ES&S Voting System 5.2.0.3

System Functionality Description

Document Revision 1.0

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Election Systems & Software

MAINTAINING VOTER CONFIDENCE.
ENHANCING THE VOTING EXPERIENCE.

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Table of Changes

Revision	Date	Notes
0.1	*06.23.2015*	*Initial staging for EVS5203. – CC*
1.0	*06.26.2015*	*Release for publication with TDP Rev01. – CC*

Contents

I. INTRODUCTION

The System Functionality Description declares the overall scope of the voting system's functional capabilities.

I.1 PURPOSE

This document declares the scope of the ES&S Voting System's functional capabilities and defines the performance, design, test, manufacture and acceptance context for the system.

This document serves two purposes. Prior to release of a system for national certification testing, this document declares the scope of functionality for an identified voting system. Prior to product release to customers; ES&S product stakeholders, documentation specialists and Quality Assurance specialists can use the declared functionality to perform the following tasks:

- Define functionality for internal audit
- Define functionality for internal, Operations stakeholders
- Define functionality to be used as a work plan for production of technical and end-user documentation

After release to certification, VSTL stakeholders should use this document to:

- Define the functional scope of the voting system and scope of testing
- Define individual functional capabilities that may be used to generate testable items within a system level test plan
- Index to TDP documents that include full descriptions and procedures for implementing declared functionality, which may be used to develop test plan procedures

This document is intended for ES&S technical resources, configuration management stakeholders and VSTL review.

I.1.1 SCOPE

This document lists the ES&S voting system's functional processing capabilities, encompassing all capabilities required by the VVSG and any additional capabilities provided by the system. The System Functionality Description includes simple descriptions of system functionality. Detailed system functional descriptions are included in other TDP documentation.

The System Functionality Description reflects the functional capabilities and desired scope of testing of the system configuration(s) and capabilities declared in the *ES&S Voting System Overview*. While specific products within the system may exceed some documented system level capabilities, the document addresses only the functionality supported by the system detailed in the *ES&S Voting System Overview*.

This document heavily cross-references requirements from the *2005 Voluntary Voting System Guidelines* (2005 VVSG). This document assumes reader familiarity with those guidelines.

I.1.2 TARGET AUDIENCE

The primary audience for this document is the Test Laboratory assigned to perform national certification testing and ES&S Product Development and Certification stakeholders.

The secondary audience for this document may include ES&S technical resources, configuration management stakeholders, Election Assistance Commission ("EAC"), VSTL's, state election certification officials, and ES&S Voting System 5.2.0.3users.

I.1.3 USING THIS DOCUMENT

This document is organized to satisfy the requirements listed in the 2005 EAC Voluntary Voting System Guidelines (VVSG) and directly addresses the following requirements.

VVSG Requirements Addressed in this Document

VVSG Section	Title
V II, Section 2.2	System Functionality Description

Other Requirements Addressed in this Document

Reference	Title
N/A	N/A

I.1.3.1 DOCUMENT CONVENTIONS

- Any references to additional books or documents are indicated by the document name in *serif italics.*
- External links to information, documents, or downloads are indicated as in the following example: www.essvote.com.
  Depending upon the delivery method of this document, some links may not be active links. In this case, copy the link manually to a web browser of your choosing to view or download the external documentation.
- All tables within this document use the term "N/A" to indicate the entry is "Not Applicable" to the software or hardware.

Other conventions

- Capital Letters – Indicate the names of keys or key sequences (CTRL, SHIFT, F1, etc).
- Plus (+) Sign – A combination of keys means to hold down the first key while pressing the second key.
- Monospaced text – source code listing
- Vertical Separator Bars (|) – represent alternative elements
- Braces ({ }} – indicate a required choice
- Brackets ([ ]) – indicate a screen item or physical location on equipment

- Right Chevrons (>) – indicates the method of selecting of a sub menu or dialog item
  e.g.: Click File > Save… [Save Dialog] {file Name}

Notes, Cautions, and Warnings

These typographic indicators alert the reader to special information.

Note Example

NOTE The reader should take note of these suggestions or additional information not covered in this manual.

Caution Example

CAUTION

A caution alert indicates that possible damage can occur to the software or hardware, or improper operation of the equipment or system if the recommendations are not followed. *ES&S shall not be responsible for any damages or injury associated with the failure to follow the recommended procedures.*

Warning Example

WARNING

This warning appears next to procedures that could cause damage to the product or injury to the operator if improperly executed. Carefully read all warnings and proceed with caution if you choose to carry out the related information. *ES&S shall not be responsible for any damages or injury associated with the failure to follow the recommended procedures.*

Unsupported Functionality

This product may exceed the scope of certified functionality noted within the *System Overview*. Additional capabilities listed within this document should be considered outside the scope of certification. Wherever possible, these capabilities are identified with a gray background as in the following example:

Locale-Specific Terminology

References may be made to precincts in this document as the lowest level civil division. This naming convention differs from state to state and localities. The term “Precinct” is used in this document to denote this type of division, whether it is referred to locally as “ED” (Election District – New York), “Polling Station” (Canada), or others.

1. DOCUMENT OVERVIEW

The ES&S voting system includes the following functional subsystems, defined in the *ES&S Voting System Overview*.

Subsystem	Component	Description
Election Management System (**EMS**)	Electionware™ Election Reporting Manager™ (ERM)	**Managing Election Data (Electionware)** Managing election data includes all tasks related to the creation and configuration of the election. The Electionware database stores all of a jurisdiction's precinct, office, and candidate information. Once an initial election database is completed, it can be recalled and edited for all following elections. System event log administration includes a series of applications that track all user and equipment actions throughout the election process. **Formatting Ballots (Electionware)** This functional subsystem of Electionware includes all activities related to defining the image of a paper ballot and populating the ballot with contest, candidate and referendum information from the Electionware Database. **Configuring Ballot Handling Equipment (Electionware)** Configuring ballot handling equipment includes all tasks required to convert Electionware database information into ballot definition parameters for tabulation and ballot marking equipment. Within this functional subsystem, election management software users program the ballot counting rules for a specific election – the election definition - to the memory devices used to program tabulation equipment. **Results Consolidation and Reporting (ERM)** Results consolidation and reporting encompasses the system functions required to gather and combine results from multiple tabulators and tabulator types, and then generate paper and electronic reports for election workers, candidates, and the media.
Universal Voting System (**UVS**)	ES&S ExpressVote™	Universal voting system that supports vote capture functions for all voters, with independent voter verifiable paper record which is digitally scanned for tabulation. This device takes into account the full range of human diversity, including physical, perceptual and cognitive abilities, as well as different body sizes and shapes.
Precinct Ballot Tabulators (**PBT**)	ES&S DS200™	Precinct ballot tabulation includes the activities required to prepare, test and implement ES&S precinct ballot tabulators within a polling place environment.
Central Ballot Tabulators (**CBT**)	ES&S DS850™	Central ballot tabulation includes all tasks required to prepare, test and scan official ballots at a central count location.
Ballot Marking Devices (**BMD**)	ES&S AutoMARK™ Voter Assist Terminal	Electronic ballot marking includes all tasks related to preparing, testing and implementing ES&S' electronic ballot marking device for use in a polling place environment.

1.1 USING THIS DOCUMENT

As suggested in VVSG 2005 Vol. 2, Sec. 2.3, Section 2 of this document is formatted as a checklist referencing functional requirements of VVSG 2005 Vol. 1, Section 2. Pre-release, ES&S product stakeholders use this checklist to define the functional capabilities of a specific voting system. Once functional capabilities are defined, ES&S documentation stakeholders review the checklist to ensure that each system function is adequately documented.

In the following sections, each functional requirement is listed in the following format:

SAMPLE REQUIREMENT

Requirement Source | Requirement text

Each requirement is followed by a table that cross-references the requirement, indicates which subsystem addresses the requirement and describes how the requirement is met.

Sample Description

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
Requirement 1 cross Reference	•	•	•	•	•	•	Yes/No	The DS200 Precinct Ballot Counter employs advanced image scanning technology to quickly process ballots formatted in a variety of lengths and accurately discriminate between valid voter selection marks and extraneous ballot elements such as perforations, smudges, and folds. The DS200 is designed and constructed to sustain reading accuracy during the required operating period with a reliability level exceeding 99.999 percent.
Requirement 2 cross Reference	•	•	•	•	•	•	Yes/No	The DS200 reads only properly marked ballot targets that appear in the scanner's designated read area. ES&S configures the scanner's optical thresholds to ignore erasures and improperly marked targets. Marks that meet the strict requirements to be considered a valid vote and converted into digital data for vote accumulation.

1.1.1 ADDITIONAL REQUIREMENTS

Additional requirements include any functionality not directly addressed by 2005 VVSG Vol.2, Sec. 2.3. As suggested by 2005 VVSG Vol. 2, Sec. 2.3, additional requirements are organized under the same structure as 2005 VVSG Vol 1. Sec. 2 (Overall, Pre-Voting, Voting, Post-Voting) and appear under "Additional Requirements" sections following each major subsection of this document.

1.1.2 RELEASE FOR TESTING

ES&S provides this document to VSTL test stakeholders to define the functional context of the voting system. The ES&S *System Functionality Description* may be used to define the scope of functional testing for the ES&S voting system.

2. FUNCTIONAL REQUIREMENTS

2.1 OVERALL SYSTEM CAPABILITIES

CONTROLLING REQUIREMENT

V: 1, §2.1

Overall system capabilities describe functional capabilities that are system-wide in nature and not unique to pre-voting, voting and post voting operations. The following sections describe the ES&S voting system's capabilities to support the following subcategories of overall system functionality:

1. Security
2. Accuracy
3. Error Recovery
4. Integrity
5. System Audit
6. Election Management System
7. Vote Tabulation Program
8. Ballot Counter
9. Telecommunications
10. Data Retention

2.1.1 SECURITY

CONTROLLING REQUIREMENT

V: 1, §2.1.1

System security is achieved through a combination of technical capabilities and sound administrative practices. To ensure security, all systems shall:

a. Provide security access controls that limit or detect access to critical system components to guard against loss of system integrity, availability, confidentiality, and accountability.

b. Provide system functions that are executable only in the intended manner and order, and only under the intended conditions.

c. Use the system's control logic to prevent a system function from executing if any preconditions to the function have not been met.

d. Provide safeguards in response to system failure to protect against tampering during system repair or interventions in system operations.

e. Provide security provisions that are compatible with the procedures and administrative tasks involved in equipment preparation, testing, and operation.

f. Incorporate a means of implementing a capability if access to a system function is to be restricted or controlled.

g. Provide documentation of mandatory administrative procedures for effective system security.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.1.a	●	●	●	●	●	●	●	**EMS** In addition to the product level security features identified below, implementing physical and program level security controls to the PCs running ES&S Unity election management software is also required. Refer to the *ES&S Voting System Security Specification*, and *Hardening the EMS PC*. Further security of the installed programs as well as external access to the files is achieved through the standard use of Windows network security to limit access. Federal guidelines require that Election Administrators implement a mandatory election security program. All paper ballots and election results media must be retained to facilitate results audits and ensure system security. Electionware uses a built-in account management system to restrict user access. This system allows the election administrator to create user accounts with access rights for managing accounts, changing the target tabulator information and importing/exporting election data. The Electionware PostgreSQL database is password protected. The user password field is encrypted using a hash algorithm. An audit log of all user activity is stored in the Electionware event database. Events can be accessed through Electionware, providing the user has administrative rights. Electionware also logs exception conditions that cause the application to shut down to Windows Event Log Service. ERM security as well as securing external access to files is achieved by applying Windows network security as documented in the Hardening the EMS PC. The network administrator is responsible for setting up user IDs with appropriate folder access. The Windows Event Log logs all user activity including user type, date, time, application in use, user ID and computer name. All ERM System Log messages are written to the Windows Event using the ES&S Event Log Service. System security for ERM limits casual access to system files and election results but also depends on sound security practices at the election office as documented in ES&S Voting System Security Specification. Officials must impose administrative and physical controls that limit access to ERM and election results to authorized personnel only. Election officials must also ensure PCs running ERM remain secure before and after each election. Access to election results generated in ERM must be regulated and officials must compare election reports generated in ERM to scanner totals in order to make sure that final results are consistent with the results from ballot scanning equipment. All paper ballots and election results media must be retained to facilitate results audits and ensure system security. **UVS** ExpressVote Operating Software and physical controls provide security access controls that limit or detect access to critical system components and to guard against loss of system integrity, availability, confidentiality, and accountability.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								ExpressVote physical and system controls include: • Side access panel – Locking door protects access to USB ports used for media insertion, as well as switches for powering the unit off and on and switching between voter and administrative functions • Ballot Access Doors – Lockable doors to provide access to the paper transport in the event of a jam are located on the front and side of the ExpressVote. • Pass code protected menus – Access to test and administrative menus require the input of the proper access codes set in Electionware in addition to a toggle switch located behind a locked door. **PBT** The ES&S DS200 includes three locks to physically prevent unauthorized access to the internal components. The first lock secures the LCD display. This laptop type hinging display doubles as a built in security lid. When it is locked into its down or stored position, access to the scanner throat and other components are denied. The second lock, that cannot be accessed until the lid is raised, prevents unauthorized access to the DS200 Election Media, the Power, and Close Polls switches. An additional lever in this switch compartment controls access to the printer and paper loading mechanism. The third lock controls access to a post election process panel. This includes a Personal Electronic Ballot well for importing results from the ES&S iVotronic (*Note*: the iVotronic function is not supported in this release.) This locking panel also contains an RJ-11 jack for landline modem support. There is also an additional USB drive under this door for use of a backup polling results media USB drive or for expansion purposes. After the precinct counter is attached to the ballot box for vote tabulation, a locking door hinges into place over the front of the counter to prevent removal of the device. This also prohibits access to an expansion USB port, described in the previous paragraph, on the back of the DS200. **BMD** AutoMARK Operating Software and physical controls provide security access controls that limit or detect access to critical system components and to guard against loss of system integrity, availability, confidentiality, and accountability. Features that limit system access include: • Unavailability of Operating System – The system boots directly to the application. No access to the OS is provided through any menu. • Front access panel — Locking door protects the Flash Memory Card port. • Keyed Activation — System activation and operating mode is selected using a physical key. • Pass code protected menus — Access to test and administrative menus require input of the proper access codes set in Electionware in addition to the physical key.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								CBT DS850 core components, ports and switches are secured with lockable, sealable access panels to prevent unauthorized access vital functions. These include: • Rear System Access Panel — Dual locks, as well as a wire-seal mechanism control access to all vital power, processing, and transport functions. • Data Port Access Doors — Transparent lockable doors with wire-seal mechanisms protect all externally accessible data ports, including USB and Ethernet. • Power Access Door — Transparent lockable doors with wire-seal mechanisms protect the power cable, as well as the power switch for the unit. In addition, pass code protection limits all functions beyond basic scanning. The tabulator's operating software provides security access controls to limit and detect access to critical system components and to guard against loss of system integrity, availability, confidentiality and accountability.
V: 1, §2.1.1.b	●	●	●	●	●		No	**EMS** Electionware limits program access by requiring an authorized administrator to create an account (user name and password) for the intended users. Administrative and non-administrative users have different application privileges. Administrative users may access all areas of the program. Non administrative users may only open datasets and create Election Media. Electionware - Paper Ballot limits program access by requiring an authorized user to launch the application through Electionware. All administrative and non-administrative users have the same ballot creation privileges. Electionware tasks to create an election must be executed in the intended order. For example, election data must be configured in the capture module or imported prior to editing ballot formats. ERM safeguards against functions being executed out of order by displaying an error message stating that the prior function has not been completed. Also, once a new Results database is generated and equipment type(s) selected any further option selected that does not match the equipment type results in an error message referencing the invalid equipment type selected. **UVS** ExpressVote boots to the operating applications and only functions in the manner and order intended, and only under the intended conditions. **PBT** System functions will not execute if election workers do not configure the system properly and execute functions in the intended order. The ES&S DS200 is designed to guide the user through the open and close polls processes. The LCD display will only provide access to those tasks suitable for the current mode of operation.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								BMD The AutoMARK boots to the operating applications and only function in the manner and order intended, and only under the intended conditions. **CBT** DS850 system functions are only executable in the manner and order intended, and only under intended conditions. System and scanning functions will not execute if election administrators do not configure the system properly. The DS850 interface guides the user through all basic operation. The LCD touch screen display and application provide access to only those items suitable for the current mode of operation.
V: 1, §2.1.1.c	●	●	●	●	●		No	**EMS** Electionware and ERM prevent execution of any system function if the precondition for that function is not met. Error messages and conditionally activated interface controls prevent users from exercising an invalid workflow. **UVS** ExpressVote control logic prevents ballot printing executing if any preconditions to this function have not been met. **PBT, CBT** The DS200 and DS850 operate as standard embedded devices. A scanner operator cannot override required preconditions except those specified by the *Voluntary Voting System Guidelines* and authorized by the appropriate election official. For ballot scanning equipment used at the polling place, access to controls that change the operating mode of the scanner are physically locked between opening and closing the polls. **BMD** The AutoMARK's control logic prevents ballot marking executing if any preconditions to this function have not been met.
V: 1, §2.1.1.d	●	●	●	●	●		No	**EMS** All EMS applications provide detailed logging of events, errors, and warnings within Window's encrypted Event Manager Service database or within the Electionware encrypted log. System event logs allow an administrator to retrace all access to the EMS components and print/save the events. Event information includes the event type, date, time, ES&S application, user ID and in the case of the ERM application, the computer name. EMS component tampering is prevented through the use of passwords to access the application and subsystems within the application, depending upon the application. See product Software Design and Specifications for additional password details. See *ES&S System Hardening Procedures* and *ES&S Voting System Security Specification* for voting system security capabilities and requirements. **UVS** Control over physical to critical ExpressVote components is controlled by use of a combination of locks, special screws, allowances for seals to detect tampering. Operation of the unit cannot be modified and operations are access code protected.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								PBT DS200 hardware circuitry has no capability to write or otherwise change the election program once installed. The physical design of the system does not include any form of data entry keypad, providing a general safeguard for critical data. All supervisor functions are limited to the controls provided on the touch screen. **BMD** AutoMARK hardware includes safeguards to protect the unit against tampering during system repair, or interventions in system operations, in response to system failure. Refer to the *AutoMARK ESS System Hardware Specification AQS-18-5000-001-F* for more information. **CBT** The DS850 uses key-locks and special screws to protect the unit against tampering during system repair, or intervention in system operations, in response to system failure. The DS850 has no capability to write or otherwise change the election program once installed. The contents of the DS850 election media are digitally signed and verifiable using the application. The design does not include any form of data entry keypad thus providing a general safeguard for critical data. All administrative functions are limited to the controls allowed through the touch screen interface.
V: 1, §2.1.1.e	●	●	●	●	●		No	**EMS** Procedures for securing a PC for EMS installation appear in *ES&S System Hardening Procedures*. Hardening procedures secure the PC without affecting the ability of the EMS to execute tasks required to prepare, test or operate voting system software and equipment. **UVS** Access controls to ExpressVote during equipment preparation, testing and operation is provided by the appropriate ES&S system administrator prior to delivery of the system, or by election officials upon delivery. Administrative functions are password protected. System security measures and features do not limit any activity required for preparing, testing or operating equipment. **PBT** ES&S DS200 design prevents casual access to sensitive areas of the machine, but tabulator security ultimately depends on proper administrative procedures at the polling place and election headquarters. Supervisor functions for preparing, testing and operating equipment are limited to the controls provided in the system menus. Locking panels and system passwords protect system operating modes and system administrative functions used for preparing and testing equipment. **BMD** System access to AutoMARK during equipment preparation, testing and operation is provided by the appropriate ES&S system administrator prior to delivery of the system, or by election officials upon delivery. Administrative functions are password protected. System security measures and features do not limit any activity required for preparing, testing or operating equipment.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								CBT DS850 security measures and features do not limit any activity required for preparing, testing or operating equipment. DS850 design limits casual access to the machine but effective equipment security ultimately depends on election officials using best security practices at the counting location. Ballots should remain sealed in ballot boxes until counting begins. Officials should limit access to the scanner only to authorized personnel and make sure the scanner remains secure after testing and prior to the election. The DS850 does not have the ability to overwrite or change the election definition or system firmware once a precinct official installs the election program. Supervisor functions are limited to the controls provided in the operator panel. The DS850 has a ballot security measure in place to help protect against unauthorized ballots. [Not implemented in this release].
V: 1, §2.1.1.f	●	●	●	●	●		No	**EMS** All activity is restricted by the Electionware account management system or Window's User Account Management system (See: item 'a', above.). See *ES&S System Hardening Procedures* for procedures for configuring Windows account management. **UVS** The ExpressVote's administrative menu cannot be accessed without a physical key and system access code. An additional code is needed to access the maintenance menu. **PBT** Electionware election and the DS200 share a robust Digital Signature and password security feature. This feature provides a high level of security on data that is transferred between the election management software and the DS200. Please see the ES&S Voting System Security Specification for more details on the public and private key management and security process. The system includes password protection to prevent unauthorized access to certain system functions. The system-operating mode is physically controlled with a physical key. **BMD** The AutoMARK administrative menu cannot be accessed without a physical key and system access code. An additional code is needed to access the maintenance menu. **CBT** TheDS850 system includes password protection to prevent unauthorized access to certain system functions. Access to the system system-operating mode is controlled with a physical key.
V: 1, §2.1.1.g	●	●	●	●	●		No	**EMS** ES&S recommended administrative practices for securing voting equipment and the EMS PC appear in *ES&S Voting System Security Specifications*. Procedures for configuring Windows security settings for an EMS PC appear in *Hardening Procedures for the Election Management System PC*. Federal guidelines require Election Administrators to implement a mandatory election security program.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								For Electionware, Documentation of login and logout security procedures is provided in Electionware User's Guides. System user documentation provides procedures for setting up and maintaining password functions for ERM. In addition to password controls, officials must limit physical access to ERM and to stored tabulator results to authorized personnel only. Officials should also make sure that the PCs running ERM remain secure before and after each election and should compare final election results to totals generated directly from the tabulators to ensure that data was not tampered with during the results transfer. **UVS** Procedures for effective system security for the ExpressVote appear in the ExpressVote Operator's Guide and the ES&S Voting System Security Specification. **PBT, CBT** Please see *ES&S Voting System Security Specification* for mandatory administrative procedures for securing ES&S ballot tabulators. **BMD** Mandatory administrative procedures for effective AutoMARK system security appear in the *AutoMARK Operator's Guide* and the *ES&S Voting System Security Specification*.

2.1.2 ACCURACY

CONTROLLING REQUIREMENT

V: 1, §2.1.2

Memory hardware, such as semiconductor devices and magnetic storage media, must be accurate. The design of equipment in all voting systems shall provide for the highest possible levels of protection against mechanical, thermal, and electromagnetic stresses that impact system accuracy. VVSG 2005 Section 4 provides additional information on susceptibility requirements. To ensure vote accuracy, all systems shall:

a. Record the election contests, candidates, and issues exactly as defined by election officials.

b. Record the appropriate options for casting and recording votes

c. Record each vote precisely as indicated by the voter and produce an accurate report of all votes cast.

d. Include control logic and data processing methods incorporating parity and checksums (or equivalent error detection and correction methods) to demonstrate that the system has been designed for accuracy.

e. Provide software that monitors the overall quality of data read-write and transfer quality status, checking the number and types of errors that occur in any of the relevant operations on data and how they were corrected

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.2.a	●	●	●	●	●		No	**EMS** ERM uses configuration data from the Electionware database to define the contests, candidates and issues to build an election specific results database. Results consolidation and reporting accuracy is verified through standard logic and accuracy testing. **UVS** ExpressVote contest, candidate, and issue data is configured in Electionware. System accuracy is verified by testing voting functions and printing a test summary card for each defined ballot style to verify all positions are correctly selectable. **PBT, CBT** The DS850 and DS200 read configuration data from Electionware-generated Election Media. Tabulator election definitions exactly mirror the ballot contents and issues defined within the EMS. System accuracy is verified through logic and accuracy testing. **BMD** AutoMARK contest, candidate, and issue data is configured in Electionware. System accuracy is verified by performing a test print on a blank ballot from each defined ballot style to verify all positions are correctly selectable..
V: 1, §2.1.2.b	●	●	●	●	●		No	**EMS** ES&S ballot tabulators capture all voter selections. ERM aggregates the tabulated results. ERM provides user options for the categorization and reporting of these results. **UVS** ExpressVote creates readable text and bar codes on a narrow format voting card that accurately captures the voter's choices. ExpressVote can read the voted card and display/read the voters original choices.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								System accuracy is tested by test marking blank test cards and then using those cards to perform L&A testing with an ES&S ballot tabulator. **PBT** The ES&S DS200 detects and records valid marks as well as exception conditions or ballot handling options such as overvotes and undervotes, blank contests or ballots marked too lightly for the scanner to register. Election officials have the option to program the scanner to return ballots containing exception conditions to the voter for revision. **CBT** The DS850 detects valid marks as well as exception conditions such as ballot misreads, ballot not recognizable, ballots that cannot be processed, ballot jams while navigating the transport, cross-voted ballots in an open primary, ballots with write-ins, overvotes and undervotes as well as blank ballots or ballots marked too lightly for the scanner to register. Initial settings for the sorting of such conditions are set in the EMS and loaded onto the DS850 as part of the election definition. Election officials have the option to change these settings after the proper access code is provided and as the laws of the particular jurisdiction allow. **BMD** The AutoMARK does not record votes, but accurately translates voter inputs to mark targets on a paper ballot.
V: 1, §2.1.2.c	●	●	●	●	●		No	**EMS** ERM reports all tabulator results as recorded by ES&S ballot scanning equipment. During the database update for tabulator results, ERM runs checks to ensure that votes within any office do not exceed the ballots cast and that the database does not contain more or less candidates than the tabulator. Any exception condition is reported to the user via error message. **UVS** ExpressVote does not record votes, but accurately captures and translates voter selections to a printed voting card. System testing verifies that ballots are marked precisely and as intended. Vote recording and reporting is handled by the tabulator and EMS reporting subsystem. **PBT** The ES&S DS200 accurately records all ballot targets selected by the voter. Vote totals are stored to the system's removable Election Media. Polling results are generated directly from the system's integrated thermal printer or consolidated with results from other scanners using compatible election reporting software to produce combined election totals reports. The DS200 was designed to meet or exceed the accuracy requirements of the 1.5 million-mark test. System accuracy is verified through standard logic and accuracy testing. **BMD** The AutoMARK does not record votes, but accurately translates voter selections into marks on an ES&S paper ballot. System logic and accuracy testing verifies that ballots are marked precisely and

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								as intended. Vote recording and reporting is handled by the tabulator and EMS reporting subsystem. **CBT** The DS850 accurately records all ballot targets as selected by the voter. Vote accumulation records are saved to the system hard drive and can be transferred to the system's inserted ES&S Media Device. Accurate, machine level results reports may be generated directly from the system's report printer or consolidated with results from other scanners using compatible election reporting software to produce combined election totals reports. The DS850 was designed to meet or exceed the accuracy requirements of the 1.5 million-mark test. System accuracy is verified through standard logic and accuracy testing.
V: 1, §2.1.2.d	●	●	●	●	●		No	**EMS** Error detection and correction is handled by PC operating system and Cobol. All data I/O is handled through the Cobol runtime and reports back any unsuccessful data I/O. Please see the Election Reporting Manager User's Guide accompanying this TDP for additional information regarding RMCOBOL errors. **UVS** ExpressVote does not store results to system memory. Accuracy is measured on the ballot scanner. **PBT** The ES&S DS200 accumulates votes to an internal running total during the Close Polls routine. This total is stored in both DRAM and the system's Election Media. After each successful ballot scan, the software performs a cross-reference check of the counts against the expected ballot. If no problems are found, the ballot information will be copied to the Election Media and the ballot fed into the ballot box to the appropriate compartment (Write-In or Non-Write-In Sections). However, if the cross-reference check fails, the ballot will be fed back out of the paper transport mechanism, and the system performs the appropriate voting process error handling function. The DS200 also collects bitmap images of all ballots. Depending options configured during election coding, the system will collect all ballot images, only images that include write-in votes or none at all. The system also includes control logic to determine if the DS200 Election Media is full, and provide the ability to gracefully shut down the tabulator. Ballot coding and identification includes parity checking to ensure accurate ballot identification. **BMD** The ES&S AutoMARK does not store ballot results to system memory. To ensure mark accuracy, the system provides automated and manual routines for calibrating the system screen, scanner, and marking device for the AutoMARK. In the case of the ExpressVote, screen and scanner calibration. Accuracy of marking of ballots can be tested using the test print function on the test menu. This also verifies read accuracy as verification of the printed mark is intrinsic in printing. Additional read accuracy can be verified by hand-marking a paper ballot and verifying the ballot using the AutoMARK ballot validation

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								command. See ES&S AutoMARK Operator's Guide for procedures for executing ballot printer calibration routines and for validating marked selections. **CBT** Industry standard error detection and correction methods are implemented at all levels of the O/S and firmware. The DS850 takes a snapshot of each ballot and saves the bitmap image on the internal hard drive. Each ballot data XML file records the ballot's votes, identifying write-ins (not the actual write-in name image), overvotes undervotes, etc. Once ballots are scanned and saved, the operator can print Results Reports or Export Results to an ES&S Media Device. Either of these options will automatically aggregate the vote data for all the ballot vote image records. Aggregated totals on the ES&S Media Device can then be transferred to a software application for reporting purposes. The user also has the option to transfer the ballot images to an ES&S Media Device for review. Electionware allows the user to define which ballot images are to be copied to the ES&S Media Device (all ballot images, only those containing write-in votes, exception images only, write-in and exception images only or not at all; [not completely implemented in this release]).
V: 1, §2.1.2.e	•	•	•	•	•		No	**EMS** Read-write and data quality checks are handled by PC operating system and Cobol. All data I/O is handled thru the Cobol runtime and reports back any unsuccessful data I/O. Please see the Election Reporting Manager User's Guide for a list of system generated error messages errors. **UVS** ExpressVote generates an error if the system detects any issues translating a voter selection to a printed card. The vote summary, provided as display or audio, prevents a voter from marking an unwanted target. ExpressVote prints the card only after the voter confirms selections. See the ES&S ExpressVote Operator's Guide for a description of the voting summary routine and a description of system error messages. **PBT** DS200 Election Media contains storage space for polling results. The results are written to during the Close Polls process, which accumulates data resulting in the stored ballot files. Whenever a ballot is successfully read, the ballot data is saved internally and on the Election Media During the Close polls process, totals are updated, and a CRC (an error checking method) is generated on the new results values. The counts, along with the CRC value, are stored back onto the DS200 Election Media. The DS200 records and reports the date and time of normal and abnormal events, and maintains a permanent printed audit record. The system detects and records significant events in a log stored on the Election Media Device. See the DS200 Operator's Guide for instructions for retrieving this log. **BMD** ES&S AutoMARK firmware generates an error message if the system detects any issues when translating a voter selection into a printed mark. A ballot summary UI provides a summary of voter

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								selections in the selected ballot format; display or audio to prevent a voter from marking an unwanted ballot target. The voter must confirm selections before the system marks the paper ballot. See the ES&S AutoMARK Operator's Guide for a description of the ballot summary routine and a description of system error messages. **CBT** The DS850 records and reports the date and time of normal and abnormal events, and maintains a permanent printed record of audit information. The system detects and records significant events and reports critical errors or errors that require user intervention to the user for appropriate action. See the DS8500 Operator's Guide for instructions for retrieving this log.

2.1.2.1 ADDITIONAL REQUIREMENTS FOR DRE SYSTEMS

CONTROLLING REQUIREMENT

V: 1, §2.1.2.f — As an additional means of ensuring accuracy in DRE systems, voting devices shall record and retain redundant copies of the original ballot image. A ballot image is an electronic record of all votes cast by the voter, including undervotes

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.2.f						•	N/A	N/A

2.1.3 ERROR RECOVERY

CONTROLLING REQUIREMENT

V: 1, §2.1.2

To recover from a non-catastrophic failure of a device, or from any error or malfunction that is within the operator's ability to correct, the system shall provide the following capabilities:

a. Restoration of the device to the operating condition existing immediately prior to the error or failure, without loss or corruption of voting data previously stored in the device.

b. Resumption of normal operation following the correction of a failure in a memory component, or in a data processing component, including the central processing unit

c. Recovery from any other external condition that causes equipment to become inoperable, provided that catastrophic electrical or mechanical damage due to external phenomena has not occurred.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.3.a	•	•	•	•	•		No	**EMS** Electionware does not store voting or results data. All election configuration data is stored within a relational database. If an instance of the Electionware prematurely terminates due to a crash, power loss, or hardware failure, the user's data will appear on the next Electionware start-up. If the crash affects the database, the user will be able to recover the election data using manually backed-up database files. See the save/restore process described in Electionware user documentation. Electionware database files can be backed and restored using prescribed and documented procedures from ES&S and the database vendor's standard backup techniques. The drive containing the files which make up the election data should be backed up according to the requirements of the System Security Specification so that these files may be restored in the event of hardware failure. Depending on the error encountered the user may be returned to the main ERM system screen or a prior screen within the operation. This allows the user to restart the operation. ERM has the ability to restore data from backup file and reprocess files generated from reading tabulator media or tabulator media may also be reread. **UVS** ExpressVote resumes the operational condition existing immediately prior to an error or failure when recovering from non-catastrophic error condition such as a paper misfeed or low battery warning. Vote data is not retained once the vote session ends or the paper card is removed. **PBT** The ES&S DS200 can transfer the Election Media to a back-up media device. Upon insertion of the backup unit, the DS200 validates the integrity of the memory device and initiates a recovery process that allows any replacement DS200 to continue adding ballot images and counts to the Election Media. A backup media device is available for use and housed in the locked auxiliary USB compartment located behind the front USB compartment. The backup media is automatically detected and

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								upon polls close the results are also copied to the backup media. See System Error Recovery in the DS200 *Operator's Guide* for more details. **BMD** The AutoMARK resumes the operational condition existing immediately prior to an error or failure when recovering from non-catastrophic error condition such as a low-ink warning or low battery warning once the error condition is corrected. Voter selections are only temporarily stored until a ballot is printed. No voting data is permanently stored. **CBT** The DS850 stores all voting data to non-volatile memory that is tested to prove its susceptibility to failure conditions is appropriate. The user interface provides clear instructions in the event of an error or failure to indicate to the user what data has completed processing and what data was not completed when the failure occurred and must be reprocessed.
V: 1, §2.1.3.b	●	●	●	●	●		No	**EMS** A jurisdiction's administrative procedures must require periodic back up of data to a secure network drive or external Read Only memory device to ensure that election data can be restored following a hardware failure. Resumption of Electionware operation is dependent upon the type of equipment failure encountered on the Windows operating system platform, which is not under control of Electionware. The cases below note the worst case scenarios: Data Import and Data Entry: If a hardware error condition occurs while importing data, the import operation is aborted and the same operation can be reinitiated. If a complete disk failure occurs, best practices involving periodic backups must be used to restore election data. Data then may be re-imported from a backup. Data Export: If a hardware error condition occurs while exporting data, reformatting the Election Media device and exporting the election data. In ERM, a warning message appears if a non-fatal error, such as the failure to generate files or save data occurs. The program explains why the error occurred and gives the operator the opportunity to resolve the problem. **UVS** Recovery from a mechanical failure or other error that results in damage to the paper record or re-starting after a non-recoverable system error must be done by following the procedure to spoil the paper record and re-initialize with a new activation card. **PBT** The ES&S DS200 backup media device provides recovery functionality in the event of a memory failure. A backup media device is available for use and housed in the locked auxiliary USB compartment located behind the front USB compartment. The backup media is automatically detected and upon polls close the results are also copied to the backup media.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								See System Error Recovery in the DS200 *System Operator's Guide* for more details. **BMD** To recover from a mechanical failure or other error that results in damage to the ballot or a non-recoverable system error, poll workers must follow the procedure to spoil the ballot and re-initialize the system. **CBT** The DS850 stores all voting data to non-volatile memory. After replacing the failed component, the DS850 is capable of resuming normal operation.
V: 1, §2.1.3.c	●	●	●	●	●		No	**EMS** Jurisdiction administrative procedures must require periodic back up of data to a secure network drive or external Read Only memory device to ensure restoration of election information following a hardware failure. All Electionware election data is stored within database files on the Windows platform. Electionware database files can be backed and restored using Electionware's built-in backup or standard PostgreSQL database tools. The drive containing the files which make up the election data should be backed up periodically so they can be restored in the event of hardware failure. For ERM users, backup files must be created at the completion of major setup sections. These can be used to recover from file corruption that may occur due to unforeseen occurrences. **UVS** Recovery from a mechanical failure or other error that results in damage to the paper record or re-starting after a non-recoverable system error must be done by following the procedure to spoil the paper record and re-initialize with a new activation card. **PBT** The DS200 backup media device provides recovery from inoperable equipment. **BMD** Recovery from a mechanical or other error that results in damage to the ballot or a non-recoverable system error must follow the procedure to spoil the ballot and re-initialize the system with a new ballot. **CBT** The DS850 is capable of recovering from external conditions that are not catastrophic, once the issue causing the equipment to be inoperable has been resolved. More serious conditions may require maintenance by a qualified DS850 technician before normal operation can be resumed.

2.1.4 INTEGRITY

CONTROLLING REQUIREMENT

V: 1, §2.1.4

Integrity measures ensure the physical stability and function of the vote recording and counting processes.

To ensure system integrity, all systems shall:

a. Protect against a single point of failure that would prevent further voting at the polling place.

b. Protect against the interruption of electrical power.

c. Protect against generated or induced electromagnetic radiation.

d. Protect against ambient temperature and humidity fluctuations.

e. Protect against the failure of any data input or storage device.

f. Protect against any attempt at improper data entry or retrieval.

g. Record and report the date and time of normal and abnormal events

h. Maintain a permanent record of all original audit data that cannot be modified or overridden but may be augmented by designated authorized officials in order to adjust for errors or omissions (e.g., during the canvassing process).

i. Detect and record every event, including the occurrence of an error condition that the system cannot overcome, and time-dependent or programmed events that occur without the intervention of the voter or a polling place operator.

j. Include built-in measurement, self-test, and diagnostic software and hardware for detecting and reporting the system's status and degree of operability.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.4.a		●	●	●			No	**UVS** ExpressVote does not store election results, ensuring no data is lost if equipment fails. The election definition and log data can be moved to a spare ExpressVote device for continued operation after equipment failure. **PBT** DS200 system firmware, election definition and terminal results are stored on the DS200 Election Media that can be removed and re-installed into a replacement DS200 system in the event of catastrophic terminal failure. **BMD** The AutoMARK does not store any election results, system firmware, election definition and terminal results are stored on the Flash Memory Card, which contains the election definition, can be removed or a duplicate card used and transplanted installed in a replacement BMD system in the event of catastrophic terminal failure.
V: 1, §2.1.4.b	●	●	●	●	●		No	**EMS** Electionware cannot protect against interruption of power as it is software running on a Windows PC. Common jurisdictional procedural processes, such as the use of an Uninterruptable Power System and frequent data backup plan protect the system in the event of a power loss.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								UVS ExpressVote backup batteries protect against interruption of electronic power. **PBT** A backup battery maintains the system in the case of a power failure during the election process. The Back-up and Recovery Subsystem provides back-up in the event of a power or machine failure. The ES&S DS200 includes a 21-volt, 10 cell lithium-ion battery that needs no special maintenance. The battery obtains its charge automatically from the system power supply. It ensures complete protection from power failure and provides up to two hours of normal operation in the event of a power failure. The precinct counter can operate without the battery installed. **BMD** The AutoMARK is equipped with backup batteries that protect against interruption of electronic power. **CBT** The DS850 is equipped with a backup and recovery subsystem that provides the reliable retention of data in the event of a power failure or mechanical malfunction. ES&S recommends an Un-interruptible Power Supply (UPS) be provided during the usage, in the event that there is a loss of AC power. The UPS also provides conditioned power in the event of issues with a facility's power including spikes, surges, dips, and brown-outs.
V: 1, §2.1.4.c		●	●	●	●		No	**UVS** ExpressVote hardware design protects against electromagnetic radiation as well as ambient temperature and humidity fluctuations. **PBT, CBT** The ES&S DS850 and DS200 comply with Rules and Regulations of the Federal Communications Commission, Part 15 "Radio Frequency Devices", Subpart J, and "Computing Devices". The DS850 embedded computer is considered a "Class B" computing system, as defined therein. **BMD** The hardware design of the AutoMARK unit protects each system against electromagnetic radiation and ambient temperature and humidity fluctuations.
V: 1, §2.1.4.d		●	●	●	●		No	**UVS, PBT, CBT, BMD** As a condition of successful voting system certification, ES&S independently tests voting system hardware to withstand storage temperatures between –4 and +140 degrees Fahrenheit. System hardware must also pass independent tests to withstand uncontrolled humidity equivalent to the procedure of MIL-STD-810D, Method 507.2, Procedure I-Natural Hot-Humid. All ES&S voting system equipment is designed to meet the listed environmental requirements.
V: 1, §2.1.4.e	●	●	●	●	●		No	**EMS** Electionware data input devices consists of a standard PC and peripherals that allows simple exchange of the components if failure of a data input device occurs during creation of the

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								election definition (Pre-voting). If Electionware encounters read/write failure or detects incompatibility with an election media device used to transfer configuration data from Electionware to a ballot counting or ballot marking device, the system generates an error message that describes the issue to the election worker and ceases writing data to the election media. If data is corrupted or a data input device is damaged between data being loaded in Electionware and transferred to ballot counting or marking devices, the DS200, AutoMARK and DS850 will detect incompatibilities with the input device spawn an error message for the election worker upon attempting to load data from such devices and prevent data from being loaded. Election configuration data is stored within a relational database files on the Windows platform. Electionware database files can be further protected by being backed and restored using prescribed and documented procedures noted in the Electionware User's Guide from ES&S and the database vendor standard Windows file system techniques. The drive containing the files which make up the election data should be backed up according to the requirements of the System Security Specification so that these files may be restored in the event of hardware failure. ERM contains integrity checks that verify no office contains more votes than ballots cast and that the database does not contain more or less candidates than the tabulator. The operating system checks all standard election media data transfers. Back up data including election configurations and results data for all EMS components must be archived for at least 22 months. **UVS** ExpressVote memory management protects resident memory against the failure of any data input or any attempt at improper data entry or retrieval. In addition, the unit does not permanently stores vote selections on any storage device whether internal or external removable. **PBT** When DS200 Election Media is removed from the tabulator, or the power is shut off, the Election Media will preserve the data for at least22 months. Other provisions include protection against: generated or induced electromagnetic radiation; ambient temperature and humidity; and any attempt at improper data entry or retrieval. The preservation of paper ballots is the domain of the jurisdiction and should follow their own storage and archival procedures. **BMD** The AutoMARK utilizes memory management that protects resident memory against the failure of any data input or any attempt at improper data entry or retrieval. In addition, the unit does not permanently stores vote selections on any storage device whether internal or external removable. **CBT** Data is securely preserved on the removable ES&S Media Device for at least 22 months. The internal Hard Drive stores a protected copy of the information contained on the ES&S Media

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								Device. Other provisions include protection against: generated or induced electromagnetic radiation; ambient temperature and humidity; and any attempt at improper data entry or retrieval.
V: 1, §2.1.4.f	●	●	●	●	●		No	**EMS** Properly configuring the EMS PC using the settings detailed in *Hardening Procedures for the Election Management PC* establishes user roles and credentials to limit access to the EMS system based on the user's assigned tasks. The Windows event log records all actions executed by the logged in user. Electionware protects against improper data entry or retrieval, data is verified for correctness at the time it is imported and during the setting of ballot styles and positions. User name and password are required for entry into Electionware and protect against improper access. ERM data is accessed through the operating system which verifies the validity of the data. ERM then checks the data during precinct update. **UVS** ExpressVote protects against improper data entry or retrieval by limiting physical access to the system with locking panels. Users are required to enter access codes for administrative menus. Once configured for voting, removable media devices are physically secured behind key-locked panels. Poll workers and voters cannot alter the system's election programming using available menu or physical controls. Memory Management protects resident memory against the failure of any data input or any attempt at improper data entry or retrieval. **PBT, CBT** ES&S ballot tabulators protect against improper data entry or retrieval by limiting physical access to the system with locking panels and requiring users to enter access codes to enter administrative menus. Once configured for voting, the USB Flash drive containing the tabulator election definition is secured behind a key-locked panel. Operators and voters running the ballot tabulator cannot impact alter election definition or stored results. Electionware software and the ES&S DS200 and DS850 share robust digital signature and password security features. This feature provides a high level of security on data that is transferred between the election management software and the DS200/DS850. See the ES&S *System Security Specifications* for more details on the public and private key management and security process. The DS200 executes a cyclic redundancy check on any inserted media to ensure data integrity. Any loss or improper data entry is detected through the CRC check. **BMD** The ES&S AutoMARK protects against improper data entry or retrieval by limiting physical access to the system with locking panels. Users are required to enter access codes to enter administrative menus. Once configured for voting, removable media devices that contain an election definition are physically

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								secured behind key-locked panels. Poll workers and voters cannot alter the either system's election programming using available controls. Memory Management is used to protect resident memory against the failure of any data input or any attempt at improper data entry or retrieval.
V: 1, §2.1.4.g	●	●	●	●	●		No	**EMS** All activity, including application errors, log to the Electionware internal database or to the encrypted Windows Event Log through the ES&S Event Log Service. User logs record each activity including type, date, time, ES&S application, user ID and in the case of the ERM, the computer name. **UVS** ExpressVote diagnostic logs record and report the date and time of normal and abnormal events, system status, and degree of operability. The diagnostic log is only used for hardware and software diagnosis. Log content has no record of election results nor should the log be included in any recount considerations. **PBT** The DS200 maintains an election audit log on the inserted Election Media. This log is a chronological listing of events (a queue) occurring during the election process. This log is only updated if the election is not officially closed and it is not full. Each fixed-size entry contains a four-byte universal time stamp and codes that represent events, and any related information. A system audit log (that stores machine specific audit items) is kept in the NVRAM and is also shadowed on the DS200 Election Media. This log contains such items as number of system halts, last power on, and other system audit items. **BMD** The AutoMARK uses diagnostic logs to record and report the date and time of normal and abnormal events, system status, and degree of operability. The diagnostic log is only used for hardware and software diagnosis. Log content has no record of election results nor should the log be included in any recount considerations. **CBT** An election event log that records each critical event (operator action, system response to each operator action, standard status messages, exceptions and error events, etc.) is generated and maintained by the DS850. Each event recorded includes a date/time stamp.
V: 1, §2.1.4.h	●	●	●	●	●		No	**EMS** Audit log data is stored either in the Electionware internal log or the Windows Event Log (for ERM and Electionware exception conditions) until the election administrator purges it or it or the log data is automatically backed up and purged by the system. Electionware audit log data remains in the Electionware database. The data can be viewed within Electionware or exported to a file that is readable by third-party applications such as Microsoft Excel.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								ERM utilizes the System Event Log to log all activity. This information is available through the Windows System Event Viewer. The Windows System Event Log will log each activity including type, date, time, ES&S application, user ID and computer name. **UVS** ExpressVote diagnostic capabilities include the recording of system audit logs. These logs are stored on each system's removable storage media in a circular buffer. ExpressVote Internal Operation and USB stick System logs are limited to approximately 500 KB. The event and the Operation (OS) log will roll over, replacing the earliest recorded events, if the limit is reached. The Operation stores to the USB stick as well as to internal memory. Both logs delete when an EQC stick is inserted and activated. System audit logs can be accessed through the system's administrative menus. **PBT** The DS200 records two types of event reports. One is a summary of critical events, and the other is a printout of all the election events (also known as the Audit Log Report). Each event logged includes a timestamp identifying when the event occurred and a brief description of the event. These events are stored on the DS200 Election Media. The Critical Events Report is a report of all the critical events that have occurred thus far in relation to the Election Definition. Examples of such events are Polls Opened, Clear Totals Report, Election Definition Loaded, and Election Test Mode. The Audit Report is a report of all the events that have taken place during the election process. It also includes the total number of write-ins, reject ballots, and blank ballots. The Audit Log header contains two 32-bit Cyclical Redundancy Checks (CRCs) for both the header and the audit log entries following the header. Any fraudulent attempt to modify the log will result in a CRC error and system halt. **BMD** The AutoMARK diagnostic capabilities include the recording of system audit logs. These logs are stored on the system's removable storage media in a circular buffer. System audit logs can be accessed through the system's administrative menus. **CBT** The DS850 stores an electronic copy of the election event log. This log can be printed and/or exported on demand; however, the DS850 does not allow for augmentation of the election event log. Instead; any and all augmentation is performed off-line using the Election Management System.
V: 1, §2.1.4.i	●	●	●	●	●		No	**EMS** To detect and record every event and unrecoverable system error condition, ES&S EMS Software utilizes the Electionware internal event log or the Windows System Event Log (for ERM and Electionware exceptions) to log all activity. System logs record each activity including type, date, time, ES&S application, user ID and computer name. If the system encounters an error that cannot be overcome, EMS programs gracefully shut down and log

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								the error to the system event log. EMS programs do not execute time dependent or automated features that do not require activation by an election programmer. **UVS** To detect and record every event and unrecoverable system error condition, ExpressVote displays all errors on-screen and logs each exception to the operations log. Error conditions that the system cannot overcome display on screen, are logged to the event log and initiate a graceful system shutdown. ExpressVote does not execute time dependent or pre-programmed events. **PBT** To detect and record every event and unrecoverable system error condition, all DS200 errors are displayed on the LCD and if possible, the printer. If the DS200 Election Media is installed and is readable by the tabulator, the error will be recorded in the Audit Log. Exception/Errors are divided into two categories. The first category is the non-system halting category. Errors in this category do not jeopardize the election results, and will allow the user to continue on using the machine. The second category is the system halt category. Errors in the system halt category may jeopardize the election results and thus the system will be shut down. If the system shuts down, the user has the option to restart the system in order to let the machine re-test itself and check the validity of the DS200 Election Media data. System halt errors are logged to the audit log prior to the system shutting down. Events that are time-dependent or programmed, such as the DS200 closing for voting at the designated polls close time, generate an on screen message and are recorded to the system audit log. **BMD** To detect and record every event and unrecoverable system error condition, the AutoMARK displays all errors on-screen and logs each exception to an operations log. Error conditions that the system cannot overcome display an onscreen message, are logged to the event log and initiate a graceful system shutdown. ES&S ballot marking devices do not execute time dependent or pre-programmed events. **CBT** To detect and record every event and unrecoverable system error condition, all DS850 errors are displayed on the screen and if possible, logged to the printer. These errors are also logged to the system's internal Audit Log. Error conditions that the system cannot overcome generate an on-screen message, are logged to the event log and initiate a graceful system shutdown. The DS850 does not execute time dependent or pre-programmed events.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.4.j	●	●	●	●	●		No	**EMS** Windows startup routine evaluates hardware and determines system status and degree of operability. **UVS** Starting the ExpressVote initiates self-diagnostics for system firmware, the printer and other subcomponents. Results of system tests appear on screen with any errors initiating an error message that prompts for poll worker intervention. **PBT** During system start-up, the DS200 executes a series of internal system checks. Tests include checking the scanner software, checking the printer, and other system checks. There is no menu for this step, but a report of the test results is generated as the Initial State Report. If the system fails any of the tests, the menu system will jump to the main menu and the election definition will be removed. **BMD** Starting the AutoMARK initiates self-diagnostics that check the system firmware, printer and other system components. Results of the system tests appear on screen with any errors spawning an error message prompting poll worker intervention. **CBT** The DS850 executes a series of internal system checks on startup. Tests include the self-test of all critical hardware and the routine for validating the system firmware. A report of the test results will be automatically generated. If the system fails any test, an operator message indicating the detected fault is generated and the DS850 user interface will require the appropriate action be taken by the user or election administrator.

2.1.4.1 ADDITIONAL REQUIREMENTS FOR DRE SYSTEMS

CONTROLLING REQUIREMENT

V: 1, §2.1.4

k. Maintain a record of each ballot cast using a process and storage location that differs from the main vote detection, interpretation, processing, and reporting path.

l. Provide a capability to retrieve ballot images in a form readable by humans

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.4.k						●	N/A	N/A
V: 1, §2.1.4.l						●	N/A	N/A

2.1.5 SYSTEM AUDIT

CONTROLLING REQUIREMENT

V: 1, §2.1.5

This subsection describes the context and purpose of voting system audits and sets forth specific functional requirements. Election audit trails provide the supporting documentation for verifying the accuracy of reported election results. They present a concrete, indestructible archival record of all system activity related to the vote tally, and are essential for public confidence in the accuracy of the tally, for recounts, and for evidence in the event of criminal or civil litigation.

These requirements are based on the premise that system-generated creation and maintenance of audit records reduces the chance of error associated with manually generated audit records. Because most audit capability is automatic, the system operator has less information to track and record, and is less likely to make mistakes or omissions. The subsections that follow present operational requirements critical to acceptable performance and reconstruction of an election. Requirements for the content of audit records are described in VVSG 2005 Section 5.

The requirements for all system types, both precinct and central count, are described in generic language. Because the actual implementation of specific characteristics may vary from system to system, it is the responsibility of the vendor to describe each system's characteristics in sufficient detail so that test labs and system users can evaluate the adequacy of the system's audit trail. This description shall be incorporated in the System Operating Manual, which is part of the Technical Data Package.

Documentation of items such as paper ballots delivered, paper ballots collected, administrative procedures for system security, and maintenance performed on voting equipment are also part of the election audit trail, but are not covered in these technical standards. Useful guidance is provided by the *Innovations in Election Administration #10; Ballot Security and* Accountability, available on the EAC's website.

2.1.5.1 OPERATIONAL REQUIREMENTS

CONTROLLING REQUIREMENT

V: 1, §2.1.5.1

a. Audit records shall be prepared for all phases of election operations performed using devices controlled by the jurisdiction or its contractors. These records rely upon automated audit data acquisition and machine-generated reports, with manual input of some information. These records shall address the ballot preparation and election definition phase, system readiness tests, and voting and ballot-counting operations. The software shall activate the logging and reporting of audit data as described in the following sections.

   i. The timing and sequence of audit record entries is as important as the data contained in the record. All voting systems shall meet the requirements for time, sequence and preservation of audit records outlined below.

   ii. Except where noted, systems shall provide the capability to create and maintain a real-time audit record. This capability records and provides the operator or precinct official with continuous updates on machine status. This information allows effective operator identification of an error condition requiring intervention, and contributes to the reconstruction of election-related events necessary for recounts or litigation.

   iii. All systems shall include a real-time clock as part of the system's hardware. The system shall maintain an absolute record of the time and date or a record relative to some event whose time and date are known and recorded.

   iv. All audit record entries shall include the time-and-date stamp.

   v. The audit record shall be active whenever the system is in an operating mode. This record shall be available at all times; through it need not be continually visible.

   vi. The generation of audit record entries shall not be terminated or altered by program controls, or by the intervention of any person. The physical security and integrity of the record shall be maintained at all times.

   vii. Once the system has been activated for any function, the system shall preserve the contents of the audit record during any interruption of power to the system until processing and data reporting have been completed. The system shall be capable of printing a copy of the audit record. A separate printer

is not required for the audit record, and the record may be produced on the standard system printer if the following conditions are met

- The generation of audit trail records does not interfere with the production of output reports
- The entries can be identified so as to facilitate their recognition, segregation and retention
- The audit record entries are kept physically secure

b. All voting system shall meet the requirements for error messages below.

i. The system shall generate, store, and report to the user all error messages as they occur.

ii. All error messages requiring intervention by an operator or precinct official shall be displayed or printed unambiguously in easily understood language text, or by means of other suitable visual indicators.

iii. When the system uses numerical error codes for trained technician maintenance or repair, the text corresponding to the code shall be self-contained, or affixed inside the unit device. This is intended to reduce inappropriate reactions to error conditions and to allow for ready and effective problem correction.

iv. All error messages for which correction impacts vote recording or vote processing shall be written in a manner that is understandable to an election official who possesses training on system use and operation, but does not possess technical training on system servicing and repair

v. The message cue for all systems shall clearly state the action to be performed in the event that vote or operator response is required.

vi. System design shall ensure that erroneous responses will not lead to irreversible error.

vii. Nested error conditions shall be corrected in a controlled sequence such that system status shall be restored to the initial state existing before the first error occurred.

c. The Guidelines provide latitude in software design so that vendors can consider various user processing and reporting needs. The jurisdiction may require some status and information messages to be displayed and reported in real-time. Messages that do not require operator intervention may be stored in memory to be recovered after ballot processing has been completed.

The voting system shall display and report critical status messages using clear indicators or English language text. The voting system need not display non-critical status messages at the time of occurrence. Voting systems may display non-critical status messages (i.e., those that do not require operator intervention) by means of numerical codes for subsequent interpretation and reporting as unambiguous text.

Voting systems shall provide a capability for the status messages to become part of the real-time audit record. The voting system shall provide a capability for a jurisdiction to designate critical status messages.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.5.1.a							N/A	N/A
V: 1, §2.1.5.1.ai	●	●	●	●	●		No	**EMS** The Election Management System maintains a permanent, real-time audit record of all activity in the System Event Log through the Electionware internal audit log or Windows event log. Audit log data remains in the database until the election administrator purges it. The data can be exported to a file in a format readable by third-party applications such as Microsoft Excel. Electionware enters audit data into an event log table in the Electionware database, which includes entries for application start, login/logout, election creation; data imports; modifications to election data, ballot style creation.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								The ERM Log file contains entries for activities that take place within ERM. File is updated (records added to the end) by all ERM programs. Date, time and various codes and data are written into the records. The file is used to print the Log listings. The system log listing will look like one of the following: <DATE> <TIME> <SYSTEM ACTION OR ERROR INFORMATION> <COUNTED INFORMATION> <DATE> <TIME> <COUNTED INFORMATION> NOTE: This document will only list the <SYSTEM ACTION OR ERROR INFORMATION> and/or <COUNTED INFORMATION>. Also note that if the log is associated with precincts information, it will usually be preceded with the precinct number, and end with (BALS=nnnn TOTS=nnnn) if it exists. The nnnn represent numeric values. ERM also utilizes the Windows System Event Log to log all activity. This information is available through the Windows System Event Viewer. **UVS** ExpressVote records real-time logs to removable media. Logs can be accessed through the system's TEST mode. **PBT** The DS200 maintains a real-time audit log printable from each terminal's integrated printer and stored on the Election Media. The DS200 audit log records and reports the date and time of normal and abnormal events, and maintains a permanent printed record of audit information. The system is designed to detect and record significant events (for example, counting a marked ballot, error conditions that cannot be disposed by the system itself). **BMD** The AutoMARK includes functionality to record system audit logs. These real-time logs are stored on the system's removable media. Logs can be accessed through the systems TEST mode. **CBT** The DS850 maintains a real-time event log in two forms – an electronic log stored on the internal hard drive and a real-time hard copy printed to a dedicated log printer. The election official may also use the system's dedicated report printer to generate a hard copy of the electronic log. The DS850 log records and reports the date and time of normal and abnormal events, and maintains a permanent printed record of audit information. The system is designed to detect and record significant events (for example, counting a marked ballot, error conditions that cannot be disposed by the system itself).

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.5.1.aii	•	•	•	•	•		No	**EMS** The Election Management System uses the PC System clock to date and timestamp all log entries. **UVS** ExpressVote uses an internal real-time clock to time-and date stamp each entry in the system audit logs. **PBT** The ES&S DS200 has a battery-backed; real-time clock integrated with the system motherboard used to time stamp each event recorded to the system audit log. **BMD** The AutoMARK uses an internal real-time clock to time-and date stamp each entry in the system audit logs. **CBT** The DS850 uses a battery-backed, real-time clock to record the date and time for each audit log entry.
V: 1, §2.1.5.1.aiii	•	•	•	•	•		No	**EMS** All EMS audit log entries are date and time stamped using the PC clock. **UVS, PBT, CBT and BMD** Log entries for all ES&S voting equipment include a date and time stamp.
V: 1, §2.1.5.1.aiv	•	•	•	•	•		No	**EMS** Electionware logs all system events directly to the database Audit table(s). Logging cannot be terminated or interrupted without terminating Electionware. The audit log can be displayed at any time by the administrator in real-time using the Output pane or through the Reports menu. ERM utilizes the Windows Event Log to log all activity. This information is available through the Windows System Event Viewer. The Windows System Event Log logs each activity including type, date, time, ES&S application, user ID and computer name. **UVS** The audit logs for the ExpressVote automatically activate as soon as the system is powered on for use. The system's audit log is constantly updated and stored to inserted media.. **PBT, CBT** DS200 and DS850 audit logs automatically activate as soon as either system is powered on for use. Audit logs are constantly updated in the background and stored to removable Election Media for the DS200 or the internal HDD for the DS850. Log reports may be printed at any time from either system. An election official has the option to use the DS850 dedicated report printer to generate a hard copy of the electronic log. **BMD** The audit logs for the AutoMARK automatically activate as soon as the system is powered on for use. The system's audit log is constantly updated in the system background and stored to the inserted Flash Memory Card (FMC).

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.5.1.av	●	●	●	●	●		No	**EMS** Audit logging in Electionware is automatic and may not be disabled by the user. The event log is maintained in a password protected PostgreSQL database maintained by Electionware. Only the administrator may access and view the log. The log can be archived with the election. ERM logs all events to the Windows System Event Log. The log cannot be disabled by a user. ERM will shut down if the Windows Event Log is not running. **UVS** The system audit log cannot be bypassed or deactivated during system installation or operation by the user. **PBT** The DS200 audit record cannot be terminated or altered by system controls. User interaction with the system log is limited to printing and viewing the system audit report. **BMD** The AutoMARK system audit log cannot be bypassed or deactivated during system installation or operation by the user. **CBT** The DS850 audit record cannot be terminated or altered by system controls. The operator is limited to copying the electronic log to an ES&S Media Device or generating a hard copy of the log on the dedicated report printer.
V: 1, §2.1.5.1.avi	●	●	●	●	●		No	**EMS** The Electionware database audit table is updated immediately following an audit event. The database is contained in a file separate of the Electionware application. In the event of system or power failure, the event database is preserved for future access. The ERM system audit log is updated with the event upon completion of each event. If power failure where to occur during the execution of an event all prior entries in the system audit log would be preserved. **UVS** The ExpressVote audit record is stored on the removable USB media. Stored audit records are not affected by system power interruptions. **PBT** The system stores all audit information to DS200 Election Media. When the drive is removed from the tabulator, or the power is shut off, the data in the Election Media will be preserved. **BMD** The AutoMARK compresses and stores the system audit log to the CF card of the AutoMARK being used. The CF card maintains audit log contents during any interruption of power to the system. **CBT** The DS850 stores the system audit log to an internal hard drive. This storage technique is non-volatile. The audit log is preserved if power is lost.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.5.1.avii	•	•	•	•	•		No	**EMS** Viewing and printing Electionware logs is handled through the reporting engine built into Electionware. Selecting an Audit Report from the Administrator menu opens a report tab, where the log data can be viewed, printed and exported to various standard file formats. Generation of audit records does not interfere with other output reports. All log entries are in plain text and formatted to facilitate recognition, segregation and retention. Audit records are stored to the system's internal database and kept physically secure. ERM has the ability to print a system audit log at any time. This report can be printed to the system printer or displayed on the system. The Windows Event Log Viewer can also be used to view and print all ERM System Log messages. Generation of audit records does not interfere with other output reports. All log entries are in plain text and formatted to facilitate recognition, segregation and retention. Audit records are stored to the Windows Event Services and kept physically secure by jurisdiction security procedures. **UVS** ExpressVote does not tabulate results or generate reports. The log entry provides a numerical designation, time and date stamp, and event detail information to facilitate recognition, segregation and retention. The audit log can be viewed on the unit's touch screen panel or printed to a blank card. Each audit record is compressed and stored to the unit's removable storage media. **PBT** The ES&S DS200 generates audit reports using the system's thermal printer The printing of the system audit trail is user initiated and does not interfere with the production of other system reports. Audit log entries can be identified to facilitate recognition, segregation and retention. Audit entries stored to the system's election media are kept physically secure behind a locking panel. **BMD** The AutoMARK does not tabulate results or generate output reports. The log entry provides a numerical designation, time and date stamp, and event detail information to facilitate recognition, segregation and retention. The audit log can be viewed on the unit's touch screen panel or printed using blank stock; 8 1/2" wide ballot stock for the AutoMark. The operator is prompted to insert blank sheets as required. Each audit record is compressed and stored to the unit's removable storage media. **CBT** In addition to storing the system event log to the internal hard drive, the DS850 can generate a hard copy of event log in real time. This hard copy is produced in real time on a dedicated

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								printer. Additionally, the user may, upon demand, produce a duplicate copy of the event log that reflects all events up to the point of request. Generation of audit records does not interfere with other output reports. All log entries are in plain text and formatted one time stamped event per line printed to facilitate recognition, segregation and retention. Audit records are stored to the system's internal database and kept physically secure.
V: 1, §2.1.5.1.b							N/A	N/A
V: 1, §2.1.5.1.bi	•	•	•	•	•		No	**EMS** With the exception of import errors and warnings, all EMS programs display error messages to the user as they occur. All error messages require the user to select OK to continue. **UVS** The ExpressVote displays and stores all error messages presented as they occur to the user. Error messages are either displayed in the voter's selected language, or display the international warning symbol if intended for the poll worker or if a system general error is generated. **PBT** The ES&S DS200 displays all required error messages as they occur on the LCD display. Critical events are included in the Audit log and critical events report. **BMD** The AutoMARK displays and stores all error messages presented as they occur to the user. Error messages are either displayed in the voter's selected language, or display the international warning symbol if intended for the poll-worker or if a system general error is generated. **CBT** DS850 error messages display as they occur. The DS850 maintains a real-time event log in two forms – as an electronic log stored on the internal hard drive and a real-time printed copy generated from a dedicated log printer. Both logs record in real time.
V: 1, §2.1.5.1.bii	•	•	•	•	•		No	**EMS** With the exception of import errors, error messages for all EMS programs explain the error to the user and provide a possible resolution. Users must select OK to continue. **UVS** ExpressVote displays all error messages in plain language. If an error message is intended for an official, the international warning symbol is also used. **PBT** DS200 error messages requiring intervention by an operator or precinct official are displayed unambiguously in easily understood text on the LCD display. Depending on the language options set in election coding software, the system supports languages other than English.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								BMD The AutoMARK displays all errors in easily understood language text. If an error message is intended for an official, the international warning symbol is also used. **CBT** While all attempts have been made to generate complete and easily understood messages, it is anticipated that the DS850 operator's manual will need to be occasionally referenced to clarify and provide adequate resolution for a system error message.
V: 1, §2.1.5.1.biii			•		•		No	**PBT** Numeric codes intended to help technicians perform service and maintenance functions are listed in the Numeric Message section in the *ES&S DS200 Operator's Guide*. **CBT** Numeric codes for the DS850 are always accompanied by clear language indicating the condition. Troubleshooting procedures associated with each error condition appear in the *ES&S DS850 Operator's Guide*.
V: 1, §2.1.5.1.biv	•		•		•		No	**EMS** EMS error messages include descriptive information to clearly communicate the issue. **PBT, CBT** Error messages for which correction impacts vote recording or processing are written in a manner that is understandable to election officials with basic DS200/DS850 operational knowledge and training.
V: 1, §2.1.5.1.bv	•	•	•	•	•		No	**EMS** Electionware provides Yes-No (OK/Cancel) message boxes in appropriate places to record a user response. Once a response is obtained the program performs an action based on the response. ERM error messages contain descriptive information so that the user can clearly understand the issue at hand and the user must click OK to acknowledge. **UVS** ExpressVote error messages clearly state the recommended action to be performed. **PBT** DS200 messages assist operators to determine the correct action. The DS200 Operator's Guide includes additional troubleshooting procedures. **BMD** AutoMARK error messages clearly state the recommended action to be performed. **CBT** While all attempts have been made to generate complete and easily understood messages, it is anticipated that the troubleshooting section of the *DS850 Operator's Manual* will need to be occasionally referenced to clarify a message.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.5.1.bvi	●	●	●	●	●		No	**EMS** Electionware ensures that erroneous responses do not lead to irreversible error in the following manner; when an error is encountered a response is requested to determine the subsequent action to be performed, or the process is terminated gracefully after an error message indicating early process termination To prevent erroneous responses from leading to irreversible error ERM has many error recovery capabilities including the ability to reset results by precinct and/or tabulator and reprocess the tabulator media. **UVS, PBT, CBT, BMD** The ExpressVote, DS200, DS850 and AutoMARK ensure that erroneous responses to system error codes will not lead to irreversible error.
V: 1, §2.1.5.1.bvii	●	●	●	●	●		No	**EMS** Nested error conditions are controlled in a sequence such that the subsequent error messages are displayed after the first one is corrected by the user. As errors are encountered, the system requires the user to correct that error without continuing. Rectifying all the errors returns the application's state to what is was before the error(s) occurred, allowing the application to continue processing. **UVS** The ExpressVote system reports and displays error conditions as they are encountered. Each error condition has prescribed options for recovery. Each error condition is treated as an entity and nesting does not apply. **PBT, CBT** The ES&S DS200 and DS850 are designed to recover from errors such as feed jams, multiple feeds, or any other type of feed error that causes the machine to reject an individual ballot. The DS200 and DS850 w ill detail the nature of the error or failure condition and provide the means to correct, without loss or corruption of ballot count, data previously stored. **BMD** The AutoMARK system reports and displays error conditions as they are encountered. Each error condition has prescribed options for recovery. Each error condition is treated as an entity and nesting does not apply.
V: 1, §2.1.5.1.c	●	●	●	●	●		No	**EMS** Electionware error information is available in real time using reports or panels displaying events, errors, and warnings. Events are displayed in plain text. ERM displays status messages during various functions See the ERM Software Design and Specification for a list of Status Messages. **UVS** ExpressVote does not record votes or tabulate ballots. Critical status and error reporting displays on screen in the voter's selected language or in English along with the international warning symbol depending on the nature of the error at the

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								time of occurrence. **PBT** The ES&S DS200 displays all system critical messages, error conditions that require user intervention and system alerts in real-time. Status and information messages that do not require immediate user attention, such as terminal power status, are stored to the system audit log. The DS200 displays and reports all critical status messages on the terminal display panel in easily understood language or with an error code that directly corresponds to error condition descriptions included in DS200 Software Design Spec manual. Codes are described with language that is understandable to election officials who possess training on system use and operation but do not possess technical training on system servicing or repair. Depending on the language options set in election coding software, it will also support languages other than English. All status messages and alerts are stored to the system real-time audit log. Election officials has the option to print the Audit Log at any time after opening polls and during voting by accessing the front panel and move the key switch to OPEN/CLOSE POLLS position then select AUDIT-LOG PRINT menu. Printing Audit Log by the county during voting is done in accordance to their procedure. Audit Log printing also available at any time after poll closing. **BMD** The AutoMARK does not record votes or tabulate ballots. Critical status and error reporting displays on screen in the voter's selected language or in English along with the international warning symbol depending on the nature of the error at the time of occurrence. **CBT** The DS850 displays all system critical messages, error conditions that require user intervention and system alerts in real-time. Status and information messages that do not require immediate user attention, such as terminal power status, store to the system audit log. The DS850 displays and reports all critical status messages on the screen in easily understood language. While all attempts have been made to generate complete and easily understood messages, it is anticipated that the DS850 operator's manual will need to be occasionally referenced to clarify a message. The DS850 event log captures all status messages by default.

2.1.5.2 USE OF A SHARED COMPUTING PLATFORM

CONTROLLING REQUIREMENT

V: 1, §2.1.2

Further requirements must be applied to Commercial-off-the-Shelf operating systems to ensure completeness and integrity of audit data for election software. These operating systems are capable of executing multiple application programs simultaneously. These systems include both servers and workstations, including the many varieties of UNIX and Linux, and those offered by Microsoft and Apple. Election software running on these systems is vulnerable to

unintended effects from other user sessions, applications, and utilities executing on the same platform at the same time as the election software.

"Simultaneous processes" of concern include: unauthorized network connections, unplanned user logins, and unintended execution or termination of operating system processes. An unauthorized network connection or unplanned user login can host unintended processes and user actions, such as the termination of operating system audit, the termination of election software processes, or the deletion of election software audit and logging data. The execution of an operating system process could be a full system scan at a time when that process would adversely affect the election software processes. Operating system processes improperly terminated could be system audit or malicious code detection.

To counter these vulnerabilities, three operating system protections are required on all such systems on which election software is hosted. First, authentication shall be configured on the local terminal (display screen and keyboard) and on all external connection devices ("network cards" and "ports"). This ensures that only authorized and identified users affect the system while election software is running.

Second, operating system audit shall be enabled for all session openings and closings, for all connection openings and closings, for all process executions and terminations, and for the alteration or deletion of any memory or file object. This ensures the accuracy and completeness of election data stored on the system. It also ensures the existence of an audit record of any person or process altering or deleting system data or election data.

Third, the system shall be configured to execute only intended and necessary processes during the execution of election software. The system shall also be configured to halt election software processes upon the termination of any critical system process (such as system audit) during the execution of election software.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.5.2	●	●	●	●	●		No	**EMS** Properly configuring the EMS PC using the settings detailed in *Hardening Procedures for the Election Management PC* disables unnecessary running processes and network connections on the EMS PC. Proper user authentication is executed through Windows user and password management and all operating system events are logged to the Windows Event Log and catalogued using ES&S Event Log Service. Electionware is a multi-user application. User authentication takes place on the local terminal referencing encrypted information from the local or server database. Authenticated network connections to the Electionware database, if located on a server, are handled by the network stack embedded in the Windows operating system and password protection is used for the authentication of the connecting user. Electionware logs, logins, and logouts and the events listed in the accompanying Election Appendix 1 used the Electionware database to record the event. Electionware does not execute or redirect execution to another application or non-Electionware module within the Windows Environment with Electionware still running. The Windows operation system will halt execution of Electionware if a critical process failure occurs. Electionware - Paper Ballot is a single-user application within Electionware. User authentication takes place on the local terminal during Electionware login referencing encrypted information from the local or server database.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								Because Paper Ballot is a single-user application, error messages display if more than one user attempts to access Paper Ballot at the same time. Authenticated network connections to the Electionware database, if located on a server, are handled by the network stack embedded in the Windows operating system and password protection is used for the authentication of the connecting user. Paper Ballot records user logins and logouts. Event types are documented in the Electionware User's Guide. Real-time events are available in the applications. Network connection openings and closings are not applicable to this module. Paper Ballot does not execute or redirect execution to another application or module outside of normal execution within the Windows Environment. Microsoft Windows will halt execution of the Paper Ballot if a critical process failure occurs. Per ES&S installation guidelines, ERM runs in a dedicated election environment regardless of the system configuration employed: Stand-alone, peer-to-peer or Server based LAN. The Windows OS operates independently and does not allow for logging or monitoring of its errors by the running application's processes. Memory management is handled by the Java language's framework. This software will only allow the execution of the called binary module. Code corruption of a module or process will result in the immediate termination of the application. ERM will terminate if the ERM System Log messages cannot be successfully written to the Windows OS Event System. **UVS, PBT and BMD** ES&S voting equipment does not run on a shared platform. Devices are designed and programmed for a single purpose. Equipment does not run unnecessary or superfluous simultaneous processes and the CBT only supports network connections used for transmitting results to a central reporting PC. Voting equipment audits all system events in accordance with VVSG 2005 requirements. All devices are configured to gracefully halt election processes upon termination of critical system processes.

2.1.6 ELECTION MANAGEMENT SYSTEM

CONTROLLING REQUIREMENT

V: 1, §2.1.6

The Election Management System (EMS) is used to prepare ballots and programs for use in casting and counting votes, and to consolidate, report, and display election results. An EMS shall generate and maintain a database, or one or more interactive databases, that enables election officials or their designees to perform the following functions:

- Define political subdivision boundaries and multiple election districts as indicated in the system documentation.
- Identify contests, candidates, and issues.
- Define ballot formats and appropriate voting options.
- Generate ballots and election-specific programs for voting equipment.
- Install ballots and election-specific programs
- Test that ballots and programs have been properly prepared and installed
- Accumulate vote totals at multiple reporting levels as indicated in the system documentation
- Generate the post-voting reports required by VVSG 2005 Subsection 2.4.
- Process and produce audit reports of the data as indicated in VVSG 2005 Subsection 5.4.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.6, bullet 1	•						No	**EMS** Electionware supports entry of precincts, precinct splits, districts, district types, polling places, absentee (non-geographical), early vote, and the configuration of relationships between each of these entities.
V: 1, §2.1.6, bullet 2	•						No	**EMS** Electionware is used to define offices, contests, candidates and issues. ERM reports contain results for each contest, candidate and issue contained on the ballot. All election definition parameters are created with Electionware and passed to ERM via XML files. No election content information can be added or deleted in ERM.
V: 1, §2.1.6, bullet 3	•						No	**EMS** Electionware supports the generation of ballot formats and voting options using the Paper Ballot module.
V: 1, §2.1.6, bullet 4	•						No	**EMS** Electionware generates ballot layouts and data used by ES&S ballot scanners to determine ballot target locations. The Electionware Package module creates and programs the memory devices with election and ballot data for used by ES&S voting equipment.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.6, bullet 5	•						No	**EMS** Electionware allows the Election Official to specify the targeted tabulator equipment to create configuration data incorporated on ES&S Election Media sets (USB Flash drives). The Election media set contains tabulator-specific election rules and ballot (or ballots) layout information in RSA encrypted XML format. The Election Media is hand delivered to the tabulator(s).
V: 1, §2.1.6, bullet 6	•	•	•	•	•		No	**EMS** During pre-election L&A testing, all tabulated results should be processed into ERM and ERM precinct reports should be audited against tabulator results reports. **UVS** Proper ExpressVote program installation is verified by test marking activation cards to verify all positions are correctly selectable. Vote recording and reporting is handled by the tabulator and EMS reporting subsystem. **Tabulators** Logic and accuracy testing verifies that ballots and programs have been properly prepared and installed. **BMD** The AutoMARK does not record votes, but accurately reads voter selections to mark the appropriate target on an ES&S ballot. Proper program installation is verified by performing a test print on a blank ballot from each style to verify all positions are correctly selectable and/or logic and accuracy test ballot marking on blank test ballots and then using those BMD marked ballots to perform L&A testing with an ES&S ballot tabulator. Vote recording and reporting is handled by the tabulator and EMS reporting subsystem.
V: 1, §2.1.6, bullet 7	•				•		No	**EMS** ERM aggregates and accumulates vote totals from all system tabulators. It provides the operator the ability to print reports at the precinct, district, and jurisdiction level. **CBT** The DS850 accumulates vote totals at a precinct or machine level.
V: 1, §2.1.6, bullet 8	•				•		No	**EMS** ERM generates post-voting reports that include aggregated vote totals from the election in various formats including precinct, summary, and canvass reports. These reports include statistical and candidate information and meet the requirements of VVSG Section 2.4. **CBT** The DS850 generates results reports at the election or precinct level. These reports can include or exclude overvotes and undervotes and meet the reporting requirements of VVSG Subsection 2.4.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.6, bullet 9	•	•	•	•	•		No	**EMS** Electionware generates audit reports that meet requirements of VVSG Vol. 1, Section 5.5 for data generated in Electionware. ERM has the ability to print a system audit log at any time. This report can be printed to the system printer or displayed on the system. **UVS, PBT, CBT, BMD** ES&S voting equipment has the ability to generate audit reports that meet the requirements of VVSG 2005 Subsection 5.4.

2.1.7 VOTE TABULATION PROGRAM

CONTROLLING REQUIREMENT

V: 1, §2.1.7 Each voting system shall have a vote tabulation program that will meet specific functional requirements.

2.1.7.1 FUNCTIONS

CONTROLLING REQUIREMENT

V: 1, §2.1.7.1 The vote tabulating program software resident in each voting machine, vote count server, or other devices shall include all software modules required to:

a. Monitor system status and generate machine-level audit reports

b. Accommodate device control functions performed by polling place officials and maintenance personnel

c. Register and accumulate votes

d. Accommodate variations in ballot counting logic

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.7.1.a	•	•	•	•	•		No	**EMS** ERM has the ability to print a system audit log at any time. This report can be printed to the system printer or displayed on the system. **UVS, PBT, CBT, BMD** All voting devices maintain a continuous system audit log and store audit and event information to each device's respective removable storage media. Machine level audit reports may be generated at any time from each of the system's administrative menus.
V: 1, §2.1.7.1.b	•	•	•	•	•		No	**UVS** The ExpressVote test menu that is accessed with physical switch located behind a locked access panel on the side of the unit. **PBT** Administrative menus include a wide range of diagnostic and system test tools allowing maintenance personnel and election officials to configure, test and activate voting system equipment. Maintenance and administrative access is restricted by requiring a physical control key and pass code entry to access system maintenance functions. **BMD** The ES&S AutoMARK includes a poll worker selectable test menu that provides access to the control functions used by the poll worker. This menu requires a physical key to access. This menu includes a selection for accessing the maintenance menu that provides access to the maintenance functions. The maintenance menu requires that an operator enter a special access code not available to the poll worker.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								CBT Administrative menus include a wide range of diagnostic and system test tools allowing maintenance personnel and election officials to execute required tasks.
V: 1, §2.1.7.1.c	●	●	●	●	●		No	**EMS** ERM reports all results as tabulated. During the database update of tabulator results checks are done to ensure that votes within any office do not exceed the ballots cast and that the results database does not contain more or less candidates than the tabulator. **UVS** ExpressVote does not record votes. The unit accurately detects voter selections and converts those selections to a marked paper summary record. Correct registration of votes is tested by performing logic and accuracy tests on marked cards using an ES&S ballot tabulator. Vote recording and reporting is handled by the tabulator and EMS reporting subsystem. **PBT** The ES&S DS200 registers and tabulates polling totals at the polling place (or at designated regional sites). The DS200 system tabulates anonymous ballot data and produces a printed report of the vote count together with report data stored on DS200 Election Media. The Election Media can be removed and re-installed to another DS200 for consolidation of vote totals. Terminal level totals can be produced directly from the scanner's integrated printer. Combined totals can be generated using compatible election reporting software. **BMD** The AutoMARK does not record votes. The unit accurately detects voter selections in order to mark an appropriate target on an ES&S ballot or mark a paper summary record, respectively. Correct registration of votes is tested by performing logic and accuracy test ballot marking on blank test ballots and then using those BMD marked ballots to perform L&A testing with an ES&S ballot tabulator. Vote recording and reporting is handled by the tabulator and EMS reporting subsystem. **CBT** The DS850 system registers and accumulates vote totals, captures ballot images, aggregates system vote totals, captures vote image records and produces a printed report of the vote count together with report data stored on an ES&S Media Device. This ES&S Media Device can be removed and transported to another location for consolidation/ accumulation of vote totals.
V: 1, §2.1.7.1.d	●		●		●		No	**PBT, CBT** ES&S tabulators support all variations in ballot counting logic described in ES&S' response to requirement 2.1.7.2 below.

2.1.7.2 VOTING VARIATIONS

CONTROLLING REQUIREMENT

V: 1, §2.1.7.2

There are significant variations among state election laws with respect to permissible ballot contents, voting options, and the associated ballot counting logic. The following table identifies which of the following items listed in VVSG 2005 Volume I, Section 2.1.7.2 *can* and *cannot* be supported by the voting system, as well as *how* the voting system can implement the items supported:

- Closed Primaries
- Open Primaries
- Partisan Offices
- Non-Partisan Offices
- Write-in Voting
- Primary Presidential Delegation Nomination
- Ballot Rotation
- Straight party voting
- Cross-party endorsement
- Split Precincts
- Vote for N of M
- Recall issues with options
- Cumulative voting
- Ranked order voting
- Provisional or challenged ballots

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.7.2, Closed Primaries	●	●	●	●	●		No	**EMS** Electionware supports this type of election. **UVS, PBT, CBT and BMD** Closed Primary voting is supported in this release.
V: 1, §2.1.7.2, Open Primaries	●	●	●	●	●		No	**EMS** Electionware supports this type of election. **UVS, PBT, CBT and BMD** Open Primary voting is supported in this release.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.7.2, Partisan Offices	•	•	•	•	•		No	**EMS** Electionware supports the creation of this type of office. Offices are assigned in the Capture module. **UVS** The ExpressVote supports the use of partisan offices. **PBT** The ES&S DS200 can distinguish between partisan and non-partisan contests on the same ballot. This support extends through closed primaries, open primaries, and general elections. **CBT** The DS850 can distinguish between partisan and non-partisan contests on the same ballot. This support extends through closed primaries, open primaries, and general elections. **BMD** The AutoMARK supports the use of partisan offices.
V: 1, §2.1.7.2, Non-Partisan Offices	•	•	•	•	•		No	**EMS** Electionware supports both NY and PA style cross-endorsements through the assigning of additional parties to a candidate in the candidate dialog. **UVS, PBT, CBT and BMD** ES&S voting equipment supports cross party endorsement where a candidate may be associated with up to four different parties. Selection of any party associated with the candidate will result in that candidate receiving a vote.
V: 1, §2.1.7.2, Write-in Voting	•	•	•	•	•		No	**EMS** Electionware supports split precincts. Split precinct options are configured from Electionware-Capture. **UVS, PBT, CBT and BMD** ES&S voting equipment supports split precincts.
V: 1, §2.1.7.2, Primary Presidential Delegation Nomination						•	N/A	**EMS** Electionware supports vote for N of M (multiple vote for) contests. The number of allowed votes per contest is configured in Electionware-Capture. **UVS, PBT, CBT and BMD** ES&S voting equipment supports a contest with a vote for more than one.
V: 1, §2.1.7.2, Ballot Rotation	•	•	•	•	•		No	**EMS** Electionware supports configuration of Ballot Rotation with options. **UVS, PBT, CBT and BMD** The ExpressVote, DS200, DS850, and AutoMARK support Ballot rotation.
V: 1, §2.1.7.2, Straight party voting	•	•	•	•	•		No	**EMS** Electionware supports configuration of Straight Party voting. **UVS, PBT, CBT and BMD** The ExpressVote, DS200, DS850, and AutoMARK and support Straight Party voting.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.7.2, Cross-party endorsement	•	•	•	•	•		No	**EMS** Electionware supports both NY and PA style cross-endorsements through the assigning of additional parties to a candidate in the candidate dialog. **UVS, PBT, CBT and BMD** ES&S voting equipment supports cross party endorsement where a candidate may be associated with up to four different parties. Selection of any party associated with the candidate will result in that candidate receiving a vote.
V: 1, §2.1.7.2, Split Precincts	•	•	•	•	•		No	**EMS** Electionware supports split precincts. Split precinct options are configured from Electionware-Capture. **UVS, PBT, CBT and BMD** ES&S voting equipment supports split precincts.
V: 1, §2.1.7.2, Vote for N of M	•	•	•	•	•		No	**EMS** Electionware supports vote for N of M (multiple vote for) contests. The number of allowed votes per contest is configured in Electionware-Capture. **UVS, PBT, CBT and BMD** ES&S voting equipment supports a contest with a vote for more than one.
V: 1, §2.1.7.2, Recall issues with options	•	•	•	•	•		No	**EMS** Electionware supports recall issue D with options. **UVS, PBT, CBT and BMD** ES&S voting equipment supports recall issues with options in which the contest is broken out into two parts. The first part contains a question regarding the recall, which typically contains a Yes/No response. Regardless of the selection in the first question, if the voter then marks their choice for the candidate in the second part, the vote will be tabulated. In this situation, if the voter over or undervotes the first race, the second race is ignored by the tabulator.
V: 1, §2.1.7.2, Cumulative voting						•	N/A	N/A
V: 1, §2.1.7.2, Ranked order voting	•						No	**EMS** Electionware supports ballot layout options for Ranked Choice Voting. Cast vote record files are exported from Electionware: Produce and processed externally from the ES&S Voting System for ranked choice voting results.
V: 1, §2.1.7.2, Provisional or challenged ballots	•	•	•	•	•		No	Provisional or challenged ballots are tabulated after each ballot is verified by the jurisdiction.

2.1.8 BALLOT COUNTER

CONTROLLING REQUIREMENT

V: 1, §2.1.8

For all voting systems, each piece of voting equipment that tabulates ballots shall provide a counter that:

a. Can be set to zero before any ballots are submitted for tally

b. Records the number of ballots cast during a particular test cycle or election.

c. Increases the count only by the input of a ballot.

d. Prevents or disables the resetting of the counter by any person other than authorized persons at authorized points.

e. Is visible to designated election officials.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.8.a			•		•		No	**PBT** The ES&S DS200 can be programmed to automatically set totals to zero when a user opens the polls. Alternatively, users may set totals to zero from system administration menus. The counter automatically prints a zero totals report from the system start menu. **CBT** The DS850 has the ability to clear totals at any time with safeguards that prevent the accidental clearing of totals.
V: 1, §2.1.8.b			•		•		No	**PBT** The ES&S DS200 accurately records all marks on all ballots cast and reports a total ballots cast tally along with results totals. **CBT** The DS850 can report ballots cast on a batch basis or as an aggregate total.
V: 1, §2.1.8.c			•		•		No	**PBT** The ES&S DS200 increases the ballots cast total only through the input of a ballot. The system includes a public count display that increments only when a ballot is inserted into the scanner. **CBT** Aggregating votes is the fundamental concept behind the design of the DS850. The operator does not have the ability to manually modify the count totals.
V: 1, §2.1.8.d			•		•		No	**PBT** Access to administrative functions is restricted by a password protected menu system and a locked key panel. Once configured for official vote tabulation, the system is locked out from any operations until the precinct supervisor officially closes the polls. **CBT** The clearing of totals on the DS850 is protected by an override pass code. It is customer's responsibility to ensure that this pass code is disseminated to only appropriate election officials.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.8.e			•		•		No	**PBT** The DS200 provides visibility using the following functions: By pressing the Open Polls button, the polling place official can activate the counter allowing for the counting of official ballots. The counter will print out a verification of poll opening with a zero report, and the LCD screen will indicate normal ballot counting mode. This mode includes a public counter, which indicates the total number voting. **CBT** DS850 visibility is provided by a real time counter, which indicates the number of ballots processed, is provided as part of the default message.

2.1.9 TELECOMMUNICATIONS

CONTROLLING REQUIREMENT

V: 1, §2.1.2

For all voting systems that use telecommunications for the transmission of data during pre-voting, voting or post-voting activities, capabilities shall be provided that ensure data are transmitted with no alteration or unauthorized disclosure during transmission. Such transmissions shall not violate the privacy, secrecy, and integrity demands of the Guidelines. VVSG 2005 Section 6 describes telecommunications standards that apply to, at a minimum, the following types of data transmissions:

Voter Authentication: Coded information that confirms the identity of a voter for security purposes for a system that transmit votes individually over a public network.

Ballot Definition: Information that describes to voting equipment the content and appearance of the ballots to be used in an election.

Vote Transmission to Central Site: For voting systems that transmit votes individually over a public network, the transmission of a single vote to the county (or contractor) for consolidation with other county vote data.

Vote Count: Information representing the tabulation of votes at any one of several levels: polling place, precinct, or central count.

List of Voters: A listing of the individual voters who have cast ballots in a specific election.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.9, Voter Authentication							•	N/A	Vote transmission is not supported.
V: 1, §2.1.9, Ballot Definition							•	N/A	Vote transmission is not supported.
V: 1, §2.1.9, Vote Transmission to Central Site							•	N/A	Vote transmission is not supported.
V: 1, §2.1.9, Vote Count							•	N/A	Vote transmission is not supported.
V: 1, §2.1.9, List of Voters							•	N/A	Transmitted DS200 results do not include any information that identifies voters.

2.1.9.1 ADDITIONAL TELECOMMUNICATIONS INFORMATION

2.1.9.1.1 INTERNAL MODEMS

No modems are installed.

2.1.9.1.2 EXTERNAL MODEMS

No external modems are supported.

2.1.9.1.3 VOTER AUTHENTICATION

Not Applicable. The DS200 does not include provisions for real-time vote transmission that would require the identification of a voter. Transmission capabilities are limited to the transfer of the unofficial early results after polls close. The results are intended to be sent to a central location for vote consolidation and election reporting.

2.1.9.1.4 BALLOT DEFINITION

Not Applicable. The DS200 does not include provisions for ballot definition transmission.

2.1.9.1.5 VOTE TRANSMISSION TO CENTRAL SITE

Not Applicable. Vote transmission is not supported.

2.1.9.1.6 VOTE COUNT

Not Applicable. Transmission of vote counts is not supported.

2.1.9.1.7 LIST OF VOTERS

Not Applicable. Transmitted DS200 does not include any information that identifies voters.

The following data transmission attributes characterize the operational capabilities of the DS200's communication subsystem as outlined in Vol 1, Section 6.2 of the VVSG

2.1.9.1.8 ACCURACY

Not applicable. Transmission of vote counts is not supported.

2.1.9.1.9 DURABILITY, RELIABILITY, MAINTAINABILITY AND AVAILABILITY

Not Applicable. This requirement does not apply to the software.

2.1.9.1.10 INTEGRITY

Not Applicable.

a. This requirement does not apply to the software or DS200.

b. This requirement does not apply to the software or DS200. The DS200 is not directly compatible with DSU/CSU equipment.

c. This requirement does not apply to the software or DS200.

2.1.9.1.11 CONFIRMATION

Not Applicable. Voting transmissions is not supported.

2.1.10 DATA RETENTION

CONTROLLING REQUIREMENT

V: 1, §2.1.10

United States Code Title 42, Sections 1974 through 1974e state that election administrators shall preserve for 22 months "all records and paper that came into (their) possession relating to an application, registration, payment of poll tax, or other act requisite to voting." This retention requirement applies to systems that will be used at anytime for voting of candidates for federal offices (e.g., Member of Congress, United States Senator, and/or Presidential Elector). Therefore, all voting systems shall provide for maintaining the integrity of voting and audit data during an election and for a period of at least 22 months thereafter.

Because the purpose of this law is to assist the federal government in discharging its law enforcement responsibilities in connection with civil rights and elections crimes, its scope must be interpreted in keeping with that objective. The appropriate state or local authority must preserve all records that may be relevant to the detection and prosecution of federal civil rights or election crimes for the 22-month federal retention period, if the records were generated in connection with an election that was held in whole or in part to select federal candidates. It is important to note that Section 1974 does not require that election officials generate any specific type or classification of election record. However, if a record is generated, Section 1974 comes into force and the appropriate authority must retain the records for 22 months.

For 22-month document retention, the general rule is that all printed copy records produced by the election database and ballot processing systems shall be so labeled and archived. Regardless of system type, all audit trail information spelled out in VVSG Subsection 5.5 shall be retained in its original format, whether that be real-time logs generated by the system, or manual logs maintained by election personnel. The election audit trail includes not only in process logs of election-night and subsequent processing of absentee or provisional ballots, but also time logs of baseline ballot definition formats, and system readiness and testing results.

In many voting systems, the source of election-specific data (and ballot formats) is a database or file. In precinct count voting systems, this data is used to program each machine, establish ballot layout, and generate tallying files. It is not necessary to retain this information on electronic media if there is an official, authenticated printed copy of all final database information. However, it is recommended that the state or local jurisdiction also retain electronic records of the aggregate data for each voting machine so that reconstruction of an election is possible without data re-entry. The same requirement and recommendation applies to vote results generated by each precinct count voting machine.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.1.10	•	•	•	•	•	N/A		No	**EMS** Electionware and its modules manage data stored in a PostgreSQL database file. The database file may be backed up and restored using Electionware when the election official has appropriate Electionware rights and with PostgreSQL tools and admin rights. **UVS, PBT, BMD, CBT** Physical ballots, stored election results and equipment election programming may be reliably stored and recovered after 22 months if the jurisdiction stores election media and materials in an environment that meets manufacturer specifications.

2.1.11 ADDITIONAL OVERALL CAPABILITIES

CONTROLLING REQUIREMENT

Additional Requirements

1. Ballot Stamping Mechanism.
2. Usability - The voting system shall permit the voter to verify (in a private and independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted.
3. Usability - The voting system shall 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).
4. Usability - The voting system shall provide the voter with instructions on how to correct the ballot before it is cast and counted (including instructions on how 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).
5. Usability - The voting system shall ensure that any notification preserves the privacy of the voter and the confidentiality of the ballot.
6. Usability - Consistent with election law, the voting system should support a process that does not introduce any bias for or against any of the selections to be made by the voter. In both visual and aural formats, contest choices shall be presented in an equivalent manner.
7. Usability - The voting process shall be designed to minimize interaction difficulties for the voter.
8. Usability - The voting station shall prevent others from observing the contents of a voter's ballot.
9. Usability - The ballot and any input controls shall be visible only to the voter during the voting session and ballot submission.
10. Usability - The audio interface shall be audible only to the voter.
11. Usability - The voting system shall notify the voter of an attempted overvote in a way that preserves the privacy of the voter and the confidentiality of the ballot.
12. Usability - The accessible voting station shall be accessible to voters with partial vision. The accessible voting station shall be capable of showing all information in at least two font sizes, (a) 3.0-4.0 mm and (b) 6.3-9.0 mm
13. Usability - The audio interface shall be audible only to the voter.
14. Usability - The accessible voting station shall be accessible to voters who are blind.
15. Usability - The audio-tactile interface (ATI) of the accessible voting station shall provide the same capabilities to vote and cast a ballot as are provided by other voting machines or by the visual interface of the standard voting machine
16. Usability - The ATI shall allow the voter to have any information provided by the voting system repeated.
17. Usability - The ATI shall allow the voter to pause and resume the audio presentation.
18. Usability - The ATI shall allow the voter to skip to the next contest or return to previous contests.
19. Usability -The ATI shall allow the voter to skip over the reading of a referendum so as to be able to vote on it immediately.
20. Usability - All voting stations that provide audio presentation of the ballot shall conform to the following requirements. A sanitized headphone or handset shall be made available to each voter. The voting machine shall set the initial volume for each voter between 40 and 50 dB SPL. The voting machine shall provide a volume control with an adjustable volume from a minimum of 20dB SPL up to a maximum of 100 dB SPL, in increments no greater than 10 dB. The audio system shall be able to reproduce frequencies over the audible speech range of 315 Hz to 10 KHz.
21. Usability - The voting process shall be accessible to voters who lack fine motor control or use of their hands All keys and controls on the accessible voting station shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys shall be no greater 5 lbs. (22.2 N).
22. Usability - The accessible voting station controls shall not require direct bodily contact or for the body to be part of any electrical circuit.
23. **Telecommunications and Data Transmission -- VVSG V:1 S:7.5.5a:** If the voting system provides access to incomplete election returns and interactive inquiries before the completion of the official count, the system shall:

Be designed to provide external access to incomplete election returns (for equipment that operates in a central counting environment), only if that access for these purposes is authorized by the statutes and regulations of the using agency. This requirement applies as well to polling place equipment that contains a removable memory module or that may be removed in its entirety to a central place for the consolidation of polling place returns.

24. **VVSG Vol 1, Sec. 5.4.3.d -** In process audit records document system operations during diagnostic routines and the casting and tallying of ballots. At minimum, the in-process audit records shall contain: a.iii. Machine generated error and exception messages to demonstrate successful recovery. Examples include but are not limited to: The identification code and number of occurrences for each hardware and software error or failure.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
1.			●					Yes	**PBT** The ES&S DS200 has a solenoid mechanism for the use with a ballot stamp. This stamping mechanism is activated in this release.
2.		●		●				No	**UVS** ExpressVote summarizes the voting session using the same language and interface options selected during voting. The summary allows the voter to verify the selections made before finalizing the voting card. ExpressVote can scan a printed card and display selections using an on-screen or audio summary. **BMD** The AutoMARK provides a ballot summary at the end of the voting session using the same language and interface options selected during voting to allow the voter to verify the selections made before the marks are printed on a paper ballot. Additionally, the AutoMARK has an optional post print verification that allows them to visually validate the data that is read of the marked ballot or card before it is cast.
3.		●		●				No	**UVS, BMD** From an equipment summary screen, a voter can return to any contest and change selections before finalizing a ballot. If an incorrect selection or error is discovered after the ballot is marked, poll workers initiate a spoiled ballot procedure and provide the voter a new ballot.
4.		●		●				No	**UVS, BMD** ExpressVote and AutoMARK provide instructions in the selected language in both text and audio formats while on the summary screen.
5.		●		●				No	**UVS, BMD** ExpressVote and AutoMARK generate all notifications and instructions using the language and interface selected by the voter to preserve the privacy and confidentiality of the voting card. If a spoiled voting card or ballot procedure must be followed to obtain a replacement voting card or ballot, the voting card or ballot can be transferred to the poll worker in a privacy sleeve to prevent any breach of privacy.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
6.		●		●				No	**UVS, BMD** ExpressVote and AutoMARK provide presentation equivalence by: • Font defaults can be set up for each ballot to ensure that each candidate in a contest is displayed using the same font, font size, and emphasis. • Each candidate in a contest is allocated the exact same amount of screen space on the touch screen. • The name of each candidate is read without added emphasis to any particular candidate. • Tempo and volume options are universal and affect the audio presentation of each candidate name the same. • Color coding shall not be used as the sole means of conveying information, indicating an action, prompting a response, or distinguishing a visual element. • The system does not use color coding as the sole means of conveying information. • All text intended for the voter should be presented in a sans serif font. • The system uses the Arial font, which is a sans serif font. • The minimum figure-to-ground ambient contrast ratio for all text and informational graphics (including icons) intended for the voter shall be 3:1. • The system meets the minimum required contrast ratio in all modes and provide a high contrast mode if maximum contrast is desired.
7.		●		●				No	**UVS, BMD** No voting equipment key or control has a repetitive effect as a result of being held in its active position The interactive touch screen areas on the ExpressVote and AutoMARK activate upon release of the touch screen area rather than the initial press in order to avoid accidental repetition. Keypad keys activate once upon being pressed and will not activate again until the key is released and re-pressed.
8.		●		●				No	**UVS, BMD** When configured with the privacy shield in place and the ballot inserted, all voting information and input controls are visible only to the voter during the voting session. If AutoCAST is not used to place the printed ballot in a secure compartment and if the voter requires assistance to transfer the completed ballot from the ExpressVote or AutoMARK to the tabulator, a privacy sleeve can be placed to contain the ejected voting card so voting secrecy is preserved.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
9.		●		●				No	**UVS, BMD** When configured with the privacy shield in place and a ballot inserted, all voting information and input controls are visible only to the voter. If AutoCAST is not used to place the printed ballot in a secure compartment and if the voter requires assistance to transfer a ballot to the tabulator, a privacy sleeve can be placed to contain the ejected ballot so voting secrecy is preserved.
10.		●		●				No	**UVS, BMD** The audio interface is accessible through headphones. Equipment headphones have low sound leakage to preserve privacy.
11.		●		●				No	**UVS, BMD** Overvote warnings are presented in the normal method with text presentation on the touch screen and audio over the headphones. With privacy shields in place and headphone use, the privacy of the voter is maintained.
12.		●		●				No	**UVS, BMD** ExpressVote and AutoMARK screen magnification meets the low and high text height standards.
13.		●		●				No	**UVS, BMD** The audio interface for supported equipment is accessible through headphones. Headphones have low sound leakage to preserve privacy.
14.		●		●				No	**UVS, BMD** Audio interfaces used by supported equipment provide the same voting capabilities for voters who are blind as those provided for voters who are sighted.
15.		●		●				No	**UVS, BMD** The ATIs used by the ExpressVote and AutoMARK provide the same capabilities to vote and cast a ballot as are provided by other voting machines.
16.		●		●				No	**UVS, BMD** Supported equipment can repeat any audio by pushing a dedicated Repeat key included on the tactile keypad.
17.		●		●				No	**UVS, BMD** Audio can be paused by pressing and holding the Repeat key for 2 seconds. Audio is resumed by pressing the Repeat key a second time.
18.		●		●				No	**UVS, BMD** Navigation controls can be used to skip a contest or return to a previous contests.
19.		●		●				No	**UVS, BMD** The ExpressVote and AutoMARK allow a voter to skip immediately to the candidates or choices before the reading of a contest or referendum is complete.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
20.		●		●				No	**UVS, BMD** Headphones and sound output for supported equipment meets VVSG audio presentation requirements. Headphones are intended to be used with disposable coverings that can be provided for any voter who requires them.
21.		●		●				No	**UVS, BMD** ExpressVote and AutoMARK keys and controls are operable with one hand and with direct forward-directional force. Required force is no greater than 5 lbs
22.		●		●				No	**UVS, BMD** ExpressVote and AutoMARK require pressure only to operate and do not require direct bodily contact of any part of the electrical circuit.
23.	●		●		●	●		No	**EMS** ERM results are stored locally to a PC or secure shared storage and not susceptible to "external access." **PBT** The DS200 does not allow access to results before polls close and allows only the mandatory printing and optional transmission of the polling place results after polls close. **CBT** The DS850 does not allow external access. The machine is physically segregated from unauthorized users with no connection to a telecommunications network. DS850 units networked locally to a central reporting PC can only send results to that system and cannot be accessed from the reporting PC. In-progress reports are initiated and controlled by authorized election officials.
24.	●		●		●			No	**EMS** ERM results are stored locally to a PC or secure shared storage and not susceptible to "external access." **PBT** The DS200 does not allow access to results before polls close and allows only the mandatory printing and optional transmission of the polling place results after polls close. **CBT** The DS850 does not allow external access. The machine is physically segregated from unauthorized users with no connection to a telecommunications network. DS850 units networked locally to a central reporting PC can only send results to that system and cannot be accessed from the reporting PC. In-progress reports are initiated and controlled by authorized election officials.

2.2 PRE-VOTING CAPABILITIES

CONTROLLING REQUIREMENT

V: 1, §2.2

This section of the ES&S Voting System Functionality Description defines the ES&S Voting System's capabilities for supporting the following:

1. Ballot Preparation
2. Election Programming
3. Ballot and Program Installation and Control
4. Readiness Testing
5. Verification at the Polling Place
6. Verification at the Central Counting Place
7. This section also addresses requirements to ensure compatible interfaces with the ballot definition process and the reporting of election results.

2.2.1 BALLOT PREPARATION

CONTROLLING REQUIREMENT

V: 1, §2.2.1

Ballot preparation is the process of using election databases to define the specific contests, questions, and related instructions to be contained in ballots and to produce all permissible ballot layouts. Ballot preparation requirements include:

- General capabilities
- Ballot formatting
- Ballot production

2.2.1.1 GENERAL CAPABILITIES

CONTROLLING REQUIREMENT

V: 1, §2.2.1.1

All systems shall provide the general capabilities for ballot preparation. All systems shall be capable of:

a. Enabling the automatic formatting of ballots in accordance with the requirements for offices, candidates, and measures qualified to be placed on the ballot for each political subdivision and election district.

b. Collecting and maintaining the following data

   i. Offices and their associated labels and instructions.

   ii. Candidate names and their associated labels.

   iii. Issues or measures and their associated text.

c. Supporting the maximum number of potentially active voting positions as indicated in the system documentation

d. For a primary election, generating ballots that segregate the choices in partisan contests by party affiliation

e. Generating ballots that contain identifying codes or marks uniquely associated with each format.

f. Ensuring that vote response fields, selection buttons, or switches properly align with the specific candidate names and/or issues printed on the ballot display, ballot card or sheet, or separate ballot pages.

Paper-based voting systems shall also meet the following requirements applicable to the technology used:

g. Enable voters to make selections by making a mark in areas designated for this purpose upon each ballot sheet

h. For marksense systems, ensure that the timing marks align properly with the vote response fields.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.1.1.a	•						No	**EMS** The Paper Ballot module of Electionware allows the user to define default ballot formatting using templates and style sheets that can be applied to the ballot styles. Formatting of multiple items across all ballots, based upon the same style (First name, Last Name, etc.), is possible as well as individual elements within a ballot cell without affecting others by creating a unique element style.
V: 1, §2.2.1.1.bi-iii	•						No	**EMS** Electionware captures all jurisdictional data and election-specific data such as offices, contests, candidates, languages, rotation, issues, retention and all other information necessary for creating ballot styles.
V: 1, §2.2.1.1.c	•		•		•		No	**EMS** The maximum number of voting positions is specified in Electionware-Capture on a per-contest basis. The Paper Ballot module allows the use of various ballot sizes, which control the maximum number of voting positions on the ballot. Both landscape and portrait ballot layouts are supported. Ballot sizes and voting position limitations appear in the *Voting System Overview.*
V: 1, §2.2.1.1.d	•		•		•		No	**EMS** Electionware-Capture produces ballot styles specific to individual political parties for primary elections. Using Electionware - Paper Ballot, ballots can be formatted separately for each political party in a primary election. **PBT CBT** ES&S ballot scanners fully support tabulation of ballots containing contests segregated by party affiliation for primary elections. See the *Electionware User's Guides* for a complete discussion of ballot formatting capabilities.
V: 1, §2.2.1.1.e	•		•		•		No	**EMS** Each ballot style is assigned a unique ballot identification number. "Code Channels" along the edge of ballot (created by Electionware's Paper Ballot module) identify the ballot style.
V: 1, §2.2.1.1.f	•	•	•	•	•		No	**EMS** Electionware – Paper Ballot is used to position and configure ballot contents and targets. Ballots formatted with Electionware's Paper Ballot module can be generated in PDF format for comprehensive proofreading by election officials prior to printing the official ballot run. See the Electionware documentation for a discussion of ballot target alignment and

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								formatting capabilities. Electionware – Paper Ballot accurately places each target on the ballot in positions readable by ES&S AutoMARK and DS200 and DS850 ballot tabulators. **UVS** For ExpressVote, ballot targets for the voter interface are formatted with Electionware. Target accuracy is tested by executing a test print from the test menu on a blank voting card of each style and/or logic and accuracy testing on the vote capture device and ballot scanning equipment. **PBT, CBT** ES&S ballot scanners include system tests to ensure that paper ballots formatted for the system meet all requirements for readability – including the alignment of ballot targets and thresholds for mark detection. **BMD** For AutoMARK, ballot targets for the voter interface are formatted with Electionware. Target accuracy is tested by executing a test print from the test menu on a blank ballot of each style and/or logic and accuracy testing on the Ballot Marking Device and ballot scanning equipment.
V: 1, §2.2.1.1.g	•	•	•	•	•		No	**EMS** Target positions for every vote-able response area are defined in Electionware; these include candidate, write-in, issue response, and straight party choice. Target positions are stored in the Electionware database, which is used by the Electionware Framework to program ES&S ballot tabulators. **UVS** Voters select ballot options by touching the target associated with their selection on a visual interface, or selecting an option corresponding to an audio selection using ATI keys. All markings occur on the screen Via touch screen, navigation buttons, or sip-n-puff interfaces. The marked ballot contains readable text and matching bar codes. **PBT, CBT** ES&S ballots include clearly defined oval targets to illustrate where a voter should mark a ballot in order to designate the selection of a specific candidate or ballot option. **BMD** Voters select ballot options by touching the target associated with their selection on a visual interface, or selecting an option corresponding to an audio selection using ATI keys. These selections are printed on the inserted ballot in the same fashion as if hand marked.
V: 1, §2.2.1.1.h	•		•	•	•		No	**EMS** ES&S ballots include a series of black rectangles printed around the perimeter of the page to designate acceptable rows where ballot targets may be placed. The black rectangles, called timing marks, are configured Electionware - Paper Ballot to facilitate accurate mark detection by the ES&S AutoMARK, DS200 and DS850 ballot tabulators.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								PBT, CBT and BMD ES&S ballots include a series of black rectangles printed around the perimeter of the page to designate acceptable rows where ballot targets may be placed. Normal operating procedures for ES&S voting equipment include a series of readiness tests designed to identify any problems with ballot contents or printing.

2.2.1.2 BALLOT FORMATTING

CONTROLLING REQUIREMENT

V: 1, §2.2.1.2

Ballot formatting is the process by which election officials or their designees use election databases and voting system software to define the specific contests and related instructions contained on the ballot and present them in a layout permitted by state law. All voting systems shall provide a capability for:

a. Creation of newly defined elections.

b. Rapid and error-free definition of elections and their associated ballot layouts.

c. Uniform allocation of space and fonts used for each office, candidate, and contest such that the voter perceives no active voting position to be preferred to any other.

d. Simultaneous display of the maximum number of choices for a single contest as indicated by the vendor in the system documentation.

e. Retention of previously defined formats for an election.

f. Prevention of unauthorized modification of any ballot formats.

g. Modification by authorized persons of a previously defined ballot format for use in a subsequent election.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.1.2.a	•						No	**EMS** The user must create a new election in Electionware. The number of elections is limited solely to the hard drive capacity. A new election must be created before prior to entering election-specific data. See Electionware user documentation for procedures.
V: 1, §2.2.1.2.b	•						No	**EMS** Election data is entered or imported using Electionware-Capture. Data is checked for errors as it is imported, entered and during ballot style generation. Users can use the many proofing reports or PDFs to check that the election data was entered properly. Electionware's Paper Ballot module provides election definition and ballot layout services to election officials.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.1.2.c	•						No	**EMS** The Electionware Paper Ballot module provides ballot layout with uniform font and space allocation, unless and otherwise specified by the user.
V: 1, §2.2.1.2.d	•						No	**EMS** The Electionware Paper Ballot "ballot view" simultaneously displays all choices for a single contest.
V: 1, §2.2.1.2.e	•						No	**EMS** The Electionware database retains previous election data and ballot configuration for re-use in defining subsequent elections.
V: 1, §2.2.1.2.f	•						No	**EMS** Ballot formats can only be modified using Paper Ballot and only by users who are assigned the appropriate access levels by an election administrator.
V: 1, §2.2.1.2.g	•						No	**EMS** Previously defined ballot format and election data can be modified by authorized users for use in subsequent election by authorized persons.

2.2.1.3 BALLOT PRODUCTION

CONTROLLING REQUIREMENT

V: 1, §2.2.1.3

Ballot production is the process of converting ballot formats to a media ready for use in the physical ballot production or electronic presentation.

The voting system shall provide a means of printing or otherwise generating a ballot display that can be installed in all voting equipment for which it is intended. All voting systems shall provide the capabilities below

a. The electronic display or printed document on which the user views the ballot is capable of rendering an image of the ballot in any of the languages required by The Voting Rights Act of 1965, as amended.

b. The electronic display or printed document on which the user views the ballot does not show any advertising or commercial logos of any kind, whether public service, commercial, or political, unless specifically provided for in State law. Electronic displays shall not provide connection to such material through hyperlink.

c. The ballot conforms to vendor specifications for type of paper stock, weight, size, shape, size and location of punch or mark field used to record votes, folding, bleed through, and ink for printing if paper ballot documents or paper displays are part of the system.

Vendor documentation for marksense systems shall include specifications for ballot materials to ensure that vote selections are read from only a single ballot at a time, without detection of marks from multiple ballots concurrently (e.g., reading of bleed-through from other ballots).

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.1.2.a	•	•	•	•	•		No	**System** See the conformity statement submitted with ES&S' application for submission a list of languages supported by this voting system. **NOTE:** The languages to be certified in this release may represent a subset of languages ES&S products are capable of supporting. The product's *Software Design and Specification* document may contain additional references to an expanded list of languages only supported by that component. Language options are initially defined in Electionware-Capture.
V: 1, §2.2.1.2.b	•	•	•	•	•		No	**System** ES&S ballot layout software does not restrict election officials from placing logos or other advertisements on ballot faces should an election official choose to do so. The system relies on sound practices by election officials to prevent placement of restricted materials.
V: 1, §2.2.1.2.c	•	•	•	•	•		No	**System** See the *ES&S Ballot Production Handbook* for printing ES&S paper ballots. Partner printers and election officials must adhere to ES&S' provided standards to ensure ballot readability. Ballot layout positioning of the mark fields is executed in Electionware-Paper Ballot
V: 1, §2.2.1.2, vendor doc								**System** See the *ES&S Ballot Production Handbook.*

2.2.2 ELECTION PROGRAMMING

CONTROLLING REQUIREMENT

V: 1, §2.2.2

Election programming is a process handles in upstream applications in the Unity Software applications. Election Programming is the process by which election officials or their designees use election databases and vendor system software to logically define the voter choices associated with the contents of the ballots. All systems shall provide:

a. Logical definition of the ballot, including the definition of the number of allowable choices for each office and contest

b. Logical definition of political and administrative subdivisions, where the list of candidates or contests varies between polling places.

c. Exclusion of any contest on the ballot in which the voter is prohibited from casting a ballot because of place of residence, or other such administrative or geographical criteria

d. Ability to select from a range of voting options to conform to the laws of the jurisdiction in which the system will be used.

e. Generation of all required master and distributed copies of the voting program, in conformance with the definition of the ballots for each voting device and polling place, and for each tabulating device.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.2.a	•						No	**EMS** Electionware-Capture builds the election data that defines the contents of all ballots in the election. Configurable data includes the number of allowable choices for each contest, including write-in candidates.
V: 1, §2.2.2.b	•						No	**EMS** Electionware-Capture defines the political parties, precincts, precinct splits, and districts, which determine the contests and candidates that appear on each ballot style.
V: 1, §2.2.2.c	•						No	**EMS** Ballots are organized by ballot styles. Ballot styles formatted for a jurisdiction or political or geographic subdivisions include only the contests and ballot choices valid for that subdivision. Through ballot style definition, Electionware prevents the inclusion of any contest that a voter is not permitted to vote.
V: 1, §2.2.2.d	•						No	**EMS** Electionware-Capture controls the options which define all aspects of the election including but not limited to: • Election type • Contests on ballot • Vote for n of m how contests may be voted (ex. vote for one, vote for more than one, straight party, etc.) • candidate order/rotation • candidate group rotation • write-in control • instructions and other which data items that appear the ballot • contest order • how ballot styles are determined • ability to combine equivalent ballot styles to reduce printing costs • passwords for administrative functions • assignment of ballot identification numbers • enabling and location of stubs • tabulation statistics
V: 1, §2.2.2.e	•						No	**EMS** Electionware defines and generates ballot styles and vote-able positions which are stored in the Electionware database and used to configure the various voting devices supported by ES&S. Following ballot layout and formatting, Paper Ballot saves all vote-able positions in the Electionware database. This data is used by Electionware to create the DS200 and DS850 Election Media for the target voting equipment and tabulators.

2.2.3 BALLOT PROGRAM INSTALLATION AND CONTROL

CONTROLLING REQUIREMENT

V: 1, §2.2.3

All systems shall provide a means of installing ballots and programs on each piece of polling place or central count equipment in accordance with the ballot requirements of the election and the requirements of the jurisdiction in which the equipment will be used. All systems shall include the following at the time of ballot and program installation:

a. A detailed work plan or other documentation providing a schedule and steps for the software and ballot installation, which includes a table outlining the key dates, events and deliverables.

b. A capability for automatically verifying that the software has been properly selected and installed in the equipment or in programmable memory devices, and for indicating errors.

c. A capability for automatically validating that software correctly matches the ballot formats that it is intended to process, for detecting errors, and for immediately notifying an election official of detected errors.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.3.a	●	●	●	●	●		No	**EMS** The *Electionware Administrator's Guide* includes a sample work plan that outlines phases of election preparation with key dates and deliverables; including software and ballot installation. Electionware user manuals detail the steps necessary to create ballot styles for use on the various tabulators and include descriptions of the steps necessary to import, modify election data, and create tabulator and accessible ballot marking device media, and configuration files for Election Reporting Manager. **UVS, PBT, CBT and BMD** Sample work plans are included in ES&S *Operators Guides* for the universal voting system, tabulators and the BMD and ES&S *User's Guides* for voting system software.
V: 1, §2.2.3.b	●	●	●	●	●		No	**EMS** The Electionware installer verifies file contents prior to executing installation. Electionware also verifies that a proper Module start has occurred and continually updates the Electionware Audit Log with any errors. The software loaded on to tabulator or ballot marking device media is verified by using hashing algorithms. Paper Ballot is installed by the Electionware installer The installer verifies the file contents prior to installation. Paper Ballot also validates its operation by updating the Audit Log with any errors. **UVS, PBT, CBT and BMD** Self-diagnostic tests verify that firmware is properly installed upon system startup. Initial state reports identify the installed election program and firmware versions. Any errors loading system firmware or election programming result equipment shutdown with a clear error message. See ES&S *Operator's Guides* for a description of equipment startup procedures and instructions for printing and reading equipment initial state reports.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.3.c	●	●	●	●	●		No	**EMS** Logic and Accuracy test procedures for ES&S tabulators verify that system election programming correctly selects the proper ballot formats when creating the election media. See ES&S *Operator's Guides* for ballot scanners and ballot marking devices for Logic and Accuracy test procedures. **UVS, PBT, CBT and BMD** The Test Print capability on the ExpressVote and AutoMARK in conjunction with system Logic and Accuracy test procedures verify that system election programming correctly matches defined ballot formats. Universal Voting Systems, Ballot Tabulators and Ballot Marking Devices automatically notify election officials when scanned test ballots do not match installed ballot programming. See ES&S voting equipment *Operator's Guides* for test procedures.

2.2.4 READINESS TESTING

CONTROLLING REQUIREMENT

V: 1, §2.1.2

Election personnel conduct voting equipment and voting system readiness tests prior to the start of an election to ensure that the voting system functions properly, to confirm that voting equipment has been properly integrated and to obtain equipment status reports. All voting systems shall provide the capabilities to:

a. Verify that voting equipment and precinct count equipment is properly prepared for an election, and collects data that verifies equipment readiness.

b. Obtain status and data reports from each set of equipment.

c. Verify the correct installation and interface of all voting equipment.

d. Verify that hardware and software function correctly.

e. Generate consolidated data reports at the polling place and higher jurisdictional levels.

f. Segregate test data from actual voting data, either procedurally or by hardware/software features.

Resident test software, external devices and special purpose test software connected to or installed in voting equipment to simulate operator and voter functions may be used for those test provided that the following standards are met:

g. These elements shall be capable of being tested separately, and shall be proven to be reliable verification tools prior to their use

h. These elements shall be incapable of altering or introducing any residual effect on the intended operation of the voting device during any succeeding test and operational phase

Paper-based systems shall:

i. Support conversion testing that uses all potential ballot positions as active positions.

j. Support conversion testing of ballots with active position density for systems without pre-designated ballot positions.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.4.a		•	•	•	•			No	**UVS** The ExpressVote is verified prior to election by executing the test print function on a blank voting card of each style. Each style tested is logged. **PBT, CBT** Operating procedures for ES&S ballot scanning equipment include provisions for system logic and accuracy testing. Please see ES&S *Operators Manuals* for instructions for preparing and testing equipment. **BMD** The AutoMARK is verified prior to election by executing the test print function on a blank ballot of each style. Each style tested is logged. AutoMARK marked ballots may also be used to run logic and accuracy tests on ES&S tabulators.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.4.b	•	•	•	•	•			No	**EMS** Users can view machine log files for ES&S ballot scanners from in the Electionware-Acquire module. **UVS** ExpressVote executes automated diagnostics during system startup and displays system status information for the election worker. The operation log, scan log and service log can be printed from the system's administrative menu. **PBT** The ES&S DS200 automatically prints an Initial State Report each time a user turns on the terminal, or installs a valid election definition. This report includes identification of the system firmware, the installed election definition and details the machine's operating status and options selected in the scanner's election program. **BMD** The AutoMARK executes automated diagnostics on system startup and display system status information for the election worker. The system's operation log, scan log and service log can be printed from the system's administrative menu. **CBT** The DS850 automatically prints a System Readiness Report each time a user activates the unit. This report identifies system firmware and the installed election definition, details the machine's operating status and lists the options selected in the scanner's election program.
V: 1, §2.2.4.c	•	•	•	•	•			No	**EMS** Election Reporting Manager software is used to verified interfaces between equipment prior to an election by generated consolidated results reports from Logic and Accuracy test data generated from ES&S ballot scanners. These results ensure that the proper election program is installed on both the tabulators and reporting software and that the election programming for both is in synch. **UVS, PBT, CBT and BMD** The universal voting system and ballot marking device are verified prior to election by running the system logic and accuracy test for the marking device and using those marked ballots to run logic and accuracy tests on ES&S tabulators. This test ensures that the proper election program is installed on both the BMD and tabulator and the election programming for both is in synch.
V: 1, §2.2.4.d	•	•	•	•	•			No	**EMS** Pre-election L&A testing should include the processing of tabulated test results with ERM and the audit of these results against reports generated by ballot scanning equipment.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
									UVS, PBT, CBT and BMD Readiness and logic and accuracy tests verify the functionality and operating status of system hardware and software. ES&S recommended test procedures are included in voting equipment *Operator's Guides*.
V: 1, §2.2.4.e	•		•		•	•		No	**EMS** ES&S ballot scanning equipment provides machine level results reports. All other levels of jurisdiction reporting (ex. Polling place, precinct and jurisdiction/county totals) are provided by consolidated results reports generated using ERM. **PBT** The ES&S DS200 generates terminal level results reports from the unit's integrated thermal printer. Consolidated reports may be printed at election headquarters using Election Reporting Manager Software. **CBT** The DS850 generates precinct and election level results reports from the laser printer attached to the tabulator. Consolidated reports may be printed at election headquarters using ERM.
V: 1, §2.2.4.f	•		•		•			No	**EMS** By procedure, all pre-election L&A test data must be cleared from all voting devices and from ERM. Evidence of this removal is provided by generating "zero reports" on all voting devices and in ERM. Procedures for clearing test data are included in ES&S *Operator's Guides* and ES&S software *User's Guides*. **PBT** When testing a scanner in Election Test Mode, counts are stored on the DS200 Election Media. When the operator exits the Election Test, the DS200 forces the counts to be cleared before the operator can proceed. If Election Media is removed from the device before exiting Election Test Mode (an unlikely event), the totals will remain. But if the operator attempts to open polls with the Election Media, the system will warn that counts exist on the drive, and will force the user to decide whether text results are kept or cleared before polls can be opened. **CBT** The election official must create and employ procedures that guarantee the segregation of test data from actual voting data. Procedures for clearing vote totals from the DS850 are included the system's *Operator's Guide*.
V: 1, §2.2.4.g							•	N/A	N/A
V: 1, §2.2.4.h							•	N/A	N/A

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.4.i		●	●	●	●			No	**UVS, PBT, CBT and BMD** Conversion testing with all ballot targets marked is accomplished by testing "all fill" ballots during logic and accuracy testing. Conversion testing on the ExpressVote and AutoMARK is accomplished by activating the test print function on a blank voting card or ballot of each style. See ES&S tabulator and BMD *Operator's Guides* for Logic and Accuracy test procedures.
V: 1, §2.2.4.j							●	N/A	N/A

2.2.5 VERIFICATION AT THE POLLING PLACE

CONTROLLING REQUIREMENT

V: 1, §2.2.5

Election officials perform verification at the polling place to ensure that all voting systems and voting equipment function properly before and during an election. All voting systems shall provide a formal record of the following, in any media, upon verification of the authenticity of the command source:

a. The election's identification data

b. The identification of all equipment unit

c. The identification of the polling place.

d. The identification of all ballot formats.

e. The contents of each active candidate register by office and of each active measure register at all storage locations (showing that they contain only zeros).

f. A list of all ballot fields that can be used to invoke special voting options.

g. Other information needed to confirm the readiness of the equipment, and to accommodate administrative reporting requirements.

To prepare voting devices to accept voted ballots, all voting systems shall provide the capability to test each device prior to opening to verify that each is operating correctly. At a minimum, the tests shall include:

h. Confirmation that there are no hardware or software failures.

i. Confirmation that the device is ready to be activated for accepting votes.

If a precinct count system includes equipment for the consolidation of polling place data at one or more central counting locations, it shall have means to verify the correct extraction of voting data from transportable memory devices, or to verify the transmission of secure data over secure communication links

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.5.a		•	•	•			No	**UVS** Initial system diagnostics for the ExpressVote display the identification code for the installed election. **PBT** A DS200 Initial State Report automatically generates when a user activates the system and includes identification of the system's installed election definition. **BMD** Initial system diagnostics for the AutoMARK display the identification code for the installed election.
V: 1, §2.2.5.b		•	•	•			No	**UVS** An equipment serial number is displayed on startup and included in the operation log printed from the test mode. **PBT** The DS200 Initial State Report identifies the system firmware version. **BMD** An equipment serial number is displayed on startup and included in the operation log printed from the test mode.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.5.d		•	•	•			No	**UVS** Election programming accommodates ballot variations and formats for all polling places. Any device program may be used at any polling place if the definition includes all possible ballot formats. The log identifies the polling place as named in the election definition stored on a device's removable memory. **PBT** The DS200 Initial State Report identifies the Poll place by print name and number. **BMD** A BMD election program for the AutoMARK accommodates ballot variations and formats for all polling places. Any ballot marking device program may be used at any polling place if set up this way. The log identifies the polling place as named in the election definition stored on a device's removable memory.
V: 1, §2.2.5.d		•	•	•			No	**UVS** The election program for the ExpressVote can accommodate voting card variations and formats for all polling places. **PBT** The DS200 Initial State Report identifies the supported ballot size and number of sides for the installed election definition. **BMD** The election program for the AutoMARK can accommodate ballot variations and formats for all polling places.
V: 1, §2.2.5.e			•				No	**PBT** The ES&S DS200 automatically generates a zero report during the poll opening process to verify counts begin at zero.
V: 1, §2.2.5.f			•				No	**PBT** Ballot fields that may be used to invoke special voting options – such as a single target used to cast a straight party ballot – are clearly identified on the paper ballot.
V: 1, §2.2.5.g		•	•	•			No	**UVS** Display of the system ready screen confirms that the unit passed all internal diagnostics and is prepared for voting. **PBT** In addition to the DS200 zero report; a configurable certification report can be generated for poll worker signatures. Once the system executes all required self-test and initialization actions, the display screen automatically enters the Vote mode, which includes voter instructions indicating that the system is ready for use. **BMD** The appearance of the AutoMARK system ready screen confirms that the unit passed all internal diagnostics and is prepared for voting.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.5.h		•	•	•			No	**UVS, PBT, BMD** If hardware or firmware failures are encountered during initial testing ES&S polling place equipment terminates operation, displays an error message and logs the event. See ES&S *Operator's Guides* for pre-election Logic and Accuracy test procedures and a list of error messages with troubleshooting instructions.
V: 1, §2.2.5.i		•	•	•			No	**UVS, PBT, BMD** Successful completion of pre-election logic and accuracy testing confirms that ES&S devices are ready for accepting ballots. See ES&S *Operator's Guides* for pre-election Logic and Accuracy test procedures. After successful initialization, each item of ES&S polling place equipment displays a system ready screen with a voter-facing message that indicates that the system is ready for use.
V: 1, §2.2.5, results consolidation	•		•				No	**EMS and PBT** System audit logs for both the ES&S DS200 terminal and *Election Reporting Manager (ERM)* software verify the correct extraction of voting data from the Election Media depending on the consolidation method used by the jurisdiction. See ES&S *Operator's Guides* for precinct count equipment and the *User's Guide* for ES&S reporting software for procedures for consolidating vote data and generating audit reports.

2.2.6 VERIFICATION AT THE CENTRAL COUNT LOCATION

CONTROLLING REQUIREMENT

V: 1, §2.2.6

Election officials perform verification at the central location to ensure that vote counting and vote consolidation equipment and software function properly before and after an election. Upon verification of the authenticity of the command source, any system used in a central count environment shall provide a printed record of the following:

a. The election's identification data

b. The contents of each active candidate register by office and of each active measure register at all storage locations (showing that they contain all zeros).

c. Other information needed to ensure the readiness of the equipment and to accommodate administrative reporting requirements.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.2.6a	•				•		No	**EMS** To verify election data, the current election information is displayed in the ERM screen title bar and included on all ERM displayed and printed reports. **CBT** To verify system election data, the DS850 generates a system readiness report each time the scanner is initialized. This report includes an election identification block that is unique for each and every election. In addition, the election is identified on the system display.
V: 1, §2.2.6b	•				•		No	**EMS** To verify that initial counts are set to zero, each time a user starts ERM, the first user screen after the copyright display lists the current election name, and total ballots totaled at the time ERM is started. After pre-election L&A testing, all results must be cleared and the appropriate "zero report" generated to validate that all candidate counters are set to zero prior to live counting. **CBT** To verify initial scanner totals are set to zero, prior to official ballot tabulation, the DS850 memory can be cleared. The election official can then produce a standard set of reports that verify that system counters are set to zero.
V: 1, §2.2.6c	•				•		No	**EMS** ERM readiness tests include all information required to verify the operational status of system reporting software. See the *ERM User's Guide* for descriptions of system readiness tests procedures. **CBT** Each time the system is started, the DS850 generates a system readiness report that verifies equipment readiness. Should the readiness test fail, the DS850 provides a visual warning; generates a hard copy report of the issue encountered; and then enters a non-tabulating standby mode.

2.2.7 ADDITIONAL PRE-VOTING CAPABILITIES OR REQUIREMENTS

CONTROLLING REQUIREMENT

Functional Requirements

1. DS200 Status Barcode Display

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
1.			•				Yes	**PBT** (Optional) This setting allows the DS200 to display system health status in a QR 2D barcode that can be scanned to pass the data back to a central administration site in preparation for opening the polls. A poll worker can take a picture of the code with their smartphone and use the smartphone-based scanning application to pass the data to a central administration site.

2.3 VOTING CAPABILITIES

V: 1, §2.3

All voting systems shall support:

- Opening the polls
- Casting a ballot

Additionally, all DRE systems shall support:

- Activating the ballot
- Augmenting the election counter
- Augmenting the life-cycle counter

2.3.1 OPENING THE POLLS

CONTROLLING REQUIREMENT

V: 1, §2.3.1

The capabilities required for opening the polls are specific to individual voting system technologies. At a minimum, the systems shall provide the functional capabilities indicated below.

2.3.1.1 PRECINCT COUNT SYSTEM

CONTROLLING REQUIREMENT

V: 1, §2.3.1.1

To allow voting devices to be activated for voting, all precinct count systems shall provide:

a. An internal test or diagnostic capability to verify that all of the polling place tests specified in Subsection 2.2.5 has been successfully completed.

b. Automatic disabling of any device that has not been tested until it has been tested.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.1.1.a		•	•	•			No	**UVS** Display of the system ready screen confirms completion of self diagnostics. The ExpressVote does not accept, tabulate or store votes. The system converts vote selections into printed marks on a paper voting card. **PBT** During system initialization and poll opening, a series of internal system checks execute. These checks include the automatic printing of the initial state report, and zero report, which provide all information required by the VVSG to verify equipment readiness. See the *DS200 Operator's Guide* for sample system readiness reports. **BMD** Display of the system ready screen confirms completion of self diagnostics. The AutoMARK does not accept, tabulate or store votes. The system converts vote selections into printed marks on a paper ballot.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.1.1.b		•	•	•			No	**UVS** Failure of any startup diagnostics for the ExpressVote will halt the boot process and display an error message. **PBT** If any system test fails, or a DS200 fails to print the necessary reports, the unit will not allow voting until the issue is resolved and internal tests successfully complete. **BMD** Failure of any startup diagnostics for the AutoMARK will halt the boot process and display an error message.

2.3.1.2 PAPER-BASED SYSTEM REQUIREMENTS

CONTROLLING REQUIREMENT

V: 1, §2.3.1.2

To facilitate opening the polls, all paper-based systems shall include:

a. A means of verifying that ballot marking devices are properly prepared and ready to use.

b. A voting booth or similar facility, in which the voter may mark the ballot in privacy

c. Secure receptacles for holding voted ballots.

In addition to the above requirements, all paper-based precinct count equipment shall include a means of:

d. Activating the ballot counting device.

e. Verifying that the device has been correctly activated and is functioning properly.

f. Identifying device failure and corrective action needed.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.1.2.a		•	•	•	•		No	**UVS, BMD** The ExpressVote and AutoMARK have a test print function that prints the expected target selections and candidate names on the ballot for each candidate in each contest to ensure the paper ballot matches the AutoMARK election programming. By executing this test for a blank ballot of each style it confirms the full election setup. **PBT, CBT and BMD** The AutoMARK provides ballot marking support for voters with disabilities. Logic and accuracy testing ES&S ballot marking devices and precinct ballot scanners verify that each ballot marking device is properly prepared and ready for use. Logic and accuracy testing verifies that black levels of AutoMARK marked ballot targets fall within the read tolerance range of the ballot scanner's sensors.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								Logic and accuracy testing ES&S DS200 and DS850 ballot scanners verifies that black levels of hand marked ballot targets fall within the read tolerance range of the scanner's sensors.
V: 1, §2.3.1.2.b		•	•	•	•		No	**UVS, PBT, CBT and BMD** The ES&S voting system does not specify a voting booth. Several types of voting booths are available for purchase through the ES&S supply store. Each booth provides a private and secure environment for voters to mark a paper ballot. It is the responsibility of the jurisdiction to procure voting booths that meet the privacy and security requirements for their jurisdiction.
V: 1, §2.3.1.2.c		•	•	•	•		No	**UVS, PBT, BMD** ES&S offers two ballot boxes for use with polling place ballot scanners, a steel model, and a plastic mode. Each box integrates with the DS200. Each box includes lockable ballot compartments for storing counted ballots; and an auxiliary compartment for storing marked ballots in the event of system failure. If the AutoCAST feature is being used with the AutoMARK, a secure ballot receptacle is attached to the unit.
V: 1, §2.3.1.2.d			•				No	**PBT** The DS200 is poll worker activated. When unlocking and raising the DS200 display, the system initializes and then displays the Poll Open screen. The poll worker presses the Open Polls button, and after the unit prints the zero and certification reports, the system is prepared for ballot tabulation.
V: 1, §2.3.1.2.e		•	•	•			No	**UVS, PBT, BMD** For ES&S precinct voting equipment (ExpressVote, DS200, AutoMARK), poll workers verify that systems are correctly activated and functioning by confirming that system ready screens appear after self-diagnostics complete.
V: 1, §2.3.1.2.f		•	•	•			No	**UVS** Device failures are identified by the display of error messages. See the ExpressVote Operator's Guides for a detailed list of error messages and recommended corrective actions. **PBT** Device failures are identified by the display of error messages. Recommended corrective action for messages appears in the ES&S *DS200 Operator's Guide*. The display screen is also used extensively to identify failures and offer corrective actions. **BMD** Device failures are identified by the display of error messages. See the AutoMARK Operator's Guides for a detailed list of error messages and recommended corrective actions.

2.3.1.3 DRE System Requirements

Controlling Requirement

V: 1, §2.3.1.3

To facilitate opening the polls, all DDRE systems shall include:

a. A security seal, a password, or a data code recognition capability to prevent the inadvertent or unauthorized actuation of the poll-opening function.

b. A means of enforcing the execution of steps in the proper sequence if more than one step is required.

c. A means of verifying the system has been activated correctly.

d. A means of identifying system failure and any corrective action needed.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.1.3.a						•	N/A	N/A
V: 1, §2.3.1.3.b						•	N/A	N/A
V: 1, §2.3.1.3.c						•	N/A	N/A
V: 1, §2.3.1.3.d						•	N/A	N/A

2.3.2 ACTIVATING THE BALLOT (DRE SYSTEMS)

CONTROLLING REQUIREMENT

V: 1, §2.3.2

To activate the ballot, all DRE systems shall:

a. Enable election officials to control the content of the ballot presented to the voter, whether presented in printed form or electronic display, such that each voter is permitted to record votes only in contests in which that voter is authorized to vote.

b. Allow each eligible voter to cast a ballot.

c. Prevent a voter from voting on a ballot to which he or she is not entitled.

d. Prevent a voter from casting more than one ballot in the same election.

e. Activate the casting of a ballot in a general election.

f. Enable the selection of the ballot that is appropriate to the party affiliation declared by the voter in a primary election.

g. Activate all portions of the ballot upon which the voter is entitled to vote.

h. Disable all portions of the ballot upon which the voter is not entitled to vote.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.2.a						•	N/A	N/A
V: 1, §2.3.2.b						•	N/A	N/A
V: 1, §2.3.2.c						•	N/A	N/A
V: 1, §2.3.2.d						•	N/A	N/A
V: 1, §2.3.2.e						•	N/A	N/A
V: 1, §2.3.2.f						•	N/A	N/A
V: 1, §2.3.2.g						•	N/A	N/A
V: 1, §2.3.2.h						•	N/A	N/A

2.3.3 CASTING A BALLOT

CONTROLLING REQUIREMENT

V: 1, §2.3.3

Some required capabilities for casting a ballot are common to all systems. Others are specific to individual voting technologies or intended use. Systems must provide additional functional capabilities that enable accessibility to disabled voters as defined in VVSG Subsection 3.2.

2.3.3.1 COMMON REQUIREMENTS

CONTROLLING REQUIREMENT

V: 1, §2.3.3.1

To facilitate casting a ballot, all systems shall:

a. Provide text that is at least 3 millimeters high and provide the capability to adjust or magnify the text to an apparent size of 6.3 millimeters.

b. Protect the secrecy of the vote such that the system cannot reveal any information about how a particular voter voted, except as otherwise required by individual state law.

c. Record the selection and non-selection of individual vote choices for each contest and ballot measure.

d. Record the voter's selection of candidates whose names do not appear on the ballot, if permitted under state law, and record as many write-in votes as the number of candidates the voter is allowed to select.

e. In the event of a failure of the main power supply external to the voting system, provide the capability for any voter who is voting at the time to complete casting a ballot, allow for the successful shutdown of the voting system without loss or degradation of the voting and audit data, and allow voters to resume voting once the voting system has reverted to back-up power.

f. Provide the capability for voters to continue casting ballots in the event of a failure of a telecommunications connection within the polling place or between the polling place and any other location.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.3.1.a		•	•	•	•		No	**UVS** ExpressVote ballot magnification meets VVSG text size requirements. Font size and zoom percentage are adjustable when creating the election in Electionware. **PBT and CBT** Voters marking paper ballots have the option to use a magnifying glass or ES&S ballot marking device. **BMD** The AutoMARK provides a ballot zoom option that meets VVSG text size requirements. Font size and zoom percentage are adjustable when creating the election in Electionware, but a hard limit is applied to ballot text sizes in order to prevent the settings from exceeding the boundaries of the required text sizes.
V: 1, §2.3.3.1.b		•	•	•	•		No	**UVS** ExpressVote does not permanently store information reflecting a particular voter's ballot selections. Voting selections temporarily record to volatile memory during a voting session until they are printed on the physical paper ballot or summary card. Votes are recorded using a ballot tabulator.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								PBT and CBT All ES&S vote counting equipment (DS200 and DS850) protects voter privacy through a combination of physical and procedural measures at the polling place as well as safeguards built in to the each ballot scanner's operating firmware. At the polling place, the ES&S DS200 ballot box and voting booths can be arranged to maintain ballot secrecy. The DS200 display does not indicate how a voter marked a ballot when the ballot is cast. The only visible change in system status after a voter casts a ballot is the visible addition to the public count, which is a running numeric total of ballots cast on the terminal. **BMD** The AutoMARK does not permanently store information reflecting a particular voter's ballot selections. Voting selections are only temporarily recorded in volatile memory during a voting session until they are printed on the physical paper ballot or summary card. Votes are recorded on a polling place ballot scanner.
V: 1, §2.3.3.1.c		•	•	•	•		No	**UVS** ExpressVote does not electronically record vote selections. Vote selections only reside in memory during the voting session. Once all vote selections are made, the completed ballot is reviewed by the voter and individual vote choices are then accurately marked on the paper ballot. When the voting session ends, the ExpressVote clears ballot selections from system memory. **PBT and CBT** The ES&S DS200 and DS850 accurately record all ballot selections as ballots pass through each scanner's read paths. If a scanner detects a contest that does not include a valid selection, such as a blank vote, the DS200 may be programmed to automatically return the ballot to the voter for revision, or, in the case of the DS850, out-stack the ballot for assessment. Both the DS200 and DS850 may also be programmed to accept the ballot as cast. **BMD** The AutoMARK does not electronically record vote selections. Vote selections only reside in memory during the voting session. Once all vote selections are made, the completed ballot is reviewed by the voter and individual vote choices are then accurately marked on the paper ballot. When the voting session ends, the AutoMARK clears ballot selections from system memory.
V: 1, §2.3.3.1.d		•	•	•	•		No	**UVS** ExpressVote supports the appropriate number of write-in votes for each contest with the write-in name input using the on-screen keyboard or accessible device. The write-in name is printed on the paper ballot when the ballot is marked. **PBT, CBT** All ES&S ballot scanning equipment include provisions for handling write-in selections. Ballot tabulators recognize that a write-in oval has been filled, and record the total number of write-in votes. Individual unidentifiable ballot images are stored

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
								for each ballot, which allows for the easy retrieval and recording of write-ins. These physical write-in ballots can also be identified by the ballot stamping feature installed on the ES&S DS200. If a steel ballot box is used, the write-ins can be segregated into a separate write-in ballot bin by a diverter (this option is enabled through Electionware). Write in ballots tabulated on the DS850 can be out stacked during counting for assessment by the jurisdiction's adjudication board. **BMD** The AutoMARK supports the appropriate number of write-in votes for each contest with the write-in name input using the on-screen keyboard or accessible device. The write-in name is printed on the paper ballot when the ballot is marked.
V: 1, §2.3.3.1.e		•	•	•	•		No	**UVS** ExpressVote seamlessly reverts to the backup battery if power is lost. Voting can continue on battery power for at least two hours before power must be restored. **PBT** ES&S DS200 backup systems include a backup battery capable of maintaining operation for at least two hours. The battery "floats" on the system, meaning that the battery kicks in immediately when main power is lost without impacting the system. Immediately before the battery is depleted, the system executes a controlled shutdown to ensure that no ballots are being scanned or data is being written to the DS200 Election Media during shut off. When power returns, a recovery procedure allows voting to continue where it left off and the battery will resume charging. The ES&S ballot box has an auxiliary ballot bin for temporary storage of voted ballots so that voting can continue until power is restored. **CBT** Although the Central Ballot Tabulator is not voter-facing, the system may be instrumental in post-counting of voters preferences and provides reliability in the counting process. In the event that facilities power is lost, an Uninterruptible Power Supply (UPS) will repeat a series of 4 beeps to indicate initialization and provides battery power long enough to complete a batch that is scanning, save or delete the batch, and then perform a controlled, graceful shutdown. **BMD** The AutoMARK reverts to the backup battery if external power is lost. Ballot marking can continue on battery power for at least two hours for each system before power must be restored.
V: 1, §2.3.3.1.f						•	No	

2.3.3.2 PAPER-BASED SYSTEM REQUIREMENTS

CONTROLLING REQUIREMENT

V: 1, §2.3.3.2

All paper-based systems shall:

a. Allow the voter to easily identify the voting field that is associated with each candidate or ballot measure response.

b. Allow the voter to mark the ballot to register a vote.

c. Allow either the voter or the appropriate election official to place the voted ballot into the ballot counting device (for precinct count systems) or into a secure receptacle (for central count systems)

d. Protect the secrecy of the vote throughout the process.

In addition to the above requirements, all paper-based precinct count systems shall:

e. Provide feedback to the voter that identifies specific contests for which he or she has made no selection or fewer than the allowable number of selections (e.g., undervotes).

f. Notify the voter if he or she has made more than the allowable number of selections for any contest (e.g., overvotes).

g. Notify the voter before the ballot is cast and counted of the effect of making more than the allowable number of selections for a contest.

h. Provide the voter opportunity to correct the ballot for either an undervote or overvote before the ballot is cast and counted

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.3.2.a	•	•		•			No	**EMS** Ballot targets are accurately associated with ballot responses though correct ballot formatting using Electionware. Vote targets are placed directly in line with corresponding selection text on a paper ballot. On screen targets for ES&S ballot marking devices are also configured and positioned using Electionware. **UVS** The ExpressVote screen layout accurately associates a target in line with the ballot text. The printed ballot utilizes complete phrases to indicate the voter's choices. **BMD** For an AutoMARK using standard ballots, selection targets appear directly in line with the selection target's corresponding ballot text. Audio ballot selections are confirmed audibly.
V: 1, §2.3.3.2.b		•	•	•	•		No	**UVS** The ExpressVote lists the voters selections using phrases on the ballot after the voter accepts the voting summary. **PBT, CBT** The ES&S DS200 and DS850 recognize ballot selections marked in the appropriate target positions with approved marking devices. Ballots do not require a frame or fixture to be marked. **BMD** The AutoMARK marks voter selections on the paper ballot once the voter accepts the AutoMARK ballot summary.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.3.2.c		•	•	•	•		No	**UVS, PBT and BMD** The voting system was designed for either voter or poll worker ballot insertion into the polling place ballot scanners. For voters who require assistance physically casting a ballot, privacy sleeves are available to preserve the secrecy of the ballot. Alternatively, the ExpressVote and AutoMARK allow for ballots to be AutoCAST into an attached secure container for subsequent tabulation by an ES&S ballot scanner. **CBT** For voters who require assistance physically depositing a cast ballot into a ballot box, privacy sleeves are available to preserve the secrecy of the ballot in transit to the ballot scanner.
V: 1, §2.3.3.2.d	•	•	•	•			No	**EMS** To protect voter secrecy, ERM does not record or provide any data that can be used to identify the ballot selections of a specific voter. **UVS** When properly set up; all ballot information and input controls are visible only to the voter during the voting session. If the voter requires assistance to transfer the completed ballot from the ExpressVote to the tabulator, a privacy sleeve can be placed to catch the ejected ballot so ballot secrecy is preserved in transit to the ballot scanner. The audio interface is accessible through headphones. ExpressVote headphones have low sound leakage to preserve privacy. **PBT** To maximize vote secrecy, the ES&S DS200, ballot box, and voting booths can be arranged at the polling place to screen onlookers and maintain ballot secrecy. Privacy sleeves are available for voters who require assistance physically casting a ballot. **BMD** In order to meet requirements to provide a facility to allow marking the ballot in privacy, if not provided by the physical arrangement of the unit(s) at the poll, the Precinct/Jurisdiction may purchase an AutoMARK Table and privacy shield for each terminal. A *Privacy Shield* can be inserted into the slots of the AutoMARK table to prevent onlookers from viewing the AutoMARK screen. When properly set up with the privacy shield in place and the ballot inserted; all ballot information and input controls are visible only to the voter during the voting session. If the voter requires assistance to transfer the completed ballot from the AutoMARK to the tabulator, a privacy sleeve can be placed to catch the ejected ballot so ballot secrecy is preserved in transit to the ballot scanner. The audio interface is accessible through headphones. AutoMARK headphones have low sound leakage to preserve privacy.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.3.2.e		•	•	•			Yes	**UVS** Ballot handling rules programmed in Electionware determine how the ExpressVote alerts the voter when the voter has selected fewer candidates or choices than are allowed for a contest. **PBT** Undervotes are identified through the DS200 applying ballot handling rules. The system can be programmed in Electionware to execute specific actions when the system encounters a ballot that may be mismarked. These rules determine the scanner's behavior for ballots that appear blank, overvoted, cross-voted, undervoted, or have marginal (barely scan-able) voter marks. For each ballot condition, the scanner can be programmed for unconditional acceptance, unconditional rejection, or query, which informs voters of the ballot's condition and allows the voter to choose whether to correct the ballot or cast the ballot without revision. Configuring ballot marking and scanning equipment to unconditionally accept undervoted ballots causes ballots to be tabulated as marked, which may result in undervotes and overvotes appearing on final results reports. **BMD** Ballot handling rules programmed in Electionware determine how the AutoMARK alerts the voter when the voter has selected fewer candidates or choices than are allowed for a contest.
V: 1, §2.3.3.2.f		•	•	•			Yes	**UVS** ExpressVote does not allow overvotes. Any attempt to overvote a multiple vote for contest prevents the selection and generates a warning. For a contest that allows only one selection, depending on the election definition setting, a new selection either automatically removes the previous selection or behaves the same as a contest that allows multiple target selections. **PBT** Overvotes are identified through the DS200 applying ballot handling rules. The system can be programmed in Electionware to execute specific actions when an overvote is encountered. The scanner can be programmed to unconditionally accept or unconditionally reject overvoted ballots, or query the voter whether to return the ballot for revision or cast as marked. Configuring the DS200 to unconditionally accept an overvoted ballot will cause the ballot to be tabulated as marked. **BMD** The AutoMARK does not allow overvotes. Any attempt to overvote a multiple vote for contest will prevent the selection and generate a warning prompting the voter to remove a selection prior to selecting another choice. For a contest that allows only one selection, depending on the election definition setting, a new selection either automatically removes the previous selection or behaves the same as a contest that allows multiple target selections.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.3.2.g		•	•	•			Yes	**UVS** ExpressVote does not allow overvotes. Any attempt to overvote a contest generates a warning message that prompts the voter to change selections. **PBT** The notification supplied to a DS200 voter if the system encounters an overvote differs based on selected ballot handling rules. If the system is configured to unconditionally reject overvoted ballots, the DS200 returns any overvoted ballot to the voter without processing selections and displays a message describing the exception condition. If configured to query the voter prior to acceptance, the DS200 displays a message describing the exception condition, indicates that overvoted contests will not be counted with election totals, and prompts the voter to either revise the ballot or cast as marked. If configured to unconditionally accept, the inserted ballot will be tabulated as marked, which may result in the inclusion of undervotes and/or overvotes in system totals. **BMD** The AutoMARK does not allow overvotes. Any attempt to overvote a contest generates a warning message that prompts the voter to change selections.
V: 1, §2.3.3.2.h		•	•	•			Yes	**UVS** Universal voting system equipment provides voters the opportunity to revise selections by displaying a summary of the selections made by the voter for revision or final approval before the ballot is marked for tabulation. ExpressVote prevents voters from overvoting any contest. **PBT** The process for returning and correcting a ballot differs based on the configuration of DS200 ballot handling rules set up in Electionware. If the DS200 is configured to unconditionally reject an exception ballot, the system returns the ballot to the voter without processing selections and displays a message describing the exception condition. If configured to query the voter prior to acceptance, the DS200 displays a message describing the exception condition, and prompts the voter to either revise the ballot or cast as marked. If configured to unconditionally accept, the inserted ballot will be tabulated as marked, which may result in the inclusion of undervotes and/or overvotes in system totals. **BMD** Ballot marking equipment provides voters the opportunity to revise selections by displaying a summary of the selections made by the voter for revision or final approval before the ballot is marked for tabulation. The AutoMARK prevents voters from overvoting any contest.

2.3.3.3 DRE System Requirements

Controlling Requirement

V: 1, §2.3.3.3

In addition to the above common requirements, DRE systems shall:

a. Prohibit the voter from accessing or viewing any information on the display screen that has not been authorized by election officials and preprogrammed into the voting system (i.e., no potential for display of external information or linking to other information sources).

b. Enable the voter to easily identify the selection button or switch, or the active area of the ballot display, which is associated with each candidate or ballot measure response.

c. Allow the voter to select his or her preferences on the ballot in any legal number and combination.

d. Indicate that a selection has been made or canceled.

e. Indicate to the voter when no selection, or an insufficient number of selections, has been made for a contest (e.g., undervotes).

f. Notify the voter if he or she has made more than the allowable number of selections for any contest (e.g., overvotes).

g. Notify the voter before the ballot is cast and counted of the effect of making more than the allowable number of selections for a contest.

h. Provide the voter opportunity to correct the ballot for either an undervote or overvote before the ballot is cast and counted.

i. Notify the voter when the selection of candidates and measures is completed

j. Allow the voter, before the ballot is cast, to review his or her choices and, if the voter desires, to delete or change his or her choices before the ballot is cast.

k. For electronic image displays, prompt the voter to confirm the voter's choices before casting his or her ballot, signifying to the voter that casting the ballot is irrevocable and directing the voter to confirm the voter's intention to cast the ballot.

l. Notify the voter after the vote has been stored successfully that the ballot has been cast.

m. Notify the voter that the ballot has not been cast successfully if it is not stored successfully, including storage of the ballot image, and provide clear instruction as to the steps the voter should take to cast his or her ballot should this event occur.

n. Provide sufficient computational performance to provide responses back to each voter entry in no more than three seconds.

o. Ensure that the votes stored accurately represent the actual votes cast.

p. Prevent modification of the voter's vote after the ballot is cast.

q. Provide a capability to retrieve ballot images in a form readable by humans [in accordance with the requirements of Subsections 2.1.2 (f) and 2.1.4 (k) and (l)].

r. Increment the proper ballot position registers or counters.

s. Protect the secrecy of the vote throughout the voting process.

t. Prohibit access to voted ballots until after the close of polls.

u. Provide the ability for election officials to submit test ballots for use in verifying the end-to-end integrity of the voting system.

v. Isolate test ballots such that they are accounted for accurately in vote counts and are not reflected in official vote counts for specific candidates or measures.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.3.3.3.a						•	N/A	N/A
V: 1, §2.3.3.3.b						•	N/A	N/A
V: 1, §2.3.3.3.c						•	N/A	N/A
V: 1, §2.3.3.3.d						•	N/A	N/A
V: 1, §2.3.3.3.e						•	N/A	N/A
V: 1, §2.3.3.3.f						•	N/A	N/A
V: 1, §2.3.3.3.g						•	N/A	N/A
V: 1, §2.3.3.3.h						•	N/A	N/A
V: 1, §2.3.3.3.i						•	N/A	N/A
V: 1, §2.3.3.3.j						•	N/A	N/A
V: 1, §2.3.3.3.k						•	N/A	N/A
V: 1, §2.3.3.3.l						•	N/A	N/A
V: 1, §2.3.3.3.m						•	N/A	N/A
V: 1, §2.3.3.3.n						•	N/A	N/A
V: 1, §2.3.3.3.o						•	N/A	N/A
V: 1, §2.3.3.3.p						•	N/A	N/A
V: 1, §2.3.3.3.q						•	N/A	N/A
V: 1, §2.3.3.3.r						•	N/A	N/A
V: 1, §2.3.3.3.s						•	N/A	N/A
V: 1, §2.3.3.3.t						•	N/A	N/A
V: 1, §2.3.3.3.u						•	N/A	N/A
V: 1, §2.3.3.3.v						•	N/A	N/A

2.3.4 ADDITIONAL VOTING CAPABILITIES OR REQUIREMENTS

CONTROLLING REQUIREMENT

Functional Requirement

1. Ballot Image Storage
2. Segregation of ballots with write-ins
3. Ballot Online™ (BOL) Pocket Ballot QR Code

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
1.	●		●		●		No	**EMS** Ballot images captured by the DS200 and DS850 can be viewed in Electionware. **PBT, CBT** The ES&S DS200 and DS850 collect bitmap images of both the back and front of each successfully scanner ballot. Ballot insertion may be in any orientation. These images are stored to each scanner's Election Media. Each image is assigned a random ID with a random Date/Time stamp. These images can be retrieved and reviewed using The Electionware Acquire module.
2.	●						Yes	**EMS** (Optional) The ballot diverter can be disabled/enabled when programming the election within Electionware. The ballots with Write Ins can be filtered from other ballots in Electionware.
3.	●	●					Yes	**EMS, UVS** Allows a voter to make candidate selections using Ballot Online™ (or BOL) via web browser and produce: 1) a printable pocket ballot with bar code and 2) a Ballot Online™, ExpressVote scannable bar code sent to a mobile phone. The voter can take either bar code (printed or mobile phone) to their polling place and load their selections to an ExpressVote session using a barcode scanning device attached to the ExpressVote. The selections the voter made during their BOL session will be presented on the ExpressVote summary screen. The voter will then be able to proceed with the ExpressVote session as normal (making/changing selections, printing selections, etc.)

2.4 POST-VOTING CAPABILITIES

CONTROLLING REQUIREMENT

V: 1, §2.4

a. All voting systems shall provide capabilities to accumulate and report results for the jurisdiction and to generate audit trails. In addition, precinct count voting systems must provide a means to close the polls including generating appropriate reports. If the system provides the capability to broadcast results, additional standards apply.

2.4.1 CLOSING THE POLLS

CONTROLLING REQUIREMENT

V: 1, §2.4.1

These requirements for closing the polls and locking voting systems against future voting are specific to precinct count systems. The voting system shall provide the means for:

b. Preventing the further casting of ballots once the polls have closed.

c. Providing an internal test that verifies that the prescribed closing procedure has been followed, and that the device status is normal.

d. Incorporating a visible indication of system status.

e. Producing a diagnostic test record that verifies the sequence of events, and indicates that the extraction of voting data has been activated.

f. Precluding the unauthorized reopening of the polls once the poll closing has been completed for that election.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.4.1.a			•				No	**PBT** No additional ballots can be cast after the Close Polls routine initiates. The polls can only be reopened if the user knows the proper pass code and has access to the terminal's physical key.
V: 1, §2.4.1.b			•				No	**PBT** The system performs the polls closed routine and prints final results report(s) and a certification report to complete the operation. Once the polls close routine successfully completes, the display screen indicates that the unit is in the Closed Polls mode.
V: 1, §2.4.1.c			•				No	**PBT** System status is indicated through various status indicators on the display. See the *DS200 Operator's Guide* for a description of system status indicators.
V: 1, §2.4.1.d			•				No	**PBT** Diagnostic records are provided by system audit log reports that detail the sequence of events executed during polls close and include entries that verify the extraction or transfer of voting data. See *DS200 Operator's Guide* for a description of the process for printing the system audit report and a description of data that is logged.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.4.1.e			•				No	**PBT** The system protects against unauthorized reopening the polls by requiring a valid pass code and physical control key to execute the re-opening process.

2.4.2 CONSOLIDATING VOTE DATA

CONTROLLING REQUIREMENT

V: 1, §2.1.2 All systems shall provide a means to consolidate vote data from all polling places, and optionally from other sources such as absentee ballots, provisional ballots, and voted ballots requiring human review (e.g., write-in votes).

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.4.2	•		•		•	•		No	**EMS** ERM is the accumulation and reporting application for all ES&S equipment. ERM consolidates vote data from all tabulators and voting systems used by a jurisdiction. The software can read and store results from the precinct ballot counting media and accumulate the results. ERM can also import and consolidate results from ES&S's central count systems with precinct unit results. Hard copy reports will reflect the results that exist at the time of report creation. Because ERM is a software system used in conjunction with the ballot tabulation system for accumulation and reporting, the system requires external interfaces for uploading data from precinct or central ballot counting results media via serial communications. **PBT CBT** Consolidating results from ES&S DS200 scanners and absentee ballots is executed using Election Reporting Manager (ERM). Results from the precinct's DS200 Election Media can be physically read by ERM using a serial media reader. The results data format from precinct count equipment and ES&S central count equipment is compatible and can be combined using ERM. Refer to the *Election Reporting Manager User's Guide* for procedures.

2.4.3 PRODUCING REPORTS

CONTROLLING REQUIREMENT

V: 1, §2.4.3

All systems shall be able to create reports summarizing the vote data on multiple levels.

All systems shall provide capabilities to:

a. Support geographic reporting, which requires the reporting of all results for each contest at the precinct level and additional jurisdictional levels.

b. Produce a printed report of the number of ballots counted by each tabulator.

c. Produce a printed report for each tabulator of the results of each contest that includes the votes cast for each selection, the count of undervotes, and the count of overvotes.

d. Produce a consolidated printed report of the results for each contest of all votes cast (including the count of ballots from other sources supported by the system as specified by the vendor) that includes the votes cast for each selection, the count of undervotes, and the count of overvotes.

e. Be capable of producing a consolidated printed report of the combination of overvotes for any contest that is selected by an authorized official (e.g., the number of overvotes in a given contest combining candidate A and candidate B, combining candidate A and candidate C, etc.)

f. Produce all system audit information required in VVSG 2005 Subsection 5.4 in the form of printed reports, or in electronic memory for printing centrally.

g. Prevent data from being altered or destroyed by report generation, or by the transmission of results over telecommunications lines.

In addition, all precinct count voting systems shall:

h. Prevent the printing of reports and the unauthorized extraction of data prior to the official close of the polls.

i. Provide a means to extract information from transportable programmable memory device or data storage medium for vote consolidation.

j. Consolidate the data contained in each unit into a single report for the polling place when more than one voting machine or precinct tabulator is used.

k. Prevent data in transportable memory from being altered or destroyed by report generation, or by the transmission of official results over telecommunications lines.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.4.3.a	•		•		•			No	**EMS** ERM supports geographic reporting by aggregating election totals from all ES&S voting equipment to produce precinct reports, canvass reports and jurisdictional canvass reports. **PBT** Each ES&S DS200 scanner prints terminal level results tapes from an integrated thermal printer. Consolidated results reports from multiple scanners and additional ES&S voting equipment are generated at election headquarters using ES&S's Election Reporting Manager (ERM). ERM generates results reports for each contest at the precinct level and additional jurisdictional levels.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
									CBT The DS850 has the capability of generating reports at either the precinct level or as an aggregate total for the specific tabulator.
V: 1, §2.4.3.b	•		•		•			No	**EMS** The ERM System Log contains includes the total number of ballots cast on each tabulator as audit entries created during processing and updating of DS200 election results. **PBT** The ES&S DS200 automatically generates a printed scanner totals report during the device's polls close routine. In addition to scanner totals, the DS200 can produce a precinct by precinct report that details ballots cast for each precinct included on the DS200 election configuration program. Additional reports can be printed by the precinct official. An audit report can also be printed during the polls close process. **CBT** DS850 reports are restricted to the scanner totals for the specific machine; however, DS850 results transferred to ERM can be consolidated with results from other ES&S voting equipment to provide additional report variations.
V: 1, §2.4.3.c	•		•		•			No	**EMS** Each tabulator has the ability to print a results report that includes candidate votes, undervotes and overvotes. The ERM application generates aggregated totals from all tabulators used in the election. **PBT** Detailed, terminal results reports include undervote and overvote tallies. **CBT** The DS850 has the capability of generating such a report at either the precinct level or as an aggregate scanner totals report; however, the report is restricted to results processed by the specific tabulator. Results are transferred to ERM for additional report variations.
V: 1, §2.4.3.d	•		•		•			No	**EMS** ERM generates consolidated, printed reports that include all required information. Report varieties include an election summary report and various canvass reports. Each report includes details ballots cast, candidate/ballot target selection totals, over votes and undervotes of aggregated election totals. **PBT CBT** Consolidated results reports are produced externally from the ES&S DS200 and DS850 systems using Election Reporting Manager (ERM). ERM fully supports the generation of such reports and the inclusion of overvote and undervote tallies with election results. See ERM system documentation for a list of available report formats and included information.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.4.3.e	•		•		•			No	**EMS** ERM Precinct, Summary and Canvass Reports satisfy this requirement. These report variants provide options to specify which contest(s) are to be included. These reports also provide options to include overvote and undervote reporting at the contest level. **PBT, CBT** Consolidated results reports are produced externally from the DS200 and DS850 systems using ERM. ERM fully supports the generation of such reports and the inclusion of overvote and undervote tallies with election results. See *ES&S Election Reporting Manager User's Guide* for a list of available report formats and a description of information included on each report.
V: 1, §2.4.3.f	•		•		•		•	No	**EMS** ERM logs all system audit information required under VVSG 1.0 Subsection 5.4 to the Windows System Event Log. This information is available through the Windows System Event Viewer. The Windows System Event Log will log each activity including type, date, time, ES&S application, user ID and computer name. A report may be generated from ERM or the information exported from the Windows System Event Viewer. The ERM audit report may be printed from the reports menu. All Electionware audit files are stored in the Electionware database. The Electionware-Acquire Module allows users to view and print machine log reports read from DS200 and DS850 results media. Reports may be printed from Electionware reports menus. **PBT** System audit reports may be printed and reprinted at any time from the ES&S DS200 terminal after the system is closed for voting. The full system audit record is also saved to the inserted Election Media. **CBT** The DS850 allows the appropriate election official to both generate a printed copy of the event log and/or transfer a copy of the event log to an ES&S Media Device.
V: 1, §2.4.3.g	•		•		•			No	**EMS** The process of printing results reports from ERM accesses the results database in a "read only" mode, ensuring that this process does not alter or destroy data. All results are stored to DS200 Election Media and not altered during results transfer. **PBT** Results data sent Via a wired or wireless communications link is transmitted securely by an authenticated SFTP connection. The results are encrypted and the files signed.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Results Reporting	Not Supported	May be bypassed or deactivated	Description
									CBT The DS850 can transfer election data to an ERM reporting PC over a local network or can generate reports directly from the scanner. In the either case, the DS850 does not alter or destroy data during data transmission.
V: 1, §2.4.3.h			•					No	**PBT** The ES&S DS200 design prevents reports from printing until the DS200 polls close. To prevent unauthorized extraction of data, the memory device that stores scanner election data is stored under a locked panel, with loop holes available for applying additional numbered security seals.
V: 1, §2.4.3.i	•		•					No	**EMS** ERM is the subsystem that extracts results from the transportable memory devices for ES&S ballot scanning equipment and combines results for reporting. **PBT** The DS200 Election Media can be safely removed after closing the polls, for physical transportation and consolidation at a central location.
V: 1, §2.4.3.j	•		•					No	**EMS** ERM is used to consolidate results from each terminal to report the precinct total. **PBT** Data from multiple DS200's used in a polling place are consolidated using ERM.
V: 1, §2.4.3.k	•		•			•		No	**EMS** When ERM reads data from a precinct tabulator memory device, the contents are accessed in "read only" mode and then written to a working folder on the ERM PC or Server drive. **PBT** The ES&S DS200 has no capability to alter or destroy data on the portable memory during report generation.

2.4.4 BROADCASTING RESULTS

CONTROLLING REQUIREMENT

V: 1, §2.4.4

Some voting systems offer the capability to make unofficial results available to external organizations such as the news media, political party officials and others. Although this capability is not required, systems that make unofficial results available shall:

a. Provide only aggregated results, and not data from individual ballots.

b. Provide no access path from unofficial electronic reports or files to the storage devices for official data.

c. Clearly indicate on each report or file that the results it contains are unofficial.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.4.4.a	•						No	**EMS** ERM includes functionality to transmit results to media outlets or run a scrolling results display for public view. These results are always supplied as aggregated totals with no information that can be used to determine how individual ballots are voted.
V: 1, §2.4.4.b	•						No	**EMS** The voting system includes no access path from unofficial files to the storage devices for official data. ES&S central count equipment and reporting subsystem is segregated in a dedicated physical environment for official results reporting. All broadcasting of election results is done from a secondary results database that is created from, but not connected to, the "live" ERM database.
V: 1, §2.4.4.c	•						No	**EMS** All ERM reports include user-definable labels that can be used to indicate whether results are unofficial or official.

2.4.5 ADDITIONAL POST-VOTING CAPABILITIES OR REQUIREMENTS

CONTROLLING REQUIREMENT

Functional Requirement

1. ES&S tabulators collect both back and front bitmap images of each successfully scanner ballot. Ballot insert orientation may be either direction.
2. Poll Close Reports
3. Canceling Reports
4. Sorting of blank, over-voted and miss-marked ballots
5. Ballot Imprinter Mechanism
6. Electionware – Produce
7. Electionware – Resolve

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
1.			●		●		No	These images are stored on tabulator Election Media. There are assigned a random ID with a random Date/Time stamp.
2.	●		●		●		Yes	Reports that print automatically when the polls are closed can be deactivated when programming the USB drive in Electionware.
3.	●		●		●		Yes	Certain Reports can be bypassed or canceled at the request of the operator.
4.			●		●		Yes	The ES&S DS200 and DS850 tabulators can be programmed to unconditionally accept these ballots. The ballot will be tabulated as marked, which may contain undervotes and overvotes.
5.					●		Yes	The DS850 has an inkjet print head capable of printing a 10 digit, human-readable number on the ballot **NOTE:** Ballot imprinting is not supported with the current system configuration.
6.	●						No	The Produce module is used to: View and filter the list of provisional and non-provisional ballots included in loaded results Filter ballots for viewing. View scanned images captured by the DS200 and DS850 of paper ballots and facsimiles of Non-Provisional audio ballots Print copies of ballots for archive purposes Process provisional ballots by flagging them as accepted or rejected, or escalated for further review View, save, and print HTML and XML versions of the Election Summary Results report Export decrypted ballot images for FOIA purposes.
7.	●						Yes	Resolve allows users to display the scan images of voted ballots, view the DS200's and DS850's interpretation of the voter's marks on these ballots and, for each contest that meets an exception condition, review and either accept, reject, or change the interpreted results. When ballots have been adjudicated and saved, election results are re-totaled to include the adjudicated results Resolve is not supported in the current voting system release.

2.5 MAINTENANCE, TRANSPORTATION AND STORAGE

CONTROLLING REQUIREMENT

V: 1, §2.5

All systems shall be designed and manufactured to facilitate preventive and corrective maintenance, conforming to the hardware standards described in VVSG 2005 Subsection 4.1.

All vote casting and tally equipment designated for storage between elections shall:

a. Function without degradation in capabilities after transit to and from the place of use, as demonstrated by meeting the performance standards described in Subsection 4.1.

b. Function without degradation in capabilities after storage between elections, as demonstrated by meeting the performance standards described in Subsection 4.1.

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
V: 1, §2.5.a		•	•	•	•		No	**UVS, PBT, BMD and CBT** Properly stored and maintained ES&S voting system hardware has a functional life of at least ten years without degradation of system capabilities. Items must be maintained, stored and transported according to guidelines included in system specification and maintenance documentation. See voting system equipment *Maintenance Guides* for voting system hardware for storage and operating requirements. All ES&S voting equipment must pass non-operating hardware tests in Sub-Section 4.1, including tests responsible for simulating transportation and extreme storage conditions as a condition of successful voting system certification testing.
V: 1, §2.5.b		•	•	•	•		No	**UVS, PBT, BMD and CBT** Properly stored and maintained ES&S voting system hardware has a functional life of at least ten years without degradation of system capabilities if items are maintained, stored and transported according to guidelines included in system specification and maintenance documentation. See *Maintenance Guides* for voting system hardware for storage and operating requirements. All ES&S voting equipment must pass non-operating hardware tests in Sub-Section 4.1, including tests responsible for simulating transportation and extreme storage conditions as a condition of successful voting system certification testing.

2.5.1 ADDITIONAL MAINTENANCE, TRANSPORTATION AND STORAGE REQUIREMENTS

CONTROLLING REQUIREMENT

Functional Requirement

1. N/A

Functional Requirement	EMS	UVS	PBT	BMD	CBT	Not Supported	May be bypassed or deactivated	Description
1.							N/A	N/A

A. KEY TERMS

Terms used in this document conform to company standards set forth herein and to definitions included in the EAC 2005 *Voluntary Voting System Guidelines*. Other definitions are consistent with those found in *ANSI/IEEE Std 610.12-1990, IEEE Standard Glossary of Software Engineering Terminology*.

Term	Definition
BMD	Ballot Marking Device
BOL	Ballot On Line
CBT	Central Ballot Tabulator
Central Ballot Tabulator (central scanner, central tabulator)	A *central counter* or *central scanner* is a high-speed ballot tabulator that is used to scan ballots and accumulate voter selections. Jurisdictions that use central scanners transport ballots from various polling places to a central count location where the ballots are scanned and tabulated. Some jurisdictions mix systems and use central scanners to count absentee ballots and precinct counters to scan ballots that are cast on Election Day. The DS850 is an example of a central scanner that is available from ES&S.
CVR	Cast Vote Record
DS200 Election Media or Election Media	A portable USB 2.0 flash media device used to store application code and election data in encrypted form. The devices are utilized to transfer data to and from ES&S equipment.
Election Management System	A single application or suite of applications used to assist the Election Authorities to define an election. ES&S's application suite typically consists of Electionware for Election defining and adjudication and hardware configuration, and ERM (Election Reporting Manager) for reporting the voter's preferences.
ELS	Event Log Service
EMS	Election Management System
EQC	Election Qualification Code
EQSC	Election Qualification Security Code
ERM	Election Reporting Manager
ES&S	Election Systems and Software
EV	ExpressVote
EVS	ES&S Voting System
EW	Electionware
GB	Gigabyte
L&A	Logic and Accuracy
OS	Operating System
PBT	Precinct Ballot Tabulator

Term	Definition
Precinct Ballot Tabulator	A device used to accumulate voter's selections at the precinct or polling place level. In small jurisdictions or smaller elections, these precinct ballot tabulators can serve as a central ballot tabulator. The DS200 is an example of a precinct scanner that is available from ES&S.
QA	Quality Assurance
QAP	Quality Assurance Program
QR	Quick Response (QR code)
SOP	System Operations Procedures
TDP	Technical Data Package
Technical Data Package (TDP)	A *Technical Data Package* includes all voting system documentation sent to a *Voting System Test Laboratory*. A *TDP* contains all of the documentation for a voting system including, but not limited to, user manuals, software and hardware specifications, software change releases and system drawings.
UVS	Universal Voting System
Universal Voting System (UVS)	A universal vote capture device designed for all voters, with independent voter verifiable paper record which is digitally scanned for tabulation.
VAT	Voter Assist Terminal. The AutoMARK is a Voter Assist Terminal.
Voting System Test Laboratory (VSTL)	Test laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) to be competent to test voting systems.
VSTL	Voting System Test Laboratory
VVSG	Voluntary Voting System Guidelines

B. REFERENCES

The following resources are referenced from this publication or were considered in drafting this document. The latest revisions apply. Printed copies of these items are considered out of date.

Document Identifier	Document Title
EVS5200_C_D_0200_SFD	*System Functionality Description for ES&S Voting System 5.2.0.0*
EVS5203_C_D_1000_SysOvr	*Voting System Overview*
AQS-18-5000-001-F	*AutoMARK ESS System Hardware Specification*
DS200HW_M_SPC_0313_HWSpec	*DS200 System Hardware Specifications v1.3*
DS850HW_M_SPC_0310_HWSpec	*DS850 System Hardware Specifications*
AQS-18-5001-002-R	*AutoMARK ESS Operating Software Design and Specification*
EVS5203_CM_SPC00_SysSecuritySpec	*ES&S Voting System Security Specification*
EVS5203_CM_SPC01_ HardeningProcedures	*Hardening the Election Management System PC*
EVS5203_DOC_SOP_AMVAT	*AutoMARK Operator's Guide*
EVS5203_DOC_SOP_ExpressVote	*ExpressVote Operator's Guide*
EVS5203_DOC_SOP_DS200	*DS200 Operator's Guide*
EVS5203_DOC_SOP_DS850	*DS850 Operator's Guide*
EVS5203_DOC_SOP_ERM	*Election Reporting Manager User's Guide*
EVS5203_DOC_SOP_Electionware	*Electionware User's Guides*
EVS5203_DOC_SOP_BPG	*ES&S Ballot Production Handbook*