Environmental Hardware Test Plan

EAC VVSG 1.0

Document Number HIN-19003-ELETP-01

Prepared for:

Vendor Name	*Hart InterCivic*
Vendor System	*Verity 2.4*
EAC Application No.	*HRT-Verity-2.4*
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NVLAP TESTING
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Accredited by the Election Assistance Commission (EAC) for Selected Voting System Test Methods or Services

Revision History

Date	Release	Author	Revision Summary
Sept. 13, 2019	1.0	Darrick Forester	Initial Release
Oct. 10, 2019	1.1	Darrick Forester	Z240 Workstation Serial Numbers Updated
Oct. 22, 2019	1.2	Darrick Forester	Serial Numbers Updated

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1 INTRODUCTION

This test plan covers the environmental test requirements and methods for the Hart InterCivic Verity 2.4 Central Count voting system, to the requirements as stated in Election Assistance Commission 2005 Voluntary Voting System Guidelines 1.0 (VVSG 1). The devices covered within this test plan are Verity Central count systems, and will hereafter known as the Unit Under Test (UUT),

1.1 Qualifications

The UUT supplied by Hart InterCivic is representative of product produced in their volume manufacturing process.

1.2 Hardware Test Lab Facility

NTS, Environmental/Dynamic Test Lab
1601 Dry Creek Drive
Suite 2000
Longmont, Colorado 80503

1.3 Reference Documents

1. Election Assistance Commission: 2005 Voluntary Voting System Guidelines (EAC VVSG), 2005, Version 1.0, Volumes I and II.
2. EAC Voting System Testing and Certification Program Manual, United States Election Assistance, v 2.0, May 2015.
3. EAC Voting System Testing Laboratory Program Manual, United States Election Assistance, v 2.0, May 2015.
4. NIST Handbook 150-2016.
5. NIST Handbook 150-22-2017.
6. EAC Notice of Clarification 07-05: Voting System Test Laboratory (VSTL) responsibilities in the management and oversight of third party testing.
7. EAC Decision on Request for Interpretation 2007-05 (COTS).
8. EAC Decision on Request for Interpretation 2008-01 FINAL (temp and power variation tests).
9. EAC Decision on Request for Interpretation 2009-06 (Temperature Power Variation) FINAL.041610.
10. SLI VSTL Quality System Manual, v 3.1, prepared by SLI, June 28, 2019.

2 Product Description

2.1 Unit Under Test – Central Count (COTS)

Product / Model	Serial Number	Description	Qty
Canon DR-G2110 Color Scanner Image Formula High Speed Scanner (COTS)	JG301520 JG301522	Paper ballot scanner.	2
Canon DR-G2140 Color Scanner Image Formula High Speed Scanner (COTS)	JF300588 JF300365	Paper ballot scanner.	2
HP Z240 Workstation Central Client Server (COTS)	2UA8021XS4 2UA74526WZ 2UA74222WS 2UA74526WN	Contest resolution, and conversion of voter selection marks to electronic CVRs.	4

2.2 Product Information

Description	Dimensions	Weight
Canon DR-G2110	12.4” x 22.4” x 18.9”	55 lbs
Canon DR-G2140	12.4” x 22.1” x 18.9”	66 lbs
HP Z240 Workstations	6.7” x 15.7” x 17.4”	21 lbs

2.3 Support Equipment (SE)

Product / Model	Serial Number	Description	Qty
HP Z240 Tower Workstation Count (COTS)	2UA7351YGQ	Post-voting functionality to tabulate election results and generate reports.	1
HP Z240 Tower Workstation Count (COTS)	2UA74526WH	Central Server - Load election	1

2.4 Accessories

Type	Model	Function
Pre- Marked Test Ballots	N/A	Ballot Scanning
USB Thumb-Drives	N/A	PDF Reports

2.5 Firmware

Type	Version	Description
Test Software	2.4.0	Election software

2.6 Engineering Changes

Features for Verity Central

Added support for the following COTS central scanners due to manufacturer obsolescence of the existing certified models:

- Canon DRG-2110
- Canon DRG-2140

3 Operating Environmental Test

This section addresses a range of tests for all voting system equipment, including equipment for both precinct count systems.

3.1 Simulated Operation Diagnostic

A diagnostic test routine is performed to exercise and diagnose failures from internal subsystems in the UUT. This test performs various operations including writing and reading to storage devices and printing to internal printers. The diagnostic can be looped continuously and will halt if an error is detected while performing an operation.

For DRE equipment, each loop may be very short. For paper ballot scanning devices, a recirculation ballot operation is typically used where the ballot is read, reversed to the input position and then read again. The test will loop continuously until manually interrupted.

3.2 Integrity

The UUT is subject to integrity verification based on the provisions of Volume I, Section 2.1.4 (d) to ensure system integrity, all system shall protect against ambient temperature and humidity fluctuations. The ambient temperature fluctuations are verified during the temperature and power variation test. The MILSTD-810D, Method 507.2, Procedure I-Natural Hot-Humid is considered to be industry standard and is selected to verify humidity fluctuations.

3.3 Temperature and Power Variation

This test is similar to the low temperature and high temperature tests of MIL-STD-810-D, Method 502.2 and Method 501.2, with test conditions that correspond to the requirements of the performance standards. This procedure tests system operation under various environmental conditions for 85 hours. During 48 hours of this

operating time, the device shall be in a test chamber. For the remaining hours, the equipment shall be operated at room temperature. The system shall be powered for the entire period of this test; the power may be disconnected only if necessary for removal of the system from the test chamber.

Operation shall consist of ballot-counting cycles, which vary with system type. An output report need not be generated after each counting cycle. The interval between reports, however, should be no more than 4 hours to keep to a practical minimum the time between the occurrence of a failure or data error and its detection.

Test Ballots per Counting Cycle

- Central count systems 300 ballots/hour

The recommended pattern of votes is one chosen to facilitate visual recognition of the reported totals; this pattern shall exercise all possible voting locations. System features such as data quality tests, error logging, and audit reports shall be enabled during the test. Each operating cycle shall consist of processing the number of ballots indicated above.

Step 1: Arrange the equipment in the test chamber. Connect as required and provide for power, control, and data service through enclosure wall.

Step 2: Set the supply voltage at 117 voltage alternating current.

Step 3: Power on the equipment and perform an operational status check as in Section 4.6.1.5.

Step 4: Set the chamber temperature to 50 degrees F, observing precautions against thermal shock and condensation.

Step 5: Begin 24-hour cycle.

Step 6: At T=4 hrs, lower the supply voltage to 105 vac.

Step 7: At T=8 hrs, raise the supply voltage to 129 vac.

Step 8: At T=11:30 hrs, return the supply voltage to 117 vac and return the chamber temperature to lab ambient, observing precautions against thermal shock and condensation.

Step 9: At T=12:00 hrs, raise the chamber temperature to 95 degrees Fahrenheit.

Step 10: Repeat Steps 5 through 8, with temperature at 95 degrees Fahrenheit, complete at T=24 hrs.

Step 11: Set the chamber temperature at 50 degrees Fahrenheit as in Step 4.

Step 12: Repeat the 24-hour cycle as in Steps 5-10, complete at T=48 hrs.

Step 13: After completing the second 24-hour cycle, disconnect power from the system and remove it from the chamber if needed.

Step 14: Reconnect the system as in Step 2 and continue testing for the remaining period of operating time.

Note: Requires 24-hr continuous coverage / support from the hardware test lab for the duration of Temperature / Power Variation Test. Support from the hardware test lab includes monitoring and setting voltage meter when required base off test plan requirements.

3.3.1 Test Approach

The Central Count systems consist of COTS scanners and COTS workstations.

Test duration is for 85 continuous hours. Only the first 48 hours is required to be in temperature/power variation phase of the test.

Test Configuration = 85 hours (minimum total hours for the statistical model)

2 - Central (Server) / DRG-2110 high speed scanner - COTS
2 - Central (Server) / DRG-2140 high speed scanner – COTS
4 – Client (Server) Workstation - COTS

No printers will be included in the test; all reports will be generated as PDFs

2 – Canon DRG-2110 = 85 hours for each unit under test. Per the test ballot counting cycle requirement, the test will be conducted as follows:

- Each Canon DRG-2110 will scan 300 pre-marked test ballots every hour.

2 – Canon DRG-2140 = 85 hours for each unit under test. Per the test ballot counting cycle requirement, the test will be conducted as follows:

- Each Canon DRG-2140 will scan 300 pre-marked test ballots every hour.

The test will be conducted to run in 4 hour cycles such that each cycle is concluded with the generation of a report that details the vote data cast during that period.

Additional steps to reduce the chance of misreads include cleaning the scanners within the cleaning process/periods that Hart declares. The scanners will be cleaned every hour which requires the scanners to be powered off during cleaning per the manufacturers specifications.

SLI personnel will audit ballots once per hour until testing is completed.

3.3.2 Reliability

The accredited test lab shall test for reliability based on the provisions of Volume I, Section 4 for the acceptable Mean Time Between Failure (MBTF). The MBTF shall be measured during the conduct of other system performance tests specified in this section, and shall be at least 163 hours. Appendix C of VVSG Vol. II provides further details of the calculation for this testing period.

The “cause for failure” is only limited by the functions being performed by the scanner while in use, as partially denoted by the criteria “Loss of one or more functions“, while this list attempts to cover all potential points of failure, if an issue occurs outside of this list will still be reviewed. For this test, the criteria will be defined as any function

observed to have failed from its intended purpose, during the conduction of the test. E.g., for the scanner, scanning ballots (physically moving them in and out of the scanner), the screen remains on and active, counters are active, printer continues to function.

A failure is defined as any event which results in either:

a. Scanner not scanning ballots, ballot jam etc.
b. Scanner sensors read inconsistently
c. USB ports not writing to the vDrive
d. Device does not power on or off
e. Loss of one or more functions
f. Degradation of performance such that the device is unable to perform its intended function for longer than 10 seconds; will look for degradation of performance of the device, as opposed to actual functionality failure of the first failure criteria.
g. Any other unexpected action that deviates from device documentation.

Criteria C: COTS and support equipment may have temporary loss of function or degradation of performance, the correction of which requires operator intervention or system reset.

4 Environmental Test Summary

The following Table shows the tests to be performed on the UUT.

Test	Test Specification	VVSG 1.0
Operating Environmental Tests		
Temp / Power Variation	This test is similar to the low temperature and high temperature tests of MIL-STD-810-D, Method 502.2 and Method 501.2. See RFI 2009-06; See note below.	**V1:** 4.1.7.1, **V2:** 4.7.1
Reliability Assessment	See V1 4.3.3 for additional information.	**V1:** 4.3.3, **V2:** 4.7.2
Integrity	Protect against ambient temperature and humidity fluctuations.	**V1:** 2.1.4 (d)

Note: V1 4.1.7.1 Removable Storage Media; In voting systems that use storage media that can be removed from the system and transported to another location for readout and report generation, these media shall use devices with demonstrated error-free retention for a period of 22 months under the environmental conditions for operation and non-operation contained in Subsection 4.1.2. Examples of removable storage media include: programmable read-only memory (PROM), random access memory (RAM) with battery backup, magnetic media or optical media.

End of Environmental Hardware Test Plan