



Voting System Anomaly Root Cause Analysis Template v2.0

Root Cause Analysis for:

**VV40ECT-197: BALLOTS REJECTED REPEATEDLY BY VxCENTRALSCAN - REV. 1
VxSUITE, VERSION 4.0 AND EAC CERTIFICATION #VXS4**

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Introduction

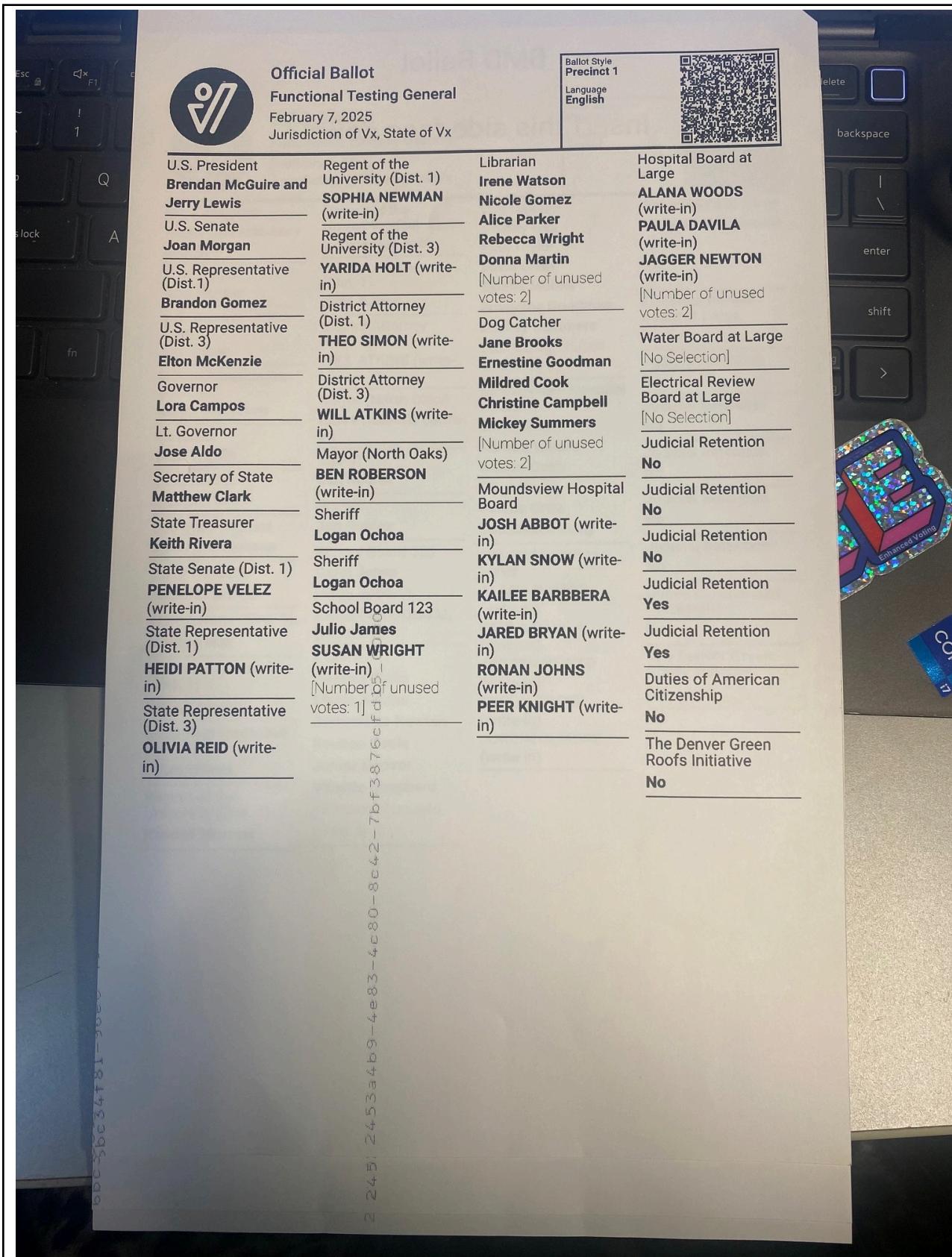
This RCA documents an anomaly where 3 specific ballots generated by the VxMarkScan ballot-marking device (BMD) were repeatedly rejected by VxCentralScan. This was reported to occur in both VxCentralScan models of commercial off-the-shelf (COTS) scanners, even after confirming the scanner was cleaned and the ballots were printed properly. Investigating the root cause was important to guarantee proper and consistent interpretation of ballots.

Anomaly Description

Complete all sections. Descriptions must be as detailed as possible, while being clear and concise since the anomaly is the source of the entire RCA. This detail should include a complete list and/or description of the “symptoms” of the anomaly and the conditions present which the symptoms occurred.

<u>Date of Anomaly:</u> September 8, 2025	<u>Time of Anomaly:</u> 9:40am
<u>Place of Anomaly:</u> SLI, Wheat Ridge, CO	<u>Person identifying Anomaly:</u> Jessica Myers, VotingWorks
<u>Expected Results of actions leading up to anomaly:</u> Ballots printed from the VxMarkScan BMD should be scanned into VxCentralScan without issue. This includes VxMarkScan ballots that have write-ins, and ballots should be restricted from exceeding system limits.	
<u>Detailed description of the event / anomaly:</u> Three VxMarkScan ballots were printed with many write-in candidates, exceeding the 60-character total character count allowed for a ballot. The ballot mark data is encoded in the QR code shown in the upper-right corner, and it includes the write-in data, leading to a high QR code density. When scanning these ballots in VxCentralScan, they were rejected. An example of these ballots is shown here below:	

EAC (Election Assistance Commission) Root Cause Analysis



EAC (Election Assistance Commission) Root Cause Analysis

If the anomaly is repeatable, provide step by step instructions to recreate it:

1. Mark a ballot using VxMarkScan, and include write-in candidates where the total number of characters across all write-ins exceeds the system limit of 60 characters. This requires entering more than one write-in candidate.
2. Print the ballot with VxMarkScan and remove it.
3. Scan the printed ballot in VxCentralScan, and watch for a rejected ballot.

Chronology of Events / Timeline

Provide a detailed chronology of the events leading up to, and following, the anomaly. Add additional events if necessary.

ID	Date/Time	Description	Entity Org/person	Result / Notes
1	9/8/25, 9:40am Mountain Time	SLI reports the anomaly with VxCentralScan and the BMD ballots.	Jessica Myers, VotingWorks	<p>SLI reported that 3 out of 50 printed BMD ballots were being rejected by VxCentralScan, with both the RICOH fi-7600 and RICOH fi-8170 scanners. The ballots were from Precinct 1 in a test election. They confirmed cleaning the scanners did not resolve the issue, and multiple attempts to scan were made. Images of the BMD ballots that were rejected were shared with VotingWorks.</p> <p>On initial inspection, VotingWorks saw from the 3 images that the QR code density and total write-in character count was higher than the VxCentralScan system limits. Counting characters confirmed this. Plans were made to better enforce these system character limits. It was noted that VxSuite documentation had been updated to describe these limits on 8/27/25.</p>
2	10/7/25, 3:36pm	VotingWorks applies software update to restrict users from going over the maximum character count limit when marking VxMarkScan ballots.	Arsalan Sufi, VotingWorks	<p>Updated code shows the user the remaining characters available when entering write-in candidates in VxMarkScan, and it restricts entering more candidates beyond the limit. Open source code changes are viewable at the pull request on GitHub here:</p> <p>https://github.com/votingworks/vxsuite/pull/7348</p>

Investigative Team and Method

This section shall describe how the investigative team is assembled by the voting system manufacturer, who it consists of, and how it gathers the data to be used in the analysis. Include the RCA method employed by the manufacturer in conducting the analysis and why this method was used.

Names and Positions of members of the investigation team:
Jessica Myers, Head of Compliance
Arsalan Sufi, Head of Software
Describe the data gathering process:
Jessica Myers initiated the investigation upon receiving the information from SLI. She exchanged data that VotingWorks staff used to quickly identify the issue based on ballot images. Arsalan Sufi implemented the code changes to enforce the character system limit better in VxMarkScan ballots and tested the new software to verify it.

EAC (Election Assistance Commission) Root Cause Analysis

Describe which methodology(s) is used to conduct the root cause analysis:

The investigation used a straightforward “Five Why’s” questioning strategy, starting by asking about all the potential causes of a VxCentralScan rejection of a BMD ballot. SLI provided data to eliminate causes related to hardware and ballot printing, and so the remaining cause was in ballot interpretation. VotingWorks staff quickly identified the cause of rejection being the overly dense QR code, in turn caused by too many write-in characters. The cause of exceeding the character limit was rooted in both documentation about system limits and software enforcement of system limits, and the investigation concluded there.

Findings and Root Cause

Describe the findings of the investigation and explain the root cause(s) based on these findings. If the RCA results in findings that are not directly related to the root cause of the anomaly, these should also be captured as manufacturer product/process improvement steps in an effort to improve the voting system.

The root cause of the ballot rejections was that the printed ballots exceeded system limits in the number of characters used in write-in candidates, going over 60 in the three ballots at issue. This caused the QR codes of the BMD ballots to be too dense, and they could not be scanned properly in VxCentralScan the majority of the time.

Corrective Action(s)

Two corrective actions addressed the root cause:

- Confirmation in system documentation that the maximum character count was clear, set at 60 characters across all write-ins combined. This can be seen here:
<https://docs.voting.works/vxsuite-tdp-v4/system-performance-and-specifications/system-limits#election-definition-limits>
- Software updates to enforce the maximum total write-in character limits in VxMarkScan. Users now see the number of characters remaining whenever they enter a write-in candidate, and they are not allowed to exceed the system limit. The open source code changes can be seen here:
<https://github.com/votingworks/vxsuite/pull/7348>

Solution Management

The purpose of this section is to manage the corrective action(s) moving forward. This should detail all process changes to manage those corrective actions, and steps taken to ensure the actions eliminate the anomaly over time.

The system documentation was reviewed for consistency with the software updates, when discussing write-in system limits for VxMarkScan. The VxMarkScan software updates were reviewed and manually tested according to standard development procedures.