Clear Ballot

ClearVote 2.3

ClearAccess System Overview

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Table of contents

Preface

This section defines the purpose of this document.

About this document

This document describes the following:

- The functional and physical components of the ClearAccess system
- How the components are structured
- The interfaces between components
- System-performance characteristics

This document complies with the requirements of the *Voluntary Voting System Guidelines* (VVSG), Version 1.0, 2005, Volume II, Section 2.2, "System Overview."

Scope of this document

This document contains the following sections:

- Chapter 1. System description
- Chapter 2. System performance

Intended audience

The document is for state and federal election officials and their voting system test laboratories. This document is part of the Technical Data Package (TDP) required to certify the ClearVote system for use. Clear Ballot personnel also use this document to support election officials and staff.

Conventions

This section describes conventions used in this document.

References to ClearVote products

A ClearVote® system can comprise the ClearAccess®, ClearCast®, ClearCount®, and ClearDesign® products. Jurisdictions are not required to purchase all products. You can ignore references to any ClearVote products that are not part of your voting system. Also ignore implementation options that are not relevant to your policies and procedures.

BDF and ADF

ClearAccess imports an election definition contained in an accessible definition file (ADF) created by ClearDesign. ClearCount and ClearCast import an election definition contained in a ballot definition file (BDF) created by ClearDesign.

Versions of ClearDesign earlier than 2.0 created unencrypted ADFs and BDFs. ClearDesign 2.0 and later versions produce encrypted ADFs and BDFs. You can distinguish between unencrypted and encrypted ADFs and BDFs by the ending of the filename.

File type	Filename ends in
Unencrypted accessible definition file	adf.zip
Encrypted accessible definition file	adfx.zip
Unencrypted ballot definition file	bdf.zip
Encrypted ballot definition file	bdfx.zip

In this document, the general terms ADF and BDF can refer to both the unencrypted and encrypted versions of these files.

For the specifics of the ADF and BDF file formats, see the following:

- *ClearDesign Accessible Definition File Guide*
- *ClearDesign Ballot Definition File Guide*

Chapter 1. System description

ClearAccess is an in-person ballot-marking system designed to ensure access for all voters. ClearAccess runs on commercial off-the-shelf (COTS) computers. The ClearAccess software captures the choices of voters and prints machine-readable ballots.

1.1 Hardware components of ClearAccess

Figure 1-1 shows the hardware components of a ClearAccess accessible voting system. Table 1-1 on page 10 describes each of the numbered component shown in Figure 1-1.

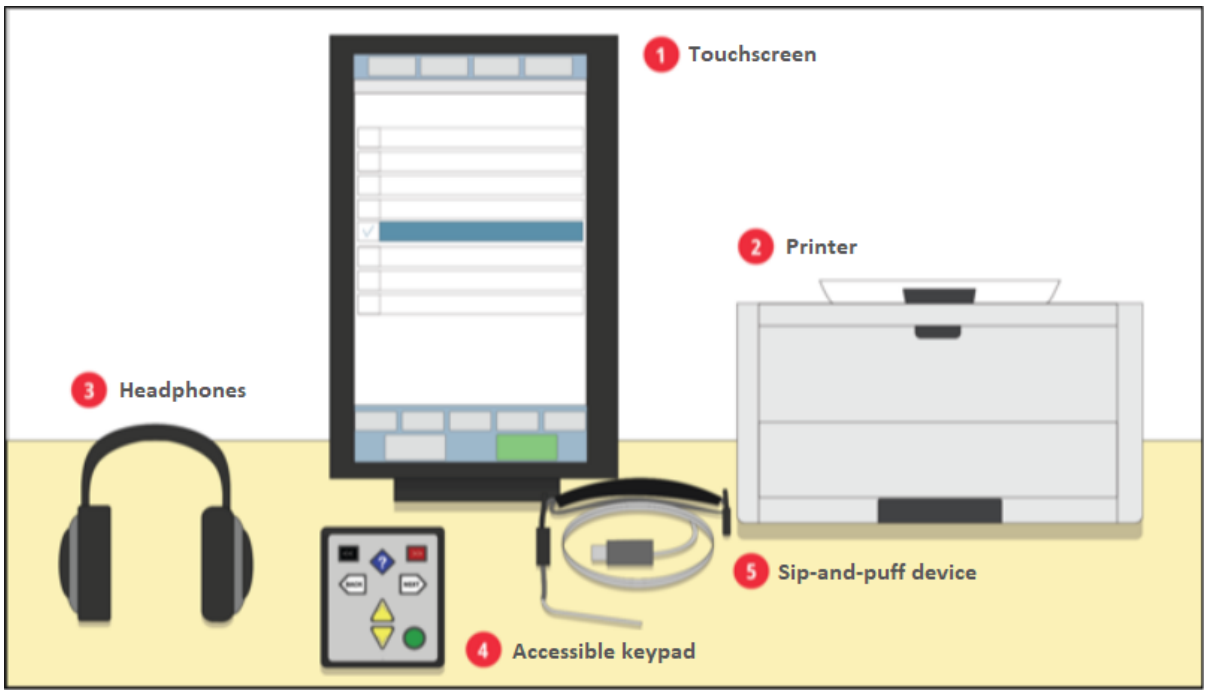

Figure 1-1. Hardware components of a ClearAccess system

Table 1-1. Description of ClearAccess hardware components

Item	Description
1. Touchscreen	The touchscreen provides a visual presentation of the ballot content with options to adjust text size or contrast. Voters can make ballot selections on the touchscreen or can use an assistive device, such as the sip-and-puff device or accessible keypad.
2. Printer	Voters end the ClearAccess voting process by printing a machine-marked, scannable paper ballot.
3. Sip-and-puff device	The sip-and-puff device enables voters to make ballot selections using their mouths instead of touching the screen or using the accessible keypad.
4. Accessible keypad	The accessible keypad enables voters to make ballot selections with a tactile device.
5. Headphones	The headphones provide an audio version of the ballot content.

An uninterruptible power supply (UPS) provides backup power for the ClearAccess system if a power outage occurs. Optionally, jurisdictions can attach a barcode scanner (not shown in Figure 1-1) that enables a poll worker to scan a QR code to select the applicable ballot style for a voter on the ClearAccess system.

1.2 Functional components

This section describes the functional components of ClearAccess.

1.2.1 Environment

The ClearAccess accessible voting system can be stored in temperatures ranging from -4° to 140° F and up to 95% humidity. The ClearAccess system can be operated in temperatures ranging from 50° to 95° F.

The specification sheets for the commercial off-the-shelf (COTS) components of the system further describe the environmental requirements.

1.2.2 Election management and control

The *ClearVote Security Policy* addresses election management and control considerations.

1.2.3 Ballot marking

The ClearAccess HTML session stores candidate and response selections temporarily. When the HTML session ends, the ClearAccess station does not retain or log any session information or any data that identifies a voter.

1.2.4 Vote conversion

The ClearAccess ballot-marking device does not read ballots, interpret marks on ballots, or tally votes.

1.2.5 Reporting

The ClearAccess ballot-marking device provides a Ballot report that includes counts of all voting sessions, ballots printed, reprinted, or canceled, by precinct, split, and ballot type, with corresponding totals. A jurisdiction can issue the Ballot report in the Pre-election mode or the Election mode. In multiday voting situations, a jurisdiction can issue the Ballot report at the end of each day before suspending voting. The Ballot report does not contain any vote tally information.

1.2.6 Logical relationships

The ClearAccess ballot-marking device is used at a polling place. Typical election-management tasks include:

- Limited preventive maintenance
- Ballot testing
- Preparation of equipment

Environmental requirements are specified by the manufacturers of the COTS components and comply with VVSG requirements.

Clear Ballot recommends setting up the polling place to ensure optimal privacy. Election officials must also ensure that voting stations comply with accessibility requirements.

Figure 1-2 and Figure 1-3 show the logical relationships between the ClearVote products.

Figure 1-2. ClearVote product suite

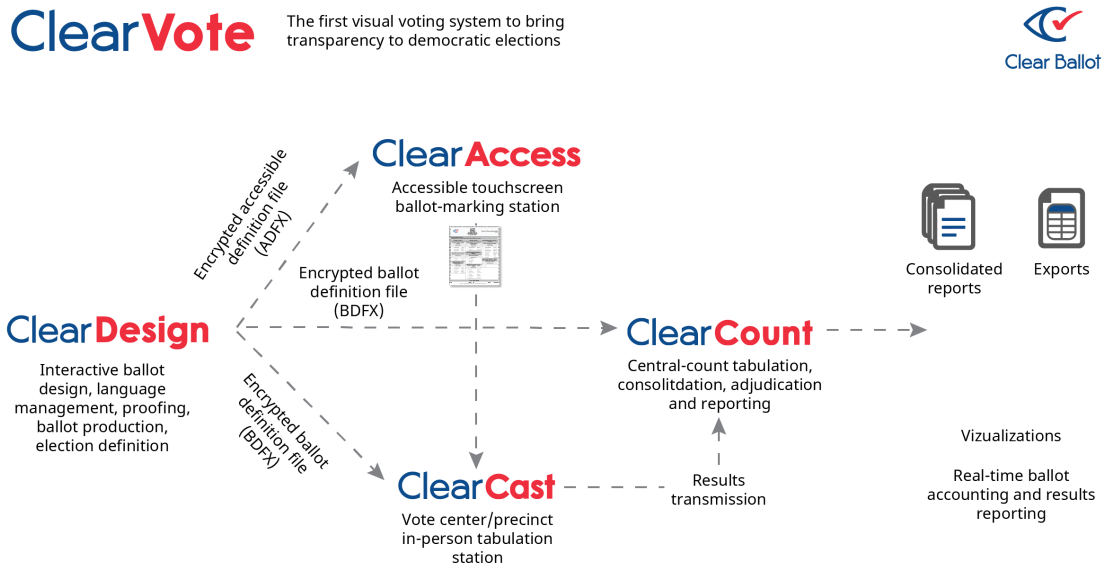

Figure 1-3. ClearVote data flows

1.3 Operational environment

The ClearAccess accessible voting system consists of the software application running on a touchscreen computer, personal assistive devices (such as the accessible keypad and sip-and puff device), and a printer. The ClearAccess voting system is used as an accessible ballot-marking device in a polling place.

The *ClearVote Approved Parts List* provides a detailed list of the hardware components of the ClearAccess system. The *ClearAccess Supervisor Guide* provides a description of the ClearAccess software.

The ClearAccess system is not attached to any network or the Internet. Wireless functionality is disabled on the ClearAccess station. The ClearAccess station has local wired connections to the personal assistive devices and the printer.

The ballot stocks tested during the certification process determine the allowed range of paper stocks for printed ballots. Consult your Clear Ballot representative to select proper stock for the ClearAccess printer. See the *ClearVote Ballot Stock and Printing Specification* for more information.

1.4 Operations concept

This section describes the operations concept of ClearAccess.

1.4.1 Election-design phase

The ClearDesign election-management system (EMS) is the ClearVote product used to define and configure election and ballot content. The ClearDesign EMS accomplishes the typical election-setup tasks such as:

- Defining the election architecture
- Adding artwork, such as logos of jurisdictions, to ballots
- Recording and managing ballot audio content

When the election definition is complete, the election and ballot data is exported to an accessible definition file (ADFx) on a USB drive. Election officials then load the ADFx on the ClearAccess stations to set up the election.

See the *ClearVote Approved Part List* for approved USB storage devices.

Figure 1-4 shows the process flow in the ClearDesign EMS for defining an election.

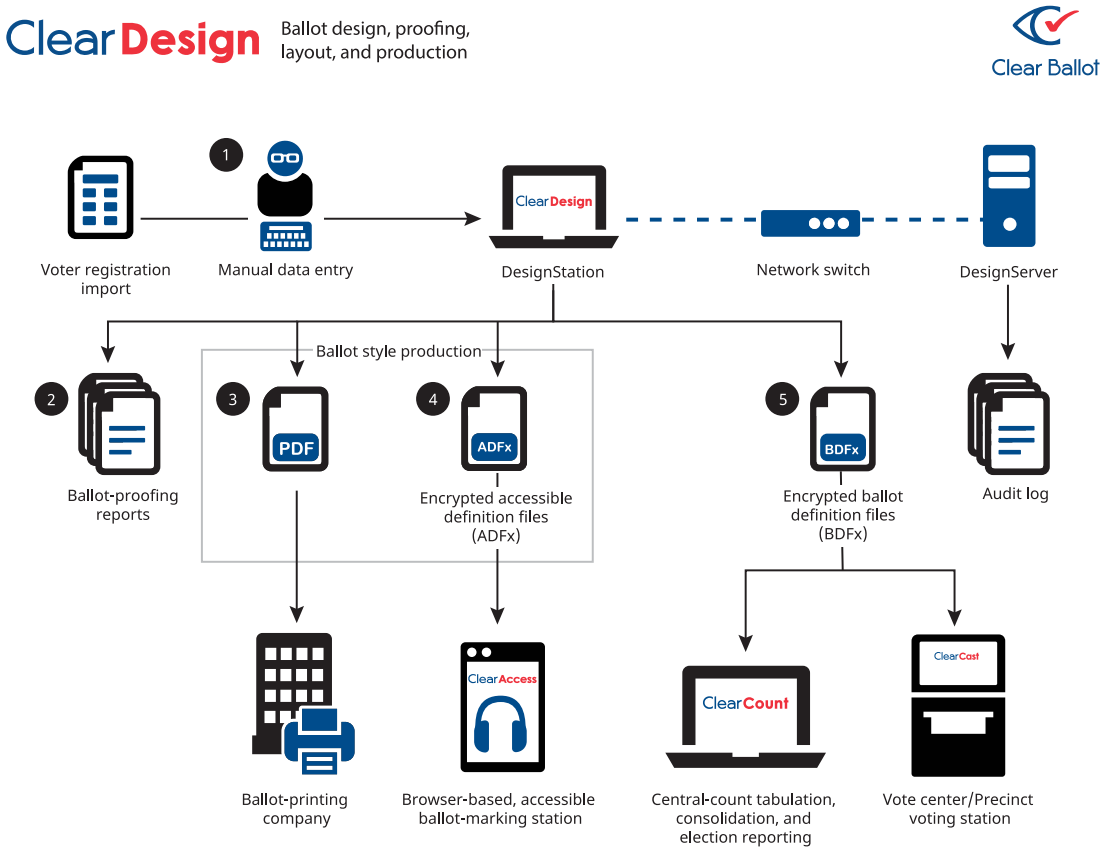

Figure 1-4. ClearDesign process flow

1.4.2 Loading the ADFx

Election officials load an accessible definition file (ADFx) on each ClearAccess station to associate the stations with the applicable vote center categories and vote centers. The vote center categories and vote centers defined in the ADFx specify the physical location of the voting stations and supported ballot styles.

1.4.3 Pre-election testing

Before an election occurs, Clear Ballot recommends thorough testing of ClearAccess including verification of the following:

- The touchscreen is responsive, and the ClearAccess station is receiving input from any peripherals, such as a keypad.
- The audio is functioning through the headphones.
- The printer is printing ballots, and the printed selections correspond to the voter's selections.

- The system meets any other requirements for logic and accuracy testing specific to the jurisdiction.

ClearAccess does not tabulate any votes, but if you are using a test deck to test precinct-count or central-count scanners, Clear Ballot recommends doing the following:

1. Remove a ballot from the test deck before scanning.
2. Write SPOILED on the original ballot.
3. Duplicate the ballot by selecting the same choices in ClearAccess and printing the ballot.
4. Check that the printed ballot from ClearAccess is identical to the original ballot from the test deck.
5. Replace the spoiled ballot with the new ballot in the test deck.
6. Repeat as desired with additional ballots from different ballot styles that may be voted on the ClearAccess station in question.

This process enables a ballot from ClearAccess to go through end-to-end testing including tabulation. By duplicating a known ballot exactly, you can validate that ClearAccess prints the ballot accurately and the expected totals from the test deck remain unchanged.

When all testing is complete, the ClearAccess stations are set to the Election mode.

1.4.4 Opening the polls

At the beginning of voting, polls are opened on each ClearAccess station. After each station has been set to the Polls Open mode, voting mode is initiated, and the station is ready for voting.

1.4.5 Voting

When a voter is ready to cast a ballot, the poll worker does the following:

- Enters the voter role code (password)
- Chooses the ballot input and presentation format desired by the voter
- Selects the applicable ballot style for the voter

The voter can customize the following:

- The ballot presentation language for instructions and navigational aids
- Screen display characteristics (such as text contrast and font size)
- Audio and assisted voting options
- The political party in an open primary

Voting by using the ClearAccess ballot-marking device takes place independently and privately. At the conclusion of voting, the voter reviews the ballot and makes any necessary corrections. Finally, the voter prints the voted ballot and inserts it in the ClearCast optical scanner or deposits it in the sealed ballot receptacle.

After the voter's ballot has been printed, the Voting login screen reappears, and the ballot-marking station is ready for the next voter.

1.4.6 Shutting down the ballot-marking station during early voting

At the end of an early voting day, the poll worker logs in to the ClearAccess station with the poll worker role and selects the Shut Down option. When the station starts up again, it returns to the Polls Open mode. All ballot-print counts and election information are maintained from the previous voting session.

1.4.7 Closing the polls

At the end of Election Day, the polls are closed. The poll worker logs in with the poll worker role and selects the Close Polls option.

1.4.8 Postelection mode

After the polls close, poll workers perform the ballot reconciliation procedures required by the jurisdiction. Poll workers print a report of the expected number of cards in the sealed ballot receptacle for the station. Election personnel scan the ballots in the ClearCast precinct voting station or transport ballots to a central site for scanning and tabulation by the ClearCount central-count system. Reports are then reconciled.

1.4.9 Logging

Every significant event that occurs on the ClearAccess ballot-marking station is posted to one of two inviolable logs:

- The election log includes any event that is specific to the election.
- The system log includes all other events that are not specific to the election.

Only the automatic posting logic of the ClearAccess system can alter these logs. These logs cannot be altered manually. These logs are written by the automatic logging functionality of the ClearAccess system and cannot be manually altered without detection. No information is logged that compromises voter privacy. At election close, election officials can view and print the logs.

1.5 Interfaces

This topic describes the interfaces of ClearAccess.

1.5.1 Functional interfaces

Table 1-2 lists the functional interfaces of ClearAccess.

Table 1-2. Functional interfaces of ClearAccess

Interface	Occurrence
Providing correct login credentials	Whenever a user accesses the system
Loading the election	Before election operations take place
Setting the voting system to election mode	After election preparation and testing are complete
Opening the polls	Before the start of official voting
Printing the Open Polls report	Before the start of official voting
Ballot printing	After a voter makes all desired ballot selections
Closing the polls	At the end of official voting
Printing the Close Polls report	When the polls officially close
Closing the election	After the polls close
Displaying an error message	When an error occurs
Recovery functionality	When the system automatically resolves an error condition

These functional interfaces are identified descriptively and not by means of unique identifiers. The *ClearAccess Supervisor Guide* describes the functions of these interfaces.

1.5.2 Physical interfaces

Table 1-3 lists the physical interfaces of ClearAccess.

Table 1-3. Physical interfaces of ClearAccess

Interface	Description
Touchscreen	The touchscreen is a visual and tactile user interface to the ClearAccess station for election personnel and the voters. The touchscreen displays messages to the user. The user touches the screen to make choices.
Printer	After making all choices, the voter prints a machine-marked, scannable ballot.
USB ports	The following devices use USB ports to connect to the ClearAccess station: • USB drives that store election data • The accessible keypad • The sip-and-puff device • The headphones • The barcode reader (if used)
Power switch	The touchscreen, printer, and UPS have power switches to turn the devices on and off.

For a list of specific models, see the *ClearAccess Approved Parts List*. For the operation of these devices, see the *ClearAccess Supervisor Guide*.

The external interface to ClearAccess is the ADFx. ClearDesign creates the election definition that is exported to an ADFx. Election officials import the election definition contained in the ADFx into the ClearAccess station.

1.6 COTS components

The *ClearAccess Approved Parts List* identifies all COTS components used for ClearAccess operations.

Communications routers, modem drivers and dial-up networking software do not apply because the ClearAccess station is never connected to a communications network.

1.7 Internal and external interfaces

For information about interfaces, see "Physical interfaces" above.

1.8 Benchmark directory listings

The About screen provides directory listings of the ClearAccess and third-party software components. The *ClearAccess System Identification Guide* also contains the information found on the About screen.

Chapter 2. System performance

This chapter describes system performance.

2.1 Performance characteristics

Table 2-1 lists ClearAccess performance metrics.

Table 2-1. ClearAccess performance metrics

Metric	Description
Download time to decrypt the ADFx and install HTML files onto the ballot-marking device	Varies based on the size and complexity of the files, but is based on the USB 3.0 speed
Transition time between contests	Less than a second
Printing time	Varies according to the length of the ballot page and printer model, but is generally less than a minute

Performance is the same in the Pre-election test mode and the Election mode.

2.2 Quality attributes

This topic describes quality attributes.

2.2.1 Reliability

The reliability of the ClearAccess system is ensured by the use of a COTS delivery platform, including:

- The computer on which the ClearAccess application is installed
- The personal assistive devices used to navigate the system and make vote choices
- The printer used to print ballots

The logic and accuracy testing mandated for voting equipment before an election demonstrates the system's reliability.

2.2.2 Maintainability

The computer that runs the ClearAccess application, the personal assistive devices, and printer are COTS components. These components are easy to maintain and upgrade when necessary.

See "Preventive maintenance" in the *ClearAccess Maintenance Guide*.

2.2.3 Availability

The ClearAccess accessible voting station is designed for high availability. Availability also depends upon procedural and functional constraints. The ClearAccess system must be available for voting only during the permitted time period and only to qualified voters. Only users who supply the correct codes (passwords) are allowed to access the system.

The setup of ClearAccess in the polling location must ensure that no additional configuration is required for a subsequent voter. All personal assistive devices must be installed before the polls open. The system must be installed to allow wheelchair access.

After a ballot has been printed, the system is ready for the next voter, subject to the poll worker's login and selection of the ballot style and voting options.

See "Reliability" on the previous page for additional availability considerations.

2.2.4 Usability

Perkins Solutions conducted a usability study on the ClearAccess system by following a modified version of the ISO/IEC 25062:2006. Clear Ballot is submitting this usability study with the ClearVote Technical Data Package (TDP).

A total of 44 test subjects were included in this study to address how the ClearAccess system accommodates voters with partial vision, blindness, dexterity and fine motor-skill challenges, and poll workers.

Participants in this study included individuals who:

- Are representative of the general population
- Are blind
- Have impaired vision
- Do not speak English
- Have a dexterity challenge

Participants used the ClearAccess accessible voting and ballot-marking system to vote in a simulated election. The election consisted of one test ballot with 20 different contests, including:

- Federal, state, and local contests
- Partisan and nonpartisan contests
- Retention races
- Constitutional amendments
- Ballot measures

The test ballot used for this study was modeled on the test ballot developed by the National Institute of Standards and Technology (NIST). The test ballot contained voting tasks that model typical ballots found in the U.S., including:

- Selecting candidates from a list of names in a particular contest
- Voting for questions and amendments of varying lengths
- Entering write-in votes
- Choosing not to vote in a particular contest

Summary statistics of this usability study are as follows:

- The percentage of participants that were able to complete the voting process and cast a ballot was 95.65%
- The mean accuracy of all participants in completing their 20 core tasks as directed was 91.32%
- The mean confidence level with respect to the voting experience was 4.00 out of 5.00

2.2.5 Portability

The ClearAccess systems is available in models that are compact, lightweight, and designed for portability. Personal assistive devices are also compact and lightweight.

The *ClearVote Approved Parts List* lists the models of ClearAccess station that are currently available.

2.3 Provisions

This topic describes provisions.

2.3.1 Safety

A Nationally Recognized Testing Laboratory (NRTL) has tested all COTS hardware used for ClearAccess. All COTS hardware used for ClearAccess is marked with a UL or other safety mark.

2.3.2 Privacy

Polling stations must maintain privacy while a voters make ballot selections. As a result, a privacy screen is placed on the three sides of the ballot-marking station.

The ClearAccess system does not collect any information that identifies a voter.

2.3.3 Continuity of operation

The ClearAccess runs on COTS touchscreen computers. The computers supported by ClearAccess do not include internal batteries. To ensure continuity of operation, jurisdictions must ensure that the touchscreen computers remain plugged in during operation.

UPS devices are used to continue operations if a power outage occurs.

2.4 Constraints

This topic describes constraints.

2.4.1 Design constraints

The following table summarizes the testing of design constraints by Clear Ballot.

Table 2-2. Design constraints

Characteristic	Tested Limit
Number of HTML ballot styles	8,192

2.4.2 Compatibility requirements

ClearDesign produces an election definition in an ADFx file that is fully compatible with and can be imported into ClearAccess.

Ballots printed by ClearAccess can be scanned and tabulated by the ClearCast and the ClearCount systems.