System Overview

ES&S Voting System 5.2.2.0

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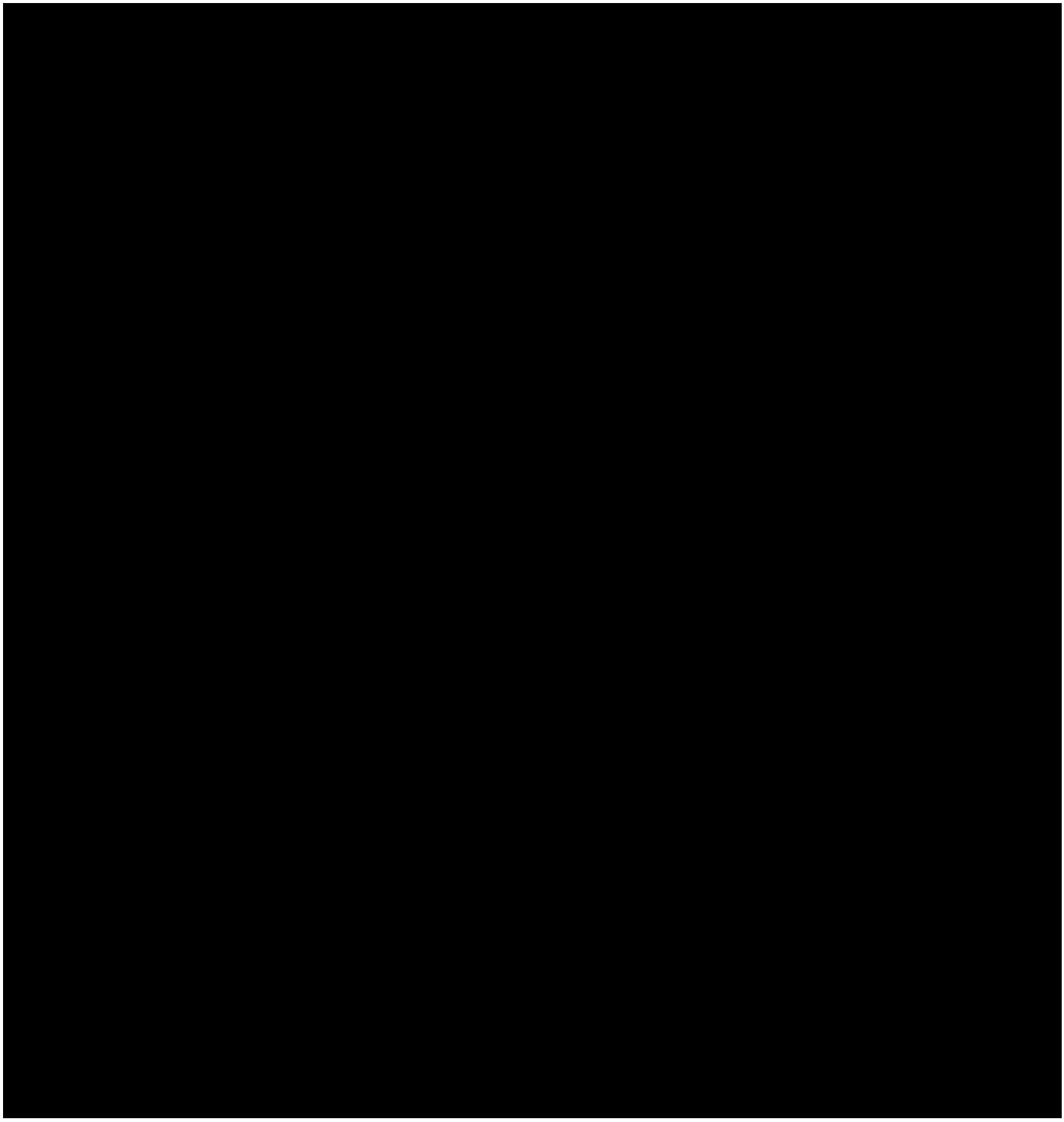


1 INTRODUCTION

The *System Overview* details the configuration and high-level operation of ES&S Voting System 5.2.2.0 (EVS5220). Contents include a description of the functional and physical system and subsystems that make up the voting system and a description of system performance characteristics.

1.1 PURPOSE

The *System Overview* enables the Voting System Test Lab (VSTL) or other accreditation agency to identify the functional and physical components of the system, determine how those components are structured and identify the interfaces between components.

1.1.1 SCOPE

This document describes subsystems and components included in EVS5220. Detailed technical information appears in product specific documentation included in the system Technical Data Package (TDP) documentation.

The *System Overview* reflects the system configuration and functional scope of the ES&S voting system presented for national and state certification testing. Individual components may exceed some documented system level capabilities, or support functions not tested for certification with this system, this document reflects only the capabilities of the system to be tested.

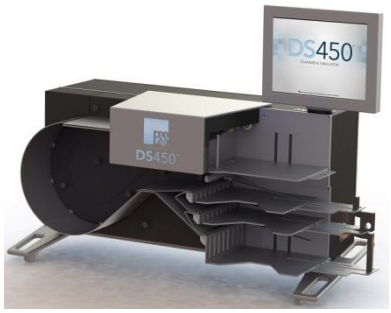
1.2 OVERVIEW SUMMARY

The *System Overview* compares the features and products included with the ES&S Voting System 5.2.2.0 (EVS5220) release to those provided with the previously certified ES&S Voting System 5.2.1.0 (EVS5210) release certified by the EAC on December 18, 2015. EVS5220 is a modification to EVS5210. Like the system it is based on, EVS5220 fully complies with the *EAC 2005 Voluntary Voting System Guidelines, Version 1.0*.

ES&S Voting System 5.2.2.0 (EVS5220) presents a fully integrated suite of election management products. The primary enhancement of this release is the introduction of the DS450 mid-range scanner and tabulator. Additionally, the random number generator used for security functions has been updated to meet new NIST standards. This release also establishes ExpressVote's ability to display candidates in either one or two columns in a particular contest screen based on a configuration flag from Electionware. In addition to the new enhancements, this release contains optimization and performance improvements to our existing voting system products. Specific enhancements are detailed in the subsequent sections.

1.2.1 NEW PRODUCTS

1.2.1.1 DS450



The DS450 mid-range scanner and tabulator simultaneously scans the front and back of a paper ballot and/or vote summary card. TruGrip™ technology insures that multiple sets of rollers are controlling the ballot in the transport at all times. This provides for reliable handling of ballots; even folded ballots. It can also read ballots in any of four orientations. The DS450 uses our patented Positive Target Recognition and Compensation™ (PTRAC) and Intelligent Mark Recognition™ (IMR) technology to determine what constitutes as a mark for a candidate. It sorts tabulated ballots into discrete output bins without interrupting scanning. Optionally, this device may be configured to transmit tabulation results to the results server through a closed network connection rather than using physically transported USB flash drives.

1.2.2 ES&S VOTING SYSTEM PRODUCT ENHANCEMENTS

In addition to optimization and performance improvements common to all ES&S voting system updates, this release provides the following notable enhancements. See the *System Change Notes* for a detailed list of modifications and enhancements.

1.2.2.1 ELECTIONWARE

Electionware is the election management software that provides end-to-end election management activities through a powerful and intuitive user interface. Its efficient and flexible design enables jurisdictions of all sizes to effectively manage their elections. Electionware delivers everything needed to run an election, from creating the ballots to reporting the voting results.

This release contains enhancements to Electionware, including:

- Changed device-specific label to “Central Count” for central ballot tabulators. The Central Count label will now apply to DS850s and DS450s.
- [Electionware – Configure] Added an ExpressVote configuration flag to display candidates in either 1 or 2 columns in a particular contest screen.
- Addressed minor bugs.
- Updated the random number generator used for security functions to meet new NIST standards.

1.2.2.2 ELECTION REPORTING MANAGER (ERM)

Election Reporting Manager (ERM) is ES&S’ election results reporting program. ERM is used to generate paper and electronic reports for poll workers, candidates, and the media. ERM is designed to display updated election totals on a monitor as ballot data is tabulated. Report editing features enable you to read data from a variety of ballot tabulators, customize your report formats, and generate accurate election results.

ERM is designed to support a wide range of ES&S ballot scanning equipment and can produce reports for both central count systems and precinct count systems.

This release contains enhancements to ERM, including:

- Changed device-specific label to “Central Count” for central ballot tabulators. The Central Count label will now apply to DS850s and DS450s.
- Updated the random number generator used for security functions to meet new NIST standards.

1.2.2.3 EXPRESSVOTE UNIVERSAL VOTING SYSTEM

The ExpressVote universal voting system is a vote capture device designed for all voters, with independent voter-verifiable paper record that is digitally scanned for tabulation on a compatible ES&S tabulator. This system combines paper-based voting with touch screen technology. The ExpressVote can serve all voters, including those with special needs, allowing voters to cast vote summary cards autonomously. Voters navigate ballot selections using the touch screen, detachable ADA keypad or ADA support peripheral such as a sip and puff device or two-position switch. ExpressVote guides voters through the ballot selection process with screen prompts, symbols and ballot audio. Screen controls meet all applicable guidelines for size and readability.

The ExpressVote includes a mandatory vote summary screen that requires voters to confirm or revise selections prior to printing the vote summary card using the internal thermal printer. Once printed, an ES&S tabulator may process the vote summary card. This device includes an optional secure card container that can serve as a receptacle for ADA voters who prefer a “hands free” method to cast their vote summary cards. ES&S has fully integrated the ExpressVote with the existing suite of ES&S voting system products.

This release contains enhancements to the ExpressVote, including:

- Implemented 2-column candidate listing on ExpressVote contests.
- Updated the random number generator used for security functions to meet new NIST standards.
- Addressed minor bugs.

1.2.2.4 EXPRESSLINK

ExpressLink Application

ExpressLink is a standalone application which interfaces with Pollbook systems and the ExpressVote Activation Card Printer to print the ballot activation code on an ExpressVote activation card. This code on the activation card activates the correct ballot the voter is authorized to vote.

ExpressVote Activation Card Printer

The ExpressVote Activation Card Printer is a small thermal printer used to print the ballot activation code on the ExpressVote activation card.

This release does not contain enhancements to ExpressLink.

1.2.2.5 DS200

The DS200 precinct-based scanner and tabulator is a high-resolution, paper-based tabulator that scans voter selections from both sides of the ballot simultaneously. It has a large touch screen for voter communication, an integrated thermal printer for limitless Election Day printing, an easy-to-use interface and an internal battery pack for reliable power in the event of a power outage. The DS200 can scan a variety of ballot sizes, including ExpressVote vote summary cards. It can read ballots in any of four orientations. It uses our patented Positive Target Recognition and Compensation™ (PTRAC) and Intelligent Mark Recognition™ (IMR) technology to determine what constitutes as a mark for a candidate. Tabulated voter selections are stored to a USB flash drive. The flash drive is removable from the system for transport to a central election location where vote totals are consolidated for reporting. There is also an optional results backup media capability. The DS200 is typically deployed within a carrying case that is secured to the ballot box. The carrying case has wheels and a telescoping handle that allow it to be transported separately and attached to the ballot box at the poll site.

This release contains enhancements to the DS200, including:

- Updated the random number generator used for security functions to meet new NIST standards.

1.2.2.6 DS850

The DS850 central scanner and tabulator provides high-speed digital processing. It can scan a variety of ballot sizes, including ExpressVote cards, and it can read ballots in any of four orientations. The DS850 uses Positive Target Recognition and Compensation™ (PTRAC) and Intelligent Mark Recognition™ (IMR) technology to determine what constitutes as a mark for a candidate. It scans, tabulates, and automatically sorts ballots, separating them into one of three discrete output bins without interrupting scanning. The DS850 is designed with TruGrip™ technology that insures that multiple sets of rollers are controlling the ballot in the transport at all times. This provides for reliable handling of ballots, even folded ballots. Optionally, this device may be configured to transmit tabulation results to the results server through a closed network connection rather than using physically transported USB flash drives.

This release contains enhancements to the DS850, including:

- Updated the random number generator used for security functions to meet new NIST standards.

1.2.2.7 AUTOMARK

The AutoMARK is an ADA-compliant ballot marking device. It provides autonomy and voting privacy to voters who are blind, visually impaired, have limited dexterity or physical disabilities, or voters who want to read or hear ballot content in an alternate language; any condition that makes it difficult to traditionally mark a ballot. Voters navigate the ballot using the touch screen, physical keypad or an ADA support peripheral, such as a "sip and puff" device or two-position switch. The device visually and/or audibly guides the voter through the ballot marking process with screen prompts and symbols, as well as audible voice prompts. Screen controls meet all applicable guidelines for size and readability. Physical keys are shaped and positioned to provide an intuitive voting session and labeled in both Braille and text to indicate function.

The AutoMARK includes a mandatory vote summary verification screen that requires voters to confirm or revise selections prior to marking a paper ballot. The AutoMARK can be configured with AutoCAST, a feature that allows the voter to independently cast a verified ballot into an attached secure ballot box.

This release contains enhancements to the AutoMARK, including:

- Updated the random number generator used for security functions to meet new NIST standards.

1.2.2.8 EVENT LOGGING SERVICE (ELS)

The users' interactions with the Election Management System are primarily logged to the Electionware Postgres database. Events that happen when a connection to the database is not available are logged to the Windows Operating System log through the Event Log Service.

This release does not contain enhancements to the Event Logging Service.

1.2.2.9 REMOVABLE MEDIA SERVICE (RMS)

Removable Media Service (RMS) is a utility that runs in the background of the Windows Operating System. RMS reads specific information from any attached USB flash drives so that ES&S applications such as Electionware and ERM can use that information for flash drive validation purposes. The service also provides functionality similar to the Safely Remove Hardware feature on the Windows system tray, allowing applications to eject flash drives without user input.

This release does not contain enhancements to the Removable Media Service.

2 SYSTEM DESCRIPTION

ES&S Voting System 5.2.2.0 introduces the DS450, a mid-range central scanner and tabulator. This release provides end-to-end election support; from populating an election database to generating final results reports. The system includes the following ES&S products:

Product	Description
Electionware **Removable Media Service** **ExpressVote Previewer** **VAT Preview** **Event Log Service**	Election Management System (EMS) software used for defining contests, candidates and ballot formats and performing post-election results processing.
ExpressVote	Universal voting system that supports vote capture functions for all voters, with independent voter verifiable paper record which is digitally scanned for tabulation on any ES&S certified tabulator.
DS200	Precinct-based ballot scanner and tabulator for processing ballots and/or ExpressVote vote summary cards at a polling place.
DS450 **DS850**	Central ballot scanner and tabulator for tabulation of mail ballots, absentee ballots or Election Day ballots and/or ExpressVote vote summary cards. Jurisdictions can network units to a central reporting PC for central count operations.
AutoMARK	Accessible ballot marking system that supports audio ballot playback and ballot marking for voters with low vision or physical disabilities.
Election Reporting Manager (ERM)	Results consolidation and reporting software.

Table 1: ES&S Products

In addition to the components included in ES&S Voting System 5.2.2.0, ES&S offers ancillary products, utilities and systems that interact with the certified voting system, listed below. These products are offered outside of the required certified voting component list. Many of the products were used in testing to demonstrate system interoperability. See Appendix A: Ancillary Systems for descriptions of these products.

- Ballot on Demand
- Ballot Online w/ExpressPass
- Electronic Pollbook
- ExpressLink System
  - ◊ ExpressLink
  - ◊ ExpressVote Activation Card Printer
- Electionware Toolbox
  - ◊ Test Deck
  - ◊ Text to Speech

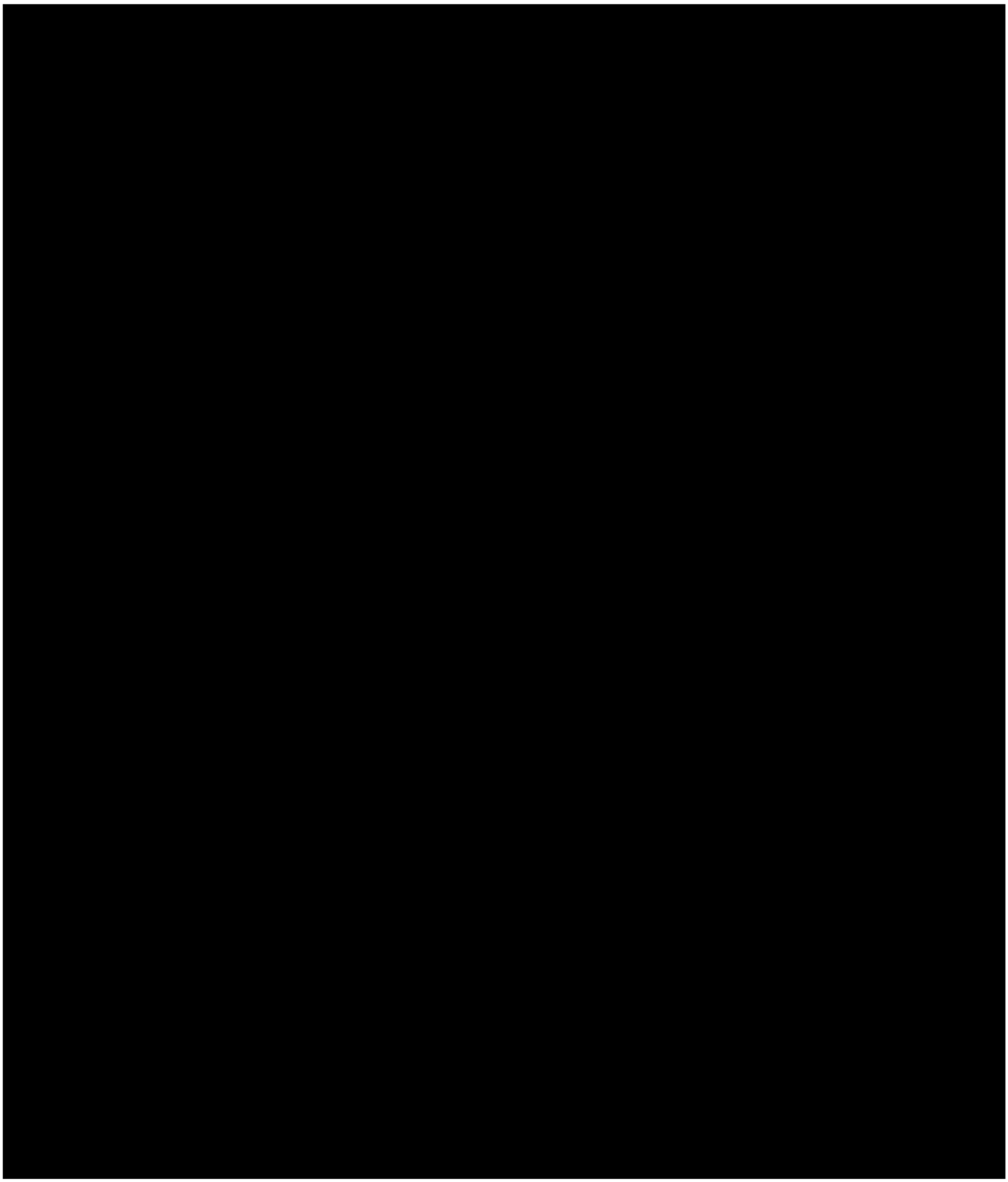
ES&S voting system equipment and software is divided into the following, functional groups:

Functional Group	Included Products
Universal Voting System (UVS)	ExpressVote
Election Management System (EMS)	Electionware Election Reporting Manager Removable Media Service ExpressVote Previewer VAT Preview Event Log Service
Precinct Ballot Tabulators (PBT)	DS200
Central Ballot Tabulators (CBT)	DS450 DS850
Ballot Marking Devices (BMD)	AutoMARK
Accessories, peripherals and 3rd party equipment	See Attachment 2, "Voting System Configuration".

Table 2: Functional Groups

2.1 FUNCTIONAL COMPONENT AND SUBSYSTEM OVERVIEW

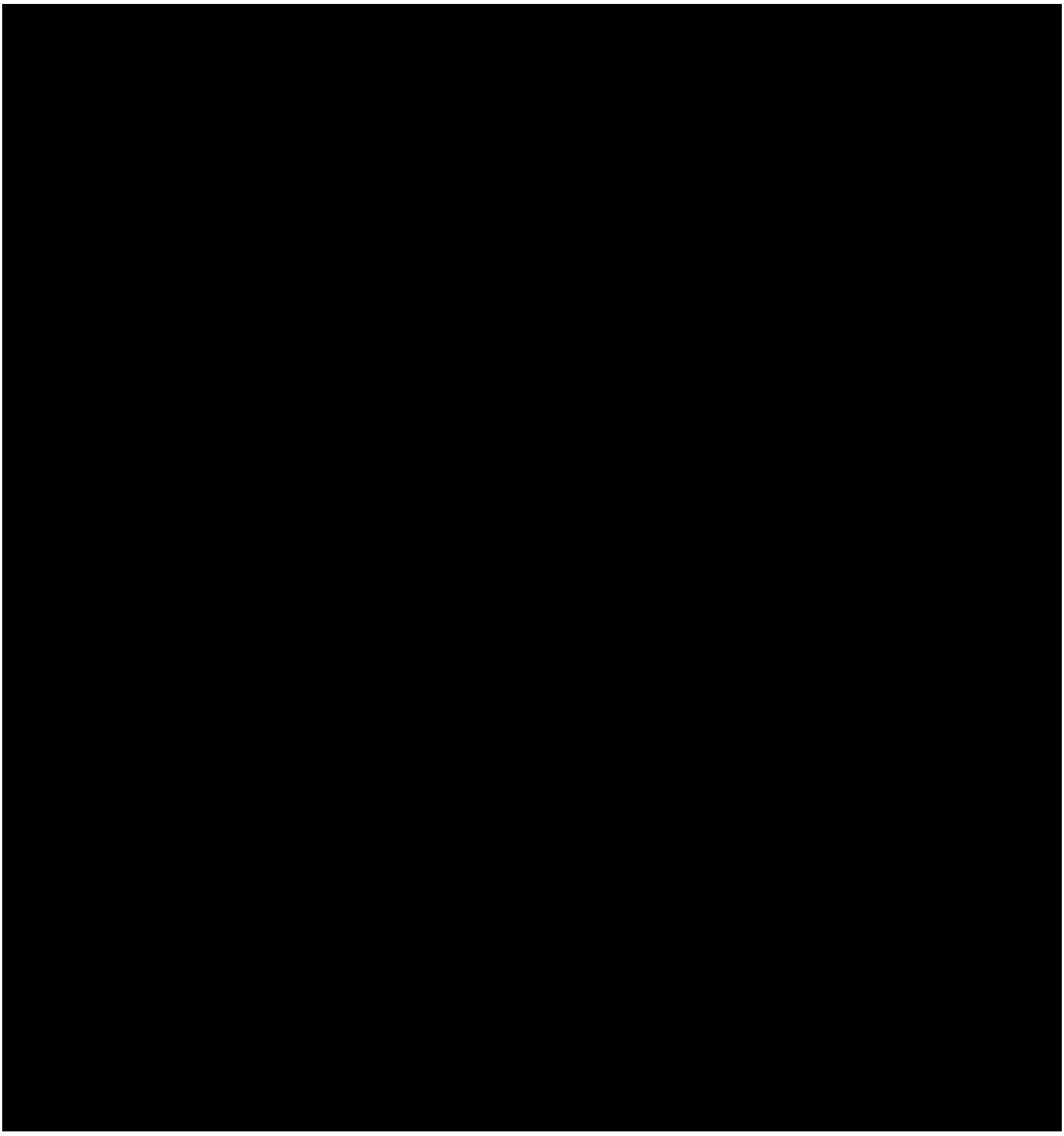
Figure 1 illustrates end-to-end functionality of the ES&S Voting System. Functional descriptions appear in the sections that follow.



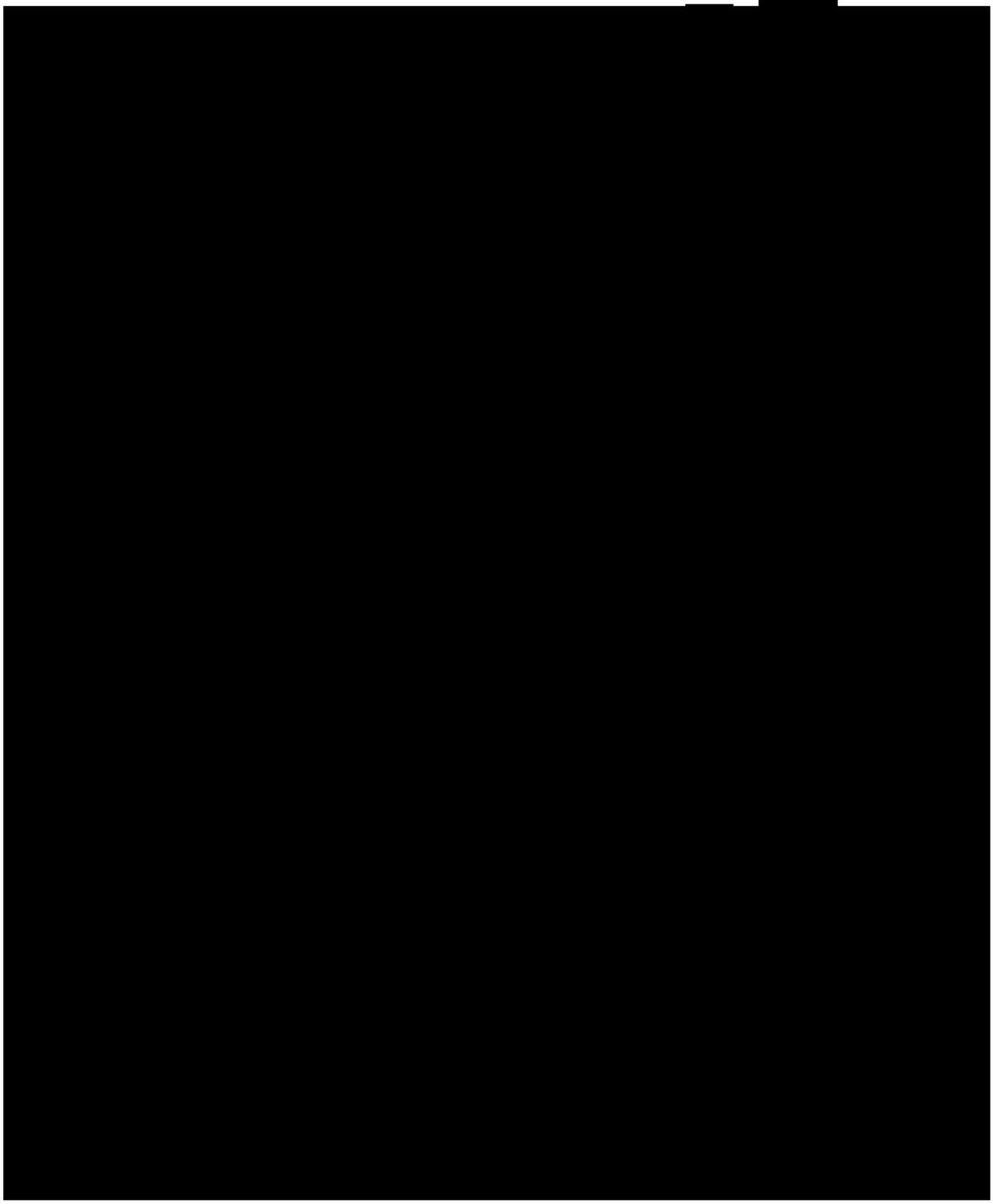
2.1.1 SUBSYSTEM DESCRIPTIONS

Table 2 lists the functional subsystems included with ES&S Voting System 5.2.2.0

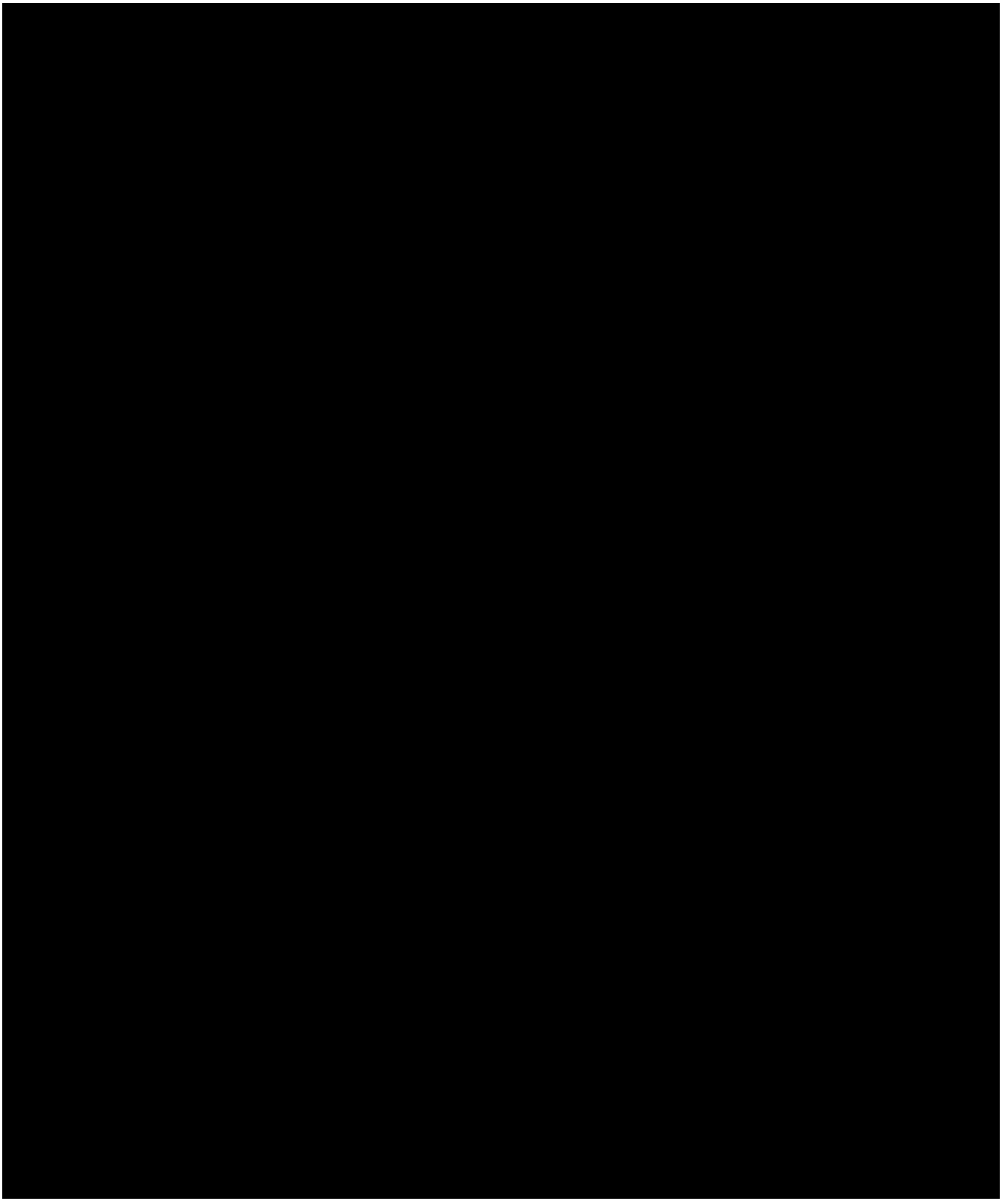
2.1.2 ELECTION DATA MANAGEMENT



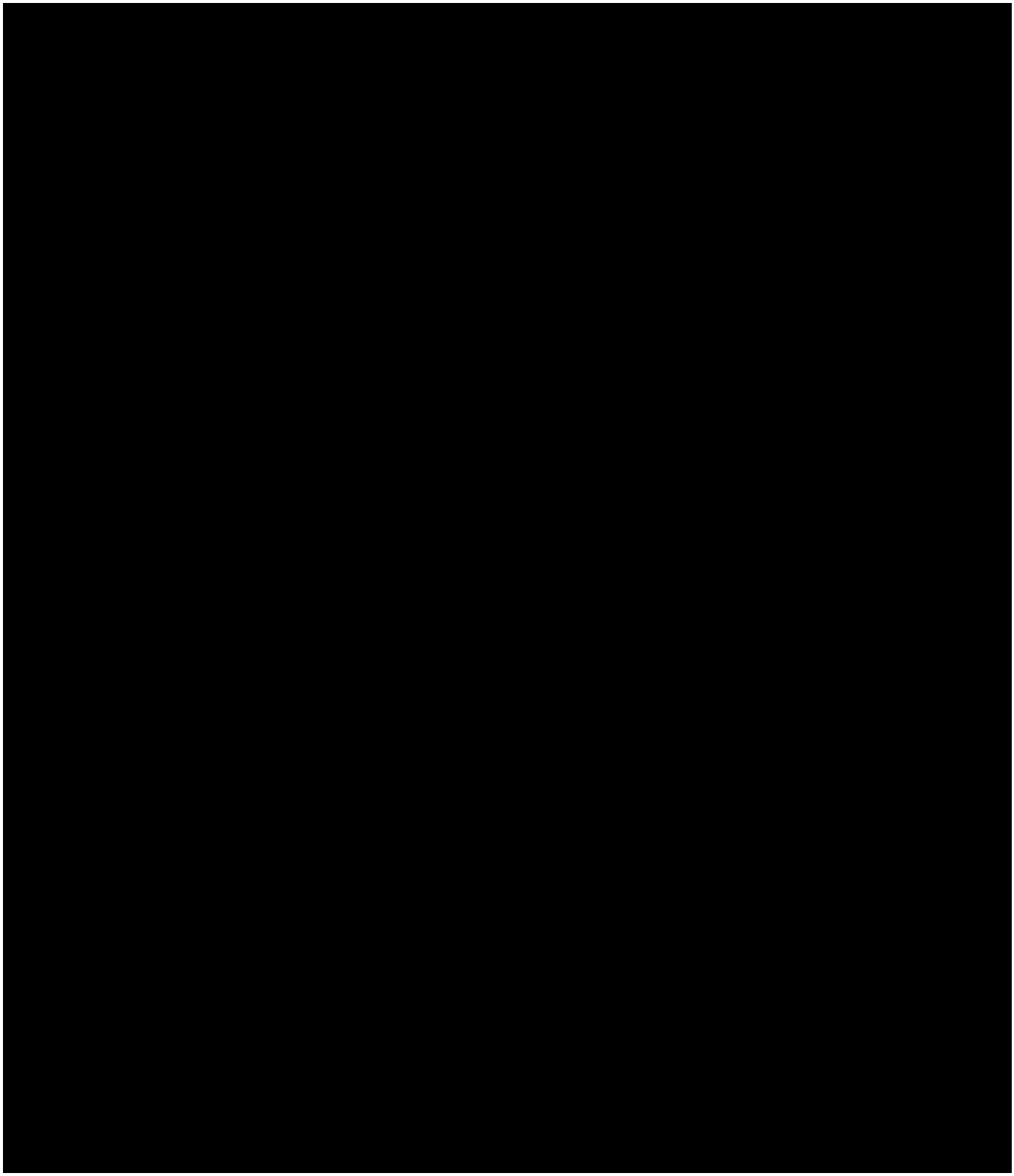
2.1.3 BALLOT AND ACTIVATION CARD FORMATTING AND PRINTING



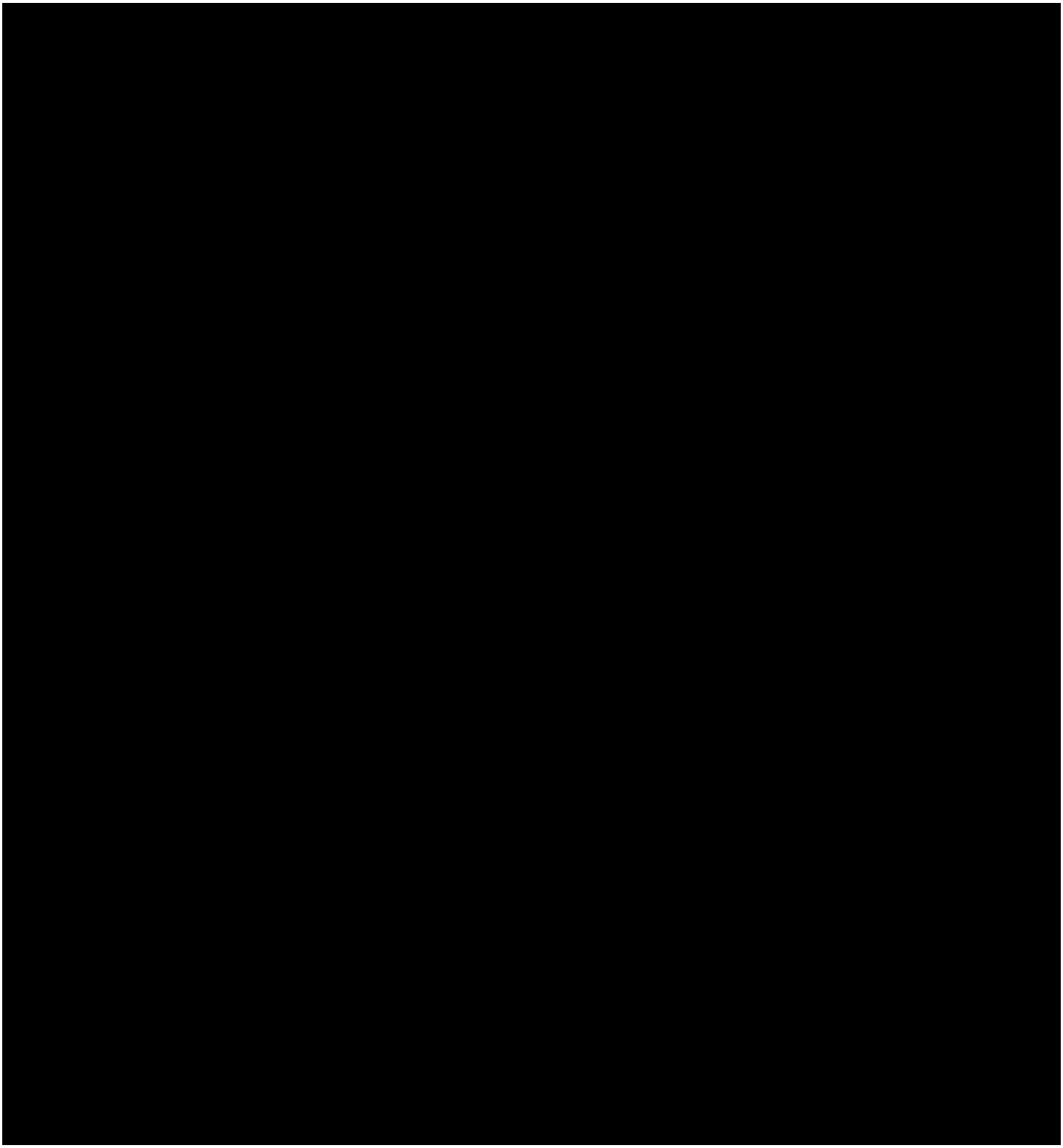
2.1.4 VOTING EQUIPMENT CONFIGURATION



2.1.5 VOTING AND TABULATION



2.1.6 RESULTS CONSOLIDATION AND REPORTING



2.2 OPERATIONAL ENVIRONMENTS OVERVIEW

This section provides a description of the operational environment of the system. This description is comprised of three parts: the operational environments, the components that comprise the operational environments (hardware, software, etc.) and the communication structures that connect the environments and components together.

2.2.1 OPERATIONAL ENVIRONMENTS

The following sections describe the physical operating environments supported by ES&S. Those environments include:

1. Ballot Production
2. Election Central
3. Polling Place
4. Ballot Online

2.2.1.1 BALLOT PRODUCTION

2.2.1.2 ELECTION CENTRAL

2.2.1.3 POLLING PLACE

2.2.1.4 BALLOT ONLINE

2.2.2 OPERATIONAL ENVIRONMENT COMPONENTS

The certified voting system includes the following operational environment hardware and software components:

1. ExpressVote
2. DS200
3. DS450
4. DS850
5. AutoMARK
6. Electionware
7. Election Reporting Manager
8. Event Log Service
9. Removable Media Service

A description of each component is provided in the subsequent sections.

2.2.2.1 EXPRESSVOTE

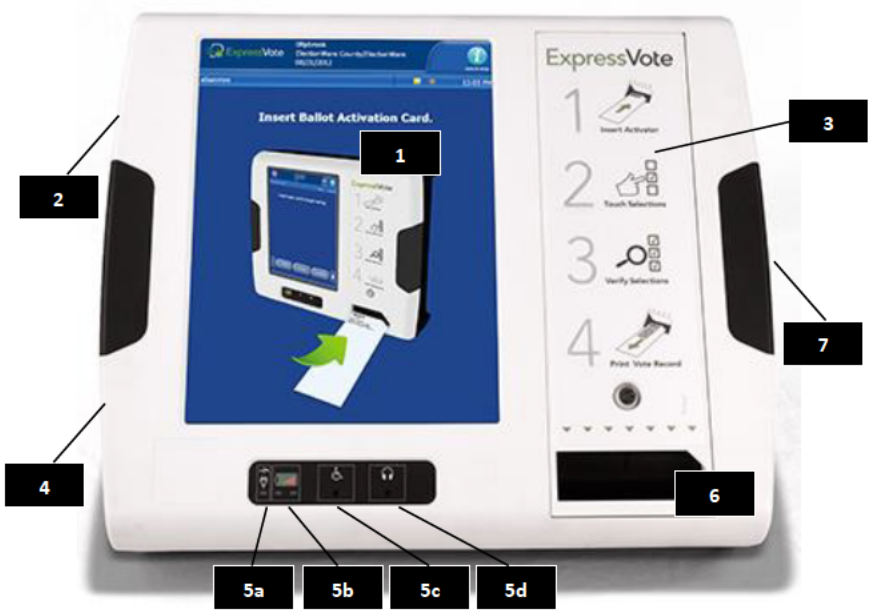


Figure 7: ExpressVote

The ExpressVote universal voting system is a vote capture device designed for all voters, with independent voter-verifiable paper record that is digitally scanned for tabulation on a compatible ES&S tabulator. This system combines paper-based voting with touch screen technology. The ExpressVote can serve all voters, including those with special needs, allowing voters to cast vote summary cards autonomously. Voters navigate ballot selections using the touch screen, detachable ADA keypad or ADA support peripheral such as a sip and puff device or two-position switch. ExpressVote guides voters through the ballot selection process with screen prompts, symbols and ballot audio. Screen controls meet all applicable guidelines for size and readability.

The ExpressVote includes a mandatory vote summary screen that requires voters to confirm or revise selections prior to printing the vote summary card using the internal thermal printer. Once printed, an ES&S tabulator may process the vote summary card. This device includes an optional secure card container that can serve as a receptacle for ADA voters who prefer a "hands free" method to cast their vote summary cards. ES&S has fully integrated the ExpressVote with the existing suite of ES&S voting system products.

1. Touch screen
2. Access compartment
3. Instruction panel
4. ADA keypad (nested within the unit)
5. Auxillary panel
   a. Power source indicator
   b. Battery status indicator
   c. ADA peripheral port
   d. Headphone jack
6. Card slot
7. Side handles

2.2.2.1.1 ADA TABLE CONFIGURATION

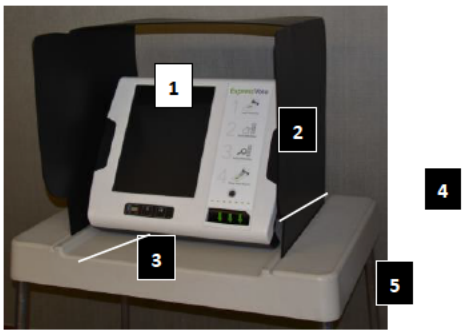


Figure 8: ADA Table Configuration

This view shows the ExpressVote in the ADA table configuration.

1. Privacy screen
2. ExpressVote unit (described above)
3. ExpressVote support
4. Kickstand stop (not pictured, in back)
5. ADA table

2.2.2.1.2 STANDARD TABLE CONFIGURATION

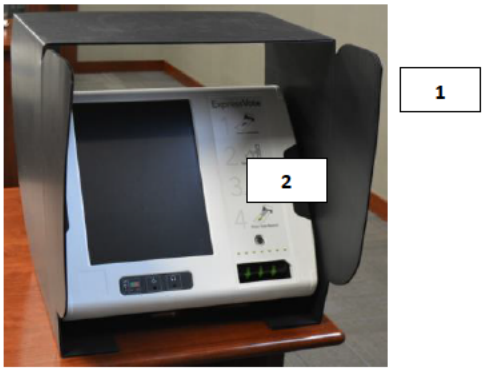


Figure 9: Standard Table Configuration

This view shows the ExpressVote in the standard tabletop configuration.

1. Privacy screen
2. ExpressVote unit (described above)

2.2.2.1.3 VOTING BOOTH CONFIGURATION

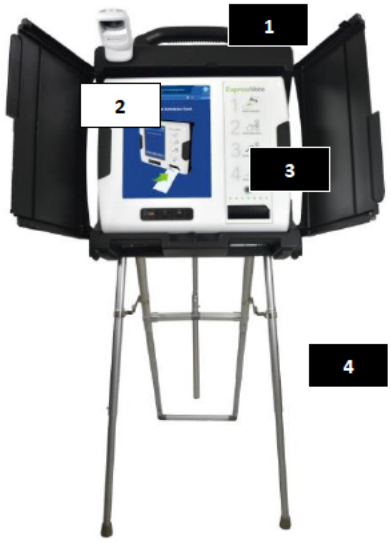


Figure 10: Voting Booth Configuration

This view shows the ExpressVote in the standard voting booth configuration.

1. Barcode scanner (optional)
2. Privacy screen
3. ExpressVote unit (described above)
4. Retractable voting booth legs

2.2.2.1.4 ROLLING KIOSK CONFIGURATION

Figure 11: Rolling Kiosk Configuration

This view shows the ExpressVote in the rolling kiosk configuration.

1. Docking station
2. ExpressVote unit (described above)
3. Access compartment
4. Privacy screen
5. Rolling kiosk
6. Secure card container
7. Portable stand

2.2.2.2 DS200

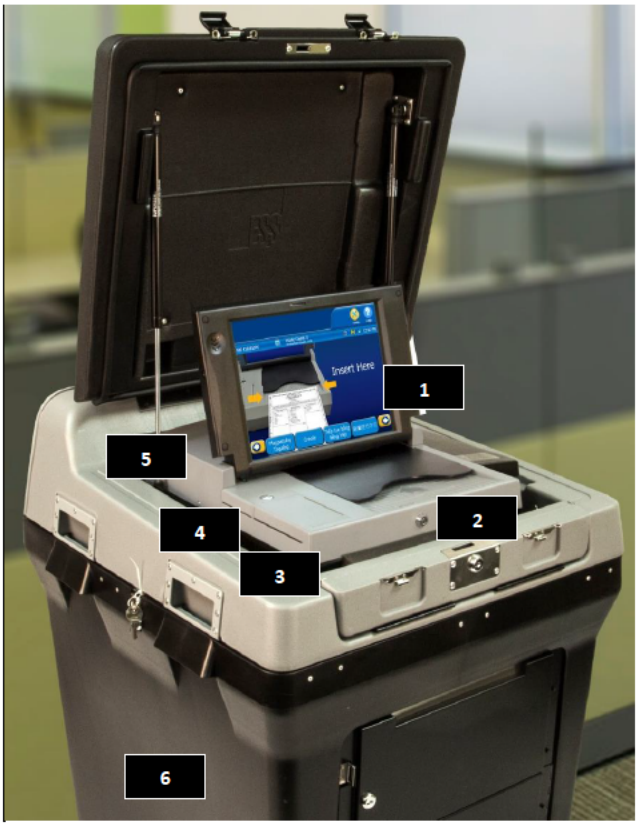


Figure 12: DS200

The DS200 precinct-based scanner and tabulator scans voted ballots and/or ExpressVote vote summary cards. Ballots will scan successfully when inserted in any of four orientations. It can scan a variety of ballot sizes, including ExpressVote vote summary cards. Both sides of the ballot are processed simultaneously with high-resolution scanners and the resulting ballot images are decoded using our patented PTRAC™ and IMR™ technology to determine what constitutes as a mark for a candidate. Tabulated voter selections are stored to a USB flash drive. The flash drive is removable from the system for transport to a central election location where vote totals are consolidated for reporting. The device also has an optional results backup flash drive. The DS200 is typically deployed within a carrying case that connects to the plastic ballot box. The carrying case has wheels and a telescoping handle that allow it to be transported separately and attached to the ballot box at the poll site. If the configuration requires a ballot diverter, the optional steel ballot box may be used instead of the plastic ballot box.

The DS200 has a large, touch screen, easy-to-use interface for voter and poll worker communication. It also includes an integrated thermal printer for limitless Election Day printing of zero reports at the opening of the polls, machine totals and log reports and polling place totals upon the official closing of the polls. The unit also has a USB flash drive for loading the election definition and storing results, and an internal battery pack for reliable power in the event of a power outage.

1. Touch screen
2. Input slot
3. Thermal printer paper access
4. Election media storage compartment
5. Backup election media storage compartment
6. Ballot box (optional)

2.2.2.3 DS450

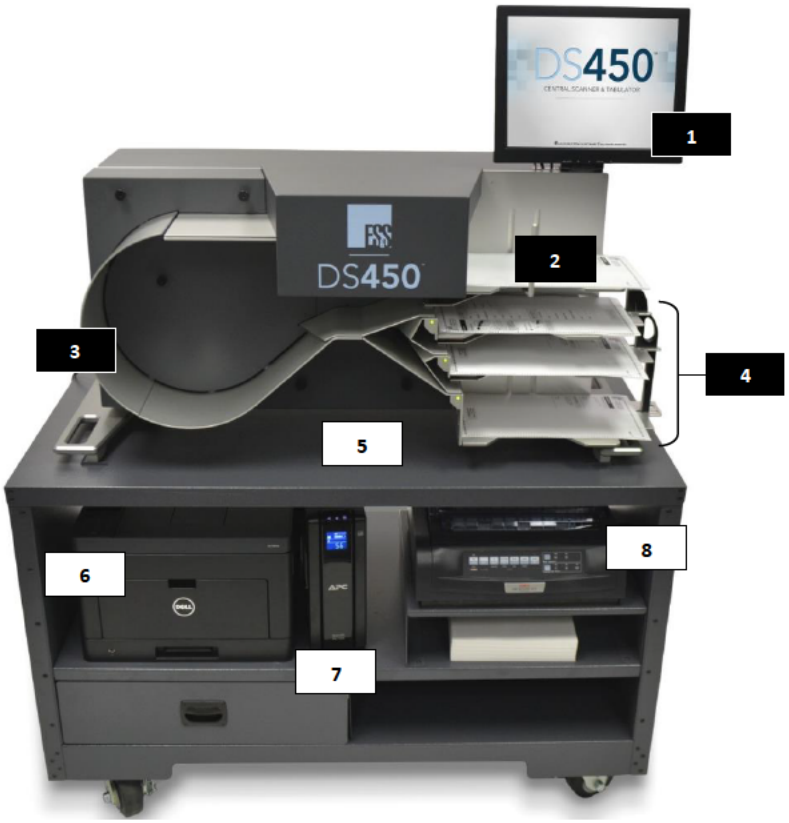


Figure 13: DS450

The DS450 mid-range scanner and tabulator simultaneously scans the front and back of a paper ballot and/or vote summary card. TruGrip™ technology insures that multiple sets of rollers are controlling the ballot in the transport at all times. This provides for reliable handling of ballots; even folded ballots. It can also read ballots in any of four orientations. The DS450 uses our patented Positive Target Recognition and Compensation™ (PTRAC) and Intelligent Mark Recognition™ (IMR) technology to determine what constitutes as a mark for a candidate. It sorts tabulated ballots into discrete output bins without interrupting scanning.

A dedicated dot matrix printer generates a continuous printed event log. Machine level results and status reports output from a second laser printer. The tabulator saves voter selections and ballot images to an internal hard disk and exports results to a USB flash drive or optional closed local network for processing with the EMS reporting subsystem.

The DS450 includes the following components:

1. Touch screen
2. Input tray
3. C-curve ballot transport
4. Output bins
5. DS450 cart
6. Report Printer
7. Uninterruptable Power Supply
8. Audit Printer

2.2.2.4 DS850

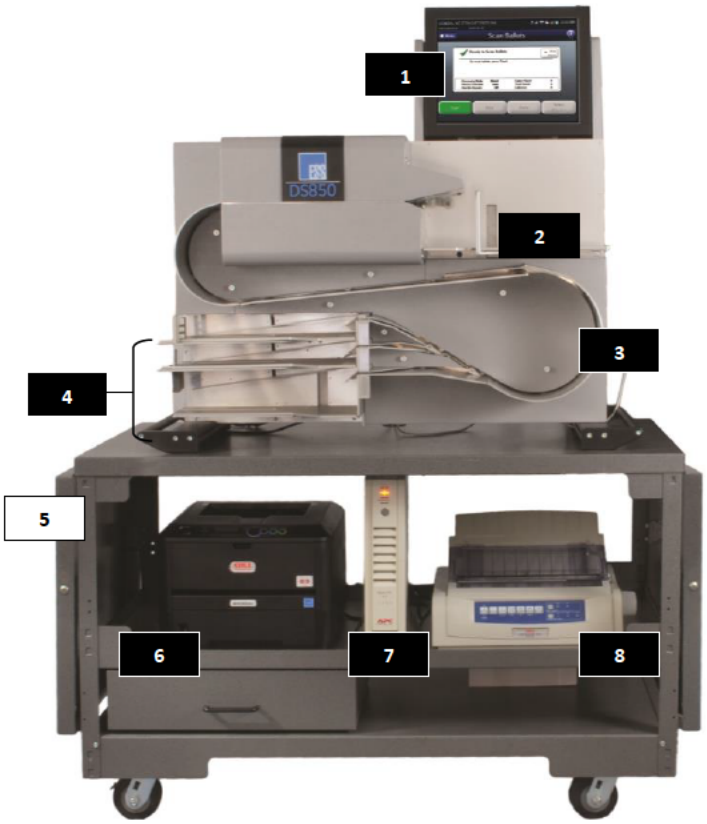


Figure 14: DS850

The DS850 central scanner and tabulator provides high-speed digital processing. It can scan a variety of ballot sizes, including ExpressVote cards, and it can read ballots in any of four orientations. The DS850 uses Positive Target Recognition and Compensation™ (PTRAC) and Intelligent Mark Recognition™ (IMR) technology to determine what constitutes as a mark for a candidate. It scans, tabulates, and automatically sorts ballots, separating them into one of three discrete output bins without interrupting scanning. The DS850 is designed with TruGrip™ technology that insures that multiple sets of rollers are controlling the ballot in the transport at all times. This provides for reliable handling of ballots, even folded ballots. Optionally, this device may be configured to transmit tabulation results to the results server through a closed network connection rather than using physically transported USB flash drives.

A dedicated dot matrix printer generates a continuous printed event log. Machine level results and status reports output from a second laser printer.

The DS850 includes the following components:

1. Touch screen
2. Input tray
3. S-curve ballot transport
4. Output bins
5. DS850 Table
6. Report Printer
7. Uninterruptable Power Supply
8. Audit Printer

2.2.2.5 AUTOMARK

Figure 15: AutoMARK

The AutoMARK is an ADA-compliant ballot marking device. It provides autonomy and voting privacy to voters who are blind, visually impaired, or have limited dexterity or physical disabilities, or voters who want to read or hear ballot content in an alternate language; any condition that makes it difficult to traditionally mark a ballot. Voters navigate the ballot using the touch screen, physical keypad or an ADA support peripheral, such as a "sip and puff" device or two-position switch. The device visually and/or audibly guides the voter through the ballot marking process with screen prompts and symbols, as well as audible voice prompts. Screen controls meet all applicable guidelines for size and readability. Physical keys are shaped and positioned to provide an intuitive voting session and labeled in both Braille and text to indicate function.

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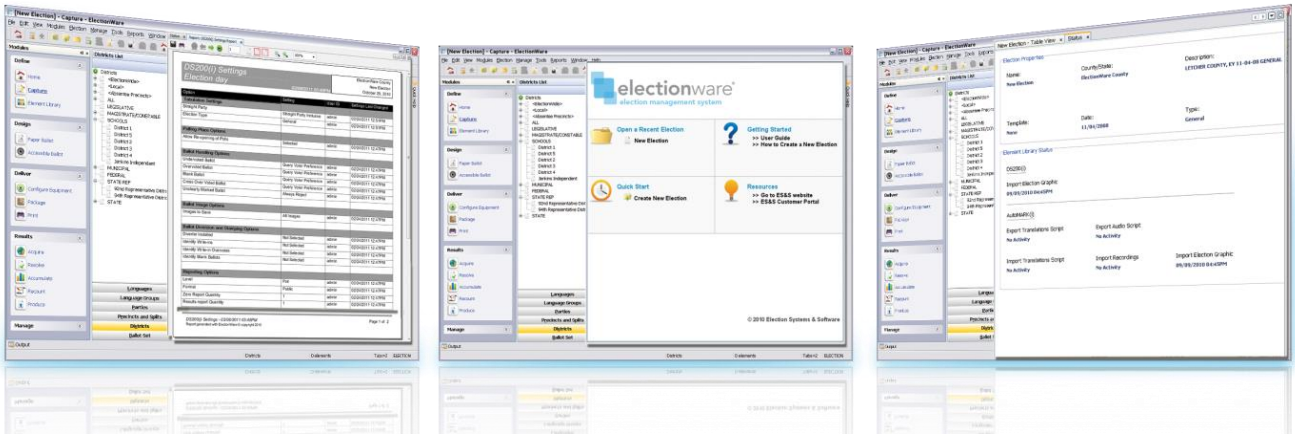
The AutoMARK includes the following components:

1. Touch screen
2. Physical control panel with Braille embossed keys
3. Headphone and accessible device ports
4. Input slot
5. Control key port
6. Election programming media compartment

2.2.2.6 ELECTIONWARE



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2.2.2.7 ELECTION REPORTING MANAGER

Election Reporting Manager (ERM) is ES&S's election results reporting program. Use ERM to generate paper and electronic reports for poll workers, candidates, and the media. ERM is designed to display updated election totals on a monitor as ballot data is tabulated. Data loading and report editing features enable the user to read data from a variety of ballot tabulators, customize report formats, and generate accurate election results.

ERM is designed to support a wide range of ES&S ballot scanning equipment and can produce reports for both central count systems and precinct count systems.

2.2.2.8 EVENT LOG SERVICE

The users' interactions with the Election Management System are primarily logged to the Electionware Postgres database. Events that happen when a connection to the database is not available are logged to the Windows Operating System log through the Event Log Service.

2.2.2.9 REMOVABLE MEDIA SERVICE

Removable Media Service (RMS) is a utility that runs in the background of the Windows operating system. RMS reads specific information from any attached USB flash drives so that ES&S applications such as Electionware and ERM can use that information for media validation purposes. The service also provides functionality similar to the Safely Remove Hardware feature on the Windows system tray, allowing applications to eject media devices without user input.

2.2.3 COMMUNICATIONS STRUCTURE

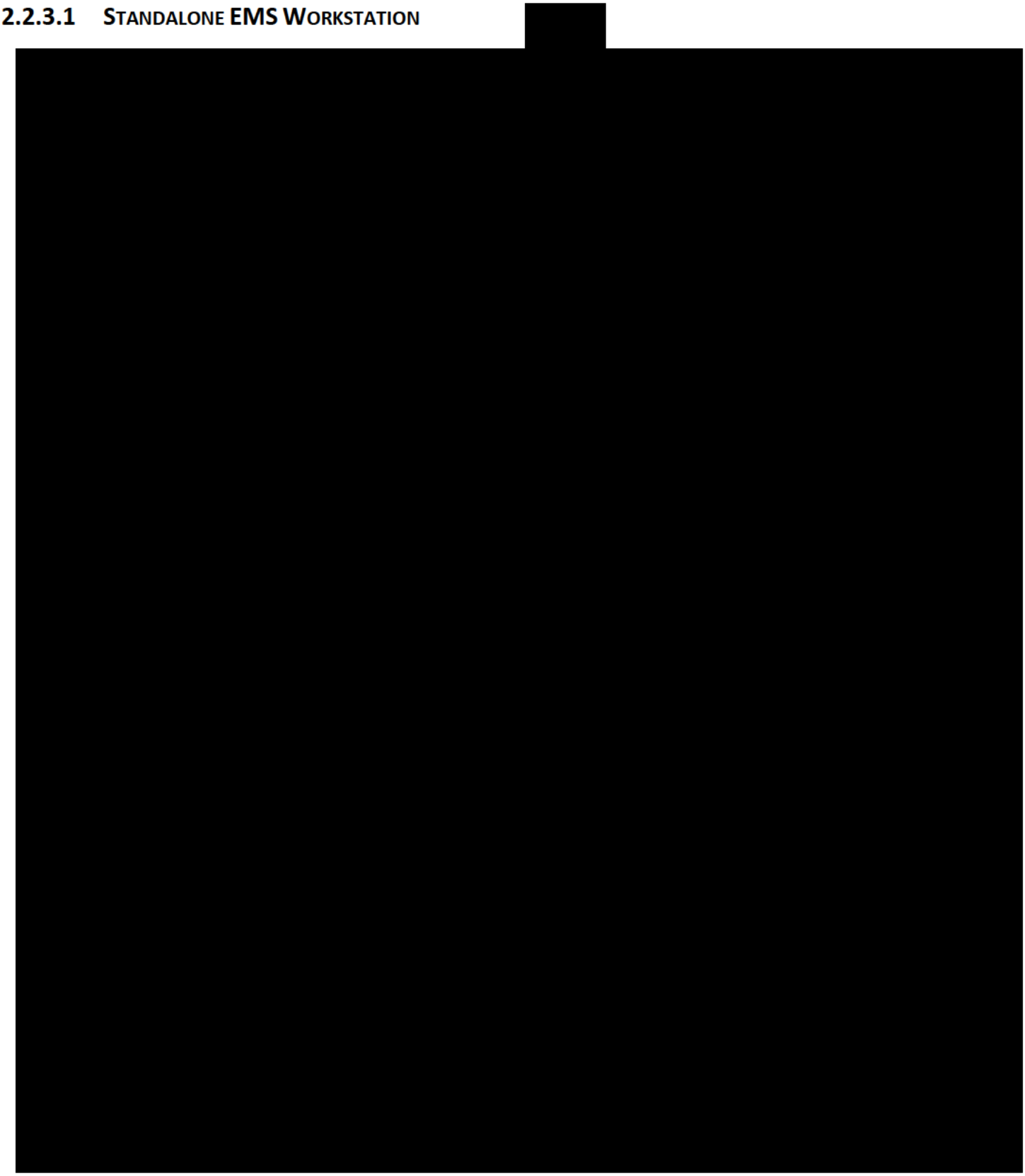
The certified voting system includes the following operational communication structures:

1. Standalone EMS Workstation
2. Local Area Network EMS
3. Polling Place
4. ExpressVote Activation Card Printing
5. Ballot Online – ExpressPass and UOCAVA

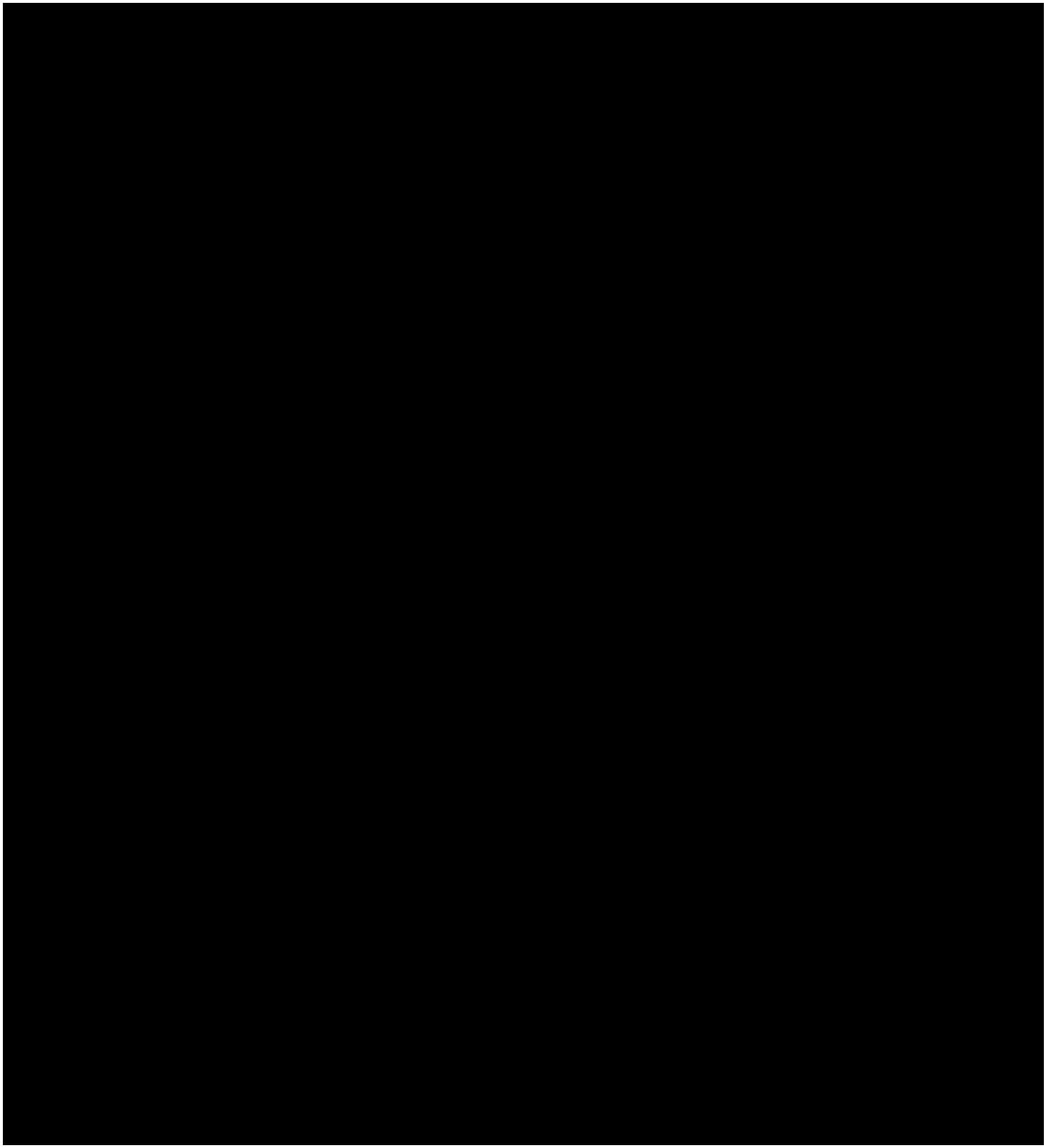
A description of each communications structure is provided in the subsequent sections.

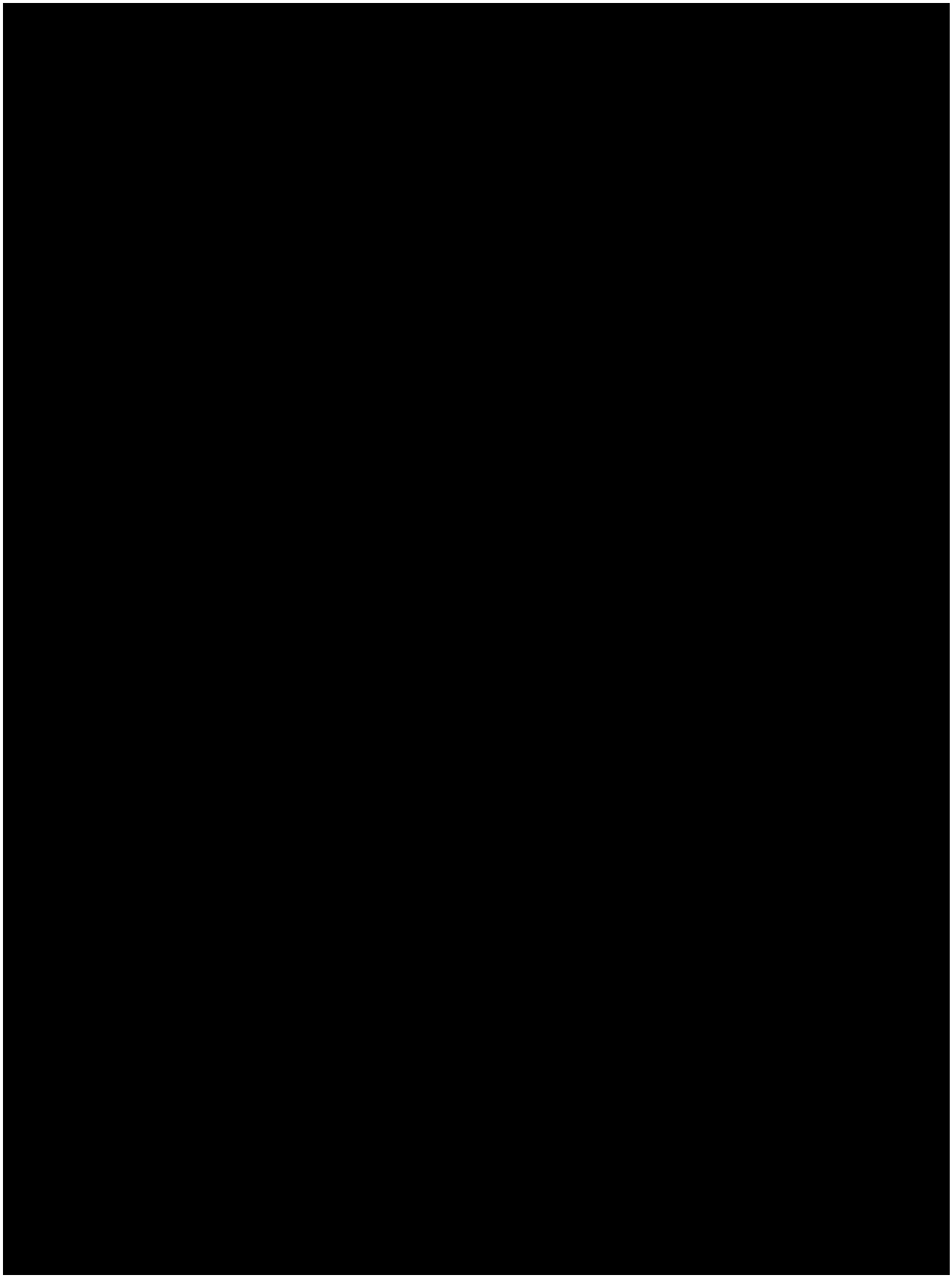
High-resolution drawings of the diagrams in this section are provided as an attachment to this document.

2.2.3.1 STANDALONE EMS WORKSTATION

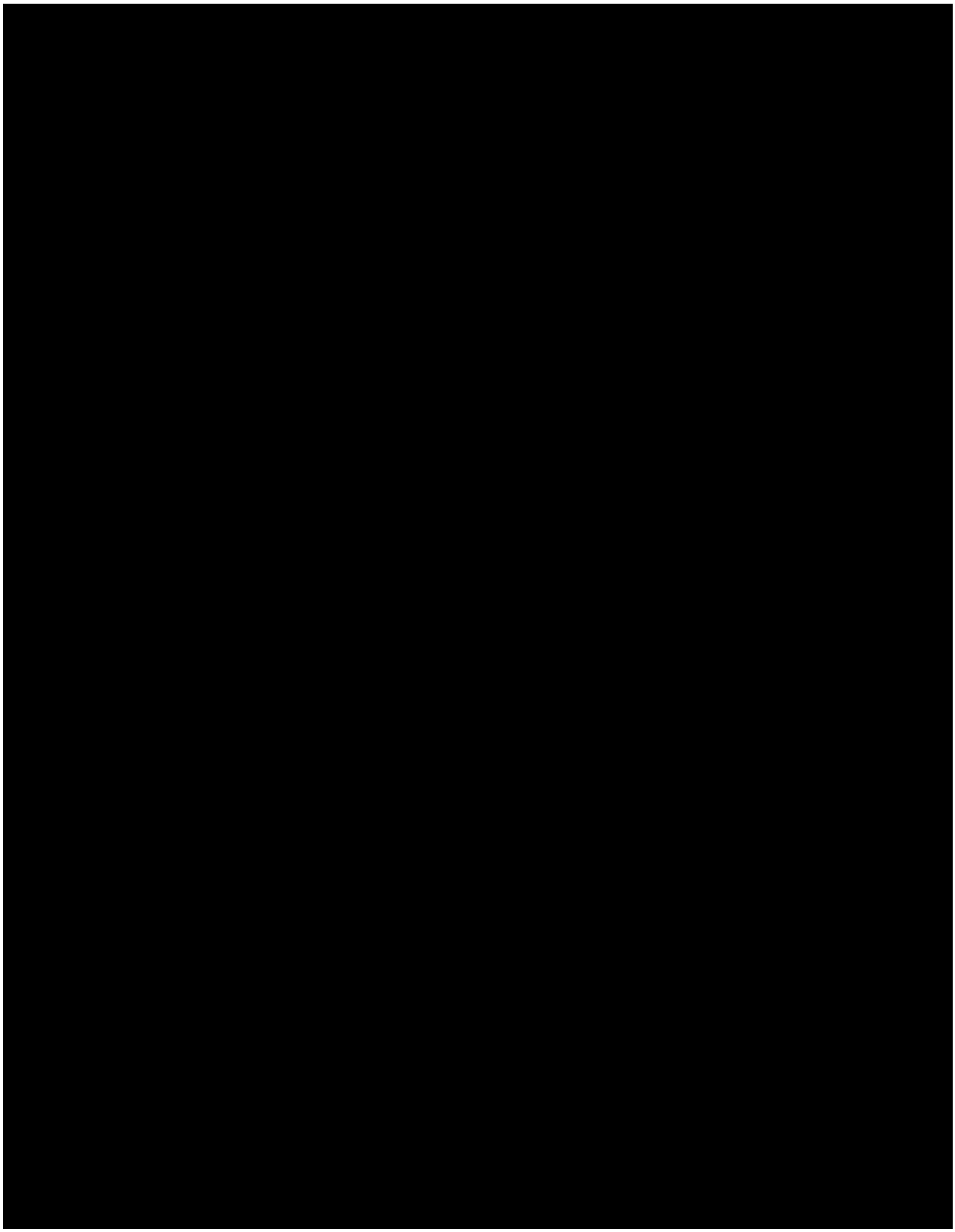


2.2.3.2 LOCAL AREA NETWORK EMS

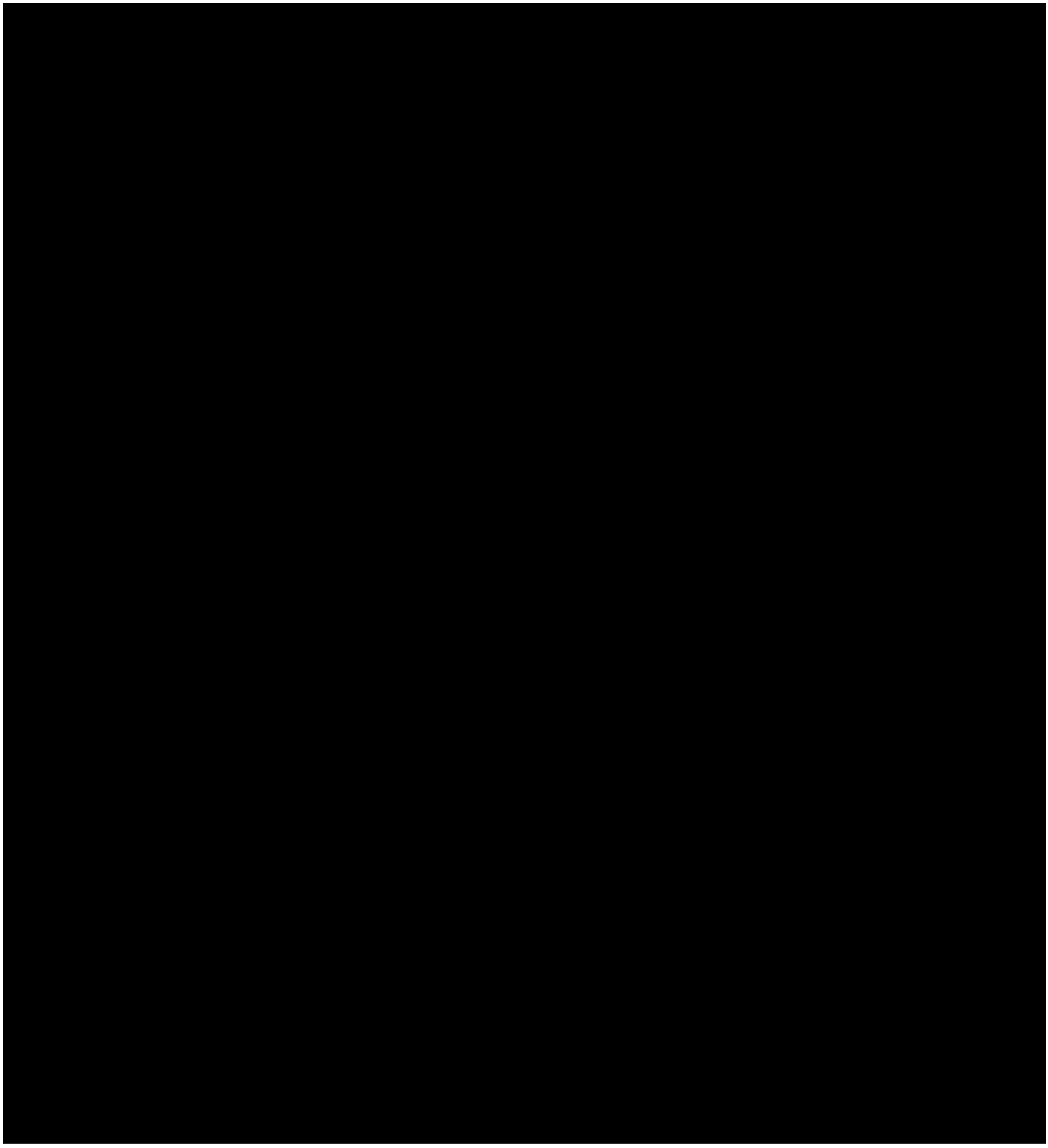




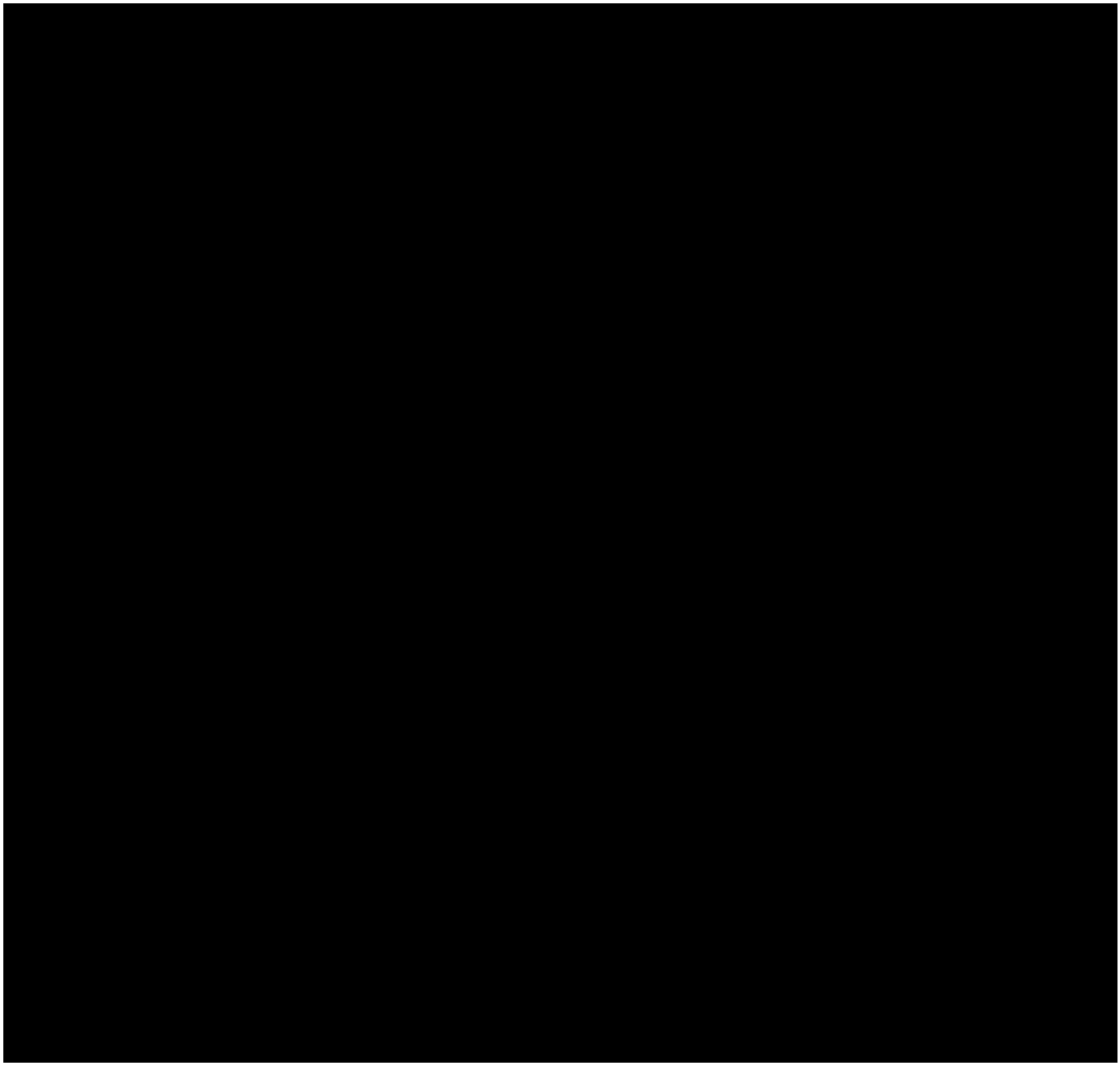
2.2.3.3 POLLING PLACE



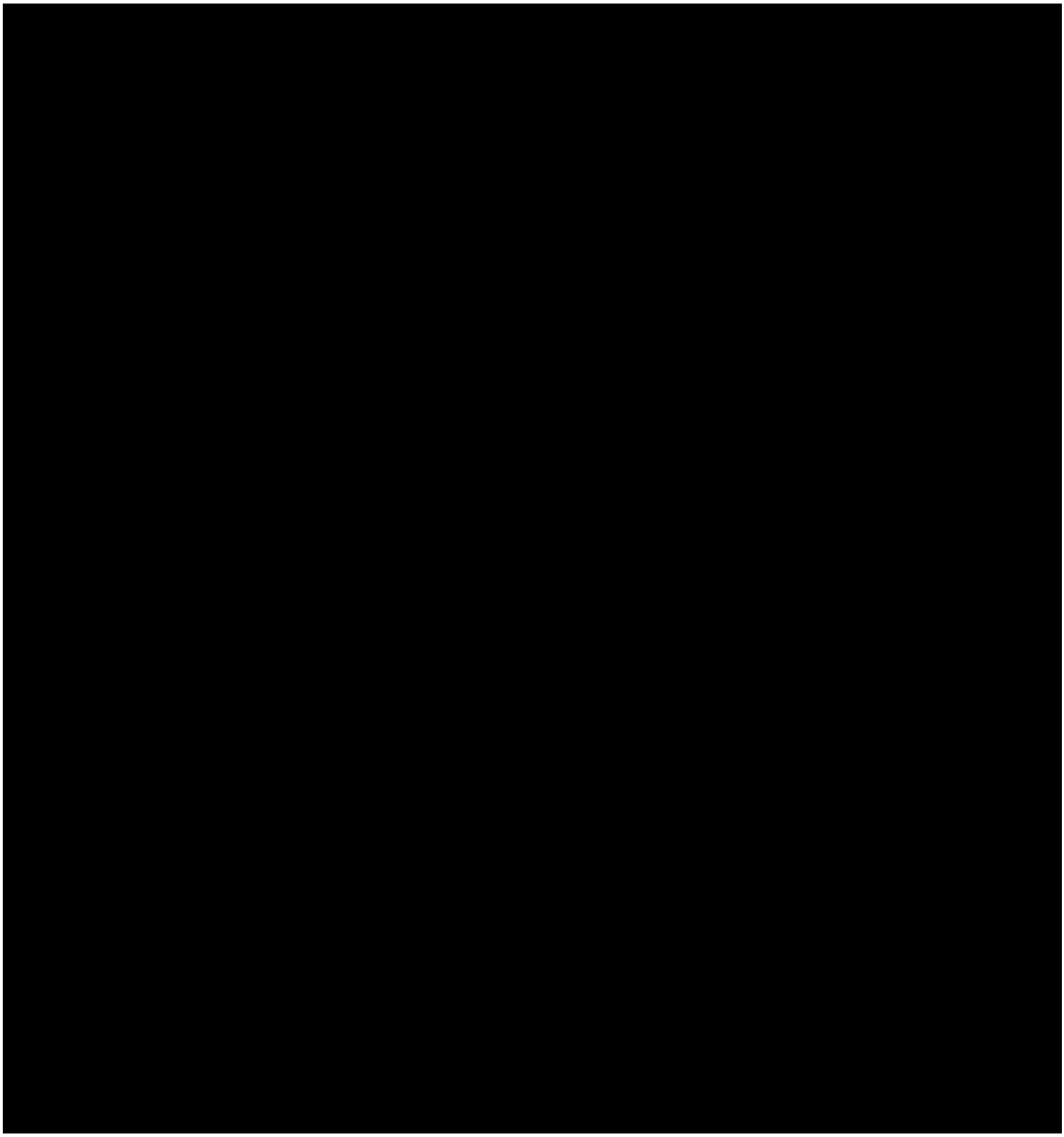
2.2.3.4 EXPRESSVOTE ACTIVATION CARD PRINTING



2.2.3.5 BALLOT ONLINE - EXPRESSPASS



2.2.3.6 BALLOT ONLINE - UOCAVA



2.2.3.7 PERIPHERALS

2.3 CONCEPT OF OPERATION

See the system diagram included under Section 2.1 and system/subsystem descriptions under Section 2.1.1 for the voting system concept of operation.

The functional subsystem descriptions under Section 2.1.1 include a description of each system function and a discussion of how each function is achieved in the system design.

2.4 FUNCTIONAL AND PHYSICAL INTERFACES

The diagrams and subsystem descriptions under Section 2.1.1 illustrate the functional interactions between system components. Physical interfaces are illustrated and described under Section 2.6.

2.5 COTS HARDWARE, SOFTWARE AND COMMUNICATION SERVICES

A list of Consumer off the Shelf (COTS) products utilized in core system software and firmware appears in Attachment 2, "Voting System Configuration."

2.6 INTERFACES AMONG COMPONENTS

2.7 BENCHMARK DIRECTORY LISTINGS

See Attachment 2, “Voting System Configuration,” for default and recommended install locations for voting system software. Components are listed in the order they should be installed. Firmware for vote counting and ballot marking equipment is installed by ES&S and cannot be accessed, installed or modified by a voting system user.

3 SYSTEM PERFORMANCE

This section provides an overview of system performance characteristics for each system component. Detailed performance characteristics for each product in the system appear in Attachment 3, “Product Specification Sheets.” System boundaries and limitations appear in Attachment 1, “Voting System Limitations.”

3.1 PERFORMANCE CHARACTERISTICS

Performance characteristics including estimated maximum speed, volume and throughput capacity appear in Attachment 3, “Product Specification Sheets.”

3.1.1 PAPER BALLOT AND EXPRESSVOTE ACTIVATION CARD LIMITATIONS

Limitations for paper ballots including ballot formats and target positions appear in Attachment 3, “Product Specification Sheets.”

Selection limitations for ExpressVote activation cards appear in Attachment 3, “Product Specification Sheets.”

3.2 QUALITY ATTRIBUTES

[redacted]

3.2.1 RELIABILITY

[redacted]

3.2.2 MAINTAINABILITY

[redacted]

[redacted]

3.2.3 AVAILABILITY

[redacted]

3.2.4 USABILITY

ES&S designs voting systems for a broad range of election jurisdictions. The system accounts for many variables to support a variety of local and State regulations and incorporates functionality built to specific customer requests and requirements. To ensure that users can maximize their understanding of the system, ES&S enhances usability and accessibility through Heuristic evaluation, intelligent system design, comprehensive training programs and administrative support services.

3.2.4.1 SYSTEM FEATURES AND DESIGN

[redacted]

3.2.4.2 TRAINING

ES&S training services supplement user documentation and support services. Election Day and pre-election courses are available and training classes can be tailored to meet the unique needs of clients. See the *Personnel Deployment and Training Program* for further details.

Classroom instruction includes audio, visual and hands-on demonstrations and exercises – specific to student responsibilities. Students receive training materials that feature visual and step-by-step instructions. Customized job aids and testing materials may be developed to meet the individualized needs of the students.

ES&S offers refresher training after first use, and always evaluates the effectiveness of every class in order to continually refine and improve a customized training program.

3.2.4.3 SUPPORT SERVICES

ES&S Customer Service Managers, Customer Support Representatives, and Field Service Technicians provide implementation, service and support of election systems.

3.2.5 PORTABILITY

ES&S voting equipment is designed for its intended purpose. Equipment designed for use at polling places includes wheels and carrying cases that support mobility and protect equipment from drops and collisions. ES&S central ballot tabulators are designed for speed and durability and not for high portability. See Attachment 3, “Product Specification Sheets,” for product dimensions and weight.

3.3 PROVISIONS FOR SAFETY, SECURITY, PRIVACY AND CONTINUITY OF OPERATION

The following sections include a discussion of ES&S design considerations for safety, security, privacy and continuity of operation. The voting system security specification, product user's/operator's manuals and maintenance manuals include expanded information.

3.3.1 SAFETY

See Attachment 3, "Product Specification Sheets," for product safety considerations.

3.3.2 SECURITY

Voting equipment is designed with specific security features and procedures that contribute to the overall security of the voting system. The following table includes general descriptions of the security features and procedures for each product. Product manuals and security specifications provide detailed security descriptions by product.

ES&S Product	Security Features/Description
ExpressVote	See Attachment 3, "Product Specification Sheets."
DS850	See Attachment 3, "Product Specification Sheets."
DS450	See Attachment 3, "Product Specification Sheets."
DS200	See Attachment 3, "Product Specification Sheets."
AutoMARK	See Attachment 3, "Product Specification Sheets."
Event Log Service	[redacted]
Electionware	

ES&S Product	
Election Reporting Manager	[redacted]

3.3.3 PRIVACY

Voting System Hardware	See Attachment 3, "Product Specification Sheets," for privacy features of ES&S voting equipment.
Election Management System	No voter information is stored to voting system software; ensuring voter privacy and security.

Table 17: Product Privacy Features

3.3.4 CONTINUITY OF OPERATION

Voting System Hardware	See Attachment 3, "Product Specification Sheets," for battery specifications and backup features of ES&S voting equipment.
Election Management System	Frequent backups and the use of an uninterruptable power source ensure continuity of operation for EMS software.

Table 18: Product Continuity of Operation Features

3.4 DESIGN CONSTRAINTS, APPLICABLE STANDARDS AND COMPATIBILITY REQUIREMENTS

The following sections describe external factors affecting the system design.

3.4.1 DESIGN CONSTRAINTS

ES&S Product	Constraint
ExpressVote	ExpressVote meets all VVSG 1.0 requirements and human engineering considerations for all voters, including those with disabilities. The design includes audio output and a removable keypad with Braille embossed keys to accommodate voters who are blind or have low vision, and a touch pad and "sip n puff" input to accommodate voters with limited physical mobility.

ES&S Product	
DS450	[redacted]
DS850	
DS200	
AutoMARK	
Election Management System	

3.4.2 APPLICABLE STANDARDS

ES&S Product	Constraint
ExpressVote	See Attachment 3, "Product Specification Sheets," for design standards used in the development of ES&S voting equipment.
DS850	See Attachment 3, "Product Specification Sheets," for design standards used in the development of ES&S voting equipment.
DS450	See Attachment 3, "Product Specification Sheets," for design standards used in the development of ES&S voting equipment.
DS200	See Attachment 3, "Product Specification Sheets," for design standards used in the development of ES&S voting equipment.
AutoMARK	See Attachment 3, "Product Specification Sheets," for design standards used in the development of ES&S voting equipment.
Electionware	[redacted]
Election Reporting Manager	

3.4.3 COMPATIBILITY REQUIREMENTS

System requirements appear in Attachment 2, "Voting System Configuration."

A. ANCILLARY SYSTEMS

A.1 INTRODUCTION

Ancillary systems represent products and utilities that are not part of the certified configuration. However, these products and utilities may be used to streamline and facilitate the certification testing process. Ancillary systems include:

- Ballot on Demand (BOD)
- Ballot Online – ExpressPass
- Electronic Pollbook
- ExpressLink System
  - ExpressLink
  - ExpressVote Activation Card Printer
- Electionware – ToolBox
  - Test Deck
  - Text to Speech

High-resolution drawings of the diagrams in this section are provided as an attachment to this document.

A.2 BALLOT ON DEMAND (BOD)

ES&S offers an ancillary product called Ballot on Demand (BOD). BOD is a process that allows you to print ad hoc ballots. This process eliminates the need for organizing and storing mass quantities of ballots while simultaneously ending ballot shortages. BOD uses the jurisdiction's election database (created in Electionware Capture) to create BOD files and ballot artwork PDFs. Electionware Print uses the BOD data and ballot artwork to create production quality ballots with the appropriate ballot style.

A.3 BALLOT ONLINE – EXPRESSPASS

Ballot Online is an optional system that allows a user to access online and make sample ballot selections on any device connected to the Internet. When finished, the output from this system is the ExpressPass – a selection summary with scannable QR code that the user can either print or save in an electronic format on their mobile device. If submitting the vote selections for official tabulation, the user is required to go to the polling place to submit the vote selections on their ExpressPass, following standard voter authentication at the polling place. The voter operates the ExpressVote to scan, review and validate vote selections. The vote summary card may then be submitted for tabulation on an ES&S tabulator. See Section 2.2.3: Ballot Online – ExpressPass for further details regarding the communications structure of this system.

A.4 ELECTRONIC POLLBOOK

The ES&S ExpressPoll-5000 electronic pollbook stores registered voter information for precincts, districts, or entire jurisdictions. Poll workers enter an identifying piece of information onto the large touch screen to verify that a voter is registered.

The voter registration data can be shared with the ExpressLink application (discussed in Appendix A: Ancillary Systems, ExpressLink.)

A.5 EXPRESSLINK SYSTEM

ES&S offers an ancillary electronic pollbook system called ExpressLink. This system is comprised of two components: the ExpressLink application and the ExpressVote Activation Card Printer.

A.5.1 EXPRESSLINK

The ExpressLink application receives BOD files from Electionware Package and electronic Pollbook systems. ExpressLink uses this information to format the ballot style code for an ExpressVote activation card. The ExpressLink application communicates with the Expressvote Activation Card Printer to print the ballot style code on the activation card. This ballot style code activates the voter's authorized ballot when the activation card is inserted into the ExpressVote.

ExpressLink is a standalone application that interfaces with voter registration (electronic Pollbook) systems and the ExpressVote Activation Card Printer to print the ballot activation code on an ExpressVote activation card. This code on the activation card activates the correct precinct/ballot the voter is authorized to vote.

A.5.2 EXPRESSVOTE ACTIVATION CARD PRINTER

The ExpressVote Activation Card Printer is a small, thermal, on demand printer used to print the ballot activation code on the ExpressVote activation card.

A.6 ELECTIONWARE TOOLBOX

Electionware Toolbox is a set of utilities that can be integrated into the Electionware EMS to enhance the software usability experience and streamline various processes. These add-on utilities include Test Deck and Text to Speech.

A.6.1 TEST DECK

The Test Deck module provides a means for the election official to test the election on each machine that will be used for voting. Vote patterns can be created with automatic ballot marking, and then the ballots can be printed and scanned through an ES&S tabulator to test logic and accuracy of the counting. Additionally, a test pattern file can be created for the ExpressVote that allows automated logic and accuracy testing on the universal voting machine. Test Deck significantly reduces the time, effort, and cost associated with accurate testing and verification of voting and tabulation on the machines used within a jurisdiction.

A.6.2 TEXT TO SPEECH

The Text to Speech module provides a simplified method for creating the audio wave files that make up the audible ballot. These audio wave files may be used with ES&S hardware that is ADA compatible, such as the ExpressVote or AutoMARK. This utility makes the conversion process less time consuming than utilizing the traditional microphone and scripting method.

B. 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*.

JURISDICTIONAL NOMENCLATURE

Terminology for the lowest-level common geopolitical civil division differs by state and country. In this manual and other ES&S documentation, the entity is referred to as a precinct.

As a company with accounts across the country and around the world, ES&S recognizes that certain jurisdictions use terms other than precinct. Some examples of the terms used by other jurisdictions are Election District (or ED), Borough, Province, Division, and District. These terms and others may be substituted for precinct depending upon the particular jurisdiction. However, for consistency, ES&S uses the term precinct throughout its documentation.

ACRONYMS AND DEFINITIONS

Acronym	Definition
BMD	Ballot Marking Device
BOD	Ballot on Demand
CBT	Central Ballot Tabulator
EMS	Election Management System
ERM	Election Reporting Manager
PBT	Precinct Ballot Tabulator
QR Code	Quick Response Code
SFTP	Secure File Transfer Protocol
Universal design	The design of a product to be useable by all people, that takes into account the full range of human diversity, including physical, perceptual and cognitive abilities, as well as different body sizes and shapes; “ExpressVote was designed with universal design principles applied to be usable by all voters, with or without a disability, without discrimination.”
UVS	Universal Voting System
WYSIWYG	What You See Is What You Get

C. REFERENCES

DOCUMENTATION REFERENCES

ES&S considered the following documents and resources in the design and application of this voting system. The latest revisions apply. Regard printed versions as outdated.

Document Title	Description
ES&S Voting System 5.2.1.0 - System Overview	System Overview from the reference project.

D. 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 Overview

Other Requirements Addressed in this Document

Reference	Title
N/A	N/A

DOCUMENT CONVENTIONS

- Any references to additional books or documents are indicated by the document name in *italics*.
- External links to information, documents, or downloads are indicated as it 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 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

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

IMPORTANT EXAMPLE

The Important symbol calls attention to critical information.

CAUTION EXAMPLE

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

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.

E. ATTACHMENTS

The table below lists the attachments contained within the *System Overview*. The original source files for these attachments, which are separate, self-contained documents, are stored in the ES&S technical documentation repository. Printed copies of these items are considered out of date.

ATTACHMENT 1: VOTING SYSTEM LIMITATIONS

ATTACHMENT 2: VOTING SYSTEM SUMMARY

ATTACHMENT 3: PRODUCT SPECIFICATION SHEETS

ATTACHMENT 4: SYSTEM DIAGRAMS

ExpressVote

AutoMA

DS450