

**PRO V&V**



# Test Plan

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

Prepared by: Wendy Owens

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**June 17, 2015**

# 1 Introduction

The purpose of this Test Plan is to document the procedures that Pro V&V, Inc. will follow 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.

At test conclusion, the results of all testing performed as part of this test campaign will be presented in a final report.

## 1.1 Scope

The scope of this testing event will incorporate a sufficient spectrum of physical and functional tests to verify that the ClearVote 1.0 System conforms to the State of Colorado Requirements. Specifically, the testing event has the following goals:

- Verify that the ClearVote 1.0 System meets the applicable Colorado-specific requirements for voting systems
- Ensure the ClearVote 1.0 System provides support for all Colorado election management requirements (i.e. ballot design, results reporting, recounts, etc.).
- Simulate pre-election, Election Day, absentee, recounts, and post-election activities on the ClearVote 1.0 System and corresponding components of the EMS.

## 1.2 References

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

- 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.*

### **1.3 Terms and Abbreviations**

The terms and abbreviations applicable to the development of this Test Plan 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

### **1.4 Testing Responsibilities**

All testing will be conducted under the guidance of Pro V&V by personnel verified by Pro V&V to be qualified to perform the testing. The examination shall be performed at the Pro V&V, Inc. test facility located in Huntsville, AL. If hardware testing is required, it will be performed at an off-site accredited third-party lab under the supervision of Pro V&V personnel.

### **1.5 Project Schedule**

The schedule for this project is contained in a Pro V&V-generated spreadsheet. This schedule is presented in Attachment B. The dates on the schedule are not firm dates but are estimates to completion based on multiple variables

## 2 Test Candidate

**Table 2-1: Vendor Name and Product Name and Model Number**

|   |                           |
|---|---------------------------|
| <b>Vendor/Manufacturer Information:</b> |                           |
| <b>Name:</b>                            | Clear Ballot Group        |
| <b>Address:</b>                         | 71 Summer Street, Suite 3 |
|   | Boston, MA 02110          |
| <b>Primary Point of Contact:</b>        | Ed Smith                  |
| <b>Product Name and Model Number:</b>   | ClearVote 1.0             |
| <b>Date of Submission:</b>              | May 12, 2015              |

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

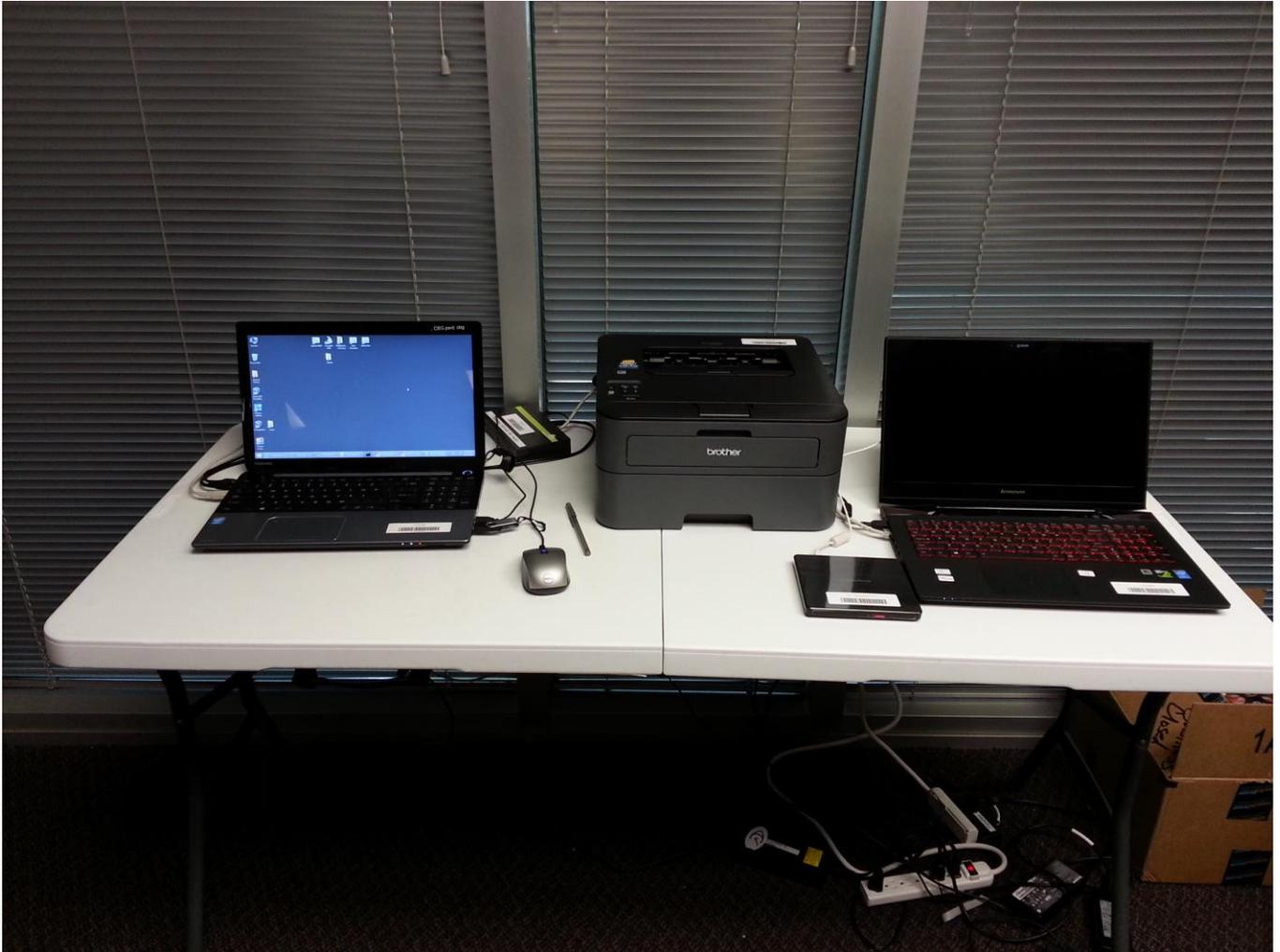
ClearCount is a central, high-speed, optical scan ballot tabulator coupled with ballot processing applications.



**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)



**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)

The follow table provides the software and hardware components of the ClearVote 1.0 System to be tested, identified with version numbers.

**Table 2-2: Firmware/Software Versions**

| State of Colorado<br>ClearVote System   | Firmware/Software<br>Version |
|---|------------------------------|
| <b>ClearVote System EMS Software Components</b>                               |                              |
| <b>ClearDesign</b>  | <b>1.0.0</b>                 |
| <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                        |

|   |        |
|---|--------|
| 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  |
| fastclick (JavaScript Tablet extension)                 | 1.0.6  |
| jquery-qrcode (JavaScript QRCode extension)             | 1.0.0  |
| <b>ClearVote System ClearAccess Software Components</b> |        |

|  |              |
|--|--------------|
| <b>ClearAccess</b>   | <b>1.0.0</b> |
| <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          |
| Chrome (Chrome Browser under Windows 8.1 Pro – <i>stations used as voting machines</i> ) | 43.0         |
| <b>ClearVote System ClearCount Software Components</b>                                   |              |
| <b>ClearCount</b>  | <b>1.0.7</b> |
| <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          |
| Microsoft Visual C++   | 2010 Express |
| Ubuntu Server Edition  | 13.04        |
| <i>Additional Product Installation Requirements</i>  |              |
| <p>Scanstation:</p> <ul style="list-style-type: none"> <li>• Fujitsu ScandAll Pro</li> <li>• Fujitsu scanner-specific drivers</li> <li>• Microsoft Windows 8.1 Pro</li> <li>• Firefox, Chrome, or Internet Explorer</li> </ul> |              |
| <p>Election Administration Station:</p> <ul style="list-style-type: none"> <li>• Firefox, Chrome, or Internet Explorer</li> <li>• Any operating system (e.g. Windows, Linux, iOS as examples)</li> </ul>                       |              |

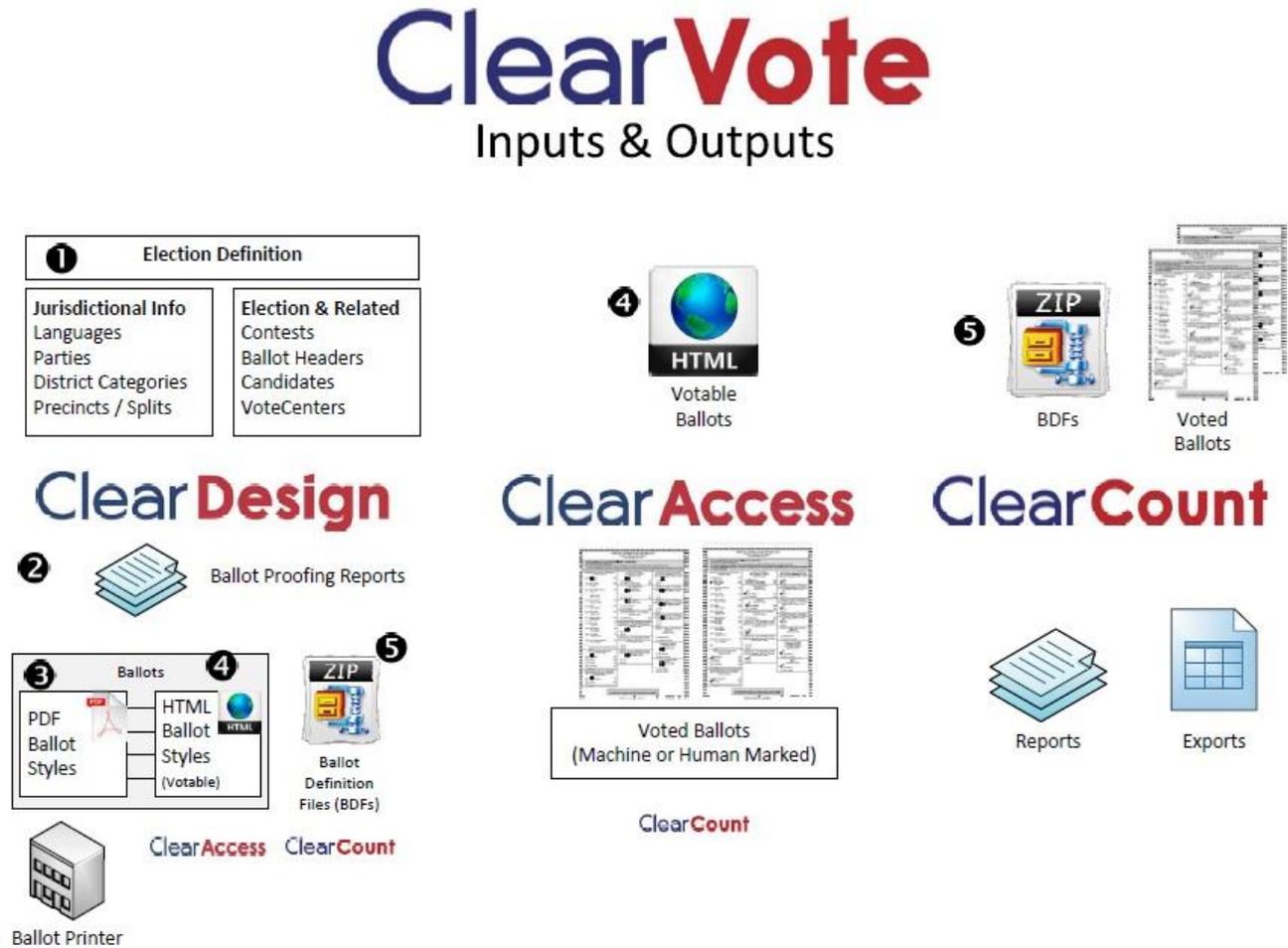
**Table 2-3: Hardware Versions**

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

|  |   |
|--|---|
| Origin Instruments Sip/Puff Breeze with Headset        | Model: BZ2<br>P/N: AC-0313-H2   |
| Over-Ear Stereo Headphones                             | Model: Hamilton Buhl<br>M/N: HA-7   |
| ElectionSource Table Top Voting Booth (Privacy Screen) | Model: VB-60B   |
| Brother Laser Printer                                  | Model: HL-L2340DW<br>S/N's:<br>U63879M4N628612,<br>U63879M4N628617 &<br>U63879M4N628535 |
| <i>ClearCount Components</i>                           |   |
| Toshiba Satellite Laptops                              | Model: S55-A5167<br>S/N: 1E098351S &<br>1E068199U                                       |
| Fujitsu Scanner  | Model: fi-7180<br>S/N: A2OD000798   |
| Fujitsu Scanner  | Model: fi-6800<br>S/N: A9HCA00737   |
| Lenovo USB Portable DVD Burner                         | Model: GP60NB50<br>S/N's: 411HV005130 &<br>411HR027583                                  |
| TP-LINK VPN Router                                     | Model: TL-R600VPN<br>S/N: 2149342000209   |

## 2.1 Test Candidate System Overview

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:



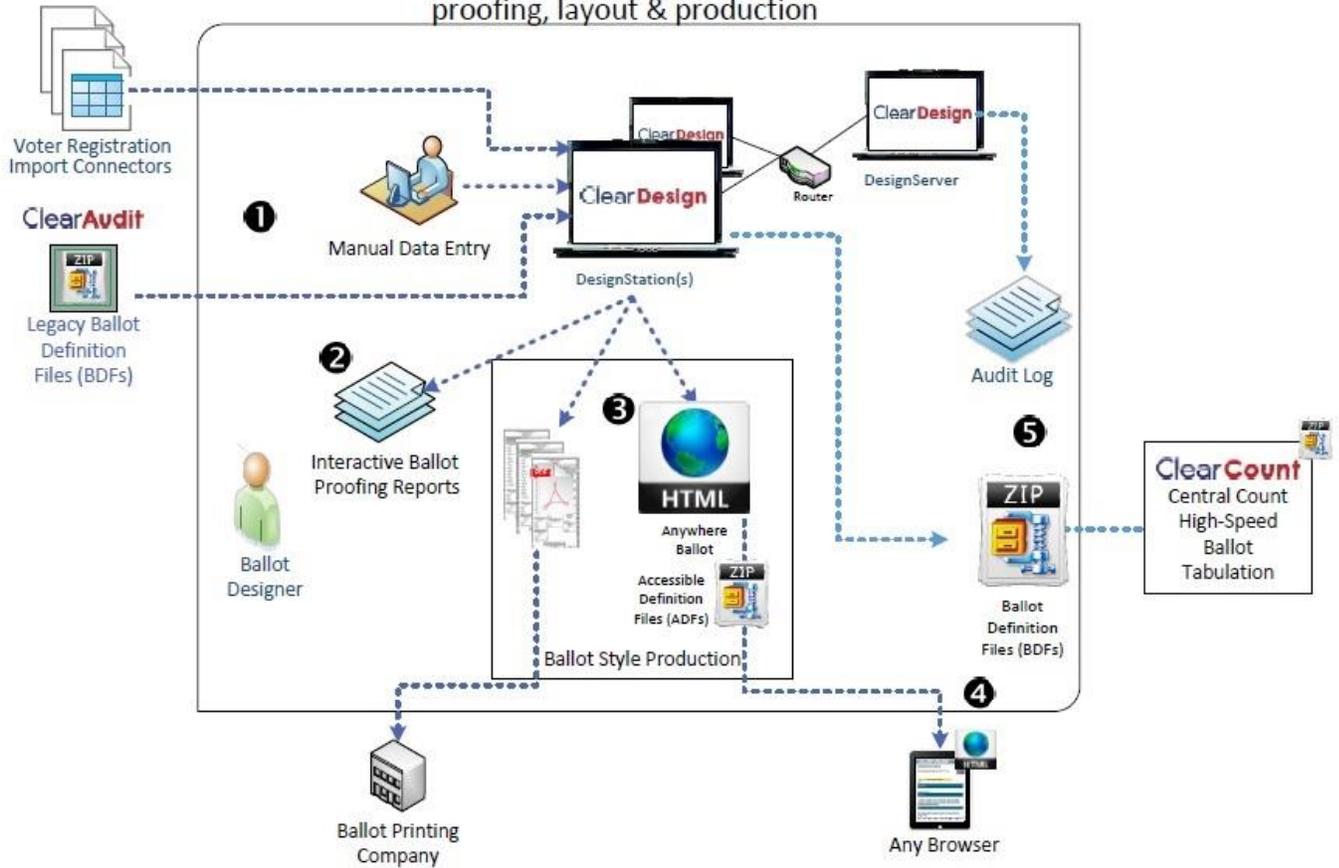
**Figure 2.1-1: ClearVote Inputs & Outputs**

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

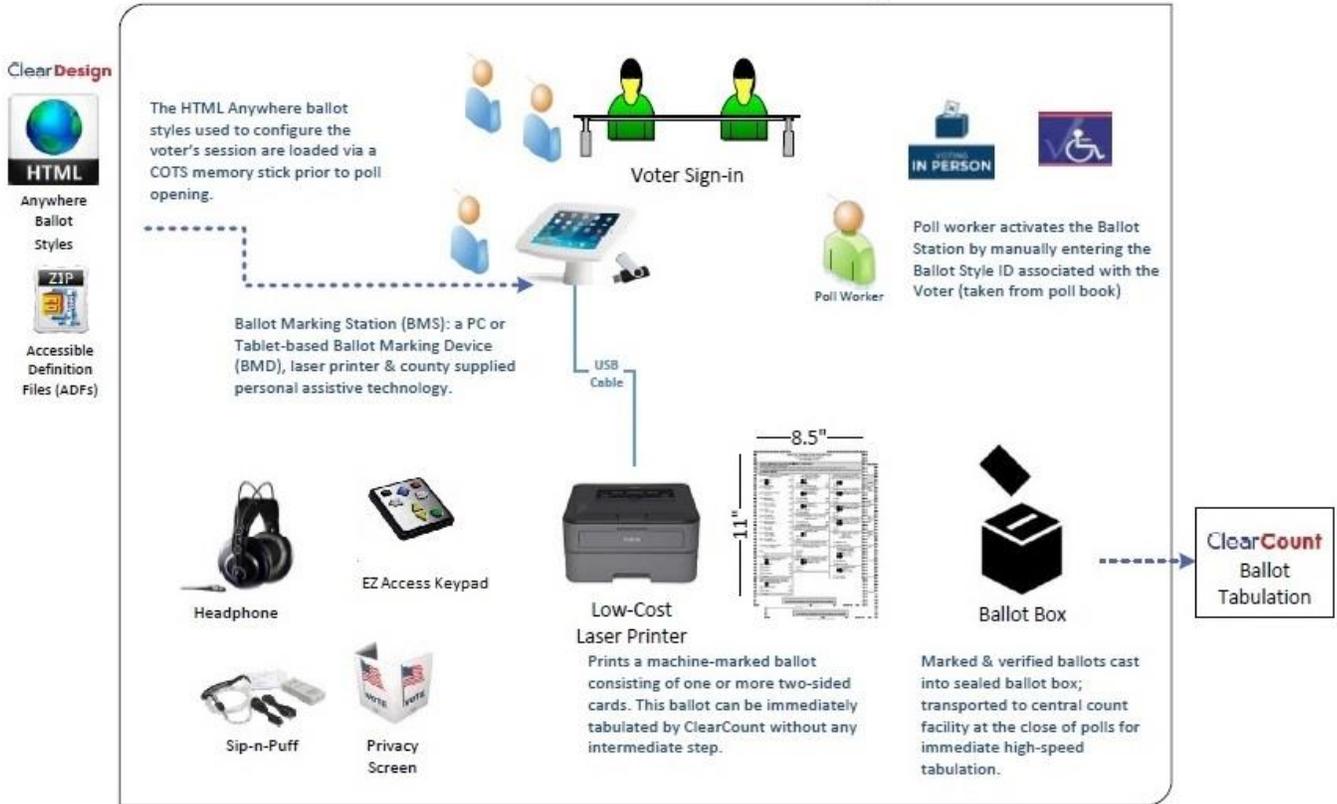


**Figure 2.1-2: ClearDesign**

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.

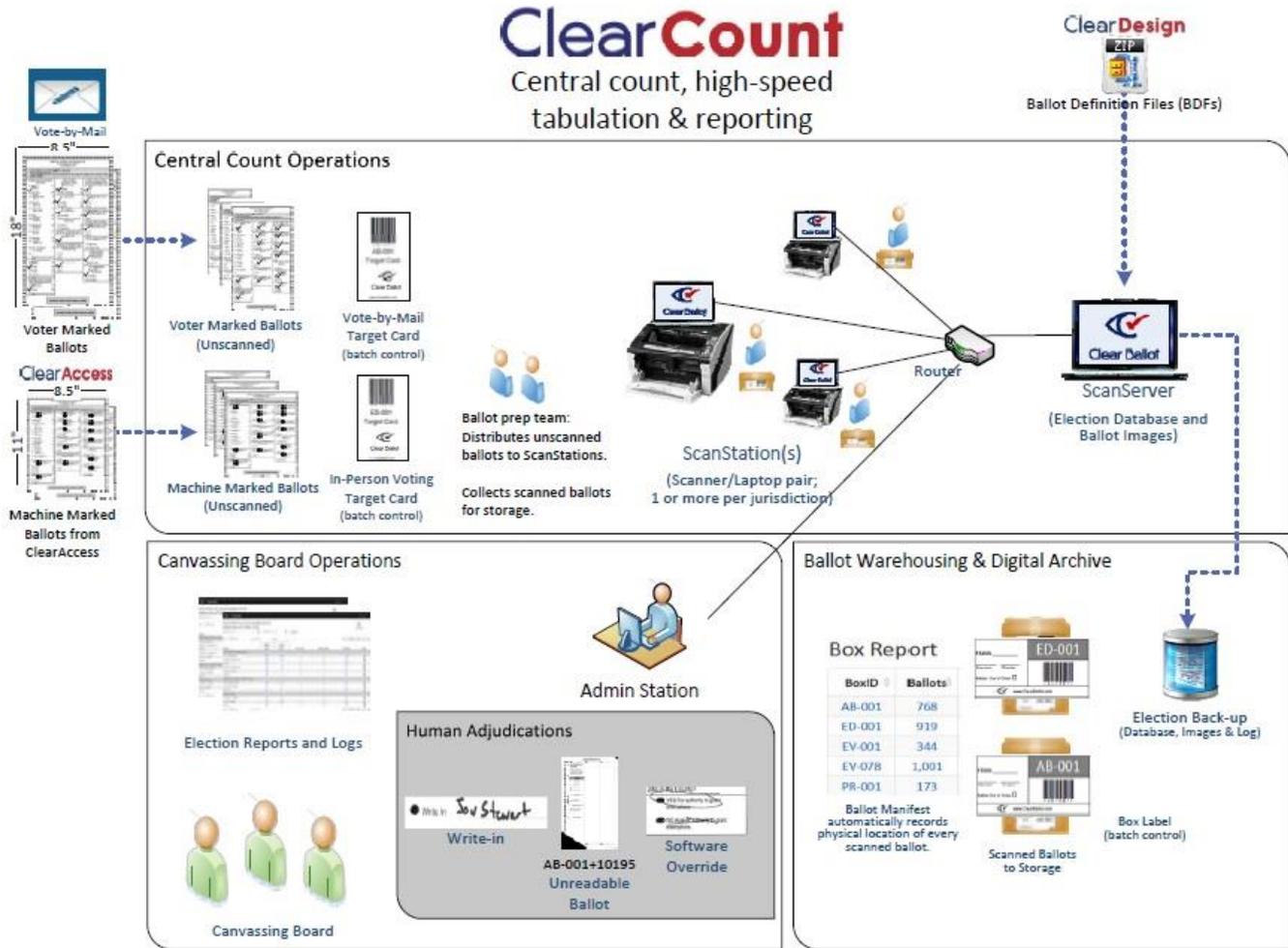
# ClearAccess

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.

## 2.2 Testing Configuration

The testing event will utilize 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 will consist of one ClearVote 1.0 System in a standalone configuration. In the pre-election phase of testing, ballots will be created utilizing ClearDesign, the EMS component of the ClearVote 1.0 System. Ballot styles will then be imported into

ClearAccess for ballot marking. Once ballots are marked and the polls are closed, ballot reconciliation procedures will be performed and the ballots will be tabulated by ClearCount, the central count tabulation and reporting component of the ClearVote 1.0 System.

Clear Ballot is expected to provide all previously identified software and equipment necessary for the test campaign along with the supporting materials listed in section 2.3.

### 2.3 Test Support Equipment/Materials

The following materials are expected to be supplied by Clear Ballot to facilitate testing:

- USB Flash Drives, PC Cards, Compact Flash, and Zip disks
- Test Decks
- Power Cords
- Ballot Paper
- Labels
- Other materials and equipment as required

### 2.4 Technical Data Package

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

**Table 2.4-1: Technical Data Package**

| Document Name                          | Document Number |
|--|-----------------|
| ClearVote 1.0 System Overview          | 100042-10001    |
| ClearDesign 1.0 System Overview        | 100043-10001    |
| ClearDesign 1.0 Security Specification | 100045-10001    |
| ClearDesign 1.0 Functional Description | 100046-10001    |
| ClearAccess 1.0 System Overview        | 100044-10001    |

|  |              |
|--|--------------|
| ClearDesign 1.0 Sample Test Scripts                      | ---          |
| Clear Ballot Group Scanning and Training Checklist       | ---          |
| ClearDesign Installation Procedure                       | ---          |
| ClearVote 1.0 System Hardware Specification, Version 1.3 | ---          |
| ClearVote 1.0 System Operations Procedures, Version 1.2  | 100024-10001 |
| ClearVote System Maintenance Manual, Version 1.2         | ---          |
| ClearVote Configuration Management Plan, Version 1.2     | 100003-10001 |
| ClearVote Functional Specification, Version 1.2          | 100021-10001 |
| ClearVote 1.0 Security Specification, Version 1.3        | ---          |

## 2.5 Third Party Test Reports

*This subsection lists the reports by third party entities that are relevant to the system being evaluated and the test engagement.*

**Table 2.5-1: Third Party Test Reports**

| Report Title | Revision | Issue Date |
|--------------|----------|------------|
| ----         | ----     | ----       |

### **3 Test Process**

The following procedure outlines the steps that the test team will execute to evaluate the ClearVote 1.0 System under the scope defined in Section 1.1.

#### **3.1 General Information**

All testing will be conducted under the guidance of Pro V&V by personnel verified by Pro V&V to be qualified to perform the testing. The examination shall be performed at the Pro V&V, Inc. test facility located in Huntsville, AL. If hardware testing is required, it will be performed at an off-site accredited third-party lab under the supervision of Pro V&V personnel.

#### **3.2 Test Cases/Procedures**

Pro V&V has will develop test procedures designed to evaluate the system being tested against the stated requirements. The test procedures can be executed independently.

Prior to execution of the required test procedures, the system under test will undergo testing initialization. The testing initialization will seek to establish the baseline for testing and ensure that the testing candidate matches the expecting testing candidate and that all equipment and supplies are present.

The following will be 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.

The procedures that will be utilized for this test engagement are summarized below (*Reference Attachment A*):

- 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 are entered on the TDP Review Checklist and are reported to the customer for disposition of any discrepancies. This process is ongoing until all discrepancies are resolved. Any revised documents during the TDP review process are compared with the previous document revision to determine changes made, and the document is re-reviewed to determine whether the discrepancies have been resolved.
- Trusted Build – The trusted build is a specific type of source code inspection. It consists of inspecting customer submitted source code, COTS, and Third Party software products and combining them to create the executable code. This inspection follows the documented process from the “United States Election Assistance Commission Voting System Test Laboratory Program Manual” Section 5.5 – 5.7. *Performance of the trusted build includes the build documentation review.*
- Functional Configuration Audit (FCA) – This area of testing targets the specific functionality claimed by the manufacturer to ensure the product functions as documented. This testing uses both positive and negative test data to test the robustness of the system. The FCA encompasses an examination of manufacturer tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer’s documentation submitted in the TDP (such as system operations, voter manual, maintenance, and diagnostic testing manuals). It includes a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities are 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.
- Accuracy – The accuracy test ensures that the voting system components can process ballot positions within the allowable target error rate. This test is designed to test the ability of the system to “capture, record, store, consolidate, and report” specific voter selections and absences of a selection.
- System Integration – The system level certification tests address the integration of the hardware and software. This testing focuses 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 is configured as would be for normal field use.
- Regression Testing – Regression testing will be performed on all 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.
- Physical Configuration Audit (PCA) – The PCA compares the voting system components submitted for testing to the manufacturer’s technical documentation.
- Security – During the execution of this test case, the system shall be inspected for various controls and measure that are in place 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
- Usability – This area of testing focuses on the usability of the system being tested. Usability is defined generally as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. In the context of voting, the primary user is the voter, the product is the voting system, and the task is the correct recording of the voter ballot selections. Additional requirements for task performance are independence and privacy: the voter should normally be able to complete the voting task without assistance from others, and the voter selections should be private. Lack of independence or privacy may adversely affect effectiveness and efficiency.
- Accessibility – This area of testing evaluates the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B). Ideally, every voter would be able to vote independently and privately. As a practical matter, there may be some number of voters whose disabilities are so severe that they will need personal assistance.

Nonetheless, these requirements are meant to make the voting system independently accessible to as many voters as possible.

- Reliability – The reliability of the system being evaluated will be measured during the performance of the system level tests.
- Maintainability – The maintainability of the system represents the ease with which preventive and corrective maintenance actions can be performed based on the design characteristics of the system being evaluated and the process the manufacturer has in place for prevention and reacting to failures.

#### **4 Conditions of Satisfaction**

The voting system will be 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, Pro V&V will execute tests, inspect resultant data and perform technical documentation reviews to ensure that each applicable requirement is met. The Requirements Matrix and the Conditions of Satisfaction for meeting each requirement will be included in the Final Test Report for this test campaign.

#### **5 Test Data**

The output test data will be collected and stored in an appropriate manner as to allow for data analysis. Actual results from executed tests will be recorded in real-time in Test Execution Logs.

#### **6 Test Report**

At test conclusion, a Test Report will be generated documenting all findings. Pro V&V will follow standard requirements for the format of the Test Report. The Recommendation section of the Test Report will follow the requirements of the NIST 150 Handbook for opinions and interpretations.

## 7 Agreement

Clear Ballot agrees to have the ClearVote 1.0 System evaluated using this Test Plan as presented with the understanding that the Test Plan is a dynamic document that may be modified as necessary in order to fulfill the requirements set forth by the State of Colorado for voting systems.

**Clear Ballot Voting Systems Representative**

**Date**

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## **Attachment A**

| <b>FUNCTIONAL CONFIGURATION AUDIT (FCA)</b>   |   |
|---|---|
| <b>Test Objective:</b> To determine if the voting system functions in accordance with all representations including attached peripherals.   | <b>Test Configuration:</b> Normal operational configuration   |
| <b>Equipment:</b>   | All system documentation submitted as part of the application.  |
| <b>Special Procedural Requirements:</b>   | The voting system will be configured per the system documentation submitted by the voting system manufacturer. The voting system firmware will be loaded by the examiner from a trusted source.   |
| <b>Assumptions:</b>   | This test is a system level test that requires all equipment and software that is being considered for certification.   |
| <b>Test Approach:</b>   | <p>During the performance of the functional configuration audit (FCA) each component and subcomponent of the voting system will be functionally evaluated as designed and documented. The FCA will depend heavily on black box testing techniques for the individual software components. The examiner will use “equivalence partitioning” and “boundary value testing” to evaluate the robustness and stability of the software submitted for evaluation.</p> <p>“Equivalence partitioning” will be used to evaluate specific software functions and data entry points. For software functions and data entry points, an entry will be made for valid data requirement and at least one invalid data requirement to test for normal and abnormal conditions. This can include the input of numeric values and special characters for alphabetic and text fields and may also include alphabetic and special characters for numeric fields.</p> <p>“Boundary value testing” will be used to evaluate specific software functions and data entry points for minimums and maximums. For software functions and data entry points an entry will be made for all minimum and all maximum documented requirements to test for normal and abnormal conditions. This can include numeric ranges as well as non-numeric ranges.</p> |
| <p><b>Test Method:</b><br/> The method for testing these requirements is execution. The Functional Configuration Audit (FCA) encompasses an examination of manufacturer tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer’s documentation submitted in the TDP (such as system operations, voter manual, maintenance, and diagnostic testing manuals). It includes a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities are categorized as follows by the phase of election activity in which they are required:</p> <p><u>Overall System Capabilities:</u> 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.</p> <p><u>Pre-voting Capabilities:</u> These functional capabilities are used to prepare the voting system for voting.</p> |   |

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.

During performance of the FCA, the examiner will input both positive and negative test data to trigger normal and abnormal conditions. If negative test data is allowed to be input, the examiner will continue the process of the data flow as document in the “mapping of the data life cycle” to ensure the negative testing data does not have an effect on downstream processes.

**Criteria for Evaluation of the Test Results:** At the conclusion of the FCA, the examiner will analyze all deficiencies and make a determination on the voting system’s ability to perform in accordance with all representations concerning functionality, usability, security, accessibility, and sustainability.

| <b>TECHNICAL DATA PACKAGE (TDP) REVIEW</b>  |  |
|---|--|
| <b>Test Objective:</b> To review and verify stated functionality in the TDP.  | <b>Test Configuration:</b> None                                |
| <b>Equipment:</b>   | All system documentation submitted as part of the application. |
| <b>Special Procedural Requirements:</b>   | None.  |
| <b>Assumptions:</b>   | None.  |
| <b>Test Approach:</b>   | Review.  |
| <p><b>Test Method:</b><br/> The method for testing these requirements is 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 reviewed documents are entered on the TDP Review Checklist and are reported to the customer for disposition of any discrepancies. This process is ongoing until all discrepancies are resolved. Any revised documents during the TDP review process are compared with the previous document revision to determine changes made, and the document is re-reviewed to determine whether the discrepancies have been resolved.</p> |  |
| <p><b>Criteria for Evaluation of the Test Results:</b> At the conclusion of the TDP Review, the examiner will verify that all deficiencies have been met.</p>   |  |

| <b>TRUSTED BUILD</b>  |                                 |
|---|---------------------------------|
| <b>Test Objective:</b> To executable code of the system under test.   | <b>Test Configuration:</b> None |
| <b>Equipment:</b>   | Build machine.                  |
| <b>Special Procedural Requirements:</b>   | None.                           |
| <b>Assumptions:</b>   | None.                           |
| <b>Test Approach:</b>   | Execution.                      |
| <p><b>Test Method:</b><br/> A Build Inspection will be performed in order to provide a chain of custody from the source to the machine to a readable application. It consists of combining inspected customer submitted source code, COTS, and Third Party software products in order to create the executable code (Software Under Test – SUT) with adequate security measures that provide confidence that the executable code is verifiable and a faithful representation of the source.</p> |                                 |
| <p><b>Criteria for Evaluation of the Test Results:</b> At the conclusion of the Trusted Build, executable code will be generated.</p>   |                                 |

| <b>RELIABILITY</b>   |   |
|--|---|
| <b>Test Objective:</b> The reliability of the system being evaluated will be measured during the performance of the system level tests.  | <b>Test Configuration:</b> As for normal operation. |
| <b>Equipment:</b>  | Voting system configured for normal use.            |
| <b>Special Procedural Requirements:</b>  | None.   |
| <b>Assumptions:</b>  | None.   |
| <b>Test Approach:</b>  | Execution.  |
| <p><b>Test Method:</b><br/> The system reliability will be evaluated throughout the test campaign. The data from each system level test will be combined to determine the acceptable MTBF of the system.</p> <p>A specific test for reliability will be conducted by utilizing a modified functional reliability test that is typically performed during the Temperature and Power Variation Test. This test will be conducted at standard ambient conditions. Ballots will be cast continually until test conclusion.</p> |   |
| <p><b>Criteria for Evaluation of the Test Results:</b> The voting system successfully completes the test with all actual results matching the expected results.</p>  |   |

**PHYSICAL CONFIGURATION AUDIT (PCA)**

**Test Objective:** The Physical Configuration Audit (PCA) compares the voting system components submitted for qualification to the manufacturer’s technical documentation. The PCA includes the following activities:

- Establish a configuration baseline of software and hardware to be tested; confirm whether the manufacturer’s documentation is sufficient for the user to install, validate, operate, and maintain the voting system.
- Verify software conforms to the manufacturer’s specifications; inspect all records of manufacturer’s release control system; if changes have been made to the baseline version, verify manufacturer’s engineering and test data are for the software version submitted for certification.
- Review drawings, specifications, technical data, and test data associated with system hardware (if non-COTS) to establish system hardware baseline associated with software baseline.
- Review manufacturer documents of user acceptance test procedures and data against system’s functional specifications; resolve any discrepancy or inadequacy in manufacturer’s plan or data prior to beginning system integration functional and performance tests.
- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation, are subject to re-examination

|   |   |
|---|---|
| <b>Equipment:</b>   | For the PCA, the manufacturer shall provide a list of all documentation and data to be audited, cross-referenced to the contents of the TDP, along with the following: <ul style="list-style-type: none"> <li>a. Identification of all items that are to be part of the software release</li> <li>b. Specification of compiler (or choice of compilers) to be used to generate executable programs</li> <li>c. Identification of all hardware that interfaces with the software</li> <li>d. Configuration baseline data for all hardware that is unique to the system</li> <li>e. Copies of all software documentation intended for distribution to users, including program listings, specifications, operations manual, voter manual, and maintenance manual</li> <li>f. User acceptance test procedures and acceptance criteria</li> </ul> |
| <b>Special Procedural Requirements:</b>   | None.   |
| <b>Assumptions:</b>   | None.   |
| <b>Test Approach:</b>   | Execution.  |
| <b>Test Method:</b> The PCA will be conducted in two phases:<br>Initial – Baseline the system prior to test commencement<br>Final – Verify final software and hardware configurations |   |

**Initial PCA**

1. Assigned test personnel will document each hardware and software component of the voting system by component name, model, serial number, major component, and any other relevant information needed to identify the component. Information will be recorded in the Engineering Log Book. Photographs of each hardware component will also be taken. All photographs taken shall include the following information: Manufacturer name, Pro V&V assigned job number, date, system name, component name.
2. Assigned test personnel will document if the components are COTS, modified COTS, or manufacturer-developed.
3. For COTS equipment, every effort will be made to verify that the COTS equipment has not been modified for use.
4. Assigned test personnel will document each piece of documentation submitted in the manufacturer TDP and record the document name, description, document number, revision number, and date of release.
5. Assigned test personnel will compile all data.

**Final PCA**

1. Assigned test personnel will verify that any changes made to the software, hardware, or documentation during the test process are fully and properly documented in the Engineering Log Book.
2. For the system hardware, assigned test personnel will verify that any changes made are documented and that all ECOs are properly implemented, and take photographs of any modified components.
3. Assigned test personnel will create a list of filenames and directories for each software component along with the software description, version, coding language, and unique identifier (digital signature or hash value).
4. A final list of all system documentation will be compiled that will include the document name, description, number, revision, and date.

**Criteria for Evaluation of the Test Results:** Assigned test personnel will compile all data for inclusion into the final report.

| <b>SECURITY</b>   |   |
|---|---|
| <p><b>Test Objective:</b></p> <p>The objectives of the security standards for voting systems are:</p> <ul style="list-style-type: none"> <li>• To protect critical elements of the voting system</li> <li>• To establish and maintain controls to minimize errors</li> <li>• To protect the system from intentional manipulation, fraud and malicious mischief</li> <li>• To identify fraudulent or erroneous changes to the voting system</li> <li>• To protect secrecy in the voting process</li> </ul>   | <p><b>Test Configuration:</b> Normal field use.</p> |
| <b>Equipment:</b>   | Manufacturer-submitted TDP.                         |
| <b>Special Procedural Requirements:</b>   | None.   |
| <b>Assumptions:</b>   | None.   |
| <b>Test Approach:</b>   | Execution and review.                               |
| <p><b>Test Method:</b></p> <p>During the Security Tests, the voting system shall be tested for:</p> <p><u>Access Control</u> – procedures and system capabilities that limit or detect access to critical system components in order to guard against loss of system integrity, availability, confidentiality, and accountability</p> <p><u>Physical Security</u> – physical security measures and procedures that prevent disruption of the voting process at the polling place and corruption of data</p> <p><u>Software Security</u> – standards that address the installation of software, including firmware, in the voting system and the protection against malicious software.</p> <p><u>Telecommunications and Data Transmission</u> – standards that address security for the electronic transmission of data between system components or locations over private, public, and wireless networks</p> <p><u>Use of Public Communications Networks</u> – standards that address security for systems that communicate individual votes or vote totals over public communications networks</p> <p><u>Wireless Communications</u> – address the security of the voting system and voting data when wireless is used</p> <p><u>Independent Verification Systems</u> – the requirements for DREs with voter verifiable paper audit trails</p> |   |
| <p><b>Criteria for Evaluation of the Test Results:</b></p> <ol style="list-style-type: none"> <li>1. Verify that the manufacturer’s TDP contains documented access and physical controls.</li> <li>2. Following the manufacturer’s documented procedures, configure the voting system for use and functionally verify that the documented controls are in place and adequate and meet the stated requirements.</li> </ol>   |   |

| <b>USABILITY</b>   |  |
|--|--|
| <p><b>Test Objective:</b><br/> Voting systems shall be designed in such a way that they can be used by voters in a way that is comfortable, efficient, and that provides voters with confidence that they have cast their votes effectively. During the Usability test, the following principles shall be addressed:</p> <ol style="list-style-type: none"> <li>1. All eligible voters shall have access to the voting process without discrimination.</li> <li>2. Each cast ballot shall accurately capture the selections made by the voter.</li> <li>3. The voting process shall preserve the secrecy of the ballot.</li> </ol>   | <p><b>Test Configuration:</b> Normal field use.</p>                  |
| <p><b>Equipment:</b></p>   | <p>Manufacturer-submitted TDP, voting system configured for use.</p> |
| <p><b>Special Procedural Requirements:</b></p>   | <p>None.</p>   |
| <p><b>Assumptions:</b></p>   | <p>None.</p>   |
| <p><b>Test Approach:</b></p>   | <p>Execution and review.</p>   |
| <p><b>Test Method:</b></p> <ol style="list-style-type: none"> <li>1. Following the manufacturer’s documented instructions, assigned test personnel shall setup and configure the voting system as for normal operation at the polling place, with privacy screens and peripheral devices in place.</li> <li>2. Perform the Operational Status Check that has been developed specifically for the system under test.</li> <li>3. Verify that each function and capability operates as expected and documented. Specifically, verify that: <ol style="list-style-type: none"> <li>a. Instructions on system operation are clear and concise</li> <li>b. The ballot is displayed on the system in a manner that is clear and usable</li> <li>c. The voting process is clear</li> <li>d. There is a way to verify and accept or modify ballot selections prior to the casting of a ballot</li> <li>e. The voting system notifies the voter upon successful casting of the ballot</li> <li>f. 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)</li> <li>g. 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)</li> <li>h. The voting system shall notify the voter before the ballot is cast and counted of the</li> </ol> </li> </ol> |  |

effect of making more than the allowable number of selections for a contest

- i. 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
- j. The voting system shall allow the voter, at his or her choice, to submit an undervoted ballot without correction
- k. DRE voting machines shall allow the voter to change a vote within a contest before advancing to the next contest
- l. 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)
- m. The system is capable of presenting the ballot, ballot selections, review screens and instructions in any language required by state or federal law or stated to be supported by the manufacturer
- n. The voting system supports a voting process that does not introduce any bias for or against any of the selections to be made by the voter and that contest choices are presented in an equivalent manner.
- o. The voting system provides clear instructions and assistance to allow voters to successfully execute and cast their ballots independently
- p. The voting system provides the capability to design a ballot for maximum clarity and comprehension.
- q. 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.
- r. The use of color by the voting system should agree with common conventions: (a) green, blue or white is used for general information or as a normal status indicator; (b) amber or yellow is used to indicate warnings or a marginal status; (c) red is used to indicate error conditions or a problem requiring immediate attention.
- s. The voting process is designed to minimize perceptual difficulties for the voter.
- t. The system is designed to minimize interaction difficulties for the voter.
- u. When deployed according to the manufacturer instructions, the voting system shall prevent others from observing the contents of a voter's ballot.

**Criteria for Evaluation of the Test Results:** The manufacturer's submitted TDP contains all required information and the system being evaluated meets the required standards for usability,

| <b>ACCESSIBILITY</b>   |  |
|--|--|
| <p><b>Test Objective:</b><br/> Voting systems shall be designed in such a way that they can be used by voters in a way that is comfortable, efficient, and that provides voters with confidence that they have cast their votes effectively. During the Accessibility test, the following principles shall be addressed:</p> <ol style="list-style-type: none"> <li>1. All eligible voters shall have access to the voting process without discrimination.</li> <li>2. Each cast ballot shall accurately capture the selections made by the voter.</li> <li>3. The voting process shall preserve the secrecy of the ballot.</li> </ol>   | <p><b>Test Configuration:</b> Normal field use.</p>                  |
| <p><b>Equipment:</b></p>   | <p>Manufacturer-submitted TDP, voting system configured for use.</p> |
| <p><b>Special Procedural Requirements:</b></p>   | <p>None.</p>   |
| <p><b>Assumptions:</b></p>   | <p>None.</p>   |
| <p><b>Test Approach:</b></p>   | <p>Execution and review.</p>   |
| <p><b>Test Method:</b></p> <ol style="list-style-type: none"> <li>1. Following the manufacturer’s documented instructions, assigned test personnel shall setup and configure the voting system as for normal operation at the polling place, with privacy screens and peripheral devices in place.</li> <li>2. Perform the Operational Status Check that has been developed specifically for the system under test.</li> <li>3. Verify that each function and capability operates as expected and documented. Specifically, verify that: <ul style="list-style-type: none"> <li>– All messages posted on a voting machine are also posted in a format that can be utilized by the visually impaired</li> <li>– All messaged and instructions presented to a voter that is voting in any alternate method are the same instructions that are presented to a standard voter</li> <li>– Voting can be completed with items provided within the voting system or detailed in the TDP as supplied by the Polling Station. Disabled voters are not required to bring special devices with them in order to vote successfully</li> <li>– If the voting system utilizes biometric measures that requires a voter to possess particular biological characteristics, the voting process shall provide a secondary means that does not depend on those characteristics</li> <li>– The accessible voting system is accessible to voters with visual disabilities.</li> </ul> </li> </ol> |  |

- The accessible voting system is accessible to voters who are blind.
- The voting process shall be accessible to voters who lack fine motor control or use of their hands.
- The voting process shall be accessible to voters who use mobility aids, including wheelchairs.
- The voting process shall be accessible to voters with hearing disabilities.
- The voting process does not require speech for its operation.
- For voters who lack proficiency in reading English, or whose primary language is unwritten, the voting equipment shall provide spoken instructions and ballots in the preferred language of the voter, consistent with state and federal law

**Criteria for Evaluation of the Test Results:** The manufacturer's submitted TDP contains all required information and the system being evaluated meets the required standards for accessibility.

| <b>MAINTAINABILITY</b>  |   |
|---|---|
| <p><b>Test Objective:</b><br/> Maintainability represents the ease with which maintenance actions can be performed based on the design characteristics of equipment and software and the processes the vendor and election officials have in place for preventing failures and for reacting to failures. Maintainability includes the ability of equipment and software to self-diagnose problems and make non-technical election workers aware of a problem. Maintainability addresses all scheduled and unscheduled events, which are performed to:</p> <ul style="list-style-type: none"> <li>• Determine the operational status of the system or a component</li> <li>• Adjust, align, tune or service components</li> <li>• Repair or replace a component having a specified operating life or replacement interval</li> <li>• Repair or replace a component that exhibits an undesirable predetermined physical condition or performance degradation</li> <li>• Repair or replace a component that has failed</li> <li>• Verify the restoration of a component or the system to operational status</li> </ul> | <p><b>Test Configuration:</b> Normal field use.</p>           |
| <b>Equipment:</b>   | Manufacturer-submitted TDP, voting system configured for use. |
| <b>Special Procedural Requirements:</b>   | None.   |
| <b>Assumptions:</b>   | None.   |
| <b>Test Approach:</b>   | Execution and review.   |
| <p><b>Test Method:</b></p> <ol style="list-style-type: none"> <li>1. Assigned test personnel shall evaluate the manufacturer technical documentation to verify that all maintenance activities are identified.</li> <li>2. Assigned test personnel shall verify the following physical attributes of the voting system: <ol style="list-style-type: none"> <li>a. Presence of labels and the identification of test points</li> <li>b. Provision of built-in test and diagnostic circuitry or physical indicators of condition</li> <li>c. Presence of labels and alarms related to failures</li> <li>d. Presence of features that allow non-technicians to perform routine maintenance tasks (such as update of the system database)</li> </ol> </li> <li>3. Assigned test personnel shall assess the following additional attributes: <ol style="list-style-type: none"> <li>a. Ease of detecting that equipment has failed by a non-technician</li> <li>b. Ease of diagnosing problems by a trained technician</li> </ol> </li> </ol>  |   |

- c. Low false alarm rates (i.e., indications of problems that do not exist)
- d. Ease of access to components for replacement
- e. Ease with which adjustment and alignment can be performed
- f. Ease with which database updates can be performed by a non-technician
- g. Adjust, align, tune or service components

**Criteria for Evaluation of the Test Results:** The manufacturer's submitted TDP contains all required information and the system being evaluated meets the required standards for maintainability.

| <b>ACCURACY</b>   |  |
|---|--|
| <b>Test Objective:</b><br>The Logic and Accuracy Test is designed to test the ability of the voting system to capture, record, store, consolidate, and report the specific selections, and absence of selections, made by the voter for each ballot position without error.   | <b>Test Configuration:</b> Normal field use. |
| <b>Equipment:</b>   | Voting system configured for use.            |
| <b>Special Procedural Requirements:</b>   | None.  |
| <b>Assumptions:</b>   | None.  |
| <b>Test Approach:</b>   | Execution.                                   |
| <b>Test Method:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Using the developed election definition, generate a test deck of paper ballots.</li> <li>2. Following the manufacturer instructions, complete all steps necessary to open the polls and print the zero totals report.</li> <li>3. Determine the number of times the test deck will be run to achieve the target of 1,549,703 ballot positions.</li> <li>4. Review and sign the zero totals report.</li> <li>5. Run the test deck the determined number of times.</li> <li>6. Following the manufacturer’s instructions, complete all steps necessary to close the polls, perform precinct level tabulations, and export the ballot results.</li> <li>7. Following the manufacturer’s instructions, complete all steps necessary steps to import all election results into the EMS/Central Tabulation.</li> <li>8. Following the manufacturer’s instructions, complete all steps necessary steps to print, export, and review the audit log.</li> <li>9. At Central Tabulation site, perform all steps necessary to import the totals (including absentee ballots), resolve irregular ballots (write-ins, etc.), consolidate votes from all precinct components, finalize results, print all results, and print the audit log</li> </ol> |  |
| <b>Criteria for Evaluation of the Test Results:</b> The voting system successfully completes the test with all actual results matching the expected results.  |  |

| <b>SYSTEM INTEGRATION</b>  |   |
|--|---|
| <p><b>Test Objective:</b><br/>This test addresses the integrated operation of both hardware and software, along with any telecommunications capabilities. System integration includes the cumulative results of functional testing, Volume and Stress, Logic and Accuracy, Security and Usability, as well as the PCA and FCA. The primary objective of system integration testing is to validate that the voting system functions correctly.</p>  | <p><b>Test Configuration:</b> Normal field use.</p> |
| <p><b>Equipment:</b></p>   | <p>Voting system configured for use, TDP</p>        |
| <p><b>Special Procedural Requirements:</b></p>   | <p>None.</p>  |
| <p><b>Assumptions:</b></p>   | <p>PCA has been completed.</p>                      |
| <p><b>Test Approach:</b></p>   | <p>Execution and review</p>                         |
| <p><b>Test Method:</b></p> <ol style="list-style-type: none"> <li>1. The assigned test personnel will review the TDP to determine the declared capabilities of the system being tested.</li> <li>2. The assigned test personnel will perform the PCA as required which includes documenting each system hardware and software component.</li> <li>3. Election definitions will be created to cover all voting variations support by the system. This data will be input into test cases that will be utilized to baseline the system.</li> <li>4. Following the manufacturer’s documented instruction, completes all steps necessary to perform the following steps: <ol style="list-style-type: none"> <li>1. Use EMS to input election definitions into the voting system</li> <li>2. Print pre-election reports.</li> <li>3. Load election media.</li> <li>4. Load machines with election information.</li> <li>5. Configure voting system for voting by opening polls and printing the zero report.</li> <li>6. Input voting data as required by the test cases.</li> <li>7. Perform actions required to close polls, perform precinct level tabulations, print totals report, and export the results.</li> <li>8. Perform actions required to import all election results into the EMS/Central Tabulation.</li> <li>9. Perform all steps necessary to import the totals, consolidate votes from all precinct components, finalize results, print all results, and print the audit log.</li> </ol> </li> </ol> |   |
| <p><b>Criteria for Evaluation of the Test Results:</b> The voting system successfully completes the test with all actual results matching the expected results.</p>  |   |

## **Attachment B**

## PROJECT SCHEDULE

| Task Name                           | Start           | End Date        | % Complete | Duration  | Predecessors |
|-------------------------------------|-----------------|-----------------|------------|-----------|--------------|
| <b>TDP</b>                          | <b>05/11/15</b> | <b>06/24/15</b> | <b>25%</b> | <b>32</b> |              |
| Functional Description Review       | 05/11/15        | 05/26/15        | 25%        | 3         |              |
| Final Functional Review             | 06/19/15        | 06/24/15        | 0%         | 3         | 19           |
| <b>Test Plan</b>                    | <b>05/11/15</b> | <b>05/27/15</b> | <b>0%</b>  | <b>13</b> |              |
| Test Plan Creation                  | 05/11/15        | 05/21/15        | 90%        | 10        |              |
| Vendor Review & Comments            | 05/22/15        | 05/26/15        | 0%         | 2         | 6            |
| Test Plan Finalized                 | 05/27/15        | 05/27/15        | 0%         | 1         | 7            |
| <b>Source Code</b>                  | <b>05/21/15</b> | <b>06/15/15</b> | <b>50%</b> | <b>6</b>  |              |
| Document Review                     | 05/21/15        | 05/22/15        | 30%        | 2         | 8            |
| Trusted Build                       | 05/25/15        | 05/28/15        | 60%        | 4         | 10           |
| <b>System Loads &amp; Hardening</b> | <b>05/18/15</b> | <b>06/18/15</b> | <b>25%</b> | <b>8</b>  |              |
| Equipment Delivered                 | 05/18/15        | 05/19/15        | 100%       | 1         |              |
| PCA                                 | 05/22/15        | 06/05/15        | 90%        | 1         | 13           |
| System Loads & Hardening            | 05/26/15        | 06/18/15        | 0%         | 6         | 11           |
| <b>Hardware Testing</b>             | <b>06/23/15</b> | <b>06/24/15</b> | <b>0%</b>  | <b>1</b>  |              |
| Maintainability                     | 06/03/15        | 06/03/15        | 0%         | 1         | 15           |
| <b>System Level Testing</b>         | <b>06/04/15</b> | <b>06/30/15</b> | <b>0%</b>  | <b>17</b> |              |
| FCA                                 | 06/04/15        | 06/24/15        | 0%         | 15        | 17           |
| Reliability                         | 06/04/15        | 06/19/15        | 0%         | 12        | 17           |
| Security                            | 06/25/15        | 06/26/15        | 0%         | 2         | 19           |
| Usability                           | 06/22/15        | 06/24/15        | 0%         | 3         | 20           |
| Accessibility                       | 06/22/15        | 06/24/15        | 0%         | 3         | 20           |
| Accuracy                            | 06/24/15        | 06/29/15        | 0%         | 3         | 17           |
| System Integration                  | 06/29/15        | 06/29/15        | 0%         | 4         | 24           |
| Regression Testing                  | 06/30/15        | 06/30/15        | 0%         | 2         | 25           |
| <b>Test Report</b>                  | <b>06/19/15</b> | <b>07/06/15</b> | <b>0%</b>  | <b>12</b> |              |
| Test Report Creation                | 06/19/15        | 06/30/15        | 0%         | 8         | 15           |
| Vendor Review & Comments            | 07/01/15        | 07/02/15        | 0%         | 2         | 28           |
| Test Report Finalized               | 07/03/15        | 07/06/15        | 0%         | 2         | 26           |