Electrical Hardware Test Plan

EAC VVSG 1.0

Document Number HIN-21005-ELHTP-01

Prepared for:

Vendor Name	Hart InterCivic
Vendor System	Verity 2.7
EAC Application No.	HRT-Verity-2.7
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TESTING
NVLAP Lab Code 200733-0

Accredited by the Election Assistance Commission (EAC) for Selected Voting System Test Methods or Services

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Revision History

Date	Release	Author	Revision Summary
February 28, 2022	1.0	*Darrick Forester*	Initial Release
March 10, 2022	2.0	*Darrick Forester*	Updated for EAC Comments
March 14, 2022	3.0	*Darrick Forester*	Updated for EAC Comments

Disclaimer

The information reported herein must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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1   INTRODUCTION

This test plan covers the EMC (Electromagnetic Compatibility) and EMI (Electromagnetic Interference) test requirements and methods for the Hart InterCivic 2.7 voting system, to the requirements as stated in Election Assistance Commission 2005 Voluntary Voting System Guidelines Version 1.0. The devices covered within this test plan is the Verity Touch Writer, Verity Scan and Controller / Touch Writer Duo / Touch Writer Duo and will hereafter be referred to 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, EMI / EMC Test Lab
1736 Vista View Drive
Longmont, Colorado 80504

1.3   Reference Documents

- Election Assistance Commission Voluntary Voting System Guidelines version 1.0 (EAC VVSG), Volumes I & II.
- EAC Voting System Testing and Certification Program Manual, United States Election Assistance Commission, v 2.0, May 2015.
- EAC Voting System Testing Laboratory Program Manual, United States Election Assistance, Commission v 2.0, May 2015.
- NIST Handbook 150-2020.
- NIST Handbook 150-22-~~2021~~2017.
- NOC 2007-05 - Voting System Test Laboratory (VSTL) responsibilities in the management and oversight of third party testing.
- EAC Notice of Clarification 08-001: Validity of Prior Non-Core Hardware Environmental and EMC Testing.
- EAC Decision on Request for Interpretation 2007-05 (COTS).
- EAC Decision on Request for Interpretation 2008-02 Battery Back Up for Op Scan.
- EAC Decision on Request for Interpretation 2008-10 (EFT).
- EAC Decision on Request for Interpretation 2009-03 Battery Back Up for Central Count.

- EAC Decision on Request for Interpretation 2010-01 Voltage Levels and ESD Test.
- SLI Compliance VSTL Quality System Manual, v 3.3, December 17, 2020.

2   Product Description

2.1   Intended Use

The UUT is intended to be used in the polling place environment.

2.2   Unit Under Test

Product / Model	Serial Number	Description	Qty
Verity Controller (38BT), 3006085 Touch Writer Duo (38BT), daisy chain configuration. 3006070 1x Controller 2x Touch Writer Duo	C2115161506 B1903101010 B2013730601	**Verity Controller** - is a poll worker device use for management of voting devices. **Verity Touch Writer Duo** - is a voting device that prints to ab 8.5"x11" or 8.5"x14" thermal paper ballot. They are networked together via a daisy-chain network cable (100Mbit Ethernet over a proprietary cable). An optional accessibility controller (ATI) may be equipped.	1 Set
Verity Touch Writer (38BT), 3006090	W2014374311	**Verity Touch Writer** - Polling Place Ballot Marking Device for voters that require an accessible way to mark a paper ballot.	1
Verity Scan (38BT), 3006080	S2115228806	**Verity Scan** - Precinct ballot scanner device.	1

2.3   AC Power Adapter

Manufacturer	Model	Input	Output and Type
SL Power Electronics	TE60 Series	N/A	24VDC, 2.7A

2.4   Power Requirements

Input Voltage Rating as it appears on unit, power supply, or power brick	100-240VAC, 50-60Hz, 1.5A

Input Current (specify @ 230 Vac/50 Hz)	1.5A (100-240VAC, 50-60Hz)
Input Power	120VAC

2.5 Support Equipment (SE)

Product / Model	Serial Number	Description	Qty
Accessible Booth with ATI Tray	TBD	For Touch Writer Duo and Touch Writer	2
Standard Booth	TBD	For Touch Writer Duo	1
AutoBallot (barcode scanner) Hart P/N 3005174 Motorola/Zebra DS4308-SR7U2100AZW	TBD	Optional COTs barcode scanner. This is an option for and does not ship with the unit as a default configuration.	2
Red/Green Jelly Switches	N/A	Red/Green jelly switches for disabled use. These are COTS switches that do not ship with the unit and are typically provided by an accessible user	2
Headphones Hart: P/N 2005230 v7 brand HA300-2NP	N/A	Optional COTS Headphones for listening to audio.	2
Brother Laser Printer HL-L6400DWVS	U64185J1N427136	Print Marked Ballots	1
Hart Verity ATI Module	TBD	Audio-Tactile Interface (ATI) intended for voters that cannot, or prefer not to, use the touch screen.	2
Ballot Box	N/A	For Scan	1

2.6 UUT Software / Firmware

Name	Version	Description
Verity Software (all)	2.7.0	Election software for operational status check.
Verity Baseboard Microcontroller Firmware	1	Duo devices only.
Verity Baseboard Microcontroller Firmware	17	Verity Devices.

2.7   Accessories

Type	Model	Function
Test Ballots	N/A	Mark / View Ballots
Verity Key - Security Key	N/A	User authentication and configuration of election security.
Verity vDrive	N/A	Load election definitions, record CVRs and audit logs.

3   Units Under Test

Backup units of the same model with unique serial numbers may be used throughout EMC/EMI testing provided the following criteria are met:

▪ Issue with UUT
▪ Identical hardware
▪ All hardware components are listed in Manufacturer's BOM or APL.

3.1   Operating Modes and Test Configurations

Prior and during testing, proper operation of the UUT shall be confirmed using Hart InterCivic software. An operational status check shall be performed prior to and after each test to fully exercise the UUT and ensure that no damage has occurred as a result of the test.

To fully exercise all the features of each product, test software is run during electrical tests to exercise the model's particular hardware features.

Controller, and 2 **Touch Writer Duo** units are daisy-chained via network cables. All ports are active:
- **Verity Controller**
    o On Tabletop
    o 1 unterminated daisy-chain Hart Ethernet cable, bundled in serpentine fashion.
    o AutoBallot barcode reader connected via obfuscated passthrough from vDrive port
    o 1 daisy-chain Hart Ethernet cable connected to next device in daisy-chain
    o Plugged in to AC line with provided power adapter.
- **Verity Touch Writer Duo**
    o Serial #: B1903101010
    o On Standard Booth <u>or</u> on Tabletop.

- o 1 daisy-chain Hart Ethernet cable connected to next device in daisy-chain
  - o Plugged in to AC line with provided power adapter.
- **Verity Touch Writer Duo**
  - o Hart P/N 3006070
  - o Serial #: B2013730601
  - o On Accessible Booth with ATI Tray
  - o Equipped with ATI, plugged in rear port
    - Headphones
    - Jelly Switch
  - o Plugged in to AC line with provided power adapter.
  - o 1 unterminated daisy-chain Hart Ethernet cable, bundled in serpentine fashion.
- **Additional Materials needed during EMC Test**
  - o 3 Test CFast cards (Win10 MVT 1.0.1 38BT)
  - o vDrive for EMC testing
  - o Fanfold thermal paper
- **During Operational Status Check**
  - o Verity 2.7 Controller CFast card
  - o 2 Verity 2.7 Touch Writer Duo CFast cards
  - o Verity Key (to load test election only)
  - o vDrive with test election
  - o Thermal paper ballot stock

Initial Setup and Operational Status Check
- Plug in battery in the back of all tablets.
- Place Verity Controller on top tabletop.
- Place one of the Verity Touch Writer Duo devices onto a Standard Booth or tabletop, and one onto an Accessible Booth with ATI tray.
- Connect accessories and cables according to the testing block diagram on all 3 devices. Cable slack should be bundled in serpentine fashion.
- Install the Verity 2.7 CFast cards into each device.
- Connect all devices to AC Power.
- Turn on all devices with the rear power button.
- Plug in the vDrive and Verity Key for the test election into the Verity Controller. The AutoBallot will need to be temporarily uninstalled to complete the authorization with the Verity Key.
- Load the election.
- Remove the Verity Key and reinstall the AutoBallot.
- Open polls.

- Use the Verity Control to activate 2 voting sessions. Print one ballot off each TW Duo device.
- Turn off devices with the red power button.

Setup Verity Controller for EMC Testing

- Replace the Verity 2.7 CFast with the Test CFast card. Ensure that the tablet is fully reassembled prior to test.
- Replace vDrive with election with vDrive for EMC testing.
- Close the cover on the vDrive bay door.
- Open folder on desktop titled **Controller**.
- Double tap button **RunIn Seiko Printer** icon. The thermal report printer will print every 300s for up to 40 hours.
- Double tap **File IO Test** icon. The vDrive for EMC testing will have 100 bytes of data written to it every 5 seconds for up to 20 hours.
- The AutoBallot function can be checked by scanning a barcode while the cursor is active in the **Notepad** application.
- Open **Ethernet Tests** folder and tap **Set Device 1 IP** wait about 5 seconds, then tap **Ping Device 3.** This tool is a bit finicky, so ensure you see "IP currently set as Device 1" on the screen, and activity in the Console. The ping will not be successful until an associated Duo device is set to Device 3.
- Controller is now ready for test.

Verity Touch Writer Duo #1 (no ATI)

- No AutoBallot or vDrives are used. Be sure no devices are connected to the USB ports in vDrive bay and that the door is covered.
- Open folder on desktop titled **Touch Writer Duo**.
- Double tap **Platform Manager Tests** icon. Wait for the window to open and tap the Radio button under Touch Duo LEDs **Set Insertion Ready**.
- Open **Ethernet Tests** folder and tap **Set Device 2 IP** wait about 5 seconds, then tap **Ping Device 1.** This tool is a bit finicky, so ensure you see "IP currently set as Device 2" on the screen, and activity in the Console indicating a ping (see mitigation below).
- Click on the **start** button (windows icon), tap the **gear** icon, tap on **Devices**, tap on **Printers & Scanners**, tap on **Brother PJ-723 (Copy1)**, click **Manage**, click **Printing preferences**.
- In the Printing Preferences window, click on the drop down next to **Form Feed Mode**, change it to **No Feed**, and hit **Apply**.
- Back in the Touch Writer Duo folder, double tap **8.5in Thermal Printer – 100 sheets**. Watch and wait to ensure it sends one job to the print queue (**Printing Page 1 of Document** window appears and disappears).

- Feed in a sheet of fanfold style thermal paper with the black square up and to righthand side. Only one sheet is needed. Be careful not to skew the paper. It will immediately print. It will then print every 300s for up to 8 hours.
- First Touch Writer Duo is now ready for test.

Verity Touch Writer Duo #2 (with ATI)
- No AutoBallot or vDrives are used. Be sure no devices are connected to the USB ports in vDrive bay and that the door is covered.
- Open folder on desktop titled **Touch Writer Duo**.
- Double tap **Audio 8 Hrs**. Audio will play on the headphones for up to 8 hours.
- Double tap **ATI Test**. Validate the function of the ATI by pressing buttons using rotating the scroll wheel. ~~Note that the following will appear in the program command window occasionally: *** *UNKNOWN* ***; this is an error in the software, but does not indicate the device is working inappropriately.~~
- Double tap **Platform Manager Tests** icon. Wait for the window to open and tap the Radio button under Touch Duo LEDs **Set Insertion Ready**.
- Open **Ethernet Tests** folder and tap **Set Device 3 IP** wait about 5 seconds, then tap **Ping Device 1.** This tool is a bit finicky, so ensure you see "IP currently set as Device 3" on the screen, and activity in the Console indicating a ping (see mitigation below).
- Click on the **start** button (windows icon), tap the **gear** icon, tap on **Devices**, tap on **Printers & Scanners**, tap on **Brother PJ-723 (Copy1**), click **Manage**, click **Printing preferences**.
- In the Printing Preferences window, click on the drop down next to **Form Feed Mode**, change it to **No Feed**, and hit **Apply**.
- Back in the Touch Writer Duo folder, double tap **8.5in Thermal Printer – 100 sheets**. Watch and wait to ensure it sends one job to the print queue (**Printing Page 1 of Document** window appears and disappears).
- Feed in a sheet of fanfold style thermal paper with the black square up and to righthand side. Only one sheet is needed. Be careful not to skew the paper. It will immediately print. It will then print every 300s for up to 8 hours.
- All units are now ready for test.

Network Communication Mitigation: If there is no communication on the Ethernet, then re-tap the **Set Device # IP** batch file. Windows may change IP addresses due to a conflict if a significant amount of time lapses between the set-up of each device. Alternatively, unplug the network cables from the center device prior to turning on the devices with the Test CFast card, then reconnect after configuration is complete.

Follow-up Operational Status Checks
- Replace the Test CFast cards with the appropriate Verity 2.7 CFast cards.
- Replace EMC test vDrive in the Controller with the vDrive for the election.
- Turn on all three devices with the red power button.
- Resume voting. Use the Verity Control to activate 2 voting sessions, printing one ballot off each TW Duo device.
- Turn off each device. Keep printed ballots aside.

- **Verity Touch Writer**
  - AutoBallot barcode reader connected via obfuscated passthrough from vDrive port
  - Headphones
  - Jelly Switch
  - Floor Standing, on Accessible Booth
- **Brother L6400 Laser Printer (Support equipment)**
  - Loaded with Ballot Stock
  - Tabletop

Additional Materials needed during EMC Test
  - Test CFast card (Win10 MVT 1.0.1 38BT)
  - vDrive for EMC testing

During Operational Status Check
  - Verity 2.7 Touch Writer (38BT) CFast card
  - Verity Key (to load test election only)
  - vDrive with test election

Initial Setup and Operational Status Check
- Plug in battery in the back of tablet.
- Place Verity Touch Writer atop the Accessible Booth.
- Place Brother L6400 printer on tabletop and load with letter sized paper.
- Plug in Brother L6400 printer to the back of the device using an obfuscated USB cable.
- Connect accessories and cables according to the testing block diagram. Cable slack should be bundled in serpentine fashion.
- Install the Verity 2.7 CFast card into the device.
- Connect Touch Writer and Printer to AC Power.
- Turn on all devices with the rear power button.
- Plug in the vDrive and Verity Key for the test election into the Touch Writer. The AutoBallot will need to be temporarily uninstalled to complete the authorization with the Verity Key.
- Load the election.
- Remove the Verity Key and reinstall the AutoBallot.

- Open polls.
- Activate a voting session and print a ballot.
- Turn off Touch Writer with the red power button.

Setup for EMC Testing
- Replace the Verity 2.7 CFast with the Test CFast card. Ensure that the tablet is fully reassembled prior to test.
- Replace vDrive with election with vDrive for EMC testing.
- Close the cover on the vDrive bay door.
- Open folder on desktop titled **Touch Writer**.
- Double tap button **RunIn Seiko Printer** icon. The thermal report printer will print every 300s for up to 40 hours.
- Double tap **File IO Test** icon. The vDrive for EMC testing will have 100 bytes of data written to it every 5 seconds for up to 20 hours.
- Double tap **Audio 8 Hrs** icon. Audio will play on the headphones for up to 8 hours.
- ~~Double tap **ATI Test** icon. Validate the function of the ATI by pressing buttons using rotating the scroll wheel. Note that the following will appear in the program command window occasionally: **** UNKNOWN ****; this is an error in the software, but does not indicate the device is working inappropriately.~~
- Double tap **Brother HL-L6400DWVS – 100 sheets** icon. The laser printer will print a sheet every 5 minutes for up to 8 hours.
- Device is now ready for testing.

Follow-up Operational Status Checks
- Replace the Test CFast card with the Verity 2.7 Touch Writer CFast card.
- Replace EMC test vDrive with the vDrive for the election.
- Turn on device with the red power button.
- Activate a voting session and print a ballot.
- Turn off device.

- **Verity Scan**
  - Floor Standing, on Ballot Box
  - Plugged in to AC line with provided power adapter.
  - **Additional Materials needed during EMC Test**
    - Test CFast card (Win10 MVT 1.0.1 38BT)
    - vDrive for EMC testing
    - Ballot Stock
    - USB keyboard

During Operational Status Check
- o Verity 2.7 Scan (38BT) CFast card
- o Verity Key (to load test election only)
- o vDrive with test election
- o Marked ballots valid for test election.

Initial Setup and Operational Status Check
- Plug in battery in the back of tablet.
- Place Verity Scan atop Ballot Box.
- Install the Verity 2.7 CFast card into the device.
- Connect device to AC Power.
- Turn on all device with the rear power button.
- Plug in Verity Key and vDrive with election into the Scan.
- Load the election.
- Remove the Verity Key.
- Open polls.
- Scan ballots valid for the test election.
- Turn off device with the red power button.

Setup Verity Scan for EMC Testing
- Replace the Verity 2.7 CFast with the Test CFast card. Ensure that the tablet is fully reassembled prior to test.
- Replace vDrive with election with vDrive for EMC testing.
- Insert keyboard into other USB port in vDrive Bay.
- Turn on device.
- Open folder on desktop titled **Scan**.
- Double tap **File IO Test** icon. The vDrive for EMC testing will have 100 bytes of data written to it every 5 seconds for up to 20 hours.
- Double tap **Audio 8 Hrs** icon. Audio will play on the internal speaker for up to 8 hours.
- Double tap **RunIn Seiko Printer** icon. The thermal report printer will print every 300s for up to 40 hours.
- Double tap **Platform Manager Tests** icon. Wait for window to open and tap the Radio button under Scanner LEDs **Set Ready to Scan**.
- Double Tap **Scanner Diagnostic** icon.
  - a. Hit "**Connect**", located just below the "**File**" menu.
  - b. Hit the **Options** tab.
  - c. Hit the checkbox **Enable Recycle Mode**.
  - d. Hit the checkbox **No Image Display**.
 - e. Use the keyboard to change **Rescan delay** to **15500**

f. Place a ballot into to Verity Scan. It will repeatedly feed the same ballot (shoeshine) without fully dropping it into the box.

▪ Remove keyboard and close cover of vDrive bay.
▪ Device is now ready for testing.

Follow-up Operational Status Checks
▪ Replace the Test CFast card with the Verity 2.7 Scan CFast card.
▪ Replace EMC test vDrive with the vDrive for the election.
▪ Turn on device with the red power button.
▪ Resume voting. Scan ballots valid for the test election.
▪ Turn off device.

3.2   Block Diagrams

Verity Controller / 2, Touch Writer Duo
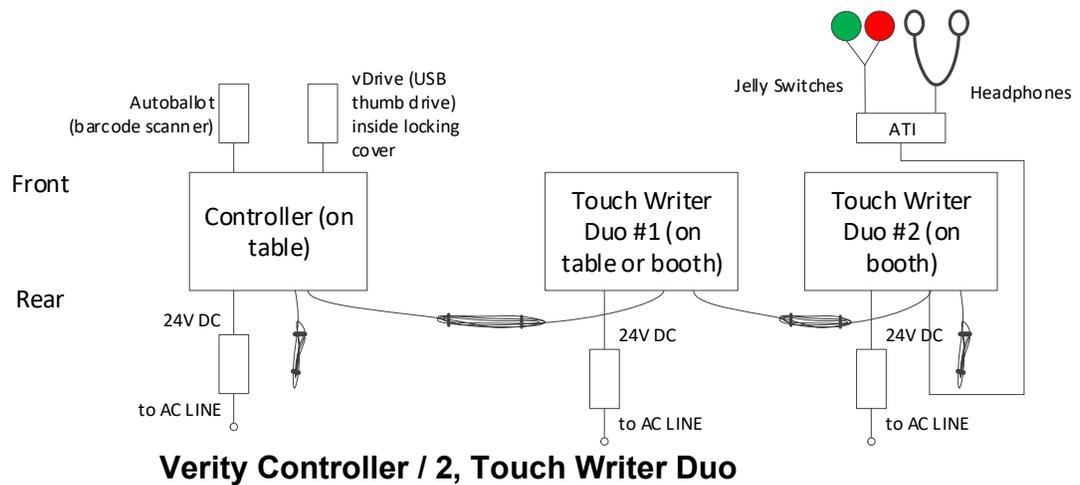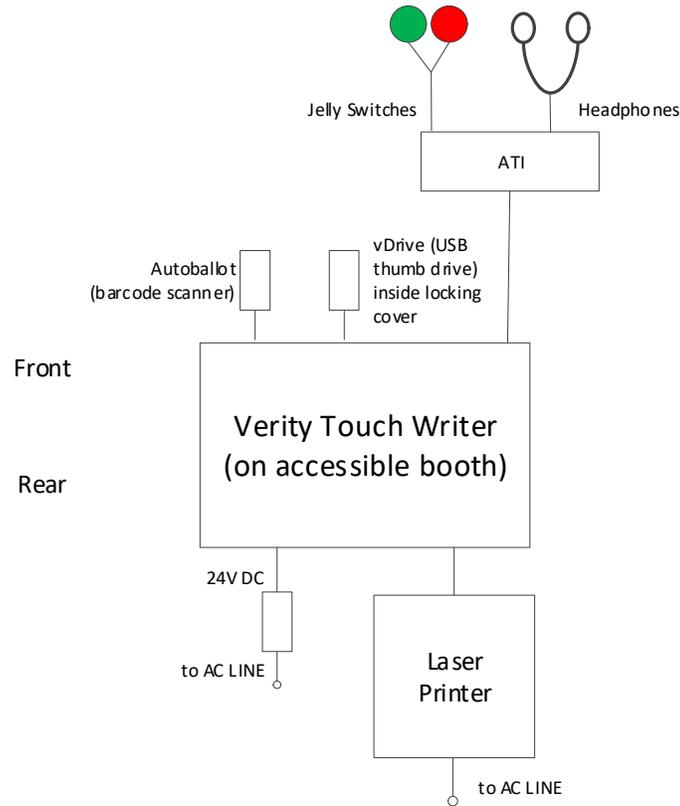
Verity Touch Writer with Laser Printer attached
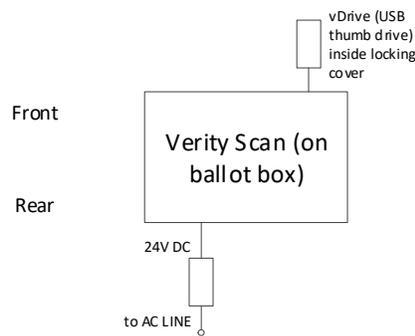
Verity Scan

3.3   Treatment of Test Failures

Failures of electrical tests or failures of the exercising software to perform shall be documented in the electrical test report.

3.4 Test Documentation

A test report shall be obtained from the test lab that meets the pertinent requirements of EN45001, and ISO/IEC17025, "General Requirements of Testing and Calibration Laboratories".

4 EMC / EMI Test Requirements

4.1 Electromagnetic Emissions

Objective: To verify that the electromagnetic emissions generated by the product under normal use and in the product's intended environment are below a level as specified by the 2005 VVSG 1.0.

4.1.1 Radiated Electromagnetic Emissions

Test Method: FCC Part 15, Radio Frequency Devices

Deviations from Test Method: None

Exit Criteria: The UUT shall meet the following emissions limits:

Frequency Band (MHz)	Class B Equipment 10m Measurement Distance (dBuV/m)
30 – 88	29.5
88-216	33.1
216 – 960	36.6
960-1000	43.5
1000-5000 (GHz)	43.5

4.1.2 Conducted Electromagnetic Emissions

Test Method: FCC Part 15, Radio Frequency Devices

Deviations from Test Method: None

Exit Criteria: The UUT shall meet the following emissions limits:

Frequency Band (MHz)	Class B Equipment Quasi-Peak Measurement (dBuV)	Average Measurement (dBuV)
0.15 – 0.5	66 decreasing with the log of the frequency to 56	56 decreasing with the log of the frequency to 46
0.5 – 5.0	56	46
5.0 – 30	60	50

4.2   Electromagnetic Immunity

Objective: To verify that the product performs as intended when exposed to different types of electromagnetic energies that may be encountered under normal use in the product's intended environment.

4.2.1 Immunity Compliance Criteria

Criterion A: The UUT shall be able to withstand the test without disruption of normal operation or loss of data.

Criterion B: The UUT shall be able to withstand the test without damage or loss of data. The equipment may reset or have momentary interruption so long as normal operation is resumed without human intervention or loss of data. Loss of data refers to votes that have been completed and confirmed to the voter.

Criterion C: The COTS and support equipment may have temporary loss of function or degradation of performance, where the correction **does not require** operator intervention or system rese.

4.2.2 Electrostatic Disruption

The test for electrostatic disruption **shall** be conducted in compliance with the test specified in IEC 61000-4-2 (2008-12) Ed. 2.0. *Contact discharge at the 8 kV level is the preferred test method. Where contact discharge cannot be applied, air discharge **shall** be used at all four identified test levels (2 kV, 4 kV, 8 kV, 15 kV). During exploratory pre-testing, investigation of the possibility of windowing effects should be explored. If there are indications that a unit has sensitivity at a lower voltage but not at a higher voltage, test levels **shall** be added to evaluate the immunity at lower voltage levels*

>   **Test Method:** IEC61000-4-2, Ed. 2, Electrostatic Disruption Test, (2008)
>   **Test Levels:** Will not exceed the required ESD limits for all ESD test levels.

Test Location	Discharge Voltage +/- (kV)
Indirect Contact: HCP	8.00
Indirect Contact: VCP	8.00
Direct Contact to Metallic Surfaces	8.00
Air Discharges to Insulated Surfaces	2.00, 4.00, 8.00, 15.00

>   **Deviations from Test Method:** None
>   **Exit Criterion:** B

Note: COTS printer connected via USB will not be subject to ESD testing.

4.2.3 Electromagnetic Susceptibility

Test Method: IEC61000-4-3, Radiated, Radio-Frequency, Electromagnetic Field Immunity Test, (1996)

Test Levels:

Frequency Range (MHz)	Test Level (V/m)	Modulation / Sweep
80 to 1000	10 V/m	1 kHz 80% AM, 1% steps with 3s dwell
Clock Frequencies	10 V/m	1 kHz 80% AM, 1% steps with 3s dwell

Deviations from Test Method: None

Exit Criterion: A

4.2.4 Electrical Fast Transient

Test Method: IEC61000-4-4, Electrical Fast Transient Test, (1995-01)

Note: Repetition Rate for all transient pulses will be 100 kHz

Test Levels:

a. +2 kV and −2 kV on External Power lines (both AC and DC)
b. +1 kV and −1 kV on Input/Output lines (signal, data, and control lines) longer than 3 meters
c. Repetition Rate for all transient pulses will be 100 kHz

Deviations from Test Method: None

Exit Criterion: A

4.2.5 Lightning Surge

Test Method: IEC61000-4-5, Lightning Surge Test, (1995-02)

Test Levels:

Test Voltage: +/- kV	Coupling Mode
+/- 2 kV	AC line to line (Differential Mode)
+/- 2 kV	AC line to earth (Common Mode)
+ or - 0.5 kV	DC line to line >10m (Differential Mode)
+ or - 0.5 kV	DC line to earth >10m (Common Mode)
+/- 1 kV	I/O sig/control >30m

Deviations from Test Method: None

Exit Criterion: A

4.2.6 Conducted RF Immunity

Test Method: IEC61000-4-6, Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields, (1996-04)

Test Levels:

Conducted RF Energy
10V rms over the frequency range 150 KHz to 80 MHz with an 80% amplitude modulation with a 1 KHz sine wave AC & DC power.
10V sig/control >3 m over the frequency range 150 KHz to 80 MHz with an 80% amplitude modulation with a 1 KHz sine wave

Deviations from Test Method: None

Exit Criterion: A

4.2.7 Magnetic Fields Immunity

Test Method: IEC61000-4-8, Power Frequency Magnetic Field Immunity Test, (1993-06)

Test Levels:

AC magnetic fields of: 30 A/m at 60 Hz.

Deviations from Test Method: None

Exit Criterion: A

4.2.8 Electrical Power Disturbance

Test Method: IEC61000-4-11, Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests, (1994-06)

Test Levels:

Electrical Power Disturbance
Voltage dip of 30% of nominal @10 ms;
Voltage dip of 60% of nominal @100 ms & 1 sec
Voltage dip of >95% interrupt @5 sec
Surges of + 15% and − 15% line variations of nominal line voltage
Electric power increases of 7.5% and reductions of 12.5% of nominal specified power supply for a period of up to four hours at each power level

Deviations from Test Method: None

Exit Criterion: A

5 EMC / EMI Test Summary

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

Test	Test Specification	VVSG 1.0	Comments
Electromagnetic Emissions Tests			
Radiated Electromagnetic Emissions	FCC, Part 15 Class B ANSI C63.4	**V1:** 2.1.4 (b,c), 4.1.2.9, 4.1.7.1 **V2**: 4.8	
Conducted Electromagnetic Emissions	FCC, Part 15 Class B ANSI C63.4	**V1:** 2.1.4 (b,c), 4.1.2.9, 4.1.7.1 **V2**: 4.8	
Electromagnetic Immunity Tests			
Electrostatic Disruption	IEC 61000-4-2 (2008-12) Ed.2.0	**V1:** 2.1.4 (b), 4.1.2.8, 4.1.7.1 **V2**: 4.8	See RFI 2010-01 **COTS printer connected via USB will not be subject to ESD testing**
Electromagnetic Susceptibility	IEC 61000-4-3 (1996)	**V1:** 2.1.4 (b), 4.1.2.10, 4.1.7.1 **V2**: 4.8	
Electrical Fast Transient	IEC 61000-4-4 (2004-07) Ed.2.0	**V1:** 2.1.4 (b), 4.1.2.6, 4.1.7.1 **V2**: 4.8	
Lightning Surge	IEC 61000-4-5 (1995-02)	**V1:** 2.1.4 (b), 4.1.2.7, 4.1.7.1 **V2**: 4.8	
Conducted RF Immunity	IEC 61000-4-6 (1996-04)	**V1:** 2.1.4 (b), 4.1.2.11, 4.1.7.1 **V2**: 4.8	
Magnetic Fields	IEC 61000-4-8 (1993-06)	**V1:** 2.1.4 (b), 4.1.2.12, 4.1.7.1 **V2**: 4.8	
Electrical Power Disturbance	IEC 61000-4-11 (1994-06)	**V1:** 2.1.4 (b), 4.1.2.5, 4.1.7.1 **V2**: 4.8	60 Hz input of 120/60 (0.6 cycles, 6 cycles, 300 cycles)

End of ELEC Hardware Test Plan