure rate of transmission consistent with security requirements.

- System must demonstrate the proper functionality to ensure ease of use for clerks on election night.

- System must be configured such that the modem component remains inoperable until after the official closing of the polls and printing of one (1) copy of the results tape**.**

PART III: PROPOSED SECURITY PROCEDURES

Staff recommends that as a condition of purchase, any municipality or county which purchases this equipment and uses modem functionality must also agree to the following conditions of approval.

1. Devices which may be incorporated in or attached to components of the system for the purpose of transmitting tabulation data to another data processing system, printing system, or display device shall not be used for the preparation or printing of an official canvass of the vote unless they conform to a data interchange and interface structure and protocol which incorporates some form of error checking.

2. Any jurisdiction using a modeming solution to transfer results from the polling place to the central count location may not activate the modem functionality until after the polling place closes.

3. Any municipality using modeming technology must have one set of results printed before it attempts to modem any data.

4. Any municipality purchasing and using modem technology to transfer results from the polling location to the central count location must conduct an audit of the voting equipment after the conclusion of the canvass process.

5. Default passwords provided by ES&S to county/municipality must be changed upon receipt of equipment.

6. Counties must change their passwords after every election.

PART IV: CONDITIONS FOR APPROVAL (VENDOR)

Additionally, staff recommends that, as a condition/continuing condition of approval, ES&S shall:

1. Reimburse actual costs incurred by the G.A.B. and local election officials, where applicable, in examining the system *(including travel and lodging)* pursuant to state processes.

2. Configure modem component to remain inoperative (incapable of either receiving or sending transmissions) prior to the closing of the polls and the printing of tabulated results.

APPENDIX E: ExpressLink Testing Protocol

WEC Protocol for Approving the Elections Systems and Software ExpressLink Component

Background

As part of an application submitted on March 17, 2017, Elections Systems and Software (ES&S) requested the Wisconsin Elections Commission (WEC) to certify the ExpressLink component as part of the EVS 5.2.2.0 and EVS 5.3.2.0 systems. ExpressLink was outside of the scope of certification that was granted by the Elections Assistance Commission (EAC) for those systems. The WEC staff review of the application materials for EVS 5.2.2.0 and EVS 5.3.2.0 determined that this component was part of the voting system and should be subject to testing and certification, contrary to the EAC review. This component was not included in the voting equipment system that was certified for use in Wisconsin by the WEC on June 20, 2017. Staff was instructed, however, to create a protocol to test and certify the ExpressLink component outside of the EAC process. Wis. Stat. § 5.91 provides that the WEC may certify any such voting device, automatic tabulating equipment, or related equipment or materials regardless of whether any such system is approved by the EAC and this protocol outlines the procedures for reviewing the ExpressLink consistent with this statutory authority.

Component Information

The ExpressLink is designed for use by election officials in conjunction with the ExpressVote Universal Voting System that was approved as part of the EVS 5.2.20 and EVS 5.3.2.0 systems. This voting system component consists of both the ExpressLink software application and one piece of hardware, the ExpressVote Activation Card Printer. ExpressLink is a Windows application housed on a laptop computer that uses contest and candidate information imported from Election Ware election management system to determine the appropriate ballot style for a voter. The system then prints the activation barcode using the ExpressVote Activation Card Printer. The ExpressVote Activation Card Printer is a small, thermal, on demand printer used to print the ballot activation barcode on the ExpressVote ballot card. A voter would then use the ballot card that contains the barcode printed via the ExpressLink to activate the correct ballot style on the ExpressVote Universal Voting System.

Review and Testing Process

- WEC staff shall complete a review of supporting documentation provided by the vendor that details the functionality of the ExpressLink before functional testing is conducted. The manufacturer shall provide both a full and a redacted set of the following documentation as part of the process to review the component, if applicable:
    - Complete specifications for all hardware, firmware and software;
    - All technical manuals and documentation related to the component;

- Complete instruction materials necessary for the operation of the equipment and a description of training available to users and purchasers;

- Reports from voting system test laboratories accredited by the US Election Assistance Commission (EAC) demonstrating that the system component functions as described by the vendor in the application materials.

- A list of all the states and municipalities in which the system has been approved for use and how long the ExpressLink component has been in use in those jurisdictions.

- If any portion of the materials provided to the Wisconsin Elections Commission is copyrighted, trademarked, or otherwise trade secret, the application shall include written assertion of any protected interests and redacted versions of the application and all materials consistent with any properly asserted protected interests. Simply identifying the individual item as "proprietary" is not sufficient. Any assertion of proprietary rights must include detailed specifics of each item protected, the factual and legal basis for protection, whether there is anything public within the protected item, and if there is, how to extract it along with a statement whether there are costs to do so.

- If applicable, provide the WEC with a list of software components, pursuant to Wis. Stat. § 5.905, that "record and tally the votes cast with this system." For purposes of this condition, "software components" include vote-counting source code, table structures, modules, program narratives and other human-readable computer instructions used to count votes with this system.

- The vendor shall submit the component to the WEC for functional testing. The hardware and software submitted for certification testing shall be equivalent, in form and function, to the actual production versions of the component.

    - An operational status check shall be conducted on the ExpressLink to determine if it functions as described by the vendor using the following procedures:

        - Arrange the system for normal operation and power on the system.
        - Perform any servicing, and make any adjustments necessary, to achieve operational status.
        - Operate the equipment in all modes, demonstrating all functions and features that would be used during election operations.
        - Commission staff shall verify that all system functions have been correctly executed.

    - Compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment, shall be determined through functional tests integrating the voting system software with

the remainder of the system and to determine if the software meets the vendor's design specifications.

- The election definition file that is created in ElectionWare for use with the ExpressLink shall be verified to determine if the data contained in that file is accurate.
- The ExpressLink will be tested in a mock election to determine if it can print barcodes on ExpressVote ballot cards that access the correct ballot styles.
- The ExpressLink will be tested to determine if it can accommodate multiple ballot styles for an election on a single ExpressVote machine.

Conditions for Approval (vendor)

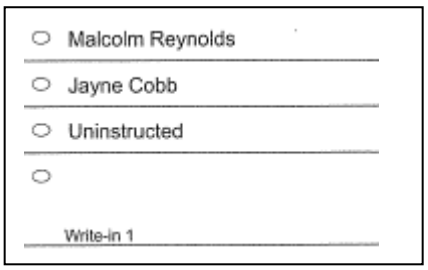
Additionally, staff recommends that, as a condition/continuing condition of approval, ES&S shall:

1. Reimburse the WEC for all costs associated with the testing campaign for the ExpressLink, where applicable, pursuant to state processes.

2. Agree to any additional conditions for approval and use that may be identified after the review and testing process is complete.

APPENDIX F: DS200 Write-In Report Testing and Pilot Test Protocol

In response to clerk interest as well as pending legislation, Commission staff conducted testing on the write-in report functionality of the DS200. Staff created a pilot testing protocol to account for and review how the DS200 would capture images of write-in votes in several scenarios and how the machine would display the write-in votes on the report that would be used to tabulate those votes. These scenarios included circumstances such as write-in votes with a blank oval or a write-in vote as part of an overvote or crossover vote. A total of 80 ballots were marked based on a customized test deck utilizing the election definitions from the General and Presidential Preference test elections. When the write-in report is enabled on the DS200, the write-in area on the ballot is roughly twice the size of what it would normally be, as illustrated by the example to the right.



The larger write-in area is required to ensure that write-in votes where the corresponding oval is not filled in by the voter will be captured on the write-in report. This programming must be done to allow for write-in votes to be tabulated in accordance with Wis. Stat. §7.50(d), which states that "If an elector writes a person's name in the proper space for write-in candidates for an office, it is a vote for the person written in for the office indicated, regardless of whether the elector strikes the names appearing in the same column for the same office, or places a mark by the same or any other name for the same office, or omits placing a mark to the right of the name written in". Under the proposed legislation, ballots cast via electronic voting equipment during the in-person absentee voting period would not be reviewed for write-in votes and all tabulation of write-in votes would be done using the output on the write-in report created by the voting equipment.

When programming a ballot with the larger write-in area, it is not possible to have multiple candidate lines represented. Write-in vote areas with two candidate lines are used in both Presidential and Gubernatorial elections in Wisconsin. The programming for the DS200 was unable to accommodate this style of write-in field. Testing showed that the write-in report functionality records images of write-in votes and tabulates the corresponding votes correctly and accurately.

As with traditional paper ballots, ballots from an ExpressVote with write-in votes will be imprinted with a pink circle by the tabulator prior to being dispatched to the ballot bin. To correctly account for write-in votes on ExpressVote ballots, they must be identified by election inspectors through a hand tally of ballots.

It is important to note that the write-in report testing was conducted on a pilot basis. Prior to further write-in report testing, staff would need to review the legislation if signed into law and gain Commission approval for an appropriate test protocol. If the Commission wishes staff to further explore DS200 write-in report testing or implementation, staff will work with Commissioners and management to address next steps.

Write-in Report Testing Checklist

Requirement	Pass: Y or N	Notes
Early voting demonstration from vendor (open polls multiple times, end of night procedures without closing polls, etc.)	Y	DS200 is simply shut down at the end of day with auto generated report cancelled by clerk; or lid can be closed and locked w/o powering down, putting it into a "sleep" mode.
Write-in report testing scenarios (outlined below): per the test deck	Y	If a ballot has write-ins that are part of a crossover or overvote situation, those votes do not appear on the report.
Write-in totals on tape and inclusion on write-in report: do they match the expected results?	Y	Since overvotes and crossover votes are not tallied nor captured on the write-in report, all contests tested reconciled.
Machine with multiple reporting units (simulate early voting scenario): Are the write-in records itemized by ward/precinct/reporting unit?	Y	EVS6040/6050 prints the write-in report by reporting unit, then by contest within that reporting unit.

1. Write-in Scenarios
    - i Oval/good vote
    - ii No oval/good vote
    - iii Oval/blank vote
    - iv Oval/w-i/overvote
    - v No oval/w-i/overvote
    - vi Oval/no w-i/overvote
    - vii Oval/crossover (PP, Pres Pref)
    - viii No oval/crossover (PP, Pres Pref)

APPENDIX G: Wisconsin Voting Equipment Review Panel's Feedback

These comments were provided via a structured feedback form.

1. How would you rate the functionality of the equipment?

Very Poor	Poor	Fair	Good	Excellent
			3	4

- User friendly and durable. It would be nice if the ExpressVote had a location to display headphones and tactile keypad on for visibility.
- The functionality of the equipment was really good.
- Equipment and software are secure as presented.
- ExpressVote is 100% better than AutoMark. DS200/450/850 = 5. The small DS200 case is too much work. The one slight issue is the ExpressVote Tabulator seems wobbly when using on the stand.
- Generally, seems good. There are some lags between screens.
- EV tabulator should provide PDF of marked ballot for review prior to tabulation. All other equipment is very functional and improved. Additional concern with Win 7 support.
- Tabulator/EV were easy to navigate.

2. How would you rate the accessible features?

Very Poor	Poor	Fair	Good	Excellent
			2	5

- Very well covered on the ExpressVote.
- The accessible features were easy to use.
- Screws clearly visible and color coded, etc. Have options for audio, as well as voter prompts, etc.
- Very easy to understand and navigate through the screens or with the pads.
- I would recommend the WEC seek additional feedback from voters with disabilities or disability advocacy groups on the accessibility of the ExpressVote Tabulator. There have been accessibility issues in the past with machines that serve as the AVE (Assistive Voting Equipment) and as the tabulator. Those concerns may not apply in this situation, but further evaluation with members of the disability community is needed.
- A handicapped voter should not need to handle the ballot on the EV tabulator for a self-contained system.
- Easy for any user.

3. Rate your overall impression of the system.

Very Poor	Poor	Fair	Good	Excellent
			2	5

- Looking forward to the upgrades on DS200s and implementing ExpressVote.
- Everything that was presented was in good order.
- Seems to be safe and secure. Hardened and locked down from the outside.
- Meets the needs of county and municipal workers and electors. Should be approved by Commission!
- It would be preferable if people had to review their ballot selections on paper before casing their ballots on the ExpressVote Tabulator. Also, on the ExpressVote Tabulator, if one voter wants to review their card twice, the machine stops prompting them to vote. Other parts generally seem good.
- EVS 6050 is very needed for 2020 elections and modeming. In our county, alternative methods of receipt are very time intensive.

APPENDIX H: ES&S Ongoing Support for Windows 7 Equipment

Via U.S. Mail and Email

August 16, 2019

Mr. Steve Pearson
Vice President of Certification
Election Systems & Software
11208 John Galt Blvd.
Omaha, NE 68137

Mr. Pearson:

This communication is a follow-up to our meeting on June 10, 2019 and intends to clarify the process by which ES&S will provide ongoing support for any voting system running Windows 7 after Microsoft discontinues base system support on January 14, 2020. The Wisconsin Elections Commission (WEC) is responsible for ensuring that voting equipment used in Wisconsin is up to date and secure and that any equipment in use will be able to maintain its state certification. To help the WEC make these determinations, we are specifically seeking further written explanations for the following questions:

1. Which ES&S voting systems currently operating in Wisconsin will be affected by Windows 7 reaching its end of life?

ES&S Response:
Listed below are the ES&S voting systems currently operating in Wisconsin on the Windows 7 platform. The Unity and Electionware Election Management Systems ("EMS") operate in a locked down, closed and hardened environment. When the system is configured as certified, it is not exposed to the public internet. This means that these systems are protected from risks commonly associated with other systems that interact with the internet.

- *EVS 5.2.0.0/5.3.0.0*
- *EVS 5.2.2.0/5.3.2.0*
- *EVS 5.2.4.0/5.3.4.0*
- *Unity 3.4.1.0*
- *Unity 3.0.1.0*

a. Which counties and municipalities are currently using these voting systems?

ES&S Response:
Below is a list of counties and the voting system release they are currently using:

Adams	EVS 5.2.0.0
Ashland	Unity 3.0.1.0
Bayfield	Unity 3.0.1.0

Brown	EVS 5.3.0.0
Calumet	EVS 5.3.2.0
Clark	Unity 3.0.1.0
Columbia	EVS 5.3.2.0
Dane	EVS 5.3.0.0
Dodge	EVS 5.3.2.0
Douglas	EVS 5.3.2.0
Eau Claire	EVS 5.3.2.0
Iowa	Unity 3.0.1.0/ EVS 5.2.2.0
Jefferson	EVS 5.3.0.0
Kenosha	EVS 5.3.0.0
La Crosse	Unity 3.4.1.0
Lafayette	EVS 5.2.0.0
Lincoln	Unity 3.4.1.0
Manitowoc	Unity 3.4.1.0/ EVS 5.2.2.0
Marathon	EVS 5.3.0.0
Menominee	EVS 5.3.2.0
Milwaukee	EVS 5.3.0.0
Outagamie	EVS 5.3.2.0
Pierce	EVS 5.2.2.0
Portage	Unity 3.4.1.0
Rock	EVS 5.3.2.0
Sauk	EVS 5.3.0.0
St Croix	EVS 5.3.0.0
Taylor	Unity 3.0.1.0
Waukesha	EVS 5.3.2.0
Wood	Unity 3.4.1.0

b. What communication protocol will ES&S follow to contact customers currently operating Windows 7 based voting systems?

ES&S Response:
ES&S recently provided all of our customer County Clerks and the larger Municipal Clerks Windows 7 Support FAQ for their information. ES&S is happy to answer any questions the counties may have regarding Windows 7 support and will continue to keep them informed when new information is available. A copy of the FAQ is attached with this response.

2. It is our understanding that ES&S has entered into an agreement with Microsoft to continue support for Windows 7 devices after the official end of life date. What is your plan for continuing to provide extended support to ES&S customers after January 14, 2020?

ES&S Response:
Microsoft will be offering extended security updates ("ESU") for Windows 7 for a nominal cost per license through 2023. Microsoft ESU licenses are not yet available for purchase. Once Microsoft ESU licenses are available, ES&S will notify the Wisconsin Elections Commission and our county customers on how to obtain

these licenses. Discussions are underway with both Microsoft and the Election Assistance Commission ("EAC") to determine how this process will unfold.

ES&S will continue to support Windows 7, and we are confident a process for providing system updates will be in place soon. ES&S will work with Microsoft to address any critical updates in all certified ES&S system releases. ES&S and Microsoft are committed to working together to identify risks that would impact ES&S' customer's ability to conduct secure elections.

a. In terms of this support, how will patches, security updates, etc., be rolled out or implemented to customers?

ES&S Response:
ES&S regularly reviews vulnerabilities for all of our voting equipment and systems. When a vulnerability is discovered, the ES&S Vulnerability Review team reviews the vulnerability to determine if it affects any of the ES&S products, in this case the EMS systems. If the vulnerability is critical in nature, ES&S will notify affected customers and start the Engineering Change Order ("ECO") process in accordance with the EAC Testing and Certification Program.

The ECO process involves internal testing with ES&S as well as third party testing at a Voting System Test Laboratory ("VSTL"). Installation procedures and staged Windows patch files will be included as part of the ECO package. The installation procedures will be tested by the VSTL to confirm that the patches are installed correctly. Once the VSTL completes their testing and review of the ECO and provides their recommendation and approved by the EAC, the ECO is presented to the WEC for approval. Once approved by the WEC, the Counties and jurisdictions may apply the patches in the ECO to their EMS systems.

It should also be noted, the EAC is currently in the process of reviewing and drafting procedures to allow for more efficiency for Windows security upgrades to be applied.

b. Who is responsible for installing these patches and updates?

ES&S Response:
Once the patches have completed the ECO process and are approved for use in the State of Wisconsin, the patches can be applied to the EMS systems. At that point, the Wisconsin jurisdictions can utilize installation instructions provided by ES&S or contract with ES&S for patch installation services.

c. Who will be responsible for the costs associated with this extended support contract?

ES&S Response:
The County jurisdictions will be responsible for all Microsoft ESU license costs associated with the extended support contract should such jurisdictions elect to participate in the Microsoft program.

d. Will the costs be covered under existing support contracts or will additional expenditures be required on the part of customer municipalities or counties?

ES&S Response:
The Microsoft ESUs and any third party items associated with such Microsoft ESUs are not covered under existing support contracts and will require an additional expenditure for Wisconsin jurisdictions wishing to have the extended Microsoft support contract.

e. Will the cost of maintaining a support contract remain consistent from 2020 to 2023 or will contracts have a graduated fee structure/cost more as they remain in place?

ES&S Response:
Pricing details are yet not available from Microsoft. We have been informed the per license fee will be nominal.

f. How will extended support contracts address Commercial Off-the-Shelf (COTS) products utilized as internal components within voting systems being used by customers?

ES&S Response:
The Microsoft ESU specifically relates to the EMS Operating Systems. COTS products outside of the EMS Operating Systems are not included in the Microsoft ESU program.

g. Will each customer municipality or county have to work out a support contract with Microsoft or will this be handled by ES&S?

ES&S Response:
More information will be provided on this once Microsoft has finalized the plan. ES&S will stay involved and engaged to assist Wisconsin jurisdictions in facilitating the purchasing of licenses if needed.

h. How long will extended support contracts be in place? Will the contracts be in place until 2023 (or until the customer upgrades to a Windows 10-based system) or will they need to be renewed on a yearly basis?

ES&S Response:
It is our understanding the Microsoft ESU license contracts will be available in three, 12-month increments following the January 2020 End of Support and available until January 2023.

i. To your knowledge, how many current customers in Wisconsin will require extended support contracts for Windows 7-based equipment?

ES&S Response:
ES&S has 30 customer jurisdictions currently on Windows 7 based EMS systems. All will be eligible to participate in the Microsoft ESU program.

3. What is the eventual plan for providing support to customers after extended Windows 7 support is completely discontinued in 2023?

ES&S Response:
ES&S will make every effort to migrate our customer base to Windows 10 based voting systems prior to the January 2023 conclusion of the Microsoft ESU program.

a. If there are still customers using system versions operating Windows 7 as of 2023, will there be a concerted effort to upgrade these customers to Windows 10-based system at that time?

ES&S Response:
Yes. ES&S is planning on bringing EVS releases with Windows 10 to the States well in advance of 2023. It will be ES&S' recommendation that Wisconsin counties upgrade to a Windows 10 based release prior to 2023.

b. Can you assure the Commission that customers who upgrade to a Windows 10-based system will be able to do so without purchasing additional or replacement hardware?

ES&S Response:
Due to the age of some of the voting systems currently in use in the State, we do not anticipate all systems will be able to be upgraded to a Windows 10 platform. Systems purchased in the last 3-5 years will likely support Windows 10 and may not be required to be replaced. However, depending on the age and condition of the equipment, it may be best for jurisdictions to upgrade their hardware to newer systems.

c. Is there a contingency plan in place if customers do not or cannot update to a Windows 10-based system by 2023?

ES&S Response:
ES&S will continue to support our customers that remain on any one of the Windows 7 voting systems certified for use in the State. Given the fact that EMS environments operate in a locked down, closed and hardened environment with no connectivity to the internet and are not subject to the same risks that internet based systems are, by following our recommended security best practices, the counties can trust that their systems are secure and reliable for use.

4. How will ES&S ensure that all impacted systems and equipment are regularly and correctly updated?

ES&S Response:
ES&S regularly reviews vulnerabilities for all of our voting equipment and systems. When a vulnerability is discovered, the ES&S Vulnerability Review team reviews the vulnerability to determine any possible affects it might have on any of our fielded systems. In the event the vulnerability is determined to be critical in nature and represents a risk to the voting system, ES&S will notify affected customers immediately and initiate the Engineering Change Order (ECO) process in accordance with the EAC Testing and Certification Program and Wisconsin certification procedures.

5. When implementing a large-scale update or patch, beyond federal and state certification, and pre-election logic and accuracy testing, how does ES&S ensure that each update was successfully installed?

ES&S Response:
ES&S will thoroughly test the update installation procedures prior to and during the VSTL 3rd party testing. These same Installation procedures will be provided to the Counties ensuring the installations are consistent with the certified procedures. These procedures will include steps to validate the successful installation of the patch or update.

a. How will you provide confirmation that updates/patching have been completed to the county, municipality, or state?

ES&S Response:
Once an ECO is approved by the State, the Windows patches are available to be installed on the EMS systems. ES&S will work with the jurisdictions to have the approved ECO patch files and related documentation staged and sent via secure methods to the jurisdictions. The jurisdictions can then either apply the patches themselves based on the provided instructions or enlist the services of ES&S to apply the patches. ES&S will follow up with each of the jurisdictions receiving the update to verify the patch was applied successfully.

The Commission is committed to providing accurate information to local election officials and the public regarding the status and security of voting equipment used in the State of Wisconsin in a transparent and timely manner. Therefore, please provide a written response to these questions no later than August 30, 2019. If you have any questions, please do not hesitate to contact our office. Thank you for your attention to these issues.

Sincerely,

Wisconsin Elections Commission

Meagan M. Wolfe