VotingWorks

Test Report - VxScan Feature Acceptance Criteria: Administrative Functions

Dates of testing: May 1, 2024 - Jun 28, 2024
Updated Oct 29, 2025 by Pius Wong

Summary

This report documents a series of small-scale tests related to the administrative functions of VxScan. These functions are tied to the scanner access panel and pollworker door features, which would be accessed by system administrators, election managers, and poll workers. They address internal VotingWorks requirements as well as some VVSG requirements listed below.

Applicable VVSG Requirements

Some of the tests listed here *indirectly* support these VVSG requirements below, although they are not the final tests to support these requirements:

- 8.4 – The voting system is evaluated for usability with election workers.
- 8.1-K – Eliminating hazards
- 2.7-D – Ability to support maintenance and repair physical environment conditions – non-operating
- 2.7-E – Ability to support transport and storage physical environment conditions – non-operating

Devices Under Test

- VxScan, v4.0, Build 0

Results

Tests were performed on each of the following design feature requirements listed below, with results informing design refinement. Followup plans are included for each test, if applicable.

1. Usability: Easy to open/close USB access door (poll worker door)

   a. **Source of requirement**
      i. VotingWorks internal requirements
      ii. VVSG 8.4 – The voting system is evaluated for usability with election workers.
   b. **Acceptance criteria**
      i. **Description**
         1. Minimal problems using door to access USB ports
      ii. **Metrics Evaluated**
         1. Is the door easy to identify and find?
         2. Is it easy to open with the left hand?
         3. Is it easy to open with the right hand?
         4. Does the door open smoothly and not get caught?
         5. Does the door close smoothly and not get caught?
         6. Is there an indication of how far to open the door without causing problems?
         7. Is there an indication of when the door is fully closed?
         8. Does the door not interfere with using any other functions in the system?
      iii. **Acceptable Metrics**
         1. Yes to all questions above
      iv. **Unacceptable Failure Modes**
         1. No to any questions above
      v. **Source of Metrics**
         1. VotingWorks internal requirements
   c. **Test Results**
      i. Yes to all questions, both access doors.
      ii. Testing performed by VotingWorks in Austin, TX.

    d. Summary Results
        i.   Pass
    e. Other Notes
        i.   n/a
    f. Followup Plan
        i.   Retested with additional users internally and in User Acceptance Testing.
    g. Followup Test Results
        i.   Passed internal tests at VotingWorks in San Francisco, CA, and Bellingham, WA.
        ii.   User Acceptance Testing gave additional feedback confirming results.

2. Usability: Easy to insert/remove USB drives

    a. Source of requirement
        i.   VotingWorks internal requirements
        ii.   VVSG 8.4 – The voting system is evaluated for usability with election workers.
    b. Acceptance criteria
        i.   Description
            1.   Minimal problems using USB reader
        ii.   Metrics Evaluated
            1.   Can you insert a USB in all available ports?
            2.   Can you remove a USB from each port?
            3.   Can you insert two USBs in the ports at the same time?
            4.   Can you insert a USB hub or peripheral keyboard in the ports?
            5.   Is there enough hand access in this compartment? Assume a finger size of 2cm. Is there 2cm clearance around a USB inserted in the port?
            6.   Is the USB port easy to identify and find?
            7.   Does the USB reader not interfere with any other functions in the system, particularly the latching mechanism?
        iii.   Acceptable Metrics
            1.   Yes to all questions above
        iv.   Unacceptable Failure Modes
            1.   No to any questions above
        v.   Source of Metrics
            1.   VotingWorks internal requirements
            2.   For metric #5, MIT touchlab study on finger width
    c. Test Results
        i.   Yes to all questions, both access doors.
        ii.   Testing performed by VotingWorks in Austin, TX.
    d. Summary Results
        i.   Pass

e. **Other Notes**
   i. n/a
f. **Followup Plan**
   i. Retested with additional users internally and in User Acceptance Testing.
g. **Followup Test Results**
   i. Passed internal tests at VotingWorks in Bellingham, WA.
   ii. User Acceptance Testing gave additional feedback confirming results.

3. Usability: Easy to insert/remove smart card

a. **Source of requirement**
   i. VotingWorks internal requirements
   ii. VVSG 8.4 – The voting system is evaluated for usability with election workers.
b. **Acceptance criteria**
   i. **Description**
      1. Minimal problems using smart card reader
   ii. **Metrics Evaluated**
      1. Can you insert a smart card in reader?
      2. Is there enough hand access for the smart card? Assume a finger size of 2cm. Is there 2cm clearance around a smart card in the port?
      3. Is the card reader easy to identify and find?
      4. Does the card reader not interfere with using any other functions in the system?
   iii. **Acceptable Metrics**
      1. Yes to all questions above
   iv. **Unacceptable Failure Modes**
      1. No to any questions above
   v. **Source of Metrics**
      1. VotingWorks internal requirements
      2. For metric #2, MIT touchlab study on finger width
c. **Test Results**
   i. Yes to all questions, both access doors.
   ii. Testing performed by VotingWorks in Austin, TX.
d. **Summary Results**
   i. Pass
e. **Other Notes**
   i. n/a
f. **Followup Plan**
   i. Retested with additional users internally and in User Acceptance Testing.
g. **Followup Test Results**

i. Passed internal tests at VotingWorks in San Francisco, CA, and Bellingham, WA.
ii. User Acceptance Testing gave additional feedback confirming results.

4. Usability: Easy to open/close printer/scanner access door

   a. Source of requirement
   i. VotingWorks internal requirements
   ii. VVSG 8.4 – The voting system is evaluated for usability with election workers.
   b. Acceptance criteria
   i. Description
   1. Minimal problems using door to access the printer and scanner
   ii. Metrics Evaluated
   1. Is the door easy to identify and find?
   2. Is it easy to open with the left hand?
   3. Is it easy to open with the right hand?
   4. Does the door open smoothly and not get caught?
   5. Does the door close smoothly and not get caught?
   6. Is there an indication of how far to open the door without causing problems?
   7. Is there an indication of when the door is fully closed?
   8. Does the door not interfere with using any other functions in the system?
   iii. Acceptable Metrics
   1. Yes to all questions above
   iv. Unacceptable Failure Modes
   1. No to any questions above
   v. Source of Metrics
   1. VotingWorks internal requirements
   c. Test Results
   i. Yes to all questions, both access doors.
   ii. Testing performed by VotingWorks in Austin, TX.
   d. Summary Results
   i. Pass
   e. Other Notes
   i. n/a
   f. Followup Plan
   i. Retested with additional users internally and in User Acceptance Testing.
   g. Followup Test Results
   i. Passed internal tests at VotingWorks in San Francisco, CA, and Bellingham, WA.
   ii. User Acceptance Testing gave additional feedback confirming results.

5. Safety: Administrative features should not pose hazard to user or interfacing elements

    a. Source of requirement
- i. VotingWorks internal requirements
- ii. VVSG 8.4 – The voting system is evaluated for usability with election workers.
- iii. VVSG 8.1-K – Eliminating hazards

    b. Acceptance criteria
- **i. Description**
    1. Minimal risk to hands and body parts from features around the USB ports, card reader, printer, and scanner, and their access doors.
- **ii. Metrics Evaluated**
    1. Are all features smooth, finished, rounded, and not sharp?
    2. Do the features avoid snagging clothing and accessories?
    3. Are there minimal risks to eyes or other body parts from parts in compression/tension?
    4. Are electronics sufficiently protected from the user, and vice versa?
- **iii. Acceptable Metrics**
    1. Yes to all questions above
- **iv. Unacceptable Failure Modes**
    1. No to any questions above
- **v. Source of Metrics**
    1. VotingWorks internal requirements

    c. Test Results
- i. Yes to all questions, both access doors.
- ii. Testing performed by VotingWorks in Austin, TX.

    d. Summary Results
- i. Pass

    e. Other Notes
- i. n/a

    f. Followup Plan
- i. Retested with additional users internally and in User Acceptance Testing.
- ii. Official Safety Testing (UL 62368-1) with Eurofins in Austin, TX.
- iii. Continued monitoring of units used internally and in the field.

    g. Followup Test Results
- i. Passed internal tests at VotingWorks in San Francisco, CA, and Bellingham, WA.
- ii. User Acceptance Testing gave additional feedback confirming results.

   iii. Safety Testing with Eurofins/MET passed (UL 62368-1, report number MET 132954) Oct 24, 2024 .

   iv. Continued normal results as of October 2025.

6. Security: Administrative features are secure and tamper-evident

 a. Source of requirement
   i. VotingWorks internal requirements

 b. Acceptance criteria
   i. Description
    1. When sealed, all features are tamper-evident
   ii. Metrics Evaluated
    1. Examine the unsealed doors. Are the USB reader, card reader, scanner, and printer all secure in place when tugging and pushing on them with typical forces?
    2. Seal the doors as recommended. Is there no feasible way to access the USB reader, printer, and scanner door from outside the sealed doors, without breaking the seal or leaving other evidence?
   iii. Acceptable Metrics
    1. Yes to all questions above
   iv. Unacceptable Failure Modes
    1. No to any questions above
   v. Source of Metrics
    1. VotingWorks internal requirements

 c. Test Results
   i. Yes to all questions.
   ii. Possibly the wires above the scanner are a concern, but in use it is sealed and never accessed by untrained users or voters.
   iii. Testing performed by VotingWorks in Austin, TX.

 d. Summary Results
   i. Pass

 e. Other Notes
   i. n/a

 f. Followup Plan
   i. Continued monitoring of units used internally and in the field.

 g. Followup Test Results
   i. Continued normal results as of October 2025.

7. Robustness: Administrative features mechanically withstand regular use

    a. Source of requirement
        i. VotingWorks internal requirements
    b. Acceptance criteria
        i. Description
            1. Resists damage from bumps, knocks
            2. Resists wear
        ii. Metrics Evaluated
            1. Let the doors fall naturally down from upright positions, if possible. Does this cause no damage?
            2. Open and close the doors 180+ times. Examine the features for wear and other damage. Does it avoid damage?
        iii. Acceptable Metrics
            1. Yes to all questions above
        iv. Unacceptable Failure Modes
            1. No to any questions above
        v. Source of Metrics
            1. VotingWorks internal requirements
            2. 180 assumes 6 elections per year * 10 years * 3x opening and closing doors per election.
    c. Test Results
        i. Yes to all questions, both access doors.
        ii. Testing performed by VotingWorks in Austin, TX.
    d. Summary Results
        i. Pass
    e. Other Notes
        i. n/a
    f. Followup Plan
        i. Continued monitoring of units used internally and in the field.
    g. Followup Test Results
        i. Continued normal results as of October 2025.

8. Cleanability: Easy to clean administrative features

    a. Source of requirement
        i. VotingWorks internal requirements
    b. Acceptance criteria
        i. Description
            1. Resists damage from cleaning
        ii. Metrics Evaluated
            1. Can you clean all outer surfaces with microfiber cloth and alcohol without causing damage?

2. Are inner compartments blocked off from other electronics, when a door is open?
3. Can you blow a can of air in the compartments without causing damage?

iii. **Acceptable Metrics**
    1. Yes to all questions above

iv. **Unacceptable Failure Modes**
    1. No to any questions above

v. **Source of Metrics**
    1. VotingWorks internal requirements

c. **Test Results**
    i. Yes to all questions, both access doors.
    ii. Testing performed by VotingWorks in Austin, TX.

d. **Summary Results**
    i. Pass

e. **Other Notes**
    i. n/a

f. **Followup Plan**
    i. Continued monitoring of units used internally and in the field.

g. **Followup Test Results**
    i. Continued normal results as of October 2025.

9. Unexpected Inputs: Handles or prevents unexpected inputs into administrative features appropriately

a. **Source of requirement**
    i. VotingWorks internal requirements

b. **Acceptance criteria**

i. **Description**
    1. Keeps out unexpected inputs
    2. Resists damage from unexpected inputs

ii. **Metrics Evaluated**
    1. Try to drop or place the following items into the compartments in available spaces, when administrative doors are both open and closed. Are they prevented from going in, or can you get them out easily without causing damage?
        a. Smart card
        b. USB drive
        c. Ballot, crumpled
        d. Smartphone
        e. Cleaning cloth

iii. **Acceptable Metrics**
    1. Yes to all questions above

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   iv. **Unacceptable Failure Modes**
     1. No to any questions above
   v. **Source of Metrics**
     1. VotingWorks internal requirements
  c. **Test Results**
   i. Yes, with notes: Possible to drop card along edges, including by card reader, but unlikely and can be pulled out. USB drive can fall in but can be pulled out by removing the printer roll.
   ii. Testing performed by VotingWorks in Austin, TX.
  d. **Summary Results**
   i. Pass
  e. **Other Notes**
   i. n/a
  f. **Followup Plan**
   i. Continued monitoring of units used internally and in the field.
  g. **Followup Test Results**
   i. Continued normal results as of October 2025.

10. Transit Testing: Administrative features survive forces seen in transport

  a. **Source of requirement**
   i. VotingWorks internal requirements
   ii. VVSG 2.7-D – Ability to support maintenance and repair physical environment conditions – non-operating
  b. **Acceptance criteria**
   i. **Description**
     1. List of items most at risk for failure during transport
   ii. **Metrics Evaluated**
     1. Identify components at risk of failure due to vibration. Add this to a list to test later.
   iii. **Acceptable Metrics**
     1. Known, limited number of items identified (~10) to test and monitor later.
   iv. **Unacceptable Failure Modes**
     1. Unknown number of items at risk.
   v. **Source of Metrics**
     1. VotingWorks internal requirements
  c. **Test Results**
   i. Possible administrative item features to monitor for vulnerability to transit or tests are hinges, metal surfaces, fasteners, latching alignment.
   ii. Evaluation performed by VotingWorks in Austin, TX.
  d. **Summary Results**

      i. Pass
- **e. Other Notes**
  - i. Mechanical connections and cosmetic surfaces were noted as features to more closely inspect in future tests related to transport.
- **f. Followup Plan**
  - i. Continued monitoring of units used internally and in the field, in various transportation modes (ground via car, ground via freight, air).
- **g. Followup Test Results**
  - i. Continued normal results as of October 2025, including for items/features listed for closer monitoring.

11. Environmental: Minimizes mechanical failures in administrative features due to heat and cold

- **a. Source of requirement**
  - i. VotingWorks internal requirements
  - ii. 2.7-E – Ability to support transport and storage physical environment conditions – non-operating
- **b. Acceptance criteria**
  - **i. Description**
    1. List of items most at risk of failure in hot and cold storage
  - **ii. Metrics Evaluated**
    1. Identify any materials, components, and assemblies related to this feature that may be at the most risk of failure due to storage and use in hot and humid, and cold environments. These include plastics, rubbers, electronics, fastener assemblies, adhesives, tapes, etc.
    2. The failures in these could be cracks/fracture, deformation, wear, seizing of moving parts, loosening connections, corrosion, and major discoloration or cosmetic damage to user-facing parts. What are these most at-risk items? List these out for future detailed testing.
  - **iii. Acceptable Metrics**
    1. Known, limited number of items identified (~10) to test and monitor later.
  - **iv. Unacceptable Failure Modes**
    1. Unknown number of items at risk.
  - **v. Source of Metrics**
    1. VotingWorks internal requirements
- **c. Test Results**
  - i. Possible administrative item features to monitor for vulnerability to heat and cold are plastic hinges and electronics.
  - ii. Evaluation performed by VotingWorks in Austin, TX.

    d. Summary Results
- i. Pass

    e. Other Notes
- i. Plastics and electronics were noted as features to more closely inspect in future tests related to environmental conditions.

    f. Followup Plan
- i. Continued monitoring of units used internally and in the field.
- ii. Environmental testing closer to VVSG requirements.

    g. Followup Test Results
- i. Continued normal results as of October 2025, including for items/features listed for closer monitoring.
- ii. Environmental testing documented in:
  1. Test Report - VxScan Bulk Scan & Warm Operational Conditions, August 2024
  2. Test Report - VxScan Cold Storage, September 2024