

PRO V&V



Test Report

**Clear Ballot Group
ClearVote 1.0 Voting System
State of Colorado
Certification Testing**

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1 Introduction

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform certification testing of the Clear Ballot Group ClearVote 1.0 System to the requirements set forth for voting systems by the State of Colorado.

1.1 References

The documents listed below were utilized in the development of this Test Report:

- Pro V&V, Inc. Test Plan “Clear Ballot Group ClearVote 1.0 Voting System State of Colorado Certification Testing”, dated June 17, 2015
- Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21
- Clear Ballot ClearVote Colorado Requirements Matrix
- ClearAccess System Overview 1.0
- ClearDesign Functional Description
- ClearDesign Security Specification
- ClearDesign System Overview
- ClearVote 1.0 System Overview, dated May 5, 2015
- Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG)
- Federal Election Commission (FEC) 2002 Voting Systems Standards (VSS)
- Help America Vote Act (HAVA) of 2002, Public Law 107-252, 42 U.S.C. § 15301 *et seq.*

1.2 Terms and Abbreviations

The terms and abbreviations applicable to the development of this Test Report are listed below:

“BMD” – Ballot Marking Device

“Clear Ballot” – Clear Ballot Group

“COTS” – Commercial Off-The-Shelf

- “EAC” – Election Assistance Commission
- “EMS” – Election Management System
- “FCA” – Functional Configuration Audit
- “PCA” – Physical Configuration Audit
- “TDP” – Technical Data Package
- “2002 VSS” – 2002 Voting System Standards
- “2005 VVSG” – 2005 Voluntary Voting System Guidelines

1.3 Background

The ClearVote 1.0 System is a new system that has not previously been evaluated for Colorado certification. It has been submitted for evaluation against the requirements set forth for voting systems by the State of Colorado. To start the process, Clear Ballot submitted an Application for Certification to the Colorado Secretary of State Elections Division on June 11, 2015.

2 Testing Overview

The evaluation of the ClearVote 1.0 System was designed to achieve the goals set forth in the Test Plan. These goals were constructed to verify that the ClearVote 1.0 System conforms to the State of Colorado Requirements. The evaluation successfully addressed each of the test goals in the following manner:

Table 2-1: Testing Overview

Test Goal	Testing Response
<p>Verify that the ClearVote 1.0 System meets the applicable Colorado-specific requirements for voting systems</p>	<p>This was tested by evaluating the ClearVote 1.0 System to specific election scenarios using a combination of different ballot programming approaches, ballot designs, ballot sizes, languages, and tabulators.</p>
<p>Ensure the ClearVote 1.0 System provides support for all Colorado election management requirements (i.e. ballot design, results reporting, recounts, etc.)</p>	<p>This was tested by evaluating the ClearVote 1.0 System against the applicable requirements of the Colorado Gap Analysis Matrix for voting systems.</p>

Table 2-1: Testing Overview *(continued)*

Test Goal	Testing Response
<p>Simulate pre-election, Election Day, absentee, recounts, and post-election activities on the ClearVote 1.0 System and corresponding components of the EMS</p>	<p>The components of the ClearVote 1.0 System were tested in pre-election, Election Day, post-election and recount situations and evaluated against documented behavior and expected results for all scenarios.</p>
<p>Generate Trusted Builds for Colorado of the ClearVote 1.0 System software components</p>	<p>The ClearCount source code submitted by Clear Ballot was reviewed by PRO V&V and was successfully built using the submitted COTS and third party software products. Additionally, build documentation was reviewed.</p>

2.1 Test Candidate

The ClearVote 1.0 System is a browser-based voting system that consists of the major components listed below:

ClearDesign

ClearDesign is an interactive set of applications which are responsible for all pre-voting and post-voting groups of activities in the process of defining and managing elections. This includes ballot design, proofing, layout, and production.

ClearAccess

ClearAccess is an accessible touchscreen ballot marking device (BMD) used for the creation of paper ballots that can be scanned and tabulated by ClearCount.

ClearCount

ClearCount is a central, high-speed, optical scan ballot tabulator coupled with ballot processing applications.

The ClearVote 1.0 System utilizes the data flows and configurations depicted in the following figures to exchange information, as taken from the Clear Ballot-provided technical documentation:

ClearVote

Inputs & Outputs

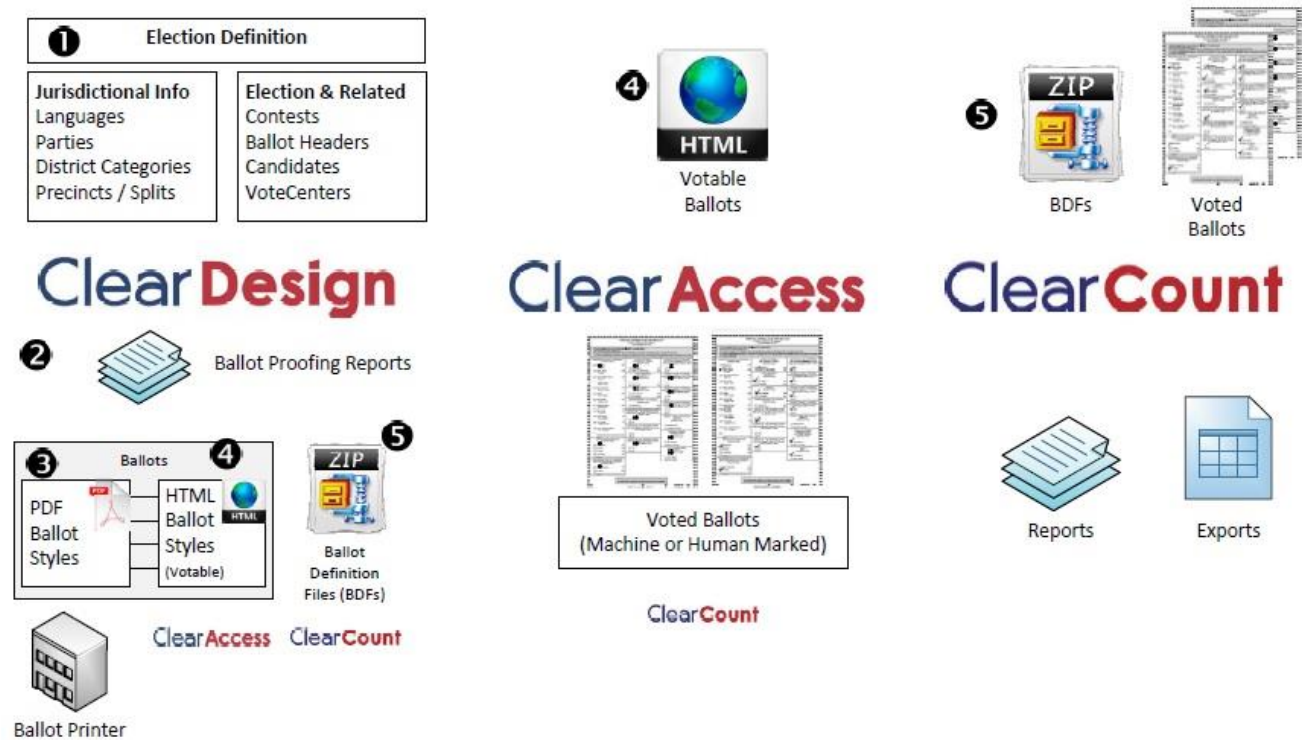


Figure 2.1-1: ClearVote Inputs & Outputs

The inputs and outputs of the ClearVote System depicted in Figure 2.1-1 are listed below:

- Inputs: Election Definition
- Outputs: Ballot proofing reports, PDF ballot styles, HTML Anywhere ballot marking files, Ballot Definition files

ClearDesign

Interactive, ballot design,
proofing, layout & production

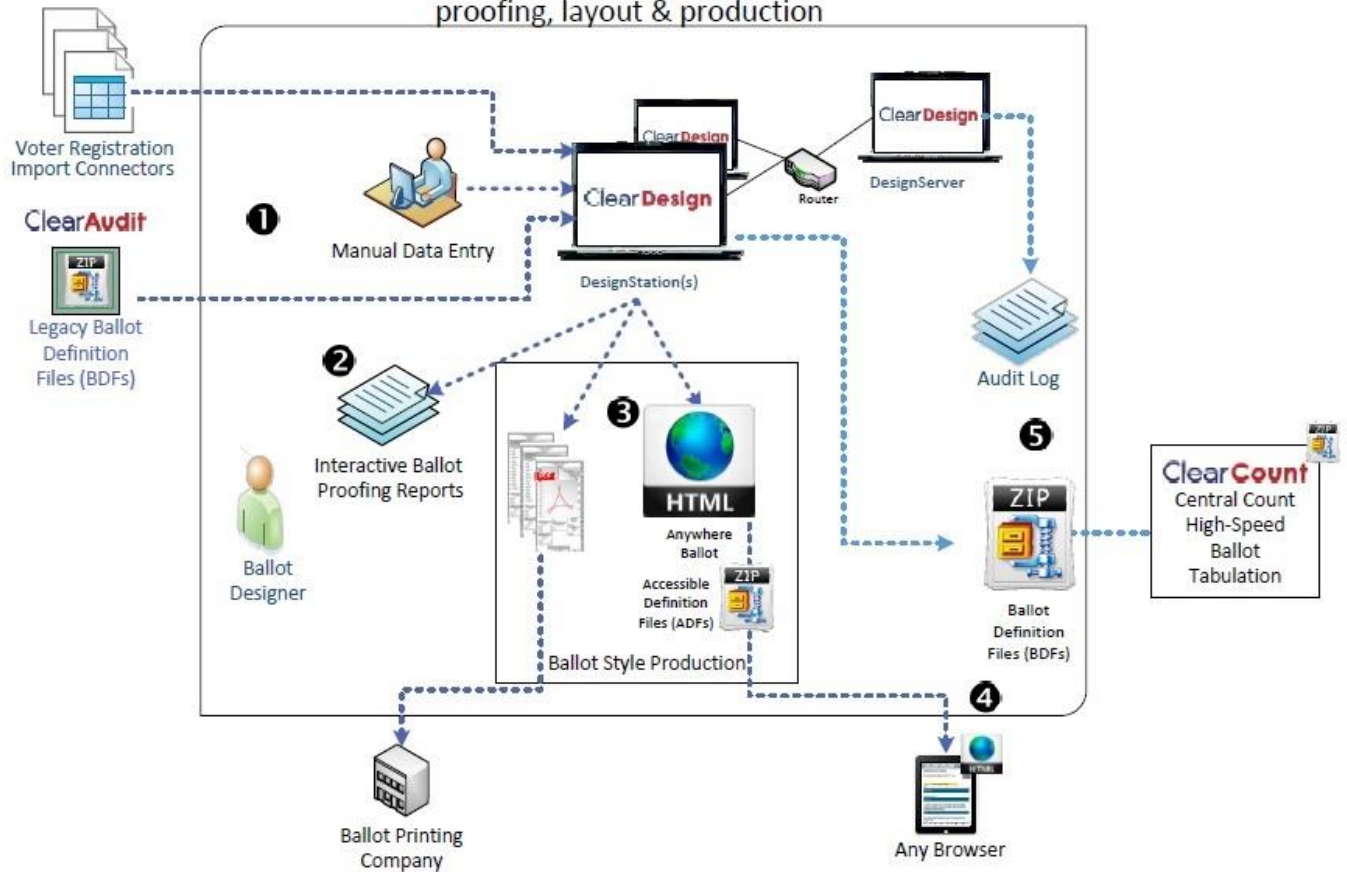


Figure 2.1-2: ClearDesign

As illustrated in Figure 2.1-2, ballot design, proofing, layout, and production are accomplished in ClearDesign, the ballot design component of the ClearVote product family. The ClearDesign system consists of the following physical components (all of which are unmodified COTS hardware and are connected via closed, wired Ethernet connections): DesignServer, DesignStation(s), and router.

ClearAccess

Touchscreen, in-person & accessible ballot marking

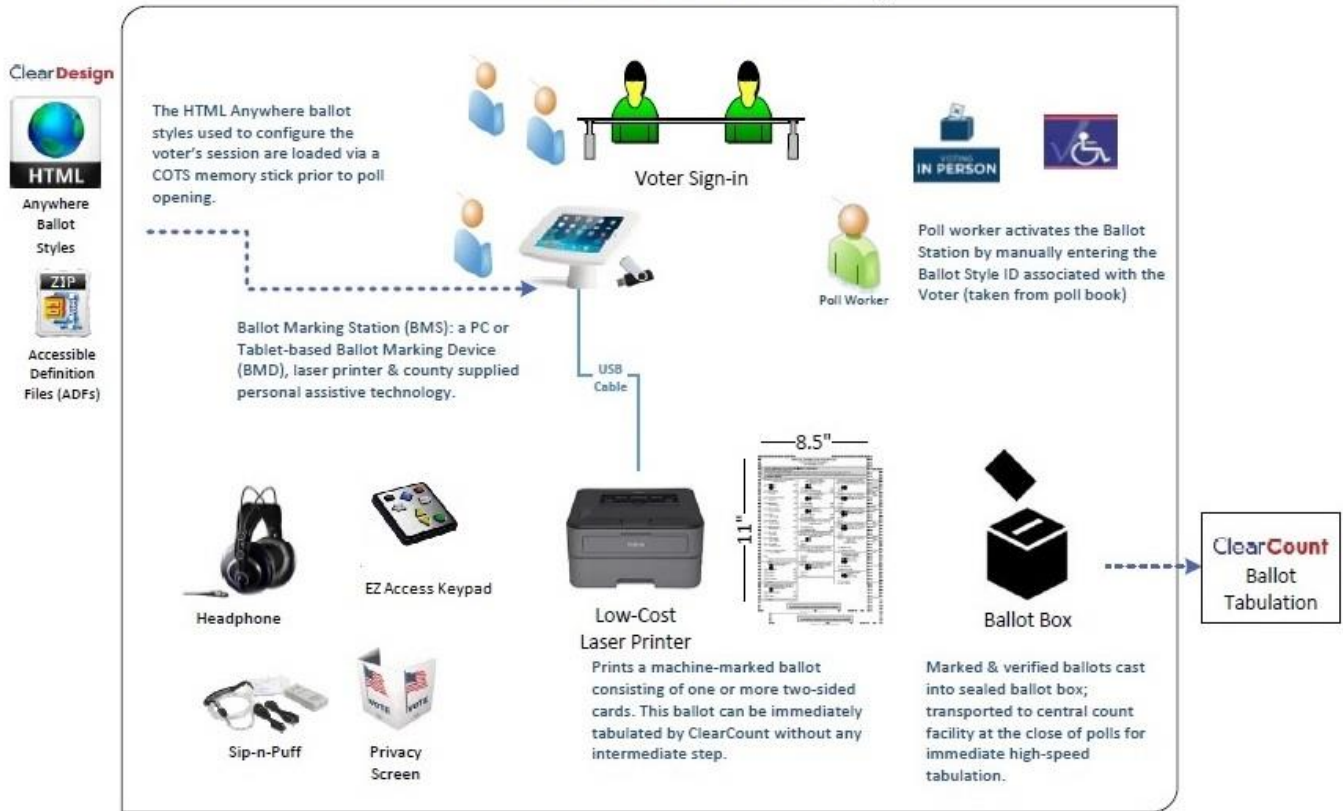


Figure 2.1-3: ClearAccess

ClearAccess, depicted in figure 2.1-3, is an accessible touchscreen ballot marking device (BMD) used for the creation of paper ballots that can be scanned and tabulated by ClearCount. The ClearAccess ballot marking system consists of one or more Ballot Marking Stations (BMS) having the following physical components (all of which consist of standalone, unconnected, unmodified COTS hardware): Ballot Marking Device (BMD), privacy screen, Personal Assistive Technology Devices (PATs), ballot style transfer stick, and laser printer.

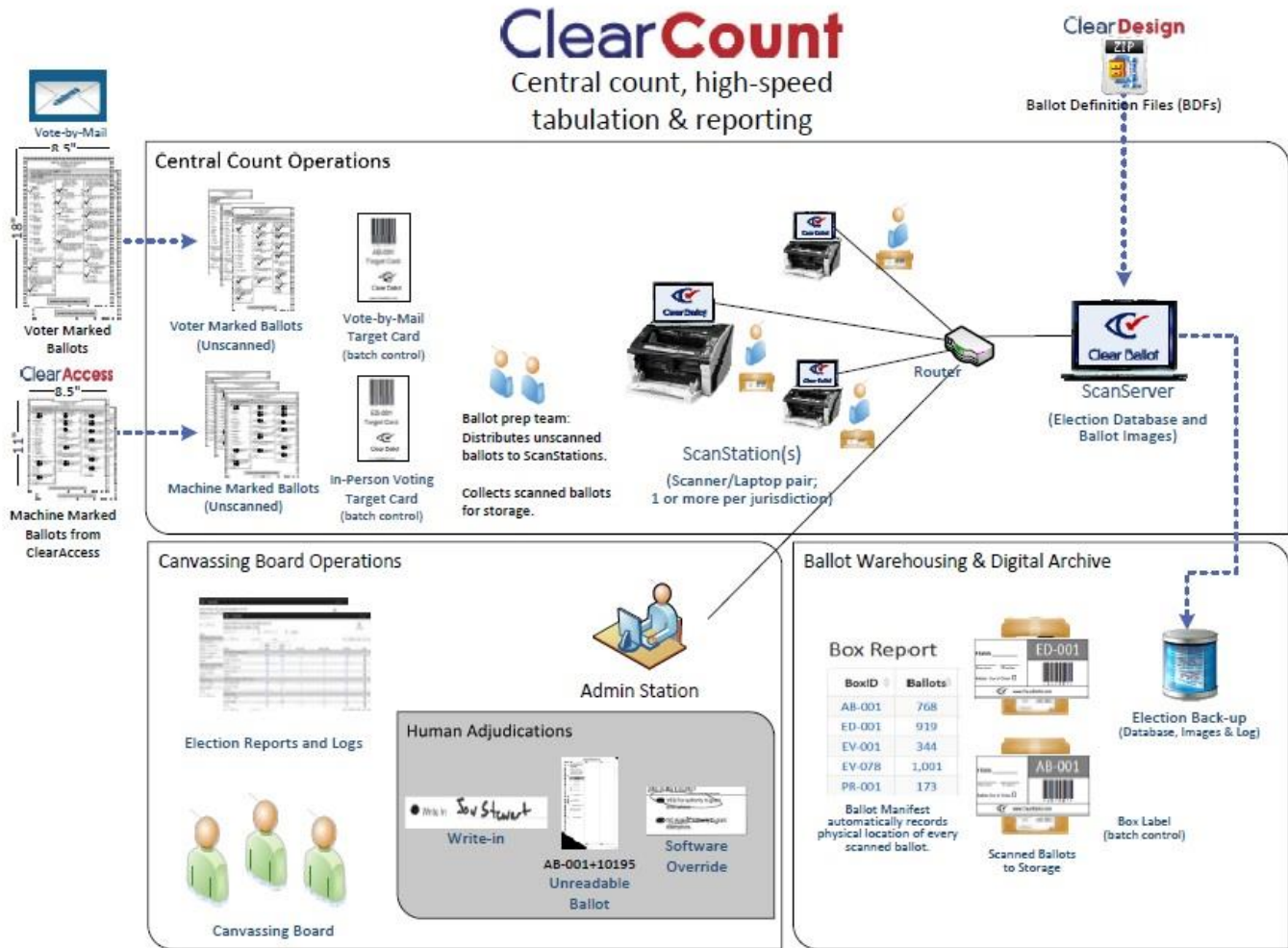


Figure 2.1-4: ClearCount

Tabulation and reporting at the central location is accomplished by ClearCount, as depicted in Figure 2.1-4.

The follow table provides the software and hardware components of the ClearVote 1.0 System that were evaluated during this test effort.

Table 2.1-1: Firmware/Software Versions

State of Colorado ClearVote System	Firmware/Software Version
ClearVote System EMS Software Components	
ClearDesign	1.0.0
<i>ClearDesign Components</i>	
Ubuntu (Operating System)	14.01
Pip (Python installer – <i>used for build machine setup</i>)	7.0.3.
unzip (Ubuntu zip utility – <i>used for build machine setup</i>)	3.0.8
Pyinstaller (Python install builder – <i>used for packaging ClearDesign</i>)	2.1
mysql-server (database engine)	5.5.41
python-mysqldb (python database driver)	1.2.5
python-sqlalchemy (data modeler)	0.8.4
python-webpy (application framework)	0.37
python-pillow (image library)	2.8.2

Table 2.1-1: Firmware/Software Versions (continued)

State of Colorado ClearVote System	Firmware/Software Version
<i>ClearDesign Components (continued)</i>	
phantomjs (server ballot rendering engine)	1.9
dbutils (database utilities)	1.1
fpdf (PDF writer for creating reports)	1.54
xlrd (Excel file reader)	0.9.3
Rtf(rich text parser Library)	0.2.1
jquery (JavaScript Query Library)	1.10.2
bootstrap (JavaScript framework)	3.0.0
DataTable (javaScript Table extension)	1.10.5
tinymce (JavaScript rich text editor)	4.0.8
jquery-impromptu (JavaScript Prompt extension)	5.2.3
jQuery-splitter (JavaScript Splitter extension)	0.14.0
jscolor (JavaScript color picker extension)	1.4.2

Table 2.1-1: Firmware/Software Versions (continued)

State of Colorado ClearVote System	Firmware/Software Version
<i>ClearDesign Components (continued)</i>	
fastclick (JavaScript Tablet extension)	1.0.6
jquery-qrcode (JavaScript QRCode extension)	1.0.0
ClearVote System ClearAccess Software Components	
ClearAccess	1.0.0
<i>ClearAccess Components</i>	
Windows (Operating System – <i>build and runtime systems</i>)	8.1 Pro
Python (Python for windows)	2.7.10
Python-pip (Python library installer – <i>build machine only</i>)	7.0.3
Python-webpy (<i>application framework</i>)	0.37
Pywin32 (<i>Python win32 interface library</i>)	219
Jquery (<i>Javascript support library</i>)	10.1
Pyinstaller (Python install builder - <i>build machine only</i>)	2.1

Table 2.1-1: Firmware/Software Versions (continued)

State of Colorado ClearVote System	Firmware/Software Version
<i>ClearAccess Components (continued)</i>	
Chrome (Chrome Browser under Windows 8.1 Pro – <i>stations used as voting machines</i>)	43.0
ClearVote System ClearCount Software Components	
ClearCount	1.0.7
<i>ClearCount Components (Build Machine)</i>	
Windows (install as 64 bit)	7
Python	2.7.2
Pillow	2.5.1
MySQLdb	1.2.3
pywin32	2.1.6
easy_install	0.6c11
distribute	0.6.49
PyInstaller	2.1

Table 2.1-1: Firmware/Software Versions (continued)

<p style="text-align: center;">State of Colorado ClearVote System</p>	<p style="text-align: center;">Firmware/Software Version</p>
<p><i>ClearCount Components (Build Machine)(continued)</i></p>	
<p>Microsoft Visual C++</p>	<p>2010 Express</p>
<p>Ubuntu Server Edition</p>	<p>13.04</p>
<p><i>Additional Product Installation Requirements</i></p>	
<p>Scanstation:</p> <ul style="list-style-type: none"> • Fujitsu ScandAll Pro • Fujitsu scanner-specific drivers • Microsoft Windows 8.1 Pro • Firefox, Chrome, or Internet Explorer 	
<p>Election Administration Station:</p> <ul style="list-style-type: none"> • Firefox, Chrome, or Internet Explorer • Any operating system (e.g. Windows, Linux, iOS as examples) 	

Table 2.1-2: Hardware Versions

State of Colorado ClearVote System	Hardware Version
<i>ClearDesign Components</i>	
Toshiba Satellite Laptop	Model: L55-A5299 S/N: 1E123732S
Lenovo Laptop	Model: Y50-70:20378 S/N's: CB34673854 & CB34965397
TRENDnet Switch	Model: TEG-S80g S/N: CA11238032857
Lenovo USB Portable DVD Burner	Model: GP60NB50 S/N's: 411HV005130 & 411HR027583
<i>ClearAccess Components</i>	
Storm EZ Access Keypad	Model: EZ08-22201 S/N: 1500005
Dell Laptop	Model: Inspiron 7000 S/N: CPBF532
Dell OptiPlex	Model: 3030AIO S/N's: 1VXMD42 & 27RQD42

Table 2.1-2: Hardware Versions (continued)

State of Colorado ClearVote System	Hardware Version
<i>ClearAccess Components (continued)</i>	
Origin Instruments Sip/Puff Breeze with Headset	Model: BZ2 P/N: AC-0313-H2
Over-Ear Stereo Headphones	Model: Hamilton Buhl M/N: HA-7
ElectionSource Table Top Voting Booth (Privacy Screen)	Model: VB-60B
Brother Laser Printer	Model: HL-L2340DW S/N's: U63879M4N628612, U63879M4N628617 & U63879M4N628535
APC Back-UPS XS1500 (for the All in One PC)	Back-UPS XS1500 S/N:481448P39979
APC Smart-UPS 1500 (for the Brother Laser Printer)	Smart-UPS 1500 S/N:35150X06925
Hosa Technology Male 3.5 mini to Female ¼” Adapter	Model: GMP112
Hamilton Buhl Sanitary Headphone Covers	Model: HYGEX45
<i>ClearCount Components</i>	
Toshiba Satellite Laptops	Model: S55-A5167 S/N: 1E098351S & 1E068199U

Table 2.1-2: Hardware Versions (continued)

State of Colorado ClearVote System	Hardware Version
<i>ClearCount Components (continued)</i>	
Fujitsu Scanner	Model: fi-7180 S/N: A2OD000798
Fujitsu Scanner	Model: fi-6800 S/N: A9HCA00737
Lenovo USB Portable DVD Burner	Model: GP60NB50 S/N's: 411HV005130 & 411HR027583
TP-LINK VPN Router	Model: TL-R600VPN S/N: 2149342000209

2.2 Testing Configuration

The testing event utilized one setup of the ClearVote 1.0 System and its components. The following is a breakdown of the ClearVote 1.0 System components and configurations for the test setup:

Standard Testing Platform:

The standard testing platform consisted of one ClearVote 1.0 System in a standalone configuration. In the pre-election phase of testing, ballots were created utilizing ClearDesign, the EMS component of the ClearVote 1.0 System. Ballot styles were then imported into ClearAccess for ballot marking. Once ballots were marked and the polls were closed, ballot reconciliation procedures were performed and the ballots were tabulated by ClearCount, the central count tabulation and reporting component of the ClearVote 1.0 System.



Photograph 2-1: ClearAccess Configuration

The configuration for ClearAccess consists of the following components:

- ClearAccess Laptop (Model: Dell Inspiron 7000) (*optional*)
- ClearAccess All-in-One (Model: Dell Optiplex 3030AIO)
- Brother Laser Printers (Model: HL-L2340DW)
- Origin Instruments Sip/Puff Breeze (Model: BZ2)
- Over-ear Stereo Headphone (Model: Hamilton Buhl HA-7) (*not pictured*)
- ElectionSource Table Top Voting Booth Privacy Screen (Model: VB-60B) (*not pictured*)
- Storm EZ Access Keypad (Model: EZ08-22201)
- Battery Backup (APC Back-UPS XS1500 for the All in One PC) (*not pictured*)
- Battery Backup (APC Smart-UPS 1500 for the Brother Laser Printer) (*not pictured*)



Photograph 2-2: ClearDesign Configuration

The configuration for ClearDesign consists of the following components:

- ClearDesign Server Laptop (Lenovo Model: Y50-70:20378)
- Client Laptop (Toshiba Satellite Laptop Model: L55-A5299)
- Brother Laser Printer (Model: HL-L2340DW)
- TRENDnet Switch (Model: TEG-S80g)
- Lenovo USB Portable DVD Burner (Model: GP60NB50)



Photograph 2-3: ClearCount Configuration

The configuration for ClearCount consists of the following components:

- ScanServer Laptop (Lenovo Model: Y50-70:20378)
- ClearCount Scanner (Fujitsu fi-6800)
- ClearCount Scanner (Fujitsu fi-7180)
- ScanStation ClearCount Laptops (Model: Toshiba S55-A5167)
- TP-LINK VPN Router (Model: TL-R600VPN)

2.3 Test Support Equipment/Materials

All test support equipment/ materials required to facilitate testing were supplied by Clear Ballot.

2.4 Technical Data Package

This subsection lists all manufacturer provided documentation that is relevant to the system that was tested.

Table 2.4-1: Technical Data Package

Document Name	Version	Document Number
ClearVote 1.0 System Overview	1.0	100042-10001
ClearDesign 1.0 System Overview	1.0	100043-10001
ClearDesign 1.0 Security Specification	1.0	100045-10001
ClearDesign 1.0 Functional Description	1.0	100046-10001
ClearAccess 1.0 System Overview	1.0	100044-10001
ClearVote Configuration Management Plan	1.2	100003-10001
Clear Ballot Group Scanning and Training Checklist	---	---
ClearDesign 1.0 Installation Procedure	1.0	---
ClearVote 1.0 System Hardware Specification	1.3	---
ClearVote 1.0 System Operations Procedures	1.2	100024-10001

Table 2.4-1: Technical Data Package (continued)

Document Name	Version	Document Number
ClearAccess Functional Description	1.0	100049-10001
ClearAccess 1.0 Installation Procedure	1.0	---
ClearAccess 1.0 Security Specification	1.0.2	100050-10001
ClearAccess User's Guide	2.0	---
ClearDesign User's Guide	1.0.1	100041-10001
ClearVote Election Administrator's Guide	1.3	100040-10001
ClearVote 1.0 Approved Parts List	1.2	100001-10001
ClearVote 1.0 Glossary and Acronyms	1.2	---
ClearVote Election Preparation and Installation Guide	1.9	100006-10001
ClearVote 1.0 Personnel Deployment and Training Plan	1.2	100014-10001
ClearVote 1.0 Release Notes Summary	1.2	100039-10001
ClearVote 1.0 Software Design and Specification	1.2	---
ClearVote 1.0 Test and Verification Specification	1.2	---

Table 2.4-1: Technical Data Package (continued)

Document Name	Version	Document Number
ClearDesign 1.0 Sample Test Scripts	---	---
ClearVote 1.0 System Maintenance Manual	1.2	---
ClearVote System Functionality Description	1.2	100021-10001
ClearVote 1.0 Security Specification	1.3	---
ClearAccess Pollworker’s Guide	1.0	---
<i>Supplemental Documents</i>		
ClearAccess Build Procedure	1.0	100051-10001
ClearCount Build Procedure	---	---

3 Test Process and Results

The following sections outline the test process that was followed to evaluate the ClearVote 1.0 System against the test goals defined in Section 2.

3.1 General Information

All testing was conducted by Pro V&V personnel verified by Pro V&V to be qualified to perform the testing. The test campaign was performed at the Pro V&V, Inc. test facility located in Huntsville, AL.

3.2 Test Cases/Procedures

Test procedures were developed to evaluate the system being tested against the stated requirements. Prior to execution of the required test procedures, the system under test was subjected to testing initialization to establish the baseline for testing and ensure that the test candidate matched the expected test candidate and that all equipment and supplies are present.

The following tasks were completed during the testing initialization:

- Ensure proper system of equipment. Check network connections, power cords, keys, etc.
- Check version numbers of (system) software and firmware on all components.
- Verify the presence of only the documented COTS.
- Ensure removable media is clean
- Ensure batteries are fully charged.
- Inspect supplies and test decks.
- Record protective counter on all tabulators.
- Review physical security measures of all equipment.
- Record basic observations of the testing setup and review.
- Record serial numbers of equipment.
- Retain proof of version numbers.

3.3 Test Results

The procedures that were utilized during the test engagement and the results obtained are summarized in the following paragraphs. During the evaluation, the test team made observations of general system behavior.

TDP Review - This review was conducted only for stated functionality review and verification. This review did not address consistency or completeness of documents. Results of the review of each document were entered on the TDP Review Checklist and were reported to Clear Ballot for disposition of any discrepancies. This process was ongoing until all discrepancies were resolved. Any documents that were revised during the TDP review process were compared with the previous document revision to determine changes made, and the document was re-reviewed to determine whether the discrepancies had been resolved.

Summary Findings:

During execution of the test procedure, it was verified that the technical documentation provided for the ClearVote 1.0 System was successfully subjected to the TDP review with all discrepancies that were noted during the review being resolved.

Trusted Build (EAC equivalent Compliance Build) – To perform the trusted build for Colorado, Clear Ballot-submitted source code, COTS, and Third Party software products were inspected and combined to create the executable code. Additionally, during the performance of the compliance build, the build documentation was reviewed.

Summary Findings:

During execution of the Trusted Build, the source code submitted by Clear Ballot Group and reviewed by PRO V&V was successfully built using the submitted COTS and third party software products, and the reviewed build documentation.

Functional Configuration Audit (FCA) – During this area of testing, the specific functionality of the system under evaluation that is claimed by the manufacturer was targeted to ensure the product functioned as documented. This testing used both positive and negative test data to test the robustness of the system.

Summary Findings:

During the test case design and execution phases of the FCA, a number of issues were identified and submitted to Clear Ballot for resolution. Clear Ballot addressed these issues with source code changes as well as other forms of remediation as required. All discrepancies noted were resolved prior to conclusion of this test campaign.

A list of the discrepancies identified is presented below:

ClearDesign

Discrepancy # 1 - ClearDesign prints out different fonts to PDF masters compared to ClearAccess printed ballots.

Discrepancy # 2 – After modifying and reverting ballot and card layout fonts, it was observed that Internet Explorer displayed the fonts differently than the FireFox and Chrome browsers.

Discrepancy # 3 – Unable to bring up webpage for write-in candidate after clicking the write-in link. Displayed “not found”.

Discrepancy # 4 - ClearDesign server showed instability after deleting a District Category with associated Districts. This eventually caused ClearDesign client to stop working.

ClearAccess

Discrepancy # 5 - ClearAccess Audio has some difficulty pronouncing large numbers. (i.e. \$30,000,000)

ClearCount

Discrepancy # 6 – In the Resolving Ballots page, the Clear All Votes button does not clear all of the votes on resolved ballot. However, you can still clear votes individually for each contest.

During the performance of the functional configuration audit each component and subcomponent of the voting system was functionally evaluated as designed and documented in the TDP. The FCA included a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities were categorized as follows by the phase of election activity in which they are required:

- Overall System Capabilities: These functional capabilities apply throughout the election process. They include security, accuracy, integrity, system audit ability, election management system, vote tabulation, ballot counters, telecommunications, and data retention.
- Pre-voting Capabilities: These functional capabilities are used to prepare the voting system for voting. They include ballot preparation, the preparation of election-specific software (including firmware), the production of ballots, the installation of ballots and ballot counting software (including firmware), and system and equipment tests.
- Voting System Capabilities: These functional capabilities include all operations conducted at the polling place by voters and officials including the generation of status messages.
- Post-voting Capabilities: These functional capabilities apply after all votes have been cast. They include closing the polling place; obtaining reports by voting machine, polling place, and precinct; obtaining consolidated reports; and obtaining reports of audit trails.
- Maintenance, Transportation and Storage Capabilities: These capabilities are necessary to maintain, transport, and store voting system equipment.

Throughout the performance of the FCA, the assigned test personnel input both positive and negative test data to trigger normal and abnormal conditions. At the conclusion of the FCA, the test personnel analyzed all deficiencies and determined the voting system's ability to perform in accordance with all representations concerning functionality, usability, security, accessibility, and sustainability were compliant with requirements; therefore, it was verified that the ClearVote 1.0 System successfully completed the FCA with all actual results obtained during test execution matching the expected results.

Accuracy – An accuracy test was performed to ensure that the voting system components could process ballot positions within the allowable target error rate. This test was designed to test the ability of the system to “capture, record, store, consolidate, and report” specific voter selections and absences of a selection.

Summary Findings:

To perform the Accuracy Test, ballots generated during the reliability test were scanned by ClearCount and a results report was generated. Each ballot had 608 ballot positions and a total of 2,550 ballots were scanned resulting in a total of 1,550,400 ballot positions being read accurately. During execution of the test procedure, it was verified that the ClearVote 1.0 System successfully completed the accuracy test with all actual results obtained during test execution matching the expected results.

System Integration – The system level certification tests addressed the integration of the hardware and software. This testing focused on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system. During test performance, the system was configured as would be for normal field use.

Summary Findings:

To perform the System Integration test, a General Election was designed in ClearDesign. The election was then loaded into the ClearAccess ballot marking device. Ballots were marked using the ClearAccess and were read by ClearCount. The results were adjudicated by ClearCount for results reporting. During execution of the test procedure, it was verified that the ClearVote 1.0 System successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

Regression Testing – Regression testing was performed as needed on the system components to verify that all functional and/or firmware modifications made during the test campaign did not adversely affect the system and its operation.

Summary Findings:

Regression Testing was performed to verify that functional testing discrepancies discovered during the test case design process for the Functional Configuration Audit were addressed by Clear Ballot. Each discrepancy was tested to verify that it functioned correctly as described in the TDP. During execution of the test procedure, it was verified that the ClearVote 1.0 System successfully completed the functional regression test with all actual results obtained during test execution matching the expected results.

Physical Configuration Audit (PCA) – A PCA was performed to compare the voting system components submitted for testing to the manufacturer’s technical documentation. The PCA was conducted in two phases: Initial and Final. The Initial PCA was conducted in order to baseline the system prior to test campaign commencement. The Final PCA was conducted in order to verify the final software and hardware configurations.

Summary Findings:

During execution of the test procedure, the components of the ClearVote 1.0 System were documented by component name, model, serial number, major component, and any other relevant information needed to identify the component. For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. Additionally, each technical document submitted in the TDP was recorded by document name, description, document number, revision number, and date of release. At the conclusion of the test campaign, test personnel verified that any changes made to the software, hardware, or documentation during the test process were fully and properly documented

Security – During the execution of this test case, the system was inspected to verify that various controls and measure were in place in order to meet the objectives of the security standards which include: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

Summary Findings:

To evaluate the security of the voting system, test personnel first verified that the manufacturer’s TDP contained documented access and physical controls and then, following the manufacturer’s documented procedures, configured the voting system for use and functionally verified that the documented controls were in place and were adequate to meet the stated requirements. Information which was not present in the TDP was presented to Clear Ballot for resolution. Clear Ballot then submitted updated documentation which was reviewed to ensure that the required information was present. During execution of the test procedure, it was verified that the ClearVote 1.0 System successfully completed the security evaluation with all actual results obtained during test execution matching the expected results

Usability – The system under evaluation was subjected to usability testing to determine the effectiveness, efficiency, and satisfaction of the system performance when used by the voter. This testing included additional requirements for task performance such as independence and privacy.

Summary Findings:

To perform the usability test, the assigned test personnel followed the manufacturer’s documented instructions to setup and configure the voting system as for normal operation at the

polling place, with privacy screens and peripheral devices in place. An operational status check was then performed to verify system operation. The assigned test personnel then verified that each function and capability presented to the voter operated as expected and documented. This included verification of the following:

Table 3.3-1: Usability Findings

Function/Capability	Successful Verification
Instructions on system operation are clear and concise	Yes
The ballot is displayed on the system in a manner that is clear and usable	Yes
The voting process is clear	Yes
There is a way to verify and accept or modify ballot selections prior to the casting of a ballot	Yes
The voting system notifies the voter upon successful casting of the ballot	Yes
The voting system shall provide feedback to the voter that identifies specific contests or ballot issues for which he or she has made no selection or fewer than the allowable number of selections (e.g., undervotes)	Yes
The voting system shall notify the voter if he or she has made more than the allowable number of selections for any contest (e.g., overvotes)	N/A ClearAccess does not allow overvoting to occur
The voting system shall 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	N/A ClearAccess does not allow overvoting to occur
The voting system shall provide the voter the opportunity to correct the ballot for either an undervote or overvote before the ballot is cast and counted	Yes
The voting system shall allow the voter, at his or her choice, to submit an undervoted ballot without correction	Yes
DRE voting machines shall allow the voter to change a vote within a contest before advancing to the next contest	Yes

Table 3.3-1: Usability Findings (continued)

Function/Capability	Successful Verification
DRE voting machines should provide navigation controls that allow the voter to advance to the next contest or go back to the previous contest before completing a vote on the contest currently being presented (whether visually or aurally)	Yes
The ballot marking device shall have multiple language capability	Yes
The voting system provides clear instructions and assistance to allow voters to successfully execute and cast their ballots independently	Yes
The voting system provides the capability to design a ballot for maximum clarity and comprehension	Yes
Warnings and alerts issued by the voting system should clearly state the nature of the problem and the set of responses available to the voter	Yes
When deployed according to the manufacturer instructions, the voting system shall prevent others from observing the contents of a voter's ballot	Yes

During execution of the test procedure, it was verified that the ClearVote 1.0 System successfully complied with the Usability requirements.

Accessibility – The system under evaluation was subjected to accessibility testing to evaluate the system against the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B) of which the goal is to make the voting system independently accessible to as many voters as possible.

Summary Findings:

To perform the accessibility test, the assigned test personnel followed the manufacturer's documented instructions to setup and configure the voting system as for normal operation at the polling place, with privacy screens and peripheral devices in place. An operational status check was then performed to verify system operation. The assigned test personnel then verified that each function and capability presented to the voter operated as expected and documented. This included verification of the following:

Table 3.3-3: Accessibility Findings

Function/Capability	Successful Verification
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).	Yes
Voting systems shall be accessible for individuals with disabilities in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.	Yes

During execution of the test procedure, it was verified that the ClearVote 1.0 System successfully completed the accessibility tests with all actual results obtained during test execution matching the expected results

Reliability – The reliability of the system being evaluated was measured during the performance of the system level tests.

Summary Findings:

The system reliability was evaluated throughout the test campaign. The data from each system level test was combined to determine acceptable MTBF of the system. In addition, a specific test for reliability was conducted by utilizing a modified functional reliability test that is typically performed during the Temperature and Power Variation Test. This test was conducted at standard ambient conditions with ballots being cast continually until test conclusion.

The parameters of the reliability test were as follows: Two ClearAccess units were used to manually mark and print a total of 2,000 ballots containing a total of 608 ballot positions. A total of 550 hand marked ballots were added to the 2000 printed ballots. All 2,550 ballots were then used in the performance of the Accuracy Test.

During execution of the test procedure, two events were noted.

- The ClearAccess PC lost communication with the printer causing the application to stop functioning. The application was closed and the communication was restored to the printer. This event could not be repeated, and the event was documented as such. ClearAccess was restarted and continued throughout the test with no issues. The ClearAccess unit was also left running for an additional 7 days with no issues.
- The ClearAccess printer had jamming problems during duplex printing because of the ballot paper stock. It was identified that the ballot paper was too thick and heavy. Per the

direction of Clear Ballot, a lighter and thinner ballot paper was substituted. Following the change, there were no further issues with paper jams for the remainder of the test.

The ClearVote 1.0 System successfully completed the reliability tests with all actual results obtained during test execution matching the expected results.

3.4 Conditions of Satisfaction

The voting system was evaluated against the Clear Ballot ClearVote Colorado Requirements Matrix, which incorporates the 2002 VSS requirements and the Colorado-specific requirements in the Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21. Throughout this test campaign, as tests were executed, resultant data was inspected and technical documentation reviews were performed to ensure that each applicable requirement was met; therefore fulfilling the conditions of satisfaction. The Requirements Matrix including verification that the conditions of satisfaction were met is included in Attachment A.

4 Conclusions

Based on the results obtained during the test campaign, Pro V&V determines that the ClearVote 1.0 System, as presented for evaluation, meets the requirements for voting systems of the State of Colorado as prescribed in the Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21 with the exception of the discrepancies identified during the performance of the Functional Configuration Audit. Upon successful resolution of these issues, regression testing will be performed and a revised Test Report will be issued.

Attachment A

(Colorado Requirement Matrix provided separately as

Colorado Requirements Matrix-CBG1.0)