



Test Report

**Election Systems & Software (ES&S)
Voting System (EVSFL) 6.0.6.0
Hardware Testing**

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1.0 INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform hardware testing on components of the Election Systems and Software (ES&S) Voting System EVS FL 6.0.6.0 (EVSFL6.0.6.0) to the hardware test requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0.

1.1 References

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

- ES&S Voting System EVS FL 6.0.6.0 System Change Notes, Document Revision 1.1
- 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, 2020 Edition, “NVLAP Procedures and General Requirements (NIST Handbook 150)”, dated July 2020
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2017 Edition, “Voting System Testing (NIST Handbook 150-22)”, dated July 2017
- 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)
- ES&S Voting System EVS 5.3.4.1 Technical Data Package (*A listing of the TDP documents submitted for this test campaign is included in Section 3.3.1 of this Test Report*)

1.2 Terms and Abbreviations

“COTS” – Commercial Off-The-Shelf

“EAC” – Election Assistance Commission

“ES&S” Election Systems & Software LLC

“PCA” – Physical Configuration Audit

“TDP” – Technical Data Package

“VVSG” – Voluntary Voting System Guidelines

1.3 Description of Modification

ES&S Voting System EVS FL 6.0.6.0 (EVSFL6060) is based on the previously EAC-certified EVS6040. Hardware configuration changes introduced as part of this release include new configuration options and modifications to existing products. This release introduces the DS950, a new high-speed central count scanner and tabulator with ballot sorting capabilities.

Additionally, this release introduces ExpressVote end-of-life hardware replacements for select internal and external batteries.

ES&S has identified the following hardware modifications which are incorporated into the EVSFL6060 system:

Hardware Configuration Changes

New Hardware:

- DS950: introduced new high-speed central count scanner and tabulator

Hardware Modifications:

- ExpressVote updated the following components to replace end-of-life parts:
 - Main battery pack
 - CMOS battery

1.4 Scope of Testing

Pro V&V performed an evaluation of the results from the previous test campaign along with the submitted hardware changes made to the system to determine the scope of testing required for the submitted modification. It was determined the following tasks would be required to verify compliance of the VVPAT:

- Technical Data Package (TDP) Review

A limited TDP Review was performed to ensure that all submitted modifications were accurately documented and that the documents meet the requirements of the EAC VVSG, Version 1.0.

- Physical Configuration Audit (PCA)

A PCA was performed to compare the voting system submitted for certification testing to the manufacturer’s technical documentation.

- Hardware Testing

The full suite of hardware electrical and all applicable environmental testing, as detailed in the EAC VVSG 1.0, was performed on the DS950. For the ExpressVote end-of-life battery replacement, one hardware version was subjected to select electrical testing. Third party testing was utilized during the performance of hardware testing, with the exception of the Electrical Supply Test. All testing was witnessed on-site by Pro V&V personnel.

2.0 TESTING OVERVIEW

The evaluation of EVSFL6060 was designed to verify the submitted hardware changes, which have been modified from the certified baseline system, conform to the applicable EAC VVSG 1.0 requirements.

The evaluation addressed each of the test goals in the following manner:

Table 1-1: Testing Overview

Test Goal	Testing Response
Perform TDP Modification Review	A cursory review of the modified documents was performed to ensure that adequate system information exists
Perform PCA & Receipt Inspection	A PCA and Receipt Inspection were performed to compare the voting system components and materials submitted for testing against the manufacturer’s technical documentation to ensure everything was in agreement and correct.
Hardware Testing	The full suite of hardware electrical and all applicable environmental testing, as detailed in the EAC VVSG 1.0, was performed on the DS950. Select electrical testing was performed on one hardware version of the ExpressVote. Third party testing was utilized during the performance of hardware testing, with the exception of the Electrical Supply Test. All testing was witnessed on-site by Pro V&V personnel.

2.1 Test Candidate

A description of the system tested, as taken from the manufacturer's submitted technical documentation, is provided in the paragraphs below. Note: Only the DS950 and the ExpressVote HW2.1 were tested during this test campaign.

EVSFL6060 includes the following hardware: ExpressVote XL Full-Face Universal Voting System (ExpressVote XL), ExpressVote Universal Voting System Hardware 1.0 (ExpressVote HW1.0), ExpressVote Universal Voting System Hardware 2.1 (ExpressVote HW2.1), DS450 High-Throughput Central Tabulator, DS850 High-Speed Central Tabulator (DS850), DS950 High-Speed Central Tabulator (DS950), and DS200 Precinct-Based Tabulator (DS200).

ExpressVote XL Full-Face Universal Voting System (ExpressVote XL)

ExpressVote XL is a hybrid paper-based polling place voting device that provides a full-face touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, and tabulation scanning into a single unit.

ExpressVote Hardware 1.0 (ExpressVote HW1.0)

ExpressVote HW1.0 is a hybrid paper-based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, to be scanned for tabulation in any one of the ES&S precinct or central scanners.

ExpressVote Hardware (ExpressVote HW2.1)

ExpressVote HW2.1 is a hybrid paper-based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, and tabulation scanning into a single unit. ExpressVote HW2.1 is capable of operating in either marker or tabulator mode, depending on the configurable mode that is selected in Electionware.

DS200 Precinct-based Scanner and Tabulator (DS200)

DS200 is a polling place paper-based voting system, specifically a digital scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

DS450 High-Throughput Scanner and Tabulator (DS450)

DS450 is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

DS850 High-Speed Scanner and Tabulator (DS850)

DS850 is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

DS950 High-Speed Scanner and Tabulator (DS850)

The DS950 is a high-speed central count scanner and tabulator with ballot sorting capabilities. It can scan a variety of ballot sizes, including vote summary cards, and it can read both sides of the ballots in any of four orientations, even folded ballots. The DS950 scans, tabulates, and automatically sorts ballots, separating them into one of three discrete output bins without interrupting scanning. Optionally, this device may be configured to transmit tabulation results to the results server through a closed network connection rather than using physically transported USB flash drives. The DS950 is mounted on a cart with supporting equipment, including a laser printer and UPS.

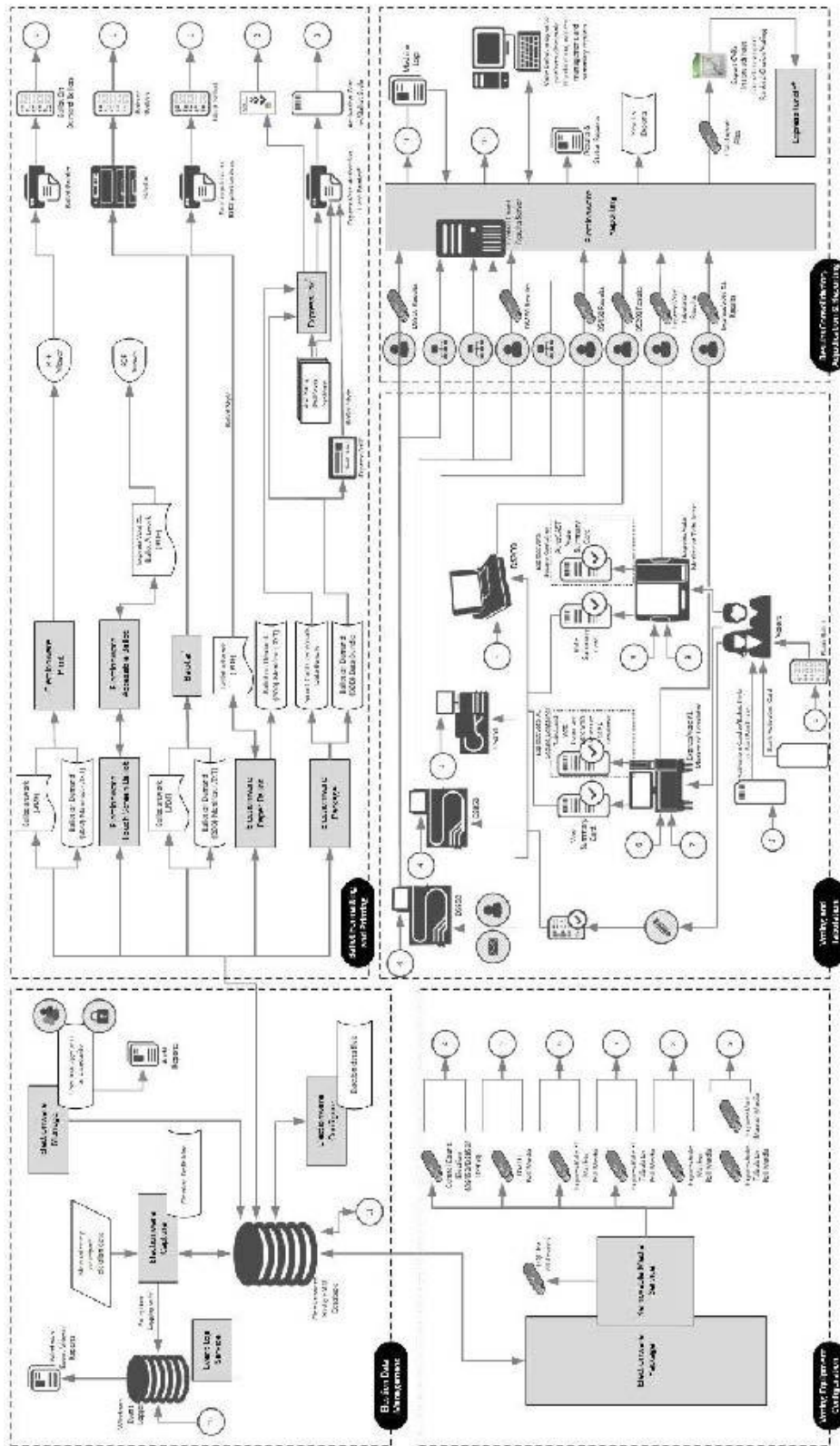


Figure 2.1 Voting System Overview

Table 2-1 lists the software components of the EVSFL6060 that were evaluated during testing.

Table 2-1: EVSFL6060 System Hardware Components

System Component	Software or Firmware Version	Hardware Version(s)	Description
DS950	3.5.0.0	1.0	High-Speed Central Scanner and Tabulator
ExpressVote HW2.1	2.6.0.0	2.1 2.1.2.0	Hybrid paper-based vote capture and selection device and precinct count tabulator

3.3.3 Hardware Testing

The identified EVSFL6060 components were subjected to the hardware tests listed below:

Electrical Testing

- Electrical Power Disturbance*
- Radiated Emissions
- Conducted Emissions*
- Electrostatic Disruption*
- Electromagnetic Susceptibility
- Electrical Fast Transient
- Lightning Surge*
- Conducted RF Immunity
- Magnetic Fields Immunity
- Electrical Supply
- Safety

Environmental Tests:

- Low Temperature
- High Temperature
- Humidity
- Temperature Power Variation*

**Denotes testing for the ExpressVote HW2.1*

Pro V&V utilized third party testing during the performance of hardware testing. All hardware testing was performed at the NTS Longmont facility located in Longmont, Colorado. All testing was witnessed on-site by Pro V&V personnel, with the exception of Temperature Power Variation in which Pro V&V qualified staff executed all testing at the NTS Longmont facility.

Summary Findings

Electrical Testing was performed on the components listed above. The procedures and results for this testing are included in NTS Test Report ETR-PR120980-00 Revision 0, presented in Attachment A, Part 1, and NTR Test Report ITR-PR120980-00 Revision 0, presented in Attachment A, Part 2.

The test results from this testing are summarized below:

Table 3-2. Electrical Hardware Test Results

Standard/Method	Description	Criteria	Class/Level	Result
FCC 15.107 ICES-003 VVSG Vol. 1 4.1.2.9	Power Line Conducted Emissions	N/A	Class B	Compliant
FCC 15.109 ICES-003 VVSG Vol. 1 4.1.2.9	Radiated Emissions	N/A	Class B	Compliant
EN61000-4-11 VVSG Vol. 1 4.1.2.5	Electrical Power Disturbance	Normal Operation & No Data Loss	Various	Compliant
EN61000-4-4 VVSG Vol. 1 4.1.2.6	Electrical Fast Transient	Normal Operation & No Data Loss	±2kV - Mains	Compliant
EN61000-4-5 VVSG Vol. 1 4.1.2.7	Lightning Surge	Normal Operation & No Data Loss	±2kV Line - Line ±2kV Line - Ground	Compliant
EN61000-4-2 VVSG Vol. 1 4.1.2.8	Electrostatic Disruption	Normal Operation & No Data Loss	±8kV Contact ±15kV Air	Compliant
EN61000-4-3 VVSG Vol. 1 4.1.2.10	Electromagnetic Susceptibility	Normal Operation & No Data Loss	10 V/m, 80 MHz – 1 GHz	Compliant
EN61000-4-6 VVSG Vol. 1 4.1.2.11	Conducted RF Immunity	Normal Operation & No Data Loss	10 Vrms, 150 kHz – 80 MHz	Compliant
EN61000-4-8 VVSG Vol. 1 4.1.2.12	Magnetic Immunity	Normal Operation & No Data Loss	30 A/m	Compliant
EN62368-1 UL62368-1 VVSG Vol. 1 4.38	Safety	Normal Operation & No Data Loss		Compliant
Overall Result				Pass/Compliant

The Electrical Supply portion of the Electrical Testing was performed at Pro V&V's test facility. The DS950 completed the test requirements successfully with no deficiencies noted. Test Result – PASS

Environmental Testing was performed on the components listed above. The procedures and results for this testing are included in NTS Test Report TR-PR120980-1 Revision 1, presented in Attachment A, Part 3 and NTS Test Report TR-PR120980 Revision 2, presented in Attachment A, Part 4.

The test results from this testing are summarized below:

Low Temperature - Storage (MIL-STD-810D, 502.2, II-3)

The DS950 was subjected to Low Temperature – Storage Testing. Samples were subjected to a temperature of -4°F (-20°C +/-3 °C) for a duration of 4 hours, after which operation was confirmed by Pro V&V. Samples were not powered, and were left in their packaging for the duration of the test. They were removed from the boxes for operational verification after the test. At the conclusion of testing, a visual inspection and an operational status check was performed. Test Result – PASS

High Temperature - Storage (MIL-STD-810D, 501.2, I-3.2)

The DS950 was subjected to High Temperature – Storage Testing. Samples were subjected to a temperature of 140°F (60°C +/-3 °C) for a duration of 4 hours, after which operation was confirmed by Pro V&V. Samples were not powered, and were left in their packaging for the duration of the test. They were removed from the boxes for operational verification after the test. At the conclusion of testing, a visual inspection and an operational status check was performed. Test Result – PASS

Humidity – Hot/Humid (MIL-STD-810D, 507.2, I-3.2)

The DS950 was subjected to Humidity – Hot/Humid Testing. Samples were subjected as per Table 507.2-I, Hot-Humid (Cycle 1), for a duration of 240 hours (10 days), after which operation was confirmed by Pro V&V. Samples were not powered/operational, and were left in their packaging for the duration of the test, and were removed from the boxes for operational verification. At the conclusion of testing, a visual inspection and an operational status check was performed. Test Result – PASS

Temp-Power Variation Testing (MIL-STD-810D, 501.2/502.2)

The DS950 and the ExpressVote HW 2.1 were subjected to Temperature/Power Variation Testing. The ExpressVote components were powered and being operated by Pro V&V for the duration of the environmental profile, to confirm operation.

Test Result – PASS

4.0 CONCLUSION

The EVSFL6060 components, as presented for testing, successfully met the hardware requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0, with no deficiencies or anomalies noted during testing.