



Test Report

**Clear Ballot Group
ClearVote 1.4 VBM Voting System
Certification Testing**

Approved by: _____

Michael Walker
For

Michael Walker, VSTL Project Manager

Approved by: _____

Wendy Owens

Wendy Owens, VSTL Program Manager

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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's ClearVote 1.4 VBM Voting System to the requirements set forth in the Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG).

1.1 Scope

The scope of this testing campaign incorporated a sufficient spectrum of physical and functional tests to verify that the ClearVote 1.4 VBM Voting System conformed to the applicable EAC 2005 VVSG requirements, with the exception of Volume I, Section 4.1.2.13.

Specifically, the testing event has the following goal:

- Evaluate the ClearVote 1.4 VBM Voting System to the applicable requirements of the EAC 2005 VVSG

1.2 References

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

- ClearDesign, ClearCount, and ClearAccess Change Notes
- Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2006 Edition, "NVLAP Procedures and General Requirements (NIST Handbook 150)", dated February 2006
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)", dated May 2008
- Pro V&V, Inc. Quality Assurance Manual, Revision 7.0
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Election Assistance Commission Testing and Certification Program Manual, Version 2.0

- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0
- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)
- EAC Notices of Clarification (NOC) (listed on www.eac.gov)
- ClearVote 1.4 VBM Technical Data Package (*A listing of the TDP documents submitted for this test campaign is listed in Section 2.3 of this Test Plan*)

1.3 Terms and Abbreviations

“BMD” – Ballot Marking Device

“Clear Ballot” – Clear Ballot Group

“COTS” – Commercial Off-The-Shelf

“DRE” – Direct Record Electronic

“EAC” – Election Assistance Commission

“EMS” – Election Management System

“FCA” – Functional Configuration Audit

“PCA” – Physical Configuration Audit

“TDP” – Technical Data Package

“HAVA” – Help America Vote Act

“2005 VVSG” – 2005 Voluntary Voting System Guidelines

1.4 Background

The ClearVote 1.4 VBM Voting System is comprised of previously VSTL tested and state certified components. The ClearVote 1.4 VBM Voting system is based on the ClearVote 1.3 and the ClearVote 1.3.3 Voting Systems. Clear Ballot Group has identified the following high level functional and usability enhancements, as well as defect resolutions, which are incorporated into the ClearCount, ClearDesign, and ClearAccess components of the ClearVote Voting System. *For a detailed list of changes, the change note documents provided by Clear Ballot Group are included for reference in Attachment A.*

ClearCount

- Merge ClearCast results
- Security enhancements including
 - FIPS 140-2 encryption
 - Replacing all network based SQL transactions
- Reporting enhancements including:
 - Warning message when nonvotable cards are present
 - Added Vote Centers report
 - Changed Level of Detail default
 - Changed filtering on PDF reports
 - Overvotes are now displayed on the Statement of Votes Cast by Geography Report
 - Added new report to the Reports menu
 - Added All Precincts section
- Card Resolution Tool enhancements
- Operating systems enhancements
- Multiple general enhancements
- Multiple performance enhancements
- Multiple defect resolutions

ClearDesign

- Enhancements including:
 - Additional options to save files in various formats
 - Option to sign a Ballot Definition File (BDF)
 - Enhanced support for large elections

- Selecting a ballot set from a header
- Barcode macros
- Browser Support
- Clear All button for voter counts
- Election state enhancements
- FIPS 140
- Inactivity timeout and logging back in
- Layout styles and values for inherited settings
- Multithreading and printing
- Password length
- Reports
- Multiple defect resolutions including:
 - Backup and restore
 - Fixes for discrepancies in table names
 - Backing up an election in any state
 - Contests with no candidates no longer appear on ballots
 - Duplicate names and exporting
 - Fonts – warning messages

ClearAccess

- Added protection for Audit Logs from potential deletion
- Printed second ballot card in Windows 10 environment
- Expanded instructions on the Primary Preference Party Selection screen
- Configuring the printer is now also set in Chrome
- Sip-and-Puff audio control functionality introduced
- Button sizes and spacing revised
- Software installation process revised

2 Test Candidate

A description of the system tested, as taken from the manufacturer's technical documentation is provided in the paragraphs below.

The ClearVote 1.4 VBM Voting System is a voting system encompassing all aspects of election management, including election definition and configuration, ballot creation, voting, vote data management, reporting, and auditing. The ClearVote 1.4 VBM Voting 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 1.4 VBM Voting 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

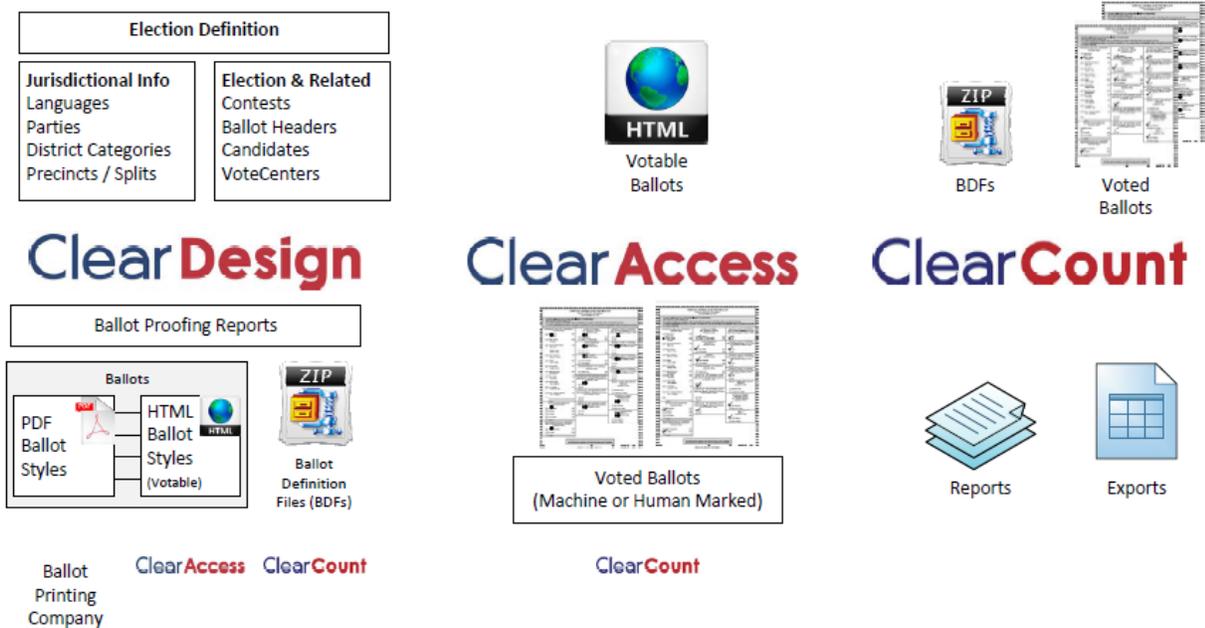


Figure 2-1 ClearVote Inputs & Outputs Diagram

The inputs and outputs of the ClearVote System depicted in Figure 2-1 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,
layout & proofing

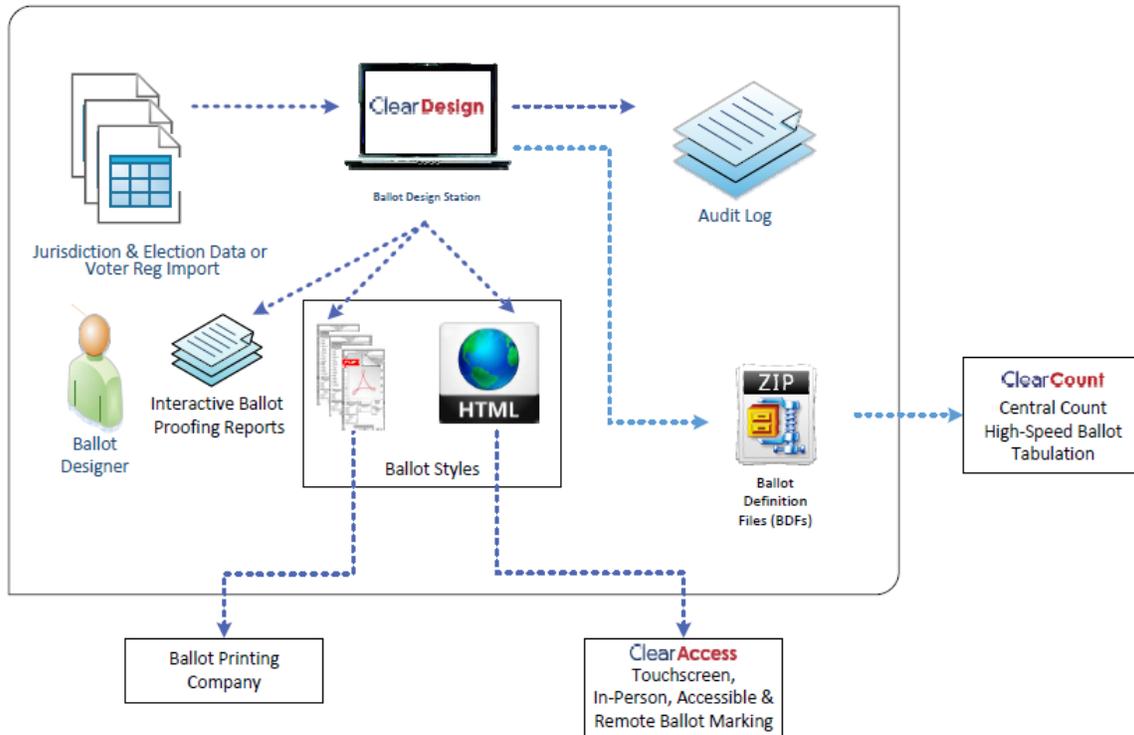


Figure 2-2 ClearDesign Interactive, Ballot Design, Layout, and Proofing Diagram

As illustrated in Figure 2-2, 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

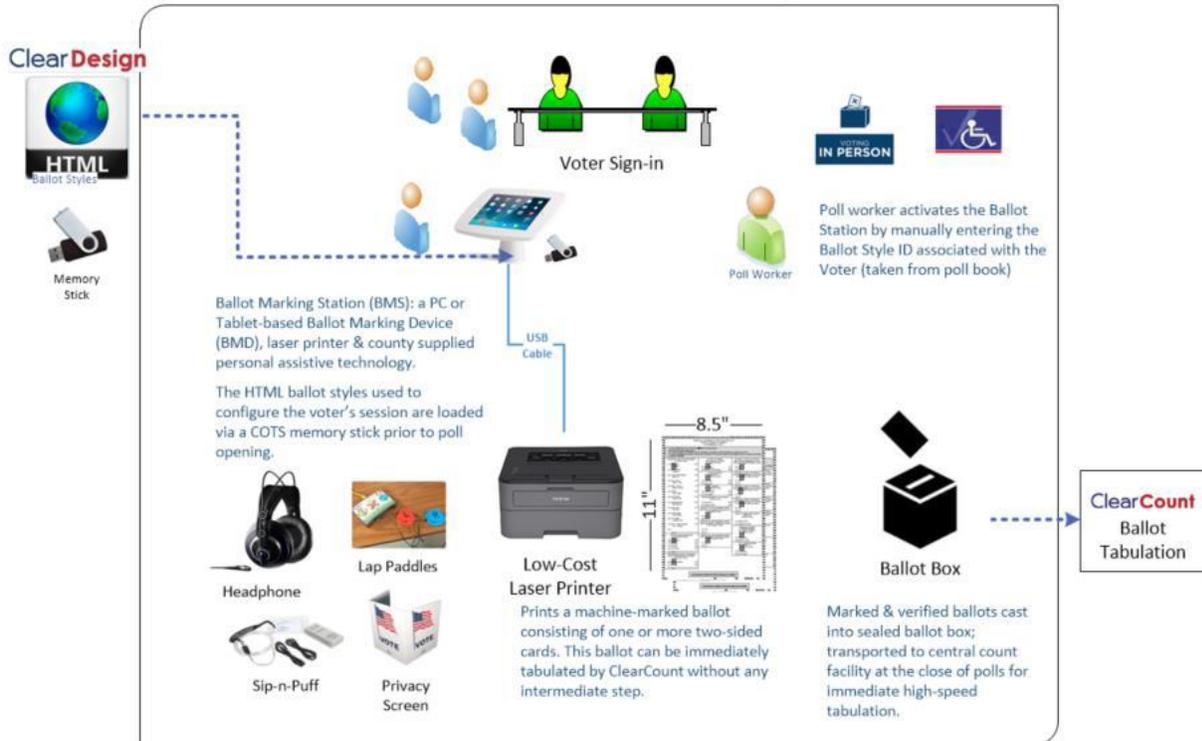


Figure 2-3 ClearAccess Touchscreen, In-Person, and Accessible Ballot Marking Diagram

ClearAccess, depicted in figure 2-3, 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), USB flash drive, and laser printer.

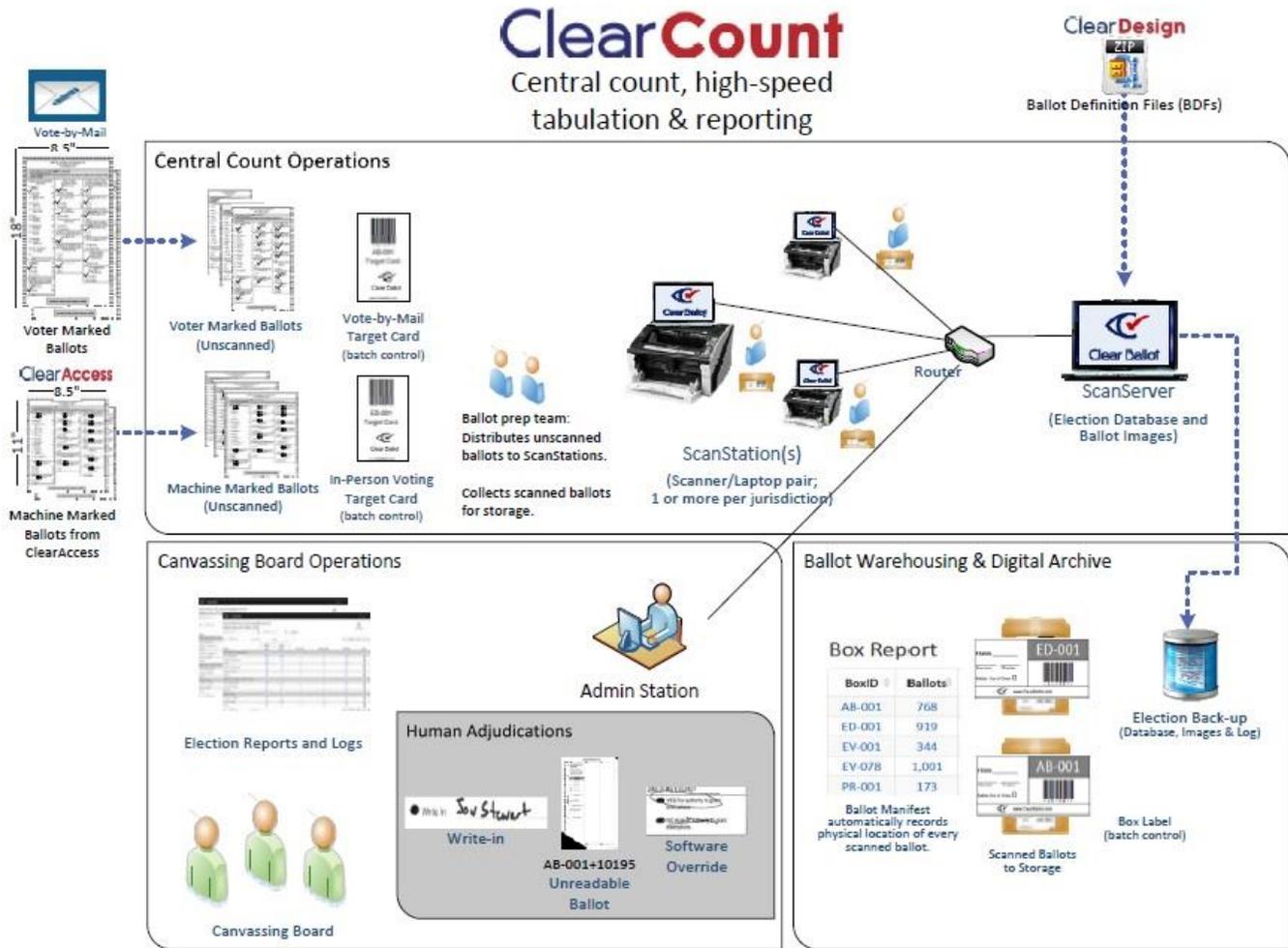


Figure 2-4 ClearCount Central Count Tabulation and Reporting Diagram

Tabulation and reporting at the central location is accomplished by ClearCount, as depicted in Figure 2-4.

The following table 2-1 lists the proprietary and COTS software provided by the manufacturer as part of the test campaign. The individual components were compiled to create the ClearVote 1.4 VBM Voting System.

Table 2-1: Software /Firmware Versions

Firmware/Software	Version
<i>ClearDesign Components, Version 1.4 .0</i>	
Windows	10 Pro
Ubuntu	14.04.4
MySQL	5.5.55
Apache	2.4.7
libapache2-mod-fcgid	2.3.9
PhantomJS	1.9.0
Usbmount	0.0.22
Uzip	6.0.9
Samba	4.3.11
Python	2.7.6
Python webpy	0.38
Python MySQL DB	1.2.3
SQLAlchemy	1.0.15
Python Pillow	2.3.0
Python Flup	1.0.2
Python DBUtils	1.1
Python XLRD	0.9.4
Python FontTools library	3.0
Python RTF	0.2.1
OpenSSL (FIPS)	2.0.5
OpenSSL	1.0.1f
DataTable	1.10.5
DataTable-TableTools	2.2.3
DataTable-ColVis	1.1.1
DataTable-ColReorder	1.1.2
DataTablePlugins	1.10.10
bootstrap	3.0.0
jquery	1.10.2
jquery-impromptu	5.2.3
jquery-qrcode	1.0
jquery-splitter	0.14.0
jquery-ui	1.10.4
jscolor	1.4.2
tinymce	4.1.9
fastclick	1.0.4
libmp3lame	0.5.0

jszip	3.1.2
papaparse	4.1.2
jsmin	12/4/2003
<i>ClearAccess Components, Version 1.4 .0</i>	
Windows	10 Pro
nsis	3.01
PyInstaller	3.2
Python	2.7.10
webpy	0.38
Python-future	0.15.2
pefile	2016.3.28
pywin	220
Google Chrome	59.0.3071.104
jquery	1.10.5
DataTables	1.10.5
ColVis	1.1.1
ColReorder	1.1.2
jsmin	2003-12-04
<i>ClearCount Components, Version 1.4.0</i>	
Windows	10 Pro
Ubuntu	16.04.1
Python(part of Ubuntu)	2.7.12
Pillow (part of Ubuntu)	2.5.1
MySQLdb (part of Ubuntu)	1.2.3
PyInstaller	3.2.1
PollyReports	1.7.6
OpenSSL	1.0.2g
OpenSSL FIPS Object Module	2.0.10
JavaScript Bootstrap library	2.3.2
JavaScript Chosen library	1.0.0
JavaScript jQuery library	1.10.2
J JavaScript jQuery-migrate library	1.2.1
JavaScript DataTables library	1.9.4
ColVis	1.0.8
JavaScript TableTools library	2.1.5
ZeroClipboard	1.0.4-TableTools2
JavaScript FixedHeader library	2.0.6
JavaScript hotkeys library	1.0
JavaScript tooltip library	1.3
JavaScript pep library	1.0
JavaScript LESS library	1.3.3

The follow table 2-2 provides the software components of the ClearVote 1.4 VBM Voting System that were evaluated during this test effort.

Table 2-2: Software /Firmware Versions

<i>ClearVote 1.4 VBM Software/Firmware Versions</i>	
ClearCount	1.4.0
ClearDesign	1.4.0
ClearAccess	1.4.0
<i>IBML Software/Firmware Versions</i>	
<i>ImageTrac Lite Scanner 6000 series</i>	
Image Trac Manager	6.7.1
SoftTrac capture suite	4.0.0.58
IT base	6.7.159
Firmware Build	6.00 build 56
DocNetics	5.5.2
<i>ImageTrac DS series Scanner 1210</i>	
SoftTrac version	4.3
ImageTracDs 1210 firmware	1.0.3
SoftTrac capture suite	4.0.0
Twain Manager	6.4.0
DocNetics	5.4.0

The follow table 2-3 provides the hardware components of the ClearVote 1.4 VBM Voting System that were evaluated during this test effort.

Table 2-3: Hardware Components

Component	Serial Number(s)
<i>ClearDesign Components</i>	
Dell PowerEdge Server T630	2K5YFK2
Dell 24 inch Monitor SE2416H	FVWV5G2
Dell Latitude Laptop E5580	7L6M3G2
TRENDnet Switch TEG-S80g	CA11238032857
<i>ClearAccess Components</i>	
Dell OptiPlex 5250 All In One	BPYXCH2
Dell Inspiron 15 5000 Series 2 in 1	29XF1C2
Okidata Laser Printer Model: B432dn	SAK5B007647A0
Brother Laser Printer Model: HL-L2340DW	U63879M4N628612, U63879M4N628617, & U63879M4N628535
HP OfficeJet 100 Mobile printer	MY648F10JG

APC Smart-UPS 2200 (for the Laser Printers) Model: SMT2200	AS1603160039
Origin Instruments Sip/Puff Breeze with Headset Model: BZ2	AC-0313-H2
Storm EZ Access Keypad Model: BZ2	1500005
Hamilton Buhl Over-Ear Stereo Headphones Model:HA-7	CLR-002-20-HP
ElectionSource Table Top Voting Booth (Privacy Screen) Model: VB-60B	CLR-002-21-VB
Hamilton Buhl Sanitary Headphone Covers Security Seals Model: MRS2-12030	Model: HYGEX45 CLR-002-22-Seal
ClearCount Components	
Fujitsu fi-6800 Scanner	A9HCA00737
Fujitsu fi-6670 Scanner	AAADC00936
Fujitsu fi-7180 Scanner	A20D000798
IBML ImageTrac Lite Scanner 6000 series	A-1090514000007
IBML ImageTrac DS series Scanner 1210	763 SHT-4165-68M1 00050005
Dell Latitude Laptop E5580	2F3L3G2, C9S22G2, CF3L3G2
Dell OptiPlex 7440 AIO	64WPXG2
Dell Precision Workstation T3620	GW6XHH2
Dell PowerEdge Server T330	FHV9RD2
Dell Precision 7910	BPH0TD2
Dell 22 inch Monitor Model: S2240M	CN-0CFGKT-64180-58B-0X3T
Dell 27 inch Monitor Model: P2717H	CDMS672
APC Smart-UPS 1500 (for Fujitsu scanners) Model: SMT1500	3S1525X07491
APC Smart-UPS 2200 (for IBML scanners) Model: SMT2200	AS1603160039
Cisco Catalyst Switch Model: 2960-X Series	S/N: FCW2039B6QF
Lenovo USB Portable DVD Writer Model: GP60NB50	411HV005130 & 411HR027583
EZ Scanning Shelf (fi-6400 or fi-6800)	Model: WorkeEZ

2.1 Testing Configuration

The testing event utilized one setup of the ClearVote 1.4 VBM Voting System and its components. The following is a breakdown of the ClearVote 1.4 VBM Voting System components and configurations for the test setup:

Standard Testing Platform:

The standard testing platform consisted of one ClearVote 1.4 VBM Voting System in a standalone configuration. In the pre-election phase of testing, ballots were created utilizing ClearDesign, the EMS component of the ClearVote 1.4 VBM Voting 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 1.4 VBM Voting System.

ClearDesign Configuration

The tested configuration for ClearDesign consists of the following components:

- ClearDesign Server (Dell T630)
- ClearDesign client (Dell Laptop Latitude E5580 or Dell Precision Workstation T3620)
- TRENDnet Switch (Model: TEG-S80g)

ClearAccess Configuration

The tested configuration for ClearAccess consists of the following components:

- ClearAccess All-in-One (Model: Dell Optiplex 5250)
- Brother Laser Printer (Model: HL-L2340DW)
- Oki Laser Printer (Model: B432dn)
- Storm EZ Access Keypad (Model: EZ08-22201)
- Origin Instruments Sip/Puff Breeze (Model: BZ2)
- Over-ear Stereo Headphone (Model: Hamilton Buhl HA-7)
- ClearAccess Laptop (Model: Dell Inspiron 15 5000 Series)
- HP OfficeJet (Model: 100 Mobile printer)
- ElectionSource Table Top Voting Booth Privacy Screen (Model: VB-60B)
- Battery Backup (APC Smart-UPS 2200 (for laser printers))

ClearCount Configuration

The tested configuration for ClearCount consists of the following components:

- ScanServer Dell Server (PowerEdge T330)
- ScanStation Dell Laptop (Dell Latitude E5580)
- ScanStation Dell Tower (Dell Precision 7910 IBML Image-Trac Lite Scanner)
- ClearCount Scanner (Fujitsu fi-6800)
- ClearCount Scanner (Fujitsu fi-6670)
- ClearCount Scanner (Fujitsu fi-7180)
- ClearCount Scanner (IBML ImageTrac Lite Scanner 6000 series)
- ClearCount Scanner (IBML ImageTrac DS series Scanner 1210 or 1155)
- Cisco Catalyst Switch (Model: 2960-X Series)
- Battery Backup (APC Smart-UPS 1500 (for Fujitsu scanners))
- Battery Backup (APC Smart-UPS 2200 (for IBML scanners))
- ClearCount Election Administration Station (Dell Precision Workstation T3620)
- ClearCount Adjudication Station (Dell OptiPlex 7440 All In One)

2.2 Test Support Equipment/Materials

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

2.3 Technical Data Package

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

The following TDP documents were submitted as part of this test campaign:

Table 2.4: ClearVote 1.4 VBM Technical Data Package

Document Number	Description	Version
<i>ClearVote Documents</i>		
100101	ClearVote 1.4 VBM Approved Parts List	1.0.5
100067	ClearVote 1.4 VBM Ballot Stock and Printing Specification	1.0.3

100057	ClearVote 1.4 VBM Configuration Management Plan	1.0.4
100069	ClearVote 1.4 VBM Glossary	1.0.3
100058	ClearVote 1.4 VBM Personnel Deployment and Training Plan	1.0.2
100059	ClearVote 1.4 VBM Quality Assurance Program	1.0.3
100086	ClearVote 1.4 VBM Security Policy	1.0.4
100071	ClearVote 1.4 VBM System Overview	1.0.1
100073	ClearVote 1.4 VBM Test and Verification Specification	1.0.3
<i>ClearDesign Documents</i>		
100011	ClearDesign 1.4 VBM Acceptance Test Checklist	1.0.3
100062	ClearDesign 1.4 VBM Administration Guide	1.0.4
100083	ClearDesign 1.4 VBM Build Procedures	1.0.2
100103	ClearDesign 1.4 VBM Database Specifications	1.0.3
100046	ClearDesign 1.4 VBM Functionality Description	1.0.4
100098	ClearDesign 1.4 VBM Hardware Specification	1.0.3
100063	ClearDesign 1.4 VBM Installation Guide	1.0.4
100082	ClearDesign 1.4 VBM Maintenance Guide	1.0.3
100045	ClearDesign 1.4 VBM Security Specification	1.0.4
100072	ClearDesign 1.4 VBM Software Design and Specification	1.0.4
100043	ClearDesign 1.4 VBM System Overview	1.0.4
100041	ClearDesign 1.4 VBM User Guide	1.0.5
<i>ClearCount Documents</i>		
100102	ClearCount 1.4 VBM Acceptance Test Checklist	1.0.3
100009	ClearCount 1.4 VBM Build Procedures	1.4.0
100005	ClearCount 1.4 VBM Database Specification	1.0.2
100004	ClearCount 1.4 VBM Election Administration Guide	1.0.5
100006	ClearCount 1.4 VBM Election Preparation and Installation Guide	1.0.6
100021	ClearCount 1.4 VBM Functionality Description	1.0.3
100022	ClearCount 1.4 VBM Hardware Specification	1.0.3
100023	ClearCount 1.4 VBM Maintenance Guide	1.0.4
100070	ClearCount 1.4 VBM Reporting Guide	1.0.3
100013	ClearCount 1.4 VBM Scanner Operator Guide	1.0.2
100026	ClearCount 1.4 VBM Security Specification	1.0.3

100019	ClearCount 1.4 VBM Software Design and Specification	1.0.5
100047	ClearCount 1.4 VBM System Identification Guide	1.0.1
100024	ClearCount 1.4 VBM System Operations Procedures	1.0.3
100025	ClearCount 1.4 VBM System Overview	1.0.2
<i>ClearAccess Documents</i>		
100109	ClearAccess 1.4 VBM Acceptance Test Checklist	1.0.2
100051	ClearAccess 1.4 VBM Build Procedures	1.0.3
100049	ClearAccess 1.4 VBM Functionality Description	1.0.3
100085	ClearAccess 1.4 VBM Hardware Specification	1.0.3
100053	ClearAccess 1.4 VBM Installation Guide	1.1.1
100052	ClearAccess 1.4 VBM Maintenance Guide	1.1.1
100054	ClearAccess 1.4 VBM Poll Worker Guide	1.1.1
---	ClearAccess Poll Worker Instructions (poster)	1.0
---	ClearAccess Poll Worker Instructions-Multi Day Voting (poster)	1.0
100050	ClearAccess 1.4 VBM Security Specification	1.1.1
---	ClearAccess Simplified Voter Instructions (poster)	1.0
100099	ClearAccess 1.4 VBM Software Design and Specification	1.2
100055	ClearAccess 1.4 VBM Supervisor Guide	1.1.1
100038	ClearAccess 1.4 VBM System Identification Guide	1.0.1
100044	ClearAccess 1.4 VBM System Overview	1.0.4
100056	ClearAccess 1.4 VBM Voter Guide	1.0.3

3 Test Process and Results

The following sections outline the test process that was followed to evaluate the ClearVote 1.4 VBM Voting System to the test goals defined in the scope of this test report.

3.1 General Information

All testing, with exception of the IBML testing, was conducted by qualified Pro V&V personnel at the Pro V&V test facility located in Huntsville, AL. The IBML testing was conducted by qualified Pro V&V personnel at the IBML facility located in Irondale, AL.

As stated in section 1.2, Hardware Requirements listed in the EAC 2005 VVSG Volume I Section 4.1.2.13 were not tested as part of this test campaign.

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.

Limited TDP Review - This review is conducted only for stated functionality review and verification. This review does 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 1.4 VBM Voting System was successfully subjected to the TDP review with all discrepancies that were noted during the review being resolved.

Source Code Review - The Source Code Review was a formal review of the submitted source code to specific requirements. The requirements may be published standards, manufacturer supplied requirements, and/or third party supplied requirements. The Source Code Review included a Trusted Build of the submitted source code.

Summary Findings:

During execution of the test procedure, it was verified that the source code provided for the ClearVote 1.4 VBM Voting System successfully met the requirements. After a review of the submitted code was completed, all issues were reports and resolved prior to the Trusted Build.

Trusted Build (EAC equivalent Compliance Build) – To perform the trusted build 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. The focus of the FCA was the incorporation of the general improvements to the system.

Summary Findings:

During the test case design and execution phases of the FCA, it was verified that the ClearVote 1.4 VBM Voting System successfully completed the FCA 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 1.4 VBM Voting 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 measures 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 1.4 VBM Voting 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. During execution of the test procedure, it was verified that the ClearVote 1.4 VBM Voting System successfully complied with the Usability requirements.

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, 1000 test ballots were accurately printed by ClearAccess. Those ballots were then scanned by ClearCount along with each Fujitsu and IBML scanners and a results report was generated. Each ballot had 1600 ballot positions and a total of 3000 ballots were scanned resulting in a total of 4,800,000 ballot positions being read accurately. During execution of the test procedure, it was verified that the ClearVote 1.4 VBM Voting 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 and a Primary election were designed in ClearDesign. The elections were then loaded into ClearAccess. Ballots were marked using 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 1.4 VBM Voting System successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

Volume/Stress Test - The Volume and Stress Tests were designed to investigate the voting system’s response to transient overload conditions, processing more than the expected number of ballots/voter per precinct and processing more than expected number of precincts. This test was an attempt to overload the system’s capacity to process, store, and report data. The test method for performing the Volume/Stress Test was execution.

Summary Findings:

Successful testing included voting ballots over a set time at a fast rate, creating an election with more precincts over the stated limit, overloading ballot bins, utilizing more than the appropriate number of hardware and/or inputs, and using paper ballots that represented the formatting extremes. During execution of the test procedure, it was verified that the ClearVote 1.4 VBM Voting System successfully completed the test 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 software modifications made during the test campaign did not adversely affect the system and its operation.

Summary Findings:

During execution of the test procedure, it was verified that the ClearVote 1.4 VBM Voting System successfully completed the functional regression test with all actual results obtained during test execution matching the expected results.

3.4 Additional Testing

As stated in section 3.1 of this test report, Pro V&V personnel performed offsite testing for the IBML scanners that included the ImageTrac Lite Scanner 6000 series and the ImageTrac DS 1210/1155 series Scanner. Pro V&V performed various testing that included Accuracy, Volume and Stress, and System Integration. During execution of the test procedures, it was verified that the IBML scanners successfully completed the testing with all actual results obtained during test execution matching the expected results.

4 Conclusions

Based on the results obtained during the test campaign, Pro V&V determines that the ClearVote 1.4 VBM Voting System, as presented for evaluation, meets the requirements to the Election Assistance Commission 2005 Voluntary Voting Systems Guidelines for the requirements that were tested. Pro V&V, Inc. has determined that ClearVote 1.4 VBM Voting System is in compliance with Election Assistance Commission 2005 Voluntary Voting Systems.

ATTACHMENT A
TECHNICAL CHANGE NOTES

TECHNICAL CHANGE NOTES

CLEAR ACCESS CHANGE NOTES (1.3 to 1.4)

ClearAccess Change Notes (1.3 to 1.4)

The following issues arose in ClearAccess 1.3 and were closed in ClearAccess 1.4.

Audit Logs are now protected from potential deletion

System and Election Audit log files are now protected by an HMAC (Hashing Message Authentication Code) on each record, as well as an HMAC of the last HMAC.

When the Audit log file is opened, it is validated to ensure no records have been changed or deleted.

Second ballot card now prints (Windows 10)

The second ballot card now prints in case of a two-page ballot in the Windows 10 environment.

The Primary Preference Party Selection screen provides expanded instructions

Instructions are now presented to the voter with the Primary Preference Party Selection contest, be it on the touchscreen or audio ballot. The default instructions presented to the voter may be customized in ClearDesign.

Configuring the printer in ClearAccess is now also set in Chrome (Windows 10 Pro)

The printer may now be configured in the ClearAccess application and also set in Chrome in the Windows 10 Professional environment.

During ClearAccess installation, the default printer should be named 'ClearAccess', and the same printer should be selected in Chrome when configuring Chrome. If this is not done, then changing the printer in the Setup screen will not change the printer that Chrome prints to.

Sip-and-Puff audio control functionality introduced

The same functionality is now available to Sip-and-Puff users as to other voters.

A long sip now switches to menu mode, allowing the voter to move between menu items (Settings, Help, Cancel, Review Votes, Pause, Faster, Slower, Volume Up, and Volume Down). A long sip also exits menu mode, and returns the voter to the ballot.

Audio help is played back when the voters enters menu mode (if the ballot has been configured to vote using the Sip-and-Puff as well as audio).

A triple sip is now used to show the Help screen, rather than the Cancel screen, since the Cancel screen can be accessed from the menu.

Button sizes and spacing revised

ClearAccess has been brought into compliance with respect to Volume 1, section 3.1.6 (d)(i) of the VVSG standards. These requirements apply to the size of and spacing between buttons.

The minimum height of buttons has now been set to 56 pixels, and the spacing between buttons to 10 pixels.

To accommodate the potential DPI variances of the touchscreen ballot resulting from varying screen sizes and resolutions, ClearAccess may be configured with one of the following Screen DPI setting options in the Setup screen:

- Normal - approx. 100 DPI
- Large - approx. 130 DPI
- Extra Large - approx. 160 DPI



ClearAccess software installation process revised

The ClearAccess software installation process has been revised. The ClearAccess installer now bundles together ClearAccess installation, Chrome installation, creation of a 'ClearAccess' user, as well as device hardening.

The ClearAccess installation component of the installer now installs the software, adds a shortcut on the desktop, enables FIPS 140 encryption, and sets the default TTS voice to female.

The Chrome installation component of the installer installs the Chrome Standalone Enterprise 64 bit version of Chrome, and adds the following default preferences:

- Skip the first time run screen
- Disable Autofill
- Disable password saving
- Disable translations
- Disable prompting for setting Chrome as the default browser
- Enable Flash player

The hardening component of the installer includes the following:

- Create a ClearAccess user with no password
- Set the ClearAccess user to run ClearAccess, and only ClearAccess, when logged in
- Uninstall all Windows applications
- Turn off and disable unused services including all networking and blue tooth services
- Disable the CTRL, ALT, Windows, and Menu keys

Note that there are additional hardening steps that must still be performed manually, and that are included in the *ClearAccess Installation Guide*.

The hardening option should only be selected on a dedicated ClearAccess station, since no other software will be able to run on the machine following hardening.

Details of the ClearAccess installation process are documented in the *ClearAccess Installation Guide*.



TECHNICAL CHANGE NOTES
CLEAR COUNT CHANGE NOTES (1.4)

Upgrading to 1.4

ClearCount 1.4 offers the following product enhancements, as well as several bug fixes. Please contact your Clear Ballot representative if you have any questions regarding this software release.

Merge ClearCast results

Election results from the ClearCast precinct tabulator can now be merged into the ClearCount central-count system for consolidated reporting.

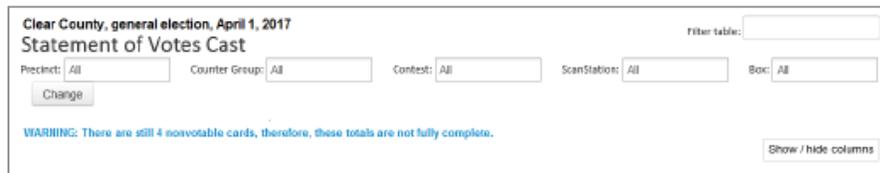
Security enhancements

- FIPS 140-2 encryption has been incorporated. FIPS 140-2 mode is configured on the Windows-based ScanStation using the Windows OS FipsAlgorithmPolicy enabled via the Windows Policy Editor. FIPS 140-2 mode is automatically configured on the s ScanServer during installation.
- All network-based SQL transactions have been replaced with HTTP/HTTPS-based custom transactions so that network activity is encrypted.

Reports

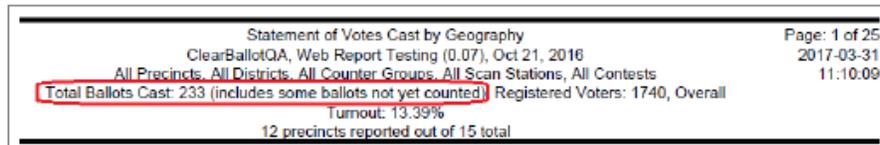
- A warning message now appears on web and PDF reports when there are still nonvotable cards.

Web reports



- Clicking the message on a web report opens the Card Images page to display the nonvotable cards.

PDF reports



- The message can be suppressed in PDF reports by selecting the new "Hide warnings about uncounted ballots" option on the Generate PDF Report page.

- A new report, the Vote Centers report, provides a summary of ClearCast election results that have been merged into ClearCount.
- On PDF reports, the Level of Detail default option has changed from *Detail and Grand Total* to *Grand Total only*.

Level of Detail

Grand Total only ▼

- PDF reports now display filtering by ScanStation in their report headers (information indicates the selected ScanStations or *All ScanStations*).

Statement of Votes Cast by Geography ClearBallotOA, Web Report Testing (0.07), Oct 21, 2016 All Precincts, All Districts, All Counter Groups, All Scan Stations , All Contests Total Ballots Cast: 233 (includes some ballots not yet counted), Registered Voters: 1740, Overall Turnout: 13.39% 12 precincts reported out of 15 total	Page: 1 of 25 2017-03-31 11:10:09
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- The Statement of Votes Cast by Geography PDF report now displays overvotes (as defined by the EAC). Previously, only *overvoted ballots* and *undervotes* appeared. Now, *overvotes* also appears.

United States Senator (Vote for 1) 218 ballots (21 over voted ballots, 21 overvotes, 25 blank voted), 1490 registered voters, turnout 14.63%									
John Black	67	30.73%	10	6	23	7	4	8	0
Beth Brown	37	21.51%	1	5	14	2	5	5	5
Jeffrey Green	32	18.60%	4	3	9	7	1	6	2
Mary Maroon	23	13.37%	4	0	8	6	1	1	3
Rachel White	13	7.66%	1	3	5	0	2	1	1
Total	172	100.00%	20	17	59	22	13	21	20

- When the vote rule equals 1, the report displays *blank voted* instead of *undervotes* for the contest. This is because when the vote rule equals 1 and the contest is undervoted, it is the same as a blank-voted contest.
- A new report has been added to the Reports menu. The Contest Vote Discrepancy Threshold report appears for elections that have imported a comparison results file (CFR). It provides analysis of contests that fail a discrepancy test.
- In PDF reports, the All Precincts section now appears correctly after the last precinct.

Card Resolutions tool

Improvements have been made to the Card Resolutions tool that enhance ClearCount's performance and response times in the following situations:

- When adjudicating unresolved cards for a large election
- When clicking the **Vote** button when there are an extremely large number of styles



Operating systems

- The ScanServer operating system has been updated to Ubuntu 16.04.
- The operating systems for the ScanStation and election administration station have been updated to Microsoft Windows 10.

General enhancements

Clear Ballot has made the following product updates to improve your ClearCount user experience:

- Results filters are now saved when refreshing the Card Resolution page.
- A warning now appears if you attempt to overwrite an existing election when creating a new one.
- A Backup Date column has been added to the Start Election Restore and Merge Election pages to make it easier to select the correct item from the list of available backups.
- The Card Reconciliation section of the Dashboard now indicates any cards that were automatically judged to be nonballots and later visually resolved as valid ballots.
- In the Card Images report, the Card ID can now be clicked to open a larger version of the image.
- The Windows Event Log on the ScanStation and election administration station computers now records the loss and restoration of AC power.
- The ScanStation user account is now included on the Users tab of the User Administration page.
- In the Card Resolutions tool, the Select Precinct drop-down menu has been renamed to Select Precinct (and Style) to better reflect the menu items. A CS indicator appears before each style number to indicate *card style*.
- Four new fields (RowNumber, BoxPosition, PrecinctStyleName, ScanComputerName) were added to the Cast Vote Record export.
- CSV exports now include ContestID and ChoiceID columns.

Performance enhancements

Several improvements have been made to enhance ClearCount's performance when administering elections, including speedier results when:

- Opening the Contests report
- Accessing overvoted contest images on the Contest Images report
- Accessing the Card Resolutions tool
- Resolving individual cards for an election that has a large number of precincts and ballot styles

Bug fixes

- The Ballots with Contest values now display accurately for a single contest that appears on all card styles.
- The header of the PDF reports now indicates when the results are filtered by box.



- The Safely Merge BDF feature now imports UTF-8 multibyte characters properly.
- The XML results export now exports the regVoters attribute if its value is zero. The export now also handles null fields appropriately.
- When creating an XML results file, the values for the overvotes attribute in the Contest, ContestGroup, and ContestGroupVotes elements now calculate correctly, as does the value for the ballotsCast attribute in the Precinct element.



TECHNICAL CHANGE NOTES
CLEAR DESIGN CHANGE NOTES (1.3.3 to 1.4)

ClearDesign 1.3.3 to 1.4

This document summarizes the enhancements and fixed defects from ClearDesign versions 1.3.3 to 1.4.

Enhancements

This section describes the enhancements in ClearDesign versions 1.3.3 to 1.4.

About window—saving file lists in various formats

The About window of ClearDesign provides two tabs containing the following file lists:

- Clear Ballot Product Files
- Installed System Information

Recent enhancements include buttons to save the file lists as PDF, CSV, and HTML files.

To reach the About window:

1. Click your user name that appears in the upper right corner of the screen.
2. When the drop-down list appears, select **About this software** (Figure 1).

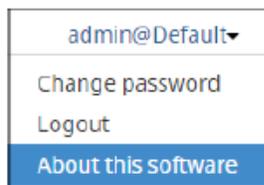


Figure 1. Drop-down list that appears when you click your login ID

ClearDesign displays the About window (Figure 2). By default, the Clear Ballot Product Files tab appears selected. In Figure 2, a red rectangle indicates the buttons for saving the files in various formats.

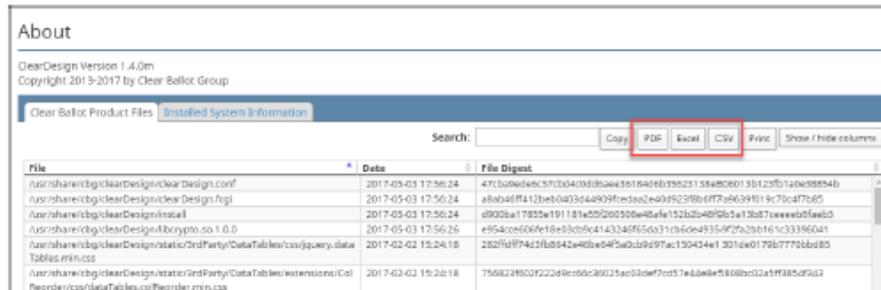


Figure 2. About window—PDF, Excel, and CSV buttons

Accessible Definition File (ADF) / Ballot Definition File (BDF)

Signed BDF

New security functionality enables ClearDesign to sign a BDF and ClearCount to verify the signature. Signing the BDF is optional.

The signature is stored in the config.json file within the BDF Zip file. For details of the BDF and config.json contents, see the *ClearDesign Software and Design Specification*.

Enhanced support for large elections

ClearDesign has enhanced its support for creating BDF and ADF files for large elections. Elections are considered large if they contain more than 5000 precincts or more than seven languages.

Selecting a ballot set from a header

You can now apply a header to a particular ballot set.

Header dialogs contain a new **Ballot Set** drop-down list. The default value is All, which applies the current header to all the ballot sets in an election. If desired, you can select a particular ballot set to apply the header only to that ballot set.

Figure 3 shows an example of a Header dialog. The Ballot Set drop-down list is enclosed in a red rectangle.



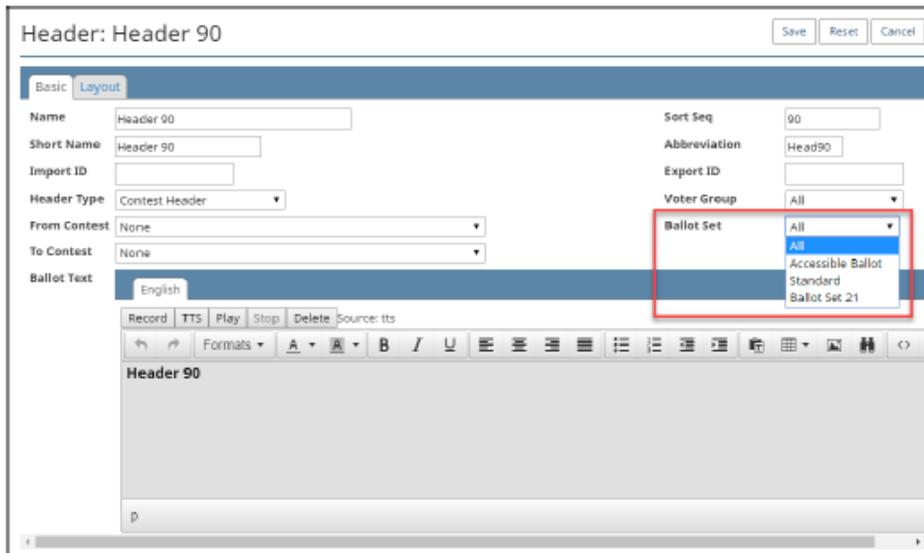


Figure 3. Header dialog—Ballot Set field

Barcode macros

ClearDesign has added the following macros to generate barcodes:

~{code128A(parameter)}

~{code128B(parameter)}

~{code128C(parameter)}

~{code25(parameter)}

When generating barcodes, invalid characters are ignored.

Example

To create a 2 of 5 barcode using the numbers in the precinct abbreviation and the split ballot sequence, enter the following:

~{code25(precinct.abbreviation.split.ballotSequence)}

The ~{ and } surround the complete macro and the code 25 has '(' and ')' around the macros to use with spaces between the macros.

The code25 and code128C macros extract the numeric values. If the precinct abbreviation is 01-234 and the split.ballotSequence is 5, the barcode contains the value 012345. If the barcode value is an odd number of digits, it is prepended with a 0.



To display the data as barcode, you must use an appropriate barcode font. ClearBallot has tested the BarCodeWiz 2 of 5 font (<http://barcodewiz.com>).

Browser support

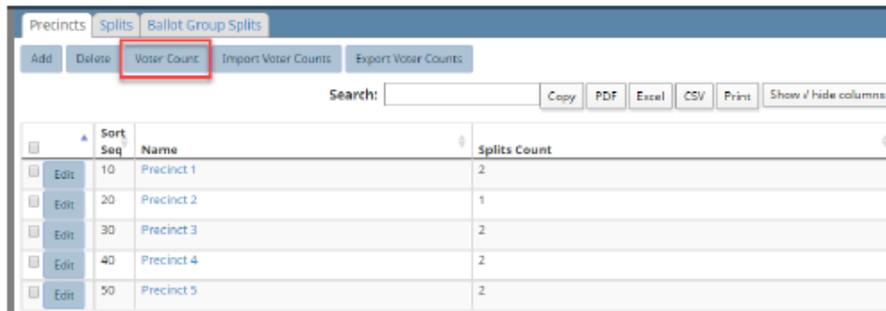
The installation and upgrade media for ClearDesign include the installation of Google Chrome. Clear Ballot recommends using Google Chrome to ensure that CSV files are saved properly when you create ADF and BDF files.

Clear All button for voter counts

ClearDesign has a new clear all functionality available from the Precincts view. This functionality enables you to clear all voter counts.

To clear voter counts:

1. From the Precincts view, click **Voter Count** (Figure 4).



	Sort Seq	Name	Splits Count
Edit	10	Precinct 1	2
Edit	20	Precinct 2	1
Edit	30	Precinct 3	2
Edit	40	Precinct 4	2
Edit	50	Precinct 5	2

Figure 4. Precincts view

The Voter Count dialog appears (Figure 5).



VoterCount: Save Reset Cancel

Clear All

Figure 5. Voter Count dialog—Clear All button

2. Click **Clear All** and then **Save**.
ClearDesign briefly displays a status message while clearing the voter counts.



Election states

While ballots are under development, the election state indicates the level of completion of the ballot-development process. ClearDesign has reduced the number of election states.

Available election states

Table 1-1 lists and describes the various ClearDesign election states.

Table 1-1. Election states

Election state	Description
1. Election created	(Default). All entities are editable.
2. Ballots created	Any actions that can change ballots are unavailable.
3. Cards created	Any actions that can change cards are unavailable.
4. Media created	Any actions that can change media are unavailable.

Election states correspond to the typical ballot development process and are cumulative. The base election state is Election Created. This base states allows users who have the appropriate permissions to edit any entity.

Advancing the election state continues the restrictions from a previous state while factoring in the restrictions of the current election state. This mechanism prevents team members from accidentally making changes.

You can return to a previous election state if revisions are necessary.

You can import data to or export data from ClearDesign only while in the Election Created state. However, you can back up an election under development at any time.

Setting the election state

You can change the election state in the following situations:

- When you click the **Edit** button on the Elections or Info tabs and the editor window for the selected election appears, you can change the **Election State** field.
- When you print cards, you can set the **Election State** to Cards Created.
- When you generate an BDF or ADF file, you can set the **Election State** to Media Created.



FIPS 140

Clear Ballot products—ClearDesign, ClearAccess, ClearCast, and ClearCount—are written in the Python language using the standard Python libraries. The standard Python hashing libraries use OpenSSL on the Linux platforms, including Ubuntu, and the Windows cryptographic libraries on the Windows 10 platforms. Where native Python support does not exist, a thin wrapper has been created to access the underlying cryptographic libraries.

Clear Ballot products running on Ubuntu build the FIPS-certified version of OpenSSL during the build process. They use the OpenSSL FIPS version 2.0.5 that is included as part of the FIPS 140 certificate #1747 and build it in conformance with the security policy defined in the certification process. See <https://www.openssl.org/docs/fipsnotes.html> for more information.

Clear Ballot products running on Windows use the cryptographic system provided by the Windows 10 operating system. Versions of Windows 10 used by Clear Ballot products have FIPS 140 certificate #2605.

When the Clear Ballot products start up, they check that the cryptographic module is operating in FIPS mode. If not, the product displays an error message and will not proceed.

Inactivity timeout and logging back in

ClearDesign times out after 30 minutes of inactivity.

If ClearDesign logs you out due to inactivity, a dialog appears that allows you to log in again.

Layout styles and values for inherited settings

The Layout Style dialogs associated with the default entity styles, such as Header Default, Contest Default, and Choice Default, have changed the display of inherited settings. Previously, if an entity style inherited a setting, such as **Font Name** or **Size**, the corresponding field displayed the value "Inherit."

Now the Layout Style dialogs associated with default entity styles display specific values for inherited field settings. Figure 6 shows an example of the Layout Style: Color and Border dialog. In this dialog, the **Font Name** field shows a specific font and the **Size** field contains a value.



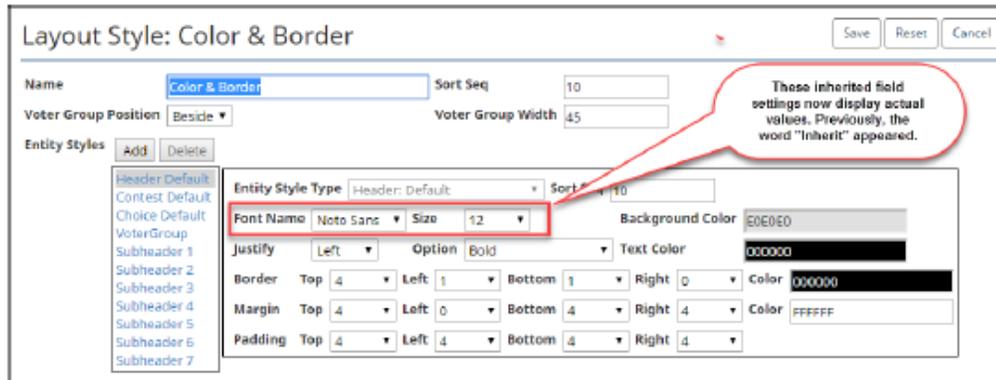


Figure 6. Layout Style: Color & Border dialog

Multithreading and printing

To provide maximum throughput, ClearDesign provides multithreading for printing.

Password length

A user's assigned role governs the required password length. ClearDesign now requires a password from 1 to 20 characters long.

If you have the appropriate permissions to create and edit roles, you can specify the password length in the Role dialog. This dialog appears when you create a new role or click the **Edit** button corresponding to an existing role in the Roles view.

Figure 7 shows an example of the Role dialog. The **Minimum Password Length** field appears in a red rectangle.

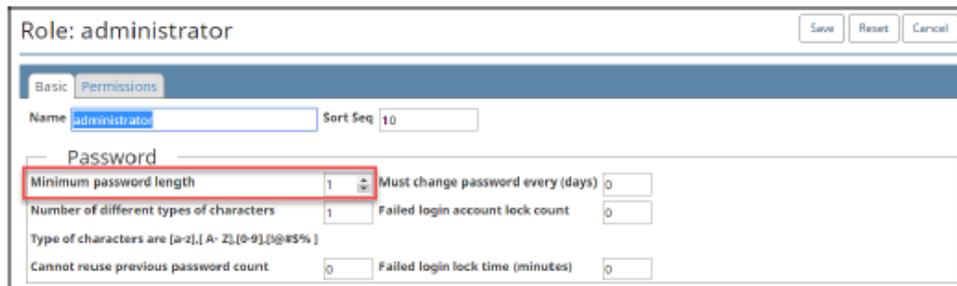


Figure 7. Role dialog



Reports

ClearDesign includes some improvements to reports.

By default, the **Format** option HTML appears selected when you open the Reports window. You can also save a report as a PDF or CSV file.

To reach the Reports window:

1. From the Elections tab, click the name of a desired election to select it.
2. When the Info tab for the selected election appears, click the **Reports** button.

ClearDesign displays the Reports the following window (Figure 8).

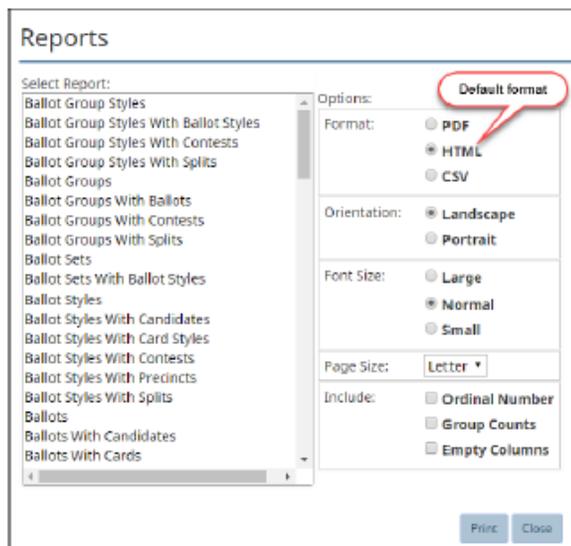


Figure 8. Another caption

Clear Ballot has enhanced some reports by removing some superfluous totals and improving the formatting. One example is the **Ballot Styles with Contests** report.



Fixes to defects

This section describes fixes to defects in ClearDesign 1.3.3 to 1.4.

Backup and restore

The following fixes have improved the backup and restore functionality.

Fixes for discrepancies in table names

Previously, ClearDesign was unable to restore an election when there were discrepancies in table names. ClearDesign now converts all table names to lower case during the backup and restoration process. This conversion resolves the previous issue.

Backing up an election in any state

As previously indicated in "Available election states" on page 5, you can back up an election while under development in any state. However, you can import data and export data from an election only when the election is in a Media Created state.

Contests with no candidates no longer appear on ballots

Previously, contests with no candidates appeared on HTML ballots. In one situation, a contest appeared containing only a blank title. This issue no longer occurs and no longer affects the layout options for ballots.

Duplicate names and exporting

When you export an election, ClearDesign issues a warning message about specific duplicate names. Examples are duplicate contest names, short names, and abbreviations for languages, voter groups, and district categories, districts, and precincts. ClearDesign allows you to export the election containing the duplicates, but Clear Ballot recommends resolving the duplicates before committing to final version. Duplicate names can cause identification issues in other ClearVote products.

Fonts—warning messages

When you add a new font to an election, ClearDesign now provides a warning message if you do not supply a **Font Family** or select a **Font file** (Figure 9).



Figure 9. Warning message when trying to save a new font without specifying a Font Family or Font file.

Google Translate—additional guideline

The *ClearDesign User Guide* provides some guidelines for using Google Translate to process language files. Clear Ballot recommends an additional guideline.

When you export a language file from ClearDesign and open it for processing with Google Translate, page or scroll through the entire file. Following this guideline ensures that the entire file gets translated.

OCVR

- ClearDesign supports all updates to the Oregon Central Voter Registration (OCVR) format.
- The OCVR import now maintains all questions as one column when importing.

Permissions

Clear Ballot has addressed some issues that affect permissions:

- ClearDesign permissions now correctly control which related items can be edited.
- Users can view only the elections for which they have the appropriate permissions.

Import issues resolved for EIMS/WEI data

Previously, issues occurred when some jurisdictions tried to import Election Information Management System (EIMS)/Washington Election Information (WEI) data into ClearDesign. Clear Ballot has resolved these issues.

